GROUP 00

GENERAL

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GENERAL 00

GENERAL <ELECTRICAL> 00E

GROUP 00

GENERAL

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HOW TO USE THIS MANUAL

M1001000103302

SCOPE OF MAINTENANCE, REPAIR AND SERVICING EXPLANATIONS

This manual provides explanations, etc. concerning procedures for the inspection, maintenance, repair and servicing of the subject model. Note, however, that for engine and transmission-related component parts, this manual covers only on-vehicle inspections, adjustments, and the removal and installation procedures for major components. For detailed information concerning the inspection, checking, adjustment, disassembly and reassembly of the engine, transmission and major components after they have been removed from the vehicle, please refer to separate manuals covering the engine and the transmission.

ON-VEHICLE SERVICE

"On-vehicle Service" is procedures for performing inspections and adjustments of particularly important locations with regard to the construction and for maintenance and servicing, but other inspection (for looseness, play, cracking, damage, etc.) must also be performed.

INSPECTION

Under this title are presented inspection and checking procedures to be performed by using special tools and measuring instruments and by feeling, but, for actual maintenance and servicing procedures, visual inspections should always be performed as well.

DEFINITION OF TERMS

STANDARD VALUE

Indicates the value used as the standard for judging the quality of a part or assembly on inspection or the value to which the part or assembly is corrected and adjusted. It is given by tolerance.

LIMIT

Shows the standard for judging the quality of a part or assembly on inspection and means the maximum or minimum value within which the part or assembly must be kept functionally or in strength. It is a value established outside the range of standard value.

REFERENCE VALUE

Indicates the adjustment value prior to starting the work (presented in order to facilitate assembly and adjustment procedures, and so they can be completed in a shorter time).

DANGER, WARNING, AND CAUTION

DANGER, WARNING, and CAUTION call special attention to a necessary action or to an action that must be avoided. The differences among DANGER, WARNING, and CAUTION are as follows:

- If a DANGER is not followed, the result is severe bodily harm or even death.
- If a WARNING is not followed, the result could be bodily injury.
- If a CAUTION is not followed, the result could be damage to the vehicle, vehicle components or service equipment.

INDICATION OF TIGHTENING TORQUE

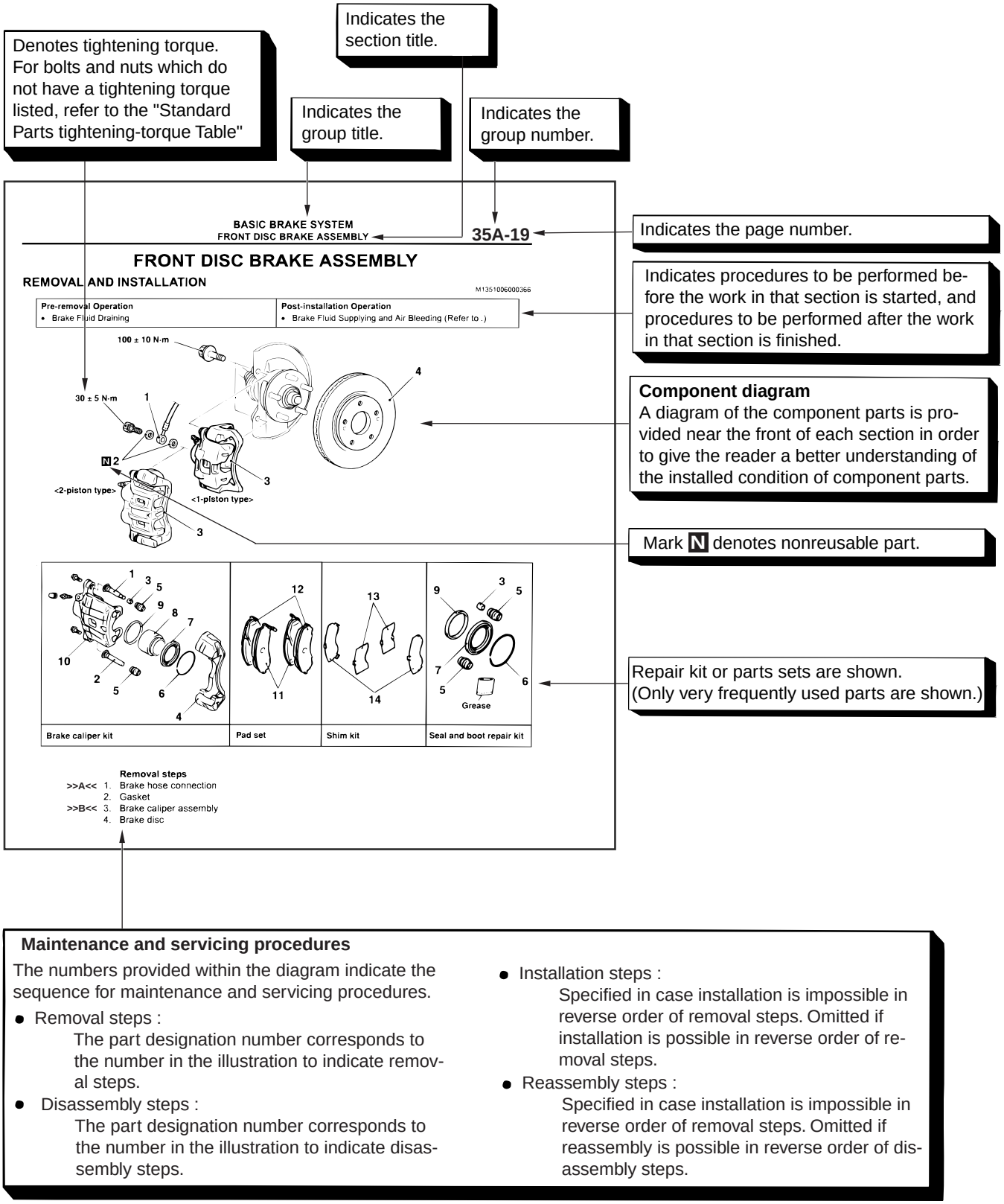
Tightening torques (units: N·m) are set to take into account the central value and the allowable tolerance. The central value is the target value, and the allowable tolerance provides the checking range for tightening torques. If bolts and nuts are not provided with tightening torques.

MODEL INDICATIONS

The following abbreviations are used in this manual for identification of model types.

2500:Indicates an engine with the 2,477mL <4D56> diesel engine.
2WD:Indicates the 2-wheel drive vehicles.
4WD:Indicates the 4-wheel drive vehicles.
A/C:Indicates the air conditioner.
A/T:Indicates the automatic transmission.
DOHC: Indicates an engine with the double overhead camshaft.
M/T:Indicates the manual transmission.

EXPLANATION OF MANUAL CONTENTS



Maintenance and servicing procedures

The numbers provided within the diagram indicate the sequence for maintenance and servicing procedures.

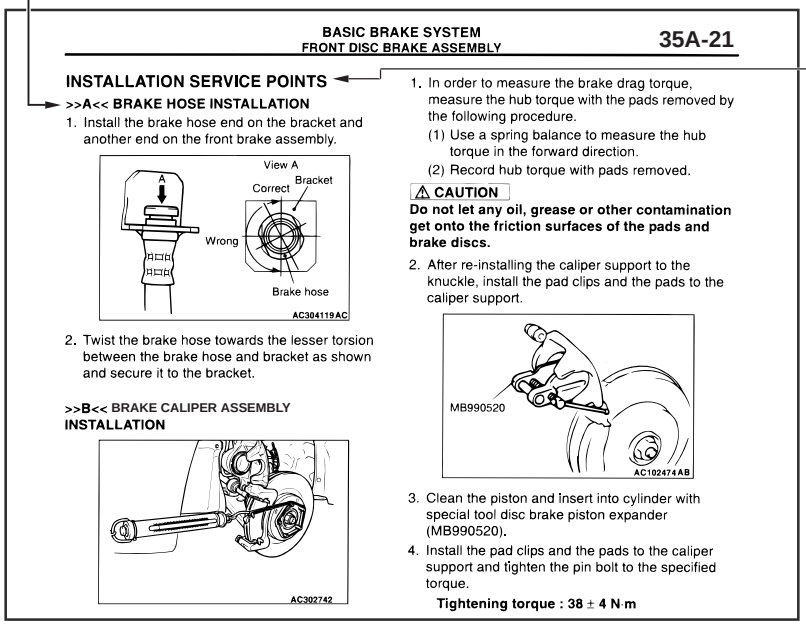
- Removal steps :
  The part designation number corresponds to the number in the illustration to indicate removal steps.
- Disassembly steps :
  The part designation number corresponds to the number in the illustration to indicate disassembly steps.
- Installation steps :
  Specified in case installation is impossible in reverse order of removal steps. Omitted if installation is possible in reverse order of removal steps.
- Reassembly steps :
  Specified in case installation is impossible in reverse order of removal steps. Omitted if reassembly is possible in reverse order of disassembly steps.

AC311238AE

Classifications of major maintenance / service points

When there are major points relative to maintenance and servicing procedures (such as essential maintenance and service points, maintenance and service standard values, information regarding the use of special tools, etc.). These are arranged together as major maintenance and service points and explained in detail.

<<A>> : Indicates that there are essential points for removal or disassembly.
>>A<< : Indicates that there are essential points for installation or reassembly.



BASIC BRAKE SYSTEM
FRONT DISC BRAKE ASSEMBLY
35A-21

INSTALLATION SERVICE POINTS

>>A<< BRAKE HOSE INSTALLATION

1. Install the brake hose end on the bracket and another end on the front brake assembly.

View A
Correct
Bracket
Wrong
Brake hose
AC304119AC

2. Twist the brake hose towards the lesser torsion between the brake hose and bracket as shown and secure it to the bracket.

>>B<< BRAKE CALIPER ASSEMBLY INSTALLATION

AC302742

1. In order to measure the brake drag torque, measure the hub torque with the pads removed by the following procedure.
   (1) Use a spring balance to measure the hub torque in the forward direction.
   (2) Record hub torque with pads removed.

⚠ CAUTION
Do not let any oil, grease or other contamination get onto the friction surfaces of the pads and brake discs.

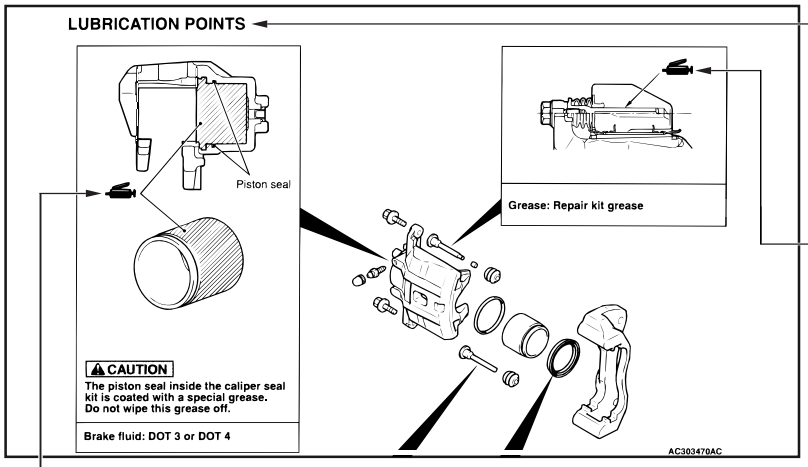
2. After re-installing the caliper support to the knuckle, install the pad clips and the pads to the caliper support.

MB990520
AC102474AB

3. Clean the piston and insert into cylinder with special tool disc brake piston expander (MB990520).
4. Install the pad clips and the pads to the caliper support and tighten the pin bolt to the specified torque.

Tightening torque : 38 ± 4 N·m

Operating procedures, cautions, etc. on removal, installation, disassembly and reassembly are described



LUBRICATION POINTS

Piston seal

⚠ CAUTION
The piston seal inside the caliper seal kit is coated with a special grease. Do not wipe this grease off.

Brake fluid: DOT 3 or DOT 4

Grease: Repair kit grease

AC303470AC

The title of the page (following the page on which the diagram of component parts is presented) indicating the locations of lubrication and sealing procedures.

Indicates (by symbols) where lubrication is necessary.

Symbols for lubrication, sealants and adhesives

Symbols are used to show the locations for lubrication and for application of sealants and adhesives.
These symbols are included in the diagram of component parts or on the page following the component parts page. The symbols do not always have accompanying text to support that symbol.

- : Grease (Multi-purpose grease unless there is a brand or type specified)
- : Sealant or adhesive
- : Automatic transmission fluid, brake fluid, power steering fluid or air conditioning compressor oil
- : Engine oil or gear oil
- : Adhesive tape or butyl rubber tape

AC509265AF

HOW TO USE TROUBLESHOOTING/INSPECTION SERVICE POINTS

CONTENTS OF TROUBLESHOOTING

M1001013300794

⚠ CAUTION

During diagnosis, a diagnosis code associated with other system may be set when the ignition switch is turned on with connector(s) disconnected. On completion, confirm all systems for diagnosis code(s). If diagnosis code(s) are set, erase them all.

⚠ WARNING

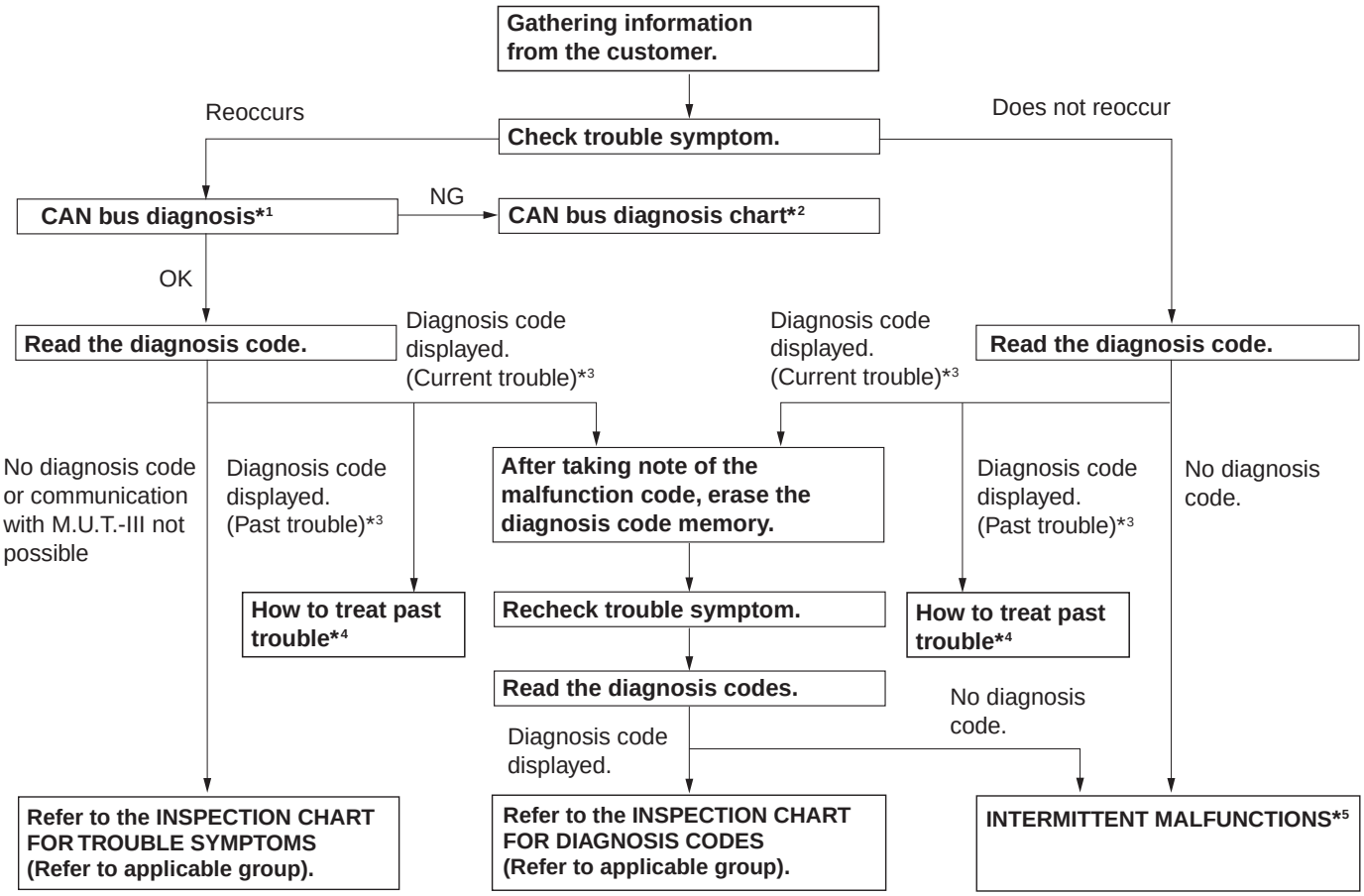
Since the radiator fan rotates during CAN bus line diagnostics, make sure that no one is servicing the engine compartment before diagnosing the CAN bus line. Since the CAN communication stops when diagnosing the CAN bus line, the ETACS-ECU detects the time-out of the engine-ECU, and activates the radiator fan to prevent overheating as fail-safe.

Troubleshooting of electronic control systems for which the M.U.T.-III can be used follows the basic outline described below. Even in systems for which the M.U.T.-III cannot be used, some of these systems still follow this outline.

1. STANDARD FLOW OF DIAGNOSIS TROUBLESHOOTING

Troubleshooting sections are based on the diagnostic flow as below. If the diagnostic flow is different from that given below, or if additional explanation is required, the details of such differences or additions will also be listed.

Diagnosis method



AC501888

- *1: For how to diagnose CAN bus lines, refer to GROUP 54C .
- *2: For the CAN bus diagnosis chart, refer to GROUP 54C .
- *3: When the M.U.T.-III detects a diagnosis code, its display informs users whether a mechanical problem currently exists or whether it existed before. The message for the former state identifies it as a "Active" and the message for the latter identifies it as a "Stored".
- *4: For how to treat past trouble, refer to P.00-15.
- *5: For how to cope with intermittent malfunctions, refer to P.00-14.

2. SYSTEM OPERATION AND SYMPTOM VERIFICATION TESTS

If verification of the symptom(s) is difficult, procedures for checking operation and verifying symptoms are shown.

3. DIAGNOSIS FUNCTION

Details specific to individual systems are described.

4. DIAGNOSIS CODE CHART

Diagnosis codes and diagnostic items are shown.

5. DIAGNOSIS CODE PROCEDURES

Indicates the inspection procedures corresponding to each diagnosis code (Refer to How to Use Inspection Procedures P.00-9).

6. TROUBLE SYMPTOM CHART

If there are trouble symptoms even though the M.U.T.-III does not find any diagnosis codes, Inspection procedures for each trouble symptom will be found by means of this chart.

7. SYMPTOM PROCEDURES

Indicates the inspection procedures corresponding to each symptoms classified in the Symptom Chart (Refer to How to Use Inspection Procedures P.00-9).

8. SERVICE DATA REFERENCE TABLE

Inspection items and normal judgment values have been provided in this chart as reference information.

9. ACTUATOR TEST TABLE

The Actuator Test item numbers, inspection items, and judgment values have been provided in this chart as reference information.

10. CHECK AT ECU TERMINALS

Terminal numbers for the ECU connectors, inspection items, and judgment values have been provided in this chart as reference information.

11. INSPECTION PROCEDURE BY USING AN OSCILLOSCOPE

When there are inspection procedures using an oscilloscope, these are described here.

DIAGNOSIS FUNCTION

M1001013400865

The diagnosis function retrieves diagnosis code and service data by M.U.T.-III and enables the performance of the actuator test.

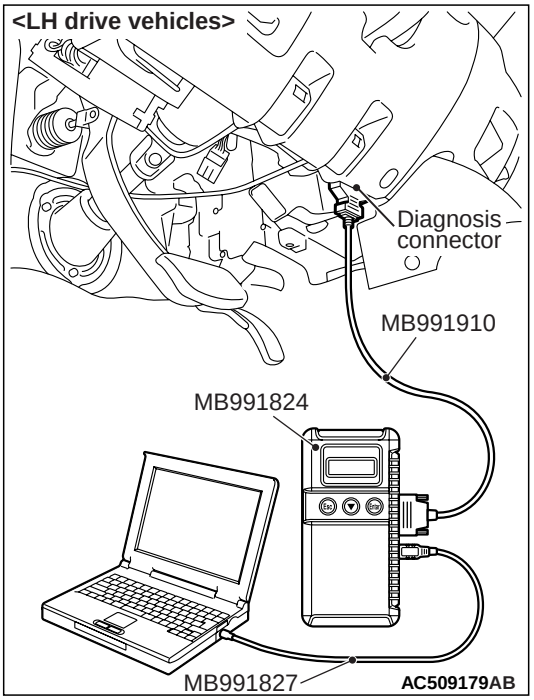
- DIAGNOSIS CODE
- Service data sent
- Actuator test
- Diagnosis deletion using M.U.T.-III
- Freeze frame data
- Status indication by diagnosis code
- ECU information display

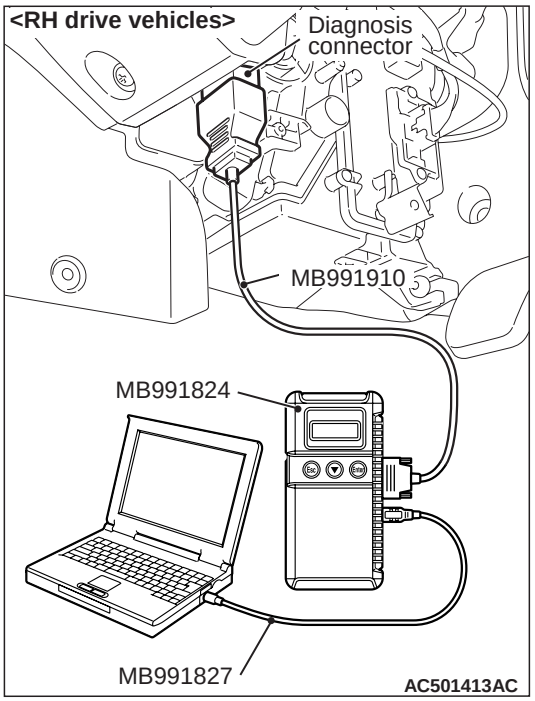
NOTE: If a diagnosis code is set, the "status indication by diagnosis code" informs users whether a mechanical problem currently exists (current trouble) or whether it existed before but normal operation has been restored (past trouble).

HOW TO READ DIAGNOSIS CODE

⚠ CAUTION

Before connecting or disconnecting the M.U.T.-III, turn the ignition switch to the "LOCK" (OFF) position.





Connect the M.U.T.-III to the 16-pin diagnosis connector, and read the diagnosis code.

NOTE: For details on how to use the M.U.T.-III, refer to the "M.U.T.-III operation manual."

1. Ensure that the ignition switch is at the "LOCK" (OFF) position.
2. Start up the personal computer.

3. Connect special tool M.U.T.-III USB cable MB991827 to V.C.I. (MB991824) and the personal computer.
4. Connect special tool M.U.T.-III main harness A (MB991910) to the V.C.I.
5. Connect the M.U.T.-III main harness A to the diagnosis connector of the vehicle.
6. Turn the V.C.I. power switch to the "ON" position.

   NOTE: When the V.C.I. is energized, the V.C.I. indicator lamp will be illuminated in a green colour.
7. Start the M.U.T.-III system on the personal computer and turn the ignition switch to the "ON" position.
8. Read the diagnosis code.

NOTE: When storing the diagnosis code as reference information, the freeze frame data obtains the data when the diagnosis code is confirmed, and then stores the ECU status of that time. By analysing each data using M.U.T.-III, troubleshooting can be carried out efficiently.

9. Disconnecting the M.U.T.-III is the reverse of the connecting sequence, making sure that the ignition switch is at the "LOCK" (OFF) position.

ERASING DIAGNOSIS CODE

⚠ CAUTION

Before connecting or disconnecting the M.U.T.-III, turn the ignition switch to the "LOCK" (OFF) position.

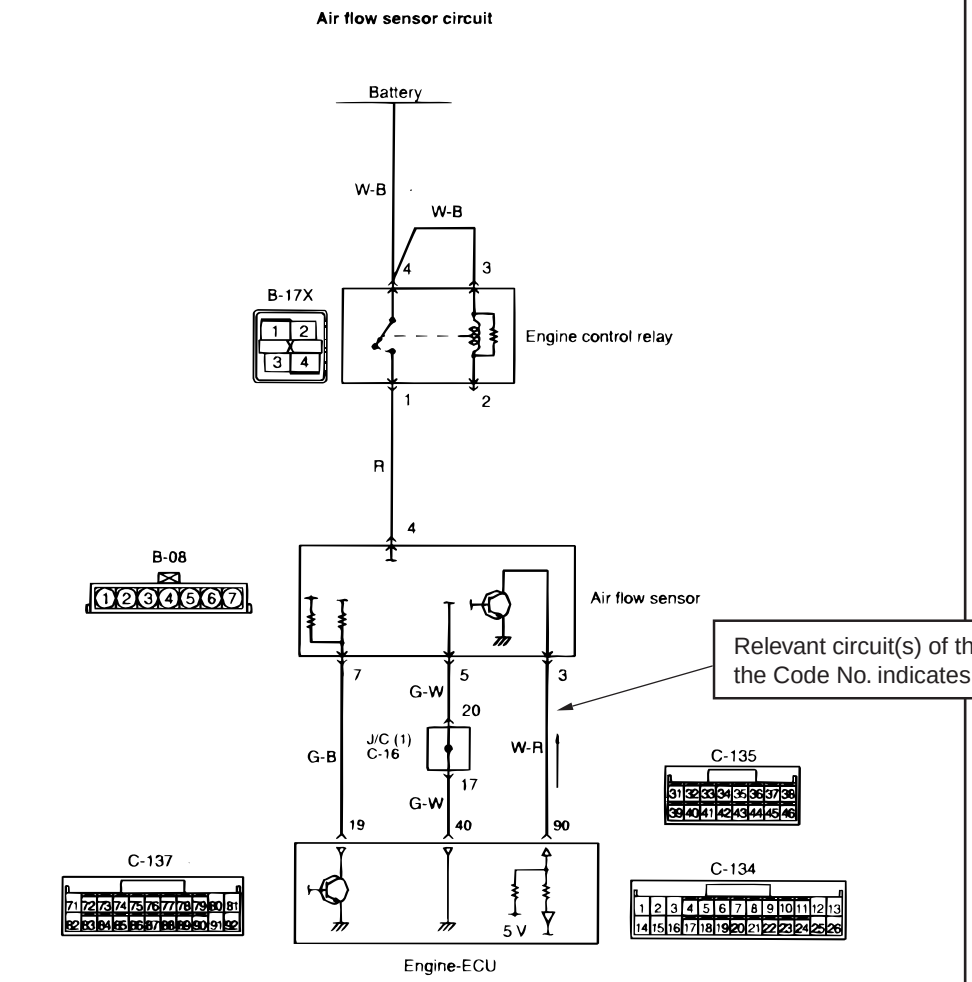
Connect the M.U.T.-III to the diagnosis connector, and erase the diagnosis code. The procedure is the same as "How to Read Diagnosis Code ."

HOW TO USE THE INSPECTION PROCEDURES

M1001013500345

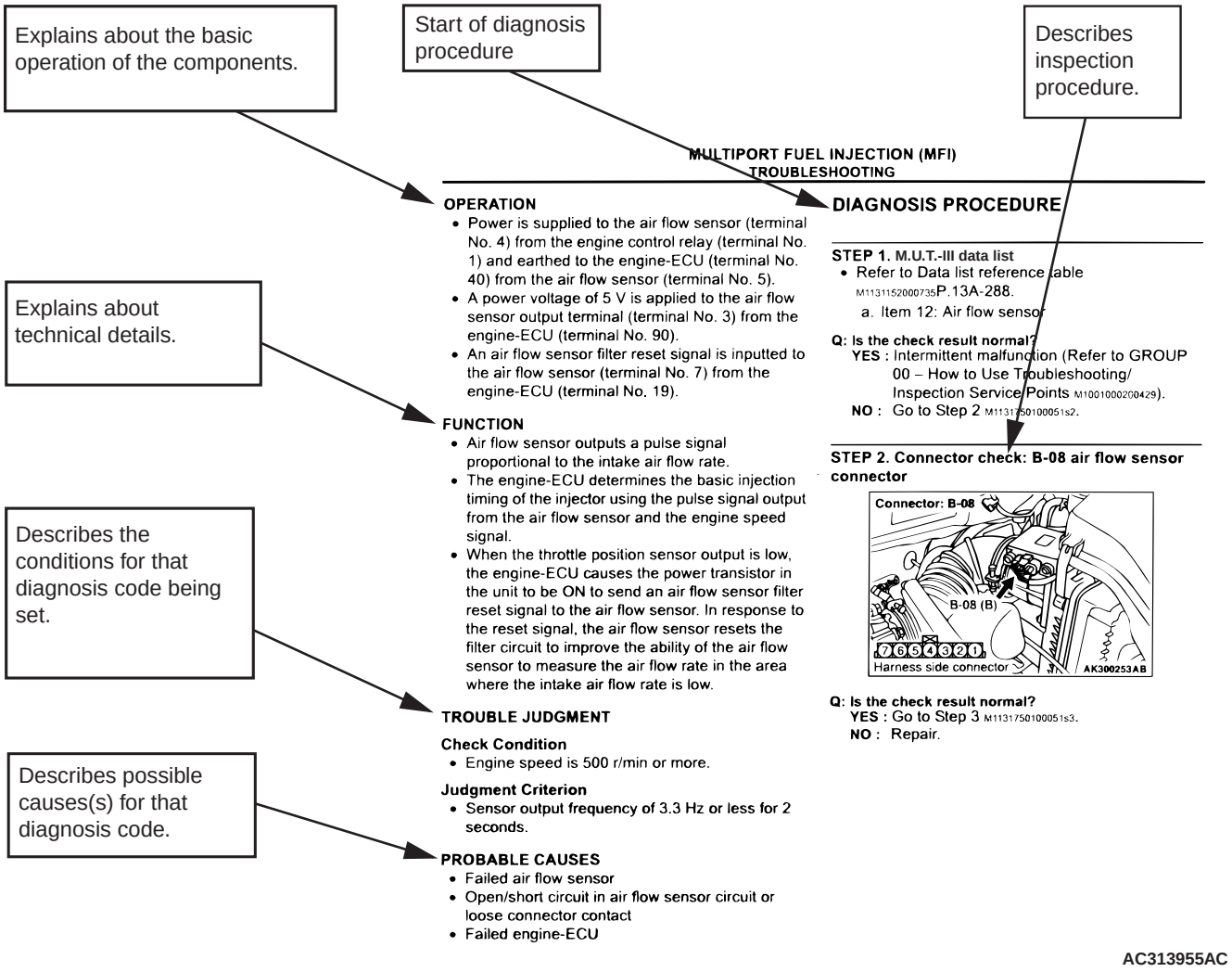
The causes of many of the problems occurring in electric circuitry are generally the connectors, components, the ECU, the wiring harnesses between connectors, in that order. These inspection procedures follow this order. They first try to discover a problem with a connector or a defective component.

Code No. P0100 Air Flow Sensor System



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V:Violet

AC301964AC



AC313955AC

CURRENT TROUBLE

Indicates that the status is "Active" and the trouble is currently present. Carry out troubleshooting as described in the applicable inspection procedure.

PAST TROUBLE

Indicates that the status is "Stored" and the trouble is historic. Since the trouble may still be present, set the vehicle to the diagnosis code detection condition and check that the status changes to "Active". If the status does not change from "Stored", observe the applicable inspection procedure with particular emphasis on connector(s) and wiring harness.

HARNESS CHECK

Check for an open or short circuit in the harness between the terminals which are faulty according to the connector measurements. Carry out this inspection while referring to the Electrical Wiring Manual. Here, "Check the wiring harness between the power supply and terminal xx" also includes checking for blown fuse. For inspection service points when there is a blown fuse, refer to "Inspection Service Points for a Blown Fuse P.00-14."

MEASURES TO TAKE AFTER REPLACING THE ECU

If the trouble symptoms have not disappeared even after replacing the ECU, repeat the inspection procedure from the beginning.

CONNECTOR MEASUREMENT SERVICE POINTS

M1001013600386

⚠ CAUTION

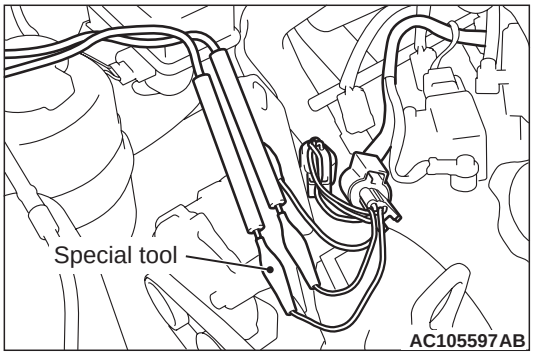
During diagnosis, a diagnosis code associated with other system may be set when the ignition switch is turned on with connector(s) disconnected. On completion, confirm all systems for diagnosis code(s). If diagnosis code(s) are set, erase them all.

Turn the ignition switch to the "LOCK" (OFF) position when connecting and disconnecting the connectors. Turn the ignition switch to "ON" when measuring, unless there are instructions to the contrary.

IF INSPECTING WITH THE CONNECTOR CONNECTED <WATERPROOF CONNECTORS>

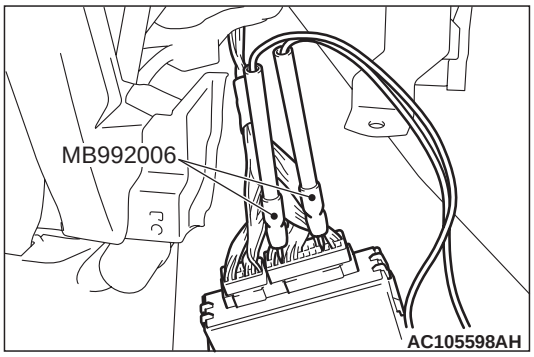
⚠ CAUTION

Never insert a test probe from the harness side, as this will reduce the waterproof performance and result in corrosion.



Use the special tools such as test harness, harness connector or check harness.

IF INSPECTING WITH THE CONNECTOR CONNECTED <ORDINARY (NON-WATERPROOF) CONNECTORS>

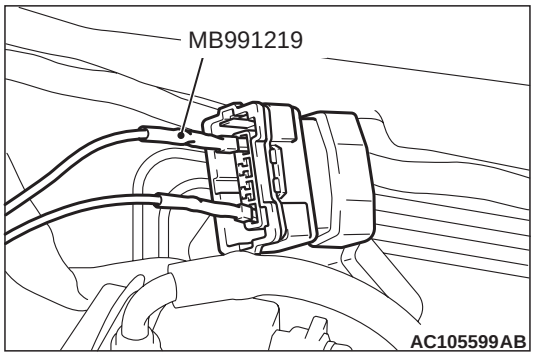


Inspect by inserting a test probe from the harness side. If the connector is too small to insert a test probe (e.g. control unit connector), do not insert it forcibly. Use special tool extra fine probe (MB992006).

IF INSPECTING WITH THE CONNECTOR DISCONNECTED <WHEN INSPECTING A FEMALE PIN>

⚠ CAUTION

- **Use special tool inspection harness (MB991219). If the test bar is inserted forcibly, it will cause a poor contact.**
- **If the connector is disconnected, a diagnosis code may be stored for the system to be checked or other systems.**

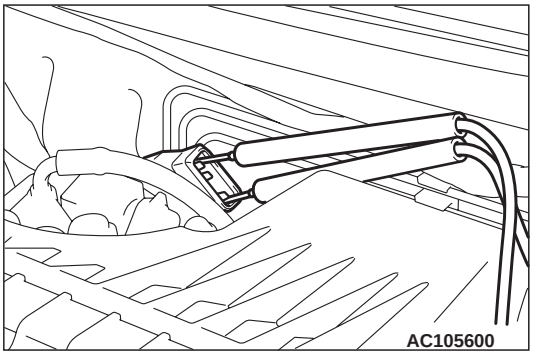


Use inspection harness (MB991219) of special tool harness set (MB991223).

IF INSPECTING WITH THE CONNECTOR DISCONNECTED <WHEN INSPECTING A MALE PIN>

⚠ CAUTION

- **Be careful not to short the connector pins with the test bars. To do so may damage the circuits inside the ECU.**
- **If the connector is disconnected, a diagnosis code may be stored for the system to be checked or other systems.**

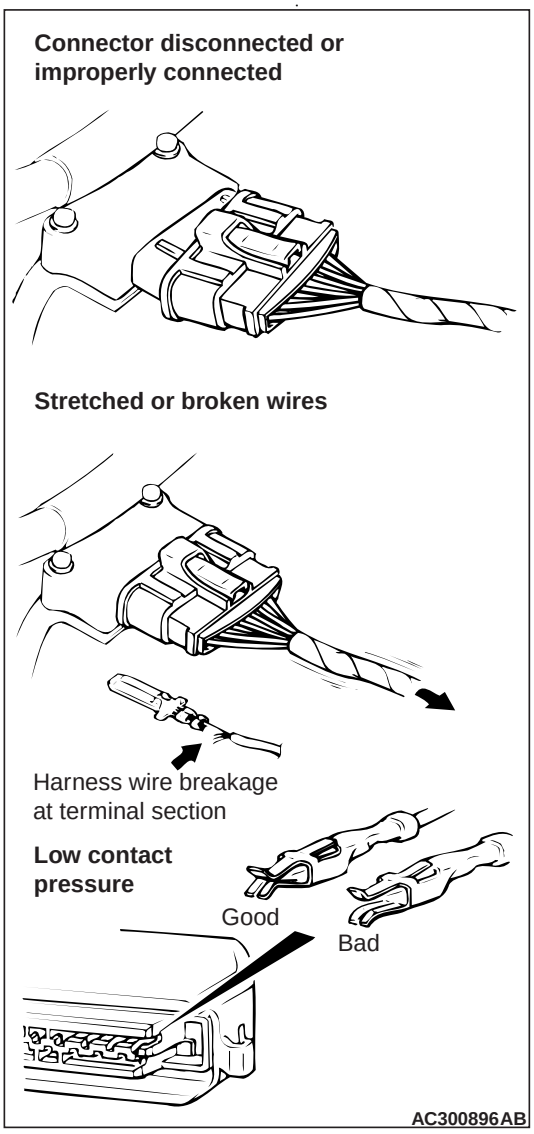


Touch the pin directly with the test bar.

CONNECTOR INSPECTION SERVICE POINTS

M1001013700275

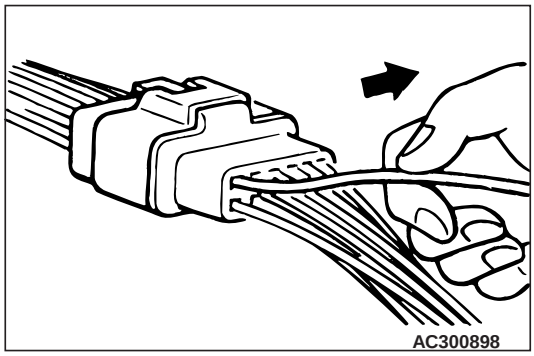
VISUAL INSPECTION



Connector is disconnected or improperly connected

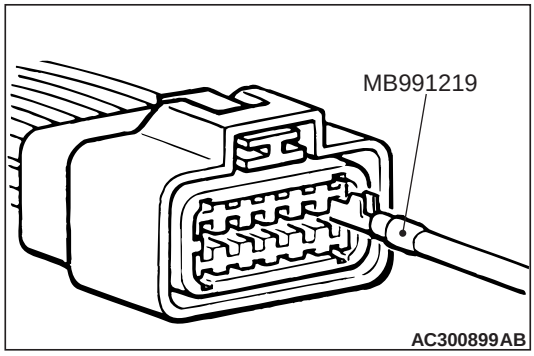
- Connector pins are pulled out
- Due to harness tension at terminal section
- Low contact pressure between male and female terminals
- Low connection pressure due to rusted terminals or foreign matter lodged in terminals

CONNECTOR PIN INSPECTION



If the connector pin stopper is damaged, the terminal connections (male and female pins) will not be perfect even if the connector body is connected, and the pins may pull out of the reverse side of the connector. Therefore, gently pull the harnesses one by one to make sure that no pins pull out of the connector.

CONNECTOR ENGAGEMENT INSPECTION



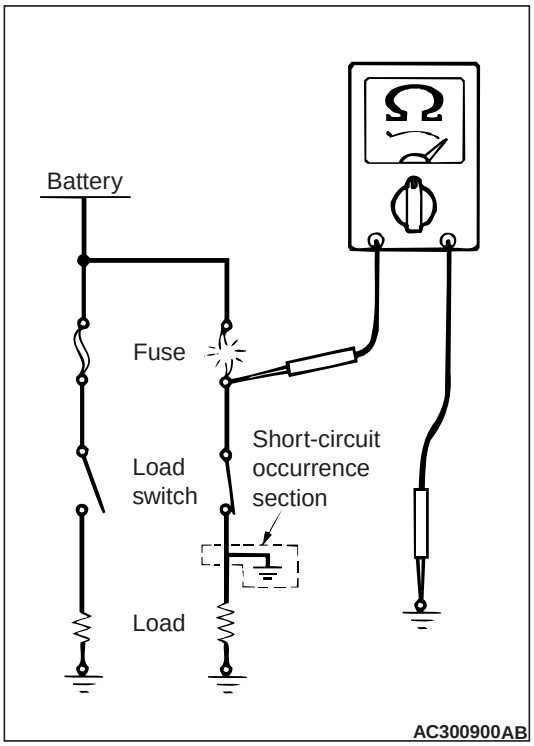
Use special tool inspection harness (MB991219) (connector pin connection pressure inspection harness of the inspection harness set) to inspect the engagement of the male pins and female pins. (Pin drawing force: 1 N or more)

INSPECTION SERVICE POINTS FOR A BLOWN FUSE

M1001013800250

⚠ CAUTION

A diagnosis code may be stored due to a blown fuse.



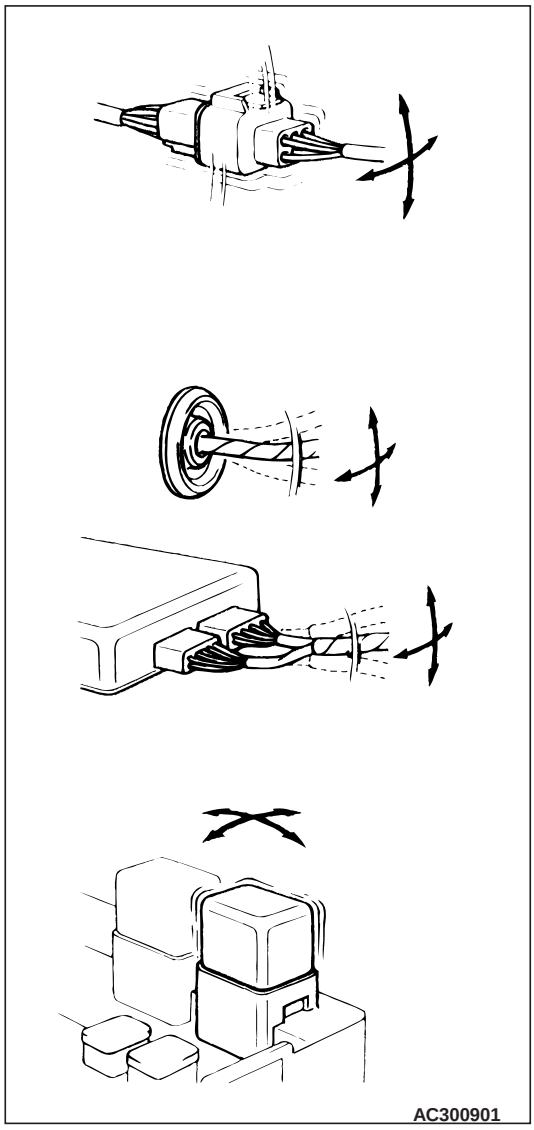
Remove the blown fuse and measure the resistance between the load side of the blown fuse and the earth. Close the switches of all circuits which are connected to this fuse. If the resistance is almost 0 Ω at this time, there is a short somewhere between these switches and the load. If the resistance is not 0 Ω, there is no short at the present time, but a momentary short has probably caused the fuse to blow.

The main causes of a short circuit are the following.

- Harness being clamped by the vehicle body
- Damage to the outer casing of the harness due to wear or heat
- Water getting into the connector or circuitry
- Human error (mistakenly shorting a circuit, etc.)

HOW TO COPE WITH INTERMITTENT MALFUNCTIONS

M1001013900257



Intermittent malfunctions often occur under certain conditions, and if these conditions can be ascertained, determining the cause becomes simple. In order to ascertain the conditions under which an intermittent malfunction occurs, first ask the customer for details about the driving conditions, weather conditions, frequency of occurrence and trouble symptoms, and then try to recreate the trouble symptoms. Next, ascertain whether the reason why the trouble symptom occurred under these conditions is due to vibration, temperature or some other factor. If vibration is thought to be the cause, carry out the following checks with the connectors and components to confirm whether the trouble symptom occurs. The objects to be checked are connectors and components which are indicated by inspection procedures or given as probable causes (which generates diagnosis codes or trouble symptoms).

- Gently shake the connector up, down and to the left and right.
- Gently shake the wiring harness up, down and to the left and right.
- Gently rock each sensor and relay, etc. by hand.
- Gently shake the wiring harness at suspensions and other moving parts.

NOTE: If determining the cause is difficult, the drive recorder function of the M.U.T.-III can also be used. (For details on how to use the M.U.T.-III, refer to the "M.U.T.-III operation manual).

HOW TO TREAT PAST TROUBLE

M1001014100243

Since the trouble may still be present even the status is "Stored", set the vehicle to the diagnosis code detection condition and check that the status changes to "Active". If the status does not change from "Stored", carry out the following procedure.

1. Establish from the customer whether a fuse or connector has been replaced or disconnected.
2. If yes, erase the diagnosis code, and then check that no diagnostic code is reset. If no diagnosis code is reset, the diagnosis is complete.
3. If no, follow the applicable Diagnostic Trouble Code Chart. Then check the wiring harness and connector, and refer to "How to Cope with Intermittent Malfunction P.00-14 ."

VEHICLE IDENTIFICATION

MODELS

M1001000306510

VEHICLES FOR EUROPE

<SINGLE CAB>

Model code		Engine model	Transmission model	Fuel supply system
KA4T	NENMZL6	4D56 (2,477 mL) DOHC DI-D (Direct Injection-Diesel) engine with intercooled turbocharger	R5MB1 (Rear wheel drive 2WD, 5M/T)	Common rail fuel injection (Electrical fuel injection)
KB4T	NENMZL6/R6		V5MB1 (Easy select 4WD, 5M/T)	

<CLUB CAB>

Model code		Engine model	Transmission model	Fuel supply system
KB4T	NCNUZL6/R6	4D56 (2,477 mL) DOHC DI-D (Direct Injection-Diesel) engine with intercooled turbocharger	V5MB1 (Easy select 4WD, 5M/T)	Common rail fuel injection (Electrical fuel injection)
	GCNXZL6		V5MB1 (Super select 4WD, 5M/T)	
	GCNXZPL6	4D56 (2,477 mL) DOHC DI-D (Direct Injection-Diesel) high-power engine with intercooled turbocharger		

<DOUBLE CAB>

Model code		Engine model	Transmission model	Fuel supply system
KA4T	NJNUZL6	4D56 (2,477 mL) DOHC DI-D (Direct Injection-Diesel) engine with intercooled turbocharger	R5MB1 (Rear wheel drive 2WD, 5M/T)	Common rail fuel injection (Electrical fuel injection)
	HJNUZL6			
	HJRUZL6		R4A5A (Rear wheel drive 2WD, 4A/T)	
KB4T	NJNUZL6/R6		V5MB1 (Easy select 4WD, 5M/T)	
	NJRUZL6		V4A5A (Easy select 4WD, 4A/T)	
	GJNXZL6		V5MB1 (Super select 4WD, 5M/T)	
	GJRXZR6		V4A5A (Super select 4WD, 4A/T)	
	GJNXZPL6/R6	4D56 (2,477 mL) DOHC DI-D (Direct Injection-Diesel) high-power engine with intercooled turbocharger	V5MB1 (Super select 4WD, 5M/T)	
	GJYXZPL6/R6		V5A5A (Super select 4WD, 5A/T)	

VEHICLES FOR RUSSIA (EASTERN EUROPE COUNTRIES)

Model code		Engine model	Transmission model	Fuel supply system
KB4T	NJNUZL6Z	4D56 (2,477 mL) DOHC DI-D (Direct Injection-Diesel) engine with intercooled turbocharger	V5MB1 (Easy select 4WD, 5M/T)	Common rail fuel injection (Electrical fuel injection)
	GJNXZL6Z		V5MB1 (Super select 4WD, 5M/T)	
	GJRXZL6Z		V4A5A (Super select 4WD, 4A/T)	

MODEL CODE <VEHICLES FOR EUROPE AND RUSSIA (EASTERN EUROPE COUNTRIES)>

AC407365AK

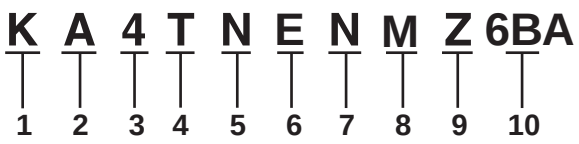
No.	Item	Content	
1	Development	K	L200
2	Drive system	A	2WD
		B	4WD
3	Engine type	4	2.5L diesel engine (4D56)
4	Sort	T	Truck
5	Vehicle width	G	Wide fender
		H	High rider
		N	Standard
6	Body style	E	Single cab
		C	Club cab
		J	Double cab

No.	Item	Content	
7	Transmission type	N	5-speed manual transmission
		R	4-speed automatic transmission
		Y	5-speed automatic transmission
8	Vehicle grade	M	GL
		U	GLX
		X	GLS
9	Engine specification	Z	Common rail (intercooled turbocharger)
		ZP	Common rail (intercooled turbocharger high power engine)
10	Steering wheel location	L	Left hand
		R	Right hand
11	Destination	6	Vehicles for Europe
		6Z	Vehicles for Russia (Eastern Europe countries)

VEHICLES FOR MOROCCO

Model code		Engine model	Transmission model	Fuel supply system
KA4T	NENMZ6BA	4D56 (2,477 mL) DOHC DI-D (Direct Injection-Diesel) engine with intercooled turbocharger	R5MB1 (Rear wheel drive 2WD, 5M/T)	Common rail fuel injection (Electrical fuel injection)

MODEL CODE <VEHICLES FOR MOROCCO>



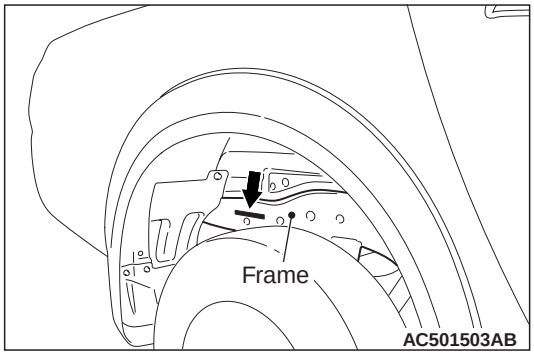
ACA00801AC

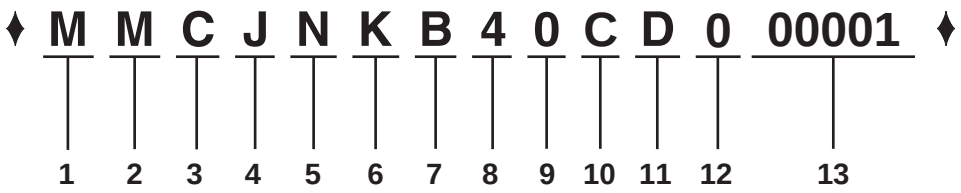
No.	Item	Content	
1	Development	K	L200
2	Drive system	A	2WD
3	Engine type	4	2.5L diesel engine (4D56)
4	Sort	T	Truck
5	Vehicle width	N	Standard
6	Body style	E	Single cab
7	Transmission type	N	5-speed manual transmission
8	Vehicle grade	M	GL
9	Engine specification	Z	Common rail (intercooled turbocharger)
10	Destination	6BA	Vehicles for Morocco

VEHICLE IDENTIFICATION NUMBER

M1001005602547

The vehicle identification number is stamped on the side wall of the frame near the rear wheel (right side).

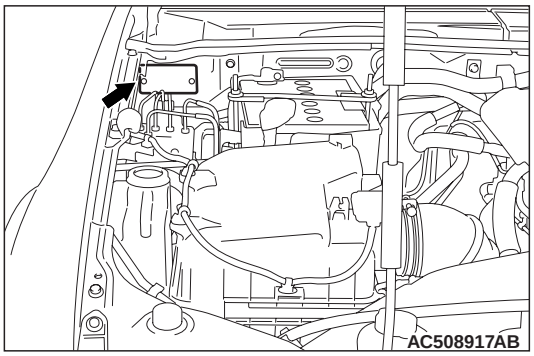




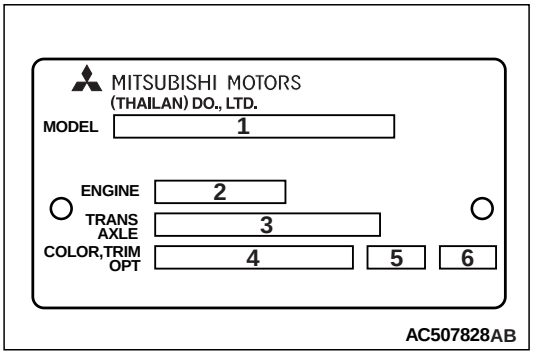
No.	Item	Content	
1	Country	M	Thailand
2	Make	M	MITSUBISHI MOTORS (Thailand) Co., Ltd.
3	Register	C	Europe (including Russia)
4	Body type	E	Single cab
		C	Club cab
		J	Double cab
5	Transmission type	N	5-speed manual transmission
		R	4-speed automatic transmission
		Y	5-speed automatic transmission
6	Vehicle line	K	MITSUBISHI L200
7	Drive system	A	2WD
		B	4WD
8	Engine	4	2.5L diesel engine (4D56)
9	MMTh internal purpose	0	No meaning
10	Model year	C	2012 year
11	Plants	D	Laemchabang-2 (Thailand motor vehicle works)
		F	Laemchabang-1 (Thailand motor vehicle works)
12	Emission step	0	Euro-4 <Vehicles for Morocco>, Euro-5
		9	Euro-4 <Vehicles for Turkey>
		Z	Euro-3, Euro-4 <Vehicles for Russia (Eastern Europe countries) >
13	Serial number	00001 to 99999	

VEHICLE INFORMATION CODE PLATE

M1001005402792



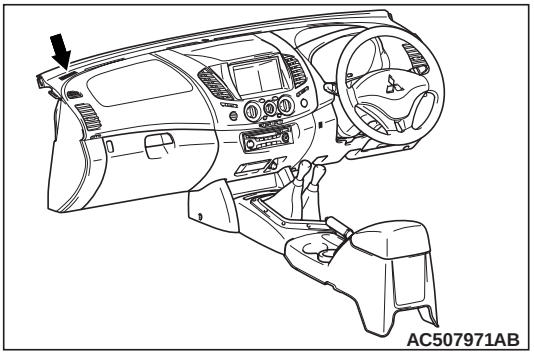
The information code plate is riveted to the cowl top outer panel in the engine compartment.



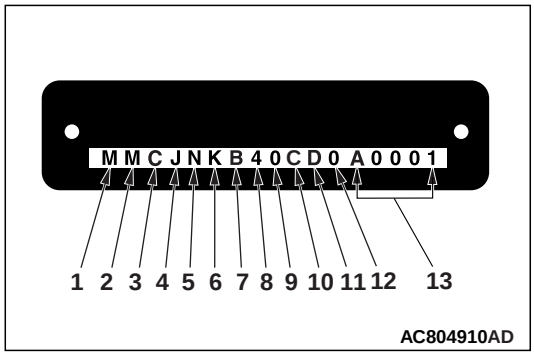
No.	Item	Example	Content
1	MODEL	KB4T	Vehicle model
		GJRXZL6	Model series
2	ENGINE	4D56	Engine model
3	TRANS AXLE	V4A5A 4100	Transmission model and final gear ratio
4	COLOUR	W32	Body colour code
5	TRIM	10X	Interior code
6	OPT	S31	Option code

VEHICLE IDENTIFICATION NUMBER (VIN) PLATE <VEHICLES FOR RHD>

M1001005501945



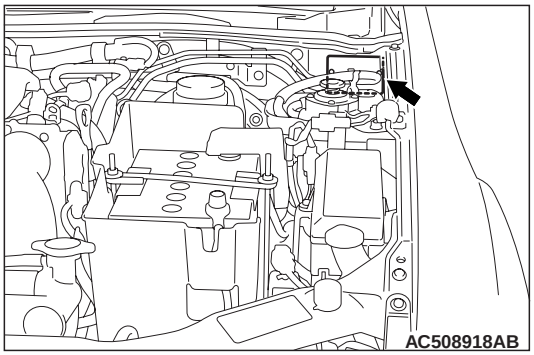
The vehicle identification number (VIN) is located on a plate attached to the left top side of the instrument panel.



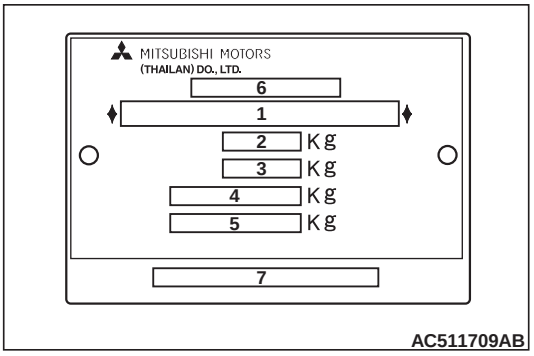
No.	Item	Content	
1	Country	M	Thailand
2	Make	M	MITSUBISHI MOTORS (Thailand) Co., Ltd.
3	Register	C	Europe
4	Body type	E	Single cab
		C	Club cab
		J	Double cab
5	Transmission type	N	5-speed manual transmission
		R	4-speed automatic transmission
		Y	5-speed automatic transmission
6	Vehicle line	K	MITSUBISHI L200
7	Drive system	B	4WD
8	Engine	4	2.5L diesel engine (4D56)
9	MMTh internal purpose	0	No meaning
10	Model year	C	2012
11	Plants	D	Laemchabang-2 (Thailand motor vehicle works)
		F	Laemchabang-1 (Thailand motor vehicle works)
12	Emission step	0	Euro-5
13	Serial number	00001 to 99999	

MANUFACTURER PLATE

M1001017600399



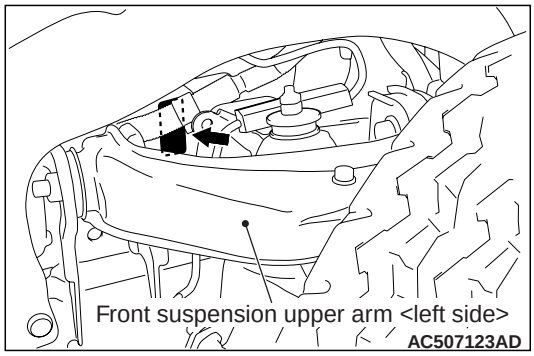
The manufacturer plate is riveted to the cowl top outer panel in the engine compartment.



No.	Content
1	Chassis No. (Vehicle identification number)
2	Gross vehicle weight
3	Gross combination weight
4	Gross axle weight front
5	Gross axle weight rear
6 or 7	NTA No. (National type approval number)

ENGINE MODEL STAMPING

M1001005700861



The engine model is stamped on the cylinder block. This engine model numbers is as shown as follow.

Engine model	Engine displacement
4D56	2,477 mL

The engine serial number is stamped near the engine model number.

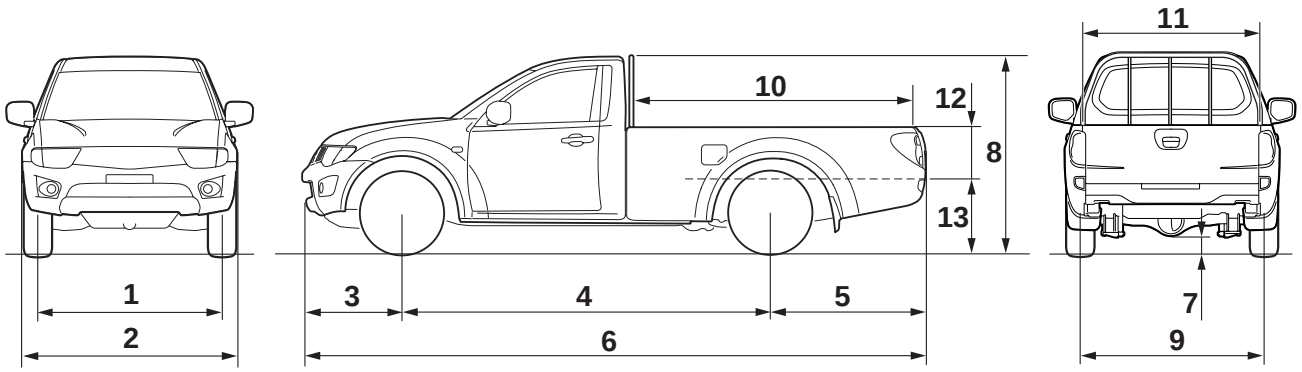
Engine serial number	AA0201 to YY9999

GENERAL DATA AND SPECIFICATIONS

GENERAL DATA AND SPECIFICATIONS <VEHICLES FOR EUROPE>

M1001000906642

SINGLE CAB



AC805672

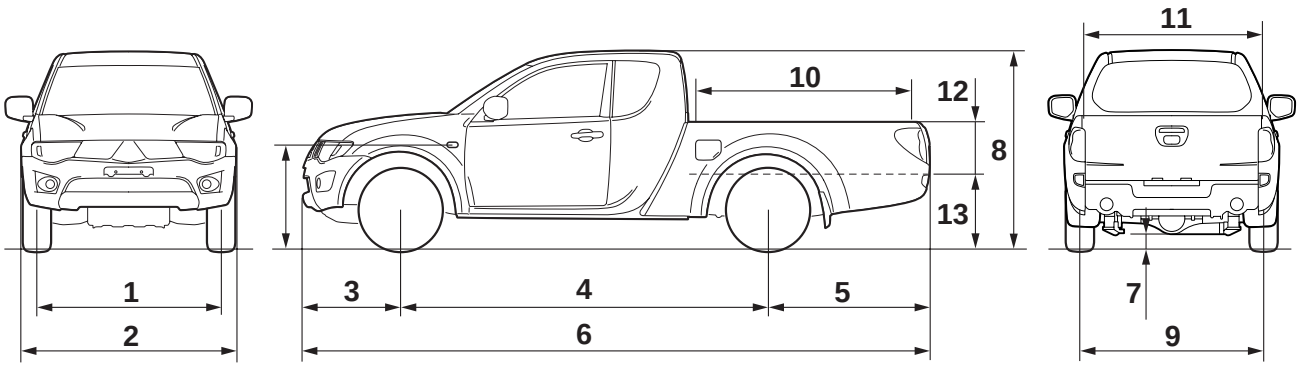
Item				KA4T	KB4T
				NENMZL6	NENMZL6/NENMZR6
Vehicle dimension mm	Front track		1	1,505	1,505
	Overall width		2	1,750	1,750
	Front overhang		3	830	830
	Wheel base		4	3,000	3,000
	Rear overhang		5	1,210	1,210
	Overall length		6	5,040	5,040
	Ground clearance (unladen)		7	200	200
	Overall height (unladen)		8	1,655	1,775
	Rear track		9	1,500	1,500
	Cargo bed interior length		10	2,220	2,220
	Cargo bed interior width		11	1,470	1,470
	Cargo bed interior height		12	405	405
	Cargo floor height (unladen)		13	715	845
Vehicle weight kg	Kerb weight	Without optional parts		1,565	1,780 <LHD> 1,770 <RHD>
		With full optional parts		1,595	1,840 <LHD> 1,810 <RHD>
	Max. gross vehicle weight			2,630	2,850 <LHD> 2,890 <RHD>
	Max. axle weight rating-front			1,030	1,260
	Max. axle weight rating-rear			1,700	1,800
	Max. towable weight	With brake		1,800	2,700
		Without brake		750	750
	Max. trailer-nose weight			77	115
	Max. gross combination weight			4,400	5,500 <LHD> 5,540 <RHD>

Item		KA4T	KB4T
		NENMZL6	NENMZL6/NENMZR6
Seating capacity (including a driver)		2	2
Engine	Model code	4D56	4D56
	Total displacement mL	2,477	2,477
	Type	DOHC diesel Intercooled, Turbocharger	DOHC diesel Intercooled, Turbocharger
	Max. output kW/rpm (EEC net)	94/4,000	100/4,000
	Max. torque N·m/rpm (EEC net)	240/1,500 – 3,500	314/2,000
Transmission	Model code	R5MB1	V5MB1
	Type	5M/T	5M/T
	Drive system	Rear wheel drive 2WD	Easy select 4WD
Fuel system	Fuel supply system	Electrical fuel injection	Electrical fuel injection
Turning radius m	Body	6.1	6.3
	Wheel	5.7	5.9

NOTE:

- *Trailer specifications indicate the manufacturer's recommendation.*
- *When loading luggage and/or towing a trailer, make sure not to exceed any of the above maximum weights all the time.*

CLUB CAB



AC805455

Item				KB4T	
				NCNUZL6/NCNUZR6	GCNXZL6
Vehicle dimension mm	Front track		1	1,505	1,520
	Overall width		2	1,750	1,815
	Front overhang		3	795	795
	Wheel base		4	3,000	3,000
	Rear overhang	Without rear bumper	5	1,325	1,325
		With rear bumper		1,400	1,400
	Overall length	Without rear bumper	6	5,120	5,120
		With rear bumper		5,195	5,195
	Ground clearance (unladen)		7	200	205
	Overall height (unladen)		8	1,775/1,790*	1,780
	Rear track		9	1,500	1,515
	Cargo bed interior length		10	1,805	1,805
	Cargo bed interior width		11	1,470	1,470
	Cargo bed interior height		12	460	460
	Cargo floor height (unladen)		13	855	860
Vehicle weight kg	Kerb weight	Without optional parts		1,800	1,815
		With full optional parts		1,900 <LHD> 1,880 <RHD>	1,910
	Max. gross vehicle weight			2,850	2,850
	Max. axle weight rating-front			1,260	1,260
	Max. axle weight rating-rear			1,800	1,800
	Max. towable weight	With brake		2,700	2,700
		Without brake		750	750
	Max. trailer-nose weight			115	115
	Max. gross combination weight			5,500	5,500
Seating capacity (including a driver)				4	4
Engine	Model code			4D56	4D56
	Total displacement mL			2,477	2,477
	Type			DOHC diesel Intercooled, Turbocharger	DOHC diesel Intercooled, Turbocharger
	Max. output kW/rpm (EEC net)			100/4,000	100/4,000
	Max. torque N·m/rpm (EEC net)			314/2,000	314/2,000
Transmission	Model code			V5MB1	V5MB1
	Type			5M/T	5M/T
	Drive system			Easy select 4WD	Super select 4WD
Fuel system	Fuel supply system			Electrical fuel injection	Electrical fuel injection
Turning radius m	Body			6.3	6.3
	Wheel			5.9	5.9

NOTE:

- **:Vehicles with rear body ground frame.*
- *Trailer specifications indicate the manufacturer's recommendation.*
- *When loading luggage and/or towing a trailer, make sure not to exceed any of the above maximum weights all the time.*

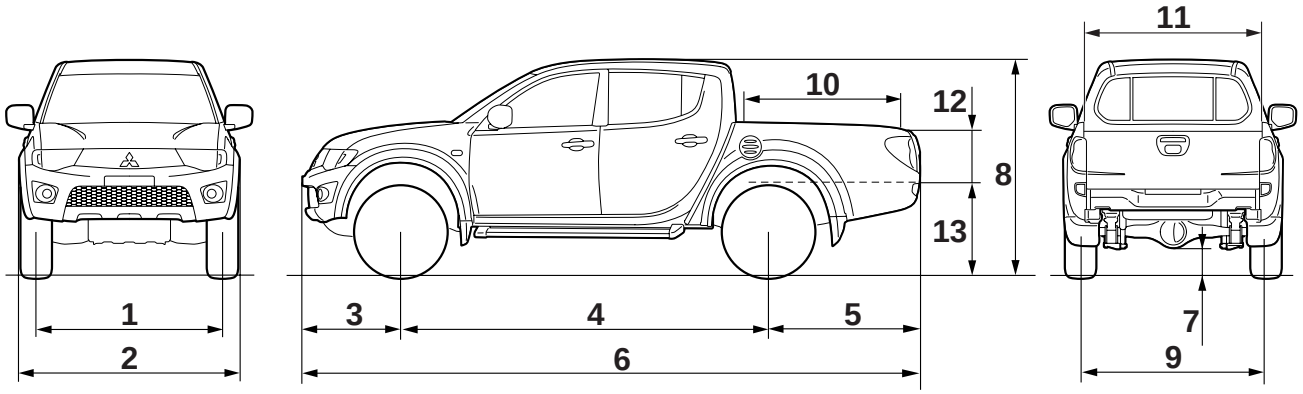
Item				**KB4T**
				GCNXZPL6
Vehicle dimension mm	Front track		1	1,520
	Overall width		2	1,815
	Front overhang		3	795
	Wheel base		4	3,000
	Rear overhang	Without rear bumper	5	1,325
		With rear bumper		1,400
	Overall length	Without rear bumper	6	5,120
		With rear bumper		5,195
	Ground clearance (unladen)		7	205
	Overall height (unladen)		8	1,780
	Rear track		9	1,515
	Cargo bed interior length		10	1,805
	Cargo bed interior width		11	1,470
	Cargo bed interior height		12	460
	Cargo floor height (unladen)		13	860
Vehicle weight kg	Kerb weight	Without optional parts		1,825
		With full optional parts		1,920
	Max. gross vehicle weight			2,850
	Max. axle weight rating-front			1,260
	Max. axle weight rating-rear			1,800
	Max. towable weight	With brake		2,700
		Without brake		750
	Max. trailer-nose weight			115
	Max. gross combination weight			5,500
Seating capacity (including a driver)				4
Engine	Model code			4D56
	Total displacement mL			2,477
	Type			DOHC High-power diesel Intercooled, Turbocharger
	Max. output kW/rpm (EEC net)			131/3,750
	Max. torque N·m/rpm (EEC net)			400/2,000 – 2,850
Transmission	Model code			V5MB1
	Type			5M/T
	Drive system			Super select 4WD

Item		KB4T
		GCNXZPL6
Fuel system	Fuel supply system	Electrical fuel injection
Turning radius m	Body	6.3
	Wheel	5.9

NOTE:

- *Trailer specifications indicate the manufacturer's recommendation.*
- *When loading luggage and/or towing a trailer, make sure not to exceed any of the above maximum weights all the time.*

DOUBLE CAB



AC809340AB

<2WD>

Item				KA4T	
				NJNUZL6	HJNUZL6
Vehicle dimension mm	Front track		1	1,505	1,505
	Overall width		2	1,750	1,750
	Front overhang		3	830	795
	Wheel base		4	3,000	3,000
	Rear overhang	Without rear bumper	5	1,210/1,390*	1,210/1,390*
		With rear bumper		–	1,285/1,465*
	Overall length	Without rear bumper	6	5,040/5,220	5,005/5,185*
		With rear bumper		–	5,080/5,260*
	Ground clearance (unladen)		7	200	200
	Overall height (unladen)		8	1655	1,775
	Rear track		9	1,500	1,500
	Cargo bed interior length		10	1,325/1,505*	1,325/1,505*
	Cargo bed interior width		11	1,470	1,470
	Cargo bed interior height		12	405/460*	405/460*
	Cargo floor height (unladen)		13	715	845

Item			KA4T	
			NJNUZL6	HJNUZL6
Vehicle weight kg	Kerb weight	Without optional parts	1,665	1,770
		With full optional parts	1,735	1,900
	Max. gross vehicle weight		2,630	2,800
	Max. axle weight rating-front		1,030	1,260
	Max. axle weight rating-rear		1,700	1,800
	Max. towable weight	With brake	1,800	2,700
		Without brake	750	750
	Max. trailer-nose weight		75	112
	Max. gross combination weight		4,400	5,465
Seating capacity (including a driver)			5	5
Engine	Model code		4D56	4D56
	Total displacement mL		2,477	2,477
	Type		DOHC diesel Intercooled, Turbocharger	DOHC diesel Intercooled, Turbocharger
	Max. output kW/rpm (EEC net)		94/4,000	100/4,000
	Max. torque N·m/rpm (EEC net)		240/1,500 – 3,500	314/2,000
Transmission	Model code		R5MB1	R5MB1
	Type		5M/T	5M/T
	Drive system		Rear wheel drive 2WD	Rear wheel drive 2WD
Fuel system	Fuel supply system		Electrical fuel injection	Electrical fuel injection
Turning radius m	Body		6.1	6.3
	Wheel		5.7	5.9

NOTE:

- **:Vehicles with long cargo bed.*
- *Trailer specifications indicate the manufacturer's recommendation.*
- *When loading luggage and/or towing a trailer, make sure not to exceed any of the above maximum weights all the time.*

Item				KA4T
				HJRUZL6
Vehicle dimension mm	Front track		1	1,505
	Overall width		2	1,750
	Front overhang		3	795
	Wheel base		4	3,000
	Rear overhang	Without rear bumper	5	1,210/1,390*
		With rear bumper		1,285/1,465*
	Overall length	Without rear bumper	6	5,005/5,185*
		With rear bumper		5,080/5,260*
	Ground clearance (unladen)		7	200
	Overall height (unladen)		8	1,775
	Rear track		9	1,500
	Cargo bed interior length		10	1,325/1,505*
	Cargo bed interior width		11	1,470
	Cargo bed interior height		12	405/460*
	Cargo floor height (unladen)		13	845
Vehicle weight kg	Kerb weight	Without optional parts		1,780
		With full optional parts		1,910
	Max. gross vehicle weight			2,800
	Max. axle weight rating-front			1,260
	Max. axle weight rating-rear			1,800
	Max. towable weight	With brake		2,700
		Without brake		750
	Max. trailer-nose weight			112
	Max. gross combination weight			5,465
Seating capacity (including a driver)				5
Engine	Model code			4D56
	Total displacement mL			2,477
	Type			DOHC diesel Intercooled, Turbocharger
	Max. output kW/rpm (EEC net)			100/4,000
	Max. torque N·m/rpm (EEC net)			314/2,000
Transmission	Model code			R4A5A
	Type			4A/T
	Drive system			Rear wheel drive 2WD
Fuel system	Fuel supply system			Electrical fuel injection
Turning radius m	Body			6.3
	Wheel			5.9

NOTE:

- **:Vehicles with long cargo bed.*
- *Trailer specifications indicate the manufacturer's recommendation.*
- *When loading luggage and/or towing a trailer, make sure not to exceed any of the above maximum weights all the time.*

<4WD>

Item				**KB4T**	
				NJNUZL6/NJNUZR6	**NJRUZL6**
Vehicle dimension mm	Front track		1	1,505	1,505
	Overall width		2	1,750	1,750
	Front overhang		3	795	795
	Wheel base		4	3,000	3,000
	Rear overhang	Without rear bumper	5	1,210/1,390*	1,210/1,390*
		With rear bumper		1,285/1,465*	1,285/1,465*
	Overall length	Without rear bumper	6	5,005/5,185*	5,005/5,185*
		With rear bumper		5,080/5,260*	5,080/5,260*
	Ground clearance (unladen)		7	200	200
	Overall height (unladen)		8	1,775	1,775
	Rear track		9	1,500	1,500
	Cargo bed interior length		10	1,325/1,505*	1,325/1,505*
	Cargo bed interior width		11	1,470	1,470
	Cargo bed interior height		12	405/460*	405/460*
	Cargo floor height (unladen)		13	845	845
Vehicle weight kg	Kerb weight	Without optional parts		1,870 <LHD> 1,850 <RHD>	1,880
		With full optional parts		2,000 <LHD> 1,980 <RHD>	2,010
	Max. gross vehicle weight			2,850 <LHD> 2,900 <RHD>	2,850
	Max. axle weight rating-front			1,260	1,260
	Max. axle weight rating-rear			1,800	1,800
	Max. towable weight	With brake		2,700	2,700
		Without brake		750	750
	Max. trailer-nose weight			115	115
	Max. gross combination weight			5,500 <LHD> 5,550 <RHD>	5,500
Seating capacity (including a driver)				5	5

Item		KB4T	
		NJNUZL6/NJNUZR6	NJRUZL6
Engine	Model code	4D56	4D56
	Total displacement mL	2,477	2,477
	Type	DOHC diesel Intercooled, Turbocharger	DOHC diesel Intercooled, Turbocharger
	Max. output kW/rpm (EEC net)	100/4,000	100/4,000
	Max. torque N·m/rpm (EEC net)	314/2,000	314/2,000
Transmission	Model code	V5MB1	V4A5A
	Type	5M/T	4A/T
	Drive system	Easy select 4WD	Easy select 4WD
Fuel system	Fuel supply system	Electrical fuel injection	Electrical fuel injection
Turning radius m	Body	6.3	6.3
	Wheel	5.9	5.9

NOTE:

- **:Vehicles with long cargo bed.*
- *Trailer specifications indicate the manufacturer's recommendation.*
- *When loading luggage and/or towing a trailer, make sure not to exceed any of the above maximum weights all the time.*

Item				KB4T	
				GJNXZL6	GJRXZR6
Vehicle dimension mm	Front track		1	1,520	1,520
	Overall width		2	1,815	1,815
	Front overhang		3	795	795
	Wheel base		4	3,000	3,000
	Rear overhang	Without rear bumper	5	1,210/1,390*	1,210/1,390*
		With rear bumper		1,285/1,465*	1,285/1,465*
	Overall length	Without rear bumper	6	5,005/5,185*	5,005/5,185*
		With rear bumper		5,080/5,260*	5,080/5,260*
	Ground clearance (unladen)		7	205	205
	Overall height (unladen)		8	1,780	1,780
	Rear track		9	1,515	1,515
	Cargo bed interior length		10	1,325/1,505*	1,325/1,505*
	Cargo bed interior width		11	1,470	1,470
	Cargo bed interior height		12	405/460*	405/460*
	Cargo floor height (unladen)		13	850	850

Item			KB4T	
			GJNXZL6	GJRXZR6
Vehicle weight kg	Kerb weight	Without optional parts	1,890	1,885
		With full optional parts	2,030	2,030
	Max. gross vehicle weight		2,850	2,930
	Max. axle weight rating-front		1,260	1,260
	Max. axle weight rating-rear		1,800	1,800
	Max. towable weight	With brake	2,700	2,700
		Without brake	750	750
	Max. trailer-nose weight		115	115
	Max. gross combination weight		5,500	5,580
Seating capacity (including a driver)			5	5
Engine	Model code		4D56	4D56
	Total displacement mL		2,477	2,477
	Type		DOHC diesel Intercooled, Turbocharger	DOHC diesel Intercooled, Turbocharger
	Max. output kW/rpm (EEC net)		100/4,000	100/4,000
	Max. torque N·m/rpm (EEC net)		314/2,000	314/2,000
Transmission	Model code		V5MB1	V4A5A
	Type		5M/T	4A/T
	Drive system		Super select 4WD	Super select 4WD
Fuel system	Fuel supply system		Electrical fuel injection	Electrical fuel injection
Turning radius m	Body		6.3	6.3
	Wheel		5.9	5.9

NOTE:

- **:Vehicles with long cargo bed.*
- *Trailer specifications indicate the manufacturer's recommendation.*
- *When loading luggage and/or towing a trailer, make sure not to exceed any of the above maximum weights all the time.*

Item				KB4T	
				GJNXZPL6/GJNXZPR6	GJYXZPL6/GJYXZPR6
Vehicle dimension mm	Front track		1	1,520	1,520
	Overall width		2	1,815	1,815
	Front overhang		3	795	795
	Wheel base		4	3,000	3,000
	Rear overhang	Without rear bumper	5	1,210/1,390*	1,210/1,390*
		With rear bumper		1,285/1,465*	1,285/1,465*
	Overall length	Without rear bumper	6	5,005/5,185*	5,005/5,185*
		With rear bumper		5,080/5,260*	5,080/5,260*
	Ground clearance (unladen)		7	205	205
	Overall height (unladen)		8	1,780	1,780
	Rear track		9	1,515	1,515
	Cargo bed interior length		10	1,325/1,505*	1,325/1,505*
	Cargo bed interior width		11	1,470	1,470
	Cargo bed interior height		12	405/460*	405/460*
	Cargo floor height (unladen)		13	850	850
Vehicle weight kg	Kerb weight	Without optional parts		1,900 <LHD> 1,885 <RHD>	1,915 <LHD> 1,900 <RHD>
		With full optional parts		2,040 <LHD> 2,030 <RHD>	2,045
	Max. gross vehicle weight			2,850 <LHD> 2,930 <RHD>	2,850 <LHD> 2,945 <RHD>
	Max. axle weight rating-front			1,260	1,260
	Max. axle weight rating-rear			1,800	1,800
	Max. towable weight	With brake		2,700	2,700
		Without brake		750	750
	Max. trailer-nose weight			115	115
	Max. gross combination weight			5,500 <LHD> 5,580 <RHD>	5,500 <LHD> 5,595 <RHD>
Seating capacity (including a driver)				5	5
Engine	Model code			4D56	4D56
	Total displacement mL			2,477	2,477
	Type			DOHC High-power diesel Intercooled, Turbocharger	DOHC High-power diesel Intercooled, Turbocharger
	Max. output kW/rpm (EEC net)			131/3,750	131/3,750
	Max. torque N·m/rpm (EEC net)			400/2,000 – 2,850	350/1,800 – 3,500
Transmission	Model code			V5MB1	V5A5A
	Type			5M/T	5A/T
	Drive system			Super select 4WD	Super select 4WD

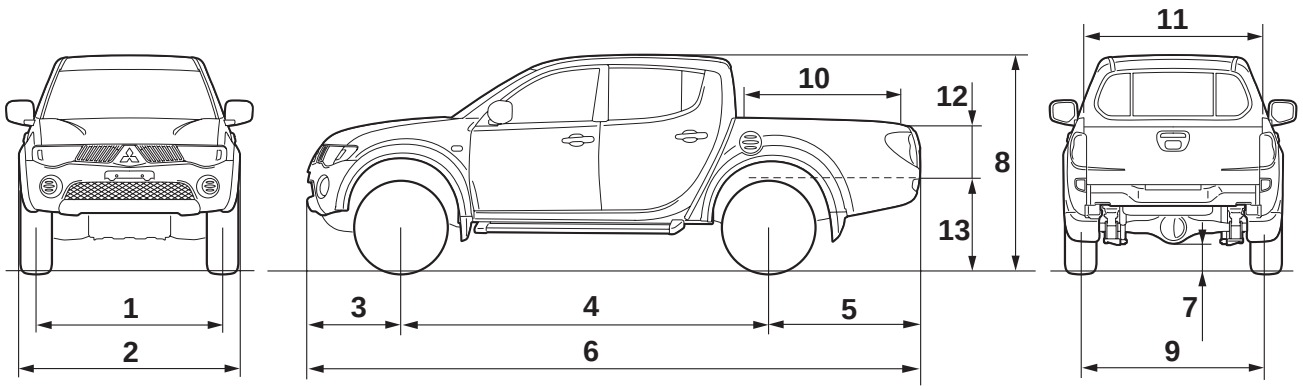
Item		KB4T	
		GJNXZPL6/GJNXZPR6	GJYXZPL6/GJYXZPR6
Fuel system	Fuel supply system	Electrical fuel injection	Electrical fuel injection
Turning radius m	Body	6.3	6.3
	Wheel	5.9	5.9

NOTE:

- **:Vehicles with long cargo bed.*
- *Trailer specifications indicate the manufacturer's recommendation.*
- *When loading luggage and/or towing a trailer, make sure not to exceed any of the above maximum weights all the time.*

GENERAL DATA AND SPECIFICATIONS <VEHICLES FOR RUSSIA (EASTERN EUROPE COUNTRIES)>

M1001000906653



AC502186AB

Item				KB4T	
				NJNUZL6Z	GJNXZL6Z
Vehicle dimension mm	Front track		1	1,505	1,520
	Overall width		2	1,750	1,800
	Front overhang		3	830	830
	Wheel base		4	3,000	3,000
	Rear overhang	Without rear bumper	5	1,210/1,390*1	1,210/1,390*1
		With rear bumper		1,285/1,465*1	1,285/1,465*1
	Overall length	Without rear bumper	6	5,040/5,220*1	5,040/5,220*1
		With rear bumper		5,115/5,295*1	5,115/5,295*1
	Ground clearance (unladen)		7	200	205
	Overall height (unladen)		8	1,775	1,780
	Rear track		9	1,500	1,515
	Cargo bed interior length		10	1,325/1,505*1	1,325/1,505*1
	Cargo bed interior width		11	1,470	1,470
	Cargo bed interior height		12	405/460*1	405/460*1
	Cargo floor height (unladen)		13	845	850
Vehicle weight kg	Kerb weight	Without optional parts		1,860	1,880
		With full optional parts		1,980	2,015
	Max. gross vehicle weight			2,850	2,850
	Max. axle weight rating-front			1,260	1,260
	Max. axle weight rating-rear			1,800	1,800
	Max. towable weight	With brake		2,700	2,700
		Without brake		750	750
	Max. trailer-nose weight			115	115
	Max. gross combination weight			5,500	5,500
Seating capacity (including a driver)				5	5
Engine	Model code			4D56	4D56
	Total displacement mL			2,477	2,477
	Type			DOHC diesel Intercooled, Turbocharger	DOHC diesel Intercooled, Turbocharger
	Max. output kW/rpm (EEC net)			100/3,500	100/3,500
	Max. torque N·m/rpm (EEC net)			314/2,000	314/2,000
Transmission	Model code			V5MB1	V5MB1
	Type			5M/T	5M/T
	Drive system			Easy select 4WD	Super select 4WD
Fuel system	Fuel supply system			Electrical fuel injection	Electrical fuel injection
Turning radius m	Body			6.3	6.3
	Wheel			5.9	5.9

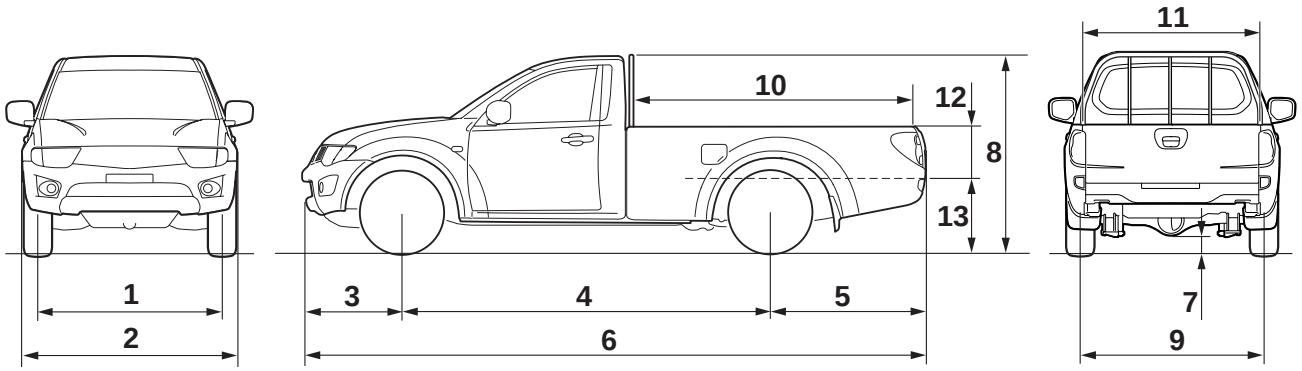
Item				KB4T
				GJRXZL6Z
Vehicle dimension mm	Front track		1	1,520
	Overall width		2	1,800
	Front overhang		3	830
	Wheel base		4	3,000
	Rear overhang	Without rear bumper	5	1,210/1,390*1
		With rear bumper		1,285/1,465*1
	Overall length	Without rear bumper	6	5,040/5,220*1
		With rear bumper		5,115/5,295*1
	Ground clearance (unladen)		7	205
	Overall height (unladen)		8	1,780
	Rear track		9	1,515
	Cargo bed interior length		10	1,325/1,505*1
	Cargo bed interior width		11	1,470
	Cargo bed interior height		12	405/460*1
	Cargo floor height (unladen)		13	850
Vehicle weight kg	Kerb weight	Without optional parts		1,890
		With full optional parts		2,025
	Max. gross vehicle weight			2,850
	Max. axle weight rating-front			1,260
	Max. axle weight rating-rear			1,800
	Max. towable weight	With brake		2,700
		Without brake		750
	Max. trailer-nose weight			115
	Max. gross combination weight			5,500
Seating capacity (including a driver)				5
Engine	Model code			4D56
	Total displacement mL			2,477
	Type			DOHC diesel Intercooled, Turbocharger
	Max. output kW/rpm (EEC net)			100/3,500
	Max. torque N·m/rpm (EEC net)			314/2,000
Transmission	Model code			V4A5A
	Type			4A/T
	Drive system			Super select 4WD
Fuel system	Fuel supply system			Electrical fuel injection
Turning radius m	Body			6.3
	Wheel			5.9

NOTE:

- **1: Vehicle with extended cargo bed (optional)*
- *Trailer specifications indicate the manufacturer's recommendation.*
- *When loading luggage and/or towing a trailer, make sure not to exceed any of the above maximum weights all the time.*

GENERAL DATA AND SPECIFICATIONS <VEHICLES FOR MOROCCO>

M1001000906675



AC805672

Item			KA4T
			NENMZ6BA
Vehicle dimension mm	Front track	1	1,505
	Overall width	2	1,750
	Front overhang	3	830
	Wheel base	4	3,000
	Rear overhang	5	1,210/1,385*1
	Overall length	6	5,040/5,215*1
	Ground clearance (unladen)	7	200
	Overall height (unladen)	8	1,655
	Rear track	9	1,500
	Cargo bed interior length	10	2,220
	Cargo bed interior width	11	1,470
	Cargo bed interior height	12	405
	Cargo floor height (unladen)	13	715
Vehicle weight kg	Kerb weight	Without optional parts	1,550
		With full optional parts	1,600
	Max. gross vehicle weight		2,630
	Max. axle weight rating-front		1,030
	Max. axle weight rating-rear		1,700
Seating capacity (including a driver)			2

Item		KA4T
		NENMZ6BA
Engine	Model code	4D56
	Total displacement mL	2,477
	Type	DOHC diesel Intercooled, Turbocharger
	Max. output kW/rpm (EEC net)	94/4,000
	Max. torque N·m/rpm (EEC net)	240/1,500 – 3,500
Transmission	Model code	R5MB1
	Type	5M/T
	Drive system	Rear wheel drive 2WD
Fuel system	Fuel supply system	Electrical fuel injection
Turning radius m	Body	6.1
	Wheel	5.7

NOTE:

- **1: Vehicles with rear step bumper assembly.*

PRECAUTIONS BEFORE SERVICE

SERVICING COMMON RAIL ENGINE

M1001016400154

⚠ ***DANGER***

- ***The working near to a naked flame or sparks must be avoided.***
- ***Attention during engine running:***
  a. ***Do not work on the high pressure fuel circuit.***
  b. ***Always remain out of the way of possible fuel jet that may result in serious injuries.***
  c. ***Do not place your hand near the high pressure fuel circuit.***
- ***Attention before service:***
  a. ***After turning the ignition switch to the "LOCK" (OFF) position, wait for 30 seconds before starting any repair work.This period of time is required so that the high pressure fuel circuit pressure can get back to the atmospheric pressure.***
  b. ***After turning the ignition switch to the "LOCK" (OFF) position, wait 10 minutes before disconnecting the fuel return pipe from diesel injectors.***

VEHICLES WITH SEMI AUTOMATIC AIR CONDITIONER STARTING

M1001011300077

⚠ **CAUTION**

Never start the engine with the refrigerant system empty as it will damage the A/C compressor.

SUPPLEMENTAL RESTRAINT SYSTEM (SRS) AND SEAT BELT WITH PRE-TENSIONER

M1001011601695

⚠ CAUTION

Items to review when servicing SRS:

1. **Be sure to read GROUP 52B – Supplemental Restraint System (SRS). For safe operation, please follow the directions and heed all warnings.**
2. **Wait at least 60 seconds after disconnecting the battery cable before doing any further work. The SRS system is designed to retain enough voltage to deploy the air bag even after the battery has been disconnected. Serious injury may result from unintended air bag deployment if work is done on the SRS system immediately after the battery cable is disconnected.**
3. **Warning/Caution labels must be heeded when servicing or handling SRS components. Warning labels can be found in the following locations. (Refer to WARNING/CAUTION LABELS .)**
4. **Always use the designated special tools and test equipment.**
5. **Store components removed from the SRS in a clean and dry place. The air bag module should be stored on a flat surface and placed so that the pad surface is facing upward. Do not place anything on top of it.**
6. **Never attempt to disassemble or repair the SRS components (SRS-ECU, air bag module and clock spring).**
7. **Whenever you finish servicing the SRS, check the SRS warning lamp operation to make sure that the system functions properly.**
8. **Be sure to deploy the air bag before disposing of the air bag module or disposing of a vehicle equipped with an air bag (Refer to GROUP 52B – Air Bag Module Disposal Procedures).**

Observe the following when carrying out operations on places where SRS components are installed, including operations not directly related to the SRS air bag.

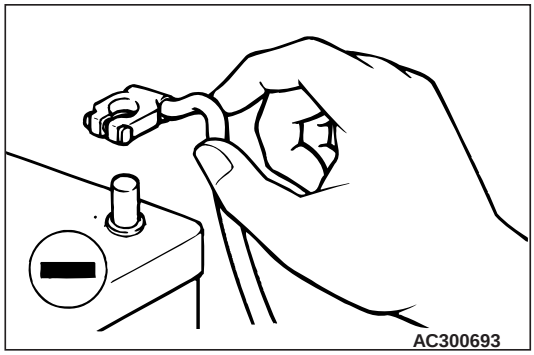
1. **When removing or installing parts, do not allow any impact or shock to the SRS components.**
2. **If heat damage may occur during paint work, remove the SRS-ECU, the air bag module, clock spring, the front impact sensor, and the seat belt pre-tensioner.**
   - **SRS-ECU, air bag modules, clock spring and impact sensors: 93° C or more**
   - **Seat belt with pre-tensioner: 90°C or more**

SERVICING ELECTRICAL SYSTEM

M1001011900303

⚠ CAUTION

Before connecting or disconnecting the negative (–) cable, be sure to turn off the ignition switch and the lighting switch (If this is not done, there is the possibility of semiconductor parts being damaged).



Before replacing a component related to the electrical system and before undertaking any repair procedures involving the electrical system, be sure to first disconnect the negative (–) cable from the battery in order to avoid damage caused by short-circuiting.

IN ORDER TO PREVENT VEHICLES FROM FIRE

M1001011100147

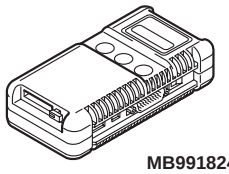
"Improper installation of electrical or fuel related parts could cause a fire. In order to retain the high quality and safety of the vehicle, it is important that any accessories that may be fitted or modifications/ repairs that may be carried out which involve the electrical or fuel systems, must be carried out in accordance with MMC's information/Instructions".

MULTI USE TESTER (M.U.T.-III) SUB ASSEMBLY

M1001012400215

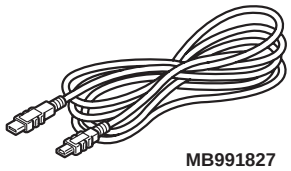
Multi use tester (M.U.T.-III) sub assembly

Vehicle communication interface (V.C.I.)



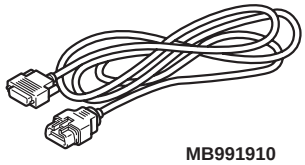
MB991824

M.U.T.-III USB cable



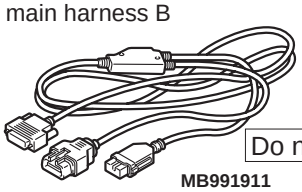
MB991827

M.U.T.-III main harness A



MB991910

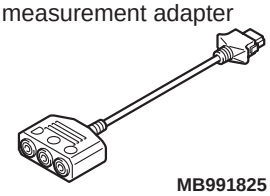
M.U.T.-III main harness B



Do not use

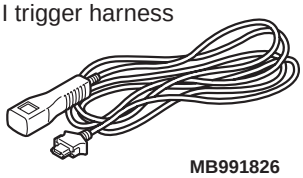
MB991911

M.U.T.-III measurement adapter



MB991825

M.U.T.-III trigger harness



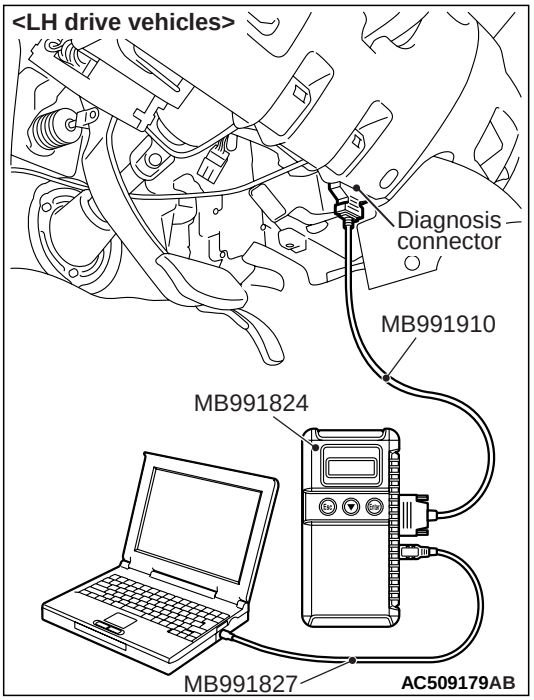
MB991826

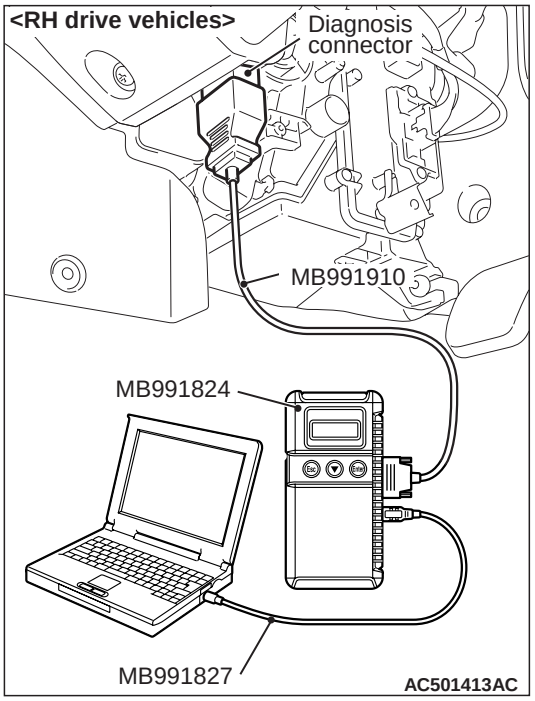
AC305090AK

Refer to the "M.U.T.-III OPERATION MANUAL" for instructions on handling the M.U.T.-III.

⚠ CAUTION

Turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting the M.U.T.-III.





Connect the M.U.T.-III to the diagnosis connector as shown in the illustration.

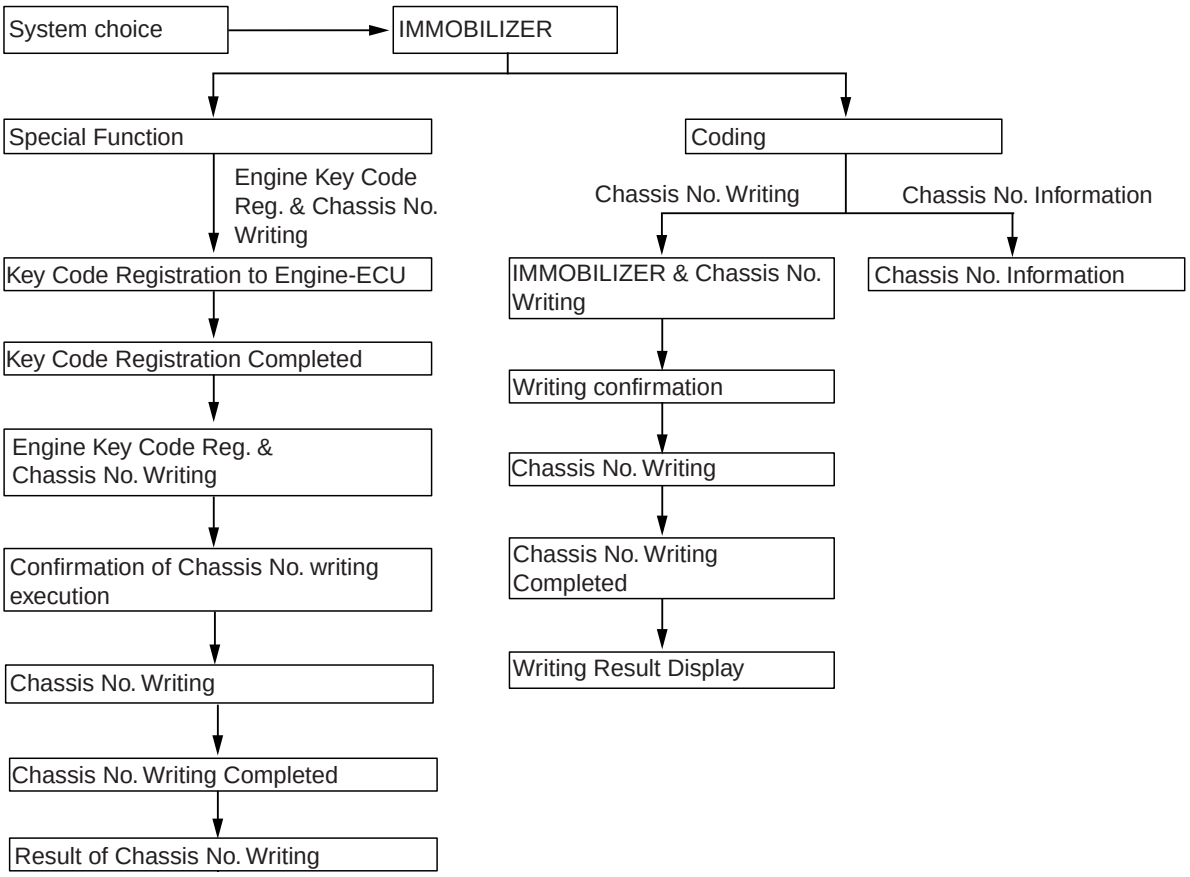
HOW TO PERFORM CHASSIS NUMBER (CHASSIS NO.) WRITING

M1001015200715

Write the Chassis Number (Chassis No.) of immobiliser system as following procedure.

The Chassis Number (Chassis No.) is stored in the engine-ECU or ETACS-ECU by the vehicle manufacture. If the Chassis No. to be stored in the engine-ECU or ETACS-ECU is eliminated fraudulently, the engine warning lamp illuminates and Diagnostic Trouble Code (diagnosis code) No.P0630 (Chassis No. malfunction) is shown. When the engine-ECU or ETACS-ECU is replaced, and entry of the Chassis No. necessary due to diagnosis code No. P0630 (Chassis No. malfunction). Enter the Chassis No. in accordance with the procedure as follows:

SCREEN FLOW OF M.U.T.-III

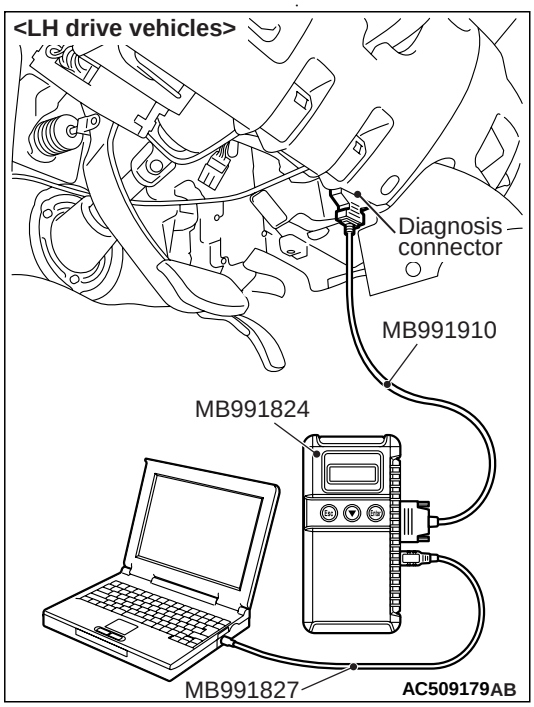


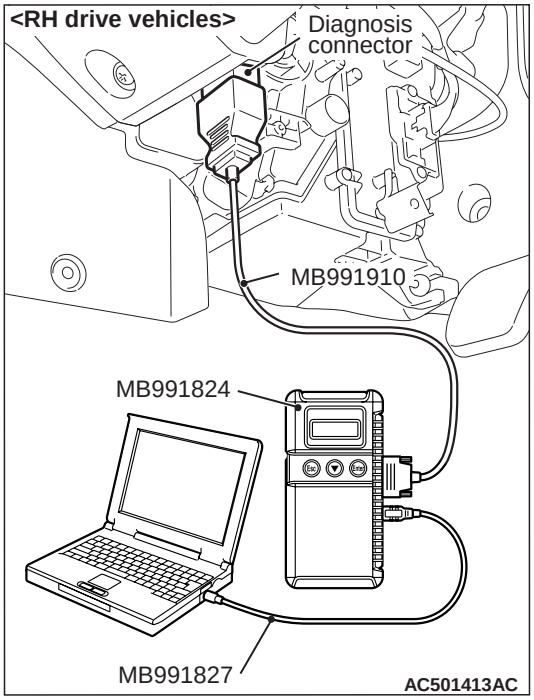
AC510087AE

CHASSIS NUMBER REGISTRATION PROCEDURE FOR ENGINE-ECU

⚠ CAUTION

- **Check that diagnosis code No.P0603 (EEPROM malfunction) is not set. If diagnosis code No.P0603 (EEPROM malfunction) is set, entered Chassis No. cannot be stored. Therefore, carry out troubleshooting and repair the malfunction when this code is set.**





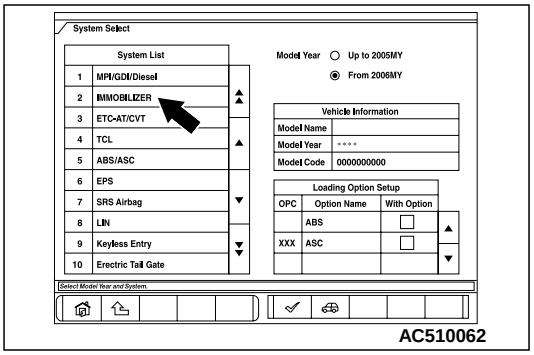
To prevent damage to M.U.T.-III, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting M.U.T.-III.

Connect the M.U.T.-III to the 16-pin diagnosis connector, and read the diagnosis code.

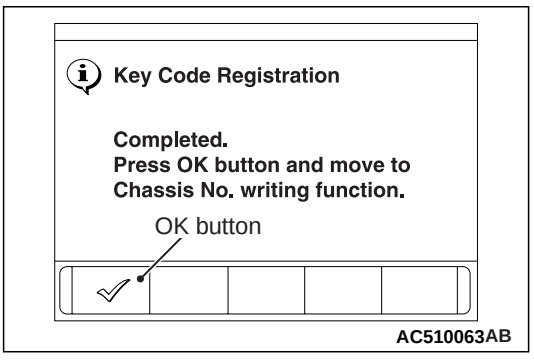
NOTE: For details on how to use the M.U.T.-III, refer to the "M.U.T.-III operation manual."

1. Ensure that the ignition switch is at the "LOCK" (OFF) position.
2. Start up the personal computer.
3. Connect special tool M.U.T.-III USB cable (MB991827) to V.C.I. (MB991824) and the personal computer.
4. Connect special tool M.U.T.-III main harness A (MB991910) to the V.C.I.
5. Connect the M.U.T.-III main harness A to the diagnosis connector.
6. Turn the V.C.I. power switch to the "ON" position.

   NOTE: When the V.C.I. is energized, the V.C.I. indicator lamp will be illuminated in a green colour.
7. Start the M.U.T.-III system on the personal computer and turn the ignition switch to the "ON" position.

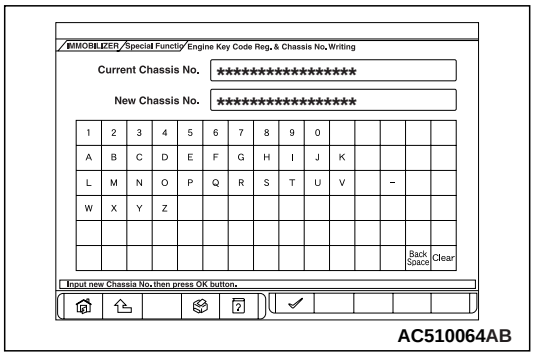


8. Select "IMMOBILIZER" in the "System Select" tag. Select the model year and push the OK button (Check each model if there is an option). Select "Special Function" on the next screen, and select "Engine Key Code Reg. & Chassis No. Writing" on the further screen.



9. Push the OK button after "Key Code Registration" is displayed.

10.Push the OK button after "Completed. Press the OK button and move to Chassis No. writing function." is displayed.

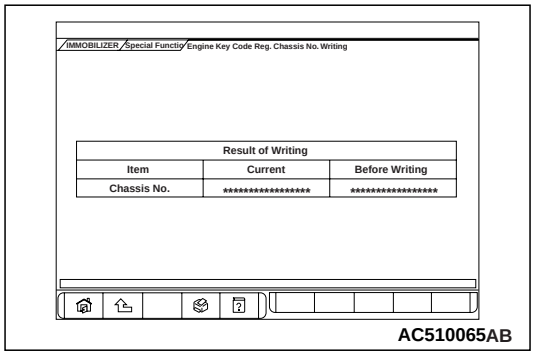


11.Enter the Chassis No. of registering vehicle and push the OK button.

12.Push the OK button after "Chassis No. Writing will start. Are you sure?" is displayed.

13.Return to the previous screen and "In Progress" is displayed at the lower-left corner on the screen.

14.Push the OK button after "Completed." is displayed.



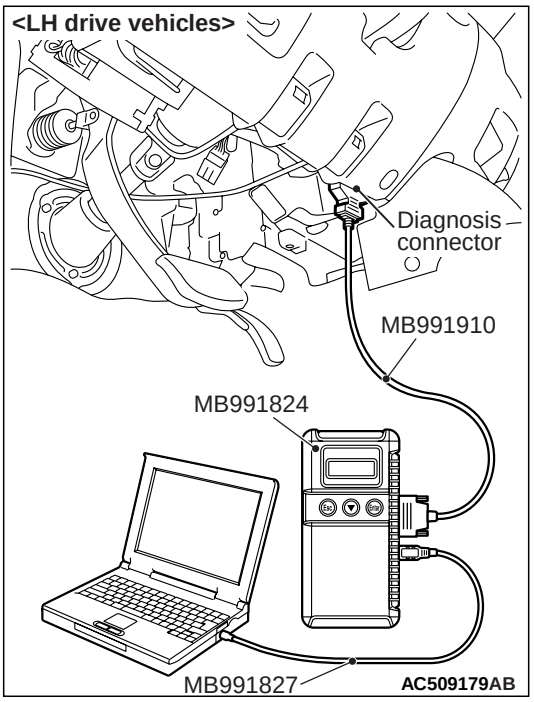
15.Chassis No. writing result is displayed.

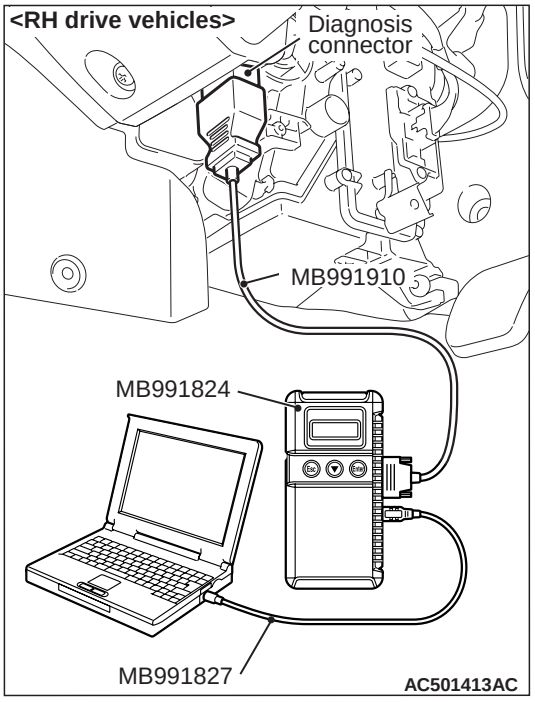
16.Select "Chassis No. Information" on the "Coding" screen after the Chassis No. writing is completed, and check that the Chassis No. is changed.

17.Complete the M.U.T.-III.

18.Disconnecting the M.U.T.-III is the reverse of the connecting sequence, making sure that the ignition switch is at the "LOCK" (OFF) position.

CHASSIS NUMBER REGISTRATION PROCEDURE FOR ETACS-ECU.



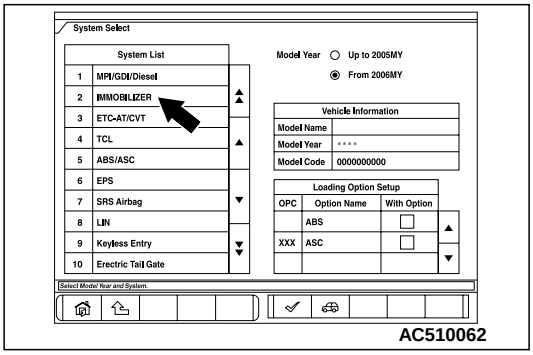


Connect the M.U.T.-III to the 16-pin diagnosis connector, and read the diagnosis code.

NOTE: For details on how to use the M.U.T.-III, refer to the "M.U.T.-III operation manual."

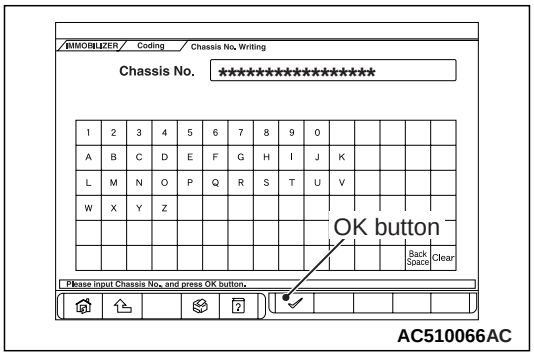
1. Ensure that the ignition switch is at the "LOCK" (OFF).
2. Start up the personal computer.
3. Connect M.U.T.-III USB cable (MB991827) to special tool Vehicle Communication Interface (V.C.I.) (MB991824) and the personal computer.

4. Connect M.U.T.-III main harness A (MB991910) to the V.C.I.
5. Connect the M.U.T.-III main harness A to the diagnosis connector.
6. Turn the V.C.I. power switch to the "ON" position.
   NOTE: When the V.C.I. is energized, the V.C.I. indicator lamp will be illuminated in a green colour.
7. Start the M.U.T.-III system on the personal computer and turn the ignition switch to the "ON" position.



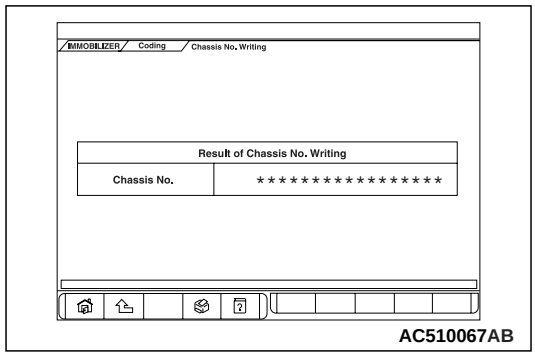
AC510062

8. Select "IMMOBILIZER" in the "System Select" tag. Select the model year and push the OK button (Check each model if there is an option).Select "Coding" on the next screen, and select "Chassis No. Writing" on the further screen.



AC510066AC

9. Enter the Chassis No. of registering vehicle and push the OK button.
10. Push the OK button after "Chassis No. Writing will start. Are you sure?" is displayed.
11. Return to the previous screen and "In Progress" is displayed at the lower-left corner on the screen.
12. Push the OK button after "Completed." is displayed.



AC510067AB

13. Chassis No. writing result is displayed.
14. Select "Chassis No. Information" on the "Coding" screen after the Chassis No. writing is completed, and check that the Chassis No. is changed.
15. Resister the other ID code.(Refer to GROUP 54A, Immobilizer system – On-vehicle service)

PRE-INSPECTION CONDITION

M1001012100388

"Pre-inspection condition" refers to the condition that the vehicle must be in before proper engine inspection can be carried out. If you see the words "Set the vehicle to the pre-inspection condition" in this manual. It means to set the vehicle to the following condition.

- Engine coolant temperature 80 to 90°C
- Lamps, electric cooling fan and all accessories: OFF
- M/T: Neutral
- A/T: P range

ENGINE OILS

M1001011200155

HEALTH WARNING

Prolonged and repeated contact with mineral oil will result in the removal of natural fats from the skin, leading to dryness, irritation and dermatitis. In addition, used engine oil contains potentially harmful contaminants which may cause skin cancer. Adequate means of skin protection and washing facilities must be provided.

RECOMMENDED PRECAUTIONS

The most effective precaution is to adapt working practices which prevent, as far as practicable, the risk of skin contact with mineral oils, for example by using enclosed systems for handling used engine oil and by degreasing components, where practicable, before handling them.
Other precautions:

- Avoid prolonged and repeated contact with oils, particularly used engine oils.

- Wear protective clothing, including impervious gloves where practicable.
- Avoid contaminating clothes, particularly underpants, with oil.
- Do not put oily rags in pockets, the use of overalls without pockets will avoid this.
- Do not wear heavily soiled clothing and oil-impregnated foot-wear. Overalls must be cleaned regularly and kept separately from personal clothing.
- Where there is a risk of eye contact, eye protection should be worn, for example, chemical goggles or face shields; in addition an eye wash facility should be provided.
- Obtain first aid treatment immediately for open cuts and wounds.
- Wash regularly with soap and water to ensure all oil is removed, especially before meals (skin cleansers and nail brushes will help). After cleaning, the application of preparations containing lanolin to replace the natural skin oils is advised.
- Do not use petrol, kerosine, diesel fuel, gas oil, thinners or solvents for cleaning skin.
- Use barrier creams, applying them before each work period, to help the removal of oil from the skin after work.
- If skin disorders develop, obtain medical advice without delay.

WHAT THE COMMON RAIL ENGINE LEARNS

M1001012500018

After fuel-related parts are replaced, the common rail engine must register their identification codes with the engine-ECU and execute learning.
The table below shows what should be registered and learned after each type of operation.

NOTE: When the engine-ECU is replaced, collect in advance the injector identification code from the current engine-ECU. Doing it makes registration easy.

Correspondence table

Registration and learning item	Operation type		
	Injector replacement	Supply pump replacement	Engine-ECU replacement
Injector identification code registration	applicable	–	applicable
Small injection quantity learning	applicable	–	applicable
Supply pump correction learning	–	applicable	–

REGISTRATION AND LEARNING PROCEDURE

Injector identification code registration
Refer to P.00-43, INJECTOR IDENTIFICATION CODE REGISTRATION PROCEDURE.

Small injection quantity learning
Refer to P.00-45, SMALL INJECTION QUANTITY LEARNING PROCEDURE.

Supply pump correction learning
Refer to P.00-45, SUPPLY PUMP CORRECTION LEARNING PROCEDURE.

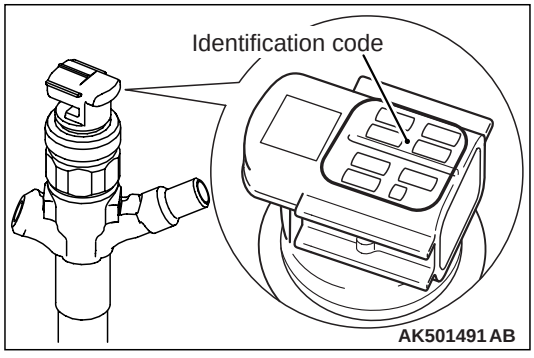
INJECTOR IDENTIFICATION CODE REGISTRATION PROCEDURE

M1001012600015

⚠ CAUTION

1. **If the injector identification code is not registered, the engine warning lamp goes on and diagnosis code No. P1626 is logged.**
2. **Failure to register the injector identification code correctly will cause rough idling, abnormal noise, and emission deterioration.**

PURPOSE



Because individual injectors have different injection characteristics, the engine-ECU corrects injection time for each cylinder to improve injection accuracy.

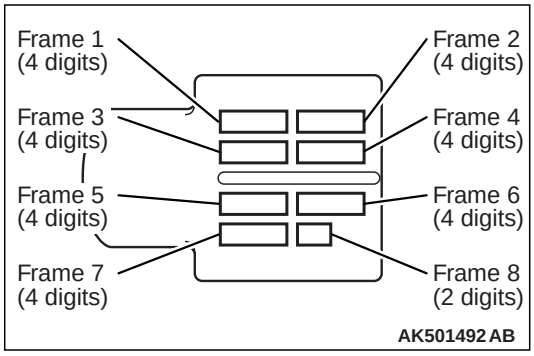
For this reason, when the injector or engine-ECU is replaced, injector correction data must be registered afterwards in the engine-ECU using the Multi Use Tester III (M.U.T.-III).
Correction data is converted into an identification code consisting of 30 alphanumeric characters and printed on the injector connector.

REGISTRATION PROCEDURE

1. When replacing the engine-ECU, connect the current engine-ECU to the body harness.

NOTE: This operation is purposed to read the injector identification code stored in the engine-ECU. Reading the identification code in this way before replacement can eliminate manual input of the identification code after replacement.

2. After the ignition switch is in "LOCK" (OFF) position, connect the M.U.T.-III to the diagnosis connector.
3. Turn the ignition switch to "ON" position.
4. Select SPECIAL FUNCTION from the function menu.
5. When the current engine-ECU is still mounted, read and register the injector identification code as follows:
   (1) Select Read Injector ID Code (for engine-ECU replacement) from the SPECIAL FUNCTION menu.
   (2) Select Write and Save Injector ID Code from the menu to read data from the current engine-ECU and save the data if it could be read normally.
   (3) Mount the new engine-ECU on the vehicle.
   (4) Select SPECIAL FUNCTION from the function menu.
   (5) Select Write Injector ID Code (for engine-ECU replacement) from the SPECIAL FUNCTION menu.
   (6) Select SAVED INJECTOR ID WRITING from the Write Injector ID Code menu to write the data, which was saved previously, to the engine-ECU.
6. If the injector has been replaced or data has not been read from the current engine-ECU, register the injector identification code as follows:
   (1) Select Write Injector ID Code from the SPECIAL FUNCTION menu.
   (2) If the injector was replaced, specify whether to write to every cylinder or a specific cylinder.



   (3) Select the write mode from the menu, enter the identification code printed on the injector, and execute writing.

⚠ CAUTION

Even if the number of the cylinder to be registered does not match the actual injector mounting location, registration ends normally. Specify the cylinder number correctly.

NOTE: The identification code is displayed in order of the frame numbers when it is read.

7. Makes sure that the engine warning lamp that is on changes to blinking, indicating the registration is complete.

NOTE: When the injector is replaced, executing the write operation also clears the values of small injection quantity learning.

8. Execute small injection quantity learning.

   Refer to P.00-45, the SMALL INJECTION QUANTITY LEARNING PROCEDURE for the learning procedure.

9. Confirm that the engine warning lamp is off.

   Confirm also that the diagnosis code is not stored.

SMALL INJECTION QUANTITY LEARNING PROCEDURE

M1001014300322

⚠ CAUTION

1. **If small injection quantity learning has not been executed, the engine warning lamp blinks.**
2. **When the requirements for learning are satisfied by operation after replacement of the engine-ECU, learning is automatically executed even if no instruction is given from the M.U.T.-III. Accordingly, the malfunction indicator lamp goes off. However, the learning thus executed is tentative and limited. Be sure to complete leaning using the M.U.T.-III.**

PURPOSE

To keep emission and noise level at adequate levels, the engine-ECU must learn injector fuel injection in idle mode.
During learning, the engine-ECU calculates actual injection from each cylinder based on changes in engine speeds and corrects pilot injection control. It then keeps records of this amount of correction as a learned value.
For this reason, after the engine-ECU or injector is replaced, learning must be executed using the M.U.T.-III.

NOTE: Engine friction changes or injector deterioration over time may cause fluctuation in pilot injection. After use over time, it may prevent injection of an accurate amount of fuel according to the indication by the engine-ECU. This is why learning must be executed again periodically.
For this reason, the engine-ECU periodically leans injection according to the cumulative mileage.
Note that making the M.U.T.-III learn again resets the cumulative mileage.

NOTE: The engine sound may change or idling engine speeds may increase during injection learning. These are not abnormalities.

LEARNING PROCEDURE

1. After the ignition switch is in "LOCK" (OFF) position, connect the M.U.T.-III to the diagnosis connector.
2. Put the vehicle in the following idling stable conditions:
   - Engine coolant temperature: 80 – 90°C
   - Fuel temperature: 30 – 100°C
   - Intake air temperature: –30 to 100°C
   - Barometric pressure: 70 kPa or more
   - Automatic transmission fluid temperature: 60°C or higher
   - Lamps, A/C condenser fan and all accessories: OFF
   - Transmission: Neutral <M/T>, "P" range <A/T>
   - Power steering: Static state
3. Select SPECIAL FUNCTION from the function menu.
4. Select LEARNING from the SPECIAL FUNCTION menu.
5. Select Item No. 1 Small injection quantity learning to execute learning.

⚠ CAUTION

If the vehicle conditions go out of the learning conditions during idling, learning is interrupted.
To reexecute learning, the ignition switch must once be turned off.

6. Continue idling for about 3 minutes before learning is completed.
7. Confirm that the engine warning lamp is off. If it still blinks, reexecute learning.

SUPPLY PUMP CORRECTION LEARNING PROCEDURE

M1001014400299

PURPOSE

The engine-ECU learns the relation between the suction control valve (linear solenoid valve) of the supply pump drive current and the fuel injection volume.
The learning value is calculated from the suction control valve drive current and the rail pressure sensor output voltage.
When the supply pump is replaced, therefore, this learning must be executed.

Re-learning is executed when the engine is idling after the learning value in the engine-ECU has been reset by the M.U.T.-III.

LEARNING PROCEDURE

After the ignition switch is in "LOCK" (OFF) position, connect the M.U.T.-III to the diagnosis connector.

1. Turn the ignition switch to "ON" position. (Do not start the engine.)
2. Select SPECIAL FUNCTION from the function menu.

3. Select INITIALIZATION from SPECIAL FUNCTION menu.
4. Select and initialize Item No. 21 Supply pump exchange service.
5. After initializing, run the engine at idle in the following conditions.
   - Accelerator pedal: OFF
   - Engine coolant temperature: 60°C or higher
   - Fuel temperature: 30°C or higher
6. Confirm that the item No. 65 High pressure pump learned status on M.U.T.-III Service Data is "2".

NOTE: "2" indicates that the learning has completed.

INITIALIZATION PROCEDURE FOR LEARNING VALUE IN DIESEL PARTICULATE FILTER (DPF) SYSTEM <Euro5>

M1001015600069

PURPOSE

The engine-ECU stores the change of the DPF system caused by the various driving conditions as the learning value and uses it for assumption of the PM accumulated amount or for the acceptance/rejection criteria of the DPF system. For this reason, the learning value is necessary to be initialized when the parts related to the DPF system are replaced.

INITIALISATION PROCEDURE

1. After the ignition switch is in "LOCK" (OFF) position, connect M.U.T.-III with the diagnosis connector.
2. Ignition switch is in "ON" position.
3. Select the "SPECIAL FUNCTION" from the "FUNCTION MENU" on the M.U.T.-III.
4. Select the INITIALIZATION from the SPECIAL FUNCTION.
5. Select the item on the screen of the initialization for learning, and perform the initialization.

Service	Item No.	Item
At replacing DPF	40	DPF exchange service
At replacing exhaust differential pressure sensor	41	DPF differential pressure sensor exchange service
At replacing catalytic converter	42	DPF system malfunction service

BATTERY CURRENT SENSOR CALIBRATION <Euro5>

M1001018600240

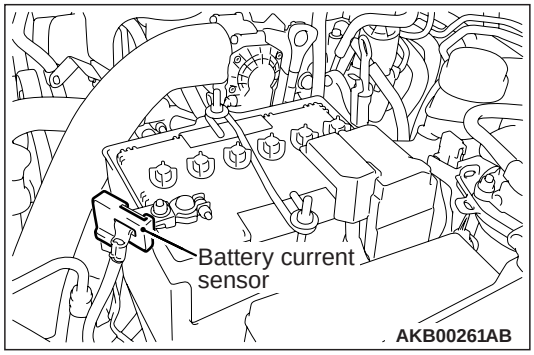
PURPOSE

The engine-ECU carries out the electrical generation control according to the charge level of the battery, based on the battery current sensor signal. To improve the effect of reducing the fuel consumption by the electrical generation control, it is necessary to accurately detect the charge level of the battery. For this, if the following services are performed, carry out the battery current sensor calibration.

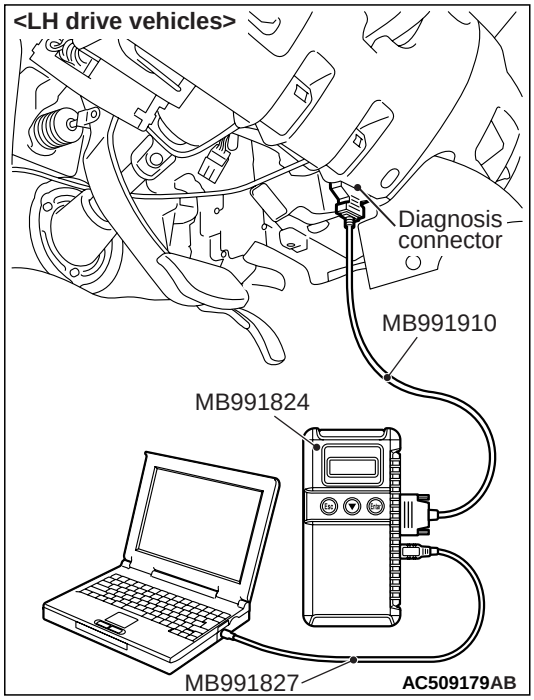
- Replacing the battery current sensor
- Replacing the engine-ECU

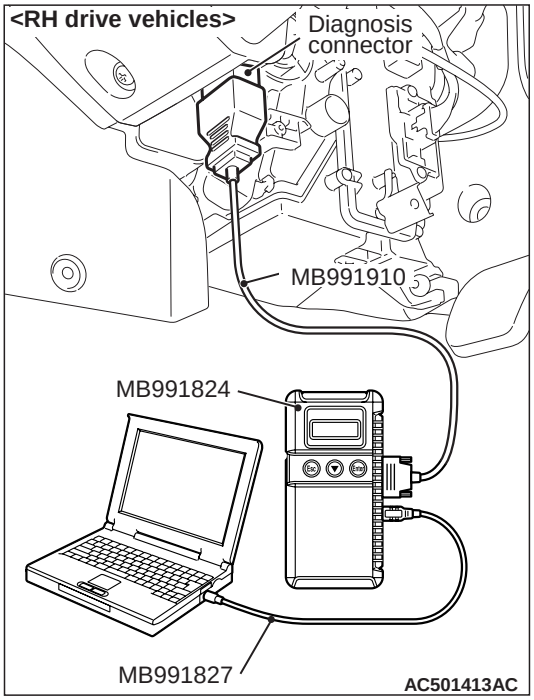
LEARNING PROCEDURE

1. After the ignition switch is in "LOCK" (OFF) position, disconnect the battery cable from the negative battery terminal.



2. Remove the battery current sensor from the battery cable (Do not disconnect the battery current sensor connector).
3. Connect the battery cable without the battery current sensor to the negative battery terminal.





4. Connect the M.U.T.-III to the diagnosis connector (But do not start the engine).
5. Turn the ignition switch to the ON position.
6. Select "MPI/GDI/DIESEL" from System select Screen of the M.U.T.-III.
7. Select "Special Function" from MPI/GDI/DIESEL Screen.
8. Select "Learning" from Special Function Screen.
9. Select "Battery current SNSR.calibration" from Learning Screen.
10. Start the calibration by pressing the "OK" button.
11. Confirm that the M.U.T.-III data list item No. 452 Battery current sensor calibration is "Completed".
12. After the ignition switch is in "LOCK" (OFF) position, disconnect the M.U.T.-III.
13. Install the battery current sensor.

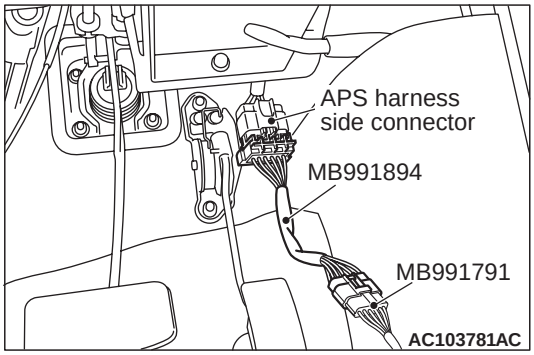
HOW TO USE THE THROTTLE CONTROLLER

M1001009300036

As for a vehicle with the electronic control throttle valve*, engine operations such as racing can not be performed from outside the vehicle. Thus, the throttle valve controller (MB991791) is provided as a special tool to enable the engine operation from outside the vehicle.

*NOTE: *: A vehicle with the accelerator pedal position sensor (APS) installed to the accelerator pedal*

THE THROTTLE CONTROLLER CONNECTION



1. Disconnect the accelerator pedal position sensor (APS) connector installed to the accelerator pedal, and connect the 6-pin connector of throttle controller adaptor (MB991894) to the vehicle harness-side connector.
2. Connect the throttle controller (MB991791) to the 8-pin connector of throttle controller adaptor (MB991894).

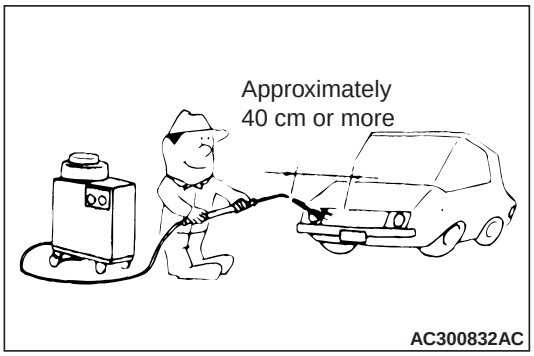
APPLICATION OF ANTI-CORROSION AGENTS AND UNDERCOATS

M1001011000247

If oil or grease gets onto the oxygen sensor, it will cause a drop in the performance of the sensor. Cover the oxygen sensor with a protective cover when applying anti-corrosion agents and undercoats.

VEHICLE WASHING

M1001012000723



If high-pressure car-washing equipment or steam car-washing equipment is used to wash the vehicle, be sure to note the following information in order to avoid damage to plastic components, etc.

- Spray nozzle distance: Approx. 40 cm or more
- Spray pressure: 3,900 kPa or less
- Spray temperature: 82°C or less
- Time of concentrated spray to one point: within 30 sec.

PRECAUTIONS FOR INSTALLATION OF ON-VEHICLE RADIO TRANSMISSION EQUIPMENT

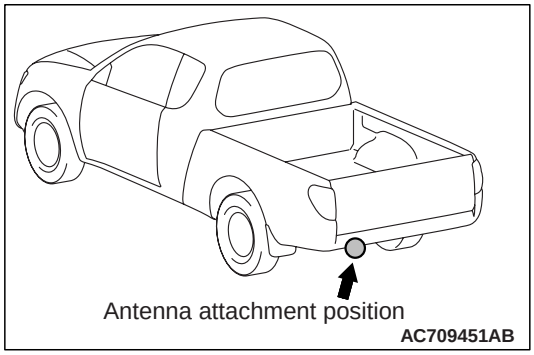
M1001015500095

The computers (control unit) for various on-vehicle electronic equipment are provided with sufficient protective measures against external radio wave interference. However, because the on-vehicle radio transmission equipment may affect adversely the computers (control unit), pay attention to the following precautions for installation.

- Install radio transmission equipment and antenna (including coaxial cables) 200 mm or more away from the computers (control unit) for on-vehicle electronic equipment.
- Because radio wave is radiated from the coaxial cables of the antenna for radio transmission equipment, do not route the cables in parallel with the vehicle wiring harness.
- Install only radio transmission equipment with the frequencies, output, and radio wave types described in the table.

FREQUENCY, OUTPUT, AND RADIO WAVE TYPE OF THE RADIO TRANSMISSION EQUIPMENT

Frequency (MHz)	Maximum output power (W)	Modulation
3.5	50	CW, FM, AM, SSB
7		
14		
21		
28		
50		
144		
430		
1,260	2	



Install the antenna for radio transmission equipment only to the position shown in the figure.

SUPPLEMENTAL RESTRAINT SYSTEM (SRS)

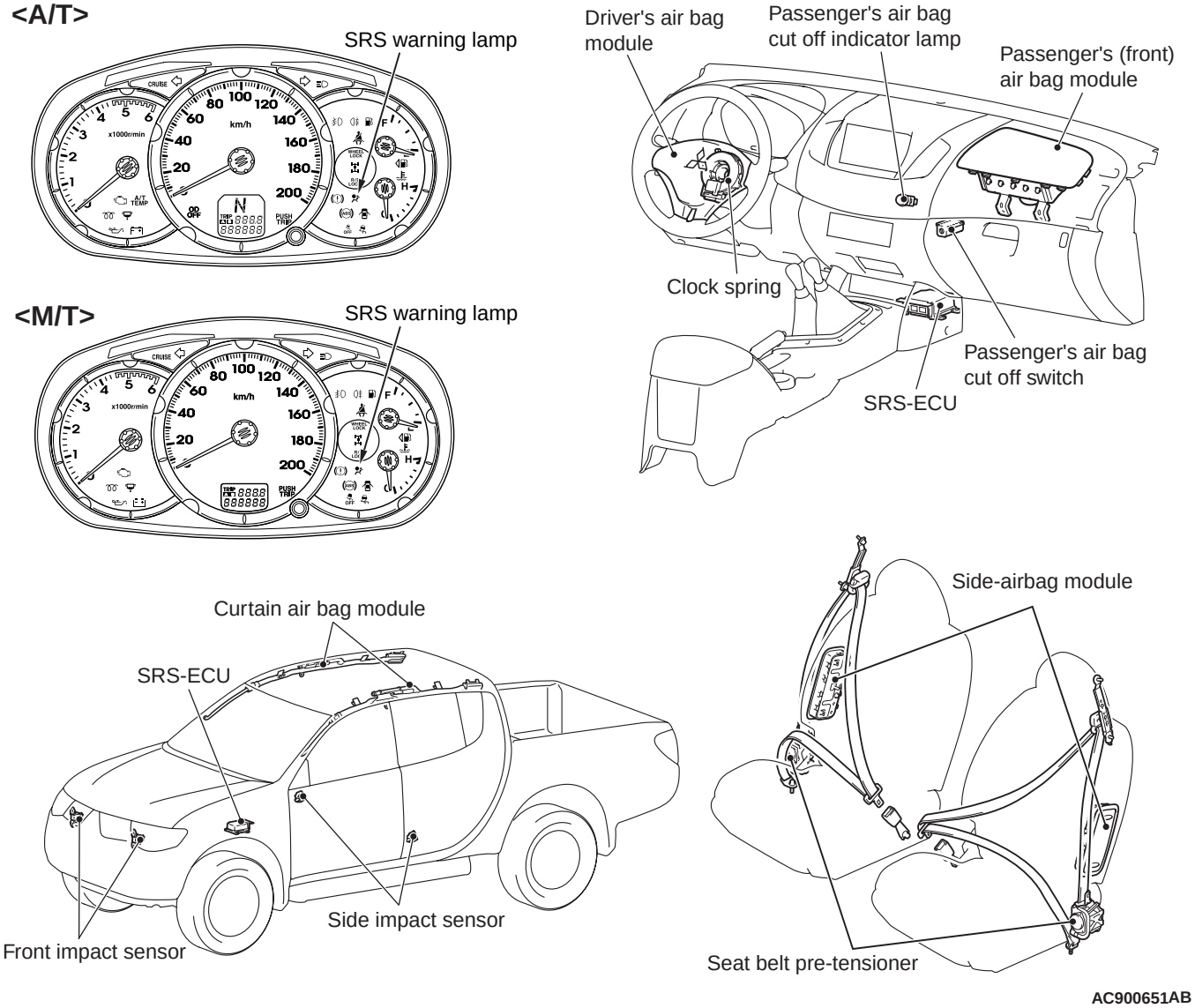
M1001009801120

The driver's and passenger's air bag and seat belt with pre-tensioner is designed to supplement the driver's and front passenger's seat belts to help reduce the risk or severity of injury to the driver and front passenger by activating and deploying both front air bags in certain frontal collisions. The side-air bag and the curtain air bag are activated when an impact exceeds the threshold upon a side collision, and inflates to protect the heads of the occupants in the front and rear seats.

The Supplemental Restraint System (SRS) consists of air bag modules, SRS air bag control unit (SRS-ECU), front impact sensors, side impact sensor, SRS warning lamp, clock spring, passenger's air bag cut off switch, passenger's air bag cut off indicator lamp and seat belt with pre-tensioner. Front air bags are located in the centre of the steering wheel and above the glove box. Side-airbags are located inside the front seatback assemblies. The curtain air bag module is installed in the roof side sections (from the

driver's and the passenger's front pillars to the rear pillars). Each air bag is made up of a folded air bag and an inflator unit. The SRS-ECU is mounted on the front of the floor console and has a front air bag safing G-sensor, front air bag analogue G-sensor. The front impact sensor is installed out side of the headlamp support panel. The side impact sensor is installed in the lower parts of the centre pillars. The warning lamp on the instrument panel indicates the operational status of the SRS. The clock spring is installed in the steering column. The passenger's air bag cut off switch is located above inside the glove box. The passenger's air bag cut off indicator lamp is located above the centre upper panel. The seat belt pre-tensioner is built into the driver's and passenger's front seat belt retractor.

Only authorized service personnel should do work on or around the SRS components. Those service personnel should read this manual carefully before starting any such work.



SRS SERVICE PRECAUTIONS

M1001006001006

⚠ *DANGER*

In order to avoid injury to yourself or others from accidental deployment of the air bag during servicing, read and carefully follow all the precautions and procedures described in this manual.

⚠ **CAUTION**

Do not use any electrical test equipment on or near SRS components, except those specified on .

⚠ **CAUTION**

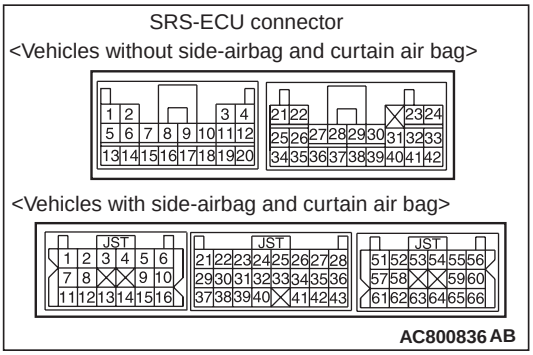
Never attempt to repair the following components:

1. **SRS-ECU**
2. **Front impact sensor**
3. **Clock spring**
4. **Driver's and passenger's (front) air bag modules**
5. **Seat belt with pre-tensioner**
6. **Side impact sensor**
7. **Front seatback assembly incorporating side-airbag module**
8. **Curtain air bag module**

NOTE: If any of these components are diagnosed as faulty, they should only be replaced, in accordance with the INDIVIDUAL COMPONENTS SERVICE procedures in this manual, starting at page .

<Vehicle without side-airbag and curtain air bag>

⚠ **CAUTION**



Do not attempt to repair the wiring harness connectors of the SRS. If a defective wiring harness is found, repair or replace it by referring to the table below.

SRS-ECU terminal No.	Destination of harness	Remedy
1, 2	Instrument panel wiring harness → Front wiring harness → Front impact sensor (RH)	Correct or replace each wiring harness.
3, 4	Instrument panel wiring harness → Front wiring harness → Front impact sensor (LH)	Correct or replace each wiring harness.
8	Instrument panel wiring harness → SRS warning lamp	Correct or replace the Instrument panel wiring harness.
9, 10	Instrument panel wiring harness → Passenger's air bag cut off switch → Passenger's (front) air bag module	Correct or replace the instrument panel wiring harness.
11, 12	Instrument panel wiring harness → Clock spring → Driver's air bag module	Correct or replace instrument panel wiring harness. Replace the clock spring.
13	Instrument panel wiring harness → Junction block (fuse No.21)	Correct or replace the instrument panel wiring harness.

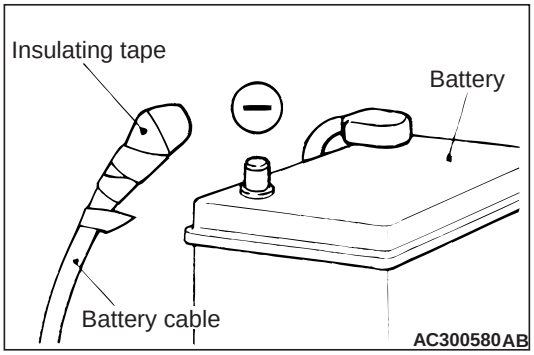
SRS-ECU terminal No.	Destination of harness	Remedy
16	Instrument panel wiring harness → Junction block (fuse No.15)	Correct or replace the instrument panel wiring harness.
18	Instrument panel wiring harness → Earth	Correct or replace the instrument panel wiring harness.
20	Instrument panel wiring harness → Diagnosis connector	Correct or replace the instrument panel wiring harness.
27, 28	Instrument panel wiring harness → Floor wiring harness → Seat belt pre-tensioner (passenger's side)	Correct or replace each wiring harness.
29, 30	Instrument panel wiring harness → Floor wiring harness → Seat belt pre-tensioner (driver's side)	Correct or replace each wiring harness.

<Vehicle with side-airbag and curtain air bag>

SRS-ECU terminal No.	Destination of harness	Remedy
1, 2	Floor wiring harness → Instrument panel wiring harness → roof wiring harness → curtain air bag module (LH)	Correct or replace each wiring harness.
3, 4	Floor wiring harness → side-airbag module (LH)	Correct or replace the floor wiring harness.
5, 6	Floor wiring harness → Seat belt pre-tensioner (passenger's side)	
15, 16	Floor wiring harness → side impact sensor (LH)	
21, 22	Instrument panel wiring harness → Passenger's air bag cut off switch → Passenger's (front) air bag module	Correct or replace the instrument panel wiring harness.
27, 28	Instrument panel wiring harness → Clock spring → Driver's air bag module	Correct or replace instrument panel wiring harness. Replace the clock spring.
29, 30	Instrument panel wiring harness → Front wiring harness → Front impact sensor (LH)	Correct or replace each wiring harness.
35, 36	Instrument panel wiring harness → Front wiring harness → Front impact sensor (RH)	
37	Instrument panel wiring harness → Junction block (fuse No.15)	Correct or replace the instrument panel wiring harness.
38	Instrument panel wiring harness → Diagnosis connector	
39	Instrument panel wiring harness → SRS warning lamp	
41	Instrument panel wiring harness → Earth	
43	Instrument panel wiring harness → Junction block (fuse No.21)	

SRS-ECU terminal No.	Destination of harness	Remedy
51, 52	Floor wiring harness → Seat belt pre-tensioner (driver's side)	Correct or replace the floor wiring harness.
53, 54	Floor wiring harness → side-airbag module (RH)	
55, 56	Floor wiring harness → Instrument panel wiring harness → roof wiring harness → curtain air bag module (RH)	Correct or replace each wiring harness.
61, 62	Floor wiring harness → side impact sensor (RH)	Correct or replace the floor wiring harness.

⚠ DANGER



After disconnecting the battery cable, wait 60 seconds or more before proceeding with the following work. In addition, insulate the negative battery terminal with a tape. The condenser inside the SRS-ECU is designed to retain enough voltage to deploy the air bag

for a short time even after the battery has been disconnected, so serious injury may result from unintended air bag deployment if work is done on the SRS system immediately after the battery cables are disconnected.

⚠ CAUTION

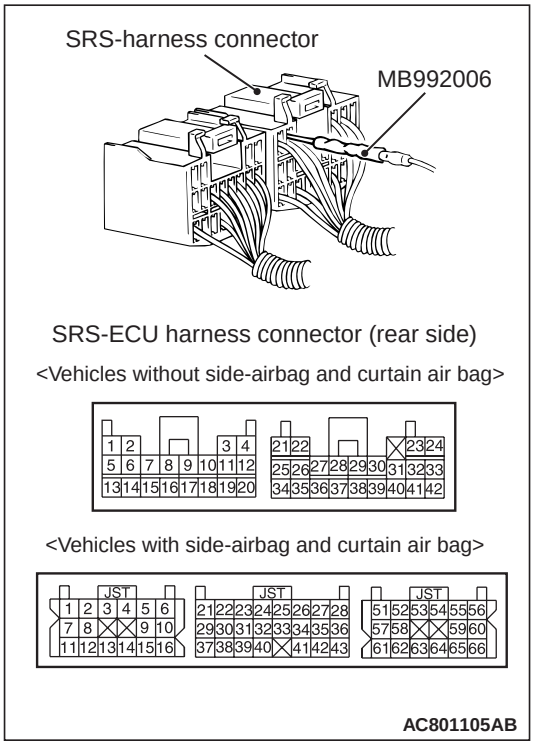
The SRS components and seat belt with pre-tensioner should not be subjected to heat, so remove the SRS-ECU, driver's and passenger's (front) air bag modules, clock spring, front impact sensor, seat belt with pre-tensioner before drying or baking the vehicle after painting.

- **SRS-ECU, air bag modules, clock spring and impact sensors: 93° C or more**
- **Seat belt with pre-tensioner: 90°C or more**

⚠ CAUTION

Whenever you finish servicing the SRS, always erase the diagnosis code and check warning lamp operation to make sure that the system functions properly.

⚠ CAUTION



If checks are carried out by using the SRS-ECU harness connector, observe the following procedures: Insert the special tool extra fine probe (MB992006) into connector from harness side (rear side), and connect the tester to this probe. If any tool than special tool is used, damage to the harness and other components will result. Never insert the probe directly to the terminals from the front of the connector. The terminals are plated to increase their conductivity, so that if they are touched directly by the probe, the plating may break, which will cause drops in reliability.

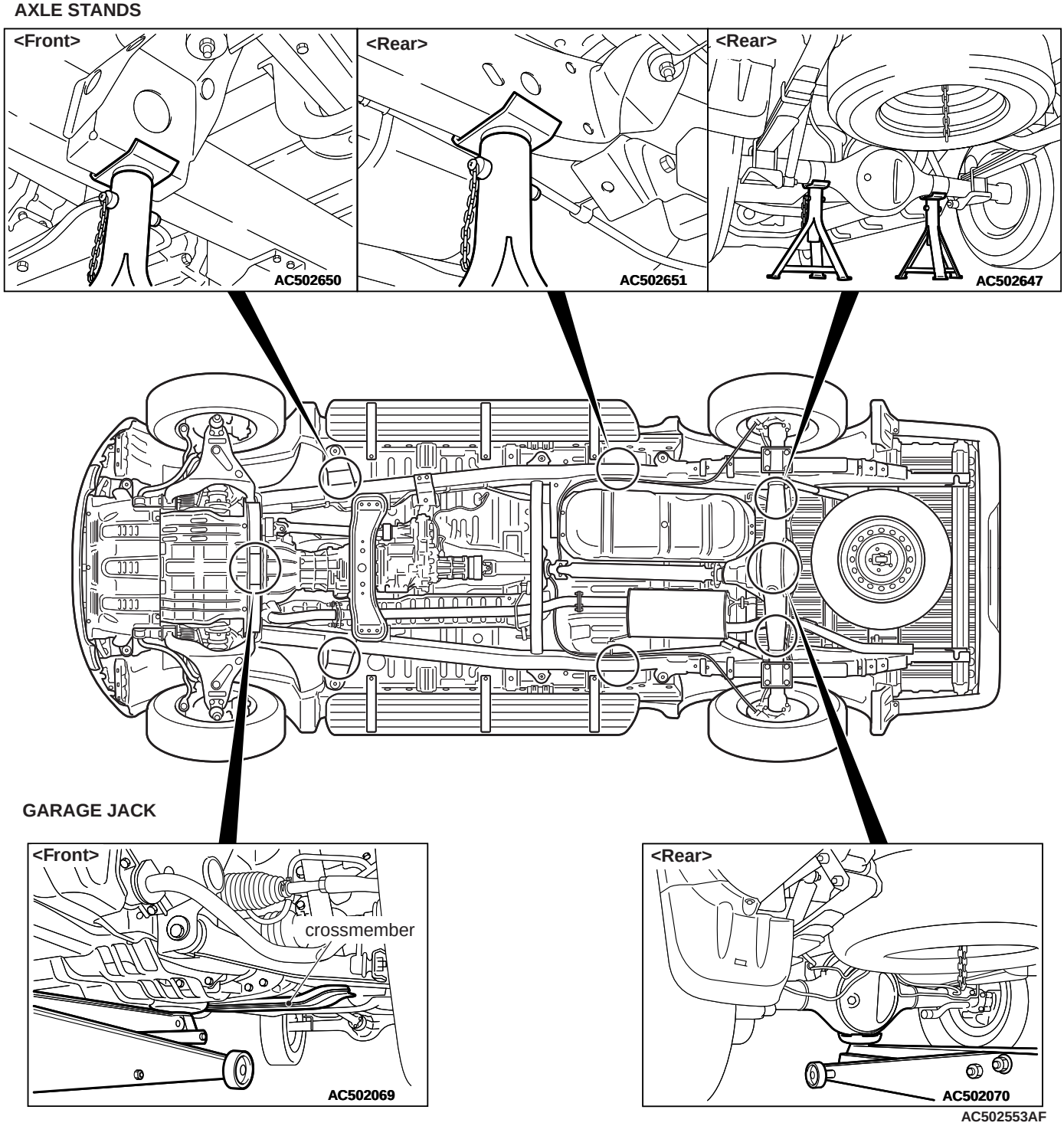
SUPPORT LOCATIONS FOR LIFTING AND JACKING

M1001000701160

SUPPORT POSITIONS FOR A GARAGE JACK AND AXLE STANDS

⚠ CAUTION

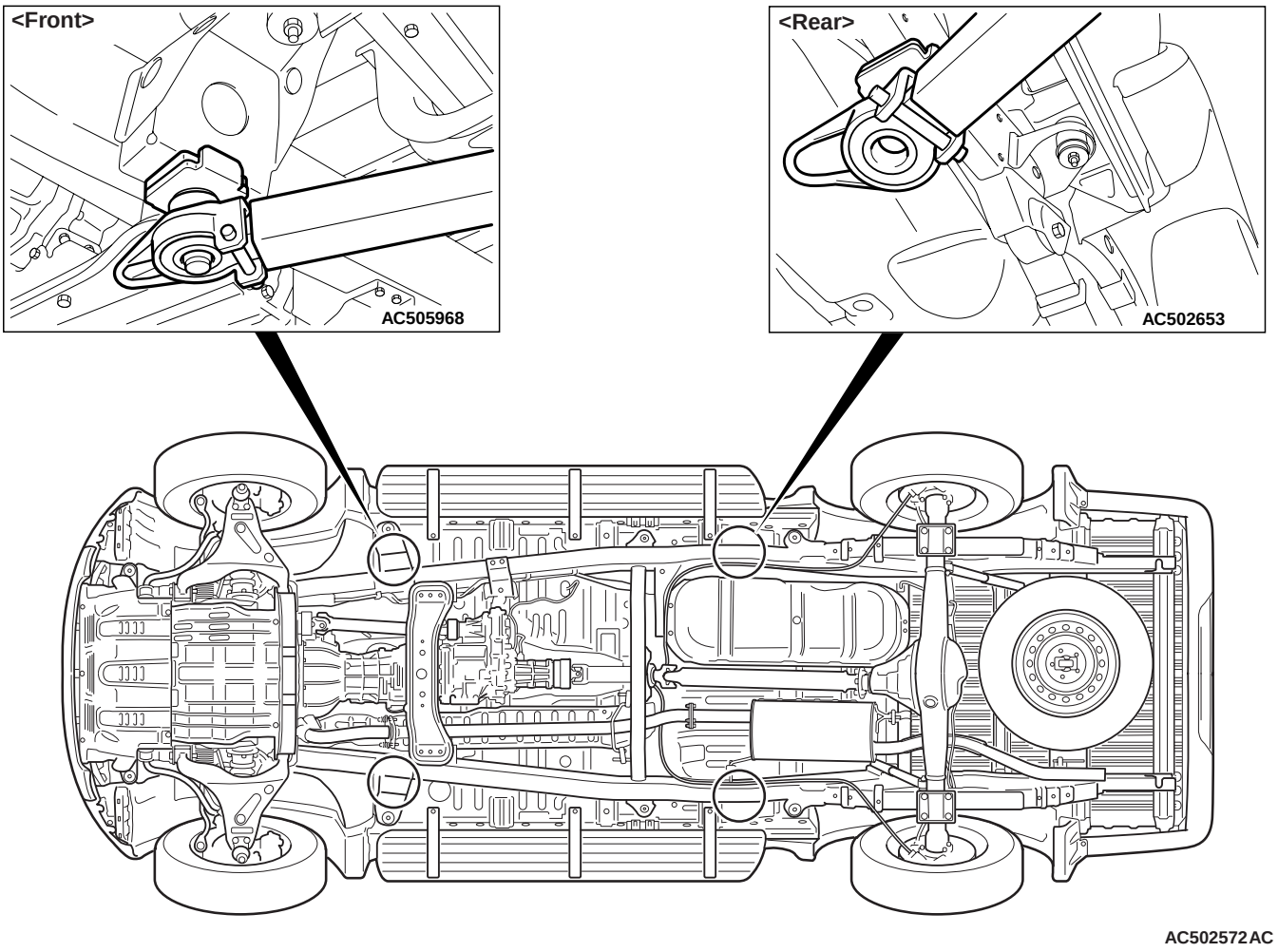
Do not support the vehicles at locations other than specified supporting points. Doing so will cause damage, etc.



SUPPORT POSITIONS FOR A SINGLE-POST LIFT OR DOUBLE-POST LIFT

⚠ CAUTION

When service procedures require removing rear suspension, spare tyre and rear bumper, place additional weight on rear end of vehicle or anchor vehicle to hoist to prevent tipping of centre of gravity changes.



AC502572AC

GROUP 00E

GENERAL <ELECTRICAL>

CONTENTS

HOW TO READ WIRING DIAGRAMS 00E-2
COMPOSITION AND CONTENTS OF WIRING DIAGRAMS 00E-2
HOW TO READ CONFIGURATION DIAGRAMS 00E-2
HOW TO READ CIRCUIT DIAGRAMS 00E-4
MARKINGS FOR CONNECTOR AND EARTHING 00E-5
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ABBREVIATION SYMBOLS 00E-8

HOW TO READ WIRING DIAGRAMS

COMPOSITION AND CONTENTS OF WIRING DIAGRAMS

M1001012800150

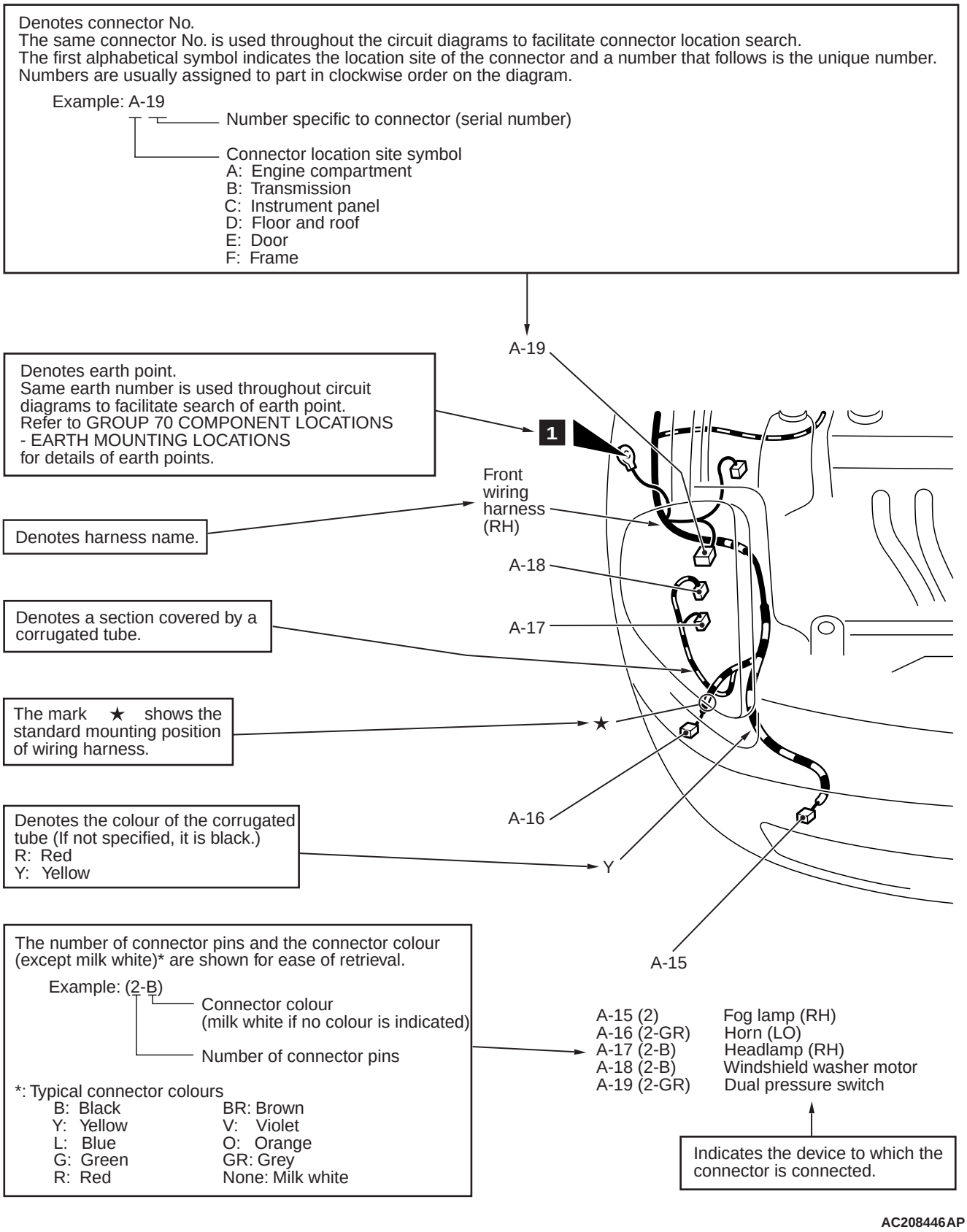
In each section, all specifications are listed, including optional specifications. Accordingly, some specifications may not be applicable for individual vehicles.

Section	Basic contents
Component locations	Locations are shown for each point of relays, ECUs, sensors, solenoid valves, inspection connectors, fusible links, fuses, etc. In the part's lists, parts are listed in alphabetical order.
Configuration diagrams	Connector locations and harness wiring configurations on actual vehicles are illustrated.
Circuit diagrams	Circuits from power source to earth are shown completely, classified according to system. There is a main division into power source circuits and circuits classified by system. • Junction block The entire circuit for the junction block is described, because only the part of the junction block needed is normally shown in each circuit diagram. • Joint connectors The internal circuits for all joint connectors are described, because only the part needed is shown in each circuit diagram. • Power source circuits Circuits from the battery to fusible link, fuse, ignition switch, etc are shown. • Circuits classified by system For each system, the circuits are shown from fuse to earth, excluding the power source sections.

HOW TO READ CONFIGURATION DIAGRAMS

M1001006400227

The wiring harness diagrams clearly show the connector locations and harness routings at each site on actual vehicles.

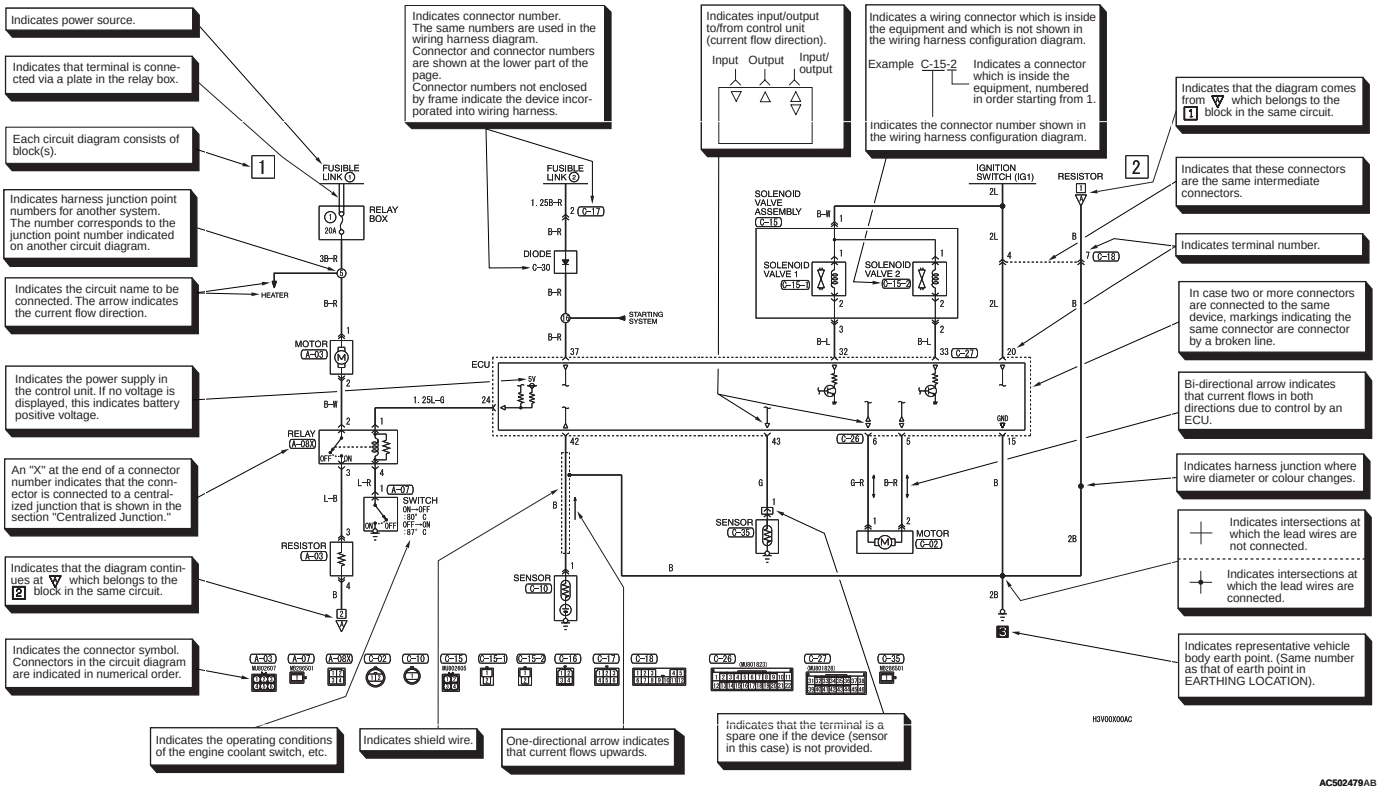

Denotes connector No.
The same connector No. is used throughout the circuit diagrams to facilitate connector location search.
The first alphabetical symbol indicates the location site of the connector and a number that follows is the unique number.
Numbers are usually assigned to part in clockwise order on the diagram.
Example: A-19
Number specific to connector (serial number)
Connector location site symbol
A: Engine compartment
B: Transmission
C: Instrument panel
D: Floor and roof
E: Door
F: Frame
A-19
Denotes earth point.
Same earth number is used throughout circuit diagrams to facilitate search of earth point.
Refer to GROUP 70 COMPONENT LOCATIONS - EARTH MOUNTING LOCATIONS for details of earth points.
1
Front wiring harness (RH)
Denotes harness name.
A-18
Denotes a section covered by a corrugated tube.
A-17
The mark ★ shows the standard mounting position of wiring harness.
★
A-16
Denotes the colour of the corrugated tube (If not specified, it is black.)
R: Red
Y: Yellow
Y
A-15
The number of connector pins and the connector colour (except milk white)* are shown for ease of retrieval.
Example: (2-B)
Connector colour (milk white if no colour is indicated)
Number of connector pins
*: Typical connector colours
B: Black
Y: Yellow
L: Blue
G: Green
R: Red
BR: Brown
V: Violet
O: Orange
GR: Grey
None: Milk white
A-15 (2) Fog lamp (RH)
A-16 (2-GR) Horn (LO)
A-17 (2-B) Headlamp (RH)
A-18 (2-B) Windshield washer motor
A-19 (2-GR) Dual pressure switch
Indicates the device to which the connector is connected.

AC208446AP

HOW TO READ CIRCUIT DIAGRAMS

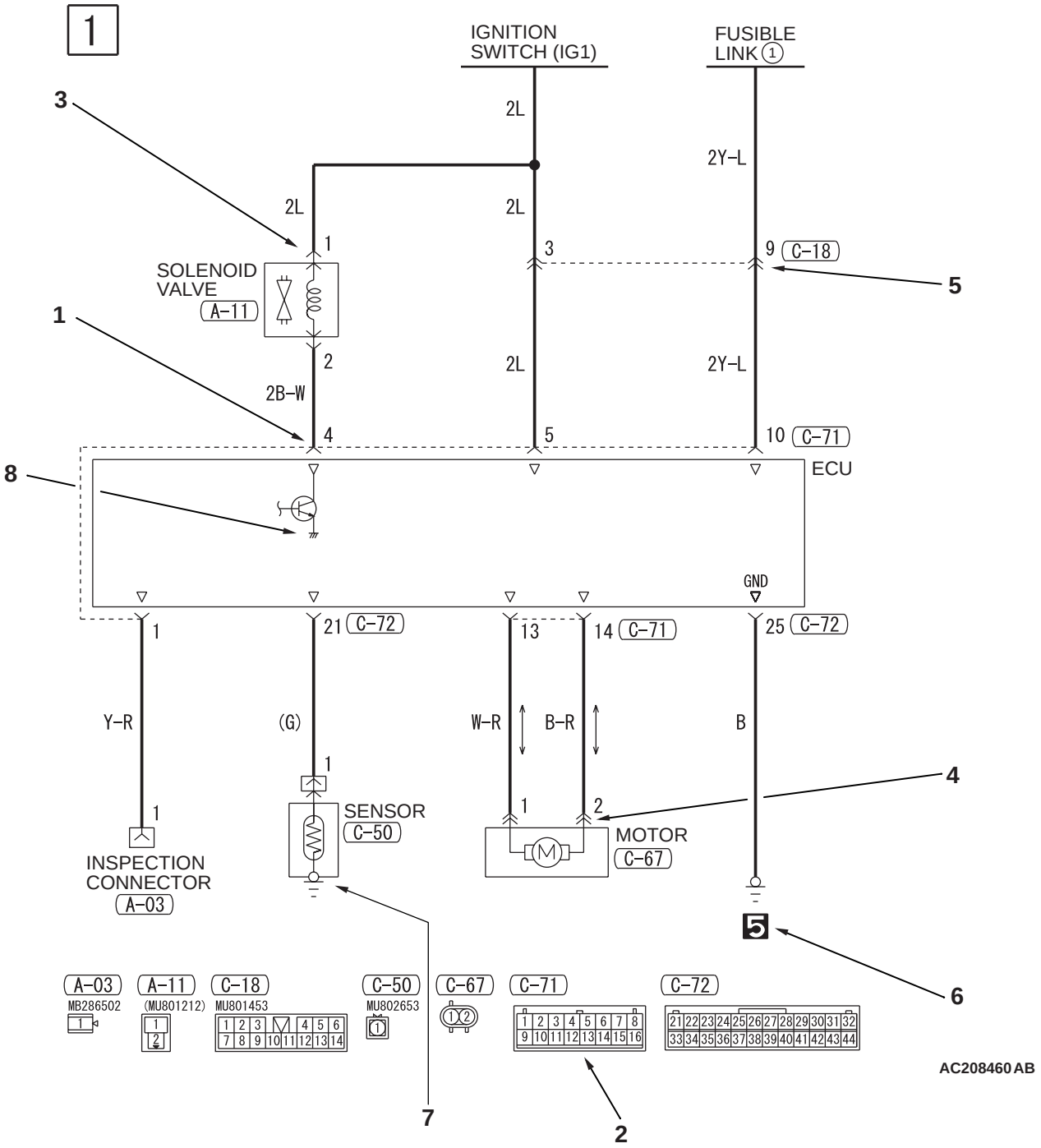
M1001006500194

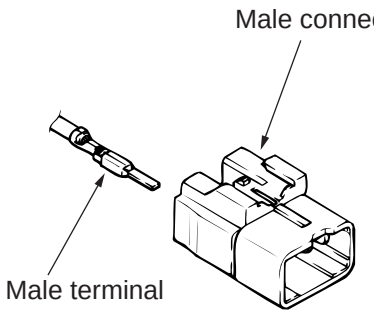
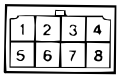
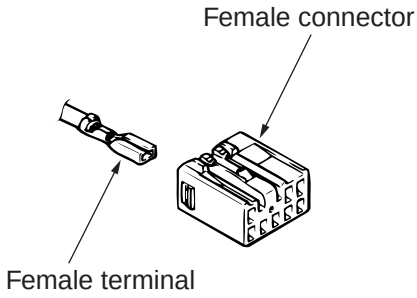
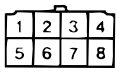
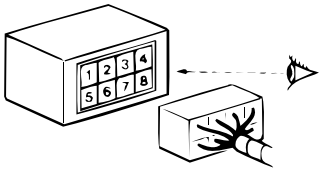
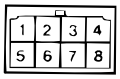
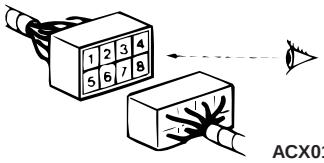
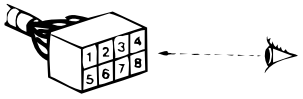
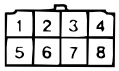
The circuit of each system from the fuse (or fusible link) to earth is shown. The power source is shown at the top and the earth at the bottom to facilitate understanding of how the current flows. The circuit diagrams show the state when switches are not operated.

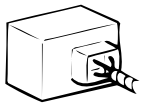
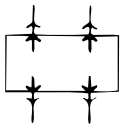
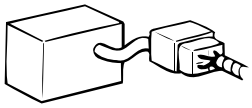
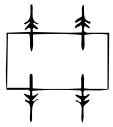
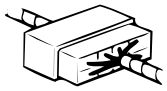


MARKINGS FOR CONNECTOR AND EARTHING

M1001007900162



Item	No.	Connector/Earthing	Symbol	Contents
Connector and terminal marking	1	 ACX01251AE	Male terminal ACX01252AD	The male and female terminals are indicated as shown. The connector with male terminal(s) is called as male connector and indicated by two connector contour lines, while the connector with female terminal(s) is called as female connector and indicated by single connector contour line.
			Male connector  ACX01253AI	
		 ACX01254AD	Female terminal ACX01255AD	
			Female connector  ACX01256AH	
Connector symbol marking	2	Device  ACX01257AD	 ACX01253	The symbol indicates the connector is viewed as shown. At a device connection, the connector symbol on the device side is shown. For an intermediate connector, the male connector symbol is shown. For spare connectors and check connectors, no device is connected, and so the harness-side connector symbol is shown for these connectors. However, a diagnosis connector is exceptional.
		Intermediate connector  ACX01258AD		
		Spare connector, check connector  ACX01816AD	 ACX01256	

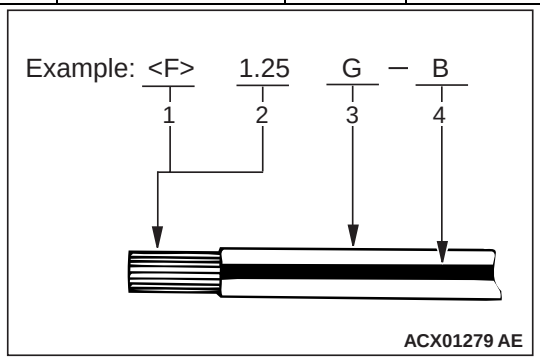
Item	No.	Connector/Earthing	Symbol	Contents
Connector connection marking	3	Direct connection type  ACX01260 AD	 ACX01261	Connection between a device and the harness is either by direct insertion in the device (direct connection type) or by connection with a harness connector furnished on the device side (harness connection type). The two types are indicated as illustrated.
	4	Harness connection type  ACX01262 AD	 ACX01263	
	5	Intermediate connector  ACX01264 AD	ACX01265	
Earth marking	6	Body earth AC208448 AB	ACX01274	Earthing is either by body earth, device earth or control unit interior earth. These are indicated as illustrated.
	7	Device earth AC208449 AB	ACX01276	
	8	Earth in control unit AC208450 AB	ACX01278	

WIRE COLOUR CODE

M1001008000195

Wire colours are identified by the following colour codes.

Code	Wire colour	Code	Wire colour	Code	Wire colour	Code	Wire colour
B	Black	L	Blue	PU	Purple	V	Violet
BR	Brown	LG	Light green	R	Red	W	White
G	Green	O	Orange	SB	Sky blue	Y	Yellow
GR	Grey	P	Pink	SI	Silver	–	–



If a cable has two colours, the first of the two colour code characters indicates the basic colour (colour of the cable coating) and the second indicates the marking colour.

No.	Meaning
1	<F>: Flexible wire
	<T>: Twisted wire
2	Wire size (mm^2)*
3	Basic colour (colour of the cable coating)
4	Marking colour

NOTE:

**: No code indicates 0.5 mm^2. Cable colour code in parentheses indicates 0.3 mm^2.*

ABBREVIATION SYMBOLS

M1001008101593

The abbreviation symbols used in wiring diagrams are defined below.

1. FOR SYSTEM NAME

Abbreviation symbol	Meaning	Abbreviation symbol	Meaning
ABS	Anti-skid braking system	LHD	Left hand drive vehicles
ASTC	Active stability and traction control system	MMCS	Mitsubishi multi-communication system
CAN	Controller area network	PTC	Positive temperature coefficient
ELC-4A/T	Electronic controlled 4-speed automatic transmission	RHD	Right hand drive vehicles
ELC-5A/T	Electronic controlled 5-speed automatic transmission	RV	Recreation vehicle
J/B	Junction block	SRS	Supplemental restraint system
J/C	Joint connector	USB	Universal serial bus

2. FOR COMBINATION METERS

Abbreviation symbol	Meaning	Abbreviation symbol	Meaning
4WD	4-wheel drive indicator lamp	GLOW	Diesel preheat indicator lamp
A/T TEMP	Automatic transmission fluid temperature warning lamp	LCD	Liquid crystal display
ABS	Anti-skid braking system warning lamp	ODO	Odometer
ASTC	ASTC indicator lamp	OD OFF	Overdrive off indicator lamp
ASTC OFF	ASTC OFF indicator lamp	OIL	Engine oil pressure warning lamp
BEAM	High beam indicator lamp	REAR DIFF LOCK	Rear differential lock indicator lamp
BRAKE	Brake warning lamp	REAR FOG	Rear fog lamp indicator lamp
C/D LOCK	Centre differential lock indicator lamp	REAR WHEEL	Rear wheel indicator lamp
CHECK ENGINE	Check engine warning lamp	SEAT BELT	Seat belt warning lamp
CHG	Charging warning lamp	SPEED	Speedometer
CPU	Central processing unit	SRS	Supplemental restraint system warning lamp
CRUISE	Cruise control indicator lamp	T/GA	Engine coolant temperature gauge
DOOR	Door-ajar warning lamp	TACHO	Tachometer
DPF	Diesel particulate filter warning lamp		
F/GA	Fuel gauge	TRIP	Tripmeter
FRONT FOG	Front fog lamp indicator lamp	TURN (LH)	Turn-signal indicator lamp and hazard warning indicator lamp
FRONT WHEEL	Front wheel indicator lamp	TURN (RH)	
FUEL	Low fuel warning lamp	WATER SEPARATOR	Fuel filter warning lamp

3. FOR SWITCHES AND RELAYS

Name of switches and relays	Abbreviation symbol	Operation
Blower switch	LO	Blower operates at low speed
	ML	Blower operates at medium low speed
	MH	Blower operates at medium high speed
	HI	Blower operates at high speed
Cruise control switch	ON/OFF	Cruise control system ON/OFF
	RES/ACC	Set the vehicle speed
	SET/CST	
	CANCEL	Cancel the driving at a constant speed
Door lock actuator	LOCK	Door locked
	UNLOCK	Door unlocked

Name of switches and relays	Abbreviation symbol	Operation
Headlamp levelling switch	0, 1, 2, 3, 4	Lower the optical axis of the headlamp (LO) in steps at each position
Heated seat switch	LO	Normal heating
	HI	Rapid heating
Ignition switch	LOCK	When turned to the LOCK position, no circuits will start
	ACC	When turned to the ACC (ACCESSORY) or ON position, the power circuit will start
	IG2	When at the ST (START) position, the power circuit will not start functioning
	IG1	Even when at the ST (START) position, the power circuit will start
	ST	Only when turned to the ST (START) position, the power circuit will start
Inhibitor switch	P	Selector lever is at the P (PARKING) position
	R	Selector lever is at the R (REVERSE) position
	N	Selector lever is at the N (NEUTRAL) position
	D	Selector lever is at the D (DRIVE) position
	2	Selector lever is at the 2 (SECOND) position
	L	Selector lever is at the L (LOW) position
Lighting switch	LO	Low beams ON
	HI	High beams ON
	PASS	High beams ON
	TAIL	Tail, position, licence plate and illumination lamps ON
	HEAD	Headlamps ON
	AUTO	Headlamps or tail lamps automatically illuminate by sensing ambient brightness.
	FOG	Front, rear fog lamps ON
Others	ON	Switched ON
	OFF	Switched OFF
Power window switch	UP	Window closes
	DOWN	Window opens
	AUTO UP	Window is easily closed with one action
	AUTO DOWN	Window is easily opened with one action
	LOCK	Prevents all switches other than the main switch from operating the power windows
	UNLOCK	Every switch can open or close the respective window
Power seat switch	FR	Seat is moved forwards or seat back is stood upright
	RR	Seat is moved forwards or seat back is leaned backward
	UP	Seat cushion is tilted up
	DOWN	Seat cushion is tilted down

Name of switches and relays	Abbreviation symbol	Operation
Rear panel power window switch	UP	Window closes
	DOWN	Window opens
	FULL UP	Window is easily closed with one action
	FULL DOWN	Window is easily opened with one action
Remote controlled mirror switch	LH	LH mirror operates
	RH	RH mirror operates
Room lamp	DOOR	Room lamp ON when a door is open
Steering wheel audio remote control switch	MODE	Switches the mode
	CH UP	Changes the radio frequency or the music number in the CD
	CH DOWN	
	VOL UP	Increases the sound volume
	VOL DOWN	Decreases the sound volume
Sunroof switch	OPEN	Sunroof slides to open
	CLOSE	Sunroof slides to close
Turn-signal lamp switch	LH	LH turn-signal lamps ON
	RH	RH turn-signal lamps ON
Windshield intermittent wiper interval adjusting knob	SLOW	Pause time for intermittent operation lengthens
	FAST	Pause time for intermittent operation shortens
Windshield rain sensitive wiper function adjusting knob	–	Lowers the sensitivity of the lighting control sensor to the amount of rainfall.
	+	Raises the sensitivity of the lighting control sensor to the amount of rainfall.
Windshield wiper switch	MIST	Windshield wiper operates once
	AUTO	The windshield wiper operates depending on the amount of rainfall.
	INT	Windshield wiper operates intermittently
	LO	Windshield wiper operates at low speed
	HI	Windshield wiper operates at high speed

4. FOR OTHERS

Abbreviation symbol	Meaning	Abbreviation symbol	Meaning
2WD	2 wheel-drive vehicles	HI	High
4WD	4 wheel-drive vehicles	IC	Integrated circuit
A/C	Air conditioner	ILL	Illumination lamp
A/T	Automatic transmission	IND	Indicator lamp
CPU	Central processing unit	LIN	Local interconnect network
D.C	Direct current	LH	Left hand
ECU	Electronic control unit	LO	Low

Abbreviation symbol	Meaning	Abbreviation symbol	Meaning
EEPROM	Electrical erasable and programmable read only memory	M/T	Manual transmission
ETACS	Electronic time and alarm control system	M.U.T.	Multi-use tester
EGR	Exhaust gas recirculation	RH	Right hand
GND	Earthing		

GROUP 11

ENGINE

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GROUP 11A

ENGINE MECHANICAL

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GENERAL INFORMATION

M1111000102222

Item			Euro 5	Except Euro 5
Total displacement mL			2,477	
Bore × Stroke mm			91.1 × 95.0	
Compression ratio			16.5	17
Combustion chamber			Direct injection type	
Camshaft arrangement			DOHC	
Number of valve	Inlet		8	
	Exhaust		8	
Valve timing	Inlet	Opening	BTDC 13°	BTDC 20°
		Closing	ABDC 30°	ABDC 40°
	Exhaust	Opening	BBDC 38°	
		Closing	ATDC 22°	
Fuel system			Common rail fuel injection	
Rocker arm			Double roller type	

SERVICE SPECIFICATIONS

M1111000302118

Item		Standard value	Limit
A/C compressor drive belt tension (When checked)	Vibration frequency Hz	222.5 – 251.0	–
	Tension N	363 – 462	–
	Deflection mm (Reference)	6.8 – 8.0	–
A/C compressor drive belt tension (When adjusted)	Vibration frequency Hz	222.5 – 251.0	–
	Tension N	363 – 462	–
	Deflection mm (Reference)	6.8 – 8.0	–
A/C compressor drive belt tension (When replaced)	Vibration frequency Hz	259.8 – 300.0	–
	Tension N	495 – 660	–
	Deflection mm (Reference)	5.1 – 6.4	–
Alternator and power steering oil pump drive belt tension <Except Euro5>	Vibration frequency Hz (Reference)	107 – 151	–
	Tension N (Reference)	196 – 392	–
Alternator and power steering oil pump drive belt tension <Euro5>	Vibration frequency Hz (Reference)	87 – 123	–
	Tension N (Reference)	196 – 392	–
Valve clearance (at cold) [indicates clearance between cam and roller] mm	Intake valve	0.09	–
	Exhaust valve	0.14	–

Item		Standard value	Limit
Idle speed r/min	Euro 5-M/T	600 ± 50	–
	Euro 5-A/T	650 ± 50	–
	Except Euro 5-2WD-except high rider	650 ± 50	–
	Except Euro 5-high rider and 4WD	700 ± 50	–
Compression pressure (at engine speed of 250 r/min) kPa	Euro 5	2,400	Minimum 1,650
	Except Euro 5	2,500	Minimum 1,750
Compression pressure difference of all cylinder kPa		–	Maximum 300
Timing belt B tension mm		4 – 5	
Timing belt auto tensioner rod protrusion amount mm		2.3 – 7.6	

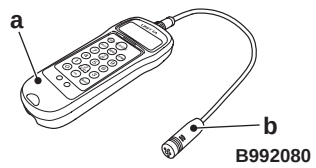
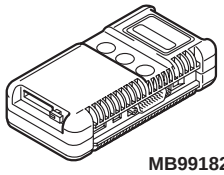
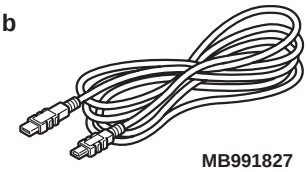
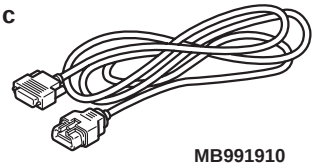
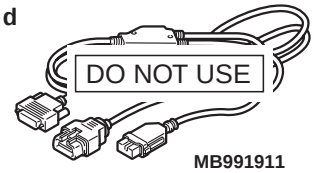
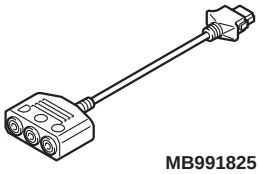
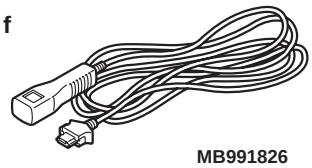
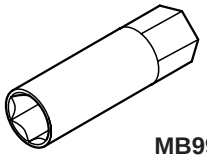
SEALANTS

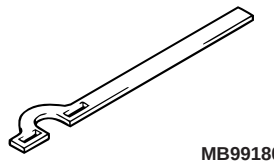
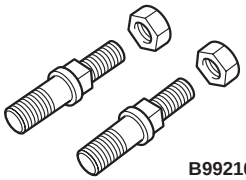
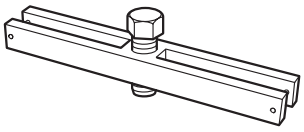
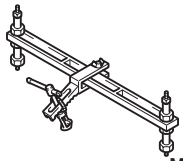
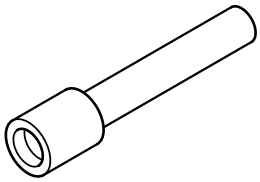
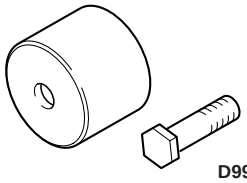
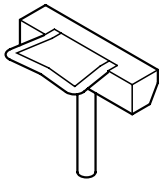
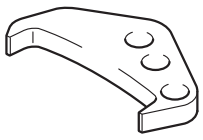
M1111000500956

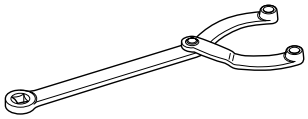
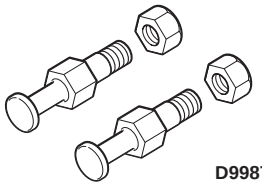
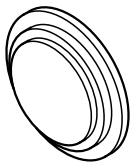
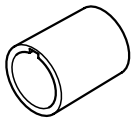
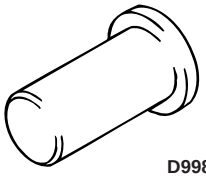
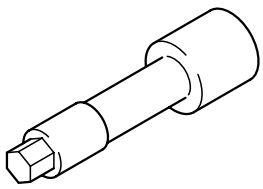
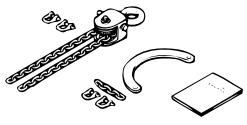
Item	Specified Sealant	Remark
Semi-circular packing	3M ATD Part No. 8660 or exact equivalent	Semi-drying sealant
Front left camshaft bearing cap		
Oil seal case assembly	ThreeBond 1207F (Mitsubishi Genuine Part No. 1000A992) or exact equivalent	

SPECIAL TOOLS

M1111000602799

Tool	Number	Name	Use
	MB992080 a: MB992081 b: MB992082	Belt tension meter set a: Belt tension meter b: Microphone assembly	Drive belt tension check
a  b  c  d  e  f  MB991955	MB991955 a: MB991824 b: MB991827 c: MB991910 d: MB991911 e: MB991825 f: MB991826	M.U.T.-III sub assembly a: Vehicle communication interface (V.C.I.) b: M.U.T.-III USB cable c: M.U.T.-III main harness A (Vehicles with CAN communication system) d: M.U.T.-III main harness B (Vehicles without CAN communication system) e: M.U.T.-III adapter harness f: M.U.T.-III trigger harness	⚠ CAUTION **For vehicles with CAN communication, use M.U.T.-III main harness A to send simulated vehicle speed. If you connect M.U.T.-III main harness B instead, the CAN communication does not function correctly.** • Checking the idle speed • Erasing diagnosis code
	MB992046	Valve adjusting socket	Adjustment of valve clearance

Tool	Number	Name	Use
 MB991800	MB991800	Pulley holder	Holding the crankshaft pulley
 B992100	MB992100	Crank pulley holder	• Holding the crankshaft pulley • Crankshaft pulley removal
 B992099	MB992099	Crank pulley puller	Crankshaft pulley removal
 MD998772	MD998772	Valve spring compressor	Compressing valve spring
	MB991999	Valve stem seal installer	Valve stem seal installation
 D998713	MD998713	Camshaft oil seal installer	Camshaft oil seal installation
 D998727	MD998727	Oil pan FIPG cutter	Oil pan removal
 MB991883	MB991883	Flywheel stopper	• Supporting the flywheel assembly <M/T> • Supporting the inertia ring assembly <A/T>

Tool	Number	Name	Use
 B990767	MB990767	Front hub and flange yoke holder	Holding the camshaft sprocket
 D998719	MD998719	Pin	
	MB992147	Oil seal installer	Crankshaft rear oil seal installation
 D998383	MD998383	Crankshaft front oil seal guide	Crankshaft front oil seal installation
 D998382	MD998382	Crankshaft front oil seal installer	
	MD998051	Cylinder head bolt wrench	Removal and installation of cylinder head bolt
 B991683	MB991683	Sling chain set	Removal and installation of engine assembly

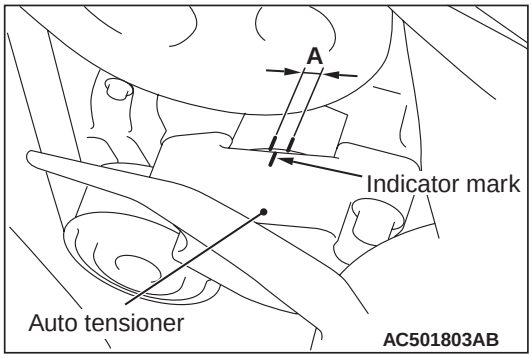
ON-VEHICLE SERVICE

ALTERNATOR AND POWER STEERING OIL PUMP DRIVE BELT TENSION CHECK

M1111001200033

⚠ CAUTION

Check the drive belt tension after turning the crankshaft clockwise one turn or more.



1. Make sure that the indicator mark is within the area marked with A in the illustration.
2. If the mark is out of the area, replace the drive belt. (Refer to P.11A-17).

   NOTE: The drive belt tension check is not necessary as auto tensioner is adopted.

A/C COMPRESSOR DRIVE BELT TENSION CHECK AND ADJUSTMENT

M1111001000363

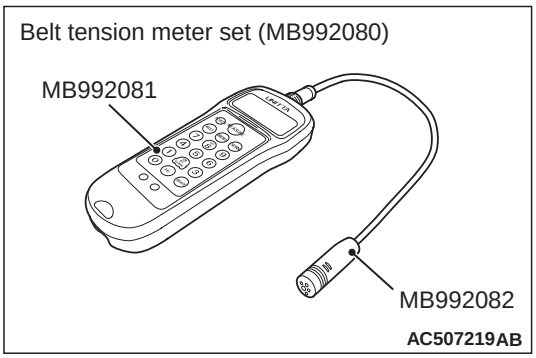
Check the drive belt tension by the following procedures.

STANDARD VALUE:

Item	When checked	When adjusted	When replaced
Vibration frequency Hz	222.5 – 251.0	222.5 – 251.0	259.8 – 300.0
Tension N	363 – 462	363 – 462	495 – 660
Deflection mm (Reference)	6.8 – 8.0	6.8 – 8.0	5.1 – 6.4

WHEN THE VIBRATION FREQUENCY IS MEASURED (SPECIAL TOOL MB992080 IS USED): RECOMMENDATION

NOTE: The vibration frequency measuring method is recommended for check and adjustment of the drive belt tension.

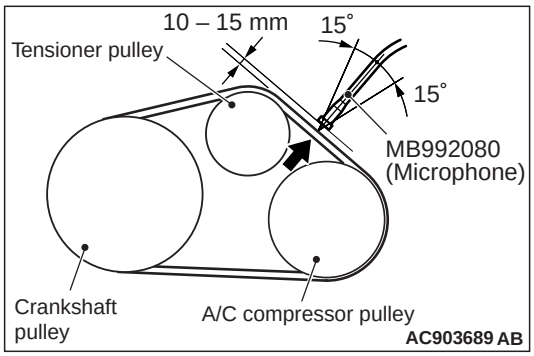


1. Connect special tool microphone assembly (MB992082) to special tool belt tension meter (MB992081) of special tool belt tension meter set (MB992080).
2. Press the "POWER" button to turn on the power supply.
3. Press the numeral key of "1" and check that "No.1" appears on the upper left of the display.

   NOTE: This operation is to temporarily set the preset data such as the belt specifications, because if the measurement is taken without input of the belt specifications, conversion to tension value (N) cannot be made, resulting in judgement of error.
4. Press "Hz" button twice to change the display to the frequency display (Hz).

⚠ CAUTION

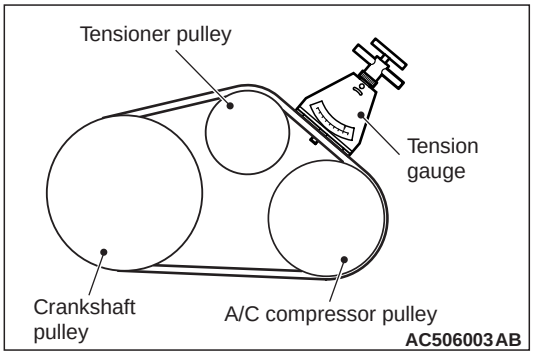
- **The temperature of the surface of the belt should be as close to normal temperature as possible.**
- **Do not let any contaminants such as water or oil get onto the microphone.**
- **If strong gusts of wind blow against the microphone or if there are any loud sources of noise nearby, the values measured by the microphone may not correspond to actual values.**
- **If the microphone is touching the belt while the measurement is being made, the values measured by the microphone may not correspond to actual values.**
- **Do not take the measurement while the vehicle's engine is running.**



5. Hold special tool MB992080 to the middle of the belt between the pulleys (at the place indicated by arrow) where it does not contact the belt (approximately 10 – 15 mm away from the rear surface of the belt) so that it is perpendicular to the belt (within an angle of ± 15 °).
6. Press the "MEASURE" button.
7. Gently tap the middle of the belt between the pulleys (the place indicated by the arrow) with your finger as shown in the illustration, and check that the vibration frequency of the belt is within the standard value.

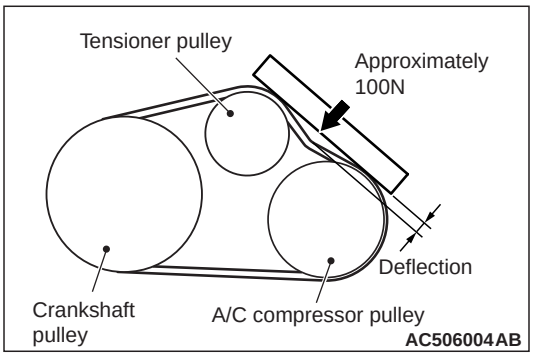
   NOTE: To take the measurement repeatedly, fillip the belt again.

WHEN USING THE TENSION GAUGE



Use a belt tension gauge in the middle of the belt between the pulleys shown in the figure (at the place indicated by the arrow) to check that the belt tension is within the standard value.

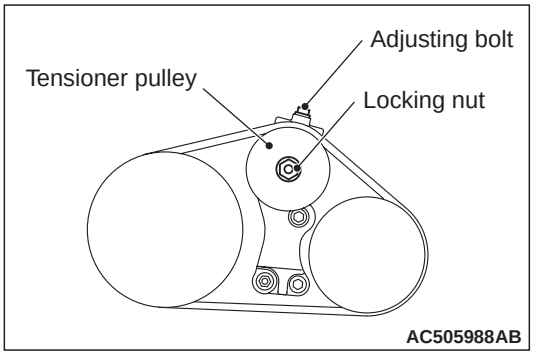
BELT DEFLECTION CHECK



Apply approximately 100 N of pressure against the location between the pulleys shown by the arrow in the illustration and then measure the deflection. When the belt tension is adjusted by measuring the belt deflection, adjust it with a tool for vibration frequency measurement or tension measurement afterward.

BELT TENSION ADJUSTMENT

If not within the standard value, adjust the belt tension by the following procedure.



1. Loosen the locking nut of the tensioner pulley.

2. Use the adjusting bolt to adjust the belt tension. The tension will increase when turning the adjusting bolt clockwise, and decrease when turning anti-clockwise.
3. Tighten the locking nut.
4. Tighten the adjusting bolt.

⚠ CAUTION

When checking the belt tension, turn the crankshaft clockwise one turn or more.

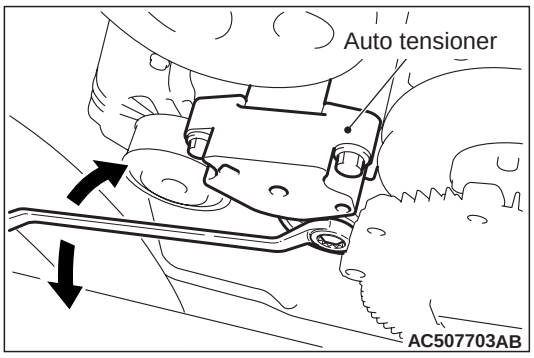
5. Check the belt tension, and readjust if necessary.

AUTO-TENSIONER CHECK

M1111003003216

OPERATION CHECK

1. Turn off the engine from the idle state then check to see that the drive belt is not protruding from the pulley width of the auto tensioner.
2. Remove the drive belt (Refer to P.11A-17).



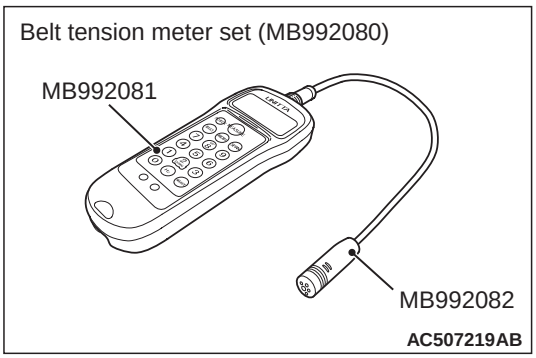
3. Install the tool to the auto tensioner, and check that no binding is present by turning the auto tensioner in the left and right directions.
4. If there are any problems in the procedure 1 or 3, replace the auto tensioner (Refer to P.11A-43).
5. Install the drive belt (Refer to P.11A-17).

FUNCTION CHECK

You can verify if the auto tensioner is defective or not by checking the drive belt tension.

When the vibration frequency is measured (Special tool MB992080 is used): Recommendation

1. Check the drive belt tension (Refer to P.11A-7).
2. Measure the drive belt tension vibration frequency by the following procedures:



(1) Connect special tool microphone assembly (MB992082) to special tool belt tension meter (MB992081) of special tool belt tension meter set (MB992080).

(2) Press the "POWER" button to turn on the power supply.

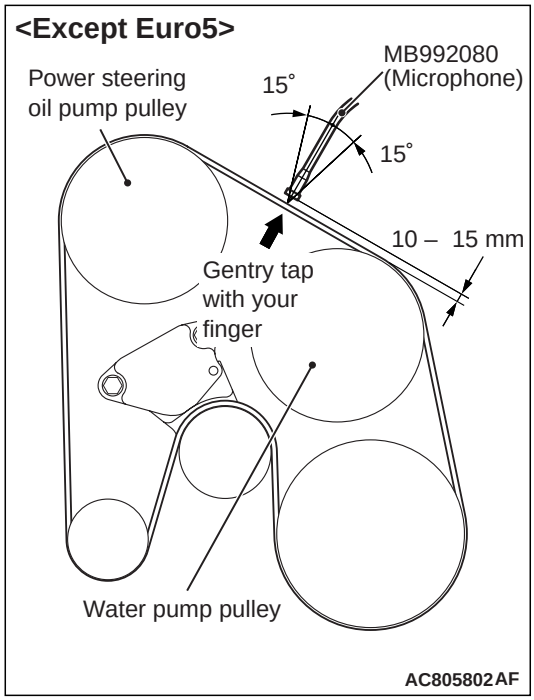
(3) Press the numeral key of "1" and check that "No.1" appears on the upper left of the display.

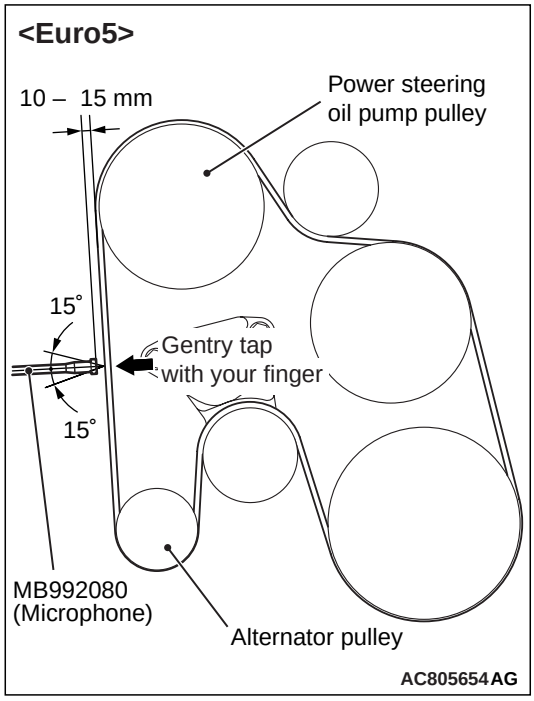
NOTE: This operation is to temporarily set the preset data such as the belt specifications, because if the measurement is taken without input of the belt specifications, conversion to tension value (N) cannot be made, resulting in judgement of error.

(4) Press "Hz" button twice to change the display to the frequency display (Hz).

⚠ CAUTION

- **The temperature of the surface of the belt should be as close to normal temperature as possible.**
- **Do not allow any contaminants such as water or oil to get onto the microphone.**
- **If strong gusts of wind blow against the microphone or if there are any loud sources of noise nearby, the values measured by the microphone may not correspond to actual values.**
- **If the microphone is touching the belt while the measurement is being made, the values measured by the microphone may not correspond to actual values.**
- **Do not take the measurement while the vehicle's engine is running.**





(5) Hold special tool MB992080 to the middle of the belt between the pulleys (at the place indicated by arrow) where it does not contact the belt (approximately 10 – 15 mm away from the rear surface of the belt) so that it is perpendicular to the belt (within an angle of ± 15 °).

(6) Press the "MEASURE" button.

(7) Gently tap the middle of the belt between the pulleys (the place indicated by the arrow) with your finger as shown in the illustration, and check that the vibration frequency of the belt is within the standard value.

Standard value (Reference):
<Except Euro5> 107 – 151 Hz
<Euro5> 87 – 123 Hz

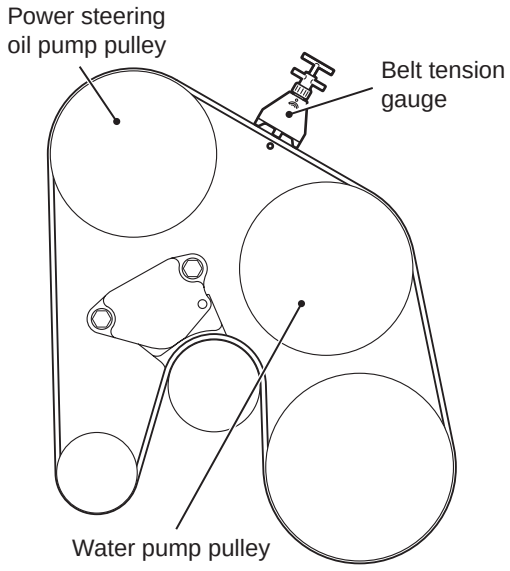
NOTE: To take the measurement repeatedly, fillip the belt again.

3. If not within the standard value, replace the auto tensioner (Refer to P.11A-43).

When using the tension gauge

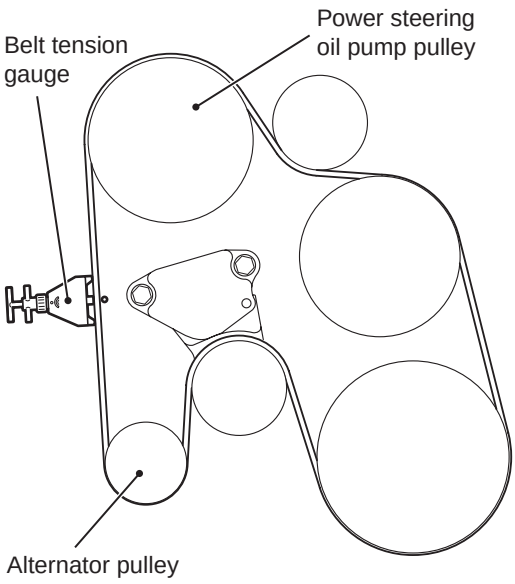
1. Check the drive belt tension (Refer to P.11A-7).

<Except Euro5>



AC805803AE

<Euro5>



AC805655AF

2. Use a belt tension gauge in the middle of the belt between the pulleys shown in the figure (at the place indicated by the arrow) to check that the belt tension is within the standard value.

Standard value (Reference): 196 – 392 N

3. If not within the standard value, replace the auto tensioner (Refer to P.11A-43).

VALVE CLEARANCE CHECK AND ADJUSTMENT

M1111001502096

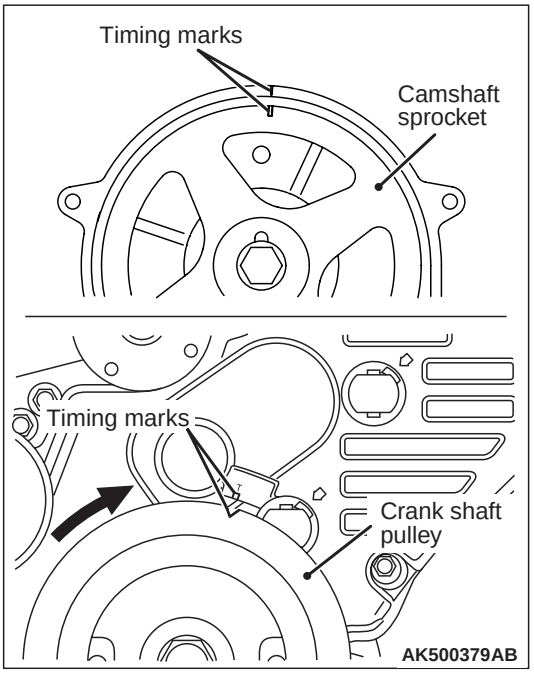
NOTE: The valve clearance check and adjustment should be done when the engine is cold.

1. Remove the engine air intake pipe.
2. Remove the inlet manifold.
3. Remove the injection pipe.

⚠ CAUTION

Leaked fuel on parts causes a decrease in function and burning. Therefore, Place waste to absorb leaked fuel.

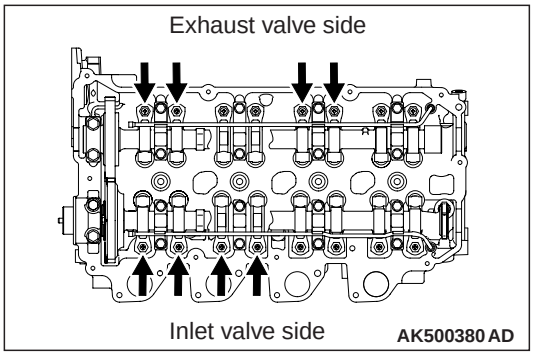
4. Remove the timing belt cover.
5. Remove the rocker cover.



6. Align the camshaft sprocket timing marks and set the No. 1 cylinder at top dead centre.

⚠ CAUTION

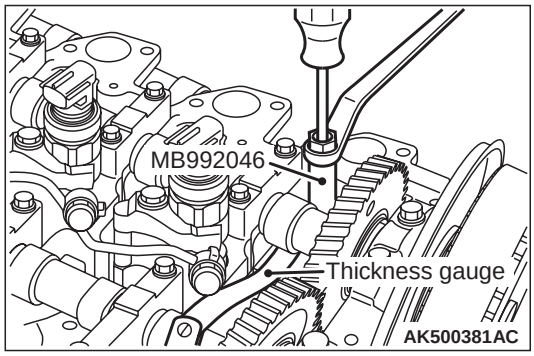
The crankshaft should always be turned in a clockwise direction.



7. Measure the valve clearance.

   If the valve clearance is not as specified, loosen the rocker arm lock nut and adjust the clearance using a thickness gauge between the cam shaft and the roller while turning the adjusting screw.

   Standard value (cold engine):
   Inlet valve: 0.09 mm
   Exhaust valve: 0.14 mm



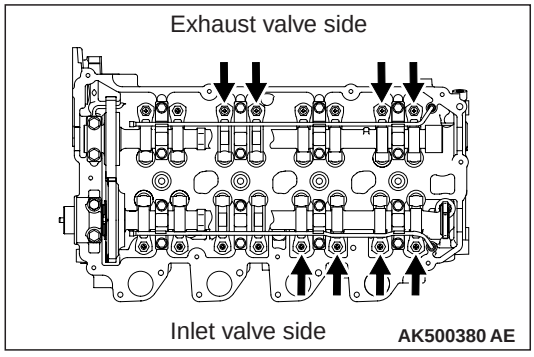
8. While holding the adjusting screw with a screwdriver to prevent it from turning, tighten the lock nut to the specified torque using a valve adjusting socket. (MB992046)

   Tightening torque: 15 ± 3 N·m

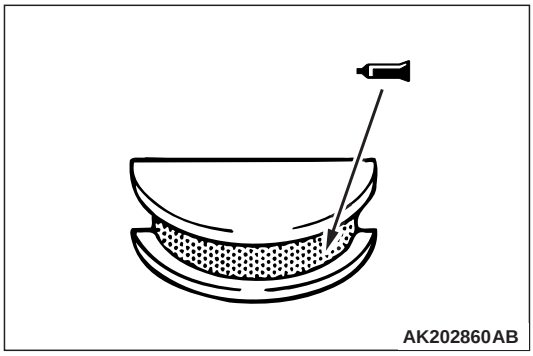
⚠ CAUTION

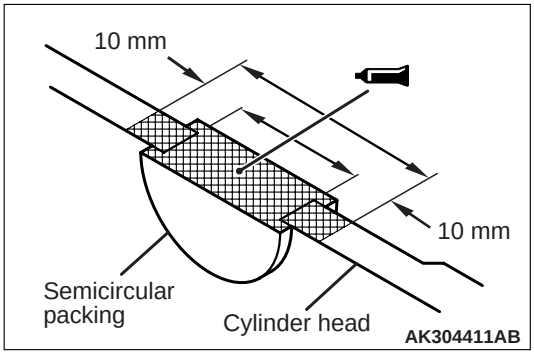
Pay special attention that the tightening torque is not beyond this valve. If the tightening torque is beyond the valve, the valve stem would possibly bend.

9. Turn the crankshaft 360° clockwise to bring No. 4 cylinder to the top dead centre position.



10. Measure the valve clearances at the places indicated by arrows in the illustration. If the clearance is not within the standard value, repeat steps 7 and 8 above.





11.Apply specified sealant to the section of the semicircular packing shown in the illustration.

Specified sealant: 3M ATD Part No. 8660 or equivalent

12.Install the rocker cover.

13.Install the timing belt cover.

14.Install the injection pipe, the injection pipe to the specified torque.

Tightening torque: 35 ± 5 N·m

⚠ CAUTION

- **The reinstallation histories of the removed injection pipe are up to five times. To count how many times the injection pipe is reinstalled, record the number of the reinstallation histories on the service booklet by adding this latest number of the histories, which is usually "1", to the previous one. Use a new injection pipe when the total reinstallation history numbers reach five times, or when the injector or common rail is replaced. In this case, record " a new injector pipe, the number of the reinstallation histories is zero" on the service booklet.**
- **When the injection pipe is reinstalled, confirm there is no foreign material on the seal surface or in the pipe and then install it not to deviate from the axis, fitting the seal surface.**

15.Install the inlet manifold.

NOTE: Install a new gasket

16.Install the engine air intake pipe.

17.After the ignition switch is in "LOCK" (OFF) position, connect the M.U.T.-III to the diagnosis connector.

18.Start the engine, and let it run at idle.

19.Select SPECIAL FUNCTION from the function menu.

20.Select FUEL LEAKAGE CHECK from SPECIAL FUNCTION menu to execute the test.

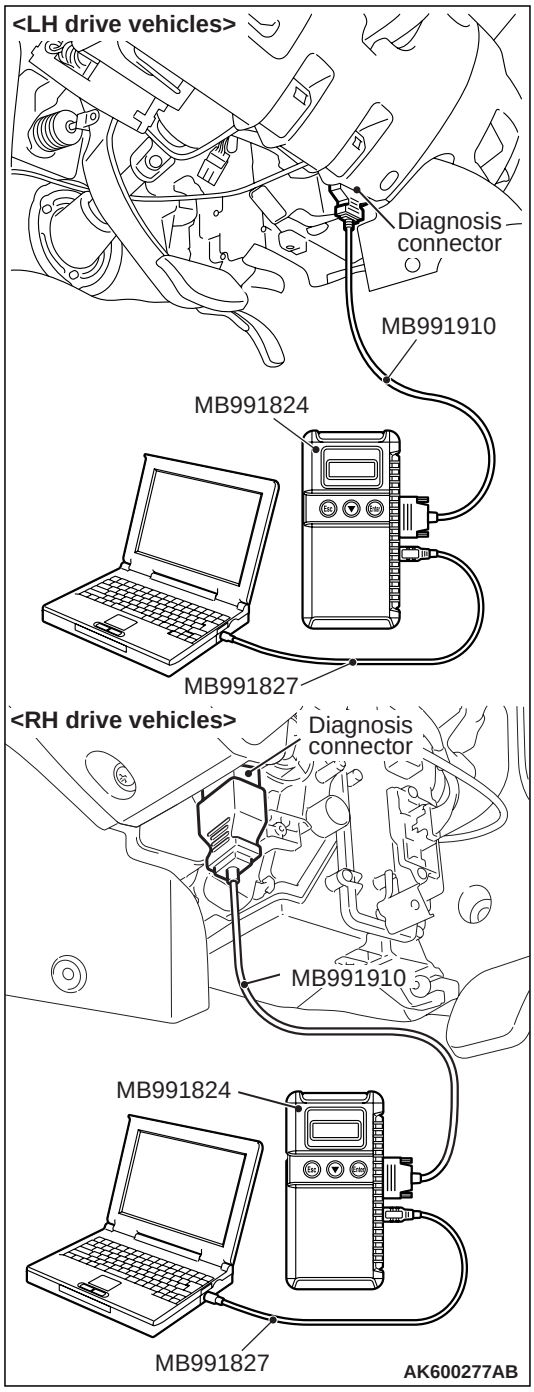
NOTE: During the test, the engine speed and the fuel pressure is 2, 000 r/min and 180Mpa for 20 seconds respectively.

21.Confirm there is no fuel leak from the joint for the injection pipe.

IDLE SPEED CHECK

M1111003503277

1. Set the vehicle to the pre-inspection condition.



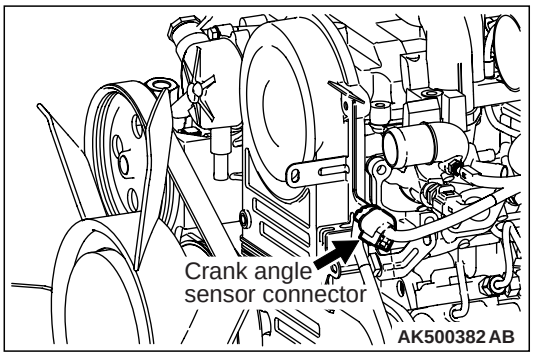
2. Turn the ignition switch to "LOOK" (OFF) position, and connect the diagnosis connector to the M.U.T.-III.
3. Start the engine, and let it run at idle.
4. Check the idle speed.

   Standard value:
   600 ± 50 r/min <Euro 5-M/T>
   650 ± 50 r/min <Euro 5-A/T>
   650 ± 50 r/min <Except Euro 5-2WD-except high rider>
   700 ± 50 r/min <Except Euro 5-high rider and 4WD>
5. If the idle speed is not within the standard value, inspect the diesel system (Refer to GROUP 13A – Troubleshooting – Inspection Chart for Diagnosis Code P.13A-429).

COMPRESSION PRESSURE CHECK

M1111002604058

1. Before inspection, check that the engine oil, starter and battery are normal. In addition, set the vehicle to the pre-inspection condition.
2. Remove the engine air intake pipe.
3. Remove the inlet manifold.
4. Remove all of the glow plugs.

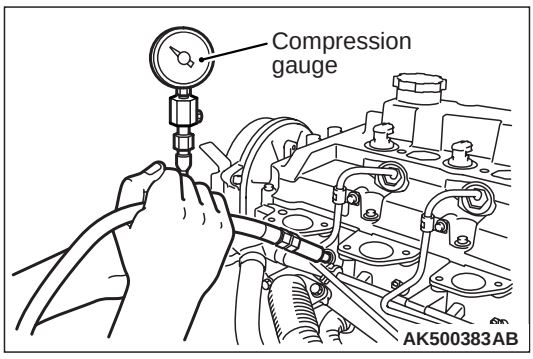


5. Disconnect the crank angle sensor connector.

   NOTE: Doing this will prevent carrying out fuel injection.
6. Cover the glow plug hole with a shop towel etc., and after the engine has been cranked, check that no foreign material is adhering to the shop towel.

⚠ CAUTION

- **Keep away from the glow plug hole when cranking.**
- **If compression is measured with water, oil, fuel, etc., that has come from cracks inside the cylinder, these materials will become heated and will gush out from glow plug hole, which is dangerous.**



7. Set compression gauge to one of the glow plug holes.
8. Crank the engine and measure the compression pressure.

Standard value (at engine speed of 250 r/min):
2,400 kPa <Euro 5>
2,500 kPa <Except Euro 5>

Limit (at engine speed of 250 r/min):
Minimum 1,650 kPa <Euro 5>
Minimum 1,750 kPa <Except Euro 5>

9. Measure the compression pressure for all the cylinders, and check that the pressure differences of the cylinders are below the limit.

   Limit: Maximum 300 kPa

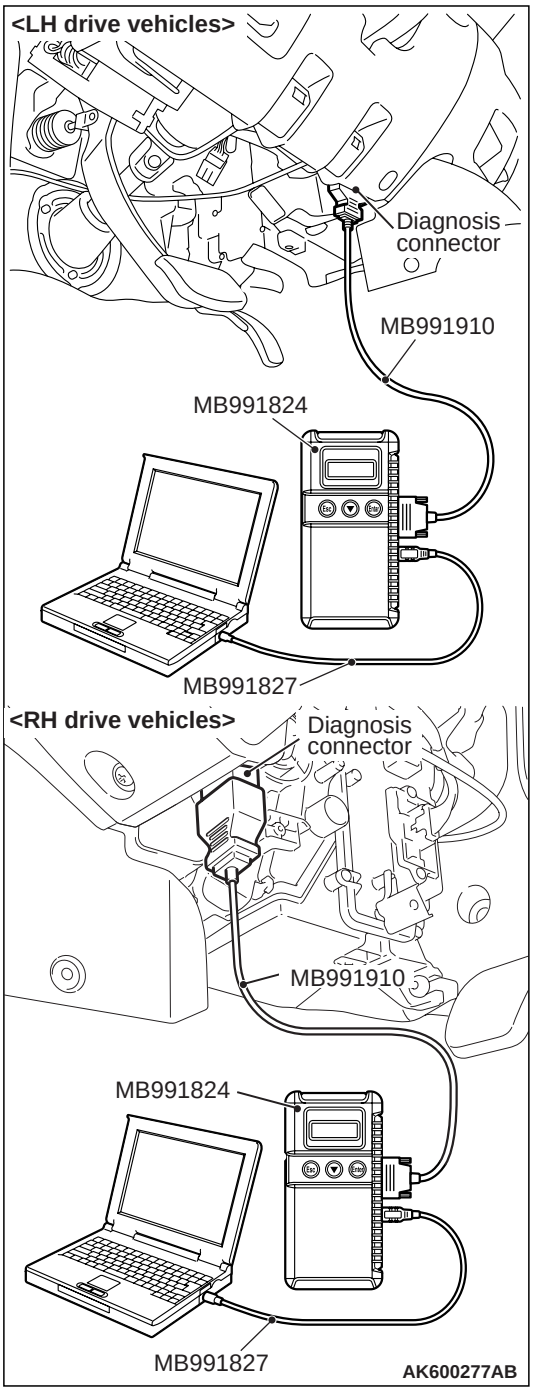
10. If there is a cylinder with compression or a compression difference that is outside the limit, pour a small amount of engine oil through the glow plug hole, and repeat the operations in steps (8) and (9).
    (1) If the compression increases after oil is added, the cause of the malfunction is a worn or damaged piston ring and/or cylinder inner surface.
    (2) If the compression does not rise after oil is added, the cause is a burnt or defective valve seat, or pressure is leaking from the gasket.
11. Connect the crank angle sensor connector.
12. Install the glow plugs.

    Tightening torque: 17 ± 2 N·m

13. Install the inlet manifold.

NOTE: Install a new gasket.

14. Install the engine air intake pipe.



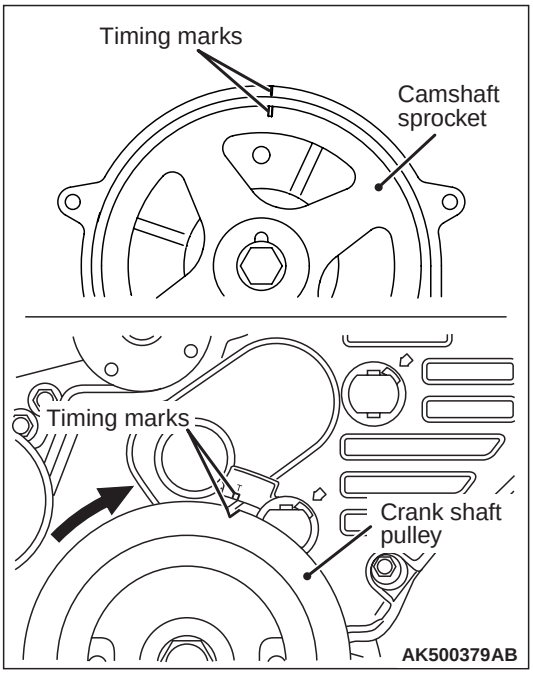
15. Use the M.U.T.-III to erase the diagnosis codes.

    NOTE: This will erase the diagnosis code resulting from the crank angle sensor connector being disconnected.

TIMING BELT B TENSION ADJUSTMENT

M1111004900031

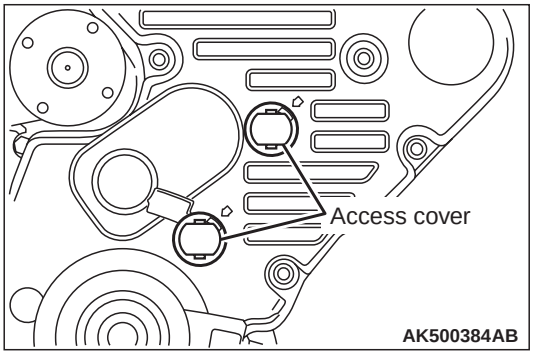
1. Remove timing belt upper cover.
2. Turn the crankshaft in the clockwise direction and check the timing belt around its entire circumference for abnormalities.



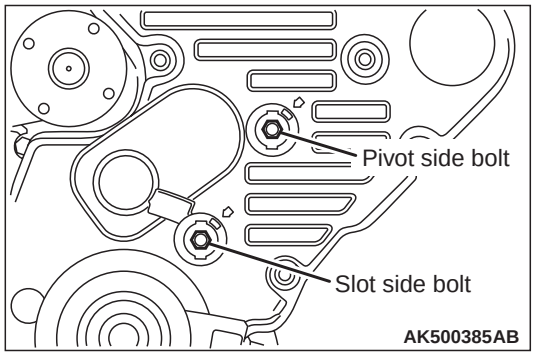
3. Align the timing marks on the sprockets with the timing mark on the front upper case.

⚠ CAUTION

When aligning the timing mark, be sure not to turn the crankshaft in the anti-clockwise direction as this can cause improper belt tension.



4. Remove the access cover.

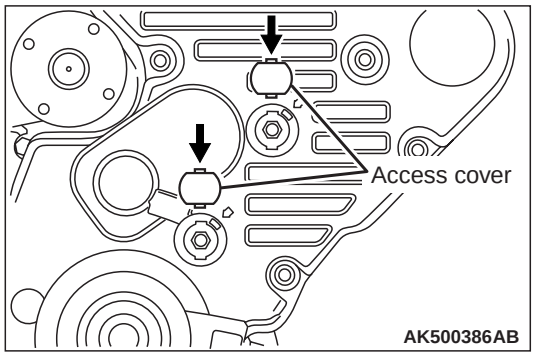


5. Loosen the tensioner pivot side bolt 1 turn and slot side nut 1 or 2 turns.

   NOTE: These works will allow the tensioner spring to tension timing belt B automatically.

6. First tighten tensioner slot side nut, and then tighten pivot side bolt to the specified torque.

   Tightening torque:
   Pivot side bolt 23 ± 3 N·m
   Slot side bolt 20 ± 4 N·m



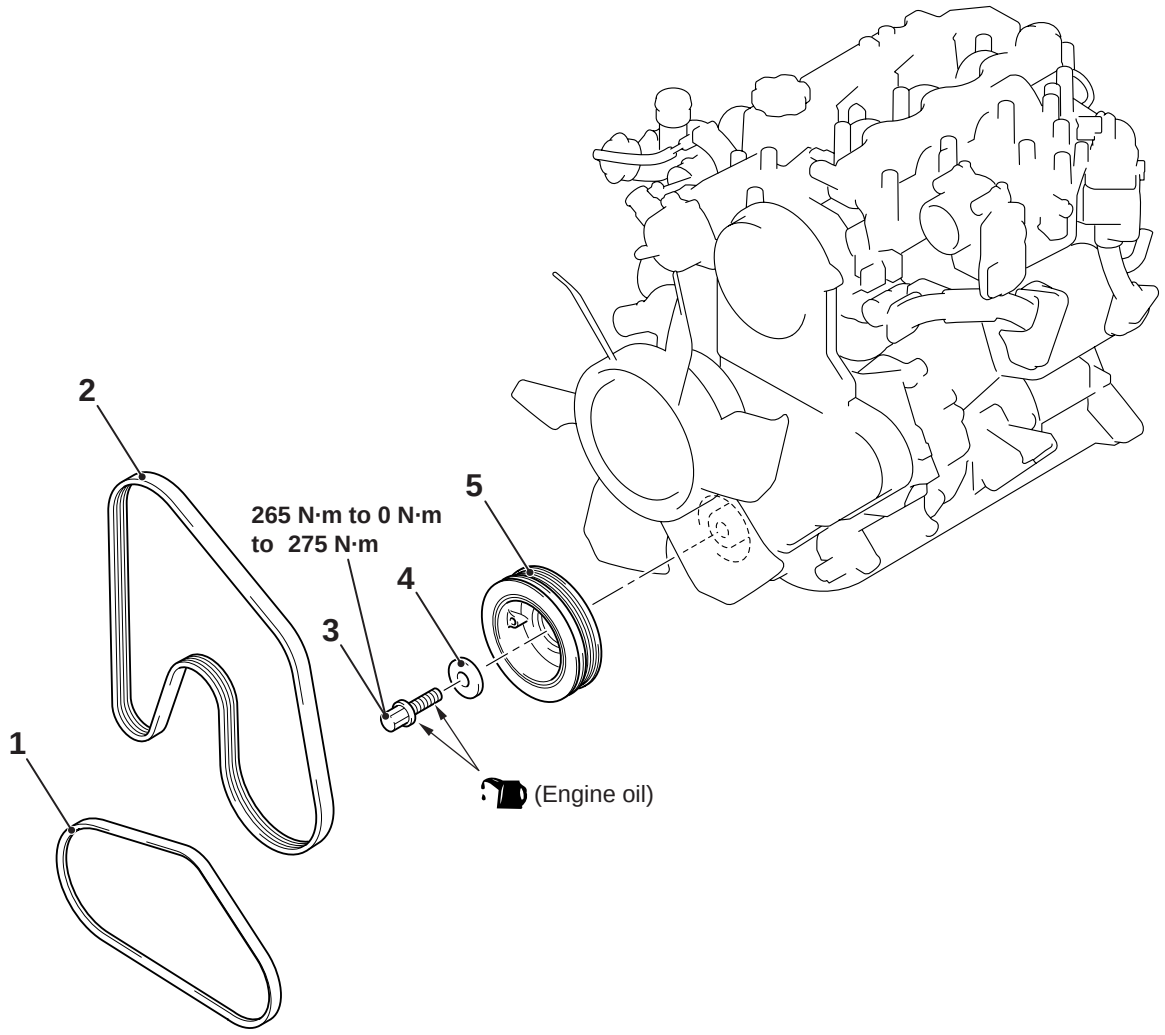
7. Install the access cover.
8. Install the timing belt upper cover.

CRANKSHAFT PULLEY

REMOVAL AND INSTALLATION

M1112001602814

Pre-removal Operation	Post-installation Operation
• Under Skid Plate and Engine Room Under Cover Removal (Refer to GROUP 51 – Under Cover P.51-32).	• Alternator and Power Steering Oil Pump Drive Belt Tension Check (Refer to P.11A-7). • A/C Compressor Drive Belt Tension Check and Adjustment (Refer to P.11A-7). • Under Skid Plate and Engine Room Under Cover Installation (Refer to GROUP 51 – Under Cover P.51-32).



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Removal steps

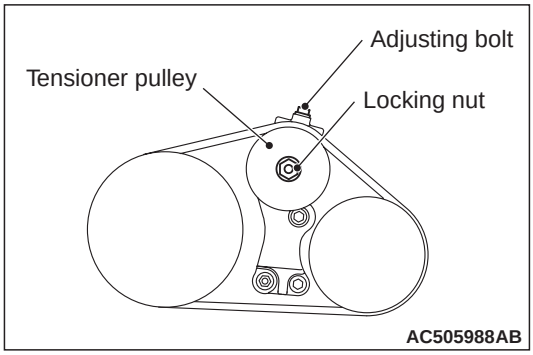
<<A>> 1. A/C compressor drive belt
<<B>> 2. Alternator and power steering oil pump drive belt

Removal steps (Continued)

<<C>> >>A<< 3. Crankshaft pulley bolt
<<C>> >>A<< 4. Crankshaft pulley washer
<<C>> >>A<< 5. Crankshaft pulley

REMOVAL SERVICE POINTS

<<A>> A/C COMPRESSOR DRIVE BELT REMOVAL



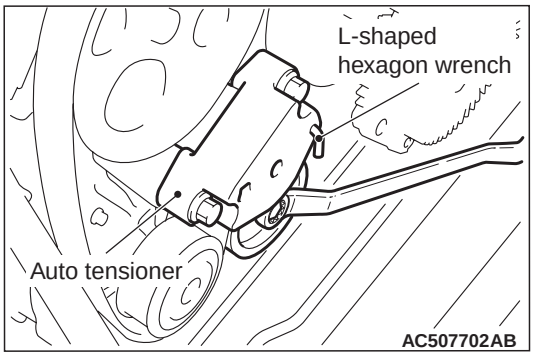
1. Loosen the locking nut of the tensioner pulley.

⚠ CAUTION

To reuse the drive belt, draw an arrow indicating the rotating direction (clockwise) on the back of the belt using chalk, etc.

2. Rotate the adjusting bolt to the anti-clockwise direction (to the left), and remove the drive belt.

<<B>> ALTERNATOR AND POWER STEERING OIL PUMP DRIVE BELT REMOVAL



The following operations will be needed due to the introduction of the serpentine drive system with the auto tensioner.

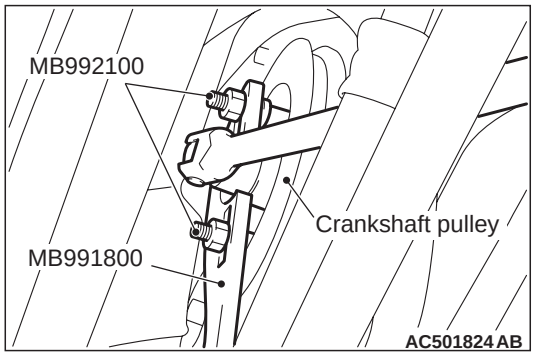
1. Set the tool to the pulley bolt of auto tensioner, and then turn the auto tensioner clockwise.

⚠ CAUTION

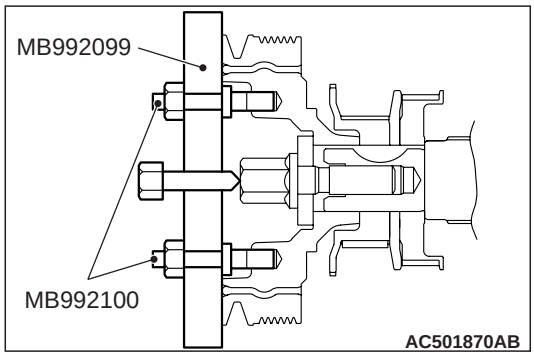
To reuse the drive belt, draw an arrow indicating the rotating direction (clockwise) on the back of the belt using chalk, etc.

2. Insert an L-shaped hexagon wrench, etc. into the hole to fix and then remove the drive belt.

<<C>> CRANKSHAFT PULLEY BOLT/ CRANKSHAFT PULLEY WASHER/CRANKSHAFT PULLEY REMOVAL



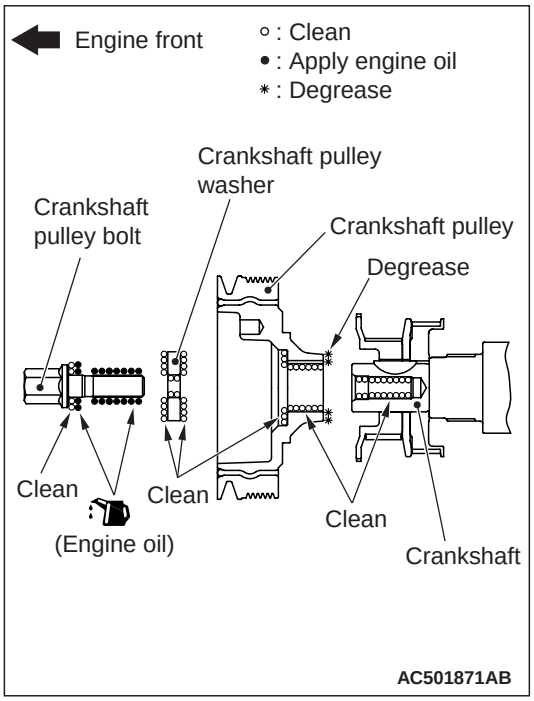
1. Use the following special tools to hold the crankshaft pulley.
   - Pulley holder (MB991800)
   - Crank pulley holder (MB992100)
2. Loosen the crankshaft pulley bolt and remove the crankshaft pulley washer and crankshaft pulley.
3. If the crankshaft pulley cannot be removed from the crankshaft, follow the procedure below.
   (1) Install the crankshaft pulley bolt and crankshaft pulley washer to the crankshaft pulley. At this time, the crankshaft pulley bolt must be loosened by 3 to 4 turns from the completely tightened state.



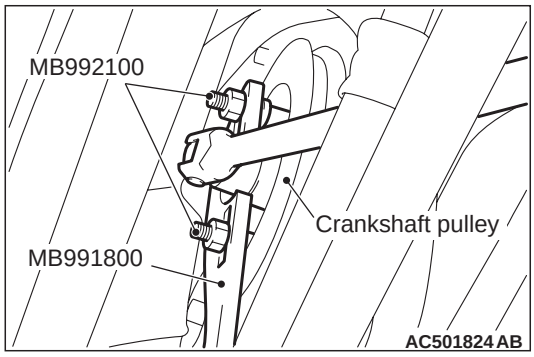
   (2) Using the special tools below, remove the crankshaft pulley.
   - Crank pulley puller (MB992099)
   - Crank pulley holder (MB992100)

INSTALLATION SERVICE POINT

>>A<< CRANKSHAFT PULLEY/CRANKSHAFT PULLEY WASHER/CRANKSHAFT PULLEY BOLT INSTALLATION



1. Clean the screw hole of the crankshaft, the crankshaft pulley, the crankshaft pulley bolt and the crankshaft pulley washer.
2. Install the crankshaft pulley.
3. Apply an appropriate quantity of new engine oil to the thread of crankshaft pulley bolt.



4. In the same way as for removing, using the special tools below, support the crankshaft pulley.
   - Pulley holder (MB991800)
   - Crank pulley holder (MB992100)
5. Tighten the crankshaft pulley bolt according to the procedure below.
   (1) Tighten the crankshaft pulley bolt to the specified torque.

   Tightening torque: 265 N·m

   (2) Loosen the crankshaft pulley bolt fully.
   (3) Tighten the crankshaft pulley bolt to the specified torque again.

   Tightening torque: 275 N·m

CAMSHAFT AND VALVE STEM SEAL

REMOVAL AND INSTALLATION

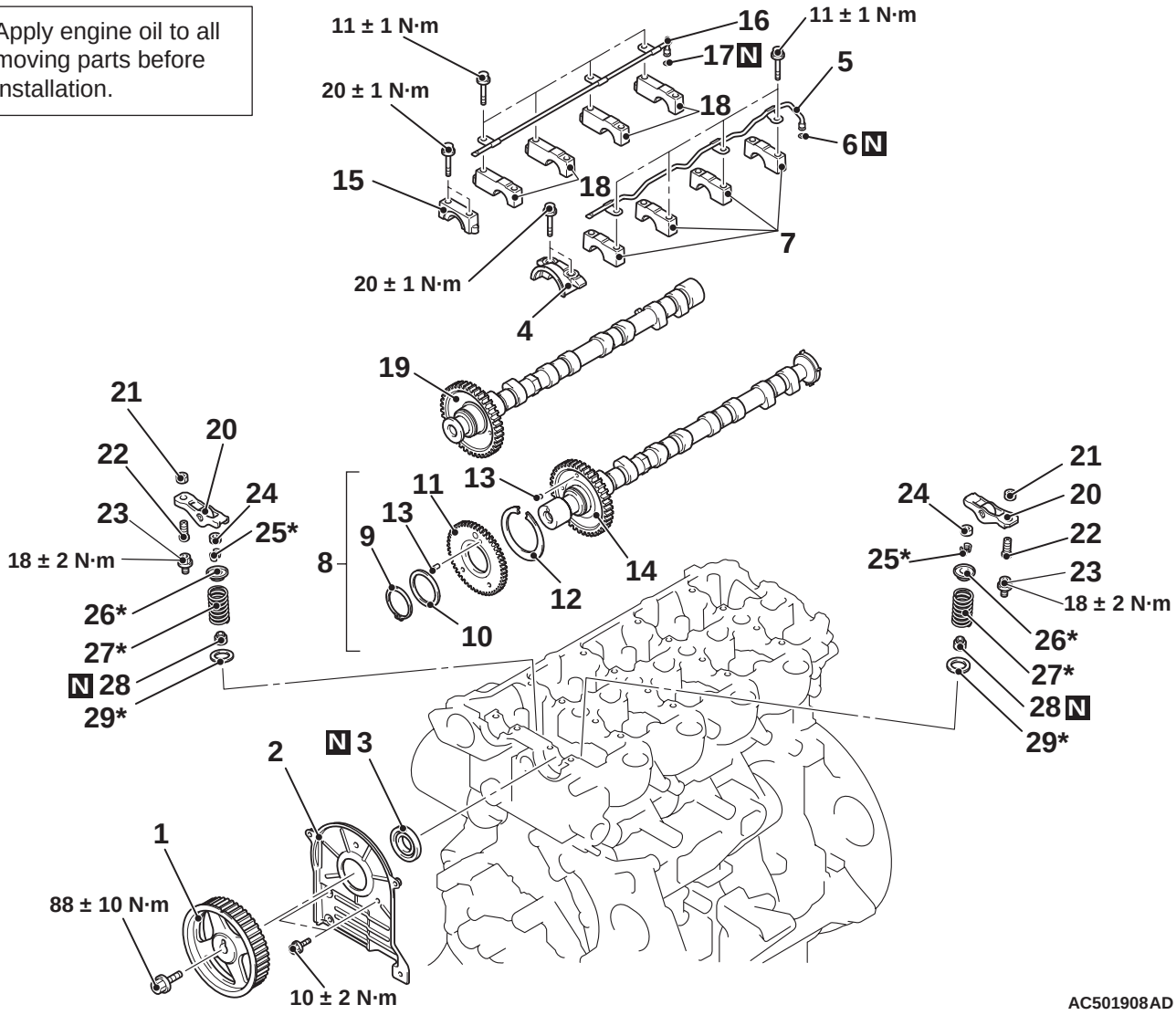
M1112006602262

⚠ CAUTION

*** Remove and assemble the marked parts in each cylinder unit.**

Pre-removal and Post-installation Operation
- Inlet Manifold Removal and Installation (Refer to GROUP 15 – Inlet Manifold P.15-15).

Apply engine oil to all moving parts before installation.



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Inlet camshaft removal steps
- Timing belt (Refer to P.11A-43).
- Rocker cover (Refer to GROUP 13A – Fuel Injector P.13A-598).
- Valve clearance check and adjustment (Refer to P.11A-12).

<<A>>	>>K<<	1.	Camshaft sprocket
		2.	Timing belt rear cover
	>>J<<	3.	Camshaft oil seal
<<B>>	>>I<<	4.	Front left camshaft bearing cap
	>>I<<	5.	Inlet oil pipe assembly
	>>I<<	6.	O-ring
<<B>>	>>I<<	7.	Left camshaft bearing cap

Inlet camshaft removal steps

>>H<<		8.	Inlet camshaft assembly
>>G<<		9.	Snap ring
>>G<<		10.	Wave washer
>>G<<		11.	Sub gear
>>G<<		12.	C-spring
>>G<<		13.	Dowel pin
>>G<<		14.	Inlet camshaft

Exhaust camshaft removal steps

- Rocker cover (Refer to GROUP 13A – Fuel Injector P.13A-598).
- Valve clearance check and adjustment (Refer to P.11A-12).

<<B>> >>F<< 15. Front right camshaft bearing cap
>>F<< 16. Exhaust oil pipe assembly
>>F<< 17. O-ring
<<B>> >>F<< 18. Right camshaft bearing cap
>>E<< 19. Exhaust camshaft assembly

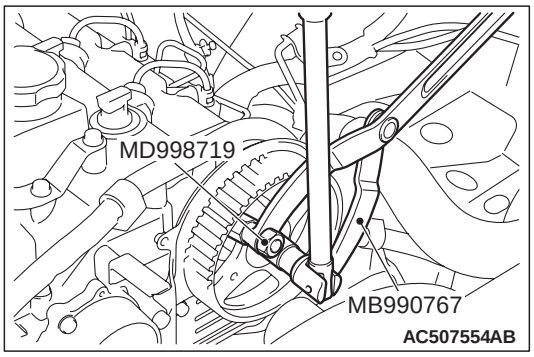
Valve stem seal removal steps

- Timing belt (Refer to P.11A-43).
- Rocker cover (Refer to GROUP 13A – Fuel Injector P.13A-598).
- Valve clearance check and adjustment (Refer to P.11A-12).

<<A>> >>K<< 1. Camshaft sprocket
2. Timing belt rear cover
>>J<< 3. Camshaft oil seal
<<B>> >>I<< 4. Front left camshaft bearing cap
>>I<< 5. Inlet oil pipe assembly
>>I<< 6. O-ring
<<B>> >>I<< 7. Left camshaft bearing cap
>>H<< 8. Inlet camshaft assembly
<<B>> >>F<< 15. Front right camshaft bearing cap
>>F<< 16. Exhaust oil pipe assembly
>>F<< 17. O-ring
<<B>> >>F<< 18. Right camshaft bearing cap
>>E<< 19. Exhaust camshaft assembly
>>D<< 20. Rocker arm assembly
>>D<< 21. Nut
>>D<< 22. Adjusting screw
23. Pivot bolt
>>C<< 24. Stem end cap
<<C>> >>B<< 25. Valve spring retainer lock
26. Valve spring retainer
27. Valve spring
>>A<< 28. Valve stem seal
29. Valve spring seat

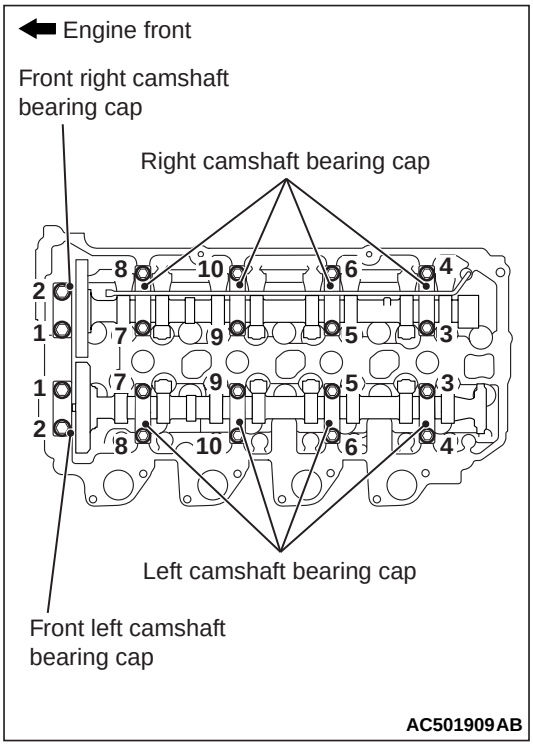
REMOVAL SERVICE POINTS

<<A>> CAMSHAFT SPROCKET REMOVAL



1. Use the following special tools to hold the camshaft sprocket.
   - Front hub and flange yoke holder (MB990767)
   - Pin (MD998719)
2. Loosen the camshaft sprocket mounting bolt and remove the camshaft sprocket.

<<B>> FRONT LEFT CAMSHAFT BEARING CAP/ LEFT CAMSHAFT BEARING CAP/FRONT RIGHT CAMSHAFT BEARING CAP/RIGHT CAMSHAFT BEARING CAP REMOVAL

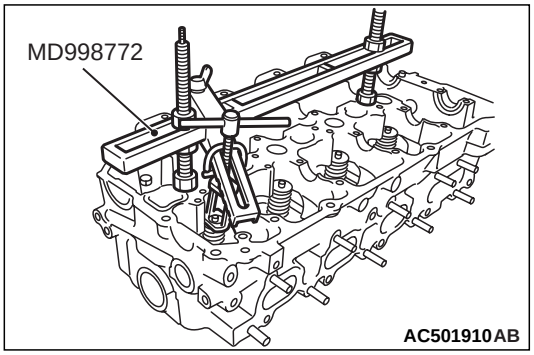


Loosen the mounting bolts of the front camshaft bearing cap and camshaft bearing cap in the order shown in the figure. Then, remove the front camshaft bearing cap and camshaft bearing caps.

<<C>> VALVE SPRING RETAINER LOCK REMOVAL

⚠ CAUTION

When removing valve spring retainer lock, leave the piston of each cylinder in the TDC (Top Dead Centre) position. The valve may fall into the cylinder if the piston is not properly in the TDC position.



Use special tool valve spring compressor (MD998772) to compress the valve spring and then remove the valve spring retainer lock.

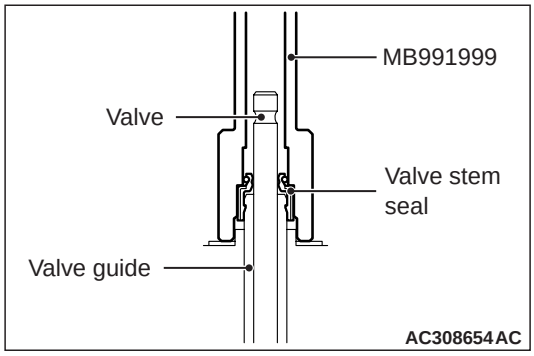
INSTALLATION SERVICE POINTS

>>A<< VALVE STEM SEAL INSTALLATION

1. Apply a small amount of engine oil to the valve stem seal.

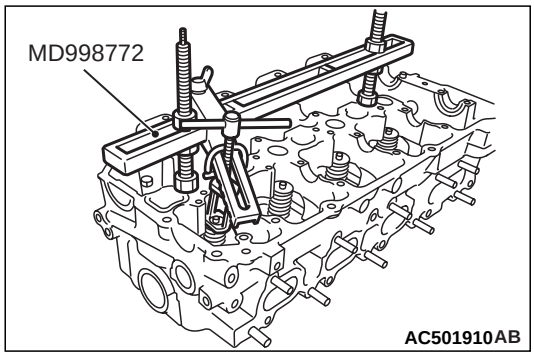
⚠ CAUTION

- **Do not re-use the valve stem seal.**
- **Special tool valve stem seal installer (MB991999) must be used to install the valve stem seal. Improper installation could result in oil leaking past the valve guide.**



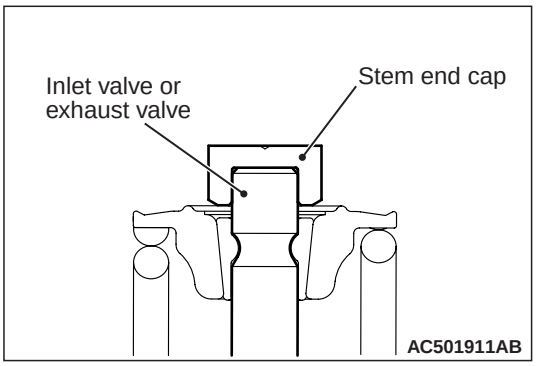
2. Use the special tool valve stem seal installer (MB991999) to fill a new valve stem seal in the valve guide using the valve stem area as a guide.

>>B<< VALVE SPRING RETAINER LOCK INSTALLATION



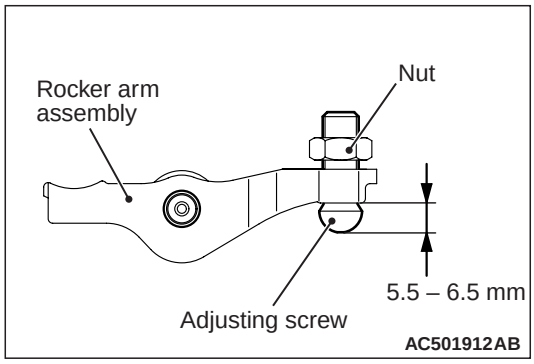
Use special tool valve spring compressor (MD998772) to compress the valve spring and then install the valve spring retainer lock in the same manner as removal.

>>C<< STEM END CAP INSTALLATION



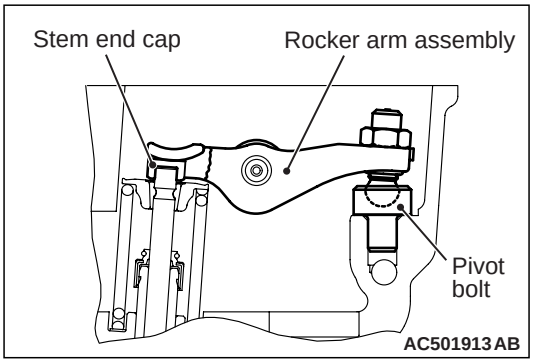
Install the stem end cap. Make sure that the stem end cap is in close contact with the stem end faces of the inlet and exhaust valve.

>>D<< ADJUSTING SCREW/NUT/ROCKER ARM ASSEMBLY INSTALLATION



1. Screw the adjusting screw into the rocker arm assembly, and then temporarily assemble using a nut so that the adjusting screw protrusion becomes the dimension shown in the figure.
2. Apply the engine oil to the sliding surface of the parts below.

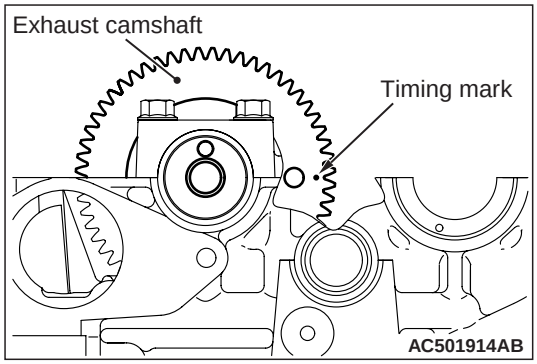
- Roller and valve-side sliding area of the rocker arm assembly
- Concave spherical surface of pivot bolt or spherical surface of adjusting screw



3. Place the rocker arm assembly onto the pivot bolt and the stem end cap as shown in the figure.

>>E<< EXHAUST CAMSHAFT ASSEMBLY INSTALLATION

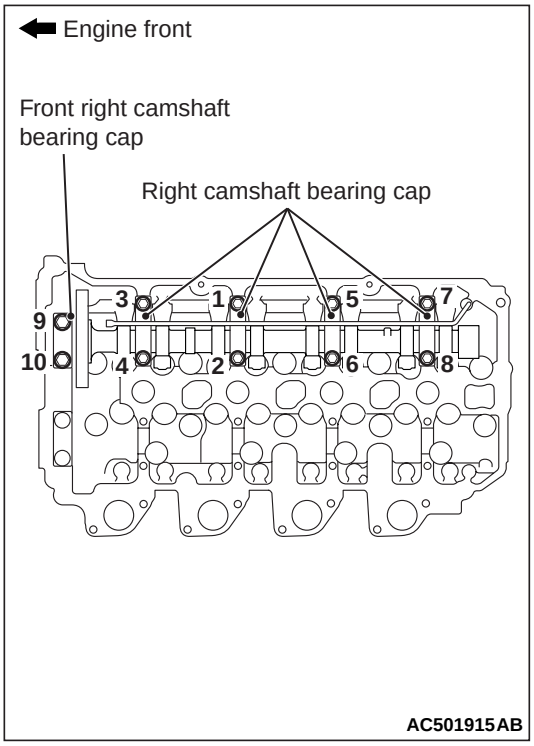
1. Apply the engine oil to the cam face, journal section, thrust face, and gear teeth face of exhaust camshaft.



2. Set the timing mark of the exhaust camshaft in the position shown in the figure.

>>F<< RIGHT CAMSHAFT BEARING CAP/O-RING/EXHAUST OIL PIPE ASSEMBLY/FRONT RIGHT CAMSHAFT BEARING CAP INSTALLATION

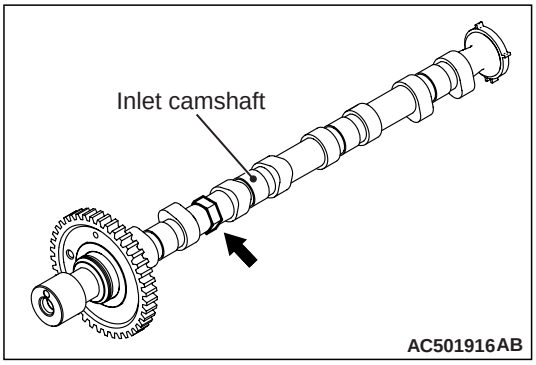
1. Place the right camshaft bearing cap onto the camshaft journal section.
2. Apply the engine oil to the O-ring section of exhaust oil pipe assembly, and insert the tip of exhaust oil pipe assembly into the cylinder head. Then, place the pipe section onto the right camshaft bearing cap.



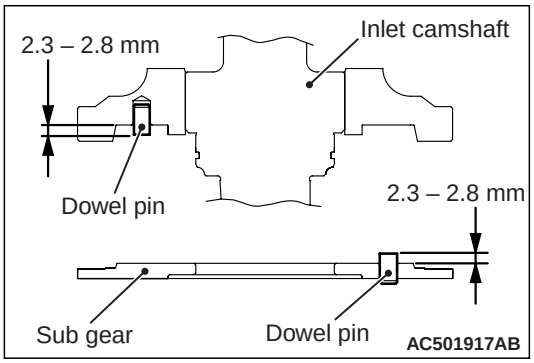
3. Tighten the mounting bolts of the right camshaft bearing cap and front right camshaft bearing cap to the specified torque in the order shown in the figure. Then, fix the right camshaft bearing cap, exhaust oil pipe assembly, and front right camshaft bearing cap to the cylinder head.

Tightening torque:
11 ± 1 N·m (Right camshaft bearing cap mounting bolts)
20 ± 1 N·m (Front right camshaft bearing cap mounting bolts)

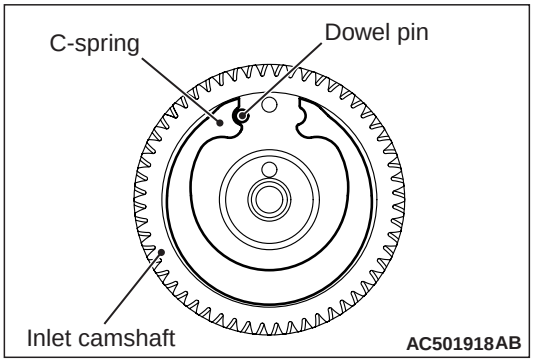
>>G<< INLET CAMSHAFT/DOWEL PIN/C-SPRING/SUB GEAR/WAVE WASHER/SNAP RING INSTALLATION



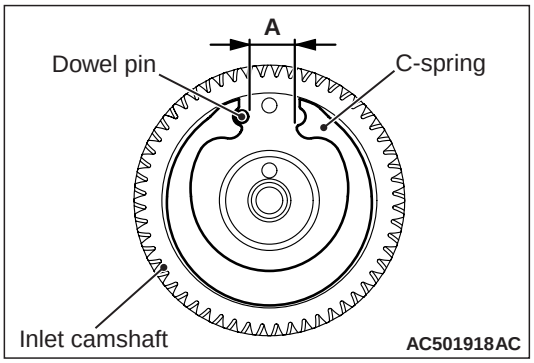
1. Fix the inlet camshaft hexagonal area using a vice or other devices.



2. Press fit the dowel pin into the inlet camshaft and sub gear so that the dimension becomes as shown in the figure.

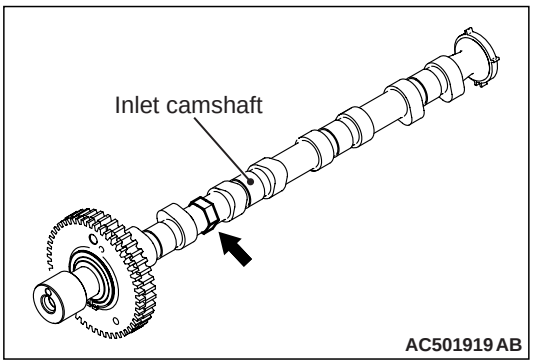


3. After contacting the C-spring with the dowel pin as shown in the figure, set to the inlet camshaft.



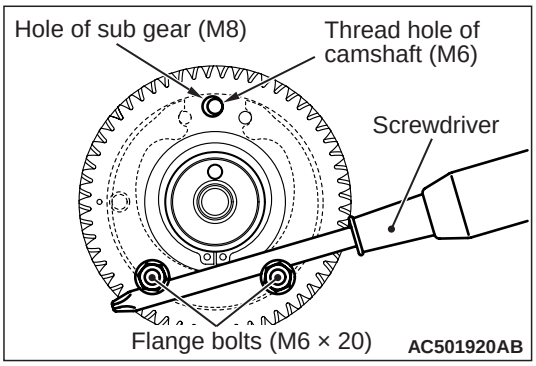
4. Set the sub gear to the inlet camshaft so that the sub gear dowel pin is inside the A range between the C-spring and inlet camshaft dowel pin as shown in the figure.
5. Assemble the wave washer and the snap ring to the inlet camshaft.

>>H<< INLET CAMSHAFT ASSEMBLY INSTALLATION

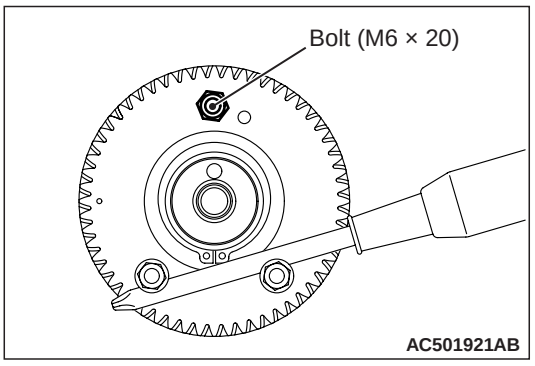


1. Fix the hexagonal area of inlet camshaft assembly using a vice or other devices.

⚠ CAUTION
Avoid turning the sub gear than necessary.

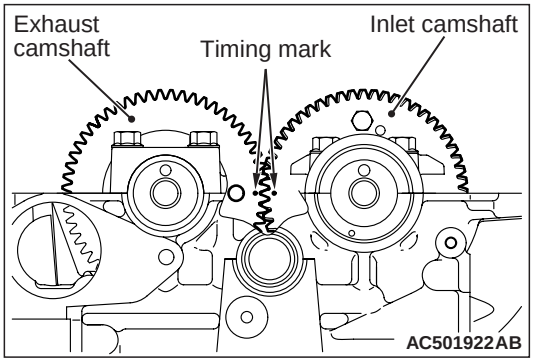


2. Set the flange bolts (M6 x 20) to 2 locations of sub gear. Then, using a screwdriver, turn the sub gear clockwise until the sub gear hole (M8) and the threaded hole (M6) of inlet camshaft gear match as shown in the figure.



3. Temporarily fix the sub gear using the bolt (M6 x 20). At this time, screw in until the bolt head is in contact with the sub gear.
4. Remove the 2 flange bolts (M6 x 20) installed in the step 2.

5. Remove from the vice or other devices the inlet camshaft assembly to which the sub gear being temporarily fixed. Then, apply the engine oil to the cam face, journal section, thrust face, and gear teeth face of inlet camshaft assembly.



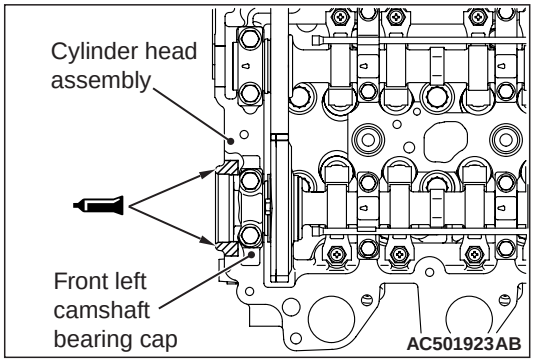
6. Set the timing mark of the inlet camshaft assembly and exhaust camshaft in the position shown in the illustration.

>>I<< LEFT CAMSHAFT BEARING CAP/O-RING/ INLET OIL PIPE ASSEMBLY/FRONT LEFT CAMSHAFT BEARING CAP INSTALLATION

1. Place the left camshaft bearing cap onto the camshaft journal.
2. Apply the engine oil to the O-ring of the inlet oil pipe assembly, and insert the tip of the inlet oil pipe assembly into the cylinder head. Then, place the pipe onto the left camshaft bearing cap.

⚠ CAUTION

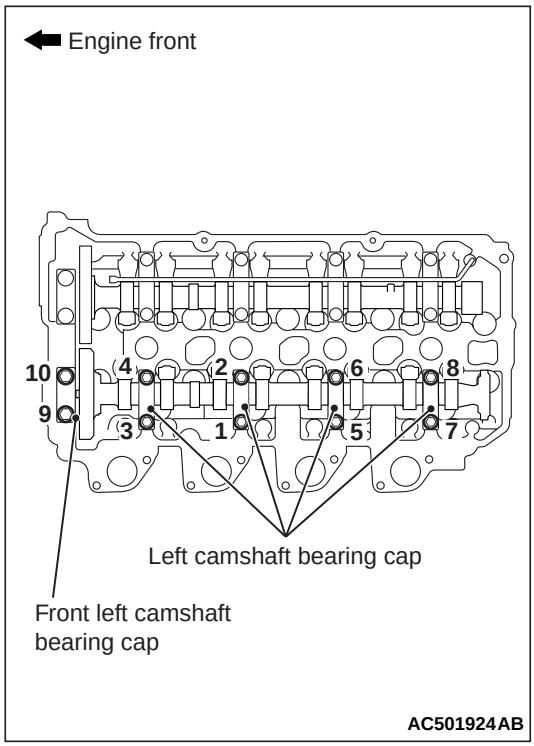
After the installation, until a sufficient period of time (one hour or more) elapses, do not apply the oil or water to the sealant application area or start the engine.



3. Apply specified sealant to the matching area of the cylinder head assembly and the front left camshaft bearing cap as shown, and install the left camshaft bearing cap to the cylinder head assembly.

Specified sealant: 3M ATD Part No.8660

NOTE: Install the front left camshaft bearing cap immediately after applying sealant.

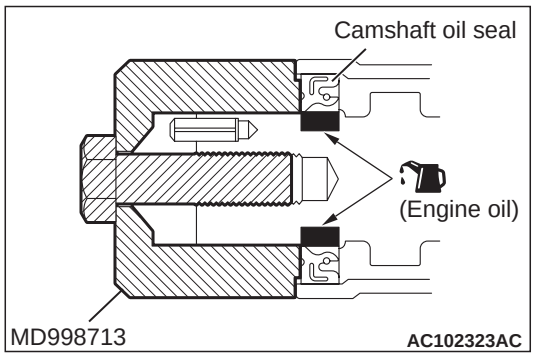


4. Tighten the mounting bolts of the left camshaft bearing cap and front left camshaft bearing cap to the specified torque in the order shown in the figure. Then, fix the left camshaft bearing cap, inlet oil pipe assembly, and front left camshaft bearing cap to the cylinder head.

Tightening torque:
11 ± 1 N·m (Left camshaft bearing cap mounting bolts)
20 ± 1 N·m (Front left camshaft bearing cap mounting bolts)

5. Remove the bolt (M6 x 20) used to temporarily fix the sub gear of inlet camshaft assembly.

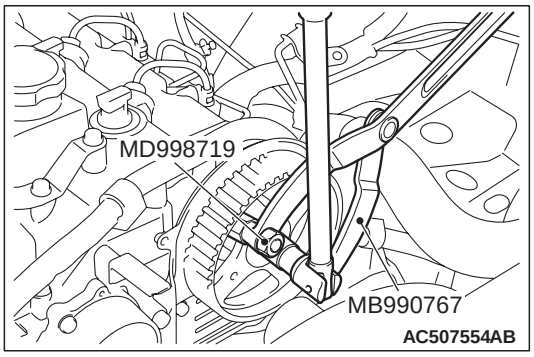
>>J<< CAMSHAFT OIL SEAL INSTALLATION



1. Apply engine oil to the entire inner diameter of the oil seal lip.

2. Use special tool camshaft oil seal installer (MD998713) to press-fit the oil seal as shown.

>>K<< CAMSHAFT SPROCKET INSTALLATION



1. Use the following special tool as during removal to hold the camshaft sprocket.
   - Front hub and flange yoke holder (MB990767)
   - Pin (MD998719)
2. Tighten the camshaft sprocket mounting bolt to the specified torque.

   Tightening torque: 88 ± 10 N·m

OIL PAN AND OIL STRAINER

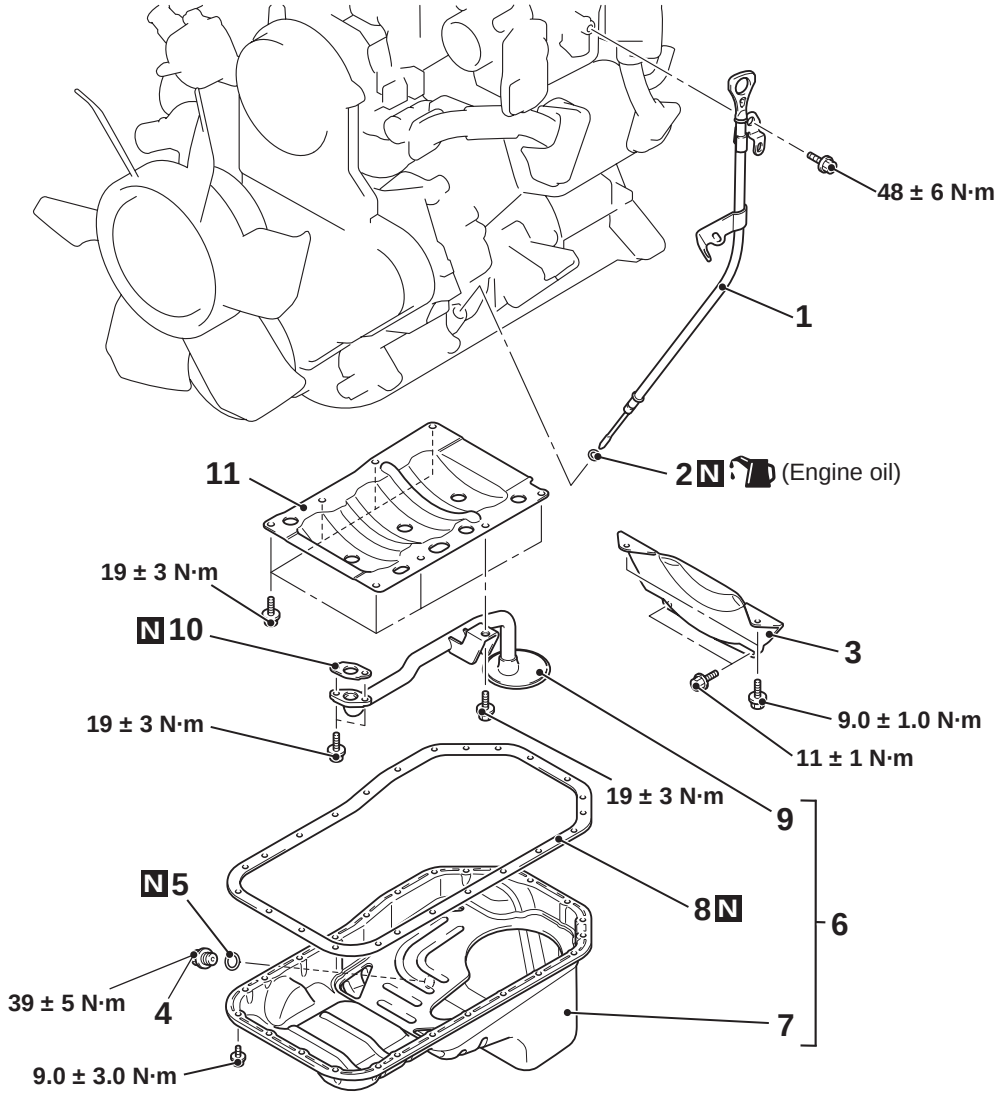
REMOVAL AND INSTALLATION <2WD (EXCEPT HIGH RIDER)>

M1112008301004

⚠ CAUTION

At the time of factory shipment or when the engine is overhauled, liquid gasket is used for the engine oil pan gasket. Use the replacement engine oil pan gasket since the sealed surface may interfere with surrounding parts, causing engine oil leak when the engine oil pan is installed on the vehicle using the liquid gasket.

Pre-removal Operation	Post-installation Operation
• Engine Room Under Cover Removal (Refer to GROUP 51 – Under Cover P.51-32). • Engine Oil Draining (Refer to GROUP 12 – On-vehicle Service, Engine Oil Replacement P.12-4).	• Engine Oil Refilling (Refer to GROUP 12 – On-vehicle Service, Engine Oil Replacement P.12-4). • Engine Room Under Cover Installation (Refer to GROUP 51 – Under Cover P.51-32).



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Removal steps

1. Engine oil level gauge and guide assembly
2. O-ring
3. Bell housing cover

Removal steps (Continued)

4. Engine oil pan drain plug

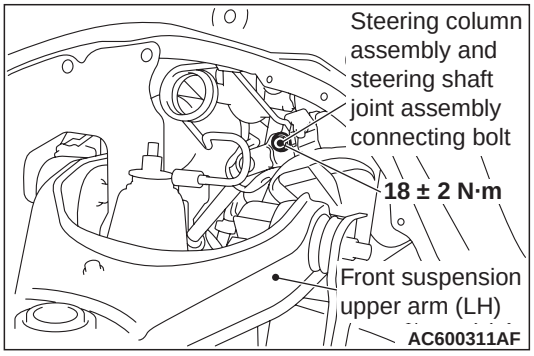
>>B<< 5. Engine oil pan drain plug gasket

Removal steps (Continued)

<<A>> • Steering column assembly and steering shaft joint assembly connection
<<B>> • Power steering gear & link assembly mounting bolt
<<B>> • Return tube clamp
<<B>> • Pressure tube clamp
<<C>> 6. Engine oil pan and engine oil pan strainer assembly
>>A<< 7. Engine oil pan
>>A<< 8. Engine oil pan gasket
>>A<< 9. Engine oil pan strainer
>>A<< 10. Engine oil pan strainer gasket
11. Stiffener

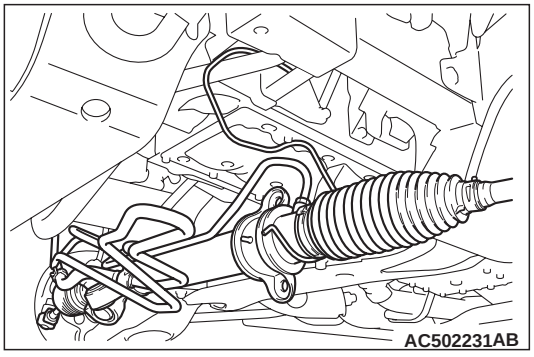
REMOVAL SERVICE POINTS

<<A>> STEERING COLUMN ASSEMBLY AND STEERING SHAFT JOINT ASSEMBLY DISCONNECTION



Disconnect the steering column assembly and the steering shaft joint assembly. (Refer to GROUP 37 – Steering Column Shaft Assembly P.37-18).

<<B>> POWER STEERING GEAR & LINK ASSEMBLY MOUNTING BOLT/RETURN TUBE CLAMP/PRESSURE TUBE CLAMP REMOVAL



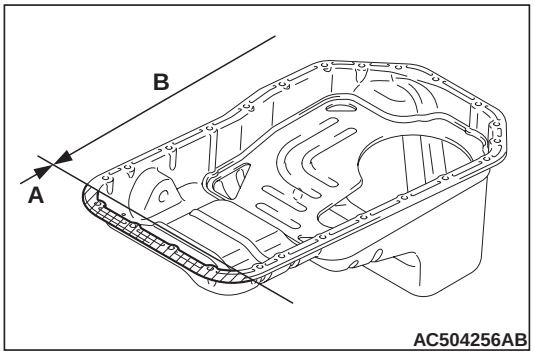
Remove the mounting bolts of the power steering gear & link assembly and of the tube clamps, and hung the power steering gear & link assembly using a wire or other similar material. (Refer to GROUP 37 – Power Steering Gear Box and Linkage P.37-22, and Power Steering Hoses P.37-40).

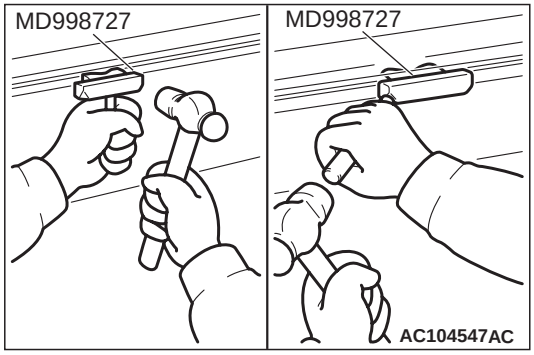
<<C>> ENGINE OIL PAN AND ENGINE OIL PAN STRAINER ASSEMBLY REMOVAL

1. Remove the engine oil pan mounting bolts.

⚠ CAUTION

Do not use special tool oil pan FIPG cutter (MD998727) in area A of the engine oil pan. Using the special tool (MD998727) in area A may cause deformation of the cylinder block case assembly front lower because the cylinder block case assembly front lower is made of aluminium.





2. Tap special tool (MD998727) into the range B between the cylinder block assembly and the engine oil pan, and then slide the tool sideways.
NOTE: If any surrounding parts interfere with the removal, there is no need to use the special tool.
3. With the engine oil pan separated from the cylinder block assembly, remove the engine oil pan strainer mounting bolts, and then remove the engine oil pan together with the engine oil pan strainer.

INSTALLATION SERVICE POINTS

>>A<< ENGINE OIL PAN STRAINER GASKET/ ENGINE OIL PAN STRAINER/ENGINE OIL PAN GASKET/ENGINE OIL PAN INSTALLATION

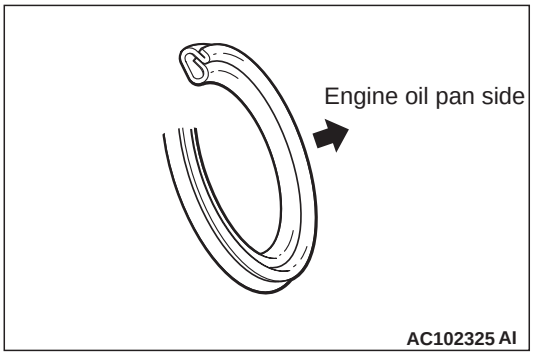
1. Remove sealant from the engine oil pan and cylinder block assembly surfaces.

2. Place the engine oil pan strainer into the engine oil pan. Then, insert the engine oil pan and engine oil pan gasket into the clearance between the cylinder block assembly and the power steering gear & link assembly.
3. Set the engine oil pan strainer gasket and the engine oil pan strainer in the engine oil pan to the cylinder block assembly, and tighten the engine oil pan strainer mounting bolts to the specified torque.

   Tightening torque: 19 ± 3 N·m
4. Set the engine oil pan gasket and engine oil pan to the cylinder block assembly, and tighten the engine oil pan mounting bolts to the specified torque.

   Tightening torque: 9.0 ± 3.0 N·m

>>B<< ENGINE OIL PAN DRAIN PLUG GASKET INSTALLATION



Replace the gasket with a new gasket. Install the new gasket in the direction shown in the illustration.

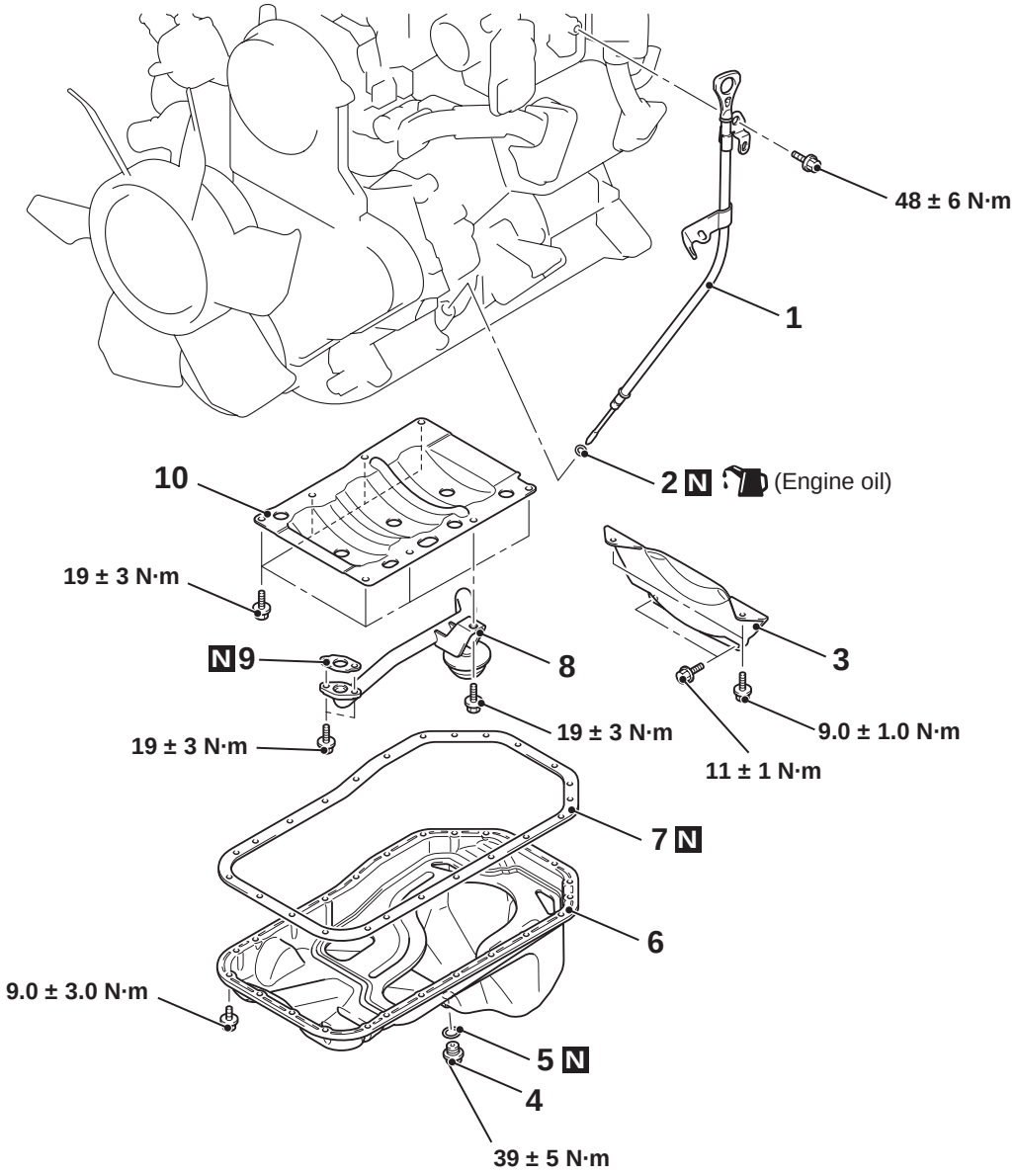
REMOVAL AND INSTALLATION <2WD (HIGH RIDER) AND 4WD>

M1112008301015

⚠ CAUTION

At the time of factory shipment or when the engine is overhauled, liquid gasket is used for the engine oil pan gasket. Use the replacement engine oil pan gasket since the sealed surface may interfere with surrounding parts, causing oil leak when the engine oil pan is installed on the vehicle using the liquid gasket.

Pre-removal Operation	Post-installation Operation
• Under Skid Plate and Engine Room Under Cover Removal (Refer to GROUP 51 – Under Cover P.51-32). • Engine Oil Draining (Refer to GROUP 12 – On-vehicle Service, Engine Oil Replacement P.12-4). • Differential Gear Oil Draining (Refer to GROUP 26 – On-vehicle Service, Gear Oil Replacement P.26-11) <4WD>. • Front Differential Carrier Assembly Removal (Refer to GROUP 26 – Differential Carrier and Freewheel Clutch P.26-33) <4WD>. • Power Steering Gear Box and Linkage Assembly Removal (Refer to GROUP 37 – Power Steering Gear Box and Linkage P.37-22).	• Power Steering Gear Box and Linkage Assembly Installation (Refer to GROUP 37 – Power Steering Gear Box and Linkage P.37-22). • Front Differential Carrier Assembly Installation (Refer to GROUP 26 – Differential Carrier and Freewheel Clutch P.26-33) <4WD>. • Differential Gear Oil Refilling (Refer to GROUP 26 – On-vehicle Service, Gear Oil Replacement P.26-11) <4WD>. • Engine Oil Refilling (Refer to GROUP 12 – On-vehicle Service, Engine Oil Replacement P.12-4). • Under Skid Plate and Engine Room Under Cover Installation (Refer to GROUP 51 – Under Cover P.51-32).



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Removal steps

1. Engine oil level gauge and guide assembly
2. O-ring
3. Bell housing cover
4. Engine oil pan drain plug
>>C<< 5. Engine oil pan drain plug gasket
<<A>> >>B<< 6. Engine oil pan
>>A<< 7. Engine oil pan gasket
8. Engine oil pan strainer

Removal steps (Continued)

9. Engine oil pan strainer gasket
10. Stiffener

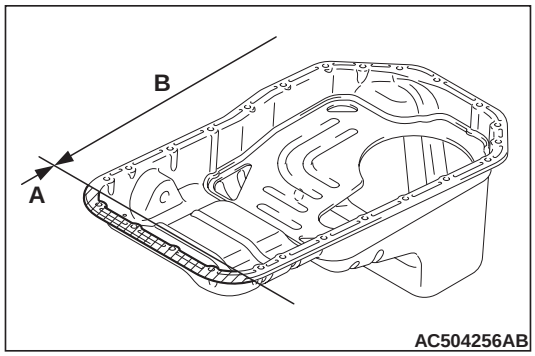
REMOVAL SERVICE POINT

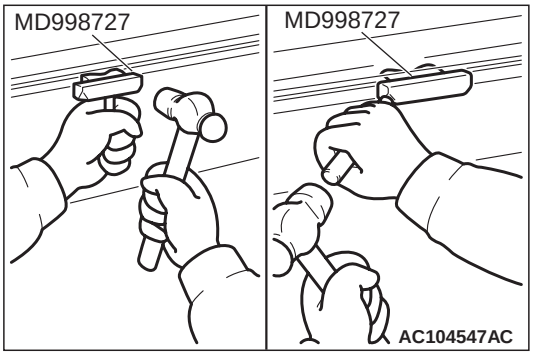
<<A>> ENGINE OIL PAN REMOVAL

1. Remove the engine oil pan mounting bolts.

⚠ CAUTION

Do not use special tool oil pan FIPG cutter (MD998727) in area A of the engine oil pan. Using the special tool MD998727 in area A may cause deformation of the front case because the front case is made of aluminium.





2. Tap special tool MD998727 into the range (B) between the cylinder block and the engine oil pan, and then slide the special tool MD998727 sideways.

   NOTE: If any surrounding parts interfere with the removal, there is no need to use the special tool MD998727.

3. Remove the engine oil pan.

INSTALLATION SERVICE POINTS

>>A<< ENGINE OIL PAN GASKET INSTALLATION

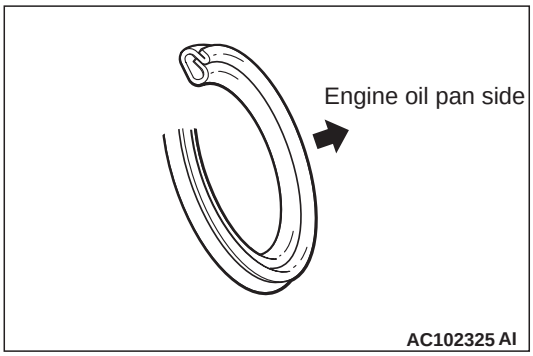
Install the engine oil pan gasket so that its fluorine-coated surface faces the cylinder block side.

>>B<< ENGINE OIL PAN INSTALLATION

1. Remove sealant from the engine oil pan and cylinder block surfaces.
2. Install the engine oil pan.
3. Tighten the engine oil pan bolts to the specified torque.

   Tightening torque: 9.0 ± 3.0 N·m

>>C<< ENGINE OIL PAN DRAIN PLUG GASKET INSTALLATION



Replace the gasket with a new gasket. Install the new gasket in the direction shown in the illustration.

INSPECTION

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- Check the engine oil pan for cracks.
- Check the engine oil pan sealant-coated surface for damage and deformation.
- Check the engine oil pan strainer for cracked, clogged or damaged wire net and pipe.

CRANKSHAFT OIL SEAL

REMOVAL AND INSTALLATION <M/T>

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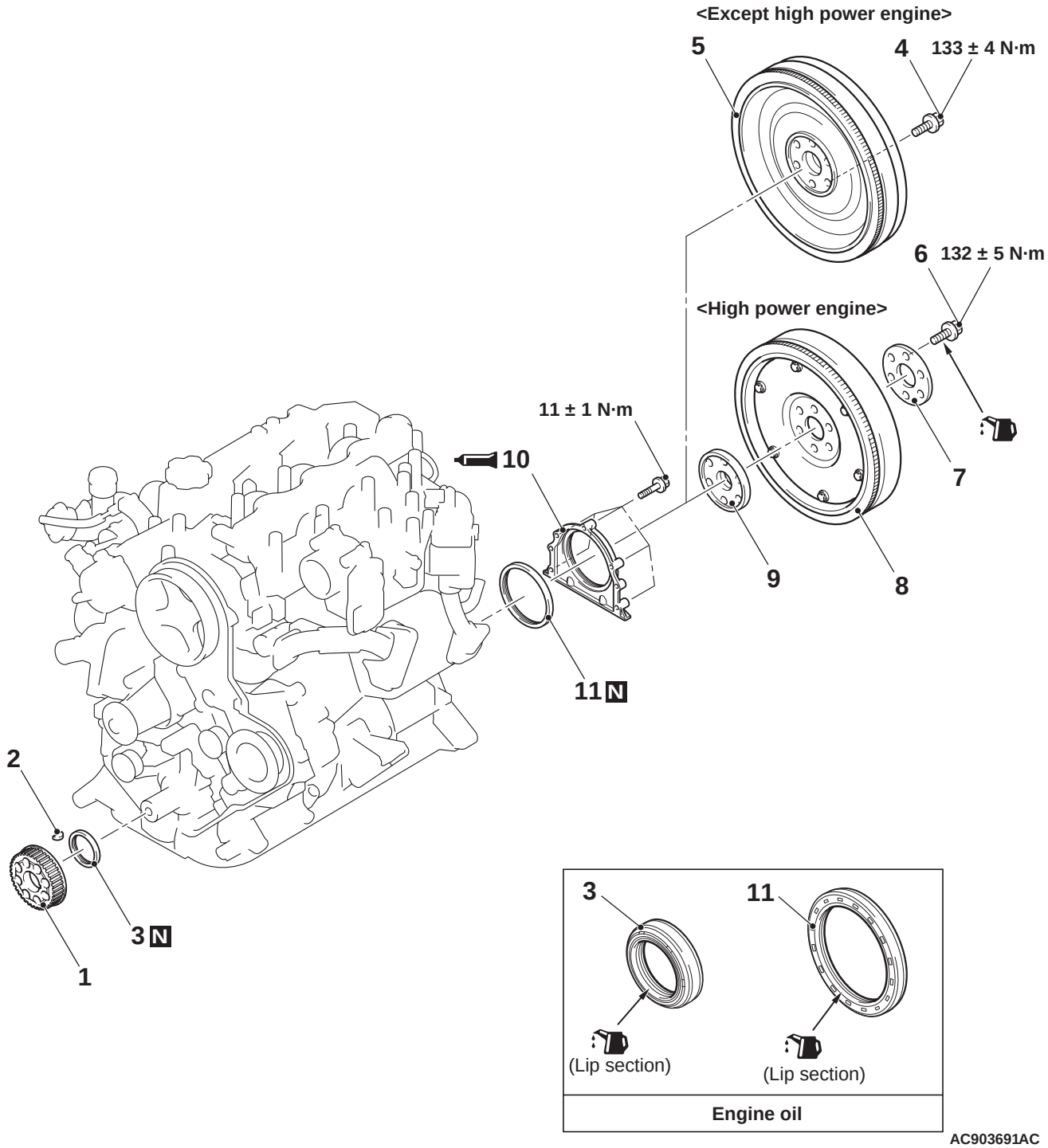

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Crankshaft front oil seal removal steps

- Timing belt, timing belt B (Refer to P.11A-43)

>>F<< 1. Crankshaft B sprocket
2. Crankshaft key
>>E<< 3. Crankshaft front oil seal

Crankshaft rear oil seal removal steps <Except high power engine>

- Transmission assembly (Refer to GROUP 22A – Transmission Assembly P.22A-9) <2WD>
- Transmission assembly (Refer to GROUP 22A – Transmission Assembly P.22A-10) <4WD>

Crankshaft rear oil seal removal steps <Except high power engine> (Continued)

- Clutch cover and clutch disc (Refer to GROUP 21B – Clutch P.21B-3)

<<B>> >>D<< 4. Flywheel bolt
5. Flywheel assembly
>>B<< 10. Oil seal case assembly
>>A<< 11. Crankshaft rear oil seal

Crankshaft rear oil seal removal steps <High power engine>

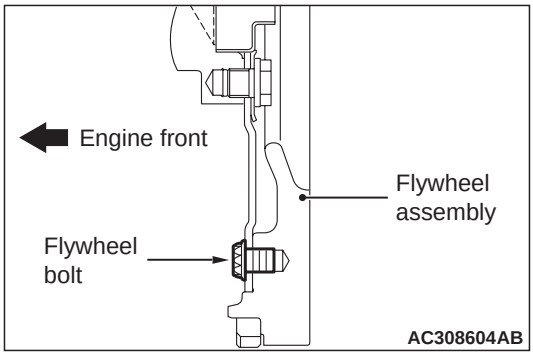
<<A>>
- Transmission assembly (Refer to GROUP 22A – Transmission Assembly P.22A-10) <4WD>
- Clutch cover and clutch disc (Refer to GROUP 21B – Clutch P.21B-3)

<<B>> >>D<< 6. Flywheel bolt
>>C<< 7. Adapter
8. Flywheel assembly
9. Crankshaft adapter
>>B<< 10. Oil seal case assembly
>>A<< 11. Crankshaft rear oil seal

REMOVAL SERVICE POINTS

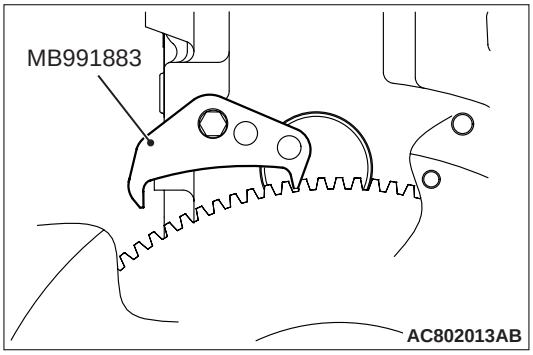
<<A>> TRANSMISSION ASSEMBLY REMOVAL

⚠ CAUTION



Do not remove the flywheel bolt. If this bolt is removed, the flywheel assembly will become out of balance and damaged.

<<B>> FLYWHEEL BOLT REMOVAL

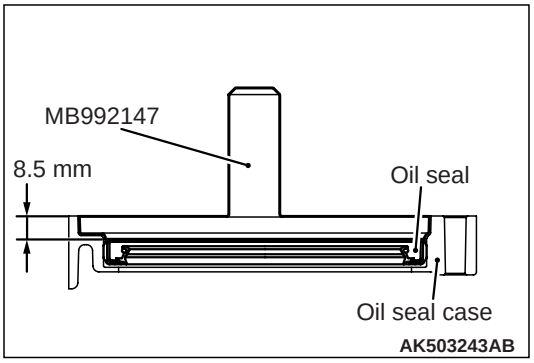


1. Use special tool flywheel stopper (MB991883) to secure the flywheel assembly.
2. Remove the flywheel bolts.

INSTALLATION SERVICE POINTS

>>A<< CRANKSHAFT REAR OIL SEAL INSTALLATION

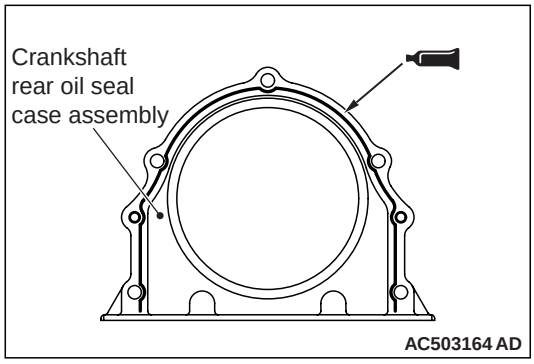
1. Apply a small amount of engine oil to the entire inner diameter of the oil seal lip.



2. Use special tool oil seal installer (MB992147) to press-fit the crankshaft rear oil seal.
3. Press-fit the crankshaft rear oil seal into the oil seal case assembly to have the dimension shown in the illustration.

>>B<< CRANKSHAFT REAR OIL SEAL CASE ASSEMBLY INSTALLATION

1. Remove completely old sealant remaining on the crankshaft rear oil seal case assembly and cylinder block.



2. Apply a continuous bead of the specified sealant to the crankshaft rear oil seal case assembly mating surface as shown.

Specified sealant: ThreeBond 1207F

NOTE: Install the crankshaft rear oil seal case assembly immediately applying sealant.

⚠ CAUTION

After the installation, until a sufficient period of time (one hour or more) elapses, do not apply the oil or water to the sealant application area or start the engine.

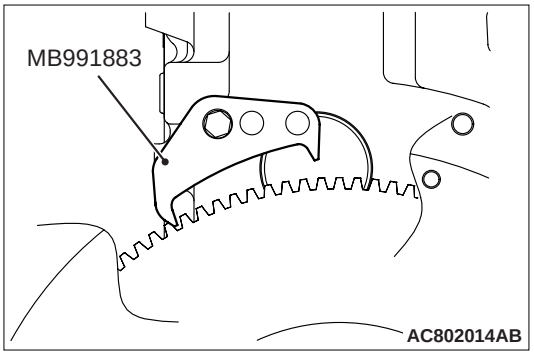
3. Applying an appropriate amount of engine oil to the entire circumference of its crankshaft oil seal rear lip portion, and then set the crankshaft rear oil seal case assembly to the cylinder block and tighten the mounting bolts to the specified torque.

   Tightening torque: 11 ± 1 N·m

>>C<< ADAPTER INSTALLATION

Install the adapter to the flywheel so that the identification mark (ϕ4 mm) faces the transmission side.

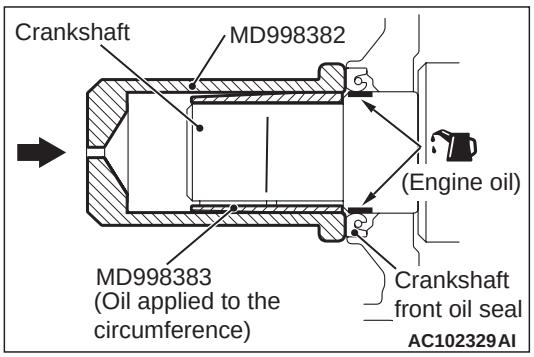
>>D<< FLYWHEEL BOLT INSTALLATION



1. Use special tool flywheel stopper (MB991883) to secure the flywheel assembly in the same manner as removal.
2. Tighten the flywheel bolts to the specified torque.

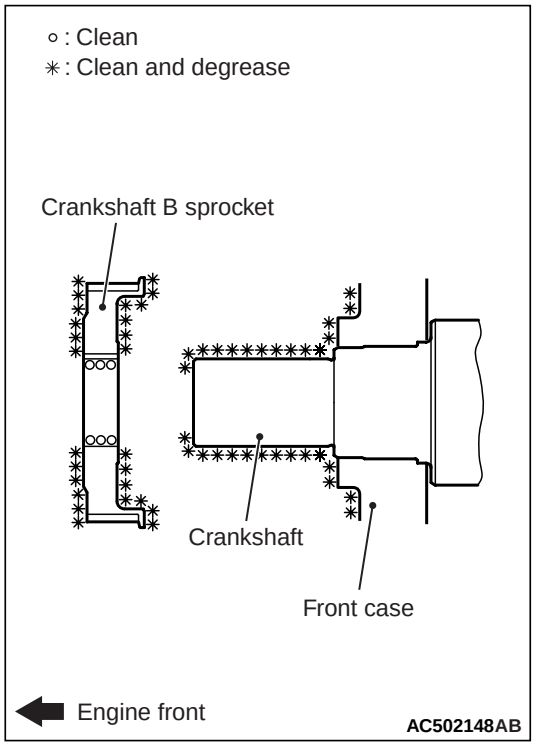
   Tightening torque:
   <Except high power engine> 133 ± 4 N·m
   <High power engine> 132 ± 5 N·m

>>E<< CRANKSHAFT FRONT OIL SEAL INSTALLATION



1. Apply a small amount of engine oil to the outer diameter of special tool crankshaft front oil seal guide (MD998383) and install it to the crankshaft.
2. Apply a small amount of engine oil to the entire inner diameter of the oil seal lip.
3. Use special tool crankshaft front oil seal installer (MD998382) to press-fit the crankshaft front oil seal.

>>F<< CRANKSHAFT B SPROCKET INSTALLATION



1. Clean or degrease the oil pump case, the crankshaft and the crankshaft B sprocket as shown.

   NOTE: Also clean the degreased surfaces.
2. Install the crankshaft B sprocket in the direction shown in the illustration.

REMOVAL AND INSTALLATION <A/T>

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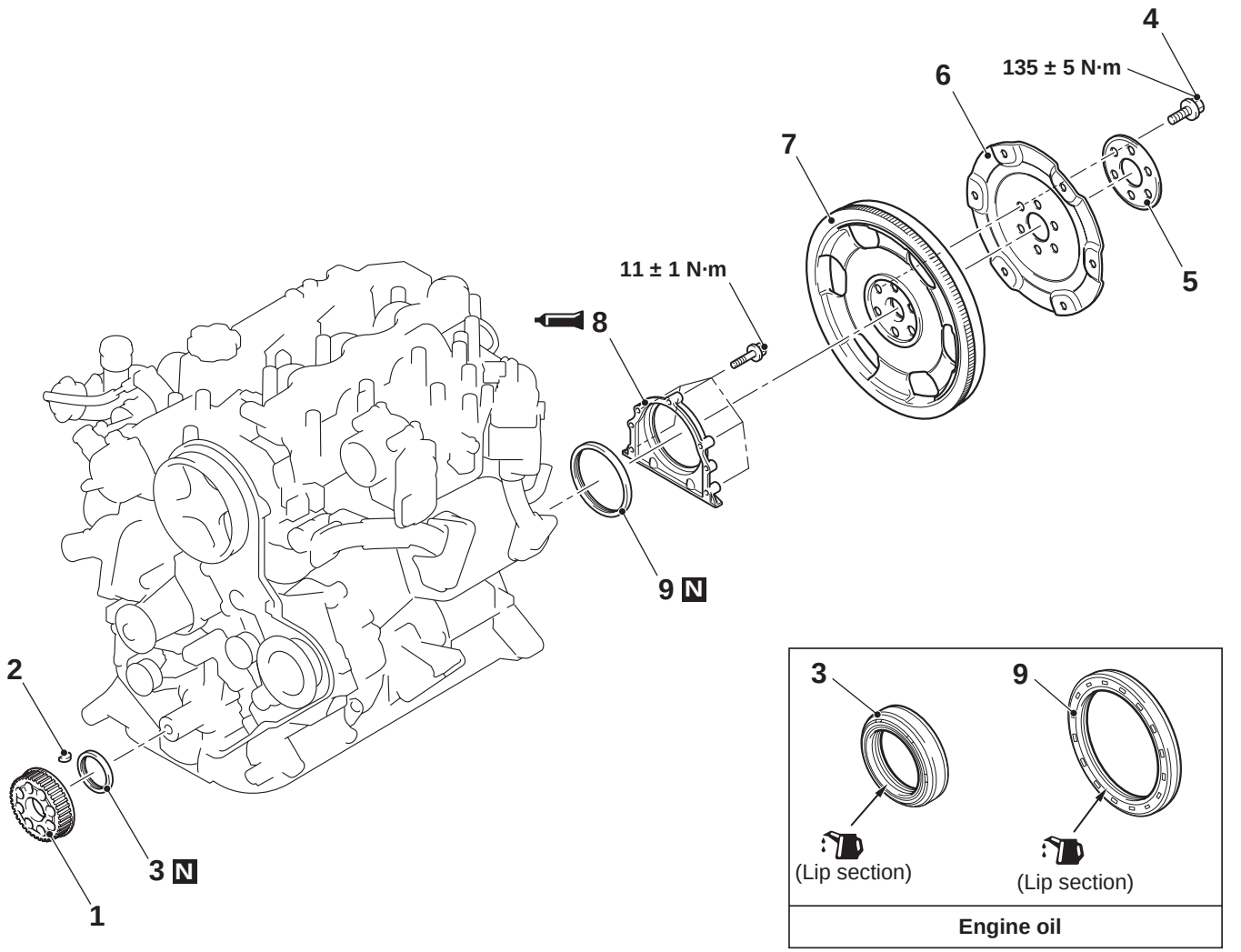


Crankshaft front oil seal removal steps

- Timing belt, timing belt B (Refer to P.11A-43)

>>E<< 1. Crankshaft B sprocket
2. Crankshaft key
>>D<< 3. Crankshaft front oil seal

Crankshaft rear oil seal removal steps

- Transmission assembly (Refer to GROUP 23A – Transmission Assembly P.23A-135) <4A/T>
- Transmission assembly (Refer to GROUP 23A – Transmission Assembly P.23A-139) <5A/T>

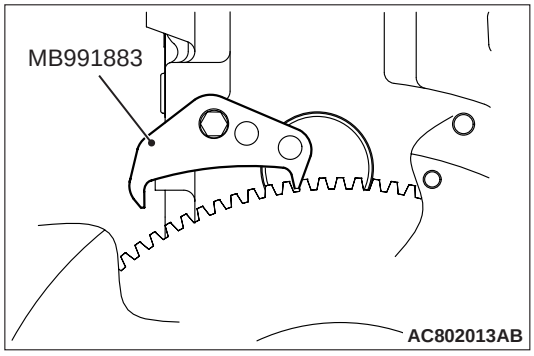
<<A>> >>C<< 4. Drive plate bolt
5. Adapter plate
6. Drive plate
7. Inertia ring assembly

Crankshaft rear oil seal removal steps (Continued)

>>B<< 8. Oil seal case assembly
>>A<< 9. Crankshaft rear oil seal

REMOVAL SERVICE POINT

<<A>> DRIVE PLATE BOLT REMOVAL

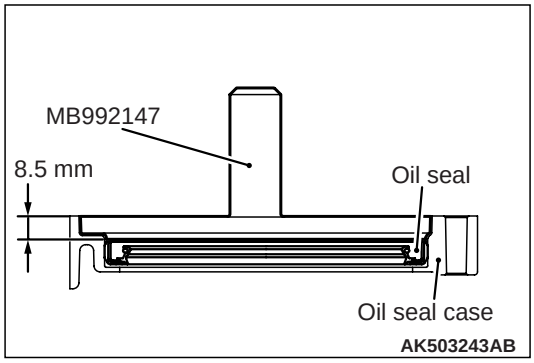


1. Use special tool flywheel stopper (MB991883) to secure the inertia ring assembly.
2. Remove the drive plate bolts.

INSTALLATION SERVICE POINTS

>>A<< CRANKSHAFT REAR OIL SEAL INSTALLATION

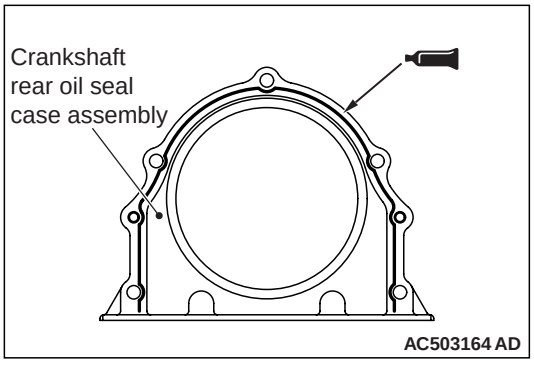
1. Apply a small amount of engine oil to the entire inner diameter of the oil seal lip.



2. Use special tool oil seal installer (MB992147) to press-fit the crankshaft rear oil seal.
3. Press-fit the crankshaft rear oil seal into the oil seal case assembly to have the dimension shown in the illustration.

>>B<< CRANKSHAFT REAR OIL SEAL CASE ASSEMBLY INSTALLATION

1. Remove completely old sealant remaining on the crankshaft rear oil seal case assembly and cylinder block.



2. Apply a continuous bead of the specified sealant to the crankshaft rear oil seal case assembly mating surface as shown.

   Specified sealant: ThreeBond 1207F

   NOTE: Install the crankshaft rear oil seal case assembly immediately applying sealant.

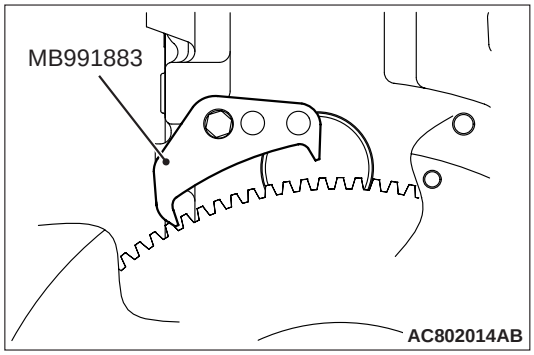
⚠ CAUTION

After the installation, until a sufficient period of time (one hour or more) elapses, do not apply the oil or water to the sealant application area or start the engine.

3. Applying an appropriate amount of engine oil to the entire circumference of its crankshaft oil seal rear lip portion, and then set the crankshaft rear oil seal case assembly to the cylinder block and tighten the mounting bolts to the specified torque.

   Tightening torque: 11 ± 1 N·m

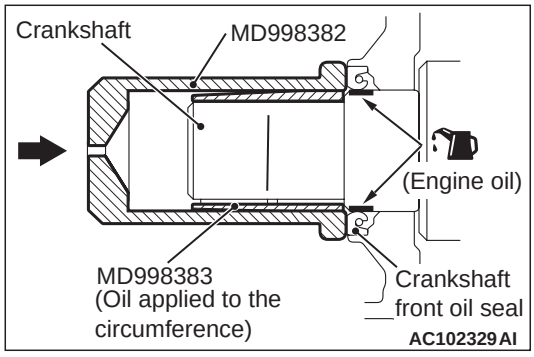
>>C<< DRIVE PLATE BOLT INSTALLATION



1. Use special tool flywheel stopper (MB991883) to secure the inertia ring assembly in the same manner as removal.
2. Tighten the drive plate bolts to the specified torque.

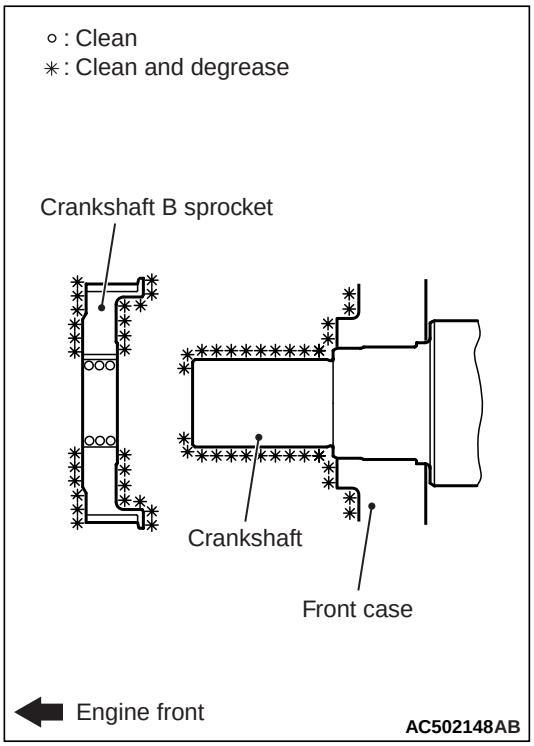
   Tightening torque: 135 ± 5 N·m

>>D<< CRANKSHAFT FRONT OIL SEAL INSTALLATION



1. Apply a small amount of engine oil to the outer diameter of special tool crankshaft front oil seal guide (MD998383) and install it to the crankshaft.
2. Apply a small amount of engine oil to the entire inner diameter of the oil seal lip.
3. Use special tool crankshaft front oil seal installer (MD998382) to press-fit the crankshaft front oil seal.

>>E<< CRANKSHAFT B SPROCKET INSTALLATION



1. Clean or degrease the oil pump case, the crankshaft and the crankshaft B sprocket as shown.

   NOTE: Also clean the degreased surfaces.
2. Install the crankshaft B sprocket in the direction shown in the illustration.

CYLINDER HEAD GASKET

REMOVAL AND INSTALLATION

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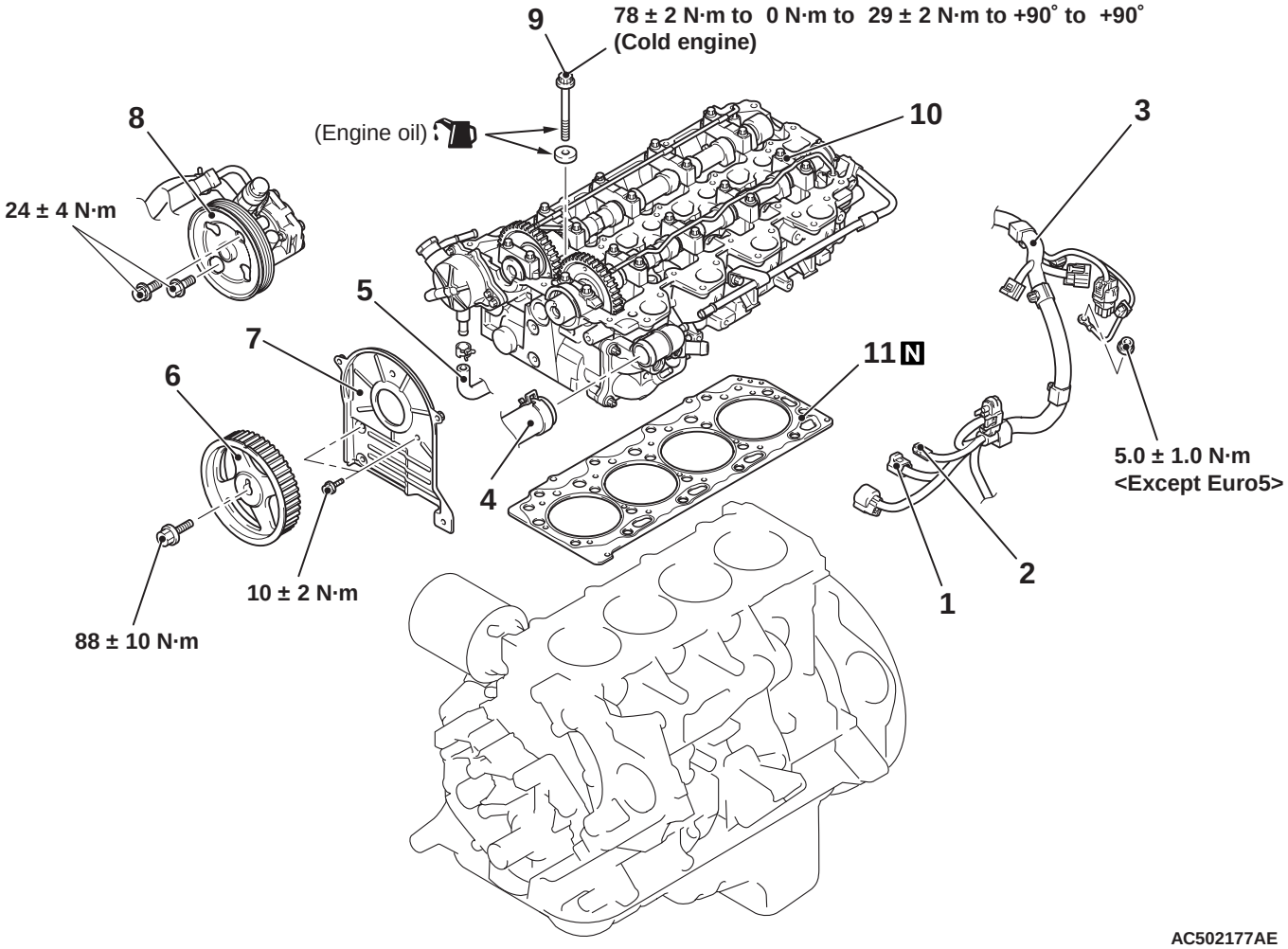
Pre-removal Operation	Post-installation Operation
• Engine Oil Draining (Refer to GROUP 12 – On-vehicle Service, Engine Oil Replacement P.12-4). • Fuel Injector Removal (Refer to GROUP 13A – Fuel Injector P.13A-598). • Common Rail Assembly Removal (Refer to GROUP 13A – Common Rail and Supply Pump P.13A-604). • Turbocharger Assembly and Exhaust Manifold Removal (Refer to GROUP 15 – Turbocharger Assembly P.15-19) <Except Euro5>. • Turbocharger Assembly and Exhaust Manifold Removal (Refer to GROUP 15 – Turbocharger Assembly P.15-21) <Euro5>. • Timing Belt Removal (Refer to P.11A-43).	• Timing Belt Installation (Refer to P.11A-43). • Turbocharger Assembly and Exhaust Manifold Installation (Refer to GROUP 15 – Turbocharger Assembly P.15-19) <Except Euro5>. • Turbocharger Assembly and Exhaust Manifold Installation (Refer to GROUP 15 – Turbocharger Assembly P.15-21) <Euro5>. • Common Rail Assembly Installation (Refer to GROUP 13A – Common Rail and Supply Pump P.13A-604). • Fuel Injector Installation (Refer to GROUP 13A – Fuel Injector P.13A-598). • Engine Oil Refilling (Refer to GROUP 12 – On-vehicle Service, Engine Oil Replacement P.12-4).



Removal steps

1. Engine coolant temperature sensor connector
2. Engine coolant temperature gauge unit connector
3. Control wiring harness connection

<<A>> >>D<<

4. Radiator upper hose connection
5. Oil hose connection

<<B>> >>C<<

<<C>>

<<D>> >>B<<

Removal steps (Continued)

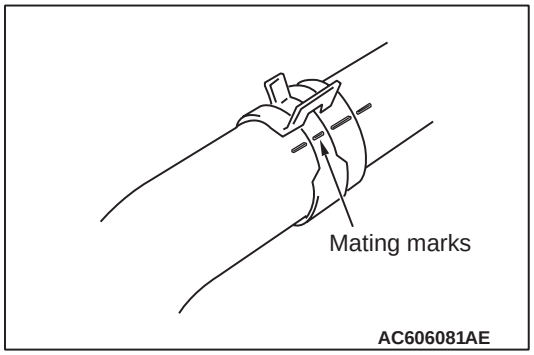
6. Camshaft sprocket
7. Timing belt rear cover
8. Power steering oil pump assembly
9. Cylinder head bolt
10. Cylinder head assembly

>>A<<

11. Cylinder head gasket

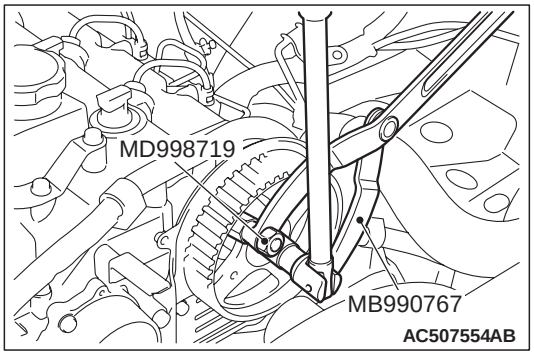
REMOVAL SERVICE POINTS

<<A>> RADIATOR UPPER HOSE DISCONNECTION



Make mating marks on the radiator hose and hose clamp as shown to install them in the original position. Then, remove them.

<<B>> CAMSHAFT SPROCKET REMOVAL



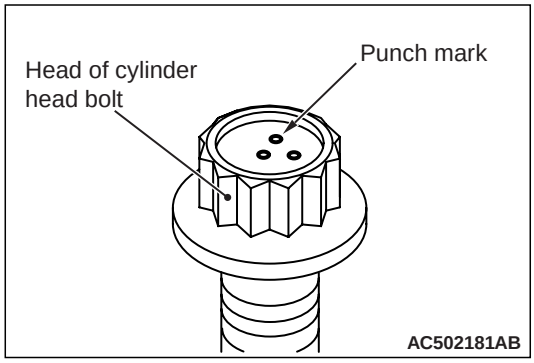
1. Use the following special tools to hold the camshaft sprocket.
   - Front hub and flange yoke holder (MB990767)
   - Pin (MD998719)
2. Loosen the camshaft sprocket mounting bolt and remove the camshaft sprocket.

<<C>> POWER STEERING OIL PUMP ASSEMBLY REMOVAL

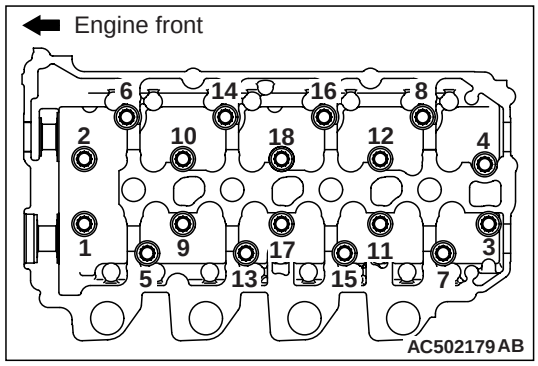
1. With the hose installed, remove the power steering oil pump assembly from the bracket.
2. After removing the power steering oil pump assembly, secure it with a cord in the location where the removal and installation of the cylinder head assembly cannot be hindered.

<<D>> CYLINDER HEAD BOLT REMOVAL

⚠ CAUTION



Provide one punch mark on the head of the cylinder head bolt each time the bolt is tightened. Replace the bolt that already has five punch marks (the evidence of having been tightened five times)



Loosen the cylinder head bolts in two or three steps in the order of the numbers shown in the illustration.

INSTALLATION SERVICE POINTS

>>A<< CYLINDER HEAD GASKET INSTALLATION

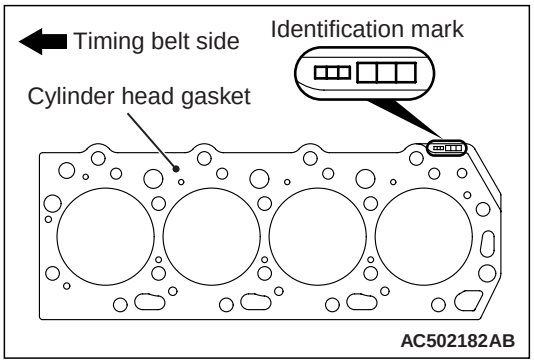
⚠ CAUTION

Do not allow any foreign materials get into the coolant passages, oil passages and cylinder.

1. Degrease the cylinder head gasket mounting surface.

⚠ CAUTION

The thickness of the original cylinder head gasket is selected according to protrusion amount of the piston. Therefore, If the cylinder block, piston, connecting rod or crankshaft is replaced, the protrusion amount may be changed. Always select a correct gasket by measuring the protrusion amount (Refer to GROUP 11B – Cylinder Head and Valves P.11B-46).



2. When replacing the cylinder head gasket only, confirm the gasket identification mark, and then select a replacement part according to the following table.

<Except Euro5>

Specification	Identification mark (fitted thickness mm)	Thickness of selected gasket (when tightened) mm
A	D5–205	0.95 ± 0.04
B	D5–206	1.00 ± 0.04
C	D5–207	1.05 ± 0.04

<Euro5>

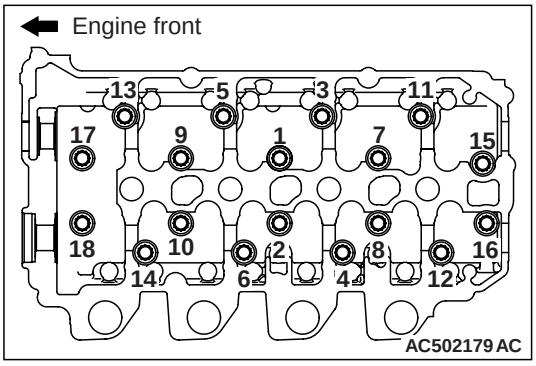
Specification	Identification mark (fitted thickness mm)	Thickness of selected gasket (when tightened) mm
A	D5 – 819	1.07 ± 0.04
	D5 – 996	
B	D5 – 997	1.12 ± 0.04
C	D5 – 998	1.17 ± 0.04

>>B<< CYLINDER HEAD BOLTS INSTALLATION

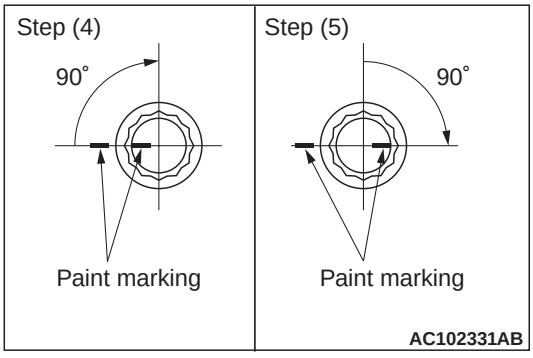
⚠ CAUTION

- **Before installing the cylinder head bolt, check the number of punch marks on its head. (the bolt is reusable if it is four or less.) The number of punch marks corresponds to that to times the bolt has been tightened to the plastic area. If the bolt has five punch marks, replace it.**

1. Set the cylinder head bolt washer with its shear droop toward the bolt head.
2. Apply a small amount of engine oil to the thread of the bolts and to the washers.



3. Tighten the cylinder head bolts in the following procedures.
   (1) Tighten the bolts to 78 ± 2 N·m in the order shown.
   (2) Loosen the bolts fully in the reverse sequence to that shown.
   (3) Tighten the bolts to 29 ± 2 N·m in the order shown.



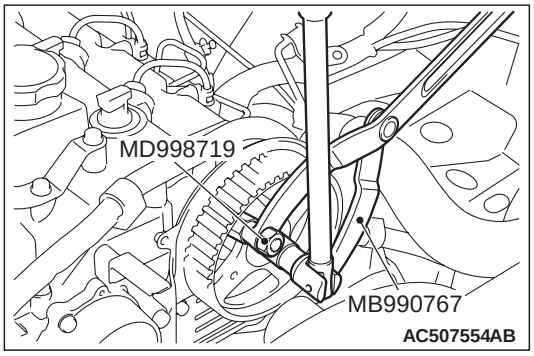
   (4) Apply a paint mark to the heads of the cylinder head bolts and cylinder head, then tighten 90° as shown.

⚠ CAUTION

- **The bolt is not tightening sufficiently if the tightening angle is less than a 90°.**
- **If the tightening angle exceeds the standard specification, remove the bolt and start over from step (1).**

(5) Tighten in a 90° as shown in the instructions of the illustration, then check to see that the paint mark on the head of the cylinder head bolts and the paint mark on the cylinder head is on a linear line.

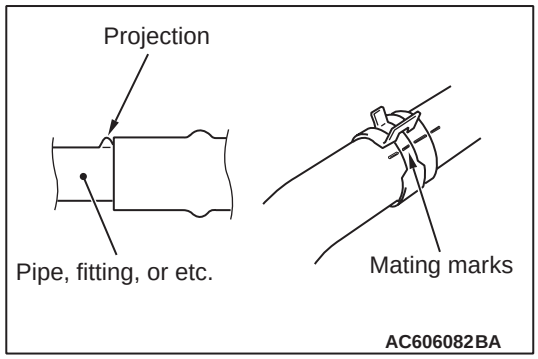
>>C<< CAMSHAFT SPROCKET INSTALLATION



1. Use the following special tools as during removal to hold the camshaft sprocket.
   - Front hub and flange yoke holder (MB990767)
   - Pin (MD998719)
2. Tighten the camshaft sprocket mounting bolt to the specified torque.

   Tightening torque: 88 ± 10 N·m

>>D<< RADIATOR UPPER HOSE CONNECTION



1. Insert radiator hose as far as the projection of the cooling water outlet hose fitting.
2. Align the mating marks on the radiator hose and hose clamp, and then connect the radiator hose.

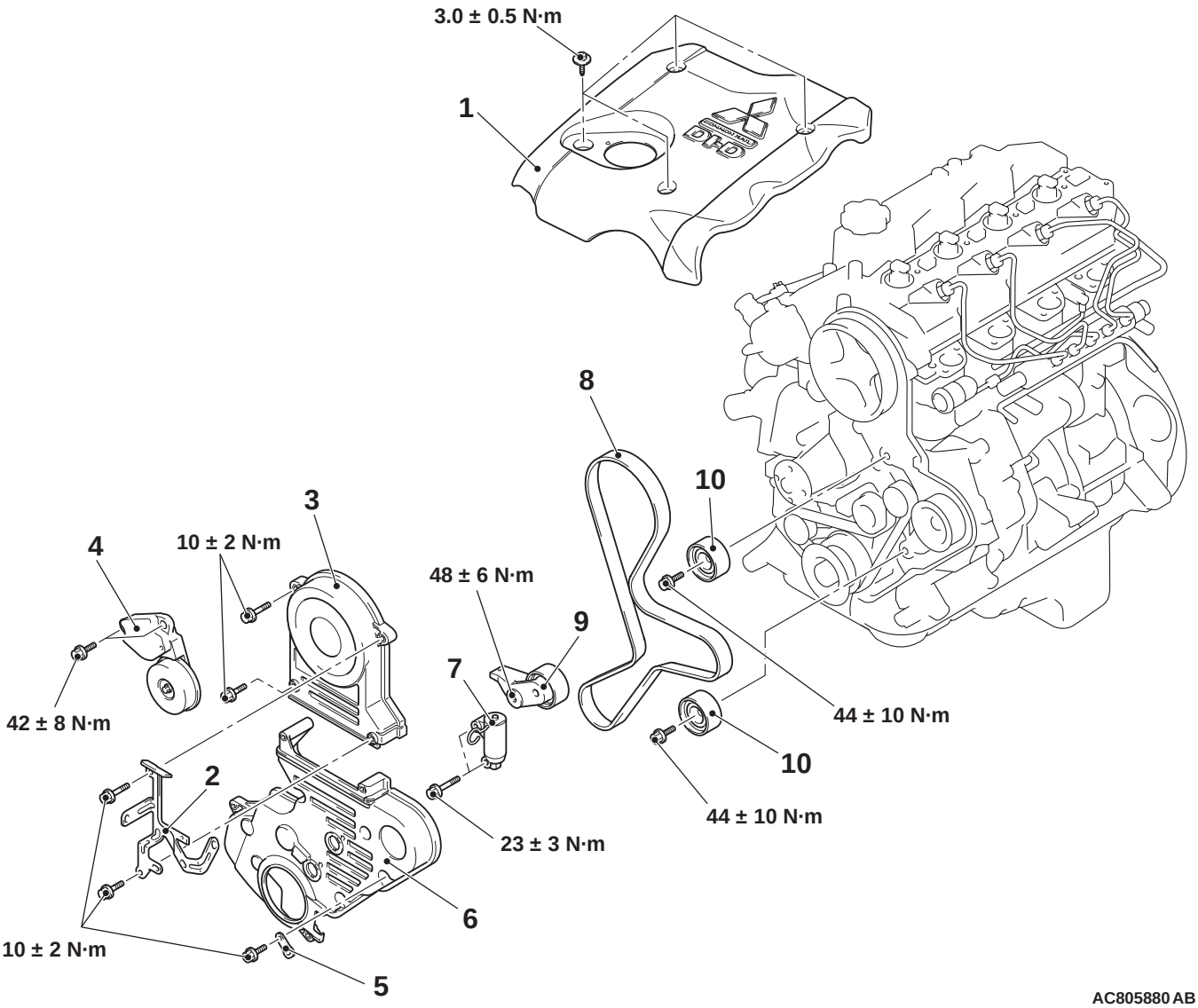
TIMING BELT

REMOVAL AND INSTALLATION

M1112004302889

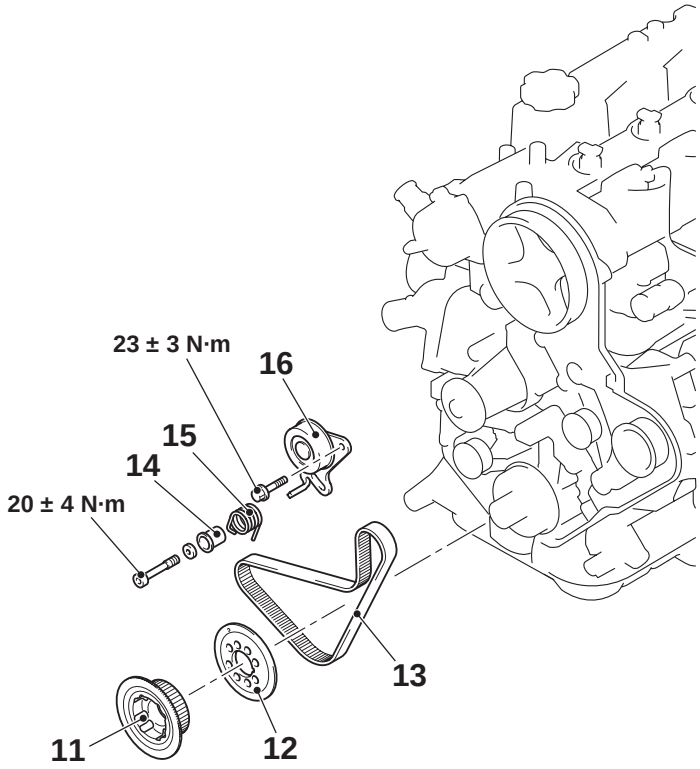
Pre-removal and Post-installation Operation
- Water Pump Pulley Removal and Installation (Refer to GROUP 14 – Radiator Fan P.14-6).
- Crankshaft Pulley Removal and Installation (Refer to P.11A-17).

<Except Euro5>



Removal steps
1. Engine cover
2. Harness bracket
3. Timing belt upper cover
4. Auto tensioner
5. Harness bracket

Removal steps (Continued)
6. Timing belt lower cover
>>D<< 7. Auto tensioner
<<A>> >>D<< 8. Timing belt
>>D<< 9. Tensioner arm assembly
10. Idler pulley



AC502913AE

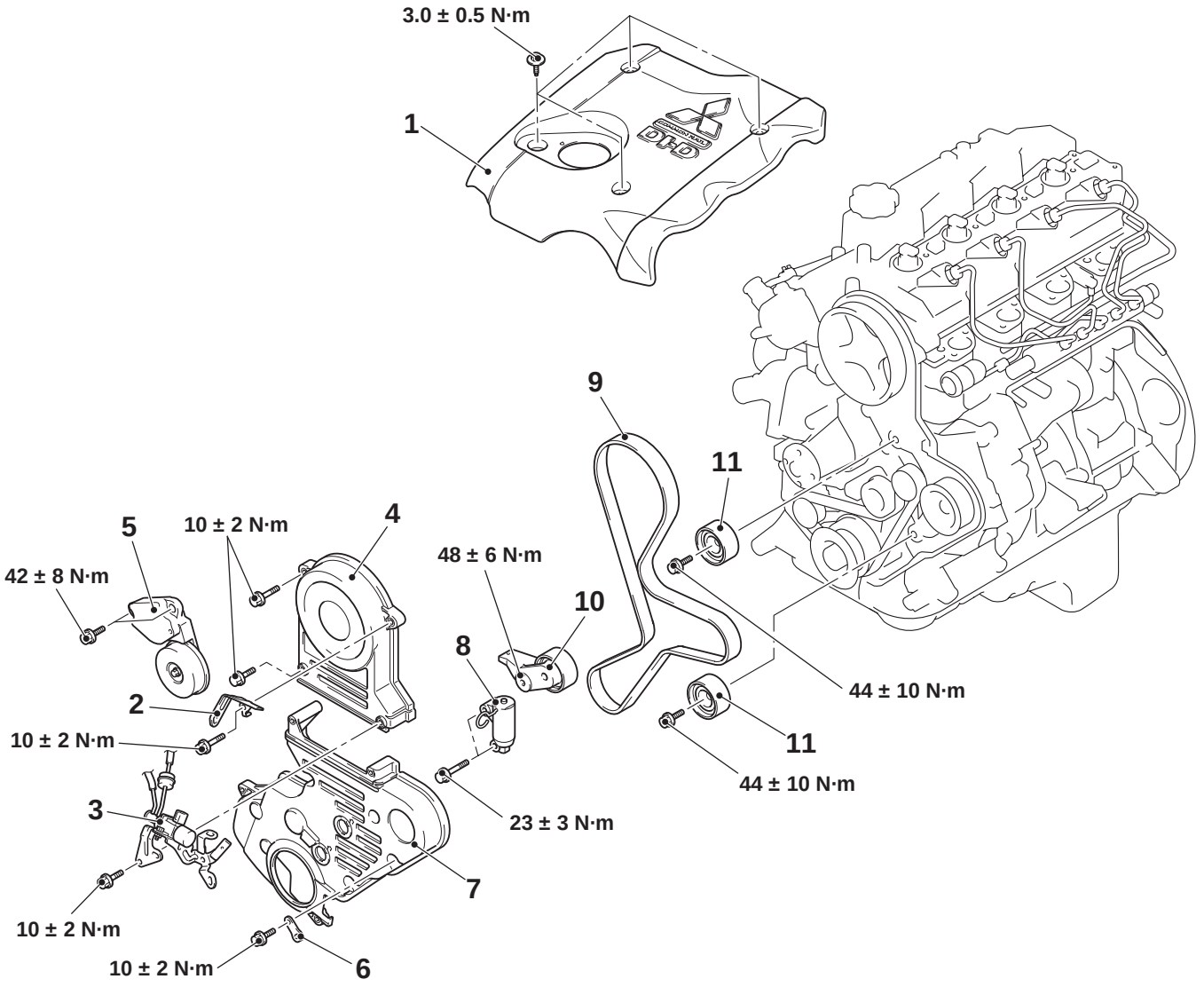
Removal steps

	>>**C**<<	11.	Crankshaft sprocket
	>>**C**<<	12.	Flange
<<**B**>>	>>**B**<<	13.	Timing belt B
	>>**A**<<	14.	Tensioner B spacer

Removal steps (Continued)

>>**A**<<	15.	Tensioner B spring
>>**A**<<	16.	Timing belt B tensioner assembly

<Euro5>



AC805668AB

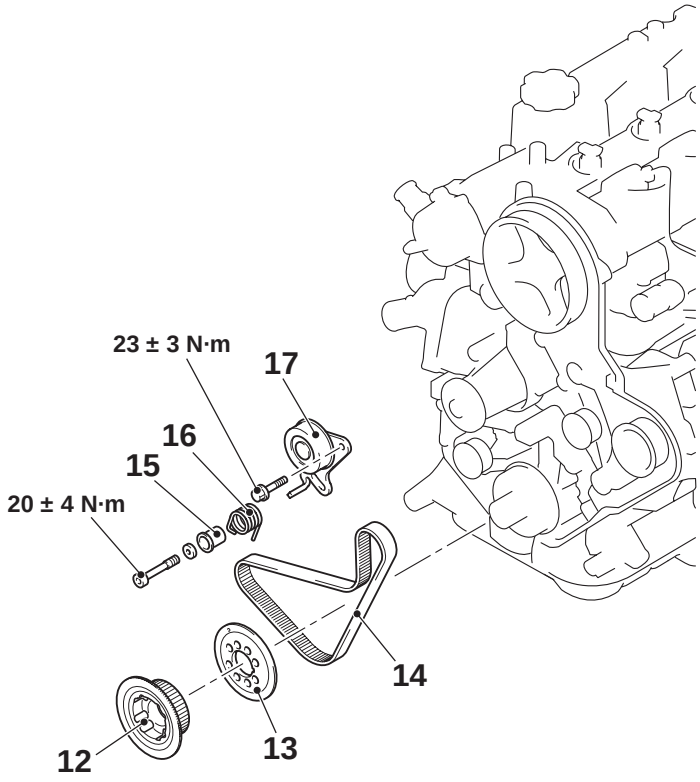
Removal steps

1. Engine cover
2. Harness bracket
3. Solenoid valve and harness bracket assembly
4. Timing belt upper cover
5. Auto tensioner

<<A>> >>D<<

Removal steps (Continued)

6. Harness bracket
7. Timing belt lower cover
8. Auto tensioner >>D<<
9. Timing belt >>D<<
10. Tensioner arm assembly >>D<<
11. Idler pulley



AC502913AF

Removal steps

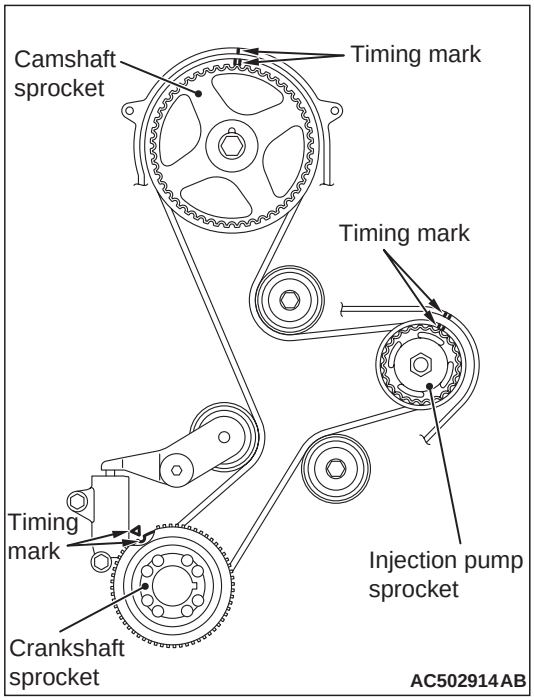
	>>C<<	12.	Crankshaft sprocket
	>>C<<	13.	Flange
<<B>>	>>B<<	14.	Timing belt B
	>>A<<	15.	Tensioner B spacer
	>>A<<	16.	Tensioner B spring
	>>A<<	17.	Timing belt B tensioner assembly

REMOVAL SERVICE POINTS

<<A>> TIMING BELT REMOVAL

⚠ CAUTION

Never turn the crankshaft anti-clockwise.

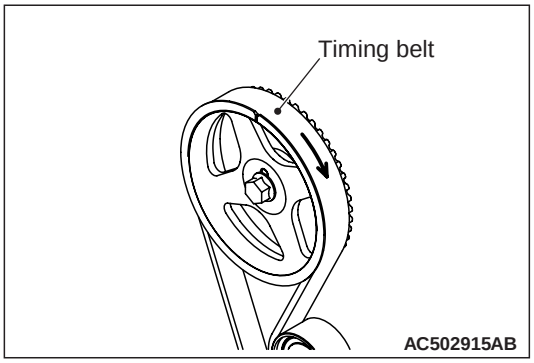


AC502914AB

1. Turn the crankshaft clockwise, align each timing mark to set No.1 cylinder to TDC of its compression stroke.

⚠ CAUTION

To reuse the timing belt, draw an arrow indicating the rotating direction (clockwise) on the back of the belt using chalk, etc.

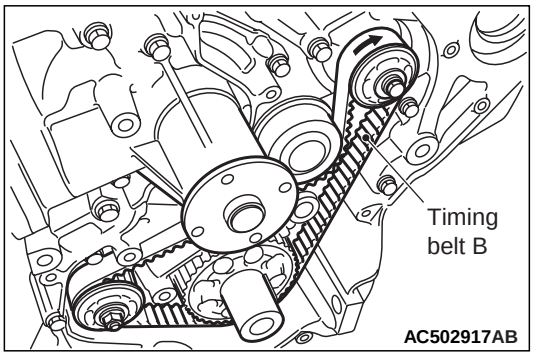


2. Remove the timing belt.

<<B>> TIMING BELT B REMOVAL

⚠ CAUTION

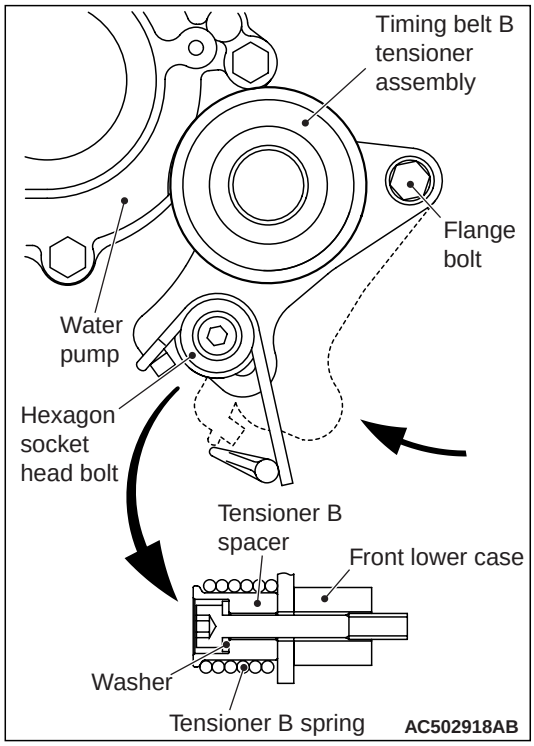
To reuse the timing belt B, draw an arrow indicating the rotating direction on the back of the belt using chalk, etc.



1. Loosen the timing belt B tensioner assembly mounting bolts.
2. Push the timing belt B tensioner assembly to water pump side and tighten the timing belt B tensioner assembly mounting bolts.
3. Remove the timing belt B.

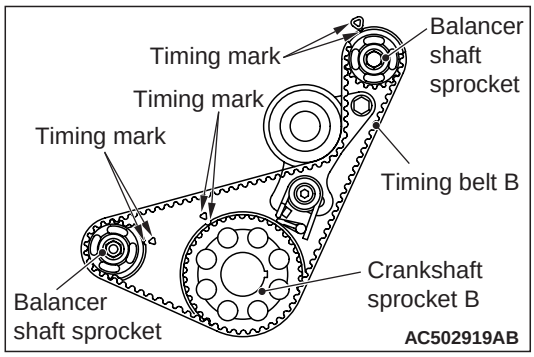
INSTALLATION SERVICE POINTS

>>A<< TIMING BELT B TENSIONER ASSEMBLY/ TENSIONER B SPRING/TENSIONER B SPACER INSTALLATION

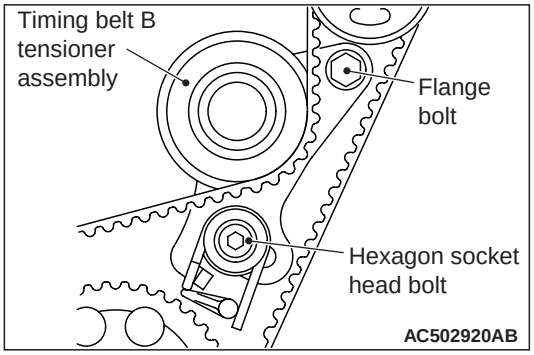


1. Install the timing belt B tensioner assembly, tensioner B spring and tensioner B spacer.
   NOTE: Be sure to install the tensioner B spring with its shorter end toward the water pump.
2. Move timing belt B tensioner assembly toward water pump and tighten mounting bolts.

>>B<< TIMING BELT B INSTALLATION

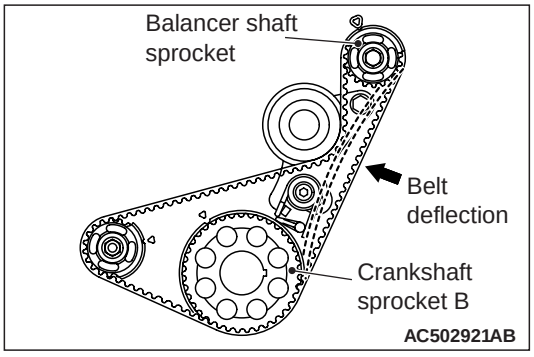


1. Align timing marks on the crankshaft sprocket B, and balancer shaft sprockets with their timing marks.
2. Install balancer timing belt B onto sprockets and ensure that its tension side is not slack.



3. Loosen timing belt B tensioner assembly mounting flange bolt, one to two turns.
4. Tighten the timing belt B tensioner assembly mounting hexagon socket head bolt.
5. timing belt B tensioner assembly mounting flange bolt.

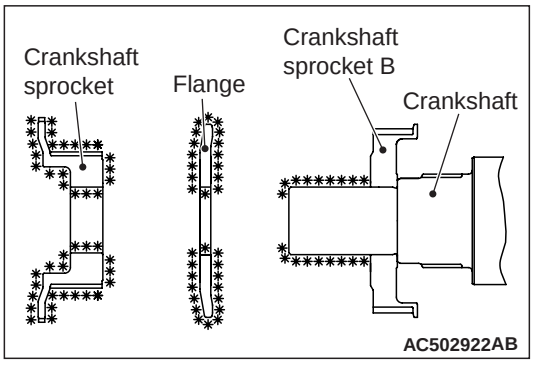
   NOTE: If the bolt is tightened first, the timing belt B tensioner assembly should be turned together, resulting in reduced timing belt B tensioner assembly.



6. Ensure that the deflection is as specified when the timing belt B is pushed by the index finger at the position indicated by an arrow.

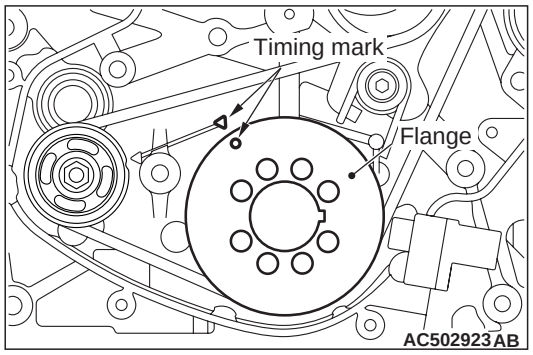
   Belt deflection: 4 – 5 mm

>>C<< FLANGE/CRANKSHAFT SPROCKET INSTALLATION



1. Clean or degrease the crankshaft, the flange and crankshaft sprocket as shown.

   NOTE: Also clean the degreased surfaces.



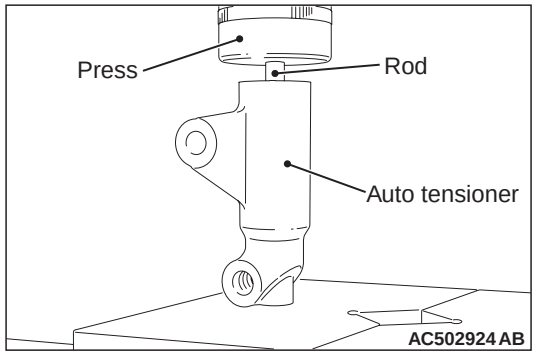
2. Assemble the flange by aligning the timing mark of the front lower case and the timing mark of the flange.

>>D<< TENSIONER ARM ASSEMBLY/TIMING BELT/AUTO TENSIONER INSTALLATION

1. To reuse the auto tensioner, bleed the air according to the procedure below, and then set the rod to the auto tensioner.

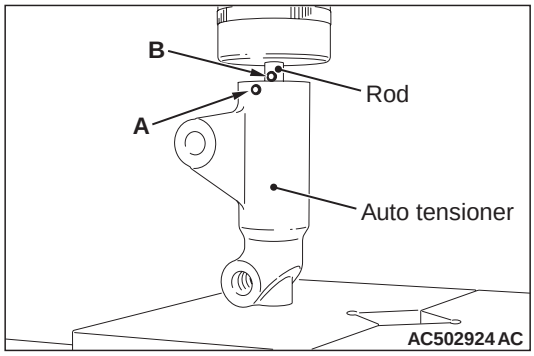
⚠ CAUTION

- **If a horizontal press such as a vice is used, the air entrainment may occur. Thus, a vertical press must be used.**
- **If the compression is too fast, the procedure may damage the rod. Make sure to compress slowly and thoroughly.**
- **To prevent a damage to the auto tensioner, do not push down the rod exceeding the bottom end (a position where the rod protrusion is at 0.5 mm from the auto tensioner).**

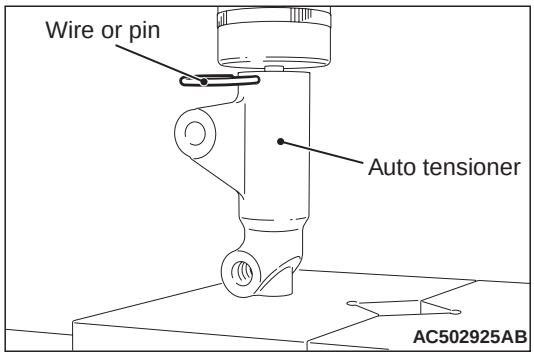


(1) Set the auto tensioner to the vertical press, and then slowly compress the rod to the bottom end (a position where the rod protrusion is at 0.5 mm from the auto tensioner). Perform this operation 2 to 3 times.
(2) With the rod protruding (a position where the rod protrusion is at 5 mm from the auto tensioner), check that there is a rigidity when the rod is pushed with a load (100 to 200 N).

(3) If the rod rigidity is not obtained by repeating the operations of (1) and (2), replace the auto tensioner.



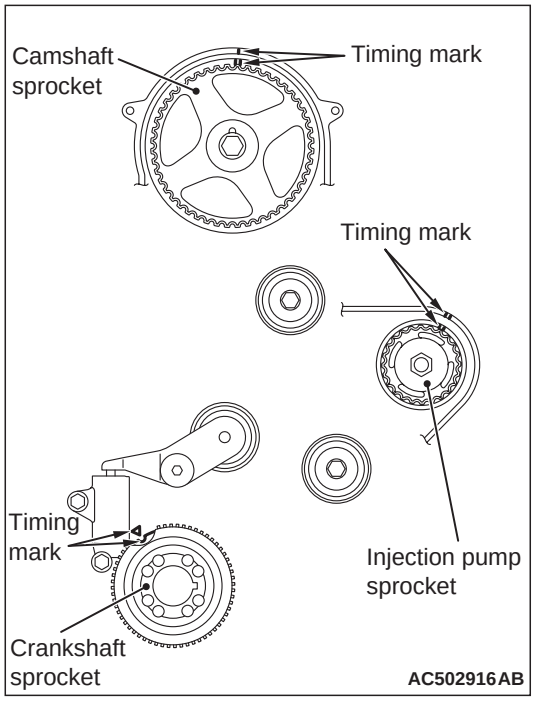
(4) Compress the rod slowly, and then align the set hole A of the rod with the set hole B of the auto tensioner body.



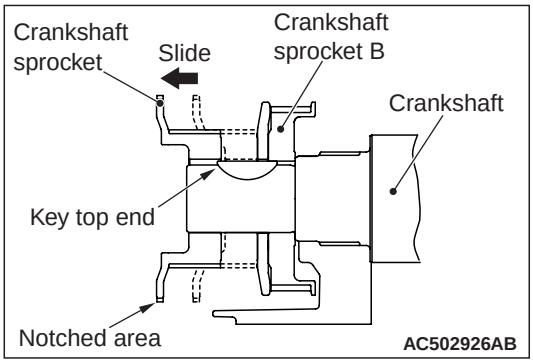
(5) Insert a wire or pin in the aligned set hole.

NOTE: When the auto tensioner is replaced with a new part, the auto tensioner is set with a pin.

2. Install the auto tensioner in position. Leave the wire or pin installed until the auto tensioner is completely installed.
3. Install the tensioner arm assembly.



4. Align the timing mark of each sprocket.



5. In the order below, install the timing belt without slack.

NOTE: When installing the timing belt into the crankshaft sprocket, slide the crankshaft sprocket to near the tip of the key, and then install the timing belt. (When installing the timing belt, be careful not to damage the belt by the cut-out of crankshaft sprocket.) After that, install the crankshaft sprocket to the correct position.

(1) Crankshaft sprocket
(2) Idler pulley
(3) Injection pump sprocket
(4) Idler pulley
(5) Camshaft sprocket
(6) Tensioner pulley

6. Check that the timing marks on sprockets are at the correct positions.
7. Remove the wire or pin of the auto tensioner.

8. Turn the crankshaft 2 turns clockwise, and then measure the protrusion of auto tensioner rod.

   Standard value: 2.3 – 7.6 mm

9. Check again that the timing marks on sprockets are at the correct positions.

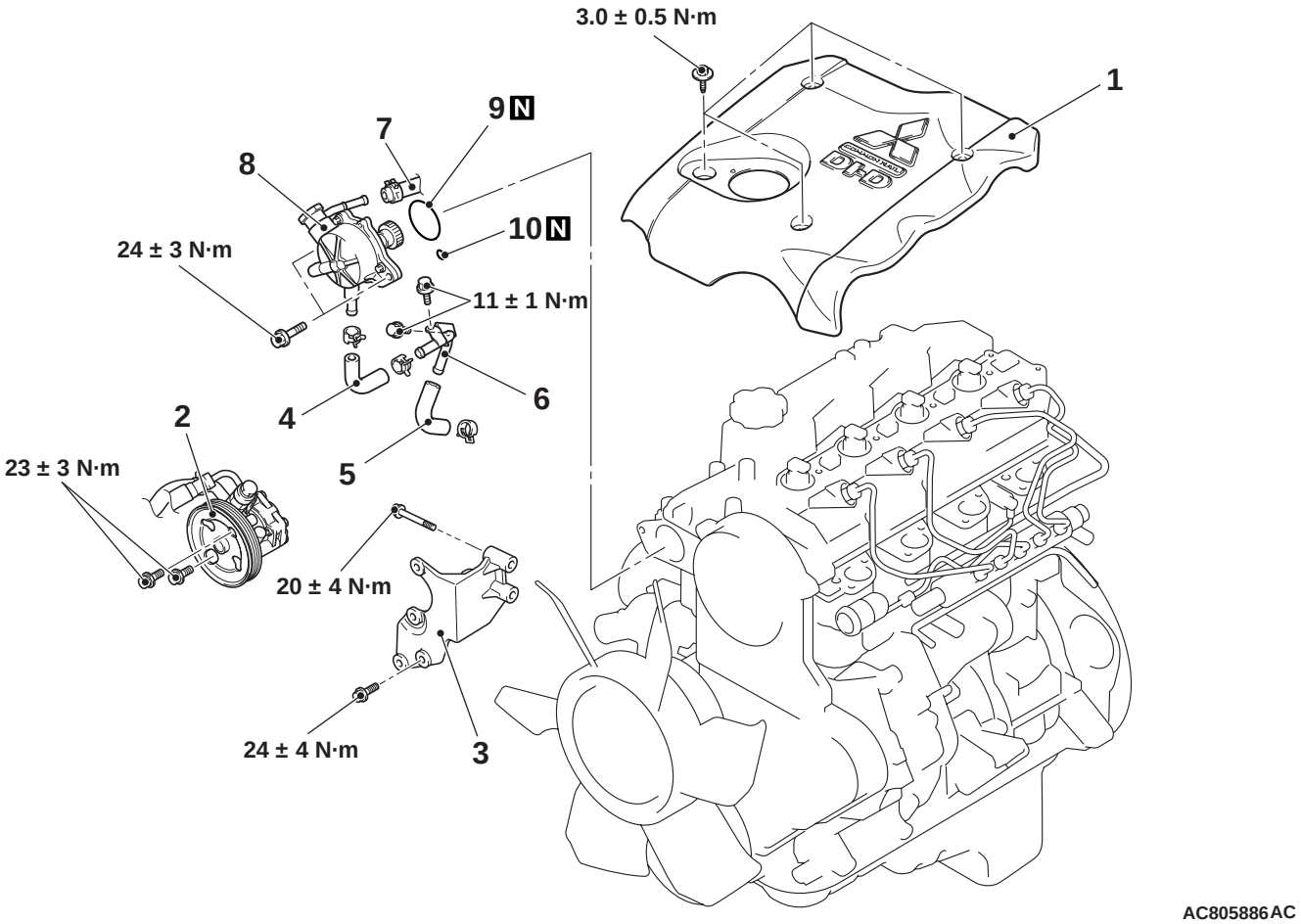
VACUUM PUMP

REMOVAL AND INSTALLATION

M1112005200458

Pre-removal and Post-installation Operation
- A/C Compressor Drive Belt, Alternator and Power Steering Oil Pump Drive Belt Removal and Installation (Refer to P.11A-17).
- Air Duct Removal and Installation (Refer to GROUP 15 – Air Cleaner P.15-6).

<Except Euro5>



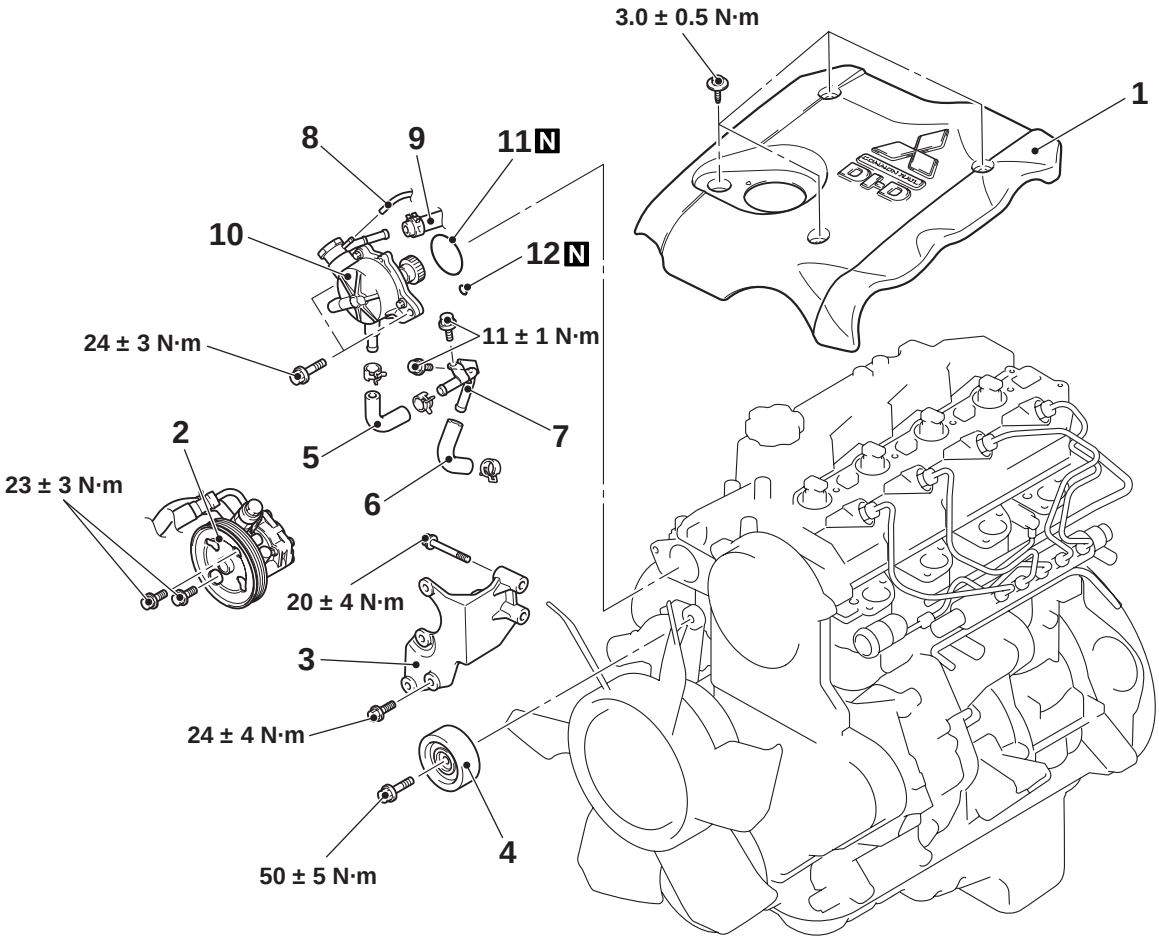
Removal steps

<<A>>
1. Engine cover
2. Power steering oil pump assembly
3. Power steering oil pump bracket A
4. Oil hose
5. Oil hose
6. Oil pipe

Removal steps (Continued)

7. Vacuum hose connection
8. Vacuum pump assembly
9. O-ring
10. O-ring

<Euro5>



AC805665AC

Removal steps

1. Engine cover

<<A>>

2. Power steering oil pump assembly
3. Power steering oil pump bracket A
4. Idler pulley
5. Oil hose
6. Oil hose
7. Oil pipe
8. Vacuum hose connection
9. Vacuum hose connection
10. Vacuum pump assembly
11. O-ring
12. O-ring

REMOVAL SERVICE POINT

<<A>> POWER STEERING OIL PUMP ASSEMBLY REMOVAL

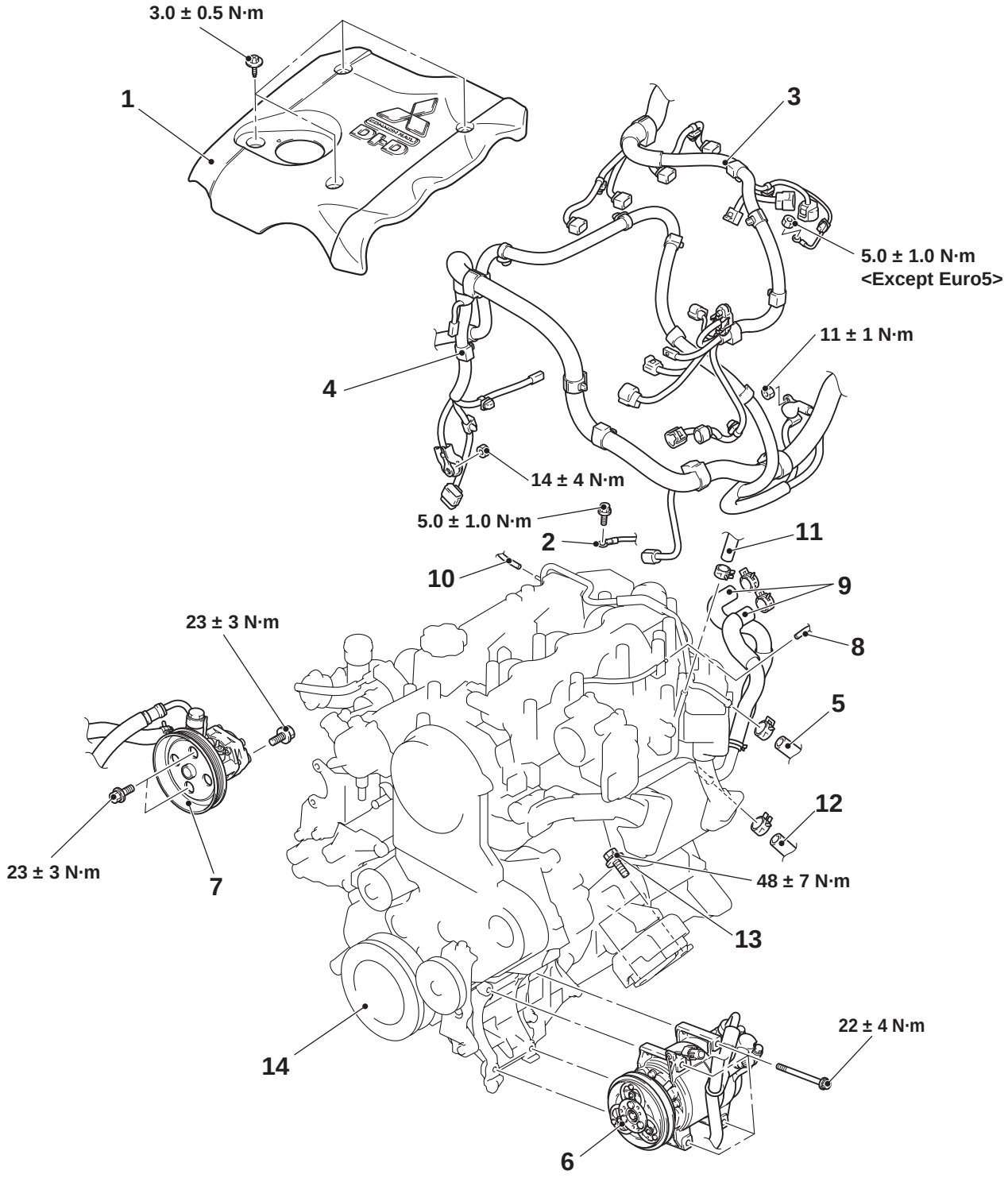
1. With the hose installed, remove the power steering oil pump assembly from the bracket.
2. After removing the power steering oil pump assembly, secure it with a cord in the location where the removal and installation of the vacuum pump assembly cannot be hindered.

ENGINE ASSEMBLY

REMOVAL AND INSTALLATION

M1112001006784

Pre-removal Operation	Post-installation Operation
• Hood Removal (Refer to GROUP 42 – Hood P.42-6). • Engine Oil Draining (Refer to GROUP 12 – On-vehicle Service, Engine Oil Replacement P.12-4). • Air Cleaner Assembly Removal (Refer to GROUP 15 – Air Cleaner P.15-6). • Battery Removal • Cooling Fan and Fan Clutch Assembly Removal (Refer to GROUP 14 – Cooling Fan P.14-6). • Radiator Removal (Refer to GROUP 14 – Radiator P.14-16). • Windshield Wiper Assembly Removal (Refer to GROUP 51 – Windshield Wiper P.51-68). • Cowl Top Panel Front Removal	• Cowl Top Panel Front Installation • Windshield Wiper Assembly Installation (Refer to GROUP 51 – Windshield Wiper P.51-68). • Radiator Installation (Refer to GROUP 14 – Radiator P.14-16). • Cooling Fan and Fan Clutch Assembly Installation (Refer to GROUP 14 – Cooling Fan P.14-6). • Battery Installation • Air Cleaner Assembly Installation (Refer to GROUP 15 – Air Cleaner P.15-6). • Engine Oil Refilling (Refer to GROUP 12 – On-vehicle Service, Engine Oil Replacement P.12-4). • Air Bleeding from Fuel Line (Refer to GROUP 13A – On-vehicle Service, Evacuation of Air from Fuel Line P.13A-589). • Hood Installation (Refer to GROUP 42 – Hood P.42-6).



AC903710AC

Removal steps

1. Engine cover
2. Earth cable connection
3. Control wiring harness connection
4. Battery wiring harness connection

<<A>>

5. Power steering oil pump assembly

<<B>>

Removal steps (Continued)

6. A/C compressor assembly
7. Brake booster vacuum hose connection
8. Boost sensor vacuum hose connection

Removal steps (Continued)

9. Heater piping hose connection
10. Free-wheeling hub solenoid valve vacuum hose connection <4WD>
11. Fuel hose D connection
12. Fuel return hose connection

<<C>>
- Transmission assembly <M/T>.
- Transmission assembly (Refer to GROUP 23A – Transmission Assembly P.23A-135) <4A/T>.
- Transmission assembly (Refer to GROUP 23A – Transmission Assembly P.23A-139) <5A/T>.

13. Front engine mounting insulator mounting bolt

<<D>> >>A<< 14. Engine assembly

REMOVAL SERVICE POINTS

<<A>> POWER STEERING OIL PUMP ASSEMBLY REMOVAL

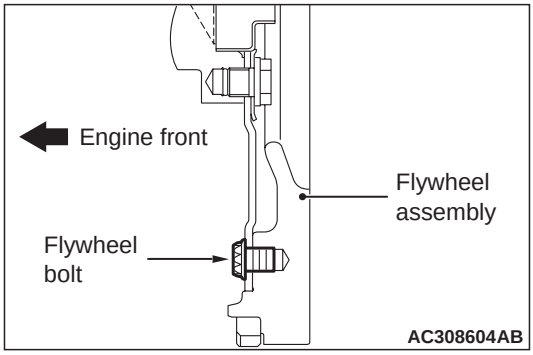
1. With the hose installed, remove the power steering oil pump assembly from the bracket.
2. After removing the power steering oil pump assembly, secure it with a cord in the location where the removal and installation of the engine assembly cannot be hindered.

<<B>> A/C COMPRESSOR ASSEMBLY REMOVAL

1. With the hose installed, remove the A/C compressor assembly from the bracket.
2. After removing the A/C compressor assembly, secure it with a cord in the location where the removal and installation of the engine assembly cannot be hindered.

<<C>> TRANSMISSION ASSEMBLY REMOVAL <M/T>

⚠ CAUTION



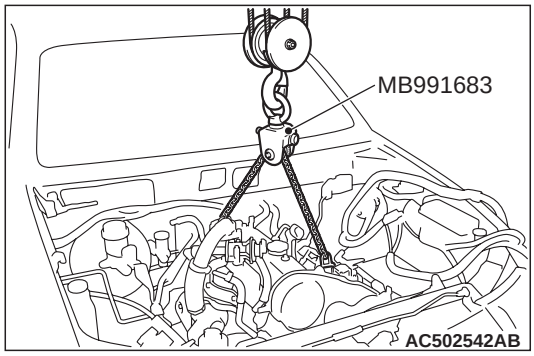
Do not remove the flywheel bolt. If this bolt is removed, the flywheel assembly will become out of balance and damaged <High power engine>.

Refer to GROUP 22A – Transmission Assembly P.22A-9 <2WD>.

Refer to GROUP 22A – Transmission Assembly P.22A-10 <4WD>.

<<D>> ENGINE ASSEMBLY REMOVAL

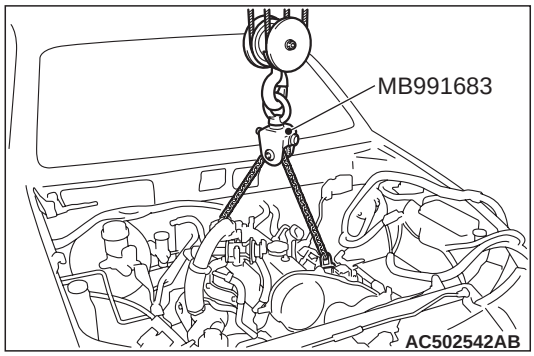
1. Check that all cables, hoses and wiring harness connectors are disconnected from the engine



2. Lift the special tool sling chain set (MB991683) and chain block slowly to remove the engine assembly upwards from the engine compartment.

INSTALLATION SERVICE POINT

>>A<< ENGINE ASSEMBLY INSTALLATION



1. Use special tool sling chain set (MB991683) and chain block to lift the engine assembly in the same manner as removal.
2. Install the engine assembly, being careful not to pinch the cables, hoses or wiring harness connectors.

GROUP 11B

ENGINE OVERHAUL

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GENERAL SPECIFICATIONS

M1113000203046

Description			Specifications
Total displacement mL			2,477
Bore × Stroke mm			91.1 × 95
Compression ratio			17 <Except Euro5>, 16.5 <Euro5>
Compression chamber			Vortex chamber type
Camshaft arrangement			DOHC
Number of valve		Intake	2
		Exhaust	2
Valve timing	Intake valve	Open	20° BTDC <Except Euro5>, 13° BTDC <Euro5>
		Close	40° BTDC <Except Euro5>, 30° BTDC <Euro5>
	Exhaust valve	Open	38° BBDC
		Close	22° ATDC
Rocker arm			End pivot type
Lubrication system			Pressure feed, full-flow filtration
Oil pump			Trochoid type
Fuel system			Common rail type injection pump
Turbocharger			Water-cooled
Cooling system			Water-cooled
Water pump type			Centrifugal impeller type

SERVICE SPECIFICATIONS

M1113000303601

Item			Standard	Limit
Timing belt				
Auto-tensioner rod extension length (with timing belt installed) mm			2.3 – 7.6	–
Auto-tensioner rod extension length (when free) mm			14.5	–
Auto-tensioner rod retraction length (when pressed with force of 100 – 200 N·m) mm			Less than 1	–
Rocker arm and camshaft				
Valve clearance mm		Intake	0.09	–
		Exhaust	0.14	–
Cam height mm	Intake	Except Euro5	35.47	34.97
		Euro5	35.42	34.92
	Exhaust		35.41	34.91
Cylinder head and valves				

Item				Standard	Limit
Flatness of gasket surface mm *Grinding is not suitable for correction.				0.03	*0.2
Cylinder head overall height mm				129.9 – 130.1	–
Valve thickness of valve head mm (margin)			Intake	1.3	0.8
			Exhaust	1.5	1.0
Valve length mm			Intake	107.58	107.08
			Exhaust	107.98	107.48
Valve spring free height mm				54.3	53.3
Valve spring cut-of-squareness				2° or less	Max. 4°
Valve seat contact width mm				1.1 – 1.5	–
Valve stem-to guide clearance mm			Intake	0.020 – 0.047	0.10
			Exhaust	0.035 – 0.062	0.15
Valve guide protrusion				18.3 – 18.9	–
Oil pan and oil pump					
Balancer shaft oil clearance mm		Front	Right	0.02 – 0.05	–
			Left	0.02 – 0.06	–
		Rear		0.06 – 0.10	–
Oil pump tip clearance mm				0.11 – 0.24	–
Oil pump side clearance mm				0.04 – 0.10	–
Oil pump body clearance mm				0.10 – 0.18	0.35
Piston and connecting rod					
Piston ring end gap mm	No. 1 ring	Except Euro5		0.30 – 0.45	0.8
		Euro5		0.20 – 0.30	0.8
	No. 2 ring	Except Euro5		0.30 – 0.45	0.8
		Euro5		0.20 – 0.35	0.8
	Oil ring			0.25 – 0.45	0.8
Piston ring-to-ring groove clearance mm			No. 1 ring	0.07 – 0.10	0.15
			No. 2 ring	0.05 – 0.06	0.15
			Oil ring	0.02 – 0.06	0.10
Oil clearance at crankshaft pins mm				0.02 – 0.05	0.10
Connecting rod big end side clearance mm				0.10 – 0.25	0.40
Crankshaft and cylinder block					
Crankshaft end play mm				0.05 – 0.25	0.45
Oil clearance at crankshaft journal mm				0.02 – 0.03	0.10
Cylinder block gasket surface warp mm				0.05	0.10
Cylinder I.D. mm				91.10 – 91.13	–
Cylindricity mm				–	0.02

NOTE: O.D.: Outer diameter
I.D.: Inner diameter

REWORK DIMENSIONS

M1113024301728

Item		Standard value
Cylinder head and valves		
Cylinder head oversize valve guide hole diameter mm	0.05 O.S.	11.050 – 11.068
Cylinder head oversize valve seat hole diameter, intake mm	0.30 O.S.	33.300 – 33.325
Cylinder head oversize valve seat hole diameter, exhaust mm	0.30 O.S.	29.300 – 29.321

TORQUE SPECIFICATIONS

M1113023405274

Item	N·m
Alternator	
Cooling fan bolt	11 ± 1
Fan clutch bolt	11 ± 1
Crankshaft bolt	265 → 0 → 275
Idler pulley bolt <Euro5>	50 ± 5
Power steering pump bracket "A" bolt (Bolt, washer assembly)	20 ± 4
Power steering pump bracket "A" bolt (Flange bolt)	24 ± 4
Power steering pump bracket "B" bolt (M8 × 30)	23 ± 2
Power steering pump bracket "B" bolt (M8 × 90)	24 ± 4
Alternator pivot nut	44 ± 10
Oil level gauge bolt	48 ± 6
Inlet manifold	
Vacuum pump pipe "B" bolt	24 ± 3
Air temperature sensor	14 ± 1
EGR pipe "B" bolt (EGR valve side)	49 ± 6
EGR pipe "B" bolt (EGR cooler side)	17 ± 2
EGR pipe "A" heat protector bolt	11 ± 1
EGR pipe "A" bolt and nut	17 ± 2
EGR valve bolt	48 ± 6
Throttle body bolt	13 ± 2
Fuel inlet pipe bolt	20 ± 4
Inlet manifold stay bolt	24 ± 3
Inlet manifold bolt	24 ± 3
Inlet manifold nut	20 ± 2
Exhaust manifold	
<Except Euro5>	
Engine hanger bolt	24 ± 3
Eye bolt (oil pipe)	17 ± 2
Oil pipe bolt	9.0 ± 1.0

Item	N·m
Eye bolt (water pipe)	53 ± 7
Water pipe bolt	11 ± 1
Oil return pipe bolt	9.0 ± 1.0
Turbocharger nut	59 ± 10
Exhaust manifold heat protector bolt	14 ± 1
Exhaust manifold nut (M8)	18 ± 2
Exhaust manifold nut (M10)	30 ± 2
<Euro5>	
Engine hanger bolt	24 ± 3
Eye bolt	17 ± 2
Oil pipe bolt	24 ± 3
Heat protector bolt	9.0 ± 1.0
Heat protector bracket bolt (M6)	9.0 ± 1.0
Heat protector bracket bolt (M8)	24 ± 3
Turbocharger water pipe bolt (M6)	11 ± 1
Turbocharger water pipe bolt (M8)	24 ± 3
Vacuum pipe and hose bolt	23 ± 6
Connector bracket bolt	9.5 ± 1.5
E-VRV bolt	9.5 ± 2.5
Oil return pipe bolt	9.0 ± 1.0
Turbocharger heat protector bolt	14 ± 1
Turbocharger bolt and nut	59 ± 10
Exhaust manifold heat protector A bolt	14 ± 1
Exhaust manifold heat protector B bolt	14 ± 1
Exhaust manifold nut (M8)	34 ± 3
Exhaust manifold nut (M10)	62 ± 10
Timing belt	
Oil pipe bolt	11 ± 1
Vacuum pump bolt	24 ± 3
Vacuum pump pipe "A" bolt	24 ± 3
Cover bolt	11 ± 1
Crank angle sensor bolt	11 ± 1
Timing belt cover bolt	10 ± 2
Glow plug plate nut	1.8 ± 0.2
Glow plug	9.0 ± 1.0 → +30° to 40°
Tensioner arm bolt	48 ± 6
Auto tensioner bolt	23 ± 3
Pump sprocket nut	64 ± 5
Idler pulley bolt	44 ± 10
Hexagon socket head bolt	20 ± 4

Item	N·m
Timing belt tensioner "B" bolt	23 ± 3
Balancer shaft sprocket bolt and nut	36 ± 3
Common rail and supply pump	
EGR cooler bracket bolt	24 ± 3
EGR cooler bolt	24 ± 3
Supply pump bolt	24 ± 4
EGR cooler nut	28 ± 4
Suction control valve kit bolt	8.9 ± 1.9
Fuel supply pump pipe flare nut	35 ± 5
Fuel supply pump pipe bolt	10 ± 2
Fuel supply pump pipe bracket bolt	10 ± 2
Bracket bolt <Euro5>	20 ± 4
Fuel injection pipe flare nut	35 ± 5
Fuel injection pipe bolt	10 ± 2
Common rail bolt	24 ± 4
Fuel return pipe bolt	10 ± 2
Eyebolt (Cylinder head side) <Except Euro5>	17 ± 2
Eyebolt (Cylinder head side) <Euro5>	20 ± 2
Eyebolt (Common rail side)	20 ± 2
Rocker cover and injector	
Rocker cover bolt	3.0 ± 1.0 → 10 ± 2
Injector holder bolt	10 ± 1 → +120° to 125°
Eye bolt	15 ± 2
Camshaft sprocket bolt	88 ± 10
Timing belt rear cover bolt	10 ± 2
Water hose and pipe	
Water pipe "A" bolt <Except Euro5>	24 ± 3
Water pipe bolt (M6)	11 ± 1
Water pipe bolt (M8)	24 ± 3
Water pipe "D" flare nut	54 ± 4
Water pipe "D" bolt	24 ± 3
Joint	39 ± 5
Front upper case stiffener bolt	50 ± 5
Engine coolant temperature gauge unit	11 ± 1
Engine coolant temperature sensor	29 ± 10
Water outlet fitting bolt and nut	24 ± 3
Water inlet fitting bolt	24 ± 3
Plate bolt	10 ± 2
Water pump bolt	24 ± 3
Rocker arm and camshaft	

Item	N·m
Cam position sensor bolt	11 ± 1
Camshaft bearing cap bolt (M6)	11 ± 1
Camshaft bearing cap bolt (M8)	20 ± 1
Pivot bolt	18 ± 2
Cylinder head and valves	
Cylinder head bolt	78 ± 2 → 0 → 29 ± 2 → +90° → +90°
Oil pan and oil pump	
Oil filter	22 ± 2
Oil pressure switch	10 ± 2
Oil cooler bolt	39 ± 5
Heat protector bolt <Except Euro5>	10 ± 2
Oil filter bracket bolt	24 ± 4
Harness bracket bolt	9.5 ± 2.5
Oil drain plug	39 ± 5
Oil pan bolt	9.0 ± 3.0
Oil screen bolt	19 ± 3
Stiffener bolt	19 ± 3
Front upper case bolt	24 ± 4
Plug cap	23 ± 3
Balancer shaft driven gear bolt	37 ± 3
Front lower case bolt	24 ± 4
Plug	37 ± 7
Oil pump cover screw	12 ± 2
Balancer shaft gear cover bolt	23 ± 4
Piston and connecting rod	
Connecting rod cap nut	27 ± 2 → +90° to 94°
Crankshaft and cylinder block	
Drive plate bolt (A/T)	135 ± 5
Flywheel bolt (M/T)	132 ± 5
Rear plate bolt	9.0 ± 1.0
Bell housing cover bolt	9.0 ± 1.0
Oil seal case bolt	11 ± 1
Bearing cap bolt	40 ± 2 → +35° to 39°
Check valve	32 ± 2
Engine support bracket bolt	54 ± 5

SEALANTS

M1113000503531

Item	Specified sealant
Cover	Three bond 1207C, Three bond 1207D, Three bond 1207F (Mitsubishi Part No. 1000A992), Three bond 1217G (Mitsubishi Part No. 1000A923), Three bond 1227D
Cover seal bolt	Three bond 2310 or equivalent
Rocker cover	Three bond 1212D, Three bond 1217G (Mitsubishi Part No. 1000A923)
Semi-circular packing	Three bond 1212D, Three bond 1217G (Mitsubishi Part No. 1000A923)
Coolant temperature gauge unit	Three bond 2310 or equivalent
Coolant temperature sensor	Three bond 1324N, LOCTITE 262
Camshaft bearing cap, front left	Three bond 1212D or equivalent
Oil pressure switch	Three bond 1141J, Three bond 1215, Three bond 1212D, Three bond 1207F (Mitsubishi Part No. 100A992), Three bond 1207C
Oil pan	Three bond 1227D, Three bond 1217G (Mitsubishi Part No. 1000A923), LOCTITE 5970, LOCTITE 5900
Oil seal case	Three bond 1207C, Three bond 1207D, Three bond 1207F (Mitsubishi Part No. 1000A992), Three bond 1217G (Mitsubishi Part No. 1000A923), Three bond 1227D

*NOTE: *: Part to be sealed with a form-in-place gasket (FIPG)*

FORM-IN-PLACE GASKET (FIPG)

This engine has several areas where the form-in-place gasket (FIPG) is used for sealing. To ensure that the FIPG fully serves its purpose, it is necessary to observe some precautions when applying it.
Bead size, continuity and location are of paramount importance. Too thin a bead could cause leaks. Too thick a bead, on the other hand, could be squeezed out of location, causing blocking or narrowing of fluid passages. To prevent leaks or blocking of passages, therefore, it is absolutely necessary to apply the FIPG evenly without a break, while observing the correct bead size.
FIPG hardens as it reacts with the moisture in the atmospheric air, and it is usually used for sealing metallic flange areas.

Disassembly

Parts sealed with a FIPG can be easily removed without need for the use of a special method. In some cases, however, the FIPG in joints may have to be broken by tapping parts with a mallet or similar tool.

Surface Preparation

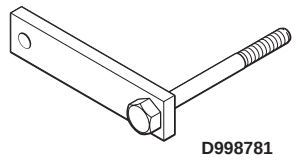
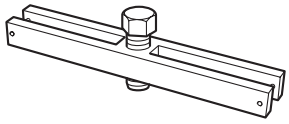
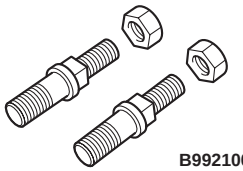
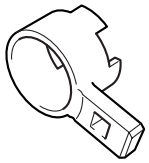
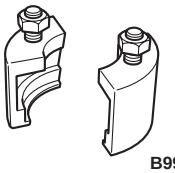
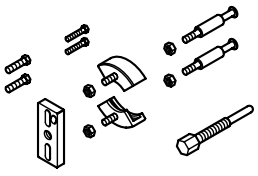
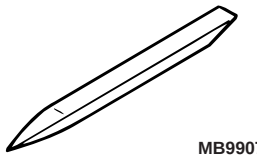
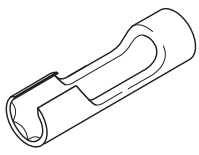
Thoroughly remove all substances deposited on the FIPG application surface, using a gasket scraper. Make sure that the FIPG application surface is flat and smooth. Also make sure that the surface is free from oils, greases and foreign substances. Do not fail to remove old FIPG that may remain in the fastener fitting holes.

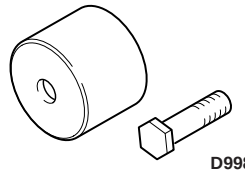
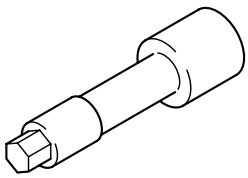
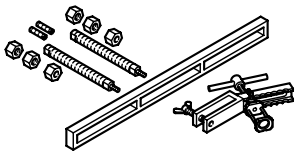
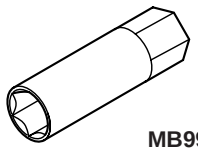
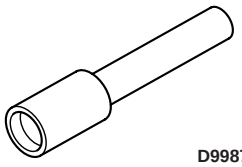
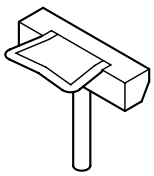
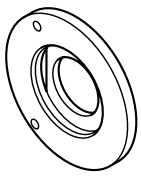
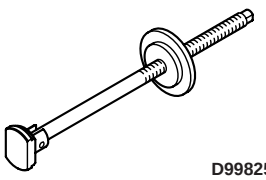
FIPG Application

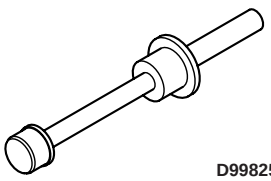
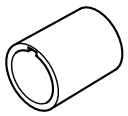
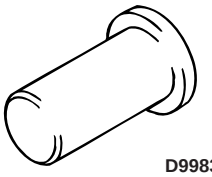
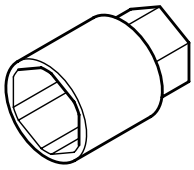
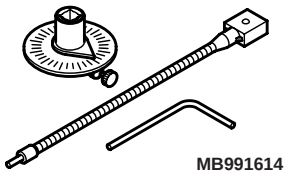
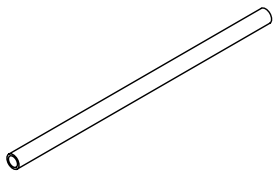
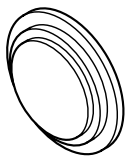
Applied FIPG bead should be of the specified size and free of any break. FIPG can be wiped away unless it has completely hardened. Install the mating parts in position while the FIPG is still wet (in less than 15 minutes after application). Do not allow FIPG to spread beyond the sealing areas during installation. Avoid operating the engine or letting oils or water come in contact with the sealed area before a time sufficient for FIPG to harden (approximately one hour) has passed. FIPG application method may vary from location to location. Follow the instruction for each particular case described later in this manual.

SPECIAL TOOLS

M1113000603271

Tool	Number	Name	Use
 D998781	MD998781	Flywheel stopper	Holding flywheel and drive plate
 B992099	MB992099	Crank pulley puller	• Removal of crankshaft pulley (Use with MB992100) • Removal of pump sprocket (Use with MB992098)
 B992100	MB992100	Crank pulley holder	Removal of crankshaft pulley (Use with MB992099)
 B992048	MB992048	Injection pump sprocket holder	Holding pump sprocket
 B992098	MB992098	Injection pump sprocket puller	Removal of pump sprocket (Use with MB992099)
	MD998778	Crankshaft sprocket puller	Removal of crankshaft sprocket
 MB990784	MB990784	Ornament remover	Clean of cylinder head (Injector insert hole)
	MB992188	Fuel injection pipe wrench	Installation of fuel injection pipe

Tool	Number	Name	Use
 D998713	MD998713	Camshaft oil seal installer	Installation of camshaft oil seal
	MD998051	Cylinder head bolt wrench	Removal and installation of cylinder head bolt
	MD998772	Valve spring compressor	Compression of valve spring
 MB992046	MB992046	Valve adjusting socket	Adjustment of valve clearance
 D998775	MD998775	Valve stem seal installer	Installation of valve stem seal
 D998727	MD998727	Oil pan sealer cutter	Removal of oil pan
 D998380	MD998380	Bearing installer stopper	Guide for removal and installation of silent shaft right rear bearing
 D998251	MD998251	Balancer shaft bearing puller	Removal of silent shaft rear bearing

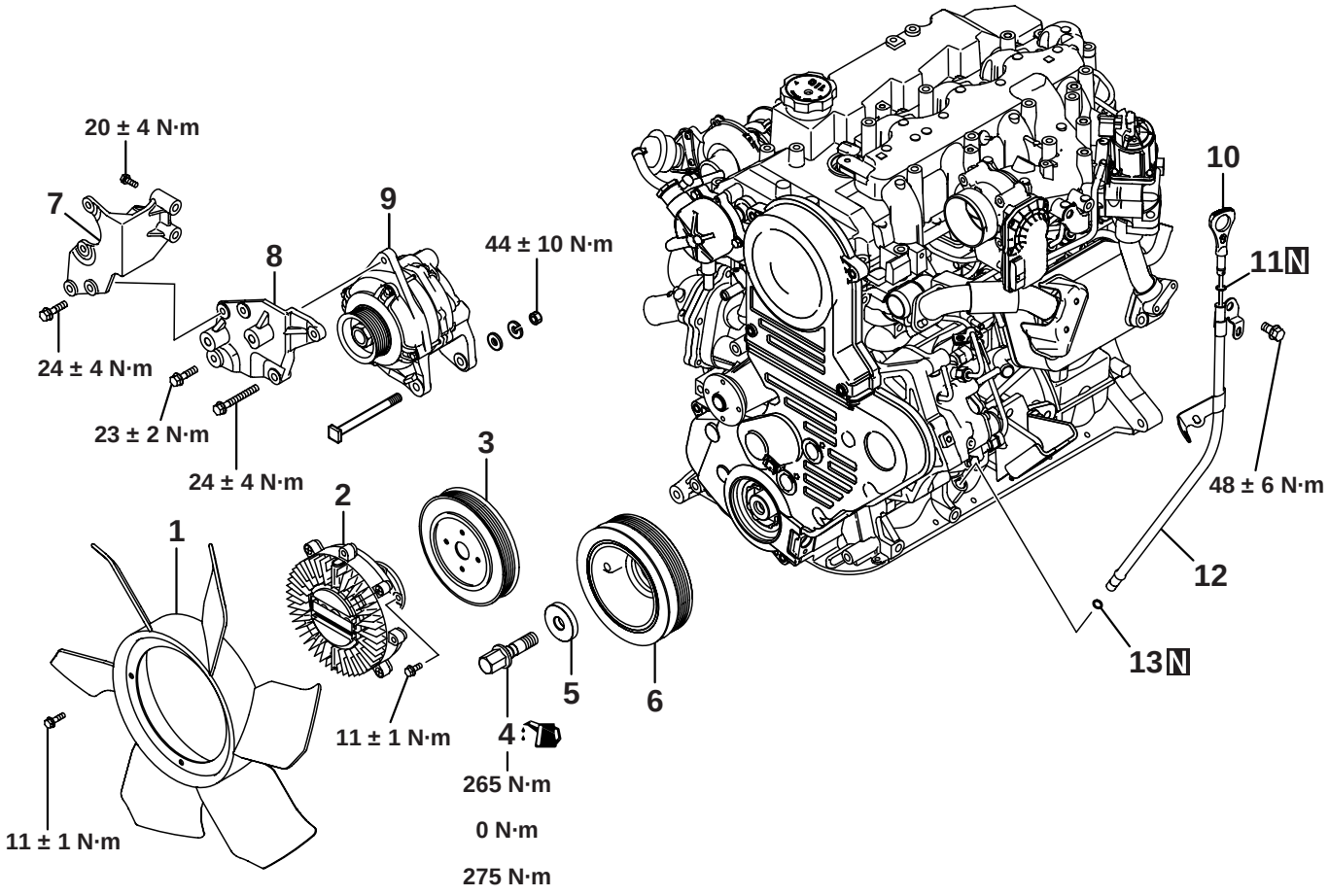
Tool	Number	Name	Use
 D998250	MD998250	Balancer shaft bearing installer	Installation of silent shaft rear bearing
D998385	MD998385	Balancer shaft drive gear oil seal guide	Installation of silent shaft drive oil seal
 D998383	MD998383	Crankshaft front oil seal guide	Installation of crankshaft front oil seal
 D998382	MD998382	Crankshaft front oil seal installer	Guide for installation of crankshaft front oil seal
	MD998012	Oil pressure switch wrench	Removal and installation of oil pressure switch
 MB991614	MB991614	Angle gauge	Installation of bearing cap bolt and injector holder bolt and connecting rod cap nut
	MB992010	Bolt guide	Removal and installation of piston and connecting rod assembly
	MB992147	Oil seal installer	Removal and installation of rear oil seal

ALTERNATOR

REMOVAL AND INSTALLATION

M1113027600684

<Except Euro5>



AK502994AC

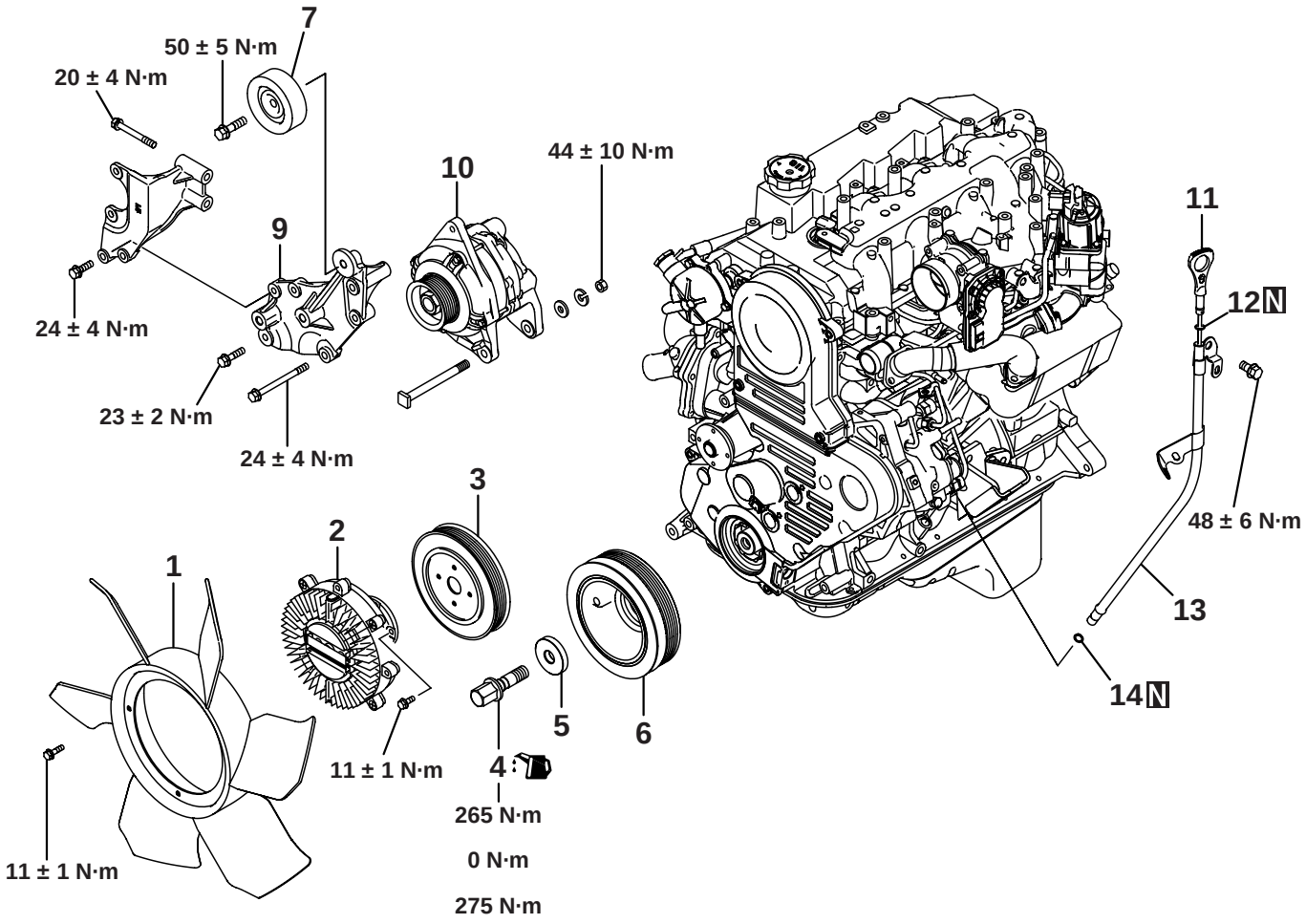
Removal steps

1. Cooling fan
2. Fan clutch
3. Water pump pulley
<<**A**>> >>**A**<< 4. Crankshaft bolt
<<**A**>> >>**A**<< 5. Crankshaft pulley washer
<<**B**>> >>**A**<< 6. Crankshaft pulley
7. Power steering pump bracket "A"

Removal steps (Continued)

8. Power steering pump bracket "B"
9. Alternator
10. Oil level gauge
11. O-ring
12. Oil level gauge guide
13. O-ring

<Euro5>



AKB00328AB

Removal steps

1. Cooling fan
2. Fan clutch
3. Water pump pulley

<<A>> >>A<< 4. Crankshaft bolt

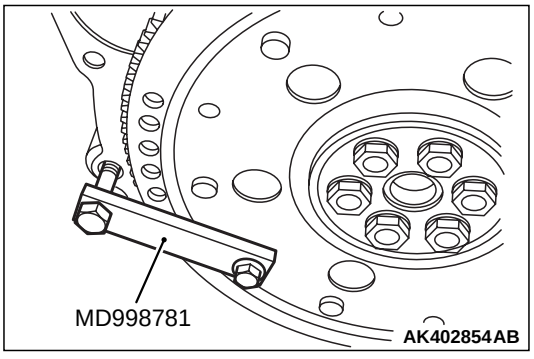
<<A>> >>A<< 5. Crankshaft pulley washer

<<B>> >>A<< 6. Crankshaft pulley

7. Idler pulley
8. Power steering pump bracket "A"
9. Power steering pump bracket "B"
10. Alternator
11. Oil level gauge
12. O-ring
13. Oil level gauge guide
14. O-ring

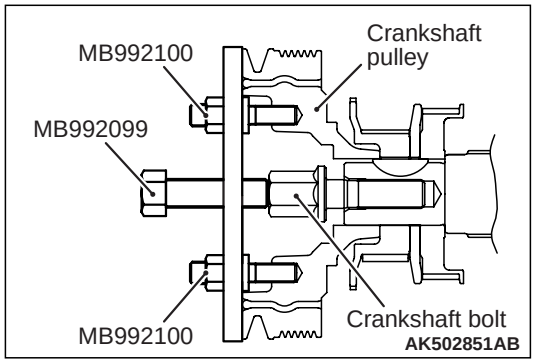
REMOVAL SERVICE POINTS

<<A>> CRANKSHAFT BOLT / CRANKSHAFT PULLEY WASHER REMOVAL



1. Use the special tool Flywheel stopper (MD998781), hold the flywheel.
2. Remove the crankshaft bolt and washer.

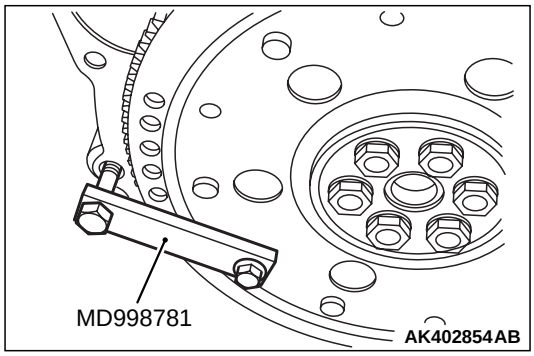
<<B>> CRANKSHAFT PULLEY REMOVAL



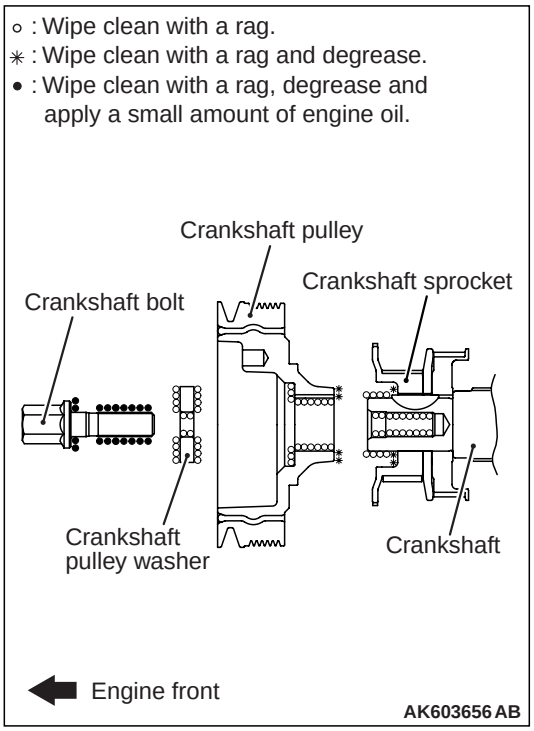
1. Screw securely the crankshaft bolt into the crankshaft.
2. Use the special tool, remove the crankshaft pulley.
   - Crank pulley puller (MB992099)
   - Crank pulley holder (MB992100)
3. Remove the crankshaft bolt.

INSTALLATION SERVICE POINTS

>>A<< CRANKSHAFT BOLT / CRANKSHAFT PULLEY WASHER / CRANKSHAFT PULLEY INSTALLATION



1. Use the special tool Flywheel stopper (MD998781), hold the flywheel.



2. Wipe the dirt on the crankshaft pulley washer using a rag.
3. Using a rag, wipe the dirt on the crankshaft pulley, the crankshaft sprocket, the thread hole of the crankshaft and then remove the grease.

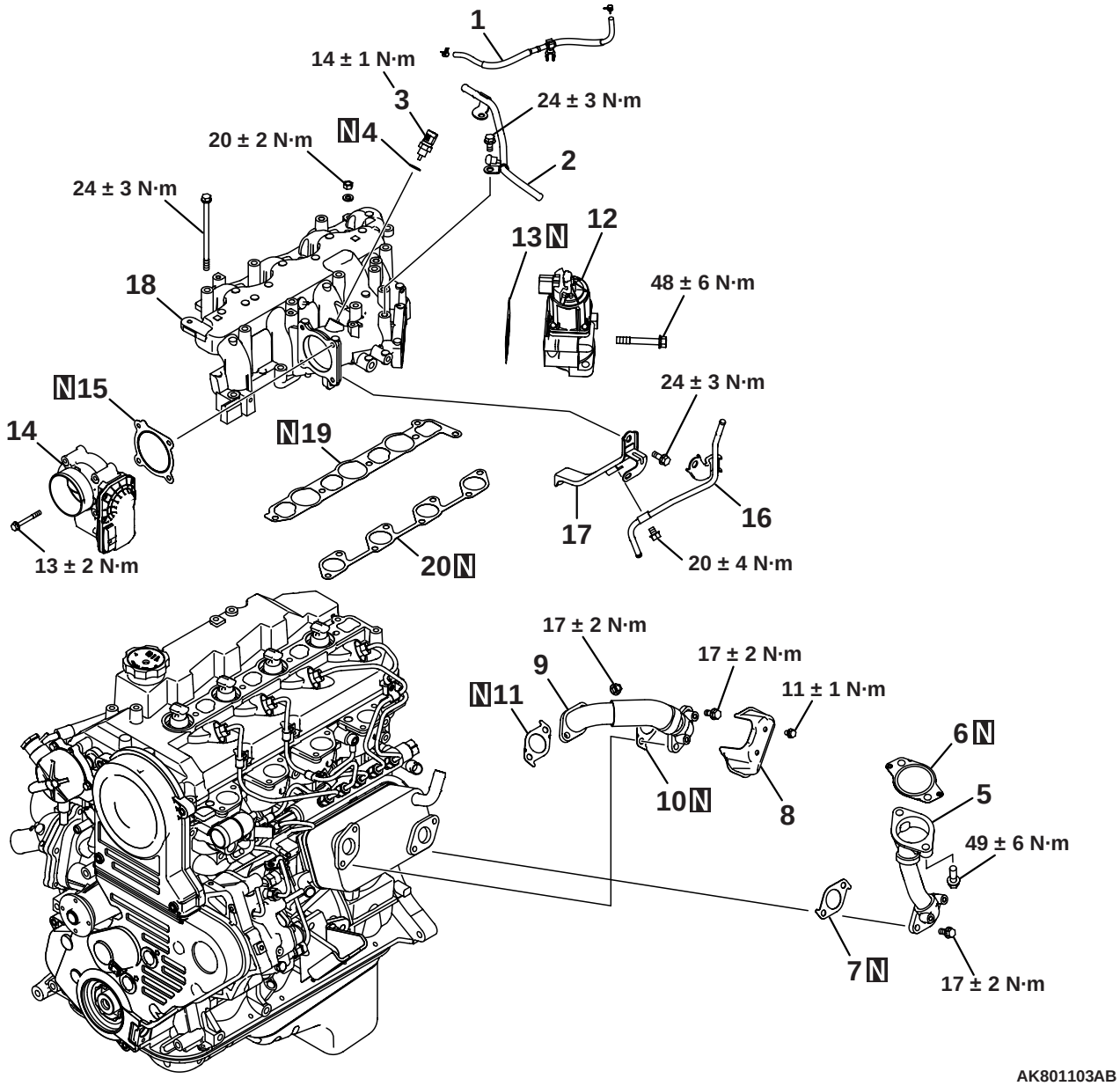
   NOTE: Degreasing is necessary to prevent decrease in the friction between contacting surfaces.
4. Install the front flange and crankshaft pulley.
5. Apply an appropriate and minimum amount of engine oil to the threads of crankshaft bolt and lower part of the flange.
6. Install the crankshaft pulley washer to the crankshaft bolt.
7. Tighten the crankshaft bolt to the specified torque of 265 N·m.
8. Loosen the bolt completely.
9. Tighten the crankshaft bolt again to the specified torque of 275 N·m.

INLET MANIFOLD

REMOVAL AND INSTALLATION

M1113026101258

<Except Euro5>



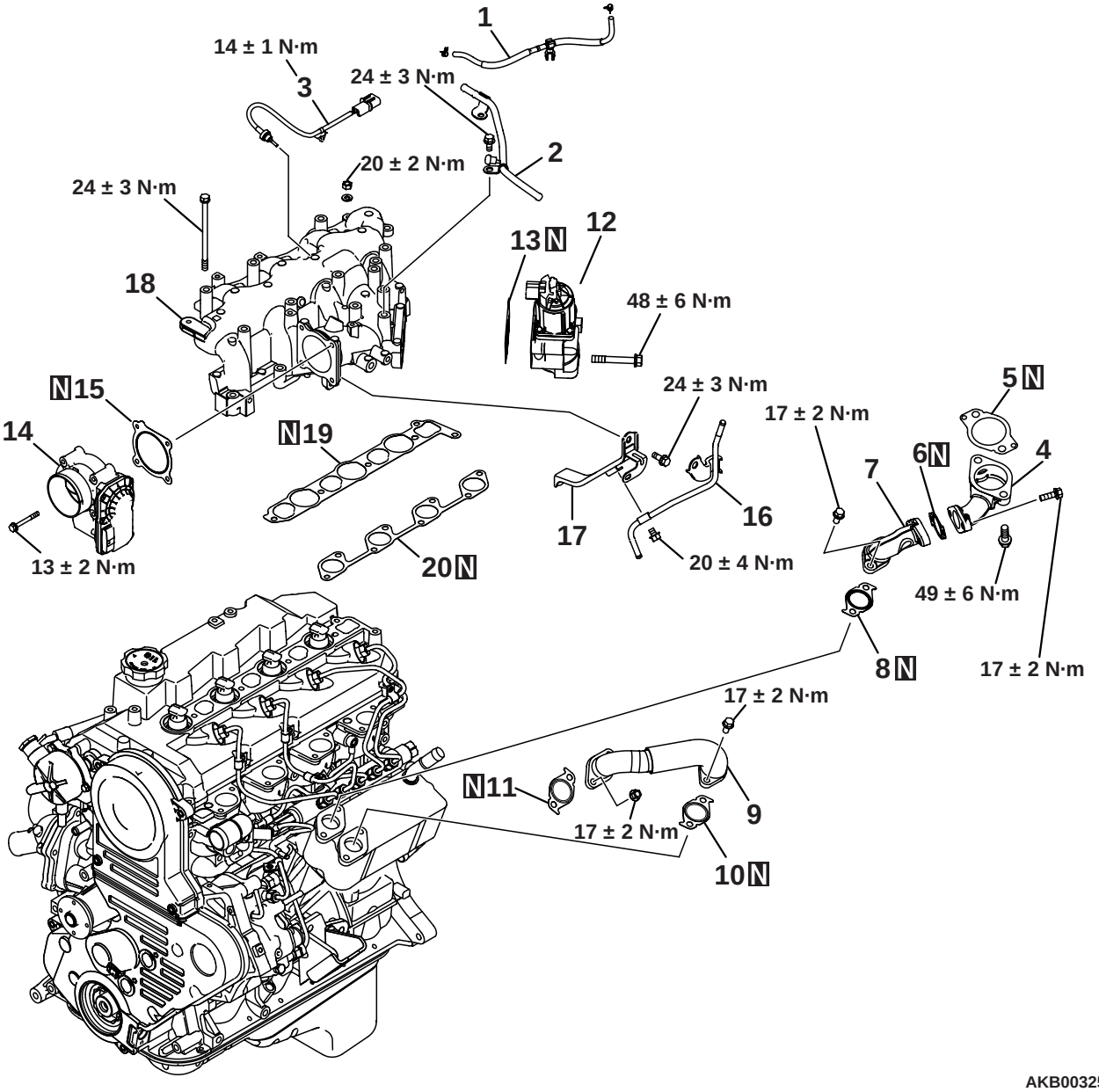
Removal steps

1. Vacuum hose
2. Vacuum pump pipe "B"
3. Air temperature sensor
4. Gasket
5. EGR pipe "B"
6. EGR pipe gasket
7. EGR pipe gasket
8. EGR pipe heat protector
9. EGR pipe "A"
10. EGR pipe gasket

Removal steps (Continued)

>>D<< 11. EGR pipe gasket
12. EGR valve
>>C<< 13. EGR valve gasket
14. Throttle body
>>B<< 15. Throttle body gasket
16. Fuel inlet pipe
17. Inlet manifold stay
>>A<< 18. Inlet manifold
19. Herical gasket
20. Tangential gasket

<Euro5>



AKB00325AB

Removal steps

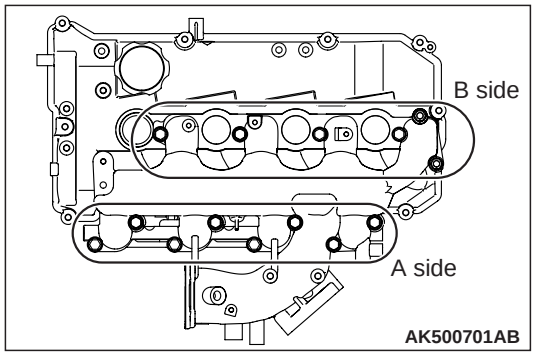
1. Vacuum hose
2. Vacuum pump pipe "B"
3. Air temperature sensor
4. EGR pipe fitting "B"
5. EGR pipe gasket
6. EGR pipe gasket
7. EGR pipe "B"
8. EGR pipe gasket
9. EGR pipe "A"
10. EGR pipe gasket

Removal steps (Continued)

>>**D**<< 11. EGR pipe gasket
12. EGR valve
>>**C**<< 13. EGR valve gasket
14. Throttle body
>>**B**<< 15. Throttle body gasket
16. Fuel inlet pipe
17. Inlet manifold stay
>>**A**<< 18. Inlet manifold
19. Herical gasket
20. Tangential gasket

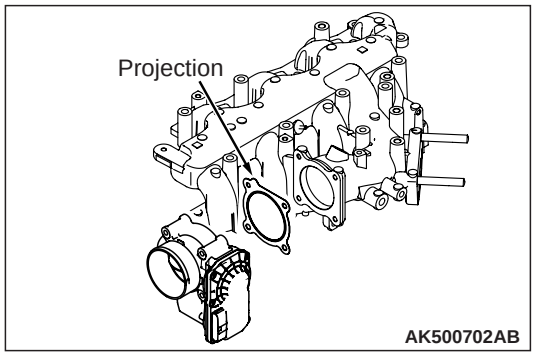
INSTALLATION SERVICE POINTS

>>A<< INLET MANIFOLD INSTALLATION



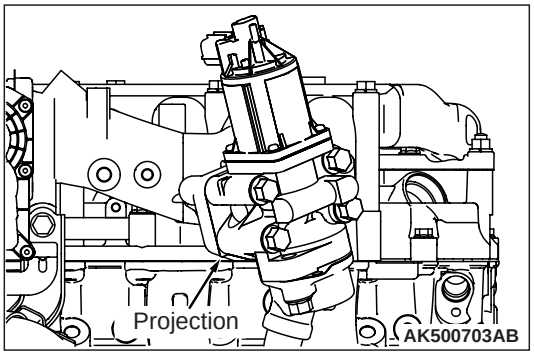
1. As shown in the illustration, temporarily tighten to 6.0 ± 1.0 N·m the bolts located at side "A."
2. As shown in the illustration, tighten to the specified torque of 24 ± 3 N·m the bolts located at side "B" Tighten nuts to the specified torque of 20 ± 2 N·m.
3. As shown in the illustration, tighten to the specified torque of 24 ± 3 N·m the bolts located at side "A."

>>B<< THROTTLE BODY GASKET INSTALLATION



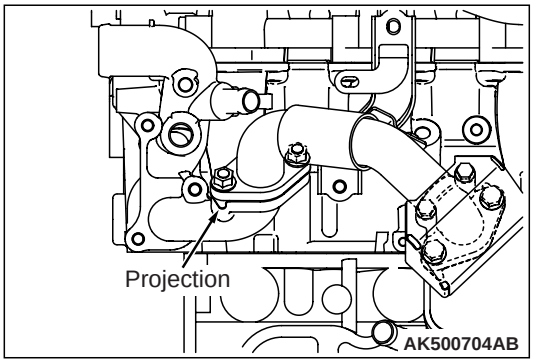
Position the projection as shown in the illustration.

>>C<< EGR VALVE GASKET INSTALLATION



Position the projection as shown in the illustration.

>>D<< EGR PIPE GASKET INSTALLATION



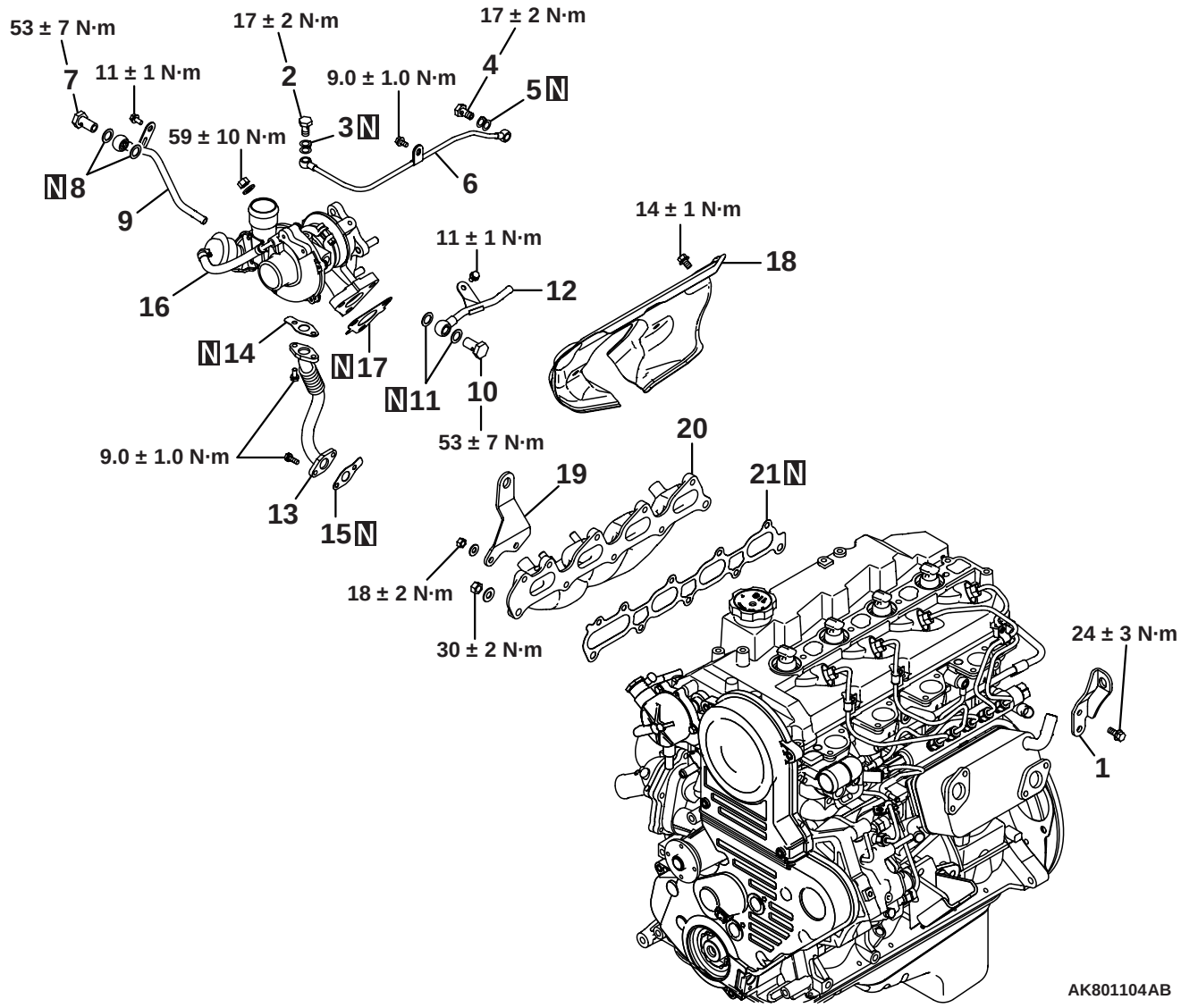
Position the projection as shown in the illustration.

EXHAUST MANIFOLD

REMOVAL AND INSTALLATION

M1113011901195

<Except Euro5>



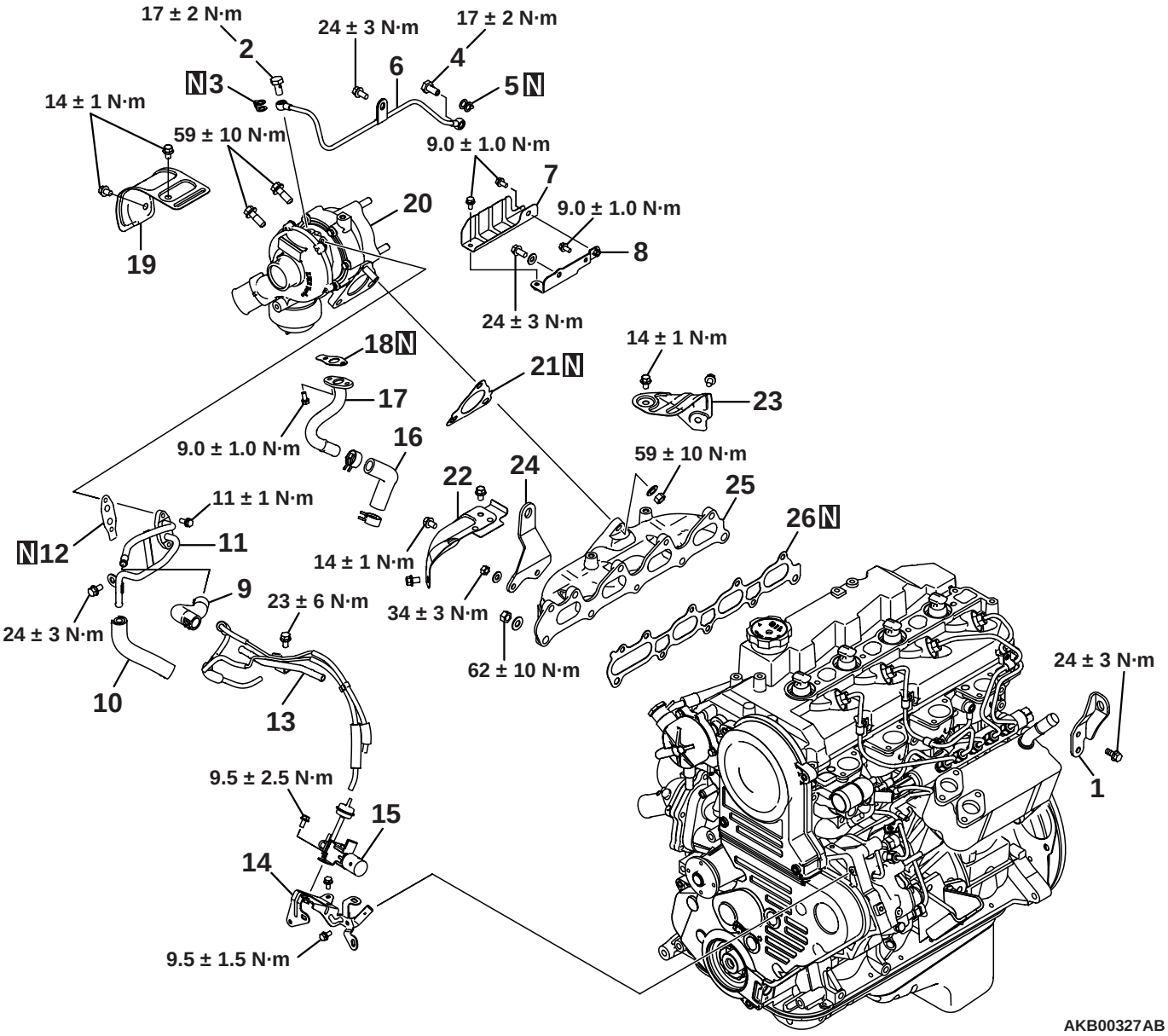
Removal steps

1. Engine hanger
>>C<< 2. Eyebolt (Oil pipe)
>>C<< 3. Gasket
>>C<< 4. Eyebolt (Oil pipe)
>>C<< 5. Gasket
>>C<< 6. Oil pipe
7. Eyebolt (Water pipe)
8. Gasket
9. Water pipe "C"
10. Eyebolt (Water pipe)
11. Gasket

Removal steps (Continued)

12. Water pipe "B"
13. Oil return pipe
14. Oil return pipe gasket
>>B<< 15. Oil return pipe gasket
16. Turbocharger
>>A<< 17. Turbocharger gasket
18. Exhaust manifold heat protector
19. Engine hanger
20. Exhaust manifold
21. Exhaust manifold gasket

<Euro5>



Removal steps

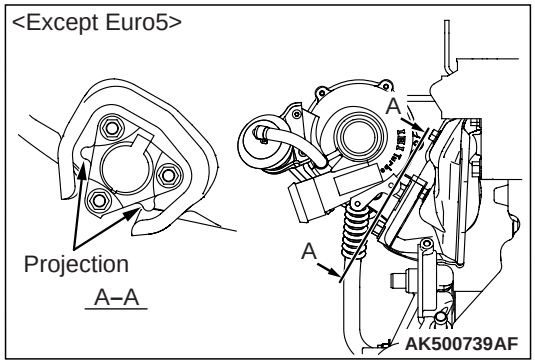
1. Engine hanger
>>C<< 2. Eyebolt (Oil pipe)
>>C<< 3. Gasket
>>C<< 4. Eyebolt (Oil pipe)
>>C<< 5. Gasket
>>C<< 6. Oil pipe
7. Heat protector
8. Heat protector bracket
9. Water hose
10. Water hose
11. Turbocharger water pipe
>>D<< 12. Turbocharger water pipe gasket
13. Vacuum pipe and hose

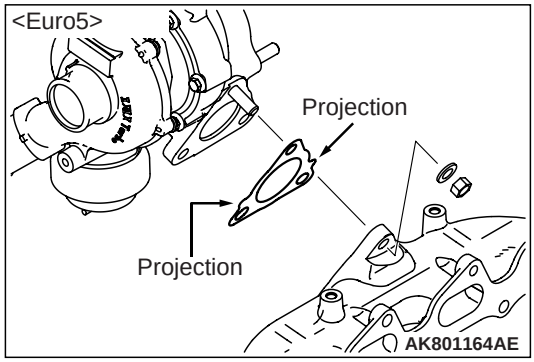
Removal steps (Continued)

14. Connector bracket
15. E-VRV
16. Oil return hose
17. Oil return pipe
18. Oil return pipe gasket
19. Turbocharger heat protector
20. Turbocharger
>>A<< 21. Turbocharger gasket
22. Exhaust manifold heat protector A
23. Exhaust manifold heat protector B
24. Engine hanger
25. Exhaust manifold
26. Exhaust manifold gasket

INSTALLATION SERVICE POINTS

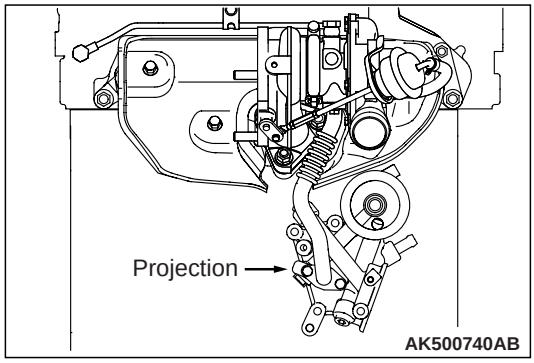
>>A<< TURBOCHARGER GASKET INSTALLATION





Position the projection as shown in the illustration.

>>B<< OIL RETURN PIPE GASKET INSTALLATION

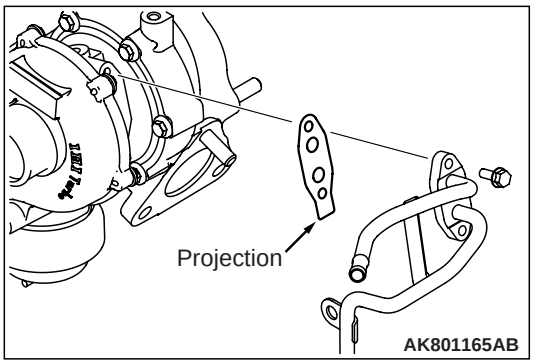


Position the projection as shown in the illustration.

>>C<< EYE BOLT / GASKET / OIL PIPE INSTALLATION

1. Temporarily tighten the oil pipe with eye bolt.
   NOTE: At this time, always install the gasket.
2. Tighten the eye bolt temporarily tightened to the specified torque of 17 ± 2 N·m.
   NOTE: Ensure there is neither torsion nor camber.
3. Tighten the flange bolt to the specified torque of 24 ± 3 N·m.

>>D<< TURBOCHARGER WATER PIPE GASKET INSTALLATION

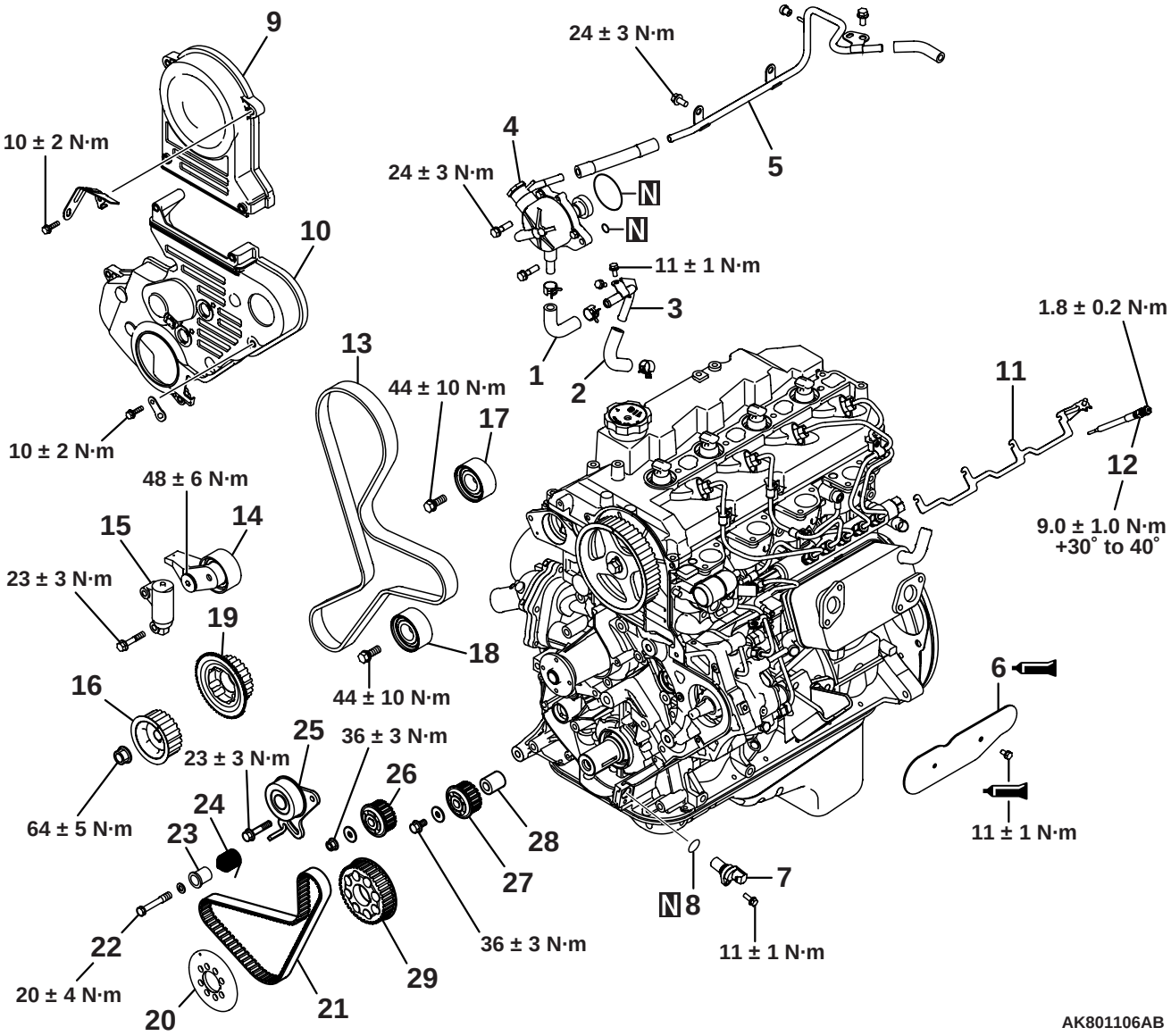


Position the projection as shown in the illustration.

TIMING BELT

REMOVAL AND INSTALLATION

M1113001902164



Removal steps

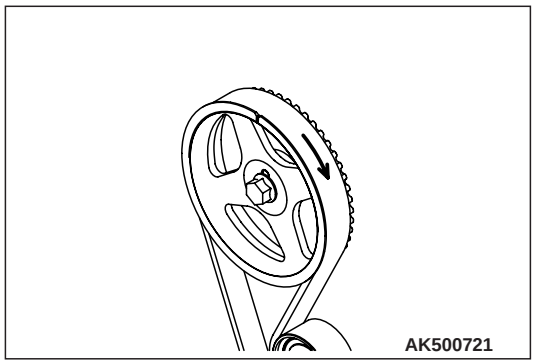
	1.	Oil hose
	2.	Oil hose
	3.	Oil pipe
	4.	Vacuum pump
	5.	Vacuum pump pipe "A"
>>K<<	6.	Cover
	7.	Crank angle sensor
	8.	O-ring
	9.	Timing belt upper cover
	10.	Timing belt lower cover
>>J<<	11.	Glow plug plate
>>J<<	12.	Glow plug
<<A>> >>J<<	13.	Timing belt
	14.	Tensioner arm
<<B>> >>I<<	15.	Auto tensioner

Removal steps (Continued)

<<C>> >>H<<	16.	Pump sprocket
	17.	Idler pulley
	18.	Idler pulley
<<D>> >>G<<	19.	Crankshaft sprocket
>>G<<	20.	Flange
<<E>> >>F<<	21.	Timing belt "B"
	22.	Hexagon socket head bolt
	23.	Tensioner spacer "B"
	24.	Tensioner spring "B"
>>E<<	25.	Timing belt tensioner "B"
<<F>> >>D<<	26.	Balancer shaft sprocket, right
<<G>> >>C<<	27.	Balancer shaft sprocket, left
>>B<<	28.	Spacer
<<H>> >>A<<	29.	Crankshaft sprocket "B"

REMOVAL SERVICE POINTS

<<A>> TIMING BELT REMOVAL

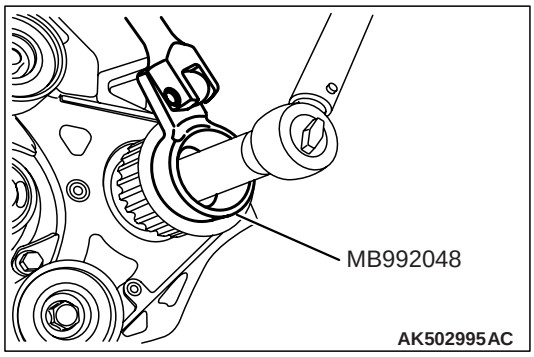


1. Using chalk, etc., mark an arrow on the back of the timing belt to indicate the direction of rotation. This is to ensure correct installation of the belt in case it is reused.

<<B>> AUTO TENSIONER REMOVAL

Keep the auto-tensioner longitudinal. If it were kept lateral, it would possibly cause aeration.

<<C>> PUMP SPROCKET REMOVAL

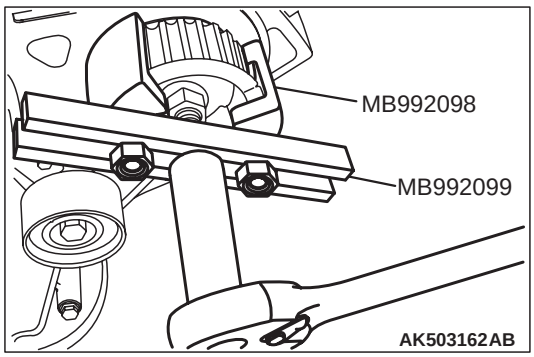


1. Use the special tool Injection pump sprocket holder (MB992048), hold the pump sprocket.

⚠ CAUTION

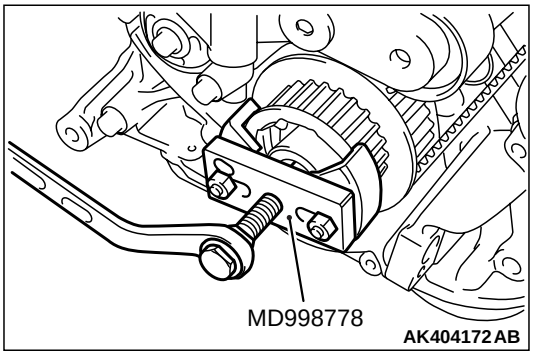
Never strike the shaft or sprocket to remove the sprocket. This may cause malfunction in the injection pump. Be sure to use a puller to remove the sprocket.

2. Remove the pump sprocket nut.



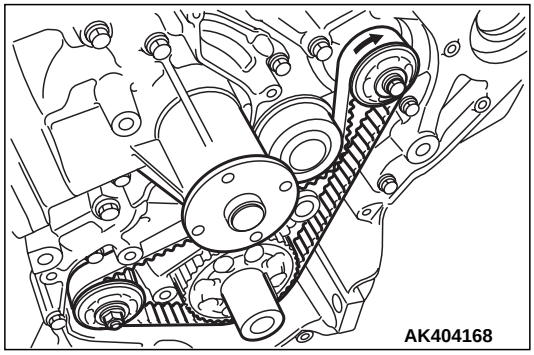
3. Use the special tool remove the pump sprocket.
   - Injection pump sprocket puller (MB992098)
   - Crank pulley puller (MB992099)

<<D>> CRANKSHAFT SPROCKET REMOVAL



Use the special tool Crankshaft sprocket puller (MD998778), if the sprocket is stuck and hard to remove.

<<E>> TIMING BELT "B" REMOVAL

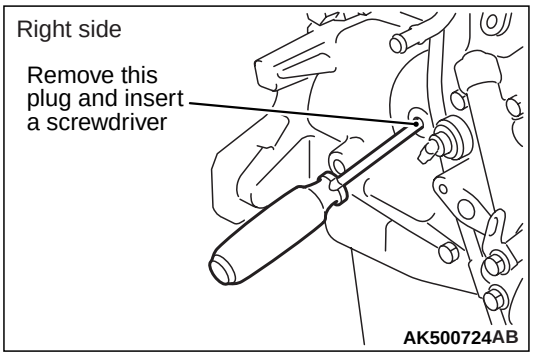


Using chalk, etc., mark an arrow on the back of the timing belt to indicate the direction of rotation. This is to ensure correct installation of the belt in case it is reused.

NOTE: Water or oil on the belt shortens its life drastically, so the removed timing belt, sprocket, and tensioner must be free from oil and water. Do not immerse parts in cleaning solvent.

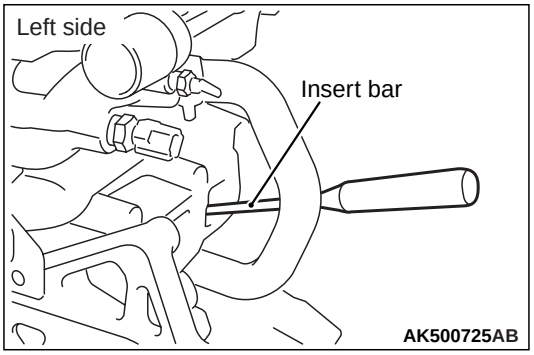
NOTE: If there is oil or water on any part, check front case oil seals, camshaft oil seal and water pump for leaks.

<<F>> BALANCER SHAFT, RIGHT REMOVAL



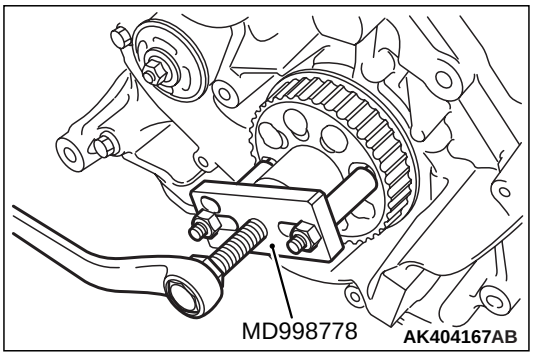
1. Remove the plug at the right side of the cylinder block.
2. Insert a Phillips screwdriver [shank diameter 8 mm] through the plug hole and lock the balancer shaft.
3. Loosen the balancer shaft sprocket nut.

<<G>> BALANCER SHAFT, LEFT REMOVAL



1. Insert a wrench extension bar or similar rod and lock the balancer shaft.
2. Loosen the balancer shaft sprocket bolt.

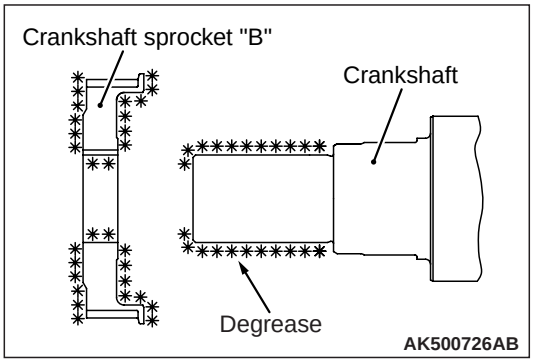
<<H>> CRANKSHAFT SPROCKET "B" REMOVAL



Use the special tool Crankshaft sprocket puller (MD998778), if the sprocket is stuck and hard to remove.

INSTALLATION SERVICE POINTS

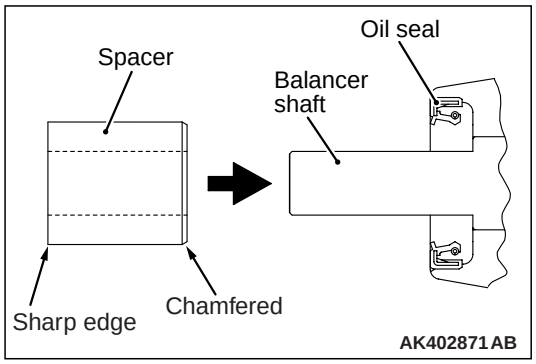
>>A<< CRANKSHAFT SPROCKET "B" INSTALLATION



Clean and then degrease the front face of the oil pump gear drive shaft, crankshaft sprocket "B" and crankshaft surface on which sprocket "B" is attached.

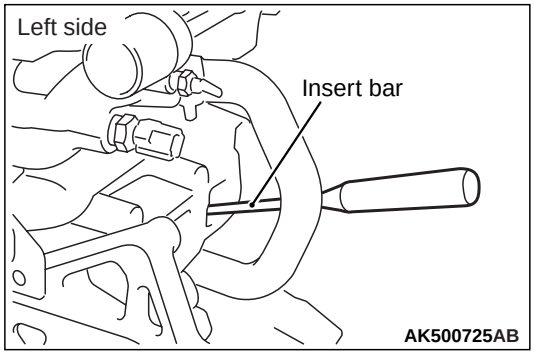
NOTE: Degreasing is necessary to prevent decrease in the friction between contacting surfaces.

>>B<< SPACER INSTALLATION



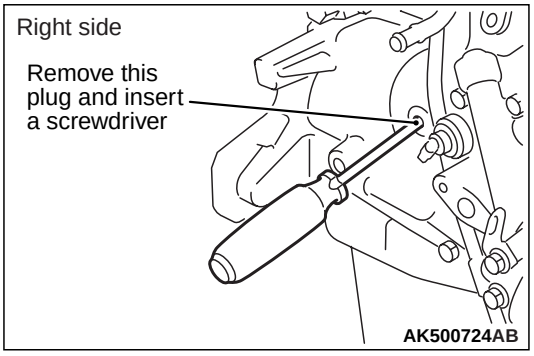
Install the spacer with its chamfered end toward the oil seal.

>>C<< BALANCER SHAFT SPROCKET, LEFT INSTALLATION



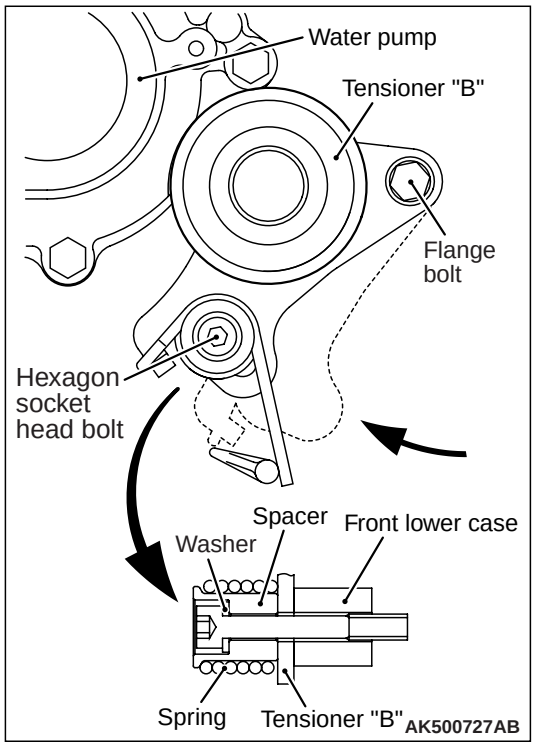
1. Lock the balancer shaft in the same way as used in the removal procedure.
2. Install the balancer shaft sprocket and tighten the bolt to the specified torque of 36 ± 3 N·m.

>>D<< BALANCER SHAFT SPROCKET, RIGHT INSTALLATION



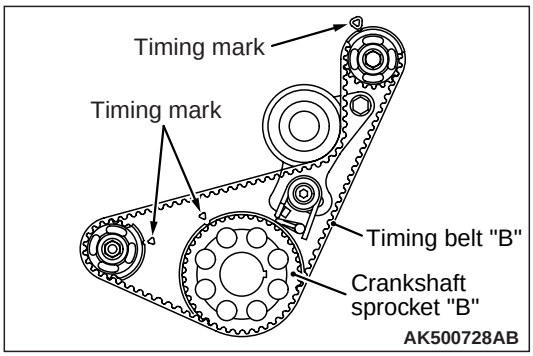
1. Lock the balancer shaft in the same way as used in the removal procedure.
2. Install the balancer shaft sprocket and tighten the nut to the specified torque of 36 ± 3 N·m.

>>E<< TIMING BELT TENSIONER "B" INSTALLATION

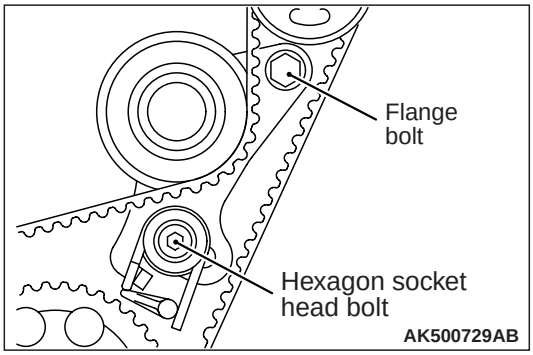


1. Install the tensioner, tensioner spring and spacer.
   NOTE: Be sure to install the tensioner spring with its shorter end toward the water pump.
2. Move tensioner "B" toward water pump and tighten mounting bolt.

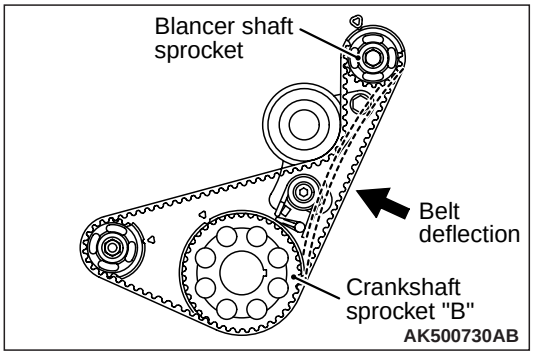
>>F<< TIMING BELT "B" INSTALLATION



1. Align timing marks on the crankshaft sprocket "B", and silent shaft sprockets with their timing marks.
2. Install timing belt "B" onto sprockets and ensure that its tension side is not slack.



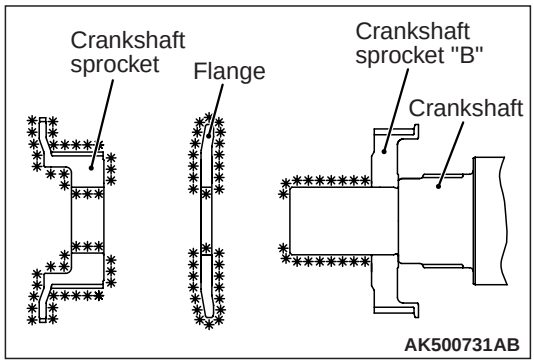
3. Loosen tensioner "B" mounting flange bolt, one to two turns.
4. Tighten the tensioner "B" attaching hexagon socket head bolt.
5. Tighten the tensioner "B" attaching flange bolt.
   NOTE: If the bolt is tightened first, the tensioner "B" should be turned together, resulting in reduced timing belt "B" tension.



6. Ensure that the deflection is as specified when the belt is pushed by the index finger at the position indicated by an arrow.

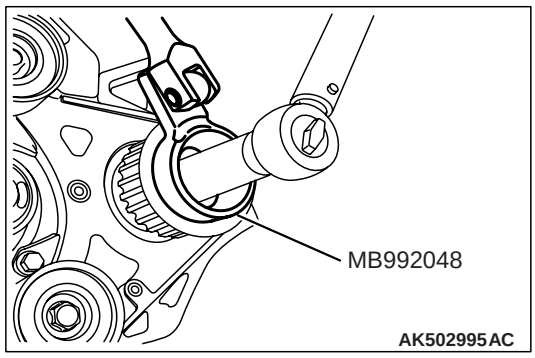
   Belt deflection: 4 – 5 mm

>>G<< FLANGE / CRANKSHAFT SPROCKET INSTALLATION



1. Clean and then degrease the following surfaces and parts: Sprocket mounting surface of crankshaft, flange, and crankshaft sprocket.
   NOTE: Degreasing is necessary to prevent decrease in the friction between contacting surfaces.
2. Clean the crankshaft contacting surface of the crankshaft sprocket.
3. Install the flange, aligning a timing mark on a front lower case with that on the flange.

>>H<< PUMP SPROCKET INSTALLATION

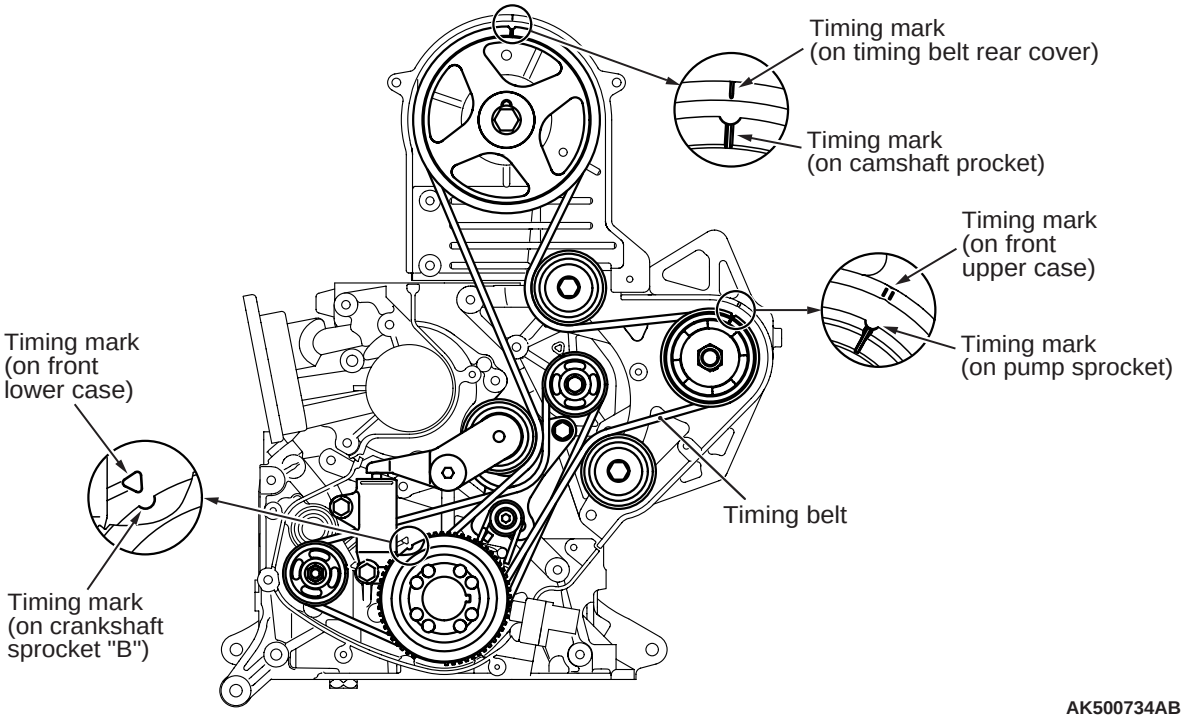


1. Use the special tool Injection pump sprocket holder (MB992048) to prevent the pump sprocket from rotating.
2. Tighten the pump sprocket nut to the specified torque of 64 ± 5 N·m.

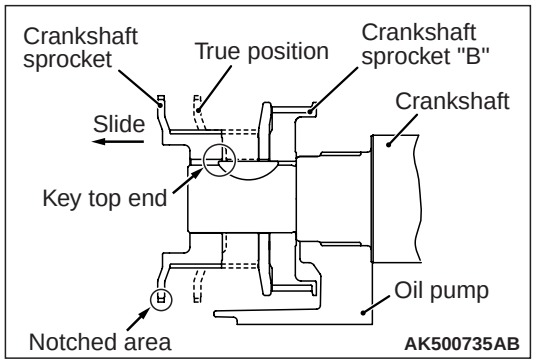
>>I<< AUTO TENSIONER INSTALLATION

⚠ CAUTION
Always bleed the auto-tensioner of air before installing the auto-tensioner. (Refer to auto tensioner inspection P.11B-27 .)

>>J<< TIMING BELT INSTALLATION



1. Align the timing marks on each sprocket.
2. In accordance with the following procedure, install a timing belt not to be slack.
   crankshaft sprocket → idler pulley → pump sprocket → idler pulley → camshaft sprocket → tensioner pulley



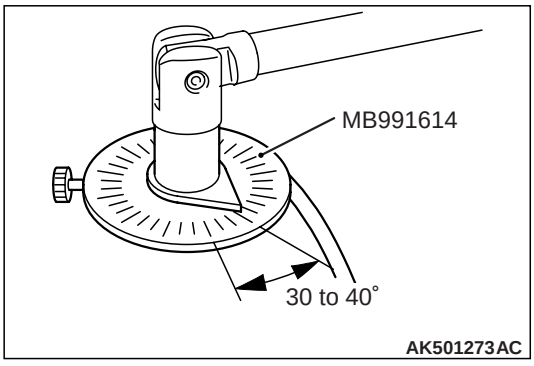
NOTE: When the timing belt is installed into the crankshaft sprocket, install the timing belt after sliding the crankshaft sprocket to around the key end. (Pay attention to the notch on the crankshaft sprocket not to be damaged at the timing belt installation.) And then, install the crankshaft sprocket in position.

3. Confirm the timing marks on each sprocket are in position.

⚠ CAUTION

Check that the glow plugs, glow plug mounting threads and plug seating surfaces of cylinder head are dry.

4. When installing the glow plug, screw in one thread or more with fingers and then tighten with a tool.
5. Tighten the glow plugs to 9.0 ± 1.0 N·m.

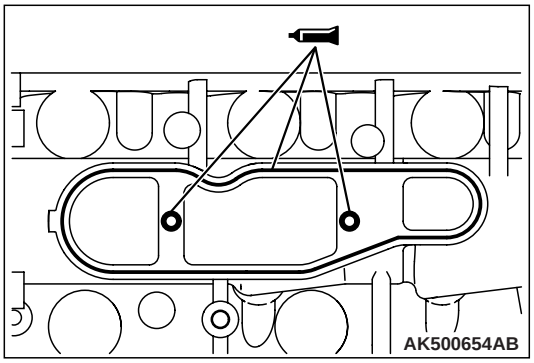


6. Using the special tool Angle gauge (MB991614), tighten the glow plug to a further 30° to 40°.
7. Install a glow plug plate to the glow plug, and then tighten them to the specified torque of 1.8 ± 0.2 N·m.
8. Pull out the set pin of an auto tensioner.
9. Turn the crankshaft twice in a clockwise direction and measure the protrusion height of the auto tensioner.

   Standard value: 2.3 – 7.6 mm

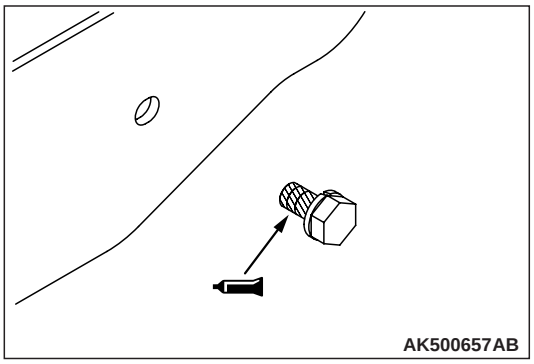
10. Confirm the timing marks on each sprocket are in position.

>>K<< COVER INSTALLATION



1. Clean both mating surfaces of cover and cylinder block.
2. Apply a 2.3 ± 1.0 mm wide bead of sealant to the cylinder block.

   Specified sealant:
   Three bond 1217G or equivalent



3. Coat the bolt with sealant, then install and tighten it.

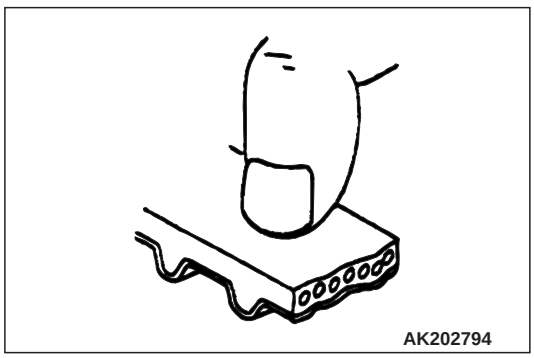
   Specified sealant:
   Three bond 2310 or equivalent

INSPECTION

M1113002001428

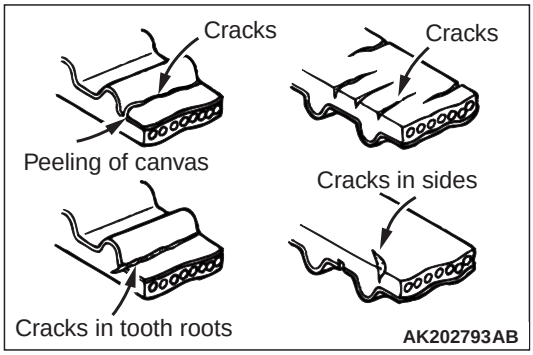
TIMING BELTS

The timing belts must be checked closely. Should the following defects be evident, replace the belt with a new one.

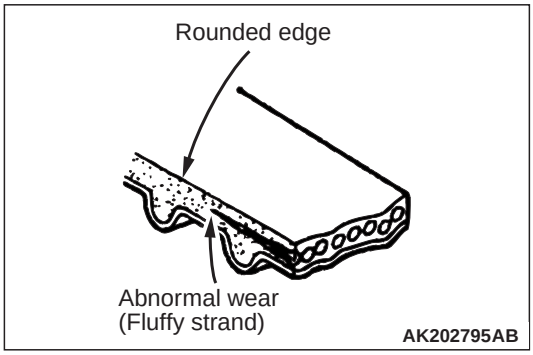


1. Hardened back surface rubber.

Glossy, non-elastic, and so hard that no mark is produced even when scratched by fingernails.

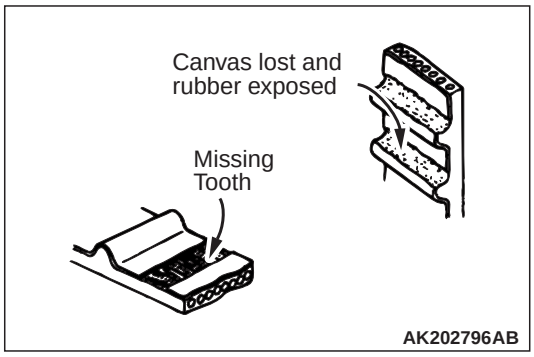


2. Cracked back surface rubber.
3. Cracked or separated canvas.
4. Cracked tooth bottom.
5. Cracked side.



6. Abnormal wear on side.

   NOTE: Normal belt should have clear-cut sides as if cut by a sharp knife.



7. Abnormal wear in teeth.

Initial stage:
Canvas on load side tooth flank worn (Fluffy canvas fibers, rubber gone and color changed to white, and unclear canvas texture)
Last stage:
Canvas on load side tooth flank worn down and rubber exposed (tooth width reduced)

8. Missing tooth.

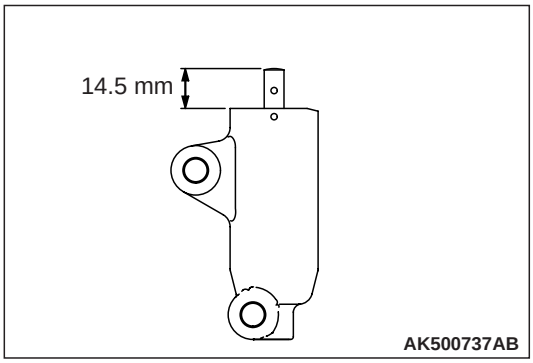
AUTO-TENSIONER

1. Check the auto-tensioner for leaks from the sealed sections.

   Replace it if leaky.

2. Check the rod end for wear and other damage.

   Replace the auto-tensioner if the rod is badly worn or damaged.



3. Measure the extension length of the rod.

   If it is not within the standard value range, replace the auto-tensioner.

   Standard value: 14.5 mm

4. Measure the amount of the retraction when the rod is pressed with the force of 100 – 200 N. If it deviates from the standard value, replace the auto tensioner.

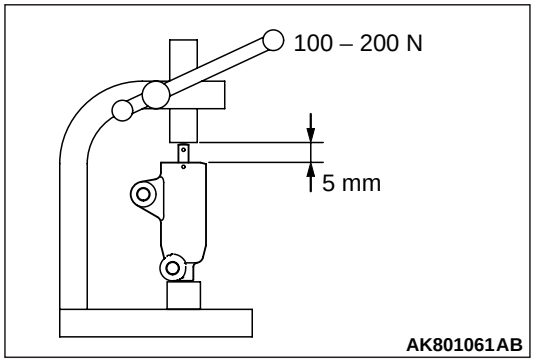
   Standard value: within 1.0 mm

AIR BLEEDING PROCEDURE OF AUTO-TENSIONER

When the auto tensioner is not kept with its rod upward, or when the set pin having ϕ2 mm is pulled out before the installation to the engine, carry out the air bleeding as follows.

⚠ CAUTION

- **If the lateral type press is used, the appropriate air bleeding is not carried out. Always use longitudinal type press.**
- **To prevent damage to the auto tensioner, do not apply the load of 5,000 N or more.**
- **To prevent damage to the auto tensioner, do not push down the rod from the cylinder end plane by 0.5 mm or less.**



1. Set the auto tensioner to the longitudinal type press as shown in the illustration.
2. Slowly press down the rod, two or three times, to the cylinder end plane.
3. When the rod protrusion has approximately 5 mm, apply the load of 100 – 200 N. Check whether the auto tensioner has sufficient stiffness.
4. If the auto tensioner does not have sufficient stiffness, replace the auto tensioner.
5. Slowly pressing down the rod, insert the set pin having ϕ2mm through the hole to fix the auto tensioner.

⚠ CAUTION

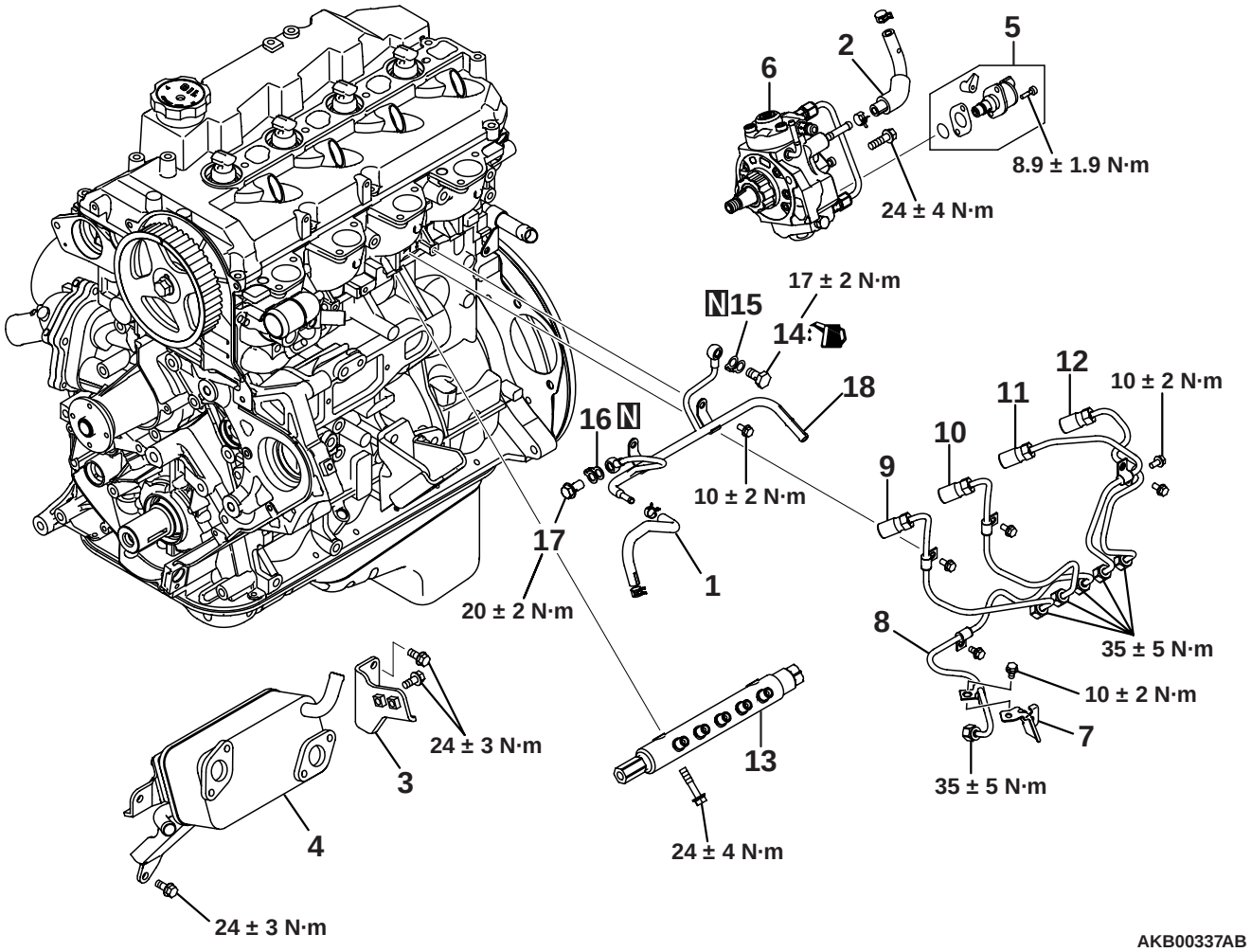
To prevent the air from being incorporated, keep the auto tensioner with its rod upward after the air bleeding. Do not keep the auto tensioner with 60° or more tilt.

COMMON RAIL AND SUPPLY PUMP

REMOVAL AND INSTALLATION

M1113029200239

<Except Euro5>



AKB00337AB

Removal steps

1. Fuel return hose
2. Fuel inlet hose
>>**B**<< 3. EGR cooler bracket
4. EGR cooler
>>**B**<< 5. Suction control valve kit *1
>>**B**<< 6. Supply pump
7. Fuel supply pump pipe bracket
>>**B**<< 8. Fuel supply pump pipe
>>**A**<< 9. Fuel injection No.1 pipe

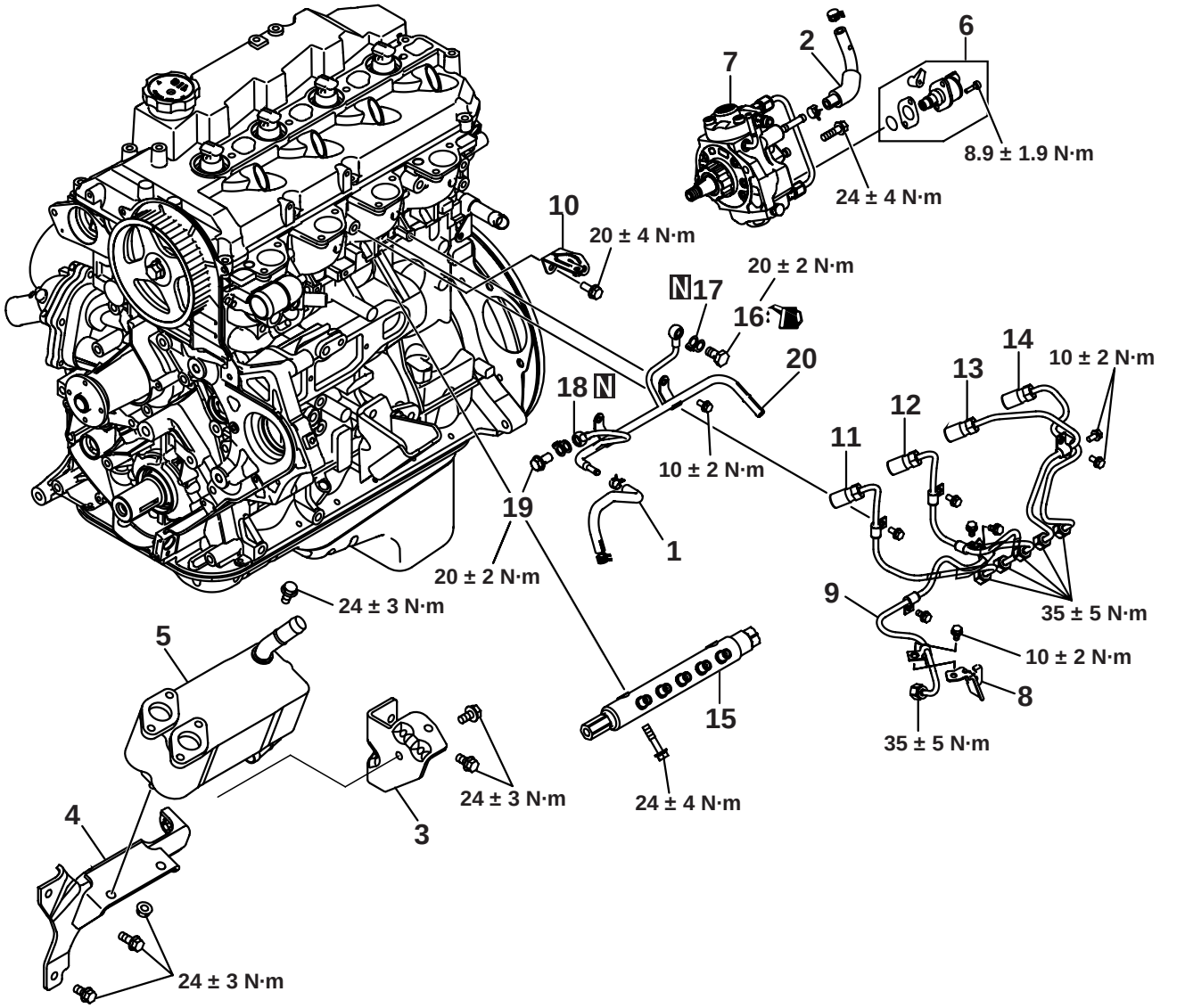
Removal steps (Continued)

>>**A**<< 10. Fuel injection No.2 pipe
>>**A**<< 11. Fuel injection No.3 pipe
>>**A**<< 12. Fuel injection No.4 pipe
>>**A**<< 13. Common rail
>>**A**<< 14. Eye bolt (Cylinder head side)
>>**A**<< 15. Fuel return gasket
>>**A**<< 16. Eye bolt (Common rail side)
>>**A**<< 17. Fuel return gasket
>>**A**<< 18. Fuel return pipe

⚠ CAUTION

***1: Unless replaced, do not remove the sensor.**

<Euro5>



AKB00324AB

Removal steps

1. Fuel return hose
2. Fuel inlet hose
>>**B**<< 3. EGR cooler brackct assenbly "B"
>>**B**<< 4. EGR cooler brackct assenbly "A"
>>**B**<< 5. EGR cooler
6. Suction control valve kit *1
>>**B**<< 7. Supply pump
>>**B**<< 8. Fuel supply pump pipe bracket
>>**A**<< 9. Fuel supply pump pipe
>>**A**<< 10. Bracket

Removal steps (Continued)

11. Fuel injection No.1 pipe
>>**A**<< 12. Fuel injection No.2 pipe
>>**A**<< 13. Fuel injection No.3 pipe
>>**A**<< 14. Fuel injection No.4 pipe
>>**A**<< 15. Common rail
>>**A**<< 16. Eye bolt (Cylinder head side)
>>**A**<< 17. Fuel return gasket
>>**A**<< 18. Eye bolt (Common rail side)
>>**A**<< 19. Fuel return gasket
>>**A**<< 20. Fuel return pipe

⚠ CAUTION

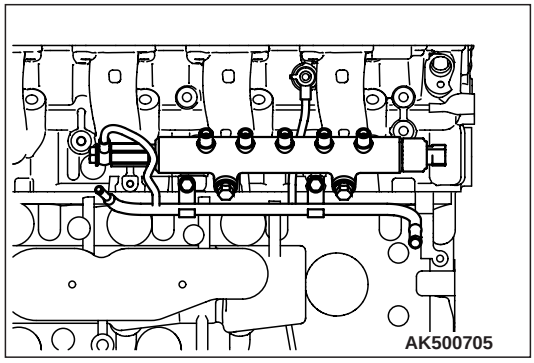
***1: Unless replaced, do not remove the sensor.**

INSTALLATION SERVICE POINTS

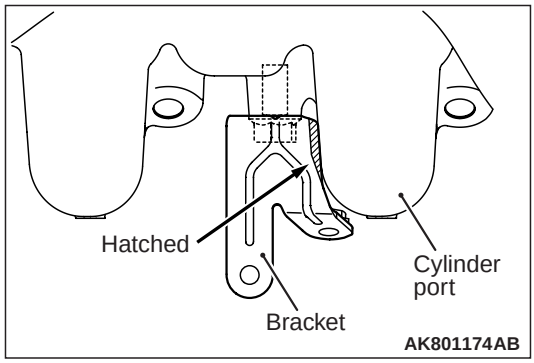
>>A<< BRACKET / FUEL INJECTION PIPE / COMMON RAIL / EYE BOLT / FUEL RETURN GASKET / FUEL RETURN PIPE INSTALLATION

⚠ CAUTION

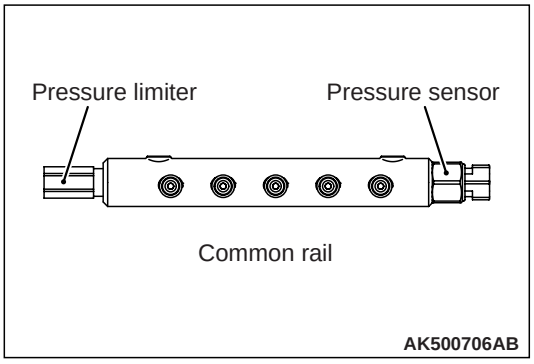
- **The reinstallation histories of the removed injection pipe are up to five times. To count how many times the injection pipe is reinstalled, record the number of the reinstallation histories on the service booklet by adding this latest number of the histories, which is usually "1", to the previous one. Use a new injection pipe when the total reinstallation history numbers reach five times, or when the injector or common rail is replaced. In this case, record "a new injection pipe, the number of the reinstallation histories is zero" on the service booklet.**
- **If a fuel leak is present in the fuel injection pipe and fuel injection pipe set once, do not reuse it and replace with a new one.**
- **If the fuel injector assembly, common rail assembly or supply pump assembly is replaced, the contact surface (seal surface) between the fuel injection pipe and fuel injection pipe set, and the other side component is changed, do not reuse the fuel injection pipe and fuel supply pump pipe and replace with a new one.**
- **When the injection pipe is reinstalled, confirm there is no foreign material on the seal surface or in the pipe and then install it not to deviate from the axis, fitting the seal surface.**



1. Temporarily tighten the fuel return pipe with bolts.



2. Slightly put the hatched area of the bracket to the cylinder port and tighten it to the specified torque of 20 ± 2 N·m. <Euro5>
3. Tighten to the specified torque of 20 ± 2 N·m the eye bolt and the fuel return gasket located at the cylinder head side.
4. Temporarily tighten the common rail with bolts, holding the common rail body.

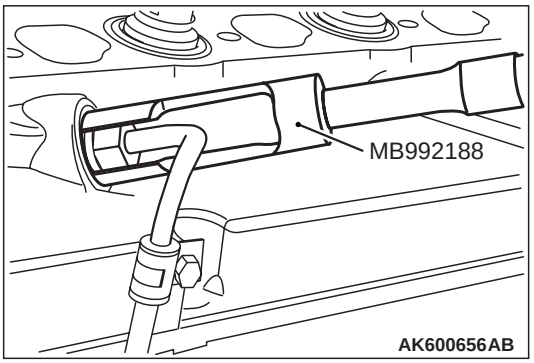


NOTE: At this time, do not hold the pressure limiter or pressure sensor of the common rail.

NOTE: Before the installation, confirm there is neither foreign material nor a rust on the threads and the sealing surface of a high-pressure pipe.

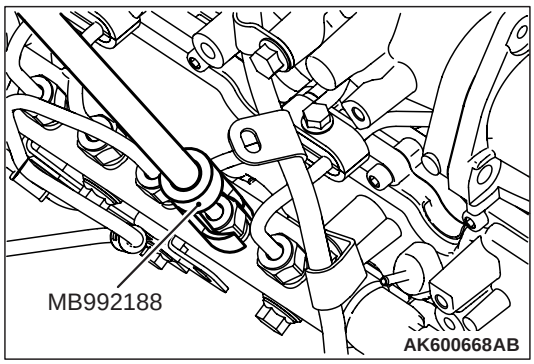
5. Align the fuel injection pipe centre axis with the other side components (fuel injector assembly and common rail assembly) centre axis to install the fuel injection pipe. Then, tighten the flare nut temporarily until the tip of pipe (seal surface) contacts with the other side components.

NOTE: When the fuel injection pipe is installed, tighten the flare nut while shaking the pipe lightly to align the centre axis of both components.



6. Using special tool Fuel injection pipe wrench (MB992188), install injection pipe assembly No.1 to No.4.

   Tighten to the specified torque of 35 ± 5 N·m the flare nuts of the fuel injection pipe No.1 to No.4 at injector side.



7. Using special tool Fuel injection pipe wrench (MB992188), install injection pipe assembly No.1 to No.4.

   Tighten to the specified torque of 35 ± 5 N·m the flare nuts of the fuel injection pipe No.1 to No.4 at common rail side.

8. Tighten the common rail to the specified torque of 24 ± 4 N·m.
9. Tighten to the specified torque of 20 ± 2 N·m the eye bolt and the fuel return gasket located at the common rail side.
10. Tighten the fuel return pipe to the specified torque of 10 ± 2 N·m.
11. Tighten to the specified torque of 10 ± 2 N·m the bolts of the fuel injection pipe No.1 to No.4.

>>B<< EGR COOLER / EGR COOLER BRACKET / SUPPLY PUMP / FUEL SUPPLY PUMP PIPE / FUEL SUPPLY PUMP PIPE BRACKET INSTALLATION

⚠ CAUTION

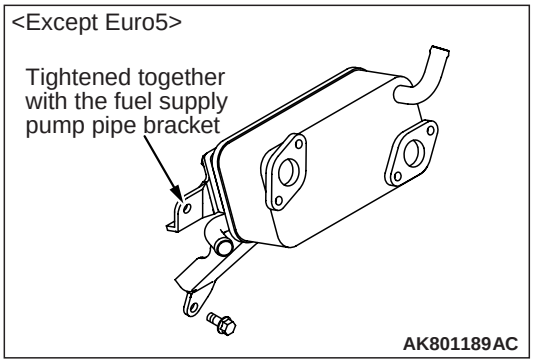
- **The reinstallation histories of the removed fuel supply pump pipe are up to five times. To count how many times the fuel supply pump pipe is reinstalled, record the number of the reinstallation histories on the service booklet by adding this latest number of the histories, which is usually "1", to the previous one. Use a new fuel supply pump pipe when the total reinstallation history numbers reach five times, or when the supply pump or common rail is replaced. In this case, record "a new fuel supply pump pipe, the number of the reinstallation histories is zero" on the service booklet.**
- **If a fuel leak is present in the fuel injection pipe and fuel injection pipe set once, do not reuse it and replace with a new one.**
- **If the fuel injector assembly, common rail assembly or supply pump assembly is replaced, the contact surface (seal surface) between the fuel injection pipe and fuel injection pipe set, and the other side component is changed, do not reuse the fuel injection pipe and fuel supply pump pipe and replace with a new one.**
- **When the fuel supply pump pipe is reinstalled, confirm there is no foreign material on the seal surface or in the pipe and then install it not to deviate from the axis, fitting the seal surface.**

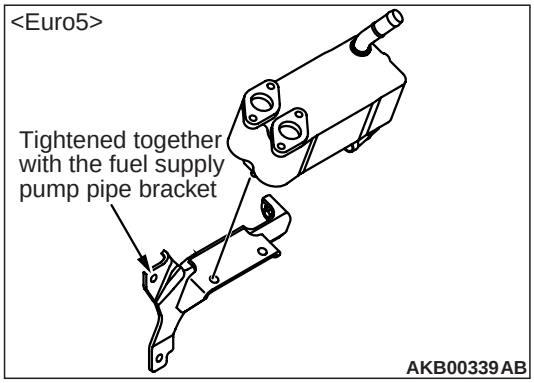
1. Align the fuel supply pump pipe centre axis with the other side components (common rail assembly and supply pump assembly) centre axis to install the fuel supply pump pipe. Then, tighten the flare nut temporarily until the tip of pipe (seal surface) contacts with the other side components.

   NOTE: When the fuel supply pump pipe is installed, tighten the flare nut while shaking the pipe lightly to align the centre axis of both components.

2. Temporarily tighten the supply pump with bolts.
3. Temporarily tighten the fuel supply pump pipe flare nuts.
4. Tighten to the specified torque of 35 ± 5 N·m the flare nuts of the fuel supply pump pipe together with the supply pump and common rail.

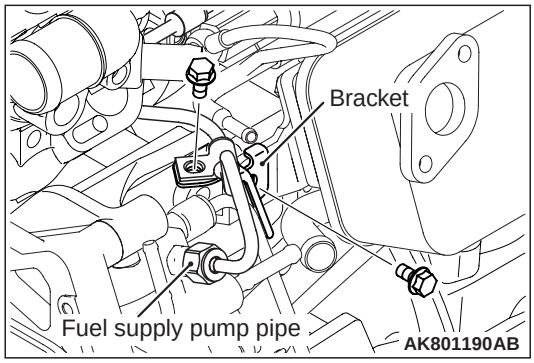
5. Tighten the supply pump to the specified torque of 24 ± 4 N·m.





6. Tighten the EGR cooler to the specified torque of 24 ± 3 N·m.

   NOTE: The arrow position shown in the illustration is tightened together with the fuel supply pump pipe bracket.

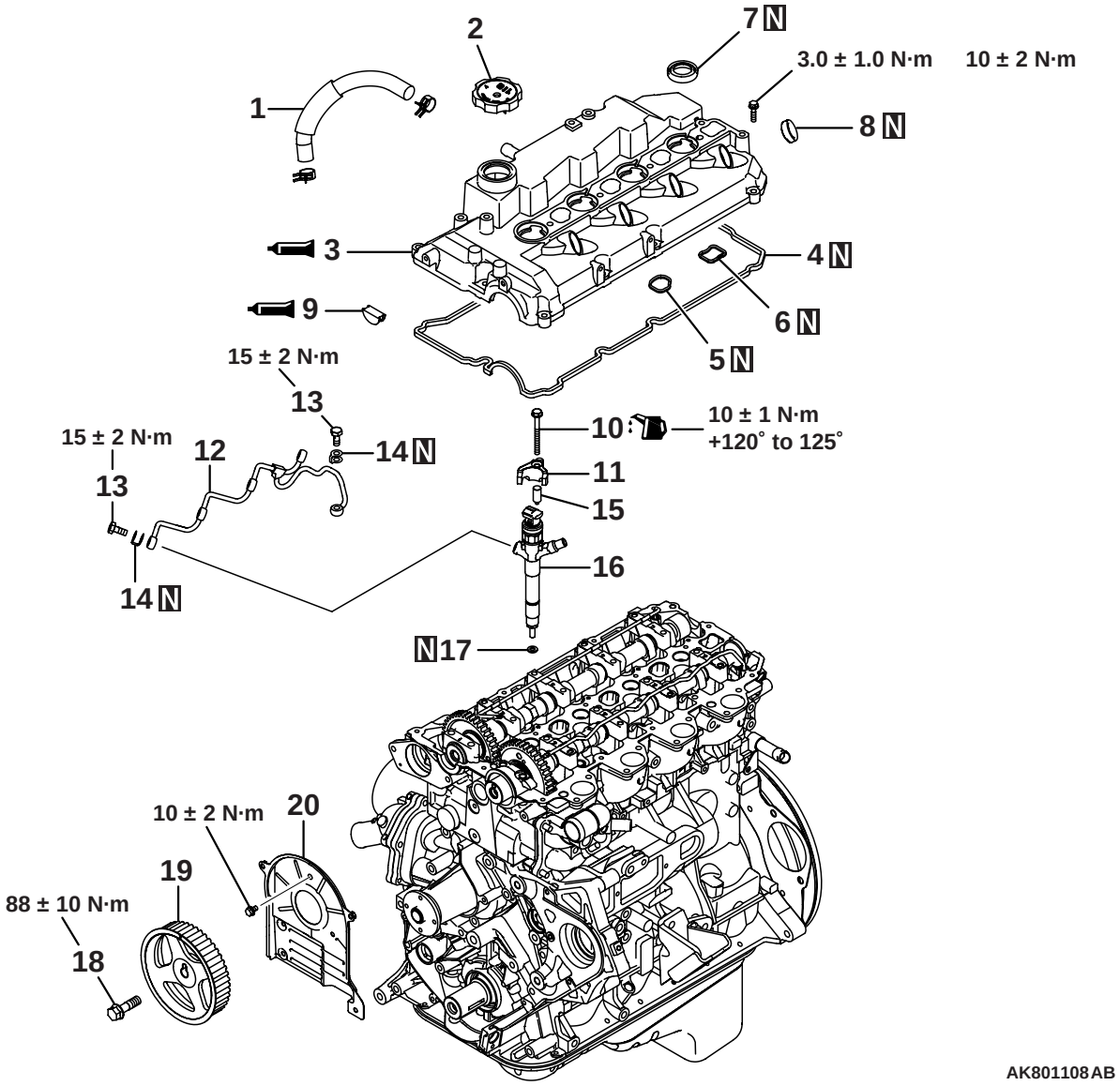


7. Tighten the EGR cooler bracket to the specified torque of 24 ± 3 N·m.
8. Tighten to the specified torque of 10 ± 2 N·m the installation fuel supply pump pipe bolts together with the fuel supply pump pipe bracket.

ROCKER COVER AND INJECTOR

REMOVAL AND INSTALLATION

M1113028500282



Removal steps

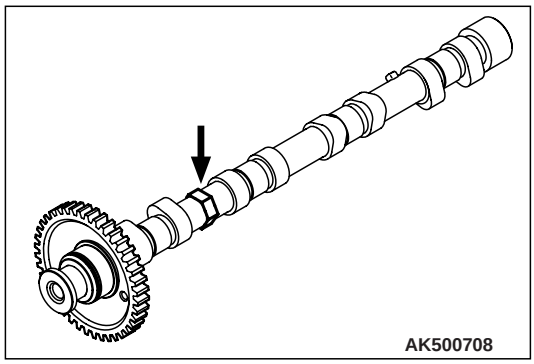
1. Breather hose
2. Oil filler cap
>>**F**<< 3. Rocker cover
4. Gasket "A"
5. Gasket "B"
6. Gasket "C"
>>**E**<< 7. Oil seal
>>**D**<< 8. Oil seal
>>**C**<< 9. Semi-circular packing
>>**B**<< 10. Injector holder bolt

Removal steps (Continued)

>>**B**<< 11. Injector holder
>>**B**<< 12. Fuel leakage pipe
>>**B**<< 13. Eye bolt
>>**B**<< 14. Fuel leak-off gasket
15. Pivot boss
16. Injector
17. Nozzle gasket
>>**A**<< 18. Camshaft sprocket bolt
<<**A**>> >>**A**<< 19. Camshaft sprocket
20. Timing belt rear cover

REMOVAL SERVICE POINTS

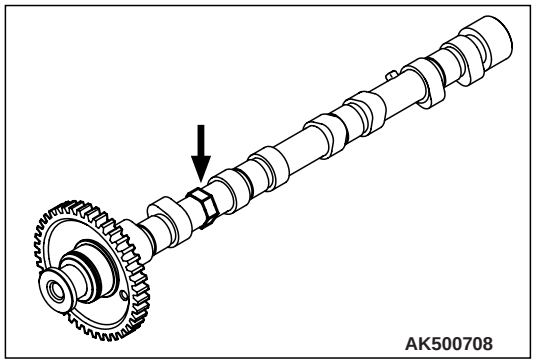
<<A>> CAMSHAFT SPROCKET REMOVAL



Remove the camshaft sprocket holding the hexagonal area of the camshaft with a wrench.

INSTALLATION SERVICE POINTS

>>A<< CAMSHAFT SPROCKET INSTALLATION



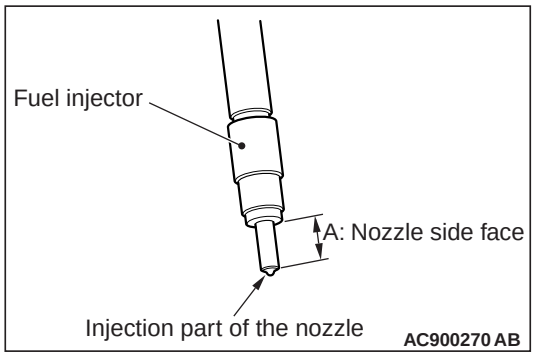
Tighten the camshaft sprocket to the specified torque of 88 ± 10 N·m holding the hexagonal area of the camshaft with a wrench.

>>B<< INJECTOR / PIVOT BOSS / FUEL LEAK-OFF GASKET / EYE BOLT / FUEL LEAKAGE PIPE / INJECTOR HOLDER / INJECTOR HOLDER BOLT INSTALLATION

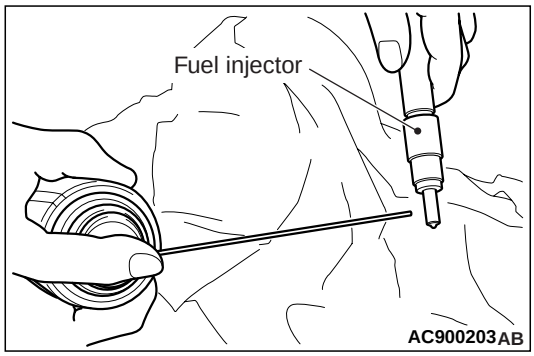
1. Clean the fuel injector assembly (nozzle) and the cylinder head (fuel injector insertion hole) by following the procedure below.

⚠ CAUTION

Do not clean the injection part of the nozzle with a resin spatula.



(1) Using a resin spatula, scrape off the carbon deposit on the fuel injector nozzle side face ("A" shown in the figure).

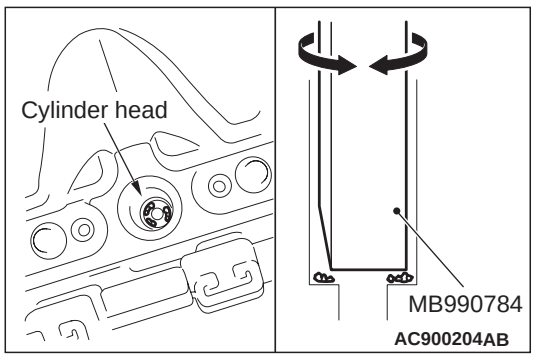


(2) Spray the carburetor cleaner (MZ100139) or equivalent to the nozzle side face ("A" shown in the figure).

⚠ CAUTION

Do not touch the injection part of the nozzle with hand or wipe it with a rag.

(3) Leave the injection part for a while until the carbon deposit melts down, and then blow air to the injection part.



(4) Insert the special tool ornament remover (MB990784) to the cylinder head (fuel injector insertion hole) with turning the special tool as shown, and scrape off the carbon deposit.

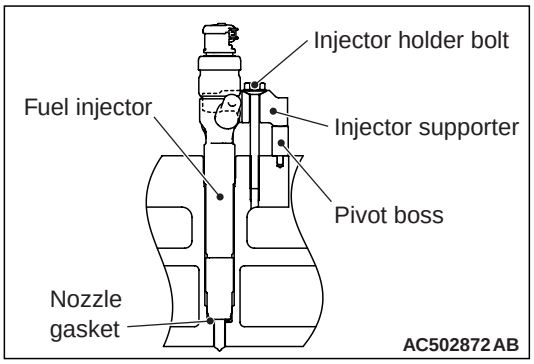
⚠ CAUTION

In order to prevent carbon from adhering to the inner surface of the cylinder, blow air with the piston in the TDC position.

(5) Remove the special tool MB990784, and blow off the carbon deposit on the cylinder head (fuel injector insertion hole) by air.

(6) Check that there is no carbon deposit remaining on the contact surface of the fuel injector nozzle gasket.

NOTE: Repeat step 4 to step 6 several times until the carbon deposit is completely removed.



2. Install the nozzle gasket, fuel injector, pivot boss, and injector supporter to the cylinder head as shown in the figure.
3. Apply a small amount of engine oil to the seat surface and thread of injector holder bolt, and then temporarily tighten the bolt to the cylinder head.
4. Set the fuel leak-off gasket to the fuel leakage pipe, and temporarily tighten to the fuel injector and to the cylinder head using the eye bolt.
5. Tighten the eye bolt of the fuel injector side to the specified torque.

   Tightening torque: 15 ± 2 N·m

6. Tighten the eye bolt of the cylinder head side to the specified torque.

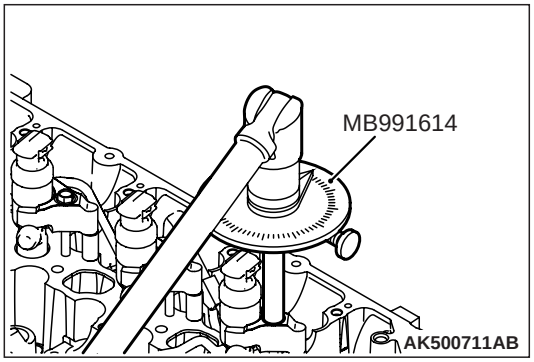
   Tightening torque: 15 ± 2 N·m

7. Tighten the injector holder bolt to the specified torque.

   Tightening torque: 10 ± 1 N·m

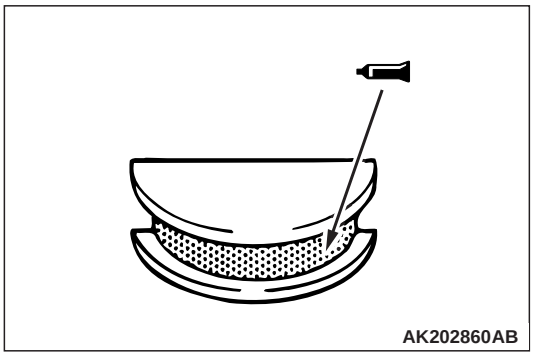
⚠ CAUTION

- **When the tightening angle is smaller than the specified tightening angle, the appropriate tightening capacity cannot be secured.**
- **When the tightening angle is larger than the specified tightening angle, remove the bolt to start from the beginning again according to the procedure.**



8. Using the special tool Angle gauge (MB991614), tighten the injector holder bolt in the illustrated sequence by a further 120 to 125°.

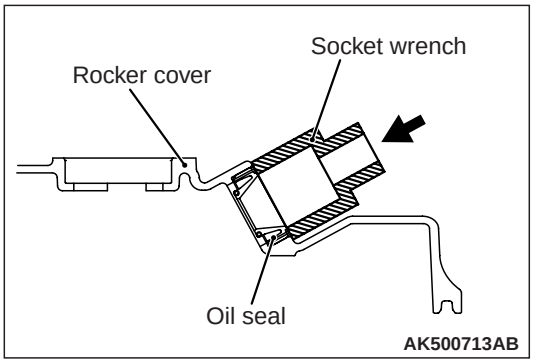
>>C<< SEMI-CIRCULAR PACKING INSTALLATION



Apply specified sealant to portions indicated in illustration.

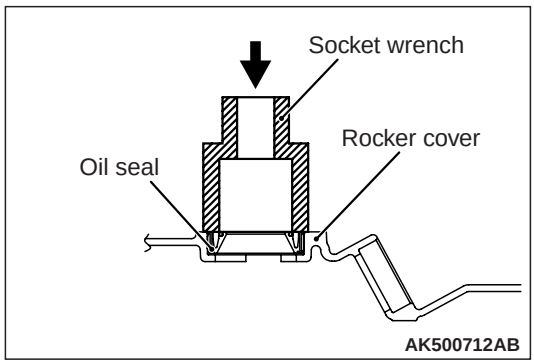
Specified sealant:
Three bond 1217G or equivalent

>>D<< OIL SEAL INSTALLATION



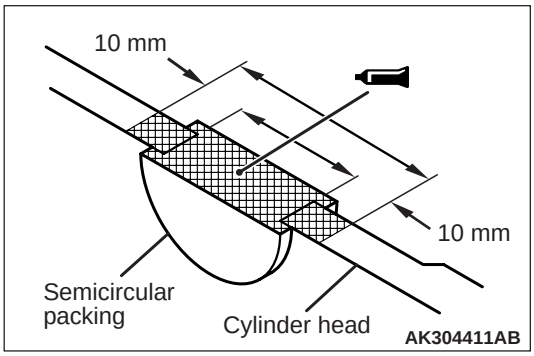
Using a proper socket wrench, the oil seal is pressed and fit into the rocker cover.

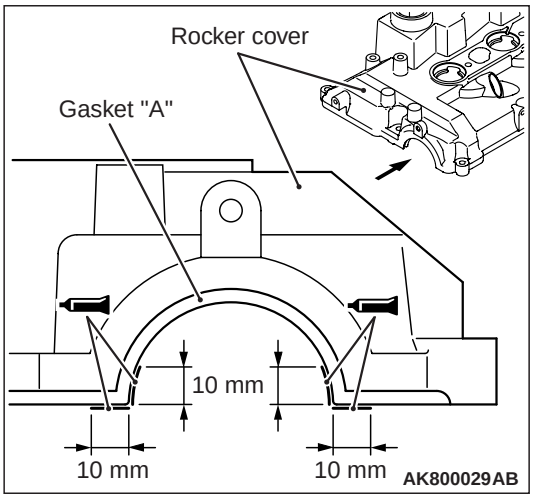
>>E<< OIL SEAL INSTALLATION



Using a proper socket wrench, the oil seal is pressed and fit into the rocker cover.

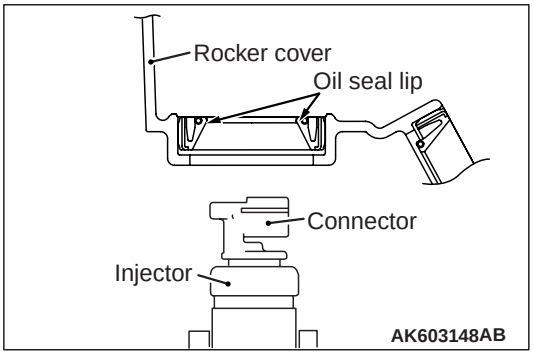
>>F<< ROCKER COVER INSTALLATION

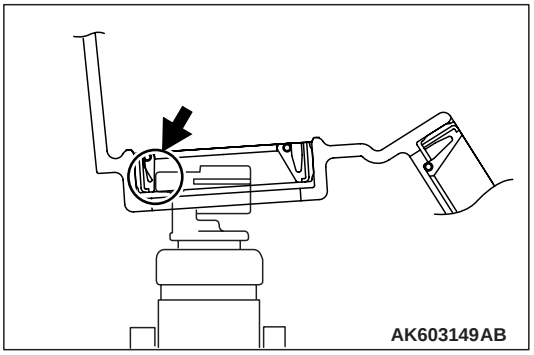




1. Apply specified sealant to portions indicated in illustration.

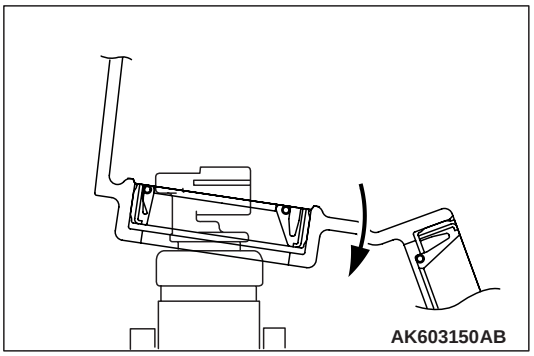
Specified sealant:
Three bond 1217G or equivalent



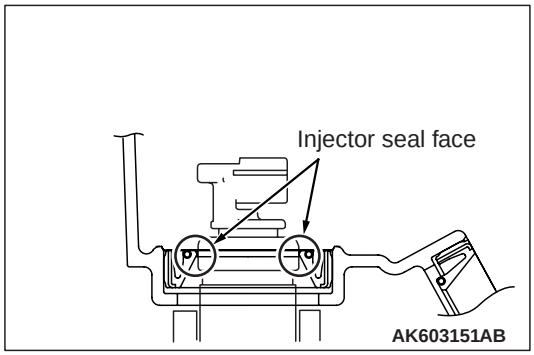


⚠ CAUTION
Pay attention that the connector does not damage the seal lip when inserting the rocker cover.

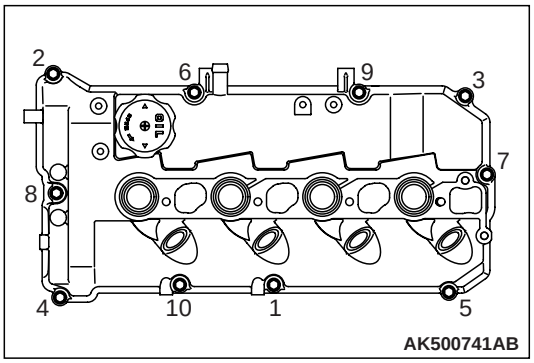
2. Slightly press the oil seal lip to the place in the opposite direction of the connector, shown in the illustration.
3. Leave enough clearance for the connector to avoid touching the seal lip.



4. Slowly get the seal lip through not making contact with the connector.
5. Put the rocker cover down to the installation location.



6. Check that the injector-sealing surface has the seal lip.



7. In accordance with the tightening order shown in the illustration, tighten bolts to 3.0 ± 1.0 N·m.
8. Again, in accordance with the tightening order shown in the illustration, tighten bolts to the specified torque of 10 ± 2 N·m.

WATER HOSE AND PIPE

REMOVAL AND INSTALLATION

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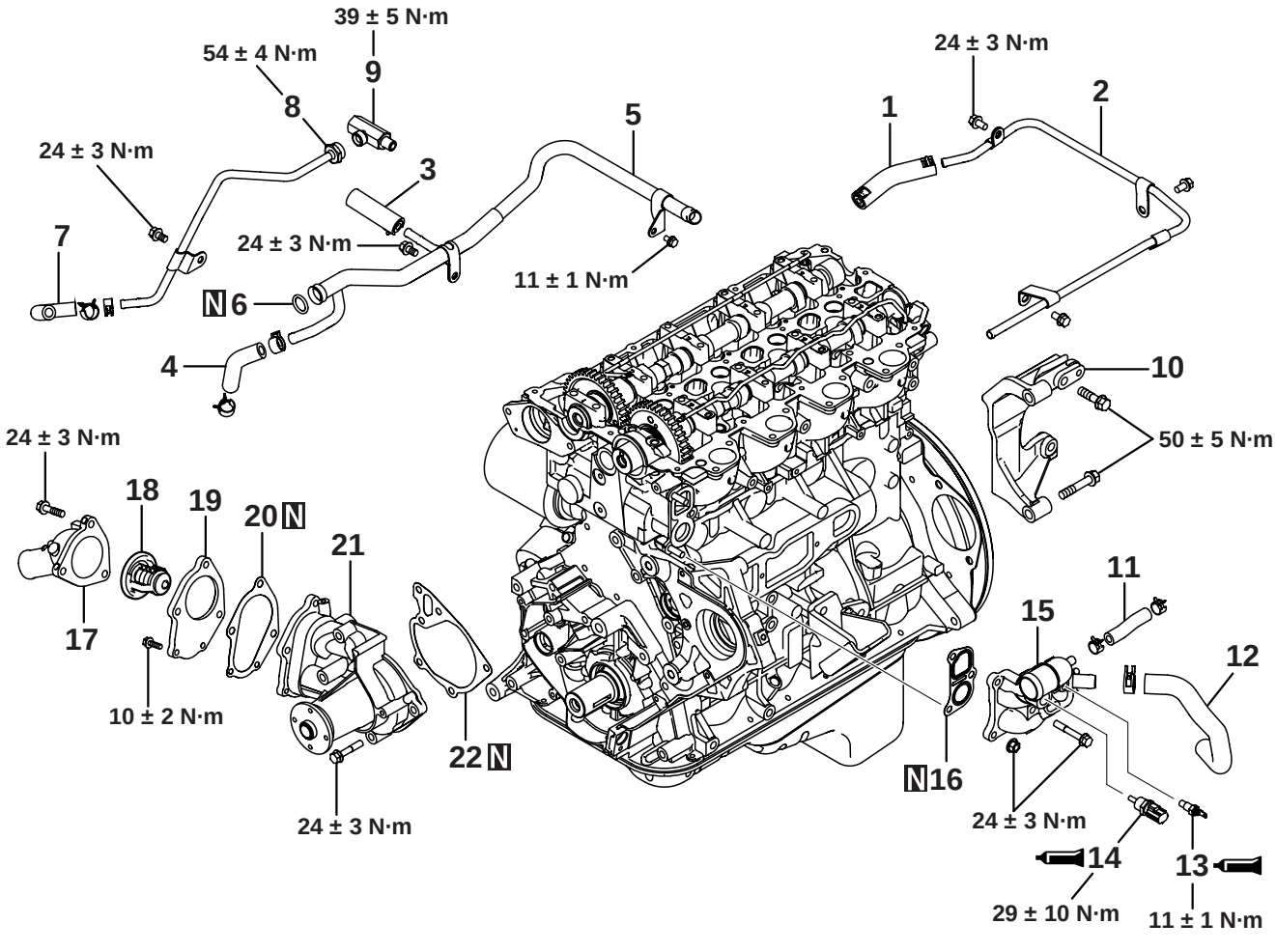
<Except Euro5>



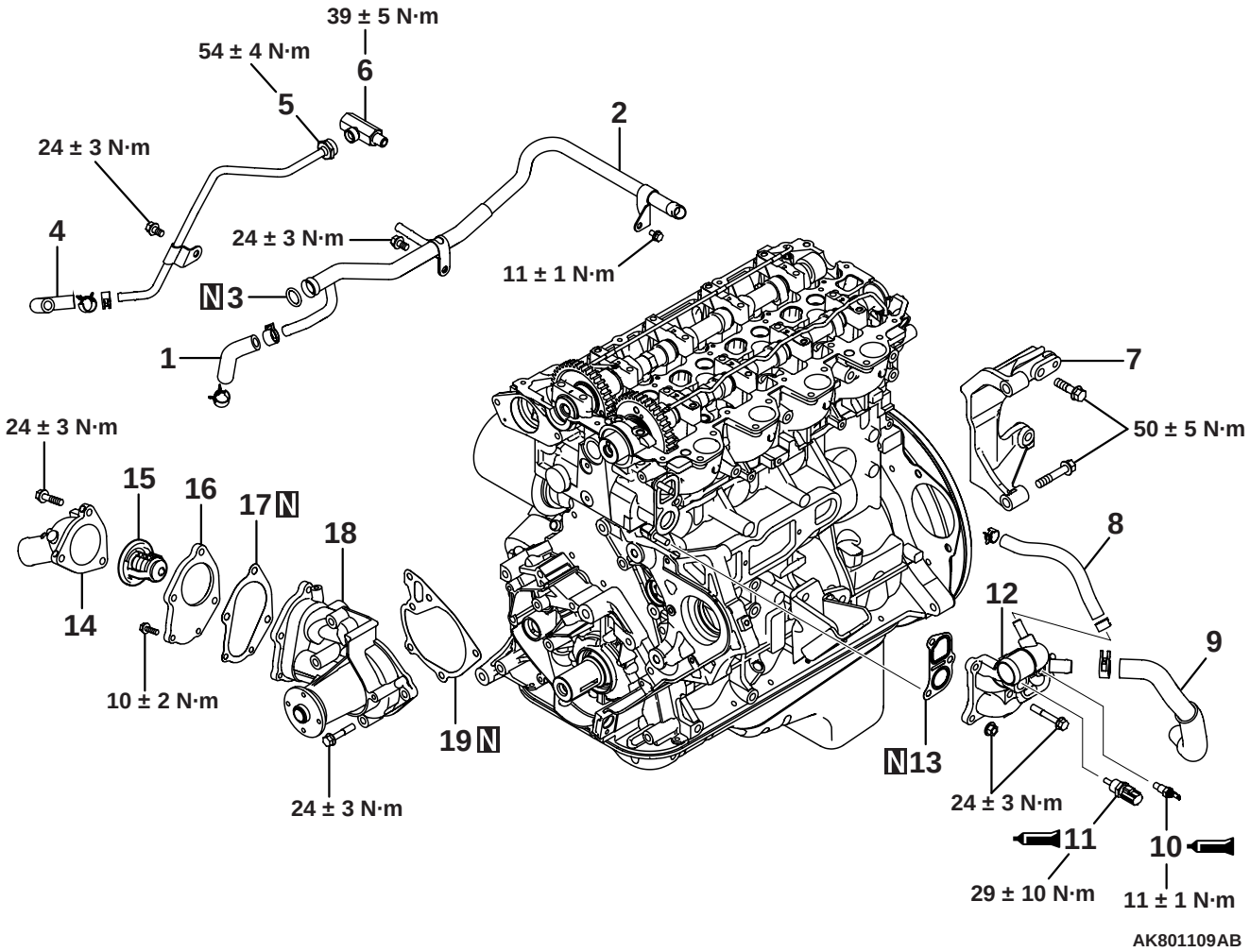
Removal steps

1. Water hose
2. Water pipe "A"
3. Water hose
4. Water hose
>>**E**<< 5. Water pipe
>>**E**<< 6. O-ring
7. Water hose
8. Water pipe "D"
9. Joint
>>**D**<< 10. Front upper case stiffener
11. Water hose

Removal steps (Continued)

12. Water hose
>>**C**<< 13. Coolant temperature gauge unit
>>**B**<< 14. Coolant temperature sensor
15. Water outlet fitting
16. Water outlet fitting gasket
17. Water inlet fitting
>>**A**<< 18. Thermostat
19. Plate
20. Gasket
21. Water pump
22. Water pump gasket

<Euro5>



Removal steps

1. Water hose
>>**E**<< 2. Water pipe
>>**E**<< 3. O-ring
4. Water hose
5. Water pipe "D"
6. Joint
>>**D**<< 7. Front upper case stiffener
8. Water hose
9. Water hose

Removal steps (Continued)

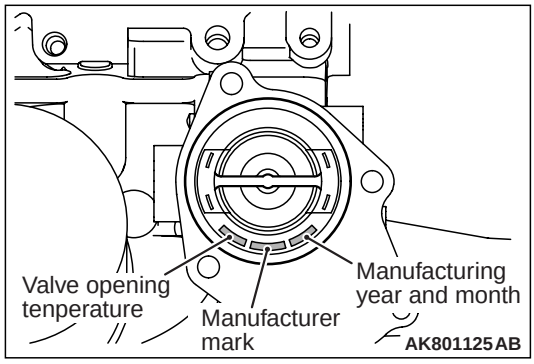
>>**C**<< 10. Coolant temperature gauge unit
>>**B**<< 11. Coolant temperature sensor
12. Water outlet fitting
13. Water outlet fitting gasket
14. Water inlet fitting
>>**A**<< 15. Thermostat
16. Plate
17. Gasket

Removal steps (Continued)

18. Water pump
19. Water pump gasket

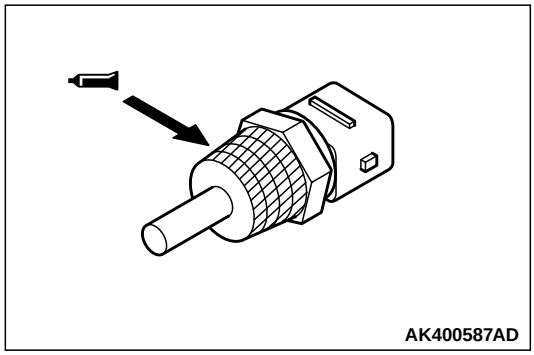
INSTALLATION SERVICE POINTS

>>A<< THERMOSTAT INSTALLATION



1. Check that the rubber ring is undamaged and seated correctly in the thermostat flange.
2. Install the thermostat as shown in the illustration.

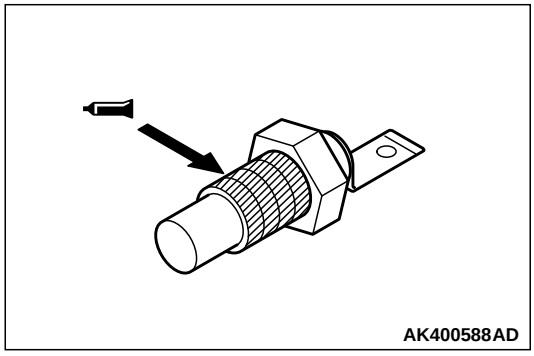
>>B<< COOLANT TEMPERATURE SENSOR INSTALLATION



When reusing the sensor, apply the specified sealant to the threads.

Specified sealant:
Three bond 1324N, LOCTITE 262 or equivalent

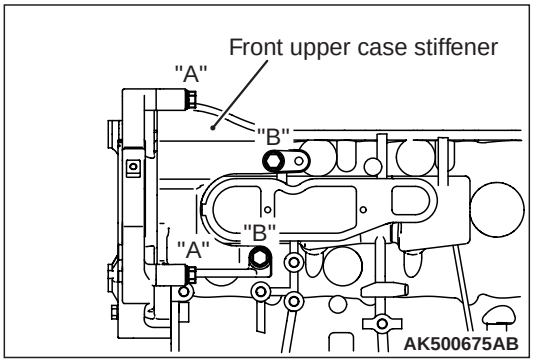
>>C<< COOLANT TEMPERATURE GAUGE UNIT INSTALLATION



Apply the specified sealant to the threads.

Specified sealant:
Three bond 2310 or equivalent

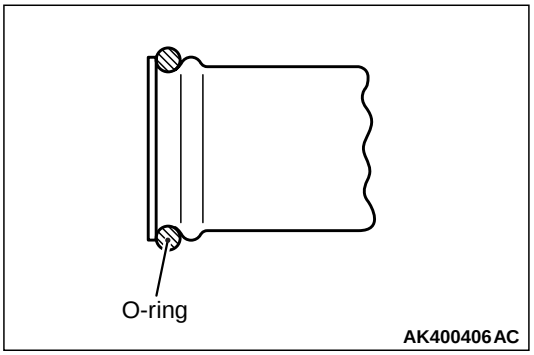
>>D<< FRONT UPPER CASE STIFFENER INSTALLATION



1. Temporarily tighten the front upper case stiffener with bolts.
2. Tighten to the specified torque of 50 ± 5 N·m Bolt "A" located at the front upper case side.
3. Next, tighten to the specified torque of 50 ± 5 N·m Bolt "B" located at the cylinder block side.

>>E<< WATER PIPE / O-RING INSTALLATION

⚠ CAUTION
Keep the O-ring free of oil or grease.



1. Attach a new O-ring to each end of the water pipe.
2. Wet the O-ring with water.
3. Insert the rear end of the pipe into the thermostat housing.

ROCKER ARMS AND CAMSHAFT

REMOVAL AND INSTALLATION

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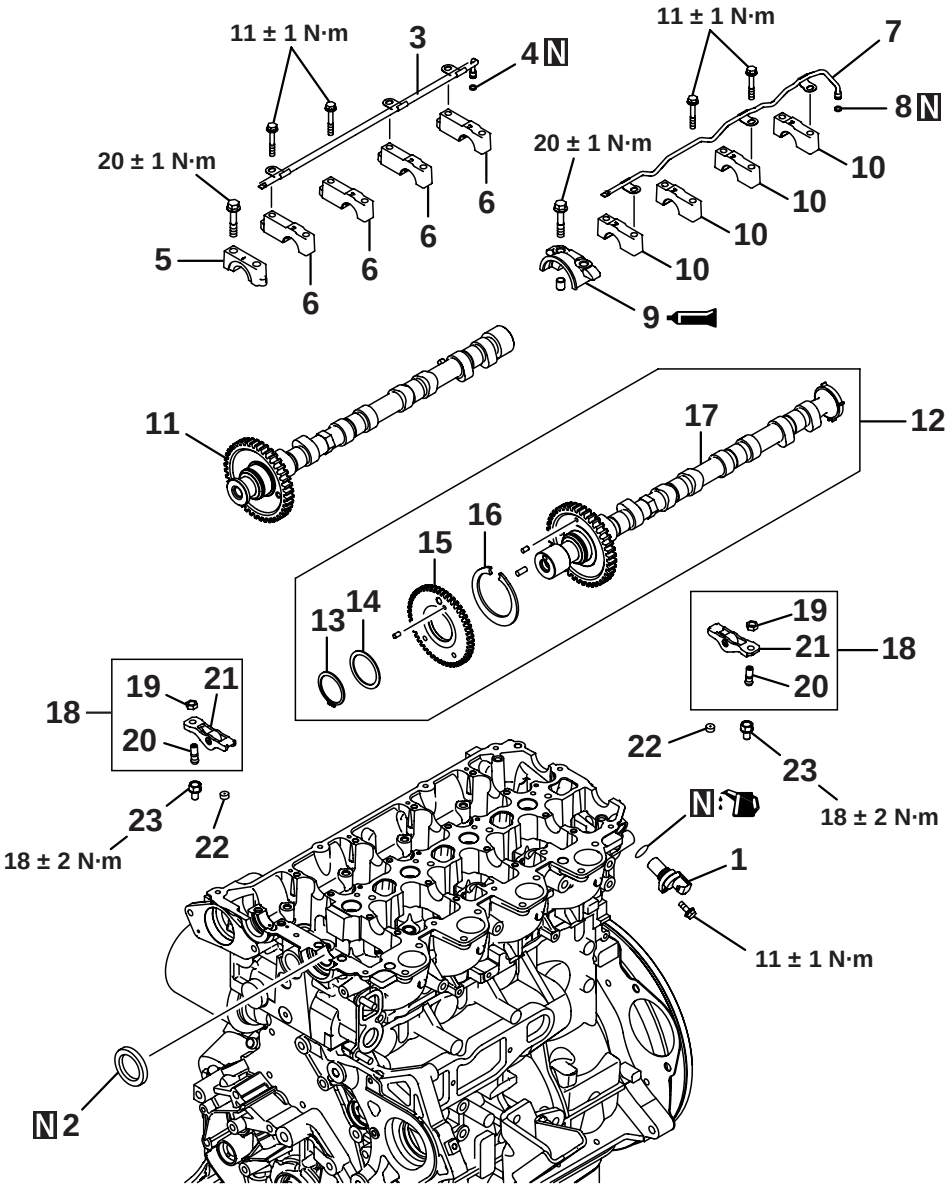


AK503039AB

Removal steps

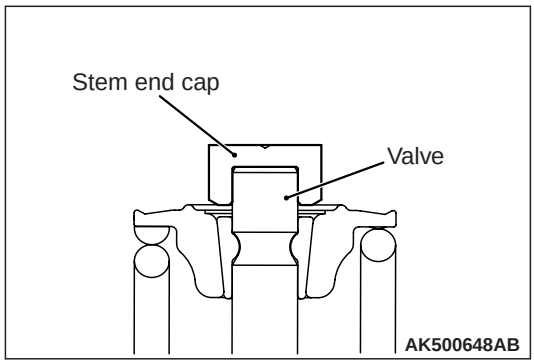
1. Camshaft position sensor
>>**F**<< 2. Camshaft oil seal
>>**E**<< 3. Exhaust oil pipe
>>**E**<< 4. O-ring
>>**E**<< 5. Camshaft bearing cap, front right
>>**E**<< 6. Camshaft bearing cap, right
>>**E**<< 7. Inlet oil pipe
>>**E**<< 8. O-ring
>>**E**<< 9. Camshaft bearing cap, front left
>>**E**<< 10. Camshaft bearing cap, left
>>**D**<< 11. Exhaust camshaft
>>**D**<< 12. Inlet camshaft assembly

Removal steps (Continued)

>>**C**<< 13. Snap ring
>>**C**<< 14. Wave washer
>>**C**<< 15. Sub gear
>>**C**<< 16. C-spring
17. Inlet camshaft
>>**B**<< 18. Rocker arm assembly
19. Nut
20. Adjusting screw
21. Rocker arm
>>**A**<< 22. Stem end cap
23. Pivot bolt

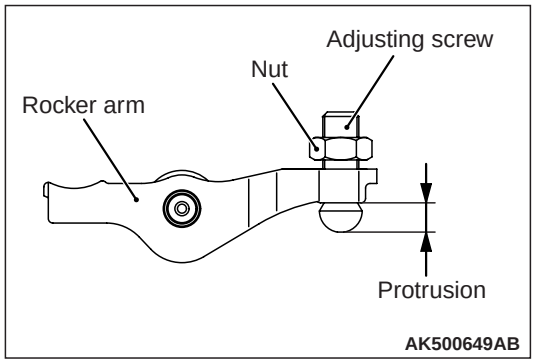
INSTALLATION SERVICE POINTS

>>A<< STEM END CAP INSTALLATION



Install the stem end cap securely to attach the stem end surfaces of the intake and exhaust valves.

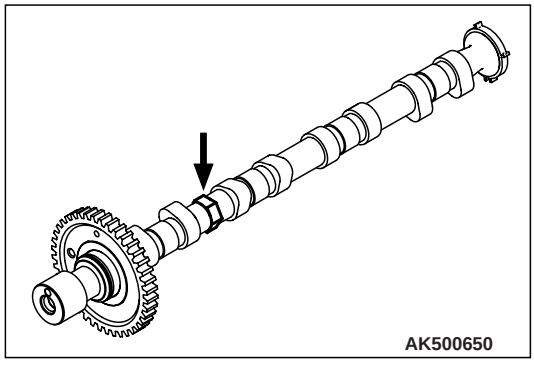
>>B<< ROCKER ARM ASSEMBLY INSTALLATION



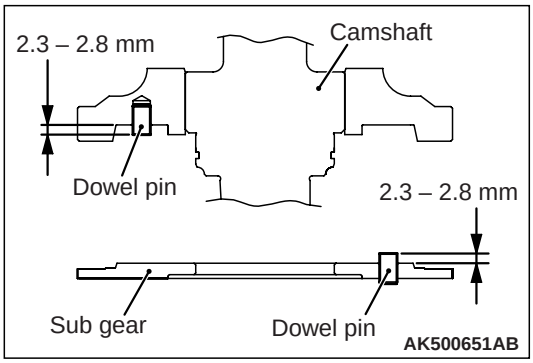
Temporarily install the adjusting screw to the rocker arm with screw nut.

Protrusion: 5.5 – 6.5 mm

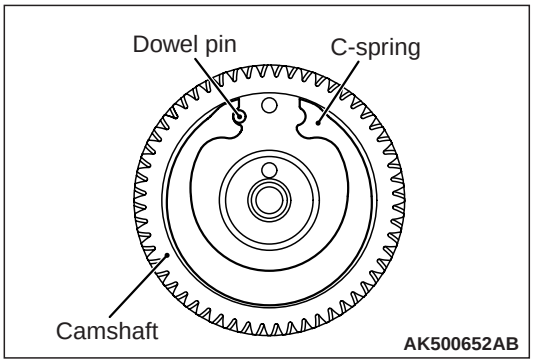
>>C<< SNAP RING / WAVE WASHER / SUB GEAR / C SPRING INSTALLATION



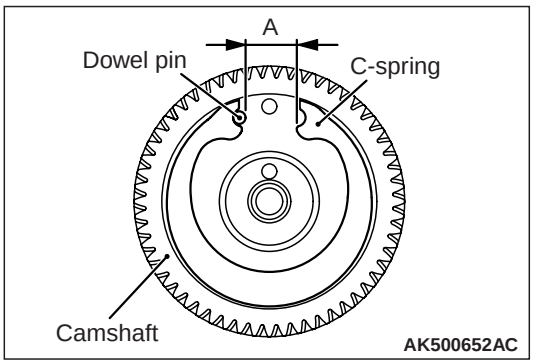
1. Fix the camshaft using the hexagonal area of the inlet camshaft.



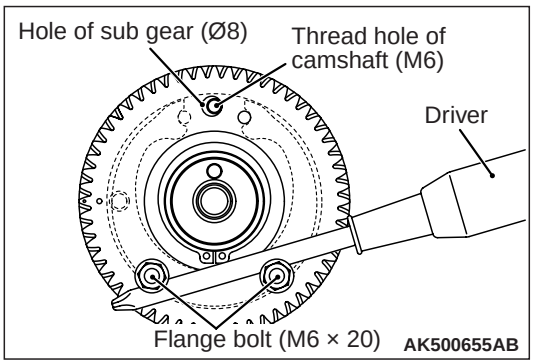
2. Press and fit a dowel pin into the inlet camshaft and sub gear to be the dimension shown in the illustration.



3. Place the c-spring adjoining the dowel pin which is pressed and fit into the inlet camshaft.



4. Within the area "A" between the c-spring and inlet camshaft, place the dowel pin which is pressed and fitted into the sub gear.
5. Install the wave washer and snap ring.



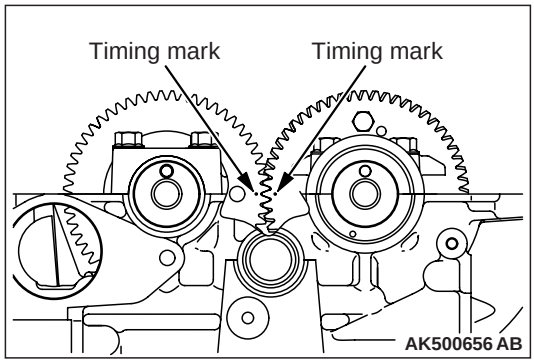
6. Set two flange bolts (M6 × 20) to two places on the sub gear. As shown in the illustration, turn the sub gear in a clockwise direction so that the sub gear hole (ϕ8) can align with the inlet camshaft thread hole (M6).

⚠ CAUTION

- **Do not turn the sub gear excessively.**
- **Do not press the snap ring strongly with a driver.**

7. Screw the bolts to attach the bolt heads to the sub gear. Temporarily fix the sub gear.
8. After the temporary installation of the sub gear, remove two flange bolts (M6 × 20) described in No. 6.

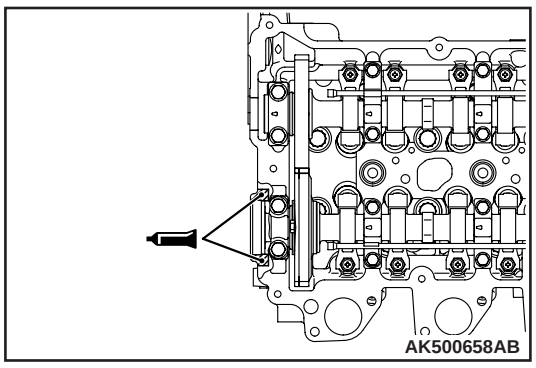
>>D<< INLET CAMSHAFT ASSEMBLY/ EXHAUST CAMSHAFT INSTALLATION



1. Install the camshaft so that each timing mark can be in position as shown in the illustration.

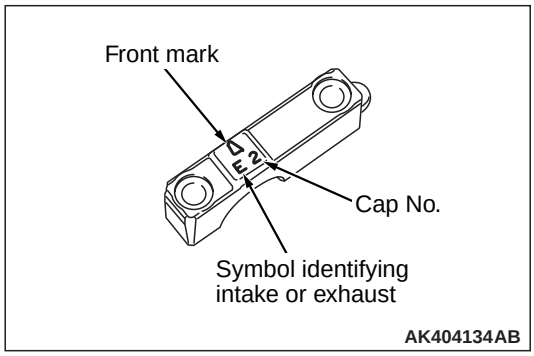
   NOTE: Carefully install the camshaft because a rocker arm assembly is easily dropped at the camshaft installation.
2. Confirm all the stem end caps are installed.
3. Confirm the rocker arm assembly is straightly mounted on the pivot bolts and stem end caps.

>>E<< OIL PIPE / O-RING / CAMSHAFT BEARING CAP FRONT LEFT / CAMSHAFT BEARING CAP INSTALLATION

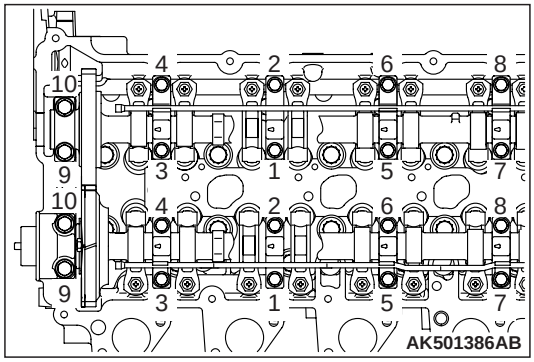


1. Apply specified sealant to portions indicated in illustration.

   Specified sealant:
   Three bond 1212D or equivalent
2. Installation the bearing cap.

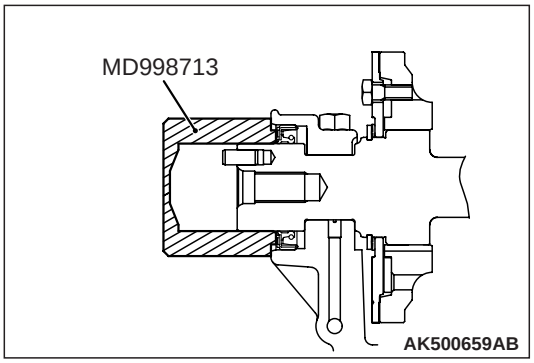


   NOTE: Install the camshaft bearing cap in numerical order in accordance with "cap No." stamped on the upper surface of the bearing cap.
3. Installation the O-ring and oil pipe.



4. In accordance with the tightening order shown in the illustration, tighten the bearing cap bolt to the specified torque.

>>F<< CAMSHAFT OIL SEAL INSTALLATION

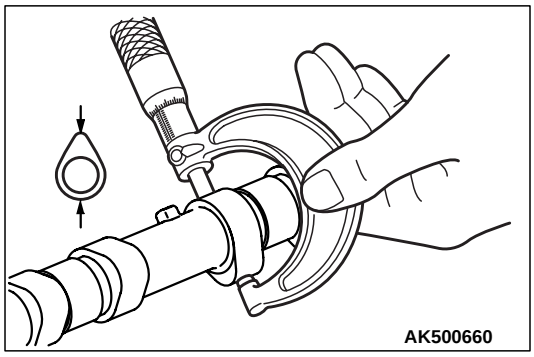


1. Apply oil to the oil seal lips.
2. Using the special tool Camshaft oil seal installer (MD998713), press-fit a new camshaft oil seal into the front left bearing cap.

INSPECTION

M1113005501660

CAMSHAFT



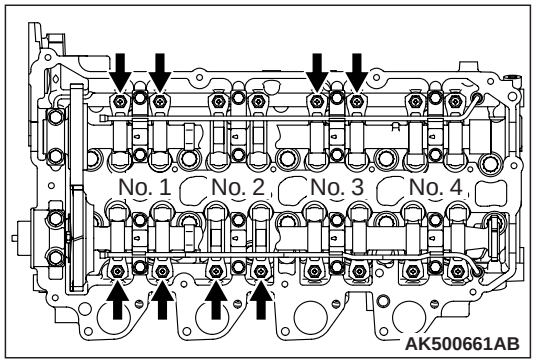
Measure the cam height.

Standard value:
Intake:
35.47 mm <Except Euro5>
35.42 mm <Euro5>
exhaust: 35.41 mm

Limit:
Intake:
34.97 mm <Except Euro5>
34.92 mm <Euro5>
exhaust: 34.91 mm

VALVE CLEARANCE ADJUSTMENT

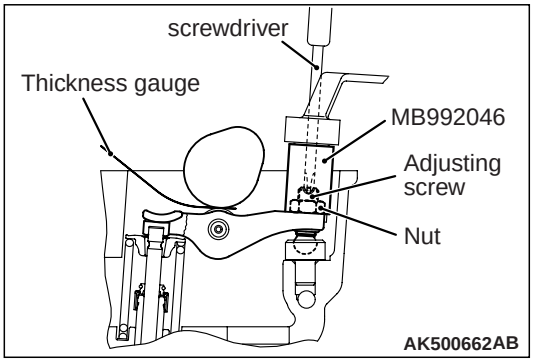
Turn the crankshaft clockwise to bring No. 1 cylinder to the top dead centre position.



1. Measure the valve clearance.

   If the valve clearance is not as specified, loosen the rocker arm lock nut and adjust the clearance using a thickness gauge between the cam shaft and the roller while turning the adjusting screw.

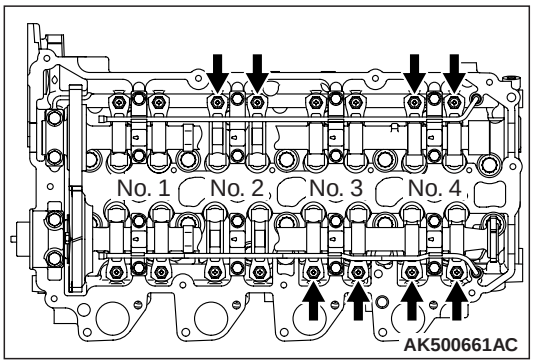
   Standard value (cold engine):
   Intake valve: 0.09 mm
   Exhaust valve: 0.14 mm



2. While holding the adjusting screw with a screwdriver to prevent it from turning, tighten the lock nut to the specified torque using a special tool Valve adjusting socket (MB992046).

   Tightening torque: 15 ± 3 N·m

3. Turn the crankshaft 360° clockwise to bring No. 4 cylinder to the top dead centre position.

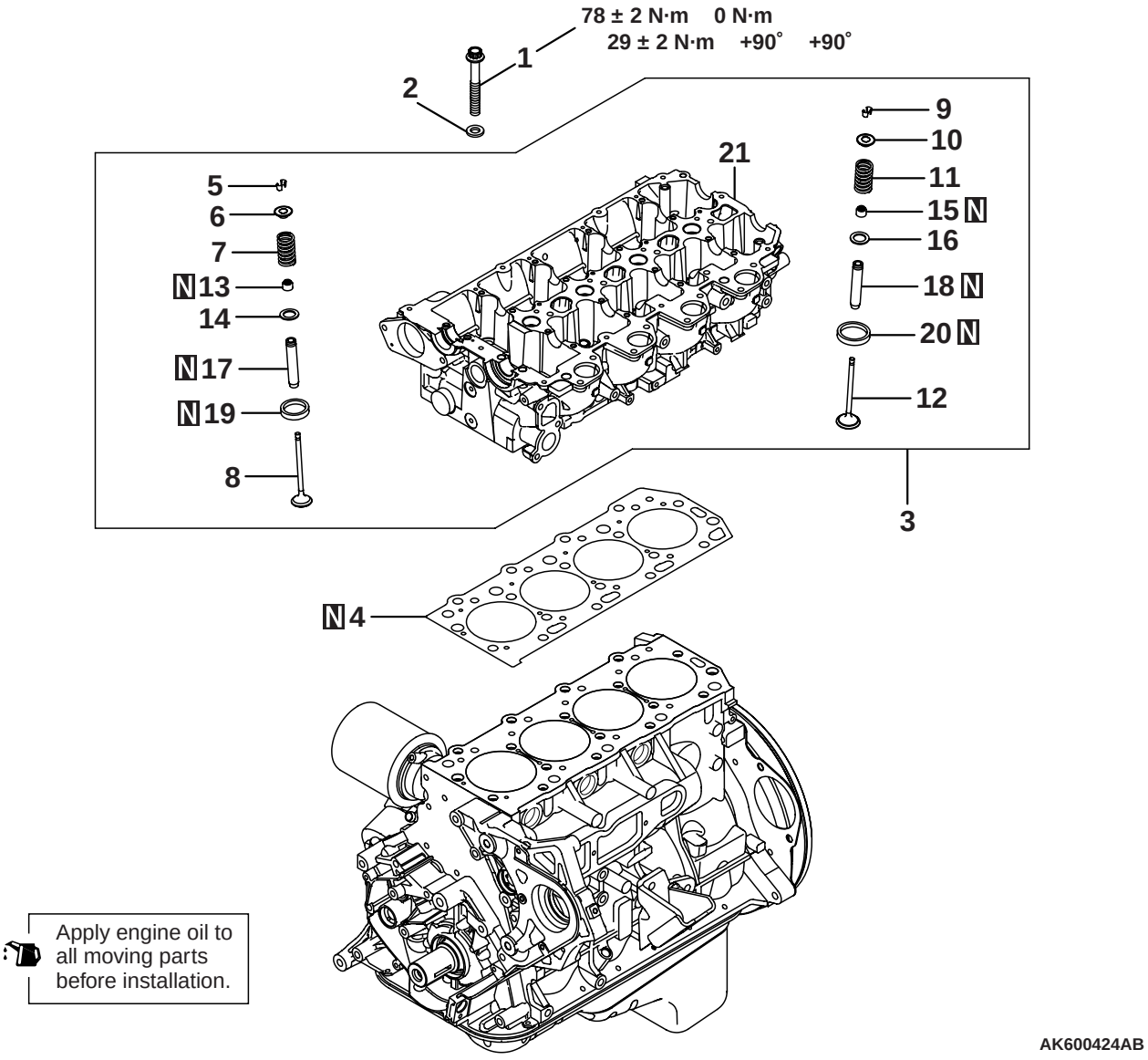


4. Adjust the valve clearance at points shown in the illustration.
5. Repeat steps 3 to 5 to adjust the valve clearance of remaining valves.

CYLINDER HEAD AND VALVES

REMOVAL AND INSTALLATION

M1113006903407



Removal steps

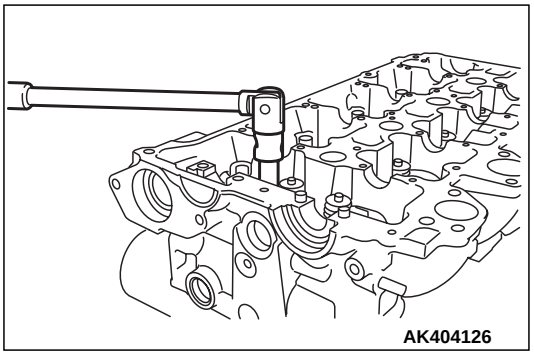
<<A>> >>D<< 1. Cylinder head bolt
2. Cylinder head bolt washer
3. Cylinder head assembly
>>C<< 4. Cylinder head gasket
<<B>> >>B<< 5. Valve spring retainer lock
6. Valve spring retainer
7. Valve spring
8. Intake valve
<<B>> >>B<< 9. Valve spring retainer lock
10. Valve spring retainer
11. Valve spring

Removal steps (Continued)

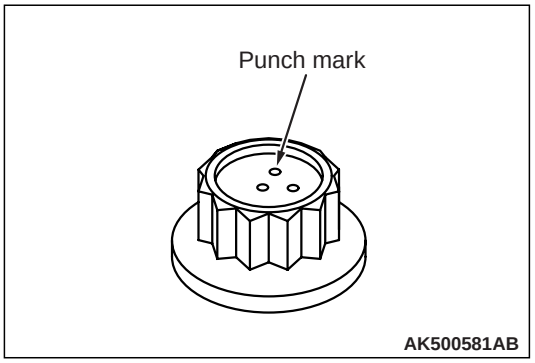
12. Exhaust valve
>>A<< 13. Valve stem seal
14. Spring seat
>>A<< 15. Valve stem seal
16. Spring seat
17. Intake valve guide
18. Exhaust valve guide
19. Exhaust valve seat
20. Intake valve seat
21. Cylinder head

REMOVAL SERVICE POINTS

<<A>> CYLINDER HEAD BOLTS REMOVAL


AK404126

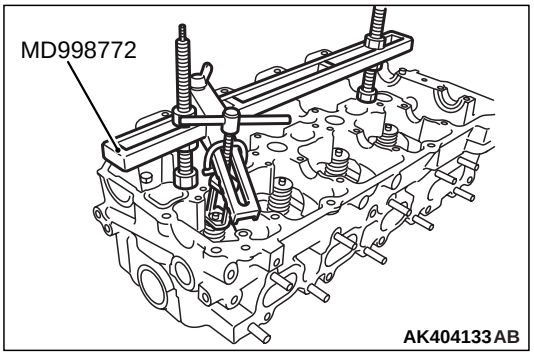
Using a 14 mm – 12 points socket wrench, loosen the cylinder head bolt. Loosen each bolt evenly, little by little, by two or three steps.



AK500581AB

⚠ CAUTION
provide one punch mark on the head of the cylinder head bolt each time the bolt is tightened. replace the bolt that already has five punch marks (the evidence of having been tightened five times)

<<B>> VALVE SPRING RETAINER LOCK REMOVAL



AK404133AB

1. Set special tool Valve spring compressor (MD998772) as illustrated to compress the valve spring. Remove the retainer lock.

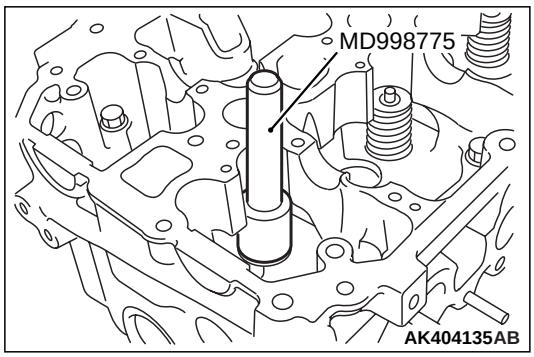
>>C<< CYLINDER HEAD GASKET INSTALLATION

2. Relieve the spring tension and remove the valve, retainer, spring, etc. Store removed valves, springs, and other parts, tagged to indicate their cylinder no. and location for assembly.

INSTALLATION SERVICE POINTS

>>A<< VALVE STEM SEAL INSTALLATION

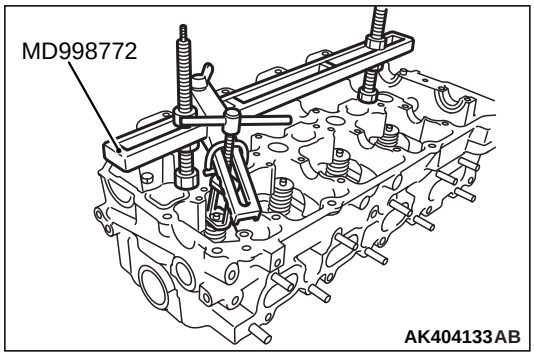
⚠ CAUTION
Do not reuse removed valve stem seals.



AK404135AB

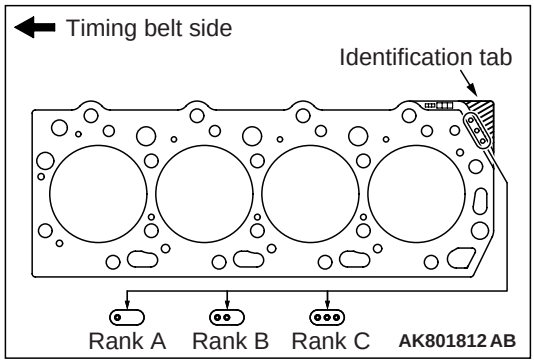
1. Install the valve spring seat.
2. The special tool Valve stem seal installer (MD998775) must be used to install the valve stem seal. Improper installation could result in oil consumption through valve guide.

>>B<< VALVE SPRING RETAINER LOCK INSTALLATION

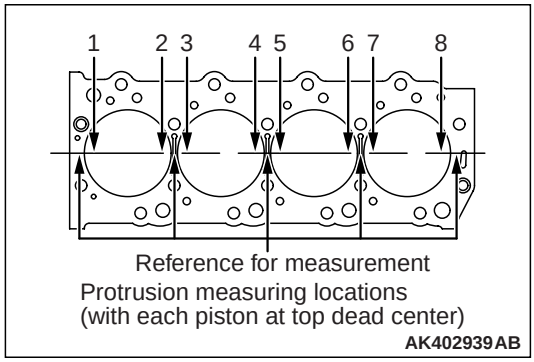


AK404133AB

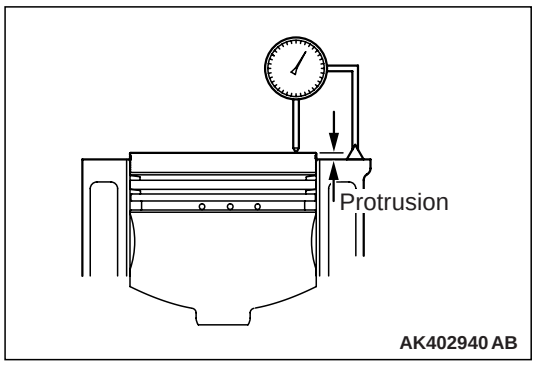
⚠ CAUTION
The valve spring, if excessively compressed, causes the bottom end of the retainer to be in contact with, and damage, the stem seal.
Compress the valve spring using the special tool Valve spring compressor (MD998772), them install the retainer lock.



1. In case any of the cylinder block, piston, connecting rod and crankshaft has not been replaced, install the gasket of the same rank as before which can be identified by the identification tab shown in the illustration at left.



2. In case any of the cylinder block, piston, connecting rod and crankshaft have been replaced, reselect and install the gasket in accordance with the following procedure.
   (1) With each piston held at the top dead center, measure its protrusion from the upper block surface at the locations shown in the illustration at left (total of eight locations). Be sure to take measurements on the crankshaft center line.



   (2) Using the average of the eight measurements, select the gasket rank (A, B or C) in accordance with the table given below. If, however, the maximum protrusion at any one location exceeds the protrusion tolerance shown for any rank in the following table, use the gasket one rank higher that rank.

<Except Euro5>

Rank	Average value of piston protrusions mm	Protrusion tolerance for each rank mm	Thickness of selected gasket (when tightened) mm	Identification tab
A	0.06 – 0.12	0.17	0.95 ± 0.04	Non-equipped
B	0.12 – 0.18	0.23	1.00 ± 0.04	
C	0.18 – 0.24	–	1.05 ± 0.04	

<Euro5>

Rank	Average value of piston protrusions mm	Protrusion tolerance for each rank mm	Thickness of selected gasket (when tightened) mm	Identification tab
A	0.16 – 0.22	0.17	1.07 ± 0.04	Equipped
B	0.22 – 0.28	0.23	1.12 ± 0.04	
C	0.28 – 0.34	–	1.17 ± 0.04	

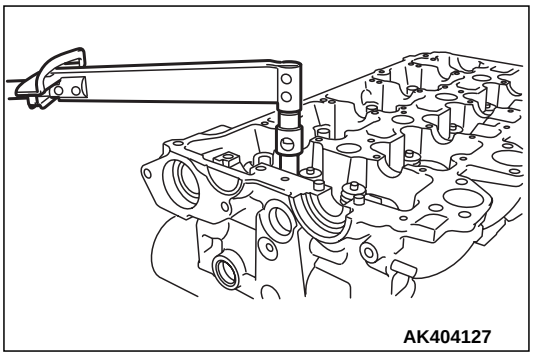
NOTE: If the piston projection exceeds the tolerance, replace the piston, connecting rod, crankshaft or cylinder block and check again.

>>D<< CYLINDER HEAD BOLT INSTALLATION

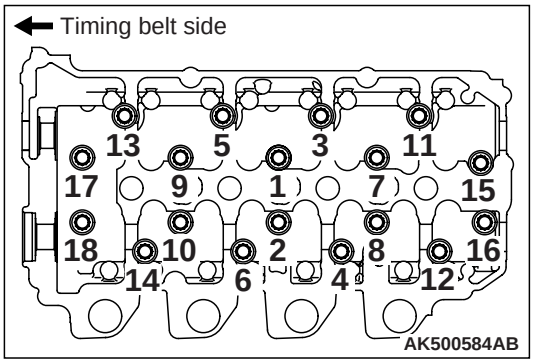
⚠ CAUTION

Before installing the cylinder head bolt, check the number of punch marks on its head. (the bolt is reusable if it is four or less.) the number of punch marks corresponds to that to times the bolt has been tightened to the plastic area. if the bolt has five punch marks, replace it.

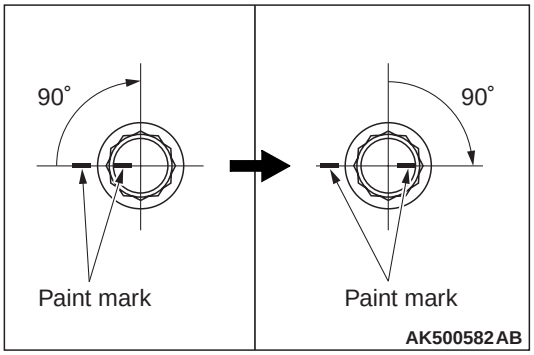
1. Set the cylinder head bolt washer with its shear droop toward the bolt head.
2. Apply engine oil to the bolt threads and washers.



NOTE: Using a 14 mm − 12 points socket wrench.



3. Tighten the bolts to 78 ± 2 N·m in the indicated sequence.
4. Loosen all the bolts completely.
5. Tighten the bolts again to a torque of 29 ± 2 N·m in the indicated sequence. After that, confirm all bolts are reached to the specified torque, and then go to the next process.



6. Make paint marks on each bolt's head and on the cylinder head.

⚠ CAUTION

- **When the tightening angle is smaller than the specified tightening angle, the appropriate tightening capacity cannot be secured.**
- **When the tightening angle is larger than the specified tightening angle, remove the bolt to start from the beginning again according to the procedure.**

7. Turn the bolts 90° in the tightening direction and in the indicated sequence.
8. Give another 90° turn in the tightening direction to each bolt, making sure that the paint mark on the bolt head and that on the cylinder head are on the same line.

INSPECTION

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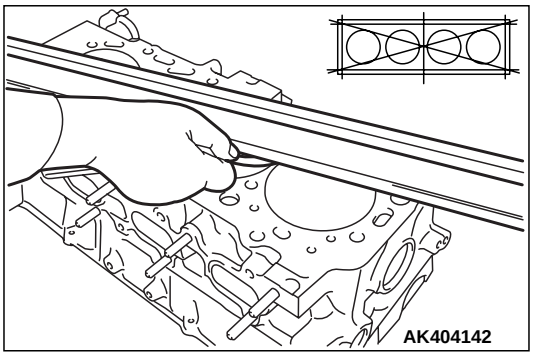
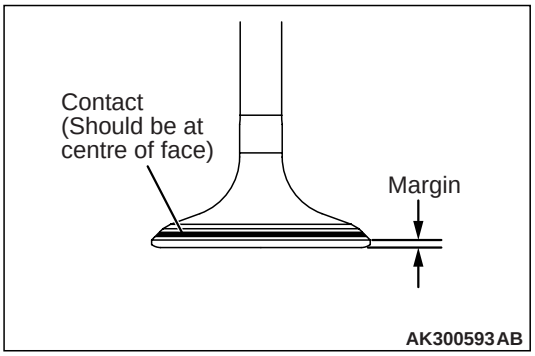
CYLINDER HEAD



Check the cylinder head gasket surface for flatness by using a straightedge in the directions of illustration.

Standard value: 0.03 mm
Limit: 0.2 mm

VALVE

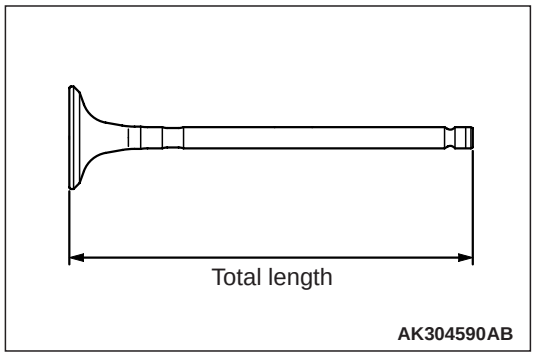


1. Check the valve face for correct contact. If incorrect, reface using valve refacer. Valve seat contact should be maintained uniform at the center of valve face.

2. If the margin is smaller than the service limit, replace the valve.

Standard value:
Intake: 1.3 mm
Exhaust: 1.5 mm

Limit:
Intake: 0.8 mm
Exhaust: 1.0 mm

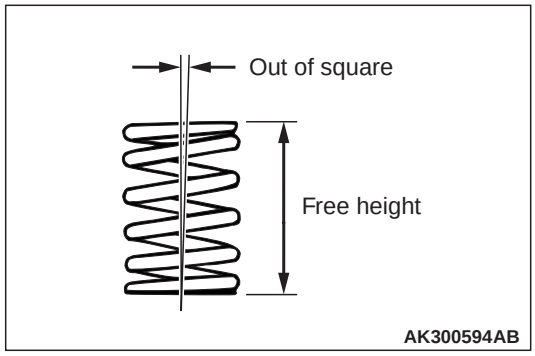


3. Measure the valves total length. If the measurement is less than the limit, replace the valve.

Standard value:
Intake: 107.58 mm
Exhaust: 107.98 mm

Limit:
Intake: 107.08 mm
Exhaust: 107.48 mm

VALVE SPRING



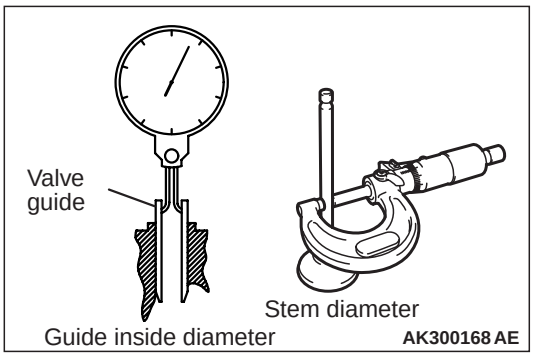
1. Measure the free height of spring and if it is smaller than the limit, replace.

Standard value: 54.3 mm
Limit: 53.3 mm

2. Measure the squareness of the spring and, if the limit is exceeded, replace.

Standard value: 2° or less
Limit: Max. 4°

VALVE GUIDE

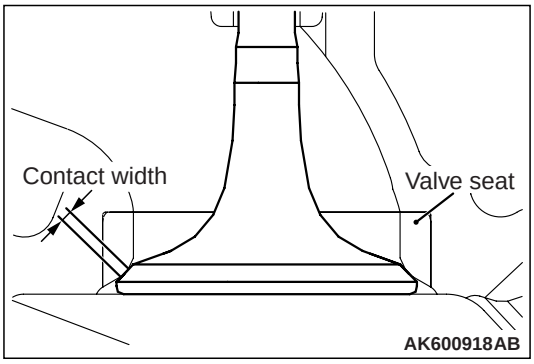


Measure the clearance between the valve guide and valve stem. If the limit is exceeded, replace the valve guide or valve, or both.

Standard value:
Intake: 0.020 – 0.047 mm
Exhaust: 0.035 – 0.062 mm

Limit:
Intake: 0.10 mm
Exhaust: 0.15 mm

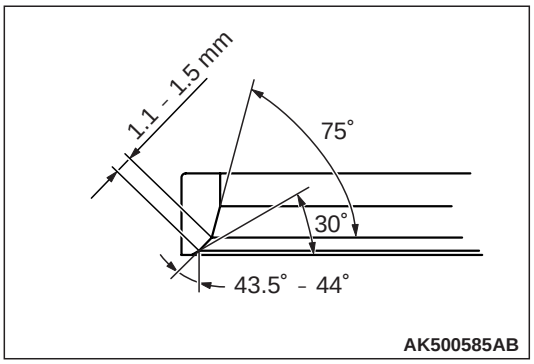
VALVE SEAT



Assemble the valve, then measure the contact width. If the measurement exceeds the specified limit, replace the valve seat.

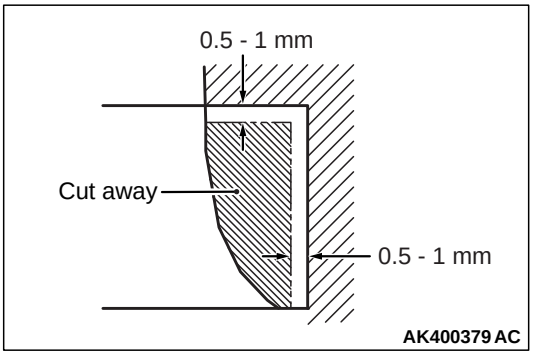
Standard value: 1.1 – 1.5 mm

VALVE SEAT RECONDITIONING PROCEDURE

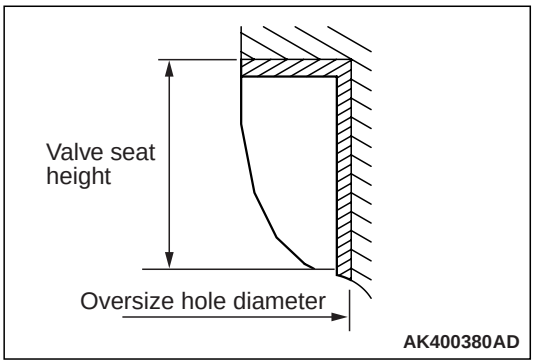


1. Before correcting the valve seat, check for clearance between the valve guide and valve and, if necessary, replace the valve guide.
2. Using the seat grinder, correct to obtain the specified seat width and angle.
3. After correction, valve and valve seat should be lapped with a lapping compound.

VALVE SEAT REPLACEMENT PROCEDURE



1. Cut the valve seat to be replaced from the inside to thin the wall thickness. Then, remove the valve seat.



2. Rebore the valve seat hole in cylinder head to the oversize valve seat diameter.

   Intake valve seat hole diameter:
   0.30 O.S.: 33.300 – 33.325 mm

   Exhaust valve seat hole diameter:
   0.30 O.S.: 29.300 – 29.321 mm

3. When the valve sheet is a press fit, engine oil is applied to the valve sheet or the cylinder head not to damage the inside diameter of the cylinder head.
4. Using valve seat cutter, correct the valve seat to the specified width and angle.

   See "VALVE SEAT RECONDITIONING PROCEDURE."

VALVE GUIDE REPLACEMENT PROCEDURE

1. Force out the valve guide toward the cylinder block using a press.

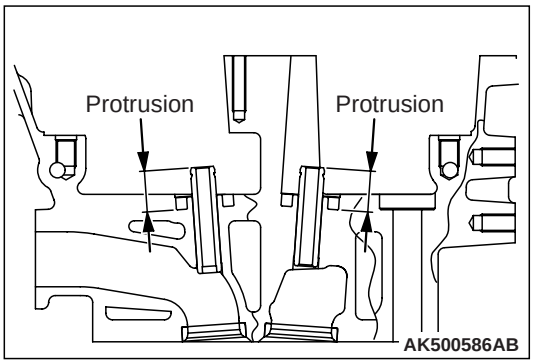
⚠ CAUTION

Do not use a replacement valve guide of the same size as the removed one.

2. Machine the valve guide hole in the cylinder head to the size matched to the selected oversize valve guide.

   Valve guide hole diameter:
   0.05 O.S.: 11.050 – 11.068 mm

   NOTE: Do not install a valve guide of the same size again.



3. Press-fit the valve guide until it remains protruded above the cylinder head by the amount indicated in the illustration.

   Protrusion: 18.3 – 18.9 mm

   NOTE: Press the valve guide from above the cylinder head.

   NOTE: The valve guides for the intake valves are different in length from those for the exhaust valves (45.2 mm for intake valves; 48.2 mm for exhaust valves)

4. After installing the valve guide, insert a new valve in it to check for smooth movement.

OIL PAN AND OIL PUMP

REMOVAL AND INSTALLATION

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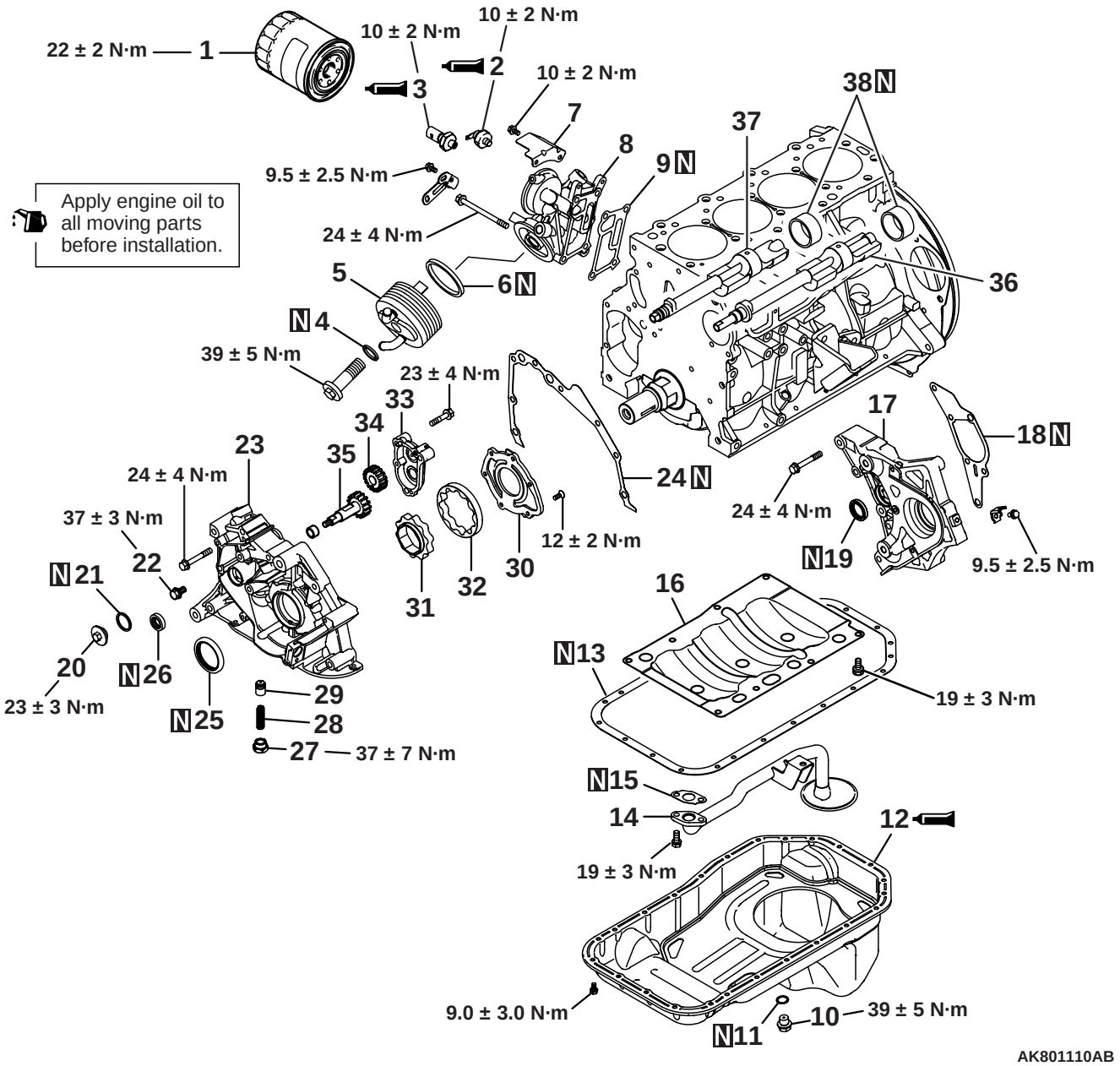


AK801110AB

Removal steps

- >>M<< 1. Oil filter
- <<A>> >>L<< 2. Oil pressure switch <Except Euro5>
- >>K<< 3. Oil pressure switch <Euro5>
- 4. O-ring
- >>J<< 5. Oil cooler
- 6. O-ring
- 7. Heat protector <Except Euro5>
- 8. Oil filter bracket
- 9. Oil filter bracket gasket
- 10. Oil drain plug
- >>I<< 11. Oil drain plug gasket
- <<B>> >>H<< 12. Oil pan
- >>H<< 13. Oil pan gasket*

Removal steps (Continued)

- 14. Oil screen
- 15. Oil screen gasket
- 16. Stiffener
- 17. Front upper case
- 18. Front upper case gasket
- >>G<< 19. Front upper case oil seal
- 20. Plug cap
- 21. O-ring
- <<C>> >>F<< 22. Flange bolt
- 23. Front lower case
- 24. Front lower case gasket
- >>E<< 25. Crankshaft front oil seal
- >>D<< 26. Balancer shaft oil seal
- 27. Plug

Removal steps (Continued)

28. Relief spring
29. Relief plunger
30. Oil pump cover

<<D>> >>C<< 31. Inner rotor

<<D>> >>C<< 32. Outer rotor

33. Balancer shaft gear cover

>>B<< 34. Balancer shaft driven gear

>>B<< 35. Balancer shaft drive gear

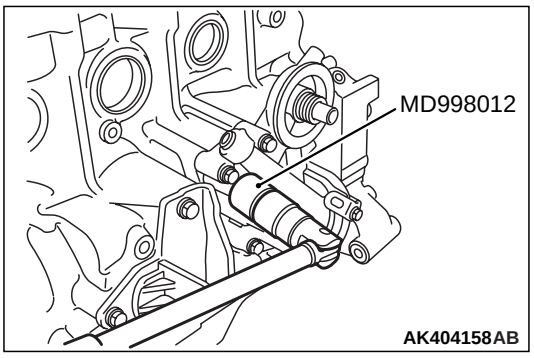
36. Balancer shaft, left
37. Balancer shaft, right

<<E>> >>A<< 38. Balancer shaft bearing

*NOTE: *:Use either an oil pan gasket or a sealant for installing the oil pan.*

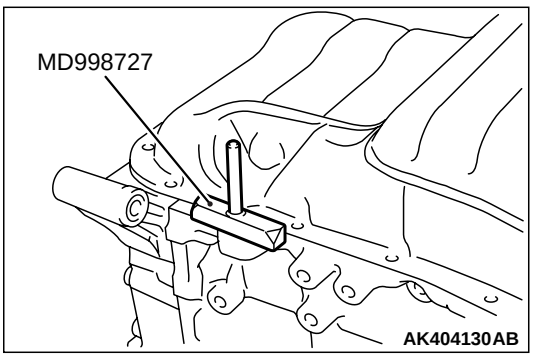
REMOVAL SERVICE POINTS

<<A>> OIL PRESSURE SWITCH REMOVAL



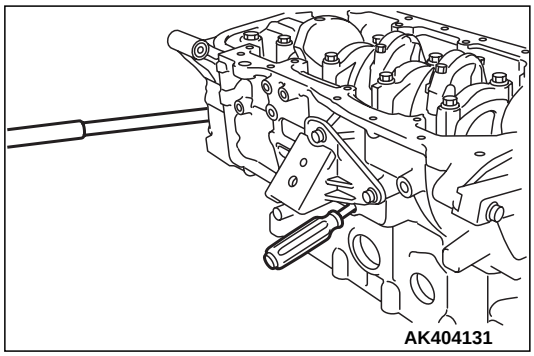
Using special tool Oil pressure switch socket wrench (MD998012), removal the oil pressure switch.

<<B>> OIL PAN REMOVAL



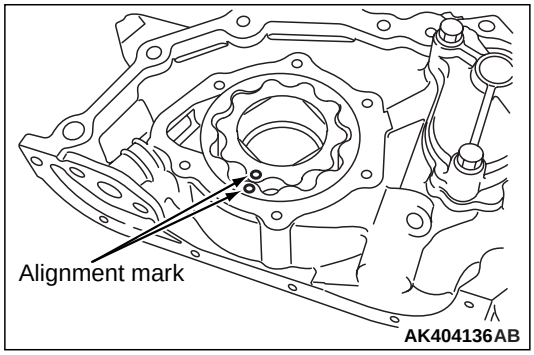
1. Knock the special tool Oil pan sealer cutter (MD998727) deeply between the oil pan and the cylinder block.
2. Hitting the side of the special tool Oil pan sealer cutter (MD998727), slide the special tool along the oil pan to remove it.

<<C>> FLANGE BOLT REMOVAL



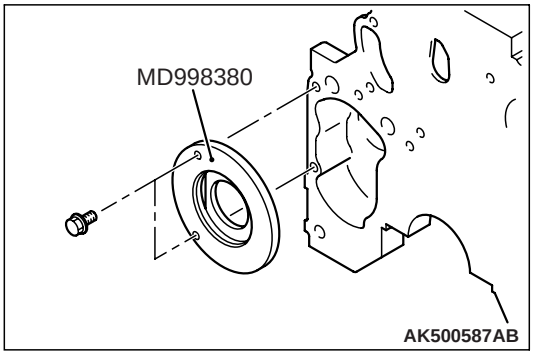
1. Remove the plug on the right side of cylinder block.
2. Insert a Phillips screwdriver into the plug hole to lock the silent shaft in position.
3. Remove the flange bolt.

<<D>> OUTER ROTOR / INNER ROTOR REMOVAL

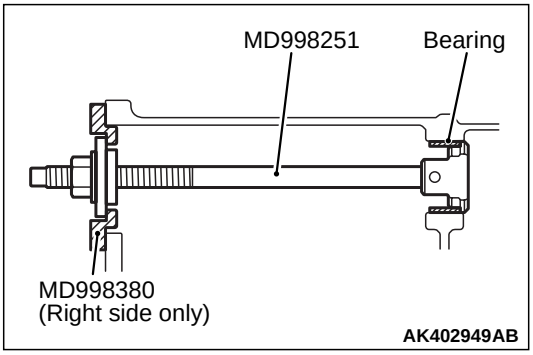


Put alignment marks on the outer and inner rotors for reference in reassembly.

<<E>> BALANCER SHAFT BEARING REMOVAL



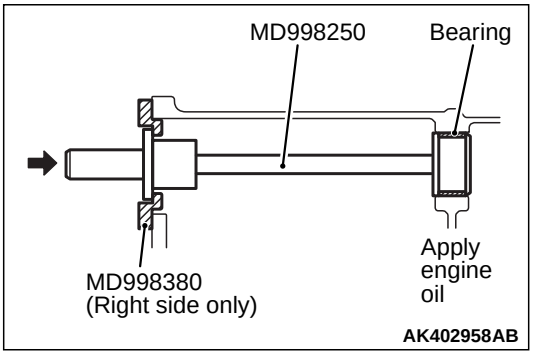
1. Install the special tool Bearing installer stopper (MD998380) to the cylinder block. This is used to hold the special tool.



2. Pull out the rear bearing from the cylinder block using the special tool Balancer shaft bearing puller (MD998251).

INSTALLATION SERVICE POINTS

>>A<< BALANCER SHAFT BEARING INSTALLATION

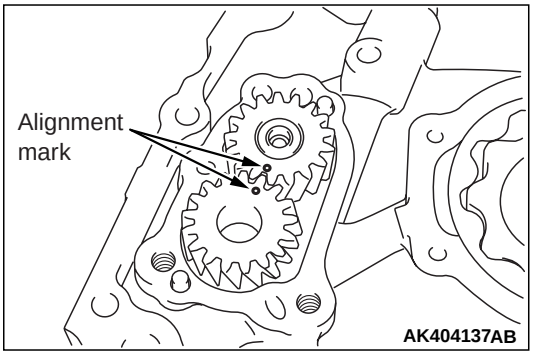


Using the special tools, press-fit the bearing into the cylinder block.
Before press-fitting the bearing, apply an ample amount of engine oil to the bearing surfaces as well as bearing hole in the cylinder block.

- Balance shaft bearing installer (MD998250)
- Bearing installer stopper (MD998380)

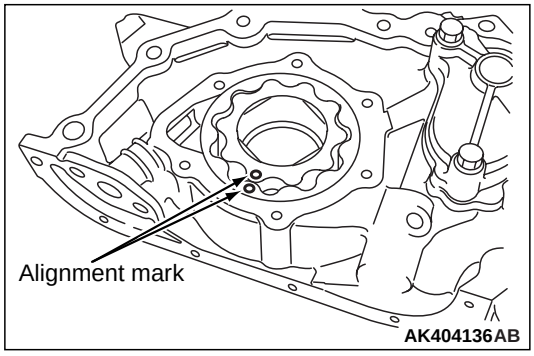
>>B<< BALANCER SHAFT DRIVE GEAR / BALANCER SHAFT DRIVEN GEAR INSTALLATION

1. Apply engine oil to the balancer shaft drive and driven gears.



2. Install the balancer shaft drive and driven gears to the front lower case. Make sure that the alignment marks are in line.

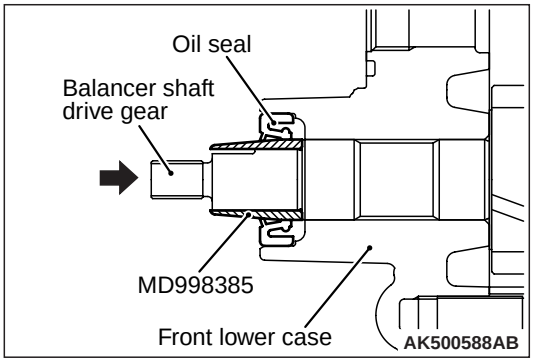
>>C<< INNER ROTOR / OUTER ROTOR INSTALLATION



Install the outer rotor in the same direction as before noting the mark put at the time of removal. Apply engine oil to the entire rotor surface.

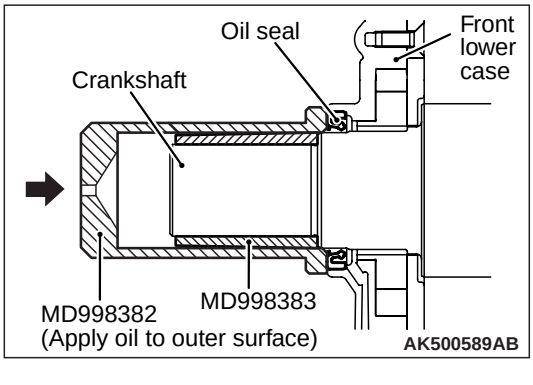
>>D<< OIL SEAL INSTALLATION

1. Apply engine oil to the oil seal outer surface.



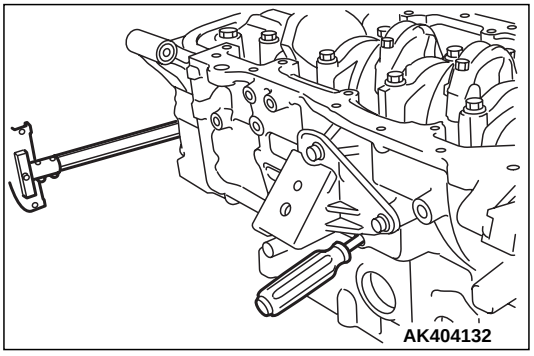
2. Using the special tool Balancer shaft drive gear oil seal guide (MD998385), drive in with a socket wrench.

>>E<< CRANKSHAFT FRONT OIL SEAL INSTALLATION



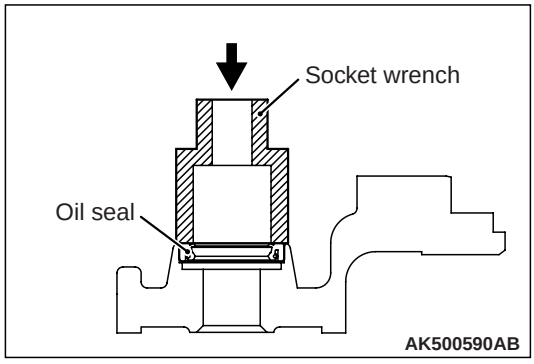
1. Attach the special tool Crankshaft front oil seal guide (MD998383) to the crankshaft and apply engine oil to the outer surface of the tool.
2. Using the special tool Crankshaft front oil seal installer (MD998382), install the front oil seal into the front lower case.

>>F<< FLANGE BOLT INSTALLATION



1. Insert a Phillips screwdriver into the plug hole to block the balancer shaft.
2. Install the flange bolt and tighten to the specification.
3. Remove the screwdriver and install the plug.

>>G<< FRONT UPPER CASE OIL SEAL INSTALLATION

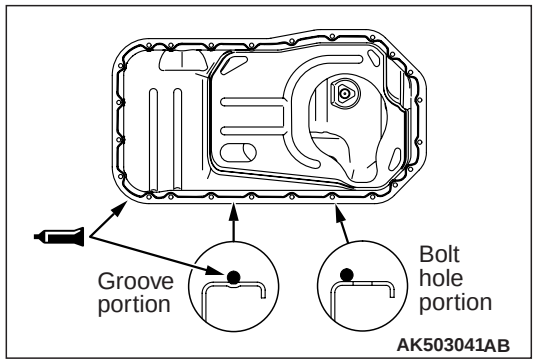


Apply engine oil to the oil seal outer surface and drive in with a socket wrench.

>>H<< OIL PAN / OIL PAN GASKET INSTALLATION

Use either an oil pan gasket or a sealant for installing the oil pan. Install the oil pan in accordance with the following procedure respectively.

<SEALANT>



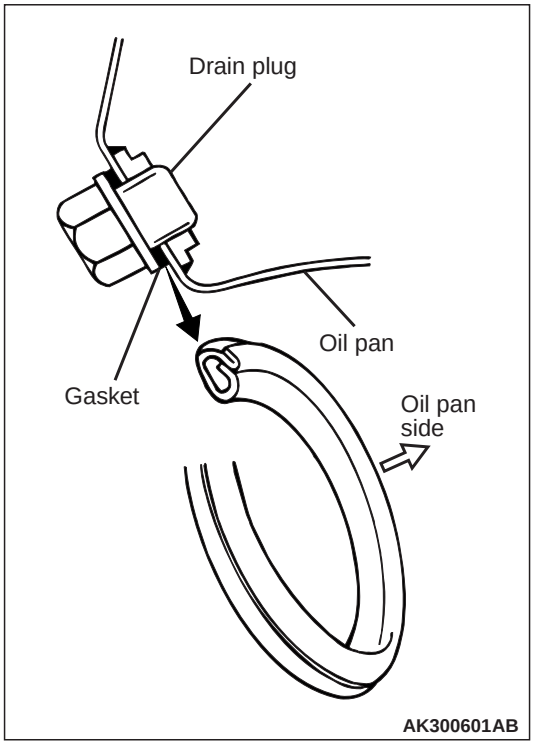
1. Clean both mating surfaces of oil pan and cylinder block.
2. Apply a 4 mm wide bead of sealant to the entire circumference of the oil pan flange.

   Specified sealant:
   Three bond 1217G or equivalent
3. The oil pan should be installed in 15 minutes after the application of sealant.

<GASKET>

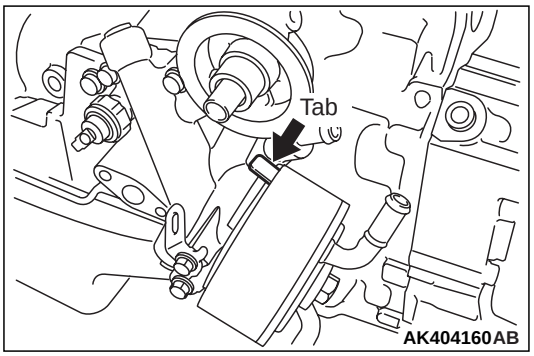
Clean both mating surfaces of oil pan and cylinder block.

>>I<< OIL DRAIN PLUG GASKET INSTALLATION



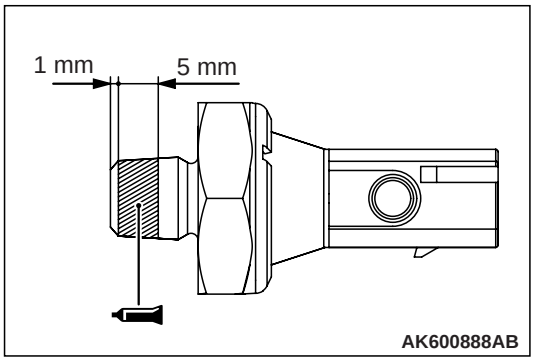
Replace the gasket with a new one and install it in the direction shown in the illustration.

>>J<< OIL COOLER SWITCH INSTALLATION



Position the tab as shown in the illustration.

>>K<< OIL PRESSURE SWITCH INSTALLATION



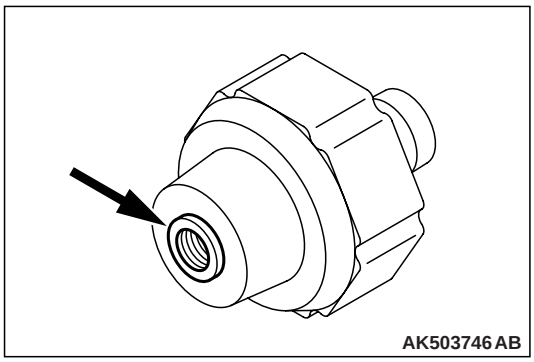
⚠ CAUTION

Use care not to allow the sealant to plug the oil passage.

Apply sealant to the threads of the switch.

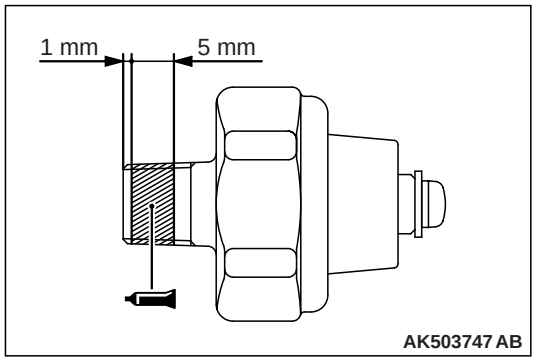
Specified sealant:
Three bond 1207F or equivalent

>>L<< OIL PRESSURE SWITCH INSTALLATION



⚠ CAUTION

This area shall be free from oil (antirust oil etc.) for switch output shall be adversely affected.

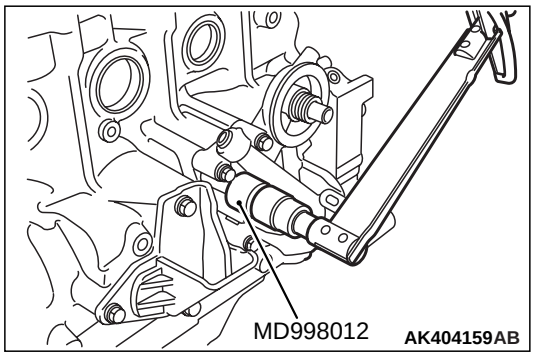


⚠ CAUTION

Use care not to allow the sealant to plug the oil passage.

1. Apply sealant to the threads of the switch.

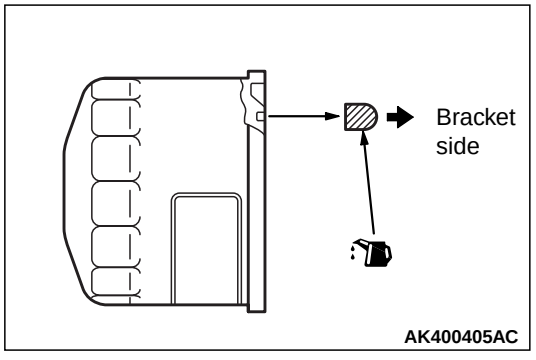
   Specified sealant:
   Three bond 1207F or equivalent



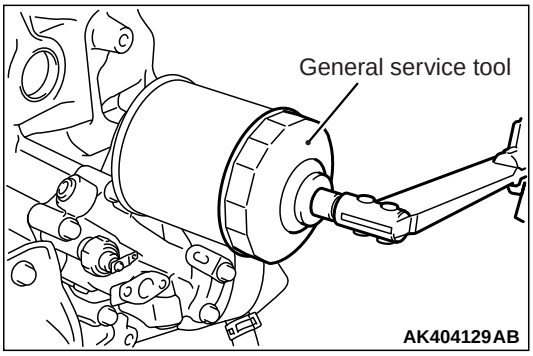
2. Using special tool Oil pressure switch socket wrench (MD998012), tighten the oil pressure switch to the specified torque.

   Tightening torque: 10 ± 2 N·m

>>M<< OIL FILTER INSTALLATION



1. Clean the filter mounting surface of the oil filter bracket.
2. Apply engine oil to the O-ring of the oil filter.



3. Using general service tool Oil filter wrench, Install the oil filter to the bracket and tighten it to the specified torque.

   Tightening torque: 22 ± 2 N·m

4. If a torque wrench cannot be used use the following procedure.
   (1) Screw in the oil filter until its o-ring contacts the oil filter bracket.
   (2) Tighten the oil filter 3/4 turn.

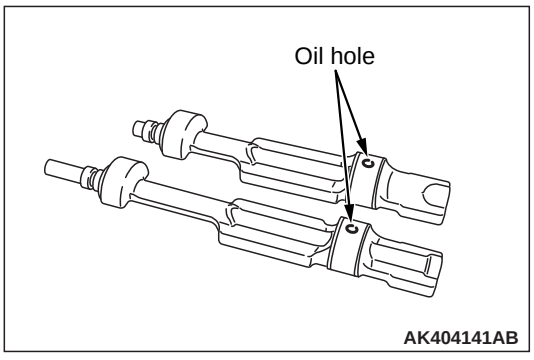
INSPECTION

M1113008200568

FRONT LOWER CASE

1. The front case parts must be free from damage and cracks.
2. Install the oil pump rotor or gear into the front case and make sure that the rotor or gear turns smoothly with no excessive play in it.
3. The front case and oil pump cover surfaces in contact with the pump rotor or gear side face must be free from ridge wear.

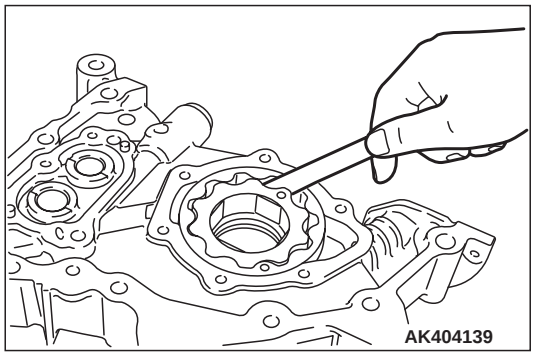
BALANCER SHAFT



1. Check oil holes must be free from clogging.
2. Check journal for size, damage, and contact with bearing. If defects are evident, replace the balancer shaft, bearing, or front case assembly.
3. Check the balancer shaft oil clearance. If wear is excessive, replace the balancer shaft bearing, balancer shaft or front case assembly.

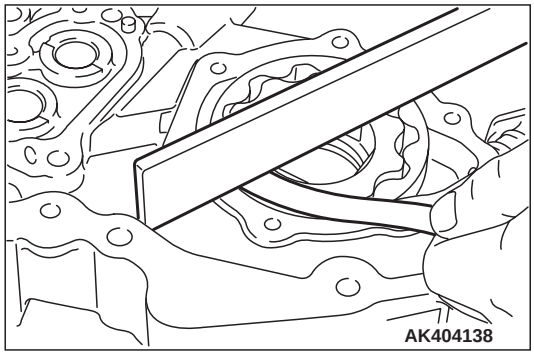
   Standard value
   Front:
   Right 0.02 – 0.05 mm
   Left 0.02 – 0.06 mm
   Rear: 0.06 – 0.10 mm

OIL PUMP



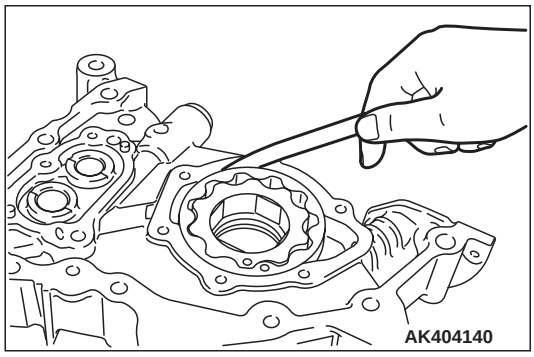
1. Install the inner and outer rotors in the front case.
2. Check the tip clearance using a thickness gauge.

   Standard value: 0.11 – 0.24 mm



3. Check the side clearance using a straight edge and a thickness gauge.

   Standard value: 0.04 – 0.10 mm



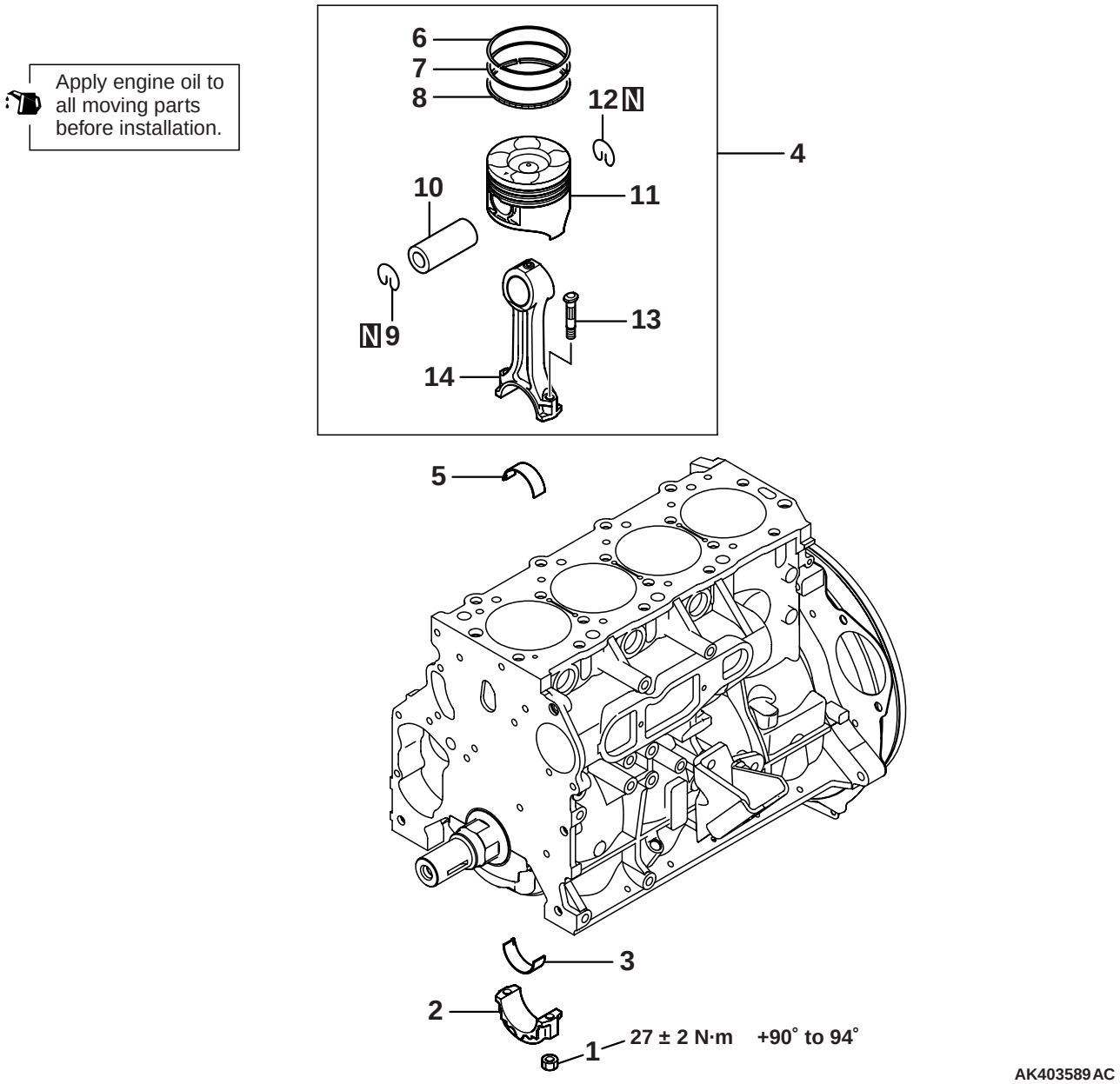
4. Check the body clearance using a thickness gauge.

   Standard value: 0.10 – 0.18 mm
   Limit: 0.35 mm

PISTON AND CONNECTING ROD

REMOVAL AND INSTALLATION

M1113008403840



Removal steps

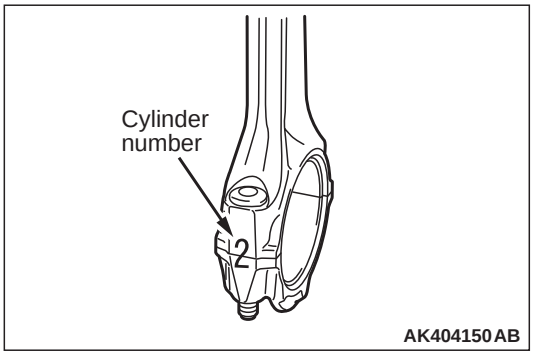
	>>**E**<<	1.	Connecting rod cap nut
<<**A**>>	>>**E**<<	2.	Connecting rod cap
		3.	Connecting rod bearing
<<**B**>>	>>**D**<<	4.	Piston and connecting rod assembly
		5.	Connecting rod bearing
	>>**C**<<	6.	Piston ring No. 1
	>>**C**<<	7.	Piston ring No. 2

Removal steps (Continued)

>>**B**<<	8.	Oil ring
>>**A**<<	9.	Snap ring
>>**A**<<	10.	Piston pin
>>**A**<<	11.	Piston
>>**A**<<	12.	Snap ring
	13.	Bolt
>>**A**<<	14.	Connecting rod

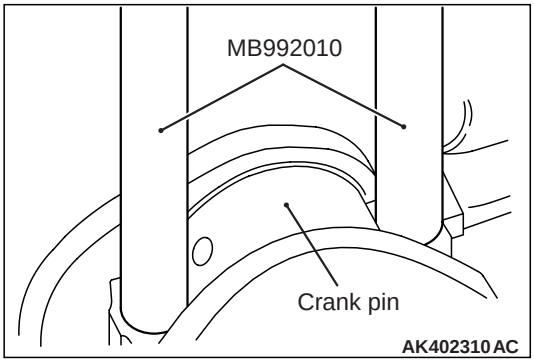
REMOVAL SERVICE POINTS

<<A>> CONNECTING ROD CAP REMOVAL



Mark the cylinder number on the side of the connecting rod big end for correct reassembly.

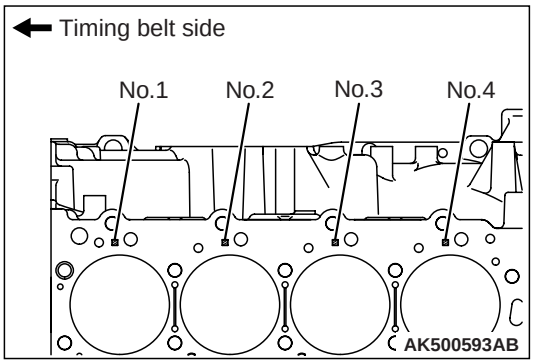
<<B>> PISTON AND CONNECTING ROD ASSEMBLY REMOVAL



1. Not to damage the crank pin, attach a special tool Bolt guide (MB992010), to the connecting rod bolt.
2. Remove the piston and connecting rod assembly from the cylinder block.

INSTALLATION SERVICE POINTS

>>A<< CONNECTING ROD / SNAP RING / PISTON PIN / PISTON INSTALLATION

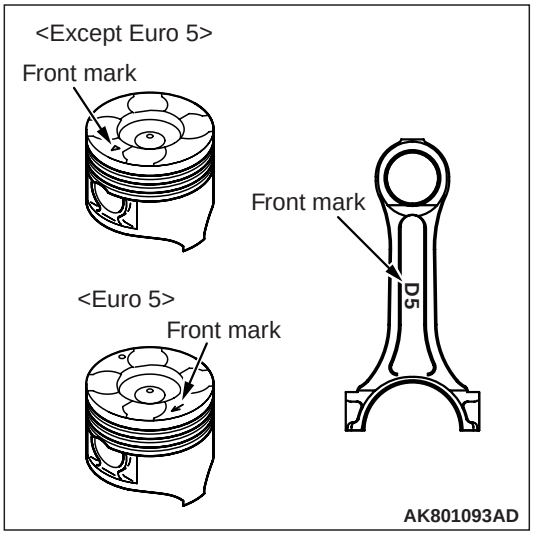


1. When replacing the piston pin, read off the cylinder bore size mark on the cylinder block as illustrated, and select a piston according to the following table.

Cylinder bore size	Piston size mark
A	A
B	None
C	C

NOTE: The piston size mark shows on the top of the piston.

2. Set the snap ring into one side of the piston pin hole.

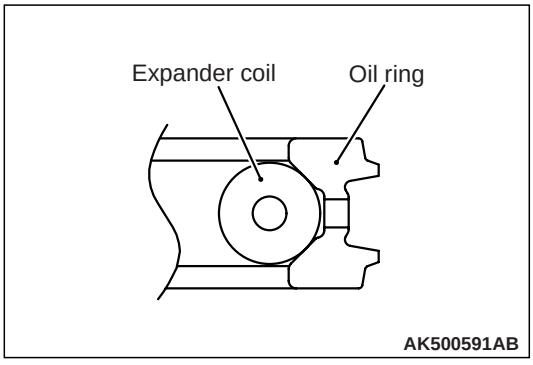


3. With the front mark of the connecting rod and that of the piston located on the same side, insert the piston pin.

   NOTE: It is difficult to fit the piston pin into the piston when they have a different temperature, Therefore, fit the piston pin into the piston when they have the same temperature.

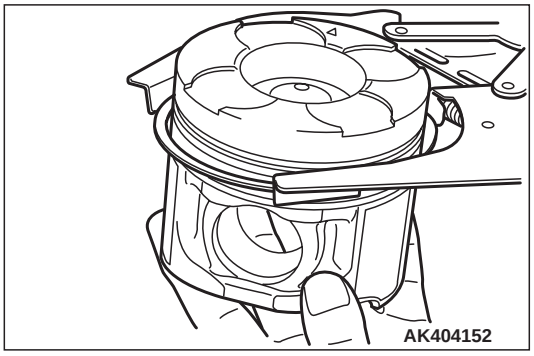
4. Set the snap ring into the other side of the piston pin hole.
5. Check that the piston moves smoothly.

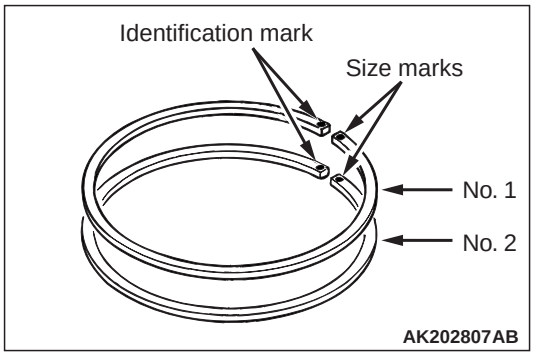
>>B<< OIL RING INSTALLATION



Install the expander coil and oil ring in the piston ring groove.

>>C<< PISTON RING NO. 1 / PISTON RING NO. 2 INSTALLATION

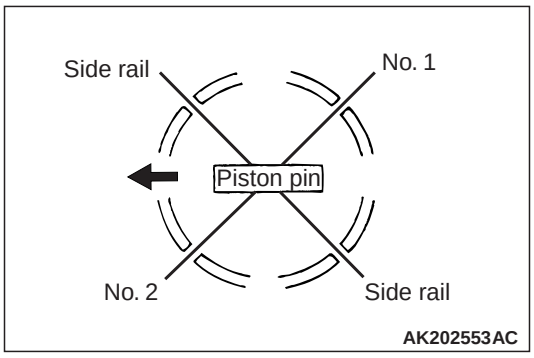




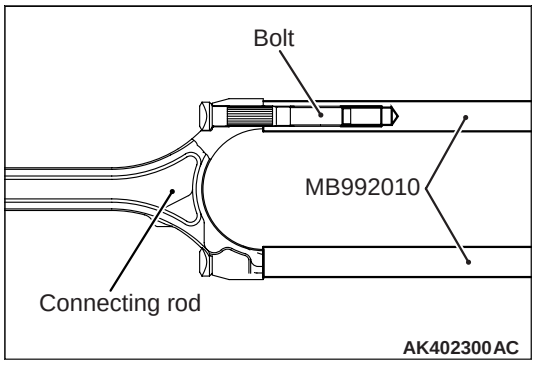
Use a piston ring expander to install the No.1 and No.2 piston rings. The ring identification mark should face upwards.

Identification marks
No. 1 ring: 1R
No. 2 ring: 2R

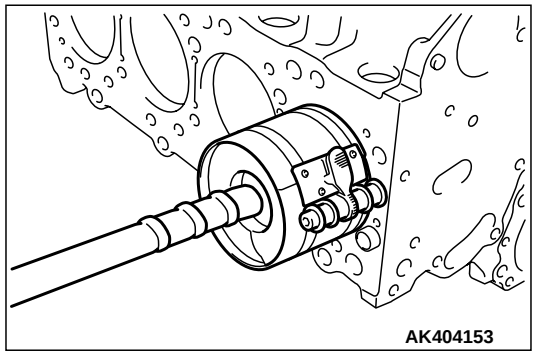
>>D<< PISTON AND CONNECTING ROD ASSEMBLY INSTALLATION



1. Liberally coat engine oil on the circumference of the piston, piston ring, and oil ring.
2. Arrange the piston ring and oil ring gaps (side rail and spacer) as shown in the figure.
3. Rotate crankshaft so that crank pin is on center of cylinder bore.



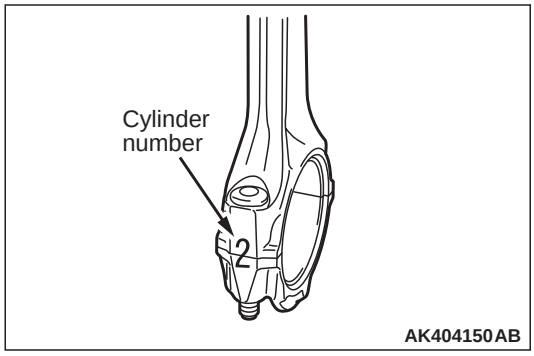
4. Not to damage the crank pin, attach a special tool Bolt guide (MB992010), to the connecting rod bolt.



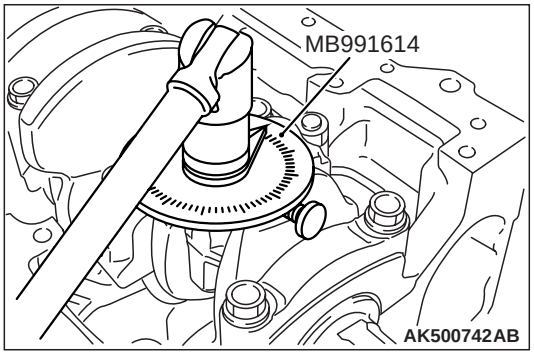
5. Use suitable thread protectors on connecting rod bolts before inserting piston and connecting rod assembly into cylinder block. Care must be taken not to nick crank pin.
6. Using a suitable piston ring compressor tool, install piston and connecting rod assembly into cylinder block.

⚠ CAUTION
Insert with the front mark on the piston head directed toward the engine front (timing belt side).

>>E<< CONNECTING ROD CAP / CONNECTING ROD CAP NUT INSTALLATION



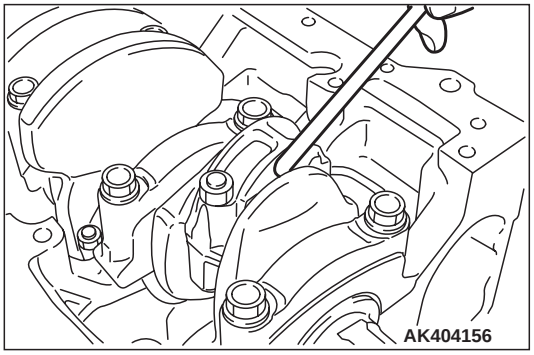
1. Verifying the mark made during disassembly, install the bearing cap to the connecting rod. If the connecting rod is new with no index mark, make sure that the bearing locking notches come on the same side as shown.
2. The connecting rod cap bolts and nuts are tightened using the torque-to-yield method. For this reason, each bolt to be reused must be checked for elongation before installation. Whether or not the bolt has been elongated can be determined by running a nut with fingers through all the threads of the bolt. If the nut does not turn smoothly over all the threads, the bolt has been elongated and must be replaced.
3. Apply engine oil to the threads and bearing surface of each nut before installation.
4. Finger-tighten the nuts on the bolts, then tighten the nuts alternately and repeatedly to install the cap properly.
5. Tighten the nuts to a torque of 27 ± 2 N·m.



6. Using the special tool Angle gauge (MB991614), tighten the connecting rod cap nut in the illustrated sequence by a further 90° to 94°.

⚠ CAUTION

- **When the tightening angle is smaller than the specified tightening angle, the appropriate tightening capacity cannot be secured.**
- **When the tightening angle is larger than the specified tightening angle, remove the bolt to start from the beginning again according to the procedure.**



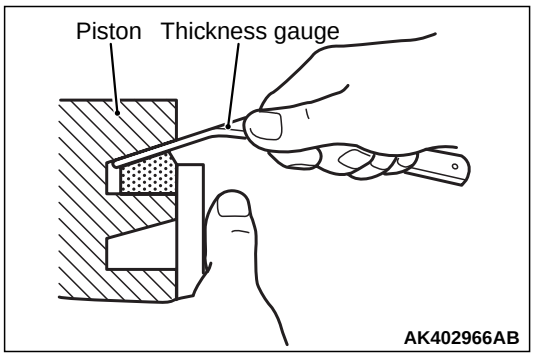
7. Make sure that connecting rod big end side clearance meets the specification.

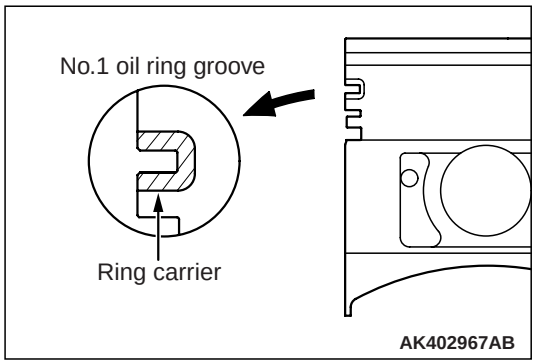
Standard value: 0.10 – 0.25 mm
Limit: 0.40 mm

INSPECTION

M1113008502651

PISTON RING



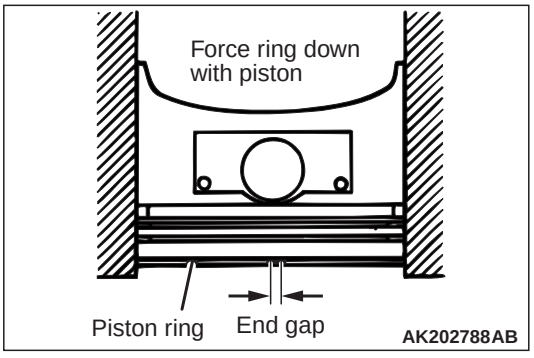


1. Check for side clearance. If the limit is exceeded, replace the ring or piston, or both.

NOTE: In cases of keystone type, measure the ring to groove clearance as shown.

Standard value:
No. 1: 0.07 – 0.10 mm
No. 2: 0.05 – 0.06 mm
Oil: 0.02 – 0.06 mm

Limit:
No. 1: 0.15 mm
No. 2: 0.15 mm
Oil: 0.10 mm

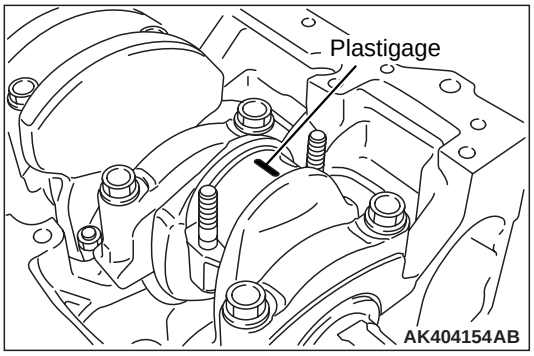


2. Insert the piston ring into cylinder bore. Force it down with a piston, its crown being in contact with the ring, to correctly position it at right angles to the cylinder wall. Then, measure the end gap with a thickness gauge. If the end gap is excessive, replace piston ring.

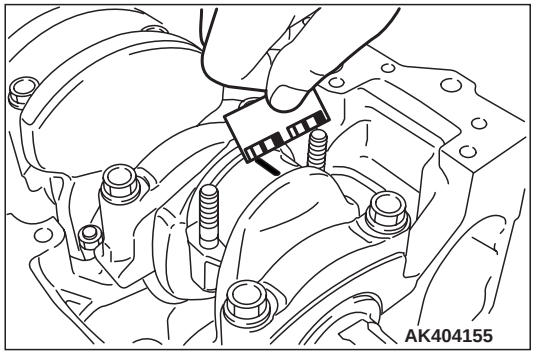
Item		Standard value mm	Limit mm
No.1	Except Euro5	0.30 – 0.45	0.8
	Euro5	0.20 – 0.30	0.8
No.2	Except Euro5	0.30 – 0.45	0.8
	Euro5	0.20 – 0.35	0.8
Oil		0.25 – 0.45	0.8

CRANKSHAFT PIN OIL CLEARANCE (PLASTIGAGE METHOD)

1. Wipe off oil from the crankshaft pin and connecting rod bearing.



2. Cut a piece of plastigage whose length is equivalent to the width of the bearing and place it on the crankshaft pin in parallel with its axis.
3. Install the connecting rod cap carefully and tighten the nuts according to INSTALLATION SERVICE POINTS >>E<< P.11B-58 .
4. Remove the nuts, then remove the connecting rod cap carefully.



5. Measure the largest width of the crushed plastigage using the ruler printed on the bag of the plastigage.

Standard value: 0.02 – 0.05 mm
Limit: 0.1 mm

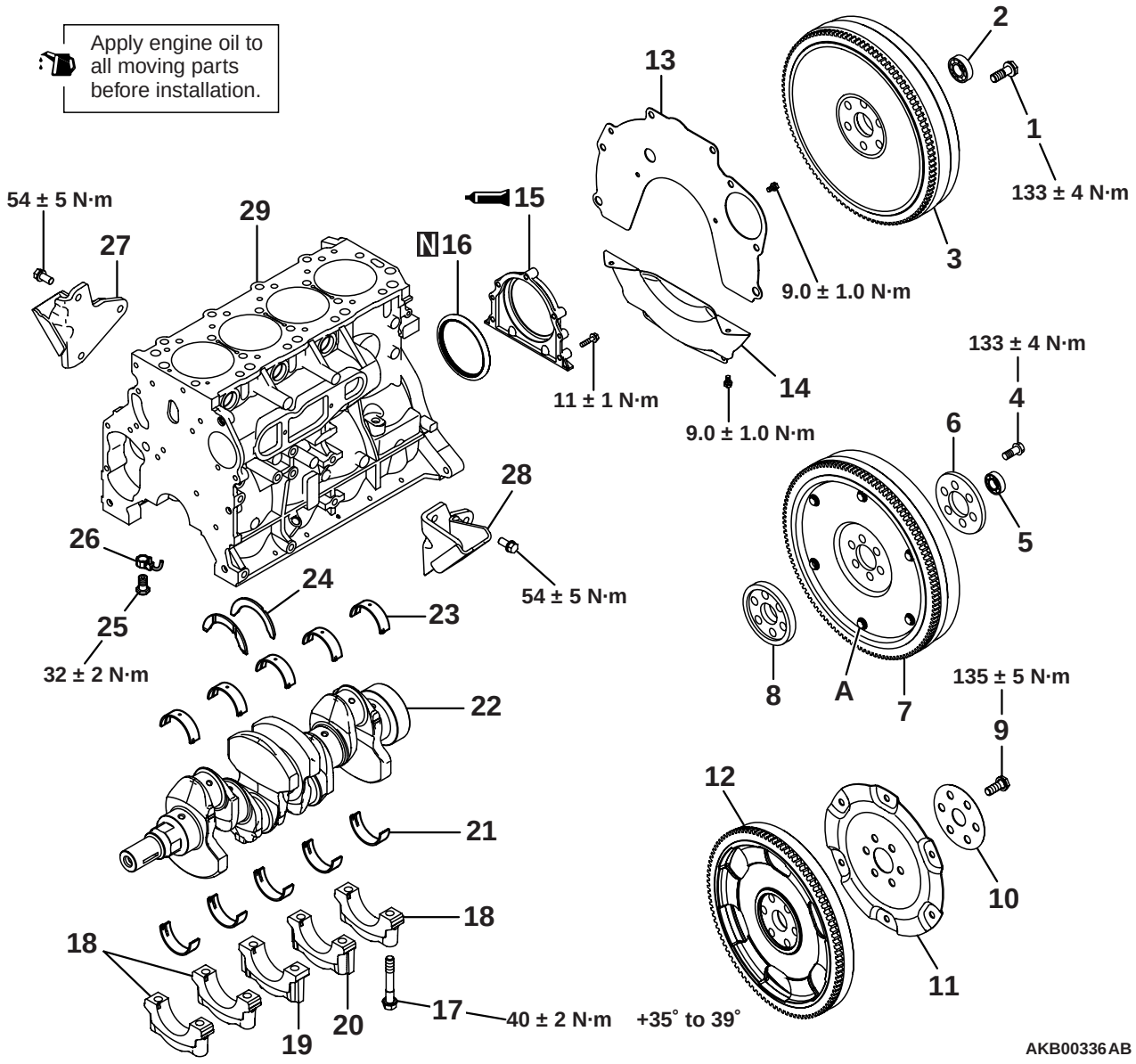
CRANKSHAFT AND CYLINDER BLOCK

REMOVAL AND INSTALLATION

M1113008704208

⚠ CAUTION

On the flexible flywheel equipped engines, do not remove any of the bolts "A" of the flywheel shown in the illustration. The balance of the flexible flywheel is adjusted in an assembled condition. Removing the bolt, therefore, can cause the flexible flywheel to be out of balance giving and resulting in damage.



Removal steps

1. Flywheel bolt (M/T−2WD)
2. Ball bearing (M/T−2WD)
3. Flywheel (M/T−2WD)
4. Flywheel bolt (M/T−4WD)
5. Ball bearing (M/T−4WD)
6. Adapter (M/T−4WD)
7. Flexible flywheel (M/T−4WD)
8. Crankshaft adapter (M/T−4WD)
9. Drive plate bolt (A/T)

Removal steps (Continued)

10. Adapter plate (A/T)
11. Drive plate (A/T)
12. Inertiar ring(A/T)
13. Rear plate
14. Bell housing cover

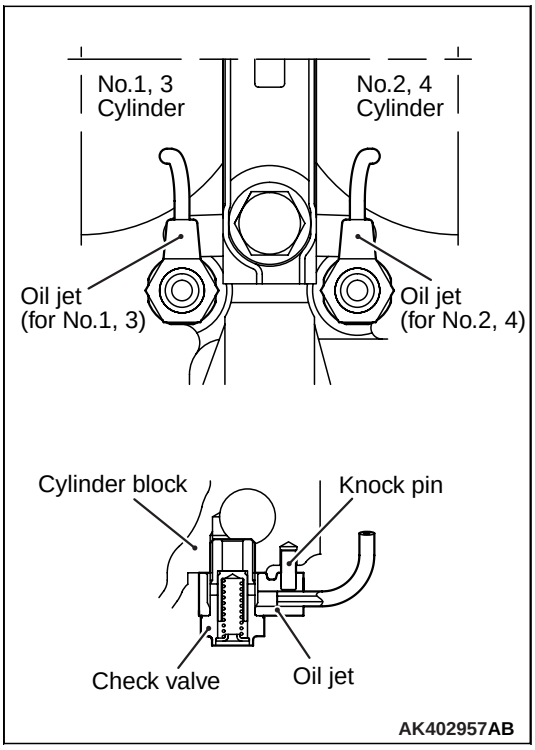
>>**E**<< 15. Oil seal case
>>**D**<< 16. Oil seal
>>**C**<< 17. Bearing cap bolt
>>**C**<< 18. Bearing cap

Removal steps (Continued)

>>C<< 19. Bearing cap No.3
>>C<< 20. Bearing cap No.4
>>B<< 21. Crankshaft bearing, lower
22. Crankshaft
>>B<< 23. Crankshaft bearing, upper
>>B<< 24. Crankshaft thrust bearing
>>A<< 25. Check valve
>>A<< 26. Oil jet
27. Engine support bracket, right
28. Engine support bracket, left
29. Cylinder block

INSTALLATION SERVICE POINTS

>>A<< OIL JET INSTALLATION

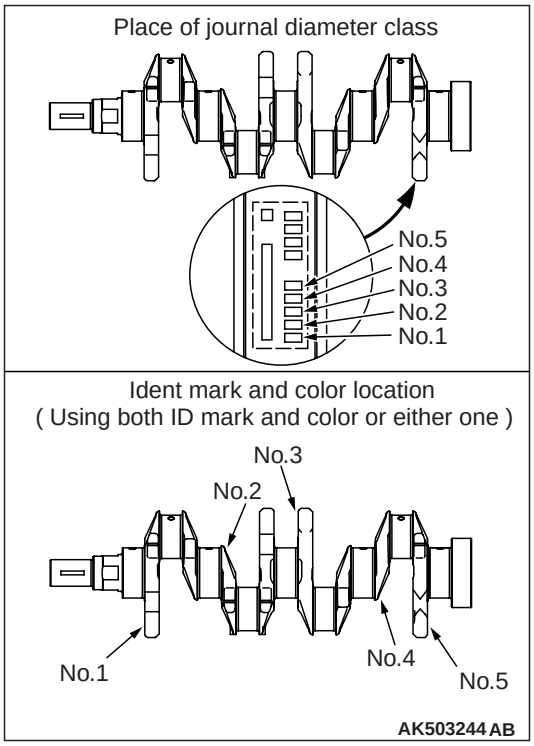


There are two types of oil jets installed.
one for No.1 and 3 and the other for N0.2 and 4.
Make sure that the correct one is installed with correct direction as shown.

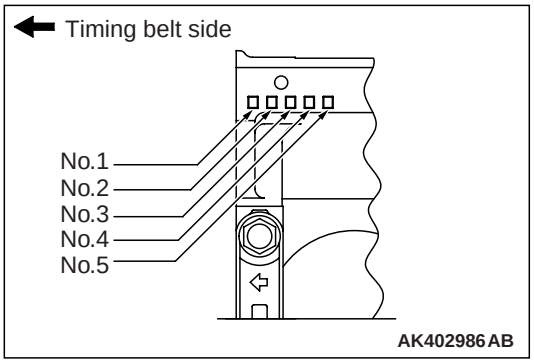
>>B<< CRANKSHAFT BEARING INSTALLATION

1. When the bearing needs replacing, select a proper bearing by the following procedure.

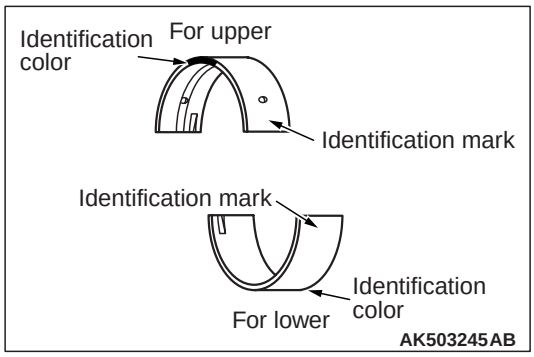
   NOTE: If the crankshaft is machined to an undersized, bearings for undersized crankshaft should be used and therefore the following selection procedure is unnecessary.



(1) Measure the crankshaft journal diameter and confirm its classification from the following table. In the case of a crankshaft supplied as a service part, identification colors and marks of its journals and painted at the positions shown in the illustration.



(2) The cylinder block bore diameter identification marks are stamped at the position shown in the illustration from front to rear beginning at No.1.



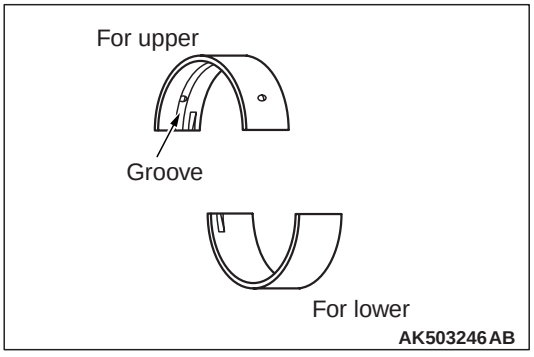
(3) Select proper bearings from the below table on the basis of the identification data confirmed under Items (1) and (2).

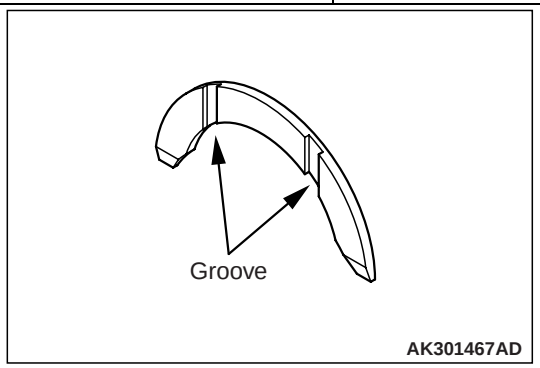
Example

a. If the measured value of a crankshaft journal outer diameter is 65.997 mm, the journal is classified as "1" or "Yellow" in the table. In case the crankshaft is also replaced by a spare part, check the identification colors of the journals painted on the new crankshaft.

b. Next, check the cylinder block bearing bore identification mark stamped on the cylinder block. If it is "A" read the "Bearing identification mark" column to find the identification mark of the bearing to be used. In this case, it is "1" or "Green"

Combination of crankshaft journal diameter and cylinder block bearing bore diameter				**Bearing identification mark**
Crankshaft journal Classification			**Cylinder block bearing bore diameter identification mark**	
Identification color or mark Using both ID (mark and color) or either one		**O.D. mm**		
1	Yellow	65.994 – 66.000	A	1 or Green
			B	2 or Yellow
			C	3 or None
2	None	65.988 – 65.994	A	2 or Yellow
			B	3 or None
			C	4 or Blue
3	White	65.982 – 65.988	A	3 or None
			B	4 or Blue
			C	5 or Red





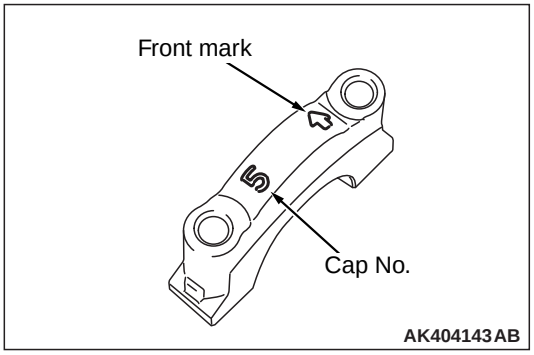
2. Crankshaft bearing
   (1) Install the bearings having an oil groove to the cylinder block.

   NOTE: The No. 3 bearing integrated with thrust bearing has no oil groove.

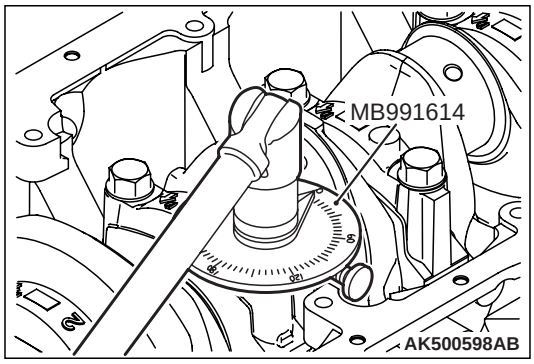
   (2) Install the bearings having no oil groove to the bearing cap.

3. Crankshaft thrust bearing installation
   (1) Install the two thrust bearing in the number 3 bearing bore in the cylinder block. For easier installation, apply engine oil to the bearings; this will help hold them in position.
   (2) The thrust bearings must be installed with their groove side toward the crankshaft web.

>>C<< BEARING CAP / BEARING CAP BOLT INSTALLATION



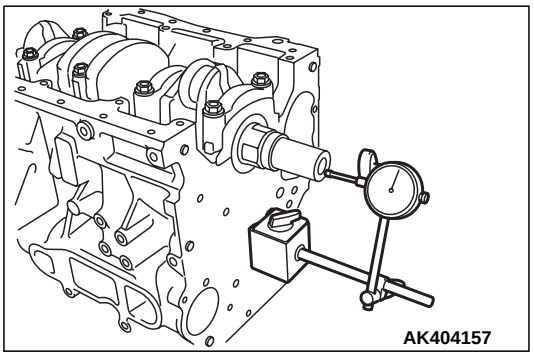
1. Install according to the front mark and cap No.
2. Apply engine oil to the threaded portion and seating face of the bolt.
3. Tighten the bearing cap bolts in the illustrated sequence to 40 ± 2 N·m.



⚠ CAUTION

- **When the tightening angle is smaller than the specified tightening angle, the appropriate tightening capacity cannot be secured.**
- **When the tightening angle is larger than the specified tightening angle, remove the bolt to start from the beginning again according to the procedure.**

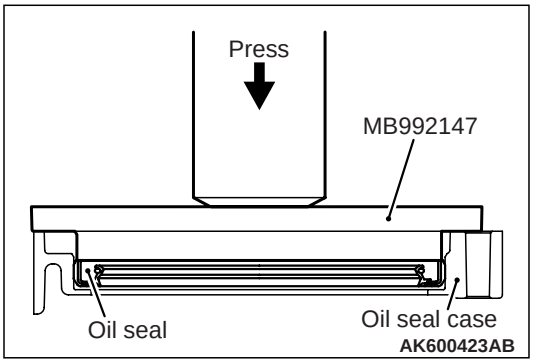
4. Using the special tool Angle gauge (MB991614), tighten the bearing cap bolts in the illustrated sequence by a further 35° to 39°.



5. After installing the bearing caps, make sure that the crankshaft turns smoothly and the end play is correct. If the end play exceeds the limit, replace crankshaft bearings.

Standard value: 0.05 – 0.25 mm
Limit: 0.45 mm

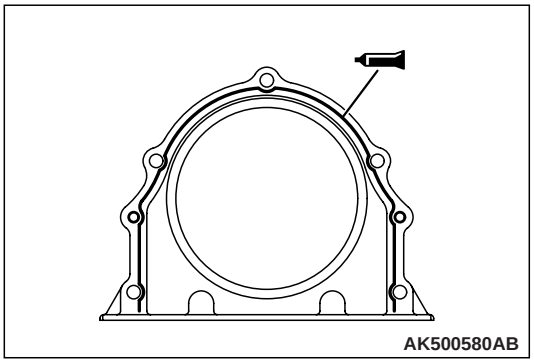
>>D<< OIL SEAL INSTALLATION



1. Apply oil to oil seal lips.
2. Using the special tool Oil seal installer (MD992147), Press and fit the oil seal into the oil seal case to have the dimension shown in the illustration.

>>E<< OIL SEAL CASE INSTALLATION

1. Remove completely old FIPG remaining on the rear oil seal case and cylinder block.



2. Apply a bead of FIPG to the surface of the rear oil seal case as shown in the drawing.

   Specified sealant:
   Three bond 1217G or equivalent

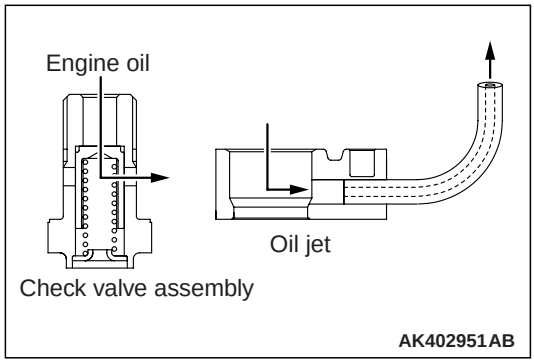
   NOTE: Be sure to install the case quickly while the sealant is wet (within 15 minutes).
3. Install the oil seal into the cylinder block after applying an appropriate amount of engine oil to the entire circumference of its lip portion.
4. Install the rear oil seal case by tightening its bolts to 11 ± 1 N·m.

NOTE: After installation, keep the sealed area away from the oil for approximately one hour.

INSPECTION

M1113008802759

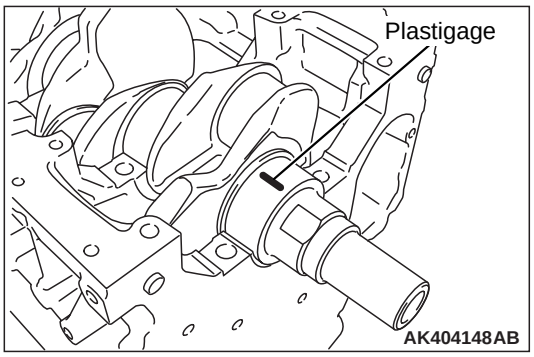
OIL JET / CHECK VALVE



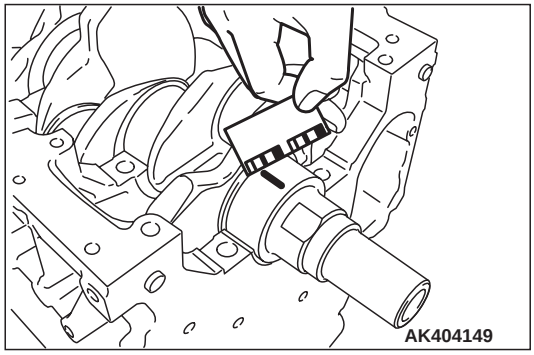
The inspection procedure for this oil jet is the same as for the conventional oil jet.

CRANKSHAFT OIL CLEARANCE (PLASTIGAGE METHOD)

The crankshaft oil clearance can be measured easily by using a plastigage, as follows.



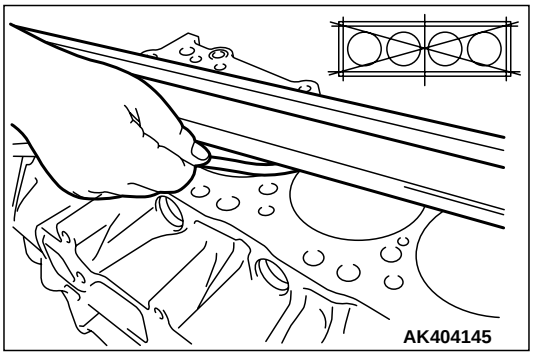
1. Remove oil and grease and any other foreign matters from crankshaft journal and bearing inner surface.
2. Install the crankshaft.
3. Cut the plastigage to the same length as the width of bearing and place it on journal in parallel with its axis.
4. Gently place the crankshaft bearing cap over it and tighten the bolts to the specified torque.
5. Remove the bolts and gently remove the crankshaft bearing cap.



6. Measure the width of the smashed plastigage at its widest section by using a scale printed on the plastigage bag.

   Standard value: 0.02 – 0.03 mm
   Limit: 0.1 mm

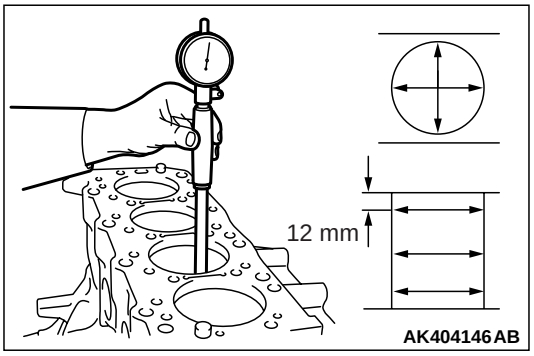
CYLINDER BLOCK



1. Using a straightedge and thickness gauge, check the block top surface for warpage. Make sure that the surface is free from gasket chips and other objects.

   Standard value: 0.05 mm
   Limit: 0.1 mm

2. If the distortion is excessive, replace the cylinder block.



3. Check cylinder walls for scratches and size. If defects are evident, replace the cylinder block.

4. Using cylinder gauge, measure the cylinder bore, and cylindricity. If worn badly, replace the cylinder block. Measurement points are shown in illustration.

Standard value:
Cylinder I.D. 91.10 – 91.13 mm
Cylindricity 0.02 mm

GROUP 12

ENGINE LUBRICATION

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ENGINE OIL COOLER 12-10

ENGINE OIL COOLER REMOVAL AND INSTALLATION 12-10

GENERAL INFORMATION

M1121000101242

The lubrication method is a fully force-fed, full-flow filtration type. Water-cooled oil cooler built into the oil filter bracket have been adopted.

ENGINE OILS

HEALTH WARNING

Prolonged and repeated contact with mineral oil will result in the removal of natural fats from the skin, leading to dryness, irritation and dermatitis. In addition, used engine oil contains potentially harmful contaminants which may cause skin cancer. Adequate means of skin protection and washing facilities must be provided.

RECOMMENDED PRECAUTIONS

The most effective precaution is to adapt working practices which prevent, as far as practicable, the risk of skin contact with mineral oils, for example by using enclosed systems for handling used engine oil and by degreasing components, where practicable, before handling them. Other precautions:

- Avoid prolonged and repeated contact with oils, particularly used engine oils.
- Wear protective clothing, including impervious gloves where practicable.
- Avoid contaminating clothes, particularly underpants, with oil.
- Do not put oily rags in pockets, the use of overalls without pockets will avoid this.
- Do not wear heavily soiled clothing and oil-impregnated foot-wear. Overalls must be cleaned regularly and kept separate from personal clothing.
- Where there is a risk of eye contact, eye protection should be worn, for example, chemical goggles or face shields; in addition an eye wash facility should be provided.
- Obtain first aid treatment immediately for open cuts and wounds.
- Wash regularly with soap and water to ensure all oil is removed, especially before meals (skin cleansers and nail brushes will help). After cleaning, the application of preparations containing lanolin to replace the natural skin oils is advised.
- Do not use petrol, kerosine, diesel fuel, gas oil, thinners or solvents for cleaning skin.
- Use barrier creams, applying them before each work period, to help the removal of oil from the skin after work.
- If skin disorders develop, obtain medical advice without delay.

SERVICE SPECIFICATION

M1121000300414

Item		Standard value
Oil pressure kPa	at idle	29 or more
	at 3,500 r/min	294 – 686

SEALANT

M1121000501262

Item	Specified sealant
Engine oil pressure switch	Three bond 1141J, Three bond 1215, Three bond 1212D, Three bond 1207F (Mitsubishi Part No. 1000A992), Three bond 1207C or equivalent

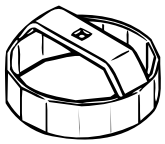
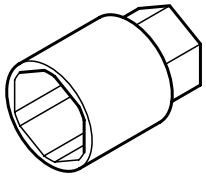
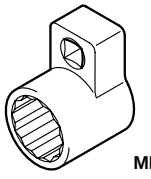
LUBRICANT

M1121000402923

Item			Vehicles without DPF	Vehicles with DPF
Engine oil ACEA classification			A1/B1, A3/B3, A3/B4 or A5/B5	C1, C2, C3 or C4
Engine oil API classification			CF-4	–
Engine oil JASO classification			–	DL-1
Engine oil quantity L	2WD with 15 inch tyres	Oil pan	6.5	
		Oil filter	0.8	
		Oil cooler	0.1	
		Total	7.4	
	2WD with 16 inch tyres, 4WD	Oil pan	5.5	
		Oil filter	0.8	
		Oil cooler	0.1	
		Total	6.4	

SPECIAL TOOLS

M1121000602433

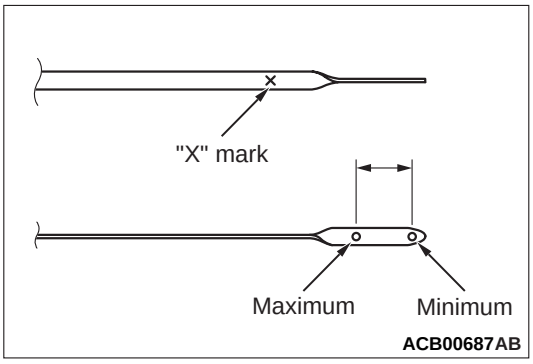
Tool	Number	Name	Use
 MH061590	MH061590	Oil filter wrench	Removal and installation of engine oil filter
	MD998012	Oil pressure switch wrench	Removal and installation of engine oil pressure switch <Except Euro5>
 MB992118	MB992118	Oil pressure switch wrench	Removal and installation of engine oil pressure switch <Euro5>

ON-VEHICLE SERVICE

ENGINE OIL CHECK

M1121000901475

⚠ CAUTION



When burning away and removing soot accumulated in the DPF, fuel can mix with the engine oil and an increase in the engine oil level may occur. This does not indicate an abnormality. However, if the engine oil level is at or over the "X" mark on the engine oil level gauge, change the engine oil <Vehicles with diesel particulate filter (DPF)>.

1. Pull out the engine oil level gauge slowly and check that the engine oil level is in the illustrated range.
2. Check that the engine oil is not excessively dirty, that there is no engine coolant or fuel mixed in, and that it has sufficient viscosity.

ENGINE OIL REPLACEMENT

M1121001003608

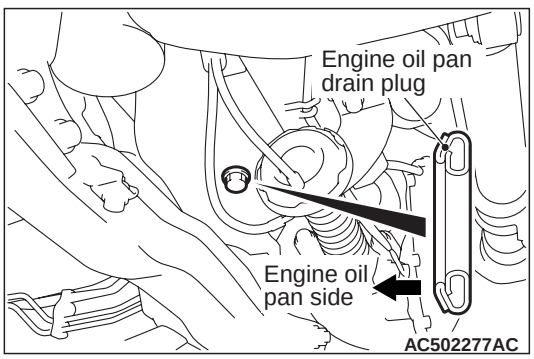
<Vehicles without diesel particulate filter (DPF)>

1. Start the engine and allow it to warm up until the temperature of the coolant reaches 80 °C to 90 °C.
2. Remove the engine oil filler cap.

⚠ WARNING

Use care as oil could be hot.

3. Remove the drain plug to drain oil.



4. Install a new drain plug gasket so that it faces in the direction shown in the illustration, and then tighten the drain plug to the specified torque.

   Tightening torque: 39 ± 5 N·m

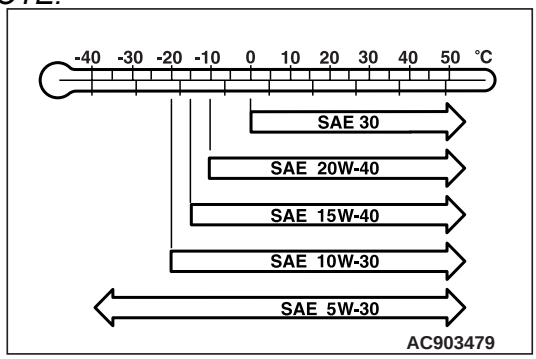
   NOTE: Install the drain plug gasket so it faces in the direction shown in the illustration.

5. Refill with specified quantity of oil.

   Specified Engine Oil
   - **ACEA classification: "For service A1/B1, A3/B3, A3/B4 or A5/B5"**
   - **API classification: "For service CF-4"**

   Total quantity (Includes volume inside oil filter and oil cooler):
   <2WD with 15 inch tyres> 7.4L
   <2WD with 16 inch tyres, 4WD> 6.4L

   NOTE:



   Select engine oil of the proper SAE viscosity number according to the atmospheric temperature.

6. Install the engine oil filler cap.
7. Check oil level.

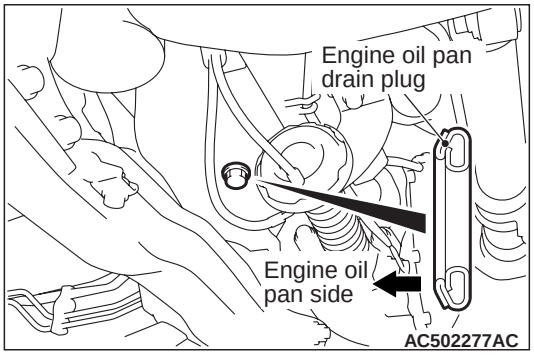
<Vehicles with diesel particulate filter (DPF)>

1. Start the engine and allow it to warm up until the temperature of the coolant reaches 80 °C to 90 °C.
2. Remove the engine oil filler cap.

⚠ WARNING

Use care as oil could be hot.

3. Remove the drain plug to drain oil.



4. Install a new drain plug gasket so that it faces in the direction shown in the illustration, and then tighten the drain plug to the specified torque.

   Tightening torque: 39 ± 5 N·m

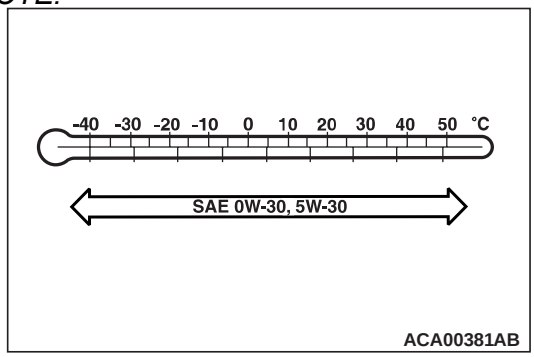
   NOTE: Install the drain plug gasket so it faces in the direction shown in the illustration.

5. Refill with specified quantity of oil.

   Specified Engine Oil
   - **ACEA classification: "For service C1, C2, C3 or C4"**
   - **JASO classification: "For service DL-1"**

   Total quantity (Includes volume inside oil filter and oil cooler):
   <2WD with 15 inch tyres> 7.4L
   <2WD with 16 inch tyres, 4WD> 6.4L

   NOTE:



   Select engine oil of the proper SAE viscosity number according to the atmospheric temperature.

6. Install the engine oil filler cap.
7. Check oil level.

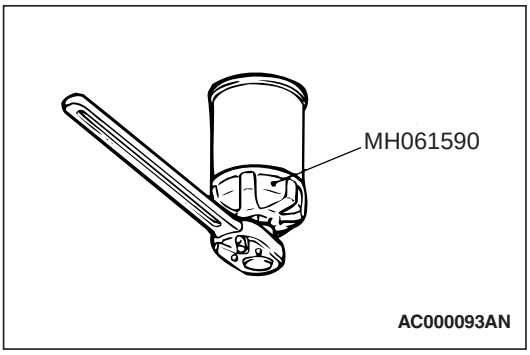
ENGINE OIL FILTER REPLACEMENT

M1121001100703

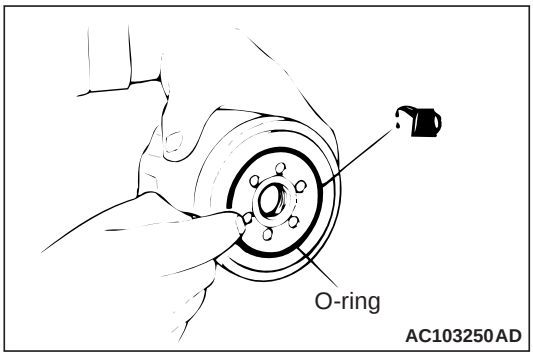
1. Start the engine and allow it to warm up until the temperature of the coolant reaches 80 °C to 90 °C.
2. Remove the engine oil filler cap.

⚠ WARNING
Use care as oil could be hot.

3. Remove the drain plug to drain oil.
4. Remove the under cover.



5. Use the special tool oil filter wrench (MH061590) to remove the engine oil filter.
6. Clean the filter bracket side mounting surface.



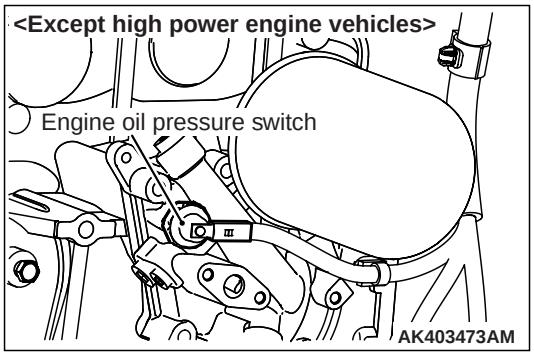
7. Apply a small amount of engine oil to the O-ring of the new oil filter.
8. Once the O-ring of the oil filter is touching the flange, use the special tool oil filter wrench (MH061590) to tighten to the specified torque.

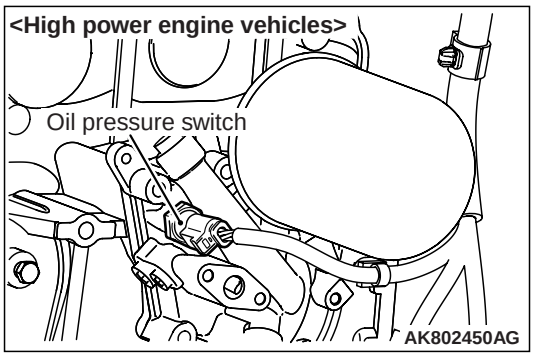
   Tightening torque: Approximately 3/4 turn (22 ± 2 N·m)

9. Install the drain plug and refill the engine oil (Refer to P.12-4).
10. Race the engine 2–3 times, and check to be sure that no engine oil leaks from installation section of the oil filter.

OIL PRESSURE CHECK

M1121002302472





1. Check engine oil quantity.
2. Remove the engine oil pressure switch (Refer to engine oil pressure switch removal and installation).
3. Install the oil pressure gauge.

   NOTE: Use an adapter of PT 1/8 thread.
4. Run the engine to warm it.
5. After the engine has been warmed up, check that oil pressure is within the standard value.

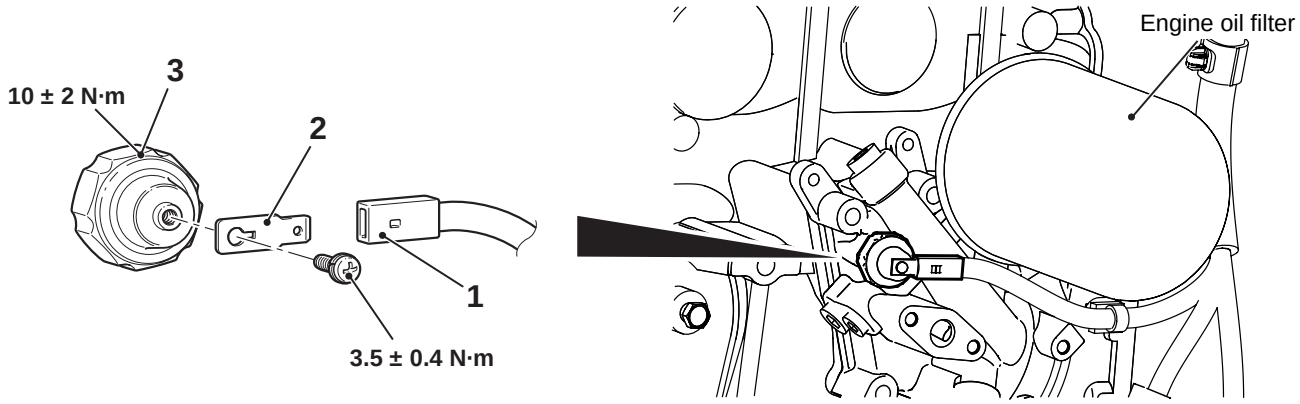
   Standard value:
   At idle: 29 kPa or more
   At 3,500 r/min: 294 – 686 kPa
6. Remove the oil pressure gauge.
7. Install the engine oil pressure switch (Refer to engine oil pressure switch removal and installation).

ENGINE OIL PRESSURE SWITCH

REMOVAL AND INSTALLATION <Except Euro5>

M1121002502078

Pre-removal Operation	Post-installation Operation
• Under Skid Plate and Engine Room Under Cover Removal (Refer to GROUP 51 – Under Cover P.51-32).	• Engine Oil Check (Refer to P.12-4). • Under Skid Plate and Engine Room Under Cover Installation (Refer to GROUP 51 – Under Cover P.51-32).



Removal steps

1. Engine oil pressure switch connector connection

Removal steps (Continued)

>>**B**<< 2. Engine oil pressure switch terminal

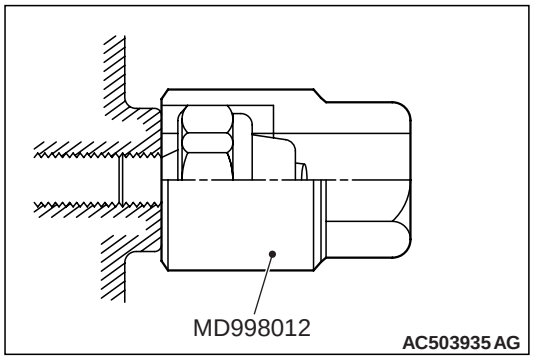
<<**A**>> >>**A**<< 3. Engine oil pressure switch

REMOVAL SERVICE POINT

<<A>> ENGINE OIL PRESSURE SWITCH REMOVAL

⚠ CAUTION

The sealant is applied to the bolt. Remove the bolt with care not to break it.

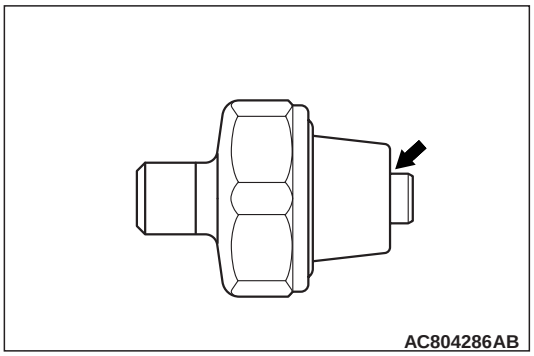


Use special tool oil pressure switch wrench (MD998012) to remove the engine oil pressure switch.

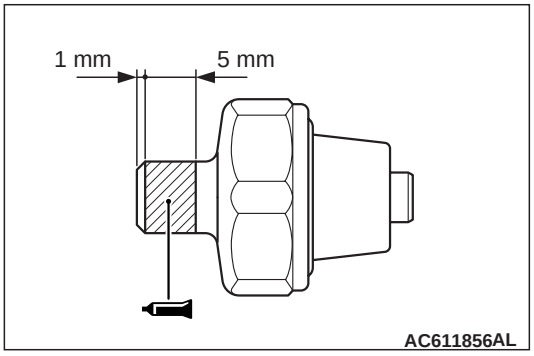
INSTALLATION SERVICE POINTS

>>A<< ENGINE OIL PRESSURE SWITCH INSTALLATION

⚠ CAUTION



Do not get any oil (rust prevention oil etc.) on the area as shown in the figure to prevent the influence of switch function.



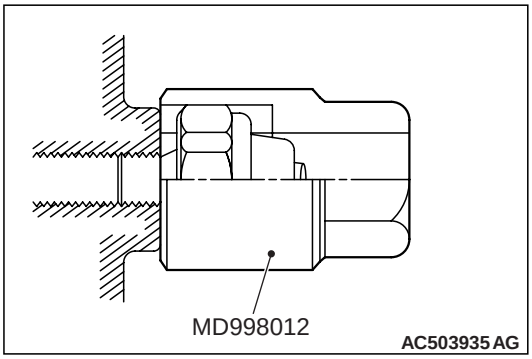
1. Apply sealant to the engine oil pressure switch thread.

   Specified sealant: Three bond 1215 or equivalent

   NOTE: Install the engine oil pressure switch immediately after applying sealant.

⚠ CAUTION

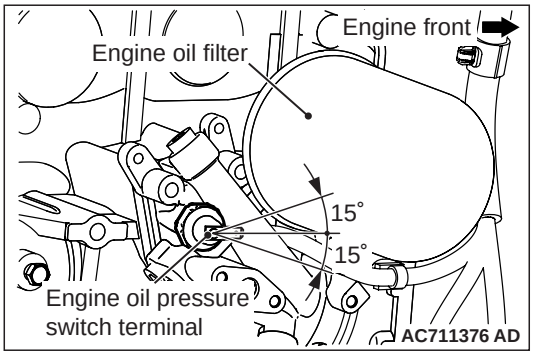
After the installation, until a sufficient period of time (one hour or more) elapses, do not apply the oil or water to the sealant application area or start the engine.



2. In the same manner as removal, use special tool oil pressure switch wrench (MD998012) to tighten the engine oil pressure switch to the specified torque.

   Tightening torque: 10 ± 2 N·m

>>B<< ENGINE OIL PRESSURE SWITCH TERMINAL INSTALLATION



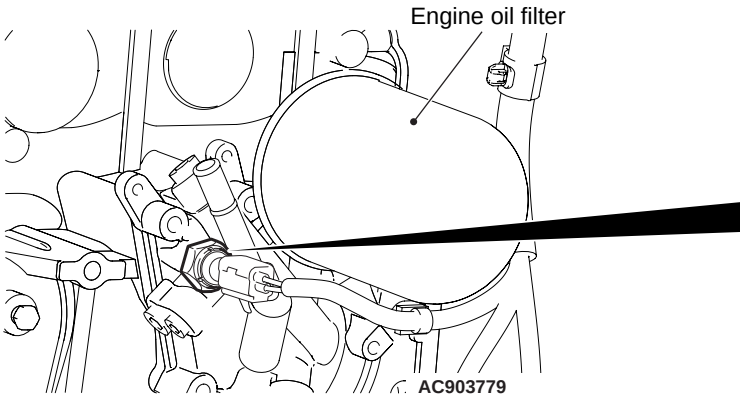
1. Install the engine oil pressure switch terminal in the direction shown in the illustration.
2. Tighten the engine oil pressure switch terminal mounting screw to the specified torque.

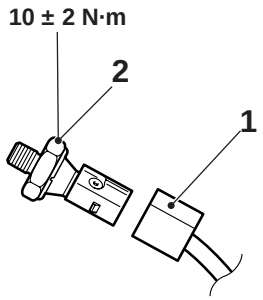
   Tightening torque: 3.5 ± 0.4 N·m

REMOVAL AND INSTALLATION <Euro5>

M1121002502089

Pre-removal Operation	Post-installation Operation
• Under Skid Plate and Engine Room Under Cover Removal (Refer to GROUP 51 – Under Cover P.51-32).	• Engine Oil Check (Refer to P.12-4). • Under Skid Plate and Engine Room Under Cover Installation (Refer to GROUP 51 – Under Cover P.51-32).





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Removal steps

1. Engine oil pressure switch connector connection

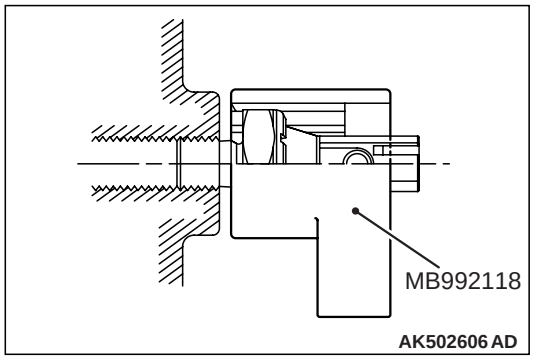
<<A>> >>A<< 2. Engine oil pressure switch

REMOVAL SERVICE POINT

<<A>> ENGINE OIL PRESSURE SWITCH REMOVAL

⚠ CAUTION

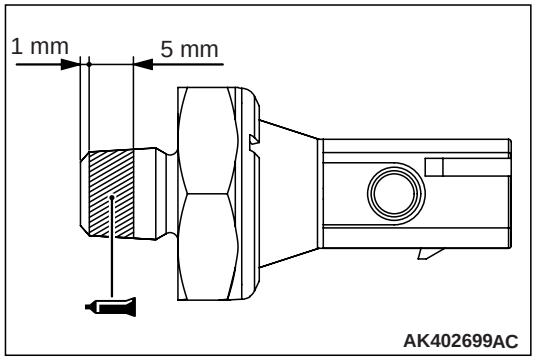
The sealant is applied to the bolt. Remove the bolt with care not to break it.



Use special tool oil pressure switch wrench (MB992118) to remove the engine oil pressure switch.

INSTALLATION SERVICE POINT

>>A<< ENGINE OIL PRESSURE SWITCH INSTALLATION



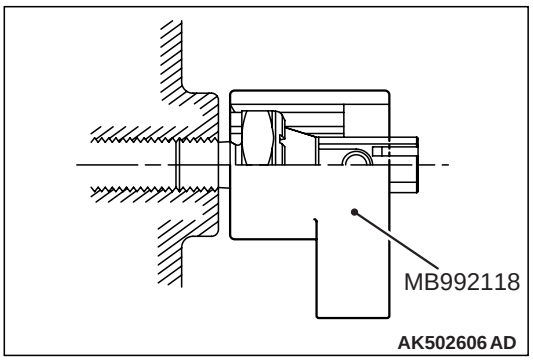
1. Apply sealant to the engine oil pressure switch thread.

   Specified sealant: Three bond 1215 or equivalent

   NOTE: Install the engine oil pressure switch immediately after applying sealant.

⚠ **CAUTION**

After the installation, until a sufficient period of time (one hour or more) elapses, do not apply the oil or water to the sealant application area or start the engine.



2. In the same manner as removal, use special tool oil pressure switch wrench (MB992118) to tighten the engine oil pressure switch to the specified torque.

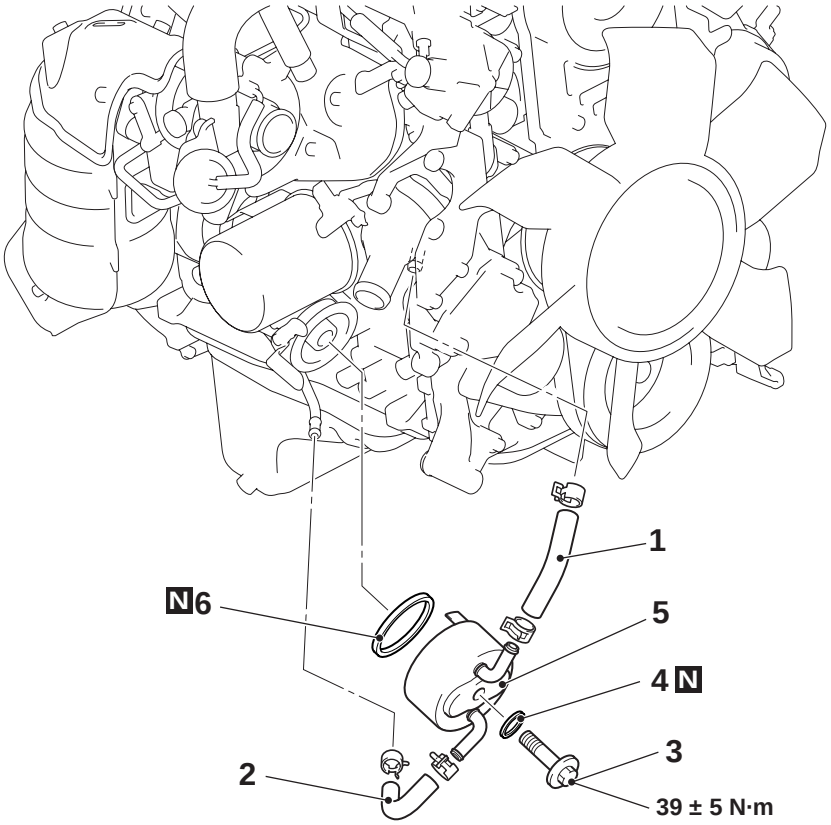
   Tightening torque: 10 ± 2 N·m

ENGINE OIL COOLER

REMOVAL AND INSTALLATION

M1121001300923

Pre-removal Operation	Post-installation Operation
• Under Skid Plate and Engine Room Under Cover Removal (Refer to GROUP 51 – Under Cover P.51-32). • Engine Coolant Draining (Refer to GROUP 14 – On-vehicle Service, Engine Coolant Replacement P.14-4). • Engine Oil Draining (Refer to P.12-4). • Alternator Removal (Refer to GROUP 16 – Charging System, Alternator P.16-13).	• Alternator Installation (Refer to GROUP 16 – Charging System, Alternator P.16-13). • Engine Coolant Refilling (Refer to GROUP 14 – On-vehicle Service, Engine Coolant Replacement P.14-4). • Engine Oil Refilling (Refer to P.12-4). • Under Skid Plate and Engine Room Under Cover Installation (Refer to GROUP 51 – Under Cover P.51-32).



AC806119AB

Removal steps

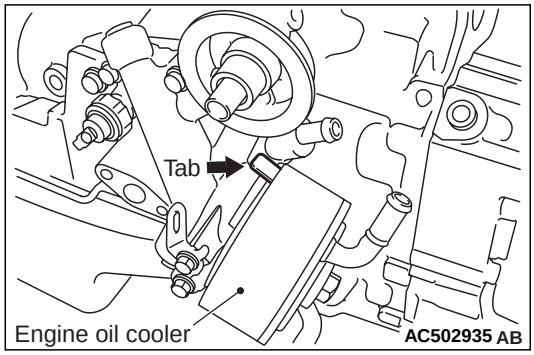
1. Water hose
2. Water hose
3. Engine oil cooler bolt
4. O-ring

>>A<< 5. Engine oil cooler

6. O-ring

INSTALLATION SERVICE POINT

>>A<< ENGINE OIL COOLER INSTALLATION



Position the tab as shown in the illustration.

GROUP 13

FUEL

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GROUP 13A

DIESEL FUEL

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CODE NO. P2147 INJECTOR COMMON 1 (CYLINDER NO. 1 AND NO. 4) CIRCUIT EARTH SHORT <Euro5> 13A-374
CODE NO. P2147 INJECTOR COMMON CIRCUIT GND SHORT <Except Euro5> 13A-378
CODE NO. P2148 INJECTOR COMMON 1 (CYLINDER NO. 1 AND NO. 4) CIRCUIT BATTERY SHORT <Euro5> 13A-383
CODE NO. P2148 INJECTOR COMMON CIRCUIT BATTERY SHORT <Except Euro5> 13A-387
CODE NO. P2149 INJECTOR COMMON 2 (CYLINDER NO.2 AND NO.3) CIRCUIT OPEN <Euro5> 13A-392
CODE NO. P2149 INJECTOR COMMON 2 (CYLINDER NO.2 AND NO.3) CIRCUIT OPEN <Except Euro5> 13A-396
CODE NO. P2150 INJECTOR COMMON 2(CYLINDER NO. 2 AND NO. 3) CIRCUIT EARTH SHORT <Euro5> 13A-399
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CODE NO. U1101 A/T-ECU TIME-OUT <A/T> 13A-421
CODE NO. U1102 ASTC-ECU TIME-OUT <Except vehicles for Morocco> 13A-422
CODE NO. U1109 ETACS TIME-OUT 13A-424
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GENERAL INFORMATION

M1133000101089

The common rail fuel injection system consists of sensors which detect the condition of the diesel engine, an engine electronic control unit (engine-ECU) which controls the system based on signals from these sensors, and actuators which operate according to control commands from the engine-ECU. The engine-ECU carries out activities such as fuel injection control and idle speed control. In addition, the engine-ECU is equipped with several self-diagnosis functions which make troubleshooting easier in the event that a problem develops.

FUEL INJECTION CONTROL

The injector drive time, the injection timing and the fuel pressure are controlled so that the appropriate quantities of fuel are supplied to the engine in response to engine conditions which can change frequently. A single injector is mounted at each cylinder. The supply pump increases the fuel pressure to the pressure which is required for high-pressure injection, and then send the fuel each injector.

IDLE SPEED CONTROL

The idle speed is kept at the optimum speed by controlling the fuel injection quantity in accordance with changes in idling conditions and engine load during idling.

The engine-ECU drives the fuel injector to keep the engine running at the pre-set idle target speed in accordance with the engine coolant temperature and A/C and other electrical load.

SELF-DIAGNOSIS FUNCTION

- When an abnormality is detected in any of the sensors or actuators, the engine warning lamp illuminates to warn the driver.
- When an abnormality is detected in any of the sensors or actuators, a diagnosis code number corresponding to the problem which occurred is output.
- The RAM data relating to the sensors and actuators which is stored in the engine-ECU can be read using the M.U.T.-III. In addition, the actuator can be force-driven under certain conditions.

OTHER CONTROL FUNCTIONS

1. Power Supply Control

When the ignition switch ON signal is input by the ignition switch, the engine-ECU turns ON the power transistor for controlling the engine control relay. As a result, current flows through the coil in the engine control relay, causing the relay switch to turn ON and supply power to the sensors and actuators.

2. Glow Control

Refer to GROUP 16
(Refer to , GROUP 16 – Glow System).

3. EGR Control

Refer to GROUP 17
[Refer to , GROUP 17 – Engine And Emission Control – Exhaust Gas Recirculation (EGR) System].

4. A/C Relay Control

Turns the compressor clutch of the A/C ON and OFF.

5. Condenser Fan Motor Relay Control

Controls the condenser fan motor relay based on the A/C switch, A/C load signal, engine coolant temperature and vehicle speed input signals.

6. PTC Heater Relay Control <Vehicle with PTC heater>

The PTC heater is turned ON is accordance with the A/C operation at the engine cold state.

7. DPF System Control <Euro5>

[Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System <Euro5> – General Information (DPF system)].

8. Variable Geometry Turbocharger Control <Euro5>

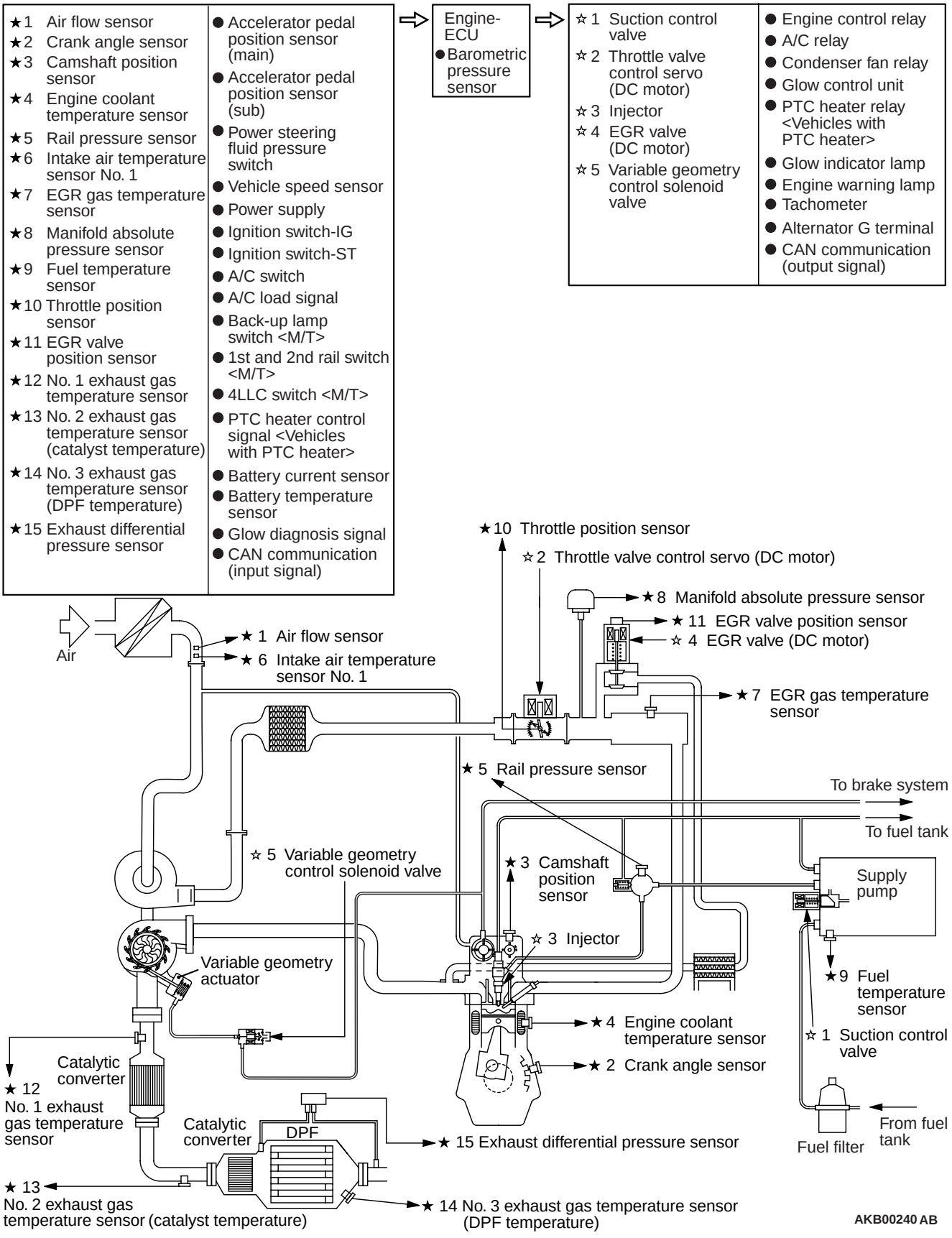
Performing the duty control over the variable geometry control solenoid valve, the engine-ECU opens and closes the nozzle vane located in the turbocharger assembly. This allows the boost pressure to be obtained in accordance with the engine operation.

9. Alternator Output Current Control <Euro5>

Prevents the alternator output current from increasing suddenly and the idle speed from varying such as when the headlamp is turned on.

FUEL INJECTION SYSTEM DIAGRAM

<Euro5>



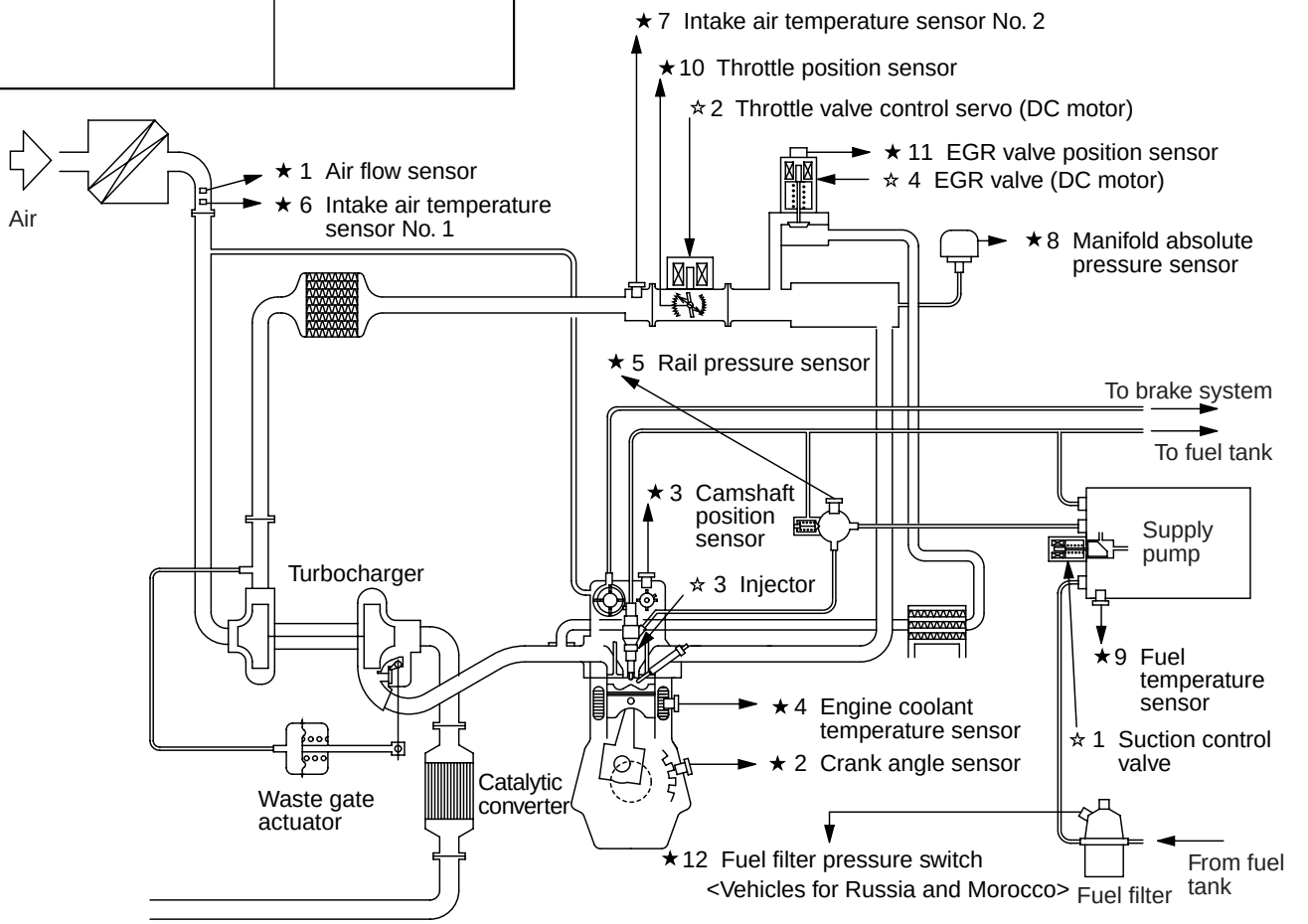
<Except Euro5>

★1 Air flow sensor ★2 Crank angle sensor ★3 Camshaft position sensor ★4 Engine coolant temperature sensor ★5 Rail pressure sensor ★6 Intake air temperature sensor No. 1 ★7 Intake air temperature sensor No. 2 ★8 Manifold absolute pressure sensor ★9 Fuel temperature sensor ★10 Throttle postion sensor ★11 EGR valve position sensor ★12 Fuel filter pressure switch <Vehicles for Russia and Morocco>	● Accelerator pedal position sensor (main) ● Accelerator pedal position sensor (sub) ● Power steering fluid pressure switch ● Vehicle speed sensor ● Power supply ● Ignition switch-IG ● Ignition switch-ST ● A/C switch ● A/C load signal ● Back-up switch <M/T> ● 1st and 2nd rail switch <M/T> ● PTC heater control signal <Vehicles with PTC heater> ● CAN communication (input signal)

⇨ Engine-ECU
● Barometric pressure sensor

⇨

☆1 Suction control valve ☆2 Throttle valve control servo (DC motor) ☆3 Injector ☆4 EGR valve (DC motor)	● Engine control relay ● A/C relay ● Glow plug relay ● PTC heater relay <Vehicles with PTC heater> ● Glow indicator lamp ● Engine warning lamp ● Tachometer ● CAN communication (output signal)



AKB00239AB

SERVICE SPECIFICATIONS

M1133000300488

Items		Specifications
Engine coolant temperature sensor resistance kΩ	Engine coolant temperature at –20°C	14 – 17
	Engine coolant temperature at 0°C	5.1 – 6.5
	Engine coolant temperature at 20°C	2.1 – 2.7
	Engine coolant temperature at 40°C	0.9 – 1.3
	Engine coolant temperature at 60°C	0.48 – 0.68
	Engine coolant temperature at 80°C	0.26 – 0.36
Intake air temperature sensor No.1 resistance kΩ	Intake air temperature at –20°C	13 – 17
	Intake air temperature at 0°C	5.4 – 6.6
	Intake air temperature at 20°C	2.3 – 3.0
	Intake air temperature at 40°C	1.0 – 1.5
	Intake air temperature at 60°C	0.56 – 0.76
	Intake air temperature at 80°C	0.31 – 0.43
Intake air temperature sensor No.2 resistance kΩ <Except Euro5>	Intake air temperature at –20°C	13 – 18
	Intake air temperature at 0°C	5.1 – 6.9
	Intake air temperature at 20°C	2.0 – 3.0
	Intake air temperature at 40°C	0.9 – 1.5
	Intake air temperature at 60°C	0.40 – 0.78
	Intake air temperature at 80°C	0.23 – 0.42
Injector coil resistance Ω (at 20°C)		Approximately 0.45
Suction control valve resistance Ω (at 20°C)		Approximately 2.1
Fuel temperature resistance kΩ (at 20°C)		2.0 – 3.0
Throttle valve control servo resistance (at 20°C) Ω		0.3 – 100

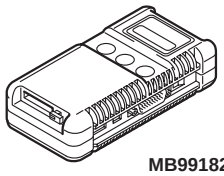
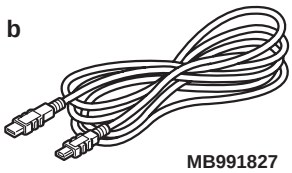
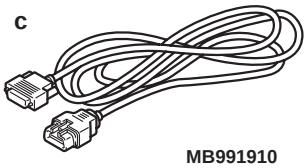
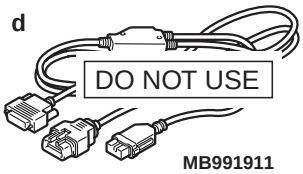
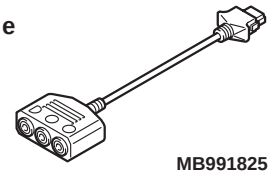
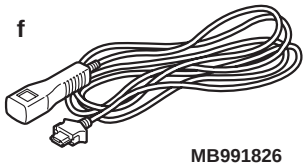
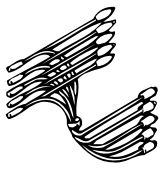
SEALANTS

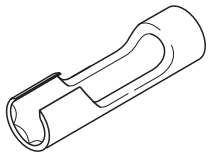
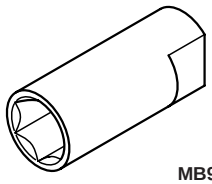
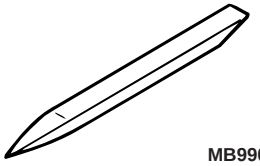
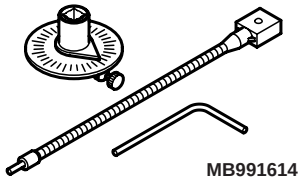
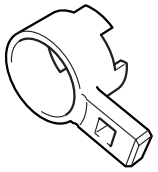
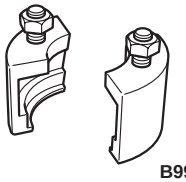
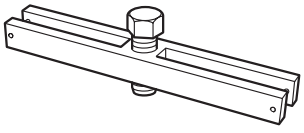
M1133000500385

Item	Specified sealant
Engine coolant temperature sensor threaded portion	3M Nut Locking Part No. 4171 or equivalent
Semi-circular packing	Three bond 1212D, Three bond 1217G (Mitsubishi Part No. 1000A923) or equivalent
Cylinder head	

SPECIAL TOOLS

M1133000600746

Tool	Number	Name	Use
a  MB991824 b  MB991827 c  MB991910 d  MB991911 e  MB991825 f  MB991826 MB991955	MB991955 a: MB991824 b: MB991827 c: MB991910 d: MB991911 e: MB991825 f: MB991826	M.U.T.-III sub assembly a: Vehicle communication interface (V.C.I.) b: M.U.T.-III USB cable c: M.U.T.-III main harness A (Vehicles with CAN communication system) d: M.U.T.-III main harness B (Vehicles without CAN communication system) e: M.U.T.-III adapter harness f: M.U.T.-III trigger harness	⚠ CAUTION **For vehicles with CAN communication, use M.U.T.-III main harness A to send simulated vehicle speed. If you connect M.U.T.-III main harness B instead, the CAN communication does not function correctly.** • Reading diagnosis code • Diesel system inspection • Measurement of fuel pressure • Fuel line leak check
 MB991658	MB991658	Test harness	• Measurement of voltage during troubleshooting • Inspection using an oscilloscope
	MB991709	Test harness	• Measurement of voltage during Troubleshooting • Inspection using an oscilloscope

Tool	Number	Name	Use
	MB992188	Fuel injection pipe wrench	Removal and installation of fuel injection pipe
 MB992042	MB992042	Engine coolant temperature sensor wrench	Removal and installation of the engine coolant temperature sensor
 MB990784	MB990784	Ornament remover	Carbon deposit cleaning
 MB991614	MB991614	Angle gauge	Installation of injector holder bolt
 B992048	MB992048	Sprocket holder	Injection pump sprocket bolt removal and installation
 B992098	MB992098	Injection pump sprocket puller	Injection pump sprocket removal
 B992099	MB992099	Crank pulley puller	

TROUBLESHOOTING

DIAGNOSIS TROUBLESHOOTING FLOW

M1133003700430

Refer to , GROUP 00 – How to Use Troubleshooting/ shooting.
Inspection Service Points – Contents of Trouble-

⚠ *WARNING*

A high-tension voltage is flowing between the engine-ECU and the injectors while the engine is running. Handle them carefully to avoid receiving electric shocks from the voltage.

⚠ **CAUTION**

After replacing the engine-ECU, register the injector identification code and learn fuel injection. (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns)

⚠ **CAUTION**

After replacing the injector, register the injector identification code and learn fuel injection. (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).

⚠ **CAUTION**

After replacing the supply pump, learn the supply pump. (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).

⚠ **CAUTION**

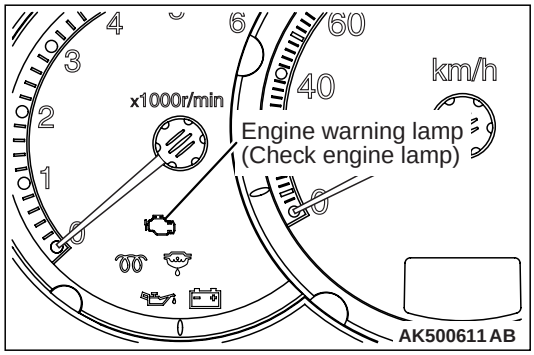
The vehicle equipped with the DPF shall initialize the learning value after the following parts are replaced (Refer to GROUP 00 – Precautions Before Service – Initialization Procedure for Learning Value in Diesel Particulate Filter (DPF) System <Euro5>).

- **DPF**
- **Exhaust differential pressure sensor**
- **Catalytic converter**
- **Engine oil**

DIAGNOSIS FUNCTION

M1133003800954

ENGINE WARNING LAMP (CHECK ENGINE LAMP)



When the abnormal condition occurs with respect to the items of electronically controlled fuel injection system shown in the table, the engine warning lamp is illuminated. When the lamp remains illuminated after the engine start, or when the lamp is illuminated while the engine is running, check the diagnosis code output. There are two methods for checking the indicator lamp burn out: When the ignition switch is in ON position, the indicator lamp is illuminated, and then extinguished few seconds later. When the ignition switch is in ON position and the engine starts, the indicator lamp is extinguished.

ENGINE WARNING LAMP INSPECTION ITEMS

⚠ **CAUTION**

The engine warning lamp continuously illuminates when the engine-ECU malfunctions.

Code No.	Diagnosis item
–	Engine-ECU
P0003*	Suction control valve open <Euro5>
P0004*	Suction control valve battery short <Euro5>
P0016*	Crank angle sensor/camshaft position sensor phase problem
P0047*	Variable geometry control solenoid valve circuit low input <Euro5>
P0048*	Variable geometry control solenoid valve circuit high input <Euro5>
P0072	Intake air temperature sensor No.1 circuit low input <Euro5>
P0072	Intake air temperature sensor No. 2 circuit low input <Except Euro5>
P0073	Intake air temperature sensor No.1 circuit high input <Euro5>

Code No.	Diagnosis item
P0073	Intake air temperature sensor No. 2 circuit high input <Except Euro5>
P0088*	Common rail pressure malfunction
P0089*	Suction control valve stuck
P0093*	Fuel leak problem
P0102	Air flow sensor circuit low input
P0103	Air flow sensor circuit high input
P0106*	Manifold absolute pressure sensor range/performance problem
P0107*	Manifold absolute pressure sensor circuit low input
P0108*	Manifold absolute pressure sensor circuit high input
P0112	EGR gas temperature sensor circuit low input <Euro5>
P0112	Intake air temperature sensor No. 1 circuit low input <Except Euro5>
P0113	EGR gas temperature sensor circuit high input <Euro5>
P0113	Intake air temperature sensor No. 1 circuit high input <Except Euro5>
P0117	Engine coolant temperature sensor circuit low input
P0118	Engine coolant temperature sensor circuit high input
P0122	Throttle position sensor circuit low input
P0123	Throttle position sensor circuit high input
P0182	Fuel temperature sensor circuit low input
P0183	Fuel temperature sensor circuit high input
P0191*	Rail pressure sensor range/performance problem
P0192*	Rail pressure sensor low input
P0193*	Rail pressure sensor high input
P0201*	No. 1 Injector circuit malfunction
P0202*	No. 2 Injector circuit malfunction
P0203*	No. 3 Injector circuit malfunction
P0204*	No. 4 Injector circuit malfunction
P0234*	Turbocharger overboost condition <Except Euro5>
P0299*	Turbocharger under boost condition
P0301*	No. 1 cylinder injector malfunction (No injection)
P0302*	No. 2 cylinder injector malfunction (No injection)
P0303*	No. 3 cylinder injector malfunction (No injection)
P0304*	No. 4 cylinder injector malfunction (No injection)
P0335*	Crank angle sensor system
P0336*	Crank angle sensor range/performance problem
P0340*	Camshaft position sensor system
P0341*	Camshaft position sensor range/performance problem
P0381	Glow plug open/short malfunction <Euro5>
P0401	EGR flow insufficient <Euro5>
P0403	EGR valve (DC motor) malfunction
P0405	EGR valve position sensor circuit low input <Except Euro5>

Code No.	Diagnosis item
P0406	EGR valve position sensor circuit high input <Except Euro5>
P0420*	Catalyst malfunction <Euro5>
P0427*	No. 2 exhaust gas temperature sensor (catalyst temperature) circuit low input <Euro5>
P0428*	No. 2 exhaust gas temperature sensor (catalyst temperature) circuit high input <Euro5>
P0489	EGR valve position sensor circuit low input <Euro5>
P0490	EGR valve position sensor circuit high input <Euro5>
P0502	Vehicle speed sensor low input
P0513*	Immobilizer malfunction
P0545*	No. 1 exhaust gas temperature sensor circuit low input <Euro5>
P0546*	No. 1 exhaust gas temperature sensor circuit high input <Euro5>
P0551	Power steering fluid pressure switch system
P0603	EEPROM malfunction <Except Euro5>
P0604	Random access memory (RAM) malfunction
P0605*	Read only memory (FLASH ROM) malfunction
P0606*	Engine-ECU (main CPU) malfunction
P0607*	Engine-ECU (sub CPU) malfunction
P0628*	Suction control valve open <Except Euro5>
P0629*	Suction control valve battery short <Except Euro5>
P062F	EEPROM malfunction <Euro5>
P0630*	Chassis number not programmed
P0638	Throttle valve control servo stuck
P0642*	Analog sensor reference voltage No. 1 too low
P0643*	Analog sensor reference voltage No. 1 too high
P064C	Glow control unit malfunction <Euro5>
P0652*	Analog sensor reference voltage No. 2 too low
P0653*	Analog sensor reference voltage No. 2 too high
P0683	Glow control unit communication abnormality <Euro5>
P1203*	Capacitor insufficient charging
P1204*	Capacitor excessive charging
P1272	Pressure limiter malfunction
P1273*	Supply pump insufficient flow
P1274*	Supply pump protection
P1275*	Supply pump exchange
P1276	Fuel filter exchange <Except Euro5>
P1298*	Variable geometry turbocharger control system malfunction (high pressure) <Euro5>
P1299*	Variable geometry turbocharger control system malfunction (low pressure) <Euro5>
P1427*	No. 3 exhaust gas temperature sensor (DPF temperature) circuit low input <Euro5>
P1428*	No. 3 exhaust gas temperature sensor (DPF temperature) circuit high input <Euro5>
P1497*	DPF system malfunction <Euro5>

Code No.	Diagnosis item
P1498*	Excessive PM accumulated in DPF <Euro5>
P1499*	Abnormally high DPF temperature <Euro5>
P1608*	Battery current sensor system <Euro5>
P1625*	Injection quantity compensation valve error
P1626*	Injection quantity compensation valve not coding
P2118	Throttle valve control (DC motor) current malfunction
P2122*	Accelerator pedal position sensor (main) circuit low input
P2123*	Accelerator pedal position sensor (main) circuit high input
P2127*	Accelerator pedal position sensor (sub) circuit low input
P2128*	Accelerator pedal position sensor (sub) circuit high input
P2138*	Accelerator pedal position sensor (main and sub) range/performance problem
P2146*	Injector common 1 (cylinder No. 1 and No. 4) circuit open
P2147*	Injector common circuit earth short
P2148*	Injector common circuit battery short
P2149*	Injector common 2 (cylinder No. 2 and No. 3) circuit open
P2150*	Injector common 2 circuit earth short <Euro5>
P2151*	Injector common 2 circuit battery short <Euro5>
P2228	Barometric pressure sensor circuit low input
P2229	Barometric pressure sensor circuit high input
P2413	EGR system performance
P2454*	Exhaust differential pressure sensor circuit low input <Euro5>
P2455*	Exhaust differential pressure sensor circuit high input <Euro5>

NOTE:

- *After the engine-ECU has detected a malfunction, the engine warning lamp illuminates when the engine is next turned on and the same malfunction is re-detected. However, for items marked with a "*" in the diagnosis code number column, the engine warning lamp illuminates only on the first detection of the malfunction.*
- *When the fuel runs out, the engine warning lamp would illuminate possibly. Supplying the fuel turns off the engine warning lamp, but the diagnosis code No. P1272 and P1273 are stored.*

METHOD OF READING AND ERASING DIAGNOSIS CODES

Refer to , GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions.

INSPECTION USING M.U.T.-III DATA LIST AND ACTUATOR TESTING

1. Carry out inspection by means of the data list and the actuator test function, if there is an abnormality, check and repair the chassis harness and components.
2. After repairing, re-check using the M.U.T.-III and check that the abnormal input and output have returned to normal as a result of the repairs.
3. Erase the diagnosis code memory.
4. Remove the M.U.T.-III, and then start the engine again and carry out a road test to confirm that the problem has disappeared.

PROVISIONAL DIAGNOSIS CODE CONFIRMED

If detecting the malfunction during the first drive cycle, the engine-ECU temporarily stores the diagnosis code as the provisional diagnosis code. If detecting the same malfunction during the next drive cycle, the engine-ECU determines that the malfunction exists. The engine-ECU outputs the diagnosis code. On the M.U.T.-III it is possible to display the stored provisional diagnosis code which the engine-ECU had detected during the first drive cycle. This makes it possible to confirm in one drive cycle whether the malfunction could happen again after the repair.

CONFIRMATION METHOD

1. After the ignition switch is in "LOCK" (OFF) position, connect the M.U.T.-III to the diagnosis connector.
2. Turn the ignition switch to the "ON" position.
3. Select "MPI/GDI/DIESEL" from System select Screen of the M.U.T.-III.
4. Select "Special Function" from MPI/GDI/DIESEL Screen.
5. Select "Provisional DTCs" from Special Function Screen.

FREEZE FRAME DATA

When the engine-ECU detects a malfunction and stores a diagnosis code, it also stores a current status of the engine. This function is called "Freeze frame data". By analyzing this "Freeze frame" data with the M.U.T.-III, an effective troubleshooting can be performed.
The display items of freeze frame data are shown below.

DISPLAY ITEM LIST

Item No.	Data	Unit
2	Ignition cycle	–
4	Accumulated minute*1	min
500*2	Air flow sensor	g/s
501*2	Throttle position sensor (main)	%
507*2	Target exhaust gas recirculation valve	%
508*2	Barometric pressure sensor	kPa
509*2	Relative throttle position sensor	%
511*2	Accelerator pedal position sensor (main)	%
512*2	Accelerator pedal position sensor (sub)	%
516*2	Engine coolant temperature sensor	°C
525*2	Manifold absolute pressure sensor	kPa
526*2	Crank angle sensor	r/min
527*2	Vehicle speed	km/h
529*2	Intake air temperature sensor	°C
530*2	Time since engine running*3	sec
537*2	Power supply voltage	V
541*2	Throttle valve control servo	%
560*2	Rail pressure sensor	kPa
573*2	Exhaust gas recirculation error	%

*NOTE: *1: Accumulated time of current malfunction from time point when malfunction is detected.*

*NOTE: *2: The items of Freeze Frame Data can be seen by selecting "Freeze Frame Data (OBD)" on "Self-diagnosis" screen of M.U.T.-III. When system malfunctions are detected, the first detected malfunction data only is stored.*

*NOTE: *3: Time between engine start and malfunction detection.*

FAIL-SAFE FUNCTION REFERENCE TABLE

When the diagnostic function detects a sensor or actuator fault or an abnormality in the control condition, the vehicle is controlled by means of the pre-set control logic to maintain safe conditions for driving.

Malfunctioning item	Control contents during malfunction
Accelerator pedal position sensor	• The accelerator pedal opening is controlled as 0%. • Idle rotations are 1,300 r/min (both main and sub are faulty or have a characteristic error).
Accelerator pedal position sensor (main)	The amount of depression of the accelerator pedal is detected with using the accelerator pedal position sensor (sub) signal, which is calculated by taking half of the normal value.
Accelerator pedal position sensor (sub)	The amount of depression of the accelerator pedal is detected with using the accelerator pedal position sensor (main) signal, which is calculated by taking half of the normal value.
Throttle position sensor	Power to the throttle valve control servo is interrupted.
Crank angle sensor	The engine is stopped (fuel injection and pump pressure feed are stopped).
Camshaft position sensor	• Rail pressure is controlled in the range from 50 to 100 MPa. • Fuel injection is restricted (output restriction). • The open angle of the accelerator pedal is controlled. • The engine is stopped when a characteristic error of the crank angle sensor occurs (fuel injection and pump pressure feed are stopped).
Engine coolant temperature sensor	• Engine coolant temperature is controlled as 80 °C (–25 °C at startup). • EGR control is stopped (fully closed).
Rail pressure sensor	• Rail pressure is controlled in the range from 50 to 100 MPa. • Fuel injection is restricted (output restriction). • The open angle of the accelerator pedal is controlled. • The throttle valve is shut (opening fixed) • EGR control is stopped (fully closed).
Fuel temperature sensor	Fuel temperature is controlled as 45 °C (–25 °C at startup).
Air flow sensor	• EGR control is stopped (fully closed). • Control is performed using the previous value.
Manifold absolute pressure sensor	• Manifold absolute pressure is controlled as 100 kPa. • EGR control is stopped (fully closed).
Barometric pressure sensor	• Barometric pressure is controlled as 100 kPa. • EGR control is stopped (fully closed).
Intake air temperature sensor No. 1	• Intake air temperature is controlled as 50 °C. • EGR control is stopped (fully closed).
Intake air temperature sensor No. 2 <Except Euro5>	• Intake air temperature is controlled as 50 °C. • EGR control is stopped (fully closed).
EGR valve position sensor	EGR control is stopped (fully closed).
No. 1 exhaust gas temperature sensor <Euro5>	• The throttle valve is shut (fully closed). • Exhaust gas recirculation control is stopped (fully closed). • DPF regeneration prohibited
No. 2 exhaust gas temperature sensor (catalyst temperature) <Euro5>	• The throttle valve is shut (fully closed). • Exhaust gas recirculation control is stopped (fully closed). • DPF regeneration prohibited

Malfunctioning item	Control contents during malfunction
No. 3 exhaust gas temperature sensor (DPF temperature) <Euro5>	• The throttle valve is shut (fully closed). • Exhaust gas recirculation control is stopped (fully closed). • DPF regeneration prohibited
Exhaust differential pressure sensor <Euro5>	• The throttle valve is shut (fully closed). • Exhaust gas recirculation control is stopped (fully closed). • DPF regeneration prohibited
Injector	EGR control is stopped (fully closed).
Suction control valve	• Rail pressure is controlled in the range from 50 to 100 MPa. • Fuel injection is restricted (output restriction). • The open angle of the accelerator pedal is controlled. • The throttle valve is shut (opening fixed) • EGR control is stopped (fully closed).
EGR valve (DC motor)	EGR control is stopped (fully closed).
Throttle valve control servo	Power to the throttle valve control servo is interrupted.
Rail pressure too high	• The throttle valve is shut (opening fixed) • The engine is stopped (fuel injection and pump pressure feed are stopped).
Fuel leak	The engine is stopped (fuel injection and pump pressure feed are stopped).
Engine overrun	• The throttle valve is shut (opening fixed) • The engine is stopped (fuel injection and pump pressure feed are stopped).
Boost pressure too high	• Fuel injection is restricted (output restriction). • EGR control is stopped (fully closed).
Engine-ECU (RAM error)	The engine is stopped (fuel injection and pump pressure feed are stopped).
Engine-ECU (sensor power error)	• The accelerator pedal opening is controlled as 0%. • Idle rotations are 1,300 r/min.
Engine-ECU (flash ROM error, CPU error)	• Rail pressure is controlled in the range from 50 to 100 MPa. • Fuel injection is restricted (output restriction). • The open angle of the accelerator pedal is controlled. • The throttle valve is shut (opening fixed) • EGR control is stopped (fully closed).
Engine-ECU (insufficient charging of capacitor for injector)	• Rail pressure is controlled in the range from 50 to 100 MPa. • Fuel injection is restricted (output restriction). • The open angle of the accelerator pedal is controlled. • EGR control is stopped (fully closed).
Engine-ECU (excessive charging of capacitor for injector)	The engine is stopped. (The fuel injection and pump delivery pressure are stopped).
Injector drive circuit error	The engine is stopped. (The fuel injection and pump delivery pressure are stopped).
Pressure limiter open valve error	• Rail pressure is controlled in the range from 50 to 100 MPa. • Fuel injection is restricted (output restriction). • The open angle of the accelerator pedal is controlled. • EGR control is stopped (fully closed).

Malfunctioning item	Control contents during malfunction
Supply pump error	• Rail pressure is controlled in the range from 50 to 60 MPa • Fuel injection is restricted (output restriction). • The open angle of the accelerator pedal is controlled. • A/C is cut <Except the driving condition that the fuel pressure exceeds the seizure resistance> • The throttle valve is shut (fully closed) <Except the driving condition that the fuel pressure exceeds the seizure resistance> • Exhaust gas recirculation control is stopped (fully closed). • When the burn-in limit is exceeded, the engine is stopped gradually
Injector correction data (Error data, unwritten)	• Rail pressure is controlled in the range from 50 to 100 MPa. • Fuel injection is restricted (output restriction). • The open angle of the accelerator pedal is controlled. • EGR control is stopped (fully closed).
Variable geometry control solenoid valve error <Euro5>	• Rail pressure is controlled in the range from 50 to 100 MPa. <Except when the malfunction of battery short circuit exists> • Fuel injection is restricted (output restriction). <Except when the malfunction of battery short circuit exists> • The open angle of the accelerator pedal is controlled. <Except when the malfunction of battery short circuit exists> • The throttle valve is shut (fully closed). • EGR control is stopped (fully closed).
Catalytic converter <Euro5>	• The throttle valve is shut (fully closed). • Exhaust gas recirculation control is stopped (fully closed). • DPF regeneration prohibited.
DPF <Euro5>	• The throttle valve is shut (fully closed). • Exhaust gas recirculation control is stopped (fully closed). • Fuel injection is restricted (output restriction). • The open angle of the accelerator pedal is controlled. • DPF regeneration prohibited.

INSPECTION CHART FOR DIAGNOSIS CODES

M1133004000962

Diagnosis code No.	Diagnosis item	Reference page
P0003	Suction control valve open <Euro5>	P.13A-26
P0004	Suction control valve battery short <Euro5>	P.13A-29
P0016	Crank angle sensor/camshaft position sensor phase problem	P.13A-32
P0047	Variable geometry control solenoid valve circuit low input <Euro5>	P.13A-48
P0048	Variable geometry control solenoid valve circuit high input <Euro5>	P.13A-57
P0072	Intake air temperature sensor No. 1 circuit low input <Euro5>	P.13A-43
P0072	Intake air temperature sensor No. 2 circuit low input <Except Euro5>	P.13A-48
P0073	Intake air temperature sensor No. 1 circuit high input <Euro5>	P.13A-53
P0073	Intake air temperature sensor No. 2 circuit high input <Except Euro5>	P.13A-57
P0088	Common rail high pressure malfunction	P.13A-60
P0089	Suction control valve stuck	P.13A-63

Diagnosis code No.	Diagnosis item	Reference page
P0093	Fuel leak problem	P.13A-64
P0102	Air flow sensor circuit low input	P.13A-68
P0103	Air flow sensor circuit high input	P.13A-75
P0106	Manifold absolute pressure sensor range/performance problem	P.13A-78
P0107	Manifold absolute pressure sensor circuit low input	P.13A-83
P0108	Manifold absolute pressure sensor circuit high input	P.13A-91
P0112	EGR gas temperature sensor circuit low input <Euro5>	P.13A-94
P0112	Intake air temperature sensor No. 1 circuit low input <Except Euro5>	P.13A-99
P0113	EGR gas temperature sensor circuit high input <Euro5>	P.13A-104
P0113	Intake air temperature sensor No. 1 circuit high input <Except Euro5>	P.13A-109
P0117	Engine coolant temperature sensor circuit low input	P.13A-113
P0118	Engine coolant temperature sensor circuit high input	P.13A-119
P0122	Throttle position sensor circuit low input	P.13A-124
P0123	Throttle position sensor circuit high input	P.13A-131
P0182	Fuel temperature sensor circuit low input	P.13A-134
P0183	Fuel temperature sensor circuit high input	P.13A-139
P0191	Rail pressure sensor range/performance problem	P.13A-143
P0192	Rail pressure sensor circuit low input	P.13A-147
P0193	Rail pressure sensor circuit high input	P.13A-155
P0201	No. 1 injector circuit malfunction	P.13A-158
P0202	No. 2 injector circuit malfunction <Euro5>	P.13A-161
P0202	No. 2 injector circuit malfunction <Except Euro5>	P.13A-164
P0203	No. 3 injector circuit malfunction <Euro5>	P.13A-167
P0203	No. 3 injector circuit malfunction <Except Euro5>	P.13A-170
P0204	No. 4 injector circuit malfunction <Euro5>	P.13A-173
P0204	No. 4 injector circuit malfunction <Except Euro5>	P.13A-176
P0219	Engine overspeed condition	P.13A-178
P0234	Turbocharger overboost condition <Except Euro5>	P.13A-179
P0299	Turbocharger under boost condition	P.13A-180
P0301	No. 1 Cylinder injector malfunction (No injection)	P.13A-180
P0302	No. 2 Cylinder injector malfunction (No injection)	P.13A-181
P0303	No. 3 Cylinder injector malfunction (No injection)	P.13A-182
P0304	No. 4 Cylinder injector malfunction (No injection)	P.13A-183
P0335	Crank angle sensor system	P.13A-184
P0336	Crank angle sensor range/performance problem	P.13A-190
P0340	Camshaft position sensor system	P.13A-192

Diagnosis code No.	Diagnosis item	Reference page
P0341	Camshaft position sensor range/performance problem	P.13A-198
P0381	Glow plug open/short malfunction <Euro5>	P.13A-200
P0401	EGR flow insufficient <Euro5>	P.13A-204
P0402	EGR flow excessive <Euro5>	P.13A-209
P0403	EGR valve (DC motor) malfunction	P.13A-215
P0405	EGR valve position sensor circuit low input <Except Euro5>	P.13A-219
P0406	EGR valve position sensor circuit high input <Except Euro5>	P.13A-227
P0420	Catalyst malfunction <Euro5>	P.13A-229
P0427	No. 2 exhaust gas temperature sensor (catalyst temperature) circuit low input <Euro5>	P.13A-231
P0428	No. 2 exhaust gas temperature sensor (catalyst temperature) circuit high input <Euro5>	P.13A-234
P0489	EGR valve position sensor circuit low input <Euro5>	P.13A-240
P0490	EGR valve position sensor circuit high input <Euro5>	P.13A-248
P0502	Vehicle speed sensor low input <2WD-M/T and 4WD vehicles>	P.13A-251
P0513	Immobilizer malfunction	P.13A-254
P0515	Battery temperature sensor system <Euro5>	P.13A-255
P0545	No. 1 exhaust gas temperature sensor circuit low input <Euro5>	P.13A-260
P0546	No. 1 exhaust gas temperature sensor circuit high input <Euro5>	P.13A-263
P0551	Power steering fluid pressure switch system	P.13A-268
P0603	EEPROM malfunction <Except Euro5>	P.13A-270
P0604	Random access memory (RAM) malfunction	P.13A-271
P0605	Read only memory (FLASH ROM) malfunction	P.13A-271
P0606	Engine-ECU (main CPU) malfunction	P.13A-272
P0607	Engine-ECU (sub CPU) malfunction	P.13A-272
P0620	Alternator control circuit <Euro5>	P.13A-273
P0628	Suction control valve open <Except Euro5>	P.13A-276
P0629	Suction control valve battery short <Except Euro5>	P.13A-279
P062F	EEPROM malfunction <Euro5>	P.13A-282
P0630	Chassis number not programmed	P.13A-282
P0638	Throttle valve control servo stuck	P.13A-284
P0642	Analog sensor reference voltage No. 1 too low	P.13A-286
P0643	Analog sensor reference voltage No. 1 too high	P.13A-287
P064C	Glow control unit malfunction <Euro5>	P.13A-288
P0652	Analog sensor reference voltage No. 2 too low	P.13A-290
P0653	Analog sensor reference voltage No. 2 too high	P.13A-291
P0683	Glow control unit communication abnormality <Euro5>	P.13A-292

Diagnosis code No.	Diagnosis item	Reference page
P1203	Capacitor insufficient charging	P.13A-296
P1204	Capacitor excessive charging	P.13A-296
P1272	Pressure limiter malfunction	P.13A-297
P1273	Supply pump insufficient flow	P.13A-300
P1274	Supply pump protection	P.13A-301
P1275	Supply pump exchange	P.13A-302
P1276	Fuel filter exchange <Vehicles with fuel filter pressure switch>	P.13A-304
P1277	Fuel filter freeze <Vehicles with fuel filter pressure switch>	P.13A-307
P1298	Variable geometry turbocharger control system malfunction (high pressure) <Euro5>	P.13A-327
P1299	Variable geometry turbocharger control system malfunction (low pressure) <Euro5>	P.13A-328
P1427	No. 3 exhaust gas temperature sensor (DPF temperature) circuit low input <Euro5>	P.13A-310
P1428	No. 3 exhaust gas temperature sensor (DPF temperature) circuit high input <Euro5>	P.13A-313
P1497	DPF system malfunction <Euro5>	P.13A-319
P1498	Excessive PM accumulated in DPF <Euro5>	P.13A-320
P1499	Abnormally high DPF temperature <Euro5>	P.13A-320
P1608	Battery current sensor system <Euro5>	P.13A-322
P1625	Injection quantity compensation value error	P.13A-327
P1626	Injection quantity compensation value not coding	P.13A-328
P2118	Throttle valve control (DC motor) current malfunction	P.13A-329
P2122	Accelerator pedal position sensor (main) circuit low input	P.13A-333
P2123	Accelerator pedal position sensor (main) circuit high input	P.13A-341
P2124	Accelerator pedal position sensor (main) circuit high input intermittent	P.13A-345
P2127	Accelerator pedal position sensor (sub) circuit low input	P.13A-349
P2128	Accelerator pedal position sensor (sub) circuit high input	P.13A-357
P2138	Accelerator pedal position sensor (main and sub) range/performance problem	P.13A-360
P2146	Injector common 1 (cylinder No. 1 and No. 4) circuit open <Euro5>	P.13A-368
P2146	Injector common 1 (cylinder No. 1 and No. 4) circuit open <Except Euro5>	P.13A-371
P2147	Injector common 1 (cylinder No. 1 and No. 4) circuit earth short <Euro5>	P.13A-374
P2147	Injector common circuit earth short <Except Euro5>	P.13A-378
P2148	Injector common 1 (cylinder No. 1 and No. 4) circuit battery short <Euro5>	P.13A-383
P2148	Injector common circuit battery short <Except Euro5>	P.13A-387

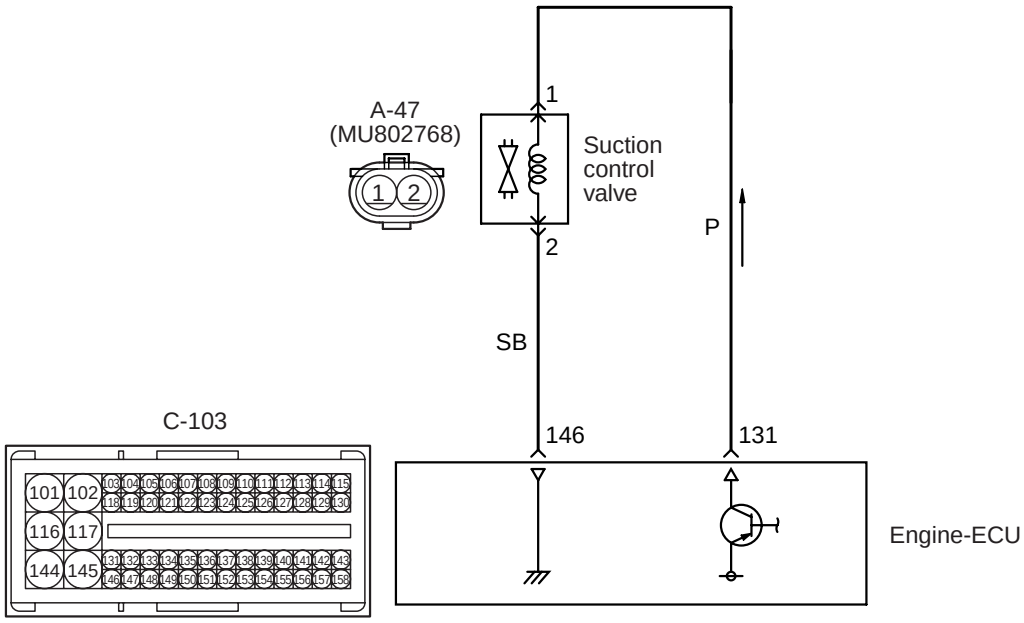
Diagnosis code No.	Diagnosis item	Reference page
P2149	Injector common 2 (cylinder No. 2 and No. 3) circuit open <Euro5>	P.13A-392
P2149	Injector common 2 (cylinder No. 2 and No. 3) circuit open <Except Euro5>	P.13A-396
P2150	Injector common 2 circuit earth short <Euro5>	P.13A-399
P2151	Injector common 2 circuit battery short <Euro5>	P.13A-403
P2228	Barometric pressure sensor circuit low input	P.13A-406
P2229	Barometric pressure sensor circuit high input	P.13A-407
P2413	EGR system performance	P.13A-408
P2454	Exhaust differential pressure sensor circuit low input <Euro5>	P.13A-411
P2455	Exhaust differential pressure sensor circuit high input <Euro5>	P.13A-417
P252F	Engine oil level malfunction <Euro5>	P.13A-419
U1073	Bus off	P.13A-420
U1101*	A/T-ECU time-out <A/T>	P.13A-421
U1102*	ASTC-ECU time-out <Except vehicles for Morocco>	P.13A-422
U1109*	ETACS-ECU time-out	P.13A-424
U1110*	A/C-ECU time-out <Euro5>	P.13A-425
U1117*	ETACS-ECU (Immobilizer- ECU) time-out	P.13A-427
U1190	The network system diagnosis code output permitted signal can not be received	P.13A-428

*NOTE: *:When the diagnosis codes relating to the CAN communication error are output, make sure of the vehicle equipment. When the vehicle is not equipped with the system the engine-ECU communicates to, the diagnosis code is always output. This is not abnormal.*

DIAGNOSIS CODE PROCEDURES

Code No. P0003: Suction Control Valve Open <Euro5>

Suction Control Valve Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V: Violet PU: Purple SI: Silver

AKA00106 AB

OPERATION

- The voltage is applied from the engine-ECU (terminal No. 131) to the suction control valve (terminal No. 1) via the power transistor in the engine-ECU.
- The voltage is earthed to the engine-ECU (terminal No. 146) from the suction control valve (terminal No. 2).

FUNCTION

- The engine-ECU performs duty control over the suction control valve.
- The engine-ECU checks whether the amount of current for driving duty is adequate.

TROUBLE JUDGMENT

Check Conditions

- Battery positive voltage is 8 – 16 V
- 2 seconds later after the ignition switch has been in "ON" position or the engine has started up.
- The supply pump and injector are being normally controlled.
- The fuel injection rate is 4 mm^3/st or more.

Judgment Criterion

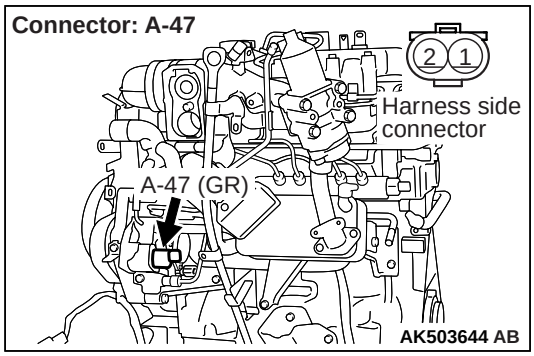
- When the driving duty ratio of the suction control valve is higher than the specified value, the driving current is lower than the specified value.

PROBABLE CAUSES

- Failed suction control valve
- Open/short circuit or harness damage in suction control valve circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. Connector check: A-47 suction control valve connector



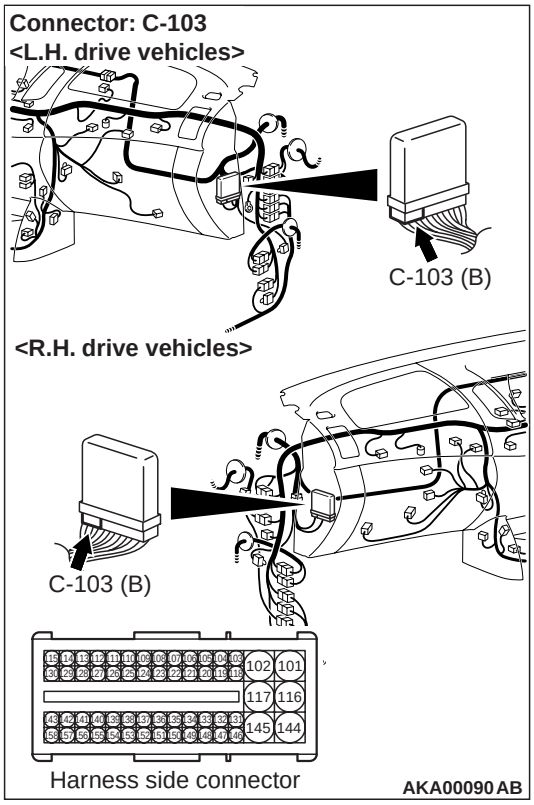
Q: Is the check result normal?
YES : Go to Step 2 .
NO : Repair or replace the connector.

STEP 2. Check suction control valve itself.

- Check suction control valve itself (Refer to P.13A-596).

Q: Is the check result normal?
YES : Go to Step 3 .
NO : Replace the suction control valve.

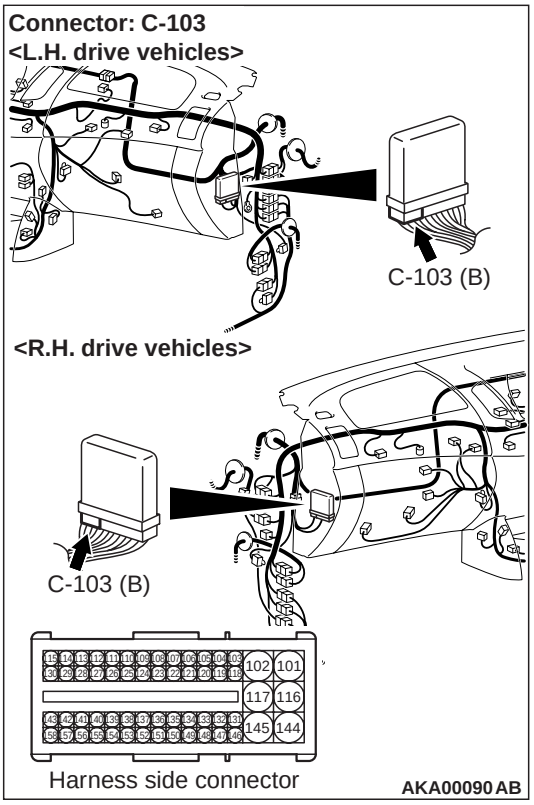
STEP 3. Connector check: C-103 engine-ECU connector

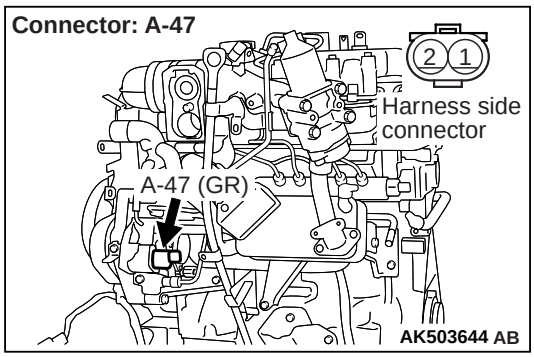


Q: Is the check result normal?
YES : Go to Step 4 .
NO : Repair or replace the connector.

STEP 4. Check harness between C-103 (terminal No. 131) engine-ECU connector and A-47 (terminal No. 1) suction control valve connector.

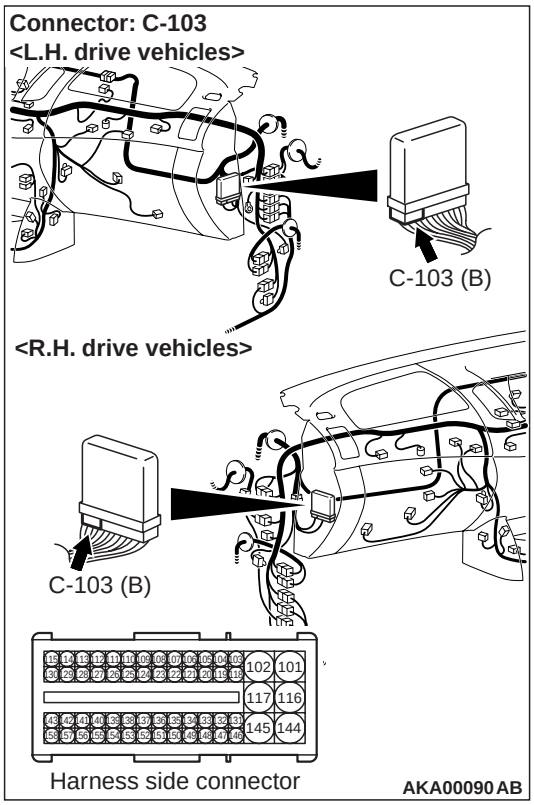
- Check power supply line for open/short circuit and damage.

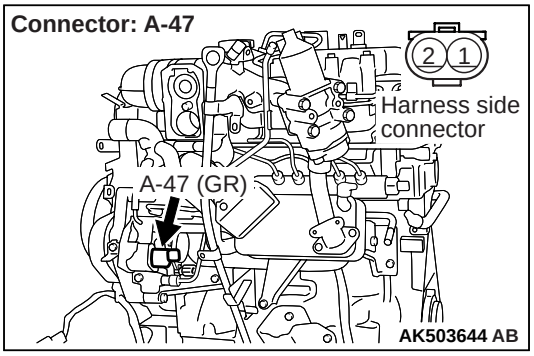




Q: Is the check result normal?
YES : Go to Step 5 .
NO : Repair the damaged harness wire.

STEP 5. Check harness between C-103 (terminal No. 146) engine-ECU connector and A-47 (terminal No. 2) suction control valve connector.





- Check earthing line for open/short circuit and damage.

Q: Is the check result normal?
YES : Go to Step 6 .
NO : Repair the damaged harness wire.

STEP 6. M.U.T.-III diagnosis code

- Reconfirmation of diagnosis code.

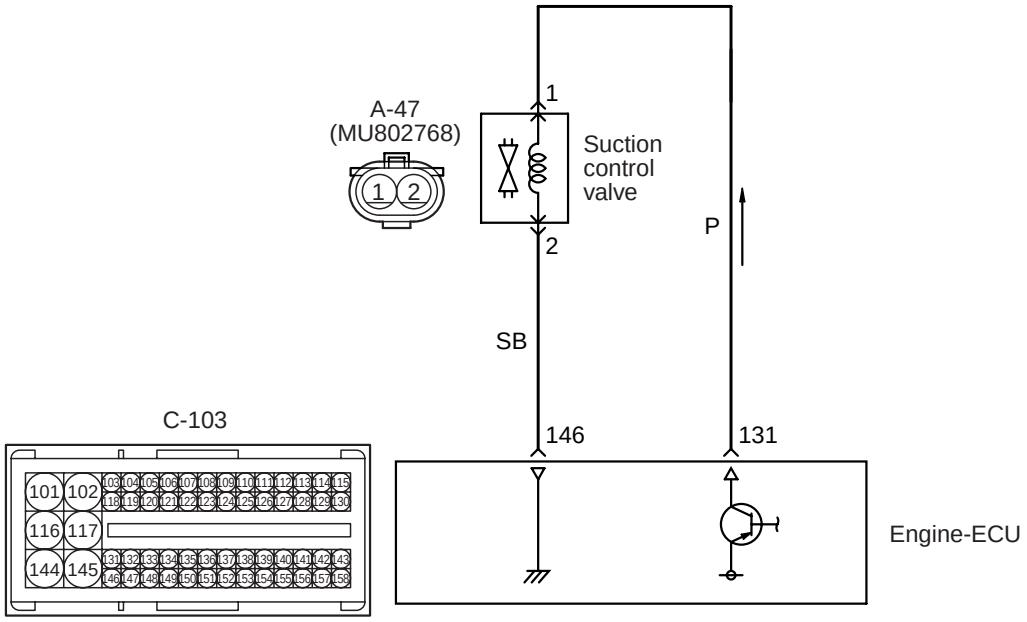
Q: Is the diagnosis code set?

YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, carry out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

Code No. P0004: Suction Control Valve Battery Short <Euro5>

Suction Control Valve Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V: Violet PU: Purple SI: Silver

AKA00106 AB

OPERATION

- The voltage is applied from the engine-ECU (terminal No. 131) to the suction control valve (terminal No. 1) via the power transistor in the engine-ECU.
- The voltage is earthed to the engine-ECU (terminal No. 146) from the suction control valve (terminal No. 2).

FUNCTION

- The engine-ECU performs duty control over the suction control valve.
- The engine-ECU checks whether the amount of current for driving duty is adequate.

TROUBLE JUDGMENT

Check Conditions

- Battery positive voltage is 8 – 16 V
- 2 seconds later after the ignition switch has been in "ON" position or the engine has started up
- The supply pump and injector are being normally controlled.
- The fuel injection rate is 4 mm^3/st or more.

Judgment Criterion

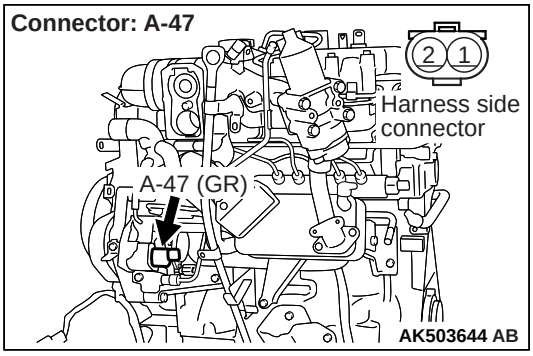
- When the driving duty ratio of the suction control valve is lower than the specified value, the driving current is higher than the specified value.

PROBABLE CAUSES

- Failed suction control valve
- Short circuit in suction control valve circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. Connector check: A-47 suction control valve connector



Q: Is the check result normal?

YES : Go to Step 2.
NO : Repair or replace the connector.

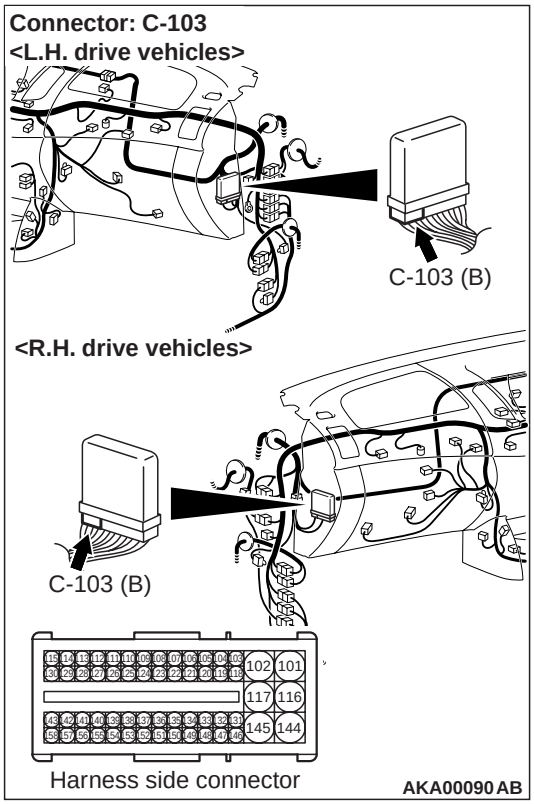
STEP 2. Check suction control valve itself.

- Check suction control valve itself (Refer to P.13A-596).

Q: Is the check result normal?

YES : Go to Step 3.
NO : Replace the suction control valve.

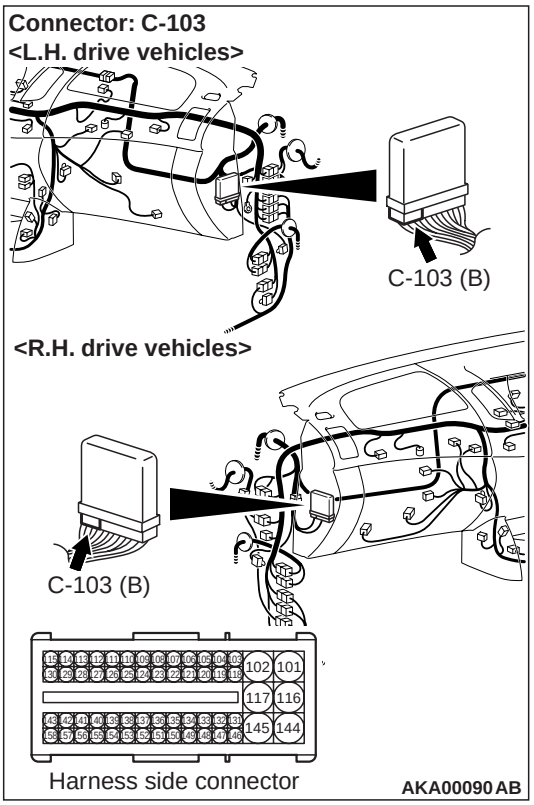
STEP 3. Connector check: C-103 engine-ECU connector

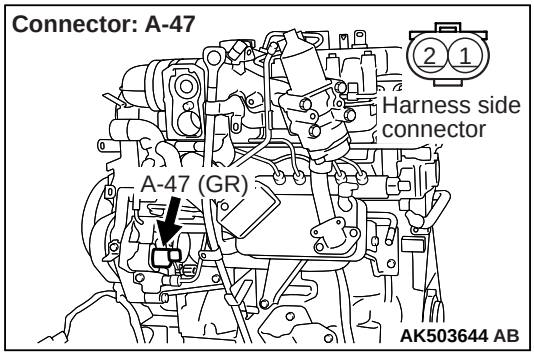


Q: Is the check result normal?

YES : Go to Step 4.
NO : Repair or replace the connector.

STEP 4. Check harness between C-103 (terminal No. 131) engine-ECU connector and A-47 (terminal No. 1) suction control valve connector.

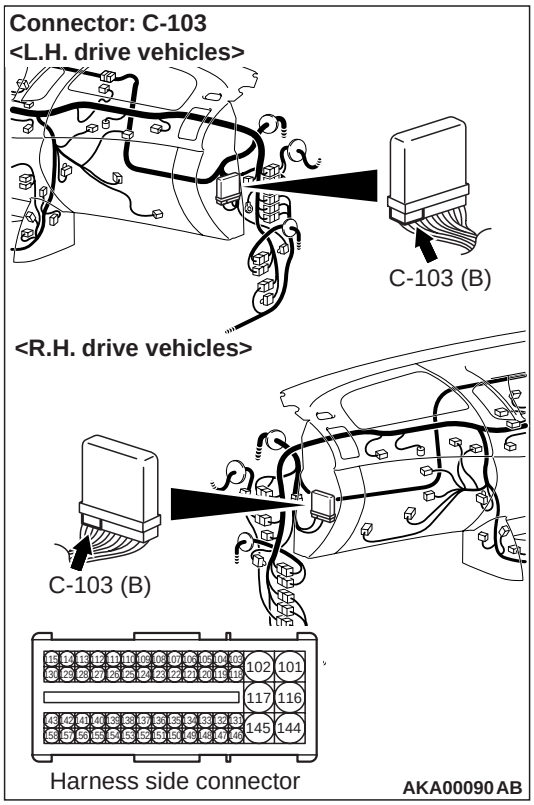


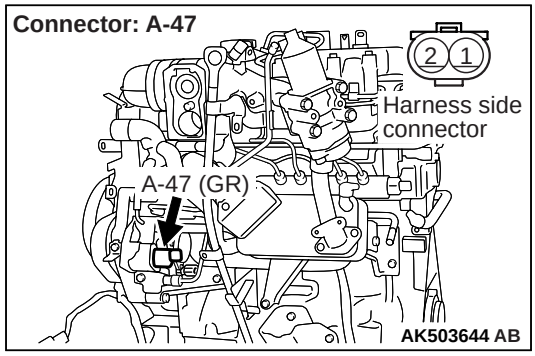


- Check power supply line for short circuit.

Q: Is the check result normal?
YES : Go to Step 5.
NO : Repair the damaged harness wire.

STEP 5. Check harness between C-103 (terminal No. 146) engine-ECU connector and A-47 (terminal No. 2) suction control valve connector.





- Check earthing line for short circuit.

Q: Is the check result normal?
YES : Go to Step 6.
NO : Repair the damaged harness wire.

STEP 6. M.U.T.-III diagnosis code.

- Reconfirmation of diagnosis code.

Q: Is the diagnosis code set?

YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, carry out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

Code No. P0016: Crank Angle Sensor/Camshaft Position Sensor Phase Problem

OPERATION
- Refer to Code No. P0335: Crank Angle Sensor System P.13A-184
- Refer to Code No. P0340: Camshaft Position Sensor System P.13A-192

FUNCTION
- The engine-ECU monitors the signals input from the crank angle sensor and camshaft position sensor.
- The engine-ECU compares these input pulse signals to check the position relations for validity.

TROUBLE JUDGMENT

Check Conditions
- Battery positive voltage is 8 – 16 V
- One of the following two is true.
  1. 2 seconds have passed after the ignition switch is turned on, the crank angle sensor and camshaft position sensor output signals are normal, and the engine rotation speed is 1,200 r/min or lower.
  2. Cranking is in progress, the engine rotation speed is 350 r/min or faster, and the engine coolant temperature is –30°C or higher.

Judgment Criterion
- The phase shift angle between the crank and camshaft position sensor signals exceeds its threshold value.

YES : Go to Step 5 .

PROBABLE CAUSES
- Failed crank angle sensor
- Failed camshaft position sensor
- Failed timing chain
- Failed engine-ECU

DIAGNOSTIC PROCEDURE

STEP 1. M.U.T.-III diagnosis code.

Q: Is any other diagnosis code than P0016 output?
YES : Inspection chart for diagnosis codes (Refer to P.13A-21).
NO : Go to Step 2 .

STEP 2. Check the timing chain.
- See the timing marks to check for skipped gear teeth.

Q: Is the check result normal?
YES : Go to Step 3 .
NO : Repair.

STEP 3. Check crankshaft sensing vane.

Q: Is the check result normal?
YES : Go to Step 4 .
NO : Replace the crankshaft sprocket.

STEP 4. Check camshaft sensing vane.

Q: Is the check result normal?
NO : Replace the camshaft.

STEP 5. M.U.T.-III diagnosis code.

- After clearing the diagnosis code through M.U.T.-III, start the engine and confirm whether the diagnosis code is output.

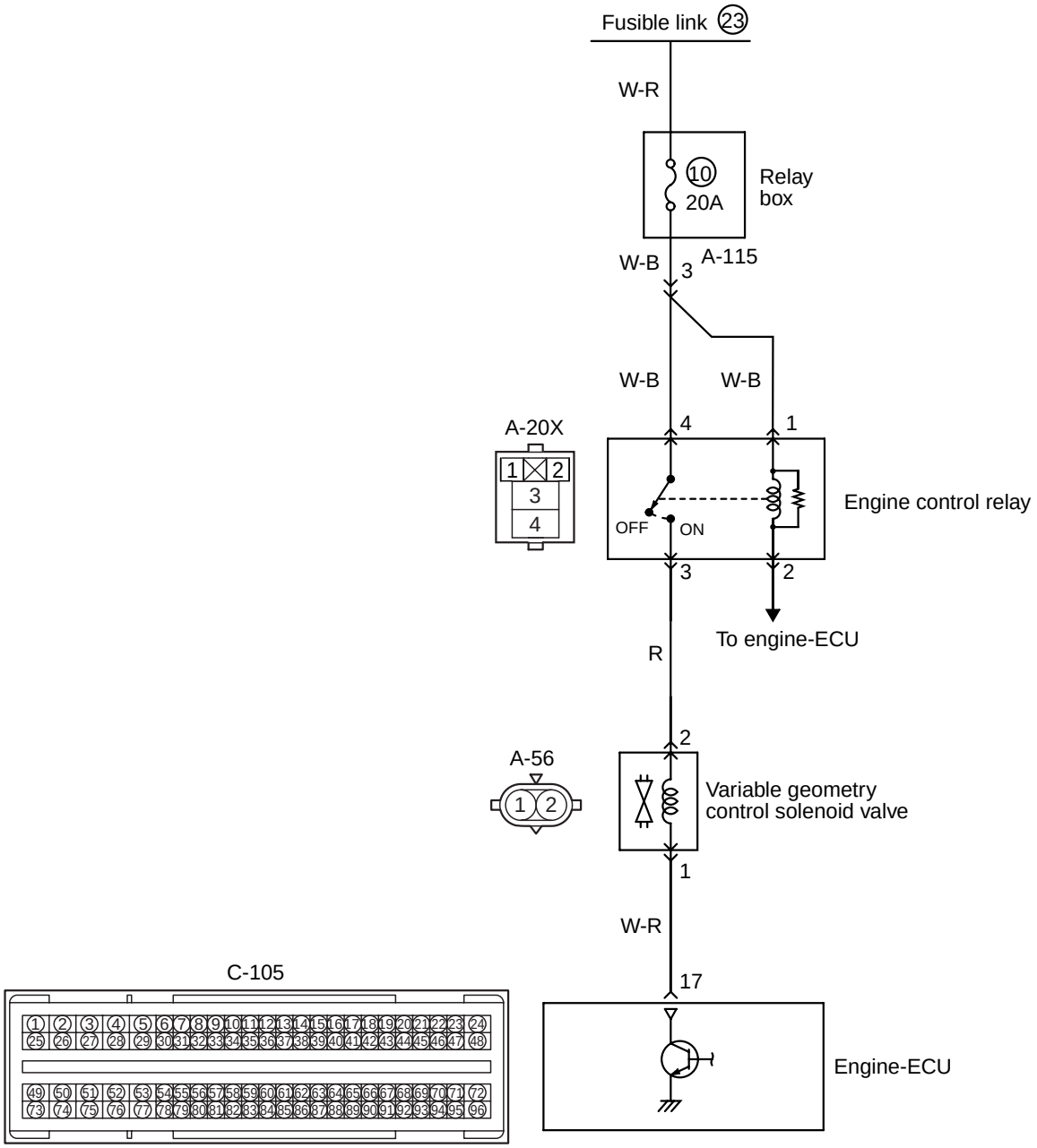
Q: Is the diagnosis code set?

YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

Code No. P0047: Variable Geometry Control Solenoid Valve Circuit Low Input <Euro5>

Variable geometry control solenoid valve circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V: Violet PU: Purple SI: Silver

AKA00128 AD

OPERATION

- Power is supplied to the variable geometry control solenoid valve (terminal No. 2) from the engine control relay (terminal No. 3).
- The engine-ECU (terminal No. 17) makes the power transistor in the unit be in "ON" position, and that makes currents go on the variable geometry control solenoid valve (terminal No. 1).

FUNCTION

- The variable geometry control solenoid valve controls the vacuum pressure introduced into the variable geometry actuator, using the signal from the engine-ECU. This allows the boost pressure to be adequate for the driving conditions.

TROUBLE JUDGMENT

Check Conditions

- Battery positive voltage is 8 – 16 V.
- 2 seconds later after the engine has started up.

Judgment Criterion

- Variable geometry control solenoid valve output voltage is 0.4 V or less (driving current is abnormally low).

PROBABLE CAUSES

- Failed variable geometry control solenoid valve
- Open/short circuit or harness damage in variable geometry control solenoid valve circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III actuator test

- Item 36: Variable geometry control solenoid valve

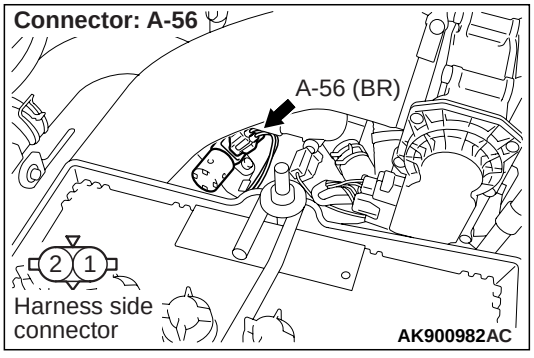
OK: The variable geometry actuator is operated

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

NO : Go to Step 2 .

STEP 2. Connector check: A-56 variable geometry control solenoid valve connector

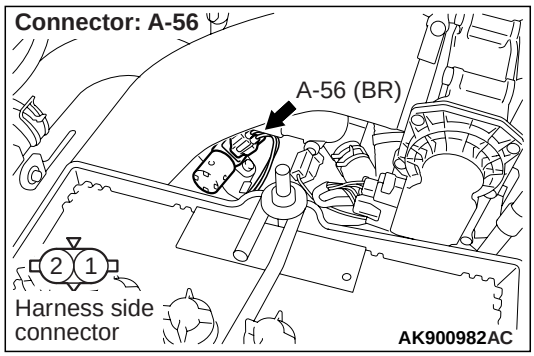


Q: Is the check result normal?

YES : Go to Step 3 .

NO : Repair or replace the connector.

STEP 3. Perform resistance measurement at A-56 variable geometry control solenoid valve connector.



- Disconnect connector, and measure at solenoid valve side.
- Resistance between terminal No. 1 and No. 2.

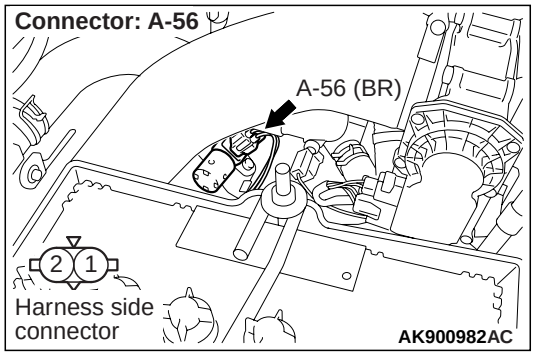
OK: 10 – 14 Ω (at 20°C)

Q: Is the check result normal?

YES : Go to Step 4 .

NO : Replace the variable geometry control solenoid valve.

STEP 4. Perform voltage measurement at A-56 variable geometry control solenoid valve connector.



- Disconnect connector, and measure at harness side.
- Ignition switch: ON
- Voltage between terminal No. 2 and earth.

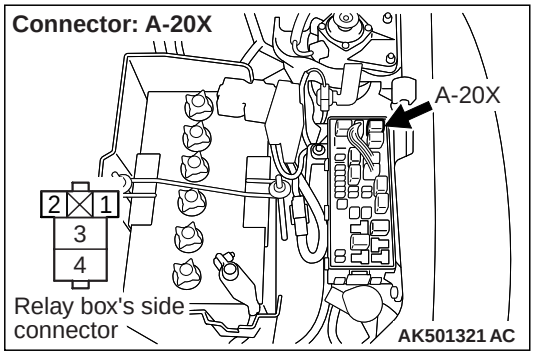
OK: System voltage

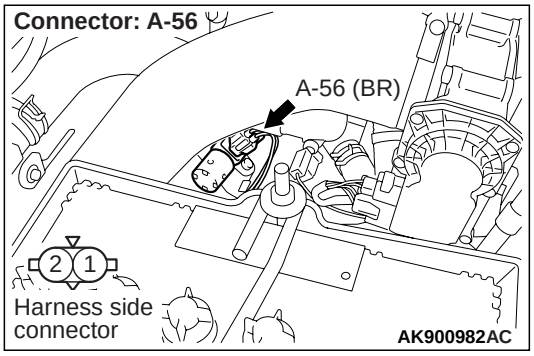
Q: Is the check result normal?

YES : Go to Step 6 .

NO : Go to Step 5 .

STEP 5. Connector check: A-20X engine control relay connector





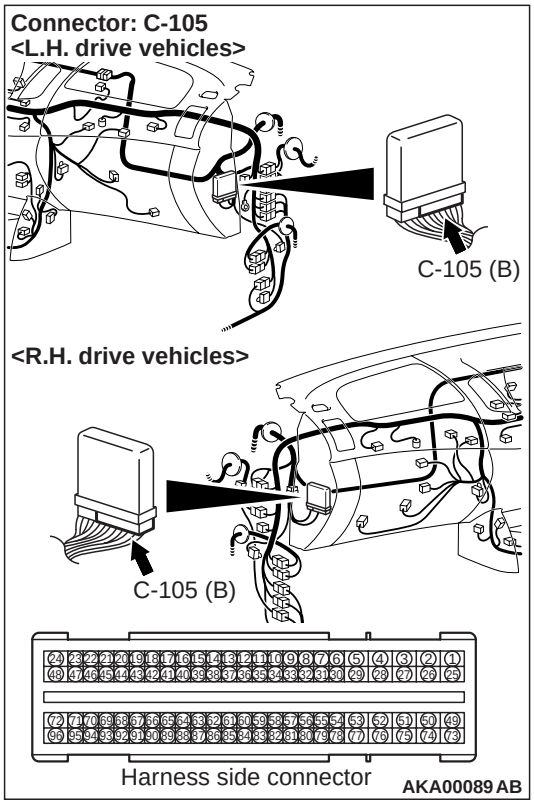
Q: Is the check result normal?

YES : Check and repair harness between A-56 (terminal No. 2) variable geometry control solenoid valve connector and A-20X (terminal No. 3) engine control relay connector.

- Check power supply line open/short circuit

NO : Repair or replace the connector.

STEP 6. Perform voltage measurement at C-105 engine-ECU connector.



- Disconnect connector, and measure at harness side.
- Ignition switch: ON
- Voltage between terminal No. 17 and earth.

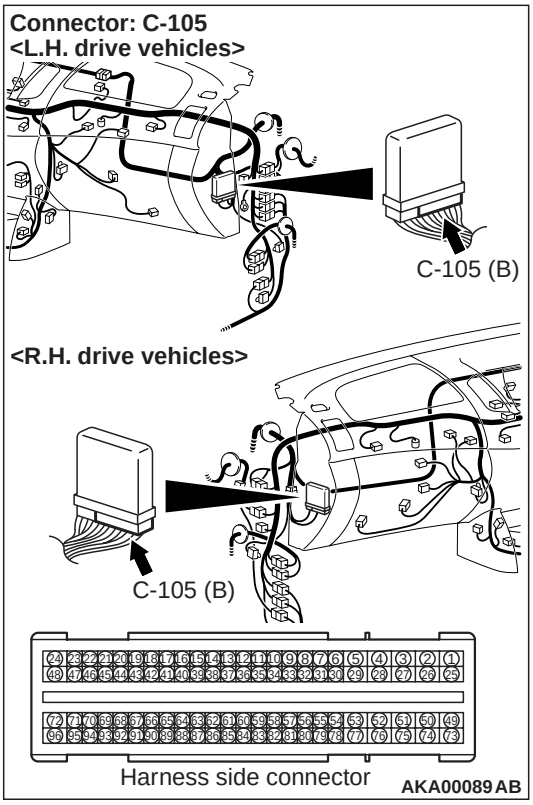
OK: System voltage

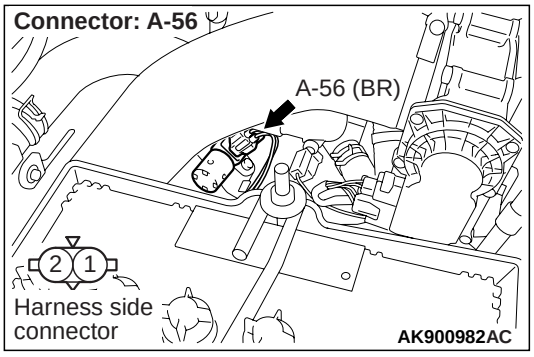
Q: Is the check result normal?

YES : Go to Step 8 .

NO : Go to Step 7 .

STEP 7. Connector check: C-105 engine-ECU connector



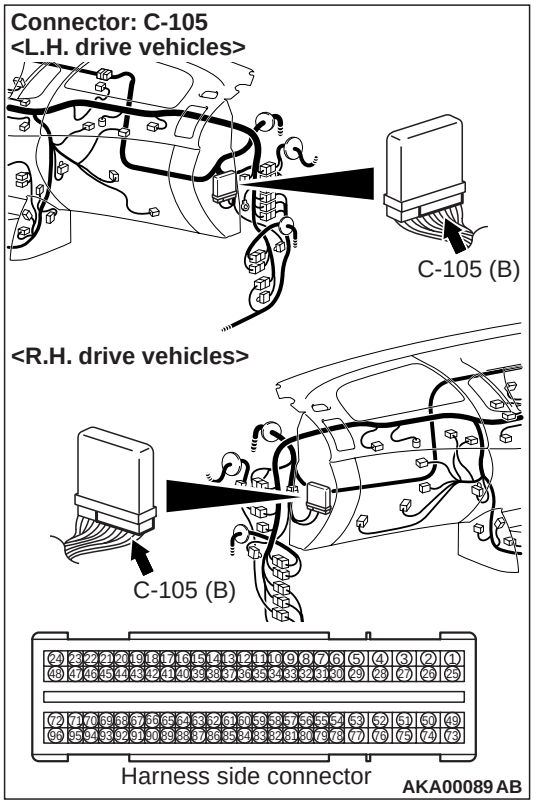


Q: Is the check result normal?

YES : Check and repair harness between A-56 (terminal No. 1) variable geometry control solenoid valve connector and C-105 (terminal No. 17) engine-ECU connector.
- Check output line for open/short circuit.

NO : Repair or replace the connector.

STEP 8. Connector check: C-105 engine-ECU connector

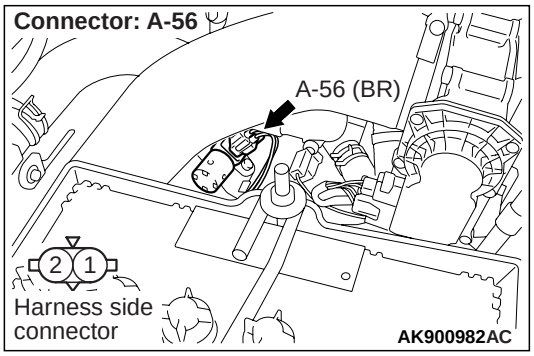


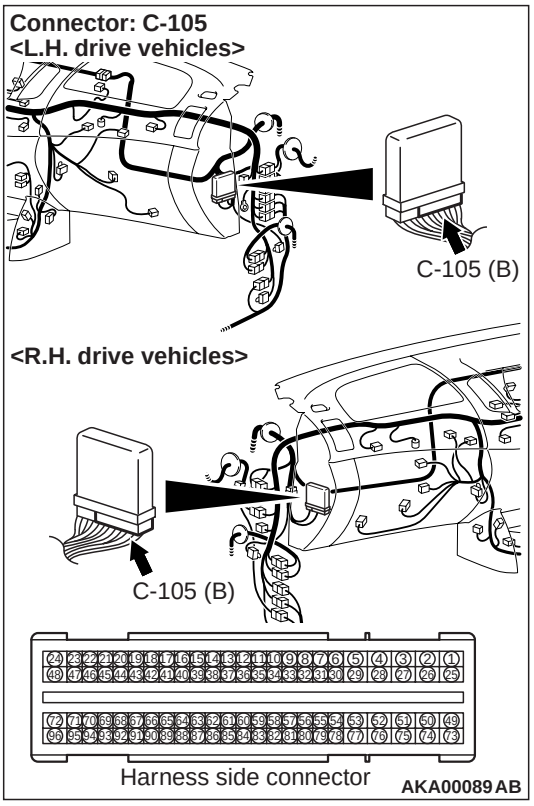
Q: Is the check result normal?

YES : Go to Step 9 .

NO : Repair or replace the connector.

STEP 9. Check harness between A-56 (terminal No. 1) variable geometry control solenoid valve connector and C-105 (terminal No. 17) engine-ECU connector.



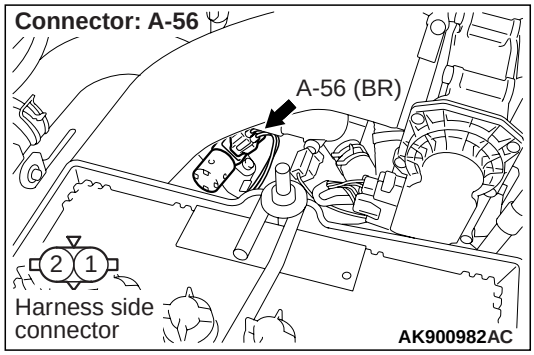


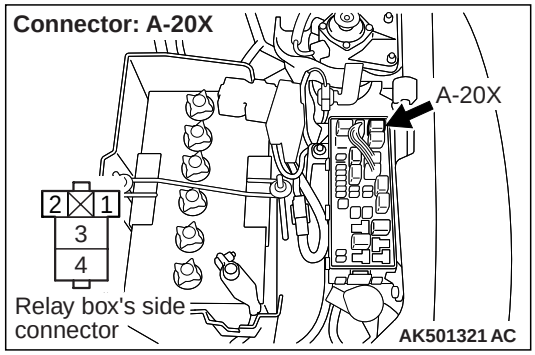
- Check output line for damage.

Q: Is the check result normal?

YES : Go to Step 10 .
NO : Repair the damaged harness wire.

STEP 10. Check harness between A-56 (terminal No. 2) variable geometry control solenoid valve connector and A20X (terminal No. 3) engine control relay connector.





- Check power supply line for damage.

Q: Is the check result normal?

YES : Go to Step 11 .
NO : Repair the damaged harness wire.

STEP 11. M.U.T.-III actuator test

- Item 36: Variable geometry control solenoid valve

  OK: The variable geometry actuator is operated

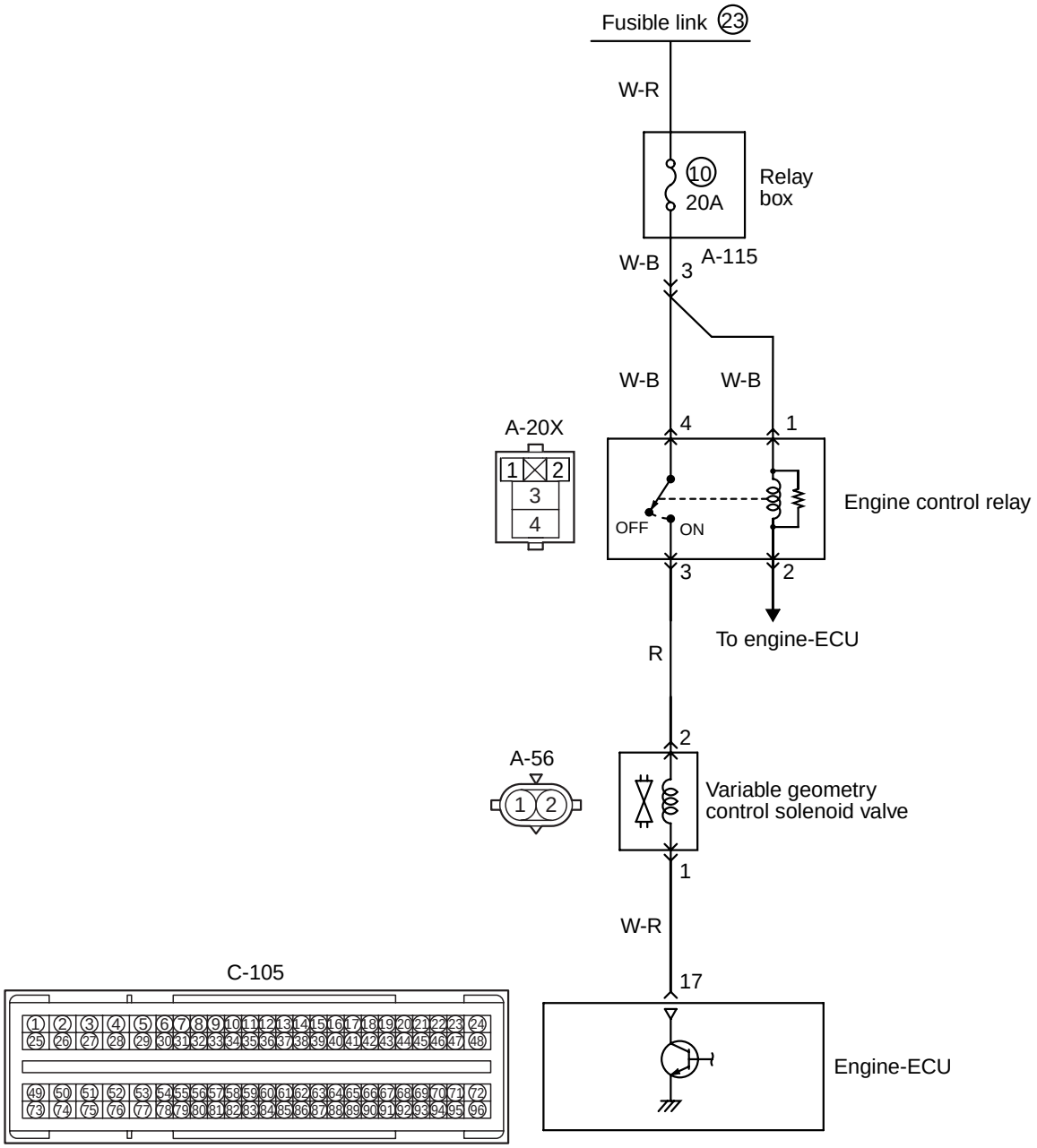
Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

NO : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, carry out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

Code No. P0048: Variable Geometry Control Solenoid Valve Circuit High Input <Euro5>

Variable geometry control solenoid valve circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V: Violet PU: Purple SI: Silver

AKA00128 AD

OPERATION

- Power is supplied to the variable geometry control solenoid valve (terminal No. 2) from the engine control relay (terminal No. 3).
- The engine-ECU (terminal No. 17) makes the power transistor in the unit be in "ON" position, and that makes currents go on the variable geometry control solenoid valve (terminal No. 1).

FUNCTION

- The variable geometry control solenoid valve controls the vacuum pressure introduced into the variable geometry actuator, using the signal from the engine-ECU. This allows the boost pressure to be adequate for the driving conditions.

TROUBLE JUDGMENT

Check Conditions

- Battery positive voltage is 8 – 16 V.
- 2 seconds later after the engine has started up.

Judgment Criterion

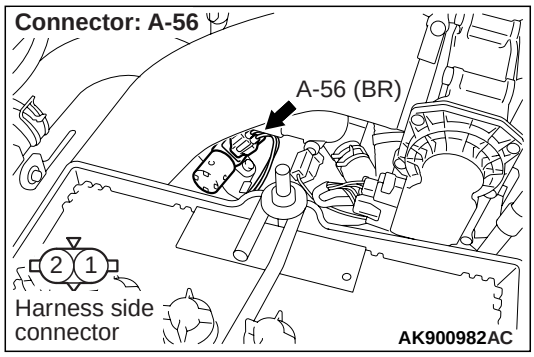
- Variable geometry control solenoid valve output voltage is 4.5 V or more (driving current is abnormally high).

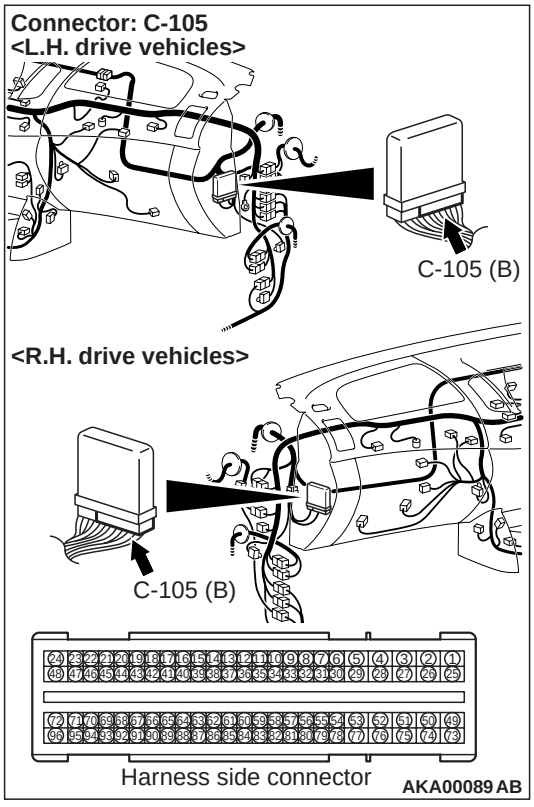
PROBABLE CAUSES

- Short circuit in variable geometry control solenoid valve circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. Connector check: A-56 variable geometry control solenoid valve connector, C-105 engine-ECU connector



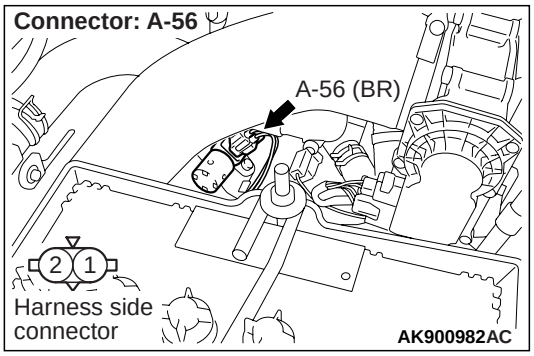


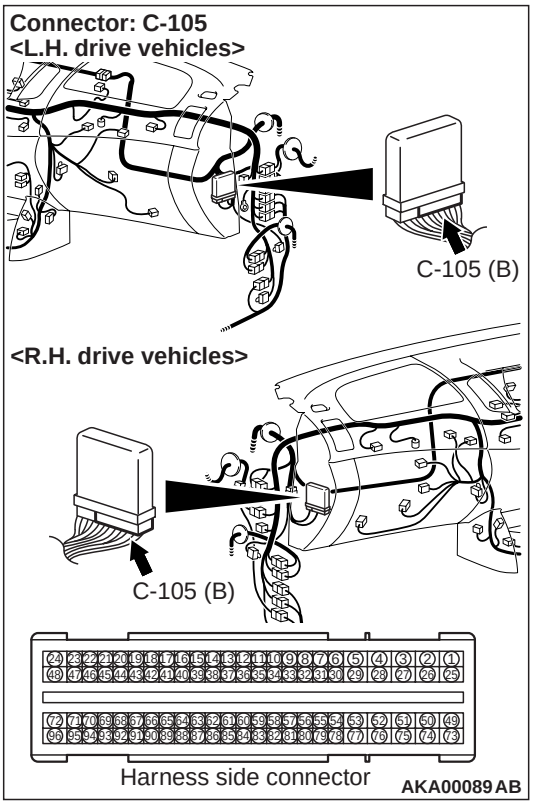
Q: Are the check results normal?

YES : Go to Step 2 .

NO : Repair or replace the connector.

STEP 2. Check harness between A-56 (terminal No. 1) variable geometry control solenoid valve connector and C-105 (terminal No. 17) engine-ECU connector.





- Check output line for short circuit.

Q: Is the check result normal?

YES : Go to Step 3 .
NO : Repair the damaged harness wire.

STEP 3. M.U.T.-III diagnosis code

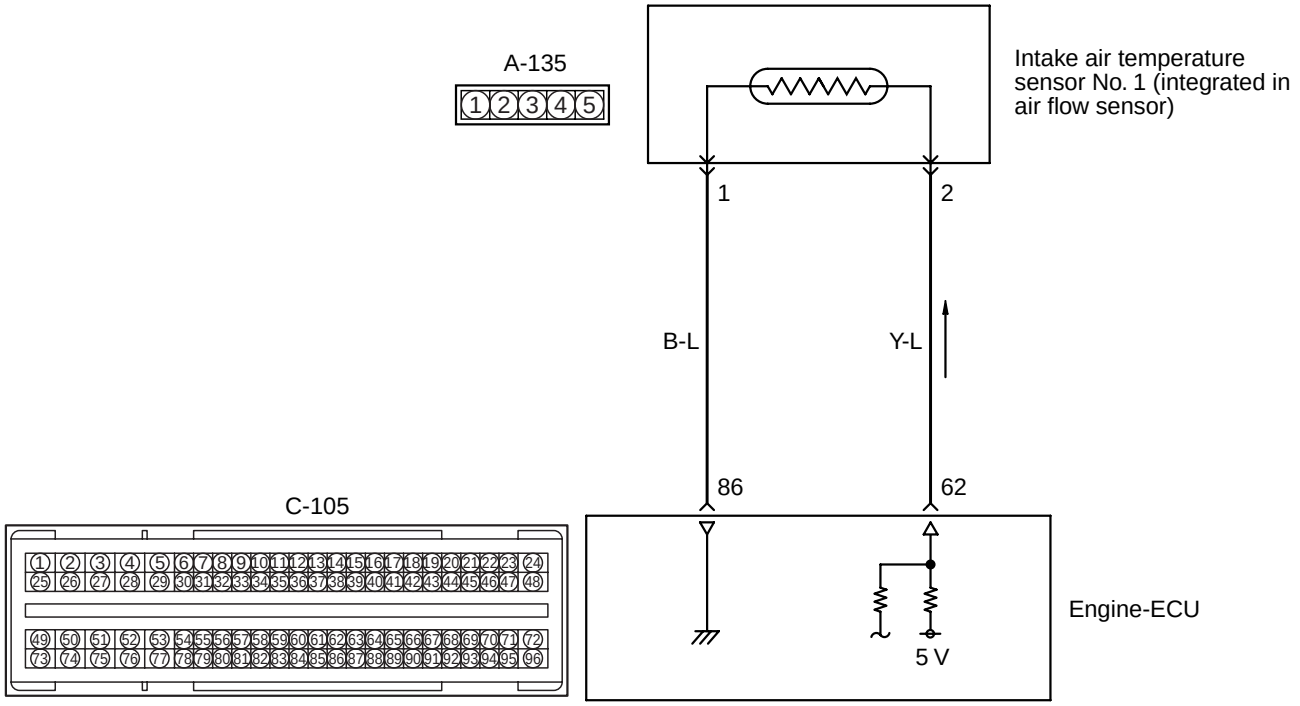
- Reconfirmation of diagnosis code.

Q: Is diagnosis code set?

YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, carry out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

Code No. P0072: Intake Air Temperature Sensor No. 1 Circuit Low Input <Euro5>

Intake Air Temperature Sensor No. 1 Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Gray
R: Red P: Pink V: Violet PU: Purple SI: Silver

AKA00356 AB

OPERATION

- A power voltage of 5 V is applied to the intake air temperature sensor No. 1 output terminal (terminal No. 2) from the engine-ECU (terminal No. 62).
- The power voltage is earthed to the engine-ECU (terminal No. 86) from the intake air temperature sensor No. 1 (terminal No. 1).

FUNCTION

- The intake air temperature sensor No. 1 converts the intake air temperature into a voltage and inputs the voltage signal to the engine-ECU.
- In response to the signal, the engine-ECU corrects the fuel injection amount, etc.
- The intake air temperature sensor No. 1 is a kind of resistor, which has characteristics to reduce its resistance as the intake air temperature rises. Therefore, the sensor output voltage varies with the intake air temperature, and becomes lower as the intake air temperature rises.

TROUBLE JUDGMENT

Check Conditions

- Battery positive voltage is 8 – 16 V
- 2 seconds later after the ignition switch has been in "ON" position or the engine has started up.

Judgment Criterion

- The intake air temperature sensor No. 1 output voltage is 0.09 V or less for 0.5 second.

PROBABLE CAUSES

- Failed intake air temperature sensor No. 1
- Short circuit or harness damage in intake air temperature sensor No.1 circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III data list

- Item 43: Intake air temperature sensor No. 1

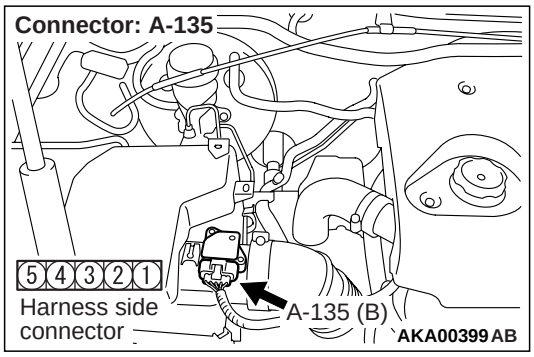
  OK: At ambient temperature (atmospheric temperature) or equivalent.

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

NO : Go to Step 2 .

STEP 2. Connector check: A-135 air flow sensor connector



Q: Is the check result normal?

YES : Go to Step 3 .

NO : Repair or replace the connector.

STEP 3. Check intake air temperature sensor No. 1 itself.

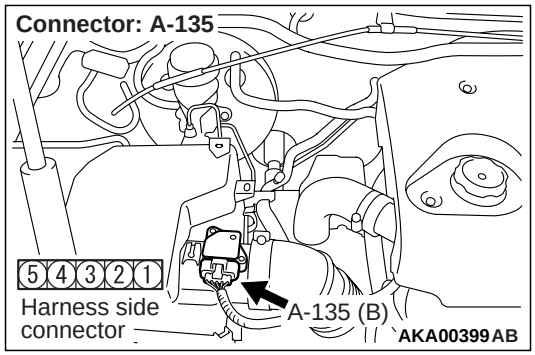
- Check intake air temperature sensor No. 1 itself (Refer to P.13A-595).

Q: Is the check result normal?

YES : Go to Step 4 .

NO : Replace the air flow sensor.

STEP 4. Perform Voltage measurement at A-135 air flow sensor connector.



- Disconnect connector, and measure at harness side.
- Ignition switch: ON
- Voltage between terminal No. 2 and earth.

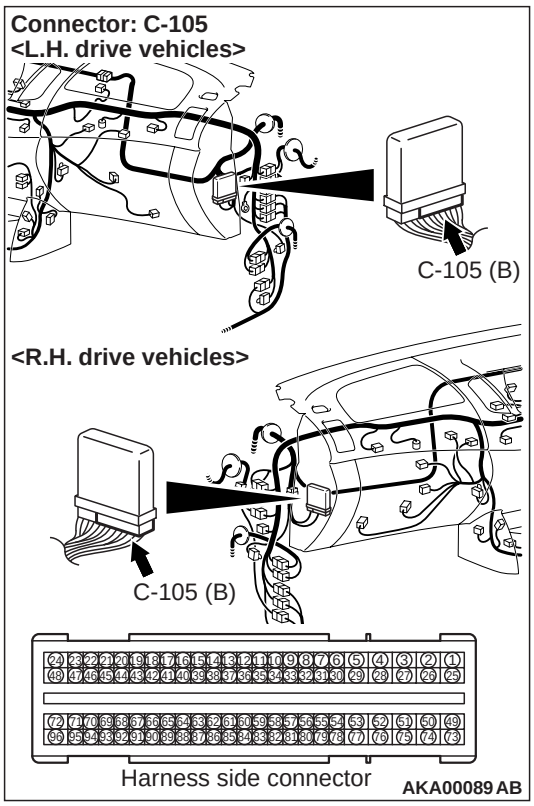
  OK: 4.5 – 4.9 V

Q: Is the check result normal?

YES : Go to Step 8 .

NO : Go to Step 5 .

STEP 5. Connector check: C-105 engine-ECU connector

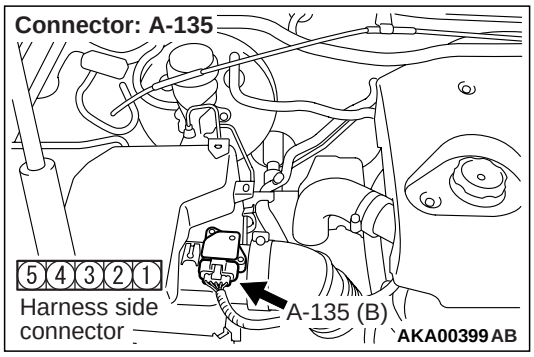


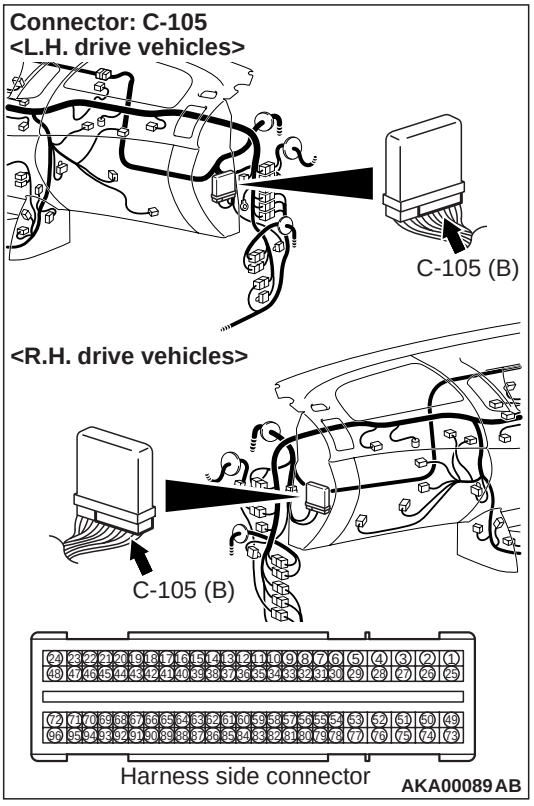
Q: Is the check result normal?

YES : Go to Step 6 .

NO : Repair or replace the connector.

STEP 6. Check harness between A-135 (terminal No. 2) air flow sensor connector and C-105 (terminal No. 62) engine-ECU connector.





- Check output line for short circuit.

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair the damaged harness wire.

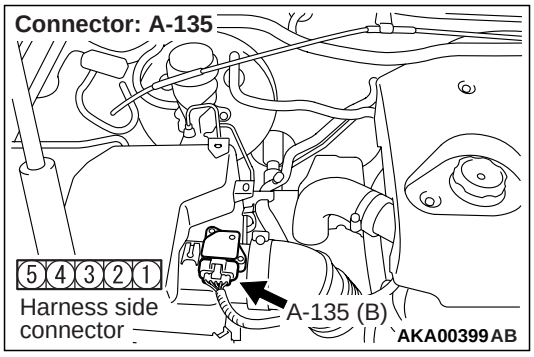
STEP 7. M.U.T.-III data list

- Item 43: Intake air temperature sensor No. 1

  OK: At ambient temperature (atmospheric temperature) or equivalent.

Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).
NO : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, carry out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

STEP 8. Perform resistance measurement at A-135 air flow sensor connector.

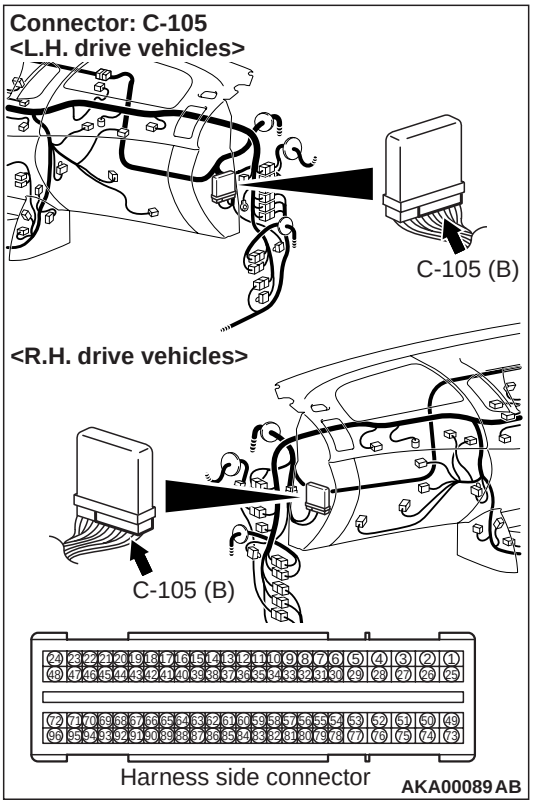


- Disconnect connector, and measure at harness side.
- Resistance between terminal No. 1 and earth.

  OK: Continuity (2 Ω or less)

Q: Is the check result normal?
YES : Go to Step 11 .
NO : Go to Step 9 .

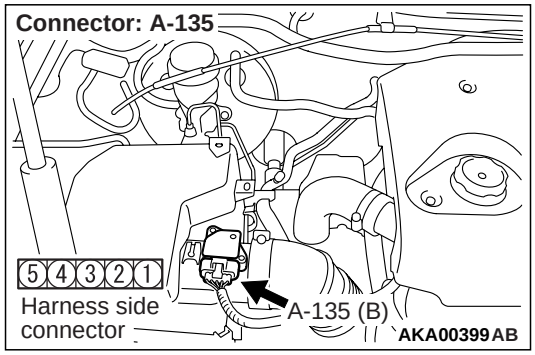
STEP 9. Connector check: C-105 engine-ECU connector

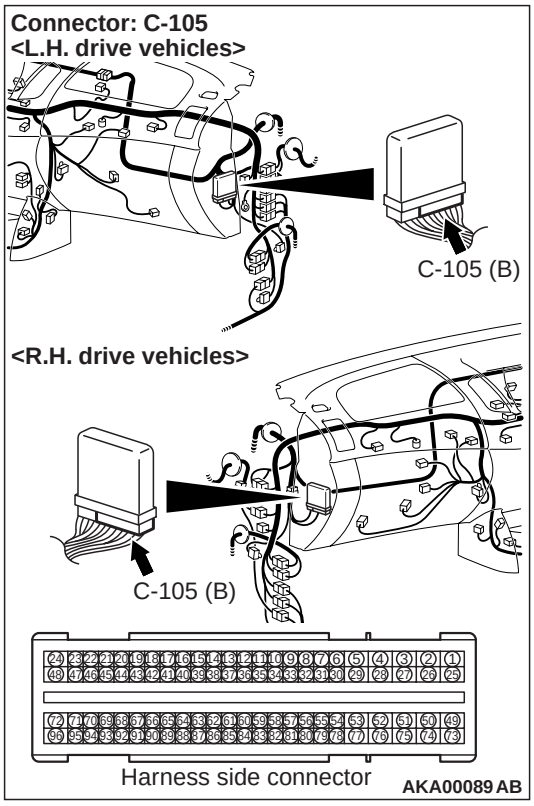


Q: Is the check result normal?
YES : Go to Step 10 .
NO : Repair or replace the connector.

STEP 10. Check harness between A-135 (terminal No. 1) air flow sensor connector and C-105 (terminal No. 86) engine-ECU connector.

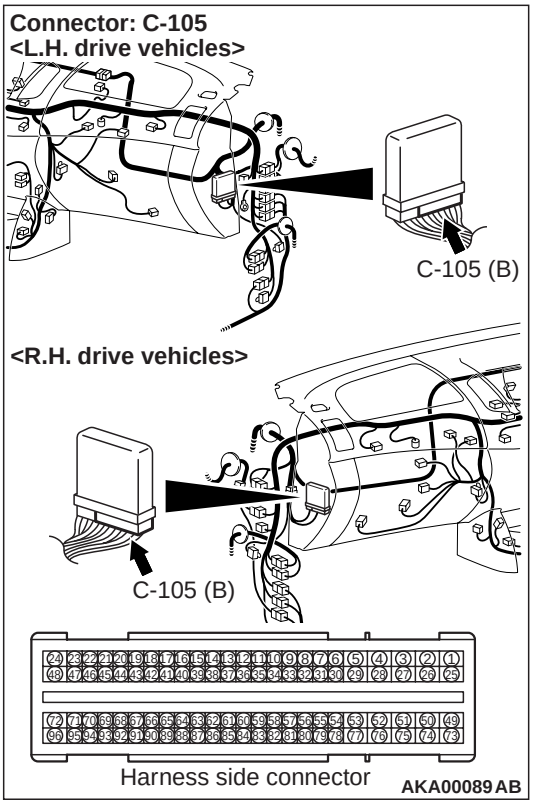
- Check earthing line for damage.





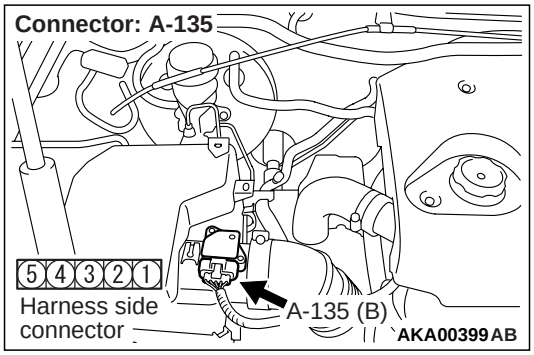
Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair the damaged harness wire.

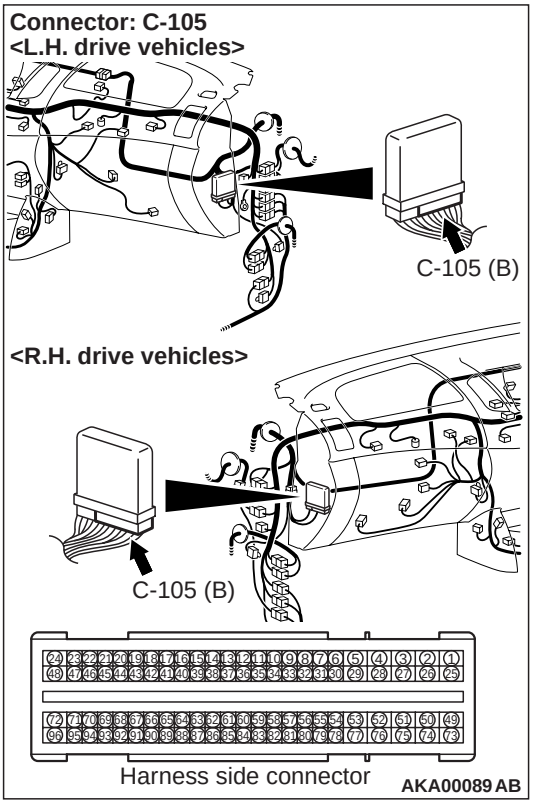
STEP 11. Connector check: C-105 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 12 .
NO : Repair or replace the connector.

STEP 12. Check harness between A-135 (terminal No. 2) air flow sensor connector and C-105 (terminal No. 62) engine-ECU connector.



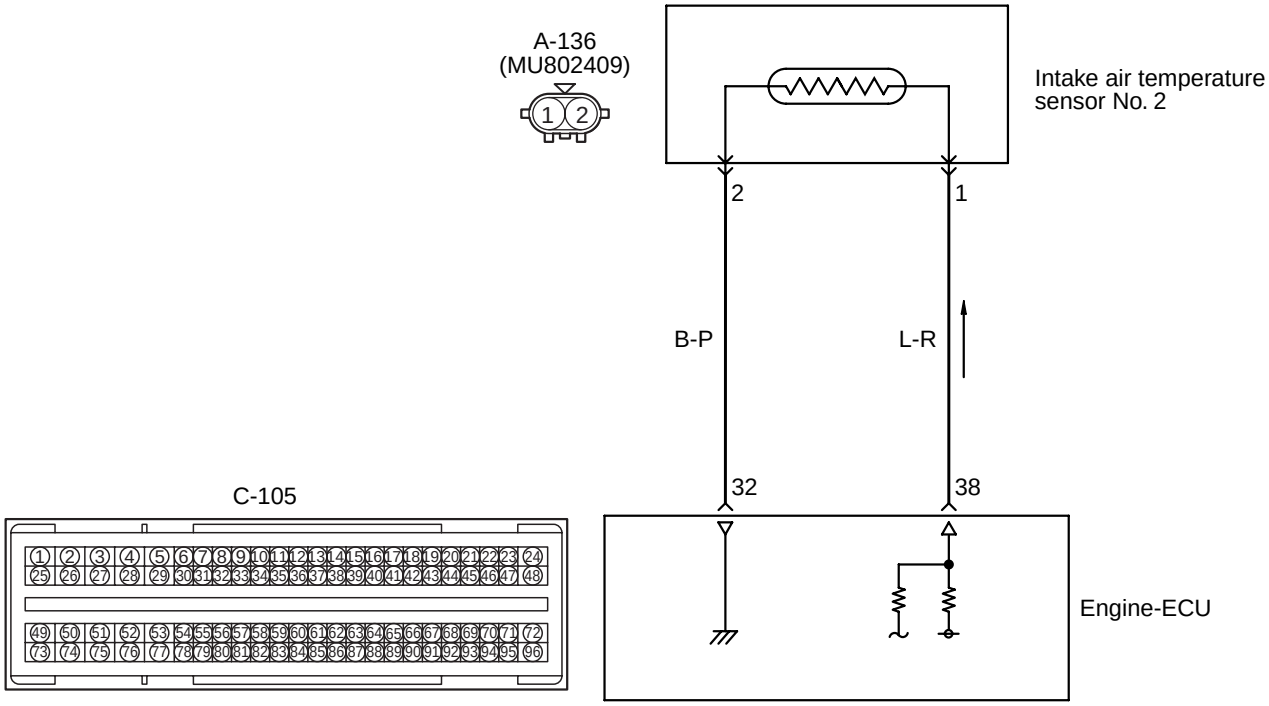


- Check output line for damage.

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair the damaged harness wire.

Code No. P0072: Intake Air Temperature Sensor No. 2 Circuit Low Input <Except Euro5>

Intake Air Temperature Sensor No. 2 Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Gray
R: Red P: Pink V: Violet PU: Purple SI: Silver

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OPERATION

- A power voltage of 5 V is applied to the intake air temperature sensor No. 2 output terminal (terminal No. 1) from the engine-ECU (terminal No. 38).
- The power voltage is earthed to the engine-ECU (terminal No. 32) from the intake air temperature sensor (terminal No. 2).

FUNCTION

- The intake air temperature sensor No. 2 converts the intake air temperature into a voltage and inputs the voltage signal to the engine-ECU.
- In response to the signal, the engine-ECU corrects the fuel injection amount, etc.
- The intake air temperature sensor No. 2 is a kind of resistor, which has characteristics to reduce its resistance as the intake air temperature rises. Therefore, the sensor output voltage varies with the fuel temperature, and becomes lower as the intake air temperature rises.

TROUBLE JUDGMENT

Check Conditions

- Battery positive voltage is 8 – 16 V
- 2 seconds later after the ignition switch has been in "ON" position or the engine has started up.

Judgment Criterion

- The intake air temperature sensor No. 2 output voltage is 0.05 V or less (the intake air temperature is above 150°C or equivalent) for 0.5 second.

PROBABLE CAUSES

- Failed intake air temperature sensor No. 2
- Short circuit or harness damage in intake air temperature sensor No. 2 circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III data list

- Item 8: Intake air temperature sensor No. 2

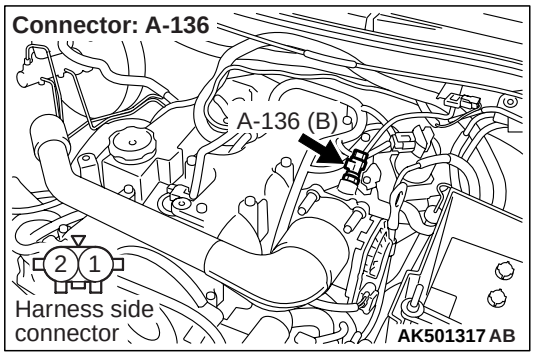
  OK: At ambient temperature (atmospheric temperature) or equivalent.

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

NO : Go to Step 2 .

STEP 2. Connector check: A-136 intake air temperature sensor No. 2 connector



Q: Is the check result normal?

YES : Go to Step 3 .

NO : Repair or replace the connector.

STEP 3. Check intake air temperature sensor No. 2 itself.

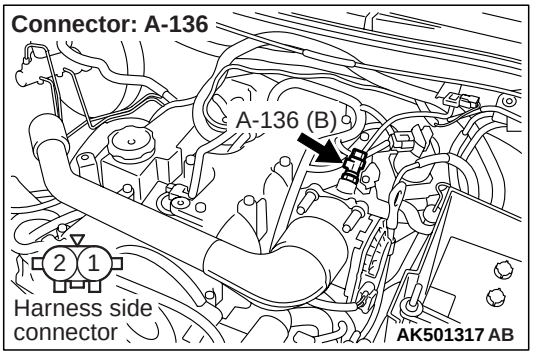
- Check intake air temperature sensor No. 2 itself (Refer to P.13A-595).

Q: Is the check result normal?

YES : Go to Step 4 .

NO : Replace the intake air temperature sensor No. 2.

STEP 4. Perform voltage measurement at A-136 intake air temperature sensor No. 2 connector.



- Disconnect connector, and measure at harness side.
- Ignition switch: ON
- Voltage between terminal No. 1 and earth.

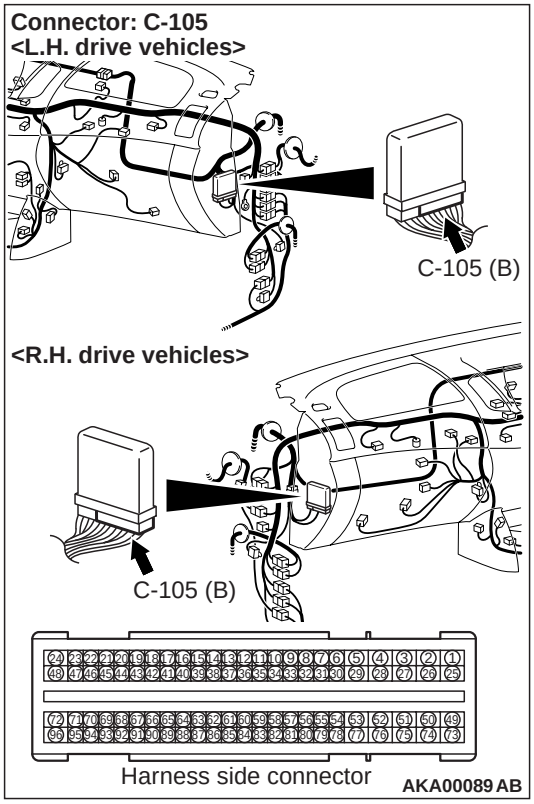
  OK: 4.5 – 4.9 V

Q: Is the check result normal?

YES : Go to Step 8 .

NO : Go to Step 5 .

STEP 5. Connector check: C-105 engine-ECU connector

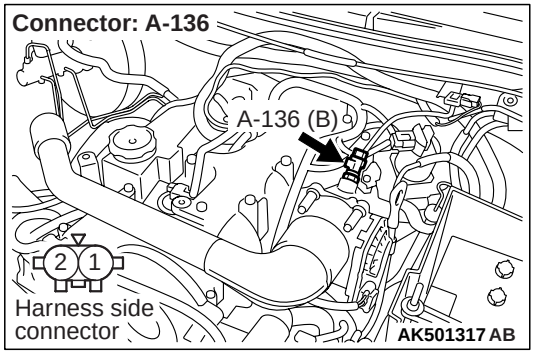


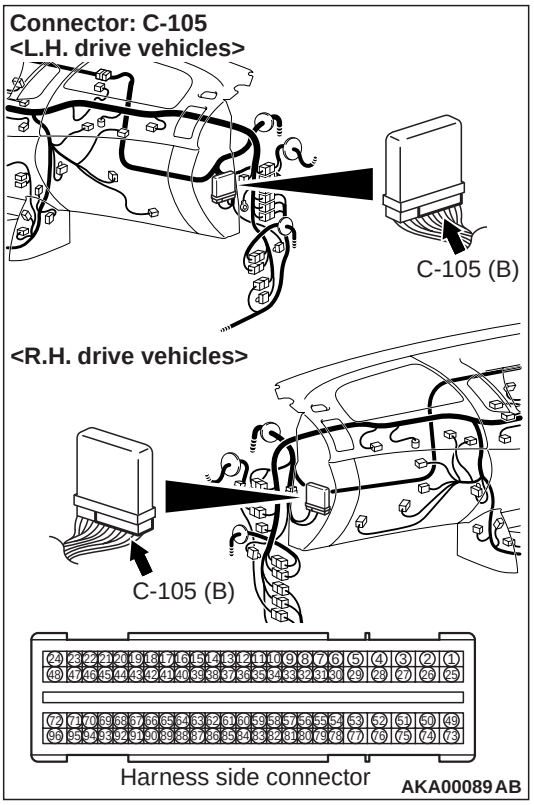
Q: Is the check result normal?

YES : Go to Step 6 .

NO : Repair or replace the connector.

STEP 6. Check harness between A-136 (terminal No. 1) intake air temperature sensor No. 2 connector and C-105 (terminal No. 38) engine-ECU connector.





- Check output line for short circuit.

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair the damaged harness wire.

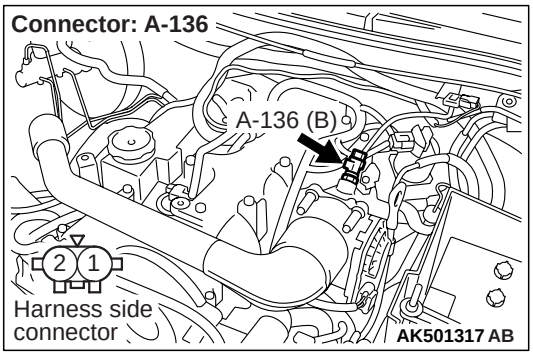
STEP 7. M.U.T.-III data list

- Item 8: Intake air temperature sensor No. 2

  OK: At ambient temperature (atmospheric temperature) or equivalent.

Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).
NO : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).

STEP 8. Perform resistance measurement at A-136 intake air temperature sensor No. 2 connector.

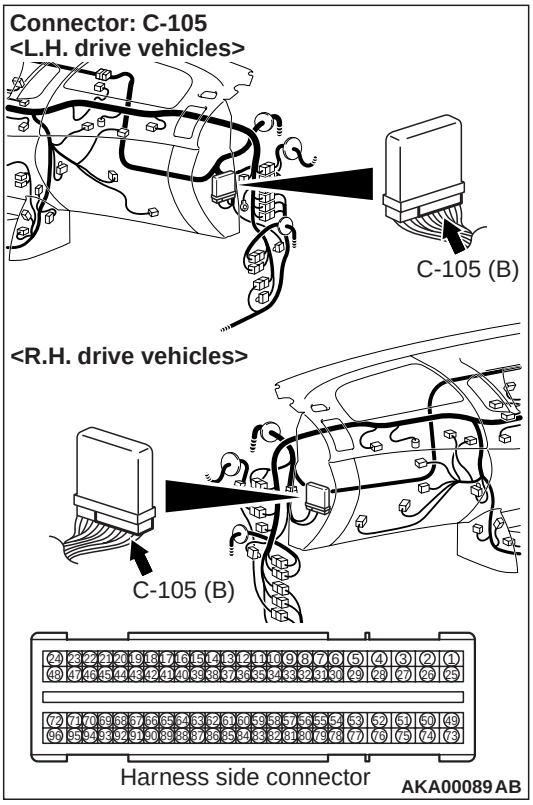


- Disconnect connector, and measure at harness side.
- Resistance between terminal No. 2 and earth.

  OK: Continuity (2 Ω or less)

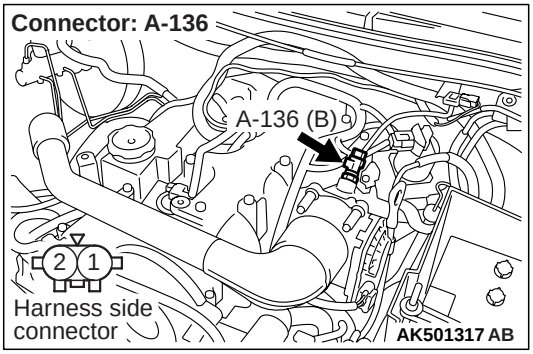
Q: Is the check result normal?
YES : Go to Step 11 .
NO : Go to Step 9 .

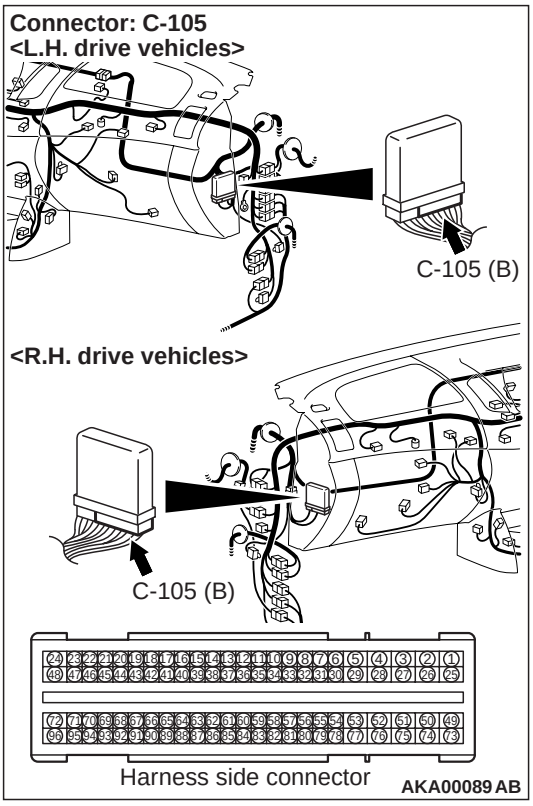
STEP 9. Connector check: C-105 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 10 .
NO : Repair or replace the connector.

STEP 10. Check harness between A-136 (terminal No. 2) intake air temperature sensor No. 2 connector and C-105 (terminal No. 32) engine-ECU connector.

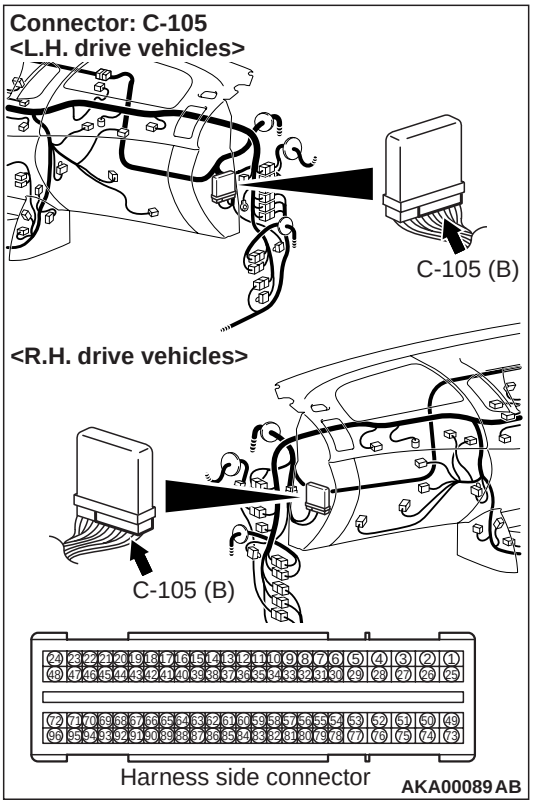




- Check earthing line for damage.

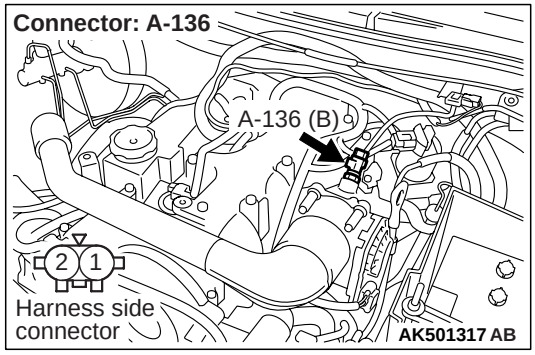
Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair the damaged harness wire.

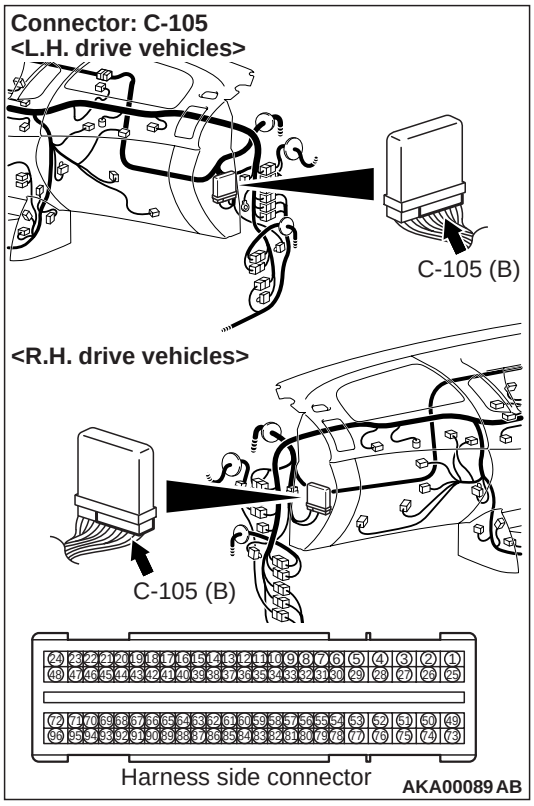
STEP 11. Connector check: C-105 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 12 .
NO : Repair or replace the connector.

STEP 12. Check harness between A-136 (terminal No. 1) intake air temperature sensor No. 2 connector and C-105 (terminal No. 38) engine-ECU connector.



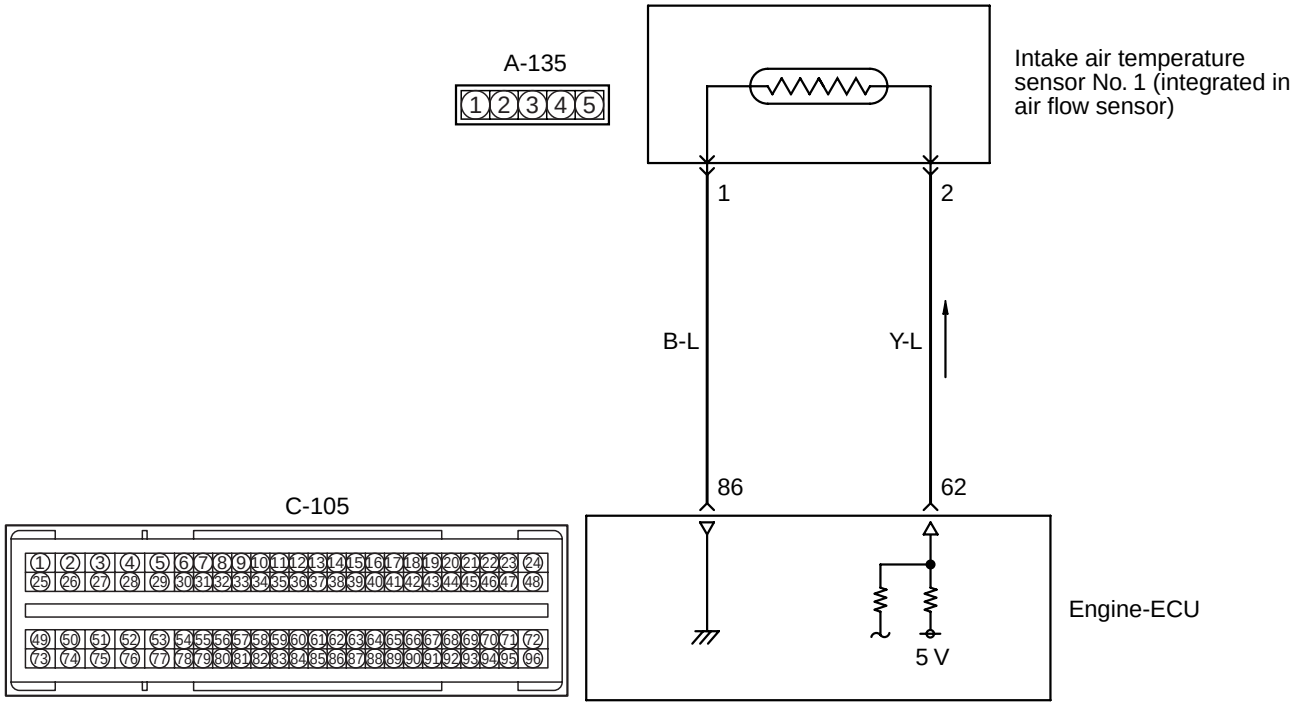


- Check output line for damage.

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair the damaged harness wire.

Code No. P0073: Intake Air Temperature Sensor No. 1 Circuit High Input <Euro5>

Intake Air Temperature Sensor No. 1 Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Gray
R: Red P: Pink V: Violet PU: Purple SI: Silver

AKA00356 AB

OPERATION

- A power voltage of 5 V is applied to the intake air temperature sensor No.1 output terminal (terminal No. 2) of air flow sensor connector from the engine-ECU (terminal No. 62).
- The power voltage is earthed to the engine-ECU (terminal No. 86) from the intake air temperature sensor No. 1 (terminal No. 1).

FUNCTION

- The intake air temperature sensor No. 1 converts the intake air temperature into a voltage and inputs the voltage signal to the engine-ECU.
- In response to the signal, the engine-ECU corrects the fuel injection amount, etc.
- The intake air temperature sensor No. 1 is a kind of resistor, which has characteristics to reduce its resistance as the intake air temperature rises. Therefore, the sensor output voltage varies with the intake air temperature, and becomes lower as the intake air temperature rises.

TROUBLE JUDGMENT

Check Conditions

- Battery positive voltage is 8 – 16 V
- 2 seconds later after the ignition switch has been in "ON" position or the engine has started up.

Judgment Criterion

- The intake air temperature sensor No. 1 output voltage is 4.87 V or more for 0.5 second.

PROBABLE CAUSES

- Failed intake air temperature sensor No. 1
- Open circuit or harness damage in intake air temperature sensor No. 1 circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

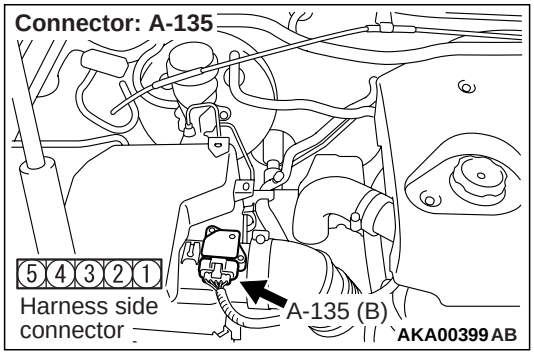
STEP 1. M.U.T.-III data list

- Refer to Data List Reference Table P.13A-542.
  a. Item 43: Intake air temperature sensor No. 1

  OK: At ambient temperature (atmospheric temperature) or equivalent.

Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).
NO : Go to Step 2 .

STEP 2. Connector check: A-135 air flow sensor connector



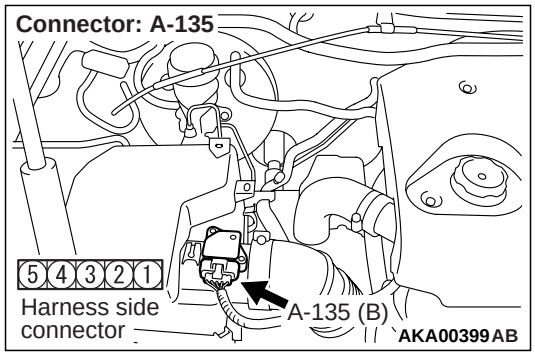
Q: Is the check result normal?
YES : Go to Step 3 .
NO : Repair or replace the connector.

STEP 3. Check intake air temperature sensor No. 1 itself.

- Check intake air temperature sensor No. 1 itself (Refer to P.13A-595).

Q: Is the check result normal?
YES : Go to Step 4 .
NO : Replace the air flow sensor.

STEP 4. Perform voltage measurement at A-135 air flow sensor No. 1 connector.

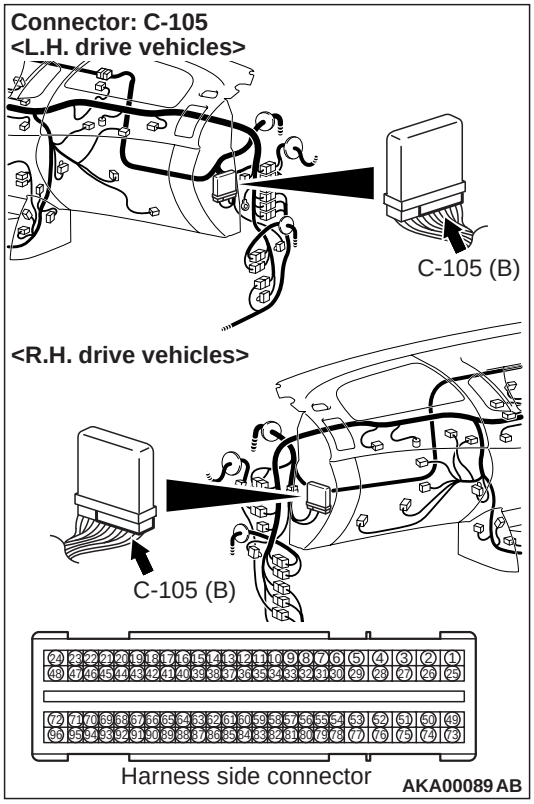


- Disconnect connector, and measure at harness side.
- Ignition switch: ON
- Voltage between terminal No. 2 and earth.

  OK: 4.5 – 4.9 V

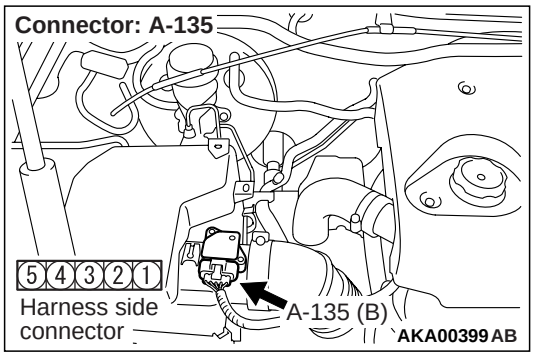
Q: Is the check result normal?
YES : Go to Step 8 .
NO : Go to Step 5 .

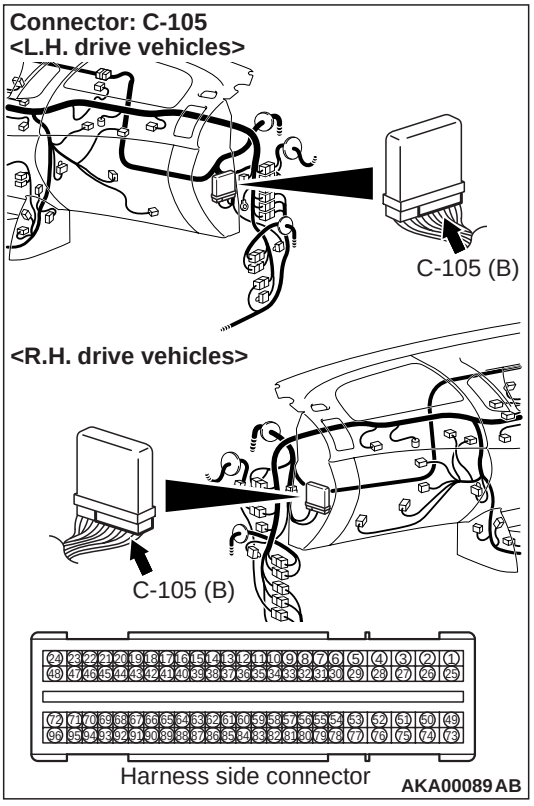
STEP 5. Connector check: C-105 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 6 .
NO : Repair or replace the connector.

STEP 6. Check harness between A-135 (terminal No. 2) air flow sensor connector and C-105 (terminal No. 62) engine-ECU connector.





- Check output line for open circuit.

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair the damaged harness wire.

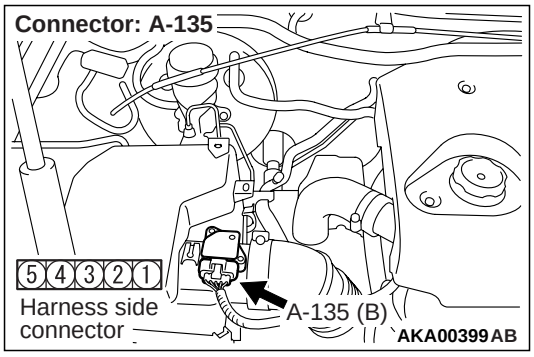
STEP 7. M.U.T.-III data list

- Item 43: Intake air temperature sensor No. 1

  OK: At ambient temperature (atmospheric temperature) or equivalent.

Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).
NO : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, carry out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

STEP 8. Perform resistance measurement at A-135 air flow sensor connector.

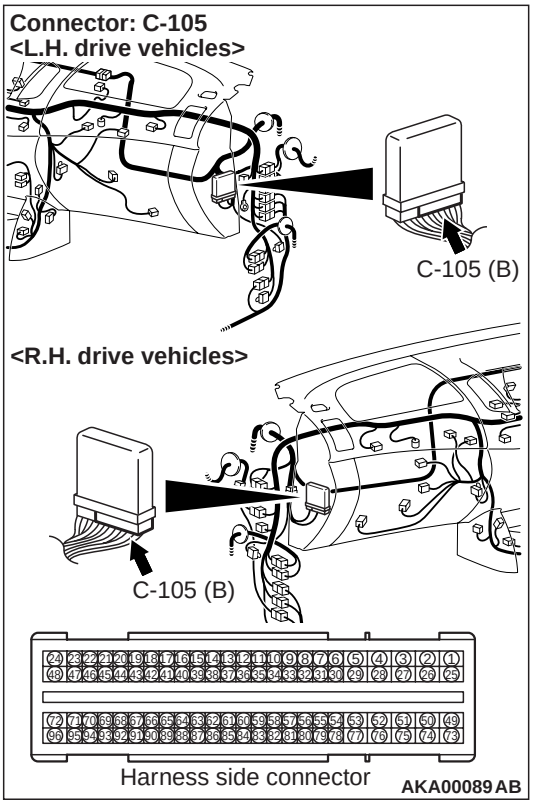


- Disconnect connector, and measure at harness side.
- Resistance between terminal No. 1 and earth.

  OK: Continuity (2 Ω or less)

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Go to Step 9 .

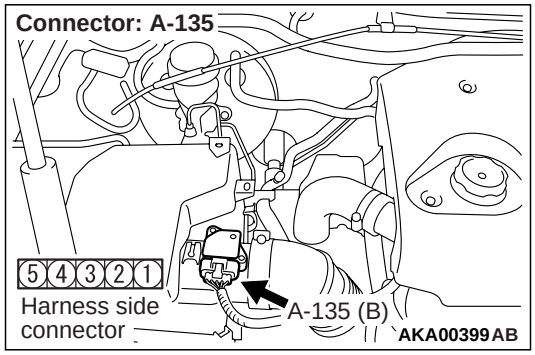
STEP 9. Connector check: C-105 engine-ECU connector

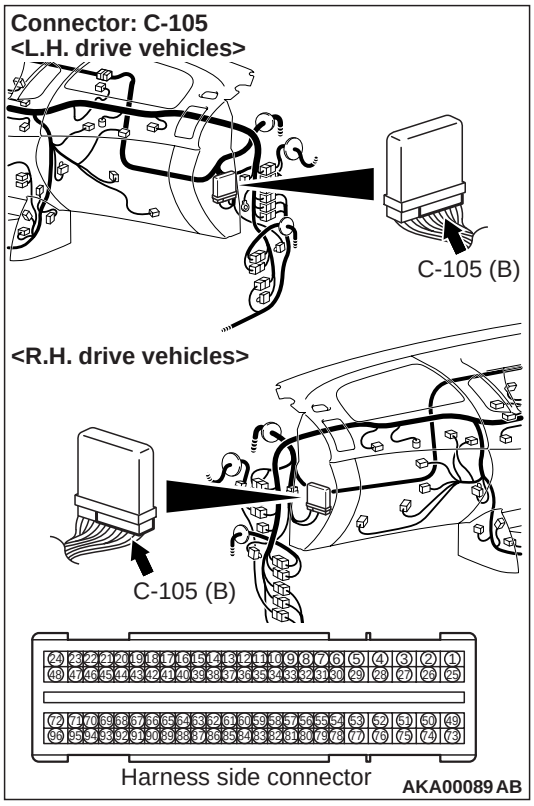


Q: Is the check result normal?
YES : Go to Step 10 .
NO : Repair or replace the connector.

STEP 10. Check harness between A-135 (terminal No. 1) air flow sensor connector and C-105 (terminal No. 86) engine-ECU connector.

- Check earthing line open circuit and damage.

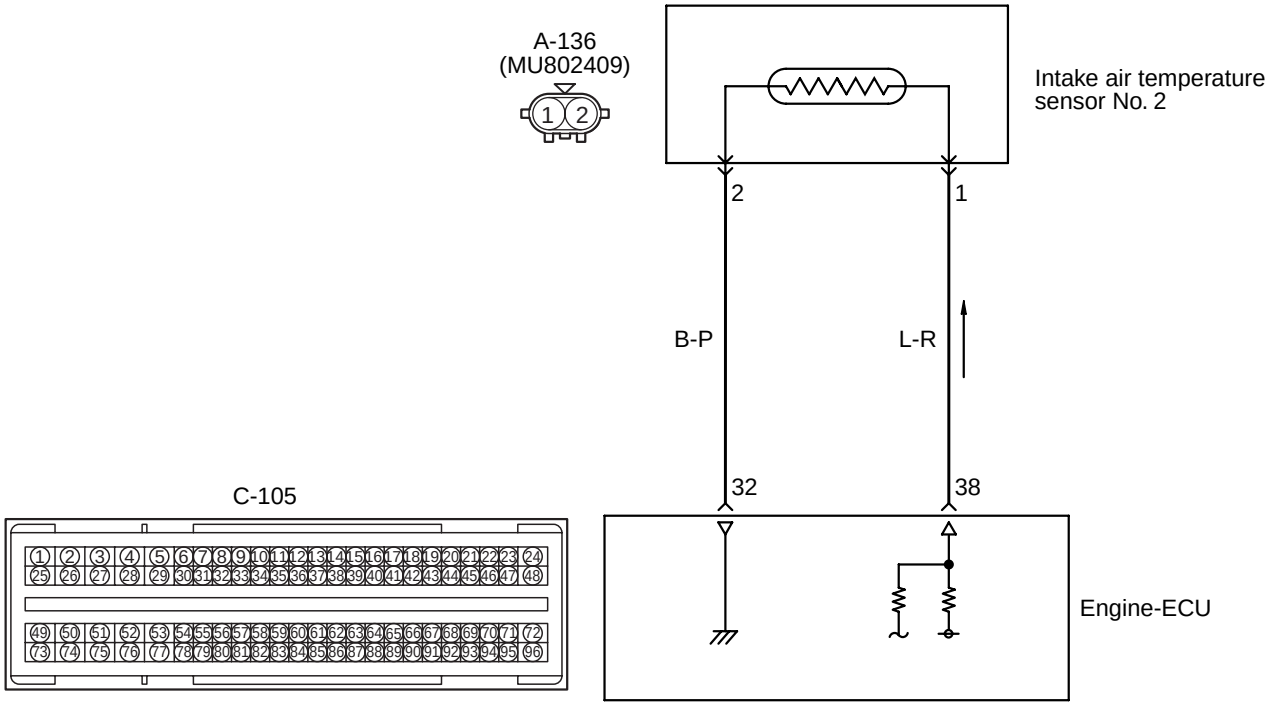




Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair or replace the connector.

Code No. P0073: Intake Air Temperature Sensor No. 2 Circuit High Input <Except Euro5>

Intake Air Temperature Sensor No. 2 Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Gray
R: Red P: Pink V: Violet PU: Purple SI: Silver

AKA00091AB

OPERATION

- A power voltage of 5 V is applied to the intake air temperature sensor No. 2 output terminal (terminal No. 1) from the engine-ECU (terminal No. 38).
- The power voltage is earthed to the engine-ECU (terminal No. 32) from the intake air temperature sensor No. 2 (terminal No. 2).

FUNCTION

- The intake air temperature sensor No. 2 converts the intake air temperature into a voltage and inputs the voltage signal to the engine-ECU.
- In response to the signal, the engine-ECU corrects the fuel injection amount, etc.
- The intake air temperature sensor No. 2 is a kind of resistor, which has characteristics to reduce its resistance as the intake air temperature rises. Therefore, the sensor output voltage varies with the fuel temperature, and becomes lower as the intake air temperature rises.

TROUBLE JUDGMENT

Check Conditions

- Battery positive voltage is 8 – 16 V
- 2 seconds later after the ignition switch has been in "ON" position or the engine has started up.

Judgment Criterion

- The intake air temperature sensor No. 2 output voltage is 4.9 V or more (the intake air temperature is below –40°C or equivalent) for 0.5 second.

PROBABLE CAUSES

- Failed intake air temperature sensor No. 2
- Open circuit in intake air temperature sensor No. 2 circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III data list

- Item 8: Intake air temperature sensor No. 2

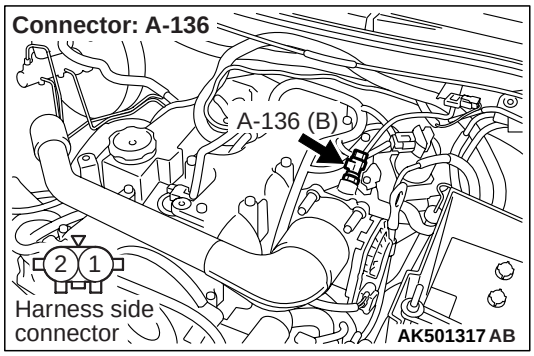
  OK: At ambient temperature (atmospheric temperature) or equivalent.

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

NO : Go to Step 2 .

STEP 2. Connector check: A-136 intake air temperature sensor No. 2 connector



Q: Is the check result normal?

YES : Go to Step 3 .

NO : Repair or replace the connector.

STEP 3. Check intake air temperature sensor No. 2 itself.

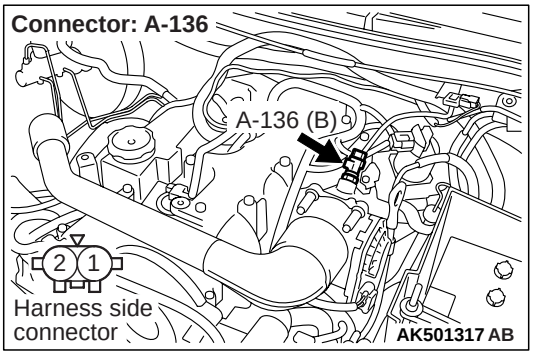
- Check intake air temperature sensor No. 2 itself (Refer to P.13A-595).

Q: Is the check result normal?

YES : Go to Step 4 .

NO : Replace the intake air temperature sensor No. 2.

STEP 4. Perform voltage measurement at A-136 intake air temperature sensor No. 2 connector.



- Disconnect connector, and measure at harness side.
- Ignition switch: ON
- Voltage between terminal No. 1 and earth.

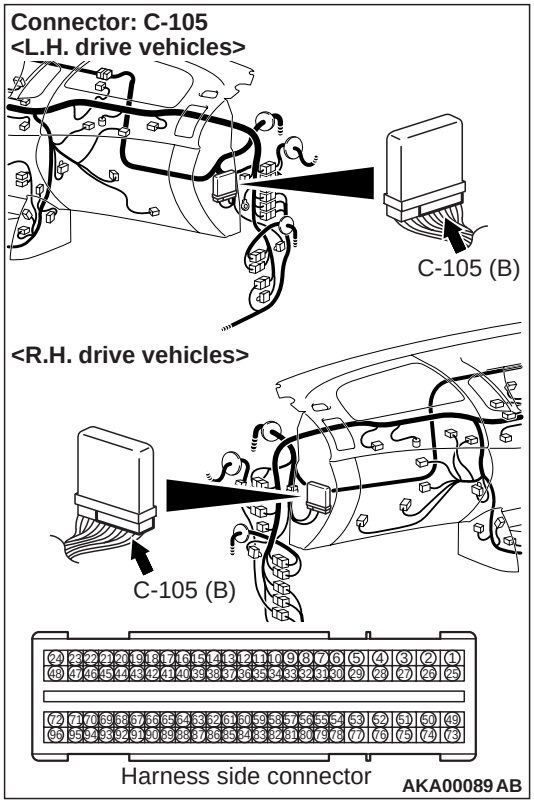
  OK: 4.5 – 4.9 V

Q: Is the check result normal?

YES : Go to Step 8 .

NO : Go to Step 5 .

STEP 5. Connector check: C-105 engine-ECU connector

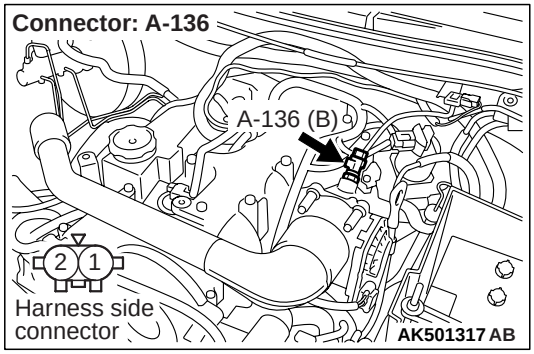


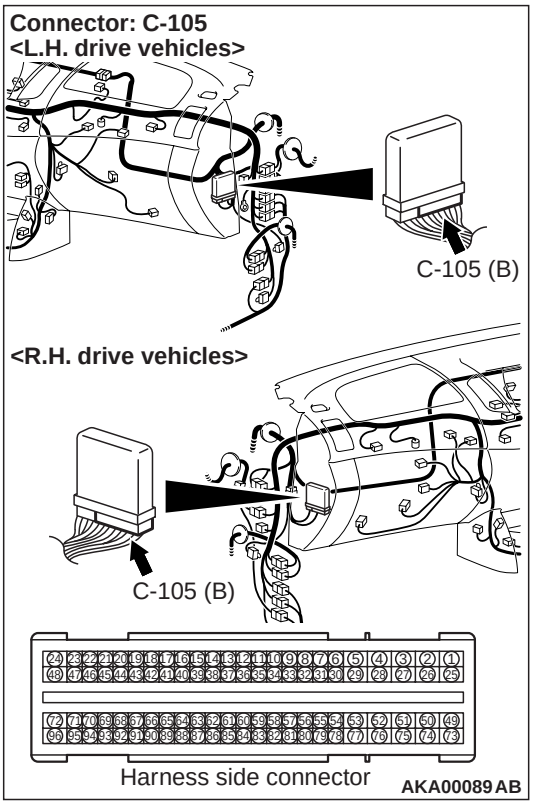
Q: Is the check result normal?

YES : Go to Step 6 .

NO : Repair or replace the connector.

STEP 6. Check harness between A-136 (terminal No. 1) intake air temperature sensor No. 2 connector and C-105 (terminal No. 38) engine-ECU connector.





- Check output line for open circuit.

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair the damaged harness wire.

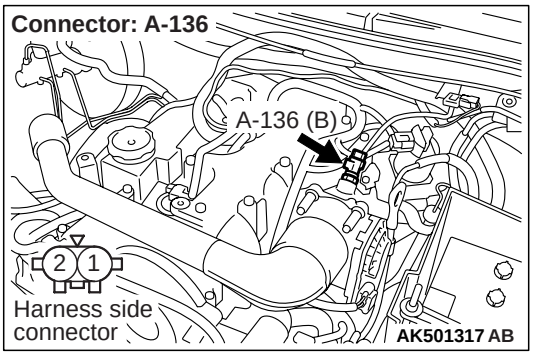
STEP 7. M.U.T.-III data list

- Item 8: Intake air temperature sensor No. 2

  OK: At ambient temperature (atmospheric temperature) or equivalent.

Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).
NO : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).

STEP 8. Perform resistance measurement at A-136 intake air temperature sensor No. 2 connector.

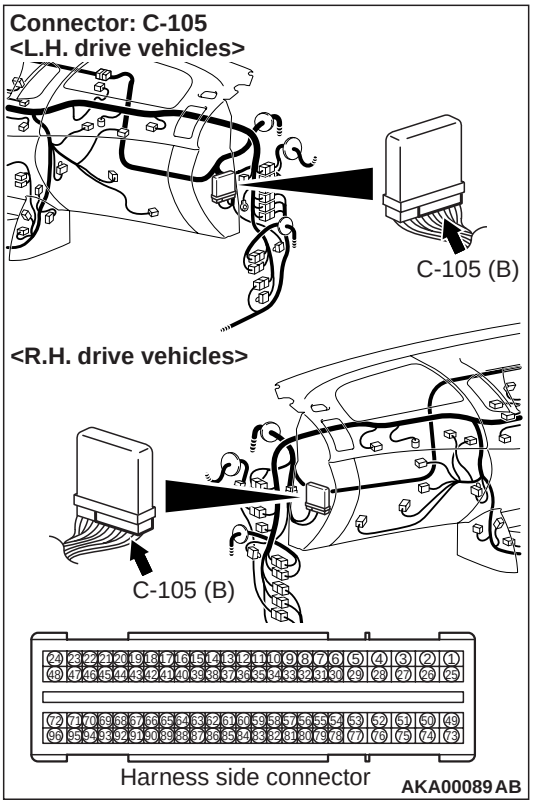


- Disconnect connector, and measure at harness side.
- Resistance between terminal No. 2 and earth.

  OK: Continuity (2 Ω or less)

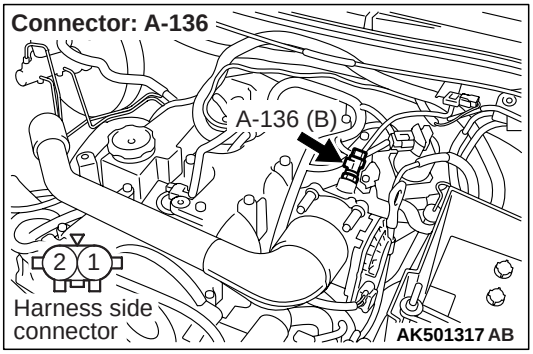
Q: Is the check result normal?
YES : Go to Step 7 .
NO : Go to Step 9 .

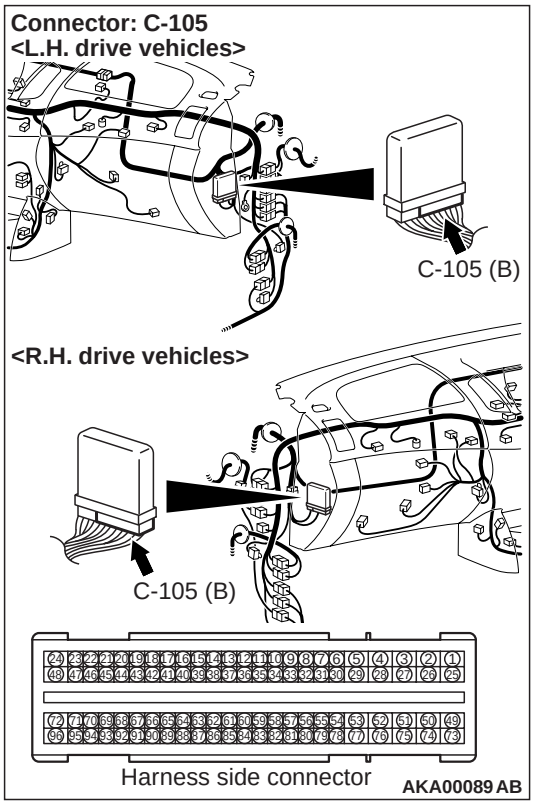
STEP 9. Connector check: C-105 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 10 .
NO : Repair or replace the connector.

STEP 10. Check harness between A-136 (terminal No. 2) intake air temperature sensor No. 2 connector and C-105 (terminal No. 32) engine-ECU connector.





- Check earthing line for open circuit.

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair the damaged harness wire.

Code No. P0088: Common Rail High Pressure Malfunction

OPERATION

- 5 V power is supplied from the engine-ECU (terminal No. 70) to the rail pressure sensor (terminal No. 1).
- The rail pressure sensor (terminal No. 3) is earthed to the engine-ECU (terminal No. 88).
- Sensor signals are input from the rail pressure sensor (terminal No. 2) to the engine-ECU (terminal No. 64).

FUNCTION

- The engine-ECU monitors the signals input from the rail pressure sensor.

- Based on The input signals, the engine-ECU checks whether the fuel pressure in the common rail exceeds the maximum withstand pressure of the system.

TROUBLE JUDGMENT

Check Conditions
- Rail pressure sensor is normal
- Battery positive voltage is 8 – 16 V

Judgment Criterion
- The rail pressure exceeds the threshold value of an abnormal high pressure for 3 seconds (continuous or accumulated).

PROBABLE CAUSES
- Failed suction control valve
- Failed rail pressure sensor
- Failed engine-ECU

DIAGNOSIS PROCEDURE

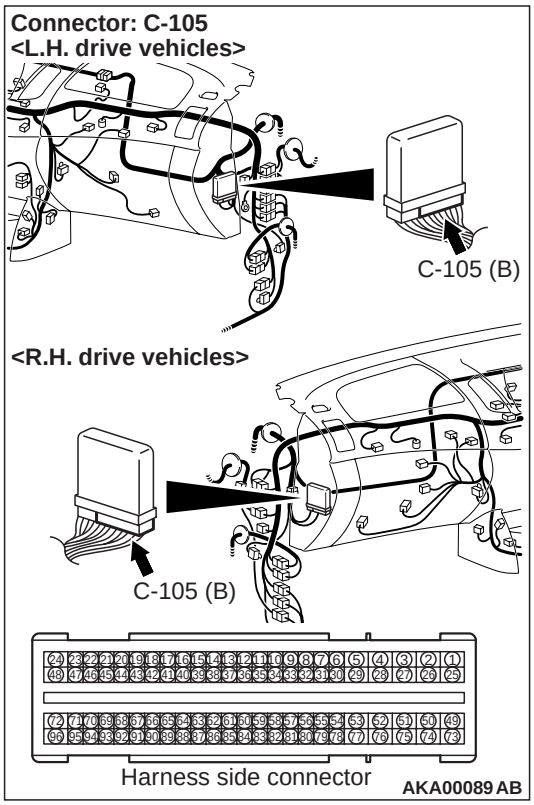
STEP 1. M.U.T.-III diagnosis code

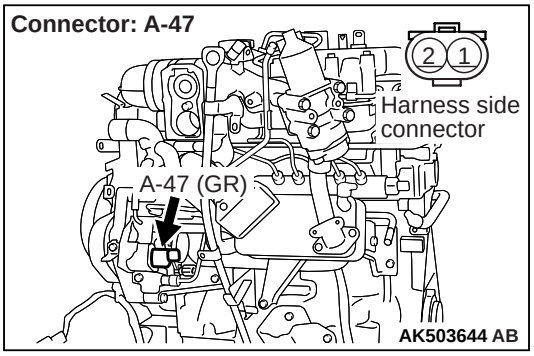
Q: Is any other diagnosis code than P0088 output?
YES : Inspection chart for diagnosis codes (Refer to P.13A-21).
NO : Go to Step 2 .

STEP 2. Check suction control valve itself
- Check suction control valve itself (Refer to P.13A-596).

Q: Is the check result normal?
YES : Go to Step 3 .
NO : Replace the suction control valve. After replacing the suction control valve, learn the supply pump (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).

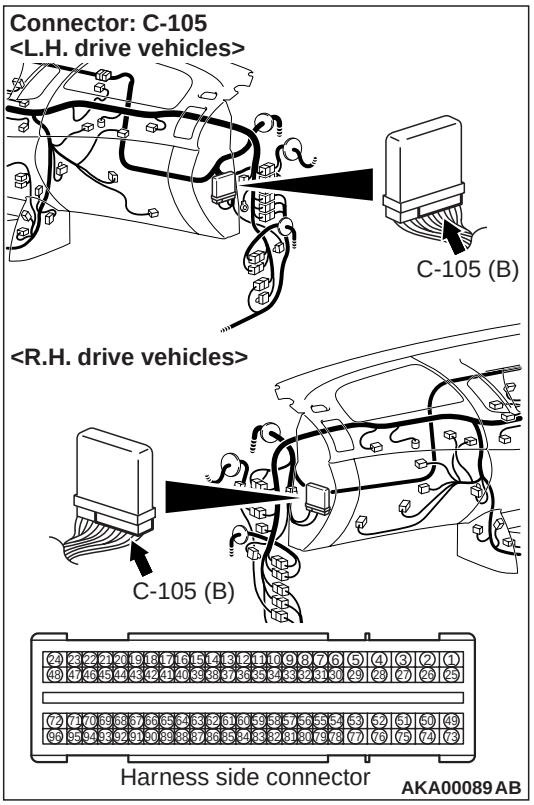
STEP 3. Connector check: C-105 engine-ECU connector and A-47 suction control valve connector.

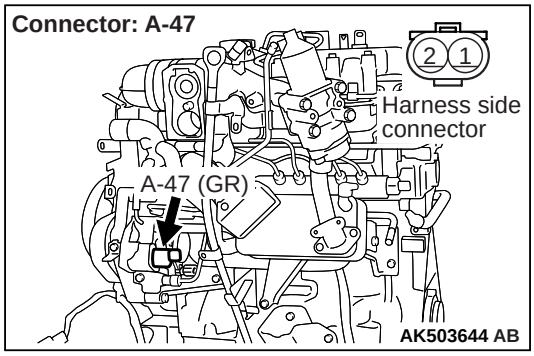




Q: Are the check results normal?
YES : Go to Step 4 .
NO : Repair or replace the connector.

STEP 4. Check harness between C-105 (terminal No. 131) engine-ECU connector and A-47 (terminal No. 1) suction control valve connector.

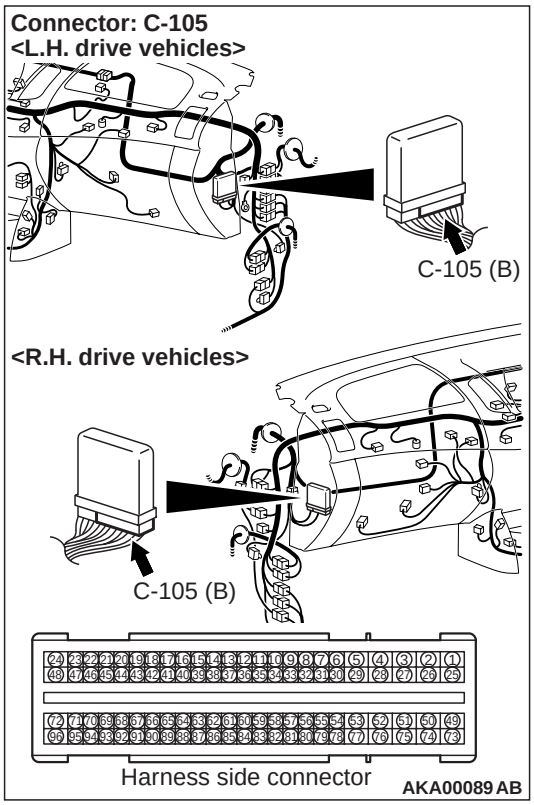


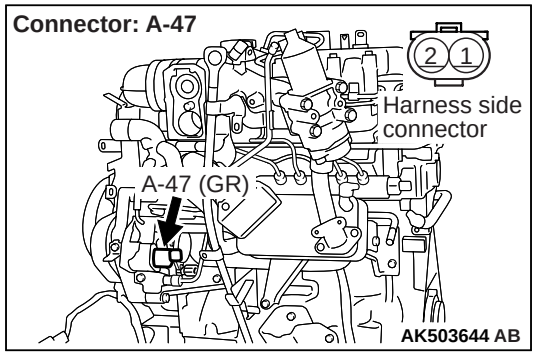


- Check output line for open/short circuit and damage.

Q: Is the check result normal?
YES : Go to Step 5 .
NO : Repair the damaged harness wire.

STEP 5. Check harness between C-105 (terminal No. 146) engine-ECU connector and A-47 (terminal No. 2) suction control valve connector.

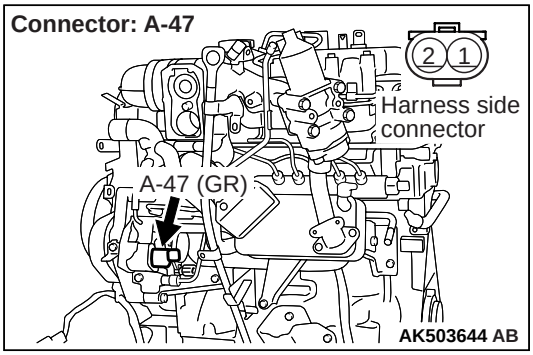




- Check output line for open/short circuit and damage.

Q: Is the check result normal?
YES : Go to Step 6 .
NO : Repair the damaged harness wire.

STEP 6. Perform output wave pattern measurement at A-47 suction control valve (Using an oscilloscope).



- Engine: Idling
- Connect the oscilloscope special patterns pickup to engine-ECU terminal No. 146 and earth.

OK: The waveform should show a pattern similar to the illustration of inspection procedure using an oscilloscope (Refer to P.13A-586).

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Replace the suction control valve. After replacing the suction control valve, learn the supply pump (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).

STEP 7. Replace the common rail assembly and fuel injection tubes.

- After replacing the common rail assembly and fuel injection tubes, re-check the trouble symptoms

Q: Does trouble symptom persist?
YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).
NO : The check is end.

Code No. P0089: Suction Control Valve Stuck

OPERATION

- Battery power is supplied from the engine-ECU (terminal No. 131) to the suction control valve (terminal No. 1).
- The engine-ECU (terminal No. 146) turns on the power transistor to flow current to the suction control valve (terminal No. 2).

FUNCTION

- The engine-ECU monitors the signals input from the rail pressure sensor.
- The engine-ECU monitors the difference between the target fuel pressure and actual fuel pressure to check whether the suction control valve is open or fixed.

TROUBLE JUDGMENT

Check Conditions

- Battery positive voltage is 8 – 16 V
- 2 seconds later after the ignition switch has been in "ON" position or the engine has started up

Judgment Criterion

- The actual rail pressure remains higher than the objective rail pressure by 10 MPa or more for a certain interval.

PROBABLE CAUSES

- Failed suction control valve
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III actuator test.

- Refer to Actuator Test Table P.13A-574.
  a. Item 19: Suction control valve

Q: Is the check result normal?
YES : Go to Step 2 .
NO : Go to Step 4 .

STEP 2. Make a check on the following items.
- Check for foreign matters (water, kerosene, etc.) in fuel and replace if necessary.
- Check fuel filter itself.

Q: Are the check results normal?
YES : Go to Step 3 .
NO : Make a repair or replacement for items whose checking results are abnormal.

STEP 3. M.U.T.-III diagnosis code.
- Reconfirmation of diagnosis code

Q: Is the diagnosis code set?
YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

STEP 4. Replace the suction control valve.
- After the suction control valve, learn the supply pump. (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).
- After learning the supply pump assembly, re-check the trouble symptoms

Q: Does trouble symptom persist?
YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).
NO : The check is end.

Code No. P0093: Fuel Leak Problem

OPERATION
- Refer to Code No. P0192: Rail Pressure Sensor Circuit Low Input P.13A-147.

FUNCTION
- The engine-ECU monitors the signals input from the rail pressure sensor.
- The engine-ECU controls the suction control valve so that necessary fuel pressure can be obtained before fuel injection.
- The engine-ECU compares the fuel pressure immediately before fuel injection and the fuel pressure after injection to check whether. The pressure drop greatly exceeds the expected range determined based on fuel consumption. The engine-ECU detects fuel leaks in this way.

TROUBLE JUDGMENT

Check Conditions
- Battery positive voltage is 8 – 16 V
- 2 seconds later after the ignition switch has been in "ON" position or the engine has started up
- The engine speed is 600 r/min or more
- Rail pressure sensor is normal

Judgment Criterion
- The fuel discharge rate of the supply pump continues to exceed its threshold value against the fuel injection rate.

PROBABLE CAUSES
- Fuel leakage or fuel line blocked
- Failed injector
- Failed suction control valve

- Failed rail pressure sensor.
- Harness damage in rail pressure sensor circuit or loose connector contact.
- Failed engine-ECU

DIAGNOSTIC PROCEDURE

STEP 1. M.U.T.-III diagnosis code

Q: Is any other diagnosis code than P0093 set?
YES : Inspection chart for diagnosis codes (Refer to P.13A-21).
NO : Go to Step 2 .

STEP 2. Detection of fuel line leakage

- Check whether fuel is leaking from a high-pressure fuel line.

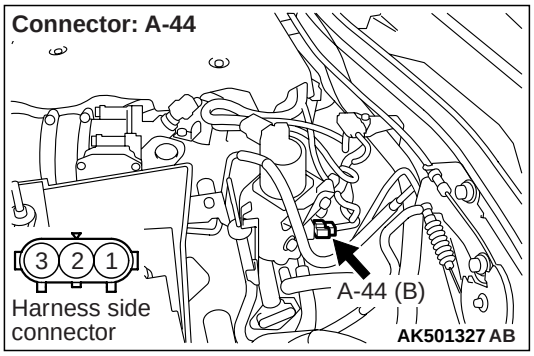
Q: Is the check result normal?
YES : Go to Step 3 .
NO : Replace the parts of an abnormal location.

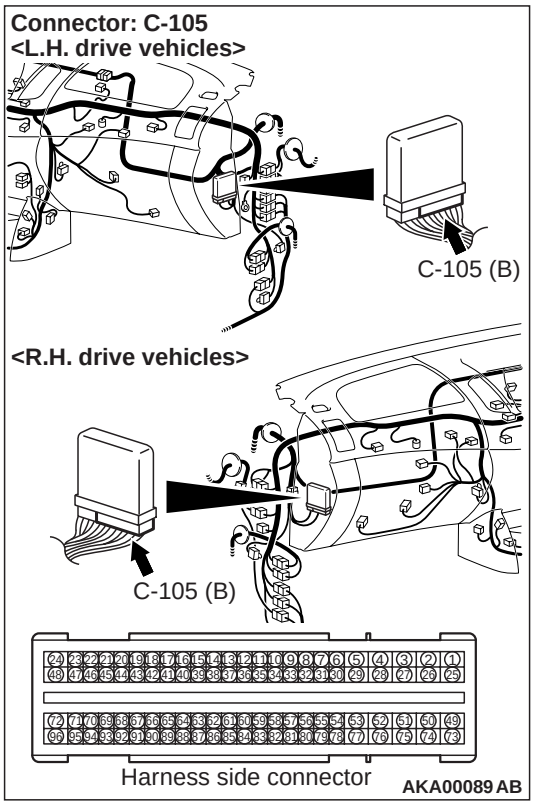
STEP 3. Release the air from the fuel line.

- After releasing the air from the fuel line, continue idle operation for about five minutes and recheck for trouble symptoms.

Q: Does the trouble symptom persist?
YES : Go to Step 4 .
NO : The check is end.

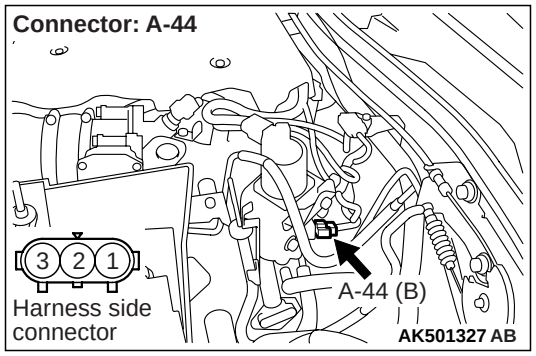
STEP 4. Connector check: A-44 rail pressure sensor connector and C-105 engine-ECU connector.

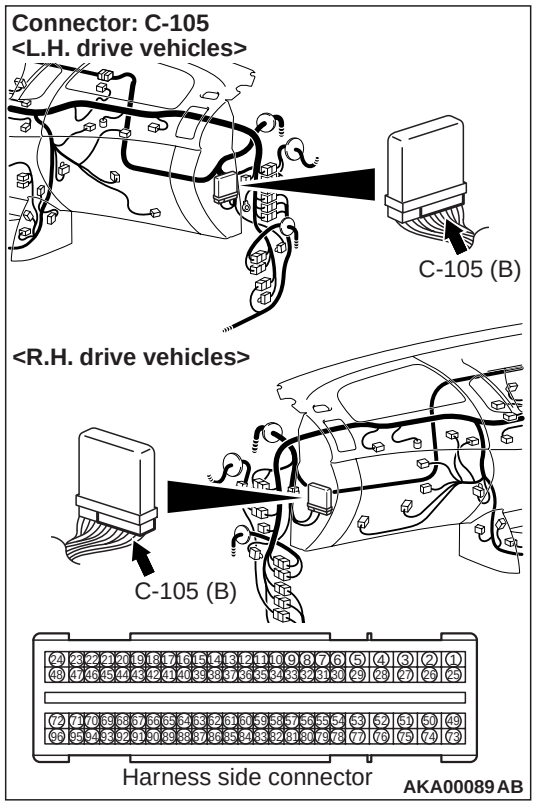




Q: Are the check results normal?
YES : Go to Step 5 .
NO : Repair or replace the connector.

STEP 5. Check harness between A-44 (terminal No. 1) rail pressure sensor connector and C-105 (terminal No. 70) engine-ECU connector.





NOTE: Before checking harness, check intermediate connector A-131, and repair if necessary.

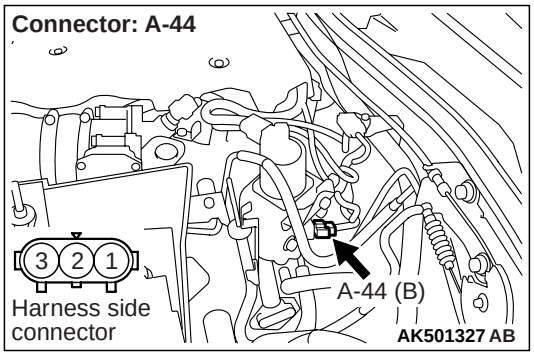
- Check power supply line for damage.

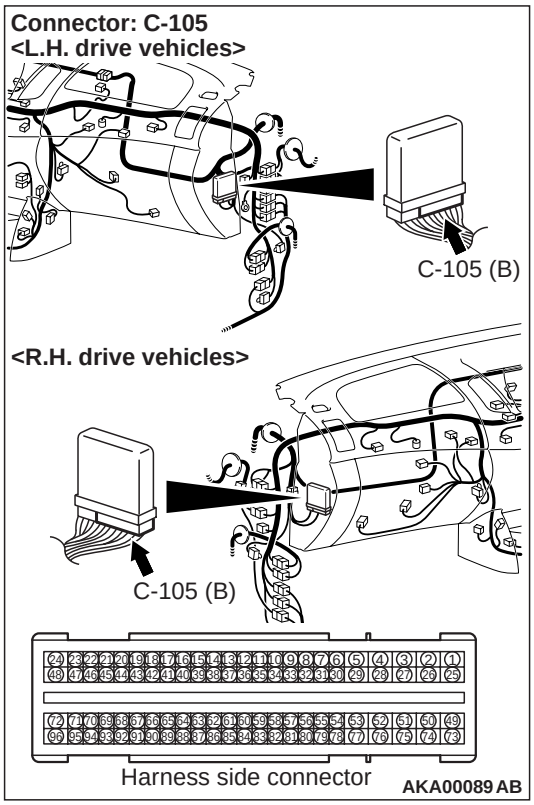
Q: Is the check result normal?

YES : Go to Step 6 .

NO : Repair the damaged harness wire.

STEP 6. Check harness between A-44 (terminal No. 2) rail pressure sensor connector and C-105 (terminal No. 64) engine-ECU connector.





NOTE: Before checking harness, check intermediate connector A-131, and repair if necessary.

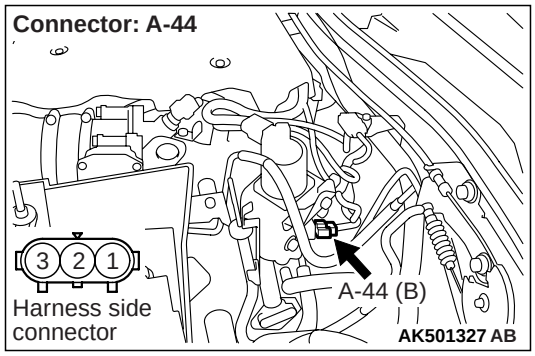
- Check output line for damage.

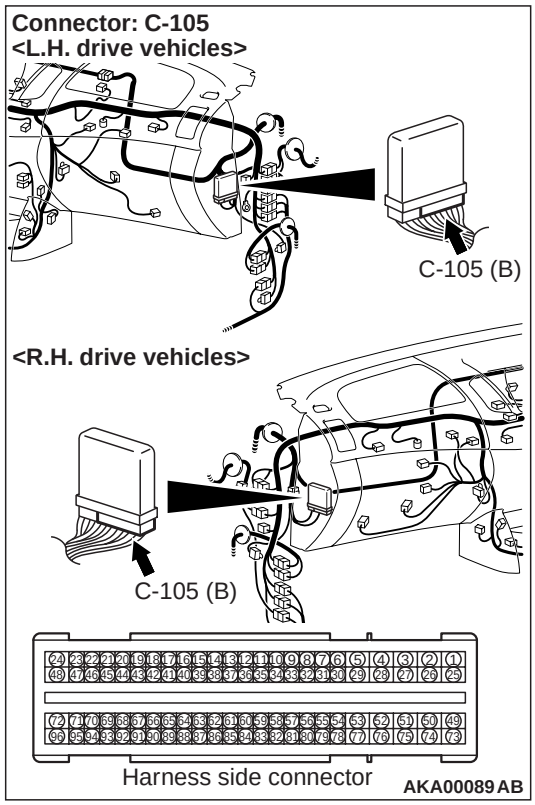
Q: Is the check result normal?

YES : Go to Step 7 .

NO : Repair the damaged harness wire.

STEP 7. Check harness between A-44 (terminal No. 3) rail pressure sensor connector and C-105 (terminal No. 88) engine-ECU connector.





NOTE: Before checking harness, check intermediate connector A-131, and repair if necessary.

- Check earthing line for damage.

Q: Is the check result normal?

YES : Go to Step 8 .
NO : Repair the damaged harness wire.

STEP 8. Detection of fuel leakage from injector body

- Remove the injector. Check whether there is the evidence of the fuel leakage from the injector body.

Q: Is the check result normal?

YES : Go to Step 9 .
NO : Replace the abnormal injector. After replacing the injector, register the injector identification code and learn fuel injection. (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).

STEP 9. Replace the common rail assembly and fuel injection tubes.

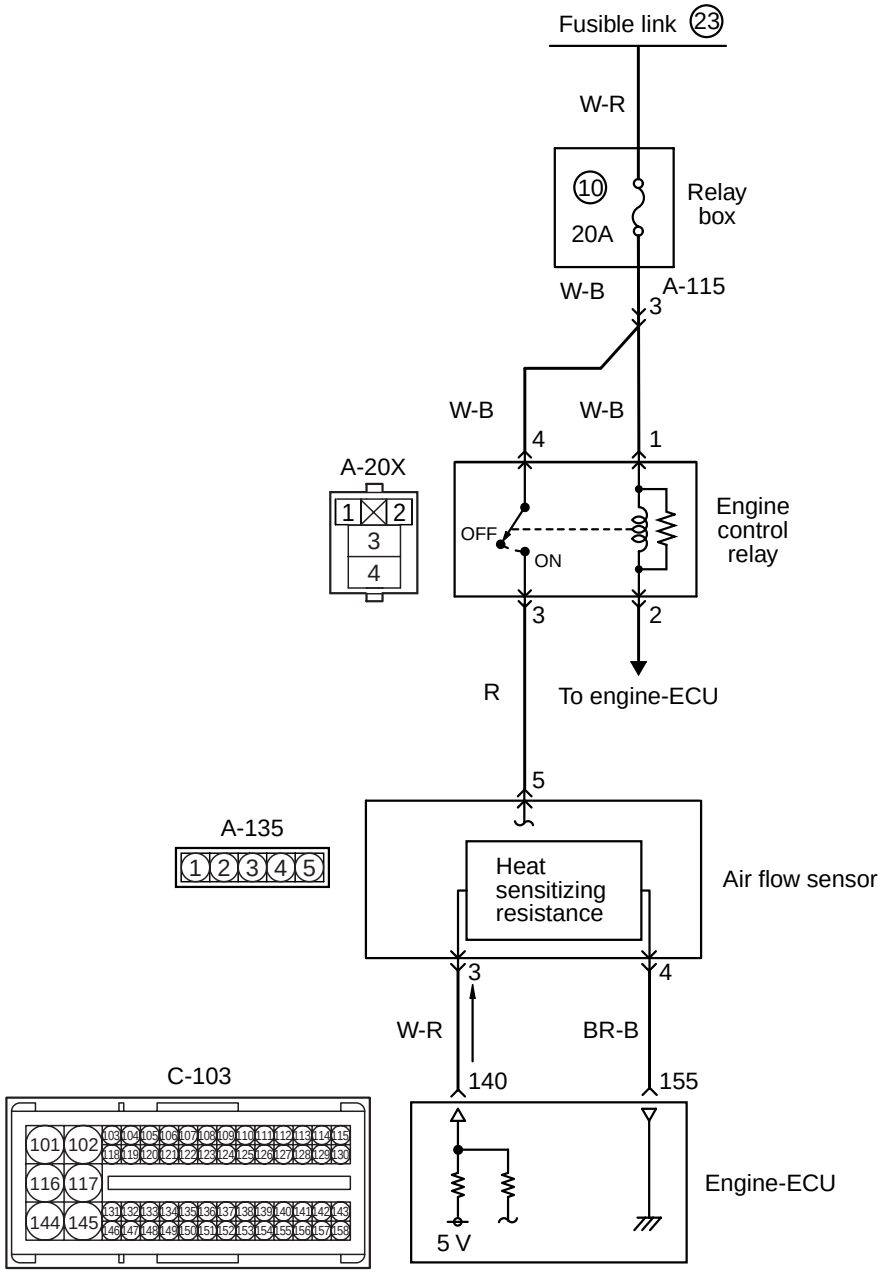
- After replacing the common rail assembly and fuel injection tubes, re-check the trouble symptoms.

Q: Does the trouble symptom persist?

YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).
NO : The check is end.

Code No. P0102: Air flow Sensor Circuit Low Input

Air Flow Sensor Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V: Violet PU: Purple SI: Silver

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OPERATION

- Power is supplied by the engine control relay (terminal No. 3) to the air flow sensor (terminal No. 5), and the air flow sensor (terminal No. 4) is earthed through the engine-ECU (terminal No. 155).
- The air flow sensor (terminal No. 3) outputs a sensor signal, which is input into the engine-ECU (terminal No. 140).

FUNCTION

- The air flow sensor outputs pulse signal that varies in accordance with the intake air volume.
- In response to the signal, the engine-ECU controls EGR control, etc.

TROUBLE JUDGMENT

Check Conditions

- Battery positive voltage is 8 – 16 V
- 2 seconds later after the ignition switch has been in "ON" position or the engine has started up.

Judgment Criterion

- The air flow sensor output voltage is 0.50 V or less.

PROBABLE CAUSES

- Failed air flow sensor
- Open/short circuit or harness damage in air flow sensor circuit or loose connector contact
- Failed engine-ECU

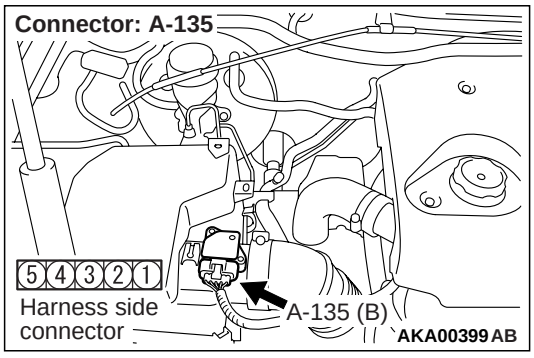
DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III data list

- Refer to Data List Reference Table P.13A-542.
  a. Item 114: Air flow sensor

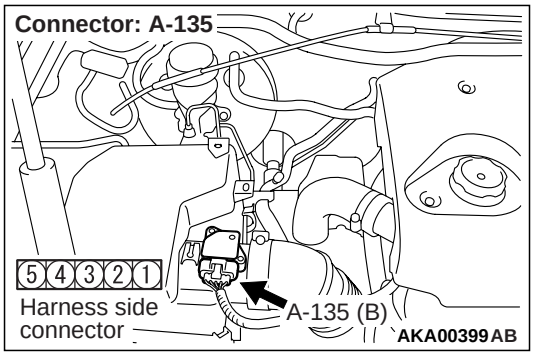
Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).
NO : Go to Step 2 .

STEP 2. Connector check: A-135 air flow sensor connector



Q: Is the check result normal?
YES : Go to Step 3 .
NO : Repair or replace the connector.

STEP 3. Perform voltage measurement at A-135 air flow sensor connector.

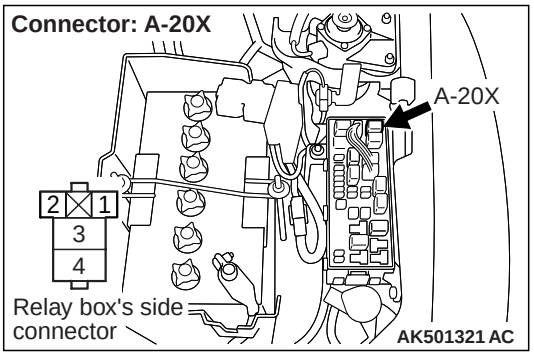


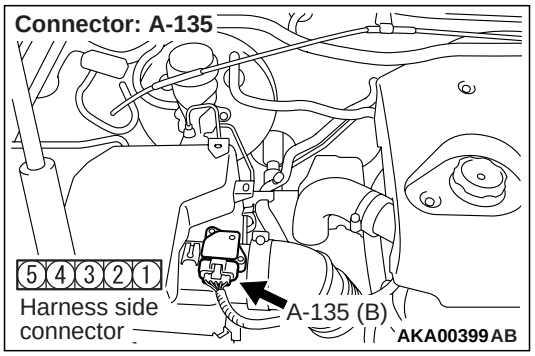
- Disconnect connector, and measure at harness side.
- Ignition switch: ON
- Voltage between terminal No. 5 and earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 5 .
NO : Go to Step 4 .

STEP 4. Connector check: A-20X engine control relay connector



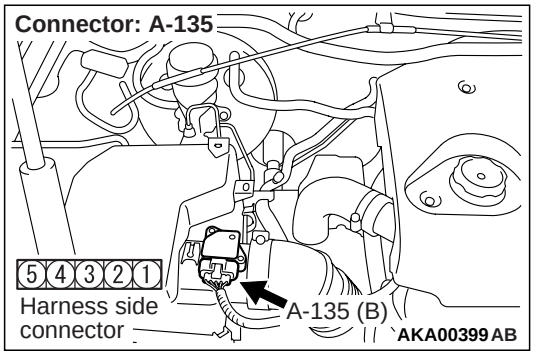


Q: Is the check result normal?

YES : Check and repair harness between A-20X (terminal No. 3) engine control relay connector and A-135 (terminal No. 5) air flow sensor connector.
- Check power supply for open/short circuit.

NO : Repair or replace the connector.

STEP 5. Perform resistance measurement at A-135 air flow sensor connector.



- Disconnect connector, and measure at harness side.
- Resistance between terminal No. 4 and earth.

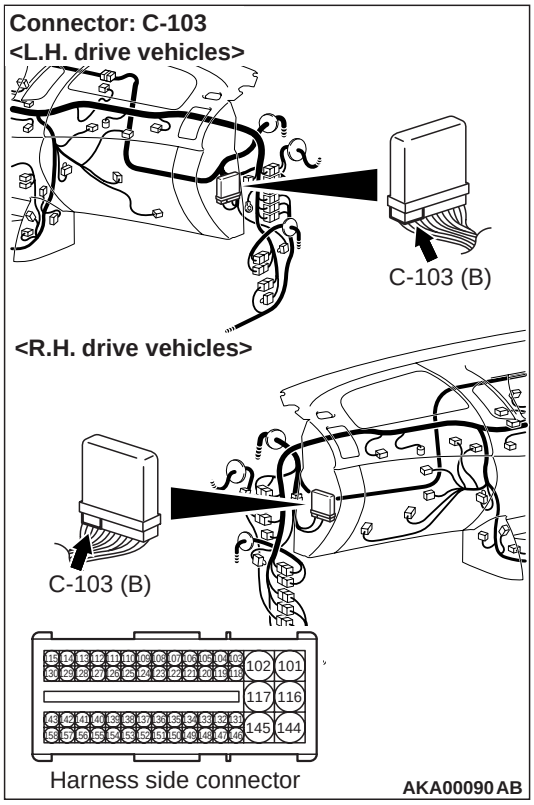
OK: Continuity (2 Ω or less)

Q: Is the check result normal?

YES : Go to Step 9 .

NO : Go to Step 6 .

STEP 6. Connector check: C-103 engine-ECU connector

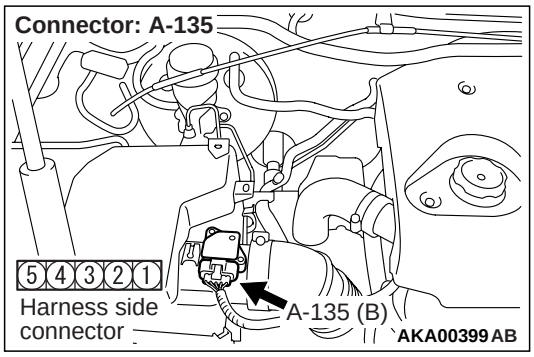


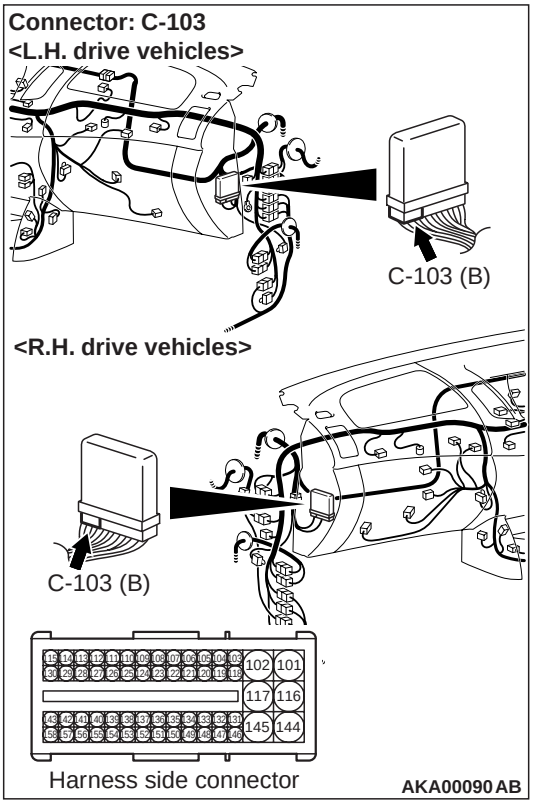
Q: Is the check result normal?

YES : Go to Step 7 .

NO : Repair or replace the connector.

STEP 7. Check harness between A-135 (terminal No. 4) air flow sensor connector and C-103 (terminal No. 155) engine-ECU connector.





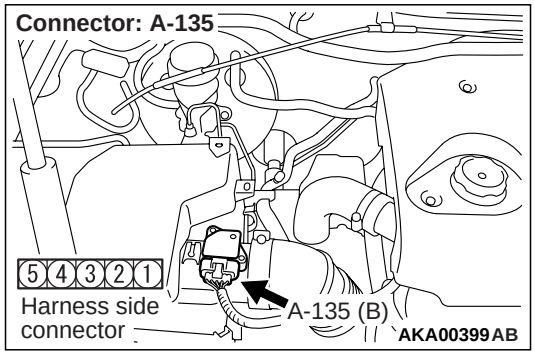
- Check earthing line for damage.

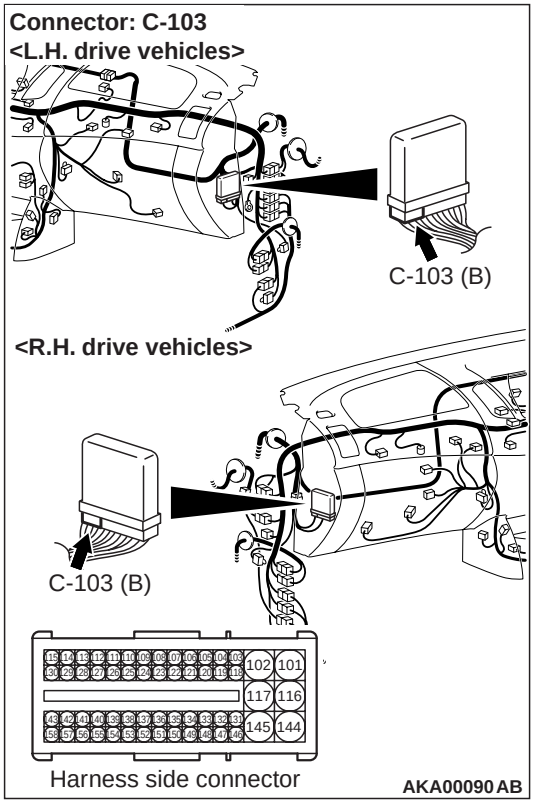
Q: Is the check result normal?

YES : Go to Step 8 .

NO : Repair the damaged harness wire.

STEP 8. M.U.T.-III data list



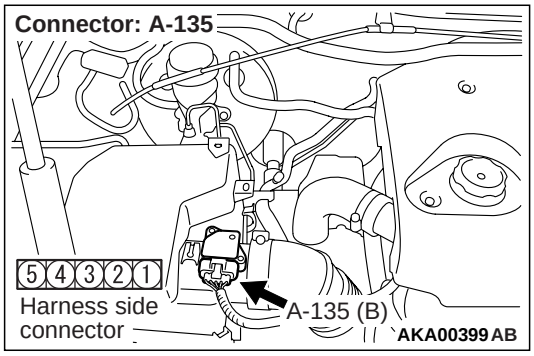


- Refer to Data List Reference Table P.13A-542.
  a. Item 114: Air flow sensor

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).
NO : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

STEP 9. Perform voltage measurement at A-135 air flow sensor connector.



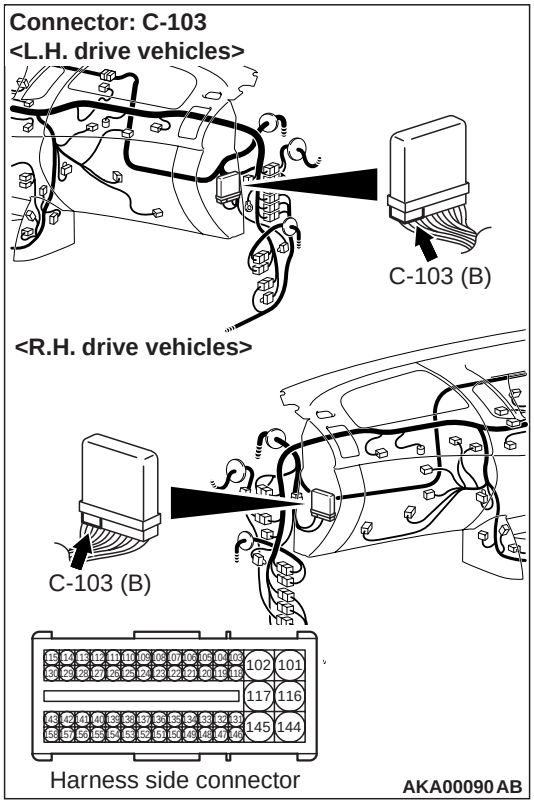
- Disconnect connector, and measure at harness side.
- Voltage between terminal No. 3 and earth.

OK: 4.9 – 5.1 V

Q: Is the check result normal?

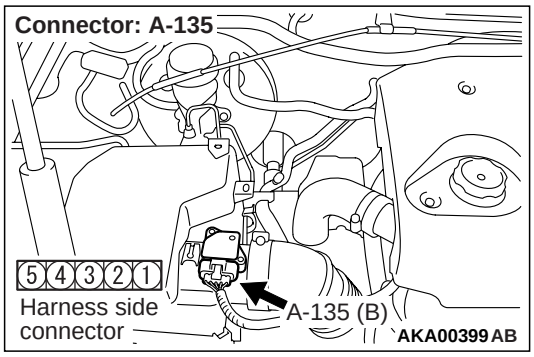
YES : Go to Step 12 .
NO : Go to Step 10 .

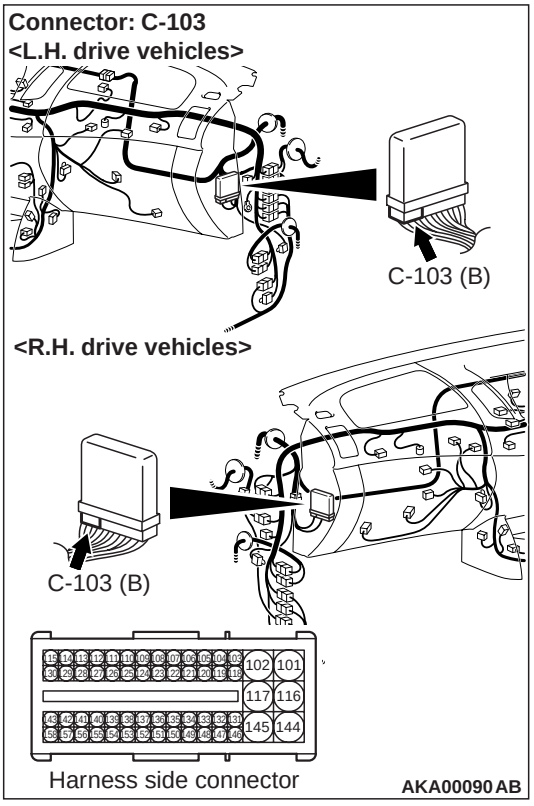
STEP 10. Connector check: C-103 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 11 .
NO : Repair or replace the connector.

STEP 11. Check harness between A-135 (terminal No. 3) air flow sensor connector and C-103 (terminal No. 140) engine-ECU connector.

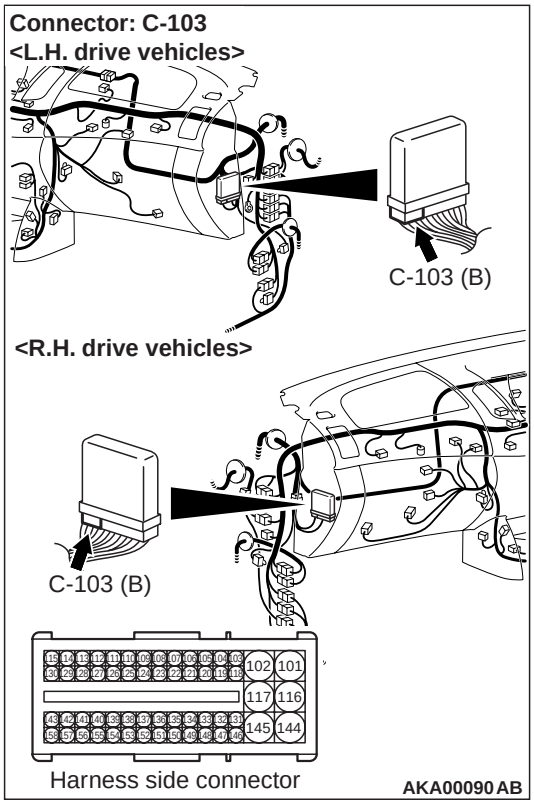


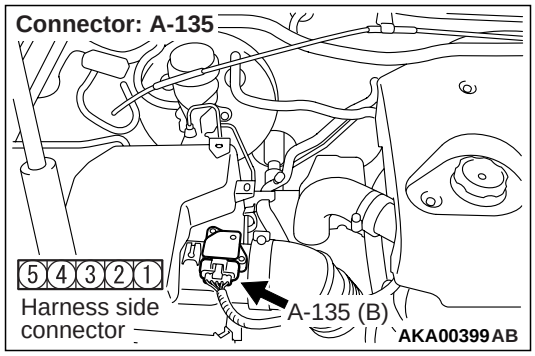


- Check output line for short circuit.

Q: Is the check result normal?
YES : Replace the air flow sensor.
NO : Repair the damaged harness wire.

STEP 12. Perform voltage measurement at C-103 engine-ECU connector.



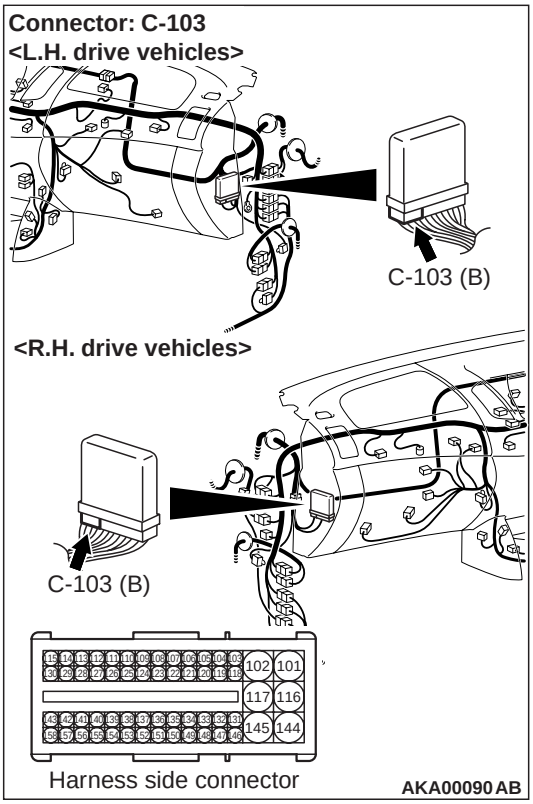


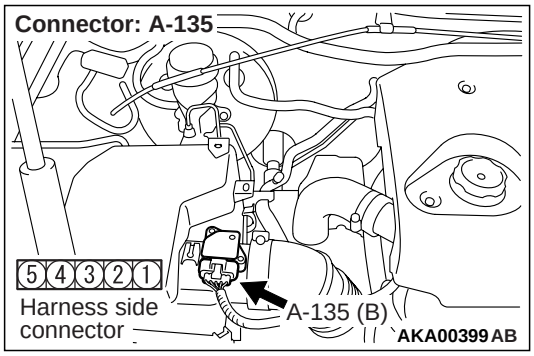
- Measure engine-ECU terminal voltage.
- Disconnect A-135 air flow sensor connector.
- Ignition switch: ON
- Voltage between terminal No. 140 and earth.

OK: 4.9 – 5.1 V

Q: Is the check result normal?
YES : Go to Step 14 .
NO : Go to Step 13 .

STEP 13. Connector check: C-103 engine-ECU connector



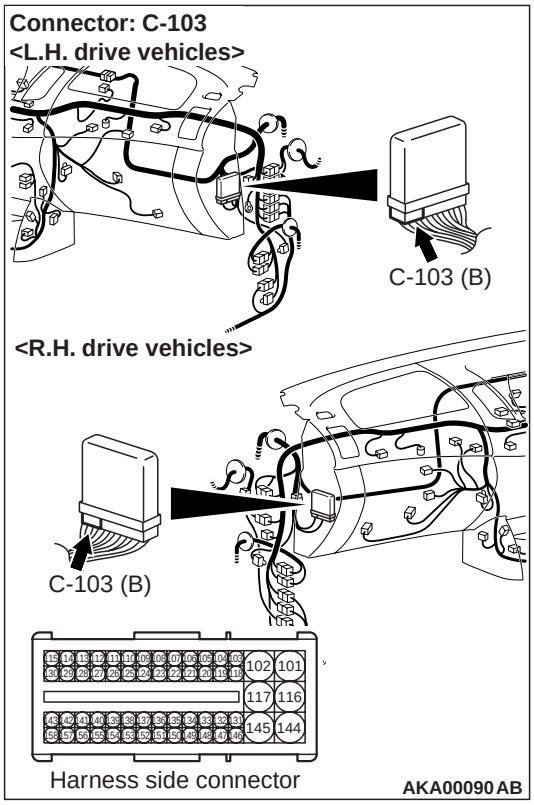


Q: Is the check result normal?

YES : Check and repair harness between A-135 (terminal No. 3) air-flow sensor connector and C-103 (terminal No. 140) engine-ECU connector.
- Check output line for open circuit.

NO : Repair or replace the connector.

STEP 14. Connector check: C-103 engine-ECU connector



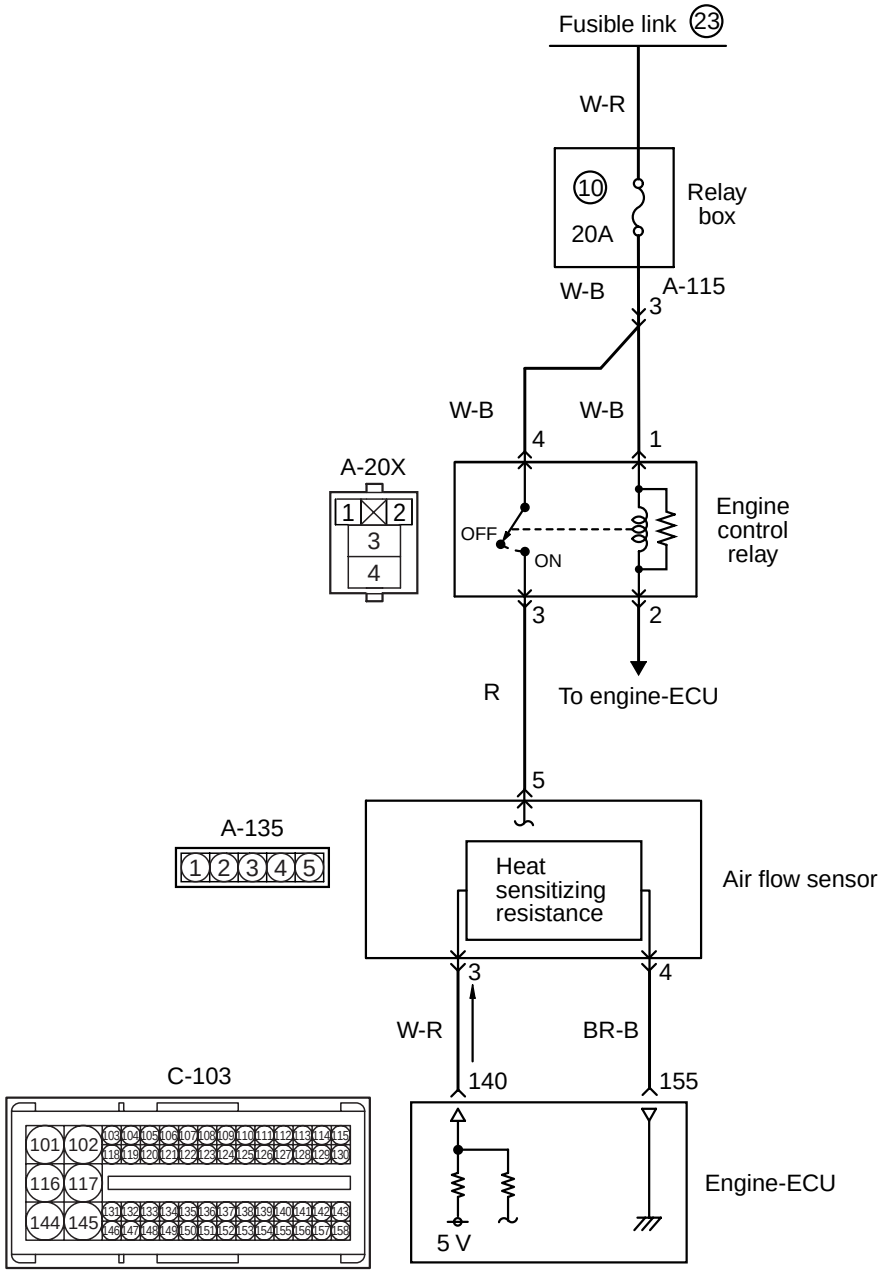
Q: Is the check result normal?

YES : Go to Step 8 .

NO : Repair or replace the connector.

Code No. P0103: Air Flow Sensor Circuit High Input

Air Flow Sensor Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V: Violet PU: Purple SI: Silver

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OPERATION

- Power is supplied by the engine control relay (terminal No. 3) to the air flow sensor (terminal No. 5), and the air flow sensor (terminal No. 4) is earthed through the engine-ECU (terminal No. 155).
- The air flow sensor (terminal No. 3) outputs a sensor signal, which is input into the engine-ECU (terminal No. 140).

FUNCTION

- The air flow sensor outputs pulse signal that varies in accordance with the intake air volume.
- In response to the signal, the engine-ECU controls EGR control, etc.

TROUBLE JUDGMENT

Check Conditions

- Battery positive voltage is 8 – 16 V
- 2 seconds later after the ignition switch has been in "ON" position or the engine has started up.

Judgment Criterion

- The air flow sensor output voltage is 4.72 V or more.

PROBABLE CAUSES

- Failed air flow sensor
- Open circuit in air flow sensor circuit or loose connector contact
- Failed engine-ECU

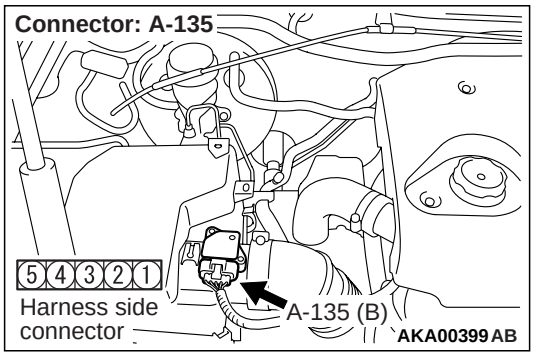
DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III data list

- Refer to Data List Reference Table P.13A-542.
  a. Item 114: Air flow sensor

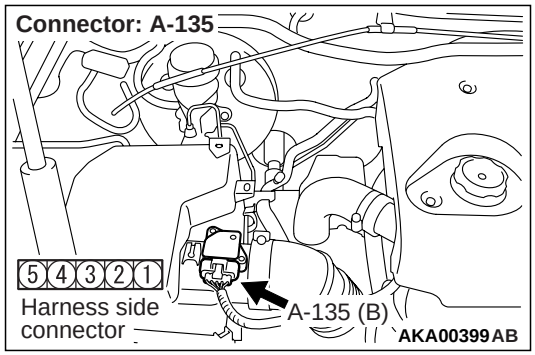
Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).
NO : Go to Step 2 .

STEP 2. Connector check: A-135 air flow sensor connector



Q: Is the check result normal?
YES : Go to Step 3 .
NO : Repair or replace the connector.

STEP 3. Perform resistance measurement at A-135 air flow sensor connector.

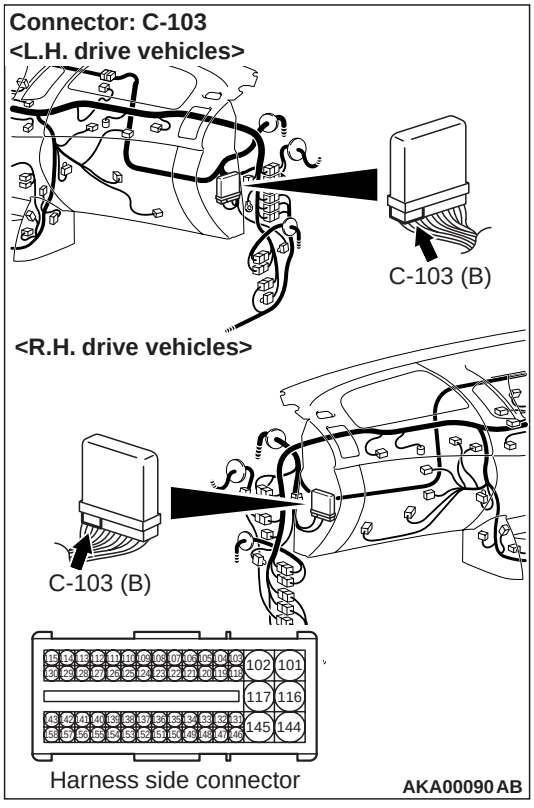


- Disconnect connector, and measure at harness side.
- Resistance between terminal No. 4 and earth.

OK: Continuity (2 Ω or less)

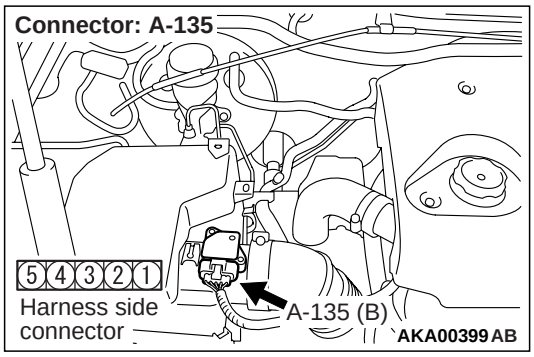
Q: Is the check result normal?
YES : Go to Step 7 .
NO : Go to Step 4 .

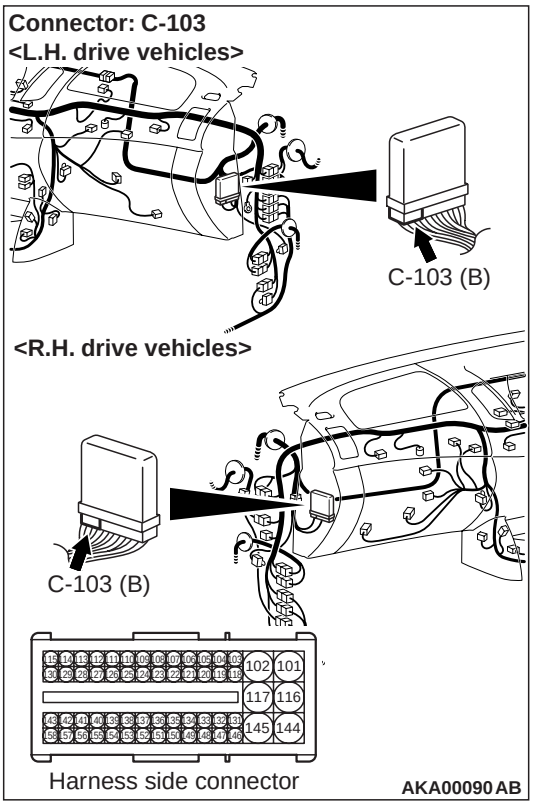
STEP 4. Connector check: C-103 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 5 .
NO : Repair or replace the connector.

STEP 5. Check harness between A-135 (terminal No. 4) air flow sensor connector and C-103 (terminal No. 155) engine-ECU connector.





- Check earthing line for open circuit.

Q: Is the check result normal?

YES : Go to Step 6 .
NO : Repair the damaged harness wire.

STEP 6. M.U.T.-III data list

- Refer to Data List Reference Table P.13A-542.
  a. Item 114: Air flow sensor

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).
NO : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

STEP 7. M.U.T.-III data list

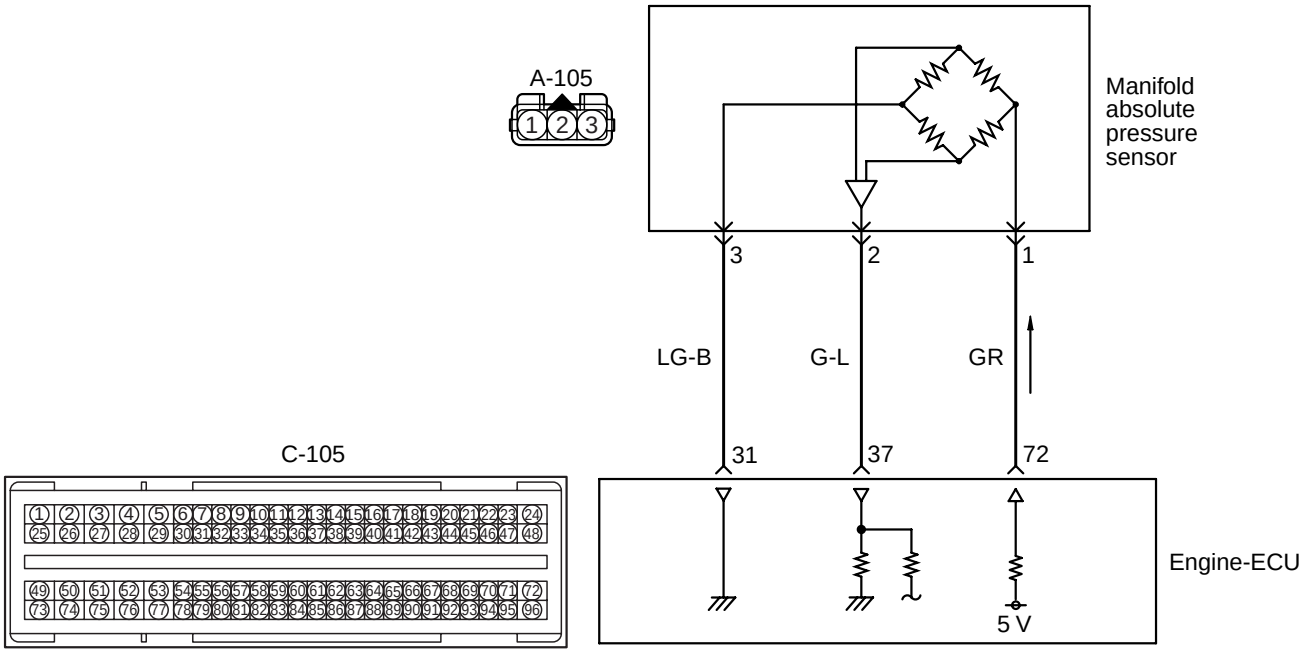
- Refer to Data List Reference Table P.13A-542.
  a. Item 114: Air flow sensor

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).
NO : Replace the air flow sensor.

Code No. P0106: Manifold Absolute Pressure Sensor Range/Performance Problem

Manifold Absolute Pressure Sensor Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V:Violet PU: Purple SI:Silver

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OPERATION

- A power voltage of 5 V is applied to the manifold absolute pressure sensor power terminal (terminal No. 1) from the engine-ECU (terminal No. 72) and earthed to the engine-ECU (terminal No. 31) from the manifold absolute pressure sensor (terminal No. 3).
- The sensor signal is inputted to the engine-ECU (terminal No. 37) from the manifold absolute pressure sensor output terminal (terminal No. 2).

FUNCTION

- The manifold absolute pressure sensor converts the manifold absolute pressure into a voltage signal and inputs the signal to the engine-ECU.
- In response to the signal, the engine-ECU corrects the fuel injection amount, etc.

TROUBLE JUDGMENT

Check Conditions

- Battery positive voltage is 8 – 16 V
- 2 seconds later after the ignition switch has been in "ON" position or the engine has started up.
- The following 3 conditions are formed:
  1. The engine cooling water temperature is from –5 to 80 °C.
  2. The air intake temperature is from –5 to 80 °C.
  3. The atmospheric pressure is from 76 to 120 kPa.

Judgment Criterion

- When an idle state and an engine rotation speed of 2,000 r/min continue for three seconds, manifold absolute pressures are read and the difference between them goes under 800 Pa for 1 second.

PROBABLE CAUSES

- Failed manifold absolute pressure sensor
- Manifold absolute pressure sensor circuit harness damage or loose connector contact.
- EGR cooler clogged.
- EGR pipe (A, B) clogged.
- Failed engine-ECU

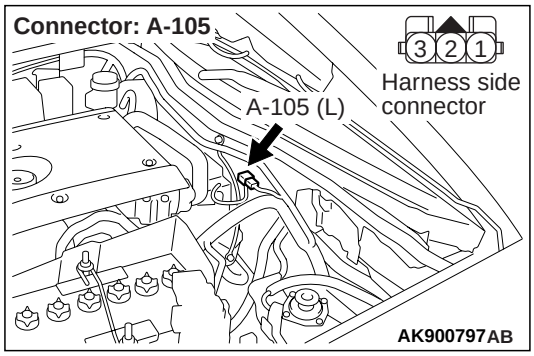
DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III data list

- Refer to Data List Reference Table P.13A-542.
  a. Item 6: Manifold absolute pressure sensor

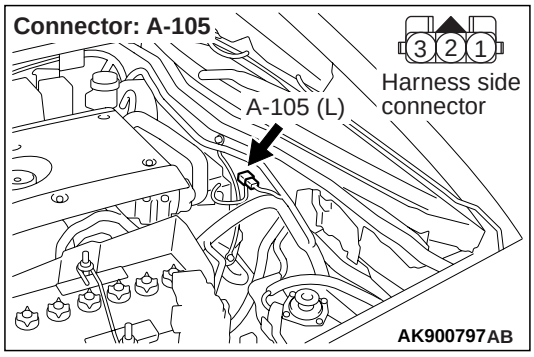
Q: Is the check result normal?
YES : Go to Step 10.
NO : Go to Step 2.

STEP 2. Connector check: A-105 manifold absolute pressure sensor connector



Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair or replace the connector.

STEP 3. Perform voltage measurement at A-105 manifold absolute pressure sensor connector.

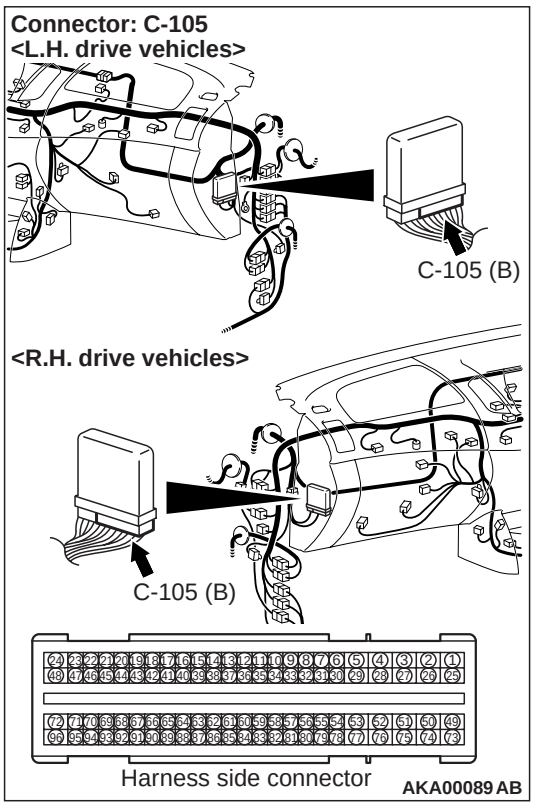


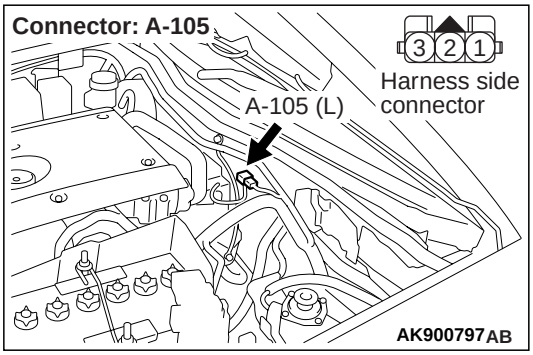
- Use special tool test harness (MB991709) to connect connector, and measure at pick-up harness.
- Ignition switch: ON
- Voltage between terminal No. 1 and earth.

OK: 4.9 – 5.1 V

Q: Is the check result normal?
YES : Go to Step 5.
NO : Go to Step 4.

STEP 4. Connector check: C-105 engine-ECU connector

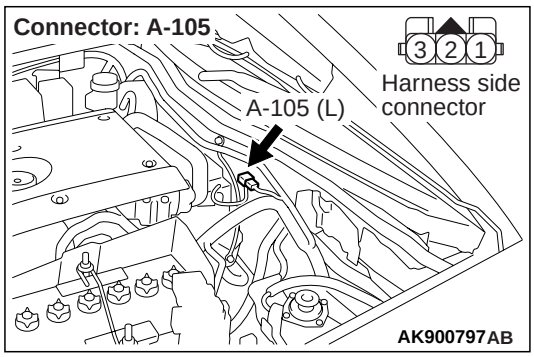




Q: Is the check result normal?
YES : Check and repair harness between A-105 (terminal No. 1) manifold absolute pressure sensor connector and C-105 (terminal No. 72) engine-ECU connector.
- Check power supply line for damage.

NO : Repair or replace the connector.

STEP 5. Perform voltage measurement at A-105 manifold absolute pressure sensor connector.



- Use special tool harness (MB991709) to connect connector, and measure at pick-up harness.
- Ignition switch: ON
- Voltage between terminal No. 3 and earth.

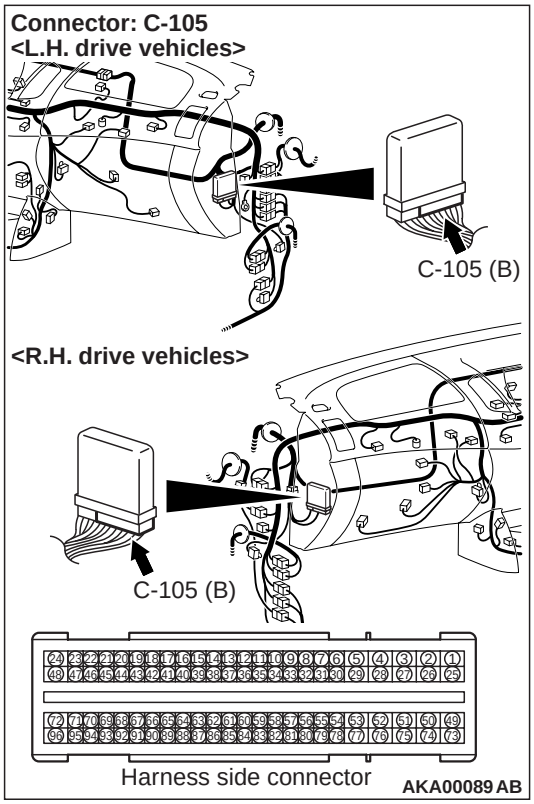
OK: 0.5 V or less

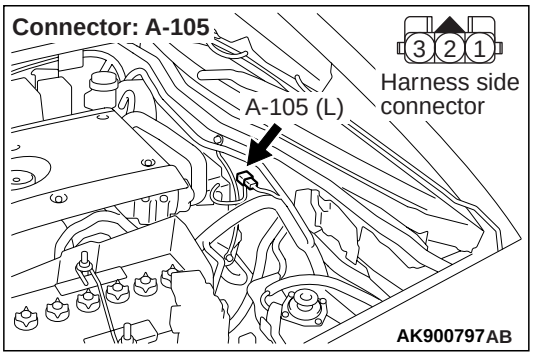
Q: Is the check result normal?

YES : Go to Step 7.

NO : Go to Step 6.

STEP 6. Connector check: C-105 engine-ECU connector





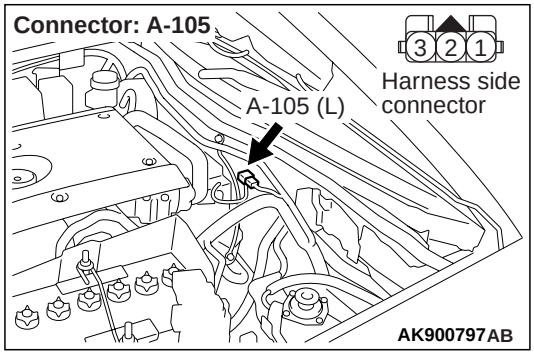
Q: Is the check result normal?

YES : Check and repair harness between A-105 (terminal No. 3) manifold absolute pressure sensor connector and C-105 (terminal No. 31) engine-ECU connector.

- Check earthing line for damage.

NO : Repair or replace the connector.

STEP 7. Perform voltage measurement at A-105 manifold absolute pressure sensor connector.



- Use special tool harness (MB991709) to connect connector, and measure at pick-up harness.
- Ignition switch: ON
- Voltage between terminal No. 2 and earth.

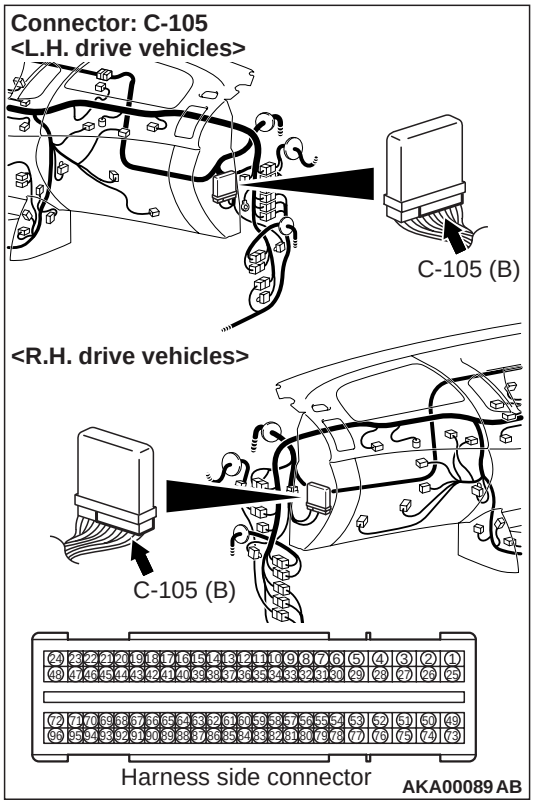
OK: The voltage should be 0.7 – 1.2 V. When the accelerator pedal is quickly depressed from the idling state, the voltage temporarily rises.

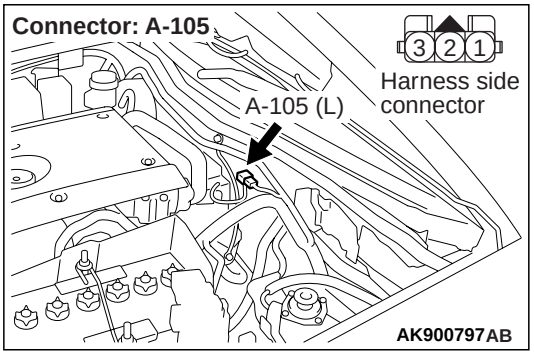
Q: Is the check result normal?

YES : Go to Step 8.

NO : Replace the manifold absolute pressure sensor.

STEP 8. Perform voltage measurement at C-105 engine-ECU connector.





- Measure engine-ECU terminal voltage.
- Ignition switch: ON
- Voltage between terminal No. 37 and earth.

OK: The voltage should be 0.7 – 1.2 V. When the accelerator pedal is quickly depressed from the idling state, the voltage temporarily rises.

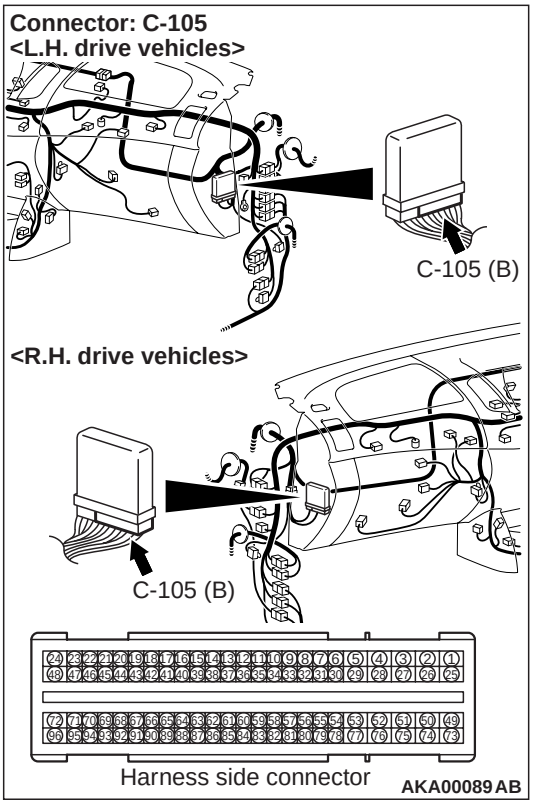
Q: Is the check result normal?

YES : Go to Step 9.

NO : Check and repair harness between A-105 (terminal No. 2) manifold absolute pressure sensor connector and C-105 (terminal No. 37) engine-ECU connector.

- Check output line for damage.

STEP 9. Connector check: C-105 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 10.
NO : Repair or replace the connector.

STEP 10. Check on clogged EGR cooler.

NOTE: When checking the clogged EGR cooler, make a visual check or use an air blower.

- Check whether the EGR cooler is being clogged or not.

Q: Is the check result normal?
YES : Go to Step 11.
NO : Replace the EGR cooler.

STEP 11. Check on clogged EGR pipe (A, B).

- Check whether the EGR pipe (A, B) is being clogged or not.

Q: Is the check result normal?
YES : Go to Step 12.
NO : Replace the EGR pipe (A, B).

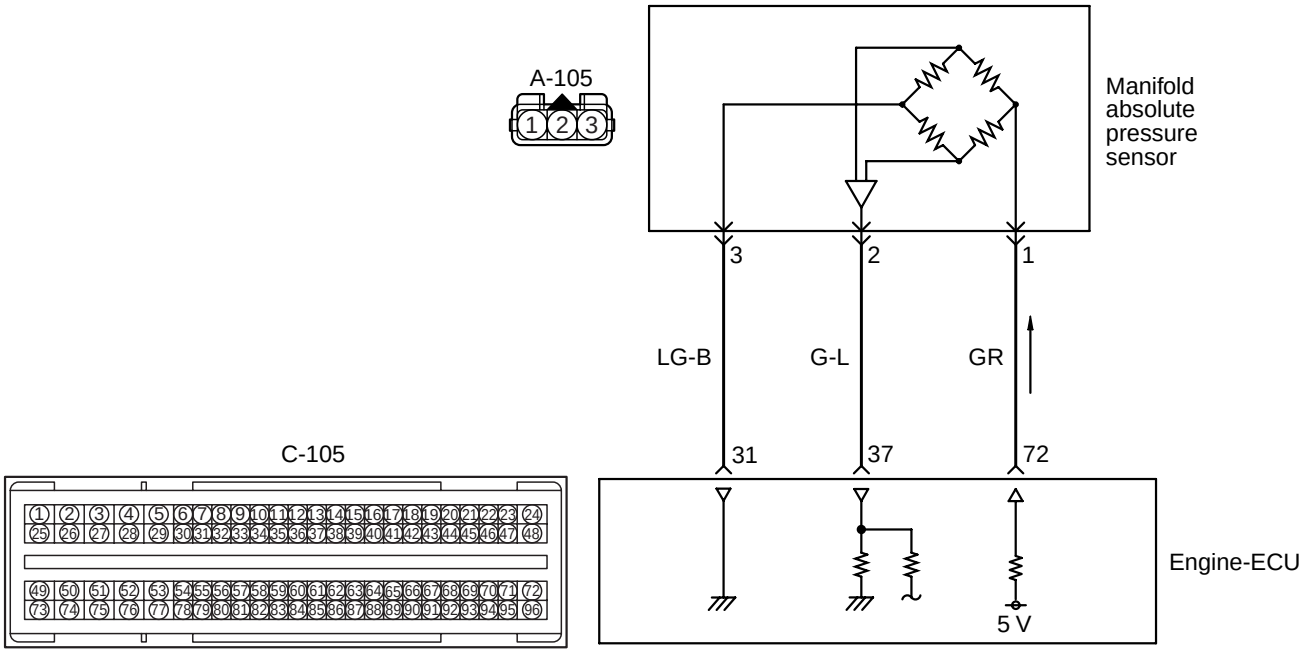
STEP 12. M.U.T.-III data list

- Refer to Data List Reference Table P.13A-542.
  a. Item 6: Manifold absolute pressure sensor

Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).
NO : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

Code No. P0107: Manifold Absolute Pressure Sensor Circuit Low Input

Manifold Absolute Pressure Sensor Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V:Violet PU: Purple SI:Silver

AKA00093 AB

OPERATION

- A power voltage of 5 V is applied to the manifold absolute pressure sensor power terminal (terminal No. 1) from the engine-ECU (terminal No. 72) and earthed to the engine-ECU (terminal No. 31) from the manifold absolute pressure sensor (terminal No. 3).
- The sensor signal is inputted to the engine-ECU (terminal No. 37) from the manifold absolute pressure sensor output terminal (terminal No. 2).

FUNCTION

- The manifold absolute pressure sensor converts the manifold absolute pressure into a voltage signal and inputs the signal to the engine-ECU.
- In response to the signal, the engine-ECU corrects the fuel injection amount, etc.

TROUBLE JUDGMENT

Check Conditions

- Battery positive voltage is 8 – 16 V
- 2 seconds later after the ignition switch has been in "ON" position or the engine has started up

Judgment Criterion

- The manifold absolute pressure sensor output voltage should is lower than 0.28 V for 0.5 seconds.

PROBABLE CAUSES

- Failed manifold absolute pressure sensor
- Open/short or harness damage circuit in manifold absolute pressure sensor circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III data list

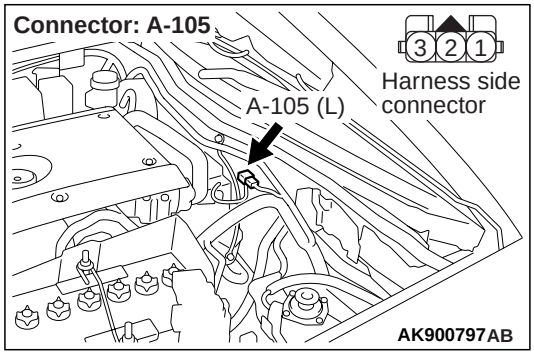
- Refer to Data List Reference Table P.13A-542.
  a. Item 6: Manifold absolute pressure sensor

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

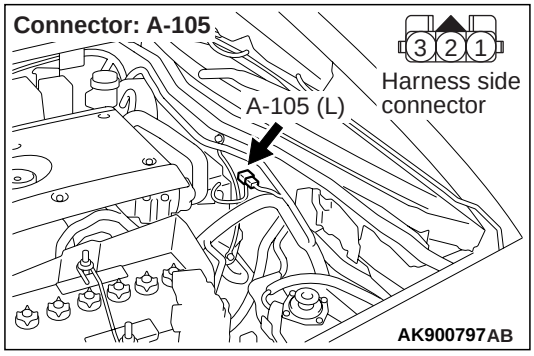
NO : Go to Step 2 .

STEP 2. Connector check: A-105 manifold absolute pressure sensor connector



Q: Is the check result normal?
YES : Go to Step 3 .
NO : Repair or replace the connector.

STEP 3. Perform voltage measurement at A-105 manifold absolute pressure sensor connector.

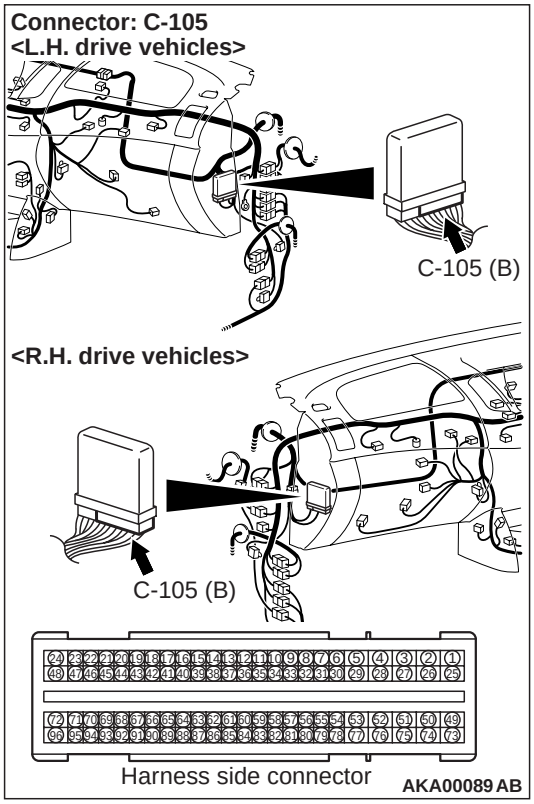


- Use special tool test harness (MB991709) to connect connector, and measure at pick-up harness.
- Ignition switch: ON
- Voltage between terminal No. 1 and earth.

OK: 4.9 – 5.1 V

Q: Is the check result normal?
YES : Go to Step 9 .
NO : Go to Step 4 .

STEP 4. Perform voltage measurement at C-105 engine-ECU connector.

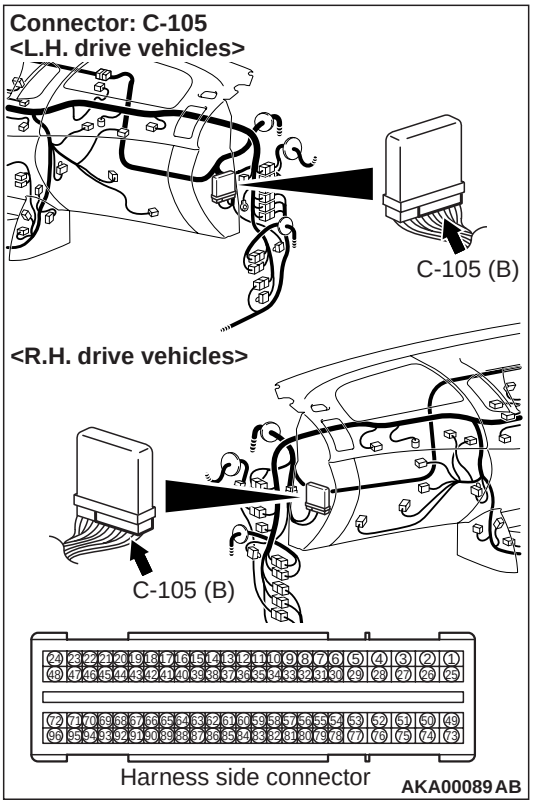


- Measure engine-ECU terminal voltage.
- Ignition switch: ON
- Voltage between terminal No. 72 and earth.

OK: 4.9 – 5.1 V

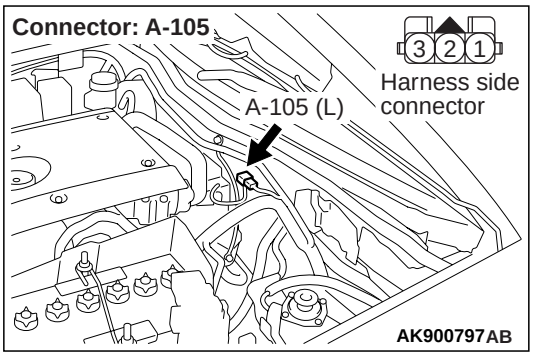
Q: Is the check result normal?
YES : Go to Step 8 .
NO : Go to Step 5 .

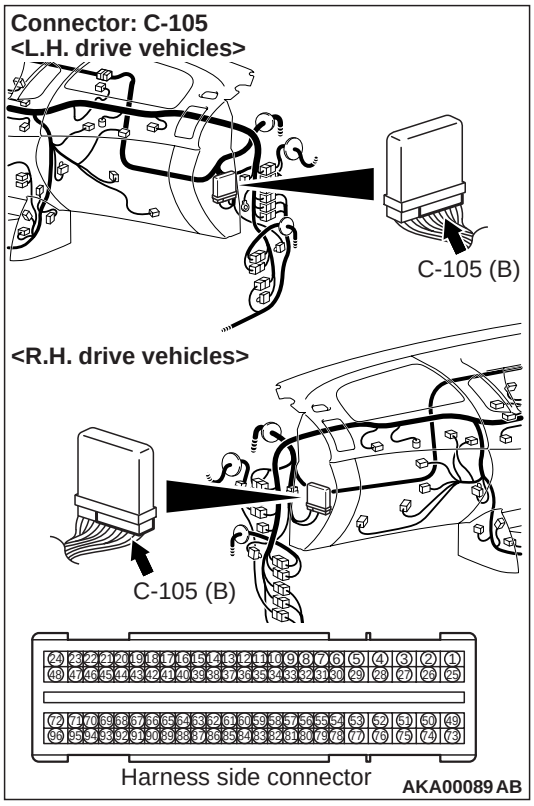
STEP 5. Connector check: C-105 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 6 .
NO : Repair or replace the connector.

STEP 6. Check harness between A-105 (terminal No. 1) manifold absolute pressure sensor connector and C-105 (terminal No. 72) engine-ECU connector.





- Check power supply line for short circuit.

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair the damaged harness wire.

STEP 7. M.U.T.-III data list

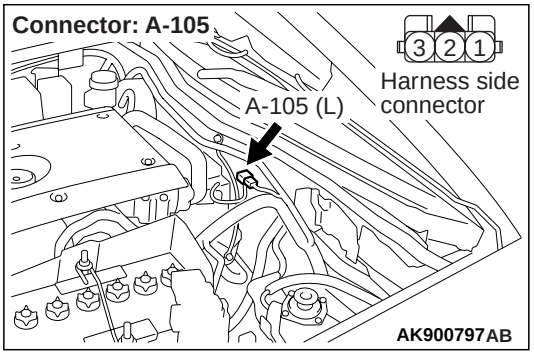
- Refer to Data List Reference Table P.13A-542.
  a. Item 6: Manifold absolute pressure sensor

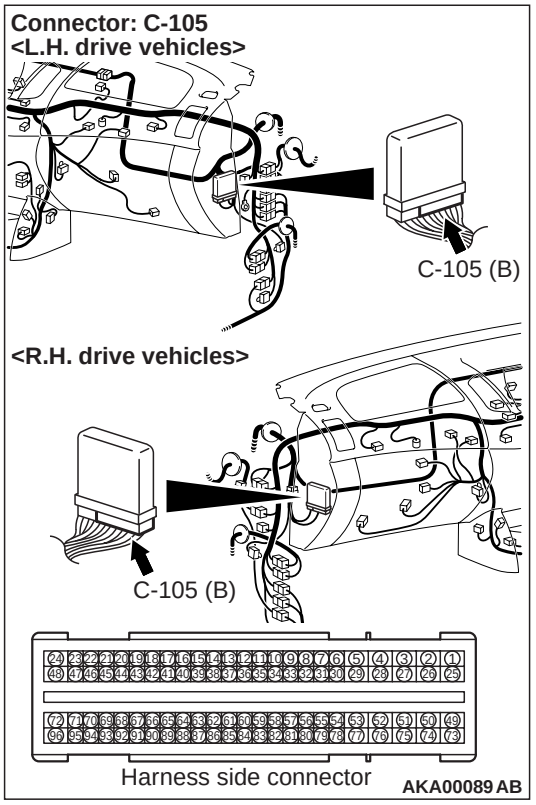
Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

NO : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

STEP 8. Connector check: C-105 engine-ECU connector





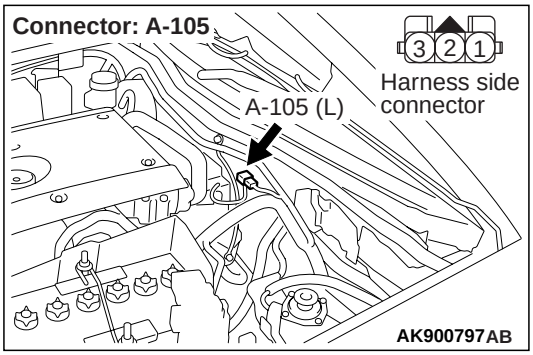
Q: Is the check result normal?

YES : Check and repair harness between A-105 (terminal No. 1) manifold absolute pressure sensor connector and C-105 (terminal No. 72) engine-ECU connector.

- Check power supply line for open circuit and damage.

NO : Repair or replace the connector.

STEP 9. Perform resistance measurement at A-105 manifold absolute pressure sensor connector.

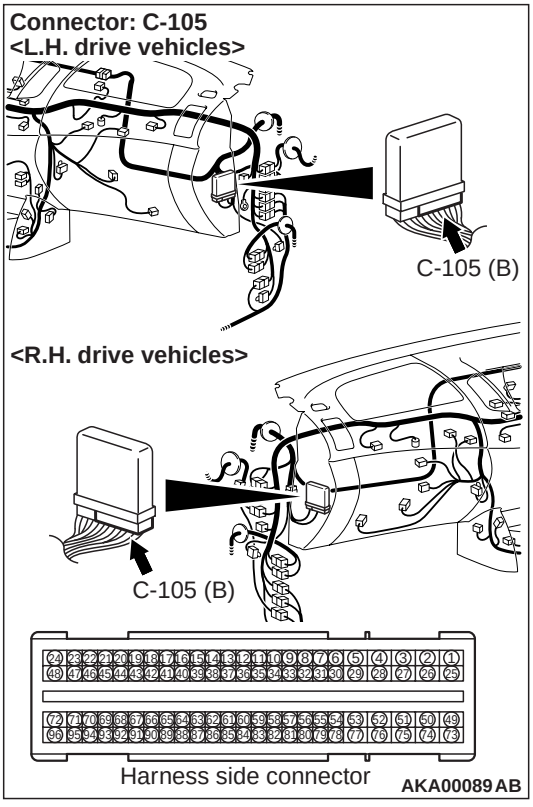


- Disconnect connector, and measure at harness side.
- Resistance between terminal No. 3 and earth.

OK: Continuity (2 Ω or less)

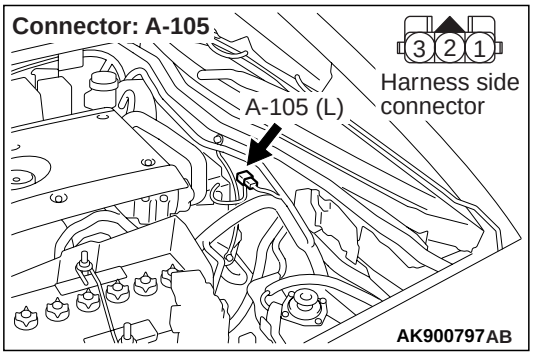
Q: Is the check result normal?
YES : Go to Step 12 .
NO : Go to Step 10 .

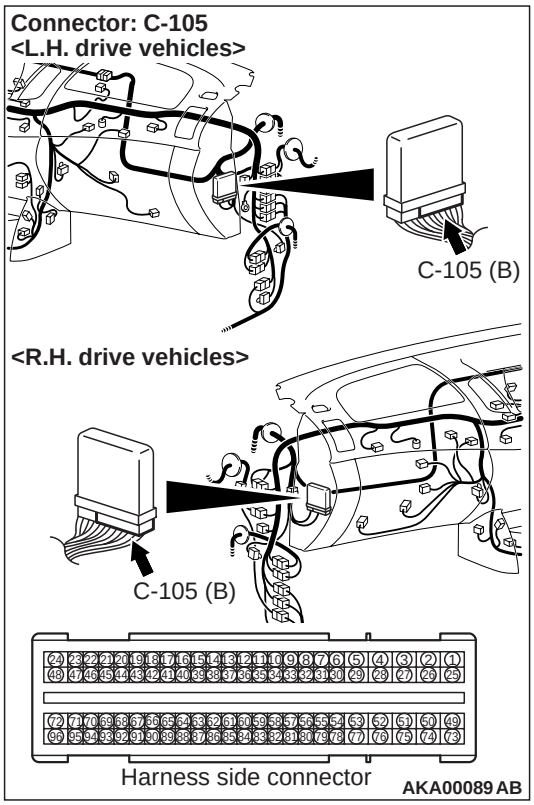
STEP 10. Connector check: C-105 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 11 .
NO : Repair or replace the connector.

STEP 11. Check harness between A-105 (terminal No. 3) manifold absolute pressure sensor connector and C-105 (terminal No. 31) engine-ECU connector.

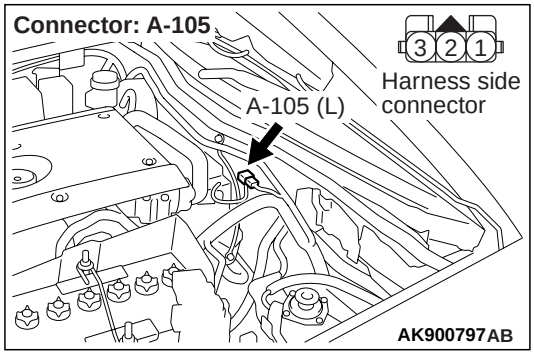




- Check earthing line for damage.

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair the damaged harness wire.

STEP 12. Perform voltage measurement at A-105 manifold absolute pressure sensor connector.

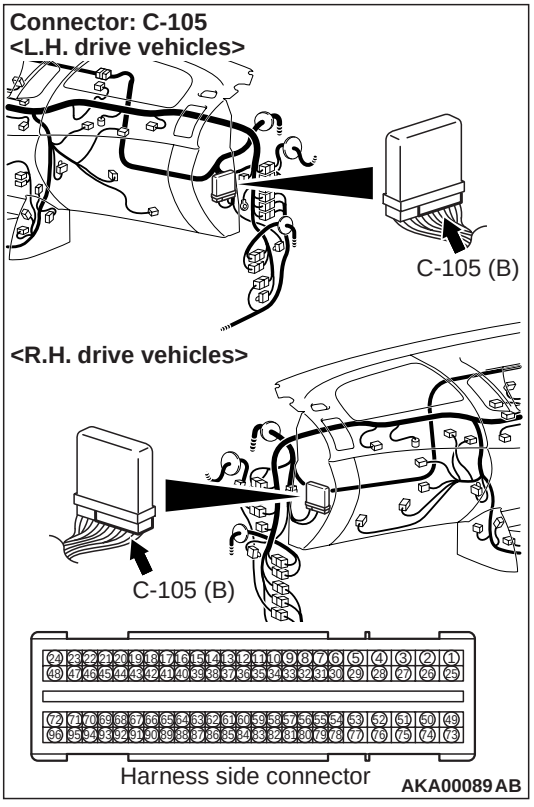


- Use special tool test harness (MB991709) to connect connector, and measure at pick-up harness.
- Ignition switch: ON
- Voltage between terminal No. 2 and earth.

OK: 0.7 – 1.2 V

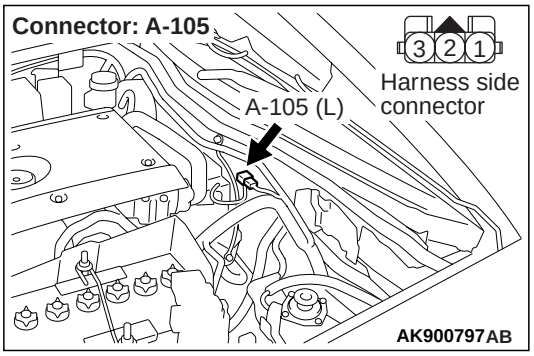
Q: Is the check result normal?
YES : Go to Step 15 .
NO : Go to Step 13 .

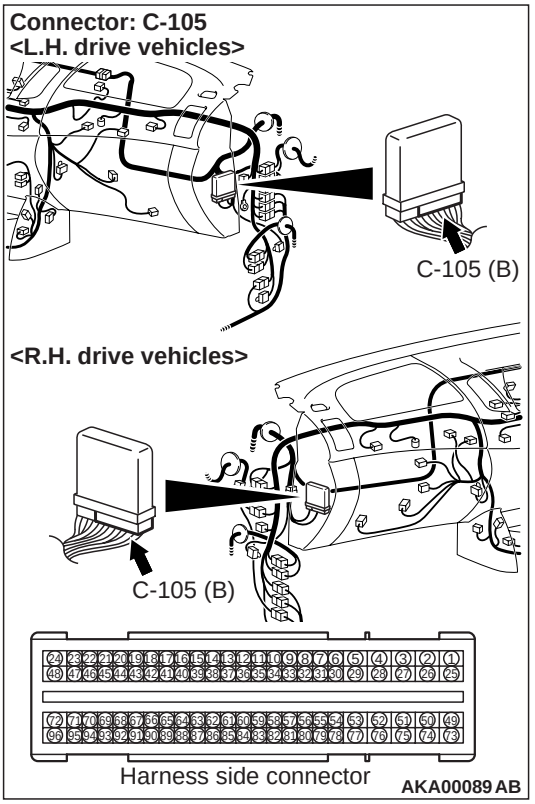
STEP 13. Connector check: C-105 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 14 .
NO : Repair or replace the connector.

STEP 14. Check harness between A-105 (terminal No. 2) manifold absolute pressure sensor connector and C-105 (terminal No. 37) engine-ECU connector.

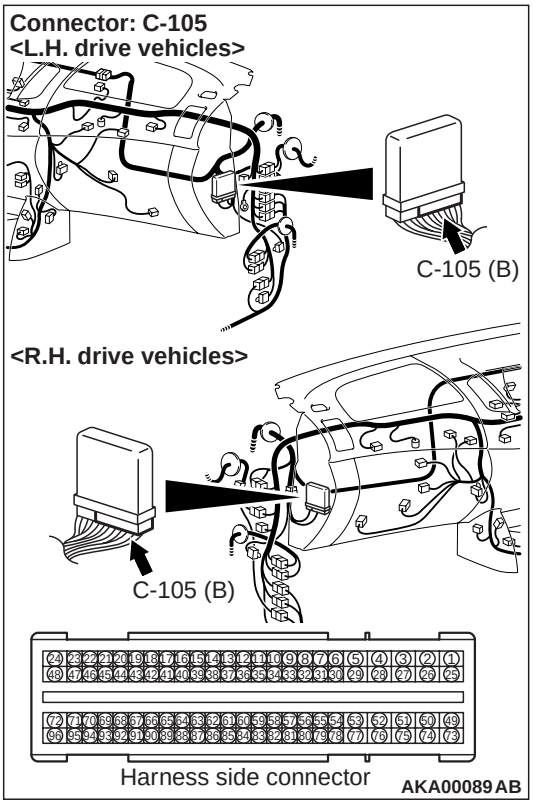




- Check output line for short circuit.

Q: Is the check result normal?
YES : Replace the manifold absolute pressure sensor.
NO : Repair the damaged harness wire.

STEP 15. Perform voltage measurement at C-105 engine-ECU connector.



- Measure engine-ECU terminal voltage.
- Ignition switch: ON
- Voltage between terminal No. 37 and earth.

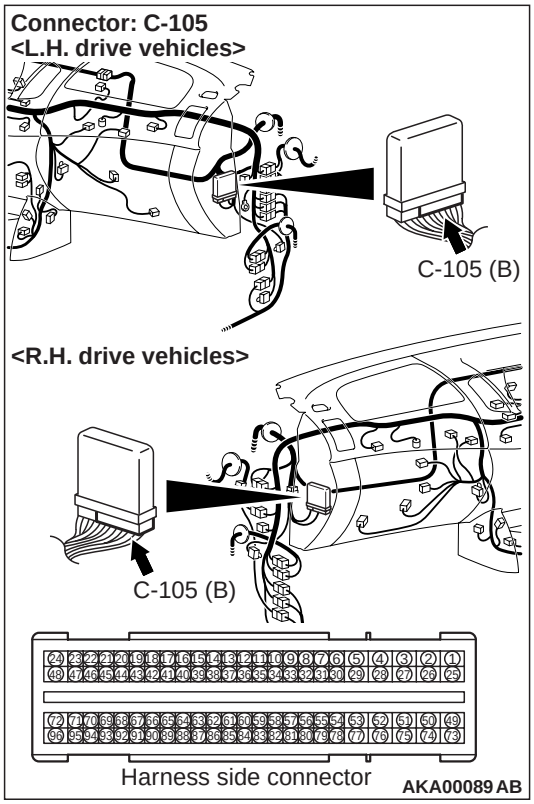
OK: 0.7 – 1.2 V

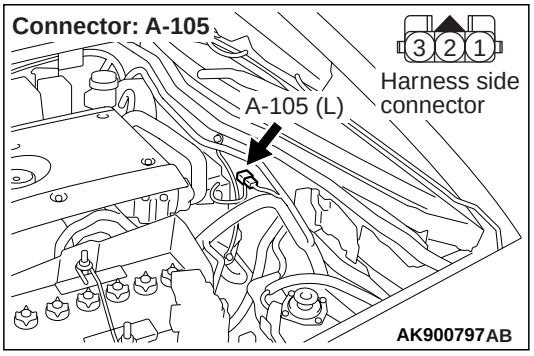
Q: Is the check result normal?

YES : Go to Step 17 .

NO : Go to Step 16 .

STEP 16. Connector check: C-105 engine-ECU connector





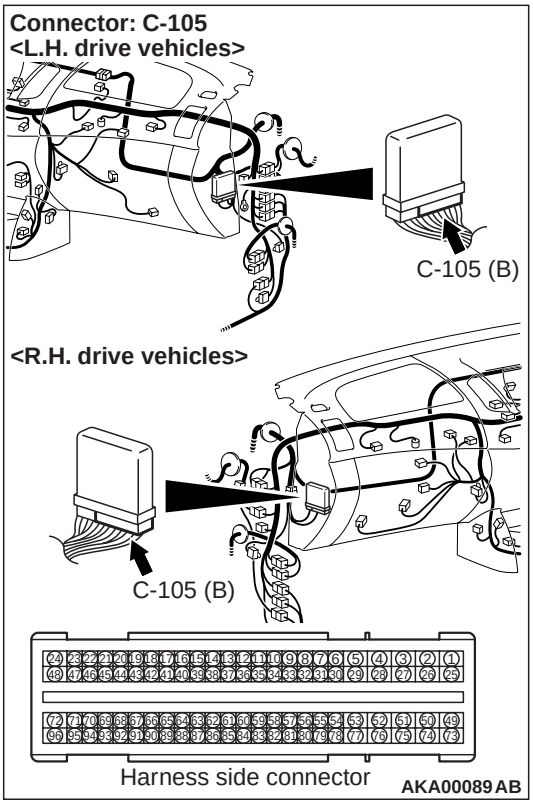
Q: Is the check result normal?

YES : Check and repair check harness between A-105 (terminal No. 2) manifold absolute pressure sensor connector and C-105 (terminal No. 37) engine-ECU connector.

- Check output line for open circuit and damage.

NO : Repair or replace the connector.

STEP 17. Connector check: C-105 engine-ECU connector

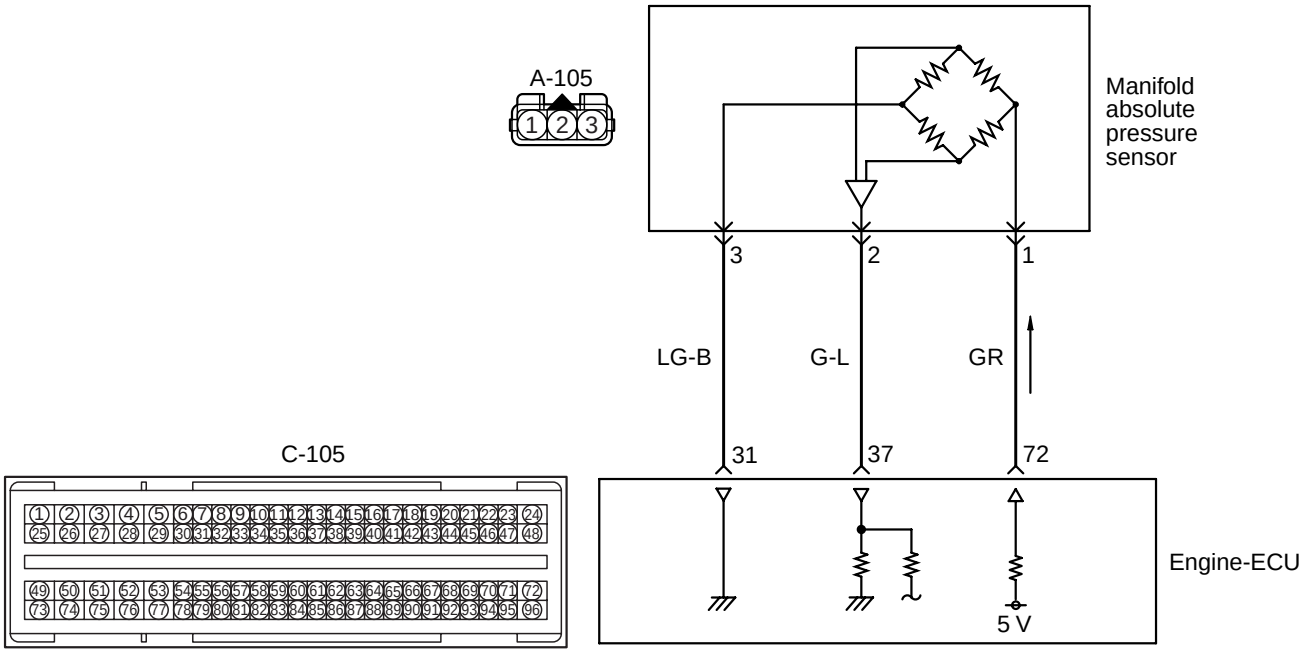


Q: Is the check result normal?

YES : Go to Step 7 .
NO : Repair or replace the connector.

Code No. P0108: Manifold Absolute Pressure Sensor Circuit High Input

Manifold Absolute Pressure Sensor Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V:Violet PU: Purple SI:Silver

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OPERATION

- A power voltage of 5 V is applied to the manifold absolute pressure sensor power terminal (terminal No. 1) from the engine-ECU (terminal No. 72) and earthed to the engine-ECU (terminal No. 31) from the manifold absolute pressure sensor (terminal No. 3).
- The sensor signal is inputted to the engine-ECU (terminal No. 37) from the manifold absolute pressure sensor output terminal (terminal No. 2).

FUNCTION

- The manifold absolute pressure sensor converts the manifold absolute pressure into a voltage signal and inputs the signal to the engine-ECU.
- In response to the signal, the engine-ECU corrects the fuel injection amount, etc.

TROUBLE JUDGMENT

Check Conditions

- Battery positive voltage is 8 – 16 V
- 2 seconds later after the ignition switch has been in "ON" position or the engine has started up

Judgment Criterion

- The manifold absolute pressure sensor output voltage should exceed 4.72 V for 0.5 seconds.

PROBABLE CAUSES

- Failed manifold absolute pressure sensor
- Open circuit in manifold absolute pressure sensor circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III data list

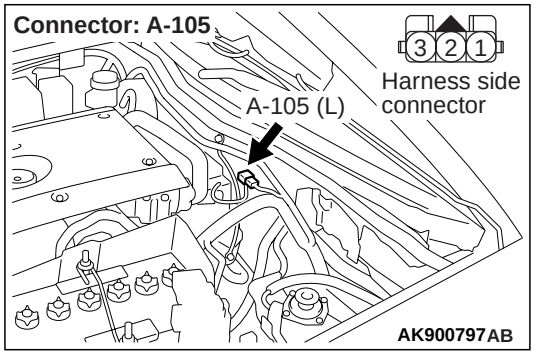
- Refer to Data List Reference Table P.13A-542.
  a. Item 6: Manifold absolute pressure sensor

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

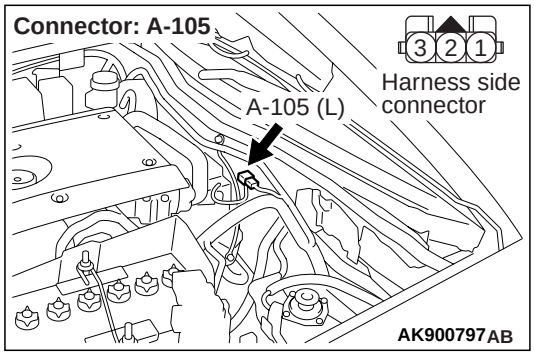
NO : Go to Step 2 .

STEP 2. Connector check: A-105 manifold absolute pressure sensor connector



Q: Is the check result normal?
YES : Go to Step 3 .
NO : Repair or replace the connector.

STEP 3. Perform resistance measurement at A-105 manifold absolute pressure sensor connector.

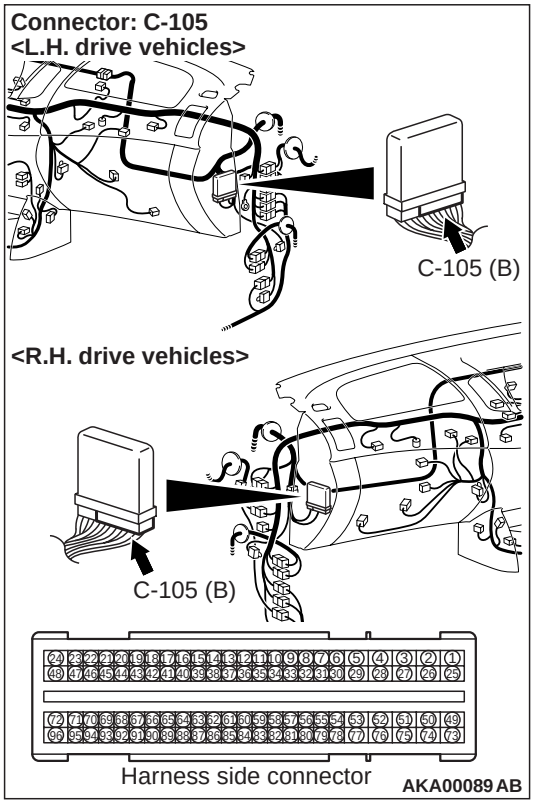


- Disconnect connector, and measure at harness side.
- Resistance between terminal No. 3 and earth.

OK: Continuity (2 Ω or less)

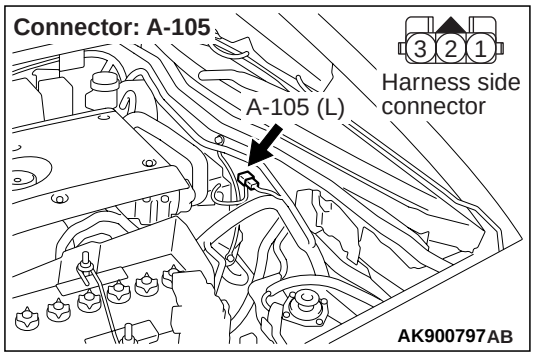
Q: Is the check result normal?
YES : Go to Step 7 .
NO : Go to Step 4 .

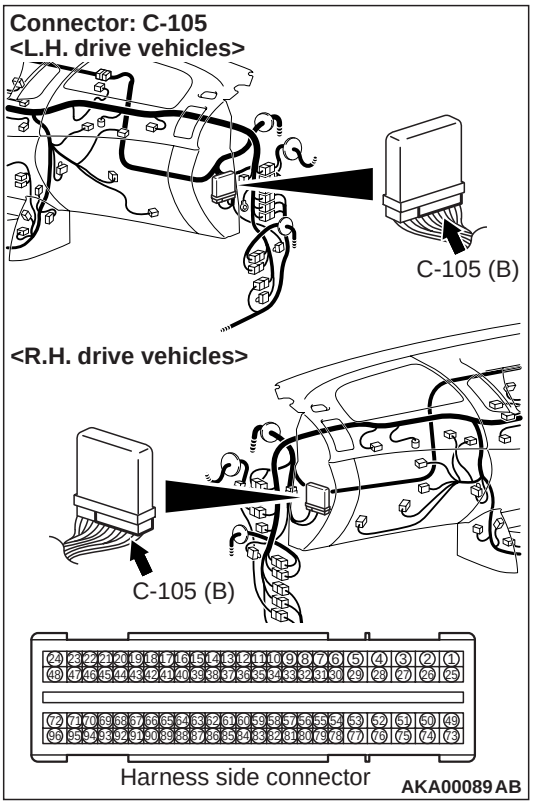
STEP 4. Connector check: C-105 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 5 .
NO : Repair or replace the connector.

STEP 5. Check harness between A-105 (terminal No. 3) manifold absolute pressure sensor connector and C-105 (terminal No. 31) engine-ECU connector.





- Check earthing line for open circuit.

Q: Is the check result normal?

YES : Go to Step 6 .
NO : Repair the damaged harness wire.

STEP 6. M.U.T.-III data list

- Refer to Data List Reference Table P.13A-542.
  a. Item 6: Manifold absolute pressure sensor

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).
NO : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

STEP 7. M.U.T.-III data list

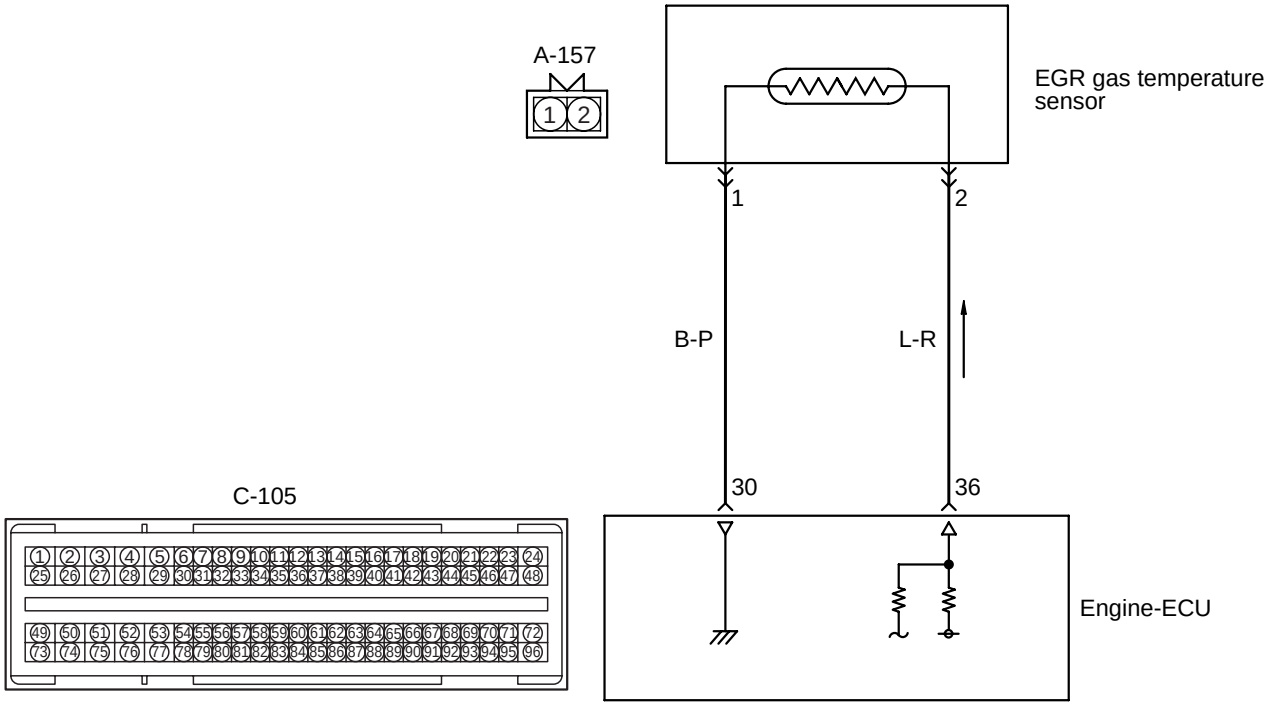
- Refer to Data List Reference Table P.13A-542.
  a. Item 6: Manifold absolute pressure sensor

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).
NO : Replace the manifold absolute pressure sensor.

Code No. P0112: EGR Gas Temperature Sensor Circuit Low Input <Euro5>

EGR Gas Temperature Sensor Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V: Violet PU: Purple SI: Silver

AKB00262AB

OPERATION

- A power voltage of 5 V is applied to the EGR gas temperature sensor output terminal (terminal No. 2) from the engine-ECU (terminal No. 36).
- The power voltage is earthed to the engine-ECU (terminal No. 30) from the EGR gas temperature sensor (terminal No. 1).

FUNCTION

- The EGR gas temperature sensor converts the EGR gas temperature into a voltage and inputs the voltage signal to the engine-ECU.
- The EGR gas temperature sensor is a kind of resistor, which has characteristics to reduce its resistance as the EGR gas temperature rises. Therefore, the sensor output voltage varies with the EGR gas temperature, and becomes lower as the EGR gas temperature rises.

TROUBLE JUDGMENT

Check Conditions

- Battery positive voltage is 8 – 16 V
- 2 seconds later after the ignition switch has been in "ON" position or the engine has started up.

Judgment Criterion

- The EGR gas temperature sensor output voltage is 0.11 V or less (the EGR gas temperature is above 500°C or equivalent).

PROBABLE CAUSES

- Failed EGR gas temperature sensor
- Short circuit or harness damage in EGR gas temperature sensor circuit or loose connector contact
- Failed engine-ECU

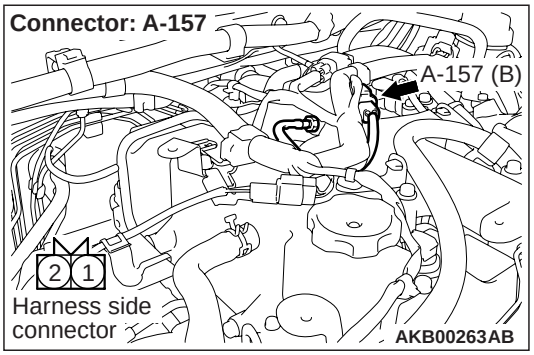
DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III data list

- Refer to Data List Reference Table P.13A-542
  a. Item 8: EGR gas temperature sensor

Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).
NO : Go to Step 2 .

STEP 2. Connector check: A-157 EGR gas temperature sensor connector



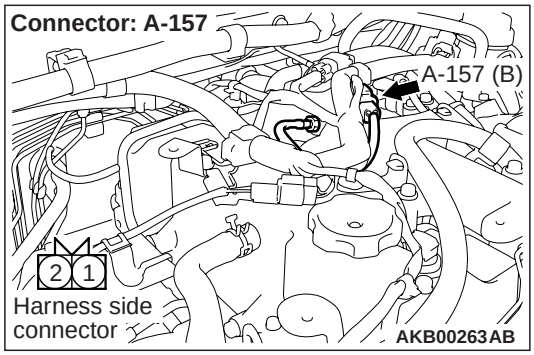
Q: Is the check result normal?
YES : Go to Step 3 .
NO : Repair or replace the connector.

STEP 3. Check EGR gas temperature sensor itself.

- Check EGR gas temperature sensor itself (Refer to GROUP 17 – Emission Control – Exhaust Gas Recirculation (EGR) System – EGR Gas Temperature Sensor Check).

Q: Is the check result normal?
YES : Go to Step 4 .
NO : Replace the EGR gas temperature sensor.

STEP 4. Perform voltage measurement at A-157 EGR gas temperature sensor connector.

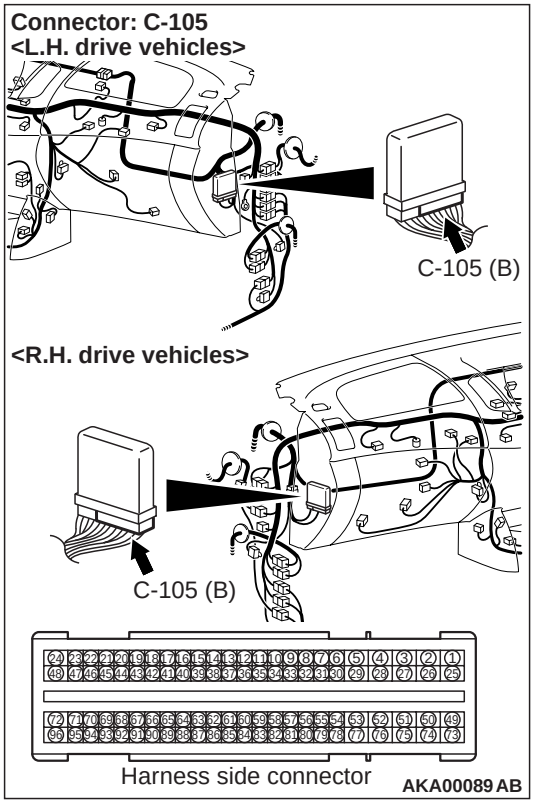


- Disconnect connector, and measure at harness side.
- Ignition switch: ON
- Voltage between terminal No. 2 and earth.

OK: 4.5 – 4.9 V

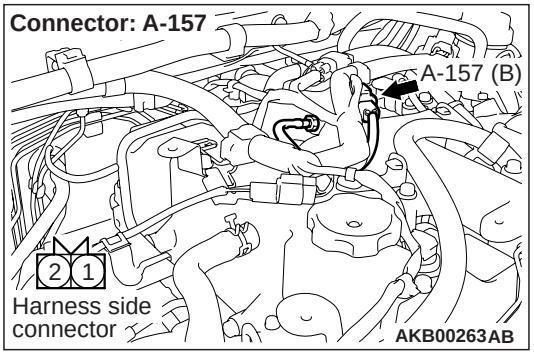
Q: Is the check result normal?
YES : Go to Step 8 .
NO : Go to Step 5 .

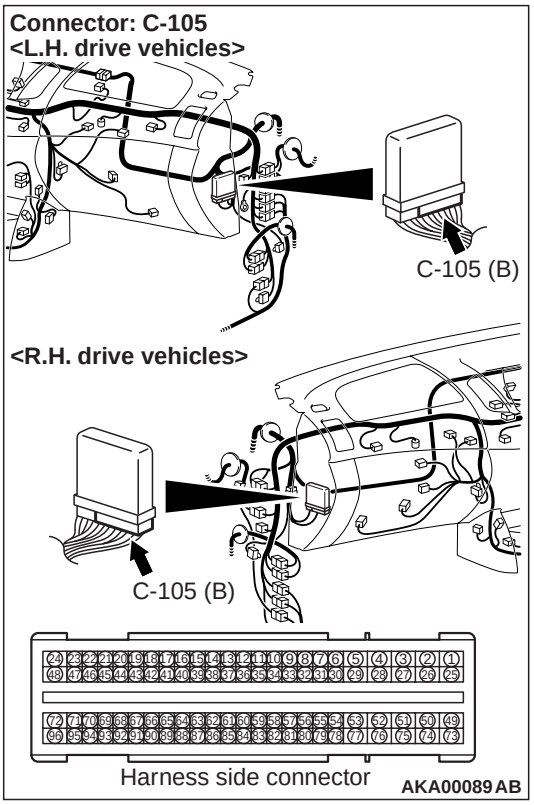
STEP 5. Connector check: C-105 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 6 .
NO : Repair or replace the connector.

STEP 6. Check harness between A-157 (terminal No. 2) EGR gas temperature sensor connector and C-105 (terminal No. 36) engine-ECU connector.





- Check output line for short circuit.

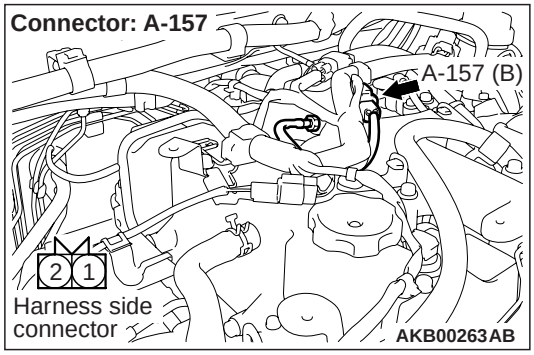
Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair the damaged harness wire.

STEP 7. M.U.T.-III data list

- Refer to Data List Reference Table P.13A-542
  a. Item 8: EGR gas temperature sensor

Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).
NO : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, carry out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

STEP 8. Perform resistance measurement at A-157 EGR gas temperature sensor connector.

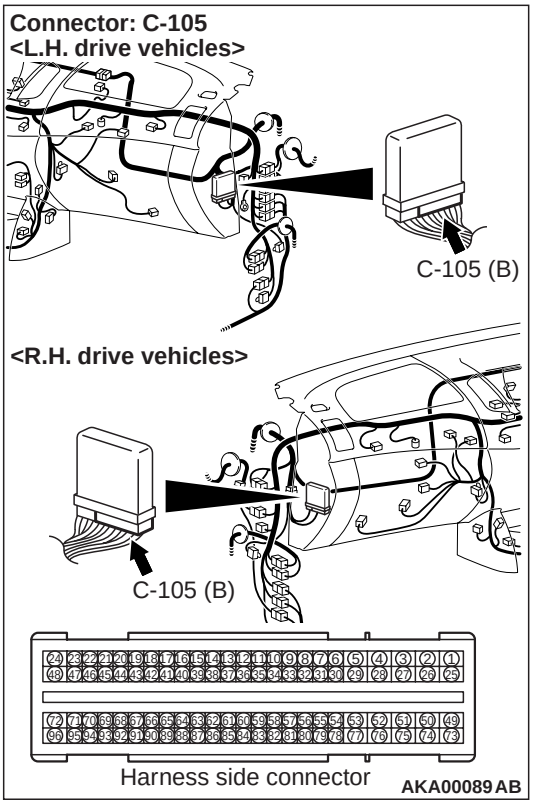


- Disconnect connector, and measure at harness side.
- Resistance between terminal No. 1 and earth.

OK: Continuity (2 Ω or less)

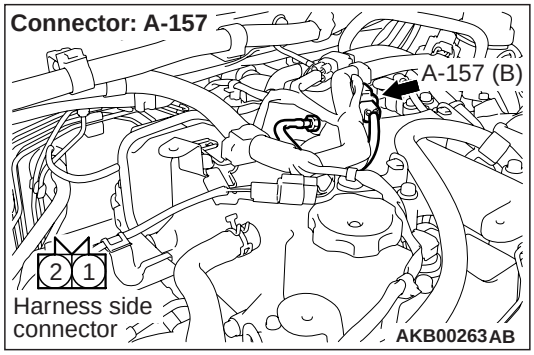
Q: Is the check result normal?
YES : Go to Step 11 .
NO : Go to Step 9 .

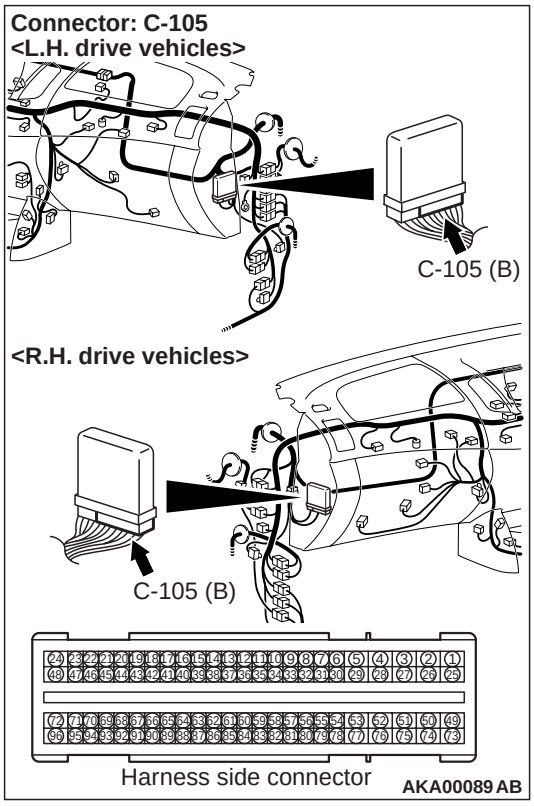
STEP 9. Connector check: C-105 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 10 .
NO : Repair or replace the connector.

STEP 10. Check harness between A-157 (terminal No. 1) EGR gas temperature sensor connector and C-105 (terminal No. 30) engine-ECU connector.

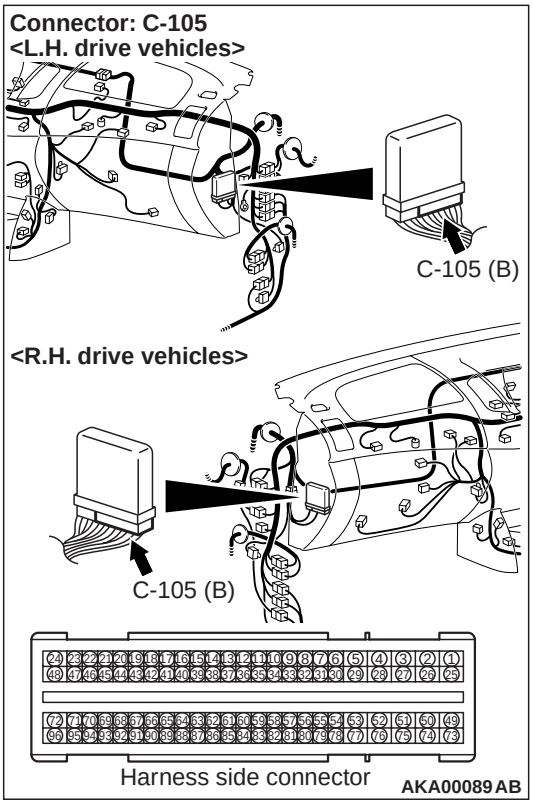




- Check earthing line for damage.

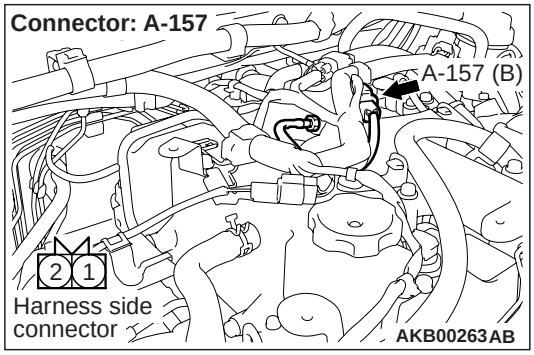
Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair the damaged harness wire.

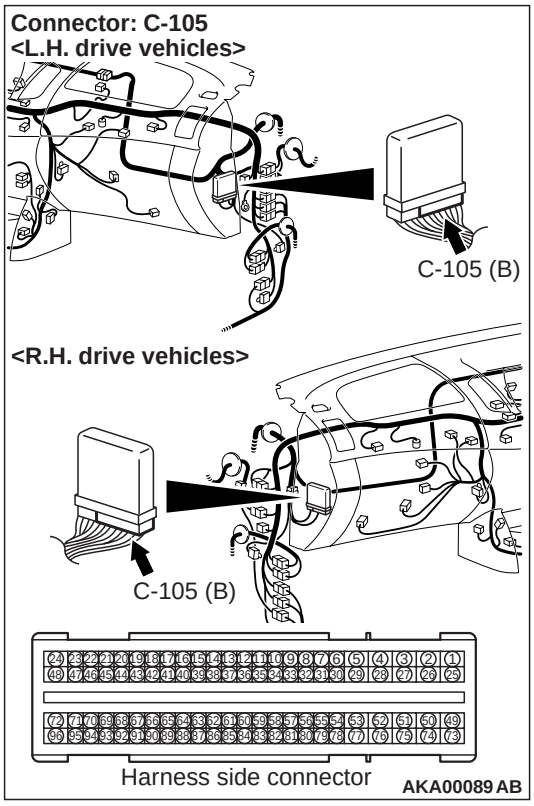
STEP 11. Connector check: C-105 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 12 .
NO : Repair or replace the connector.

STEP 12. Check harness between A-157 (terminal No. 2) EGR gas temperature sensor connector and C-105 (terminal No. 36) engine-ECU connector.



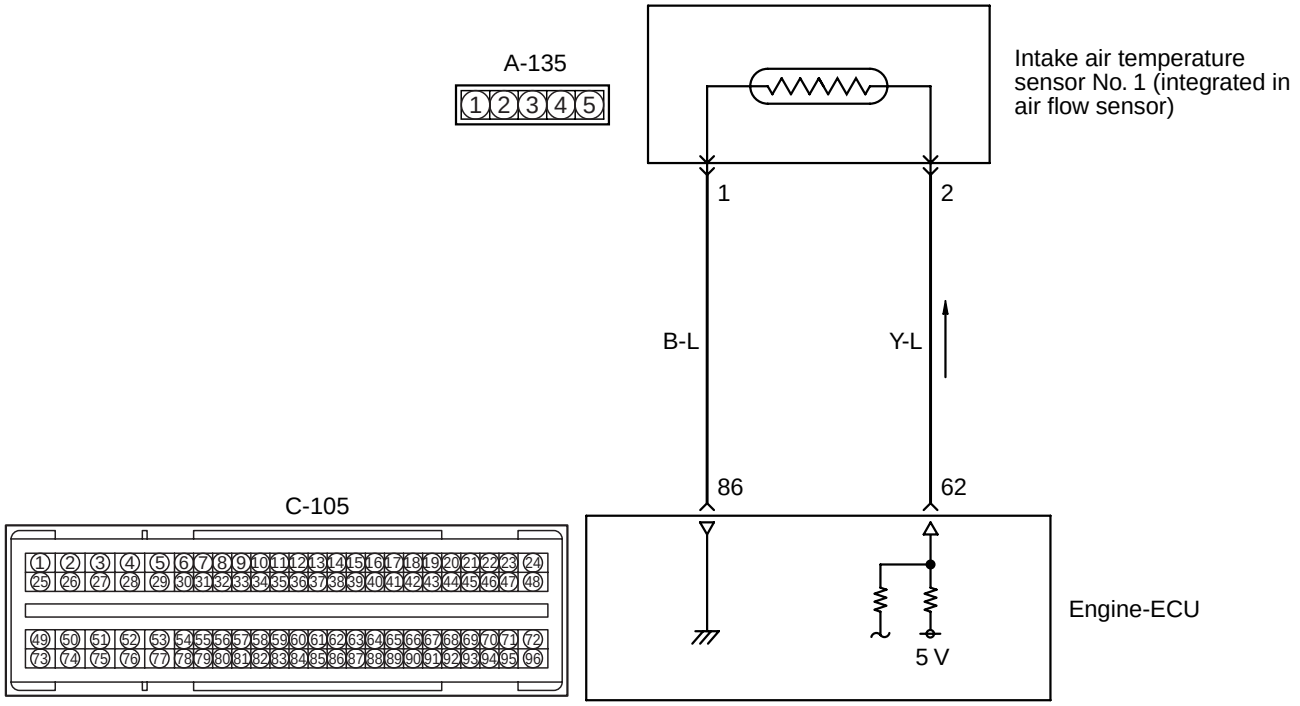


- Check output line for damage.

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair the damaged harness wire.

Code No. P0112: Intake Air Temperature Sensor No. 1 Circuit Low Input <Except Euro5>

Intake Air Temperature Sensor No. 1 Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Gray
R: Red P: Pink V: Violet PU: Purple SI: Silver

AKA00356 AB

OPERATION

- A power voltage of 5 V is applied to the intake air temperature sensor No. 1 output terminal (terminal No. 2) from the engine-ECU (terminal No. 62).
- The power voltage is earthed to the engine-ECU (terminal No. 86) from the intake air temperature sensor No. 1 (terminal No. 1).

FUNCTION

- The intake air temperature sensor No. 1 converts the intake air temperature into a voltage and inputs the voltage signal to the engine-ECU.
- In response to the signal, the engine-ECU corrects the fuel injection amount, etc.
- The intake air temperature sensor No. 1 is a kind of resistor, which has characteristics to reduce its resistance as the intake air temperature rises. Therefore, the sensor output voltage varies with the intake air temperature, and becomes lower as the intake air temperature rises.

TROUBLE JUDGMENT

Check Conditions

- Battery positive voltage is 8 – 16 V
- 2 seconds later after the ignition switch has been in "ON" position or the engine has started up.

Judgment Criterion

- The intake air temperature sensor No. 1 output voltage is 0.09 V or less for 0.5 second.

PROBABLE CAUSES

- Failed intake air temperature sensor No. 1
- Short circuit or harness damage in intake air temperature sensor No.1 circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III data list

- Item 43: Intake air temperature sensor No. 1

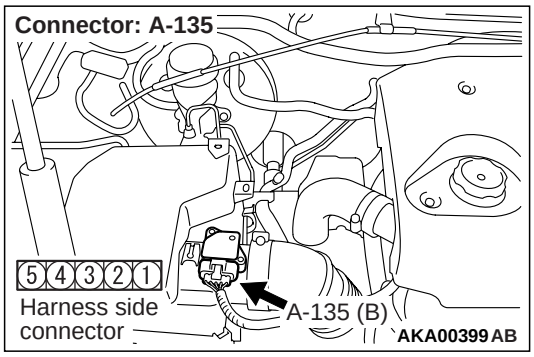
  OK: At ambient temperature (atmospheric temperature) or equivalent.

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

NO : Go to Step 2 .

STEP 2. Connector check: A-135 air flow sensor connector



Q: Is the check result normal?

YES : Go to Step 3 .

NO : Repair or replace the connector.

STEP 3. Check intake air temperature sensor No. 1 itself.

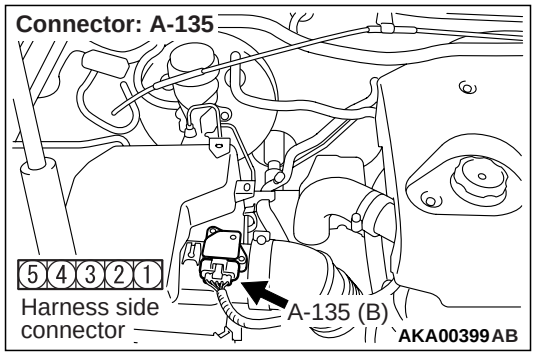
- Check intake air temperature sensor No. 1 itself (Refer to P.13A-595).

Q: Is the check result normal?

YES : Go to Step 4 .

NO : Replace the air flow sensor.

STEP 4. Perform Voltage measurement at A-135 air flow sensor connector.



- Disconnect connector, and measure at harness side.
- Ignition switch: ON
- Voltage between terminal No. 2 and earth.

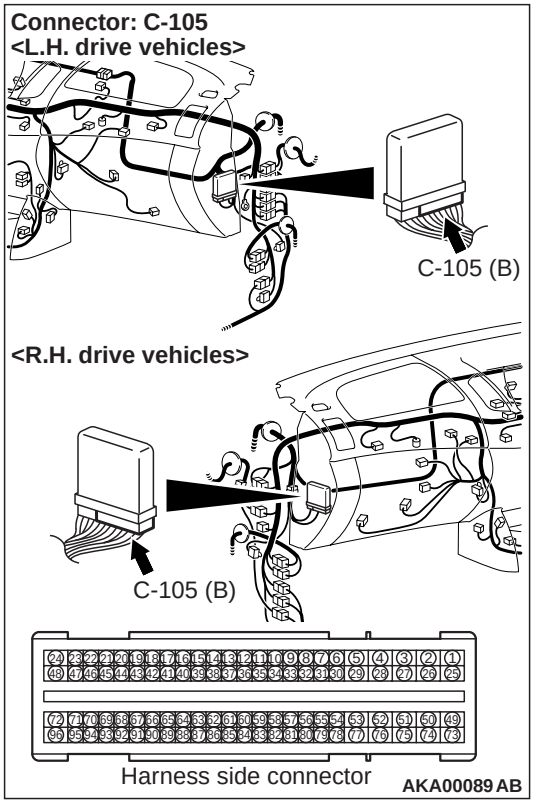
  OK: 4.5 – 4.9 V

Q: Is the check result normal?

YES : Go to Step 8 .

NO : Go to Step 5 .

STEP 5. Connector check: C-105 engine-ECU connector

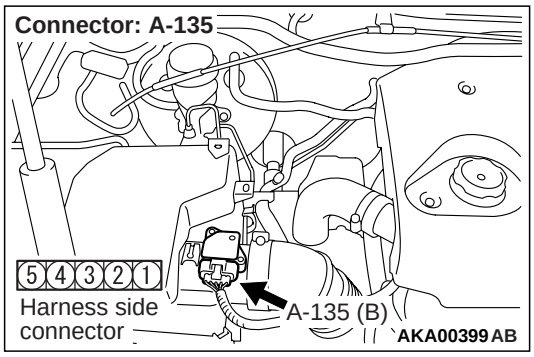


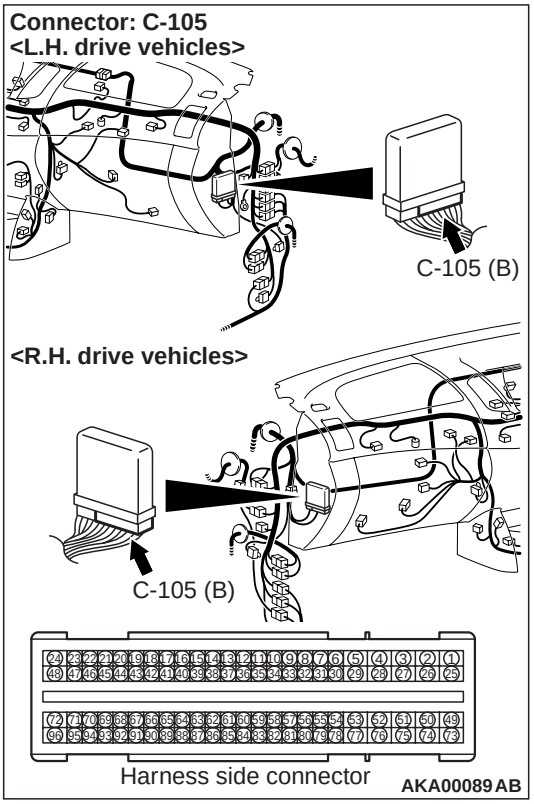
Q: Is the check result normal?

YES : Go to Step 6 .

NO : Repair or replace the connector.

STEP 6. Check harness between A-135 (terminal No. 2) air flow sensor connector and C-105 (terminal No. 62) engine-ECU connector.





- Check output line for short circuit.

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair the damaged harness wire.

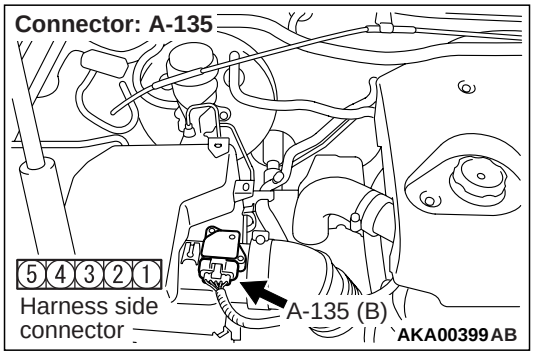
STEP 7. M.U.T.-III data list

- Item 43: Intake air temperature sensor No. 1

  OK: At ambient temperature (atmospheric temperature) or equivalent.

Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).
NO : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).

STEP 8. Perform resistance measurement at A-135 air flow sensor connector.

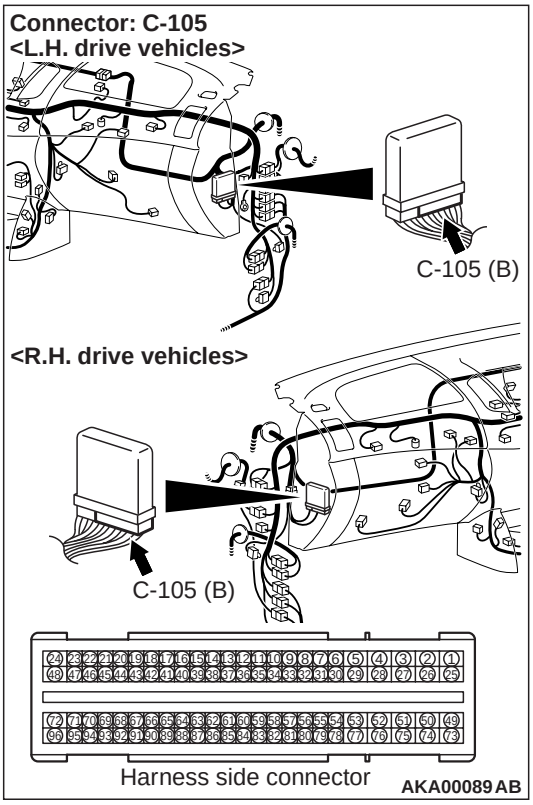


- Disconnect connector, and measure at harness side.
- Resistance between terminal No. 1 and earth.

  OK: Continuity (2 Ω or less)

Q: Is the check result normal?
YES : Go to Step 11 .
NO : Go to Step 9 .

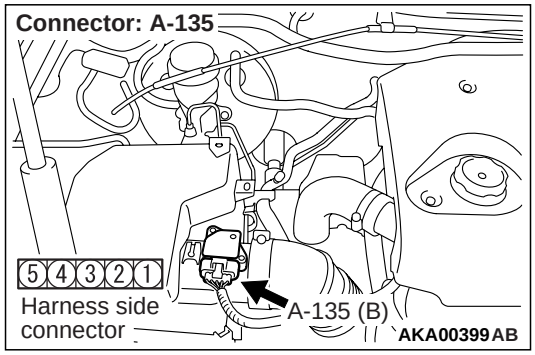
STEP 9. Connector check: C-105 engine-ECU connector

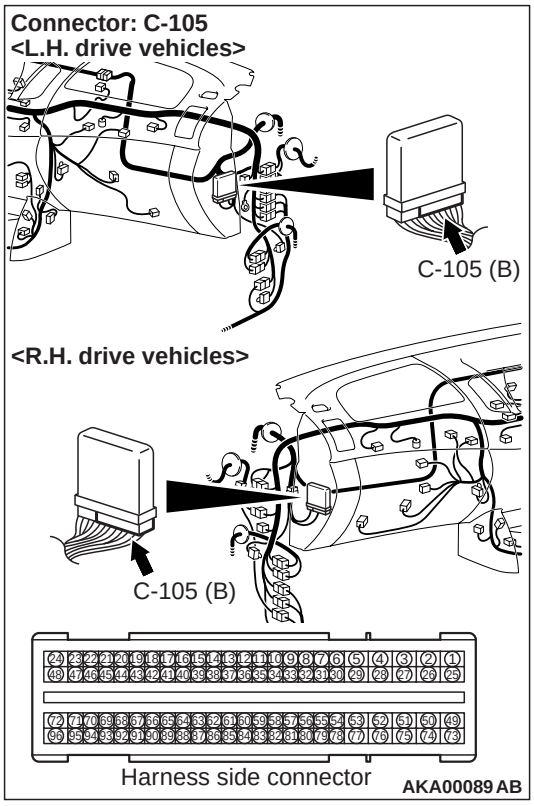


Q: Is the check result normal?
YES : Go to Step 10 .
NO : Repair or replace the connector.

STEP 10. Check harness between A-135 (terminal No. 1) air flow sensor connector and C-105 (terminal No. 86) engine-ECU connector.

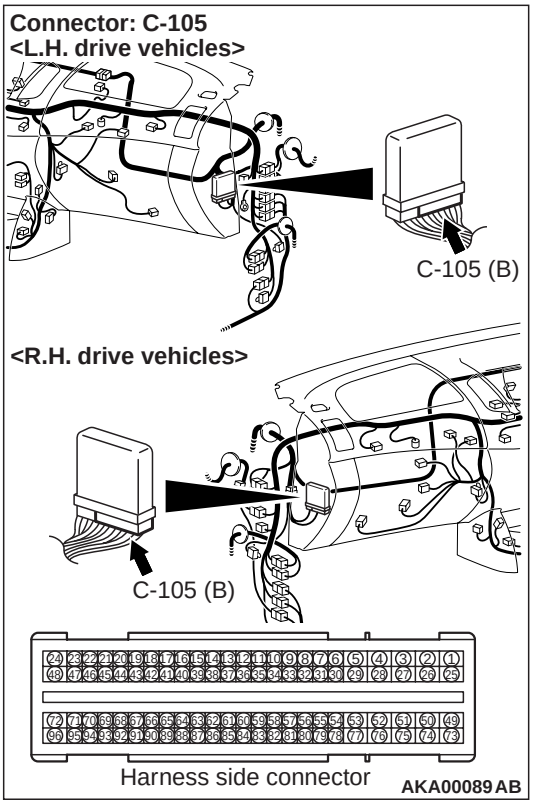
- Check earthing line for damage.





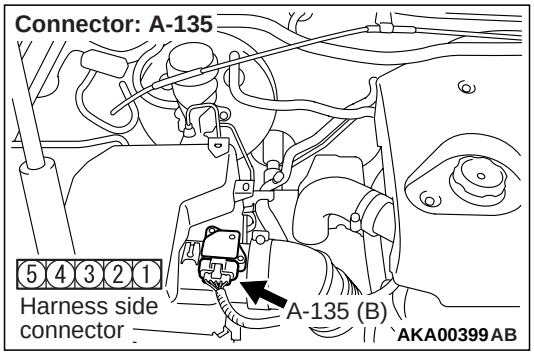
Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair the damaged harness wire.

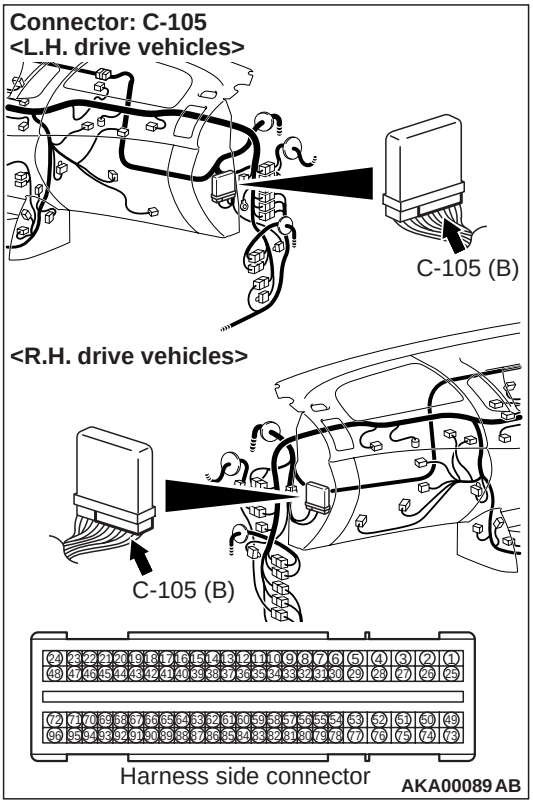
STEP 11. Connector check: C-105 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 12 .
NO : Repair or replace the connector.

STEP 12. Check harness between A-135 (terminal No. 2) air flow sensor connector and C-105 (terminal No. 62) engine-ECU connector.



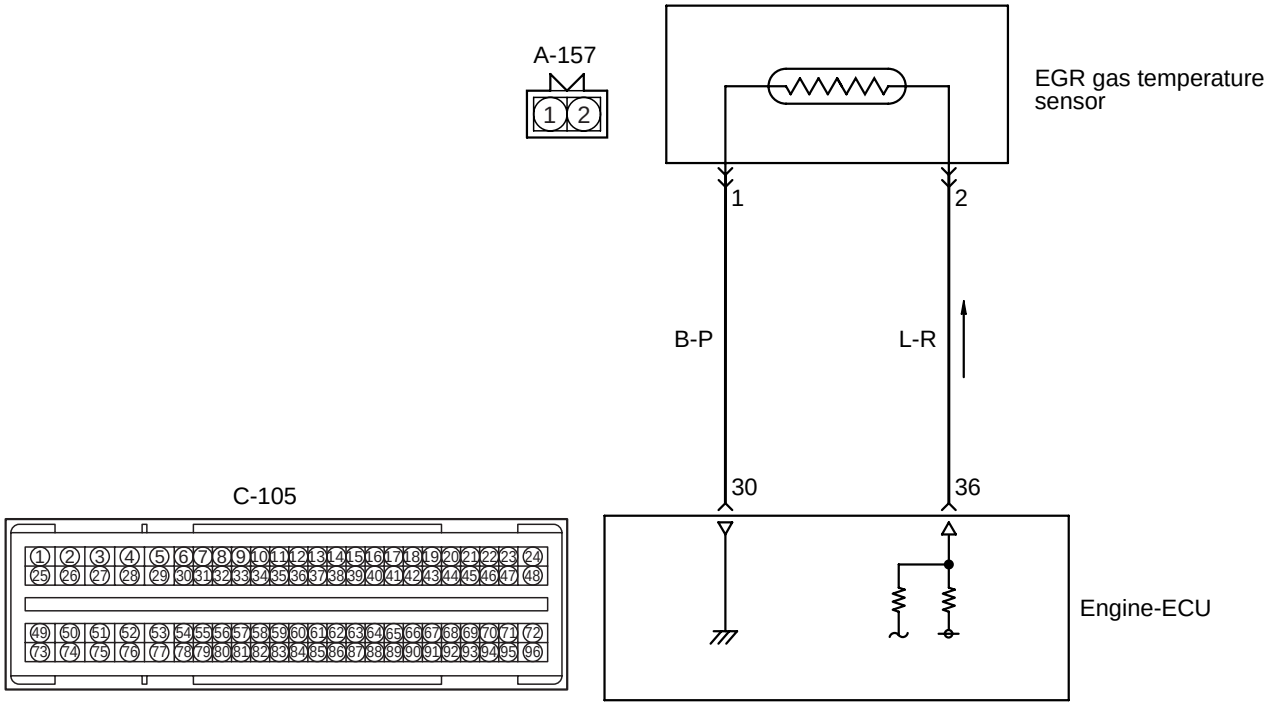


- Check output line for damage.

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair the damaged harness wire.

Code No. P0113: EGR Gas Temperature Sensor Circuit High Input <Euro5>

EGR Gas Temperature Sensor Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V: Violet PU: Purple SI: Silver

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OPERATION

- A power voltage of 5 V is applied to the EGR gas temperature sensor output terminal (terminal No. 2) from the engine-ECU (terminal No. 36).
- The power voltage is earthed to the engine-ECU (terminal No. 30) from the EGR gas temperature sensor (terminal No. 1).

FUNCTION

- The EGR gas temperature sensor converts the EGR gas temperature into a voltage and inputs the voltage signal to the engine-ECU.
- The EGR gas temperature sensor is a kind of resistor, which has characteristics to reduce its resistance as the EGR gas temperature rises. Therefore, the sensor output voltage varies with the EGR gas temperature, and becomes lower as the EGR gas temperature rises.

TROUBLE JUDGMENT

Check Conditions

- Battery positive voltage is 8 – 16 V
- 2 seconds later after the ignition switch has been in "ON" position or the engine has started up.

Judgment Criterion

- The EGR gas temperature sensor output voltage is 4.96 V or more (the EGR gas temperature is below –50°C or equivalent).

PROBABLE CAUSES

- Failed EGR gas temperature sensor
- Open circuit in EGR gas temperature sensor circuit or loose connector contact
- Failed engine-ECU

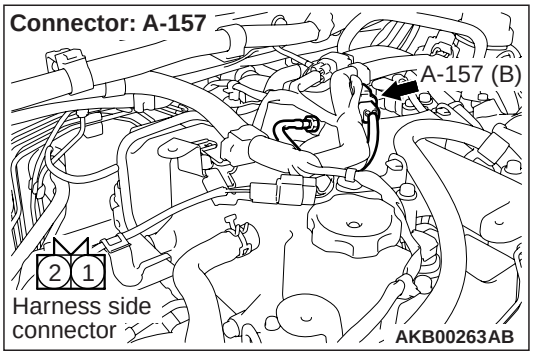
DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III data list

- Refer to Data List Reference Table P.13A-542
  a. Item 8: EGR gas temperature sensor

Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).
NO : Go to Step 2 .

STEP 2. Connector check: A-157 EGR gas temperature sensor connector



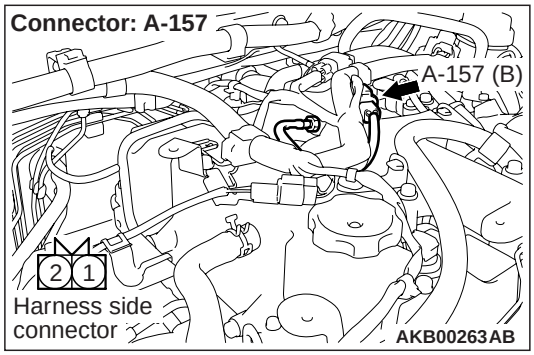
Q: Is the check result normal?
YES : Go to Step 3 .
NO : Repair or replace the connector.

STEP 3. Check EGR gas temperature sensor itself.

- Check EGR gas temperature sensor itself (Refer to GROUP 17 – Emission Control – Exhaust Gas Recirculation (EGR) System – EGR Gas Temperature Sensor Check).

Q: Is the check result normal?
YES : Go to Step 4 .
NO : Replace the EGR gas temperature sensor.

STEP 4. Perform voltage measurement at A-157 EGR gas temperature sensor connector.

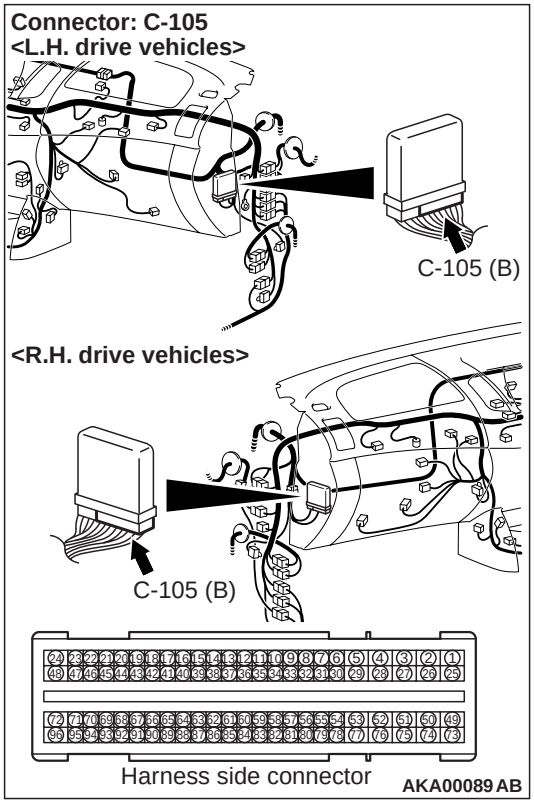


- Disconnect connector, and measure at harness side.
- Ignition switch: ON
- Voltage between terminal No. 2 and earth.

OK: 4.5 – 4.9 V

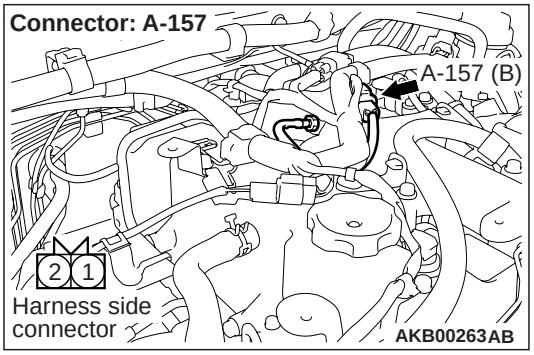
Q: Is the check result normal?
YES : Go to Step 8 .
NO : Go to Step 5 .

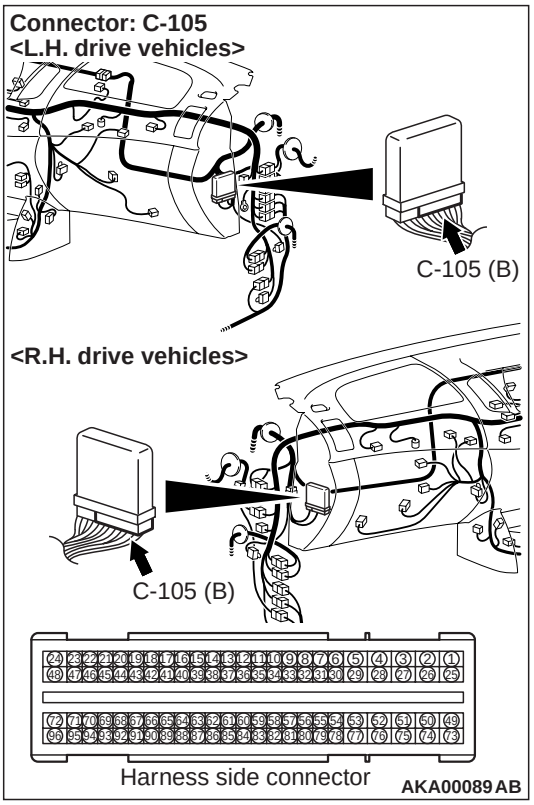
STEP 5. Connector check: C-105 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 6 .
NO : Repair or replace the connector.

STEP 6. Check harness between A-157 (terminal No. 2) EGR gas temperature sensor connector and C-105 (terminal No. 36) engine-ECU connector.





- Check output line for open circuit.

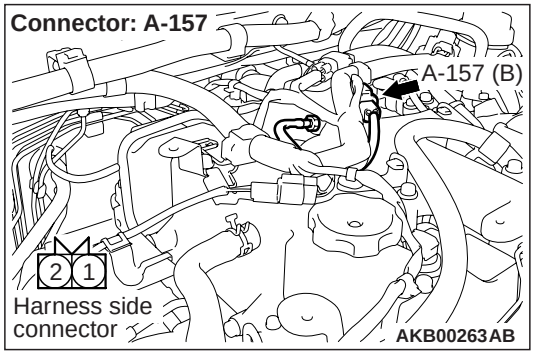
Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair the damaged harness wire.

STEP 7. M.U.T.-III data list

- Refer to Data List Reference Table P.13A-542
  a. Item 8: EGR gas temperature sensor

Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).
NO : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, carry out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

STEP 8. Perform resistance measurement at A-157 EGR gas temperature sensor connector.

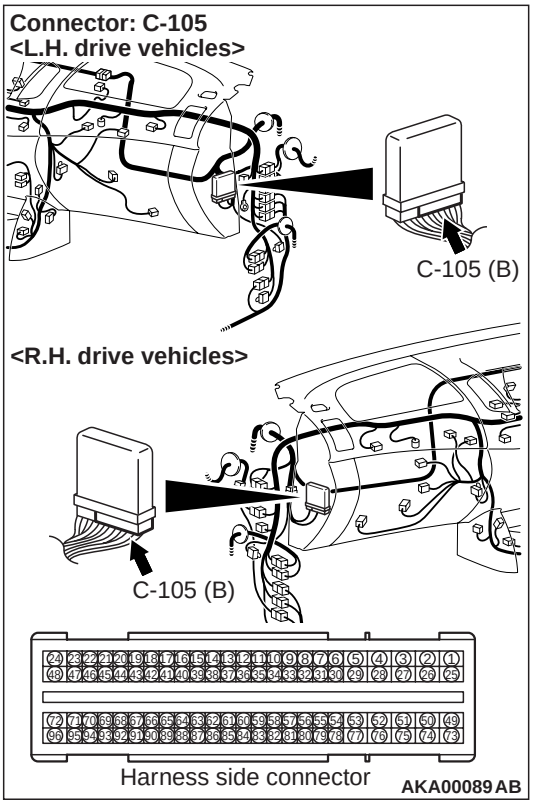


- Disconnect connector, and measure at harness side.
- Resistance between terminal No. 1 and earth.

OK: Continuity (2 Ω or less)

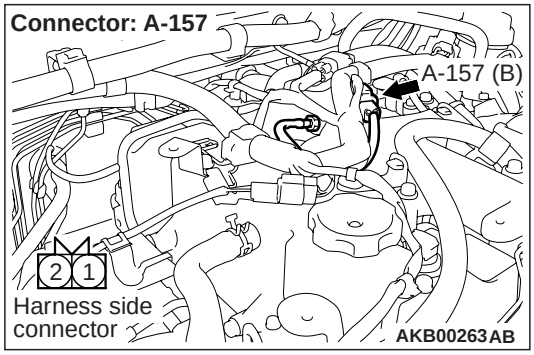
Q: Is the check result normal?
YES : Go to Step 11 .
NO : Go to Step 9 .

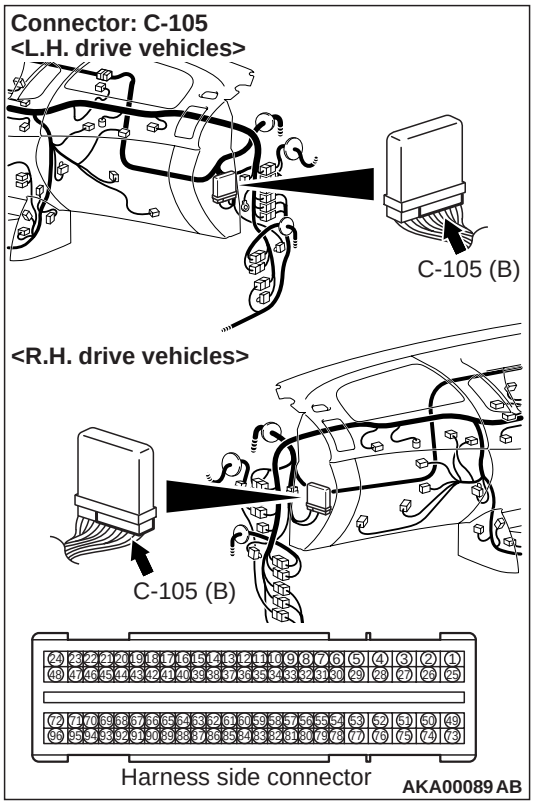
STEP 9. Connector check: C-105 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 10 .
NO : Repair or replace the connector.

STEP 10. Check harness between A-157 (terminal No. 1) EGR gas temperature sensor connector and C-105 (terminal No. 30) engine-ECU connector.

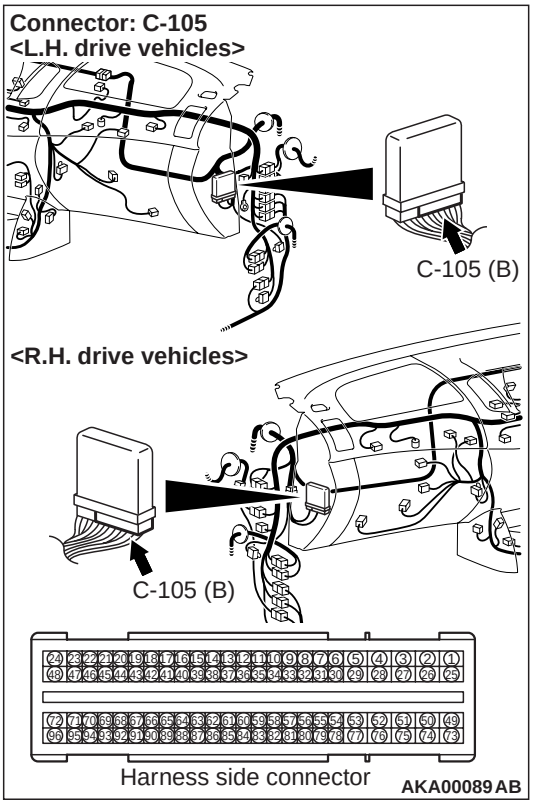




- Check earthing line for open circuit.

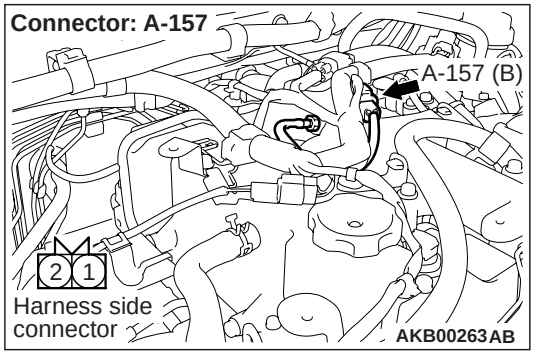
Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair the damaged harness wire.

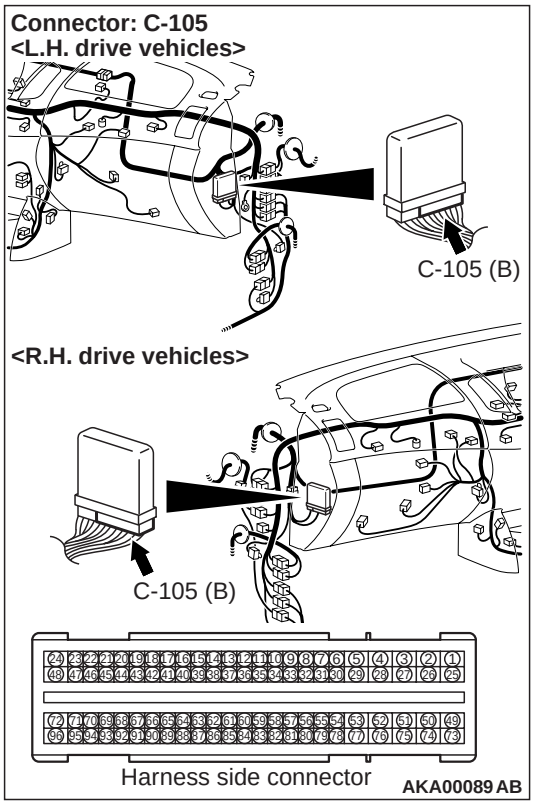
STEP 11. Connector check: C-105 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 12 .
NO : Repair or replace the connector.

STEP 12. Check harness between A-157 (terminal No. 2) EGR gas temperature sensor connector and C-105 (terminal No. 36) engine-ECU connector.



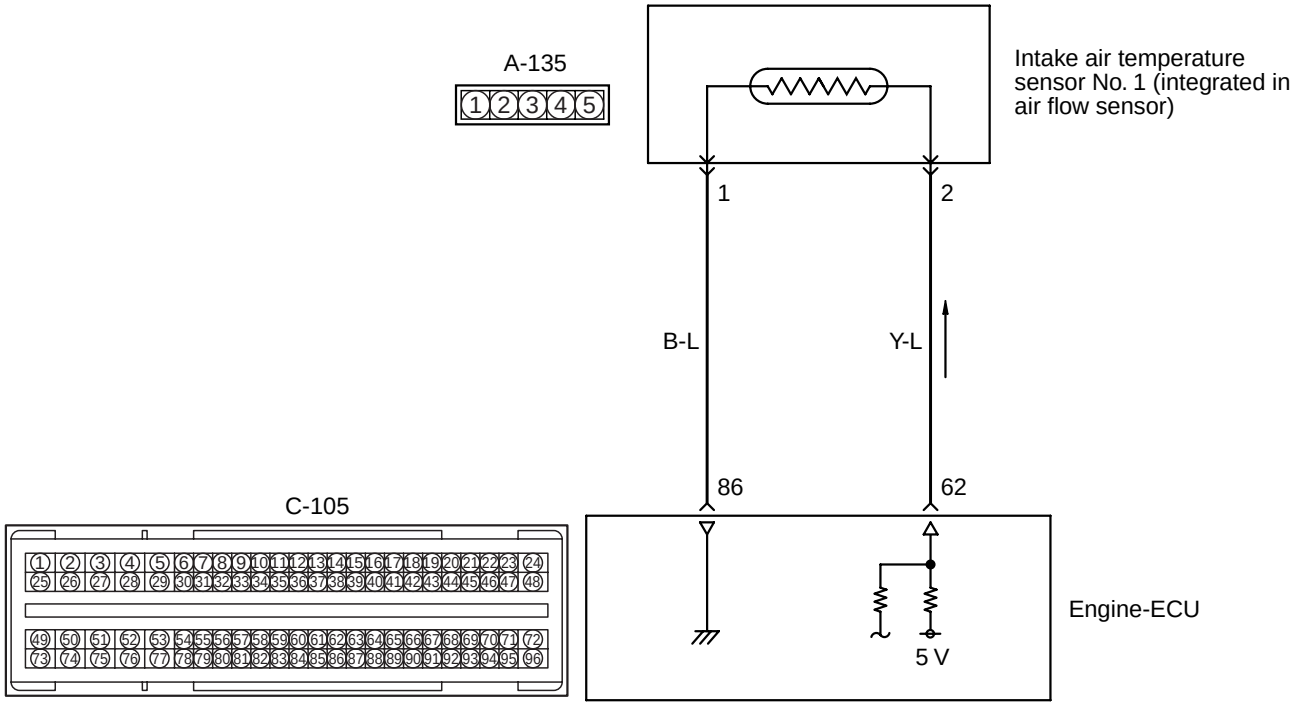


- Check output line for damage.

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair the damaged harness wire.

Code No. P0113: Intake Air Temperature Sensor No. 1 Circuit High Input <Except Euro5>

Intake Air Temperature Sensor No. 1 Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Gray
R: Red P: Pink V: Violet PU: Purple SI: Silver

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OPERATION

- A power voltage of 5 V is applied to the intake air temperature sensor No.1 output terminal (terminal No. 2) of air flow sensor connector from the engine-ECU (terminal No. 62).
- The power voltage is earthed to the engine-ECU (terminal No. 86) from the intake air temperature sensor No. 1 (terminal No. 1).

FUNCTION

- The intake air temperature sensor No. 1 converts the intake air temperature into a voltage and inputs the voltage signal to the engine-ECU.
- In response to the signal, the engine-ECU corrects the fuel injection amount, etc.
- The intake air temperature sensor No. 1 is a kind of resistor, which has characteristics to reduce its resistance as the intake air temperature rises. Therefore, the sensor output voltage varies with the intake air temperature, and becomes lower as the intake air temperature rises.

TROUBLE JUDGMENT

Check Conditions

- Battery positive voltage is 8 – 16 V
- 2 seconds later after the ignition switch has been in "ON" position or the engine has started up.

Judgment Criterion

- The intake air temperature sensor No. 1 output voltage is 4.87 V or more for 0.5 second.

PROBABLE CAUSES

- Failed intake air temperature sensor No. 1
- Open circuit or harness damage in intake air temperature sensor No. 1 circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

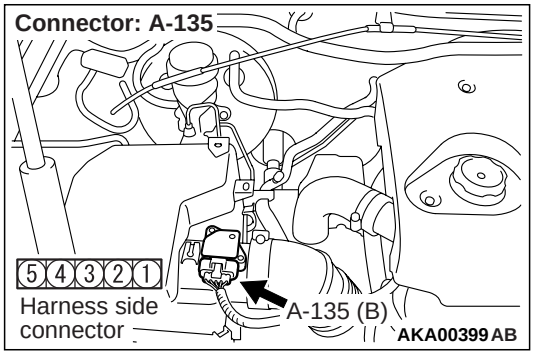
STEP 1. M.U.T.-III data list

- Refer to Data List Reference Table P.13A-542.
  a. Item 43: Intake air temperature sensor No. 1

  OK: At ambient temperature (atmospheric temperature) or equivalent.

Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).
NO : Go to Step 2 .

STEP 2. Connector check: A-135 air flow sensor connector



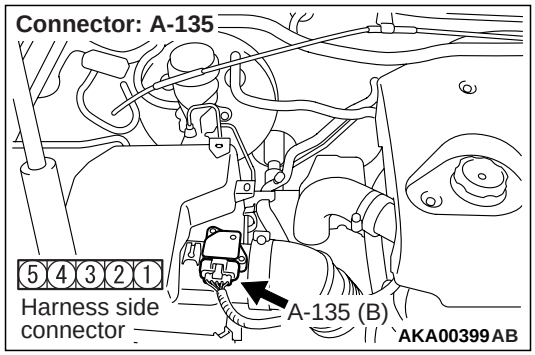
Q: Is the check result normal?
YES : Go to Step 3 .
NO : Repair or replace the connector.

STEP 3. Check intake air temperature sensor No. 1 itself.

- Check intake air temperature sensor No. 1 itself (Refer to P.13A-595).

Q: Is the check result normal?
YES : Go to Step 4 .
NO : Replace the air flow sensor.

STEP 4. Perform voltage measurement at A-135 air flow sensor No. 1 connector.

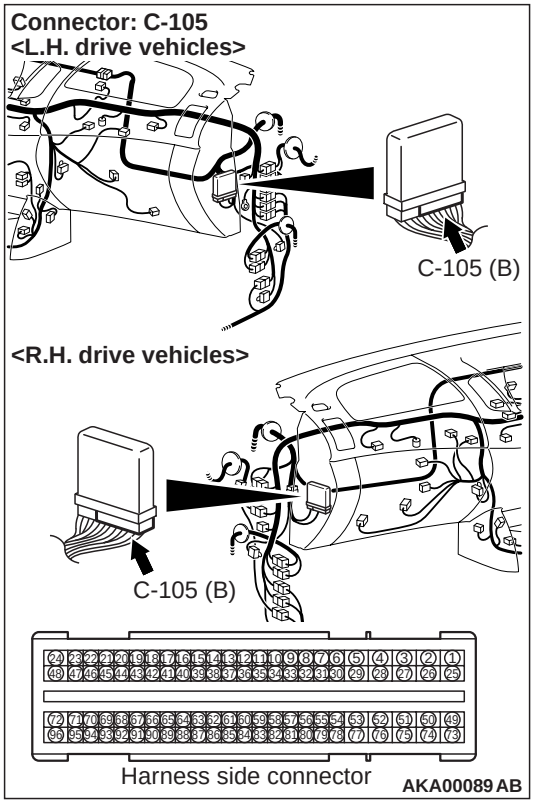


- Disconnect connector, and measure at harness side.
- Ignition switch: ON
- Voltage between terminal No. 2 and earth.

  OK: 4.5 – 4.9 V

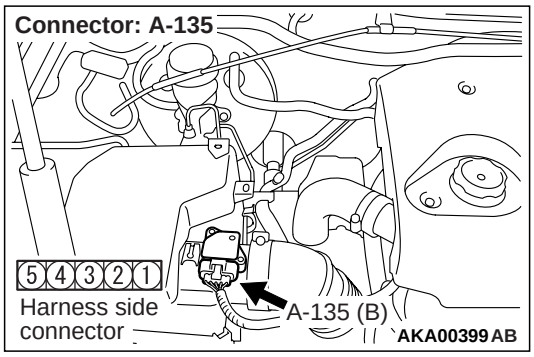
Q: Is the check result normal?
YES : Go to Step 8 .
NO : Go to Step 5 .

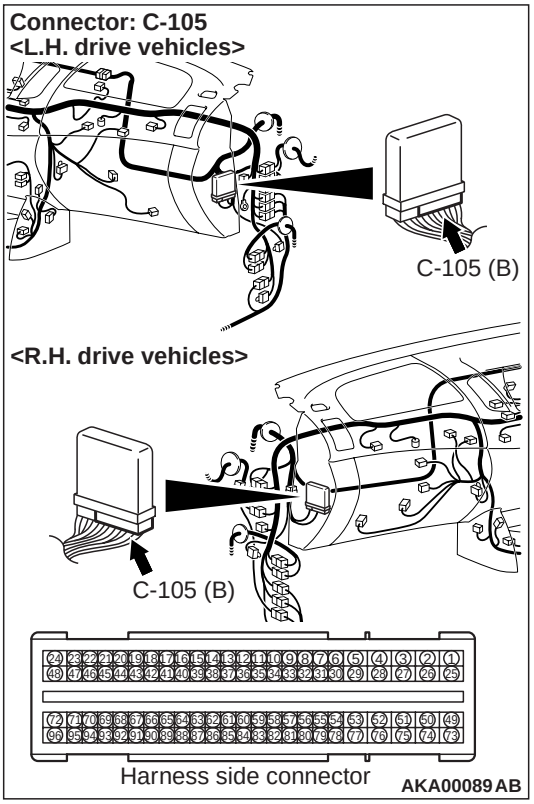
STEP 5. Connector check: C-105 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 6 .
NO : Repair or replace the connector.

STEP 6. Check harness between A-135 (terminal No. 2) air flow sensor connector and C-105 (terminal No. 62) engine-ECU connector.





- Check output line for open circuit.

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair the damaged harness wire.

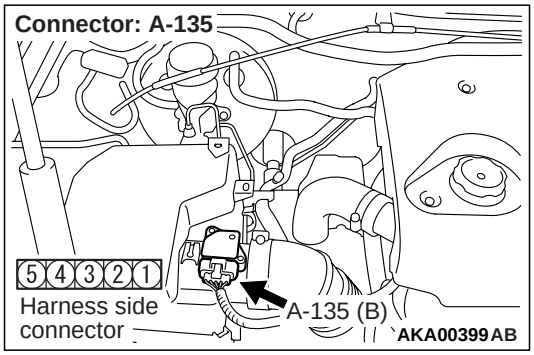
STEP 7. M.U.T.-III data list

- Item 43: Intake air temperature sensor No. 1

  OK: At ambient temperature (atmospheric temperature) or equivalent.

Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).
NO : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).

STEP 8. Perform resistance measurement at A-135 air flow sensor connector.

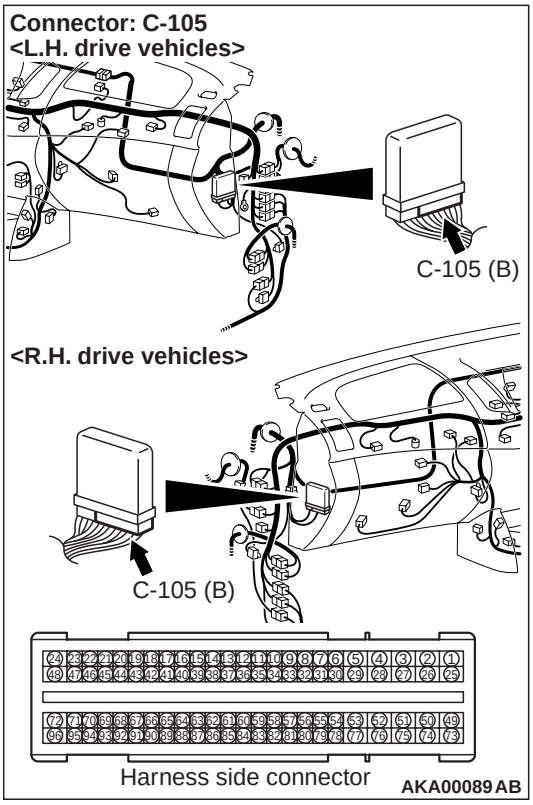


- Disconnect connector, and measure at harness side.
- Resistance between terminal No. 1 and earth.

  OK: Continuity (2 Ω or less)

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Go to Step 9 .

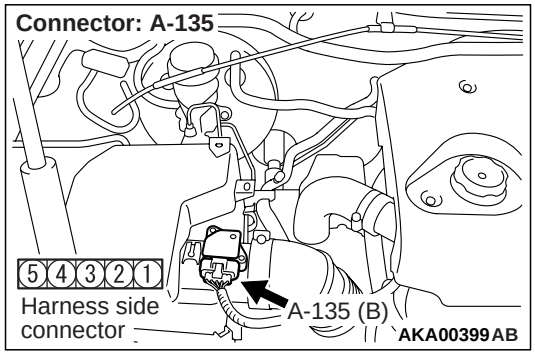
STEP 9. Connector check: C-105 engine-ECU connector

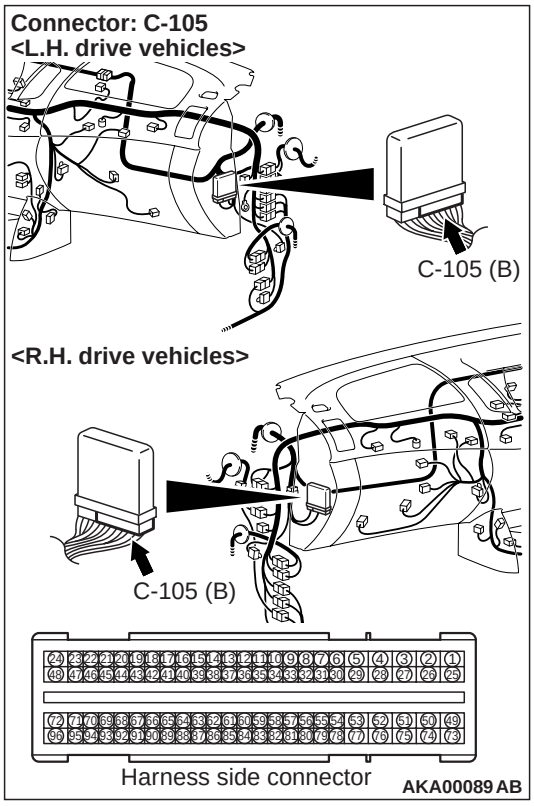


Q: Is the check result normal?
YES : Go to Step 10 .
NO : Repair or replace the connector.

STEP 10. Check harness between A-135 (terminal No. 1) air flow sensor connector and C-105 (terminal No. 86) engine-ECU connector.

- Check earthing line open circuit and damage.

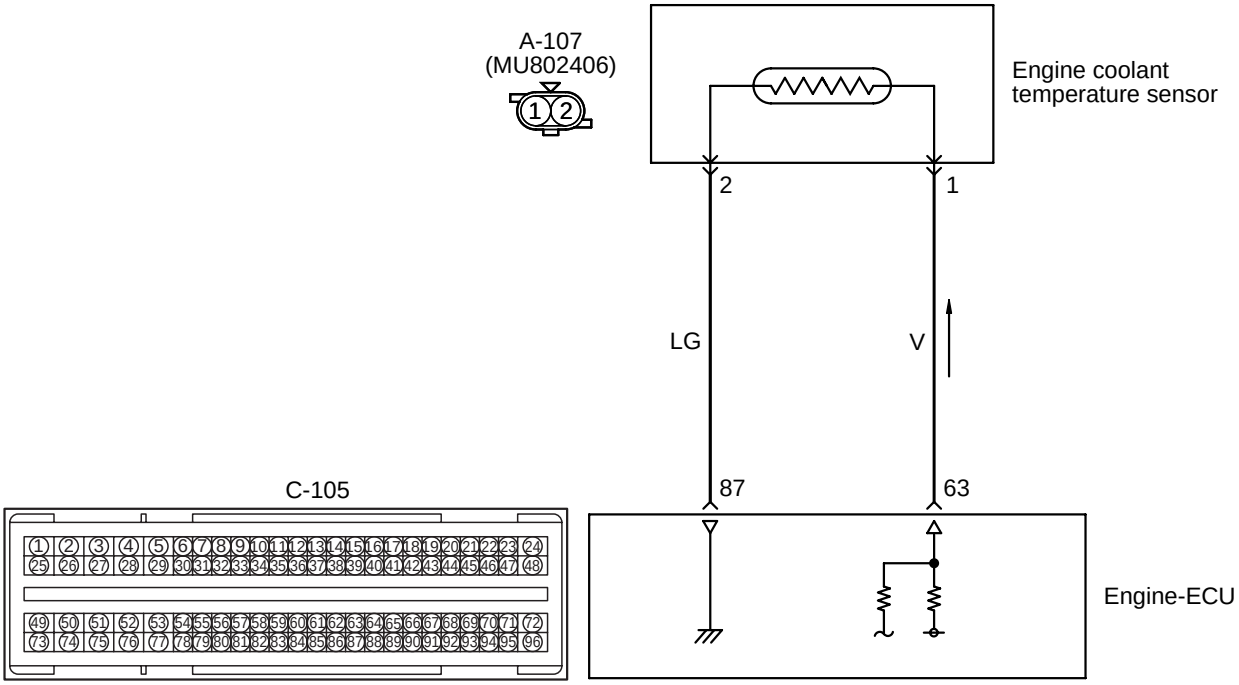




Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair or replace the connector.

Code No. P0117: Engine Coolant Temperature Sensor Circuit Low Input

Engine Coolant Temperature Sensor Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V: Violet PU: Purple SI: Silver

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OPERATION
- A power voltage of 5 V is applied to the engine coolant temperature sensor output terminal (terminal No. 1) from the engine-ECU (terminal No. 63).
- The power voltage is earthed to the engine-ECU (terminal No. 87) from the engine coolant temperature sensor (terminal No. 2).

FUNCTION
- The engine coolant temperature sensor converts the engine coolant temperature into a voltage signal, and inputs the voltage to the engine-ECU.
- In response to the signal, the engine-ECU controls the fuel infection amount and the fast idle speed when the engine is cold state.
- The engine coolant temperature sensor is a kind of resistor, which has characteristics to reduce its resistance as the engine coolant temperature rises. Therefore, the sensor output voltage varies with the engine coolant temperature, and becomes lower as the engine coolant temperature rises.

TROUBLE JUDGMENT

Check Conditions
- Battery positive voltage is 8 – 16 V
- 2 seconds later after the ignition switch has been in "ON" position or the engine has started up.

Judgment Criterion
- The engine coolant temperature sensor output voltage is 0.15 V or less for 0.5 second.

PROBABLE CAUSES
- Failed engine coolant temperature sensor

- Short circuit or harness damage in engine coolant temperature sensor circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

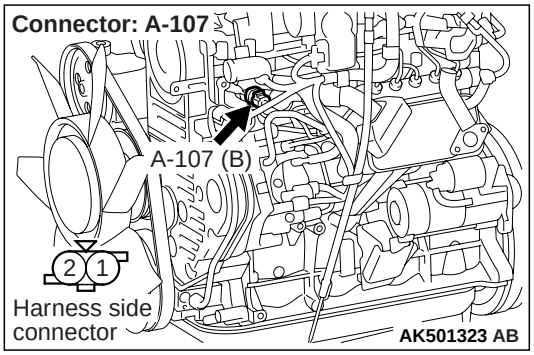
STEP 1. M.U.T.-III data list

- Item 7: Engine coolant temperature sensor

OK:
Engine cold state: At ambient temperature (atmospheric temperature) or equivalent.
Engine hot state: At 80 – 120°C

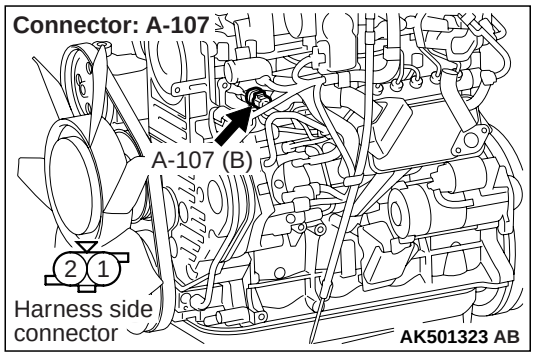
Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).
NO : Go to Step 2 .

STEP 2. Connector check: A-107 engine coolant temperature sensor connector



Q: Is the check result normal?
YES : Go to Step 3 .
NO : Repair or replace the connector.

STEP 3. Perform resistance measurement at A-107 engine coolant temperature sensor connector.

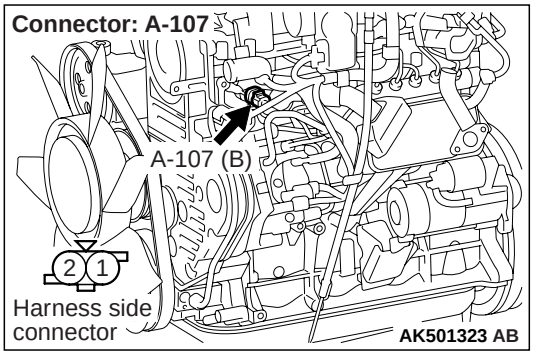


- Disconnect connector, and measure at sensor side.
- Resistance between terminal No. 1 and No. 2.

OK:
Engine coolant temperature at –20°C: 14 – 17 kΩ
Engine coolant temperature at 0°C: 5.1 – 6.5 kΩ
Engine coolant temperature at 20°C: 2.1 – 2.7 kΩ
Engine coolant temperature at 40°C: 0.9 – 1.3 kΩ
Engine coolant temperature at 60°C: 0.48 – 0.68 kΩ
Engine coolant temperature at 80°C: 0.26 – 0.36 kΩ

Q: Is the check result normal?
YES : Go to Step 4 .
NO : Replace the engine coolant temperature sensor.

STEP 4. Perform voltage measurement at A-107 engine coolant temperature sensor connector.



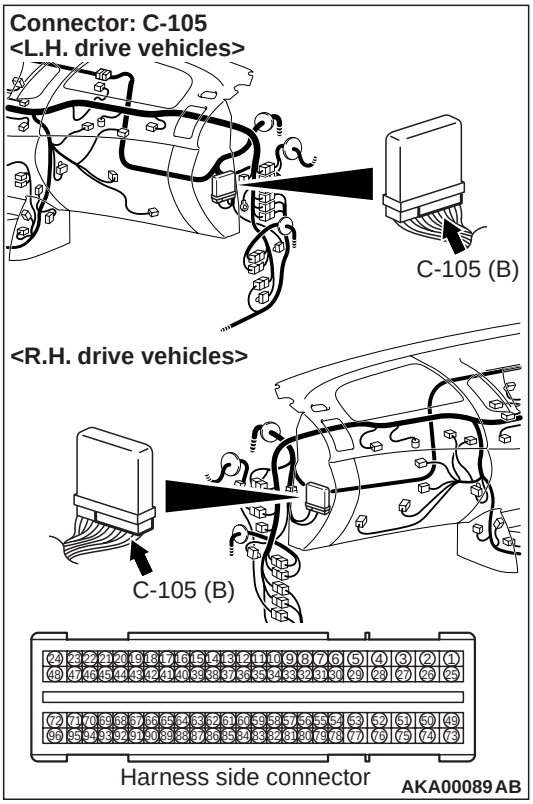
- Disconnect connector, and measure at harness side.
- Ignition switch: ON
- Voltage between terminal No. 1 and earth.

OK: 4.5 – 4.9 V

Q: Is the check result normal?
YES : Go to Step 8 .
NO : Go to Step 5 .

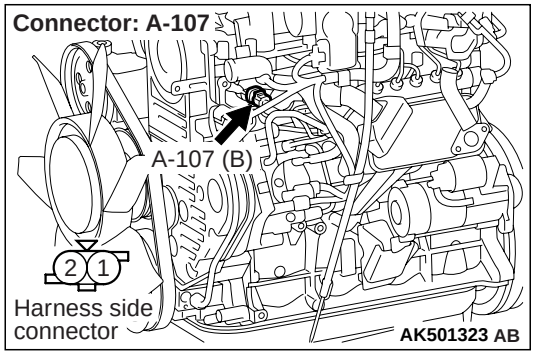
STEP 5. Connector check: C-105 engine-ECU connector

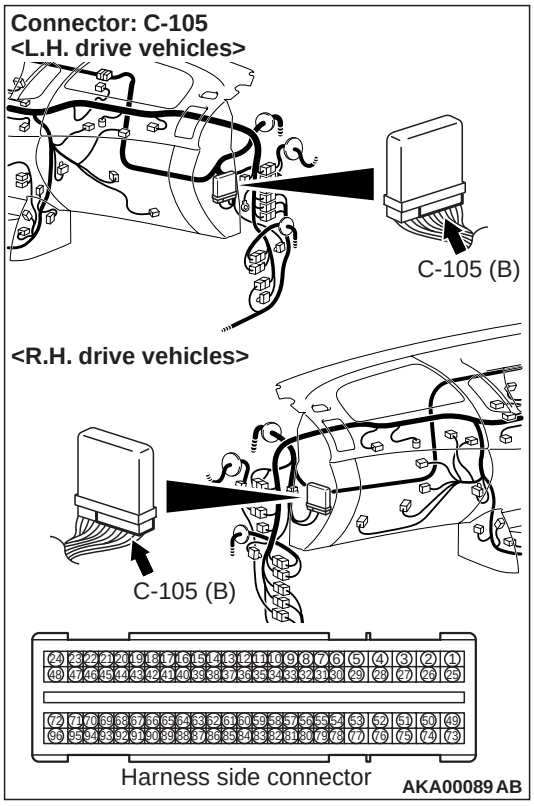
Q: Is the check result normal?



YES : Go to Step 6 .
NO : Repair or replace the connector.

STEP 6. Check harness between A-107 (terminal No. 1) engine coolant temperature sensor connector and C-105 (terminal No. 63) engine-ECU connector.





- Check output line for short circuit.

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair the damaged harness wire.

STEP 7. M.U.T.-III data list

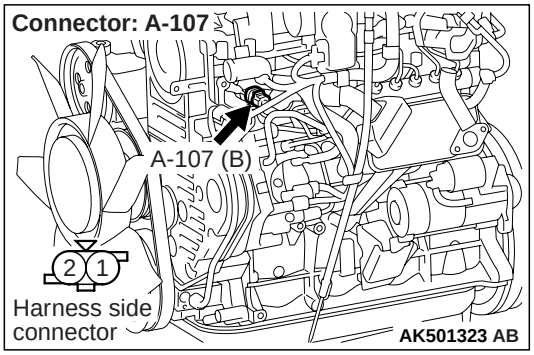
- Item 7: Engine coolant temperature sensor

OK:
Engine cold state: At ambient temperature (atmospheric temperature) or equivalent.
Engine hot state: At 80 – 120 °C

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).
NO : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

STEP 8. Perform resistance measurement at A-107 engine coolant temperature sensor connector.

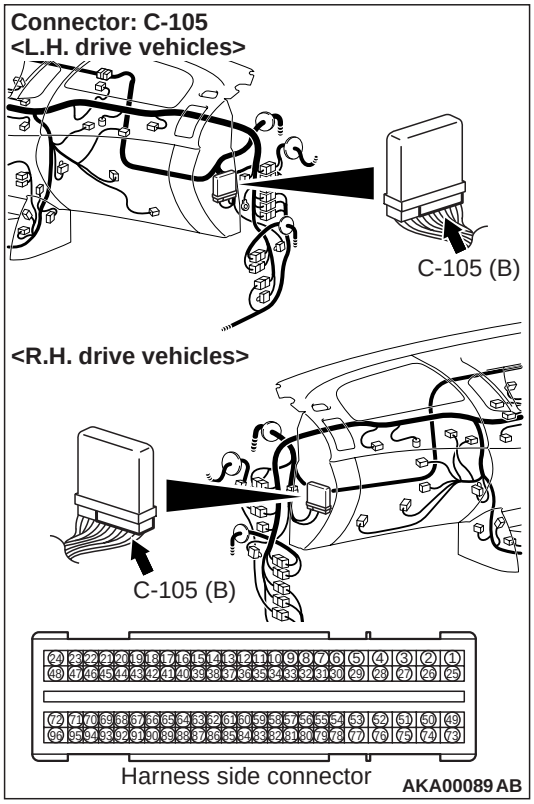


- Disconnect connector, and measure at harness side.
- Resistance between terminal No. 2 and earth.

OK: Continuity (2 Ω or less)

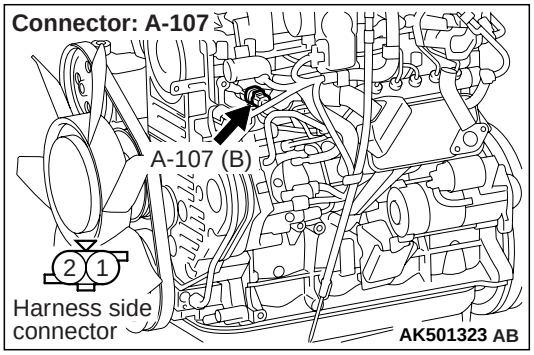
Q: Is the check result normal?
YES : Go to Step 11 .
NO : Go to Step 9 .

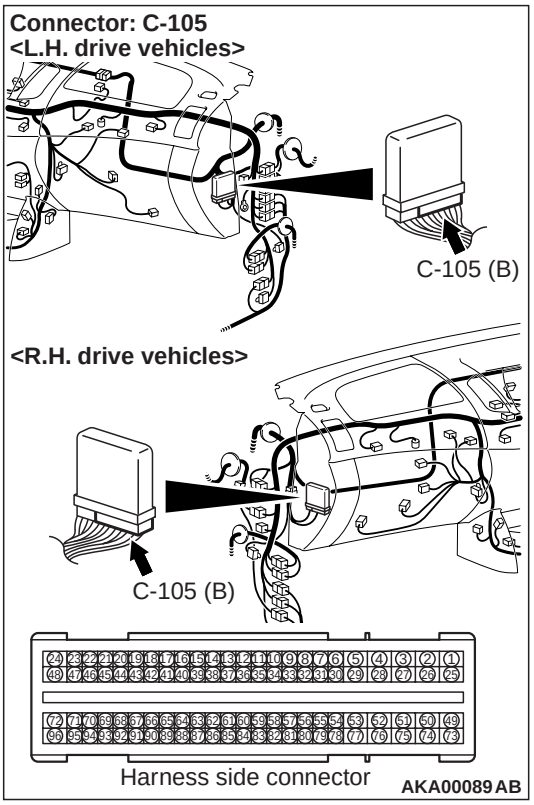
STEP 9. Connector check: C-105 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 10 .
NO : Repair or replace the connector.

STEP 10. Check harness between A-107 (terminal No. 2) engine coolant temperature sensor connector and C-105 (terminal No. 87) engine-ECU connector.



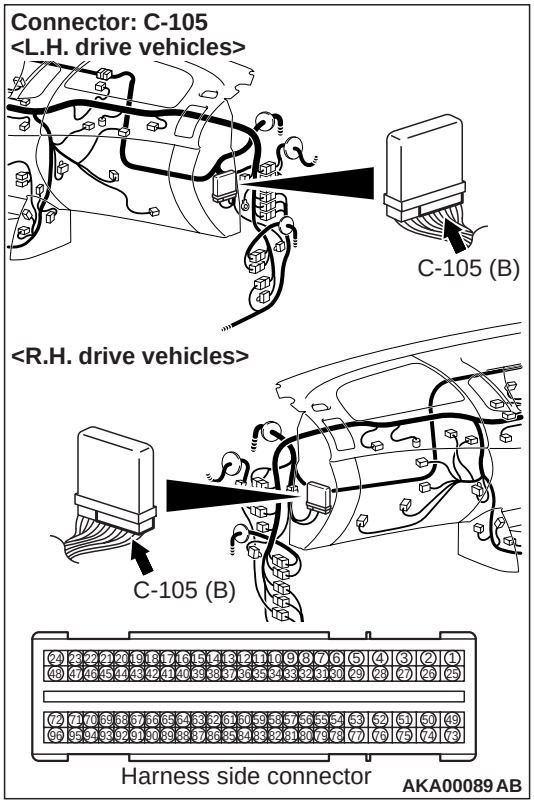


- Check earthing line for damage.

Q: Is the check result normal?

YES : Go to Step 7 .
NO : Repair the damaged harness wire.

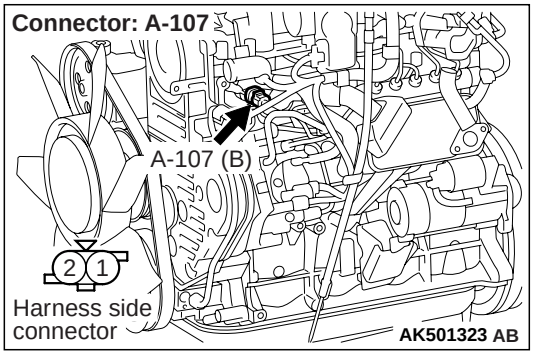
STEP 11. Connector check: C-105 engine-ECU connector

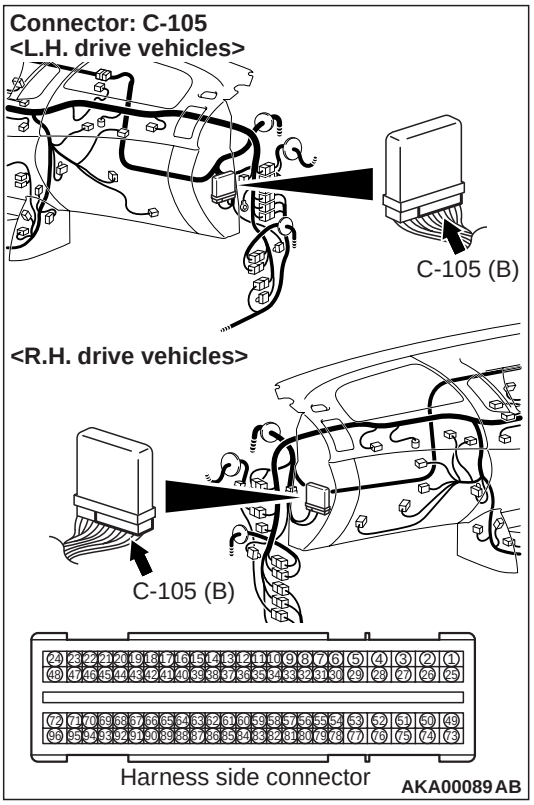


Q: Is the check result normal?

YES : Go to Step 12 .
NO : Repair or replace the connector.

STEP 12. Check harness between A-107 (terminal No. 1) engine coolant temperature sensor connector and C-105 (terminal No. 63) engine-ECU connector.





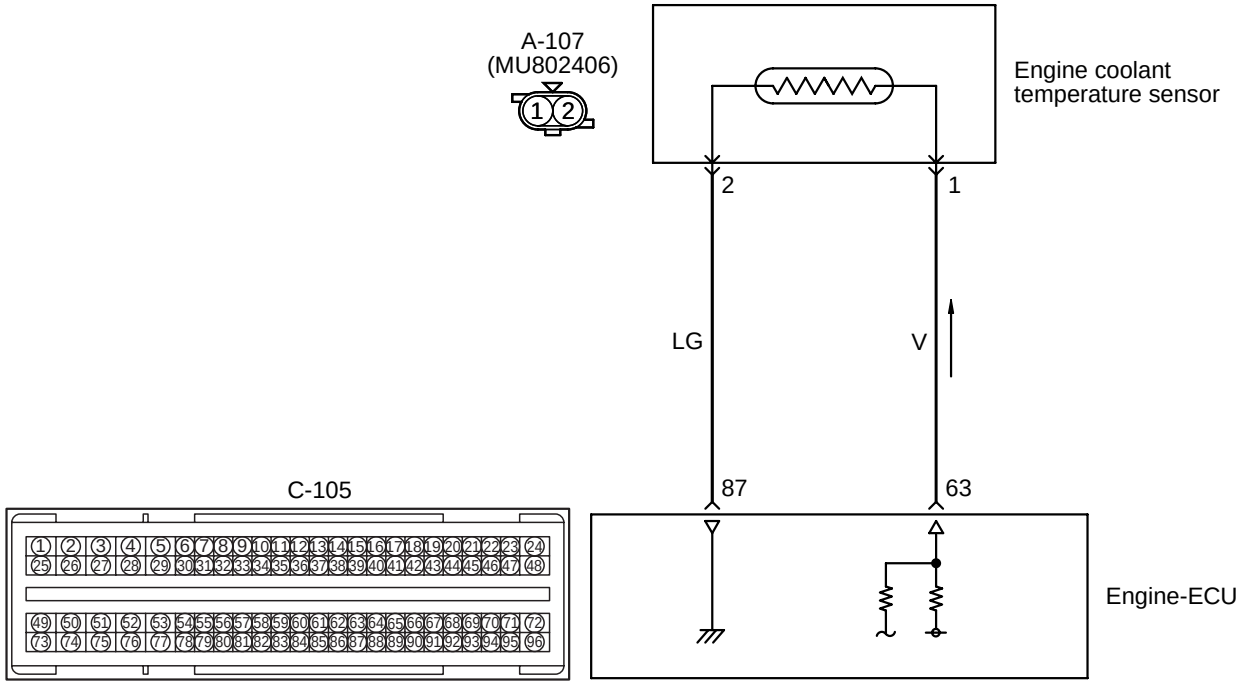
- Check output line for damage.

Q: Is the check result normal?

YES : Go to Step 7 .
NO : Repair the damaged harness wire.

Code No. P0118: Engine Coolant Temperature Sensor Circuit High Input

Engine Coolant Temperature Sensor Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V: Violet PU: Purple SI: Silver

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OPERATION
- A power voltage of 5 V is applied to the engine coolant temperature sensor output terminal (terminal No. 1) from the engine-ECU (terminal No. 63).
- The power voltage is earthed to the engine-ECU (terminal No. 87) from the engine coolant temperature sensor (terminal No. 2).

FUNCTION
- The engine coolant temperature sensor converts the engine coolant temperature into a voltage signal, and inputs the voltage to the engine-ECU.
- In response to the signal, the engine-ECU controls the fuel infection amount and the fast idle speed when the engine is cold state.

PROBABLE CAUSES
- Open circuit in engine coolant temperature sensor circuit or loose connector contact
- Failed engine coolant temperature sensor
- The engine coolant temperature sensor is a kind of resistor, which has characteristics to reduce its resistance as the engine coolant temperature rises. Therefore, the sensor output voltage varies with the engine coolant temperature, and becomes lower as the engine coolant temperature rises.

TROUBLE JUDGMENT

Check Conditions
- Battery positive voltage is 8 – 16 V
- 2 seconds later after the ignition switch has been in "ON" position or the engine has started up.

Judgment Criterion
- The engine coolant temperature sensor output voltage is 4.95 V or more for 0.5 second.

- Failed engine-ECU

DIAGNOSIS PROCEDURE

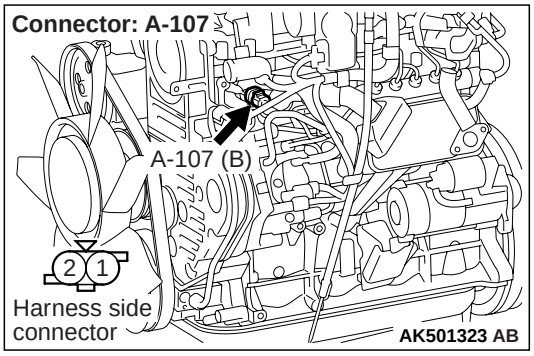
STEP 1. M.U.T.-III data list

- Item 7: Engine coolant temperature sensor

OK:
Engine cold state: At ambient temperature (atmospheric temperature) or equivalent.
Engine hot state: At 80 – 120°C

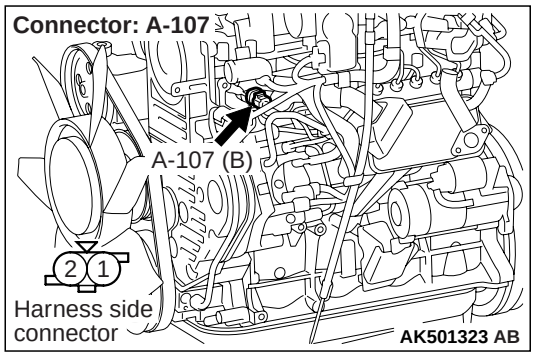
Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).
NO : Go to Step 2 .

STEP 2. Connector check: A-107 engine coolant temperature sensor connector



Q: Is the check result normal?
YES : Go to Step 3 .
NO : Repair or replace the connector.

STEP 3. Perform resistance measurement at A-107 engine coolant temperature sensor connector.

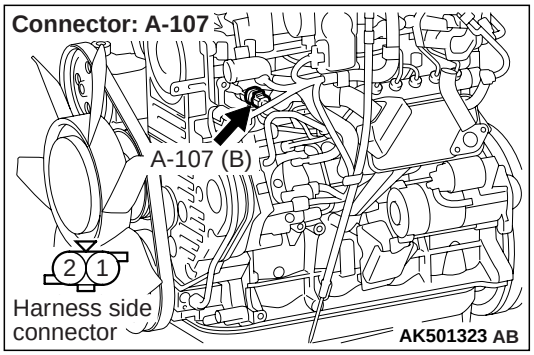


- Disconnect connector, and measure at sensor side.
- Resistance between terminal No. 1 and No. 2.

OK:
Engine coolant temperature at –20°C: 14 – 17 kΩ
Engine coolant temperature at 0°C: 5.1 – 6.5 kΩ
Engine coolant temperature at 20°C: 2.1 – 2.7 kΩ
Engine coolant temperature at 40°C: 0.9 – 1.3 kΩ
Engine coolant temperature at 60°C: 0.48 – 0.68 kΩ
Engine coolant temperature at 80°C: 0.26 – 0.36 kΩ

Q: Is the check result normal?
YES : Go to Step 4 .
NO : Replace the engine coolant temperature sensor.

STEP 4. Perform voltage measurement at A-107 engine coolant temperature sensor connector.



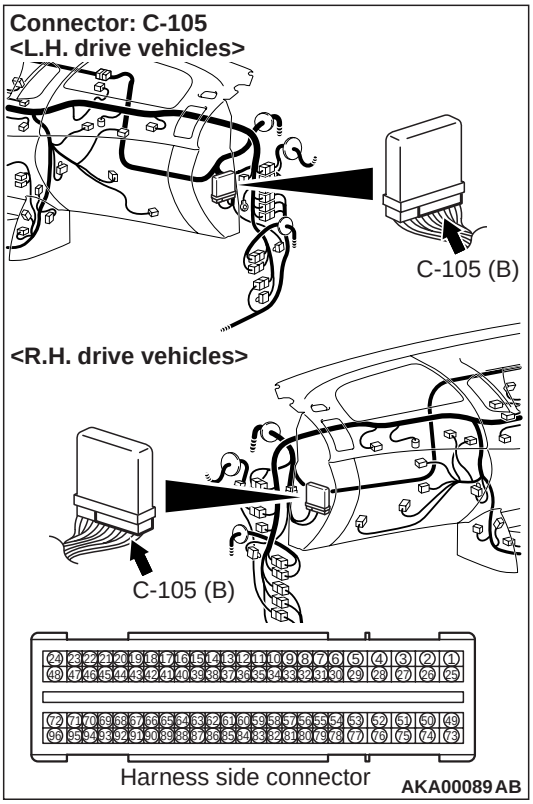
- Disconnect connector, and measure at harness side.
- Ignition switch: ON
- Voltage between terminal No. 1 and earth.

OK: 4.5 – 4.9 V

Q: Is the check result normal?
YES : Go to Step 8 .
NO : Go to Step 5 .

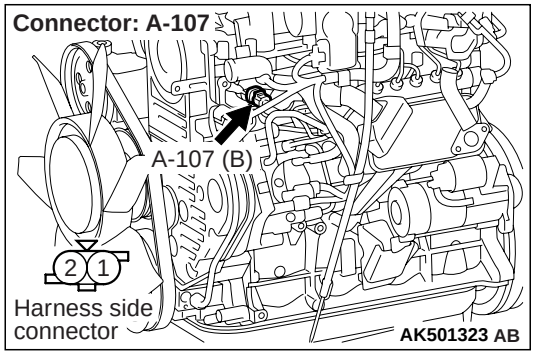
STEP 5. Connector check: C-105 engine-ECU connector

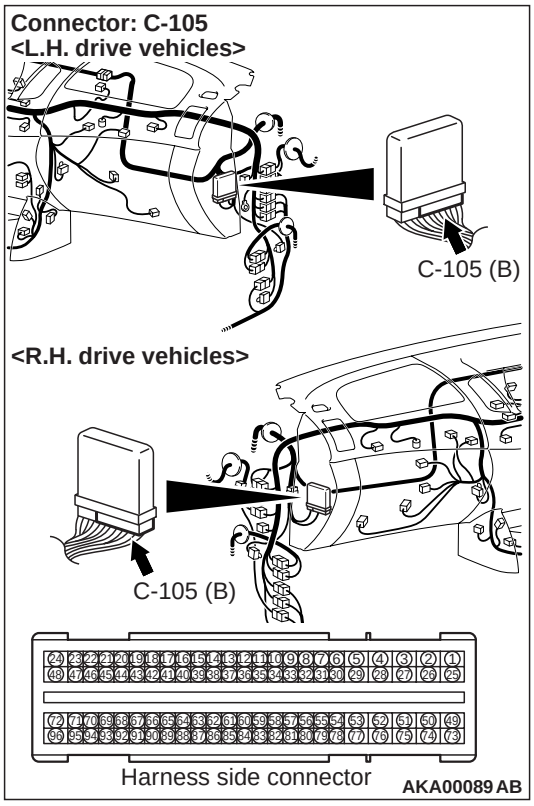
Q: Is the check result normal?



YES : Go to Step 6 .
NO : Repair or replace the connector.

STEP 6. Check harness between A-107 (terminal No. 1) engine coolant temperature sensor connector and C-105 (terminal No. 63) engine-ECU connector.





- Check output line for open circuit.

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair the damaged harness wire.

STEP 7. M.U.T.-III data list

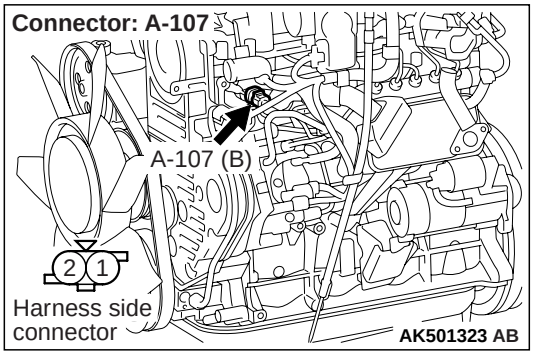
- Item 7: Engine coolant temperature sensor

OK:
Engine cold state: At ambient temperature (atmospheric temperature) or equivalent.
Engine hot state: At 80 – 120 °C

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).
NO : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

STEP 8. Perform resistance measurement at A-107 engine coolant temperature sensor connector.

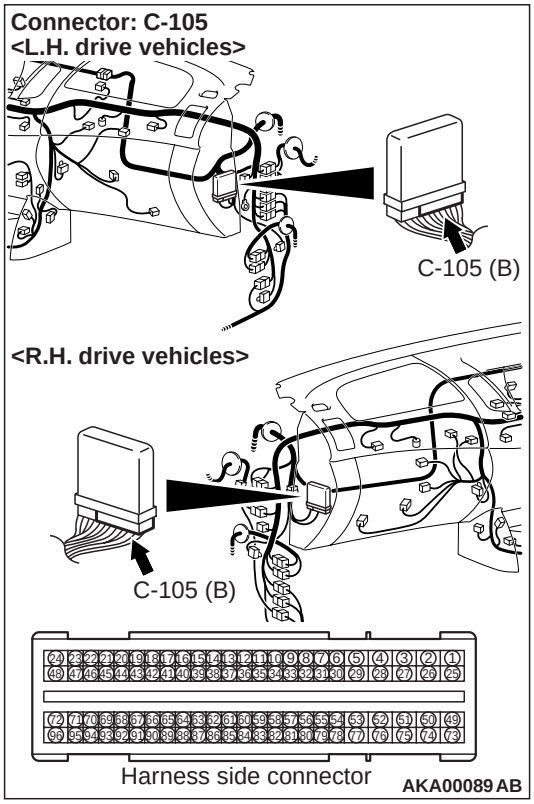


- Disconnect connector, and measure at harness side.
- Resistance between terminal No. 2 and earth.

OK: Continuity (2 Ω or less)

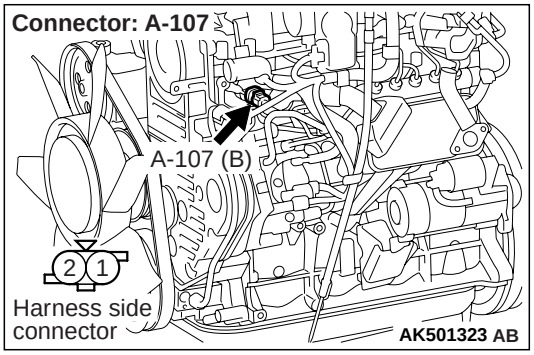
Q: Is the check result normal?
YES : Go to Step 7 .
NO : Go to Step 9 .

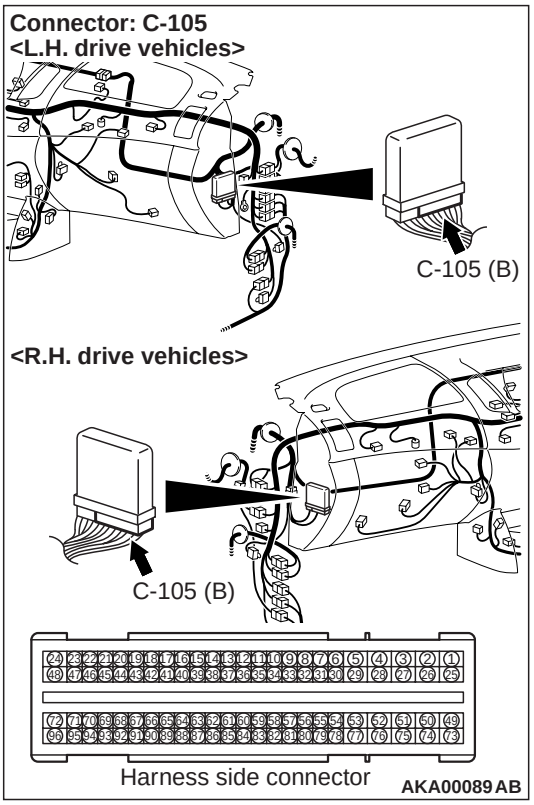
STEP 9. Connector check: C-105 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 10 .
NO : Repair or replace the connector.

STEP 10. Check harness between A-107 (terminal No. 2) engine coolant temperature sensor connector and C-105 (terminal No. 87) engine-ECU connector.





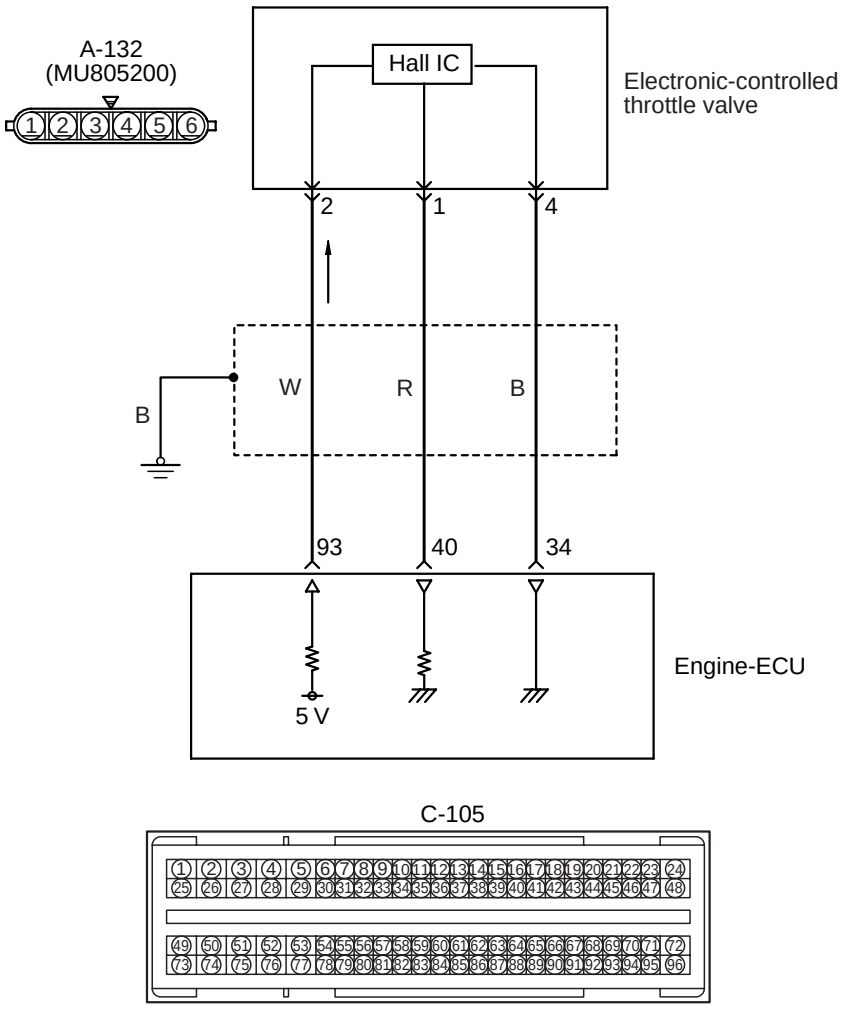
- Check earthing line for open circuit.

Q: Is the check result normal?

YES : Go to Step 7 .
NO : Repair the damaged harness wire.

Code No. P0122: Throttle Position Sensor Circuit Low Input

Throttle Position Sensor Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Gray
R: Red P: Pink V: Violet PU: Purple SI: Silver

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OPERATION

- A power voltage of 5 V is applied to the electronic-controlled throttle valve (terminal No. 2) from the engine-ECU (terminal No. 93).
- The power voltage is earthed to the engine-ECU (terminal No. 34) from the electronic-controlled throttle valve (terminal No. 4).
- The sensor signal is inputted to the engine-ECU (terminal No. 40) from the electronic-controlled throttle valve output terminal (terminal No. 1).
- 2 seconds later after the ignition switch has been

FUNCTION

- The throttle position sensor converts the throttle valve position into voltage and inputs it into the engine-ECU.
- The engine-ECU control the throttle valve position.

TROUBLE JUDGMENT

Check Conditions

- Battery positive voltage is 8 – 16 V
  in "ON" position or the engine has started up

Judgment Criterion
- The throttle position sensor output voltage is 0.15 V or less for 0.5 second.

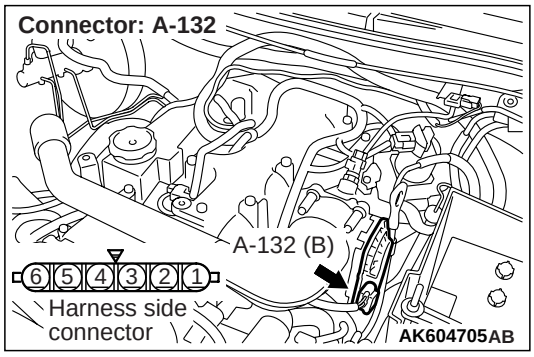
PROBABLE CAUSES
- Failed throttle position sensor
- Open/short circuit or harness damage in throttle position sensor circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III data list
- Refer to Data List Reference Table P.13A-542.
  a. Item 45: Throttle position sensor

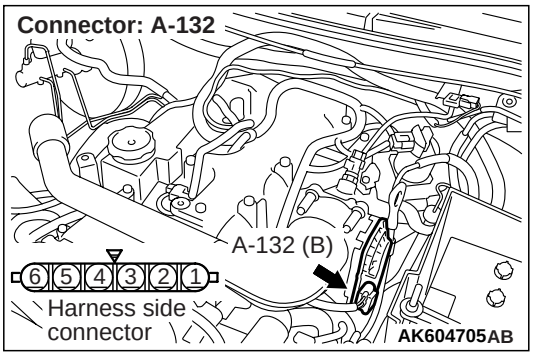
Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).
NO : Go to Step 2 .

STEP 2. Connector check: A-132 electronic-controlled throttle valve connector



Q: Is the check result normal?
YES : Go to Step 3 .
NO : Repair or replace the connector.

STEP 3. Perform voltage measurement at A-132 electronic-controlled throttle valve connector.

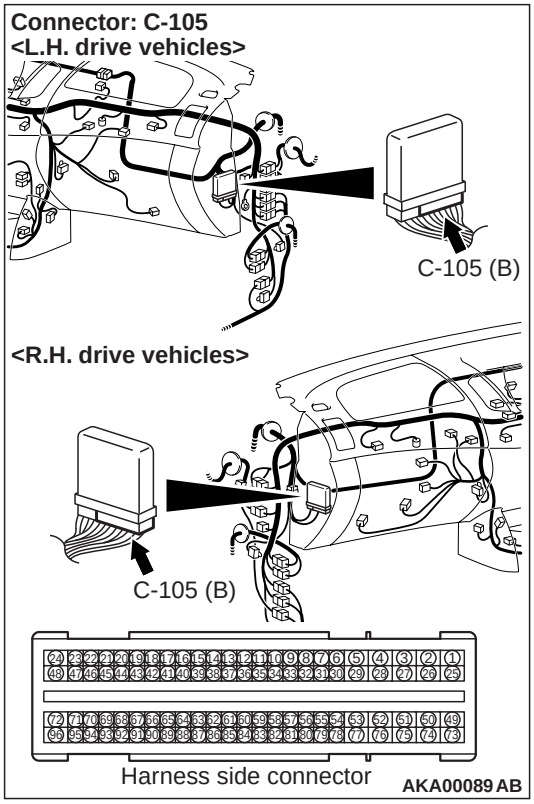


- Disconnect connector, and measure at harness side.
- Ignition switch: ON
- Voltage between terminal No. 2 and earth.

OK: 4.9 – 5.1 V

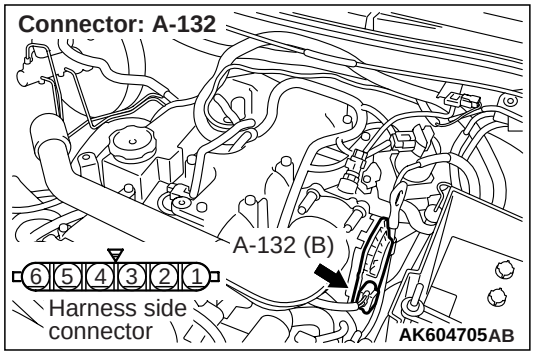
Q: Is the check result normal?
YES : Go to Step 7 .
NO : Go to Step 4 .

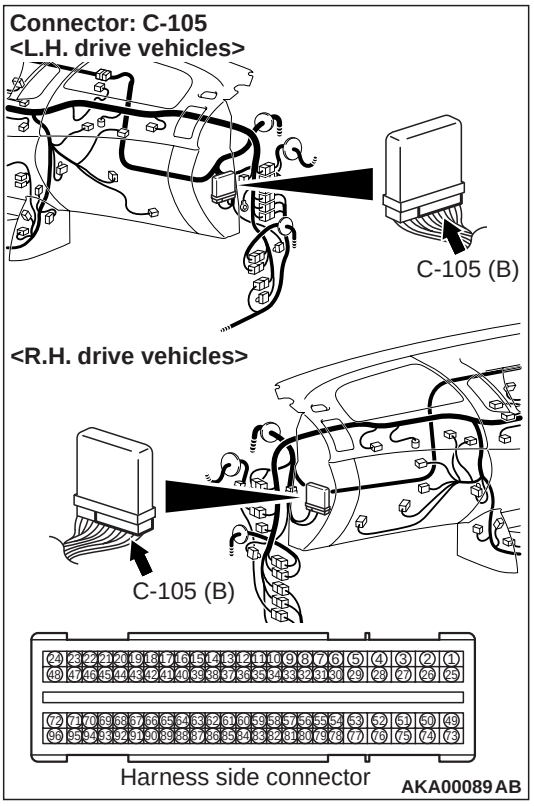
STEP 4. Connector check: C-105 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 5 .
NO : Repair or replace the connector.

STEP 5. Check harness between A-132 (terminal No. 2) electronic-controlled throttle valve connector and C-105 (terminal No. 93) engine-ECU connector.





- Check power supply line for open/short circuit.

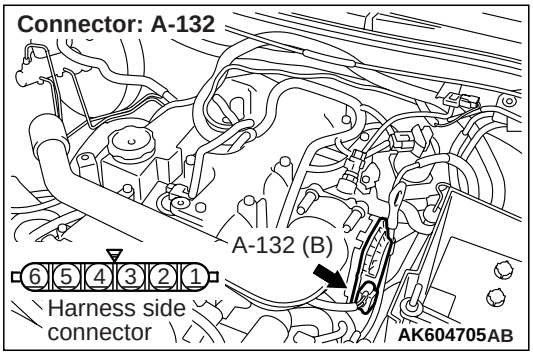
Q: Is the check result normal?
YES : Go to Step 6 .
NO : Repair the damaged harness wire.

STEP 6. M.U.T.-III data list

- Refer to Data List Reference Table P.13A-542.
  a. Item 45: Throttle position sensor

Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).
NO : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

STEP 7. Perform resistance measurement at A-132 electronic-controlled throttle valve connector.

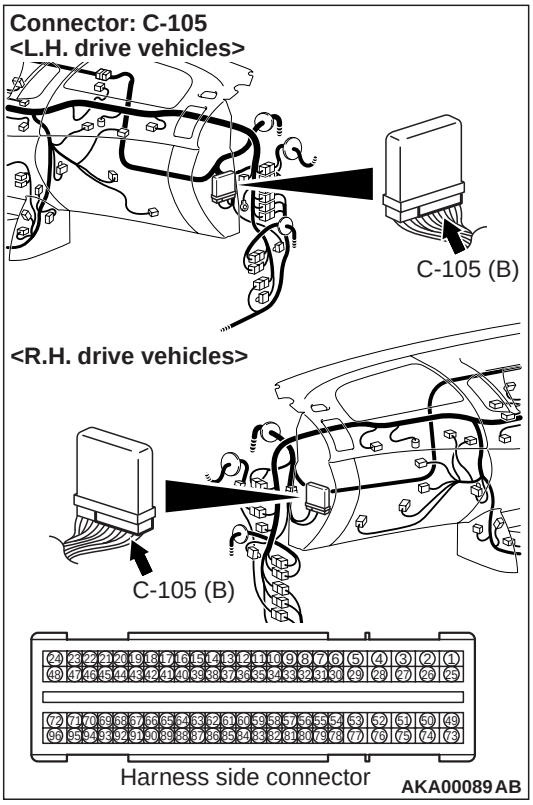


- Disconnect connector, and measure at harness side.
- Resistance between terminal No. 4 and earth.

OK: Continuity (2 Ω or less)

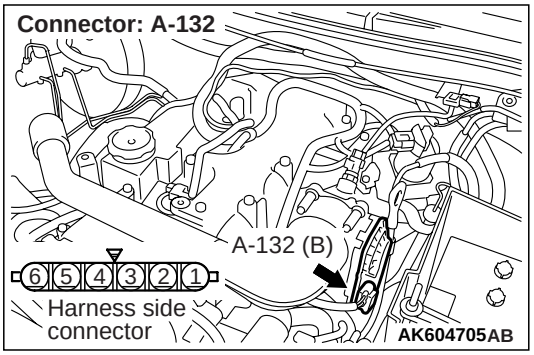
Q: Is the check result normal?
YES : Go to Step 10 .
NO : Go to Step 8 .

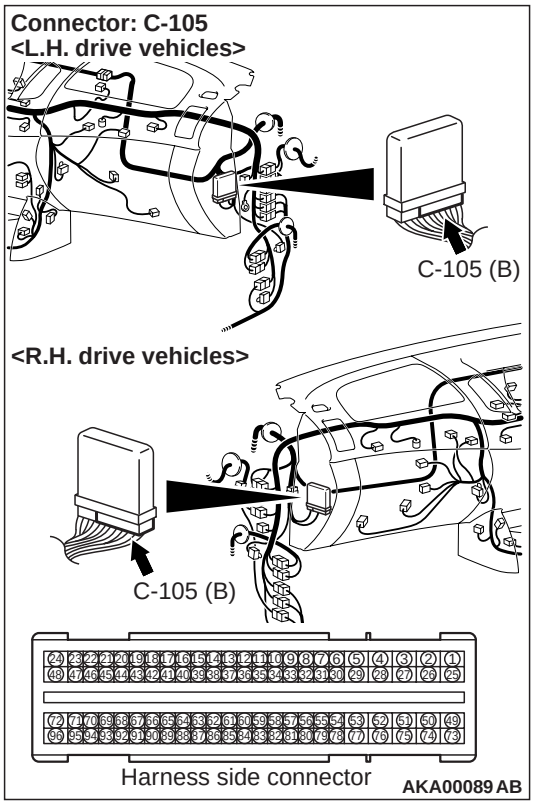
STEP 8. Connector check: C-105 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 9 .
NO : Repair or replace the connector.

STEP 9. Check harness between A-132 (terminal No. 4) electronic-controlled throttle valve connector and C-105 (terminal No. 34) engine-ECU connector.

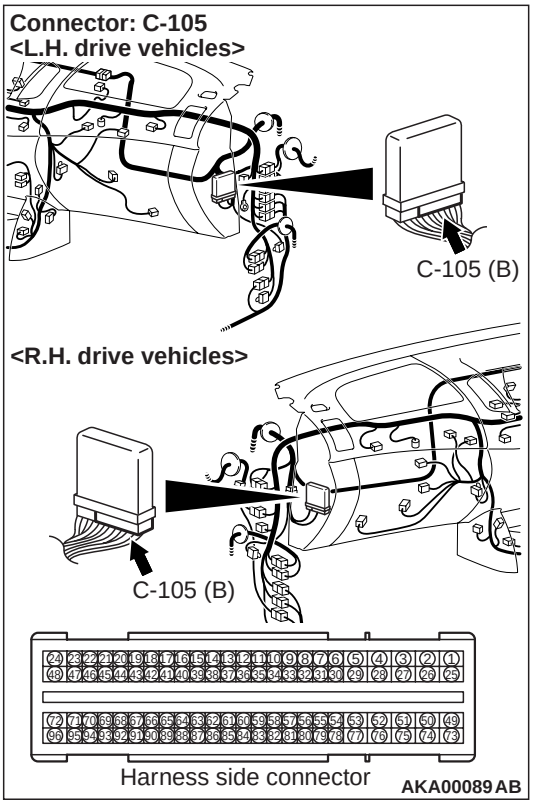




- Check earthing line for damage.

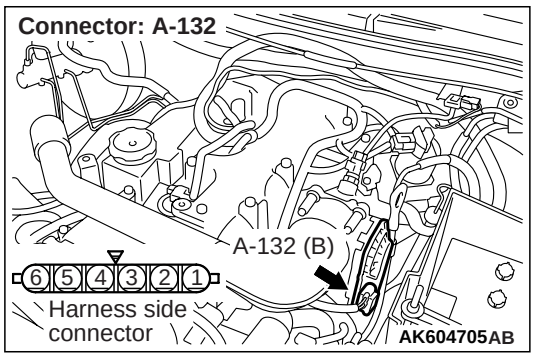
Q: Is the check result normal?
YES : Go to Step 6 .
NO : Repair the damaged harness wire.

STEP 10. Connector check: C-105 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 11 .
NO : Repair or replace the connector.

STEP 11. Perform voltage measurement at A-132 electronic-controlled throttle valve connector.

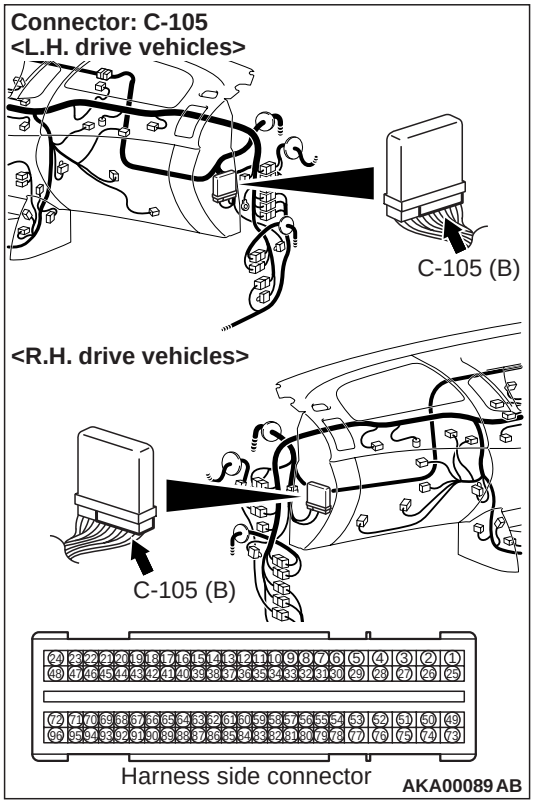


- Use special tool test harness (MB991658) to connect connector, and measure at pick-up harness.
- Ignition switch: ON
- Voltage between terminal No. 1 and earth.

OK: 3.7 V or higher.

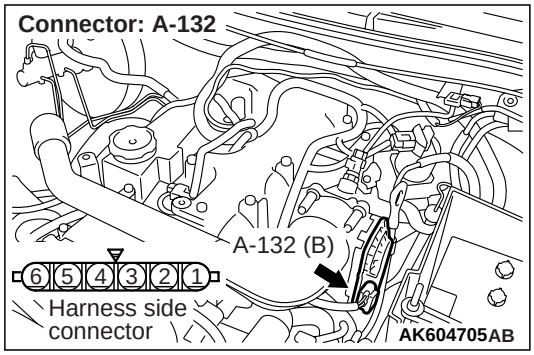
Q: Is the check result normal?
YES : Go to Step 15 .
NO : Go to Step 12 .

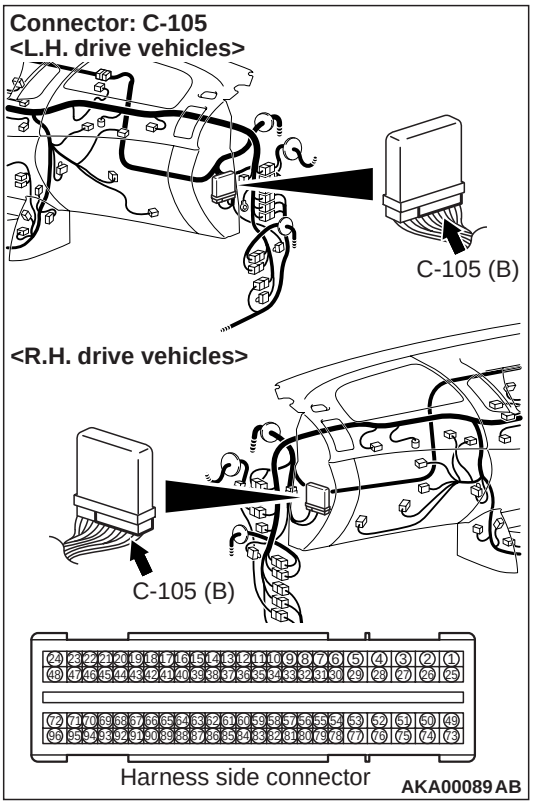
STEP 12. Connector check: C-105 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 13 .
NO : Repair or replace the connector.

STEP 13. Check harness between A-132 (terminal No. 1) electronic-controlled throttle valve connector and C-105 (terminal No. 40) engine-ECU connector.

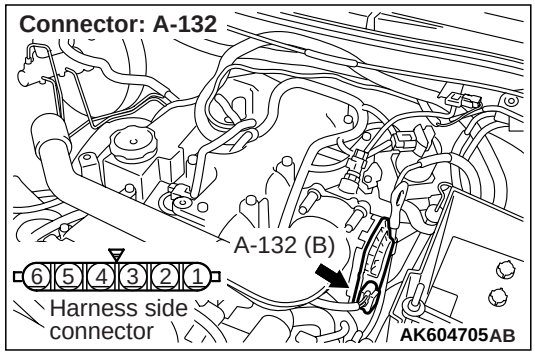


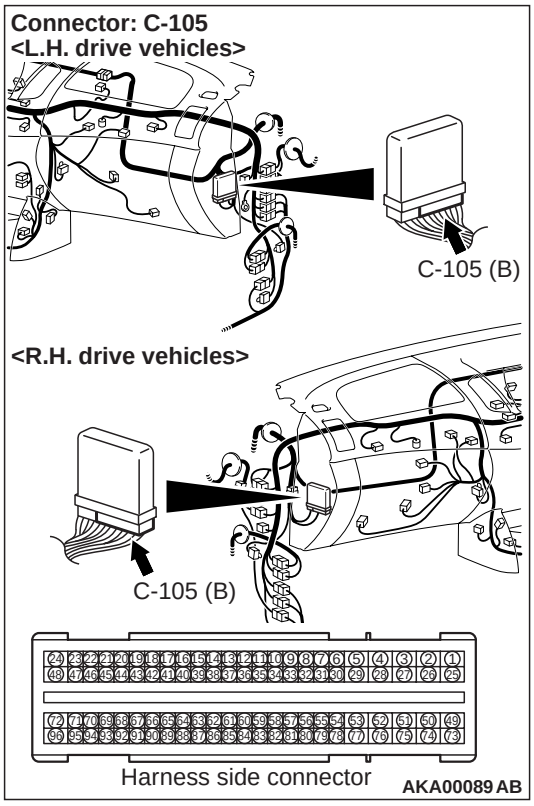


- Check output line for short circuit.

Q: Is the check result normal?
YES : Go to Step 14 .
NO : Repair the damaged harness wire.

STEP 14. Check harness between A-132 (terminal No. 2) electronic-controlled throttle valve connector and C-105 (terminal No. 93) engine-ECU connector.

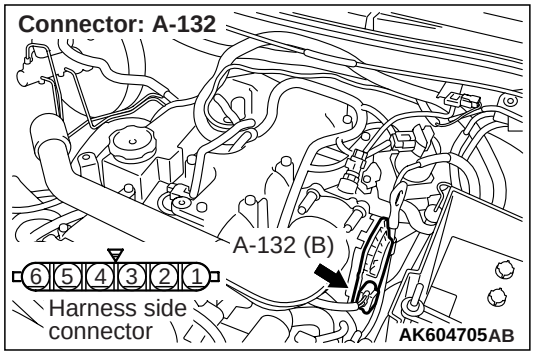


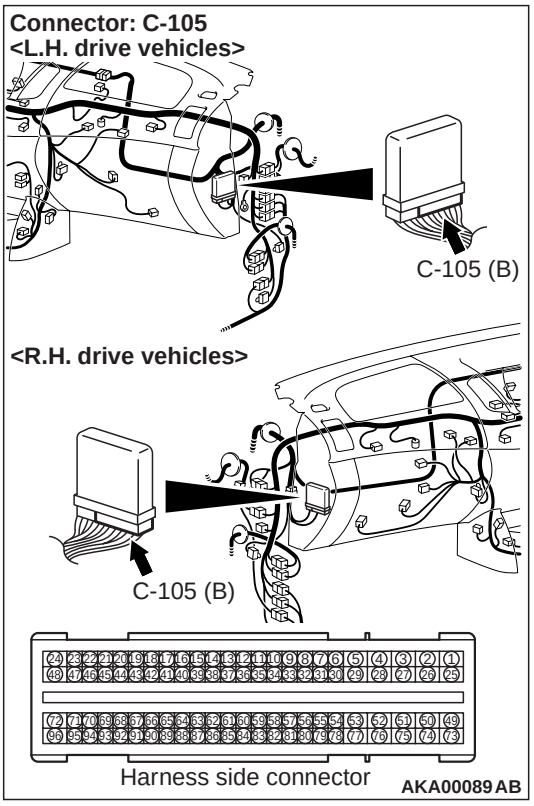


- Check power supply line for damage.

Q: Is the check result normal?
YES : Replace the electronic-controlled throttle valve.
NO : Repair the damaged harness wire.

STEP 15. Check harness between A-132 (terminal No. 1) electronic-controlled throttle valve connector and C-105 (terminal No. 40) engine-ECU connector.





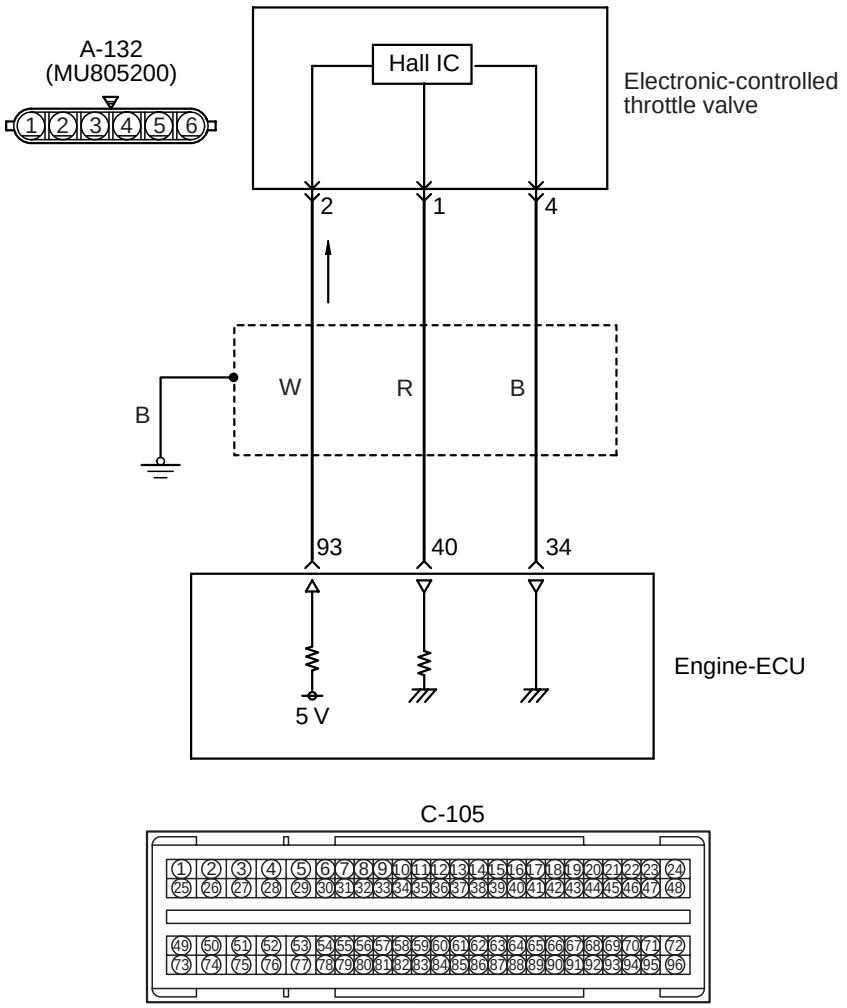
- Check output line for open circuit and damage.

Q: Is the check result normal?

YES : Go to Step 6 .
NO : Repair the damaged harness wire.

Code No. P0123: Throttle Position Sensor Circuit High Input

Throttle Position Sensor Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Gray
R: Red P: Pink V: Violet PU: Purple SI: Silver

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OPERATION

- A power voltage of 5 V is applied to the electronic-controlled throttle valve (terminal No. 2) from the engine-ECU (terminal No. 93).
- The power voltage is earthed to the engine-ECU (terminal No. 34) from the electronic-controlled throttle valve (terminal No. 4).
- The sensor signal is inputted to the engine-ECU (terminal No. 40) from the electronic-controlled throttle valve output terminal (terminal No. 1).
- 2 seconds later after the ignition switch has been

FUNCTION

- The throttle position sensor converts the throttle valve position into voltage and inputs it into the engine-ECU.
- The engine-ECU control the throttle valve position.

TROUBLE JUDGMENT

Check Conditions

- Battery positive voltage is 8 – 16 V
  in "ON" position or the engine has started up

Judgment Criterion

- The throttle position sensor output voltage is 4.85 V or more for 0.5 second.

PROBABLE CAUSES

- Failed throttle position sensor
- Open circuit or harness damage in throttle position sensor circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III data list

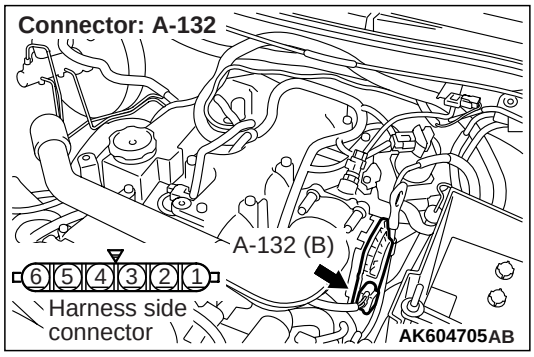
- Refer to Data List Reference Table P.13A-542.
  a. Item 45: Throttle position sensor

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

NO : Go to Step 2 .

STEP 2. Connector check: A-132 electronic-controlled throttle valve connector

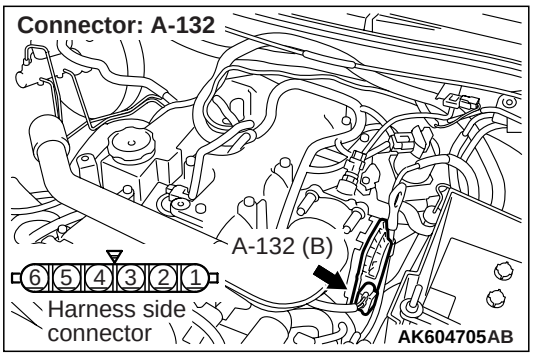


Q: Is the check result normal?

YES : Go to Step 3 .

NO : Repair or replace the connector.

STEP 3. Perform resistance measurement at A-132 electronic-controlled throttle valve connector.



- Disconnect connector, and measure at harness side.
- Resistance between terminal No. 4 and earth.

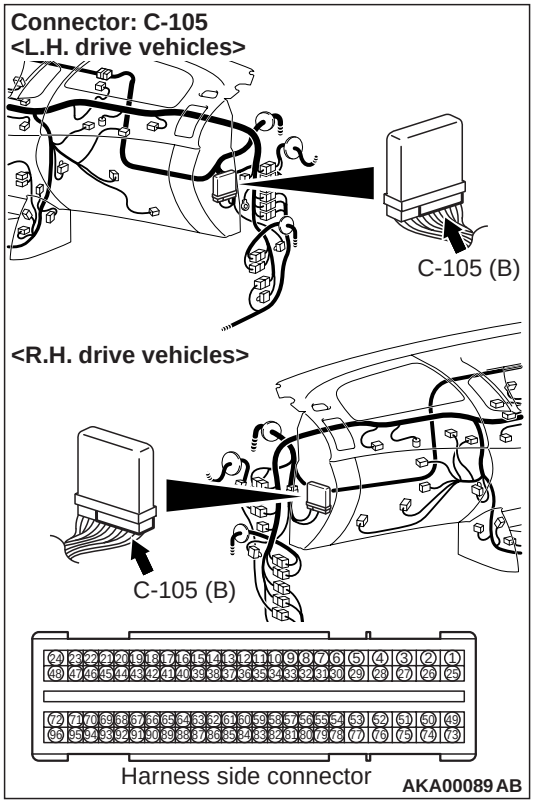
OK: Continuity (2 Ω or less)

Q: Is the check result normal?

YES : Go to Step 7 .

NO : Go to Step 4 .

STEP 4. Connector check: C-105 engine-ECU connector

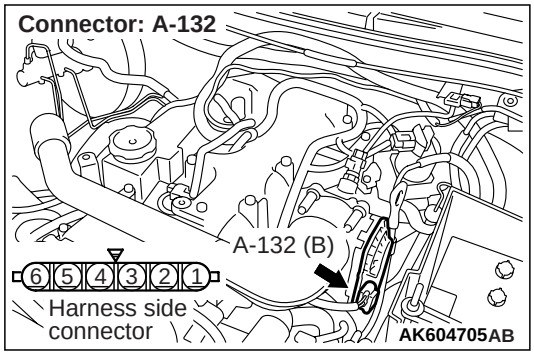


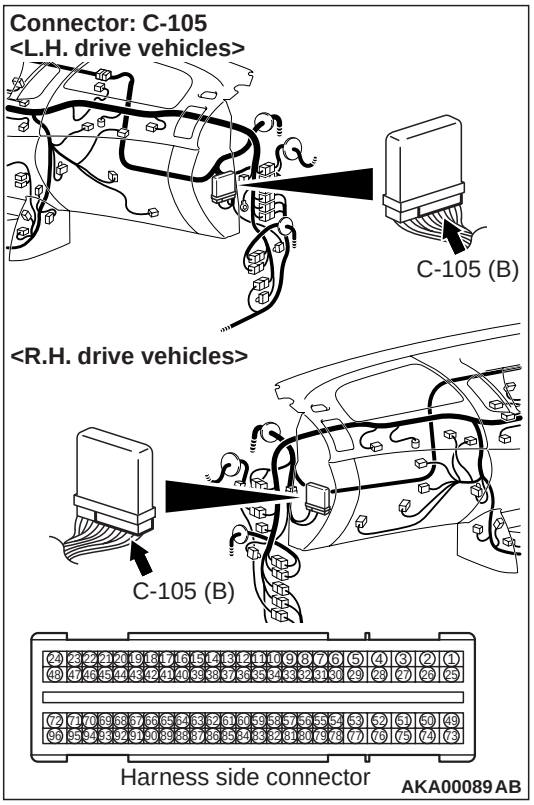
Q: Is the check result normal?

YES : Go to Step 5 .

NO : Repair or replace the connector.

STEP 5. Check harness between A-132 (terminal No. 4) electronic-controlled throttle valve connector and C-105 (terminal No. 34) engine-ECU connector.





- Check earthing line for open circuit and damage.

Q: Is the check result normal?
YES : Go to Step 6 .
NO : Repair the damaged harness wire.

STEP 6. M.U.T.-III data list

- Refer to Data List Reference Table P.13A-542.
  a. Item 45: Throttle position sensor

Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).
NO : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

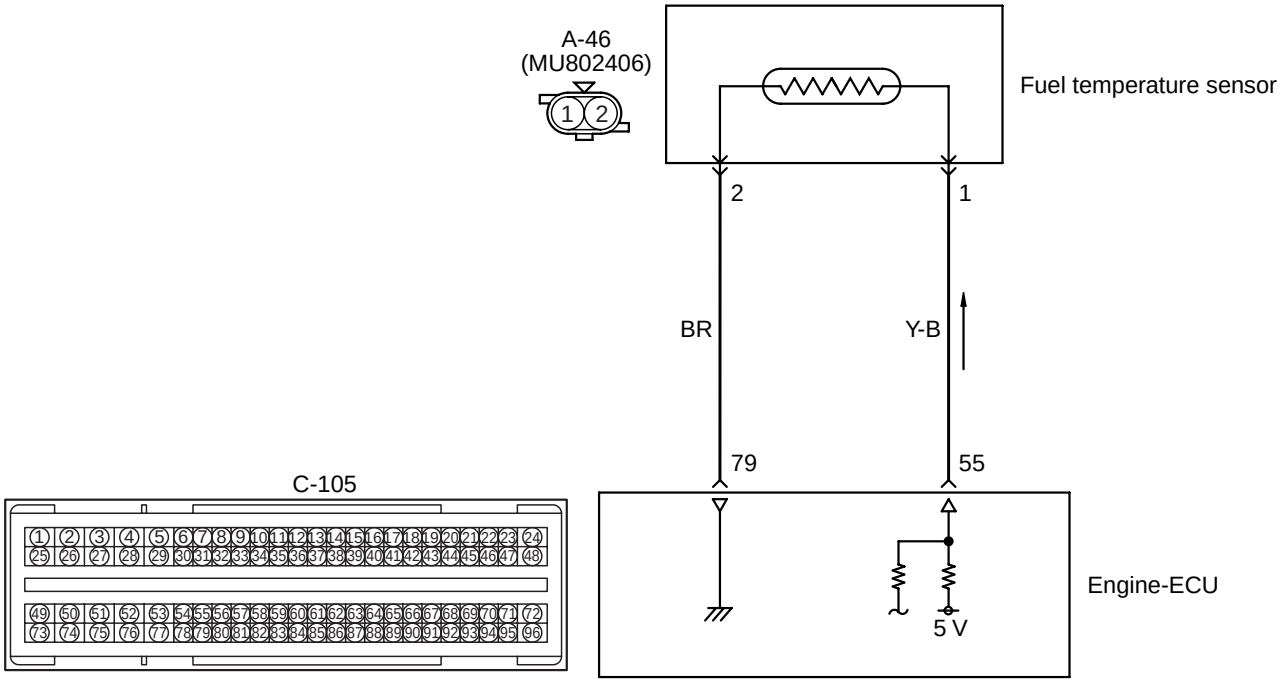
STEP 7. Replace the electronic-controlled throttle valve assembly

- After replacing the electronic-controlled throttle valve assembly, re-check the trouble symptoms.

Q: Is the check result normal?
YES : Check end.
NO : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

Code No. P0182: Fuel Temperature Sensor Circuit Low input

Fuel Temperature Sensor Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V: Violet PU: Purple SI: Silver

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OPERATION

- A power voltage of 5 V is applied to the fuel temperature sensor output terminal (terminal No. 1) from the engine-ECU (terminal No. 55).
- The power voltage is earthed to the engine-ECU (terminal No. 79) from the fuel temperature sensor (terminal No. 2).

FUNCTION

- The fuel temperature sensor converts the fuel temperature into a voltage and inputs the voltage signal to the engine-ECU.
- In response to the signal, the engine-ECU corrects the fuel injection amount, etc.
- The fuel temperature sensor is a kind of resistor, which has characteristics to reduce its resistance as the fuel temperature rises. Therefore, the sensor output voltage varies with the fuel temperature, and becomes lower as the fuel temperature rises.

TROUBLE JUDGMENT

Check Conditions

- Battery positive voltage is 8 – 16 V
- 2 seconds later after the ignition switch has been in "ON" position or the engine has started up.

Judgment Criterion

- The fuel temperature sensor output voltage is 0.10 V or less for 0.5 second.

PROBABLE CAUSES

- Failed fuel temperature sensor
- Short circuit or harness damage in fuel temperature sensor circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III data list

- Item 21: Fuel temperature sensor

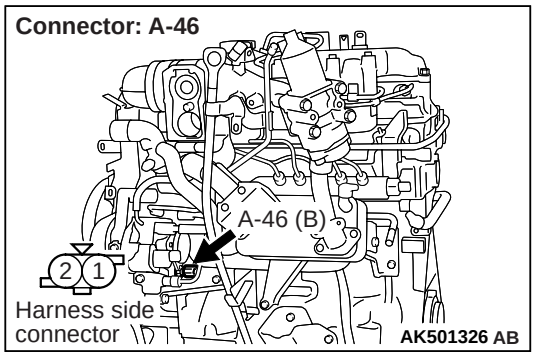
  OK: At ambient temperature (fuel temperature) or equivalent.

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

NO : Go to Step 2 .

STEP 2. Connector check: A-46 fuel temperature sensor connector



Q: Is the check result normal?

YES : Go to Step 3 .

NO : Repair or replace the connector.

STEP 3. Check fuel temperature sensor itself.

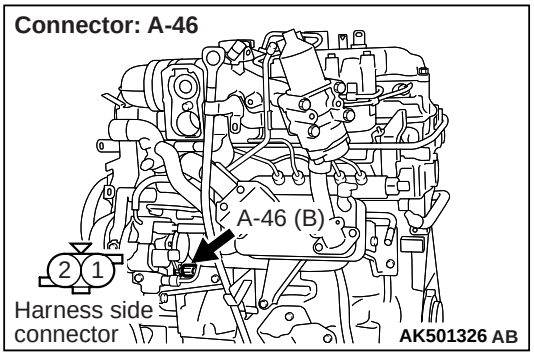
- Check fuel temperature sensor itself (Refer to P.13A-596).

Q: Is the check result normal?

YES : Go to Step 4 .

NO : Replace the fuel temperature sensor.

STEP 4. Perform voltage measurement at A-46 fuel temperature sensor connector.



- Disconnect connector, and measure at harness side.
- Ignition switch: ON
- Voltage between terminal No. 1 and earth.

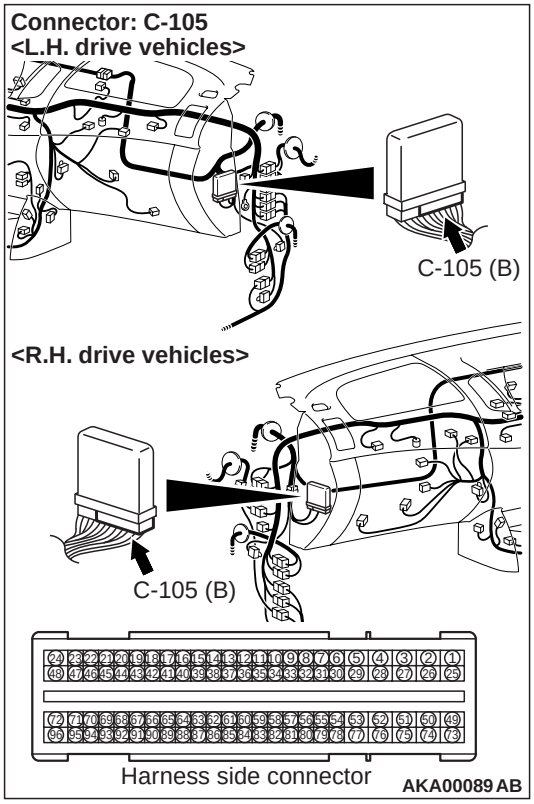
  OK: 4.5 – 4.9 V

Q: Is the check result normal?

YES : Go to Step 8 .

NO : Go to Step 5 .

STEP 5. Connector check: C-105 engine-ECU connector

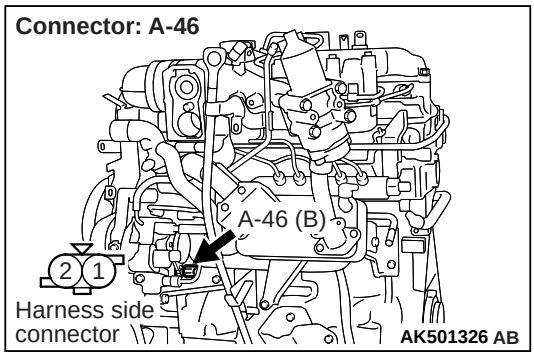


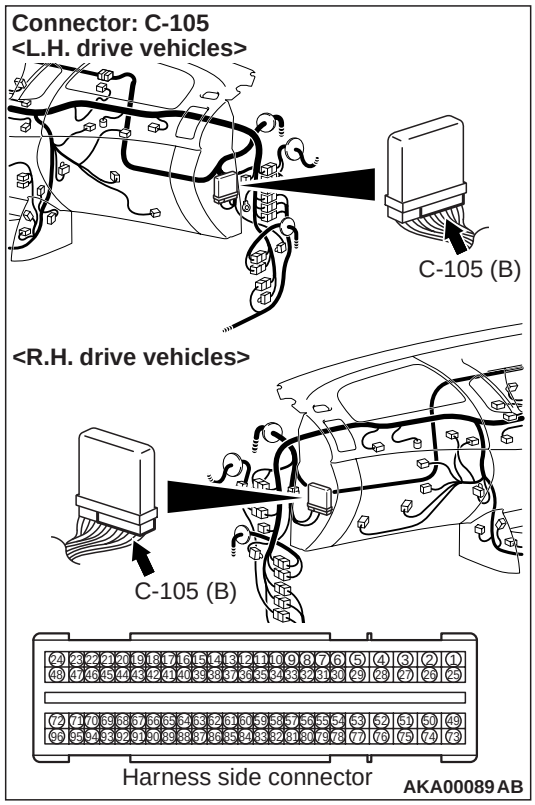
Q: Is the check result normal?

YES : Go to Step 6 .

NO : Repair or replace the connector.

STEP 6. Check harness between A-46 (terminal No. 1) fuel temperature sensor connector and C-105 (terminal No. 55) engine-ECU connector.





- Check output line for short circuit.

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair the damaged harness wire.

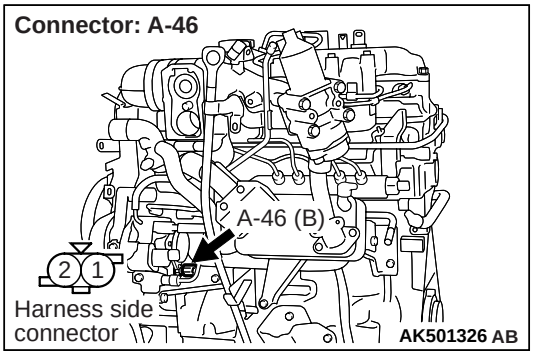
STEP 7. M.U.T.-III data list

- Item 21: Fuel temperature sensor

OK: At ambient temperature (fuel temperature) or equivalent.

Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).
NO : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

STEP 8. Perform resistance measurement at A-46 fuel temperature sensor connector.

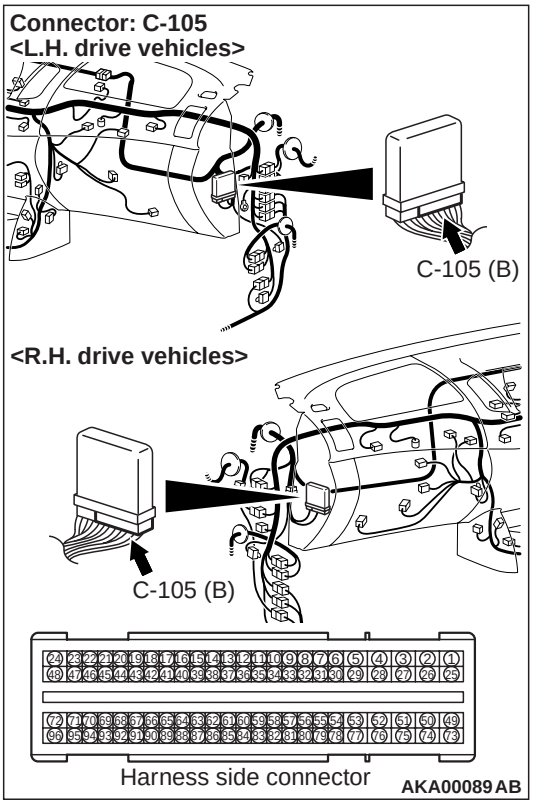


- Disconnect connector, and measure at harness side.
- Resistance between terminal No. 2 and earth.

OK: Continuity (2 Ω or less)

Q: Is the check result normal?
YES : Go to Step 11 .
NO : Go to Step 9 .

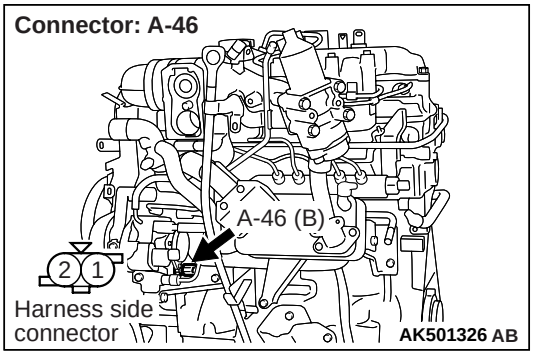
STEP 9. Connector check: C-105 engine-ECU connector

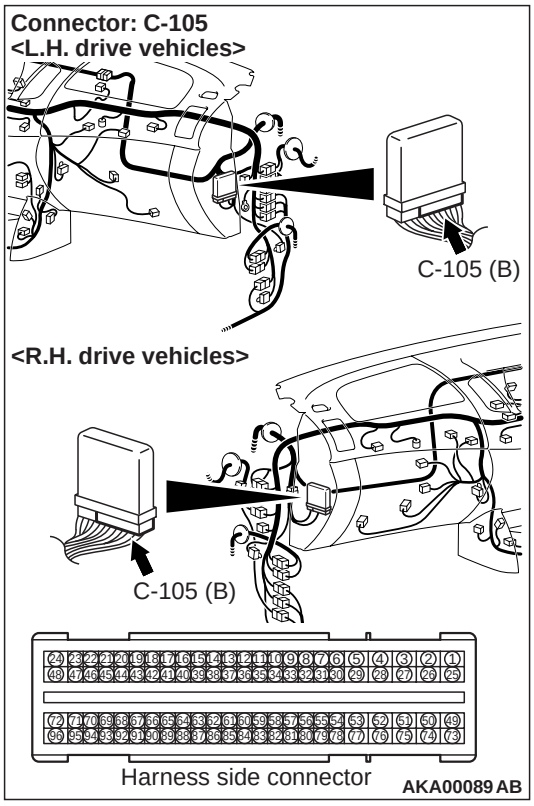


Q: Is the check result normal?
YES : Go to Step 10 .
NO : Repair or replace the connector.

STEP 10. Check harness between A-46 (terminal No. 2) fuel temperature sensor connector and C-105 (terminal No. 79) engine-ECU connector.

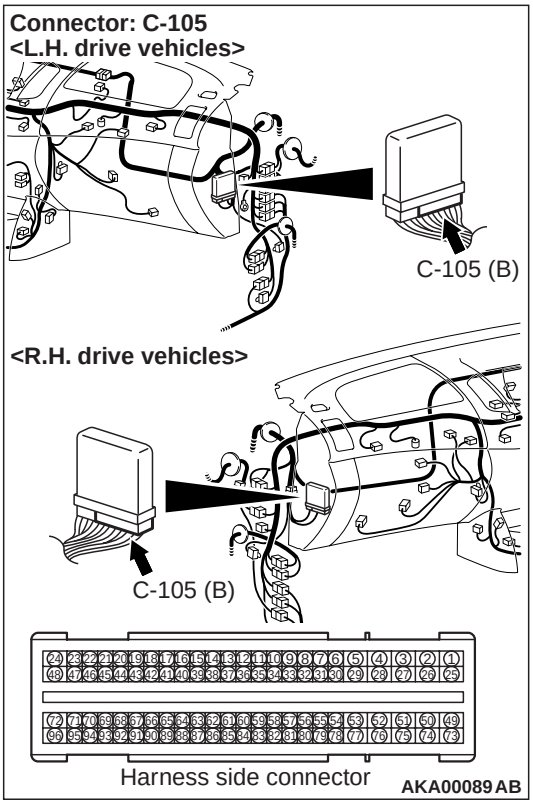
- Check earthing line for damage.





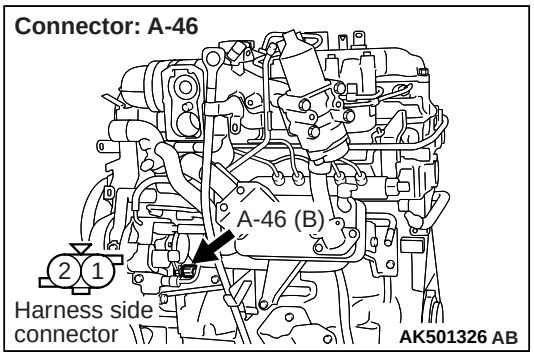
Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair the damaged harness wire.

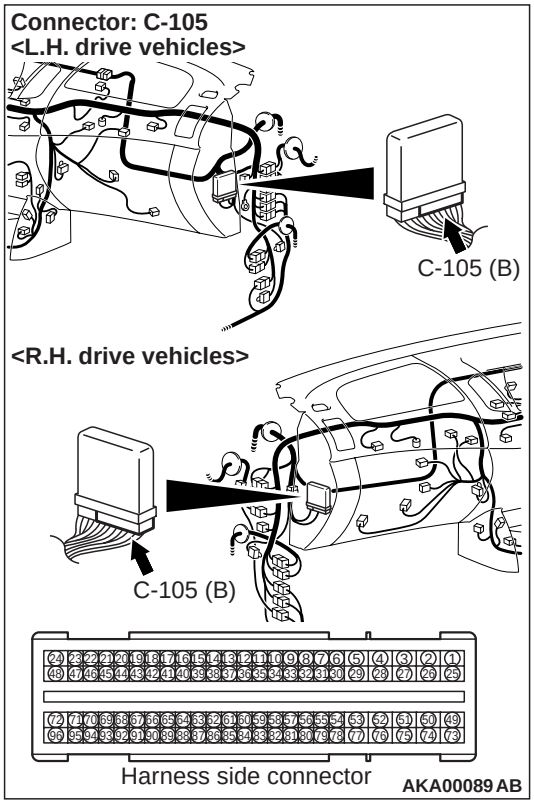
STEP 11. Connector check: C-105 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 12 .
NO : Repair or replace the connector.

STEP 12. Check harness between A-46 (terminal No. 1) fuel temperature sensor connector and C-105 (terminal No. 55) engine-ECU connector.



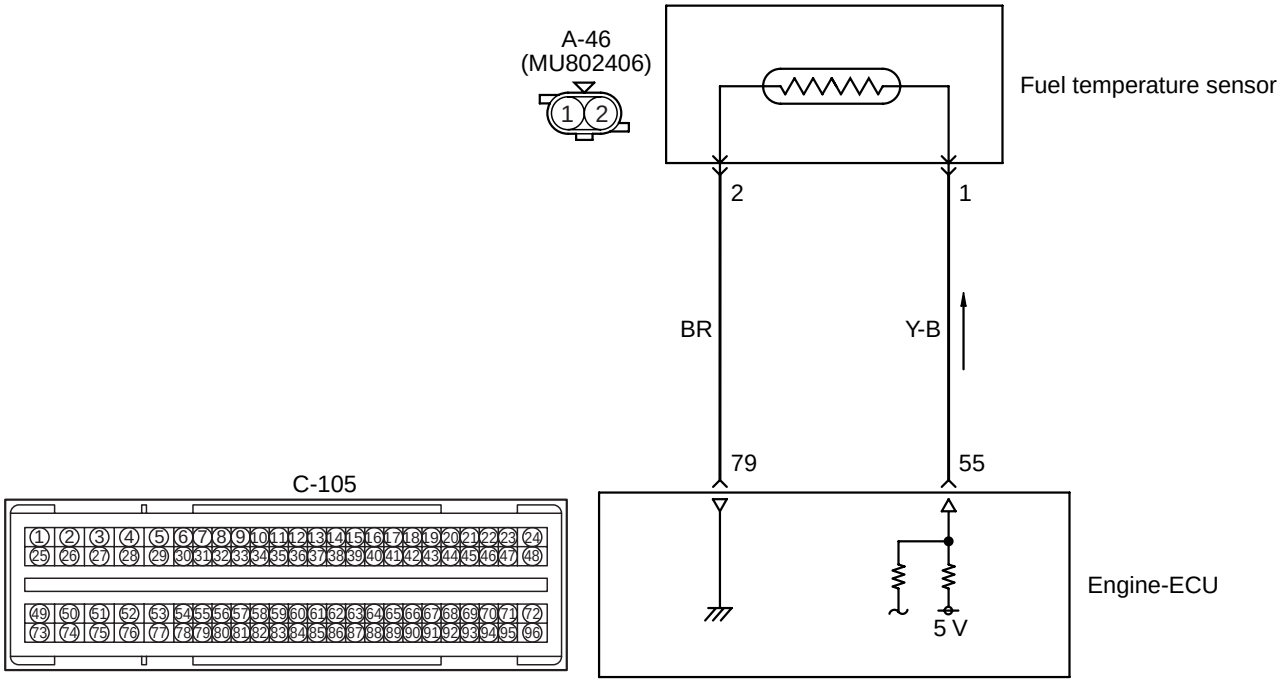


- Check output line for damage.

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair the damaged harness wire.

Code No. P0183: Fuel Temperature Sensor Circuit High Input

Fuel Temperature Sensor Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V: Violet PU: Purple SI: Silver

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OPERATION

- A power voltage of 5 V is applied to the fuel temperature sensor output terminal (terminal No. 1) of the air flow sensor connector from the engine-ECU (terminal No. 55).
- The power voltage is earthed to the engine-ECU (terminal No. 79) from the fuel temperature sensor (terminal No. 2).

FUNCTION

- The fuel temperature sensor converts the intake air temperature into a voltage and inputs the voltage signal to the engine-ECU.
- In response to the signal, the engine-ECU corrects the fuel injection amount, etc.
- The fuel temperature sensor is a kind of resistor, which has characteristics to reduce its resistance as the intake air temperature rises. Therefore, the sensor output voltage varies with the fuel temperature, and becomes lower as the fuel temperature rises.

TROUBLE JUDGMENT

Check Conditions

- Battery positive voltage is 8 – 16 V
- 2 seconds later after the ignition switch has been in "ON" position or the engine has started up.

Judgment Criterion

- The fuel temperature sensor output voltage is 4.95 V or more for 0.5 second.

PROBABLE CAUSES

- Failed fuel temperature sensor
- Open circuit or harness damage in fuel temperature sensor circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III data list

- Item 21: Fuel temperature sensor

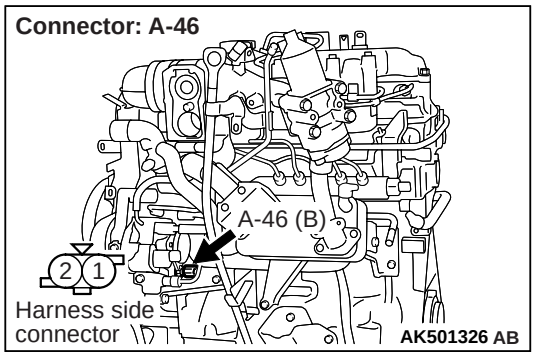
  OK: At ambient temperature (fuel temperature) or equivalent.

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

NO : Go to Step 2 .

STEP 2. Connector check: A-46 fuel temperature sensor connector



Q: Is the check result normal?

YES : Go to Step 3 .

NO : Repair or replace the connector.

STEP 3. Check fuel temperature sensor itself.

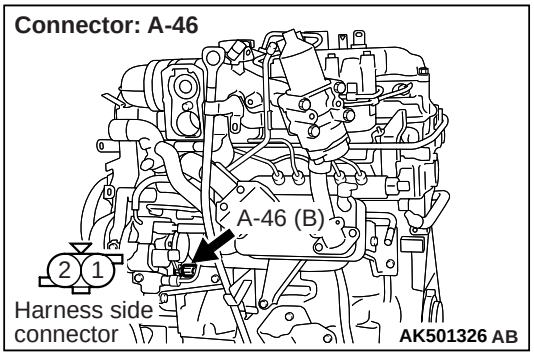
- Check fuel temperature sensor itself (Refer to P.13A-596).

Q: Is the check result normal?

YES : Go to Step 4 .

NO : Replace the fuel temperature sensor.

STEP 4. Perform voltage measurement at A-46 fuel temperature sensor connector.



- Disconnect connector, and measure at harness side.
- Ignition switch: ON
- Voltage between terminal No. 1 and earth.

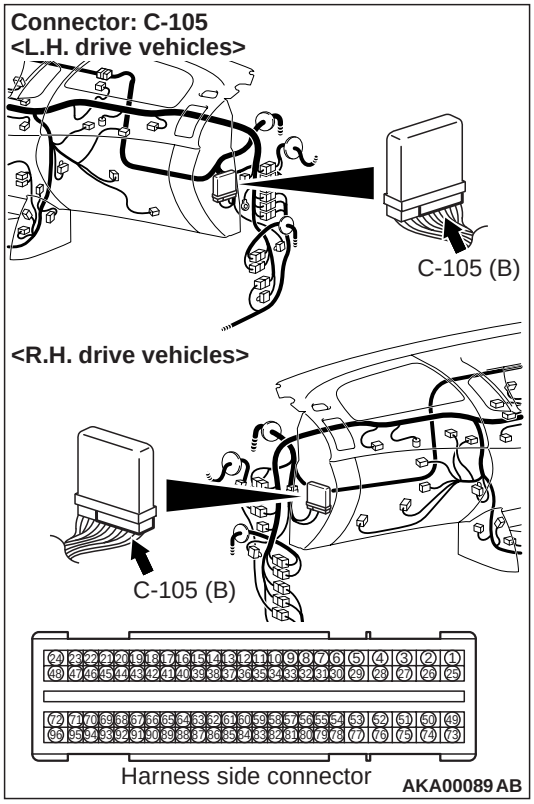
  OK: 4.5 – 4.9 V

Q: Is the check result normal?

YES : Go to Step 8 .

NO : Go to Step 5 .

STEP 5. Connector check: C-105 engine-ECU connector

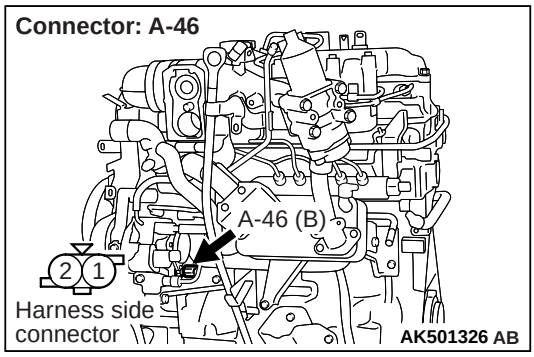


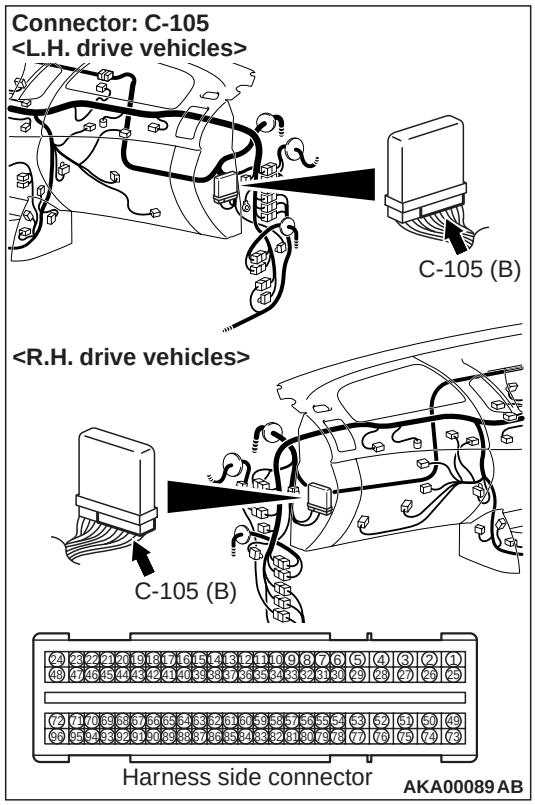
Q: Is the check result normal?

YES : Go to Step 6 .

NO : Repair or replace the connector.

STEP 6. Check harness between A-46 (terminal No. 1) fuel temperature sensor connector and C-105 (terminal No. 55) engine-ECU connector.





- Check output line for open circuit.

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair the damaged harness wire.

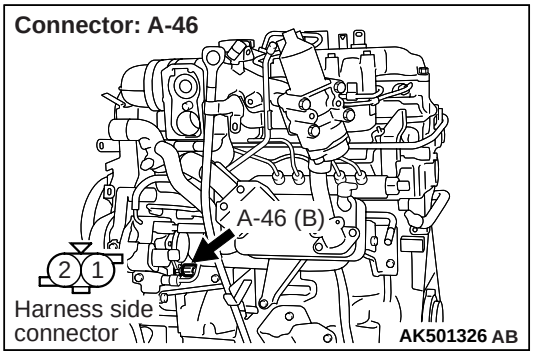
STEP 7. M.U.T.-III data list

- Item 21: Fuel temperature sensor

OK: At ambient temperature (fuel temperature) or equivalent.

Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).
NO : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

STEP 8. Perform resistance measurement at A-46 fuel temperature sensor connector.

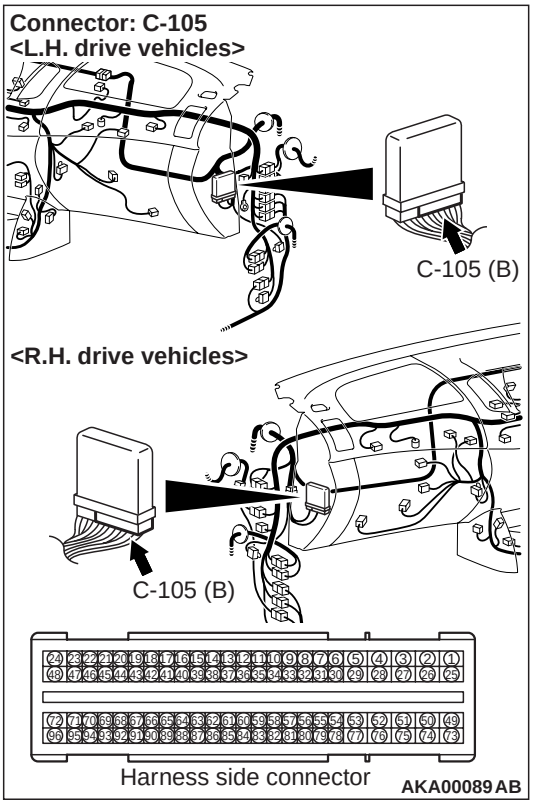


- Disconnect connector, and measure at harness side.
- Resistance between terminal No. 2 and earth.

OK: Continuity (2 Ω or less)

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Go to Step 9 .

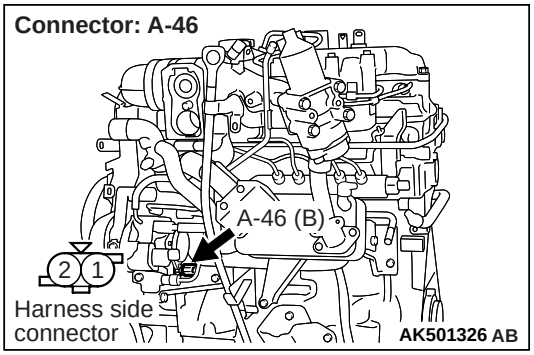
STEP 9. Connector check: C-105 engine-ECU connector

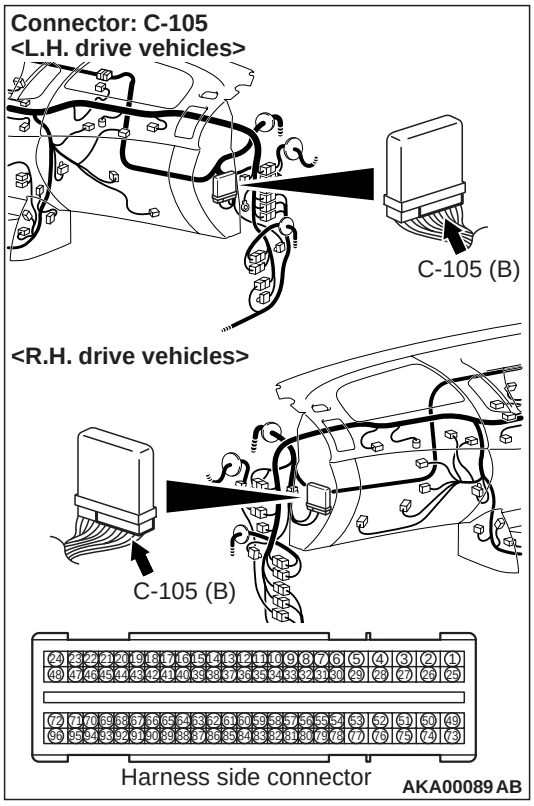


Q: Is the check result normal?
YES : Go to Step 10 .
NO : Repair or replace the connector.

STEP 10. Check harness between A-46 (terminal No. 2) fuel temperature sensor connector and C-105 (terminal No. 79) engine-ECU connector.

- Check earthing line for open circuit and damage.

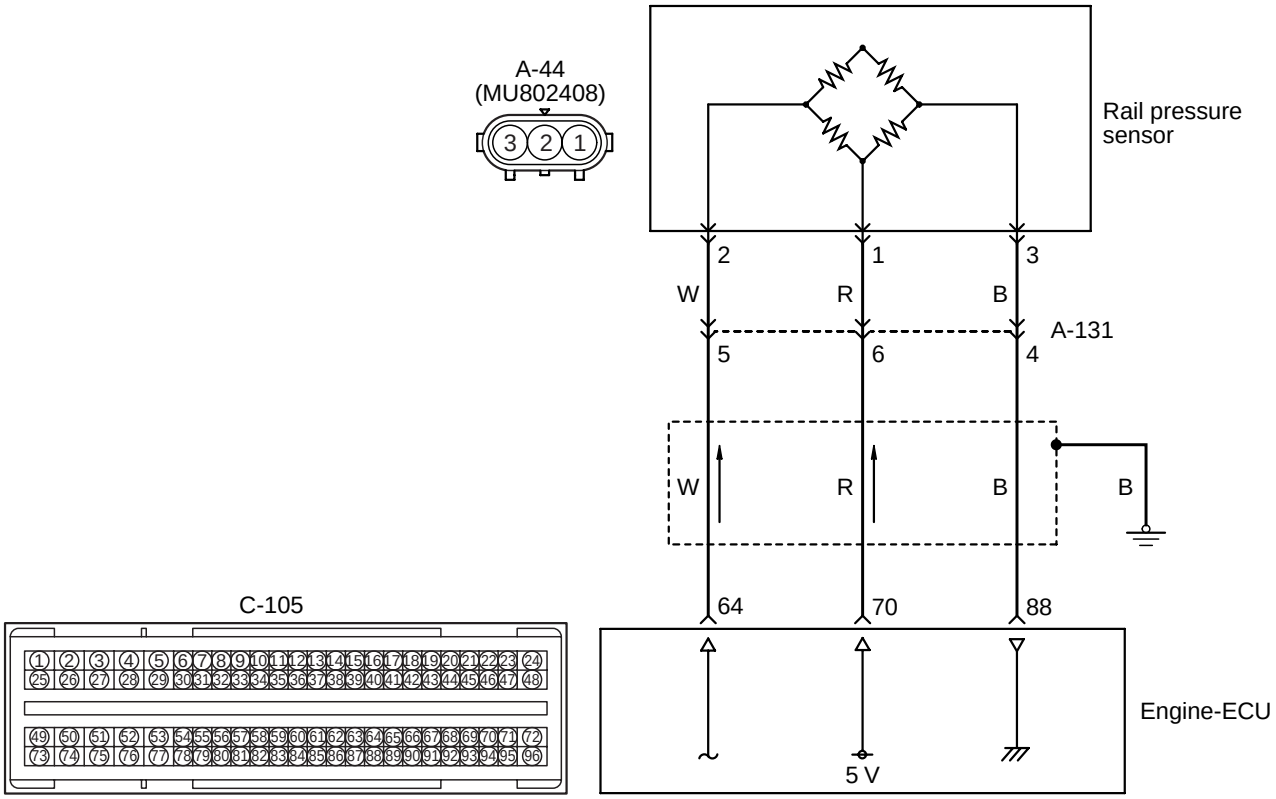




Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair the damaged harness wire.

Code No. P0191: Rail Pressure Sensor Range/Performance Problem

Rail Pressure Sensor Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V:Violet PU: Purple SI: Silver

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OPERATION

- 5 V power is supplied from the engine-ECU (terminal No. 70) to the rail pressure sensor (terminal No. 1).
- The rail pressure sensor (terminal No. 3) is earthed to the engine-ECU (terminal No. 88).
- Sensor signals are input from the rail pressure sensor (terminal No. 2) to the engine-ECU (terminal No. 64).

FUNCTION

- The engine-ECU monitors the signals input from the rail pressure sensor.
- Based on these signals, the engine-ECU checks the rail pressure sensor for errors.

TROUBLE JUDGMENT

Check Condition

- Engine is running.

Judgment Criterion

- A difference between the objective and actual rail pressures exceeds 15 MPa for 0.5 second, and the rail pressure sensor has an output voltage variation of 0.01 V or less.

PROBABLE CAUSES

- Failed rail pressure sensor
- Failed suction control valve
- Fuel line blocked
- Failed engine-ECU

DIAGNOSIS PROCEDURE

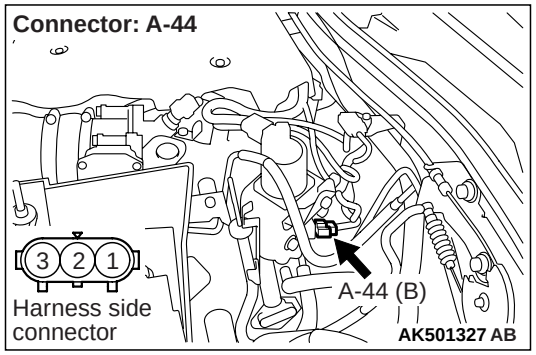
STEP 1. Check suction control valve itself.

- Check suction control valve itself (Refer to P.13A-596).

Q: Is the check result normal?

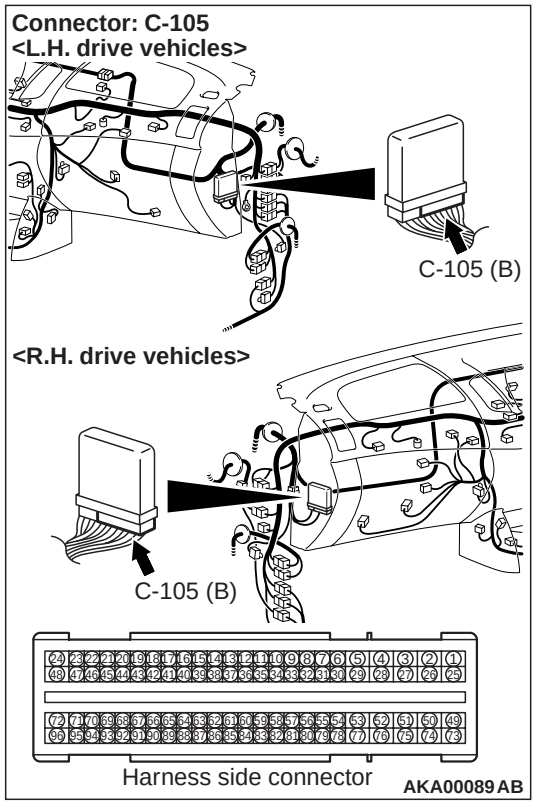
YES : Go to Step 2.
NO : Replace the suction control valve. After replacing the suction control valve, learn the supply pump (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).

STEP 2. Connector check: A-44 rail pressure sensor connector.



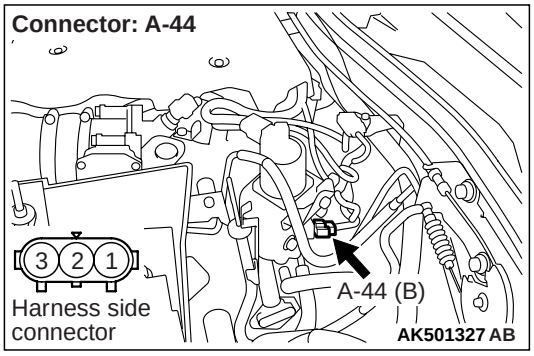
Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair or replace the connector.

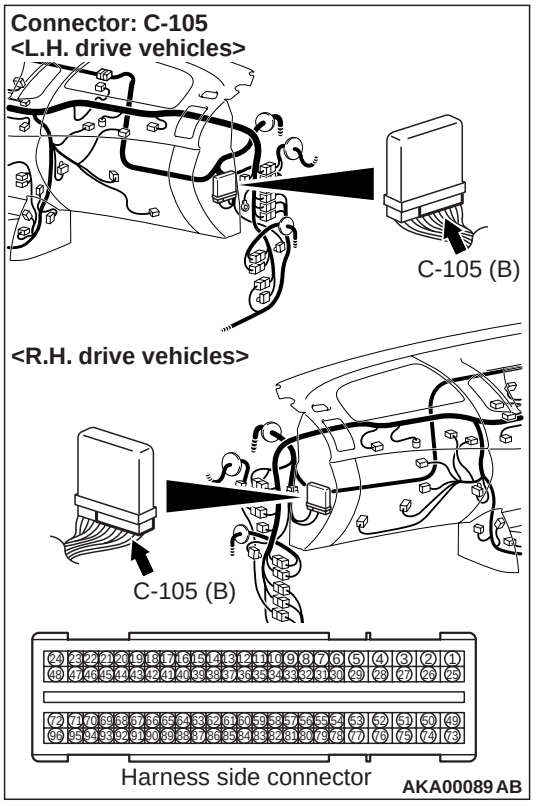
STEP 3. Connector check: C-105 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 4.
NO : Repair or replace the connector.

STEP 4. Check harness between A-44 (terminal No. 3) rail pressure sensor connector and C-105 (terminal No. 88) engine-ECU connector.

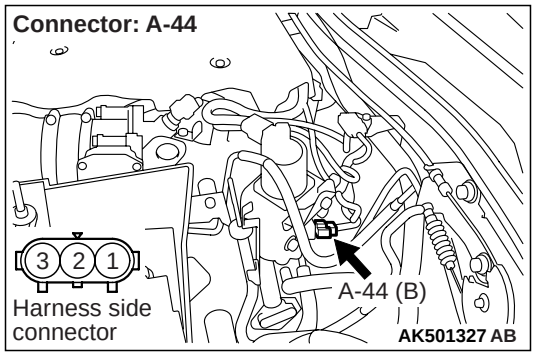


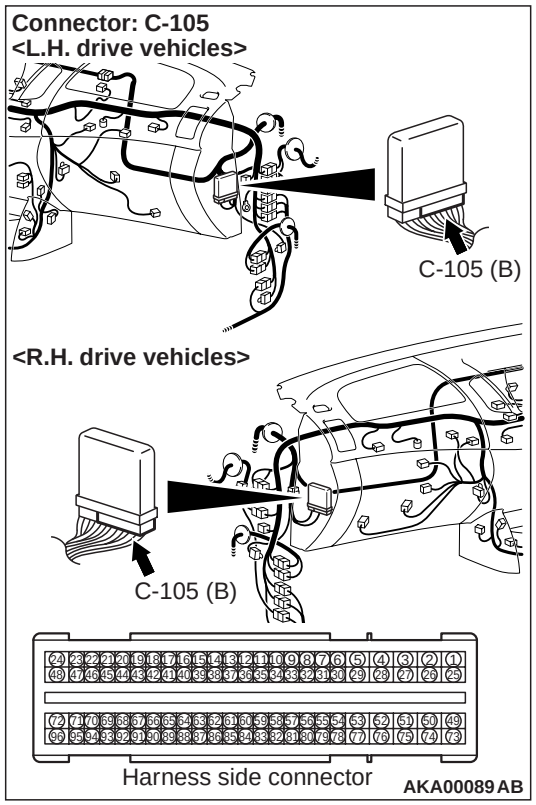


NOTE: Before checking harness, check intermediate connector A-131, and repair if necessary.
- Check earthing line for damage.

Q: Is the check result normal?
YES : Go to Step 5.
NO : Repair the damaged harness wire.

STEP 5. Check harness between A-44 (terminal No. 1) rail pressure sensor connector and C-105 (terminal No. 70) engine-ECU connector.





NOTE: Before checking harness, check intermediate connector A-131, and repair if necessary.

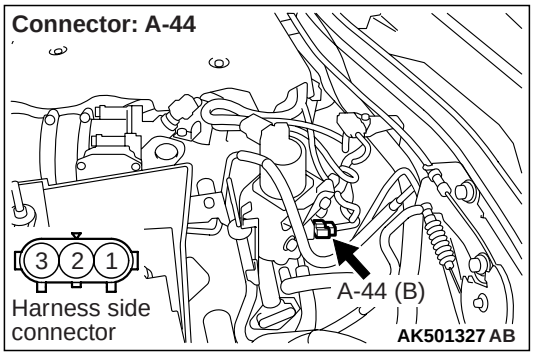
- Check power supply line for damage.

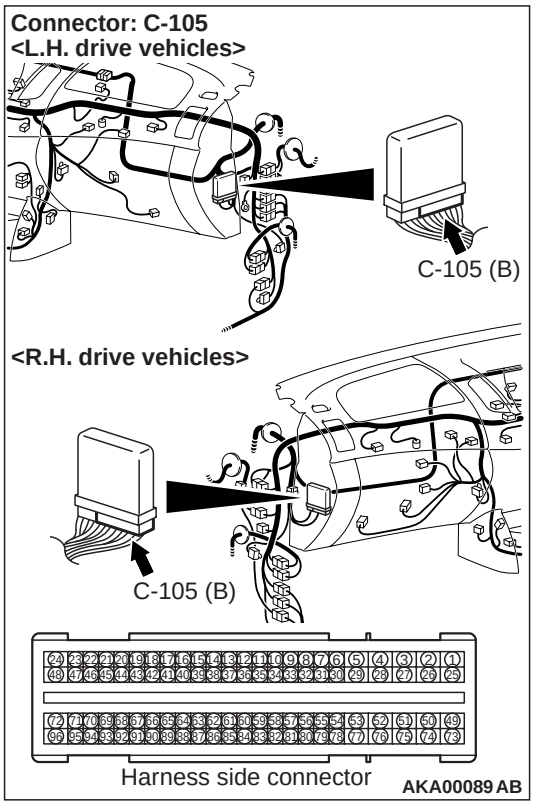
Q: Is the check result normal?

YES : Go to Step 6.

NO : Repair the damaged harness wire.

STEP 6. Check harness between A-44 (terminal No. 2) rail pressure sensor connector and C-105 (terminal No. 64) engine-ECU connector.





NOTE: Before checking harness, check intermediate connector A-131, and repair if necessary.

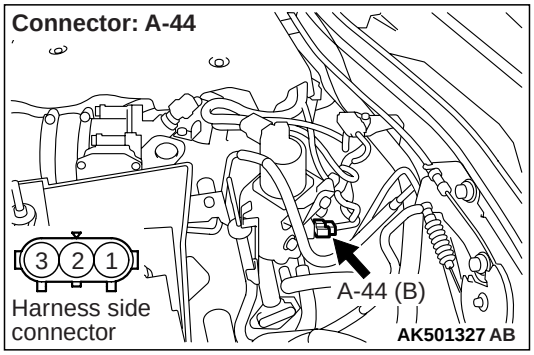
- Check output line for damage.

Q: Is the check result normal?

YES : Go to Step 7.

NO : Repair the damaged harness wire.

STEP 7. Perform voltage measurement at A-44 rail pressure sensor connector.



- Use special tool test harness (MB991658) to connect connector, and measure at pick-up harness.
- Engine: Idling (after warning up)
- Voltage between terminal No. 2 and earth.

OK: 1.15 – 1.75 V

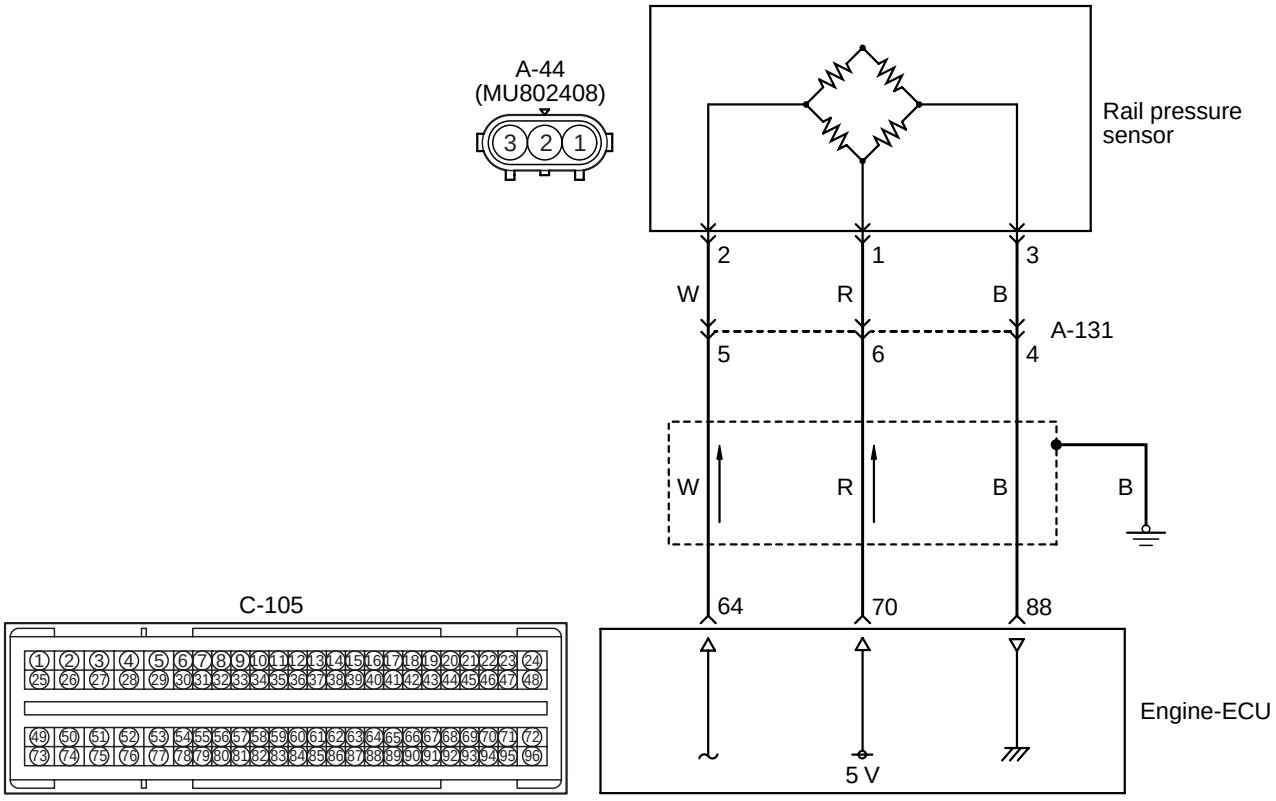
Q: Is the check result normal?

YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

NO : Replace the common rail assembly and fuel injection tubes.

Code No. P0192: Rail Pressure Sensor Circuit Low Input

Rail Pressure Sensor Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V:Violet PU: Purple SI: Silver

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OPERATION

- A power voltage of 5 V is applied to the rail pressure sensor power terminal (terminal No. 1) from the engine-ECU (terminal No. 70) and earthed to the engine-ECU (terminal No. 88) from the rail pressure sensor (terminal No. 3).
- The sensor signal is inputted to the engine-ECU (terminal No. 64) from the rail pressure sensor output terminal (terminal No. 2).

FUNCTION

- The rail pressure sensor converts the rail pressure into a voltage signal and inputs the signal to the engine-ECU.
- In response to the signal, the engine-ECU corrects the fuel injection quantity.

TROUBLE JUDGMENT

Check Conditions

- Battery positive voltage is 8 – 16 V
- 2 seconds later after the ignition switch has been in "ON" position or the engine has started up.

Judgment Criterion

- The rail pressure sensor output voltage is 0.70 V or less for 0.5 second.

PROBABLE CAUSES

- Failed rail pressure sensor
- Open/short circuit or harness damage in rail pressure sensor circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III data list

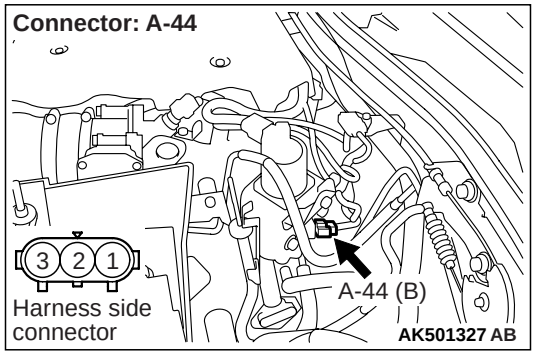
- Refer to Data List Reference Table P.13A-542.
  a. Item 63: Rail pressure sensor

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

NO : Go to Step 2 .

STEP 2. Connector check: A-44 rail pressure sensor connector

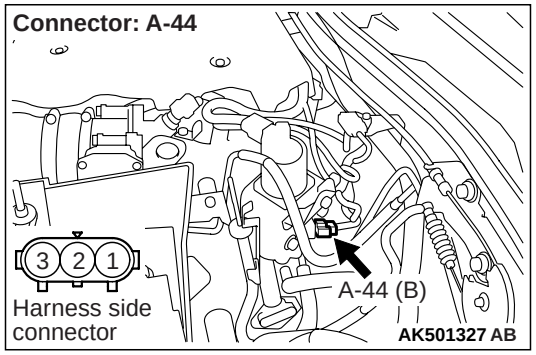


Q: Is the check result normal?

YES : Go to Step 3 .

NO : Repair or replace the connector.

STEP 3. Perform voltage measurement at A-44 rail pressure sensor connector.



- Use special tool test harness (MB991658) to connect connector, and measure at pick-up harness.
- Ignition switch: ON
- Voltage between terminal No. 1 and earth.

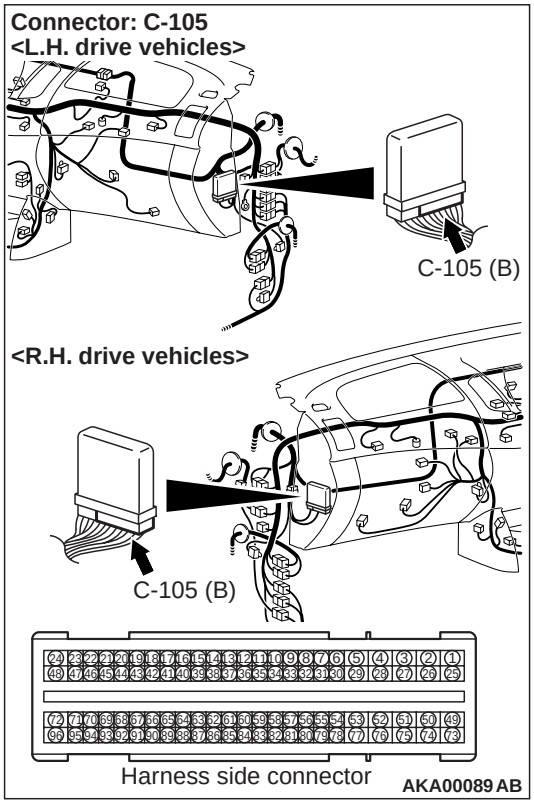
OK: 4.9 – 5.1 V

Q: Is the check result normal?

YES : Go to Step 9 .

NO : Go to Step 4 .

STEP 4. Perform voltage measurement at C-105 engine-ECU connector.



- Measure engine-ECU terminal voltage.
- Ignition switch: ON
- Voltage between terminal No. 70 and earth.

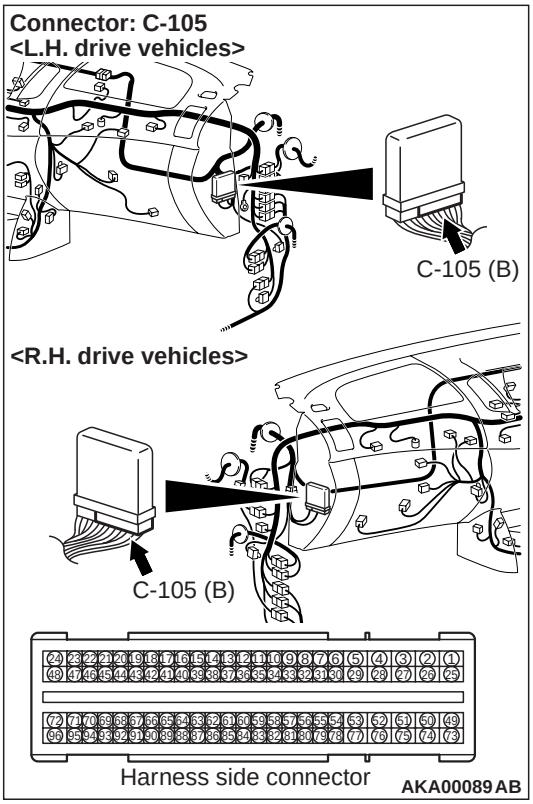
OK: 4.9 – 5.1 V

Q: Is the check result normal?

YES : Go to Step 8 .

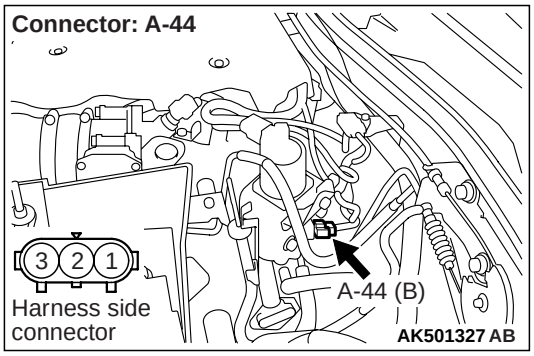
NO : Go to Step 5 .

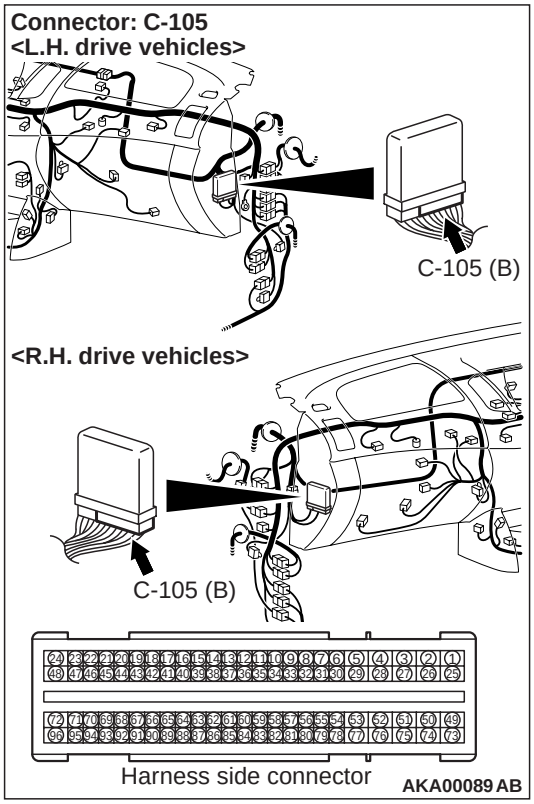
STEP 5. Connector check: C-105 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 6 .
NO : Repair or replace the connector.

STEP 6. Check harness between A-44 (terminal No. 1) rail pressure sensor connector and C-105 (terminal No. 70) engine-ECU connector.





NOTE: Before checking harness, check intermediate connector A-131, and repair if necessary.
- Check power supply line for short circuit.

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair the damaged harness wire.

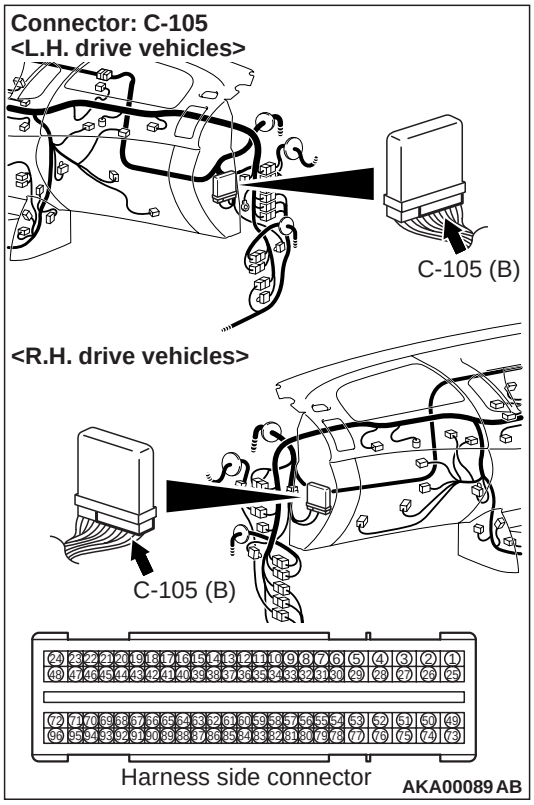
STEP 7. M.U.T.-III data list
- Refer to Data List Reference Table P.13A-542.
  a. Item 63: Rail pressure sensor

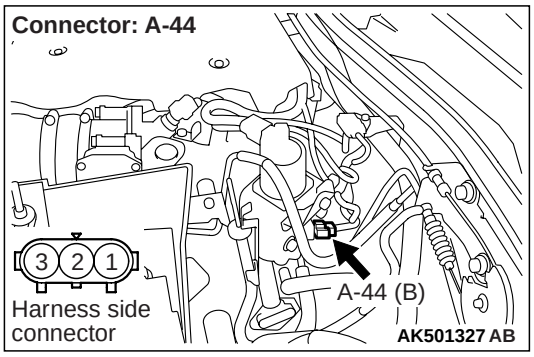
Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

NO : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

STEP 8. Connector check: C-105 engine-ECU connector





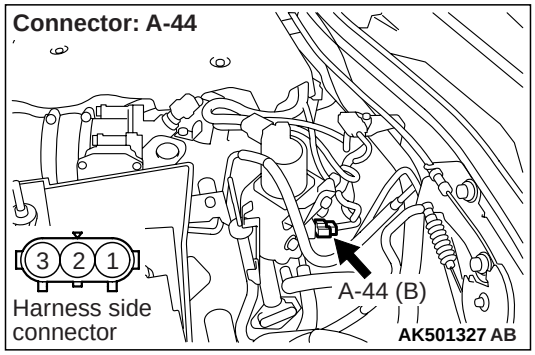
Q: Is the check result normal?

YES : Check intermediate connector A-131, and repair if necessary. If intermediate connector is normal, check and repair harness between A-44 (terminal No. 1) rail pressure sensor connector and C-105 (terminal No. 70) engine-ECU connector.

- Check power supply line for open circuit and damage.

NO : Repair or replace the connector.

STEP 9. Perform resistance measurement at A-44 rail pressure sensor connector.

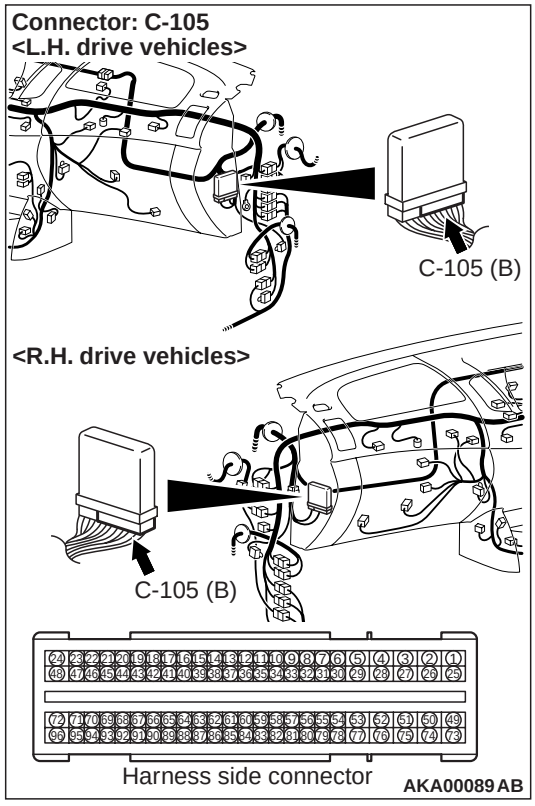


- Disconnect connector, and measure at harness side.
- Resistance between terminal No. 3 and earth.

OK: Continuity (2 Ω or less)

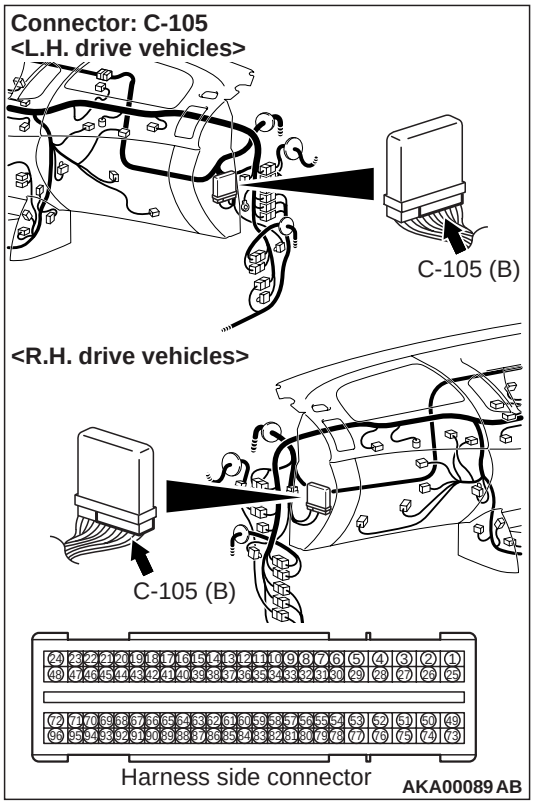
Q: Is the check result normal?
YES : Go to Step 12 .
NO : Go to Step 10 .

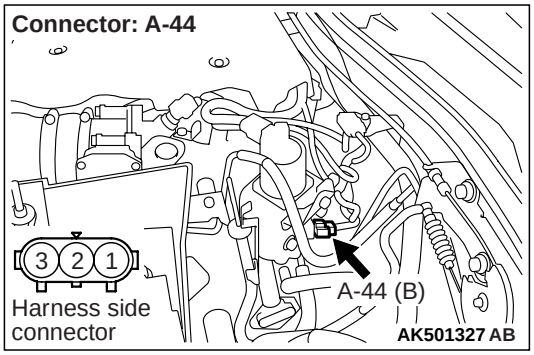
STEP 10. Connector check: C-105 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 11 .
NO : Repair or replace the connector.

STEP 11. Check harness between A-44 (terminal No. 3) rail pressure sensor connector and C-105 (terminal No. 88) engine-ECU connector.



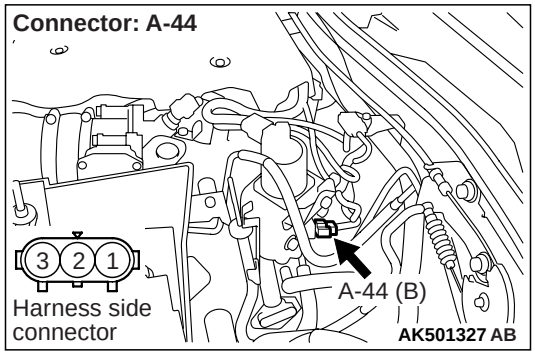


NOTE: Before checking harness, check intermediate connector A-131, and repair if necessary.

- Check earthing line for damage.

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair the damaged harness wire.

STEP 12. Perform voltage measurement at A-44 rail pressure sensor connector.

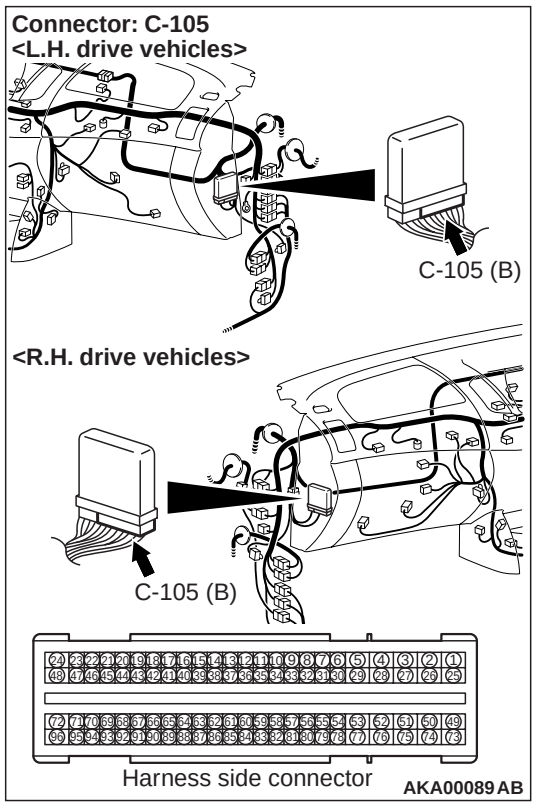


- Use special tool test harness (MB991658) to connect connector, and measure at pick-up harness.
- Engine: Idle (after warning up)
- Voltage between terminal No. 2 and earth.

OK: 1.15 – 1.75 V

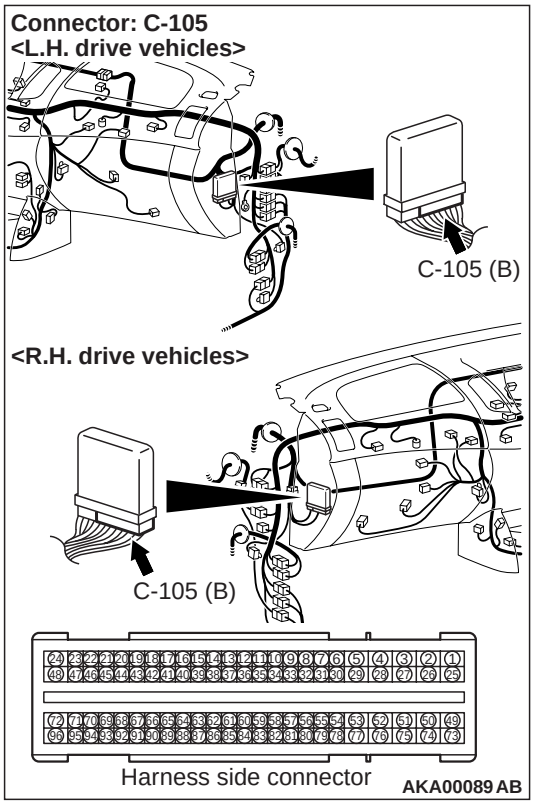
Q: Is the check result normal?
YES : Go to Step 15 .
NO : Go to Step 13 .

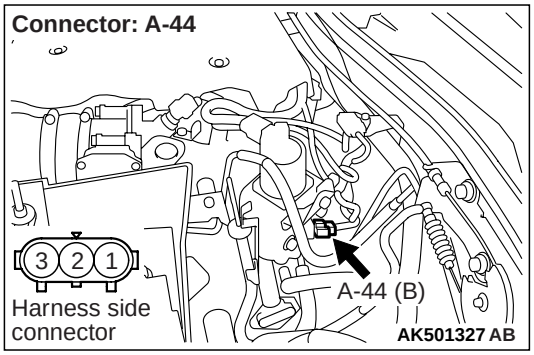
STEP 13. Connector check: C-105 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 14 .
NO : Repair or replace the connector.

STEP 14. Check harness between A-44 (terminal No. 2) rail pressure sensor connector and C-105 (terminal No. 64) engine-ECU connector.



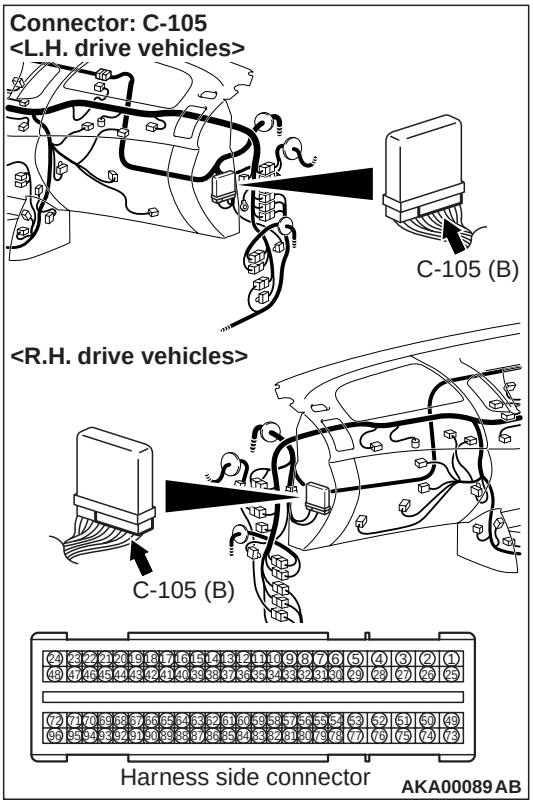


NOTE: Before checking harness, check intermediate connector A-131, and repair if necessary.

- Check output line for short circuit.

Q: Is the check result normal?
YES : Replace the common rail assembly.
NO : Repair the damaged harness wire.

STEP 15. Perform voltage measurement at C-105 engine-ECU connector.



- Measure engine-ECU terminal voltage.
- Engine: Idle (after warning up)
- Voltage between terminal No. 64 and earth.

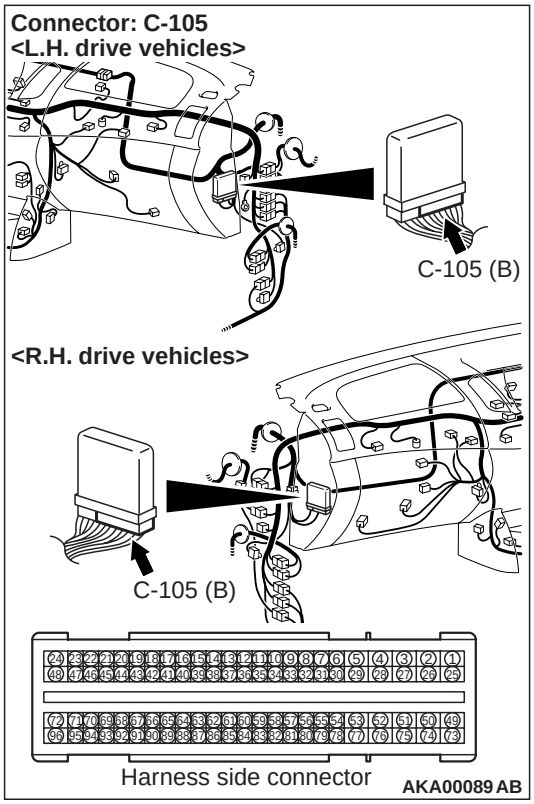
  OK: 1.15 – 1.75 V

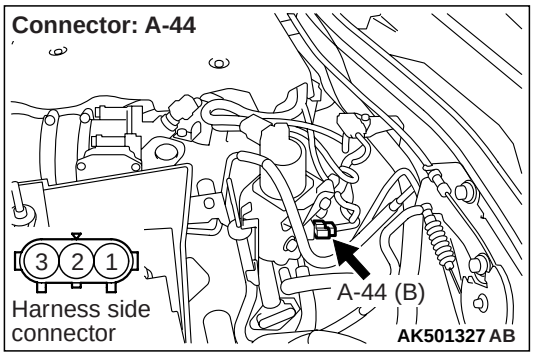
Q: Is the check result normal?

YES : Go to Step 17 .

NO : Go to Step 16 .

STEP 16. Connector check: C-105 engine-ECU connector





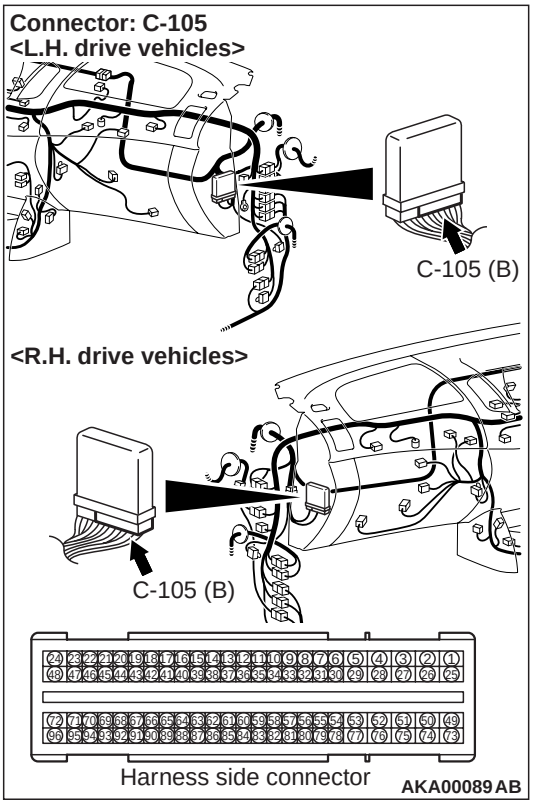
Q: Is the check result normal?

YES : Check intermediate connector A-131, and repair if necessary. If intermediate connector is normal, check and repair check harness between A-44 (terminal No. 2) rail pressure sensor connector and C-105 (terminal No. 64) engine-ECU connector.

- Check output line for open circuit and damage.

NO : Repair or replace the connector.

STEP 17. Connector check: C-105 engine-ECU connector

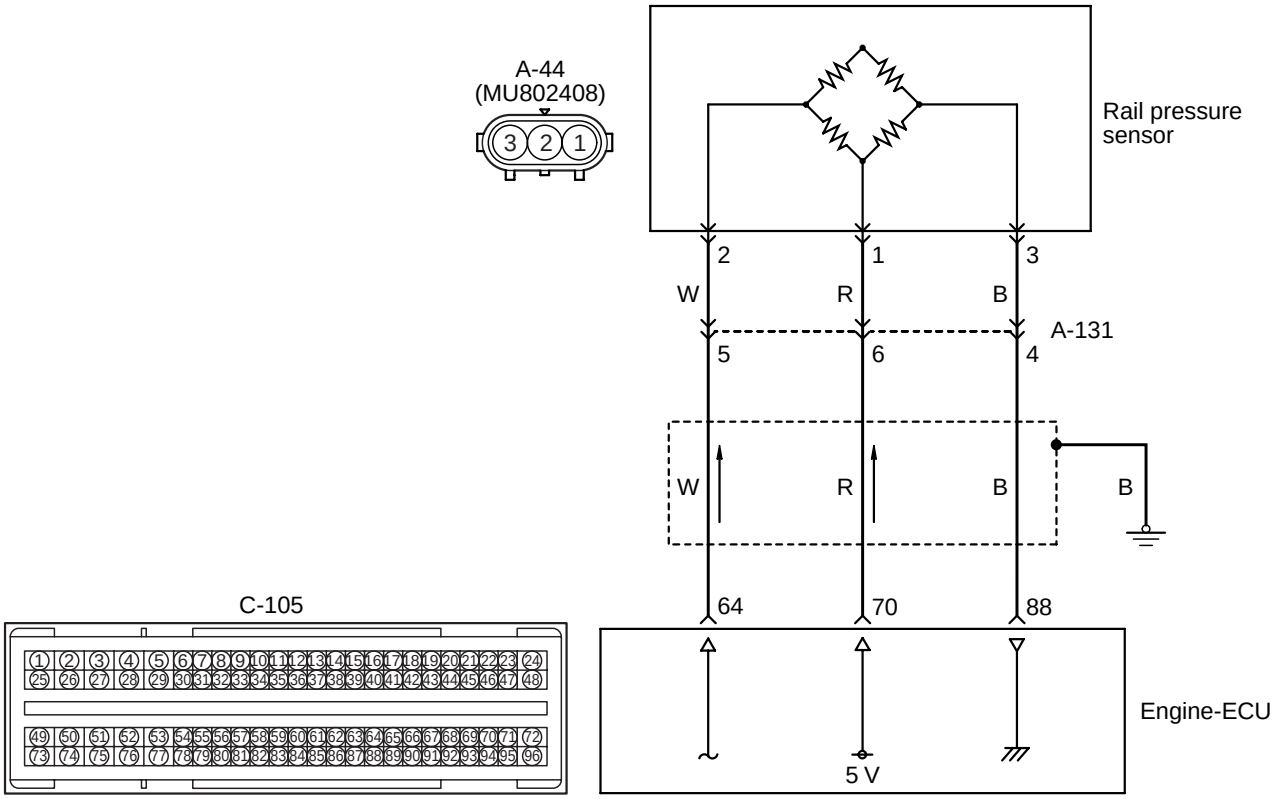


Q: Is the check result normal?

YES : Go to Step 7 .
NO : Repair or replace the connector.

Code No. P0193: Rail Pressure Sensor Circuit High Input

Rail Pressure Sensor Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V:Violet PU: Purple SI: Silver

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OPERATION

- A power voltage of 5 V is applied to the rail pressure sensor power terminal (terminal No. 1) from the engine-ECU (terminal No. 70) and earthed to the engine-ECU (terminal No. 88) from the rail pressure sensor (terminal No. 3).
- The sensor signal is inputted to the engine-ECU (terminal No. 64) from the rail pressure sensor output terminal (terminal No. 2).

FUNCTION

- The rail pressure sensor converts the rail pressure into a voltage signal and inputs the signal to the engine-ECU.
- In response to the signal, the engine-ECU corrects the fuel injection quantity.

TROUBLE JUDGMENT

Check Conditions

- Battery positive voltage is 8 – 16 V
- 2 seconds later after the ignition switch has been in "ON" position or the engine has started up.

Judgment Criterion

- The rail pressure sensor output voltage is 4.85 V or more for 0.5 second.

PROBABLE CAUSES

- Failed rail pressure sensor
- Open circuit in rail pressure sensor circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III data list

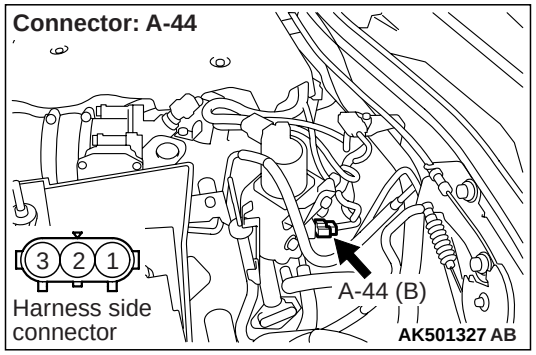
- Refer to Data List Reference Table P.13A-542.
  a. Item 63: Rail pressure sensor

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

NO : Go to Step 2 .

STEP 2. Connector check: A-44 rail pressure sensor connector

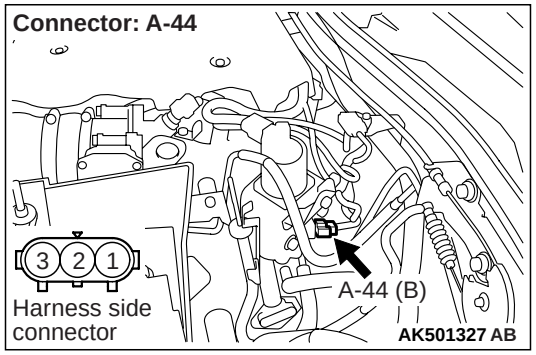


Q: Is the check result normal?

YES : Go to Step 3 .

NO : Repair or replace the connector.

STEP 3. Perform resistance measurement at A-44 rail pressure sensor connector.



- Disconnect connector, and measure at harness side.
- Resistance between terminal No. 3 and earth.

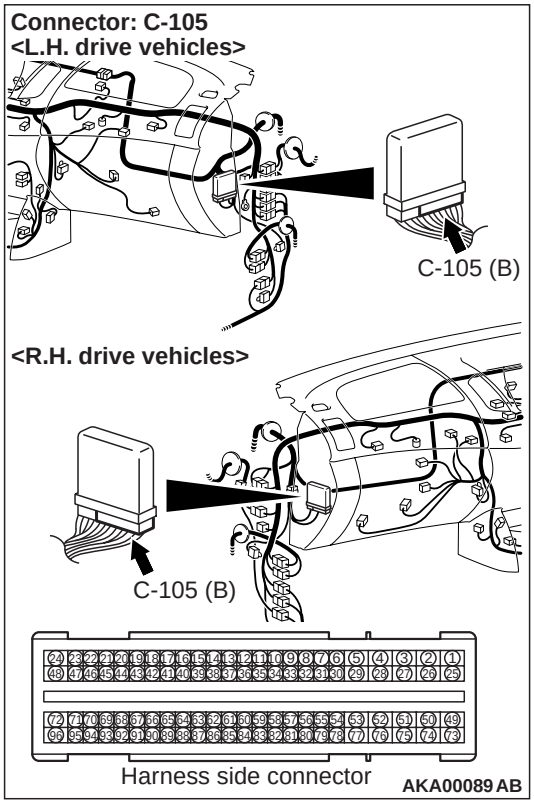
  OK: Continuity (2 Ω or less)

Q: Is the check result normal?

YES : Go to Step 7 .

NO : Go to Step 4 .

STEP 4. Connector check: C-105 engine-ECU connector

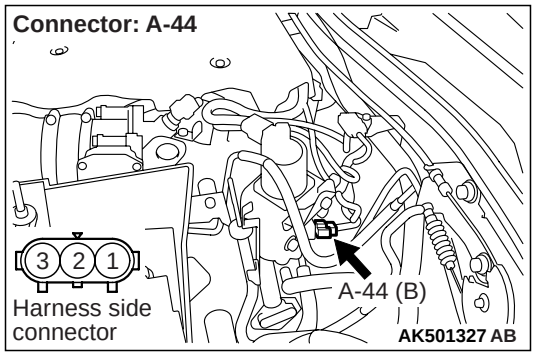


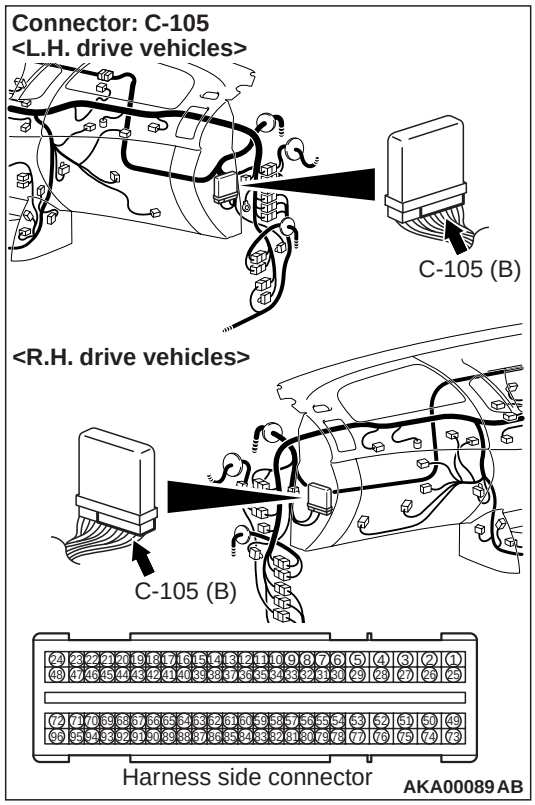
Q: Is the check result normal?

YES : Go to Step 5 .

NO : Repair or replace the connector.

STEP 5. Check harness between A-44 (terminal No. 3) rail pressure sensor connector and C-105 (terminal No. 88) engine-ECU connector.





NOTE: Before checking harness, check intermediate connector A-131, and repair if necessary.

- Check earthing line for open circuit.

Q: Is the check result normal?

YES : Go to Step 6 .
NO : Repair the damaged harness wire.

STEP 6. M.U.T.-III data list

- Refer to Data List Reference Table P.13A-542.
  a. Item 63: Rail pressure sensor

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).
NO : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

STEP 7. M.U.T.-III data list

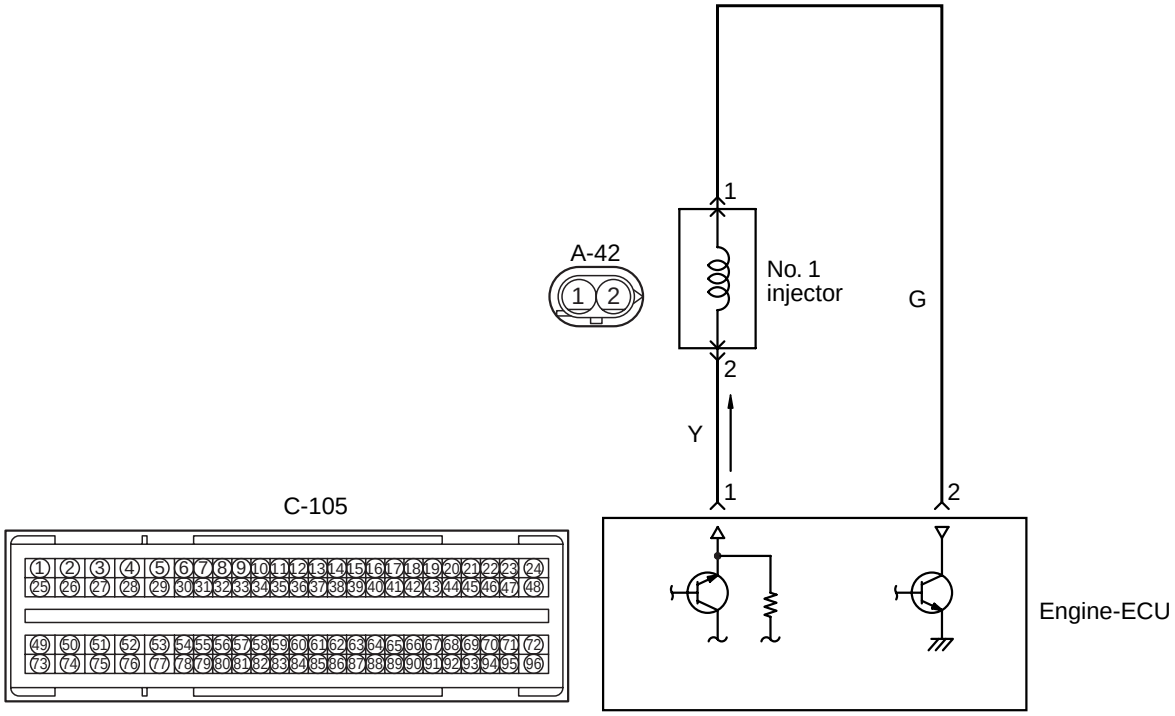
- Refer to Data List Reference Table P.13A-542.
  a. Item 63: Rail pressure sensor

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).
NO : Replace the common rail assembly.

Code No. P0201: No. 1 Injector Circuit Malfunction

No. 1 Injector Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Gray
R: Red P: Pink V: Violet PU: Purple SI: Silver

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OPERATION
- Driving power is supplied from the engine-ECU (terminal No. 1) to the No. 1 injector (terminal No. 2).
- The engine-ECU (terminal No. 2) turn on the power transistor to flow current to the No. 1 injector (terminal No. 1).

FUNCTION
- The engine-ECU monitors peak current during injector drive control to detect disconnection in the injector No. 1 circuit.

TROUBLE JUDGMENT

Check Conditions
- Ignition switch is in ON position
- Battery positive voltage is 8 V or more.
- Except during the engine cranking period
- When an engine-ECU internal capacitor is allowed to be charged

Judgment Criterion
- When the peak current of the No. 1 injector circuit is not detected, the circuit is judged to be open.

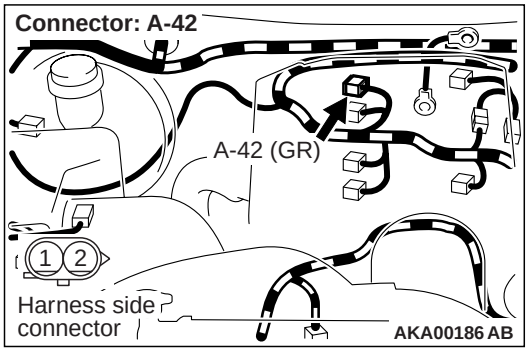
PROBABLE CAUSES
- Failed No. 1 injector
- Open/short circuit or harness damage in No. 1 injector circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

⚠ CAUTION

A high-tension voltage is flowing between the engine-ECU and the injectors while the engine is running. Handle them carefully to avoid receiving electric shocks from the voltage.

STEP 1. Connector check: A-42 No. 1 injector connector



Q: Is the check result normal?

YES : Go to Step 2 .

NO : Repair or replace the connector.

STEP 2. Check No. 1 injector itself.

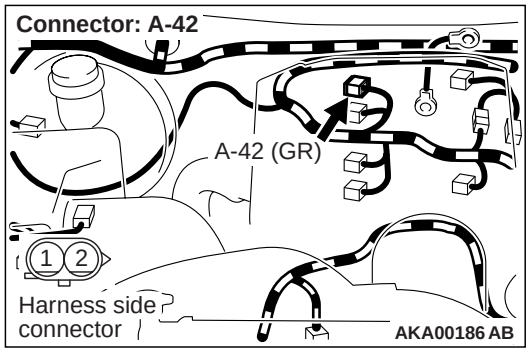
- Check No. 1 injector itself (Refer to P.13A-595).

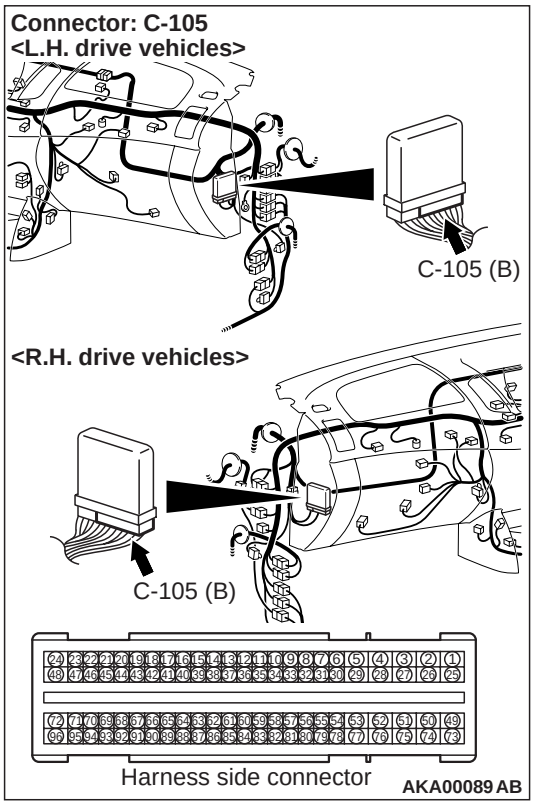
Q: Is the check result normal?

YES : Go to Step 3 .

NO : Replace the No. 1 injector. After replacing the Injector, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).

STEP 3. Check harness between No. 1 injector connector and engine-ECU connector.





Check harness between A-42 (terminal No. 1) No. 1 injector connector and C-105 (terminal No. 2) engine-ECU connector.

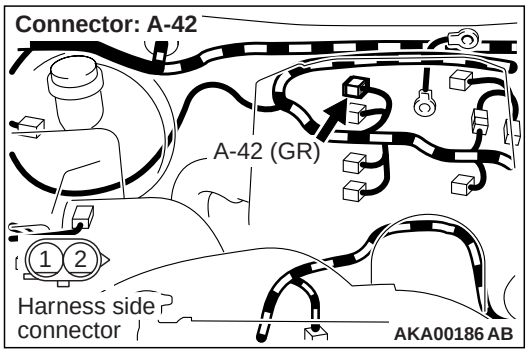
- Check earthing line for open/short circuit and damage.

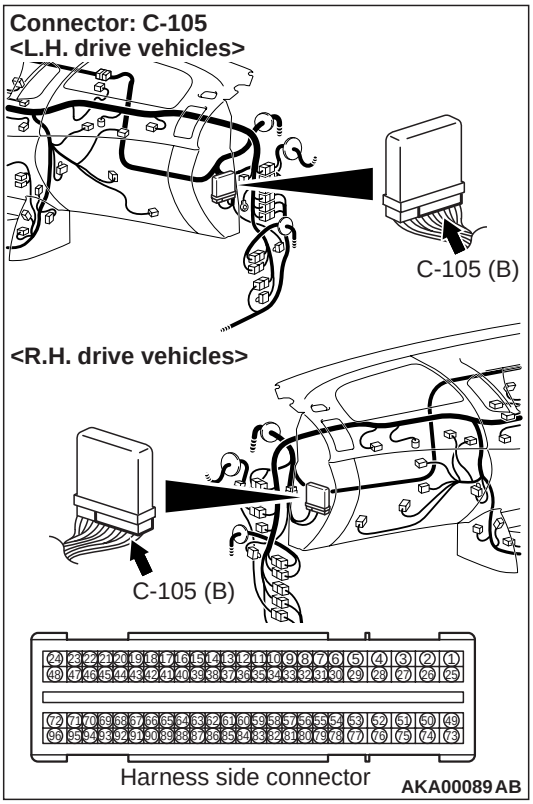
Q: Are the check results normal?

YES : Go to Step 4 .

NO : Repair the damaged harness wire.

STEP 4. Check harness between A-42 (terminal No. 2) No. 1 injector connector and C-105 (terminal No. 1) engine-ECU connector.

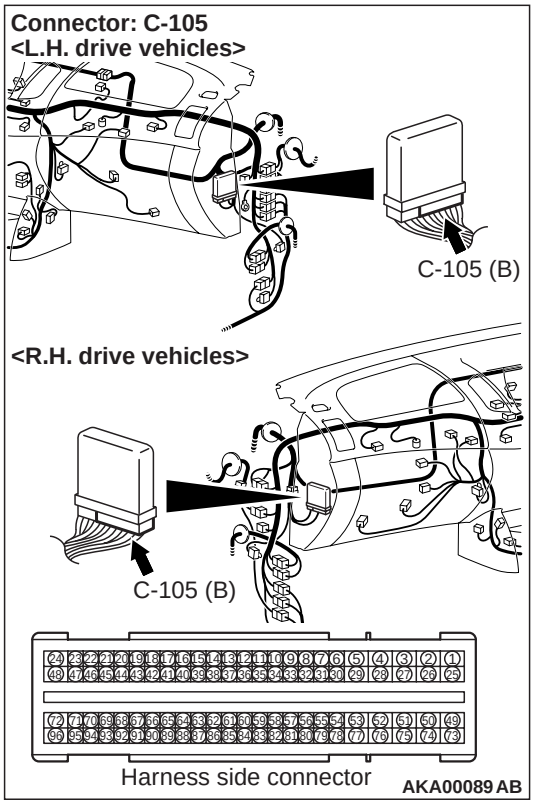




- Check power supply line for open/short circuit and damage.

Q: Is the check result normal?
YES : Go to Step 5 .
NO : Repair or replace the connector.

STEP 5. Connector check: C-105 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 6 .
NO : Repair or replace the connector.

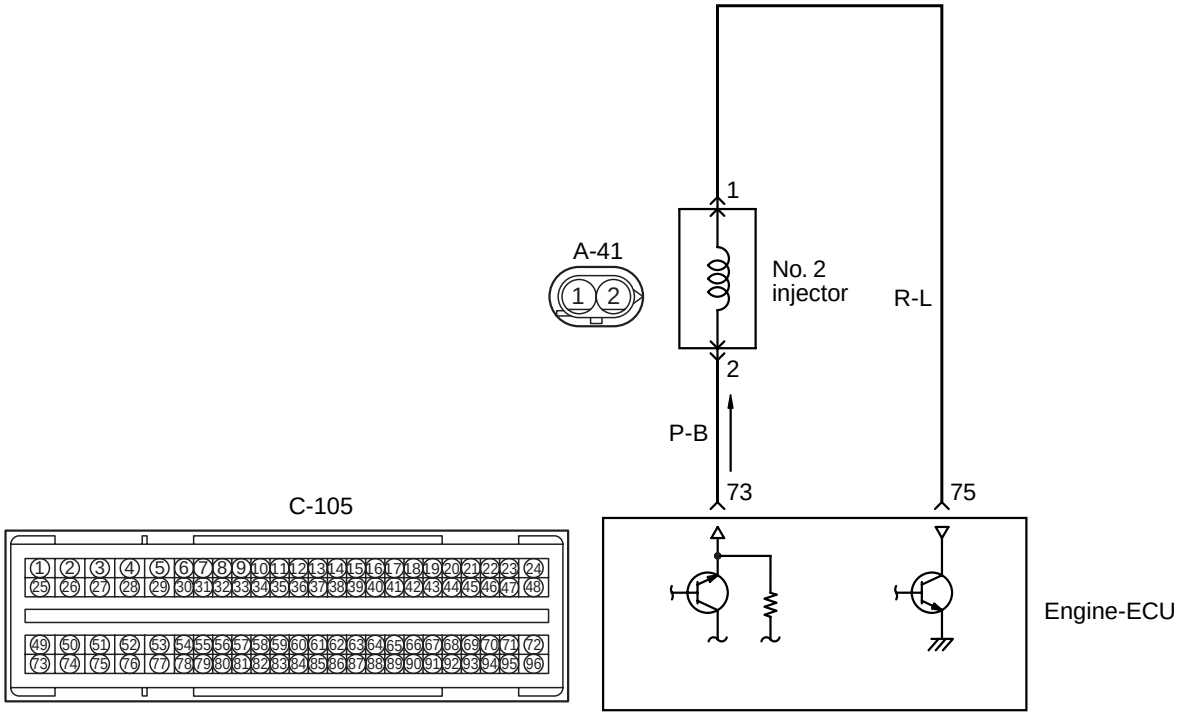
STEP 6. M.U.T.-III diagnosis code

- Reconfirmation of diagnosis code.

Q: Is the diagnosis code set?
YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

Code No. P0202: No. 2 Injector Circuit Malfunction <Euro5>

No. 2 Injector Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V: Violet PU: Purple SI: Silver

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OPERATION
- Driving power is supplied from the engine-ECU (terminal No. 73) to the No. 2 injector (terminal No. 2).
- The engine-ECU (terminal No. 75) turn on the power transistor to flow current to the No. 2 injector (terminal No. 1).

FUNCTION
- The engine-ECU monitors peak current during injector drive control to detect disconnection in the injector No. 2 circuit.

TROUBLE JUDGMENT

Check Conditions
- Ignition switch is in ON position
- Battery positive voltage is 8 V or more.
- Except during the engine cranking period
- When an engine-ECU internal capacitor is allowed to be charged

Judgment Criterion
- When the peak current of the No. 2 injector circuit is not detected, the circuit is judged to be open.

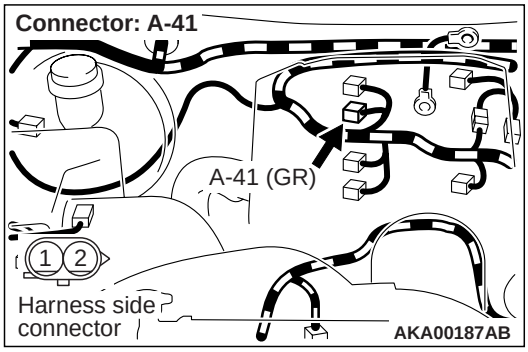
PROBABLE CAUSES
- Failed No. 2 injector
- Open/short circuit or harness damage in No. 2 injector circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

⚠ CAUTION

A high-tension voltage is flowing between the engine-ECU and the injectors while the engine is running. Handle them carefully to avoid receiving electric shocks from the voltage.

STEP 1. Connector check: A-41 No. 2 injector connector



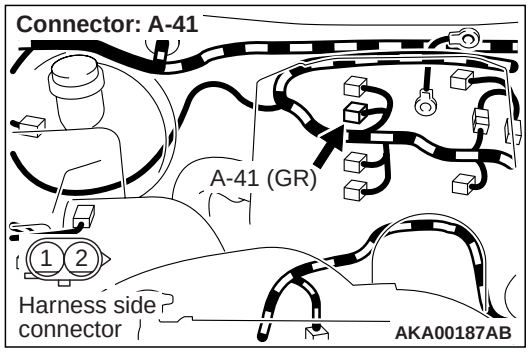
Q: Is the check result normal?
YES : Go to Step 2 .
NO : Repair or replace the connector.

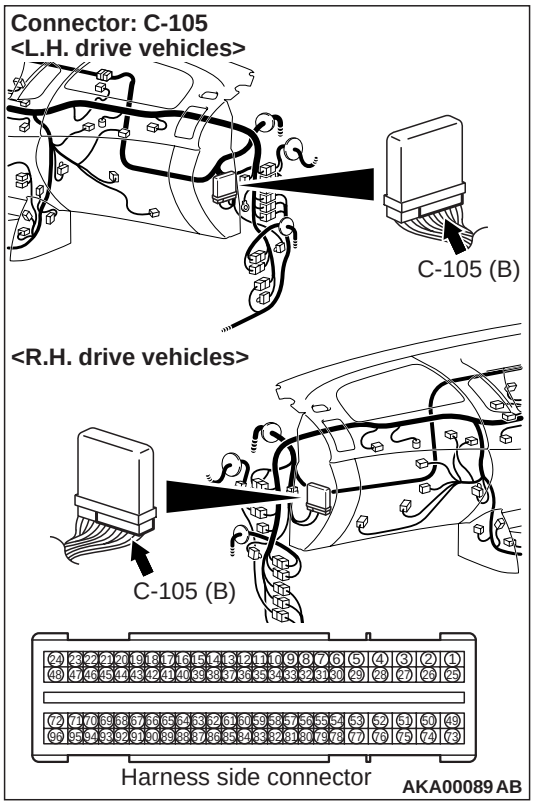
STEP 2. Check No. 2 injector itself.

- Check No. 2 injector itself (Refer to P.13A-595).

Q: Is the check result normal?
YES : Go to Step 3 .
NO : Replace the No. 2 injector. After replacing the Injector, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).

STEP 3. Check harness between No. 2 injector connector and engine-ECU connector.



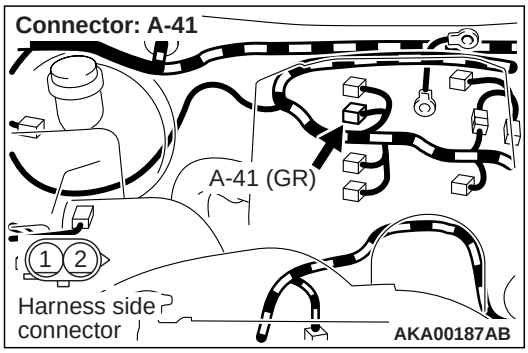


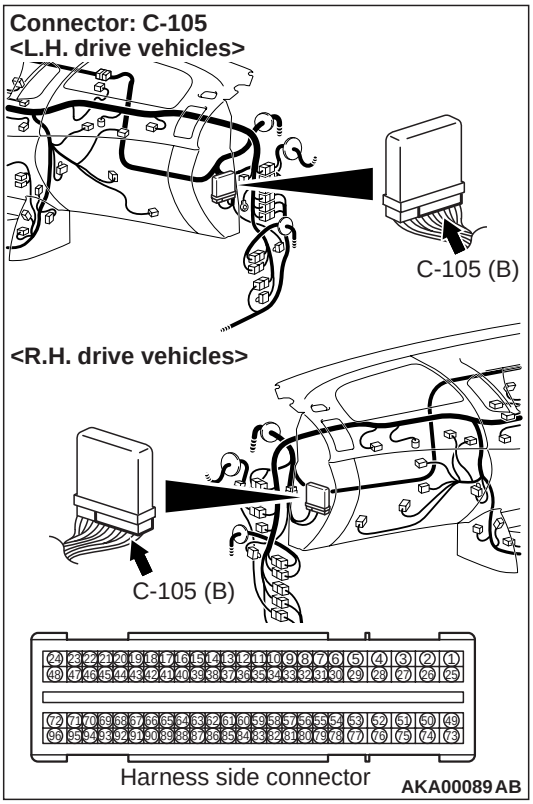
Check harness between A-41 (terminal No. 1) No. 2 injector connector and C-105 (terminal No. 75) engine-ECU connector.

- Check earthing line for open/short circuit and damage.

Q: Are the check results normal?
YES : Go to Step 4 .
NO : Repair the damaged harness wire.

STEP 4. Check harness between A-41 (terminal No. 2) No. 2 injector connector and C-105 (terminal No. 73) engine-ECU connector.

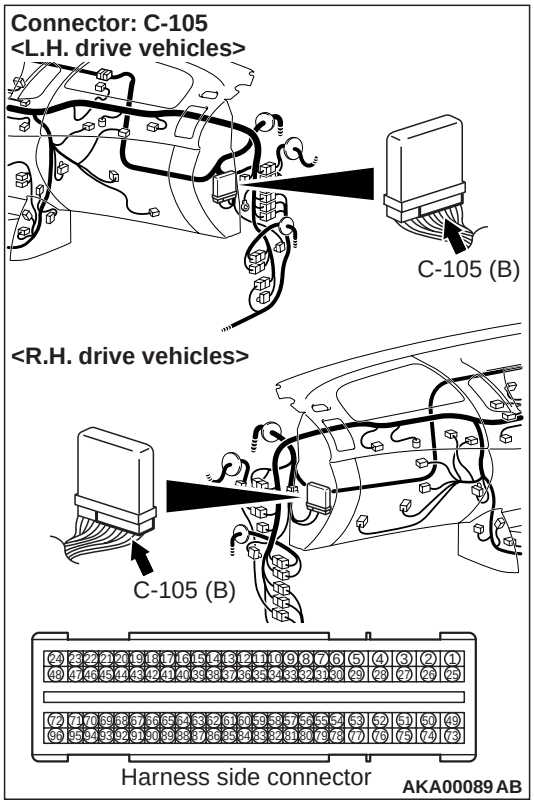




- Check power supply line for open/short circuit and damage.

Q: Is the check result normal?
YES : Go to Step 5 .
NO : Repair or replace the connector.

STEP 5. Connector check: C-105 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 6 .
NO : Repair or replace the connector.

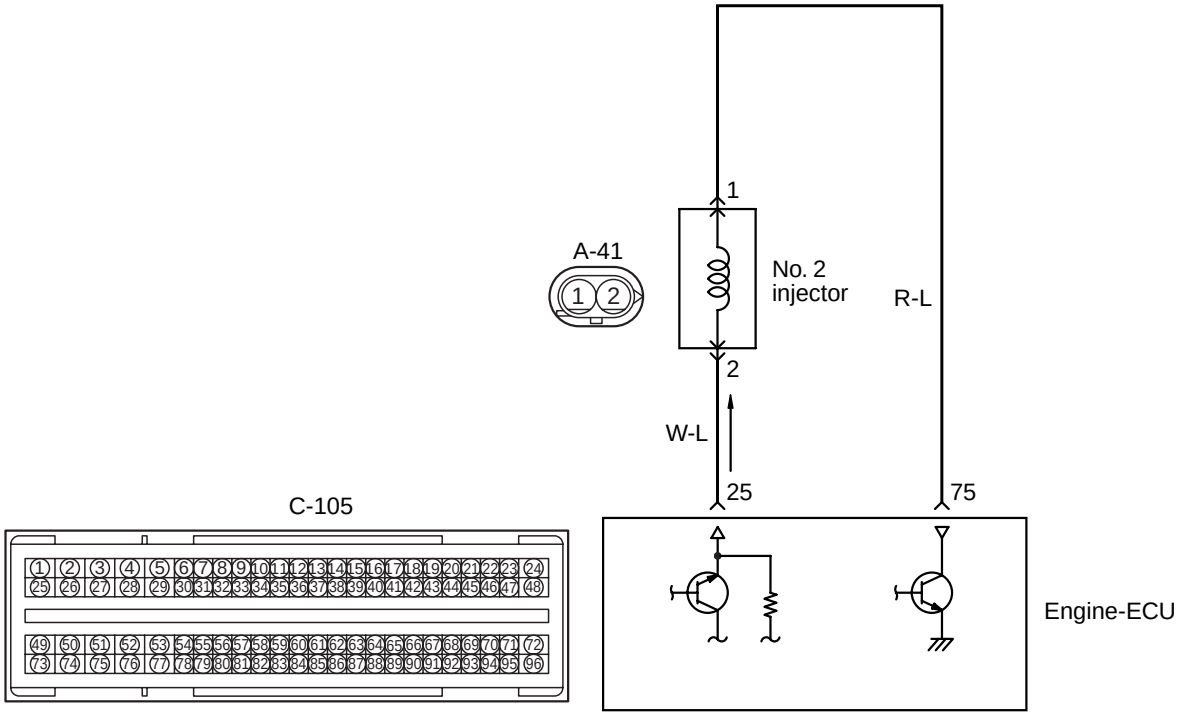
STEP 6. M.U.T.-III diagnosis code

- Reconfirmation of diagnosis code.

Q: Is the diagnosis code set?
YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, carry out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

Code No. P0202: No. 2 Injector Circuit Malfunction <Except Euro5>

No. 2 Injector Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Gray
R: Red P: Pink V: Violet PU: Purple SI: Silver

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OPERATION
- Driving power is supplied from the engine-ECU (terminal No. 25) to the No. 2 injector (terminal No. 2).
- The engine-ECU (terminal No. 75) turn on the power transistor to flow current to the No. 2 injector (terminal No. 1).

FUNCTION
- The engine-ECU monitors peak current during injector drive control to detect disconnection in the injector No. 2 circuit.

TROUBLE JUDGMENT

Check Conditions
- Ignition switch is in ON position
- Battery positive voltage is 8 V or more.
- Except during the engine cranking period
- When an engine-ECU internal capacitor is allowed to be charged

Judgment Criterion
- When the peak current of the No. 2 injector circuit is not detected, the circuit is judged to be open.

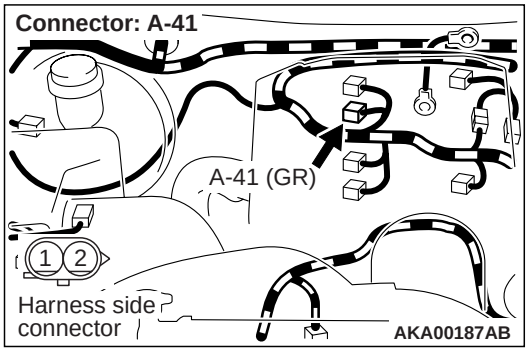
PROBABLE CAUSES
- Failed No. 2 injector
- Open/short circuit or harness damage in No. 2 injector circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

⚠ CAUTION

A high-tension voltage is flowing between the engine-ECU and the injectors while the engine is running. Handle them carefully to avoid receiving electric shocks from the voltage.

STEP 1. Connector check: A-41 No. 2 injector connector



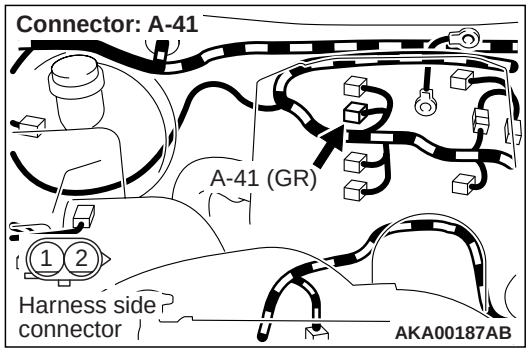
Q: Is the check result normal?
YES : Go to Step 2 .
NO : Repair or replace the connector.

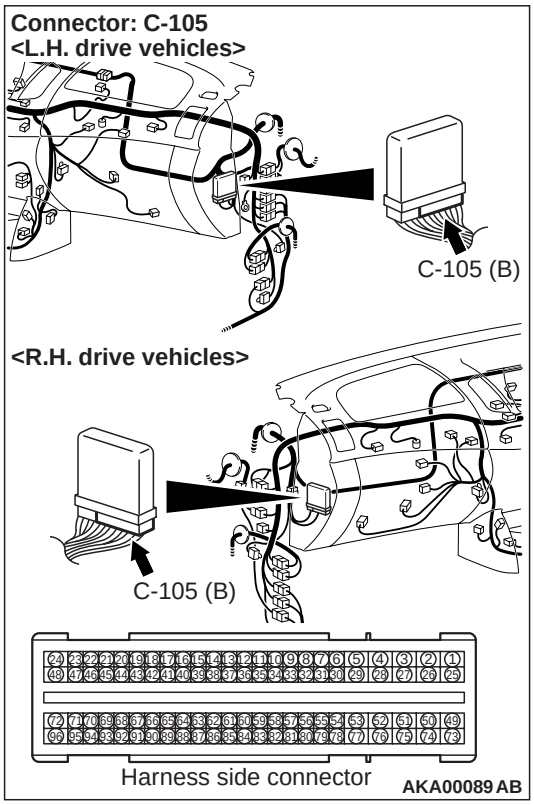
STEP 2. Check No. 2 injector itself.

- Check No. 2 injector itself (Refer to P.13A-595).

Q: Is the check result normal?
YES : Go to Step 3 .
NO : Replace the No. 2 injector. After replacing the Injector, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).

STEP 3. Check harness between No. 2 injector connector and engine-ECU connector.



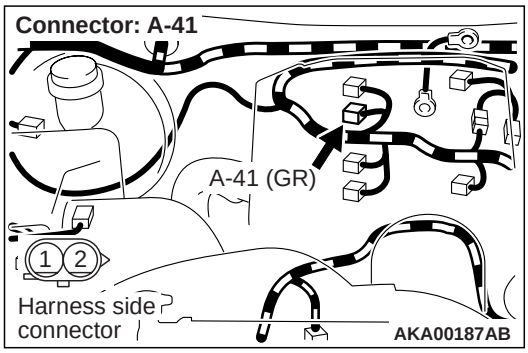


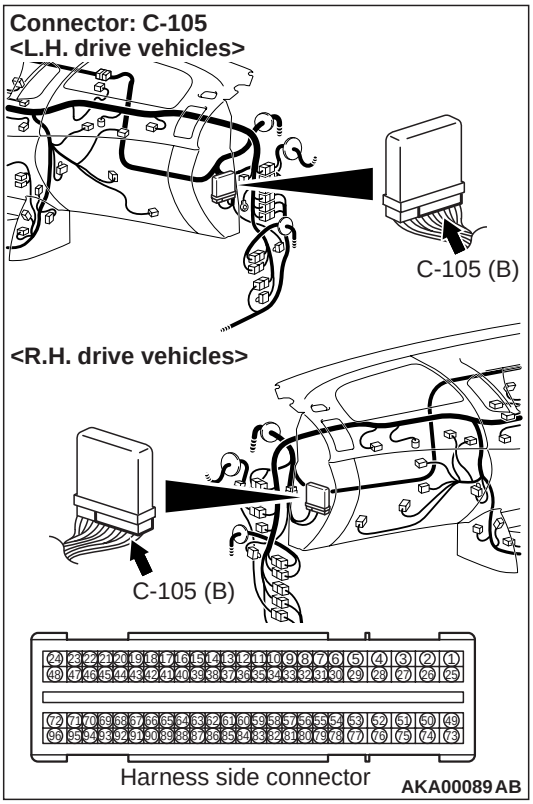
Check harness between A-41 (terminal No. 1) No. 2 injector connector and C-105 (terminal No. 75) engine-ECU connector.

- Check earthing line for open/short circuit and damage.

Q: Are the check results normal?
YES : Go to Step 4 .
NO : Repair the damaged harness wire.

STEP 4. Check harness between A-41 (terminal No. 2) No. 2 injector connector and C-105 (terminal No. 25) engine-ECU connector.

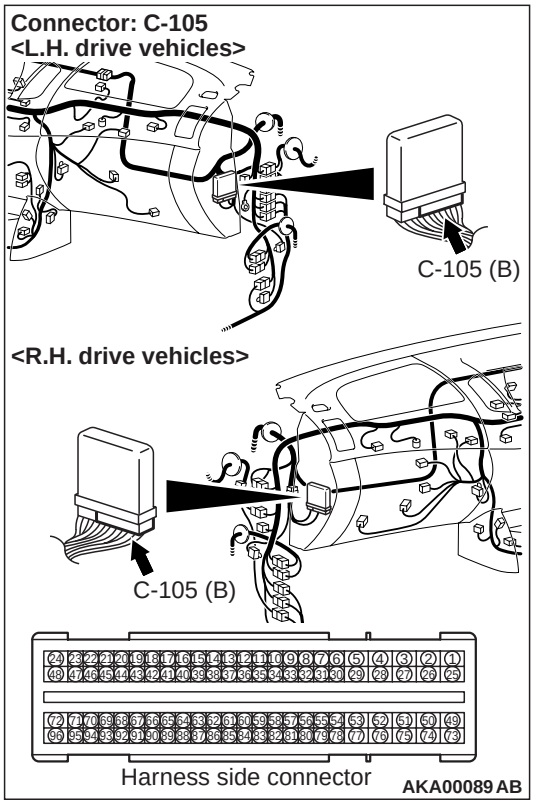




- Check power supply line for open/short circuit and damage.

Q: Is the check result normal?
YES : Go to Step 5 .
NO : Repair or replace the connector.

STEP 5. Connector check: C-105 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 6 .
NO : Repair or replace the connector.

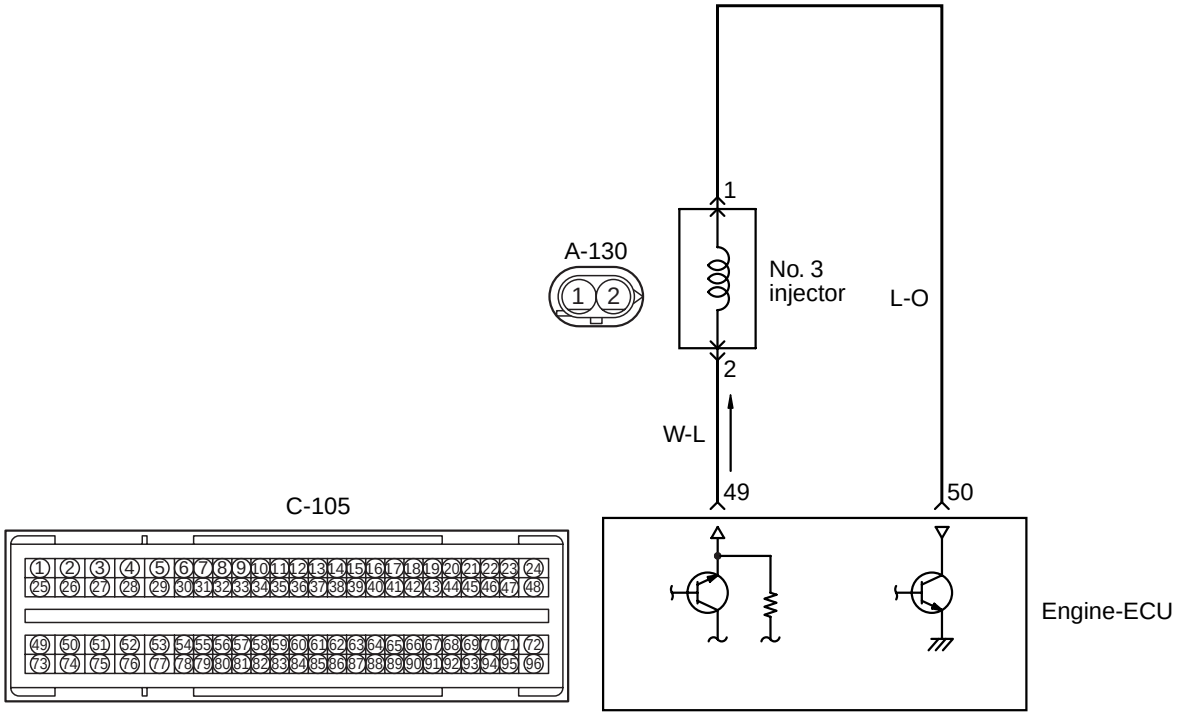
STEP 6. M.U.T.-III diagnosis code

- Reconfirmation of diagnosis code.

Q: Is the diagnosis code set?
YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

Code No. P0203: No. 3 Injector Circuit Malfunction <Euro5>

No. 3 Injector Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V: Violet PU: Purple SI: Silver

AKA00099AP

OPERATION
- Driving power is supplied from the engine-ECU (terminal No. 49) to the No. 3 injector (terminal No. 2).
- The engine-ECU (terminal No. 50) turn on the power transistor to flow current to the No. 3 injector (terminal No. 1).

FUNCTION
- The engine-ECU monitors peak current during injector drive control to detect disconnection in the injector No. 3 circuit.

TROUBLE JUDGMENT

Check Conditions
- Ignition switch is in ON position
- Battery positive voltage is 8 V or more.
- Except during the engine cranking period
- When an engine-ECU internal capacitor is allowed to be charged

Judgment Criterion
- When the peak current of the No. 3 injector circuit is not detected, the circuit is judged to be open.

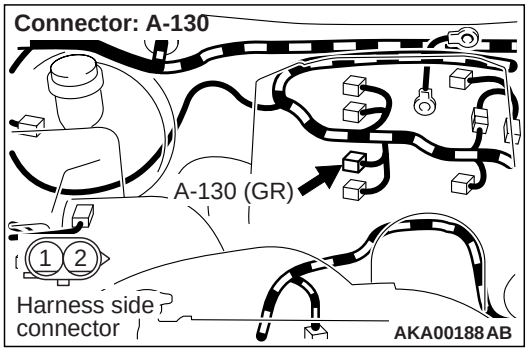
PROBABLE CAUSES
- Failed No. 3 injector
- Open/short circuit or harness damage in No. 3 injector circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

⚠ CAUTION

A high-tension voltage is flowing between the engine-ECU and the injectors while the engine is running. Handle them carefully to avoid receiving electric shocks from the voltage.

STEP 1. Connector check: A-130 No. 3 injector connector



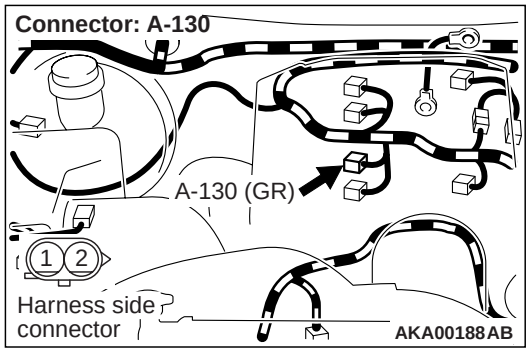
Q: Is the check result normal?
YES : Go to Step 2 .
NO : Repair or replace the connector.

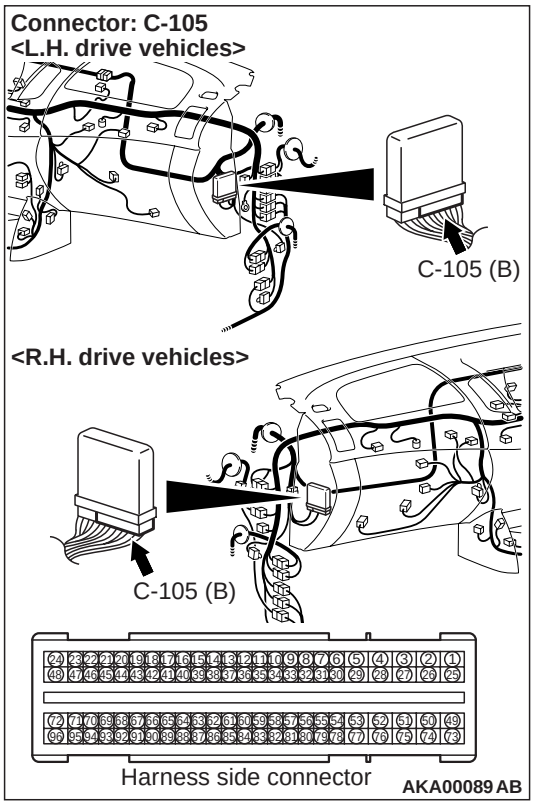
STEP 2. Check No. 3 injector itself.

- Check No. 3 injector itself (Refer to P.13A-595).

Q: Is the check result normal?
YES : Go to Step 3 .
NO : Replace the No. 3 injector. After replacing the Injector, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).

STEP 3. Check harness between No. 3 injector connector and engine-ECU connector.



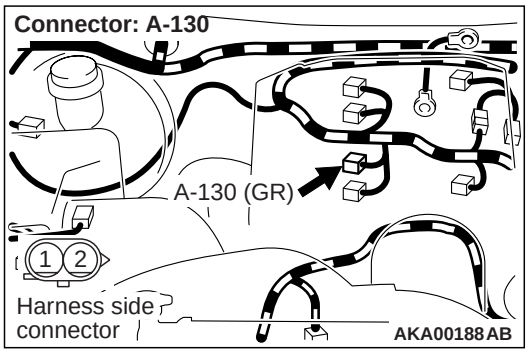


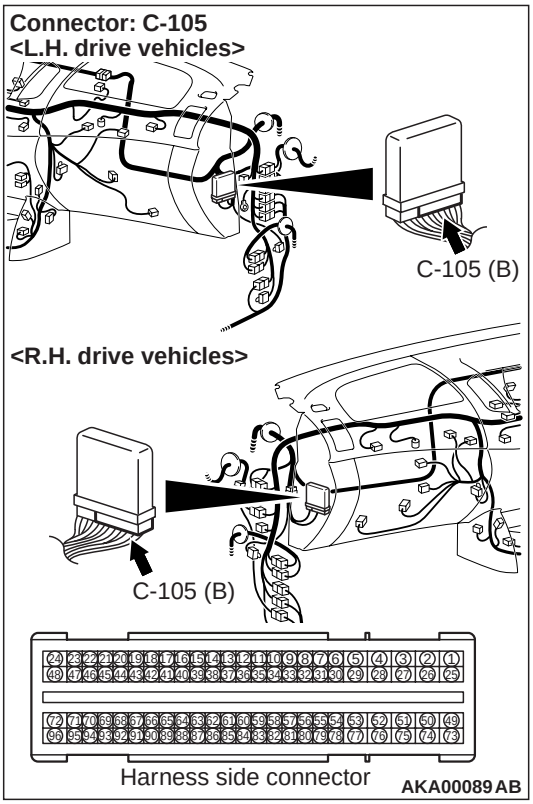
Check harness between A-130 (terminal No. 1) No. 3 injector connector and C-105 (terminal No. 50) engine-ECU connector.

- Check earthing line for open/short circuit and damage.

Q: Are the check results normal?
YES : Go to Step 4 .
NO : Repair the damaged harness wire.

STEP 4. Check harness between A-130 (terminal No. 2) No. 3 injector connector and C-105 (terminal No. 49) engine-ECU connector.

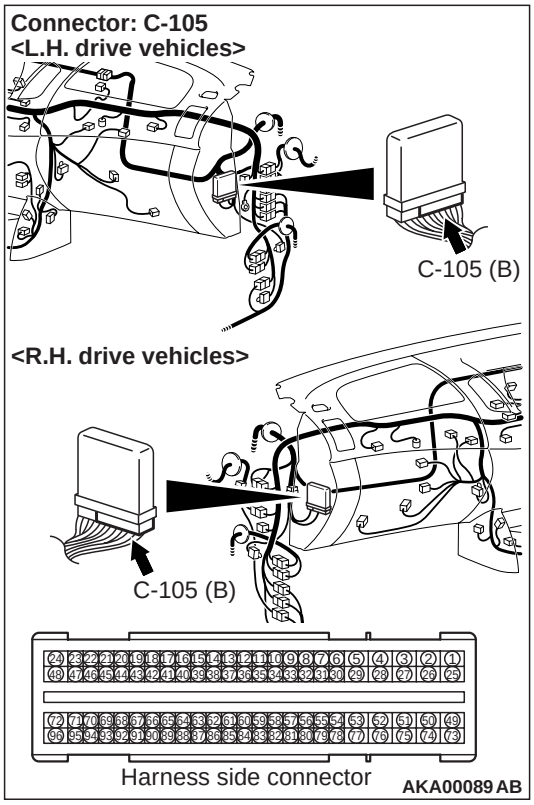




- Check power supply line for open/short circuit and damage.

Q: Is the check result normal?
YES : Go to Step 5 .
NO : Repair or replace the connector.

STEP 5. Connector check: C-105 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 6 .
NO : Repair or replace the connector.

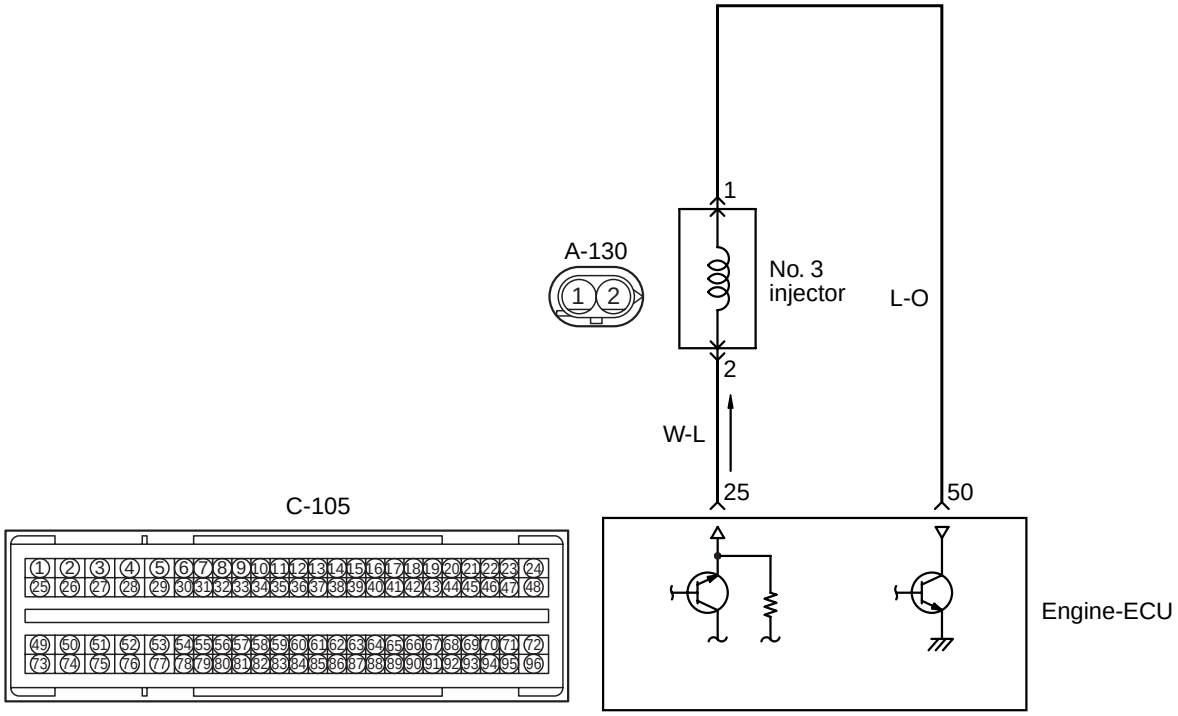
STEP 6. M.U.T.-III diagnosis code

- Reconfirmation of diagnosis code.

Q: Is the diagnosis code set?
YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, carry out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

Code No. P0203: No. 3 Injector Circuit Malfunction <Except Euro5>

No. 3 Injector Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Gray
R: Red P: Pink V: Violet PU: Purple SI: Silver

AKA00099AL

OPERATION
- Driving power is supplied from the engine-ECU (terminal No. 25) to the No. 3 injector (terminal No. 2).
- The engine-ECU (terminal No. 50) turn on the power transistor to flow current to the No. 3 injector (terminal No. 1).

FUNCTION
- The engine-ECU monitors peak current during injector drive control to detect disconnection in the injector No. 3 circuit.

TROUBLE JUDGMENT

Check Conditions
- Ignition switch is in ON position
- Battery positive voltage is 8 V or more.
- Except during the engine cranking period
- When an engine-ECU internal capacitor is allowed to be charged

Judgment Criterion
- When the peak current of the No. 3 injector circuit is not detected, the circuit is judged to be open.

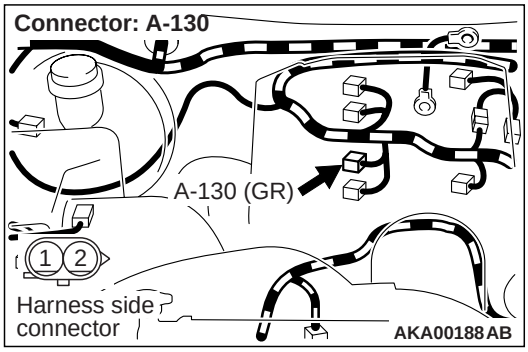
PROBABLE CAUSES
- Failed No. 3 injector
- Open/short circuit or harness damage in No. 3 injector circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

⚠ CAUTION

A high-tension voltage is flowing between the engine-ECU and the injectors while the engine is running. Handle them carefully to avoid receiving electric shocks from the voltage.

STEP 1. Connector check: A-130 No. 3 injector connector



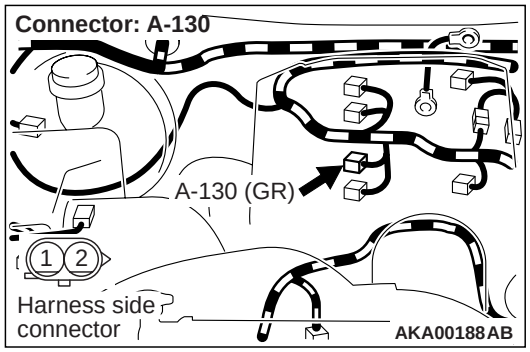
Q: Is the check result normal?
YES : Go to Step 2 .
NO : Repair or replace the connector.

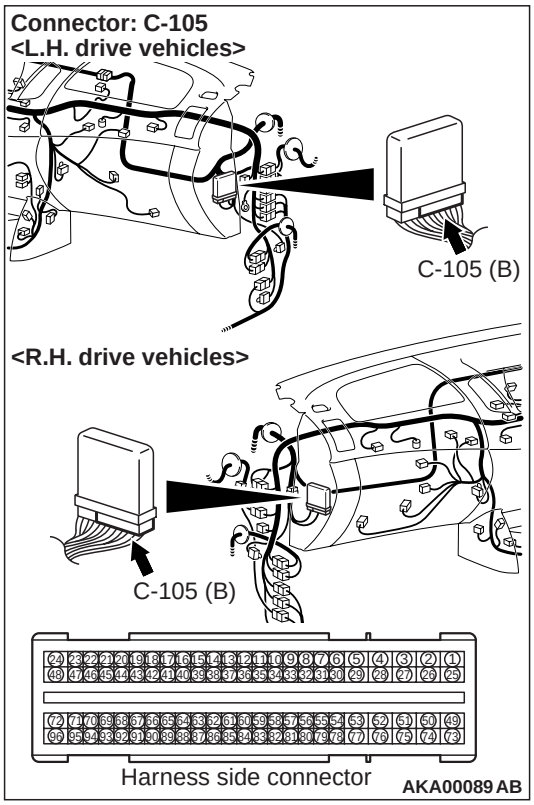
STEP 2. Check No. 3 injector itself.

- Check No. 3 injector itself (Refer to P.13A-595).

Q: Is the check result normal?
YES : Go to Step 3 .
NO : Replace the No. 3 injector. After replacing the Injector, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).

STEP 3. Check harness between No. 3 injector connector and engine-ECU connector.



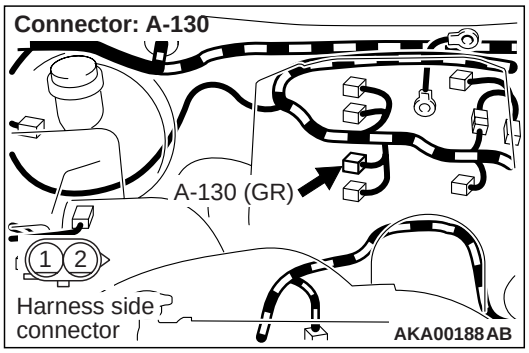


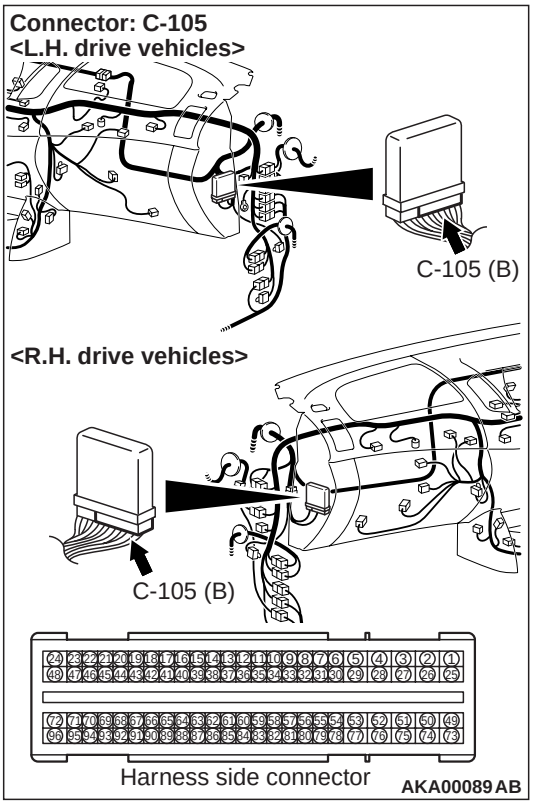
Check harness between A-130 (terminal No. 1) No. 3 injector connector and C-105 (terminal No. 50) engine-ECU connector.

- Check earthing line for open/short circuit and damage.

Q: Are the check results normal?
YES : Go to Step 4 .
NO : Repair the damaged harness wire.

STEP 4. Check harness between A-130 (terminal No. 2) No. 3 injector connector and C-105 (terminal No. 25) engine-ECU connector.

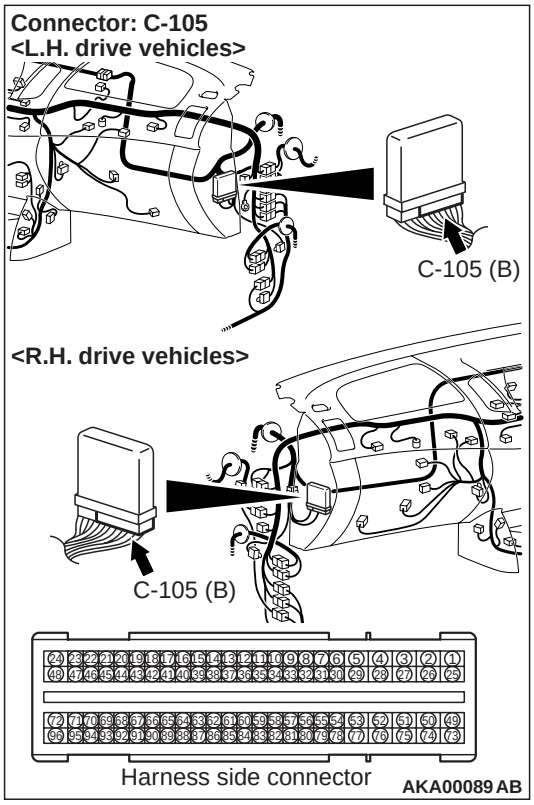




- Check power supply line for open/short circuit and damage.

Q: Is the check result normal?
YES : Go to Step 5 .
NO : Repair or replace the connector.

STEP 5. Connector check: C-105 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 6 .
NO : Repair or replace the connector.

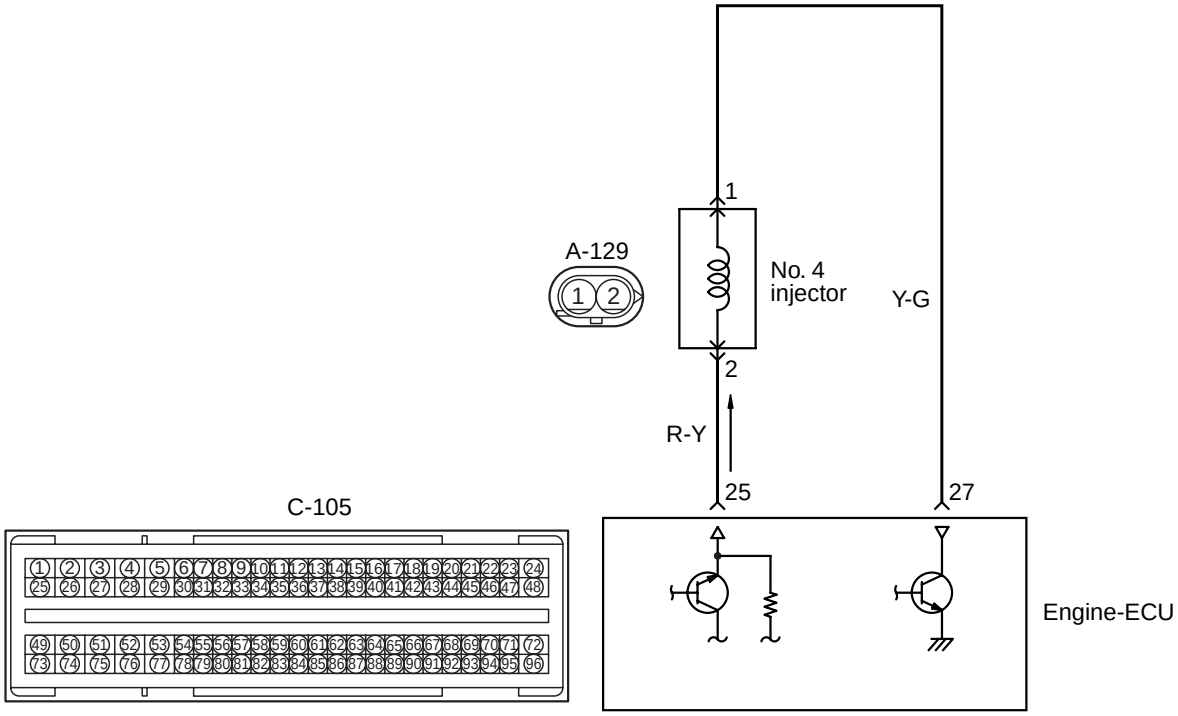
STEP 6. M.U.T.-III diagnosis code

- Reconfirmation of diagnosis code.

Q: Is the diagnosis code set?
YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

Code No. P0204: No. 4 Injector Circuit Malfunction <Euro5>

No. 4 Injector Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V: Violet PU: Purple SI: Silver

AKA00099 AO

OPERATION
- Driving power is supplied from the engine-ECU (terminal No. 25) to the No. 4 injector (terminal No. 2).
- The engine-ECU (terminal No. 27) turn on the power transistor to flow current to the No. 4 injector (terminal No. 1).

FUNCTION
- The engine-ECU monitors peak current during injector drive control to detect disconnection in the injector No. 4 circuit.

TROUBLE JUDGMENT

Check Conditions
- Ignition switch is in ON position
- Battery positive voltage is 8 V or more.
- Except during the engine cranking period
- When an engine-ECU internal capacitor is allowed to be charged

Judgment Criterion
- When the peak current of the No. 4 injector circuit is not detected, the circuit is judged to be open.

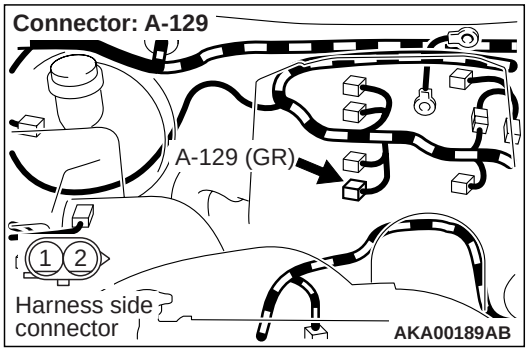
PROBABLE CAUSES
- Failed No. 4 injector
- Open/short circuit or harness damage in No. 4 injector circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

⚠ CAUTION

A high-tension voltage is flowing between the engine-ECU and the injectors while the engine is running. Handle them carefully to avoid receiving electric shocks from the voltage.

STEP 1. Connector check: A-129 No. 4 injector connector



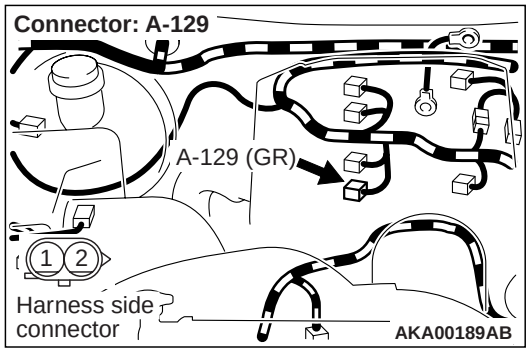
Q: Is the check result normal?
YES : Go to Step 2 .
NO : Repair or replace the connector.

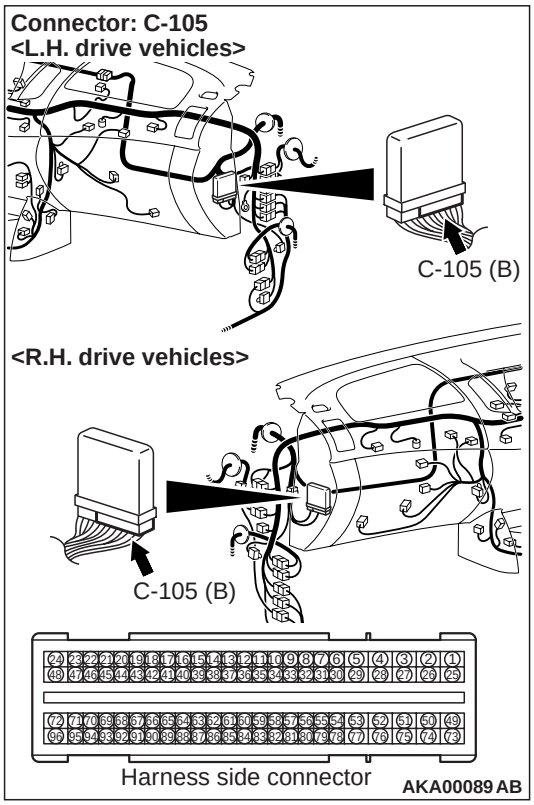
STEP 2. Check No. 4 injector itself.

- Check No. 4 injector itself (Refer to P.13A-595).

Q: Is the check result normal?
YES : Go to Step 3 .
NO : Replace the No. 4 injector. After replacing the Injector, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).

STEP 3. Check harness between No. 4 injector connector and engine-ECU connector.



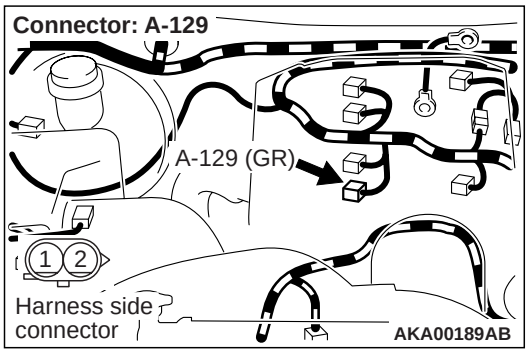


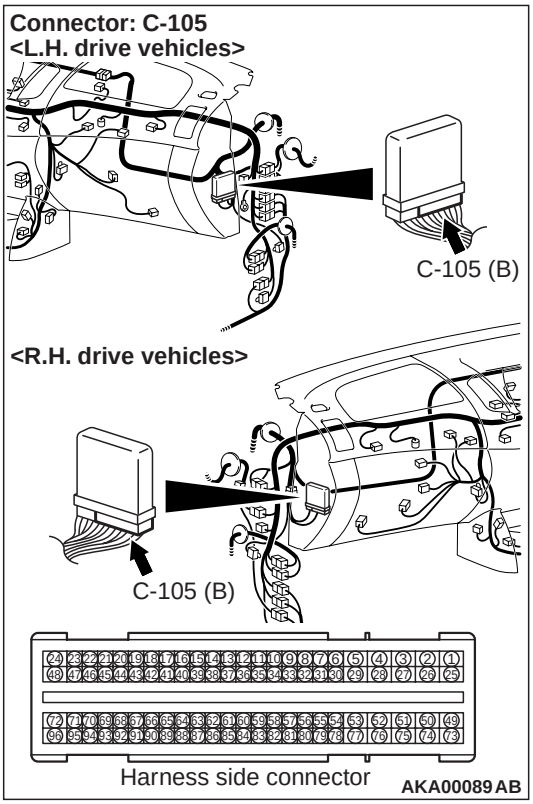
Check harness between A-129 (terminal No. 1) No. 4 injector connector and C-105 (terminal No. 27) engine-ECU connector.

- Check earthing line for open/short circuit and damage.

Q: Are the check results normal?
YES : Go to Step 4 .
NO : Repair the damaged harness wire.

STEP 4. Check harness between A-129 (terminal No. 2) No. 4 injector connector and C-105 (terminal No. 25) engine-ECU connector.

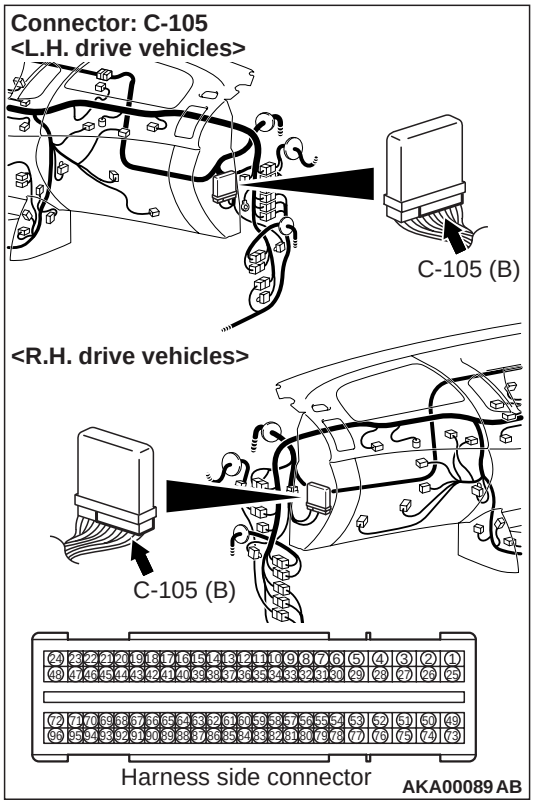




- Check power supply line for open/short circuit and damage.

Q: Is the check result normal?
YES : Go to Step 5 .
NO : Repair or replace the connector.

STEP 5. Connector check: C-105 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 6 .
NO : Repair or replace the connector.

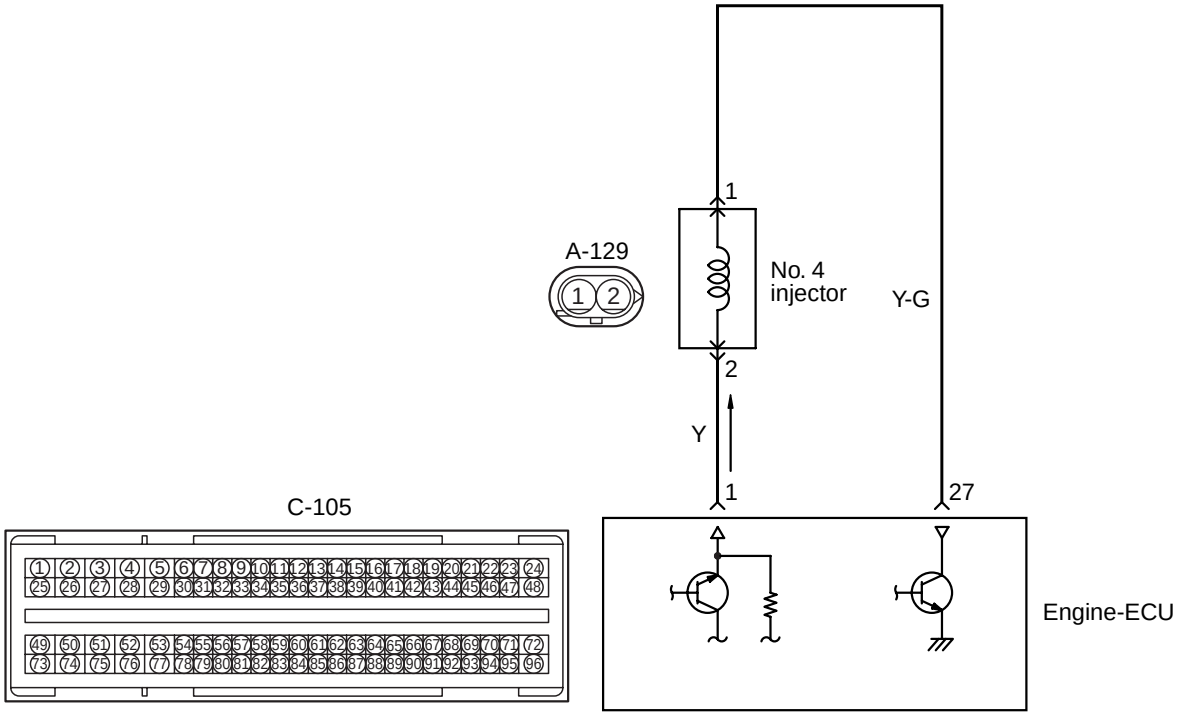
STEP 6. M.U.T.-III diagnosis code

- Reconfirmation of diagnosis code.

Q: Is the diagnosis code set?
YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, carry out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

Code No. P0204: No. 4 Injector Circuit Malfunction <Except Euro5>

No. 4 Injector Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Gray
R: Red P: Pink V: Violet PU: Purple SI: Silver

AKA00099 AM

OPERATION
- Driving power is supplied from the engine-ECU (terminal No. 1) to the No. 4 injector (terminal No. 2).
- The engine-ECU (terminal No. 27) turn on the power transistor to flow current to the No. 4 injector (terminal No. 1).

FUNCTION
- The engine-ECU monitors peak current during injector drive control to detect disconnection in the injector No. 4 circuit.

TROUBLE JUDGMENT

Check Conditions
- Ignition switch is in ON position
- Battery positive voltage is 8 V or more.
- Except during the engine cranking period
- When an engine-ECU internal capacitor is allowed to be charged

Judgment Criterion
- When the peak current of the No. 4 injector circuit is not detected, the circuit is judged to be open.

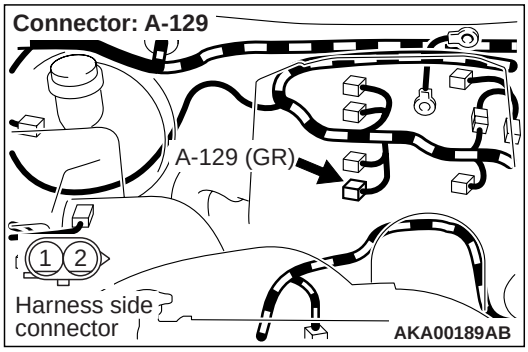
PROBABLE CAUSES
- Failed No. 4 injector
- Open/short circuit or harness damage in No. 4 injector circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

⚠ CAUTION

A high-tension voltage is flowing between the engine-ECU and the injectors while the engine is running. Handle them carefully to avoid receiving electric shocks from the voltage.

STEP 1. Connector check: A-129 No. 4 injector connector



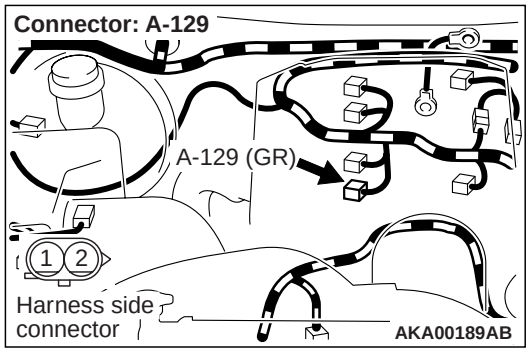
Q: Is the check result normal?
YES : Go to Step 2 .
NO : Repair or replace the connector.

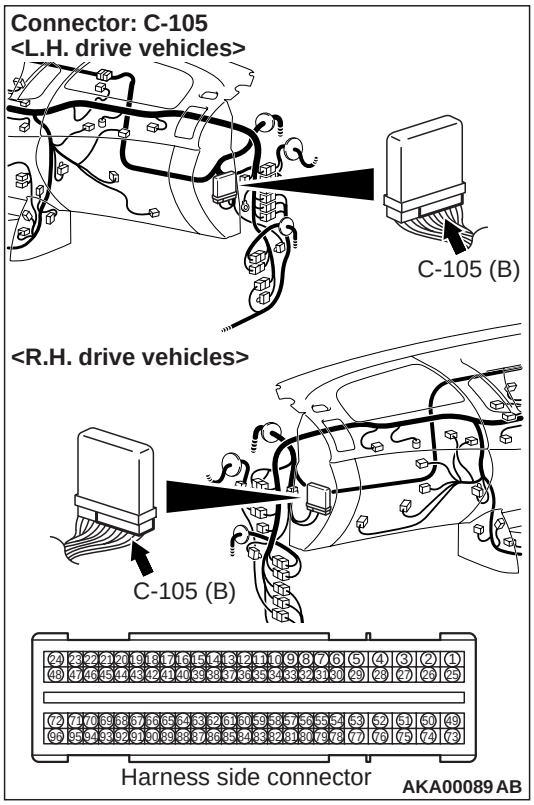
STEP 2. Check No. 4 injector itself.

- Check No. 4 injector itself (Refer to P.13A-595).

Q: Is the check result normal?
YES : Go to Step 3 .
NO : Replace the No. 4 injector. After replacing the Injector, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).

STEP 3. Check harness between No. 4 injector connector and engine-ECU connector.



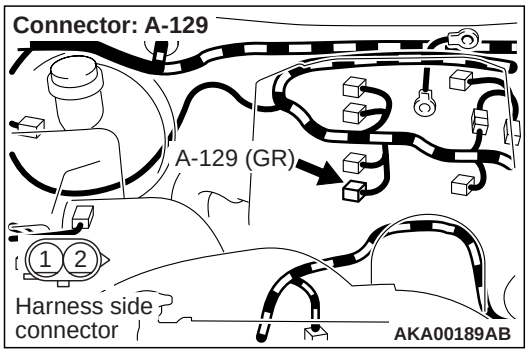


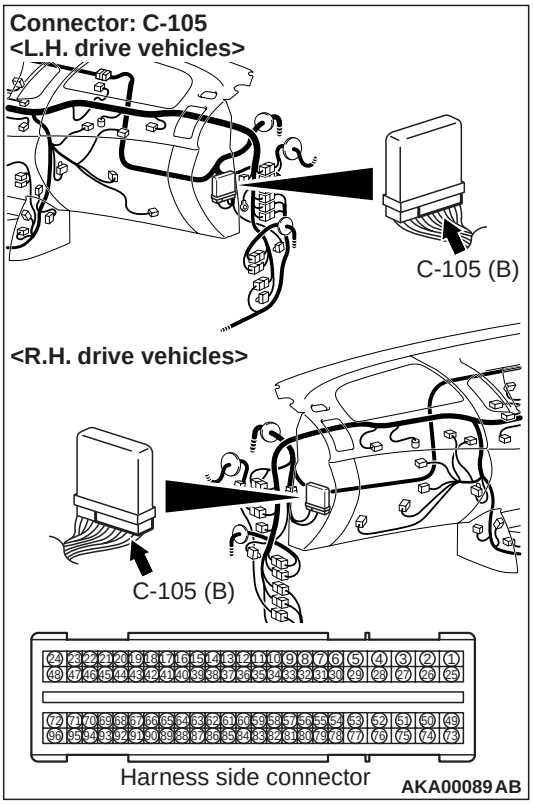
Check harness between A-129 (terminal No. 1) No. 4 injector connector and C-105 (terminal No. 27) engine-ECU connector.

- Check earthing line for open/short circuit and damage.

Q: Are the check results normal?
YES : Go to Step 4 .
NO : Repair the damaged harness wire.

STEP 4. Check harness between A-129 (terminal No. 2) No. 4 injector connector and C-105 (terminal No. 1) engine-ECU connector.

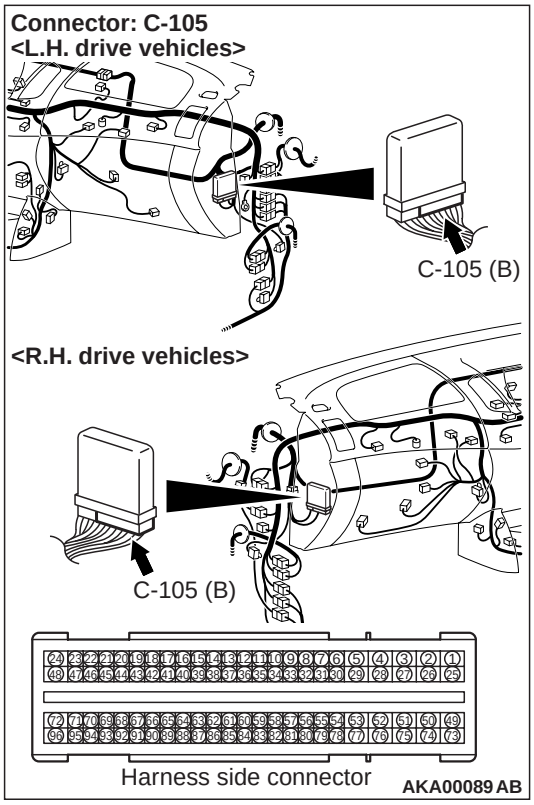




- Check power supply line for open/short circuit and damage.

Q: Is the check result normal?
YES : Go to Step 5 .
NO : Repair or replace the connector.

STEP 5. Connector check: C-105 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 6 .
NO : Repair or replace the connector.

STEP 6. M.U.T.-III diagnosis code

- Reconfirmation of diagnosis code.

Q: Is the diagnosis code set?
YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

Code No. P0219: Engine Overspeed Condition

OPERATION

- Refer to Code No. P0335: Crank Angle Sensor System P.13A-184.

FUNCTION
- The engine-ECU monitors the engine speeds based on the signals from the crank angle sensor.
- The engine-ECU checks whether the engine speeds are too high.

TROUBLE JUDGMENT

Check Condition
- Ignition switch is in ON position

Judgment Criterion
- Engine speed is 5,500 r/min or more

PROBABLE CAUSE
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code

Q: Is any other diagnosis code than P0219 output?

YES : Inspection chart for diagnosis codes (Refer to P.13A-21).
NO : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

Code No. P0234: Turbocharger Overboost Condition <Except Euro5>

FUNCTION
- The engine-ECU checks whether the boost pressure is not higher than the specified value.

TROUBLE JUDGMENT

Check Condition
- Engine is running

Judgement Criterion
- The boost pressure exceeds the abnormality determination value for 3 seconds.

PROBABLE CAUSES
- Failed the waste gate actuator
- Failed the engine-ECU

DIAGNOSIS

STEP 1. Check waste gate actuator itself.
- Check waste gate actuator itself (Refer to GROUP 15 – On-vehicle Service – Waste Gate Actuator Check).

Q: Is the check result normal?

YES : Go to Step 2 .
NO : Replace the waste gate actuator.

STEP 2. M.U.T.-III diagnosis code
- Reconfirmation of diagnosis code.

Q: Is the diagnosis code set?
YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, carry out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

Code No. P0299: Turbocharger Under Boost Condition

FUNCTION
- The engine-ECU checks whether the boost pressure is not lower than the specified value.

TROUBLE JUDGMENT

Check Condition
- Engine is running

Judgment Criterion
- The opening degree of accelerator pedal is 23% for 3 seconds and the boost pressure is not lower than the specified value.

PROBABLE CAUSES
- Intercooler air hose disconnected or damaged
- Vacuum hose of manifold absolute pressure sensor disconnected or damaged
- Failed manifold absolute pressure sensor
- Failed engine-ECU

DIAGNOSIS

STEP 1. Check on intercooler air hose.
- Check whether the intercooler air hose is disconnected or damaged.

Q: Is the check result normal?
YES : Go to Step 2 .
NO : Repair.

STEP 2. Check on vacuum hose of manifold absolute pressure sensor.
- Check whether the vacuum hose of manifold absolute pressure sensor is disconnected or damaged.

Q: Is the check result normal?
YES : Go to Step 3 .
NO : Repair.

STEP 3. Check turbocharger supercharging pressure..
- Check turbocharger supercharging pressure (Refer to GROUP 15 – On-vehicle – Turbocharger Supercharging Pressure Check).

Q: Is the check result normal?
YES : Go to Step 4 .
NO : Repair.

STEP 4. M.U.T.-III diagnosis code
- Reconfirmation of diagnosis code.

Q: Is the check result normal?
YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

Code No. P0301: No. 1 Cylinder Injector Malfunction (No Injection)

FUNCTION
- The Engine-ECU, by monitoring the variation in the engine revolution, detects the non-fuel injection state.

TROUBLE JUDGMENT

Check Conditions
- During the normal engine operation
- Engine coolant temperature is 80°C or higher.
- Crank angle sensor is normal.

Judgment Criterion
- The variation in the engine revolution is more than the specified value.

PROBABLE CAUSES
- Failed No. 1 injector
- No. 1 fuel injection pipe clogged
- Failed Engine-ECU

DIAGNOSIS PROCEDURE

⚠ CAUTION

A high-tension voltage is flowing between the engine-ECU and the injectors while the engine is running. Handle them carefully to avoid receiving electric shocks from the voltage.

STEP 1. M.U.T.-III diagnosis code

- After erasing the diagnosis code through M.U.T.-III, operate the engine in the warm-up state and confirm and confirm whether the diagnosis code is output

Q: Is the diagnosis code set?

YES : Go to Step 2 .

NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

STEP 2. Check for No.1 fuel injection pipe clogged

- Remove the No.1 fuel injection pipe.
- Check whether No.1 fuel injection pipe is clogged or not.

Q: Is it clogged?

YES : Clean or replace the No. 1 fuel injection pipe.

NO : Replace the No.1 injector. After replacing the injector, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). Then go to Step 3 .

STEP 3. M.U.T.-III diagnosis code

- After erasing the diagnosis code through M.U.T.-III, operate the engine in the warm-up state and confirm and confirm whether the diagnosis code is output.

Q: Is the diagnosis code set?

YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

NO : The check is end.

Code No. P0302: No. 2 Cylinder Injector Malfunction (No Injection)

FUNCTION

- The Engine-ECU, by monitoring the variation in the engine revolution, detects the non-fuel injection state.

TROUBLE JUDGMENT

Check Conditions

- During the normal engine operation
- Engine coolant temperature is 80°C or higher.
- Crank angle sensor is normal.

Judgment Criterion

- The variation in the engine revolution is more than the specified value.

PROBABLE CAUSES

- Failed No. 2 injector
- No. 2 fuel injection pipe clogged
- Failed Engine-ECU

DIAGNOSIS PROCEDURE

⚠ CAUTION

A high-tension voltage is flowing between the engine-ECU and the injectors while the engine is running. Handle them carefully to avoid receiving electric shocks from the voltage.

STEP 1. M.U.T.-III diagnosis code

- After erasing the diagnosis code through M.U.T.-III, operate the engine in the warm-up state and confirm and confirm whether the diagnosis code is output

Q: Is the diagnosis code set?

YES : Go to Step 2 .
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

STEP 2. Check for No. 2 fuel injection pipe clogged
- Remove the No. 2 fuel injection pipe.
- Check whether No. 2 fuel injection pipe is clogged or not.

Q: Is it clogged?
YES : Clean or replace the No. 2 fuel injection pipe.
NO : Replace the No. 2 injector. After replacing the injector, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). Then go to Step 3 .

STEP 3. M.U.T.-III diagnosis code
- After erasing the diagnosis code through M.U.T.-III, operate the engine in the warm-up state and confirm and confirm whether the diagnosis code is output.

Q: Is the diagnosis code set?
YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).
NO : The check is end.

Code No. P0303: No. 3 Cylinder Injector Malfunction (No Injection)

FUNCTION
- The Engine-ECU, by monitoring the variation in the engine revolution, detects the non-fuel injection state.

TROUBLE JUDGMENT

Check Conditions
- During the normal engine operation
- Engine coolant temperature is 80°C or higher.
- Crank angle sensor is normal.

Judgment Criterion
- The variation in the engine revolution is more than the specified value.

PROBABLE CAUSES
- Failed No. 3 injector
- No. 3 fuel injection pipe clogged
- Failed Engine-ECU

DIAGNOSIS PROCEDURE

⚠ CAUTION
A high-tension voltage is flowing between the engine-ECU and the injectors while the engine is running. Handle them carefully to avoid receiving electric shocks from the voltage.

STEP 1. M.U.T.-III diagnosis code
- After erasing the diagnosis code through M.U.T.-III, operate the engine in the warm-up state and confirm and confirm whether the diagnosis code is output

Q: Is the diagnosis code set?
YES : Go to Step 2 .
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

STEP 2. Check for No. 3 fuel injection pipe clogged
- Remove the No. 3 fuel injection pipe.
- Check whether No. 3 fuel injection pipe is clogged or not.

Q: Is it clogged?

YES : Clean or replace the No. 3 fuel injection pipe.
NO : Replace the No. 3 injector. After replacing the injector, register the injector identification code and learn fuel injection. (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). Then go to Step 3 .

STEP 3. M.U.T.-III diagnosis code
- After erasing the diagnosis code through M.U.T.-III, operate the engine in the warm-up state and confirm and confirm whether the diagnosis code is output.

Q: Is the diagnosis code set?

YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).
NO : The check is end.

Code No. P0304: No. 4 Cylinder Injector Malfunction (No Injection)

FUNCTION
- The Engine-ECU, by monitoring the variation in the engine revolution, detects the non-fuel injection state.

TROUBLE JUDGMENT

Check Conditions
- During the normal engine operation
- Engine coolant temperature is 80°C or higher.
- Crank angle sensor is normal.

Judgment Criterion
- The variation in the engine revolution is more than the specified value.

PROBABLE CAUSES
- Failed No. 4 injector
- No. 4 fuel injection pipe clogged
- Failed Engine-ECU

DIAGNOSIS PROCEDURE

⚠ CAUTION
A high-tension voltage is flowing between the engine-ECU and the injectors while the engine is running. Handle them carefully to avoid receiving electric shocks from the voltage.

STEP 1. M.U.T.-III diagnosis code
- After erasing the diagnosis code through M.U.T.-III, operate the engine in the warm-up state and confirm and confirm whether the diagnosis code is output

Q: Is the diagnosis code set?

YES : Go to Step 2 .
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

STEP 2. Check for No.4 fuel injection pipe clogged
- Remove the No. 4 fuel injection pipe.
- Check whether No.4 fuel injection pipe is clogged or not.

Q: Is it clogged?
YES : Clean or replace the No. 4 fuel injection pipe.
NO : Replace the No. 4 injector. After replacing the injector, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). Then go to Step 3 .

STEP 3. M.U.T.-III diagnosis code
- After erasing the diagnosis code through M.U.T.-III, operate the engine in the warm-up state and confirm and confirm whether the diagnosis code is output.

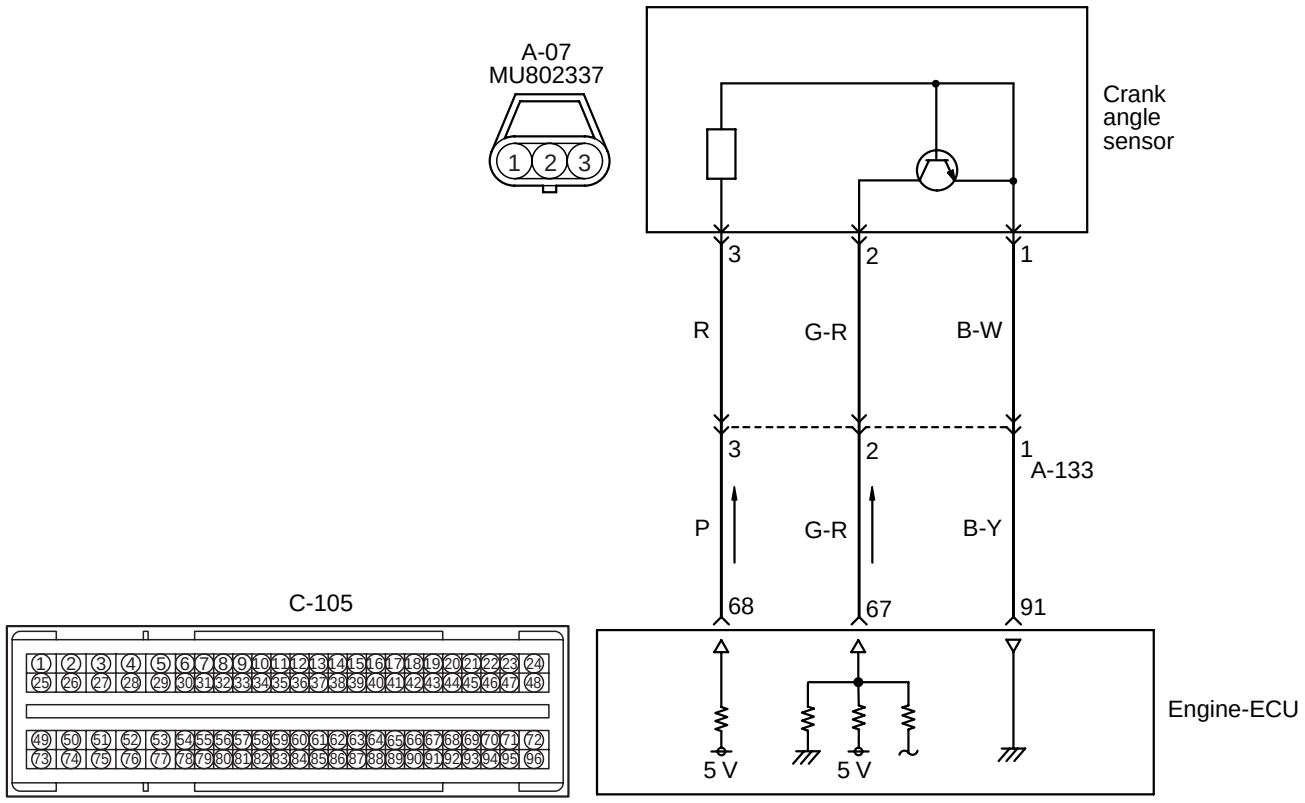
Q: Is the diagnosis code set?

YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

NO : The check is end.

Code No. P0335: Crank Angle Sensor System

Crank Angle Sensor Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V: Violet PU: Purple SI: Silver

AKA00100 AB

OPERATION

- A power voltage of 5 V is applied to the crank angle sensor power terminal (terminal No. 3) from the engine-ECU (terminal No. 68) and earthed to engine-ECU (terminal No. 91) from the crank angle sensor (terminal No. 1).
- The sensor signal is inputted to the engine-ECU (terminal No. 67) from the crank angle sensor output terminal (terminal No. 2).

FUNCTION

- The crank angle sensor detects the crank angle (position) and inputs a pulse signal to the engine-ECU.
- In response to the signal, the engine ECU detects the engine speed, controls the fuel injection timing and fuel injection quantity, etc.

TROUBLE JUDGMENT

Check Condition

- Battery positive voltage is 6 – 16 V.

Judgment Criterion

- The number of output pulses from the crank angle sensor per engine rotation is one or less.

PROBABLE CAUSES

- Failed crank angle sensor
- Open/short circuit in crank angle sensor circuit or loose connector contact
- Failed engine-ECU

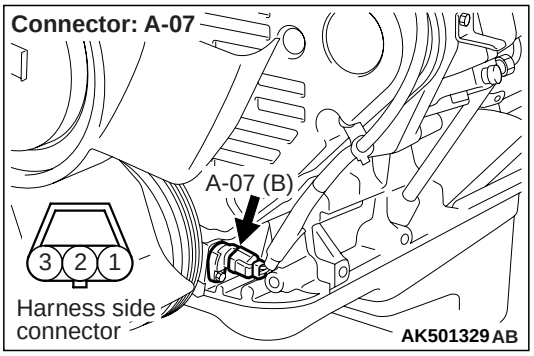
DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III data list

- Refer to Data List Reference Table
  a. Item 2: Engine revolution

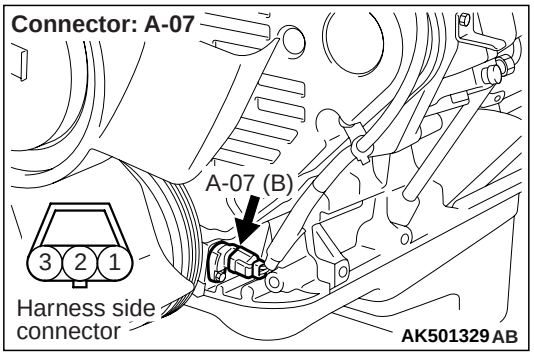
Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).
NO : Go to Step 2 .

STEP 2. Connector check: A-07 crank angle sensor connector



Q: Is the check result normal?
YES : Go to Step 3 .
NO : Repair or replace the connector.

STEP 3. Perform voltage measurement at A-07 crank angle sensor connector.

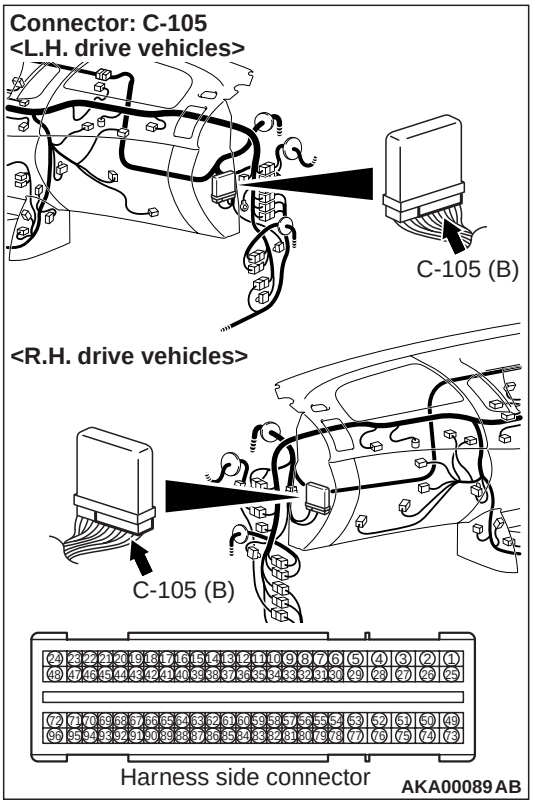


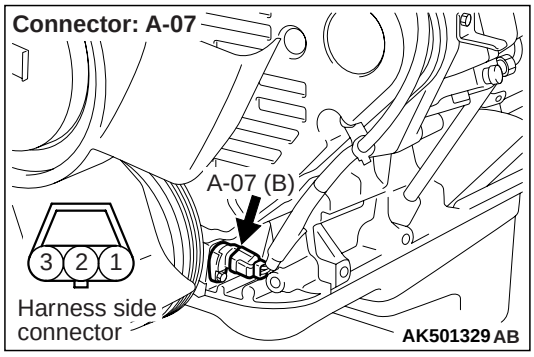
- Use special tool test harness (MB991709) to connect connector, and measure at pick-up harness.
- Ignition switch: ON
- Voltage between terminal No. 2 and earth.

OK: 4.9 – 5.1 V

Q: Is the check result normal?
YES : Go to Step 9 .
NO : Go to Step 4 .

STEP 4. Perform voltage measurement at C-105 engine-ECU connector.





- Measure engine-ECU terminal voltage.
- Disconnect A-07 crank angle sensor connector.
- Ignition switch: ON
- Voltage between terminal No. 67 and earth.

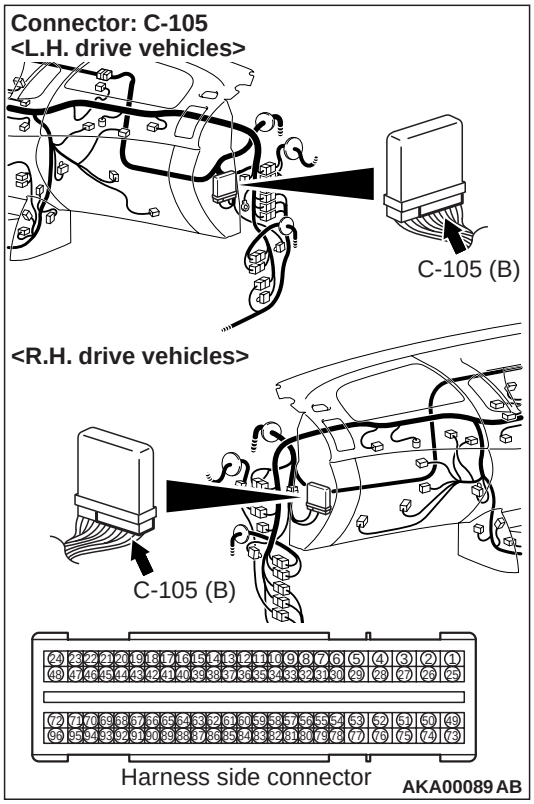
OK: 4.9 – 5.1 V

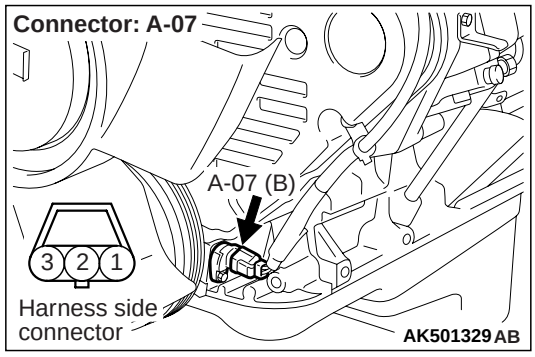
Q: Is the check result normal?

YES : Go to Step 5 .

NO : Go to Step 6 .

STEP 5. Connector check: C-105 engine-ECU connector





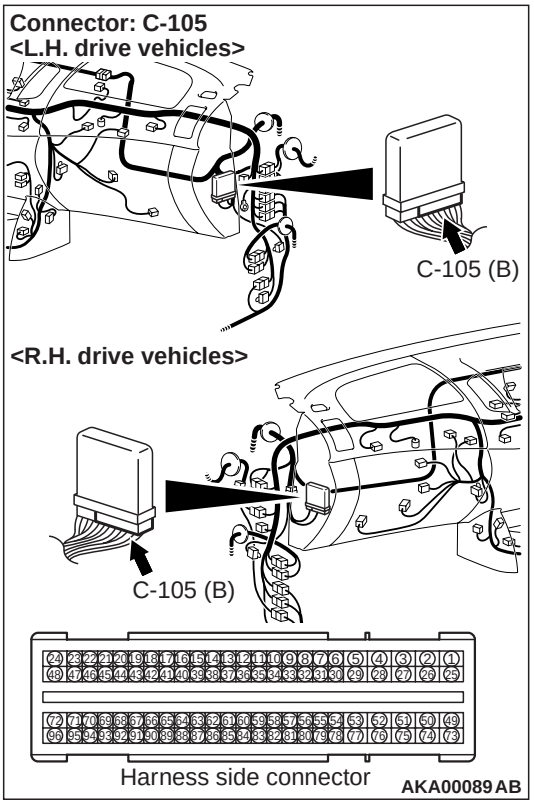
Q: Is the check result normal?

YES : Check intermediate connector A-133, and repair if necessary. If intermediate connector is normal, check and repair harness between A-07 (terminal No. 2) crank angle sensor connector and C-105 (terminal No. 67) engine-ECU connector.

- Check output line for open circuit and damage.

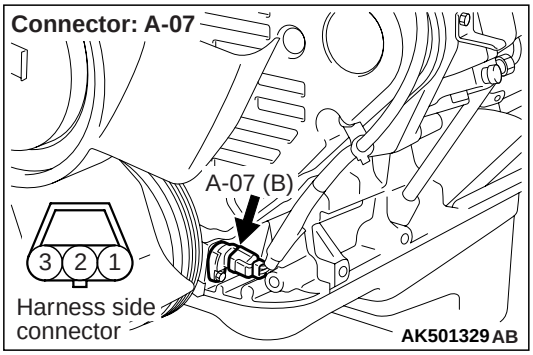
NO : Repair or replace the connector.

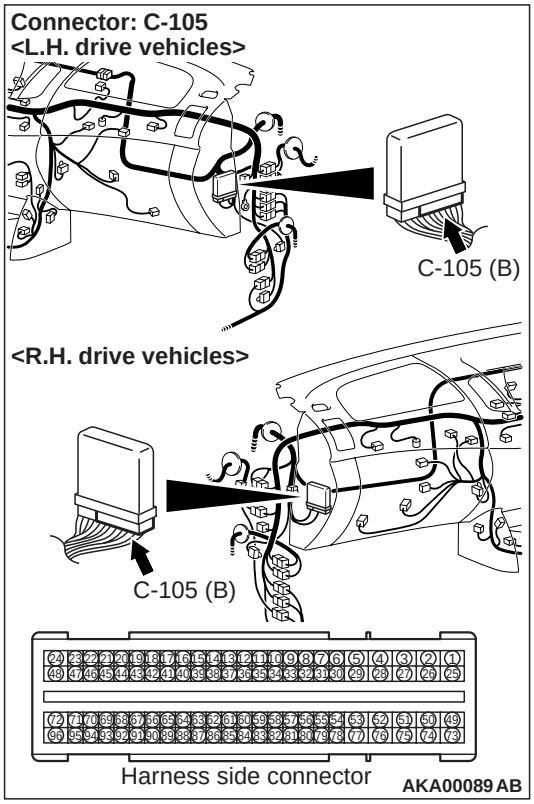
STEP 6. Connector check: C-105 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair or replace the connector.

STEP 7. Check harness between A-07 (terminal No. 2) crank angle sensor connector and C-105 (terminal No. 67) engine-ECU connector.





NOTE: Before checking harness, check intermediate connector A-133, and repair if necessary.
- Check output line for short circuit.

Q: Is the check result normal?
YES : Go to Step 8 .
NO : Repair the damaged harness wire.

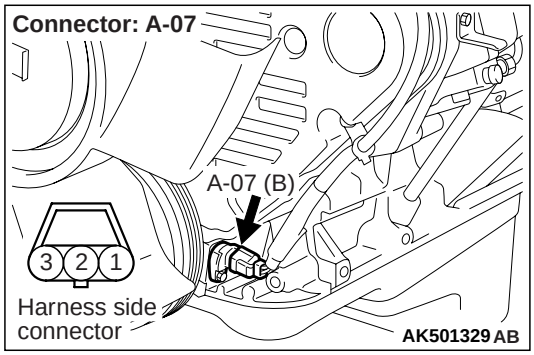
STEP 8. M.U.T.-III data list
- Refer to Data List Reference Table
  a. Item 2: Engine revolution

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

NO : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

STEP 9. Perform voltage measurement at A-07 crank angle sensor connector.



- Use special tool test harness (MB991709) to connect connector, and measure at pick-up harness.
- Ignition switch: ON
- Voltage between terminal No. 3 and earth.

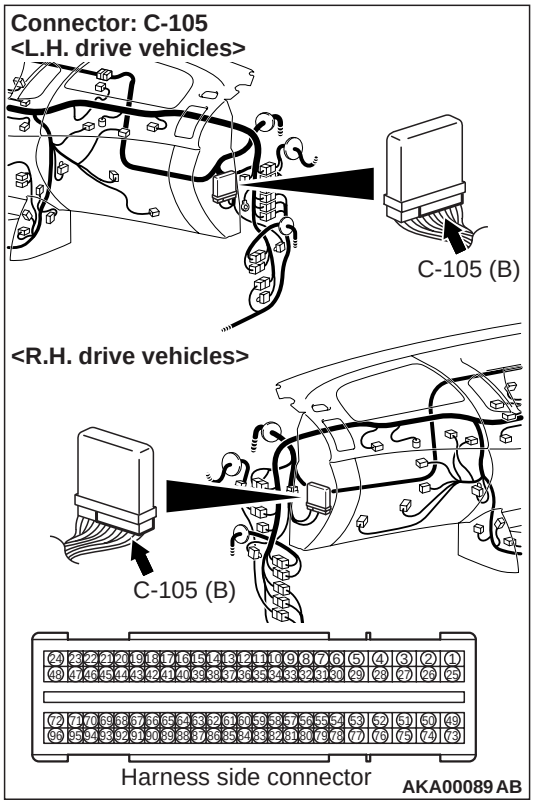
OK: 4.9 – 5.1 V

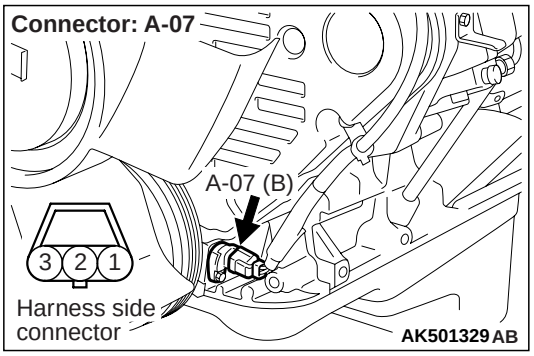
Q: Is the check result normal?

YES : Go to Step 11 .

NO : Go to Step 10 .

STEP 10. Connector check: C-105 engine-ECU connector





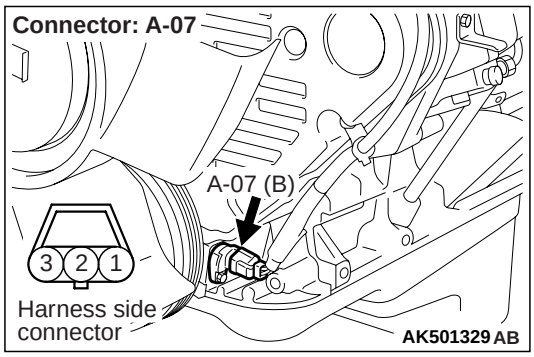
Q: Is the check result normal?

YES : Check intermediate connector A-133, and repair if necessary. If intermediate connector is normal, check and repair harness between A-07 (terminal No. 3) crank angle sensor connector and C-105 (terminal No. 68) engine-ECU connector.

- Check power supply line for open/ short circuit and damage.

NO : Repair or replace the connector.

STEP 11. Perform resistance measurement at A-07 crank angle sensor connector.

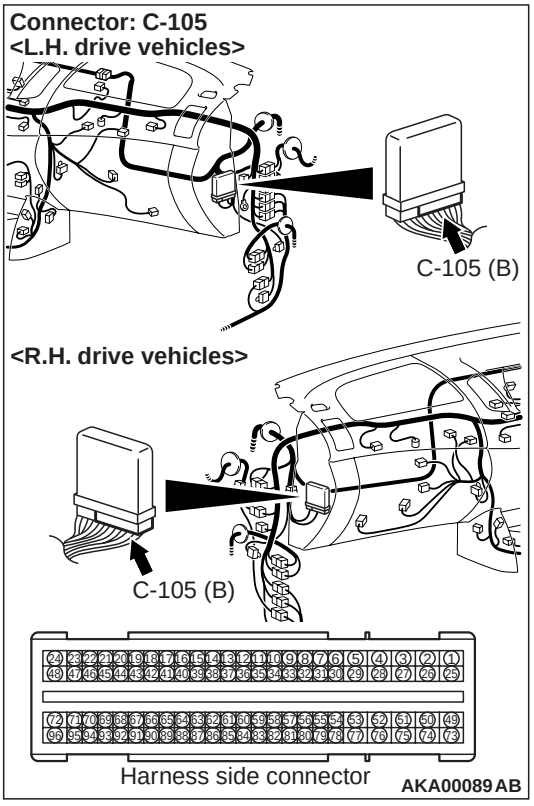


- Disconnect connector, and measure at harness side.
- Resistance between terminal No. 1 and earth.

OK: Continuity (2 Ω or less)

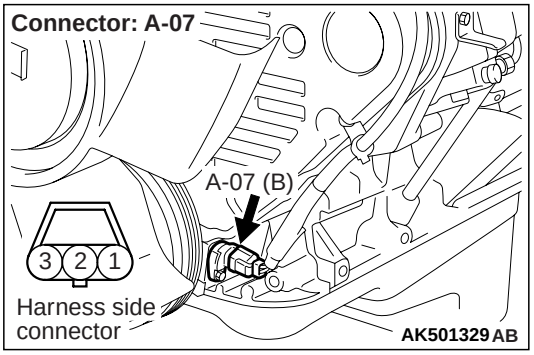
Q: Is the check result normal?
YES : Go to Step 14 .
NO : Go to Step 12 .

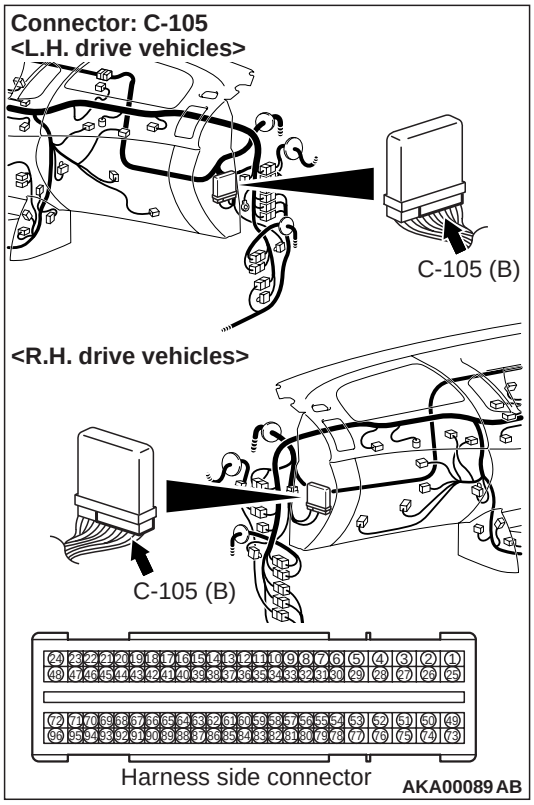
STEP 12. Connector check: C-105 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 13 .
NO : Repair or replace the connector.

STEP 13. Check harness between A-07 (terminal No. 1) crank angle sensor connector and C-105 (terminal No. 91) engine-ECU connector.



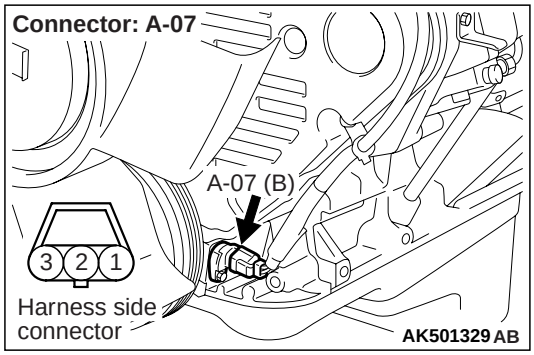


NOTE: Before checking harness, check intermediate connector A-133, and repair if necessary.

- Check earthing line for open circuit and damage.

Q: Is the check result normal?
YES : Go to Step 8 .
NO : Repair the damaged harness wire.

STEP 14. Perform output wave pattern measurement at A-07 crank angle sensor (Using an oscilloscope).



- Use special tool test harness (MB991709) to connect connector, and measure at pick-up harness.
- Engine: Idling
- Transmission: Neutral <M/T> or P range <A/T>
- Voltage between terminal No. 2 and earth.

OK: Waveforms should be displayed on Inspection procedure using an oscilloscope (Refer to P.13A-586), its maximum value should be 4.8 V or more, and its minimum valve should be 0.6 V or less with no noise in waveform.

Q: Is the check result normal?

YES : Go to Step 8 .
NO : Go to Step 15 .

STEP 15. Check the crankshaft sensing blade.

Q: Is the check result normal?

YES : Go to Step 16 .
NO : Replace the crankshaft sensing blade

STEP 16. M.U.T-III data list

- Refer to Data List Reference Table
  a. Item 2: Engine revolution

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).
NO : Replace the crank angle sensor

Code No. P0336: Crank Angle Sensor Range/Performance Problem

OPERATION

- Refer to Code No. P0335: Crank Angle Sensor System P.13A-184.

FUNCTION

- The crank angle sensor detects the crank angle (position) and inputs a pulse signal to the engine-ECU.
- In response to the signal, the engine-ECU detects the engine speed, controls the fuel injection timing and fuel injection quantity, etc

TROUBLE JUDGMENT

Check Conditions

- Battery positive voltage is 6 – 16 V.
- Engine speed is 350 r/min or more

Judgment Criterion

- The number of pulses from the crank shaft position sensor per engine rotation is abnormal.

PROBABLE CAUSES

- Failed crank angle sensor
- Open/short circuit in crank angle sensor circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. Installation check of crank angle sensor

- Check whether the crank angle sensor is correctly installed.

Q: Is the check result normal?

YES : Go to Step 2 .
NO : Repair or replace the crank angle sensor.

STEP 2. M.U.T.-III diagnosis code

- Reconfirmation of diagnosis code.

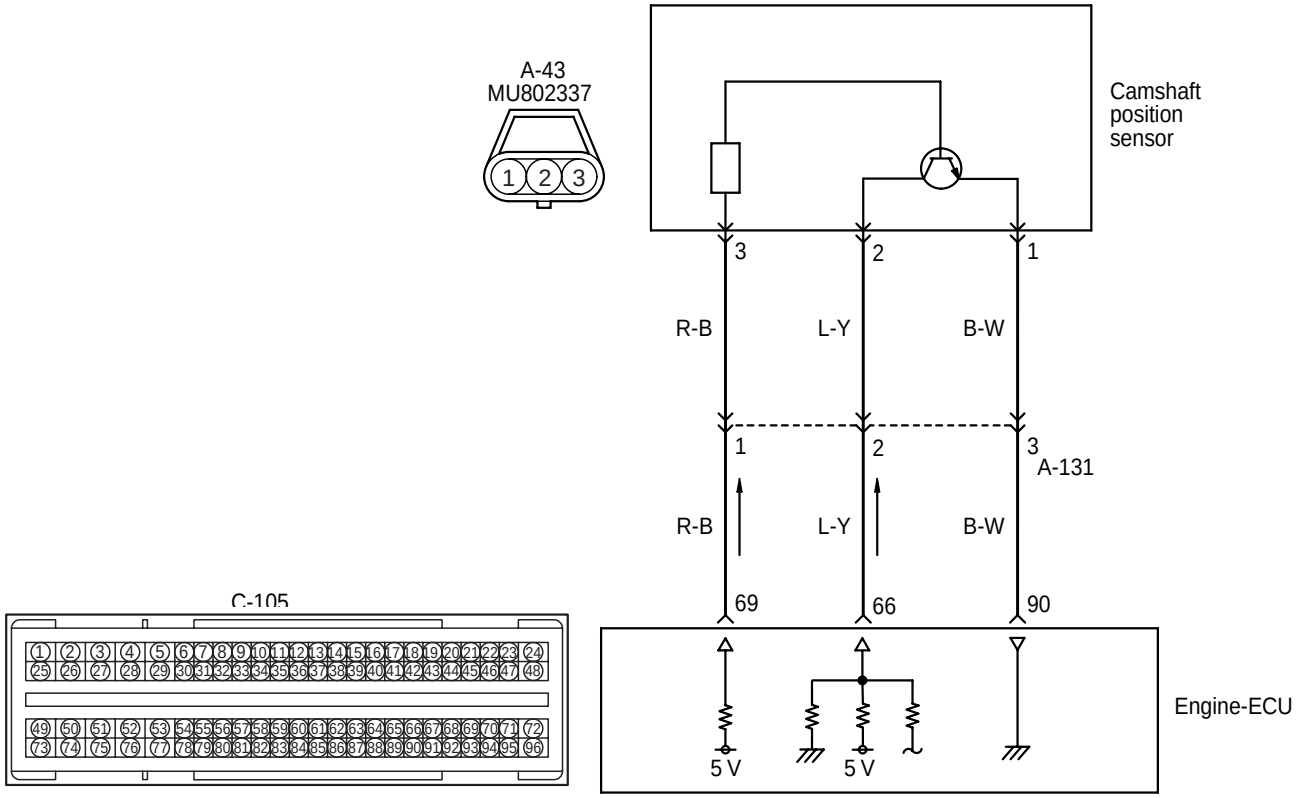
Q: Is the diagnosis code set?

YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

Code No. P0340: Camshaft Position Sensor System

Camshaft Position Sensor Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V: Violet PU: Purple SI: Silver

AKA00197AB

OPERATION

- A power voltage of 5 V is applied to the camshaft position sensor power terminal (terminal No. 3) from the engine-ECU (terminal No. 69) and earthed to engine-ECU (terminal No. 90) from the camshaft position sensor (terminal No. 1).
- The sensor signal is inputted to the engine-ECU (terminal No. 66) from the camshaft position sensor output terminal (terminal No. 2).

FUNCTION

- The camshaft position sensor detects the top dead center on the compression stroke of the No. 1 cylinder and inputs a pulse signal to the engine-ECU.

TROUBLE JUDGMENT

Check Condition

- Battery positive voltage is 6 – 16 V.

Judgment Criterion

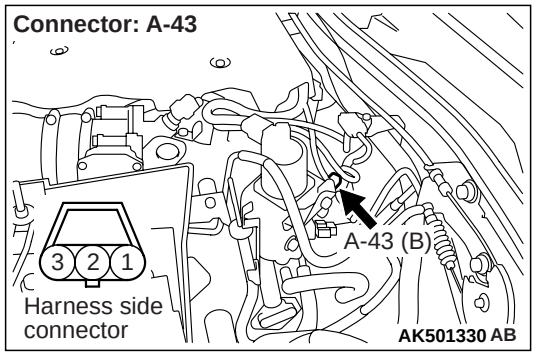
- The number of output pulses from the camshaft position sensor per engine rotation is one or less.

PROBABLE CAUSES

- Failed camshaft position sensor
- Open/short circuit or harness damage in camshaft position sensor circuit or loose connector contact
- Failed engine-ECU

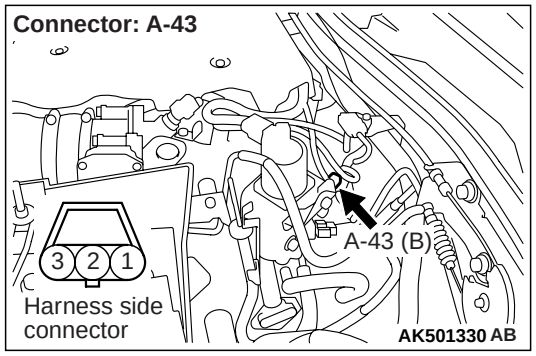
DIAGNOSIS PROCEDURE

STEP 1. Connector check: A-43 camshaft position sensor connector



Q: Is the check result normal?
YES : Go to Step 2 .
NO : Repair or replace the connector.

STEP 2. Perform voltage measurement at A-43 camshaft position sensor connector.

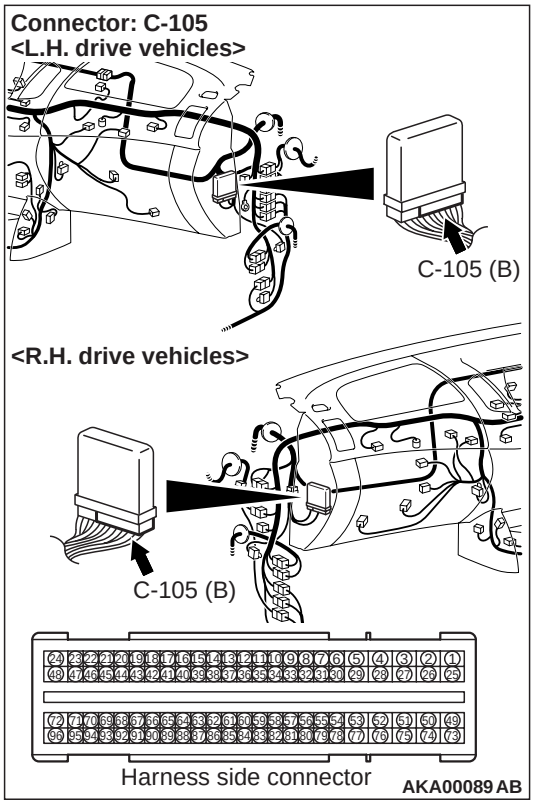


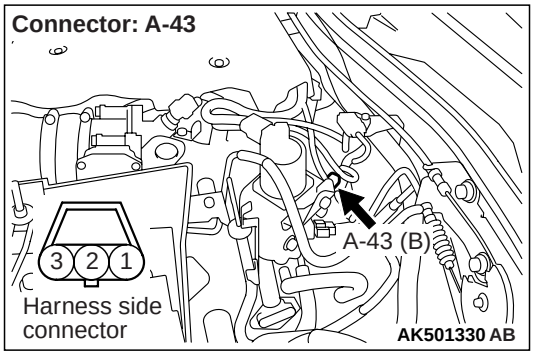
- Use special tool harness (MB991709) to connect connector, and measure at pick-up harness.
- Ignition switch: ON
- Voltage between terminal No. 2 and earth.

OK: 4.9 – 5.1 V

Q: Is the check result normal?
YES : Go to Step 8 .
NO : Go to Step 3 .

STEP 3. Perform voltage measurement at C-105 engine-ECU connector.



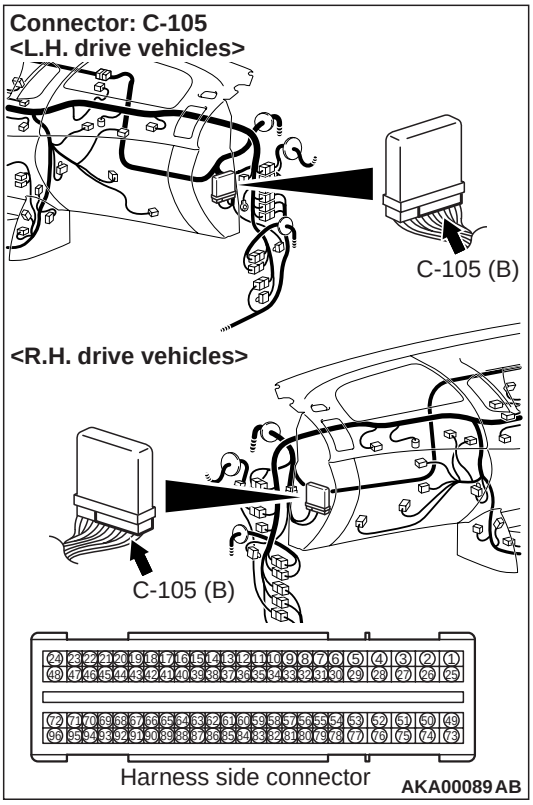


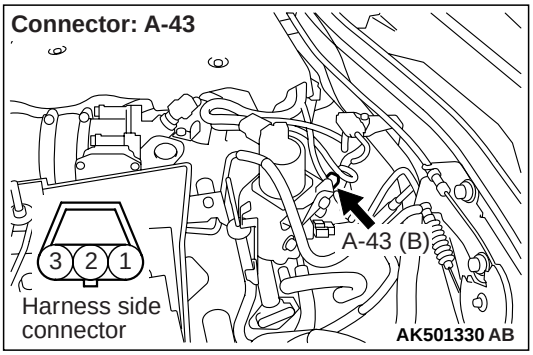
- Measure engine-ECU terminal voltage.
- Disconnect A-43 camshaft position sensor connector.
- Ignition switch: ON
- Voltage between terminal No. 66 and earth.

OK: 4.9 – 5.1 V

Q: Is the check result normal?
YES : Go to Step 4 .
NO : Go to Step 5 .

STEP 4. Connector check: C-105 engine-ECU connector



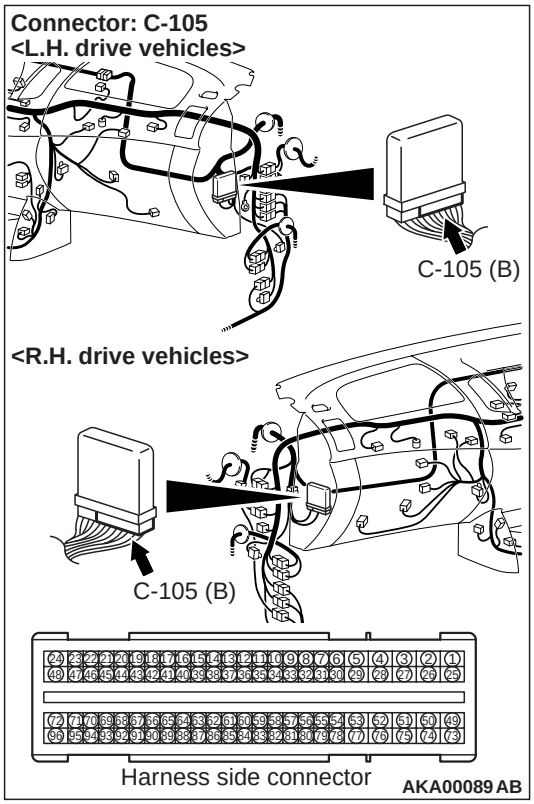


Q: Is the check result normal?

YES : Check intermediate connector A-131, and repair if necessary. If intermediate connector is normal, check and repair harness between A-43 (terminal No. 2) camshaft sensor connector and C-105 (terminal No. 66) engine-ECU connector.
- Check output line for open circuit and damage.

NO : Repair or replace the connector.

STEP 5. Connector check: C-105 engine-ECU connector

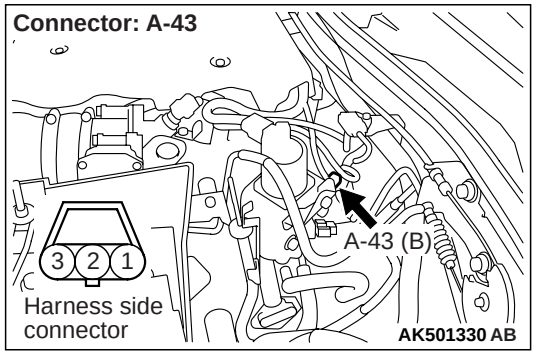


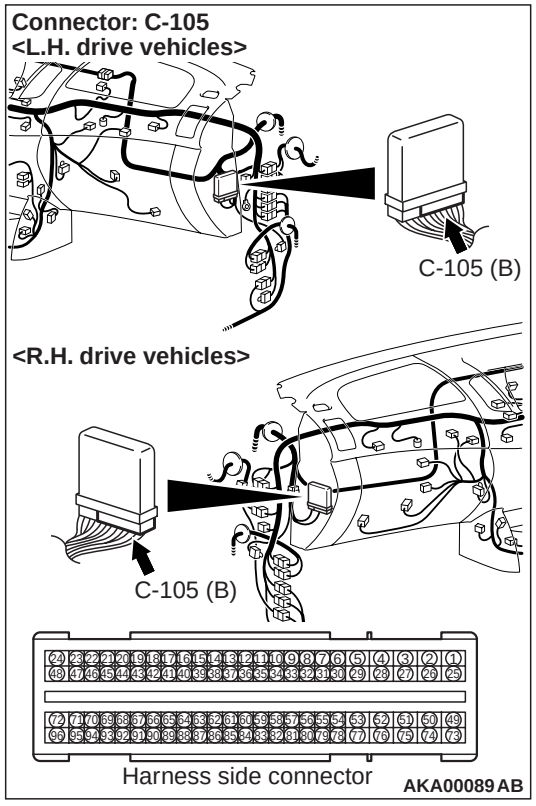
Q: Is the check result normal?

YES : Go to Step 6 .

NO : Repair or replace the connector.

STEP 6. Check harness between A-43 (terminal No. 2) camshaft position sensor connector and C-105 (terminal No. 66) engine-ECU connector.





NOTE: Before checking harness, check intermediate connector A-131, and repair if necessary.

- Check output line for short circuit.

Q: Is the check result normal?

YES : Go to Step 7 .

NO : Repair the damaged harness wire.

STEP 7. M.U.T.-III diagnosis code

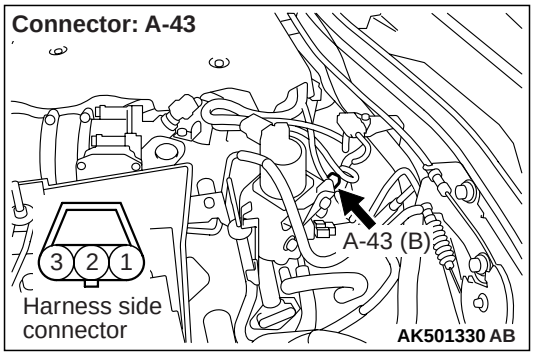
- Reconfirmation of diagnosis code.

Q: Is the diagnosis code set?

YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

STEP 8. Perform voltage measurement at A-43 camshaft position sensor connector.



- Use special tool harness (MB991709) to connect connector, and measure at pick-up harness.
- Ignition switch: ON
- Voltage between terminal No. 3 and earth.

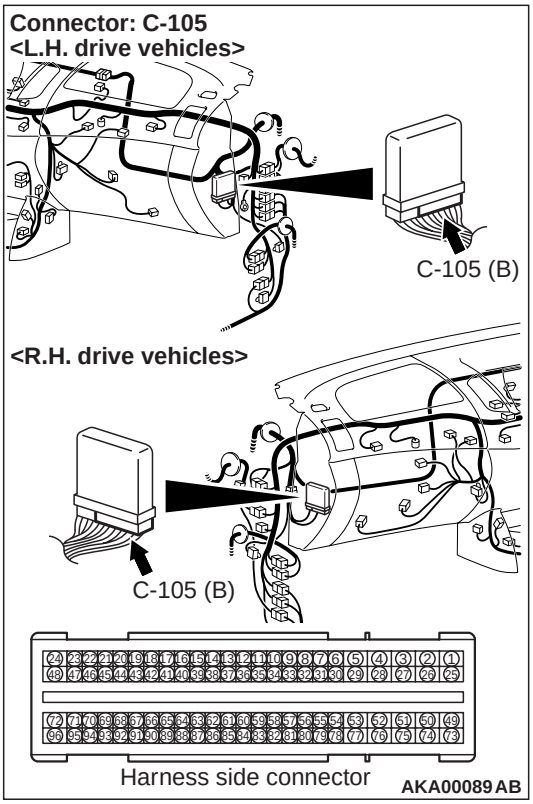
OK: 4.9 – 5.1 V

Q: Is the check result normal?

YES : Go to Step 11 .

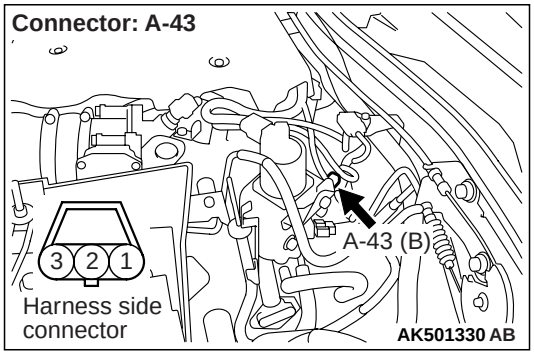
NO : Go to Step 9 .

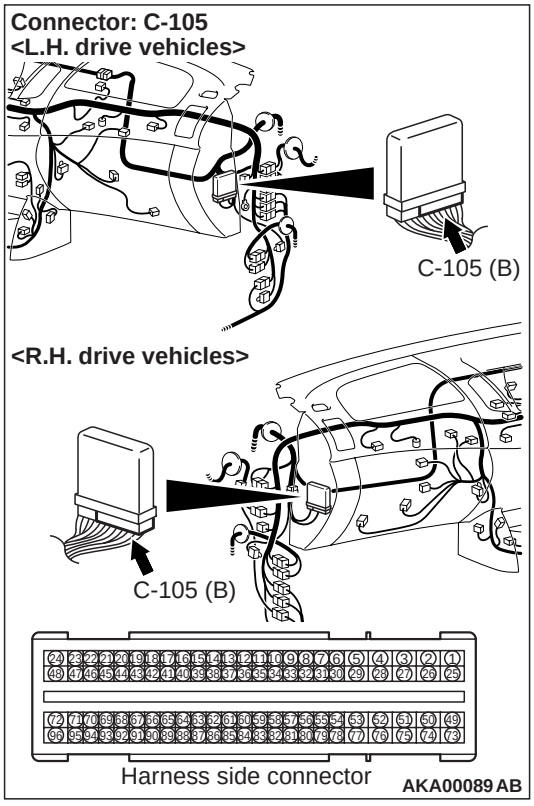
STEP 9. Connector check: C-105 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 10 .
NO : Repair or replace the connector.

STEP 10. Check harness between A-43 (terminal No. 3) camshaft position sensor connector and C-105 (terminal No. 69) engine-ECU connector.



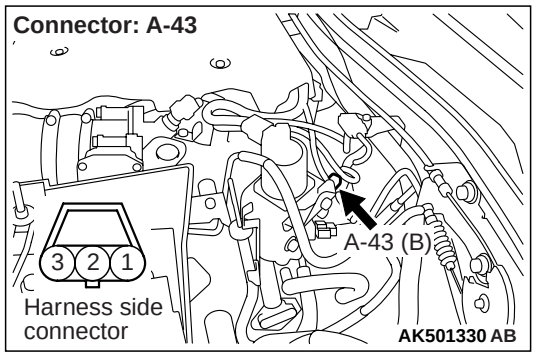


NOTE: Before checking harness, check intermediate connector A-131, and repair if necessary.

- Check power supply line for short circuit and damage.

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair the damaged harness wire.

STEP 11. Perform resistance measurement at A-43 camshaft position sensor connector.

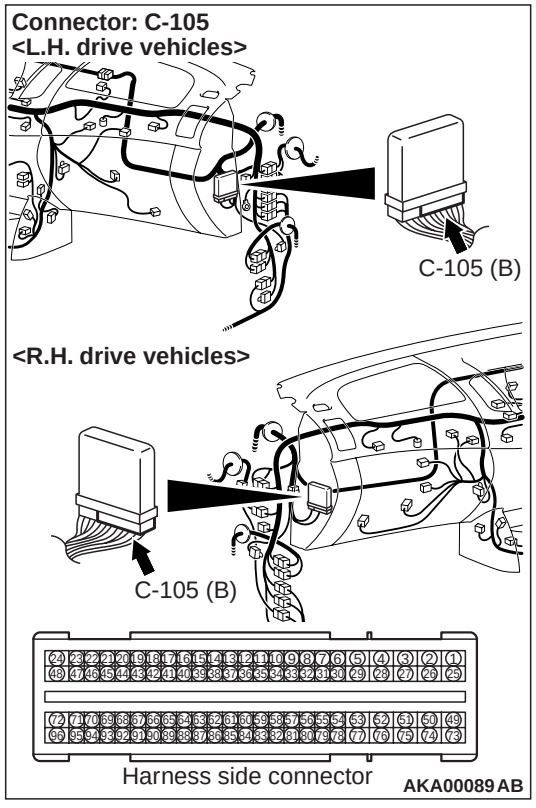


- Disconnect connector, and measure at harness side.
- Resistance between terminal No. 1 and earth.

OK: Continuity (2 Ω or less)

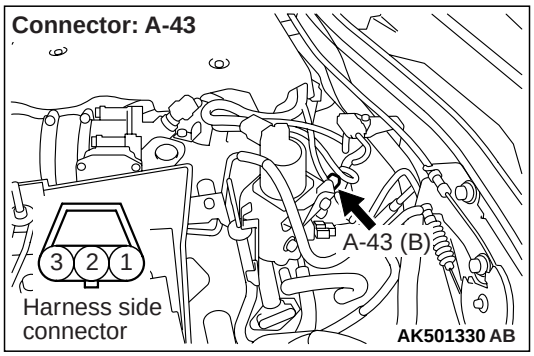
Q: Is the check result normal?
YES : Go to Step 14 .
NO : Go to Step 12 .

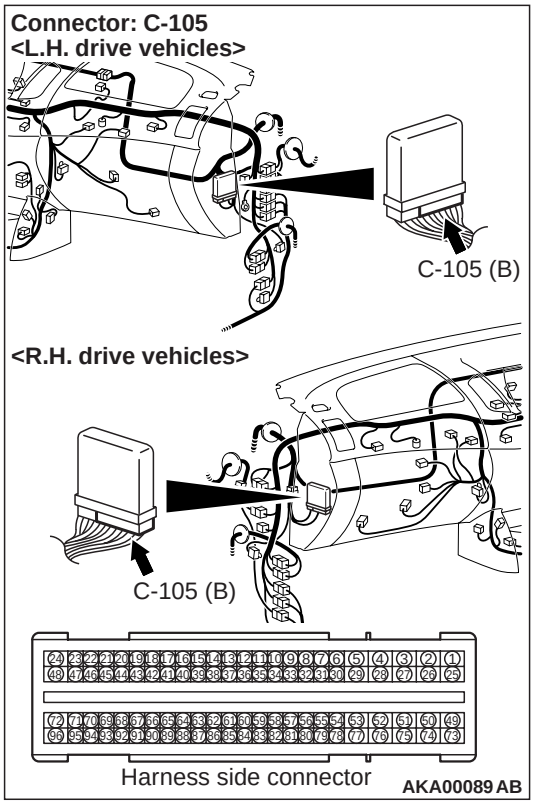
STEP 12. Connector check: C-105 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 13 .
NO : Repair or replace the connector.

STEP 13. Check harness between A-43 (terminal No. 1) camshaft position sensor connector and C-105 (terminal No. 90) engine-ECU connector.



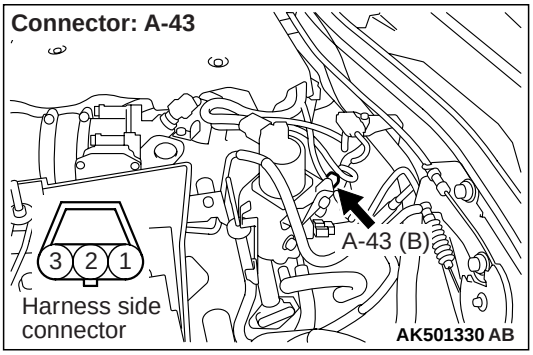


NOTE: Before checking harness, check intermediate connector A-131, and repair if necessary.

- Check earthing line for open circuit and damage.

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair the damaged harness wire.

STEP 14. Perform output wave pattern measurement at A-43 camshaft position sensor (Using an oscilloscope).



- Use special tool test harness (MB991709) to connect connector, and measure at pick-up harness.
- Engine: Idling
- Transmission: Neutral <M/T> or P range <A/T>
- Voltage between terminal No. 2 and earth.

OK: Waveforms should be displayed on Inspection procedure using an oscilloscope (Refer to P.13A-586), its maximum value should be 4.8 V or more, and its minimum valve should be 0.6 V or less with no noise in waveform.

Q: Is the check result normal?

YES : Go to Step 7 .
NO : Replace the camshaft position sensor.

Code No. P0341: Camshaft Position Sensor Range/Performance Problem

OPERATION
- Refer to Code No. P0340: Camshaft Position Sensor System P.13A-192.

FUNCTION
- The camshaft position sensor detects the top dead center on the compression stroke of the No. 1 cylinder and inputs a pulse signal to the engine-ECU.

TROUBLE JUDGMENT

Check Conditions
- Battery positive voltage is 6 – 16 V.
- Engine speed is 350 r/min or more.

Judgment Criterion
- The number of output pulses from the camshaft position sensor every two engine rotations (from when one excessive tooth is detected to when another is detected) is not five.

PROBABLE CAUSES
- Failed camshaft position sensor
- Open/short circuit in camshaft position sensor circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. Installation check of camshaft position sensor
- Check whether the camshaft position sensor is correctly installed.

Q: Is the check result normal?
YES : Go to Step 2 .
NO : Repair or replace the camshaft position sensor.

STEP 2. M.U.T.-III diagnosis code
- Reconfirmation of diagnosis code.

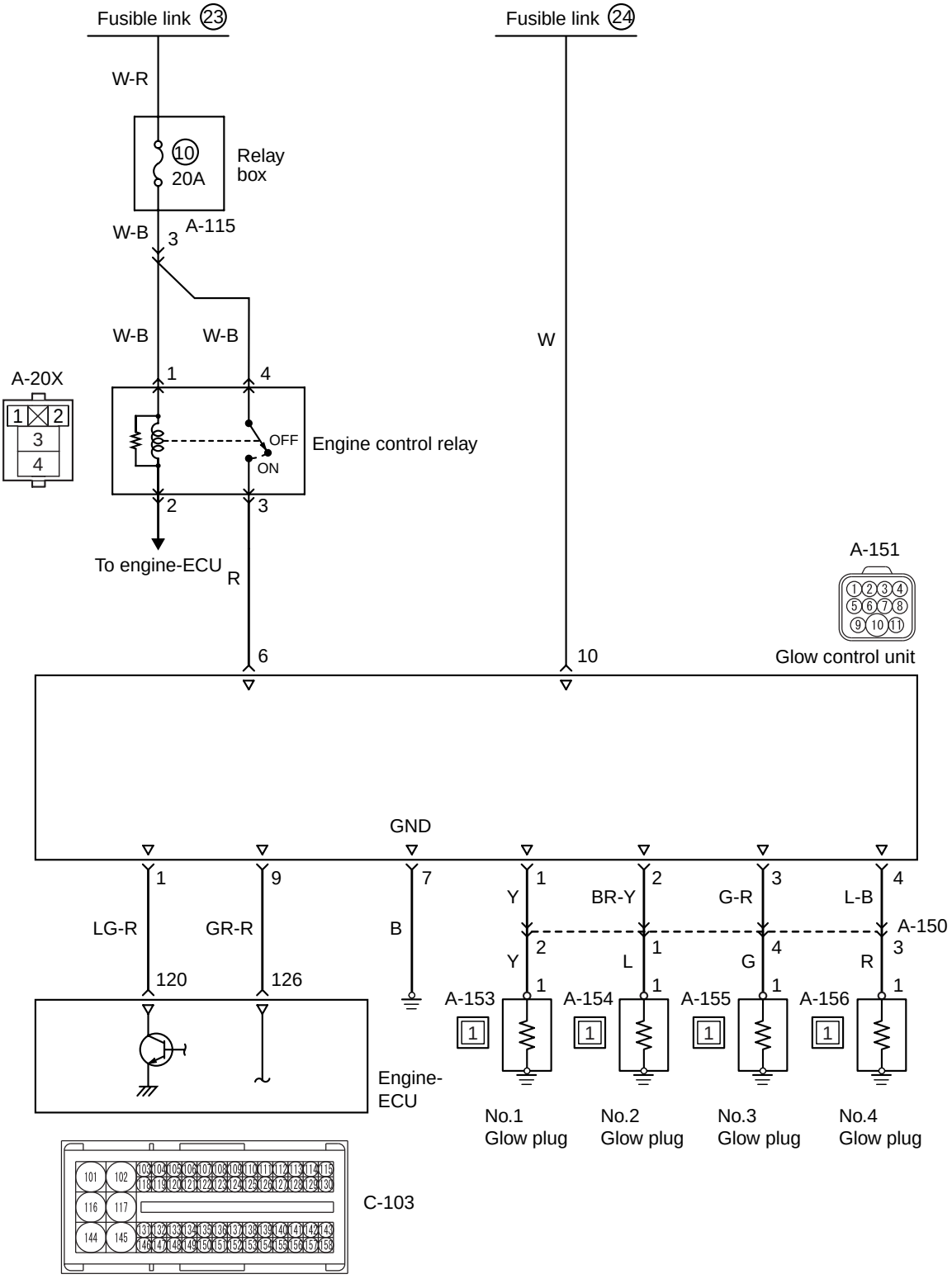
Q: Is the diagnosis code set?

YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

Code No. P0381: Glow Plug Open/Short Malfunction <Euro5>

Glow System Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V: Violet PU: Purple SI: Silver

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OPERATION

- The electrical current source is supplied from the engine control relay (terminal No.3) to the glow control unit (terminal No.6). Also, it is supplied from the glow control unit (terminal No.7) to the body earth.
- The request signal of operating the glow plug is input into the glow control unit (terminal No. 1) from the engine-ECU (terminal No.120).
- The voltage for the glow plug is applied from the battery to the glow control unit (terminal No.10).
- The voltage is applied from the glow control unit (terminal No.1, 2, 3 and 4) to each glow plug.
- The diagnosis signal is output from the glow control unit (terminal No.9) to the engine-ECU (terminal No.126).

FUNCTION

- The voltage applied to the glow control unit (terminal No.10) from the battery is applied to each glow plug in the duty ratio according to the signal from the engine ECU.

TROUBLE JUDGMENT

Check Conditions

- While the engine is running
- The electrical continuity duty to the glow plug is 17 – 83 %.

Judgment Criterion

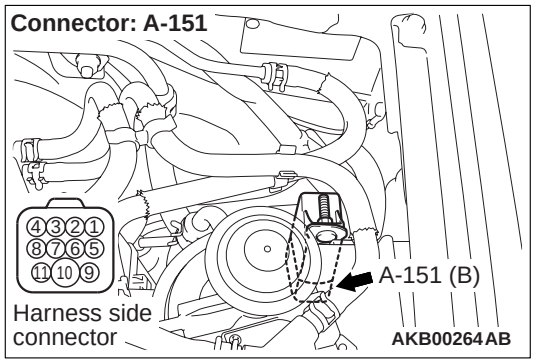
- The information that the glow is abnormal is received from the glow control unit.

PROBABLE CAUSES

- Failed glow plug
- Failed glow control unit
- Open/short circuit or harness damage in glow plug circuit or loose connector contact.
- Failed engine-ECU

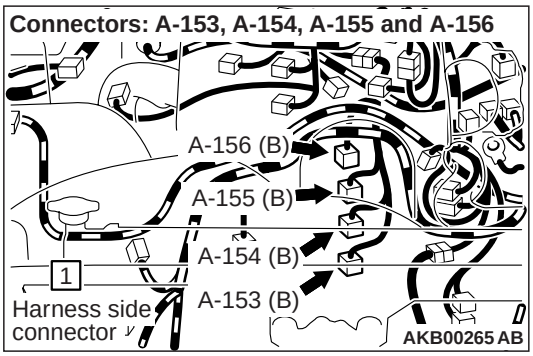
DIAGNOSTIC PROCEDURE

STEP 1. Connector check: A-151 glow control unit connector



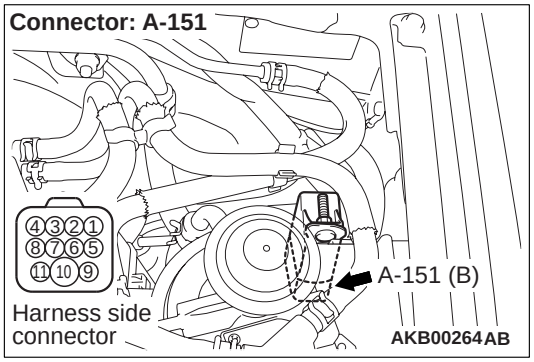
Q: Is the check result normal?
YES : Go to Step 2 .
NO : Repair or replace the connector.

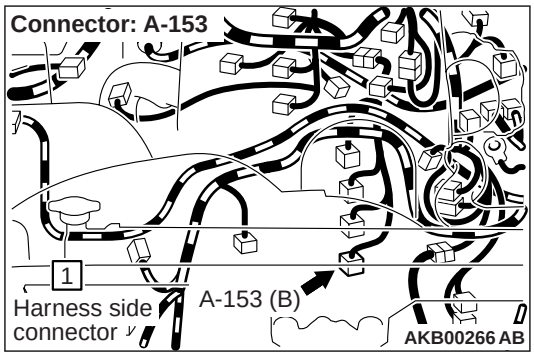
STEP 2. Connector check: A-153 No. 1 glow plug connector, A-154 No. 2 glow plug connector, A-155 No. 3 glow plug connector and A-156 No. 4 glow plug connector.



Q: Is the check result normal?
YES : Go to Step 3 .
NO : Repair or replace the connector.

STEP 3. Check harness between A-151 (terminal No.1) glow control unit connector and A-153 (terminal No.1) No.1 glow plug connector.



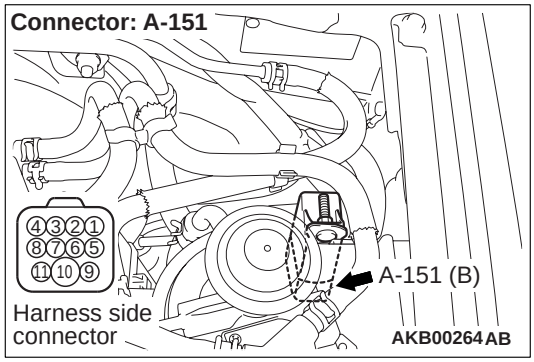


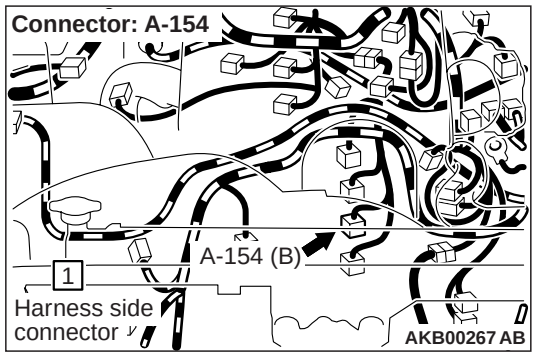
NOTE: Before checking harness, check intermediate connector A-150, and repair if necessary.

- Check output line for open/short circuit and damage.

Q: Is the check result normal?
YES : Go to Step 4 .
NO : Repair the damaged harness wire.

STEP 4. Check harness between A-151 (terminal No. 2) glow control unit connector and A-154 (terminal No. 1) No.2 glow plug connector.



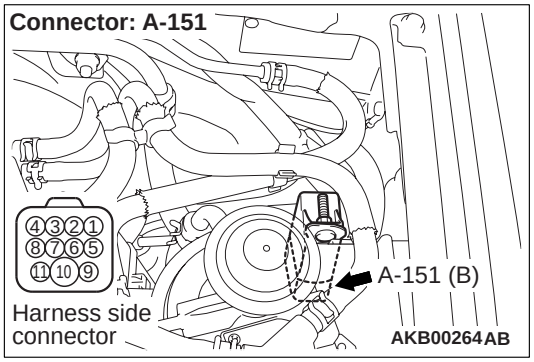


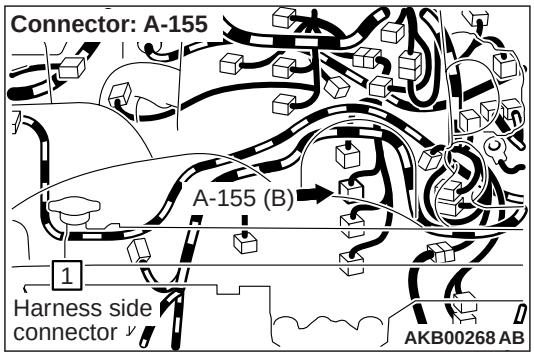
NOTE: Before checking harness, check intermediate connector A-150, and repair if necessary.

- Check output line for open/short circuit and damage.

Q: Is the check result normal?
YES : Go to Step 5 .
NO : Repair the damaged harness wire.

STEP 5. Check harness between A-151 (terminal No. 3) glow control unit connector and A-155 (terminal No. 1) No.3 glow plug connector.





NOTE: Before checking harness, check intermediate connector A-150, and repair if necessary.

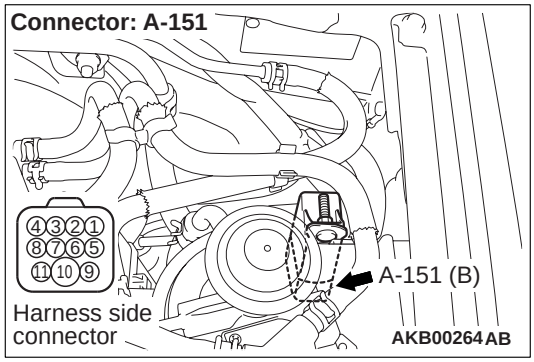
- Check output line for open/short circuit and damage.

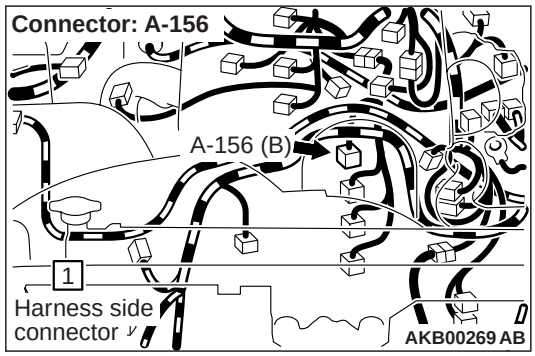
Q: Is the check result normal?

YES : Go to Step 6 .

NO : Repair the damaged harness wire.

STEP 6. Check harness between A-151 (terminal No. 4) glow control unit connector and A-156 (terminal No. 1) No.4 glow plug connector.





NOTE: Before checking harness, check intermediate connector A-150, and repair if necessary.

- Check output line for open/short circuit and damage.

Q: Is the check result normal?

YES : Go to Step 7 .

NO : Repair the damaged harness wire.

STEP 7. Replace the glow control unit.

- After replacing the glow control unit, reconfirm whether the diagnosis code is set.

Q: Is the diagnosis code set?

YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, carry out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

NO : Check is end.

Code No. P0401: EGR Flow Insufficient <Euro5>

OPERATION
- Refer to Code No. P0102: Air Flow Sensor Circuit Low Input P.13A-68.
- Refer to Code No. P0403: EGR Valve (DC Motor) Malfunction P.13A-215.
- Refer to Code No. P0489: EGR Valve Position Sensor Circuit Low Input <Euro5> P.13A-240.

FUNCTION
- The engine-ECU monitors the EGR flow rate.

TROUBLE JUDGMENT

Check Conditions
- Engine is running.
- Battery positive voltage is 8 – 16 V.
- Normal running (vehicle speed: 65 – 75 km/h, transmission: 5th <M/T>, D range <A/T>).
- The intake air temperature is from 20 to 40 °C.

Judgment Criterion
- The EGR flow rate is larger than target EGR flow rate by the rate that is more than the specified value.

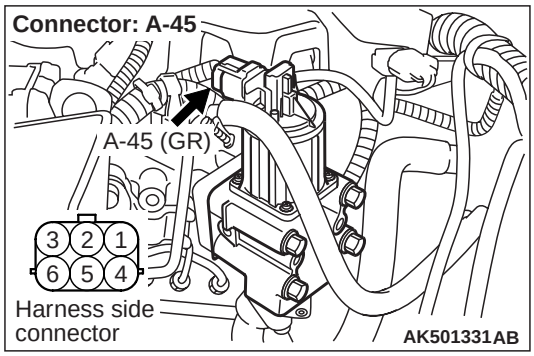
PROBABLE CAUSES
- Failed EGR passage (leakage and clogged EGR passage)
- Harness damage in EGR valve circuit or loose connector contact
- Failed EGR valve operation
- Harness damage in air flow sensor circuit or loose connector contact
- Failed air flow sensor (abnormal output characteristics)
- Failed engine-ECU

DIAGNOSTIC PROCEDURE

STEP 1. M.U.T.-III diagnosis code

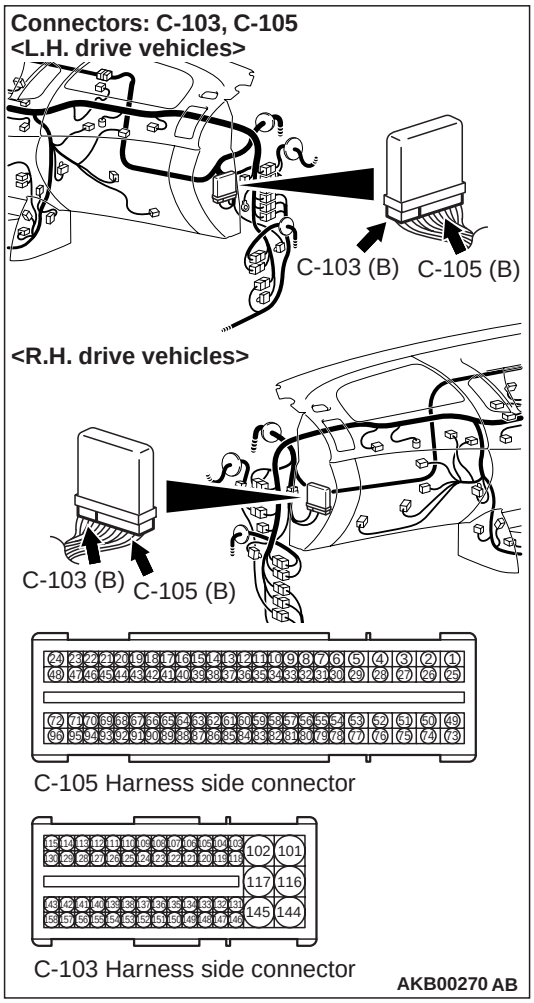
Q: Is the diagnosis code P0403 or P2413 set?
YES : Inspection chart for diagnosis codes (Refer to P.13A-21).
NO : Go to Step 2 .

STEP 2. Connector check: A-45 EGR valve assembly connector



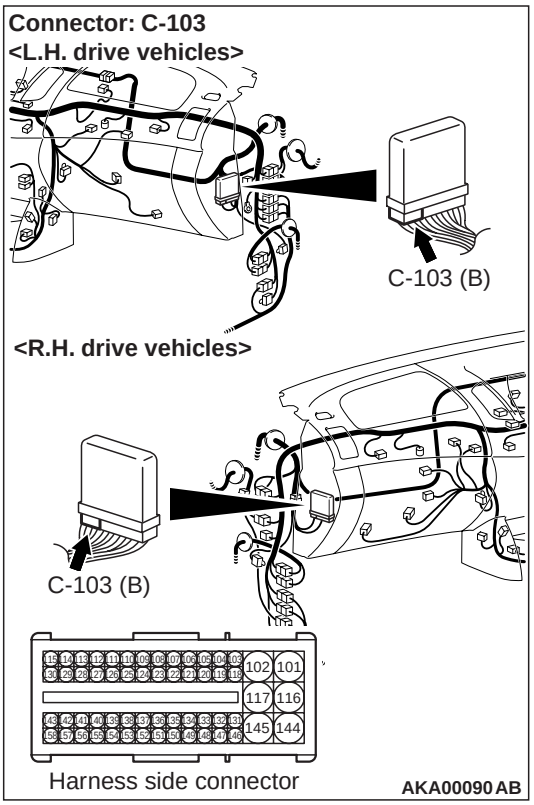
Q: Is the check result normal?
YES : Go to Step 3 .
NO : Repair or replace the connector.

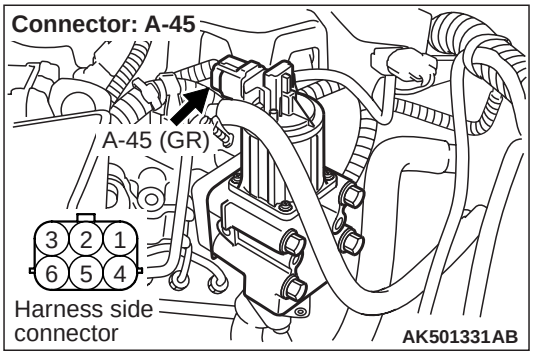
STEP 3. Connector check: C-103 and C-105 engine-ECU connectors



Q: Is the check result normal?
YES : Go to Step 4 .
NO : Repair or replace the connector.

STEP 4. Check harness between C-103 (terminal No. 115) engine-ECU connector and A-45 (terminal No. 6) EGR valve assembly connector.

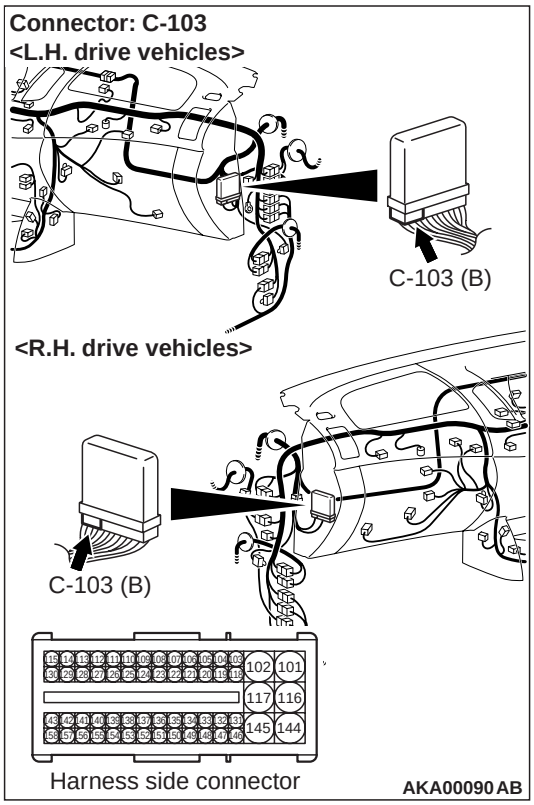


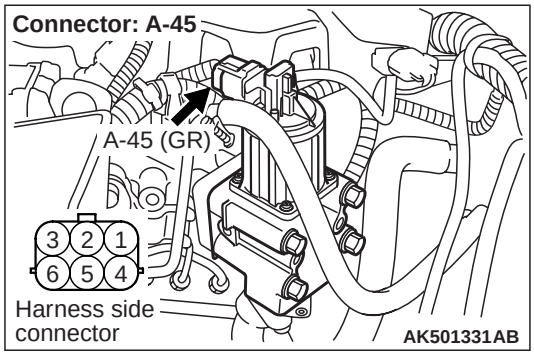


- Check output line for damage.

Q: Is the check result normal?
YES : Go to Step 5 .
NO : Repair the damaged harness wire.

STEP 5. Check harness between C-103 (terminal No. 130) engine-ECU connector and A-45 (terminal No. 4) EGR valve assembly connector.

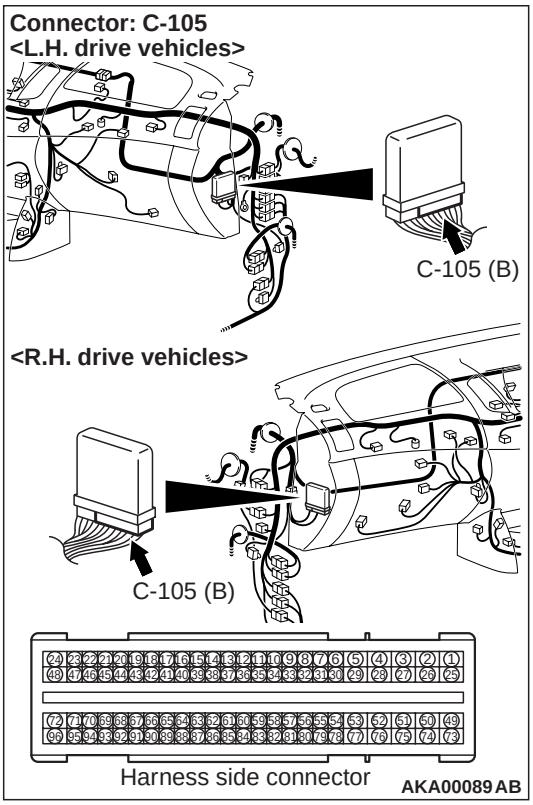


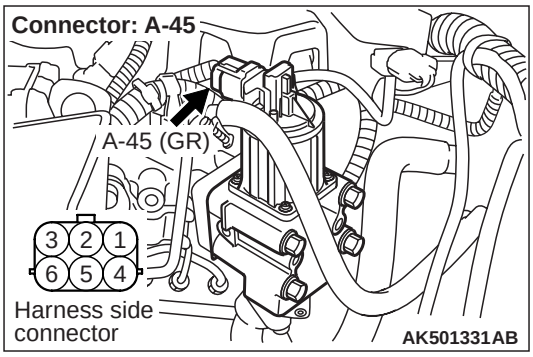


- Check output line for damage.

Q: Is the check result normal?
YES : Go to Step 6 .
NO : Repair the damaged harness wire.

STEP 6. Check harness between C-105 (terminal No. 81) engine-ECU connector and A-45 (terminal No. 2) EGR valve assembly connector.

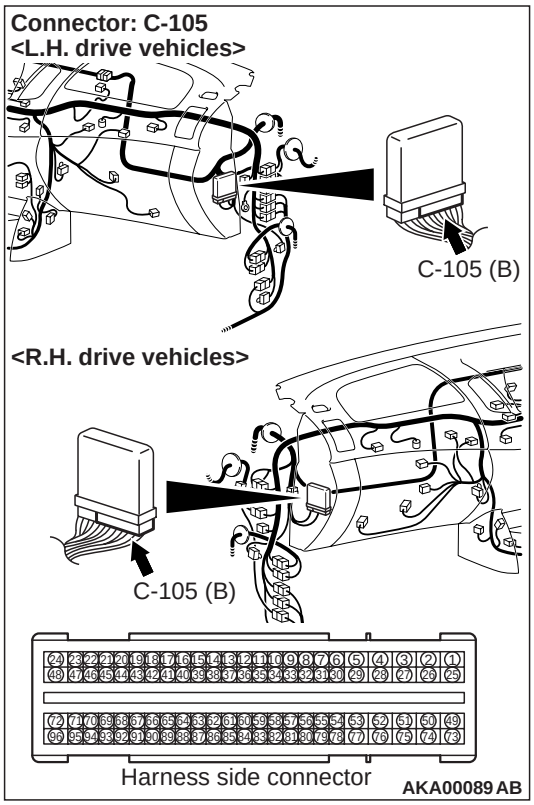


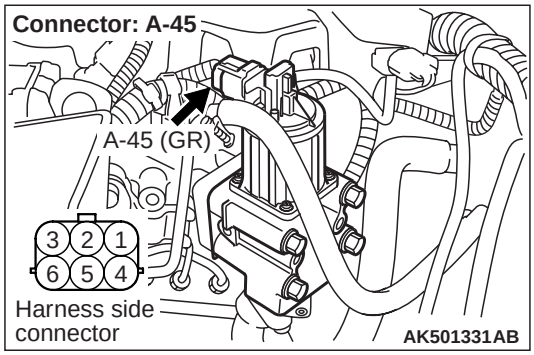


- Check earthing line for damage.

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair the damaged harness wire.

STEP 7. Check harness between C-105 (terminal No. 71) engine-ECU connector and A-45 (terminal No. 3) EGR valve assembly connector.

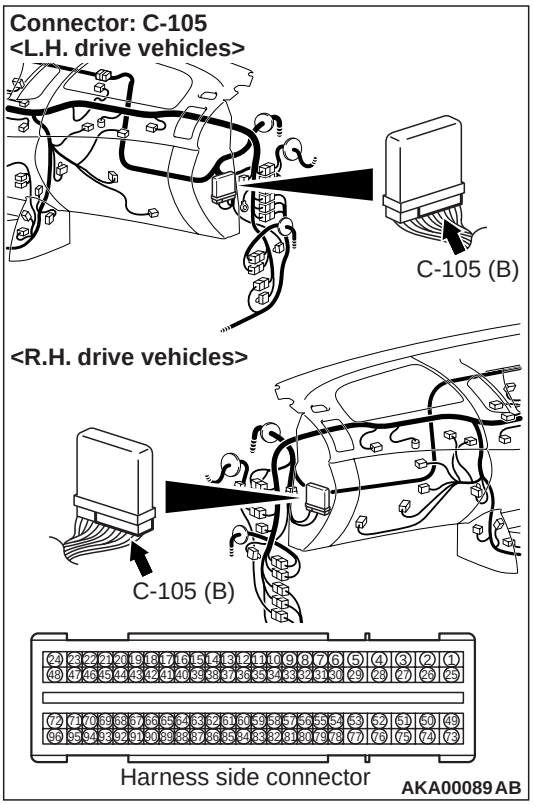


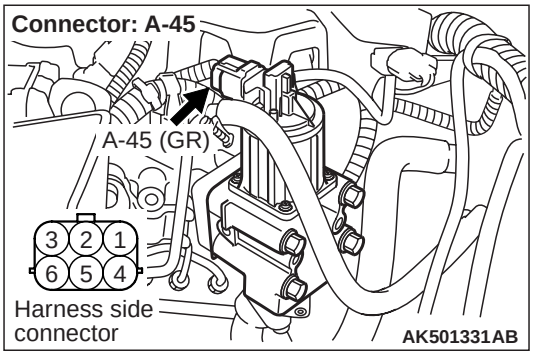


- Check power supply line for damage.

Q: Is the check result normal?
YES : Go to Step 8 .
NO : Repair the damaged harness wire.

STEP 8. Check harness between C-105 (terminal No. 57) engine-ECU connector and A-45 (terminal No. 1) EGR valve assembly connector.





- Check output line for damage.

Q: Is the check result normal?

YES : Go to Step 9 .
NO : Repair the damaged harness wire.

STEP 9. Check EGR valve itself.

- Check EGR valve itself [Refer to GROUP 17 – Emission Control – Exhaust Gas Recirculation (EGR) System – EGR Valve (DC motor) Check].

Q: Is the check result normal?

YES : Go to Step 10 .
NO : Replace the EGR valve assembly.

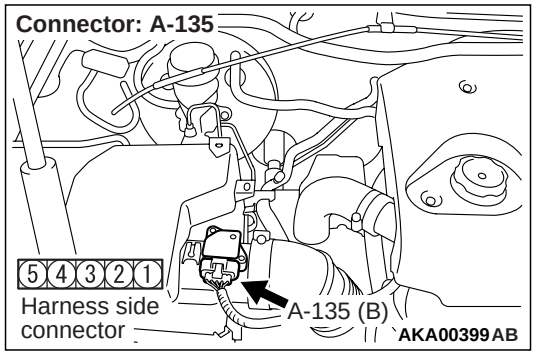
STEP 10. Check EGR passage for deposits.

- Check the EGR valve, the EGR pipe and the inside of the EGR cooler for deposits. (Refer to GROUP 17 – Emission Control – EGR Valve And EGR Cooler – Removal And Installation).

Q: Is the check result normal?

YES : Go to Step 11 .
NO : Cleaning or replace the EGR valve, EGR pipe and EGR cooler.

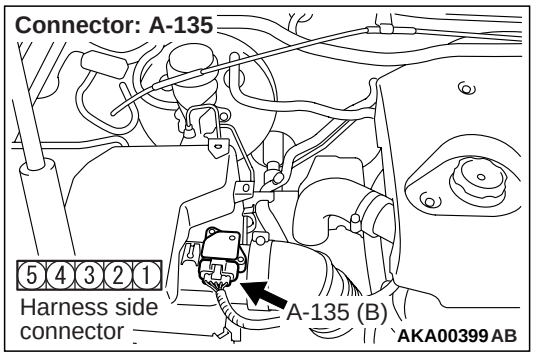
STEP 11. Connector check: A-135 air flow sensor connector.

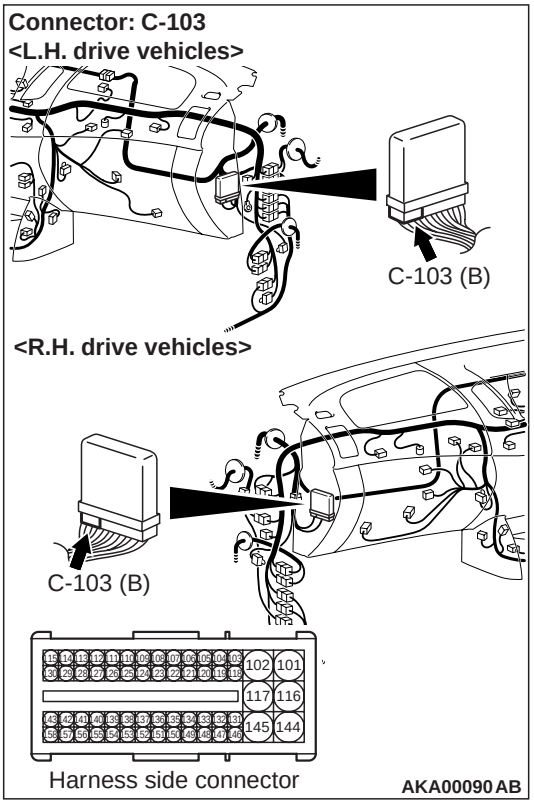


Q: Is the check result normal?

YES : Go to Step 12 .
NO : Repair or replace the connector.

STEP 12. Check harness between A-135 (terminal No. 4) air flow sensor connector and C-103 (terminal No. 155) engine-ECU connector.

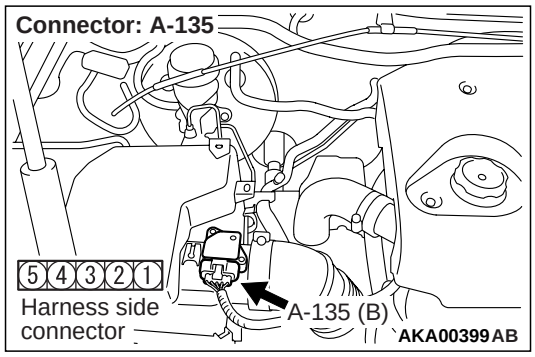


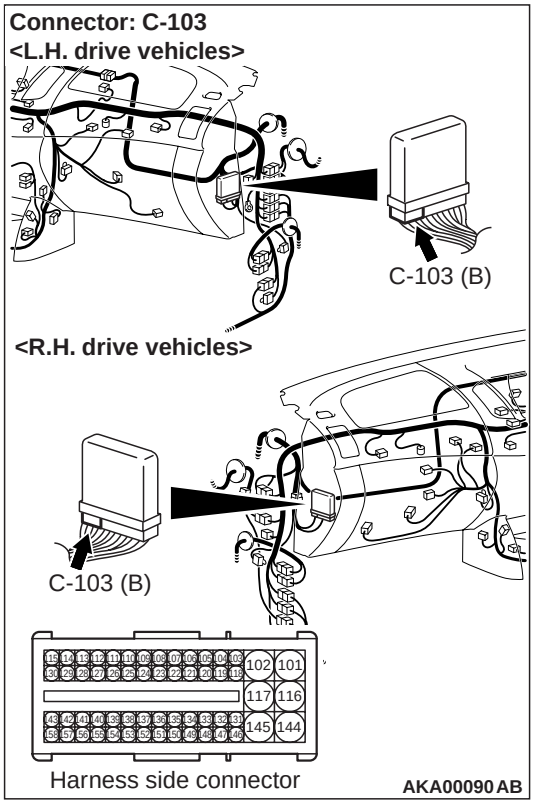


- Check earthing line for damage.

Q: Is the check result normal?
YES : Go to Step 13 .
NO : Repair the damaged harness wire.

STEP 13. Check harness between A-135 (terminal No. 3) air flow sensor connector and C-103 (terminal No. 140) engine-ECU connector.





- Check output line for damage.

Q: Is the check result normal?
YES : Go to Step 14 .
NO : Repair the damaged harness wire.

STEP 14. Replace the air flow sensor.

- After replacing the air flow sensor, re-check the trouble symptoms.

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).
NO : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, carry out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

Code No. P0402: EGR Flow Excessive <Euro5>

OPERATION
- Refer to Code No. P0102: Air Flow Sensor Circuit Low Input P.13A-68.
- Refer to Code No. P0403: EGR Valve (DC Motor) Malfunction P.13A-215.
- Refer to Code No. P0489: EGR Valve Position Sensor Circuit Low Input <Euro5> P.13A-240.

FUNCTION
- The engine-ECU monitors the EGR flow rate.

TROUBLE JUDGMENT

Check Conditions
- Engine is running
- Battery positive voltage is 8 – 16 V.
- Vehicle is stopped (transmission: Neutral <M/T>, P range <A/T>)

Judgment Criterion
- The EGR flow rate is smaller than target EGR flow rate by the rate that is more than the specified value.

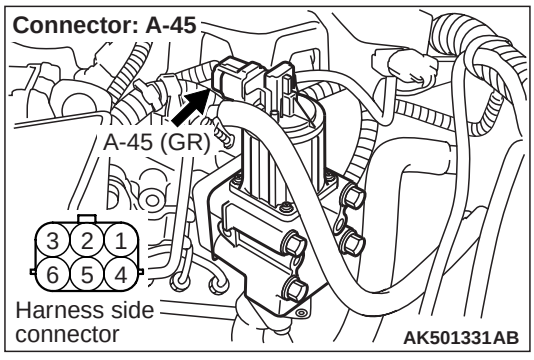
PROBABLE CAUSES
- Failed EGR passage (air suction)
- Harness damage in EGR valve circuit or loose connector contact
- Failed EGR valve operation
- Harness damage in air flow sensor circuit or loose connector contact
- Failed air flow sensor (abnormal output characteristics)
- Failed engine-ECU

DIAGNOSTIC PROCEDURE

STEP 1. M.U.T.-III diagnosis code

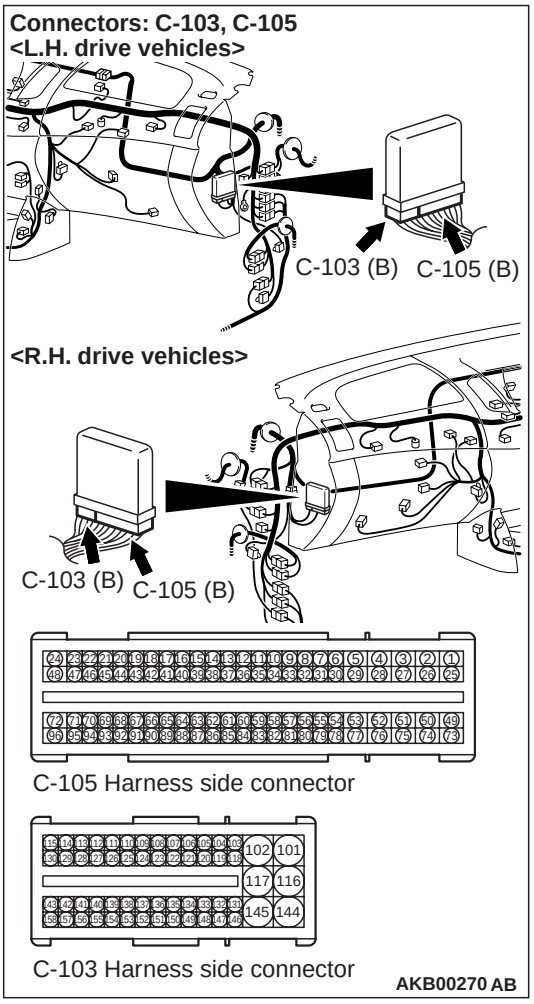
Q: Is the diagnosis code P0403 or P2413 set?
YES : Inspection chart for diagnosis codes (Refer to P.13A-21).
NO : Go to Step 2 .

STEP 2. Connector check: A-45 EGR valve assembly connector



Q: Is the check result normal?
YES : Go to Step 3 .
NO : Repair or replace the connector.

STEP 3. Connector check: C-103 and C-105 engine-ECU connectors

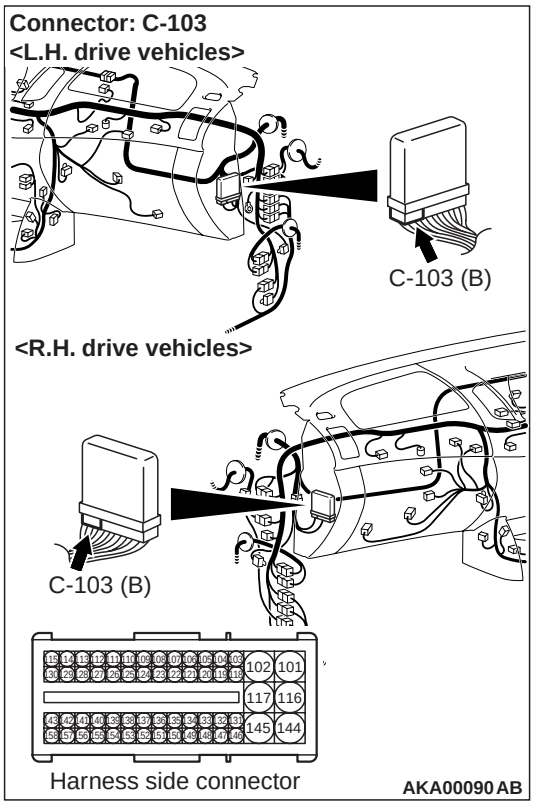


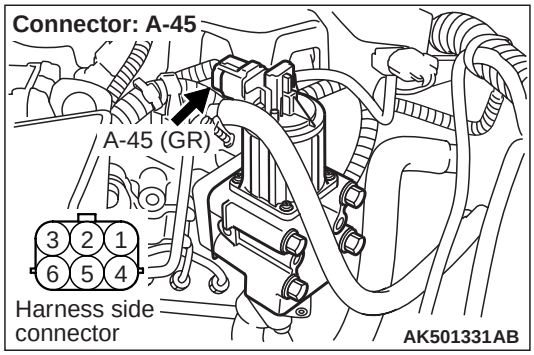
Q: Is the check result normal?

YES : Go to Step 4 .

NO : Repair or replace the connector.

STEP 4. Check harness between C-103 (terminal No. 115) engine-ECU connector and A-45 (terminal No. 6) EGR valve assembly connector.





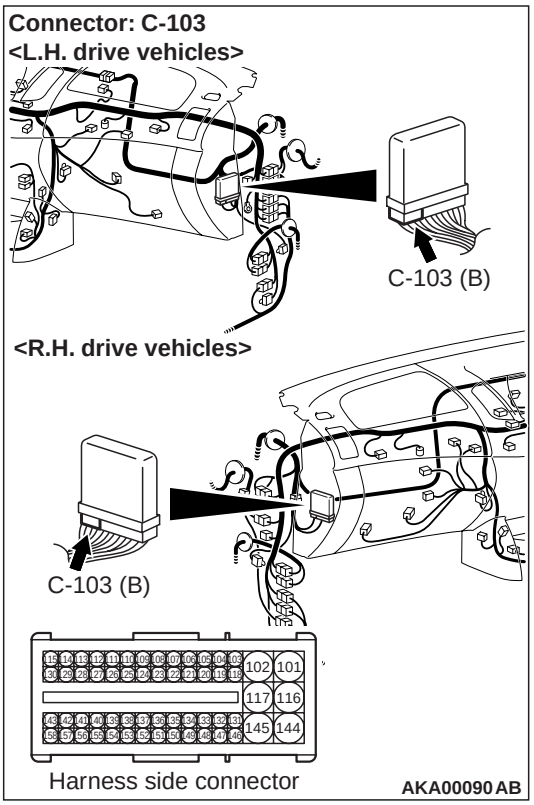
- Check output line for damage.

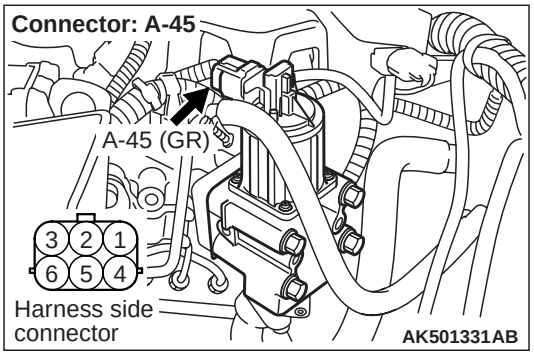
Q: Is the check result normal?

YES : Go to Step 5 .

NO : Repair the damaged harness wire.

STEP 5. Check harness between C-103 (terminal No. 130) engine-ECU connector and A-45 (terminal No. 4) EGR valve assembly connector.

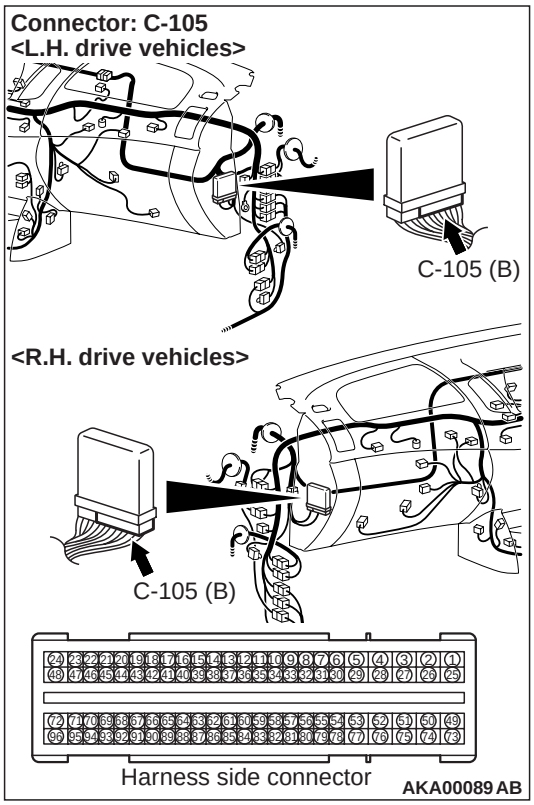


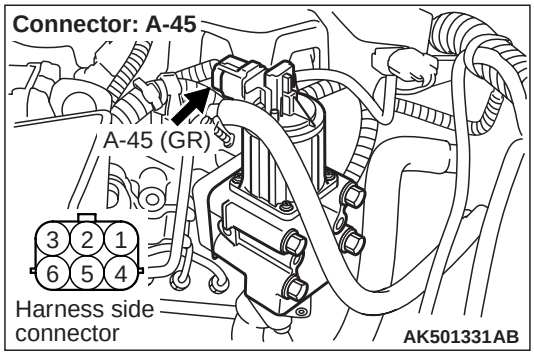


- Check output line for damage.

Q: Is the check result normal?
YES : Go to Step 6 .
NO : Repair the damaged harness wire.

STEP 6. Check harness between C-105 (terminal No. 81) engine-ECU connector and A-45 (terminal No. 2) EGR valve assembly connector.

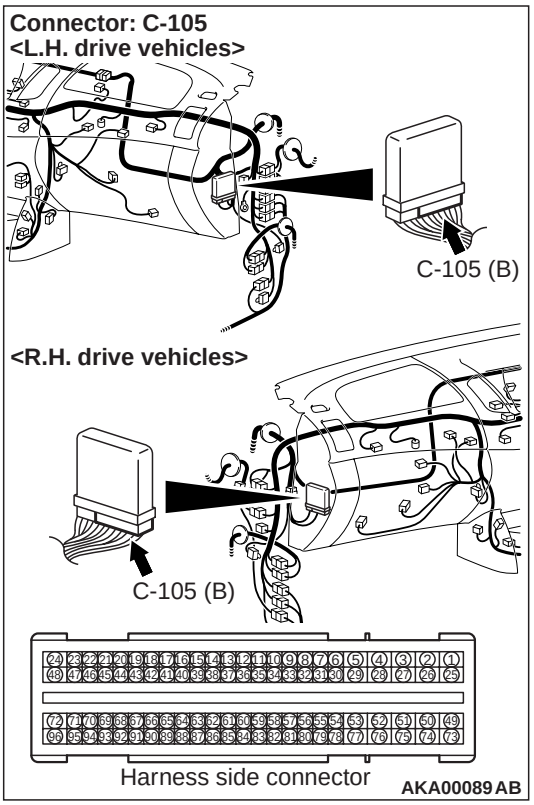


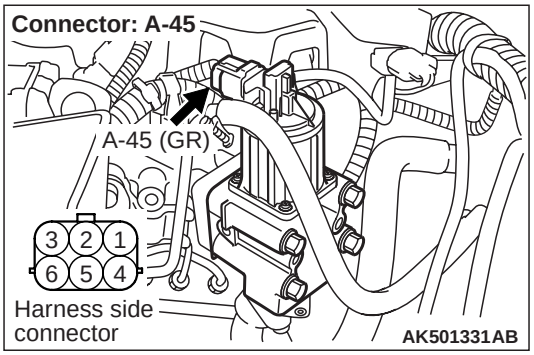


- Check earthing line for damage.

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair the damaged harness wire.

STEP 7. Check harness between C-105 (terminal No. 71) engine-ECU connector and A-45 (terminal No. 3) EGR valve assembly connector.

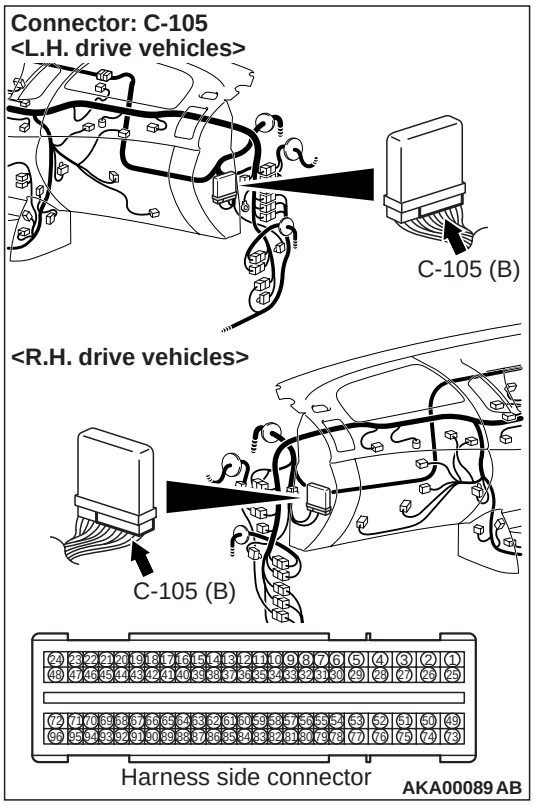


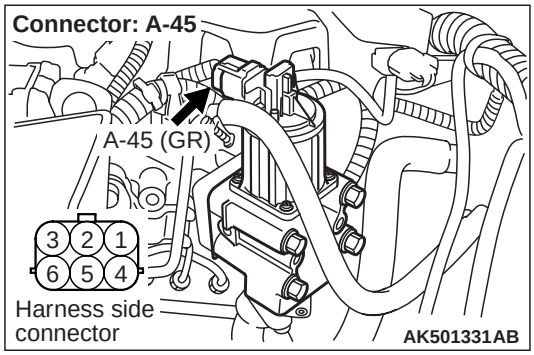


- Check power supply line for damage.

Q: Is the check result normal?
YES : Go to Step 8 .
NO : Repair the damaged harness wire.

STEP 8. Check harness between C-105 (terminal No. 57) engine-ECU connector and A-45 (terminal No. 1) EGR valve assembly connector.





- Check output line for damage.

Q: Is the check result normal?
YES : Go to Step 9 .
NO : Repair the damaged harness wire.

STEP 9. Check EGR valve itself.

- Check EGR valve itself [Refer to GROUP 17 – Emission Control – Exhaust Gas Recirculation (EGR) System – EGR Valve (DC motor) Check].

Q: Is the check result normal?
YES : Go to Step 10 .
NO : Replace the EGR valve assembly.

STEP 10. Check EGR passage for air suction.

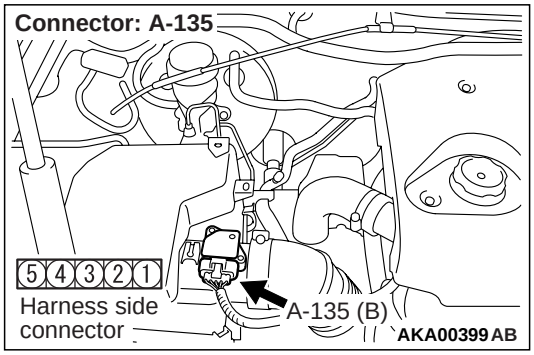
- Check the EGR valve, the EGR pipe and the EGR cooler for the air suction.

Q: Is the check result normal?

YES : Go to Step 11 .

NO : Cleaning or replace the EGR valve, EGR pipe and EGR cooler.

STEP 11. Connector check: A-135 air flow sensor connector

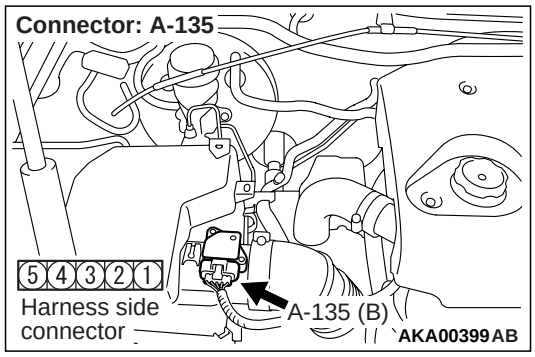


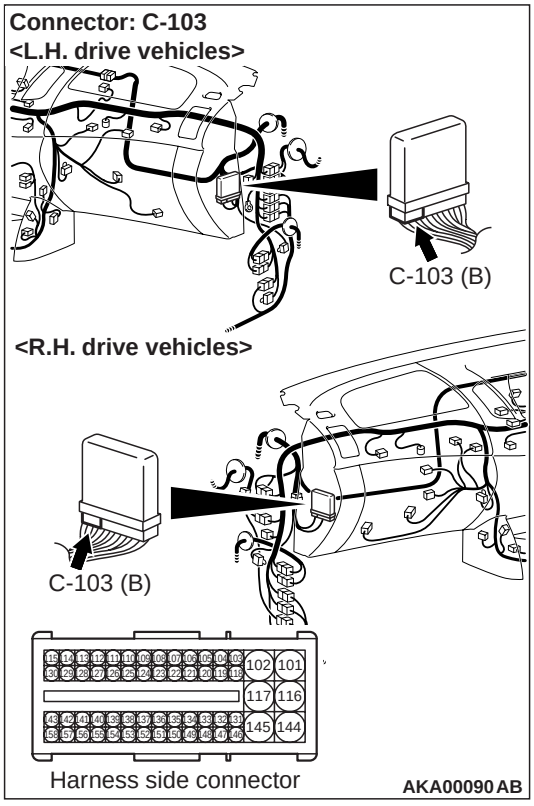
Q: Is the check result normal?

YES : Go to Step 12 .

NO : Repair or replace the connector.

STEP 12. Check harness between A-135 (terminal No. 4) air flow sensor connector and C-103 (terminal No. 155) engine-ECU connector.





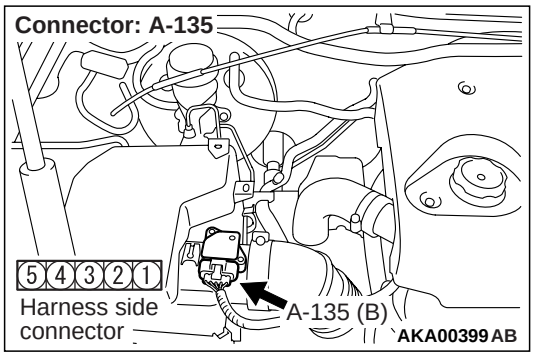
- Check earthing line for damage.

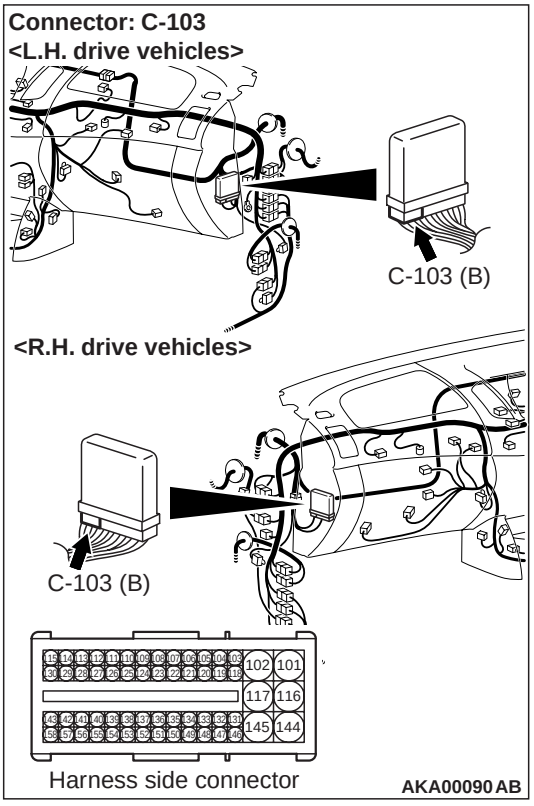
Q: Is the check result normal?

YES : Go to Step 13 .

NO : Repair the damaged harness wire.

STEP 13. Check harness between A-135 (terminal No. 3) air flow sensor connector and C-103 (terminal No. 140) engine-ECU connector.





- Check output line for damage.

Q: Is the check result normal?

YES : Go to Step 14 .
NO : Repair the damaged harness wire.

STEP 14. Replace the air flow sensor.

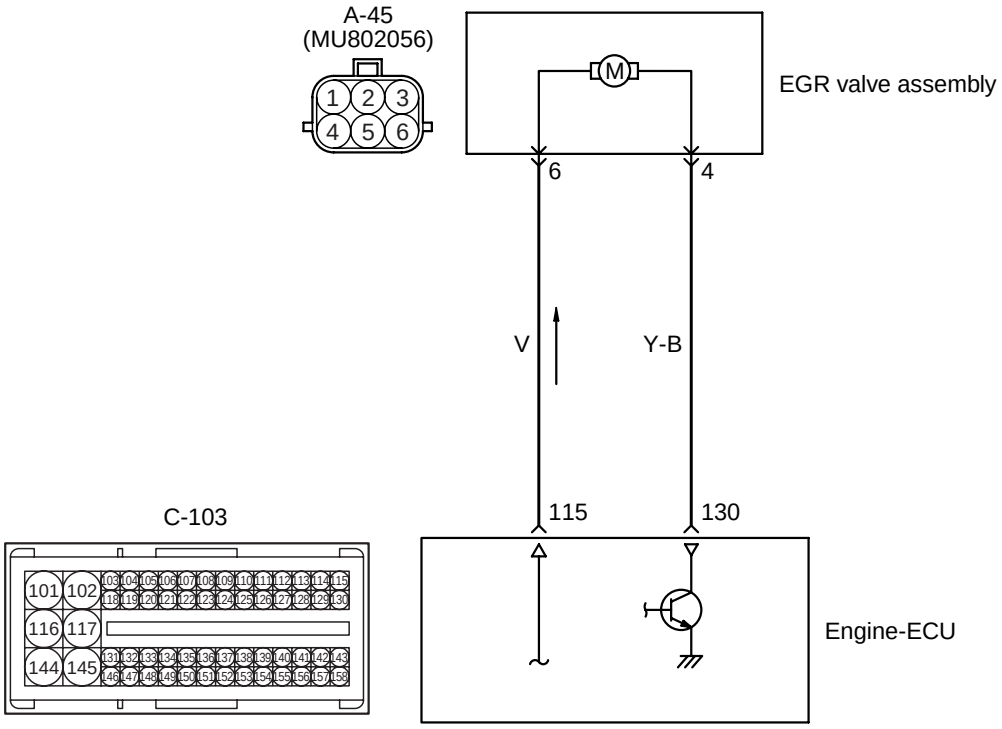
- After replacing the air flow sensor, re-check the trouble symptoms.

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).
NO : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, carry out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

Code No. P0403: EGR Valve (DC Motor) Malfunction

EGR Valve (DC motor) Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V: Violet PU: Purple SI: Silver

AKA00102 AB

OPERATION

- The electric current from the engine-ECU (terminal No. 130 and No. 115) to the EGR valve (DC motor) (terminal No. 4 and No. 6).

FUNCTION

- The engine-ECU performs duty control over the EGR valve (DC motor).
- The engine-ECU performs feedback control over the EGR valve based on the signals from the EGR position sensor.

TROUBLE JUDGMENT

Check Condition

- Ignition switch is in "ON" position

Judgment Criterion

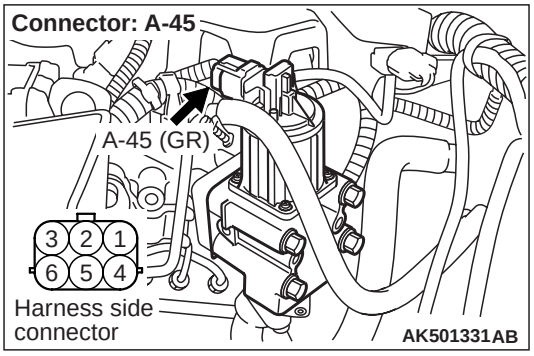
- An overcurrent cut-off signal from the EGR valve drive control integrated circuit (IC) is detected for 0.5 second.

PROBABLE CAUSES

- Failed EGR valve
- Open/short circuit or harness damage in EGR valve circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. Connector check: A-45 EGR valve assembly connector



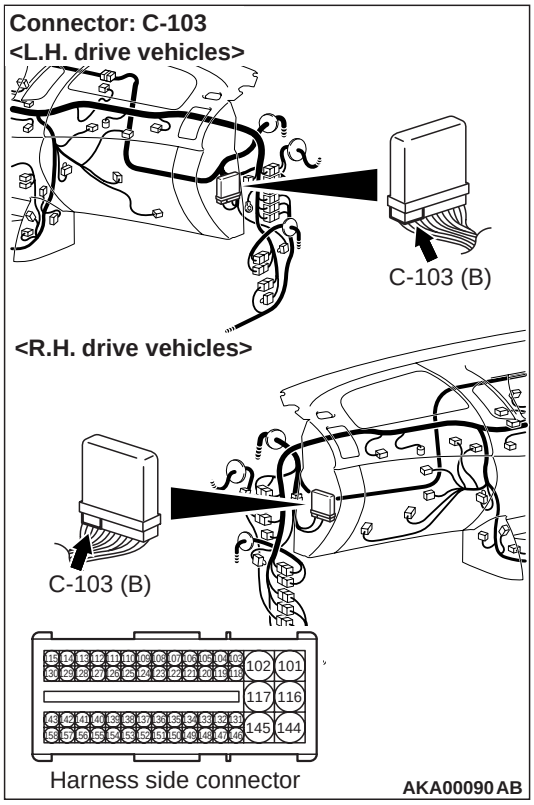
Q: Is the check result normal?
YES : Go to Step 2 .
NO : Repair or replace the connector.

STEP 2. Check EGR valve itself

- Check EGR valve itself [Refer to GROUP 17 – Exhaust Gas Recirculation (EGR) System – EGR valve (DC motor) check].

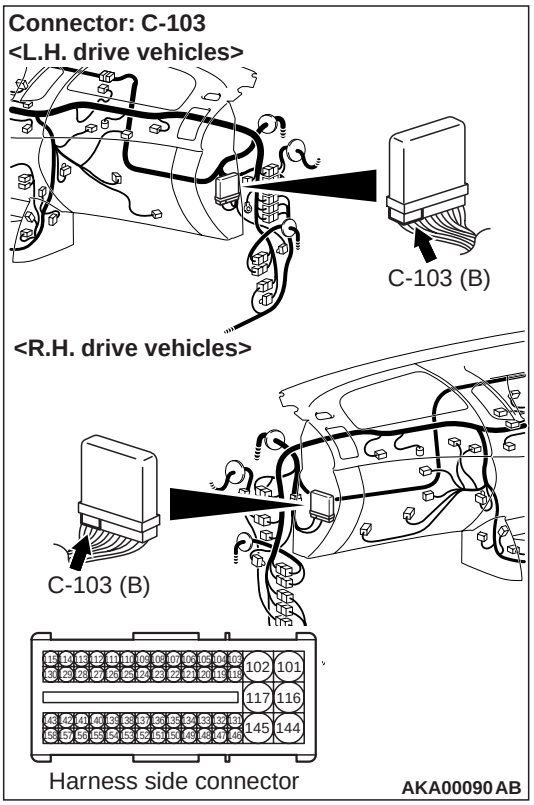
Q: Is the check result normal?
YES : Go to Step 3 .
NO : Replace the EGR valve assembly.

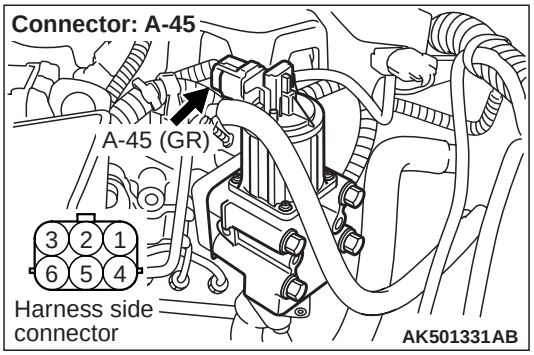
STEP 3. Connector check: C-103 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 4 .
NO : Repair or replace the connector.

STEP 4. Check harness between C-103 (terminal No. 115) engine-ECU connector and A-45 (terminal No. 6) EGR valve assembly connector.

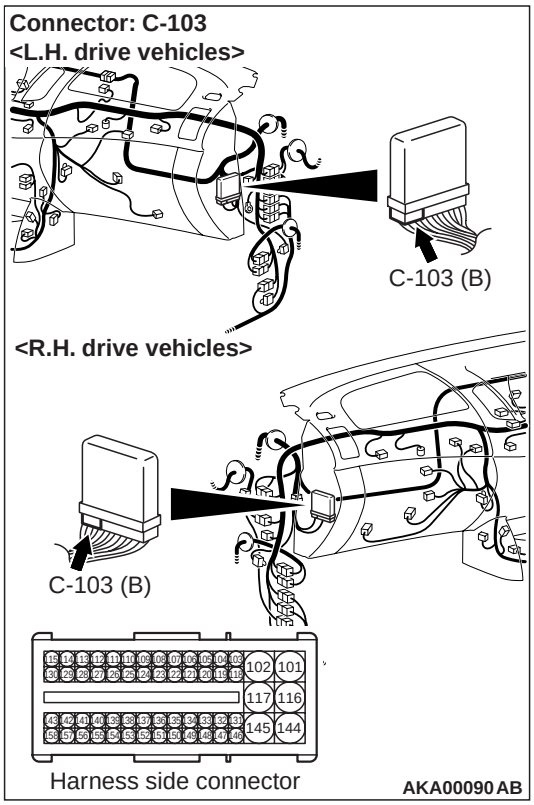


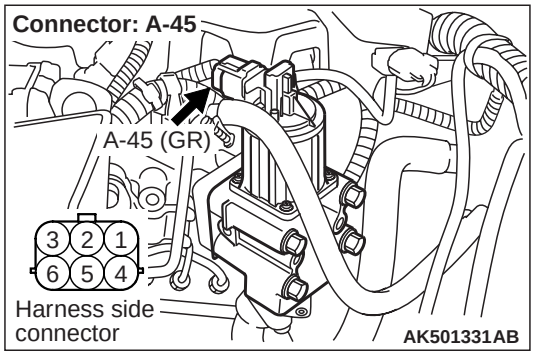


- Check output line for open/short circuit and damage.

Q: Is the check result normal?
YES : Go to Step 5 .
NO : Repair the damaged harness wire.

STEP 5. Check harness between C-103 (terminal No. 130) engine-ECU connector and A-45 (terminal No. 4) EGR valve connector.





- Check output line for open/short circuit and damage.

Q: Is the check result normal?
YES : Go to Step 6 .
NO : Repair the damaged harness wire.

STEP 6. M.U.T.-III diagnosis code

- After clearing the diagnosis code through M.U.T.-III, start the engine and confirm whether the diagnosis code is output.

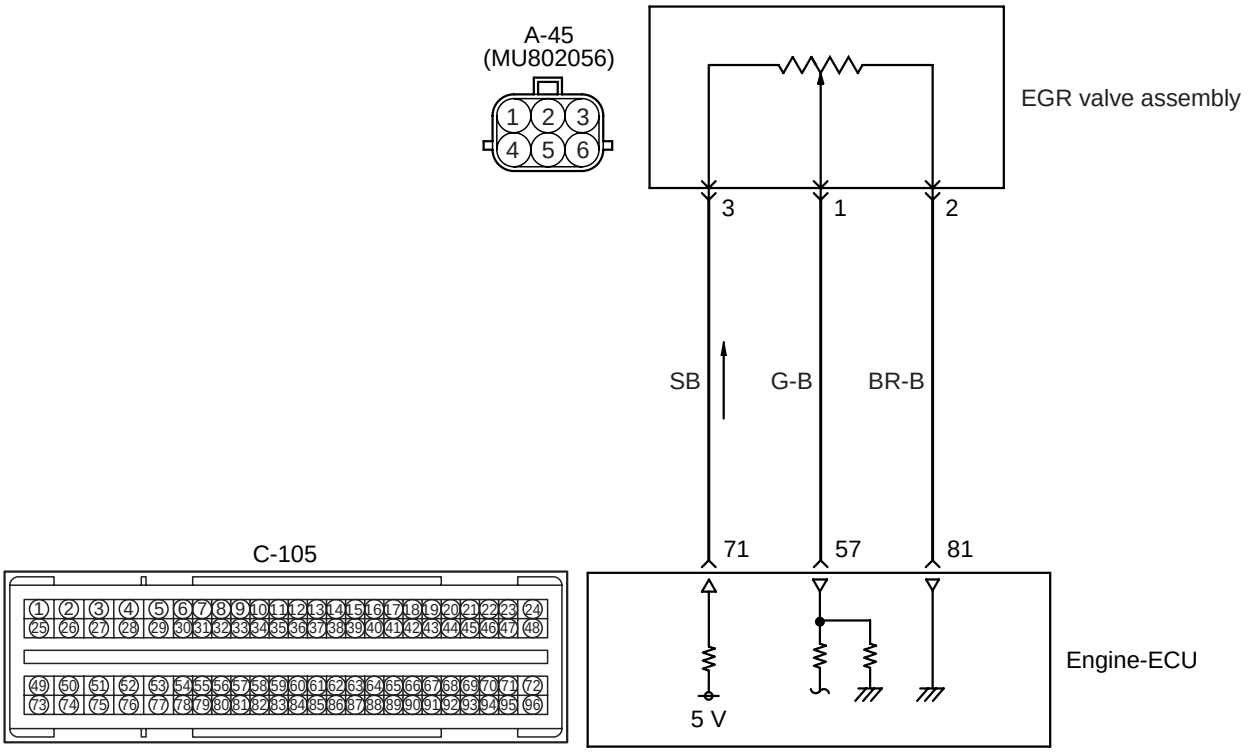
Q: Is the diagnosis code set?

YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

Code No. P0405: EGR Valve Position Sensor Circuit Low Input <Except Euro5>

EGR valve Position Sensor Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V: Violet PU: Purple SI: Silver

AKA00103AB

OPERATION

- A power voltage of 5 V is applied to the EGR valve assembly power terminal (terminal No. 3) from the engine-ECU (terminal No. 71) and earthed to the engine-ECU (terminal No. 81) from the EGR valve assembly (terminal No. 2).
- The sensor signal is inputted to the engine-ECU (terminal No. 57) from the EGR valve assembly output terminal (terminal No. 1).

FUNCTION

- The EGR valve assembly detects the position of the EGR valve and sends the signal to the engine-ECU.
- Based on the signal, the engine-ECU performs the feedback control of the EGR valve.

TROUBLE JUDGMENT

Check Conditions

- Battery positive voltage is 8 – 16 V
- 2 seconds later after the ignition switch has been in "ON" position or the engine has started up.

Judgment Criterion

- The EGR valve position sensor output voltage is 0.20 V or less for 0.5 second.

PROBABLE CAUSES

- Failed EGR valve position sensor
- Open/short circuit or harness damage in EGR valve position sensor circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III data list

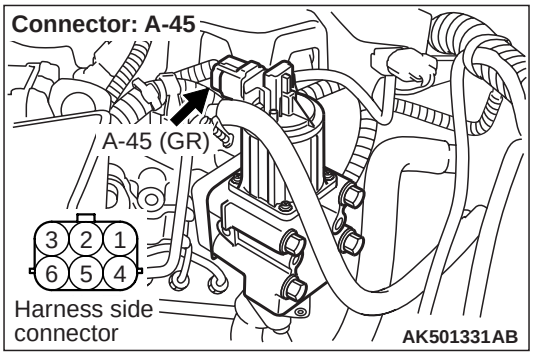
- Refer to Data List Reference Table P.13A-542.
  a. Item 16: EGR valve position sensor

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

NO : Go to Step 2 .

STEP 2. Connector check: A-45 EGR valve assembly connector

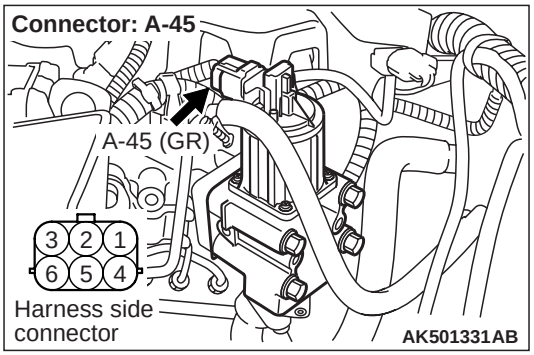


Q: Is the check result normal?

YES : Go to Step 3 .

NO : Repair or replace the connector.

STEP 3. Perform voltage measurement at A-45 EGR valve assembly connector.



- Disconnect connector, and measure at harness side.
- Ignition switch: ON
- Voltage between terminal No. 3 and earth.

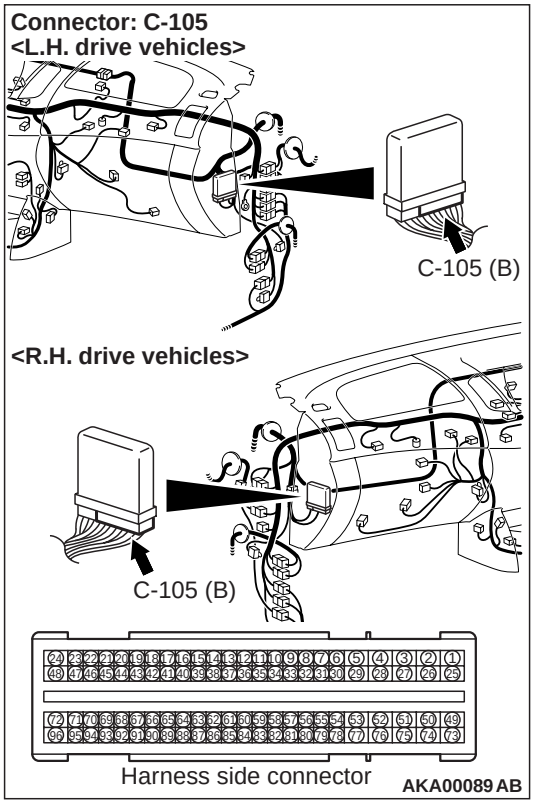
OK: 4.9 – 5.1 V

Q: Is the check result normal?

YES : Go to Step 9 .

NO : Go to Step 4 .

STEP 4. Perform voltage measurement at C-105 engine-ECU connector.



- Measure engine-ECU terminal voltage.
- Ignition switch: ON
- Voltage between terminal No. 71 and earth.

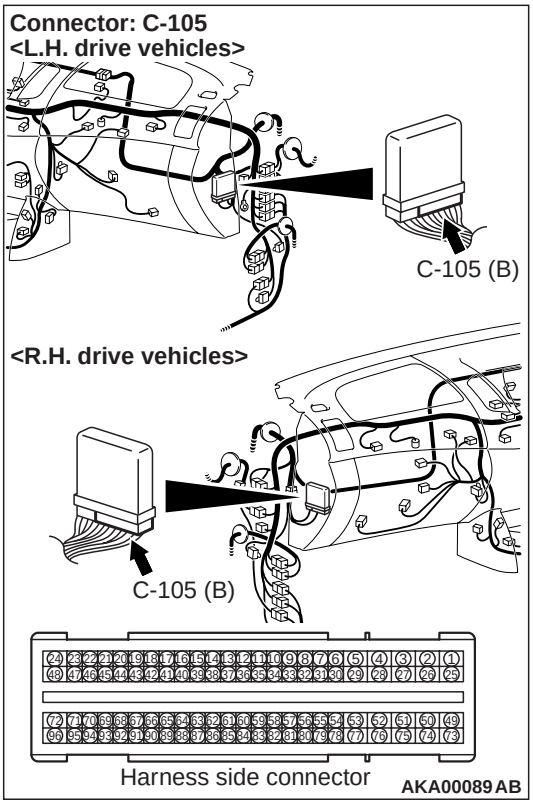
OK: 4.9 – 5.1 V

Q: Is the check result normal?

YES : Go to Step 8 .

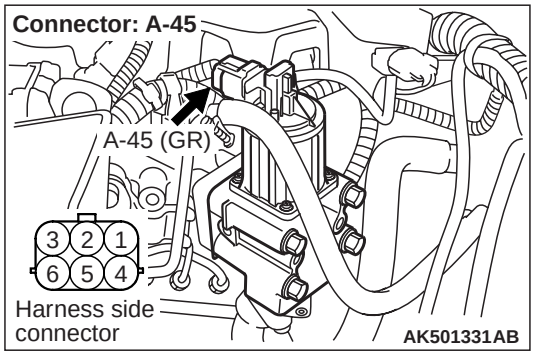
NO : Go to Step 5 .

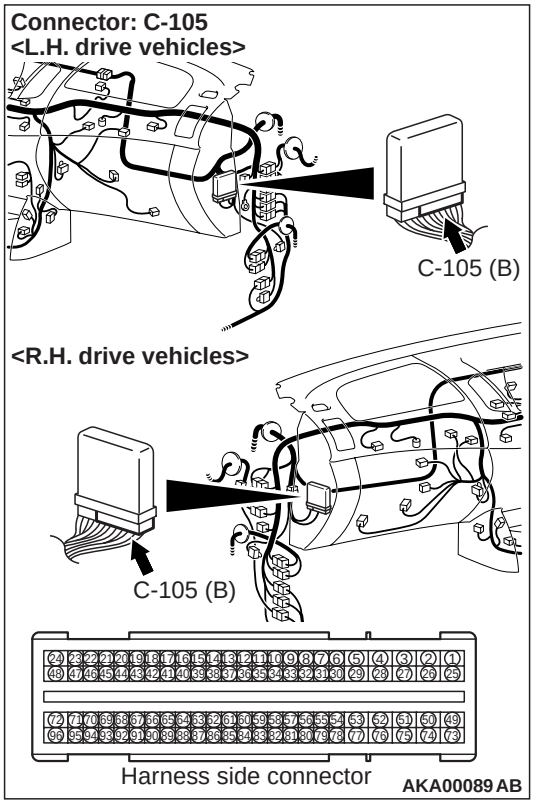
STEP 5. Connector check: C-105 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 6 .
NO : Repair or replace the connector.

STEP 6. Check harness between A-45 (terminal No. 3) EGR valve assembly connector and C-105 (terminal No. 71) engine-ECU connector.





- Check power supply line for short circuit.

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair the damaged harness wire.

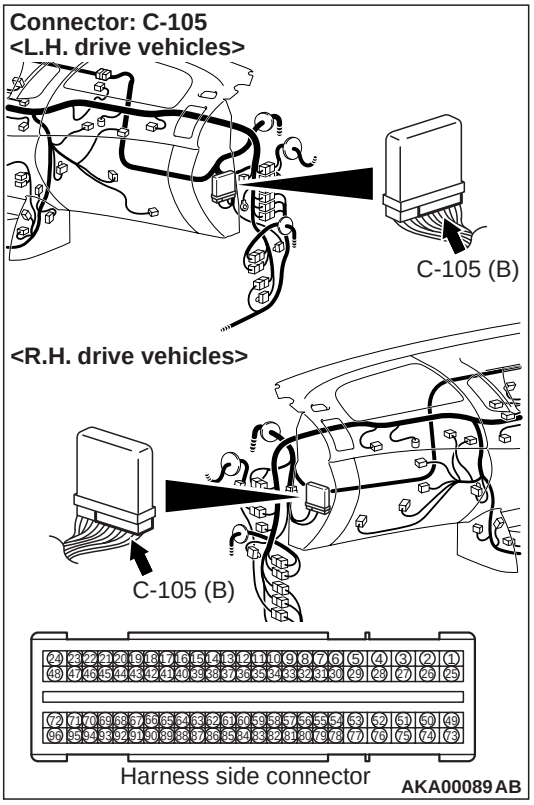
STEP 7. M.U.T.-III data list

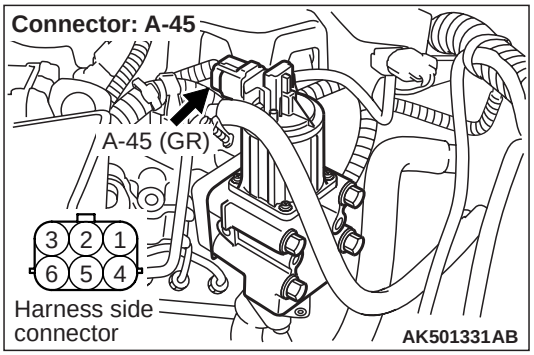
- Refer to Data List Reference Table P.13A-542.
  a. Item 16: EGR valve position sensor

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).
NO : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).

STEP 8. Connector check: C-105 engine-ECU connector

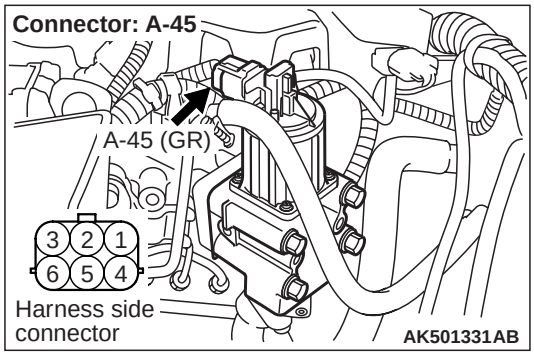




Q: Is the check result normal?
YES : Check and repair harness between A-45 (terminal No. 3) EGR valve assembly connector and C-105 (terminal No. 71) engine-ECU connector.
- Check power supply line for open circuit and damage.

NO : Repair or replace the connector.

STEP 9. Perform resistance measurement at A-45 EGR valve assembly connector.

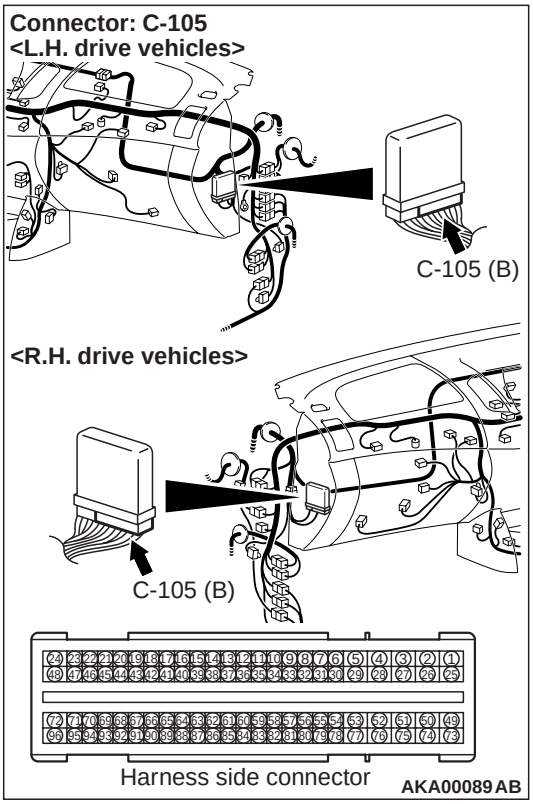


- Disconnect connector, and measure at harness side.
- Ignition switch: ON
- Resistance between terminal No. 2 and earth.

OK: Continuity (2 Ω or less)

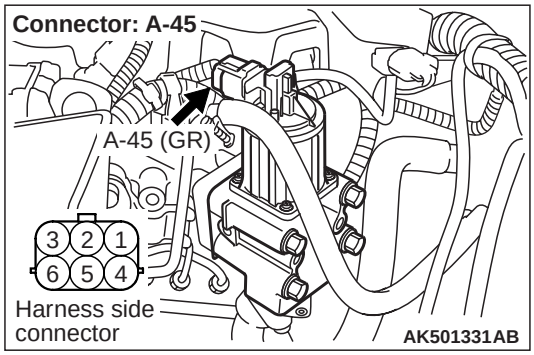
Q: Is the check result normal?
YES : Go to Step 12 .
NO : Go to Step 10 .

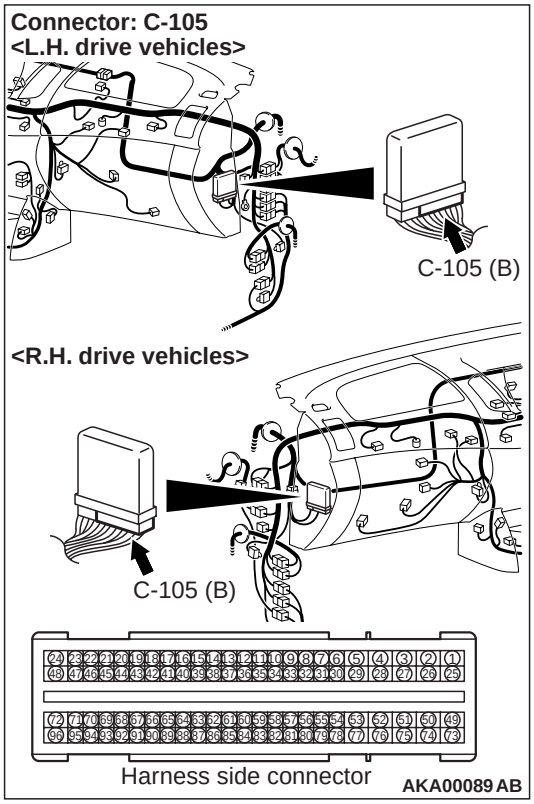
STEP 10. Connector check: C-105 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 11 .
NO : Repair or replace the connector.

STEP 11. Check harness between A-45 (terminal No. 2) EGR valve assembly connector and C-105 (terminal No. 81) engine-ECU connector.

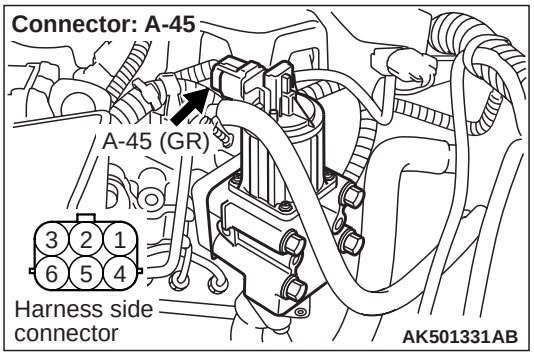




- Check earthing line for damage.

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair the damaged harness wire.

STEP 12. Perform voltage measurement at A-45 EGR valve assembly connector.

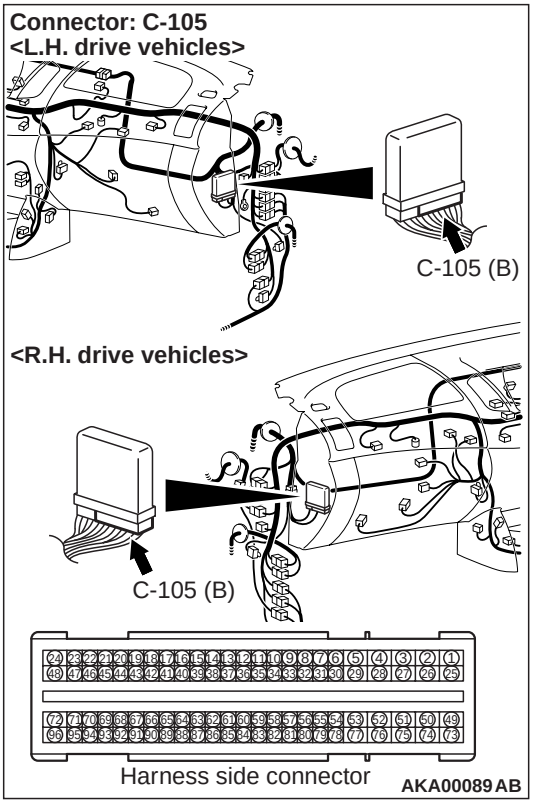


- Use special tool test harness (MB991658) to connect connector and measure at pick-up harness.
- Engine: Idling (after warning up)
- Voltage between terminal No. 1 and earth.

OK: 2.0 V or higher

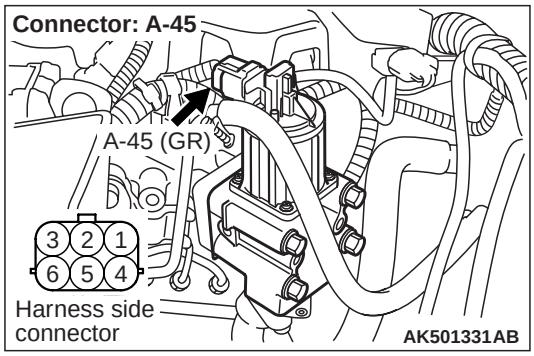
Q: Is the check result normal?
YES : Go to Step 15 .
NO : Go to Step 13 .

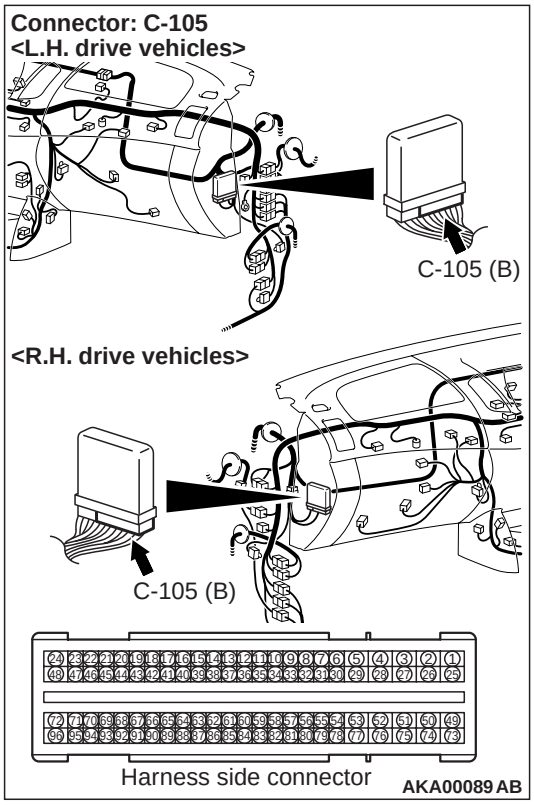
STEP 13. Connector check: C-105 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 14 .
NO : Repair or replace the connector.

STEP 14. Check harness between A-45 (terminal No. 1) EGR valve assembly connector and C-105 (terminal No. 57) engine-ECU connector.

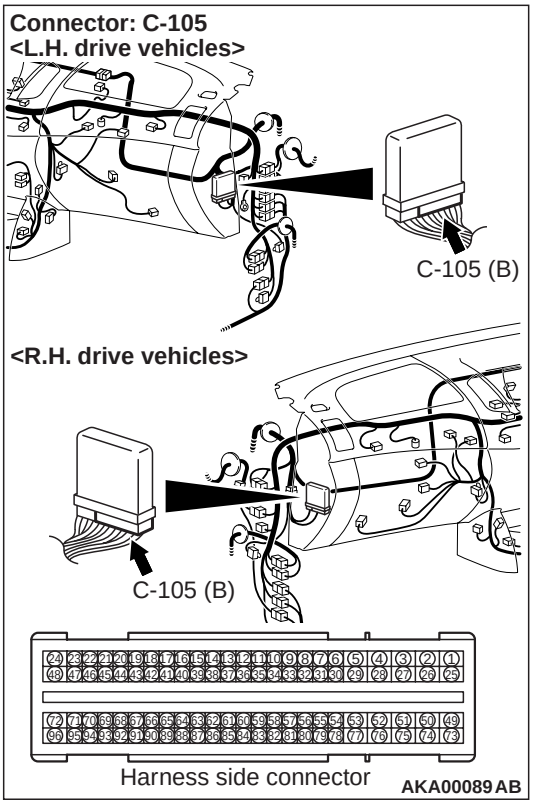




- Check output line for short circuit.

Q: Is the check result normal?
YES : Replace the EGR valve assembly.
NO : Repair the damaged harness wire.

STEP 15. Perform voltage measurement at C-105 engine-ECU connector.



- Measure engine-ECU terminal voltage.
- Engine: Idling (after warning up)
- Voltage between terminal No. 57 and earth.

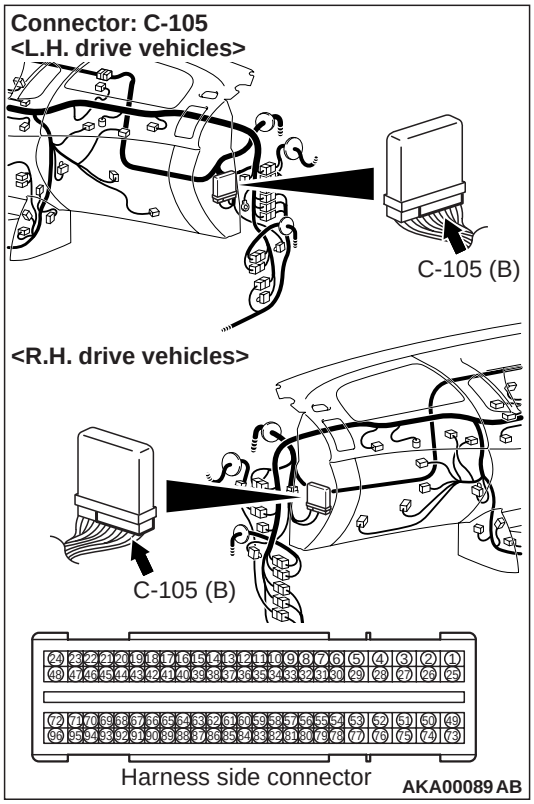
OK: 2.0 V or higher

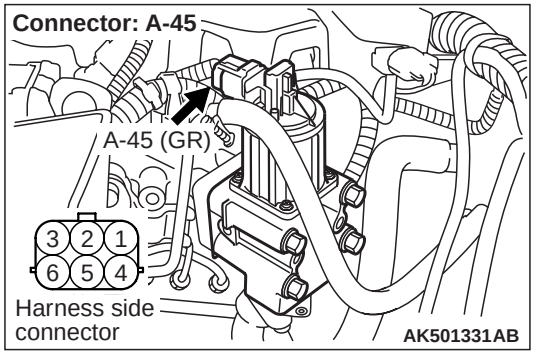
Q: Is the check result normal?

YES : Go to Step 17 .

NO : Go to Step 16 .

STEP 16. Connector check: C-105 engine-ECU connector





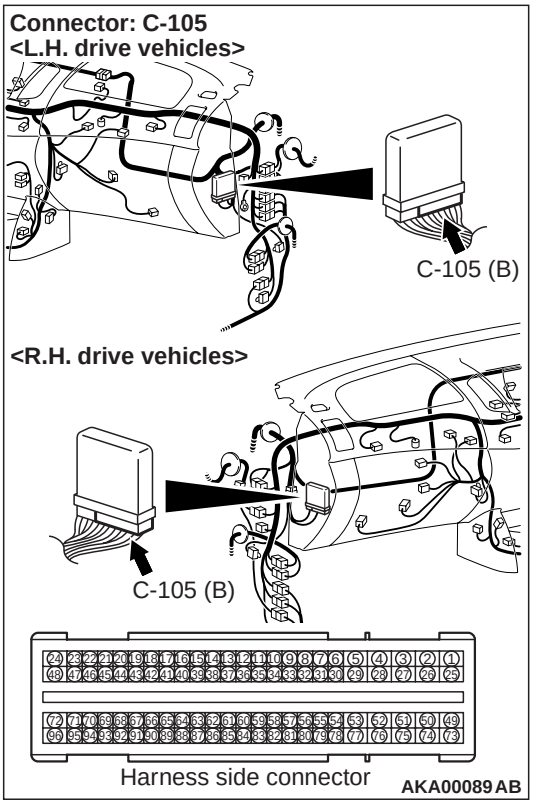
Q: Is the check result normal?

YES : Check and repair harness between A-45 (terminal No. 1) EGR valve assembly connector and C-105 (terminal No. 57) engine-ECU connector.

- Check output line for open circuit and damage.

NO : Repair or replace the connector.

STEP 17. Connector check: C-105 engine-ECU connector

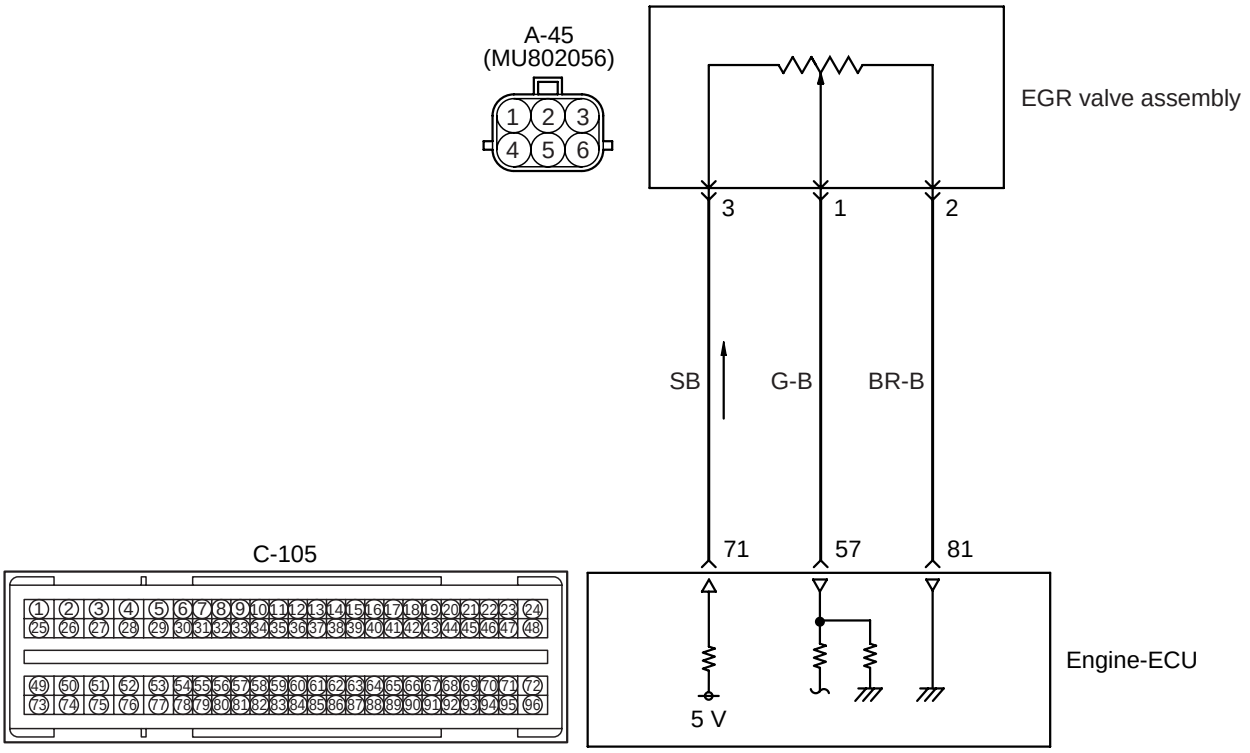


Q: Is the check result normal?

YES : Go to Step 7 .
NO : Repair or replace the connector.

Code No. P0406: EGR Valve Position Sensor Circuit High Input <Except Euro5>

EGR valve Position Sensor Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V: Violet PU: Purple SI: Silver

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OPERATION

- A power voltage of 5 V is applied to the EGR valve assembly power terminal (terminal No. 3) from the engine-ECU (terminal No. 71) and earthed to the engine-ECU (terminal No. 81) from the EGR valve assembly (terminal No. 2).
- The sensor signal is inputted to the engine-ECU (terminal No. 57) from the EGR valve assembly output terminal (terminal No. 1).

FUNCTION

- The EGR valve assembly detects the position of the EGR valve and sends the signal to the engine-ECU.
- Based on the signal, the engine-ECU performs the feedback control of the EGR valve.

TROUBLE JUDGMENT

Check Conditions

- Battery positive voltage is 8 – 16 V
- 2 seconds later after the ignition switch has been in "ON" position or the engine has started up.

Judgment Criterion

- The EGR valve position sensor output voltage is 4.80 V or more for 0.5 second.

PROBABLE CAUSES

- Failed EGR valve position sensor
- Open circuit in EGR valve position sensor circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III data list

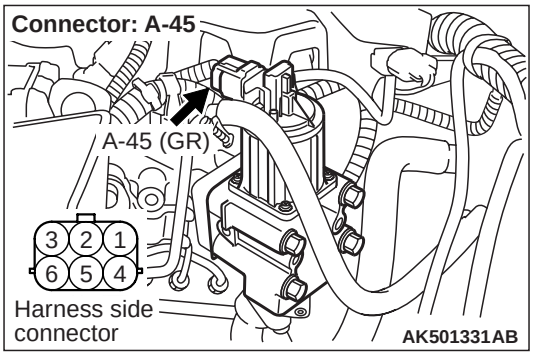
- Refer to Data List Reference Table P.13A-542.
  a. Item 16: EGR valve position sensor

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

NO : Go to Step 2 .

STEP 2. Connector check: A-45 EGR valve assembly connector

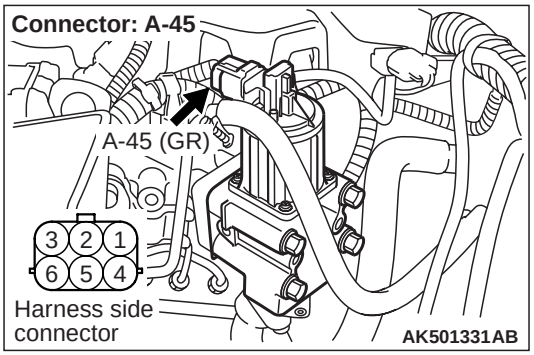


Q: Is the check result normal?

YES : Go to Step 3 .

NO : Repair or replace the connector.

STEP 3. Perform resistance measurement at A-45 EGR valve assembly connector.



- Disconnect connector, and measure at harness side.
- Resistance between terminal No. 2 and earth.

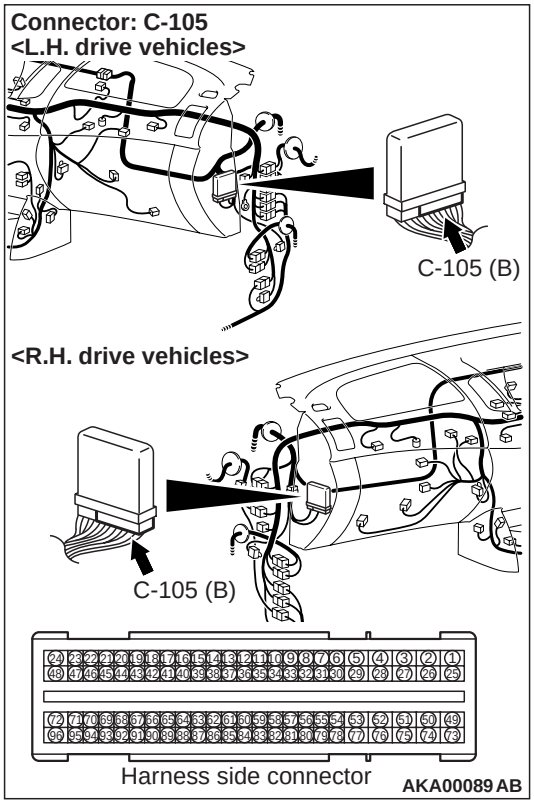
OK: Continuity (2 Ω or less)

Q: Is the check result normal?

YES : Go to Step 7 .

NO : Go to Step 4 .

STEP 4. Connector check: C-105 engine-ECU connector

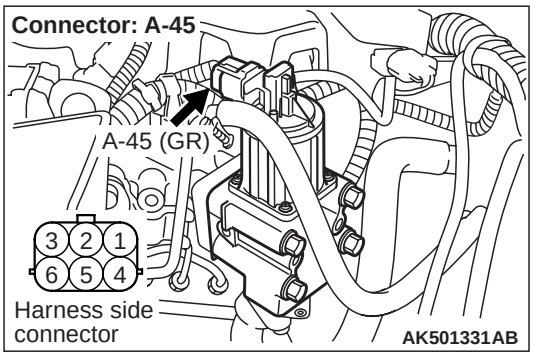


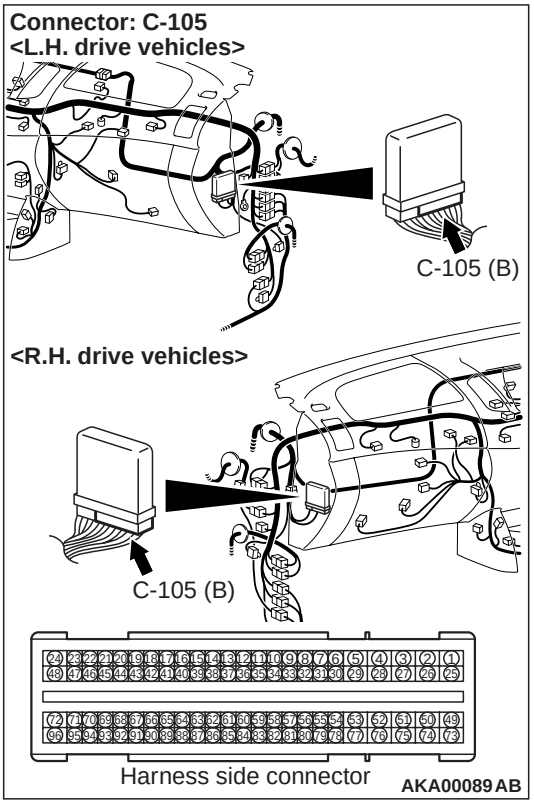
Q: Is the check result normal?

YES : Go to Step 5 .

NO : Repair or replace the connector.

STEP 5. Check harness between A-45 (terminal No. 2) EGR valve assembly connector and C-105 (terminal No. 81) engine-ECU connector.





- Check earthing line for open circuit.

Q: Is the check result normal?

YES : Go to Step 6 .
NO : Repair the damaged harness wire.

STEP 6. M.U.T.-III data list

- Refer to Data List Reference Table P.13A-542.
  a. Item 16: EGR valve position sensor

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).
NO : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).

STEP 7. M.U.T.-III data list

- Refer to Data List Reference Table P.13A-542.
  a. Item 16: EGR valve position sensor

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).
NO : Replace the EGR valve assembly.

Code No. P0420: Catalyst Malfunction <Euro5>

FUNCTION

- The engine-ECU injects the fuel with the slower timing than usual (post injection), so that the oxygen and HC of exhaust gas burn in the catalyst, and the exhaust gas temperature raises up to the level which enables the DPF regeneration.
- The engine-ECU monitors the signals from the No. 2 exhaust gas temperature sensor (catalyst temperature) to detect the catalyst inactivation.

TROUBLE JUDGMENT

Check Condition

- On DPF regeneration

Judgement Criteria

- The conditions below continues for 30 seconds.
- The fuel injection amount exceeds the specified value.
- The engine speed exceeds the specified value.

- The No. 1 exhaust gas temperature sensor is 350°C or higher.
- The No. 2 exhaust gas temperature sensor (catalyst temperature) is 450°C or below.

PROBABLE CAUSES

- Failed No. 1 exhaust gas temperature sensor
- Failed No. 2 exhaust gas temperature sensor (catalyst temperature)
- Catalytic converter inactive

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III data list.

- Refer to Data List Reference Table P.13A-542.
  a. Item 117: No. 1 exhaust gas temperature sensor
  b. Item 118: No. 2 exhaust gas temperature sensor (catalyst temperature)

Q: Are the check results normal?

YES : Go to Step 2 .

NO : Perform the diagnosis code classified check procedure for the sensor that has shown an abnormal data value (Refer to Inspection Chart for Diagnosis Code P.13A-21).

STEP 2. Forcible DPF regeneration execution

- Initialise the DPF-related parts, and then delete the diagnosis code (Refer to GROUP 00 – Precautions before Service – Initialisation Procedure for Learning Value in Diesel Particulate Filter (DPF) System).
  a. Item 42: DPF system malfunction service
- Carry out the forcible DPF regeneration (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

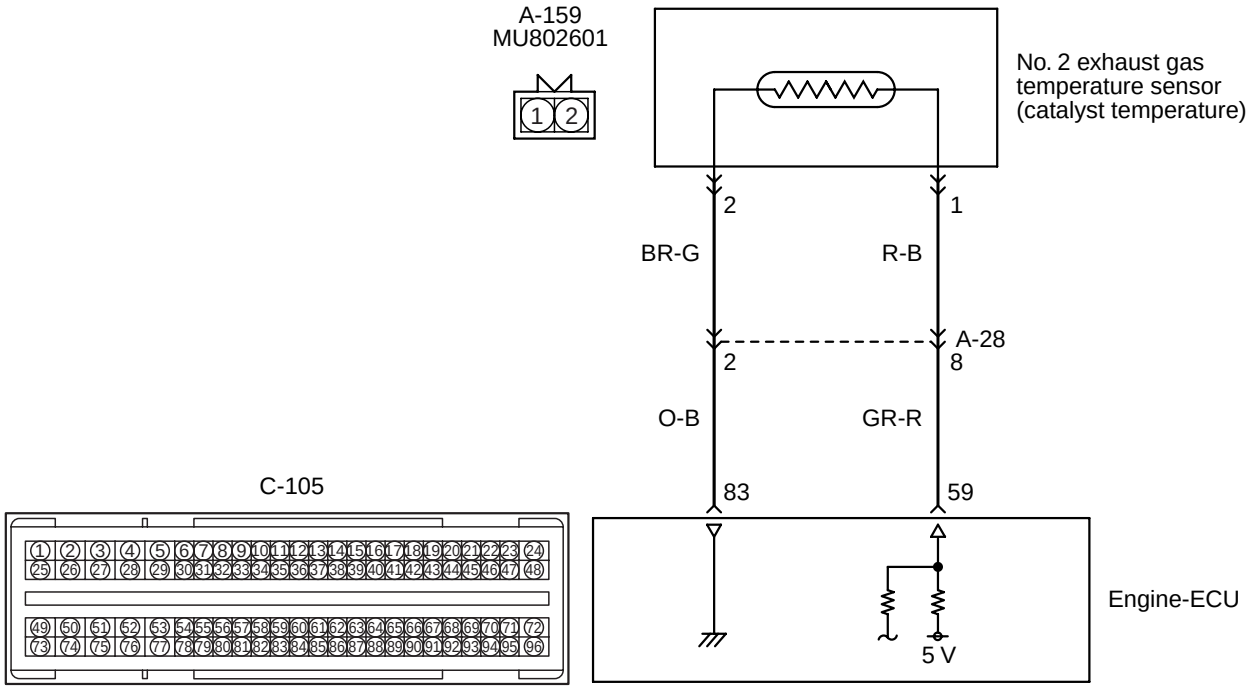
Q: Is the diagnosis code P0420 or P1497 output?

YES : Replace the catalytic converter. When the catalytic converter is replaced, initialise the learning value. (Refer to GROUP 00 – Precautions before Service – Initialisation Procedure for Learning Value in Diesel Particulate Filter (DPF) System .) On completion, carry out the forcible DPF regeneration (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

NO : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, carry out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

Code No. P0427: No. 2 Exhaust Gas Temperature Sensor (catalyst temperature) Circuit Low Input <Euro5>

No. 2 Exhaust Gas Temperature Sensor (catalyst temperature) Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V: Violet PU: Purple SI: Silver

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OPERATION

- A power voltage of 5 V is applied to the No. 2 exhaust gas temperature sensor (catalyst temperature) output terminal (terminal No. 1) from the engine-ECU (terminal No. 59).
- The power voltage is earthed to the engine-ECU (terminal No. 83) from the No. 2 exhaust gas temperature sensor (catalyst temperature) (terminal No. 2).

FUNCTION

- The No. 2 exhaust gas temperature sensor (catalyst temperature) converts the catalyst temperature into a voltage and inputs the voltage signal to the engine-ECU.
- Engine-ECU uses this voltage output for DPF regeneration control.
- The No. 2 exhaust gas temperature sensor (catalyst temperature) is a kind of resistor, which has characteristics to reduce its resistance as the catalyst temperature rises. Therefore, the sensor output voltage varies with the catalyst temperature, and becomes lower as the catalyst temperature rises.

TROUBLE JUDGMENT

Check Conditions

- Battery positive voltage is 8 – 16 V
- 2 seconds later after the ignition switch has been in "ON" position or the engine has started up.

Judgment Criterion

- The No. 2 exhaust gas temperature sensor (catalyst temperature) output voltage is 0.255 V or less.

PROBABLE CAUSES

- Failed No. 2 exhaust gas temperature sensor (catalyst temperature)
- Short circuit in No. 2 exhaust gas temperature sensor (catalyst temperature) circuit or loose connector contact
- Failed engine-ECU

DIAGNOSTIC PROCEDURE

STEP 1. M.U.T.-III data list

- Refer to Data List Reference Table P.13A-542.

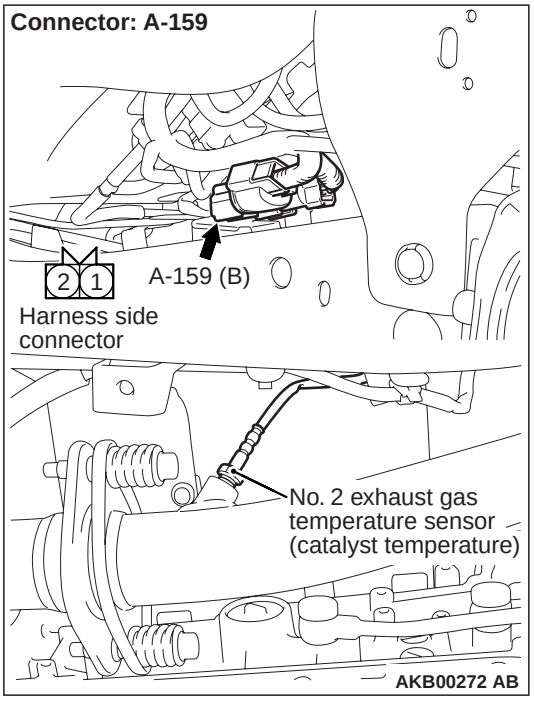
a. Item 118: No. 2 exhaust gas temperature sensor (catalyst temperature)

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

NO : Go to Step 2 .

STEP 2. Connector check: A-159 No. 2 exhaust gas temperature sensor (catalyst temperature) connector



Q: Is the check result normal?

YES : Go to Step 3 .

NO : Repair or replace the connector.

STEP 3. Check No. 2 exhaust gas temperature sensor (catalyst temperature) itself.

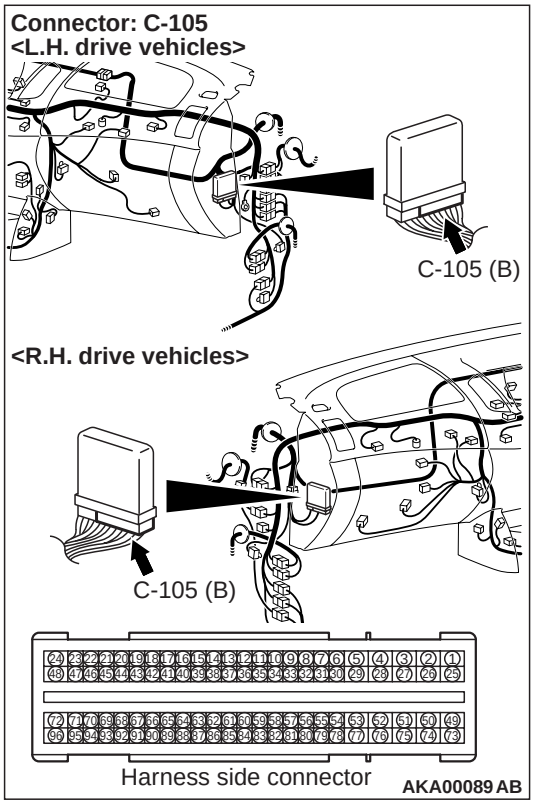
- Check No. 2 exhaust gas temperature sensor (catalyst temperature) itself (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – No. 2 Exhaust Gas Temperature Sensor (catalyst temperature) Check).

Q: Is the check result normal?

YES : Go to Step 4 .

NO : Replace the No. 2 exhaust gas temperature sensor (catalyst temperature). After replacing the No. 2 exhaust gas temperature sensor (catalyst temperature), carry out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

STEP 4. Connector check: C-105 engine-ECU connector

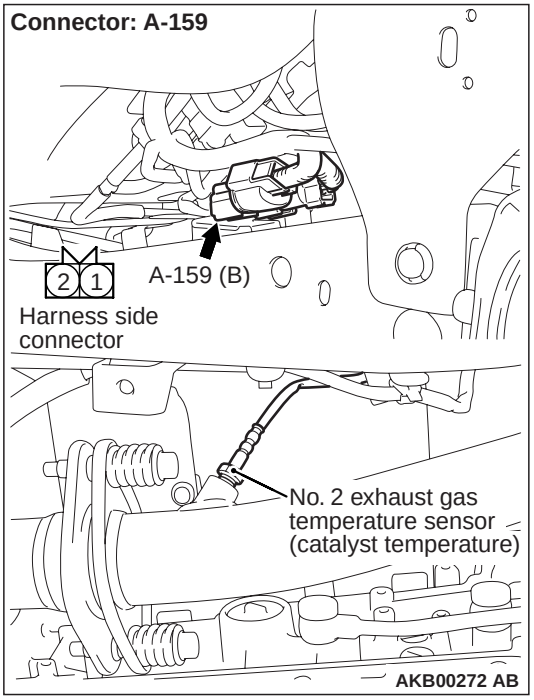


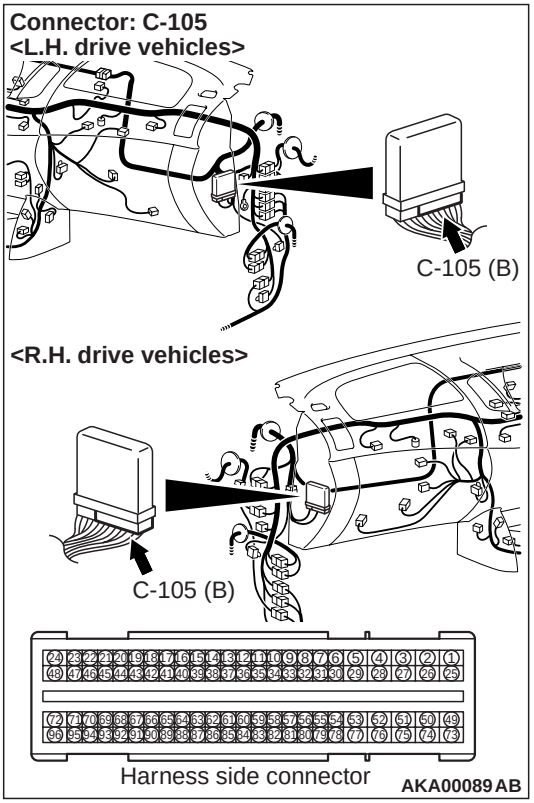
Q: Is the check result normal?

YES : Go to Step 5 .

NO : Repair or replace the connector.

STEP 5. Check harness between A-159 (terminal No. 1) No. 2 exhaust gas temperature sensor (catalyst temperature) connector and C-105 (terminal No. 59) engine-ECU connector.





NOTE: Before checking harness, check intemediate connector A-28, and repair if necessary.

- Check output line for short circuit.

Q: Is the check result normal?

YES : Go to Step 6 .
NO : Repair the damaged harness wire.

STEP 6. M.U.T.-III data list

- Refer to Data List Reference Table P.13A-542

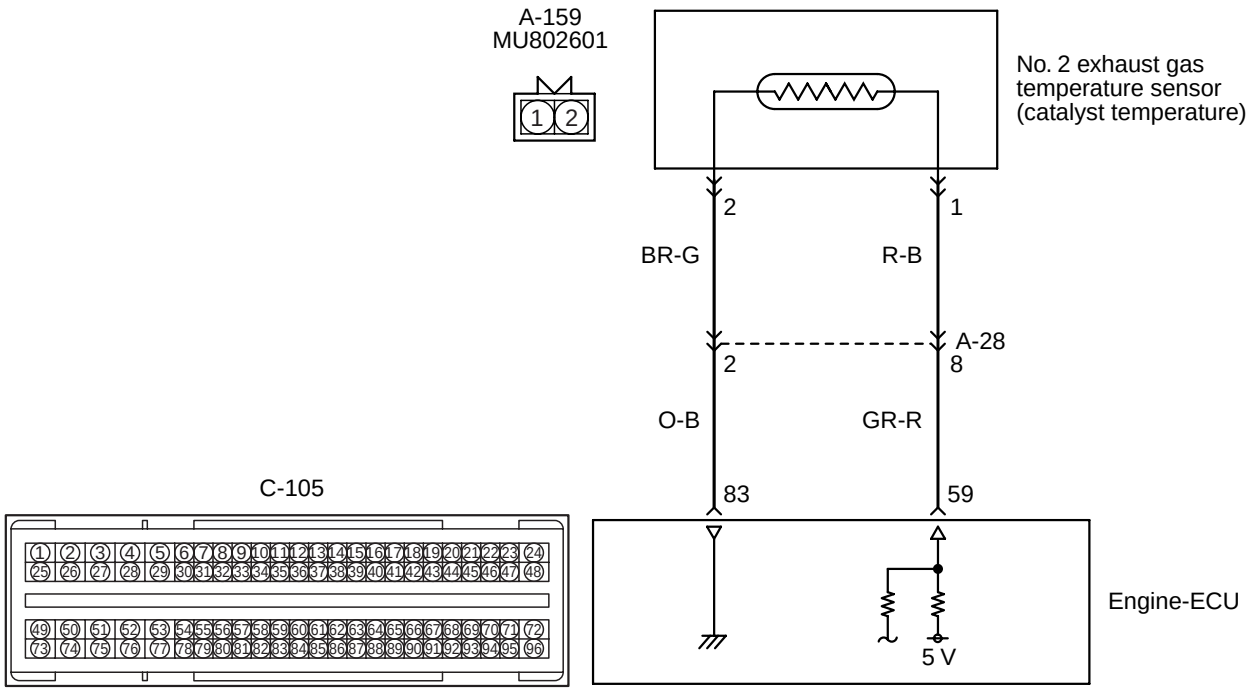
a. Item 118: No. 2 exhaust gas temperature sensor (catalyst temperature)

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).
NO : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, carry out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

Code No. P0428: No. 2 Exhaust Gas Temperature Sensor (catalyst temperature) Circuit High Input <Euro5>

No. 2 Exhaust Gas Temperature Sensor (catalyst temperature) Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V: Violet PU: Purple SI: Silver

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OPERATION

- A power voltage of 5 V is applied to the No. 2 exhaust gas temperature sensor (catalyst temperature) output terminal (terminal No. 1) from the engine-ECU (terminal No. 59).
- The power voltage is earthed to the engine-ECU (terminal No. 83) from the No. 2 exhaust gas temperature sensor (catalyst temperature) (terminal No. 2).

FUNCTION

- The No. 2 exhaust gas temperature sensor (catalyst temperature) converts the catalyst temperature into a voltage and inputs the voltage signal to the engine-ECU.
- Engine-ECU uses this voltage for DPF regeneration control.
- The No. 2 exhaust gas temperature sensor (catalyst temperature) is a kind of resistor, which has characteristics to reduce its resistance as the catalyst temperature rises. Therefore, the sensor output voltage varies with the catalyst temperature, and becomes lower as the catalyst temperature rises.

TROUBLE JUDGMENT

Check Conditions

- Battery positive voltage is 8 – 16 V.
- 2 seconds later after the ignition switch has been in "ON" position or the engine has started up.
- Vehicle speed is 20 km/h or higher.

Judgment Criterion

- The No. 2 exhaust gas temperature sensor (catalyst temperature) output voltage is 4.95 V or more.

PROBABLE CAUSES

- Failed No. 2 exhaust gas temperature sensor (catalyst temperature)
- Open circuit or harness damage in No. 2 exhaust gas temperature sensor (catalyst temperature) circuit or loose connector contact
- Failed engine-ECU

DIAGNOSTIC PROCEDURE

STEP 1. M.U.T.-III data list

- Refer to Data List Reference Table P.13A-542

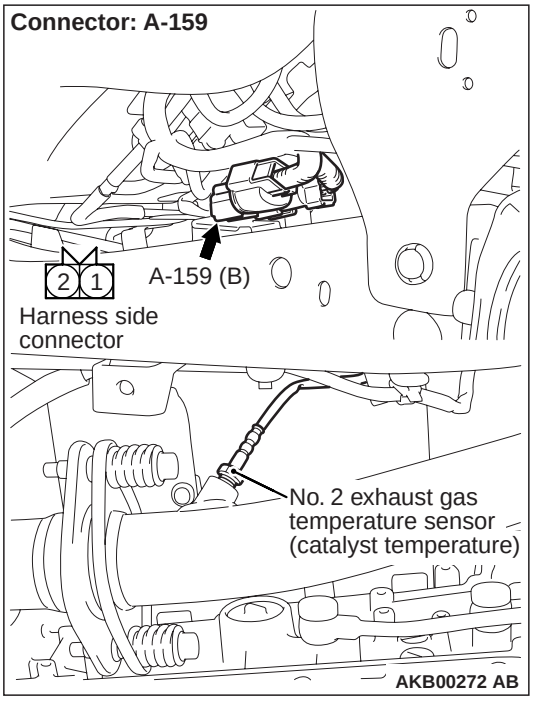
a. Item 118: No. 2 exhaust gas temperature sensor (catalyst temperature)

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

NO : Go to Step 2 .

STEP 2. Connector check: A-159 No. 2 exhaust gas temperature sensor (catalyst temperature) connector



Q: Is the check result normal?

YES : Go to Step 3 .

NO : Repair or replace the connector.

STEP 3. Check No. 2 exhaust gas temperature sensor (catalyst temperature) itself.

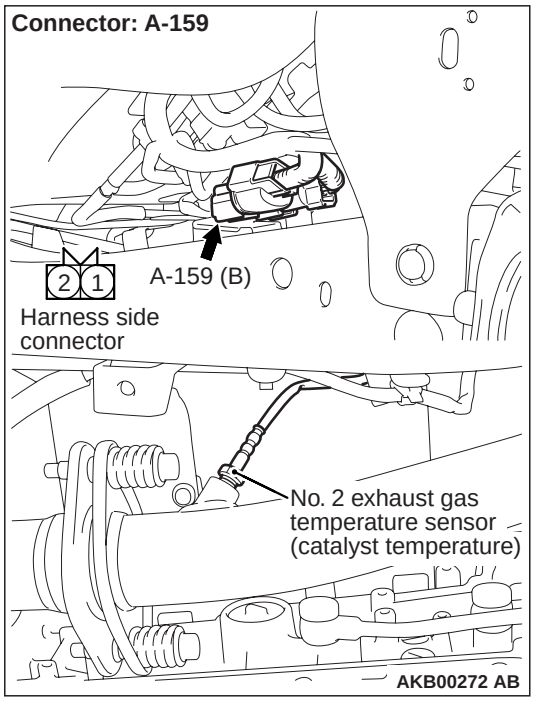
- Check No. 2 exhaust gas temperature sensor (catalyst temperature) itself (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – No. 2 Exhaust Gas Temperature Sensor (catalyst temperature) Check).

Q: Is the check result normal?

YES : Go to Step 4 .

NO : Replace the No. 2 exhaust gas temperature sensor (catalyst temperature). After replacing the No. 2 exhaust gas temperature sensor (catalyst temperature), carry out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

STEP 4. Perform voltage measurement at A-159 No. 2 exhaust gas temperature sensor (catalyst temperature) connector.



- Disconnect connector, and measure at harness side.
- Ignition switch: ON
- Voltage between terminal No. 1 and earth.

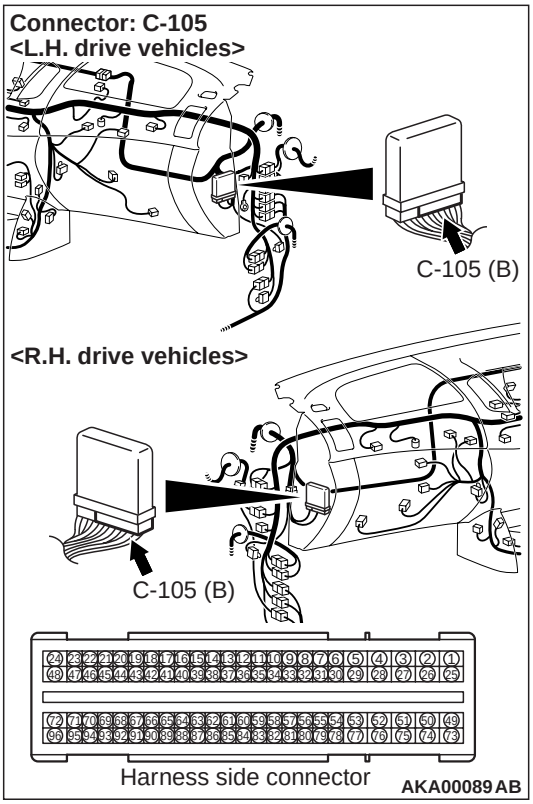
OK: 4.5 – 4.9 V

Q: Is the check result normal?

YES : Go to Step 8 .

NO : Go to Step 5 .

STEP 5. Connector check: C-105 engine-ECU connector.

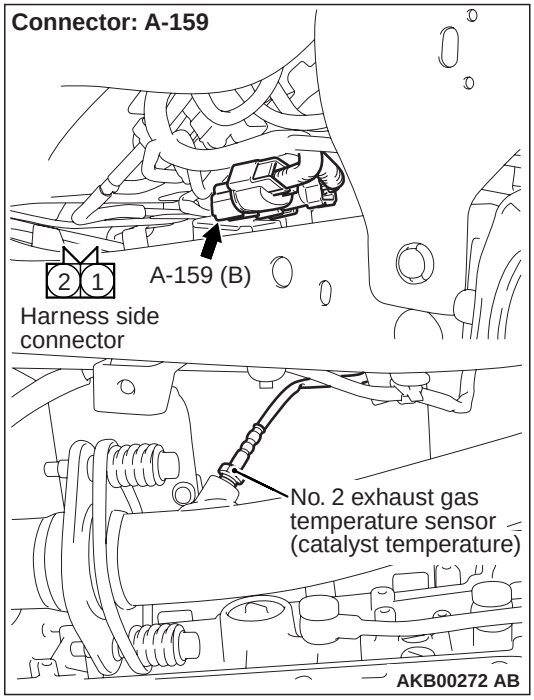


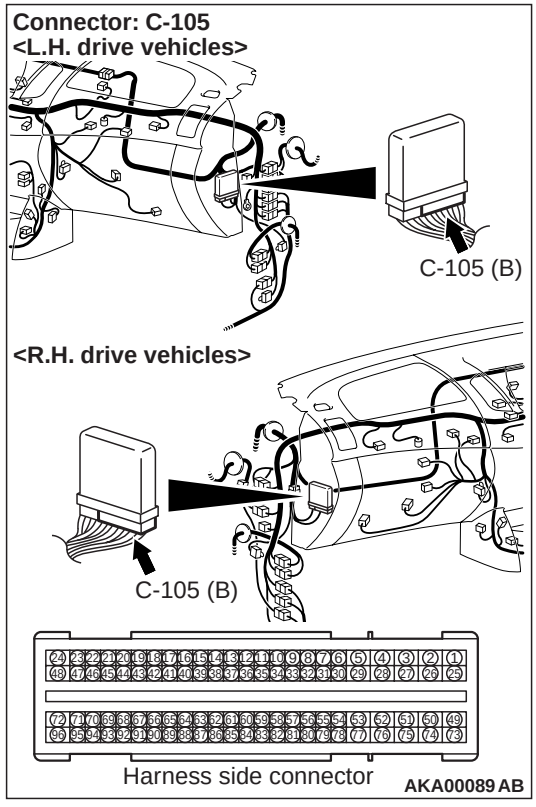
Q: Is the check result normal?

YES : Go to Step 6 .

NO : Repair or replace the connector.

STEP 6. Check harness between A-159 (terminal No. 1) No. 2 exhaust gas temperature sensor (catalyst temperature) connector and C-105 (terminal No. 59) engine-ECU connector.





NOTE: Before checking harness, check intemediate connector A-28, and repair if necessary.

- Check output line for open circuit.

Q: Is the check result normal?

YES : Go to Step 7 .
NO : Repair the damaged harness wire.

STEP 7. M.U.T.-III data list

- Refer to Data List Reference Table P.13A-542

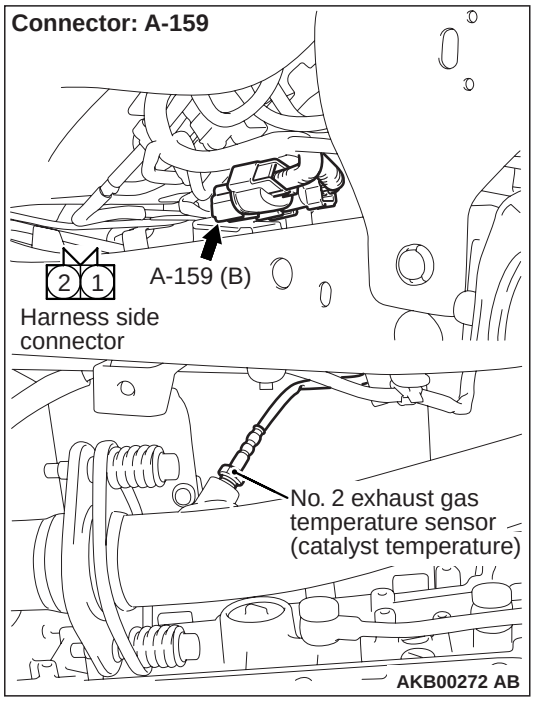
a. Item 118: No. 2 exhaust gas temperature sensor (catalyst temperature)

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

NO : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, carry out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

STEP 8. Perform resistance measurement at A-159 No. 2 exhaust gas temperature sensor (catalyst temperature) connector.



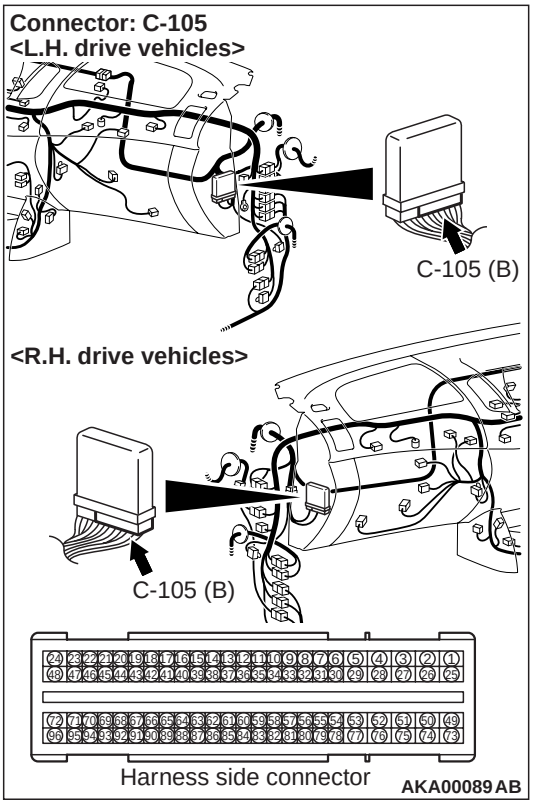
- Disconnect connector, and measure at harness side.
- Resistance between terminal No. 2 and earth.

OK: Continuity (2 Ω or less)

Q: Is the check result normal?

YES : Go to Step 11 .
NO : Go to Step 9 .

STEP 9. Connector check: C-105 engine-ECU connector

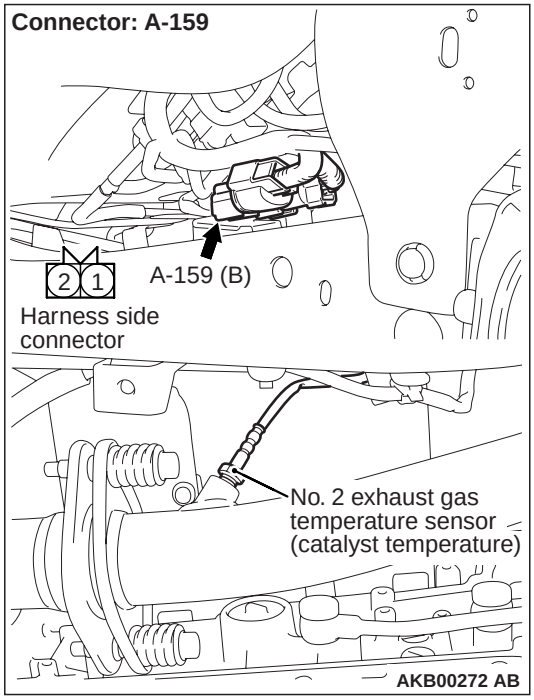


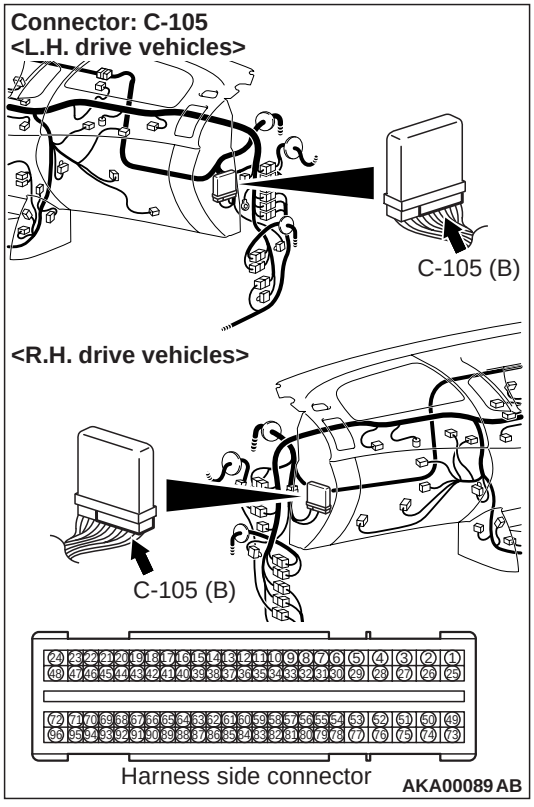
Q: Is the check result normal?

YES : Go to Step 10 .

NO : Repair or replace the connector.

STEP 10. Check harness between A-159 (terminal No. 2) No. 2 exhaust gas temperature sensor (catalyst temperature) connector and C-105 (terminal No. 83) engine-ECU connector.





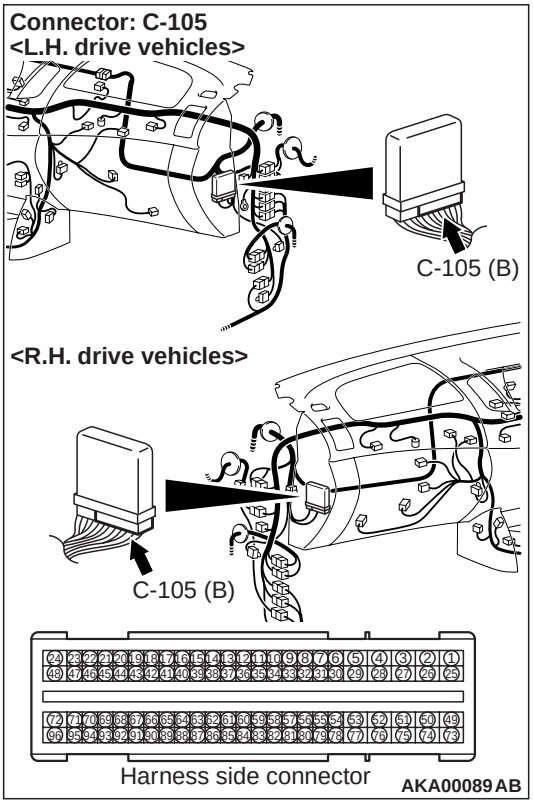
NOTE: Before checking harness, check intemediate connector A-28, and repair if necessary.

- Check earthing line for open circuit and damage.

Q: Is the check result normal?

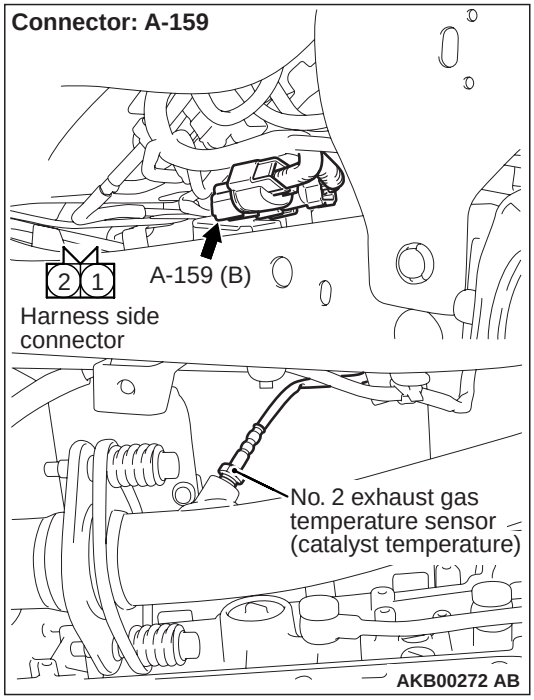
YES : Go to Step 7 .
NO : Repair the damaged harness wire.

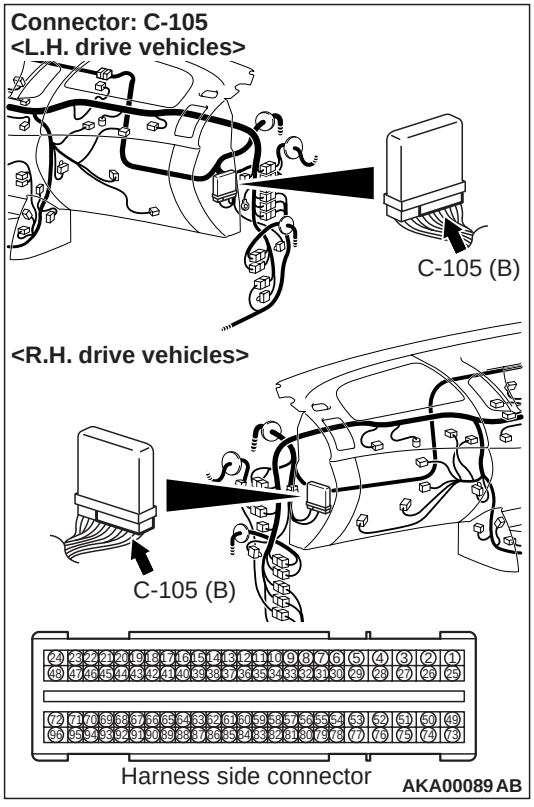
STEP 11. Connector check: C-105 engine-ECU connector.



Q: Is the check result normal?
YES : Go to Step 12 .
NO : Repair or replace the connector.

STEP 12. Check harness between A-159 (terminal No. 1) No. 2 exhaust gas temperature sensor (catalyst temperature) connector and C-105 (terminal No. 59) engine-ECU connector.





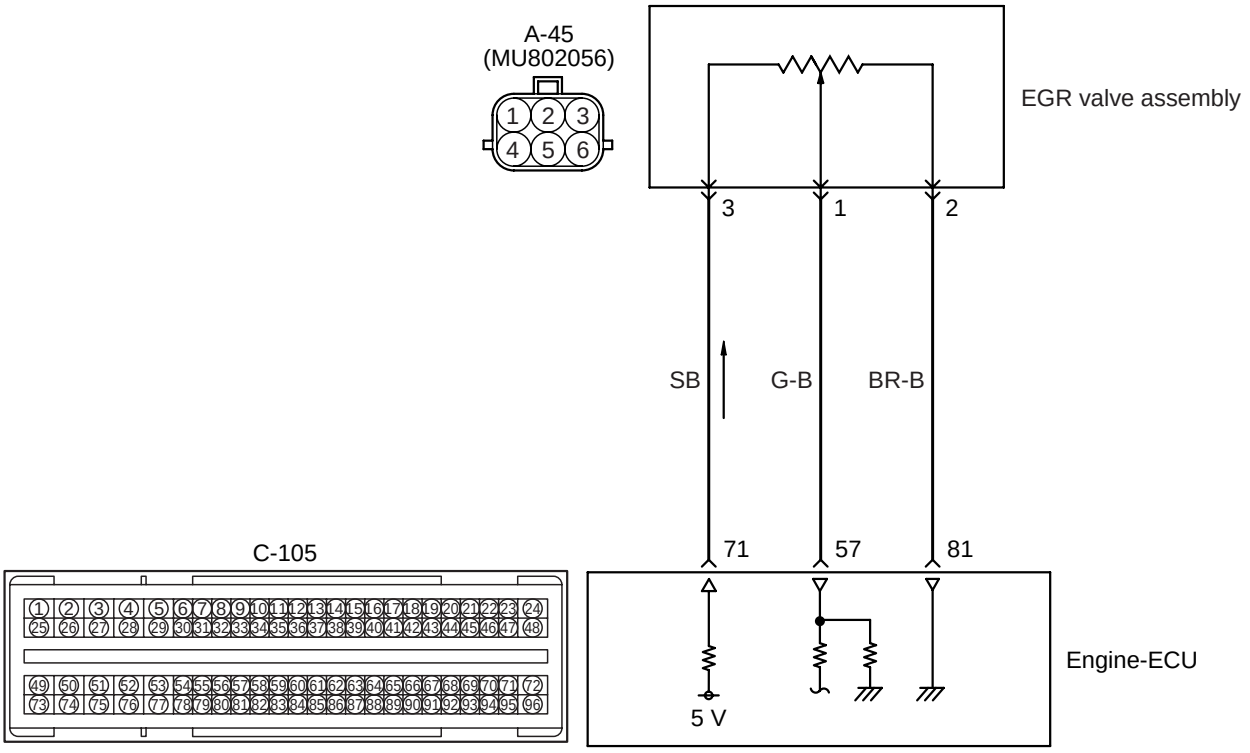
NOTE: Before checking harness, check intemediate connector A-28, and repair if necessary.
- Check output line for damage.

Q: Is the check result normal?

YES : Go to Step 7 .
NO : Repair the damaged harness wire.

Code No. P0489: EGR Valve Position Sensor Circuit Low Input <Euro5>

EGR valve Position Sensor Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V: Violet PU: Purple SI: Silver

AKA00103AB

OPERATION
- A power voltage of 5 V is applied to the EGR valve assembly power terminal (terminal No. 3) from the engine-ECU (terminal No. 71) and earthed to the engine-ECU (terminal No. 81) from the EGR valve assembly (terminal No. 2).
- The sensor signal is inputted to the engine-ECU (terminal No. 57) from the EGR valve assembly output terminal (terminal No. 1).

FUNCTION
- The EGR valve assembly detects the position of the EGR valve and sends the signal to the engine-ECU.
- Based on the signal, the engine-ECU performs the feedback control of the EGR valve.

TROUBLE JUDGMENT

Check Conditions
- Battery positive voltage is 8 – 16 V
- 2 seconds later after the ignition switch has been in "ON" position or the engine has started up.

Judgment Criterion
- The EGR valve position sensor output voltage is 0.20 V or less for 0.5 second.

PROBABLE CAUSES
- Failed EGR valve position sensor
- Open/short circuit or harness damage in EGR valve position sensor circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III data list

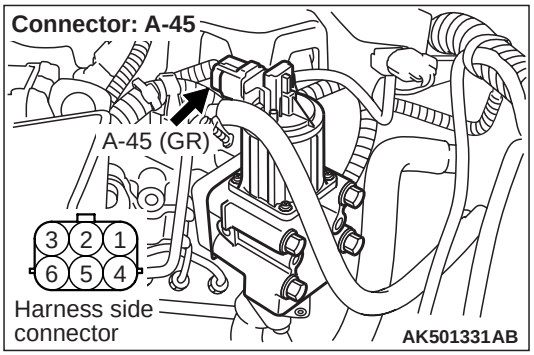
- Refer to Data List Reference Table P.13A-542.
  a. Item 16: EGR valve position sensor

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

NO : Go to Step 2 .

STEP 2. Connector check: A-45 EGR valve assembly connector

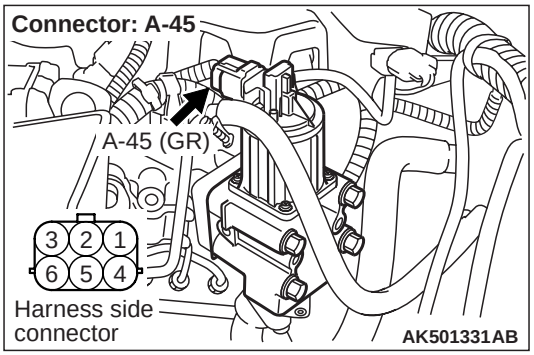


Q: Is the check result normal?

YES : Go to Step 3 .

NO : Repair or replace the connector.

STEP 3. Perform voltage measurement at A-45 EGR valve assembly connector.



- Disconnect connector, and measure at harness side.
- Ignition switch: ON
- Voltage between terminal No. 3 and earth.

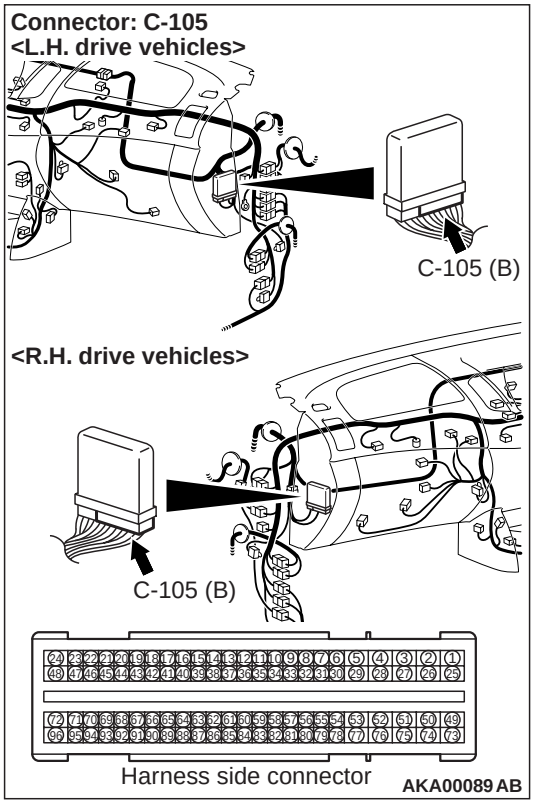
OK: 4.9 – 5.1 V

Q: Is the check result normal?

YES : Go to Step 9 .

NO : Go to Step 4 .

STEP 4. Perform voltage measurement at C-105 engine-ECU connector.



- Measure engine-ECU terminal voltage.
- Ignition switch: ON
- Voltage between terminal No. 71 and earth.

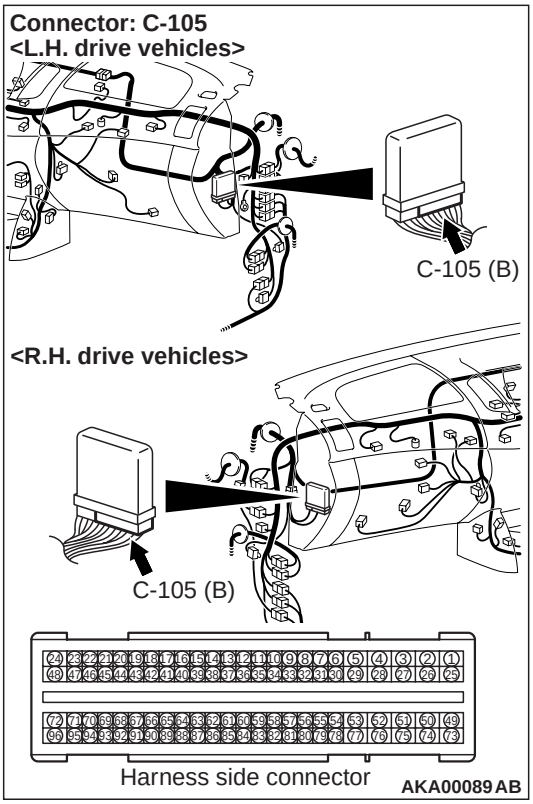
OK: 4.9 – 5.1 V

Q: Is the check result normal?

YES : Go to Step 8 .

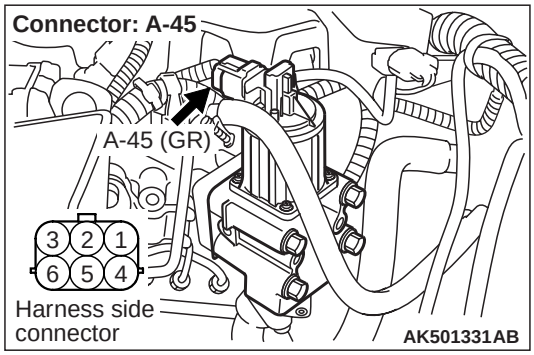
NO : Go to Step 5 .

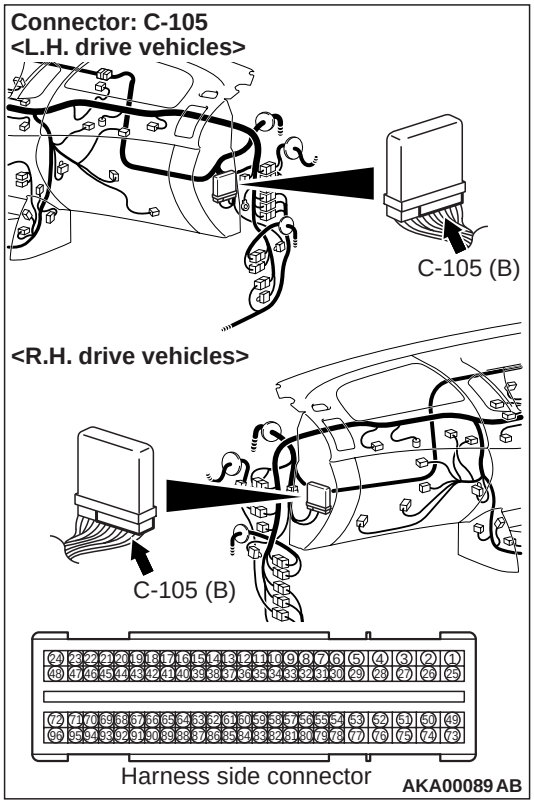
STEP 5. Connector check: C-105 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 6 .
NO : Repair or replace the connector.

STEP 6. Check harness between A-45 (terminal No. 3) EGR valve assembly connector and C-105 (terminal No. 71) engine-ECU connector.





- Check power supply line for short circuit.

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair the damaged harness wire.

STEP 7. M.U.T.-III data list

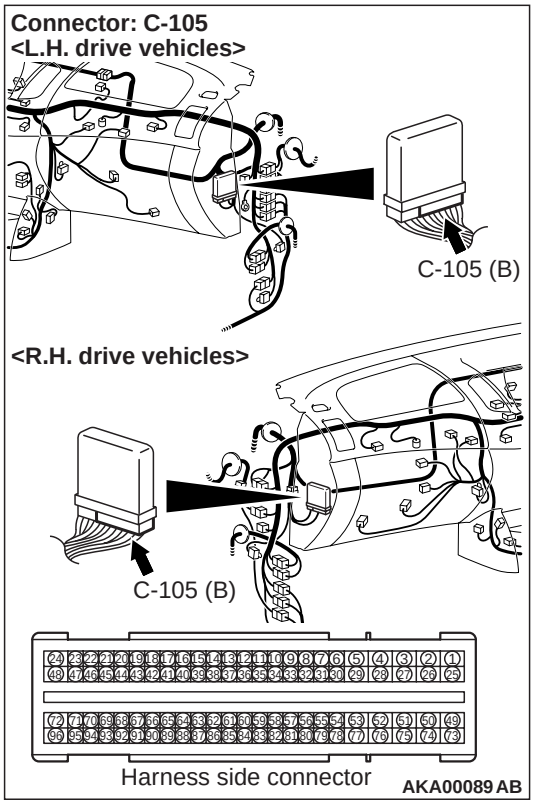
- Refer to Data List Reference Table P.13A-542.
  a. Item 16: EGR valve position sensor

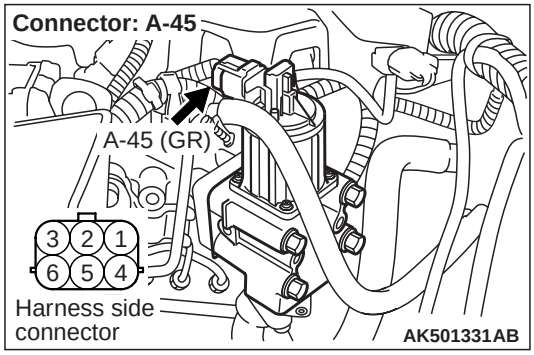
Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

NO : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, carry out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

STEP 8. Connector check: C-105 engine-ECU connector





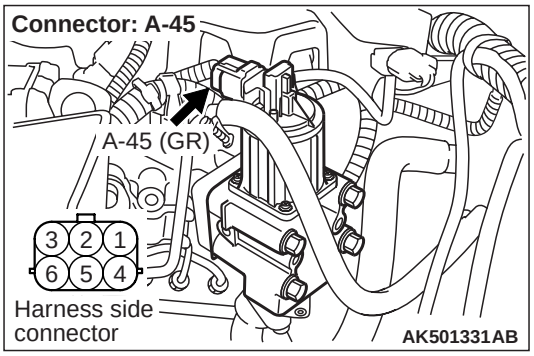
Q: Is the check result normal?

YES : Check and repair harness between A-45 (terminal No. 3) EGR valve assembly connector and C-105 (terminal No. 71) engine-ECU connector.

- Check power supply line for open circuit and damage.

NO : Repair or replace the connector.

STEP 9. Perform resistance measurement at A-45 EGR valve assembly connector.

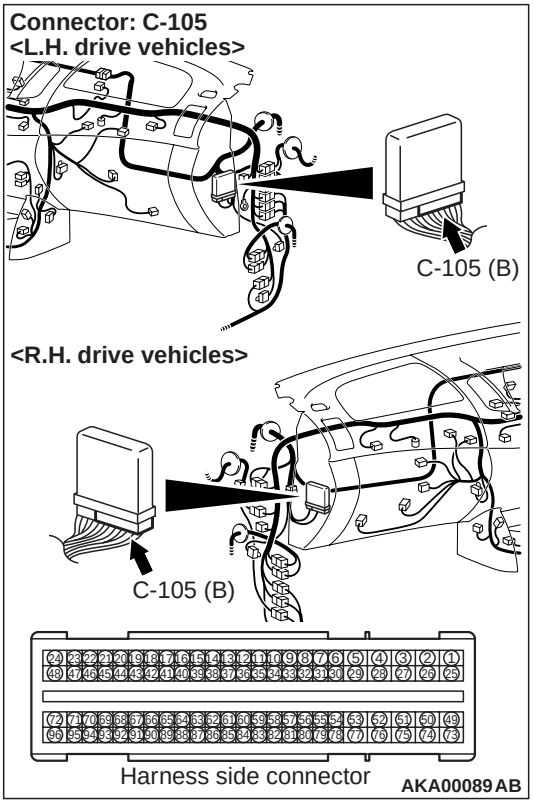


- Disconnect connector, and measure at harness side.
- Ignition switch: ON
- Resistance between terminal No. 2 and earth.

OK: Continuity (2 Ω or less)

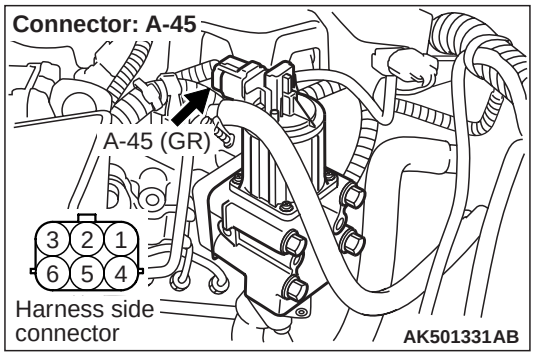
Q: Is the check result normal?
YES : Go to Step 12 .
NO : Go to Step 10 .

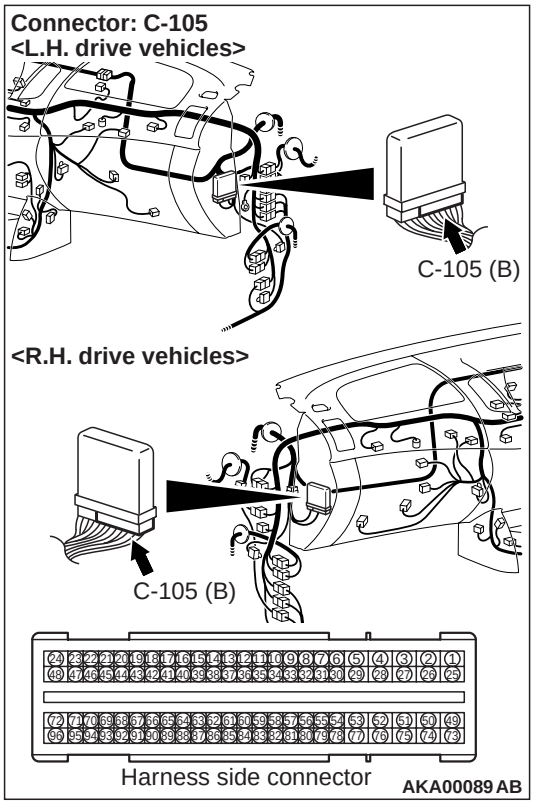
STEP 10. Connector check: C-105 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 11 .
NO : Repair or replace the connector.

STEP 11. Check harness between A-45 (terminal No. 2) EGR valve assembly connector and C-105 (terminal No. 81) engine-ECU connector.

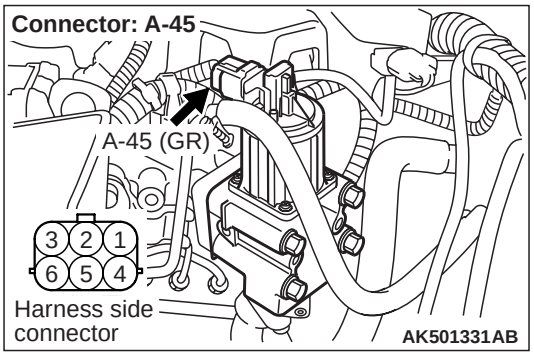




- Check earthing line for damage.

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair the damaged harness wire.

STEP 12. Perform voltage measurement at A-45 EGR valve assembly connector.

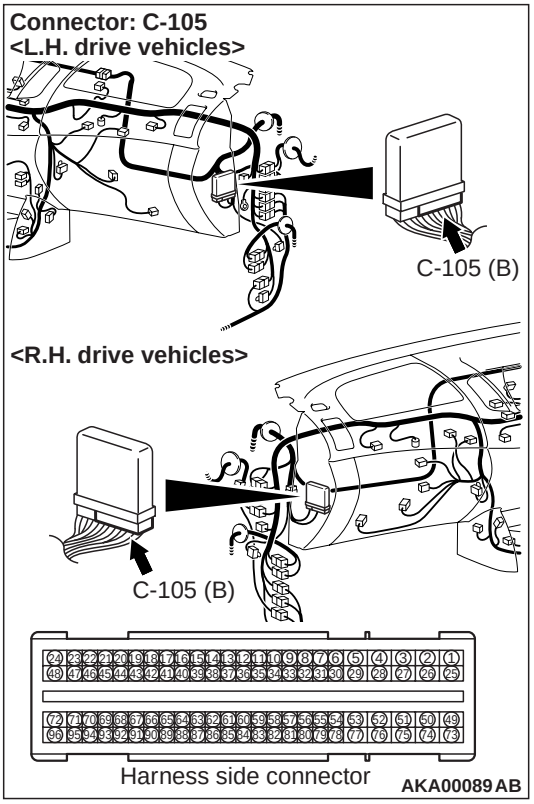


- Use special tool test harness (MB991658) to connect connector and measure at pick-up harness.
- Engine: Idling (after warning up)
- Voltage between terminal No. 1 and earth.

OK: 2.0 V or higher

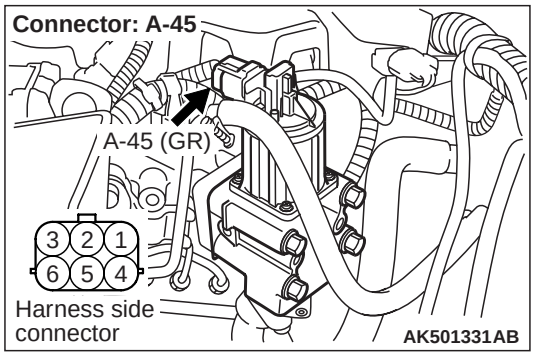
Q: Is the check result normal?
YES : Go to Step 15 .
NO : Go to Step 13 .

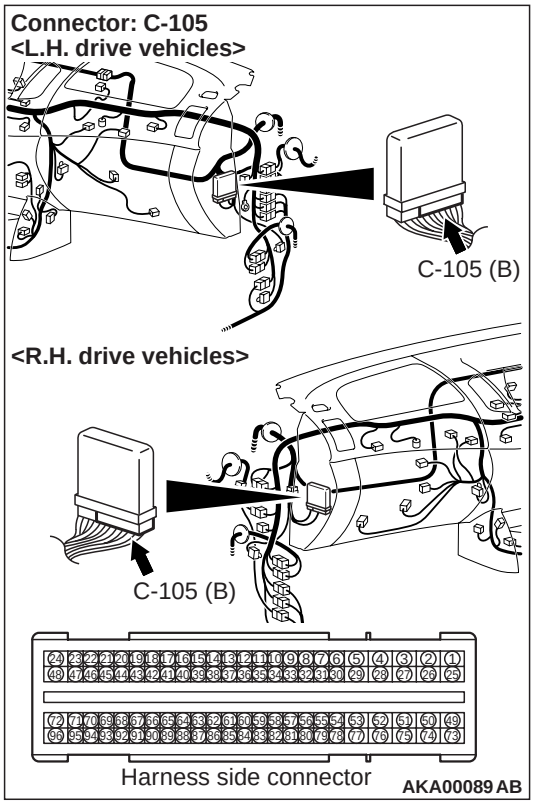
STEP 13. Connector check: C-105 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 14 .
NO : Repair or replace the connector.

STEP 14. Check harness between A-45 (terminal No. 1) EGR valve assembly connector and C-105 (terminal No. 57) engine-ECU connector.

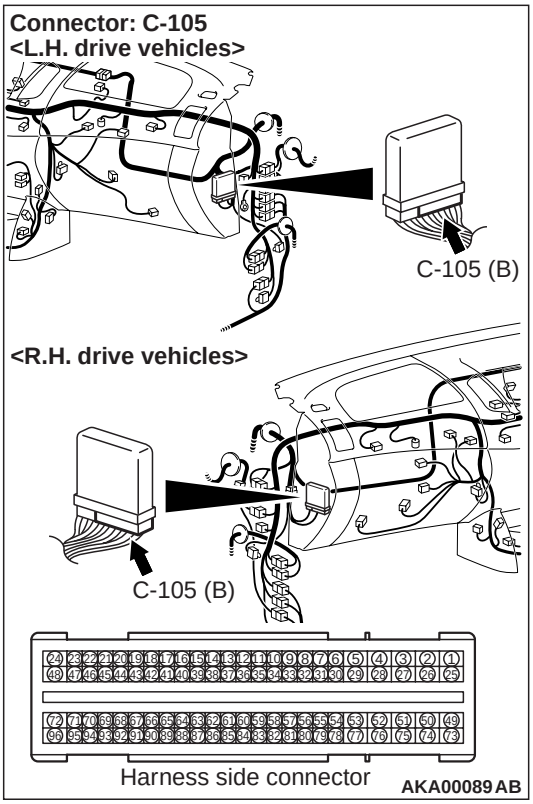




- Check output line for short circuit.

Q: Is the check result normal?
YES : Replace the EGR valve assembly.
NO : Repair the damaged harness wire.

STEP 15. Perform voltage measurement at C-105 engine-ECU connector.



- Measure engine-ECU terminal voltage.
- Engine: Idling (after warning up)
- Voltage between terminal No. 57 and earth.

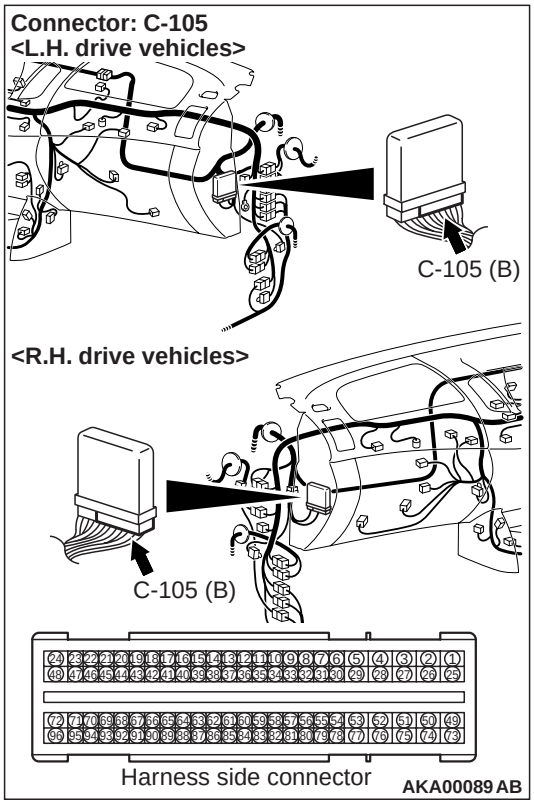
OK: 2.0 V or higher

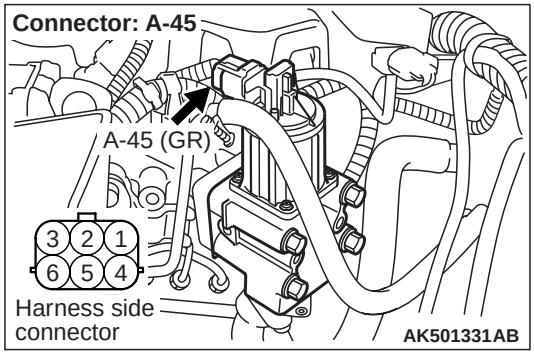
Q: Is the check result normal?

YES : Go to Step 17 .

NO : Go to Step 16 .

STEP 16. Connector check: C-105 engine-ECU connector





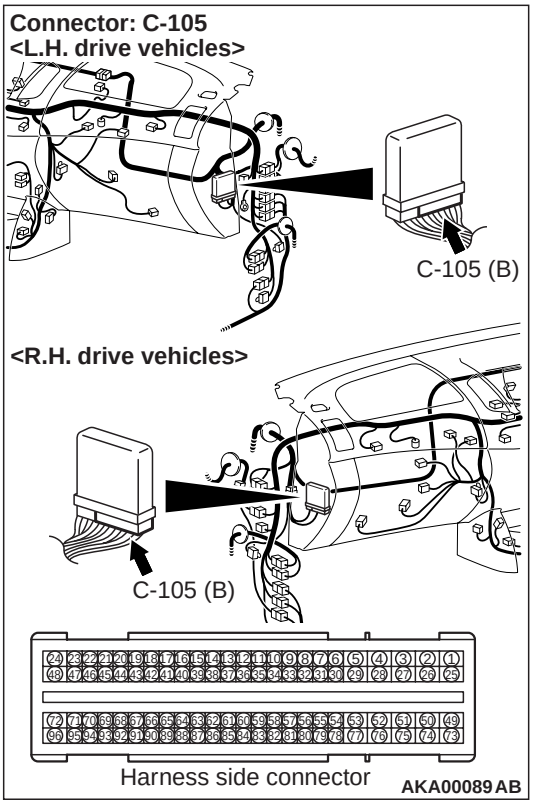
Q: Is the check result normal?

YES : Check and repair harness between A-45 (terminal No. 1) EGR valve assembly connector and C-105 (terminal No. 57) engine-ECU connector.

- Check output line for open circuit and damage.

NO : Repair or replace the connector.

STEP 17. Connector check: C-105 engine-ECU connector

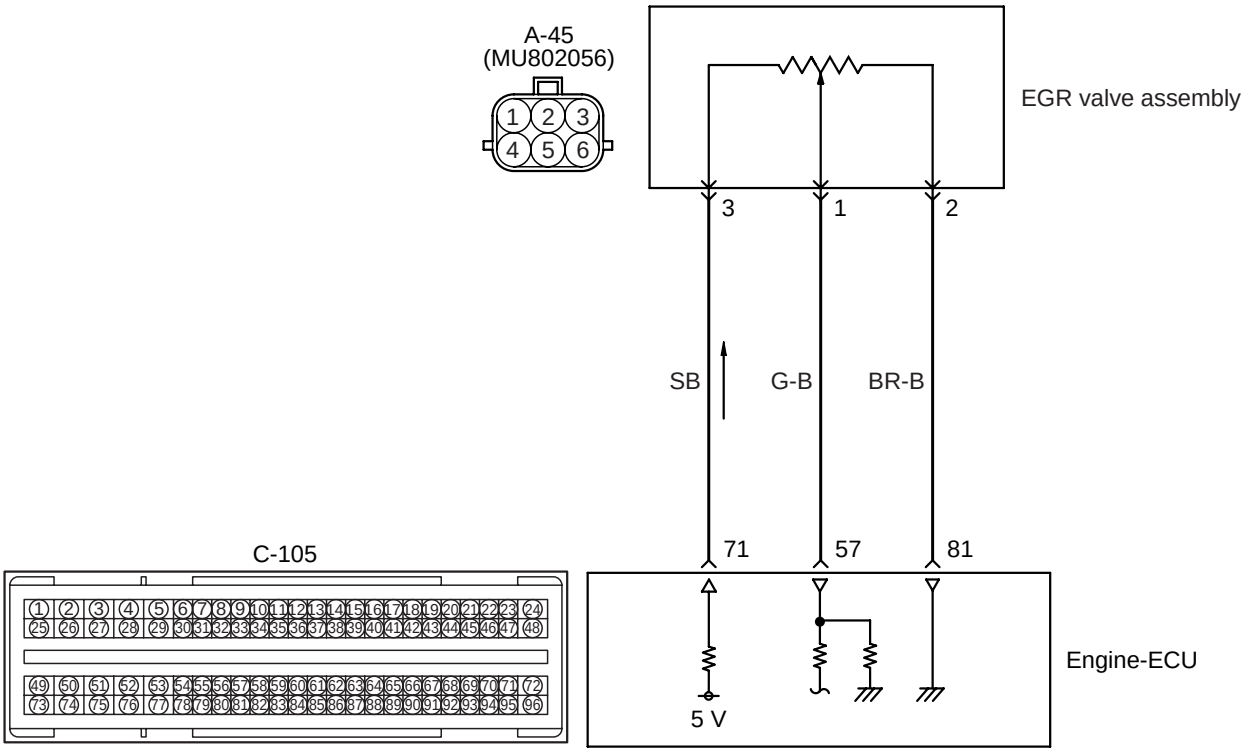


Q: Is the check result normal?

YES : Go to Step 7 .
NO : Repair or replace the connector.

Code No. P0490: EGR Valve Position Sensor Circuit High Input <Euro5>

EGR valve Position Sensor Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V: Violet PU: Purple SI: Silver

AKA00103AB

OPERATION

- A power voltage of 5 V is applied to the EGR valve assembly power terminal (terminal No. 3) from the engine-ECU (terminal No. 71) and earthed to the engine-ECU (terminal No. 81) from the EGR valve assembly (terminal No. 2).
- The sensor signal is inputted to the engine-ECU (terminal No. 57) from the EGR valve assembly output terminal (terminal No. 1).

FUNCTION

- The EGR valve assembly detects the position of the EGR valve and sends the signal to the engine-ECU.
- Based on the signal, the engine-ECU performs the feedback control of the EGR valve.

TROUBLE JUDGMENT

Check Conditions

- Battery positive voltage is 8 – 16 V
- 2 seconds later after the ignition switch has been in "ON" position or the engine has started up.

Judgment Criterion

- The EGR valve position sensor output voltage is 4.80 V or more for 0.5 second.

PROBABLE CAUSES

- Failed EGR valve position sensor
- Open circuit in EGR valve position sensor circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III data list

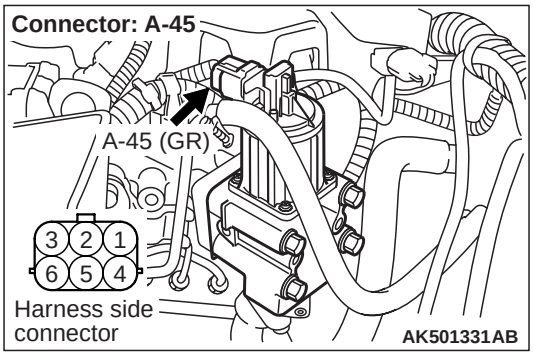
- Refer to Data List Reference Table P.13A-542.
  a. Item 16: EGR valve position sensor

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

NO : Go to Step 2 .

STEP 2. Connector check: A-45 EGR valve assembly connector

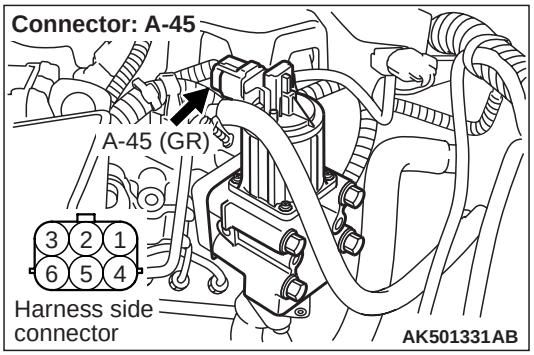


Q: Is the check result normal?

YES : Go to Step 3 .

NO : Repair or replace the connector.

STEP 3. Perform resistance measurement at A-45 EGR valve assembly connector.



- Disconnect connector, and measure at harness side.
- Resistance between terminal No. 2 and earth.

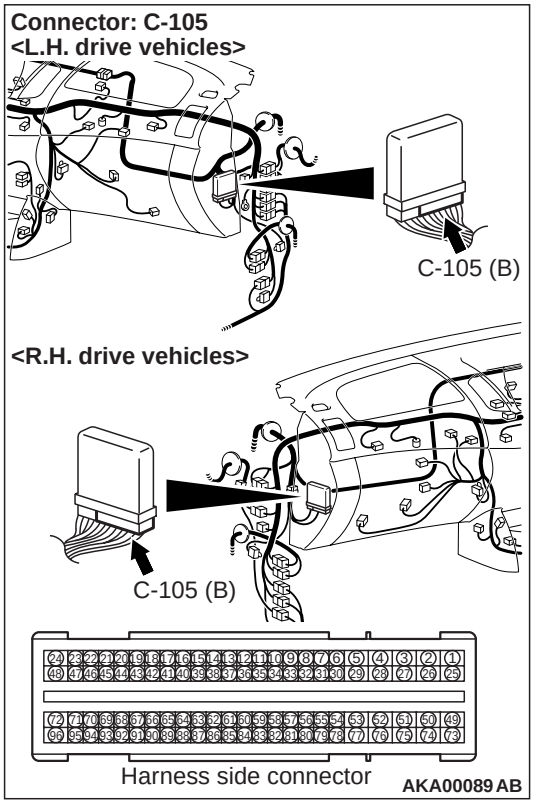
OK: Continuity (2 Ω or less)

Q: Is the check result normal?

YES : Go to Step 7 .

NO : Go to Step 4 .

STEP 4. Connector check: C-105 engine-ECU connector

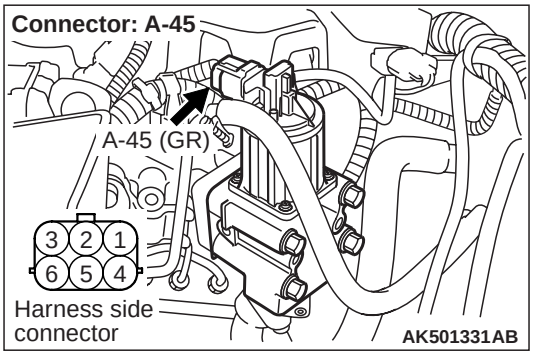


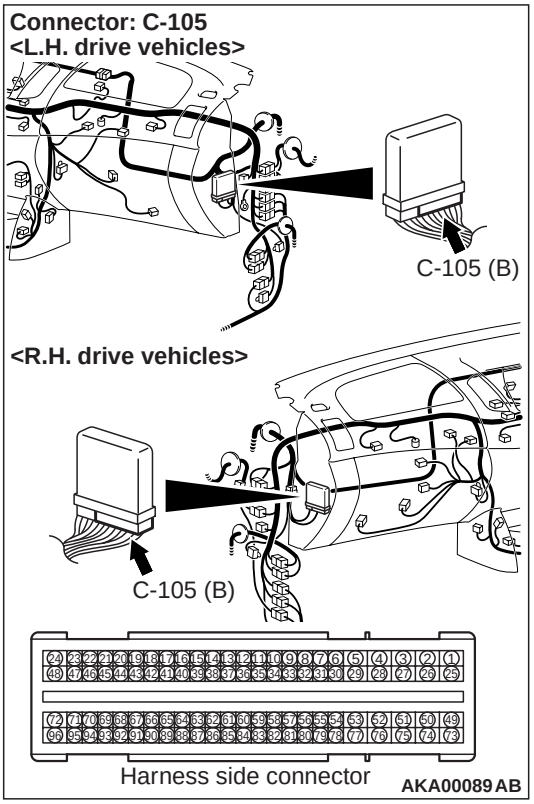
Q: Is the check result normal?

YES : Go to Step 5 .

NO : Repair or replace the connector.

STEP 5. Check harness between A-45 (terminal No. 2) EGR valve assembly connector and C-105 (terminal No. 81) engine-ECU connector.





- Check earthing line for open circuit.

Q: Is the check result normal?

YES : Go to Step 6 .
NO : Repair the damaged harness wire.

STEP 6. M.U.T.-III data list

- Refer to Data List Reference Table P.13A-542.
  a. Item 16: EGR valve position sensor

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).
NO : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, carry out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

STEP 7. M.U.T.-III data list

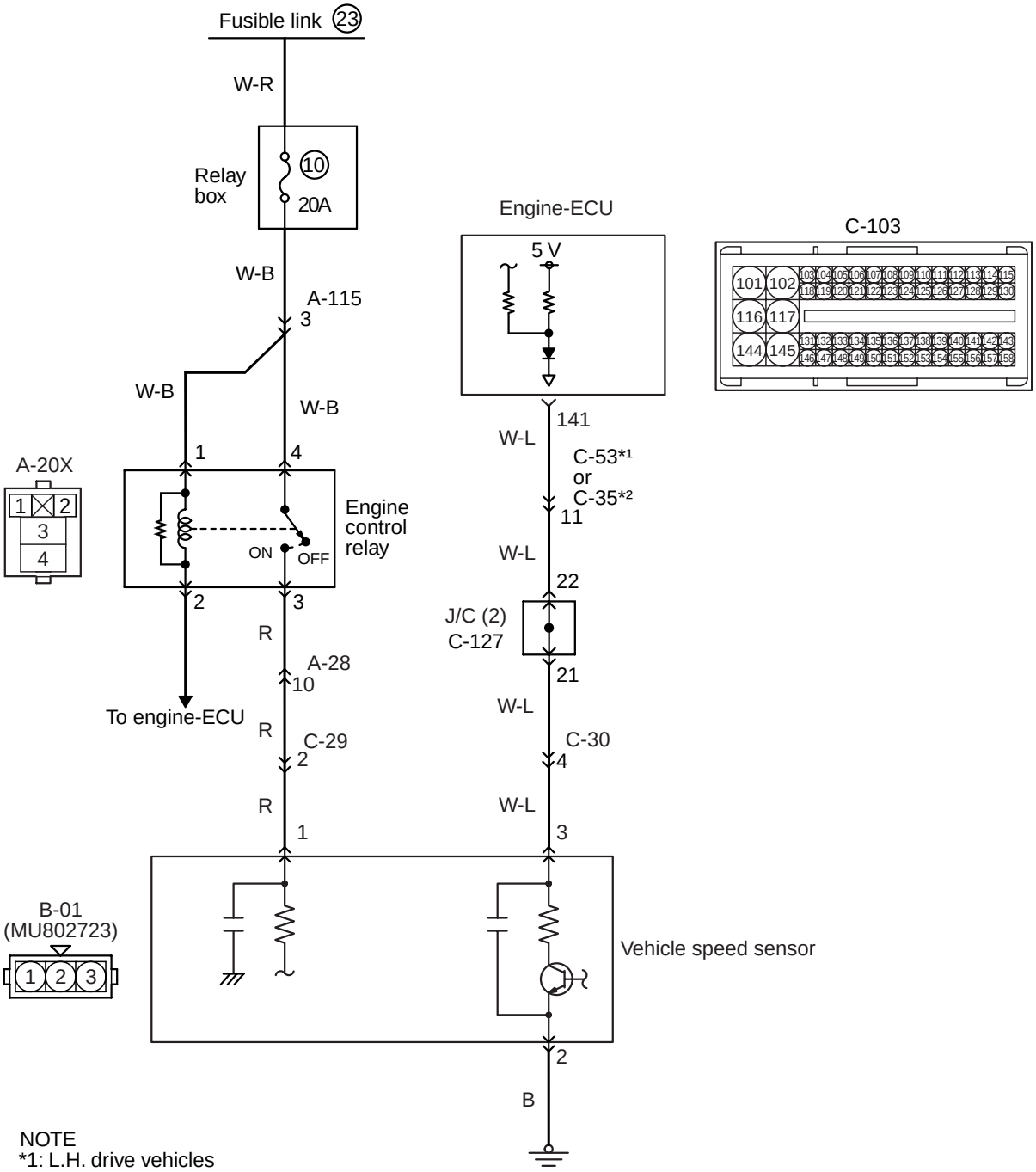
- Refer to Data List Reference Table P.13A-542.
  a. Item 16: EGR valve position sensor

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).
NO : Replace the EGR valve assembly.

Code No. P0502: Vehicle Speed Sensor Low Input <2WD-M/T and 4WD vehicles>

Vehicle Speed Sensor Circuit



NOTE
*1: L.H. drive vehicles
*2: R.H. drive vehicles

Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V: Violet PU: Purple SI: Silver

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OPERATION
- A power voltage of 5 V is applied to the vehicle speed sensor (terminal No. 3) from the engine-ECU (terminal No. 114).

FUNCTION
- The vehicle speed sensor converts the vehicle speed to the voltage, and then input it into the engine-ECU

TROUBLE JUDGMENT

Check Conditions
- Engine is running
- Engine coolant temperature is 80°C or higher
- The last fuel injection rate exceeds the specified value.
- Engine speed is 2,900 r/min or more.

Judgment Criterion
- Vehicle speed is 5 km/h or lower for 2 seconds.

PROBABLE CAUSES
- Failed vehicle speed sensor
- Open/short circuit or harness damage in vehicle speed sensor circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

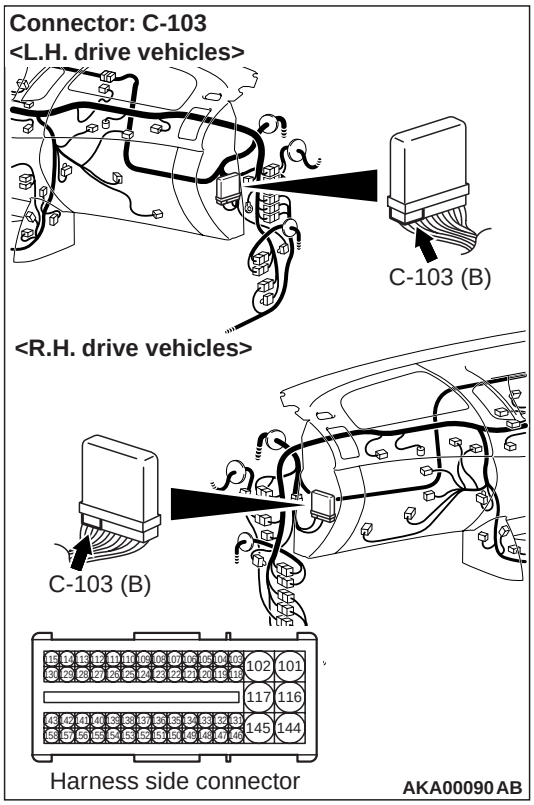
STEP 1. Check the speed meter

Q: Is the check result normal?
YES : Go to Step 2 .
NO : Check the speed meter (Refer to GROUP 54A –Combination Meter – On-vehicle Service – Speedometer Check).

STEP 2. M.U.T.-III data list
- Refer to Data list reference table P.13A-542.
  a. Item 4: Vehicle speed sensor

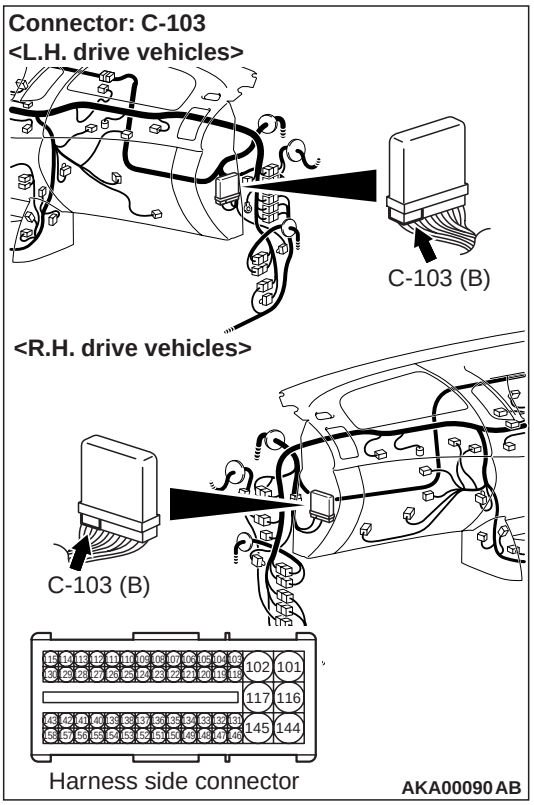
Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).
NO : Go to Step 3 .

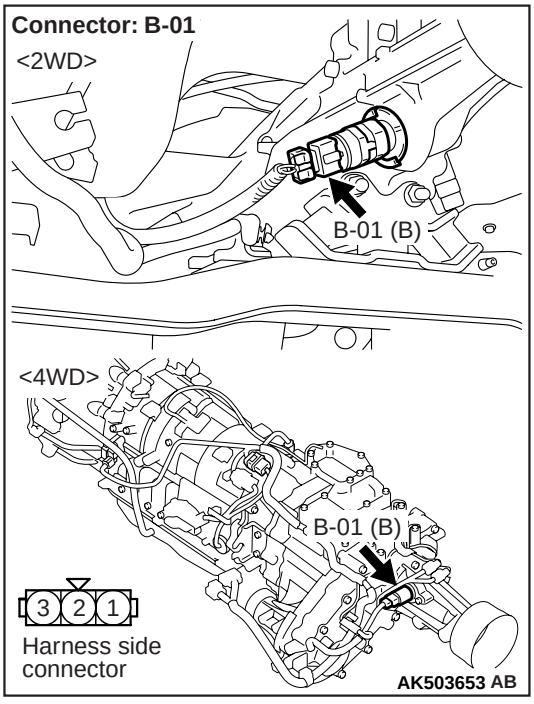
STEP 3. Connector check: C-103 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 4 .
NO : Repair or replace the connector.

STEP 4. Check harness between C-103 (terminal No. 114) engine-ECU connector and B-01 (terminal No. 3) Vehicle speed sensor connector.





NOTE: Before checking harness, check intermediate connectors C-30, C-35 <R. H. drive vehicles>, C-53 <L. H. drive vehicles> and C-127, and repair if necessary.

- Check output line for open circuit and damage.

Q: Is the check result normal?

YES : Go to Step 5 .
NO : Repair the damaged harness wire.

STEP 5. M.U.T.-III diagnosis code

- Reconfirmation of diagnosis code.

Q: Is the diagnosis code set?

YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

Code No. P0513: Immobilizer Malfunction

FUNCTION

- Engine-ECU sends or receives the control signals to or from ETACS-ECU to certify the ignition key.

NOTE:

- *If the registered ignition keys are close each other when starting the engine, radio interference may cause this code to be displayed.*
- *This code may be displayed when registering the key encrypted code.*

TROUBLE JUDGMENT

Check Condition

- Ignition switch is in "ON" position.

Judgment Criterion

- The check result of the ETACS-ECU is not suitable for that of the engine-ECU.

PROBABLE CAUSES

- Open/short circuit in immobilizer system circuit or loose connector contact
- Failed ETACS-ECU
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III other system diagnosis code.

- Confirm whether the diagnosis codes are output from ETACS-ECU.

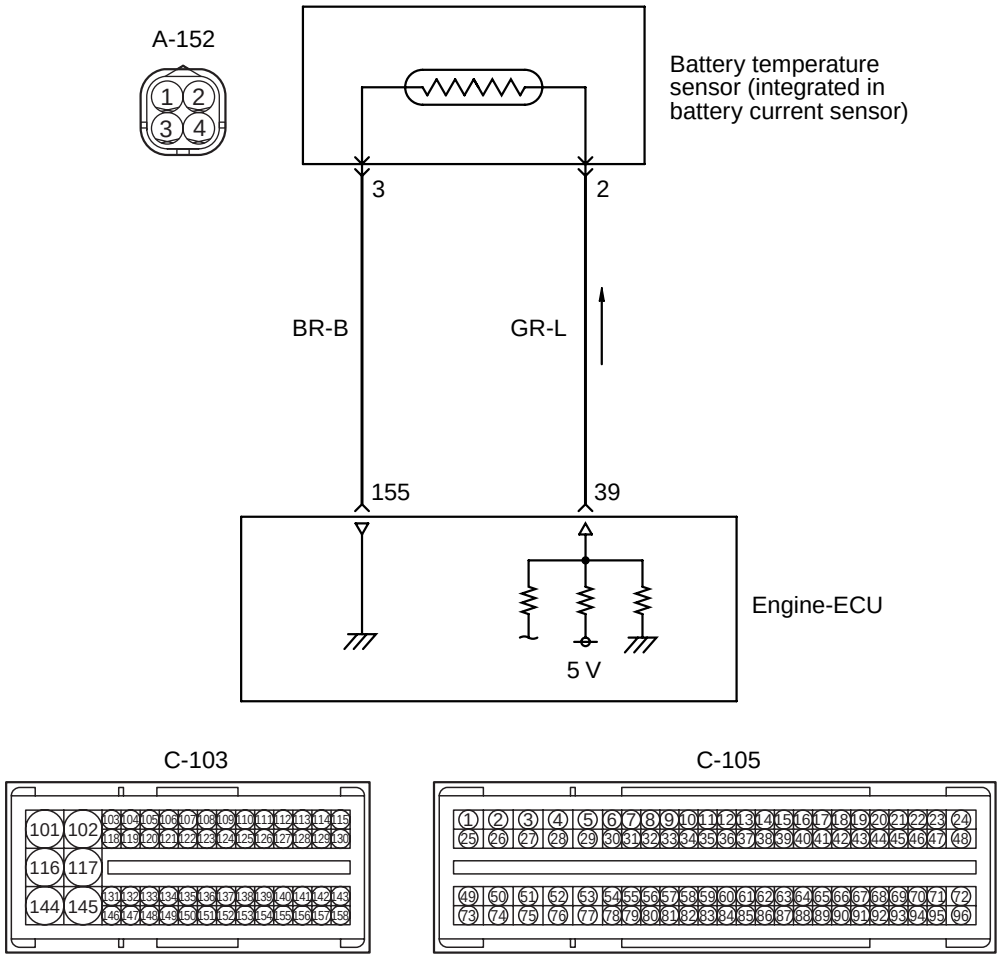
Q: Is the diagnosis code output?

YES : Perform the troubleshooting of immobilizer system (Refer to GROUP 54A – Immobilizer System – Check Chart for Diagnosis Code).

NO : If diagnosis code P0513 output again after the MPI diagnosis code has been erased, replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

Code No. P0515: Battery Temperature Sensor System <Euro5>

Battery Temperature Sensor Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V: Violet PU: Purple SI: Silver

AKB00273AB

OPERATION

- A power voltage of 5 V is applied to the battery temperature sensor output terminal (terminal No. 2) from the engine-ECU (terminal No. 39).
- The power voltage is earthed to the engine-ECU (terminal No. 155) from the battery temperature sensor (terminal No. 3).

FUNCTION

- The battery temperature sensor converts the battery temperature into a voltage and inputs the signal to the engine-ECU.
- In response to the signal, the engine-ECU controls charging and discharging.
- The battery temperature sensor is a kind of resistor, which has characteristics to reduce its resistance as the battery temperature rises. Therefore, the sensor output voltage varies with the battery temperature, and becomes lower as the battery temperature rises.

TROUBLE JUDGMENT

Check Condition

- Battery positive voltage is 8 – 16 V.
- 2 seconds later after the ignition switch has been in "ON" position or the engine has started up.

Judgment Criterion

- The battery temperature sensor output voltage is more than 4.88 V.

or

- The battery temperature sensor output voltage is less than 0.99 V.

PROBABLE CAUSES

- Failed battery temperature sensor
- Open/short circuit or harness damage in battery temperature sensor circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III data list

- Item No. 402: Battery temperature sensor

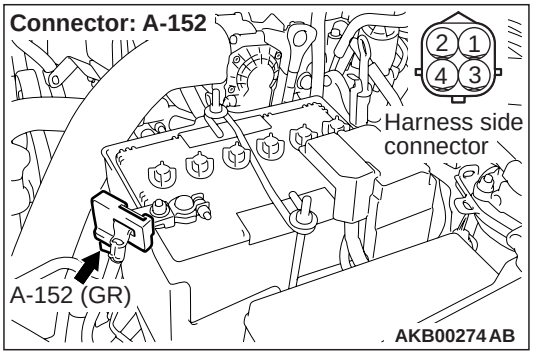
  OK: At ambient temperature (atmospheric temperature) of battery temperature sensor, or equivalent

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

NO : Go to Step 2 .

STEP 2. Connector check: A-152 battery current sensor connector



Q: Is the check result normal?

YES : Go to Step 3 .

NO : Repair or replace the connector.

STEP 3. Check battery temperature sensor itself.

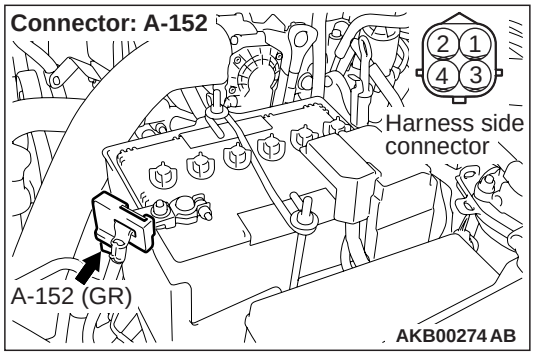
- Check battery temperature sensor itself (Refer to GROUP 54A – Battery – Inspection – Battery Current Sensor Check).

Q: Is the check result normal?

YES : Go to Step 4 .

NO : Replace the battery current sensor.

STEP 4. Perform voltage measurement at A-152 battery current sensor connector.



- Disconnect connector and measure at harness side.
- Ignition switch: ON
- Voltage between terminal No. 2 and earth.

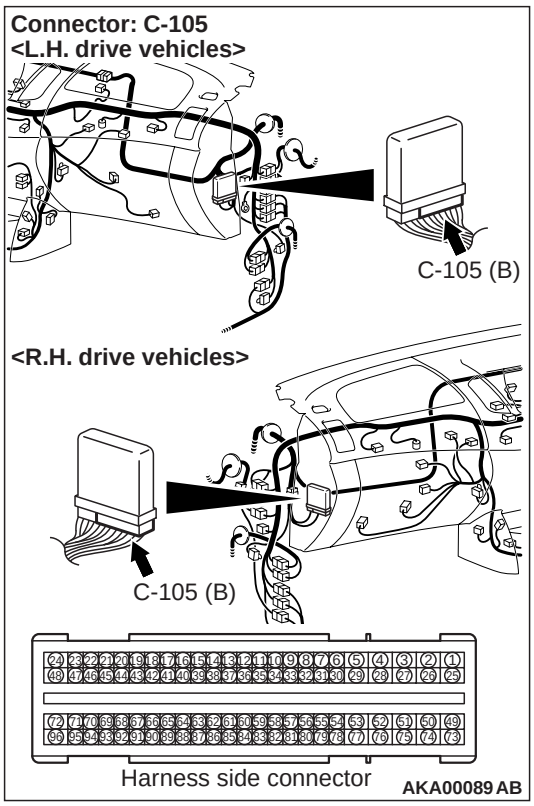
  OK: 4.5 – 4.9 V

Q: Is the check result normal?

YES : Go to Step 8 .

NO : Go to Step 5 .

STEP 5. Connector check: C-105 engine-ECU connector

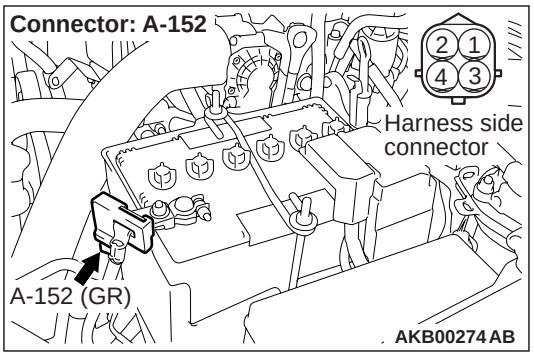


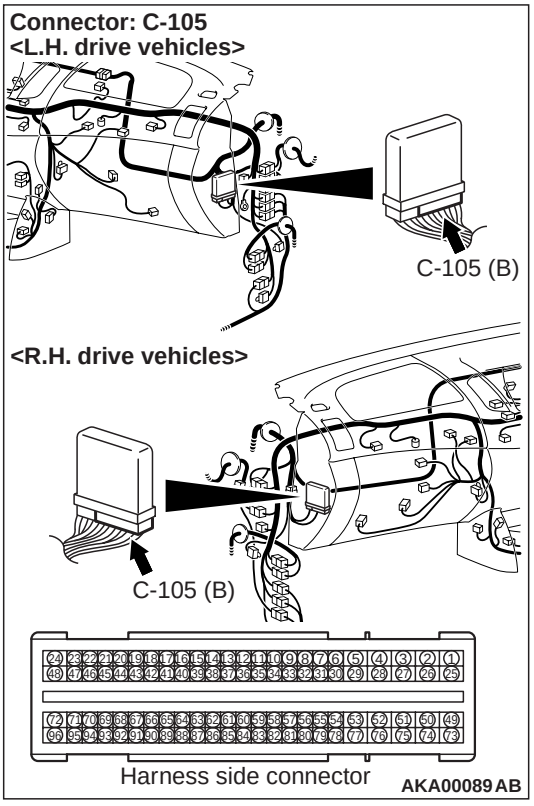
Q: Is the check result normal?

YES : Go to Step 6 .

NO : Repair or replace the connector.

STEP 6. Check harness between A-152 (terminal No. 2) battery current sensor connector and C-105 (terminal No. 39) engine-ECU connector.





- Check output line for open/short circuit.

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair the damaged harness wire.

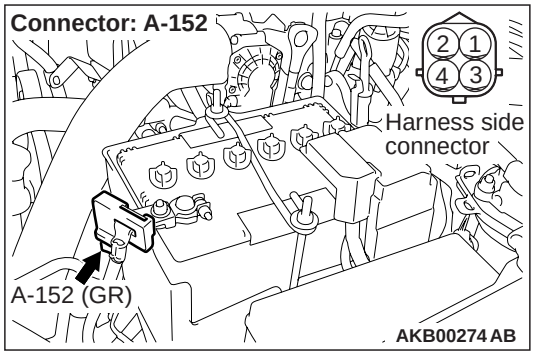
STEP 7. M.U.T.-III data list

- Item No. 402: Battery temperature sensor

OK: At ambient temperature (atmospheric temperature) of battery temperature sensor, or equivalent

Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).
NO : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, carry out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

STEP 8. Perform resistance measurement at A-152 battery current sensor connector.

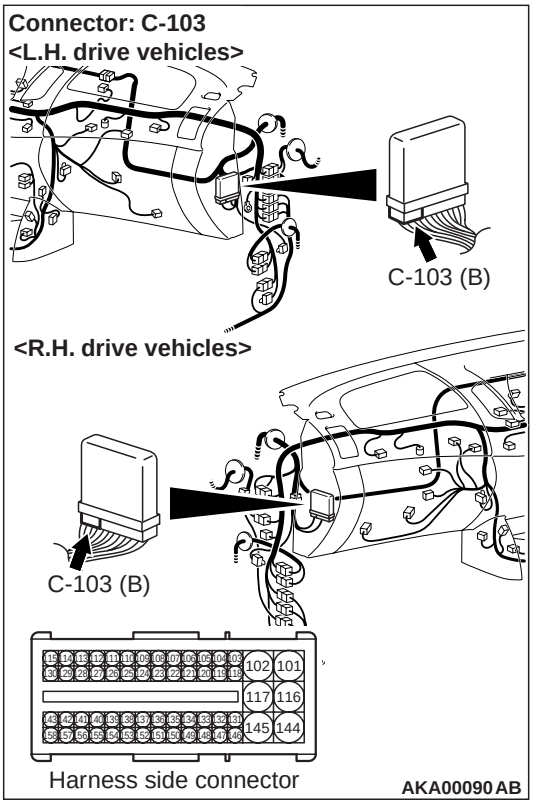


- Disconnect connector and measure at harness side.
- Resistance between terminal No. 3 and earth.

OK: Continuity (2 Ω or less)

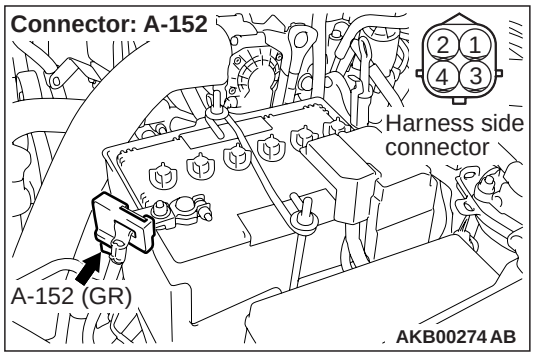
Q: Is the check result normal?
YES : Go to Step 11 .
NO : Go to Step 9 .

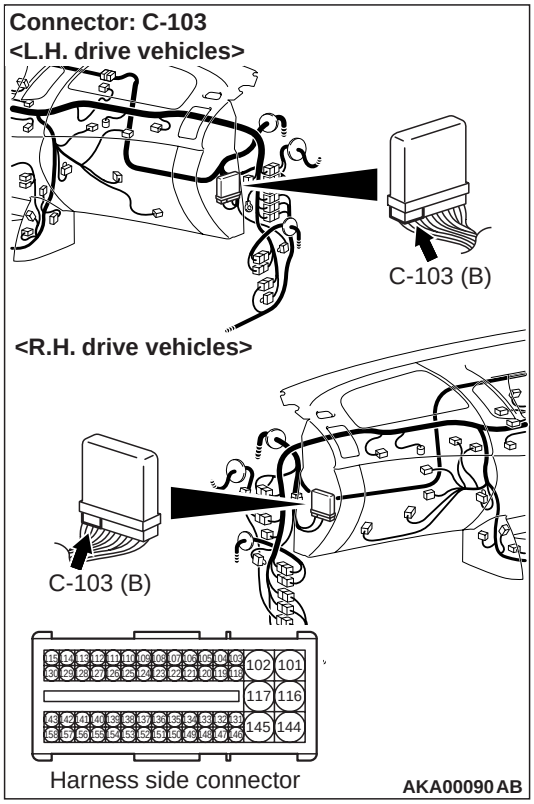
STEP 9. Connector check: C-103 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 10 .
NO : Repair or replace the connector.

STEP 10. Check harness between A-152 (terminal No. 3) battery current sensor connector and C-103 (terminal No. 155) engine-ECU connector.

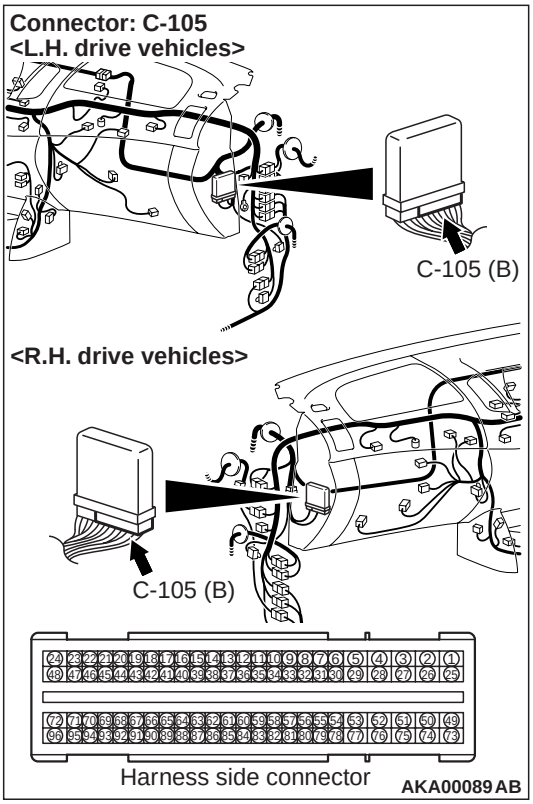




- Check earthing line for open circuit and damage.

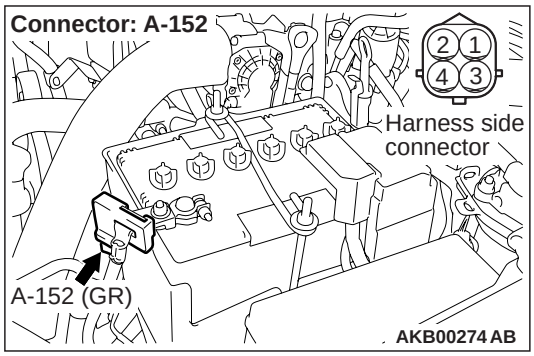
Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair the damaged harness wire.

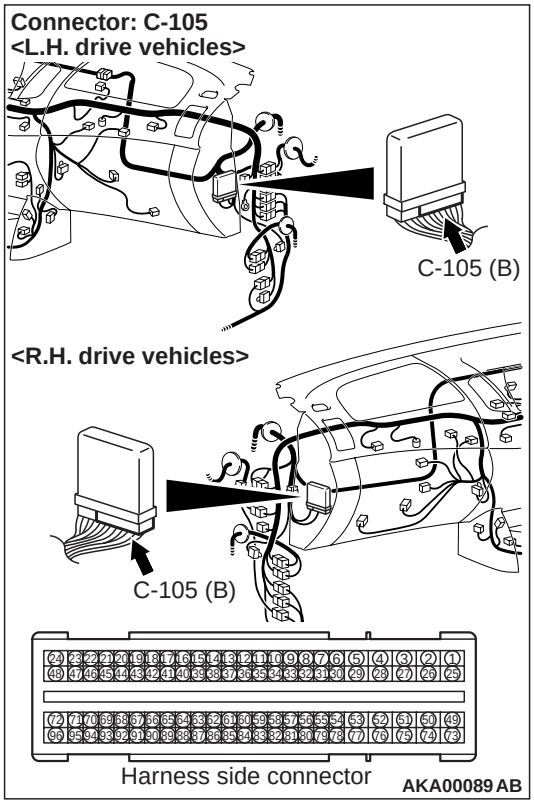
STEP 11. Connector check: C-105 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 12 .
NO : Repair or replace the connector.

STEP 12. Check harness between A-152 (terminal No. 2) battery current sensor connector and C-105 (terminal No. 39) engine-ECU connector.



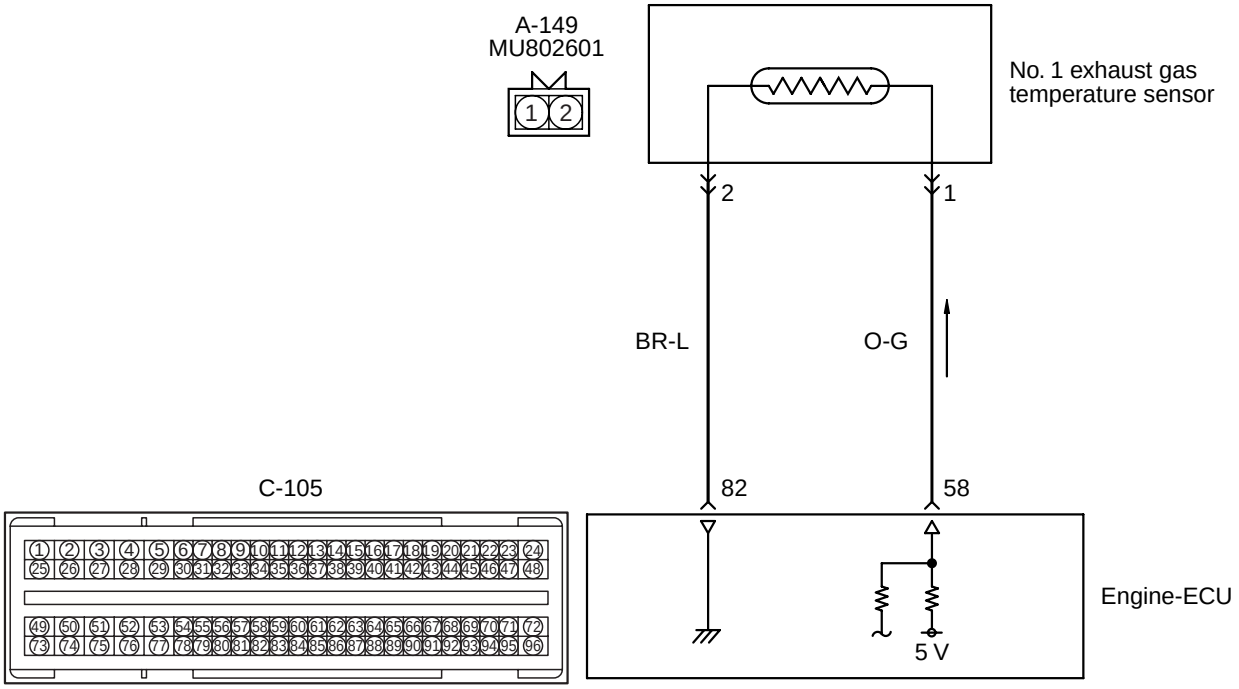


- Check output line for damage.

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair the damaged harness wire.

Code No. P0545: No.1 Exhaust Gas Temperature Sensor Circuit Low Input <Euro5>

No. 1 Exhaust Gas Temperature Sensor Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V: Violet PU: Purple SI: Silver

AKB00275 AB

OPERATION

- A power voltage of 5 V is applied to the No.1 exhaust gas temperature sensor output terminal (terminal No. 1) from the engine-ECU (terminal No. 58).
- The power voltage is earthed to the engine-ECU (terminal No. 82) from the No.1 exhaust gas temperature sensor (terminal No. 2).

FUNCTION

- The No.1 exhaust gas temperature sensor converts the exhaust gas temperature into a voltage and inputs the voltage signal to the engine-ECU.
- Engine-ECU uses this voltage output for DPF regeneration control.

PROBABLE CAUSES

- Short circuit in No.1 exhaust gas temperature
- The No.1 exhaust gas temperature sensor is a kind of resistor, which has characteristics to reduce its resistance as the exhaust gas temperature rises. Therefore, the sensor output voltage varies with the exhaust gas temperature, and becomes lower as the exhaust gas temperature rises.

TROUBLE JUDGMENT

Check Conditions

- Battery positive voltage is 8 – 16 V
- 2 seconds later after the ignition switch has been in "ON" position or the engine has started up.

Judgment Criterion

- The No.1 exhaust gas temperature sensor output voltage is 0.255 V or less.

PROBABLE CAUSES

- Failed No.1 exhaust gas temperature sensor sensor circuit or connector damage

- Failed engine-ECU

DIAGNOSTIC PROCEDURE

STEP 1. M.U.T.-III data list

- Refer to Data List Reference Table P.13A-542.

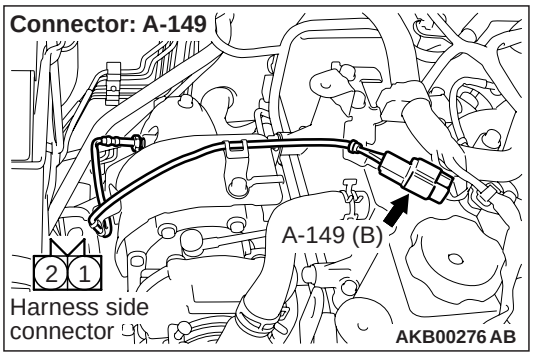
a. Item 117: No.1 exhaust gas temperature sensor

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

NO : Go to Step 2 .

STEP 2. Connector check: A-149 No.1 exhaust gas temperature sensor connector



Q: Is the check result normal?

YES : Go to Step 3 .

NO : Repair or replace the connector.

STEP 3. Check No.1 exhaust gas temperature sensor itself.

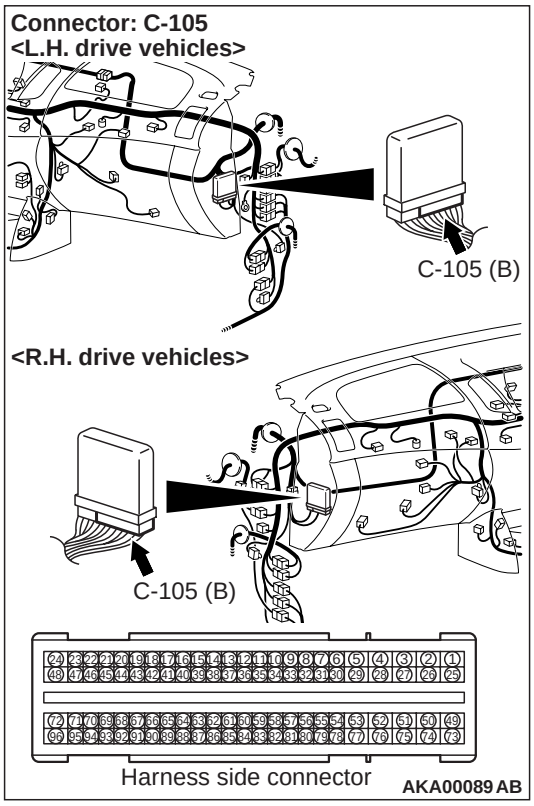
- Check No.1 exhaust gas temperature sensor itself (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – No.1 exhaust gas temperature sensor Check).

Q: Is the check result normal?

YES : Go to Step 4 .

NO : Replace the No.1 exhaust gas temperature sensor. After replacing the No.1 exhaust gas temperature sensor, carry out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

STEP 4. Connector check: C-105 engine-ECU connector

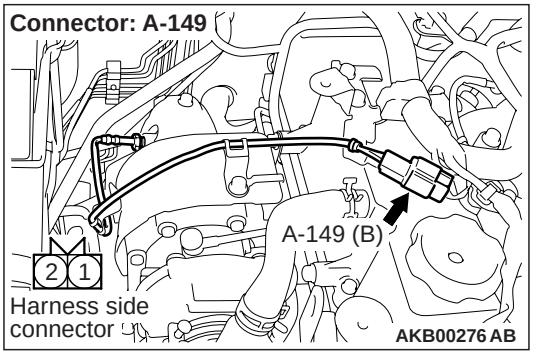


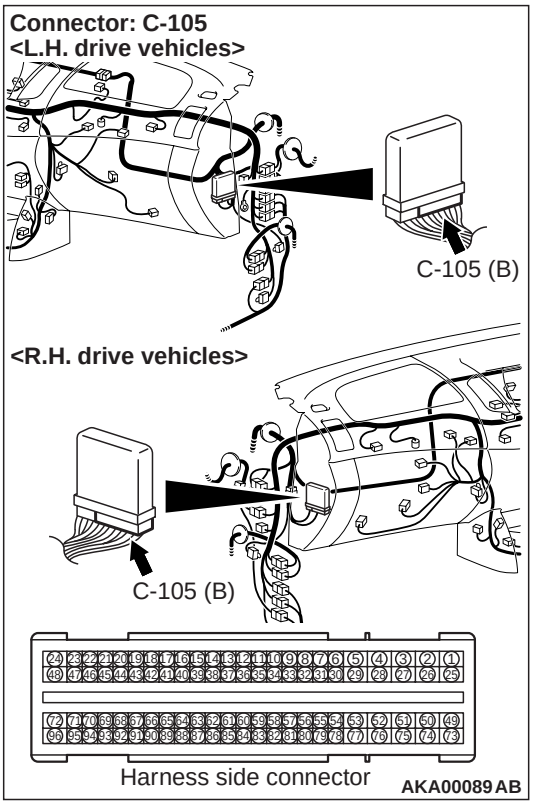
Q: Is the check result normal?

YES : Go to Step 5 .

NO : Repair or replace the connector.

STEP 5. Check harness between A-149 (terminal No. 1) No. 1 exhaust gas temperature sensor connector and C-105 (terminal No. 58) engine-ECU connector.





- Check output line for short circuit.

Q: Is the check result normal?

YES : Go to Step 6 .
NO : Repair the damaged harness wire.

STEP 6. M.U.T.-III data list

- Refer to Data List Reference Table P.13A-542

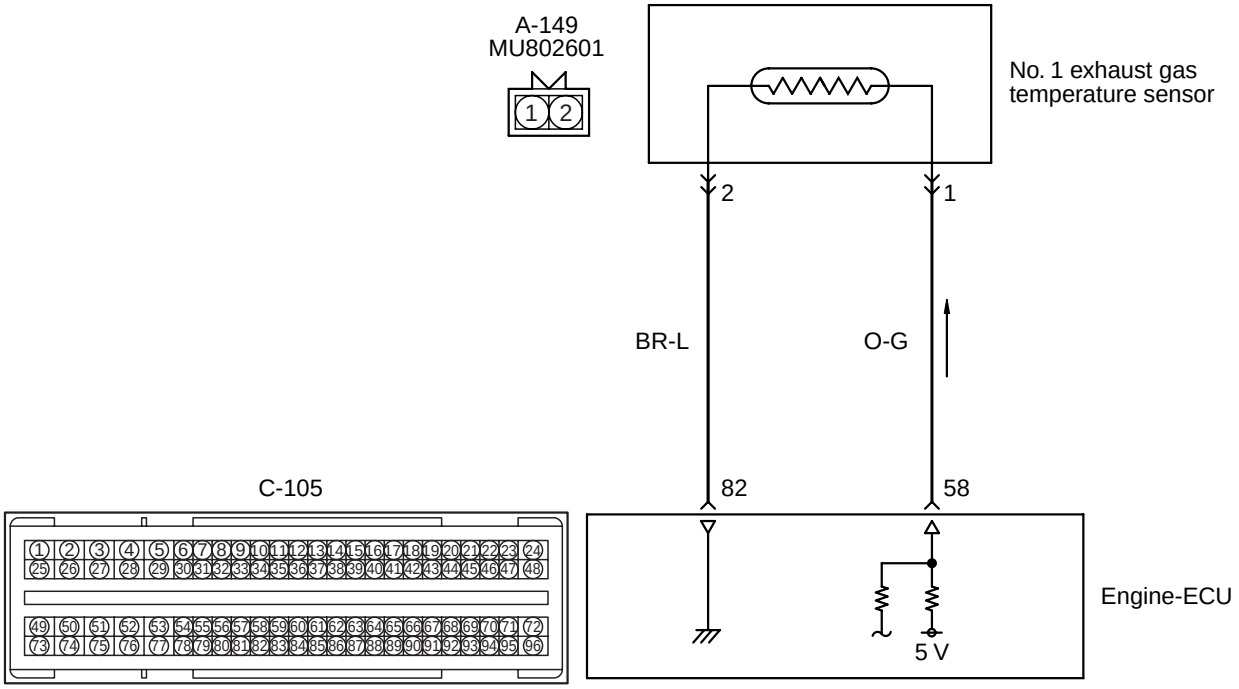
a. Item 117: No.1 exhaust gas temperature sensor

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).
NO : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, carry out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

Code No. P0546: No. 1 exhaust gas temperature sensor Circuit High Input <Euro5>

No. 1 Exhaust Gas Temperature Sensor Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V: Violet PU: Purple SI: Silver

AKB00275 AB

OPERATION

- A power voltage of 5 V is applied to the No. 1 exhaust gas temperature sensor output terminal (terminal No. 1) from the engine-ECU (terminal No. 58).
- The power voltage is earthed to the engine-ECU (terminal No. 82) from the No. 1 exhaust gas temperature sensor (terminal No. 2).

FUNCTION

- The No. 1 exhaust gas temperature sensor converts the exhaust gas temperature into a voltage and inputs the voltage signal to the engine-ECU.
- Engine-ECU uses this voltage for DPF regeneration control.
- The No. 1 exhaust gas temperature sensor is a kind of resistor, which has characteristics to reduce its resistance as the exhaust gas temperature rises. Therefore, the sensor output voltage varies with the exhaust gas temperature, and becomes lower as the exhaust gas temperature rises.

TROUBLE JUDGMENT

Check Conditions

- Battery positive voltage is 8 – 16 V.
- 2 seconds later after the ignition switch has been in "ON" position or the engine has started up.
- Vehicle speed is 20 km/h or higher.

Judgment Criterion

- The No. 1 exhaust gas temperature sensor output voltage is 4.95 V or more.

PROBABLE CAUSES

- Failed No. 1 exhaust gas temperature sensor

- Open circuit or harness damage in No. 1 exhaust gas temperature sensor circuit or loose connector contact
- Failed engine-ECU

DIAGNOSTIC PROCEDURE

STEP 1. M.U.T.-III data list

- Refer to Data List Reference Table P.13A-542

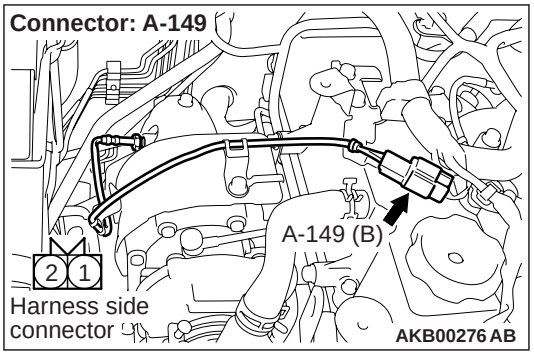
a. Item 117: No. 1 exhaust gas temperature sensor

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

NO : Go to Step 2 .

STEP 2. Connector check: A-149 No. 1 exhaust gas temperature sensor connector



Q: Is the check result normal?

YES : Go to Step 3 .

NO : Repair or replace the connector.

STEP 3. Check No. 1 exhaust gas temperature sensor itself.

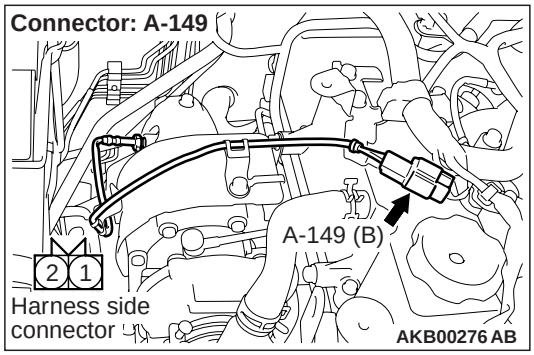
- Check No. 1 exhaust gas temperature sensor itself (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – No. 1 exhaust gas temperature sensor Check).

Q: Is the check result normal?

YES : Go to Step 4 .

NO : Replace the No. 1 exhaust gas temperature sensor. After replacing the No. 1 exhaust gas temperature sensor, carry out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

STEP 4. Perform voltage measurement at A-149 No. 1 exhaust gas temperature sensor connector.



- Disconnect connector, and measure at harness side.
- Ignition switch: ON
- Voltage between terminal No. 1 and earth.

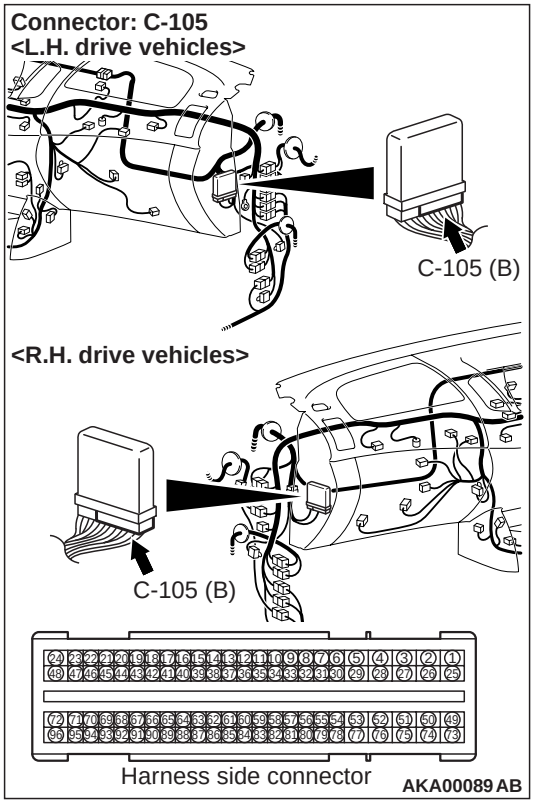
OK: 4.5 – 4.9 V

Q: Is the check result normal?

YES : Go to Step 8 .

NO : Go to Step 5 .

STEP 5. Connector check: C-105 engine-ECU connector.

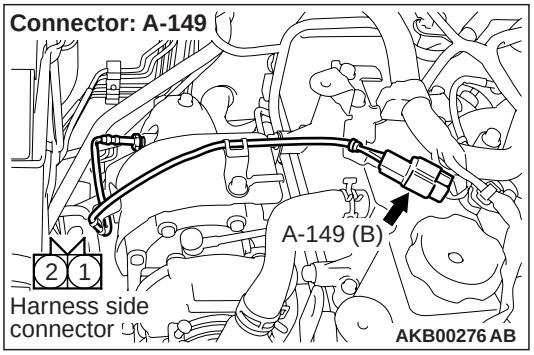


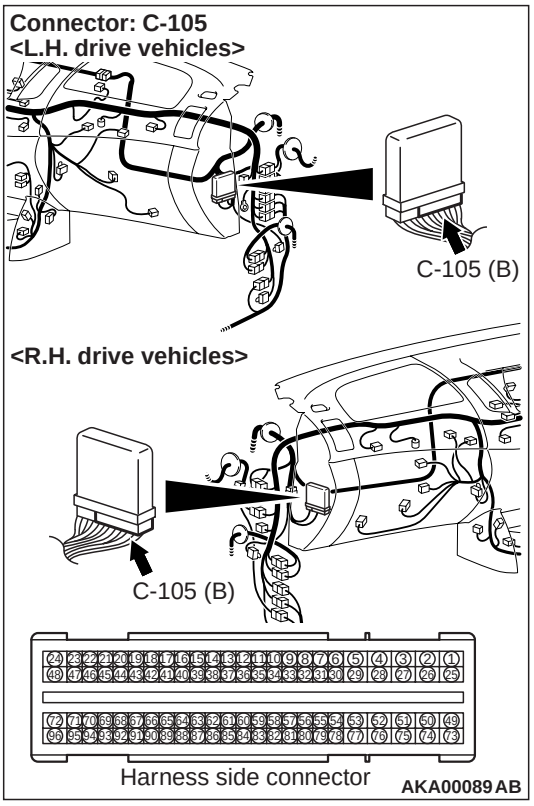
Q: Is the check result normal?

YES : Go to Step 6 .

NO : Repair or replace the connector.

STEP 6. Check harness between A-149 (terminal No. 1) No. 1 exhaust gas temperature sensor connector and C-105 (terminal No. 58) engine-ECU connector.





- Check output line for open circuit.

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair the damaged harness wire.

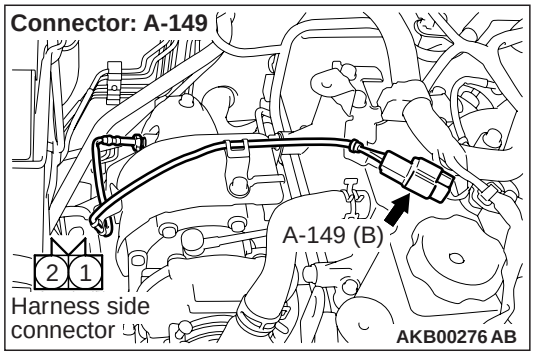
STEP 7. M.U.T.-III data list

- Refer to Data List Reference Table P.13A-542

a. Item 117: No. 1 exhaust gas temperature sensor

Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).
NO : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, carry out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

STEP 8. Perform resistance measurement at A-149 No. 1 exhaust gas temperature sensor connector.

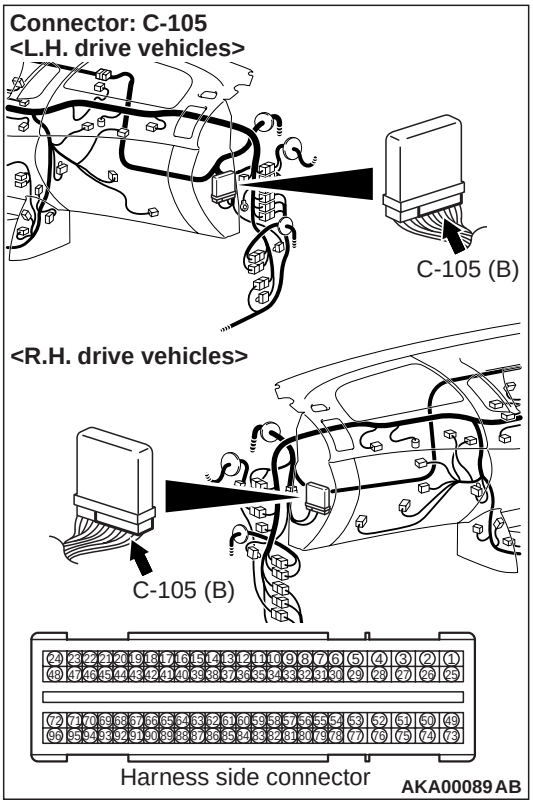


- Disconnect connector, and measure at harness side.
- Resistance between terminal No. 2 and earth.

OK: Continuity (2 Ω or less)

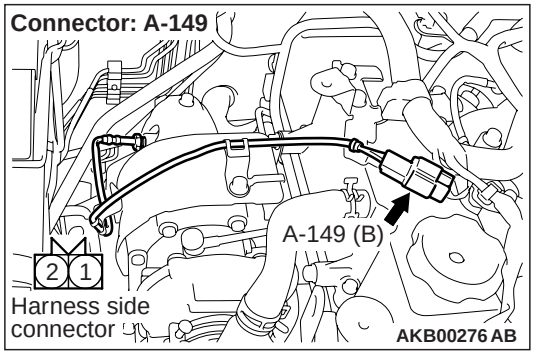
Q: Is the check result normal?
YES : Go to Step 11 .
NO : Go to Step 9 .

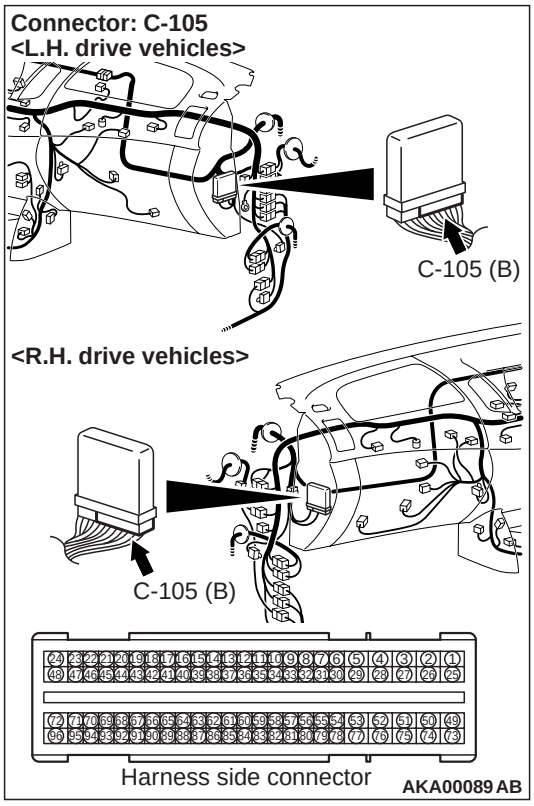
STEP 9. Connector check: C-105 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 10 .
NO : Repair or replace the connector.

STEP 10. Check harness between A-149 (terminal No. 2) No. 1 exhaust gas temperature sensor connector and C-105 (terminal No. 82) engine-ECU connector.

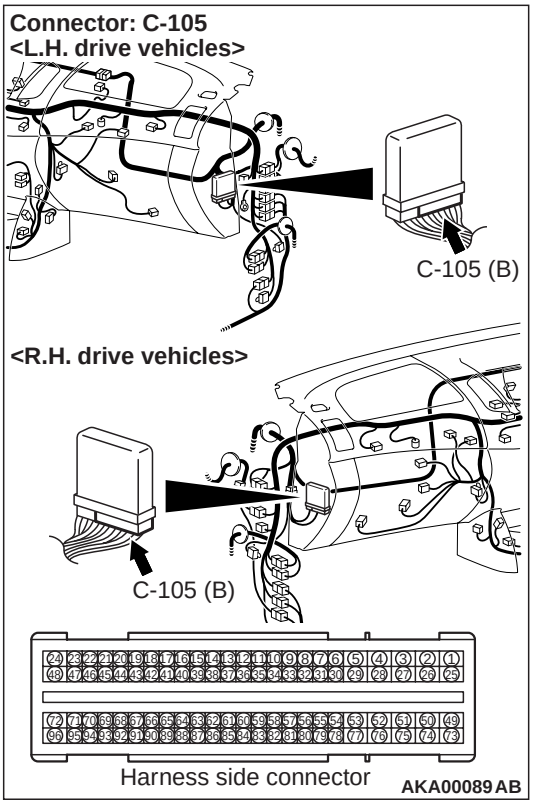




- Check earthing line for open circuit and damage.

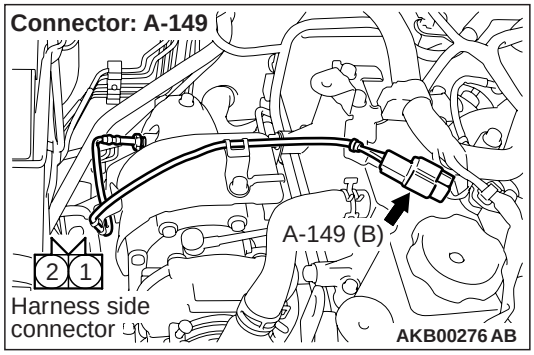
Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair the damaged harness wire.

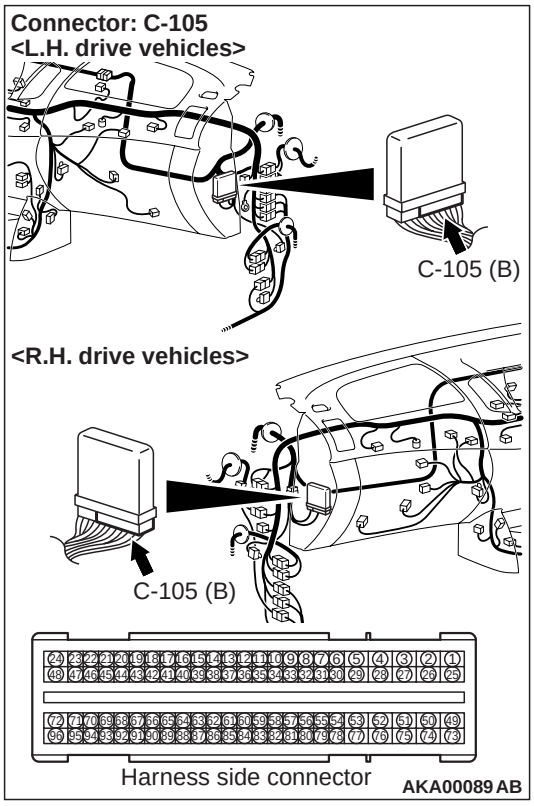
STEP 11. Connector check: C-105 engine-ECU connector.



Q: Is the check result normal?
YES : Go to Step 12 .
NO : Repair or replace the connector.

STEP 12. Check harness between A-149 (terminal No. 1) No. 1 exhaust gas temperature sensor connector and C-105 (terminal No. 58) engine-ECU connector.



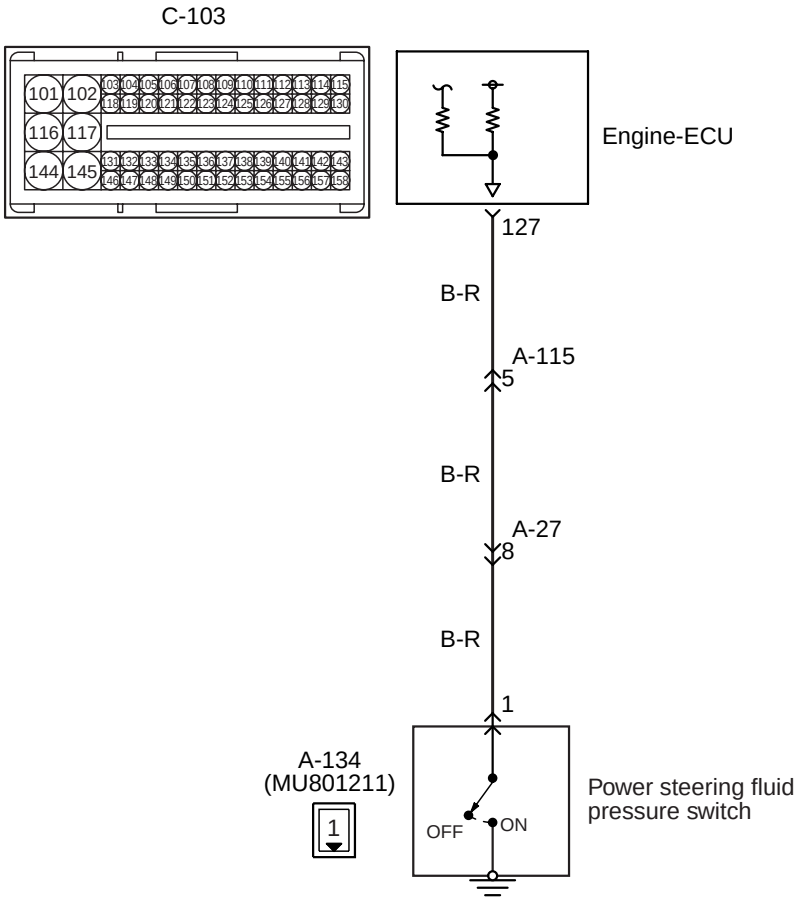


- Check output line for damage.

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair the damaged harness wire.

Code No. P0551: Power Steering Fluid Pressure Switch System

Power steering fluid pressure switch circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V: Violet PU: Purple SI: Silver

AKA00105AB

OPERATION

- The battery voltage is applied to the power steering pressure switch (terminal No. 1) from the engine-ECU (terminal No. 127)

FUNCTION

- It is detected whether a load is applied on the power steering fluid pump by steering or not, and the signal is inputted to the engine-ECU. When the power steering fluid pressure switch "ON" signal (a large load on the power steering fluid pump) is inputted, the engine-ECU provides the idle-up control.

TROUBLE JUDGMENT

Check Condition

- Within 5 seconds after the ignition switch is in the "OFF" position.

Judgment Criterion

- For 2 seconds, the power steering fluid pressure switch is in the "ON" position and the engine continuously stops.

PROBABLE CAUSES

- Failed power steering fluid pressure switch
- Short circuit in power steering fluid pressure switch circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III data list.

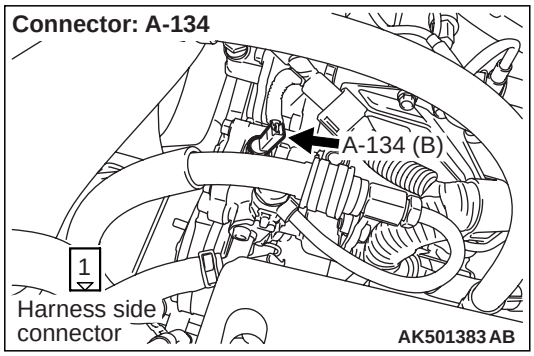
- Refer to Data List Reference Table P.13A-542.
  a. Item 75: Power steering fluid pressure switch

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

NO : Go to Step 2

STEP 2. Connector check: A-134 power steering pressure switch connector



Q: Is the check result normal?

YES : Go to Step 3 .

NO : Repair or replace the connector.

STEP 3. Check power steering pressure switch itself.

- Disconnect A-134 power steering fluid pressure switch connector.
- Continuity between terminal No.1 and earth.

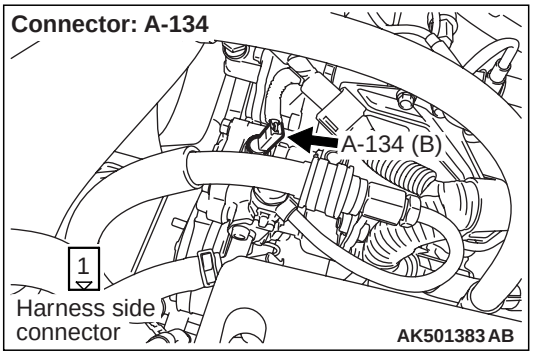
OK: No continuity

Q: Is the check result normal?

YES : Replace the power steering fluid pressure switch.

NO : Go to Step 4 .

STEP 4. Check at A-134 power steering fluid pressure switch connector.



- Disconnect connector, and measure at harness side.
- Ignition switch: ON
- Voltage between terminal No.1 and earth.

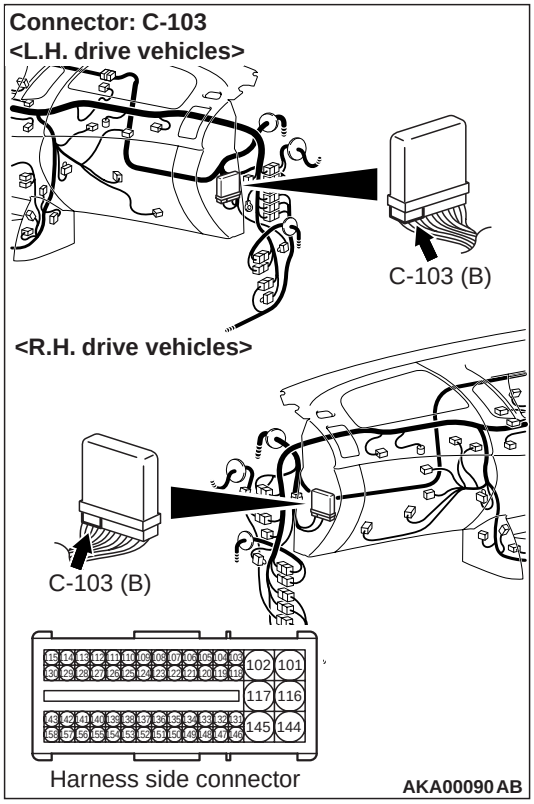
OK: System voltage

Q: Is the check result normal?

YES : Go to Step 7 .

NO : Go to Step 5 .

STEP 5. Connector check: C-103 engine-ECU connector

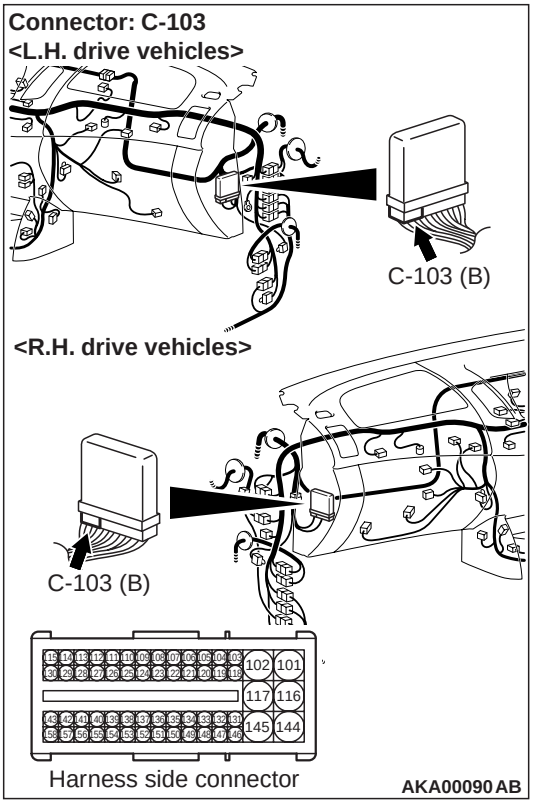


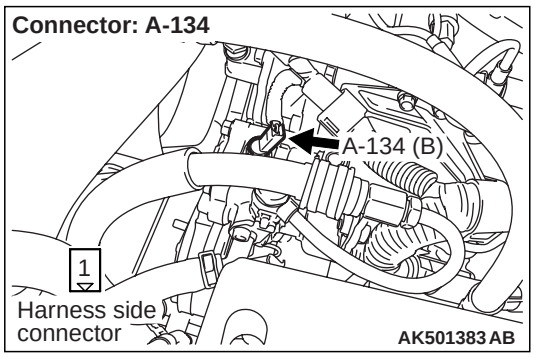
Q: Is the check result normal?

YES : Go to Step 6 .

NO : Repair or replace the connector.

STEP 6. Check harness between C-103 (terminal No. 127) engine-ECU connector and A-134 (terminal No. 1) power steering fluid pressure switch connector.





NOTE: Before checking harness, check intermediate connectors A-27 and A-115, and repair if necessary.

- Check output line for short circuit.

Q: Is the check result normal?

YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

NO : Repair the damaged harness wire.

STEP 7. M.U.T.-III data list.

- Refer to Data List Reference Table P.13A-542.
  a. Item 75: Power steering fluid pressure switch

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

NO : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

Code No. P0603: EEPROM Malfunction <Except Euro5>

FUNCTION

- To check whether the information such as the idle learned value and so on is stored in the memory of engine-ECU.

TROUBLE JUDGMENT

Check Conditions

- Ignition switch is in ON position

Judgement Criterion
- When the abnormal EEPROM memory data is detected.

PROBABLE CAUSE
- Failed the engine-ECU

DIAGNOSIS

STEP 1. Reconfirmation of diagnosis codes.

Q: Is the check result normal?

YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

Code No. P0604: Random Access Memory (RAM) Malfunction

FUNCTION
- The engine-ECU writes information to RAM or reads information from RAM.
- The engine-ECU performs an initial check to detect errors in RAM.

TROUBLE JUDGMENT

Check Condition
- Ignition switch is in "ON" position.

Judgment Criterion
- A destroyed RAM is detected by engine-ECU initial check.

PROBABLE CAUSE
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code
- After erasing the diagnosis code through M.U.T.-III, ignition switch is "ON" position and confirm whether the diagnosis code is output.

Q: Is the diagnosis code set?

YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

Code No. P0605: Read Only Memory (FLASH ROM) Malfunction

FUNCTION
- The engine-ECU reads information from flash ROM.
- The engine-ECU detects checksum errors.

TROUBLE JUDGMENT

Check Condition
- Ignition switch is in "ON" position.

Judgment Criterion
- In each inspection target area of a flash ROM, a checksum mismatch is detected three times consecutively.

PROBABLE CAUSE
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code
- After erasing the diagnosis code through M.U.T.-III, ignition switch is "ON" position and confirm whether the diagnosis code is output.

Q: Is the diagnosis code set?

YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

Code No. P0606: Engine-ECU (main CPU) Malfunction

FUNCTION
- The engine-ECU check whether the microcomputer, which performs the drive control of the throttle valve, is normal.

TROUBLE JUDGMENT

Check Condition
- Ignition switch is in "ON" position

Judgment Criterion
- The monitoring microcomputer detects a main microcomputer error.

PROBABLE CAUSE
- Failed engine-ECU

DIAGNOSIS

STEP 1. M.U.T.-III diagnosis code
- Reconfirmation of diagnosis code.

Q: Is the diagnosis code set?

YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

Code No. P0607: Engine-ECU (sub CPU) Malfunction

FUNCTION
- The main microcomputer detects errors in the sub microcomputer used for monitoring.

TROUBLE JUDGMENT

Check Conditions
- 2 seconds later after the ignition switch has been in "ON" position or the engine has started up.
- Battery positive voltage is 10 V or more

Judgment Criterion
- The main microcomputer detects a main microcomputer error.

PROBABLE CAUSE
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code
- After erasing the diagnosis code through M.U.T.-III, ignition switch is "ON" position and confirm whether the diagnosis code is output.

Q: Is the diagnosis code set?

YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

Code No. P0620: Alternator Control Circuit <Euro5>

OPERATION
- When the ignition switch is turned ON, the current should be supplied from the combination meter (terminal No. 52) to the alternator (terminal No. 3). When the engine starts under those conditions, the alternator should generate currents.
- The engine-ECU checks the voltage of the battery backup terminal (terminal No. 103) to monitor the electricity generation voltage of the alternator.

FUNCTION
- The engine-ECU compares the battery voltage with the voltage generated from the alternator to check whether the electrical generation is normal.

TROUBLE JUDGMENT

Check Conditions
- Ignition switch is "ON" position.
- The engine speed is 1 500 r/min or more.
- The battery backup voltage is 13.5 V or more.
- The G-terminal duty ratio is 10.2 % or more and 89.8 % or less.

Judgement Criterion
- For 30 seconds, the final target generation voltage subtracted from the battery backup voltage equals 0.8 V or more.

or
- For 30 seconds, the battery backup voltage subtracted from the final target generation voltage equals 1.9 V or more.

PROBABLE CAUSES
- Failed battery
- Failed drive belt
- Loose connector contact
- Open/short circuit or harness damage in alternator G-terminal circuit
- Harness damage in battery backup circuit
- Failed alternator
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. Checking engine start conditions
- Check whether the user uses the booster cable to start the engine.

NOTE: This diagnosis code can be output due to the battery voltage drop.

Q: Have you ever used the booster cable to start the engine?

YES : Delete the diagnosis code and check end.

NO : Go to Step 2 .

STEP 2. Battery check

- Check the battery (Refer to GROUP 54A – Battery – On-vehicle Service – Battery Test).

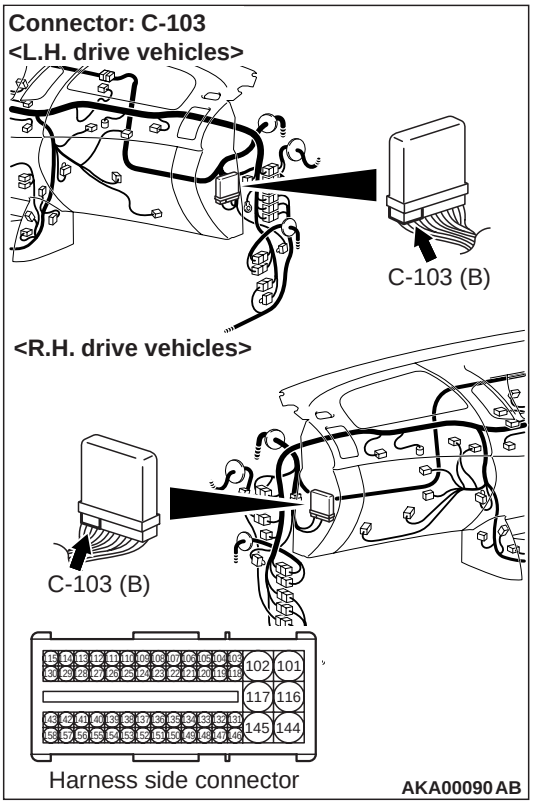
Q: Is the check result normal?
YES : Go to Step 3 .
NO : Replace the battery.

STEP 3. Drive belt tension check

- Drive belt tension check (Refer to GROUP 11A – On-vehicle Service – Alternator and Power Steering Oil Pump Drive Belt Tension Check).

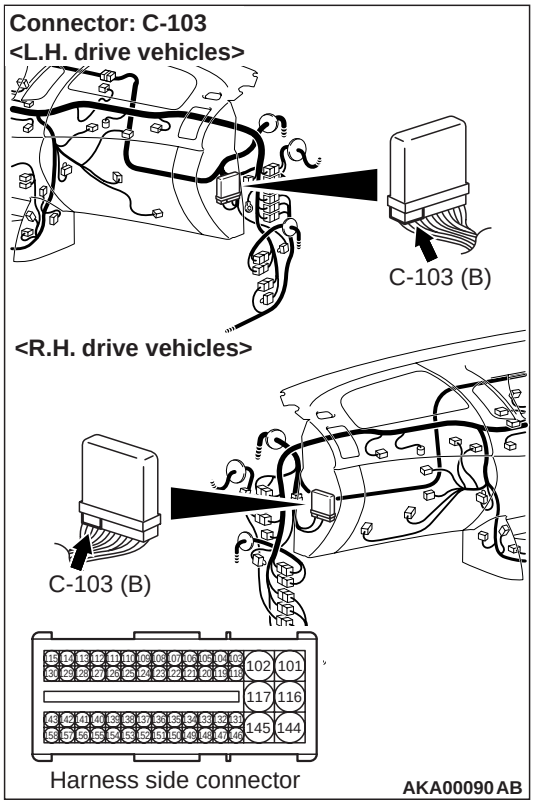
Q: Is the check result normal?
YES : Go to Step 4 .
NO : Replace the drive belt.

STEP 4. Connector check: C-103 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 5 .
NO : Repair or replace the connector.

STEP 5. Perform voltage measurement at C-103 engine-ECU connector.

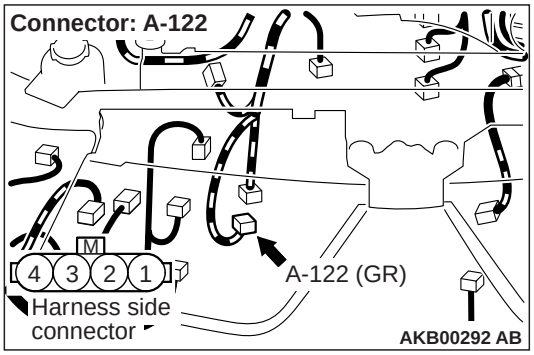


- Disconnect connector, and measure at harness side.
- Ignition switch: ON
- Voltage between terminal No. 121 and earth.

OK: System voltage

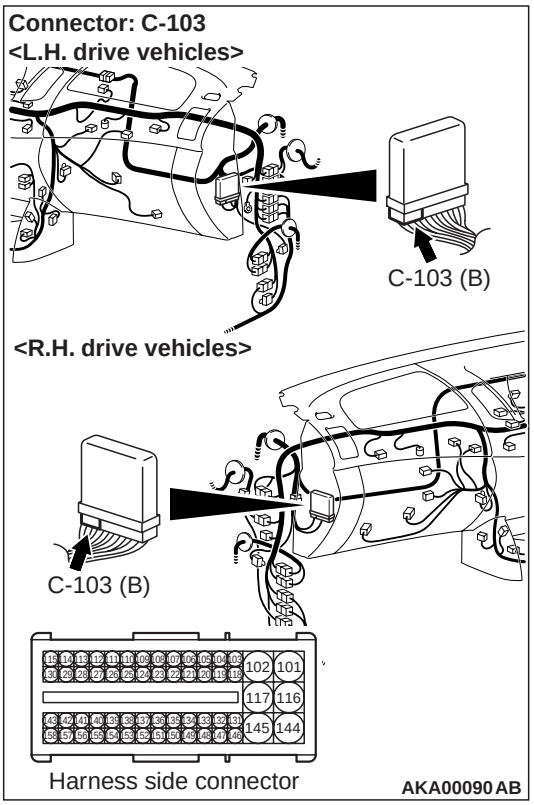
Q: Is the check result normal?
YES : Go to Step 8 .
NO : Go to Step 6 .

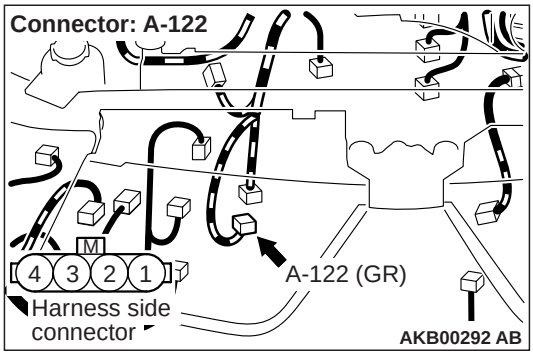
STEP 6. Connector check: A-122 alternator connector



Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair or replace the connector.

STEP 7. Check harness between C-103 (terminal No. 121) engine-ECU connector and A-122 (terminal No. 1) alternator connector.



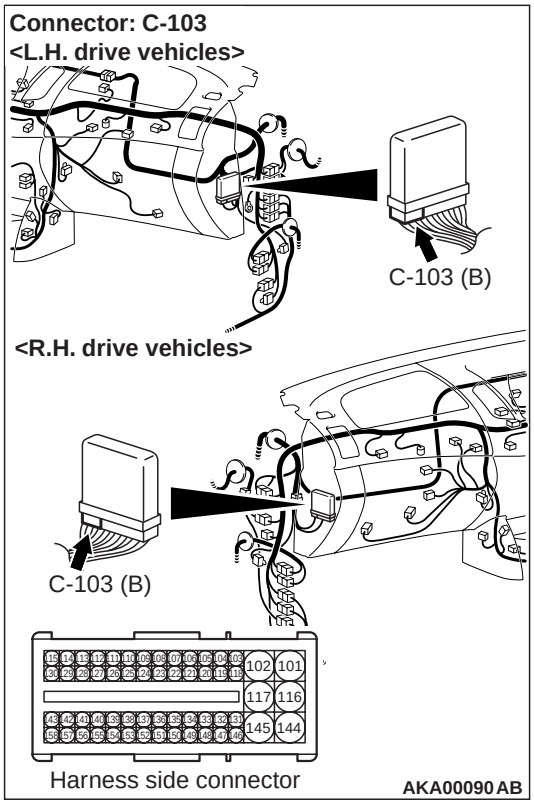


NOTE: Before checking harness, check intermediate connectors A-27 and A-115, and repair if necessary.

- Check output line for open/short circuit and damage.

Q: Is the check result normal?
YES : Check the alternator.
NO : Repair the damaged harness wire.

STEP 8. Check harness between battery and C-103 (terminal No. 103) engine-ECU connector.



NOTE: Before checking harness, check intermediate connector A-115, and repair if necessary.

- Check power supply line for damage.

Q: Is the check result normal?
YES : Go to Step 9 .
NO : Repair the damaged harness wire.

STEP 9. M.U.T.-III diagnosis code

- Reconfirmation of diagnosis code.

Q: Is diagnosis code set?
YES : Go to Step 10 .
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

STEP 10. Replace the drive belt

- After replacing the drive belt, reconfirm whether the diagnosis code is set.

Q: Is diagnosis code set?
YES : Go to Step 11 .
NO : Check end.

STEP 11. Replace the alternator

- After replacing the alternator, reconfirm whether the diagnosis code is set.

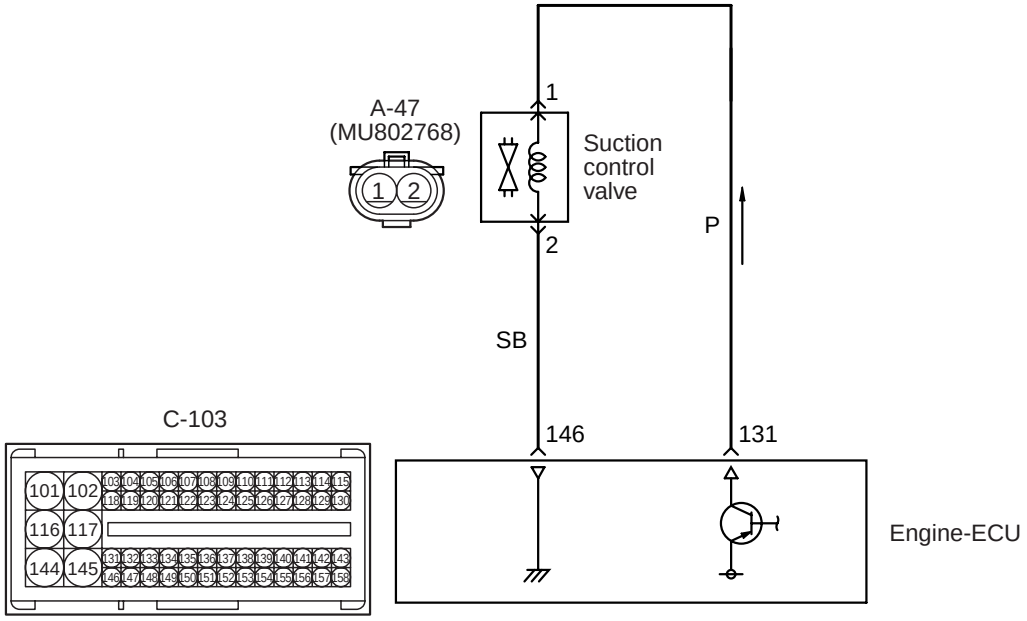
Q: Is diagnosis code set?

YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, carry out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

NO : Check end.

Code No. P0628: Suction Control Valve Open <Except Euro5>

Suction Control Valve Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V: Violet PU: Purple SI: Silver

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OPERATION

- The voltage is applied from the engine-ECU (terminal No. 131) to the suction control valve (terminal No. 1) via the power transistor in the engine-ECU.
- The voltage is earthed to the engine-ECU (terminal No. 146) from the suction control valve (terminal No. 2).

FUNCTION

- The engine-ECU performs duty control over the suction control valve.

- The engine-ECU checks whether the amount of current for driving duty is adequate.

TROUBLE JUDGMENT

Check Conditions

- Battery positive voltage is 8 – 16 V
- 2 seconds later after the ignition switch has been in "ON" position or the engine has started up.
- The supply pump and injector are being normally controlled.
- The fuel injection rate is 4 mm^3/st or more.

Judgment Criterion

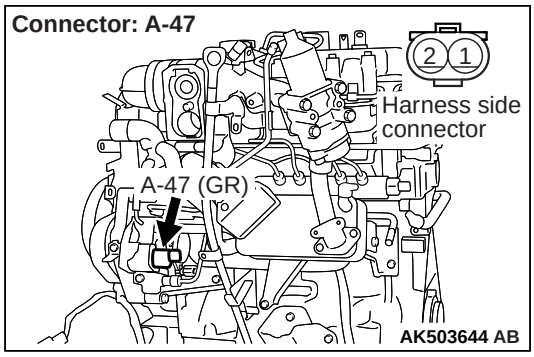
- When the driving duty ratio of the suction control valve is higher than the specified value, the driving current is lower than the specified value.

PROBABLE CAUSES

- Failed suction control valve
- Open/short circuit or harness damage in suction control valve circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. Connector check: A-47 suction control valve connector



Q: Is the check result normal?

YES : Go to Step 2 .
NO : Repair or replace the connector.

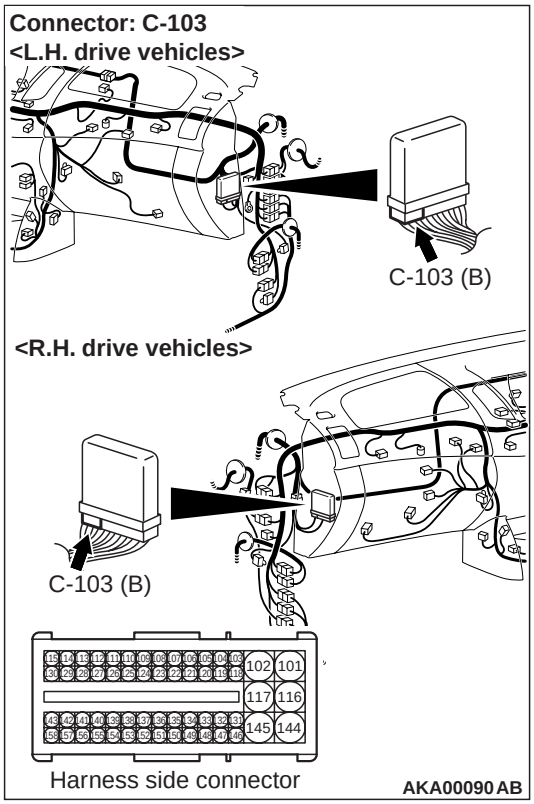
STEP 2. Check suction control valve itself.

- Check suction control valve itself (Refer to P.13A-596).

Q: Is the check result normal?

YES : Go to Step 3 .
NO : Replace the suction control valve.

STEP 3. Connector check: C-103 engine-ECU connector

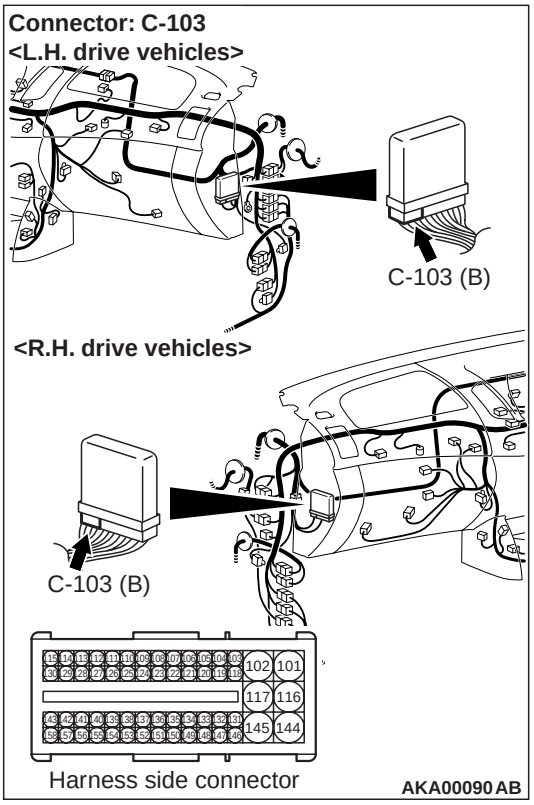


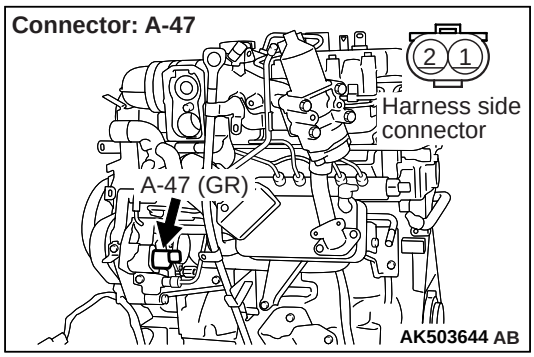
Q: Is the check result normal?

YES : Go to Step 4 .
NO : Repair or replace the connector.

STEP 4. Check harness between C-103 (terminal No. 131) engine-ECU connector and A-47 (terminal No. 1) suction control valve connector.

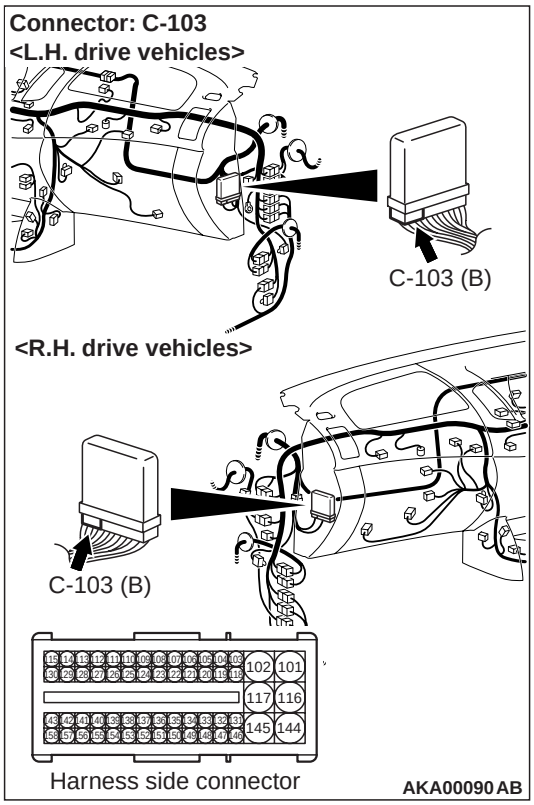
- Check power supply line for open/short circuit and damage.

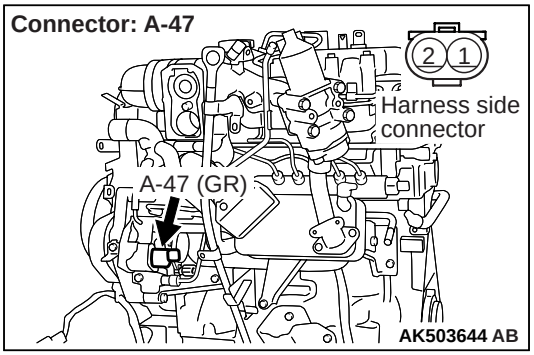




Q: Is the check result normal?
YES : Go to Step 5 .
NO : Repair the damaged harness wire.

STEP 5. Check harness between C-103 (terminal No. 146) engine-ECU connector and A-47 (terminal No. 2) suction control valve connector.





- Check earthing line for open/short circuit and damage.

Q: Is the check result normal?
YES : Go to Step 6 .
NO : Repair the damaged harness wire.

STEP 6. M.U.T.-III diagnosis code

- Reconfirmation of diagnosis code.

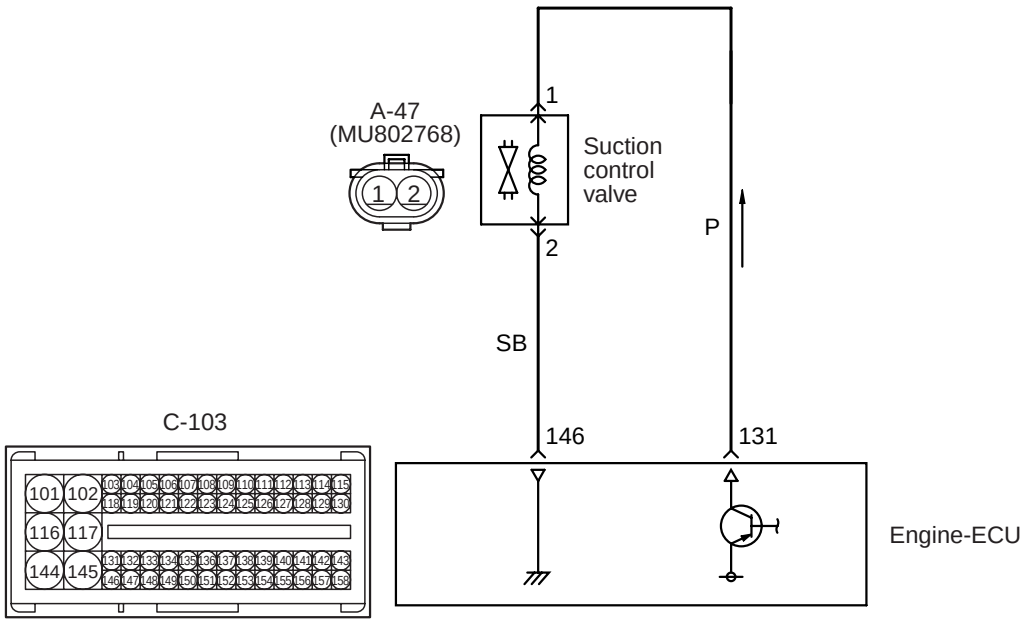
Q: Is the diagnosis code set?

YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).

NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

Code No. P0629: Suction Control Valve Battery Short <Except Euro5>

Suction Control Valve Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V: Violet PU: Purple SI: Silver

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OPERATION

- The voltage is applied from the engine-ECU (terminal No. 131) to the suction control valve (terminal No. 1) via the power transistor in the engine-ECU.
- The voltage is earthed to the engine-ECU (terminal No. 146) from the suction control valve (terminal No. 2).

FUNCTION

- The engine-ECU performs duty control over the suction control valve.
- The engine-ECU checks whether the amount of current for driving duty is adequate.

TROUBLE JUDGMENT

Check Conditions

- Battery positive voltage is 8 – 16 V

- 2 seconds later after the ignition switch has been in "ON" position or the engine has started up
- The supply pump and injector are being normally controlled.
- The fuel injection rate is 4 mm^3/st or more.

Judgment Criterion

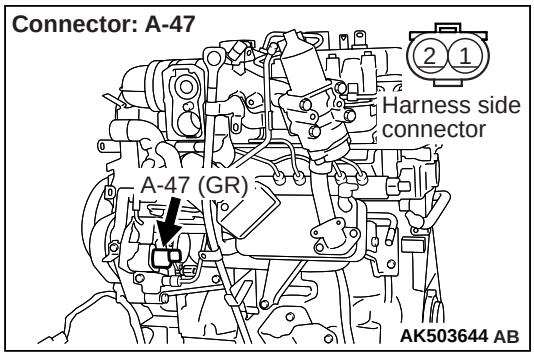
- When the driving duty ratio of the suction control valve is lower than the specified value, the driving current is higher than the specified value.

PROBABLE CAUSES

- Failed suction control valve
- Short circuit in suction control valve circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. Connector check: A-47 suction control valve connector



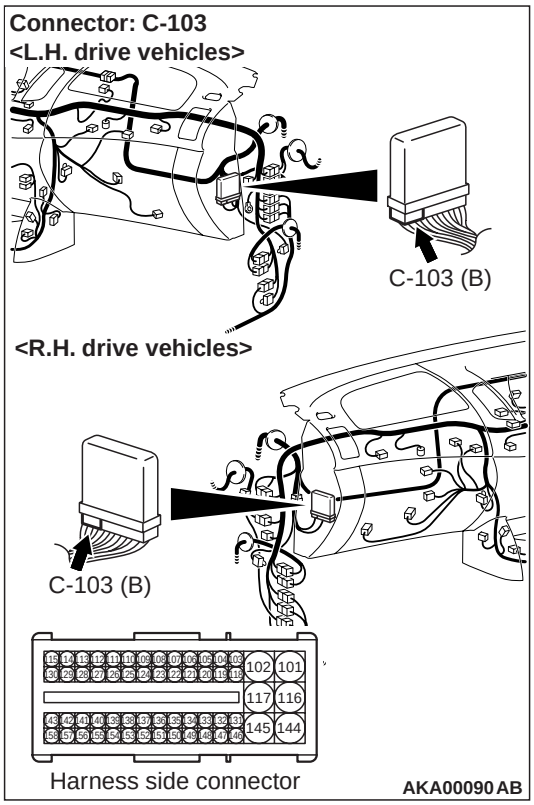
Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair or replace the connector.

STEP 2. Check suction control valve itself.

- Check suction control valve itself (Refer to P.13A-596).

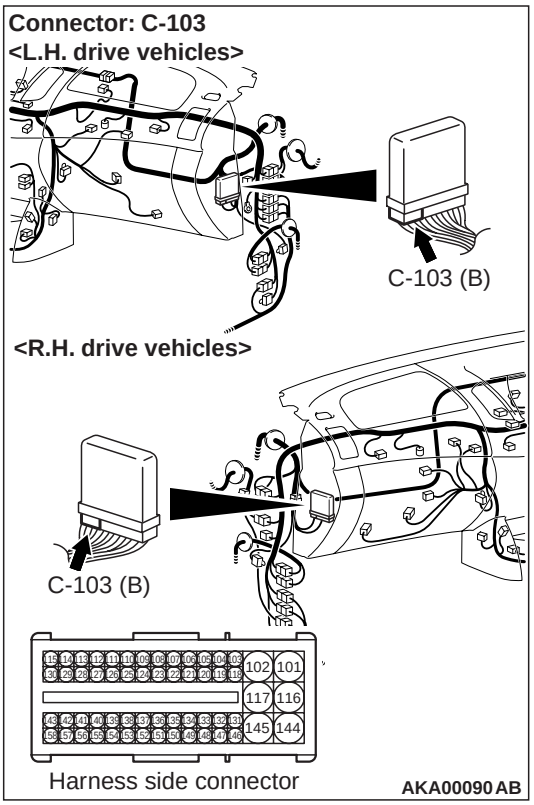
Q: Is the check result normal?
YES : Go to Step 3.
NO : Replace the suction control valve.

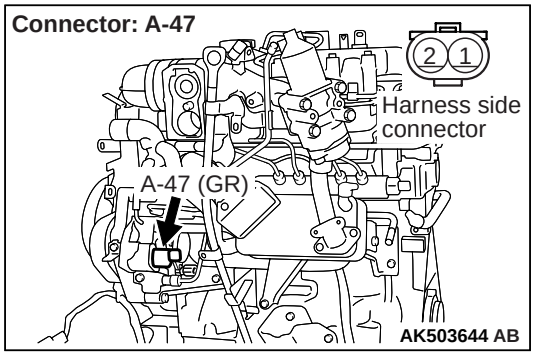
STEP 3. Connector check: C-103 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 4.
NO : Repair or replace the connector.

STEP 4. Check harness between C-103 (terminal No. 131) engine-ECU connector and A-47 (terminal No. 1) suction control valve connector.

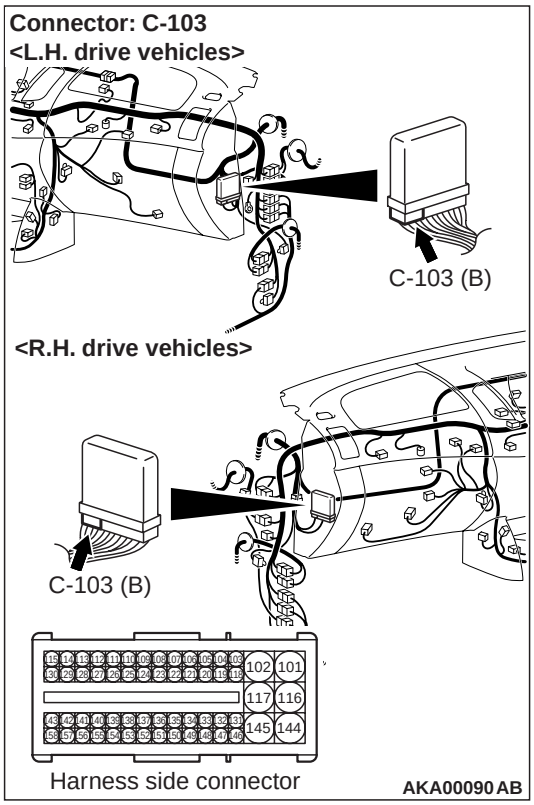


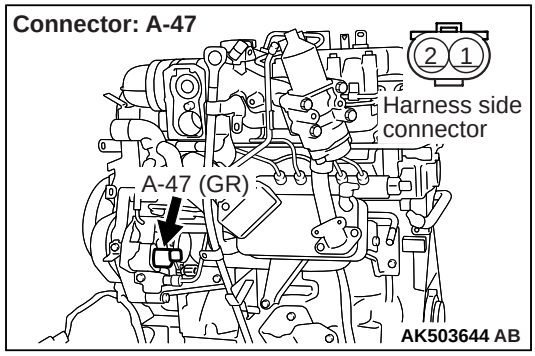


- Check power supply line for short circuit.

Q: Is the check result normal?
YES : Go to Step 5.
NO : Repair the damaged harness wire.

STEP 5. Check harness between C-103 (terminal No. 146) engine-ECU connector and A-47 (terminal No. 2) suction control valve connector.





- Check earthing line for short circuit.

Q: Is the check result normal?
YES : Go to Step 6.
NO : Repair the damaged harness wire.

STEP 6. M.U.T.-III diagnosis code.

- Reconfirmation of diagnosis code.

Q: Is the diagnosis code set?

YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

Code No. P062F: EEPROM Malfunction <Euro5>

FUNCTION
- To check whether the information such as the idle learned value and so on is stored in the memory of engine-ECU.

TROUBLE JUDGMENT

Check Conditions
- Ignition switch is in ON position

Judgement Criterion
- When the abnormal EEPROM memory data is detected.

PROBABLE CAUSE
- Failed the engine-ECU

DIAGNOSIS

STEP 1. Reconfirmation of diagnosis codes.

Q: Is the check result normal?

YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, carry out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

Code No. P0630: Chassis Number not Programmed

FUNCTION
- The chassis number is stored in the engine-ECU by the vehicle manufacturer.

TROUBLE JUDGMENT

Check Condition
- Ignition switch is "ON" position.

Judgment Criterion
- The entered chassis number data history is not found.

YES : Go to Step 2 .

PROBABLE CAUSE
- The chassis number is not entered.
- Failed engine-ECU.

DIAGNOSIS PROCEDURE

STEP 1. Check VIN information.
- Set M.U.T.-III to the coding mode for chassis number information.

Q: Has VIN (current) been written?
NO : Write VIN. Go to Step 3

STEP 2. M.U.T.-III diagnosis code.

- Reconfirm whether the diagnosis code is output.

1. Erase the diagnosis codes being output.
2. Ignition switch: "LOOK" (OFF) to ON.
3. Confirm whether the diagnosis code is output.

Q: Is the diagnosis code output?

YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

STEP 3. M.U.T.-III diagnosis code.

- Reconfirm whether the diagnosis code is output.

1. Erase the diagnosis codes being output.
2. Ignition switch: "LOOK" (OFF) to ON.
3. Confirm whether the diagnosis code is output.

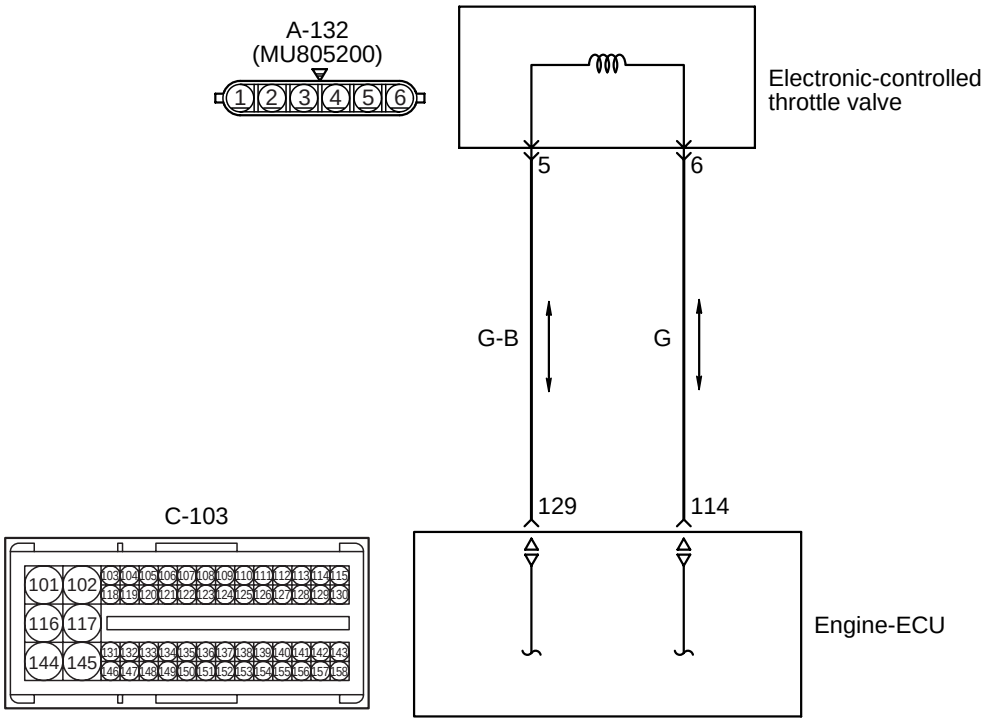
Q: Is the diagnosis code output?

YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

NO : The check is end.

Code No. P0638: Throttle Valve Control Servo Stuck

Throttle valve control servo circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Gray
R: Red P: Pink V: Violet PU: Purple SI: Silver

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OPERATION
- The electric current from the engine- ECU (terminal No. 129 and No. 114) to the throttle valve control servo (terminal No. 5 and No. 6) is controlled.

FUNCTION
- Engine- ECU checks the electronic-controlled throttle system for abnormal conditions.

TROUBLE JUDGMENT

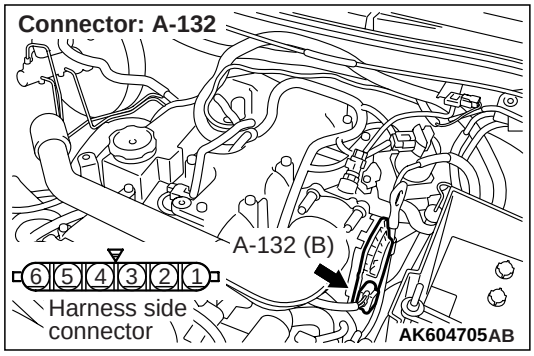
Check Conditions
The following conditions are met for 3 seconds.
- Battery positive voltage is 6 – 16 V.
- 2 seconds later after the ignition switch has been in "ON" position.
- The engine static state.

Judgment Criterion
- The difference between the objective and real openings is 10° or more for 0.5 second.

PROBABLE CAUSES
- Failed throttle valve return spring
- Failed throttle valve operation
- Failed throttle valve control servo
- Throttle valve control servo circuit harness damage or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. Connector check: A-132 electronic-controlled throttle valve connector



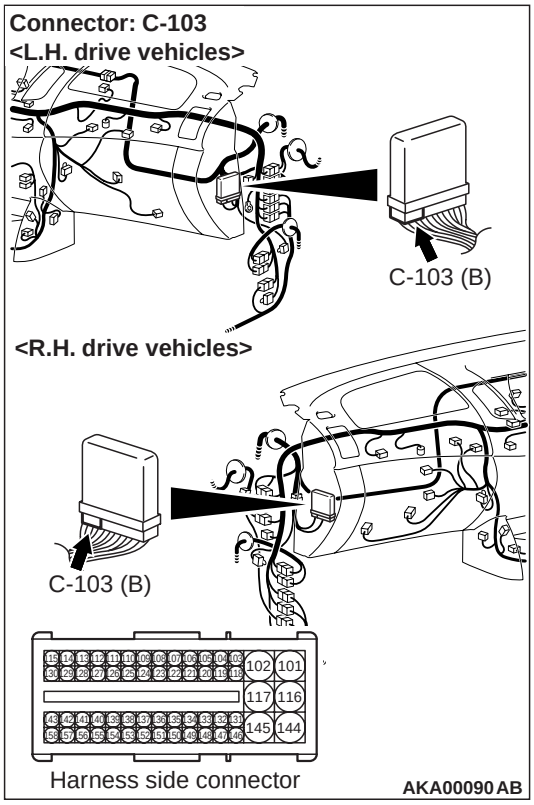
Q: Is the check result normal?
YES : Go to Step 2 .
NO : Repair or replace the connector.

STEP 2. Check throttle valve control servo itself.

- Check throttle valve control servo itself (Refer to P.13A-596).

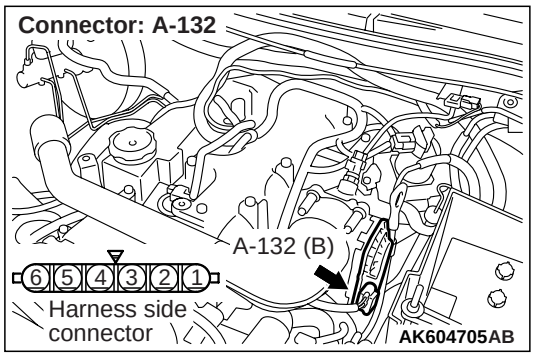
Q: Is the check result normal?
YES : Go to Step 3 .
NO : Replace the electronic-controlled throttle valve.

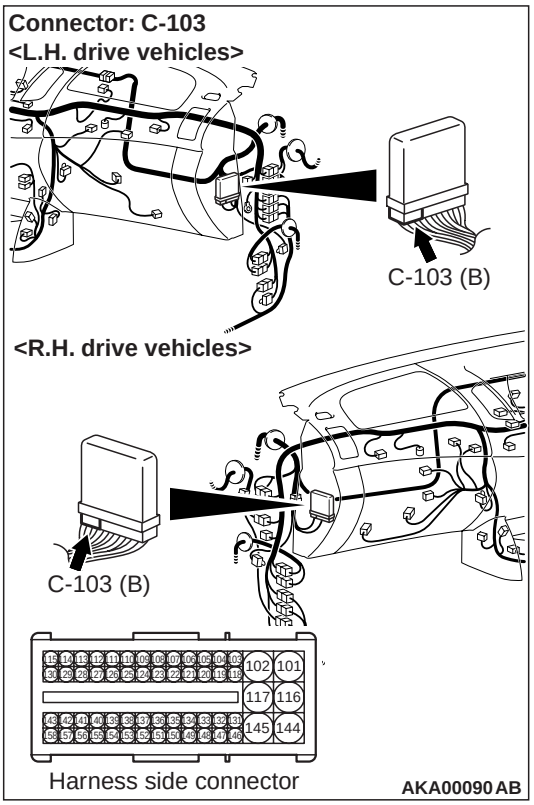
STEP 3. Connector check: C-103 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 4 .
NO : Repair or replace the connector.

STEP 4. Check harness between electronic-controlled throttle valve connector and engine-ECU connector.





a. Check harness between A-132 (terminal No.5) electronic-controlled throttle valve connector and C-103 (terminal No.129) engine-ECU connector.
b. Check harness between A-132 (terminal No.6) electronic-controlled throttle valve connector and C-103 (terminal No.114) engine-ECU connector.
   - Check output line for damage.

Q: Are the check results normal?

YES : Go to Step 5 .
NO : Repair the damaged harness wire.

STEP 5. Replace the electronic-controlled throttle valve assembly.

- After replace the electronic-controlled throttle valve assembly, re-check the trouble symptoms.

Q: Does trouble symptom persist?

YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).
NO : Check end.

Code No. P0642: Analog Sensor Reference Voltage No. 1 Too Low

FUNCTION

- The engine-ECU applies 5 V to the accelerator pedal position sensor (main).
- The engine-ECU checks whether the supply voltage is within the specified range.

TROUBLE JUDGMENT

Check Conditions
- Battery positive voltage is 8 – 16 V
- 2 seconds later after the ignition switch has been in "ON" position or the engine has started up

Judgment Criterion
- The detected voltage of analog sensor reference voltage No. 1 is 4.86 V or less for 0.5 second. [Power supply for accelerator pedal position sensor (main)]

PROBABLE CAUSE
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code
- After erasing the diagnosis code through M.U.T.-III, ignition switch is "ON" position and confirm whether the diagnosis code is output.

Q: Is the diagnosis code set?

YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

Code No. P0643: Analog Sensor Reference Voltage No. 1 Too High

FUNCTION
- The engine-ECU applies 5 V to the accelerator pedal position sensor (main).
- The engine-ECU checks whether the supply voltage is within the specified range.

TROUBLE JUDGMENT

Check Conditions
- Battery positive voltage is 8 –16 V
- 2 seconds later after the ignition switch has been in "ON" position or the engine has started up

Judgment Criterion
- The detected voltage of analog sensor reference voltage No. 1 is 5.14 V or more for 0.5 second. [Power supply for accelerator pedal position sensor (main)]

PROBABLE CAUSE
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code
- After erasing the diagnosis code through M.U.T.-III, ignition switch is "ON" position and confirm whether the diagnosis code is output.

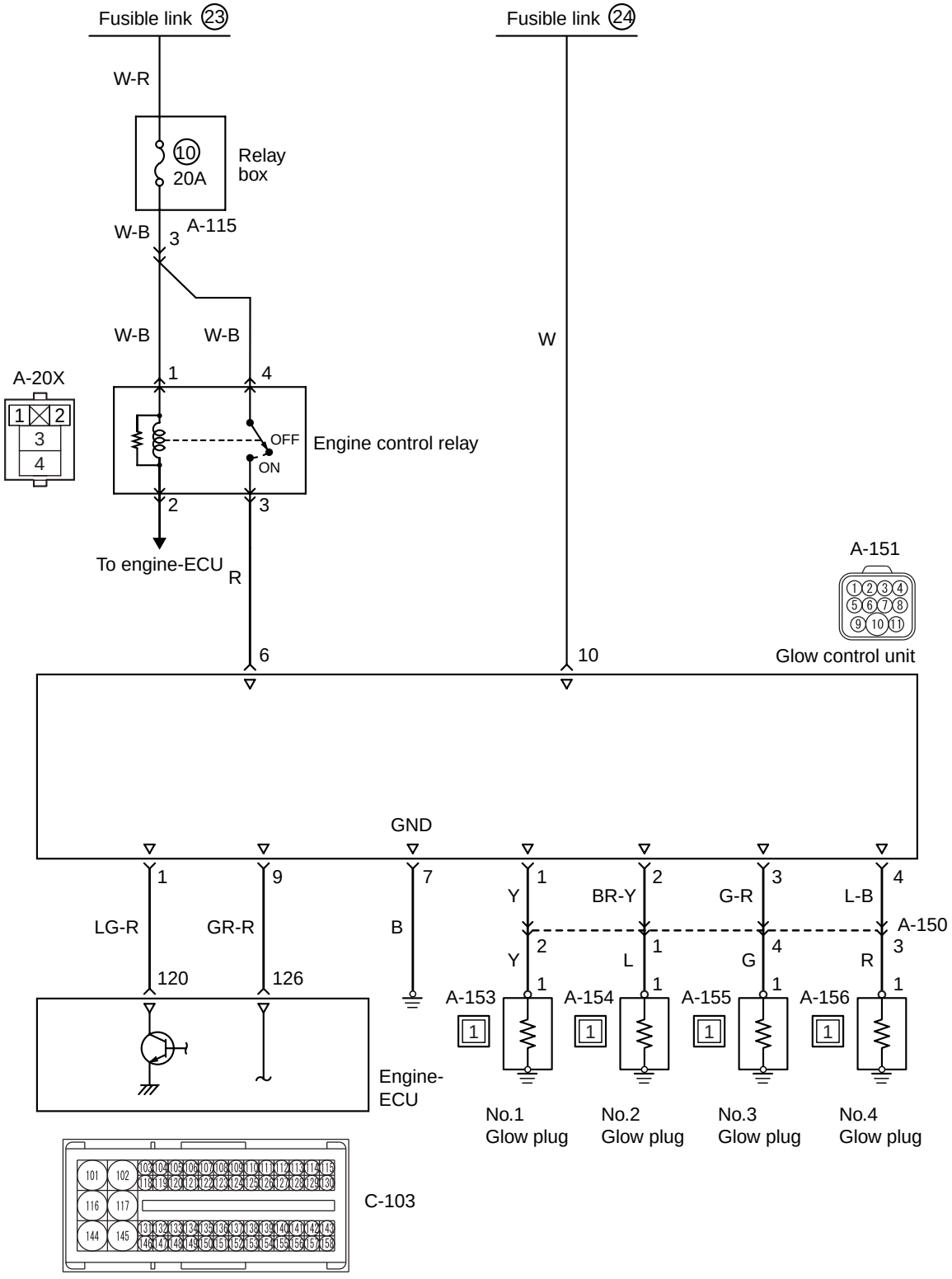
Q: Is the diagnosis code set?

YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

Code No. P064C: Glow Control Unit Malfunction <Euro5>

Glow System Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V: Violet PU: Purple SI: Silver

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OPERATION

- The electrical current source is supplied from the engine control relay (terminal No. 3) to the glow control unit (terminal No. 6). Also, it is supplied from the glow control unit (terminal No. 7) to the body earth.
- The request signal of operating the glow plug is input into the glow control unit (terminal No. 1) from the engine-ECU (terminal No.120).
- The voltage for the glow plug is applied from the battery to the glow control unit (terminal No.10).
- The voltage is applied from the glow control unit (terminal No.1, 2, 3 and 4) to each glow plug.
- The diagnosis signal is output from the glow control unit (terminal No. 9) to the engine-ECU (terminal No.126).

FUNCTION

- The voltage applied to the glow control unit (terminal No.10) from the battery is applied to each glow plug in the duty ratio according to the signal from the engine ECU.

TROUBLE JUDGMENT

Check Conditions

- While the engine is running
- The electrical continuity duty to the glow plug is 17 – 83 %.

Judgment Criterion

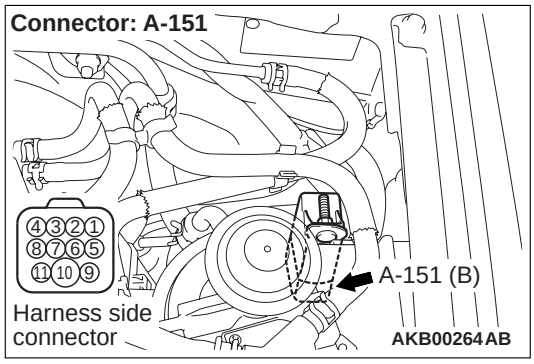
- When a failure of the glow control unit body is detected.

PROBABLE CAUSES

- Failed glow control unit
- Open/short circuit or harness damage in glow plug power supply circuit or loose connector contact.
- Failed engine-ECU

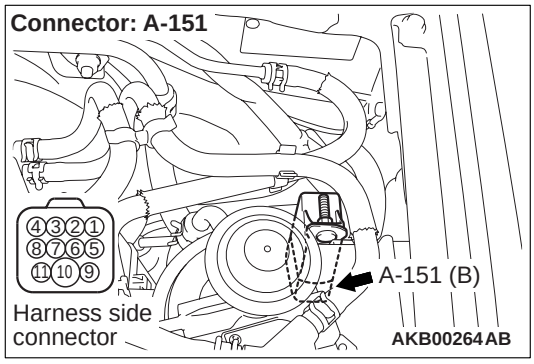
DIAGNOSTIC PROCEDURE

STEP 1. Connector check: A-151 glow control unit connector



Q: Is the check result normal?
YES : Go to Step 2 .
NO : Repair or replace the connector.

STEP 2. Perform voltage measurement at A-151 glow control unit connector.

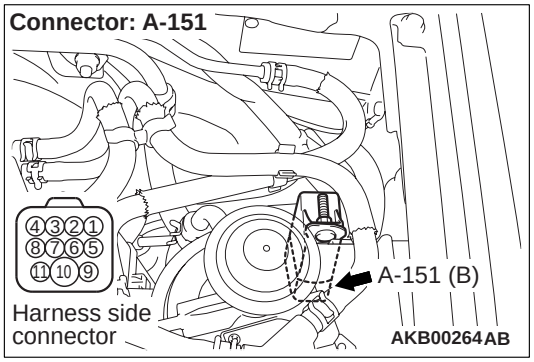


- Disconnect connector, and measure at harness side.
- Voltage between terminal No.10 and earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 3 .
NO : Check and repair harness between A-151 (terminal No.10) glow control unit connector and battery (fusible link 24).
- Check power supply line for open/short circuit.

STEP 3. Check harness between A-151 (terminal No. 10) glow control unit connector and battery (fusible link 24).



- Check power supply line for damage.

Q: Is the check result normal?
YES : Go to Step 4 .
NO : Repair the damaged harness wire.

STEP 4. M.U.T.-III diagnosis code.
- Reconfirmation of diagnosis code.

Q: Is the diagnosis code set?
YES : Go to Step 5 .
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service points – How to Cope with intermittent Malfunctions).

STEP 5. Replace the glow control unit.
- After replacing the glow control unit, reconfirm whether the diagnosis code is set.

Q: Is the diagnosis code set?
YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, carry out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).
NO : Check is end.

Code No. P0652: Analog Sensor Reference Voltage No. 2 Too Low

FUNCTION
- The engine-ECU applies 5 V to the sensors other than the accelerator pedal position sensor (main)
- The engine-ECU checks whether the supply voltage is within the specified range.

TROUBLE JUDGMENT

Check Conditions
- Battery positive voltage is 8 – 16 V
- 2 seconds later after the ignition switch has been in "ON" position or the engine has started up

Judgment Criterion
- The detected voltage of analog sensor reference voltage No. 2 is 4.86 V or less for 0.5 second. [Power supply for other than accelerator pedal position sensor (main)]

PROBABLE CAUSE
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code
- After erasing the diagnosis code through M.U.T.-III, ignition switch is "ON" position and confirm whether the diagnosis code is output.

Q: Is the diagnosis code set?

YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

Code No. P0653: Analog Sensor Reference Voltage No. 2 Too High

FUNCTION

- The engine-ECU applies 5 V to the sensors other than the accelerator pedal position sensor (main).
- The engine-ECU checks whether the supply voltage is within the specified range.

TROUBLE JUDGMENT

Check Conditions

- Battery positive voltage is 8 – 16 V
- 2 seconds later after the ignition switch has been in "ON" position or the engine has started up

Judgment Criterion

- The detected voltage of analog sensor reference voltage No. 2 is 5.14 V or more for 0.5 second. [Power supply for other than accelerator pedal position sensor (main)]

PROBABLE CAUSE

- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code

- After erasing the diagnosis code through M.U.T.-III, ignition switch is "ON" position and confirm whether the diagnosis code is output.

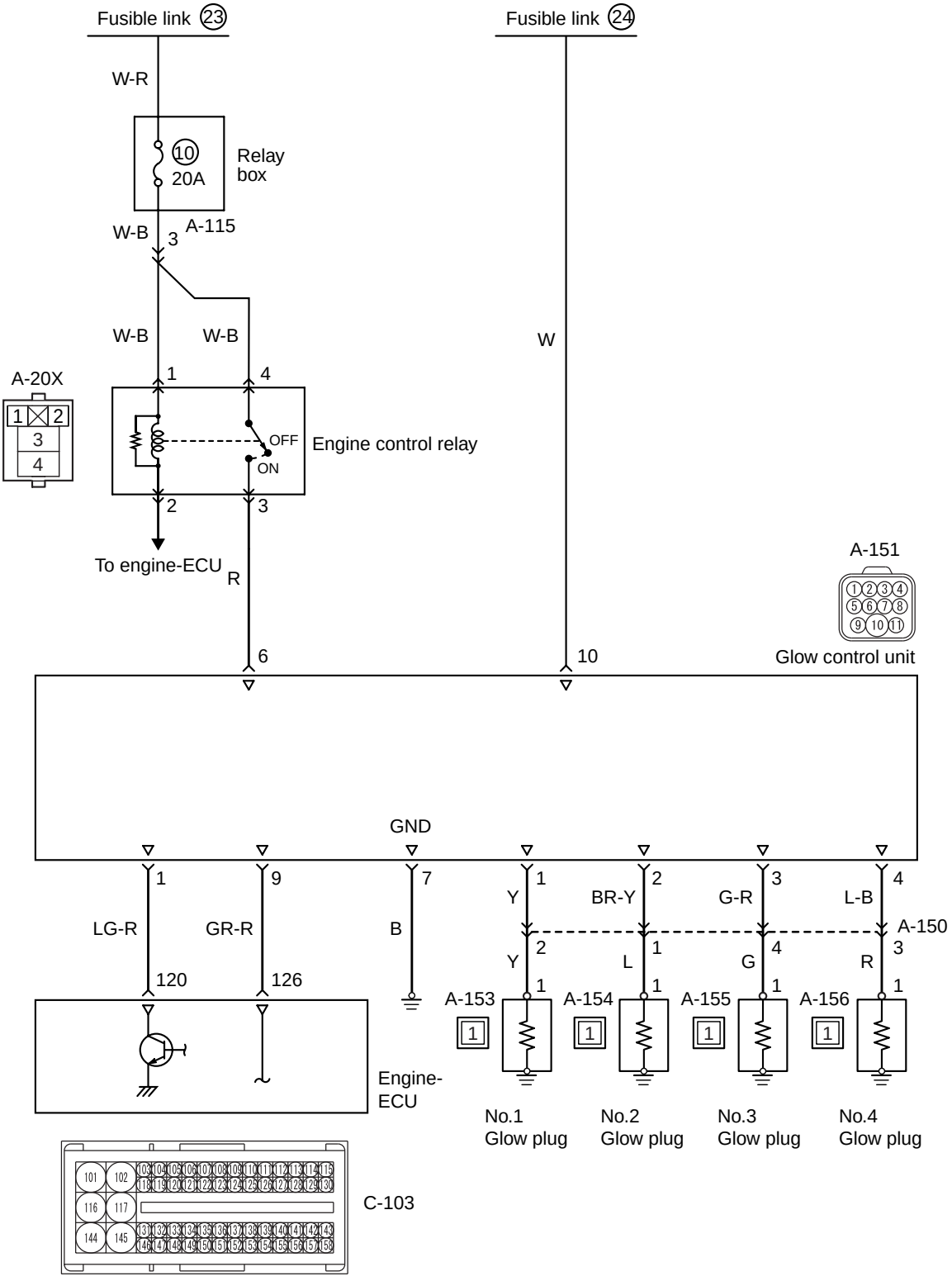
Q: Is the diagnosis code set?

YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

Code No. P0683: Glow Control Unit Communication Abnormality <Euro5>

Glow System Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V: Violet PU: Purple SI: Silver

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OPERATION

- The electrical current source is supplied from the engine control relay (terminal No. 3) to the glow control unit (terminal No. 6). Also, it is supplied from the glow control unit (terminal No.7) to the body earth.
- The request signal of operating the glow plug is input into the glow control unit (terminal No. 1) from the engine-ECU (terminal No.120).
- The voltage for the glow plug is applied from the battery to the glow control unit (terminal No. 10).
- The voltage is applied from the glow control unit (terminal No.1, 2, 3 and 4) to each glow plug.
- The diagnosis signal is output from the glow control unit (terminal No. 9) to the engine-ECU (terminal No. 126).

FUNCTION

- The voltage applied to the glow control unit (terminal No.10) from the battery is applied to each glow plug in the duty ratio according to the signal from the engine ECU.

TROUBLE JUDGMENT

Check Conditions

- While the engine is running
- The electrical continuity duty to the glow plug is 17 – 83 %.

Judgment Criterion

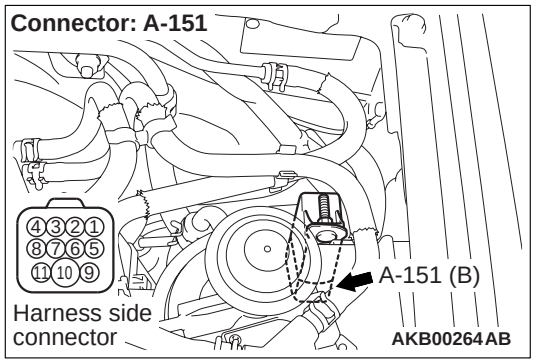
- The diagnosis signal is not received from the glow control unit for more than 5 seconds.

PROBABLE CAUSES

- Failed glow control unit
- Open/short circuit or harness damage in glow control unit power supply/earth circuit or loose connector contact.
- Loose connector contact; open/short circuit or harness damage of communication wire between glow control unit and engine-ECU.
- Failed engine-ECU

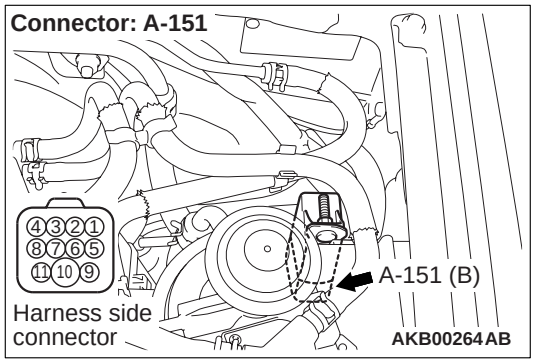
DIAGNOSTIC PROCEDURE

STEP 1. Connector check: A-151 glow control unit connector



Q: Is the check result normal?
YES : Go to Step 2 .
NO : Repair or replace the connector.

STEP 2. Perform voltage measurement at A-151 glow control unit connector.

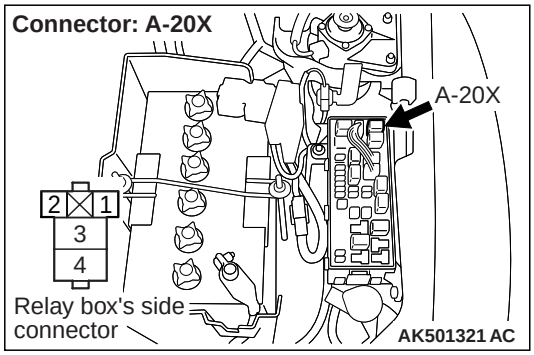


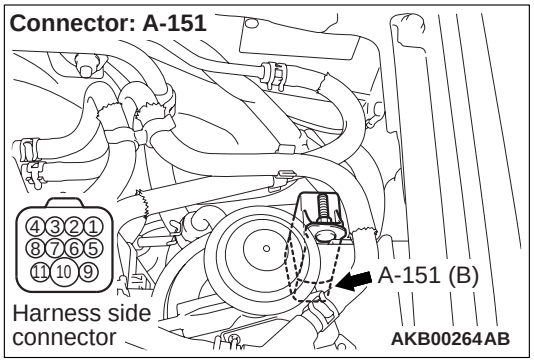
- Disconnect connector, and measure at harness side.
- Ignition switch: ON
- Voltage between terminal No. 6 and earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 4 .
NO : Go to Step 3 .

STEP 3. Connector check: A-20X engine control relay connector





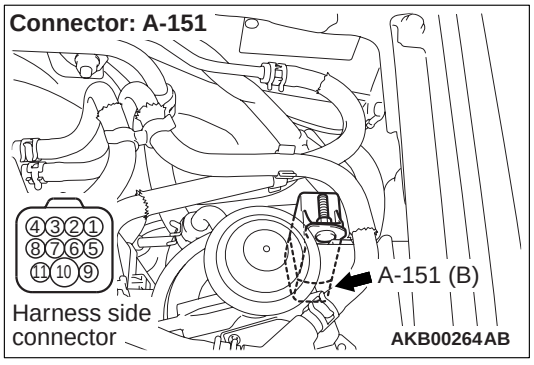
Q: Is the check result normal?

YES : Check and repair harness between A-151 (terminal No. 6) glow control unit connector and A-20X (terminal No. 3) engine control relay connector.

- Check power supply line for open/ short circuit.

NO : Repair or replace the connector.

STEP 4. Perform resistance measurement at A-151 glow control unit connector.



- Disconnect connector, and measure at harness side.
- Resistance between terminal No.7 and earth.

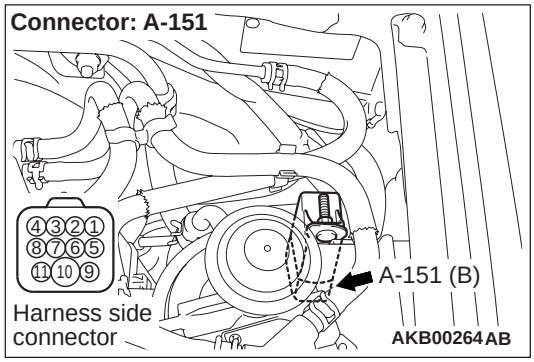
Q: Is the check result normal?

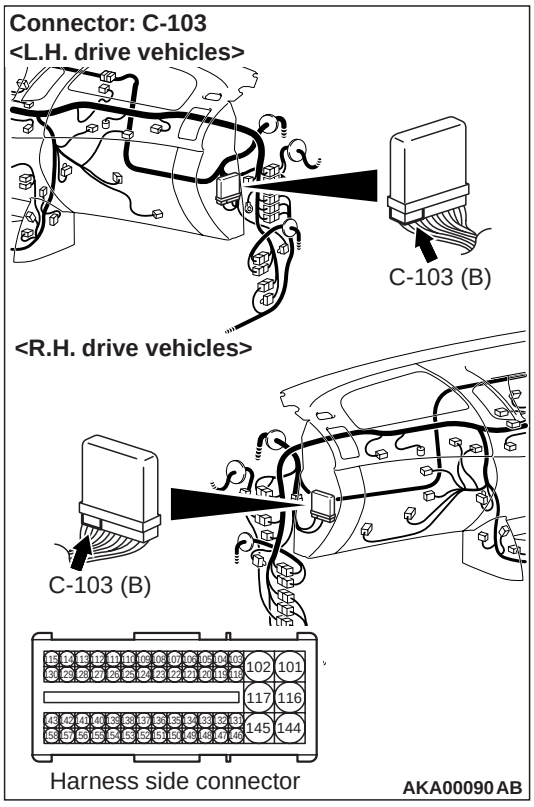
YES : Go to Step 5 .

NO : Check and repair harness between A-151 (terminal No.7) glow control unit connector and body earth.

- Check earthing line for open circuit and damage.

STEP 5. Check harness between A-151 (terminal No. 1) glow control unit connector and C-103 (terminal No. 120) engine-ECU connector.





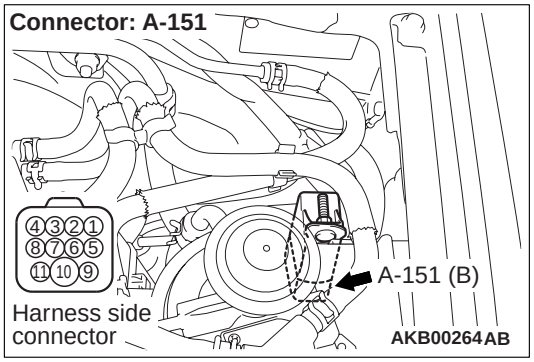
- Check signal line for open/short circuit and damage.

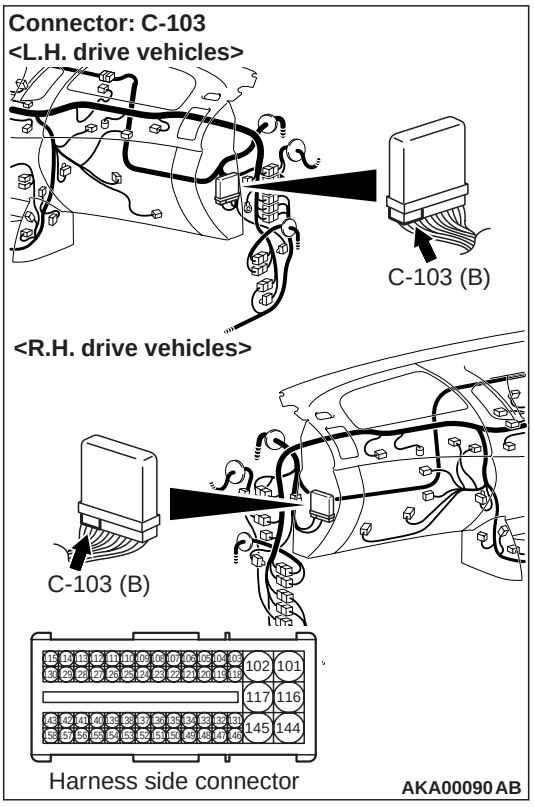
Q: Is the check result normal?

YES : Go to Step 6 .

NO : Repair the damaged harness wire.

STEP 6. Check harness between A-151 (terminal No. 9) glow control unit connector and C-103 (terminal No. 126) engine-ECU connector.

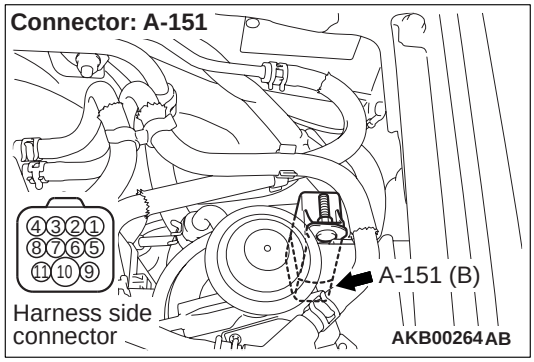


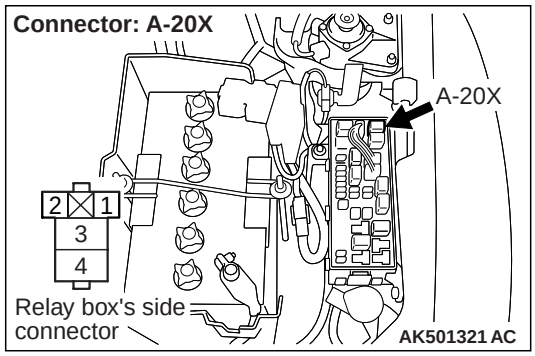


- Check signal line for open/short circuit and damage.

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair the damaged harness wire.

STEP 7. Check harness between A-151 (terminal No. 6) glow control unit connector and A-20X (terminal No. 3) engine control relay connector.





- Check power supply line for damage.

Q: Is the check result normal?
YES : Go to Step 8 .
NO : Repair the damaged harness wire.

STEP 8. M.U.T.-III diagnosis code.
- Reconfirmation of diagnosis code.

Q: Is the diagnosis code set?
YES : Go to Step 9 .
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service points – How to Cope with intermittent Malfunctions).

STEP 9. Replace the glow control unit.
- After replacing the glow control unit, reconfirm whether the diagnosis code is set.

Q: Is the diagnosis code set?

YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, carry out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).
NO : Check is end.

Code No. P1203: Capacitor Insufficient Charging

FUNCTION
- The engine-ECU monitors the charged state of the capacitor in the injector drive circuit.
- The engine-ECU checks whether the injector driving voltage is too low due to insufficient charging of the capacitor.

TROUBLE JUDGMENT

Check Conditions
- Ignition switch is in "ON" position
- Except during the engine cranking period
- Battery positive voltage is 8 V or more

Judgment Criterion
- A capacitor in low charge state (40 V or less) is detected in an engine-ECU internal circuit.

PROBABLE CAUSE
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code
- After erasing the diagnosis code through M.U.T.-III, ignition switch is "ON" position and confirm whether the diagnosis code is output.

Q: Is the diagnosis code set?
YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

Code No. P1204: Capacitor Excessive Charging

FUNCTION
- The engine-ECU monitors the charged state of the capacitor in the injector drive circuit.
- The engine-ECU checks whether the injector driving voltage is too high due to excessive charging of the capacitor.

TROUBLE JUDGMENT

Check Conditions
- Ignition switch is in "ON" position
- Except during the engine cranking period
- Battery positive voltage is 8 V or more

Judgment Criterion
- A capacitor in overcharge state (100 V or higher) is detected in an engine-ECU internal circuit.

PROBABLE CAUSE
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code
- After erasing the diagnosis code through M.U.T.-III, ignition switch is "ON" position and confirm whether the diagnosis code is output.

Q: Is the diagnosis code set?

YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

Code No. P1272: Pressure Limiter Malfunction

OPERATION
- Refer to Code No. P0003: Suction Control Valve Open P.13A-26. <Euro 5>
- Refer to Code No. P0004: Suction Control Valve Battery Short P.13A-29. <Euro 5>
- Refer to Code No. P0191: Rail Pressure Sensor Range/Performance Problem P.13A-143.
- Refer to Code No. P0192: Rail Pressure Sensor Circuit Low Input P.13A-147.
- Refer to Code No. P0193: Rail Pressure Sensor Circuit High Input P.13A-155.
- Refer to Code No. P0628: Suction Control Valve Open P.13A-276. <Except Euro 5>
- Refer to Code No. P0629: Suction Control Valve Battery Short P.13A-279. <Except Euro 5>

FUNCTION
- The engine-ECU controls the fuel discharge rate using the suction control valve.
- The engine-ECU monitors the signals input from the rail pressure sensor.
- The engine-ECU checks whether the pressure limiter valve is open, based on changes in the signals input from the rail pressure sensor (rapid drop of pressure after it goes extremely high).

TROUBLE JUDGMENT

Check Conditions
- Battery positive voltage is 8 – 16 V
- Engine speed is 600 r/min or more
- 2 seconds later after the ignition switch has been in "ON" position or the engine has started up
- Rail pressure is normal

Judgment Criterion
- After a pressure higher than the pressure of the pressure limiter opening valve is detected, fuel leakage diagnosis (supply pump discharge rate excessive) is detected within the predetermined time.

PROBABLE CAUSES
- Failed suction control valve
- Failed fuel system
- Failed common rail assembly
- Open/short circuit or harness damage in suction control valve circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

NOTE: This diagnosis code is outputted for an air penetration in the fuel line of the supply pump due to lack of fuel. Therefore, bleed air from the fuel line after the fuel supply, and delete the diagnosis code through M.U.T.-III.

STEP 1. M.U.T.-III diagnosis code

Q: Is any other diagnosis code than P1272 output?
YES : Inspection chart for diagnosis codes (Refer to P.13A-21).
NO : Go to Step 2 .

STEP 2. Check the fuel filter contamination

Q: Is the check result normal?
YES : Go to Step 3 .
NO : Replace the fuel filter then replace the common rail assembly and fuel injection tubes.

STEP 3. Release the air from the fuel line.

- After releasing the air from the fuel line, continue idle operation for about five minutes and recheck for abnormal symptoms.

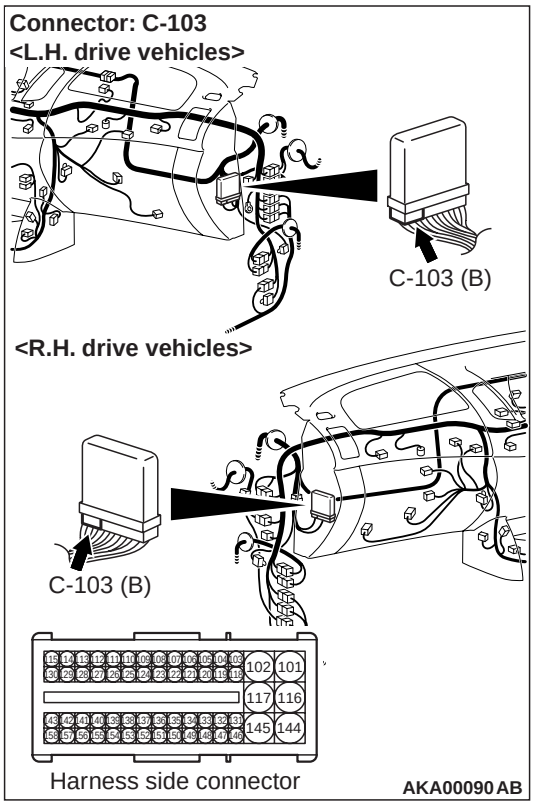
Q: Does trouble symptom persist?
YES : Replace the common rail assembly and common tubes.
NO : Go to Step 4 .

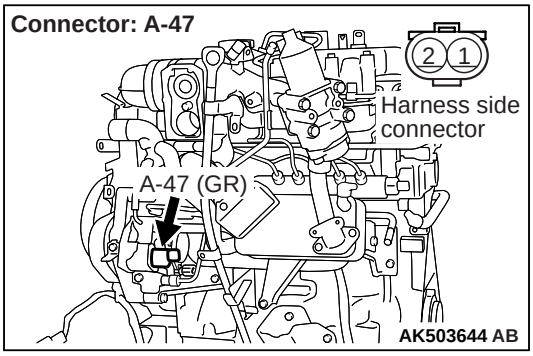
STEP 4. Check suction control valve itself

- Check suction control valve itself (Refer to P.13A-596).

Q: Is the check result normal?
YES : Go to Step 5 .
NO : Replace the suction control valve. After replacing the suction control valve, learn the supply pump (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).

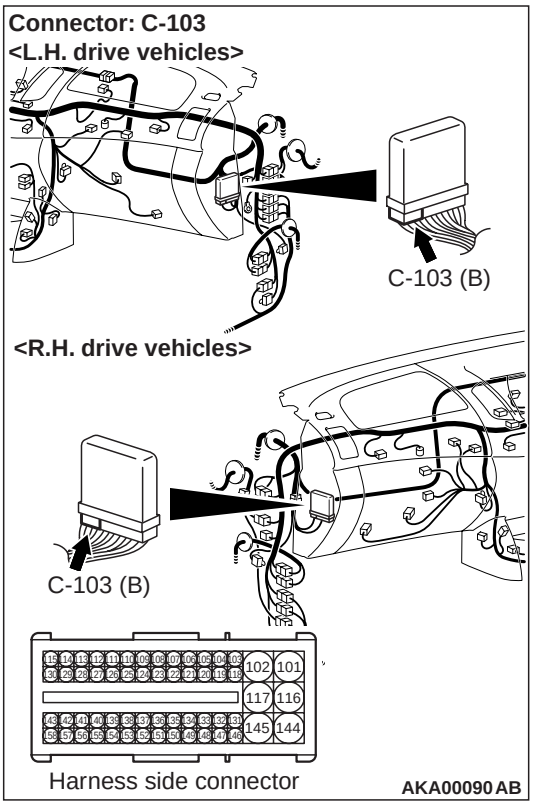
STEP 5. Connector check: C-103 engine-ECU connector and A-47 suction control valve connector

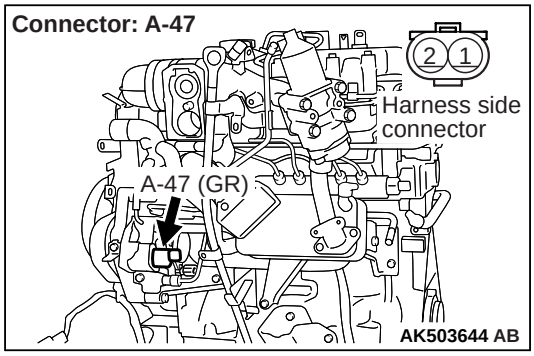




Q: Are the check results normal?
YES : Go to Step 6 .
NO : Repair or replace the connector.

STEP 6. Check harness between C-103 (terminal No. 131) engine-ECU connector and A-47 (terminal No. 1) suction control valve connector.

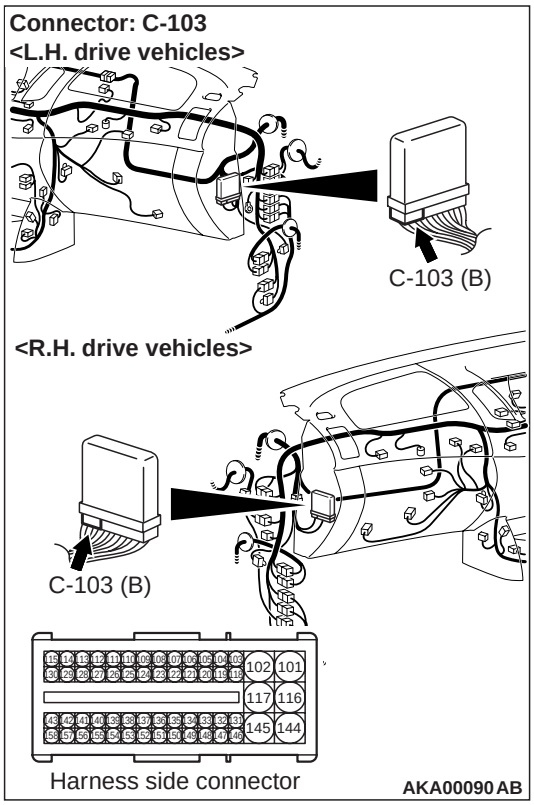


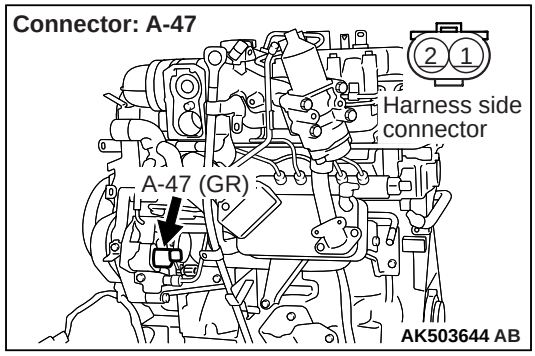


- Check output line for open/short circuit and damage.

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair the damaged harness wire.

STEP 7. Check harness between C-103 (terminal No. 146) engine-ECU connector and A-47 (terminal No. 2) suction control valve connector.

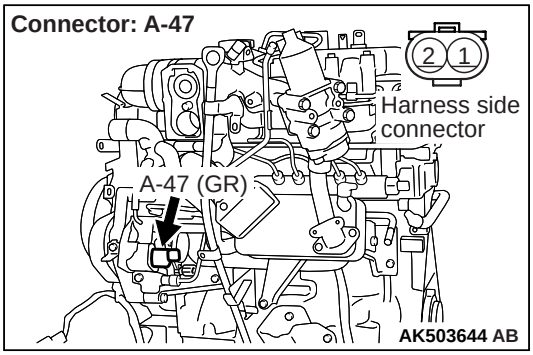




- Check output line for open/short circuit and damage.

Q: Is the check result normal?
YES : Go to Step 8 .
NO : Repair the damaged harness wire.

STEP 8. Perform output wave pattern measurement at A-47 suction control valve (Using an oscilloscope).



- Engine: Idling
- Connect the oscilloscope special patterns pickup to engine-ECU terminal No. 131 and earth.

OK: The waveform should show a pattern similar to the illustration of Inspection procedure using an oscilloscope (Refer to P.13A-586).

Q: Is the check result normal?

YES : Go to Step 9 .
NO : Replace the engine-ECU then replace the common rail assembly and fuel injection tubes. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

STEP 9. Replace the common rail assembly and fuel injection tubes.

- After replacing the common rail assembly and common tubes, re-check the trouble symptoms

Q: Does trouble symptom persist?
YES : Replace the suction control valve. After replacing the suction control valve, learn the supply pump (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).
NO : The check is end.

Code No. P1273: Supply Pump Insufficient Flow

OPERATION

- Refer to Code No. P0003: Suction Control Valve Open P.13A-26. <Euro 5>
- Refer to Code No. P0004: Suction Control Valve Battery Short P.13A-29. <Euro 5>
- Refer to Code No. P0335: Crank Angle Sensor System P.13A-184.
- Refer to Code No. P0340: Camshaft Position Sensor System P.13A-192.
- Refer to Code No. P0628: Suction Control Valve Open P.13A-276. <Except Euro 5>
- Refer to Code No. P0629: Suction Control Valve Battery Short P.13A-279. <Except Euro 5>

FUNCTION

- The engine-ECU controls the fuel discharge rate using the suction control valve.
- The engine-ECU monitors changes in the fuel discharge rate at each injection to detect a fault in one of the two plungers in the supply pump.

TROUBLE JUDGMENT

Check Condition

- Vehicle in steady and stable state (the difference from the last data of the objective common rail pressure is less than 3 MPa and that from the last data of the final fuel injection rate is less than 2 mm^3/st.

Judgment Criterion

- The inter-cylinder difference in pressure feed exceeds the predetermined value 500 times consecutively.

PROBABLE CAUSES

- Air penetration due to lack of fuel

- Failed supply pump
- Failed engine-ECU

DIAGNOSIS PROCEDURE

NOTE: This diagnosis code is outputted for an air penetration in the fuel line of the supply pump due to lack of fuel. Therefore, bleed air from the fuel line after the fuel supply, and delete the diagnosis code through M.U.T.-III.

STEP 1. M.U.T.-III diagnosis code

- With the air released from the fuel line, supply fuel if necessary.
- Continue idle operation for about 5 minutes.

Q: Is the diagnosis code P1273 outputted again?
YES : Go to Step 2 .
NO : The check is end.

STEP 2. Replace the supply pump assembly.

- After the supply pump assembly, learn the supply pump (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).
- After learning the supply pump assembly, recheck the trouble symptoms.

Q: Does trouble symptom persist?
YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).
NO : The check is end.

Code No. P1274: Supply Pump Protection

OPERATION

- Refer to Code No. P0191: Rail Pressure Sensor Range/Performance Problem P.13A-143.
- Refer to Code No. P0192: Rail Pressure Sensor Circuit Low Input P.13A-147.
- Refer to Code No. P0193: Rail Pressure Sensor Circuit High Input P.13A-155.

FUNCTION

- The engine-ECU monitors the signals input from the rail pressure sensor.
- Based on these input signals, the engine-ECU checks whether the fuel pressure in the common rail is abnormal.

TROUBLE JUDGMENT

Check Conditions

- Engine is running
- Rail pressure sensor is normal

Judgment Criterion

- For 1 seconds, the rail pressure stays in the critical pressure range in which the supply pump is burned out.

PROBABLE CAUSES

- Failed supply pump
- Failed common rail assembly
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code

Q: Is any other diagnosis code than P1274 output?
YES : Inspection chart for diagnosis codes (Refer to P.13A-21).
NO : Go to Step 2 .

STEP 2. Check suction control valve itself

- Check suction control valve itself (Refer to P.13A-596).

Q: Is the check result normal?
YES : Go to Step 3 .
NO : Replace the suction control valve. After replacing the supply pump, learn the supply pump (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).

STEP 3. Replace the supply pump assembly.
- After the supply pump assembly, learn the supply pump (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).
- After learning the supply pump assembly, re-check the trouble symptoms.

Q: Does trouble symptom persist?
YES : Go to Step 4 .
NO : The check is end.

STEP 4. Replace the common rail assembly and fuel injection tubes.
- After replacing the common rail assembly and fuel injection tubes, re-check the trouble symptoms

Q: Does trouble symptom persist?
YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).
NO : The check is end.

Code No. P1275: Supply Pump Exchange

OPERATION
- Refer to Code No. P0191: Rail Pressure Sensor Range/Performance Problem P.13A-143.
- Refer to Code No. P0192: Rail Pressure Sensor Circuit Low Input P.13A-147.
- Refer to Code No. P0193: Rail Pressure Sensor Circuit High Input P.13A-155.

FUNCTION
- The engine-ECU monitors the signals input from the rail pressure sensor.
- Based on these input signals, the engine-ECU checks whether the fuel pressure in the common rail is abnormal.

TROUBLE JUDGMENT

Check Conditions
- Engine is running
- Rail pressure sensor is normal

Judgment Criterion
- The rail pressure continues to exceed the maximum operating pressure of the supply pump for 15 seconds.

PROBABLE CAUSES
- Failed supply pump
- Failed rail pressure sensor
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code

Q: Is any other diagnosis code than P1275 output?
YES : Inspection chart for diagnosis codes (Refer to P.13A-21).
NO : Go to Step 2 .

STEP 2. Check suction control valve itself
- Check suction control valve itself (Refer to P.13A-596).

Q: Is the check result normal?
YES : Go to Step 3 .
NO : Replace the suction control valve. After replacing the suction control valve, learn the supply pump (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).

STEP 3. Replace the supply pump.
- After the supply pump assembly, learn the supply pump. (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).
- After learning the supply pump, re-check the trouble symptoms.

Q: Does trouble symptom persist?
YES : Go to Step 4 .
NO : The check is end.

STEP 4. Replace the common rail assembly and fuel injection tubes.

- After replacing the common rail assembly and fuel injection tubes, re-check the trouble symptoms.

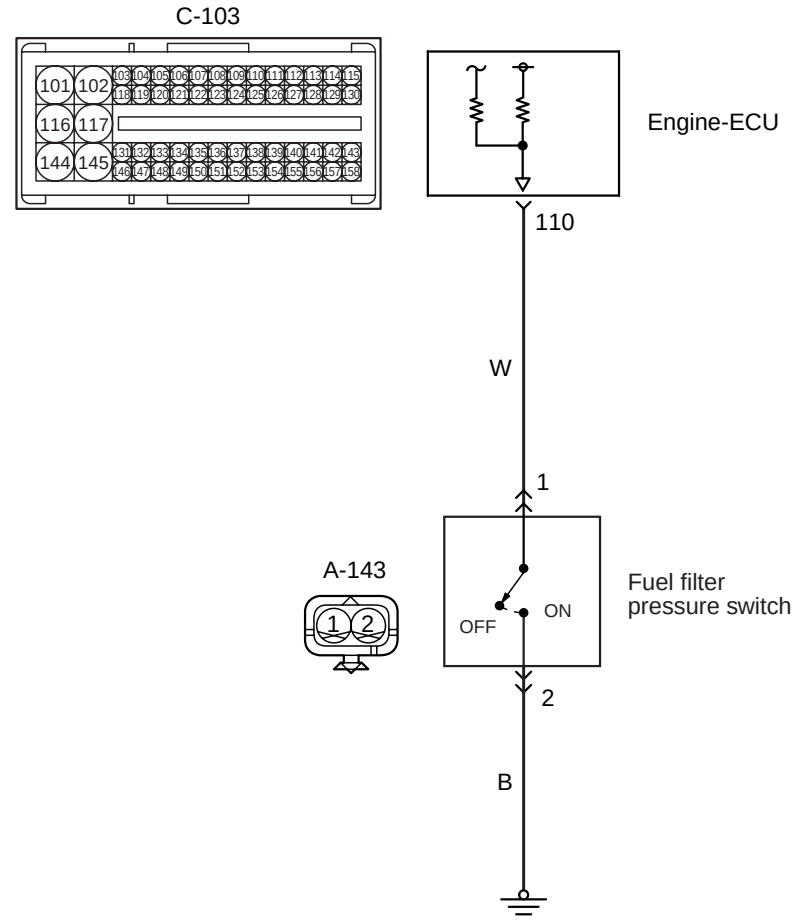
Q: Does trouble symptom persist?

YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

NO : The check is end.

Code No. P1276: Fuel Filter Exchange <Vehicles with fuel filter pressure switch>

Fuel filter pressure switch circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V: Violet PU: Purple

AKB00283 AB

OPERATION

- The battery voltage is applied to the fuel filter pressure switch (terminal No. 1) from the engine-ECU (terminal No. 110).

FUNCTION

- The engine-ECU detects the clogged fuel filter by using the fuel filter pressure switch installed on the fuel filter assembly.

TROUBLE JUDGMENT

Check Condition

- During steady driving after engine warm up.

Judgment Criterion

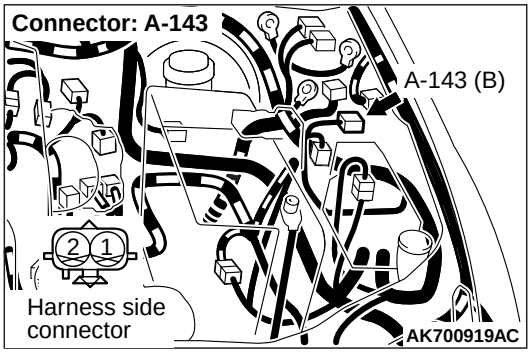
- Determination of clogged fuel filter.

PROBABLE CAUSES

- Failed fuel filter pressure switch
- Open/short circuit or harness damage in fuel filter pressure switch circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. Connector check: A-143 fuel filter pressure switch connector



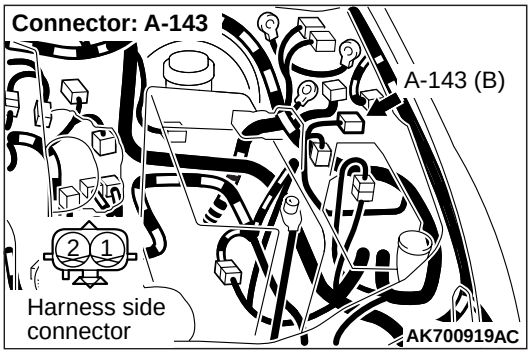
Q: Is the check result normal?
YES : Go to Step 2 .
NO : Repair or replace the connector.

STEP 2. Check the fuel filter pressure switch itself.

Check the fuel filter pressure switch itself (Refer to GROUP 13B – Fuel Filter – Fuel Filter Inspection).

Q: Is the check result normal?
YES : Replace the fuel filter body.
NO : Go to Step 3 .

STEP 3. Perform voltage measurement at A-143 fuel filter pressure switch connector.

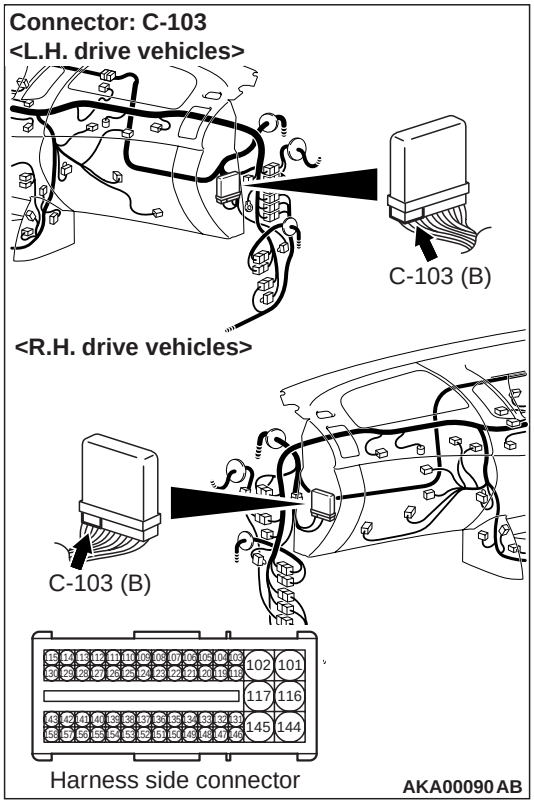


- Disconnect connector, and measure at harness side.
- Ignition switch: ON
- Voltage between terminal No. 1 and earth.

OK: System voltage

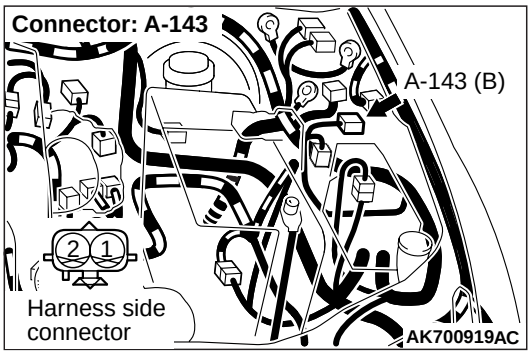
Q: Is the check result normal?
YES : Go to Step 7 .
NO : Go to Step 4 .

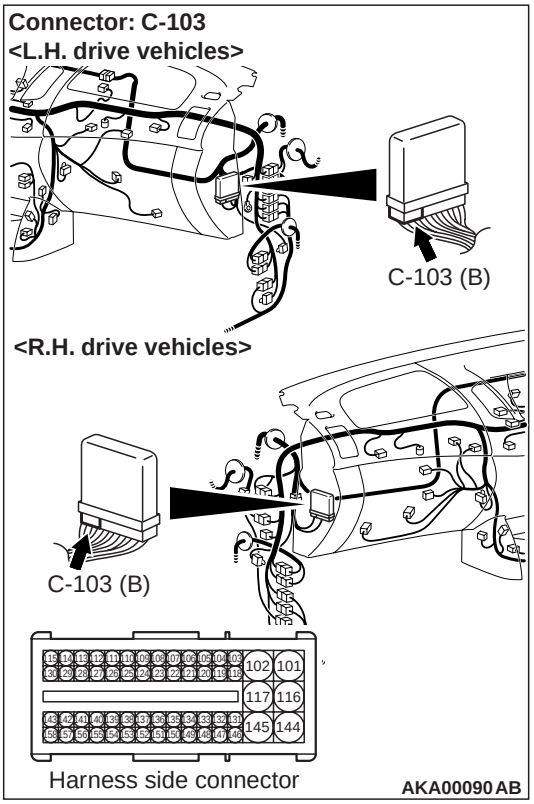
STEP 4. Connector check: C-103 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 5 .
NO : Repair or replace the connector.

STEP 5. Check harness between A-143 (terminal No. 1) fuel filter pressure switch connector and C-103 (terminal No. 110) engine-ECU connector.





- Check output line for open/short circuit.

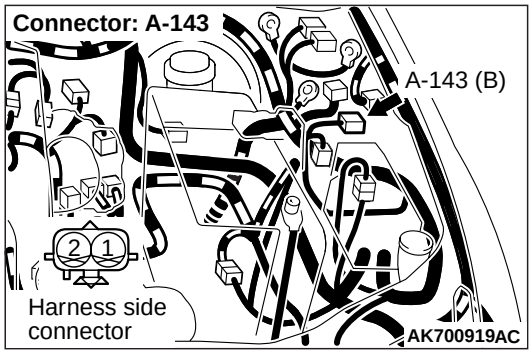
Q: Is the check result normal?
YES : Go to Step 6 .
NO : Repair the damaged harness wire.

STEP 6. M.U.T.-III data list

- Refer to Data List Reference Table P.13A-542.
  a. Item 152: Fuel filter pressure switch

Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).
NO : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).

STEP 7. Perform resistance measurement at A-143 fuel filter pressure switch connector.

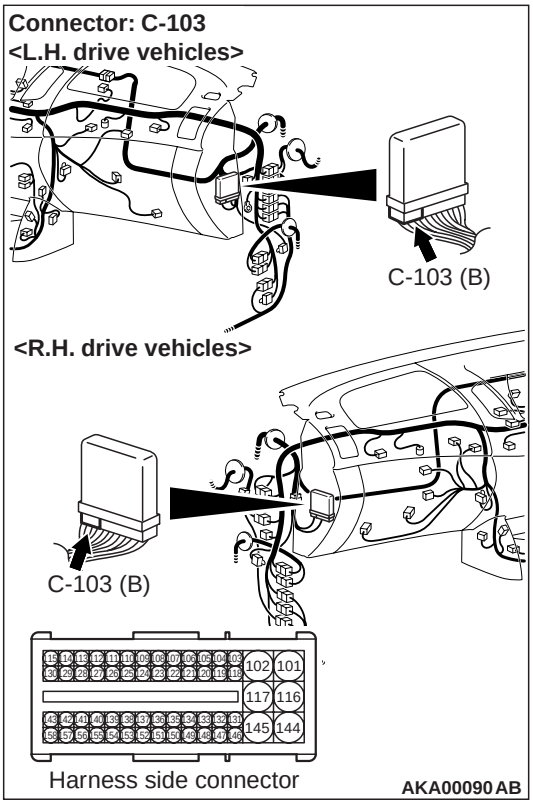


- Disconnect connector, and measure at harness side.
- Resistance between terminal No. 2 and earth.

OK: Continuity (2 Ω or less)

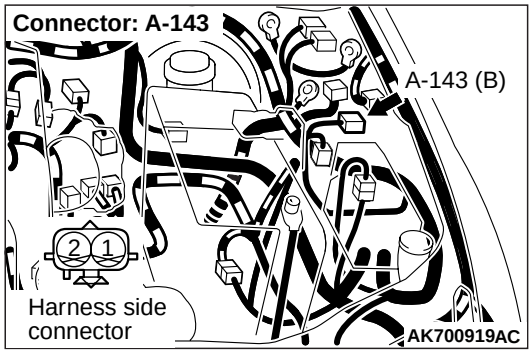
Q: Is the check result normal?
YES : Go to Step 8 .
NO : Check and repair harness between A-143 (terminal No. 2) fuel filter pressure switch connector and body earth.
- Check earthing line for open circuit and damage.

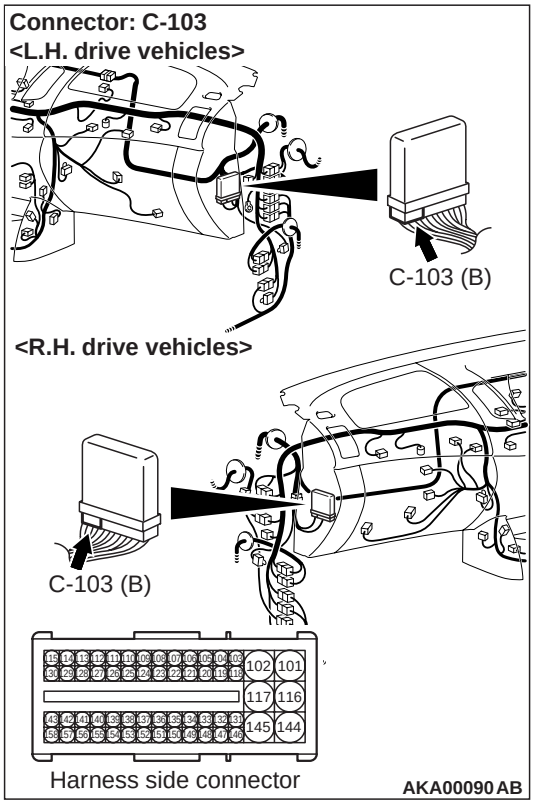
STEP 8. Connector check: C-103 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 9 .
NO : Repair or replace the connector.

STEP 9. Check harness between A-143 (terminal No. 1) fuel filter pressure switch connector and C-103 (terminal No. 110) engine-ECU connector.





- Check output line for damage.

Q: Is the check result normal?
YES : Replace the fuel filter.
NO : Repair the damaged harness wire.

Code No. P1277: Fuel Filter Freeze <Vehicles with fuel filter pressure switch>

FUNCTION

- The engine-ECU estimates that the fuel filter is freezing, using the input signal from the each sensor.
- When storing this diagnosis code, the engine-ECU blinks the glow lamp.

TROUBLE JUDGMENT

Check Conditions

- During steady driving
- Fuel temperature is lower than specified temperature
- Engine coolant temperature is lower than specified temperature

Judgment Criteria
- Determination of clogged fuel filter
- Fuel pressure hunting occurs more than certain degree, or difference more than certain degree exists between target fuel pressure and actual fuel pressure

PROBABLE CAUSE
- Fuel filter Freezing

DIAGNOSIS PROCEDURE

STEP 1. Reconfirmation of M.U.T.-III diagnosis code after warming up the engine

Q: Is any other diagnosis code than P1276 output?
YES : Inspection chart for diagnosis code (Refer to).
NO : Check end.

Code No. P1298: Variable Geometry Turbocharger Control System Malfunction (high pressure) <Euro5>

FUNCTION
- The engine-ECU controls the duty ratio of the variable geometry control solenoid valve so that the actual boost pressure can become the target boost pressure.

TROUBLE JUDGMENT

Check Condition
- Engine is running

Judgment Criterion
- Actual boost pressure is higher than target boost pressure by more than 6.7 kPa

PROBABLE CAUSES
- Failed variable geometry turbocharger control system
- Failed engine-ECU

DIAGNOSTIC PROCEDURE

STEP 1. Check the turbocharger supercharging pressure.
- Check the turbocharger supercharging pressure (refer to GROUP 15 – On-vehicle Service – Turbocharger Supercharging Pressure Check).

Q: Is the check result normal?
YES : Go to Step 2 .
NO : Repair the variable geometry turbocharger control system.

STEP 2. M.U.T.-III diagnosis code.
- After clearing the diagnosis code through M.U.T.-III, start the engine and confirm whether the diagnosis code is output.

Q: Is the diagnosis code set?
YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, carry out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

Code No. P1299: Variable Geometry Turbocharger Control System Malfunction (low pressure) <Euro5>

FUNCTION
- The engine-ECU controls the duty ratio of the variable geometry control solenoid valve so that the actual boost pressure can become the target boost pressure.

TROUBLE JUDGMENT

Check Condition
- Engine is running

Judgment Criterion
- Actual boost pressure is lower than target boost pressure by less than 6.7 kPa

PROBABLE CAUSES
- Failed variable geometry turbocharger control system
- Failed engine-ECU

DIAGNOSTIC PROCEDURE

STEP 1. Check the turbocharger supercharging pressure.
- Check the turbocharger supercharging pressure (refer to GROUP 15 – On-vehicle Service – Turbocharger Supercharging Pressure Check).

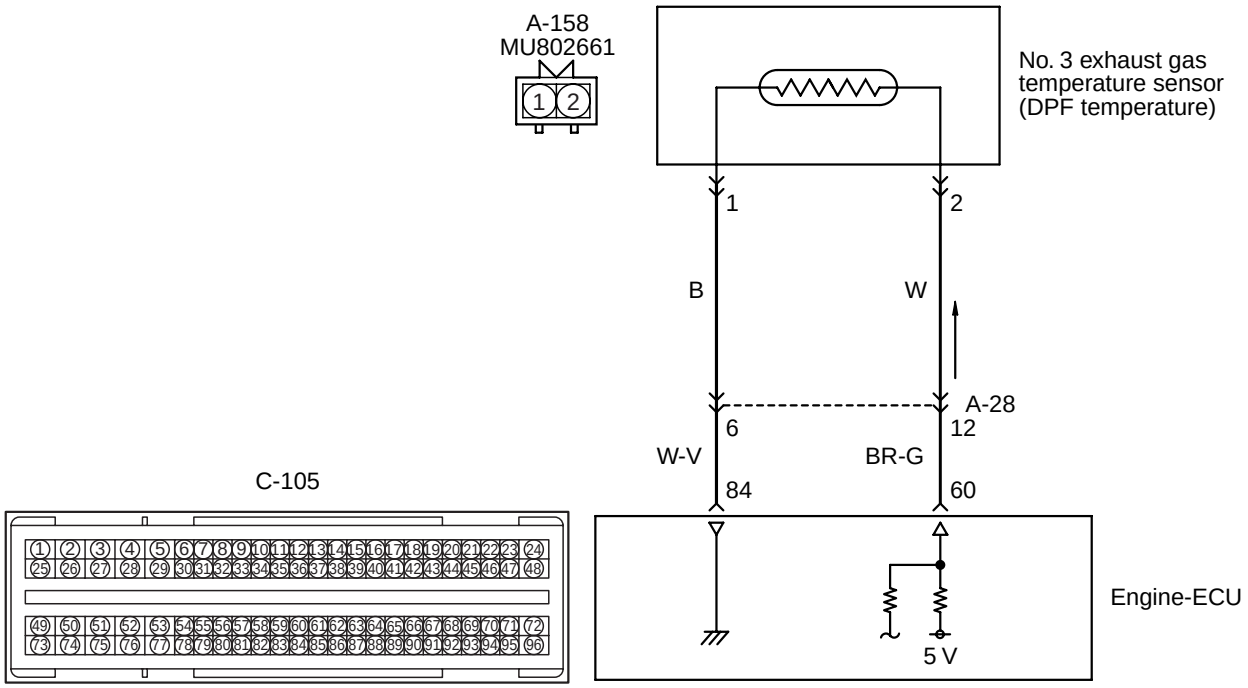
Q: Is the check result normal?
YES : Go to Step 2 .
NO : Repair the variable geometry turbocharger control system.

STEP 2. M.U.T.-III diagnosis code.
- After clearing the diagnosis code through M.U.T.-III, start the engine and confirm whether the diagnosis code is output.

Q: Is the diagnosis code set?
YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, carry out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

Code No. P1427: No. 3 Exhaust Gas Temperature Sensor (DPF temperature) Circuit Low Input <Euro5>

No. 3 Exhaust Gas Temperature Sensor (DPF temperature) Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V: Violet PU: Purple SI: Silver

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OPERATION
- A power voltage of 5 V is applied to the No. 3 exhaust gas temperature sensor (DPF temperature) output terminal (terminal No. 2) from the engine-ECU (terminal No. 60).
- The power voltage is earthed to the engine-ECU (terminal No. 84) from the No. 3 exhaust gas temperature sensor (DPF temperature) (terminal No. 1).

FUNCTION
- The No. 3 exhaust gas temperature sensor (DPF temperature) converts the DPF temperature into a voltage and inputs the voltage signal to the engine-ECU.
- Engine-ECU uses this voltage output for DPF regeneration control.
- The No. 3 exhaust gas temperature sensor (DPF temperature) is a kind of resistor, which has characteristics to reduce its resistance as the DPF temperature rises. Therefore, the sensor output voltage varies with the DPF temperature, and becomes lower as the DPF temperature rises.

TROUBLE JUDGMENT

Check Conditions
- Battery positive voltage is 8 – 16 V
- 2 seconds later after the ignition switch has been in "ON" position or the engine has started up.

Judgment Criterion
- The No. 3 exhaust gas temperature sensor (DPF temperature) output voltage is 0.255 V or less.

PROBABLE CAUSES
- Failed No. 3 exhaust gas temperature sensor (DPF temperature)

- Short circuit in No. 3 exhaust gas temperature sensor (DPF temperature) circuit or connector damage
- Failed engine-ECU

DIAGNOSTIC PROCEDURE

STEP 1. M.U.T.-III data list

- Refer to Data List Reference Table P.13A-542.

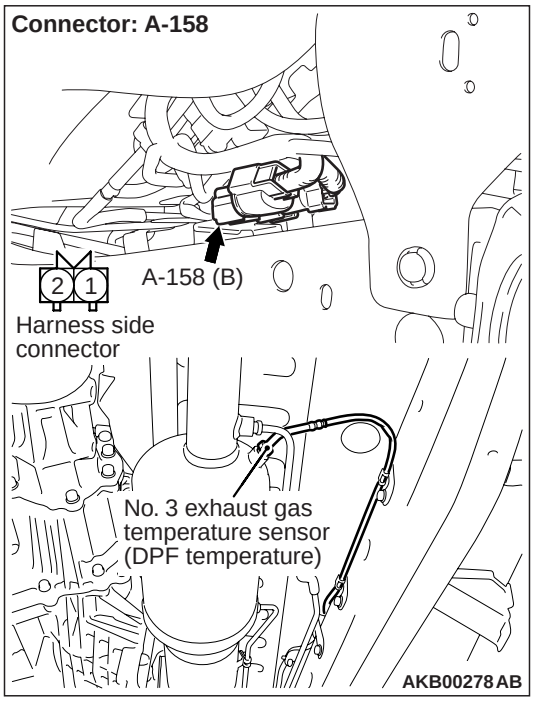
a. Item 119: No. 3 exhaust gas temperature sensor (DPF temperature)

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

NO : Go to Step 2 .

STEP 2. Connector check: A-158 No. 3 exhaust gas temperature sensor (DPF temperature) connector



Q: Is the check result normal?

YES : Go to Step 3 .

NO : Repair or replace the connector.

STEP 3. Check No. 3 exhaust gas temperature sensor (DPF temperature) itself.

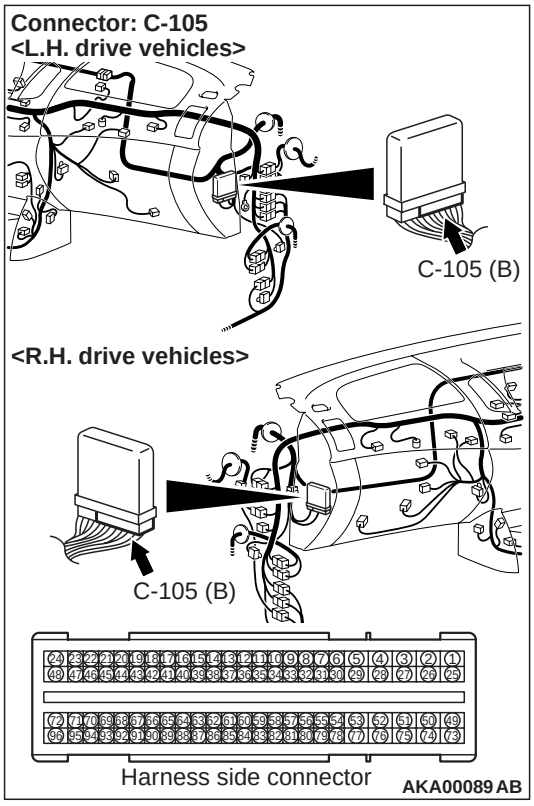
- Check No. 3 exhaust gas temperature sensor (DPF temperature) itself (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – No. 3 exhaust gas temperature sensor (DPF temperature) Check).

Q: Is the check result normal?

YES : Go to Step 4 .

NO : Replace the No. 3 exhaust gas temperature sensor (DPF temperature). After replacing the No. 3 exhaust gas temperature sensor (DPF temperature), carry out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

STEP 4. Connector check: C-105 engine-ECU connector

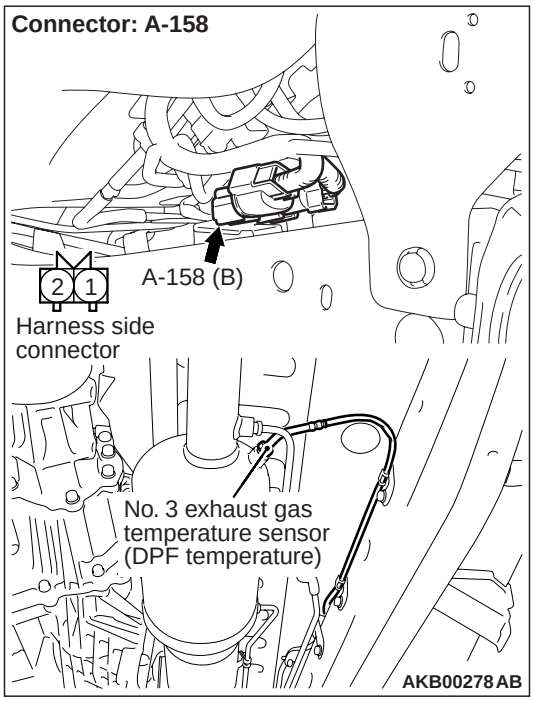


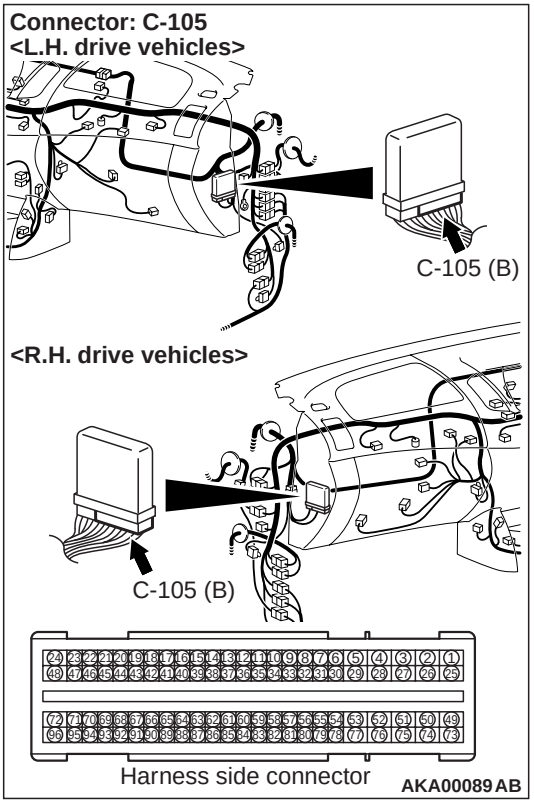
Q: Is the check result normal?

YES : Go to Step 5 .

NO : Repair or replace the connector.

STEP 5. Check harness between A-158 (terminal No. 2) No. 3 exhaust gas temperature sensor (DPF temperature) connector and C-105 (terminal No. 60) engine-ECU connector.





NOTE: Before checking harness, check intermediate connector A-28, and repair if necessary.

- Check output line for short circuit.

Q: Is the check result normal?

YES : Go to Step 6 .
NO : Repair the damaged harness wire.

STEP 6. M.U.T.-III data list

- Refer to Data List Reference Table P.13A-542

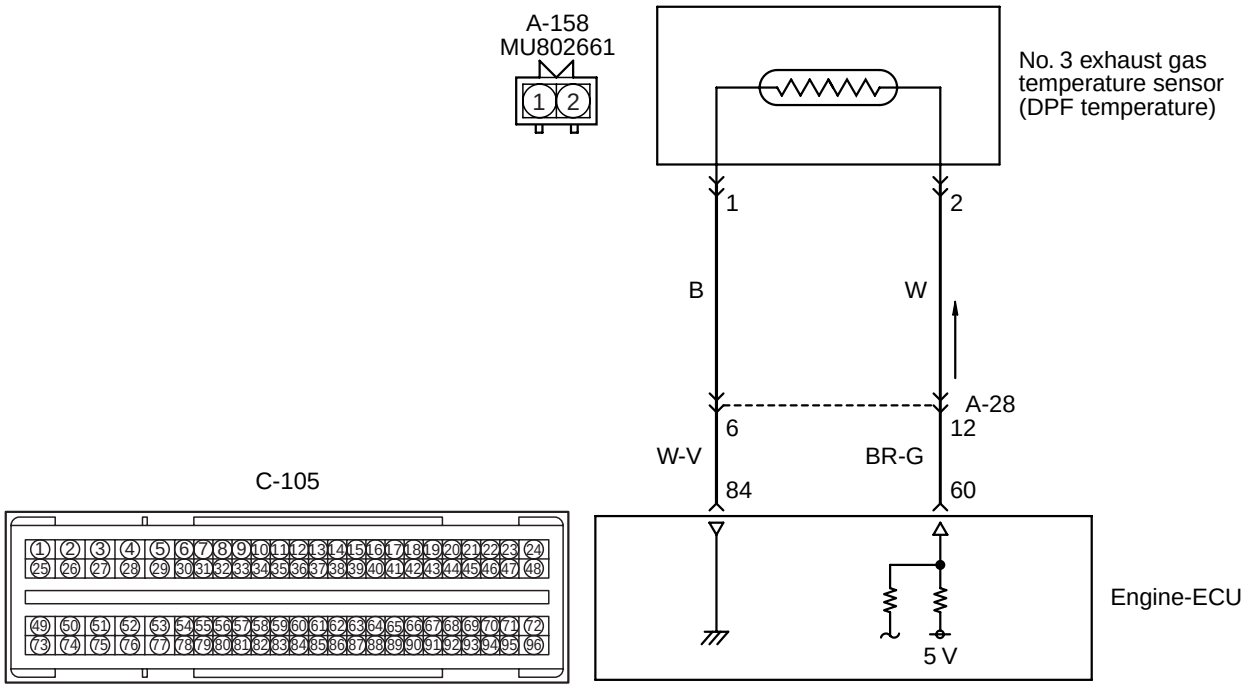
a. Item 119: No. 3 exhaust gas temperature sensor (DPF temperature)

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).
NO : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, carry out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

Code No. P1428: No. 3 Exhaust Gas Temperature Sensor (DPF temperature) Circuit High Input <Euro5>

No. 3 Exhaust Gas Temperature Sensor (DPF temperature) Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V: Violet PU: Purple SI: Silver

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OPERATION
- A power voltage of 5 V is applied to the No. 3 exhaust gas temperature sensor (DPF temperature) output terminal (terminal No. 2) from the engine-ECU (terminal No. 60).
- The power voltage is earthed to the engine-ECU (terminal No. 84) from the No. 3 exhaust gas temperature sensor (DPF temperature) (terminal No. 1).

FUNCTION
- The No. 3 exhaust gas temperature sensor (DPF temperature) converts the DPF temperature into a voltage and inputs the voltage signal to the engine-ECU.
- Engine-ECU uses this voltage for DPF regeneration control.

PROBABLE CAUSES
- Failed No. 3 exhaust gas temperature sensor
- The No. 3 exhaust gas temperature sensor (DPF temperature) is a kind of resistor, which has characteristics to reduce its resistance as the DPF temperature rises. Therefore, the sensor output voltage varies with the DPF temperature, and becomes lower as the DPF temperature rises.

TROUBLE JUDGMENT

Check Conditions
- Battery positive voltage is 8 – 16 V.
- 2 seconds later after the ignition switch has been in "ON" position or the engine has started up.
- Vehicle speed is 20 km/h or higher.

Judgment Criterion
- The No. 3 exhaust gas temperature sensor (DPF temperature) output voltage is 4.95 V or more.

(DPF temperature)

- Open circuit or harness damage in No. 3 exhaust gas temperature sensor (DPF temperature) circuit or loose connector contact
- Failed engine-ECU

DIAGNOSTIC PROCEDURE

STEP 1. M.U.T.-III data list

- Refer to Data List Reference Table P.13A-542

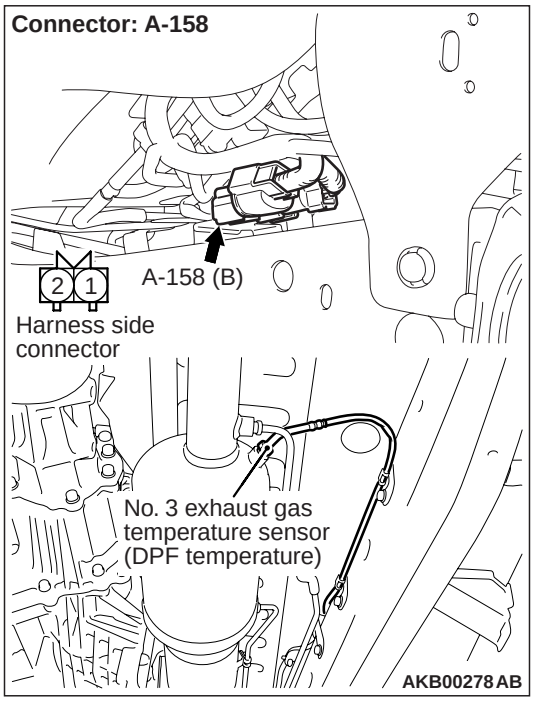
a. Item 119: No. 3 exhaust gas temperature sensor (DPF temperature)

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

NO : Go to Step 2 .

STEP 2. Connector check: A-158 No. 3 exhaust gas temperature sensor (DPF temperature) connector



Q: Is the check result normal?

YES : Go to Step 3 .

NO : Repair or replace the connector.

STEP 3. Check No. 3 exhaust gas temperature sensor (DPF temperature) itself.

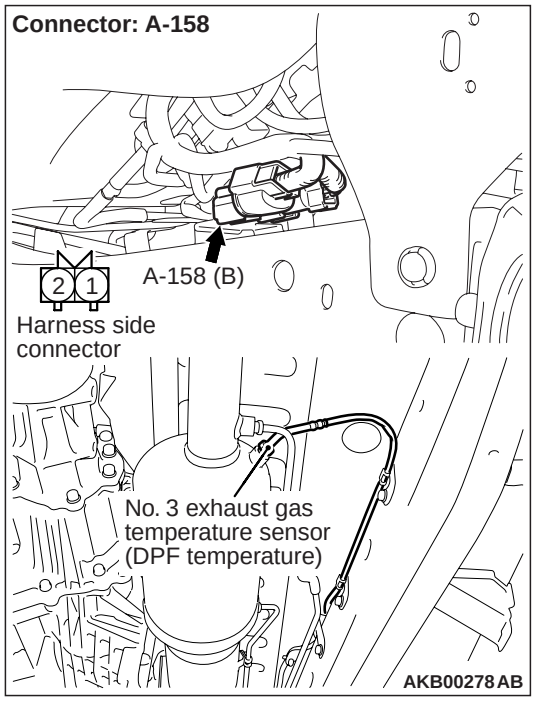
- Check No. 3 exhaust gas temperature sensor (DPF temperature) itself (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – No. 3 exhaust gas temperature sensor (DPF temperature) Check).

Q: Is the check result normal?

YES : Go to Step 4 .

NO : Replace the No. 3 exhaust gas temperature sensor (DPF temperature). After replacing the No. 3 exhaust gas temperature sensor (DPF temperature), carry out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

STEP 4. Perform voltage measurement at A-158 No. 3 exhaust gas temperature sensor (DPF temperature) connector.



- Disconnect connector, and measure at harness side.
- Ignition switch: ON
- Voltage between terminal No. 2 and earth.

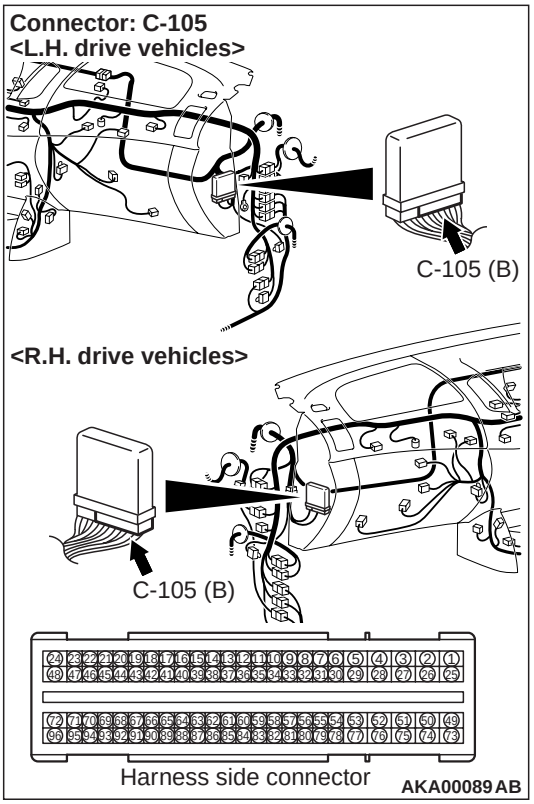
OK: 4.5 – 4.9 V

Q: Is the check result normal?

YES : Go to Step 8 .

NO : Go to Step 5 .

STEP 5. Connector check: C-105 engine-ECU connector.

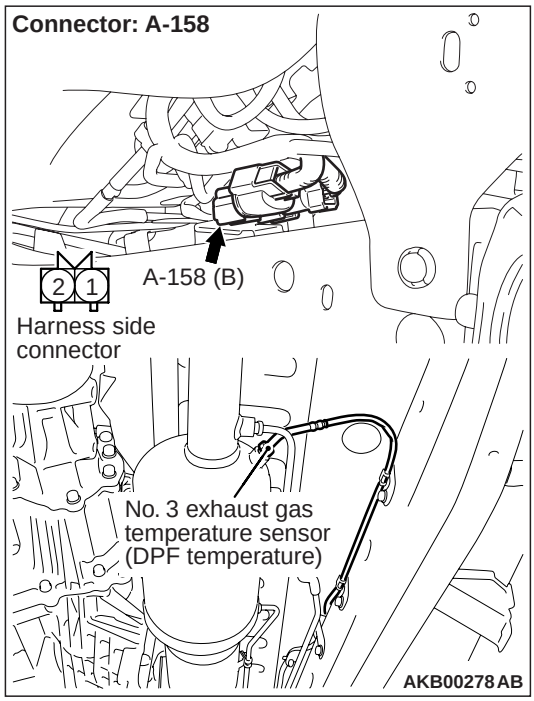


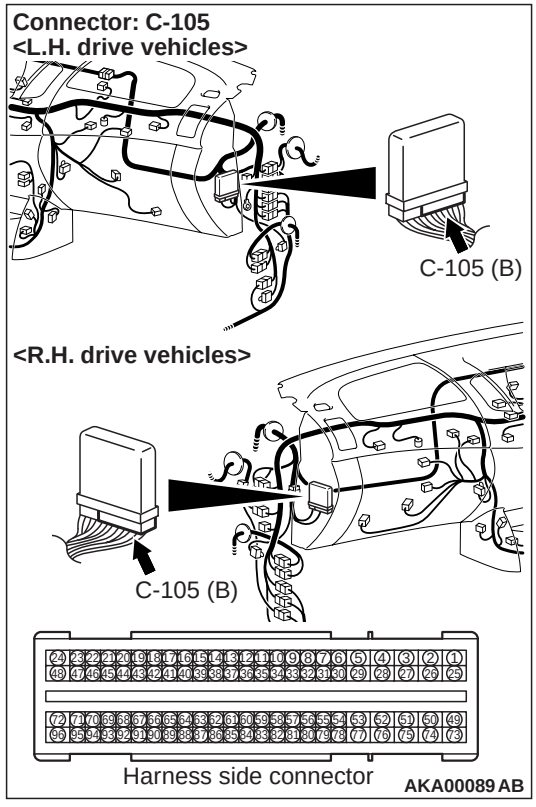
Q: Is the check result normal?

YES : Go to Step 6 .

NO : Repair or replace the connector.

STEP 6. Check harness between A-158 (terminal No. 2) No. 3 exhaust gas temperature sensor (DPF temperature) connector and C-105 (terminal No. 60) engine-ECU connector.





NOTE: Before checking harness, check intermediate connector A-28, and repair if necessary.

- Check output line for open circuit.

Q: Is the check result normal?

YES : Go to Step 7 .
NO : Repair the damaged harness wire.

STEP 7. M.U.T.-III data list

- Refer to Data List Reference Table P.13A-542

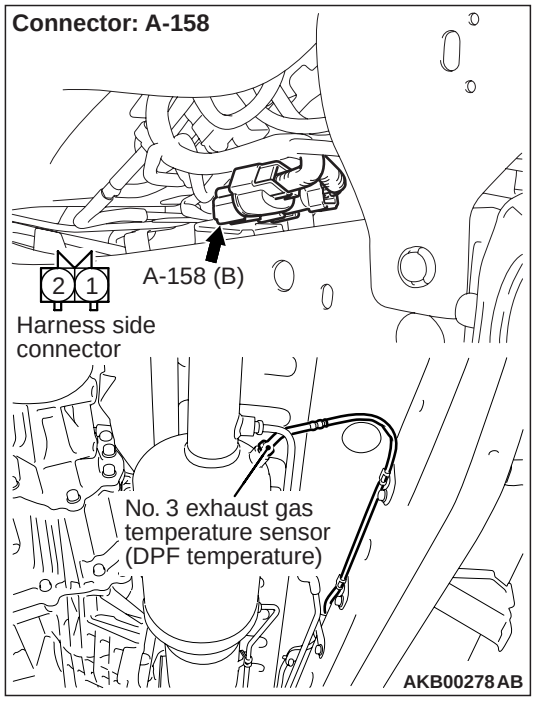
a. Item 119: No. 3 exhaust gas temperature sensor (DPF temperature)

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

NO : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, carry out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

STEP 8. Perform resistance measurement at A-158 No. 3 exhaust gas temperature sensor (DPF temperature) connector.



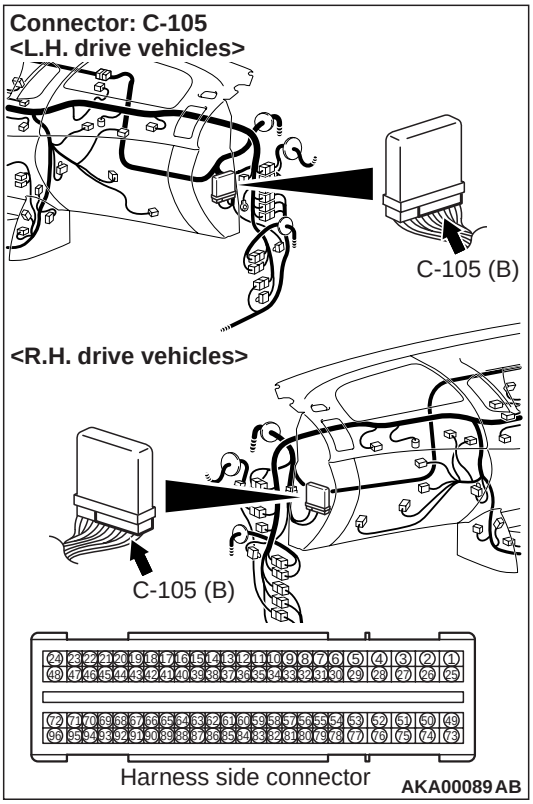
- Disconnect connector, and measure at harness side.
- Resistance between terminal No. 1 and earth.

OK: Continuity (2 Ω or less)

Q: Is the check result normal?

YES : Go to Step 11 .
NO : Go to Step 9 .

STEP 9. Connector check: C-105 engine-ECU connector

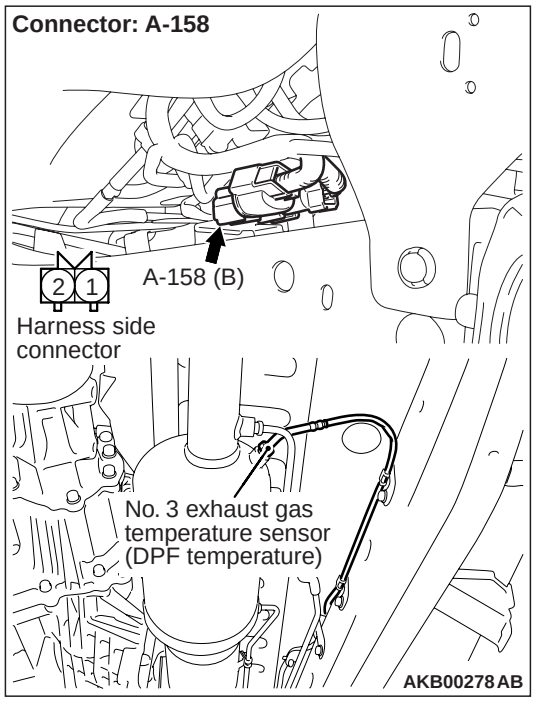


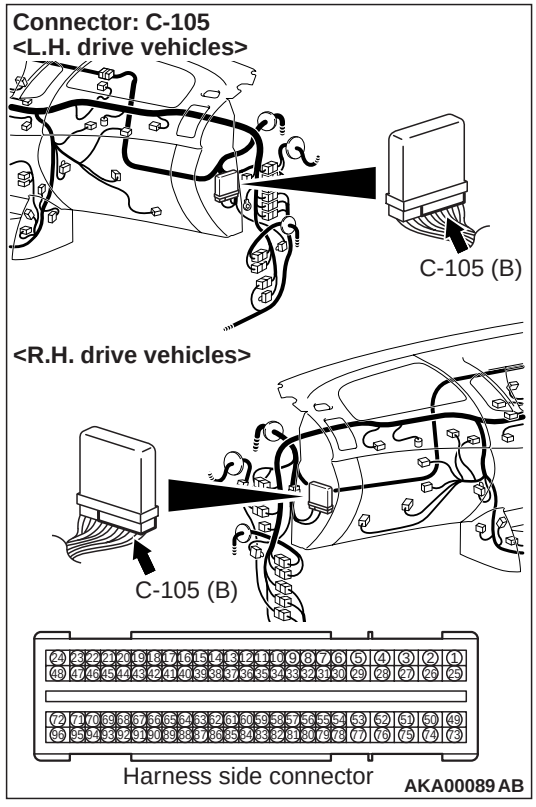
Q: Is the check result normal?

YES : Go to Step 10 .

NO : Repair or replace the connector.

STEP 10. Check harness between A-158 (terminal No. 1) No. 3 exhaust gas temperature sensor (DPF temperature) connector and C-105 (terminal No. 84) engine-ECU connector.





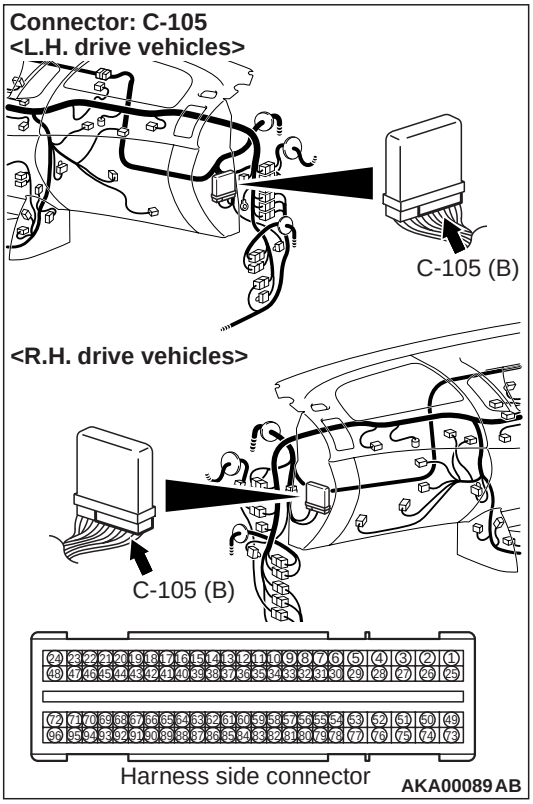
NOTE: Before checking harness, check intermediate connector A-28, and repair if necessary.

- Check earthing line for open circuit and damage.

Q: Is the check result normal?

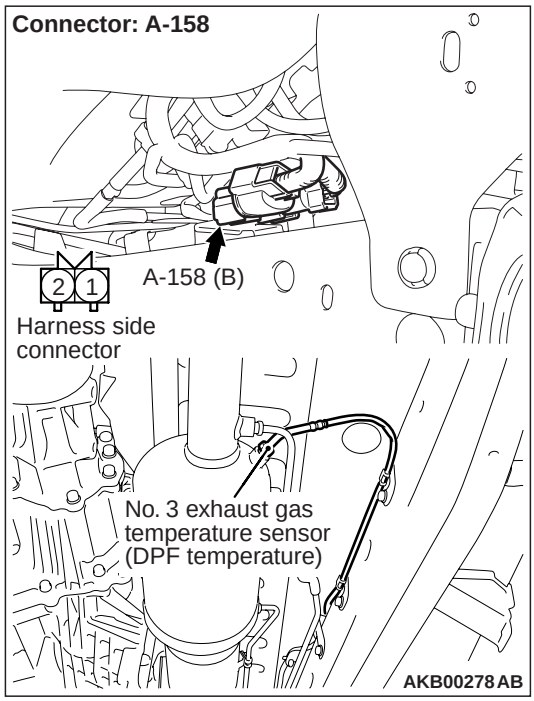
YES : Go to Step 7 .
NO : Repair the damaged harness wire.

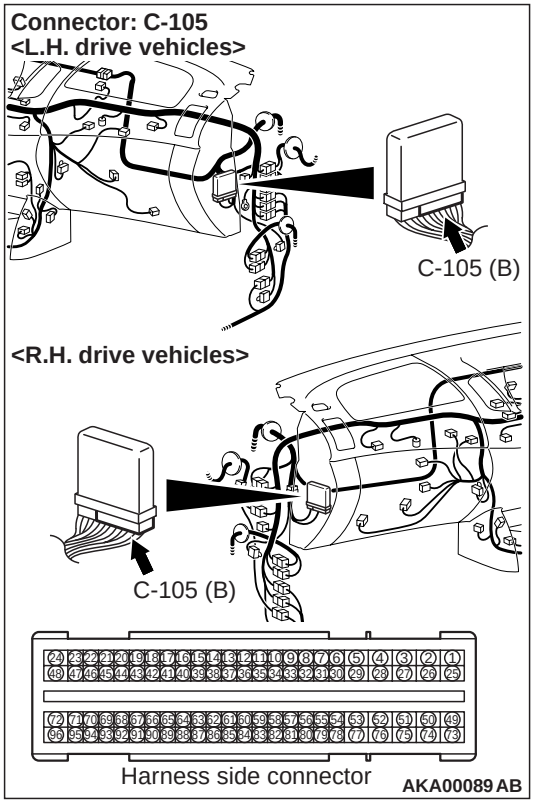
STEP 11. Connector check: C-105 engine-ECU connector.



Q: Is the check result normal?
YES : Go to Step 12 .
NO : Repair or replace the connector.

STEP 12. Check harness between A-158 (terminal No. 2) No. 3 exhaust gas temperature sensor (DPF temperature) connector and C-105 (terminal No. 60) engine-ECU connector.





NOTE: Before checking harness, check intermediate connector A-28, and repair if necessary.
- Check output line for damage.

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair the damaged harness wire.

Code No. P1497: DPF System Malfunction <Euro5>

FUNCTION
- The engine-ECU monitors the input signals from sensors to check if the DPF regeneration is executed normally.

TROUBLE JUDGMENT

Check Condition
- On DPF regeneration

Judgement Criterion
- The DPF regeneration status continues for 30 minutes or more.

Check Condition
- Ignition switch is in "ON" position

Judgement Criterion
- The regeneration with short interval continues for specified times.

PROBABLE CAUSES
- Failed No. 2 exhaust gas temperature sensor (catalyst temperature)
- Failed No. 3 exhaust gas temperature sensor (DPF temperature)
- Failed exhaust differential pressure sensor
- Failed exhaust differential pressure sensor ambient air temperature sensor
- Catalytic converter inactive
- The engine oil-containing ash is loaded to the DPF inside.

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III data list.
- Refer to Data List Reference Table P.13A-542.
  a. Item 118: No. 2 exhaust gas temperature sensor (catalyst temperature)
  b. Item 119: No. 3 exhaust gas temperature sensor (DPF temperature)
  c. Item 120: Exhaust differential pressure sensor

Q: Are the check results normal?
YES : Go to Step 2 .
NO : Perform the diagnosis code classified check procedure for the sensor that has shown an abnormal data value (Refer to Inspection Chart for Diagnosis Code P.13A-21).

STEP 2. M.U.T.-III data list.
- Item 208: Short interval DPF regeneration count

  OK: 10 or more

Q: Is the short interval DPF regeneration counting 10 or more?
YES : Go to Step 4 .
NO : Go to Step 3 .

STEP 3. Forcible DPF regeneration execution
- Initialise the DPF-related parts, and then delete the diagnosis code (Refer to GROUP 00 – Precautions before Service – Initialisation Procedure for Learning Value in Diesel Particulate Filter (DPF) System).
  a. Item 42: DPF system malfunction service
- Carry out the forcible DPF regeneration (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

Q: Is the diagnosis code P0420 or P1497 set?
YES : Replace the catalytic converter. When the catalytic converter is replaced, initialise the learning value (Refer to GROUP 00 – Precautions before Service – Initialisation Procedure for Learning Value in Diesel Particulate Filter (DPF) System). On completion, carry out the forcible DPF regeneration (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).
NO : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, carry out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

STEP 4. Forcible DPF regeneration execution

- Initialise the DPF-related parts, and then delete the diagnosis code (Refer to GROUP 00 – Precautions before Service – Initialisation Procedure for Learning Value in Diesel Particulate Filter (DPF) System).
  a. Item 42: DPF system malfunction service
- Carry out the forcible DPF regeneration 2 times (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

NOTE: Carry out the DPF regeneration 2 times because the assumption of the accumulated amount of the DPF is not stable.

- M.U.T.-III data list
  a. Item 156: Soot loading by differential pressure

  OK: 3 g/L or less

Q: Is the check result normal?

YES : Proceed to troubleshooting for black smoke (Refer to Inspection Procedure 13 P.13A-479).

NO : Replace the DPF. When the DPF is replaced, initialise the learning value (Refer to GROUP 00 – Precautions Before Service – Initialisation Procedure For Learning Value in Diesel Particulate Filter (DPF) System).

Code No. P1498: Excessive PM Accumulated in DPF <Euro5>

FUNCTION

- The engine-ECU monitors the input signals from sensors to estimate the PM amount loaded to the DPF inside.
- If the PM is loaded more than the specified amount, the DPF regeneration is automatically executed under certain conditions in order to eliminate the PM.
- If the PM is excessively loaded, the engine-ECU does not execute the automatic DPF regeneration. It makes the engine warning lamp illuminate and the DPF lamp blink.

TROUBLE JUDGMENT

Check Condition

- Ignition switch is in "ON" position.

Judgement Criterion

- Driving distance exceeds the specified value after the last DPF regeneration.

PROBABLE CAUSE

- The PM is abnormally loaded to the DPF inside.

DIAGNOSIS PROCEDURE

STEP 1. Forcible DPF regeneration execution

- Carry out the forcible DPF regeneration (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

Q: Is the diagnosis code output?

YES : Inspection chart for diagnosis code (Refer to P.13A-21).

NO : Check end.

Code No. P1499: Abnormally high DPF temperature <Euro5>

FUNCTION

- The DPF may be have melting damage if the temperature exceeds the specified value.
- The engine-ECU monitors the signals from No. 3 exhaust gas temperature sensor (DPF temperature) to check if the DPF is under the specified temperature.

TROUBLE JUDGMENT

Check Condition

- On DPF regeneration

Judgement Criterion

- The No. 3 exhaust gas temperature sensor (DPF temperature) detects the abnormally high temperature.

or

- The estimated DPF centre temperature exceeds the specified value.

PROBABLE CAUSE

- Damage by the DPF with high temperature

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III data list.

- Refer to Data List Reference Table P.13A-542.
  a. Item 119: No. 3 exhaust gas temperature sensor (DPF temperature)

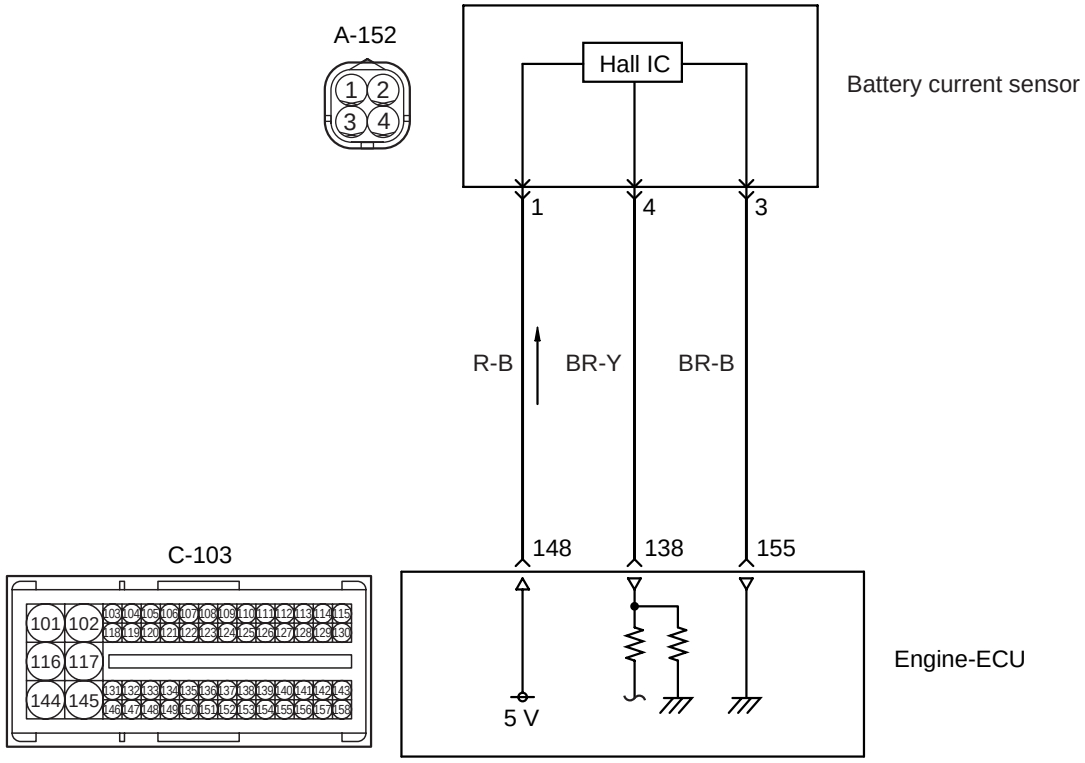
Q: Is the check result normal?

YES : Replace the DPF. When the DPF is replaced, initialise the learning value (Refer to GROUP 00 – Precautions Before Service – Initialisation Procedure For Learning Value in Diesel Particulate Filter (DPF) System).

NO : Perform the diagnosis code classified check procedure for the sensor that has shown an abnormal data value (Refer to Inspection Chart for Diagnosis Code P.13A-21).

Code No. P1608: Battery Current Sensor System <Euro5>

Battery Current Sensor Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V: Violet PU: Purple SI: Silver

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OPERATION

- A power voltage of 5 V is supplied to the battery current sensor (terminal No. 1) from the engine-ECU (terminal No. 148) and is earthed to the engine-ECU (terminal No. 155) from the battery current sensor (terminal No. 3).
- The battery current sensor (terminal No. 4) outputs a sensor signal, which is input into the engine-ECU (terminal No. 138).

FUNCTION

- The battery current sensor detects a battery current and inputs a signal into the engine-ECU.
- In response to the signal, the engine-ECU controls charging and discharging.

TROUBLE JUDGMENT

Check Condition

- Ignition switch is in "ON" position.

Judgment Criterion

- The battery current sensor output voltage is 0.2 V or less.

or

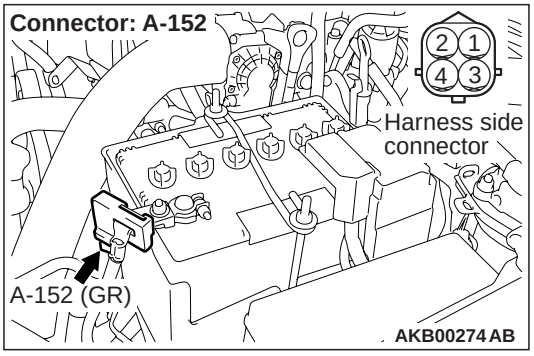
- The battery current sensor output voltage is 4.8 V or more.

PROBABLE CAUSES

- Failed battery current sensor
- Open/short circuit or harness damage in battery current sensor circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. Connector check: A-152 battery current sensor connector



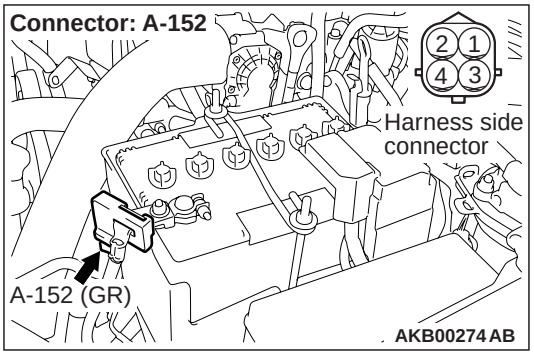
Q: Is the check result normal?
YES : Go to Step 2 .
NO : Repair or replace the connector.

STEP 2. Check battery current sensor itself.

- Check battery current sensor itself (Refer to GROUP 54A – Battery – Inspection – Battery Current Sensor Check).

Q: Is the check result normal?
YES : Go to Step 3 .
NO : Replace the battery current sensor.

STEP 3. Perform voltage measurement at A-152 battery current sensor connector.

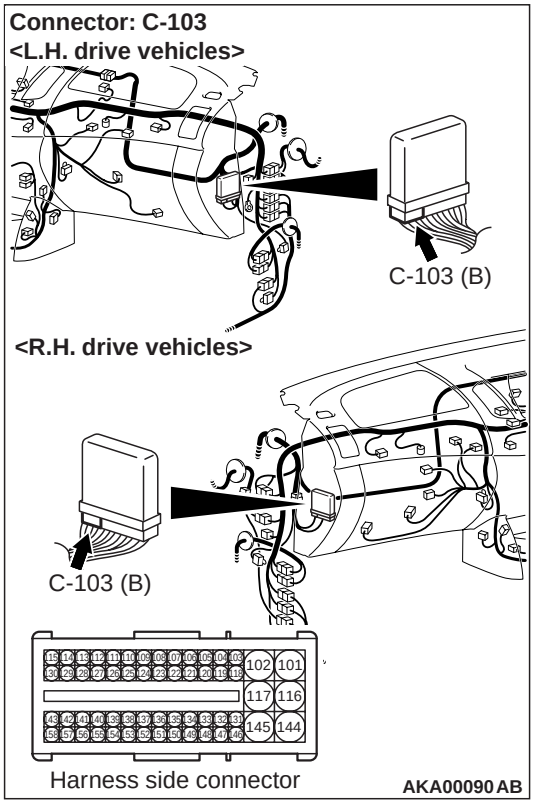


- Disconnect connector and measure at harness side.
- Ignition switch: ON
- Voltage between terminal No. 1 and earth.

OK: 4.9 – 5.1 V

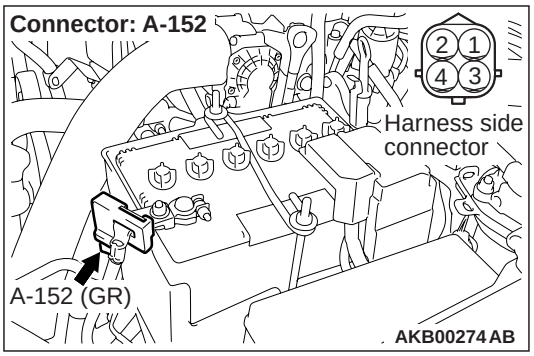
Q: Is the check result normal?
YES : Go to Step 7 .
NO : Go to Step 4 .

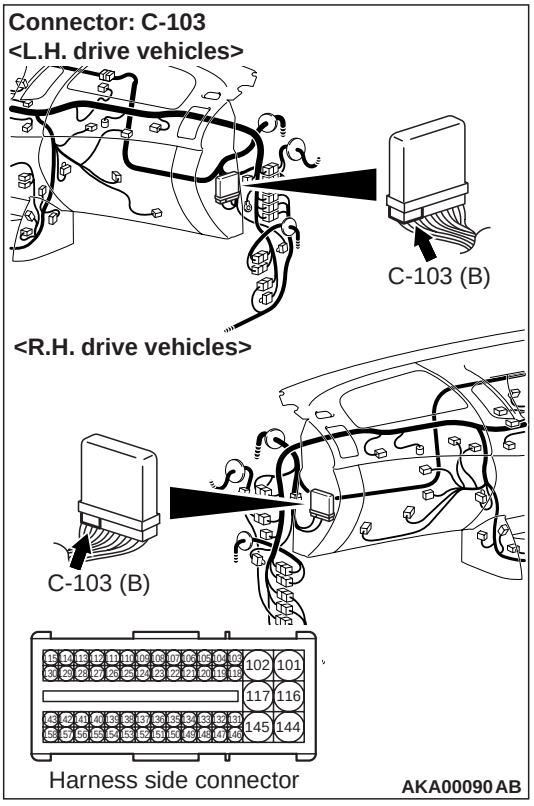
STEP 4. Connector check: C-103 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 5 .
NO : Repair or replace the connector.

STEP 5. Check harness between A-152 (terminal No. 1) battery current sensor connector and C-103 (terminal No. 148) engine-ECU connector.





- Check power supply line for open/short circuit.

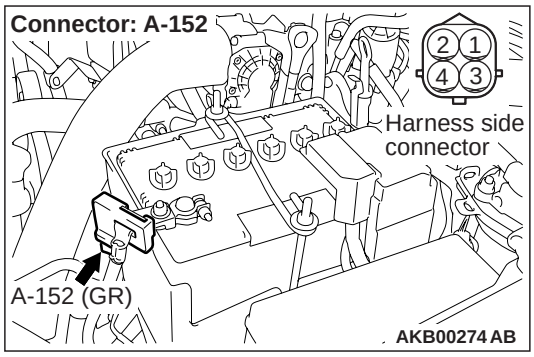
Q: Is the check result normal?
YES : Go to Step 6 .
NO : Repair the damaged harness wire.

STEP 6. M.U.T.-III diagnosis code

- Reconfirmation of diagnosis code.

Q: Is the diagnosis code set?
YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, carry out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

STEP 7. Perform resistance measurement at A-152 battery current sensor connector.

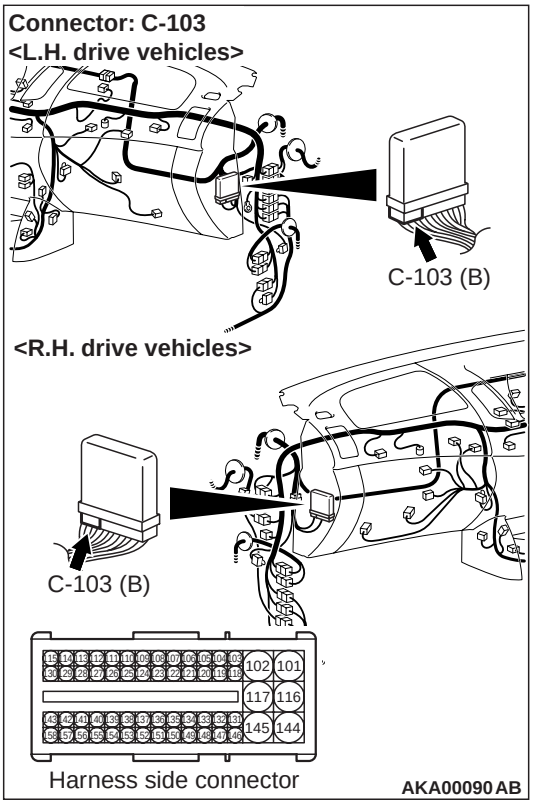


- Disconnect connector and measure at harness side.
- Resistance between terminal No. 3 and earth.

OK: Continuity (2 Ω or less)

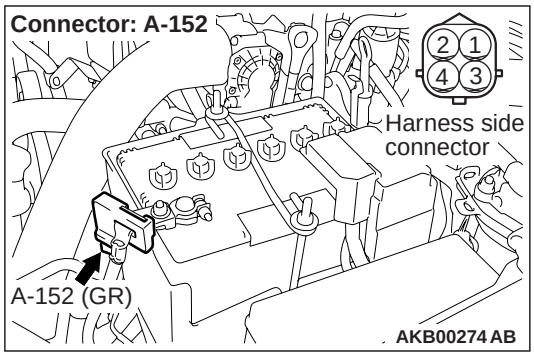
Q: Is the check result normal?
YES : Go to Step 10 .
NO : Go to Step 8 .

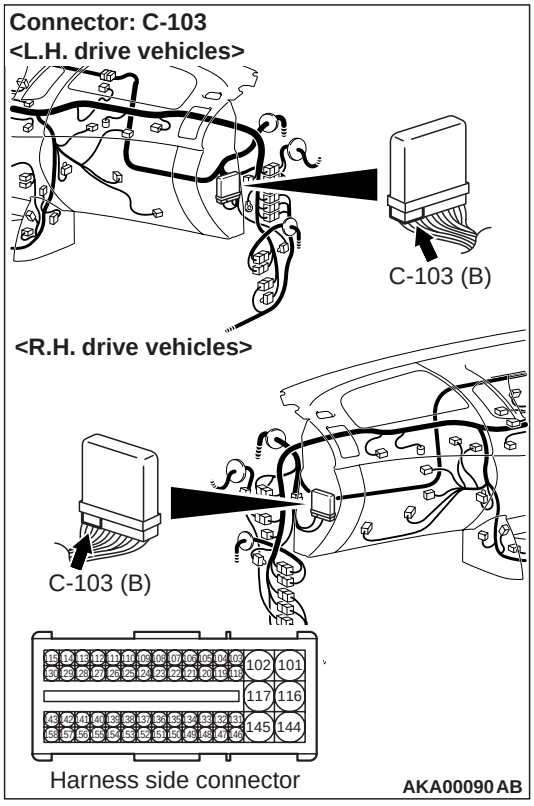
STEP 8. Connector check: C-103 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 9 .
NO : Repair or replace the connector.

STEP 9. Check harness between A-152 (terminal No. 3) battery current sensor connector and C-103 (terminal No. 155) engine-ECU connector.

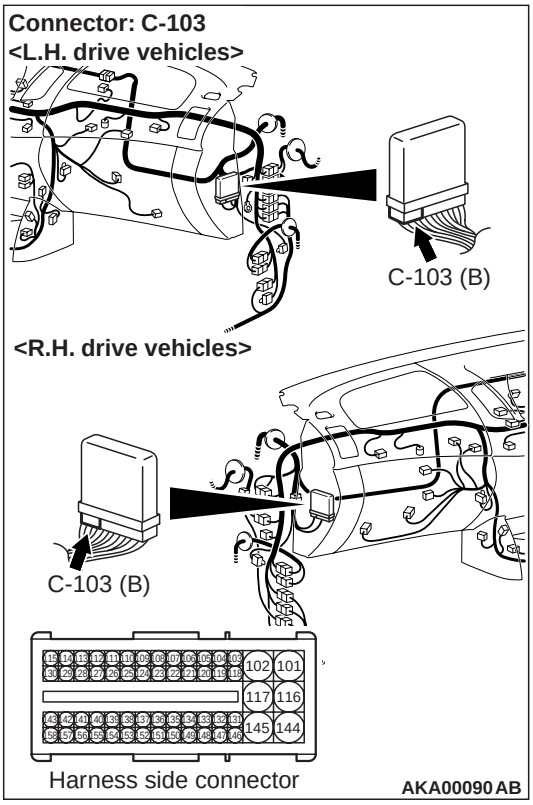




- Check earthing line for open circuit and damage.

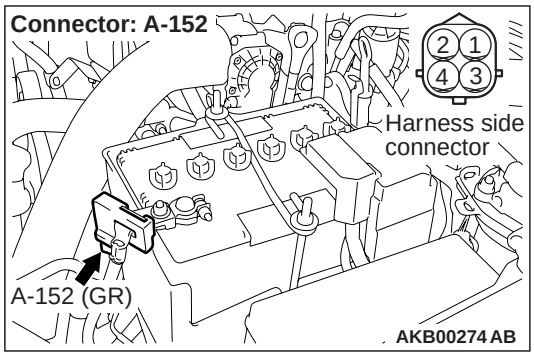
Q: Is the check result normal?
YES : Go to Step 6 .
NO : Repair the damaged harness wire.

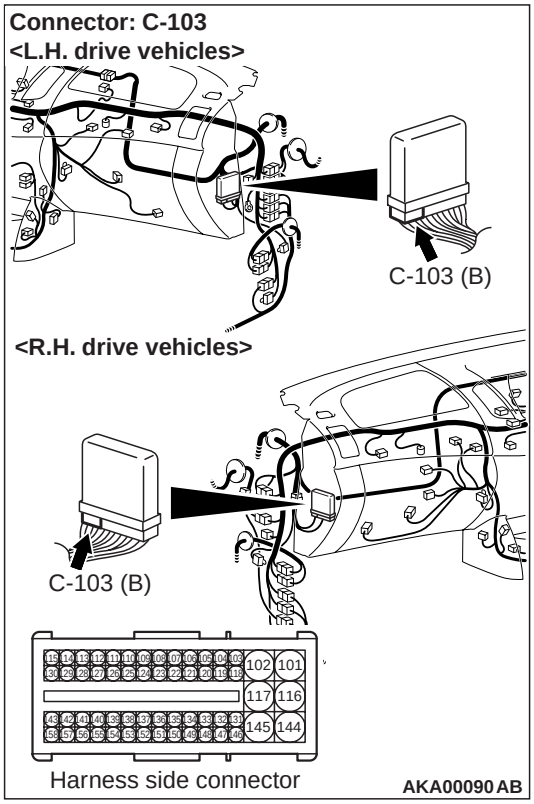
STEP 10. Connector check: C-103 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 11 .
NO : Repair or replace the connector.

STEP 11. Check harness between A-152 (terminal No. 1) battery current sensor connector and C-103 (terminal No. 148) engine-ECU connector.

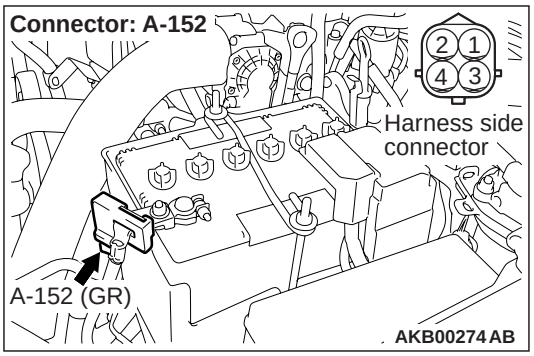


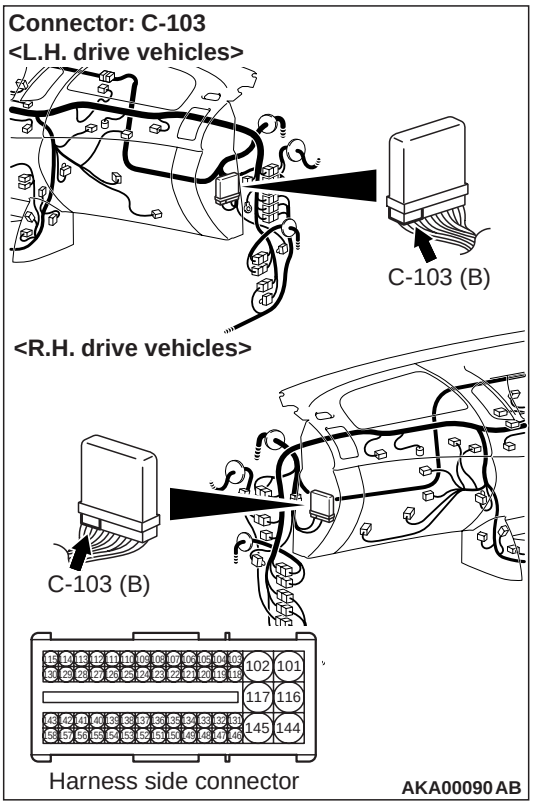


- Check power supply line for damage.

Q: Is the check result normal?
YES : Go to Step 12 .
NO : Repair the damaged harness wire.

STEP 12. Check harness between A-152 (terminal No. 4) battery current sensor connector and C-103 (terminal No. 138) engine-ECU connector.





- Check output line for open/short circuit and damage.

Q: Is the check result normal?

YES : Go to Step 6 .
NO : Repair the damaged harness wire.

Code No. P1625: Injection Quantity Compensation Value Error

FUNCTION

- Correction data of the injector built in the engine is written to the engine-ECU.
- The engine-ECU checks whether the correction data thus written is valid.

TROUBLE JUDGMENT

Check Condition

- Ignition switch is in "ON" position.

Judgment Criterion

- An error is detected during three-side majority decision check or upper/lower limit check of an injector correction value.

PROBABLE CAUSE
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. Injector identification code data check
- Check whether injector identification code data is correctly written to the engine-ECU in M.U.T.-III.

Q: Is the check result normal?
YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).
NO : Go to Step 2 .

STEP 2. Rewrite the injector identification code data again.
- Rewrite the injector identification code data (Refer to GROUP 00– Precautions Before Service – Injector Identification Code Registration Procedure).
- After rewriting the injector identification code data again, recheck for abnormal symptoms.

Q: Does trouble symptom persist?
YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).
NO : The check is end.

Code No. P1626: Injection Quantity Compensation Value Not Coding

FUNCTION
- The engine-ECU checks whether injector correction data is written to the engine-ECU.

TROUBLE JUDGMENT

Check Condition
- Ignition switch is in "ON" position.

Judgment Criterion
- No record of writing injector correction data

PROBABLE CAUSE
- Failed engine-ECU

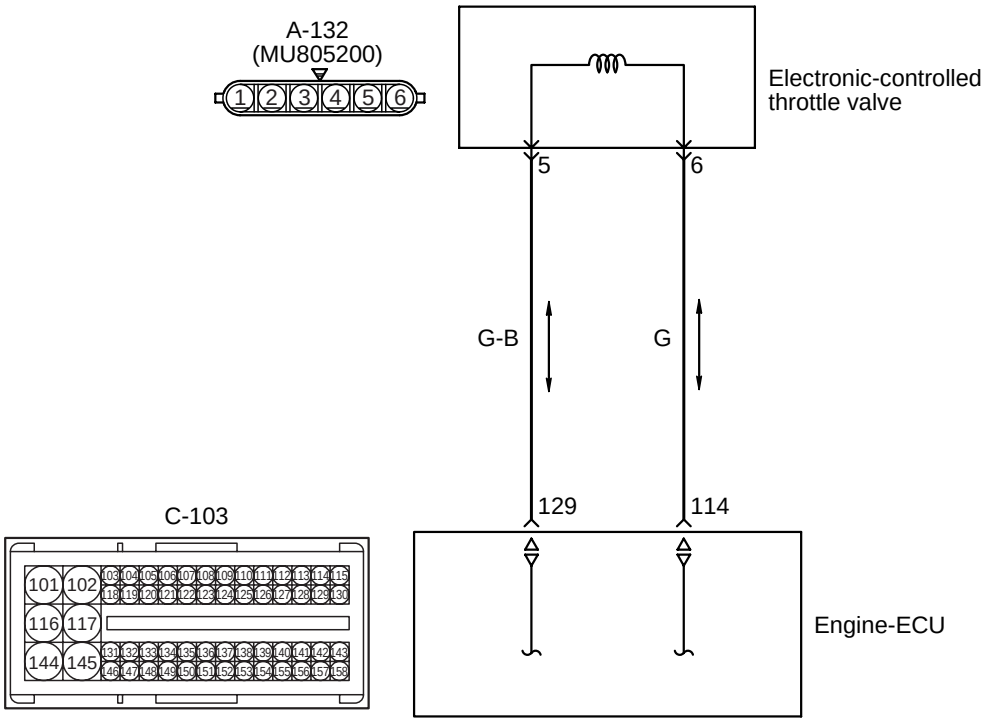
DIAGNOSIS PROCEDURE

STEP 1. Write the injector identification code data.
- Write the injector identification code data (Refer to GROUP 00 – Precautions Before Service – Injector Identification Code Registration Procedure).
- After writing the injector identification code data, recheck for abnormal symptoms.

Q: Does trouble symptom persist?
YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).
NO : The check is end.

Code No. P2118: Throttle Valve Control (DC Motor) Current Malfunction

Throttle valve control servo circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Gray
R: Red P: Pink V: Violet PU: Purple SI: Silver

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OPERATION

- Current supplied from the engine-ECU (terminal No. 129 and No. 114) to the throttle valve control servo (terminal No. 5 and No. 6) is adjusted.

FUNCTION

- The throttle valve control servo drive IC in the engine-ECU monitors current flowing in the throttle control servo and cuts energization if it detects overcurrent.

TROUBLE JUDGMENT

Check Condition

- Ignition switch is in "ON" position.

Judgment Criterion

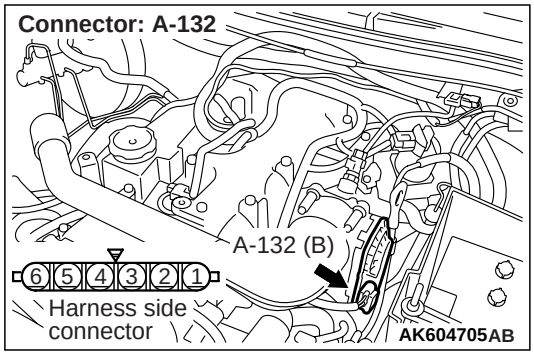
- An overcurrent cut-off signal from the throttle valve control servo drive integrated circuit (IC) is repeatedly detected for 0.5 second.

PROBABLE CAUSES

- Failed throttle control servo
- Short circuit in throttle valve control servo circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. Connector check: A-132 electronic-controlled throttle valve connector.



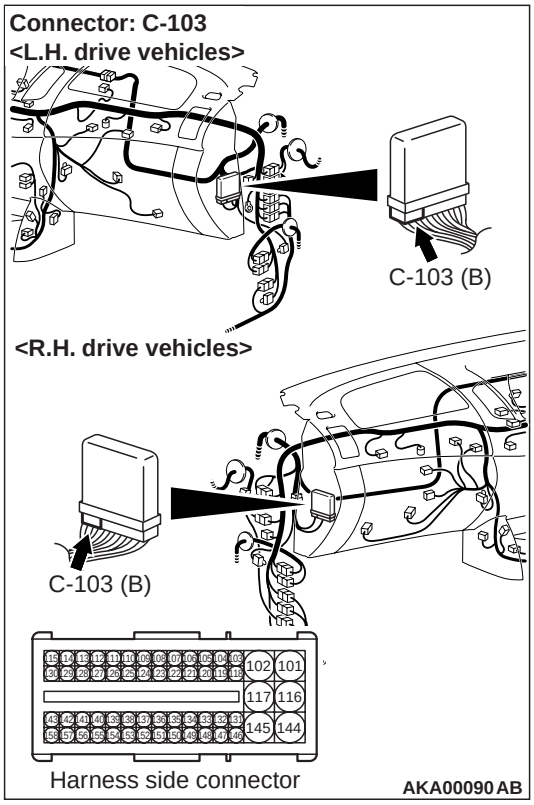
Q: Is the check result normal?
YES : Go to Step 2 .
NO : Repair or replace the connector.

STEP 2. Check throttle valve control servo itself

- Check throttle valve control servo itself (Refer to P.13A-596).

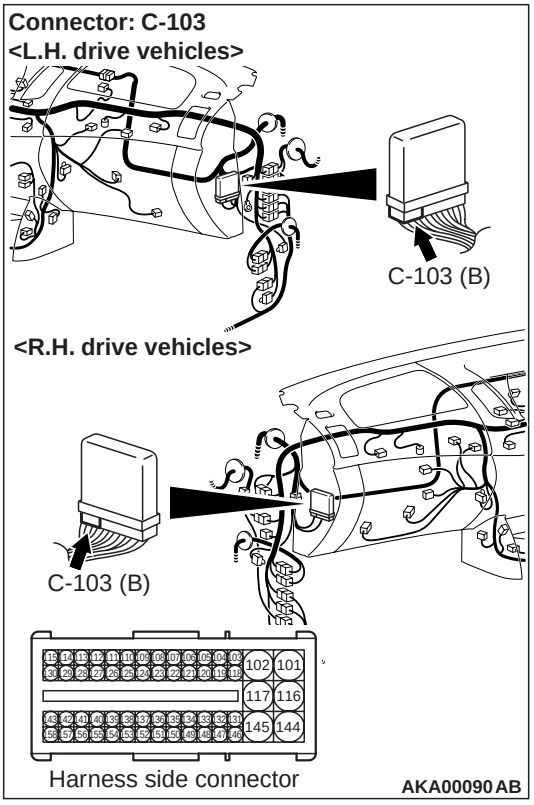
Q: Is the check result normal?
YES : Go to Step 3 .
NO : Replace the throttle body assembly.

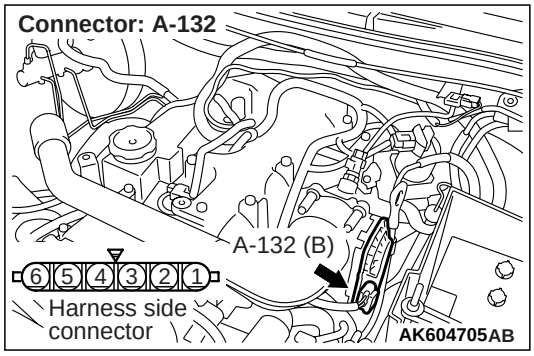
STEP 3. Connector check: C-103 engine-ECU connector.



Q: Is the check result normal?
YES : Go to Step 4 .
NO : Repair or replace the connector.

STEP 4. Check harness between C-103 (terminal No. 114) engine-ECU connector and A-132 (terminal No. 6) electronic-controlled throttle valve connector.

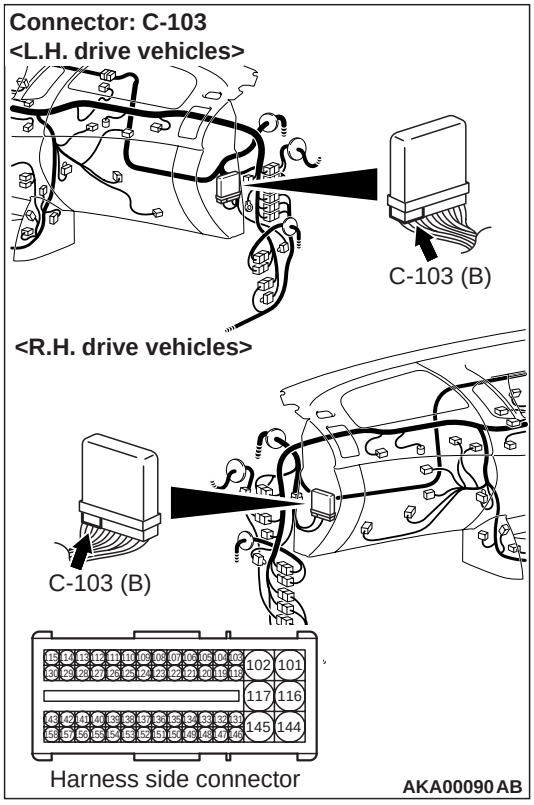


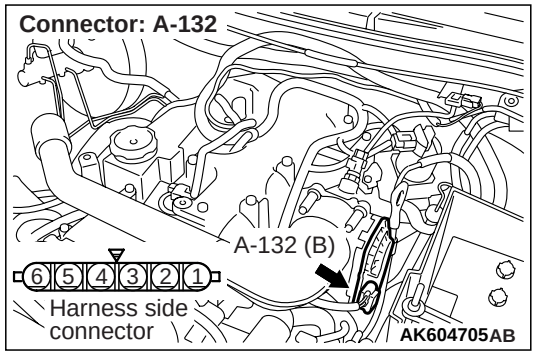


- Check output line for short circuit.

Q: Is the check result normal?
YES : Go to Step 5 .
NO : Repair the damaged harness wire.

STEP 5. Check harness between C-103 (terminal No. 129) engine-ECU connector and A-132 (terminal No. 5) electronic-controlled throttle valve connector.





- Check output line for short circuit.

Q: Is the check result normal?
YES : Go to Step 6 .
NO : Repair the damaged harness wire.

STEP 6. M.U.T.-III diagnosis code.

- After clearing the diagnosis code through M.U.T.-III, start the engine and confirm whether the diagnosis code is output.

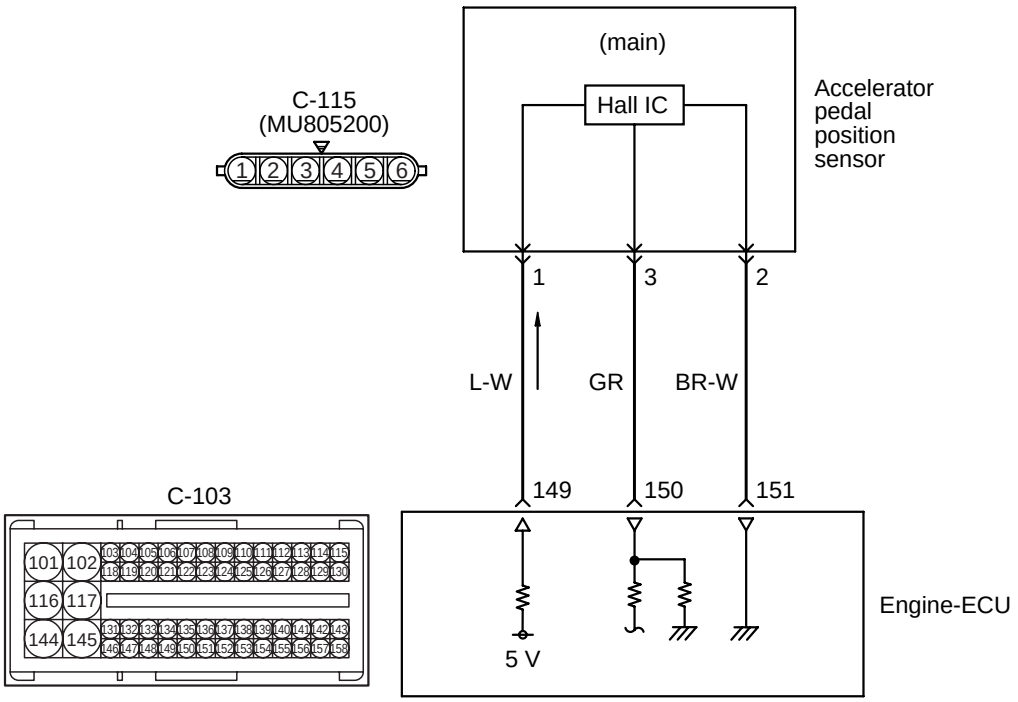
Q: Is the diagnosis code set?

YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

Code No. P2122: Accelerator Pedal Position Sensor (main) Circuit Low Input

Accelerator Pedal Position Sensor (main) Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Gray
R: Red P: Pink V: Violet PU: Purple SI: Silver

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OPERATION

- A power voltage of 5 V is applied to the accelerator pedal position sensor (terminal No. 1) from the engine-ECU (terminal No. 149).
- The power voltage is earthed to the engine-ECU (terminal No. 151) from the accelerator pedal position sensor (terminal No. 2).
- The sensor signal is inputted to the engine-ECU (terminal No. 150) from the accelerator pedal position sensor output terminal (terminal No. 3).

FUNCTION

- The accelerator pedal position sensor (main) outputs voltage which corresponds to the accelerator pedal depression.
- The engine-ECU checks whether the voltage is within a specified range.

TROUBLE JUDGMENT

Check Conditions

- Ignition switch is in "ON" position
- Accelerator pedal position sensor (sub) is normal

Judgment Criterion

- Accelerator pedal position sensor (main) output voltage is lower than 0.2 V for 0.3 seconds.

PROBABLE CAUSES

- Failed accelerator pedal position sensor
- Open/short circuit or harness damage in accelerator pedal position sensor circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III data list

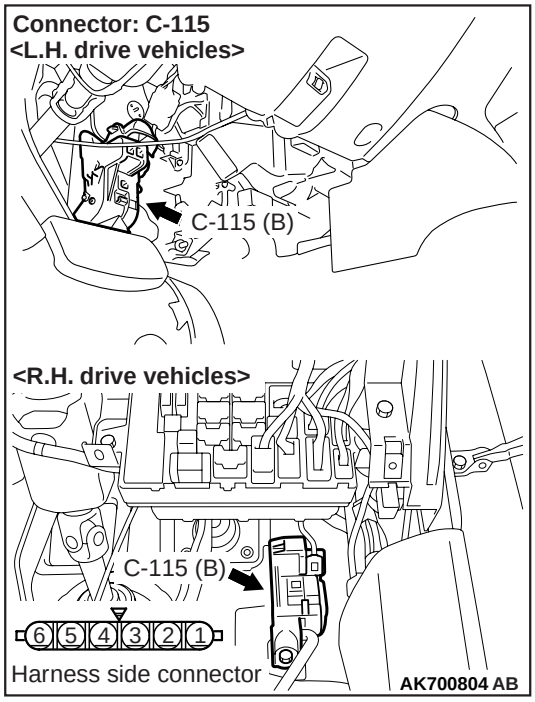
- Refer to Data List Reference Table P.13A-542.
  a. Item 9: Accelerator pedal position sensor (main)

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

NO : Go to Step 2 .

STEP 2. Connector check: C-115 accelerator pedal position sensor connector

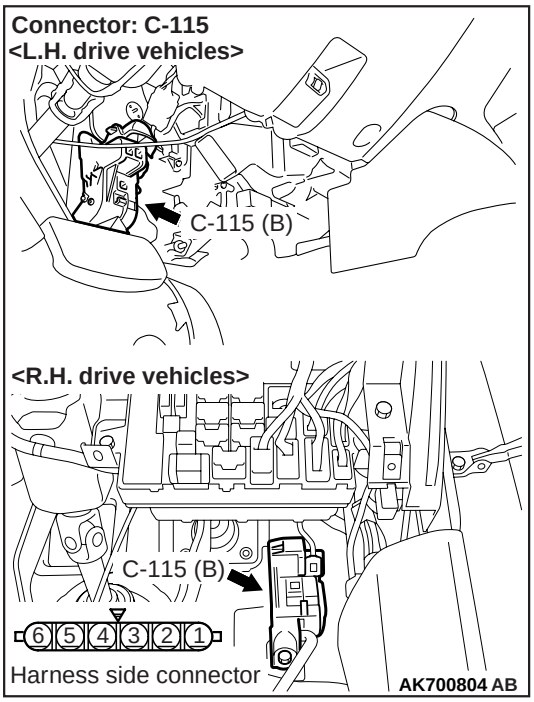


Q: Is the check result normal?

YES : Go to Step 3 .

NO : Repair or replace the connector.

STEP 3. Perform voltage measurement at C-115 accelerator pedal position sensor connector.



- Disconnect connector, and measure at harness side.
- Ignition switch: ON
- Voltage between terminal No. 1 and earth.

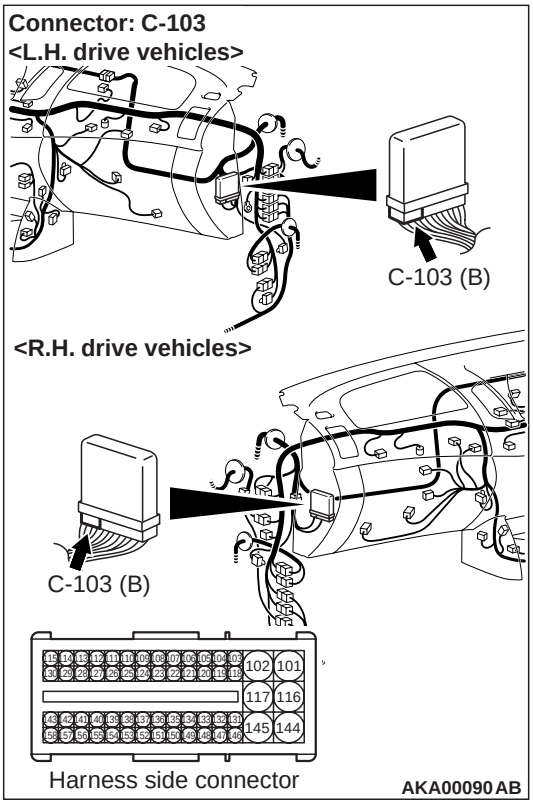
  OK: 4.9 – 5.1 V

Q: Is the check result normal?

YES : Go to Step 7 .

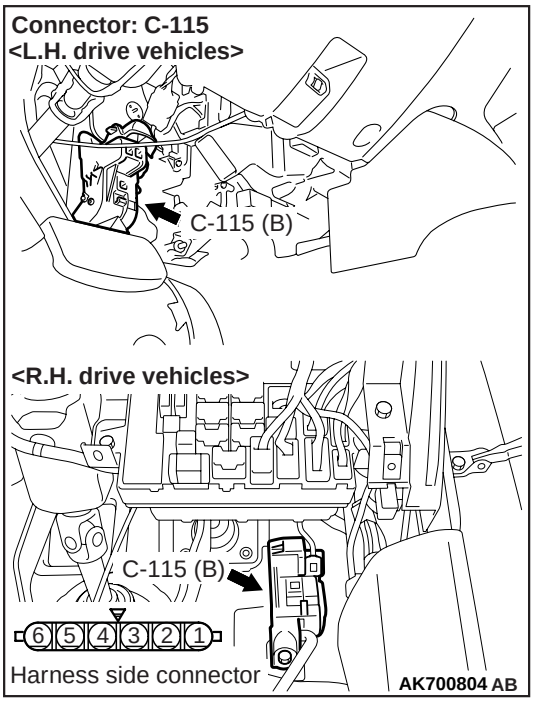
NO : Go to Step 4 .

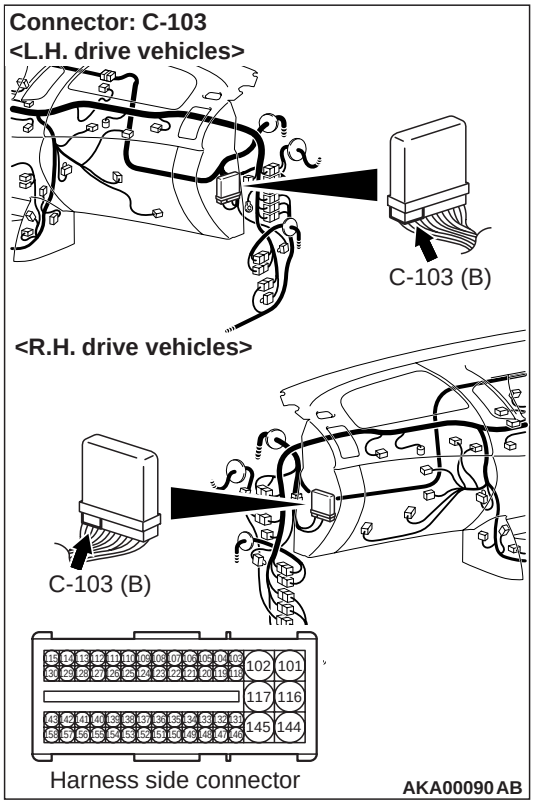
STEP 4. Connector check: C-103 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 5 .
NO : Repair or replace the connector.

STEP 5. Check harness between C-115 (terminal No. 1) accelerator pedal position sensor connector and C-103 (terminal No. 149) engine-ECU connector.





- Check power supply line for open/short circuit.

Q: Is the check result normal?
YES : Go to Step 6 .
NO : Repair the damaged harness wire.

STEP 6. M.U.T.-III data list

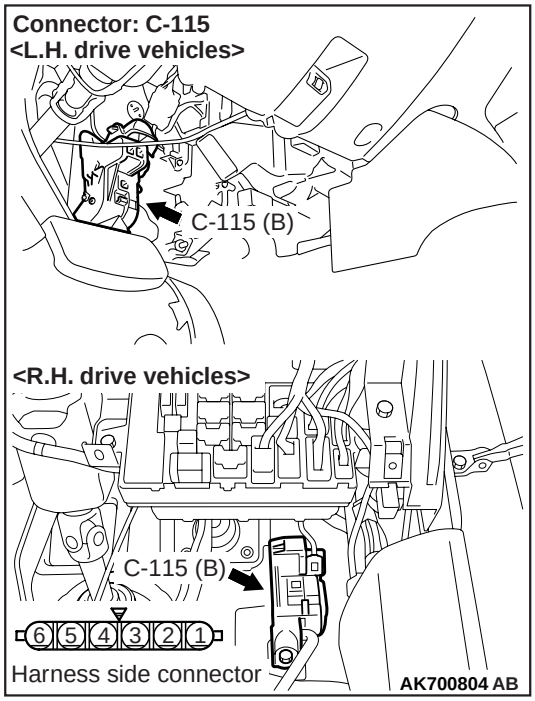
- Refer to Data List Reference Table P.13A-542.
  a. Item 9: Accelerator pedal position sensor (main)

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

NO : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

STEP 7. Perform resistance measurement at C-115 accelerator pedal position sensor connector.



- Disconnect connector, and measure at harness side.
- Resistance between terminal No. 2 and earth.

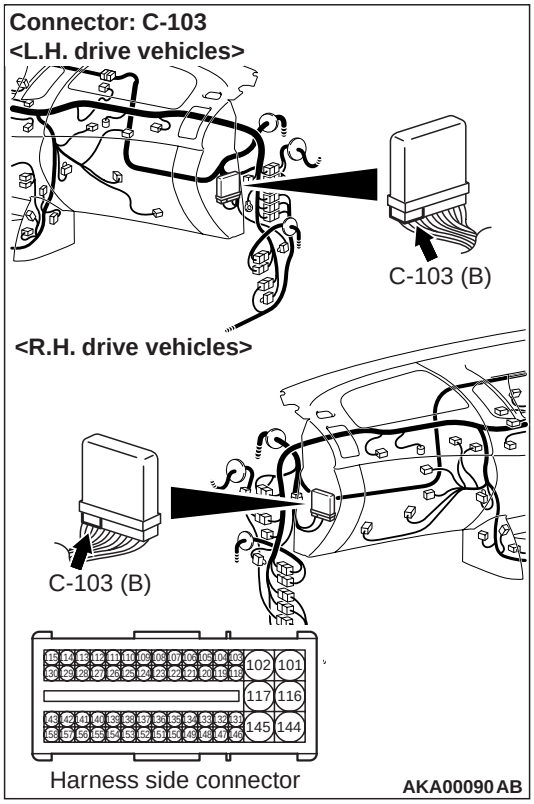
OK: Continuity (2 Ω or less)

Q: Is the check result normal?

YES : Go to Step 10 .

NO : Go to Step 8 .

STEP 8. Connector check: C-103 engine-ECU connector

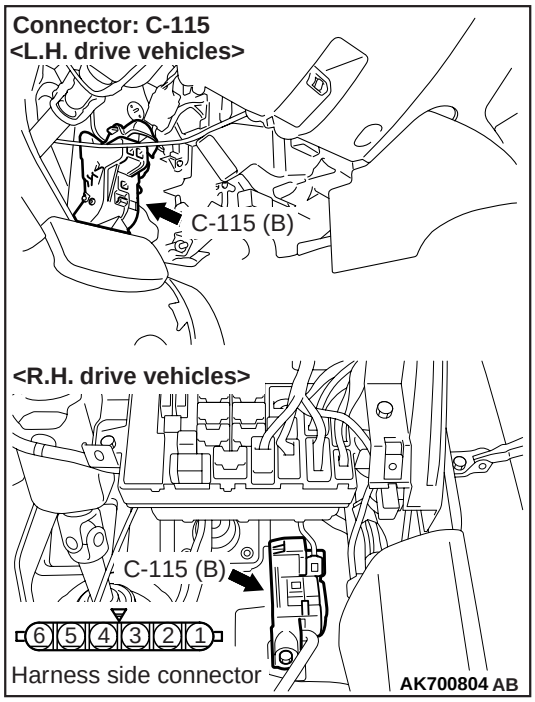


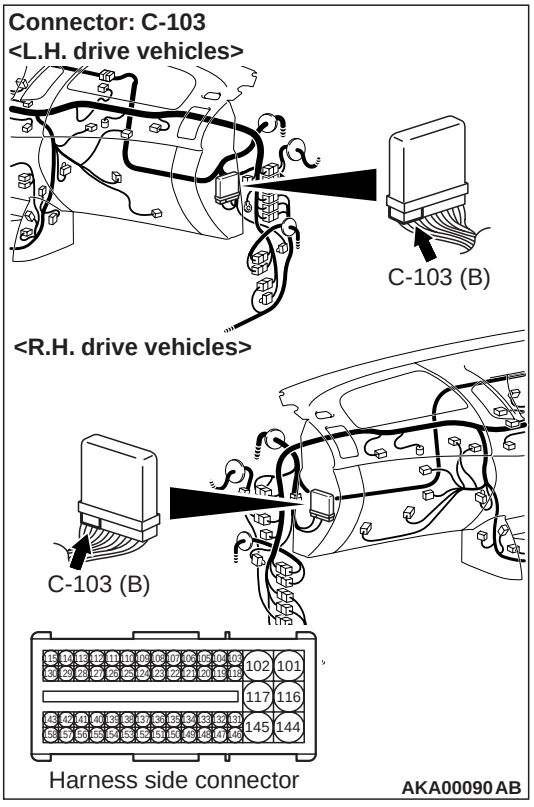
Q: Is the check result normal?

YES : Go to Step 9 .

NO : Repair or replace the connector.

STEP 9. Check harness between C-115 (terminal No. 2) accelerator pedal position sensor connector and C-103 (terminal No. 151) engine-ECU connector.



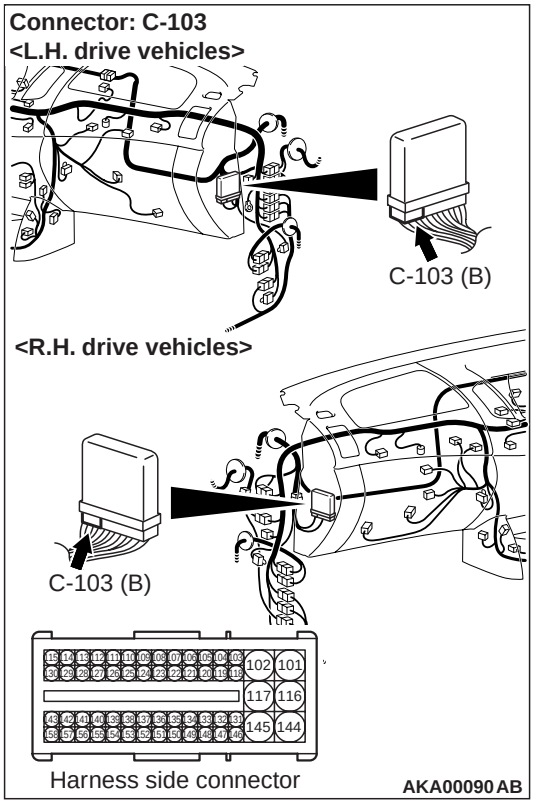


- Check earthing line for damage.

Q: Is the check result normal?

YES : Go to Step 6 .
NO : Repair the damaged harness wire.

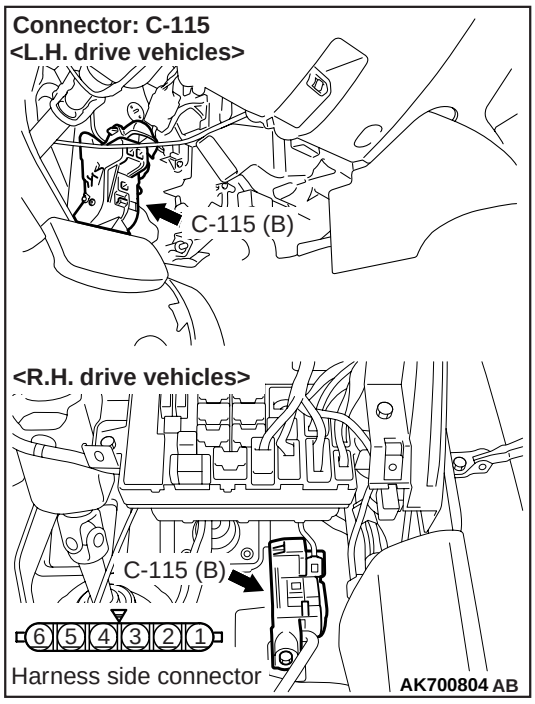
STEP 10. Connector check: C-103 engine-ECU connector



Q: Is the check result normal?

YES : Go to Step 11 .
NO : Repair or replace the connector.

STEP 11. Perform voltage measurement at C-115 accelerator pedal position sensor connector.

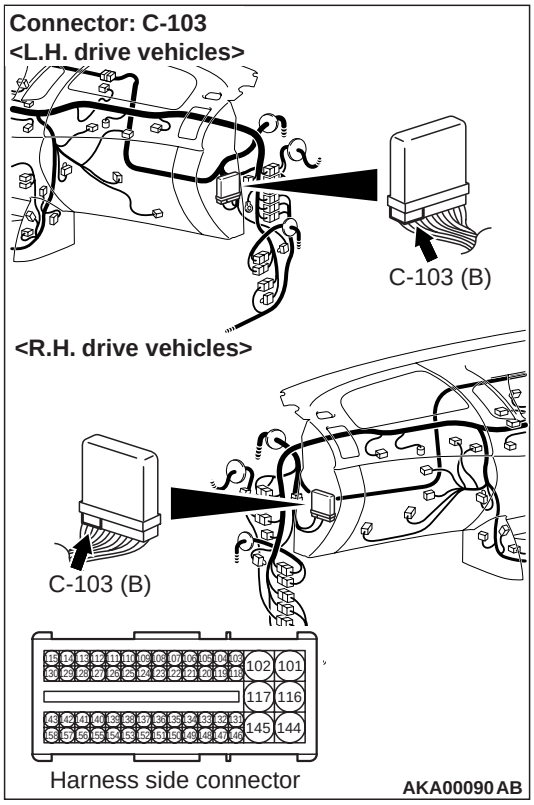


- Use special tool test harness (MB991658) to connect connector, and measure at pick-up harness.
- Ignition switch: ON
- Voltage between terminal No. 3 and earth.

OK: 0.7 – 1.3 V

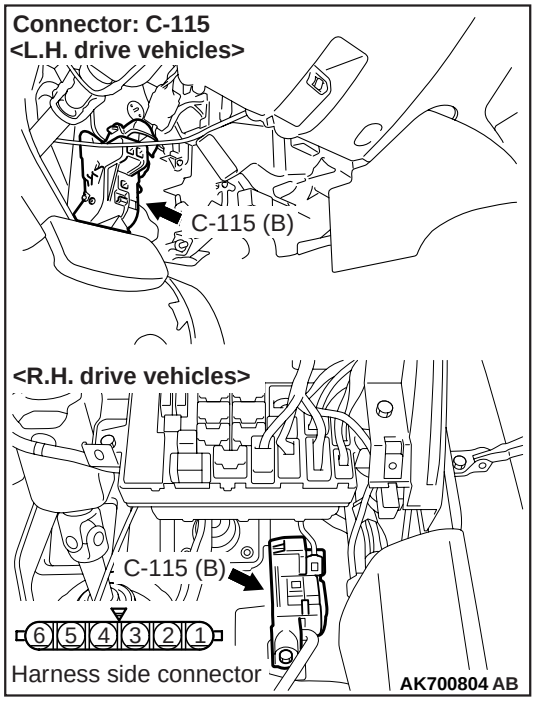
Q: Is the check result normal?
YES : Go to Step 15 .
NO : Go to Step 12 .

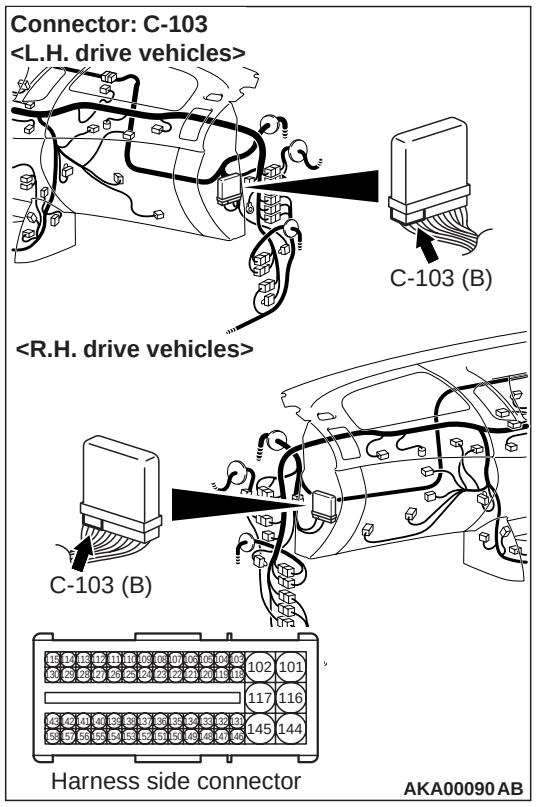
STEP 12. Connector check: C-103 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 13 .
NO : Repair or replace the connector.

STEP 13. Check harness between C-115 (terminal No. 3) accelerator pedal position sensor and C-103 (terminal No. 150) engine-ECU connector.

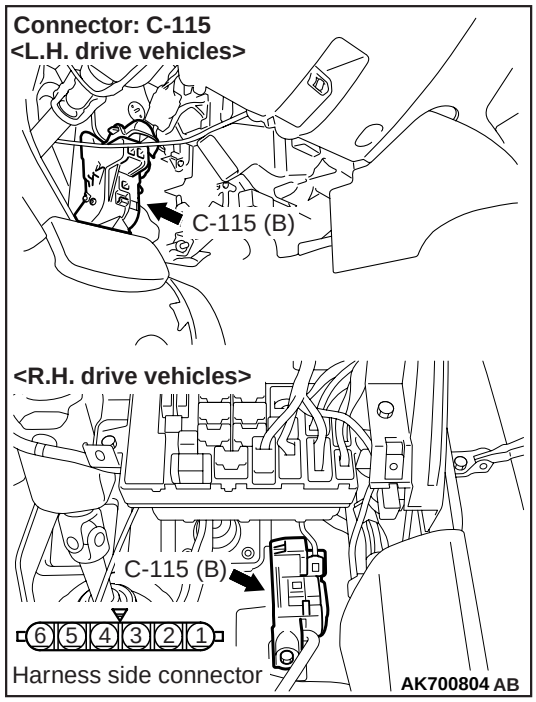


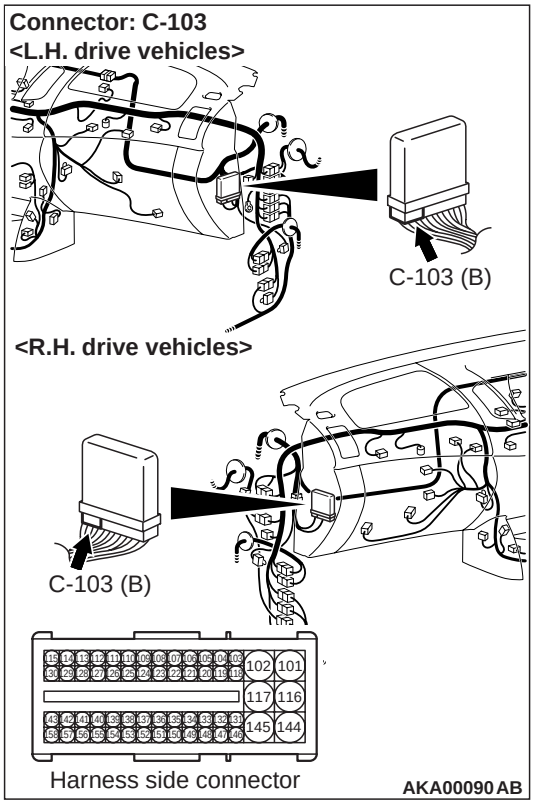


- Check output line for short circuit.

Q: Is the check result normal?
YES : Go to Step 14 .
NO : Repair the damaged harness wire.

STEP 14. Check harness between C-115 (terminal No. 1) accelerator pedal position sensor connector and C-103 (terminal No. 149) engine-ECU connector.

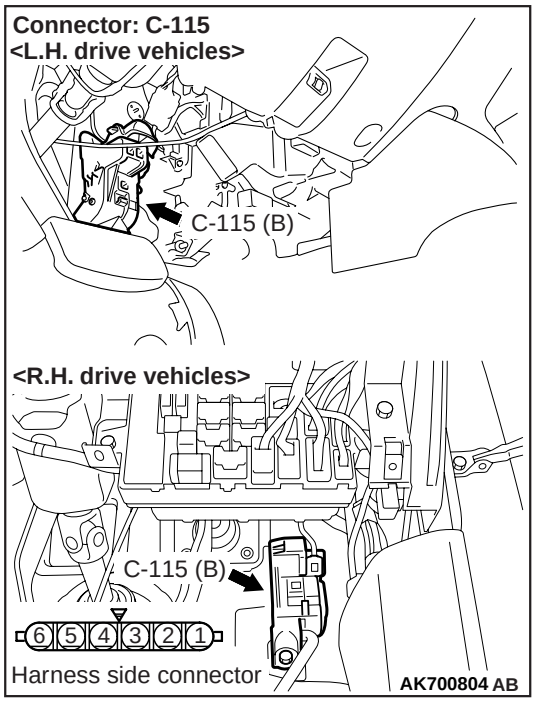


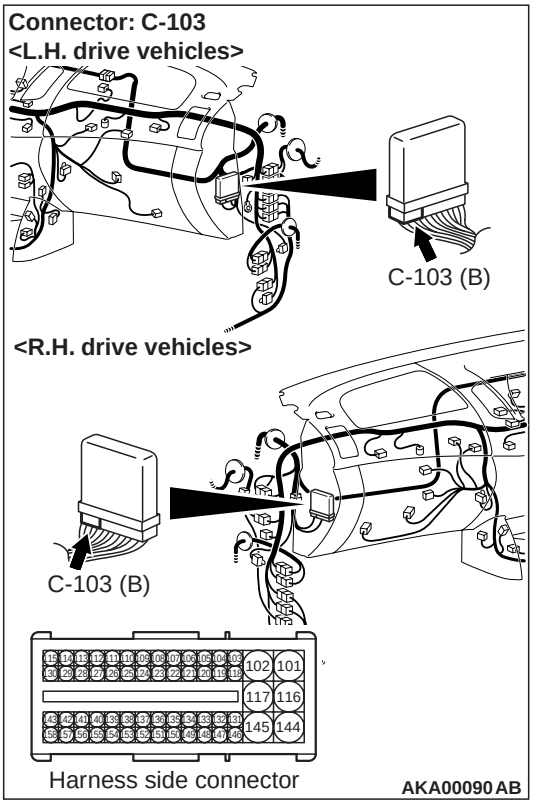


- Check power supply line for damage.

Q: Is the check result normal?
YES : Replace the accelerator pedal position sensor.
NO : Repair the damaged harness wire.

STEP 15. Check harness between C-115 (terminal No. 3) accelerator pedal position sensor connector and C-103 (terminal No. 150) engine-ECU connector.





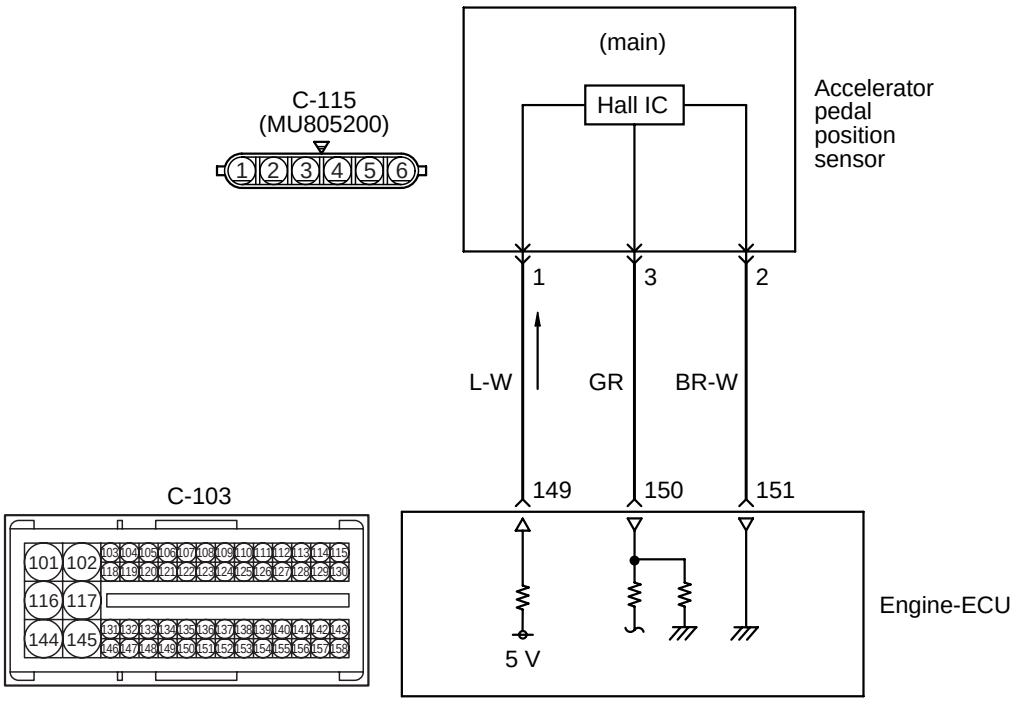
- Check output line for open circuit and damage.

Q: Is the check result normal?

YES : Go to Step 6 .
NO : Repair the damaged harness wire.

Code No. P2123: Accelerator Pedal Position Sensor (main) Circuit High Input

Accelerator Pedal Position Sensor (main) Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Gray
R: Red P: Pink V: Violet PU: Purple SI: Silver

AKA00109 AB

OPERATION

- A power voltage of 5 V is applied to the accelerator pedal position sensor (terminal No. 1) from the engine-ECU (terminal No. 149).
- The power voltage is earthed to the engine-ECU (terminal No. 151) from the accelerator pedal position sensor (terminal No. 2).
- The sensor signal is inputted to the engine-ECU (terminal No. 150) from the accelerator pedal position sensor output terminal (terminal No. 3).

FUNCTION

- The accelerator pedal position sensor (main) outputs voltage which corresponds to the accelerator pedal depression.
- The engine-ECU checks whether the voltage is within a specified range.

TROUBLE JUDGMENT

Check Conditions

- Ignition switch is in "ON" position
- Accelerator pedal position sensor (sub) is normal
- Accelerator pedal position sensor (sub) output voltage is 0.125 V or higher and 1.4 V or lower.
- DTC No. P2124 is memorized.

Judgment Criterion

- Accelerator pedal position sensor (main) output voltage exceeds 4.8 V for 0.25 seconds.

PROBABLE CAUSES

- Failed accelerator pedal position sensor
- Open circuit in accelerator pedal position sensor circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III data list

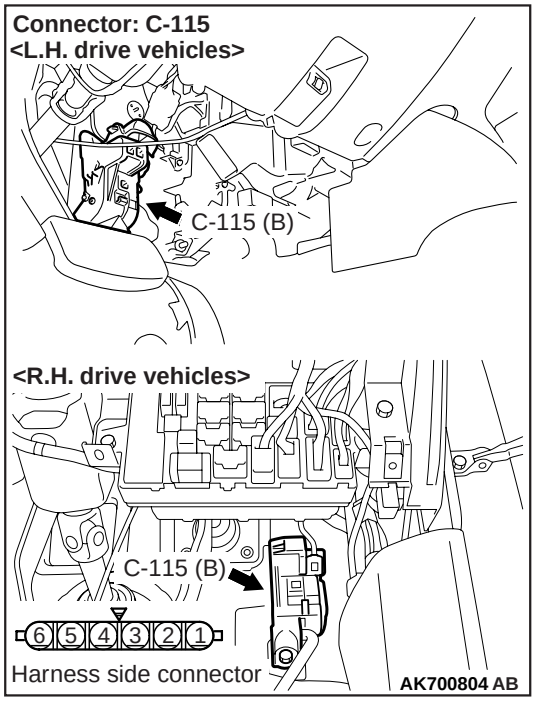
- Refer to Data List Reference Table P.13A-542.
  a. Item 9: Accelerator pedal position sensor (main)

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

NO : Go to Step 2 .

STEP 2. Connector check: C-115 accelerator pedal position sensor connector

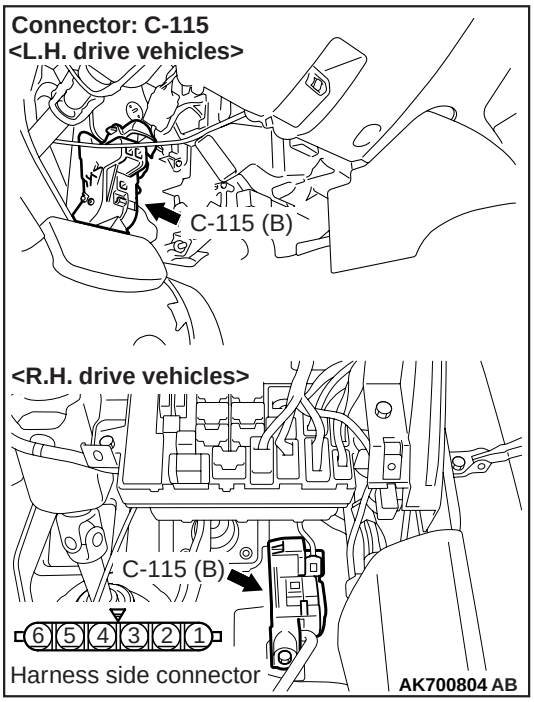


Q: Is the check result normal?

YES : Go to Step 3 .

NO : Repair or replace the connector.

STEP 3. Perform resistance measurement at C-115 accelerator pedal position sensor connector.



- Disconnect connector, and measure at harness side.
- Resistance between terminal No. 2 and earth.

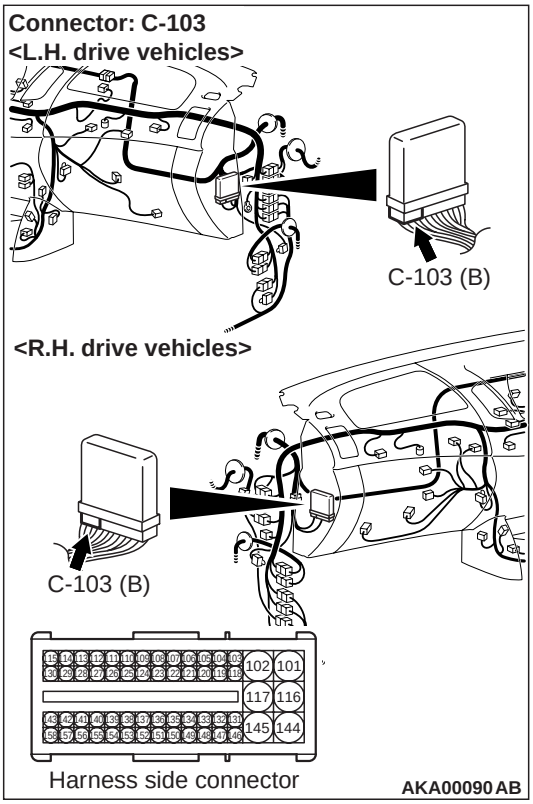
OK: Continuity (2 Ω or less)

Q: Is the check result normal?

YES : Go to Step 7 .

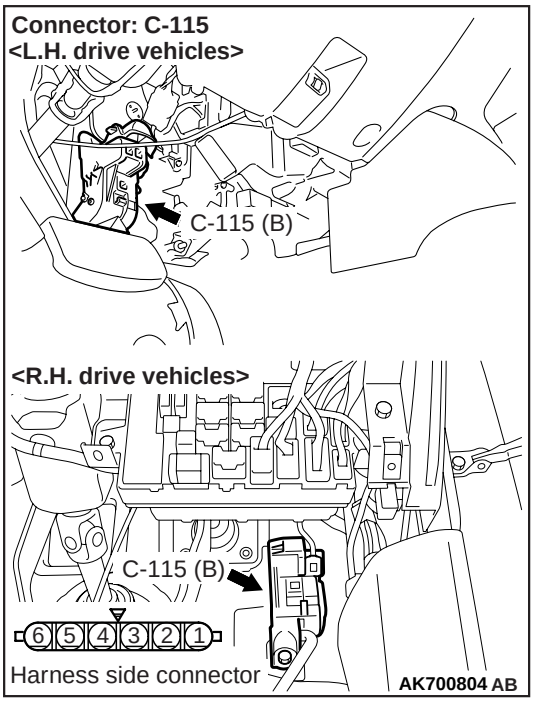
NO : Go to Step 4 .

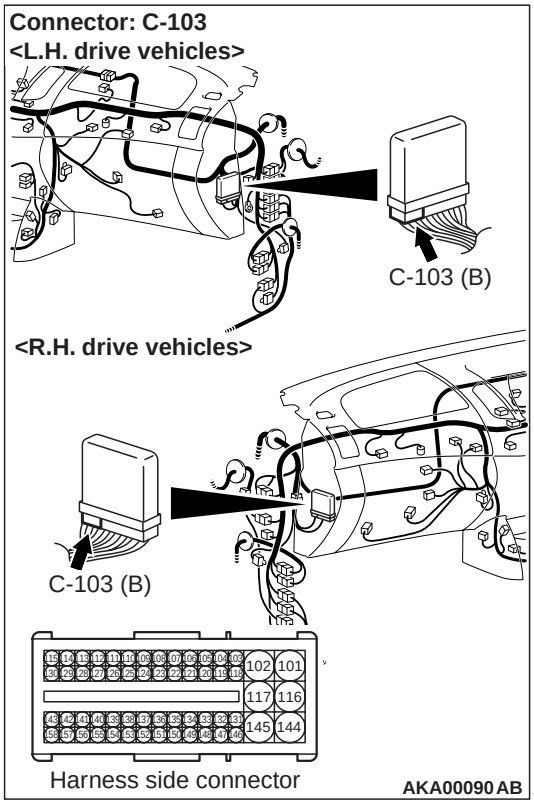
STEP 4. Connector check: C-103 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 5 .
NO : Repair or replace the connector.

STEP 5. Check harness between C-115 (terminal No. 2) accelerator pedal position sensor connector and C-103 (terminal No. 151) engine-ECU connector.





- Check earthing line for open circuit.

Q: Is the check result normal?
YES : Go to Step 6 .
NO : Repair the damaged harness wire.

STEP 6. M.U.T.-III data list

- Refer to Data List Reference Table P.13A-542.
  a. Item 9: Accelerator pedal position sensor (main)

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

NO : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

STEP 7. Replace the accelerator pedal position sensor

- After replacing the accelerator pedal position sensor, re-check the trouble symptoms.

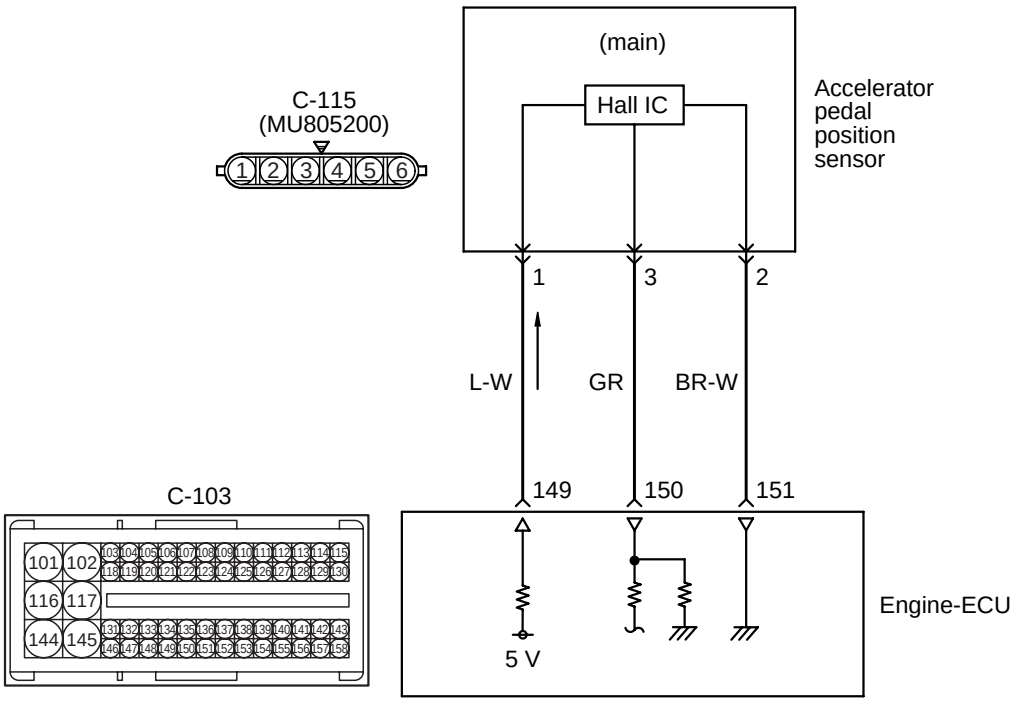
Q: Is the check result normal?

YES : The check is end.

NO : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

Code No. P2124: Accelerator Pedal Position Sensor (Main) Circuit High Input Intermittent

Accelerator Pedal Position Sensor (main) Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Gray
R: Red P: Pink V: Violet PU: Purple SI: Silver

AKA00109 AB

OPERATION
- A power voltage of 5 V is applied to the accelerator pedal position sensor (terminal No. 1) from the engine-ECU (terminal No. 149).
- The power voltage is earthed to the engine-ECU (terminal No. 151) from the accelerator pedal position sensor (terminal No. 2).
- The sensor signal is inputted to the engine-ECU (terminal No. 150) from the accelerator pedal position sensor output terminal (terminal No. 3).

FUNCTION
- The accelerator pedal position sensor (main) outputs voltage which corresponds to the accelerator pedal depression.
- The engine-ECU checks whether the voltage is within a specified range.

TROUBLE JUDGMENT

Check Conditions
- Ignition switch is in "ON" position
- Accelerator pedal position sensor (sub) is normal

Judgment Criterion
- Accelerator pedal position sensor (main) output voltage exceeds 4.8 V for 0.05 seconds.

PROBABLE CAUSES
- Failed accelerator pedal position sensor
- Open circuit in accelerator pedal position sensor circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III data list

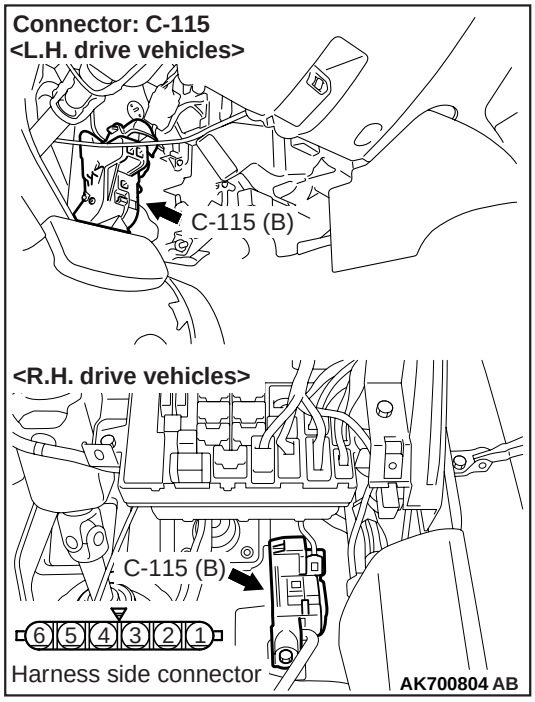
- Refer to Data List Reference Table P.13A-542.
  a. Item 9: Accelerator pedal position sensor (main)

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

NO : Go to Step 2 .

STEP 2. Connector check: C-115 accelerator pedal position sensor connector

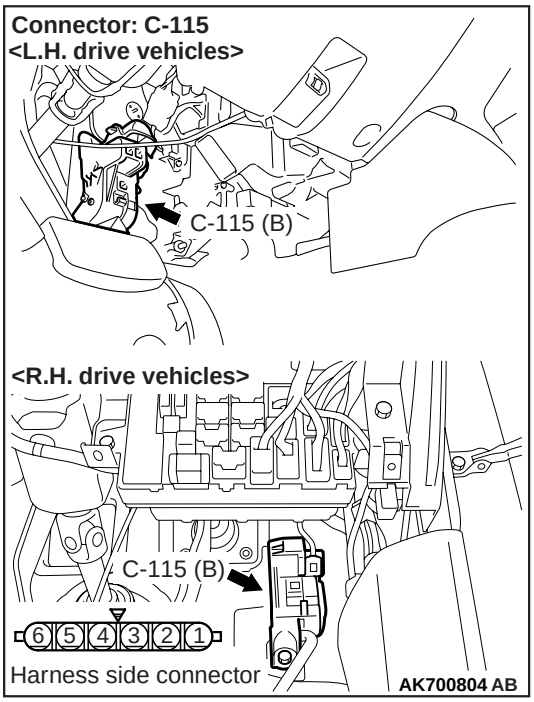


Q: Is the check result normal?

YES : Go to Step 3 .

NO : Repair or replace the connector.

STEP 3. Perform resistance measurement at C-115 accelerator pedal position sensor connector.



- Disconnect connector, and measure at harness side.
- Resistance between terminal No. 2 and earth.

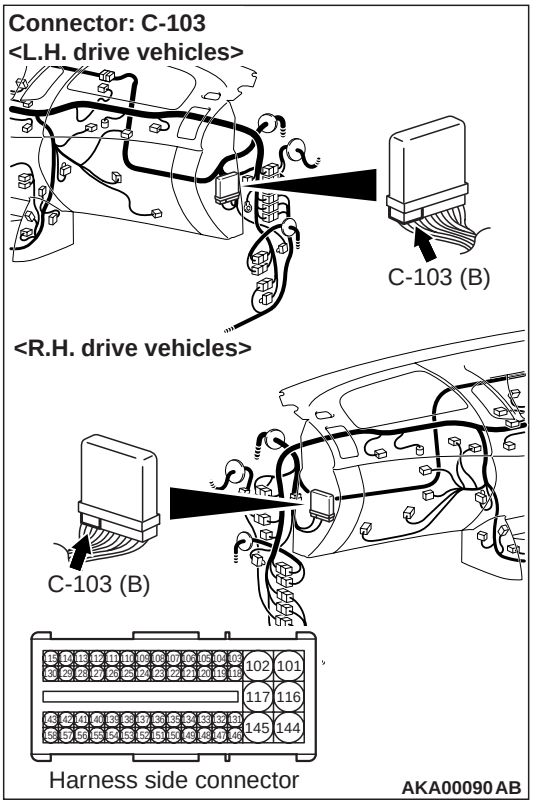
OK: Continuity (2 Ω or less)

Q: Is the check result normal?

YES : Go to Step 7 .

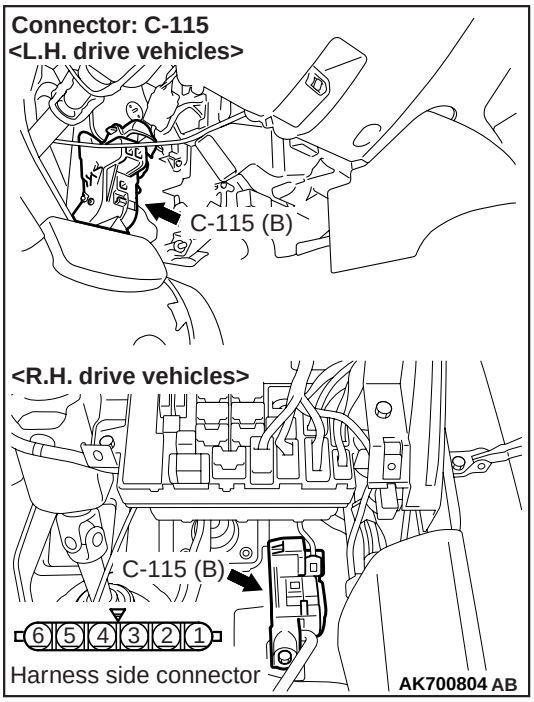
NO : Go to Step 4 .

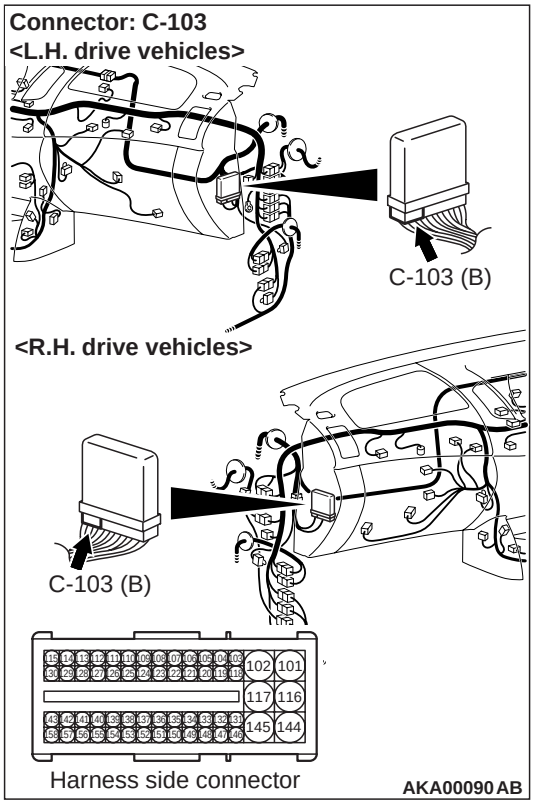
STEP 4. Connector check: C-103 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 5 .
NO : Repair or replace the connector.

STEP 5. Check harness between C-115 (terminal No. 2) accelerator pedal position sensor connector and C-103 (terminal No. 151) engine-ECU connector.





- Check earthing line for open circuit.

Q: Is the check result normal?
YES : Go to Step 6 .
NO : Repair the damaged harness wire.

STEP 6. M.U.T.-III data list

- Refer to Data List Reference Table P.13A-542.
  a. Item 9: Accelerator pedal position sensor (main)

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

NO : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

STEP 7. Replace the accelerator pedal position sensor

- After replacing the accelerator pedal position sensor, re-check the trouble symptoms.

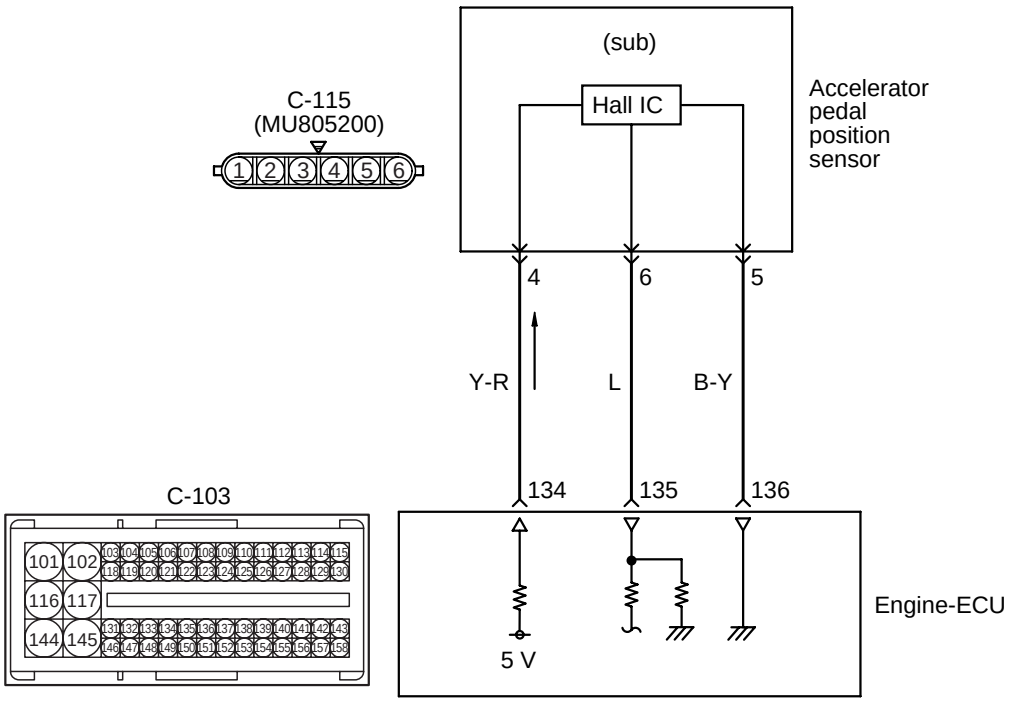
Q: Is the check result normal?

YES : The check is end.

NO : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

Code No. P2127: Accelerator Pedal Position Sensor (sub) Circuit Low Input

Accelerator Pedal Position Sensor (sub) Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V: Violet PU: Purple SI: Silver

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OPERATION

- A power voltage of 5 V is applied to the accelerator pedal position sensor (terminal No. 4) from the engine-ECU (terminal No. 134).
- The power voltage is earthed to the engine-ECU (terminal No. 136) from the accelerator pedal position sensor (terminal No. 5).
- The sensor signal is inputted to the engine-ECU (terminal No. 135) from the accelerator pedal position sensor output terminal (terminal No. 6).

FUNCTION

- The accelerator pedal position sensor (sub) outputs voltage which corresponds to the accelerator pedal depression.
- The engine-ECU checks whether the voltage is within a specified range.

TROUBLE JUDGMENT

Check Conditions

- Ignition switch is in "ON" position
- Accelerator pedal position sensor (main) is normal

Judgment Criterion

- Accelerator pedal position sensor (sub) output voltage is lower than 0.125 V for 0.3 seconds.

PROBABLE CAUSES

- Failed accelerator pedal position sensor
- Open/short circuit or harness damage in accelerator pedal position sensor circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III data list

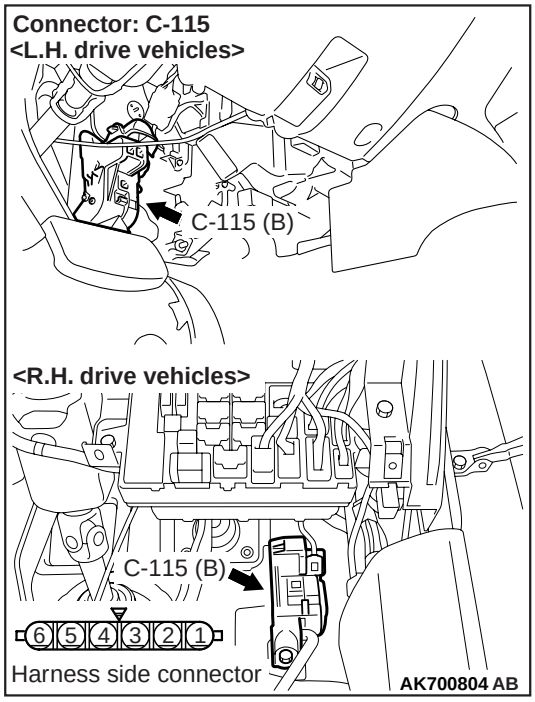
- Refer to Data List Reference Table P.13A-542.
  a. Item 10: Accelerator pedal position sensor (sub)

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

NO : Go to Step 2 .

STEP 2. Connector check: C-115 accelerator pedal position sensor connector

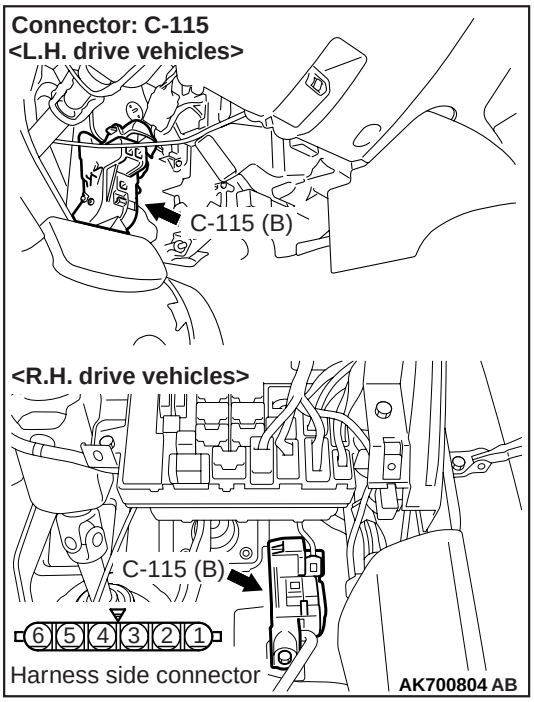


Q: Is the check result normal?

YES : Go to Step 3 .

NO : Repair or replace the connector.

STEP 3. Perform voltage measurement at C-115 accelerator pedal position sensor connector.



- Disconnect connector, and measure at harness side.
- Ignition switch: ON
- Voltage between terminal No. 4 and earth.

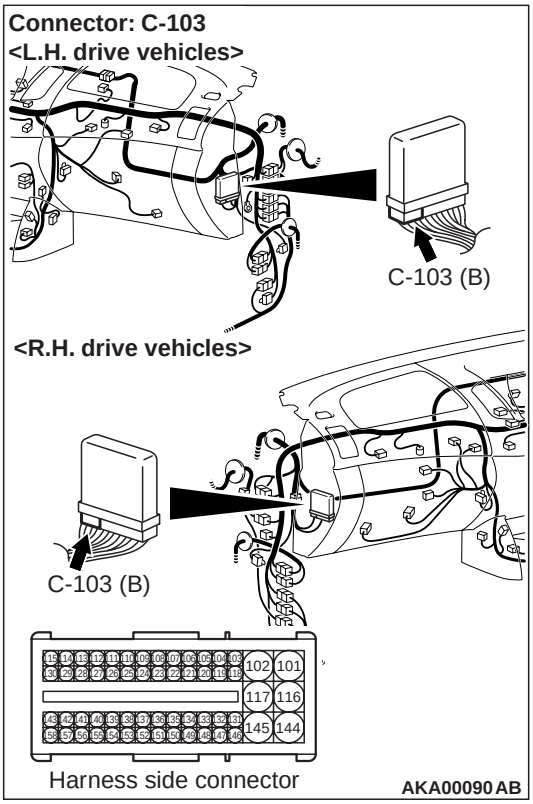
  OK: 4.9 – 5.1 V

Q: Is the check result normal?

YES : Go to Step 7 .

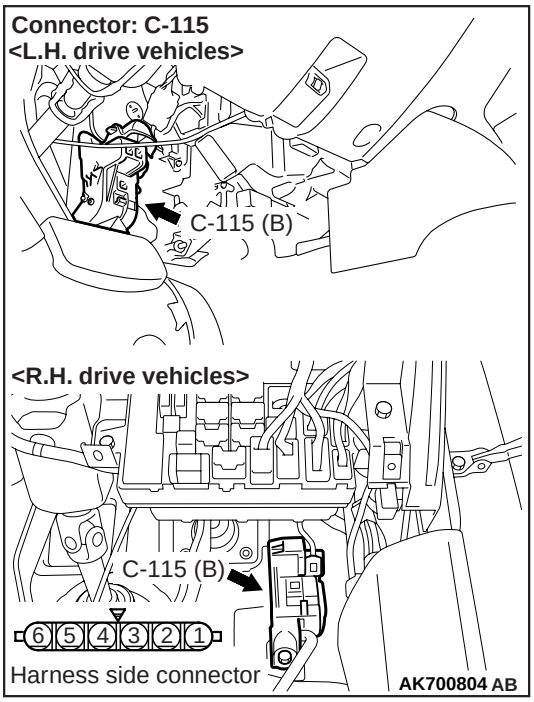
NO : Go to Step 4 .

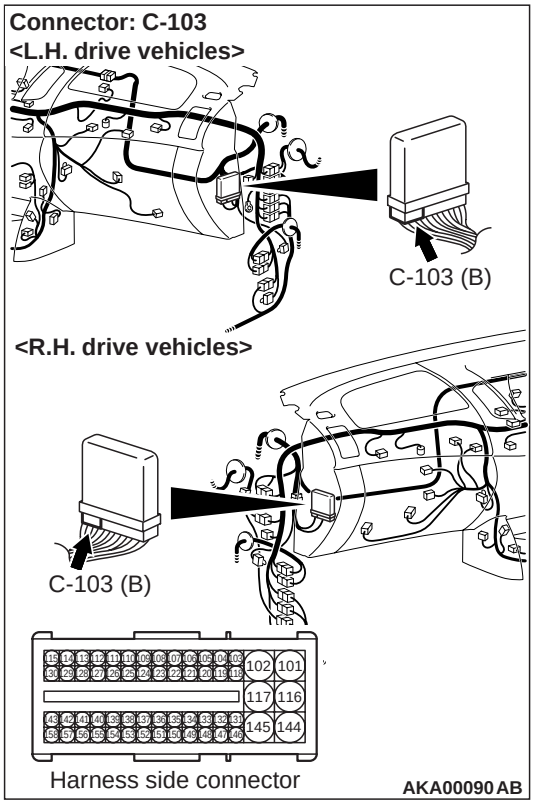
STEP 4. Connector check: C-103 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 5 .
NO : Repair or replace the connector.

STEP 5. Check harness between C-115 (terminal No. 4) accelerator pedal position sensor connector and C-103 (terminal No. 134) engine-ECU connector.





- Check power supply line for open/short circuit.

Q: Is the check result normal?
YES : Go to Step 6 .
NO : Repair the damaged harness wire.

STEP 6. M.U.T.-III data list

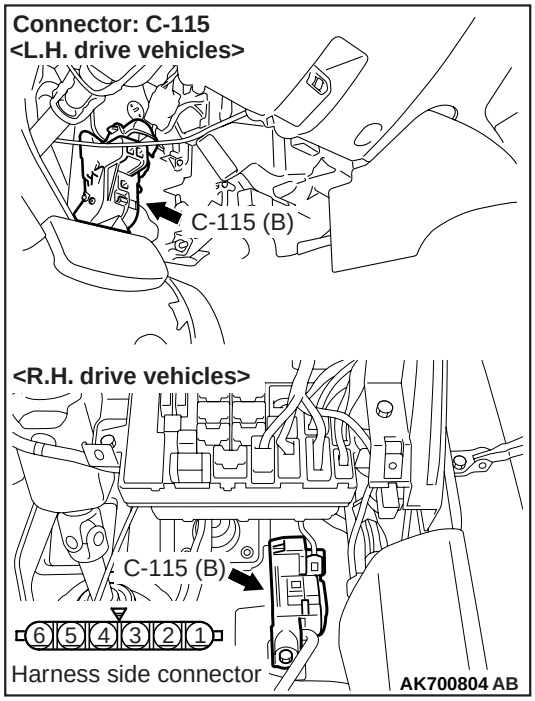
- Refer to Data List Reference Table P.13A-542.
  a. Item 10: Accelerator pedal position sensor (sub)

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

NO : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

STEP 7. Perform resistance measurement at C-115 accelerator pedal position sensor connector.



- Disconnect connector, and measure at harness side.
- Resistance between terminal No. 5 and earth.

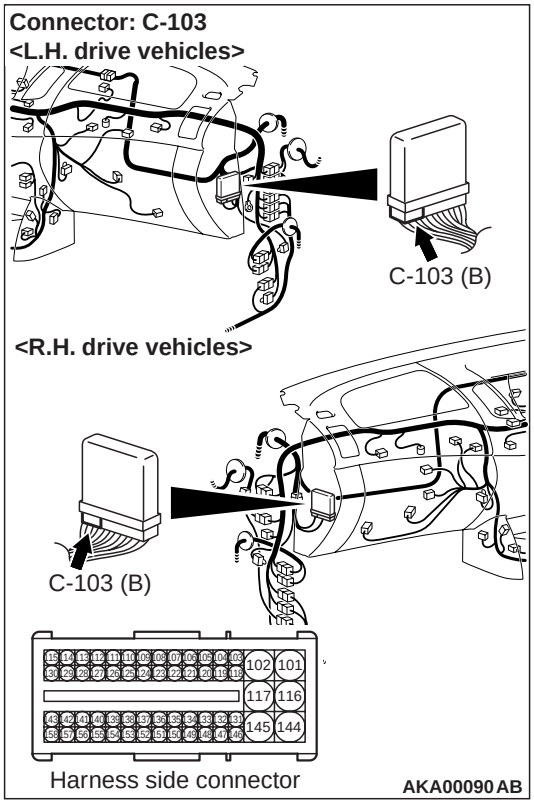
OK: Continuity (2 Ω or less)

Q: Is the check result normal?

YES : Go to Step 10 .

NO : Go to Step 8 .

STEP 8. Connector check: C-103 engine-ECU connector

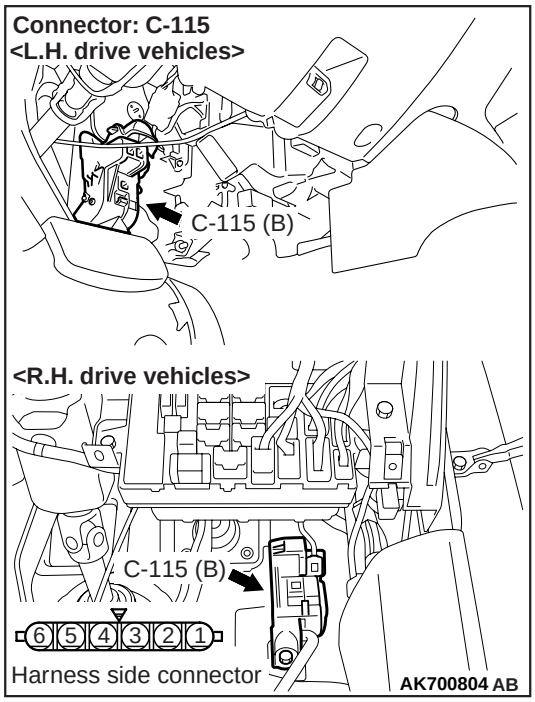


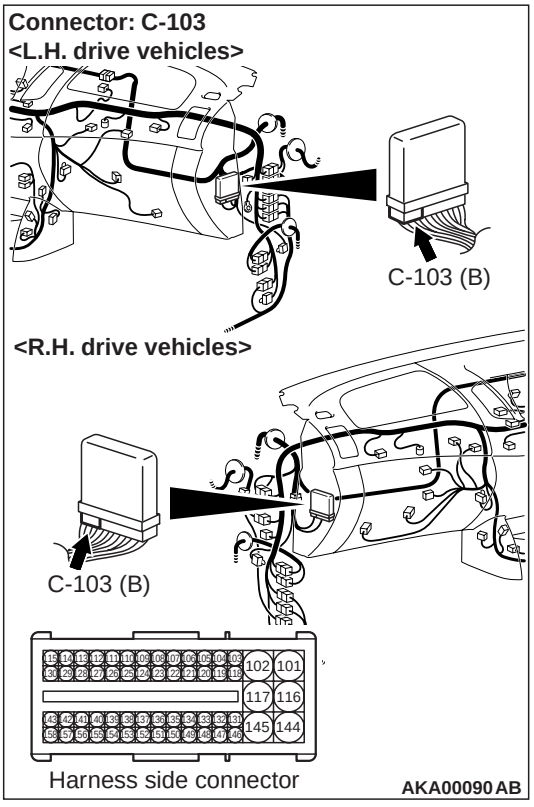
Q: Is the check result normal?

YES : Go to Step 9 .

NO : Repair or replace the connector.

STEP 9. Check harness between C-115 (terminal No. 5) accelerator pedal position sensor connector and C-103 (terminal No. 136) engine-ECU connector.



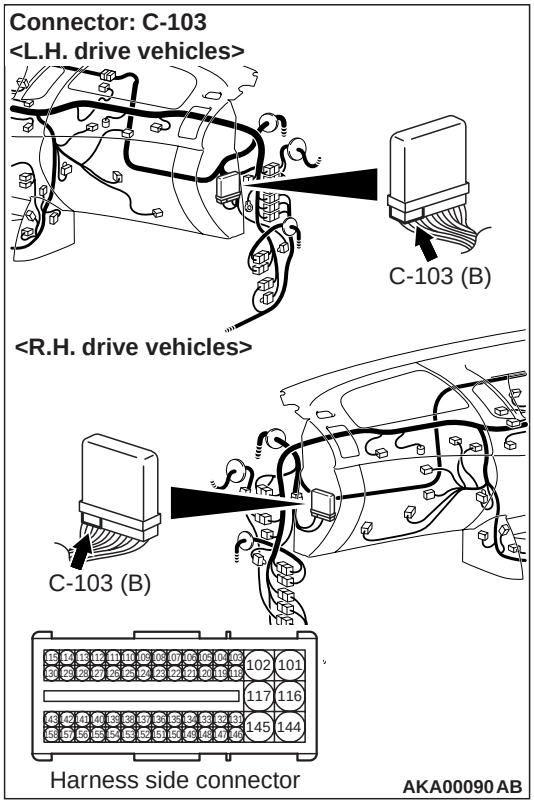


- Check earthing line for damage.

Q: Is the check result normal?

YES : Go to Step 6 .
NO : Repair the damaged harness wire.

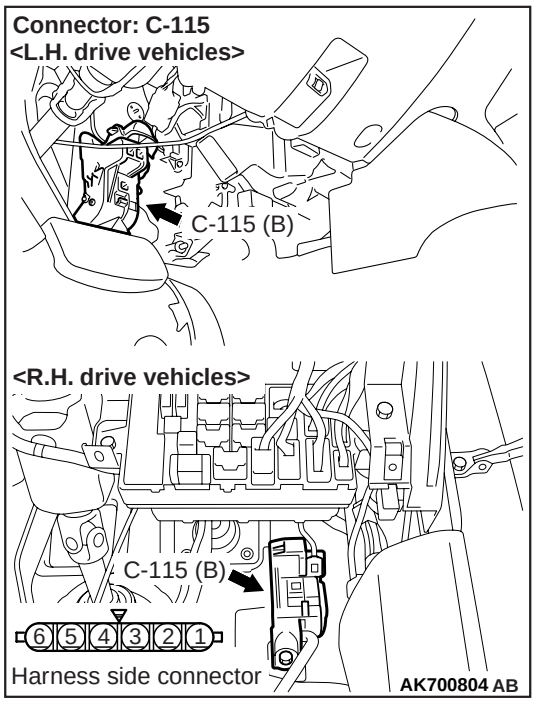
STEP 10. Connector check: C-103 engine-ECU connector



Q: Is the check result normal?

YES : Go to Step 11 .
NO : Repair or replace the connector.

STEP 11. Perform voltage measurement at C-115 accelerator pedal position sensor connector.

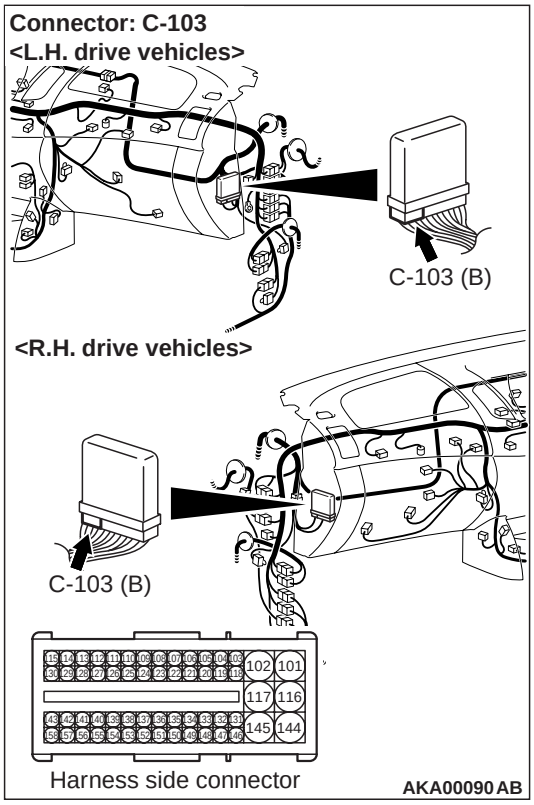


- Use special tool test harness (MB991658) to connect connector, and measure at pick-up harness.
- Ignition switch: ON
- Voltage between terminal No. 6 and earth.

OK: 0.2 – 0.8 V

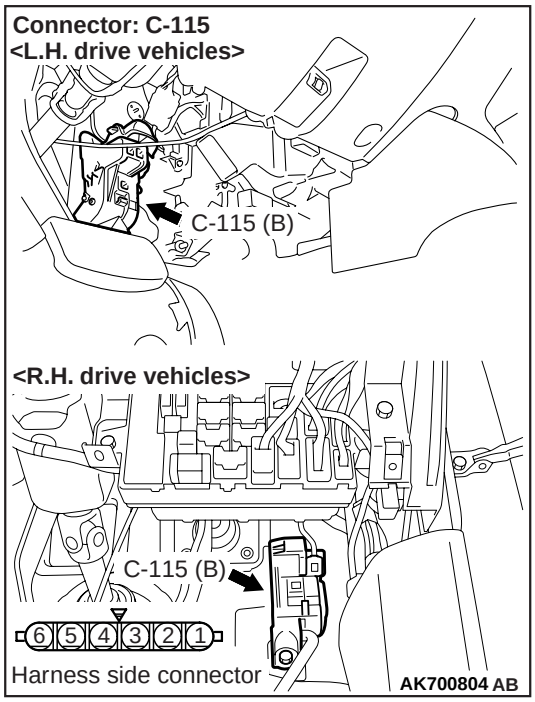
Q: Is the check result normal?
YES : Go to Step 15 .
NO : Go to Step 12 .

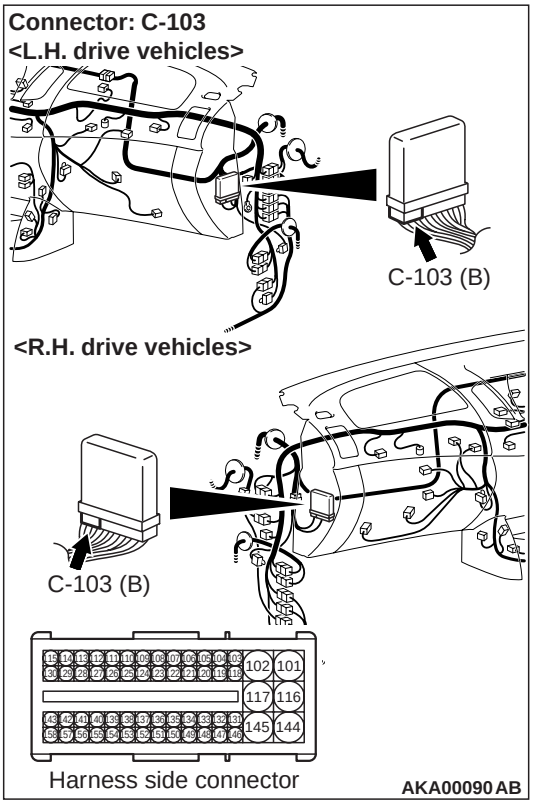
STEP 12. Connector check: C-103 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 13 .
NO : Repair or replace the connector.

STEP 13. Check harness between C-115 (terminal No. 6) accelerator pedal position sensor connector and C-103 (terminal No. 135) engine-ECU connector.

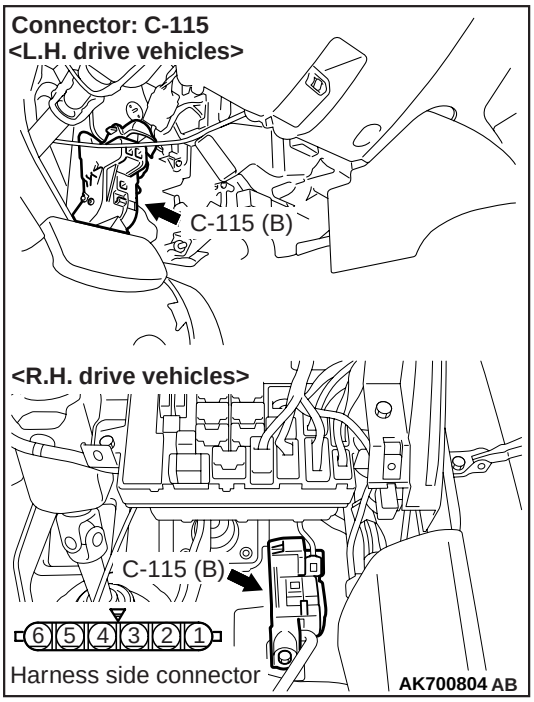


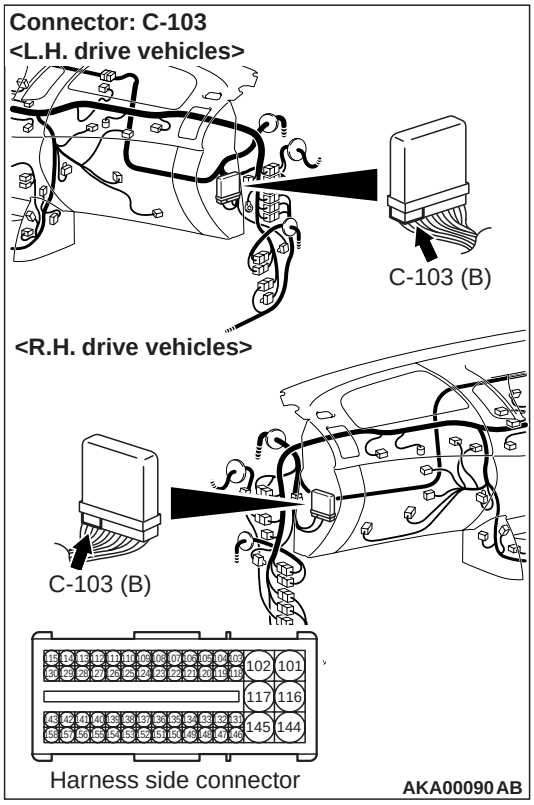


- Check output line for short circuit.

Q: Is the check result normal?
YES : Go to Step 14 .
NO : Repair the damaged harness wire.

STEP 14. Check harness between C-115 (terminal No. 4) accelerator pedal position sensor connector and C-103 (terminal No. 134) engine-ECU connector.

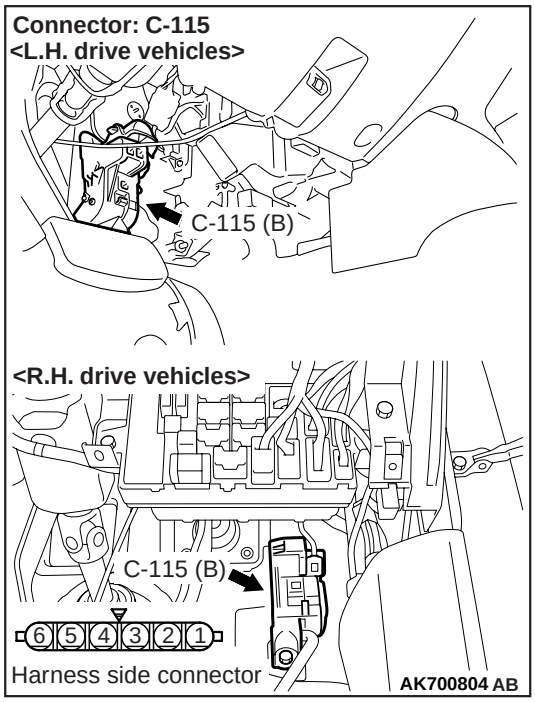


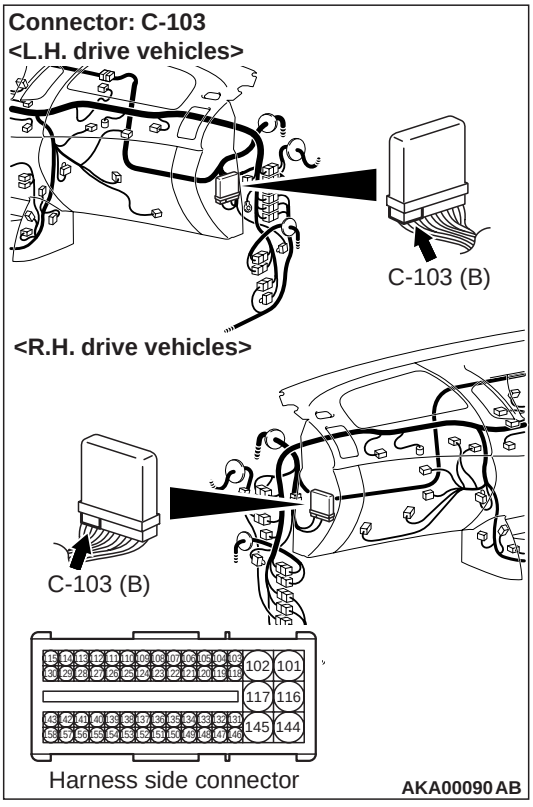


- Check power supply line for damage.

Q: Is the check result normal?
YES : Replace the accelerator pedal position sensor.
NO : Repair the damaged harness wire.

STEP 15. Check harness between C-115 (terminal No. 6) accelerator pedal position sensor connector and C-103 (terminal No. 135) engine-ECU connector.





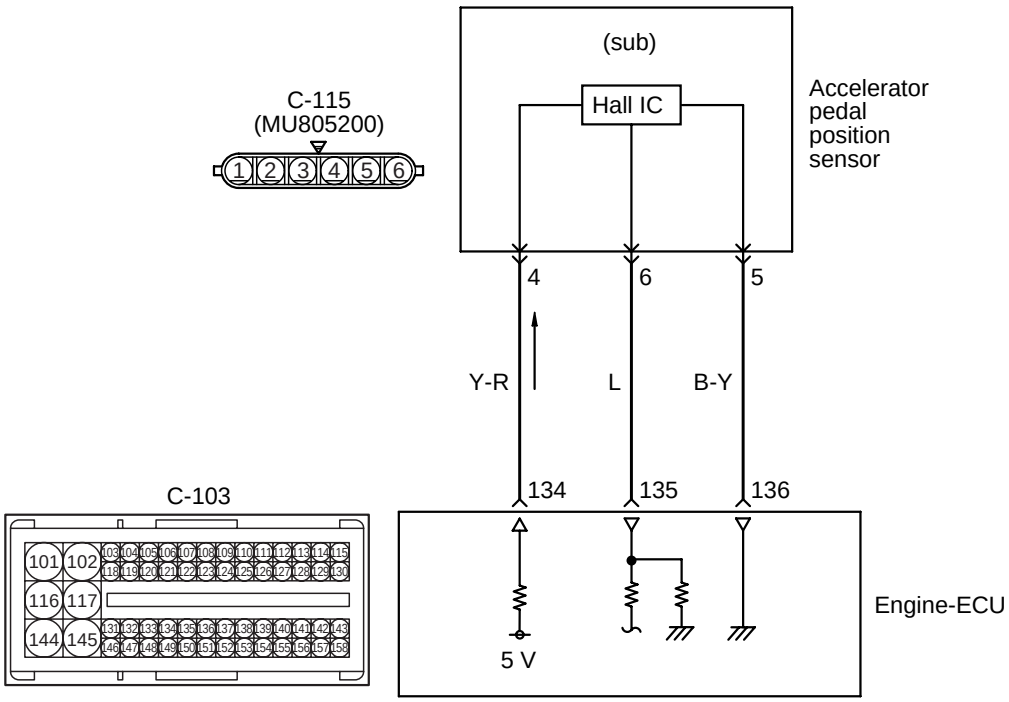
- Check output line for open circuit and damage.

Q: Is the check result normal?

YES : Go to Step 6 .
NO : Repair the damaged harness wire.

Code No. P2128: Accelerator Pedal Position Sensor (sub) Circuit High Input

Accelerator Pedal Position Sensor (sub) Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V: Violet PU: Purple SI: Silver

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OPERATION

- A power voltage of 5 V is applied to the accelerator pedal position sensor (terminal No. 4) from the engine-ECU (terminal No. 134).
- The power voltage is earthed to the engine-ECU (terminal No. 136) from the accelerator pedal position sensor (terminal No. 5).
- The sensor signal is inputted to the engine-ECU (terminal No. 135) from the accelerator pedal position sensor output terminal (terminal No. 6).

FUNCTION

- The accelerator pedal position sensor (sub) outputs voltage which corresponds to the accelerator pedal depression.
- The engine-ECU checks whether the voltage is within a specified range.

TROUBLE JUDGMENT

Check Conditions

- Battery positive voltage is 6 – 16 V
- 2 seconds later after the ignition switch has been in "ON" position or the engine has started up
- Accelerator pedal position sensor (main) is normal
- Accelerator pedal position sensor (main) output voltage is 0.2 V or higher and 2.8 V or lower.

Judgment Criterion

- Accelerator pedal position sensor (main) output voltage exceeds 2.4 V for 0.3 seconds.

PROBABLE CAUSES

- Failed accelerator pedal position sensor
- Open circuit in accelerator pedal position sensor circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III data list

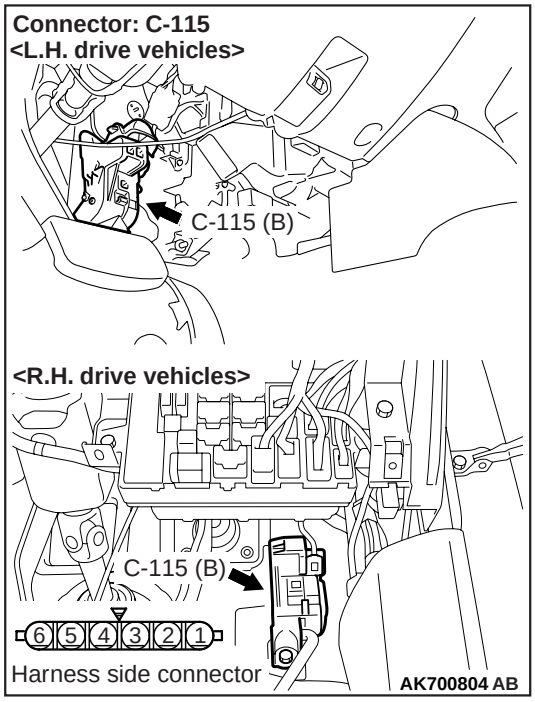
- Refer to Data List Reference Table P.13A-542.
  a. Item 10: Accelerator pedal position sensor (sub)

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

NO : Go to Step 2 .

STEP 2. Connector check: C-115 accelerator pedal position sensor connector

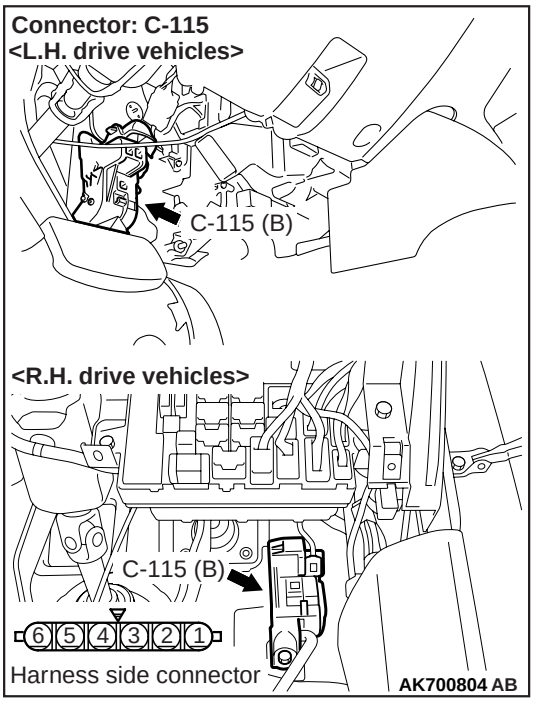


Q: Is the check result normal?

YES : Go to Step 3 .

NO : Repair or replace the connector.

STEP 3. Perform resistance measurement at C-115 accelerator pedal position sensor connector.



- Disconnect connector, and measure at harness side.
- Resistance between terminal No. 5 and earth.

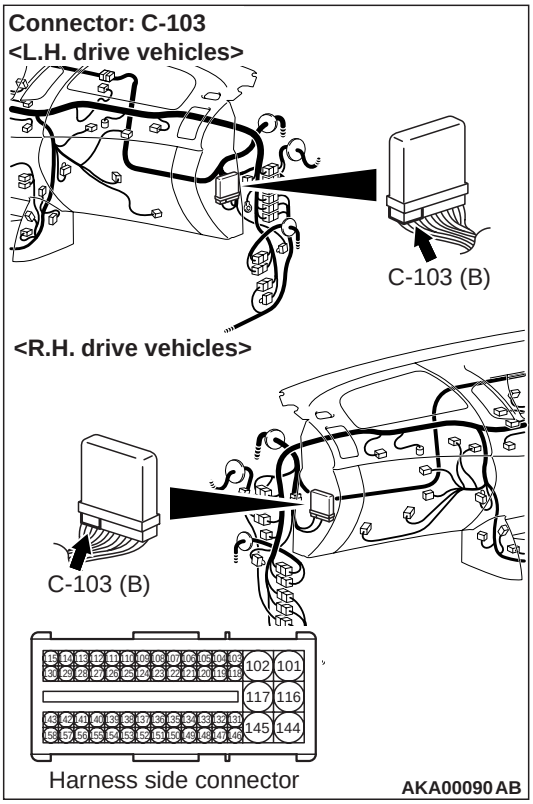
OK: Continuity (2 Ω or less)

Q: Is the check result normal?

YES : Go to Step 7 .

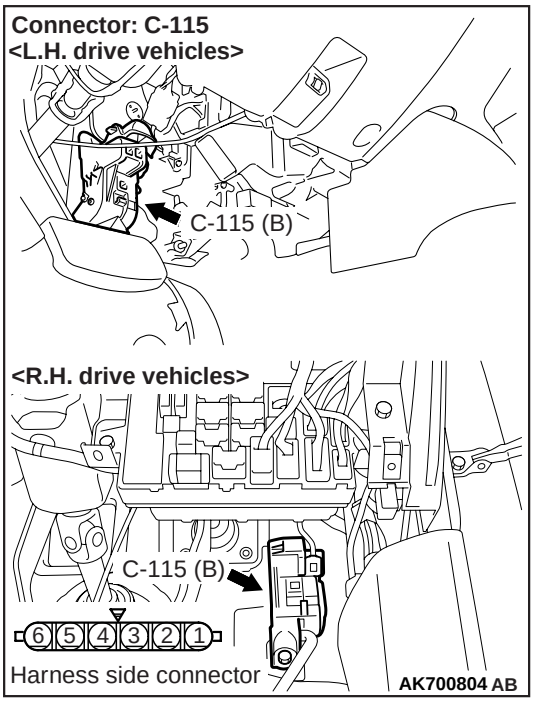
NO : Go to Step 4 .

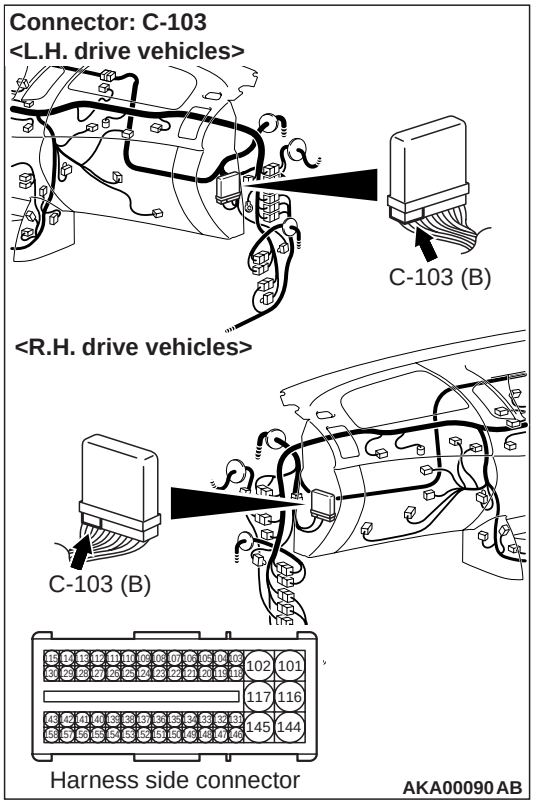
STEP 4. Connector check: C-103 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 5 .
NO : Repair or replace the connector.

STEP 5. Check harness between C-115 (terminal No. 5) accelerator pedal position sensor connector and C-103 (terminal No. 136) engine-ECU connector.





- Check earthing line for open circuit.

Q: Is the check result normal?
YES : Go to Step 6 .
NO : Repair the damaged harness wire.

STEP 6. M.U.T.-III data list

- Refer to Data List Reference Table P.13A-542.
  a. Item 10: Accelerator pedal position sensor (sub)

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

NO : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

STEP 7. Replace the accelerator pedal position sensor

- After replacing the accelerator position sensor, re-check the trouble symptoms.

Q: Is the check result normal?

YES : The check is end.

NO : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

Code No. P2138: Accelerator Pedal Position Sensor (Main and Sub) Range/Performance Problem

OPERATION

- Refer to Code No. P2122: Accelerator Pedal Position Sensor (main) Circuit Low Input P.13A-333.
- Refer to Code No. P2127: Accelerator Pedal Position Sensor (sub) Circuit Low Input P.13A-349.

FUNCTION

- Engine-ECU checks the accelerator pedal position sensor output signal characteristics for abnormal conditions.

TROUBLE JUDGMENT

Check Condition

- Ignition switch is in "ON" position.

Judgment Criterion

- When an error is detected on the High side of the accelerator pedal position (main) for 0.1 second, the accelerator pedal position sensor (sub) is faulty on the High/Low side.

Check Conditions

- Battery positive voltage is 6 – 16 V
- 2 seconds later after the ignition switch has been in "ON" position or the engine has started up
- Engine speed is 600 r/min or more.
- Accelerator pedal position sensor (main) output voltage is 0.2 V or higher and 4.8 V or lower.
- Accelerator pedal position sensor (sub) output voltage is 0.125 V or higher and 2.375 V or lower.

Judgment Criterion

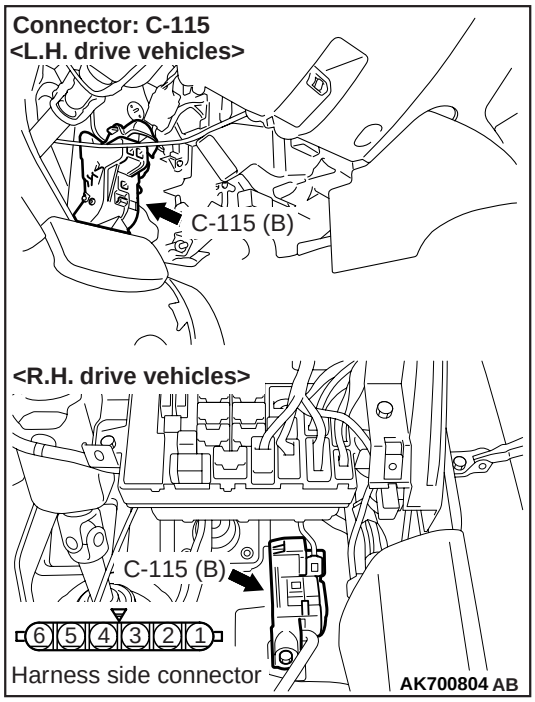
- When a change in the accelerator pedal position sensor (sub) output voltage is less than the specified value for 0.2 second, the difference between the opening indicated by the accelerator pedal position sensor (main) and that by the accelerator pedal position sensor (sub) is 18 % or more of the specified value.

PROBABLE CAUSES

- Failed accelerator pedal position sensor
- Accelerator pedal position sensor circuit harness damage or loose connector contact
- Failed engine-ECU

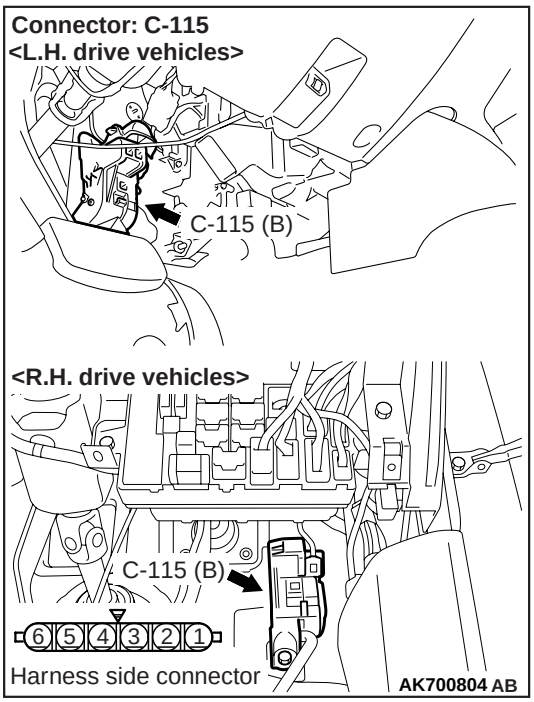
DIAGNOSIS PROCEDURE

STEP 1. Connector check: C-115 accelerator pedal position connector



Q: Is the check result normal?
YES : Go to Step 2 .
NO : Repair or replace the connector.

STEP 2. Perform resistance measurement at C-115 accelerator pedal position sensor connector.

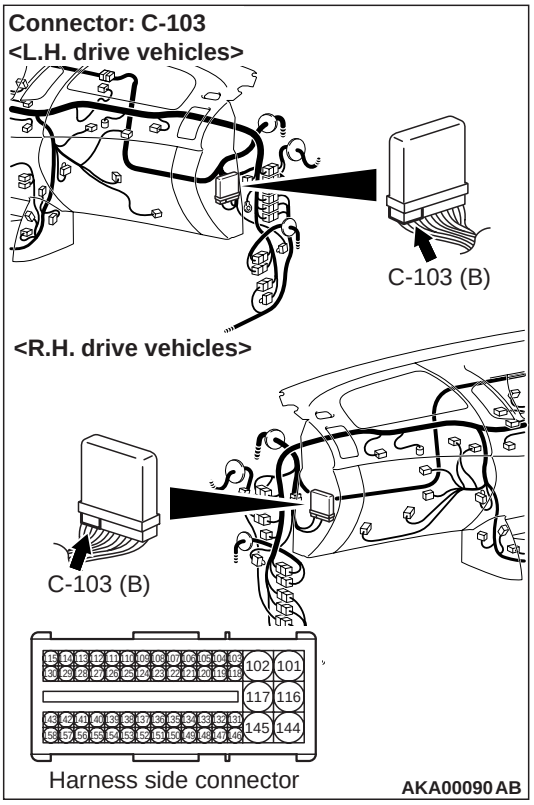


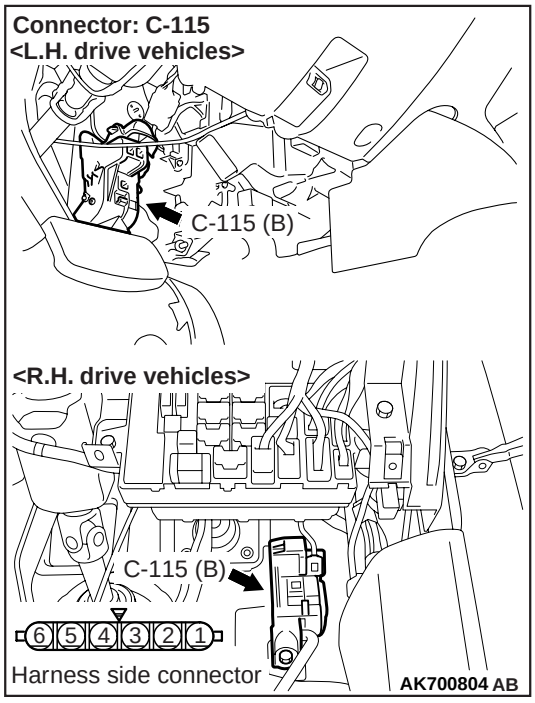
- Disconnect connector, and measure at harness side.
- Resistance between terminal No. 2 and earth.

OK: Continuity (2 Ω or less)

Q: Is the check result normal?
YES : Go to Step 4 .
NO : Go to Step 3 .

STEP 3. Connector check: C-103 engine-ECU connector



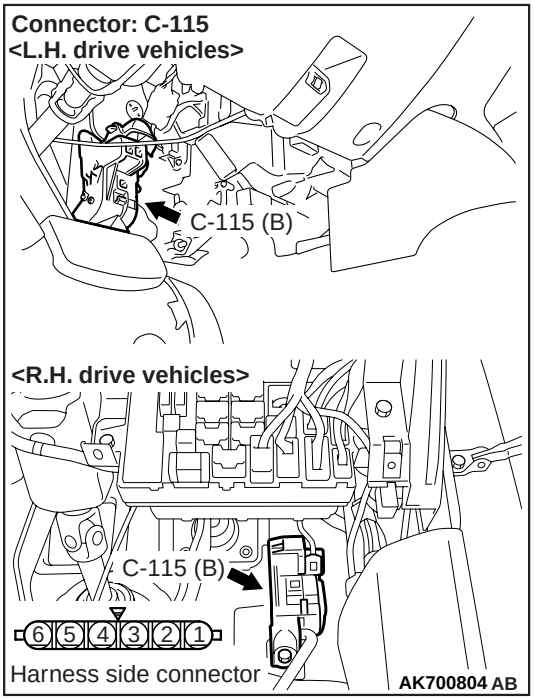


Q: Is the check result normal?

YES : Check and repair harness between C-115 (terminal No. 2) accelerator pedal position sensor connector and C-103 (terminal No. 151) engine-ECU connector.
- Check earthing line for damage.

NO : Repair or replace the connector.

STEP 4. Perform resistance measurement at C-115 accelerator pedal position sensor connector.



- Disconnect connector, and measure at harness side.
- Resistance between terminal No. 5 and earth.

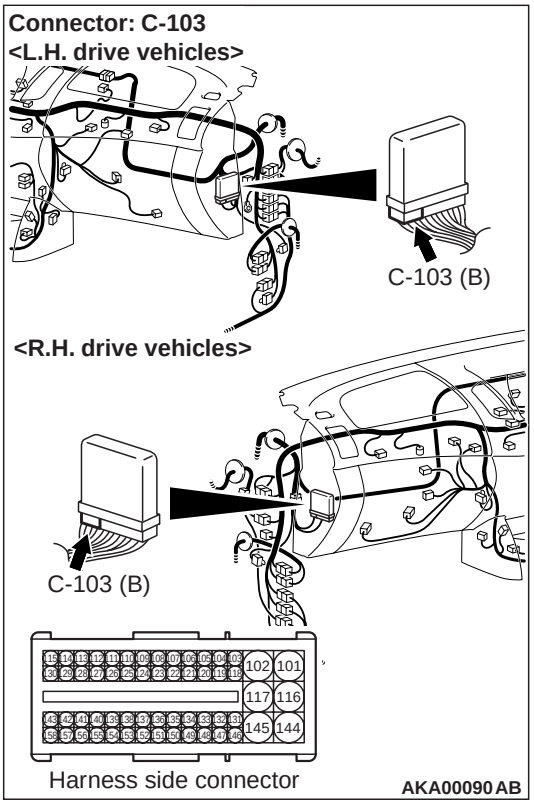
OK: Continuity (2 Ω or less)

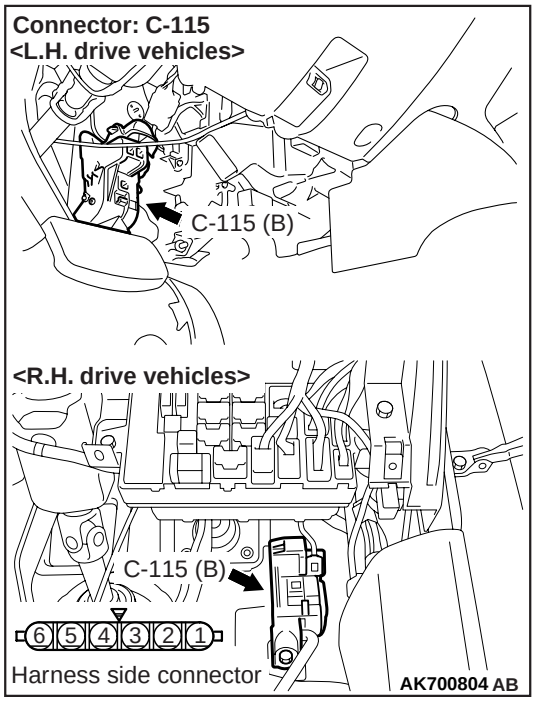
Q: Is the check result normal?

YES : Go to Step 6 .

NO : Go to Step 5 .

STEP 5. Connector check: C-103 engine-ECU connector



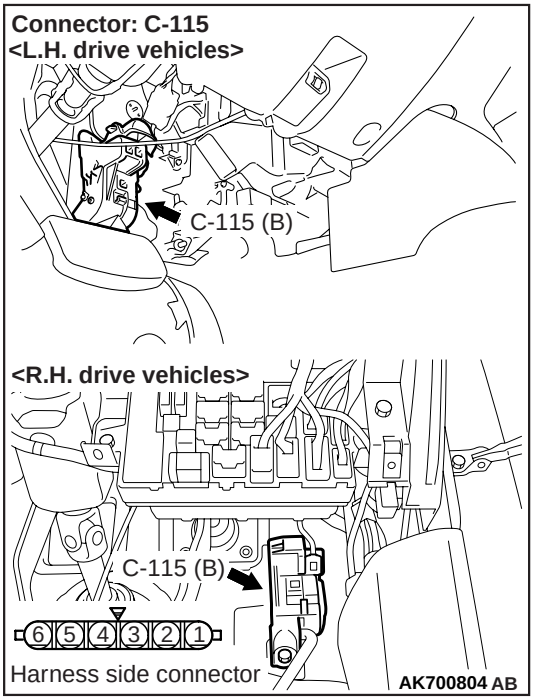


Q: Is the check result normal?

YES : Check and repair harness between C-115 (terminal No. 5) accelerator pedal position sensor connector and C-103 (terminal No. 136) engine-ECU connector.
- Check earthing line for damage.

NO : Repair or replace the connector.

STEP 6. Perform voltage measurement at C-115 accelerator pedal position sensor connector.



- Use special tool test harness (MB991658) to connect connector, and measure at pick-up harness.
- Ignition switch: ON
- Voltage between terminal No. 1 and earth.

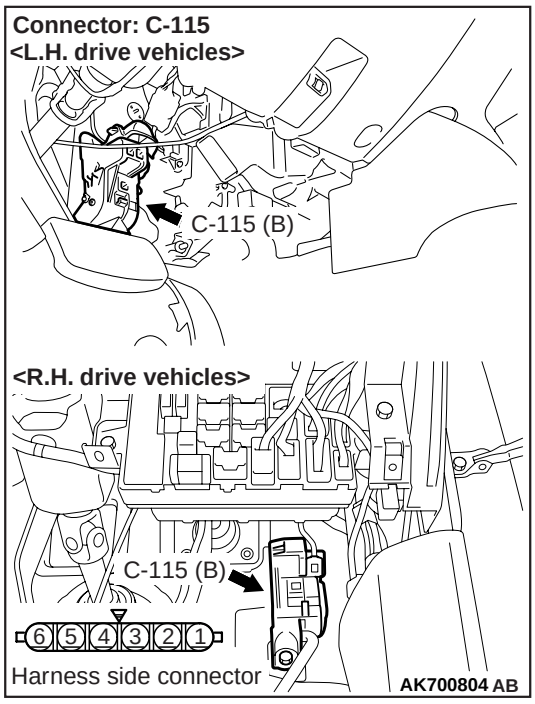
OK: 4.9 – 5.1 V

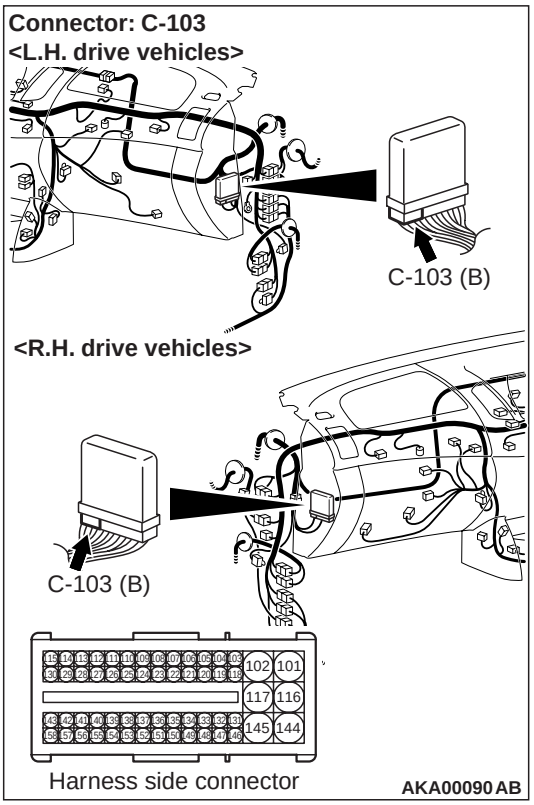
Q: Is the check result normal?

YES : Go to Step 8 .

NO : Go to Step 7 .

STEP 7. Connector check: C-103 engine-ECU connector



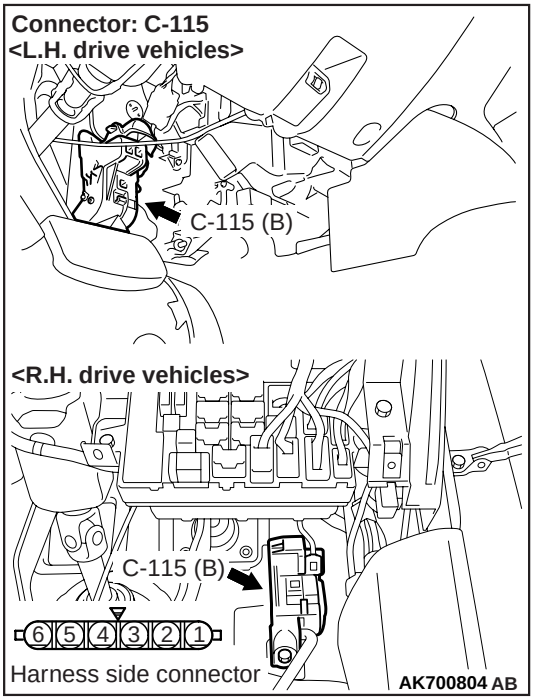


Q: Is the check result normal?

YES : Check and repair harness between C-115 (terminal No. 1) accelerator pedal position sensor connector and C-103 (terminal No. 149) engine-ECU connector.
- Check power supply line for damage.

NO : Repair or replace the connector.

STEP 8. Perform voltage measurement at C-115 accelerator pedal position sensor connector.



- Use special tool test harness (MB991658) to connect connector, and measure at pick-up harness.
- Ignition switch: ON
- Voltage between terminal No. 4 and earth.

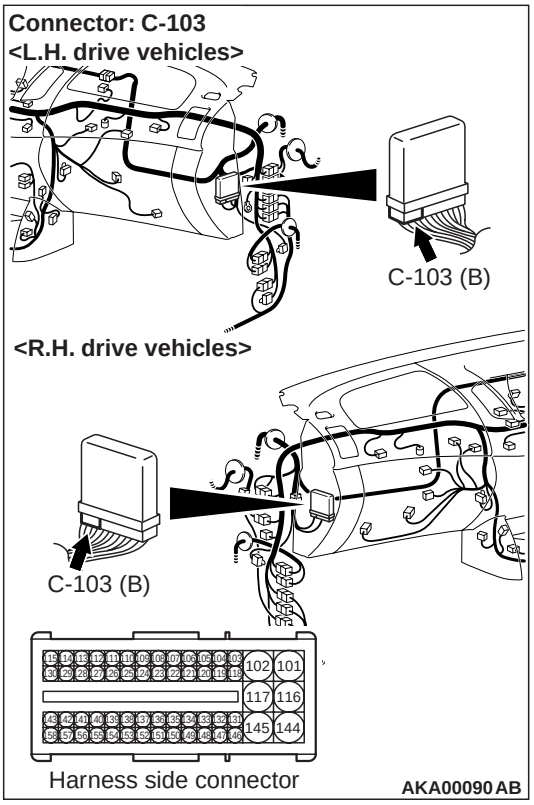
OK: 4.9 – 5.1 V

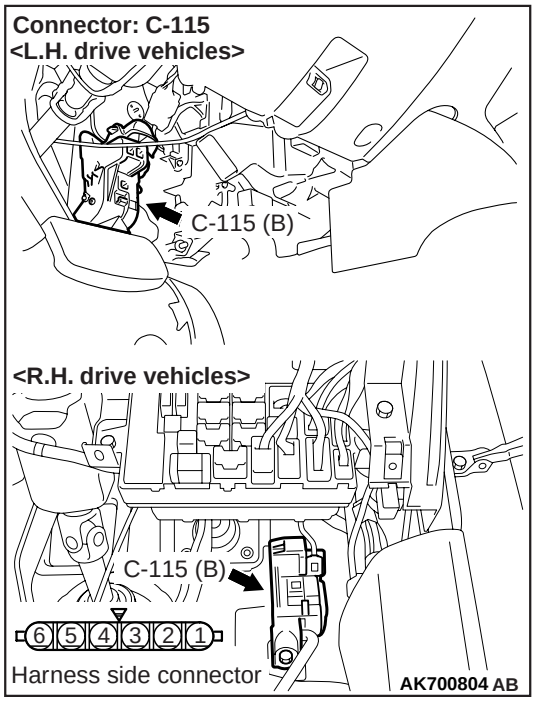
Q: Is the check result normal?

YES : Go to Step 10 .

NO : Go to Step 9 .

STEP 9. Connector check: C-103 engine-ECU connector



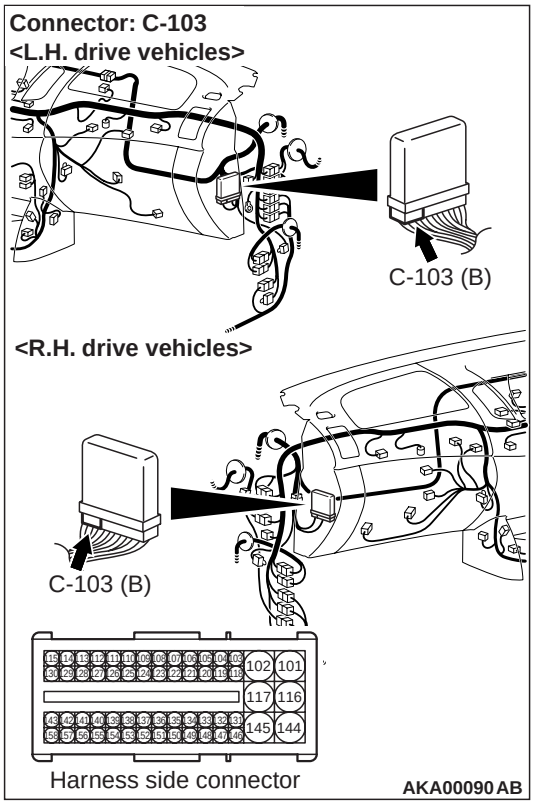


Q: Is the check result normal?

YES : Check and repair harness between C-115 (terminal No. 4) accelerator pedal position sensor connector and C-103 (terminal No. 134) engine-ECU connector.
- Check power supply line for damage.

NO : Repair or replace the connector.

STEP 10. Perform voltage measurement at C-103 engine-ECU connector.



- Measure engine-ECU terminal voltage.
- Ignition switch: ON
- Voltage between terminal No. 150 and earth.

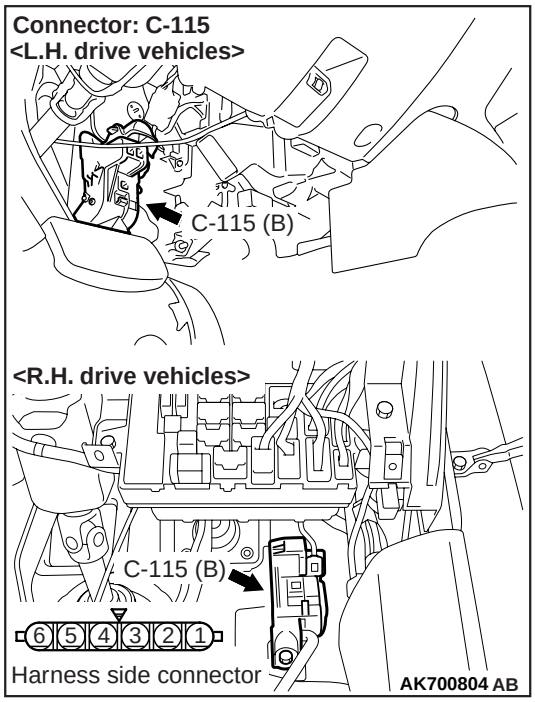
OK: 0.7 – 1.3 V

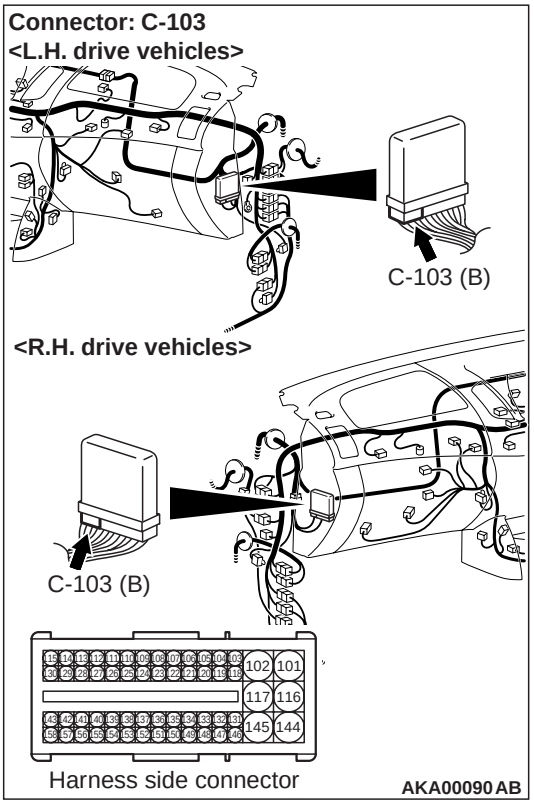
Q: Is the check result normal?

YES : Go to Step 12 .

NO : Go to Step 11 .

STEP 11. Check harness between C-115 (terminal No. 3) accelerator pedal position sensor connector and C-103 (terminal No. 150) engine-ECU connector.



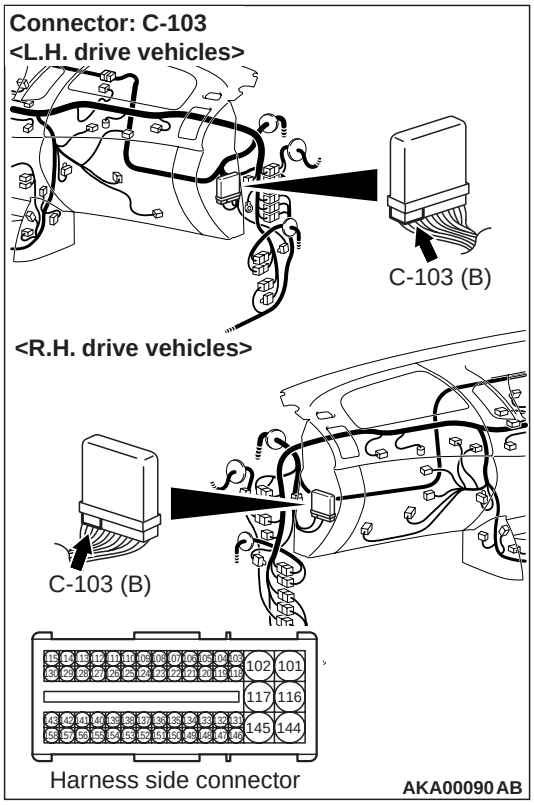


- Check output line for damage.

Q: Is the check result normal?

YES : Replace the accelerator pedal position sensor.
NO : Repair the damaged harness wire.

STEP 12. Perform voltage measurement at C-103 engine-ECU connector.



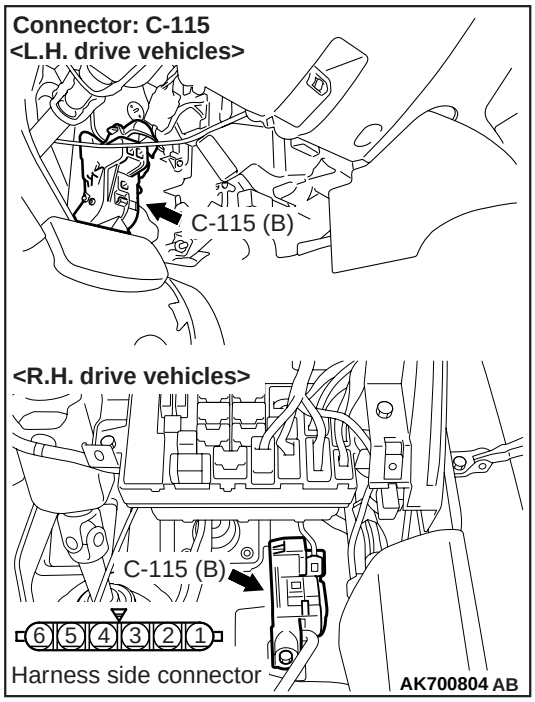
- Measure engine-ECU terminal voltage.
- Ignition switch: ON
- Voltage between terminal No. 135 and earth.

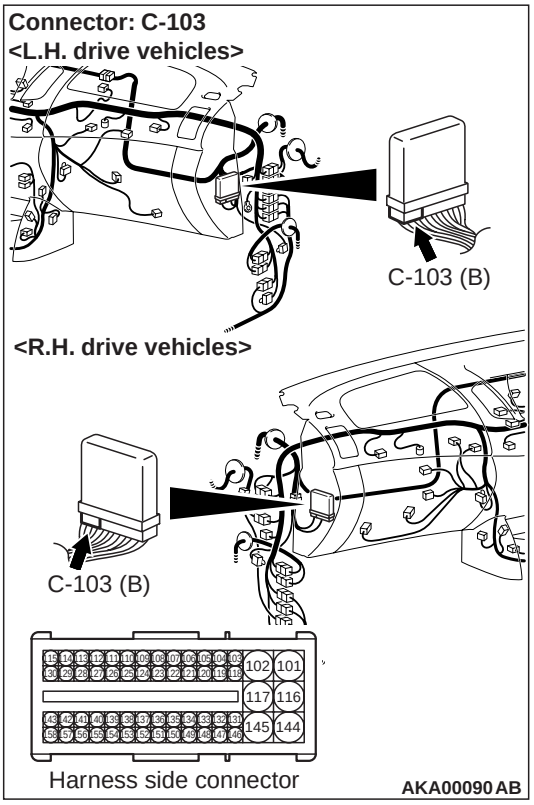
OK: 0.2 – 0.8 V

Q: Is the check result normal?

YES : Go to Step 14 .
NO : Go to Step 13 .

STEP 13. Check harness between C-115 (terminal No. 6) accelerator pedal position sensor connector and C-103 (terminal No. 135) engine-ECU connector.

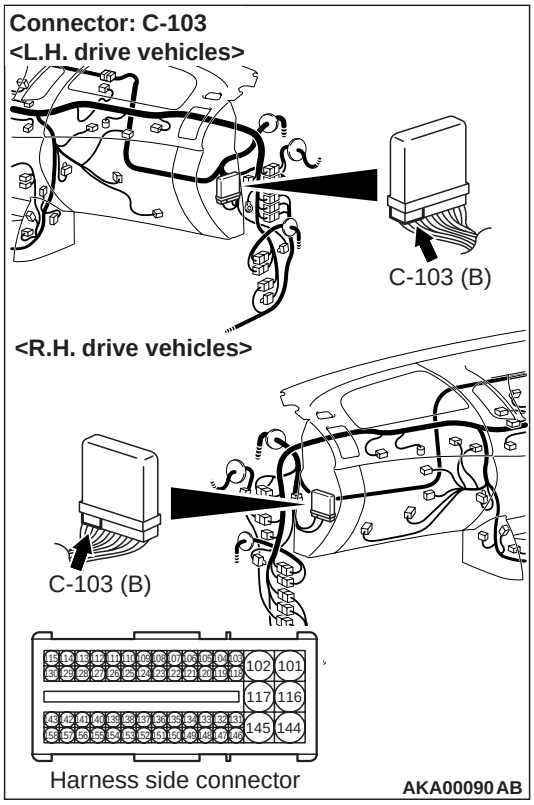




- Check output line for damage.

Q: Is the check result normal?
YES : Replace the accelerator pedal position sensor.
NO : Repair the damaged harness wire.

STEP 14. Connector check: C-103 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 15 .
NO : Repair or replace the connector.

STEP 15. M.U.T.-III diagnosis code

- Reconfirmation of diagnosis code.

Q: Is the diagnosis code set?
YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

Code No. P2146: Injector Common 1 (cylinder No. 1 and No. 4) Circuit Open <Euro5>

OPERATION
- Refer to Code No. P0201: No. 1 Injector Circuit Malfunction P.13A-158.
- Refer to Code No. P0204: No. 4 Injector Circuit Malfunction P.13A-158. <Euro5>

FUNCTION
- The engine-ECU monitors peak current from the No. 1 and No. 4 injector drive circuits.

TROUBLE JUDGMENT

Check Conditions
- Ignition switch is in "ON" position.
- Except during the engine cranking period
- Battery positive voltage is 8 V or more.

Judgment Criterion
- When the peak current is not detected in injector circuits No. 1 and No. 4

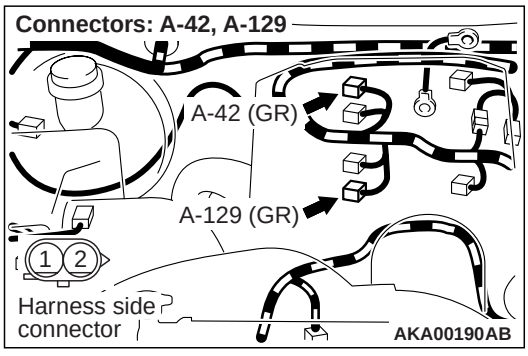
PROBABLE CAUSES
- Failed No. 1 injector
- Failed No. 4 injector
- Open/short circuit in No. 1 and No. 4 injector circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

⚠ ***WARNING***

A high-tension voltage is flowing between the engine-ECU and the injectors while the engine is running. Handle them carefully to avoid receiving electric shocks from the voltage.

STEP 1. Connector check: A-42 No. 1 injector connector and A-129 No. 4 injector connector



Q: Are the check results normal?

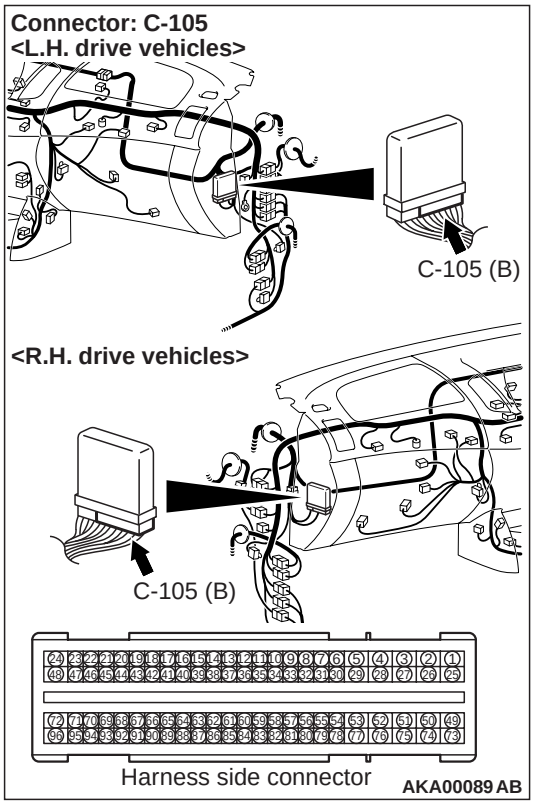
YES : Go to Step 2 .
NO : Repair or replace the connector.

STEP 2. Check Injector itself
- Check No. 1 injector and No. 4 injector itself (Refer to P.13A-595).

Q: Is the check result normal?

YES : Go to Step 3 .
NO : Replace the injector. After replacing the Injector, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).

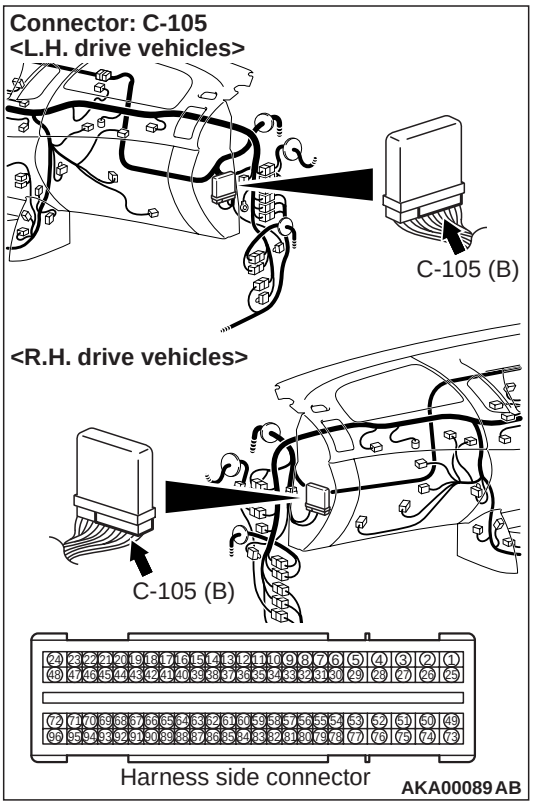
STEP 3. Connector check: C-105 engine-ECU connector

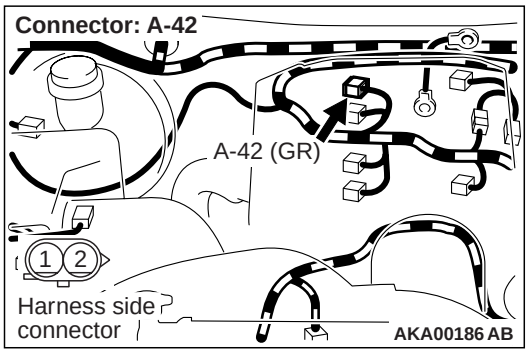


Q: Is the check result normal?

YES : Go to Step 4 .
NO : Repair or replace the connector.

STEP 4. Check harness between C-105 (terminal No. 1) engine-ECU connector and A-42 (terminal No. 2) No. 1 injector connector.

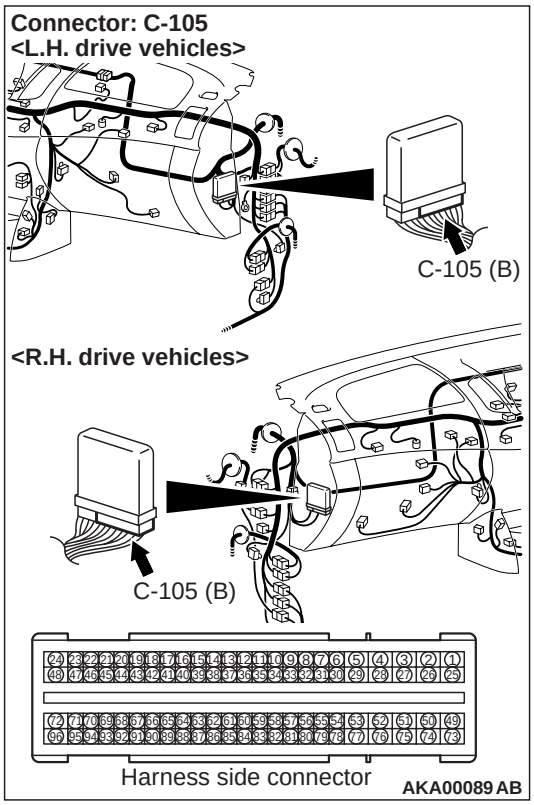


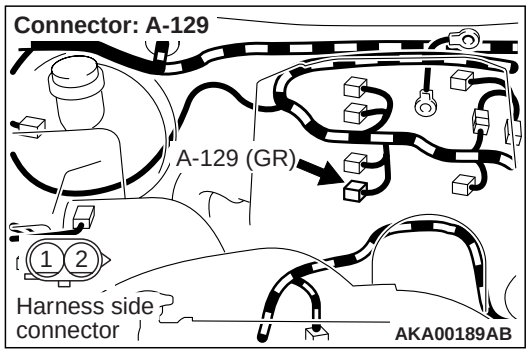


- Check power supply line for open/short circuit.

Q: Is the check result normal?
YES : Go to Step 5 .
NO : Repair the damaged harness wire.

STEP 5. Check harness between C-105 (terminal No. 25) engine-ECU connector and A-129 (terminal No. 2) No. 4 injector connector.

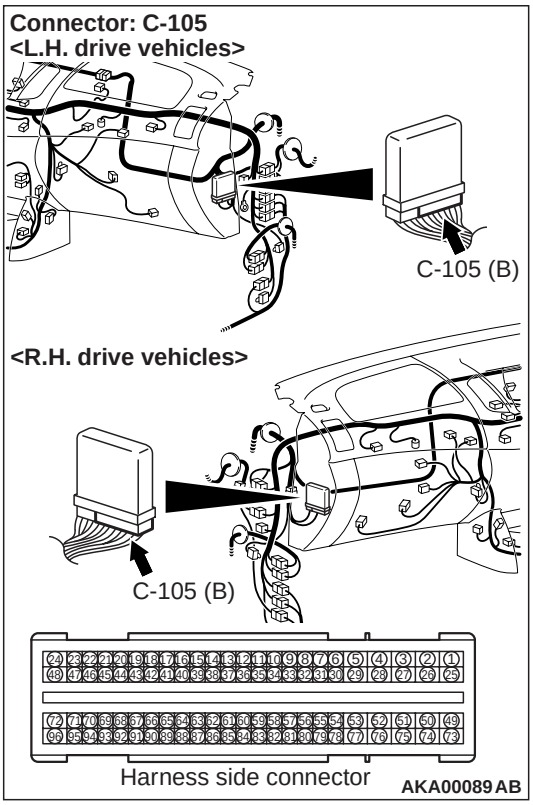


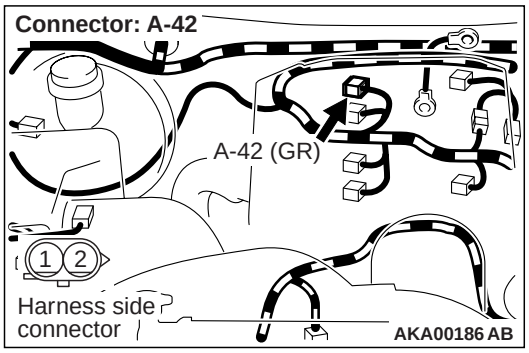


- Check power supply line for open/short circuit.

Q: Is the check result normal?
YES : Go to Step 6 .
NO : Repair the damaged harness wire.

STEP 6. Check harness between C-105 (terminal No. 2) engine-ECU connector and A-42 (terminal No. 1) No. 1 injector connector.

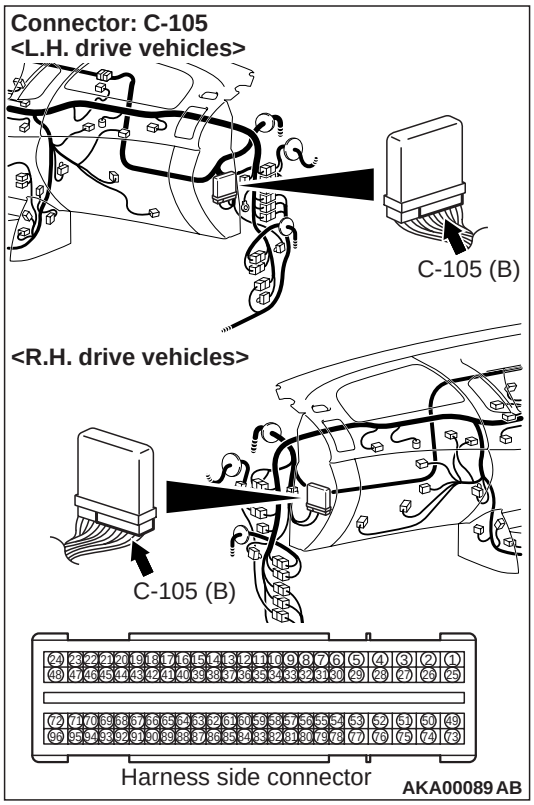


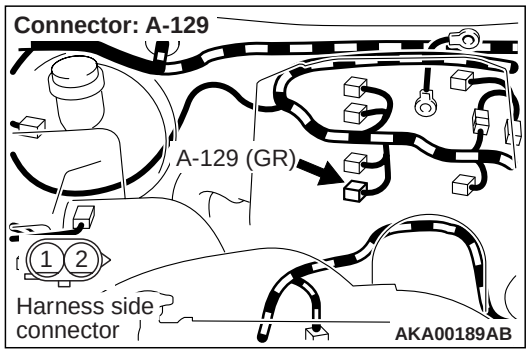


- Check earthing line for open/short circuit.

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair the damaged harness wire.

STEP 7. Check harness between C-105 (terminal No. 27) engine-ECU connector and A-129 (terminal No. 1) No. 4 injector connector.





- Check earthing line for open circuit.

Q: Is the check result normal?
YES : Go to Step 8 .
NO : Repair the damaged harness wire.

STEP 8. M.U.T.-III diagnosis code.

- After erasing the diagnosis code through M.U.T.-III, start the engine and confirm whether the diagnosis code is output.

Q: Is the diagnosis code set?

YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, carry out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

Code No. P2146: Injector Common 1 (cylinder No. 1 and No. 4) Circuit Open <Except Euro5>

OPERATION

- Driving power is supplied from the engine-ECU (terminal No. 1) to the No. 1 injector terminal (terminal No. 2) and No. 4 injector (terminal No. 2).

FUNCTION

- The engine-ECU monitors peak current from the No. 1 and No. 4 injector drive circuits.

TROUBLE JUDGMENT

Check Conditions

- Ignition switch is in "ON" position.
- Except during the engine cranking period
- Battery positive voltage is 8 V or more.

Judgment Criterion

- When the peak current is not detected in injector circuits No. 1 and No. 4

PROBABLE CAUSES

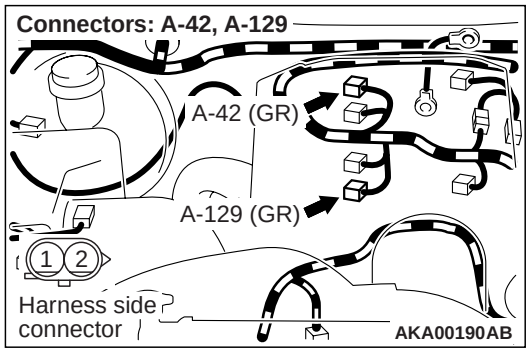
- Failed No. 1 injector
- Failed No. 4 injector
- Open/short circuit in No. 1 and No. 4 injector circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

⚠ ***WARNING***

A high-tension voltage is flowing between the engine-ECU and the injectors while the engine is running. Handle them carefully to avoid receiving electric shocks from the voltage.

STEP 1. Connector check: A-42 No. 1 injector connector and A-129 No. 4 injector connector



Q: Are the check results normal?

YES : Go to Step 2 .

NO : Repair or replace the connector.

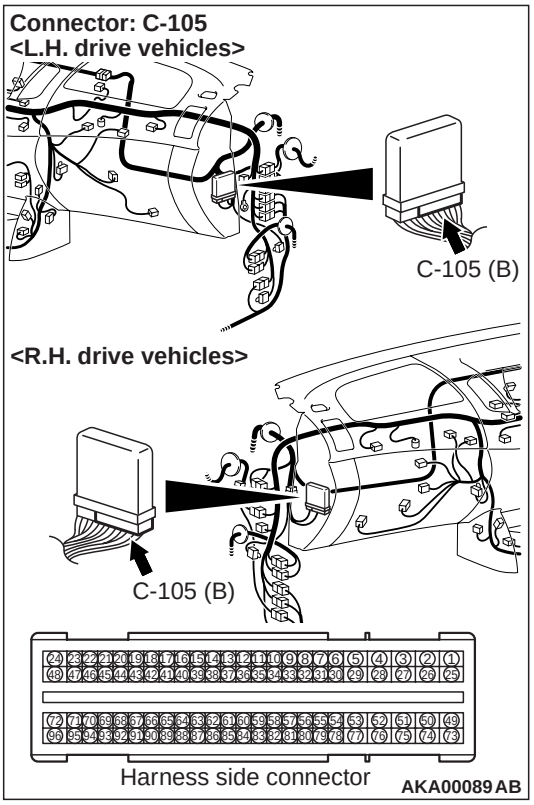
STEP 2. Check Injector itself

- Check No. 1 injector and No. 4 injector itself (Refer to P.13A-595).

Q: Is the check result normal?

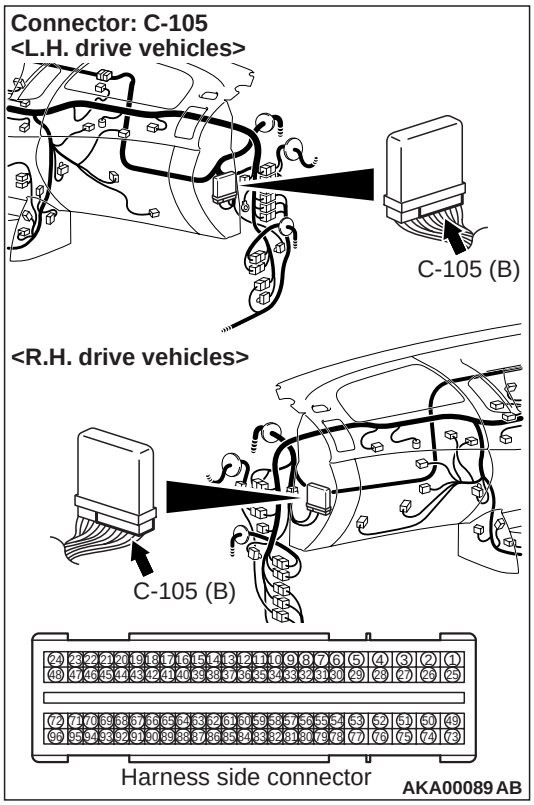
YES : Go to Step 3 .
NO : Replace the injector. After replacing the Injector, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).

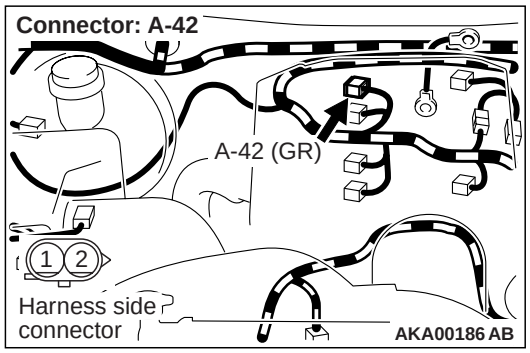
STEP 3. Connector check: C-105 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 4 .
NO : Repair or replace the connector.

STEP 4. Check harness between C-105 (terminal No. 1) engine-ECU connector and A-42 (terminal No. 2) No. 1 injector connector.

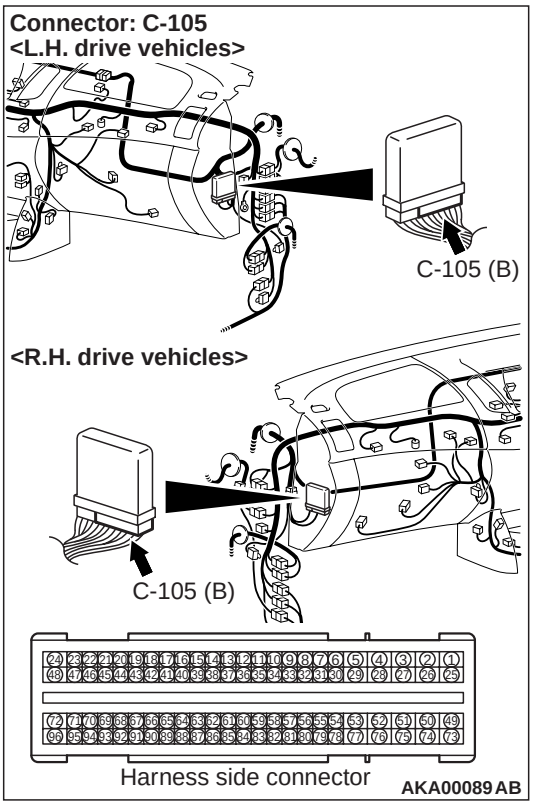


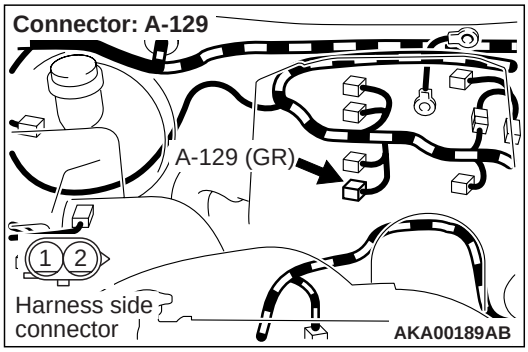


- Check power supply line for open/short circuit.

Q: Is the check result normal?
YES : Go to Step 5 .
NO : Repair the damaged harness wire.

STEP 5. Check harness between C-105 (terminal No. 1) engine-ECU connector and A-129 (terminal No. 2) No. 4 injector connector.

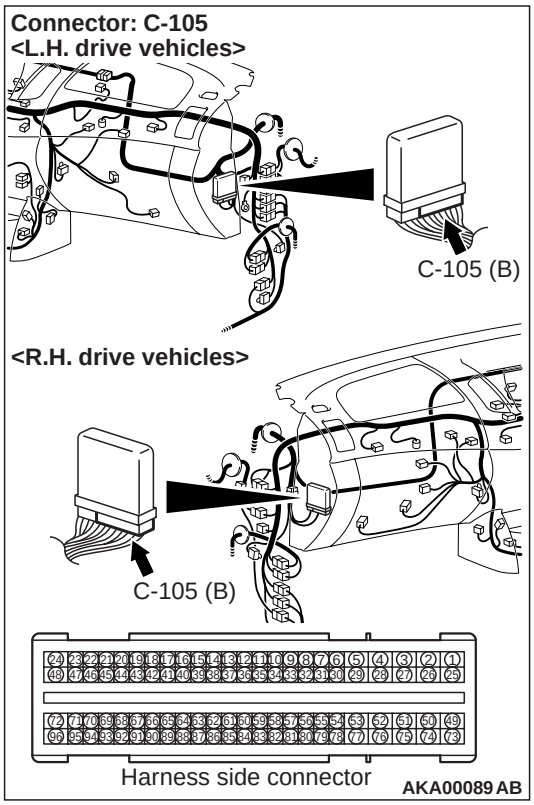


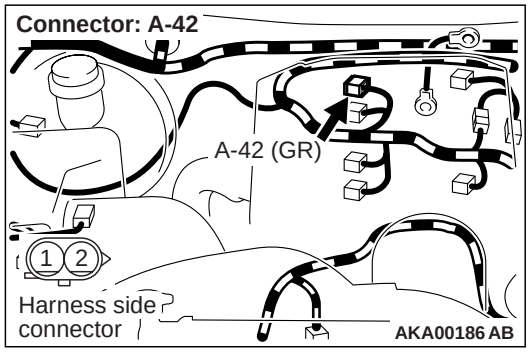


- Check power supply line for open/short circuit.

Q: Is the check result normal?
YES : Go to Step 6 .
NO : Repair the damaged harness wire.

STEP 6. Check harness between C-105 (terminal No. 2) engine-ECU connector and A-42 (terminal No. 1) No. 1 injector connector.

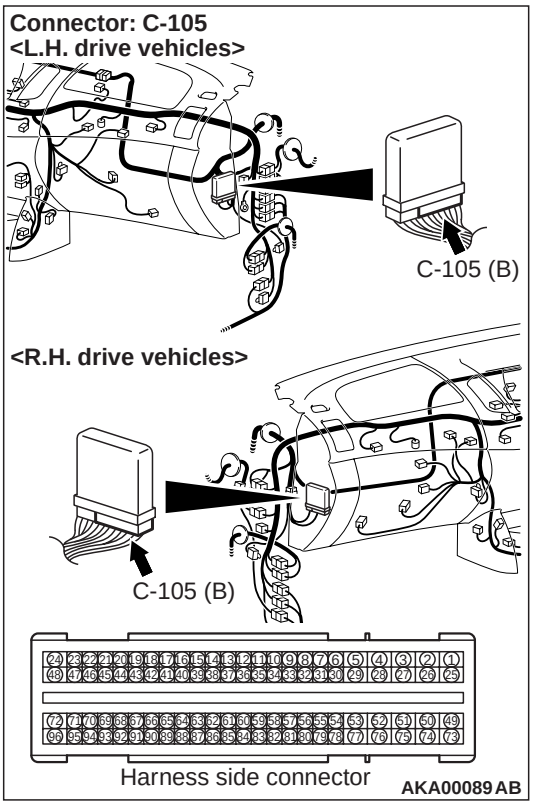


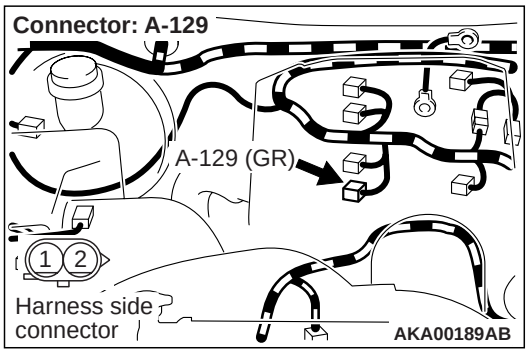


- Check earthing line for open/short circuit.

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair the damaged harness wire.

STEP 7. Check harness between C-105 (terminal No. 27) engine-ECU connector and A-129 (terminal No. 1) No. 4 injector connector.





- Check earthing line for open circuit.

Q: Is the check result normal?

YES : Go to Step 8 .
NO : Repair the damaged harness wire.

STEP 8. M.U.T.-III diagnosis code.

- After erasing the diagnosis code through M.U.T.-III, start the engine and confirm whether the diagnosis code is output.

Q: Is the diagnosis code set?

YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

Code No. P2147: Injector Common 1 (Cylinder No. 1 and No. 4) Circuit Earth Short <Euro5>

OPERATION

- Refer to Code No. P0201: No. 1 Injector Circuit Malfunction P.13A-158.
- Refer to Code No. P0204: No. 4 Injector Circuit Malfunction P.13A-173. <Euro5>

FUNCTION

- The engine-ECU monitors voltage application to the injector during no injector energization to detect errors in the No. 1 and No. 4 injector drive circuit.

TROUBLE JUDGMENT

Check Conditions

- Ignition switch is in "ON" position.

- Except during the engine cranking period
- Battery positive voltage is 8 V or more.
- When an engine-ECU internal capacitor is allowed to be charged

Judgment Criterion

- Short-circuit to the ground is detected in the injector drive circuit.

PROBABLE CAUSES

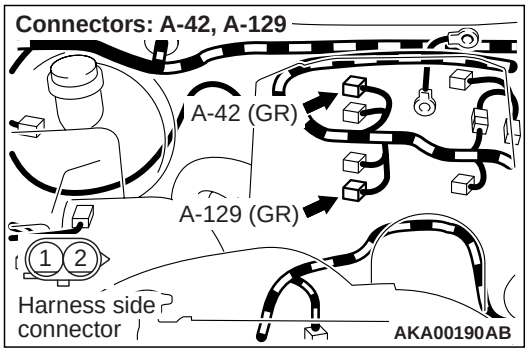
- Short circuit in injector circuit or loose connector contact
- Failed No. 1 injector
- Failed No. 4 injector
- Failed engine-ECU

DIAGNOSIS PROCEDURE

⚠ ***WARNING***

A high-tension voltage is flowing between the engine-ECU and the injectors while the engine is running. Handle them carefully to avoid receiving electric shocks from the voltage.

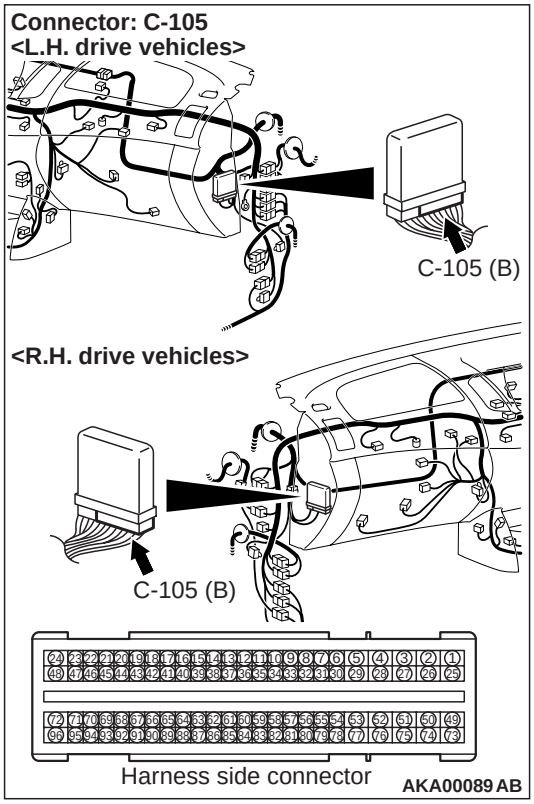
STEP 1. Connector check: A-42 No. 1 injector connector and A-129 No. 4 injector connector.



Q: Are the check results normal?

YES : Go to Step 2 .
NO : Repair or replace the connector.

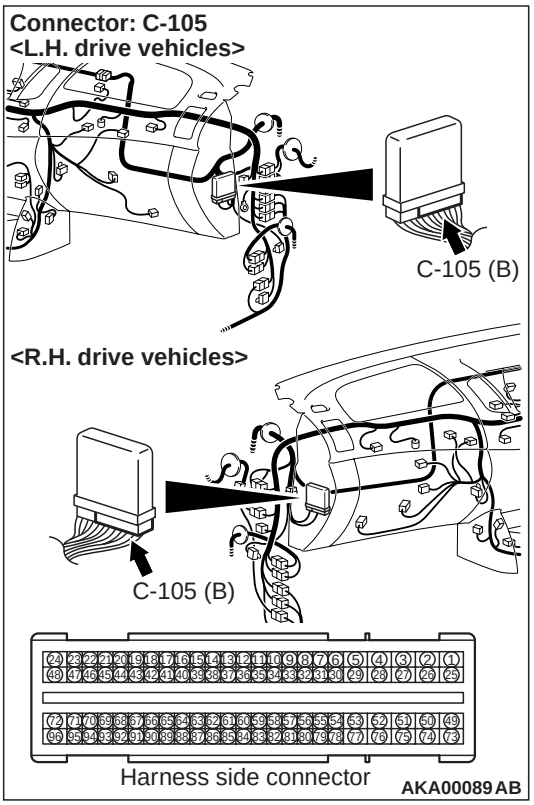
STEP 2. Connector check: C-105 engine-ECU connector.

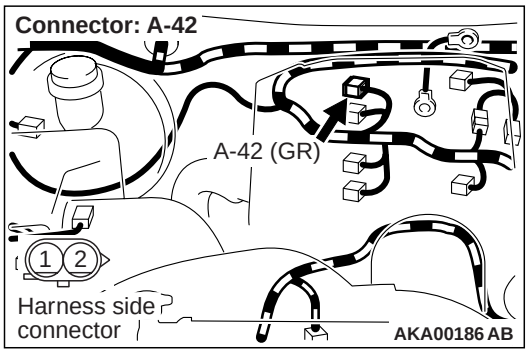


Q: Is the check result normal?

YES : Go to Step 3 .
NO : Repair or replace the connector.

STEP 3. Check harness between C-105 (terminal No. 2) engine-ECU connector and A-42 (terminal No. 1) No. 1 injector connector.

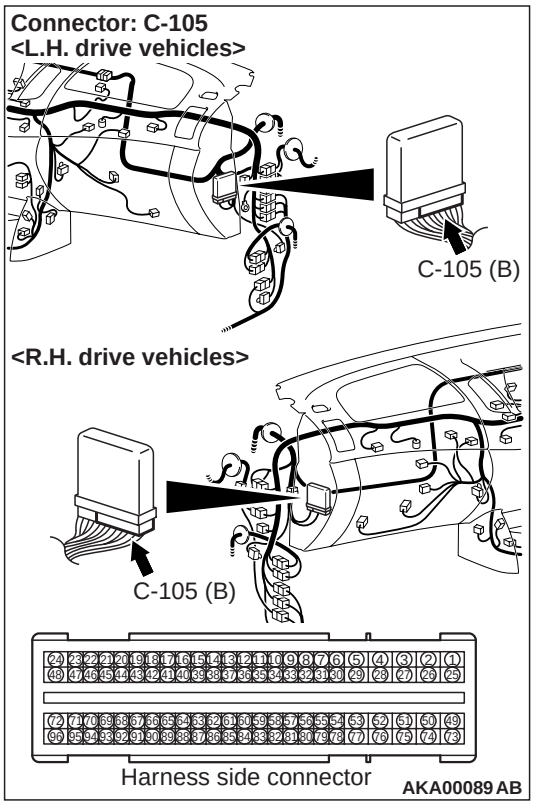


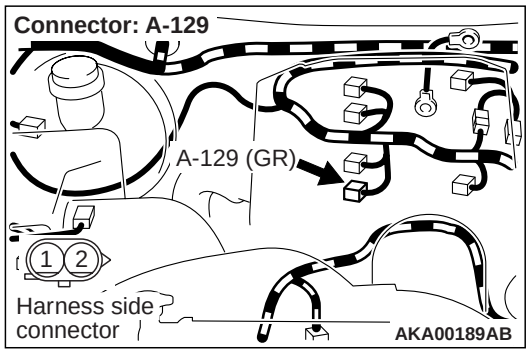


- Check earthing line for short circuit.

Q: Is the check result normal?
YES : Go to Step 4 .
NO : Repair the damaged harness wire.

STEP 4. Check harness between C-105 (terminal No. 27) engine-ECU connector and A-129 (terminal No. 1) No. 4 injector connector.

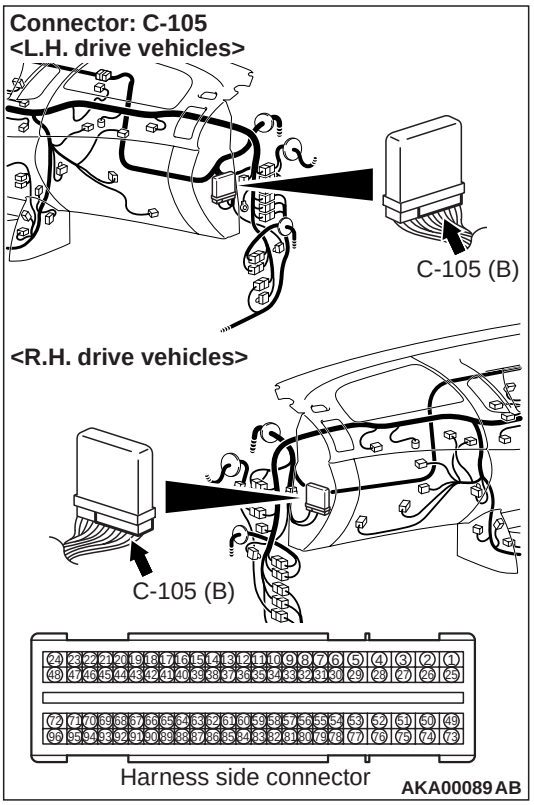


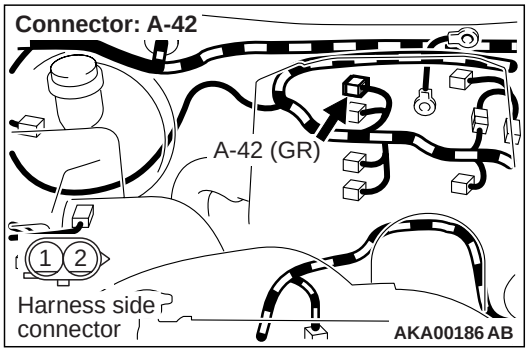


- Check earthing line for short circuit.

Q: Is the check result normal?
YES : Go to Step 5 .
NO : Repair the damaged harness wire.

STEP 5. Check harness between C-105 (terminal No. 1) engine-ECU connector and A-42 (terminal No. 2) No. 1 injector connector.

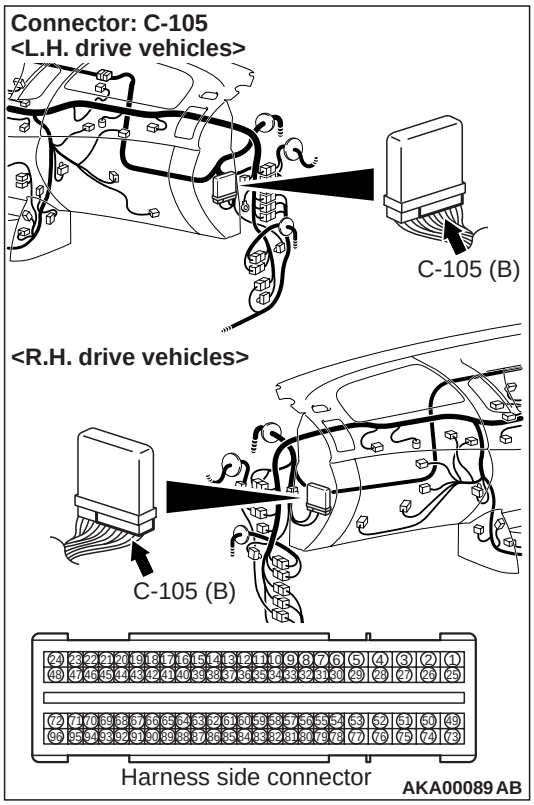


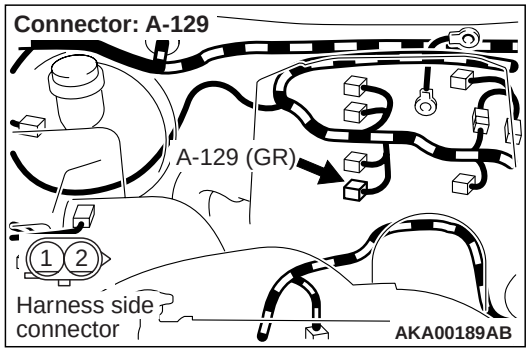


- Check power supply line for short circuit.

Q: Is the check result normal?
YES : Go to Step 6 .
NO : Repair the damaged harness wire.

STEP 6. Check harness between C-105 (terminal No. 25) engine-ECU connector and A-129 (terminal No. 2) No. 4 injector connector.





- Check power supply line for short circuit.

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair the damaged harness wire.

STEP 7. Check Injector itself

- Check No. 1 injector and No. 4 injector itself (Refer to P.13A-595).

Q: Is the check result normal?
YES : Go to Step 8 .
NO : Replace the injector.

STEP 8. M.U.T.-III diagnosis code.

- After clearing the diagnosis code through M.U.T.-III, start the engine and confirm whether the diagnosis code is set.

Q: Is the diagnosis code set?

YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, carry out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

Code No. P2147: Injector Common Circuit Earth Short <Except Euro5>

FUNCTION

- The engine-ECU monitors voltage application to the injector during no injector energization to detect errors in the injector drive circuit.

TROUBLE JUDGMENT

Check Conditions

- Ignition switch is in "ON" position.
- Except during the engine cranking period
- Battery positive voltage is 8 V or more.
- When an engine-ECU internal capacitor is allowed to be charged

Judgment Criterion

- Short-circuit to earth is detected in the injector drive circuit.

PROBABLE CAUSES

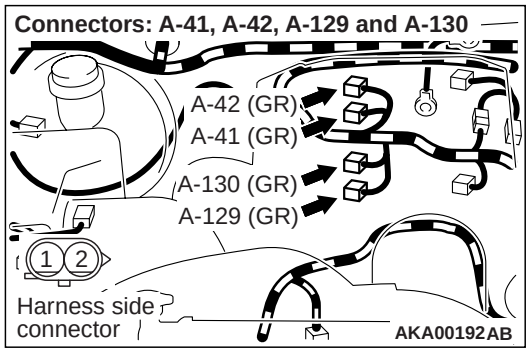
- Failed injector
- Short circuit in injector circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

⚠ ***WARNING***

A high-tension voltage is flowing between the engine-ECU and the injectors while the engine is running. Handle them carefully to avoid receiving electric shocks from the voltage.

STEP 1. Connector check: A-41, A-42, A-129 and A-130 injector connectors



Q: Are the check results normal?

YES : Go to Step 2.

NO : Repair or replace the connector.

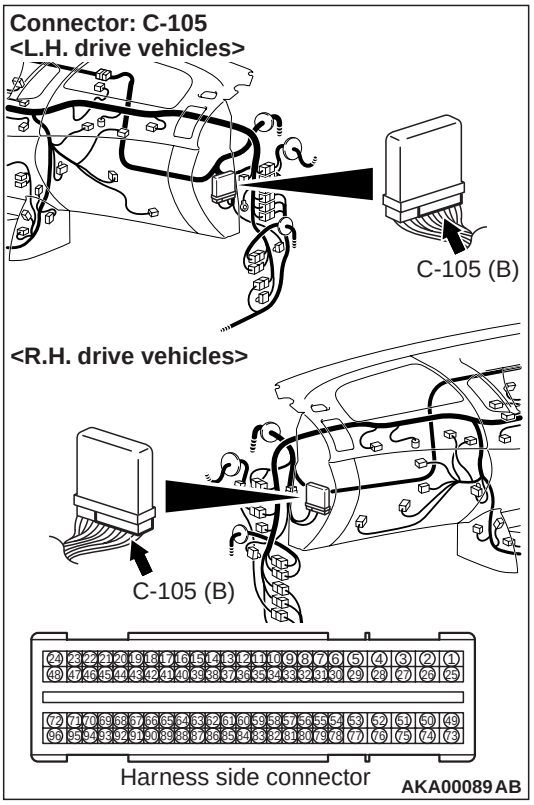
STEP 2. Check Injector itself

- Check injector itself (Refer to P.13A-595).

Q: Is the check result normal?

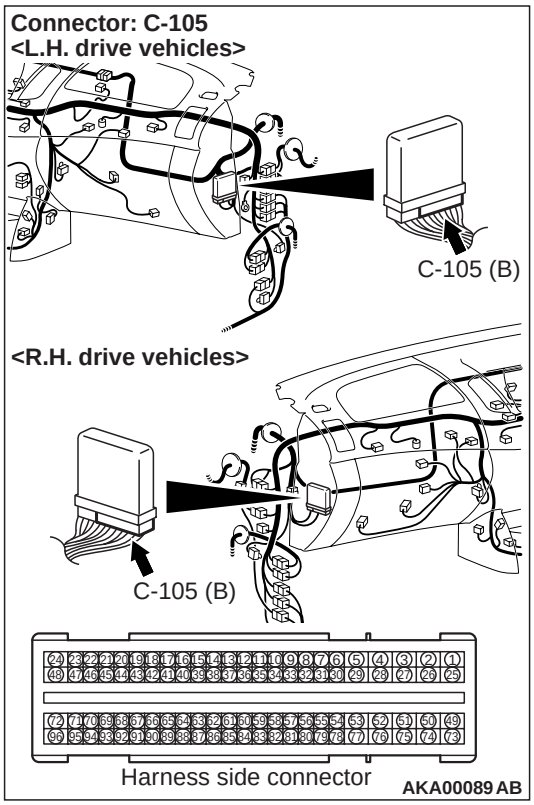
YES : Go to Step 3.
NO : Replace the injector. After replacing the Injector, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).

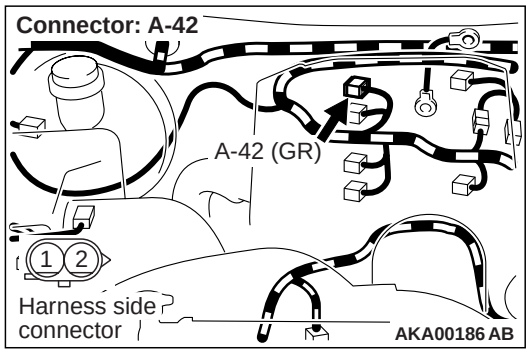
STEP 3. Connector check: C-105 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 4.
NO : Repair or replace the connector.

STEP 4. Check harness between C-105 (terminal No. 2) engine-ECU connector and A-42 (terminal No. 1) No. 1 injector connector.

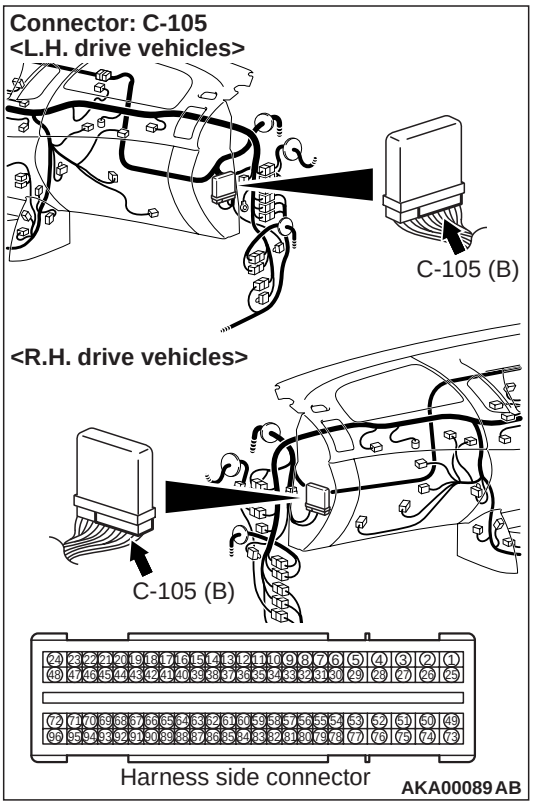


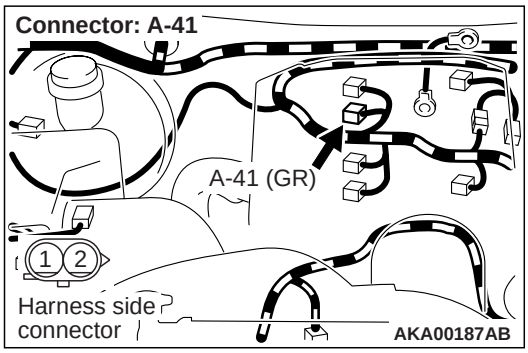


- Check earthing line for short circuit.

Q: Is the check result normal?
YES : Go to Step 5.
NO : Repair the damaged harness wire.

STEP 5. Check harness between C-105 (terminal No. 75) engine-ECU connector and A-41 (terminal No. 1) No. 2 injector connector.

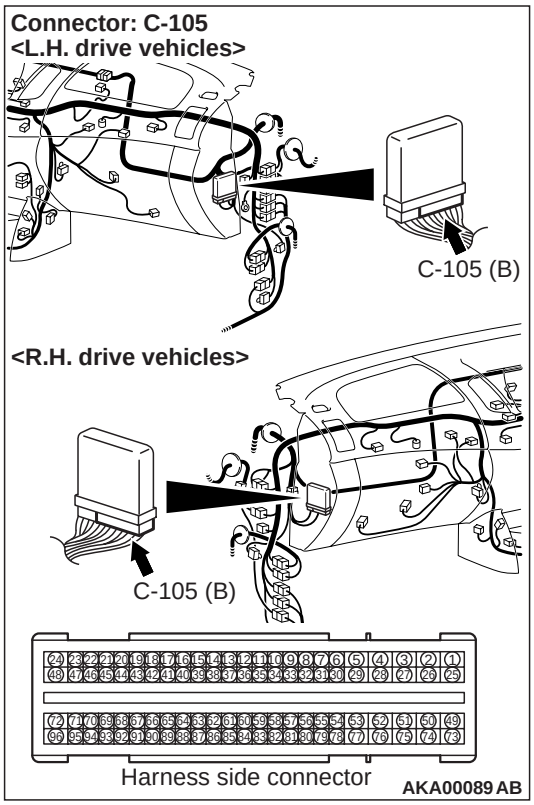


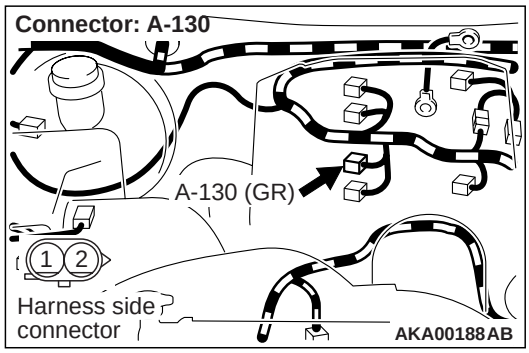


- Check earthing line for short circuit.

Q: Is the check result normal?
YES : Go to Step 6.
NO : Repair the damaged harness wire.

STEP 6. Check harness between C-105 (terminal No. 50) engine-ECU connector and A-130 (terminal No. 1) No. 3 injector connector.

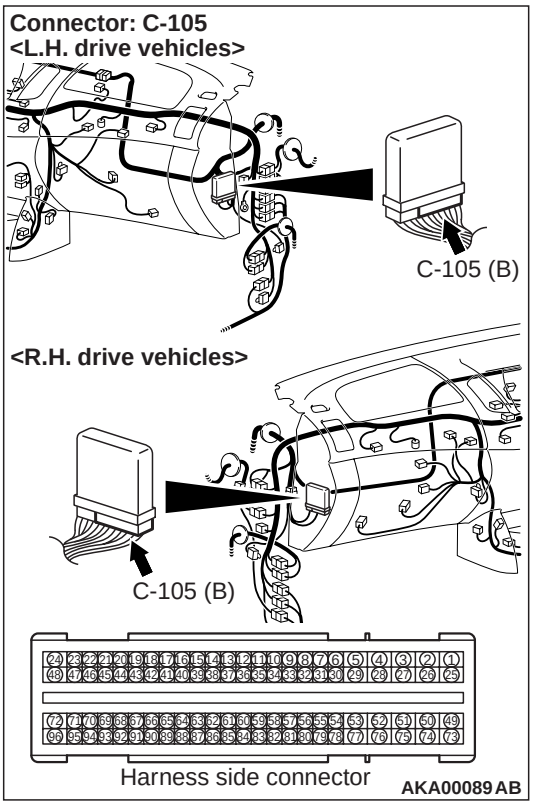


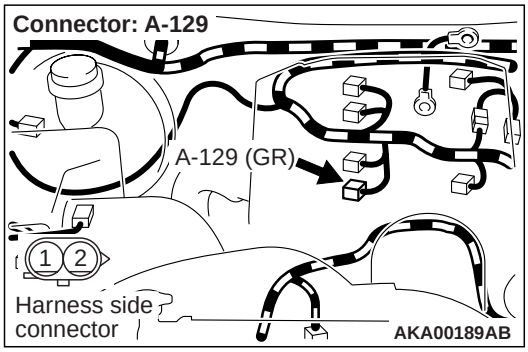


- Check earthing line for short circuit.

Q: Is the check result normal?
YES : Go to Step 7.
NO : Repair the damaged harness wire.

STEP 7. Check harness between C-105 (terminal No. 27) engine-ECU connector and A-129 (terminal No. 1) No. 4 injector connector.

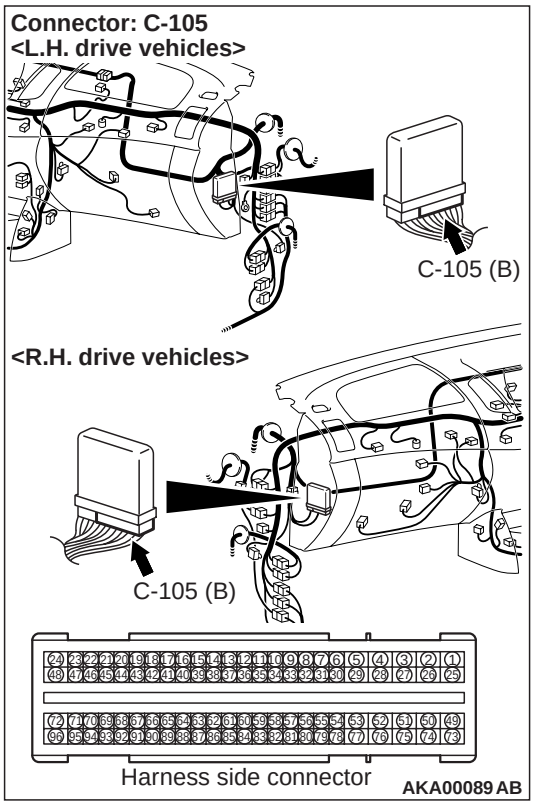


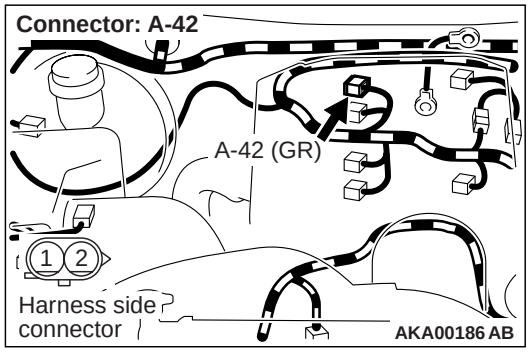


- Check earthing line for short circuit.

Q: Is the check result normal?
YES : Go to Step 8.
NO : Repair the damaged harness wire.

STEP 8. Check harness between C-105 (terminal No. 1) engine-ECU connector and A-42 (terminal No. 2) No. 1 injector connector.

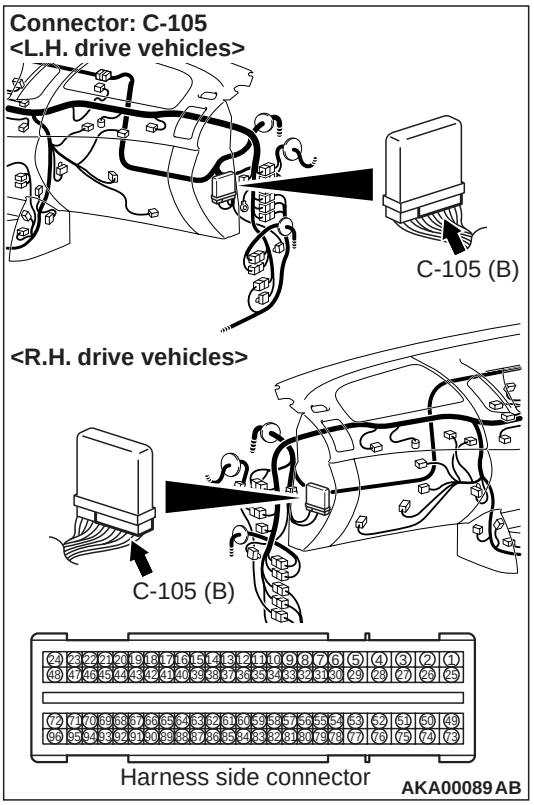


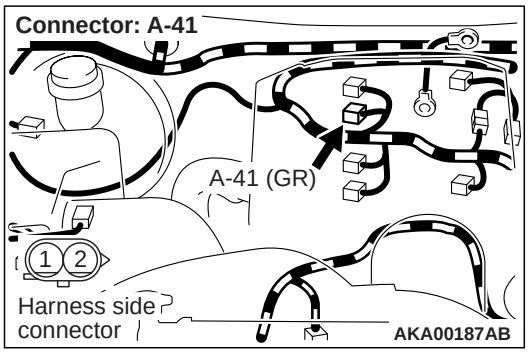


- Check power supply line for short circuit.

Q: Is the check result normal?
YES : Go to Step 9.
NO : Repair the damaged harness wire.

STEP 9. Check harness between C-105 (terminal No. 25) engine-ECU connector and A-41 (terminal No. 2) No. 2 injector connector.

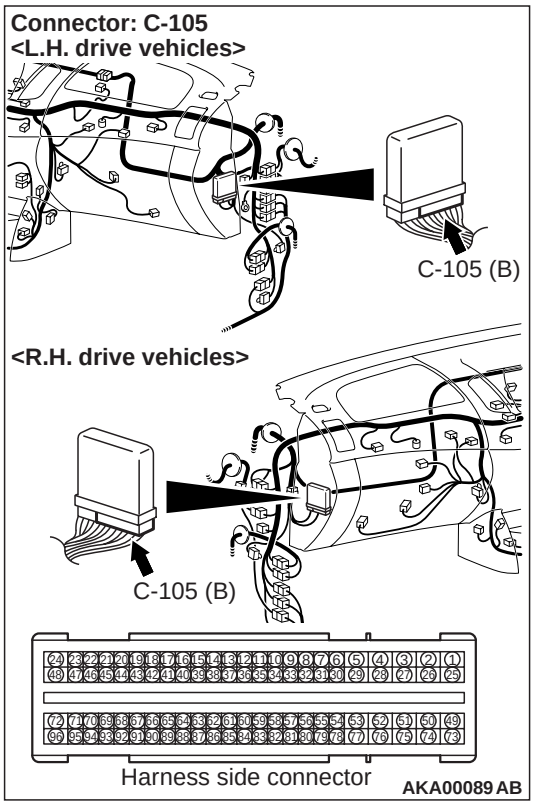


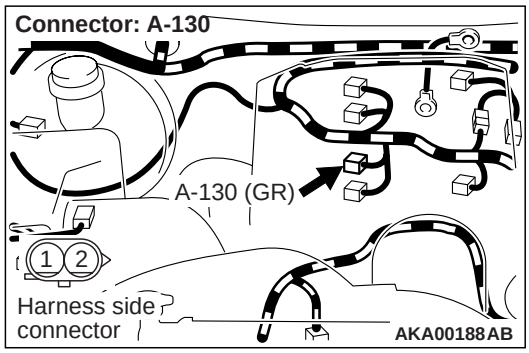


- Check power supply line for short circuit.

Q: Is the check result normal?
YES : Go to Step 10.
NO : Repair the damaged harness wire.

STEP 10. Check harness between C-105 (terminal No. 25) engine-ECU connector and A-130 (terminal No. 2) No. 3 injector connector.

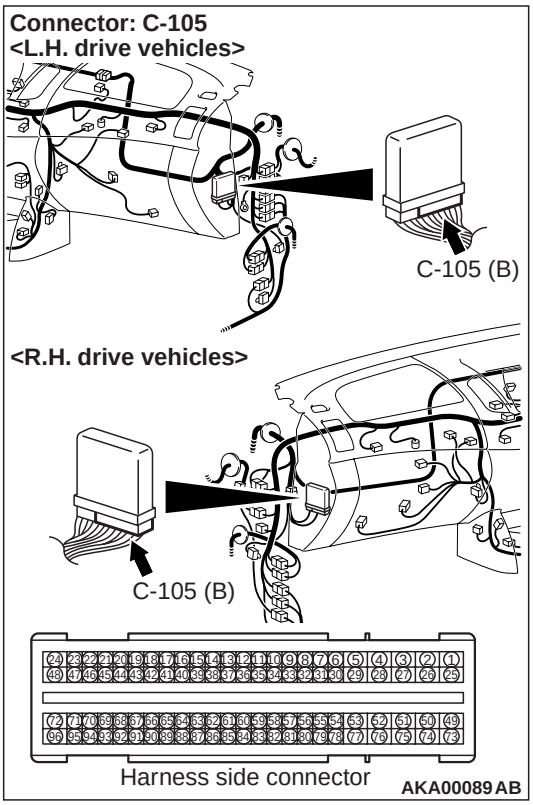


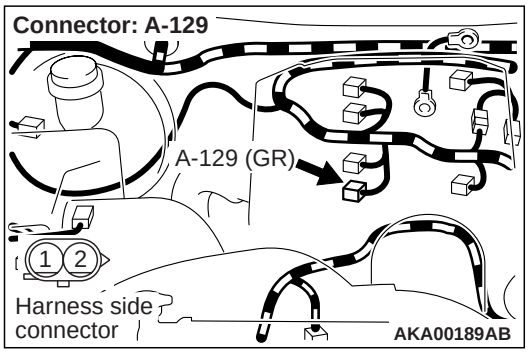


- Check power supply line for short circuit.

Q: Is the check result normal?
YES : Go to Step 11.
NO : Repair the damaged harness wire.

STEP 11. Check harness between C-105 (terminal No. 1) engine-ECU connector and A-129 (terminal No. 2) No. 4 injector connector.





- Check power supply line for short circuit.

Q: Is the check result normal?

YES : Go to Step 12.
NO : Repair the damaged harness wire.

STEP 12. M.U.T.-III diagnosis code.

- After erasing the diagnosis code through M.U.T.-III, start the engine and confirm whether the diagnosis code is set.

Q: Is the diagnosis code set?

YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

Code No. P2148: Injector Common 1 (Cylinder No. 1 and No. 4) Circuit Battery Short <Euro5>

OPERATION

- Refer to Code No. P0201: No. 1 Injector Circuit Malfunction P.13A-158.
- Refer to Code No. P0204: No. 4 Injector Circuit Malfunction P.13A-173. <Euro5>

FUNCTION

- The engine-ECU monitors voltage application to the injector during no injector energization to detect errors in the No. 1 and No. 4 injector drive circuit.

TROUBLE JUDGMENT

Check Condition

- Ignition switch is in "ON" position.

Judgment Criterion
- Short-circuit to the battery is detected in the injector drive circuit.

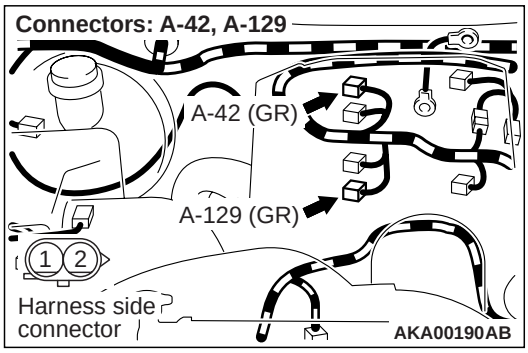
PROBABLE CAUSES
- Short circuit in injector circuit or loose connector contact
- Failed No. 1 injector
- Failed No. 4 injector
- Failed engine-ECU

DIAGNOSIS PROCEDURE

⚠ WARNING

A high-tension voltage is flowing between the engine-ECU and the injectors while the engine is running. Handle them carefully to avoid receiving electric shocks from the voltage.

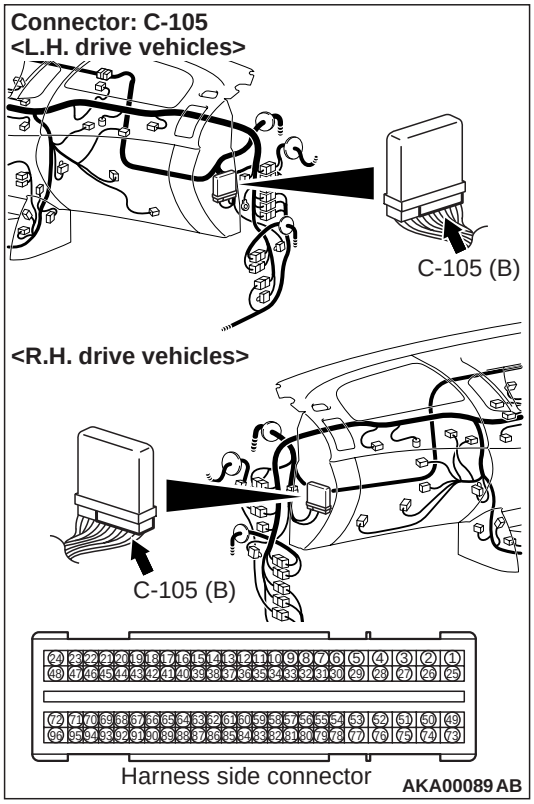
STEP 1. Connector check: A-42 No. 1 injector connector and A-129 No. 4 injector connector.



Q: Are the check results normal?

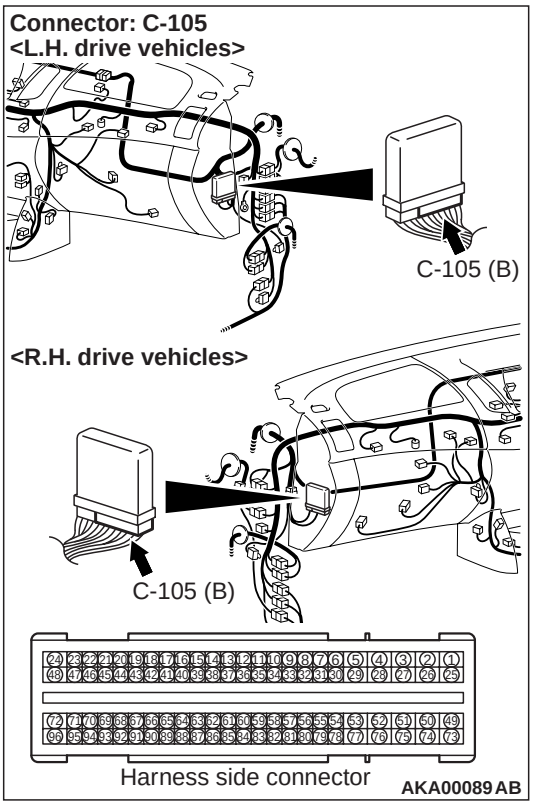
YES : Go to Step 2 .
NO : Repair or replace the connector.

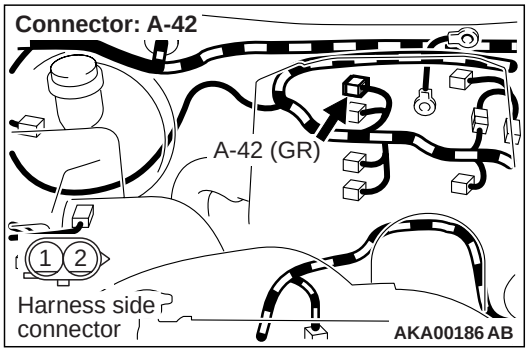
STEP 2. Connector check: C-105 engine-ECU connector.



Q: Is the check result normal?
YES : Go to Step 3 .
NO : Repair or replace the connector.

STEP 3. Check harness between C-105 (terminal No. 2) engine-ECU connector and A-42 (terminal No. 1) No. 1 injector connector.

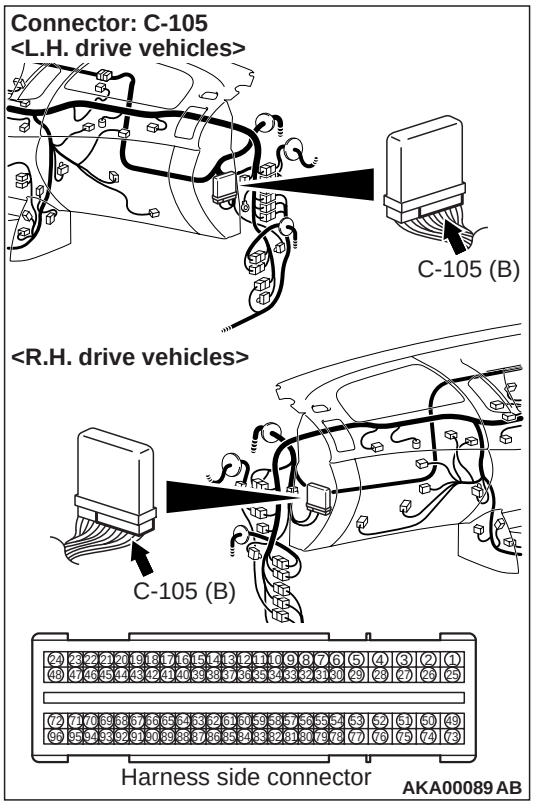


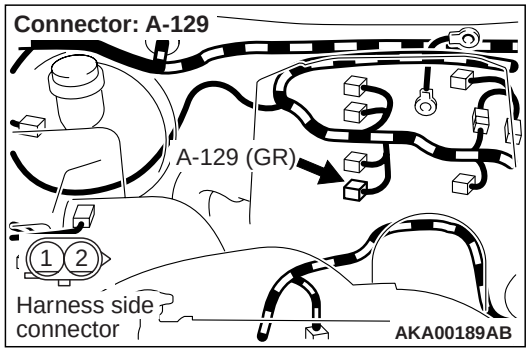


- Check earthing line for short circuit.

Q: Is the check result normal?
YES : Go to Step 4 .
NO : Repair the damaged harness wire.

STEP 4. Check harness between C-105 (terminal No. 27) engine-ECU connector and A-129 (terminal No. 1) No. 4 injector connector.

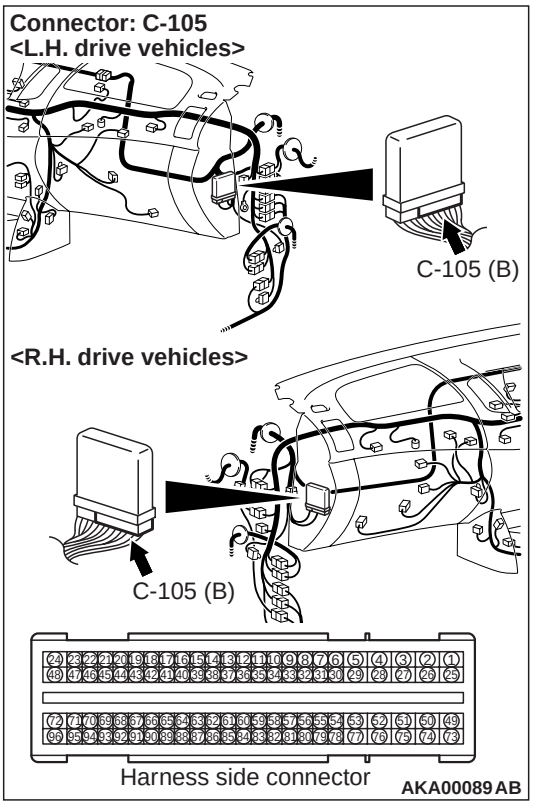


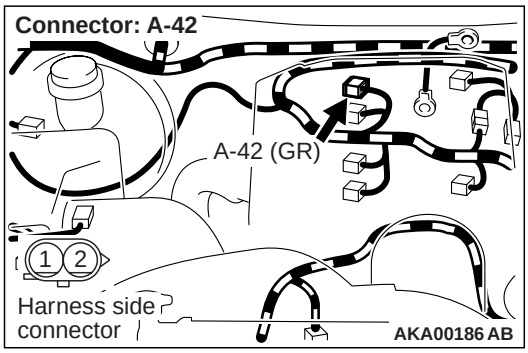


- Check earthing line for short circuit.

Q: Is the check result normal?
YES : Go to Step 5 .
NO : Repair the damaged harness wire.

STEP 5. Check harness between C-105 (terminal No. 1) engine-ECU connector and A-42 (terminal No. 2) No. 1 injector connector.

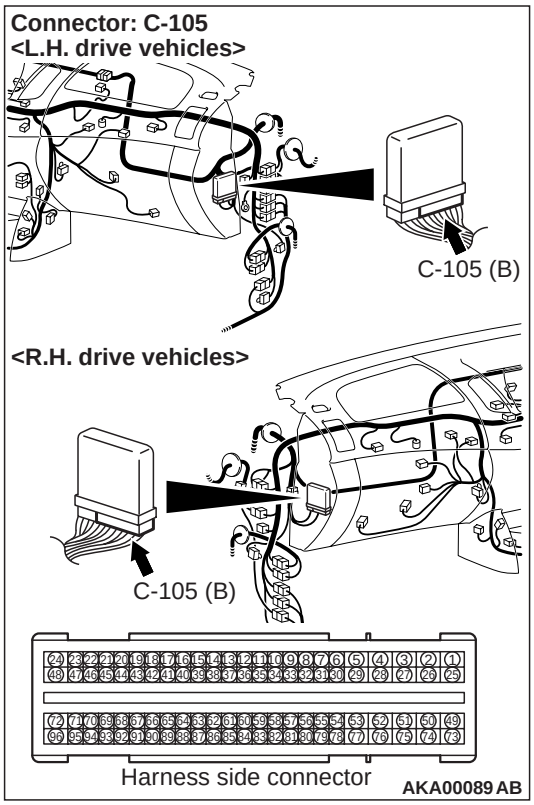


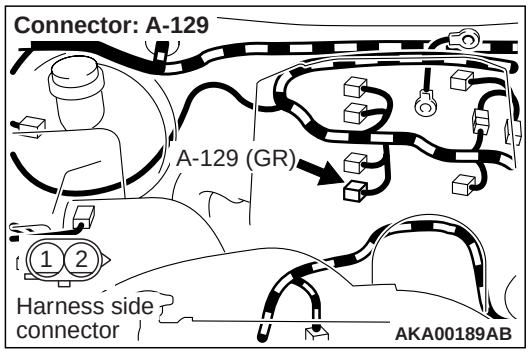


- Check power supply line for short circuit.

Q: Is the check result normal?
YES : Go to Step 6 .
NO : Repair the damaged harness wire.

STEP 6. Check harness between C-105 (terminal No. 25) engine-ECU connector and A-129 (terminal No. 2) No. 4 injector connector.





- Check power supply line for short circuit.

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair the damaged harness wire.

STEP 7. Check Injector itself

- Check No. 1 injector and No. 4 injector itself (Refer to P.13A-595).

Q: Is the check result normal?
YES : Go to Step 8 .
NO : Replace the injector.

STEP 8. M.U.T.-III diagnosis code.

- After clearing the diagnosis code through M.U.T.-III, start the engine and confirm whether the diagnosis code is set.

Q: Is the diagnosis code set?

YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, carry out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

Code No. P2148: Injector Common Circuit Battry Short <Except Euro5>

FUNCTION

- The engine-ECU monitors voltage application to the injector during no injector energization to detect errors in the injector drive circuit.

TROUBLE JUDGMENT

Check Condition

- Ignition switch is in "ON" position.

Judgment Criterion

- Short-circuit to earth is detected in the injector drive circuit.

PROBABLE CAUSES

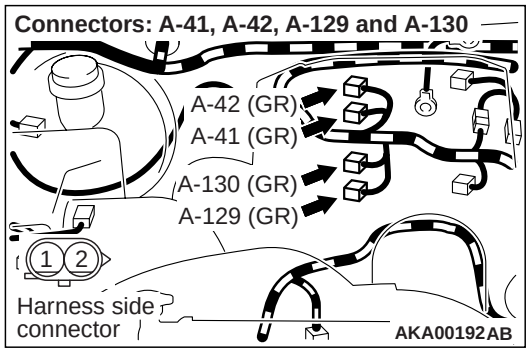
- Failed injector
- Short circuit in injector circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

⚠ ***WARNING***

A high-tension voltage is flowing between the engine-ECU and the injectors while the engine is running. Handle them carefully to avoid receiving electric shocks from the voltage.

STEP 1. Connector check: A-41, A-42, A-129 and A-130 injector connectors



Q: Are the check results normal?

YES : Go to Step 2.

NO : Repair or replace the connector.

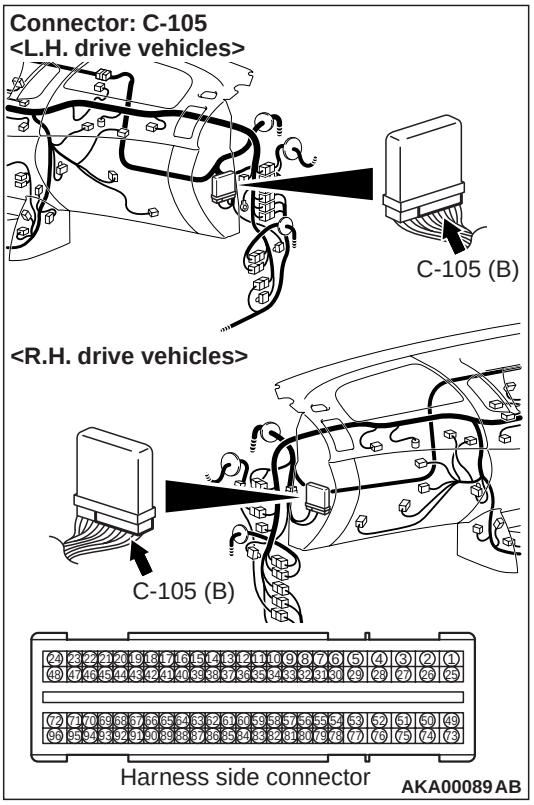
STEP 2. Check Injector itself

- Check injector itself (Refer to P.13A-595).

Q: Is the check result normal?

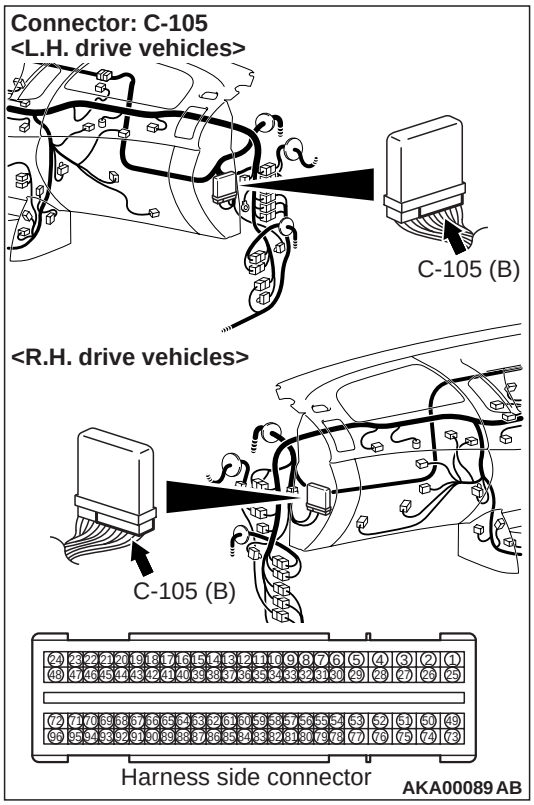
YES : Go to Step 3.
NO : Replace the injector. After replacing the Injector, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).

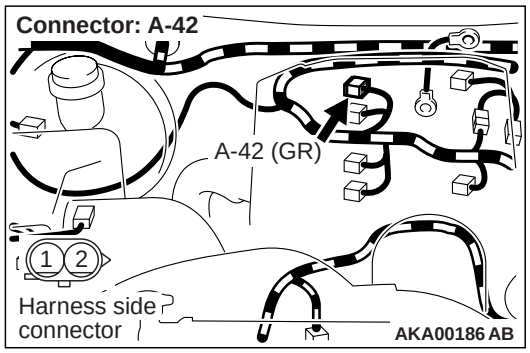
STEP 3. Connector check: C-105 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 4.
NO : Repair or replace the connector.

STEP 4. Check harness between C-105 (terminal No. 2) engine-ECU connector and A-42 (terminal No. 1) No. 1 injector connector.

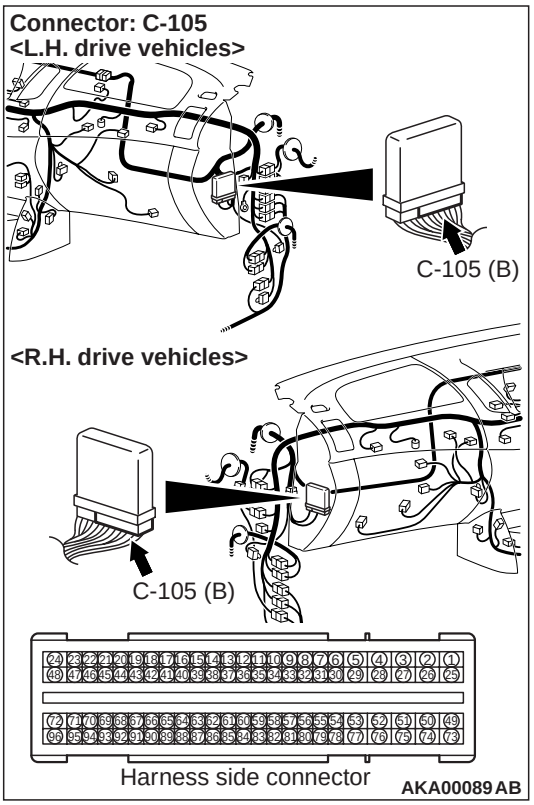


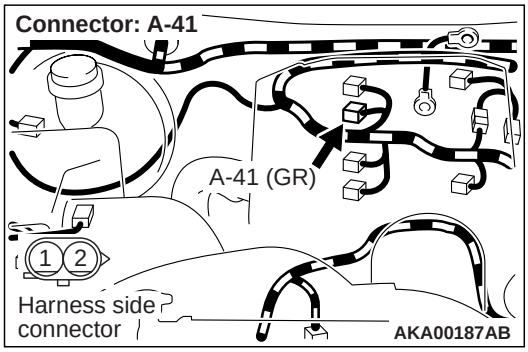


- Check earthing line for short circuit.

Q: Is the check result normal?
YES : Go to Step 5.
NO : Repair the damaged harness wire.

STEP 5. Check harness between C-105 (terminal No. 75) engine-ECU connector and A-41 (terminal No. 1) No. 2 injector connector.

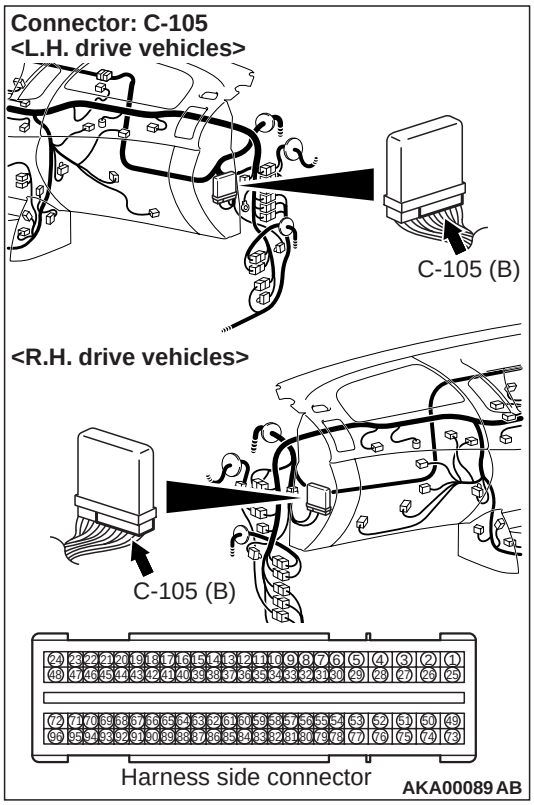


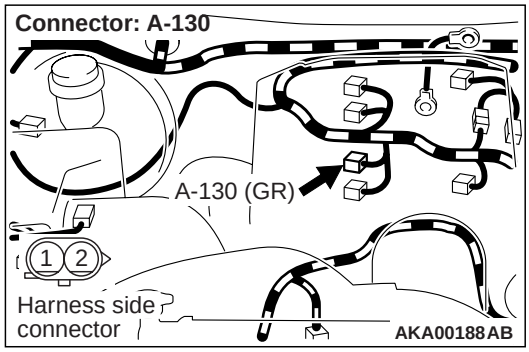


- Check earthing line for short circuit.

Q: Is the check result normal?
YES : Go to Step 6.
NO : Repair the damaged harness wire.

STEP 6. Check harness between C-105 (terminal No. 50) engine-ECU connector and A-130 (terminal No. 1) No. 3 injector connector.

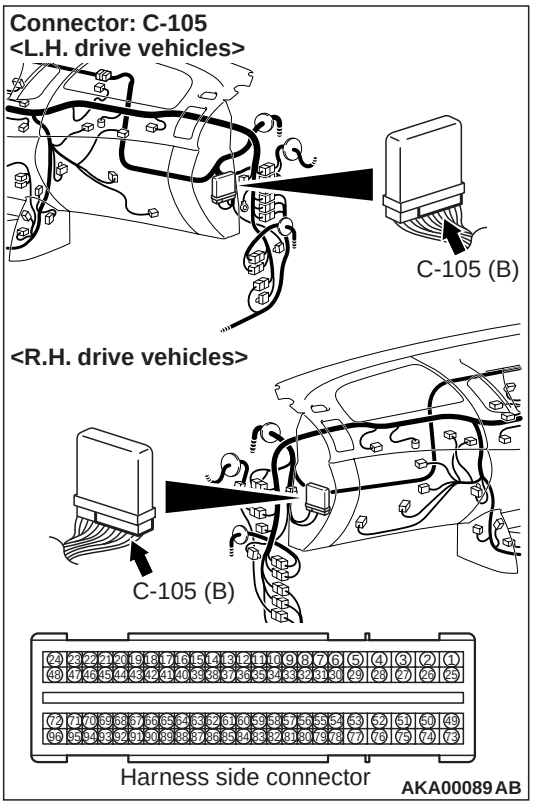


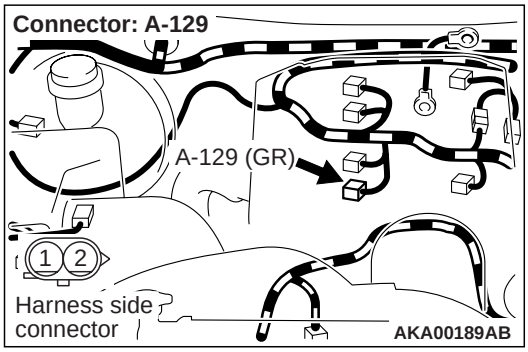


- Check earthing line for short circuit.

Q: Is the check result normal?
YES : Go to Step 7.
NO : Repair the damaged harness wire.

STEP 7. Check harness between C-105 (terminal No. 27) engine-ECU connector and A-129 (terminal No. 1) No. 4 injector connector.

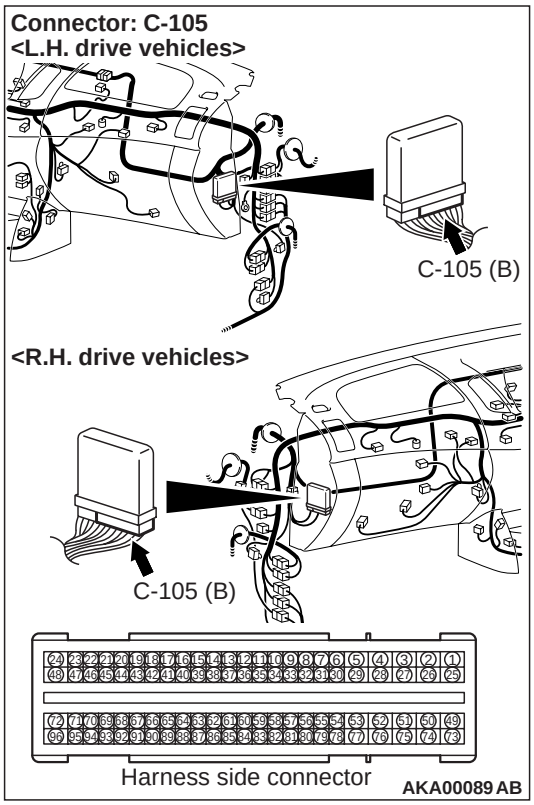


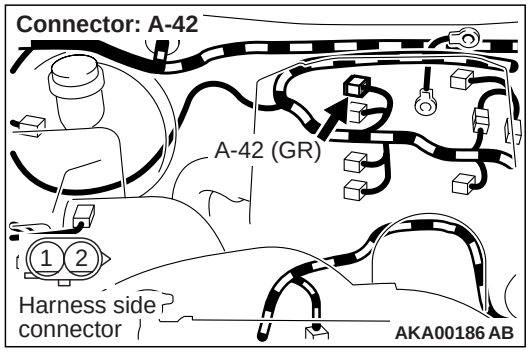


- Check earthing line for short circuit.

Q: Is the check result normal?
YES : Go to Step 8.
NO : Repair the damaged harness wire.

STEP 8. Check harness between C-105 (terminal No. 1) engine-ECU connector and A-42 (terminal No. 2) No. 1 injector connector.

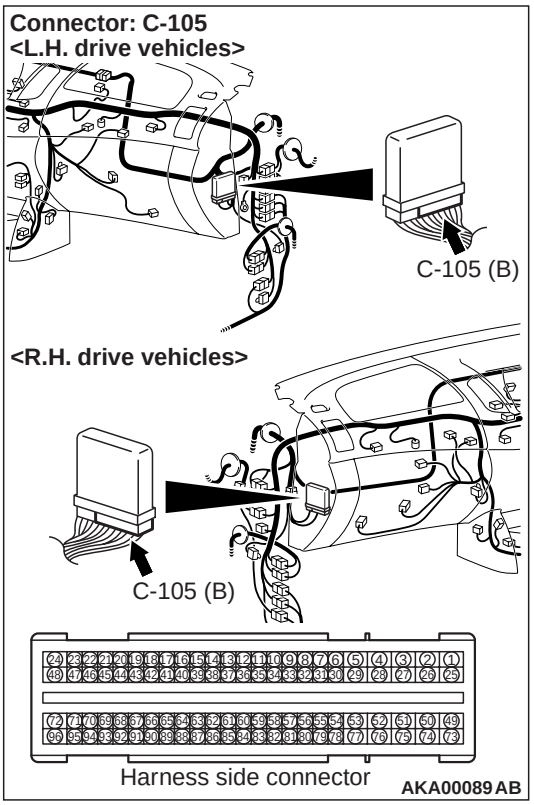


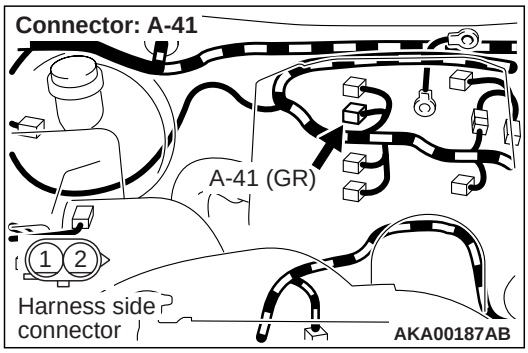


- Check power supply line for short circuit.

Q: Is the check result normal?
YES : Go to Step 9.
NO : Repair the damaged harness wire.

STEP 9. Check harness between C-105 (terminal No.25) engine-ECU connector and A-41 (terminal No. 2) No. 2 injector connector.

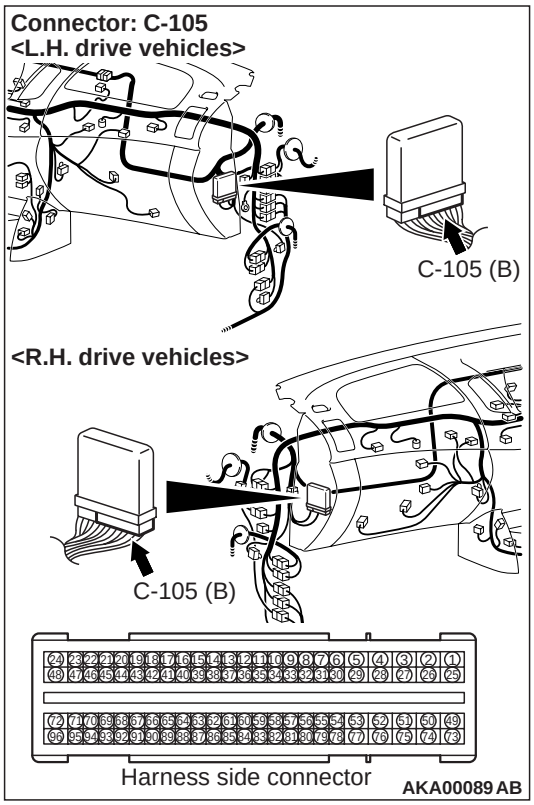


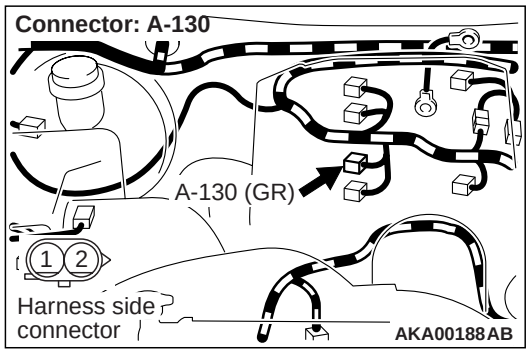


- Check power supply line for short circuit.

Q: Is the check result normal?
YES : Go to Step 10.
NO : Repair the damaged harness wire.

STEP 10. Check harness between C-105 (terminal No. 25) engine-ECU connector and A-130 (terminal No. 2) No. 3 injector connector

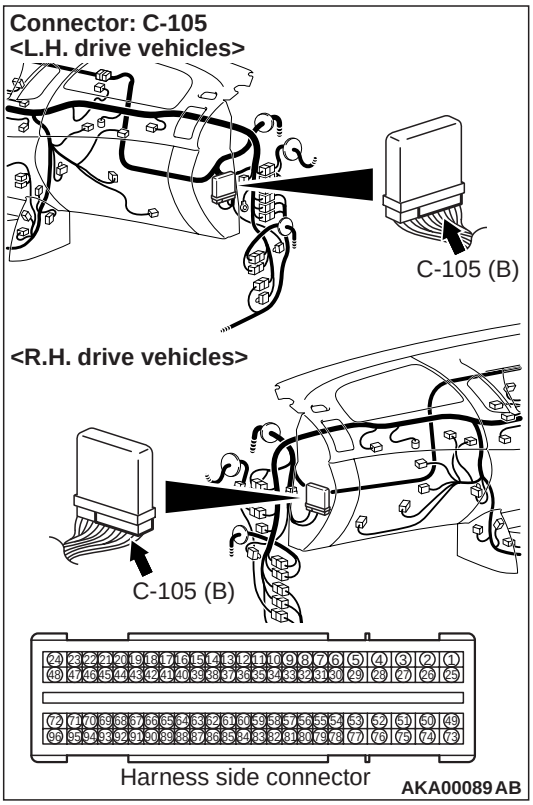


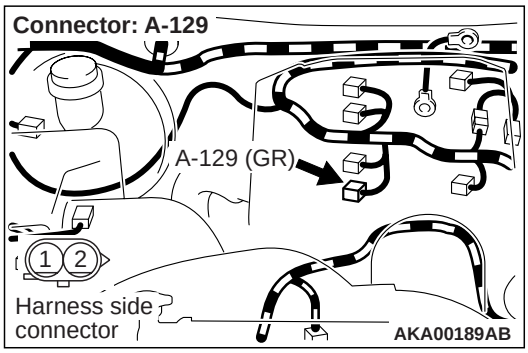


- Check power supply line for short circuit.

Q: Is the check result normal?
YES : Go to Step 11.
NO : Repair the damaged harness wire.

STEP 11. Check harness between C-105 (terminal No. 1) engine-ECU connector and A-129 (terminal No. 2) No. 4 injector connector.





- Check power supply line for short circuit.

Q: Is the check result normal?

YES : Go to Step 12.
NO : Repair the damaged harness wire.

STEP 12. M.U.T.-III diagnosis code.

- After erasing the diagnosis code through M.U.T.-III, start the engine and confirm whether the diagnosis code is set.

Q: Is the diagnosis code set?

YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

Code No. P2149: Injector Common 2 (cylinder No. 2 and No. 3) Circuit Open <Euro5>

OPERATION

- Refer to Code No. P0202: No. 2 Injector Circuit Malfunction P.13A-161. <Euro5>
- Refer to Code No. P0203: No. 3 Injector Circuit Malfunction P.13A-167. <Euro5>

FUNCTION

- The engine-ECU monitors peak current from the No. 2 and No. 3 injector drive circuits.

TROUBLE JUDGMENT

Check Conditions

- Ignition switch is in "ON" position.
- Except during the engine cranking period
- Battery positive voltage is 8 V or more.
- When an engine-ECU internal capacitor is allowed to be charged

Judgment Criterion
- When the peak current is not detected in injector circuits No. 2 and No. 3

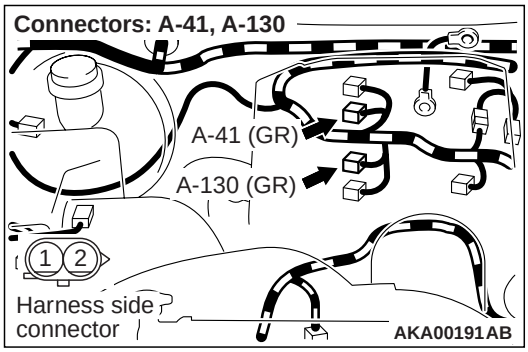
PROBABLE CAUSES
- Failed No. 2 injector
- Failed No. 3 injector
- Open/short circuit or harness damage in No. 2 and No. 3 injector circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

⚠ ***WARNING***

A high-tension voltage is flowing between the engine-ECU and the injectors while the engine is running. Handle them carefully to avoid receiving electric shocks from the voltage.

STEP 1. Connector check: A-41 No. 2 injector connector and A-130 No. 3 injector connector



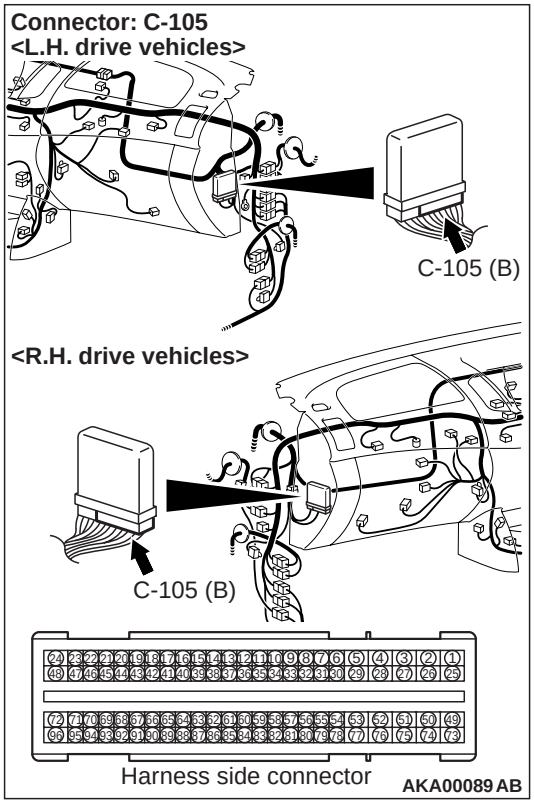
Q: Are the check results normal?
YES : Go to Step 2 .
NO : Repair or replace the connector.

STEP 2. Check Injector itself

- Check No. 2 injector and No. 3 injector itself (Refer to P.13A-595).

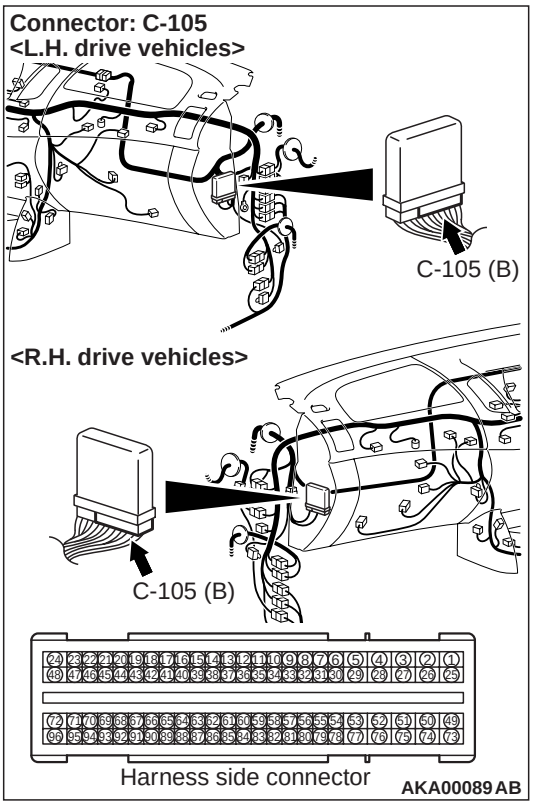
Q: Is the check result normal?
YES : Go to Step 3 .
NO : Replace the injector. After replacing the Injector, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).

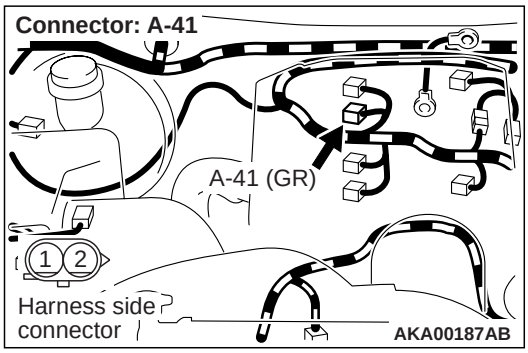
STEP 3. Connector check: C-105 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 4 .
NO : Repair or replace the connector.

STEP 4. Check harness between C-105 (terminal No. 73) engine-ECU connector and A-41 (terminal No. 2) No. 2 injector connector.

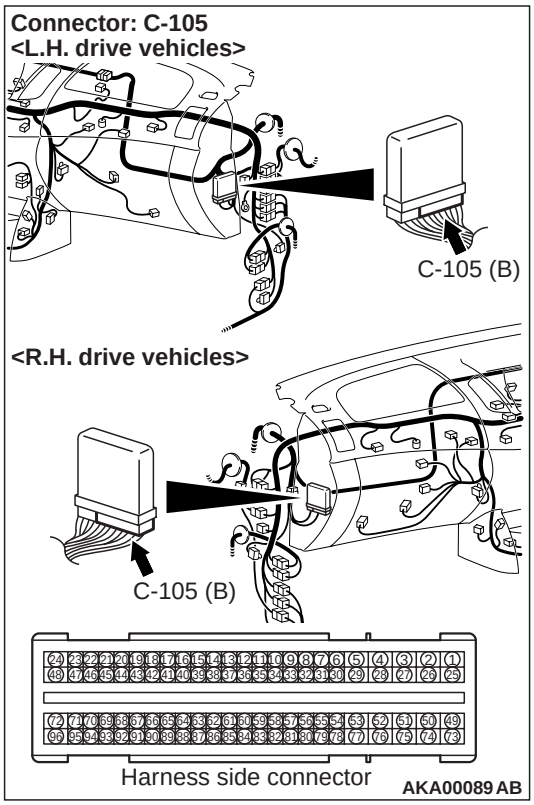


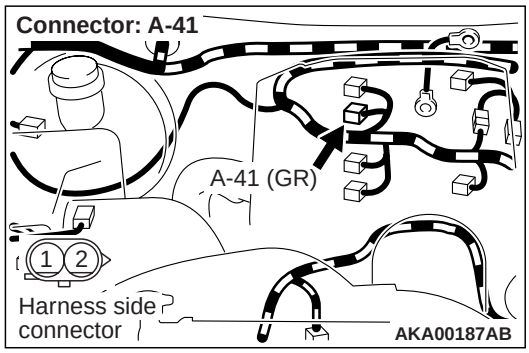


- Check power supply line for open circuit and damage.

Q: Is the check result normal?
YES : Go to Step 5 .
NO : Repair the damaged harness wire.

STEP 5. Check harness between C-105 (terminal No. 75) engine-ECU connector and A-41 (terminal No. 1) No. 2 injector connector.

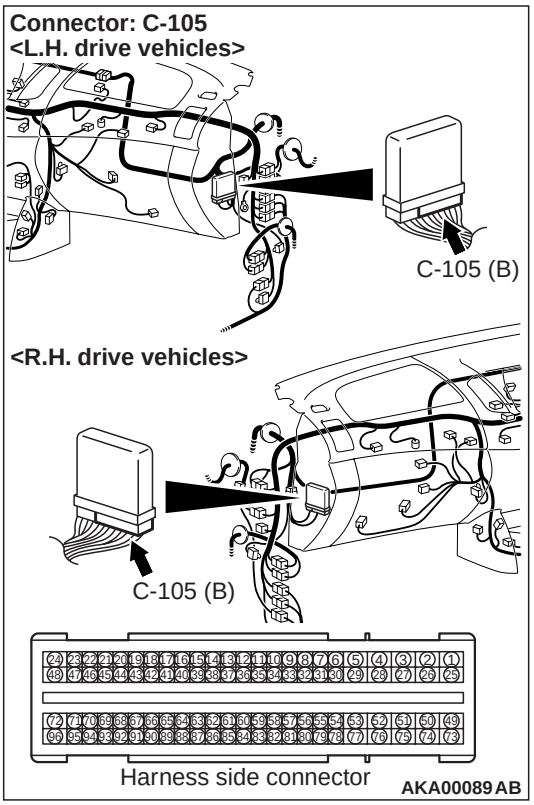


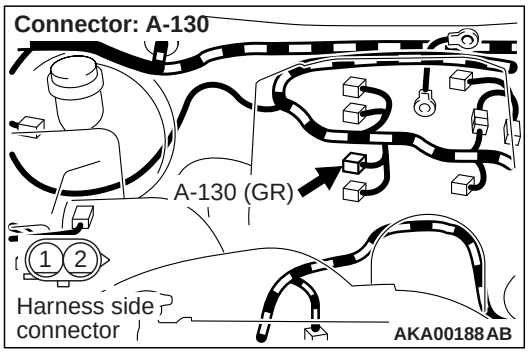


- Check earthing line for open/short circuit and damage.

Q: Is the check result normal?
YES : Go to Step 6 .
NO : Repair the damaged harness wire.

STEP 6. Check harness between C-105 (terminal No. 49) engine-ECU connector and A-130 (terminal No. 2) No. 3 injector connector.

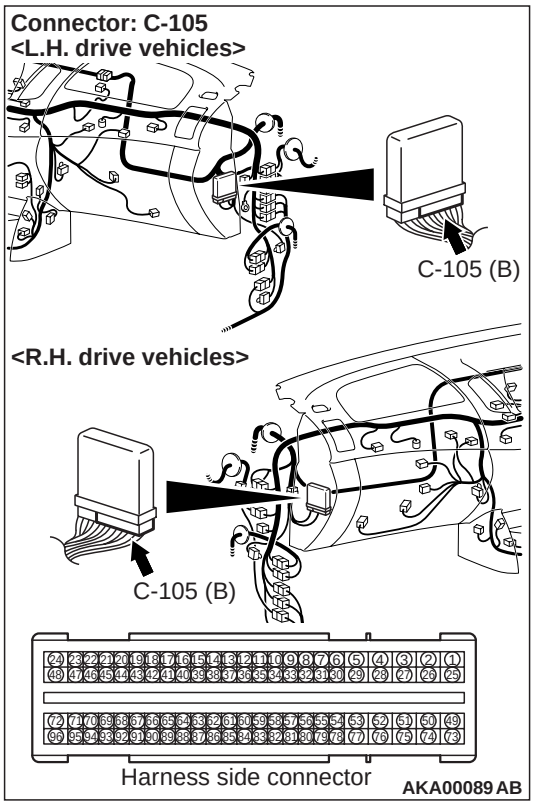


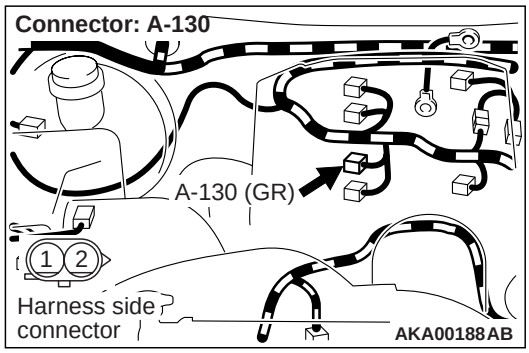


- Check power supply line for open/short circuit and damage.

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair the damaged harness wire.

STEP 7. Check harness between C-105 (terminal No. 50) engine-ECU connector and A-130 (terminal No. 1) No. 3 injector connector.





- Check earthing line for open/short circuit and damage.

Q: Is the check result normal?
YES : Go to Step 8 .
NO : Repair the damaged harness wire.

STEP 8. M.U.T.-III diagnosis code.

- After erasing the diagnosis code through M.U.T.-III, start the engine and confirm whether the diagnosis code is output.

Q: Is the diagnosis code set?

YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, carry out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

Code No. P2149: Injector Common 2 (cylinder No. 2 and No. 3) Circuit Open <Except Euro5>

OPERATION
Driving power is supplied from the engine-ECU (terminal No. 25) to the No. 2 injector (terminal No. 2) and No. 3 injector (terminal No. 2).

FUNCTION
- The engine-ECU monitors peak current from the No. 2 and No. 3 injector drive circuits.

TROUBLE JUDGMENT

Check Conditions
- Ignition switch is in "ON" position.
- Except during the engine cranking period
- Battery positive voltage is 8 V or more.
- When an engine-ECU internal capacitor is allowed to be charged

Judgment Criterion
- When the peak current is not detected in injector circuits No. 2 and No. 3

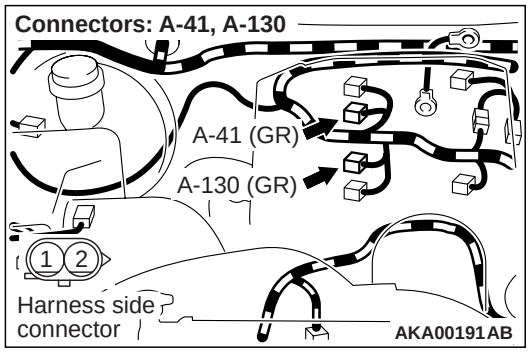
PROBABLE CAUSES
- Failed No. 2 injector
- Failed No. 3 injector
- Open/short circuit or harness damage in No. 2 and No. 3 injector circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

⚠ ***WARNING***

A high-tension voltage is flowing between the engine-ECU and the injectors while the engine is running. Handle them carefully to avoid receiving electric shocks from the voltage.

STEP 1. Connector check: A-41 No. 2 injector connector and A-130 No. 3 injector connector



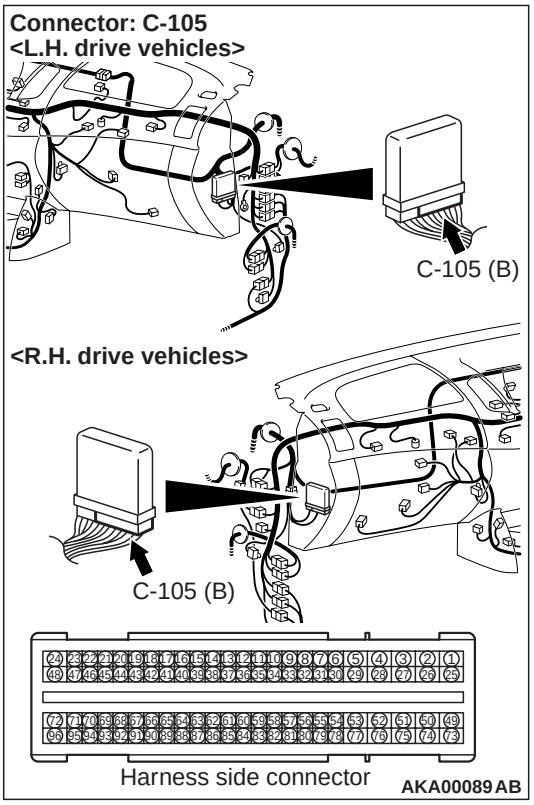
Q: Are the check results normal?
YES : Go to Step 2 .
NO : Repair or replace the connector.

STEP 2. Check Injector itself
- Check No. 2 injector and No. 3 injector itself (Refer to P.13A-595).

Q: Is the check result normal?

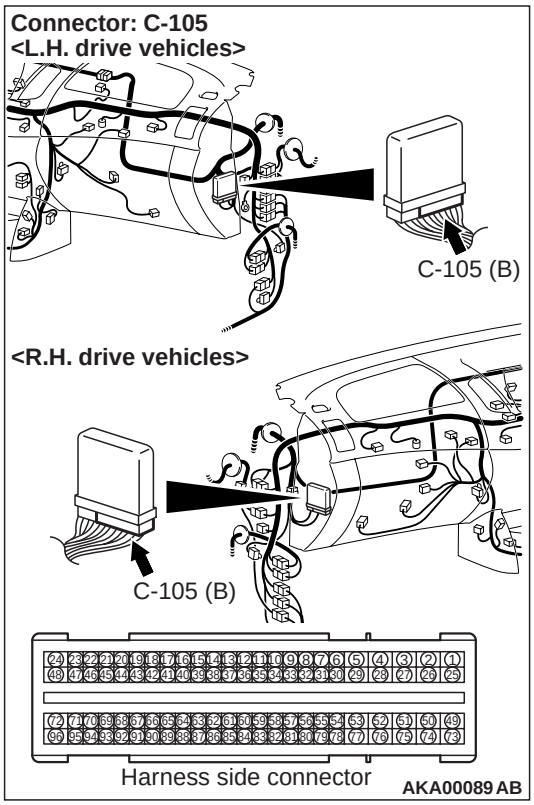
YES : Go to Step 3 .
NO : Replace the injector. After replacing the Injector, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).

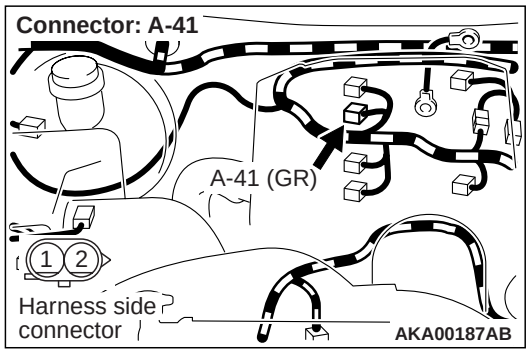
STEP 3. Connector check: C-105 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 4 .
NO : Repair or replace the connector.

STEP 4. Check harness between C-105 (terminal No. 25) engine-ECU connector and A-41 (terminal No. 2) No. 2 injector connector.

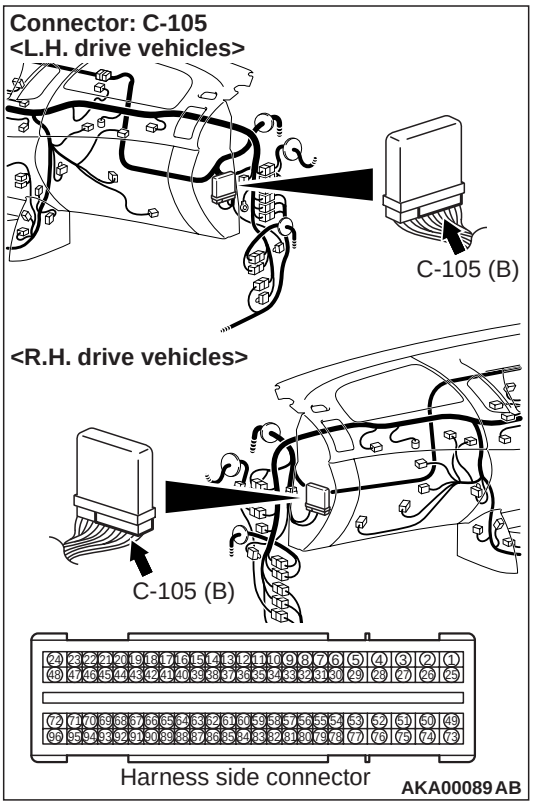


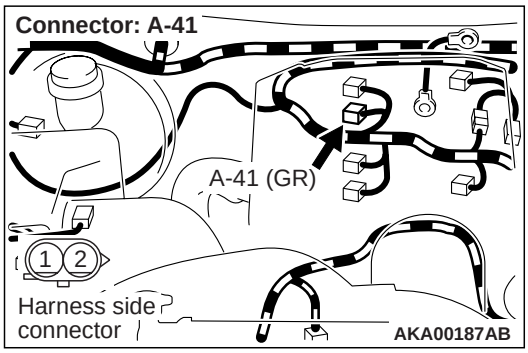


- Check power supply line for open circuit and damage.

Q: Is the check result normal?
YES : Go to Step 5 .
NO : Repair the damaged harness wire.

STEP 5. Check harness between C-105 (terminal No. 75) engine-ECU connector and A-41 (terminal No. 1) No. 2 injector connector.

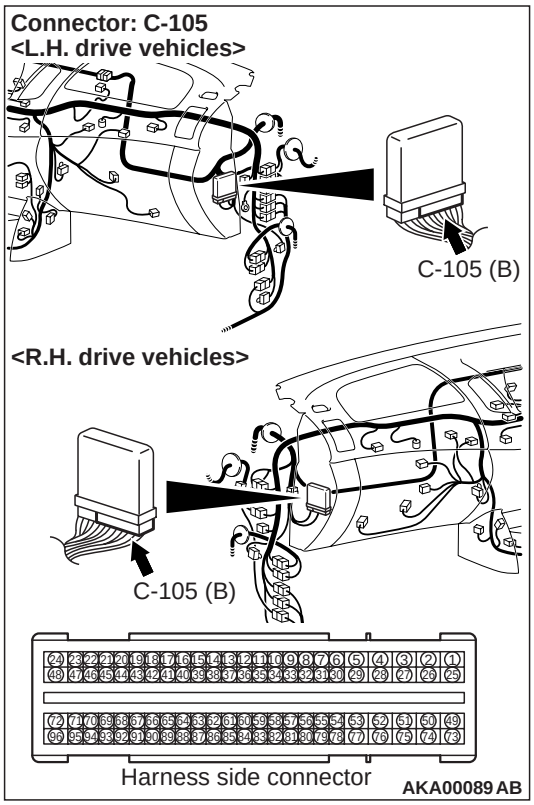


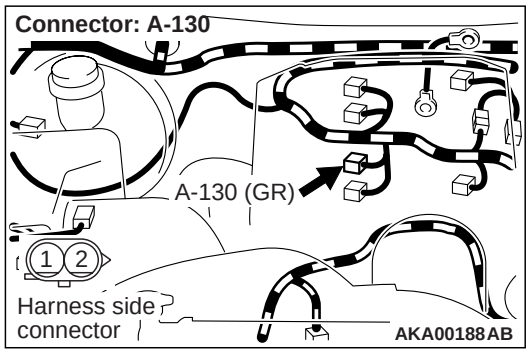


- Check earthing line for open/short circuit and damage.

Q: Is the check result normal?
YES : Go to Step 6 .
NO : Repair the damaged harness wire.

STEP 6. Check harness between C-105 (terminal No. 25) engine-ECU connector and A-130 (terminal No. 2) No. 3 injector connector.

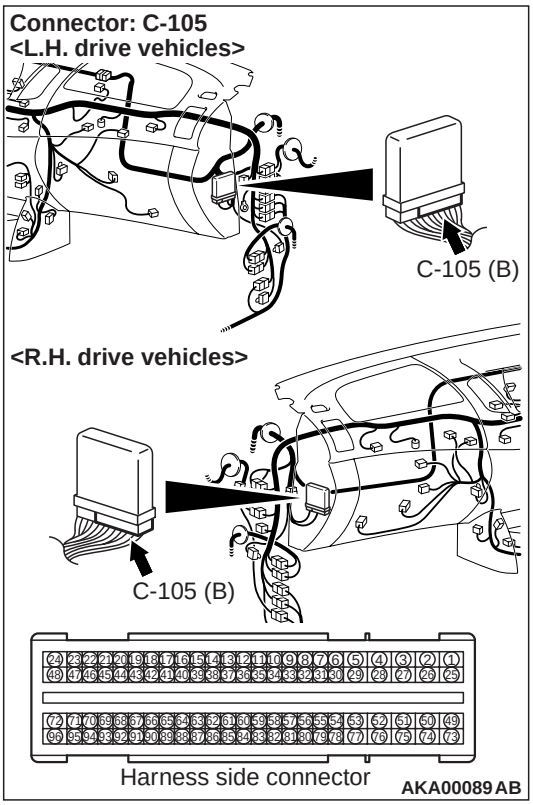


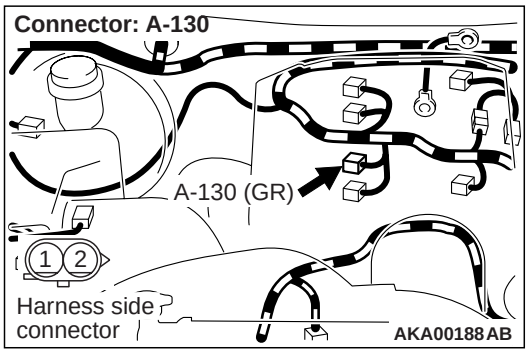


- Check power supply line for open/short circuit and damage.

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair the damaged harness wire.

STEP 7. Check harness between C-105 (terminal No. 50) engine-ECU connector and A-130 (terminal No. 1) No. 3 injector connector.





- Check earthing line for open/short circuit and damage.

Q: Is the check result normal?

YES : Go to Step 8 .
NO : Repair the damaged harness wire.

STEP 8. M.U.T.-III diagnosis code.

- After erasing the diagnosis code through M.U.T.-III, start the engine and confirm whether the diagnosis code is output.

Q: Is the diagnosis code set?

YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

Code No. P2150: Injector Common 2 (Cylinder No. 2 and No. 3) Circuit Earth Short <Euro5>

OPERATION

- Refer to Code No. P0202: No. 2 Injector Circuit Malfunction P.13A-161. <Euro5>
- Refer to Code No. P0203: No. 3 Injector Circuit Malfunction P.13A-167.

FUNCTION

- The engine-ECU monitors voltage application to the injector during no injector energization to detect errors in the No. 2 and No. 3 injector drive circuit.

TROUBLE JUDGMENT

Check Conditions

- Ignition switch is in "ON" position.
- Except during the engine cranking period
- Battery positive voltage is 8 V or more.

- When an engine-ECU internal capacitor is allowed to be charged

Judgment Criterion
- Short-circuit to the earth is detected in the injector drive circuit.

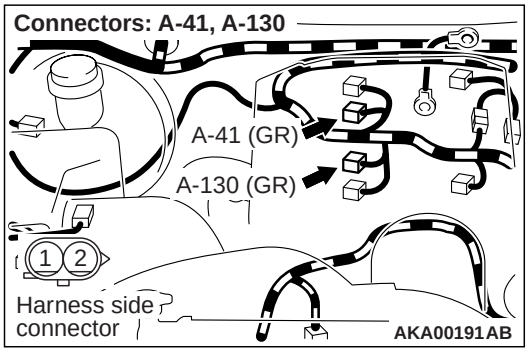
PROBABLE CAUSES
- Short circuit in injector circuit or loose connector contact
- Failed No. 2 injector
- Failed No. 3 injector
- Failed engine-ECU

DIAGNOSIS PROCEDURE

⚠ WARNING

A high-tension voltage is flowing between the engine-ECU and the injectors while the engine is running. Handle them carefully to avoid receiving electric shocks from the voltage.

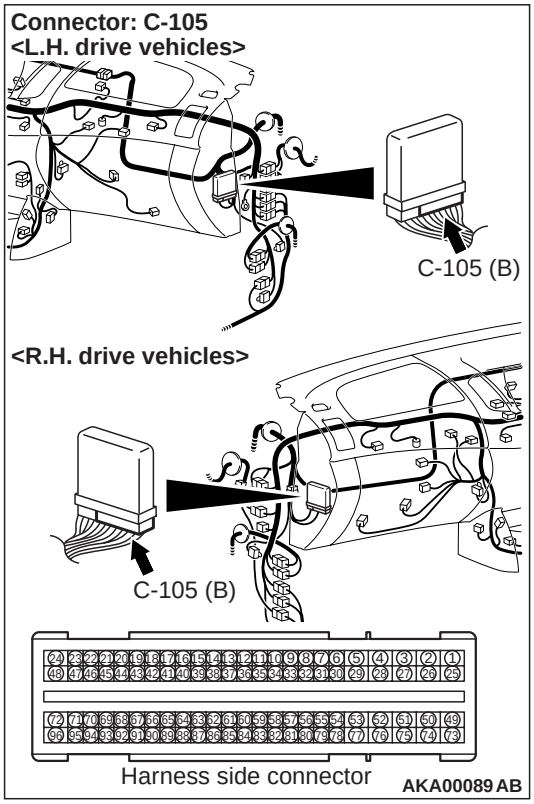
STEP 1. Connector check: A-41 No. 2 injector connector and A-130 No. 3 injector connector.



Q: Are the check results normal?

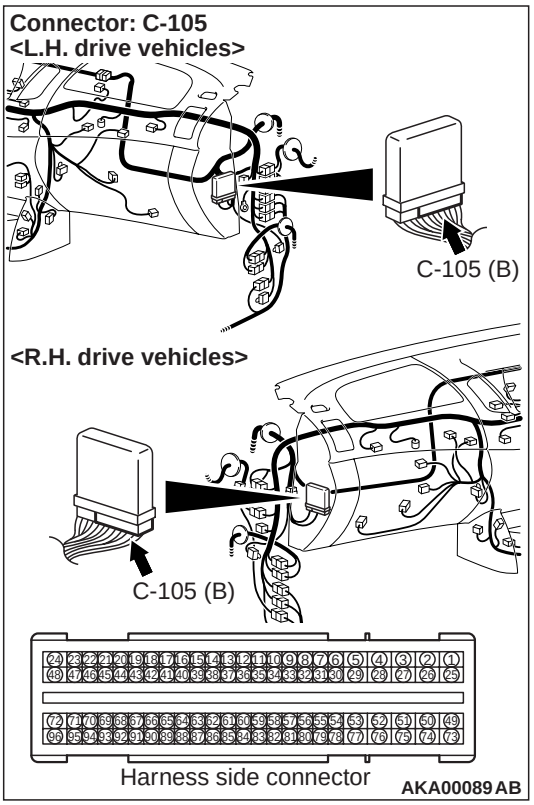
YES : Go to Step 2 .
NO : Repair or replace the connector.

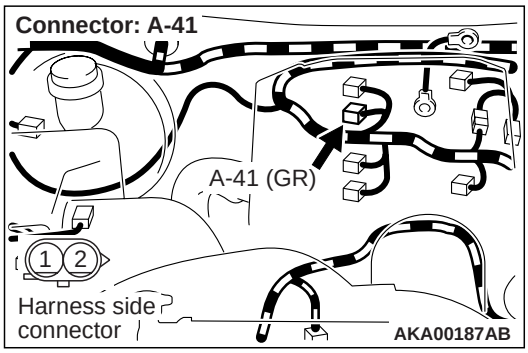
STEP 2. Connector check: C-105 engine-ECU connector.



Q: Is the check result normal?
YES : Go to Step 3 .
NO : Repair or replace the connector.

STEP 3. Check harness between C-105 (terminal No. 75) engine-ECU connector and A-41 (terminal No. 1) No. 2 injector connector.

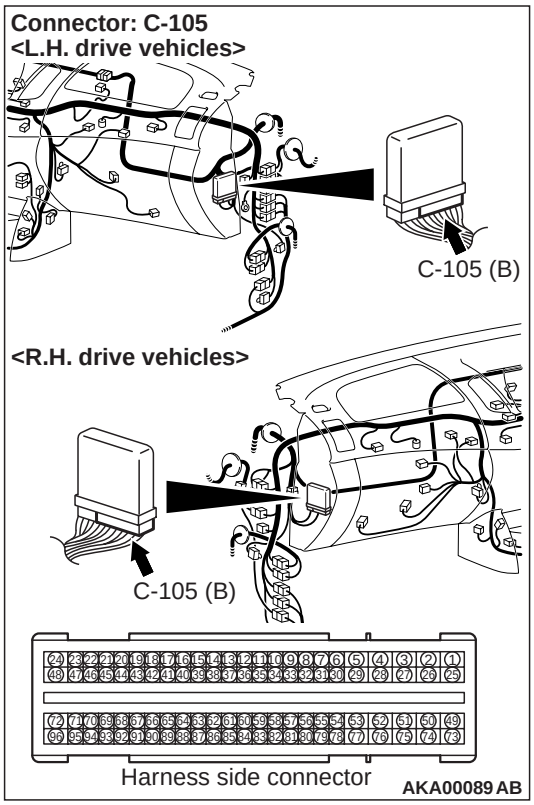


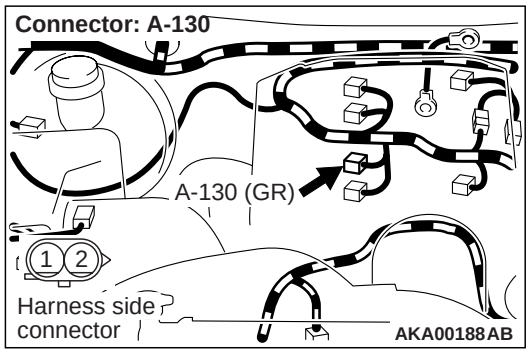


- Check earthing line for short circuit.

Q: Is the check result normal?
YES : Go to Step 4 .
NO : Repair the damaged harness wire.

STEP 4. Check harness between C-105 (terminal No. 50) engine-ECU connector and A-130 (terminal No. 1) No. 3 injector connector.

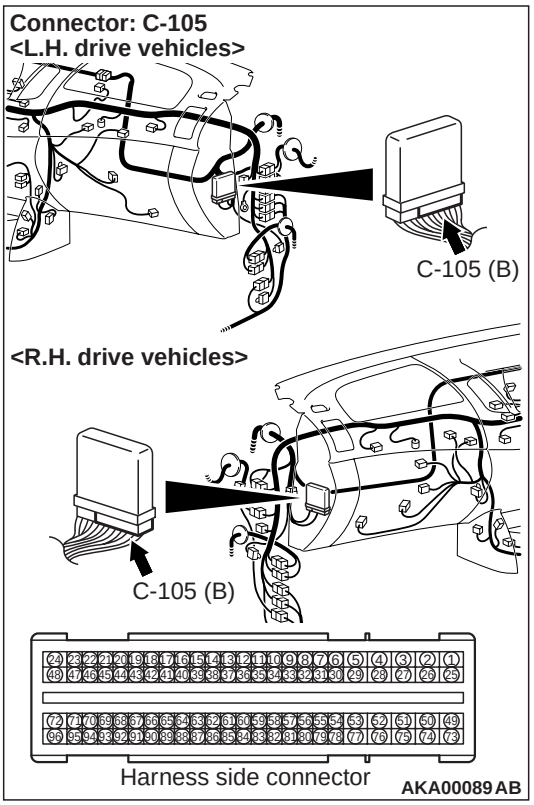


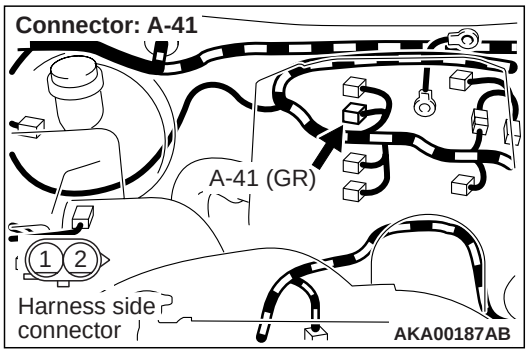


- Check earthing line for short circuit.

Q: Is the check result normal?
YES : Go to Step 5 .
NO : Repair the damaged harness wire.

STEP 5. Check harness between C-105 (terminal No. 73) engine-ECU connector and A-41 (terminal No. 2) No. 2 injector connector

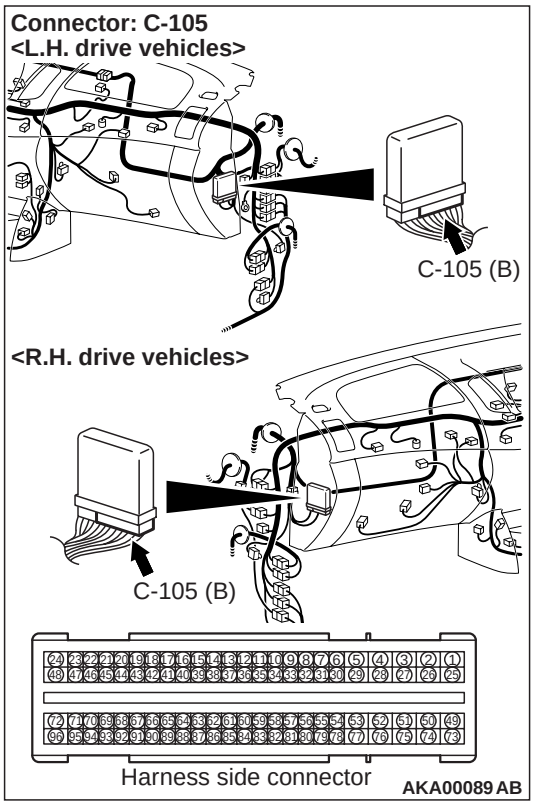


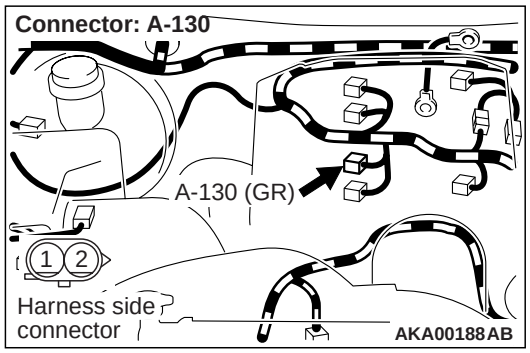


- Check power supply line for short circuit.

Q: Is the check result normal?
YES : Go to Step 6 .
NO : Repair the damaged harness wire.

STEP 6. Check harness between C-105 (terminal No. 49) engine-ECU connector and A-130 (terminal No. 2) No. 3 injector connector.





- Check power supply line for short circuit.

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair the damaged harness wire.

STEP 7. Check Injector itself

- Check No. 2 injector and No. 3 injector itself (Refer to P.13A-595).

Q: Is the check result normal?
YES : Go to Step 8 .
NO : Replace the injector. After replacing the Injector, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).

STEP 8. M.U.T.-III diagnosis code.

- After clearing the diagnosis code through M.U.T.-III, start the engine and confirm whether the diagnosis code is set.

Q: Is the diagnosis code set?

YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, carry out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

Code No. P2151: Injector Common 2 (Cylinder No. 2 and No. 3) Circuit Battery Short <Euro5>

OPERATION

- Refer to Code No. P0202: No. 2 Injector Circuit Malfunction P.13A-161. <Euro5>
- Refer to Code No. P0203: No. 3 Injector Circuit Malfunction P.13A-167. <Euro5>

FUNCTION

- The engine-ECU monitors voltage application to the injector during no injector energization to detect errors in the No. 2 and No. 3 injector drive circuit.

TROUBLE JUDGMENT

Check Condition

- Ignition switch is in "ON" position.

Judgment Criterion

- Short-circuit to the battery is detected in the injector drive circuit.

PROBABLE CAUSES

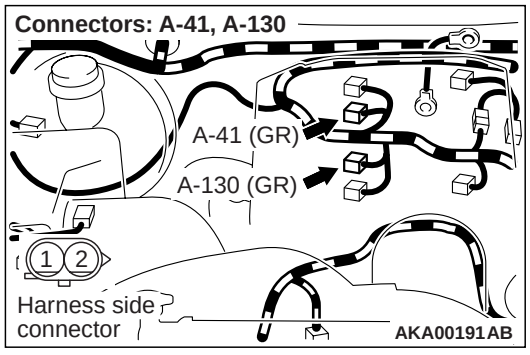
- Short circuit in injector circuit or loose connector contact
- Failed No. 2 injector
- Failed No. 3 injector
- Failed engine-ECU

DIAGNOSIS PROCEDURE

⚠ ***WARNING***

A high-tension voltage is flowing between the engine-ECU and the injectors while the engine is running. Handle them carefully to avoid receiving electric shocks from the voltage.

STEP 1. Connector check: A-41 No. 2 injector connector and A-130 No. 3 injector connector.

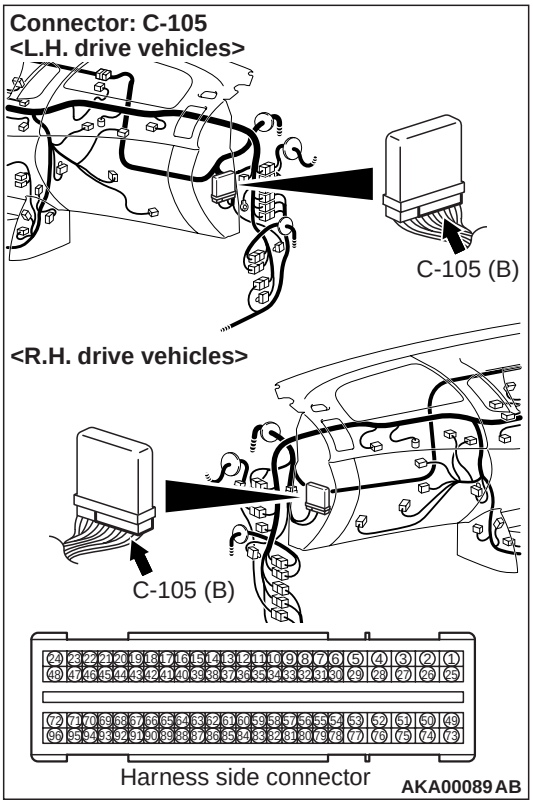


Q: Are the check results normal?

YES : Go to Step 2 .

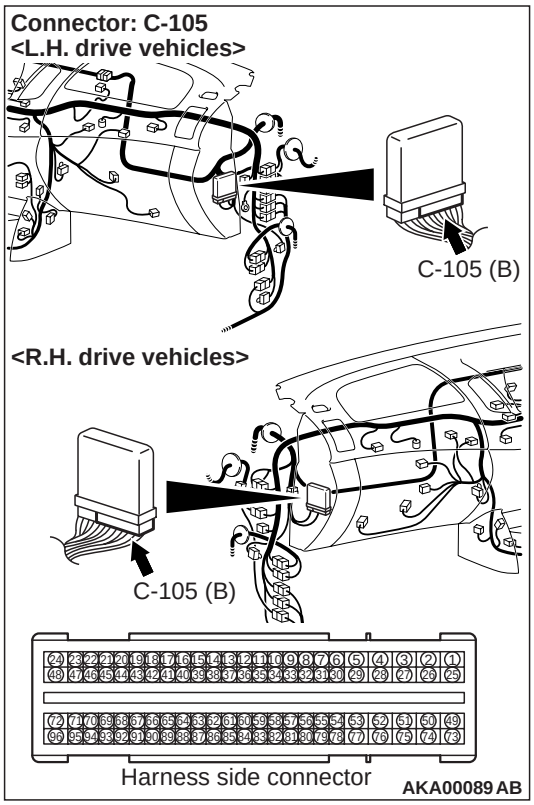
NO : Repair or replace the connector.

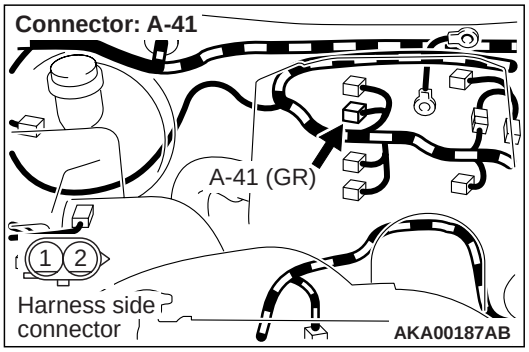
STEP 2. Connector check: C-105 engine-ECU connector.



Q: Is the check result normal?
YES : Go to Step 3 .
NO : Repair or replace the connector.

STEP 3. Check harness between C-105 (terminal No. 75) engine-ECU connector and A-41 (terminal No. 1) No. 2 injector connector.

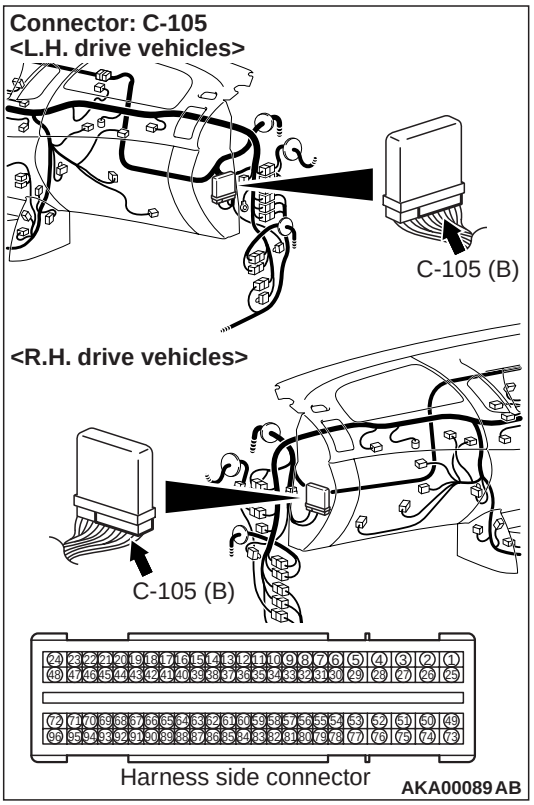


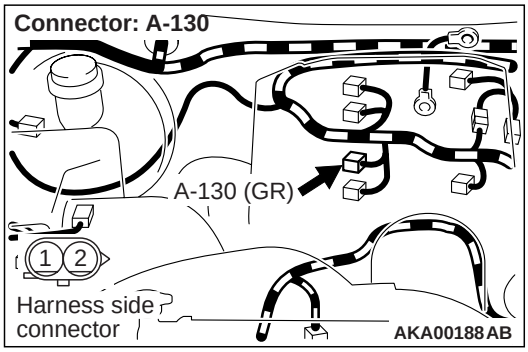


- Check earthing line for short circuit.

Q: Is the check result normal?
YES : Go to Step 4 .
NO : Repair the damaged harness wire.

STEP 4. Check harness between C-105 (terminal No. 50) engine-ECU connector and A-130 (terminal No. 1) No. 3 injector connector.

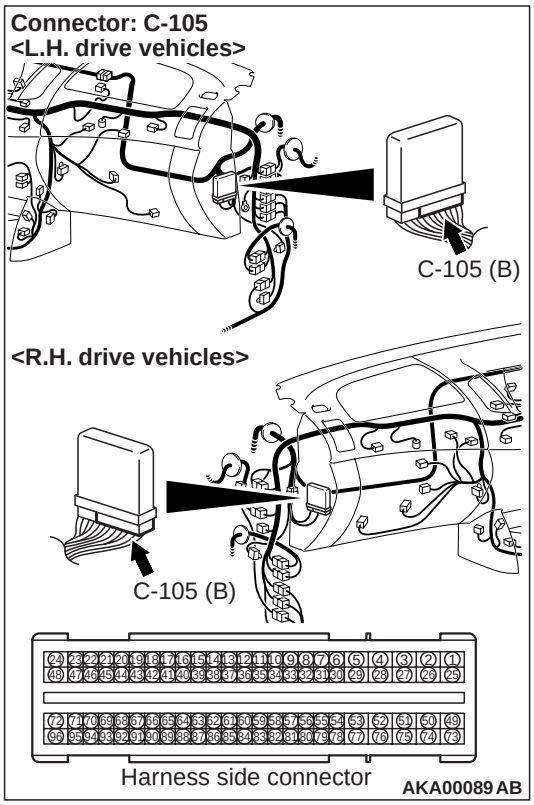


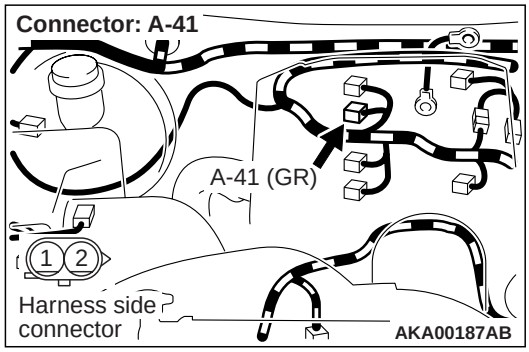


- Check earthing line for short circuit.

Q: Is the check result normal?
YES : Go to Step 5 .
NO : Repair the damaged harness wire.

STEP 5. Check harness between C-105 (terminal No. 73) engine-ECU connector and A-41 (terminal No. 2) No. 2 injector connector

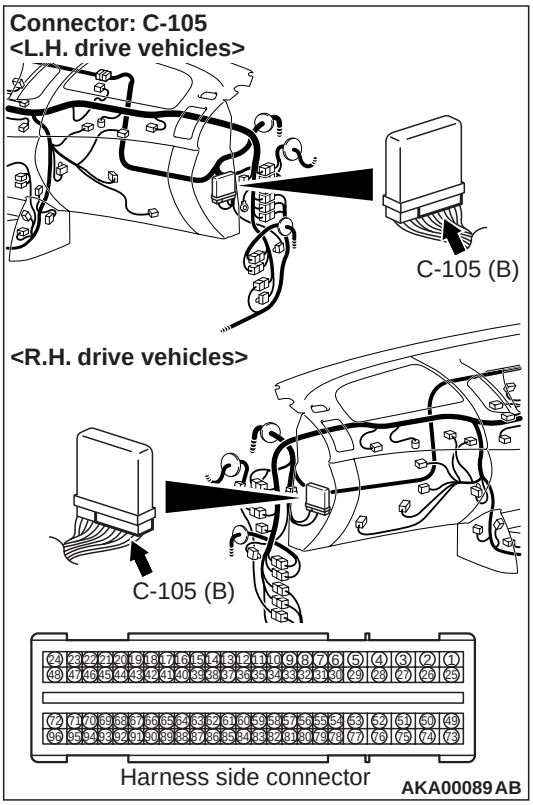


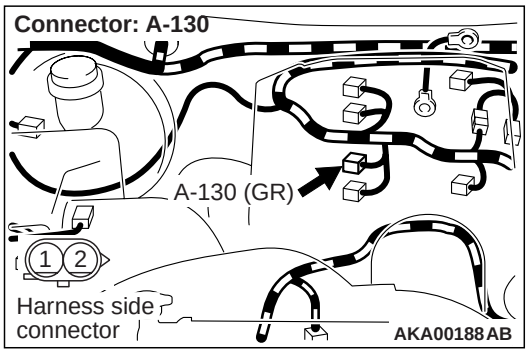


- Check power supply line for short circuit.

Q: Is the check result normal?
YES : Go to Step 6 .
NO : Repair the damaged harness wire.

STEP 6. Check harness between C-105 (terminal No. 49) engine-ECU connector and A-130 (terminal No. 2) No. 3 injector connector.





- Check power supply line for short circuit.

Q: Is the check result normal?

YES : Go to Step 7 .
NO : Repair the damaged harness wire.

STEP 7. Check Injector itself

- Check No. 2 injector and No. 3 injector itself (Refer to P.13A-595).

Q: Is the check result normal?

YES : Go to Step 8 .
NO : Replace the injector. After replacing the Injector, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).

STEP 8. M.U.T.-III diagnosis code.

- After erasing the diagnosis code through M.U.T.-III, start the engine and confirm whether the diagnosis code is set.

Q: Is the diagnosis code set?

YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, carry out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

Code No. P2228: Barometric Pressure Sensor Circuit Low Input

FUNCTION

- The barometric pressure sensor converts the barometric pressure into a voltage signal and inputs the signal to the engine-ECU.
- In response to the signal, the engine-ECU corrects the fuel injection amount, etc.

TROUBLE JUDGMENT

Check Conditions

- Battery positive voltage is 8 – 16 V
- 2 seconds later after the ignition switch has been in "ON" position or the engine has started up

Judgment Criterion

- The barometric pressure sensor output voltage is 1.60 V or less for 0.5 second.

PROBABLE CAUSE
- Failed barometric pressure sensor

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III data list
- Refer to Data List Reference Table P.13A-542.
  a. Item 5: Barometric pressure sensor

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

NO : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

Code No. P2229: Barometric Pressure Sensor Circuit High Input

FUNCTION
- The barometric pressure sensor converts the barometric pressure into a voltage signal and inputs the signal to the engine-ECU.
- In response to the signal, the engine-ECU corrects the fuel injection amount, etc.

TROUBLE JUDGMENT

Check Conditions
- Battery positive voltage is 8 – 16 V
- 2 seconds later after the ignition switch has been in "ON" position or the engine has started up

Judgment Criterion
- The barometric pressure sensor output voltage is 4.80 V or less for 0.5 second.

PROBABLE CAUSE
- Failed barometric pressure sensor

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III data list
- Refer to Data List Reference Table P.13A-542.
  a. Item 5: Barometric pressure sensor

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions .)

NO : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

Code No. P2413: EGR System Performance

OPERATION
- System power is supplied from the engine-ECU (terminal No. 115) to the EGR valve (terminal No. 6).
- The engine-ECU (terminal No. 130) turns on the power transistor to flow current to the EGR valve (terminal No. 4).

FUNCTION
- The engine-ECU performs duty control over the EGR valve (DC motor).
- The engine-ECU performs feedback control over the EGR valve based on the signals from the EGR position sensor.

TROUBLE JUDGMENT

Check Condition
- Ignition switch is in "ON" position

Judgment Criterion
- The EGR valve in sticking state (a high duty state continues for the predetermined time or more) is repeatedly detected.

PROBABLE CAUSES
- Failed EGR valve
- Open/short circuit or harness damage in EGR valve circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

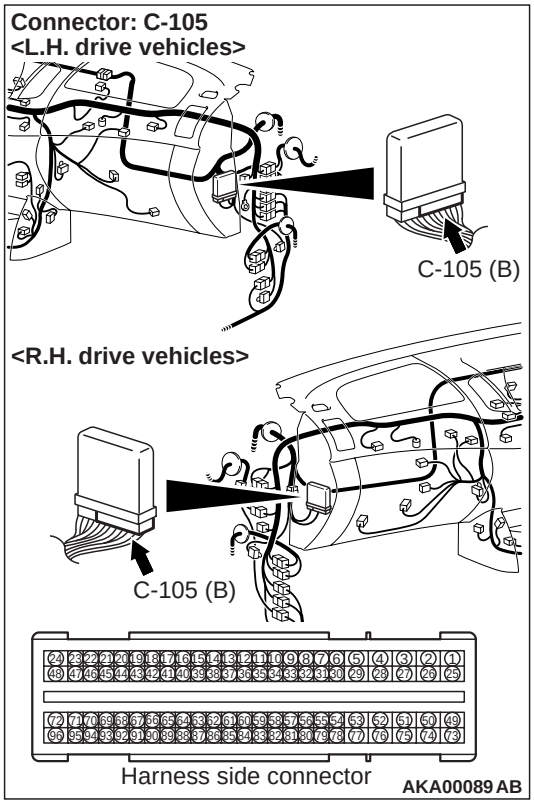
STEP 1. M.U.T.-III diagnosis code

Q: Is any other diagnosis code than P2413 output?
YES : Inspection chart for diagnosis codes (Refer to P.13A-21).
NO : Go to Step 2 .

STEP 2. Check EGR valve itself
- Check EGR valve itself [Refer to GROUP 17 – Emission Control System – Exhaust Gas Recirculation (EGR) System – EGR valve check].

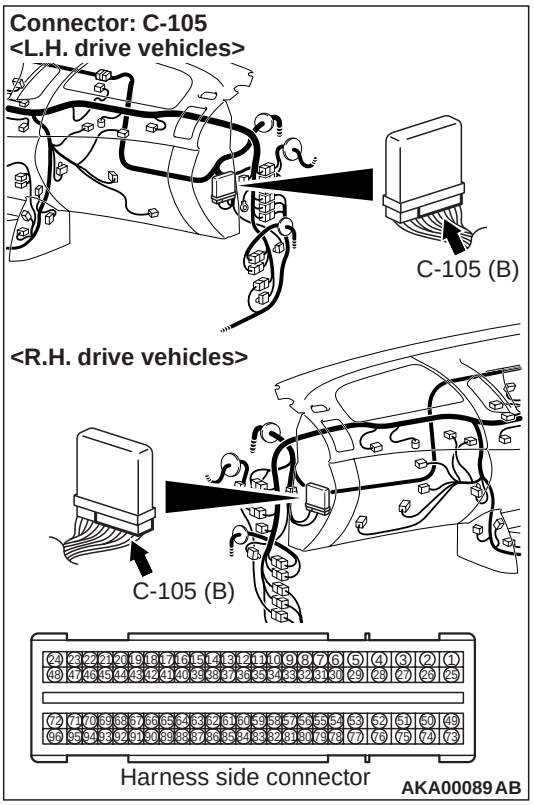
Q: Is the check result normal?
YES : Go to Step 3 .
NO : Replace the EGR valve assembly.

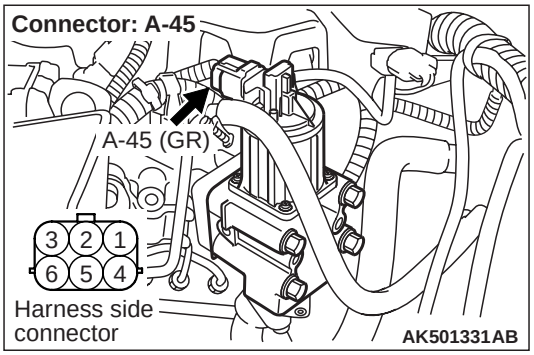
STEP 3. Connector check: C-105 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 4 .
NO : Repair or replace the connector.

STEP 4. Check harness between C-105 (terminal No. 115) engine-ECU connector and A-45 (terminal No. 6) EGR valve assembly connector.

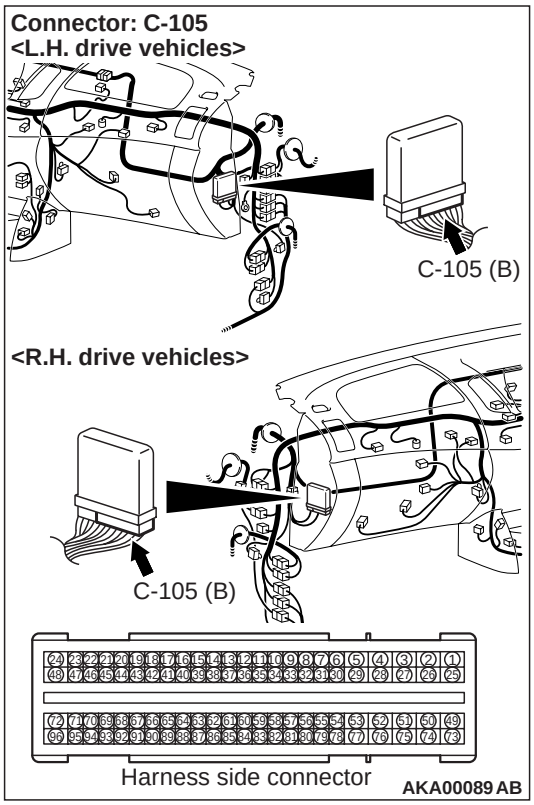


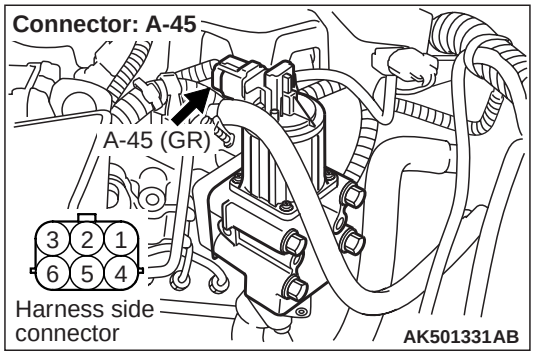


- Check output line for open/short circuit and damage.

Q: Is the check result normal?
YES : Go to Step 5 .
NO : Repair the damaged harness wire.

STEP 5. Check harness between C-105 (terminal No. 130) engine-ECU connector and A-45 (terminal No. 4) EGR valve connector.





- Check output line for open/short circuit and damage.

Q: Is the check result normal?
YES : Go to Step 6 .
NO : Repair the damaged harness wire.

STEP 6. M.U.T.-III diagnosis code.

- After erasing the diagnosis code through M.U.T.-III, start the engine and confirm whether the diagnosis code is output.

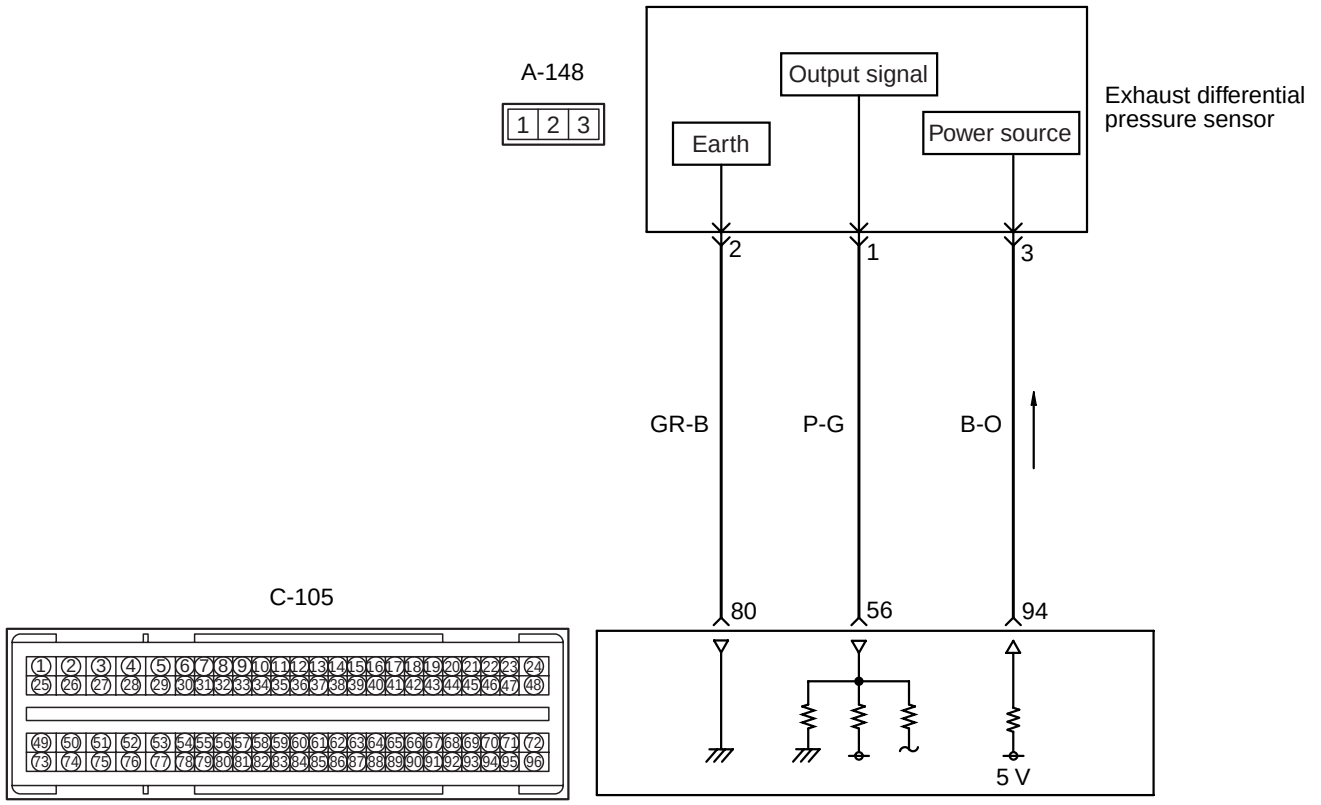
Q: Is the diagnosis code set?

YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

Code No. P2454: Exhaust Differential Pressure Sensor Circuit Low Input <Euro5>

Exhaust Differential Pressure Sensor Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V: Violet PU: Purple SI: Silver

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OPERATION

- A power voltage of 5 V is applied to the exhaust differential pressure sensor power terminal (terminal No. 3) from the engine-ECU (terminal No. 94) and earthed to the engine-ECU (terminal No. 80) from exhaust differential pressure sensor (terminal No. 2).
- The sensor signal is inputted to the engine-ECU (terminal No. 56) from the exhaust differential pressure sensor output terminal (terminal No. 1).

FUNCTION

- The exhaust differential pressure sensor outputs the voltage to the engine-ECU in accordance with the difference in the voltage between the DPF upstream area and the DPF downstream area.
- The engine-ECU anticipates the amount of PM accumulated in the DPF through this output voltage.

TROUBLE JUDGMENT

Check Conditions

- Battery positive voltage is 8 – 16 V
- 2 seconds later after the ignition switch has been in "ON" position or the engine has started up

Judgment Criterion

- The exhaust differential pressure sensor output voltage is 0.49 V or less.

PROBABLE CAUSES

- Failed exhaust differential pressure sensor
- Open/short circuit or harness damage in exhaust differential pressure sensor circuit or loose connector contact
- Failed engine-ECU

DIAGNOSTIC PROCEDURE

STEP 1. M.U.T.-III data list

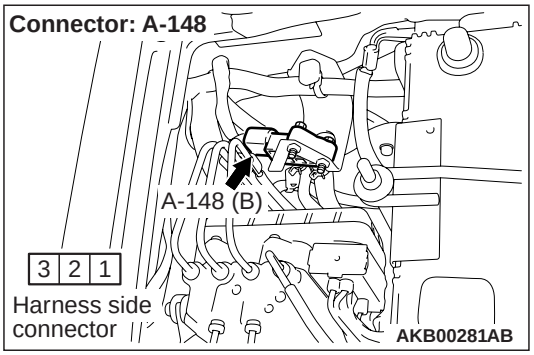
- Refer to Data List Reference Table P.13A-542.
  a. Item 120: exhaust differential pressure sensor

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

NO : Go to Step 2 .

STEP 2. Connector check: A-148 exhaust differential pressure sensor connector

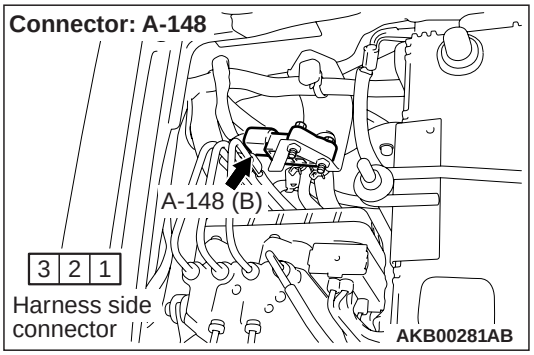


Q: Is the check result normal?

YES : Go to Step 3 .

NO : Repair or replace the connector.

STEP 3. Perform voltage measurement at A-148 exhaust differential pressure sensor connector.



- Disconnect connector, and measure at harness side.
- Ignition switch: ON
- Voltage between terminal No. 3 and earth.

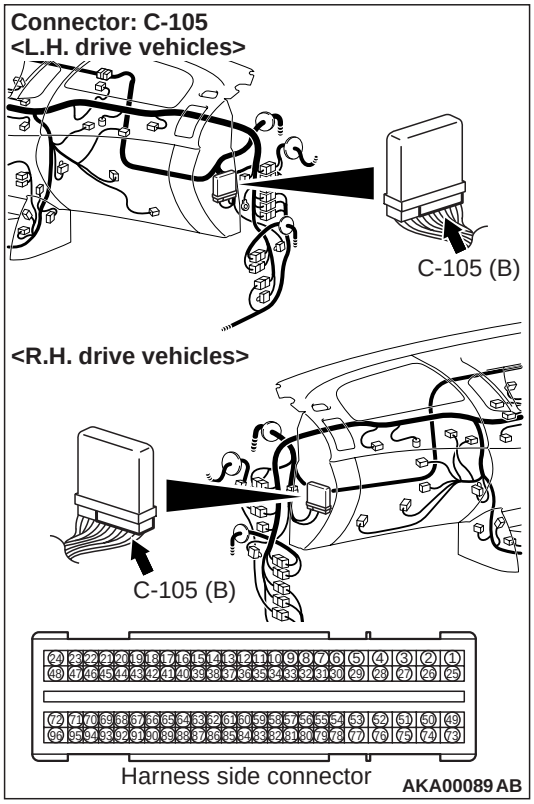
OK: 4.9 – 5.1 V

Q: Is the check result normal?

YES : Go to Step 9 .

NO : Go to Step 4 .

STEP 4. Perform voltage measurement at C-105 engine-ECU connector.



- Measure engine-ECU terminal voltage.
- Ignition switch: ON
- Voltage between terminal No. 94 and earth.

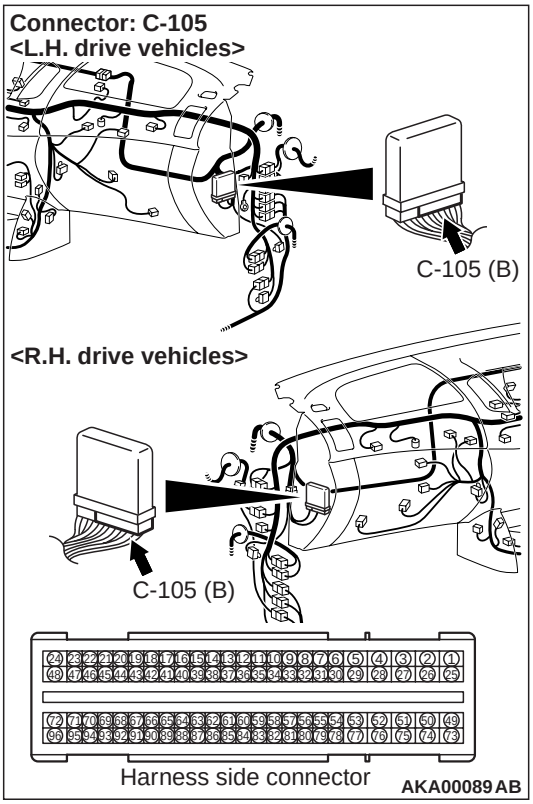
OK: 4.9 – 5.1 V

Q: Is the check result normal?

YES : Go to Step 8 .

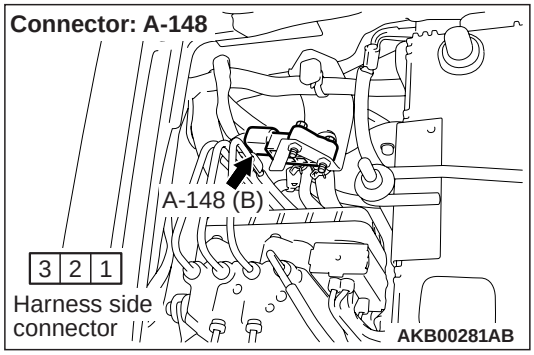
NO : Go to Step 5 .

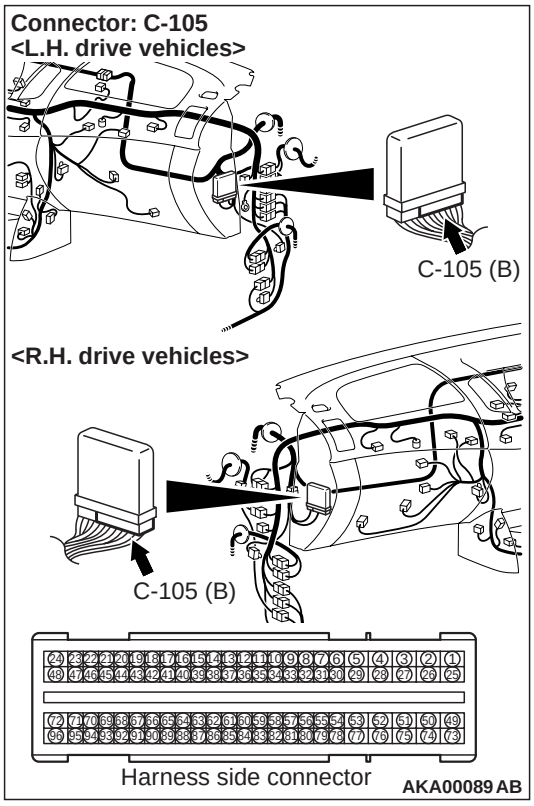
STEP 5. Connector check: C-105 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 6 .
NO : Repair or replace the connector.

STEP 6. Check harness between A-148 (terminal No. 3) exhaust differential pressure sensor connector and C-105 (terminal No. 94) engine-ECU connector.





- Check power supply line for short circuit.

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair the damaged harness wire.

STEP 7. M.U.T.-III data list

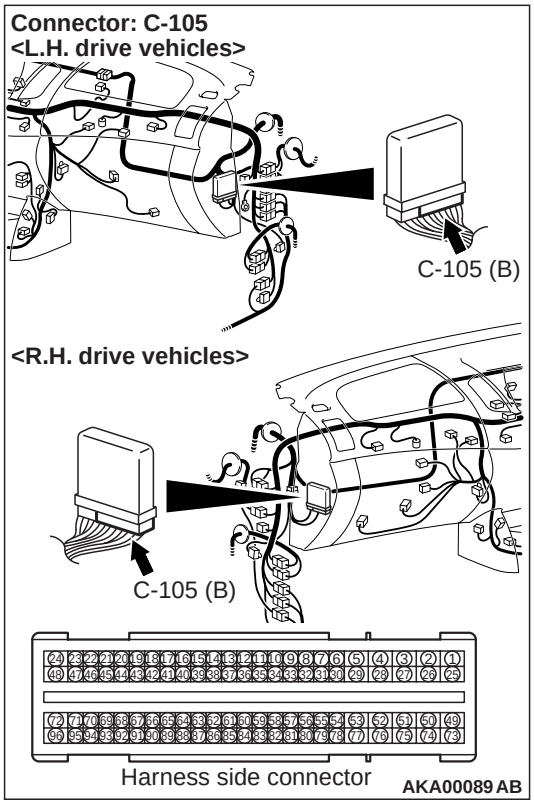
- Refer to Data List Reference Table P.13A-542.
  a. Item 120: exhaust differential pressure sensor

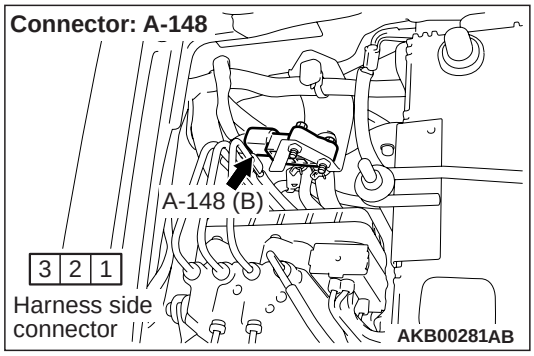
Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

NO : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, carry out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

STEP 8. Connector check: C-105 engine-ECU connector





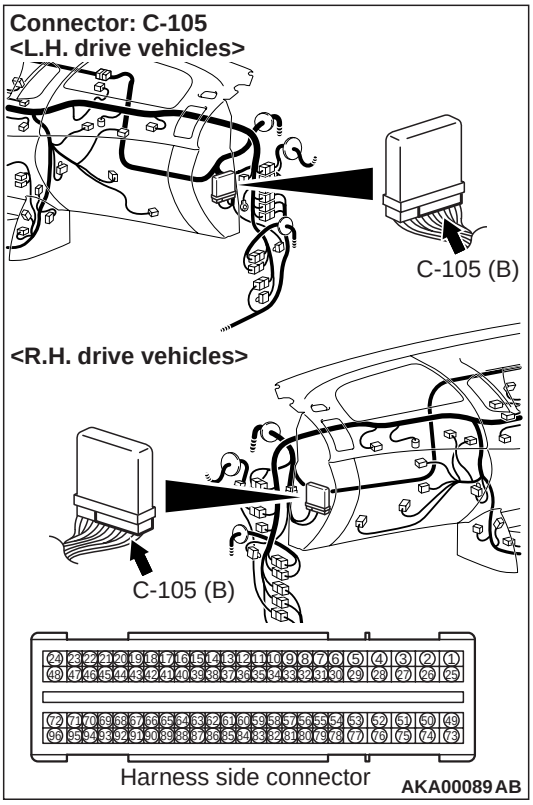
Q: Is the check result normal?

YES : Check and repair harness between A-148 (terminal No. 3) exhaust differential pressure sensor connector and C-105 (terminal No. 94) engine-ECU connector.

- Check power supply line for open circuit.

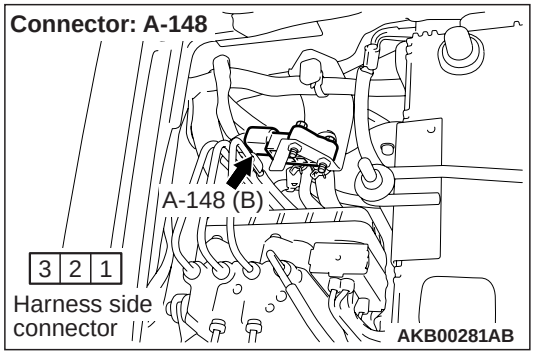
NO : Repair or replace the connector.

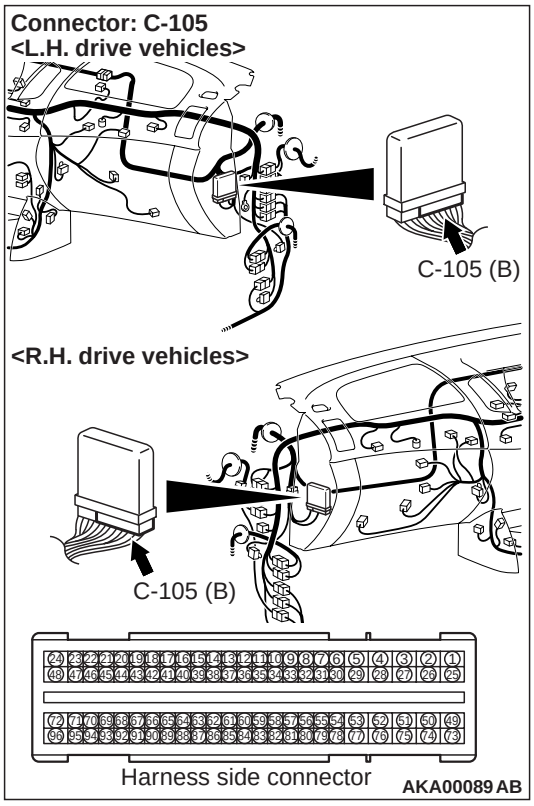
STEP 9. Connector check: C-105 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 10 .
NO : Repair or replace the connector.

STEP 10. Check harness between A-148 (terminal No. 3) exhaust differential pressure sensor connector and C-105 (terminal No. 94) engine-ECU connector.

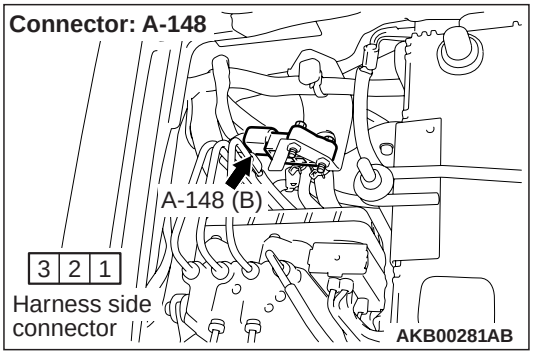


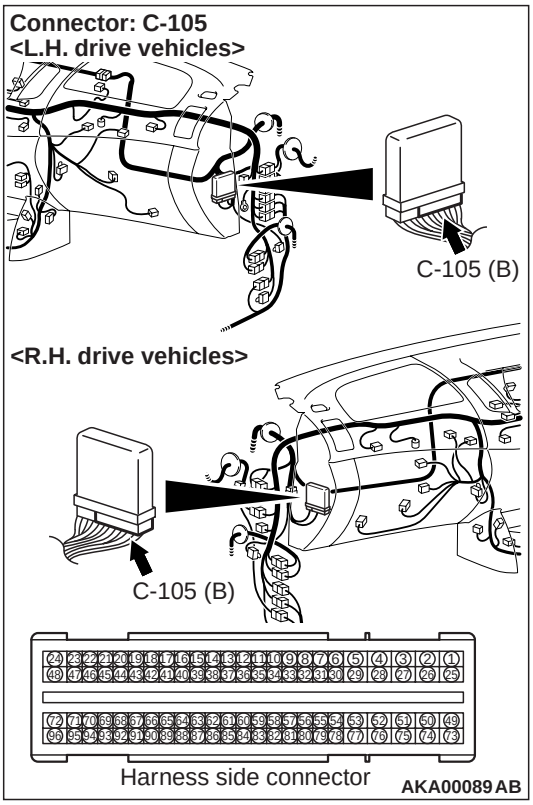


- Check power supply line for damage.

Q: Is the check result normal?
YES : Go to Step 11 .
NO : Repair the damaged harness wire.

STEP 11. Check harness between A-148 (terminal No. 1) exhaust differential pressure sensor connector and C-105 (terminal No. 56) engine-ECU connector.





- Check output line for open/short circuit and damage.

Q: Is the check result normal?
YES : Go to Step 12 .
NO : Repair the damaged harness wire.

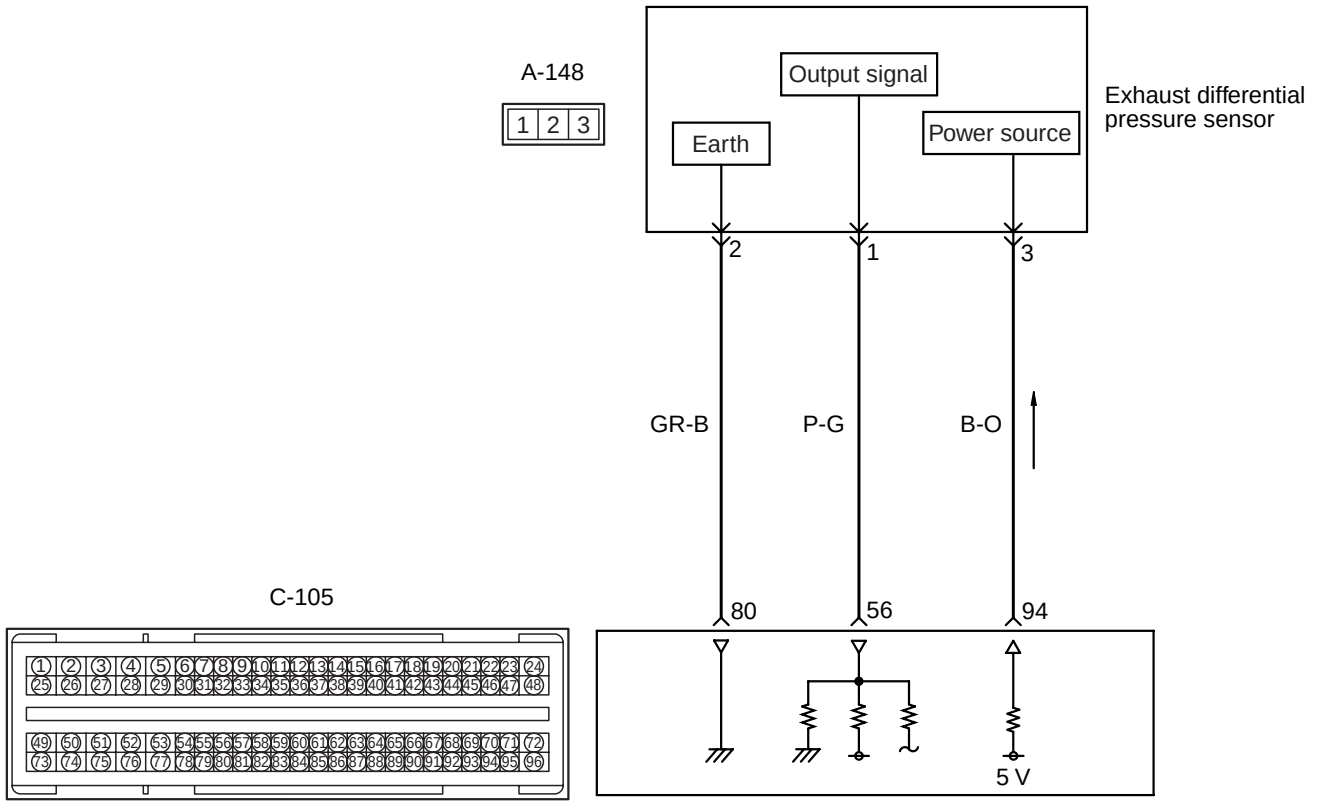
STEP 12. Replace the exhaust differential pressure sensor

- After replacing the exhaust differential pressure sensor, carry out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration). After carrying out the forcible DPF regeneration, re-check the trouble symptoms.

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Check end.

Code No. P2455: Exhaust Differential Pressure Sensor Circuit High Input <Euro5>

Exhaust Differential Pressure Sensor Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V: Violet PU: Purple SI: Silver

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OPERATION

- A power voltage of 5 V is applied to the exhaust differential pressure sensor power terminal (terminal No. 3) from the engine-ECU (terminal No. 94) and earthed to the engine-ECU (terminal No. 80) from the exhaust differential pressure sensor (terminal No. 2).
- The sensor signal is inputted to the engine-ECU (terminal No. 56) from the exhaust differential pressure sensor output terminal (terminal No. 1).

FUNCTION

- The exhaust differential pressure sensor outputs the voltage to the engine-ECU in accordance with the difference in the voltage between the DPF upstream area and the DPF down stream area.
- The engine-ECU anticipates the amount of PM accumulated in the DPF through this output voltage.

TROUBLE JUDGMENT

Check Conditions

- Battery positive voltage is 8 – 16 V
- 2 seconds later after the ignition switch has been in "ON" position or the engine has started up

Judgment Criterion

- The exhaust differential pressure sensor output voltage is 4.79 V or more.

PROBABLE CAUSES

- Failed exhaust differential pressure sensor
- Open circuit in exhaust differential pressure sensor circuit or loose connector contact
- Failed engine-ECU

DIAGNOSTIC PROCEDURE

STEP 1. M.U.T.-III data list

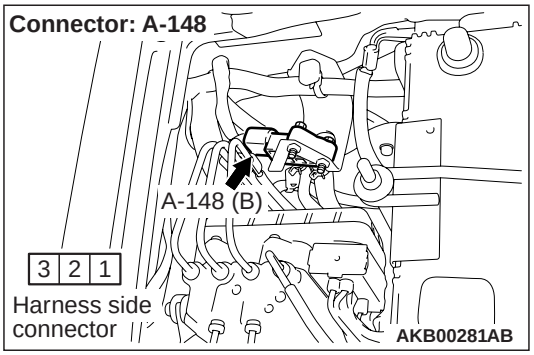
- Refer to Data List Reference Table P.13A-542.
  a. Item 120: exhaust differential pressure sensor

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

NO : Go to Step 2 .

STEP 2. Connector check: A-148 exhaust differential pressure sensor connector

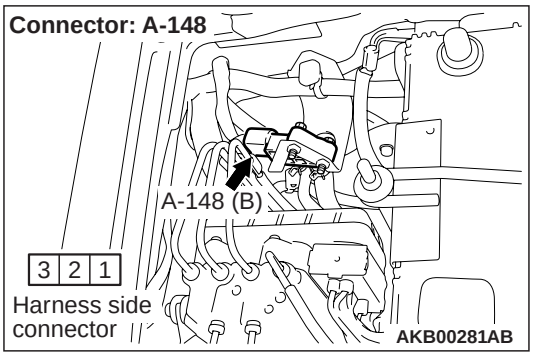


Q: Is the check result normal?

YES : Go to Step 3 .

NO : Repair or replace the connector.

STEP 3. Perform resistance measurement at A-148 exhaust differential pressure sensor connector.



- Disconnect connector, and measure at harness side.
- Ignition switch: ON
- Resistance between terminal No. 2 and earth.

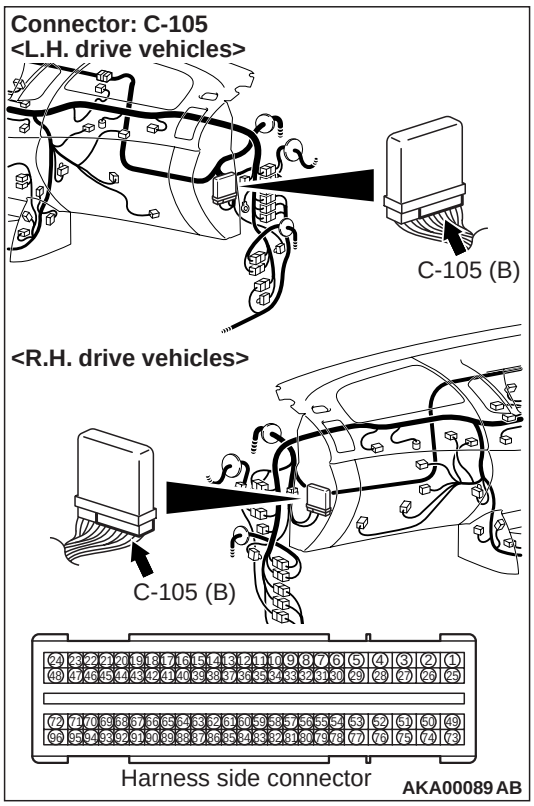
OK: Continuity (2 Ω or less)

Q: Is the check result normal?

YES : Go to Step 7 .

NO : Go to Step 4 .

STEP 4. Connector check: C-105 engine-ECU connector

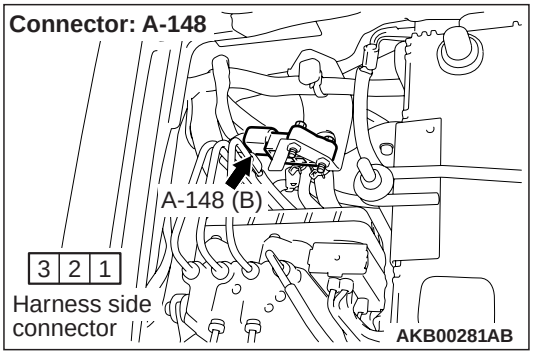


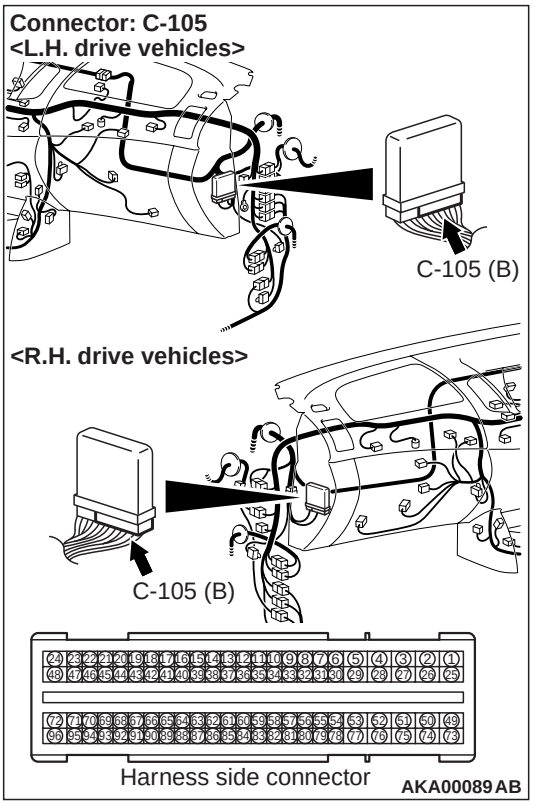
Q: Is the check result normal?

YES : Go to Step 5 .

NO : Repair or replace the connector.

STEP 5. Check harness between A-148 (terminal No. 2) exhaust differential pressure sensor connector and C-105 (terminal No. 80) engine-ECU connector.





- Check earthing line for open circuit and damage.

Q: Is the check result normal?

YES : Go to Step 6 .
NO : Repair the damaged harness wire.

STEP 6. M.U.T.-III data list

- Refer to Data List Reference Table P.13A-542.
  a. Item 120: exhaust differential pressure sensor

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).
NO : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, carry out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

STEP 7. Replace the exhaust differential pressure sensor

- After replacing the exhaust differential pressure sensor, Carry out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration). After carrying out the forcible DPF regeneration, re-check the trouble symptoms.

Q: Is the check result normal?

YES : Go to Step 6 .
NO : Check end.

Code No. P252F: Engine Oil Level Malfunction <Euro5>

FUNCTION

- The engine oil level may ascend if the fuel runs into the engine oil on the DPF regeneration.
- The engine-ECU monitors the engine driving conditions to estimate the ascend of engine oil level.

TROUBLE JUDGMENT

Check Condition

- Ignition switch is in "ON" position.

Judgement Criterion

- The estimated increased amount of the engine oil exceeds the 1,000 cc.

PROBABLE CAUSE

- The engine oil is increased.

DIAGNOSIS PROCEDURE

STEP 1. Replace the engine oil.
- Replace the engine oil, When the engine oil is replaced, initialise the learning value (Refer to GROUP 00 – Precautions before Service – Initialisation Procedure for Learning Value in Diesel Particulate Filter (DPF) System). After initialising the learning value, reconfirm diagnosis code.

Q: Is the diagnosis code set?

YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, carry out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

NO : Check end.

Code No. U1073: Bus Off

⚠ CAUTION

If diagnosis code U1073 is output from engine-ECU surely perform CAN busline diagnosis.

⚠ CAUTION

Replace ECU after certainly confirming that the communication circuits are normal.

TROUBLE JUDGMENT

Check Condition
- All the time

Judgment Criterion
- When the buss off error is detected.

COMMENT ON TROUBLE SYMPTOM
- The failure is possibly caused by malfunction of the harness and connector in CAN busline or by malfunction in engine-ECU.

PROBABLE CAUSE
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics
- Using M.U.T.-III, perform CAN busline diagnosis.

Q: Is the check result normal?

YES : Go to Step 2 .

NO : Correct CAN busline (Refer to GROUP 54C – Troubleshooting – Can Bus Diagnostics Table), and then go to Step 3 .

STEP 2. M.U.T.-III diagnosis code
- Reconfirm whether the diagnosis codes are output from engine-ECU.

1. Erase the diagnosis codes being output.
2. Ignition switch: "LOCK" (OFF) to ON
3. Confirm whether the diagnosis codes are output.

Q: Are the diagnosis codes output?

YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration). and then go to Step 3 .

NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

STEP 3. M.U.T.-III diagnosis code
- Reconfirm whether the diagnosis codes are output from engine-ECU.

1. Erase the diagnosis codes being output.
2. Ignition switch: "LOCK" (OFF) to ON
3. Confirm whether the diagnosis codes are output.

Q: Are the diagnosis codes output?

YES : Go to Step 1 .
NO : The check is end.

Code No. U1101: A/T-ECU Time-out <A/T>

⚠ CAUTION
If Diagnosis Code U1101 is output from engine-ECU surely perform CAN busline diagnosis.

⚠ CAUTION
Replace ECU after certainly confirming that the communication circuits are normal.

NOTE: When the diagnosis codes relating to the CAN communication error are output, make sure of the vehicle equipment. When the vehicle is not equipped with the system the engine-ECU communicates to, the diagnosis code is always output. This is not abnormal.

TROUBLE JUDGMENT

Check Conditions
- The diagnosis code setting enabled signal is received from ETACS-ECU.

Judgment Criterion
- The signals cannot be received from A/T-ECU for 0.5 second or more.

COMMENT ON TROUBLE SYMPTOM

Current malfunction
- The failure is possibly caused by malfunction of the harness and connector in CAN busline between engine-ECU and A/T-ECU, by malfunction in the power supply system of A/T-ECU, in combination meter itself, in engine-ECU.

Past malfunction
- Focus on diagnosing malfunction of the harness and connector in CAN busline between engine-ECU and A/T-ECU as well as malfunction in the power supply system of A/T-ECU. Refer to past trouble (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points – How to Treat Past Trouble) for the diagnosis procedure.

NOTE: In case of Past trouble, M.U.T.-III CAN bus diagnosis cannot detect the failure even if there is malfunction in CAN bus, so that check CAN busline in the same way as Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions). The diagnosis codes being output to each ECU with CAN communication can narrow down the most suspected area (Refer to GROUP 54C – Troubleshooting – Can Bus Diagnostics Table).

PROBABLE CAUSES
- Failed of the harness and the connector
- Failed A/T-ECU
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnosis
- Using M.U.T.-III, perform CAN busline diagnosis.

Q: Is the check result normal?
YES : Go to Step 2 .
NO : Correct CAN busline (Refer to GROUP 54C – Troubleshooting – CAN Bus Diagnostics Table), and then go to Step 6 .

STEP 2. M.U.T.-III other system diagnosis codes.
- Confirm whether the diagnosis codes are output from A/T-ECU.

Q: Is the diagnosis code output?
YES : Perform the troubleshooting of A/T-ECU (Refer to GROUP 23A – Check Chart for Diagnosis Code).
NO : Go to Step 3 .

STEP 3. M.U.T.-III other system diagnosis codes.

- Confirm whether Diagnosis Code U1101: A/T-ECU time out is output from the following ECU having CAN communication with automatic transmission.

a. ETACS-ECU

Q: Is the diagnosis code output?
YES : Go to Step 4 .
NO : Go to Step 5 .

STEP 4. Reconfirmation of diagnosis codes

- Reconfirm whether the diagnosis codes are output from engine-ECU

1. Erase the diagnosis codes being output.
2. Ignition switch: "LOCK" (OFF) to ON
3. Confirm whether the diagnosis codes are output.

Q: Is the diagnosis code output?
YES : After replacing the A/T-ECU, go to Step 6 .
NO : Intermittent malfunction in CAN busline between engine-ECU and A/T-ECU (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions).

STEP 5. Reconfirmation of diagnosis codes

- Reconfirm whether the diagnosis codes are output from engine-ECU

1. Erase the diagnosis codes being output.
2. Ignition switch: "LOCK" (OFF) to ON
3. Confirm whether the diagnosis codes are output.

Q: Is the diagnosis code output?
YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration). and then go to Step 6 .
NO : Intermittent malfunction in CAN busline between engine-ECU and A/T-ECU (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions).

STEP 6. Reconfirmation of diagnosis codes

- Reconfirm whether the diagnosis codes are output from engine-ECU

1. Erase the diagnosis codes being output.
2. Ignition switch: "LOCK" (OFF) to ON
3. Confirm whether the diagnosis codes are output.

Q: Is the diagnosis code output?
YES : Go to Step 1 .
NO : The check is end.

Code No. U1102 ASTC-ECU Time-out <Except vehicles for Morocco>

⚠ CAUTION
If Diagnosis Code U1102 is output from engine-ECU surely perform CAN busline diagnosis.

⚠ CAUTION
Replace ECU after certainly confirming that the communication circuits are normal.

NOTE: When the diagnosis codes relating to the CAN communication error are output, make sure of the vehicle equipment. When the vehicle is not equipped with the system the engine-ECU communicates to, the diagnosis code is always output. This is not abnormal.

TROUBLE JUDGMENT

Check Condition

- The diagnosis code setting enabled signal is received from ETACS-ECU.

Judgment Criterion

- The signals cannot be received from ASTC-ECU for 65 second or more.

COMMENT ON TROUBLE SYMPTOM

Current malfunction

- The failure is possibly caused by malfunction of the harness and connector in CAN busline between engine-ECU and ASTC-ECU, by malfunction in the power supply system of ASTC-ECU, in ASTC-ECU itself, in engine-ECU.

Past malfunction

- Focus on diagnosing malfunction of the harness and connector in CAN busline between engine-ECU and ASTC-ECU as well as malfunction in the power supply system of ASTC-ECU (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

NOTE: In case of Past trouble, M.U.T.-III CAN bus diagnosis cannot detect the failure even if there is malfunction in CAN bus, so that check CAN busline in the same way as Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions). The diagnosis codes being output to each ECU with CAN communication can narrow down the most suspected area. (Refer to GROUP 54C – Explanation About The M.U.T.-III Can Bus Diagnostics).

PROBABLE CAUSE

- Failed of the harness and the connector
- Failed engine-ECU
- Failed ASTC-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics

- Using M.U.T.-III, perform CAN busline diagnosis.

Q: Is the check result normal?

YES : Go to Step 2 .

NO : Correct CAN busline (Refer to GROUP 54C – Diagnosis – Can Bus Diagnostic Chart), and then go to Step 4 .

STEP 2. M.U.T.-III other system diagnosis codes

- Confirm whether the diagnosis codes are output from ASTC-ECU.

Q: Is the diagnosis code output?

YES : Perform the troubleshooting of anti-skid braking system (Refer to GROUP 35B – Troubleshooting – Check Chart for Diagnosis Code).

NO : Go to Step 3 .

STEP 3. M.U.T.-III diagnosis code

- Reconfirm whether the diagnosis codes are output from engine-ECU
  1. Erase the diagnosis codes being output.
  2. Ignition switch: "LOCK" (OFF) to ON
  3. Confirm whether the diagnosis codes are output.

Q: Is the diagnosis code output?

YES : Go to Step 4 .

NO : Intermittent malfunction in CAN busline between engine-ECU and ASTC-ECU (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction).

STEP 4. Replace the ASTC-ECU

- After replacing the ASTC-ECU, re-check the diagnosis code output.

Q: Is the diagnosis code output?

YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

NO : The check is end.

Code No. U1109: ETACS-ECU Time-out

⚠ CAUTION
If Diagnosis Code U1109 is output from engine-ECU surely perform CAN busline diagnosis.

⚠ CAUTION
Replace ECU after certainly confirming that the communication circuits are normal.

NOTE: When the diagnosis codes relating to the CAN communication error are output, make sure of the vehicle equipment. When the vehicle is not equipped with the system the engine-ECU communicates to, the diagnosis code is always output. This is not abnormal.

TROUBLE JUDGMENT

Check Condition
- The diagnosis code setting enabled signal is received from ETACS-ECU.

Judgment Criterion
- The signals cannot be received from ETACS-ECU for 0.5 second or more.

COMMENT ON TROUBLE SYMPTOM

Current malfunction
- The failure is possibly caused by malfunction of the harness and connector in CAN busline between engine-ECU and ETACS-ECU by malfunction in the power supply system of ETACS-ECU, in ETACS-ECU itself, in engine-ECU.

Past malfunction
- Focus on diagnosing malfunction of the harness and connector in CAN busline between engine-ECU and ETACS-ECU as well as malfunction in the power supply system of ETACS-ECU. Refer to past trouble (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points – How to Treat Past Trouble) for the diagnosis procedure.

NOTE: In case of Past trouble, M.U.T.-III CAN bus diagnosis cannot detect the failure even if there is malfunction in CAN bus, so that check CAN busline in the same way as Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions). The diagnosis codes being output to each ECU with CAN communication can narrow down the most suspected area (Refer to GROUP 54C – Can Bus Diagnosis Table).

PROBABLE CAUSES
- Failed of the harness and the connector
- Failed ETACS-ECU
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnosis
- Using M.U.T.-III, perform CAN busline diagnosis.

Q: Is the check result normal?
YES : Go to Step 2 .
NO : Correct CAN busline (Refer to GROUP 54C – Troubleshooting – CAN Bus Diagnosis Table), and then go to Step 6 .

STEP 2. M.U.T.-III other system diagnosis codes.
- Confirm whether the diagnosis codes are output from ETACS-ECU.

Q: Is the diagnosis code output?
YES : Perform the troubleshooting of ETACS-ECU (Refer to GROUP 54B – Diagnostic Code Chart)
NO : Go to Step 3 . <A/T>
NO : Go to Step 5 . <M/T>

STEP 3. M.U.T.-III other system diagnosis codes.
- Confirm whether Diagnosis Code U1109: ETACS-ECU time out is output from the following ECU having CAN communication with automatic transmission.

a. A/T-ECU

Q: Is the diagnosis code output?
YES : Go to Step 4 .
NO : Go to Step 5 .

STEP 4. Reconfirmation of diagnosis codes
- Reconfirm whether the diagnosis codes are output from engine-ECU

1. Erase the diagnosis codes being output.
2. Ignition switch: "LOCK" (OFF) to ON
3. Confirm whether the diagnosis codes are output.

Q: Is the diagnosis code output?

YES : After replacing the ETACS-ECU, go to Step 6 .
NO : Intermittent malfunction in CAN busline between engine-ECU and ETACS-ECU (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions).

STEP 5. Reconfirmation of diagnosis codes
- Reconfirm whether the diagnosis codes are output from engine-ECU

1. Erase the diagnosis codes being output.
2. Ignition switch: "LOCK" (OFF) to ON
3. Confirm whether the diagnosis codes are output.

Q: Is the diagnosis code output?
YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration). and then go to Step 6 .
NO : Intermittent malfunction in CAN busline between engine-ECU and ETACS-ECU (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions).

STEP 6. Reconfirmation of diagnosis codes
- Reconfirm whether the diagnosis codes are output from engine-ECU

1. Erase the diagnosis codes being output.
2. Ignition switch: "LOCK" (OFF) to ON
3. Confirm whether the diagnosis codes are output.

Q: Is the diagnosis code output?
YES : Go to Step 1 .
NO : The check is end.

Code No. U1110: A/C-ECU Time-out <Euro5>

⚠ CAUTION
If Diagnosis Code U1110 is output from engine-ECU surely perform CAN busline diagnosis.

⚠ CAUTION
Replace ECU after certainly confirming that the communication circuits are normal.

NOTE: When the diagnosis codes relating to the CAN communication error are output, make sure of the vehicle equipment. When the vehicle is not equipped with the system the engine-ECU communicates to, the diagnosis code is always output. This is not abnormal.

TROUBLE JUDGMENT

Check Conditions
- Ignition switch is in "ON" position.

Judgment Criterion
- The signals cannot be received from A/C-ECU for 0.5 second or more.

COMMENT ON TROUBLE SYMPTOM

Current malfunction
- The failure is possibly caused by malfunction of the harness and connector in CAN busline between engine-ECU and A/C-ECU, by malfunction in the power supply system of A/C-ECU, in A/C-ECU itself, in engine-ECU.

Past malfunction
- Focus on diagnosing malfunction of the harness and connector in CAN busline between engine-ECU and A/C-ECU as well as malfunction in the power supply system of A/C-ECU. Refer to past trouble (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points – How to Treat Past Trouble) for the diagnosis procedure.

NOTE: In case of Past trouble, M.U.T.-III CAN bus diagnosis cannot detect the failure even if there is malfunction in CAN bus, so that check CAN busline in the same way as Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions). The diagnosis codes being output to each ECU with CAN communication can narrow down the most suspected area (Refer to GROUP 54C – Troubleshooting – Can Bus Diagnostics Table).

PROBABLE CAUSES
- Failed of the harness and the connector
- Failed A/C-ECU
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnosis
- Using M.U.T.-III, perform CAN busline diagnosis.

Q: Is the check result normal?
YES : Go to Step 2 .
NO : Correct CAN busline (Refer to GROUP 54C – Troubleshooting – CAN Bus Diagnostics Table), and then go to Step 6 .

STEP 2. M.U.T.-III other system diagnosis codes.
- Confirm whether the diagnosis codes are output from A/C-ECU.

Q: Is the diagnosis code output?
YES : Perform the troubleshooting of A/C-ECU (Refer to GROUP 55B – Troubleshooting – Diagnostics Chart).
NO : Go to Step 3 .

STEP 3. M.U.T.-III other system diagnosis codes.
- Confirm whether Diagnosis Code U1110: A/C-ECU time out is output from the following ECU having CAN communication with automatic transmission.

a. ETACS-ECU

Q: Is the diagnosis code output?
YES : Go to Step 4 .
NO : Go to Step 5 .

STEP 4. Reconfirmation of diagnosis codes
- Reconfirm whether the diagnosis codes are output from engine-ECU

1. Erase the diagnosis codes being output.
2. Ignition switch: "LOCK" (OFF) to ON
3. Confirm whether the diagnosis codes are output.

Q: Is the diagnosis code output?
YES : After replacing the A/C-ECU, go to Step 6 .
NO : Intermittent malfunction in CAN busline between engine-ECU and A/C-ECU (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions).

STEP 5. Reconfirmation of diagnosis codes
- Reconfirm whether the diagnosis codes are output from engine-ECU

1. Erase the diagnosis codes being output.
2. Ignition switch: "LOCK" (OFF) to ON
3. Confirm whether the diagnosis codes are output.

Q: Is the diagnosis code output?
YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, carry out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration). and then go to Step 6 .
NO : Intermittent malfunction in CAN busline between engine-ECU and A/C-ECU (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions).

STEP 6. Reconfirmation of diagnosis codes

- Reconfirm whether the diagnosis codes are output from engine-ECU

1. Erase the diagnosis codes being output.
2. Ignition switch: "LOCK" (OFF) to ON
3. Confirm whether the diagnosis codes are output.

Q: Is the diagnosis code output?

YES : Go to Step 1 .
NO : The check is end.

Code No. U1117 ETACS-ECU (Immobilizer-ECU) Time-out

⚠ CAUTION
If Diagnosis Code U1117 is output from engine-ECU surely perform CAN busline diagnosis.

⚠ CAUTION
Replace ECU after certainly confirming that the communication circuits are normal.

NOTE: When the diagnosis codes relating to the CAN communication error are output, make sure of the vehicle equipment. When the vehicle is not equipped with the system the engine-ECU communicates to, the diagnosis code is always output. This is not abnormal.

TROUBLE JUDGMENT

Check Condition

- Ignition switch is in "ON" position.

Judgment Criterion

- The signal from the ETACS-ECU is not received for 0.5 second or more.

COMMENT ON TROUBLE SYMPTOM

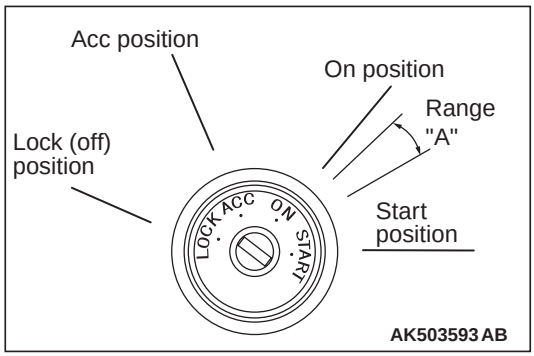
Current malfunction

- The failure is possibly caused by malfunction of the harness and connector in CAN busline between engine-ECU and ETACS-ECU, by malfunction in the power supply system of ETACS-ECU, in ETACS-ECU itself, in engine-ECU.

Past malfunction

- Focus on diagnosing malfunction of the harness and connector in CAN busline between engine-ECU and ETACS-ECU as well as malfunction in the power supply system of ETACS-ECU (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

⚠ CAUTION



When the ignition key is maintained within the range "A" (i.e., the ignition switch IG2 is in OFF position but the cranking does not start) for more than 1 second, engine-ECU stores diagnosis code U1117 (the past trouble).

NOTE: In case of Past trouble, M.U.T.-III CAN bus diagnosis cannot detect the failure even if there is malfunction in CAN bus, so that check CAN busline in the same way as Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions). The diagnosis codes being output to each ECU with CAN communication can narrow down the most suspected area. (Refer to GROUP 54C – Explanation About The M.U.T.-III Can Bus Diagnostics).

PROBABLE CAUSE

- Failed of the harness and the connector
- Failed engine-ECU
- Failed ETACS-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics

- Using M.U.T.-III, perform CAN busline diagnosis.

Q: Is the check result normal?

YES : Go to Step 2 .
NO : Correct CAN busline (Refer to GROUP 54C – Diagnosis – Can Bus Diagnostic Chart), and then go to Step 3 .

STEP 2. M.U.T.-III other system diagnosis codes
- Confirm whether the diagnosis codes are output from ETACS-ECU.

Q: Is the diagnosis code output?
YES : Perform the troubleshooting of immobilizer system (Refer to GROUP 54A – Immobilizer System – Check Chart for Diagnosis Code).
NO : Go to Step 3 .

STEP 3. M.U.T.-III diagnosis code
- Reconfirm whether the diagnosis codes are output from engine-ECU
  1. Erase the diagnosis codes being output.
  2. Ignition switch: "LOCK" (OFF) to ON
  3. Confirm whether the diagnosis codes are output.

Q: Is the diagnosis code output?
YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).
NO : Intermittent malfunction in CAN busline between engine-ECU and ETACS-ECU (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction).

Code No.U1190: The Network System Diagnosis Code Output Permitted Signal Can Not Be Received

TROUBLE JUDGMENT

Check Condition
- Ignition switch is in "ON" position

Judgment Criterion
- The diagnosis enable signal from the ETACS-ECU about the abnormal CAN is not received at all for 5 seconds or more after the ignition switch is on.

COMMENT ON TROUBLE SYMPTOM
- The ETACS-ECU sends the permitted / not permitted signals for detecting the diagnosis code (U-code) to each ECU connected with the CAN busline. When the engine-ECU cannot receive the permitted / not permitted signals for detecting the diagnosis code (U-code) for 5seconds, the diagnosis code No. U1190 is stored.

PROBABLE CAUSES
- Failed ETACS-ECU
- Failed CAN bus
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics
- Using M.U.T.-III perform the CAN buslines diagnosis.

Q: Is the check result normal?
YES : Go to Step 2 .
NO : Repair the CAN busline (Refer to GROUP 54C – Troubleshooting Can Bus Diagnostics Table), and then go to Step 3 .

STEP 2. M.U.T.-III diagnosis code.
- Reconfirm whether the diagnosis codes are output from engine-ECU.

1. Erase the diagnosis codes being output.
2. Ignition switch: "LOCK" (OFF) to "ON".
3. Confirm whether the diagnosis codes are output.

Q: Are the diagnosis codes output?
YES : Replace the ETACS-ECU, and then go to Step 3 .
NO : Check end.

STEP 3. M.U.T.-III diagnosis code.

- Reconfirm whether the diagnosis codes are output from engine-ECU.

1. Erase the diagnosis codes being output.
2. Ignition switch: "LOCK" (OFF) to "ON".
3. Confirm whether the diagnosis codes are output.

Q: Are the diagnosis codes output?

YES : Go to Step 1 .
NO : Check end.

INSPECTION CHART FOR TROUBLE SYMPTOMS

M1133004100754

Items	Trouble symptom		Inspection procedure No.
Communication with M.U.T.-III	Communication with engine-ECU is not possible		1
Engine warning lamp	The engine warning lamp does not illuminate right after the ignition switch is turned the "ON" position		2
	The engine warning lamp remains illuminating and never goes out or is blinking		3
Starting	The starter is impossible to operate.		4
	Starting impossible (Starter operative but no initial combustion)	The starter is operative and cranks the engine, but none of initial combustion is in the cylinders and the engine is not started.	5
	Starting improper (Long time to start)	It is long cranking to start the engine.	6
Improper idling	The proper idling speed is not satisfied.		7
Engine stalls	The engine stalls when decelerating	The engine stalls at the deceleration.	8
Driving	Poor acceleration	The engine cannot obtain the acceleration corresponding to the degree of throttle opening although the engine is smooth at the constant speed.	9
	A large amount of fuel consumption	Compared with before, the fuel consumption is dramatically increased.	10
Knocking, Abnormal noise	Knocking	Sharp sound like a hammer striking on the cylinder walls during the driving can be heard and wrongly affects the driving.	11
	Abnormal noise	Abnormal noise during the engine operation. (It is presumed that this is caused by malfunction over the wide range.)	

Items	Trouble symptom		Inspection procedure No.
Exhaust gas	White smoke	Exhaust gases are extraordinarily white.	12
	Black smoke	Exhaust gases are extraordinarily black.	13
Charging performance	Battery rundown	The battery is soon rundown or the charging ability of battery is small.	14
Cooling performance	Overheating	The temperature of engine cooling water is extremely high.	15

PROBLEM SYMPTOMS TABLE

Inspection procedure No.	Trouble symptom	Reference page
1	Communication with engine-ECU is not possible	P.13A-433
2	The engine warning lamp does not illuminate right after the ignition switch is turned the "ON" position	P.13A-438
3	The engine warning lamp remains illuminating and never goes out or is blinking	P.13A-441
4	The starter is impossible to operate <M/T>	P.13A-445
	The starter is impossible to operate <A/T>	P.13A-453
5	Starting impossible (Starter operative but no initial combustion)	P.13A-462
6	Improper starting (Long time to start)	P.13A-464
7	Improper idling	P.13A-466
8	The engine stalls when decelerating	P.13A-468
9	Poor acceleration	P.13A-471
10	A large amount of fuel consumption	P.13A-473
11	Knocking, Abnormal noise	P.13A-475
12	White smoke	P.13A-477
13	Black smoke	P.13A-479
14	Battery rundown <Euro5>	P.13A-481
	Battery rundown <Except Euro5>	P.13A-486
15	Overheating	P.13A-487
16	Engine-ECU power supply system	P.13A-488
17	Engine-ECU battery back-up system	P.13A-493
18	1st and 2nd rail switch system <M/T>	P.13A-497
19	Back-up lamp switch system <M/T>	P.13A-501
20	4LLC switch system <M/T-high power engine vehicle>	P.13A-505
21	Condenser fan relay system <Vehicles with A/C condenser fan>	P.13A-507
22	A/C switch system	P.13A-509

Inspection procedure No.	Trouble symptom	Reference page
23	A/C compressor relay system	P.13A-512
24	Power steering fluid pressure switch system	P.13A-514
25	Glow system <Except Euro5>	P.13A-520
26	PTC heater relay system <Vehicles with PTC heater>	P.13A-525
27	Blower switch system <Euro5>	P.13A-528
28	Rear window defogger system <Euro5>	P.13A-533
29	DPF lamp system <Euro5>	P.13A-537

CHECK CHART CLASSIFIED BY PROBLEM SYMPTOMS

M1133604700134

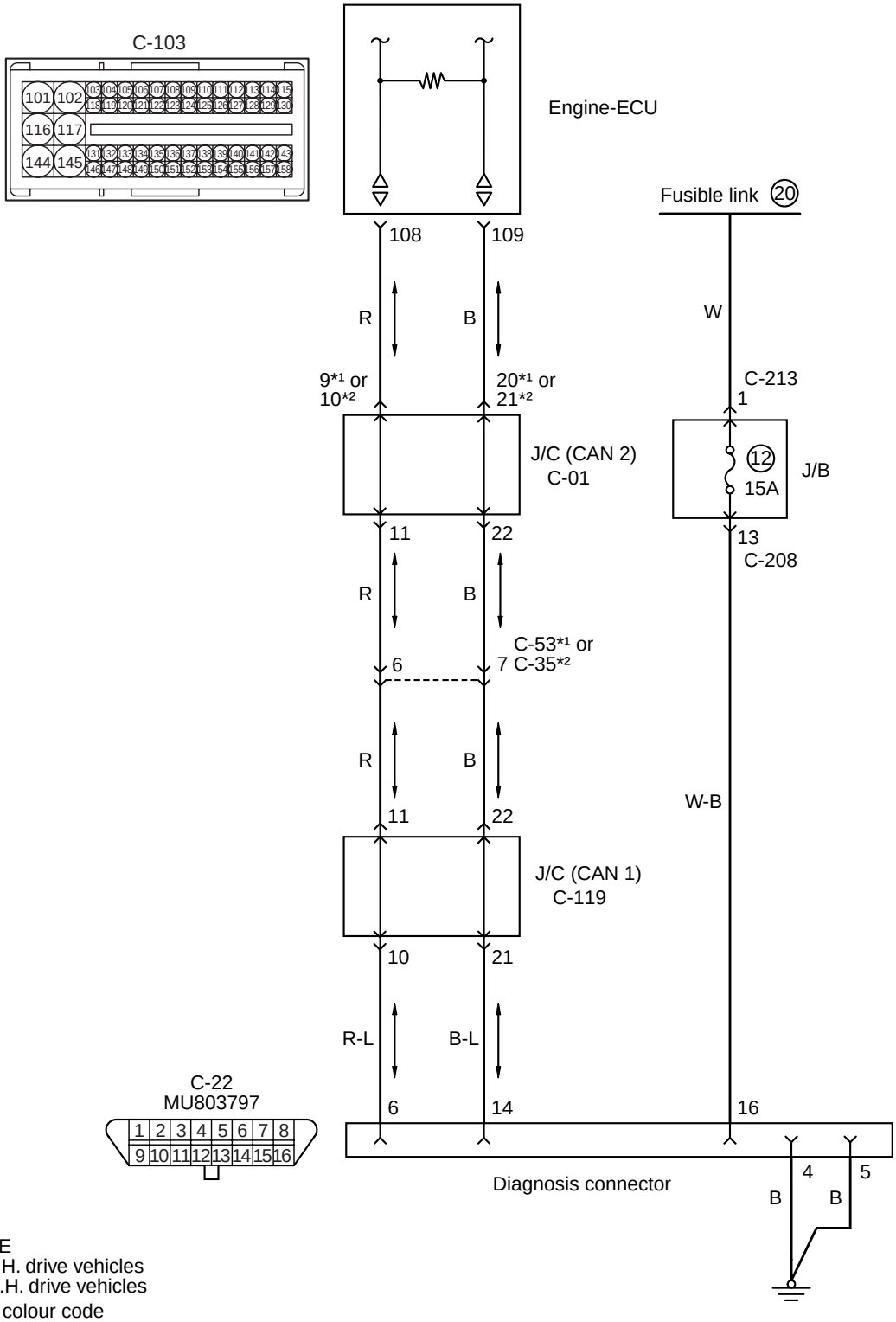
Trouble symptoms / Probable causes	Communication with engine-ECU is not possible	The engine warning lamp does not illuminate right after the ignition switch is turned the "ON" position	The engine warning lamp remains illuminating and never goes out or is blinking	The starter is impossible to operate	Starting impossible (Starter operative but no initial combustion)	Starting impossible (Long time to start)	Improper idling	The engine stalls when decelerating	Poor acceleration	A large amount of fuel consumption	Knocking, Abnormal noise	White smoke	Black smoke	Battery rundown	Overheating
Diagnosis connector circuit	○														
Engine warning lamp		○													
Engine warning lamp circuit		○	○												
Starter motor				○											
Starter motor relay				○											
Starting system related circuit				○	○										
Battery	○			○	○									○	
Inhibitor switch				○											
Engine control relay					○										
Engine-ECU power supply circuit	○				○										
Engine-ECU	○	○	○	○	○	○	○	○	○	○	○	○	○		○
Glow system					○	○						○			
Timing chain torn					○										
Valve clearance							○	○			○				
Compression pressure					○	○	○	○	○	○	○	○	○		
Common rail assembly					○	○	○	○	○	○	○	○	○		
Suction control valve					○	○	○	○	○	○	○	○	○		
Supply pump					○	○	○	○	○	○	○	○	○		
Supply pump correction learning					○	○	○	○	○	○	○	○	○		
Fuel filter clogged					○	○	○	○	○				○		
Fuel line leaking or clogged					○	○	○	○	○				○		
Mixing of air with fuel					○	○	○	○	○	○	○		○		
Improper fuel					○	○	○	○	○			○	○		
Engine oil												○			
Air cleaner clogged								○	○				○		
Electronic-controlled throttle valve							○	○	○	○	○	○	○		
EGR system							○	○	○	○	○	○	○		
EGR port clogged										○	○				
Turbocharger									○	○		○			
Injector					○	○	○	○	○	○	○	○	○		
Injector identification code registration			○		○	○	○	○	○	○	○	○	○		
Small injection quantity learning			○		○	○	○	○	○	○	○	○	○		
Crank angle sensor					○	○	○	○	○		○		○		
Camshaft position sensor					○	○	○	○	○		○		○		
Barometric pressure sensor												○	○		
Engine coolant temperature sensor						○						○	○		
Manifold absolute pressure sensor								○	○			○	○		
Fuel temperature sensor												○	○		
Accelerator pedal position sensor							○	○	○	○	○	○	○		
Throttle position sensor							○	○	○	○	○	○	○		
Fuel pressure sensor					○	○	○	○	○	○	○	○	○		
Engine cooling system										○					○
Alternator														○	

AK503602

SYMPTOM PROCEDURES

Inspection Procedure 1: Communication with Engine-ECU Is Not Possible

CAN Communication Circuit



NOTE
*1: L.H. drive vehicles
*2: R.H. drive vehicles

Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V: Violet PU: Purple SI: Silver

AKA00111AB

OPERATION

- The M.U.T.-III receives data from the engine-ECU via the CAN bus line.

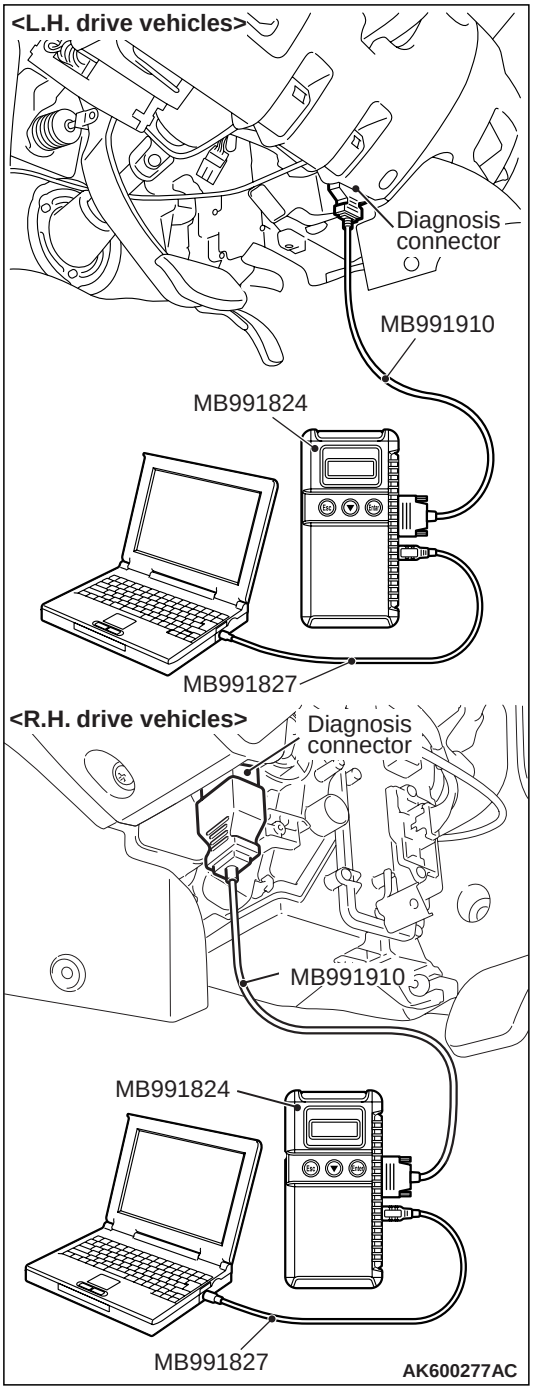
PROBABLE CAUSES

- Damaged connector (Engine-ECU connector, diagnosis connector)

- Damaged harness (Open or short circuit in the engine-ECU power supply circuit, open circuit between diagnosis connector and J/B connector, and open circuit between diagnosis connector and earth)
- Failed CAN bus line
- Failed M.U.T.-III
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. Check the V.C.I. indicator lamp illuminates.



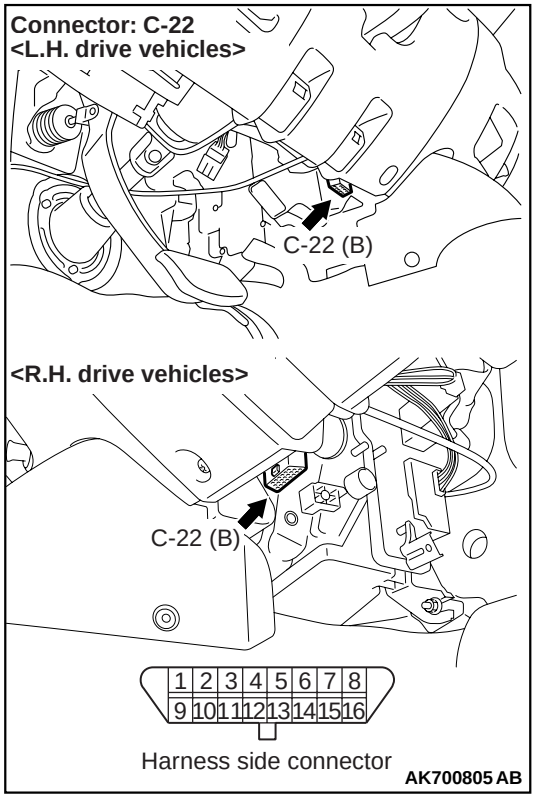
- Connect the M.U.T.-III to the diagnosis connector.

Q: Is the V.C.I. indicator lamp illuminates in a green colour?

YES : CAN bus diagnosis (Refer to GROUP 54C – Troubleshooting – Can Bus Diagnosis Table).

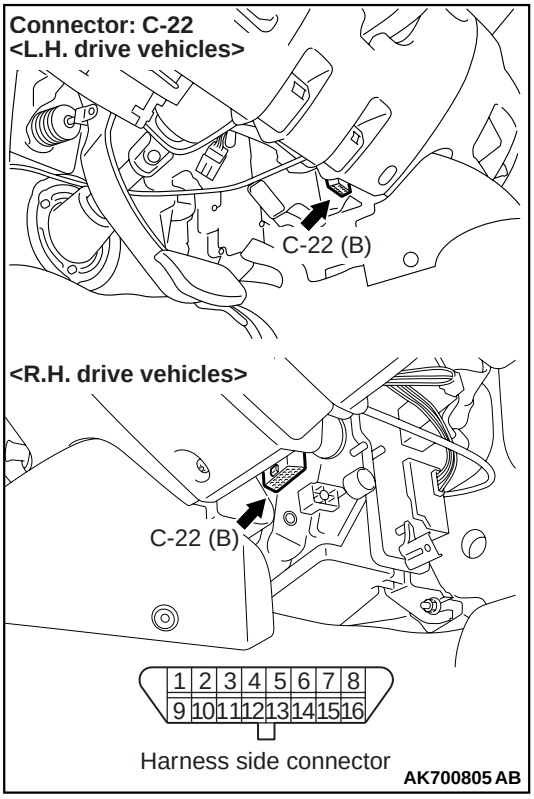
NO : Go to Step 2 .

STEP 2. Connector check: C-22 diagnosis connector



Q: Is the check result normal?
YES : Go to Step 3 .
NO : Repair or replace.

STEP 3. Perform voltage measurement for open circuit at C-22 diagnosis connector.

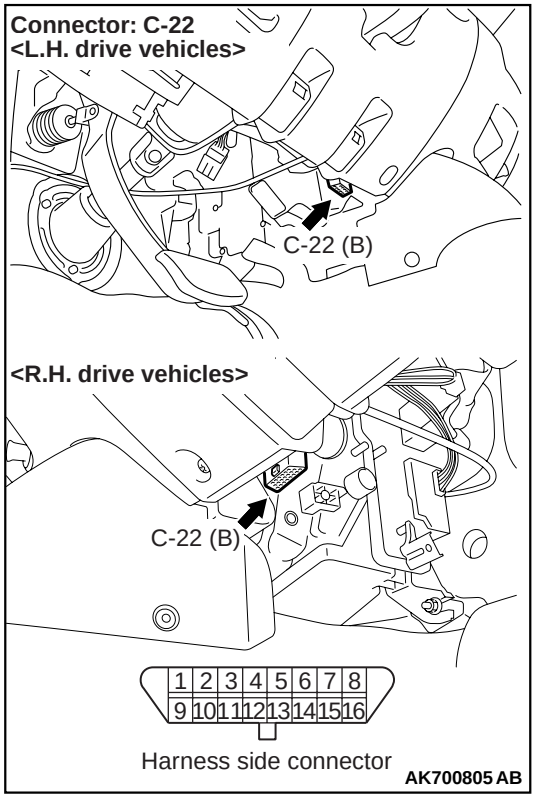


- Voltage between terminal No. 16 and earth.

  OK: System voltage

Q: Is the check result normal?
YES : Go to Step 4 .
NO : Repair harness between C-22 (terminal No. 16) diagnosis connector and C-208 (terminal No. 13) J/B connector.

STEP 4. Check for open circuit between diagnosis connector C-22 and earth.



- Disconnect connector.
- Check open circuit between terminal No. 4 and earth also between terminal No. 5 and earth.

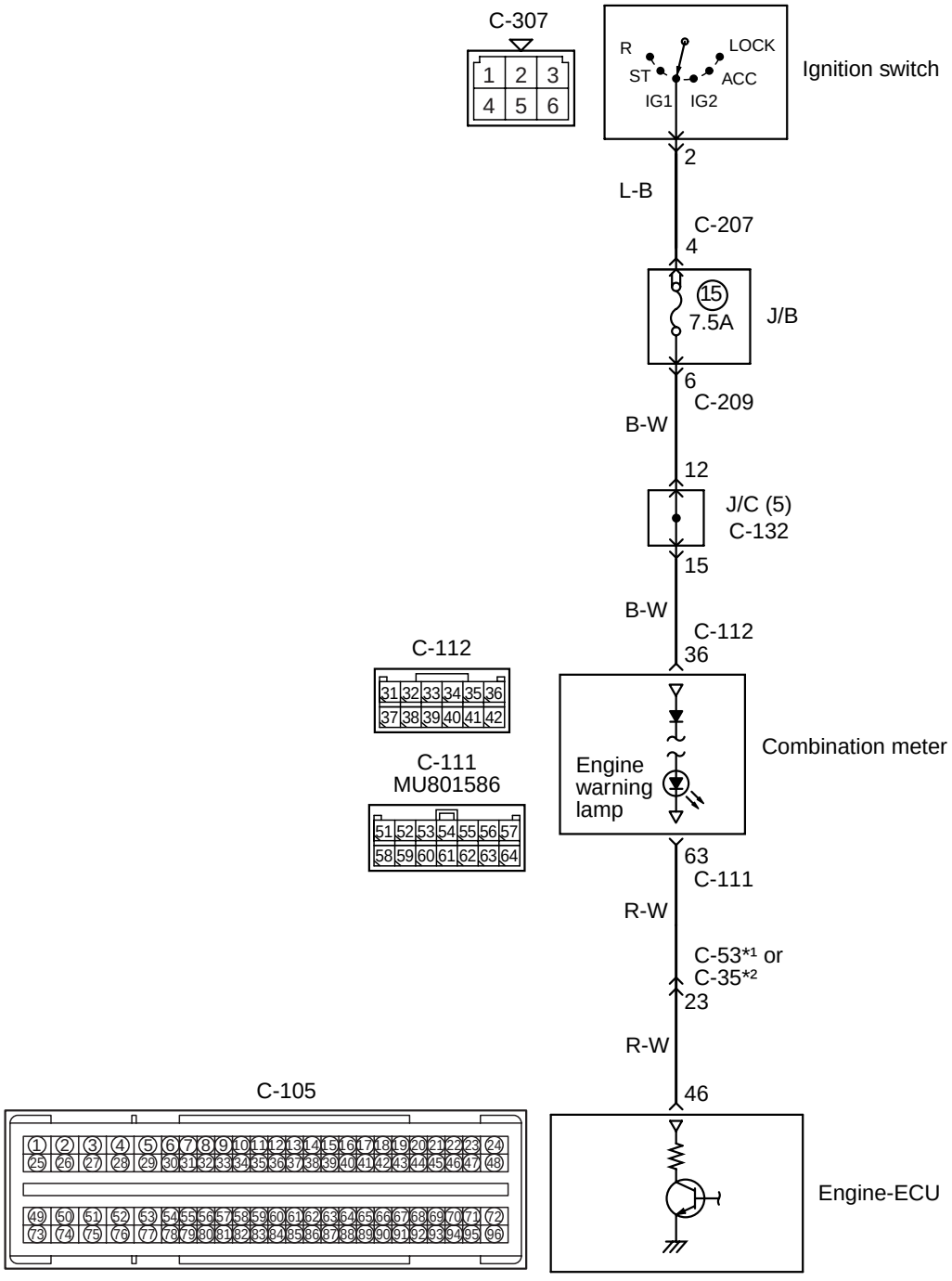
Q: Is the check result normal?

YES : Refer to M.U.T.-III User' s Manual – Troubleshooting Procedures.

NO : Repair harness between diagnosis connector and body earth.

Inspection Procedure 2: The Engine Warning Lamp Does Not Illuminate Right after the Ignition Switch Is Turned the "ON" Position

Engine Warning Lamp (check engine lamp) Circuit



NOTE
*1: L.H. drive vehicles
*2: R.H. drive vehicles

Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V: Violet PU: Purple SI: Silver

AKB00284 AB

OPERATION

- Engine-ECU turn on engine warning lamp for 5 seconds to check for burnt-out bulb immediately after ignition switch is turned to ON.

PROBABLE CAUSES

- Damaged connector (Engine-ECU connector, combination meter connector)
- Damaged harness (Open circuit between engine-ECU and combination meter)
- Failed combination meter
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. Check indicator illumination.

Q: Does an indicator other than the engine warning lamp illuminate?

YES : Go to Step 2 .

NO : Inspect combination meter and related circuits (Refer to GROUP 54A – Combination Meter – Check Chart for Trouble Symptoms).

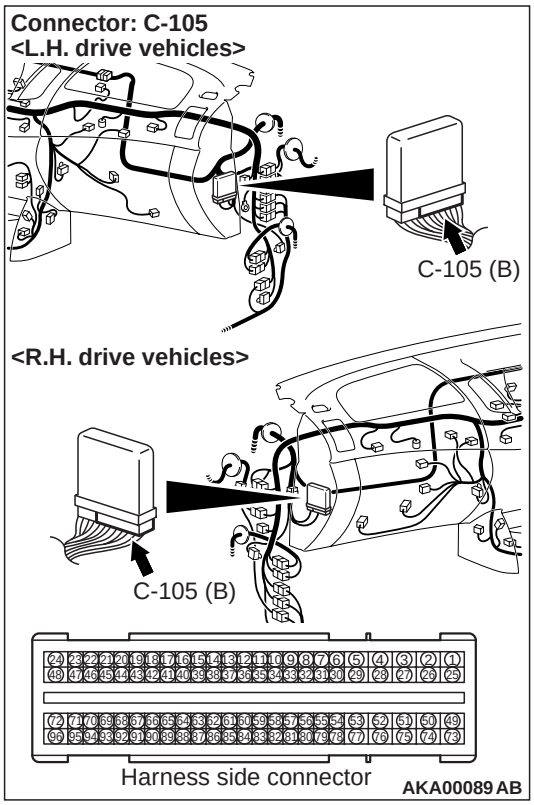
STEP 2. M.U.T.-III diagnosis code.

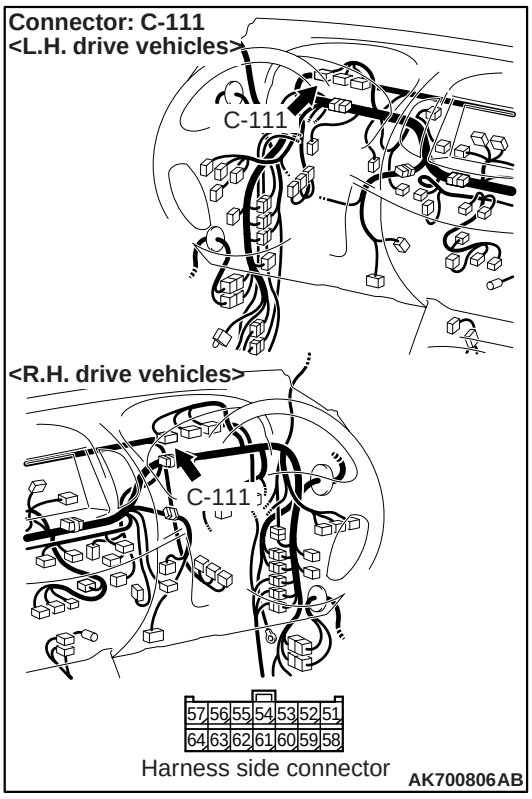
Q: Is the diagnosis code set?

YES : Inspection chart for diagnosis code (Refer to P.13A-21).

NO : Go to Step 3 .

STEP 3. Connector check: C-105 Engine-ECU connector and C-111 combination meter connector.



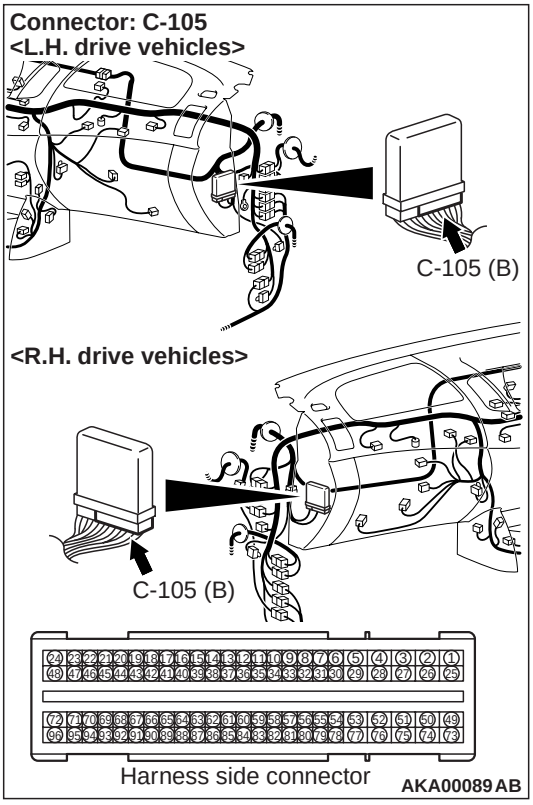


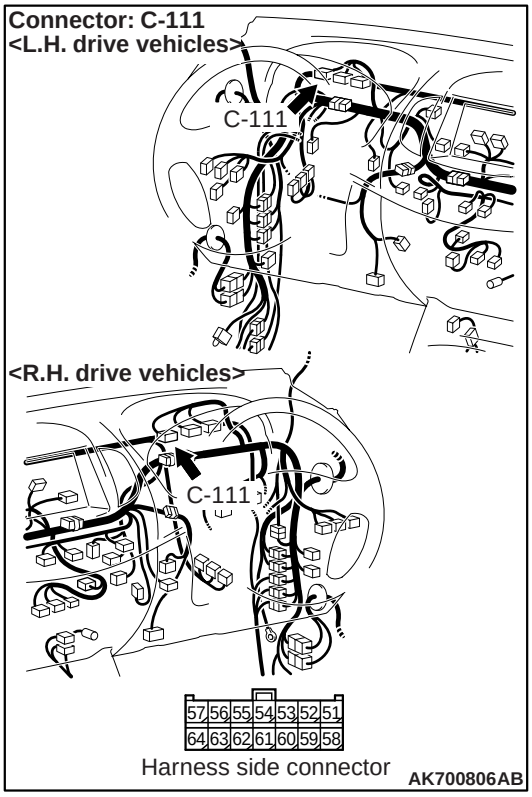
Q: Are the check results normal?

YES : Go to Step 4 .

NO : Repair or replace.

STEP 4. Perform resistance measurement for open circuit at between C-105 engine-ECU connector and C-111 combination meter connector.





- Disconnect C-105 engine-ECU connector and C-111 combination meter connector, and measure resistance at the wiring harness.
- Resistance between C-105 engine-ECU connector terminal No. 46 and C-111 combination connector terminal No. 63.

  OK: Continuity (2 Ω or less)

Q: Is the check result normal?

YES : Go to Step 5 .

NO : Check the intermediate connector C-53 <L. H. drive vehicles>, C-35 <R. H. drive vehicles>, and repair if necessary. If intermediate connector is normal, repair the harness wire.

STEP 5. Check the trouble symptoms.

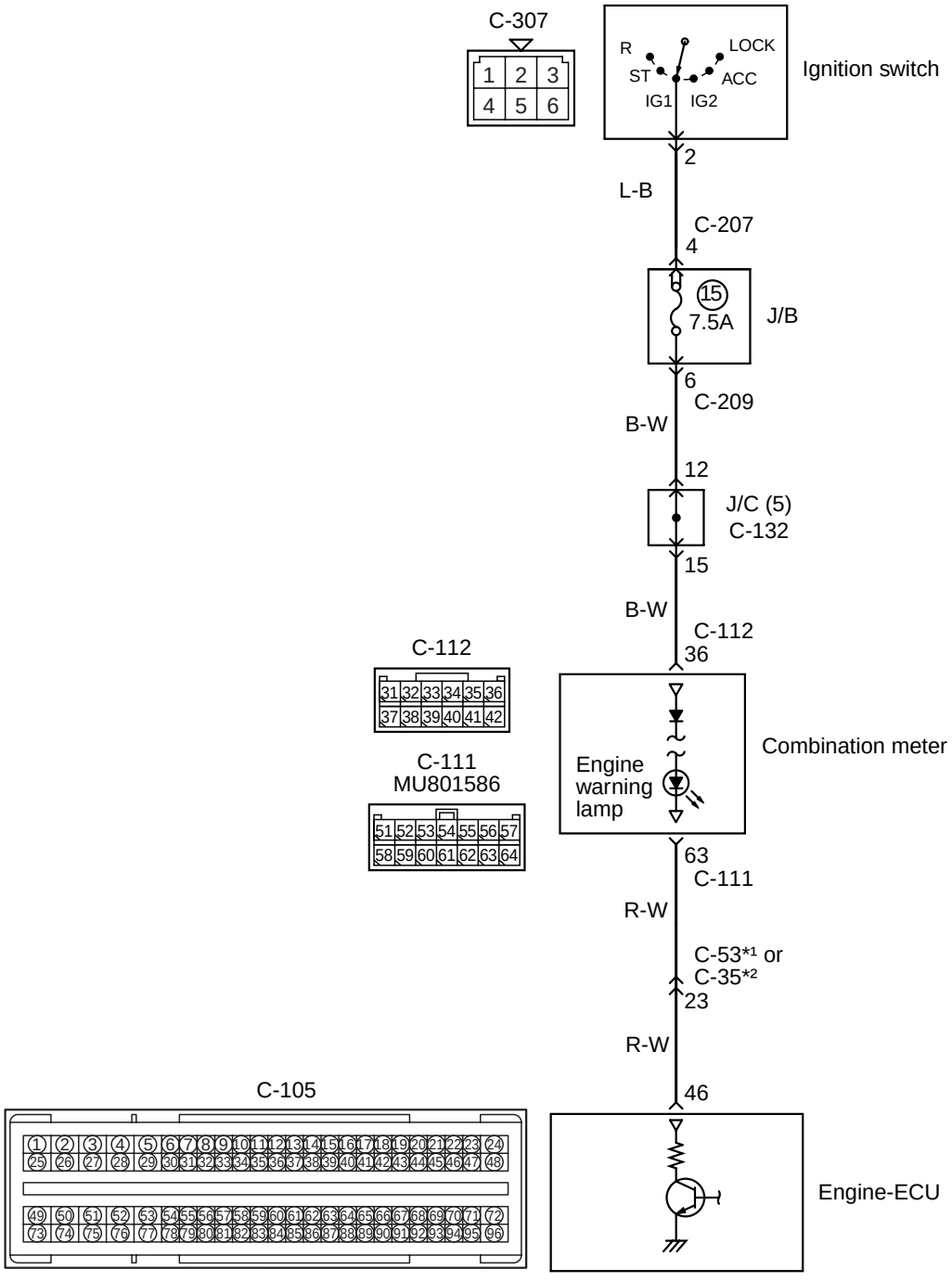
Q: Does trouble symptom persist?

YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunction).

Inspection Procedure 3: The Engine Warning Lamp Remains Illuminating and Never Goes Out or Is Blinking.

Engine Warning Lamp (check engine lamp) Circuit



NOTE
*1: L.H. drive vehicles
*2: R.H. drive vehicles

Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V: Violet PU: Purple SI: Silver

AKB00284 AB

OPERATION

- Engine-ECU has detected failed sensor or failed actuator. Or failure is possibly caused by short circuit or other faults.

PROBABLE CAUSES

- Damaged connector (Engine-ECU connector, combination meter connector)
- Damaged harness (Short circuit between engine-ECU and combination meter)
- Failed combination meter
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. Check the illuminating condition of the engine warning lamp.

Q: Is the engine warning lamp blinking?

YES : Carry out the small injection quantity learning procedure (Refer to GROUP 00 – Precautions Before Service – Small Injection Quantity Learning Procedure).

NO : Go to Step 2 .

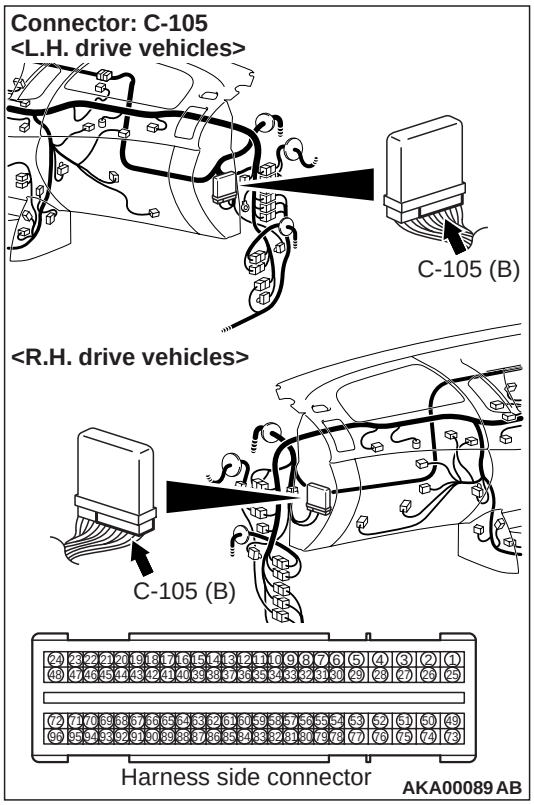
STEP 2. M.U.T.-III diagnosis code.

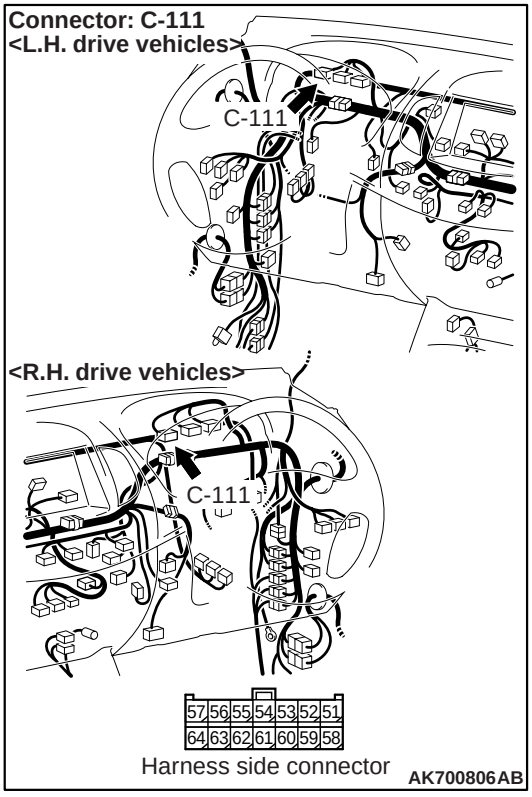
Q: Is the diagnosis code set?

YES : Inspection chart for diagnosis code (Refer to P.13A-21).

NO : Go to Step 3 .

STEP 3. Connector check: C-105 engine-ECU connector and C-111 combination meter connector



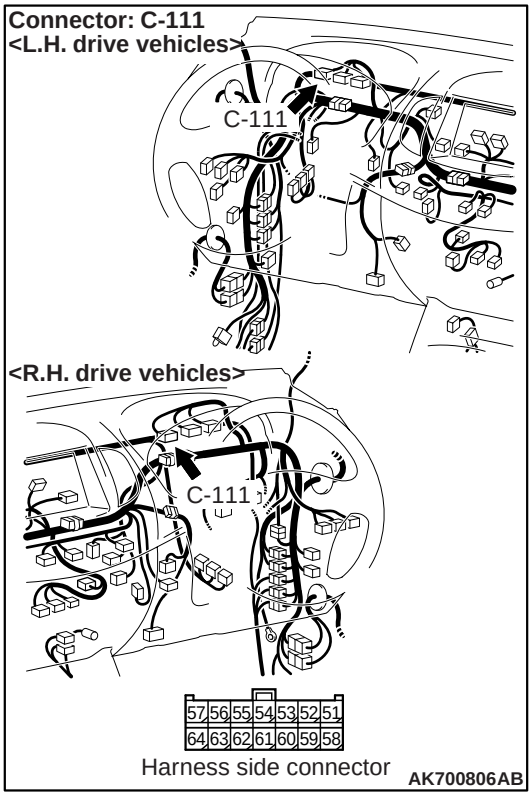


Q: Are the check results normal?

YES : Go to Step 4 .

NO : Repair or replace.

STEP 4. Check combination meter.



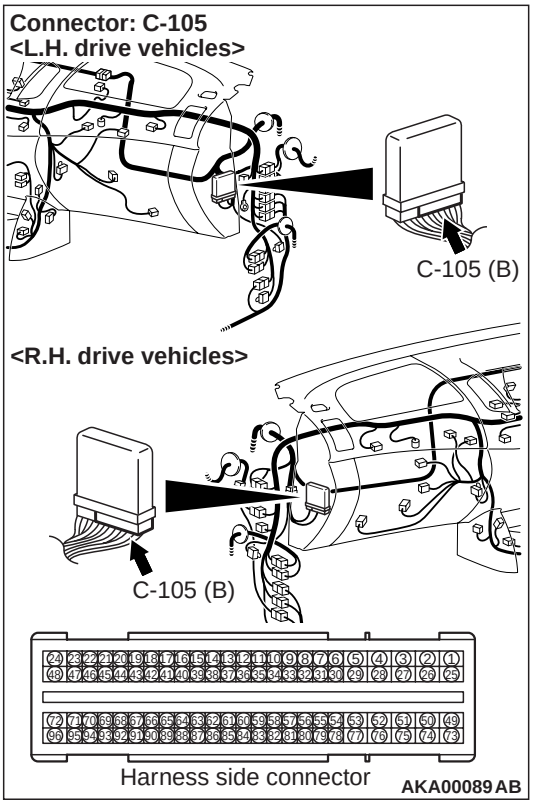
- Ignition switch: ON
- Disconnect C-111 combination meter connector

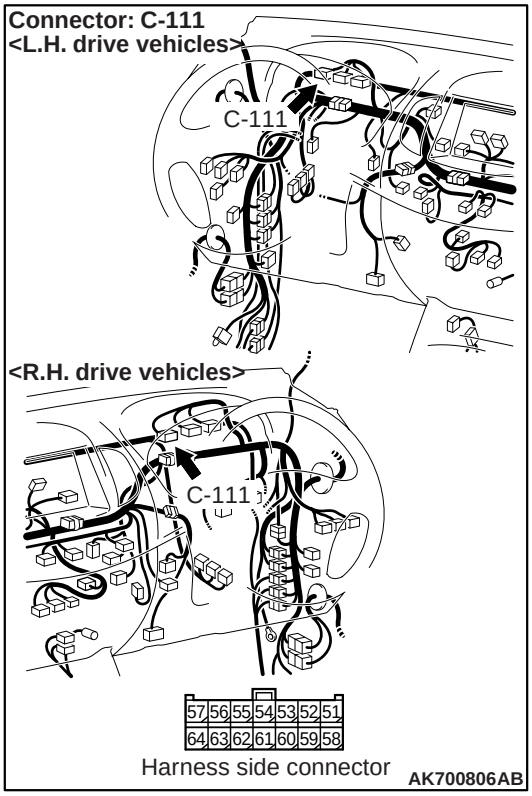
Q: Does the engine warning lamp go out?

YES : Go to Step 5 .

NO : Check combination meter (Refer to GROUP 54A – Combination Meter – Check Chart for Trouble Symptoms).

STEP 5. Perform resistance measurement for short circuit at C-105 engine-ECU connector.





- Disconnect connector, and measure at harness side.
- Disconnect C-111 combination meter connector.
- Voltage between terminal No. 46 and earth.

OK: 1 kΩ or more

Q: Is the check result normal?
YES : Go to Step 6 .
NO : Repair the harness wire.

STEP 6. Check injector identification code.

- Check injector identification code (Refer to GROUP 00 – Precautions Before Service – Injector Identification code Registration Procedure).

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Register the injector ID.

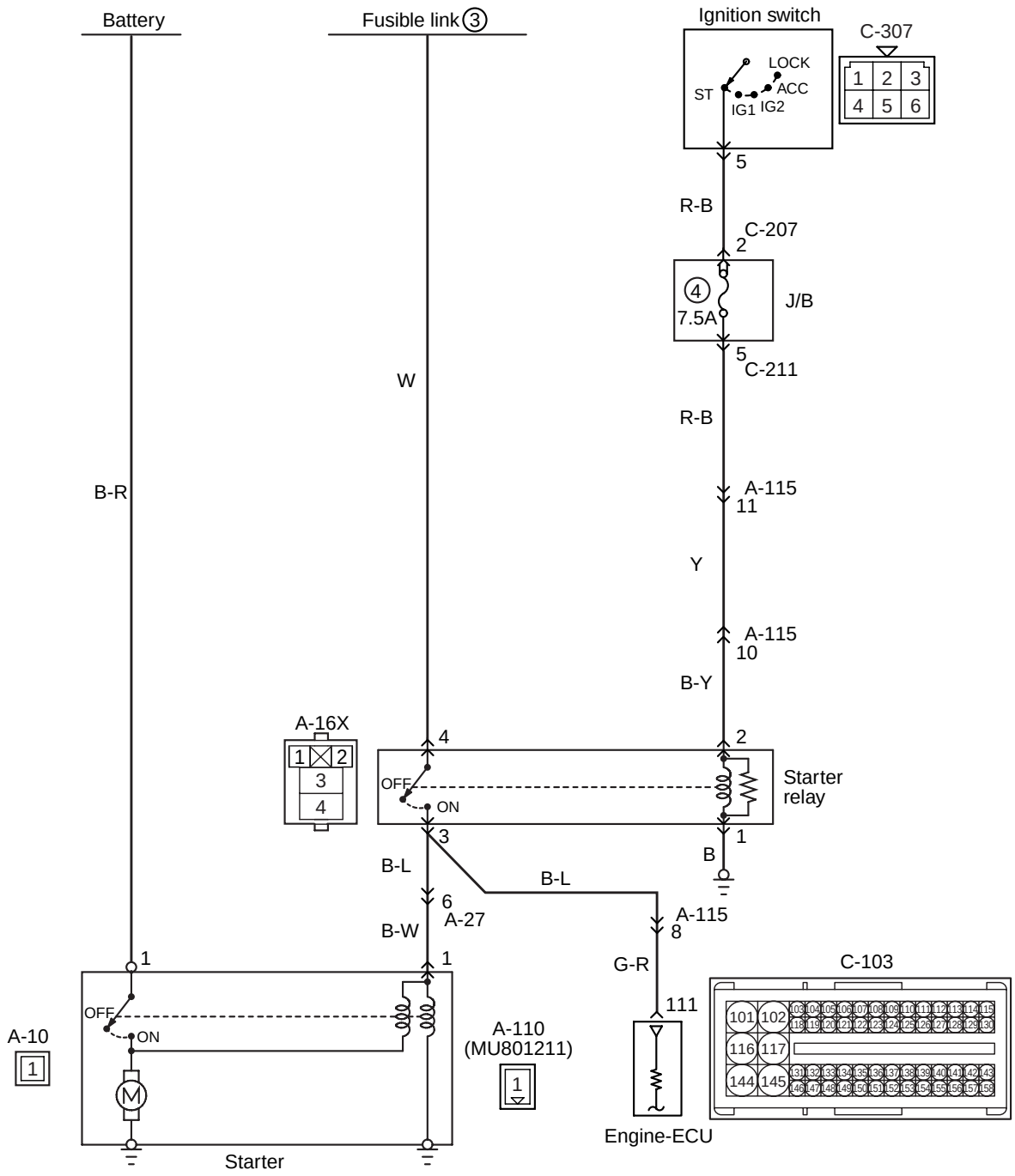
STEP 7. Small injection quantity learning.

- Carry out the small injection quantity learning procedure (Refer to GROUP 00 – Precautions Before Service – Small Injection Quantity Learning Procedure).

Q: Does trouble symptom persist?
YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).
NO : The procedure is complete.

Inspection Procedure 4: Starting Impossible (No Initial Combustion) <M/T>

Starting Impossible (no initial combustion) <M/T>



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V: Violet PU: Purple SI: Silver

AKB00285 AB

COMMENT ON TROUBLE SYMPTOM

- Failure is possibly caused by failed starter itself or failed related circuit.

PROBABLE CAUSES

- Failed battery
- Failed starter motor
- Failed starter relay
- Open/short circuit in starter associated circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. Check battery voltage.

- Measure battery voltage at cranking.

OK: 8 V or higher

Q: Is the check result normal?
YES : Go to Step 2.
NO : Check battery (Refer to GROUP 54A – Battery – On-vehicle Service – Battery Test).

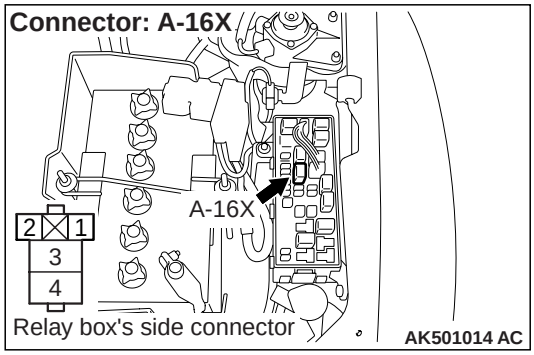
STEP 2. M.U.T.-III data list

- Item 40: Starter switch

OK:
ON (Ignition switch: ST)
OFF (Ignition switch: ON)

Q: Is the check result normal?
YES : Go to Step 13.
NO : Go to Step 3.

STEP 3. Connector check: A-16X starter relay connector



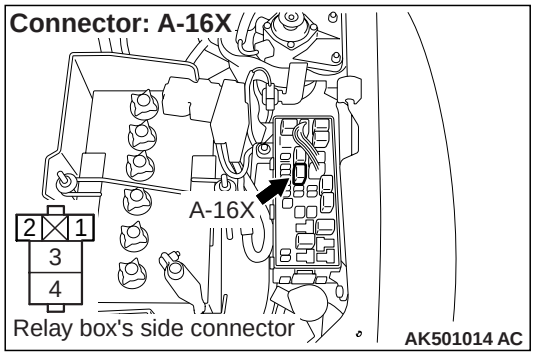
Q: Is the check result normal?
YES : Go to Step 4.
NO : Repair or replace.

STEP 4. Check starter relay.

- Check starter relay (Refer to GROUP 16 – Starting System – Starter Relay Check)

Q: Is the check result normal?
YES : Go to Step 5.
NO : Replace the starter relay.

STEP 5. Perform voltage measurement at A-16X starter relay connector.

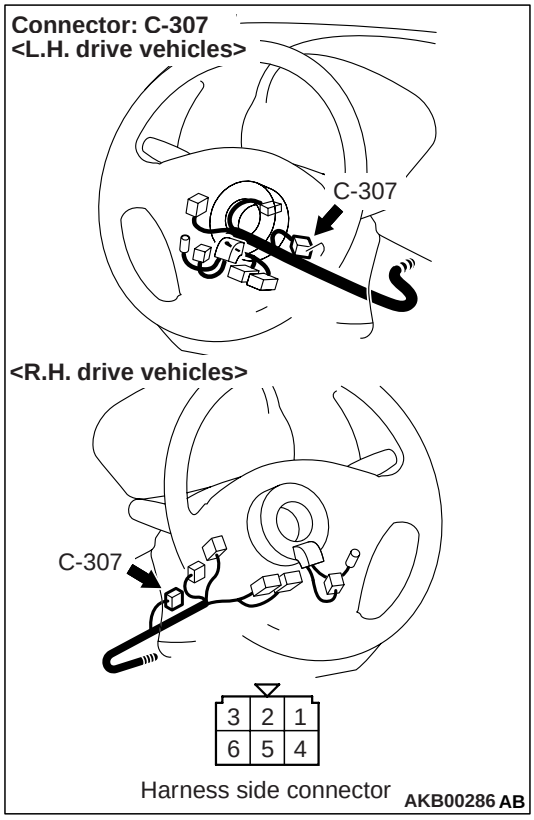


- Disconnect connector, and measure at the harness side.
- Ignition switch: ST
- Voltage between terminal No. 2 and earth.

OK: System voltage

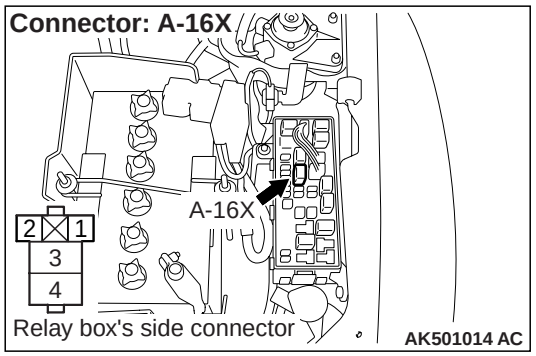
Q: Is the check result normal?
YES : Go to Step 8.
NO : Go to Step 6.

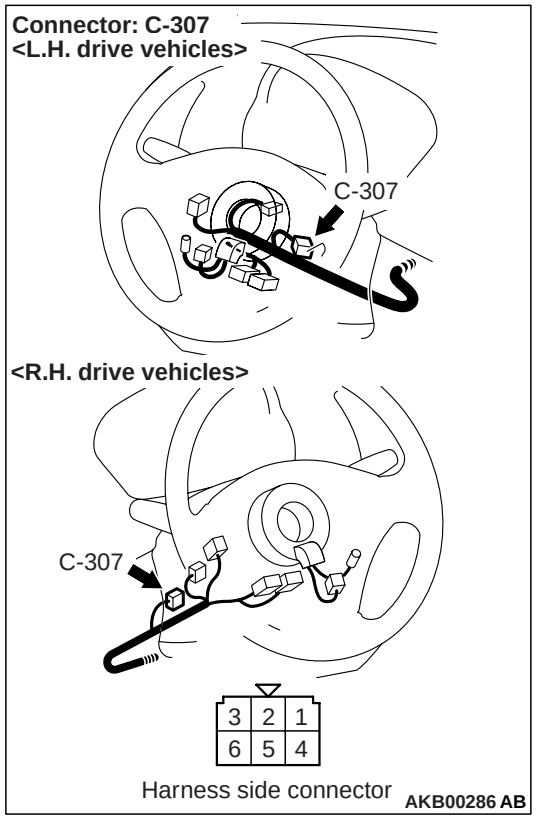
STEP 6. Connector check: C-307 ignition switch connector



Q: Is the check result normal?
YES : Go to Step 7.
NO : Repair or replace.

STEP 7. Check ignition switch.



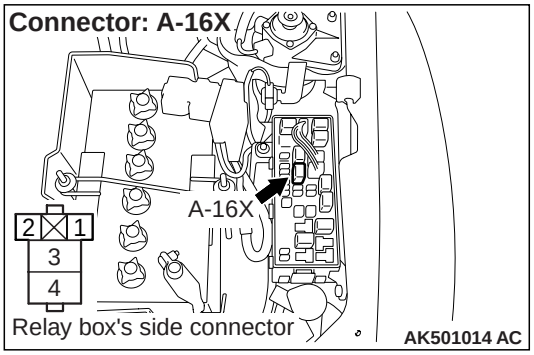


- Check ignition switch (Refer to GROUP 54A – Ignition Switch – Inspection).

Q: Is the check result normal?
YES : Check intermediate connectors A-115, C-207 and C-211, and repair if necessary. If intermediate connectors are normal, check and repair harness between A-16X (terminal No. 2) starter relay connector and C-307 (terminal No. 5) ignition switch connector.
- Check power supply line for open/ short circuit.

NO : Replace the ignition switch.

STEP 8. Perform voltage measurement at A-16X starter relay connector.

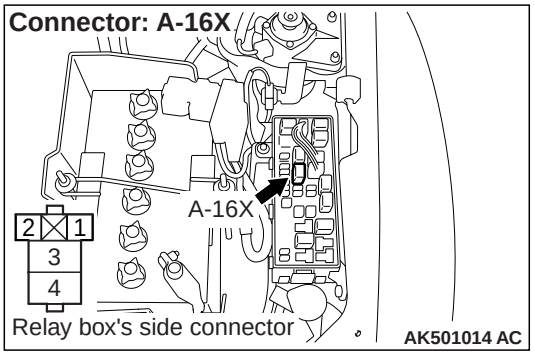


- Disconnect connector, and measure at the harness side.
- Voltage between terminal No. 4 and earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 9.
NO : Check and repair harness between A16X (terminal No. 4) starter relay connector and battery.
- Check power supply line for open/ short circuit.

STEP 9. Perform resistance measurement at A-16X starter relay connector.

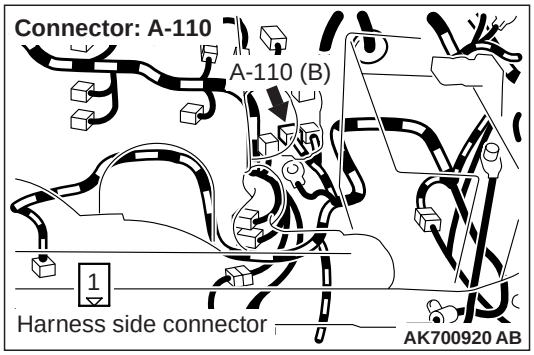


- Disconnect connector, and measure at harness side.
- Resistance between terminal No. 1 and earth.

OK: Continuity (2Ω or less)

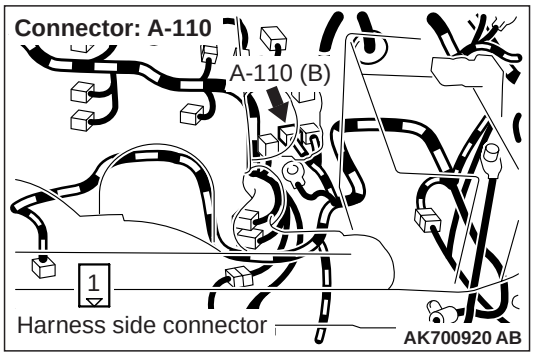
Q: Is the check result normal?
YES : Go to Step 10.
NO : Check and repair harness between A16X (terminal No. 1) starter relay connector and body earth.
- Check earth line for open circuit and damage.

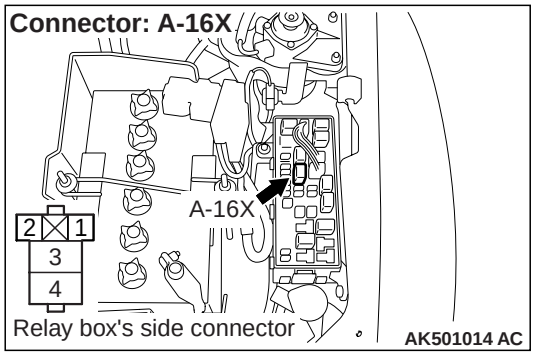
STEP 10. Connector check: A-110 starter connector



Q: Is the check result normal?
YES : Go to Step 11.
NO : Repair or replace.

STEP 11. Check harness between A-110 (terminal No. 1) starter connector and A-16X (terminal No. 3) starter relay connector.



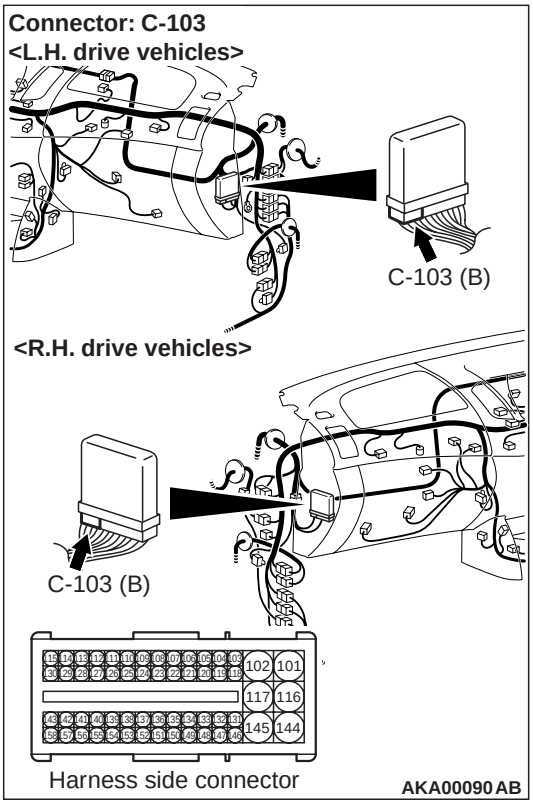


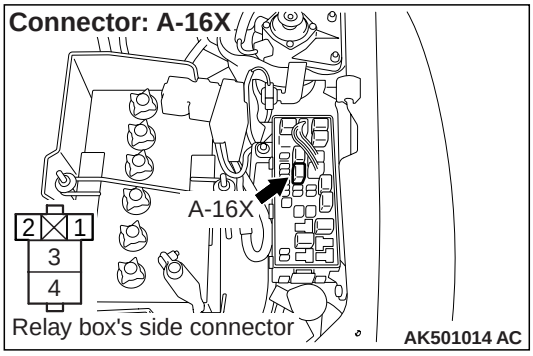
NOTE: Before checking harness, check intermediate connector A-27, and repair if necessary.

- Check output line for open/short circuit.

Q: Is the check result normal?
YES : Go to Step 12.
NO : Repair the damaged harness wire.

STEP 12. Connector check: C-103 engine-ECU connector





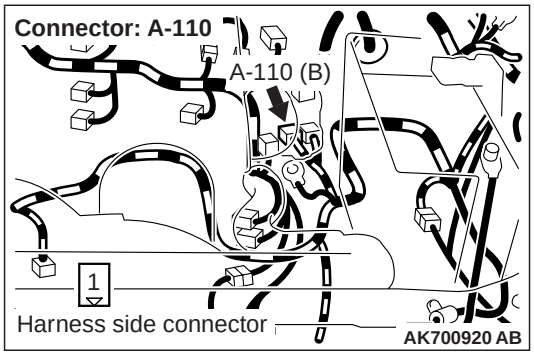
Q: Is the check result normal?

YES : Check intermediate connector A-115, and repair if necessary. If intermediate connector is normal, check and repair harness between C-103 (terminal No. 111) starter connector and A-16X (terminal No. 3) starter relay connector.

- Check output line for short circuit.

NO : Repair or replace.

STEP 13. Connector check: A-110 starter connector

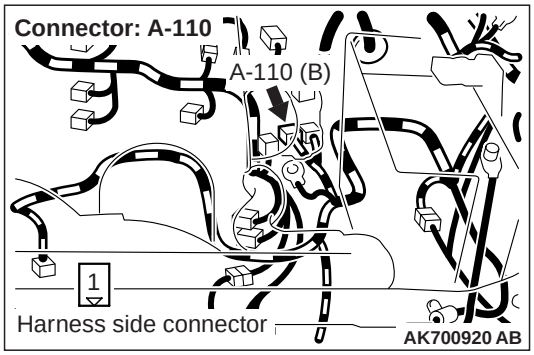


Q: Is the check result normal?

YES : Go to Step 14.

NO : Repair or replace.

STEP 14. Perform voltage measurement at A-110 starter connector.



- Disconnect connector, and measure at the harness side.
- Ignition switch: ST
- Voltage between terminal No. 1 and earth.

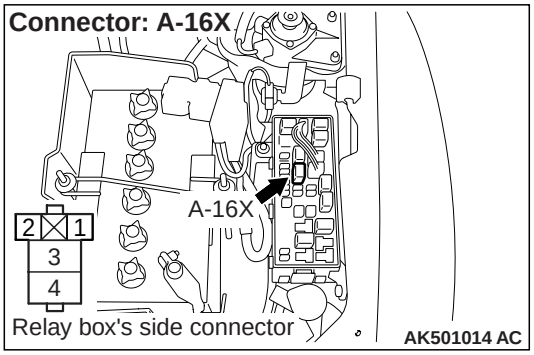
OK: System voltage

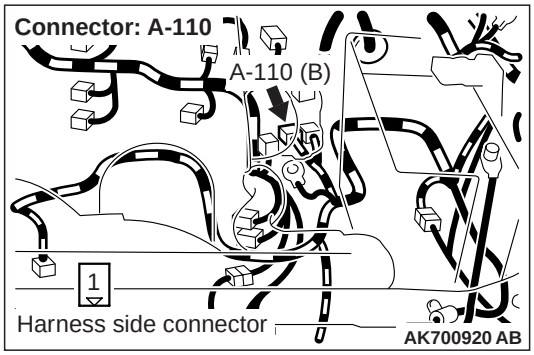
Q: Is the check result normal?

YES : Go to Step 16.

NO : Go to Step 15.

STEP 15. Connector check: A-16X starter relay connector





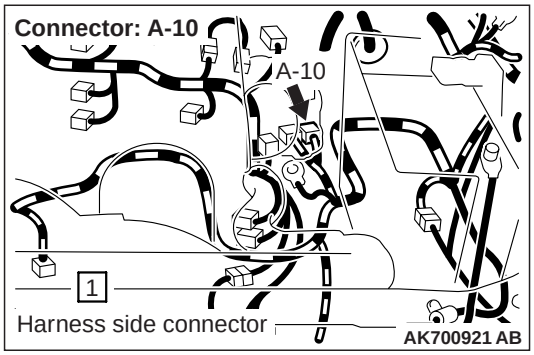
Q: Is the check result normal?

YES : Check intermediate connector A-27, and repair if necessary. If intermediate connector is normal, check and repair harness between A-16X (terminal No. 3) stater relay connector and A-110 (terminal No. 1) starter connector.

- Check output line for open circuit and damage.

NO : Repair or replace.

STEP 16. Connector check: A-10 starter connector

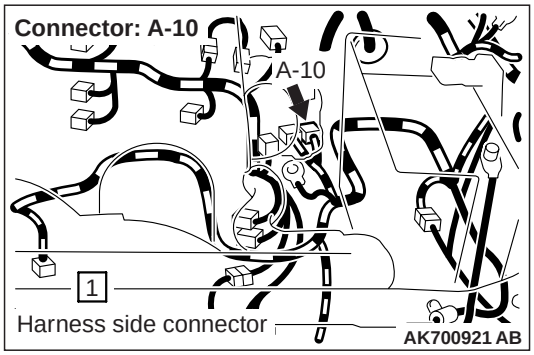


Q: Is the check result normal?

YES : Go to Step 17.

NO : Repair or replace.

STEP 17. Perform voltage measurement at A-10 starter connector.



- Disconnect connector, and measure at the harness side.
- Voltage between terminal No. 1 and earth.

OK: System voltage

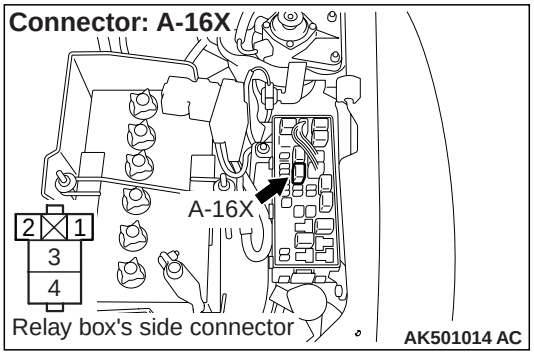
Q: Is the check result normal?

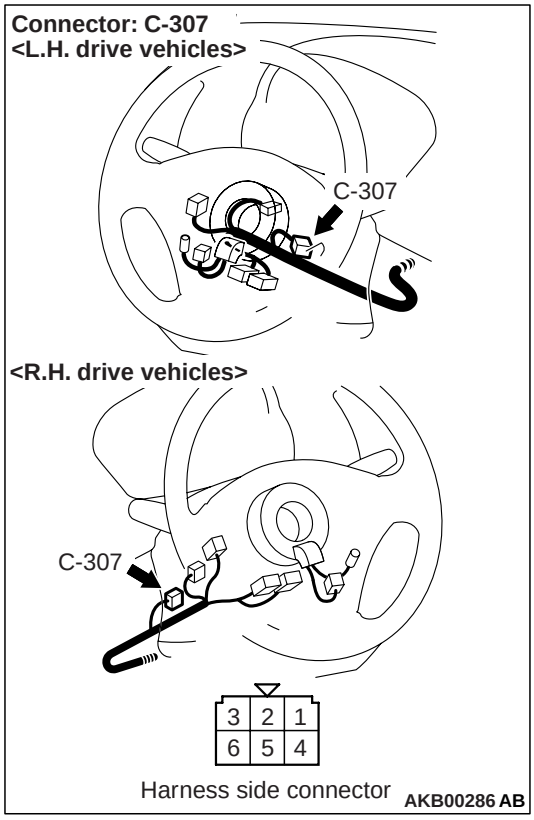
YES : Go to Step 18.

NO : Check and repair harness between A-10 (terminal No. 1) starter connector and battery.

- Check power supply line for open/ short circuit.

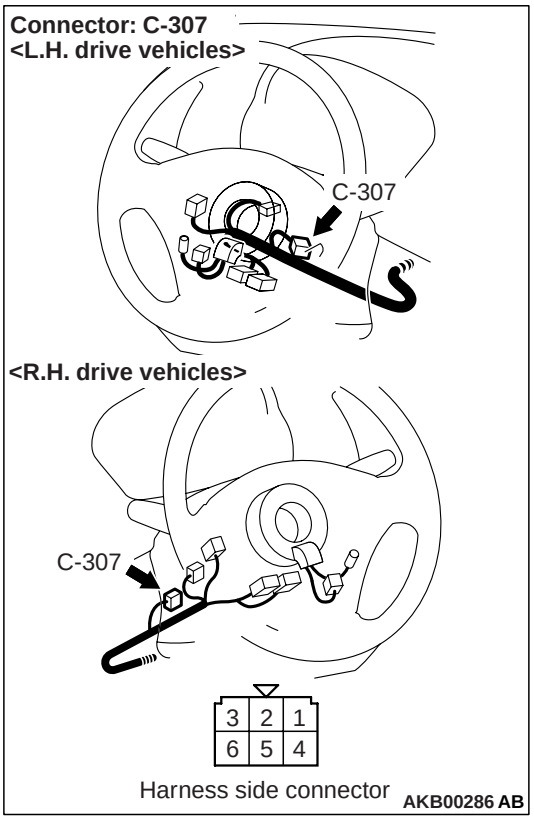
STEP 18. Connector check: A-16X starter relay connector and C-307 Ignition switch connector

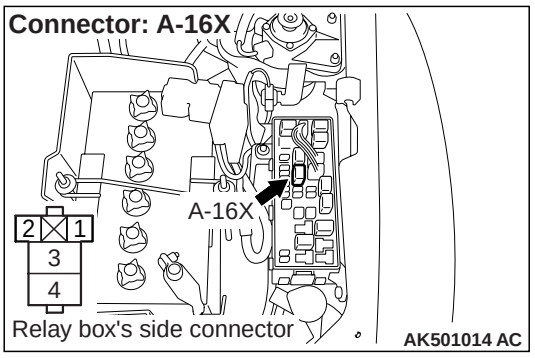




Q: Are the check results normal?
YES : Go to Step 19.
NO : Repair or replace.

STEP 19. Check harness between C-307 (terminal No. 5) ignition switch connector and A-16X (terminal No. 2) starter relay connector.



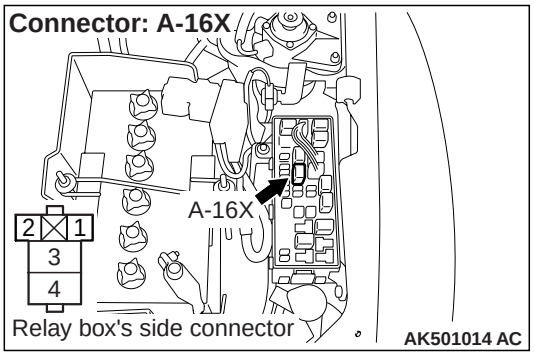


NOTE: Before checking harness, check intermediate connectors A-115, C-207 and C-211, and repair if necessary.

- Check output line for damage.

Q: Is the check result normal?
YES : Go to Step 20.
NO : Repair the damaged harness wire.

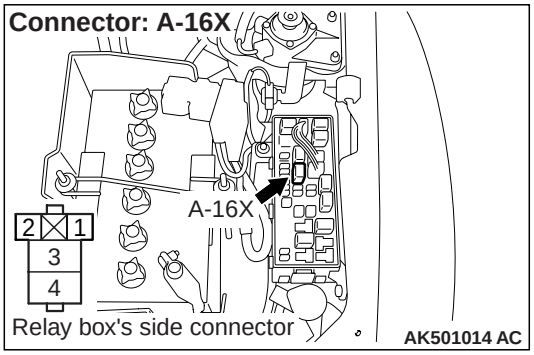
STEP 20. Check harness between A-16X (terminal No. 4) starter relay connector and battery

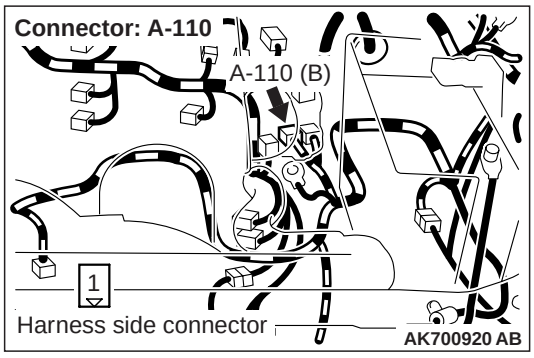


- Check power supply line for damage.

Q: Is the check result normal?
YES : Go to Step 21.
NO : Repair the damaged harness wire.

STEP 21. Check harness between A-16X (terminal No. 3) starter relay connector and A-110 (terminal No. 1) starter relay connector



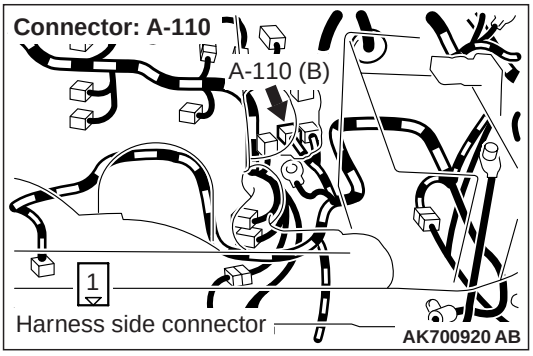


NOTE: Before checking harness, check intermediate connector A-27, and repair if necessary.

- Check output line for damage.

Q: Is the check result normal?
YES : Go to Step 22.
NO : Repair the damaged harness wire.

STEP 22. Check harness between A-10 (terminal No. 1) starter connector and battery.

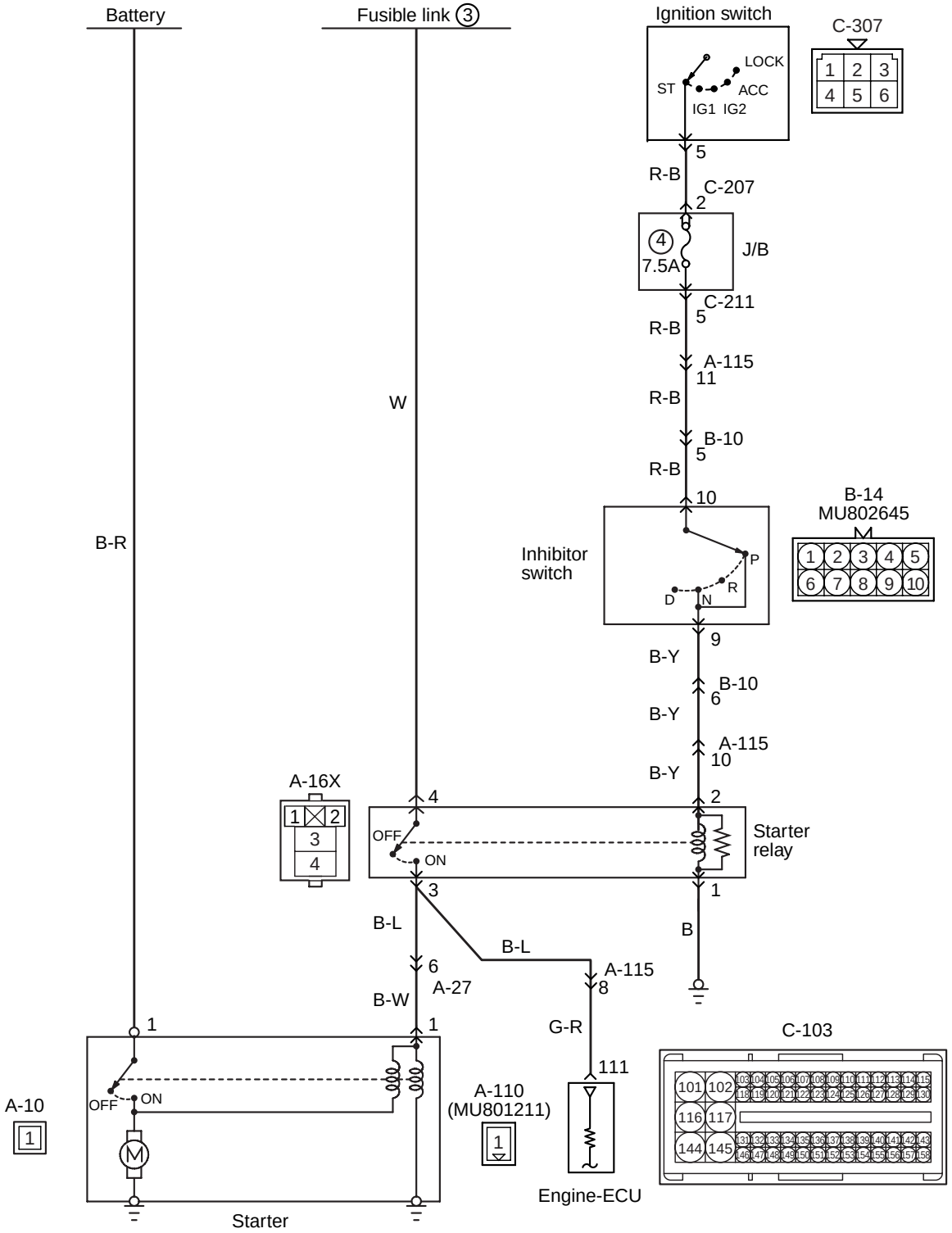


- Check power supply line for damage.

Q: Is the check result normal?
YES : Replace the starter.
NO : Repair the damaged harness wire.

Inspection Procedure 4: Starting Impossible (No Initial Combustion) <A/T>

Starting Impossible (no initial combustion) <A/T>



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V: Violet PU: Purple

AKB00287 AB

COMMENT ON TROUBLE SYMPTOM
- Failure is possibly caused by failed starter itself or failed related circuit.

PROBABLE CAUSES
- Failed battery
- Failed inhibitor switch
- Failed starter motor
- Failed starter relay
- Open/short circuit in starter associated circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. Check battery voltage.
- Measure battery voltage at cranking.

OK: 8 V or higher

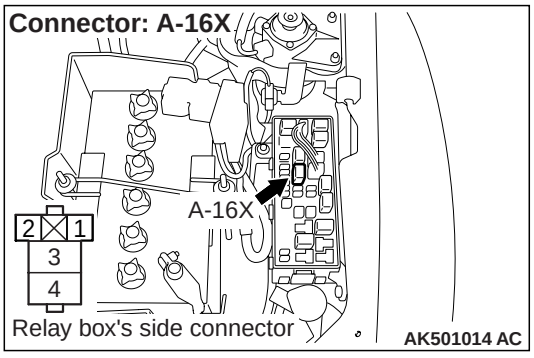
Q: Is the check result normal?
YES : Go to Step 2.
NO : Check battery (Refer to GROUP 54A – Battery-On-vehicle Service – Battery Test).

STEP 2. M.U.T.-III data list
- Item 40: Starter switch

OK:
ON (Ignition switch: ST)
OFF (Ignition switch: ON)

Q: Is the check result normal?
YES : Go to Step 17.
NO : Go to Step 3.

STEP 3. Connector check: A-16X starter relay connector



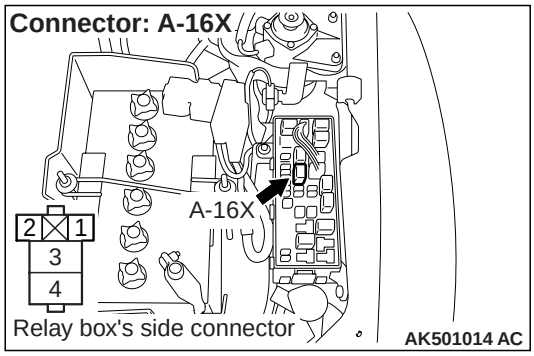
Q: Is the check result normal?
YES : Go to Step 4.
NO : Repair or replace.

YES : Go to Step 8.

STEP 4. Check starter relay
- Check starter relay (Refer to GROUP 16 – Starting System – Starter Relay Check).

Q: Is the check result normal?
YES : Go to Step 5.
NO : Replace the starter relay.

STEP 5. Perform voltage measurement at A-16X starter relay connector.

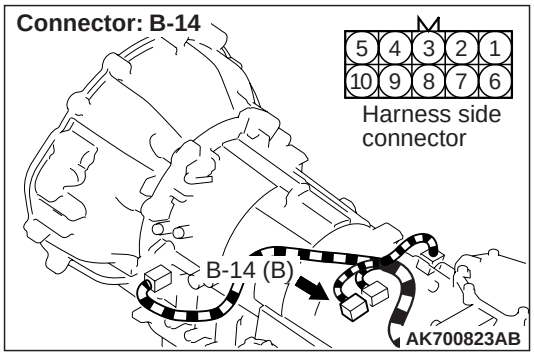


- Disconnect connector, and measure at the harness side.
- Ignition switch: ST
- Voltage between terminal No. 2 and earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 11.
NO : Go to Step 6.

STEP 6. Connector check: B-14 inhibitor switch connector

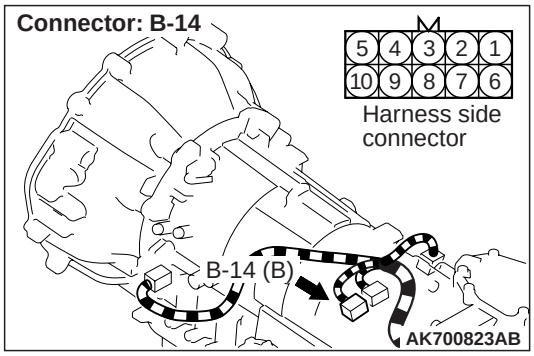


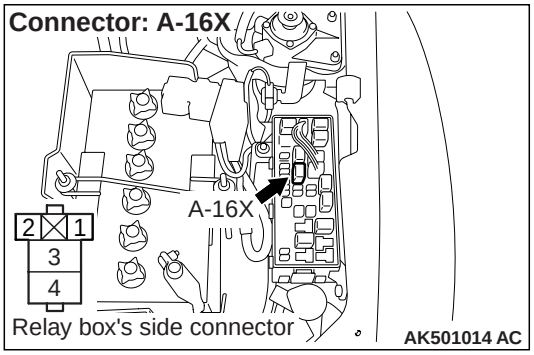
Q: Is the check result normal?
YES : Go to Step 7.
NO : Repair or replace.

STEP 7. Check inhibitor switch
- Check inhibitor switch (Refer to GROUP 23A – On-vehicle Service – Inhibitor Switch Continuity Check).

Q: Is the check result normal?
NO : Replace the inhibitor switch.

STEP 8. Perform voltage measurement at B-14 inhibitor switch connector





- Disconnect connector, and measure at the harness side.
- Ignition switch: ST
- Voltage between terminal No. 10 and earth.

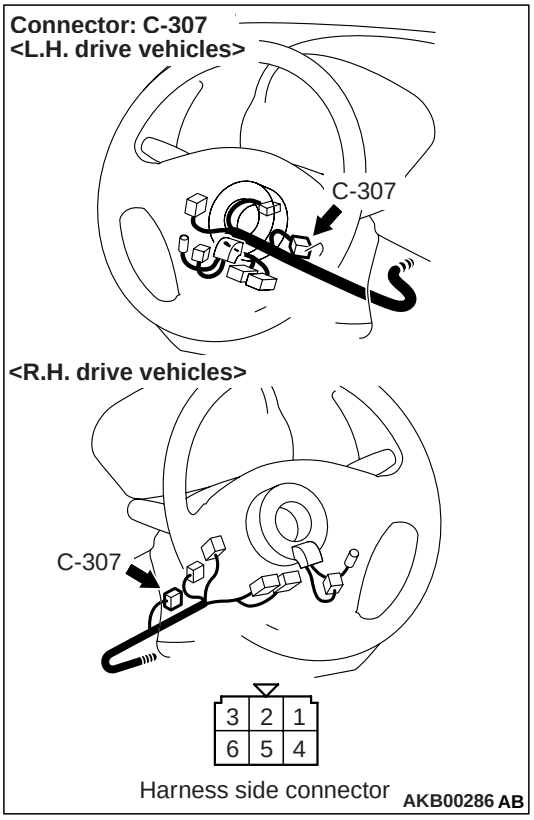
OK: System voltage

Q: Is the check result normal?

YES : Check intermediate connectors A-115 and B-10, and repair if necessary. If starter relay connector are normal, check and repair harness between A-16X (terminal No. 2) starter relay connector and B-14 (terminal No. 9) inhibitor switch connector.
- Check power supply line for open/ short circuit.

NO : Go to Step 9.

STEP 9. Connector check: C-307 ignition switch connector

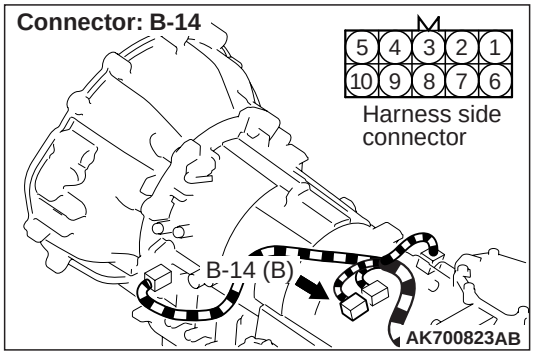


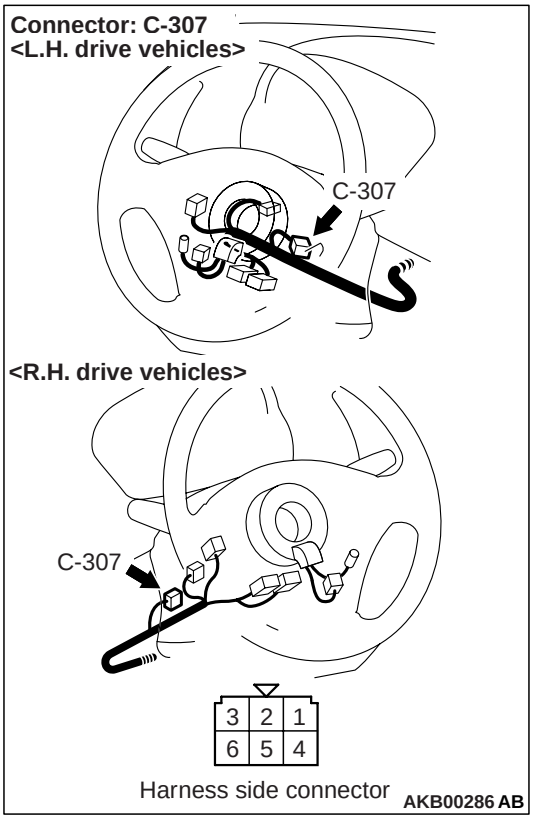
Q: Is the check result normal?

YES : Go to Step 10.

NO : Repair or replace.

STEP 10. Check ignition switch





- Check ignition switch (Refer to GROUP 54A – Ignition switch – Inspection).

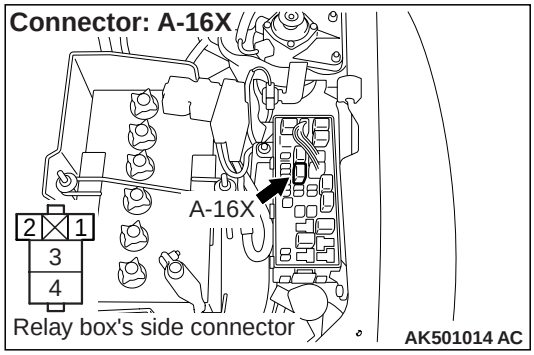
Q: Is the check result normal?

YES : Check intermediate connectors A-115, B-10, C-207 and C-211, and repair if necessary. If starter relay connectors are normal, check and repair harness between B-14 (terminal No. 10) inhibitor switch connector and C-307 (terminal No. 5) ignition switch connector.

- Check power supply line for open/ short circuit.

NO : Replace the ignition switch.

STEP 11. Perform voltage measurement at A-16X starter relay connector.



- Disconnect connector, and measure at the harness side.
- Voltage between terminal No. 4 and earth.

OK: System voltage

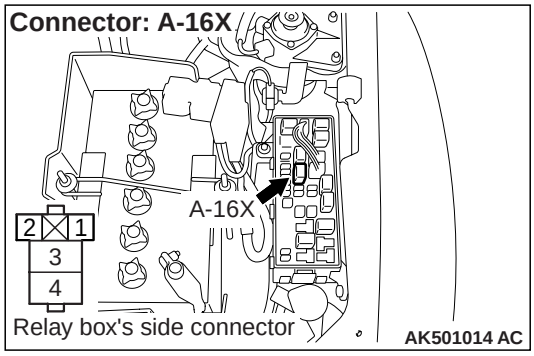
Q: Is the check result normal?

YES : Go to Step 12.

NO : Check and repair harness between A-16X (terminal No. 4) starter relay connector and battery.

- Check power supply line for open/ short circuit.

STEP 12. Perform resistance measurement at A-16X starter relay connector.



- Disconnect connector, and measure at harness side.
- Resistance between terminal No. 1 and earth.

OK: Continuity (2Ω or less)

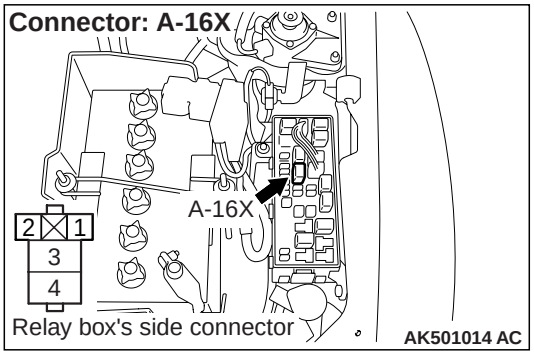
Q: Is the check result normal?

YES : Go to Step 13.

NO : Check and repair harness between A-16X (terminal No. 1) starter relay connector and body earth.

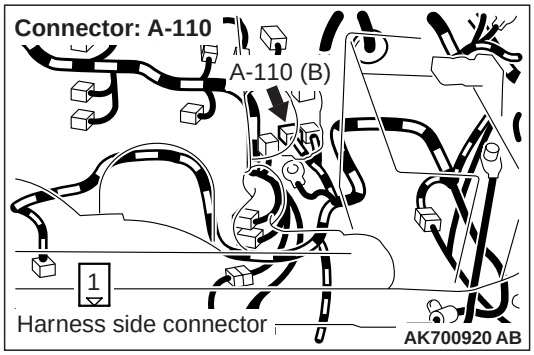
- Check earth line for open circuit and damage.

STEP 13. Connector check: A-16X starter relay connector



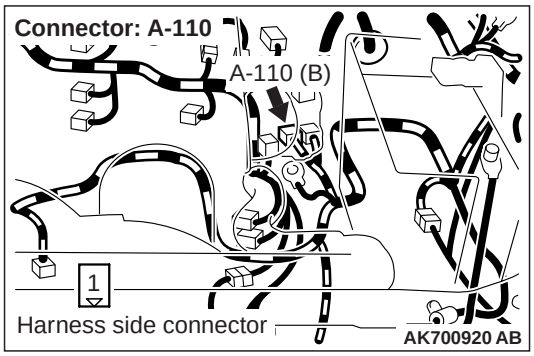
Q: Is the check result normal?
YES : Go to Step 14.
NO : Repair or replace.

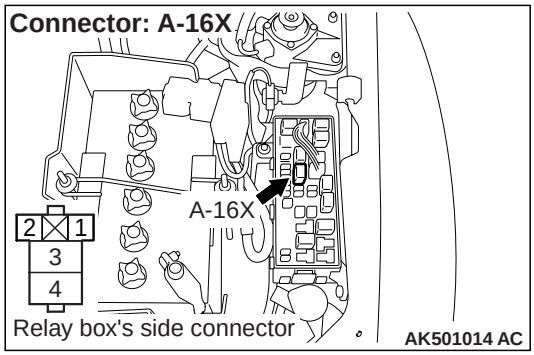
STEP 14. Connector check: A-110 starter connector



Q: Is the check result normal?
YES : Go to Step 15.
NO : Repair or replace.

STEP 15. Check harness between A-110 (terminal No. 1) starter connector and A-16X (terminal No. 3) starter relay connector.

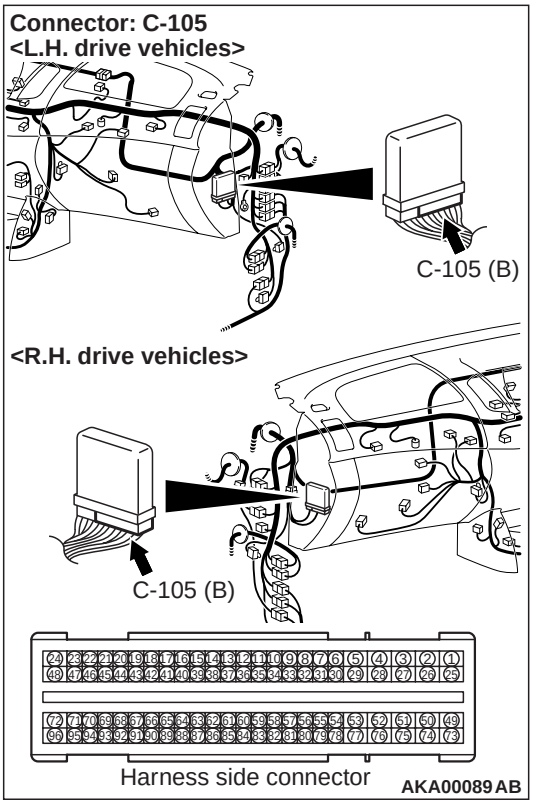


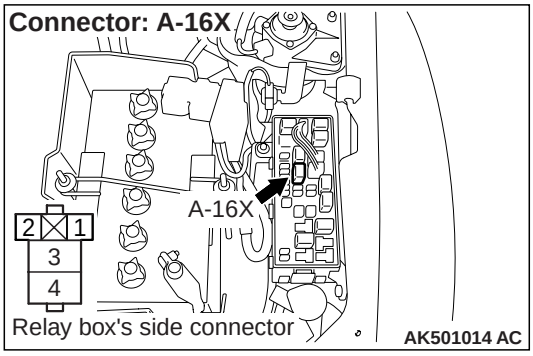


NOTE: Before checking harness, check intermediate connector A-27, and repair if necessary.
- Check output line for open/short circuit.

Q: Is the check result normal?
YES : Go to Step 16.
NO : Repair the damaged harness wire.

STEP 16. Connector check: C-103 engine-ECU connector.





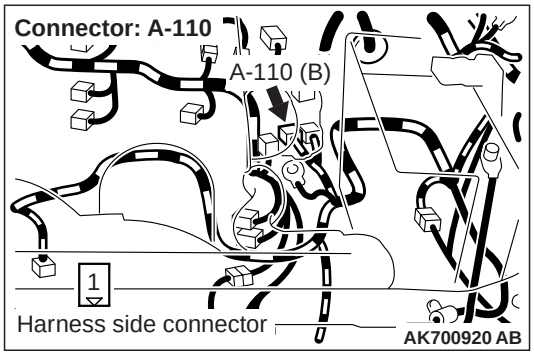
Q: Is the check result normal?

YES : Check intermediate connector A-115, and repair if necessary. If intermediate connector is normal, check and repair harness between C-103 (terminal No. 111) starter connector and A-16X (terminal No. 3) starter relay connector.

- Check output line for short circuit.

NO : Repair or replace.

STEP 17. Connector check: A-110 starter connector

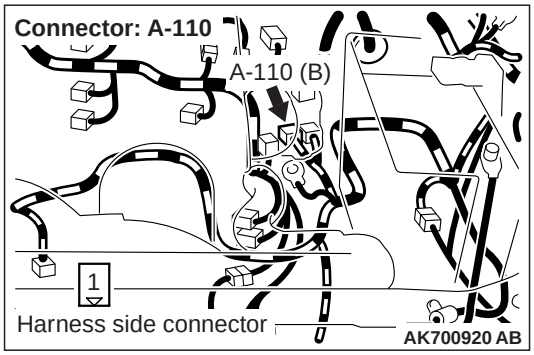


Q: Is the check result normal?

YES : Go to Step 18.

NO : Repair or replace.

STEP 18. Perform voltage measurement at A-110 starter connector.



- Disconnect connector, and measure at the harness side.
- Ignition switch: ST
- Voltage between terminal No. 1 and earth.

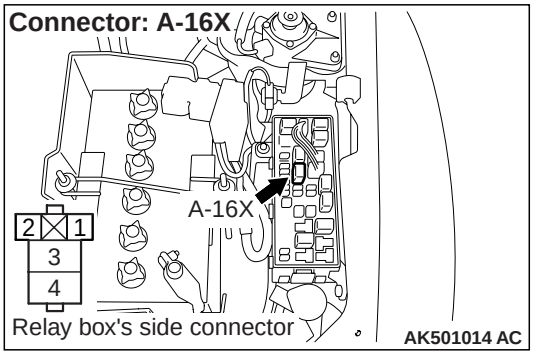
OK: System voltage

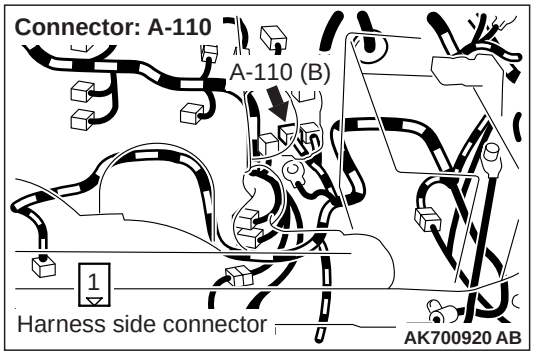
Q: Is the check result normal?

YES : Go to Step 20.

NO : Go to Step 19.

STEP 19. Connector check: A-16X starter relay connector





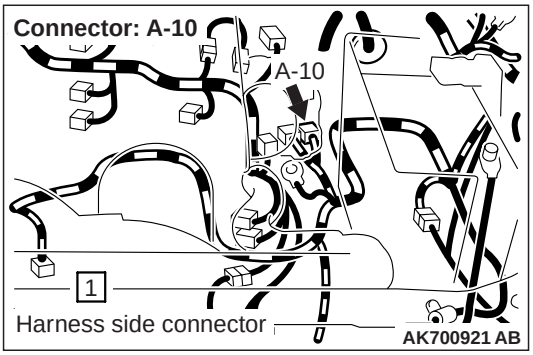
Q: Is the check result normal?

YES : Check intermediate connector A-27, and repair if necessary. If intermediate connector is normal, check and repair harness between A-16X (terminal No. 3) starter relay connector and A-110 (terminal No. 1) starter connector.

- Check output line for open circuit and damage.

NO : Repair or replace.

STEP 20. Connector check: A-10 starter connector

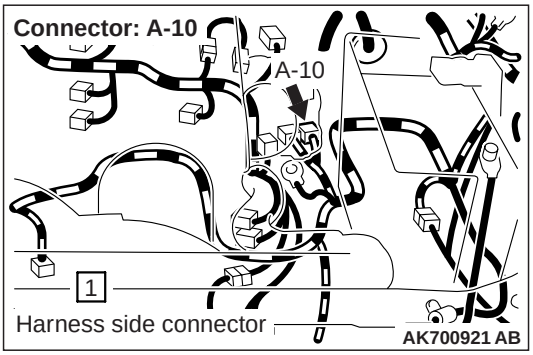


Q: Is the check result normal?

YES : Go to Step 21.

NO : Repair or replace.

STEP 21. Perform voltage measurement at A-10 starter connector.



- Disconnect connector, and measure at the harness side.
- Voltage between terminal No. 1 and earth.

OK: System voltage

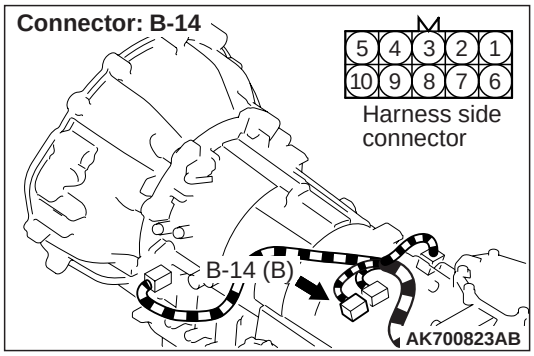
Q: Is the check result normal?

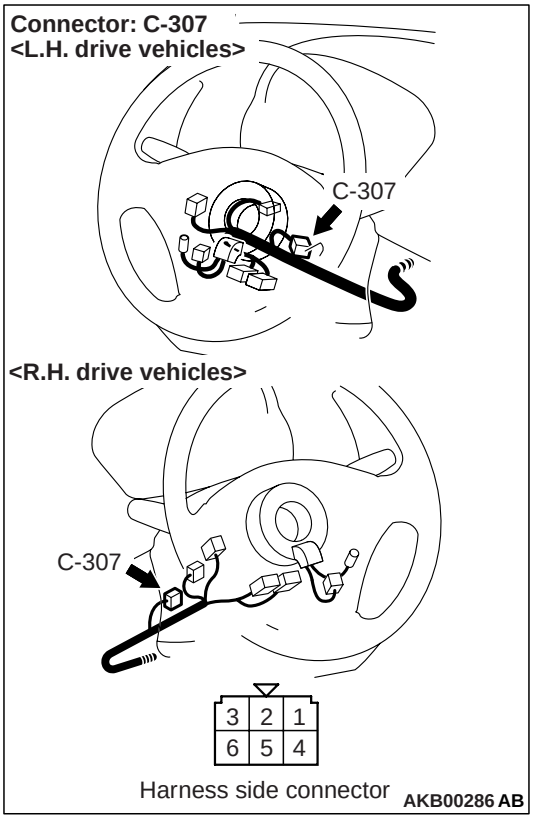
YES : Go to Step 22.

NO : Check and repair harness between A-10 (terminal No. 1) starter connector and battery.

- Check power supply line for open/ short circuit.

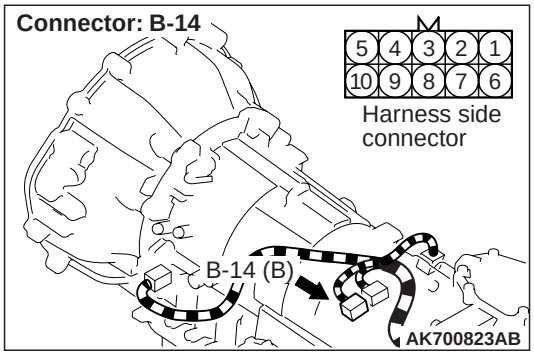
STEP 22. Connector check: B-14 inhibitor switch connector and C-307 ignition switch connector

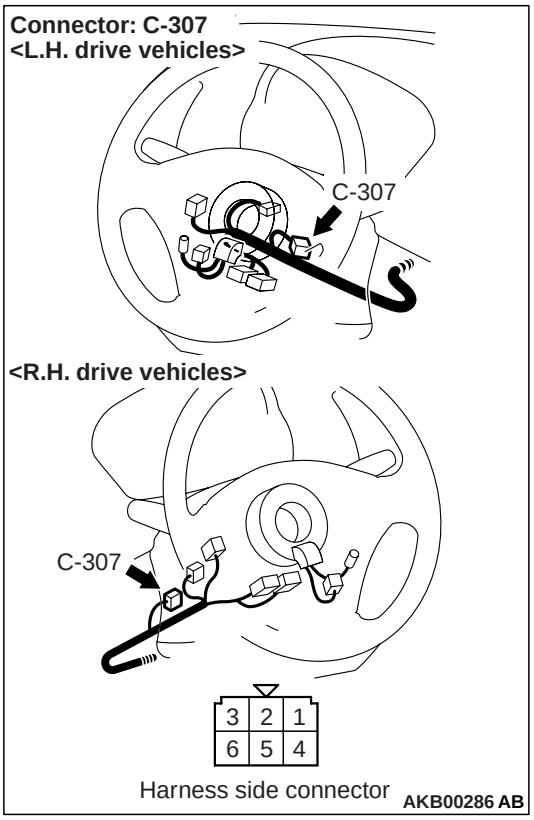




Q: Are the check results normal?
YES : Go to Step 23.
NO : Repair or replace.

STEP 23. Check harness between B-14 (terminal No. 10) inhibitor switch connector and C-307 (terminal No. 5) ignition switch connector.



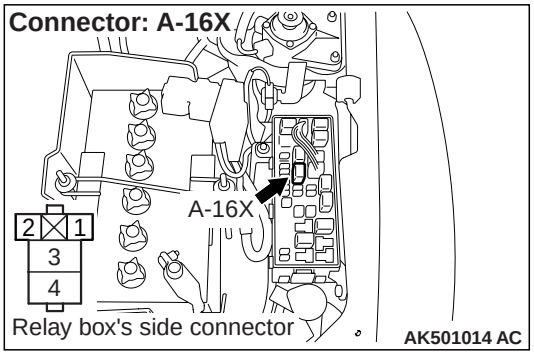


NOTE: Before checking harness, check starter relay connectors A-115, C-207 and C-211, and repair if necessary.

- Check power supply line for damage.

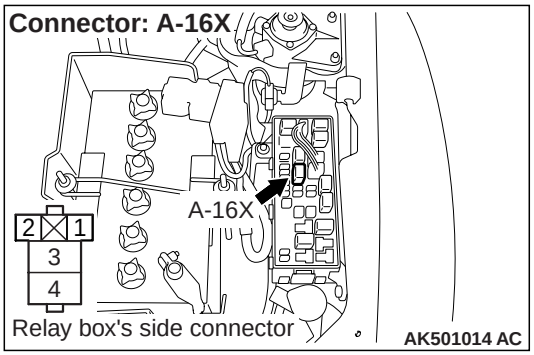
Q: Is the check result normal?
YES : Go to Step 24.
NO : Repair the damaged harness wire.

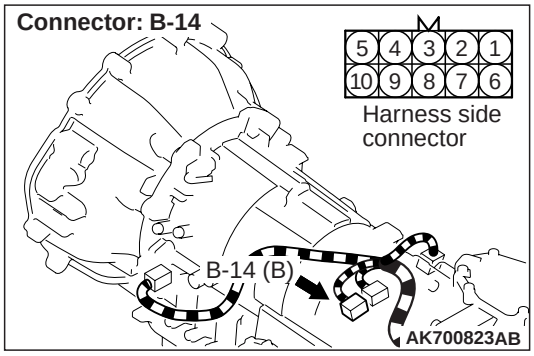
STEP 24. Connector check: A-16X starter relay connector



Q: Is the check result normal?
YES : Go to Step 25.
NO : Repair or replace.

STEP 25. Check harness between A-16X (terminal No. 2) starter relay connector and B-14 (terminal No. 9) inhibitor switch connector

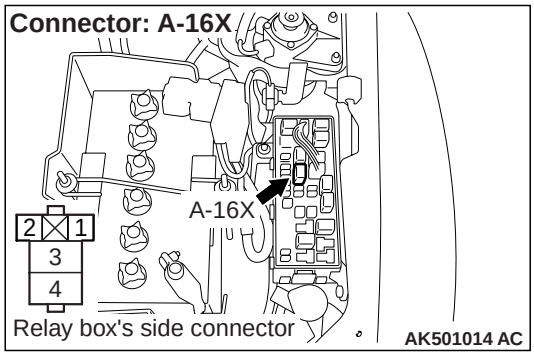


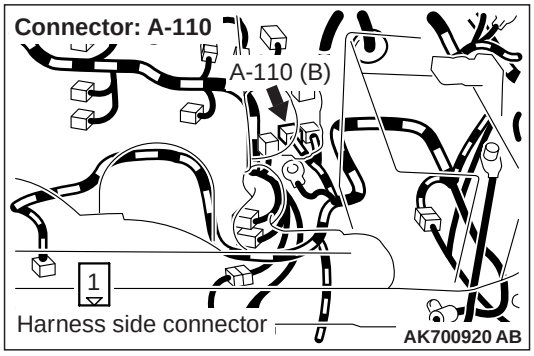


NOTE: Before checking harness, check starter relay connectors A-115 and B-10, and repair if necessary.
- Check power supply line for damage.

Q: Is the check result normal?
YES : Go to Step 26.
NO : Repair the damaged harness wire.

STEP 26. Check harness between A-16X (terminal No. 3) starter relay connector and A-110 (terminal No. 1) starter connector

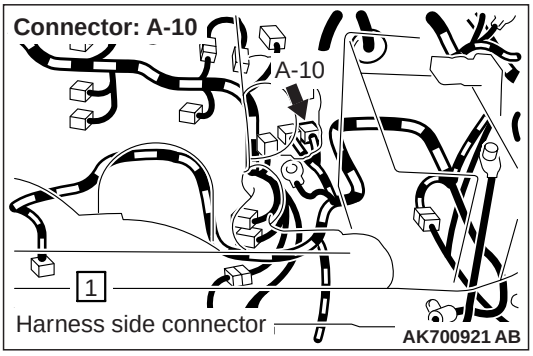




NOTE: Before checking harness, check starter relay connectors A-27, and repair if necessary.
- Check output line for damage.

Q: Is the check result normal?
YES : Go to Step 27.
NO : Repair the damaged harness wire.

STEP 27. Check harness between A-10 (terminal No. 1) starter connector and battery.



- Check power supply line for damage.

Q: Is the check result normal?
YES : Replace the starter.
NO : Repair the damaged harness wire.

Inspection Procedure 5: Starting Impossible (Starter operative but no initial combustion)

PROBABLE CAUSES

- Failed battery
- Improper fuel used
- Fuel contaminated with foreign matter
- Injector leaking or clogged
- Failed injector
- Fuel injection learning failure
- Fuel filter clogged
- Fuel line leaking or clogged
- Failed fuel pressure limiter valve
- Failed rail pressure sensor
- Failed supply pump (suction control valve)
- Failed glow system
- Timing belt broken
- Failed engine-ECU
- Air cleaner clogged
- Compression pressure low

DIAGNOSIS PROCEDURE

STEP 1. Check battery voltage.

- Measure battery voltage at cranking.

OK: 8 V or more

Q: Is the check result normal?
YES : Go to Step 2 .
NO : Check battery (Refer to GROUP 54A – Battery – On-vehicle Service – Battery test).

STEP 2. M.U.T.-III diagnosis code.

Q: Is the diagnosis code set?
YES : Inspection chart for diagnosis code (Refer to P.13A-21).
NO : Go to Step 3 .

STEP 3. Check injector identification code.

- Check injector identification code (Refer to GROUP 00 – Precautions Before Service – Injector Identification code Registration Procedure).

Q: Is the check result normal?
YES : Go to Step 4 .
NO : Register the injector ID.

STEP 4. M.U.T.-III data list.

- Item 40: Starter switch

OK:
ON (Ignition switch: ST)
OFF (Ignition switch: ON)

Q: Is the check result normal?
YES : Go to Step 5 .
NO : Check for starting impossible to operate (Refer to Inspection Procedure 4 P.13A-445 <M/T> or P.13A-453 <A/T>).

STEP 5. Check timing belt for breakage.

Q: Is the check result normal?
YES : Go to Step 6 .
NO : Replace the timing belt.

STEP 6. Confirm the using fuel.

Q: Is the specified fuel being used?
YES : Go to Step 7 .
NO : Replace fuel.

STEP 7. Check glow system.

- Check glow system (Refer to Code No. P0381 P.13A-200 <Euro5> or Inspection Procedure 25 P.13A-520 <Except Euro5>).

Q: Is the check result normal?
YES : Go to Step 8 .
NO : Repair or replace the failed item.

STEP 8. Check fuel supply line.

- Check for fuel leakage and clogging
- Check fuel filter for clogging

Q: Is the check result normal?
YES : Go to Step 9 .
NO : Repair or replace the failed item.

STEP 9. Priming (air bleeding)

- Bleed air

Q: Does trouble symptom persist?
YES : Go to Step 10 .
NO : The procedure is complete.

STEP 10. M.U.T.-III actuator test.

- Refer to Actuator Test Reference Table P.13A-574.
  a. Item 19: Suction control valve

Q: Is the check result normal?
YES : Go to Step 11 .
NO : Replace the suction control valve. After replacing the suction control valve, learn the supply pump (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).

STEP 11. Check suction control value itself.

- Check suction control value itself (Refer to P.13A-596).

Q: Is the check result normal?
YES : Go to Step 12 .
NO : Replace the suction control valve. After replacing the suction control valve, learn the supply pump (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).

STEP 12. M.U.T.-III data list.

- Refer to Data List Reference Table P.13A-542.
  a. Item 63: Rail pressure sensor
  b. Item 64: Rail pressure target

Q: Are the check results normal?
YES : Go to Step 14 .
NO : Go to Step 13 .

STEP 13. Replace the rail pressure sensor.

- Replace the common-rail assembly.

Q: Does trouble symptom persist?
YES : Go to Step 18 .
NO : The procedure is complete.

STEP 14. Check the waveforms of crank angle sensor and camshaft position sensor.

- Check the waveforms during cranking.

Q: Are waveforms being output?
YES : Go to Step 15 .
NO : Proceed to the diagnostic code procedure for the sensor that does not output waveforms (Refer to Inspection Chart for Diagnosis Code P.13A-21).

STEP 15. Check compression pressure.

- Check compression pressure (Refer to GROUP 11A – On-vehicle Service – Compression Pressure Check).

Q: Is the check result normal?
YES : Go to Step 16 .
NO : Check and repair the engine itself.

STEP 16. Check injector itself.

- Check injector itself (Refer to P.13A-595).

Q: Is the check result normal?
YES : Go to Step 17 .
NO : Replace the injector at the failed cylinder. After replacing the Injector, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).

STEP 17. M.U.T.-III data list.

- Refer to Data List Reference Table P.13A-542.
  a. Item 5: Barometric pressure sensor
  b. Item 7: Engine coolant temperature sensor
  c. Item 8: EGR gas temperature sensor <Euro5>
  d. Item 8: Intake air temperature sensor No. 2 <Except Euro5>
  e. Item 21: Fuel temperature sensor
  f. Item 43: Intake air temperature sensor No. 1

Q: Are the check results normal?
YES : Go to Step 18 .
NO : Perform the diagnosis code classified check procedure for the sensor that has shown an abnormal data value (Refer to Inspection Chart for Diagnosis Code P.13A-21).

STEP 18. Check the trouble symptoms.

Q: Does trouble symptom persist?

YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunction).

Inspection Procedure 6: Improper Starting (Long time to start)

PROBABLE CAUSES
- Failed battery
- Improper fuel used
- Fuel contaminated with foreign matter
- Injector leaking or clogged
- Failed injector
- Fuel injection learning failure
- Fuel filter clogged
- Fuel line leaking or clogged
- Failed fuel pressure limiter valve
- Failed rail pressure sensor
- Failed supply pump (suction control valve)
- Failed supply pump correction learning
- Failed glow system
- Failed EGR system operation
- Failed engine-ECU
- Compression pressure low

DIAGNOSIS PROCEDURE

STEP 1. Check battery voltage.
- Measure battery voltage during cranking.

  OK: 8 V or more

Q: Is the check result normal?
YES : Go to Step 2 .
NO : Check battery (Refer to GROUP 54A – Battery – On-vehicle Service – Battery Test).

STEP 2. M.U.T.-III diagnosis code.

Q: Is the diagnosis code set?
YES : Inspection chart for diagnosis code (Refer to P.13A-21).
NO : Go to Step 3 .

STEP 3. M.U.T.-III data list.
- Refer to Data List Reference Table (Refer to P.13A-542).
  a. Item 5: Barometric pressure sensor
  b. Item 7: Engine coolant temperature sensor
  c. Item 8: EGR gas temperature sensor <Euro5>
  d. Item 8: Intake air temperature sensor No. 2 <Except Euro5>
  e. Item 16: EGR valve position sensor
  f. Item 17: EGR valve target position
  g. Item 21: Fuel temperature sensor
  h. Item 43: Intake air temperature sensor No. 1

Q: Are the check results normal?
YES : Go to Step 4 .
NO : Perform the diagnosis code classified check procedure for the sensor that has shown an abnormal data value (Refer to Inspection Chart for Diagnosis Code P.13A-21).

STEP 4. Check injector identification code.
- Check injector identification code (Refer to GROUP 00 – Precautions Before Service – Injector Identification code Registration Procedure).

Q: Is the check result normal?
YES : Go to Step 5 .
NO : Register the injector ID.

STEP 5. Supply pump correction learning.
- Carry out the supply pump correction learning (Refer to GROUP 00 – Precautions Before Service – Supply Pump Correction Learning).

Q: Does trouble symptom persist?
YES : Go to Step 6 .
NO : The procedure is complete.

STEP 6. Small injection quantity learning.
- Carry out the small injection quantity learning procedure (Refer to GROUP 00 – Precautions Before Service – Small Injection Quantity Learning Procedure).

Q: Does trouble symptom persist?
YES : Go to Step 7 .
NO : The procedure is complete.

STEP 7. Confirm the using fuel.

Q: Is the specified fuel being used?
YES : Go to Step 8 .
NO : Replace fuel.

STEP 8. Check glow system.
- Check glow system (Refer to Code No. P0381 P.13A-200 <Euro5> or Inspection Procedure 25 P.13A-520 <Except Euro5>).

Q: Is the check result normal?
YES : Go to Step 9 .
NO : Repair or replace the failed item.

STEP 9. Check fuel supply line.
- Check for fuel leakage and clogging.
- Check fuel filter for clogging.

Q: Is the check result normal?
YES : Go to Step 10 .
NO : Repair or replace the failed item.

STEP 10. Priming (air bleeding)
- Bleed air.

Q: Does trouble symptom persist?
YES : Go to Step 11 .
NO : The procedure is complete.

STEP 11. M.U.T.-III actuator test.
- Refer to Actuator Test Reference Table P.13A-574.
  a. Item 19: Suction control valve

Q: Is the check result normal?
YES : Go to Step 12 .
NO : Replace the suction control valve. After replacing the suction control valve, learn the supply pump (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).

STEP 12. Check suction control valve itself.
- Check suction control value itself (Refer to P.13A-596).

Q: Is the check result normal?
YES : Go to Step 13 .
NO : Replace the suction control valve. After replacing the suction control valve, learn the supply pump (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).

STEP 13. M.U.T.-III data list.
- Refer to Data List Reference Table P.13A-542.
  a. Item 63: Rail pressure sensor
  b. Item 64: Rail pressure target

Q: Are the check results normal?
YES : Go to Step 15 .
NO : Go to Step 14 .

STEP 14. Replace the rail pressure sensor.
- Replace the common-rail assembly.

Q: Does trouble symptom persist?
YES : Go to Step 18 .
NO : The procedure is complete.

STEP 15. Check the waveforms of crank angle sensor and camshaft position sensor.
- Check the output waveforms on an oscilloscope (Refer to P.13A-586).

Q: Is the check result normal?
YES : Go to Step 16 .
NO : Proceed to the inspection procedure by diagnosis code for the abnormal waveform (Refer to Inspection Chart for Diagnosis Code P.13A-21).

STEP 16. Check compression pressure.

- Check compression pressure (Refer to GROUP 11A – On-vehicle Service – Compression Pressure Check).

Q: Is the check result normal?

YES : Go to Step 17 .

NO : Check and repair the engine itself.

STEP 17. Check injector itself.

- Check injector itself (Refer to P.13A-595).

Q: Is the check result normal?

YES : Go to Step 18 .

NO : Replace the injector at the failed cylinder. After replacing the Injector, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).

STEP 18. Check the trouble symptoms.

Q: Does trouble symptom persist?

YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunction).

Inspection Procedure 7: Improper Idling

PROBABLE CAUSES

- Improper fuel used
- Fuel contaminated with foreign matter
- Injector leaking or clogged
- Failed injector
- Fuel injection learning failure
- Fuel filter clogged
- Fuel line leaking or clogged
- Failed fuel pressure limiter valve
- Failed rail pressure sensor
- Failed supply pump (suction control valve)
- Failed supply pump correction learning
- Failed EGR system operation
- Failed valve clearance adjustment
- Failed engine-ECU
- Compression pressure low

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code.

Q: Is the diagnosis code set?

YES : Inspection chart for diagnosis code (Refer to P.13A-21).

NO : Go to Step 2 .

STEP 2. Check injector identification code.

- Check injector identification code (Refer to GROUP 00 – Precautions Before Service – Injector Identification code Registration Procedure).

Q: Is the check result normal?

YES : Go to Step 3 .

NO : Register the injector ID.

STEP 3. M.U.T.-III data list.

- Refer to Data List Reference Table P.13A-542.
  a. Item 16: EGR valve position sensor
  b. Item 17: EGR valve target position

Q: Are the check results normal?

YES : Go to Step 4 .

NO : Perform the diagnosis code classified check procedure for the sensor that has shown an abnormal data value (Refer to Inspection Chart for Diagnosis Code P.13A-21).

STEP 4. Confirm the using fuel.

Q: Is the specified fuel being used?

YES : Go to Step 5 .

NO : Replace fuel.

STEP 5. Check fuel supply line.
- Check for fuel leakage and clogging.
- Check fuel filter for clogging.

Q: Is the check result normal?
YES : Go to Step 6 .
NO : Repair or replace the failed item.

STEP 6. Priming (air bleeding)
- Bleed air.

Q: Does trouble symptom persist?
YES : Go to Step 7 .
NO : The procedure is complete.

STEP 7. M.U.T.-III actuator test.
- Refer to Actuator Test Reference Table P.13A-574.
  a. Item 19: Suction control valve

Q: Is the check result normal?
YES : Go to Step 8 .
NO : Replace the suction control valve. After replacing the suction control valve, learn the supply pump (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).

STEP 8. Check suction control valve itself.
- Check suction control value itself (Refer to P.13A-596).

Q: Is the check result normal?
YES : Go to Step 9 .
NO : Replace the suction control valve. After replacing the suction control valve, learn the supply pump (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).

STEP 9. M.U.T.-III data list.
- Refer to Data List Reference Table P.13A-542.
  a. Item 63: Rail pressure sensor
  b. Item 64: Rail pressure target

Q: Are the check results normal?
YES : Go to Step 11 .
NO : Go to Step 10 .

STEP 10. Replace the rail pressure sensor.
- Replace the common-rail assembly.

Q: Does trouble symptom persist?
YES : Go to Step 17 .
NO : The procedure is complete.

STEP 11. Check the waveforms of crank angle sensor and camshaft position sensor.
- Check the output waveforms on an oscilloscope (Refer to P.13A-586).

Q: Is the check result normal?
YES : Go to Step 12 .
NO : Proceed to the inspection procedure by diagnosis code for the abnormal waveform (Refer to Inspection Chart for Diagnosis Code P.13A-21).

STEP 12. Check compression pressure.
- Check compression pressure (Refer to GROUP 11A On-vehicle Service – Compression Pressure Check).

Q: Is the check result normal?
YES : Go to Step 13 .
NO : Check and repair the engine itself.

STEP 13. Check valve clearance.
- Check valve clearance (Refer to GROUP 11A – On-vehicle Service – Valve Clearance Check and Adjustment).

Q: Is the check result normal?
YES : Go to Step 14 .
NO : Adjust the valve clearance.

STEP 14. M.U.T.-III actuator test.
- Refer to Data List Reference Table P.13A-542.
  a. Item 15: Injector No. 1
  b. Item 16: Injector No. 2
  c. Item 17: Injector No. 3
  d. Item 18: Injector No. 4

Q: Are the check results normal?
YES : Go to Step 15 .
NO : Replace the injector at the failed cylinder. After replacing the Injector, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).

STEP 15. Check injector itself.
- Check injector itself (Refer to P.13A-595).

Q: Is the check result normal?

YES : Go to Step 16 .
NO : Replace the injector at the failed cylinder. After replacing the Injector, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).

STEP 16. M.U.T.-III data list.

- Refer to Data List Reference Table P.13A-542.
  a. Item 5: Barometric pressure sensor
  b. Item 6: Manifold absolute pressure sensor
  c. Item 7: Engine coolant temperature sensor
  d. Item 8: EGR gas temperature sensor <Euro5>
  e. Item 8: Intake air temperature sensor No. 2 <Except Euro5>
  f. Item 9: Accelerator pedal position sensor
  g. Item 21: Fuel temperature sensor
  h. Item 43: Intake air temperature sensor No. 1
  i. Item 45: Throttle position sensor

Q: Are the check results normal?
YES : Go to Step 17 .
NO : Perform the diagnosis code classified check procedure for the sensor that has shown an abnormal data value (Refer to Inspection Chart for Diagnosis Code P.13A-21).

STEP 17. Check the trouble symptoms.

Q: Does trouble symptom persist?
YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunction).

Inspection Procedure 8: The Engine Stalls When Decelerating

PROBABLE CAUSES

- Improper fuel used
- Fuel contaminated with foreign matter
- Injector leaking or clogged
- Failed injector
- Fuel injection learning failure
- Fuel filter clogged
- Fuel line leaking or clogged
- Failed fuel pressure limiter valve
- Failed rail pressure sensor
- Failed supply pump (suction control valve)
- Failed supply pump correction learning
- Failed EGR system operation
- Failed valve clearance adjustment
- Failed engine-ECU
- Compression pressure low
- Air cleaner clogged

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code.

Q: Is the diagnosis code set?
YES : Inspection chart for diagnosis code (Refer to P.13A-21).
NO : Go to Step 2 .

STEP 2. Check idling condition.

Q: Is the idling condition normal?
YES : Go to Step 3 .
NO : Proceed to troubleshooting for improper idling (Refer to Inspection Procedure 7 P.13A-466).

STEP 3. M.U.T.-III data list.

- Refer to Data List Reference Table P.13A-542.
  a. Item 5: Barometric pressure sensor
  b. Item 6: Manifold absolute pressure sensor
  c. Item 7: Engine coolant temperature sensor
  d. Item 8: EGR gas temperature sensor <Euro5>
  e. Item 8: Intake air temperature sensor No. 2 <Except Euro5>
  f. Item 9: Accelerator pedal position sensor (main)
  g. Item 10: Accelerator pedal position sensor (sub)
  h. Item 13: Accelerator pedal position sensor (main) learned closed position
  i. Item 16: EGR valve position sensor
  j. Item 17: EGR valve target position
  k. Item 21: Fuel temperature sensor
  l. Item 43: Intake air temperature sensor No. 1
  m. Item 45: Throttle position sensor
  n. Item 46: Throttle position sensor learned closed position

Q: Are the check results normal?
YES : Go to Step 4 .
NO : Perform the diagnosis code classified check procedure for the sensor that has shown an abnormal data value (Refer to Inspection Chart for Diagnosis Code P.13A-21).

STEP 4. Check injector identification code.

- Check injector identification code (Refer to GROUP 00 – Precautions Before Service – Injector Identification code Registration Procedure).

Q: Is the check result normal?
YES : Go to Step 5 .
NO : Register the injector ID.

STEP 5. Supply pump correction learning.

- Carry out the supply pump correction learning (Refer to GROUP 00 – Precautions Before Service – Supply Pump Correction Learning).

Q: Does trouble symptom persist?
YES : Go to Step 6 .
NO : The procedure is complete.

STEP 6. Small injection quantity learning.

- Carry out the small injection quantity learning procedure (Refer to GROUP 00 – Precautions Before Service – Small Injection Quantity Learning Procedure).

Q: Does trouble symptom persist?
YES : Go to Step 7 .
NO : The procedure is complete.

STEP 7. Check air cleaner.

Q: Is the check result normal?
YES : Go to Step 8 .
NO : Replace air cleaner.

STEP 8. Confirm the using fuel.

Q: Is the specified fuel being used?
YES : Go to Step 9 .
NO : Replace fuel.

STEP 9. Check fuel supply line.

- Check for fuel leakage and clogging.
- Check fuel filter for clogging.

Q: Is the check result normal?
YES : Go to Step 10 .
NO : Repair or replace the failed item.

STEP 10. Priming (air bleeding)

- Bleed air.

Q: Does trouble symptom persist?
YES : Go to Step 11 .
NO : The procedure is complete.

STEP 11. M.U.T.-III actuator test.

- Refer to Actuator Test Reference Table P.13A-574.
  a. Item 19: Suction control valve

Q: Is the check result normal?
YES : Go to Step 12 .
NO : Replace the suction control valve. After replacing the suction control valve, learn the supply pump (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).

STEP 12. Check suction control valve itself.

- Check suction control value itself (Refer to P.13A-596).

Q: Is the check result normal?

YES : Go to Step 13 .
NO : Replace the suction control valve. After replacing the suction control valve, learn the supply pump (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).

STEP 13. M.U.T.-III data list.
- Refer to Data List Reference Table P.13A-542.
  a. Item 63: Rail pressure sensor
  b. Item 64: Rail pressure target

Q: Are the check results normal?
YES : Go to Step 15 .
NO : Go to Step 14 .

STEP 14. Replace the rail pressure sensor.
- Replace the common-rail assembly.

Q: Does trouble symptom persist?
YES : Go to Step 20 .
NO : The procedure is complete.

STEP 15. Check the waveforms of crank angle sensor and camshaft position sensor.
- Check the output waveforms on an oscilloscope (Refer to P.13A-586).

Q: Is the check result normal?
YES : Go to Step 16 .
NO : Proceed to the inspection procedure by diagnosis code for the abnormal waveform (Refer to Inspection Chart for Diagnosis Code P.13A-21).

STEP 16. Check compression pressure.
- Check compression pressure (Refer to GROUP 11A – On-vehicle Service – Compression Pressure Check).

Q: Is the check result normal?
YES : Go to Step 17 .
NO : Check and repair the engine itself.

STEP 17. Check valve clearance.
- Check valve clearance (Refer to GROUP 11A – On-vehicle Service – Valve Clearance Check and Adjustment).

Q: Is the check result normal?
YES : Go to Step 18 .
NO : Adjust the valve clearance.

STEP 18. M.U.T.-III actuator test.
- Refer to Actuator Test Reference Table P.13A-574.
  a. Item 15: Injector No. 1
  b. Item 16: Injector No. 2
  c. Item 17: Injector No. 3
  d. Item 18: Injector No. 4

Q: Are the check results normal?
YES : Go to Step 19 .
NO : Replace the injector at the failed cylinder. After replacing the Injector, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).

STEP 19. Check injector itself.
- Check injector itself (Refer to P.13A-595).

Q: Is the check result normal?
YES : Go to Step 20 .
NO : Replace the injector at the failed cylinder. After replacing the Injector, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).

STEP 20. Check the trouble symptoms.

Q: Does trouble symptom persist?
YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunction).

Inspection Procedure 9: Poor Acceleration

PROBABLE CAUSES

- Failed boost pressure control system
- Failed turbocharger
- Improper fuel used
- Fuel contaminated with foreign matter
- Injector leaking or clogged
- Failed injector
- Fuel injection learning failure
- Fuel filter clogged
- Fuel line leaking or clogged
- Failed fuel pressure limiter valve
- Failed rail pressure sensor
- Failed supply pump (suction control valve)
- Failed supply pump correction learning
- Failed EGR system operation
- Failed valve clearance adjustment
- Failed engine-ECU
- Compression pressure low
- Air cleaner clogged

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code.

Q: Is the diagnosis code set?
YES : Inspection chart for diagnosis code (Refer to P.13A-21).
NO : Go to Step 2 .

STEP 2. Check idling condition.

Q: Is the check result normal?
YES : Go to Step 3 .
NO : Proceed to troubleshooting for improper idling (Refer to Inspection Procedure 7 P.13A-466).

STEP 3. Check injector identification code.

- Check injector identification code (Refer to GROUP 00 – Precautions Before Service – Injector Identification code Registration Procedure).

Q: Is the check result normal?
YES : Go to Step 4 .
NO : Register the injector ID.

STEP 4. M.U.T.-III data list.

- Refer to Data List Reference Table P.13A-542.
  a. Item 5: Barometric pressure sensor
  b. Item 6: Manifold absolute pressure sensor
  c. Item 7: Engine coolant temperature sensor
  d. Item 8: EGR gas temperature sensor <Euro5>
  e. Item 8: Intake air temperature sensor No. 2 <Except Euro5>
  f. Item 9: Accelerator pedal position sensor (main)
  g. Item 10: Accelerator pedal position sensor (sub)
  h. Item 13: Accelerator pedal position sensor (main) learned closed position
  i. Item 16: EGR valve position sensor
  j. Item 17: EGR valve target position
  k. Item 21: Fuel temperature sensor
  l. Item 43: Intake air temperature sensor No. 1
  m. Item 45: Throttle position sensor
  n. Item 46: Throttle position sensor learned closed position

Q: Are the check results normal?
YES : Go to Step 5 .
NO : Perform the diagnosis code classified check procedure for the sensor that has shown an abnormal data value (Refer to Inspection Chart for Diagnosis Code P.13A-21).

STEP 5. Supply pump correction learning.

- Carry out the supply pump correction learning (Refer to GROUP 00 – Precautions Before Service – Supply Pump Correction Learning).

Q: Does trouble symptom persist?
YES : Go to Step 6 .
NO : The procedure is complete.

STEP 6. Small injection quantity learning.

- Carry out the small injection quantity learning procedure (Refer to GROUP 00 – Precautions Before Service – Small Injection Quantity Learning Procedure).

Q: Does trouble symptom persist?
YES : Go to Step 7 .
NO : The procedure is complete.

STEP 7. Check air cleaner.

Q: Is the check result normal?

YES : Go to Step 8 .
NO : Replace air cleaner.

STEP 8. Confirm the using fuel.

Q: Is the specified fuel being used?
YES : Go to Step 9 .
NO : Replace fuel.

STEP 9. Checking the turbocharging pressure.
- Check the turbocharging pressure (Refer to GROUP 15 – On-vehicle Service – Turbocharger Supercharging Pressure Check).

Q: Is the check result normal?
YES : Go to Step 10 .
NO : Repair or replace the failed item.

STEP 10. Check fuel supply line.
- Check for fuel leakage and clogging.
- Check fuel filter for clogging.

Q: Is the check result normal?
YES : Go to Step 11 .
NO : Repair or replace the failed item.

STEP 11. Priming (air bleeding)
- Bleed air.

Q: Does trouble symptom persist?
YES : Go to Step 12 .
NO : The procedure is complete.

STEP 12. M.U.T.-III actuator test.
- Refer to Actuator Test Reference Table P.13A-574.
  a. Item 19: Suction control valve

Q: Is the check result normal?
YES : Go to Step 13 .
NO : Replace the suction control valve. After replacing the suction control valve, learn the supply pump (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).

STEP 13. Check suction control valve itself.
- Check suction control value itself (Refer to P.13A-596).

Q: Is the check result normal?
YES : Go to Step 14 .
NO : Replace the suction control valve. After replacing the suction control valve, learn the supply pump (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).

STEP 14. M.U.T.-III data list.
- Refer to Data List Reference Table P.13A-542.
  a. Item 63: Rail pressure sensor
  b. Item 64: Rail pressure target

Q: Are the check results normal?
YES : Go to Step 16 .
NO : Go to Step 15 .

STEP 15. Replace the rail pressure sensor.
- Replace the common-rail assembly.

Q: Does trouble symptom persist?
YES : Go to Step 20 .
NO : The procedure is complete.

STEP 16. Check the waveforms of crank angle sensor and camshaft position sensor.
- Check the output waveforms on an oscilloscope (Refer to P.13A-586).

Q: Is the check result normal?
YES : Go to Step 17 .
NO : Proceed to the inspection procedure by diagnosis code for the abnormal waveform (Refer to Inspection Chart for Diagnosis Code P.13A-21).

STEP 17. M.U.T.-III actuator test.
- Refer to Actuator Test Reference Table P.13A-574.
  a. Item 15: Injector No. 1
  b. Item 16: Injector No. 2
  c. Item 17: Injector No. 3
  d. Item 18: Injector No. 4

Q: Are the check results normal?
YES : Go to Step 18 .
NO : Replace the injector at the failed cylinder. After replacing the Injector, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).

STEP 18. Check compression pressure.

- Check compression pressure (Refer to GROUP 11A – On-vehicle Service – Compression Pressure Check).

Q: Is the check result normal?

YES : Go to Step 19 .

NO : Check and repair the engine itself.

STEP 19. Check injector itself.

- Check injector itself (Refer to P.13A-595).

Q: Is the check result normal?

YES : Go to Step 20 .

NO : Replace the injector at the failed cylinder. After replacing the Injector, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).

STEP 20. Check the trouble symptoms.

Q: Does trouble symptom persist?

YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunction).

Inspection Procedure 10: A Large Amount of Fuel Consumption

PROBABLE CAUSES

- Improper fuel used
- Injector leaking
- Failed injector
- Fuel injection learning failure
- Fuel filter clogged
- Failed rail pressure sensor
- Failed supply pump (suction control valve)
- Failed supply pump correction learning
- Failed EGR system operation
- Failed turbocharger
- Failed thermostat
- Failed engine-ECU
- Compression pressure low
- Air cleaner clogged

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code.

Q: Is the diagnosis code set?

YES : Inspection chart for diagnosis code (Refer to P.13A-21).

NO : Go to Step 2 .

STEP 2. Check whether other trouble symptoms are occurring.

Q: Are other trouble symptoms occurring?

YES : Inspection Chart for Trouble Symptoms (Refer to P.13A-429).

NO : Go to Step 3 .

STEP 3. M.U.T.-III data list.

- Refer to Data List Reference Table P.13A-542.
  a. Item 5: Barometric pressure sensor
  b. Item 6: Manifold absolute pressure sensor
  c. Item 7: Engine coolant temperature sensor
  d. Item 8: EGR gas temperature sensor <Euro5>
  e. Item 8: Intake air temperature sensor No. 2 <Except Euro5>
  f. Item 9: Accelerator pedal position sensor (main)
  g. Item 10: Accelerator pedal position sensor (sub)
  h. Item 13: Accelerator pedal position sensor (main) learned closed position
  i. Item 16: EGR valve position sensor
  j. Item 17: EGR valve target position
  k. Item 21: Fuel temperature sensor
  l. Item 43: Intake air temperature sensor No. 1
  m. Item 45: Throttle position sensor
  n. Item 46: Throttle position sensor learned closed position

Q: Are the check results normal?
YES : Go to Step 4 .
NO : Perform the diagnosis code classified check procedure for the sensor that has shown an abnormal data value (Refer to Inspection Chart for Diagnosis Code P.13A-21).

STEP 4. Check injector identification code.

- Check injector identification code (Refer to GROUP 00 – Precautions Before Service – Injector Identification code Registration Procedure).

Q: Is the check result normal?
YES : Go to Step 5 .
NO : Register the injector ID.

STEP 5. Supply pump correction learning.

- Carry out the supply pump correction learning (Refer to GROUP 00 – Precautions Before Service – Supply Pump Correction Learning).

Q: Does trouble symptom persist?
YES : Go to Step 6 .
NO : The procedure is complete.

STEP 6. Small injection quantity learning.

- Carry out the small injection quantity learning procedure (Refer to GROUP 00 – Precautions Before Service – Small Injection Quantity Learning Procedure).

Q: Does trouble symptom persist?
YES : Go to Step 7 .
NO : The procedure is complete.

STEP 7. Check turbocharger itself.

Q: Is the check result normal?
YES : Go to Step 8 .
NO : Replace the turbocharger.

STEP 8. Check the cooling system.

- Check how the engine coolant level rises.

Q: Is the check result normal?
YES : Go to Step 9 .
NO : Check the cooling system.

STEP 9. Priming (air bleeding)

- Bleed air.

Q: Does trouble symptom persist?
YES : Go to Step 10 .
NO : The procedure is complete.

STEP 10. M.U.T.-III actuator test.

- Refer to Actuator Test Reference Table P.13A-574.
  a. Item 19: Suction control valve

Q: Is the check result normal?
YES : Go to Step 11 .
NO : Replace the suction control valve. After replacing the suction control valve, learn the supply pump (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).

STEP 11. Check suction control valve itself.

- Check suction control value itself (Refer to P.13A-596).

Q: Is the check result normal?
YES : Go to Step 12 .
NO : Replace the suction control valve. After replacing the suction control valve, learn the supply pump (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).

STEP 12. M.U.T.-III data list.

- Refer to Data List Reference Table P.13A-542.
  a. Item 63: Rail pressure sensor
  b. Item 64: Rail pressure target

Q: Are the check results normal?
YES : Go to Step 14 .
NO : Go to Step 13 .

STEP 13. Replace the rail pressure sensor.

- Replace the common-rail assembly.

Q: Does trouble symptom persist?
YES : Go to Step 16 .
NO : The procedure is complete.

STEP 14. Check compression pressure.

- Check compression pressure (Refer to GROUP 11A – On-vehicle Service – Compression Pressure Check).

Q: Is the check result normal?
YES : Go to Step 15 .
NO : Check and repair the engine itself.

STEP 15. Check injector itself.

- Check injector itself (Refer to P.13A-595).

Q: Is the check result normal?
YES : Go to Step 16 .
NO : Replace the injector at the failed cylinder. After replacing the Injector, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).

STEP 16. Check the trouble symptoms.

Q: Does trouble symptom persist?
YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunction).

Inspection Procedure 11: Knocking, Abnormal Noise

PROBABLE CAUSES

- Improper fuel used
- Failed injector
- Fuel injection learning failure
- Failed fuel pressure limiter valve
- Failed supply pump (suction control valve)
- Failed supply pump correction learning
- Failed EGR system operation
- Failed engine-ECU
- Compression pressure low
- Failed valve clearance adjustment

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code.

Q: Is the diagnosis code set?
YES : Inspection chart for diagnosis code (Refer to P.13A-21).
NO : Go to Step 2 .

STEP 2. Check idling condition.

Q: Is the check result normal?
YES : Go to Step 3 .
NO : Proceed to troubleshooting for improper idling. (Refer to Inspection Procedure 7 P.13A-466).

STEP 3. M.U.T.-III data list.

- Refer to Data List Reference Table P.13A-542.
  a. Item 5: Barometric pressure sensor
  b. Item 6: Manifold absolute pressure sensor
  c. Item 7: Engine coolant temperature sensor
  d. Item 8: EGR gas temperature sensor <Euro5>
  e. Item 8: Intake air temperature sensor No. 2 <Except Euro5>
  f. Item 9: Accelerator pedal position sensor (main)
  g. Item 10: Accelerator pedal position sensor (sub)
  h. Item 13: Accelerator pedal position sensor (main) learned closed position
  i. Item 16: EGR valve position sensor
  j. Item 17: EGR valve target position
  k. Item 21: Fuel temperature sensor
  l. Item 43: Intake air temperature sensor No. 1
  m. Item 45: Throttle position sensor
  n. Item 46: Throttle position sensor learned closed position

Q: Are the check results normal?
YES : Go to Step 4 .
NO : Perform the diagnosis code classified check procedure for the sensor that has shown an abnormal data value (Refer to Inspection Chart for Diagnosis Code P.13A-21).

STEP 4. Check injector identification code.

- Check injector identification code (Refer to GROUP 00 – Precautions Before Service – Injector Identification code Registration Procedure).

Q: Is the check result normal?
YES : Go to Step 5 .
NO : Register the injector ID.

STEP 5. Supply pump correction learning.

- Carry out the supply pump correction learning (Refer to GROUP 00 – Precautions Before Service – Supply Pump Correction Learning).

Q: Does trouble symptom persist?
YES : Go to Step 6 .
NO : The procedure is complete.

STEP 6. Small injection quantity learning.

- Carry out the small injection quantity learning procedure (Refer to GROUP 00 – Precautions Before Service – Small Injection Quantity Learning Procedure).

Q: Does trouble symptom persist?
YES : Go to Step 7 .
NO : The procedure is complete.

STEP 7. Priming (air bleeding)

- Bleed air.

Q: Does trouble symptom persist?
YES : Go to Step 8 .
NO : The procedure is complete.

STEP 8. Check the waveforms of crank angle sensor and camshaft position sensor.

- Check the output waveforms on an oscilloscope (Refer to P.13A-586).

Q: Is the check result normal?
YES : Go to Step 9 .
NO : Proceed to the inspection procedure by diagnosis code for the abnormal waveform (Refer to Inspection Chart for Diagnosis Code P.13A-21).

STEP 9. M.U.T.-III actuator test.

- Refer to Actuator Test Reference Table P.13A-574.
  a. Item 15: Injector No. 1
  b. Item 16: Injector No. 2
  c. Item 17: Injector No. 3
  d. Item 18: Injector No. 4

Q: Are the check results normal?
YES : Go to Step 10 .
NO : Replace the injector at the failed cylinder. After replacing the Injector, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).

STEP 10. Check compression pressure.

- Check compression pressure (Refer to GROUP 11A – On-vehicle Service – Compression Pressure Check).

Q: Is the check result normal?
YES : Go to Step 11 .
NO : Check and repair the engine itself.

STEP 11. Check valve clearance.

- Check valve clearance (Refer to GROUP 11A – On-vehicle Service – Valve Clearance Check and Adjustment).

Q: Is the check result normal?

YES : Go to Step 12 .

NO : Adjust the valve clearance.

STEP 12. Check injector itself.

- Check injector itself (Refer to P.13A-595).

Q: Is the check result normal?

YES : Go to Step 13 .

NO : Replace the injector at the failed cylinder. After replacing the Injector, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).

STEP 13. Check the trouble symptoms.

Q: Does trouble symptom persist?

YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunction).

Inspection Procedure 12: White Smoke

PROBABLE CAUSES

- Improper fuel used
- Injector leaking or clogged
- Failed injector
- Fuel injection learning failure
- Fuel filter clogged
- Fuel line leaking or clogged
- Failed fuel pressure limiter valve
- Failed rail pressure sensor
- Failed supply pump (suction control valve)
- Failed supply pump correction learning
- Failed EGR system operation
- Failed engine-ECU
- Compression pressure low
- Air cleaner clogged

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code.

Q: Is the diagnosis code set?

YES : Inspection chart for diagnosis code (Refer to P.13A-21).

NO : Go to Step 2 .

STEP 2. Check idling condition.

Q: Is the check result normal?

YES : Go to Step 3 .

NO : Proceed to troubleshooting for improper idling (Refer to Inspection Procedure 7 P.13A-466).

STEP 3. M.U.T.-III data list.

- Refer to Data List Reference Table P.13A-542.
  a. Item 5: Barometric pressure sensor
  b. Item 6: Manifold absolute pressure sensor
  c. Item 7: Engine coolant temperature sensor
  d. Item 8: EGR gas temperature sensor <Euro5>
  e. Item 8: Intake air temperature sensor No. 2 <Except Euro5>
  f. Item 9: Accelerator pedal position sensor (main)
  g. Item 10: Accelerator pedal position sensor (sub)
  h. Item 13: Accelerator pedal position sensor (main) learned closed position
  i. Item 16: EGR valve position sensor
  j. Item 17: EGR valve target position
  k. Item 21: Fuel temperature sensor
  l. Item 43: Intake air temperature sensor No. 1
  m. Item 45: Throttle position sensor
  n. Item 46: Throttle position sensor learned closed position

Q: Are the check results normal?
YES : Go to Step 4 .
NO : Perform the diagnosis code classified check procedure for the sensor that has shown an abnormal data value (Refer to Inspection Chart for Diagnosis Code P.13A-21).

STEP 4. Check injector identification code.

- Check injector identification code (Refer to GROUP 00 – Precautions Before Service – Injector Identification code Registration Procedure).

Q: Is the check result normal?
YES : Go to Step 5 .
NO : Register the injector ID.

STEP 5. Supply pump correction learning.

- Carry out the supply pump correction learning (Refer to GROUP 00 – Precautions Before Service – Supply Pump Correction Learning).

Q: Does trouble symptom persist?
YES : Go to Step 6 .
NO : The procedure is complete.

STEP 6. Small injection quantity learning.

- Carry out the small injection quantity learning procedure (Refer to GROUP 00 – Precautions Before Service – Small Injection Quantity Learning Procedure).

Q: Does trouble symptom persist?
YES : Go to Step 7 .
NO : The procedure is complete.

STEP 7. Check air cleaner.

Q: Is the check result normal?
YES : Go to Step 8 .
NO : Replace air cleaner.

STEP 8. Confirm the using fuel.

Q: Is the specified fuel being used?
YES : Go to Step 9 .
NO : Replace fuel.

STEP 9. Check fuel supply line.

- Check for fuel leakage and clogging.
- Check fuel filter for clogging.

Q: Is the check result normal?
YES : Go to Step 10 .
NO : Repair or replace the failed item.

STEP 10. Priming (air bleeding)

- Bleed air.

Q: Does trouble symptom persist?
YES : Go to Step 11 .
NO : The procedure is complete.

STEP 11. M.U.T.-III actuator test.

- Refer to Actuator Test Reference Table P.13A-574.
  a. Item 19: Suction control valve

Q: Is the check result normal?
YES : Go to Step 12 .
NO : Replace the suction control valve. After replacing the suction control valve, learn the supply pump (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).

STEP 12. Check suction control valve itself.

- Check suction control value itself (Refer to P.13A-596).

Q: Is the check result normal?

YES : Go to Step 13 .
NO : Replace the suction control valve. After replacing the suction control valve, learn the supply pump (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).

STEP 13. M.U.T.-III data list.
- Refer to Data List Reference Table P.13A-542.
  a. Item 63: Rail pressure sensor
  b. Item 64: Rail pressure target

Q: Are the check results normal?
YES : Go to Step 15 .
NO : Go to Step 14 .

STEP 14. Replace the rail pressure sensor.
- Replace the common-rail assembly.

Q: Does trouble symptom persist?
YES : Go to Step 18 .
NO : The procedure is complete.

STEP 15. Check the waveforms of crank angle sensor and camshaft position sensor.
- Check the output waveforms on an oscilloscope (Refer to P.13A-586).

Q: Is the check result normal?
YES : Go to Step 16 .
NO : Proceed to the inspection procedure by diagnosis code for the abnormal waveform (Refer to Inspection Chart for Diagnosis Code P.13A-21).

STEP 16. Check compression pressure.
- Check compression pressure (Refer to GROUP 11A – On-vehicle Service – Compression Pressure Check).

Q: Is the check result normal?
YES : Go to Step 17 .
NO : Check and repair the engine itself.

STEP 17. Check injector itself.
- Check injector itself (Refer to P.13A-595).

Q: Is the check result normal?
YES : Go to Step 18 .
NO : Replace the injector at the failed cylinder. After replacing the Injector, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).

STEP 18. Check the trouble symptoms.

Q: Does trouble symptom persist?
YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunction).

Inspection Procedure 13: Black Smoke

PROBABLE CAUSES
- Improper fuel used
- Injector leaking or clogged
- Failed injector
- Fuel injection learning failure
- Failed fuel pressure limiter valve
- Failed rail pressure sensor
- Failed supply pump (suction control valve)
- Failed supply pump correction learning
- Failed EGR system operation
- Failed glow system
- Failed engine-ECU
- Compression pressure low
- Failed turbocharger
- Improper engine oil volume or viscosity

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code.

Q: Is the diagnosis code set?
YES : Inspection chart for diagnosis code (Refer to P.13A-21).
NO : Go to Step 2 .

STEP 2. Check idling condition.

Q: Is the check result normal?
YES : Go to Step 3 .
NO : Proceed to troubleshooting for improper idling (Refer to Inspection Procedure 7 P.13A-466).

STEP 3. M.U.T.-III data list.

- Refer to Data List Reference Table P.13A-542.
  a. Item 5: Barometric pressure sensor
  b. Item 6: Manifold absolute pressure sensor
  c. Item 7: Engine coolant temperature sensor
  d. Item 8: EGR gas temperature sensor <Euro5>
  e. Item 8: Intake air temperature sensor No. 2 <Except Euro5>
  f. Item 9: Accelerator pedal position sensor (main)
  g. Item 10: Accelerator pedal position sensor (sub)
  h. Item 13: Accelerator pedal position sensor (main) learned closed position
  i. Item 16: EGR valve position sensor
  j. Item 17: EGR valve target position
  k. Item 21: Fuel temperature sensor
  l. Item 43: Intake air temperature sensor No. 1
  m. Item 45: Throttle position sensor
  n. Item 46: Throttle position sensor learned closed position

Q: Are the check results normal?
YES : Go to Step 4 .
NO : Perform the diagnosis code classified check procedure for the sensor that has shown an abnormal data value (Refer to Inspection Chart for Diagnosis Code P.13A-21).

STEP 4. Check injector identification code.

- Check injector identification code (Refer to GROUP 00 – Precautions Before Service – Injector Identification code Registration Procedure).

Q: Is the check result normal?
YES : Go to Step 5 .
NO : Register the injector ID.

STEP 5. Supply pump correction learning.

- Carry out the supply pump correction learning (Refer to GROUP 00 – Precautions Before Service – Supply Pump Correction Learning).

Q: Does trouble symptom persist?
YES : Go to Step 6 .
NO : The procedure is complete.

STEP 6. Small injection quantity learning.

- Carry out the small injection quantity learning procedure (Refer to GROUP 00 – Precautions Before Service – Small Injection Quantity Learning Procedure).

Q: Does trouble symptom persist?
YES : Go to Step 7 .
NO : The procedure is complete.

STEP 7. Confirm the using fuel.

Q: Is the specified fuel being used?
YES : Go to Step 8 .
NO : Replace fuel.

STEP 8. Check engine oil.

Q: Are the oil volume and viscosity normal?
YES : Go to Step 9 .
NO : Replenish or change engine oil.

STEP 9. Check glow system.

- Check glow system (Refer to Code No. P0381 P.13A-200 <Euro5> or Inspection Procedure 25 P.13A-520 <Except Euro5>).

Q: Is the check result normal?
YES : Go to Step 10 .
NO : Repair or replace the failed item.

STEP 10. Check turbocharger itself.

Q: Is the check result normal?
YES : Go to Step 11 .
NO : Repair the turbocharger.

STEP 11. Check the waveforms of crank angle sensor and camshaft position sensor.

- Check the output waveforms on an oscilloscope (Refer to P.13A-586).

Q: Is the check result normal?

YES : Go to Step 12 .
NO : Proceed to the inspection procedure by diagnosis code for the abnormal waveform (Refer to Inspection Chart for Diagnosis Code P.13A-21).

STEP 12. M.U.T.-III actuator test.
- Refer to Actuator Test Reference Table P.13A-574.
  a. Item 19: Suction control valve

Q: Is the check result normal?
YES : Go to Step 13 .
NO : Replace the suction control valve. After replacing the suction control valve, learn the supply pump (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).

STEP 13. Check suction control valve itself.
- Check suction control value itself (Refer to P.13A-596).

Q: Is the check result normal?
YES : Go to Step 14 .
NO : Replace the suction control valve. After replacing the suction control valve, learn the supply pump (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).

STEP 14. M.U.T.-III data list.
- Refer to Data List Reference Table P.13A-542.
  a. Item 63: Rail pressure sensor
  b. Item 64: Rail pressure target

Q: Are the check results normal?
YES : Go to Step 16 .
NO : Go to Step 15 .

STEP 15. Replace the rail pressure sensor.
- Replace the common-rail assembly.

Q: Does trouble symptom persist?
YES : Go to Step 18 .
NO : The procedure is complete.

STEP 16. Check compression pressure.
- Check compression pressure (Refer to GROUP 11A – On-vehicle Service – Compression Pressure Check).

Q: Is the check result normal?
YES : Go to Step 17 .
NO : Check and repair the engine itself.

STEP 17. Check injector itself.
- Check injector itself (Refer to P.13A-595).

Q: Is the check result normal?
YES : Go to Step 18 .
NO : Replace the injector at the failed cylinder. After replacing the Injector, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).

STEP 18. Check the trouble symptoms.

Q: Does trouble symptom persist?
YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunction).

Inspection Procedure 14: Battery rundown <Euro5>

COMMENT ON TROUBLE SYMPTOM
- Failure is possibly caused by failed alternator, failed generation control circuit or other faults.

PROBABLE CAUSES
- Failed battery
- Open/short circuit or harness damage in alternator L terminal circuit
- Short circuit in alternator G terminal

- Failed alternator
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. Check battery.

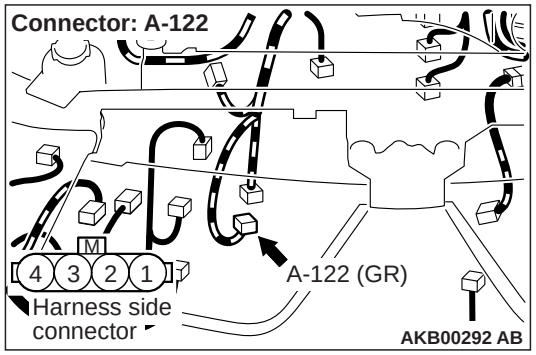
- Check battery (Refer to GROUP 54A – Battery – On-vehicle Service – Battery Test).

Q: Is the check result normal?
YES : Go to Step 2 .
NO : Replace the battery.

STEP 2. M.U.T.-III diagnosis code.

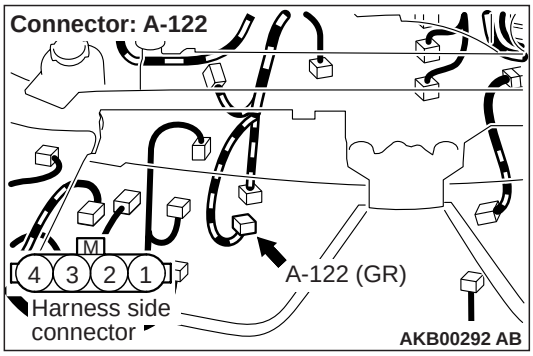
Q: Is the diagnosis code set?
YES : Inspection chart for diagnosis code (Refer to P.13A-21).
NO : Go to Step 3 .

STEP 3. Connector check: A-122 alternator connector



Q: Is the check result normal?
YES : Go to Step 4 .
NO : Repair or replace the connector.

STEP 4. Perform voltage measurement at A-122 alternator connector.

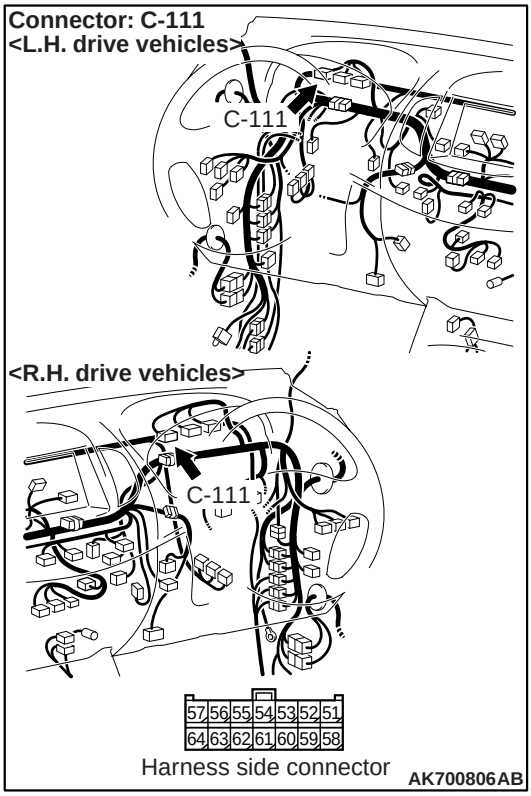


- Disconnect connector, and measure at harness side.
- Ignition switch: ON
- Voltage between terminal No. 3 and earth.

OK: System voltage

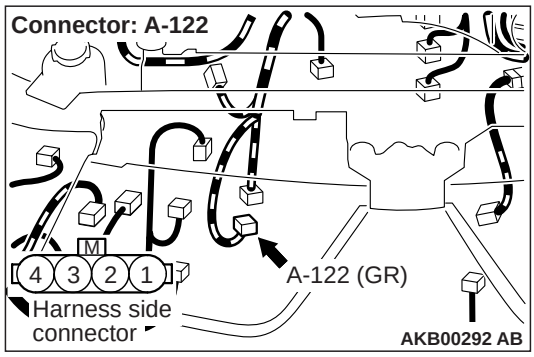
Q: Is the check result normal?
YES : Go to Step 7 .
NO : Go to Step 5 .

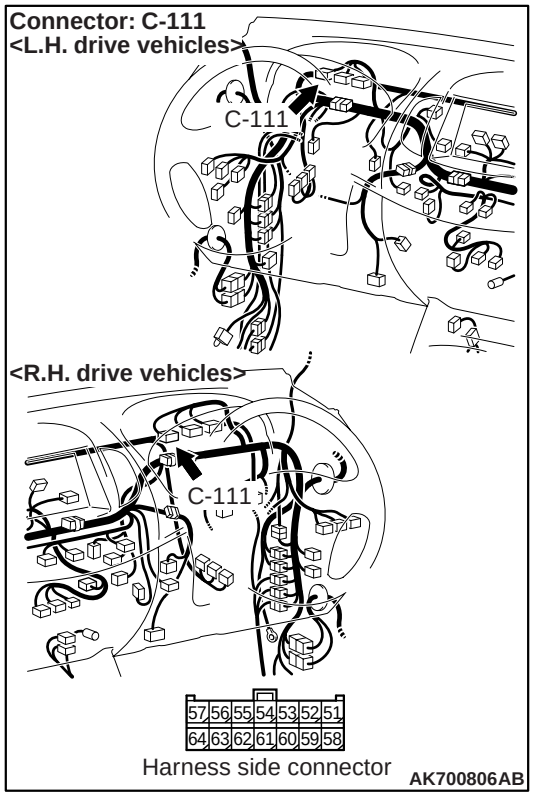
STEP 5. Connector check: C-111 combination meter connector



Q: Is the check result normal?
YES : Go to Step 6 .
NO : Repair or replace the connector.

STEP 6. Check harness between A-122 (terminal No. 3) alternator connector and C-111 (terminal No. 52) combination meter connector.





NOTE: Before checking harness, check intermediate connectors A-27, C-14 <R.H. drive vehicles> and C-54 <L.H. drive vehicles>, and repair if necessary.

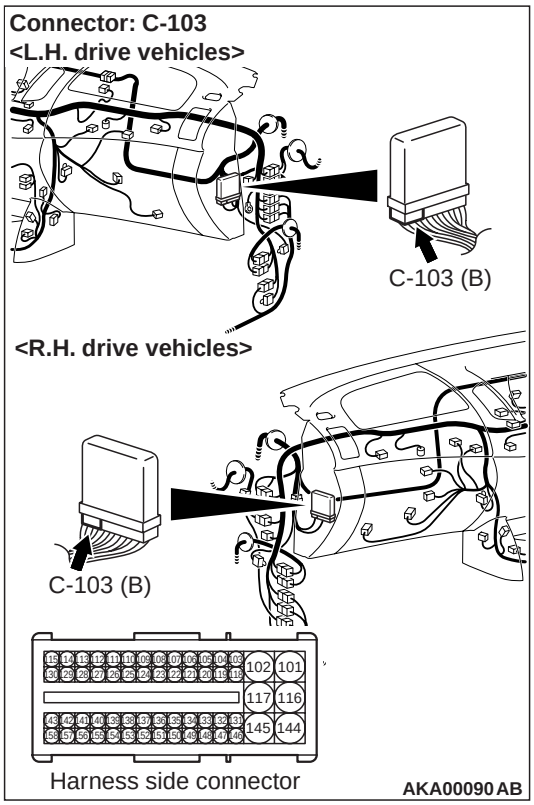
- Check power supply line for open/short circuit.

Q: Is the check result normal?

YES : Check the combination meter (Refer to GROUP 54A – Combination Meter – Trouble Symptom Chart).

NO : Repair the damaged harness wire.

STEP 7. Connector check: C-103 engine-ECU connector

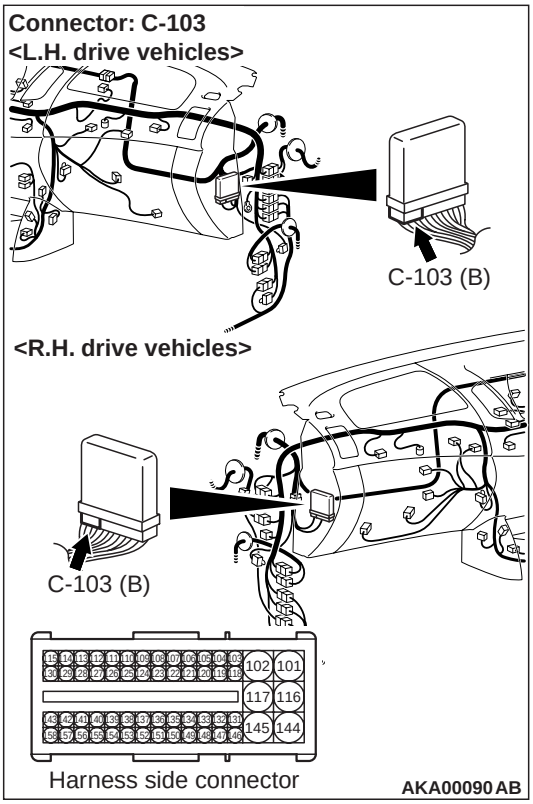


Q: Is the check result normal?

YES : Go to Step 8 .

NO : Repair or replace the connector.

STEP 8. Perform voltage measurement at C-103 engine-ECU connector.

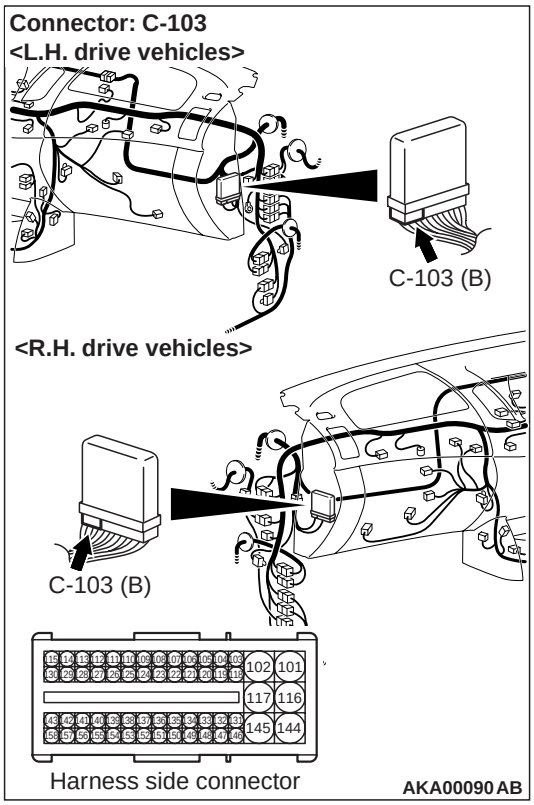


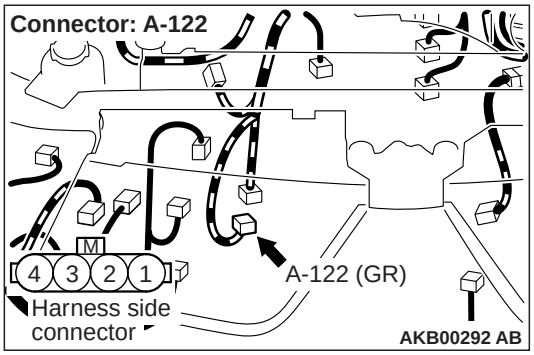
- Disconnect connector, and measure at harness side.
- Ignition switch: ON
- Voltage between terminal No. 121 and earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 12 .
NO : Go to Step 9 .

STEP 9. Check harness between C-103 (terminal No. 121) engine-ECU connector and A-122 (terminal No. 1) alternator connector.



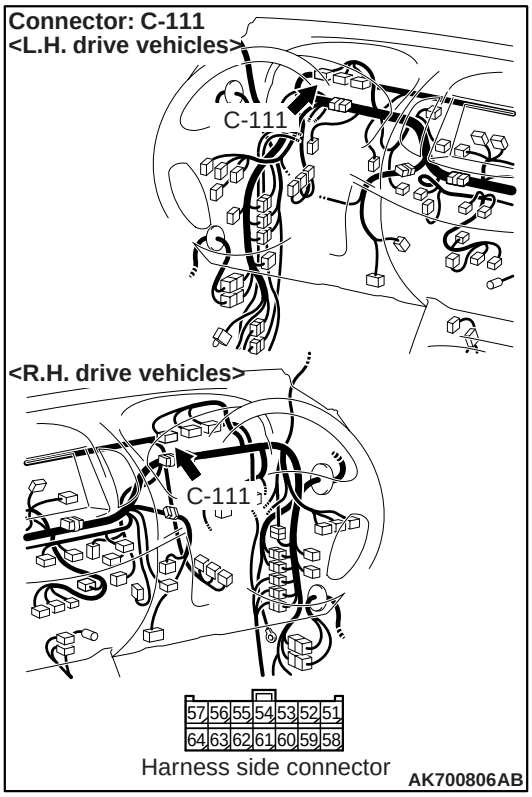


NOTE: Before checking harness, check intermediate connectors A-27 and A-115, and repair if necessary.

- Check output line for short circuit.

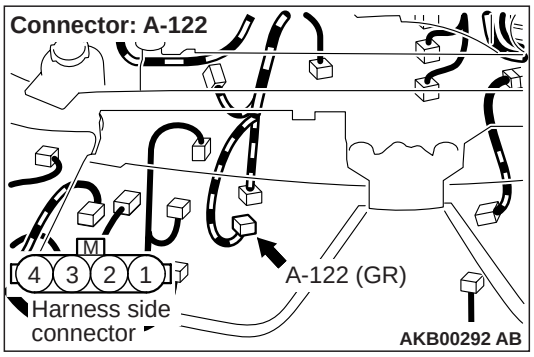
Q: Is the check result normal?
YES : Go to Step 10 .
NO : Repair the damaged harness wire.

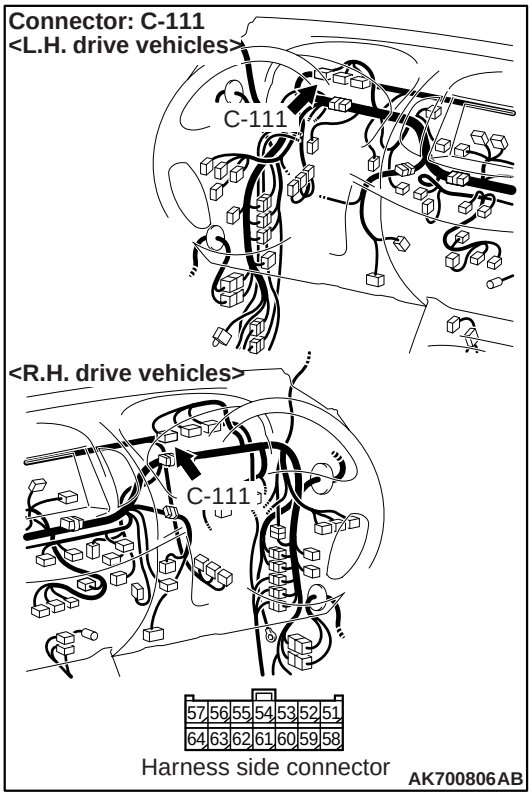
STEP 10. Connector check: C-111 combination meter connector



Q: Is the check result normal?
YES : Go to Step 11 .
NO : Repair or replace the connector.

STEP 11. Check harness between A-122 (terminal No. 3) alternator connector and C-111 (terminal No. 52) combination meter connector.

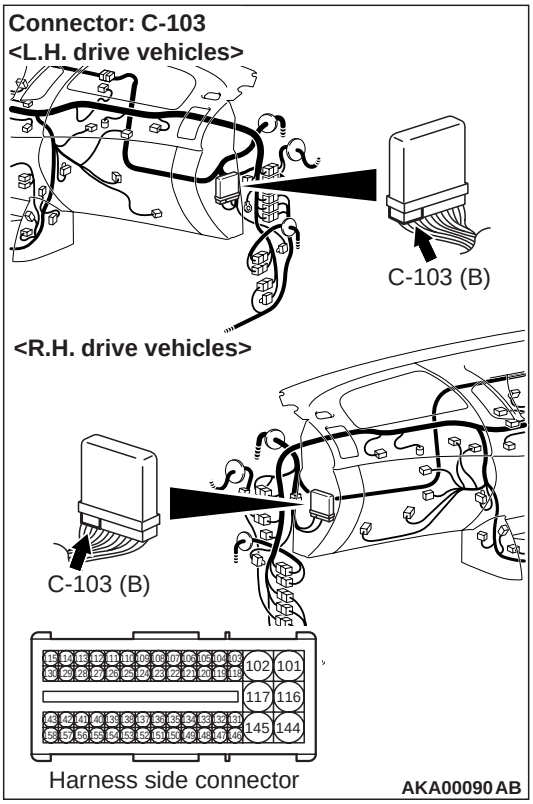




NOTE: Before checking harness, check intermediate connectors A-27, C-14 <R.H. drive vehicles> and C-54 <L.H. drive vehicles>, and repair if necessary.
- Check power supply line for damage.

Q: Is the check result normal?
YES : Check the alternator.
NO : Repair the damaged harness wire.

STEP 12. Perform voltage measurement at C-103 engine-ECU connector.



- Measure engine-ECU terminal voltage.
- Engine: Idling after warm-up
- Transmission: Neutral <M/T> or P range <A/T>
- Voltage between terminal No. 121 and earth.

  OK: The voltage increases when the head-lamp switch and the rear window defogger switch are turned ON from OFF.

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

NO : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, carry out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

Inspection Procedure 14: Battery Rundown <Except Euro5>

PROBABLE CAUSES

- Failed battery
- Failed alternator
- Damaged harness (Circuit related to charging system has an open circuit or is earthed)
- Damaged connector (Circuit related to charging system)

DIAGNOSIS PROCEDURE

STEP 1. Check battery.

- Check battery (Refer to GROUP 54A – Battery – On-vehicle Service – Battery Test).

Q: Is the check result normal?

YES : Check charging system (Refer to GROUP 16 – Charging System – On-vehicle Service – Output Current Test).

NO : Replace the battery.

Inspection Procedure 15: Overheating

PROBABLE CAUSES

- Failed cooling fan system
- Insufficient or deteriorated engine coolant
- Failed thermostat
- Failed water pump
- Failed radiator core

DIAGNOSIS PROCEDURE

STEP 1. Check cooling system.

- Check cooling fan system (Refer to GROUP 55A – Troubleshooting – Symptom Procedures <manual A/C>, Refer to GROUP 55B – Troubleshooting – Symptom Procedures <automatic A/C>).

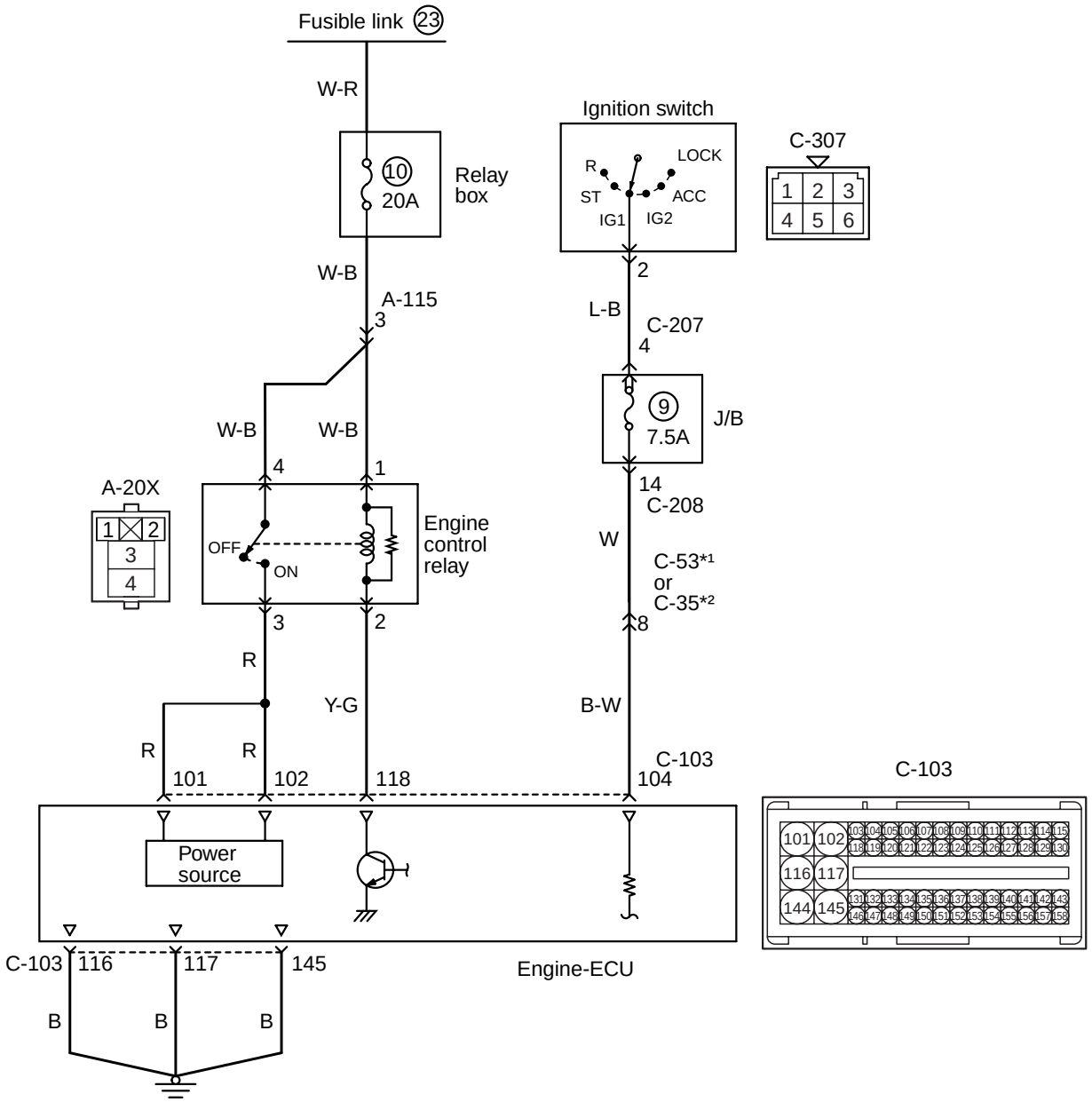
Q: Is the check result normal?

YES : Check cooling system.

NO : Repair or replace the failed item.

Inspection Procedure 16: Engine-ECU Power Supply System

Power Supply and Ignition Switch-IG Circuit



NOTE
*1: L.H. drive vehicles
*2: R.H. drive vehicles

Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V: Violet PU: Purple SI:Silver

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OPERATION

- When the ignition switch ON signal is input to the engine-ECU, the engine-ECU places the engine control relay in the ON position. Accordingly, the battery voltage is supplied to the engine-ECU, sensor and actuator.

PROBABLE CAUSES

- Failed battery
- Failed ignition switch

- Failed engine control relay
- Damaged harness (Open circuit between engine-ECU and engine control relay, engine control relay and relay box, engine-ECU and earth, and open circuit between engine-ECU and J/B)
- Damaged connector (Engine-ECU connector, diagnosis connector)
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. Check battery voltage.

- Measure battery voltage during cranking.

OK: 8 V or more

Q: Is the check result normal?

YES : Go to Step 2 .

NO : Check battery (Refer to GROUP 54A – Battery – On-vehicle Service – Battery test).

STEP 2. Check engine control relay itself.

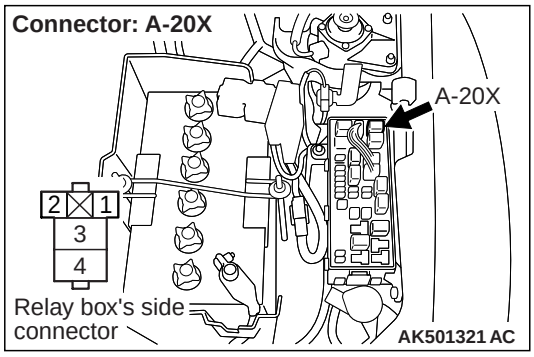
- Check engine control relay itself (Refer to P.13A-594).

Q: Is the check result normal?

YES : Go to Step 3 .

NO : Replace the engine control relay.

STEP 3. Connector check: A-20X engine control relay connector

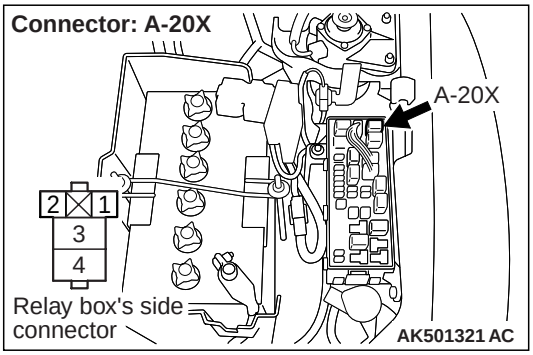


Q: Is the check result normal?

YES : Go to Step 4 .

NO : Repair or replace.

STEP 4. Perform voltage measurement at A-20X engine control relay connector.



- Remove relay, and measure at harness side.
- Voltage between terminal No. 1 and earth, also between terminal No. 4 and earth.

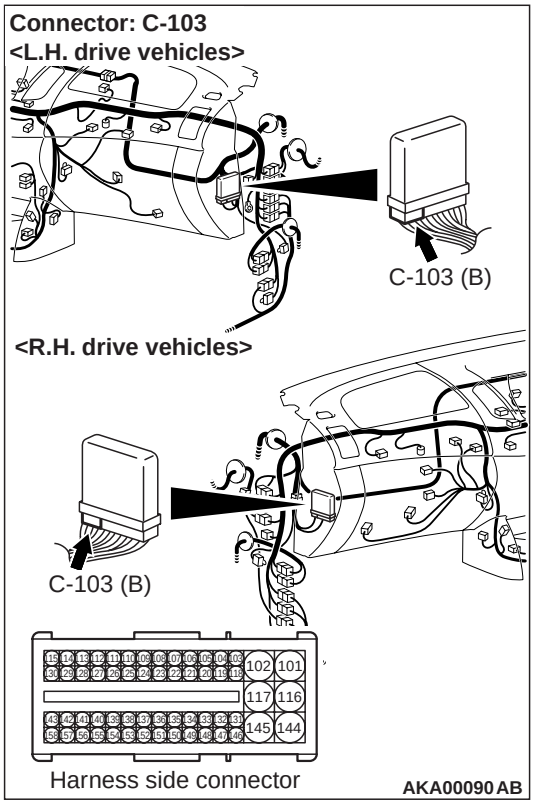
OK: System voltage

Q: Is the check result normal?

YES : Go to Step 5 .

NO : Check intermediate connector A-115, and repair if necessary. If intermediate connector is normal, check and repair harness between A-20X (terminal No. 1 and terminal No. 4) engine control relay connector and battery.

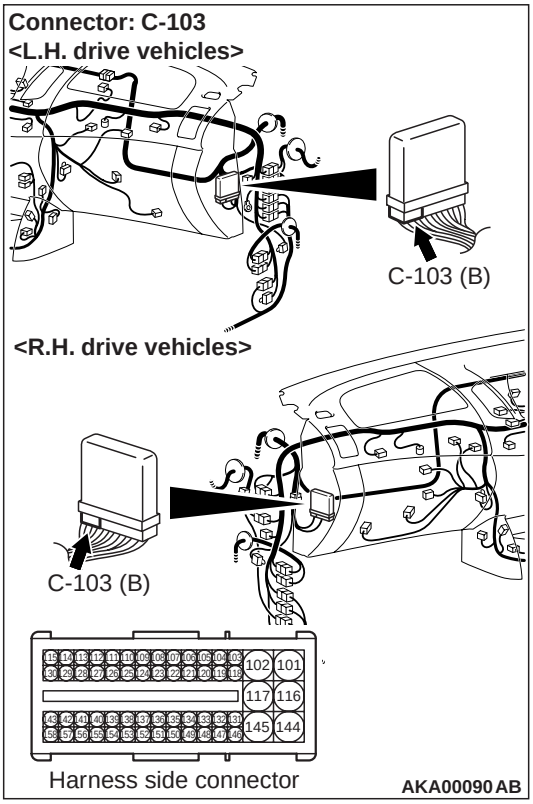
STEP 5. Connector check: C-103 engine-ECU connector.



Q: Is the check result normal?

YES : Go to Step 6 .
NO : Repair or replace.

STEP 6. Perform voltage measurement at C-103 engine-ECU connector

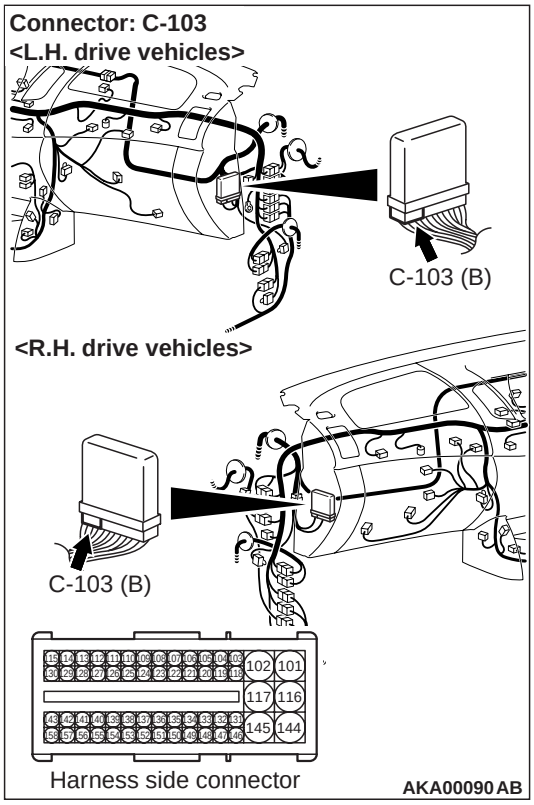


- Disconnect connector, and measure at harness side.
- Voltage between terminal No. 118 and earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair the harness wire.

STEP 7. Perform voltage measurement at C-103 engine-ECU connector.

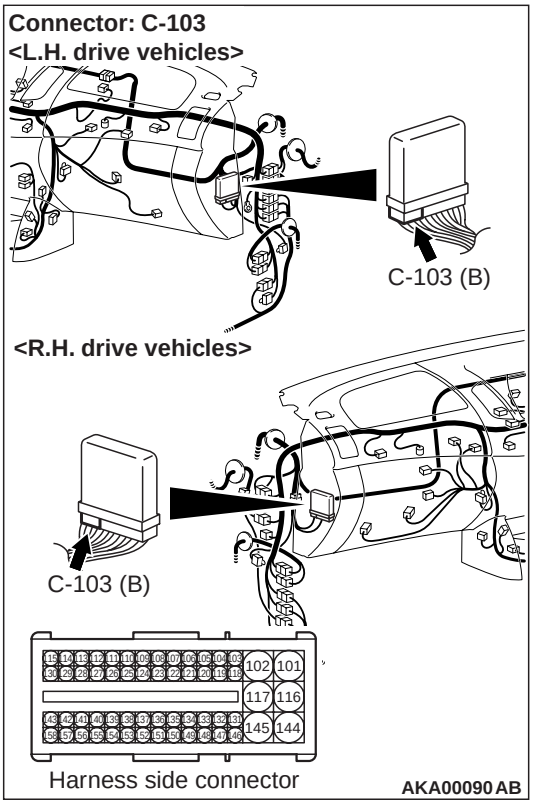


- Disconnect connector, and measure at harness side.
- Short-circuit terminal No. 118 to earth.
- Voltage between terminal No. 101 and earth also between terminal No. 102 and earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 8 .
NO : Repair the harness wire.

STEP 8. Check for open circuit between engine-ECU connector C-103 and earth.

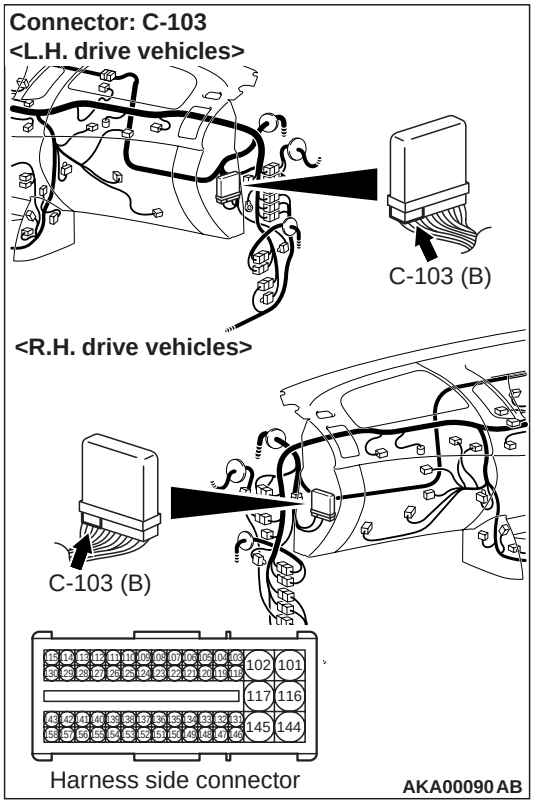


- Disconnect connector, and measure at harness side.
- Check open circuit between terminal No. 145 and earth.

Q: Is the check result normal?

YES : Go to Step 9 .
NO : Repair the harness wire.

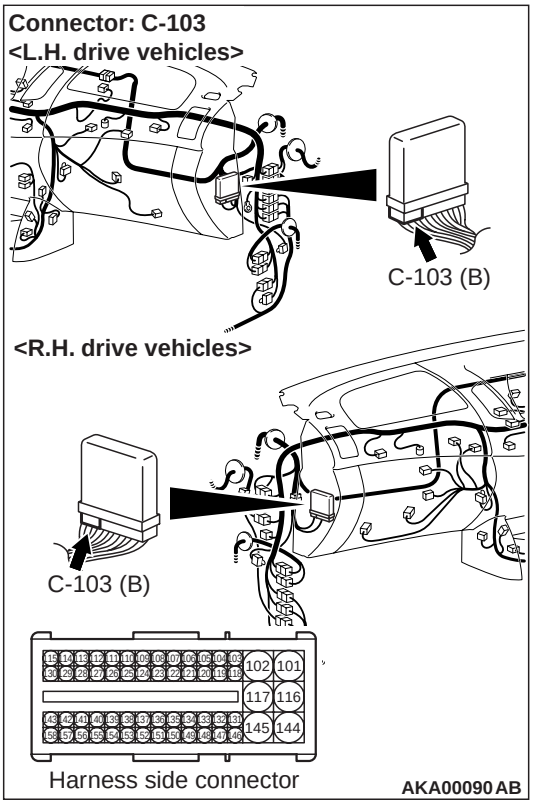
STEP 9. Connector check: C-103 engine-ECU connector.



Q: Is the check result normal?

YES : Go to Step 10 .
NO : Repair or replace.

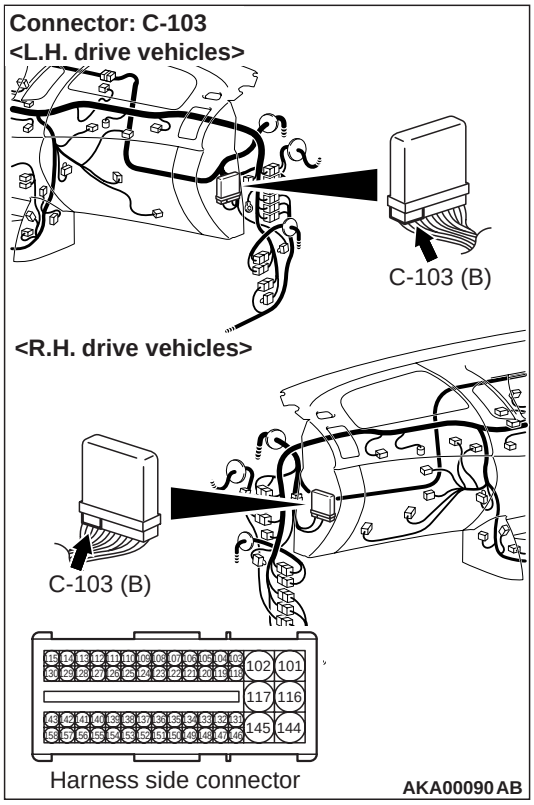
STEP 10. Check for open circuit between engine-ECU connector C-103 and earth.



- Disconnect connector.
- Check open circuit between terminal No. 116 and earth also between terminal No. 117 and earth.

Q: Is the check result normal?
YES : Go to Step 11 .
NO : Repair the harness wire.

STEP 11. Perform voltage measurement at C-103 engine-ECU connector.



- Disconnect connector, and measure at harness side.
- Ignition switch: ON
- Voltage between terminal No. 104 and earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 12 .
NO : Check intermediate connector C-53 <L. H. drive vehicles> or C-35 <R. H. drive vehicles>, and repair if necessary. If intermediate connector is normal, check and repair harness between C-103 (terminal No. 104) engine-ECU connector and C-208 J/B connector.

STEP 12. Check the trouble symptoms.

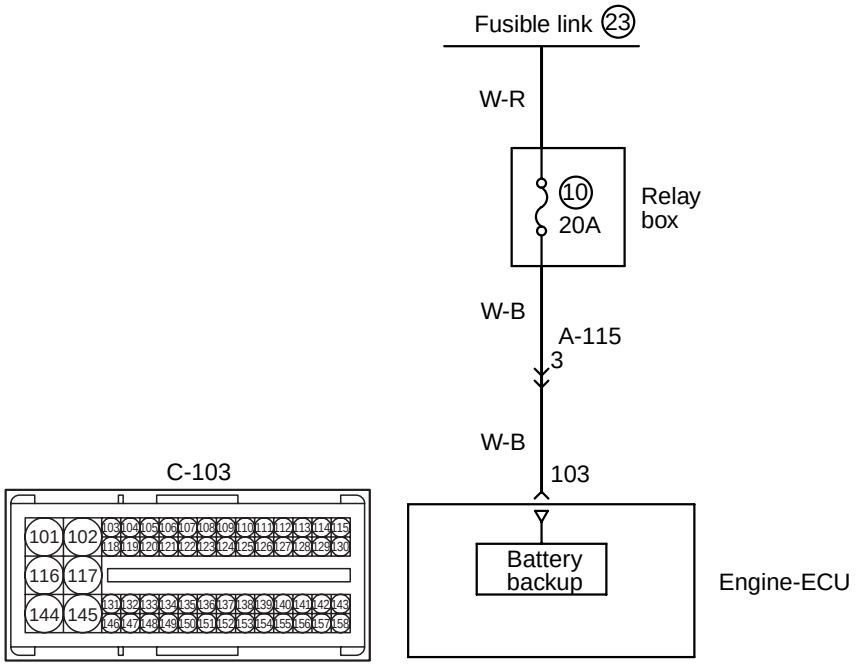
Q: Does trouble symptom persist?

YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunction).

Inspection Procedure 17: Engine-ECU Battery Back-up System

Battery back-up circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V: Violet PU: Purple SI: Silver

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OPERATION

- Backup power source is directly supplied to an engine-ECU from a battery.

PROBABLE CAUSES

- Damaged harness (Open circuit between engine-ECU and relay box)
- Damaged connector (Engine-ECU connector)
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. Check battery voltage.

- Measure battery voltage during cranking.

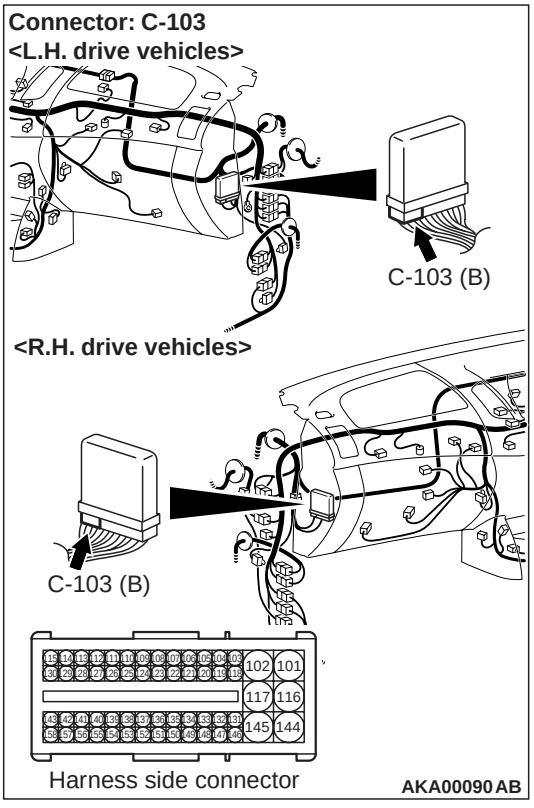
  OK: 8 V or more

Q: Is the check result normal?

YES : Go to Step 2 .

NO : Check battery (Refer to GROUP 54A – Battery – On-vehicle Service – Battery test).

STEP 2. Perform voltage measurement at C-103 engine-ECU connector.



- Disconnect connector, and measure at harness side.
- Voltage between terminal No. 103 and earth.

  OK: System voltage

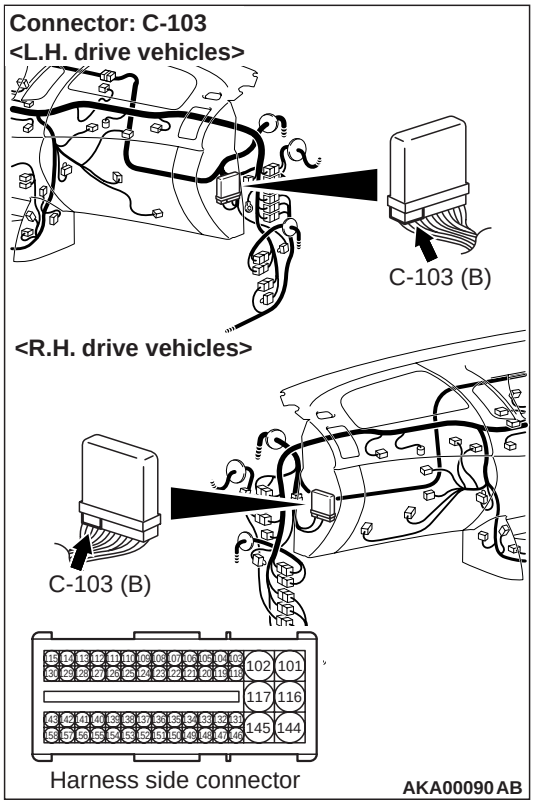
Q: Is the check result normal?

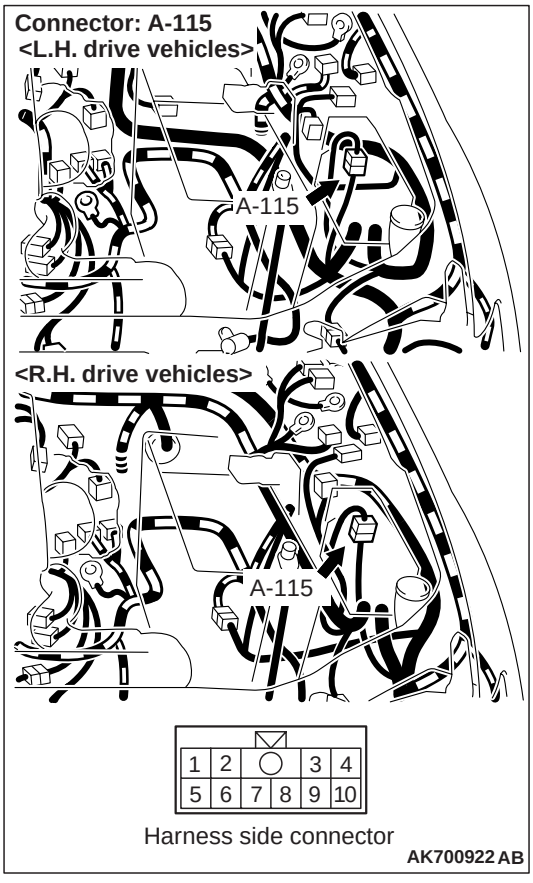
YES : Go to Step 5 .

NO : Go to Step 3 .

YES : Go to Step 4 .

STEP 3. Connector check: C-103 engine-ECU connector and A-115 intermediate connector.

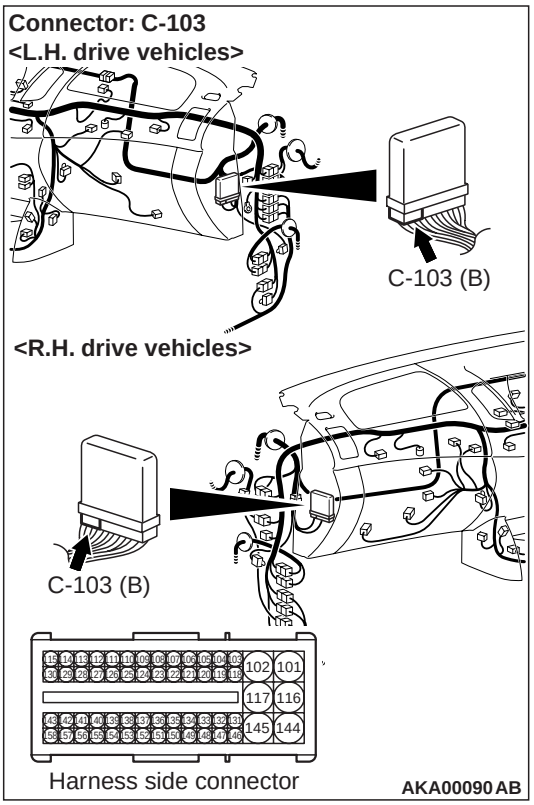


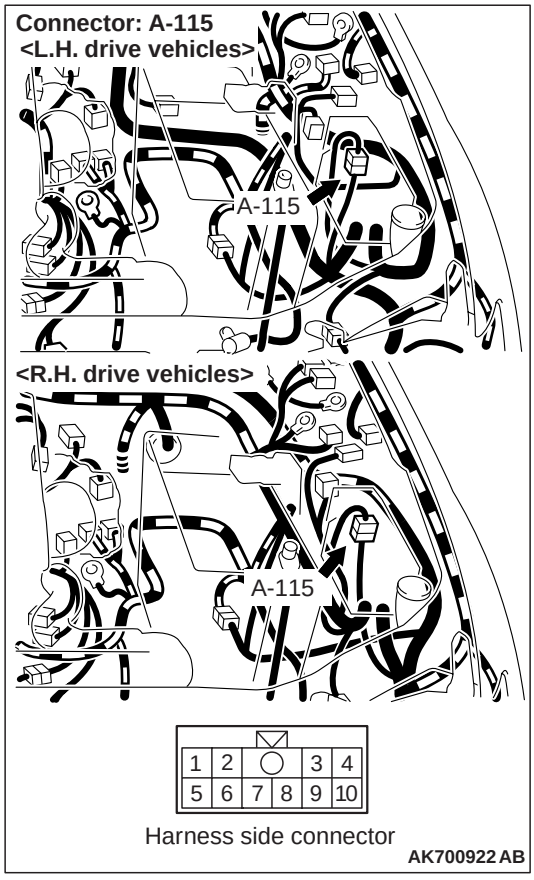


Q: Are the check results normal?

NO : Repair or replace.

STEP 4. Check for open circuit between C-103 (terminal No. 103) engine-ECU connector and A-115 (terminal No. 3) intermediate connector.





- Disconnect connector.

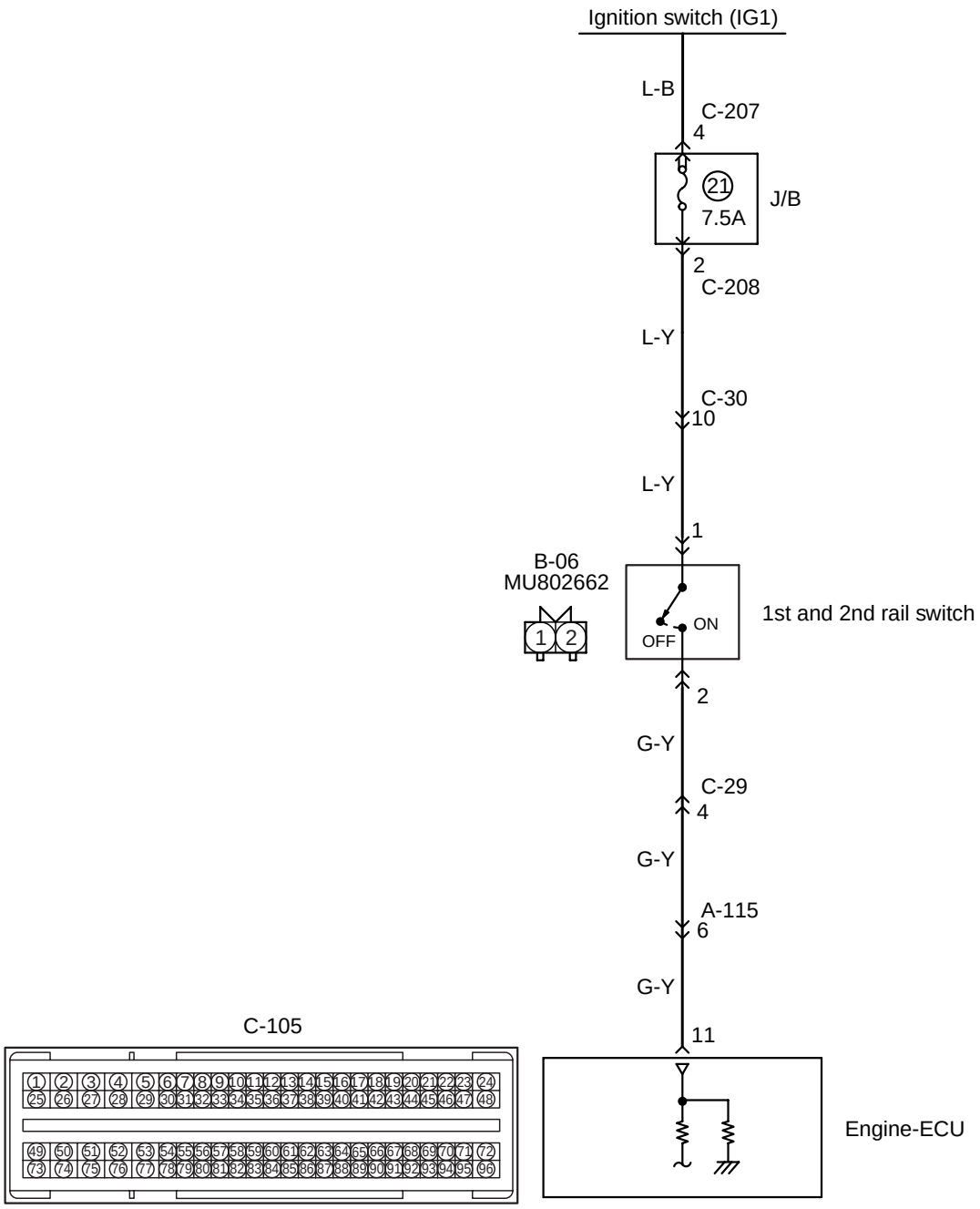
Q: Is the check result normal?
YES : Go to Step 5 .
NO : Repair the harness wire.

STEP 5. Check the trouble symptoms.

Q: Does trouble symptom persist?
YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunction).

Inspection Procedure 18: 1st and 2nd Rail Switch System <M/T>

1st and 2nd Rail Switch Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V: Violet PU: Purple SI: Silver

AKB00289 AC

OPERATION

- The 1st and 2nd rail switches detect that a transmission is shifted into the 1st speed gear position.
- An engine-ECU controls an engine speed to be 3,000 r/min or less so that an excessive load cannot be applied to a drive train system due to a sudden start in the first gear position.

PROBABLE CAUSES

- Failed 1st and 2nd rail switch

- Damaged harness (Open circuit between 1st and 2nd rail switch and engine-ECU, and open circuit between 1st and 2nd rail switch and J/B)
- Damaged connector (Engine-ECU connector, 1st and 2nd rail switch connector)
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III data list

- Refer to Data List Reference Table P.13A-542.
  a. Item 72: 1st and 2nd rail switch

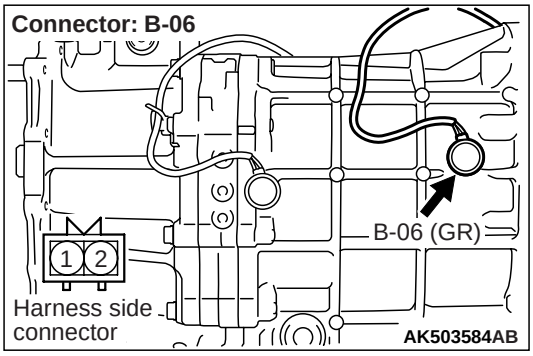
Q: Is the check result normal?
YES : Go to Step 7 .
NO : Go to Step 2 .

STEP 2. Check 1st and 2nd rail switch itself

- Check 1st and 2nd rail switch itself (Refer to GROUP 22B – Transmission – Transmission Inspection <2WD>, GROUP 22C – Transmission – Transmission Inspection <4WD>).

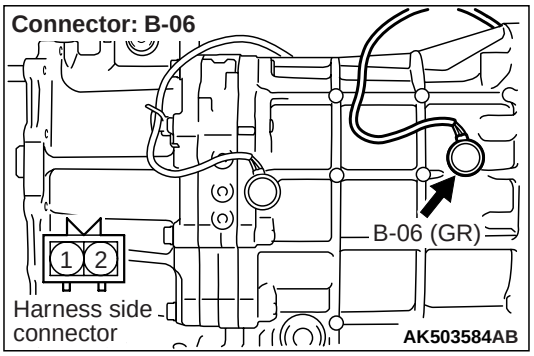
Q: Is the check result normal?
YES : Go to Step 3 .
NO : Replace the 1st and 2nd rail switch.

STEP 3. Connector check: B-06 1st and 2nd rail switch connector



Q: Is the check result normal?
YES : Go to Step 4 .
NO : Repair or replace.

STEP 4. Perform voltage measurement at B-06 1st and 2nd rail switch connector.

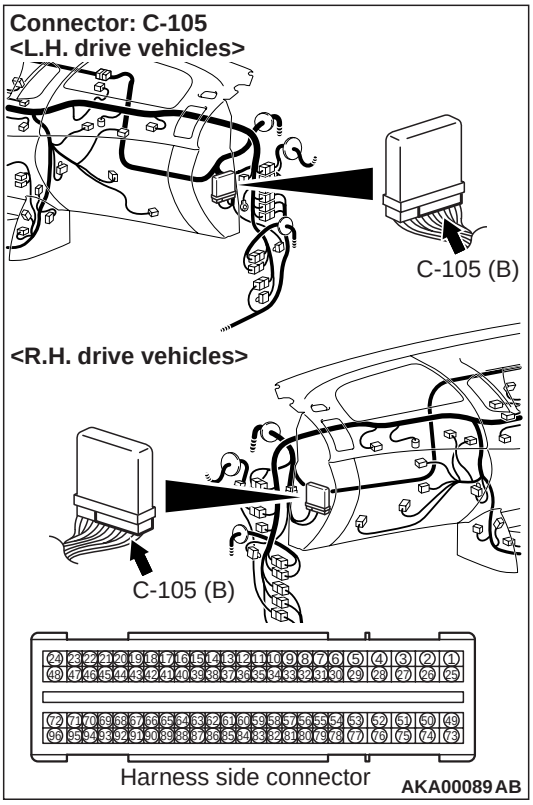


- Disconnect connector, and measure at harness side.
- Ignition switch: ON
- Voltage between terminal No. 1 and earth.

OK: System voltage

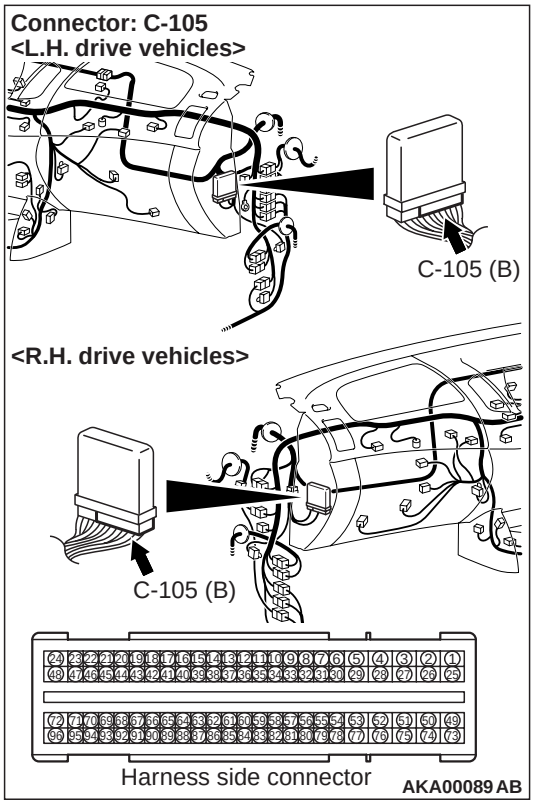
Q: Is the check result normal?
YES : Go to Step 5 .
NO : Check intermediate connector C-30, and repair if necessary. If intermediate connector is normal, check and repair harness between B-06 (terminal No. 1) 1st and 2nd rail switch connector and C-208 (terminal No. 2) J/B connector.

STEP 5. Connector check: C-105 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 6 .
NO : Repair or replace.

STEP 6. Perform voltage measurement at C-105 engine-ECU connector.



- Disconnect connector, and measure at harness side.
- Ignition switch: ON
- Voltage between terminal No. 11 and earth.

OK:
System voltage (Shift lever position: 1st)
0 V (Shift lever position: Neutral)

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Check intermediate connectors A-115 and C-29, and repair if necessary. If intermediate connectors are normal, check and repair harness between C-105 (terminal No. 11) engine-ECU connector and B-06 (terminal No. 2) 1st and 2nd rail switch connector.

STEP 7. Check the trouble symptoms.

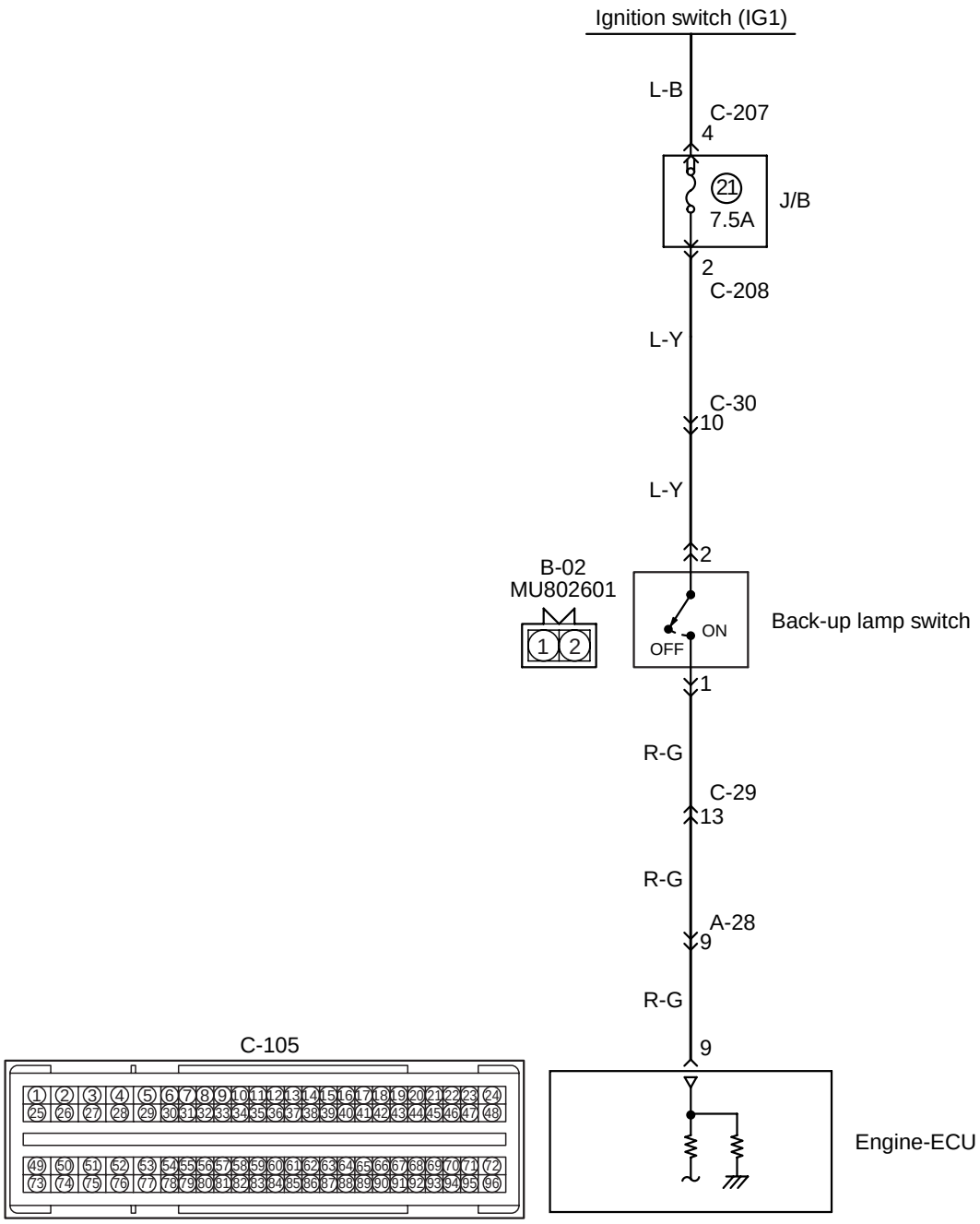
Q: Does trouble symptom persist?

YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunction).

Inspection Procedure 19: Back-up Lamp Switch System <M/T>

Back-up Lamp Switch Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V: Violet PU: Purple SI: Silver

AKB00290AB

OPERATION

- A backup lamp switch detects that a transmission is shifted into a reverse gear position.
- An engine-ECU controls an engine speed to be 3, 000 r/min or less so that an excessive load cannot be applied to a drive train system due to a sudden start in a reverse gear position.

PROBABLE CAUSES

- Failed back-up lamp switch

- Damaged harness (Open circuit between back-up lamp switch and engine-ECU, and open circuit between back-up lamp switch and J/B)
- Damaged connector (Engine-ECU connector, back-up lamp switch connector)
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III data list

- Refer to Data List Reference Table P.13A-542.
  a. Item 73: Reverse shift switch

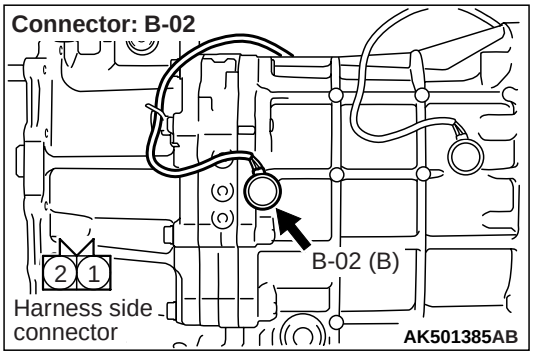
Q: Is the check result normal?
YES : Go to Step 7 .
NO : Go to Step 2 .

STEP 2. Check back-up lamp switch itself

- Check back-up lamp switch itself (Refer to GROUP 22B – Transmission – Transmission Inspection <2WD>, GROUP 22C – Transmission – Transmission Inspection <4WD>).

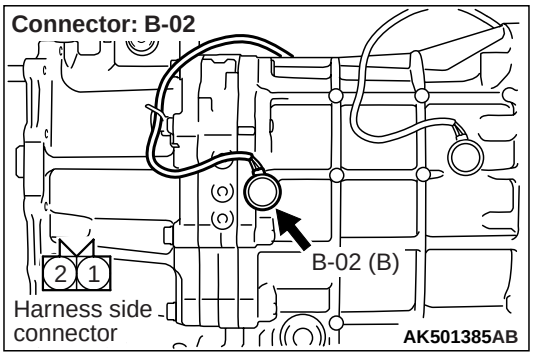
Q: Is the check result normal?
YES : Go to Step 3 .
NO : Replace the back-up lamp switch.

STEP 3. Connector check: B-02 back-up lamp switch connector



Q: Is the check result normal?
YES : Go to Step 4 .
NO : Repair or replace.

STEP 4. Perform voltage measurement at B-02 back-up lamp switch connector.

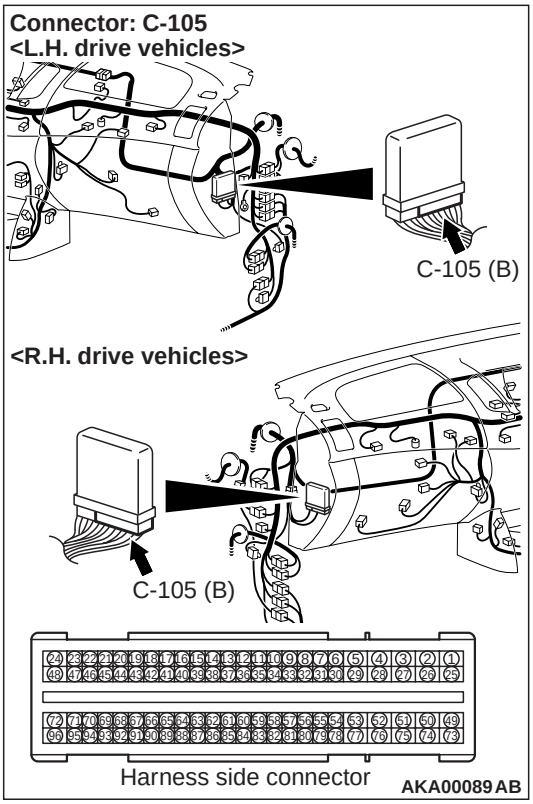


- Disconnect connector, and measure at harness side.
- Ignition switch: ON
- Voltage between terminal No. 2 and earth.

OK: System voltage

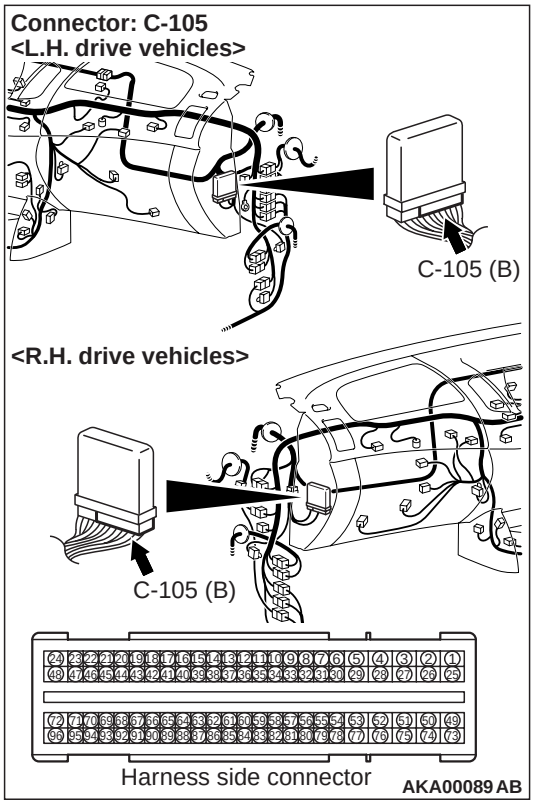
Q: Is the check result normal?
YES : Go to Step 5 .
NO : Check intermediate connector C-30, and repair if necessary. If intermediate connector is normal, check and repair harness between B-02 (terminal No. 2) back-up lamp switch connector and C-208 (terminal No. 2) connector.

STEP 5. Connector check: C-105 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 6 .
NO : Repair or replace.

STEP 6. Perform voltage measurement at C-105 engine-ECU connector.



- Disconnect connector, and measure at harness side.
- Ignition switch: ON
- Voltage between terminal No. 9 and earth.

OK:
System voltage (Shift lever position: Reverse)
0 V (Shift lever position: Neutral)

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Check intermediate connectors A-28 and C-29, and repair if necessary. If intermediate connectors are normal, check and repair harness between C-105 (terminal No. 9) engine-ECU connector and B-02 (terminal No. 1) back-up lamp switch connector.

STEP 7. Check the trouble symptoms.

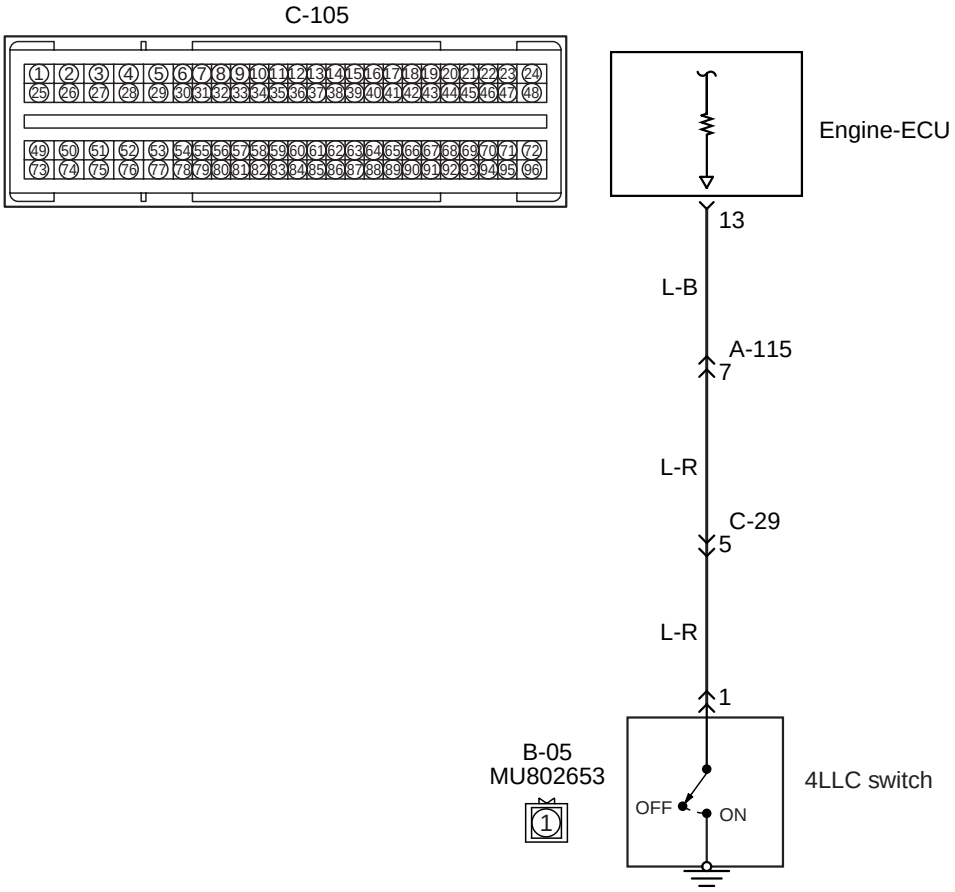
Q: Does trouble symptom persist?

YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunction).

Inspection Procedure 20: 4LLC Switch System <M/T-High power engine vehicle>

4LLC Switch Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V: Violet PU: Purple SI: Silver

AKB00291 AB

OPERATION

- A 4LLC switch detects that a transmission is shifted into a 4LLC position.
- An engine-ECU controls an engine speed to be 3, 000 r/min or less so that an excessive load cannot be applied to a drive train system due to a sudden start in a reverse gear position.

PROBABLE CAUSES

- Failed 4LLC switch
- Damaged harness (Open circuit between 4LLC switch and engine-ECU, and open circuit between 4LLC switch and J/B)
- Damaged connector (Engine-ECU connector, 4LLC switch connector)
- Failed engine-ECU

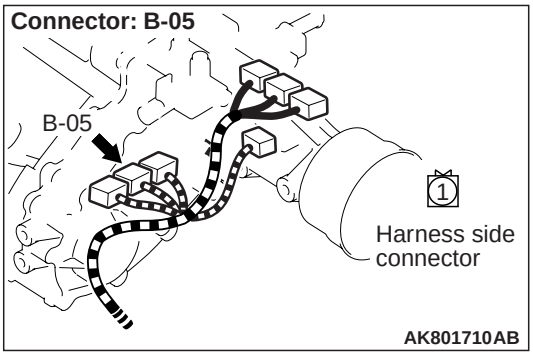
DIAGNOSIS PROCEDURE

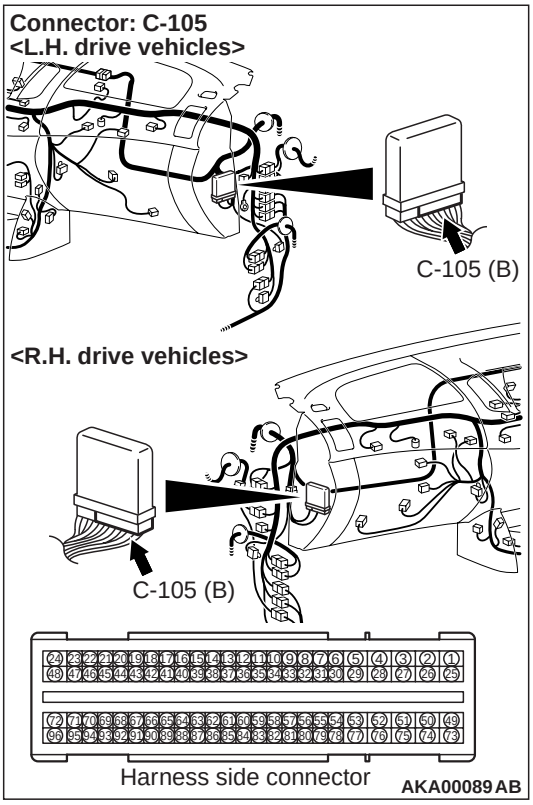
STEP 1. Check 4LLC switch itself

- Check 4LLC switch itself (Refer to GROUP 22A – On-vehicle service – 4LLC detection switch continuity check).

Q: Is the check result normal?
YES : Go to Step 2 .
NO : Replace the 4LLC switch.

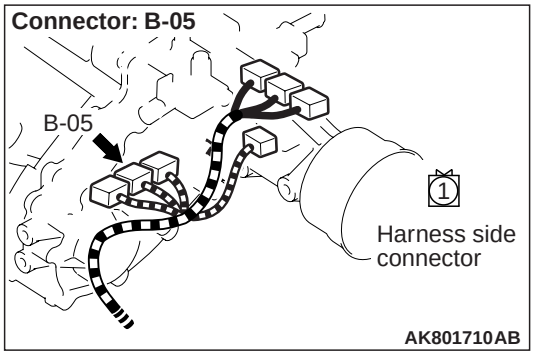
STEP 2. Connectors check: B-05 4LLC switch connector and C-105 engine-ECU connector

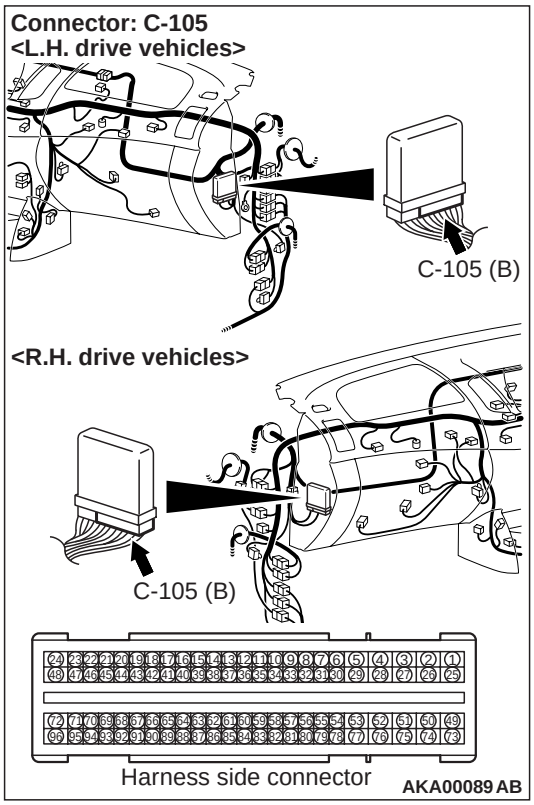




Q: Are the check results normal?
YES : Go to Step 3 .
NO : Repair or replace.

STEP 3. check harness between C-105 (terminal No. 13) engine-ECU connector and B-05 (terminal No. 1) 4LLC switch connector.





NOTE: Before checking harness, check intermediate connectors C-29 and A-115, and repair if necessary.

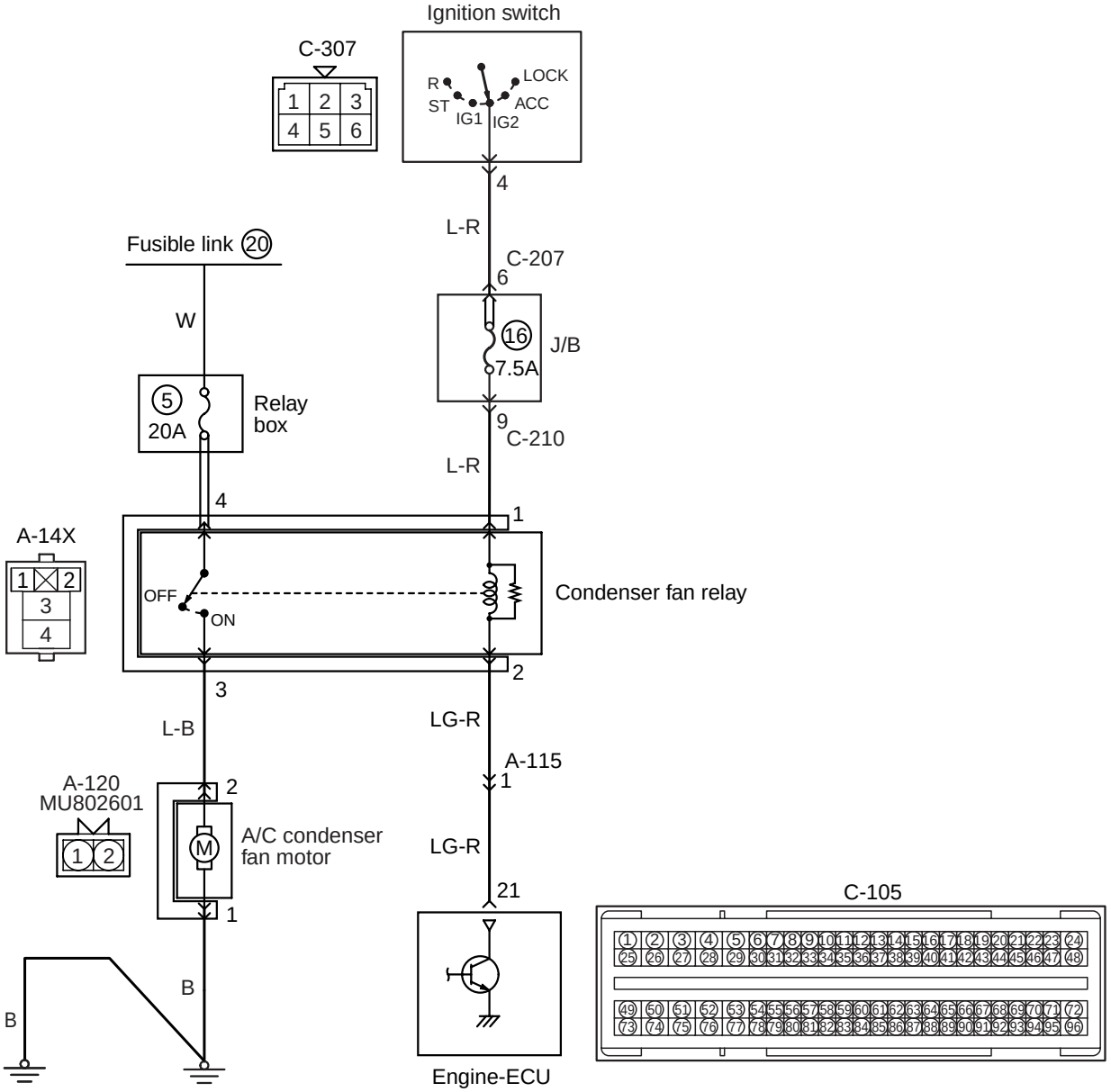
Q: Is the check result normal?

YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

NO : Repair the harness wire.

Inspection Procedure 21: Condenser Fan Relay System <Vehicles with A/C condenser fan>

Condenser Fan Relay Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V: Violet PU: Purple SI: Silver

AKB00293 AB

OPERATION

- The A/C condenser fan relay is controlled by turning on and off the power transistor in the engine-ECU.
- In response to the A/C switch signal, A/C load signal, vehicle speed and engine coolant temperature, the engine-ECU controls the condenser fan relay.

PROBABLE CAUSES

- Failed condenser fan relay
- Failed condenser fan motor
- Damaged harness (Open or short circuit between engine-ECU and condenser fan relay, Open circuit between condenser fan motor and earth, condenser fan relay and J/B, condenser fan relay and relay box, and open circuit between condenser fan relay and condenser fan motor)

- Damaged connector (condenser fan relay connector, condenser fan motor connector, Engine-ECU connector)
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III data list

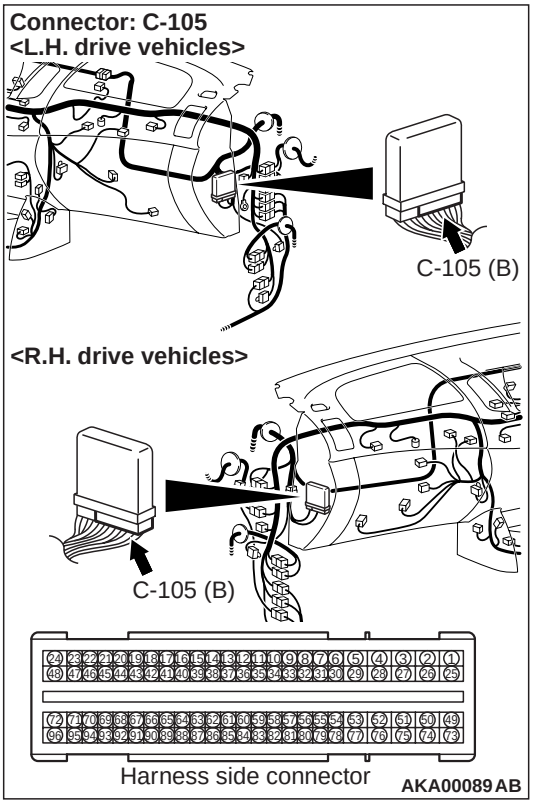
- Refer to Data List Reference Table P.13A-542.
  a. Item 26: A/C load signal

Q: Is the check result normal?

YES : Go to Step 2 .

NO : Check A/C system (Refer to GROUP 55A – Troubleshooting – Check Chart for Trouble Symptoms <Manual A/C>, GROUP 55B – Troubleshooting – Trouble Symptom Chart <Automatic A/C>).

STEP 2. Check at C-105 engine-ECU connector.



- Disconnect connector, and measure at harness side.
- Ignition switch: ON
- Short-circuit terminal No. 21 to earth.

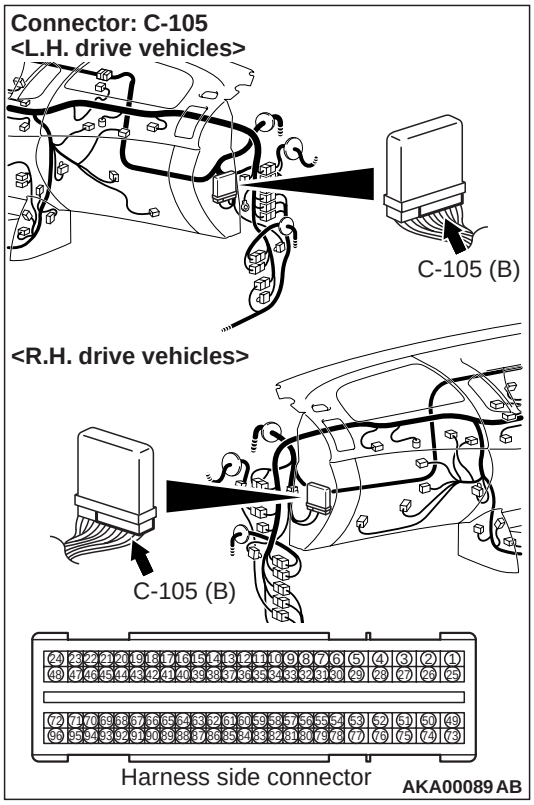
OK: Condenser fan motor rotates

Q: Is the check result normal?

YES : Go to Step 3 .

NO : Check condenser fan system (Refer to GROUP 55A – Troubleshooting – Trouble Symptom Chart <Manual A/C>, GROUP 55B – Troubleshooting – Trouble Symptom Chart <Automatic A/C>).

STEP 3. Connector check: C-105 engine-ECU connector.

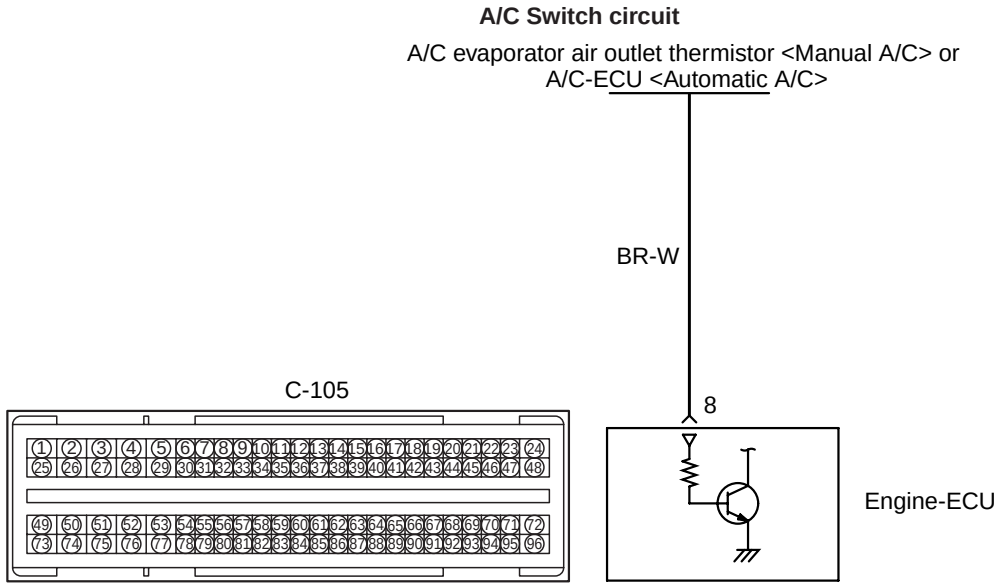


Q: Is the check result normal?

YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

NO : Repair or replace.

Inspection Procedure 22: A/C Switch System



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V: Violet PU: Purple SI: Silver

AKA00119 AF

OPERATION

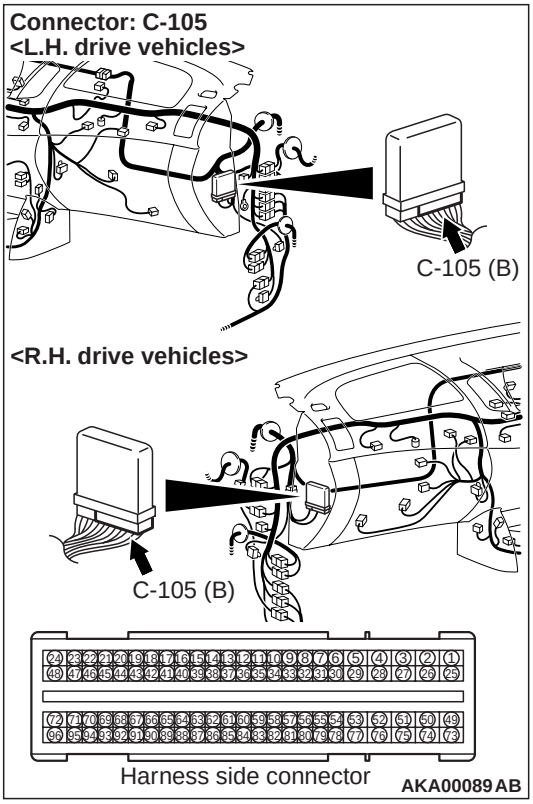
- The battery voltage is applied to the engine-ECU (terminal No. 8) from the A/C switch module.

PROBABLE CAUSES

- Failed A/C
- Failed A/C system
- Open/short circuit in A/C circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. Perform voltage measurement at C-105 engine-ECU connector.

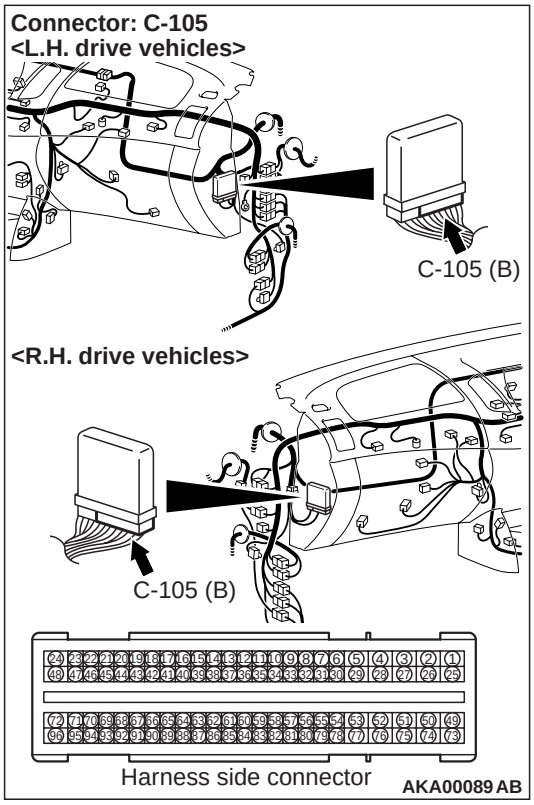


- Measure engine-ECU terminal voltage.
- Engine: Idling
- A/C set temperature:
  Maximum Cool when temperature in cabin is 25°C or more
  Maximum Hot when temperature in cabin is 25°C or less
- Voltage between terminal No. 8 and earth.

OK:
System voltage (when A/C is ON)
0.5 V or less (when A/C is OFF)

Q: Is the check result normal?
YES : Go to Step 2 .
NO : Check A/C system (Refer to GROUP 55A – Troubleshooting – Check Chart for Trouble Symptoms <Manual A/C>, GROUP 55B – Troubleshooting – Check Chart for Trouble Symptoms <Automatic A/C>).

STEP 2. Connector check: C-105 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 3 .
NO : Repair or replace.

STEP 3. M.U.T.-III data list

- Item 25: A/C switch
  a. Engine: Idling
  b. A/C set temperature:
  Maximum Cool when temperature in cabin is 25°C or more
  Maximum Hot when temperature in cabin is 25°C or less

OK:
ON (when A/C is ON)
OFF (when A/C is OFF)

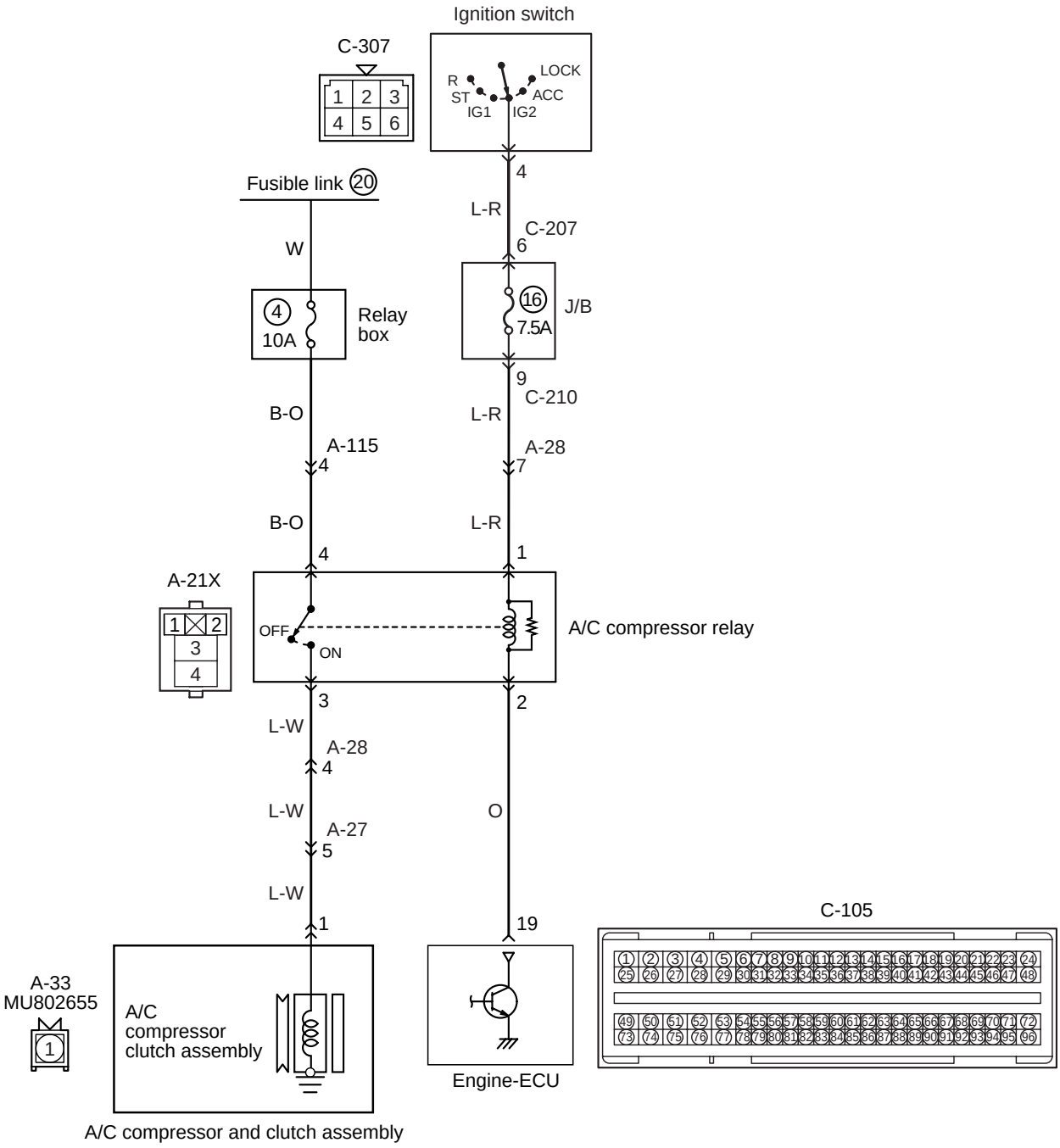
Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

NO : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

Inspection Procedure 23: A/C Compressor Relay System

A/C Compressor Relay Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V: Violet PU: Purple SI: Silver

AKB00294 AB

OPERATION

- When the A/C switch "ON" signal is input to the engine-ECU, the engine-ECU places the A/C compressor relay in the "ON" position. Accordingly, the battery voltage supplied to the A/C compressor operates the magnet clutch.

PROBABLE CAUSES

- Failed A/C compressor relay
- Failed A/C compressor assembly
- Damaged harness (Open circuit between A/C compressor relay and condenser fan relay, A/C compressor relay and engine-ECU, A/C compressor relay and A/C compressor, and open circuit between A/C compressor relay and relay box)
- Damaged connector (A/C compressor relay connector, A/C compressor connector, Engine-ECU connector)
- Failed engine-ECU

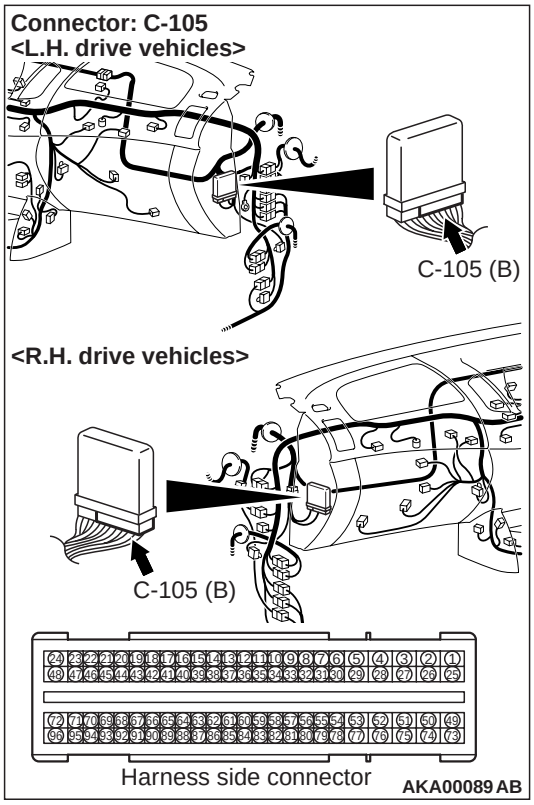
DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III data list

- Refer to Data List Reference Table P.13A-542.
  a. Item 25: A/C switch
  b. Item 26: A/C load signal
  c. Item 27: A/C relay

Q: Are the check results normal?
YES : Go to Step 2.
NO : Check A/C system (Refer to GROUP 55A – Troubleshooting – Trouble Symptom Chart <Manual A/C>, GROUP 55B – Troubleshooting – Trouble Symptom Chart <Automatic A/C>).

STEP 2. Connector check: C-105 engine-ECU connector



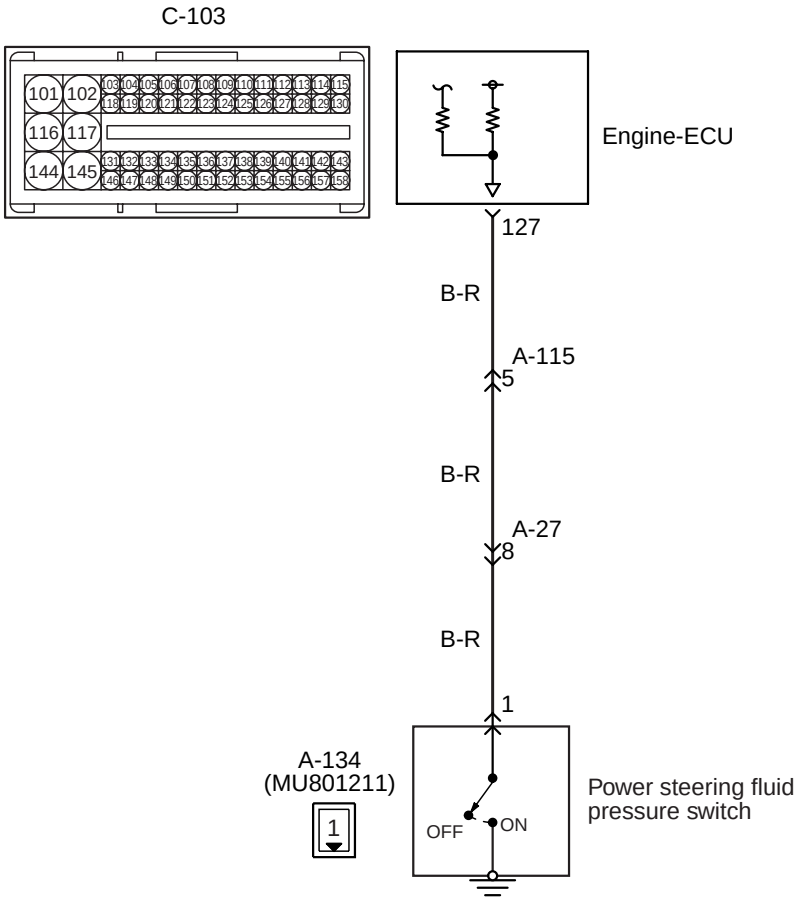
Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair or replace.

STEP 3. Check the trouble symptoms.

Q: Does trouble symptom persist?
YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunction).

Inspection Procedure 24: Power Steering Fluid Pressure Switch System

Power steering fluid pressure switch circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V: Violet PU: Purple SI: Silver

AKA00105AB

OPERATION

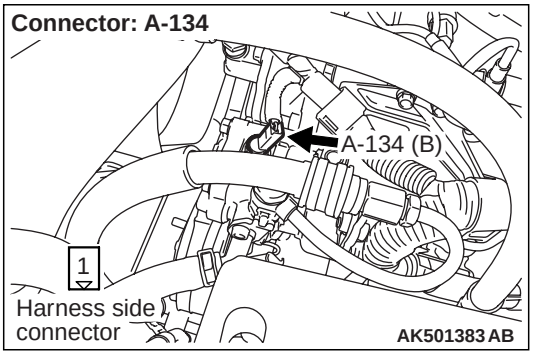
- It is detected whether a load is applied on the power steering fluid pump by steering or not, and the signal is inputted to the engine-ECU. When the power steering fluid pressure switch "ON" signal (a large load on the power steering fluid pump) is inputted, the engine-ECU provides the idle-up control.

PROBABLE CAUSES

- Failed power steering fluid pressure switch
- Damaged harness (Open or short circuit between power steering fluid pressure switch and engine-ECU)
- Damaged connector (Engine-ECU connector, power steering fluid pressure switch connector)
- Failed engine-ECU

DIAGNOSIS PROCEDURE

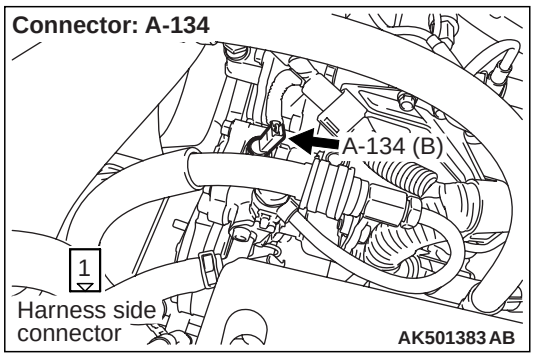
STEP 1. Connector check: A-134 power steering fluid pressure switch connector



Q: Is the check result normal?

YES : Go to Step 2 .
NO : Repair or replace.

STEP 2. Perform voltage measurement at A-134 power steering fluid pressure switch connector.

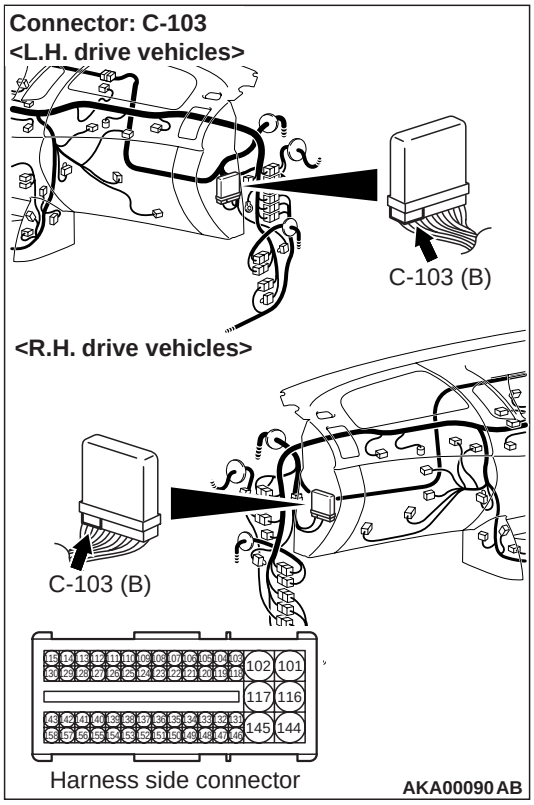


- Disconnect connector, and measure at harness side.
- Ignition switch: ON
- Voltage between terminal No. 1 and earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 8 .
NO : Go to Step 3 .

STEP 3. Perform voltage measurement at C-103 engine-ECU connector.

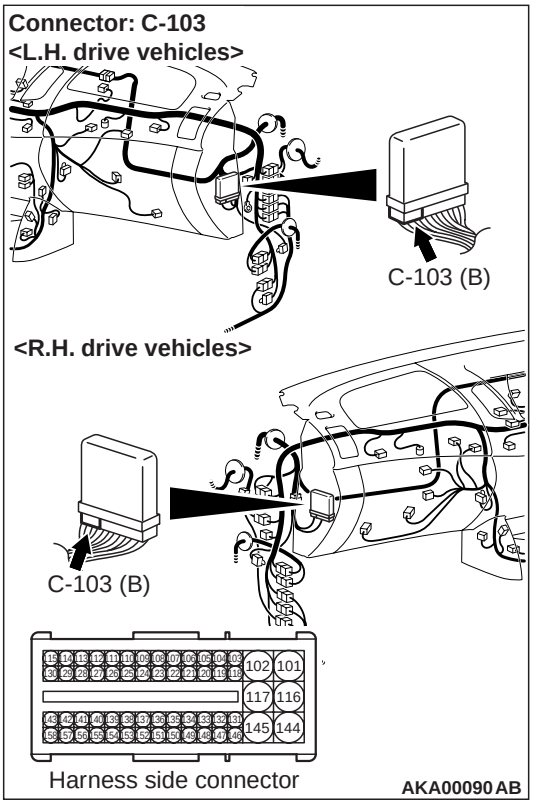


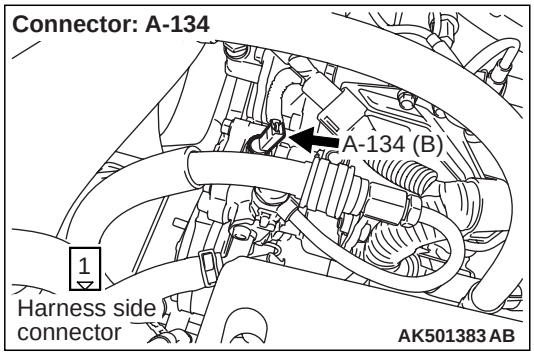
- Measure engine-ECU terminal voltage.
- Ignition switch: ON
- Voltage between terminal No. 127 and earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 4 .
NO : Go to Step 5 .

STEP 4. Connector check: C-103 engine-ECU connector



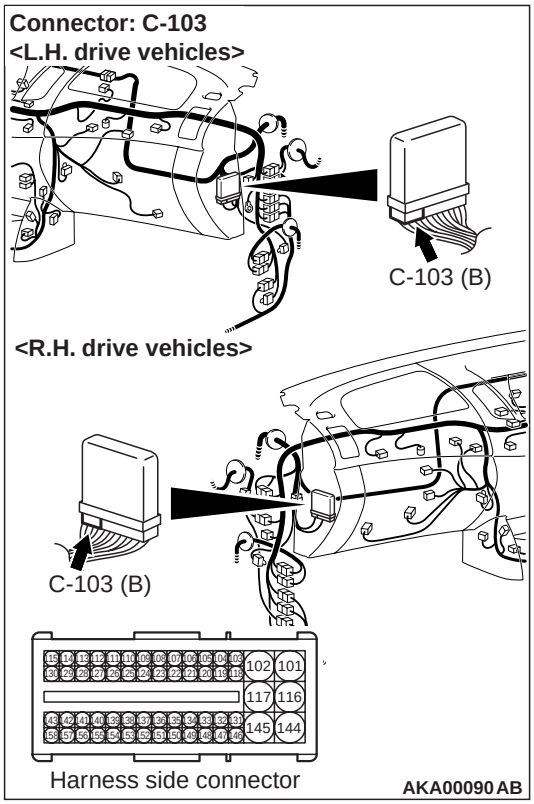


Q: Is the check result normal?

YES : Check intermediate connectors A-27 and A-115, and repair if necessary. If intermediate connector are normal, check and repair harness between A-134 (terminal No. 1) power steering fluid pressure switch connector and C-103 (terminal No. 127) engine-ECU connector.
- Check output line for open circuit.

NO : Repair or replace.

STEP 5. Connector check: C-103 engine-ECU connector

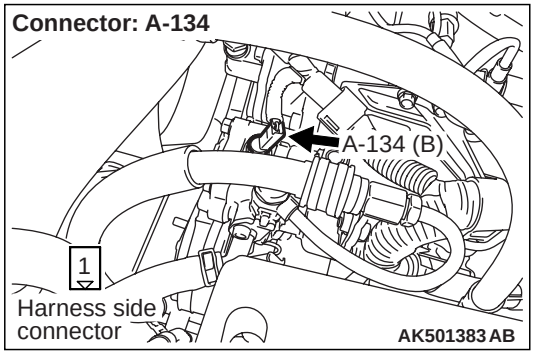


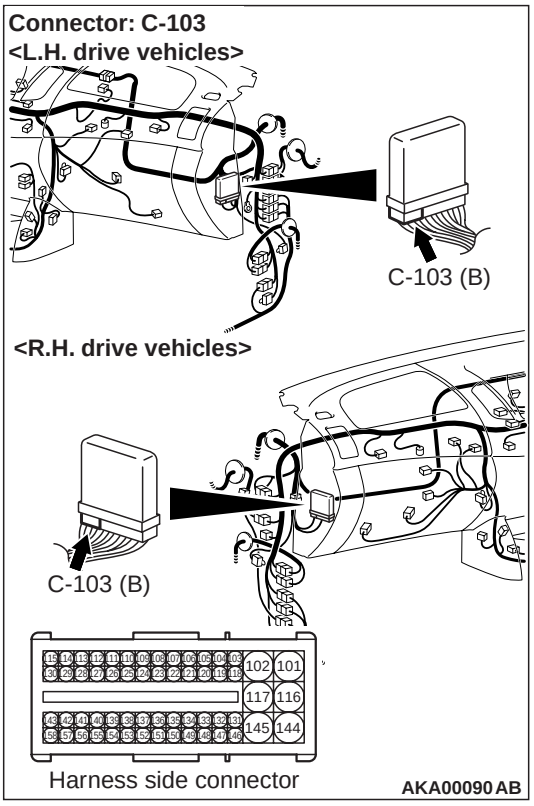
Q: Is the check result normal?

YES : Go to Step 6 .

NO : Repair or replace the connector.

STEP 6. Check harness between A-134 (terminal No. 1) power steering fluid pressure switch connector and C-103 (terminal No. 127) engine-ECU connector.





NOTE: Before checking harness, check intermediate connectors A-27 and A-115, and repair if necessary.

- Check output line for short circuit.

Q: Is the check result normal?

YES : Go to Step 7 .

NO : Repair the harness wire.

STEP 7. M.U.T.-III data list

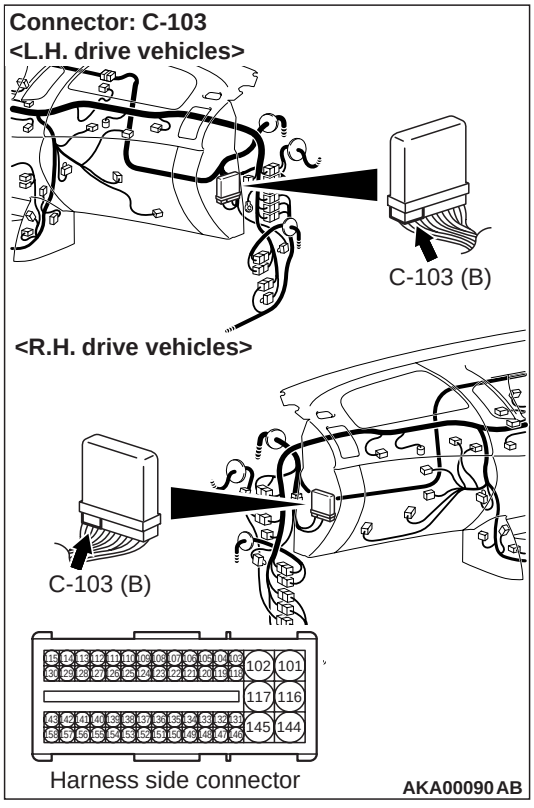
- Refer to Data List Reference Table P.13A-542.
  a. Item 75: Power steering fluid pressure switch

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

NO : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

STEP 8. Perform voltage measurement at C-103 engine-ECU connector.



- Measure engine-ECU terminal voltage.
- Engine: Idling
- Voltage between terminal No. 127 and earth.

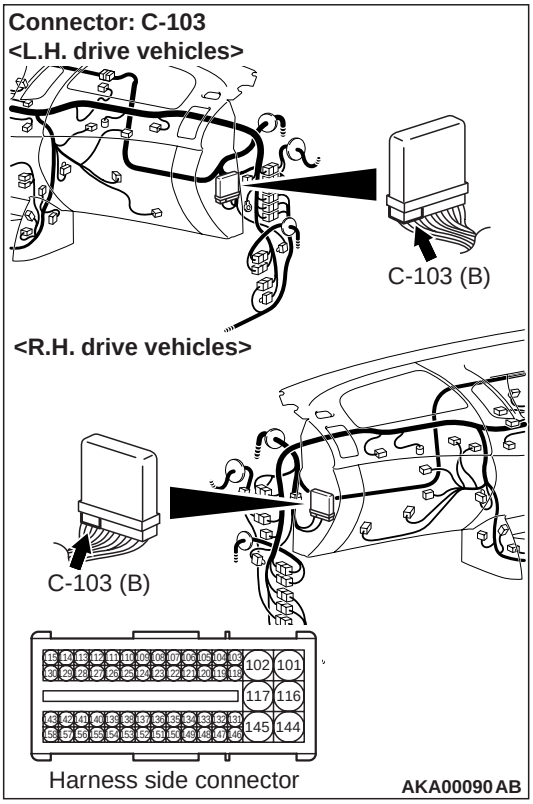
OK:

System voltage (Steering wheel: Stationary)
1 V or less (Steering wheel: Turned)

Q: Is the check result normal?

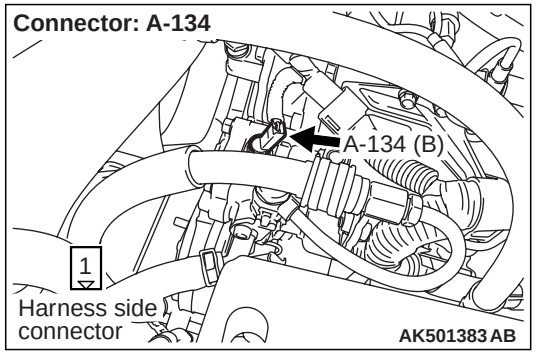
YES : Go to Step 11 .
NO : Go to Step 9 .

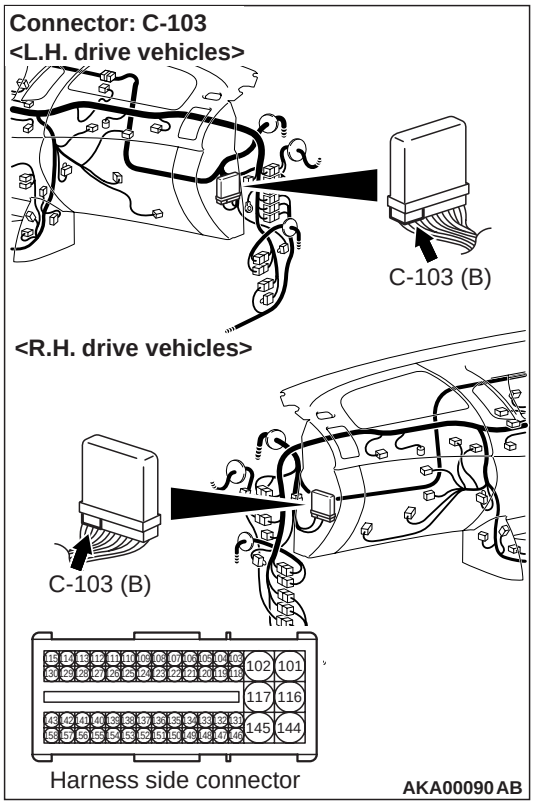
STEP 9. Connector check: C-103 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 10 .
NO : Repair or replace.

STEP 10. Check harness between A-134 (terminal No. 1) power steering fluid pressure switch connector and C-103 (terminal No. 127) engine-ECU connector.

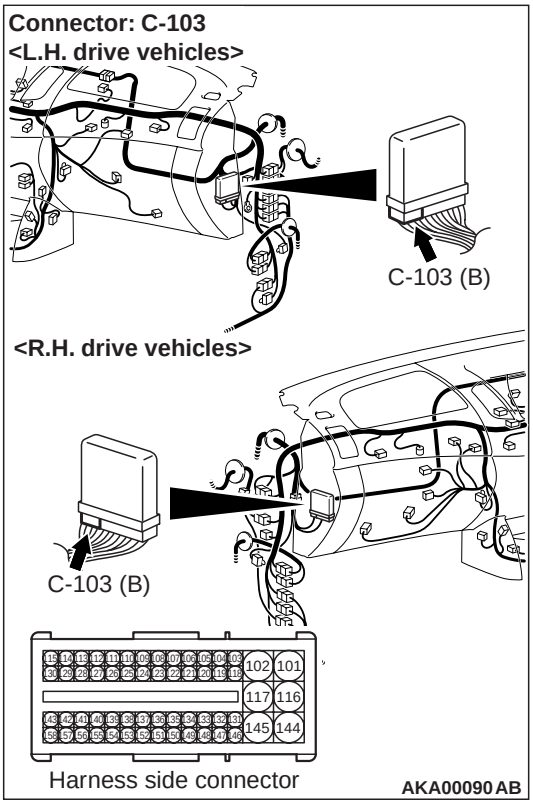




NOTE: Before checking harness, check intermediate connectors A-27 and A-115, and repair if necessary.
- Check output line for damage.

Q: Is the check result normal?
YES : Replace the power steering fluid pressure switch.
NO : Repair the harness wire.

STEP 11. Connector check: C-103 engine-ECU connector

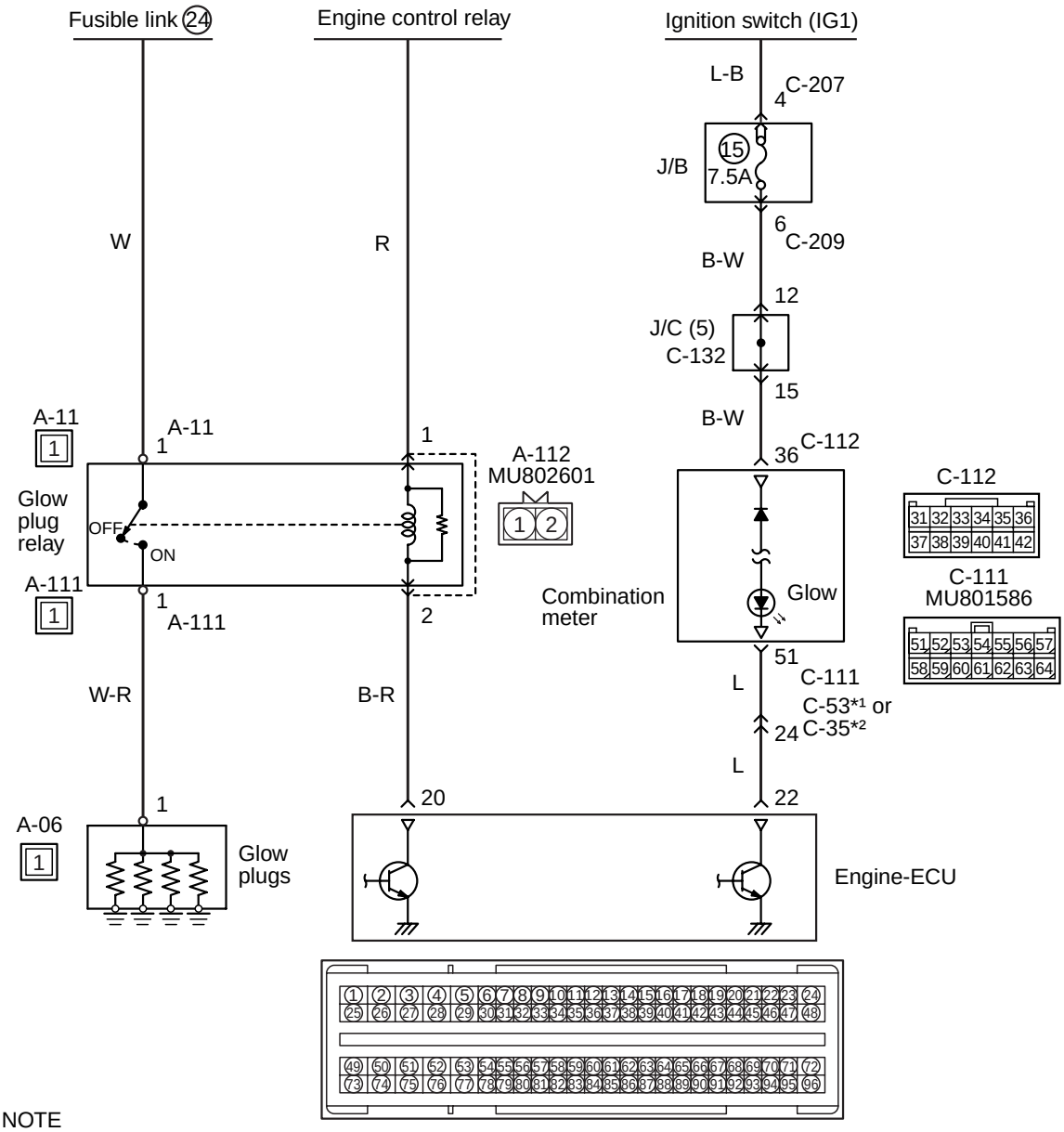


Q: Is the check result normal?

YES : Go to Step 7 .
NO : Repair or replace.

Inspection Procedure 25: Glow System <Except Euro5>

Glow System Circuit



NOTE
*1: L.H. drive vehicles
*2: R.H. drive vehicles
Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V: Violet PU: Purple SI: Silver

AKA00122 AB

OPERATION

- The engine-ECU controls the glow plug relay and glow indicator lamp based on the signal of the engine coolant temperature sensor in order to easily start the engine at the cool condition.

PROBABLE CAUSES

- Failed glow control relay
- Failed glow plug

- Damaged harness (Open or short circuit between engine-ECU and glow plug relay, and open or short circuit between glow plug relay and glow plug, Open circuit between engine control relay and glow plug relay, engine control relay and fusible link, and open circuit between engine-ECU and combination meter)
- Damaged connector (Engine-ECU connector, glow plug relay connector, combination meter connector)
- Failed engine-ECU

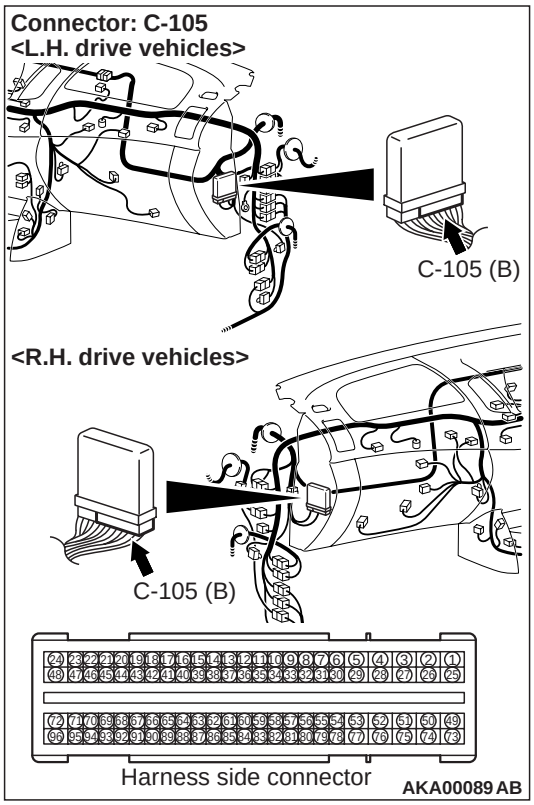
DIAGNOSIS PROCEDURE

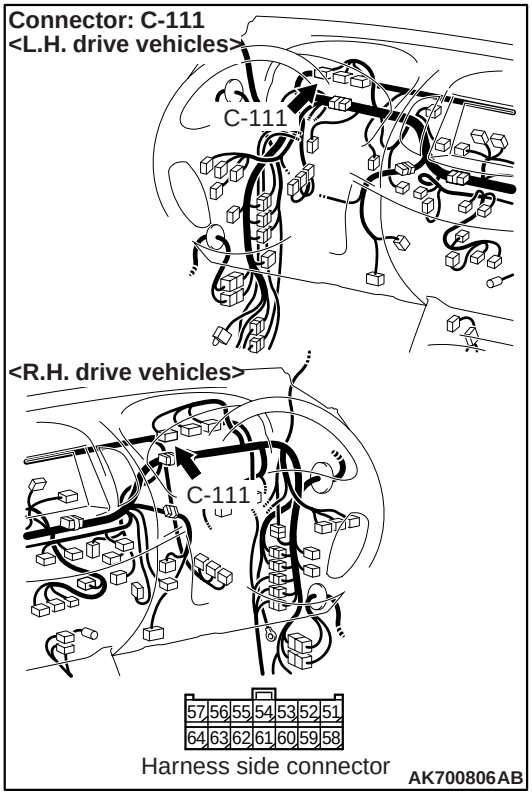
STEP 1. Check the glow indicator lamp illuminates.

- Ignition switch: ON
- Engine coolant temperature: 40°C or lower

Q: Is the glow indicator lamp illuminates?
YES : Go to Step 4 .
NO : Go to Step 2 .

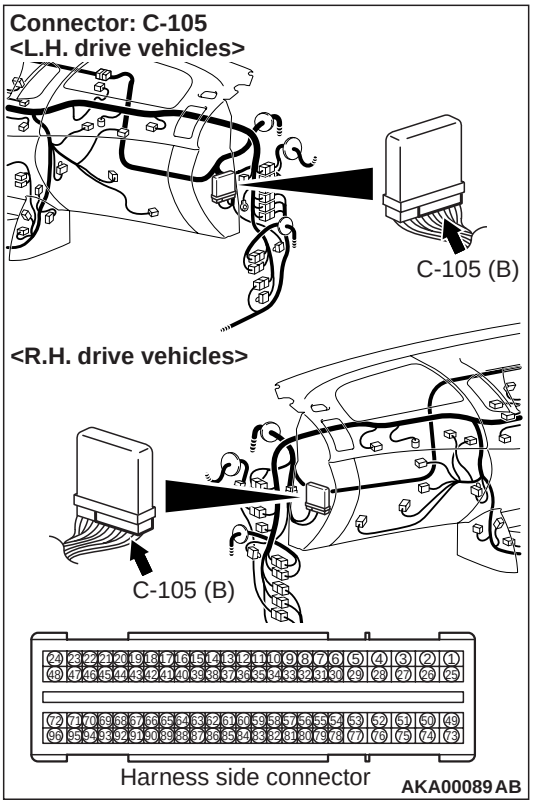
STEP 2. Connector check: C-105 engine-ECU connector and C-111 combination meter connector.





Q: Are the check results normal?
YES : Go to Step 3 .
NO : Repair or replace.

STEP 3. Perform voltage measurement at C-105 engine-ECU connector.



- Disconnect connector, and measurement at harness side.
- Ignition switch: ON
- Voltage between terminal No. 22 and earth.

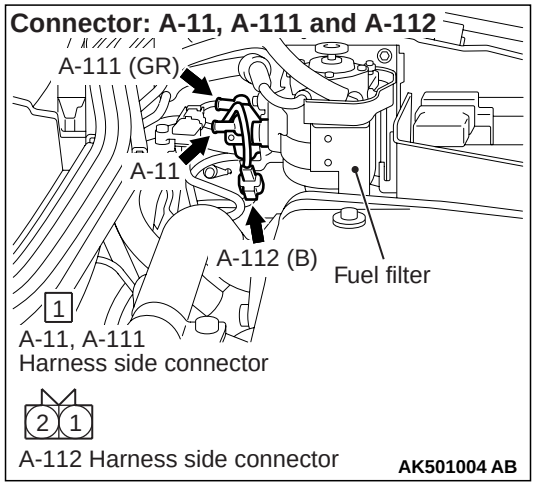
OK: System voltage

Q: Is the check result normal?

YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).

NO : Check intermediate connector C-53 <L. H. drive vehicles> or C-35 <R. H. drive vehicles>, and repair if necessary. If intermediate connector is normal, check and repair harness between C-111 (terminal No. 51) combination meter connector and C-105 (terminal No. 28) engine-ECU connector.

STEP 4. Connector checks: A-11, A-111 and A-112 glow plug relay connectors.



Q: Are the check results normal?

YES : Go to Step 5 .

NO : Repair or replace.

STEP 5. Check the glow plug relay itself.

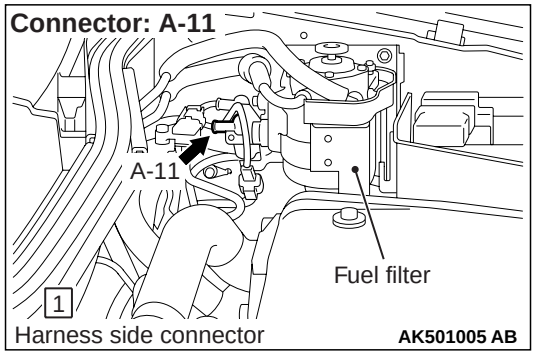
- Check the glow plug relay itself (Refer to GROUP 16 – Glow System – On-vehicle Service – Glow Plug Relay Check).

Q: Is the check result normal?

YES : Go to Step 6 .

NO : Replace the glow plug relay.

STEP 6. Perform voltage measurement at A-11 glow plug relay connector.



- Disconnect connector, and measurement at harness side.
- Voltage between terminal No. 1 and earth.

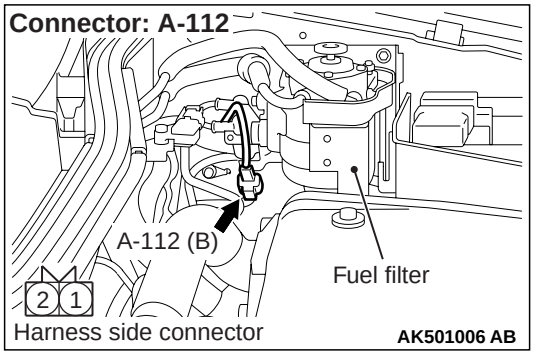
OK: System voltage

Q: Is the check result normal?

YES : Go to Step 7 .

NO : Check harness between fusible link No. 24 and A-11 (terminal No. 1) glow plug relay connector.

STEP 7. Perform voltage measurement at A-112 glow plug relay connector.



- Disconnect connector, and measurement at harness side.
- Voltage between terminal No. 1 and earth.

OK: System voltage

Q: Is the check result normal?

YES : Go to Step 8 .

NO : Check harness between A-112 (terminal No. 1) glow plug relay connector and A-20X (terminal No. 3) engine control relay connector.

STEP 8. Check glow plug itself.

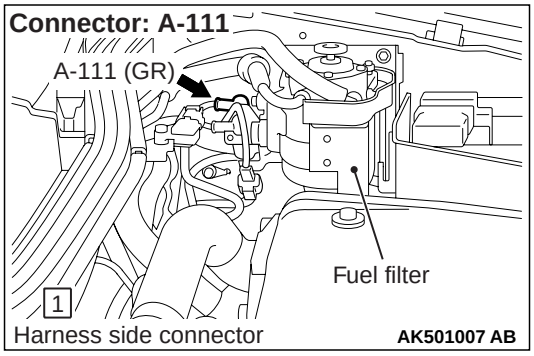
- Check glow plug itself (Refer to GROUP 16 – Glow System – On-vehicle Service – Glow Plug Check).

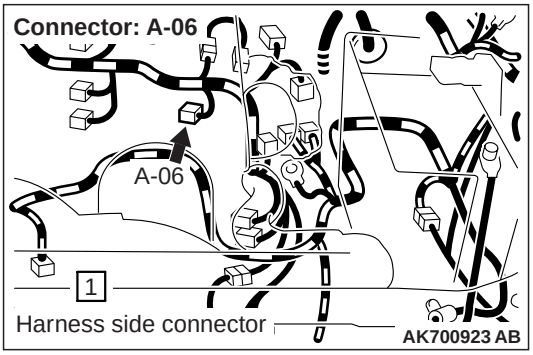
Q: Is the check result normal?

YES : Go to Step 9 .

NO : Replace the glow plug.

STEP 9. Check harness between A-111 (terminal No. 1) glow plug relay connector and A-06 (terminal No. 1) glow plug connector.



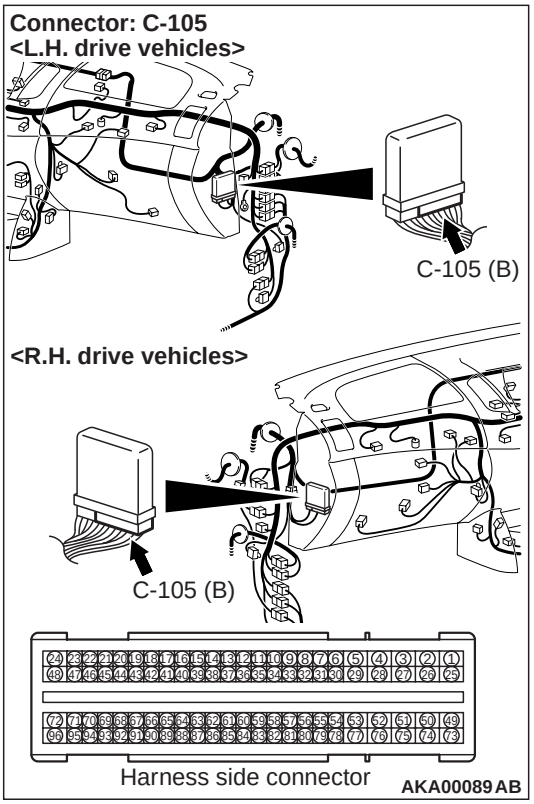


Q: Is the check result normal?

YES : Go to Step 10 .

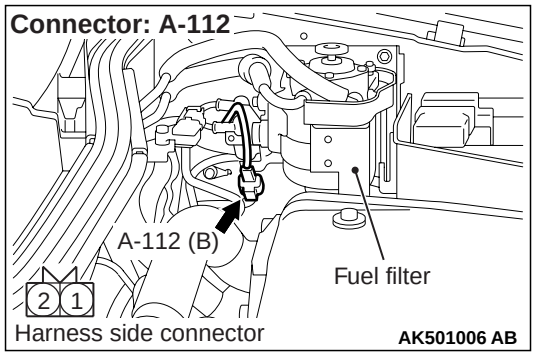
NO : Repair the harness wire.

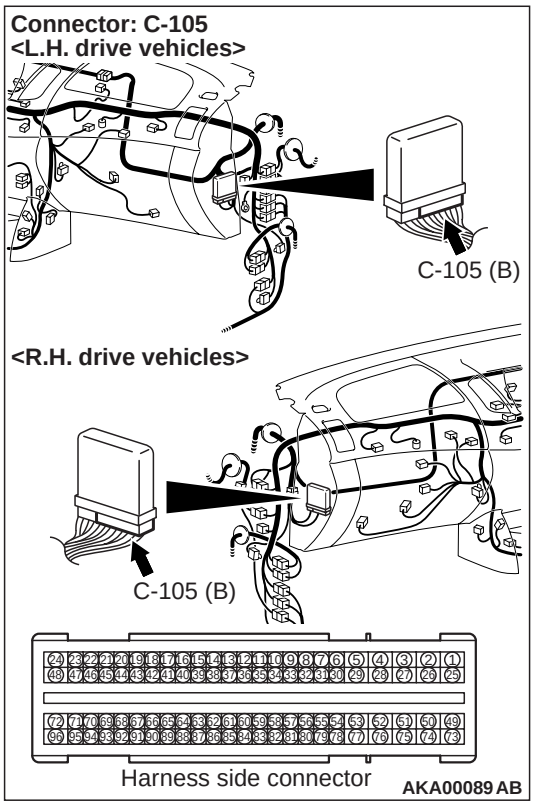
STEP 10. Connector check: C-105 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 11 .
NO : Repair or replace.

STEP 11. Check harness between A-112 (terminal No. 2) glow plug relay connector and C-105 (terminal No. 20) engine-ECU connector.

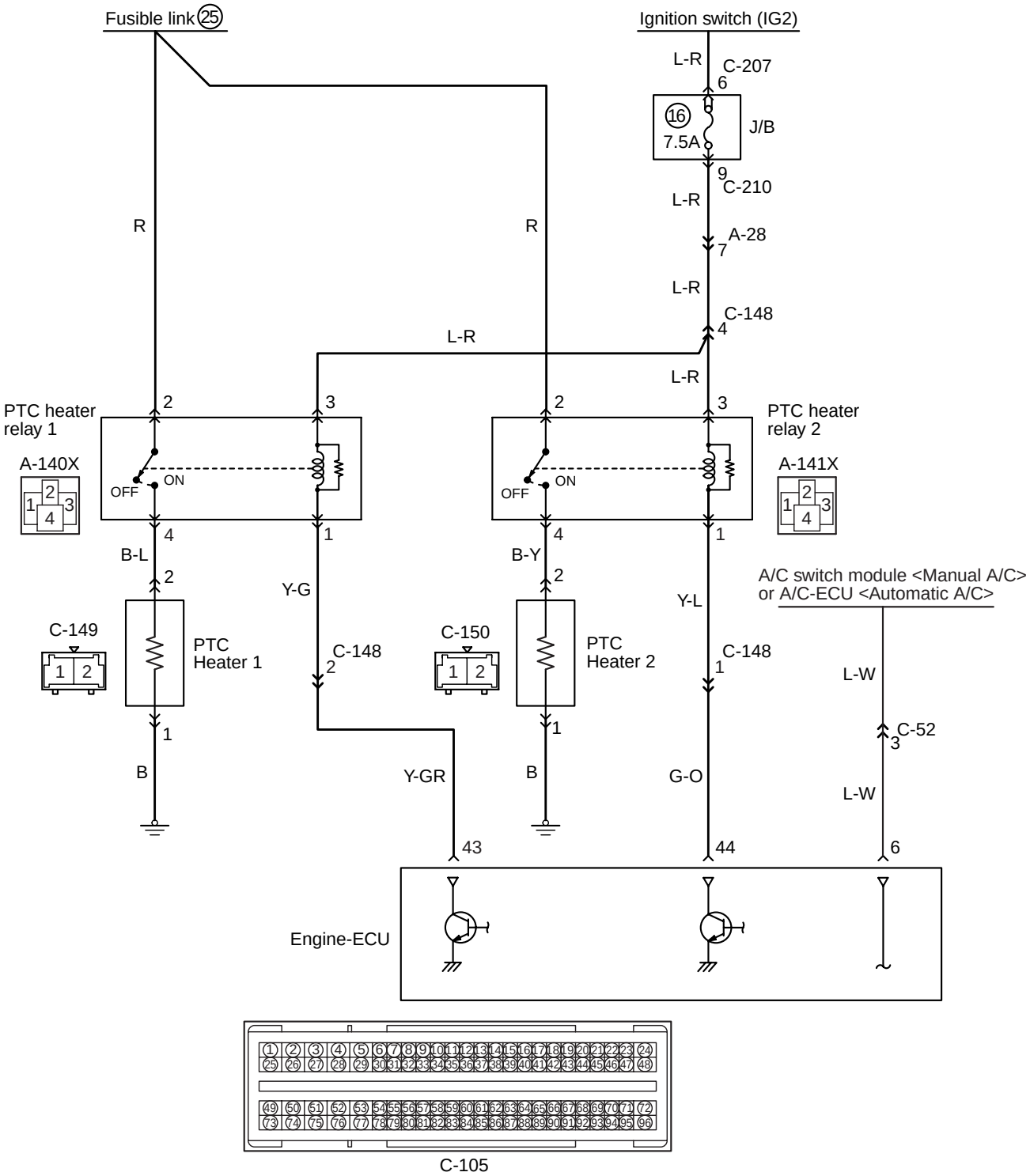




Q: Is the check result normal?
YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns).
NO : Repair the harness wire.

Inspection Procedure 26: PTC Heater Relay System <Vehicle with PTC Heater>

PTC Heater Circuit



Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V: Violet PU: Purple SI: Silver

AKB00307 AB

OPERATION

- When the PTC heater operation request signal (battery voltage) is input into the engine-ECU (terminal No. 6) from the A/C switch module <manual A/C> or A/C-ECU <automatic A/C>, the engine-ECU turns ON the PTC heater relay 1 and 2 after satisfying all the operation conditions.

Operation conditions of PTC heater relay 1

a. Engine coolant temperature is under 80°C
b. 2 seconds later after the engine has start up.
c. The PTC heater request signal has been input continuously 2 seconds or more
d. The battery voltage continues to be 12.3 V or more for 12 seconds or more.

Operation conditions of PTC heater relay 2

a. Engine coolant temperature is under 75°C.
b. The PTC heater 1 has been ON continuously 45 seconds or more.
c. Heater switch (warm up switch) is ON or vehicle speed is 20km/h or more.
d. The battery voltage continues to be 12.9 V or more for 12 seconds or more.

PROBABLE CAUSES

- Failed PTC heater relay
- Failed PTC heater
- Damaged harness (Open circuit between PTC heater relay and engine-ECU, PTC heater relay and J/B, PTC heater relay and PTC heater, PTC heater and body earth, and open circuit between PTC heater relay and fusible link 25.
- Damaged connector (PTC heater relay connector, PTC heater connector, engine-ECU connector).
- Failed engine-ECU

DIAGNOSIS PROCEDURE

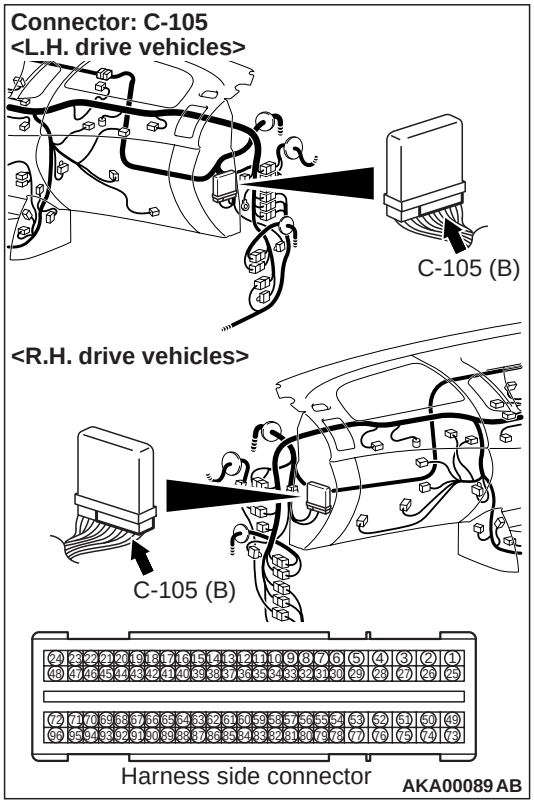
STEP 1. M.U.T.-III data list

- Refer to Data List Reference Table P.13A-542.
  a. Item 76: PTC heater relay 1
  b. Item 77: PTC heater relay 2

Q: Is the check result normal?

YES : Go to Step 2 .
NO : Check PTC heater system (Refer to GROUP 55A – Troubleshooting – Trouble Symptom Chart <manual A/C>, GROUP 55B – Troubleshooting – Trouble Symptom Chart <automatic A/C>).

STEP 2. PTC heater 1 operation check



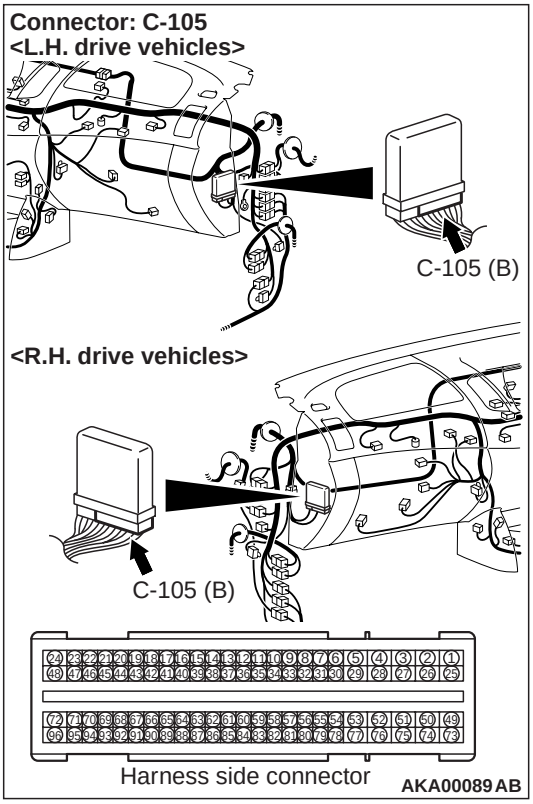
- Disconnect the C-105 connector.
- Using the jumper wire, connect terminal No. 43 to earth.

OK: The PTC heater 1 operates.

Q: Is the check result normal?

YES : Go to Step 3 .
NO : Check PTC heater system (Refer to GROUP 55A – Troubleshooting – Trouble Symptom Chart <manual A/C>, GROUP 55B – Troubleshooting – Trouble Symptom Chart <automatic A/C>).

STEP 3. PTC heater 2 operation check.

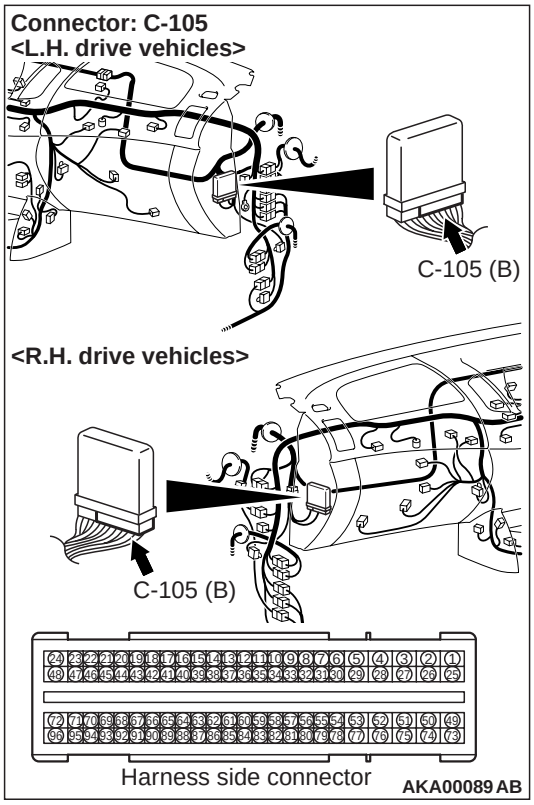


- Disconnect the C-105 connector.
- Using the jumper wire, connect terminal No. 44 to earth.

OK: The PTC heater 2 operates.

Q: Is the check result normal?
YES : Go to Step 4 .
NO : Check PTC heater system (Refer to GROUP 55A – Troubleshooting – Trouble Symptom Chart <manual A/C>, GROUP 55B – Troubleshooting – Trouble Symptom Chart <automatic A/C>).

STEP 4. Connector check: C-105 engine-ECU connector.



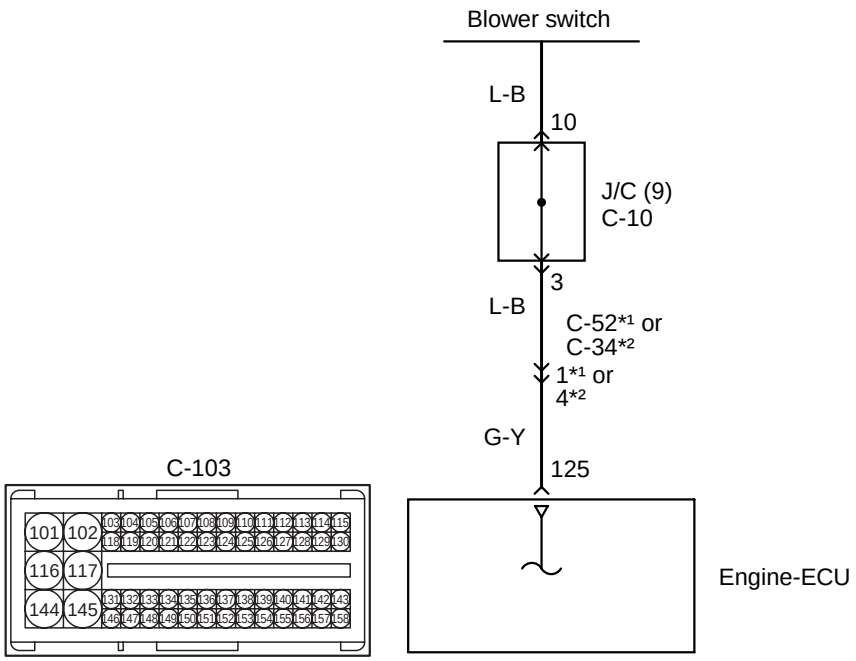
Q: Is the check result normal?
YES : Go to Step 5 .
NO : Repair or replace.

STEP 5. Check the trouble symptoms.

Q: Does the trouble symptom persist?
YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunction).

Inspection Procedure 27: Blower Switch System <Euro5>

Blower Switch Circuit



NOTE
*1: L.H. drive vehicles
*2: R.H. drive vehicles

Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V: Violet PU: Purple SI: Silver

AKB00331 AB

OPERATION

- The battery voltage is applied to the engine-ECU (terminal No. 125) from the blower switch.

FUNCTION

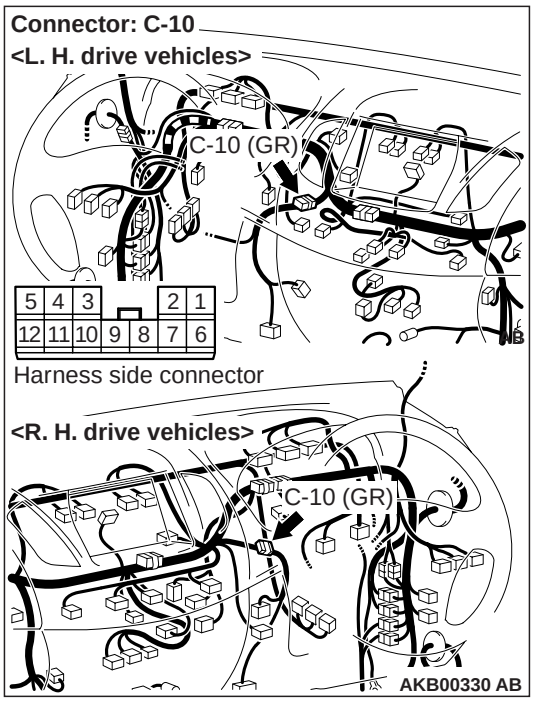
- When the blower fan is turned ON and the battery voltage is applied to the engine-ECU, the engine-ECU increases the idle speed.

PROBABLE CAUSES

- Failed A/C system
- Open/short circuit or harness damage in blower switch circuit or loose connector contact
- Failed engine-ECU

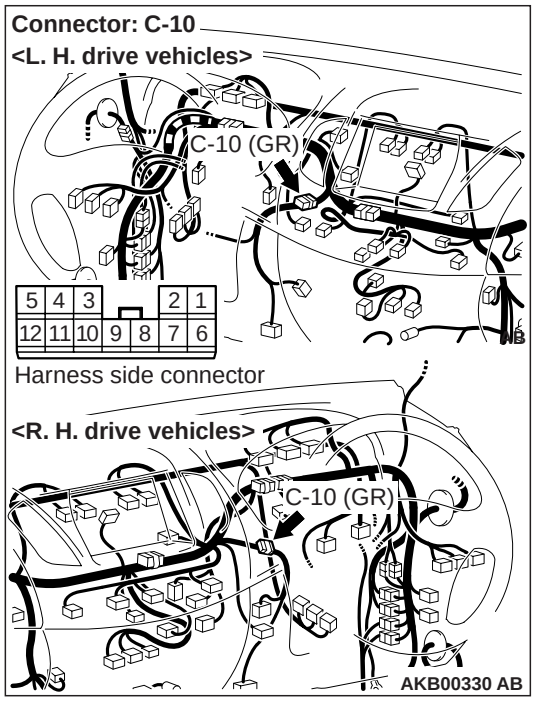
DIAGNOSIS PROCEDURE

STEP 1. Connector check: C-10 joint connector.



Q: Is the check result normal?
YES : Go to Step 2 .
NO : Repair or replace the connector.

STEP 2. Perform voltage measurement at C-10 joint connector.

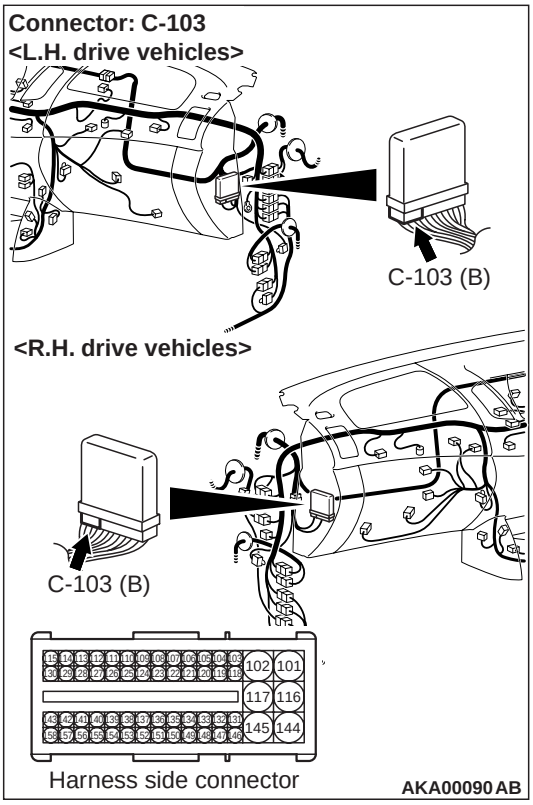


- Disconnect connector, and measure at the harness side.
- Ignition switch: ON
- Voltage between terminal No. 3 and earth.

OK: System voltage

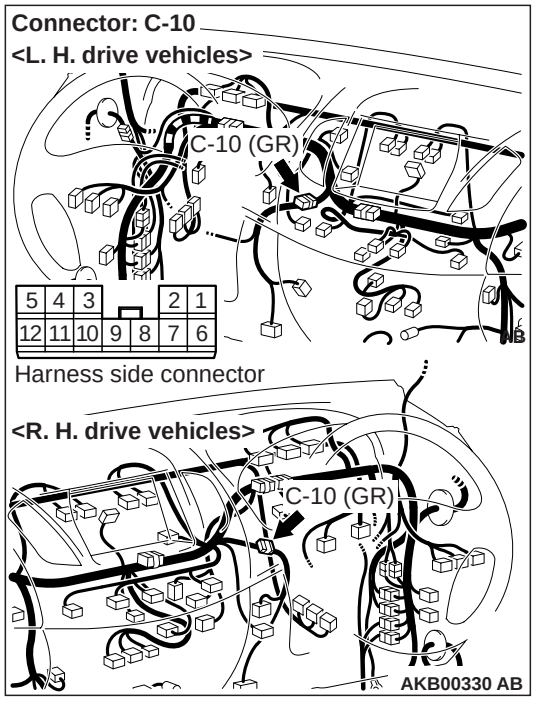
Q: Is the check result normal?
YES : Go to Step 5 .
NO : Go to Step 3 .

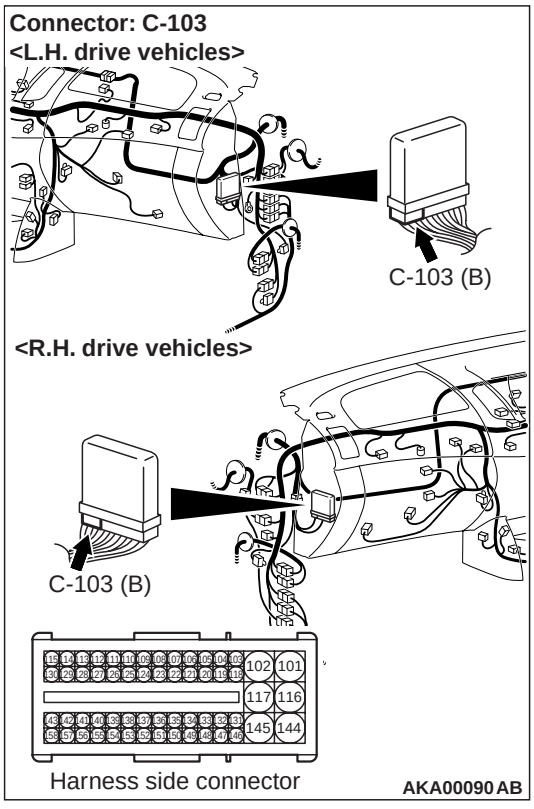
STEP 3. Connector check: C-103 engine-ECU connector.



Q: Is the check result normal?
YES : Go to Step 4 .
NO : Repair or replace the connector.

STEP 4. Check harness between C-10 (terminal No. 3) joint connector and C-103 (terminal No. 125) engine-ECU connector.





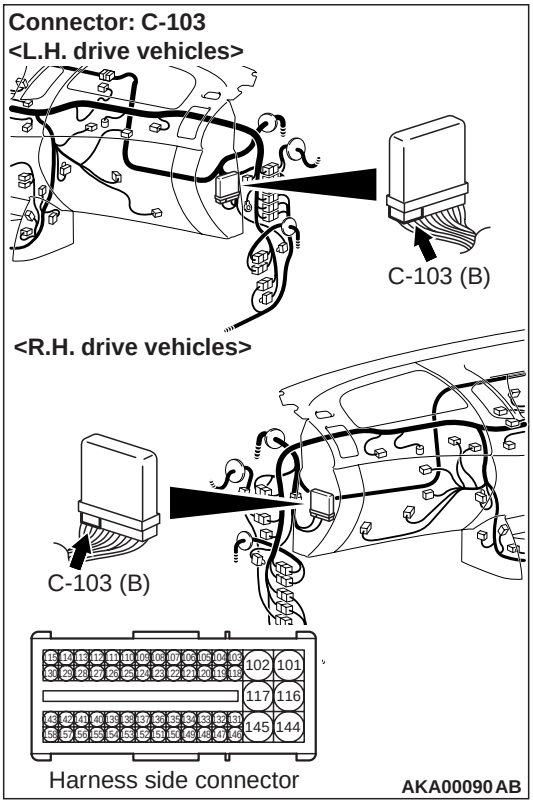
NOTE: Before checking harness, check intermediate connector C-52 <L. H. drive vehicles>, C-34 <R. H. drive vehicles>, and repair if necessary.

- Check output line for open/short circuit.

Q: Is the check result normal?

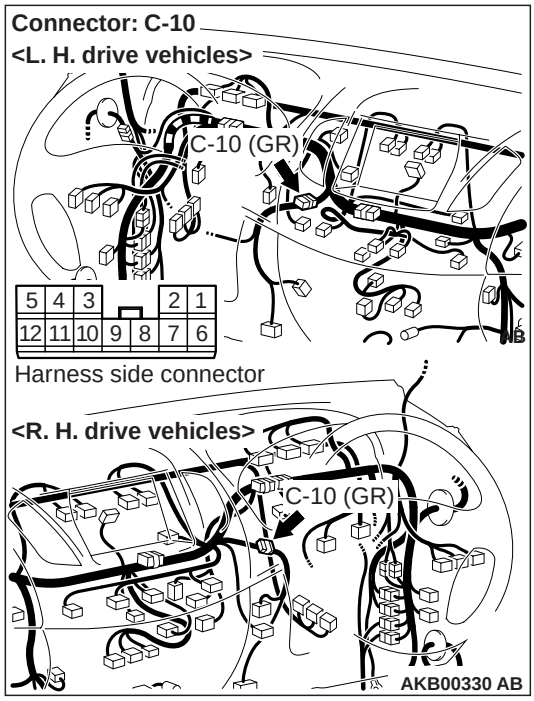
YES : Replace the engine-ECU.
NO : Repair the damaged harness wire.

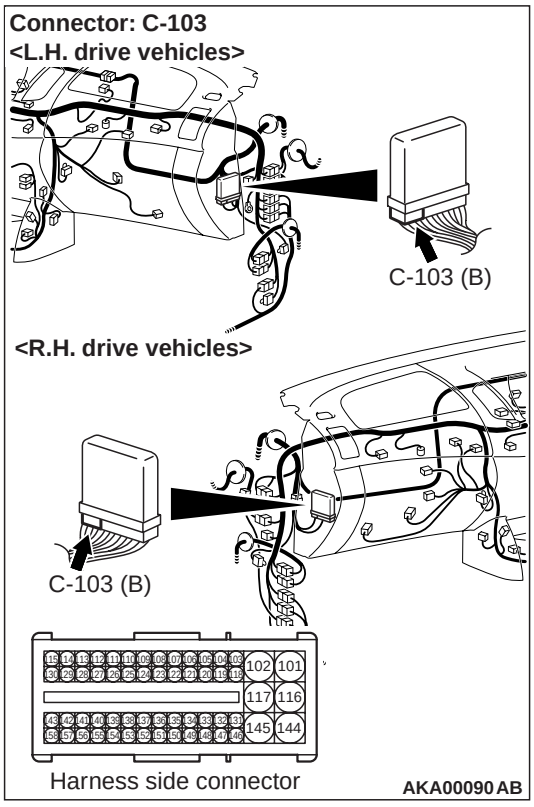
STEP 5. Connector check: C-103 engine-ECU connector.



Q: Is the check result normal?
YES : Go to Step 6.
NO : Repair or replace the connector.

STEP 6. Check harness between C-10 (terminal No. 3) joint connector and C-103 (terminal No. 125) engine-ECU connector.



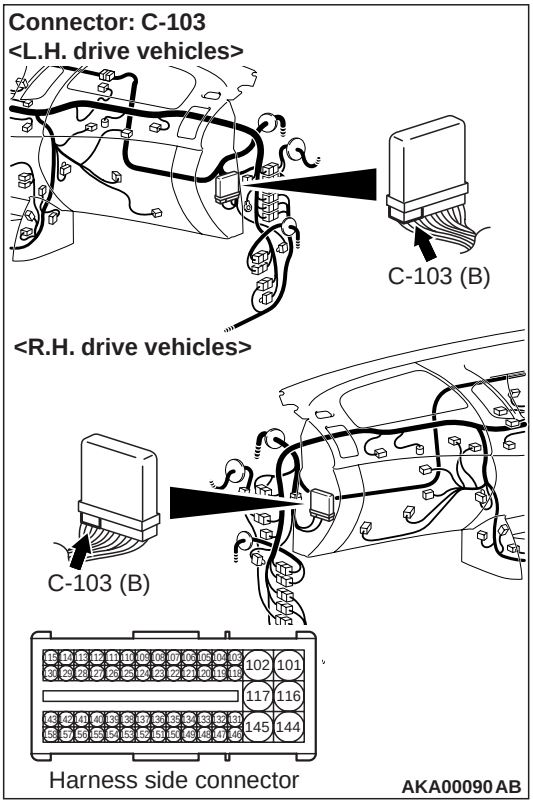


NOTE: Before checking harness, check intermediate connector C-52 <L. H. drive vehicles>, C-34 <R. H. drive vehicles>, and repair if necessary.
- Check output line for damage.

Q: Is the check result normal?

YES : Go to Step 7.
NO : Repair the damaged harness wire.

STEP 7. Perform voltage measurement at C-103 engine-ECU connector.



- Measure engine-ECU terminal voltage.
- Engine: Idling
- Voltage between terminal No. 125 and earth.

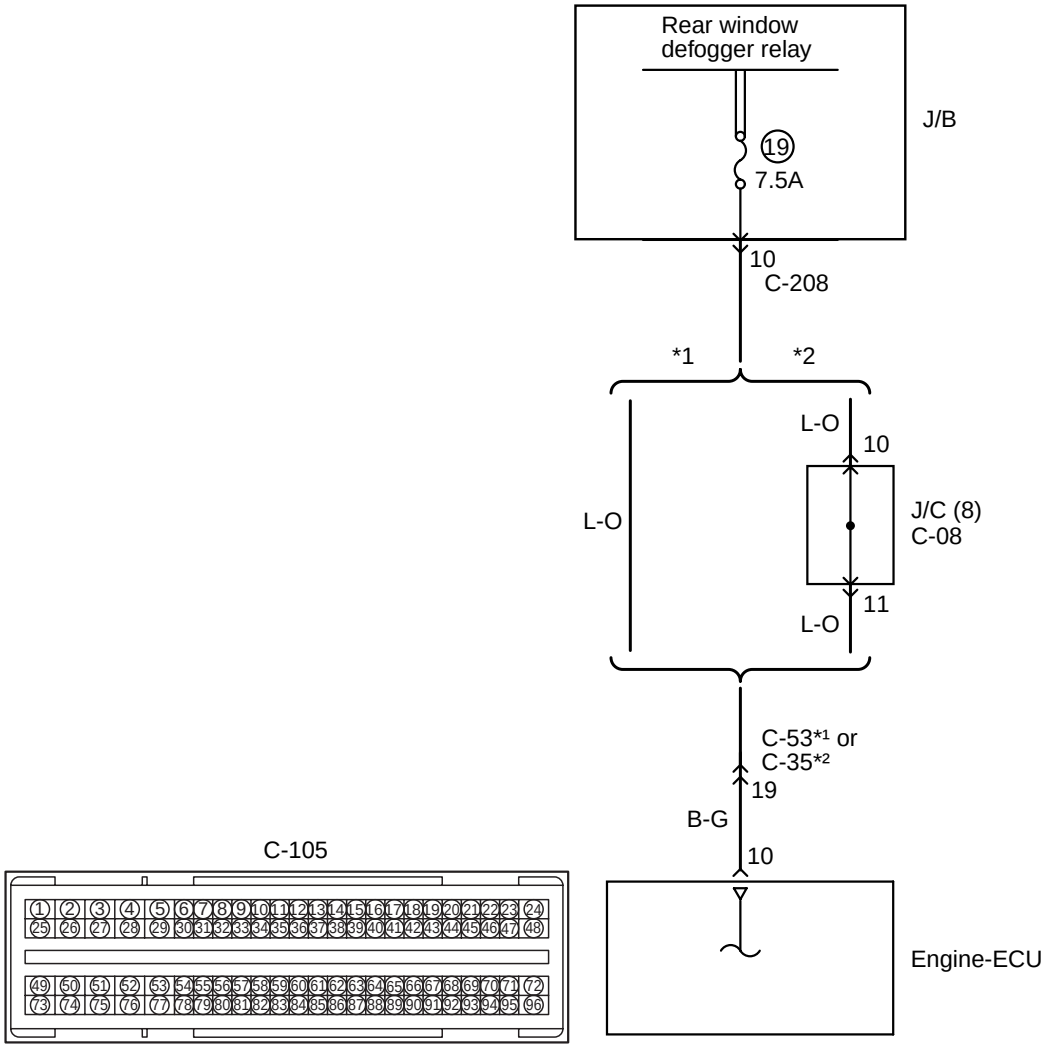
OK:
System voltage (when A/C is ON)
1 V or less (when A/C is OFF)

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).
NO : Check A/C system (Refer to GROUP 55A – Troubleshooting – Check Chart for Trouble Symptoms <Manual A/C>, GROUP 55B – Troubleshooting – Check Chart for Trouble Symptoms <Automatic A/C>).

Inspection Procedure 28: Rear Window Defogger System <Euro5>

Rear Window Defogger Circuit



NOTE
*1: L.H. drive vehicles
*2: R.H. drive vehicles

Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V: Violet PU: Purple SI: Silver

AKB00332 AB

OPERATION

- The battery voltage is applied to the engine-ECU (terminal No. 10) from the rear window defogger relay.

FUNCTION

- When the rear window defogger is turned ON and the battery voltage is applied to the engine-ECU, the engine-ECU increases the idle speed.

PROBABLE CAUSES

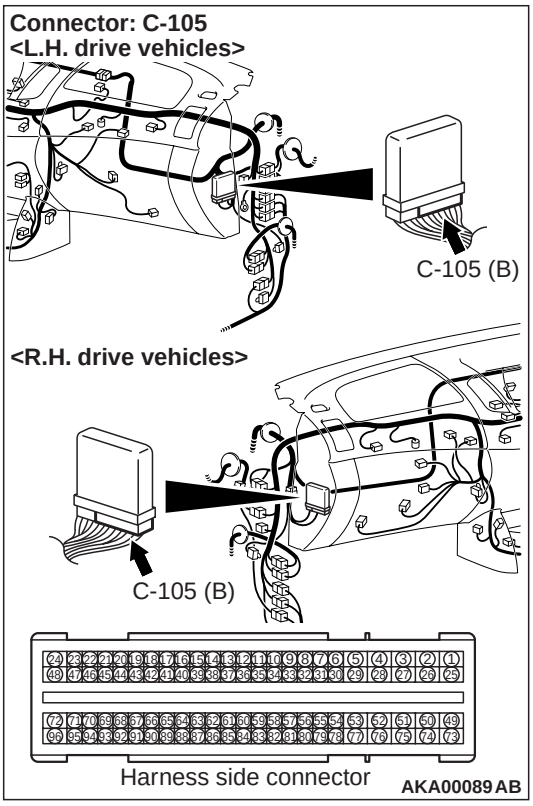
- Failed rear window defogger system
- Open/short circuit or harness damage in rear window defogger relay circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. Check the rear window defogger.
The rear defogger system should work normally (Refer to GROUP 54A, Printed Heater Lines Check).

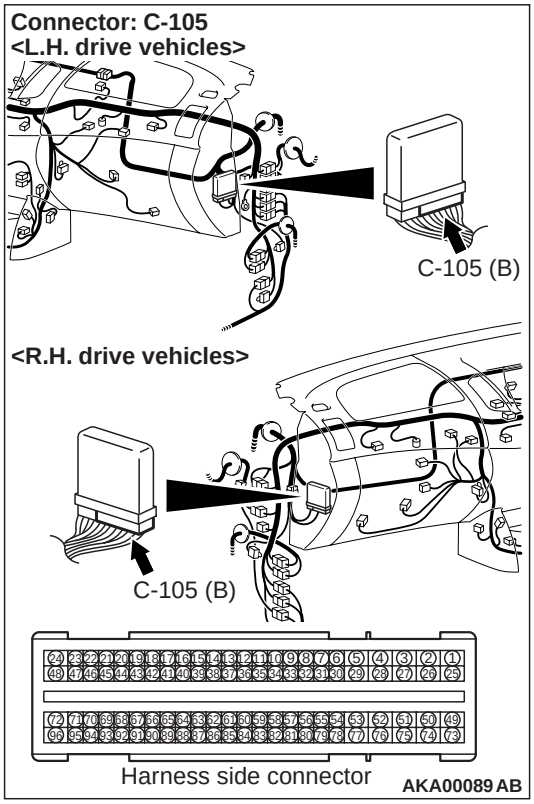
Q: Is the check result normal?
YES : Go to Step 2 .
NO : Check rear window defogger relay system (Refer to GROUP 55A – Troubleshooting – Check Chart for Trouble Symptoms <Manual A/C>, GROUP 55B – Troubleshooting – Check Chart for Trouble Symptoms <Automatic A/C>).

STEP 2. Connector check: C-105 engine-ECU connector.



Q: Is the check result normal?
YES : Go to Step 3 .
NO : Repair or replace the connector.

STEP 3. Perform voltage measurement at C-105 engine-ECU connector.

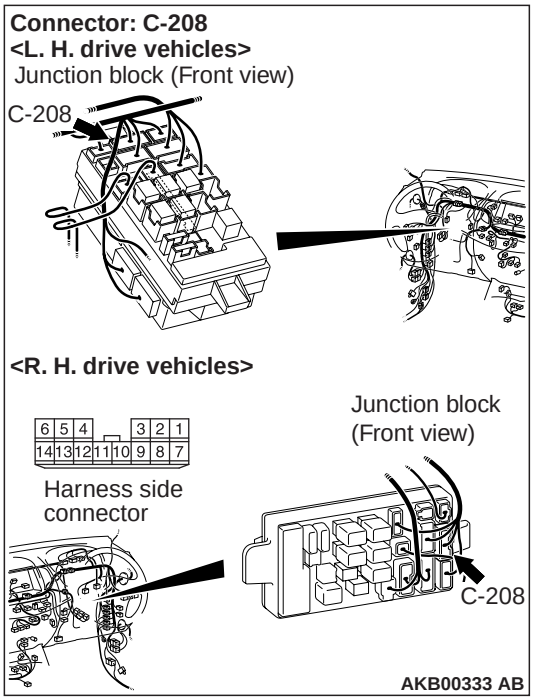


- Measure engine-ECU terminal voltage.
- Engine: Idling
- Voltage between terminal No. 10 and earth.

OK:
System voltage (when rear window defogger is ON)
1 V or less (when rear window defogger is OFF)

Q: Is the check result normal?
YES : Go to Step 6 .
NO : Go to Step 4 .

STEP 4. Connector check: C-208 junction block connector.

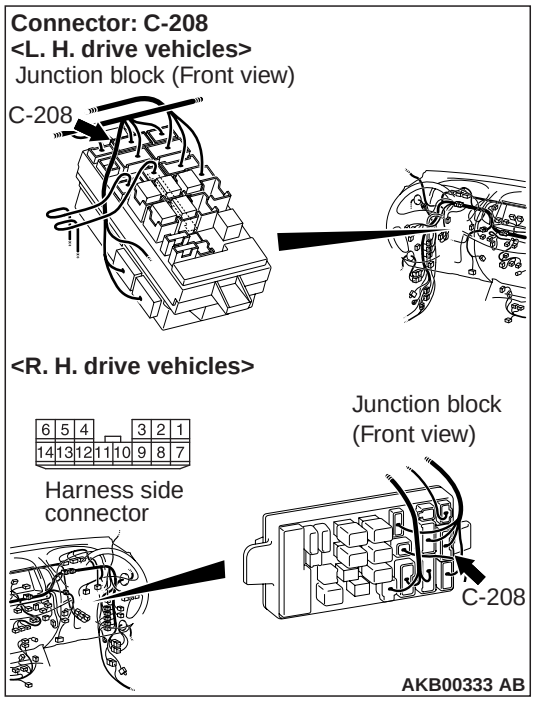


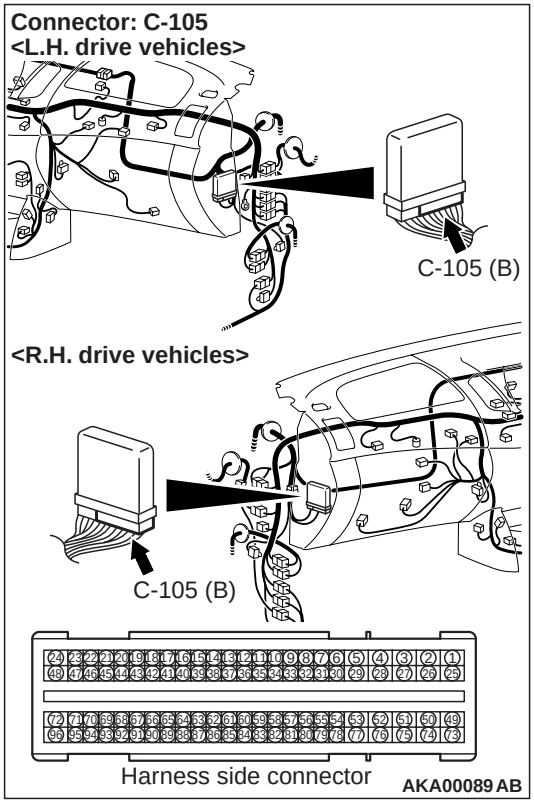
Q: Is the check result normal?

YES : Go to Step 5.

NO : Repair or replace the connector.

STEP 5. Check harness between C-208 (terminal No. 10) junction block connector and C-105 (terminal No. 10) engine-ECU connector.





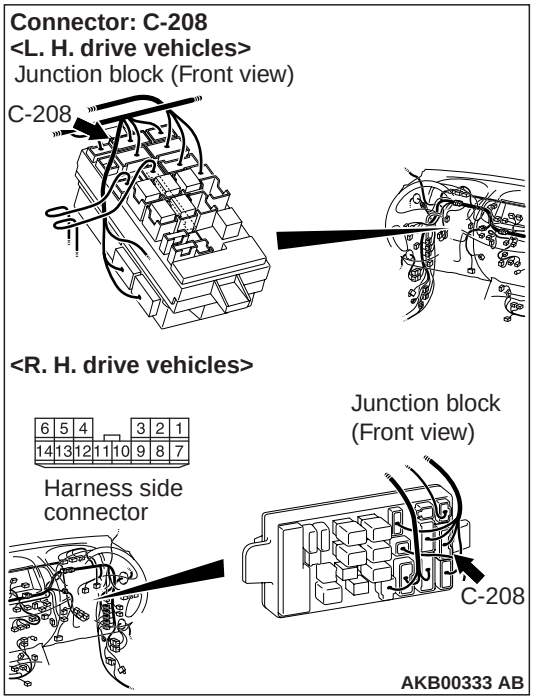
NOTE: Before checking harness, check intermediate connector C-53 <L. H. drive vehicles>, C-08 <R. H. drive vehicles> and C-35 <R. H. drive vehicles>, and repair if necessary.

- Check output line for open/short circuit.

Q: Is the check result normal?

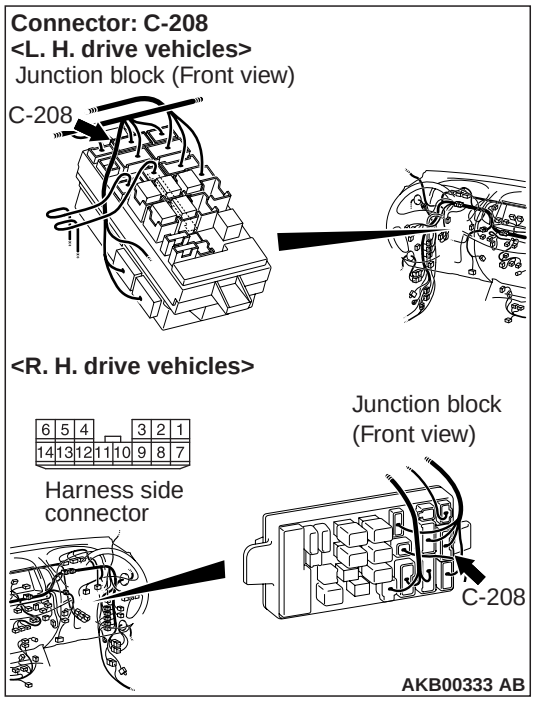
YES : Replace the engine-ECU.
NO : Repair the damaged harness wire.

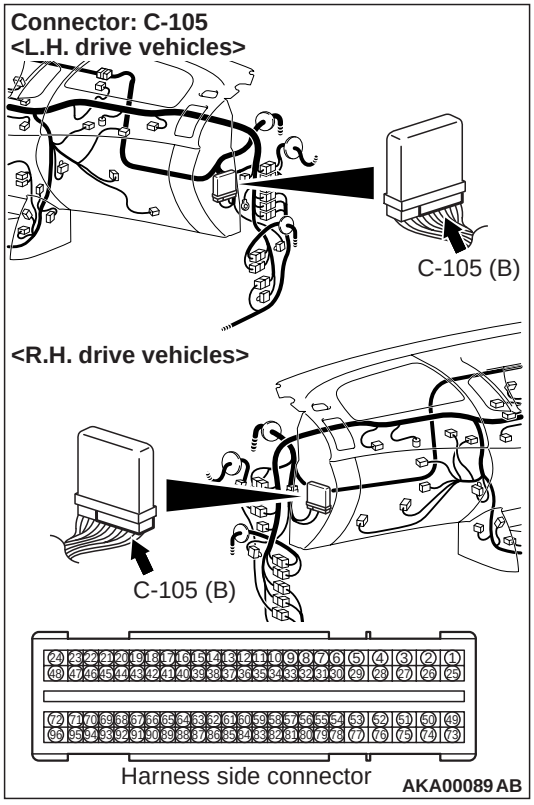
STEP 6. Connector check: C-208 junction block connector.



Q: Is the check result normal?
YES : Go to Step 7.
NO : Repair or replace the connector.

STEP 7. Check harness between C-208 (terminal No. 10) junction block connector and C-105 (terminal No. 10) engine-ECU connector.





NOTE: Before checking harness, check intermediate connector C-53 <L. H. drive vehicles>, C-08 <R. H. drive vehicles> and C-35 <R. H. drive vehicles>, and repair if necessary.

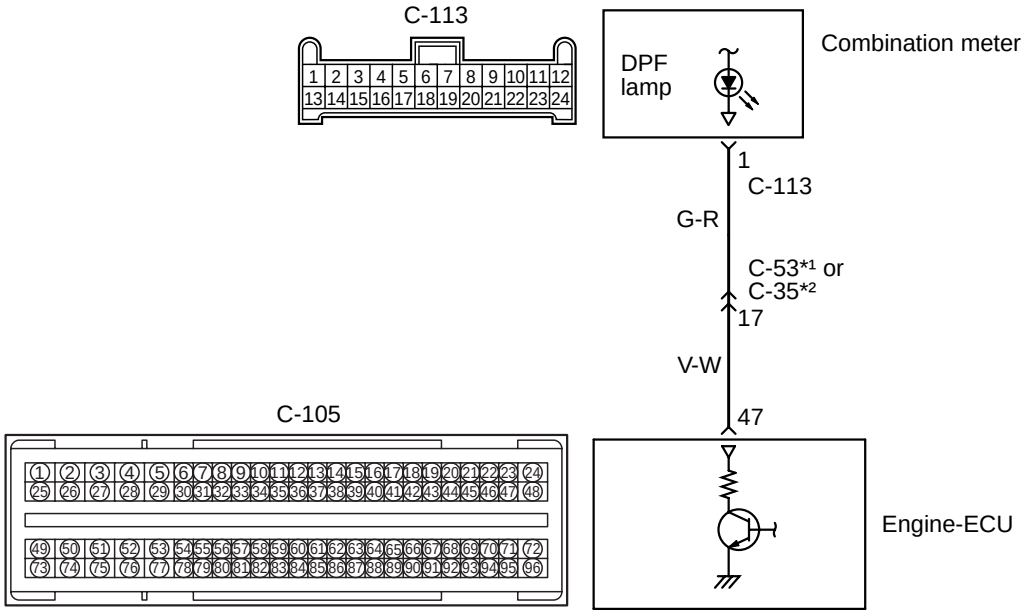
- Check output line for damage.

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).
NO : Repair the damaged harness wire.

Inspection Procedure 29: DPF Lamp System <Euro5>

DPF Lamp Circuit



NOTE
*1: L.H. drive vehicles
*2: R.H. drive vehicles

Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Grey
R: Red P: Pink V: Violet PU: Purple SI: Silver

AKB00340 AB

OPERATION
- Engine-ECU turn on DPF lamp for 5 seconds to check for burnt-out bulb immediately after ignition switch is turned to ON.
- Engine-ECU has detected failed DPF system. Or failure is possibly caused by open or short circuit or other faults.

PROBABLE CAUSES
- Damaged connector (Engine-ECU connector, combination meter connector)
- Damaged harness (Open or short circuit between engine-ECU and combination meter)
- Failed combination meter
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III actuator test.
- Refer to Actuator Test Table P.13A-574.
  a. Item 44: DPF lamp

Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Go to Step 2 .

STEP 2. Check indicator illumination.

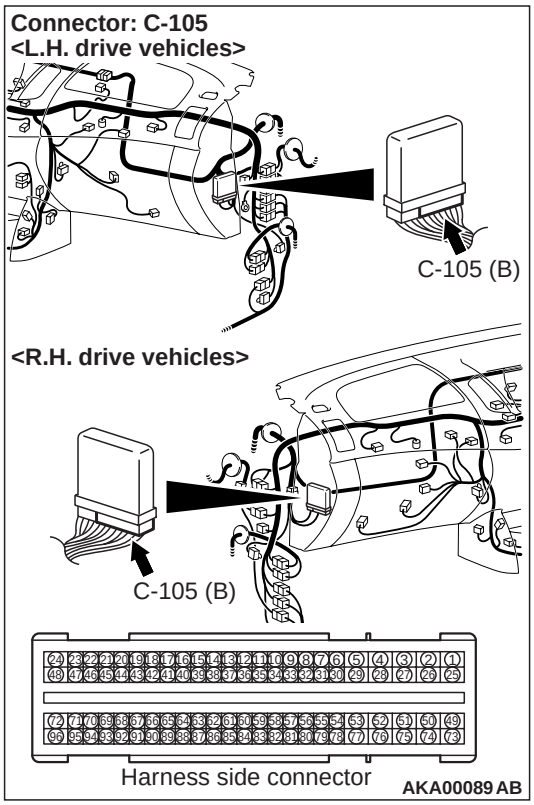
Q: Does an indicator other than the DPF lamp illuminate?

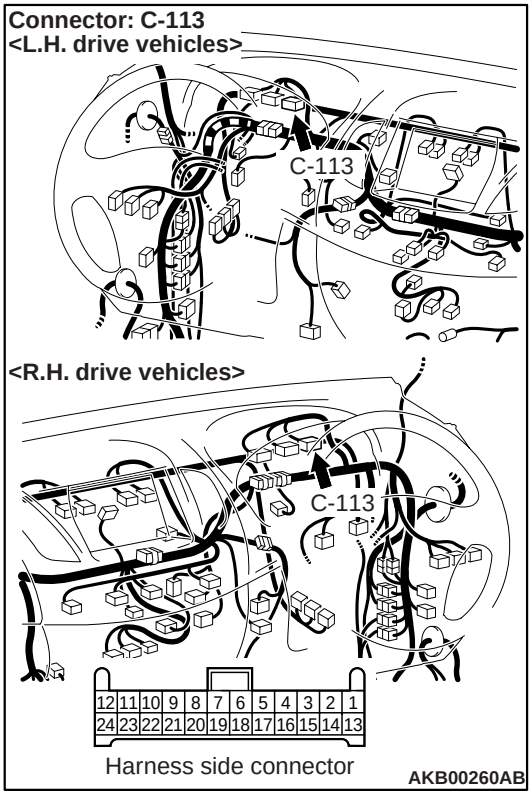
YES : Go to Step 3 .
NO : Inspect combination meter and related circuits (Refer to GROUP 54A – Combination Meter – Check Chart for Trouble Symptoms).

STEP 3. M.U.T.-III diagnosis code.

Q: Is the diagnosis code set?
YES : Inspection chart for diagnosis code (Refer to P.13A-21).
NO : Go to Step 4 .

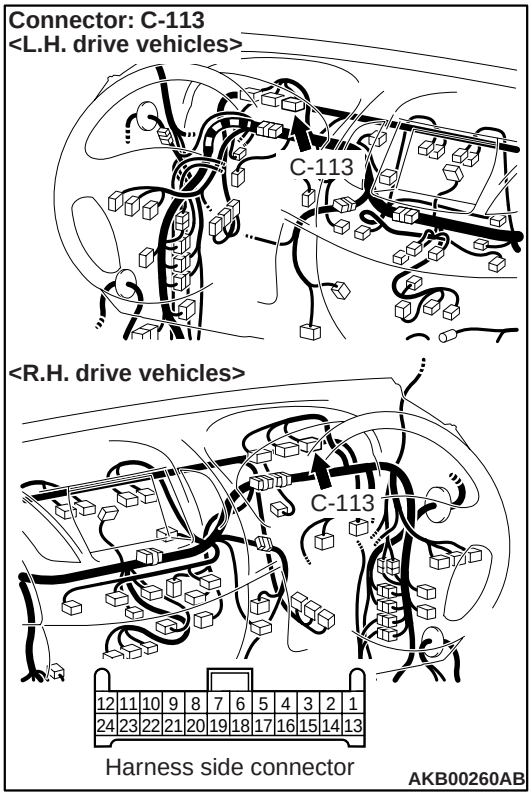
STEP 4. Connector check: C-105 Engine-ECU connector and C-113 combination meter connector.





Q: Are the check results normal?
YES : Go to Step 5 .
NO : Repair or replace.

STEP 5. Check combination meter.



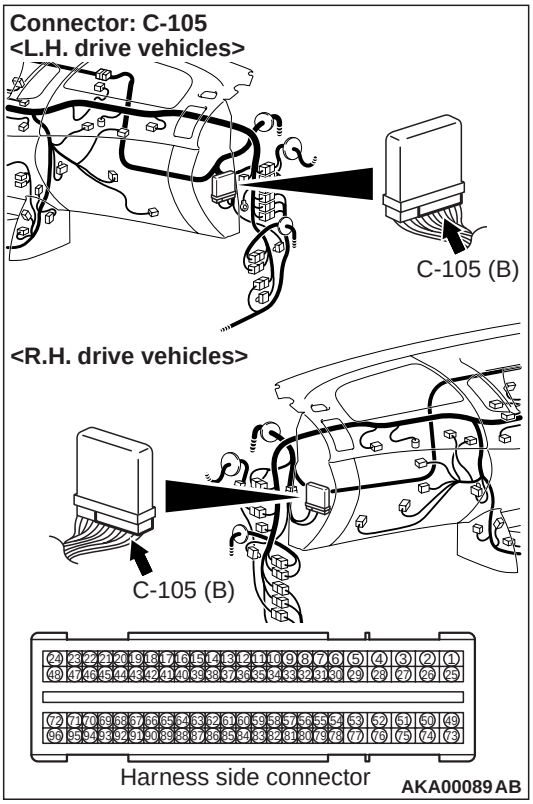
- Ignition switch: ON
- Disconnect C-113 combination meter connector

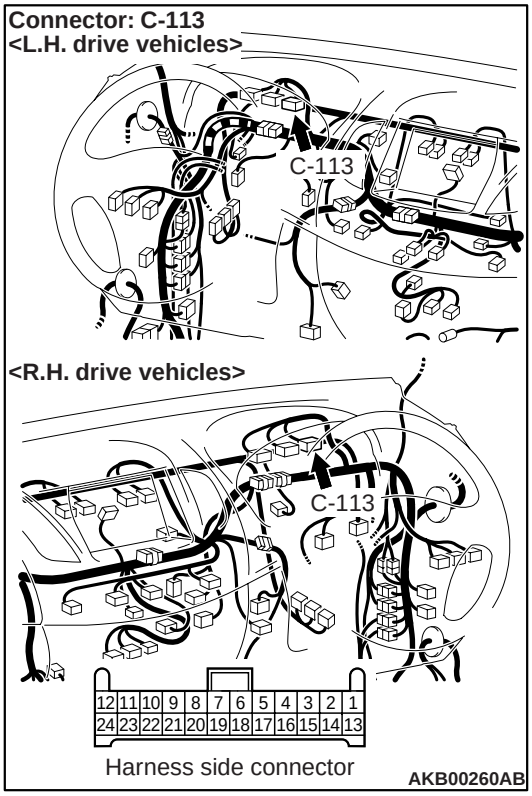
Q: Does the DPF lamp go out?

YES : Go to Step 6 .

NO : Check combination meter (Refer to GROUP 54A – Combination Meter – Check Chart for Trouble Symptoms).

STEP 6. Perform resistance measurement for short circuit at C-105 engine-ECU connector.



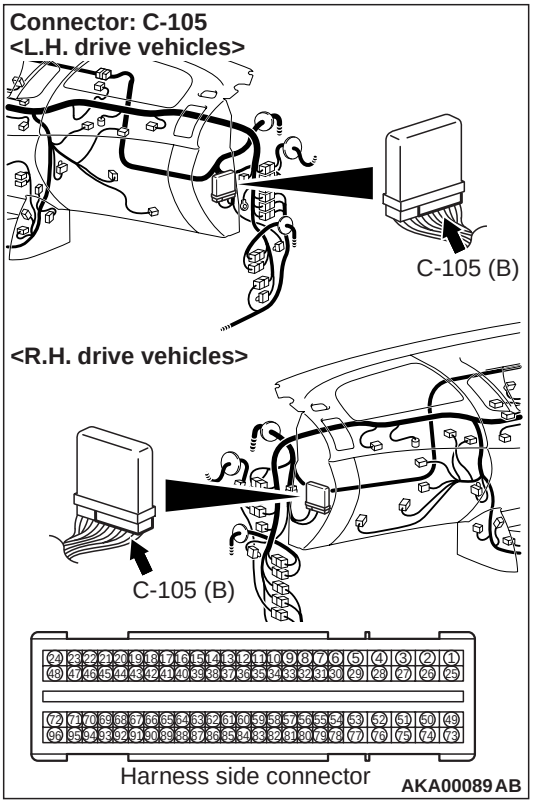


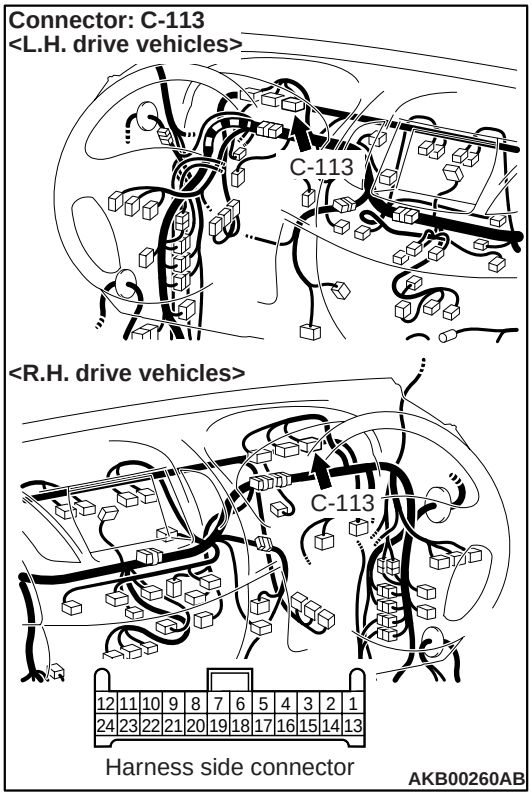
- Disconnect connector, and measure at harness side.
- Disconnect C-113 combination meter connector.
- Voltage between terminal No. 1 and earth.

OK: 1 kΩ or more

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair the harness wire.

STEP 7. Perform resistance measurement for open circuit at between C-105 engine-ECU connector and C-113 combination meter connector.





- Disconnect C-105 engine-ECU connector and C-113 combination meter connector, and measure resistance at the wiring harness.
- Resistance between C-105 engine-ECU connector terminal No. 47 and C-113 combination connector terminal No. 1.

OK: Continuity (2 Ω or less)

Q: Is the check result normal?

YES : Go to Step 8 .

NO : Check the intermediate connector C-53 <L. H. drive vehicles>, C-35 <R. H. drive vehicles>, and repair if necessary. If intermediate connector is normal, repair the harness wire.

STEP 8. Check the trouble symptoms.

Q: Does trouble symptom persist?

YES : Replace the engine-ECU. When the engine-ECU is replaced, write the chassis number (Refer to GROUP 00 – Precautions Before Service – How to Perform Chassis Number Writing). After replacing the engine-ECU, register the injector identification code and learn fuel injection (Refer to GROUP 00 – Precautions Before Service – What The Common Rail Engine Learns). After registering the injector identification code, the vehicle equipped with the DPF carries out the forcible DPF regeneration. (Refer to GROUP 17 – Emission Control – Diesel Particulate Filter (DPF) System – Forcible DPF Regeneration).

NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunction).

Data List Reference Table

M1133004201011

Item No.	Check item	Inspection conditions		Value to be determined as normal	Code No. or inspection procedure No.	Reference page
1	Battery voltage	Ignition switch: ON		System voltage	Procedure No. 16	P.13A-488
2	Engine revolution	• Engine: Cranking • Tachometer: Connected	Compare engine speed on tachometer with the value displayed on M.U.T.-III	Matched	Code No. P0335	P.13A-184
		• Engine: Idle operation • Transmission: Neutral <M/T> or P range <A/T> • A/C switch: OFF	When the engine coolant temperature: −20 °C	1,100 r/min <Euro5>		
				900 r/min <Except Euro5>		
			When the engine coolant temperature: 0 °C	1,100 r/min <Euro5>		
				900 r/min *1		
				650 r/min <Vehicles for Morocco>		
			When the engine coolant temperature: 25 °C	700 r/min *2		
				850 r/min *1		
			When the engine coolant temperature: 40 °C	600 r/min <Euro5-M/T>		
				650 r/min *3		
				800 r/min *1		
			When the engine coolant temperature: 80 °C	600 r/min <Euro5-M/T>		
				650 r/min *4		
				700 r/min *5		

Item No.	Check item	Inspection conditions		Value to be determined as normal	Code No. or inspection procedure No.	Reference page
3	Target Idle speed	• Engine: Idle operation • Transmission: Neutral <M/T> or P range <A/T> • A/C switch: OFF	When the engine coolant temperature: –20 °C	1,100 r/min <Euro5>	Code No. P0335	P.13A-184
				900 r/min <Except Euro5>		
			When the engine coolant temperature: 0 °C	1,100 r/min <Euro5>		
				900 r/min *1		
				650 r/min <Vehicles for Morocco>		
			When the engine coolant temperature: 25 °C	700 r/min *2		
				850 r/min *1		
			When the engine coolant temperature: 40 °C	600 r/min <Euro5-M/T>		
				650 r/min *3		
				800 r/min *1		
			When the engine coolant temperature: 80 °C	600 r/min <Euro5-M/T>		
				650 r/min *4		
				700 r/min *5		
4	Vehicle speed sensor	Drive 40 km/h		Approximately 40 km/h	Code No. P0502	P.13A-251
5	Barometric pressure sensor	Ignition switch: ON	Altitude 0 m	101 kPa	Code No. P2228, P2229	P.13A-406, P.13A-407
			Altitude 600 m	95 kPa		
			Altitude 1,200 m	88 kPa		
			Altitude 1,800 m	81 kPa		
6	Manifold absolute pressure sensor	Ignition switch: ON or Idle operation	Altitude: 0 m	101 kPa	Code No. P0106, P0107, P0108	P.13A-78, P.13A-83, P.13A-91
			Altitude: 600 m	95 kPa		
			Altitude: 1,200 m	88 kPa		
			Altitude: 1,800 m	81 kPa		
		• Engine coolant temperature: 85 – 95°C • Lights and all accessories: OFF • Transmission: Neutral <M/T> or P range <A/T>	When engine is suddenly raced.	The voltage in accordance with the boost pressure in the inlet manifold		

Item No.	Check item	Inspection conditions		Value to be determined as normal	Code No. or inspection procedure No.	Reference page
7	Engine coolant temperature sensor	Ignition switch: ON or the engine running	When the engine coolant temperature is –20°C	–20°C	Code No. P0117, P0118	P.13A-113, P.13A-119
			When the engine coolant temperature is 0°C	0°C		
			When the engine coolant temperature is 20°C	20°C		
			When the engine coolant temperature is 40°C	40°C		
			When the engine coolant temperature is 80°C	80°C		
8	EGR gas temperature sensor <Euro5>	Ignition switch: ON or the engine running	When the intake air temperature is –20°C	–20°C	Code No. P0112, P0113	P.13A-94, P.13A-104
			When the intake air temperature is 0°C	0°C		
			When the intake air temperature is 20°C	20°C		
			When the intake air temperature is 40°C	40°C		
			When the intake air temperature is 80°C	80°C		
			When the EGR is introduced	Varies depending on the temperature in the inlet manifold		
8	Intake air temperature sensor No. 2 <Except Euro5>	Ignition switch: ON or the engine running	When the intake air temperature is –20°C	–20°C	Code No. P0072, P0073	P.13A-48, P.13A-57
			When the intake air temperature is 0°C	0°C		
			When the intake air temperature is 20°C	20°C		
			When the intake air temperature is 40°C	40°C		
			When the intake air temperature is 80°C	80°C		

Item No.	Check item	Inspection conditions		Value to be determined as normal	Code No. or inspection procedure No.	Reference page
9	Accelerator pedal position sensor (main)	Ignition switch: ON	Release the accelerator pedal	700 – 1,300 mV	Code No. P2122, P2123, P2124	P.13A-333, P.13A-341, P.13A-345
			Depress the accelerator pedal gradually	Increases in response to the pedal depression stroke		
			Depress the accelerator pedal fully	4,000 mV or more		
10	Accelerator pedal position sensor (sub)	Ignition switch: ON	Release the accelerator pedal	200 – 800 mV	Code No. P2127, P2128	P.13A-349, P.13A-357
			Depress the accelerator pedal gradually	Increases in response to the pedal depression stroke		
			Depress the accelerator pedal fully	2,000 mV or more		
11	Accelerator pedal position sensor (main)	Ignition switch: ON	Release the accelerator pedal	0 %	Code No. P2122, P2123, P2124	P.13A-333, P.13A-341, P.13A-345
			Depress the accelerator pedal gradually	Increases in response to the pedal depression stroke		
			Depress the accelerator pedal fully	98 % or more		
12	Accelerator pedal position sensor (sub)	Ignition switch: ON	Release the accelerator pedal	20 % or below	Code No. P2127, P2128	P.13A-349, P.13A-357
			Depress the accelerator pedal gradually	Increases in response to the pedal depression stroke		
			Depress the accelerator pedal fully	98 % or more		
15	Vehicle speed sensor	Drive 40 km/h		Approximately 40 km/h	–	–

Item No.	Check item	Inspection conditions		Value to be determined as normal	Code No. or inspection procedure No.	Reference page
16	EGR valve position sensor	• Engine: After warming up the engine • Transmission: Neutral <M/T> or P range <A/T>	Idling	50 % or more*6	Code No. P0489, P0490, <Euro5> P0405, P0406 <Except Euro5>	P.13A-240, P.13A-248 <Euro5> P.13A-219, P.13A-227 <Except Euro5>
			3,500 r/min or more	10 % or below		
17	EGR valve target position	• Engine: After warming up the engine • Transmission: Neutral <M/T> or P range <A/T>	Idling	50 % or more	Code No. P0489, P0490, <Euro5> P0405, P0406 <Except Euro5>	P.13A-240, P.13A-248 <Euro5> P.13A-219, P.13A-227 <Except Euro5>
			3,500 r/min or more	10 % or below		
21	Fuel temperature sensor	Ignition switch: ON or the engine running	When the fuel temperature is −20°C	−20°C	Code No. P0182, P0183	P.13A-134, P.13A-139
			When the fuel temperature is 0°C	0°C		
			When the fuel temperature is 20°C	20°C		
			When the fuel temperature is 40°C	40°C		
			When the fuel temperature is 80°C	80°C		
25	A/C switch	Engine: Idling after warming up the engine	A/C switch: OFF	OFF	Procedure No. 22	P.13A-512
			A/C switch: ON (The A/C compressor in operation)	ON		
26	A/C load signal <Vehicles with automatic A/C>	• Engine: Idling after warming up the engine • A/C switch: ON	A/C compressor clutch not in operation	ON	Procedure No. 23	P.13A-507
			When the A/C compressor clutch is under high load	OFF		
27	A/C relay	Engine: Idling after warming up the engine	A/C switch: OFF	OFF	Procedure No. 23	P.13A-512
			A/C switch: ON	ON (A/C compressor clutch in operation)		

Item No.	Check item	Inspection conditions		Value to be determined as normal	Code No. or inspection procedure No.	Reference page
28	AT/MT switch	Ignition switch: ON	Vehicles with M/T	M/T	–	–
			Vehicles with A/T	A/T		
29	Condenser fan relay <Vehicles with A/C condenser fan>	Ignition switch: ON	A/C switch: OFF (engine coolant temperature at 97°C or lower)	OFF	Procedure No. 21	P.13A-507
			A/C switch: ON and vehicle speed is lower than 50 km/h	ON		
30	Control relay	Ignition switch: ON		ON	–	–
33	Engine check lamp	Ignition switch: "OFF" → "ON"		"ON" → "OFF" (after 5 seconds have elapsed)	Procedure No. 2	P.13A-438
35	Glow lamp	• Ignition switch: "OFF" → "ON" • Engine coolant temperature: lower than 60 °C		"ON" → "OFF" (After several seconds have elapsed)	–	–
36	Glow plug relay	Ignition switch: "OFF" → "ON"	Engine coolant temperature: lower than 60 °C	ON	–	–
			Engine coolant temperature: higher than 60 °C	OFF		
38	Ignition switch	Ignition switch: ON		ON	–	–
40	Starter switch	Ignition switch: ON	Engine: Except cranking	OFF	–	–
			Engine: Cranking	ON		
42	Neutral switch <A/T>	Ignition switch: ON	Selector lever: N or P range	N or P	–	–
			Selector lever: Except N or P range	D or R		

Item No.	Check item	Inspection conditions		Value to be determined as normal	Code No. or inspection procedure No.	Reference page
43	Intake air temperature sensor No. 1	Ignition switch: ON	Intake air temperature: –20°C	–20°C	Code No. P0072, P0073, <Euro5> P0112, P0113 <Except Euro5>	P.13A-43, P.13A-53 <Euro5> P.13A-99, P.13A-57 <Except Euro5>
			Intake air temperature: 0°C	0°C		
			Intake air temperature: 20°C	20°C		
			Intake air temperature: 40°C	40°C		
			Intake air temperature: 80°C	80°C		
45	Throttle position sensor	• Remove the intake air hose at the throttle body • Disconnect the connector of the electronic-controlled throttle valve • With the special tool test harness (MB991658) bridge only the mating terminals of No. 1, No. 2, and No. 4 of the disconnected connectors • Ignition switch: ON (engine stopped)	Fully close the throttle valve with your finger	300 – 700 mV	Code No. P0122, P0123	P.13A-124, P.13A-131
			Fully open the throttle valve with your finger	4,000 mV or higher		

Item No.	Check item	Inspection conditions		Value to be determined as normal	Code No. or inspection procedure No.	Reference page
47	Throttle position sensor	• Remove the intake air hose at the throttle body • Disconnect the connector of the electronic-controlled throttle valve • With the special tool test harness (MB991658) bridge only the mating terminals of No. 1, No. 2, and No. 4 of the disconnected connectors • Ignition switch: ON (engine stopped)	Fully close the throttle valve with your finger	0 – 5 deg	Code No. P0122, P0123	P.13A-124, P.13A-131
			Fully open the throttle valve with your finger	73 deg or higher		

Item No.	Check item	Inspection conditions		Value to be determined as normal	Code No. or inspection procedure No.	Reference page
56	Engine revolution	• Engine: Cranking • Tachometer: Connected	Compare engine speed on tachometer with the value displayed on M.U.T.-III	Matched	–	–
		• Engine: Idle operation • Transmission: Neutral <M/T> or P range <A/T> • A/C switch: OFF	When the engine coolant temperature: –20°C	1,100 r/min <Euro5>		
				900 r/min <Except Euro5>		
			When the engine coolant temperature: 0°C	1,100 r/min <Euro5>		
				900 r/min *1		
				650 r/min <Vehicles for Morocco>		
			When the engine coolant temperature: 25°C	700 r/min *2		
				850 r/min *1		
			When the engine coolant temperature: 40°C	600 r/min <Euro5-M/T>		
				650 r/min *3		
				800 r/min *1		
			When the engine coolant temperature: 80°C	600 r/min <Euro5-M/T>		
				650 r/min *4		
				700 r/min *5		
63	Rail pressure sensor	• Engine coolant temperature: 85 – 95°C • Lights and all accessories: OFF • Transmission: Neutral <M/T> or P range <A/T>	Idling	Rail pressure target ± 10 MPa	Code No. P0191, P0192, P0193	P.13A-143, P.13A-147, P.13A-155
			Depress the accelerator pedal gradually	Rail pressure target ± 15 MPa		
64	Rail pressure target	• Engine coolant temperature: 85 – 95°C • Lights and all accessories: OFF • Transmission: Neutral <M/T> or P range <A/T>	Idling	20 – 35 MPa	Code No. P0191, P0192, P0193	P.13A-143, P.13A-147, P.13A-155
			Depress the accelerator pedal gradually	Increases in response to the pedal depression stroke		

Item No.	Check item	Inspection conditions		Value to be determined as normal	Code No. or inspection procedure No.	Reference page
66	Supply pump learned value	Ignition switch: ON		–300 to 300 mA	–	–
67	Supply pump target value	• Engine coolant temperature: 85 – 95°C • Lamps and all accessories: OFF • Transmission: Neutral <M/T>, P range <A/T>	Idling	1,700 – 1,900 mA	–	–
			Depress the accelerator pedal gradually	Decreases in response to the pedal depression stroke		
72	1st and 2nd rail switch <M/T>	Ignition switch: ON	Shift position: 1st or 2nd	ON	Procedure No. 18	P.13A-497
			Shift position: except 1st or 2nd	OFF		
73	Reverse shift switch <M/T>	Ignition switch: ON	Shift position: reverse	ON	Procedure No. 19	P.13A-501
			Shift position: except reverse	OFF		
75	Power steering fluid pressure switch	Engine: Idle operation	Steering wheel stationary	OFF	Procedure No. 24	P.13A-514
			Steering wheel turning	ON		
76	PTC heater relay 1 <Vehicles with PTC heater>	• Engine coolant temperature: lower than 75°C • Heater temperature setting: Maximum • Blower fan: ON • 2 seconds later after the engine has start up		ON	Procedure No. 26	P.13A-525
		Other than the above		OFF		
77	PTC heater relay 2 <Vehicles with PTC heater>	• Engine coolant temperature: lower than 75°C • Heater switch (warm up switch) is ON or vehicle speed is 20 km/h or more • Heater temperature setting: Maximum • Blower fan: ON • 2 seconds later after the engine has start up • The PTC heater 1 has been ON continuously 45 seconds or more		ON		
		Other than the above		OFF		

Item No.	Check item	Inspection conditions		Value to be determined as normal	Code No. or inspection procedure No.	Reference page
114	Air flow sensor	• Engine coolant temperature: 85 – 95°C • Lights and all accessories: OFF • Transmission: Neutral <M/T> or P range <A/T>	Idle operation	725 – 935 mg/cyl	Code No. P0102, P0103	P.13A-68, P.13A-75,
117	No. 1 exhaust gas temperature sensor <Euro5>	Engine: Idling after warming up the engine	When the exhaust gas temperature is 150°C	150°C	Code No. P0545, P0546	P.13A-260, P.13A-263
			When the exhaust gas temperature is 300°C	300°C		
			When the exhaust gas temperature is 450°C	450°C		
			When the exhaust gas temperature is 600°C	600°C		
			When the exhaust gas temperature is 750°C	750°C		
118	No. 2 exhaust gas temperature sensor (catalyst temperature) <Euro5>	Engine: Idling after warming up the engine	When the catalyst temperature is 150°C	150°C	Code No. P0427, P0428	P.13A-231, P.13A-234
			When the catalyst temperature is 300°C	300°C		
			When the catalyst temperature is 450°C	450°C		
			When the catalyst temperature is 600°C	600°C		
			When the catalyst temperature is 750°C	750°C		

Item No.	Check item	Inspection conditions		Value to be determined as normal	Code No. or inspection procedure No.	Reference page
119	No. 3 exhaust gas temperature sensor (DPF temperature) <Euro5>	Engine: Idling after warming up the engine	When the DPF temperature is 150°C	150°C	Code No. P1427, P1428	P.13A-310, P.13A-313
			When the DPF temperature is 300°C	300°C		
			When the DPF temperature is 450°C	450°C		
			When the DPF temperature is 600°C	600°C		
			When the DPF temperature is 750°C	750°C		
120	Exhaust differential pressure sensor <Euro5>	• Remove the pressure hoses, which are connected to the both nipple of the exhaust differential pressure sensor. • Ignition switch: ON • Exhaust differential pressure sensor ambient air temperature: 0 – 85°C	Release the both nipples to the open air.	–2.5 to 2.5 kPa	Code No. P2454, P2455	P.13A-411, P.13A-417
			Connect the manual pump (pressure-application type) to the one of the nipples, and pressurise it.	Changes depending on the pressure.		
131	Clutch switch <M/T>	Ignition switch: ON	Depress the clutch pedal	OFF	–	–
			Release the clutch pedal	ON		
135	Brake lamp switch	Ignition switch: ON	Release the brale pedal	OFF	–	–
			Deplesse the brale pedal	ON		

Item No.	Check item	Inspection conditions		Value to be determined as normal	Code No. or inspection procedure No.	Reference page
142	Variable geometry control solenoid valve duty before compensation <Euro5>	• Engine coolant temperature: 85 – 95°C • Lamps and all accessories: OFF • Transmission: Neutral <M/T>, P range <A/T>	Idling	45 – 55 %	–	–
			When engine is suddenly raced	Increases		
143	Variable geometry control solenoid valve duty after compensation <Euro5>	• Engine coolant temperature: 85 – 95°C • Lamps and all accessories: OFF • Transmission: Neutral <M/T>, P range <A/T>	Idling	Variable geometry control solenoid valve duty before compensation ±10 %	–	–
			When engine is suddenly raced	Variable geometry control solenoid valve duty before compensation ±10 %		
152	Fuel filter pressure switch <Vehicles for Russia and Morocco>	Ignition switch: ON		OFF	Code No. P1276	P.13A-304
		• Engine: Idling • Squeeze the fuel hose with one's fingers at the inlet side of the fuel filter		ON		
214	DPF lamp <Euro5>	Ignition switch: ON	When DPF lamp is not illuminated	OFF	–	–
			When DPF lamp is illuminated	ON		
320	Accelerator pedal position sensor (main) (After compensation)	Ignition switch: ON	Release the accelerator pedal	0 %	Code No. P2122, P2123, P2124	P.13A-333, P.13A-341, P.13A-345
			Depress the accelerator pedal gradually	Increases in response to the pedal depression stroke		
			Depress the accelerator pedal fully	98 % or more		

Item No.	Check item	Inspection conditions		Value to be determined as normal	Code No. or inspection procedure No.	Reference page
326	4L mode <M/T-high power engine vehicle>	• Ignition switch: ON • Transmission: Neutral	Transfer position: except 4LLc	OFF	–	–
			Transfer position: 4LLc	ON		
401	Alternator G duty <Euro5>	• Engine: Idling after warming up the engine • Head lamp switch: OFF → ON		Increased	–	–
402	Battery temperature sensor <Euro5>	Ignition switch: ON or engine running	When the battery temperature sensor ambient air temperature is – 20°C	–20°C	Code No. P0515	P.13A-255
			When the battery temperature sensor ambient air temperature is 0°C	0°C		
			When the battery temperature sensor ambient air temperature is 20°C	20°C		
			When the battery temperature sensor ambient air temperature is 40°C	40°C		
			When the battery temperature sensor ambient air temperature is 80°C	80°C		

*NOTE: *1: Except Euro5 and vehicles for Morocco*

*NOTE: *2: Euro5, vehicles for Morocco*

*NOTE: *3: Euro5-A/T, vehicles for Morocco*

*NOTE: *4: Euro5-A/T, Except Euro5-2WD-Except high rider*

*NOTE: *5: Except Euro5-high rider and 4WD*

*NOTE: *6: At an outside temperature of approximately 20°C. When the EGR valve position sensor is checked at the outside temperature of 20°C or more, the value would be possibly below the opening degree (normal value). Also, the value would be possibly below the opening degree (normal value) under the following conditions:*

- *When the volumetric efficiency of the intake air is reduced due to the higher intake air temperature*

Engine-ECU Monitor Item

- Items useful for grasping the engine control condition by the engine-ECU are provided in this monitor item section.

- Values of these monitor items vary greatly depending on marginal difference of measurement conditions, difference of the environment, aged deterioration of vehicles and so on, and it is difficult to show the precise specification values. Therefore, check conditions, display range and movement of values are described.

Item No.	Inspection item	Explanation of M.U.T. display	Guideline for inspection		Display range, numerical value
13	Accelerator pedal position sensor (main) learned closed position	Learning value of not depressed accelerator pedal state is shown	Ignition switch: ON		700 – 1,300mV
46	Throttle position sensor learned closed position	Learning value of fully closed throttle valve state is shown	Ignition switch: ON		9 deg or less
57	Fuel quantity final	Indicates the final injection quantity	• Engine: After warm-up, idle operation • Lights and all accessories: OFF • Transmission: Neutral <M/T> or P range <A/T>		3 – 10 mm^3/st
58	Fuel quantity pre	Indicates the pre injection quantity	• Engine: After warm-up, idle operation • Lights and all accessories: OFF • Transmission: Neutral <M/T> or P range <A/T>		0.5 – 3 mm^3/st
59	Fuel quantity smoke limit	Indicates the limit of injection quantity determined by the charging pressure	Engine: After warm-up, 2,000r/min		35 mm^3/st or more
60	Fuel quantity start	Indicates the pilot injection quantity determined by water temperature	Ignition switch: ON	When engine coolant temperature is 0°C	40 – 50 mm^3/st
				When engine coolant temperature is 70°C	30 – 40 mm^3/st
61	Fuel injection interval pilot	Interval between end of pilot injection and start of main injection	Engine: After warm-up		200 – 2,000 us

Item No.	Inspection item	Explanation of M.U.T. display	Guideline for inspection	Display range, numerical value
62	Fuel injection timing main	Main injection timing	Engine: After warm-up, idle operation	−3 to 4°CA
65	Supply pump learned status	Although the fuel discharge quantity is decided depending on the drive current of the suction control valve of the supply pump, learning is executed in idle state because there is a machine difference. The learned status is indicated.	Ignition switch: ON	2*
78	Small injection quantity at pressure 1 − No. 1 cylinder	Indicates the final learned value of the small injection quantity of No. 1 cylinder at 25 MPa	Ignition switch: ON	−0.41 to 0.36 ms
79	Small injection quantity at pressure 1 − No. 2 cylinder	Indicates the final learned value of the small injection quantity of No. 2 cylinder at 25 MPa	Ignition switch: ON	−0.41 to 0.36 ms
80	Small injection quantity at pressure 1 − No. 3 cylinder	Indicates the final learned value of the small injection quantity of No. 3 cylinder at 25 MPa	Ignition switch: ON	−0.41 to 0.36 ms
81	Small injection quantity at pressure 1 − No. 4 cylinder	Indicates the final learned value of the small injection quantity of No. 4 cylinder at 25 MPa	Ignition switch: ON	−0.41 to 0.36 ms
82	Small injection quantity at pressure 2 − No. 1 cylinder	Indicates the final learned value of the small injection quantity of No. 1 cylinder at 40 MPa	Ignition switch: ON	−0.47 to 0.43 ms
83	Small injection quantity at pressure 2 − No. 2 cylinder	Indicates the final learned value of the small injection quantity of No. 2 cylinder at 40 MPa	Ignition switch: ON	−0.47 to 0.43 ms

Item No.	Inspection item	Explanation of M.U.T. display	Guideline for inspection	Display range, numerical value
84	Small injection quantity at pressure 2 – No. 3 cylinder	Indicates the final learned value of the small injection quantity of No. 3 cylinder at 40 MPa	Ignition switch: ON	–0.47 to 0.43 ms
85	Small injection quantity at pressure 2 – No. 4 cylinder	Indicates the final learned value of the small injection quantity of No. 4 cylinder at 40 MPa	Ignition switch: ON	–0.47 to 0.43 ms
86	Small injection quantity at pressure 3 – No. 1 cylinder	Indicates the final learned value of the small injection quantity of No. 1 cylinder at 70 MPa	Ignition switch: ON	–0.29 to 0.32 ms
87	Small injection quantity at pressure 3 – No. 2 cylinder	Indicates the final learned value of the small injection quantity of No. 2 cylinder at 70 MPa	Ignition switch: ON	–0.29 to 0.32 ms
88	Small injection quantity at pressure 3 – No. 3 cylinder	Indicates the final learned value of the small injection quantity of No. 3 cylinder at 70 MPa	Ignition switch: ON	–0.29 to 0.32 ms
89	Small injection quantity at pressure 3 – No. 4 cylinder	Indicates the final learned value of the small injection quantity of No. 4 cylinder at 70 MPa	Ignition switch: ON	–0.29 to 0.32 ms
90	Small injection quantity at pressure 4 – No. 1 cylinder	Indicates the final learned value of the small injection quantity of No. 1 cylinder at 100 MPa	Ignition switch: ON	–0.13 to 0.17 ms

Item No.	Inspection item	Explanation of M.U.T. display	Guideline for inspection	Display range, numerical value
91	Small injection quantity at pressure 4 – No. 2 cylinder	Indicates the final learned value of the small injection quantity of No. 2 cylinder at 100 MPa	Ignition switch: ON	–0.13 to 0.17 ms
92	Small injection quantity at pressure 4 – No. 3 cylinder	Indicates the final learned value of the small injection quantity of No. 3 cylinder at 100 MPa	Ignition switch: ON	–0.13 to 0.17 ms
93	Small injection quantity at pressure 4 – No. 4 cylinder	Indicates the final learned value of the small injection quantity of No. 4 cylinder at 100 MPa	Ignition switch: ON	–0.13 to 0.17 ms
94	Small injection quantity at pressure 5 – No. 1 cylinder	Indicates the final learned value of the small injection quantity of No. 1 cylinder at 150 MPa	Ignition switch: ON	–0.16 to 0.17 ms
95	Small injection quantity at pressure 5 – No. 2 cylinder	Indicates the final learned value of the small injection quantity of No. 2 cylinder at 150 MPa	Ignition switch: ON	–0.16 to 0.17 ms
96	Small injection quantity at pressure 5 – No. 3 cylinder	Indicates the final learned value of the small injection quantity of No. 3 cylinder at 150 MPa	Ignition switch: ON	–0.16 to 0.17 ms
97	Small injection quantity at pressure 5 – No. 4 cylinder	Indicates the final learned value of the small injection quantity of No. 4 cylinder at 150 MPa	Ignition switch: ON	–0.16 to 0.17 ms

Item No.	Inspection item	Explanation of M.U.T. display	Guideline for inspection	Display range, numerical value
106	Idle speed control torque	Target torque for idle speed control (ISC)	• Engine: After warm-up, idle operation • Lights and all accessories: OFF • Transmission: Neutral <M/T> or P range <A/T>	50 – 120 Nm
116	Request of mode DPF regeneration <Euro5>	• Indicates the DPF regeneration request mode. Not request: Not reached to the load amount which requires the regeneration Distance1: State in which the regeneration is required by the actual driving distance Distance2: State in which the regeneration is required by the distance calculated by subtracting the distance on the natural regeneration during driving from the actual driving distance Summ: State in which the regeneration is required by the load amount calculated by the quantity survey Pressure difference: State in which the regeneration is required by the load amount calculated by the difference pressure Manual: State in which the regeneration is forcibly performed by the M.U.T.-III.	Ignition switch: ON	Changes depending on the vehicle status.
126	No. 2 exhaust gas temperature sensor (catalyst temperature) max value <Euro5>	Indicates the highest temperature of the temperatures, saved in the engine-ECU, that are detected by the No.2 exhaust gas temperature sensor (catalyst temperature).	Ignition switch: ON	–200 to 1,075°C

Item No.	Inspection item	Explanation of M.U.T. display	Guideline for inspection	Display range, numerical value
127	No. 3 exhaust gas temperature sensor (DPF temperature) max value <Euro5>	Indicates the highest temperature of the temperatures, saved in the engine-ECU, that are detected by the No.3 exhaust gas temperature sensor (DPF temperature).	Ignition switch: ON	−200 to 1,075°C
128	Odometer at No. 3 exhaust gas temperature sensor (DPF temperature) max value <Euro5>	Indicates the driving distance at the time of the highest temperature of the temperatures, saved in the engine-ECU, that are detected by the No.3 exhaust gas temperature sensor (DPF temperature).	Ignition switch: ON	0 – 1,999,999 km
145	Odometer calculated by engine-ECU	Indicates the total driving distance saved to the odometer.	Ignition switch: ON	0 – 1,999,999 km
148	Count of DPF regeneration <Euro5>	Indicates the DPF regeneration times saved to the engine-ECU.	Ignition switch: ON	0 – 65,535
151	Status of soot load by differential pressure <Euro5>	Indicates the calibrated value to calculate the soot load amount by the difference pressure.	Ignition switch: ON	0 – 3
153	Soot loading by distance 1 <Euro5>	Indicates the driving distance after the last DPF regeneration.	Ignition switch: ON	0 – 2,550 km
154	Soot loading by distance 2 <Euro5>	Indicates the driving distance calculated by subtracting the driving distance on natural regeneration from the distance after the last DPF regeneration.	Ignition switch: ON	0 – 2,550 km

Item No.	Inspection item	Explanation of M.U.T. display	Guideline for inspection	Display range, numerical value
155	Soot loading by accumulation <Euro5>	Indicates the soot load amount calculated by the quantity survey.	Ignition switch: ON	0 – 12.75 g/L
156	Soot loading by differential pressure <Euro5>	Indicates the soot load amount calculated by the difference pressure.	Ignition switch: ON	0 – 12.75 g/L
160	Last DPF regeneration mode <Euro5>	• Last DPF regeneration request mode Not request: Not reached to the load amount which requires the regeneration Distance1: State in which the regeneration is required by the actual driving distance Distance2: State in which the regeneration is required by the distance calculated by subtracting the distance on the natural regeneration during driving from the actual driving distance Summ: State in which the regeneration is required by the load amount calculated by the quantity survey Pressure difference: State in which the regeneration is required by the load amount calculated by the difference pressure Manual: State in which the regeneration is forcibly performed by the M.U.T.-III.	Ignition switch: ON	Displays the last DPF regeneration request mode.
190	Odometer for DPF by engine-ECU <Euro5>	Indicates the driving distance for the mounted DPF.	Ignition switch: ON	0 – 1,999,999 km
191	Nonuniform soot accumulation <Euro5>	Indicates the non-uniform soot load amount.	Ignition switch: ON	0 – 100 g

Item No.	Inspection item	Explanation of M.U.T. display	Guideline for inspection	Display range, numerical value
192	Max value of DPF temperature (last DPF regeneration) <Euro5>	Indicates the maximum temperature of last DPF regeneration saved to the engine ECU.	Ignition switch: ON or DPF regeneration	–400 to 2,150 °C
193	DPF regeneration start distance 1 <Euro5>	Indicates the distance where the DPF regeneration request mode of "Distance1" launches.	Ignition switch: ON	0 – 2,550 km
194	DPF regeneration start accumulation <Euro5>	Indicates the soot load amount where the DPF regeneration request mode of "Summ" launches.	Ignition switch: ON	0 – 12.75 g/L
195	DPF regeneration start differential pressure <Euro5>	Indicates the soot load amount where the DPF regeneration request mode of "Pressure difference" launches.	Ignition switch: ON	0 – 12.75 g/L
196	DPF regeneration start distance 2 <Euro5>	Indicates the distance where the DPF regeneration request mode of "Distance2" launches.	Ignition switch: ON	0 – 2,550 km
197	DPF temperature <Euro5>	Indicates the present estimated DPF centre temperature.	Ignition switch: ON or DPF regeneration	–400 to 2,150 °C
198	Engine oil level calculated <Euro5>	Indicates the estimated engine oil level difference.	Engine: Idle operation	–1,000 to 1,500 cc
199	Engine oil consumption calculate <Euro5>	Indicates the estimated descend of the engine oil level.	Engine: Idle operation	–1,000 to 1,500 cc

Item No.	Inspection item	Explanation of M.U.T. display	Guideline for inspection	Display range, numerical value
200	Fuel dilution calculated by engine-ECU <Euro5>	Indicates the estimated ascend of engine oil level.	Engine: Idle operation	−1,000 to 1,500 cc
201	Pre-regeneration remain soot value <Euro5>	Indicates the target amount of burned soot in the DPF regeneration step 1.	Ignition switch: ON	0 − 12.75 g
202	Pre-regeneration soot value <Euro5>	Indicates the current amount of burned soot in the DPF regeneration step 1.	Ignition switch: ON	0 − 12.75 g
204	DPF regeneration mode 2 times before <Euro5>	• DPF regeneration request mode of 2 times before Not request: Not reached to the load amount which requires the regeneration Distance1: State in which the regeneration is required by the actual driving distance Distance2: State in which the regeneration is required by the distance calculated by subtracting the distance on the natural regeneration during driving from the actual driving distance Summ: State in which the regeneration is required by the load amount calculated by the quantity survey Pressure difference: State in which the regeneration is required by the load amount calculated by the difference pressure Manual: State in which the regeneration is forcibly performed by the M.U.T.-III.	Ignition switch: ON	Displays the DPF regeneration request mode of 2 times before

Item No.	Inspection item	Explanation of M.U.T. display	Guideline for inspection	Display range, numerical value
205	DPF regeneration mode 3 times before <Euro5>	• DPF regeneration request mode of 3 times before Not request: Not reached to the load amount which requires the regeneration Distance1: State in which the regeneration is required by the actual driving distance Distance2: State in which the regeneration is required by the distance calculated by subtracting the distance on the natural regeneration during driving from the actual driving distance Summ: State in which the regeneration is required by the load amount calculated by the quantity survey Pressure difference: State in which the regeneration is required by the load amount calculated by the difference pressure Manual: State in which the regeneration is forcibly performed by the M.U.T.-III.	Ignition switch: ON	Displays the DPF regeneration request mode of 3 times before.
206	DPF regeneration mode 4 times before <Euro5>	• DPF regeneration request mode of 4 times before Not request: Not reached to the load amount which requires the regeneration Distance1: State in which the regeneration is required by the actual driving distance Distance2: State in which the regeneration is required by the distance calculated by subtracting the distance on the natural regeneration during driving from the actual driving distance Summ: State in which the regeneration is required by the load amount calculated by the quantity survey Pressure difference: State in which the regeneration is required by the load amount calculated by the difference pressure Manual: State in which the regeneration is forcibly performed by the M.U.T.-III.	Ignition switch: ON	Displays the DPF regeneration request mode of 4 times before.

Item No.	Inspection item	Explanation of M.U.T. display	Guideline for inspection	Display range, numerical value
207	DPF regeneration mode 5 times before <Euro5>	• DPF regeneration request mode of 5 times before Not request: Not reached to the load amount which requires the regeneration Distance1: State in which the regeneration is required by the actual driving distance Distance2: State in which the regeneration is required by the distance calculated by subtracting the distance on the natural regeneration during driving from the actual driving distance Summ: State in which the regeneration is required by the load amount calculated by the quantity survey Pressure diff.: State in which the regeneration is required by the load amount calculated by the difference pressure Manual: State in which the regeneration is forcibly performed by the M.U.T.-III.	Ignition switch: ON	Displays the DPF regeneration request mode of 5 times before.
208	Short interval DPF regeneration count <Euro5>	Indicates the times of DPF regeneration performed under the distance of 10 km or less after the last DPF regeneration.	Ignition switch: ON	Displays the regeneration times.
217	Variable geometry turbocharger feedback target boost pressure <Euro5>	Indicates the target boost pressure.	Engine: Excessive acceleration after warm-up	0 – 340 kPa
219	Fuel injection quantity main	Indicates the main injection quantity of the injector.	Engine: Idle operation	0 – 90 mm^3/st
220	Fuel injection quantity after	Indicates the after injection quantity.	Engine: Idle operation or DPF regeneration	0 – 25.5 mm^3/st

Item No.	Inspection item	Explanation of M.U.T. display	Guideline for inspection	Display range, numerical value
221	Fuel injection quantity post 1	Indicates the 1st post injection quantity on the DPF regeneration.	On DPF regeneration	0 – 25.5 mm^3/st
222	Fuel injection quantity post 2	Indicates the 2nd post injection quantity on the DPF regeneration.	On DPF regeneration	0 – 25.5 mm^3/st
223	Fuel injection quantity post 3	Indicates the 3rd post injection quantity on the DPF regeneration.	On DPF regeneration	0 – 25.5 mm^3/st
224	Differential pressure learning temperature (M0) <Euro5>	Indicates the temperature when the compensation amount (M0) of exhaust differential pressure sensor was saved.	Ignition switch: ON	–35 to –26°C
225	Differential pressure learning zero (M0) <Euro5>	Indicates the compensation amount (M0) of exhaust differential pressure sensor when the exhaust differential pressure sensor ambient air temperature is between –35 and –26°C.	Ignition switch: ON	–5.12 to 5.08 kPa
226	Differential pressure learning temperature (M1) <Euro5>	Indicates the temperature when the compensation amount (M1) of exhaust differential pressure sensor was saved.	Ignition switch: ON	–25 to –16 °C
227	Differential pressure learning zero (M1) <Euro5>	Indicates the compensation amount (M1) of exhaust differential pressure sensor when the exhaust differential pressure sensor ambient air temperature is between –25 and –16°C.	Ignition switch: ON	–5.12 to 5.08 kPa
229	Differential pressure learning temperature (M2) <Euro5>	Indicates the temperature when the compensation amount (M2) of exhaust differential pressure sensor was saved.	Ignition switch: ON	–15 to –6°C
230	Differential pressure learning zero (M2) <Euro5>	Indicates the compensation amount (M2) of exhaust differential pressure sensor when exhaust differential pressure sensor ambient air temperature is between –15 and –6°C.	Ignition switch: ON	–5.12 to 5.08 kPa

Item No.	Inspection item	Explanation of M.U.T. display	Guideline for inspection	Display range, numerical value
231	Differential pressure learning temperature (M3) <Euro5>	Indicates the temperature when the compensation amount (M3) of exhaust differential pressure sensor was saved.	Ignition switch: ON	–5 to 4 °C
232	Differential pressure learning zero (M3) <Euro5>	Indicates the compensation amount (M3) of exhaust differential pressure sensor when the exhaust differential pressure sensor ambient air temperature is between –5 and 4°C.	Ignition switch: ON	–5.12 to 5.08 kPa
234	Differential pressure learning temperature (M4) <Euro5>	Indicates the temperature when the compensation amount (M4) of exhaust differential pressure sensor was saved.	Ignition switch: ON	5 to 14°C
235	Differential pressure learning zero (M4) <Euro5>	Indicates the compensation amount (M4) of exhaust differential pressure sensor when the exhaust differential pressure sensor ambient air temperature is between 5 and 14°C.	Ignition switch: ON	–5.12 to 5.08 kPa
236	Differential pressure learning temperature (M5) <Euro5>	Indicates the temperature when the compensation amount (M5) of exhaust differential pressure sensor was saved.	Ignition switch: ON	15 to 24°C
237	Differential pressure learning zero (M5) <Euro5>	Indicates the compensation amount (M5) of exhaust differential pressure sensor when the exhaust differential pressure sensor ambient air temperature is between 15 and 24°C.	Ignition switch: ON	–5.12 to 5.08 kPa
239	Differential pressure learning temperature (M6) <Euro5>	Indicates the temperature when the compensation amount (M6) of exhaust differential pressure sensor was saved.	Ignition switch: ON	25 to 34°C
240	Differential pressure learning zero (M6) <Euro5>	Indicates the compensation amount (M6) of exhaust differential pressure sensor when the exhaust differential pressure sensor ambient air temperature is between 25 to 34°C.	Ignition switch: ON	–5.12 to 5.08 kPa

Item No.	Inspection item	Explanation of M.U.T. display	Guideline for inspection	Display range, numerical value
241	Differential pressure learning temperature (M7) <Euro5>	Indicates the temperature when the compensation amount (M7) of exhaust differential pressure sensor was saved.	Ignition switch: ON	35 to 44 °C
242	Differential pressure learning zero (M7) <Euro5>	Indicates the compensation amount (M7) of exhaust differential pressure sensor when the exhaust differential pressure sensor ambient air temperature is between 35 and 44°C.	Ignition switch: ON	–5.12 to 5.08 kPa
244	Differential pressure learning temperature (M8) <Euro5>	Indicates the temperature when the compensation amount (M8) of exhaust differential pressure sensor was saved.	Ignition switch: ON	45 to 54°C
245	Differential pressure learning zero (M8) <Euro5>	Indicates the compensation amount (M8) of exhaust differential pressure sensor when the exhaust differential pressure sensor ambient air temperature is between 45 and 54°C.	Ignition switch: ON	–5.12 to 5.08 kPa
246	Differential pressure learning temperature (M9) <Euro5>	Indicates the temperature when the compensation amount (M9) of exhaust differential pressure sensor was saved.	Ignition switch: ON	55 to 64°C
247	Differential pressure learning zero (M9) <Euro5>	Indicates the compensation amount (M9) of exhaust differential pressure sensor when the exhaust differential pressure sensor ambient air temperature is between 55 and 64°C.	Ignition switch: ON	–5.12 to 5.08 kPa
249	Differential pressure learning temperature (M10) <Euro5>	Indicates the temperature when the compensation amount (M10) of exhaust differential pressure sensor was saved.	Ignition switch: ON	65 to 74°C
250	Differential pressure learning zero (M10) <Euro5>	Indicates the compensation amount (M10) of exhaust differential pressure sensor when the exhaust differential pressure sensor ambient air temperature is between 65 to 74°C.	Ignition switch: ON	–5.12 to 5.08 kPa

Item No.	Inspection item	Explanation of M.U.T. display	Guideline for inspection	Display range, numerical value
251	Differential pressure learning temperature (M11) <Euro5>	Indicates the temperature when the compensation amount (M11) of exhaust differential pressure sensor was saved.	Ignition switch: ON	75 to 84 °C
252	Differential pressure learning zero (M11) <Euro5>	Indicates the compensation amount (M11) of exhaust differential pressure sensor when the exhaust differential pressure sensor ambient air temperature is between 75 to 84°C.	Ignition switch: ON	–5.12 to 5.08 kPa
254	Differential pressure learning temperature (M12) <Euro5>	Indicates the temperature when the compensation amount (M12) of exhaust differential pressure sensor was saved.	Ignition switch: ON	85 to 94°C
255	Differential pressure learning zero (M12) <Euro5>	Indicates the compensation amount (M12) of exhaust differential pressure sensor when the exhaust differential pressure sensor ambient air temperature is between 85 and 94°C.	Ignition switch: ON	–5.12 to 5.08 kPa
256	Differential pressure learning temperature (M13) <Euro5>	Indicates the temperature when the compensation amount (M13) of exhaust differential pressure sensor was saved.	Ignition switch: ON	95 to 104°C
257	Differential pressure learning zero (M13) <Euro5>	Indicates the compensation amount (M13) of exhaust differential pressure sensor when the exhaust differential pressure sensor ambient air temperature is between 95 and 104°C.	Ignition switch: ON	–5.12 to 5.08 kPa
259	Differential pressure learning temperature (M14) <Euro5>	Indicates the temperature when the compensation amount (M14) of exhaust differential pressure sensor was saved.	Ignition switch: ON	105 to 114°C
260	Differential pressure learning zero (M14) <Euro5>	Indicates the compensation amount (M14) of exhaust differential pressure sensor when the exhaust differential pressure sensor ambient air temperature is between 105 and 114°C.	Ignition switch: ON	–5.12 to 5.08 kPa

Item No.	Inspection item	Explanation of M.U.T. display	Guideline for inspection	Display range, numerical value
261	Differential pressure learning temperature (M15) <Euro5>	Indicates the temperature when the compensation amount (M15) of exhaust differential pressure sensor was saved.	Ignition switch: ON	115 to 124°C
262	Differential pressure learning zero (M15) <Euro5>	Indicates the compensation amount (M15) of exhaust differential pressure sensor when the exhaust differential pressure sensor ambient air temperature is between 115 and 124°C.	Ignition switch: ON	−5.12 to 5.08 kPa
318	DPF regeneration remaining time <Euro5>	Indicating DPF regeneration remaining time. If DPF temperature is low, numerical value is not reduced.	On DPF regeneration	Indicating DPF regeneration remaining time
321	DPF regeneration <Euro5>	Showing whether DPF regeneration is being performed or not.	Ignition switch: ON	ON (during DPF regeneration), OFF (during not DPF regeneration)
328	DPF regeneration request <Euro5>	Showing whether engine-ECU requires DPF regeneration or not.	Ignition switch: ON	ON (during DPF regeneration request), OFF (during not DPF regeneration request)
377	Max value of DPF temperature <Euro5>	Indicating maximum temperature of DPF regeneration stored in engine-ECU	Ignition switch: ON	−400 to 2,150 °C
384	Odometer at DPF temperature max value <Euro5>	Indicates the driving distance at the maximum DPF temperature saved to the engine-ECU.	Ignition switch: ON	0 − 1,999,999 km
391	Count of Regeneration Request <Euro5>	Indicates the DPF regeneration request times saved to the engine-ECU.	Ignition switch: ON	0 − 65,535

Item No.	Inspection item	Explanation of M.U.T. display	Guideline for inspection	Display range, numerical value
404	Battery current sensor (learning value) <Euro5>	Indicates the learning value of battery current sensor calibration.	Ignition switch: ON	–6 to 6 A
435	Last battery deteriorated odometer <Euro5>	Indicates the travel distance when the battery is judged to be low at the last time.	Ignition switch: ON	0 – 262,140 km
436	2nd last battery deteriorated odometer <Euro5>	Indicates the travel distance when the battery was judged to be low two times before.	Ignition switch: ON	0 – 262,140 km
437	3rd last battery deteriorated odometer <Euro5>	Indicates the travel distance when the battery was judged to be low three times before.	Ignition switch: ON	0 – 262,140 km
452	Battery current sensor (learning value of neutral point) <Euro5>	• Indicates learning conditions of battery current sensor calibration. • Message "Completed" means learning has been completed. Message "Not completed" means learning has been not completed.	Ignition switch: ON	Varies depending on the learning conditions
454	Battery degrade judgement flag <Euro5>	Indicates the battery deterioration.	Ignition switch: ON	ON (deteriorated)*2, OFF (not deteriorated)
455	Battery full-charge mode flag <Euro5>	Indicates the battery full charge control is being taken.	Ignition switch: ON	ON (the battery full charge control is being taken.), OFF (the battery full charge control is not taken.)

Item No.	Inspection item	Explanation of M.U.T. display	Guideline for inspection	Display range, numerical value
488	Brake override operated odometer <Euro5>	Shows the driving distance when the engine-ECU activates the previous brake override control.	Ignition switch: ON	0 – 1,999,999 km
489	Fuel torque target	Indicates the final target torque	• Engine: After warm-up, idle operation • Lights and all accessories: OFF • Transmission: Neutral <M/T> or P range <A/T>	0 – 60 Nm
490	Fuel injection quantity pilot 1	Indicates the pilot injection quantity	• Engine: After warm-up, idle operation • Lights and all accessories: OFF • Transmission: Neutral <M/T> or P range <A/T>	0 – 3 mm3/st
491	Fuel injection quantity pilot 2	Indicates the pilot injection quantity	• Engine: After warm-up, idle operation • Lights and all accessories: OFF • Transmission: Neutral <M/T> or P range <A/T>	0 – 3 mm3/st
492	Fuel injection quantity pilot 3	Indicates the pilot injection quantity	• Engine: After warm-up, idle operation • Lights and all accessories: OFF • Transmission: Neutral <M/T> or P range <A/T>	0 – 3 mm3/st

*NOTE: *1: This item is indicated as follows. FF: Initial condition, 0: Non-learning state, 1: Temporary learning completed status, 2: Learning completed status, 3: Non-learning state.*

*NOTE: *2: The deterioration level does not request that the battery must be replaced soon.*

Actuator Test Reference Table

M1133004400711

Item No.	Check item	Drive contents	Inspection conditions	Value to be determined as normal		Code No. or inspection procedure No.	Reference page
1	Engine check lamp	Turn the warning lamp on or off	Ignition switch: ON	The warning lamp turns on.		Procedure No. 2, 3	P.13A-438, P.13A-441
2	Glow lamp	Turn the glow lamp on or off	Ignition switch: ON	The glow lamp turns on.		–	–
3	Glow plug relay	Turning the relay from OFF to ON	Ignition switch: ON	Battery charge is energized to the glow plug when the glow plug relay is ON.		–	–
4	A/C relay	Turning the relay from OFF to ON	Ignition switch: ON	The A/C compressor clutch makes an audible sound.		Procedure No. 23	P.13A-512
5	Condenser fan relay <Vehicles with A/C condenser fan>	Turning the relay from OFF to ON	Ignition switch: ON	The condenser fan rotates		Procedure No. 21	P.13A-507
15	Injector No. 1	Cut off No. 1 injector	• Ignition switch: ON • Engine: Idling • Vehicle speed: 0 km/h	ON → OFF	Engine is changed (becomes unstable)	Code No. P0201	P.13A-158
			• Ignition switch: ON • Engine: not running	OFF → ON	The solenoid of Injector is driven.		
16	Injector No. 2	Cut off No. 2 injector	• Ignition switch: ON • Engine: Idling • Vehicle speed: 0 km/h	ON → OFF	Engine is changed (becomes unstable)	Code No. P0202	P.13A-161 <Euro5>, P.13A-164 <Except Euro5>
			• Ignition switch: ON • Engine: not running	OFF → ON	The solenoid of Injector is driven.		

Item No.	Check item	Drive contents	Inspection conditions	Value to be determined as normal		Code No. or inspection procedure No.	Reference page
17	Injector No. 3	Cut off No. 3 injector	• Ignition switch: ON • Engine: Idling • Vehicle speed: 0 km/h	ON → OFF	Engine is changed (becomes unstable)	Code No. P0203	P.13A-167 <Euro5>, P.13A-170 <Except Euro5>
			• Ignition switch: ON • Engine: not running	OFF → ON	The solenoid of Injector is driven.		
18	Injector No. 4	Cut off No. 4 injector	• Ignition switch: ON • Engine: Idling • Vehicle speed: 0 km/h	ON → OFF	Engine is changed (becomes unstable)	Code No. P0204	P.13A-173 <Euro5>, P.13A-176 <Except Euro5>
			• Ignition switch: ON • Engine: not running	OFF → ON	The solenoid of Injector is driven.		
19	Suction control valve	Turn the suction control valve from OFF to ON	• Ignition switch: ON • Engine: not running	The suction control valve of supply pump is driven.		Code No. P0003, P0004, P0089 <Euro5> P0089, P0628, P0629 <Except Euro5>	P.13A-26, P.13A-29, P.13A-63 <Euro5> P.13A-63, P.13A-276, P.13A-279 <Except Euro5>
25	EGR valve 0 %	Lift position reaches 0 %	• Ignition switch: ON • Engine: Idling • Vehicle speed: 0 km/h	EGR valve lift driven into 0% position		–	–
26	EGR valve 50 %	Lift position reaches 50 %	• Ignition switch: ON • Engine: Idling • Vehicle speed: 0 km/h	EGR valve lift driven into 50% position		–	–

Item No.	Check item	Drive contents	Inspection conditions	Value to be determined as normal	Code No. or inspection procedure No.	Reference page
27	EGR valve 100 %	Lift position reaches 100 %	• Ignition switch: ON • Engine: Idling • Vehicle speed: 0 km/h	EGR valve lift driven into 100% position	–	–
28	Throttle valve 0 deg	Throttle valve is 0 deg open	• Ignition switch: ON • Engine: not running	Throttle valve is driven into 0 deg position	–	–
29	Throttle valve 45 deg	Throttle valve is 45 deg open	• Ignition switch: ON • Engine: not running	Throttle valve is driven into 45 deg position	–	–
30	Throttle valve 90 deg	Throttle valve is 90 deg open	• Ignition switch: ON • Engine: not running	Throttle valve is driven into 90 deg position	–	–
36	Variable geometry control solenoid valve <Euro5>	Turn the variable geometry control solenoid valve from OFF to ON	Engine: Idling	Variable geometry actuator is operated.	Code No. P0047, P0048	P.13A-34, P.13A-40
44	DPF lamp <Euro5>	Turn the DPF lamp on	Ignition switch: ON	Turn the DPF lamp on.	Procedure No. 29	P.13A-537

CHECK AT THE ECU TERMINALS

M1133004500901

TERMINAL VOLTAGE CHECK CHART

⚠ ***WARNING***

A high-tension voltage is flowing between the engine-ECU and the injectors while the engine is running. Handle them carefully to avoid receiving electric shocks from the voltage.

1. Connect a needle-nosed wire probe to a voltmeter probe.
2. Insert the needle-nosed wire probe into each of the engine-ECU connector terminals from the wire side, and measure the voltage while referring to the check chart.

NOTE:

1. *Make the voltage measurement with the engine-ECU connector connected.*
2. *You may find it convenient to pull out the engine-ECU to make it easier to reach the connector terminals.*
3. *The chart procedures do not have the particular order.*

⚠ **CAUTION**

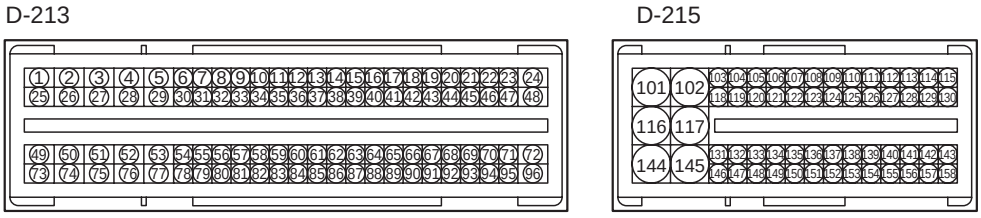
Short-circuiting the positive (+) probe between a connector terminal and earth could damage the vehicle wiring, the sensor, engine-ECU or all of them. Be careful to prevent this!

3. If voltmeter shows any division from standard value, check the corresponding sensor, actuator and related electrical wiring, then repair or replace.

4. After repair or replacement, recheck with the voltmeter to confirm that the repair has corrected the problem.

Engine-ECU Connector Terminal Arrangement

Engine-ECU connector



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Terminal No.	Check item	Inspection condition (engine status)		Normal condition:
6	PTC heater control signal <Vehicles with PTC heater>	• Heater temperature setting: Maximum • Blower fan: ON		System voltage
		Other than the above		1 V or less
8	A/C switch	Engine: Idle speed (after warning up)	A/C switch: OFF	1 V or less
			A/C switch: ON (A/C compressor in operation)	System voltage
9	Back-up lamp shift switch <M/T>	Ignition switch: ON	Shift position: Reverse	System voltage
			Shift position: Except reverse	1 V or less
10	Rear window defogger relay <Euro5>	Engine: Idling after warning up the engine	Rear window defogger: OFF	1 V or less
			Rear window defogger: ON	System voltage
11	1st and 2nd shift switch <M/T>	Ignition switch: ON	Shift position: 1st	System voltage
			Shift position: Except 1st	1 V or less
12	A/C load signal <Vehicles with automatic A/C>	• Engine: Idling after warning up the engine • A/C switch: ON	A/C compressor clutch not in operation	1 V or less
			A/C compressor clutch in operation	1 V or less ⇔ System voltage (Changes repeatedly)
13	4LLC switch <M/T-high power engine vehicle>	Ignition switch: ON	Shift position: Except 4LLC	1 V or lower
			Shift position: 4LLC	System voltage
17	Variable geometry solenoid control valve <Euro5>	Ignition switch: ON		System voltage
		Engine: Acceleration		Changed in accordance with amount of depression of accelerator pedal

Terminal No.	Check item	Inspection condition (engine status)		Normal condition:
19	A/C compressor relay	Engine: Idle speed (after warning up)	A/C switch: OFF	System voltage
			A/C switch: ON (A/C compressor in operation)	1 V or less
20	Glow plug relay <Except Euro5>	Ignition switch: OFF → ON	Engine coolant temperature: lower than 60 °C	1 V or less → System voltage (after several seconds have elapsed)
			Engine coolant temperature: higher than 60 °C	System voltage
21	Condenser fan relay <Vehicles with A/C condenser fan>	Engine: Idling after warming up the engine	A/C switch: OFF	System voltage
			A/C switch: ON	1 V or less ⇔ System voltage (Changes repeatedly)
22	Glow lamp	• Ignition switch: OFF → ON • Engine coolant temperature: lower than 60°C		1 V or lower → System voltage (after several seconds have elapsed)
36	EGR gas temperature sensor <Euro5>	Engine: Idling after warming up the engine	Intake air temperature: 20 °C	4.2 – 4.6 V
			Intake air temperature: 50 °C	3.7 – 4.1 V
			Intake air temperature: 100 °C	2.7 – 3.1 V
			Intake air temperature: 200 °C	1.2 – 1.5 V
			Intake air temperature: 400 °C	0.3 – 0.4 V
37	Manifold absolute pressure sensor	Ignition switch: ON		0.7 – 1.2 V
		Engine: Acceleration		Increases
38	No. 2 intake air temperature sensor <Except Euro5>	Ignition switch: ON	Intake air temperature: –20 °C	4.0 – 4.6 V
			Intake air temperature: 0 °C	3.1 – 3.7 V
			Intake air temperature: 20 °C	2.1 – 2.7 V
			Intake air temperature: 40 °C	1.2 – 1.8 V
			Intake air temperature: 60 °C	0.6 – 1.2 V
			Intake air temperature: 80 °C	0.3 – 0.9 V

Terminal No.	Check item	Inspection condition (engine status)		Normal condition:
39	Battery temperature sensor <Euro5>	Ignition switch: ON	Battery temperature ambient air temperature: –20 °C	3.9 – 4.5 V
			Battery temperature ambient air temperature: 0 °C	3.2 – 3.8 V
			Battery temperature ambient air temperature: 20 °C	2.3 – 2.9 V
			Battery temperature ambient air temperature: 40 °C	1.4 – 2.0 V
			Battery temperature ambient air temperature: 60 °C	0.7 – 1.3 V
			Battery temperature ambient air temperature: 80 °C	0.3 – 0.9 V
40	Throttle position sensor	• Remove the intake air hose at the throttle body • Disconnect the connector of the electronic-controlled throttle valve • With the special tool test harness (MB991658) bridge only the mating terminals of No. 1, No. 2, and No. 4 of the disconnected connectors • Ignition switch: ON (engine stopped)	Fully close the throttle valve with your finger	0.3 – 0.7 V
			Fully open the throttle valve with your finger	4.0 V or more
43	PTC heater relay 1 <Vehicles with PTC heater>	• Engine coolant temperature: lower than 75°C • Heater temperature setting: Maximum • Blower fan: ON • 2 seconds later after the engine has start up		1 V or less
		Other than the above		System voltage

Terminal No.	Check item	Inspection condition (engine status)		Normal condition:
44	PTC heater relay 2 <Vehicles with PTC heater>	• Engine coolant temperature: lower than 75°C • Heater switch (warm up switch) is ON or vehicle speed is 20 km/h or more • Blower fan: ON • Heater temperature setting: Maximum • 2 seconds later after the engine has start up • The PTC heater 1 has been ON continuously 45 seconds or more		1 V or lower
		Other than the above		System voltage
46	Engine check lamp	Ignition switch: LOCK (OFF) → ON		1 V or lower → System voltage (after 5 seconds have elapsed)
47	DPF lamp	Ignition switch: LOCK (OFF) → ON		1 V or lower → System voltage (after 5 seconds have elapsed)
55	Fuel temperature sensor	Ignition switch: ON	Fuel temperature: –20 °C	3.9 – 4.5 V
			Fuel temperature: 0 °C	3.1 – 3.7 V
			Fuel temperature: 20 °C	2.1 – 2.7 V
			Fuel temperature: 40 °C	1.2 – 1.8 V
			Fuel temperature: 60 °C	0.6 – 1.2 V
			Fuel temperature: 80 °C	0.2 – 0.8 V
56	Exhaust differential pressure sensor <Euro5>	• Remove the pressure hoses, which are connected to each end of the exhaust differential pressure sensor. • Ignition switch: ON	Leave each end open.	0.5 – 1.5 V
			Connect a manual pump (pressure-application type) to the nipple on one side, and apply pressure.	Changes depending on the pressure
57	Exhaust gas recirculation position sensor	Engine: Idling (after warning up)		2.0 V or more
		Engine: 3,500 r/min (after warning up)		1.5 V or less
58	No. 1 exhaust gas temperature sensor <Euro5>	Engine: Idling after warming up the engine	Exhaust gas temperature: 200 °C	4.0 – 4.6 V
			Exhaust gas temperature: 400 °C	2.4 – 3.0 V
			Exhaust gas temperature: 600 °C	1.2 – 1.8 V
			Exhaust gas temperature: 800 °C	0.5 – 1.1 V

Terminal No.	Check item	Inspection condition (engine status)		Normal condition:
59	No. 2 exhaust gas temperature sensor (catalyst temperature) <Euro5>	Engine: Idling after warming up the engine	Catalyst temperature: 200 °C	4.0 – 4.6 V
			Catalyst temperature: 400 °C	2.4 – 3.0 V
			Catalyst temperature: 600 °C	1.2 – 1.8 V
			Catalyst temperature: 800 °C	0.5 – 1.1 V
60	No. 3 exhaust gas temperature sensor (DPF temperature) <Euro5>	Engine: Idling after warming up the engine	DPF temperature: 200 °C	4.0 – 4.6 V
			DPF temperature: 400 °C	2.4 – 3.0 V
			DPF temperature: 600 °C	1.2 – 1.8 V
			DPF temperature: 800 °C	0.5 – 1.1 V
62	No. 1 intake air temperature sensor	Ignition switch: ON	Intake air temperature: –20 °C	4.0 – 4.6 V
			Intake air temperature: 0 °C	3.1 – 3.7 V
			Intake air temperature: 20 °C	2.1 – 2.7 V
			Intake air temperature: 40 °C	1.2 – 1.8 V
			Intake air temperature: 60 °C	0.6 – 1.2 V
			Intake air temperature: 80 °C	0.2 – 0.8 V
63	Engine coolant temperature sensor	Ignition switch: ON	Engine coolant temperature: –20 °C	4.4 – 4.9 V
			Engine coolant temperature: 0 °C	4.4 – 4.6 V
			Engine coolant temperature: 20 °C	3.3 – 3.9 V
			Engine coolant temperature: 40 °C	2.4 – 3.0 V
			Engine coolant temperature: 60 °C	1.5 – 2.1 V
			Engine coolant temperature: 80 °C	0.9 – 1.5 V
64	Rail pressure sensor	Engine: Idling (after warning up)		1.15 – 1.75 V
66	Camshaft position sensor	Engine: Cranking		0.1 – 3.0 V*
		Engine: Idling		0.5 – 1.5 V*

Terminal No.	Check item	Inspection condition (engine status)	Normal condition:
67	Crank angle sensor	Engine: Cranking	1.5 – 4.5 V*
		Engine: Idling	2.5 – 3.5 V*
68	Crank angle sensor power supply	Ignition switch: ON	4.9 – 5.1 V
69	Camshaft position sensor power supply	Ignition switch: ON	4.9 – 5.1 V
70	Rail pressure sensor power supply	Ignition switch: ON	4.9 – 5.1 V
71	Exhaust gas recirculation position sensor power supply	Ignition switch: ON	4.9 – 5.1 V
72	Manifold absolute pressure sensor power supply	Ignition switch: ON	4.9 – 5.1 V
93	Throttle position sensor power supply	Ignition switch: ON	4.9 – 5.1 V
94	Exhaust differential pressure sensor power supply <Euro5>	Ignition switch: ON	4.9 – 5.1 V
101	Battery	Ignition switch: ON	System voltage
102			
103	Backup power supply	Ignition switch: "LOCK" (OFF)	System voltage
104	Ignition switch-IG	Ignition switch: ON	System voltage
110	Fuel filter pressure switch <Vehicles for Russia and Morocco>	Engine: Idling (after warning up)	System voltage
		• Engine: Acceleration • Squeeze the fuel hose with one's fingers at the inlet side of the fuel filter.	1 V or less
111	Ignition switch-ST	Engine: Cranking	System voltage
114	Throttle valve control servo (positive)	Engine: Stopped from idling speed	Voltage changed for few seconds
115	Exhaust gas recirculation motor (positive)	Engine: Idling (after warning up)	1 – 3 V*
		Engine: 3,500 r/min (after warning up)	1.0 V or less
118	Engine control relay	Ignition switch: "LOCK" (OFF)	System voltage
		Ignition switch: ON	1 V or less

Terminal No.	Check item	Inspection condition (engine status)		Normal condition:
120	Glow control unit <Euro5>	Engine: Idling	Engine coolant temperature: lower than 40°C	System voltage
			Engine coolant temperature: lower than 80°C	1 V or less
121	Alternator G terminal <Euro5>	• Engine: Idle operation after warm-up • Head lamp switch: OFF → ON • Rear window defogger switch: OFF → ON		Voltage increase
125	Blower switch <Euro5>	Engine Idle speed (after warning up)	Blower fan: OFF	1 V or less
			Blower fan: ON	System voltage
126	Glow diagnostic signal <Euro5>	Engine: Idling	Engine coolant temperature: lower than 40°C	System voltage
			Engine coolant temperature: lower than 80°C	1 V or less
127	Power steering fluid pressure switch	Engine: Idling	When steering wheel is stationary	System voltage
			When steering wheel is turned	1.0 V or less
129	Throttle valve control servo (negative)	Engine: Stopped from idling speed		Voltage changed for few seconds
131	Suction control valve (positive)	Engine: Idling		5 – 6 V*
		Engine: Acceleration		Decreases
134	Accelerator pedal position sensor (sub) power supply	Ignition switch: ON		4.9 – 5.1 V
135	Accelerator pedal position sensor (sub)	Ignition switch: ON	Release the accelerator pedal	0.2 – 0.8 V
			Depress the accelerator pedal fully	2.0 V or more
138	Battery current sensor <Euro5>	The battery is being discharged. • Engine: Cranking		The value changes by the value less than 3.5 V.
		The battery is being charged. • Leave the ignition switch being in the ON position for several minutes, and then after the engine start.		The value changes by the value more than 3.5 V*2
140	Air flow sensor	Engine: Gradually increase the speed		Voltage increase
141	Vehicle speed sensor	• Ignition switch: ON • Move the vehicle forward slowly		0 ⇔ 5 V (Changes repeatedly)
148	Battery current sensor power supply <Euro5>	Ignition switch: ON		4.9 – 5.1 V

Terminal No.	Check item	Inspection condition (engine status)		Normal condition:
149	Accelerator pedal position sensor (main) power supply	Ignition switch: ON		4.9 – 5.1 V
150	Accelerator pedal position sensor (main)	Ignition switch: ON	Release the accelerator pedal	0.7 – 1.3 V
			Depress the accelerator pedal fully	4.0 V or more

*NOTE: *:The average voltage is shown when an analog voltmeter is used (because the average voltage might not be shown stably when digital voltmeter is used).*

CHECK CHART FOR RESISTANCE AND CONTINUITY BETWEEN TERMINALS

1. Turn the ignition switch to "LOCK" (OFF) position.
2. Disconnect the engine-ECU connector.
3. Measure the resistance and check for continuity between the terminals of the engine-ECU harness-side connector while referring to the check chart.

NOTE:

1. *When measuring resistance and checking continuity, a harness for checking contact pin pressure should be used instead of inserting a test probe.*
2. *The chart procedures do not have the particular order.*

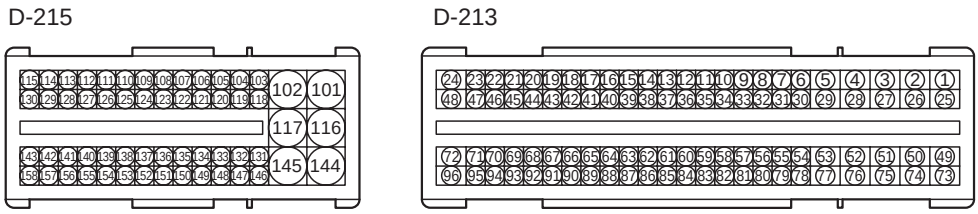
⚠ CAUTION

If the terminals that should be checked are mistaken, or if connector terminals are not correctly shorted to earth, damage may be caused to the vehicle wiring, sensors, engine-ECU and/or ohmmeter. Be careful to prevent this!

4. If the ohmmeter shows any deviation from the standard value, check the corresponding sensor, actuator and related electrical wiring, and the repair or replace.
5. After repair or replacement, recheck with the ohmmeter to confirm that the repair or replacement has corrected the problem.

Engine-ECU Harness Side Connector Terminal Arrangement

Engine-ECU harness side connector



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Terminal No.	Inspection item	Normal condition (Check condition)
1 – 2	No. 1 injector	Approximately 0.45 Ω (at 20°C)
73 – 75 <Euro5> 25 – 75 <Except Euro5>	No. 2 injector	
49 – 50 <Euro5> 25 – 50 <Except Euro5>	No. 3 injector	
25 – 27 <Euro5> 1 – 27 <Except Euro5>	No. 4 injector	
17 – 101	Variable geometry control solenoid valve <Euro5>	10 – 14 Ω (at 20°C)
30 – 36	EGR gas temperature sensor <Euro5>	55 – 78 kΩ (at –20°C)
		29 – 41 kΩ (at 0°C)
		17 – 23 kΩ (at 20°C)
		10 – 14 kΩ (at 40°C)
		7.1 – 8.8 kΩ (at 60°C)
		4.8 – 5.9 kΩ (at 80°C)
32 – 38	No. 2 intake air temperature sensor <Except Euro5>	13 – 18 kΩ (at –20°C)
		5.1 – 6.9 kΩ (at 0°C)
		2.0 – 3.0 kΩ (at 20°C)
		0.9 – 1.5 kΩ (at 40°C)
		0.40 – 0.78 kΩ (at 60°C)
		0.23 – 0.42 kΩ (at 80°C)
39 – 155	Battery temperature sensor <Euro5>	4.9 – 5.3 kΩ (at 0°C)
		2.2 – 2.6 kΩ (at 20°C)
		1.0 – 1.4 kΩ (at 40°C)
55 – 79	Fuel temperature sensor	2.0 – 3.0 kΩ (at 20 °C)
58 – 82	No. 1 exhaust gas temperature sensor <Euro5>	120 – 560 kΩ (at 20°C)

Terminal No.	Inspection item	Normal condition (Check condition)
59 – 83	No. 2 exhaust gas temperature sensor (catalyst temperature) <Euro5>	120 – 560 kΩ (at 20°C)
60 – 84	No. 3 exhaust gas temperature sensor (DPF temperature) <Euro5>	120 – 560 kΩ (at 20°C)
62 – 86	No. 1 intake air temperature sensor	13 – 18 kΩ (at –20°C)
		4.8 – 7.0 kΩ (at 0°C)
		2.1 – 2.8 kΩ (at 20°C)
		0.9 – 1.5 kΩ (at 40°C)
		0.47 – 0.69 kΩ (at 60°C)
		0.27 – 0.39 kΩ (at 80°C)
63 – 87	Engine coolant temperature sensor	14 – 17 kΩ (at –20°C)
		5.1 – 6.5 kΩ (at 0°C)
		2.1 – 2.7 kΩ (at 20°C)
		0.9 – 1.3 kΩ (at 40°C)
		0.48 – 0.68 kΩ (at 60°C)
		0.26 – 0.36 kΩ (at 80°C)
116 – Body earth	Engine-ECU earth	Continuity (2 Ω or less)
117 – Body earth		
145 – Body earth		
114 – 129	Throttle valve control servo	0.3 – 100 Ω (at 20 °C)
131 – 146	Suction control valve	Approximately 2.1 Ω (at 20°C)

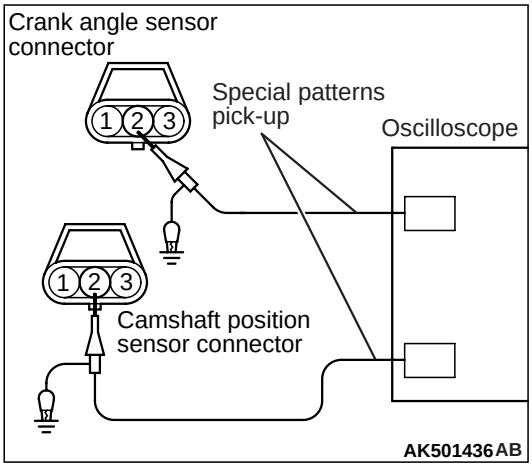
INSPECTION PROCEDURE USING OSCILLOSCOPE

M1133004600588

The output signals of the sensors and the conditions of the actuation signals of the actuators can be inspected visually by observing the waveforms on the oscilloscope.

CAMSHAFT POSITION SENSOR AND CRANK ANGLE SENSOR

Measurement Method



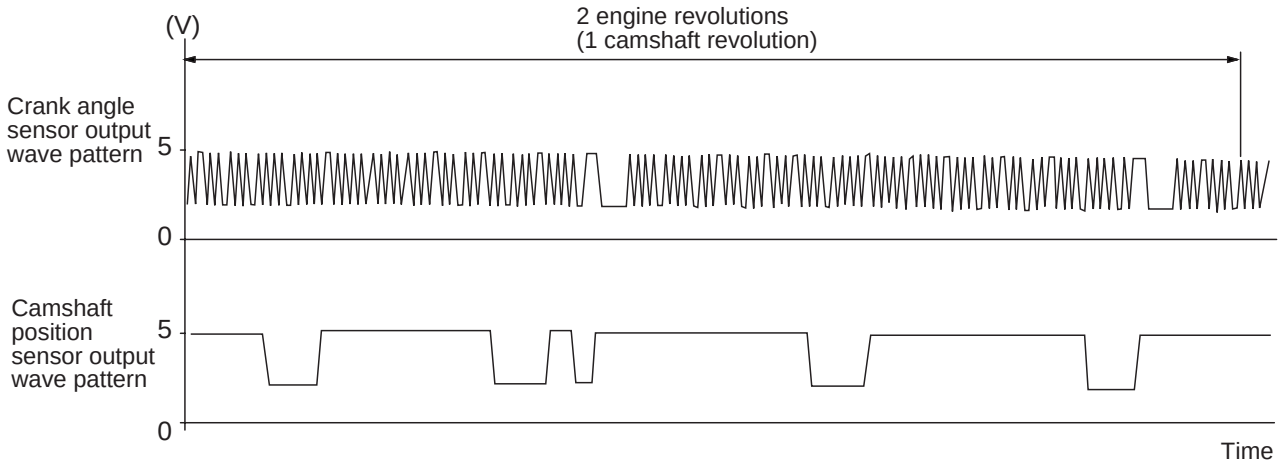
1. Disconnect the camshaft position sensor connector and connect the special tool test harness (MB991709) in between (All terminals should be connected).

2. Connect the oscilloscope special pattern pickup to camshaft position sensor terminal No. 2.
3. Disconnect the crank angle sensor intermediate connector and connect the special tool test harness (MB991709) in between.
4. Connect the oscilloscope special pattern pickup to crank angle sensor terminal No. 2.

Alternate Method (Test harness not available)

1. Connect the oscilloscope special pattern pickup to engine-ECU terminal No. 66 (When checking the camshaft position sensor signal wave pattern.)

Standard Wave Pattern



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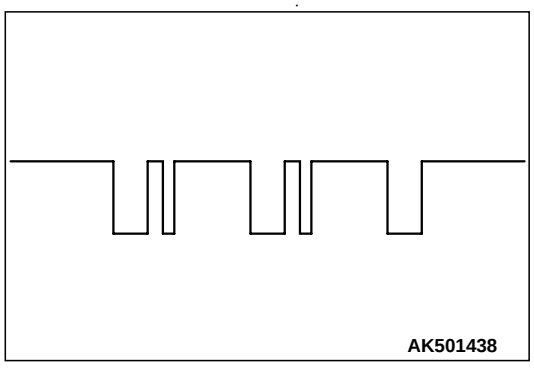
Wave Pattern Observation Points

- Check that cycle time T becomes shorter when the engine speed increases.

Examples of Abnormal Wave Patterns



AK501438

Example 1

Cause of problem

Sensor interface malfunction

2. Connect the oscilloscope special pattern pickup to engine-ECU terminal No. 67 (When checking the crank angle sensor signal wave pattern.)

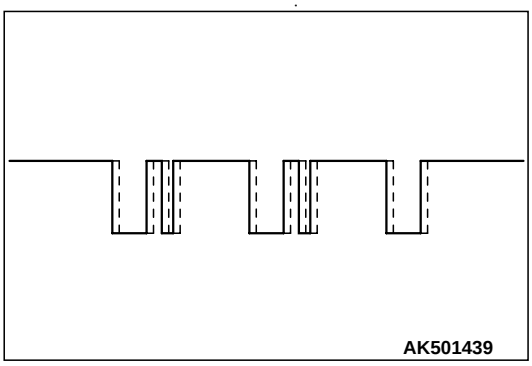
Standard Wave Pattern

Observation conditions

Function	Special patterns
Pattern height	Low
Pattern selector	Display
Engine speed	Idle

Wave pattern characteristics

Rectangular wave pattern is output even when the engine is not started.



AK501439

Example 2

Cause of problem

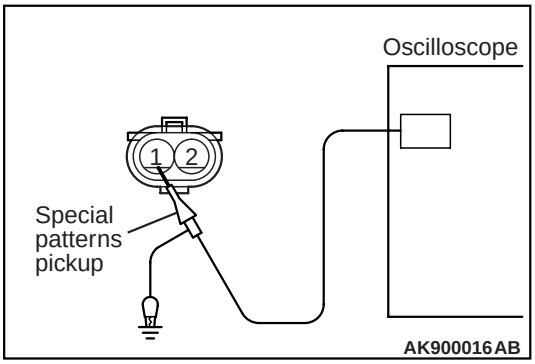
Loose timing belt
Abnormality in sensor disk

Wave pattern characteristics

Wave pattern is displaced to the left or right.

SUCTION CONTROL VALVE

Measurement Method



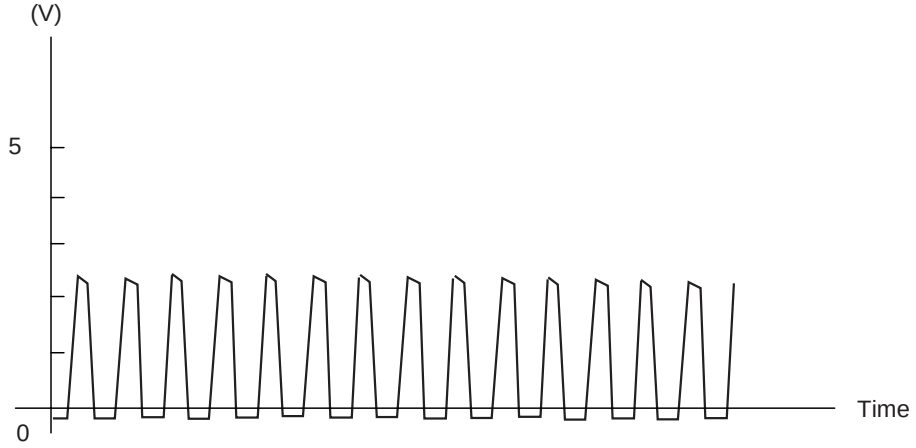
1. Disconnect the suction control valve connector, and then connect the special tool test harness (MB991658) in between (All terminals should be connected).
2. Connect the oscilloscope special pattern pickup to terminal No. 1, of the suction control valve connector.

Alternate Method (Test harness not available)

1. Connect the oscilloscope special pattern pickup to engine-ECU terminal No. 131.

Standard Wave Pattern

Standard Wave Pattern



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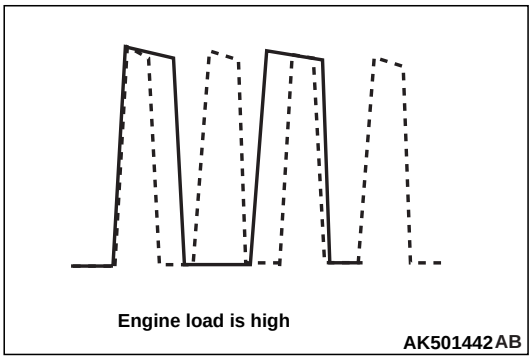
Observation conditions

Function	Special patterns
Pattern height	Variable
Variable knob	Adjust while viewing the wave pattern
Pattern selector	Display
Engine	Idle



Wave Pattern Observation Points

When fuel pressure rises while the engine load is high, the driving time of the suction control valve becomes short.

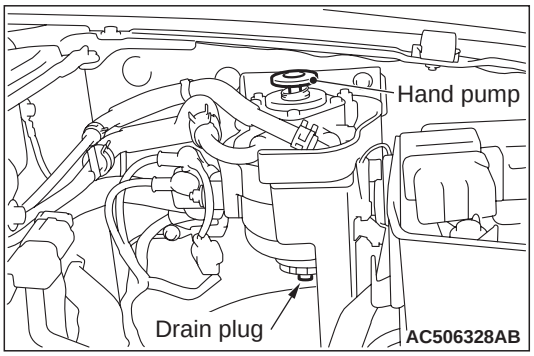
ON-VEHICLE SERVICE

EVACUATION OF WATER FROM FUEL FILTER

M1133001200406

<Vehicles with steel fuel filter case>

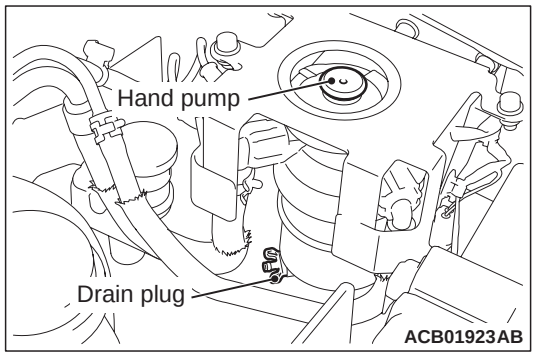
Water is in the fuel filter when fuel filter indicator lamp illuminates. Evacuate water by the following procedures.



1. Loosen the drain plug.
2. After water is evacuated by using an hand pump, tighten the drain plug.

<Vehicles with plastic fuel filter case>

Water is in the fuel filter when fuel filter indicator lamp illuminates. Evacuate water by the following procedures.



1. Loosen the drain plug.
2. After water is evacuated by using an hand pump, tighten the drain plug.

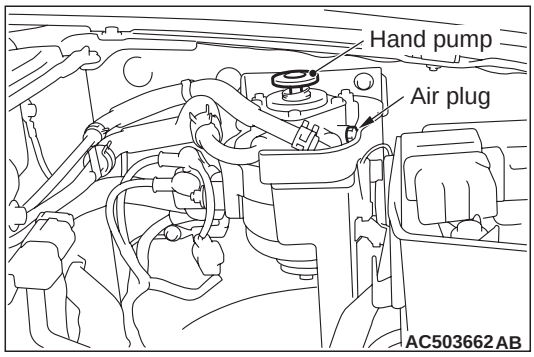
EVACUATION OF AIR FROM FUEL LINE

M1133001300362

<Vehicles with steel fuel filter case>

When the following service work(s) is done, refill the fuel tank and then evacuate air from the fuel line.

- Fuel hose or pipe is removed
- Fuel filter is replaced
- Fuel injector is removed
- If necessary for access, fuel is drained from the fuel tank.



1. Remove the fuel filter air plug and O-ring <Vehicles with air plug>.
2. Cover the circumference of the air plug hole with cloth and use a hand pump repeatedly until no bubbles come out of the air plug hole <Vehicles with air plug>.
3. Replace the air plug and O-ring with a new one. Tighten the air plug to the specified torque <Vehicles with air plug>.

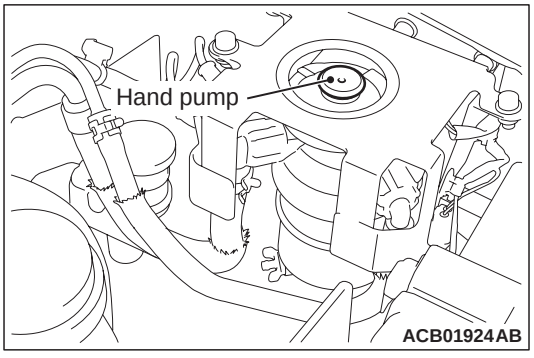
   Tightening torque: 5.0 ± 1.0 N·m

4. Repeat until the hand pump operation becomes stiff.

<Vehicles with plastic fuel filter case>

When the following service work(s) is done, refill the fuel tank and then evacuate air from the fuel line.

- Fuel hose or pipe is removed
- Fuel filter is replaced
- Fuel injector is removed
- If necessary for access, fuel is drained from the fuel tank.



1. Repeat until the hand pump operation becomes stiff.

FUEL FILTER REPLACEMENT

M1133010800387

<Vehicles with steel fuel filter case>

Refer to GROUP 13B – Fuel Filter .

<Vehicles with plastic fuel filter case>

Refer to GROUP 13B – Fuel Filter .

FUEL LINE LEAK CHECK

M1133011700189

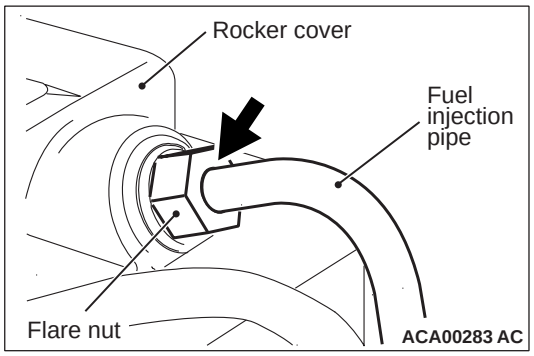
NOTE: Since the fuel injection pipe connection on the fuel injector assembly side is located inside the engine (rocker cover), visual check for fuel leak cannot be performed. Due to this, use the oil leak detection agent to check for fuel leak. As for other fuel injection pipe and the fuel supply pump pipe connection, visually check for fuel leak.

NOTE: The oil leak detection agent detects oil leak by colour change when it is applied to the area to be checked. For details on how to use the product, refer to the instruction manual.

1. Remove the engine cover assembly upper (Refer to GROUP 11A – Engine Assembly).

⚠ CAUTION

Degrease the area between the flare nut and the pipe of the fuel injection pipe by fully spraying the parts cleaner.

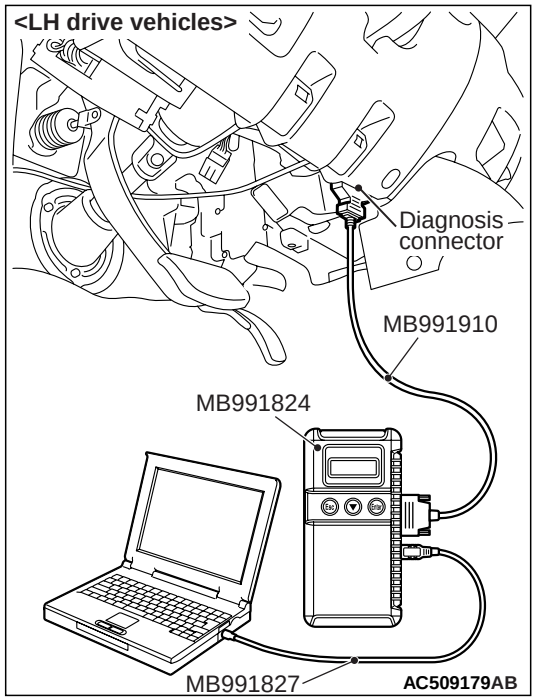


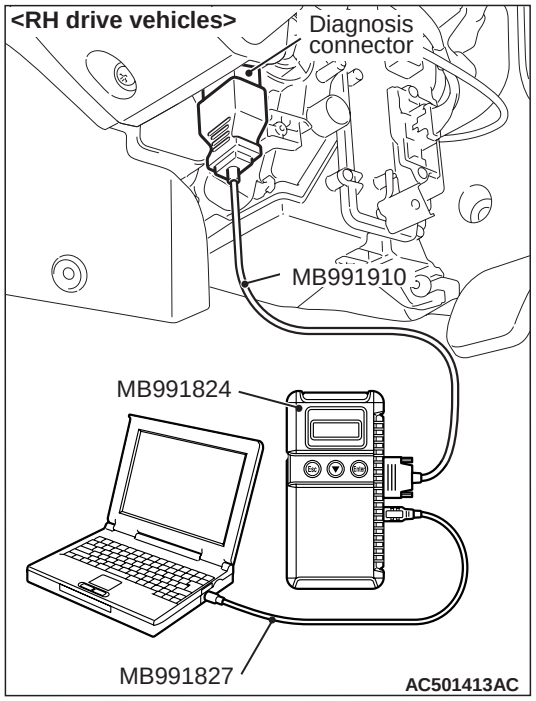
2. Carefully degrease the flare nut at the fuel injector assembly side of the fuel injection pipe with parts cleaner (MZ100387) or equivalent.
3. If the parts cleaner remains in the area between the flare nut for connection and the fuel injection pipe, the oil leak detection agent detects that there is a fuel leak. Therefore, use an air gun to blow off the remaining parts cleaner and fully dry the degreased area.
4. Apply the oil leak detection agent to the flare nut and the pipe of the fuel injection pipe.

   NOTE: It is easy to detect the oil leak when the oil leak detection agent is dry enough because the colour changes clearly. Use a dryer to dry the oil leak detection agent when it is hard to dry.

⚠ CAUTION

Before connecting or disconnecting the M.U.T.-III, turn the ignition switch to the "LOCK" (OFF) position.





5. Ensure that the ignition switch is at the "LOCK" (OFF) position.
6. Start up the personal computer.
7. Connect special tool M.U.T.-III USB cable (MB991827) to V.C.I. (MB991824) and the personal computer.
8. Connect special tool M.U.T.-III main harness A (MB991910) to the V.C.I.

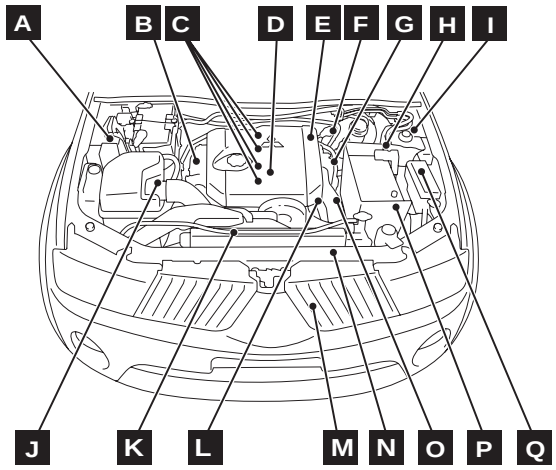
9. Connect the M.U.T.-III main harness A to the diagnosis connector of the vehicle.
10. Turn the V.C.I. power switch to the "ON" position.
    NOTE: When the V.C.I. is energized, the V.C.I. indicator lamp will be illuminated in a green colour.
11. Start the M.U.T.-III system on the personal computer and turn the ignition switch to the "ON" position.
12. Start the engine, and let it run at idle.
13. Select "MPI/GDI/DIESEL" from System select Screen of the M.U.T.-III.
14. Select "SPECIAL FUNCTION" from MPI/GDI/DIESEL Screen.
15. Select "FUEL LEAKAGE CHECK" from Test Screen. Carry out the fuel leakage check (during the test, the engine speed and the fuel pressure is 2,000 r/min and 180 MPa for 20 seconds respectively) five times in a row (20 seconds × 5 times = 100 seconds).
16. Turn the ignition switch to the "LOCK" (OFF) position, and stop the engine.
17. Disconnecting the M.U.T.-III is the reverse of the connecting sequence.
18. Check the colour change of the oil leak detection agent at the flare nut and pipe of the fuel injection pipe to check if the fuel is leaking from the fuel injection pipe connection at the fuel injector assembly side.
19. Visually check other fuel line connections for fuel leak.
20. If the fuel is leaking, replace the fuel injection pipe and the fuel supply pump pipe. (Refer to P.13A-604.)
21. If the fuel is not leaking, wipe off the oil leak detection agent using parts cleaner (MZ100387) or equivalent completely.
22. Install the engine cover assembly upper (Refer to GROUP 11A – Engine Assembly).

COMPONENT LOCATION

M1133004700660

Name	Symbol	Name	Symbol
Accelerator pedal position sensor	V	1st and 2nd rail switch <M/T>	R
A/C compressor relay	Q	Fuel filter pressure switch <Vehicle for Russia and Morocco>	I
A/C switch	Y	Fuel temperature sensor	N
Air flow sensor (incorporating intake air temperature sensor No. 1)	J	Glow control unit <Euro5>	I
Back-up lamp switch <M/T>	S	Glow plug relay <Except Euro5>	I
Battery current sensor (incorporating battery temperature sensor) <Euro5>	P	Injector	C
Camshaft position sensor	E	Intake air temperature sensor No. 2 <Except Euro5>	G
Crank angle sensor	M	Manifold absolute pressure sensor	G
Diagnosis connector	X	No. 1 exhaust gas temperature sensor <Euro5>	B
DPF lamp <Euro5>	W	No. 2 exhaust gas temperature sensor (catalyst temperature) <Euro5>	a
EGR gas temperature sensor <Euro5>	D	No. 3 exhaust gas temperature sensor (DPF temperature) <Euro5>	b
EGR valve (DC motor) (incorporating EGR valve position sensor)	F	Power steering fluid pressure switch	K
Electronic-controlled throttle valve (incorporating throttle position sensor)	G	PTC heater relay 1,2 <Vehicles with PTC heater>	H
Engine-ECU	Z	Rail pressure sensor	E
Engine control relay	Q	Starter relay	Q

Name	Symbol	Name	Symbol
Engine coolant temperature sensor	O	Suction control valve	L
Engine warning lamp (check engine lamp)	U	Variable geometry control solenoid valve <Euro5>	L
Exhaust differential pressure sensor <Euro5>	A	Vehicle speed sensor <2WD-M/T, 4WD>	T



AKB00282AB

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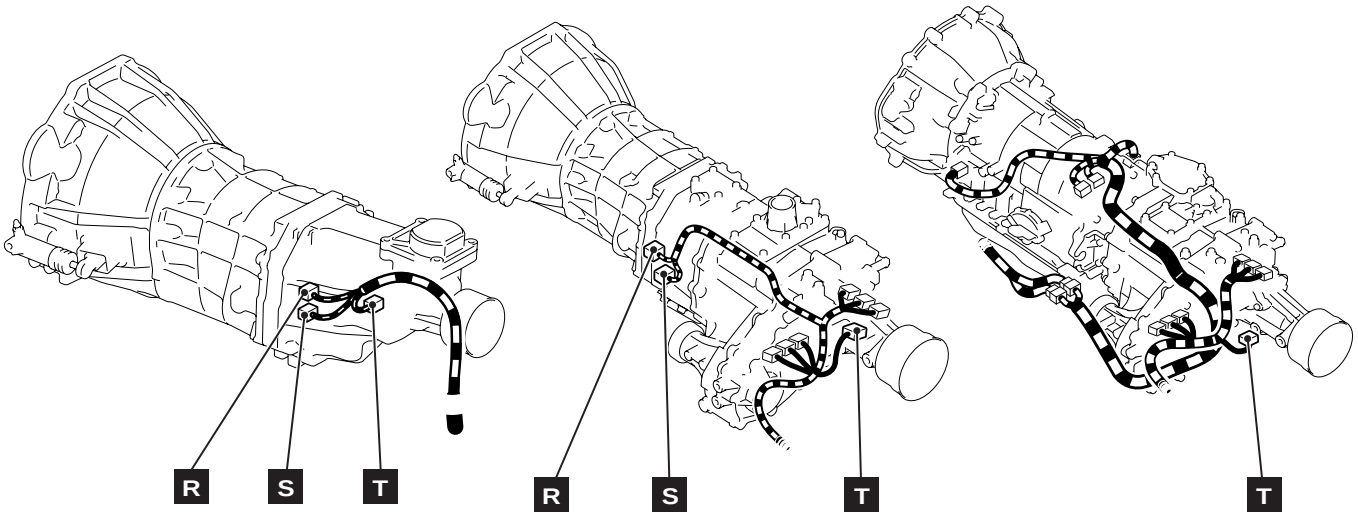
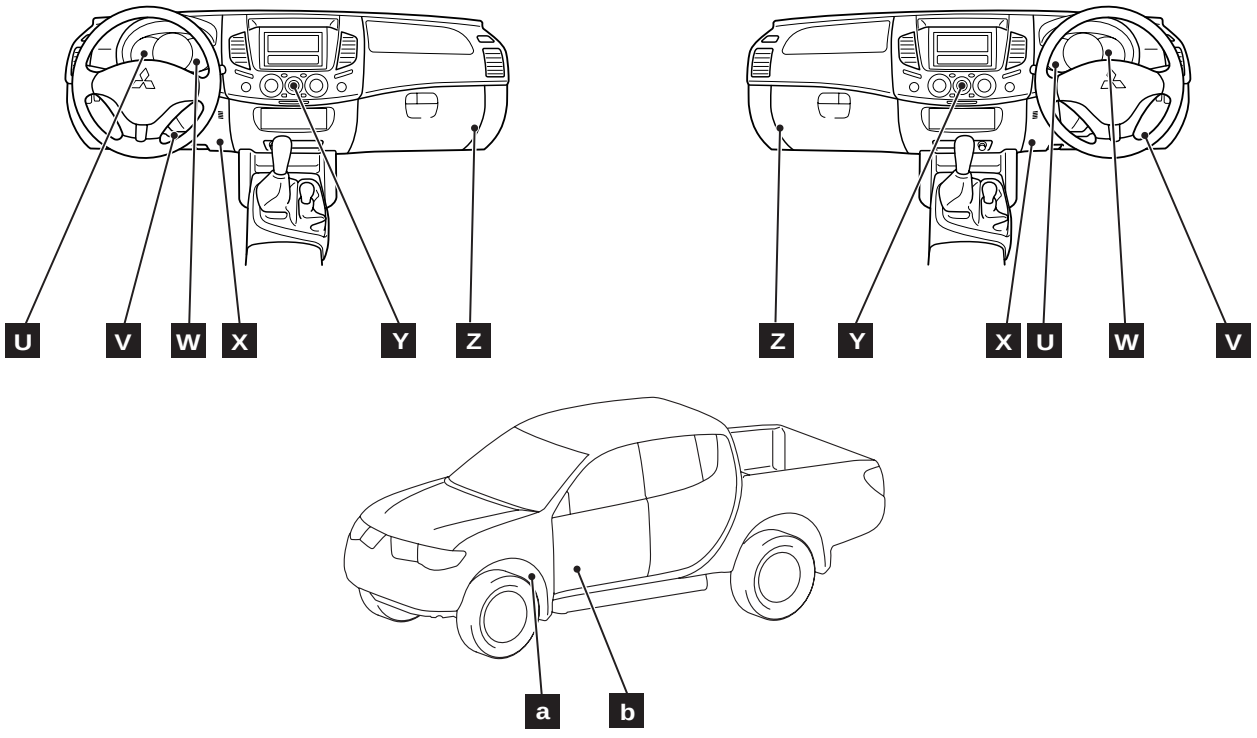


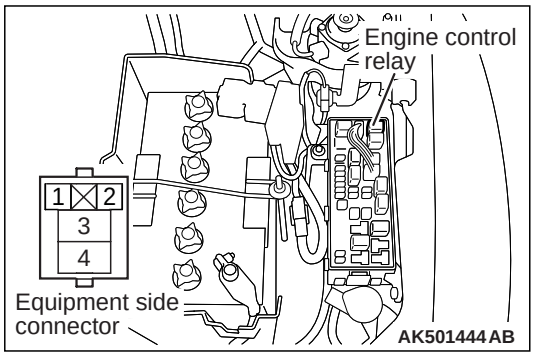
<L. H. drive vehicles> <R. H. drive vehicles>



AKB00329 AB

ENGINE CONTROL RELAY CONTINUITY CHECK

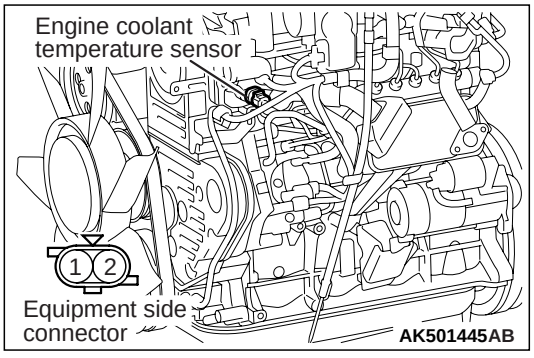
M1133008300459

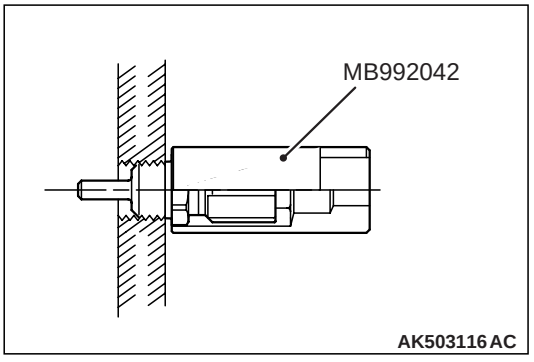


Tester Connection Terminal	Battery Voltage	Normal State
1 – 2	No voltage	Continuity
3 – 4	No voltage	No continuity
	Voltage (Connect positive (+) terminal of battery to terminal No. 1 and negative (–) terminal of battery to terminal No. 2.)	Continuity (2 Ω or less)

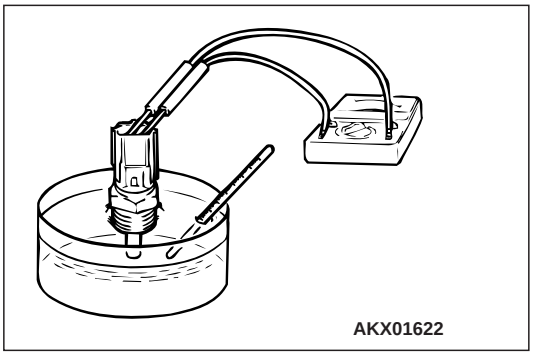
ENGINE COOLANT TEMPERATURE SENSOR CHECK

M1133005000404





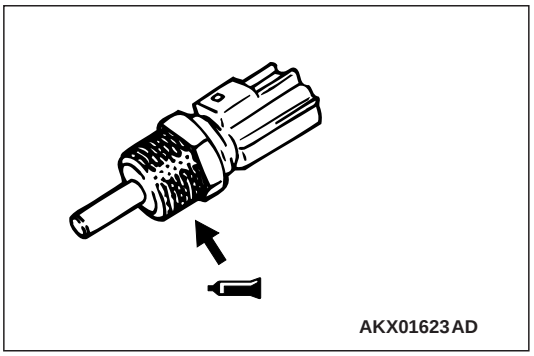
1. Remove the engine coolant temperature sensor using the special tool engine coolant temperature sensor wrench (MB992042).



2. With temperature sensing portion of engine coolant temperature sensor immersed in hot water, check resistance.

   Standard value:
   14 – 17 kΩ (at –20°C)
   5.1 – 6.5 kΩ (at 0°C)
   2.1 – 2.7 kΩ (at 20°C)
   0.9 – 1.3 kΩ (at 40°C)
   0.48 – 0.68 kΩ (at 60°C)
   0.26 – 0.36 kΩ (at 80°C)

3. If the resistance deviates from the standard value greatly, replace the sensor.



4. Apply sealant to threaded portion.

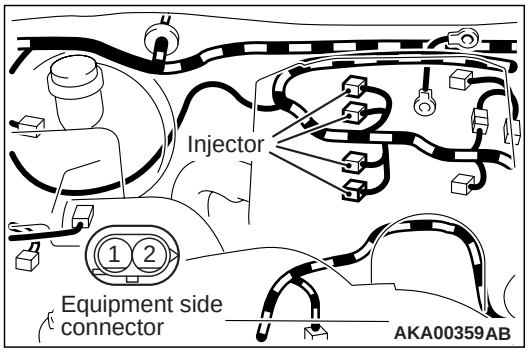
   Specified sealant:
   3M NUT Locking Part No. 4171 or equivalent

5. Tighten the engine coolant temperature sensor to the specified torque, using engine coolant temperature sensor wrench, special tool (MB992042).

   Tightening torque: 29 ± 10 N·m

INJECTOR CHECK

M1133008100314



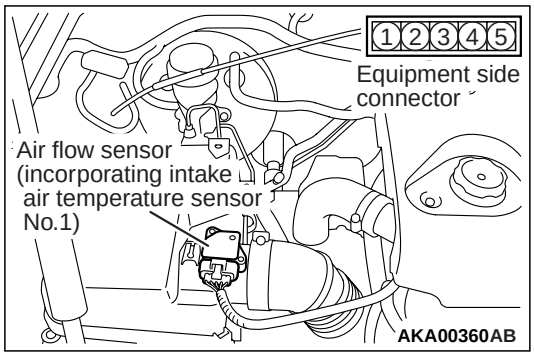
1. Disconnect the injector connector.
2. Measure the resistance between terminals No. 1 and No. 2.

   Standard value: Approximately 0.45 Ω (at 20°C)

3. If not within the standard value, replace the injector. After replacing the injector, register the injector identification code and learn fuel injection. (Refer to GROUP 00 – Precautions Before Service – What The common Rail Engine Learns).

INTAKE AIR TEMPERATURE SENSOR No. 1 CHECK

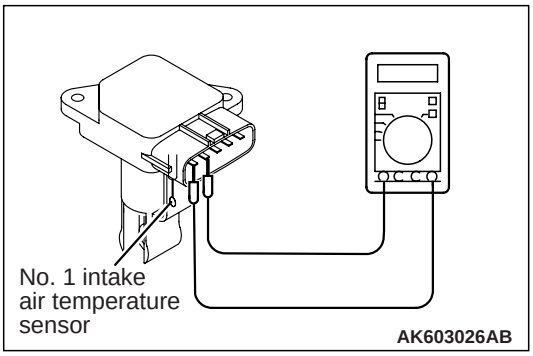
M1133010300296



1. Disconnect the air flow sensor connector.
2. Measure resistance between terminals No. 1 and No. 2.

   Standard value:
   13 – 17 kΩ (at –20°C)
   5.4 – 6.6 kΩ (at 0°C)
   2.3 – 3.0 kΩ (at 20°C)
   1.0 – 1.5 kΩ (at 40°C)
   0.56 – 0.76 kΩ (at 60°C)
   0.31 – 0.43 kΩ (at 80°C)

3. Remove the air flow sensor



4. Measure resistance while heating the sensor using a hair drier.

   Normal condition:

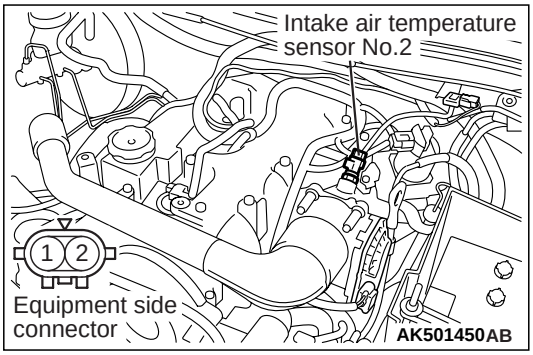
Temperature (°C)	Resistance (kΩ)
Higher	Smaller

5. If the value deviates from the standard value or the resistance remains unchanged, replace the air flow sensor assembly.
6. Install the air flow sensor and tighten it to the specified torque.

   Tightening torque: 0.7 ± 0.1 N·m

INTAKE AIR TEMPERATURE SENSOR No. 2 CHECK <Except Euro5>

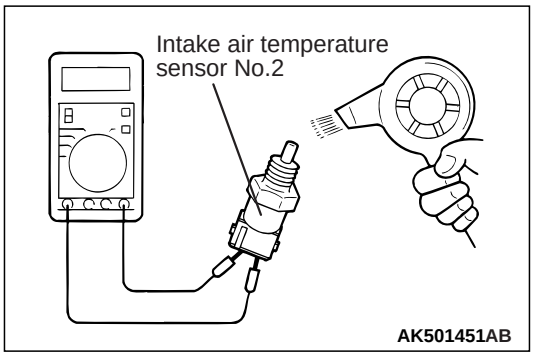
M1133010400301



1. Disconnect the intake air temperature sensor No. 2 connector.
2. Measure resistance between terminals No. 1 and No. 2.

   Standard value:
   13 – 18 kΩ (at –20°C)
   5.1 – 6.9 kΩ (at 0°C)
   2.0 – 3.0 kΩ (at 20°C)
   0.9 – 1.5 kΩ (at 40°C)
   0.40 – 0.78 kΩ (at 60°C)
   0.23 – 0.42 kΩ (at 80°C)

3. Remove the intake air temperature sensor No. 2



4. Measure resistance while heating the sensor using a hair drier.

   Normal condition:

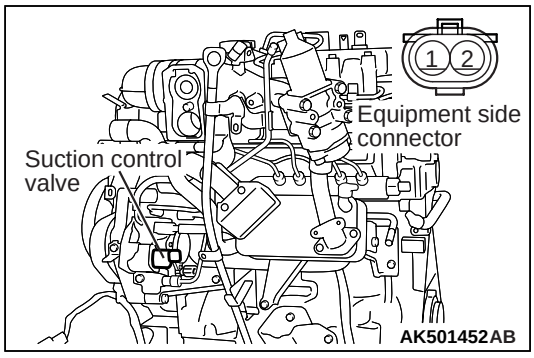
Temperature (°C)	Resistance (kΩ)
Higher	Smaller

5. If the value deviates from the standard value or the resistance remains unchanged, replace the intake air temperature sensor No. 2 sensor assembly.
6. Install the air flow sensor and tighten it to the specified torque.

   Tightening torque: 13.5 ± 1.5 N·m

SUCTION CONTROL VALVE CHECK

M1133010500290



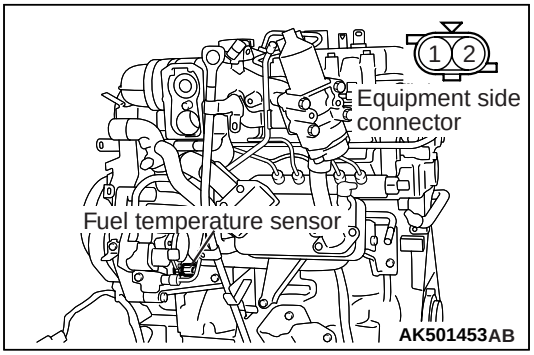
1. Disconnect the suction control valve connector.
2. Measure resistance between terminal No. 1 and No. 2

   Standard value: Approximately 2.1 Ω (at 20 °C)

3. If not within the standard value, replace the suction control valve. After replacing the suction control valve, learn the supply pump. (Refer to GROUP 00 – Precautions Before Service – What The common Rail Engine Learns).

FUEL TEMPERATURE SENSOR CHECK

M1133006800317



1. Disconnect the fuel temperature sensor connector.
2. Measure resistance between terminal No. 1 and No. 2

   Standard value: Approximately 2.0 – 3.0 kΩ (at 20 °C)

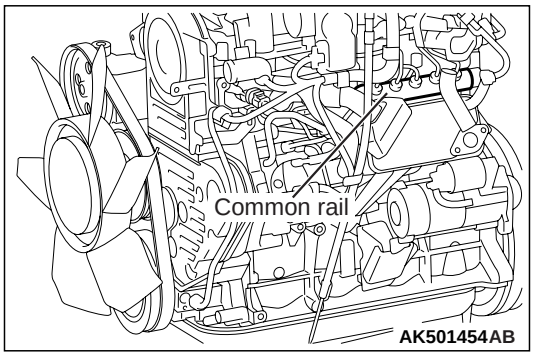
3. If not within the standard value, replace the supply pump assembly. After replacing the supply pump, learn the supply pump. (Refer to GROUP 00 – Precautions Before Service – What The common Rail Engine Learns).

COMMON RAIL CHECK

M1133010600253

⚠ CAUTION

High pressure fuel is supplied to the common rail. It is dangerous to remove the rail pressure sensor and rail pressure limiter from the common rail because it may cause fuel leaks. Do not remove the rail pressure sensor and rail pressure limiter from the common rail.



1. Visually check the common rail for cracks, damage, and corrosion.
2. If an abnormality is found, replace the common rail.

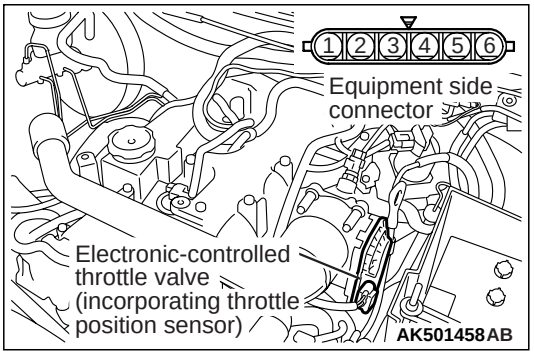
THROTTLE VALVE CONTROL SERVO CHECK

M1133010700283

OPERATION CHECK

1. Remove the air intake hose from the throttle body.
2. Turn the ignition switch to "ON" position.
3. Make sure that the throttle valve is open.
4. Turn the ignition switch to "OFF" position.

CHECK THE COIL RESISTANCE



1. Disconnect the electronic - controlled throttle valve connector.
2. Measure resistance between terminal No. 5 and No. 6 at the throttle valve control servo connector.

   Standard value: 0.3 – 100 Ω (at 20 °C)

3. If resistance is outside the standard value, replace the throttle body assembly.

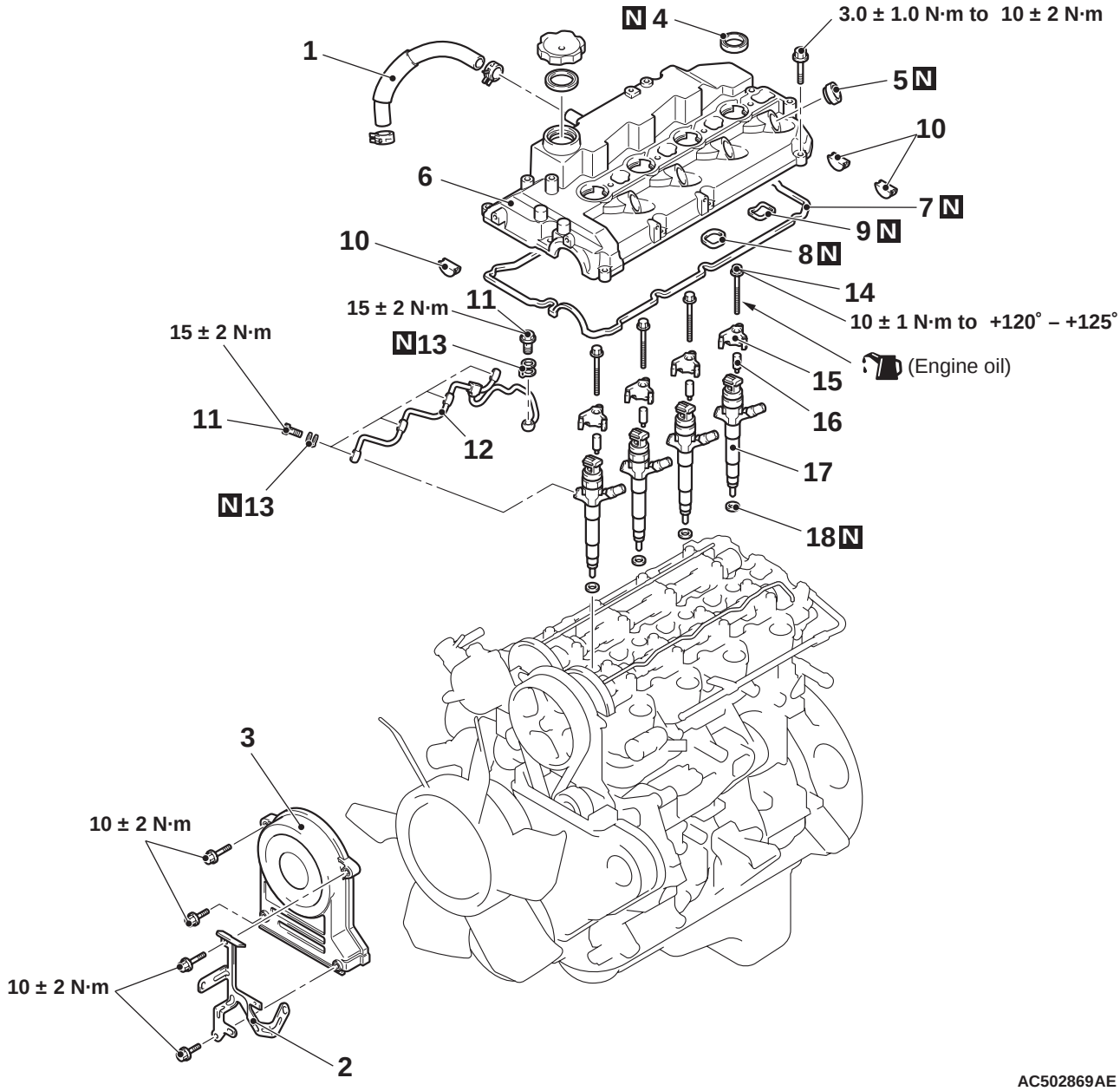
FUEL INJECTOR

REMOVAL AND INSTALLATION

M1133009400299

Pre-removal Operation	Post-installation Operation
• Inlet Manifold Removal (Refer to GROUP 15 – Inlet Manifold). • Fuel Injection Pipe Removal (Refer to P.13A-604).	• Fuel Injection Pipe Installation (Refer to P.13A-604). • Inlet Manifold Installation (Refer to GROUP 15 – Inlet Manifold).

<Except Euro5>



Removal steps

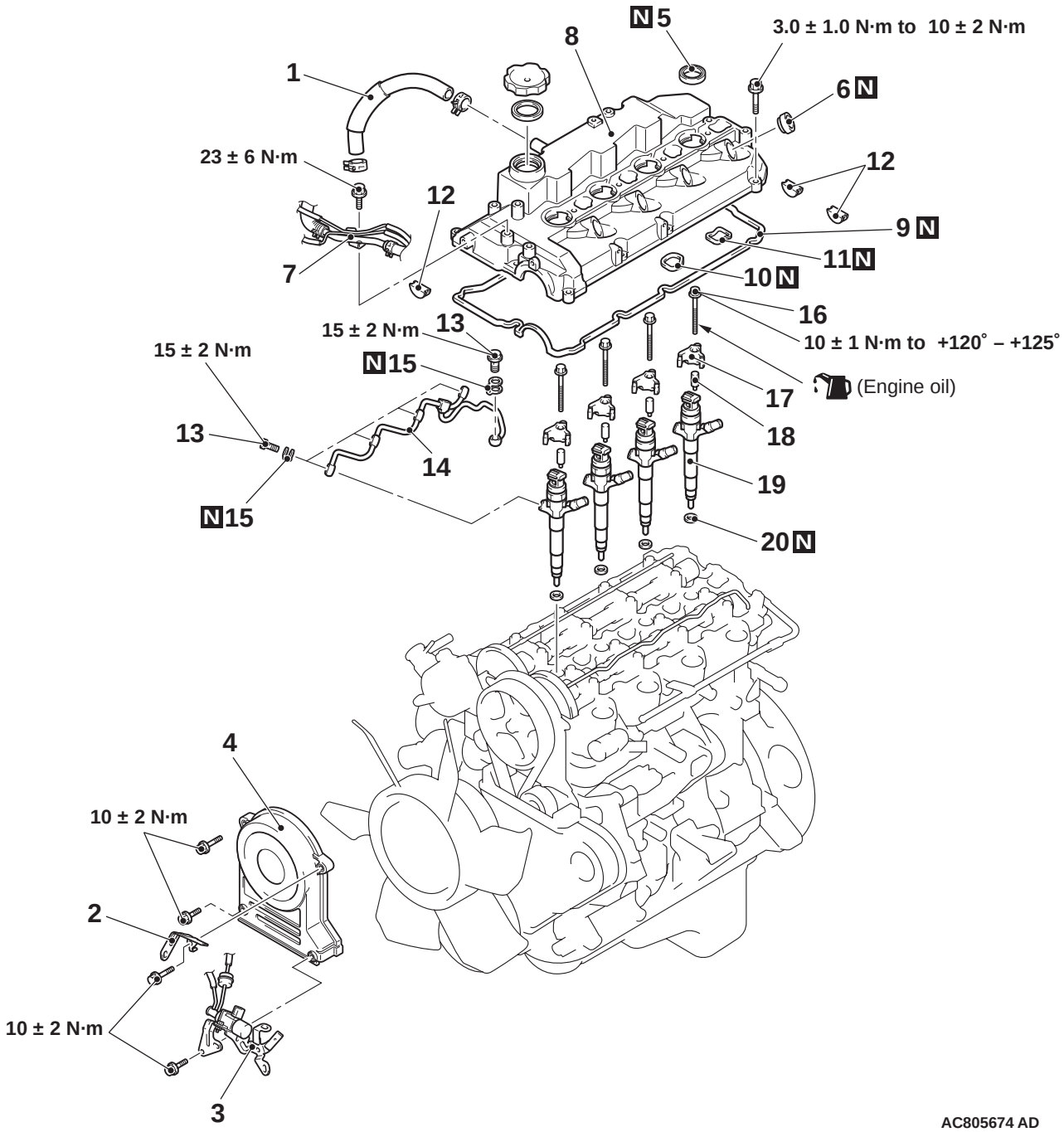
- When the fuel injector is replaced, register the injector identification code and perform the fuel injection learning (Refer to GROUP 00 – Precautions before Service, What the Common Rail Engine Learns) <Installation only>.

1. Breather hose connection
2. Harness bracket
3. Timing belt front upper cover
>>**D**<< 4. Oil seal
>>**D**<< 5. Oil seal
<<**A**>> >>**C**<< 6. Rocker cover assembly
7. Rocker cover gasket A

Removal steps (Continued)

8. Rocker cover gasket B
9. Rocker cover gasket C
>>**B**<< 10. Semi-circular packing
>>**A**<< 11. Eye bolt
>>**A**<< 12. Fuel leakage pipe
>>**A**<< 13. Fuel leak-off gasket
>>**A**<< 14. Injector holder bolt
>>**A**<< 15. Injector supporter
>>**A**<< 16. Pivot boss
>>**A**<< 17. Fuel injector
>>**A**<< 18. Nozzle gasket

<Euro5>



AC805674 AD

Removal steps

- When the fuel injector is replaced, register the injector identification code and perform the fuel injection learning (Refer to GROUP 00 – Precautions before Service, What the Common Rail Engine Learns) <Installation only>.

1. Breather hose connection
2. Harness bracket
3. Solenoid valve and harness bracket assembly
4. Timing belt front upper cover

>>**D**<< 5. Oil seal

Removal steps (Continued)

>>**D**<< 6. Oil seal
7. Vacuum pipe and hose assembly connection

<<**A**>> >>**C**<< 8. Rocker cover assembly
9. Rocker cover gasket A
10. Rocker cover gasket B
11. Rocker cover gasket C

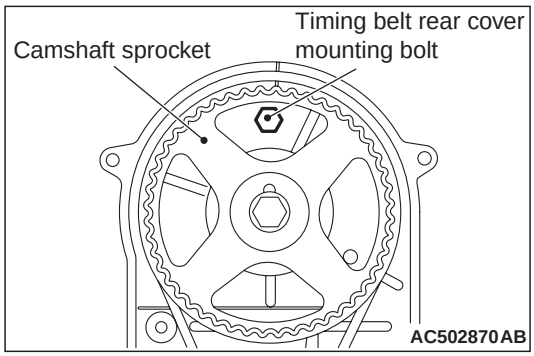
>>**B**<< 12. Semi-circular packing
>>**A**<< 13. Eye bolt
>>**A**<< 14. Fuel leakage pipe
>>**A**<< 15. Fuel leak-off gasket
>>**A**<< 16. Injector holder bolt
>>**A**<< 17. Injector supporter

Removal steps (Continued)

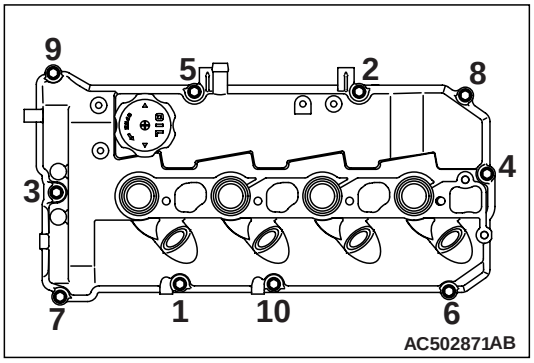
>>**A**<< 18. Pivot boss
>>**A**<< 19. Fuel injector
>>**A**<< 20. Nozzle gasket

REMOVAL SERVICE POINT

<<A>> ROCKER COVER ASSEMBLY REMOVAL



1. Turn the crankshaft clockwise, and remove the timing belt rear cover mounting bolts shown in the figure from the gap of the camshaft sprocket.



2. In the order shown in the figure, loosen the rocker cover assembly mounting bolts, and then remove the rocker cover assembly.

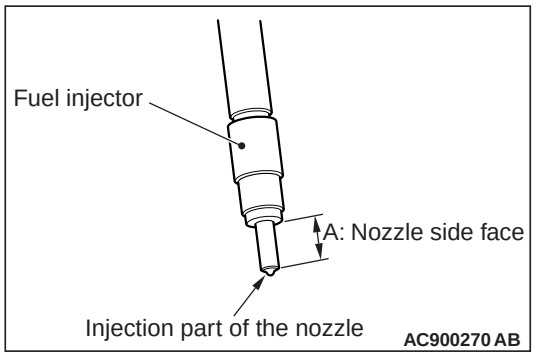
INSTALLATION SERVICE POINTS

>>A<< NOZZLE GASKET/FUEL INJECTOR/PIVOT BOSS/INJECTOR SUPPORTER/INJECTOR HOLDER BOLT/FUEL LEAK-OFF GASKET/FUEL LEAKAGE PIPE/EYE BOLT INSTALLATION

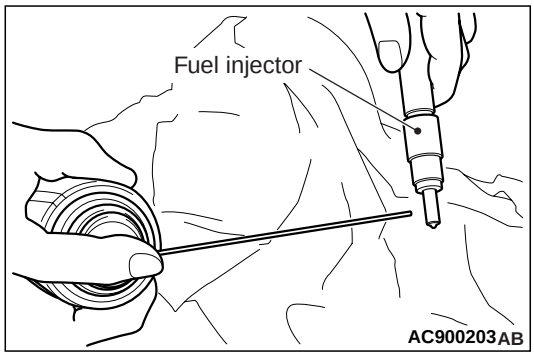
1. Clean the fuel injector assembly (nozzle) and the cylinder head (fuel injector insertion hole) by following the procedure below.

⚠ CAUTION

Do not clean the injection part of the nozzle with a resin spatula.



(1) Using a resin spatula, scrape off the carbon deposit on the fuel injector nozzle side face ("A" shown in the figure).

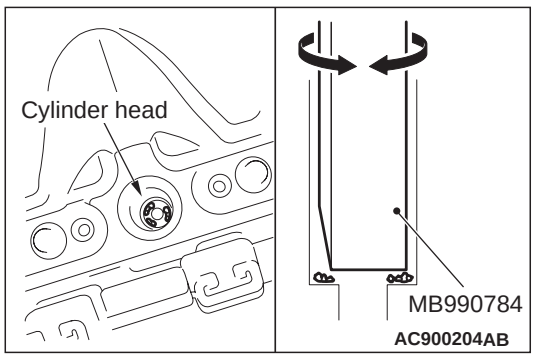


(2) Spray the carburetor cleaner (MZ100139) or equivalent to the nozzle side face ("A" shown in the figure).

⚠ CAUTION

Do not touch the injection part of the nozzle with hand or wipe it with a rag.

(3) Leave the injection part for a while until the carbon deposit melts down, and then blow air to the injection part.



(4) Insert special tool ornament remover (MB990784) to the cylinder head (fuel injector insertion hole) with turning the special tool as shown, and scrape off the carbon deposit.

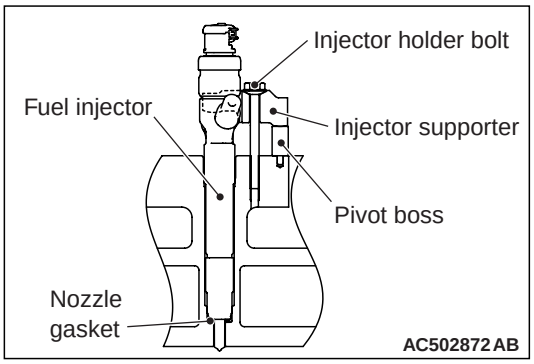
⚠ CAUTION

In order to prevent carbon from adhering to the inner surface of the cylinder, blow air with the piston in the TDC position.

(5) Remove the special tool, and blow off the carbon deposit on the cylinder head (fuel injector insertion hole) by air.

(6) Check that there is no carbon deposit remaining on the contact surface of the fuel injector nozzle gasket.

NOTE: Repeat step 4 to step 6 several times until the carbon deposit is completely removed.



2. Install the nozzle gasket, fuel injector, pivot boss, and injector supporter to the cylinder head as shown in the figure.
3. Apply a small amount of engine oil to the seat surface and thread of injector holder bolt, and then temporarily tighten the bolt to the cylinder head.
4. Set the fuel leak-off gasket to the fuel leakage pipe, and temporarily tighten to the fuel injector and to the cylinder head using the eye bolt.
5. Tighten the eye bolt of the fuel injector side to the specified torque.

   Tightening torque: 15 ± 2 N·m

6. Tighten the eye bolt of the cylinder head side to the specified torque.

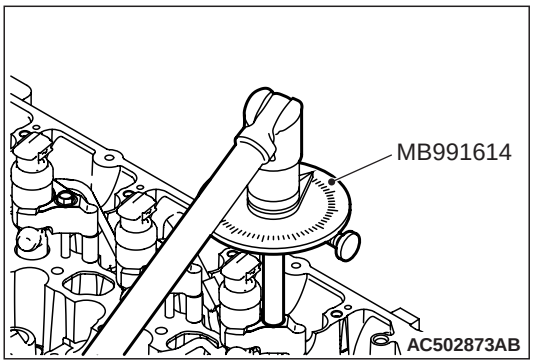
   Tightening torque: 15 ± 2 N·m

7. Tighten the injector holder bolt to the specified torque.

   Tightening torque: 10 ± 1 N·m

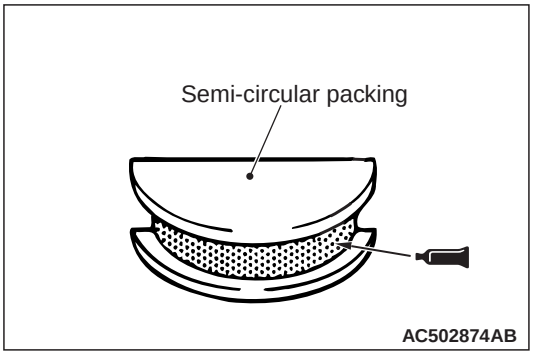
⚠ CAUTION

- **If the bolt is tightened less than the specified lower limit of 120°, the bolt may become loose. Be sure to tighten correctly.**
- **If the bolt is tightened in excess of the specified upper limit of 125°, loosen the nut completely and repeat the entire procedures.**



8. Using special tool angle gauge (MB991614), tighten the injector holder bolt in the illustrated sequence by a further 120° to 125°.

>>B<< SEMI-CIRCULAR PACKING INSTALLATION

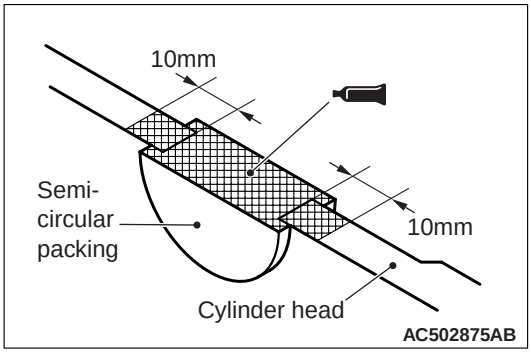


Apply specified sealant to portions indicated in illustration.

Specified sealant: Three bond 1217G or equivalent

NOTE: Install the semi-circular packing immediately after applying sealant.

>>C<< ROCKER COVER ASSEMBLY INSTALLATION

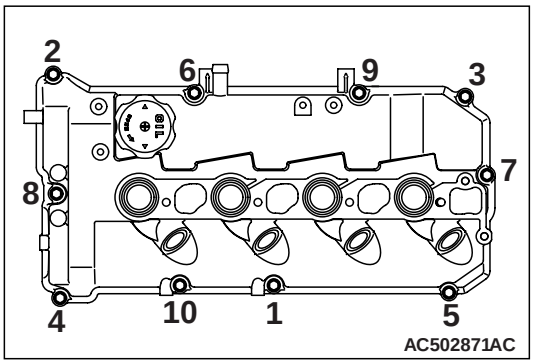


1. Apply specified sealant to portions indicated in illustration.

   Specified sealant: Three bond 1217G or equivalent

NOTE: Install the rocker cover assembly immediately after applying sealant.

2. Install the rocker cover assembly to the cylinder head.



3. Tighten the rocker cover assembly mounting bolts to the specified torque in the order shown in the figure.

   Tightening torque: 3.0 ± 1.0 N·m

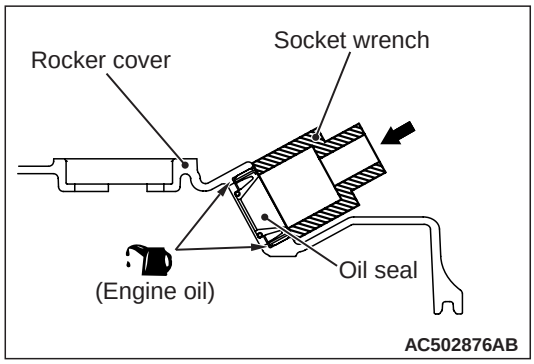
⚠ CAUTION

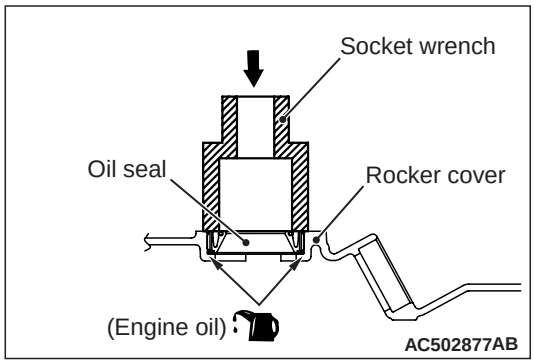
After the installation, until a sufficient period of time (one hour or more) elapses, do not apply the oil or water to the sealant application area or start the engine.

4. Tighten the rocker cover assembly mounting bolts to the specified torque in the order shown in the figure again.

   Tightening torque: 10 ± 2 N·m

>>D<< OIL SEAL INSTALLATION





Apply engine oil to the oil seal outer surface and drive in with a socket wrench.

COMMON RAIL AND SUPPLY PUMP

REMOVAL AND INSTALLATION

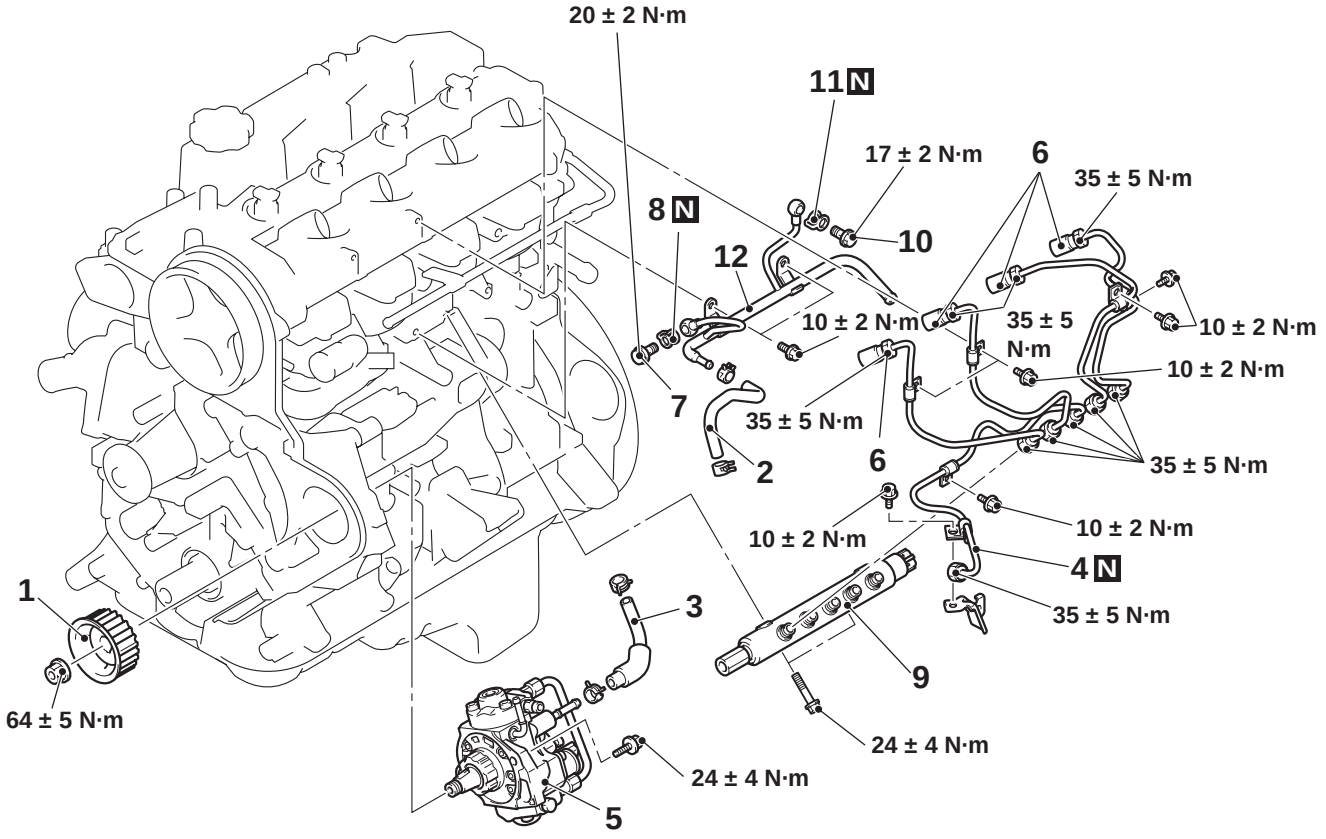
M1133009600389

⚠ CAUTION

- **The reinstallation histories of the removed fuel injection pipe and fuel supply pump pipe are up to five times. To count how many times the fuel injection pipe and fuel supply pump pipe are reinstalled, record the number of the reinstallation histories on the service booklet by adding this latest number of the histories, which is usually "1", to the previous one. Use a new fuel injection pipe or fuel supply pump pipe when the total reinstallation history numbers reach five times, or when the fuel injector assembly, common rail assembly or supply pump assembly is replaced. In this case, record " a new fuel injection pipe or fuel supply pump pipe, the number of the reinstallation histories is zero" on the service booklet.**
- **If a fuel leak is present in the fuel injection pipe and fuel supply pump pipe once, do not reuse it and replace with a new one.**
- **If the fuel injector assembly, common rail assembly or supply pump assembly is replaced, the contact surface (seal surface) between the fuel injection pipe and fuel supply pump pipe, and the other side component is changed, do not reuse the fuel injection pipe and fuel supply pump pipe and replace with a new one.**
- **When the injection pipe is reinstalled, confirm there is no foreign material on the seal surface or in the pipe and then install it not to deviate from the axis, fitting the seal surface.**

Pre-removal Operation	Post-installation Operation
• Inlet Manifold Removal (Refer to GROUP 15 – Inlet Manifold).	• Inlet Manifold Installation (Refer to GROUP 15 – Inlet Manifold). • Fuel Line Leak Check (Refer to P.13A-590).

<Except Euro5>



AC502865AG

Supply pump assembly removal steps

- When the supply pump assembly is replaced, perform the supply pump learning.(Refer to GROUP 00 – Precautions before Service, What the Common Rail Engine Learns) <Installation only>.
- Timing belt (Refer to GROUP 11A – Timing belt).

<<A>> >>D<< 1. Injection pump sprocket
2. Fuel return hose
3. Fuel inline hose
<<B>> >>C<< 4. Fuel supply pump pipe
>>C<< 5. Supply pump assembly

Fuel injection pipe removal steps

2. Fuel return hose
3. Fuel inline hose

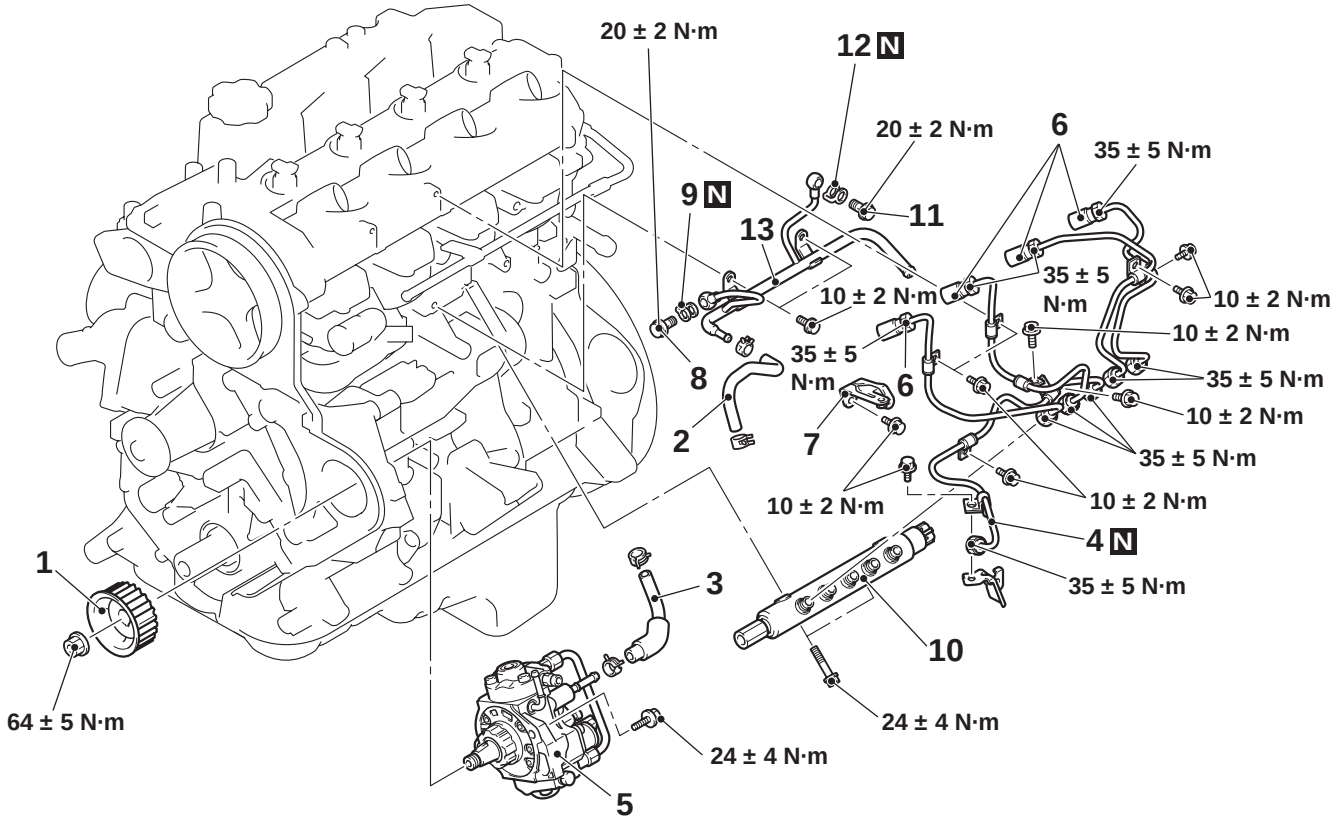
Fuel injection pipe removal steps (Continued)

<<B>> >>B<< 4. Fuel supply pump pipe
<<C>> >>B<< 6. Fuel injection pipe

Common rail assembly removal steps

2. Fuel return hose
3. Fuel inline hose
<<B>> >>C<< 4. Fuel supply pump pipe
<<C>> >>A<< 6. Fuel injection pipe
>>A<< 7. Eye bolt
>>A<< 8. Fuel return gasket
>>A<< 9. Common rail assembly
>>A<< 10. Eye bolt
>>A<< 11. Fuel return gasket
>>A<< 12. Fuel return pipe

<Euro5>



AC805678 AB

Supply pump assembly removal steps

- When the supply pump assembly is replaced, perform the supply pump learning.(Refer to GROUP 00 – Precautions before Service, What the Common Rail Engine Learns) <Installation only>.
- Timing belt (Refer to GROUP 11A – Timing belt).

<<A>> >>D<< 1. Injection pump sprocket
2. Fuel return hose
3. Fuel inline hose
<<B>> >>C<< 4. Fuel supply pump pipe
>>C<< 5. Supply pump assembly

Fuel injection pipe removal steps

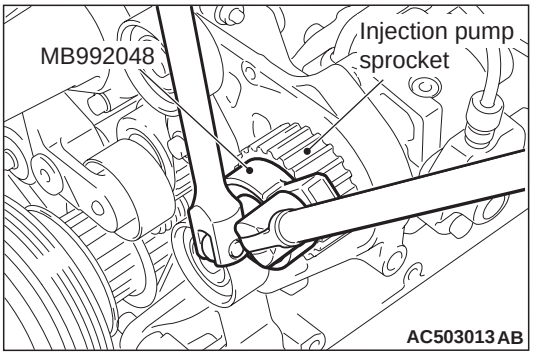
2. Fuel return hose
3. Fuel inline hose
<<B>> >>B<< 4. Fuel supply pump pipe
<<C>> >>B<< 6. Fuel injection pipe

Common rail assembly removal steps

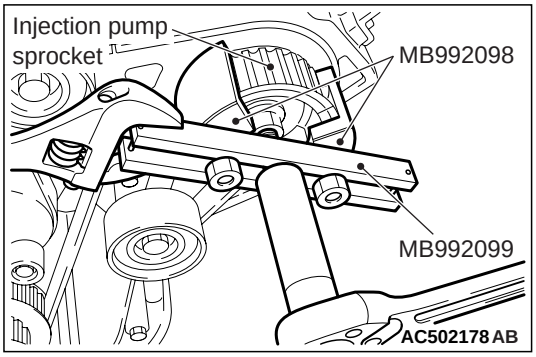
2. Fuel return hose
3. Fuel inline hose
<<B>> >>C<< 4. Fuel supply pump pipe
<<C>> >>A<< 6. Fuel injection pipe
7. Fuel injection pipe bracket
>>A<< 8. Eye bolt
>>A<< 9. Fuel return gasket
>>A<< 10. Common rail assembly
>>A<< 11. Eye bolt
>>A<< 12. Fuel return gasket
>>A<< 13. Fuel return pipe

REMOVAL SERVICE POINTS

<<A>> INJECTION PUMP SPROCKET REMOVAL



1. Using special tool sprocket holder (MB992048), lock the injection pump sprocket, and then loosen the injection pump sprocket mounting nut.



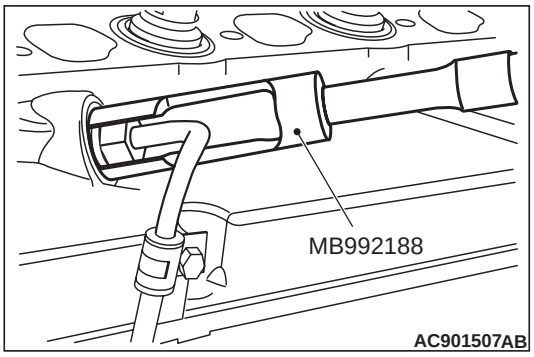
2. Using the special tools below, remove the injection pump sprocket.
   - Injection pump sprocket puller (MB992098)
   - Crank pulley puller (MB992099)

<<B>> FUEL SUPPLY PUMP PIPE REMOVAL

⚠ CAUTION

When removing the fuel supply pump pipe, the fuel pressure in the fuel line is high. Thus, wait for 3 minutes or longer after the engine stops, and cover the fuel supply pump pipe with a rag or similar materials to prevent the fuel splash, and then disconnect the fuel supply pump pipe.

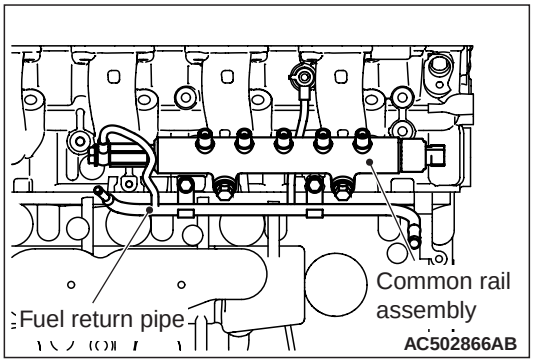
<<C>> FUEL INJECTION PIPE REMOVAL



Using special tool fuel injection pipe wrench (MB992188), remove the fuel injection pipe assembly No.1 to No.4.

INSTALLATION SERVICE POINTS

>>A<< FUEL RETURN PIPE/FUEL RETURN GASKET/EYE BOLT/COMMON RAIL ASSEMBLY/FUEL INJECTION PIPE INSTALLATION

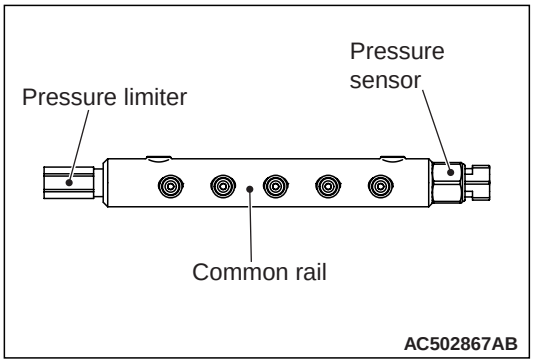


1. Temporarily tighten the fuel return pipe with bolts.
2. Tighten the eye bolt and the fuel return gasket located at the cylinder head side to the specified torque.

   Tightening torque:
   17 ± 2 N·m <Except Euro5>
   20 ± 2 N·m <Euro5>

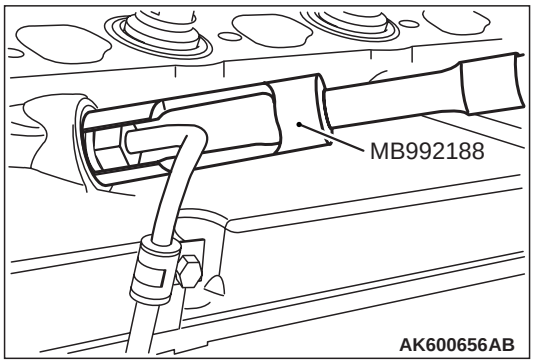
⚠ CAUTION

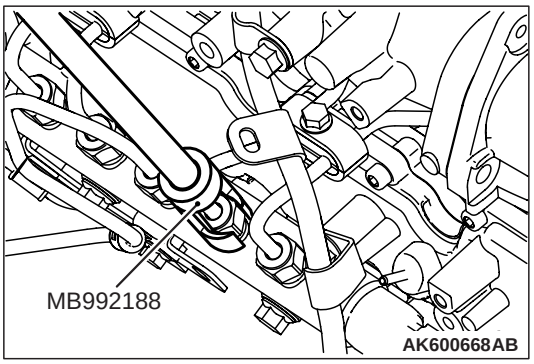
- **When operating, do not support the common rail assembly by holding the rail pressure limiter and the pressure sensor at both ends.**
- **Before the installation, make sure that there is no foreign object or rust to the thread and to the high-pressure pipe sheet surface.**



3. Temporarily tighten the common rail assembly with bolts, holding the common rail assembly.
4. Align the fuel injection pipe centre axis with the other side components (fuel injector assembly and common rail assembly) centre axis to install the fuel injection pipe. Then, tighten the flare nut temporarily until the tip of pipe (seal surface) contacts with the other side components.

   NOTE: When the fuel injection pipe is installed, tighten the flare nut while shaking the pipe lightly to align the centre axis of both components.





5. Using special tool fuel injection pipe wrench (MB992188), start tightening the fuel injector assembly side flare nut in the fuel injection pipe, and then tighten the fuel injector assembly side flare nut and common rail assembly side flare nut alternately in several steps to the specified torque.

   Tightening torque: 35 ± 5 N·m
6. Tighten the common rail assembly to the specified torque.

   Tightening torque: 24 ± 4 N·m
7. Tighten the eye bolt and the fuel return gasket located at the common rail assembly side to the specified torque.

   Tightening torque: 20 ± 2 N·m
8. Tighten the fuel return pipe to the specified torque.

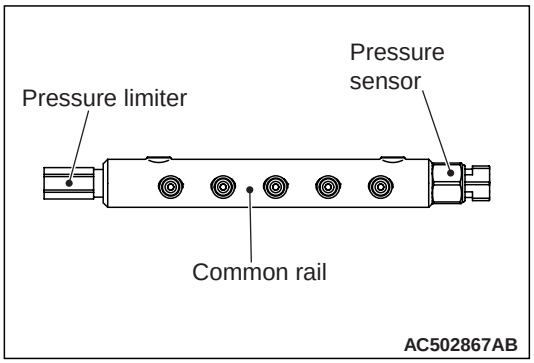
   Tightening torque: 10 ± 2 N·m
9. Tighten the bolts of the fuel injection pipe to the specified torque.

   Tightening torque: 10 ± 2 N·m
10. Tighten the common rail assembly side flare nut in the fuel supply pump pipe and the supply pump assembly side flare nut alternately in several steps to the specified torque.

    Tightening torque: 35 ± 5 N·m

>>B<< FUEL INJECTION PIPE/FUEL SUPPLY PUMP PIPE INSTALLATION

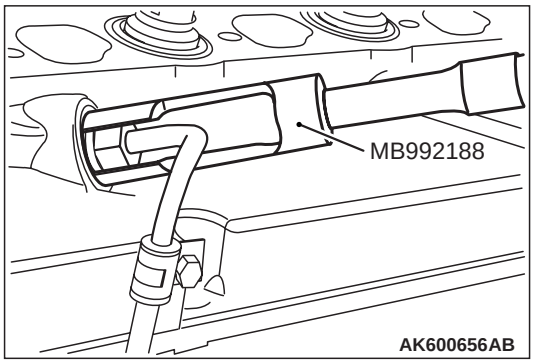
⚠ CAUTION

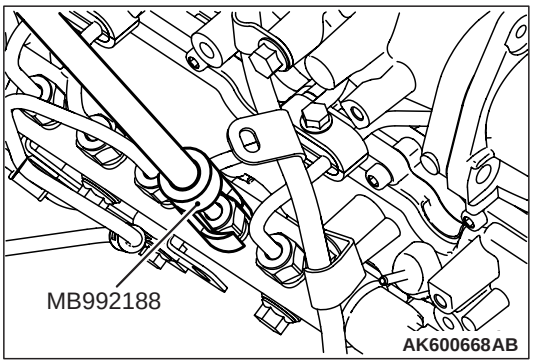


- **When operating, do not support the common rail assembly by holding the rail pressure limiter and the pressure sensor at both ends.**
- **Before the installation, make sure that there is no foreign object or rust to the thread and to the high-pressure pipe sheet surface.**

1. Loosen the common rail assembly mounting bolts so that the common rail assembly will be in the temporarily installed state.
2. Align the fuel injection pipe centre axis with the other side components (fuel injector assembly and common rail assembly) centre axis to install the fuel injection pipe. Then, tighten the flare nut temporarily until the tip of pipe (seal surface) contacts with the other side components.

   NOTE: When the fuel injection pipe is installed, tighten the flare nut while shaking the pipe lightly to align the centre axis of both components.





3. Using special tool fuel injection pipe wrench (MB992188), start tightening the fuel injector assembly side flare nut in the fuel injection pipe, and then tighten the fuel injector assembly side flare nut and common rail assembly side flare nut alternately in several steps to the specified torque.

   Tightening torque: 35 ± 5 N·m

4. Tighten the common rail assembly to the specified torque.

   Tightening torque: 24 ± 4 N·m

5. Tighten the common rail assembly side flare nut in the fuel supply pump pipe and the supply pump assembly side flare nut alternately in several steps to the specified torque.

   Tightening torque: 35 ± 5 N·m

>>C<< SUPPLY PUMP ASSEMBLY/FUEL SUPPLY PUMP PIPE INSTALLATION

1. Temporarily tighten the supply pump assembly with bolts.
2. Align the fuel supply pump pipe centre axis with the other side components (common rail assembly and supply pump assembly) centre axis to install the fuel supply pump pipe. Then, tighten the flare nut temporarily until the tip of pipe (seal surface) contacts with the other side components.

   NOTE: When the fuel supply pump pipe is installed, tighten the flare nut while shaking the pipe lightly to align the centre axis of both components.

3. Tighten the common rail assembly side flare nut in the fuel supply pump pipe and the supply pump assembly side flare nut alternately in several steps to the specified torque.

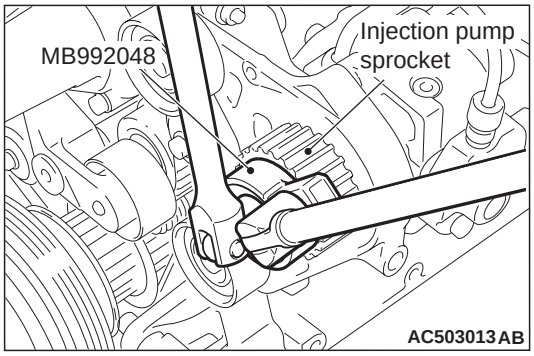
   Tightening torque: 35 ± 5 N·m

4. Tighten the supply pump assembly bolts to the specified torque.

   Tightening torque: 24 ± 4 N·m

5. Tighten the fuel supply pump pipe bolt.

>>D<< INJECTION PUMP SPROCKET INSTALLATION



In the same manner as for removal, using special tool sprocket holder (MB992048), lock the injection pump sprocket, and then tighten the injection pump sprocket mounting nut to the specified torque.

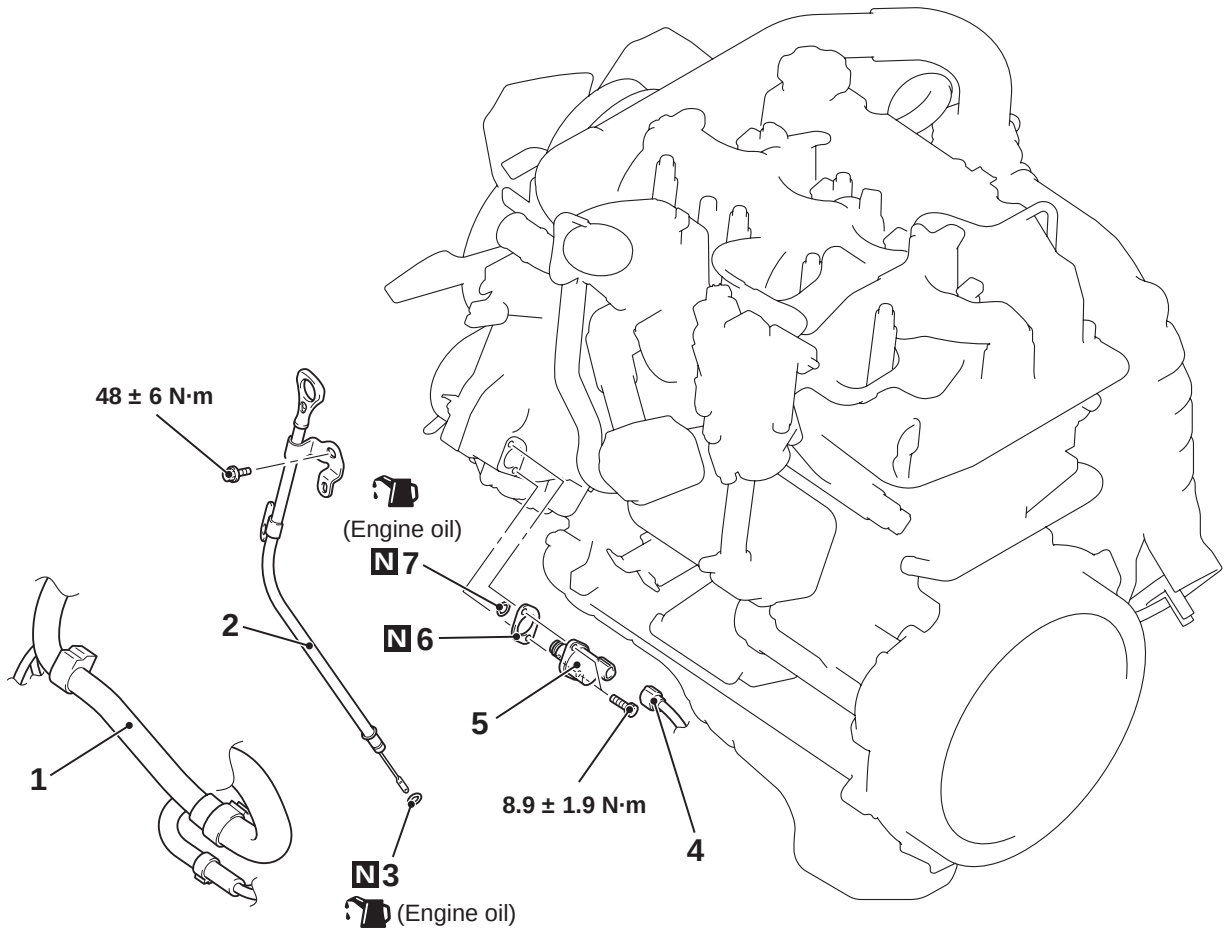
Tightening torque: 64 ± 5 N·m

SUCTION CONTROL VALVE

REMOVAL AND INSTALLATION

M1133011900213

Pre-removal and Post-installation Operation
- Battery and Battery Tray Stay Removal and Installation (Refer to GROUP 54A – Battery).



AC704545AC

Removal steps
- Supply pump assembly correction learning (Refer to GROUP 00 – Precautions Refer Service, Supply Pump Correction Learning procedure) <only at installation>.

1. Battery wiring cable connection
2. Engine oil level gauge and guide assembly
3. O-ring
4. Suction control valve connector connection

<<A>> >>A<< 5. Suction control valve
<<A>> >>A<< 6. Gasket
<<A>> >>A<< 7. O-ring

REMOVAL SERVICE POINT

<<A>> SUCTION CONTROL VALVE/GASKET/O-RING REMOVAL.

1. Clean the area around the suction control valve with a cleaner, etc.

⚠ CAUTION

Pay attention not to let foreign materials get into the supply pump assembly during and after the suction control valve removal.

2. Loosen the suction control valve mounting bolts, and remove the suction control valve from the supply pump assembly.
3. Remove the gasket
4. Remove the o-ring from the supply pump assembly.

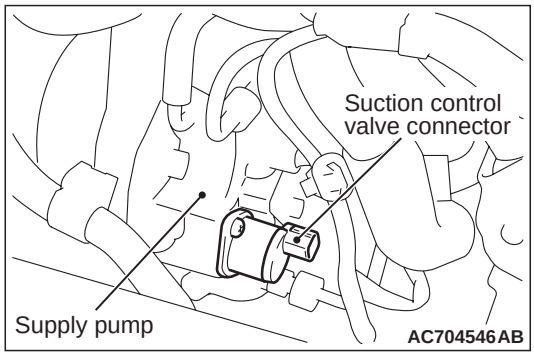
INSTALLATION SERVICE POINT

>>A<< O-RING/GASKET/SUCTION CONTROL VALVE INSTALLATION

⚠ CAUTION

- **Pay attention not to let the suction control valve be contaminated with foreign material when installing it.**
- **Pay attention not to let foreign materials get into the supply pump assembly during the suction control valve installation.**

1. Fit the O-ring to the O-ring groove on the supply pump assembly.
2. Install the gasket to the suction control valve.



3. Apply a drop of new engine oil to the O-ring in the supply pump assembly groove, and insert the suction control valve by hands until it contacts with the supply pump assembly. When inserting the suction control valve, make sure that the suction control valve connector is in the direction shown in the figure.

⚠ CAUTION

Tighten the two suction control valve mounting bolts evenly.

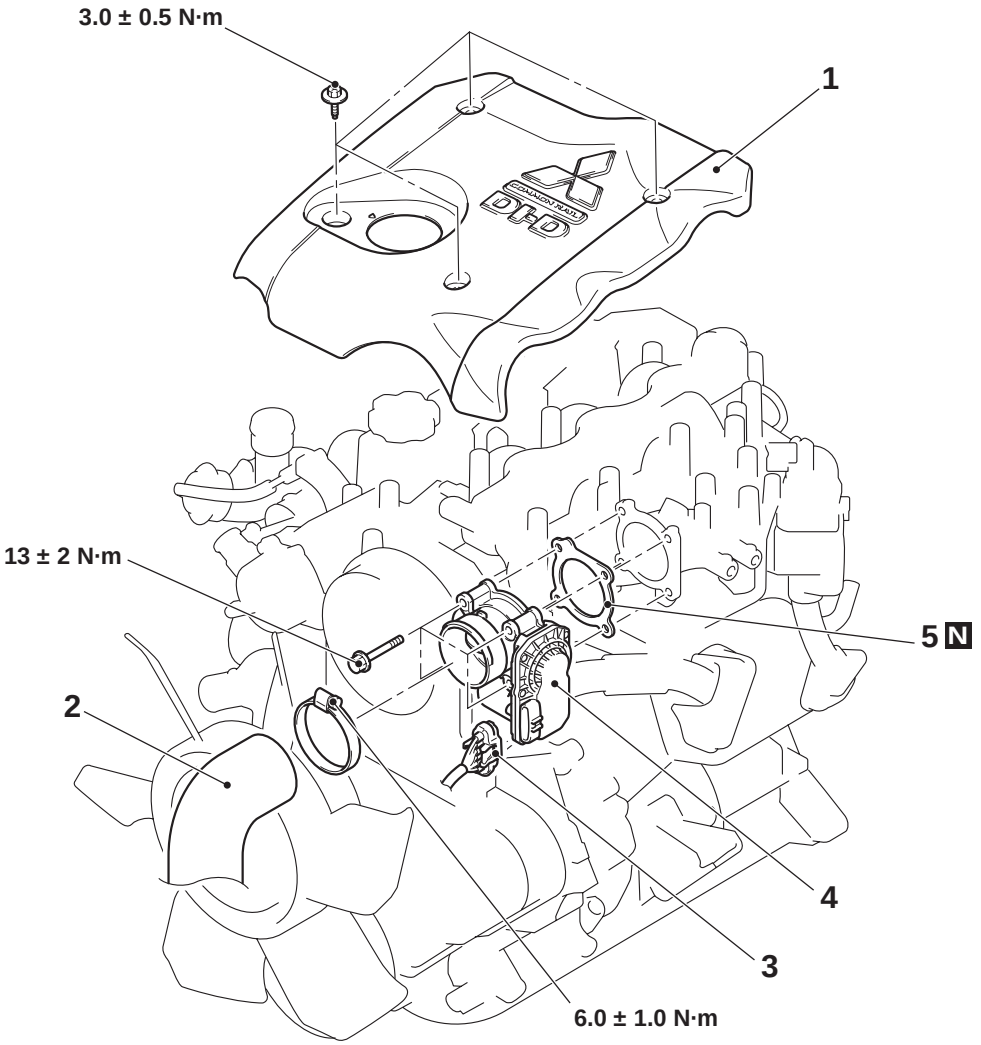
4. Tighten the suction control valve mounting bolts to the specified torque.

   Tightening torque: 8.9 ± 1.9 N·m

THROTTLE BODY ASSEMBLY

REMOVAL AND INSTALLATION

M1133007600435



AC502843AD

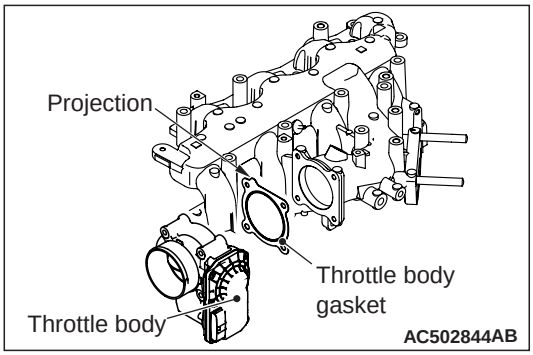
Removal steps

1. Engine cover
2. Inter cooler outlet air hose connection
3. Throttle body connector
4. Throttle body

>>A<< 5. Throttle body gasket

INSTALLATION SERVICE POINT

>>A<< THROTTLE BODY GASKET INSTALLATION



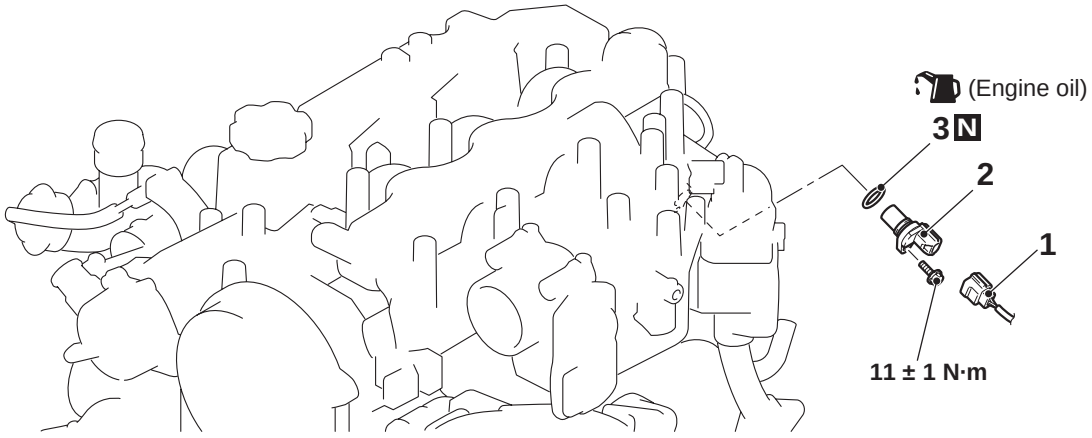
AC502844AB

Install the throttle body gasket as shown in the illustration.

CAMSHAFT POSITION SENSOR

REMOVAL AND INSTALLATION

M1133010000091



AC502938 AC

Removal steps
1. Camshaft position sensor connector

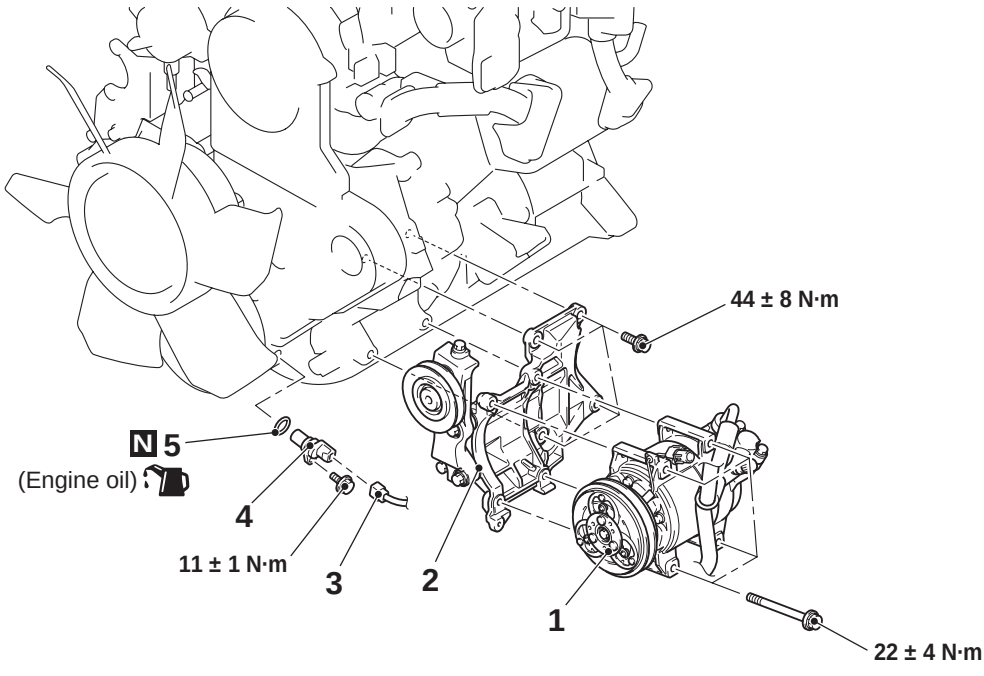
Removal steps (Continued)
2. Camshaft position sensor
3. O-ring

CRANK ANGLE SENSOR

REMOVAL AND INSTALLATION

M1133010200147

Pre-removal and Post-installation Operation
- A/C Compressor Drive Belt Removal and Installation (Refer to GROUP 11A – Crankshaft Pulley).



AC805916 AC

Removal steps

<<A>>
1. A/C compressor assembly
2. A/C compressor bracket assembly
3. Crankshaft position sensor connector
4. Crankshaft position sensor
5. O-ring

REMOVAL SERVICE POINT

<<A>> A/C COMPRESSOR ASSEMBLY REMOVAL

1. With the hose installed, remove the A/C compressor assembly from the bracket.
2. After removing the A/C compressor assembly, secure it with a cord in the location where the removal and installation of the crankshaft position sensor cannot be hindered.

ENGINE-ECU

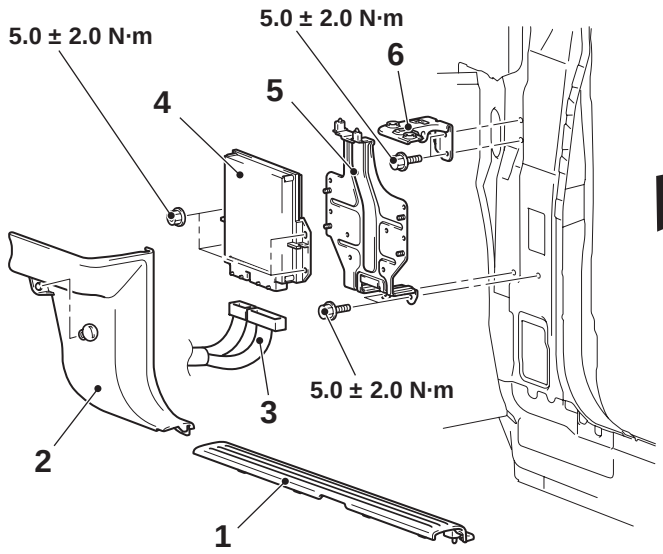
REMOVAL AND INSTALLATION

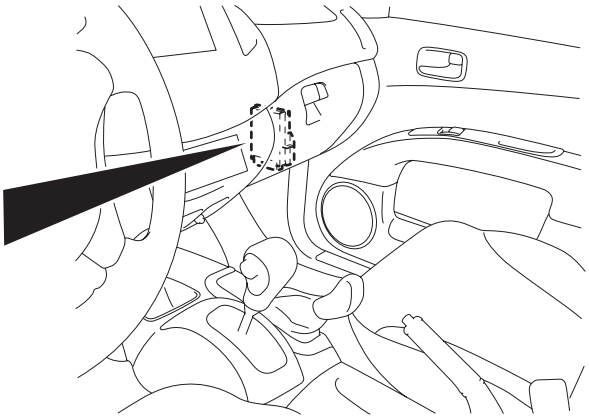
M1133009200767

⚠ CAUTION

- **After having replaced the engine-ECU, use the M.U.T.-III to register the chassis number. [Refer to GROUP 00 – Precautions before Service, How to perform chassis number (Chassis No.) writing].**
- **When the engine-ECU is replaced, register the injector identification code and perform the small injection quantity learning. (Refer to GROUP 00 – Precautions before Service, What the Common Rail Engine Learns).**
- **When the engine-ECU is replaced, make the battery current sensor learn the neutral point by using M.U.T.-III (Refer to GROUP 00 – Precautions before Service, Battery Current Sensor Calibration) <Euro5>.**

<LH drive vehicles>





AC508203AD

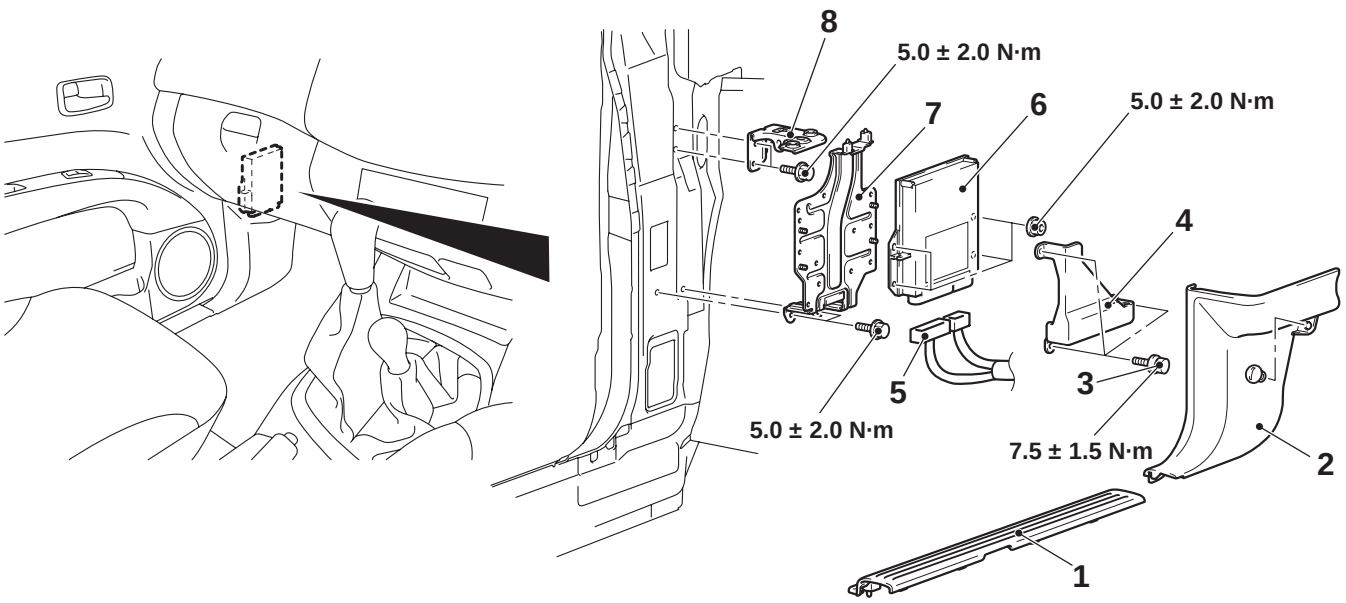
Removal steps

1. Scuff plate
2. Cowl side trim
3. Engine-ECU connectors

Removal steps (Continued)

4. Engine-ECU
5. ECU lower bracket
6. ECU upper bracket

<RH drive vehicles>



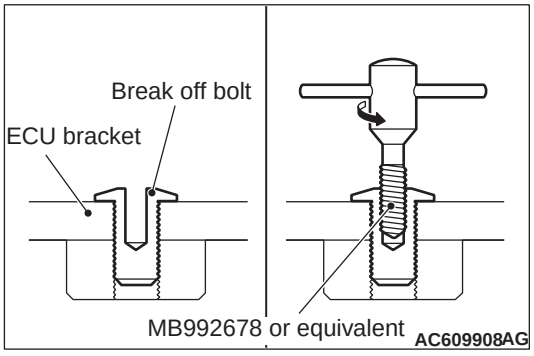
AC805918 AB

Removal steps

1. Scuff plate
2. Cowl side trim
<<A>> >>A<< 3. Brake off bolt
4. ECU cover
5. Engine-ECU connectors
6. Engine-ECU
7. ECU lower bracket
8. ECU upper bracket

REMOVAL SERVICE POINT

<<A>> BREAK OFF BOLT REMOVAL <RH DRIVE VEHICLES>



1. Drill in the break off bolt a hole deep enough for the tap to stand.
2. Use the recommended tool screw extractor set (MB992678) or equivalent to remove the break off bolt.

INSTALLATION SERVICE POINT

>>A<< BREAK OFF BOLT INSTALLATION <RH DRIVE VEHICLES>

Tighten the break off bolt until its head is broken off.

GROUP 13B

FUEL SUPPLY

CONTENTS

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ON-VEHICLE SERVICE. 13B-2
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- FUEL DRAINING 13B-3

FUEL TANK 13B-4
- FUEL TANK REMOVAL AND INSTALLATION 13B-4
- FUEL GAUGE UNIT DISASSEMBLY AND REASSEMBLY 13B-5
- FUEL GAUGE UNIT CHECK 13B-5

FUEL FILTER 13B-6
- FUEL FILTER REMOVAL AND INSTALLATION <Vehicles with steel fuel filter case> 13B-6
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- FUEL FILTER INSPECTION 13B-9

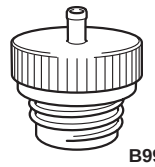
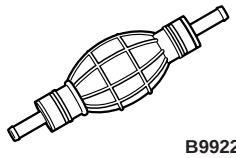
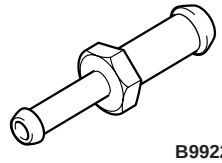
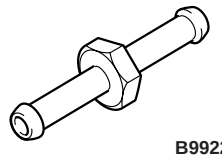
GENERAL INFORMATION

M1135000100725

Fuel tank is mounted on the front of the rear axle to reduce the shock at impact. A fuel cut valve, which prevents fuel leakage when the vehicle banks or rolls over, has been located inside the fuel tank for fewer openings and hose bonding points on the fuel tank top surface.

SPECIAL TOOLS

M1135000601143

Tool	Number	Name	Use
 B992145	MB992145	Fuel leak check cap	Fuel leak check
 B992264	MB992264	Fuel hand pump	Fuel draining
 B992265	MB992265	Fuel hose adaptor A	
 B992266	MB992266	Fuel hose adaptor B	

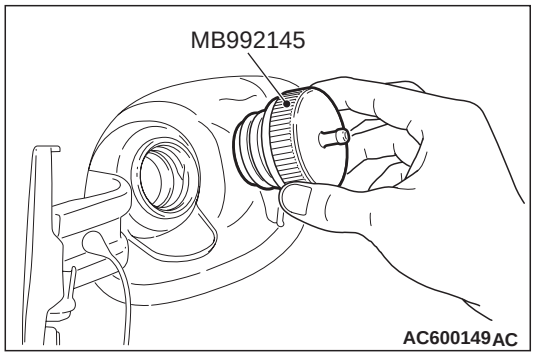
ON-VEHICLE SERVICE

FUEL LEAK CHECK OF FUEL TANK

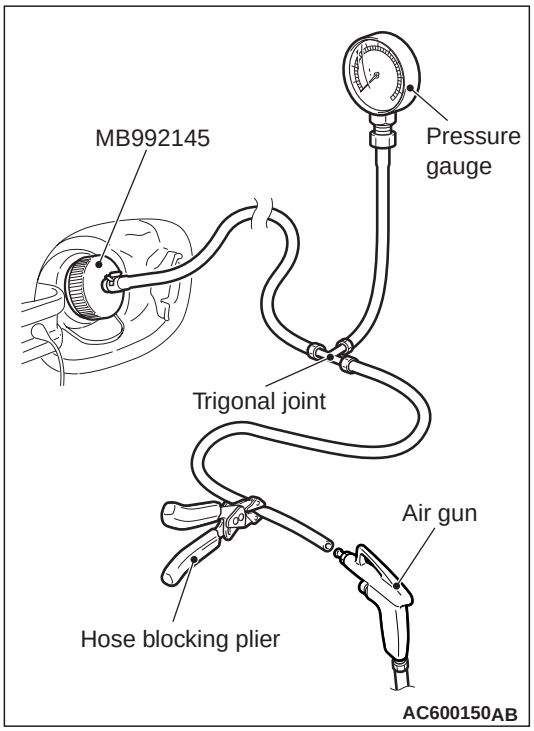
M1135005900566

⚠ CAUTION

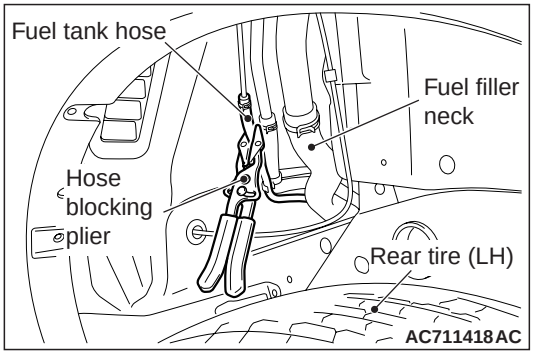
Always check the fuel leak of fuel tank with the vehicle loaded. If it is checked with the fuel tank removed, the fuel tank may be damaged.



1. Remove the fuel tank cap, install special tool fuel leak check cap (MB992145).



2. Install the hose and pressure gauge to the special tool (MB992145) as shown.



3. Remove the splash shield rear (LH) (Refer to GROUP 42 – Splash Shield), and block the fuel tank hose.

⚠ CAUTION

- **Do not pressurize suddenly.**
- **Do not pressurize 11.76 kPa or more to prevent the damage of components.**

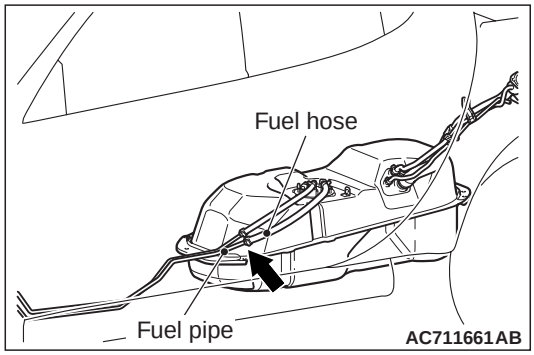
4. Pressurize while checking the pressure gauge and hold if it reaches from 9.80 to 11.76 kPa.
5. Leave it for approximately 3 minutes and check that the pressure is not weakened.
6. If the pressure is weakened, apply soapy water to each part with pressurized state and check the leak while confirming if air bubbles are seen.

FUEL DRAINING

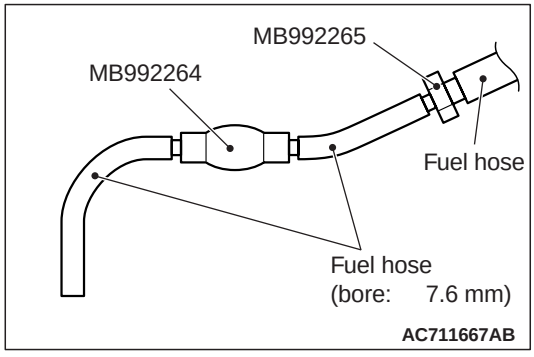
M1135006900321

⚠ CAUTION

- **Working area should be airy and kept from flame.**
- **Prepare a fire extinguisher before working.**
- **Install the earth lines to the vehicle and fuel tank to prevent static electricity, and water the work place to keep the footing from slipping.**
- **Touch the vehicle with hands to release the charged static.**
- **Keep the drained fuel in the safety place.**



1. Disconnect the fuel pipe on the side of fuel tank from the fuel hose on the front side of fuel tank.



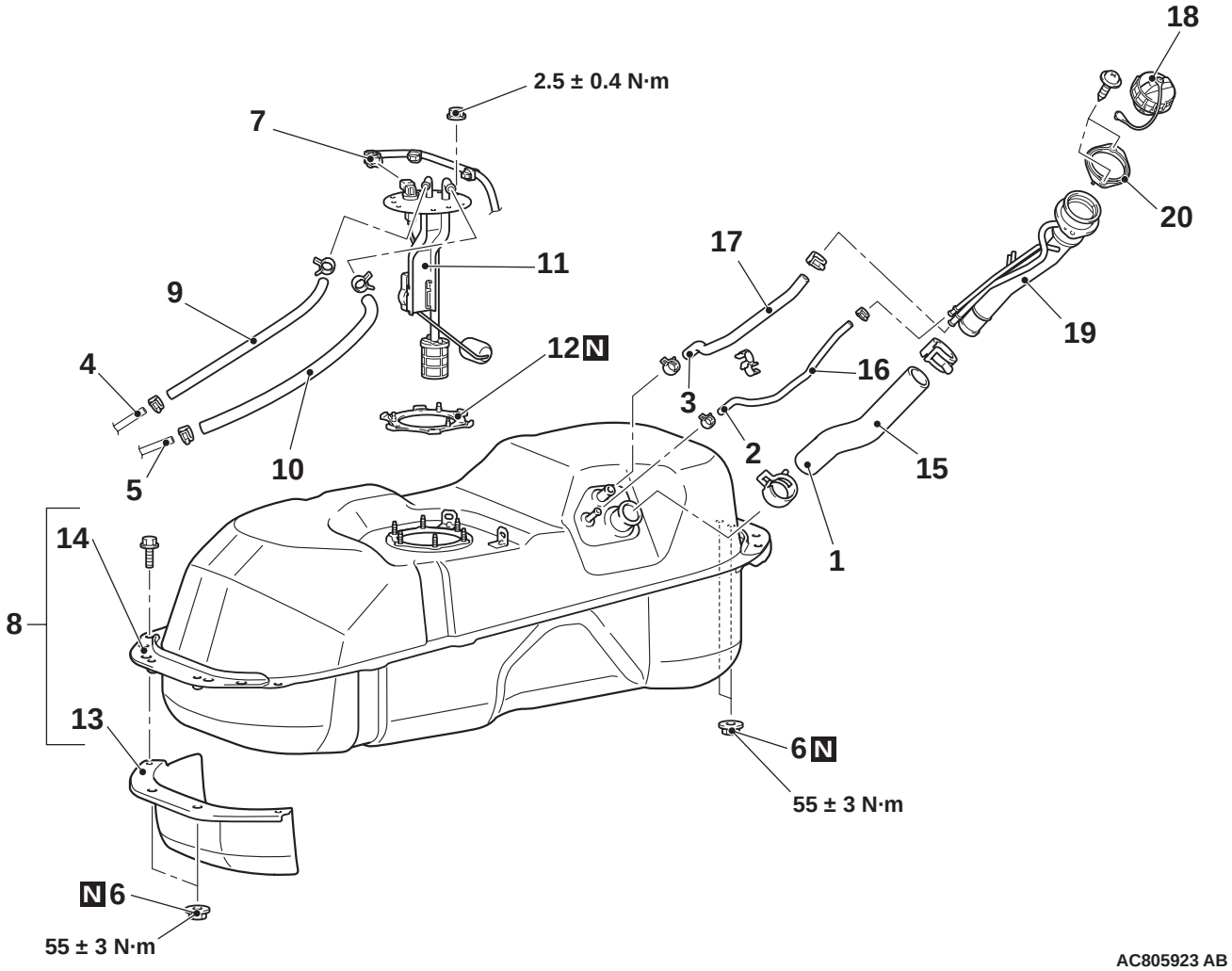
2. Connect the special tools fuel hand pump (MB992264), fuel hose adaptor A (MB992265) and two fuel hoses (Inner diameter 7.6 ± 0.4 mm) to the disconnected fuel hose.
3. Operate the special tool (MB992264) to drain fuel from the fuel tank.

FUEL TANK

REMOVAL AND INSTALLATION

M1135001902913

Pre-removal and Post-installation Operation
- Rear Splash Shield (LH) Removal and Installation (Refer to GROUP 42 – Splash Shield).



AC805923 AB

Fuel tank removal steps
1. Fuel filler hose connection
2. Vapour hose connection
3. Levelling hose connection
4. Fuel return pipe connection
5. Fuel main pipe connection

<<A>> >>A<< 6. Self-locking nut

<<A>> 7. Fuel gauge unit connector and harness clamp

<<A>> 8. Fuel tank assembly

9. Fuel return hose
10. Fuel main hose

Fuel tank removal steps
11. Fuel gauge unit
12. Packing
13. Front lower protector
14. Fuel tank

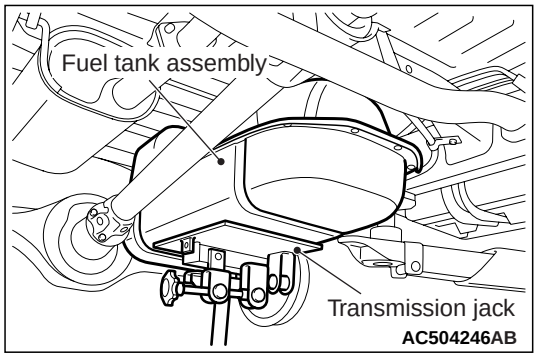
Fuel filler neck removal steps
15. Fuel filler hose
16. Vapour hose
17. Levelling hose
18. Fuel filler cap
19. Fuel filler neck
20. Packing

REMOVAL SERVICE POINT

<<A>> SELF-LOCKING NUT/FUEL GAUGE UNIT CONNECTOR AND HARNESS CLAMP/FUEL TANK ASSEMBLY REMOVAL

⚠ CAUTION

Be careful not to open circuit in the harness when removing the fuel tank assembly.

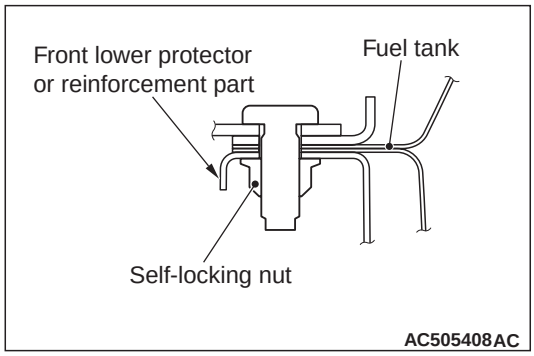


1. Support the fuel tank assembly using the transmission jack, and remove self-locking nuts.
2. Using the transmission jack while taking care of the fuel harness, lower the fuel tank assembly until the fuel harness installation position over the fuel tank assembly can be checked.
3. Disconnect fuel gauge unit connector, and harness clamp. Then, remove the fuel tank assembly.

INSTALLATION SERVICE POINT

>>A<< SELF-LOCKING NUT INSTALLATION

⚠ CAUTION

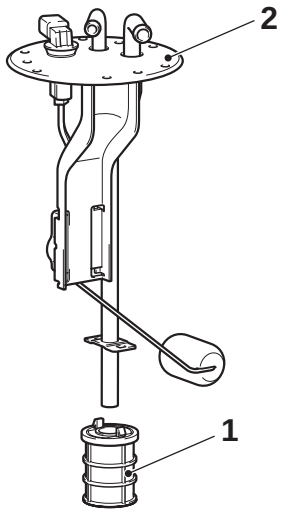


When tightening the self-locking nut, be careful not to let the nut touch the bent part of the reinforcement of the fuel lower protector and the fuel tank.

DISASSEMBLY AND REASSEMBLY

M1135051100251

FUEL GAUGE UNIT



Disassembly steps

1. Fuel in-tank filter
2. Fuel tank gauge

FUEL GAUGE UNIT CHECK

M1135003100586

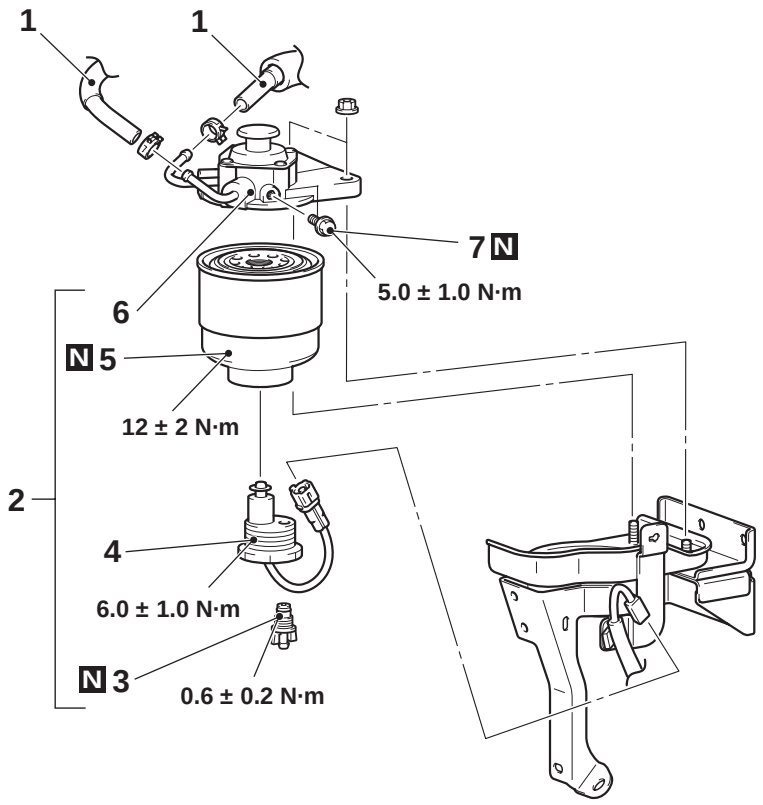
Refer to GROUP 54A – On-vehicle Service, Fuel Gauge Unit Check .

FUEL FILTER

REMOVAL AND INSTALLATION <Vehicles with steel fuel filter case>

M1135002800559

Post-installation Operation
- Evacuation of Air from Fuel Line (Refer to GROUP 13A – On-vehicle Service, Evacuation of Air from Fuel Line).



AC807196AB

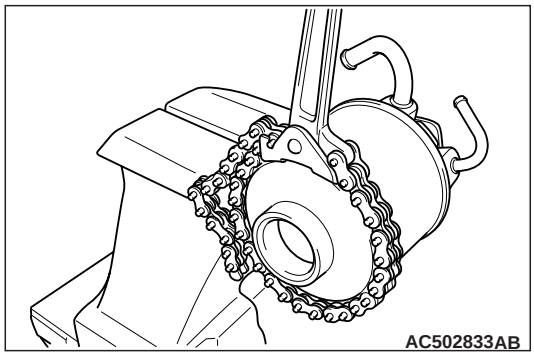
Removal steps

>>B<< 1. Fuel line hose connection
2. Fuel filter assembly
3. Fuel line plug (drain plug)
4. Water level switch

<<A>> >>A<< 5. Fuel filter
6. Fuel filter pump
7. Fuel line plug (air plug) and O-ring

REMOVAL SERVICE POINT

<<A>> FUEL FILTER REMOVAL



AC502833AB

Fix the fuel filter body to a vice, and then remove the fuel filter using an oil filter wrench.

INSTALLATION SERVICE POINTS

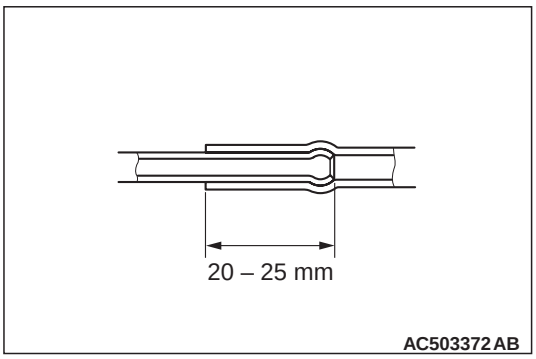
>>A<< FUEL FILTER INSTALLATION

1. Clean the mounting surface on the fuel filter body side.

2. Tighten the fuel filter to the specified torque from the point where the gasket contacts the mounting surface.

   Tightening torque: Approximately 3/4 – 1 turn (12 ± 2 N·m)

>>B<< FUEL LINE HOSE INSTALLATION

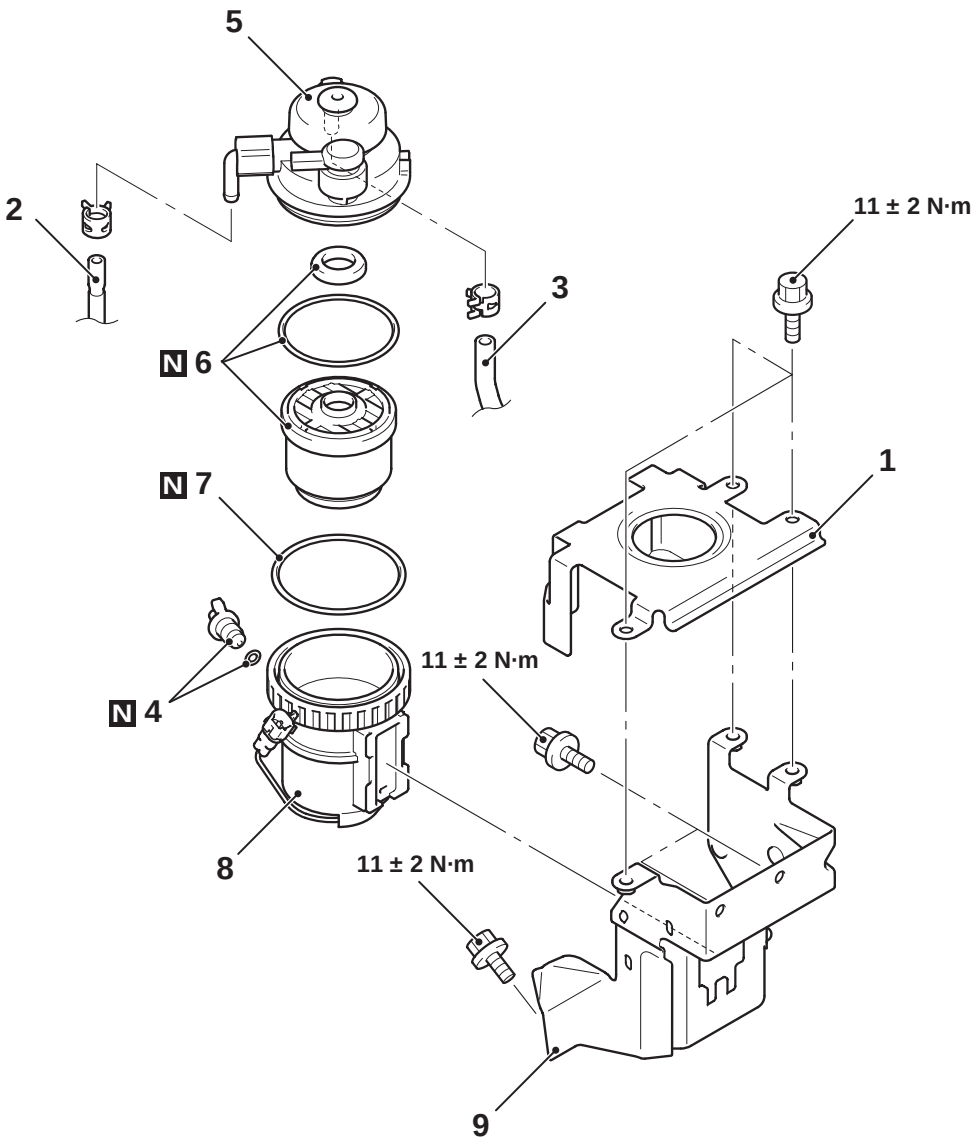


If the pipe has a stepped part, connect securely up to the stepped part. If the pipe has no stepped part, insert so that the inserted portion 20 – 25 mm long.

REMOVAL AND INSTALLATION <Vehicles with plastic fuel filter case>

M1135002800560

Post-installation Operation
- Evacuation of Air from Fuel Line (Refer to GROUP 13A – On-vehicle Service, Evacuation of Air from Fuel Line).



ACB01919AB

Fuel filter removal steps
1. Fuel filter protector B

<<A>> >>A<< 5. Fuel filter cap
6. Fuel filter and O-ring
7. O-ring

Removal steps
1. Fuel filter protector B

>>B<< 2. Fuel line hose C connection

>>B<< 3. Fuel line hose B connection
4. Fuel line plug (drain plug) and O-ring

<<B>> >>A<< 5. Fuel filter cap
6. Fuel filter and O-ring

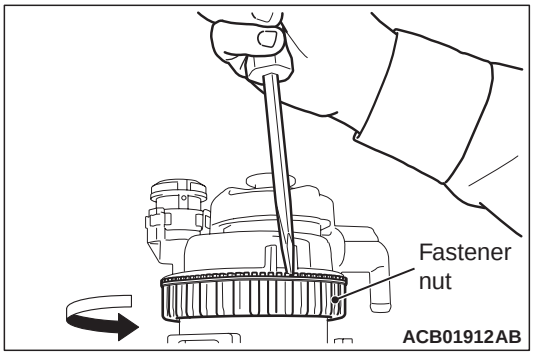
Removal steps (Continued)
7. O-ring
8. Fuel filter case
- Glow plug control relay and bracket (Refer to GROUP 16 – Glow System, Glow Plug Relay)

9. Fuel filter protector A

REMOVAL SERVICE POINTS

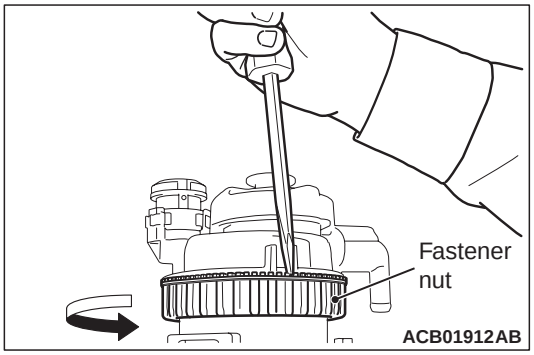
<<A>> FUEL FILTER CAP REMOVAL

1. Loosen the drain plug to drain the fuel. Then, tighten the drain plug.



2. Insert a flat-tipped screwdriver into the groove of the fastener nut.
3. Loosen the fastener nut using the flat-tipped screwdriver until it can be loosened by hand.

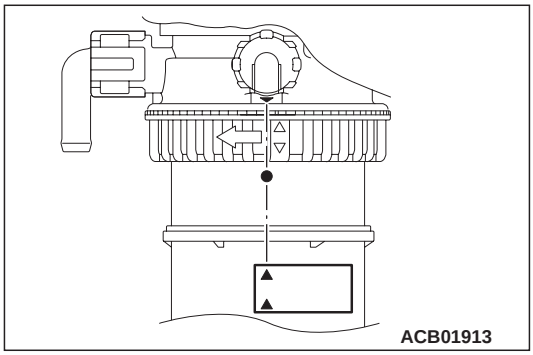
<<B>> FUEL FILTER CAP REMOVAL



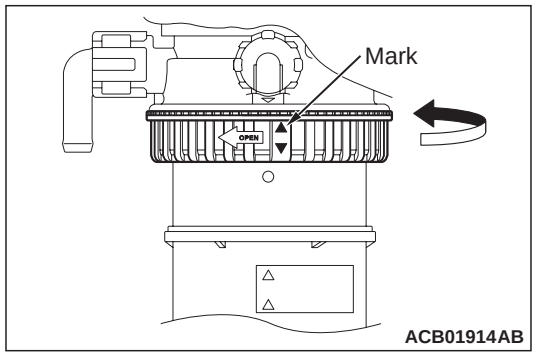
1. Insert a flat-tipped screwdriver into the groove of the fastener nut.
2. Loosen the fastener nut using the flat-tipped screwdriver until it can be loosened by hand.

INSTALLATION SERVICE POINTS

>>A<< FUEL FILTER CAP INSTALLATION

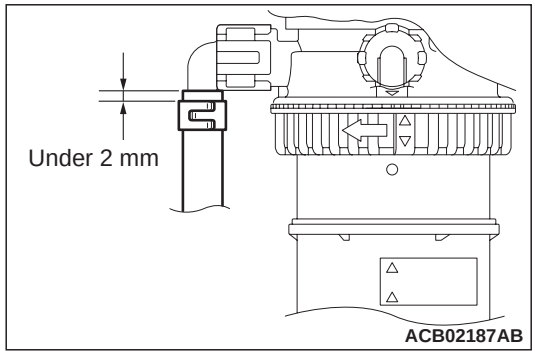


1. Install the fuel filter cap by aligning the marks on the fuel filter cap and the fuel filter case.



2. Securely tighten the fastener nut until the mark is in the position shown in the figure (until it clicks in place).

>>B<< FUEL LINE HOSE CONNECTION



Securely insert the fuel line hose to the fuel filter and install the hose clip in the position shown in the figure.

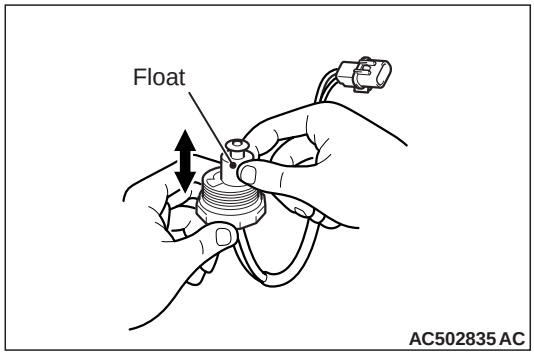
INSPECTION

M1135002900233

<Vehicles with steel fuel filter case>

WATER LEVEL SWITCH CHECK

1. Connect the circuit tester to the water level switch.

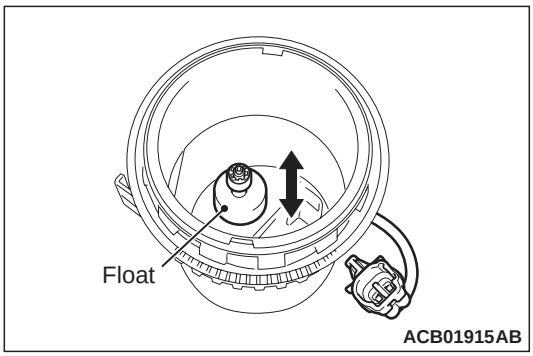


2. There should be continuity when the float is raised, while there is no continuity when it is lowered.
3. Replace the fuel filter assembly if it is faulty.

<Vehicles with plastic fuel filter case>

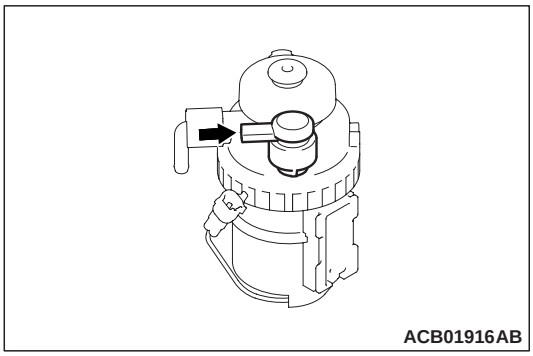
WATER LEVEL SWITCH CHECK

1. Connect the circuit tester to the water level switch.



2. There should be continuity when the float is raised, while there is no continuity when it is lowered.
3. Replace the fuel filter assembly if it is faulty.

FUEL FILTER VACUUM SWITCH CHECK



1. Connect the circuit tester to the fuel filter vacuum switch and check to see that there is continuity between the terminals.
2. Replace the fuel filter assembly if it is faulty.

GROUP 14

ENGINE COOLING

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RADIATOR REMOVAL AND INSTALLATION 14-16

GENERAL INFORMATION

M1141000101824

The cooling system is designed to keep every part of the engine at appropriate temperature in whatever condition the engine may be operated. The cooling method is of the water-cooled, pressure forced circulation type in which the water pump pressurizes coolant and circulates it throughout the engine. If the coolant temperature exceeds the prescribed temperature, the thermostat opens to circulate the coolant through the radiator as well so that the heat absorbed by the coolant may be radiated into the air. The water pump is of the centrifugal type and is driven by the drive belt from the crankshaft. The radiator is the corrugated fin, cross-flow type.

Item		Specification
Radiator	Performance kJ/h	244,300
Built-in A/T oil cooler	Performance kJ/h	6,800

SERVICE SPECIFICATIONS

M1141000300739

Item		Standard value	Limit
High-pressure valve opening pressure of radiator cap kPa		93 – 123	Minimum 83
Range of coolant antifreeze concentration of radiator %		30 – 60	-
Thermostat	Valve opening temperature of thermostat °C	82 ± 2	-
	Full-opening temperature of thermostat °C	95	-
	Valve lift mm	10 or more	-

LUBRICANT

M1141000400662

Item	Specified coolant	Quantity L
Engine coolant (including radiator condense tank)	DIA QUEEN SUPER LONG LIFE COOLANT or equivalent	8.2

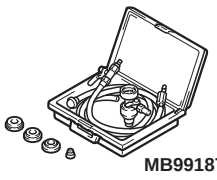
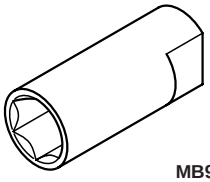
SEALANTS

M1141000501576

Item	Specified sealant
Engine coolant temperature gauge unit	3M ATD Part No.8660 or exact equivalent
Engine coolant temperature sensor	ThreeBond 1324N, LOCTITE 262 or equivalent

SPECIAL TOOLS

M1141000601432

Tool	Number	Name	Use
 MB991871	MB991871	LLC changer	Coolant refilling
 MB992042	MB992042	Engine coolant temperature sensor wrench	Removal and installation of the engine coolant temperature sensor

ON-VEHICLE SERVICE

ENGINE COOLANT LEAK CHECK

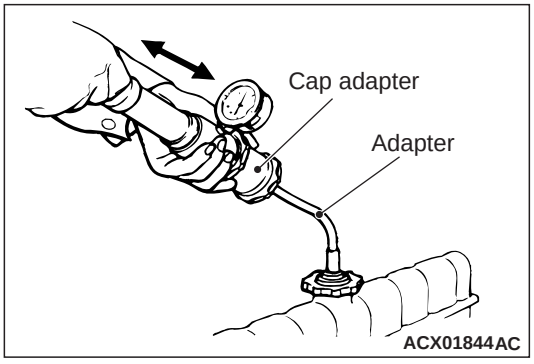
M1141001000515

⚠ *WARNING*

When pressure testing the cooling system, slowly release cooling system pressure to avoid getting burned by hot coolant.

⚠ **CAUTION**

- **Be sure to completely clean away any moisture from the places checked.**
- **When the tester is taken out, be careful not to spill any coolant.**
- **Be careful when installing and removing the tester and when testing not to deform the filler neck of the radiator.**

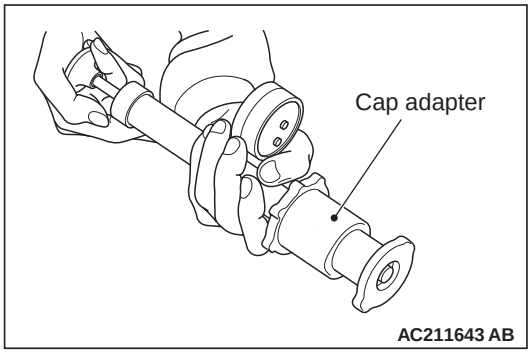


1. Check that the coolant level is up to the filler neck. Install a radiator tester and apply 160 kPa pressure, and then check for leakage from the radiator hose or connections.
2. If there is leakage, repair or replace the appropriate part.

RADIATOR CAP VALVE OPENING PRESSURE CHECK

M1141001300646

NOTE: Be sure that the cap is clean before testing. Rust or other foreign material on the cap seal will cause an improper reading.



1. Use a cap adapter to attach the cap to the tester.
2. Increase the pressure until the indicator of the gauge stops moving.

   Minimum limit: 83 kPa
   Standard value: 93 – 123 kPa
3. Replace the radiator cap if the reading does not remain at or above the limit.

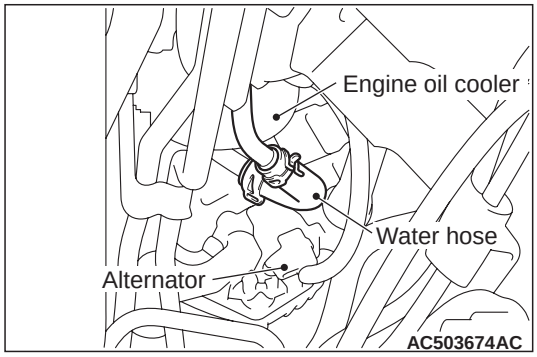
ENGINE COOLANT REPLACEMENT

M1141001201921

⚠ *WARNING*

When removing the radiator cap, use care to avoid contact with hot coolant or steam. Place a shop towel over the cap and turn the cap anti-clockwise a little to let the pressure escape through the vinyl tube. After relieving the steam pressure, remove the cap by slowly turning it anti-clockwise.

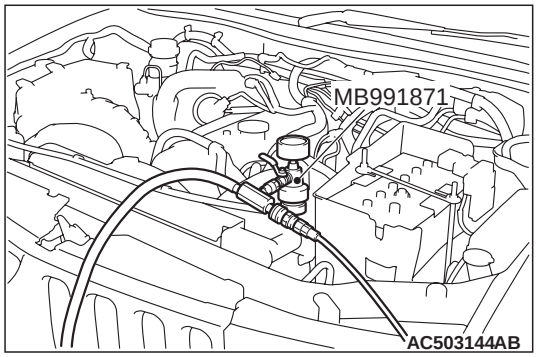
1. Drain the water from the radiator, heater core and engine after unplugging the radiator drain plug and removing the radiator cap.



2. Drain the water in the water jacket by disconnect the engine oil cooler water hose.
3. Remove the radiator condenser tank and drain the coolant.
4. Drain the coolant then clean the path of the coolant by injecting water into the radiator from the radiator cap area.
5. Connect the engine oil cooler water hose.
6. Securely tighten the drain plug of the radiator.
7. Reinstall the radiator condenser tank.

⚠ **CAUTION**

Do not use alcohol or methanol anti-freeze or any engine coolants mixed with alcohol or methanol anti-freeze. The use of an improper anti-freeze can cause corrosion of the aluminium components.



8. By referring to the section on coolant, select an appropriate concentration for safe operating temperature within the range of 30 to 60%. Use special tool LLC changer (MB991871) to refill the coolant. A convenient mixture is a 50% water and 50% antifreeze solution (freezing point: −31°C).

   Recommended antifreeze: DIA QUEEN SUPER LONG LIFE COOLANT or equivalent
   Quantity: 8.2 L

   NOTE: For how to use special tool MB991871, refer to its manufacturer's instructions.
9. Reinstall the radiator cap.
10. Start the engine and let it warm up until the thermostat opens.
11. After repeatedly revving the engine up to 3,000 r/min several times, then stop the engine.
12. Remove the radiator cap after the engine has become cold, and pour in coolant up to the brim. Reinstall the cap.

⚠ **CAUTION**

Do not overfill the radiator condenser tank.

13. Add coolant to the radiator condenser tank between the "F" and "L" mark if necessary.

CONCENTRATION MEASUREMENT

M1141001100631

Measure the temperature and specific gravity of the engine coolant to check the antifreeze concentration.

Standard value: 30 − 60% (allowable concentration range)
Recommended antifreeze: DIAQUEEN SUPER LONG LIFE COOLANT or equivalent

⚠ **CAUTION**

If the concentration of the anti-freeze is below 30%, the anti-corrosion property will be adversely affected. In addition, if the concentration is above 60%, both the anti-freezing and engine cooling properties will decrease, affecting the engine adversely. For these reasons, be sure to maintain the concentration level within the specified range.

WATER PUMP COOLANT LEAK CHECK

M1141008600392

If a residue of the coolant draining is found on the drain hole, the vapour hole and the installation surface of the water pump, check the water pump leakage by following method.

1. Wipe off the residue of the coolant draining on the water pump.

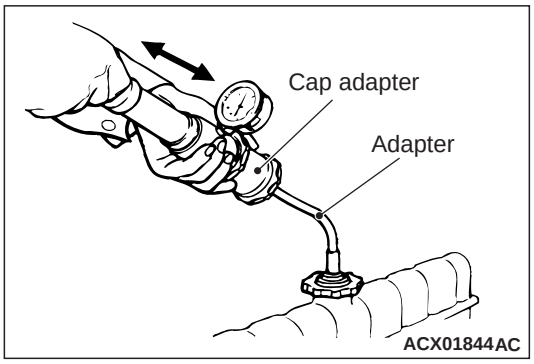
⚠ ***WARNING***

Make sure that the coolant is cold when removing the radiator cap.

2. Remove the radiator cap.

⚠ **CAUTION**

Do not pressures 100 kPa or more.



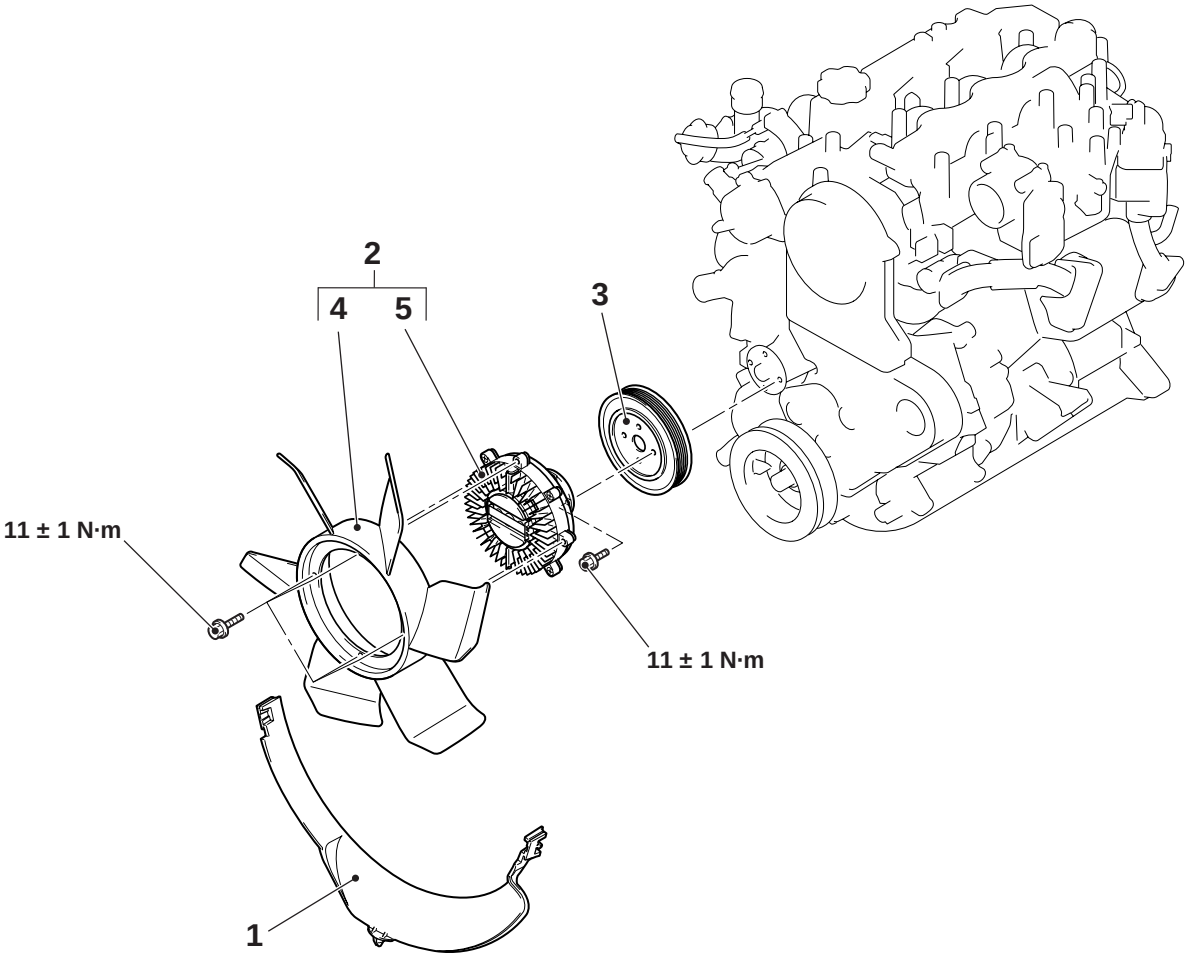
3. Install the radiator tester and pressures at 100 kPa.
4. Hold the pressurized state for 20 minutes, and check that the water leakage from the drain hole, the vapour hole or the installation surface of the water pump.
5. Remove the radiator tester, and install the radiator cap.
6. Warm up the engine, let it idle for 20 minutes and stop it.
7. Stop the engine.
8. Check that the water leakage from the drain hole, the vapour hole or the installation surface of the water pump.
9. If the water leakage is found in step 4 or 8, replace the water pump (Refer to P.14-9).

RADIATOR FAN

REMOVAL AND INSTALLATION

M1141002100872

Pre-removal and Post-installation Operation
- A/C Compressor Drive Belt, Alternator and Power Steering Oil Pump Drive Belt Removal and Installation (Refer to GROUP 11A – Crankshaft Pulley).
- Air Duct Removal and Installation (Refer to GROUP 15 – Air Cleaner).



AC805946 AB

Removal steps
1. Cooling fan shroud cover
2. Cooling fan and cooling fan clutch assembly

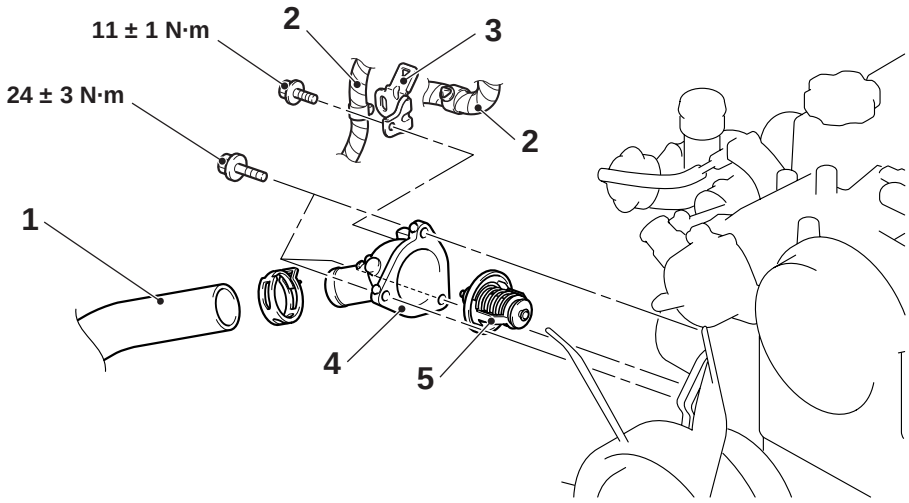
Removal steps (Continued)
3. Water pump pulley
4. Cooling fan
5. Cooling fan clutch

THERMOSTAT

REMOVAL AND INSTALLATION

M1141002402631

Pre-removal and Post-installation Operation
- Engine Coolant Draining and Refilling (Refer to P.14-4).
- Air Cleaner Assembly Removal and Installation (Refer to GROUP 15 – Air Cleaner).



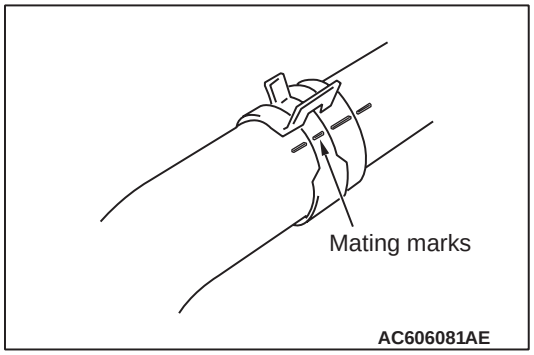
AC507713AB

Removal steps

<<A>> >>A<<
1. Radiator lower hose connection
2. Battery wiring harness connection
3. Harness bracket
4. Water pump inlet hose fitting
5. Thermostat

REMOVAL SERVICE POINT

<<A>> RADIATOR LOWER HOSE DISCONNECTION

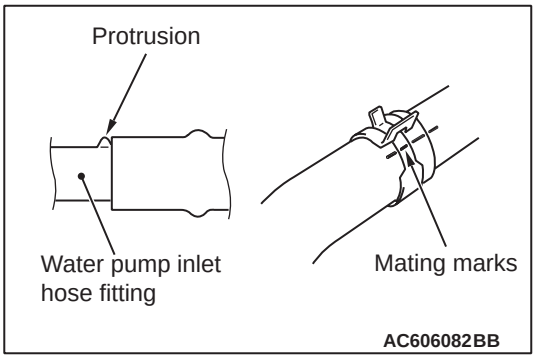


AC606081AE

Make mating marks on the radiator lower hose and the hose clip as shown to install them in the original position. Disconnect the radiator lower hose.

INSTALLATION SERVICE POINT

>>A<< RADIATOR LOWER HOSE CONNECTION



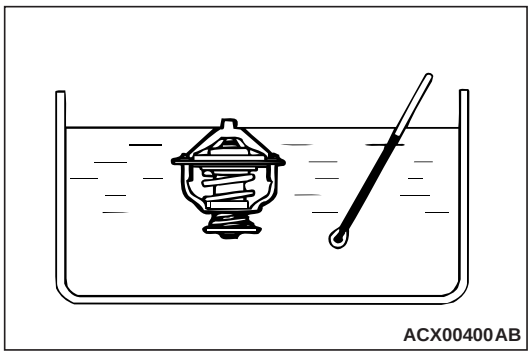
AC606082BB

1. Insert each hose as far as the projection of the water pump inlet hose fitting.
2. Align the mating marks on the radiator lower hose and hose clamp, and then connect the radiator lower hose.

INSPECTION

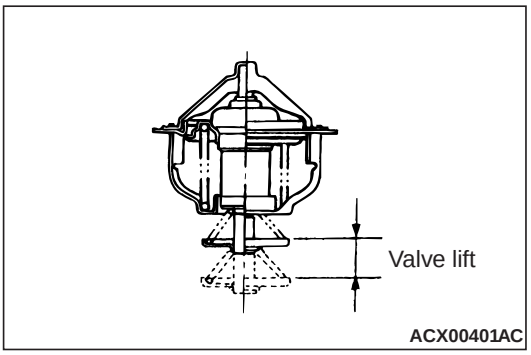
M1141002500676

THERMOSTAT CHECK



1. Immerse the thermostat in water, and heat the water while stirring. Check the thermostat valve opening temperature.

   Standard value: 82 ± 2°C



2. Check that the amount of valve lift is at the standard value when the water is at the full-opening temperature.

   NOTE: Measure the valve height when the thermostat is fully closed, and use this measurement to compare the valve height when the thermostat is fully open.

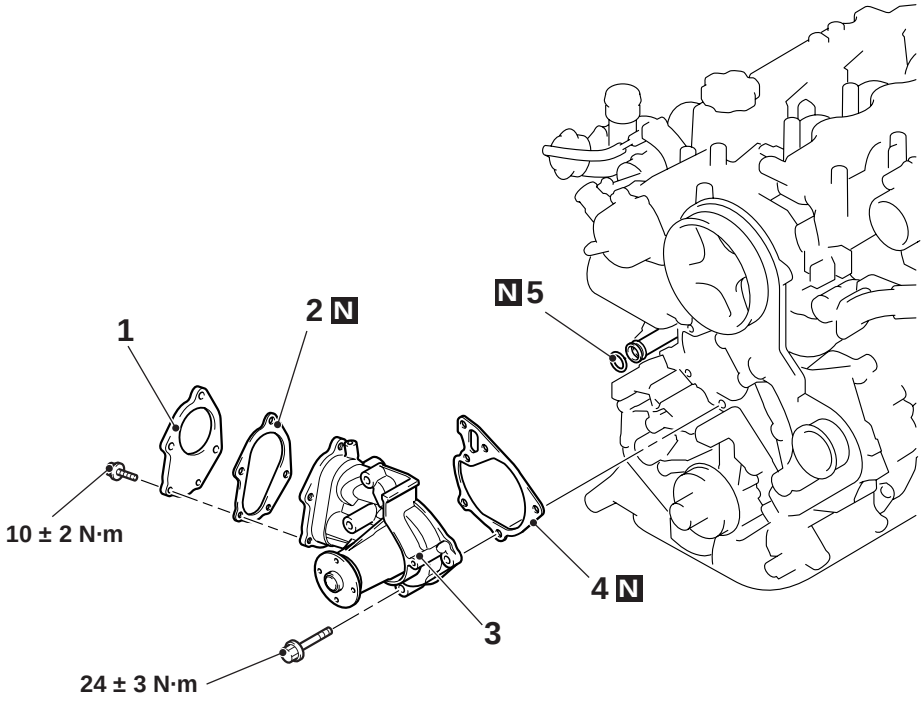
   Standard value:
   Full-opening temperature: 95°C
   Amount of valve lift: 10 mm or more

WATER PUMP

REMOVAL AND INSTALLATION

M1141002702342

Pre-removal Operation	Post-installation Operation
• Engine Coolant Draining (Refer to P.14-4). • Timing Belt and Timing Belt B Removal (Refer to GROUP 11A – Timing Belt). • Thermostat Removal (Refer to P.14-7).	• Thermostat Installation (Refer to P.14-7). • Timing Belt and Timing Belt B Installation (Refer to GROUP 11A – Timing Belt). • Engine Coolant Refilling (Refer to P.14-4).



AC502983AB

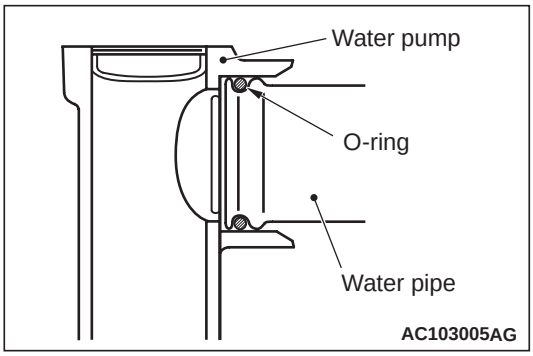
Removal steps

1. Water pump inlet fitting plate
2. Water pump inlet fitting gasket
- Oil hose and oil pipe (Refer to GROUP 11A – Vacuum Pump).
3. Water pump
4. Water pump gasket

>>A<< 5. O-ring

INSTALLATION SERVICE POINT

>>A<< O-RING INSTALLATION



Fit the O-ring to the groove in the water pipe. Then lubricate the O-ring and the inside of the water pump with water, and then insert the water pipe to the water pump.

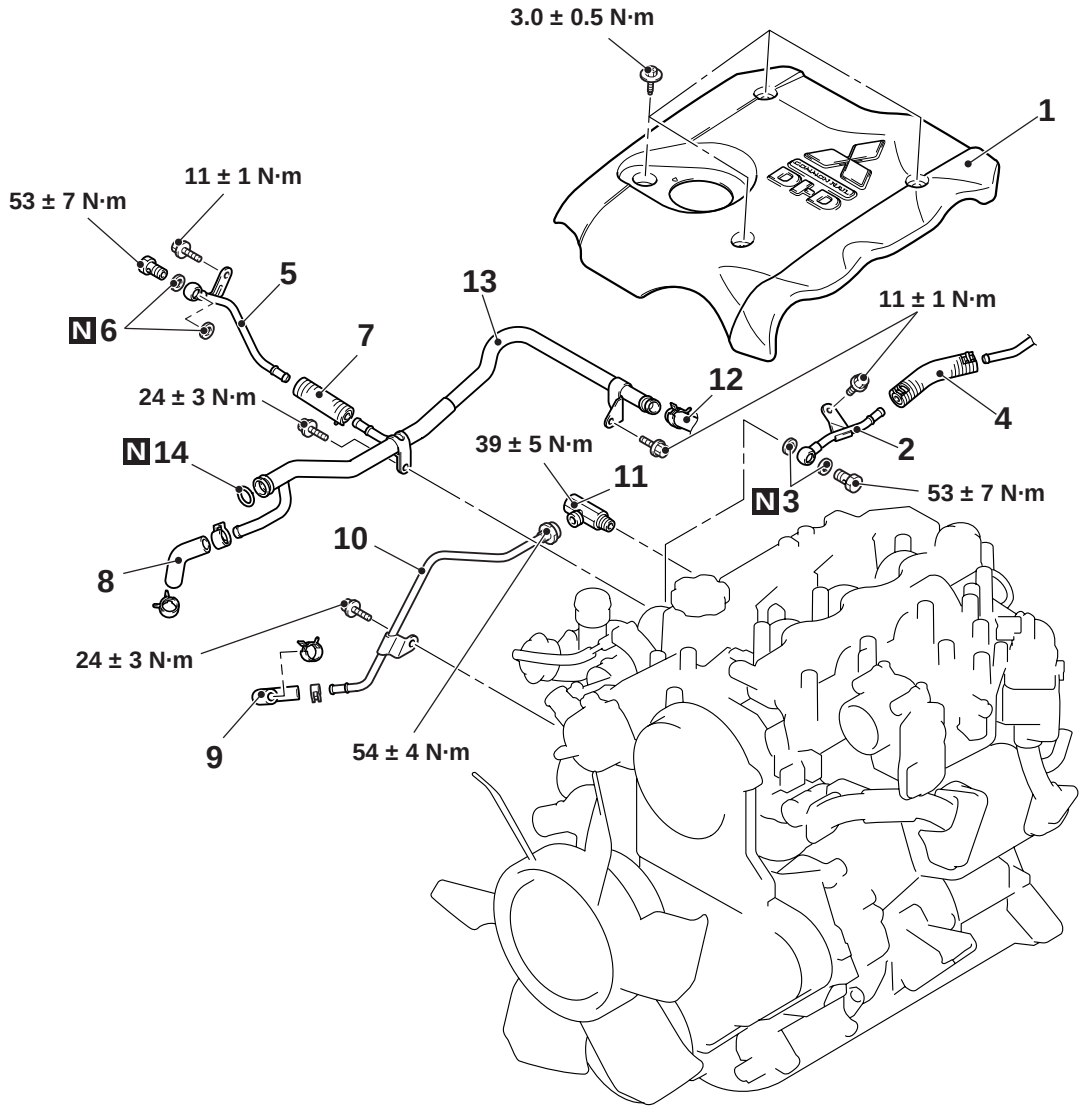
WATER HOSE AND WATER PIPE

REMOVAL AND INSTALLATION

M1141003304138

Pre-removal and Post-installation Operation
- Engine Coolant Draining and Refilling (Refer to P.14-4).

<Except Euro5>



AC502984 AB

Removal steps
- Under skid plate and engine room under cover (Refer to GROUP 51 – Under Cover).
- Air cleaner assembly (Refer to GROUP 15 – Air Cleaner).

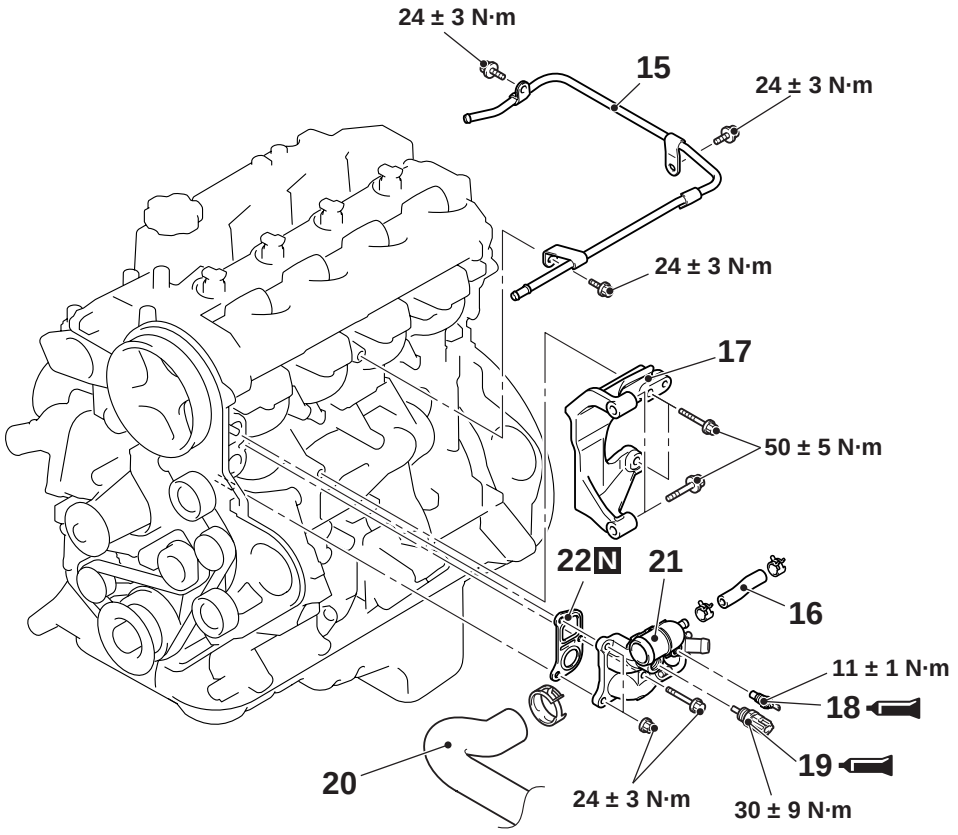
1. Engine cover
2. Water pipe B
3. Gasket
4. Water hose

Removal steps (Continued)

5. Water pipe C
6. Gasket
7. Water hose
8. Water hose
9. Water hose
10. Water pipe D
11. Joint
12. Heater piping hose connection

>>E<< 13. Water pipe

>>E<< 14. O-ring



AC502985AD

Removal steps

- Inlet manifold (Refer to GROUP 15 – Inlet Manifold).

15. Water pipe A
16. Water hose

>>**D**<< 17. Front upper case stiffener

>>**C**<< 18. Engine coolant temperature gauge unit

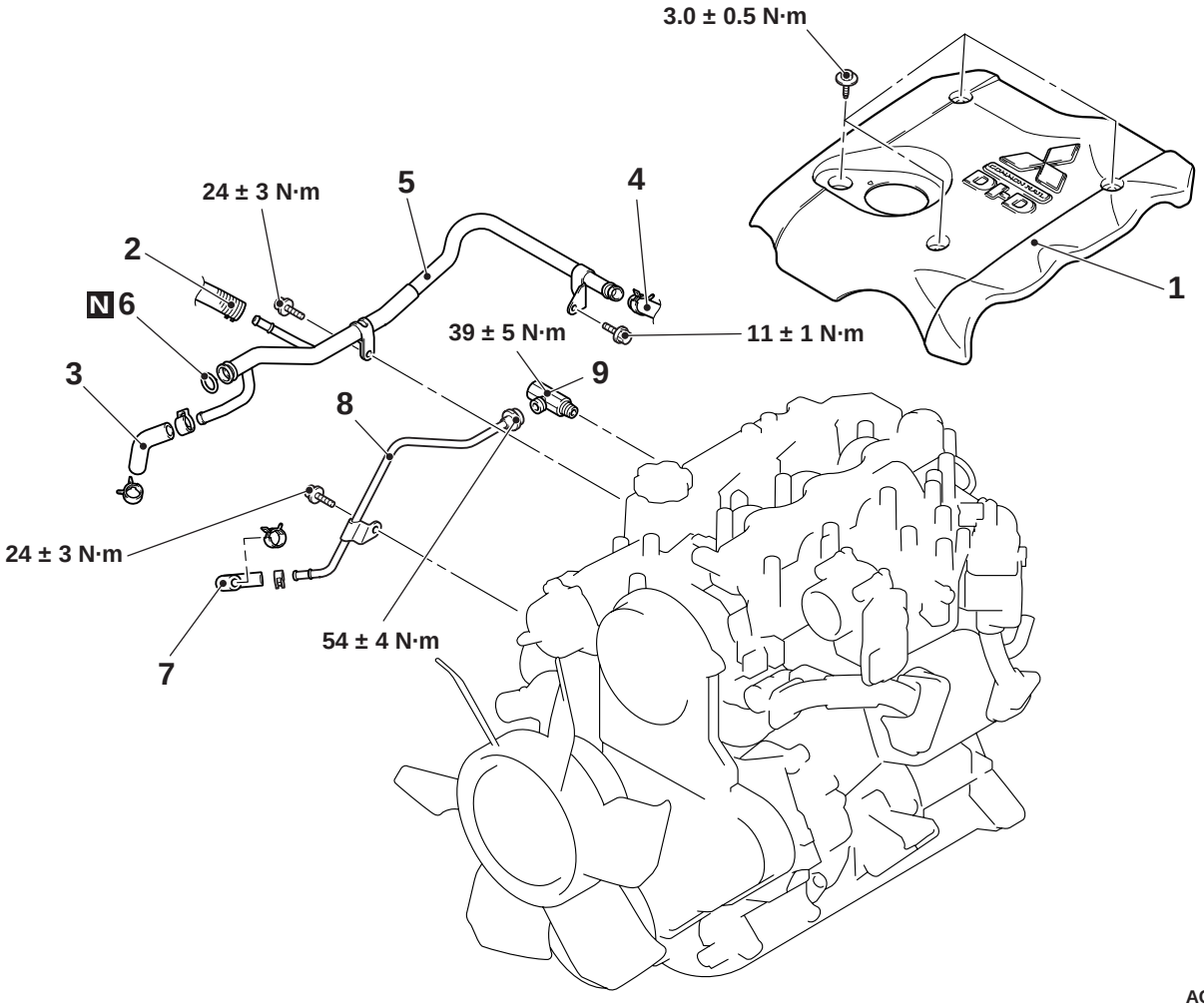
Removal steps (Continued)

<<**A**>> >>**B**<< 19. Engine coolant temperature sensor

<<**B**>> >>**A**<< 20. Radiator upper hose connection

21. Cooling water outlet hose fitting
22. Cooling water outlet hose fitting gasket

<Euro5>



AC805754 AB

Removal steps

- Under skid plate and engine room under cover (Refer to GROUP 51 – Under Cover).
- Air cleaner assembly (Refer to GROUP 15 – Air Cleaner).

1. Engine cover
2. Water hose connection

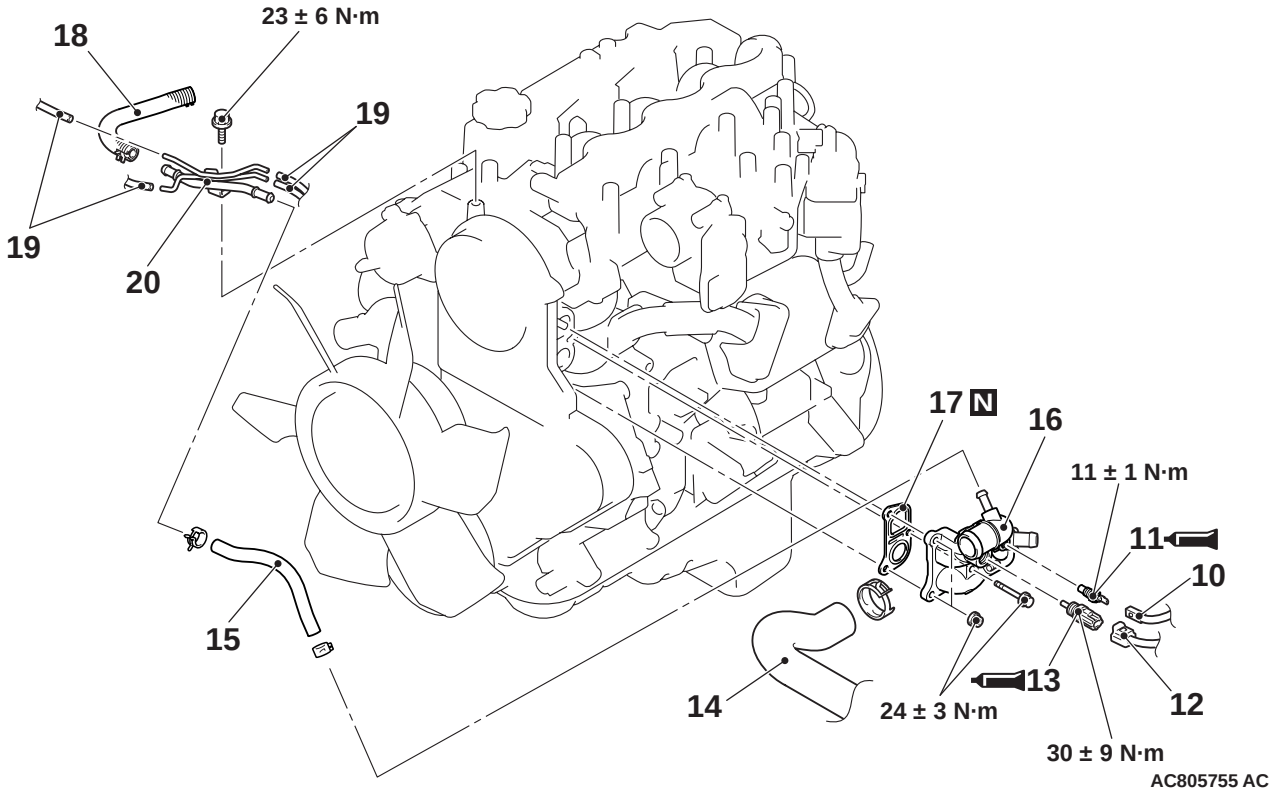
Removal steps (Continued)

3. Water hose
4. Heater piping hose connection

>>E<< 5. Water pipe

>>E<< 6. O-ring

7. Water hose
8. Water pipe D
9. Joint



Removal steps

10. Engine coolant temperature gauge unit connector

>>C<< 11. Engine coolant temperature gauge unit

12. Engine coolant temperature sensor connector

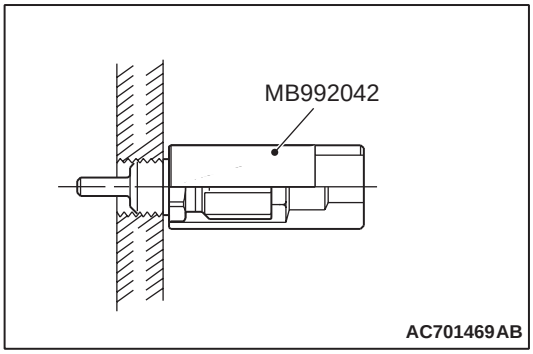
<<A>> >>B<< 13. Engine coolant temperature sensor

<<B>> >>A<< 14. Radiator upper hose connection

15. Water hose
16. Cooling water outlet hose fitting
17. Cooling water outlet hose fitting gasket
18. Water hose
19. Vacuum hose connection
20. Vacuum pipe assembly

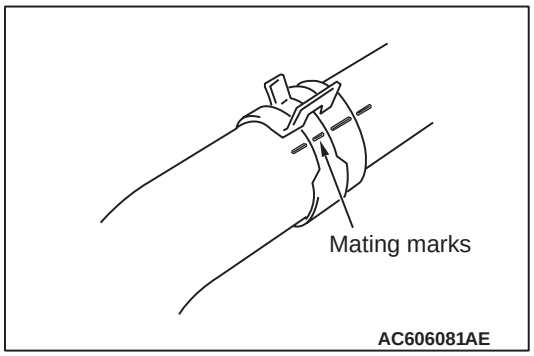
REMOVAL SERVICE POINTS

<<A>> ENGINE COOLANT TEMPERATURE SENSOR REMOVAL



Use special tool water temperature sensor wrench (MB992042) to remove the engine coolant temperature sensor.

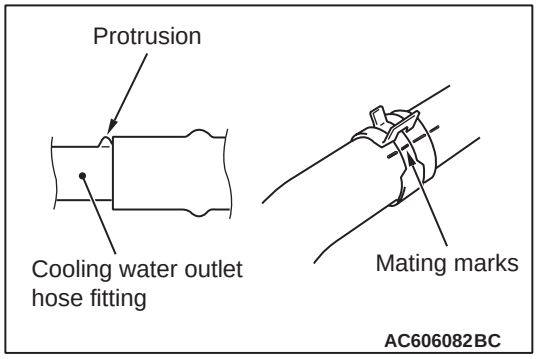
<<B>> RADIATOR UPPER HOSE DISCONNECTION



Make mating marks on the radiator upper hose and the hose clip as shown to install them in the original position. Disconnect the radiator upper hose.

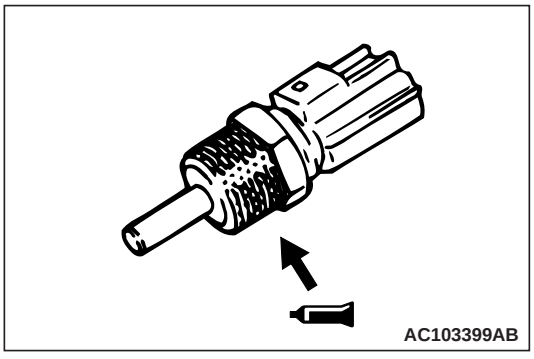
INSTALLATION SERVICE POINTS

>>A<< RADIATOR UPPER HOSE CONNECTION



1. Insert radiator upper hose as far as the protrusion of the cooling water outlet hose fitting.
2. Align the mating marks on the radiator upper hose and hose clamp, and then connect the radiator upper hose.

>>B<< ENGINE COOLANT TEMPERATURE SENSOR INSTALLATION



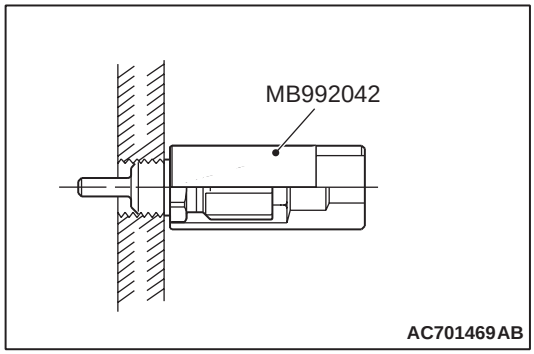
1. Apply the sealant to the thread of engine coolant temperature sensor.

Specified sealant: ThreeBond 1324N or equivalent

NOTE: Install the engine coolant temperature sensor immediately after applying sealant.

⚠ CAUTION

After the installation, until a sufficient period of time (one hour or more) elapses, do not apply the oil or water to the sealant application area or start the engine.



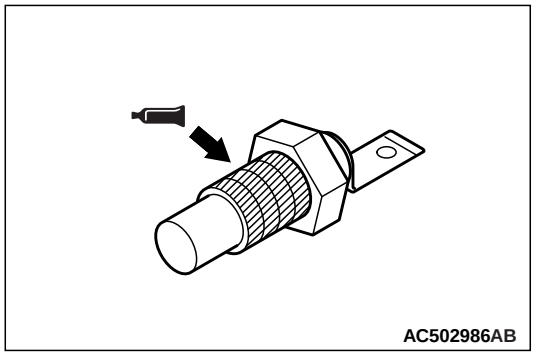
2. In the same manner as for removal, using special tool water temperature sensor wrench (MB992042), tighten to the specified torque.

Tightening torque: 30 ± 9 N·m

>>C<< ENGINE COOLANT TEMPERATURE GAUGE UNIT INSTALLATION

⚠ CAUTION

After the installation, until a sufficient period of time (one hour or more) elapses, do not apply the oil or water to the sealant application area or start the engine.

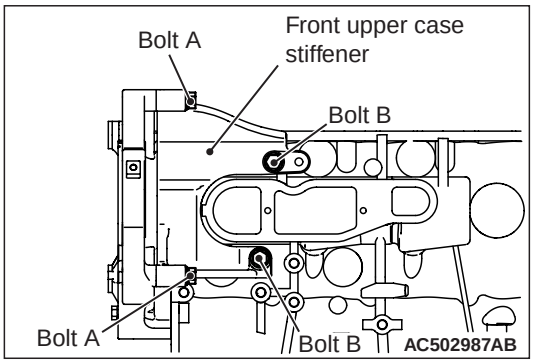


Apply the specified sealant to the thread of the engine coolant temperature gauge unit, and then tighten it to the specified torque.

Specified Sealant: 3M ATD Part No. 8660
Tightening torque: 11 ± 1 N·m

NOTE: Install the engine coolant temperature gauge unit immediately after applying sealant.

>>D<< FRONT UPPER CASE STIFFENER INSTALLATION



1. Temporarily tighten the front upper case stiffener with bolts.
2. Tighten the bolt A located at the front upper case side to the specified torque.

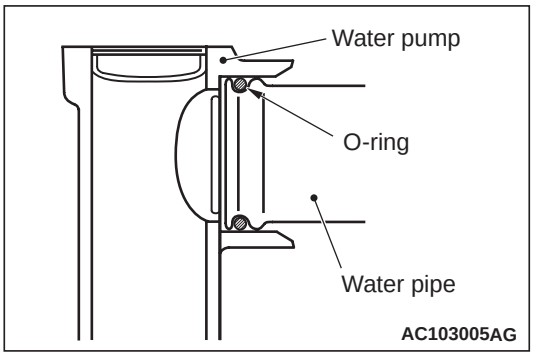
   Tightening torque: 50 ± 5 N·m
3. Next, tighten the bolt B located at the cylinder block side to the specified torque.

   Tightening torque: 50 ± 5 N·m

>>E<< O-RING/WATER PIPE INSTALLATION

⚠ CAUTION

Do not allow engine oil or other grease to adhere to the cooling water line O-ring



Fit the O-ring to the groove in the water pipe. Then lubricate the rim of O-ring or the inside of water pipe fixing position with water, and then insert the water pipe to the water pump.

INSPECTION

M1141003400467

WATER PIPE AND HOSE CHECK

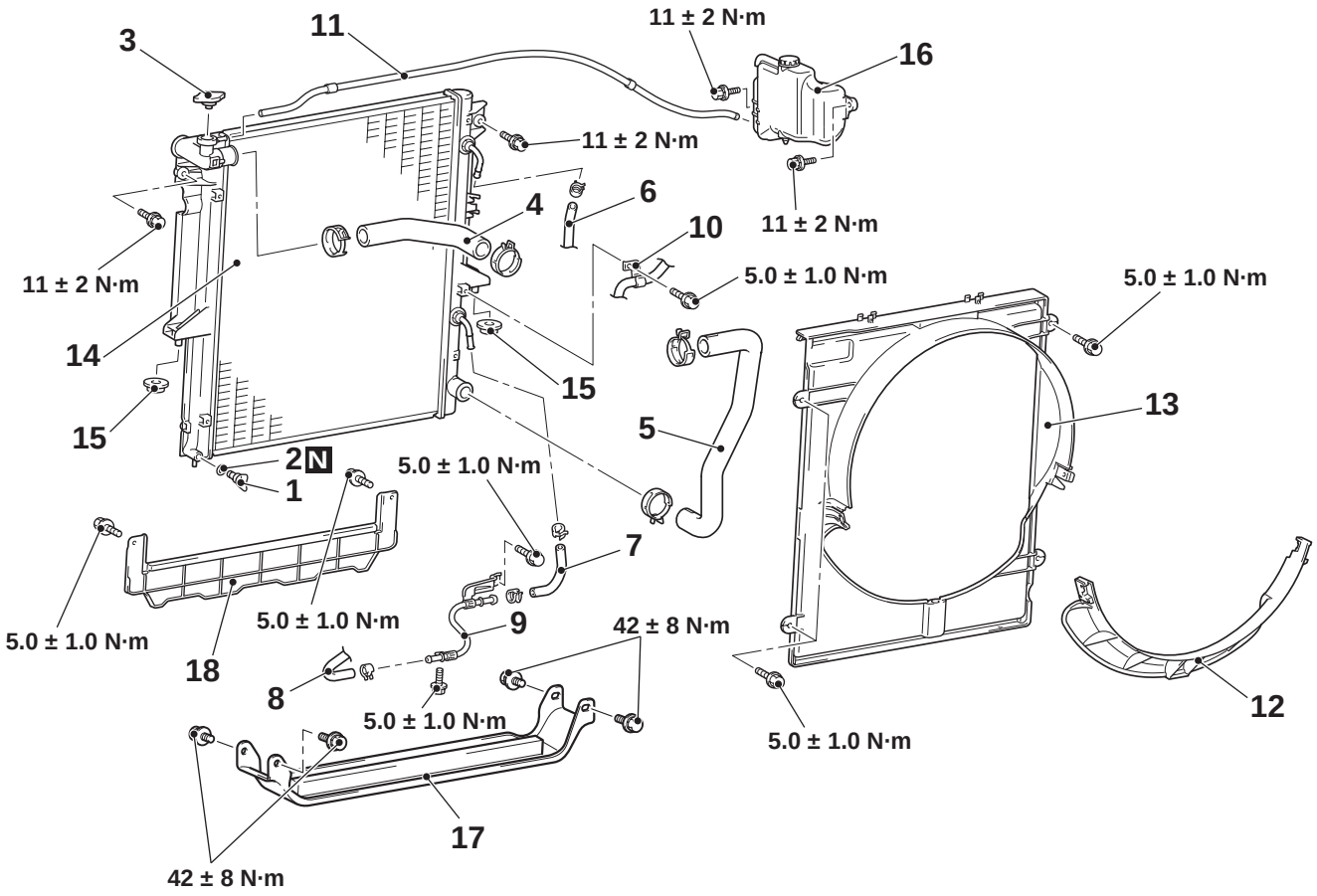
Check the water pipe and hose for cracks, damage and clogs. Replace them if necessary.

RADIATOR

REMOVAL AND INSTALLATION

M1141001503393

Pre-removal Operation	Post-installation Operation
• Engine Coolant Draining (Refer to P.14-4). • Air Cleaner Intake Duct Removal (Refer to GROUP 15 – Air Cleaner).	• Air Cleaner Intake Duct Installation (Refer to GROUP 15 – Air Cleaner). • Engine Coolant Refilling (Refer to P.14-4). • A/T Fluid Supplying and Checking (Refer to GROUP 23A – On-vehicle Service, A/T Fluid Check).



AC903736 AB

Removal steps

1. Drain plug
2. O-ring
3. Radiator cap

<<A>> >>A<< 4. Radiator upper hose

<<A>> >>A<< 5. Radiator lower hose

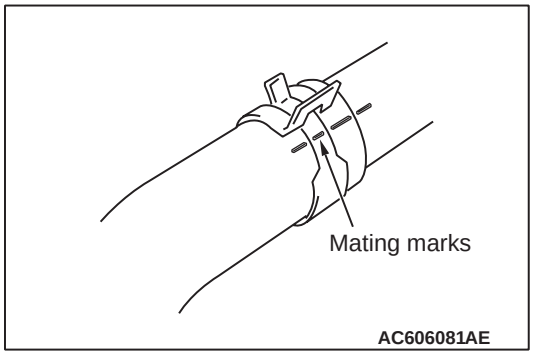
6. Cooler hose connection <A/T>
7. Hose <A/T>
8. Return hose connection <A/T>
9. Return pipe <A/T>
10. Feed hose clamp <A/T>

Removal steps (Continued)

11. Radiator condenser tank hose
12. Cooling fan shroud cover
13. Cooling fan shroud
14. Radiator
15. Radiator support lower insulator
16. Radiator condenser tank
17. Radiator guard <2WD (Except High rider)>
18. Air guide panel <2WD (High rider), 4WD>

REMOVAL SERVICE POINT

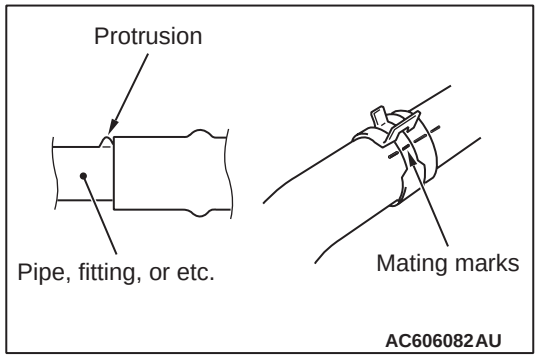
<<A>> RADIATOR UPPER HOSE/RADIATOR LOWER HOSE DISCONNECTION



Make mating marks on the radiator hose and the hose clamp. Disconnect the radiator hose.

INSTALLATION SERVICE POINT

>>A<< RADIATOR LOWER HOSE/RADIATOR UPPER HOSE CONNECTION



1. Insert radiator hose as far as the projection of the water pump inlet hose fitting, cooling water outlet hose fitting, cooling water outlet pipe or radiator.
2. Align the mating marks on the radiator hose and hose clamp, and then connect the radiator hose.

GROUP 15

INTAKE AND EXHAUST

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EXHAUST PIPE AND MAIN MUFFLER . . . 15-24

GENERAL INFORMATION

M1151000101568

The exhaust pipe is divided into three parts.

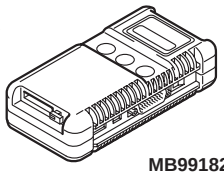
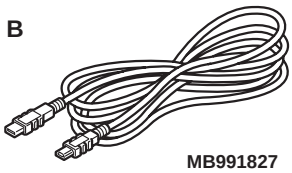
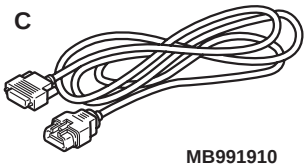
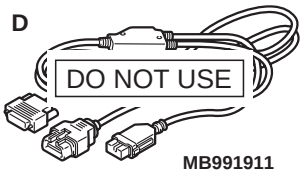
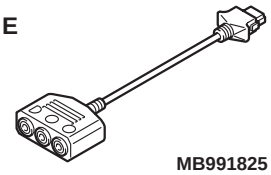
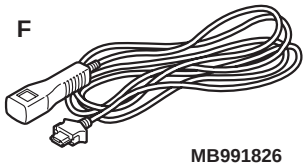
SERVICE SPECIFICATIONS

M1151000302189

Item		Standard value	Limit
Turbocharger supercharging pressure kPa	Except Euro 5	178.9 – 188.2	–
	Euro 5-low power engine	194.9 – 233.5	–
	Euro 5-normal power engine	199.4 – 237.6	–
	Euro 5-high power engine	203.1 – 238.6	–
Initial activation pressure of waste gate actuator (at the stroke of approximately 1 mm) <Except Euro 5> kPa		132.6 – 143.6	–
Initial activation vacuum of variable geometry actuator (at the stroke approximately 1.5 mm from full close) <Euro 5> kPa		45.4 – 49.2	–
Variable geometry solenoid valve coil resistance (at 20 °C) <Euro 5> Ω		10 – 14	–
Manifold distortion of the installation surface mm		0.15 or less	0.20

SPECIAL TOOLS

M1151000601842

Tool	Number	Name	Use
A  MB991824 B  MB991827 C  MB991910 D  MB991911 E  MB991825 F  MB991826 MB991955	MB991955 A: MB991824 B: MB991827 C: MB991910 D: MB991911 E: MB991825 F: MB991826	M.U.T.-III sub assembly A: Vehicle communication interface (V.C.I.) B: M.U.T.-III USB cable C: M.U.T.-III main harness A (Vehicles with CAN communication system) D: M.U.T.-III main harness B (Vehicles without CAN communication system) E: M.U.T.-III adapter harness F: M.U.T.-III trigger harness	⚠ CAUTION **For vehicles with CAN communication, use M.U.T.-III main harness A to send simulated vehicle speed. If you connect M.U.T.-III main harness B instead, the CAN communication does not function correctly.** Measurement of turbocharger supercharging pressure

ON-VEHICLE SERVICE

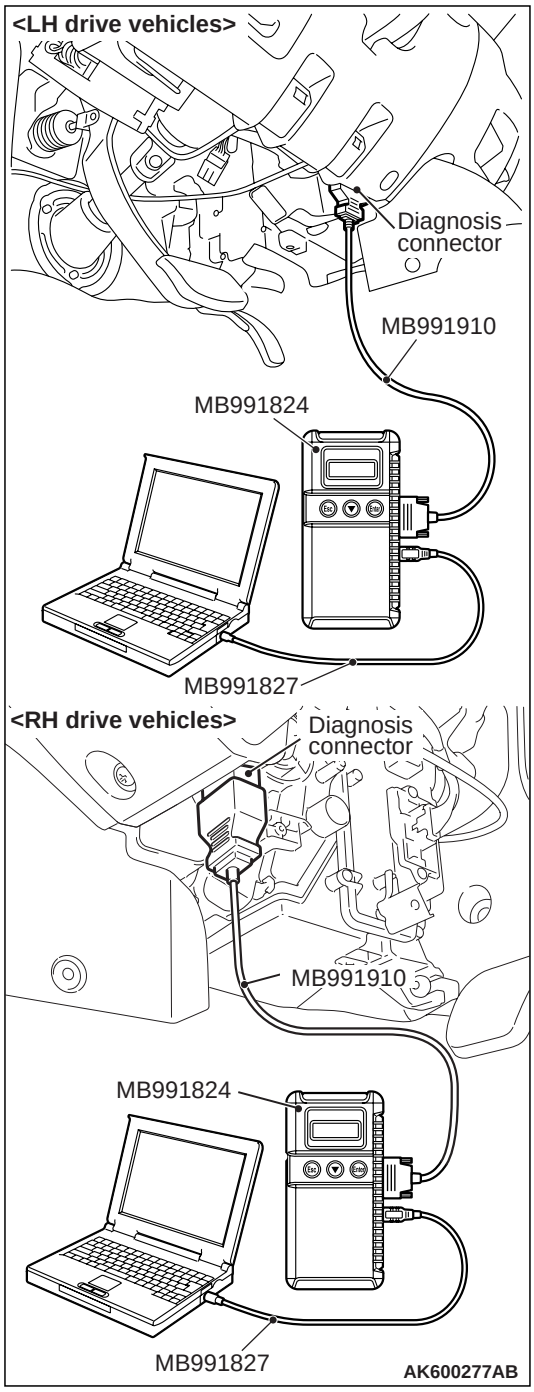
TURBOCHARGER SUPERCHARGING PRESSURE CHECK

M1151001001069

⚠ CAUTION

Conduct the driving test in a location where driving at full acceleration can be done with safety. Two person should be in the vehicle when the test is conducted; the person in the passenger seat should read the indications shown by the M.U.T.-III.

1. Set the vehicle to the pre-inspection condition.



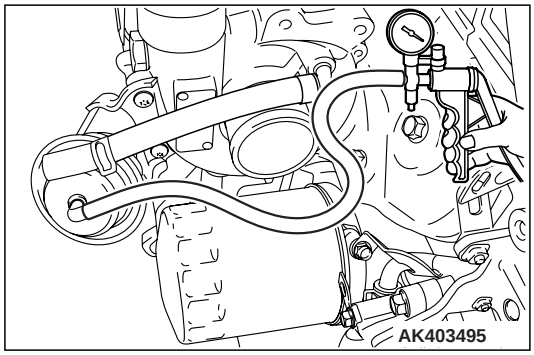
2. Turn the ignition switch to "LOOK" (OFF) position, and connect the diagnosis connector to the M.U.T.-III.
3. Use the data list function named "Item No. 6" boost pressure sensor of the M.U.T.-III to check the supercharging pressure when the engine speed increases to approximately 3,000 r/min or more by driving at full acceleration in 2nd.

Standard value:
178.9 – 188.2 kPa <Except Euro 5>
194.9 – 233.5 kPa <Euro 5-low power engine>
199.4 – 237.6 kPa <Euro 5-normal power engine>
203.1 – 238.6 kPa <Euro 5-high power engine>

4. If the supercharging pressure deviates from the standard value, check the following items for possible cause.
   - Malfunction of the waste gate actuator <Except Euro 5>
   - Malfunction of the variable geometry actuator <Euro 5>
   - Malfunction of the variable geometry solenoid valve <Euro 5>
   - Malfunction of the variable nozzle <Euro 5>
   - Malfunction of the boost pressure sensor
   - Leakage of supercharging pressure
   - Malfunction of the turbocharger
5. When the indicated supercharging is more than standard value, supercharging control may be faulty, therefore check the followings.
   - Disconnection or cracks of the waste gate actuator rubber hose <Except Euro 5>
   - Malfunction of the waste gate actuator <Except Euro 5>
   - Malfunction of the waste gate valve <Except Euro 5>
   - Malfunction of the variable geometry actuator <Euro 5>
   - Malfunction of the variable geometry solenoid valve <Euro 5>
   - Malfunction of the variable nozzle <Euro 5>
   - Malfunction of the manifold absolute pressure sensor

WASTE GATE ACTUATOR CHECK <Except Euro5>

M1151001200673



1. Connect a manual pump (pressure-application type) to nipple.

⚠ CAUTION
In order to avoid damage to the diaphragm, do not apply a pressure of 159 kPa or higher.

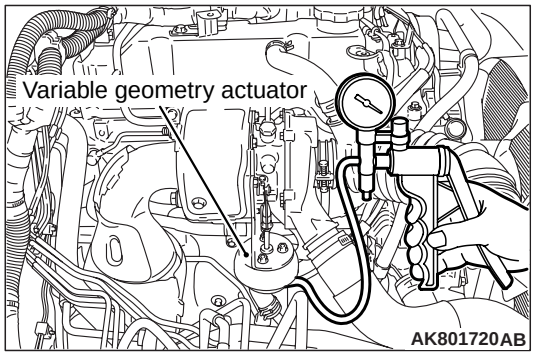
2. While gradually applying pressure, check the pressure that begins to activate (approximately 1 mm stroke) the waste gate actuator rod.

Standard value:
132.6 – 143.6 kPa

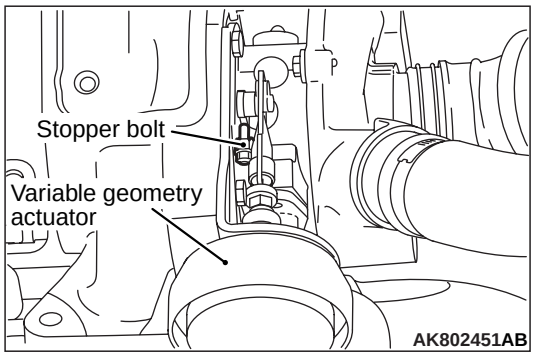
3. If there is a significant deviation from the standard value, check the actuator or the waste gate valve: replace actuator or turbocharger assembly if necessary.

VARIABLE GEOMETRY ACTUATOR CHECK <EURO5>

M1151011000249



1. Remove the vacuum hose from the variable geometry (VG) actuator. Connect the hand vacuum pump to the nipple.



⚠ CAUTION
In order to avoid damage to the diaphragm, do not apply a vacuum of 60 kPa or higher.

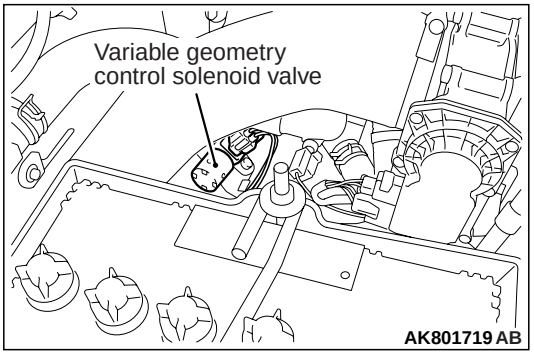
2. By applying the vacuum pressure until the VG actuator link touches the stopper bolt, fully shrink the actuator rod. The vacuum pressure is approximately 55 kPa at that time.
3. Leak the vacuum pressure gradually as much as possible to check the vacuum pressure when the VG actuator rod moves approximately 1.5 mm in the extension direction.

   Standard value: Approximately 45.4 – 49.2 kPa

4. If the vacuum pressure significantly deviates from the standard value, check the actuator or the variable nozzle. Replace the turbocharger assembly if necessary.

VARIABLE GEOMETRY SOLENOID VALVE CHECK <EURO5>

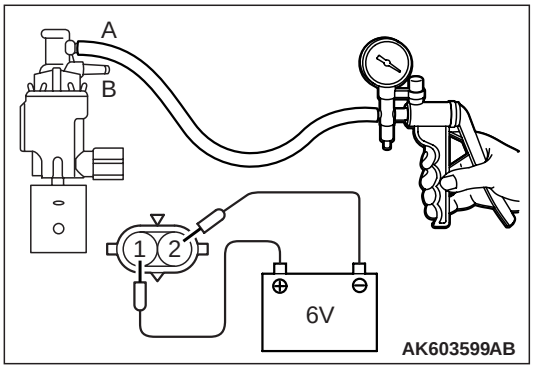
M1151011100202



1. Disconnect the vacuum hoses from the variable geometry solenoid valve.

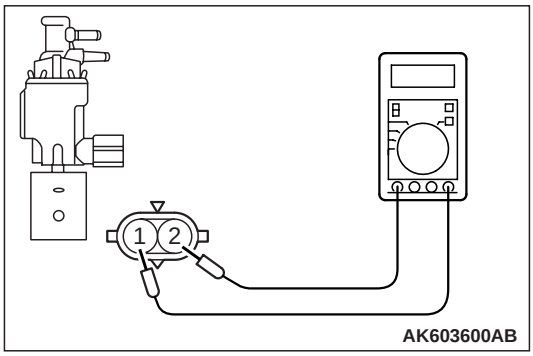
   NOTE: When disconnecting the vacuum hose, always make sure that it can be reconnected at its original position.

2. Disconnect the harness connector.



3. Connect a hand vacuum pump to nipple (A) of the variable geometry solenoid valve.
4. As described in the chart below, check airtightness by applying a vacuum with voltage applied directly from the battery to the variable geometry solenoid valve, and without applying voltage.

Battery positive voltage	Nipple (B) condition	Normal condition
Applied	Open	Vacuum leaks
	Closed	Vacuum maintained
Not applied	Open	Vacuum maintained



5. Measure the resistance between the terminals of the variable geometry solenoid valve.

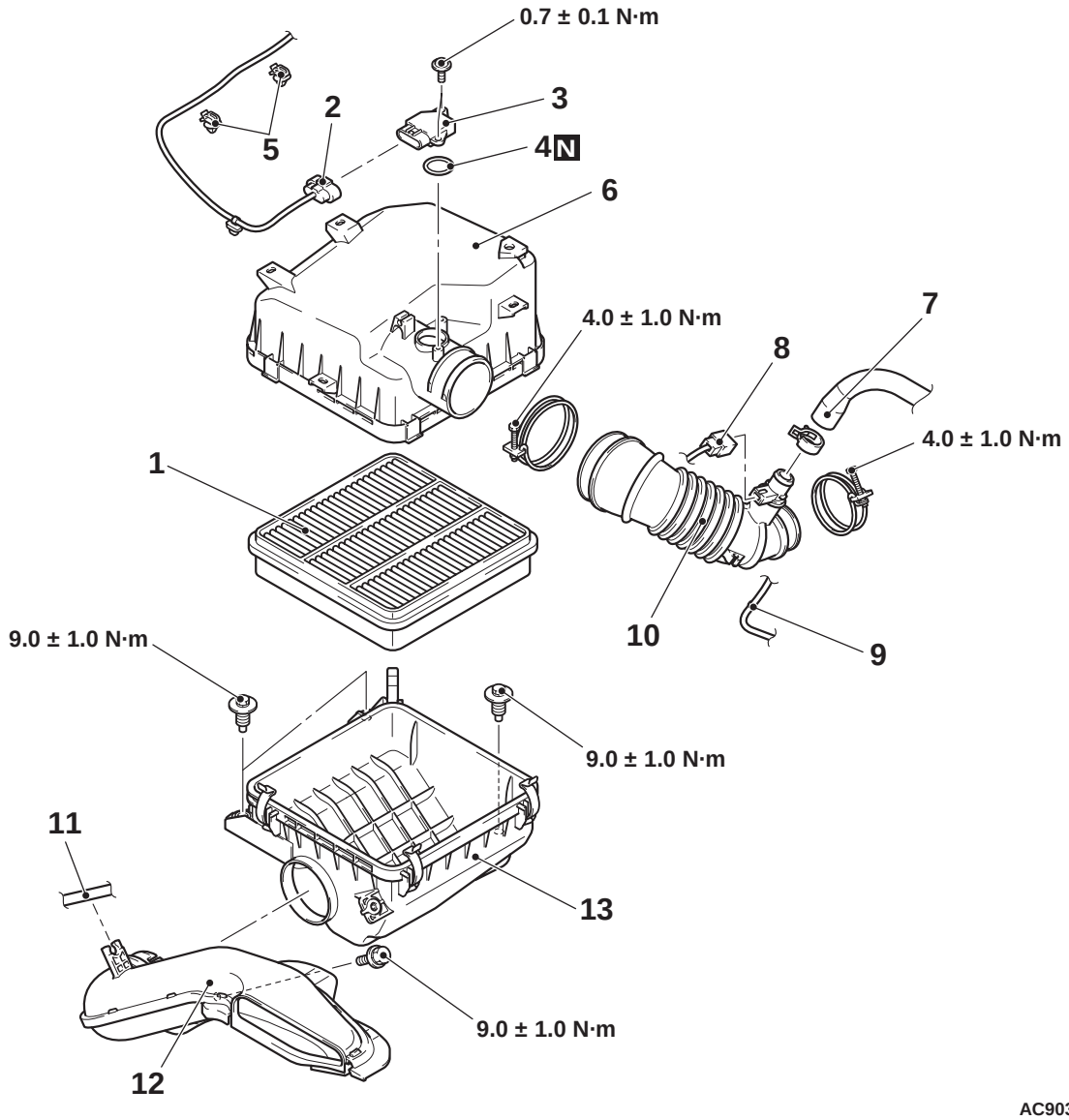
Standard value: 10 – 14 Ω (at 20°C)

6. Replace the solenoid if airtightness or resistance is out of specification.

AIR CLEANER

REMOVAL AND INSTALLATION

M1151002103485



Removal steps

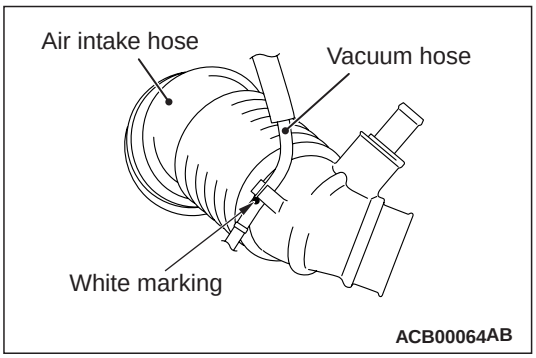
1. Air cleaner element
2. Air flow sensor connector connection
3. Air flow sensor
4. Air flow sensor O-ring
5. Harness clamp
6. Air cleaner cover
7. Breather hose connection
8. Blow-by hose heater connector <Vehicles for cold zone>

>>**A**<< 9. Vacuum hose connection <Euro5>

10. Air intake hose
11. Radiator condenser tank hose connection
12. Air cleaner intake duct
13. Air cleaner body

INSTALLATION SERVICE POINTS

>>A<< VACUUM HOSE CONNECTION



Clamp vacuum hose with clip of air intake hose beside white marking as shown.

INTERCOOLER

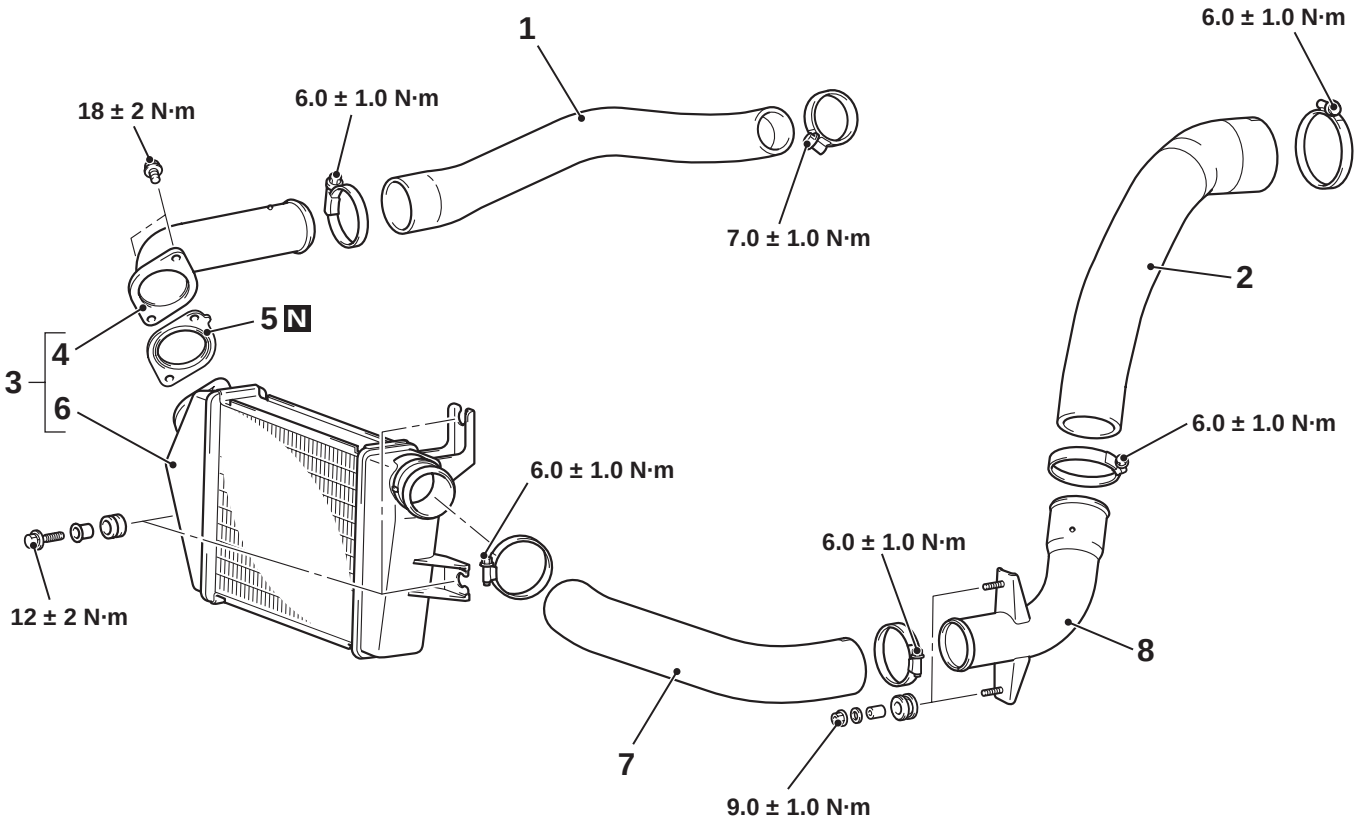
REMOVAL AND INSTALLATION <Except Euro5>

M1151002401208

⚠ CAUTION

- **Degrease the air hose and air pipe by isopropyl alcohol, parts cleaner (MZ100387) or equivalent.**
- **As for the parts cleaner, use the petroleum cleaner whose major component is aliphatic hydrocarbon.**
- **Working area should be airy and kept from flame.**

Pre-removal Operation	Post-installation Operation
• Air Cleaner Intake Duct Removal (Refer to P.15-6).	• Air Cleaner Intake Duct Installation (Refer to P.15-6).



AC804002AB

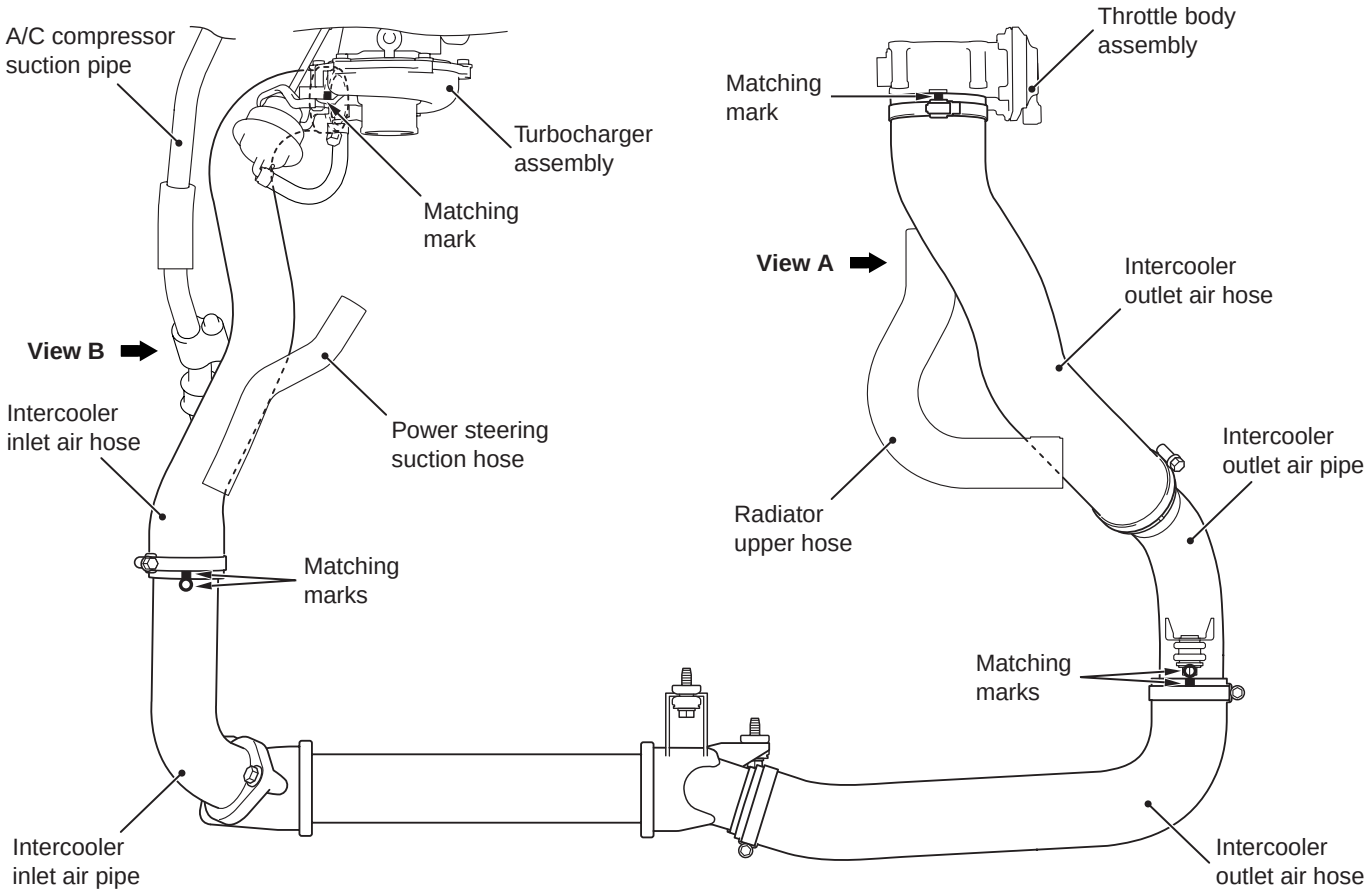
Removal steps

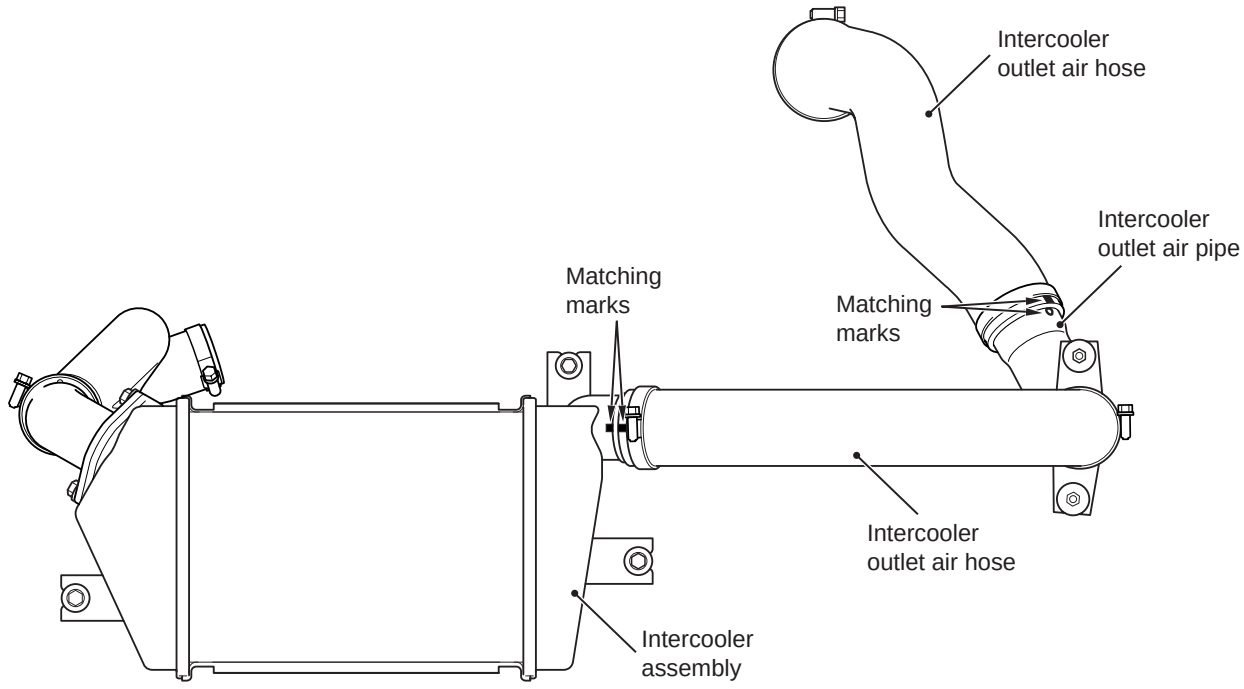
>>A<<	1.	Intercooler inlet air hose
>>A<<	2.	Intercooler outlet air hose
	•	Front bumper reinforcement (Refer to GROUP 51 – Front Bumper Assembly).
	3.	Intercooler inlet air pipe and intercooler assembly
>>A<<	4.	Intercooler inlet air pipe
>>B<<	5.	Intercooler inlet air pipe gasket
	6.	Intercooler assembly
>>A<<	7.	Intercooler outlet air hose
>>A<<	8.	Intercooler outlet air pipe

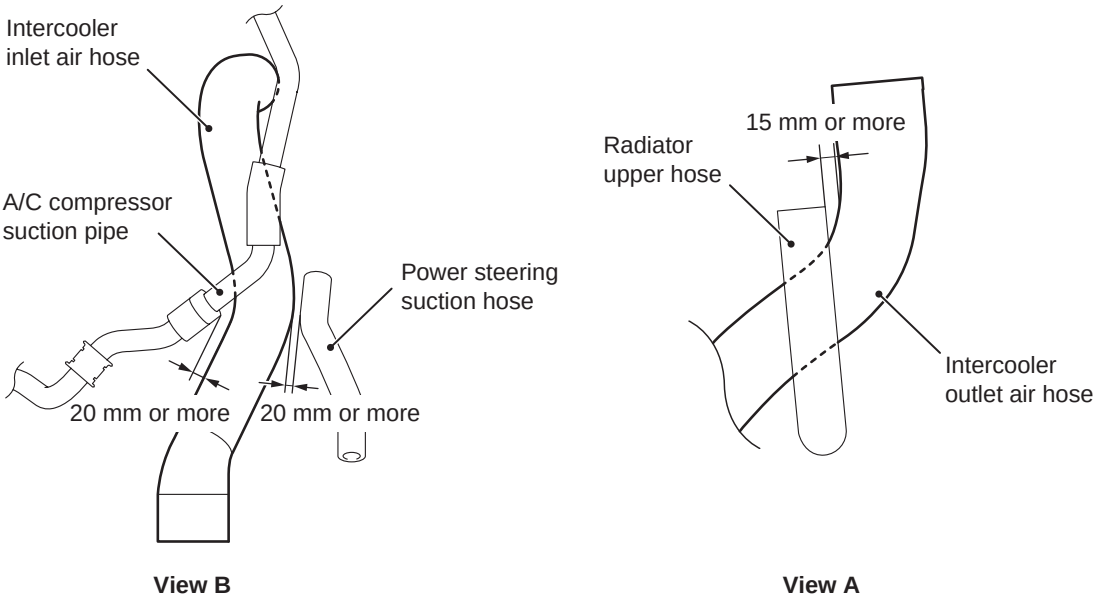
INSTALLATION SERVICE POINTS

>>A<< INTERCOOLER OUTLET AIR PIPE/INTERCOOLER OUTLET AIR HOSE/INTERCOOLER INLET AIR PIPE/INTERCOOLER OUTLET AIR HOSE/INTERCOOLER INLET AIR HOSE INSTALLATION

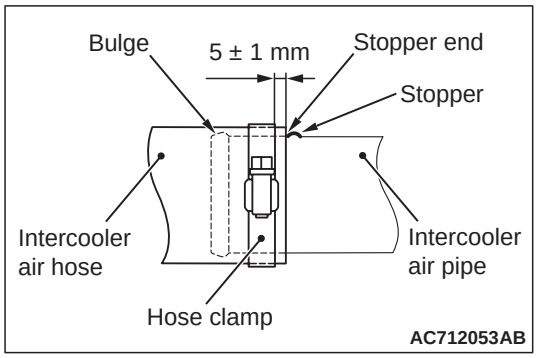
1. If the oil adheres to the insertion area of the intercooler air hose or the intercooler air pipe, degrease it.

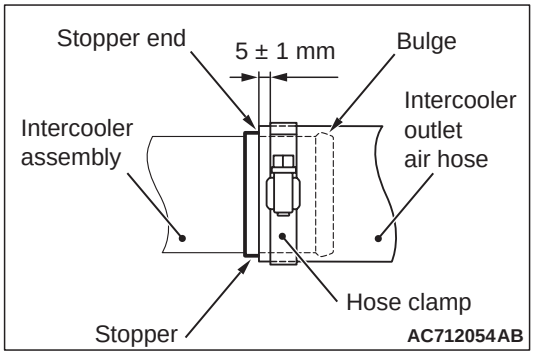

A/C compressor suction pipe
Turbocharger assembly
Matching mark
View B
Intercooler inlet air hose
Power steering suction hose
Matching marks
Intercooler inlet air pipe
Throttle body assembly
Matching mark
View A
Intercooler outlet air hose
Intercooler outlet air pipe
Radiator upper hose
Matching marks
Intercooler outlet air hose
AC804003AB

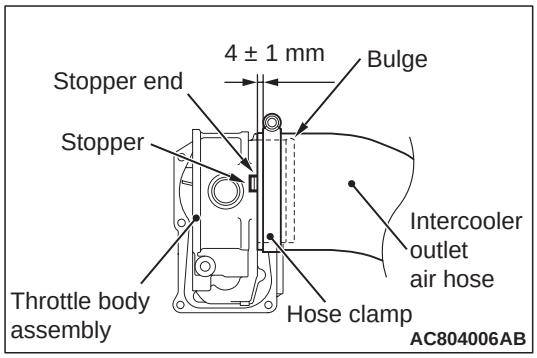

Intercooler outlet air hose
Intercooler outlet air pipe
Matching marks
Matching marks
Intercooler outlet air hose
Intercooler assembly
AC804005AB

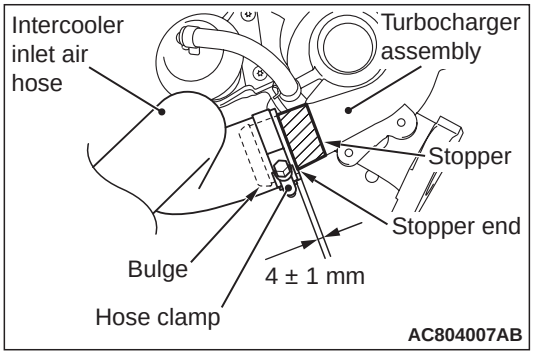


2. Install the intercooler air hose to the intercooler air pipe with the matching marks aligned as shown in the figure.
3. When installing the intercooler air hose to the throttle body assembly or the turbocharger assembly, install the intercooler air hose with its matching mark located as shown in the figure.
4. After installing the intercooler outlet air hose, check that the clearance between the intercooler outlet air hose and the radiator upper hose is 15 mm or more (View A).
5. After installing the intercooler inlet air hose, check that the clearance between the intercooler inlet air hose and the A/C compressor suction pipe is 20 mm or more (View B).
6. After installing the intercooler inlet air hose, check that the clearance between the intercooler inlet air hose and the power steering suction hose is 20 mm or more (View B).



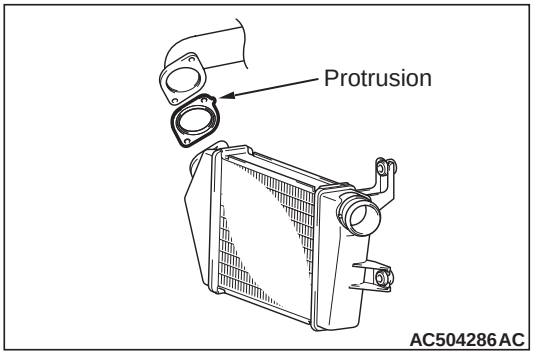






7. Insert intercooler air hose to stopper end and not overlap with stopper.
8. Place the hose clamp as shown in the figure so that it does not overlap with the bulge and the stopper end. When installing the hose clamp to the intercooler air pipe or intercooler assembly, set the hose clamp 5 ± 1 mm away from the stopper end. When installing the hose clamp to the throttle body assembly or turbocharger assembly, set the hose clamp 4 ± 1 mm away from the stopper end.

>>B<< INTERCOOLER INLET AIR PIPE GASKET INSTALLATION



Install the intercooler inlet air pipe gasket as its protrusion is in the direction shown.

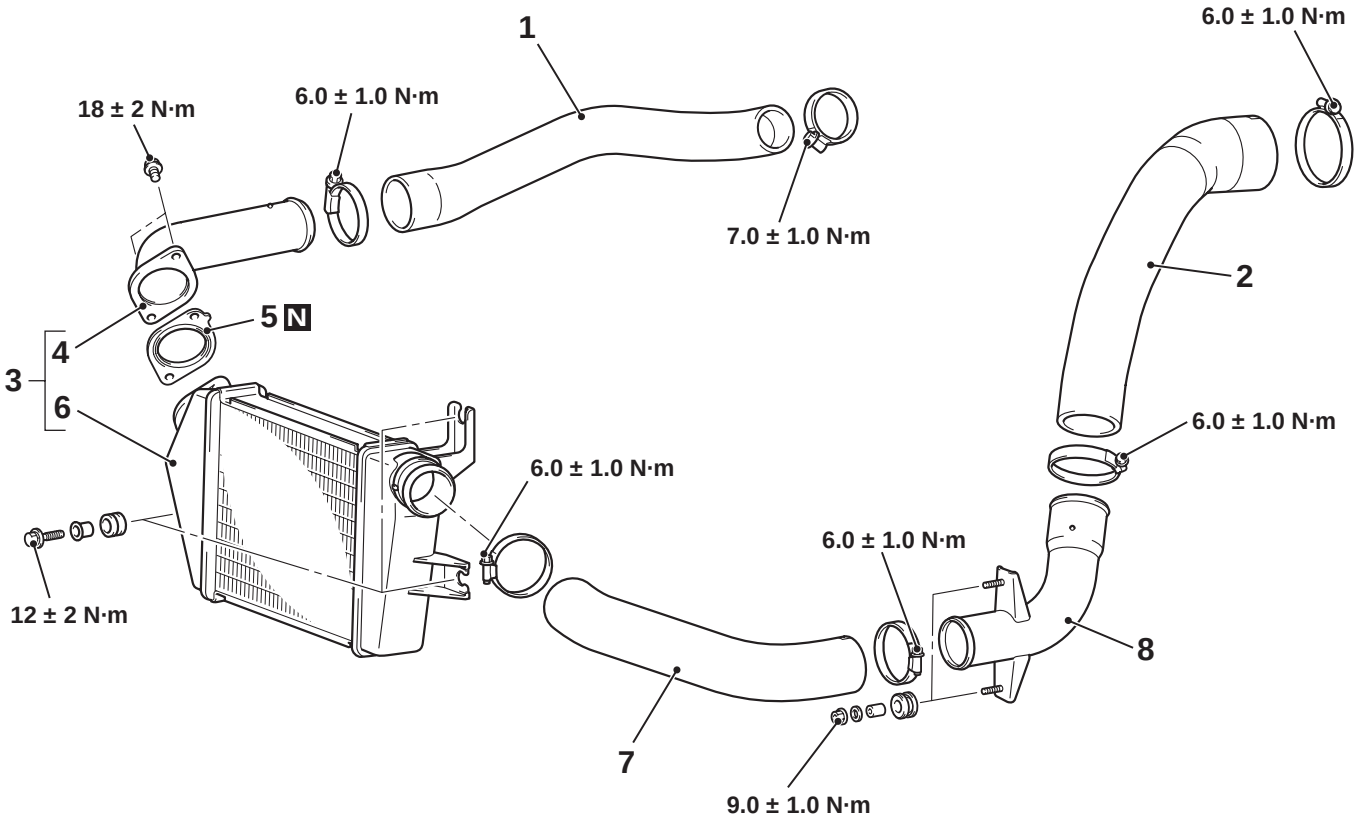
REMOVAL AND INSTALLATION <Euro5>

M1151002401219

⚠ CAUTION

- **Degrease the air hose and air pipe by isopropyl alcohol, parts cleaner (MZ100387) or equivalent.**
- **As for the parts cleaner, use the petroleum cleaner whose major component is aliphatic hydrocarbon.**
- **Working area should be airy and kept from flame.**

Pre-removal Operation	Post-installation Operation
• Air Cleaner Intake Duct Removal (Refer to P.15-6).	• Air Cleaner Intake Duct Installation (Refer to P.15-6).



AC804002AB

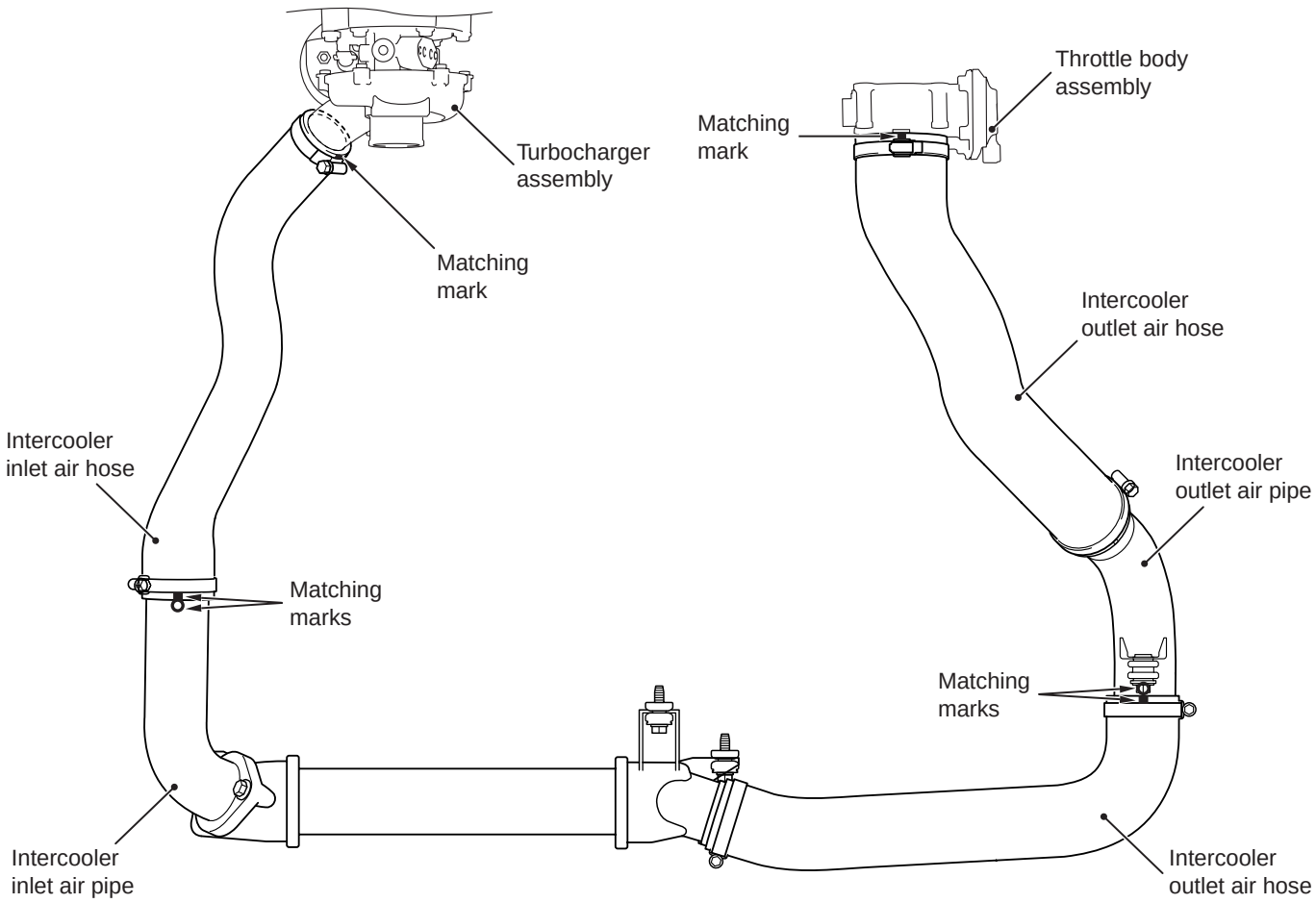
Removal steps

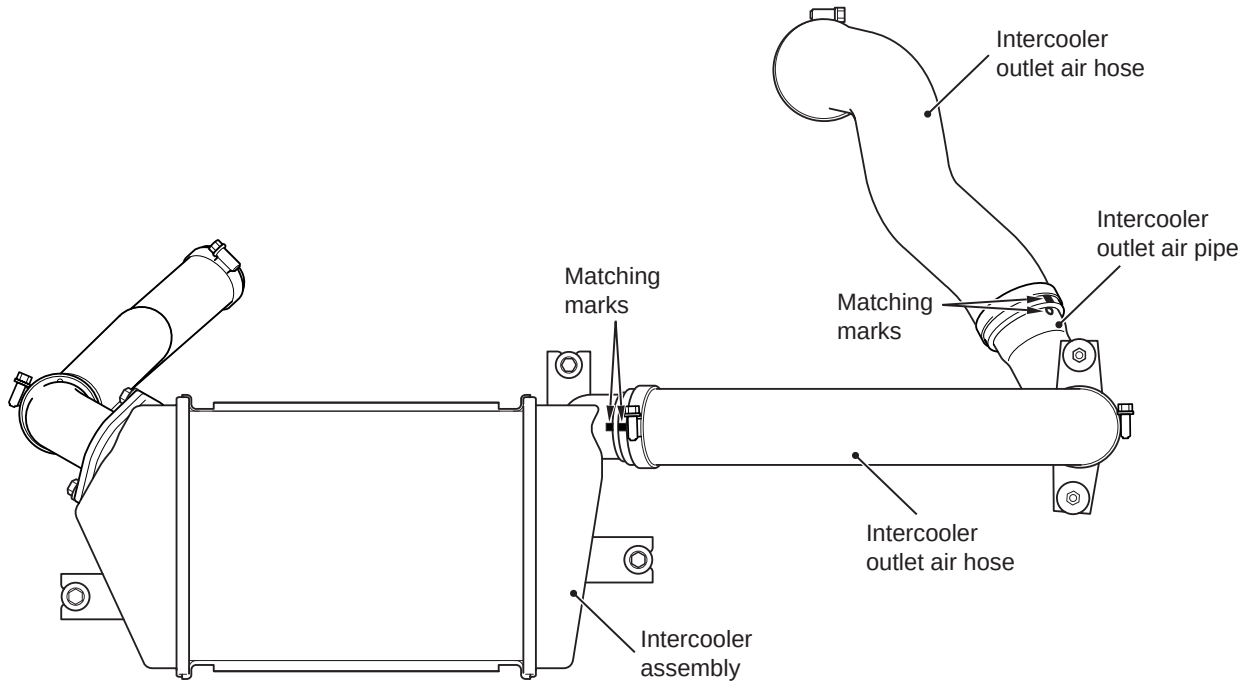
>>A<<	1.	Intercooler inlet air hose
>>A<<	2.	Intercooler outlet air hose • Front bumper reinforcement (Refer to GROUP 51 – Front Bumper Assembly).
	3.	Intercooler inlet air pipe and intercooler assembly
>>A<<	4.	Intercooler inlet air pipe
>>B<<	5.	Intercooler inlet air pipe gasket
	6.	Intercooler assembly
>>A<<	7.	Intercooler outlet air hose
>>A<<	8.	Intercooler outlet air pipe

INSTALLATION SERVICE POINTS

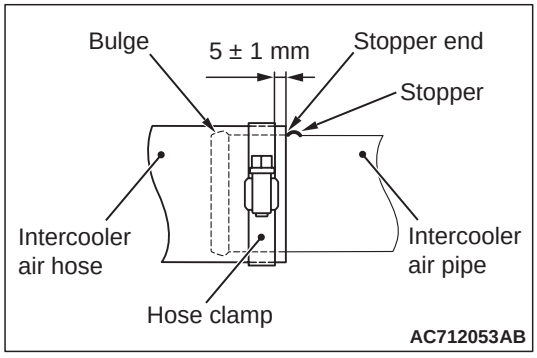
>>A<< INTERCOOLER OUTLET AIR PIPE/INTERCOOLER OUTLET AIR HOSE/INTERCOOLER INLET AIR PIPE/INTERCOOLER OUTLET AIR HOSE/INTERCOOLER INLET AIR HOSE INSTALLATION

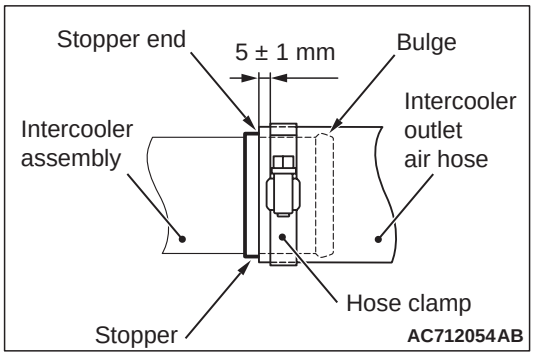
1. If the oil adheres to the insertion area of the intercooler air hose or the intercooler air pipe, degrease it.

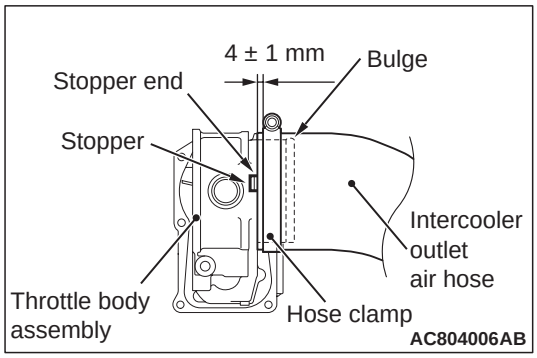

Turbocharger assembly
Matching mark
Throttle body assembly
Matching mark
Intercooler outlet air hose
Intercooler inlet air hose
Intercooler outlet air pipe
Matching marks
Matching marks
Intercooler inlet air pipe
Intercooler outlet air hose
ACB00692AB

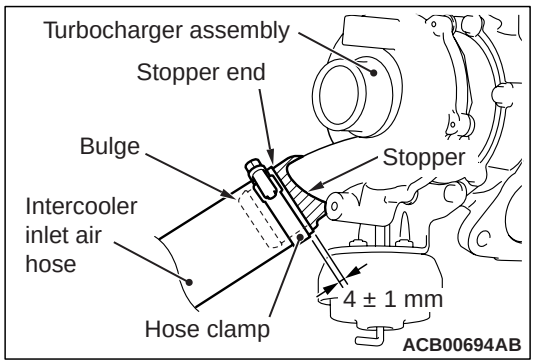

Intercooler outlet air hose
Intercooler outlet air pipe
Matching marks
Matching marks
Intercooler outlet air hose
Intercooler assembly
ACB00693AB

2. Install the intercooler air hose to the intercooler air pipe with the matching marks aligned as shown in the figure.
3. When installing the intercooler air hose to the throttle body assembly or the turbocharger assembly, install the intercooler air hose with its matching mark located as shown in the figure.



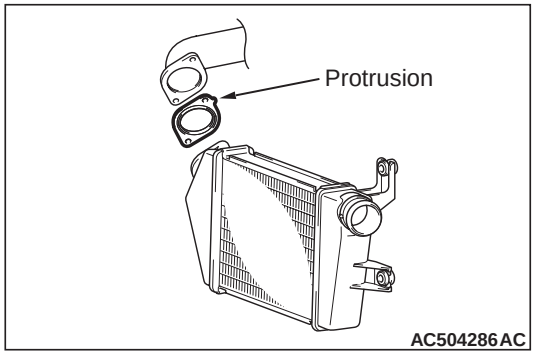






4. Insert intercooler air hose to stopper end and not overlap with stopper.
5. Place the hose clamp as shown in the figure so that it does not overlap with the bulge and the stopper end. When installing the hose clamp to the intercooler air pipe or intercooler assembly, set the hose clamp 5 ± 1 mm away from the stopper end. When installing the hose clamp to the throttle body assembly or turbocharger assembly, set the hose clamp 4 ± 1 mm away from the stopper end.

>>B<< INTERCOOLER INLET AIR PIPE GASKET INSTALLATION



Install the intercooler inlet air pipe gasket as its protrusion is in the direction shown.

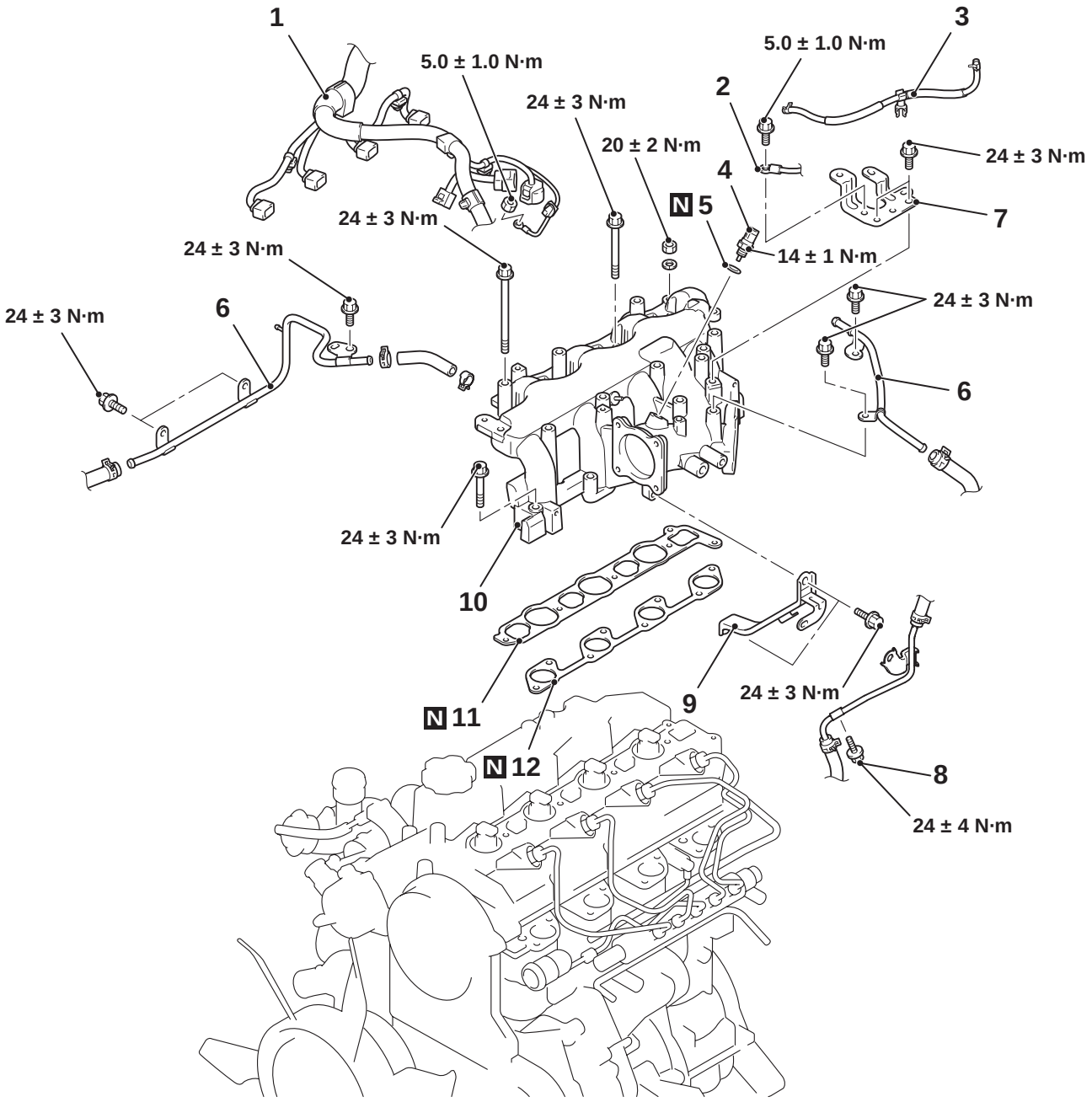
INLET MANIFOLD

REMOVAL AND INSTALLATION

M1151003004655

Pre-removal Operation	Post-installation Operation
• Throttle Body Removal (Refer to GROUP 13A – Throttle Body). • EGR Valve and EGR Pipe Removal (Refer to GROUP 17 – EGR Valve and EGR Cooler). • Windshield Wiper Removal (Refer to GROUP 51 – Windshield Wiper). • Cowl Top Panel Front Removal	• Cowl Top Panel Front Installation • Windshield Wiper Installation (Refer to GROUP 51 – Windshield Wiper). • EGR Valve and EGR Pipe Installation (Refer to GROUP 17 – EGR Valve and EGR Cooler). • Throttle Body Installation (Refer to GROUP 13A – Throttle Body). • Air Bleeding from Fuel Line (Refer to GROUP 13A – On-vehicle Service, Evacuation of Air from Fuel Line).

<Except Euro5>



ACB00688AB

Removal steps

1. Control wiring harness connection
2. Earth cable connection
3. Emission control hose
4. Intake air temperature sensor
5. Intake air temperature sensor gasket
6. Vacuum pump pipe
7. Engine cover stay
8. Fuel inlet pipe mounting bolt

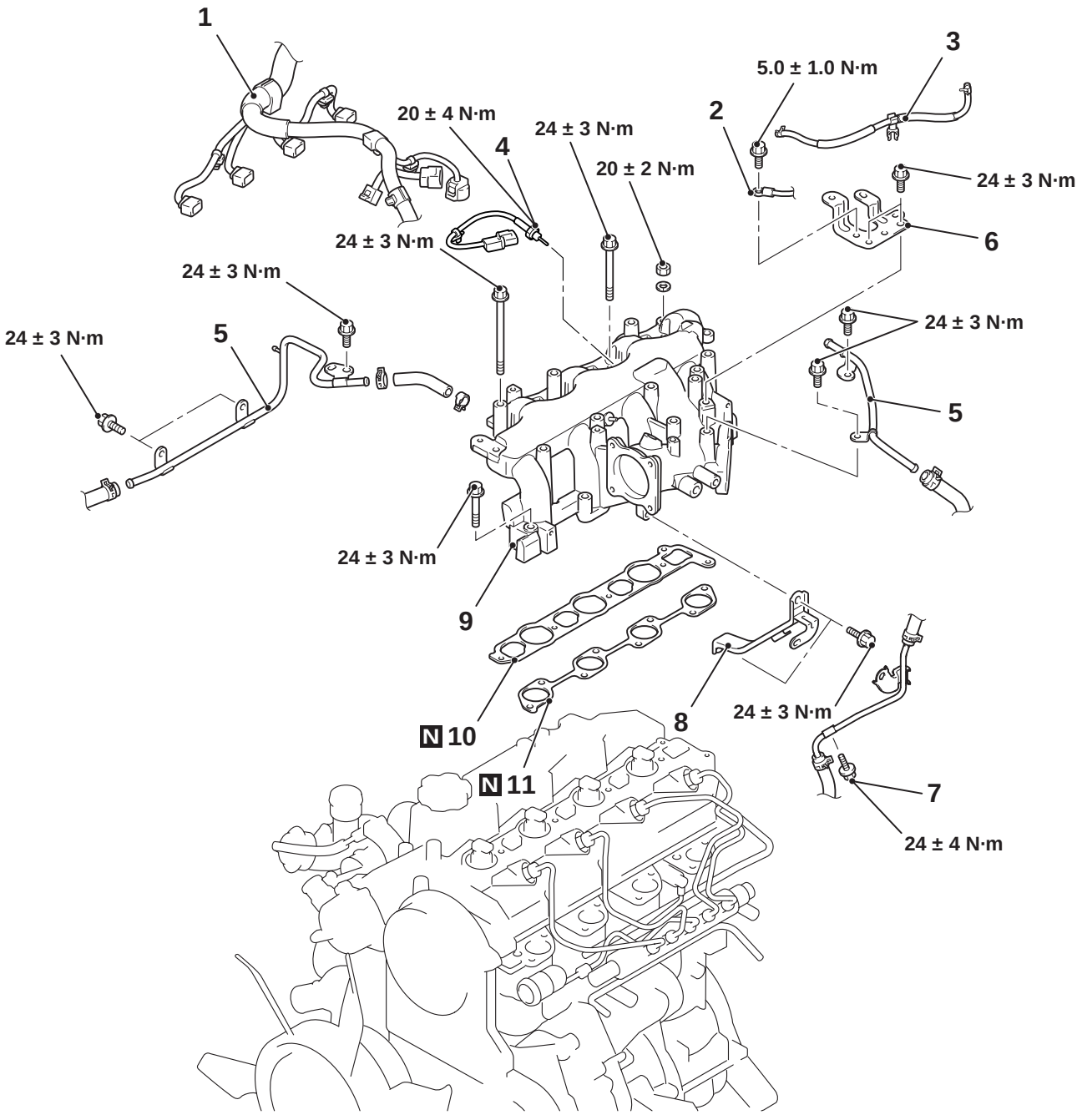
Removal steps (Continued)

9. Inlet manifold stay
   - Fuel injection pipe No.3, 4 clamp mounting bolt (Refer to GROUP 13A – Common Rail and Supply Pump)

>>B<< 10. Inlet manifold

11. Inlet manifold gasket
12. Inlet manifold gasket

<Euro5>



ACB00689AB

Removal steps

1. Control wiring harness connection
2. Earth cable connection
3. Emission control hose

<<**A**>> 4. EGR gas temperature sensor

5. Vacuum pump pipe
6. Engine cover stay
7. Fuel inlet pipe mounting bolt
8. Inlet manifold stay

Removal steps (Continued)

- Fuel injection pipe No.3, 4 clamp mounting bolt (Refer to GROUP 13A – Common Rail and Supply Pump)

>>**B**<< 9. Inlet manifold

10. Inlet manifold gasket

>>**A**<< 11. Inlet manifold gasket

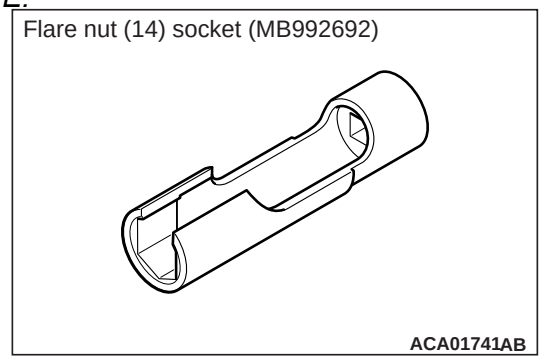
REMOVAL SERVICE POINT

<<A>> EGR GAS TEMPERATURE SENSOR REMOVAL

⚠ CAUTION

Do not use the EGR gas temperature sensor which dropped.

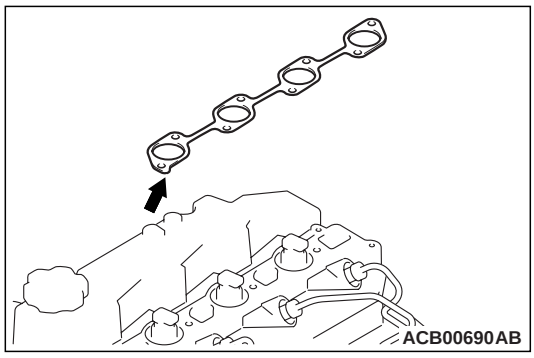
NOTE:



Use the recommended tool flare nut (14) socket (MB992692) to remove the EGR gas temperature sensor.

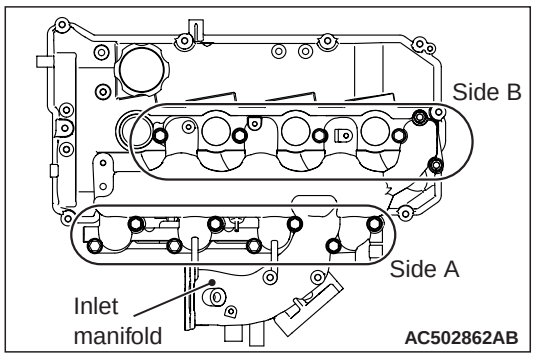
INSTALLATION SERVICE POINTS

>>A<< INLET MANIFOLD GASKET INSTALLATION



Position the projection as shown in the illustration.

>>B<< INLET MANIFOLD ASSEMBLY INSTALLATION



1. As shown in the illustration, temporarily tighten to 6.5 ± 1.5 N·m the bolts located at side A.
2. As shown in the illustration, tighten the bolts and nuts located at side B to the specified torque.

   Tightening torque:
   24 ± 3 N·m <Bolts>
   20 ± 2 N·m <Nuts>
3. As shown in the illustration, tighten the bolts located at side A to the specified torque.

   Tightening torque: 24 ± 3 N·m

INSPECTION

M1151003100843

Check the following points; replace the part if a problem is found.

INLET MANIFOLD CHECK

1. Check for damage or cracking of any part.
2. Clogging of the negative pressure (vacuum) outlet port.
3. Using a straight edge and feeler gauge, check for distortion of the cylinder head installation surface.

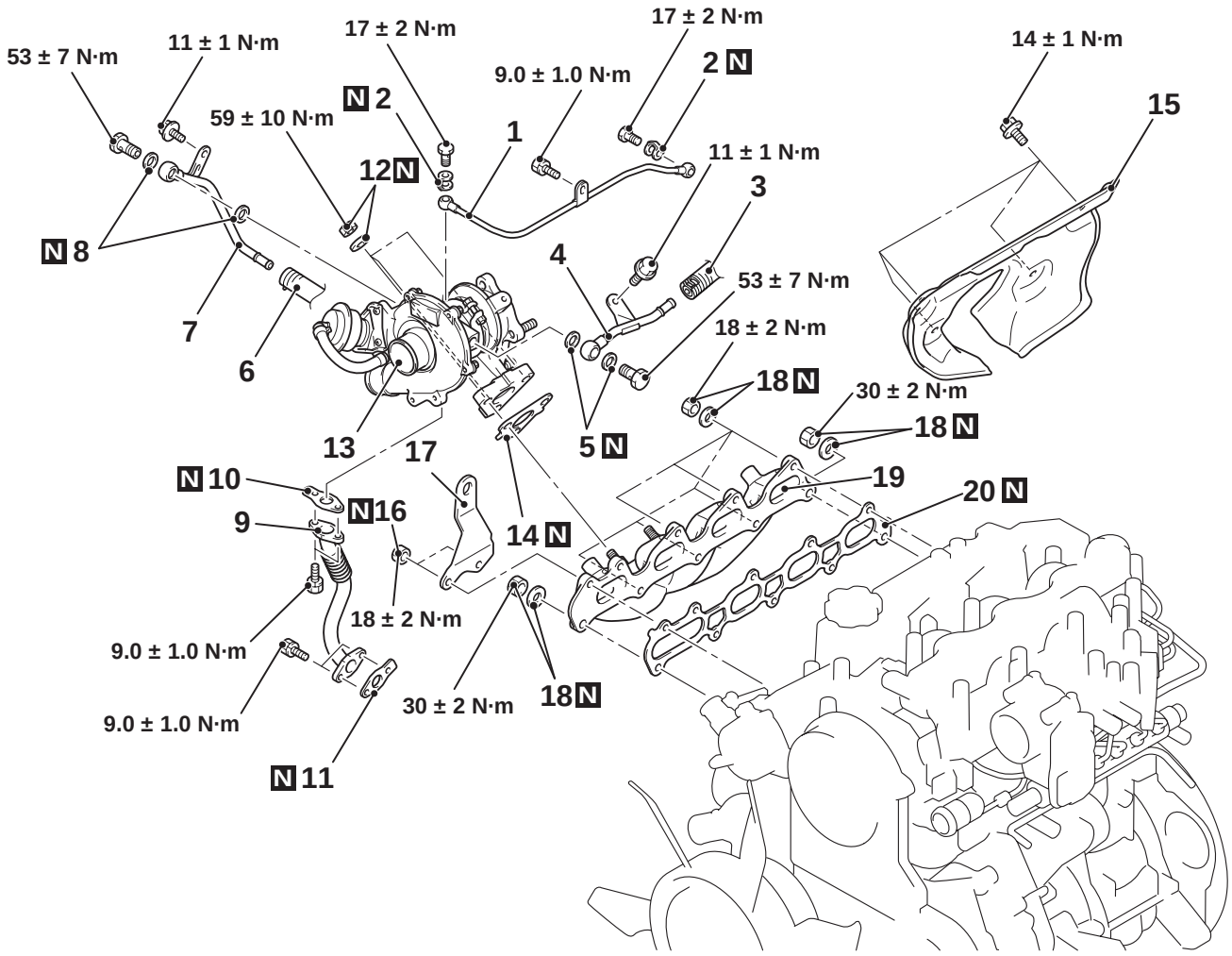
   Standard value: 0.15 mm or less
   Limit: 0.20 mm

EXHAUST MANIFOLD AND TURBOCHARGER

REMOVAL AND INSTALLATION <Except Euro5>

M1151008901353

Pre-removal Operation	Post-installation Operation
• Under Skid Plate and Engine Room Under Cover Removal (Refer to GROUP 51 – Under Cover). • Engine Coolant Draining (Refer to GROUP 14 – On-vehicle Service, Engine Coolant Replacement). • Air Cleaner Assembly Removal (Refer to P.15-6). • Battery and Battery Box Removal (Refer to GROUP 54A – Battery). • Intercooler Inlet Air Hose Removal (Refer to P.15-8). • Catalytic Converter Removal (Refer to GROUP 17 – Catalytic Converter).	• Catalytic Converter Installation (Refer to GROUP 17 – Catalytic Converter). • Intercooler Inlet Air Hose Installation (Refer to P.15-8). • Battery and Battery Box Installation (Refer to GROUP 54A – Battery). • Air Cleaner Assembly Installation (Refer to P.15-6). • Under Skid Plate and Engine Room Under Cover Installation (Refer to GROUP 51 – Under Cover). • Engine Coolant Refilling (Refer to GROUP 14 – On-vehicle Service, Engine Coolant Replacement).



AC804075AC

Removal steps

1. Turbocharger oil feed pipe
2. Turbocharger oil feed pipe gasket
3. Turbocharger water return hose connection
4. Turbocharger water feed pipe
5. Turbocharger water feed pipe gasket

Removal steps (Continued)

6. Turbocharger water feed hose connection
7. Turbocharger water return pipe
8. Turbocharger water return pipe gasket
9. Turbocharger oil return pipe
10. Turbocharger oil return pipe gasket

Removal steps (Continued)

>>**C**<< 11. Turbocharger oil return pipe gasket
12. Nut and washer
>>**B**<< 13. Turbocharger assembly
>>**A**<< 14. Turbocharger gasket
15. Exhaust manifold cover
16. Flange nut
17. Engine hanger
18. Nut and washer
19. Exhaust manifold
20. Exhaust manifold gasket

REMOVAL SERVICE POINT

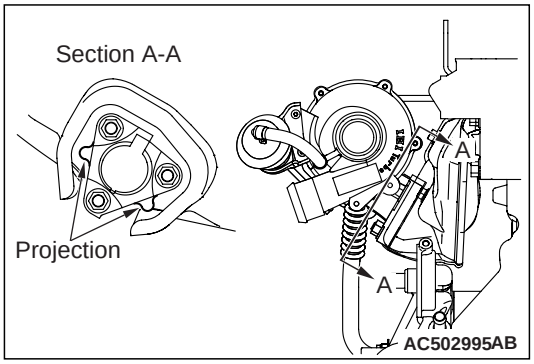
<<A>> OIL PIPE REMOVAL

⚠ CAUTION

Take care not to allow foreign objects to get into the oil passage hole of the turbocharger assembly after the oil pipe is removed.

INSTALLATION SERVICE POINTS

>>A<< TURBOCHARGER GASKET INSTALLATION



Position the projection as shown in the illustration.

>>B<< TURBOCHARGER ASSEMBLY INSTALLATION

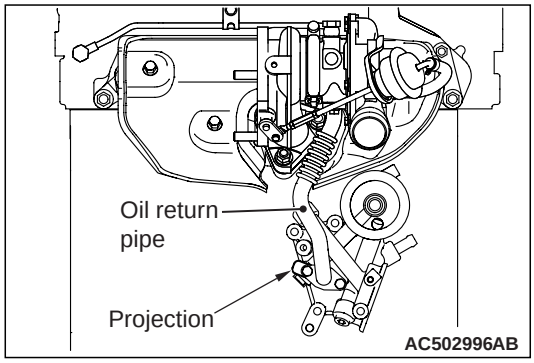
1. Check the internal surface, the eye bolt and the mating surface of the oil pipe and water pipe for clogging, and clean if necessary.

⚠ CAUTION

Be careful not to allow foreign material to enter the turbocharger.

2. If deposits of carbon are accumulated on the turbocharger oil passage, remove them and clean using the compressed air.
3. Add clean engine oil through the oil feed pipe port on the turbocharger.

>>C<< OIL RETURN PIPE GASKET INSTALLATION

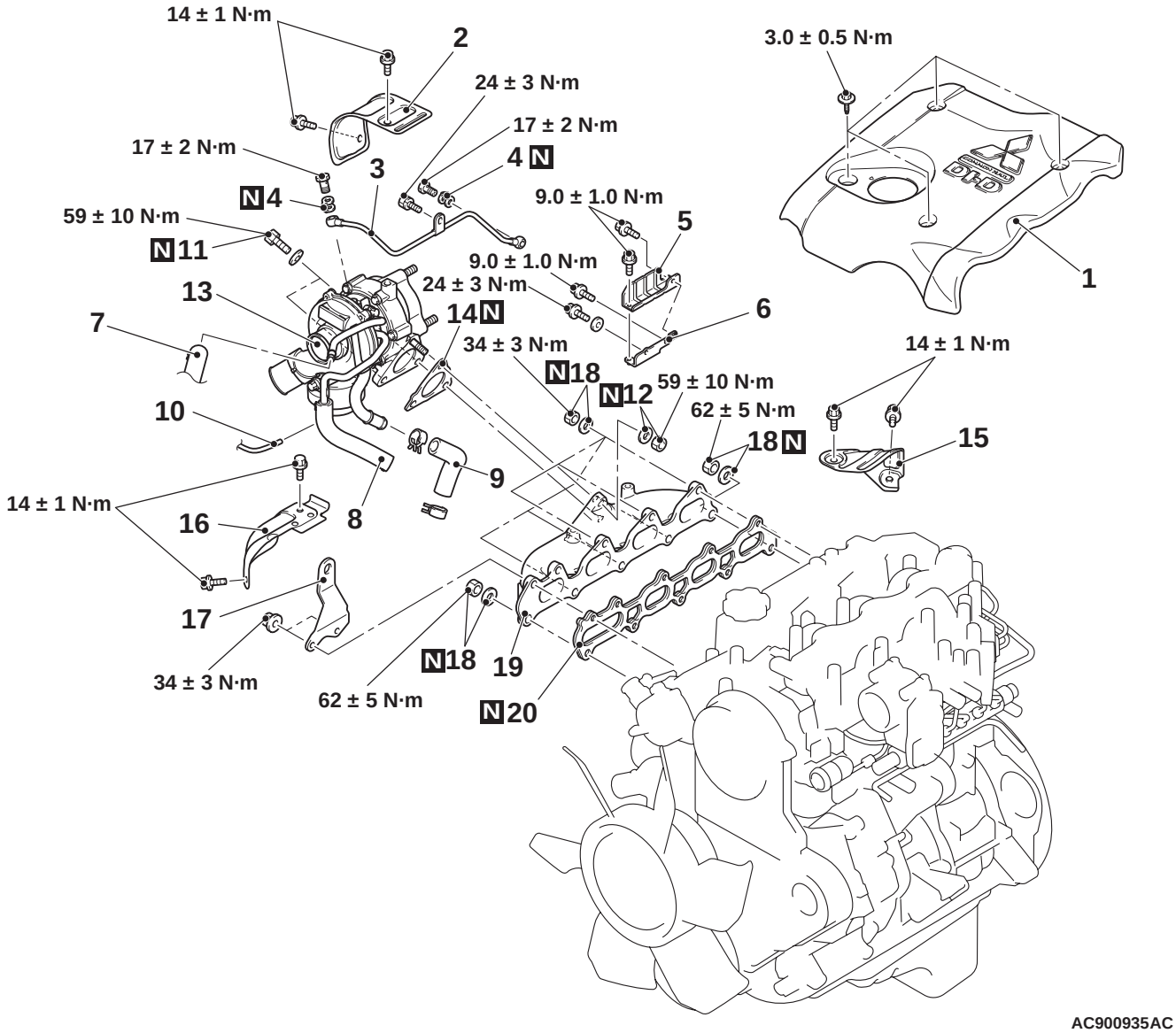


Position the projection as shown in the illustration.

REMOVAL AND INSTALLATION <Euro5>

M1151008901364

Pre-removal Operation	Post-installation Operation
• Under Skid Plate and Engine Room Under Cover Removal (Refer to GROUP 51 – Under Cover). • Engine Coolant Draining (Refer to GROUP 14 – On-vehicle Service, Engine Coolant Replacement). • Air Cleaner Assembly Removal (Refer to P.15-6). • Battery and Battery Box Removal (Refer to GROUP 54A – Battery). • Intercooler Inlet Air Hose Removal (Refer to P.15-12). • Catalytic Converter Removal (Refer to GROUP 17 – Catalytic Converter).	• Catalytic Converter Installation (Refer to GROUP 17 – Catalytic Converter). • Intercooler Inlet Air Hose Installation (Refer to P.15-12). • Battery and Battery Box Installation (Refer to GROUP 54A – Battery). • Air Cleaner Assembly Installation (Refer to P.15-6). • Under Skid Plate and Engine Room Under Cover Installation (Refer to GROUP 51 – Under Cover). • Engine Coolant Refilling (Refer to GROUP 14 – On-vehicle Service, Engine Coolant Replacement).



AC900935AC

Removal steps

1. Engine cover
2. Turbocharger heat protector

<<A>>

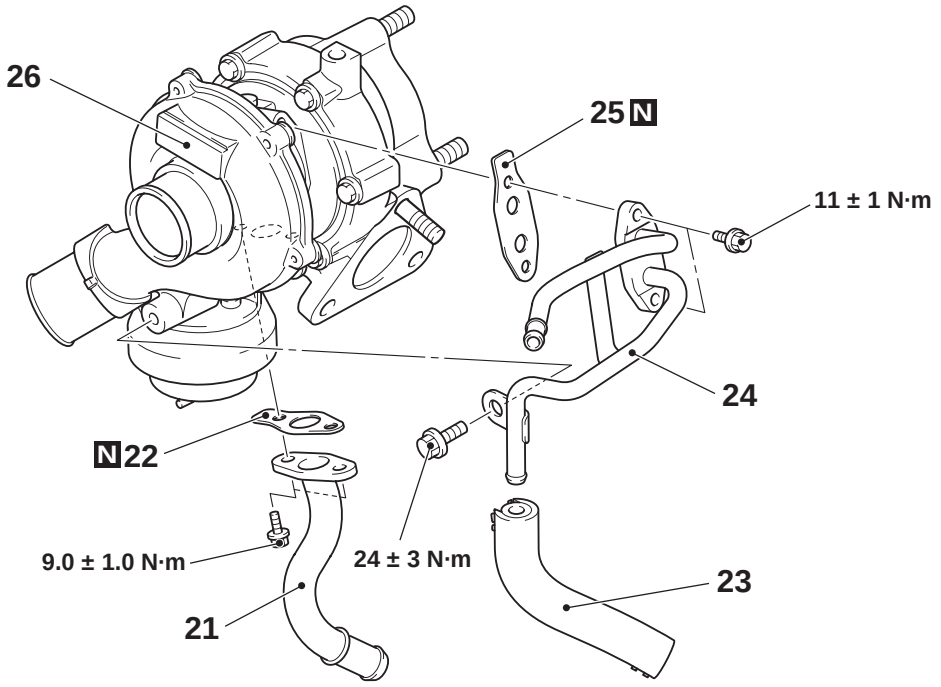
3. Oil pipe
4. Gasket
5. Heat protector
6. Heat protector bracket
7. Water hose connection

Removal steps (Continued)

8. Water hose connection
9. Oil return hose
10. Vacuum hose connection
11. Nut and washer
12. Bolt and washer
13. Turbocharger, turbocharger water pipe and oil return pipe assembly

Removal steps (Continued)

>>D<< 14. Turbocharger gasket
15. Exhaust manifold heat protector A
16. Exhaust manifold heat protector B
17. Engine hanger
18. Nut and washer
19. Exhaust manifold
20. Exhaust manifold gasket



AC805771AC

Removal steps

21. Oil return pipe
>>C<< 22. Oil return pipe gasket
23. Water hose
24. Turbocharger water pipe
>>B<< 25. Turbocharger water pipe gasket
>>A<< 26. Turbocharger assembly

REMOVAL SERVICE POINT

<<A>> OIL PIPE REMOVAL

⚠ CAUTION

Take care not to allow foreign objects to get into the oil passage hole of the turbocharger assembly after the oil pipe is removed.

INSTALLATION SERVICE POINTS

>>A<< TURBOCHARGER ASSEMBLY INSTALLATION

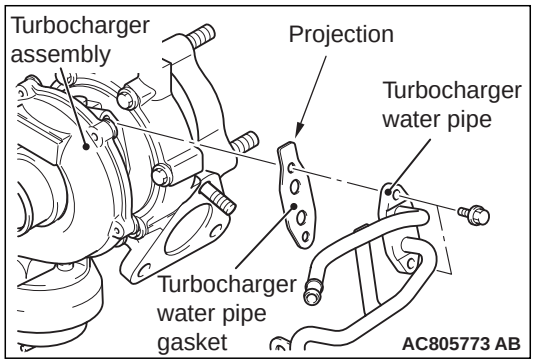
1. Check the internal surface, the eye bolt and the mating surface of the oil pipe and water pipe for clogging, and clean if necessary.

⚠ CAUTION

Be careful not to allow foreign material to enter the turbocharger.

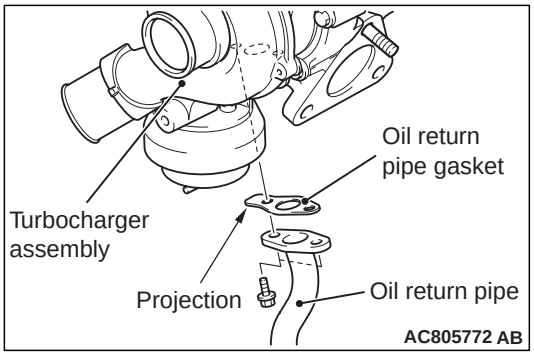
2. If deposits of carbon are accumulated on the turbocharger oil passage, remove them and clean using the compressed air.
3. Add clean engine oil through the oil pipe port on the turbocharger.

>>B<< TURBOCHARGER WATER PIPE GASKET INSTALLATION



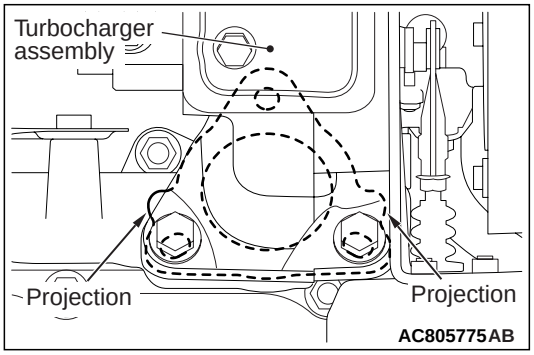
Position the projection as shown in the illustration.

>>C<< OIL RETURN PIPE GASKET INSTALLATION



Position the projection as shown in the illustration.

>>D<< TURBOCHARGER GASKET INSTALLATION



Position the projection as shown in the illustration.

INSPECTION

M1151009400057

Check the following points; replace the part if a problem is found.

EXHAUST MANIFOLD CHECK

1. Check for damage or cracking of any part.
2. Using a straight edge and a feeler gauge, check for distortion of the cylinder head installation surface.

   Standard value: 0.15 mm or less
   Limit: 0.20 mm

TURBOCHARGER ASSEMBLY CHECK

1. Visually check the turbine wheel and the compressor wheel for cracking or other damage.
2. Check whether the turbine wheel and the compressor wheel can be easily turned by hand.
3. Check for oil leakage from the turbocharger assembly.
4. Check whether or not the turbocharger waste gate regulating valve remains open. If any problem is found, replace the part after disassembly.

OIL PIPE AND OIL RETURN PIPE CHECK

Check the oil pipe and oil return pipe for clogging, bending or other damage. If there is clogging, clean it.

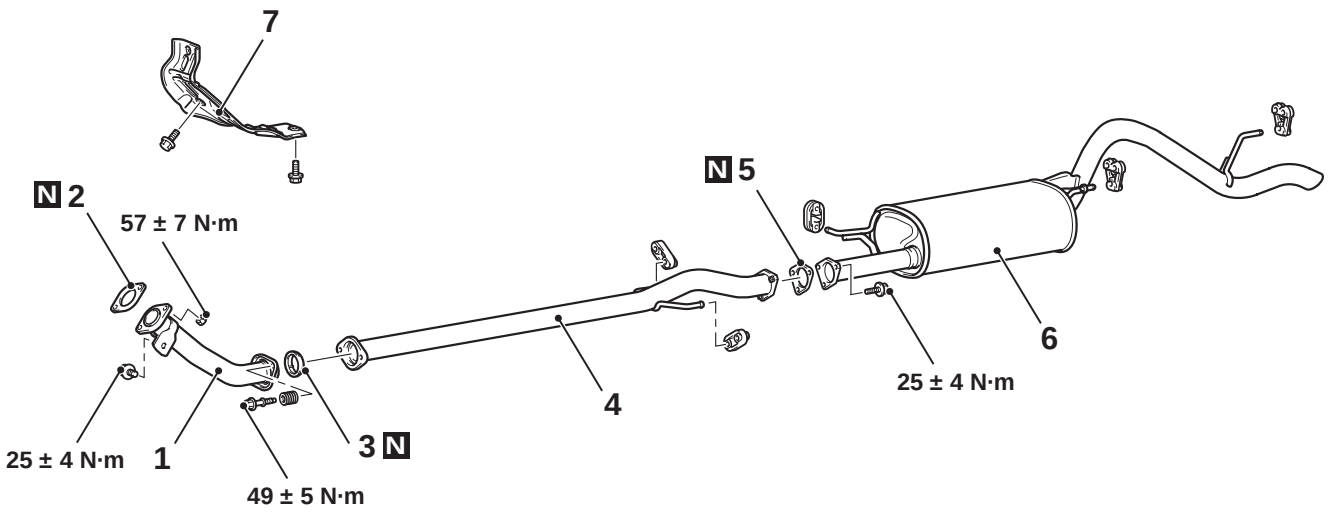
EXHAUST PIPE AND MAIN MUFFLER

REMOVAL AND INSTALLATION

M1151008600586

<Except Euro5>

Pre-removal Operation	Post-installation Operation
• Under Skid Plate and Engine Room Under Cover Removal (Refer to GROUP 51 – Under Cover).	• Under Skid Plate and Engine Room Under Cover Installation (Refer to GROUP 51 – Under Cover).



ACB00721AB

Removal steps
1. Front exhaust pipe
2. Exhaust pipe gasket
3. Seal ring
4. Centre exhaust pipe

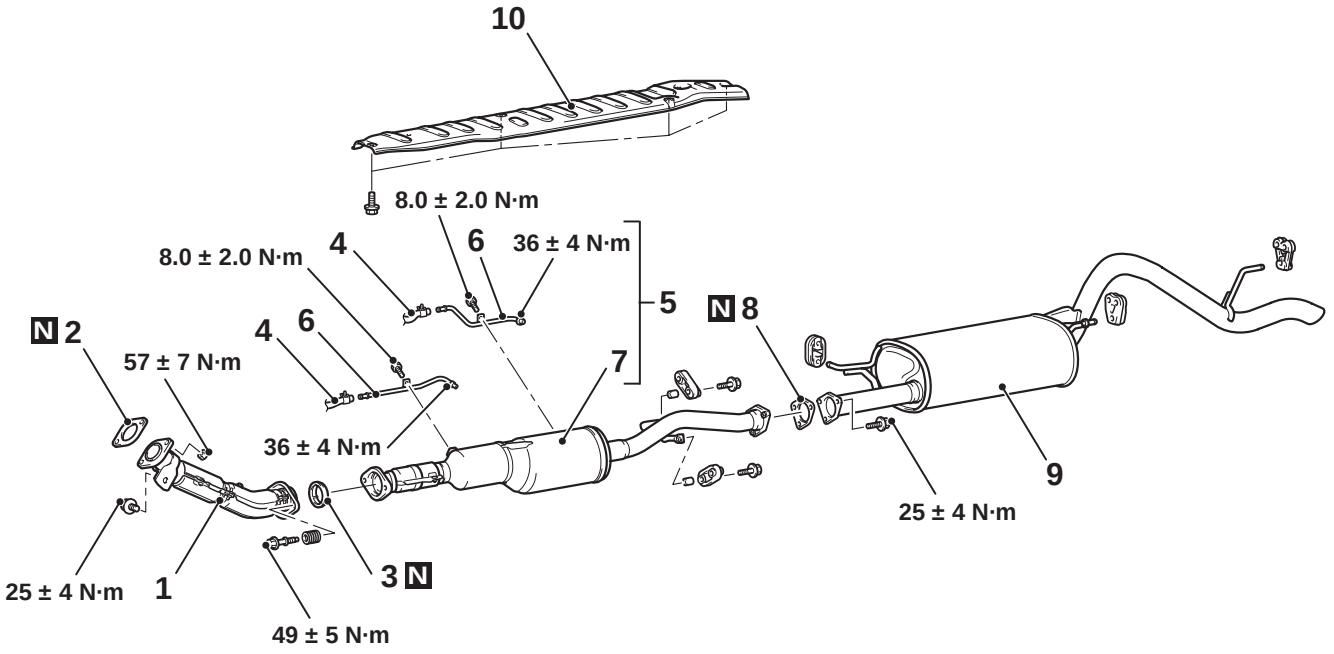
Removal steps (Continued)
5. Exhaust pipe gasket
6. Exhaust main muffler
7. Dash heat protector panel

<Euro5>

⚠ CAUTION

When the DPF is replaced, use the M.U.T.-III to initialise the learning value (Refer to GROUP 00 – Precautions before Service, Initialisation Procedure for Learning Value in DPF System).

Pre-removal Operation	Post-installation Operation
• Under Skid Plate and Engine Room Under Cover Removal (Refer to GROUP 51 – Under Cover).	• Under Skid Plate and Engine Room Under Cover Installation (Refer to GROUP 51 – Under Cover).



ACB00722AB

Removal steps

- No.2 exhaust gas temperature sensor (Refer to GROUP 17 – Emission Control, DPF System Sensors)
1. Front exhaust pipe
2. Exhaust pipe gasket
3. Seal ring
- No.2 crossmember (Refer to GROUP 32 – Rear Engine Mounting) <2WD>

Removal steps (Continued)

- No.3 exhaust gas temperature sensor (Refer to GROUP 17 – Emission Control, DPF System Sensors)
4. Exhaust pressure hose connection
5. Exhaust pressure pipe and DPF assembly
6. Exhaust pressure pipe
7. DPF
8. Exhaust pipe gasket
9. Exhaust main muffler
10. Front floor heat protector panel

GROUP 16

ENGINE ELECTRICAL

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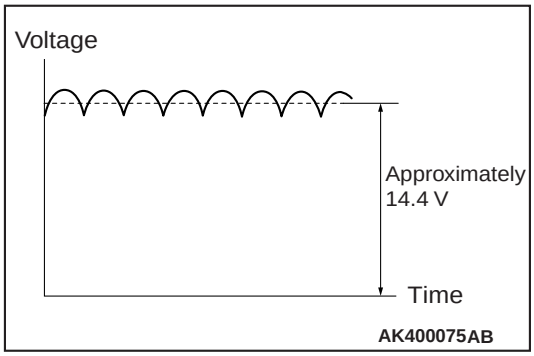
CHARGING SYSTEM

GENERAL INFORMATION

M1161000102045

The charging system uses the alternator output to keep the battery charged at a constant level under various electrical loads.

OPERATION

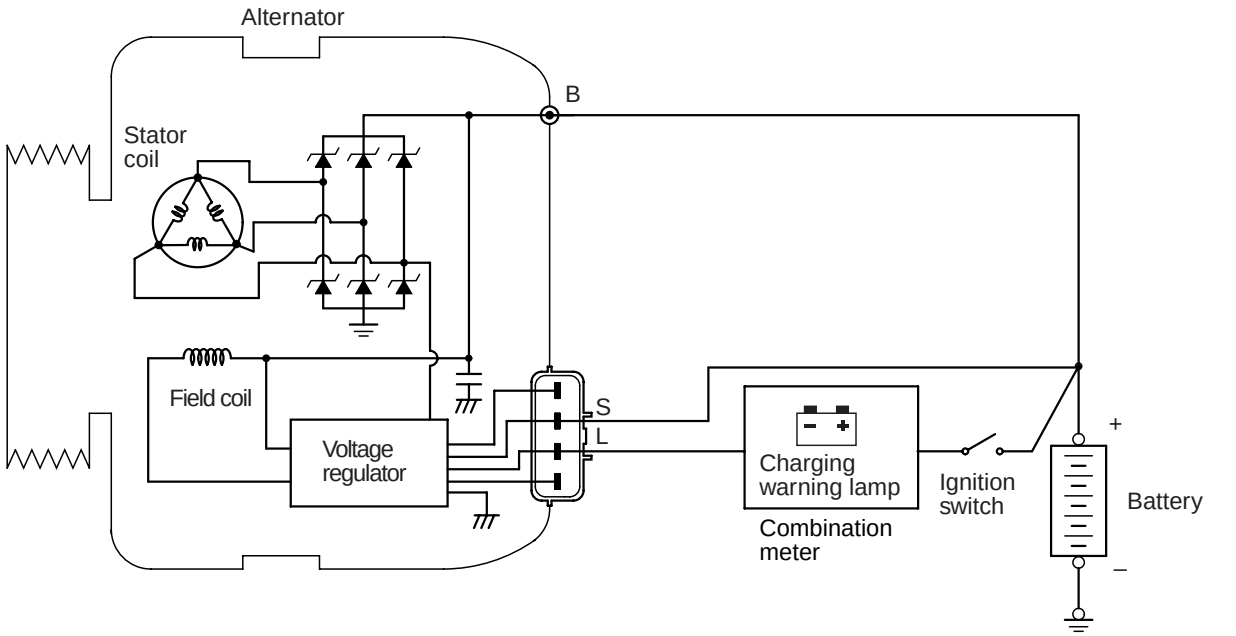


Rotation of the excited field coil generates AC voltage in the stator.
This alternating current is rectified through diodes to DC voltage having a waveform shown in the illustration.
The average output voltage fluctuates slightly with the alternator load condition.
When the ignition switch is turned on, current flows in the field coil and initial excitation of the field coil occurs.
When the stator coil begins to generate power after the engine is started, the field coil is excited by the output current of the stator coil.
The alternator output voltage rises as the field current increases and it falls as the field current decreases. When the battery voltage (alternator "S" terminal voltage) reaches a regulated voltage of approximately 14.4 V, the field current is cut off.
When the battery voltage drops below the regulated voltage, the voltage regulator regulates the output voltage to a constant level by controlling the field current.
In addition, when the field current is constant, the alternator output voltage rises as the engine speed increases.

⚠ CAUTION

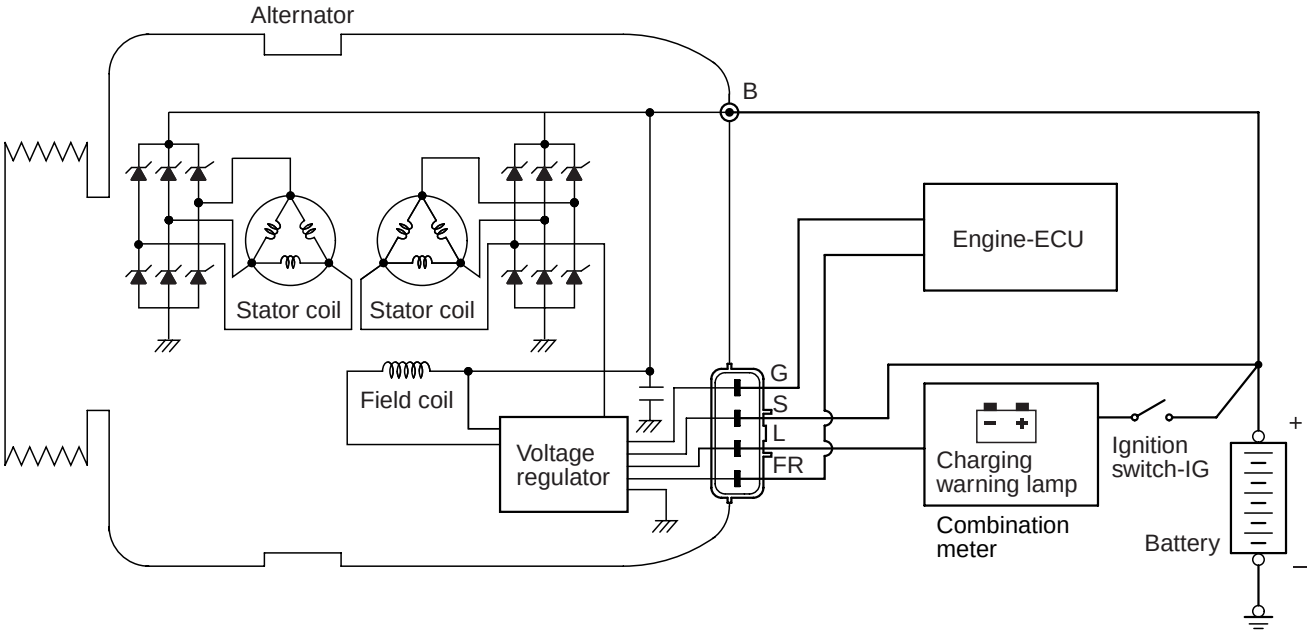
When the specified alternator is not used, each ECU would probably fail.

<Except Euro 5>



AK403859 AB

<Euro 5>



AK802592 AE

ALTERNATOR SPECIFICATIONS

Item	Except Euro 5	Euro 5
Type	Battery voltage sensing	Battery voltage sensing
Rated output V/A	12/90 <Standard> 12/120 <Cold climate zone>	12/95 <Standard> 12/130 <Cold climate zone>
Voltage regulator	Electronic built-in type	Electronic built-in type

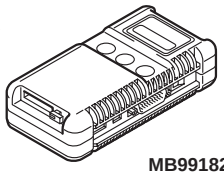
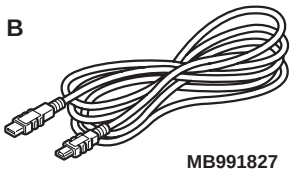
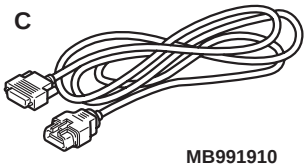
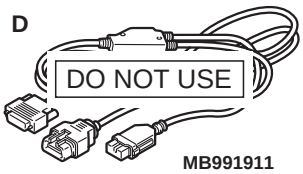
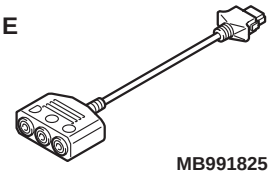
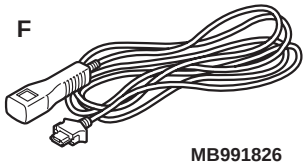
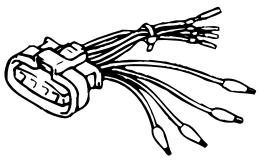
SERVICE SPECIFICATIONS

M1161000301370

Item		Standard value	Limit
Alternator output line voltage drop (at 30 A) V		–	Maximum 0.3
Regulated voltage ambient temperature at voltage regulator (vehicle stationary) V	–20°C	14.2 – 15.4	–
	20°C	13.9 – 14.9	–
	60°C	13.4 – 14.6	–
	80°C	13.1 – 14.5	–
Output current		–	70 % of normal output current

SPECIAL TOOL

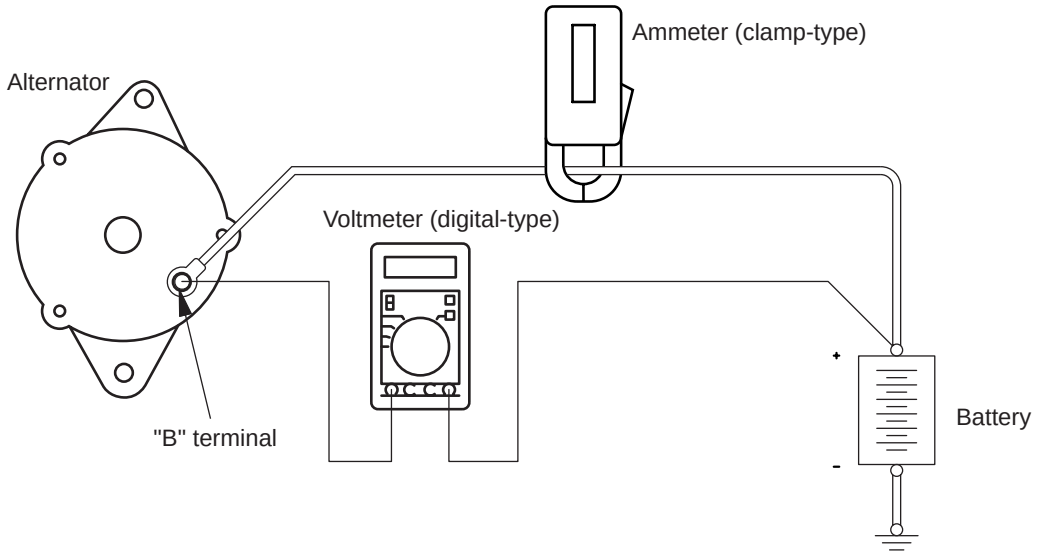
M1161000600646

Tool	Number	Name	Use
A  MB991824 B  MB991827 C  MB991910 D  MB991911 E  MB991825 F  MB991826 MB991955	MB991955 A: MB991824 B: MB991827 C: MB991910 D: MB991911 E: MB991825 F: MB991826	M.U.T.-III sub assembly • A: Vehicle communication interface (V.C.I.) • B: M.U.T.-III USB cable • C: M.U.T.-III main harness A (Vehicles with CAN communication system) • D: M.U.T.-III main harness B (Vehicles without CAN communication system) • E: M.U.T.-III measurement adapter • F: M.U.T.-III trigger harness	• Checking the engine speed **⚠ CAUTION** **For vehicles with CAN communication, use M.U.T.-III main harness A to send simulated vehicle speed. If you connect M.U.T.-III main harness B instead, the CAN communication does not function correctly.**
	MB991519	Alternator test harness	Checking the alternator ("S" terminal voltage)

ON-VEHICLE SERVICE

ALTERNATOR OUTPUT LINE VOLTAGE DROP TEST

M1161000900926



AK203361AD

This test determines whether the wiring from the alternator "B" terminal to the battery (+) terminal (including the fusible line) is in a good condition or not.

1. Always be sure to check the following before the test.
   - Alternator installation
   - Drive belt tension

   (Refer to GROUP 11A – On-Vehicle Service – Alternator and Power Steering Oil Pump Drive Belt Tension Check and Adjustment).
   - Fusible link
   - Abnormal noise from the alternator while the engine is running
2. Turn the ignition switch to the "LOCK" (OFF) position.
3. Disconnect the negative battery cable.
4. Connect a clamp-type DC test ammeter with a range of 0 – 100 A to the alternator "B" terminal output wire.

   NOTE: The way of disconnecting the alternator output wire and of connecting the ammeter is possibly not found the problem that the output current is dropping due to the insufficient connection between terminal "B" and the output wire.
5. Connect a digital-type voltmeter between the alternator "B" terminal and the battery (+) terminal. [Connect the (+) lead of the voltmeter to the "B" terminal and connect the (–) lead of the voltmeter to the battery (+) cable].
6. Reconnect the negative battery cable.
7. Connect the M.U.T.-III or tachometer
8. Leave the hood open.
9. Start the engine.
10. With the engine running at 2,500 r/min, turn the headlamps and other lamps on and off to adjust the alternator load so that the value displayed on the ammeter is slightly above 30 A.

    Adjust the engine speed by gradually decreasing it until the value displayed on the ammeter is 30 A. Take a reading of the value displayed on the voltmeter at this time.

    Limit: Maximum 0.3 V

    NOTE: When the alternator output is high and the value displayed on the ammeter does not decrease until 30 A, set the value to 40 A. Read the value displayed on the voltmeter at this time. When the value range is 40 A, the limit is maximum 0.4 V.

11.If the value displayed on the voltmeter is above the limit value, there is probably a malfunction in the alternator output wire, so check the wiring between the alternator "B" terminal and the battery (+) terminal (including fusible link).

If a terminal is not sufficiently tight or if the harness has become discoloured due to overheating, repair and then test again.

12.After the test, run the engine at idle.

13.Turn off all lamps.

14.Turn the ignition switch to the "LOCK" (OFF) position.

15.Remove the M.U.T.-III or tachometer.

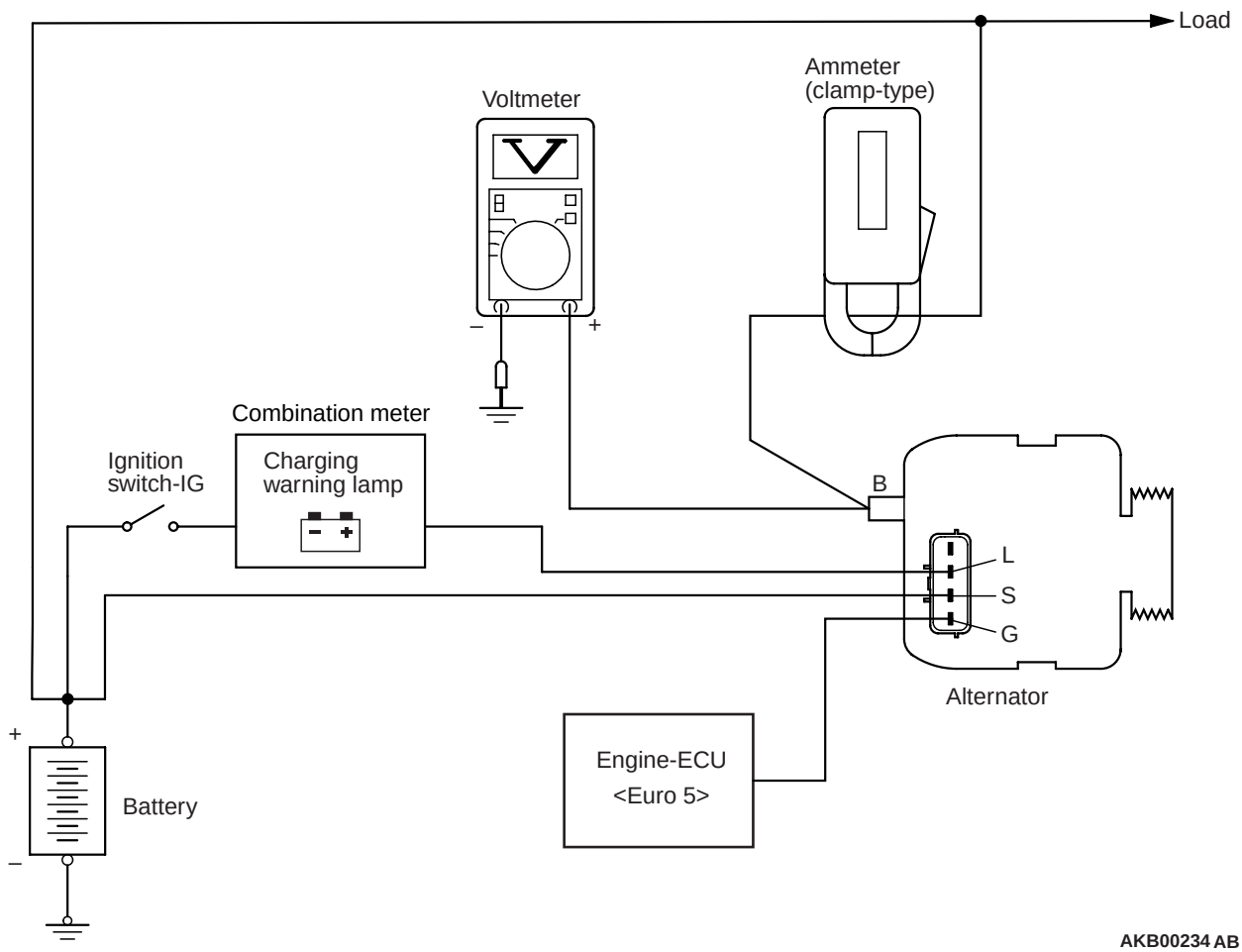
16.Disconnect the negative battery cable.

17.Disconnect the ammeter and voltmeter.

18.Connect the negative battery cable.

OUTPUT CURRENT TEST

M1161001002427



AKB00234 AB

This test determines whether the alternator output current is normal.

1. Before the test, always be sure to check the following.
   - Alternator installation
   - Battery (Refer to GROUP 54A – Battery – On-Vehicle Service – Battery Test .)

NOTE: The battery should be slightly discharged. The load needed by a fully-charged battery is insufficient for an accurate test.

   - Drive belt tension

(Refer to GROUP 11A – On-Vehicle Service – Alternator and Power Steering Oil Pump Drive Belt Tension Check and Adjustment .)

   - Fusible link
   - Abnormal noise from the alternator while the engine is running.
2. Turn the ignition switch to the "LOCK" (OFF) position.
3. Disconnect the negative battery cable.

⚠ CAUTION

Never use clips but tighten bolts and nuts to connect the line. Otherwise loose connections (e.g. using clips) will lead to a serious accident because of high current.

4. Connect a clamp-type DC test ammeter with a range of 0 – 100 A to the alternator "B" terminal output wire.

   NOTE: The way of disconnecting the alternator output wire and of connecting the ammeter is possibly not found the problem that the output current is dropping due to the insufficient connection between terminal "B" and the output wire.
5. Connect a voltmeter with a range of 0 – 20 V between the alternator "B" terminal and the earth [Connect the (+) lead of the voltmeter to the "B" terminal, and then connect the (–) lead of the voltmeter to the earth].
6. Connect the negative battery cable.
7. Connect the M.U.T.-III or tachometer.
8. Leave the hood open.
9. Check that the reading on the voltmeter is equal to the battery voltage.

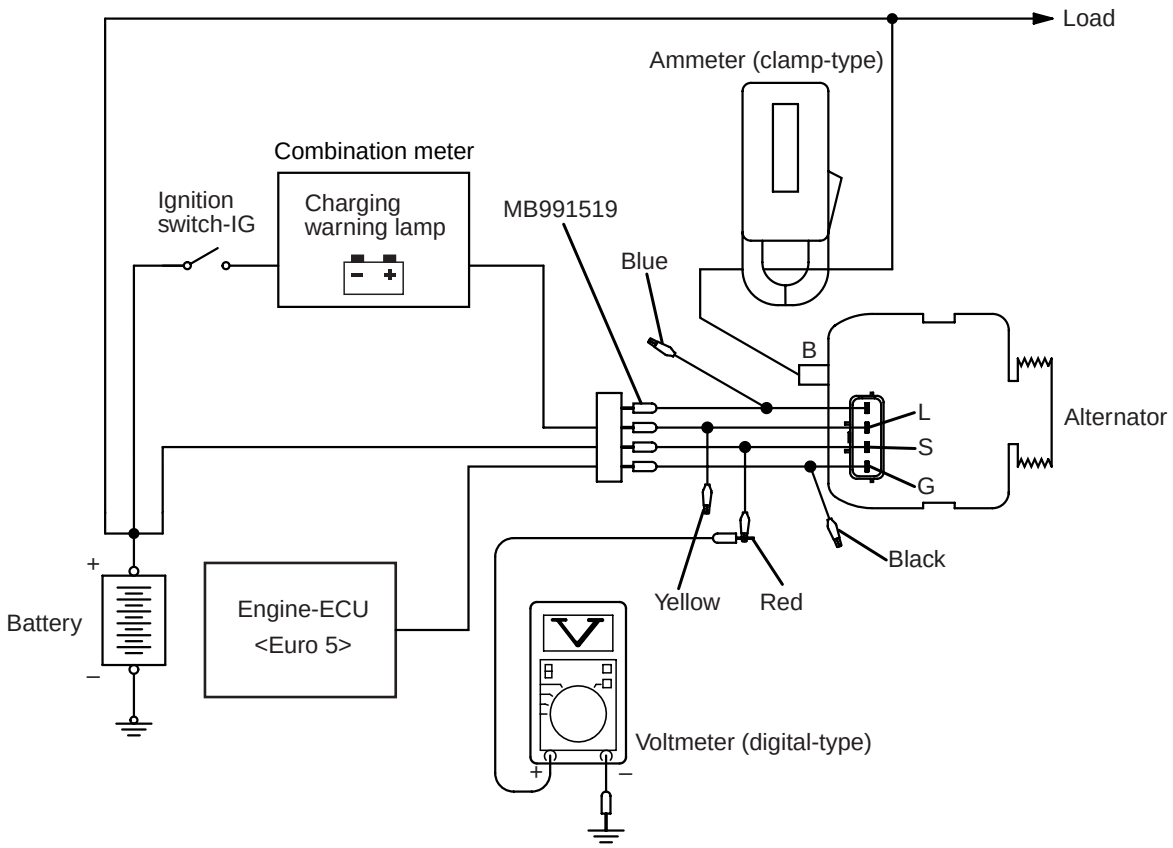
   NOTE: If the voltage is 0 V, the cause is probably an open circuit in the wire or fusible link between the alternator "B" terminal and the battery (+) terminal.
10. Turn the light switch on to turn on headlamps and then start the engine.
11. Immediately after setting the headlamps to high beam and turning the heater blower switch to the high revolution position, increase the engine speed to 2,500 r/min and read the maximum current output value displayed on the ammeter.

    Limit: 70% of normal current output

    NOTE:
    - *For the nominal current output, refer to the Alternator Specifications.*
    - *Because the current from the battery will soon drop after the engine is started, the above step should be carried out as quickly as possible in order to obtain the maximum current output value.*
    - *The current output value will depend on the electrical load and the temperature of the alternator body.*
    - *If the electrical load is small while testing, the specified level of current may not be output even though the alternator is normal. In such cases, increase the electrical load by leaving the headlamps turned on for some time to discharge the battery or by using the lighting system in another vehicle, and then test again.*
    - *The specified level of current also may not be output if the temperature of the alternator body or the ambient temperature is too high. In such cases, cool the alternator and then test again.*
12. The reading on the ammeter should be above the limit value. If the reading is below the limit value and the alternator output wire is normal, remove the alternator from the engine and check the alternator.
13. Run the engine at idle after the test.
14. Turn the ignition switch to the "LOCK" (OFF) position.
15. Remove the M.U.T.-III or tachometer.
16. Disconnect the negative battery cable.
17. Disconnect the ammeter and voltmeter.
18. Connect the negative battery cable.

REGULATED VOLTAGE TEST

M1161001102457



AKB00235 AB

This test determines whether the voltage regulator correctly controlling the alternator output voltage.

1. Always be sure to check the following before the test.
   - Alternator installation
   - Check that the battery installed in the vehicle is fully charged.

(Refer to GROUP 54A – Battery – On-Vehicle Service – Battery Test .)

   - Drive belt tension

(Refer to GROUP 11A – On-Vehicle Service – Alternator and Power Steering Oil Pump Drive Belt Tension Check and Adjustment .)

   - Fusible link
   - Abnormal noise from the alternator while the engine is running
2. Turn the ignition switch to the "LOCK" (OFF) position.
3. Disconnect the negative battery cable.
4. Use the special tool Alternator test harness (MB991519) to connect a digital voltmeter between the alternator "S" terminal and earth [Connect the (+) lead of the voltmeter to the "S" terminal, and then connect the (–) lead of the voltmeter to a secure earth or to the battery (–) terminal].
5. Connect a clamp-type DC test ammeter to the alternator "B" terminal output wire.
6. Reconnect the negative battery cable.
7. Connect the M.U.T.-III or tachometer.
8. Turn the ignition switch to the "ON" position and check that the reading on the voltmeter is equal to the battery voltage.

   NOTE: If the voltage is 0 V, the cause is probably an open circuit in the wire or fusible link between the alternator "S" terminal and the battery (+) terminal.
9. Turn all lamps and accessories off.
10. Start the engine.

    NOTE: Do not drive the vehicle after the engine starts.
11. Increase the engine speed to 2,500 r/min.

12.Read the value displayed on the voltmeter when the alternator output current alternator becomes 10 A or less.
13.If the voltage reading conforms to the value in the voltage regulation, then the voltage regulator is operating normally.

If the voltage is not within the standard value, there is a malfunction of the voltage regulator or of the alternator.

14.After the test, lower the engine speed to the idle speed.
15.Turn the ignition switch to the "LOCK" (OFF) position.
16.Remove the M.U.T.-III or tachometer.
17.Disconnect the negative battery cable.
18.Disconnect the ammeter and voltmeter.
19.Remove the special tool, and return the connector to the original condition.
20.Connect the negative battery cable.

Voltage Regulation Table

STANDARD VALUE:

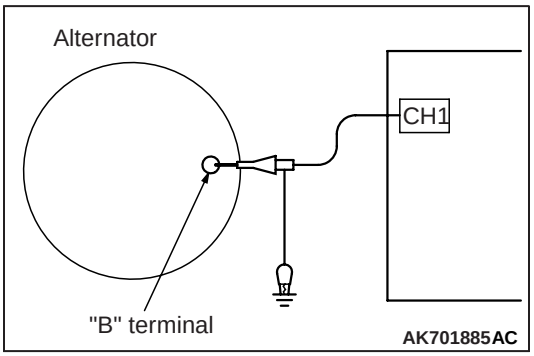
Inspection terminal	Voltage regulator ambient temperature °C	Voltage V
Terminal "S"	−20	14.2 – 15.4
	20	13.9 – 14.9
	60	13.4 – 14.6
	80	13.1 – 14.5

WAVEFORM CHECK USING AN OSCILLOSCOPE

M1161001201428

MEASUREMENT METHOD

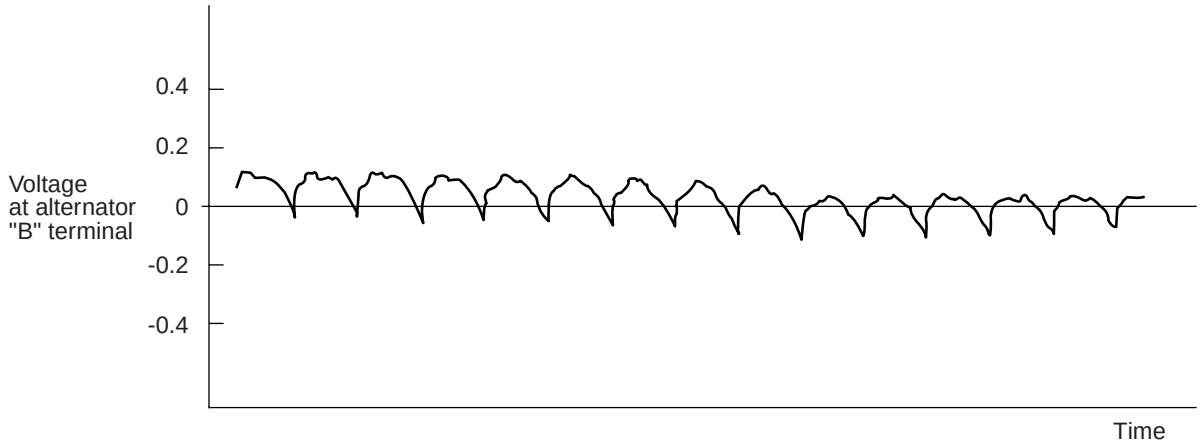
Connect the oscilloscope special patterns pick-up to the alternator "B" terminal.



STANDARD WAVEFORM

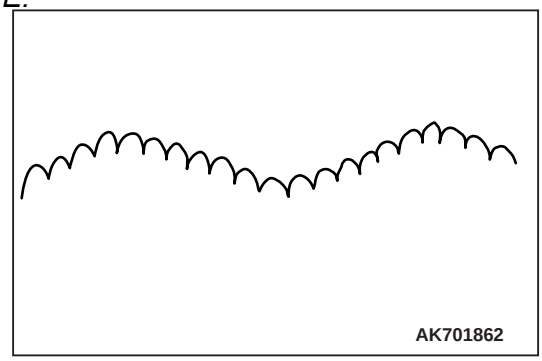
Observation Conditions

Function	Special pattern
Pattern height	Variable
Variable knob	Adjust while viewing the waveform.
Pattern selector	Raster
Engine speed	Curb idle speed



AK701886AB

NOTE:



AK701862

The voltage waveform of the alternator "B" terminal can undulate as shown in the illustration. This waveform is produced when the regulator operates according to fluctuations in the alternator load (current), and is normal for the alternator. In addition, when the voltage waveform reaches an excessively high value (approximately 2 V or higher at idle), it often indicates an open circuit due to a brown fuse between alternator "B" terminal and battery, but not a defective alternator.

EXAMPLE OF ABNORMAL WAVEFORMS

NOTE:

1. *The size of the waveform patterns differs largely, depending on the adjustment of the variable knob on the oscilloscope.*
2. *Identification of abnormal waveforms is easier when there is a large output current (regulator is not operating). (Waveforms can be observed when the headlamps are illuminated.)*
3. *Check the conditions of the charging warning lamp (illuminated/not illuminated). Also, check the charging system totally.*

Abnormal waveform		Problem cause
Except Euro 5	**Euro 5**	
Example 1 AK502669	Example 1 AK703778	Open diode
Example 2 AK502670	Example 2 AK703780	Short in diode
Example 3 AK502671	Example 3 AK703781	Broken wire in stator coil
Example 4 AK502672	Example 4 AK703782	Short in stator coil

ALTERNATOR ASSEMBLY

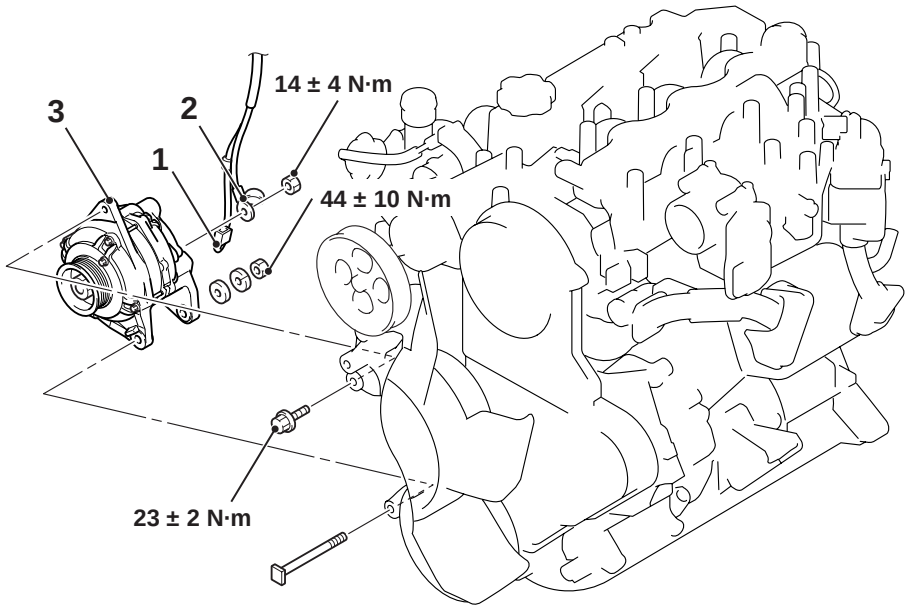
REMOVAL AND INSTALLATION

M1161001403804

⚠ CAUTION

When the specified alternator is not used, each ECU would probably fail.

Pre-removal Operation	Post-installation Operation
• Air Cleaner Assembly Removal (Refer to GROUP 15 – Air Cleaner). • Intercooler Inlet Air Hose Removal (Refer to GROUP 15 – Intercooler) <Except Euro5>. • Intercooler Inlet Air Hose Removal (Refer to GROUP 15 – Intercooler) <Euro5>. • A/C Compressor Drive Belt, Alternator and Power Steering Oil Pump Drive Belt Removal (Refer to GROUP 11A – Crankshaft Pulley).	• A/C Compressor Drive Belt, Alternator and Power Steering Oil Pump Drive Belt Installation (Refer to GROUP 11A – Crankshaft Pulley). • Intercooler Inlet Air Hose Installation (Refer to GROUP 15 – Intercooler) <Except Euro5>. • Intercooler Inlet Air Hose Installation (Refer to GROUP 15 – Intercooler) <Euro5>. • Air Cleaner Assembly Installation (Refer to GROUP 15 – Air Cleaner). • Alternator and Power Steering Oil Pump Drive Belt Tension Check (Refer to GROUP 11A – On-vehicle Service, Alternator and Power Steering Oil Pump Drive Belt Tension Check). • A/C Compressor Drive Belt Tension Check and Adjustment (Refer to GROUP 11A – On-vehicle Service, A/C Compressor Drive Belt Tension Check and Adjustment).



AC503001AC

Removal steps

1. Alternator connector connection

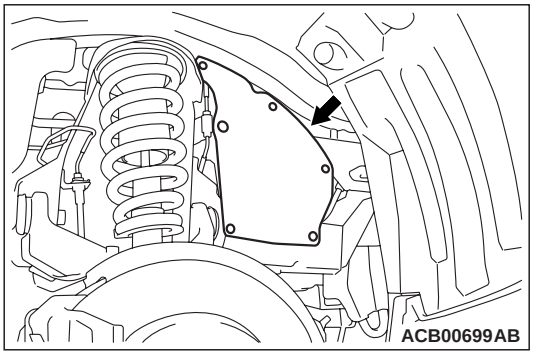
<<A>>

Removal steps (Continued)

2. Alternator terminal connection
3. Alternator assembly

REMOVAL SERVICE POINT

<<A>> ALTERNATOR ASSEMBLY REMOVAL



1. Remove the rubber shield from the wheelhouse (RH), and put the pipe, hose, etc. to side so that they will not be a hindrance when removing and installing the alternator assembly.
2. Remove the alternator assembly from the wheelhouse (RH).

STARTING SYSTEM

GENERAL INFORMATION

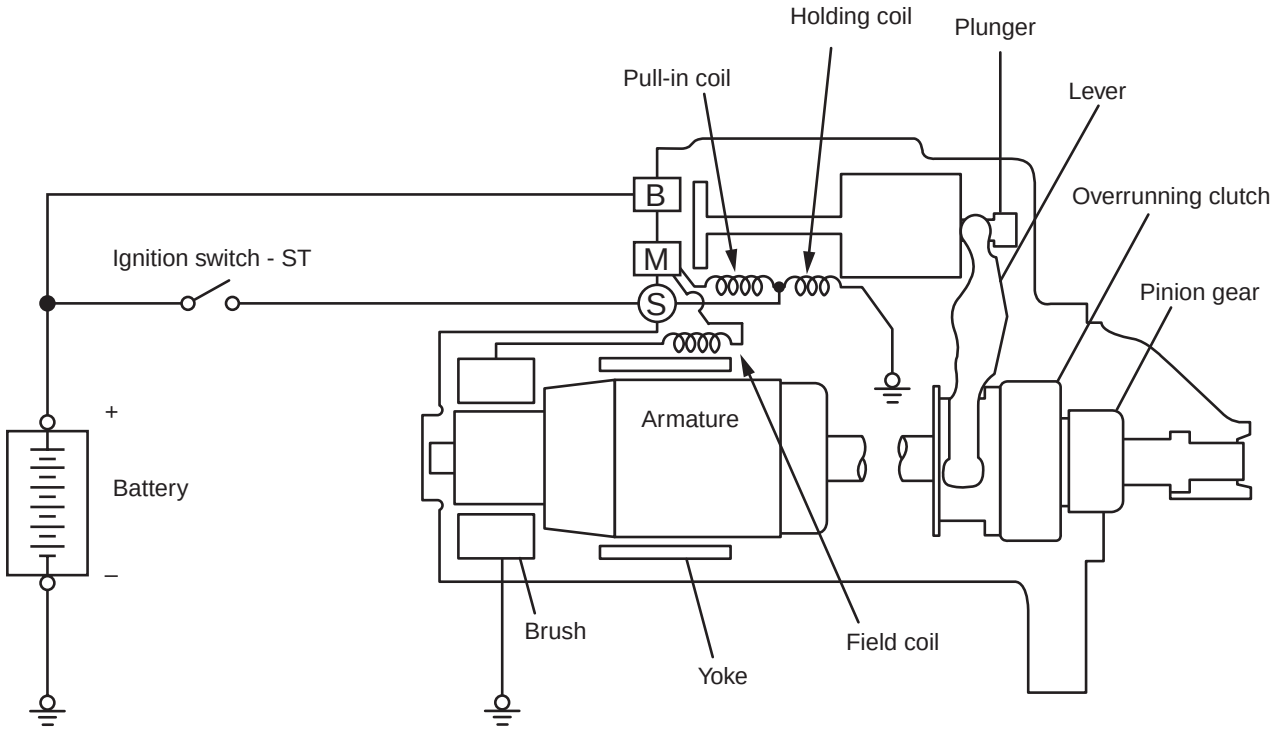
M1161000100845

If the ignition switch is turned to the "START" position, current flows in the pull-in and holding coils provided inside magnetic switch, attracting the plunger, When the plunger is attracted, the lever connected to the plunger is actuated to engage the starter clutch. On the other hand, attracting the plunger will turn on the magnetic switch, allowing the "B" terminal and "M" terminal to conduct. Thus, current flows to engage the starter motor.

When the ignition switch is returned to the "ON" position after starting the engine, the starter clutch is disengaged from the ring gear.

An overrunning clutch is provided between the pinion and the armature shaft, to prevent damage to the starter.

SYSTEM DIAGRAM



AK500030 AB

STARTER MOTOR SPECIFICATIONS

Item	Specification
Type	Reduction drive with planetary gear
Rated output kW/V	2.2/12
Number of pinion teeth	10

SERVICE SPECIFICATIONS

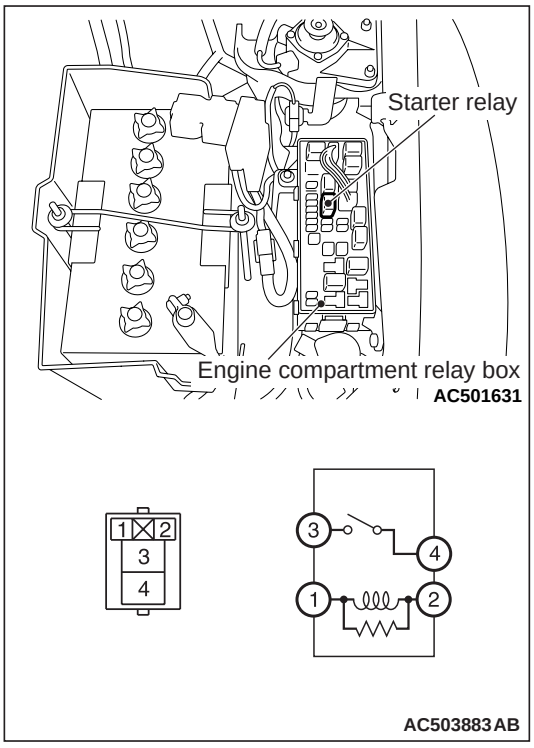
M1161000300689

Item	Standard value	Limit
Pinion gap mm	0.5 – 2.0	–

ON-VEHICLE SERVICE

STARTER RELAY CHECK

M1162001401113



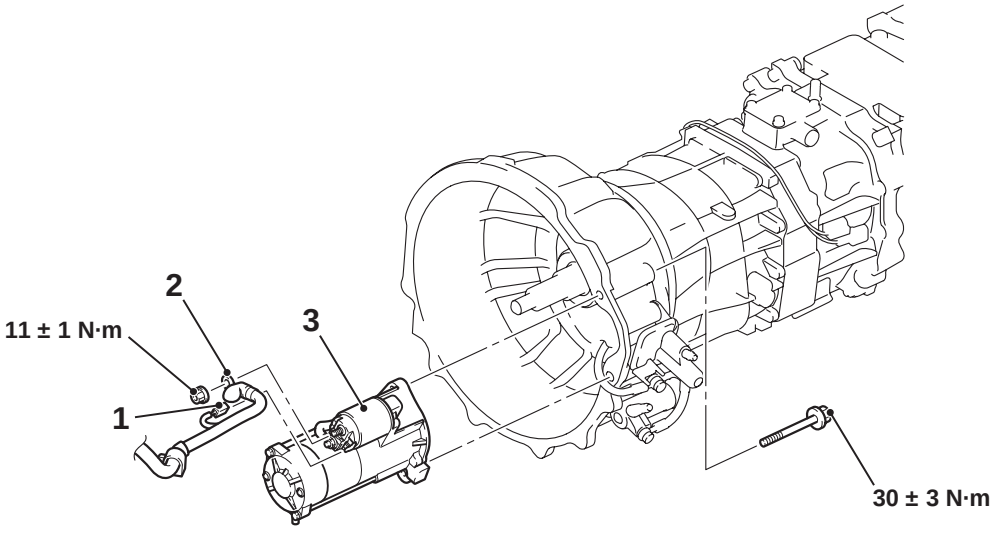
Battery voltage	Terminal No. to be connected to tester	Continuity test results
Not applied	3 – 4	Open circuit
Connect terminal No.2 and battery (+) terminal. Connect terminal No.1 and battery (–) terminal.	3 – 4	Continuity (Less than 2 Ω)

STARTER MOTOR ASSEMBLY

REMOVAL AND INSTALLATION

M1162001003296

Pre-removal Operation	Post-installation Operation
• Under Skid Plate and Engine Room Under Cover Removal (Refer to GROUP 51 – Under Cover).	• Under Skid Plate and Engine Room Under Cover Installation (Refer to GROUP 51 – Under Cover).



Removal steps

1. Starter connector connection
2. Starter terminal connection

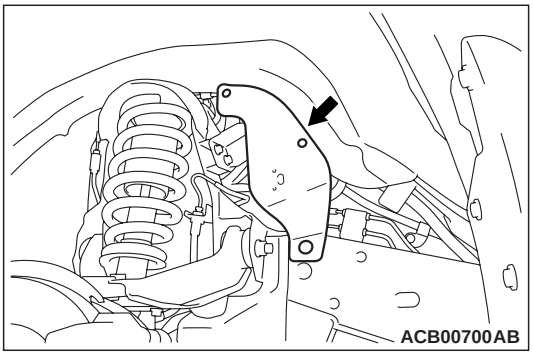
<<A>> 3. Starter assembly

REMOVAL SERVICE POINT

<<A>> STARTER ASSEMBLY REMOVAL

<2WD>

Remove the starter assembly from below the vehicle.

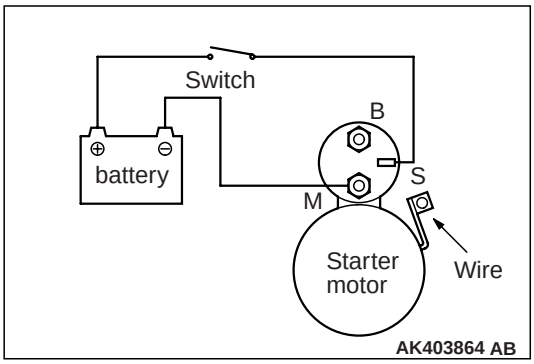


<4WD>
Remove the rubber shield from the wheelhouse (LH), and remove the starter assembly.

STARTER MOTOR ASSEMBLY INSPECTION

M1162001101112

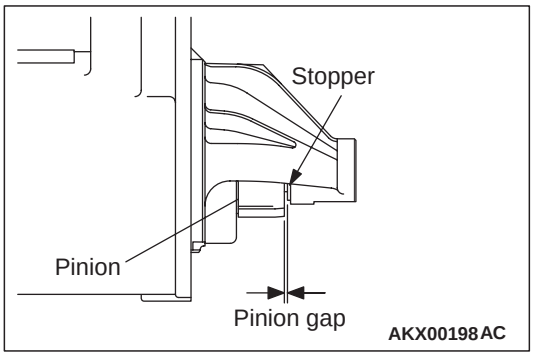
PINION GAP ADJUSTMENT



1. Disconnect the field coil wire from the M-terminal of the magnetic switch.
2. Connect a 12-volt battery between the S-terminal and M-terminal.

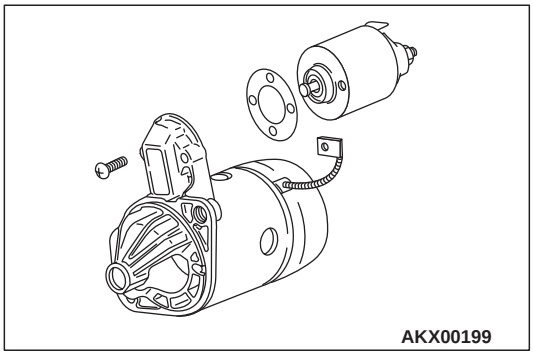
⚠ CAUTION
This test must be performed quickly (in less than 10 seconds) to prevent the coil from burning.

3. Set the switch to "ON", and the pinion will move out.



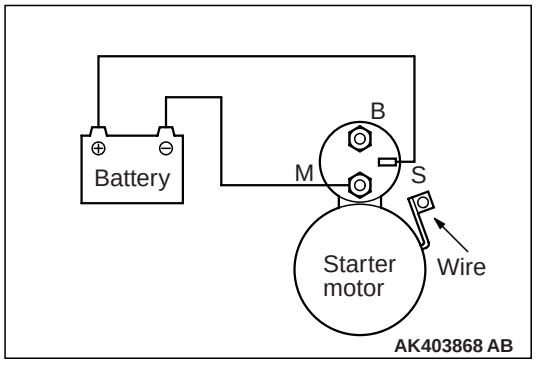
4. Check the pinion-to-stopper clearance (pinion gap) with a feeler gauge.

   Standard value: 0.5 – 2.0 mm



5. If the pinion gap is out of specification, adjust by adding or removing gasket(s) between the magnetic switch and front bracket.

MAGNETIC SWITCH PULL-IN TEST

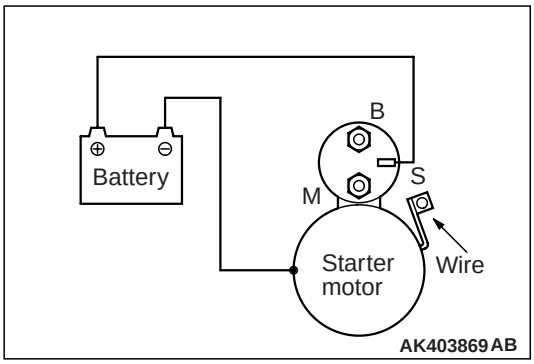


1. Disconnect the field coil wire from the M-terminal of the magnetic switch.

⚠ CAUTION
This test must be performed quickly (in less than 10 seconds) to prevent the coil from burning.

2. Connect a 12-volt battery between the S-terminal and M-terminal.
3. If the pinion moves out, the pull-in coil is good. If it doesn't, replace the magnetic switch.

MAGNETIC SWITCH HOLD-IN TEST



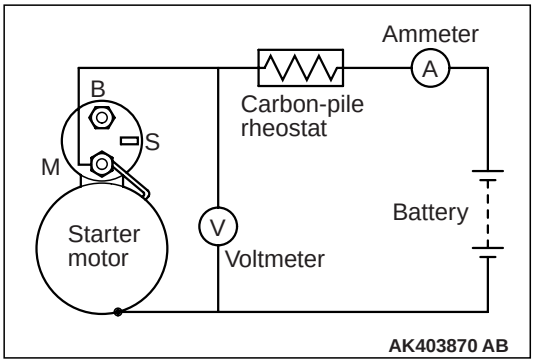
1. Disconnect the field coil wire from the M-terminal of the magnetic switch.

⚠ CAUTION

This test must be performed quickly (in less than 10 seconds) to prevent the coil from burning.

2. Connect a 12-volt battery between the S-terminal and body.
3. Manually pull out the pinion as far as the pinion stopper position.
4. If the pinion remains out, everything is in order. If the pinion moves in, the hold-in circuit is open. Replace the magnetic switch.

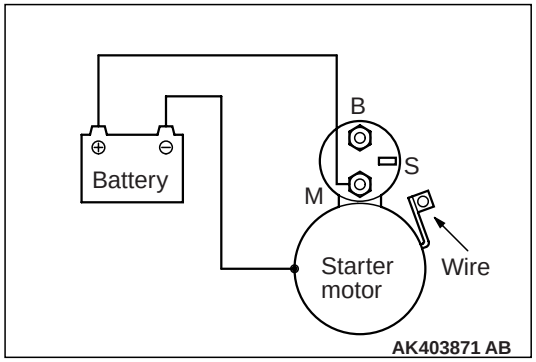
FREE RUNNING TEST



1. Connect a test ammeter (150-ampere scale or more) and carbon pile rheostat in series between the positive battery terminal and starter motor terminal.
2. Connect a voltmeter (15-volt scale) across the starter motor.
3. Rotate the rheostat to full-resistance position.
4. Connect the battery cable from the negative battery terminal to the starter motor body.
5. Adjust the rheostat until the battery positive voltage shown on the voltmeter is 11 V.
6. Confirm that the maximum amperage is within the specifications and that the starter motor turns smoothly and freely.

Current: Maximum 130 A

MAGNETIC SWITCH RETURN TEST



1. Disconnect the field coil wire from the M-terminal of the magnetic switch.

⚠ CAUTION

This test must be performed quickly (in less than 10 seconds) to prevent the coil from burning.

2. Connect a 12-volt battery between the M-terminal and body.

⚠ WARNING

Be careful not to get your fingers caught when pulling out the pinion.

3. Pull the pinion out and release. If the pinion quickly returns to its original position, everything is operating properly. If it doesn't, replace the magnetic switch.

GLOW SYSTEM

GENERAL INFORMATION

M1164000100178

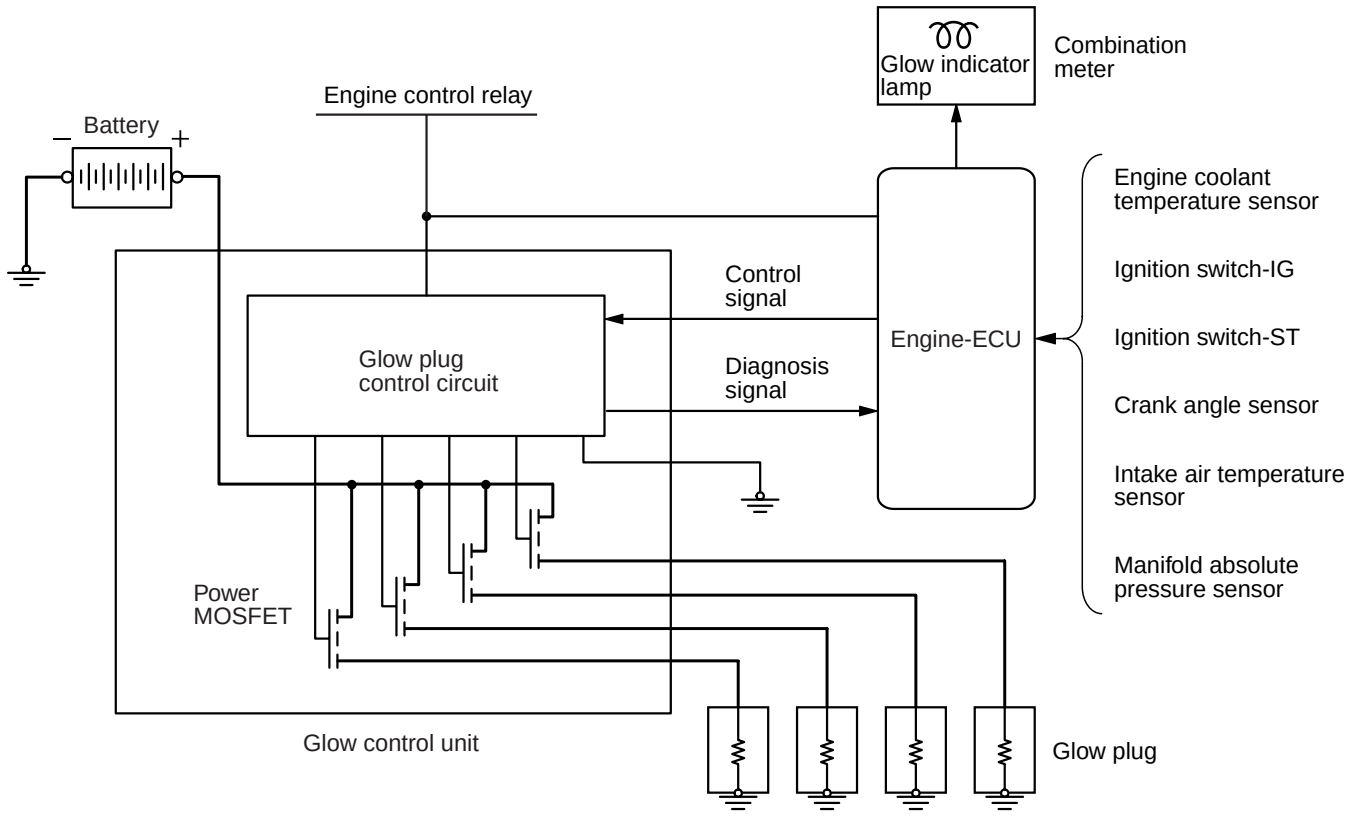
GLOW SYSTEM <EURO5>

GLOW CONTROL

The glow control unit of the glow system employs the method of energizing the glow plug of each cylinder respectively.

The glow control unit carries out the duty control to the energization of the glow plug, in accordance with the signal from the engine-ECU.This achieves the optimum voltage of the glow plug in accordance with the engine conditions at the after glow to stabilize the combustion. Also the combustion noise or hydrocarbon (HC) emissions are reduced.

System Configuration Diagram



AKB00122 AB

The engine-ECU determines the glow start, the glow time and the energization duty cycle of the glow plug. The engine-ECU outputs the PWM signal of the glow operation request to the glow control unit when the following conditions are satisfied.

Before starting (Pre-glow control)

- Ignition switch: ON
- Engine coolant temperature is 60°C or less.

Under the conditions of the engine not starting, the maximum energization time of the glow plug (duty of 100%) is 20 seconds.

While running a cold engine (After-glow control)

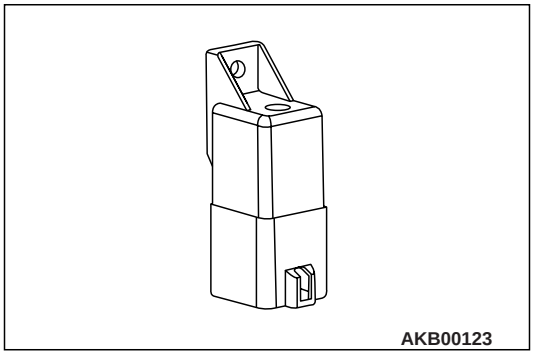
- Ignition switch: ON
- Engine coolant temperature is 70°C or less.
- Engine speed is 350 r/min or more.

NOTE: The glow duty is determined in accordance with the engine coolant temperature and the intake air temperature (at the air flow sensor).
The maximum energization time of the glow plug is 300 seconds.

Glow Indicator Lamp Control

When the engine coolant temperature is below a predetermined level, engine-ECU illuminates the glow indicator lamp. This causes the glow indicator lamp to illuminate, in order to inform the driver of the timing for starting the engine.

GLOW CONTROL UNIT

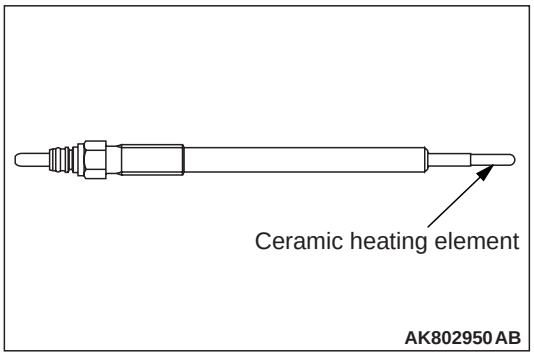


AKB00123

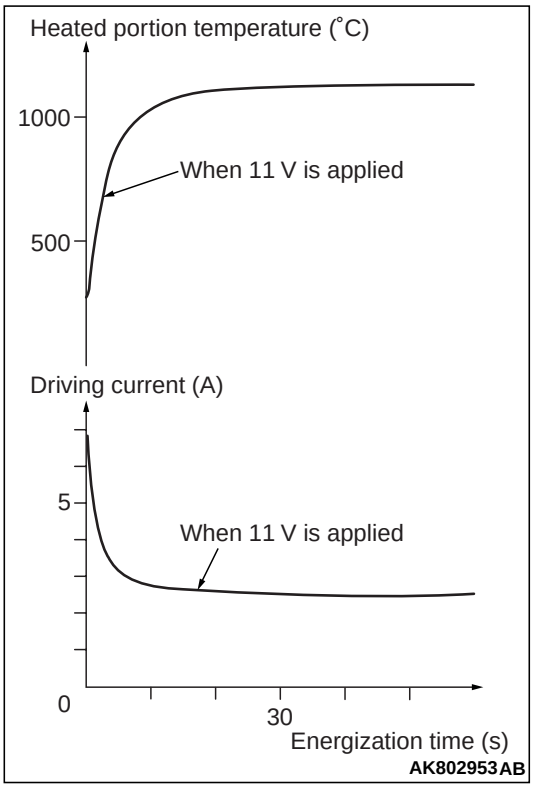
The glow control unit is installed to the fuel filter protector. The engine-ECU supplies the power to the control part of the glow control unit when the ignition switch is turned ON. The energization to the glow plug from the battery is controlled by installing the power-MOSFET (Metal Oxide Semiconductor Field

Effect Transistor) to the glow control unit for each cylinder. When receiving the signal from the engine-ECU through the control signal wire, the glow control unit controls the Power-MOSFET, based on the signal duty, to control the voltage for each glow plug. If detecting the open or short circuit of the glow plug, or communication failures to the engine-ECU, the glow control unit sends the malfunction signal to the engine-ECU through the diagnosis signal wire.

GLOW PLUG



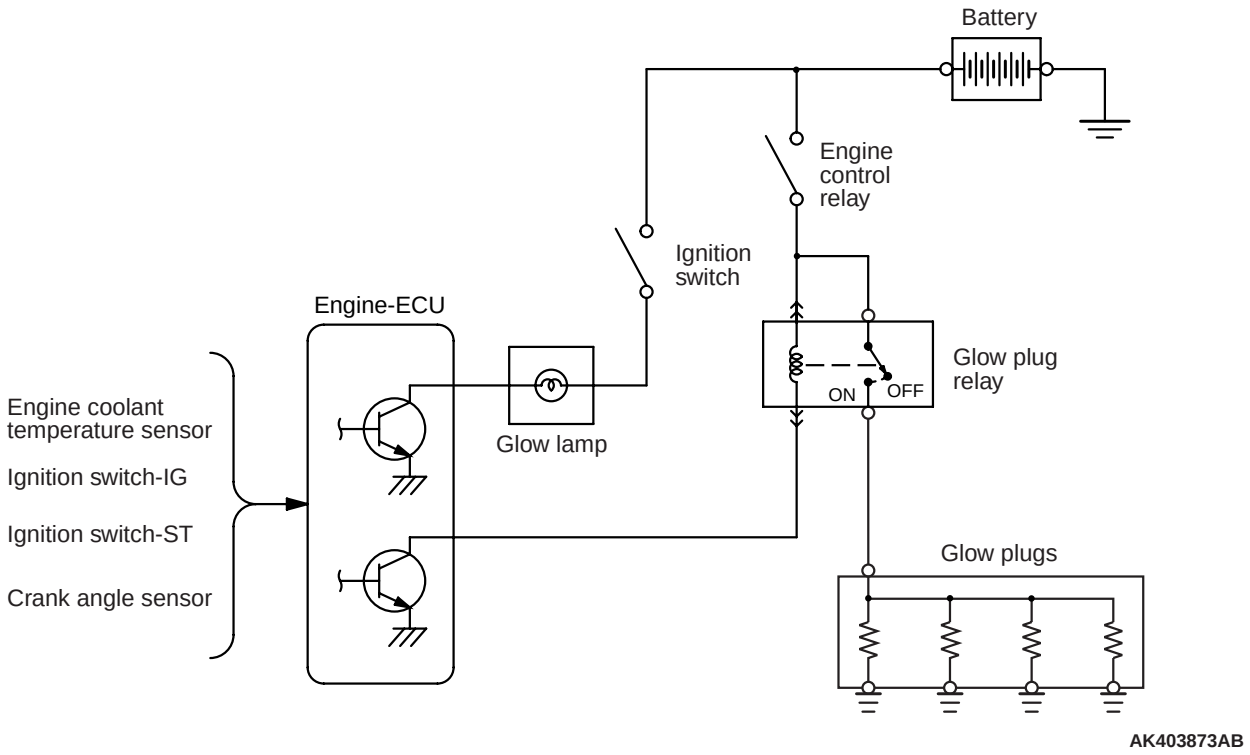
The glow plug is installed to each cylinder of the cylinder head. The glow plug performs preheating of the combustion chamber with the ceramic heating element on the acral part. The heating temperature of the glow plug is changed by adjusting the voltage applied to the glow plug through the duty control of the glow control unit.



The self control resistance is built in the ceramic heating element of the glow plug. When the current is going through the glow plug, the heating element heats up and the self control resistance increases, too.This gradually decreases the current going through the heating element to restrict the amount of heating the glow plug.

SELF-REGULATING GLOW SYSTEM <EXCEPT EURO 5>

The self-regulating glow system enables the vehicle to start ideally at low temperature by preheating the glow plug at super speed. When the ignition switch is turned to the ON position, the engine-ECU supplies electric currents and controls the glow lamp illumination in accordance with the engine coolant temperature. The control resistance wire built in the glow plug has a higher resistance as the glow plug temperature becomes higher. Because of this, the currents in the heater wire gradually decrease. The glow plug is stabilized at the specified temperature. After the engine start at low temperature, the current going to the glow plug is controlled to perform the stable combustion.



SERVICE SPECIFICATION

M1164000300194

<EURO5>

Item	Standard value
Glow plug resistance (at 20°C) Ω	0.6 – 1.4

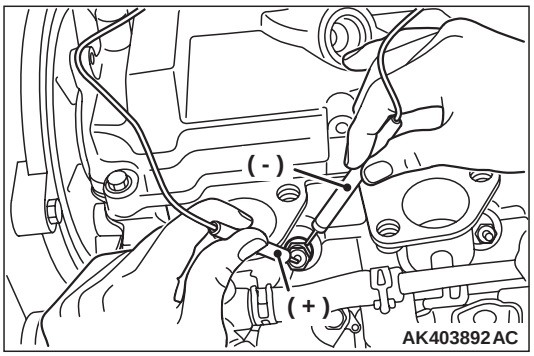
<EXCEPT EURO5>

Item		Standard value
Resistance between glow plug plate and glow plug body (parallel resistance for 4 glow plugs) (at 20°C) Ω		0.15 – 0.25
Voltage between glow plug plate and glow plug body V	Immediately after ignition switch is turned to ON (without starting the engine)	9 – 11 (Drops to 0 V after 4 – 8 seconds have passed)
	While engine is cranking	6 or more
	While engine is warning up	12 – 15 (Drops to 0 V when the engine coolant temperature increases to 60°C or more or if 180 seconds have passed since the engine was started)
Glow plug relay resistance (at 20°C) Ω		18 – 22
Glow plug resistance (at 20°C) Ω		0.6 – 1.0

ON-VEHICLE SERVICE

GLOW PLUG CHECK <EURO5>

M1164003400305



1. Disconnect the glow plug connector.
2. Measure the resistance between the glow plug terminal and the body, or the glow plug terminal and the cylinder head.

   Standard value: 0.6 – 1.4 Ω (at 20°C)

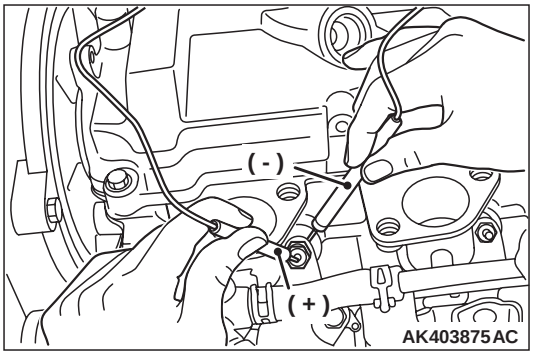
SELF-REGULATING GLOW SYSTEM CHECK <EXCEPT EURO5>

M1164001000260

SELF-REGULATING GLOW SYSTEM CHECK

1. Check that the battery voltage is 11 – 13 V.
2. Check that the engine coolant temperature is 40°C or less.

   NOTE: If the engine coolant temperature is too high, disconnect the engine coolant temperature sensor connector.



3. Measure the resistance between the glow plug plate and the glow plug body (earth).

   Standard value: 0.15 – 0.25 Ω (at 20°C)

   NOTE: The resistance value is the parallel resistance value for the four glow plugs.

4. Connect a voltmeter between the glow plug plate and the glow plug body (earth).
5. Measure the voltage immediately after the ignition switch is turned to ON (without starting the engine).

   Standard value: 9 – 11 V (Drops to 0 V after 4 – 8 seconds have passed)

In addition, check to be sure that the glow indicator lamp (red) illuminates immediately after the ignition switch is turned to ON.

NOTE: The time during which the voltage appears (energizing time) will depend on the engine coolant temperature.

6. Measure the voltage while the engine is cranking.

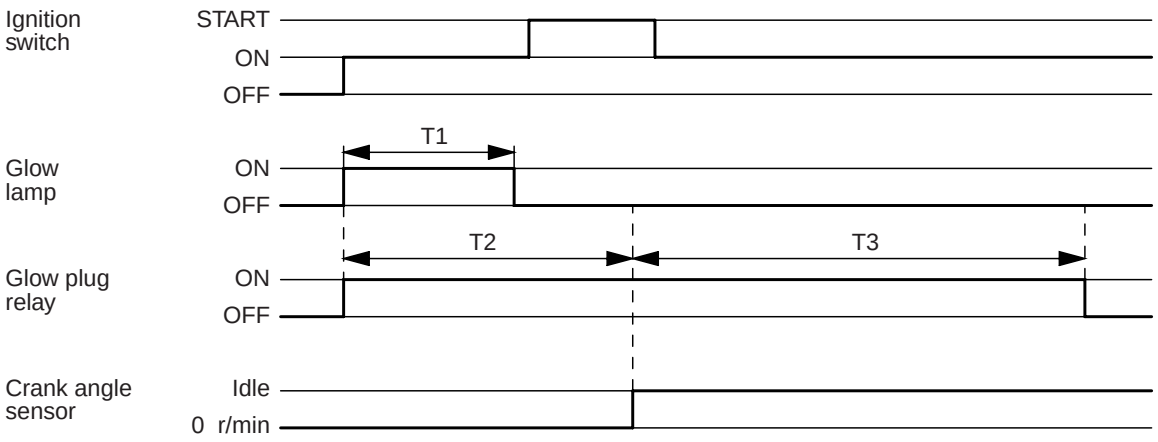
   Standard value: 6 V or more

7. Start the engine and measure the voltage while the engine is warming up.

   However, if the engine coolant temperature rises above 60°C or when 180 seconds have passed since the engine was started, the voltage will always return to 0 V (Refer to the Glow Plug Energization Timing Chart).

   Standard value: 12 – 15 V

Glow Plug Energization Timing Chart <Reference>



T1: Glow lamp

T2: Glow plug relay drive time after ignition switch is turned ON

T3: Glow plug relay drive time after engine starts (after glow)

NOTE
After glow time T3 becomes longer as the engine coolant temperature drops

AK403877AG

CHECK AT THE ECU TERMINALS <EURO5>

M1164003600246

Refer to GROUP 13A – Troubleshooting – Check at the engine-ECU terminals .

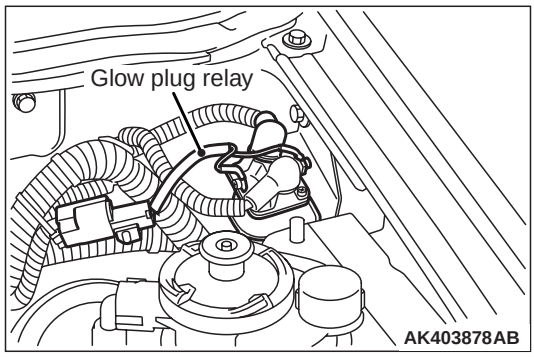
CHECK AT THE ECU TERMINALS <EXCEPT EURO5>

M1164003600257

Refer to GROUP 13A – Troubleshooting – Check at the engine-ECU terminals.

GLOW PLUG RELAY CHECK <EXCEPT EURO5>

M1164003300160

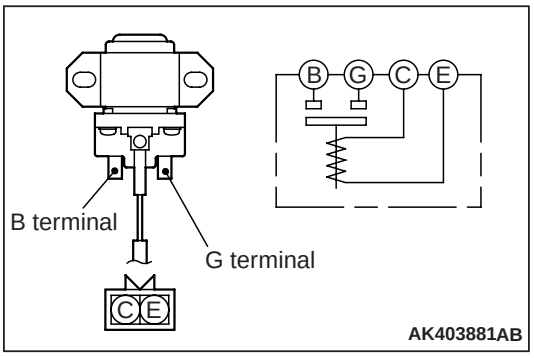


1. Disconnect the glow plug relay connector.
2. Measure resistance between terminal C and terminal E.

   Standard value: 18 – 22 Ω (at 20°C)
3. Use jumper cables to connect terminal C of the glow plug relay to the battery (+) terminal and terminal E to the battery (–) terminal.

⚠ CAUTION

1. **Always be sure to disconnect the harnesses connected to glow plug relay terminals B and G before using the jumper cable.**
2. **The terminals of the disconnected harnesses must not be shorted to earth.**
3. **When connecting the jumper cable, be very careful not to make a mistake in connecting the terminal, as this will cause damage to the relay.**

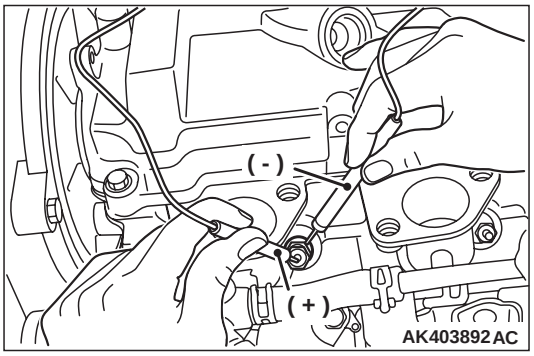


4. Check the continuity between glow plug relay terminals B and G while disconnecting and connecting the jumper cable at the battery (+) terminal.

Jumper cable at battery (+) terminal	Continuity between terminals B – G
Connected	Continuity (0.01 Ω or less)
Disconnected	No continuity (infinite resistance)

GLOW PLUG CHECK <EXCEPT EURO5>

M1164003400316



1. Remove the glow plug plate.
2. Measure the resistance between the glow plug terminals and the body.

Standard value: 0.6 – 1.0 Ω (at 20°C)

ENGINE COOLANT TEMPERATURE SENSOR CHECK <EXCEPT EURO5>

M1164003500067

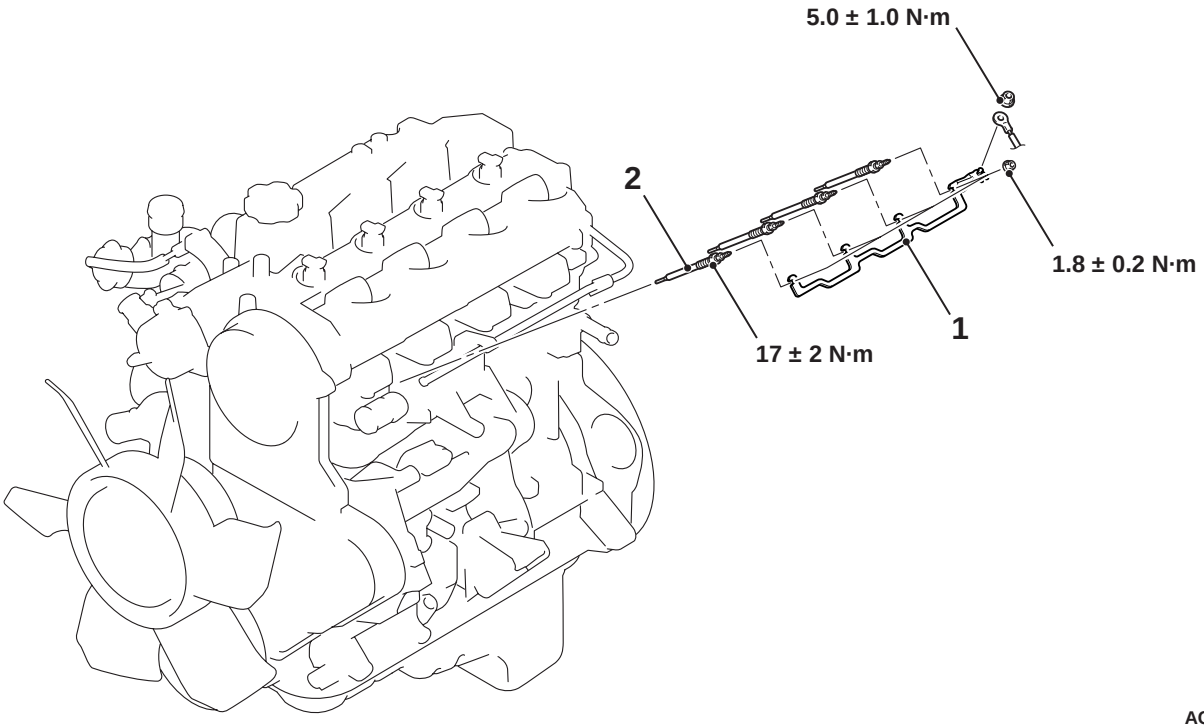
Refer to GROUP 13A – On-vehicle service – Engine coolant temperature sensor check.

GLOW PLUG

REMOVAL AND INSTALLATION

M1164001800512

Pre-removal Operation	Post-installation Operation
• Throttle Body Assembly Removal (Refer to GROUP 13A – Throttle Body). • EGR Valve and EGR Valve Pipe Removal (Refer to GROUP 17 – EGR Valve and EGR Cooler).	• EGR Valve and EGR Valve Pipe Installation (Refer to GROUP 17 – EGR Valve and EGR Cooler). • Throttle Body Assembly Installation (Refer to GROUP 13A – Throttle Body).



AC503049AE

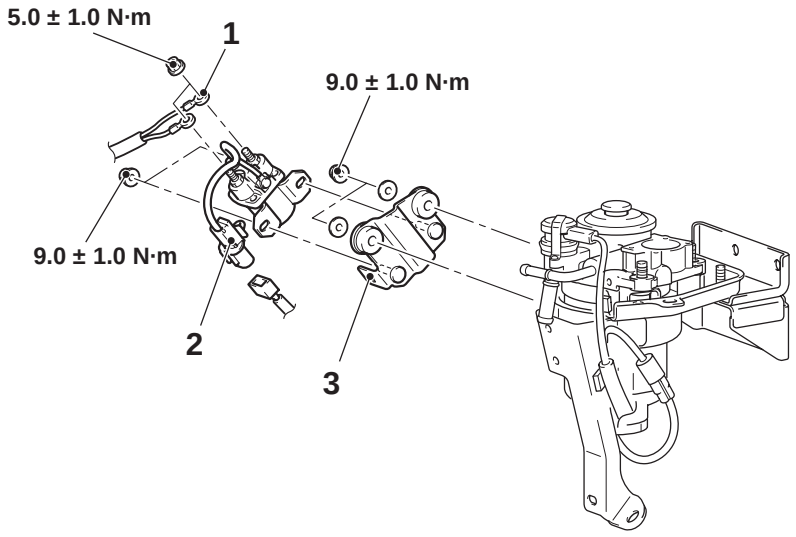
Removal steps

1. Glow plug connecting plate <Except Euro5>
2. Glow plug

GLOW PLUG RELAY <Except Euro5>

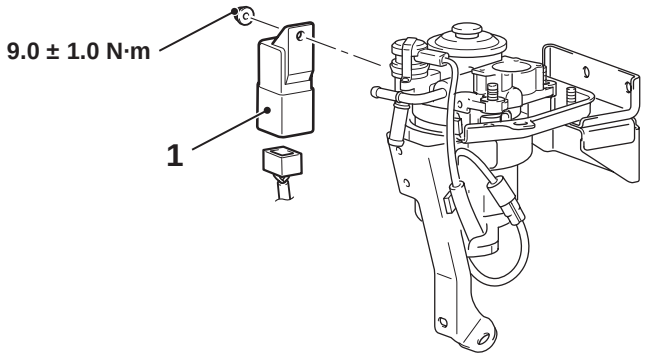
REMOVAL AND INSTALLATION

M1164002400023



AC807146AB

Removal steps
1. Glow plug control relay terminal connection
2. Glow plug control relay
3. Glow plug relay bracket



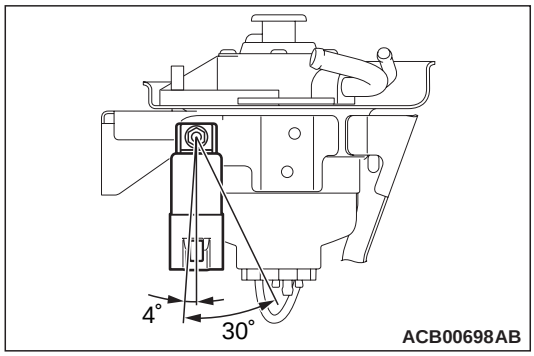
ACB00697AB

Removal

>>**A**<< 1. Glow control unit

INSTALLATION SERVICE POINT

>>A<< GLOW CONTROL UNIT INSTALLATION



ACB00698AB

GLOW CONTROL UNIT <Euro5>

REMOVAL AND INSTALLATION

M1164002100077

Set the connector of the glow control unit to the area shown in the figure, and tighten the mounting nut to the specified torque.

Tightening torque: 9.0 ± 1.0 N·m

GROUP 17

ENGINE AND EMISSION CONTROL

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ENGINE CONTROL

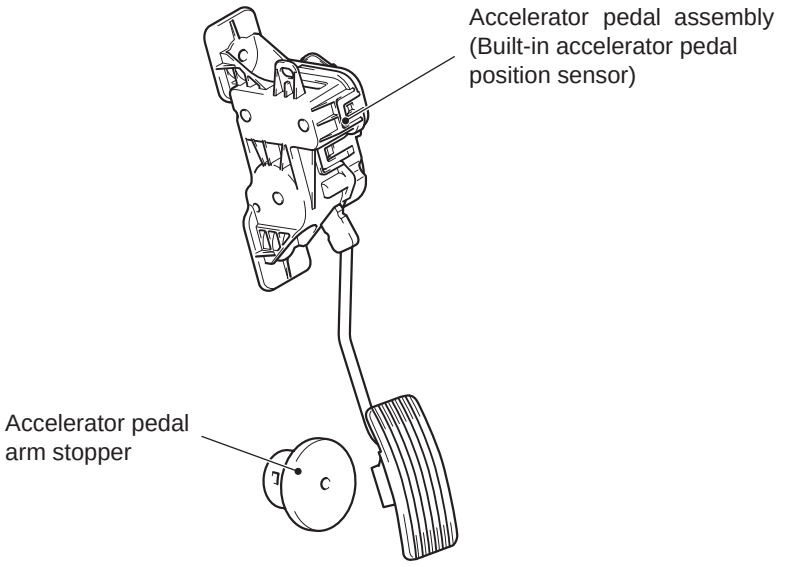
GENERAL INFORMATION

M1171000101162

For the accelerator system, a common rail fuel control system has been adopted, eliminating of an accelerator cable.

This system detects the amount of the accelerator pedal movement by using an accelerator pedal position sensor in the accelerator pedal assembly for electronic control of the fuel injection.

CONSTRUCTION DIAGRAM



AC501713 AB

ACCELERATOR PEDAL

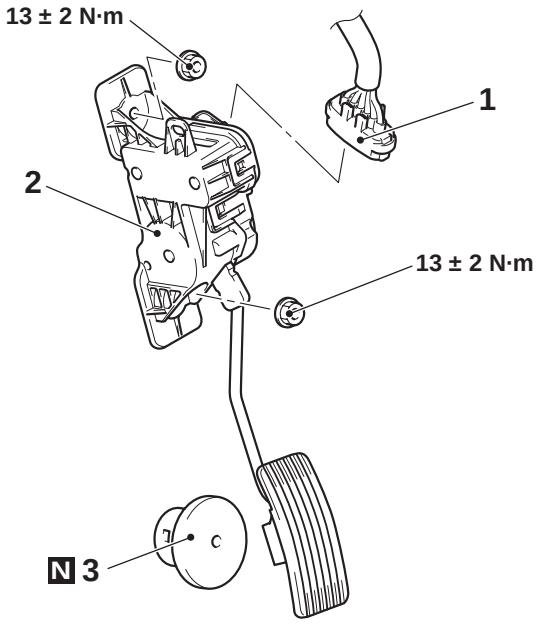
REMOVAL AND INSTALLATION

M1171003001238

⚠ CAUTION

- **Never loosen the screw fixing the accelerator pedal assembly resin cover. If the screw is loosened, the sensor position which exists inside the resin cover is off and the accelerator pedal position sensor does not work normally.**
- **Do not remove the accelerator pedal pad. If the pad is removed and installed, excessive force may damage accelerator pedal position sensor.**

Pre-removal and Post-installation Operation
Instrument Panel Driver's Side Under Cover Removal and Installation (Refer to GROUP 52A – Instrument Panel).



AC501727AD

Removal steps

1. Accelerator pedal position sensor connector
2. Accelerator pedal assembly

<<A>> >>A<< 3. Accelerator pedal arm stopper

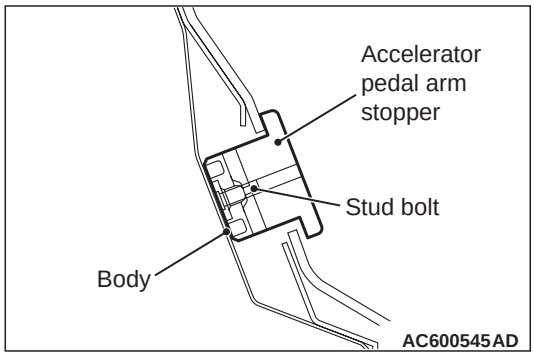
REMOVAL SERVICE POINT

<<A>> ACCELERATOR PEDAL ARM STOPPER REMOVAL

Remove turning the accelerator pedal arm stopper.

INSTALLATION SERVICE POINT

>>A<< ACCELERATOR PEDAL ARM STOPPER INSTALLATION



AC600545AD

1. Insert the accelerator pedal arm stopper straight into the stud bolt of the floor.
2. Install the accelerator pedal arm stopper securely by turning it clockwise until its underside contacts with the body as shown in the figure.

3. After the installation, slightly pull the accelerator pedal arm stopper by hand to check that it cannot be removed easily (appropriate holding power: 100 N or more).

CRUISE CONTROL

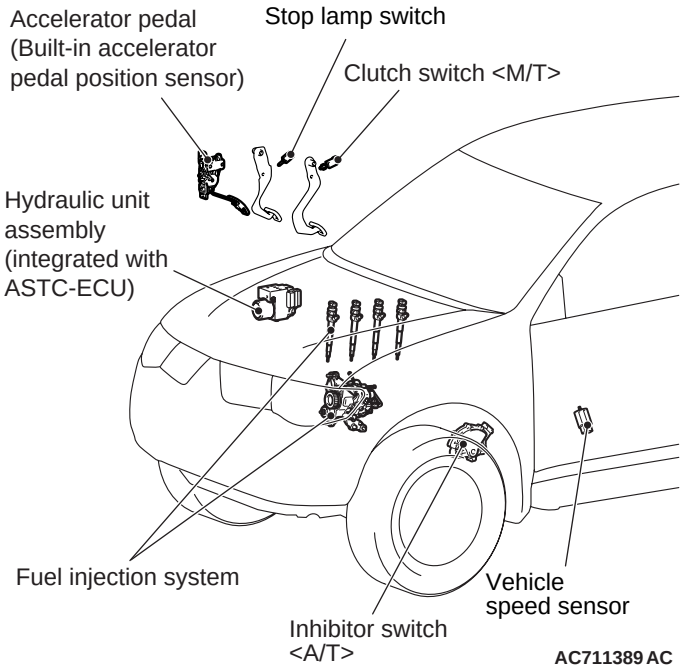
GENERAL INFORMATION

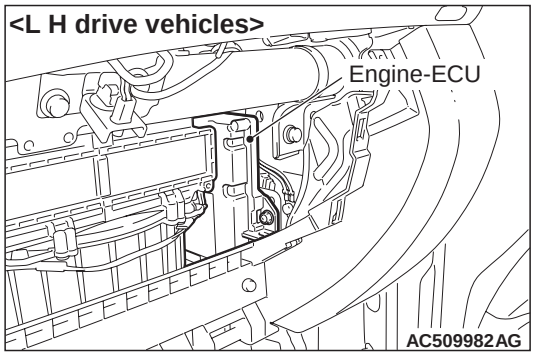
M1172000101228

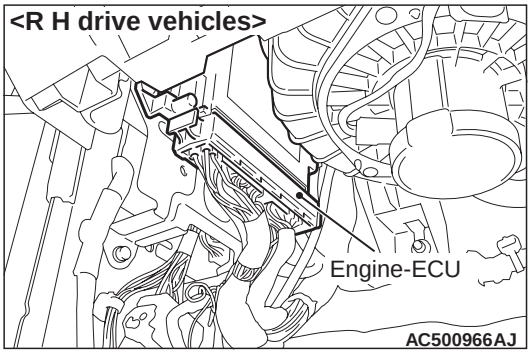
By using the cruise control system, the driver can drive at preferred speeds in a range of approximately 40 to 200 km/h without depressing the accelerator pedal.

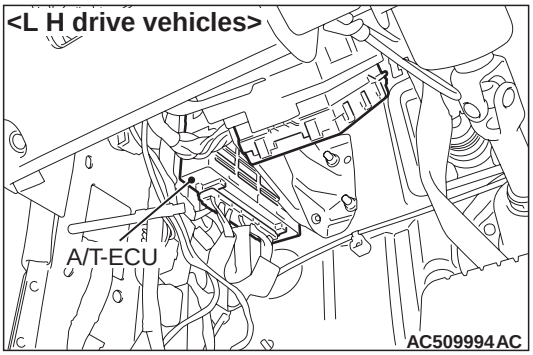
For this cruise control system, in conjunction with the common rail fuel control system, the engine-ECU electronically controls the fuel injection system.

CONSTRUCTION DIAGRAM





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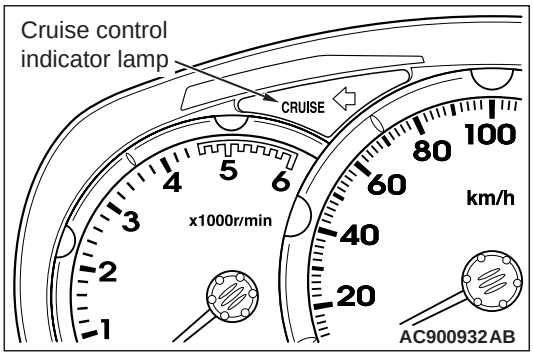
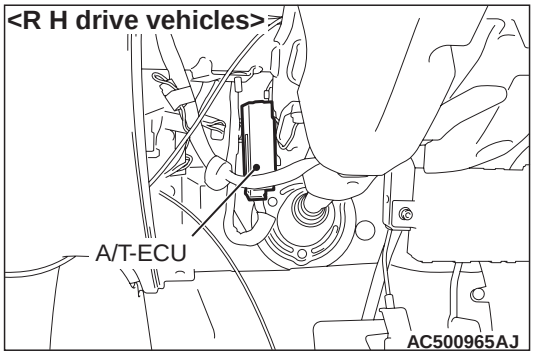
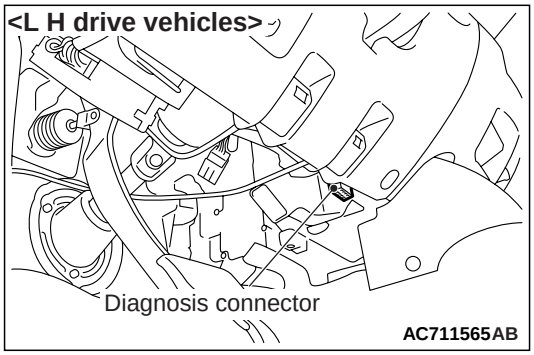
A/T-ECU
AC509994AC


Cruise control indicator lamp
CRUISE
x1000r/min
km/h
AC900932AB


<R H drive vehicles>
A/T-ECU
AC500965AJ


<L H drive vehicles>
Diagnosis connector
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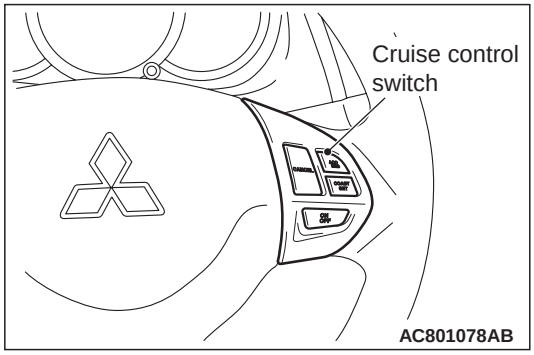
Cruise control switch
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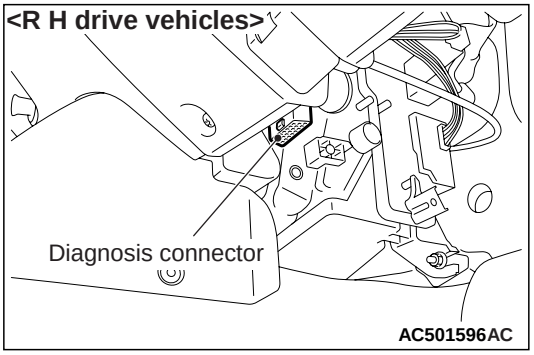
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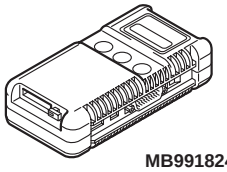
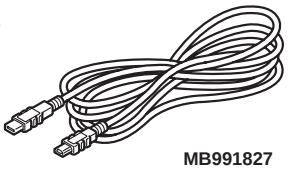
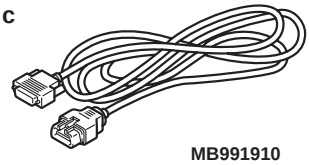
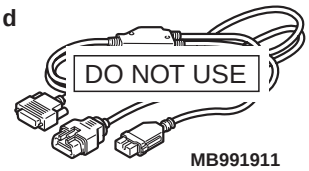
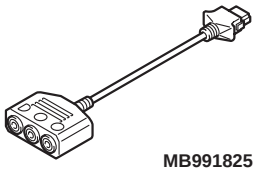
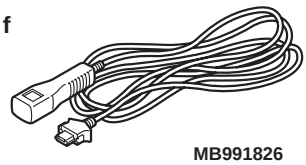
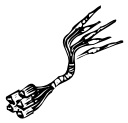
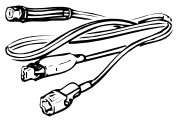
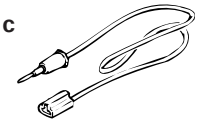
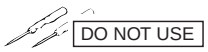
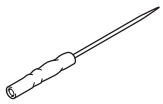
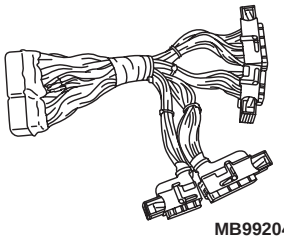
Diagnosis connector
AC501596AC

SPECIAL TOOLS

M1172000601740

Tool	Number	Name	Use
a  MB991824 b  MB991827 c  MB991910 d  MB991911 e  MB991825 f  MB991826 MB991955	MB991955 a: MB991824 b: MB991827 c: MB991910 d: MB991911 e: MB991825 f: MB991826	M.U.T.-III sub-assembly a: Vehicle Communication Interface (V.C.I.) b: M.U.T.-III USB cable c: M.U.T.-III main harness A (Vehicles with CAN communication system) d: M.U.T.-III main harness B (Vehicles without CAN communication system) e: M.U.T.-III measurement adapter f: M.U.T.-III trigger harness	⚠ CAUTION **M.U.T.-III main harness A should be used. M.U.T.-III main harness B should not be used for this vehicle. If you connect M.U.T.-III main harness B instead, the CAN communication does not function correctly.** • Checking diagnosis trouble codes • Checking data list

Tool	Number	Name	Use
a  b  c  d  MB991223	MB991223 a: MB991219 b: MB991220 c: MB991221 d: MB991222	Harness set a: Check harness b: LED harness c: LED harness adapter d: Probe	Making voltage and resistance measurement during troubleshooting a: Connector pin contact pressure inspection b: Power circuit inspection c: Power circuit inspection d: Commercial tester connection
 MB992006	MB992006	Extra fine probe	Making voltage and resistance measurement during troubleshooting
 MB992044	MB992291	Power plant ECU check harness	• Measurement of voltage during troubleshooting • Measure engine-ECU terminal voltage.

TROUBLESHOOTING

DIAGNOSIS TROUBLESHOOTING FLOW

M1172002001045

Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points, Contents of Troubleshooting .

DIAGNOSIS FUNCTION

M1172002100964

METHOD OF READING THE DIAGNOSIS CODE

Use the M.U.T.-III to read the diagnosis code (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points, Diagnosis Function).

NOTE: When reading the diagnosis code, do not select the item under "CRUISE CONTROL," but select the item under "DIESEL ENGINE."

METHOD OF ERASING THE DIAGNOSIS CODE

Use the M.U.T.-III to erase the diagnosis code (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points, Diagnosis Function).

NOTE: When erasing the diagnosis code, do not select the item under "CRUISE CONTROL," but select the item under "DIESEL ENGINE."

CHECK CHART FOR DIAGNOSIS CODES

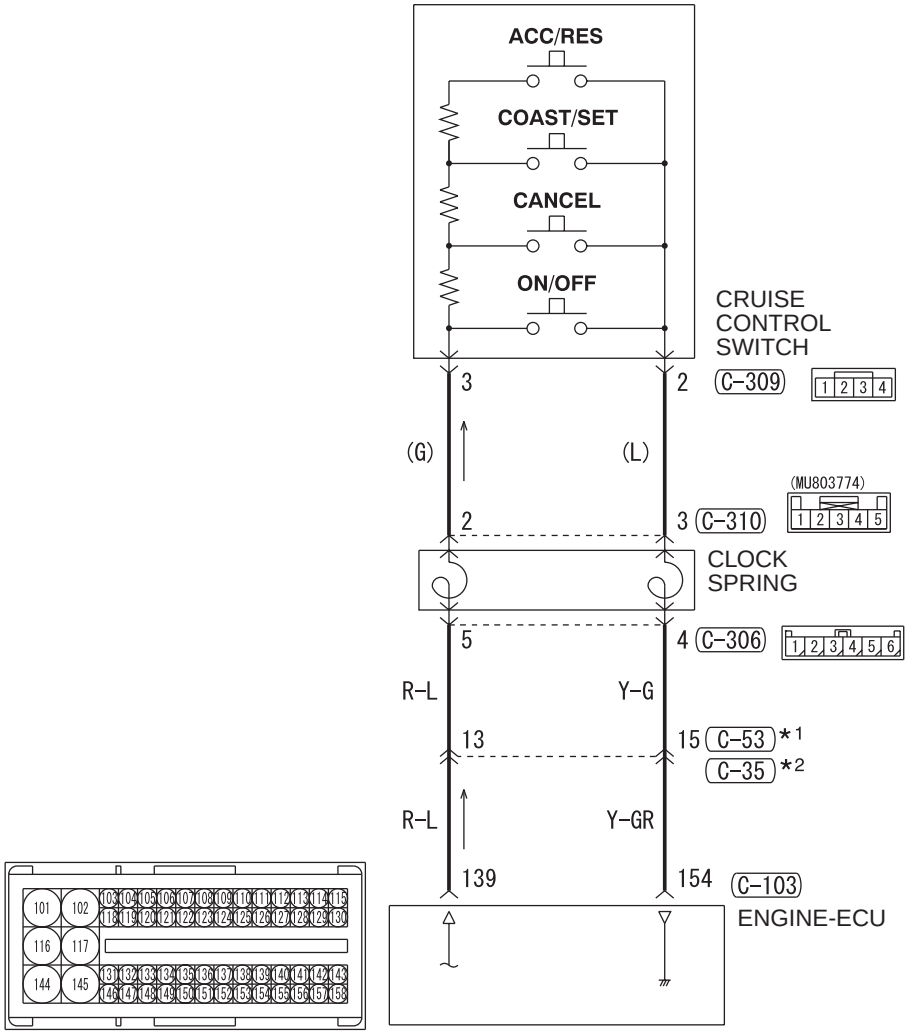
M1172002201180

Code No.	Diagnosis item	Reference page
P1564	Abnormal voltage at cruise control switch	P.17-10
P1571	Malfunction of the stop lamp switch	P.17-15

DIAGNOSIS CODE PROCEDURES

Code No.P1564: Abnormal voltage at cruise control switch

Cruise Control Switch System Circuit

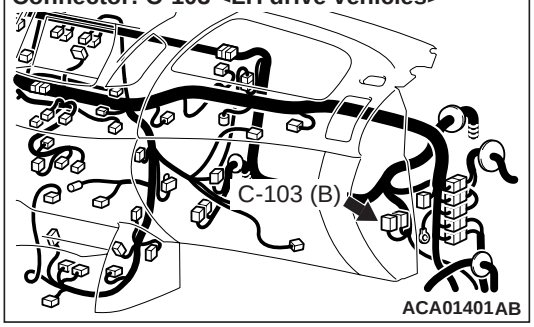


NOTE
*1 : LH drive vehicles
*2 : RH drive vehicles

Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple Sl : Silver

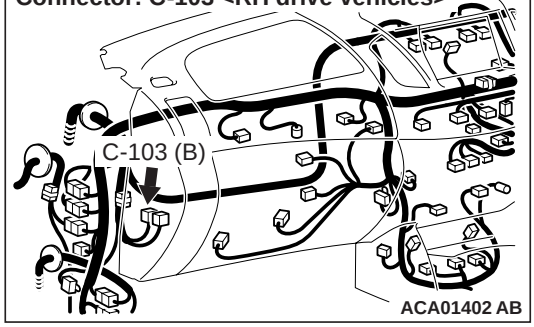
ACA01400 AB

Connector: C-103 <LH drive vehicles>



ACA01401AB

Connector: C-103 <RH drive vehicles>



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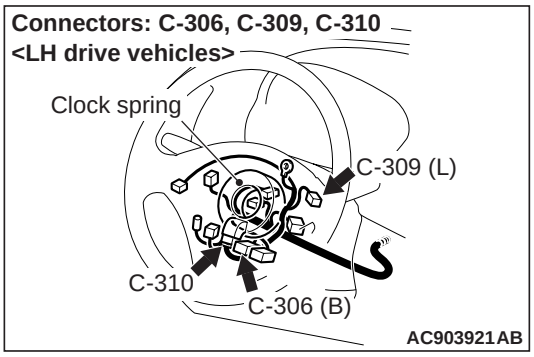
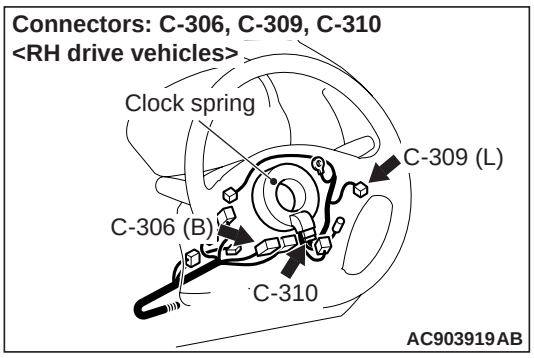




OPERATION

This circuit judges the signals of each switch ("ON/OFF", "CANCEL", "COAST/SET" and "ACC/RES") of the cruise control switch. The engine-ECU detects the state of the cruise control switch by sensing the voltages shown below.

- When all switches are released: 4.7 – 5.0 volts
- When the "ON/OFF" switch is pressed: 0 – 0.5 volt
- When the "CANCEL" switch is pressed: 1.0 – 1.8 volts
- When the "COAST/SET" switch is pressed: 2.3 – 3.0 volts
- When the "ACC/RES" switch is pressed: 3.5 – 4.2 volts

DIAGNOSIS CODE SET CONDITIONS

- If the cruise control switch is operated, this diagnosis code will be set when the engine-ECU terminal voltage is different from the standard value.
- Or, this code is set when the "COAST/SET" switch or "ACC/RES" switch is stuck to ON.

PROBABLE CAUSES

- Damaged harness or connector.
- Malfunction of the cruise control switch.
- Malfunction of the clock spring.
- Malfunction of the engine-ECU.

DIAGNOSIS PROCEDURE

STEP 1. Check the data list.

Using M.U.T.-III, check the data list (Refer to P.17-29 – data list reference table).

- Item 136: "ON/OFF" switch
- Item 137: "CANCEL" switch
- Item 138: "COAST/SET" switch
- Item 139: "ACC/RES" switch

Q: Is the check result normal?

YES : Go to Step 25.
NO : Go to Step 2.

STEP 2. Measure the terminal voltage at cruise control switch connector C-309.

(1) Remove the cruise control switch from the steering wheel with the cruise control switch connector connected (Refer to P.17-33).
(2) Connect the negative battery terminal that was disconnected when the driver's air bag module was removed.
(3) Turn the ignition switch to the "ON" position.
(4) Do not operate the cruise control switch.
(5) Measure the terminal voltage between cruise control switch connector C-309 terminal No.3 and earth with cruise control switch connector C-309 connected.

OK: 4.7 – 5.0 V

Q: Is the check result normal?

YES : Go to Step 14.
NO : Go to Step 3.

STEP 3. Measure the terminal voltage at engine-ECU connector C-103.

(1) Remove the engine-ECU (Refer to GROUP 13A – Engine-ECU).
(2) Connect special tool power plant ECU check harness (MB992291) between the engine-ECU and the body-side harness connector.
(3) Turn the ignition switch to the "ON" position.
(4) Do not operate the cruise control switch.
(5) Measure the terminal voltage between special tool 58-pin connector terminal No.139 (engine-ECU connector C-103 terminal No.139) and earth.

OK: 4.7 – 5.0 V

Q: Is the check result normal?

YES : Go to Step 10.
NO : Go to Step 4.

STEP 4. Connector check: C-103 engine-ECU connector.

Q: Is the check result normal?
YES : Go to Step 5.
NO : Repair or replace the damaged connector. Then go to Step 26.

STEP 5. Check the harness wire for short circuit to earth between engine-ECU connector C-103 terminal No.139 and cruise control switch connector C-309 terminal No.3.

(1) Disconnect engine-ECU connector C-103 and measure at the harness connector side (Refer to GROUP 13A – Engine-ECU).
(2) Turn the ignition switch to the "LOCK" (OFF) position.
(3) Measure the continuity between engine-ECU connector C-103 terminal No.139 and earth.

OK: open circuit

Q: Is the check result normal?
YES : Go to Step 24 .
NO : Go to Step 6.

STEP 6. Connectors check: C-309 cruise control switch connector, C-306 and C-310 clock spring connectors and C-53 <LHD> or C-35 <RHD> intermediate connector.

Q: Is the check result normal?
YES : Go to Step 7.
NO : Repair or replace the damaged connector. Then go to Step 26.

STEP 7. Check the harness wire between engine-ECU connector C-103 terminal No.139 and clock spring connector C-306 terminal No.5, and between clock spring connector C-310 terminal No.2 and cruise control switch connector C-309 terminal No.3.

- Check harness wire for short circuit and damage.

Q: Is the check result normal?
YES : Go to Step 8.
NO : Repair or replace the damaged harness wire. Then go to Step 26.

STEP 8. Check the clock spring.

Refer to GROUP 52B – Driver's, Front Passenger's Air Bag Module(s) and Clock Spring Inspection .

Q: Is the check result normal?
YES : Go to Step 9.
NO : Replace the clock spring [Refer to GROUP 52B – Driver's, Front Passenger's Air Bag Module(s) and Clock Spring]. Then go to Step 26.

STEP 9. Check the cruise control switch.

Refer to P.17-32.

Q: Is the check result normal?
YES : Go to Step 13.
NO : Replace the cruise control switch (Refer to P.17-33). Then go to Step 26.

STEP 10. Connectors check: C-103 engine-ECU connector, C-309 cruise control switch connector, C-306 and C-310 clock spring connectors and C-53 <LHD> or C-35 <RHD> intermediate connector.

Q: Is the check result normal?
YES : Go to Step 11.
NO : Repair or replace the damaged connector. Then go to Step 26.

STEP 11. Check the harness wire between engine-ECU connector C-103 terminal No.139 and clock spring connector C-306 terminal No.5, and between clock spring connector C-310 terminal No.2 and cruise control switch connector C-309 terminal No.3.

- Check harness wire for open circuit and damage.

Q: Is the check result normal?
YES : Go to Step 12.
NO : Repair or replace the damaged harness wire. Then go to Step 26.

STEP 12. Check the clock spring.

Refer to GROUP 52B – Driver's, Front Passenger's Air Bag Module(s) and Clock Spring Inspection .

Q: Is the check result normal?
YES : Go to Step 13.
NO : Replace the clock spring [Refer to GROUP 52B – Driver's, Front Passenger's Air Bag Module(s) and Clock Spring]. Then go to Step 26.

STEP 13. Check the data list.

Using M.U.T.-III, check the data list (Refer to P.17-29 – data list reference table).

- Item 136: "ON/OFF" switch
- Item 137: "CANCEL" switch
- Item 138: "COAST/SET" switch
- Item 139: "ACC/RES" switch

Q: Is the check result normal?

YES : Go to Step 25.
NO : Go to Step 14.

STEP 14. Measure the terminal voltage at cruise control switch connector C-309.

(1) Remove the cruise control switch from the steering wheel with the cruise control switch connector connected (Refer to P.17-33).
(2) Connect the negative battery terminal that was disconnected when the driver's air bag module was removed.
(3) Turn the ignition switch to the "ON" position.
(4) Push the "ON/OFF" switch with cruise control switch connector C-309 connected, and measure the terminal voltage between cruise control switch connector C-309 terminal No.2 and earth.

OK: 0 – 0.5 V

Q: Is the check result normal?

YES : Go to Step 20.
NO : Go to Step 15.

STEP 15. Measure the terminal voltage at engine-ECU connector C-103.

(1) Remove the engine-ECU (Refer to GROUP 13A – Engine-ECU).
(2) Connect special tool power plant ECU check harness (MB992291) between the engine-ECU and the body-side harness connector.
(3) Turn the ignition switch to the "ON" position.
(4) Push the "ON/OFF" switch, and measure the terminal voltage between special tool 58-pin connector terminal No.154 (engine-ECU connector C-103 terminal No.154) and earth.

OK: 0 – 0.5 V

Q: Is the check result normal?

YES : Go to Step 17.
NO : Go to Step 16.

STEP 16. Connector check: C-103 engine-ECU connector.

Q: Is the check result normal?

YES : Go to Step 24.
NO : Repair or replace the damaged connector. Then go to Step 26.

STEP 17. Connectors check: C-309 cruise control switch connector, C-306 and C-310 clock spring connectors and C-53 <LHD> or C-35 <RHD> intermediate connector.

Q: Is the check result normal?

YES : Go to Step 18.
NO : Repair or replace the damaged connector. Then go to Step 26.

STEP 18. Check the harness wire between engine-ECU connector C-103 terminal No.154 and clock spring connector C-306 terminal No.4, and between clock spring connector C-310 terminal No.3 and cruise control switch connector C-309 terminal No.2.

- Check harness wire for open circuit and damage.

Q: Is the check result normal?

YES : Go to Step 19.
NO : Repair or replace the damaged harness wire. Then go to Step 26.

STEP 19. Check the clock spring.

Refer to GROUP 52B – Driver's, Front Passenger's Air Bag Module(s) and Clock Spring Inspection .

Q: Is the check result normal?

YES : Go to Step 20.
NO : Replace the clock spring and install the driver's air bag module [Refer to GROUP 52B – Driver's, Front Passenger's Air Bag Module(s) and Clock Spring]. Then go to Step 26.

STEP 20. Connectors check: C-103 engine-ECU connector, C-309 cruise control switch connector, C-306 and C-310 clock spring connectors and C-53 <LHD> or C-35 <RHD> intermediate connector.

Q: Is the check result normal?

YES : Go to Step 21.
NO : Repair or replace the damaged connector. Then go to Step 26.

STEP 21. Check the harness wire between engine-ECU connector C-103 terminal No.154 and clock spring connector C-306 terminal No.4, and between clock spring connector C-310 terminal No.3 and cruise control switch connector C-309 terminal No.2.

- Check harness wire for short circuit and damage.

Q: Is the check result normal?
YES : Go to Step 22.
NO : Repair or replace the damaged harness wire. Then go to Step 26.

STEP 22. Check the clock spring.
Refer to GROUP 52B – Driver's, Front Passenger's Air Bag Module(s) and Clock Spring Inspection .

Q: Is the check result normal?
YES : Go to Step 23.
NO : Replace the clock spring [Refer to GROUP 52B – Driver's, Front Passenger's Air Bag Module(s) and Clock Spring]. Then go to Step 26.

STEP 23. Check the cruise control switch.
Refer to P.17-32.

Q: Is the check result normal?
YES : Go to Step 24.
NO : Replace the cruise control switch (Refer to P.17-33). Then go to Step 26.

STEP 24. Check the data list.
Using M.U.T.-III, check the data list (Refer to P.17-29 – data list reference table).

- Item 136: "ON/OFF" switch
- Item 137: "CANCEL" switch
- Item 138: "COAST/SET" switch
- Item 139: "ACC/RES" switch

Q: Is the check result normal?
YES : Go to Step 25.
NO : Replace the engine-ECU (Refer to GROUP 13A – Engine-ECU). Then go to Step 26.

STEP 25. Read the diagnosis code.
(1) Use the M.U.T.-III, erase the diagnosis code of the cruise control system (Refer to P.17-9).
(2) Turn the ignition switch to the "ON" position, and push the "ON/OFF" switch to turn the cruise control system to ON (turn ON the cruise control indicator lamp).
(3) After turning the cruise control system to ON, when 2 minutes or more has elapsed without operating the cruise control switches, use the M.U.T.-III to read the diagnosis code of the cruise control system (Refer to P.17-9).

Q: Is diagnosis code No.P1564 set?
YES : Replace the engine-ECU (Refer to GROUP 13A – Engine-ECU). Then go to Step 26.
NO : It can be assumed that this malfunction is intermittent (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points, How to Cope with Intermittent Malfunction).

STEP 26. Check the data list.
Using M.U.T.-III, check the data list (Refer to P.17-29 – data list reference table).

- Item 136: "ON/OFF" switch
- Item 137: "CANCEL" switch
- Item 138: "COAST/SET" switch
- Item 139: "ACC/RES" switch

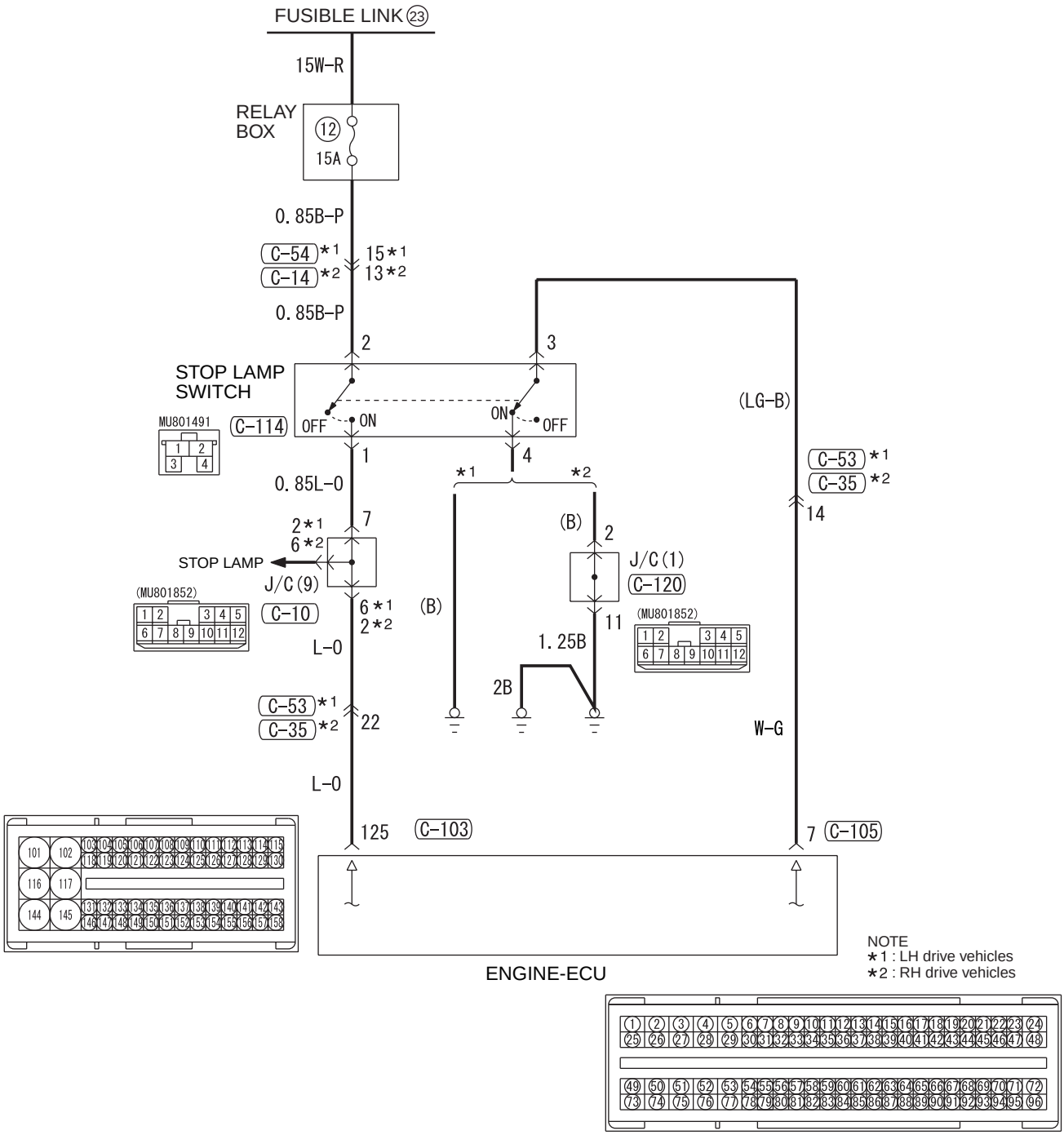
Q: Is the check result normal?
YES : Go to Step 27.
NO : Return to Step 2.

STEP 27. Read the diagnosis code.
(1) Use the M.U.T.-III, erase the diagnosis code of the cruise control system (Refer to P.17-9).
(2) Turn the ignition switch to the "ON" position, and push the "ON/OFF" switch to turn the cruise control system to ON (turn ON the cruise control indicator lamp).
(3) After turning the cruise control system to ON, when 2 minutes or more has elapsed without operating the cruise control switches, use the M.U.T.-III to read the diagnosis code of the cruise control system (Refer to P.17-9).

Q: Is diagnosis code No.P1564 set?
YES : Return to Step 1.
NO : The procedure is complete.

Code No.P1571: Malfunction of the stop lamp switch

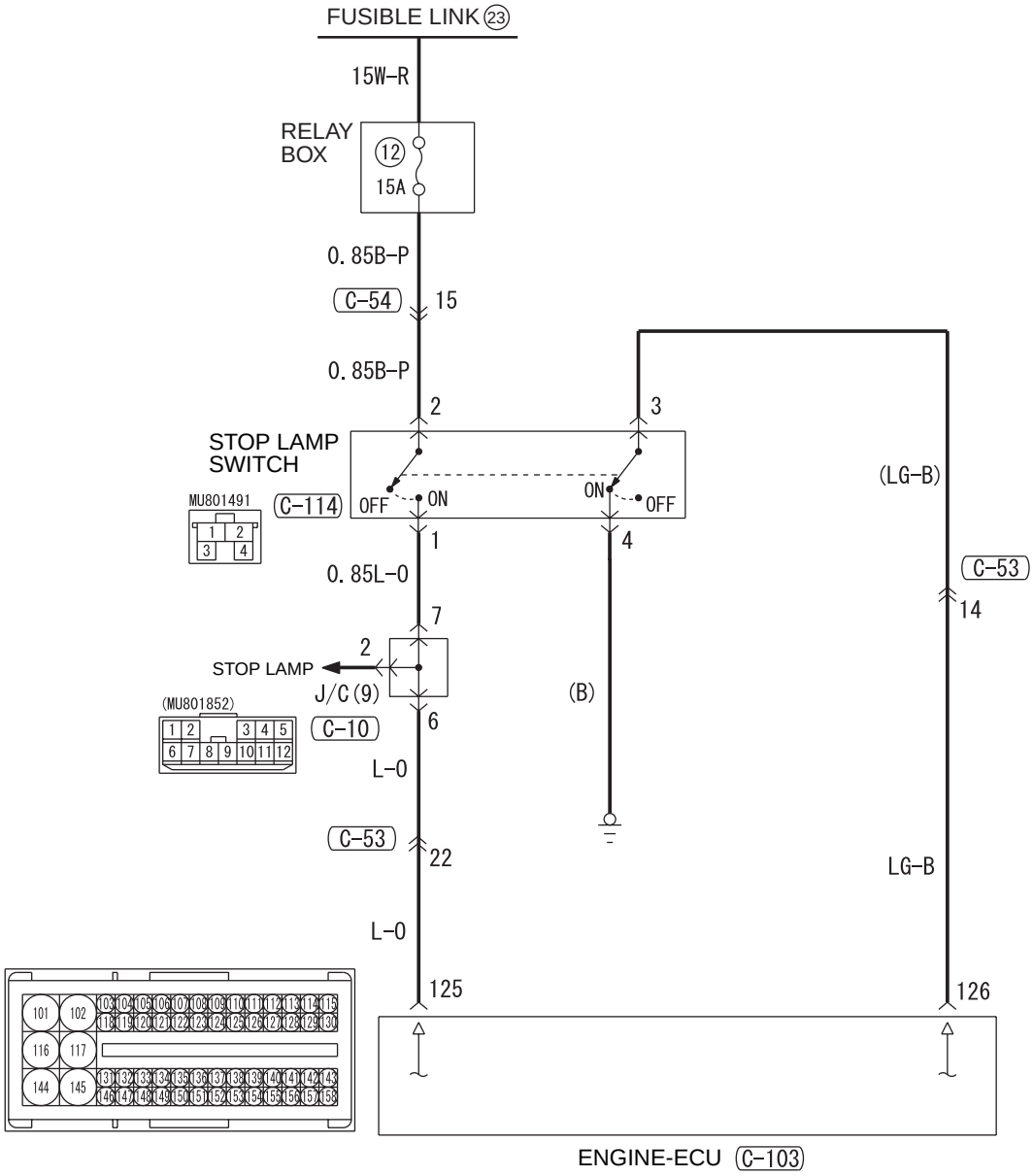
Stop Lamp Switch System Circuit (EURO 5)



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

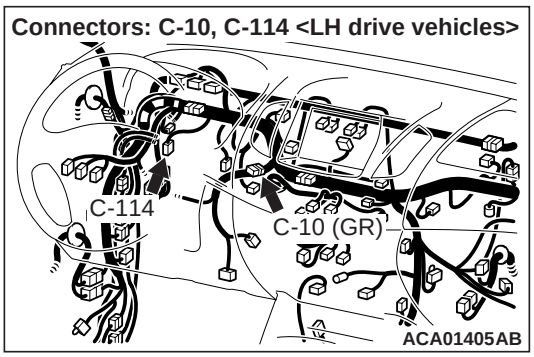
ACB01743

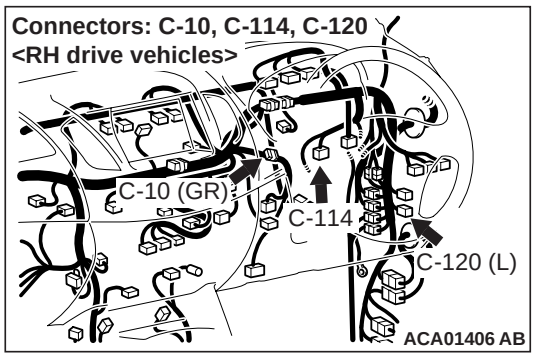
Stop Lamp Switch System Circuit (Except EURO 5)

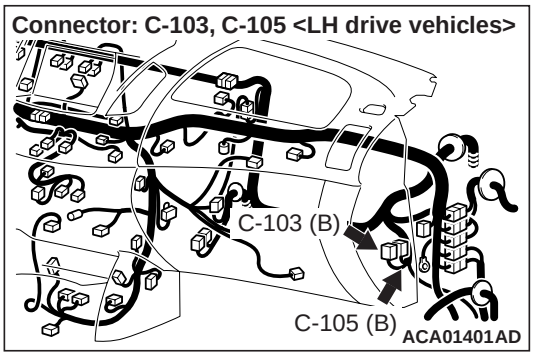


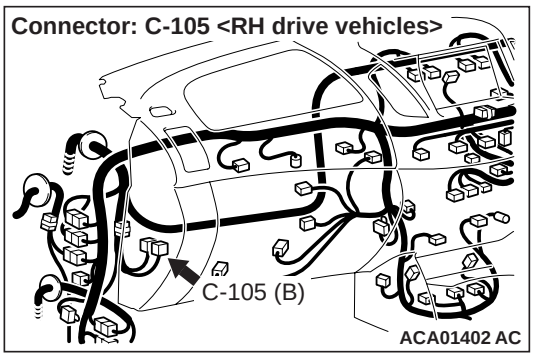
Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

ACB01742









OPERATION

- For the stop lamp switch, two switches, a stop lamp switch for the stop lamp illumination and a brake switch exclusively for the cruise control system, are incorporated to improve the reliability.
- The engine-ECU connector C-103 terminal No.125 and terminal No.126 monitor the state of the stop lamp switch and brake switch.
- The stop lamp switch and brake switch turn ON/OFF when the brake pedal is depressed/released, and the input signal to the engine-ECU changes. According to this change, the engine-ECU judges the state of the stop lamp switch and the brake switch.

DIAGNOSIS CODE SET CONDITIONS

Check Condition

- The cruise control indicator lamp illuminates.

Judgement Criteria

- Open/short in stop lamp switch circuit.
- Open circuit in the brake switch circuit (between engine-ECU connector C-103 terminal No.126 and earth).

PROBABLE CAUSES

- Damaged harness or connector.
- Malfunction of the stop lamp switch.
- Malfunction of the engine-ECU.

DIAGNOSIS PROCEDURE

STEP 1. Check the data list.

Using M.U.T.-III, check the data list (Refer to P.17-29 – data list reference table).

- Item 135: Stop lamp switch

Q: Is the check result normal?

YES : Go to Step 14.
NO : Go to Step 2.

STEP 2. Check the stop lamp operation.

Check the stop lamp operation.

OK:
Brake pedal depressed: Stop lamp will illuminate.
Brake pedal not depressed: Stop lamp does not illuminate.

Q: Is the check result normal?

YES : Go to Step 3.
NO : Go to Step 6.

STEP 3. Connectors check: C-103 engine-ECU connector, C-10 J/C (9) and C-53 <LHD> or C-35 <RHD> intermediate connector.

Q: Is the check result normal?

YES : Go to Step 4.
NO : Repair or replace the damaged connector. Then go to Step 22.

STEP 4. Check the harness wire between engine-ECU connector C-103 terminal No.125 and C-10 J/C (9) terminal No.6 <LHD>, or between engine-ECU connector C-103 terminal No.125 and C-10 J/C (9) terminal No.2 <RHD>.

- Check harness wire for open/short circuit and damage.

Q: Is the check result normal?

YES : Go to Step 5.
NO : Repair or replace the damaged harness wire. Then go to Step 22.

STEP 5. Check the data list.

Using M.U.T.-III, check the data list (Refer to P.17-29 – data list reference table).

- Item 135: Stop lamp switch

Q: Is the check result normal?

YES : Go to Step 14.
NO : Replace the engine-ECU (Refer to GROUP 13A – Engine-ECU). Then go to Step 22.

STEP 6. Measure the terminal voltage at stop lamp switch connector C-114.

(1) Disconnect stop lamp switch connector C-114 and measure at the harness side connector.
(2) Measure the terminal voltage between stop lamp switch harness C-114 terminal No.2 and earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 10.
NO : Go to Step 7.

STEP 7. Connectors check: C-114 stop lamp switch connector and C-54 <LHD> or C-14 <RHD> intermediate connector.

Q: Is the check result normal?
YES : Go to Step 8.
NO : Repair or replace the damaged connector. Then go to Step 22.

STEP 8. Check the harness wire between fuse No.12 at the relay box in engine compartment and stop lamp switch connector C-114 terminal No.2.

- Check harness wire for open/short circuit and damage.

Q: Is the check result normal?
YES : Go to Step 9.
NO : Repair or replace the damaged harness wire. Then go to Step 22.

STEP 9. Check the fuse No.12 at the relay box in engine compartment.

Q: Is the check result normal?
YES : Go to Step 13.
NO : Check the stop lamp system harness and replace the fuse. Then go to Step 22.

STEP 10. Connectors check: C-114 stop lamp switch connector and C-10 J/C (9).

Q: Is the check result normal?
YES : Go to Step 11.
NO : Repair or replace the damaged connector. Then go to Step 22.

STEP 11. Check the harness wire between stop lamp switch connector C-114 terminal No.1 and C-10 J/C (9) terminal No.7.

- Check harness wire for open/short circuit and damage.

Q: Is the check result normal?
YES : Go to Step 12.
NO : Repair or replace the damaged harness wire. Then go to Step 22.

STEP 12. Check the stop lamp switch.

Refer to GROUP 35A – Brake Pedal, Inspection, Stop Lamp Switch Check .

Q: Is the check result normal?
YES : Go to Step 13.
NO : Replace the stop lamp switch (Refer to GROUP 35A – Brake Pedal). Then go to Step 22.

STEP 13. Check the data list.

Using M.U.T.-III, check the data list (Refer to P.17-29 – data list reference table).

- Item 135: Stop lamp switch

Q: Is the check result normal?
YES : Go to Step 14.
NO : Replace the engine-ECU (Refer to GROUP 13A – Engine-ECU). Then go to Step 22.

STEP 14. Check the data list.

Using M.U.T.-III, check the data list (Refer to P.17-29 – data list reference table).

- Item 134: Brake switch

Q: Is the check result normal?
YES : Go to Step 21.
NO : Go to Step 15.

STEP 15. Connectors check: C-103 engine-ECU connector <EURO 5>, C-105 engine-ECU connector <Except EURO 5>, C-53 <LHD> or C-35 <RHD> intermediate connector and C-114 stop lamp switch connector.

Q: Is the check result normal?
YES : Go to Step 16.
NO : Repair or replace the damaged connector. Then go to Step 22.

STEP 16. Check the harness wire between engine-ECU connector C-103 terminal No.126 <EURO 5>, engine-ECU connector C-105 terminal No.7 <Except EURO 5> and stop lamp switch connector C-114 terminal No.3.

- Check harness wire for open/short circuit and damage.

Q: Is the check result normal?
YES : Go to Step 17.
NO : Repair or replace the damaged harness wire. Then go to Step 22.

STEP 17. Connectors check: C-114 stop lamp switch connector and C-120 J/C (1) <RHD>.

Q: Is the check result normal?
YES : Go to Step 18.
NO : Repair or replace the damaged connector. Then go to Step 22.

STEP 18. Check the harness wire between stop lamp switch connector C-114 terminal No.4 and earth.

- Check harness wire for open/short circuit and damage.

Q: Is the check result normal?
YES : Go to Step 19.
NO : Repair or replace the damaged harness wire. Then go to Step 22.

STEP 19. Check the stop lamp switch.

Refer to GROUP 35A – Brake Pedal, Inspection, Stop Lamp Switch Check .

Q: Is the check result normal?
YES : Go to Step 20.
NO : Replace the stop lamp switch (Refer to GROUP 35A – Brake Pedal). Then go to Step 22.

STEP 20. Check the data list.

Using M.U.T.-III, check the data list (Refer to P.17-29 – data list reference table).

- Item 134: Brake switch

Q: Is the check result normal?
YES : Go to Step 21.
NO : Replace the engine-ECU (Refer to GROUP 13A – Engine-ECU). Then go to Step 22.

STEP 21. Read the diagnosis code.

(1) Use the M.U.T.-III, erase the diagnosis code of the cruise control system (Refer to P.17-9).
(2) Turn the ignition switch to the "ON" position, and push the "ON/OFF" switch to turn the cruise control system to ON (turn ON the cruise control indicator lamp).
(3) With the cruise control switches not operated, depress the brake pedal for several seconds, and then use the M.U.T.-III to read the diagnosis code of the cruise control system (Refer to P.17-9).

Q: Is diagnosis code No.P1571 set?
YES : Replace the engine-ECU (Refer to GROUP 13A – Engine-ECU). Then go to Step 22.
NO : It can be assumed that this malfunction is intermittent (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points, How to Cope with Intermittent Malfunction).

STEP 22. Check the data list.

Using M.U.T.-III, check the data list (Refer to P.17-29 – data list reference table).

- Item 134: Brake switch
- Item 135: Stop lamp switch

Q: Is the check result normal?
YES : Go to Step 23.
NO : Return to Step 1.

STEP 23. Read the diagnosis code.

(1) Use the M.U.T.-III, erase the diagnosis code of the cruise control system (Refer to P.17-9).
(2) Turn the ignition switch to the "ON" position, and push the "ON/OFF" switch to turn the cruise control system to ON (turn ON the cruise control indicator lamp).
(3) With the cruise control switches not operated, depress the brake pedal for several seconds, and then use the M.U.T.-III to read the diagnosis code of the cruise control system (Refer to P.17-9).

Q: Is diagnosis code No.P1571 set?
YES : Return to Step 1.
NO : The procedure is complete.

CHECK CHART FOR TROUBLE SYMPTOMS

M1172002301938

Trouble symptom		Inspection procedure No.	Reference page
Communication with M.U.T.-III is not possible.	Communication with the engine-ECU only is impossible.	–	GROUP 13A – Troubleshooting, Symptom Procedures, Inspection Procedure 1
When the brake pedal is depressed, cruise control is not cancelled.		1	P.17-20
When the clutch pedal is depressed, cruise control is not cancelled <M/T>.		2	P.17-21
When the select lever is set to "N" position, cruise control is not cancelled <A/T>.		3	P.17-23
When the "CANCEL" switch is pushed, cruise control is not cancelled.		4	P.17-24
Cruise control cannot be set (No response when the "COAST/SET" switch and the "ACC/RES" switch is pushed).		5	P.17-24
Hunting (repeated acceleration and deceleration) occurs at the set vehicle speed.		6	P.17-26
When the "ON/OFF" switch is turned ON, the cruise control indicator lamp does not illuminate (However, the cruise control system is normal).		7	P.17-27

SYMPTOM PROCEDURES

Inspection Procedure 1: When the Brake Pedal is Depressed, Cruise Control is not Cancelled.

COMMENT ON TROUBLE SYMPTOM
The stop lamp switch circuit is suspected.

PROBABLE CAUSE
- Damaged harness or connector.
- Malfunction of the stop lamp switch.
- Malfunction of the engine-ECU.

DIAGNOSIS PROCEDURE

STEP 1. Check the data list.
Using M.U.T.-III, check the data list (Refer to P.17-29 – data list reference table).
- Item 134: Brake switch
- Item 135: Stop lamp switch

Q: Is the check result normal?

YES : Go to Step 2.
NO : Check the stop lamp switch system (Refer to P.17-15 – Diagnosis Code Procedures, Code No.P1571: Malfunction of the stop lamp switch system). Then go to Step 3 .

STEP 2. Check the symptom.

Q: When the brake pedal is depressed, is the cruise control cancelled?
YES : It can be assumed that this malfunction is intermittent (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points, How to Cope with Intermittent Malfunction).
NO : Replace the engine-ECU (Refer to GROUP 13A – Engine-ECU). Then go to Step 3.

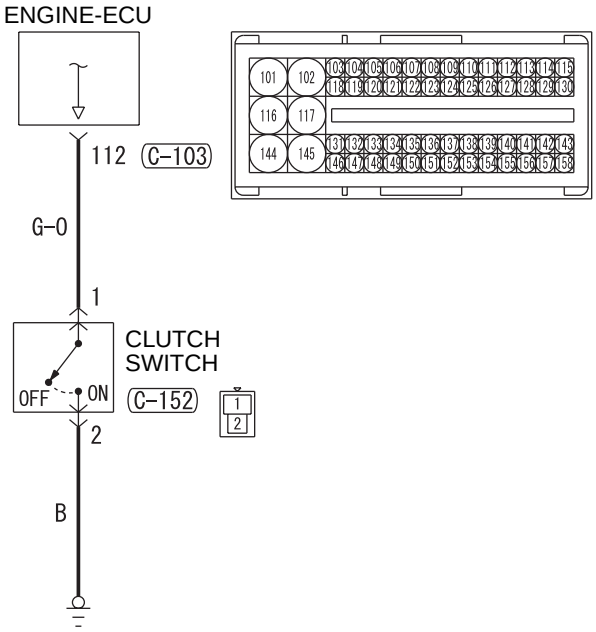
STEP 3. Check the symptom.

Q: When the brake pedal is depressed, is the cruise control cancelled?

YES : The procedure is complete.
NO : Return to Step 1.

Inspection Procedure 2: When the Clutch Pedal is Depressed, Cruise Control is not Cancelled <M/T>.

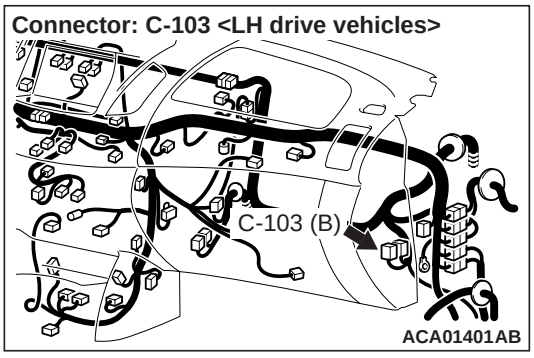
Clutch Switch System Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

ACA01419 AB

Connector: C-103 <LH drive vehicles>



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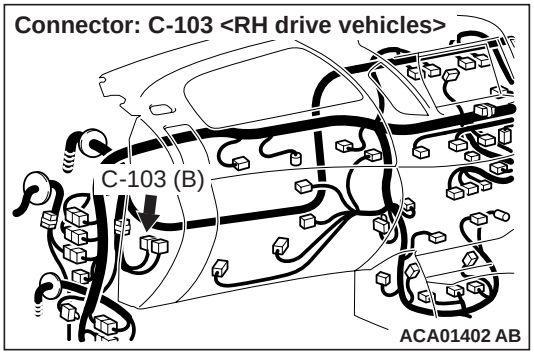
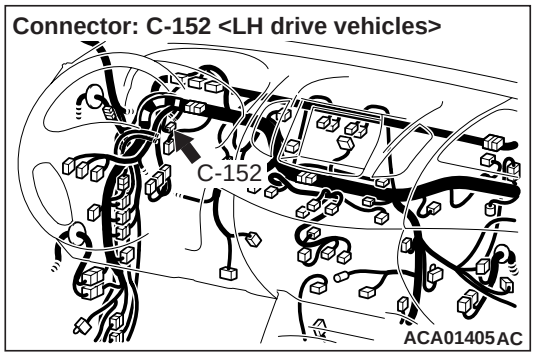
Connector: C-103 <RH drive vehicles>



ACA01402 AB

Connector: C-152 <LH drive vehicles>



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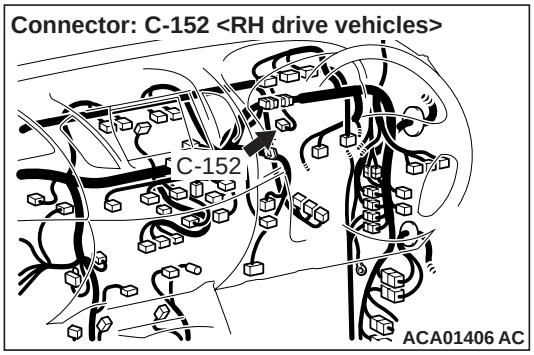


OPERATION

- The engine-ECU connector C-103 terminal No.112 monitor the clutch switch state.
- The clutch switch turn ON/OFF when the clutch pedal is depressed/released, and the input signal to the engine-ECU change. According to this change, the engine-ECU judges the clutch switch status.

COMMENT ON TROUBLE SYMPTOM

The cause is probably a malfunction of the clutch switch circuit.

POSSIBLE CAUSES

- Damaged harness or connector.
- Malfunction of the clutch switch.
- Malfunction of the engine-ECU.

DIAGNOSIS PROCEDURE

STEP 1. Check the data list.

Using M.U.T.-III, check the data list (Refer to P.17-29 – data list reference table).

- Item 131: Clutch switch

Q: Is the check result normal?

YES : Go to Step 6.
NO : Go to Step 2.

STEP 2. Connectors check: C-103 engine-ECU connector and C-152 clutch switch connector.

Q: Is the check result normal?

YES : Go to Step 3.
NO : Repair or replace the damaged connector. Then go to Step 7.

STEP 3. Check the harness wire between engine-ECU connector C-103 terminal No.112 and clutch switch connector C-152 terminal No.1, and between clutch switch connector C-152 terminal No.2 and earth.

- Check harness wire for open/short circuit and damage.

Q: Is the check result normal?

YES : Go to Step 4.
NO : Repair or replace the damaged harness wire. Then go to Step 7.

STEP 4. Check the clutch switch.

Refer to GROUP 21A – Clutch Pedal, Inspection, Clutch Switch Continuity Check .

Q: Is the check result normal?

YES : Go to Step 5.
NO : Replace the clutch switch (Refer to GROUP 21A – Clutch Pedal). Then go to Step 7.

STEP 5. Check the data list

Using M.U.T.-III, check the data list (Refer to P.17-29 – data list reference table).

- Item 131: Clutch switch

Q: Is the check result normal?

YES : Go to Step 6.
NO : Replace the engine-ECU (Refer to GROUP 13A – Engine-ECU). Then go to Step 7.

STEP 6. Check the symptom.

Q: When the clutch pedal is depressed, is the cruise control cancelled?

YES : It can be assumed that this malfunction is intermittent (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points, How to Cope with Intermittent Malfunction).
NO : Replace the engine-ECU (Refer to GROUP 13A – Engine-ECU). Then go to Step 7.

STEP 7. Check the symptom.

Q: When the clutch pedal is depressed, is the cruise control cancelled?

YES : The procedure is complete.
NO : Return to Step 1.

Inspection Procedure 3: When the Selector Lever is Set to "N" Position, Cruise Control is not Cancelled <A/T>.

OPERATION
When the selector lever is operated, the selector lever position signal from the inhibitor switch is sent to the A/T-ECU. Engine-ECU receives the selector lever position signal from the A/T-ECU via the CAN bus line.

COMMENTS ON TROUBLE SYMPTOM
- The inhibitor switch circuit is suspected.
- The CAN bus line between the engine-ECU and the A/T-ECU, the A/T-ECU, the engine-ECU may be defective.

PROBABLE CAUSES
- Malfunction of CAN bus system.
- Damaged harness or connector.
- Malfunction of the inhibitor switch.
- Malfunction of the A/T-ECU.
- Malfunction of the engine-ECU.

DIAGNOSIS PROCEDURE

⚠ CAUTION
- **If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines.**
- **Before replacing the ECU, ensure that the CAN bus lines is normal.**

STEP 1. Check the CAN bus system diagnosis.
Using M.U.T.-III, perform CAN bus diagnosis (Refer to GROUP 54C – Explanation About The M.U.T-III Can Bus Diagnostics).

Q: Is the check result satisfactory?
YES : Go to Step 2.
NO : Repair the CAN bus lines (Refer to GROUP 54C – Troubleshooting, Can Bus Diagnostic Table). Then go to Step 5.

STEP 2. Check the data list.
Using M.U.T.-III, check the data list (Refer to P.17-29 – data list reference table).
- Item 42: Inhibitor switch

Q: Is the check result normal?
YES : Go to Step 3.
NO : Check the inhibitor switch system [Refer to GROUP 23A – Troubleshooting, Diagnosis Code Procedures Code No.P1770: Inhibitor switch system (Open Circuit) or , Code No.P1771: Inhibitor switch system (Short Circuit)] <4A/T> or [Refer to GROUP 23A – Troubleshooting, Diagnosis Code Procedures Code No.P1770: Inhibitor switch system (Open Circuit) or , Code No.P1771: Inhibitor switch system (Short Circuit)] <5A/T>. Then go to Step 5.

STEP 3. Check the A/T system diagnosis code.
Using M.U.T.-III, perform A/T system diagnosis code (Refer to GROUP 23A – Troubleshooting, Diagnosis Function).

Q: Is any diagnosis code set?
YES : Repair the A/T system (Refer to GROUP 23A – Troubleshooting, Diagnosis Code Chart). Then go to Step 5.
NO : Go to Step 4.

STEP 4. Check the symptom.

Q: When the selector lever is set to "N" position, is the cruise control cancelled?
YES : It can be assumed that this malfunction is intermittent (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points, How to Cope with Intermittent Malfunction).
NO : Replace the engine-ECU (Refer to GROUP 13A – Engine-ECU). Then go to Step 5.

STEP 5. Check the symptom.

Q: When the selector lever is set to "N" position, is the cruise control cancelled?
YES : The procedure is complete.
NO : Return to Step 1.

Inspection Procedure 4: When the "CANCEL" Switch is Pushed, Cruise Control is not Cancelled.

COMMENT ON TROUBLE SYMPTOM
The cause is probably an open-circuit in the circuit inside the "CANCEL" switch.

PROBABLE CAUSE
- Malfunction of the cruise control switch.
- Malfunction of the engine-ECU.

DIAGNOSIS PROCEDURE

STEP 1. Check the data list.
Using M.U.T.-III, check the data list (Refer to P.17-29 – data list reference table).
- Item 137: "CANCEL" switch

Q: Is the check result normal?
YES : Go to Step 2.
NO : Check the cruise control switch system (Refer to P.17-10 – Diagnosis Code Procedures, Code No.P1564: Abnormal voltage at cruise control switch. Then go to Step 3 .

STEP 2. Check the symptom.

Q: When the "CANCEL" switch is pushed, is the cruise control cancelled?
YES : It can be assumed that this malfunction is intermittent (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points, How to Cope with Intermittent Malfunctions).
NO : Replace the engine-ECU (Refer to GROUP 13A – Engine-ECU). Then go to Step 3.

STEP 3. Check the symptom.

Q: When the "CANCEL" switch is pushed, is the cruise control cancelled?
YES : The procedure is complete.
NO : Return to Step 1.

Inspection Procedure 5: Cruise Control cannot be Set (No Response when the "COAST/SET" Switch and the "ACC/RES" Switch is Pushed).

COMMENTS ON TROUBLE SYMPTOM
The fail-safe function is probably cancelling cruise control system. In this case, checking the cruise control system, diesel fuel system, CAN bus system, A/T system <A/T> and ASTC system diagnosis codes. The M.U.T.-III can also be used to check if the circuits of each input switches are normal or not by checking the data list.

NOTE: Push the cruise control switches one by one securely. Otherwise, the cruise control system may not be started.

PROBABLE CAUSE
- Malfunction of CAN bus system.
- Malfunction of the diesel fuel system.
- Malfunction of the A/T system <A/T>.
- Malfunction of the ASTC system.
- Malfunction of the cruise control switch.
- Malfunction of the stop lamp switch.
- Malfunction of the clutch switch <M/T>.
- Malfunction of the inhibitor switch <A/T>.
- Malfunction of the engine-ECU.

DIAGNOSIS PROCEDURE

⚠ CAUTION
- **If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines.**
- **Before replacing the ECU, ensure that the CAN bus lines is normal.**

STEP 1. Check the CAN bus system diagnosis.
Using M.U.T.-III, perform CAN bus diagnosis (Refer to GROUP 54C – Explanation About The M.U.T-III Can Bus Diagnostics).

Q: Is the check result satisfactory?
YES : Go to Step 2.
NO : Repair the CAN bus lines (Refer to GROUP 54C – Troubleshooting, Can Bus Diagnostic Table). Then go to Step 11.

STEP 2. Check the diesel fuel system diagnosis code.
Using M.U.T.-III, perform diesel fuel system diagnosis code (Refer to GROUP 13A – Troubleshooting, Diagnosis Function).

Q: Is any diagnosis code set?
YES : Repair the diesel fuel system (Refer to GROUP 13A – Troubleshooting, Inspection Chart for Diagnosis Code). Then go to Step 11.
NO : Go to Step 4 <M/T>.
NO : Go to Step 3 <A/T>.

STEP 3. Check the A/T system diagnosis code <A/T>.
Using M.U.T.-III, perform A/T system diagnosis code (Refer to GROUP 23A – Troubleshooting, Diagnosis Function).

Q: Is any diagnosis code set?
YES : Repair the A/T system (Refer to GROUP 23A – Troubleshooting, Diagnosis Code Chart). Then go to Step 11.
NO : Go to Step 4.

STEP 4. Check the ASTC system diagnosis code.
Using M.U.T.-III, perform ASTC system diagnosis code (Refer to GROUP 35C – Troubleshooting, Diagnosis Function).

Q: Is any diagnosis code set?
YES : Repair the ASTC system (Refer to GROUP 35C – Troubleshooting, Diagnosis Code Chart). Then go to Step 11.
NO : Go to Step 5.

STEP 5. Read the diagnosis code.
(1) Use the M.U.T.-III, erase the diagnosis code of the cruise control system (Refer to P.17-9).
(2) Turn the ignition switch to the "ON" position, and push the "ON/OFF" switch to turn the cruise control system to ON (turn on the cruise control indicator lamp).
(3) After turning the cruise control system to ON, when 2 minutes or more has elapsed without operating the cruise control switches.
(4) With the cruise control switches not operated, depress the brake pedal for several seconds, and then use the M.U.T.-III to read the diagnosis code of the cruise control system (Refer to P.17-9).

Q: Is any diagnosis code set?
YES : Repair the cruise control system (Refer to P.17-9 – Diagnosis Code Chart). Then go to Step 11.
NO : Go to Step 6.

STEP 6. Check the data list.
Using M.U.T.-III, check the data list (Refer to P.17-29 – data list reference table).
- Item 136: "ON/OFF" switch
- Item 137: "CANCEL" switch
- Item 138: "COAST/SET" switch
- Item 139: "ACC/RES" switch

Q: Is the check result normal?
YES : Go to Step 7.
NO : Check the cruise control switch system (Refer to P.17-10 – Diagnosis Code Procedures, Code No.P1564: Abnormal voltage at cruise control switch). Then go to Step 11 .

STEP 7. Check the data list.
Using M.U.T.-III, check the data list (Refer to P.17-29 – data list reference table).
- Item 134: Brake switch
- Item 135: Stop lamp switch

Q: Is the check result normal?
YES : Go to Step 8 <M/T>.
YES : Go to Step 9 <A/T>.
NO : Check the stop lamp switch system (Refer to P.17-15 – Diagnosis Code Procedures, Code No.P1571: Malfunction of the stop lamp switch system). Then go to Step 11 .

STEP 8. Check the data list <M/T>.
Using M.U.T.-III, check the data list (Refer to P.17-29 – data list reference table).
- Item 131: Clutch switch

Q: Is the check result normal?
YES : Go to Step 10.
NO : Check the clutch switch system (Refer to P.17-21 – Symptom Procedures, Inspection Procedure 2). Then go to Step 11.

STEP 9. Check the data list <A/T>.
Using M.U.T.-III, check the data list (Refer to P.17-29 – data list reference table).
- Item 42: Inhibitor switch

Q: Is the check result normal?

YES : Go to Step 10.
NO : Check the inhibitor switch system [Refer to GROUP 23A – Troubleshooting, Diagnosis Code Procedures Code No.P1770: Inhibitor switch system (Open Circuit) , Code No.P1771: Inhibitor switch system (Short Circuit)] <4A/T> or [Refer to GROUP 23A – Troubleshooting, Diagnosis Code Procedures Code No.P1770: Inhibitor switch system (Open Circuit) , Code No.P1771: Inhibitor switch system (Short Circuit)] <5A/T>. Then go to Step 11.

STEP 10. Check the symptom.

Q: Can cruise control be set?
YES : It can be assumed that this malfunction is intermittent (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points, How to Cope with Intermittent Malfunctions).
NO : Replace the engine-ECU (Refer to GROUP 13A – Engine-ECU). Then go to Step 11.

STEP 11. Check the symptom.

Q: Can cruise control be set?
YES : The procedure is complete.
NO : Return to Step 1.

Inspection Procedure 6: Hunting (Repeated Acceleration and Deceleration) Occurs at the Set Vehicle Speed.

COMMENTS ON TROUBLE SYMPTOM
The vehicle speed sensor or the diesel fuel system is suspected.

NOTE: When the vehicle is driven with the low-speed gear in the sport mode, hunting occurs easily, however, this is not a failure <A/T>.

PROBABLE CAUSE
- Malfunction of the vehicle speed sensor.
- Malfunction of the diesel fuel system.
- Malfunction of the A/T system <A/T>.
- Malfunction of the engine-ECU.

DIAGNOSIS PROCEDURE

STEP 1. Check the diesel fuel system diagnosis code.
Using M.U.T.-III, perform diesel fuel system diagnosis code (Refer to GROUP 13A – Diagnosis Function).

Q: Is any diagnosis code set?
YES : Repair the diesel fuel system (Refer to GROUP 13A – Troubleshooting, Inspection Chart for Diagnosis Code). Then go to Step 5.
NO : Go to Step 3 <M/T>.
NO : Go to Step 2 <A/T>.

STEP 2. Check the A/T system diagnosis code <A/T>.
Using M.U.T.-III, perform A/T system diagnosis code (Refer to GROUP 23A – Troubleshooting, Diagnosis Function).

Q: Is any diagnosis code set?
YES : Repair the A/T system (Refer to GROUP 23A – Troubleshooting, Diagnosis Code Chart). Then go to Step 5.
NO : Go to Step 3.

STEP 3. Check the data list.
Using M.U.T.-III, check the data list (Refer to P.17-29 – data list reference table).
- Item 04: Vehicle speed signal

Q: Is the check result normal?
YES : Go to Step 4.
NO : Replace the engine-ECU (Refer to GROUP 13A – Engine-ECU). Then go to Step 5.

STEP 4. Check the symptom.

Q: Does a hunting occur?
YES : Replace the engine-ECU (Refer to GROUP 13A – Engine-ECU). Then go to Step 5.
NO : It can be assumed that this malfunction is intermittent (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points, How to Cope with Intermittent Malfunctions).

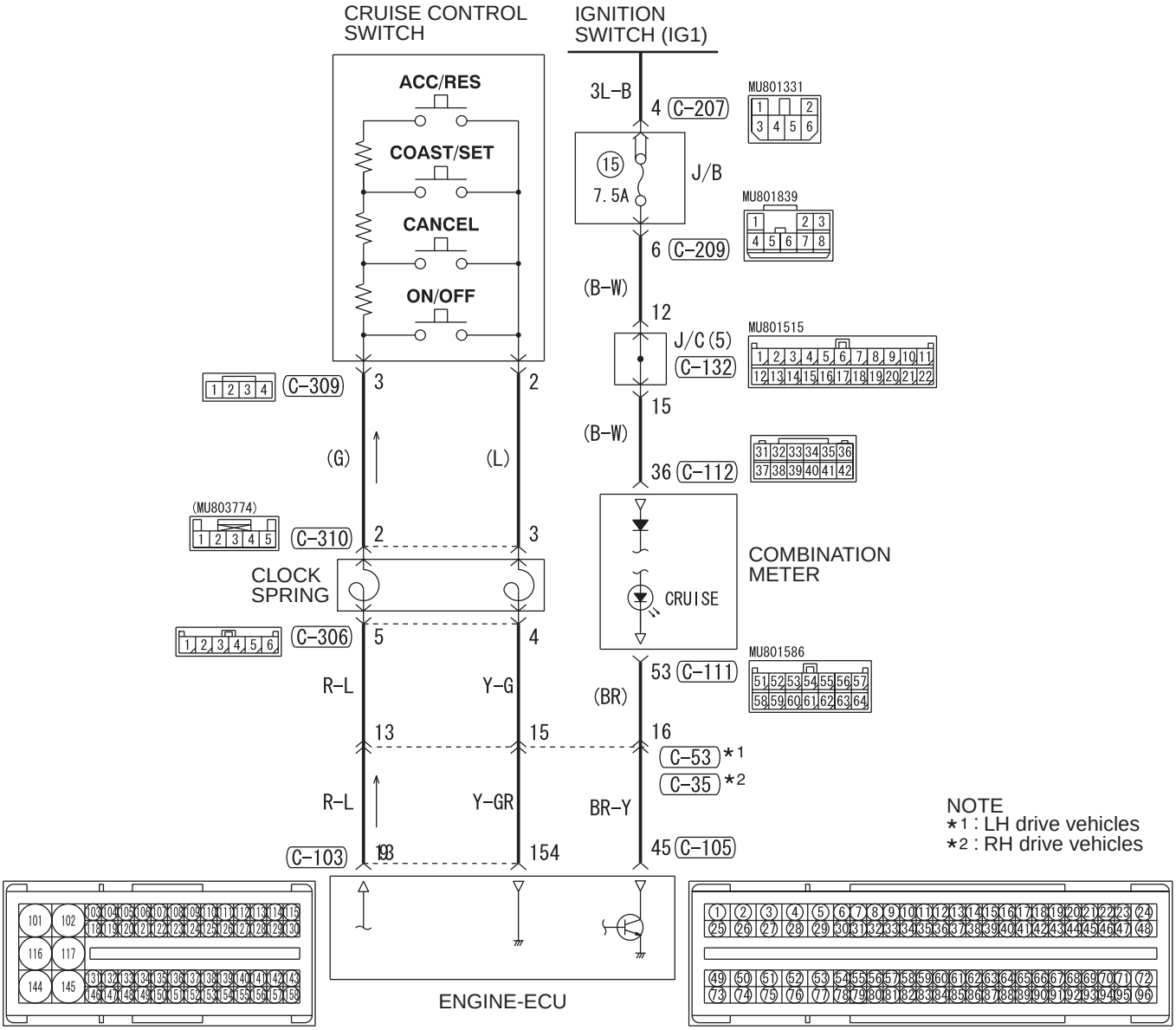
STEP 5. Check the symptom.

Q: Does a hunting occur?

YES : Return to Step 1.
NO : The procedure is complete.

Inspection Procedure 7: When the "ON/OFF" Switch is Turned ON, the Cruise Control Indicator Lamp does not Illuminate (However, the Cruise Control System is Normal).

Cruise Control Indicator Lamp System Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

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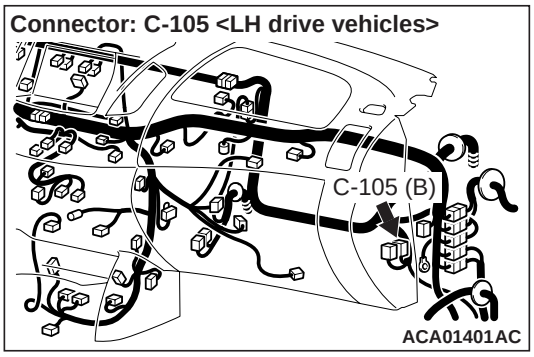
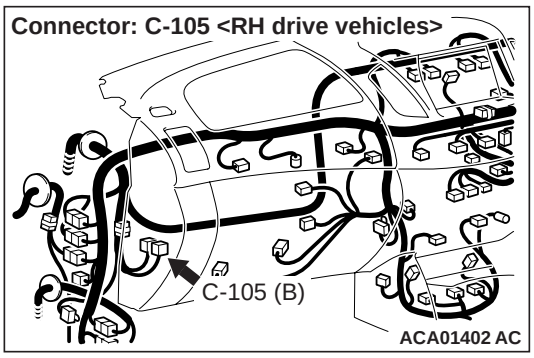
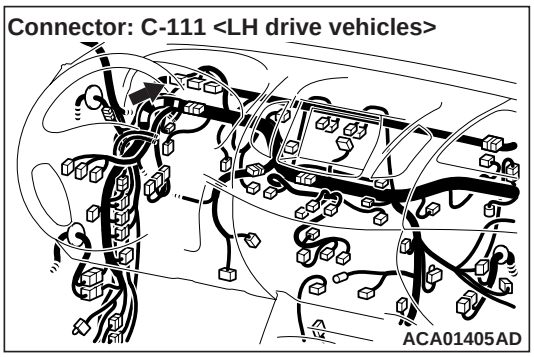
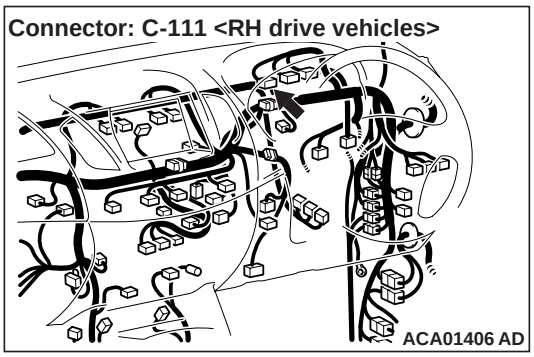








OPERATION

The engine-ECU detects "ON/OFF" switch ON signal to illuminate the cruise control indicator lamp on the combination meter.

COMMENT

The combination meter or engine-ECU may also be defective.

PROBABLE CAUSE

- Damaged harness or connector.
- Malfunction of the combination meter.
- Malfunction of the engine-ECU.

DIAGNOSIS PROCEDURE

STEP 1. Check the cruise control indicator lamp.

(1) Disconnect engine-ECU connector C-105 and check at the harness side connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check the illumination condition of the cruise control indicator lamp when engine-ECU connector C-105 terminal No.45 is earthed.

OK: The cruise control indicator lamp illuminates.

Q: Is the check result normal?
YES : Go to Step 5.
NO : Go to Step 2.

STEP 2. Connectors check: C-111 combination meter connector, C-105 engine-ECU connector and C-53 <LHD> or C-35 <RHD> intermediate connector.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair or replace the damaged connector. Then go to Step 6.

STEP 3. Check the harness wire between combination meter connector C-111 terminal No.53 and engine-ECU connector C-105 terminal No.45.

- Check harness wire for open/short circuit and damage.

Q: Is the check result normal?
YES : Go to Step 4.
NO : Repair or replace the damaged harness wire. Then go to Step 6.

STEP 4. Check the combination meter.

Refer to GROUP 54A – Combination Meter, Trouble-shooting, Check at ECU Terminals .

Q: Is the check result normal?
YES : Go to Step 5.
NO : Replace the combination meter (Refer to GROUP 54A – Combination Meter). Then go to Step 6.

STEP 5. Check the symptom.

Q: When the "ON/OFF" switch is turned ON, is the cruise control indicator lamp illuminated?
YES : It can be assumed that this malfunction is intermittent (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points, How to Cope with Intermittent Malfunctions).
NO : Replace the engine-ECU (Refer to GROUP 13A – Engine-ECU). Then go to Step 6.

STEP 6. Check the symptom.

Q: When the "ON/OFF" switch is turned ON, is the cruise control indicator lamp illuminated?
YES : The procedure is complete.
NO : Return to Step 1.

DATA LIST REFERENCE TABLE

M1172002401980

⚠ CAUTION

- **Road test always need two people: one driver and one observer.**
- **When shifting the selector lever to "D" position the brakes should be applied so that the vehicle does not move forward.**

NOTE: When reading the data list, do not select the item under "CRUISE CONTROL," but select the item under "DIESEL ENGINE."

Item No.	Check item	Check condition		Normal condition
04	Vehicle speed sensor	Road test the vehicle.		The speedometer and M.U.T.-III display the same value.
42	Inhibitor switch <A/T>	Ignition switch: "ON"	Selector lever: "N" or "P" position	ON
			Selector lever: Other than "N" or "P" position	OFF
130	Cancel code	Ignition switch: "ON"		The cancel code, which set when the cruise control system was cancelled at the last time, is set again.
131	Clutch switch <M/T>	Ignition switch: "ON"	Clutch pedal: Depressed	ON
			Clutch pedal: Released	OFF
134	Brake switch (for cruise control circuit)	Ignition switch: "ON"	Brake pedal: Depressed	ON
			Brake pedal: Released	OFF
135	Stop lamp switch (for stop lamp circuit)	Ignition switch: "ON"	Brake pedal: Depressed	ON
			Brake pedal: Released	OFF
136	Cruise control switch ("ON/OFF" switch)	Ignition switch: "ON"	"ON/OFF" switch: Pushed	ON
			"ON/OFF" switch: Pushed again	OFF
137	Cruise control switch ("CANCEL" switch)	Ignition switch: "ON"	"CANCEL" switch: Pushed	ON
			"CANCEL" switch: Released	OFF
138	Cruise control switch ("COAST/SET" switch)	Ignition switch: "ON"	"COAST/SET" switch: Pushed	ON
			"COAST/SET" switch: Released	OFF
139	Cruise control switch ("ACC/RES" switch)	Ignition switch: "ON"	"ACC/RES" switch: Pushed	ON
			"ACC/RES" switch: Released	OFF
140	Cruise control operation	Cruise control system: active		ON
		Cruise control system: Inactive		OFF

CHECK AT ENGINE-ECU TERMINAL

M1172002701936

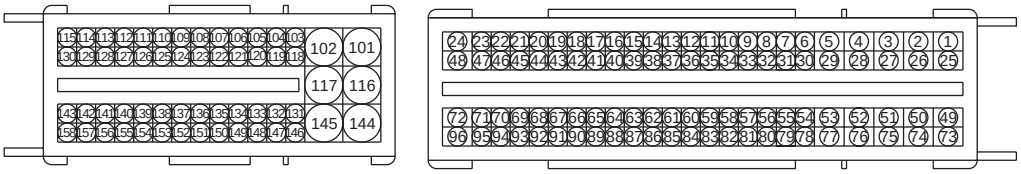
Use special tool power plant ECU check harness (MB992291), check the engine-ECU terminal voltage.

1. Remove the engine-ECU (Refer to GROUP 13A – Engine-ECU).
2. Connect special tool MB992291 between the engine-ECU and the body-side harness connector.
3. Measure the voltages between the check connector terminals of special tool MB992291 and earth terminals No.116, 117 or 145.

Special tool - Power plant ECU check harness (MB992291) connector

58-Pin connector
(Engine-ECU connector C-103)

96-Pin connector
(Engine-ECU connector C-105)



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Terminal No.	Check item	Check condition		Normal condition
7 <Except EURO 5>	Stop lamp switch (brake switch)	Ignition switch: "ON"	Depress the brake pedal.	System voltage
			Release the brake pedal.	1V or less
112	Clutch switch <M/T>	Ignition switch: "ON"	Release the clutch pedal.	10 V or more
			Depress the clutch pedal.	1 V or less
125	Stop lamp switch	Ignition switch: "ON"	Depress the brake pedal.	System voltage
			Release the brake pedal.	1V or less
126 <EURO 5>	Stop lamp switch (brake switch)	Ignition switch: "ON"	Depress the brake pedal.	System voltage
			Release the brake pedal.	1V or less
139	Cruise control switch power supply	Ignition switch: "ON"	All switches: Released	4.7 – 5.0 V
			"ON/OFF" switch: Pushed.	0 – 0.5 V
			"CANCEL" switch: Pushed.	1.0 – 1.8 V
			"COAST/SET" switch: Pushed.	2.3 – 3.0 V
			"ACC/RES" switch: Pushed.	3.5 – 4.2 V

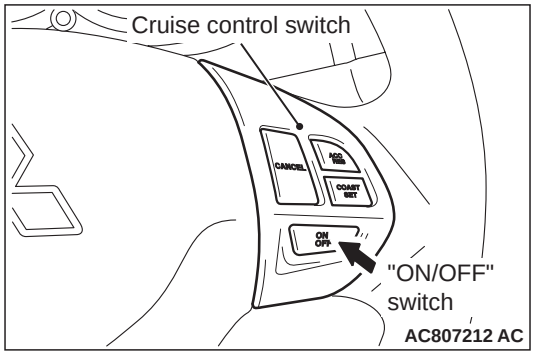
ON-VEHICLE SERVICE

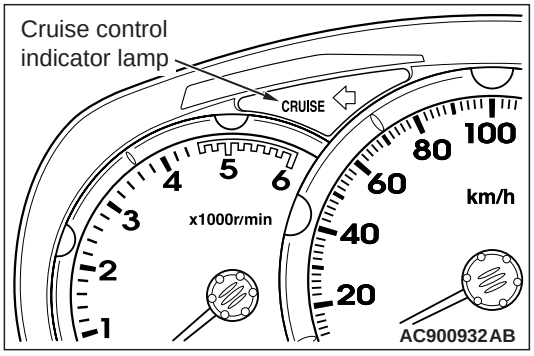
CRUISE CONTROL SWITCH CHECK

M1172001201295

CRUISE CONTROL "ON/OFF" SWITCH CHECK

1. Turn the ignition switch to "ON" position.

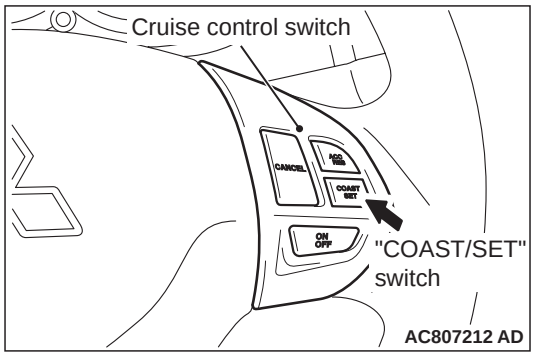




2. Push the "ON/OFF" switch of the cruise control switch, and check that the cruise control indicator lamp within the combination meter illuminates.
3. Push the "ON/OFF" switch again, and check that the cruise control indicator lamp within the combination meter goes out.

CRUISE CONTROL SETTING

1. Turn the ignition switch to "ON" position.
2. Push the "ON/OFF" switch (cruise control system: ON, cruise control indicator lamp: illuminated).
3. Drive at the desired speed within the range of approximately 40 – 200 km/h.

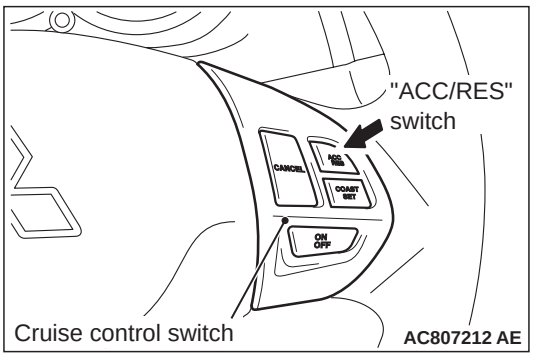


4. Push the "COAST/SET" switch.
5. Check to be sure that when the "COAST/SET" switch is released the speed is the desired constant speed.

NOTE: If the vehicle speed decreases to approximately 15 km/h below the set speed because of climbing a hill for example, it is normal for the cruise control to be cancelled. When the vehicle speed is decelerated to the low speed limit (approximately 40 km/h) or less, the constant speed driving will be cancelled even if the vehicle speed is not decelerated 15 km/h or more from the set speed.

SPEED-INCREASE SETTING

1. Turn the ignition switch to "ON" position.
2. Push the "ON/OFF" switch (cruise control system: ON, cruise control indicator lamp: illuminated).
3. Set to the desired speed within the range of approximately 40 – 200 km/h.



4. Push the "ACC/RES" switch.
5. Check to be sure that acceleration continues while the "ACC/RES" switch is pushed, and that the speed at the time it was released becomes the constant driving speed.

   NOTE: When the vehicle speed reaches the high speed limit (approximately 200 km/h) during acceleration, the vehicle is driven at a constant speed of the high speed limit (approximately 200 km/h).

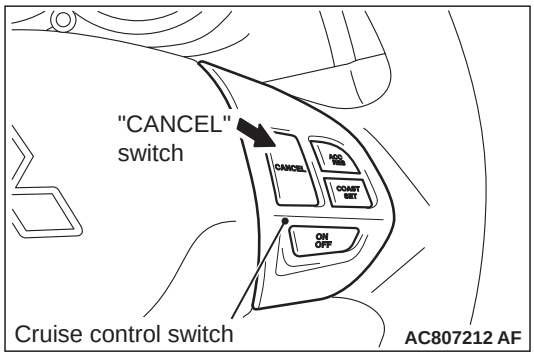
SPEED-REDUCTION SETTING

1. Turn the ignition switch to "ON" position.
2. Push the "ON/OFF" switch (cruise control system: ON, cruise control indicator lamp: illuminated).
3. Set to the desired speed within the range of approximately 40 – 200 km/h.
4. Press the "COAST/SET" switch.
5. Check to be sure that deceleration continues while the "COAST/SET" switch is pushed, and that the speed at the time it was released becomes the constant driving speed.

NOTE: When the vehicle speed reaches the low speed limit (approximately 40 km/h) during deceleration, the vehicle is driven at a constant speed of the low speed limit (approximately 40 km/h).

RETURN TO THE SET SPEED BEFORE CANCELLATION AND CRUISE CONTROL CANCELLATION

1. Turn the ignition switch to "ON" position.
2. Push the "ON/OFF" switch (cruise control system: ON, cruise control indicator lamp: illuminated).
3. Set to the desired speed within the range of approximately 40 – 200 km/h.
4. When any of the following operations are performed while at constant speed during cruise control system, check if normal driving is resumed and deceleration occurs.



(1) The "CANCEL" switch is pushed.
(2) The brake pedal is depressed.

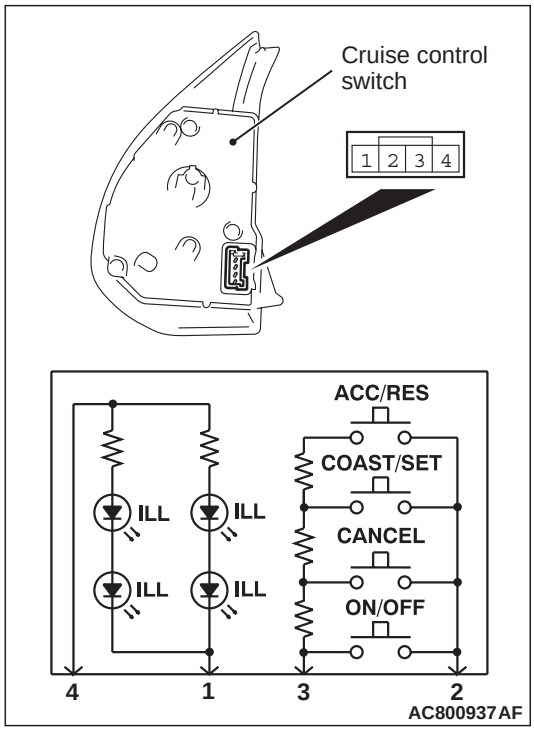
5. At a vehicle speed of the low speed limit (approximately 40 km/h) or higher, check if when the "ACC/RES" switch is pushed, the vehicle speed returns to the speed before cruise control driving was cancelled, and constant speed driving occurs.
6. When the "ON/OFF" switch is pushed again (cruise control system: OFF) while driving at constant speed, check if normal driving is resumed and deceleration occurs.

CRUISE CONTROL SYSTEM COMPONENT CHECK

M1172001701687

CRUISE CONTROL SWITCH CHECK

1. Remove the cruise control switch (Refer to P.17-33).



2. Measure the resistance between terminal No.2 and terminal No.3 when each of the "ON/OFF", "CANCEL", "COAST/SET" and "ACC/RES" switches is pushed. If the values measured at the time each switch is pushed correspond to those in the table below, the resistance values are correct.

Terminal connector of tester	Switch position	Specified condition
2 – 3	All switches are released.	Open circuit
	"ON/OFF" switch is pushed	Continuity (less than 2 ohms)
	"CANCEL" switch is pushed	202.5 - 208 Ω
	"COAST/SET" switch is pushed	610.5 - 624.5 Ω
	"ACC/RES" switch is pushed	1838 - 1877 Ω

3. Check that illumination of the cruise control switch illumination lamp turns on when the battery positive terminal is connected to cruise control switch connector terminal No.4, and the battery negative terminal is connected to cruise control switch connector terminal No.1.

STOP LAMP SWITCH CHECK

Refer to GROUP 35A – Brake Pedal, Inspection, Stop Lamp Switch Check .

CLUTCH SWITCH CHECK <M/T>

Refer to GROUP 21A – Clutch Pedal, Inspection, Clutch Switch Continuity Check .

INHIBITOR SWITCH (N POSITION) CHECK <A/T>

Refer to GROUP 23A – On-vehicle Service, Essential Service, Inhibitor Switch Continuity Check .

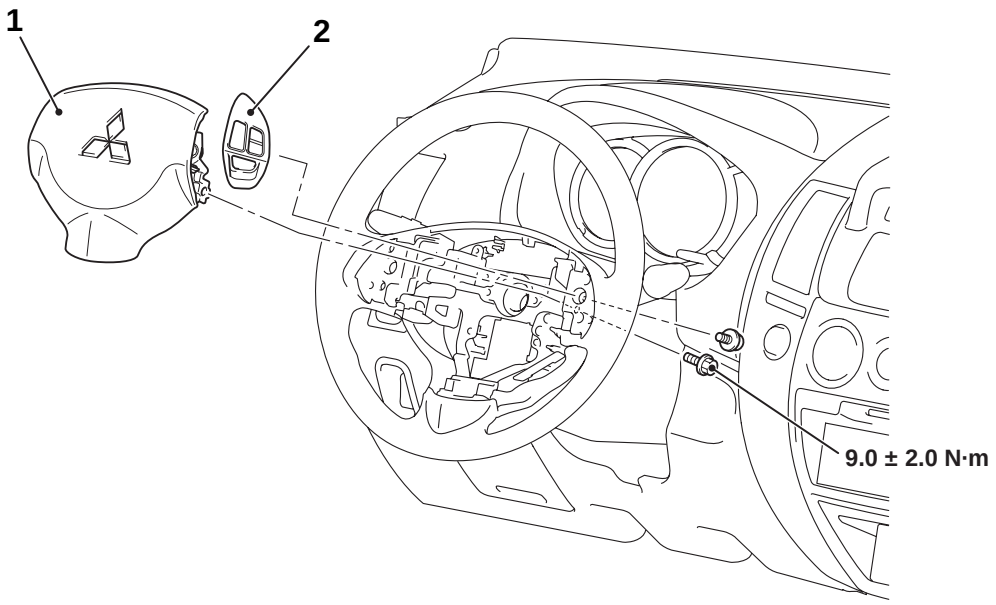
CRUISE CONTROL SWITCH

REMOVAL AND INSTALLATION

M1172007600845

⚠ WARNING

For vehicles with SRS, before removing the air bag module assembly, refer to GROUP 52B – Service Precautions , and Driver's and Front Passenger's Air Bag Module(s) and Clock Spring .



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Removal steps

1. Driver's air bag module [Refer to GROUP 52B – Driver's, Front Passenger's Air Bag Module(s) and Clock Spring]
2. Cruise control switch

EMISSION CONTROL

GENERAL INFORMATION

M1175000100484

The emission control system consists of the following subsystems:

- Exhaust gas recirculation system
- Diesel particulate filter (DPF) system <Euro5>
- Emission reduction system

Item	Name	Specification
Exhaust gas recirculation system (Purpose: NOx reduction)	EGR valve	DC motor type
	EGR valve position sensor	Hall element type
	EGR cooler	Water cooled type
	Air flow sensor	Thermo-sensing type
	EGR gas temperature sensor <Euro5>	Thermistor type
Diesel particulate filter (DPF) system <Euro5> (Purpose: PM removal)	Diesel particulate filter (DPF)	Closed type
	No. 1 exhaust gas temperature sensor	Thermistor type
	No. 2 exhaust gas temperature sensor (catalyst temperature)	Thermistor type
	No. 3 exhaust gas temperature sensor (DPF temperature)	Thermistor type
	Exhaust differential pressure sensor	Piezo resistive semiconductor type
Emission reduction system	Fuel injection control (Purpose: PM reduction)	Common rail type
	Catalytic converter (Purpose: CO, HC reduction)	Monolith type

SERVICE SPECIFICATION(S)

M1175000300295

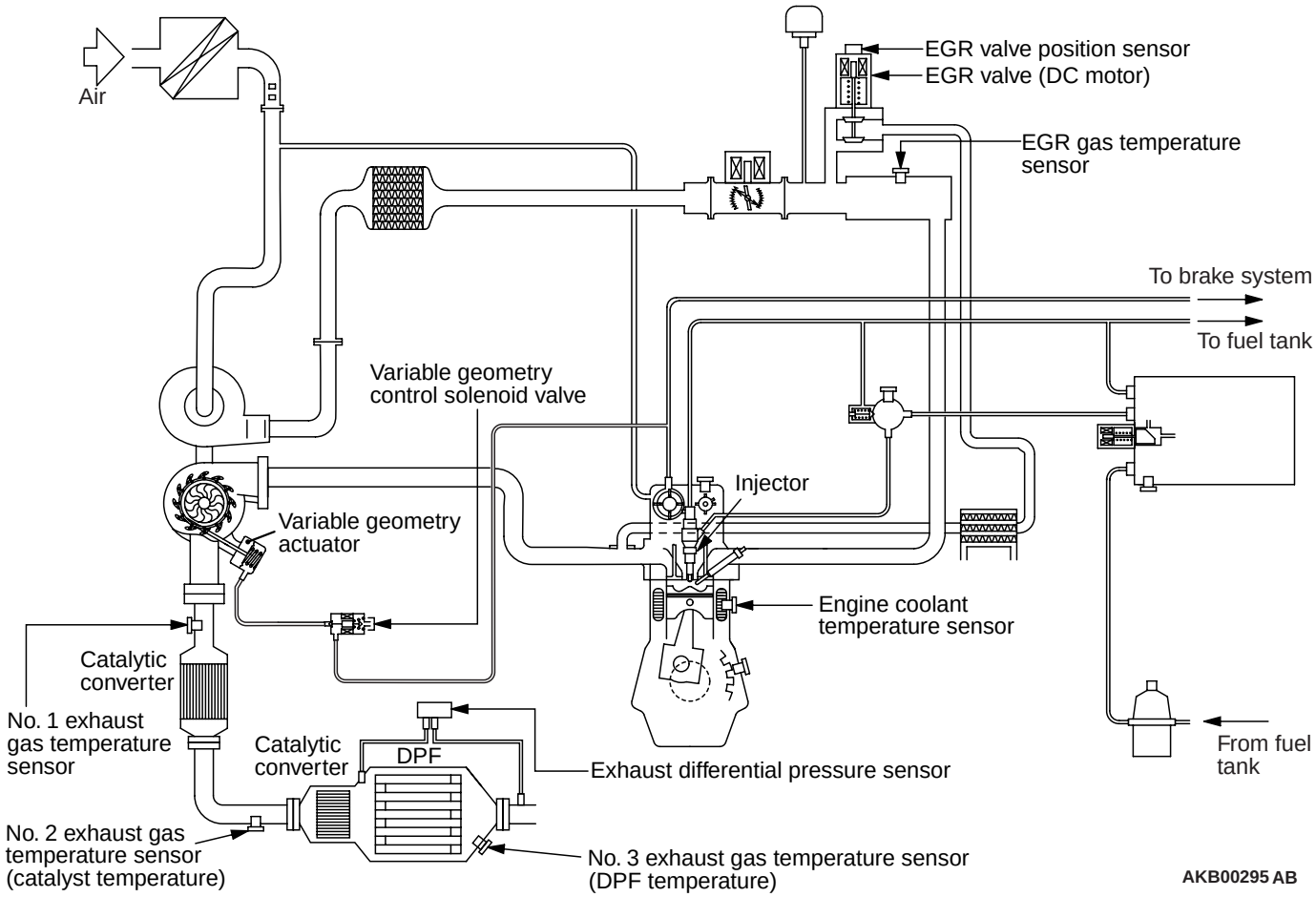
Items		Standard value
No. 1 exhaust gas temperature sensor (at 20°C) Ω <Euro5>		120 – 560
No. 2 exhaust gas temperature sensor (catalyst converter) (at 20°C) kΩ <Euro5>		120 – 560
No. 3 exhaust gas temperature sensor (DPF temperature) (at 20°C) kΩ <Euro5>		120 – 560
EGR gas temperature sensor kΩ <Euro5>	At –20°C	55 – 78
	At 0°C	29 – 41
	At 20°C	17 – 23
	At 40°C	10 – 14
	At 60°C	7.1 – 8.8
	At 80°C	4.8 – 5.9

VACUUM HOSE

VACUUM HOSE PIPING DIAGRAM

M1175004200524

<Euro5>



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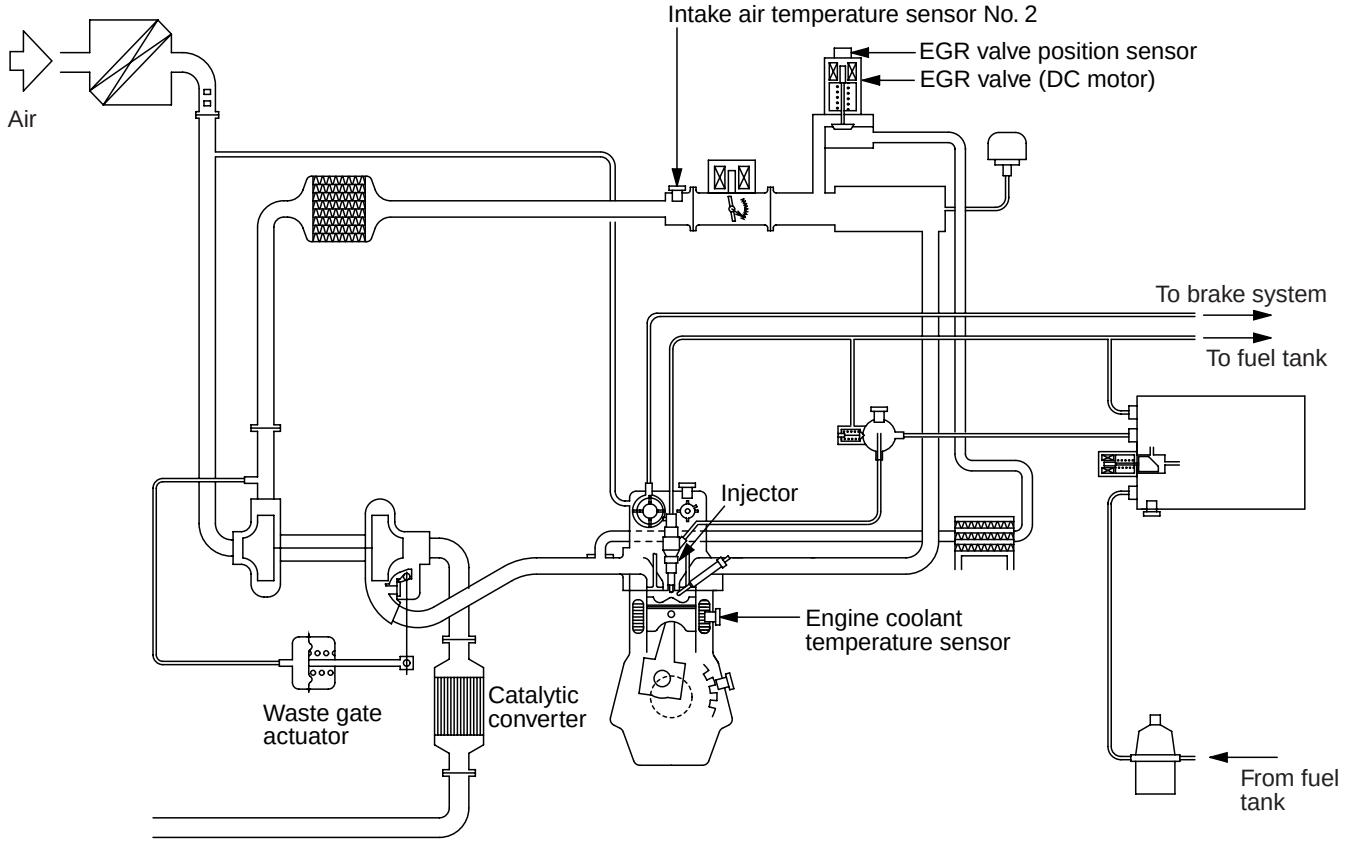

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VACUUM CIRCUIT DIAGRAM

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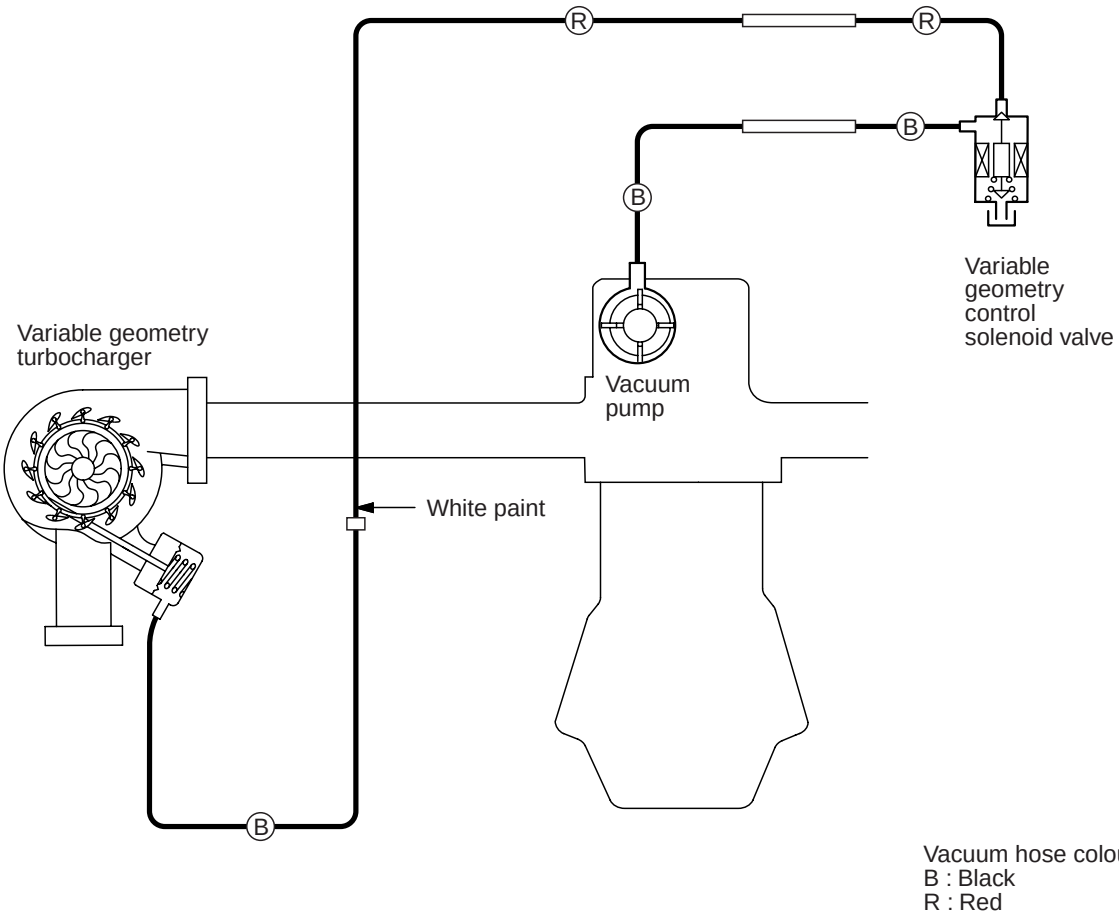
<Euro5>



VACUUM HOSE CHECK

M1175004900307

1. Using the vacuum circuit diagram as a guide, check to be sure that the vacuum hoses are correctly connected.
2. Check the connection condition of the vacuum hoses, (removed, loose, etc.) and check to be sure that there are no bends or damage.

VACUUM HOSE INSTALLATION

M1175005000288

1. When connecting the vacuum hoses, they should be securely inserted onto the nipples.
2. Connect the hoses correctly, using the vacuum circuit diagram as a guide.

EXHAUST GAS RECIRCULATION (EGR) SYSTEM

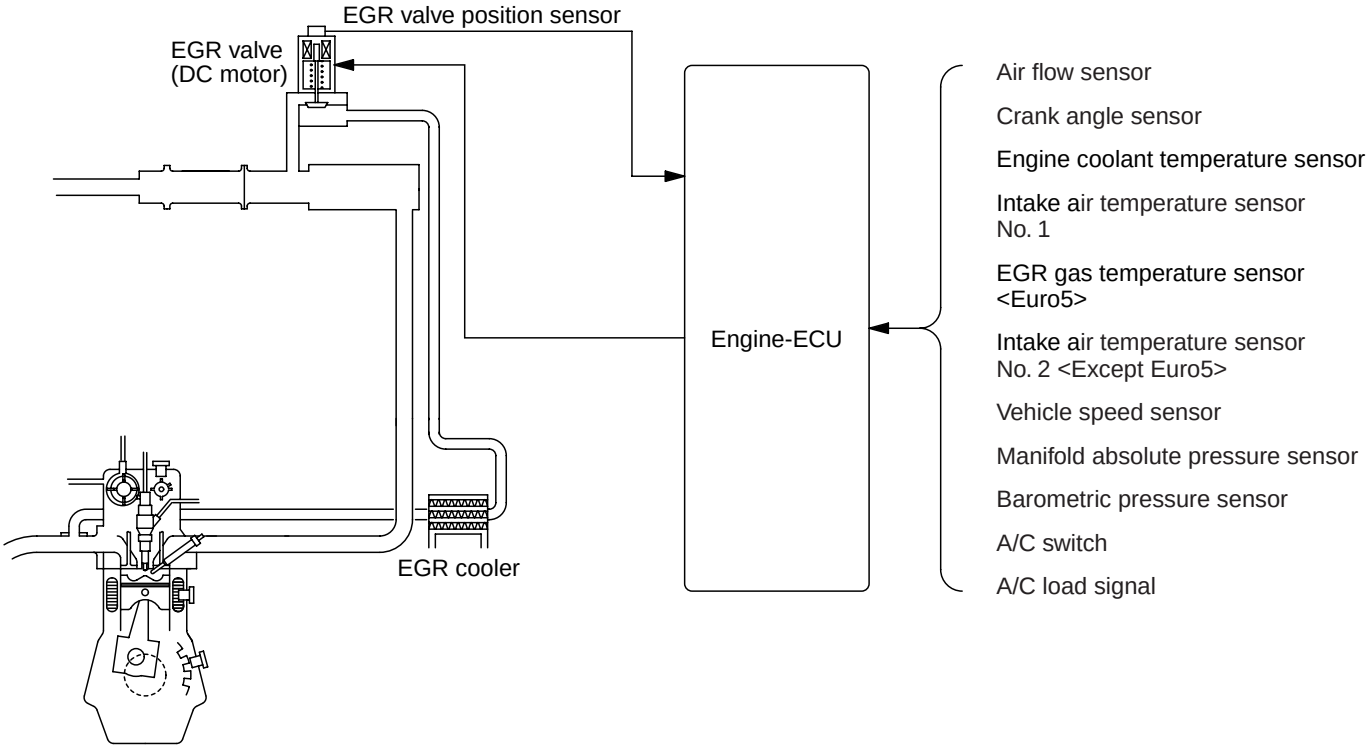
GENERAL INFORMATION (EGR SYSTEM)

M1175002600399

The electronically controlled EGR system consists of an EGR valve, engine-ECU and sensors.
The EGR valve aims at reducing the amount of NOx (nitric oxide) discharge that increases with the rise in the exhaust gas temperature. Thus, the engine-ECU optimally controls the exhaust gas temperature in accordance with the operating conditions of the engine.

To further improve the exhaust gas reduction performance, the system provides the engine-ECU feedback on the EGR valve opening. Thus, it effects EGR control to optimize the operating conditions of the engine.

SYSTEM DIAGRAM



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COMPONENT LOCATION

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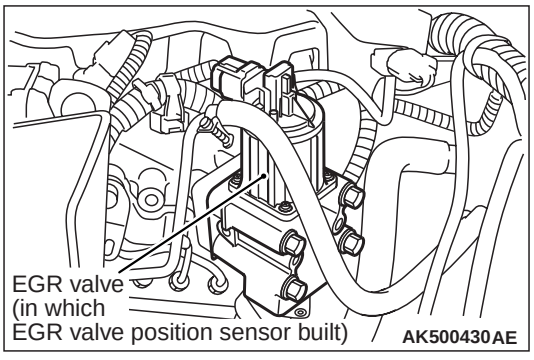

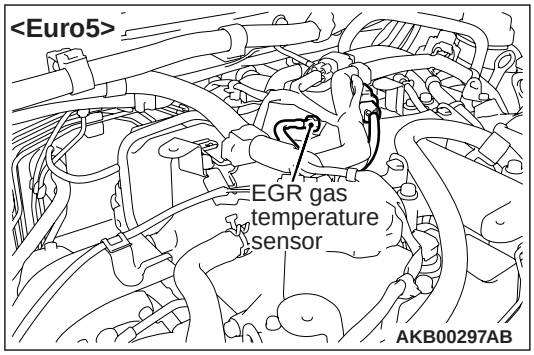

EGR VALVE (DC MOTOR) CHECK

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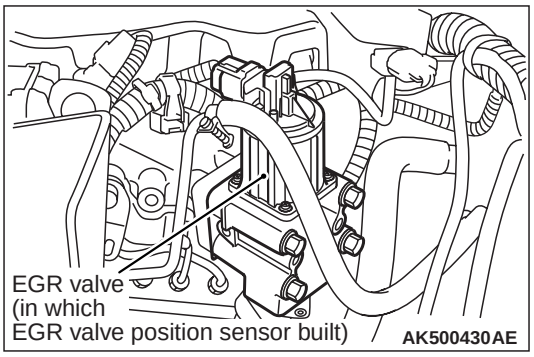
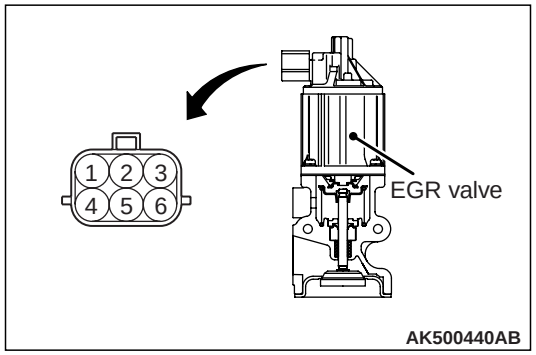
System check

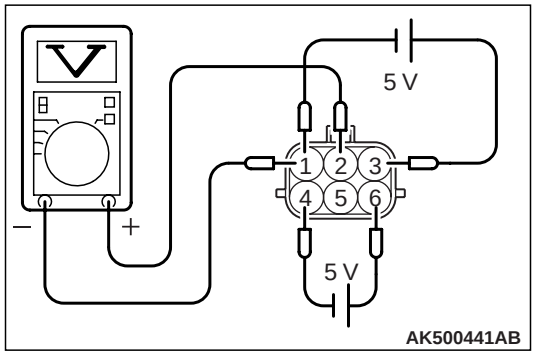


1. Connect the M.U.T.-III to the diagnosis connector to check for date list item No.16.
2. Start the engine, and warm up the engine.
3. Raise the engine speed gradually, and make sure that the valve open degree changes from 0% to 100%.

Operation check

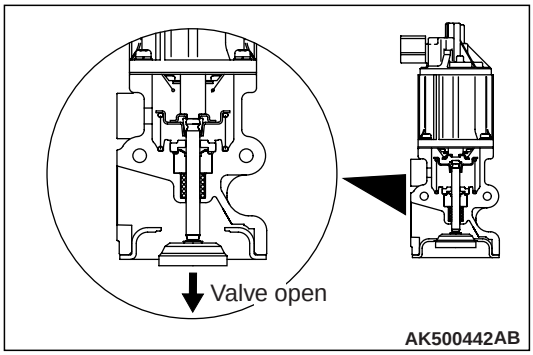


1. Remove the EGR valve.



2. Connect the terminal (+) of the sensor power supply (5V) with the terminal No.3 of the EGR valve connector, and connect the terminal (−) of the sensor power supply (5V) with the terminal No. 2.
3. A tester is to be connected between the terminal No.1 and No. 2.
4. Connect the terminal (+) of the power supply with the terminal No. 6 of the EGR valve connector, and connect the terminal (−) of the power supply with the terminal No. 4. Confirm the EGR valve is opened.

   NOTE: At this time, the power supply voltage is to be 5V. When the valve is not opened, increase the voltage 1V by 1V. For each voltage, current is to be applied within 5 seconds. Once the valve is opened, the voltage is not to be increased any more.



5. Confirm the voltage is changed between the terminal No. 1 and No. 2 together with the EGR valve opening movement.
6. By the voltage changed, the DC is recognized as being normal
7. Use a new gasket and tighten the installation bolt to the tightening torque.

   Tightening torque: 48 ± 6 N·m

Cleaning the EGR valve

⚠ CAUTION

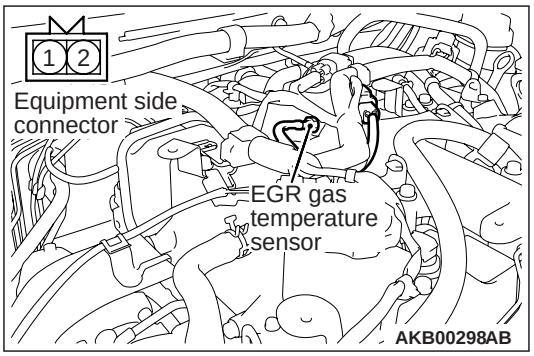
Do not use a solvent or detergent, which could enter the motor and cause it to malfunction.

1. Remove the EGR valve and check that the EGR valve is not stuck or clogged with carbon deposits. Use a wire brush to clean the valve if necessary.
2. Using a new gasket, install the EGR valve by tightening its mounting bolts to the specified torque.

   Tightening torque: 48 ± 6 N·m

EGR GAS TEMPERATURE SENSOR CHECK <Euro5>

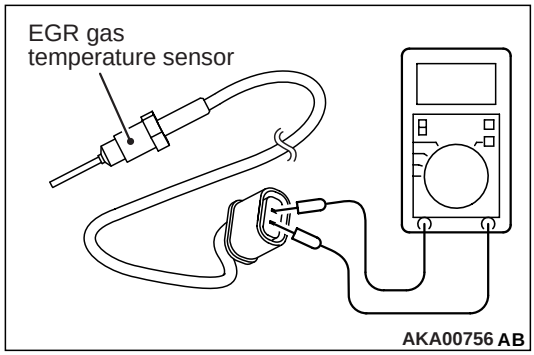
M1175011500022



1. Disconnect the EGR gas temperature sensor connector.
2. Measure resistance between terminals No. 1 and No. 2.

   Standard value:
   55 – 78 kΩ (at –20°C)
   29 – 41 kΩ (at 0°C)
   17 – 23 kΩ (at 20°C)
   10 – 14 kΩ (at 40°C)
   7.1 – 8.8 kΩ (at 60°C)
   4.8 – 5.9 kΩ (at 80°C)

3. Remove the EGR gas temperature sensor



4. Measure resistance while heating the sensor using a hair drier.

   Normal condition:

Temperature (°C)	Resistance (kΩ)
Higher	Smaller

5. If the value deviates from the standard value or the resistance remains unchanged, replace the EGR gas temperature sensor.
6. Install the EGR gas temperature sensor and tighten it to the specified torque.

   Tightening torque: 20 ± 4 N·m

AIR FLOW SENSOR CHECK

M1175005700027

Refer to GROUP 13A – Troubleshooting – Inspection Chart for Diagnosis Code.

CRANK ANGLE SENSOR CHECK

M1175005200044

Refer to GROUP 13A –Troubleshooting – Inspection Chart for Diagnosis Code.

ENGINE COOLANT TEMPERATURE SENSOR CHECK

M1175001500054

Refer to GROUP 13A – On-vehicle service – Engine coolant temperature sensor check.

INTAKE AIR TEMPERATURE SENSOR CHECK

M1175005800035

<Intake air temperature sensor No. 1>

Refer to GROUP 13A – On-vehicle service – Air temperature sensor No. 1 check.

<Intake air temperature sensor No. 2>

Refer to GROUP 13A – On-vehicle service – Air temperature sensor No. 2 check.

CHECK AT THE ECU TERMINALS

M1175003000055

Refer to GROUP 13A – Troubleshooting – Check at the ECU terminals.

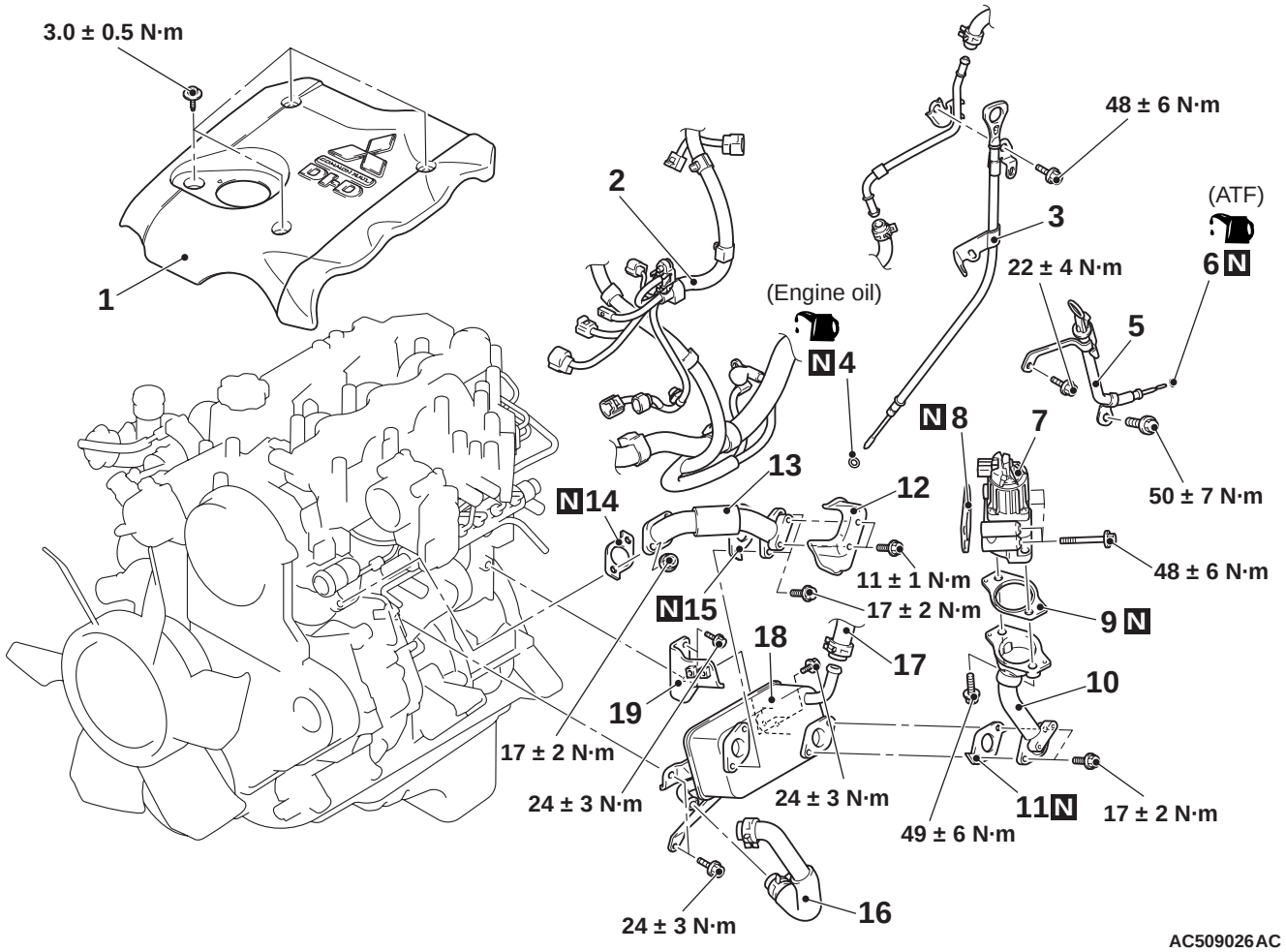
EGR VALVE AND EGR COOLER

REMOVAL AND INSTALLATION

M1175007200493

<Except Euro5>

Pre-removal Operation	Post-installation Operation
• Under Skid Plate and Engine Room Under Cover Removal (Refer to GROUP 51 – Under Cover). • Engine Coolant Draining (Refer to GROUP 14 – On-vehicle Service, Engine Coolant Replacement). • Battery and Battery Box Removal (Refer to 54A – Battery).	• Battery and Battery Box Installation (Refer to 54A – Battery). • Engine Coolant Refilling (Refer to GROUP 14 – On-vehicle Service, Engine Coolant Replacement). • Under Skid Plate and Engine Room Under Cover Installation (Refer to GROUP 51 – Under Cover).



AC509026AC

Removal steps

1. Engine cover
2. Wiring harness connection
3. Engine oil level gauge and guide assembly
4. O-ring
5. Transmission fluid level gauge and guide assembly <A/T>
6. O-ring <A/T>
7. EGR valve

>>**B**<< 8. EGR valve gasket

>>**A**<< 9. EGR pipe gasket

Removal steps (Continued)

10. EGR pipe B

>>**A**<< 11. EGR pipe gasket

12. EGR pipe heat protector
13. EGR pipe A

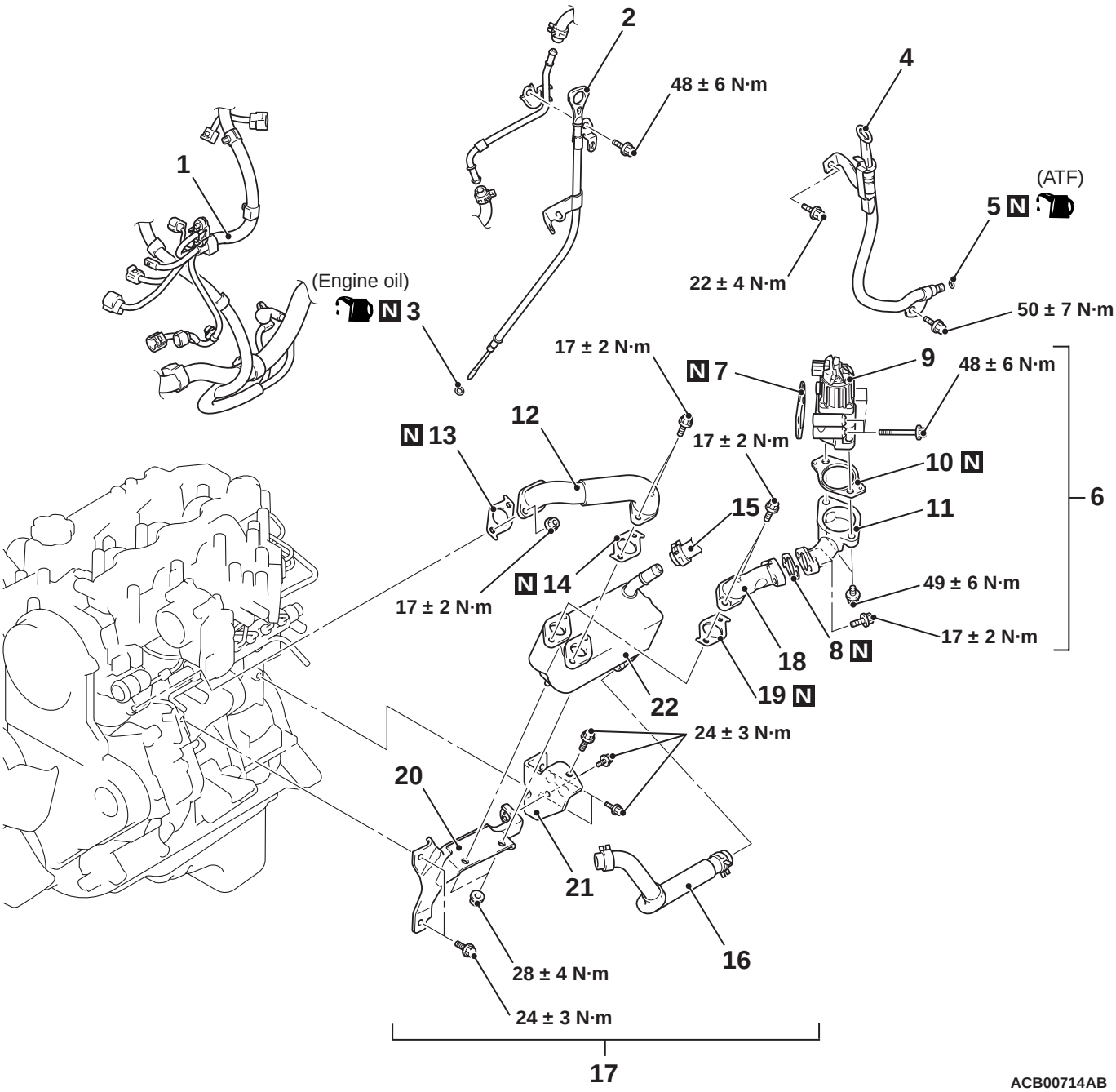
>>**A**<< 14. EGR pipe gasket

>>**A**<< 15. EGR pipe gasket

16. Water hose
17. Heater piping hose connection
18. EGR cooler
19. EGR cooler bracket

<Euro5>

Pre-removal Operation	Post-installation Operation
• Engine Cover Removal (Refer to GROUP 11A – Engine Assembly). • Under Skid Plate and Engine Room Under Cover Removal (Refer to GROUP 51 – Under Cover). • Engine Coolant Draining (Refer to GROUP 14 – On-vehicle Service, Engine Coolant Replacement). • Battery and Battery Box Removal (Refer to 54A – Battery).	• Battery and Battery Box Installation (Refer to 54A – Battery). • Engine Coolant Refilling (Refer to GROUP 14 – On-vehicle Service, Engine Coolant Replacement). • Under Skid Plate and Engine Room Under Cover Installation (Refer to GROUP 51 – Under Cover). • Engine Cover Installation (Refer to GROUP 11A – Engine Assembly).



Removal steps

1. Wiring harness connection
2. Engine oil level gauge and guide assembly

Removal steps (Continued)

3. O-ring
4. Transmission fluid level gauge and guide assembly <A/T>

Removal steps (Continued)

5. O-ring <A/T>
6. EGR valve and EGR pipe B fitting

>>**B**<< 7. EGR valve gasket

>>**A**<< 8. EGR pipe gasket

9. EGR valve

>>**A**<< 10. EGR pipe gasket

11. EGR pipe B fitting
12. EGR pipe A

>>**A**<< 13. EGR pipe gasket

>>**A**<< 14. EGR pipe gasket

15. Heater piping hose connection
- Starter assembly (Refer to GROUP 16 – Starting System, Starter Assembly)

16. Water hose

<<**A**>> 17. EGR pipe B, EGR cooler and bracket assembly

18. EGR pipe B

>>**A**<< 19. EGR pipe gasket

20. EGR cooler bracket A
21. EGR cooler bracket B
22. EGR cooler

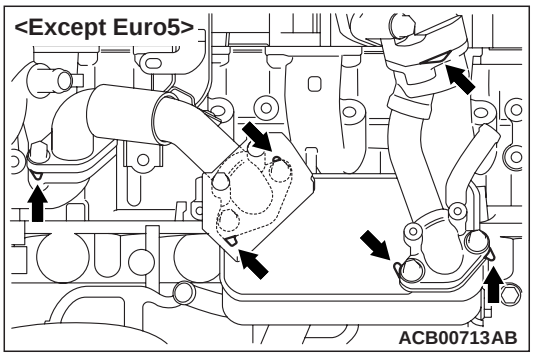
REMOVAL SERVICE POINT

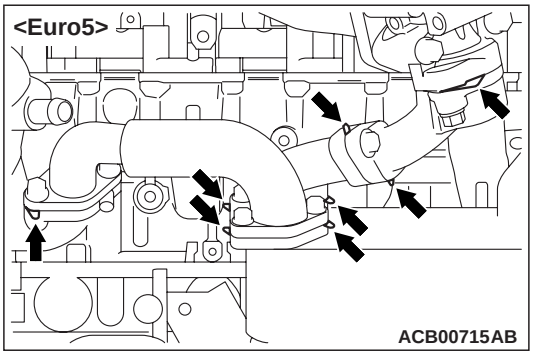
<<A>> EGR PIPE B, EGR COOLER AND BRACKET ASSEMBLY REMOVAL

1. Remove the EGR bracket mounting bolts from the wheelhouse (LH).
2. Remove the EGR pipe B, EGR cooler and bracket assembly from above the vehicle.

INSTALLATION SERVICE POINTS

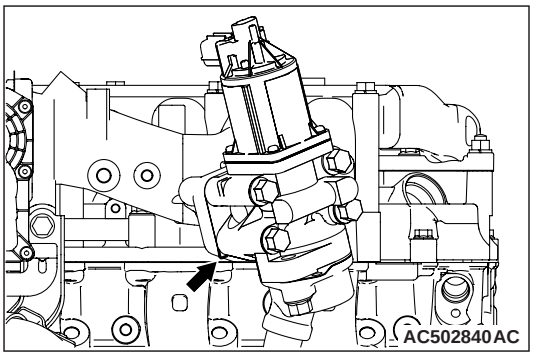
>>A<< EGR PIPE GASKET INSTALLATION





The projection on the EGR pipe gasket should be position as shown.

>>B<< EGR VALVE GASKET INSTALLATION



The projection on the EGR valve gasket should be position as shown.

DIESEL PARTICULATE FILTER (DPF) SYSTEM <Euro5>

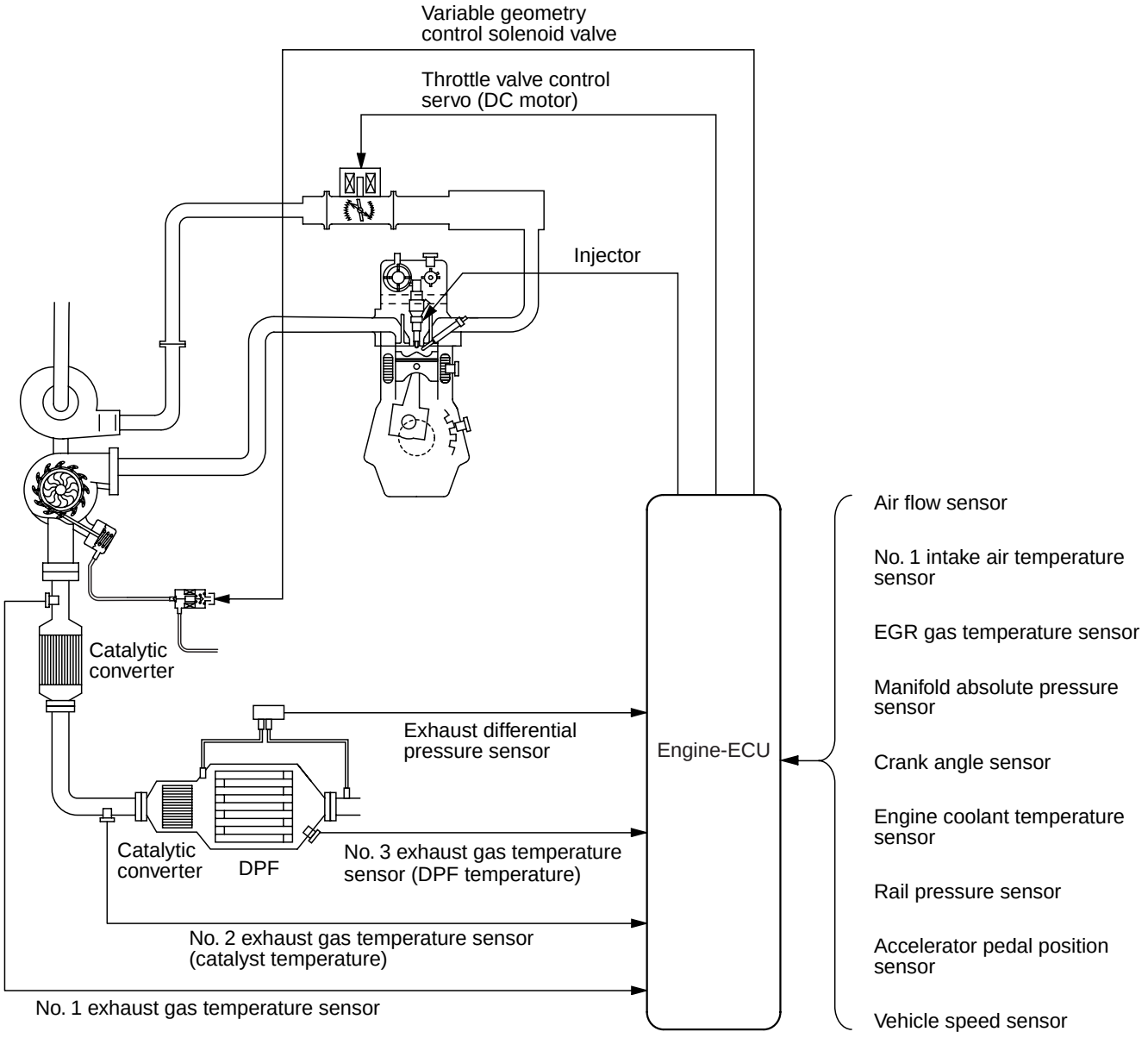
GENERAL INFORMATION (DIESEL PARTICULATE FILTER SYSTEM)

M1175006600261

The Diesel Particulate Filter (DPF) system is used to adsorb and remove the Particulate Matter (PM) contained in the exhaust gas. The engine-ECU anticipates the amount of PM accumulated in the DPF through the input signal from each sensor.

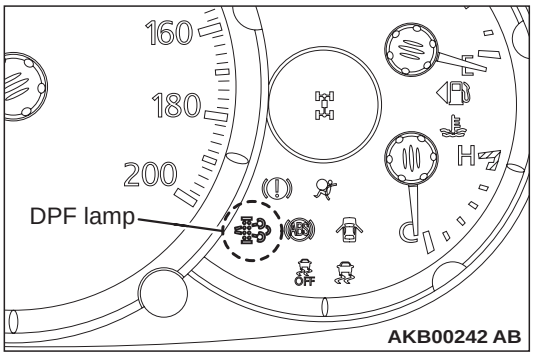
If the PM accumulates more than the standard, the engine-ECU carries out the control that automatically regenerates the DPF under certain conditions to remove the PM. At the DPF regeneration, the DPF temperature gets high and high temperature exhaust gases are given off.

SYSTEM DIAGRAM



AKB00299 AB

DPF LAMP



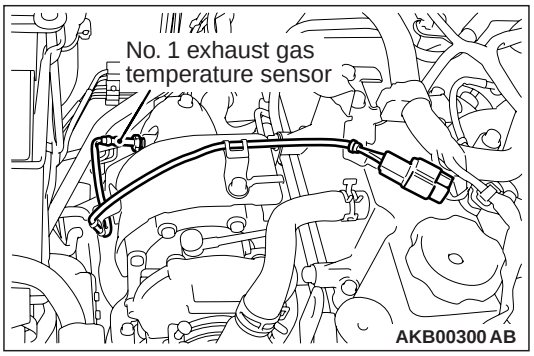
When the engine oil level or the amount of accumulated PM within the DPF exceeds the specified value, the DPF lamp is lit or blinked. When the vehicle is brought into the shop with the DPF lamp blinked, service the vehicle in accordance with the following procedures.

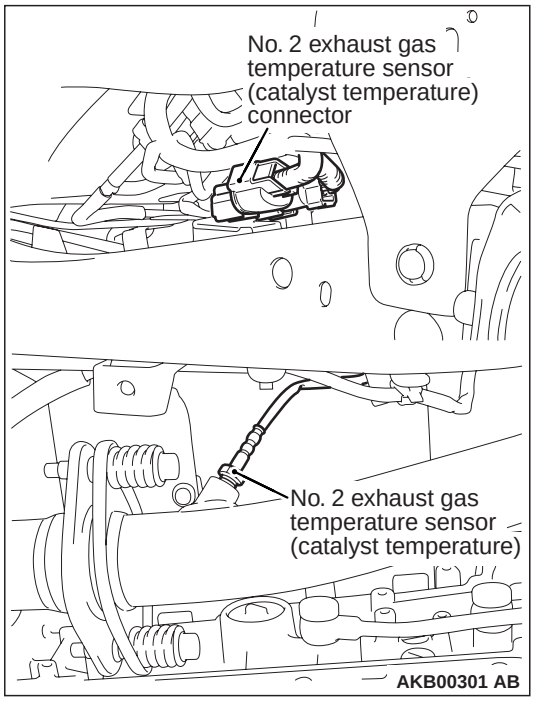
DPF lamp	Engine warning lamp	State and service
Being blinked	Being lit	Carry out the forcible DPF regeneration using M.U.T.-III because PM being excessively accumulated within DPF is assumed. (Refer to P.17-46)
Being blinked	Not being lit	Replace engine oil because engine oil level excessively increasing is assumed. (Refer to GROUP 12 – On-vehicle service – Engine Oil Replacement)

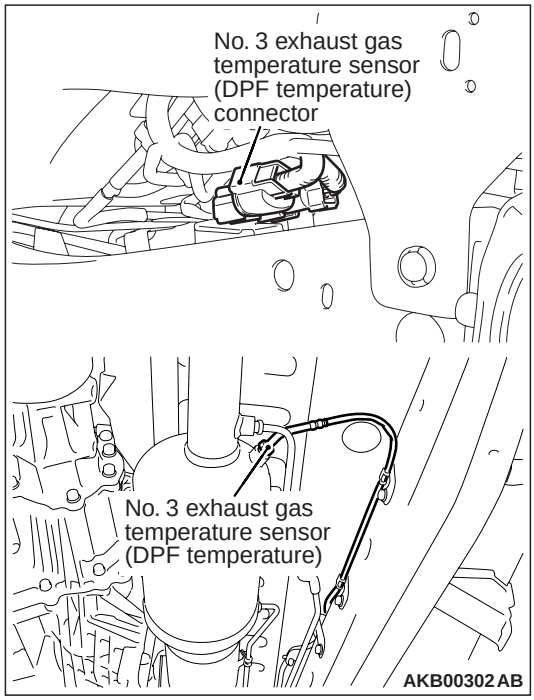
After turning the ignition switch to "ON" position, the DPF lamp is lit for the purpose of the operational check for about 5 seconds.

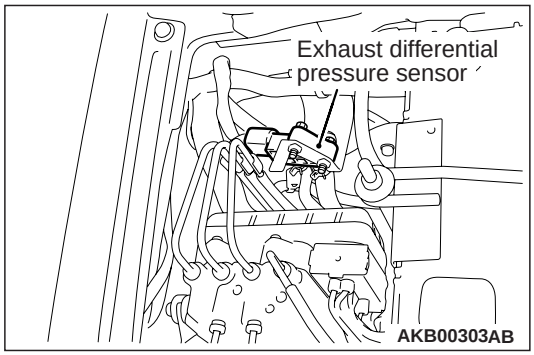
COMPONENT LOCATION (DPF SYSTEM)

M1175006700138









FORCIBLE DPF REGENERATION

M1175006800221

⚠ ***WARNING***

When the forcible DPF regeneration is carried out, confirm that no people or no combustible material is within its vicinity. If people or combustible material is around the muffler, serious injury or damage such as heat injury or fires may occur because high temperature exhaust gases are put out.

⚠ ***WARNING***

Perform the forcible DPF regeneration in a well-ventilated and flat place when the vehicle is stopped (If perform the forcible DPF regeneration indoors, surely carry out enforced ventilation).

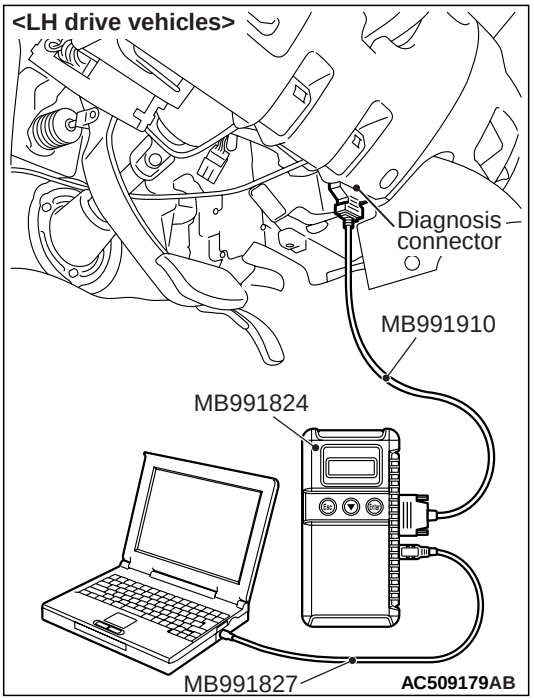
⚠ ***WARNING***

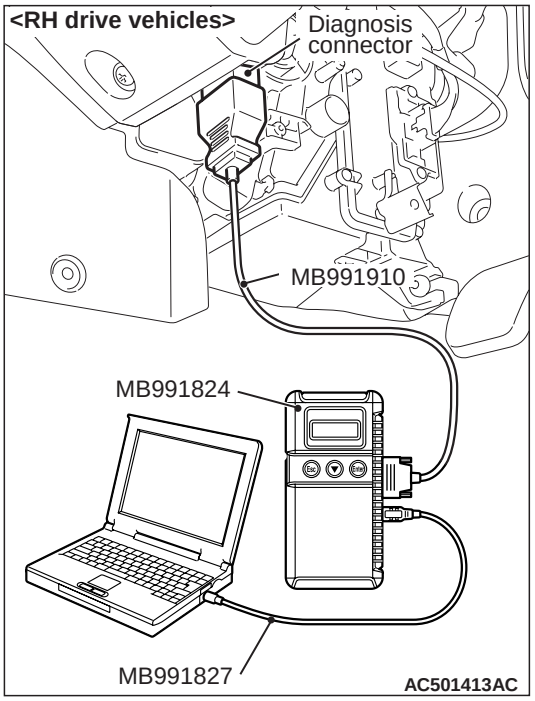
If the engine warning lamp is lit, the DPF system might be abnormal. Carry out the inspection chart for diagnosis code, and then perform the forcible DPF regeneration (Refer to , GROUP 13A – Troubleshooting – Inspection Chart For Diagnosis codes).

Set the vehicle to the pre-inspection condition.

⚠ **CAUTION**

Connection and disconnection of M.U.T.-III should be always performed with the ignition switch turned to the "LOCK" (OFF) position.





1. Connect the M.U.T.-III to the diagnosis connector.
2. Start the engine and let it run at idle.
3. From "FUNCTION MENU" on M.U.T.-III, select "SPECIAL FUNCTION".
4. From "SPECIAL FUNCTION", select "DPF REGENERATION".

⚠ CAUTION

If the forcible regeneration of the DPF is carried out while the accumulated amount of the PM in the DPF exceeds the limit, the forcible regeneration might not be correctly completed. This could be caused by the detection in the DPF system malfunction. Carry out the check procedure for the diagnosis code and solve the malfunction. (Refer to , GROUP 13A – Troubleshooting – Inspection Chart For Diagnosis Codes)

5. Perform Item No. 33, DPF Regeneration.

   NOTE: Carrying out the forcible DPF regeneration increases the engine speed 1,500 – 2,000 r/min (the temperature increases within the DPF and is maintained at approximately 600°C).

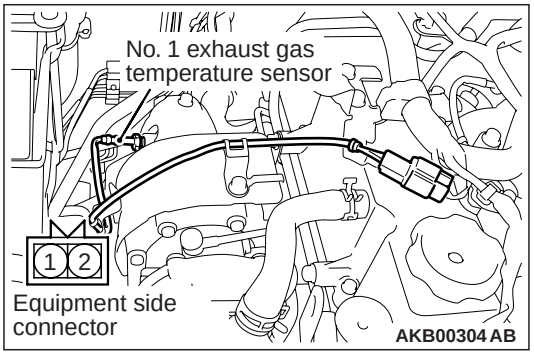
   NOTE: When performed for about 25 minutes, the forcible DPF regeneration automatically stops. Depressing the accelerator pedal during the regeneration, however, can cancel the forcible DPF regeneration.

   NOTE: If the DPF regeneration is carried out while the DPF lamp is illuminated or blinked due to the accumulated PM, the DPF lamp is turned off as soon as the forcible regeneration is correctly completed.

6. Turn the ignition switch to the "LOCK" (OFF) position and then remove the M.U.T.-III.

No. 1 EXHAUST GAS TEMPERATURE SENSOR CHECK

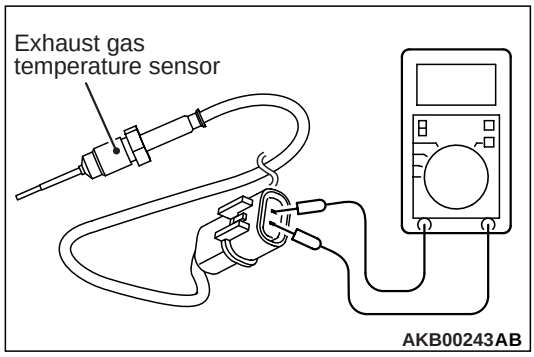
M1175006900206



1. Disconnect the No. 1 exhaust gas temperature sensor connector.
2. Measure resistance between terminals No. 1 and No. 2.

   Standard value: 120 – 560 kΩ (at 20°C)

3. Remove the No. 1 exhaust gas temperature sensor.



4. Measure resistance while heating the sensor using a hair drier.

   Normal condition:

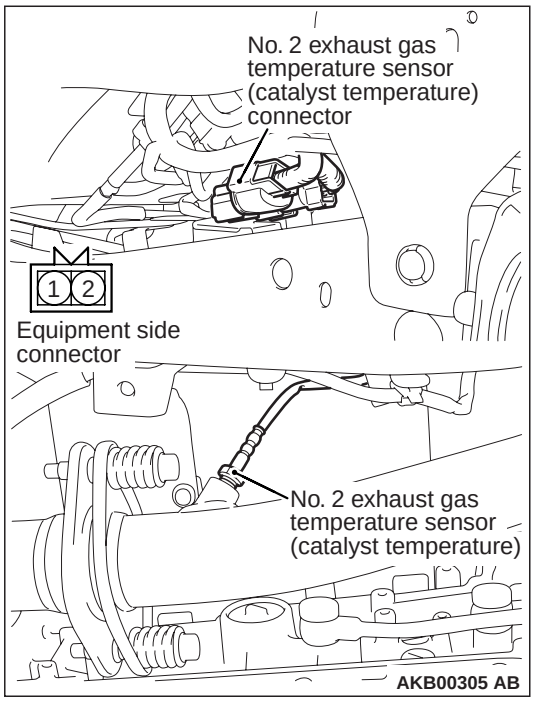
Temperature (°C)	Resistance (kΩ)
Higher	Smaller

5. If the value deviates from the standard value or the resistance remains unchanged, replace the No. 1 exhaust gas temperature sensor assembly.
6. Install the No. 1 exhaust gas temperature sensor and tighten it to the specified torque.

   Tightening torque: 30 ± 5 N·m

No. 2 EXHAUST GAS TEMPERATURE SENSOR (CATALYST TEMPERATURE) CHECK

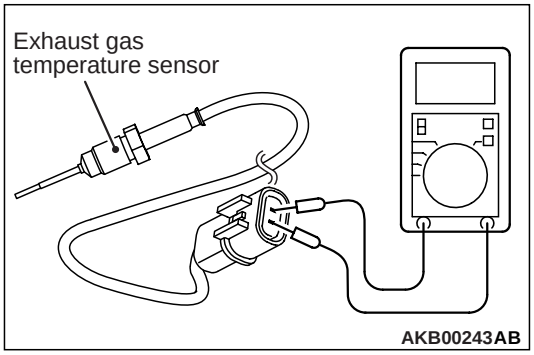
M1175007000198



1. Disconnect the No. 2 exhaust gas temperature sensor (catalyst temperature) connector.
2. Measure resistance between terminals No. 1 and No. 2.

Standard value: 120 – 560 kΩ (at 20°C)

3. Remove the No. 2 exhaust gas temperature sensor (catalyst temperature).



4. Measure resistance while heating the sensor using a hair drier.

Normal condition:

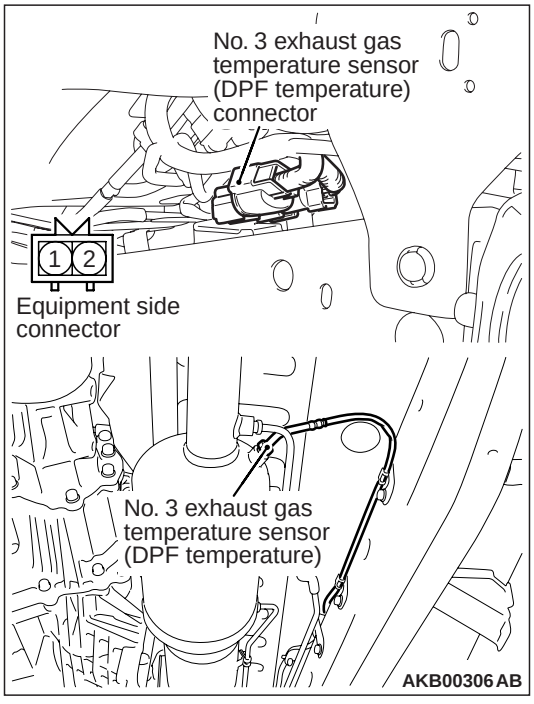
Temperature (°C)	Resistance (kΩ)
Higher	Smaller

5. If the value deviates from the standard value or the resistance remains unchanged, replace the No. 2 exhaust gas temperature sensor (catalyst temperature) assembly.
6. Install the No. 2 exhaust gas temperature sensor (catalyst temperature) and tighten it to the specified torque.

Tightening torque: 30 ± 5 N·m

No. 3 EXHAUST GAS TEMPERATURE SENSOR (DPF TEMPERATURE) CHECK

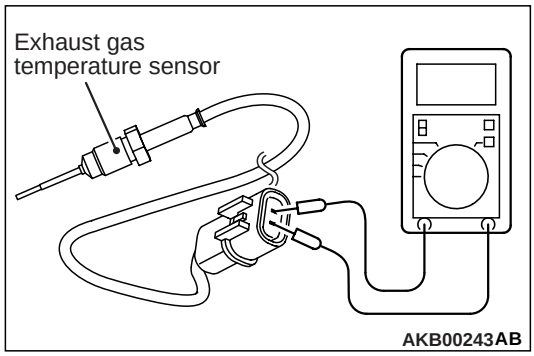
M1175007300177



1. Disconnect the No. 3 exhaust gas temperature sensor (DPF temperature) connector.
2. Measure resistance between terminals No. 1 and No. 2.

Standard value: 120 – 560 kΩ (at 20°C)

3. Remove the No. 3 exhaust gas temperature sensor (DPF temperature).



4. Measure resistance while heating the sensor using a hair drier.

Normal condition:

Temperature (°C)	Resistance (kΩ)
Higher	Smaller

5. If the value deviates from the standard value or the resistance remains unchanged, replace the No. 3 exhaust gas temperature sensor (DPF temperature) assembly.
6. Install the No. 3 exhaust gas temperature sensor (DPF temperature) and tighten it to the specified torque.

Tightening torque: 30 ± 5 N·m

CHECK AT THE ECU TERMINALS

M1175003000390

Refer GROUP 13A – Troubleshooting – Check at the ECU terminals.

DIESEL PARTICULATE FILTER (DPF) <Euro5>

REMOVAL AND INSTALLATION

M1175007700238

Refer to GROUP 15 – Exhaust Pipe and Main Muffler .

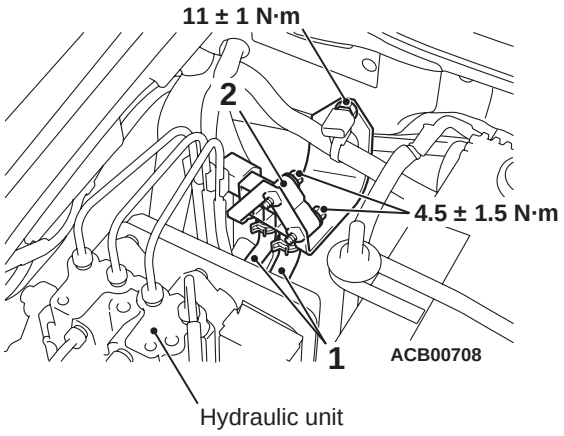
DIESEL PARTICULATE FILTER (DPF) SYSTEM SENSORS <Euro5>

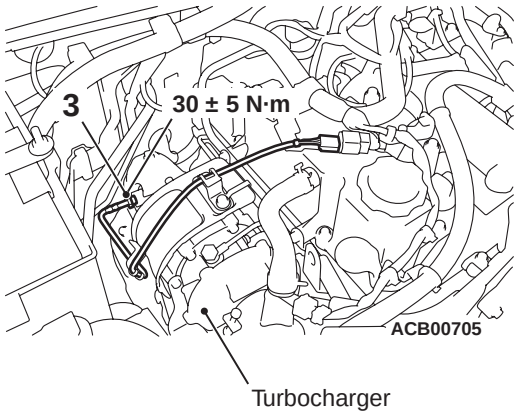
REMOVAL AND INSTALLATION

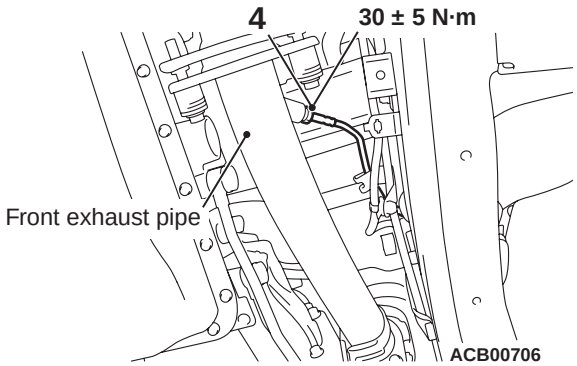
M1175008000180

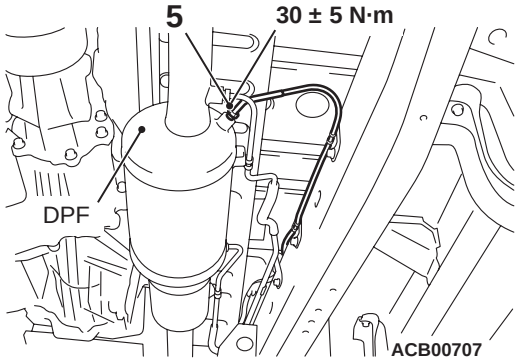
⚠ CAUTION

- **When the exhaust differential pressure sensor is replaced, use the M.U.T.-III to initialise the learning value (Refer to GROUP 00 – Precautions before Service, Initialisation Procedure for Learning Value in DPF System).**
- **When the exhaust differential pressure sensor is replaced, perform the forcible DPF regeneration after learning value in DPF system (Refer to P.17-46).**
- **When the No.1, No.2 or No.3 exhaust gas temperature sensor is replaced, perform the forcible DPF regeneration (Refer to P.17-46).**









ACB02032AB

Removal steps

1. Exhaust pressure hose connection
2. Exhaust differential pressure sensor
   - Engine cover (Refer to GROUP 11A – Engine Assembly).

<<A>> 3. No.1 exhaust gas temperature sensor
   - Under skid plate and engine room under cover (Refer to GROUP 51 – Under Cover).

<<A>> 4. No.2 exhaust gas temperature sensor

<<A>> 5. No.3 exhaust gas temperature sensor

REMOVAL SERVICE POINT

<<A>> EXHAUST GAS TEMPERATURE SENSOR REMOVAL

⚠ CAUTION

Do not use the exhaust gas temperature sensor which dropped.

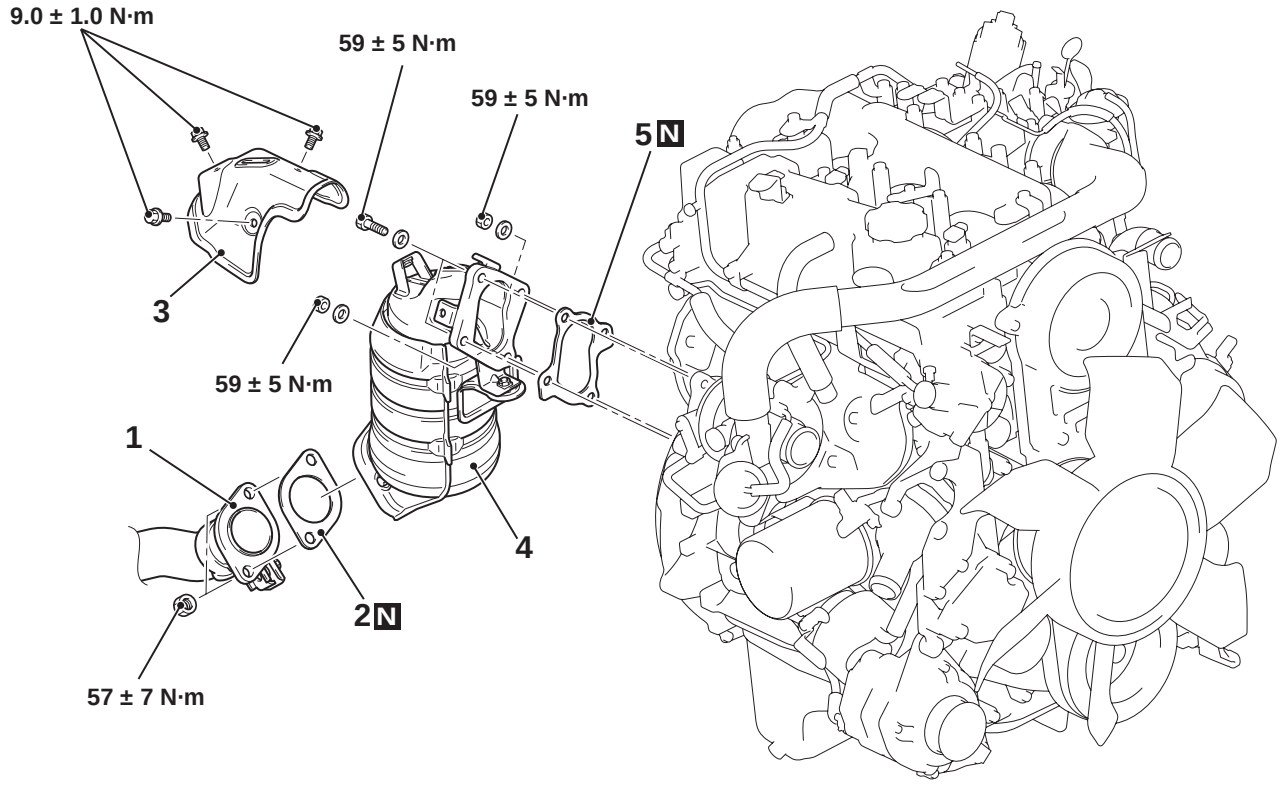
CATALYTIC CONVERTER

REMOVAL AND INSTALLATION

M1175002100673

<Except Euro5>

Pre-removal Operation	Post-installation Operation
• Under Skid Plate and Engine Room Under Cover Removal (Refer to GROUP 51 – Under Cover). • Battery and Battery Box Removal (Refer to 54A – Battery) <Vehicles with Sub Battery>.	• Battery and Battery Box Installation (Refer to 54A – Battery) <Vehicles with Sub Battery>. • Under Skid Plate and Engine Room Under Cover Installation (Refer to GROUP 51 – Under Cover).



AC502841AD

Removal steps

1. Front exhaust pipe connection
2. Exhaust pipe gasket
3. Catalytic converter protector

Removal steps (Continued)

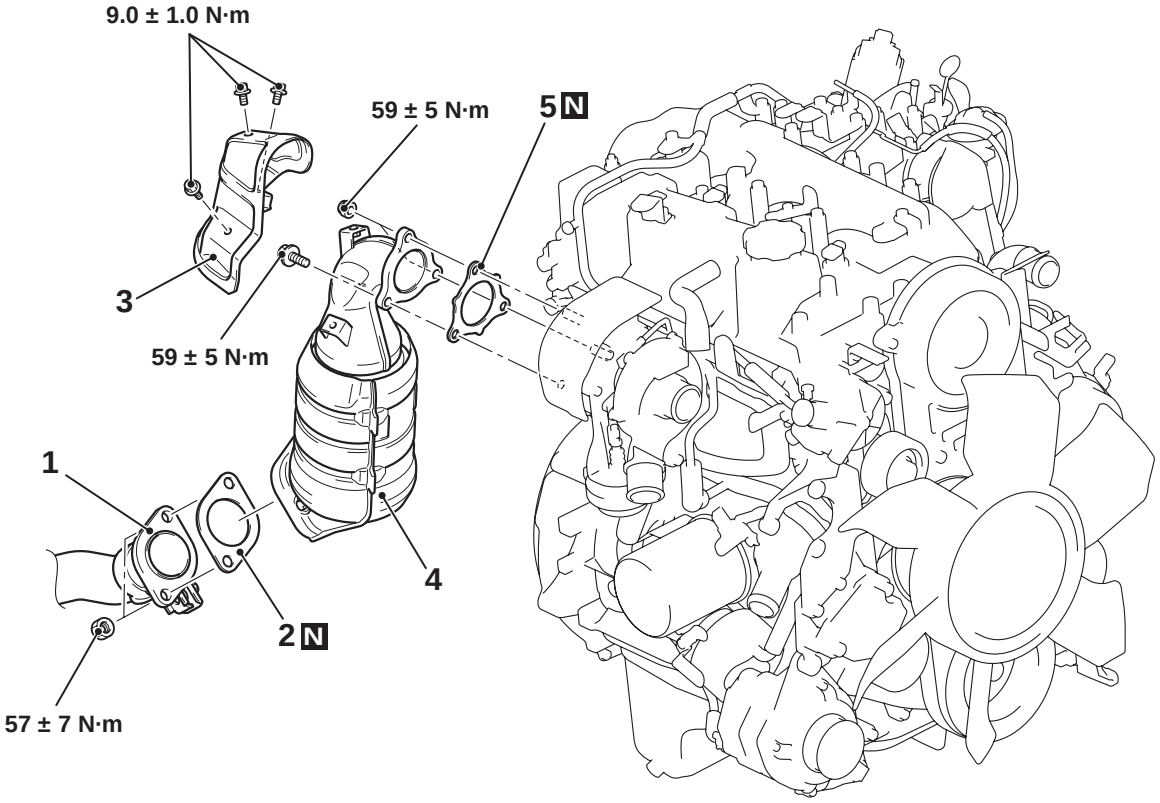
4. Catalytic converter
5. Catalytic converter gasket

<Euro5>

⚠ CAUTION

- **When the catalytic converter is replaced, use the M.U.T.-III to initialise the learning value (Refer to GROUP 00 – Precautions before Service, Initialisation Procedure for Learning Value in DPF System).**
- **When the catalytic converter is replaced, perform the forcible DPF regeneration after learning value in DPF system (Refer to P.17-46).**

Pre-removal Operation	Post-installation Operation
• Under Skid Plate and Engine Room Under Cover Removal (Refer to GROUP 51 – Under Cover). • Battery and Battery Box Removal (Refer to 54A – Battery) <Vehicles with Sub Battery>. • No.1 Exhaust Gas Temperature Sensor Removal (Refer to GROUP 17 – Emission Control, DPF System Sensors P.17-49).	• No.1 Exhaust Gas Temperature Sensor Installation (Refer to GROUP 17 – Emission Control, DPF System Sensors P.17-49). • Battery and Battery Box Installation (Refer to 54A – Battery) <Vehicles with Sub Battery>. • Under Skid Plate and Engine Room Under Cover Installation (Refer to GROUP 51 – Under Cover).



AC805698 AB

Removal steps
1. Front exhaust pipe connection
2. Exhaust pipe gasket
3. Catalytic converter protector

Removal steps (Continued)
4. Catalytic converter
5. Catalytic converter gasket

GROUP 21

CLUTCH

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CLUTCH 21A

CLUTCH OVERHAUL 21B

GROUP 21A

CLUTCH

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GENERAL INFORMATION

M1211000100308

The clutch is a dry single-disc, diaphragm type; hydraulic pressure is used for the clutch control.

SERVICE SPECIFICATIONS

M1211000300421

Item	Standard value
Clutch pedal height mm	183.5 – 186.5 <LHD> 178.5 – 181.5 <RHD>
Clutch pedal clevis pin play mm	1 – 3
Clutch pedal free play mm	4 – 13
Distance between the clutch pedal and the floorboard when the clutch is released mm	91 or more <LHD> 86 or more <RHD>

LUBRICANTS

M1211000400257

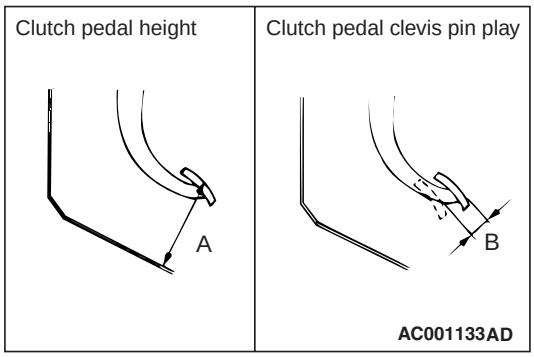
Item	Specified lubricant	Quantity
Clutch fluid	Brake Fluid DOT 3 or DOT 4	As required
Pushrod assembly	Rubber grease	As required
Release cylinder pushrod	MITSUBISHI genuine grease Part No.0101011 or equivalent	As required

ON-VEHICLE SERVICE

CLUTCH PEDAL CHECK AND ADJUSTMENT

M1211000900940

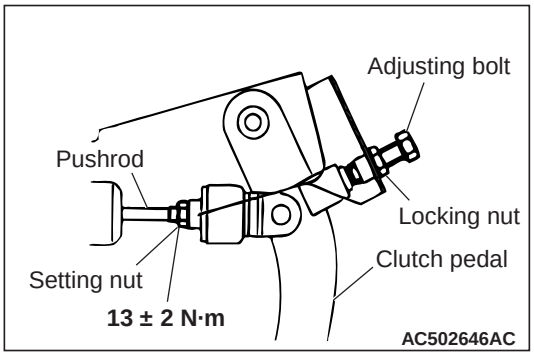
1. Turn back the carpet etc. under the clutch pedal.



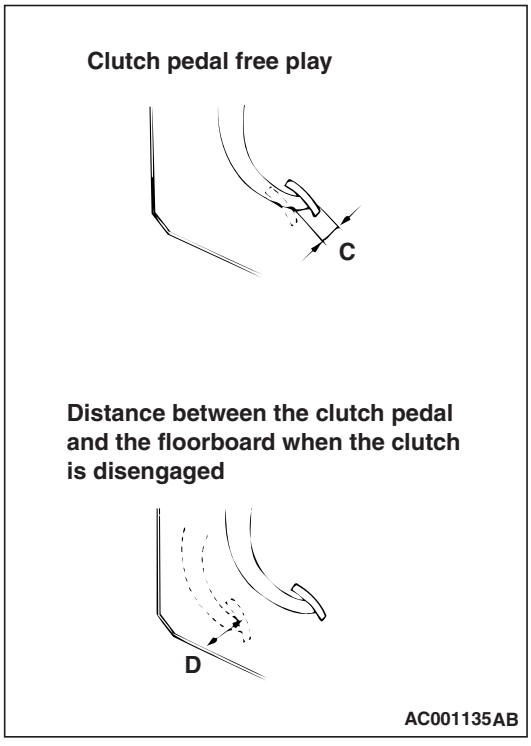
2. Measure the clutch pedal height. If the height is outside the standard value, go to step 4.
   Standard value (A):
   183.5 – 186.5 mm <LHD>
   178.5 – 181.5 mm <RHD>
3. Measure the clutch pedal clevis pin play. If the play is outside the standard value, go to Step 5.
   Standard value (B): 1 – 3 mm
4. Remove the clutch switch. (Refer to P.21A-4.) <Vehicles with cruise control>

⚠ CAUTION

Do not push in the master cylinder pushrod at this time, otherwise the clutch will not operate properly.



5. If the clutch pedal height is not within the standard value, loosen the setting nut and the locking nut <Vehicles without cruise control> to adjust the clutch pedal height to the standard value and move the pushrod and the adjusting bolt <Vehicles without cruise control>.
6. Install the clutch switch. (Refer to P.21A-4.) <Vehicles with cruise control>
7. If the clutch pedal clevis pin play is not within the standard value, loosen the setting nut and move the pushrod to adjust.



8. After the adjustments, confirm that the clutch pedal free play (measured at the face of the pedal pad) and the distance between the clutch pedal (the face of the pedal pad) and the floorboard when the clutch is disengaged are within the standard value ranges.

   Standard value (C): 4 – 13 mm
   Standard value (D):
   91 mm or more <LHD>
   86 mm or more <RHD>

9. If the measured free play and distance do not agree with the standard value ranges, it is probably the result of either air in the hydraulic system or a faulty master cylinder or clutch. Bleed the air, or disassemble and inspect the master cylinder or clutch.
10. Reinstall the carpet, etc.

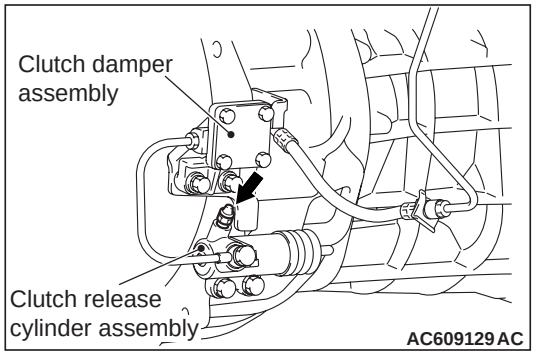
CLUTCH BLEEDING

M1211001400733

⚠ CAUTION

Use the specified brake fluid. Do not mix brake fluids.

Specified fluid: Brake fluid DOT 3 or DOT 4



1. Connect a hose with a bottle to the bleeder screw.
2. Open the bleed nipple.
3. Depress the clutch pedal slowly. Open the bleeder screw to let air and brake fluid out. Close the bleeder screw. Release the clutch pedal. Repeat until only brake fluid and no air comes out.
4. After air bleeding, tighten the bleeder screw to the specified torque.

   Tightening torque: 8.9 ± 0.9 N·m

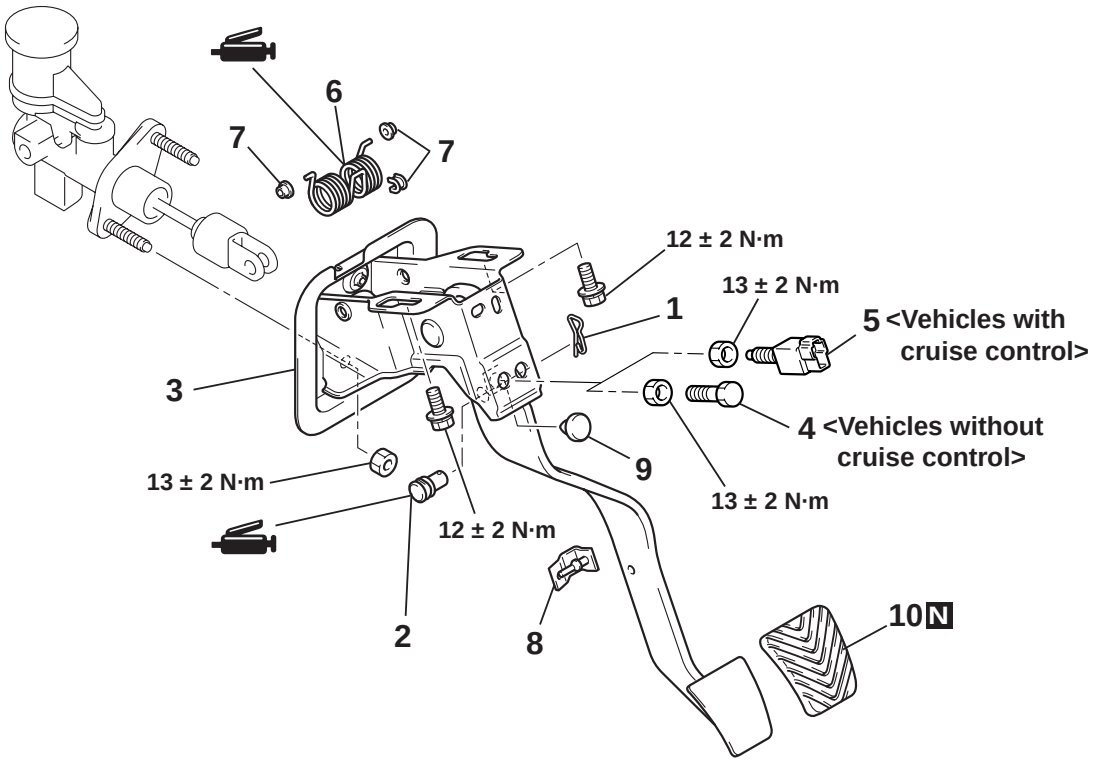
5. Check that the brake fluid reservoir level stays between "MAX" and "MIN" marks throughout the clutch bleeding process.

CLUTCH PEDAL

REMOVAL AND INSTALLATION

M1211001601008

Pre-removal Operation	Post-installation Operation
• Lower Panel Assembly Removal (Refer to GROUP 52A – Instrument Panel Assembly). • Drivers side under cover <Except vehicles Single cab> Removal (Refer to GROUP 52A – Instrument Panel Assembly). • ETACS-ECU Removal. <LHD>	• ETACS-ECU Installation. <LHD> • Drivers side under cover <Except vehicles Single cab> Installation (Refer to GROUP 52A – Instrument Panel Assembly). • Lower Panel Assembly Installation (Refer to GROUP 52A – Instrument Panel Assembly). • Clutch Pedal Adjustment (Refer to P.21A-2).



AC900934AB

Removal steps

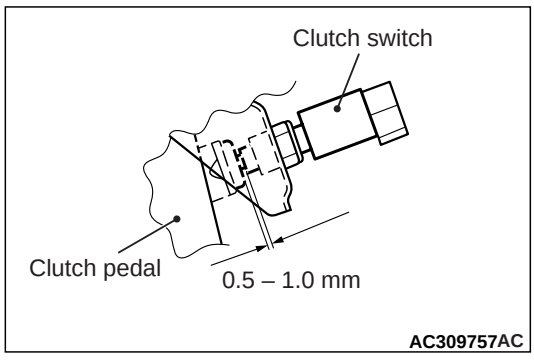
1. Snap pin
2. Clevis pin
3. Clutch pedal assembly
4. Adjusting bolt <Vehicles without cruise control>

>>**A**<< 5. Clutch switch <Vehicles with cruise control>

6. Return spring
7. Bushing
8. Stopper
9. Pedal stopper
10. Pedal pad

INSTALLATION SERVICE POINT

>>A<< CLUTCH SWITCH <VEHICLES WITH CRUISE CONTROL> INSTALLATION



AC309757AC

Install the clutch switch at the specified dimension when the clutch pedal is released.

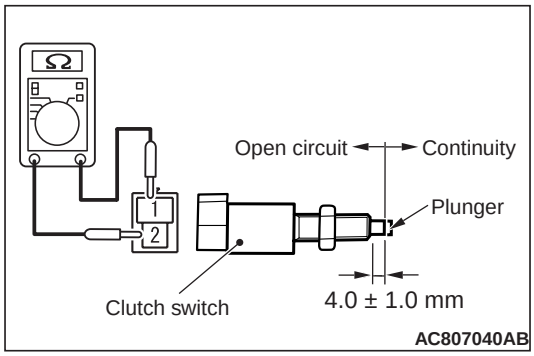
INSPECTION

CLUTCH SWITCH CONTINUITY CHECK

M1211001000263

⚠ CAUTION

Do not apply grease or lubricant to the switch and the switch installation section to avoid malfunction of the switch. In addition, do not use gloves which have grease on them.



1. Check for continuity between the terminals of the switch.

Tester connection	Plunger condition	Specified condition
1-2	Released	Continuity (less than 2 Ω)
	Pushed	Open circuit

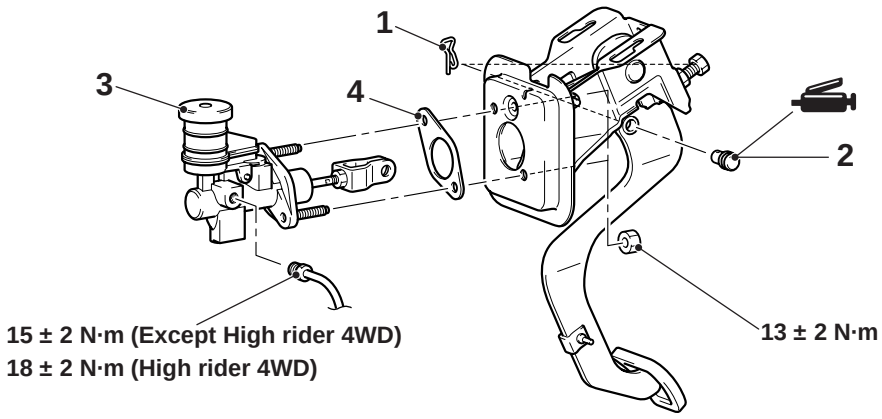
2. If the continuity is incorrect, replace the clutch switch.

CLUTCH MASTER CYLINDER

REMOVAL AND INSTALLATION

M1211050100068

Pre-removal Operation	Post-installation Operation
Clutch Fluid Draining	• Clutch Fluid Supplying • Clutch Bleeding (Refer to P.21A-3). • Clutch Pedal Adjustment (Refer to P.21A-2).



Clutch master cylinder removal steps

- Lower panel assembly (Refer to GROUP 52A – Instrument Panel Assembly).

1. Snap pin

Clutch master cylinder removal steps (Continued)

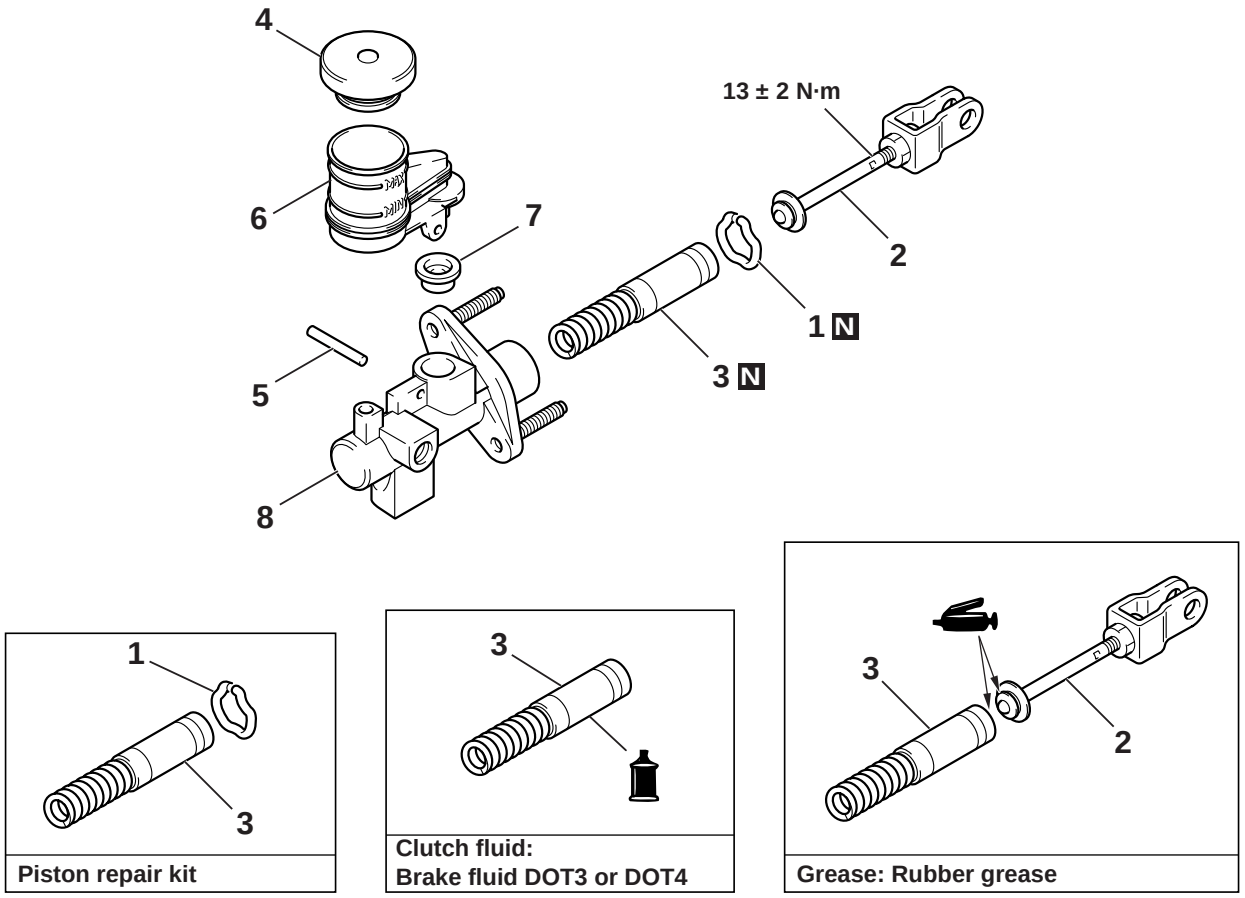
2. Clevis pin
3. Clutch master cylinder assembly
4. Sealer

DISASSEMBLY AND REASSEMBLY

M1211002100542

⚠ CAUTION

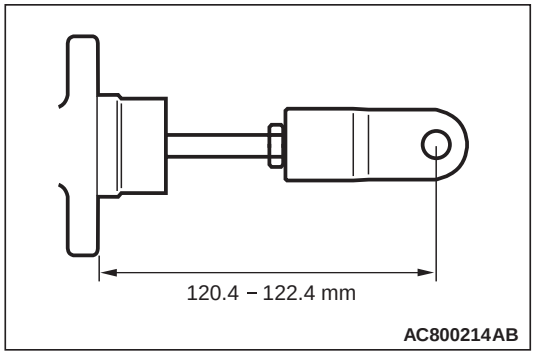
Do not disassemble the piston assembly.



Disassembly steps

1. Piston stopper ring
>>**A**<< 2. Pushrod assembly
3. Piston assembly
4. Reservoir cap
5. Spring pin
6. Reservoir tank
7. Seal
8. Master cylinder body

REASSEMBLY SERVICE POINT



>>A<< PUSHROD ASSEMBLY INSTALLATION

Set the length of the pushrod assembly to the dimension shown to make the adjustment of the clutch pedal easier.

INSPECTION

M1211002200196

- Check inside the cylinder body for rust and scars.
- Check the piston for rust and scars.
- Check the pipe connection for clogging.

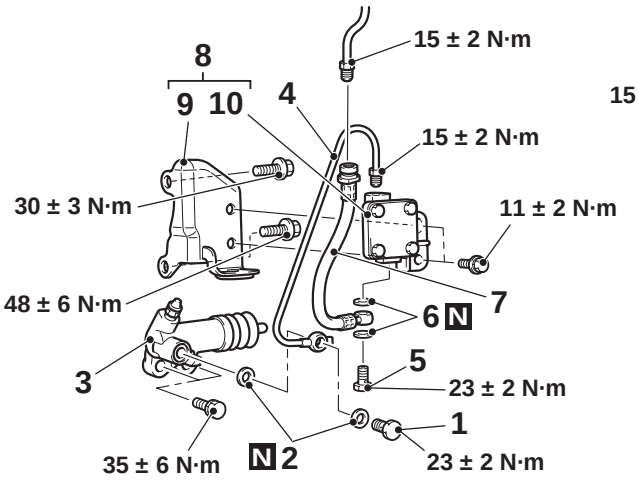
CLUTCH RELEASE CYLINDER

REMOVAL AND INSTALLATION

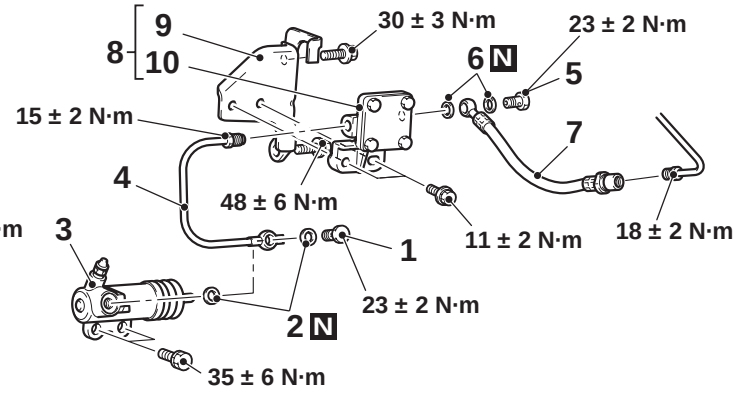
M1211005500129

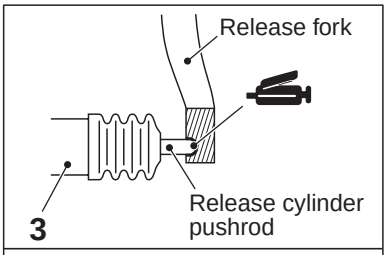
Pre-removal Operation	Post-installation Operation
Clutch Fluid Draining	• Clutch Fluid Supplying • Clutch Bleeding (Refer to P.21A-3). • Clutch Pedal Adjustment (Refer to P.21A-2).

<Except High rider, 4WD)>



<High rider, 4WD>





Specified grease:
MITSUBISHI genuine grease
PART No. 0101011 or equivalent

AC903922AB

Clutch release cylinder assembly and clutch damper assembly removal steps

- Side rubber cover rear (front wheelhouse left side).

1. Eye bolt
2. Gasket
3. Clutch release cylinder assembly
4. Clutch pipe
5. Eye bolt
6. Gasket
7. Clutch hose

Clutch release cylinder assembly and clutch damper assembly removal steps (Continued)

8. Clutch damper assembly
9. Clutch damper bracket
10. Clutch damper

INSPECTION

M1211002000200

- Check the clutch fluid line for fluid leakage.
- Check the clutch hose and pipe for cracks or clogging.

GROUP 21B

CLUTCH OVERHAUL

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CLUTCH RELEASE CYLINDER DISASSEMBLY AND REASSEMBLY 21B-6

CLUTCH RELEASE CYLINDER INSPECTION 21B-7

GENERAL SPECIFICATIONS

M1212000201356

Item	R5MB1-J-ND1	R5MB1-J-NC,V5MB1
Clutch operating method	Hydraulic type	
Clutch disc type	Single dry disc type	
Clutch disc size O.D. × I.D. mm	225 × 150	250 × 160
Clutch cover type	Diaphragm spring type	
Clutch cover setting load N	5,394 ± 441	5,850 ± 470

SERVICE SPECIFICATIONS

M1212000300286

Item	Limit
Diaphragm spring end height difference mm	0.5
Facing rivet sink mm	0.3
Release cylinder I.D. to piston O.D. clearance mm	0.15

TORQUE SPECIFICATIONS

M1212001800347

Item	N·m
Fulcrum	35 ± 6
Clutch release cylinder mounting bolt	35 ± 6
Clutch cover mounting bolt	19 ± 3
Air bleeder	8.0 ± 1.0

LUBRICANTS

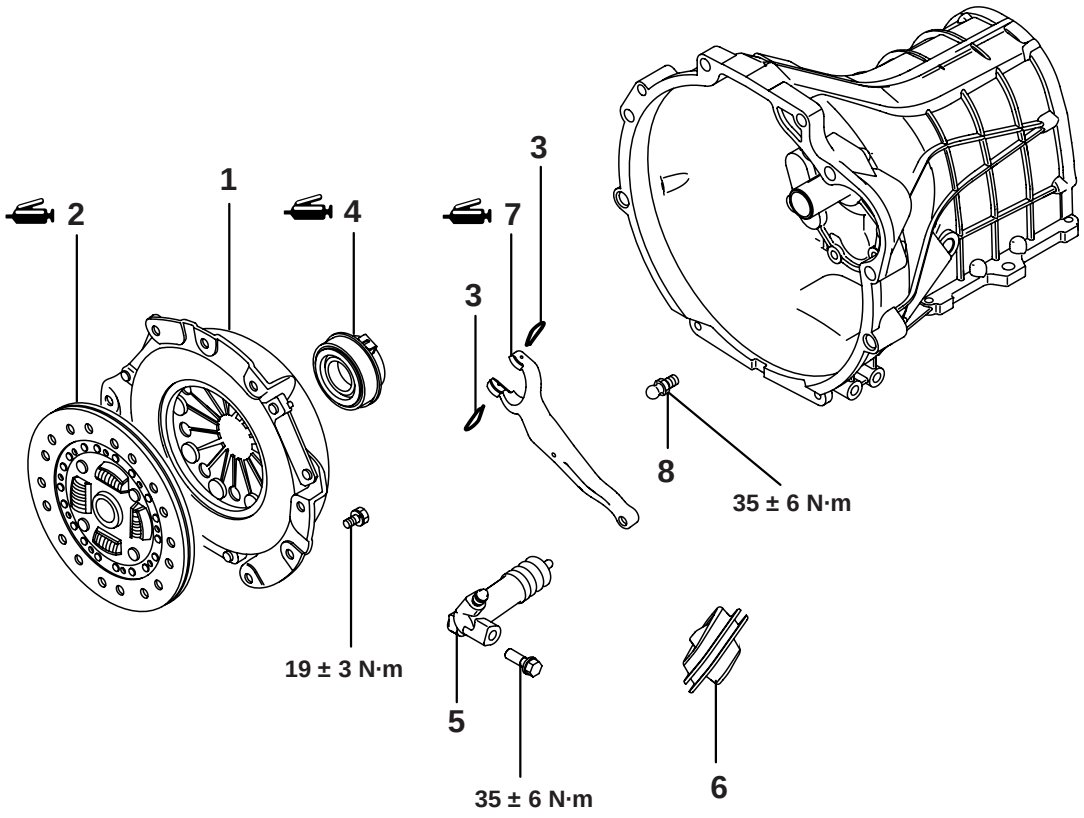
M1212000400681

Items	Specified lubricants	Quantity
Clutch release bearing to release fork contact surface	Mitsubishi Part No. 0101011 or equivalent	As required
Fulcrum to release fork contact surface		
Clutch release cylinder push rod to release fork contact surface		
Clutch release bearing inside		
Clutch disc spline		
Clutch release cylinder inner surface	Brake Fluid DOT 3 or DOT 4	
Piston and piston cups outer surface	Rubber grease	

CLUTCH

DISASSEMBLY AND REASSEMBLY

M1212001001065

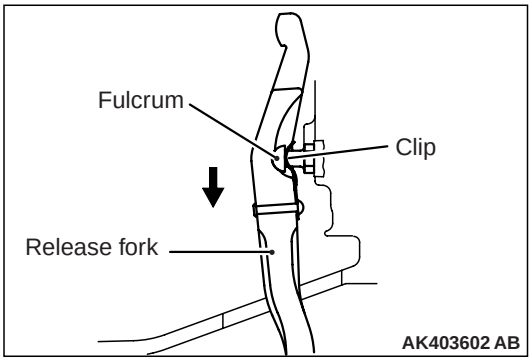


AK403591AB

			Removal steps
	>>C<<	1.	Clutch cover
	>>C<<	2.	Clutch disc
		3.	Return clip
	>>B<<	4.	Clutch release bearing
		5.	Clutch release cylinder
		6.	Boot
<<A>>	>>A<<	7.	Release fork
		8.	Fulcrum

DISASSEMBLY SERVICE POINT

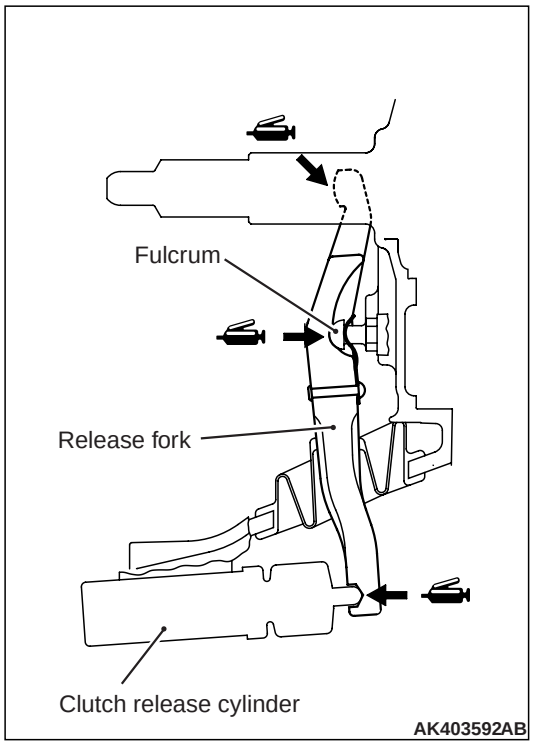
<<A>> RELEASE FORK REMOVAL



Slide the release fork in direction of the arrow and disengage the fulcrum from the clip to remove the release fork. Be careful not to damage the clip by pushing the release fork in the wrong direction or removing it with force.

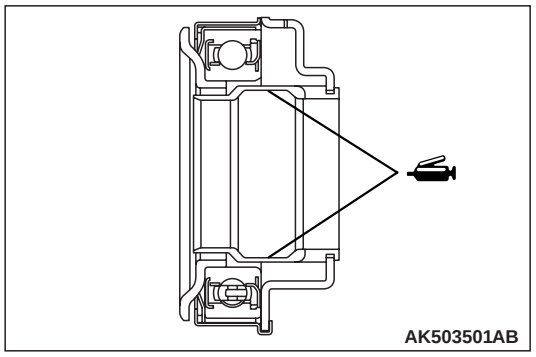
REASSEMBLY SERVICE POINTS

>>A<< RELEASE FORK INSTALLATION



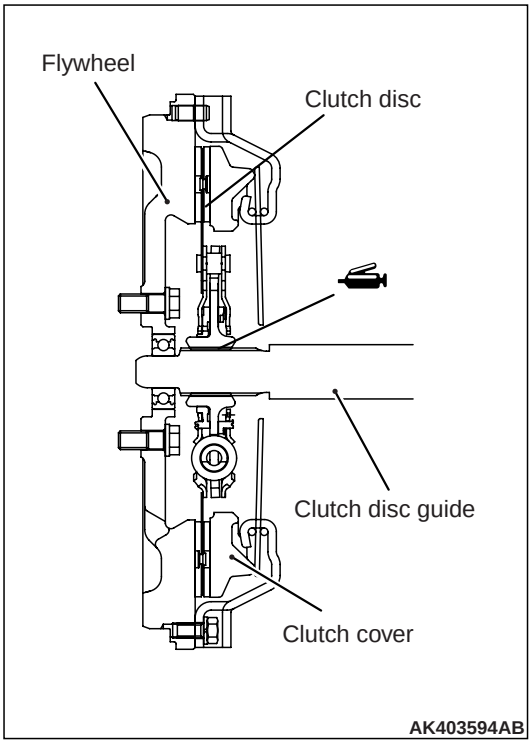
1. Apply the specified grease to the release fork.
   Specified grease: Mitsubishi Part No. 0101011 or equivalent
2. Install the release fork onto the fulcrum.

>>B<< CLUTCH RELEASE BEARING INSTALLATION

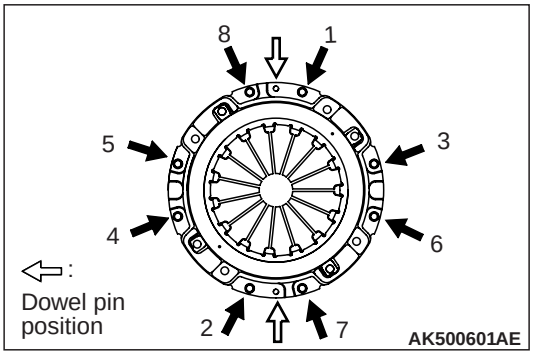


1. Apply the specified grease to the clutch release bearing inside, and fill grease in the groove.
   Specified grease: Mitsubishi Part No. 0101011 or equivalent
2. Install the clutch release bearing on the bearing retainer of the transmission.
3. Install the return clip to engage the clutch release bearing with the fork.

>>C<< CLUTCH DISC / CLUTCH COVER INSTALLATION



1. Apply the specified grease to the clutch disc splines and rub it in splines with a brush.
   Specified grease: Mitsubishi Part No. 0101011 or equivalent
2. Using the clutch disc guide to position the clutch disc on the flywheel.

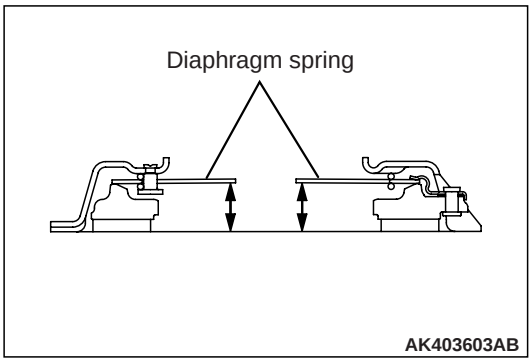


3. Install the clutch cover, aligning its installation position with the dowel pins, and then tighten the bolts to the specified torque of 19 ± 3 N·m in the order shown in the illustration.

INSPECTION

M1212001100252

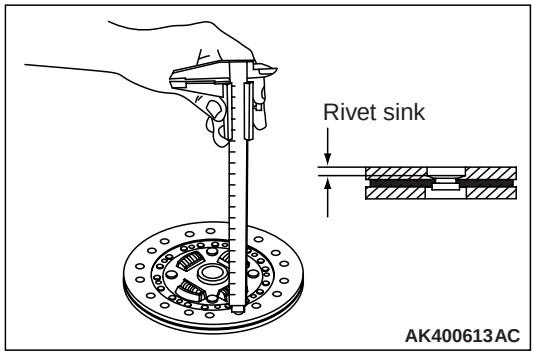
CLUTCH COVER



1. Check the diaphragm spring end for wear and uneven height. Replace if wear is evident or height difference exceeds the limit.
   Limit: 0.5 mm
2. Check the pressure plate surface for wear, cracks and seizure.
3. Check the strap plate rivets for looseness and replace the clutch cover assembly if loose.

CLUTCH DISC

⚠ CAUTION
Don't clean the clutch disc in a cleaning solvent.



1. Check the facing for loose rivets, uneven contact, deterioration due to seizure, adhesion of oil or grease. Replace the clutch disc if defective.
2. Measure the rivet sink and replace the clutch disc if it is out of specification.
   Limit: 0.3 mm
3. Check for the torsion spring play and damage. If defective, replace the clutch disc.
4. Combine the clutch disc with the input shaft and check sliding condition and play in the rotating direction. If it does not slide smoothly or the play is excessive, check after cleaning and reassembling. If the play is excessive, replace the clutch disc and/or the input shaft.

CLUTCH RELEASE BEARING

⚠ CAUTION
The clutch release bearing is packed with grease. Do not wash it in cleaning solvent.

1. Check the bearing for seizure, damage, noise, or improper rotation. If defective, replace the bearing.
2. Check for wear on the surface which contacts with the diaphragm spring. If abnormally worn, replace the bearing.
3. Check for wear on the surface which contacts with the release fork. If abnormally worn, replace the bearing.

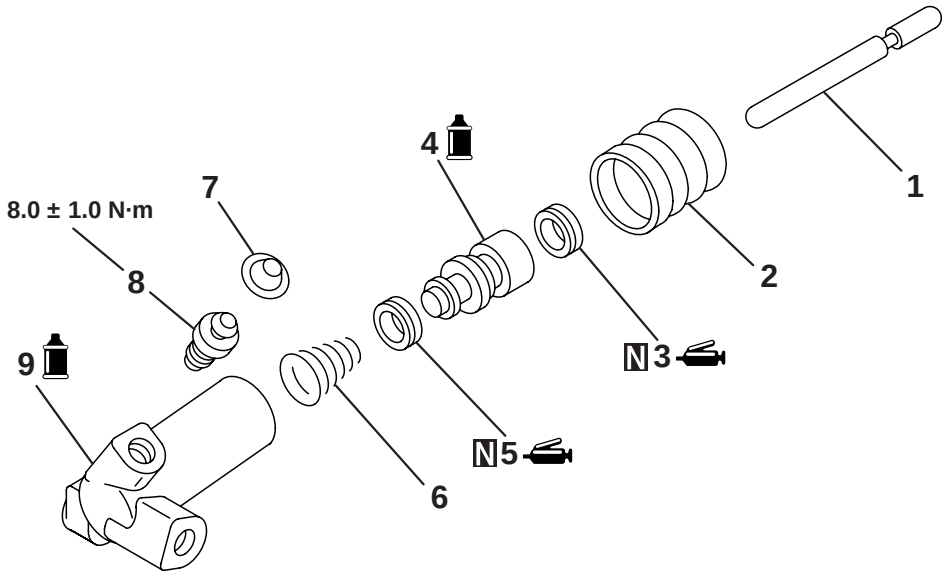
RELEASE FORK

Check for wear on the surface which contacts with the bearing. If abnormally worn, replace the release fork.

CLUTCH RELEASE CYLINDER

DISASSEMBLY AND REASSEMBLY

M1212001500573



AK503444AE

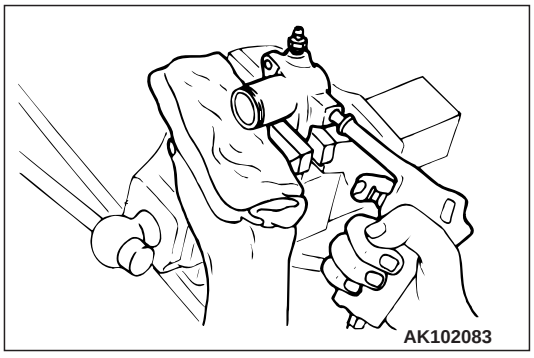
			Disassembly steps
		1.	Push rod
		2	Boot
<<**A**>>	>>**A**<<	3.	Piston cup B
<<**A**>>	>>**A**<<	4.	Piston
<<**A**>>	>>**A**<<	5.	Piston cup A
		6.	Conical spring
		7.	Cap
		8	Bleeder plug
	>>**A**<<	9.	Release cylinder

DISASSEMBLY SERVICE POINT

<<A>> PISTON CUP A / PISTON CUP B / PISTON REMOVAL

⚠ WARNING

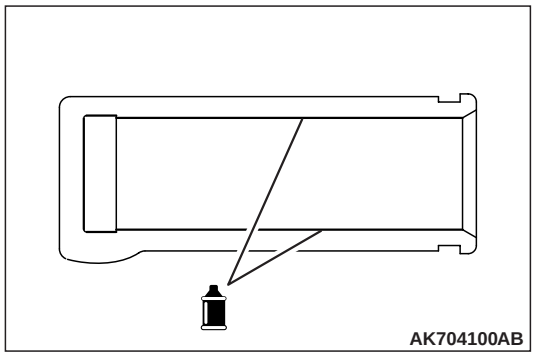
- ***Cover with a shop towel to prevent the piston from popping out.***
- ***Apply compressed air slowly to prevent brake fluid from splashing.***



Remove the piston and piston cup from the release cylinder using compressed air.

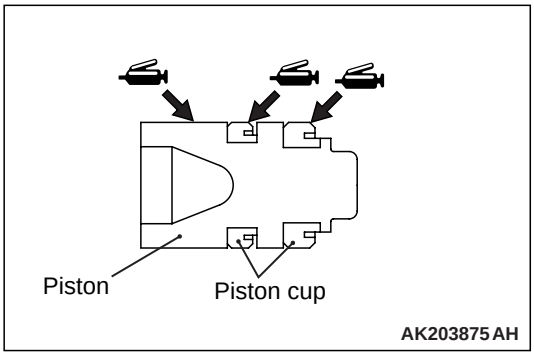
REASSEMBLY SERVICE POINT

>>A<< RELEASE CYLINDER / PISTON CUP A / PISTON CUP B / PISTON INSTALLATION



1. Apply brake fluid to the entire inner surface of the release cylinder.

   Specified brake fluid: Brake fluid DOT 3 or DOT 4



2. Apply grease to the piston and piston cups and insert the piston assembly into the release cylinder.

   Specified grease: Rubber grease

INSPECTION

M1212001600246

PISTON CUP

Check the lip of piston cup for scratch. If there are any scratches, check if there are any scores inside the release cylinder.

RELEASE CYLINDER

1. Check the inner surface of the release cylinder for rust or scratches.
2. Use a cylinder gauge to measure the inside diameter of the release cylinder at three different points (innermost, middle, and outermost points). Replace the release cylinder assembly if the clearance between the piston and cylinder exceeds the limit at any of the measurement points.

   Limit: 0.15 mm

GROUP 22

MANUAL TRANSMISSION (FR)

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GROUP 22A

MANUAL TRANSMISSION (FR)

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- TRANSMISSION OIL CHANGE 22A-3
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GENERAL INFORMATION

M1221100100403

The R5MB1 and V5MB1 type manual transmission has been adopted.

SPECIFICATIONS

Item		Specification					
Transmission mode		R5MB1	V5MB1-J-NEG	V5MB1-J-PCG	V5MB1-J-NE	V5MB1-J-PD2	V5MB1-J-NEZ
Engine model		4D56					
Transmission type		5 forward speed, one reverse, constant mesh					
Gear ratio	1st	4.313					
	2nd	2.330					
	3rd	1.436					
	4th	1.000					
	5th	0.788					
	Reverse	4.220					
Drive system		2WD	Easy select 4WD		Super select 4WD		
Centre differential		-	Not provided		Provided		
Transfer type		-	2speeds, constant mesh				
Transfer gear ratio	High	-	1.000				
	Low	-	1.900				

LUBRICANT

M1221100200154

Item		Specified lubricant	Quantity L
Transmission oil	2WD	Gear oil API classification GL-3 SAE 75W-85	2.3
	4WD		3.4
Transfer oil <4WD>		Gear oil API classification GL-3 SAE 75W-85 or API classification GL-4 SAE 75W-85	2.5

SEALANTS

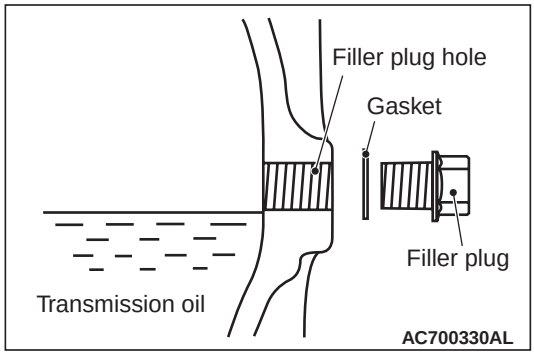
M1221102000060

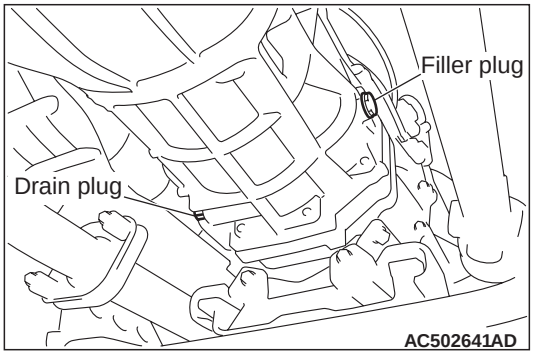
Item	Specified sealant
Transmission control lever assembly and transfer control lever assembly	3M ATD Part No.8660 or equivalent

ON-VEHICLE SERVICE

TRANSMISSION OIL LEVEL CHECK

M1221100600259



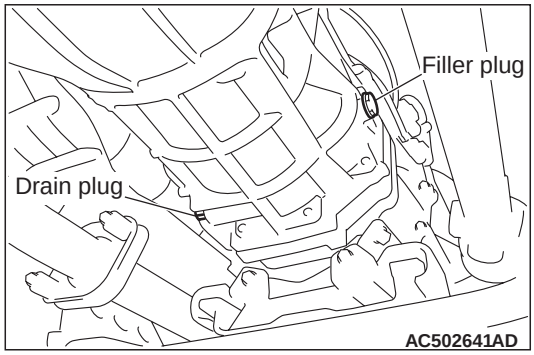


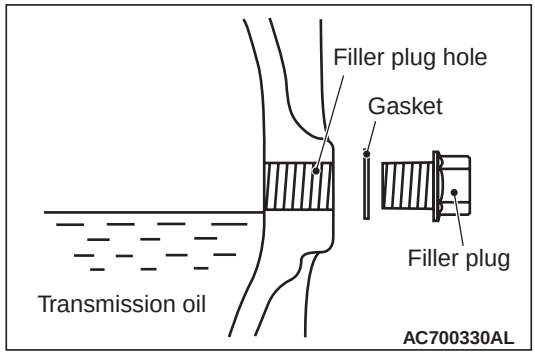
1. Remove the filler plug and gasket.
2. Check that the oil level is up to the lower edge of the filler plug hole.
3. Check that the oil is not noticeably dirty.
4. Install the filler plug and new gasket, then tighten them to the specified torque.

   Tightening torque: 37 ± 11 N·m

TRANSMISSION OIL REPLACEMENT

M1221100700342





1. Remove the filler plug and gasket.
2. Remove the drain plug and drain the oil.
3. Tighten the drain plug to the specified torque.

   Tightening torque: 37 ± 11 N·m

4. Fill with gear oil API classification GL-3 SAE 75W-85 until the level comes to the lower portion of filler plug hole.

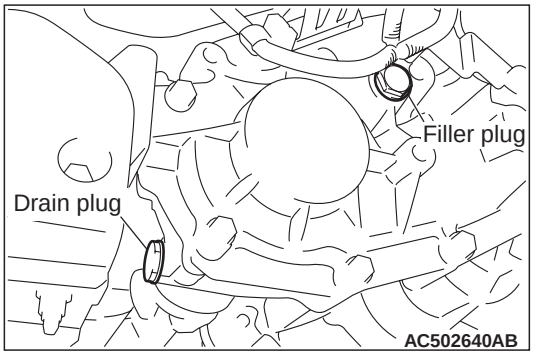
   Quantity:
   2.3 L <2WD>
   3.4 L <4WD>

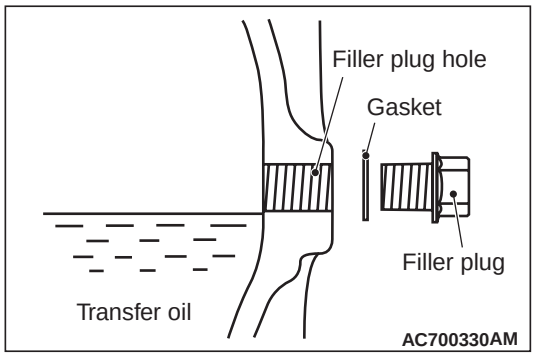
5. Install the filler plug and new gasket, then tighten them to the specified torque.

   Tightening torque: 37 ± 11 N·m

TRANSFER OIL LEVEL CHECK

M1221102500117



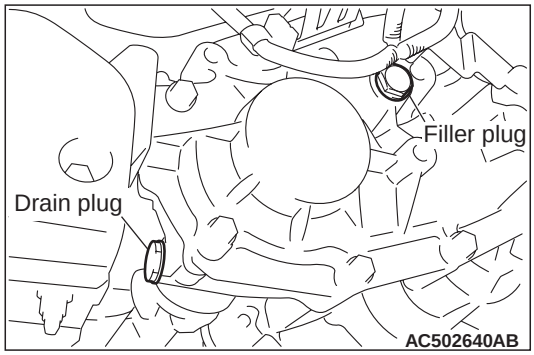


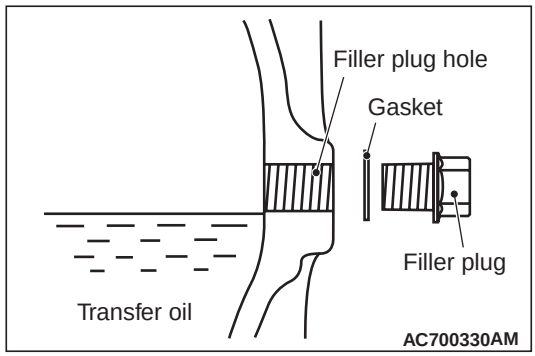
1. Remove the filler plug and gasket.
2. Check that the oil level is up to the lower edge of the filler plug hole.
3. Check that the oil is not noticeably dirty.
4. Install the filler plug and new gasket, then tighten them to the specified torque.

   Tightening torque: 32 ± 2 N·m

TRANSFER OIL REPLACEMENT

M1221102600147





1. Remove the filler plug and gasket.
2. Remove the drain plug and gasket, and then drain the oil.
3. Install the drain plug and new gasket, then tighten them to the specified torque.

   Tightening torque: 32 ± 2 N·m

4. Fill with gear oil API classification GL-3 SAE 75W-85 or API classification GL-4 SAE 75W-85 until the level comes to the lower portion of filler plug hole.

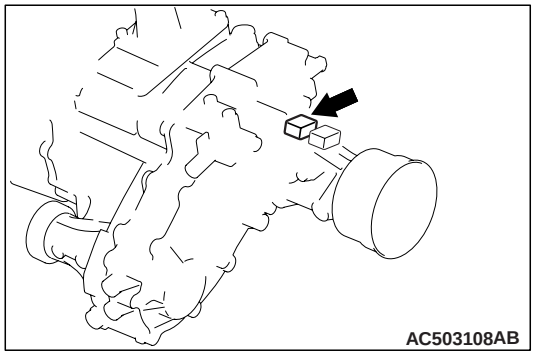
   Quantity: 2.5 L

5. Install the filler plug and new gasket, then tighten them to the specified torque.

   Tightening torque: 32 ± 2 N·m

4WD DETECTION SWITCH CONTINUITY CHECK <EASY SELECT 4WD>

M1221102700122

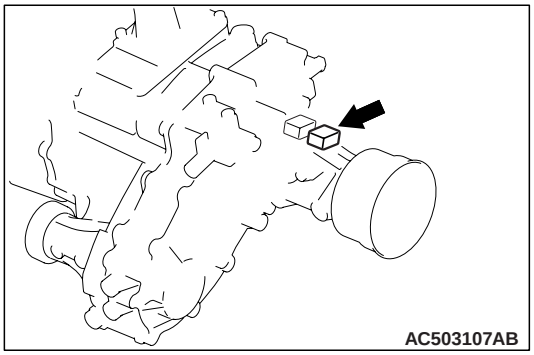


Check the continuity between terminals of the black connector and earth indicated in the illustration.

Transfer lever position	Specified condition
2H	Open circuit
4H, 4L	Continuity (Less than 2 Ω)

HIGH/LOW DETECTION SWITCH CONTINUITY CHECK <EASY SELECT 4WD>

M1221102800141

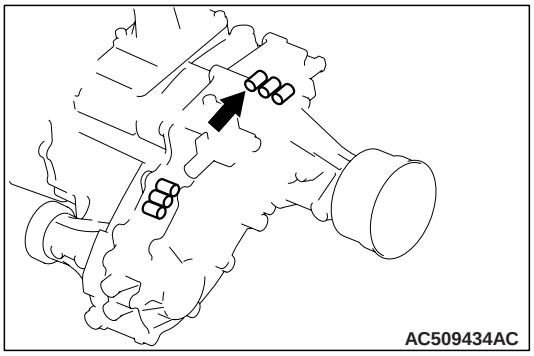


Check the continuity between terminals of the grey connector and earth indicated in the illustration.

Transfer lever position	Specified condition
While switching between 4H and 4L	Open circuit
2H, 4H, 4L	Continuity (Less than 2 Ω)

CENTRE DIFFERENTIAL LOCK DETECTION SWITCH CONTINUITY CHECK <SUPER SELECT 4WD>

M1221103100112

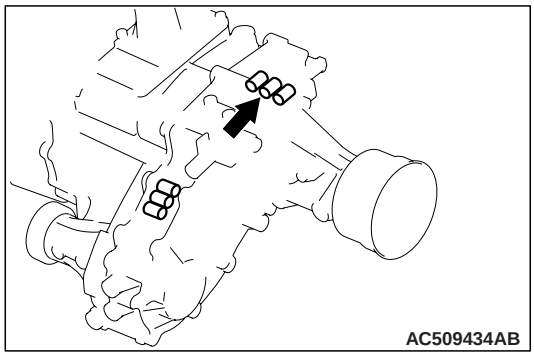


Check the continuity between terminals of the brown connector and earth indicated in the illustration.

Transfer lever position	Specified condition
4HLc and 4LLc	Continuity (Less than 2 Ω)
2H and 4H	Open circuit

2WD/4WD DETECTION SWITCH CONTINUITY CHECK <SUPER SELECT 4WD>

M1221103200119

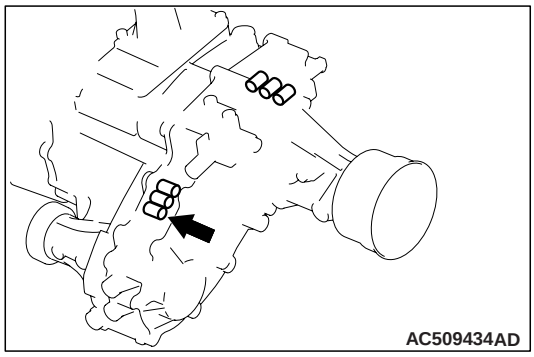


Check the continuity between terminals of the black connector and earth indicated in the illustration.

Transfer lever position	Specified condition
2H	Open circuit
4H, 4HLc and 4LLc	Continuity (Less than 2 Ω)

CENTRE DIFFERENTIAL LOCK OPERATION DETECTION SWITCH CONTINUITY CHECK <SUPER SELECT 4WD>

M1221103300075

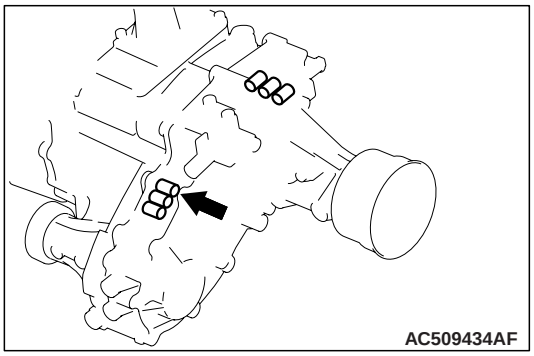


Check the continuity between terminals of the black connector and earth indicated in the illustration.

Transfer lever position	Specified condition
2H and 4H	Open circuit
4HLc and 4LLc	Continuity (Less than 2 Ω)

4WD OPERATION DETECTION SWITCH CONTINUITY CHECK <SUPER SELECT 4WD>

M1221103400038

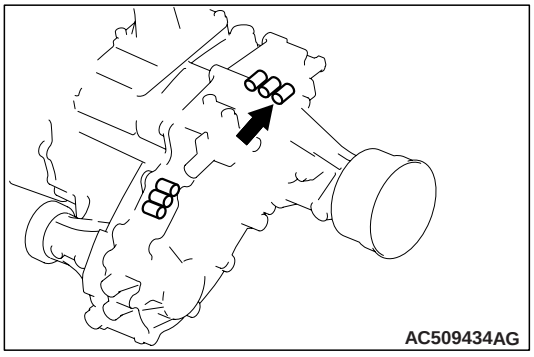

AC509434AF

Check the continuity between terminals of the brown connector and earth indicated in the illustration.

Transfer lever position	Specified condition
2H	Open circuit
4H, 4HLc and 4LLc	Continuity (Less than 2 Ω)

HIGH/LOW DETECTION SWITCH CONTINUITY CHECK <SUPER SELECT 4WD>

M1221102800152

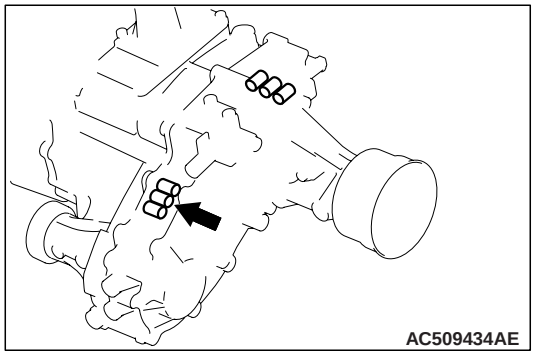

AC509434AG

Check the continuity between terminals of the white connector and earth indicated in the illustration.

Transfer lever position	Specified condition
While switching between 4HLc and 4LLc	Open circuit
2H, 4H, 4HLc and 4LLc	Continuity (Less than 2 Ω)

4LLc SWITCH CONTINUITY CHECK <HIGH POWER ENGINE>

M1221144400024


AC509434AE

Check the continuity between terminals of the white connector and earth indicated in the illustration.

Transfer lever position	Specified condition
2H, 4H, and 4HLc	Continuity (Less than 2 Ω)
4LLc	Open circuit

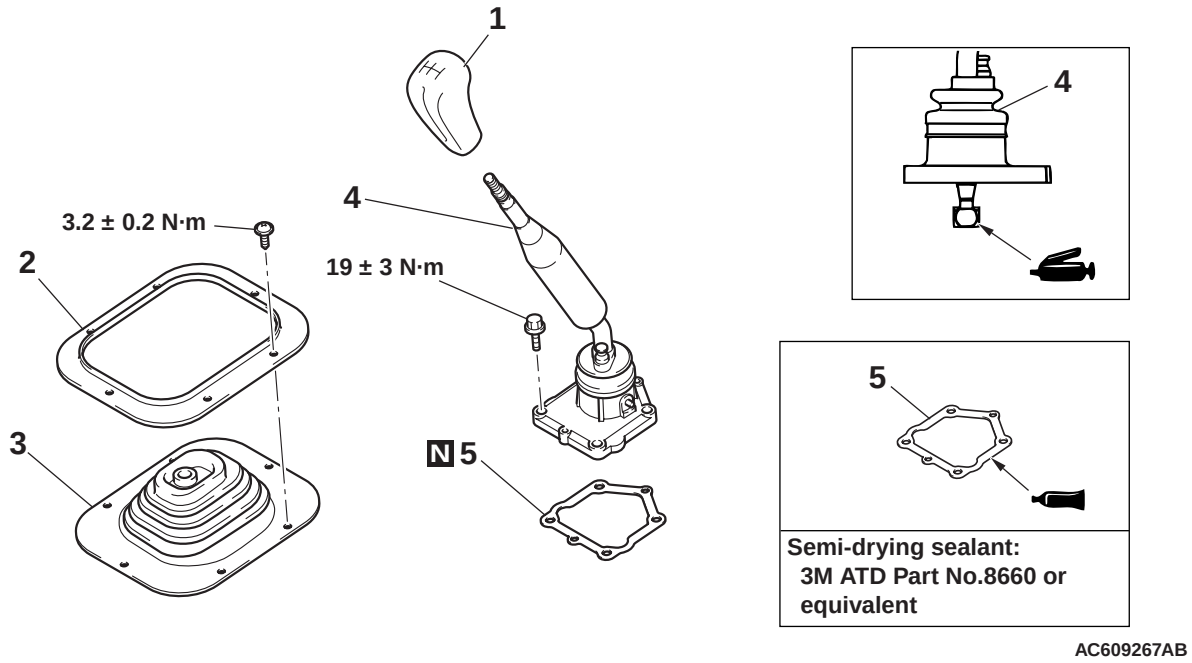
TRANSMISSION CONTROL

REMOVAL AND INSTALLATION

M1221102200116

<2WD>

Pre-removal Operation	Post-installation Operation
Move the transmission control lever to the Neutral position.	Check that the transmission control lever is moved to each position smoothly and correctly.



AC609267AB

Removal steps

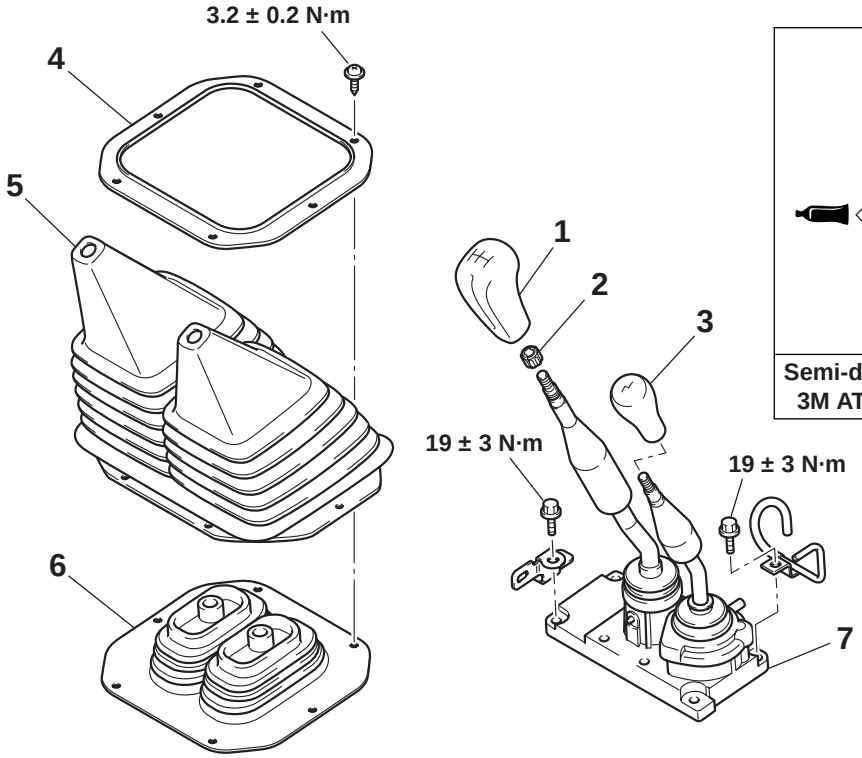
1. Shift knob
- Front floor console assembly (Refer to GROUP 52A, Floor Consol Assembly .)
2. Dust cover retaining plate
3. Dust cover

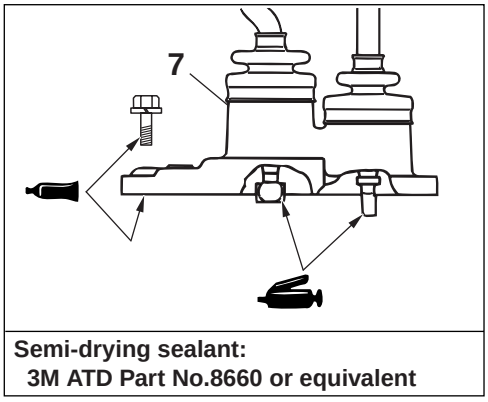
Removal steps (Continued)

4. Transmission control lever assembly
5. Gasket

<4WD>

Pre-removal Operation	Post-installation Operation
Move the transmission control lever and transfer control lever to the following positions. • Transmission control lever: Neutral • Transfer control lever: 4H	Check that the transmission control lever and the transfer control lever are moved to each position smoothly and correctly.





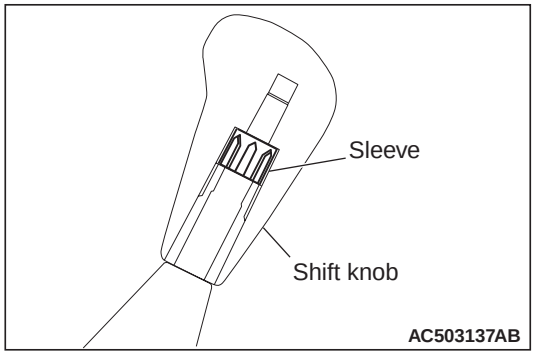
AC509473AB

Removal steps

1. Shift knob
>>A<< 2. Sleeve
3. Transfer shift lever knob
- Front floor console assembly <Vehicles with front floor consol assembly> (Refer to GROUP 52A, Floor Consol Assembly .)
4. Dust cover retaining plate
5. Control lever cover <Vehicles without front floor consol assembly>
6. Dust cover
7. Transmission control lever assembly and transfer control lever assembly

INSTALLATION SERVICE POINT

>>A<< SLEEVE INSTALLATION



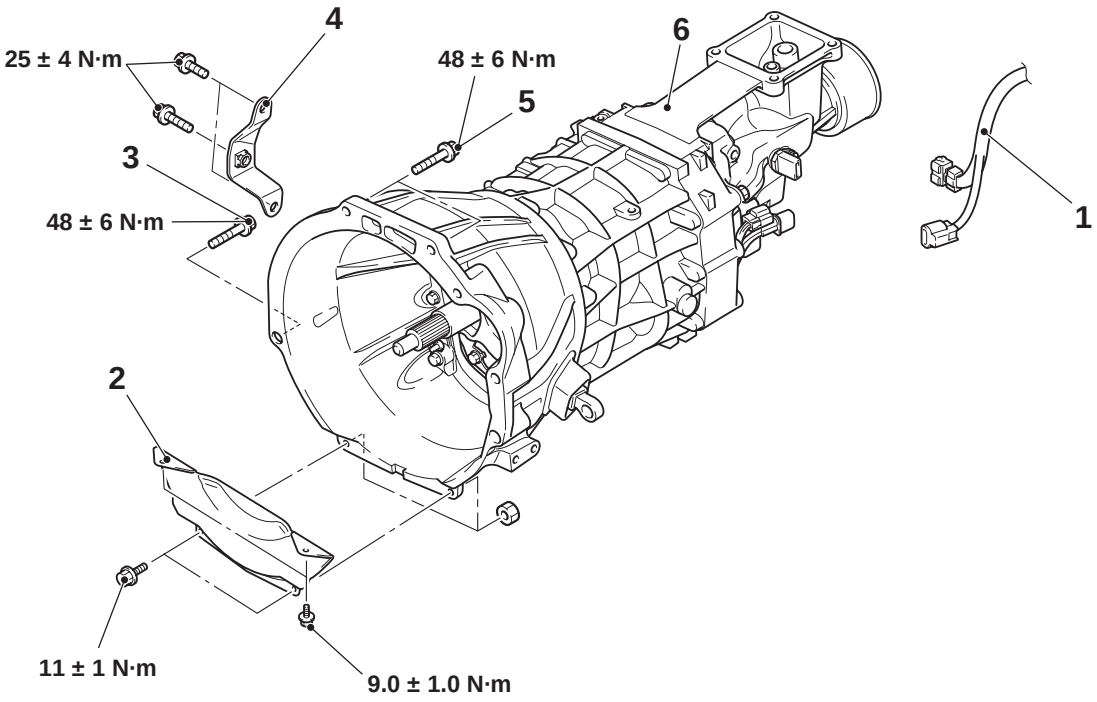
Install the sleeve with its groove facing to the direction shown in the figure, and then install the shift knob.

TRANSMISSION ASSEMBLY

REMOVAL AND INSTALLATION <2WD>

M1221102400488

Pre-removal and Post-installation Operations
- Transmission Control Lever Assembly Removal and Installation (Refer to P.22A-7).
- Transmission Oil Draining and Refilling (Refer to P.22A-3).
- Under Skid Plate and Engine Room Under Cover Removal and Installation.
- Propeller Shaft Assembly Removal and Installation (Refer to GROUP 25 – Propeller Shaft).
- Clutch Release Cylinder Assembly and Clutch Damper Assembly Removal and Installation (Disconnect the connection with transmission only and do not disconnect the clutch line.).
- Starter Assembly Removal and Installation (Refer to GROUP 16 – Starter Motor Assembly).
- No.2 Crossmember Assembly and Transmission Mount Insulator Assembly Removal and Installation (Refer to GROUP 32 – Rear Engine Mounting).



AC807940AC

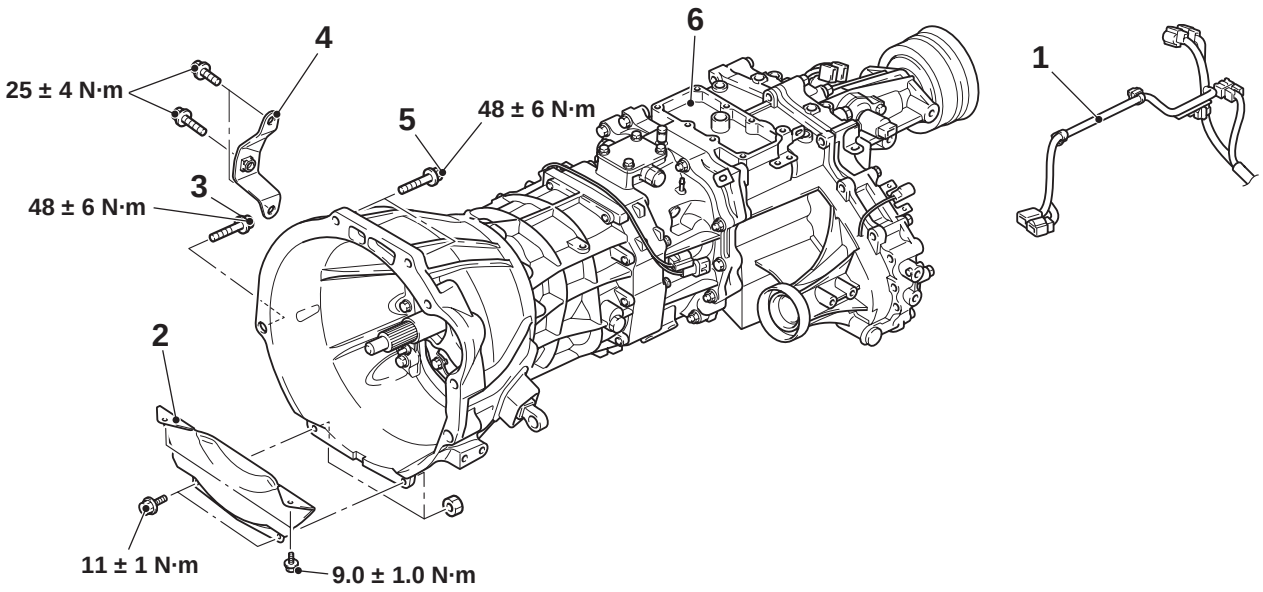
Removal steps
1. Transmission harness connector connection
- Support the transmission with a transmission jack
2. Bell housing cover

Removal steps (Continued)
3. Transmission assembly lower part coupling bolts
4. Front exhaust pipe bracket
5. Transmission assembly upper part coupling bolts
6. Transmission assembly

REMOVAL AND INSTALLATION <4WD>

M1221102400499

Pre-removal and Post-installation Operations
- Transmission Control Lever Assembly and Transfer Control Lever Assembly Removal and Installation (Refer to P.22A-7).
- Transmission Oil Draining and Refilling (Refer to P.22A-3).
- Transfer Oil Draining and Refilling (Refer to P.22A-4).
- Under Skid Plate and Engine Room Under Cover Removal and Installation (Refer to GROUP 51 – Under Cover).
- Front and Rear Propeller Shaft Removal and Installation (Refer to GROUP 25).
- Front Exhaust Pipe Removal and Installation (Refer to GROUP 15 – Front Exhaust Pipe and Main Muffler .)
- Clutch Release Cylinder Assembly and Clutch Damper Assembly Removal and Installation (Disconnect the connection with transmission only and do not disconnect the clutch line.) (Refer to GROUP 21A – Clutch Release Cylinder Assembly).
- Starter Assembly Removal and Installation (Refer to GROUP 16 – Starter Motor Assembly).
- Transfer Mount Bracket Assembly Removal and Installation (Refer to GROUP 32 – Transfer Mounting).
- No.2 Crossmember Assembly and Transmission Mount Insulator Assembly Removal and Installation (Refer to GROUP 32 – Rear Engine Mounting).



AC809607AB

Removal steps
1. Transmission harness connector connection
   - Support the transmission with a transmission jack
2. Bell housing cover

Removal steps (Continued)
3. Transmission assembly lower part coupling bolts
4. Front exhaust pipe bracket
5. Transmission assembly upper part coupling bolts
6. Transmission assembly

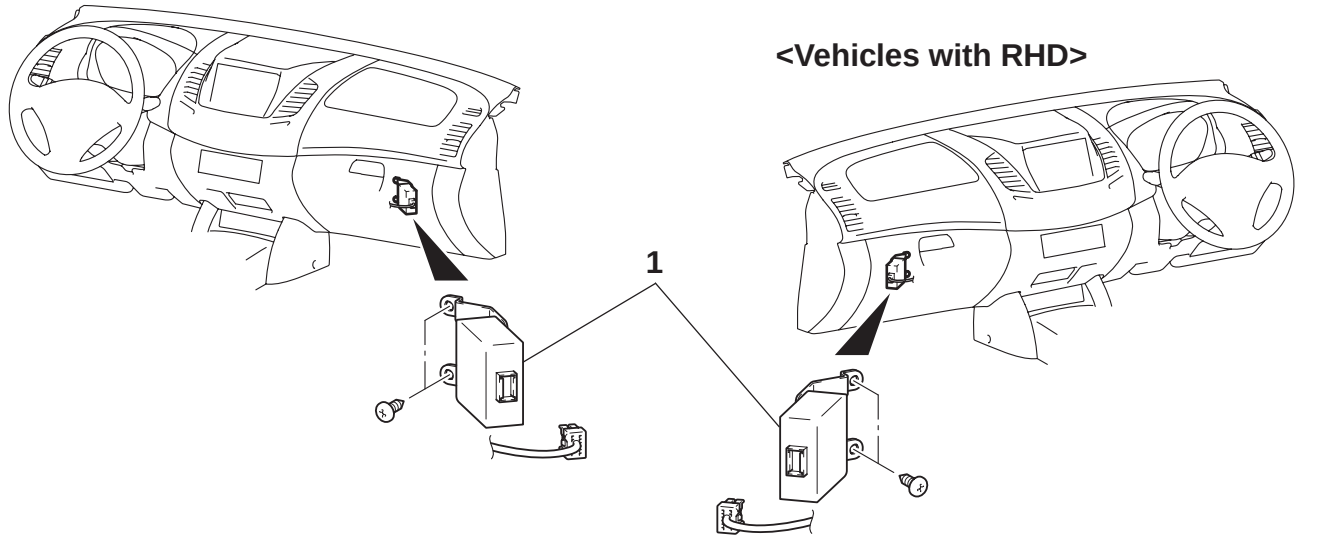
4WD INDICATOR-ECU

REMOVAL AND INSTALLATION

M1221102900029

<Vehicles with LHD>

<Vehicles with RHD>



AC509527AB

Removal steps

- Glove Box Cover (Refer to GROUP 52A, Instrument Panel Assembly).

1. 4WD indicator-ECU

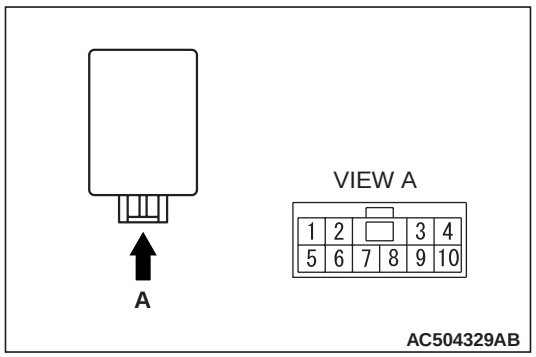
INSPECTION

M1221101200157

4WD INDICATOR-ECU

1. Measure the voltage with the control unit and harness still connected.
2. Earth terminal (8) and then measure the terminal voltage.

EASY SELECT 4WD



AC504329AB

Terminal No.	Inspection item	Ignition switch	Transfer shift position	Terminal voltage
1	Free wheel engage switch	ON	2H	System voltage
			4H*1	1 V or less
2	4WD detection switch	ON	2H	System voltage
			4H, 4L	1 V or less
3	Ignition switch	ON	–	System voltage
		OFF	–	1 V or less
6	High/low detection switch	ON	While switching between 4H and 4L	System voltage
			2H, 4H, 4L	1 V or less

Terminal No.	Inspection item	Ignition switch	Transfer shift position	Terminal voltage
7	Free wheel clutch changeover solenoid valve	ON	4H, 4L	1 V or less
			2H*2	System voltage
10	4WD indicator lamp	ON	2H	1 V or less
			4H, 4L	System voltage

NOTE:

**1: When vehicle has been moved once.*

**2: Shift the lever from 4H to 2H, and then turn the ignition switch to OFF and then back to ON.*

<SUPER SELECT 4WD>

Terminal No.	Inspection item	Ignition switch	Transfer shift position	Terminal voltage
1	Free wheel engage switch	ON	2H	System voltage
			4H*1	1 V or less
2	4WD operation detection switch	ON	2H	System voltage
			4H, 4HLc, 4LLc	1 V or less
3	Ignition switch	ON	–	System voltage
		OFF	–	1 V or less
4	Centre differential lock indicator lamp	ON	4H	1 V or less
			4HLc	System voltage
5	Rear wheel indicator lamp	ON	While switching between 4HLc and 4LLc	1 V or less
			2H, 4H, 4HLc, 4LLc	System voltage
6	High/low detection switch	ON	While switching between 4HLc and 4LLc	System voltage
			2H, 4H, 4HLc, 4LLc	1 V or less
7	Centre differential lock operation detection switch	ON	4HLc	1 V or less
			4H*2	System voltage
9	Centre differential lock detection switch	ON	4HLc	1 V or less
			4H*2	System voltage
10	Front wheel indicator lamp	ON	While switching between 4HLc and 4LLc	1 V or less
			4H, 4HLc, 4LLc	System voltage

NOTE:

**1: When vehicle has been moved once.*

**2: Shift the lever from 4HLc to 4H, and then turn the ignition switch to OFF and then back to ON.*

GROUP 22B

MANUAL TRANSMISSION OVERHAUL <R5MB1>

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GENERAL INFORMATION

M1222000101275

MANUAL TRANSMISSION MODELS

Transmission model	Engine model	Vehicle model
R5MB1-J-NC	4D56 DI-D DOHC	KA4T
R5MB1-J-ND1		

GENERAL SPECIFICATIONS

M1222000200785

Item		Specifications
Transmission model		R5MB1
Transmission type		5-speed transmission, floor shift
Transmission gear ratio	1st	4.313
	2nd	2.330
	3rd	1.436
	4th	1.000
	5th	0.789
	Reverse	4.220

SERVICE SPECIFICATIONS

M1222000300492

Item		Standard value	Limit
Transmission			
Gear spline piece No.5 end play mm		0 – 0.1	–
Clearance between the synchronizer ring and the gear mm		0.52 - 1.88	0.52
Counter shaft gear No.5	thrust clearance mm	0.10 - 0.35	0.35
	radial clearance mm	0.015 – 0.068	0.068
	inside diameter mm	38.015 – 38.040	38.040
Input shaft			
Input shaft radial ball bearing end play mm		0 – 0.1	–
clearance between the synchronizer ring and the 4th gear mm		0.70 – 1.70	0.70
Output shaft			
Thrust clearance mm	1st gear	0.20 – 0.45	0.45
	2nd gear	0.10 – 0.25	0.25
	3rd gear	0.10 – 0.25	0.25

Item		Standard value	Limit
Radial clearance mm	1st gear	0.020 – 0.073	0.073
	2nd gear	0.015 – 0.068	0.068
	3rd gear	0.015 – 0.068	0.068
Transmission clutch hub No.1 end play mm		0 – 0.1	–
Transmission clutch hub No.2 end play mm		0 – 0.1	–
5th gear end play mm		0 – 0.1	–
Clearance between the synchronizer ring and the each gear mm	1st gear	0.65 – 1.75	0.65
	2nd gear	0.65 – 1.75	0.65
	3rd gear	0.65 – 1.75	0.65
Clearance between the each sleeve and the shift fork mm	sleeve No.1	0.15 – 0.41	0.41
	sleeve No.2	0.15 – 0.35	0.35
	sleeve No.3	0.26 – 0.84	0.84
Output shaft outer shape of the needle roller bearing race mm	A	37.984 – 38.000	37.984
	B	46.984 – 47.000	46.984
	C	38.979 – 38.995	38.979
Output shaft flange thickness mm		–	4.800
Output shaft runout mm		–	0.015
Each gear inside diameter mm	1st gear	46.015 – 46.040	46.040
	2nd gear	53.015 – 53.040	53.040
	3rd gear	44.015 – 44.040	44.040
Counter shaft			
Counter gear shaft cylindrical roller bearing end play mm		0 – 0.1	–
Counter shaft outer shape of the needle roller bearing race mm	D	34.000 – 34.105	34.000
	E	29.984 – 30.000	29.984
Reverse idler gear			
Reverse idler gear radial clearance mm		0.040 – 0.082	0.082

SNAP RING, SPACER AND THRUST PLATE FOR ADJUSTMENT

M1222012000595

Shaft snap ring (For adjustment of gear spline piece No.5 end play)

Thickness mm	Identification symbol	Thickness mm	Identification symbol
2.80 – 2.85	A	3.00 – 3.05	E
2.85 – 2.90	B	3.05 – 3.10	F
2.90 – 2.95	C	3.10 – 3.15	G
2.95 – 3.00	D		

Shaft snap ring (For adjustment of input shaft radial ball bearing end play)

Thickness mm	Identification symbol	Thickness mm	Identification symbol
2.10 – 2.15	A	2.30 – 2.35	E
2.15 – 2.20	B	2.35 – 2.40	F
2.20 – 2.25	C	2.40 – 2.45	G
2.25 – 2.30	D		

Shaft snap ring (For adjustment of transmission clutch hub No.2 end play)

Thickness mm	Identification symbol	Thickness mm	Identification symbol
1.80 – 1.85	A	2.00 – 2.05	E
1.85 – 1.90	B	2.05 – 2.10	F
1.90 – 1.95	C	2.10 – 2.15	G
1.95 – 2.00	D		

Shaft snap ring (For adjustment of transmission clutch hub No.1 end play)

Thickness mm	Identification symbol	Thickness mm	Identification symbol
2.30 – 2.35	A	2.50 – 2.55	E
2.35 – 2.40	B	2.55 – 2.60	F
2.40 – 2.45	C	2.60 – 2.65	G
2.45 – 2.50	D		

Shaft snap ring (For adjustment of 5th gear end play)

Thickness mm	Identification symbol	Thickness mm	Identification symbol
2.75 – 2.80	C	3.05 – 3.10	J
2.80 – 2.85	D	3.10 – 3.15	K
2.85 – 2.90	E	3.15 – 3.20	L
2.90 – 2.95	F	3.20 – 3.25	M
2.95 – 3.00	G	3.25 – 3.30	N
3.00 – 3.05	H	3.30 – 3.35	P

Shaft snap ring (For adjustment of counter gear shaft cylindrical roller bearing end play)

Thickness mm	Identification symbol	Thickness mm	Identification symbol
2.05 – 2.10	A	2.20 – 2.25	D
2.10 – 2.15	B	2.25 – 2.30	E
2.15 – 2.20	C	2.30 – 2.35	F

TORQUE SPECIFICATIONS

M1222013900494

Item	N·m
Intermediate plate – reverse shift arm bracket mounting bolt	18 ± 5
Transmission case – clutch housing mounting bolt	36 ± 7
Transmission case – clutch housing mounting bolt (with seal)	34 ± 6
Transmission case – front bearing retainer sub-assembly mounting bolt	16.5 ± 5.0

Item	N·m
Transmission case – back-up lamp switch assembly	44 ± 9
Transmission case – shift position switch assembly <R5MB1-J-NC>	34 ± 5
Transmission case – vehicle speed sensor mounting bolt	11 ± 1
Extension housing – straight screw plug with head	18.5 ± 5.5
Transmission case – extension housing sub-assembly, and intermediate plate mounting bolt	37 ± 11
Intermediate plate – straight screw plug with head	18.5 ± 5.5
Gear shift fork No.1 mounting bolt	19.5 ± 3.9
Gear shift fork No.2 mounting bolt	19.5 ± 3.9
Intermediate plate – rear bearing output retainer mounting bolt	18 ± 5
Oil receiver pipe mounting bolt	11 ± 4
Shift lever housing mounting bolt	33 ± 3

SEALANTS

M1222000501132

Item	Specified sealant and adhesive
Between transmission case sub-assembly and intermediate plate	Mitsubishi Part No.MD974421 or equivalent
Between front bearing retainer and transmission case	
Between intermediate plate and extension housing sub-assembly	
Straight screw plug with head	
Front bearing retainer mounting bolt	
Clutch housing mounting bolt	

FORM-IN-PLACE GASKET (FIPG)

This transmission has several areas where the form-in-place gasket (FIPG) is used for sealing. To ensure that the FIPG fully serves its purpose, it is necessary to observe some precautions when applying it. Bead size, continuity and location are of paramount importance.

Too thin a bead could cause leaks. Too thick a bead, on the other hand, could be squeezed out of location, causing blocking or narrowing of fluid passages. To prevent leaks or blocking of passages, therefore, it is absolutely necessary to apply the FIPG evenly without a break, while observing the correct bead size. FIPG hardens as it reacts with the moisture in the atmospheric air, and it is usually used for sealing metallic flange areas.

⚠ CAUTION

When re-applying liquid gasket (FIPG), be sure that:

1. **Residues of FIPG are cleared from all the ins and outs of parts;**
2. **Use Mitsubishi genuine parts cleaner (MZ100387) or equivalent to well degrease the FIPG-applied surface.**
3. **FIPG is correctly applied in accordance with FIPG Application.**

Disassembly

Parts sealed with a FIPG can be easily removed without need for the use of a special method. In some cases, however, the FIPG in joints may have to be broken by tapping parts with a mallet or similar tool.

Surface Preparation
Thoroughly remove all substances deposited on the FIPG application surface, using a gasket scraper. Make sure that the FIPG application surfaces is flat and smooth. Also make sure that the surface is free from oils, greases and foreign substances. Do not fail to remove old FIPG that may remain in the fastener fitting holes.

FIPG Application
Applied FIPG bead should be of the specified size and free of any break. FIPG can be wiped away unless it has completely hardened. Install the mating parts in position while the FIPG is still wet. Do not allow FIPG to spread beyond the sealing areas during installation. Avoid operating the transmission or letting oils or water come in contact with the sealed area before a time sufficient for FIPG to harden (approximately one hour) has passed.
FIPG application method may vary from location to location. Follow the instruction for each particular case described later in this manual.

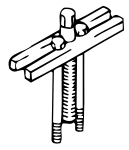
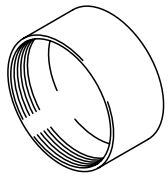
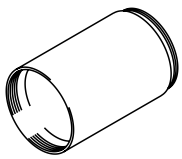
LUBRICANTS

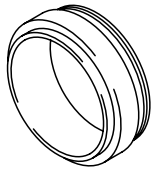
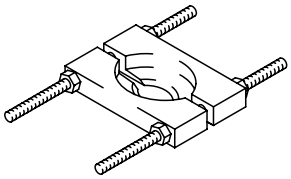
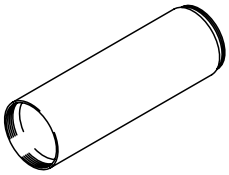
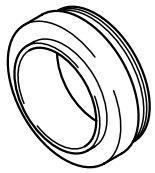
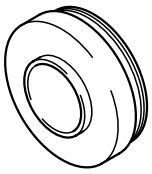
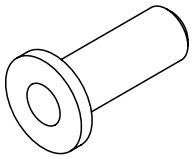
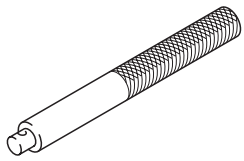
M1222000400994

Item	Specified lubricant
Transmission oil	Gear oil API classification GL-3 SAE 75W-85

SPECIAL TOOLS

M1222000600534

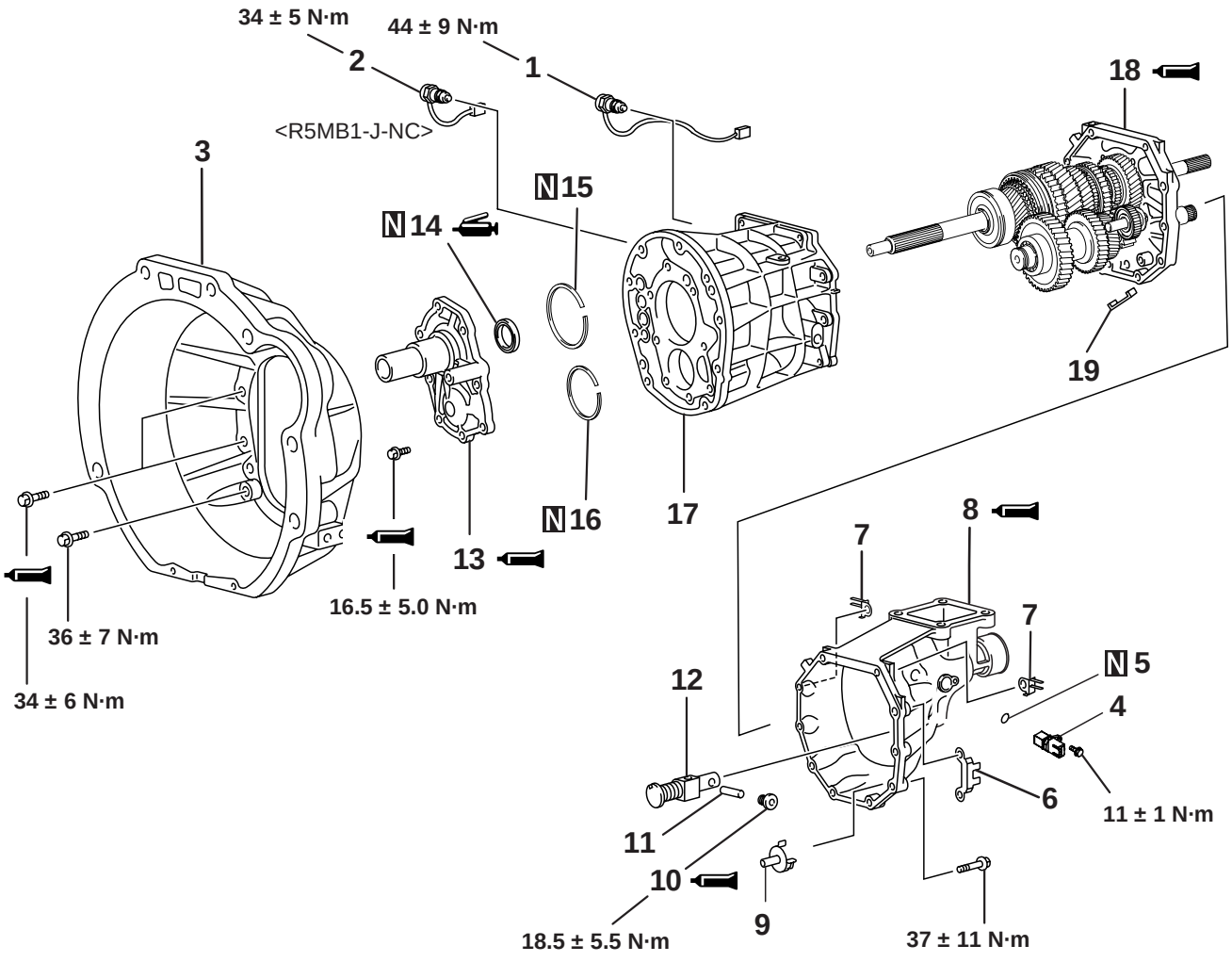
Tool	Tool number	Name	Use
 MB990803	MB990803	Steering wheel puller	Removal of gear spline piece No.5
MB990811	MB990811	Side bearing puller cup	Use with Steering wheel puller
	MD998812	Installer cap	Use with installer and adapter
	MD998813	Installer-100	Use with installer cap and adapter

Tool	Tool number	Name	Use
	MD998827	Installer adapter (56)	Use with installer cap and adapter
	MD998801	Remover	Removal of roller bearing and ball bearing, input gear corn ring, transmission clutch hub No.1 and transmission clutch hub No.2
	MD998814	Installer-200	Use with installer cap and adapter
	MD998823	Installer adapter (48)	Installation of ball bearing, 5th gear, transmission clutch hub No.1 and transmission hub No.2
	MD998817	Installer adapter (34)	Use with installer cap and adapter
	MB990699	Differential oil seal installer	Installation of oil seal
	MB990929	Installer adapter	Installation of oil seal
	MB990938	Installer bar	Use with installer adaoter

TRANSMISSION

DISASSEMBLY AND REASSEMBLY

M1222001001765



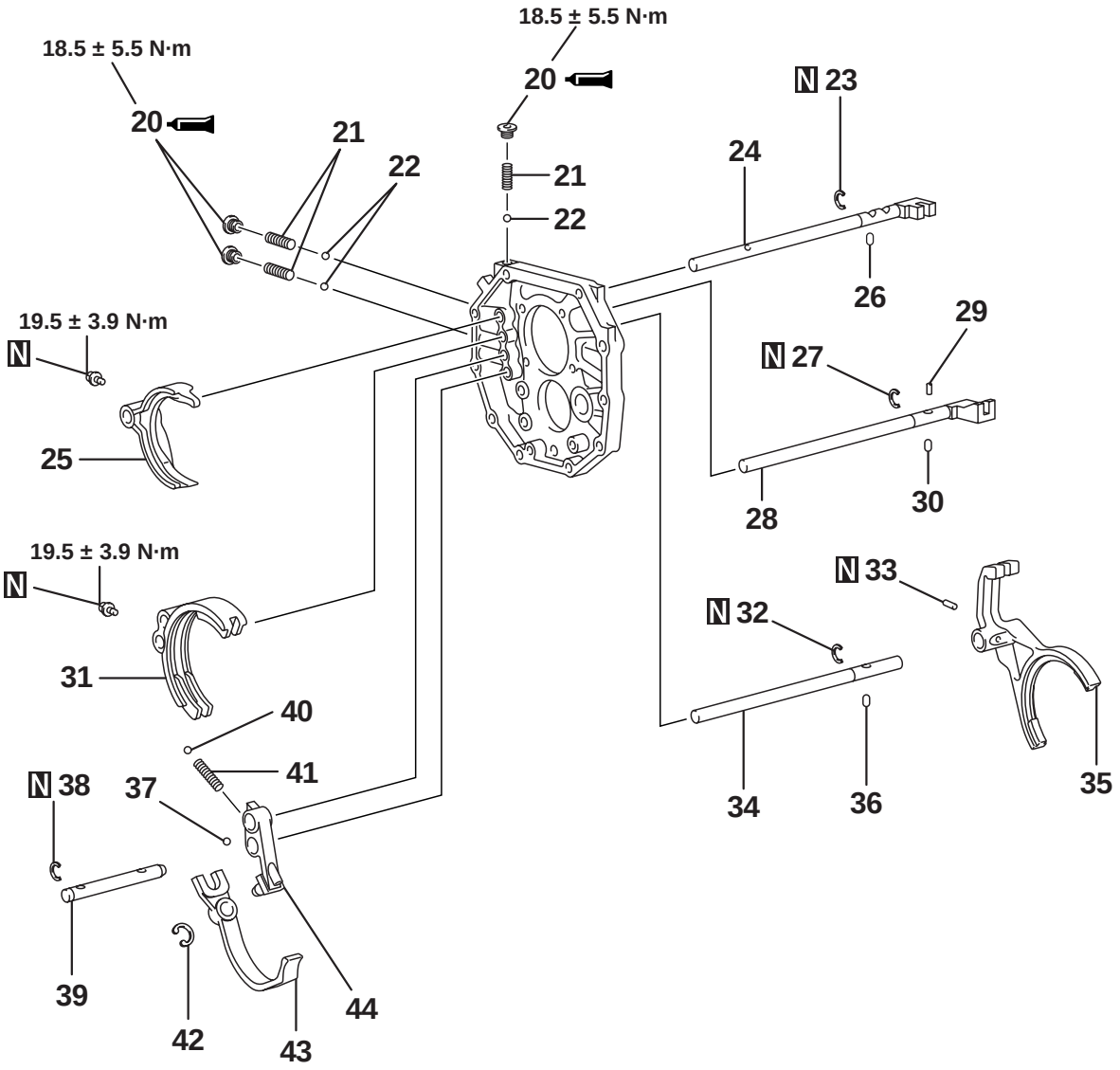
AK701068AD

Disassembly steps

1. Back-up lamp switch assembly
2. Shift position switch assembly <R5MB1-J-NC>
3. Clutch housing
4. Vehicle speed sensor
5. O-ring
6. Wiring harness clamp bracket
7. Wiring harness clamp bracket
8. Extension housing sub-assembly
9. Oil receiver pipe
10. Straight screw plug with head
11. Slotted spring pin

Disassembly steps (Continued)

12. Reverse restrict pin assembly
13. Front bearing retainer
14. Oil seal
15. Shaft snap ring
16. Shaft snap ring
17. Transmission case sub-assembly
18. Intermediate plate with shaft sub-assembly
19. Transmission magnet



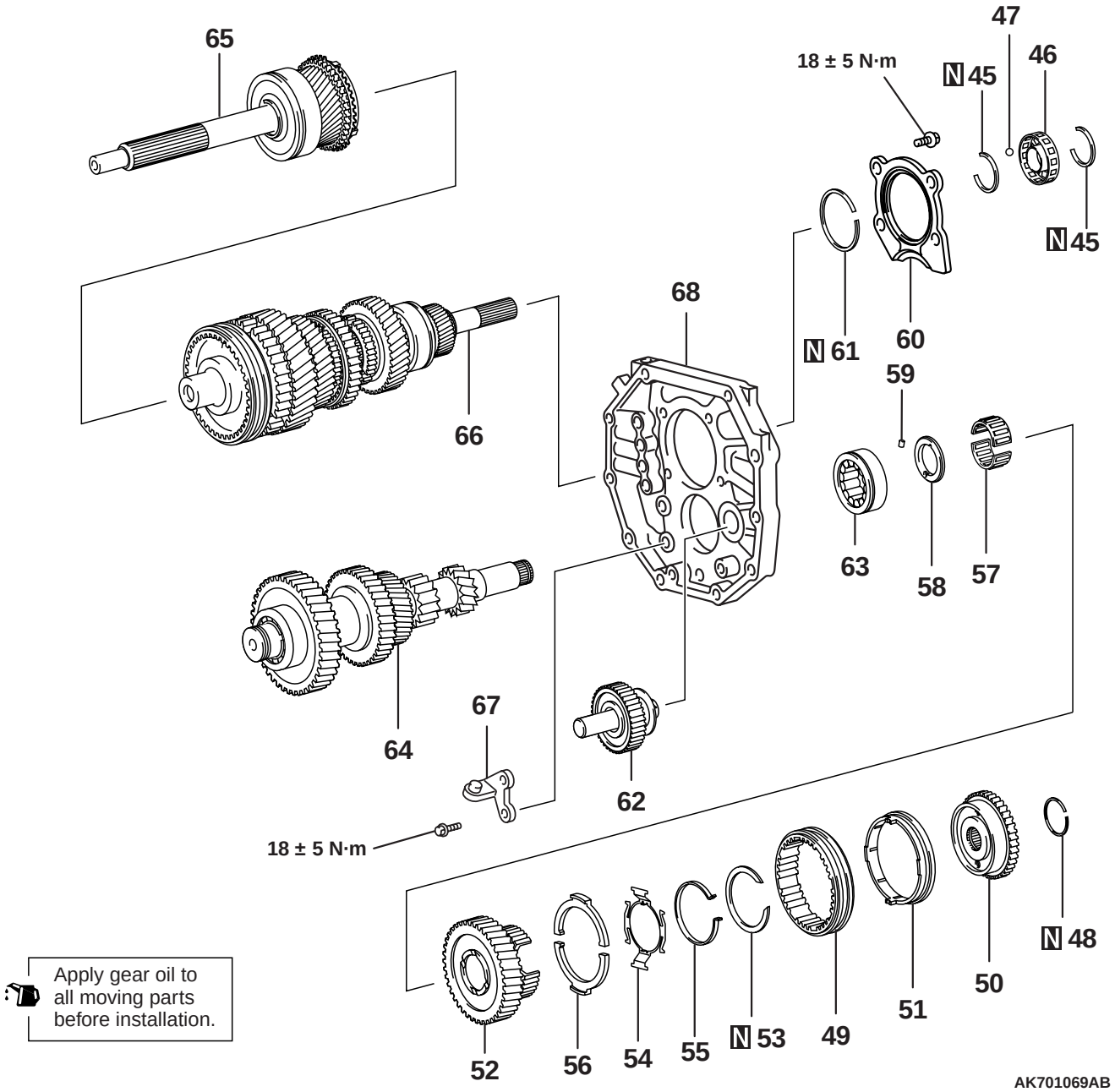
AK602734AC

Disassembly steps

20. Straight screw plug with head
21. Compression spring
22. Ball
23. Shaft snap ring
24. Gear shift fork shaft No.2
25. Gear shift fork No.2
26. Roller A
27. Shaft snap ring
28. Gear shift fork shaft No.1
29. Straight pin
30. Roller A
31. Gear shift fork No.1
32. Shaft snap ring
33. Slotted spring pin

Disassembly steps (Continued)

34. Gear shift fork shaft No.3
35. Gear shift fork No.3
36. Roller A
37. Ball
38. Shaft snap ring
39. Gear shift fork shaft No.4
40. Ball
41. Compression spring
42. E-ring
43. Reverse shift arm
44. Reverse shift fork



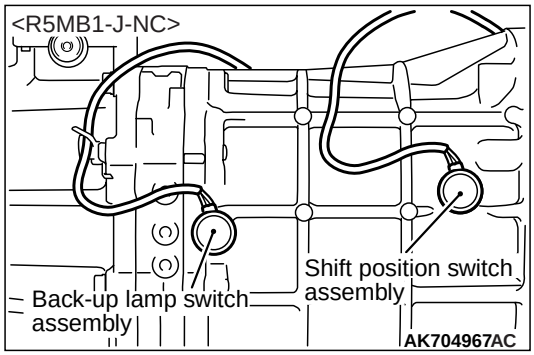
Disassembly steps

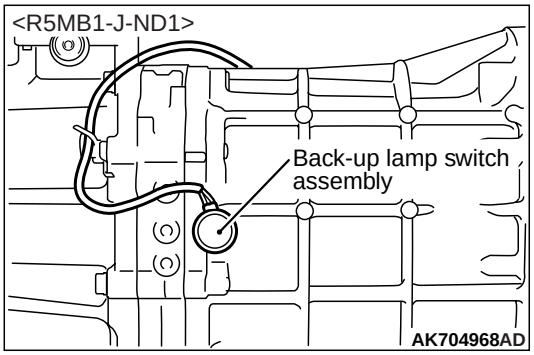
45. Shaft snap ring
46. Rotor
47. Ball
48. Shaft snap ring
49. Transmission hub sleeve No.3
50. Gear spline piece No.5
51. Synchronizer outer race No.3
52. Counter shaft gear No.5
53. Shaft snap ring
54. Synchromesh shifting key spring No.3
55. Synchromesh shifting key spring No.3
56. Synchromesh shifting key No.3

Disassembly steps (Continued)

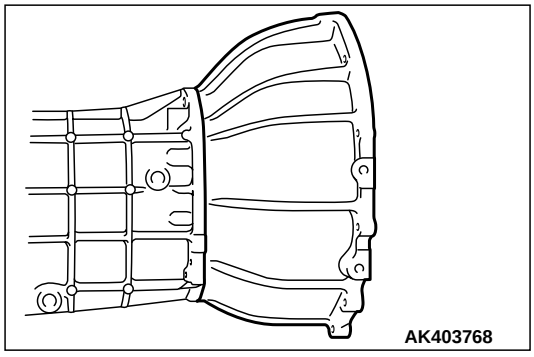
57. Needle roller bearing
58. 5th gear thrust washer
59. Straight pin
60. Rear bearing output shaft retainer
61. Shaft snap ring
62. Reverse idler gear
63. Cylindrical roller bearing
64. Counter shaft sub-assembly
65. Input shaft sub-assembly
66. Output shaft sub-assembly
67. Reverse shift arm bracket
68. Intermediate plate

DISASSEMBLY SERVICE POINTS

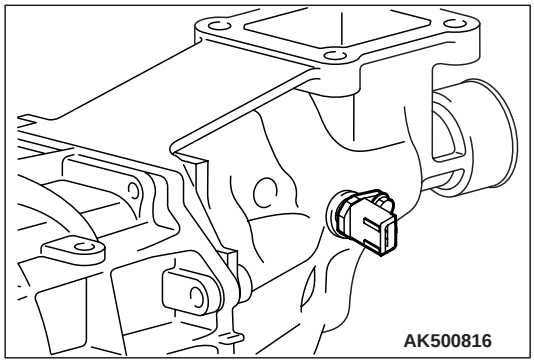




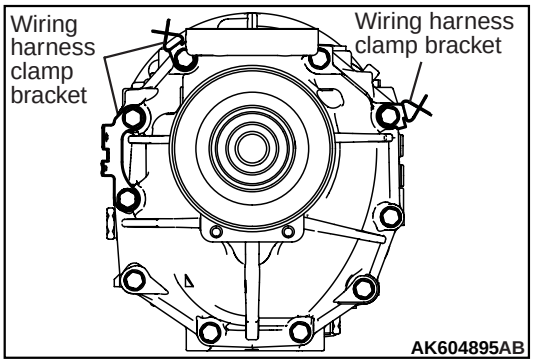
1. Remove the back-up lamp switch assembly and shift position switch assembly <R5MB1-J-NC>.



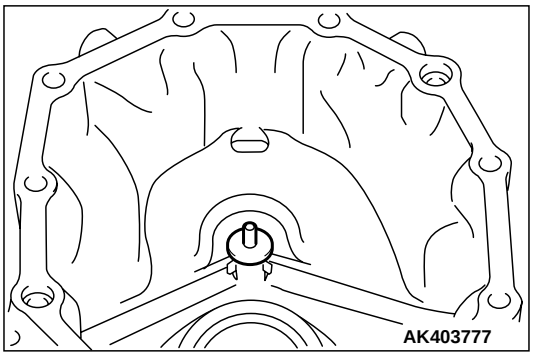
2. Remove the clutch housing.



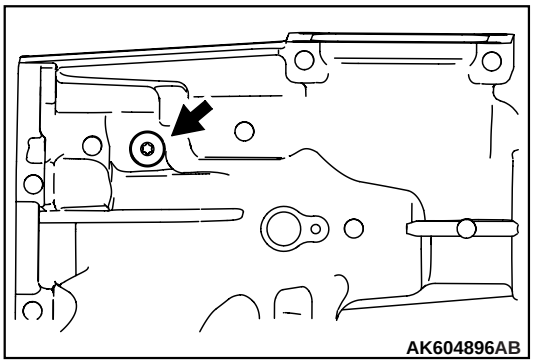
3. Remove the vehicle speed sensor.



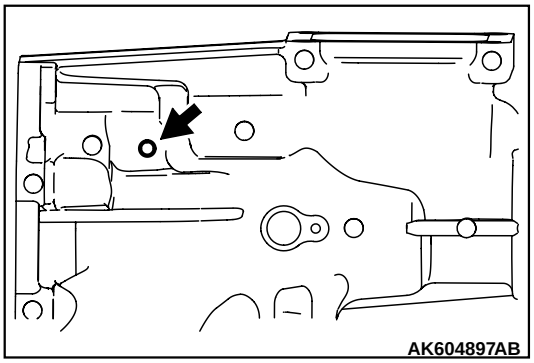
4. Remove the extension housing sub-assembly and wiring harness clamp bracket.



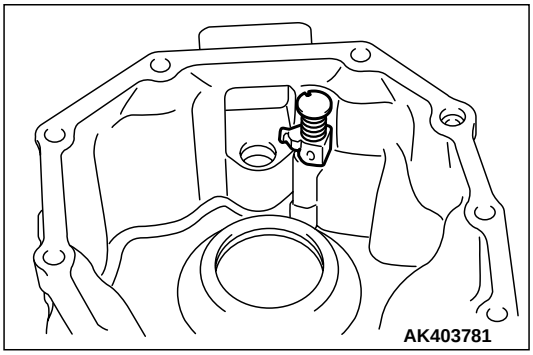
5. Remove the oil receiver pipe.



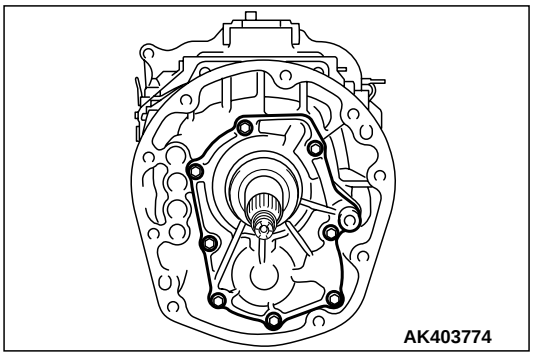
6. Remove the straight screw plug with head.



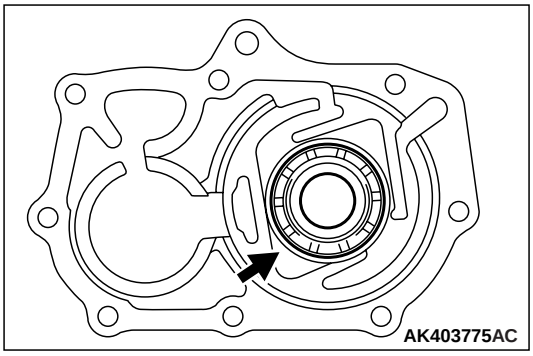
7. Remove the slotted spring pin.



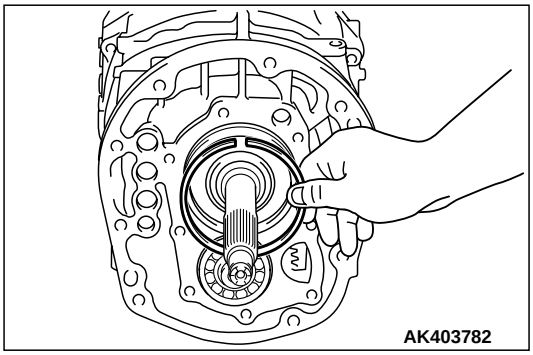
8. Remove the reverse restrict pin assembly.



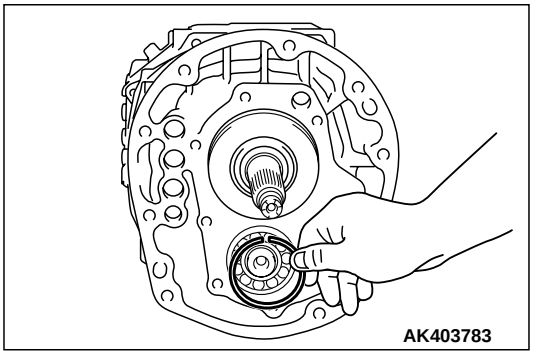
9. Remove the front bearing retainer.



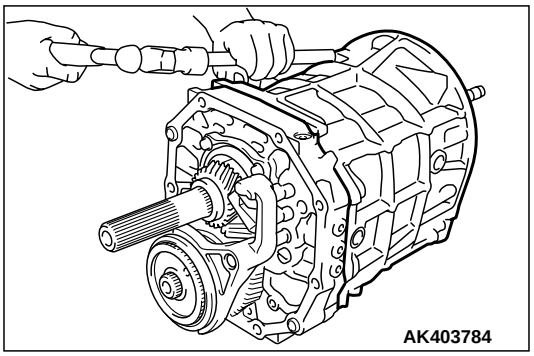
10. Remove the oil seal.



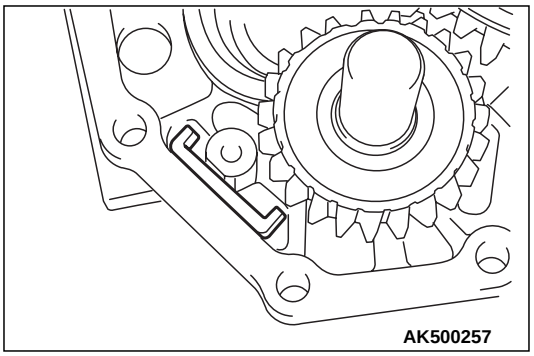
11. Remove the shaft snap ring.



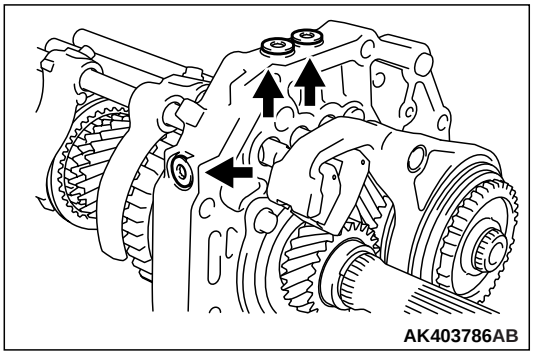
12. Remove the shaft snap ring.



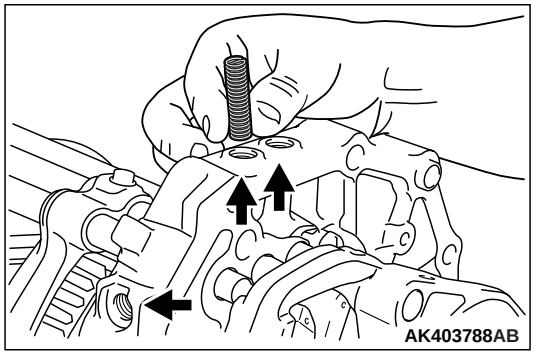
13. Remove the transmission case sub-assembly.



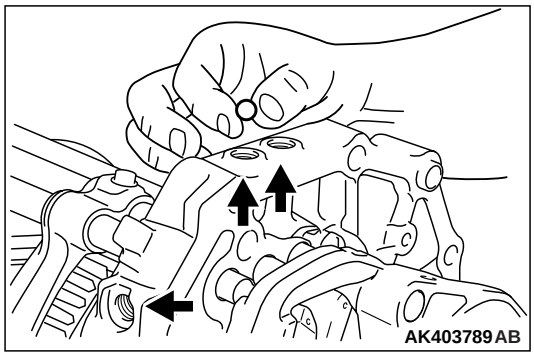
14. Remove the transmission magnet.



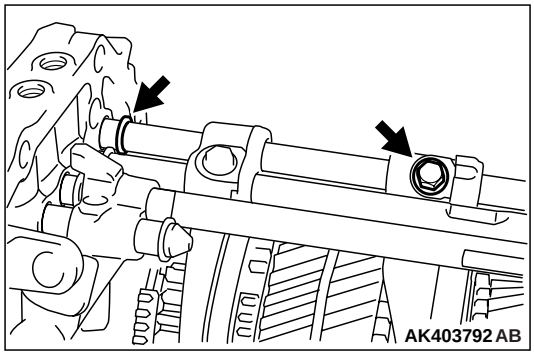
15. Remove the straight screw plug with head (3 places).



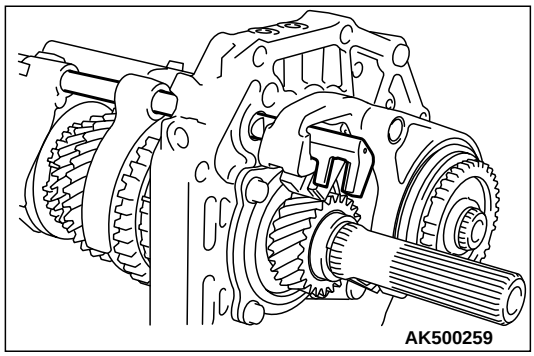
16.Remove the compression spring (3 places).



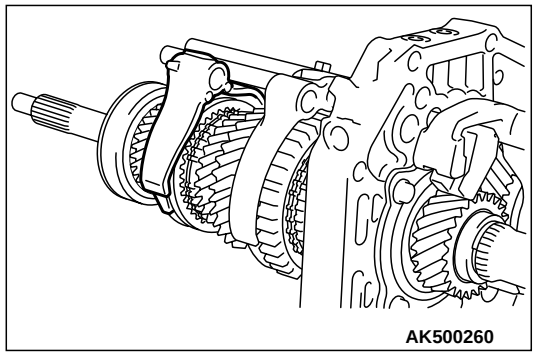
17.Remove the ball (3 places).



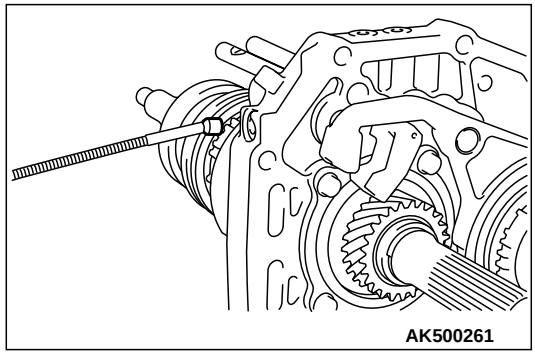
18.Remove the shaft snap ring of the gear shift fork shaft No.2 and the washer based hexagon bolt of the gearshift fork No.2.



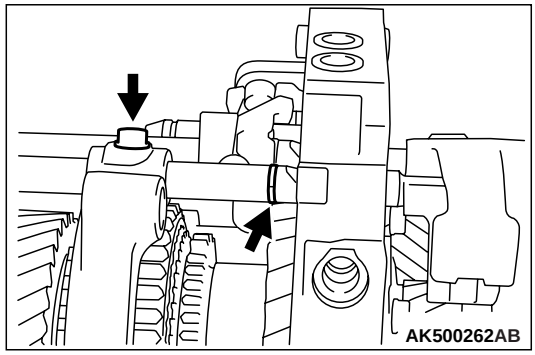
19.Remove the gear shift fork shaft No.2.



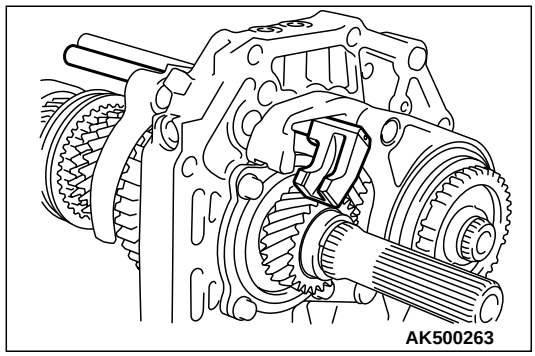
20.Remove the gear shift fork No.2.



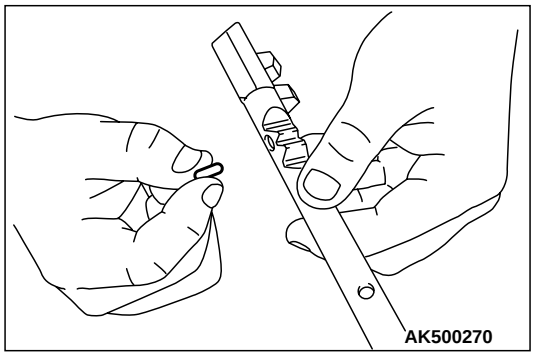
21.Remove the roller A.



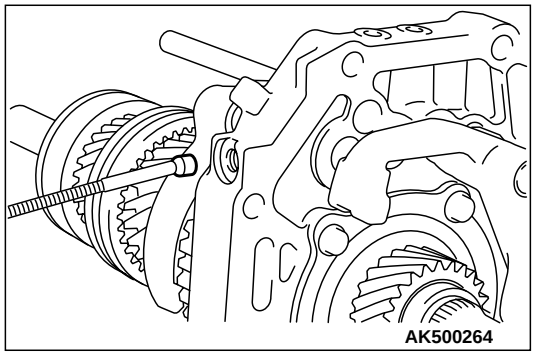
22.Remove the shaft snap ring of the gear shift fork shaft No.1 and the washer based hexagon bolt of the gear shift fork No.1.



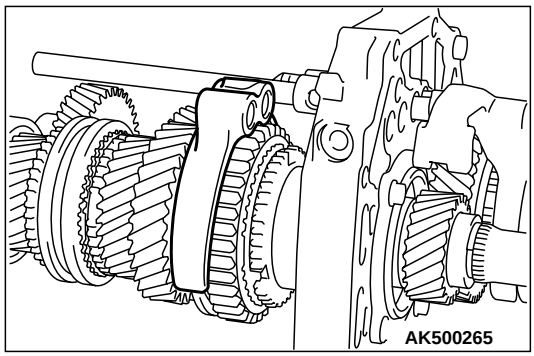
23.Remove the gear shift fork shaft No.1.



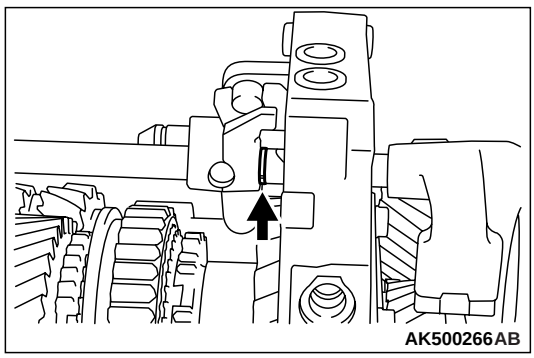
24.Remove the straight pin of the gear shift fork shaft No.1.



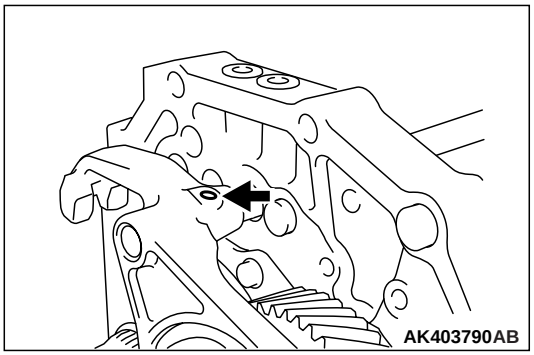
25.Remove the roller A.



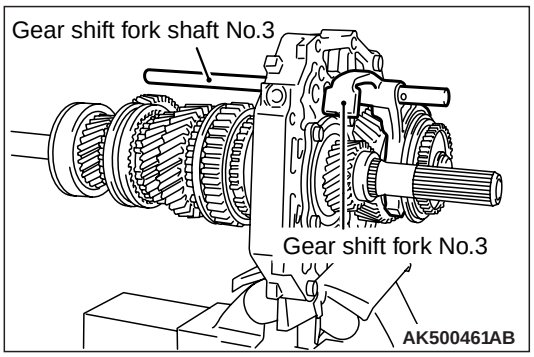
26.Remove the gear shift fork No.1.



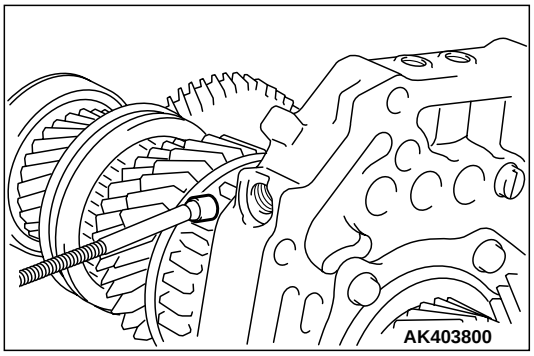
27.Remove the shaft snap ring of the gear shift fork shaft No.3.



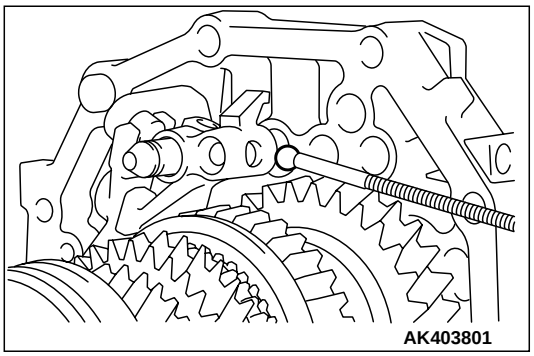
28.Remove the slotted spring pin of the gear shift fork No.3 assembly.



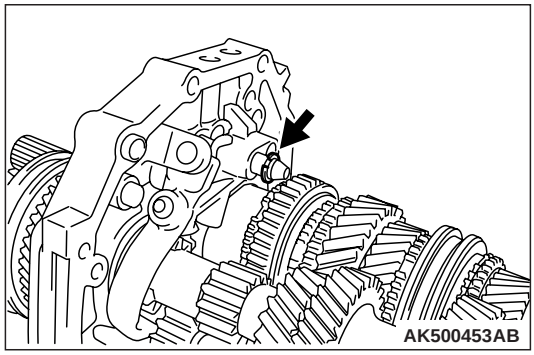
29.Remove the gear shift fork No.3 and the gear shift fork shaft No.3.



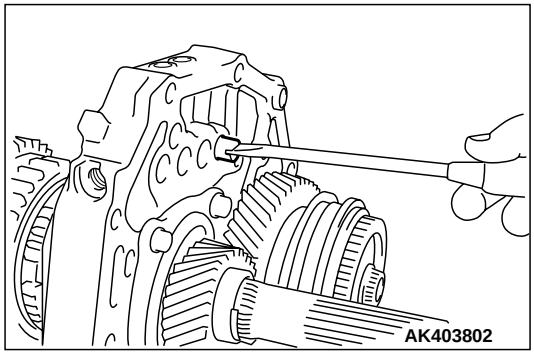
30.Remove the roller A.

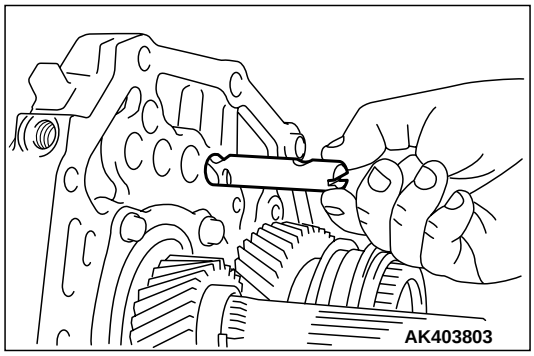


31.Remove the ball.

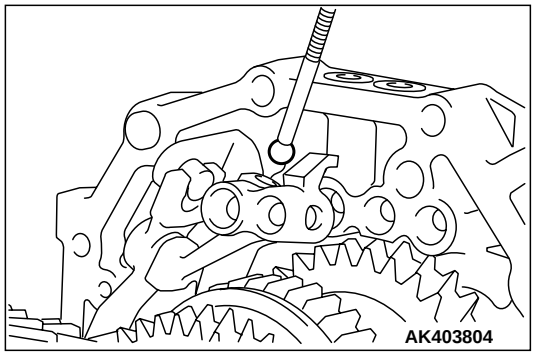


32.Remove the shaft snap ring of the gear shift fork shaft No.4.

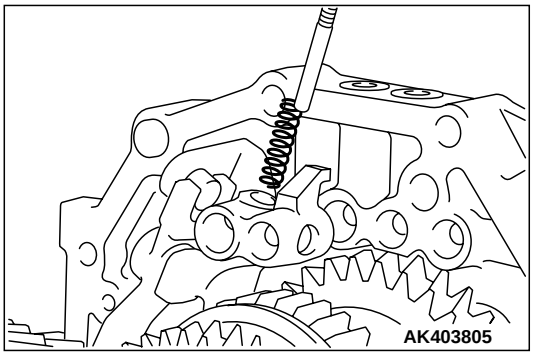




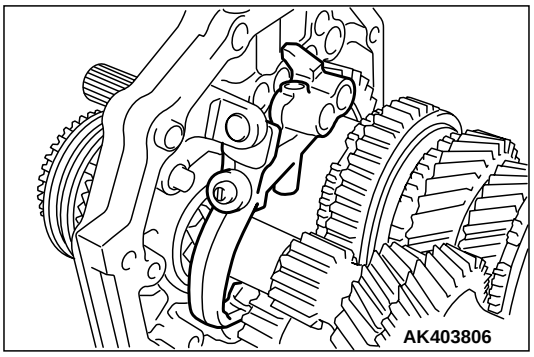
33.Remove the gear shift fork shaft No.4.



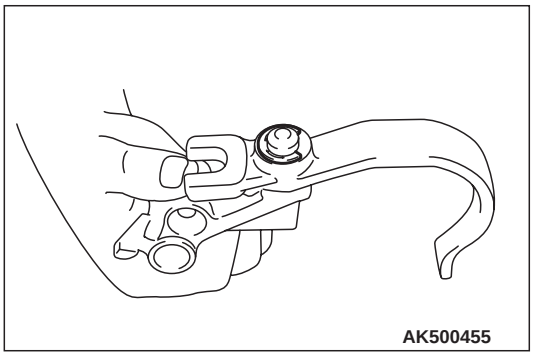
34.Remove the ball.



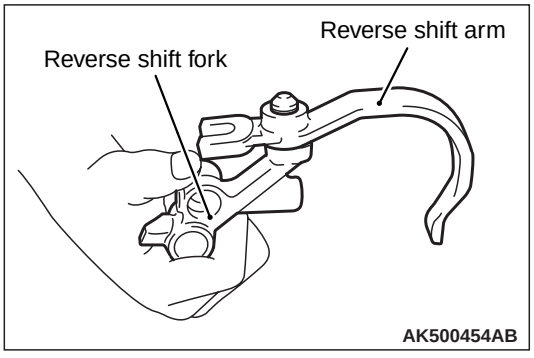
35.Remove the compression spring.



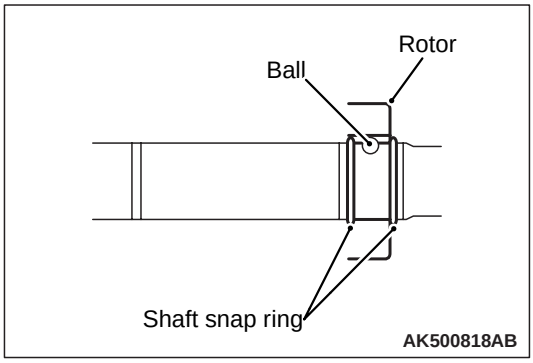
36.Remove the reverse shift fork and the reverse shift arm.



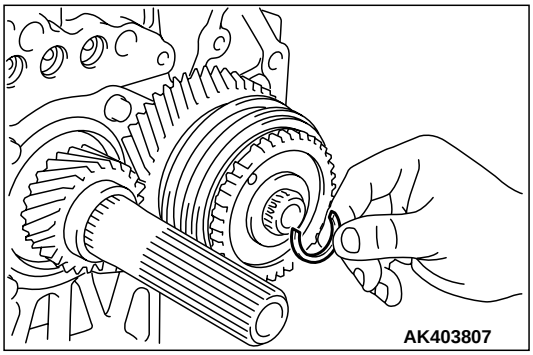
37.Remove the E-ring.



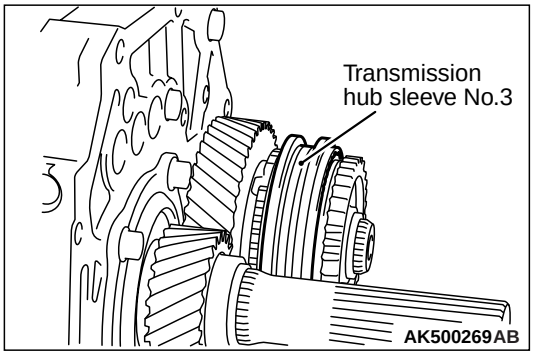
38.Remove the reverse shift arm and reverse shift fork.



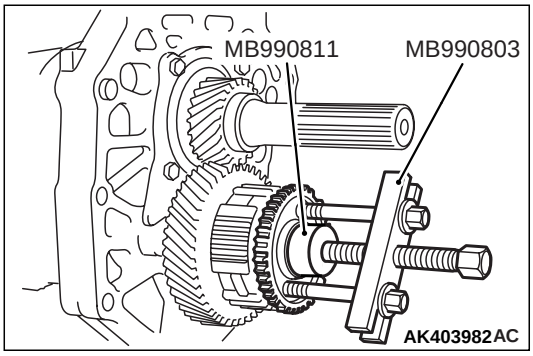
39.Remove the shaft snap ring (2 places).
40.Remove the rotor.
41.Remove the ball.



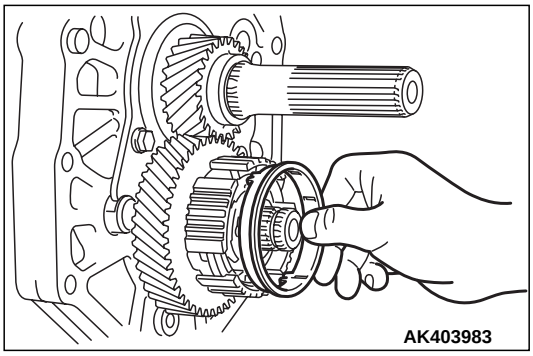
42.Remove the shaft snap ring.



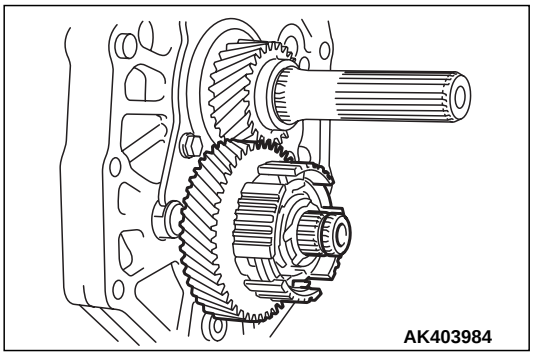
43.Remove the transmission hub sleeve No.3.



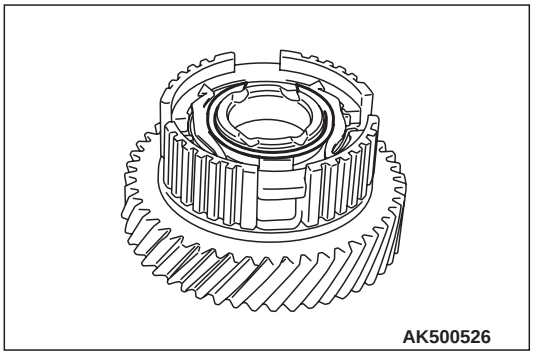
44.Use special tools to remove the gear spline piece No.5.
- Steering wheel puller (MB990803)
- Side bearing puller cup (MB990811)



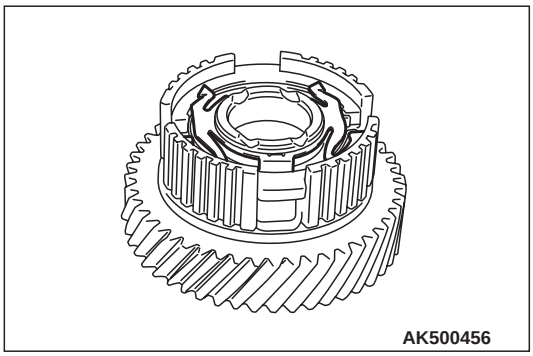
45.Remove the synchronizer outer race No.3.



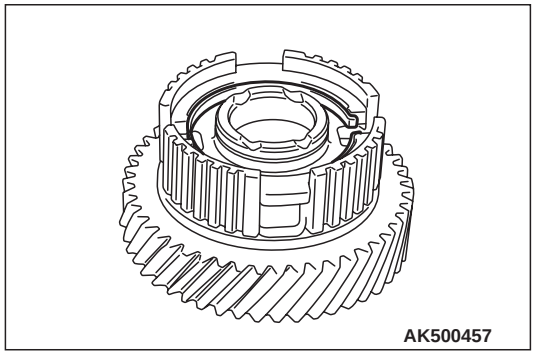
46.Remove the counter shaft gear No.5.



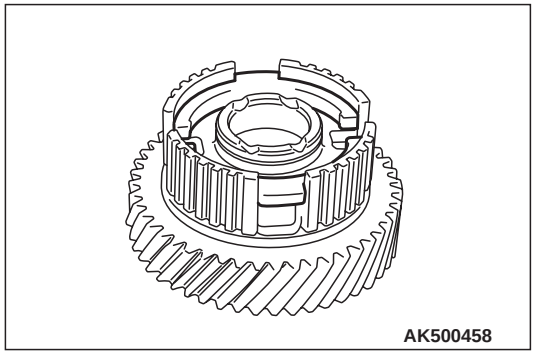
47.Remove the shaft snap ring.



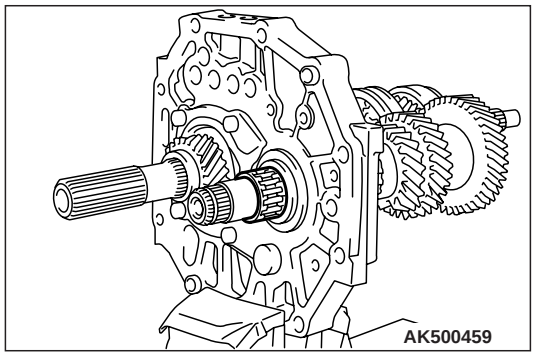
48.Remove the synchromesh shifting key spring No.3.



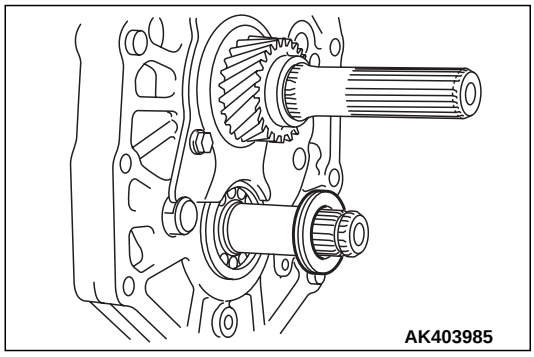
49.Remove the synchromesh shifting key spring No.3.



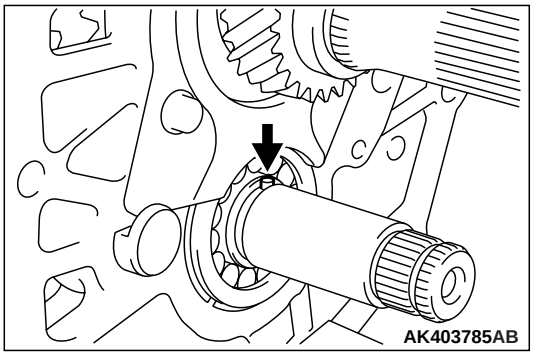
50.Remove the synchromesh shifting key No.3.



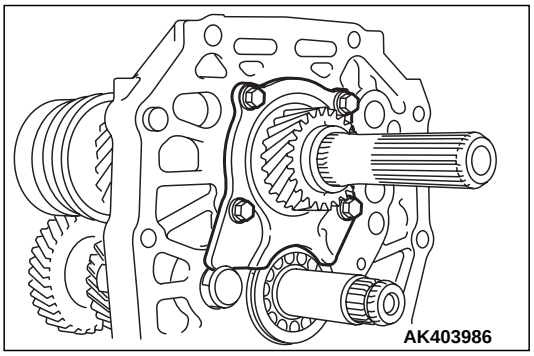
51.Remove the needle roller bearing.



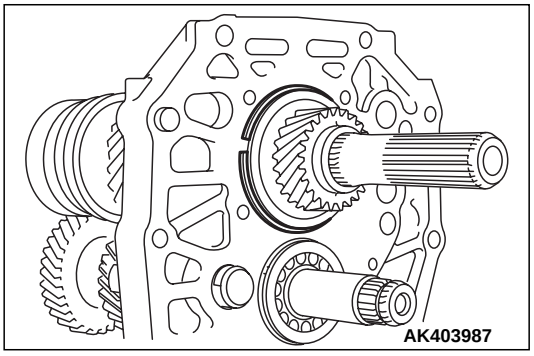
52.Remove the 5th gear thrust washer.



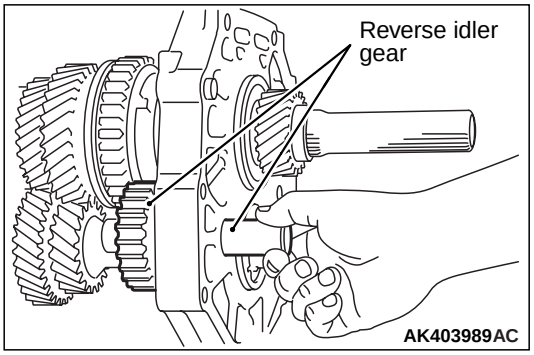
53.Remove the straight pin.



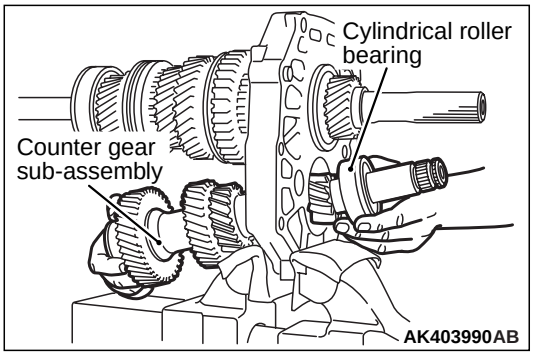
54.Remove the rear bearing output shaft retainer.



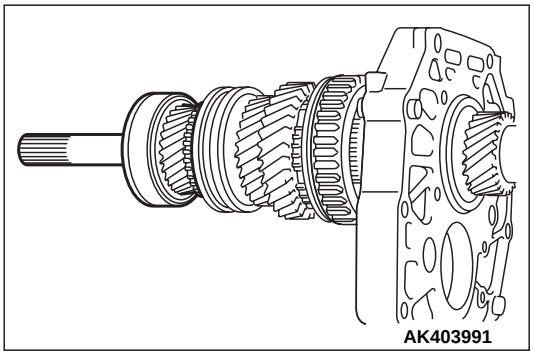
55.Remove the snap ring.



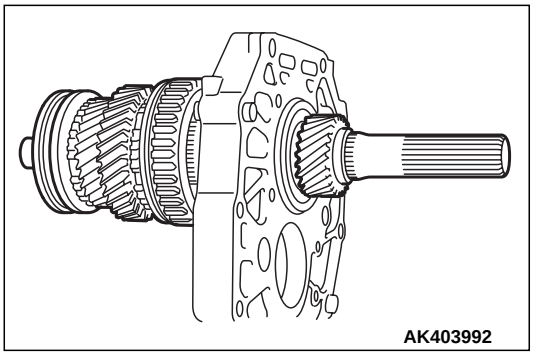
56.Remove the reverse idler gear.



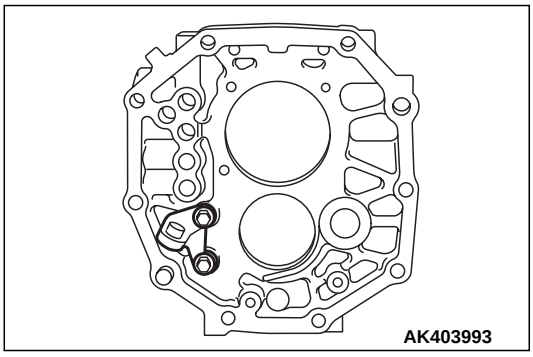
57.Remove the counter gear sub-assembly and cylindrical roller bearing.



58.Remove the input shaft sub-assembly.

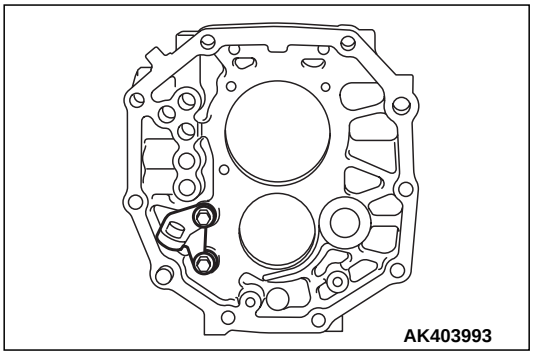


59.Remove the output shaft sub-assembly.

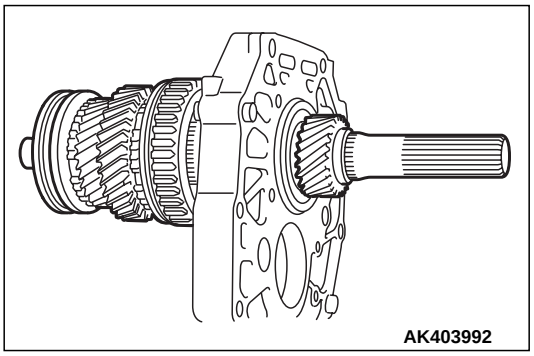


60.Remove the reverse shift arm bracket.

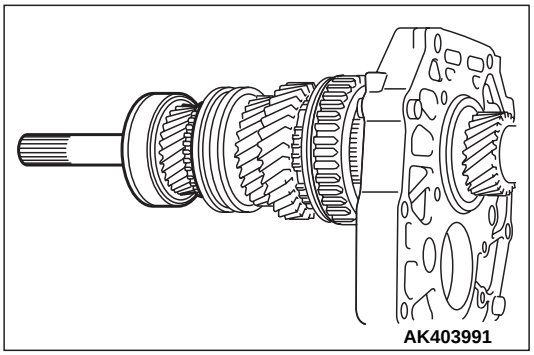
REASSEMBLY SERVICE POINTS



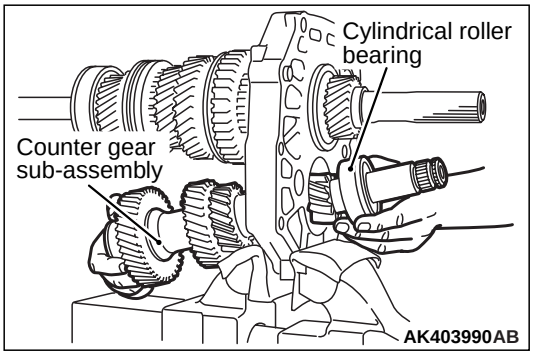
1. Set the reverse shift arm bracket to the intermediate plate and tighten the bolts to the specified torque of 18 ± 5 N·m.



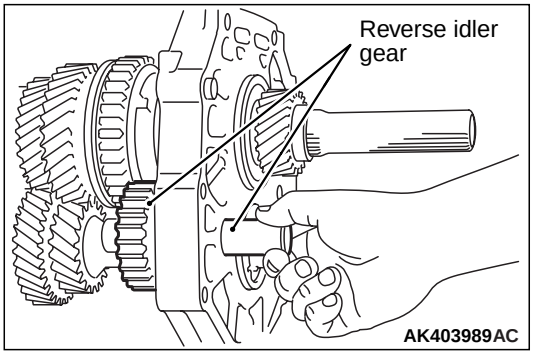
2. Install the output shaft sub-assembly to the intermediate plate.



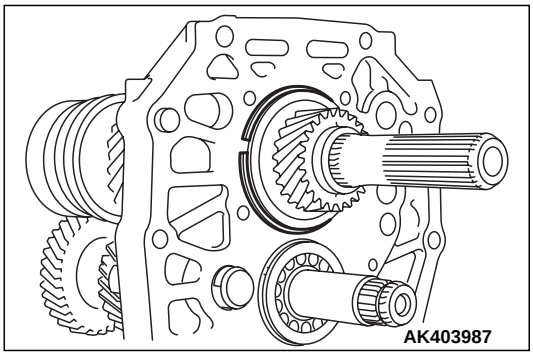
3. Install the input shaft sub-assembly to the output shaft sub-assembly.



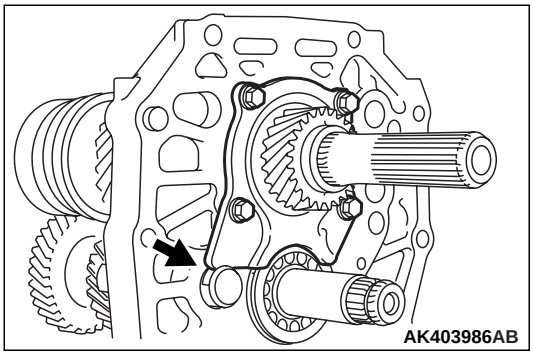
4. Insert the counter gear sub-assembly into the intermediate plate and hold it. Insert the cylindrical roller bearing into the intermediate plate and the counter gear sub-assembly.



5. Install the reverse idler gear shaft and reverse idler gear sub-assembly to the intermediate plate.

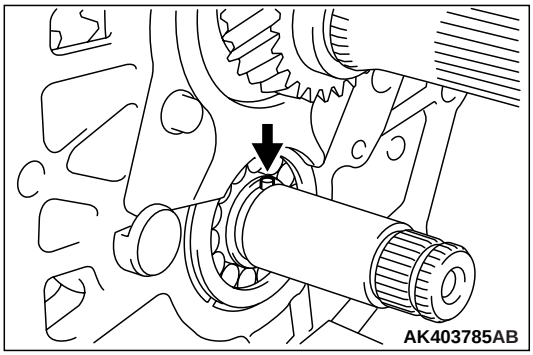


6. Install the shaft snap ring to the radial ball bearing of the input shaft sub-assembly.

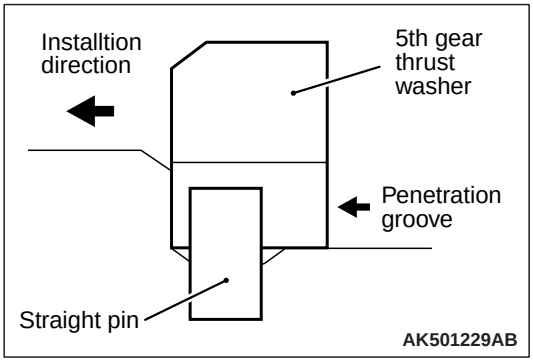


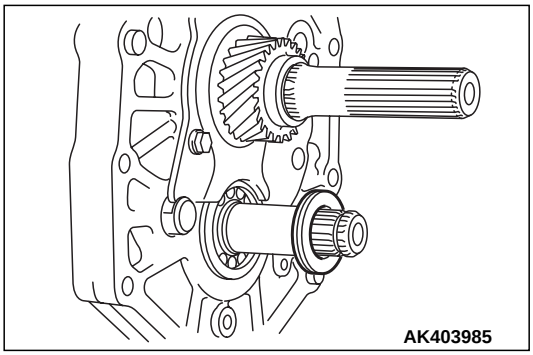
7. Set the rear bearing output shaft retainer and tighten the bolts to the specified torque of 18 ± 5 N·m.

   NOTE: Fit the rear bearing output shaft retainer into the reverse idler gear shaft slot.

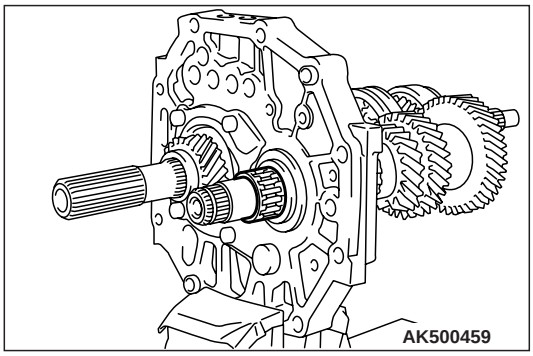


8. Install the straight pin.

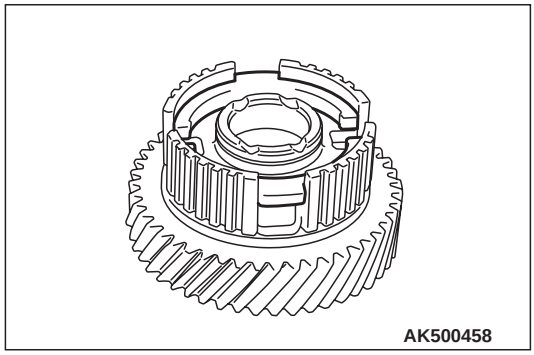




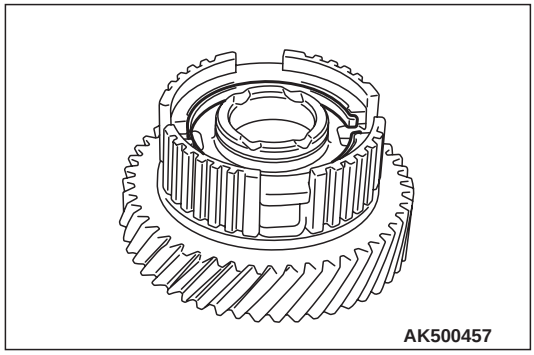
9. Check the installation direction of 5th gear thrust washer, and install it.



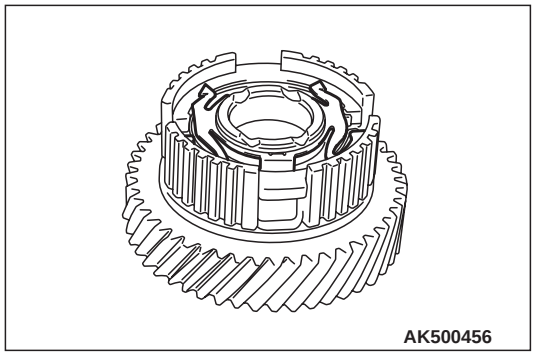
10. Install the needle roller bearing.


AK500458

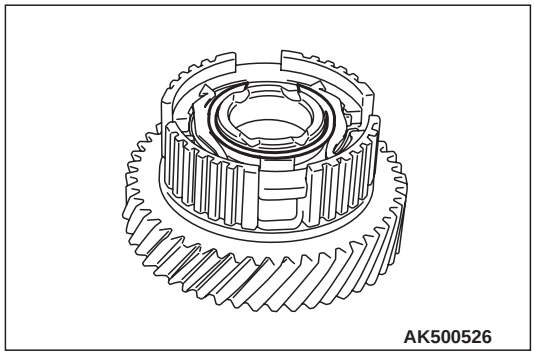
11.Install the synchromesh shifting key No.3 to the counter shaft gear No.5.


AK500457

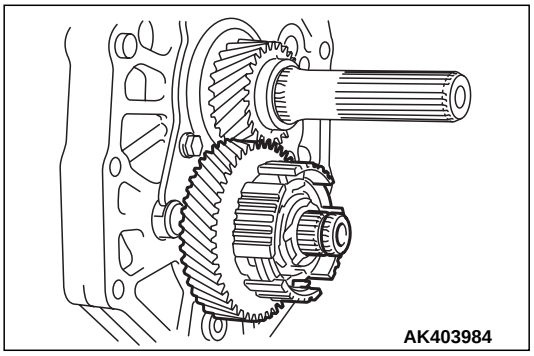
12.Install the synchromesh shifting key spring No.3 to the counter shaft gear No.5.


AK500456

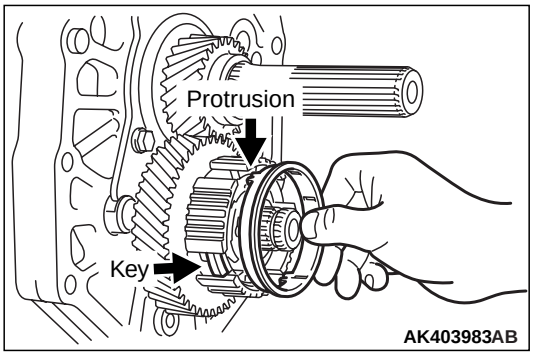
13.Install the synchromesh shifting key spring No.3 to the counter shaft gear No.5.


AK500526

14.Install the shaft snap ring to the counter shaft gear No.5.


AK403984

15.Install the counter shaft gear No.5.

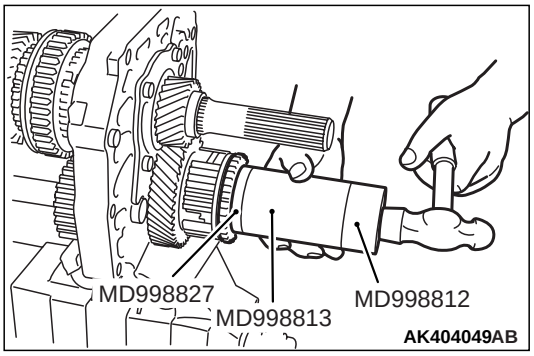


AK403983AB

⚠ CAUTION

Fit the protrusions of synchronizer ring between keys.

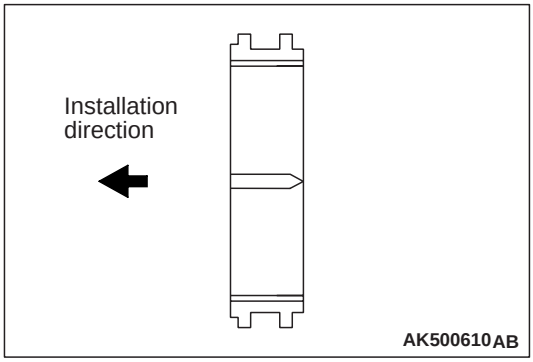
16.Install the synchronizer outer race No.3.

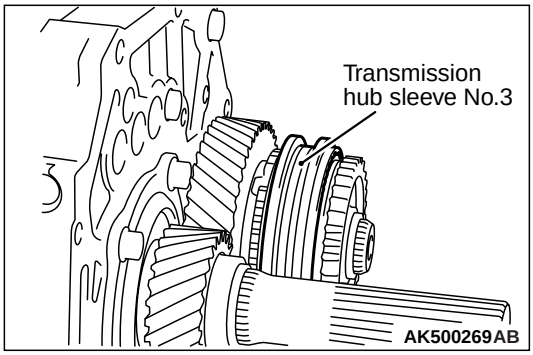


AK404049AB

17.Use special tools to install the gear spline piece No.5.

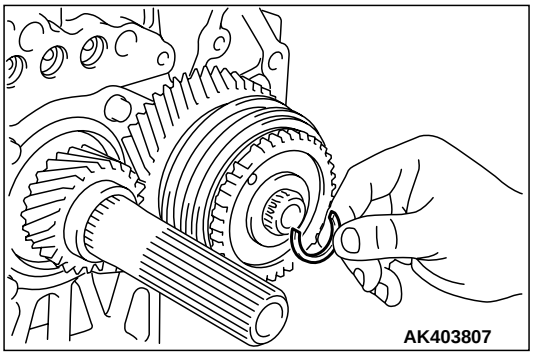
- Installer cap (MD998812)
- Installer-100 (MD998813)
- Installer adapter (56) (MD998827)





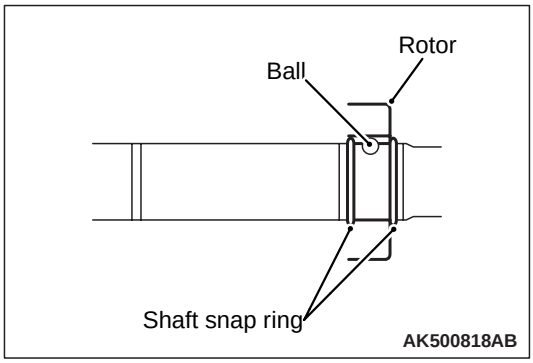
18.Check the installation direction of the transmission hub sleeve No.3 and install it on the counter shaft.

NOTE: After installation, check the sleeve operate smoothly.



19.Select a snap ring which will make the gear spline pice No.5 end play equal the standard value.

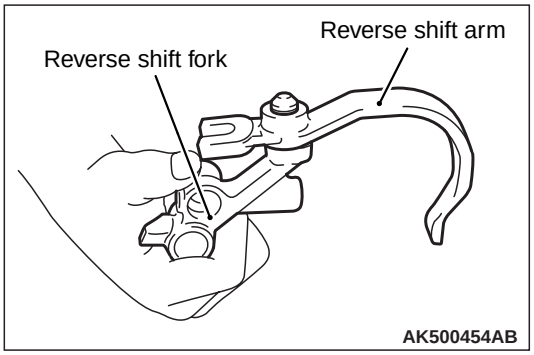
Standard value: 0 – 0.1 mm



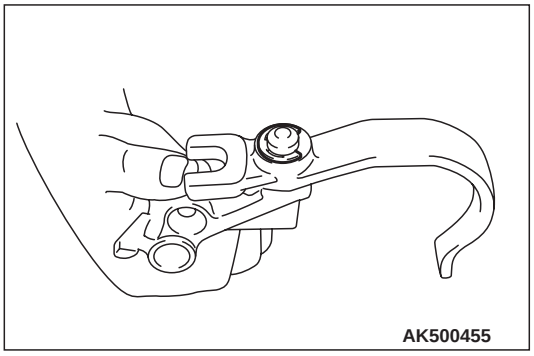
20.Install the ball to the rotor.

21.Install the rotor to the output shaft.

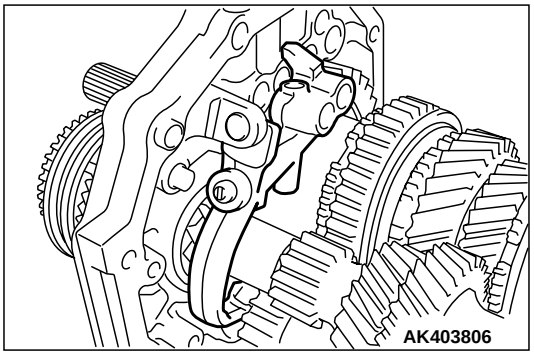
22.Remove the shaft snap ring to the output shaft (2 places).



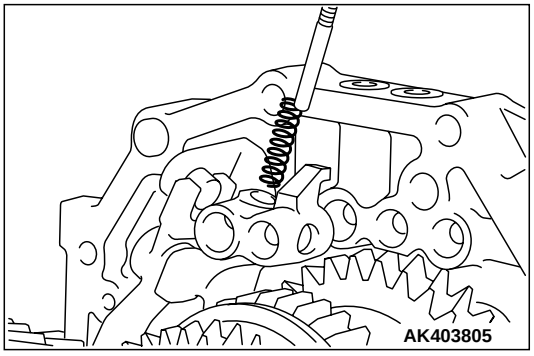
23.Install the reverse shift arm to the reverse shift fork.



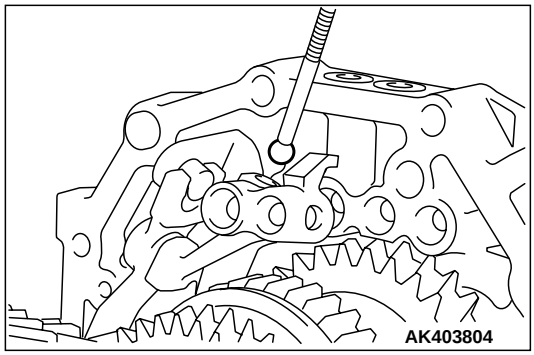
24.Install the E-ring.



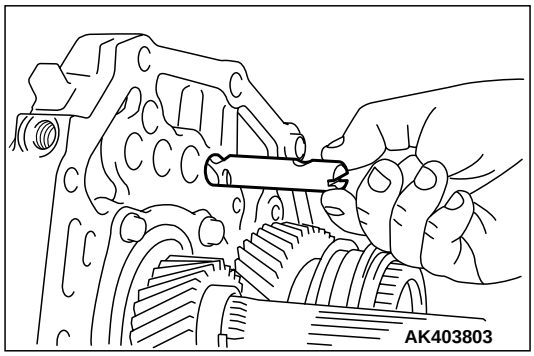
25.Install the reverse shift fork and the reverse shift arm to the intermediate plate.

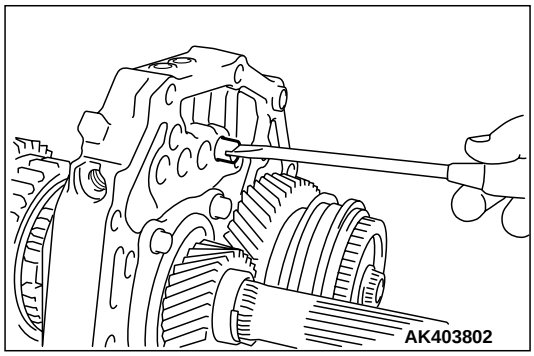


26.Install the compression spring into the reverse shift fork.



27.Install the ball into the reverse shift fork.

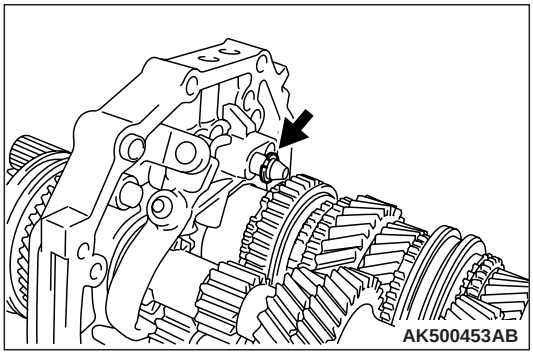




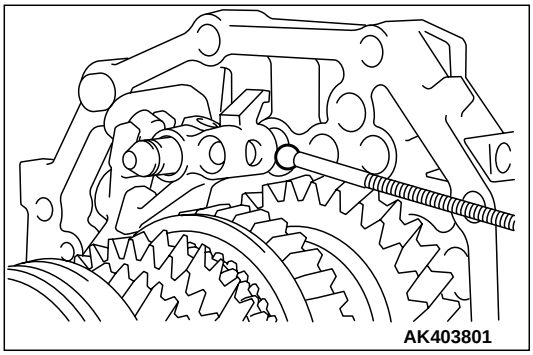
⚠ CAUTION

Install the gear shift fork shaft No.4 carefully in the specified direction. If the installation direction is wrong, the roller would be in the shaft concave and the gearshift fork shaft No.4 would not be installed.

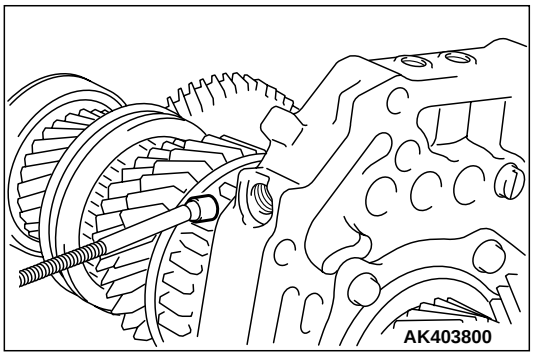
28.Install the gear shift fork shaft No.4 into the intermediate plate and the reverse shift fork.



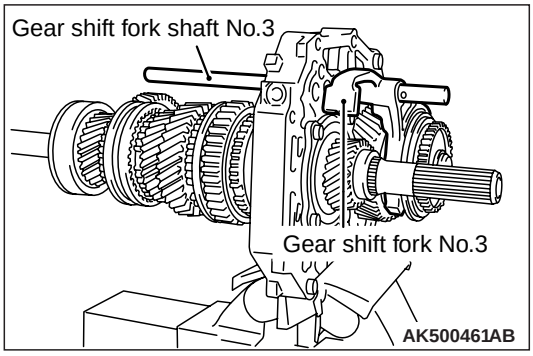
29.Install the shaft snap ring into the gear shift fork shaft No.4.



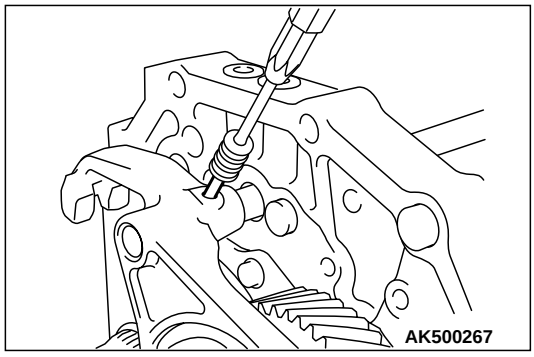
30.Install the ball into the reverse shift fork.



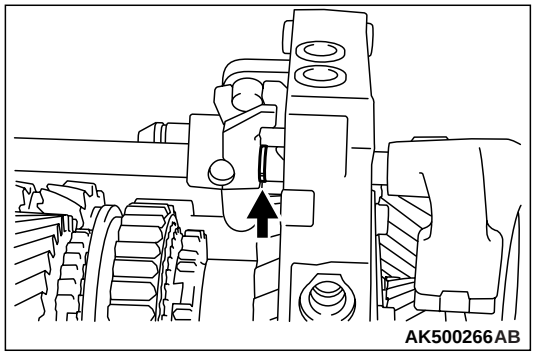
31.Install the roller A to the intermediate plate.



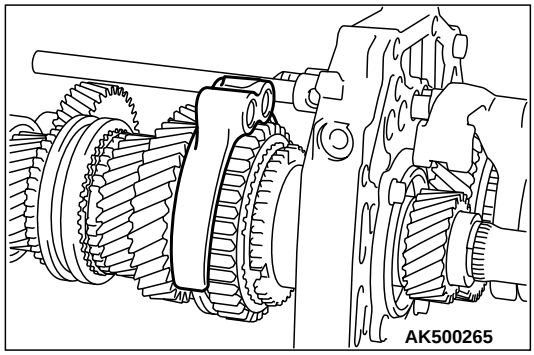
32.Install the gear shift fork No.3 assembly on the transmission hub sleeve No.3 and hold it. Insert the gear shift fork shaft No.3 into the gear shift fork No.3 assembly, the intermediate plate and the reverse shift fork.



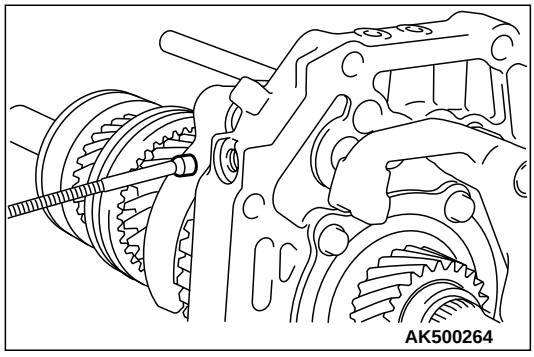
33.Install the slotted spring pin to the gear shift fork No.3 assembly.



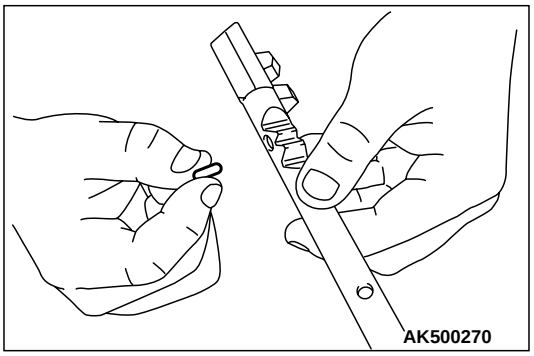
34.Install the snap ring to the gear shift fork shaft No.3.



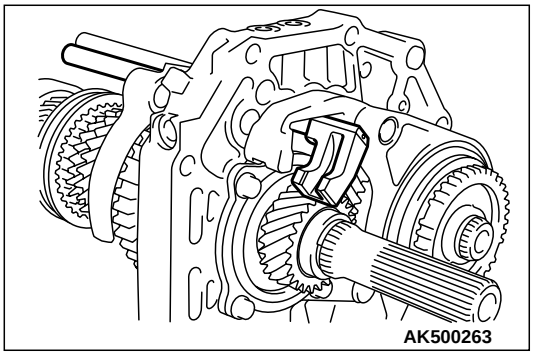
35.Install the gear shift fork No.1 on the reverse gear.



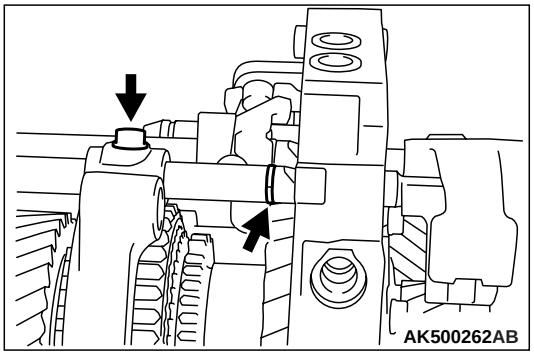
36.Install the roller A to the intermediate plate.



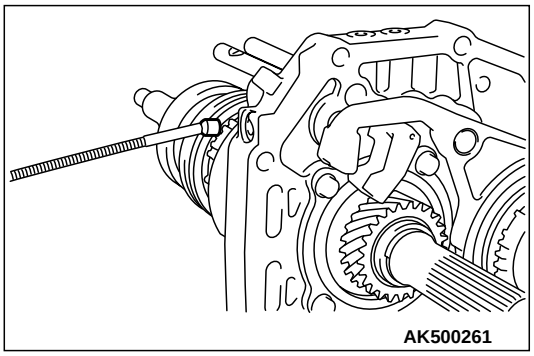
37.Install the straight pin to the gear shift fork shaft No.1.



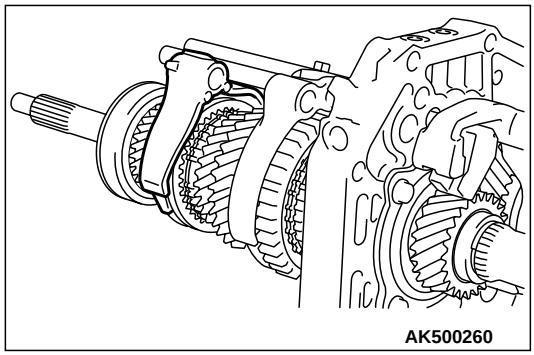
38.Install the gear shift fork shaft No.1 to the intermediate plate and the gear shift fork No.1.



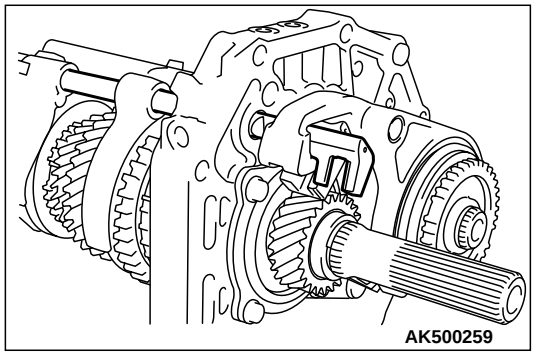
39.Install the shaft snap ring to the gear shift fork shaft No.1. Tighten the washer based hexagon bolt to the specified torque of 19.5 ± 3.9 N·m.



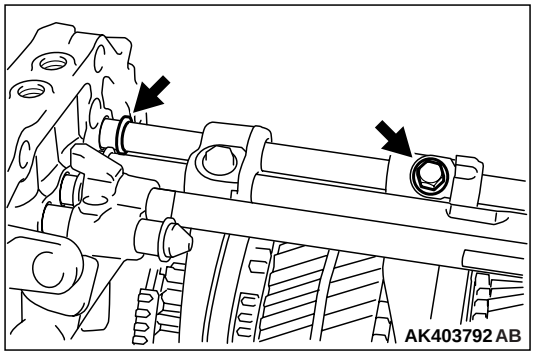
40.Install the roller A to the intermediate plate.



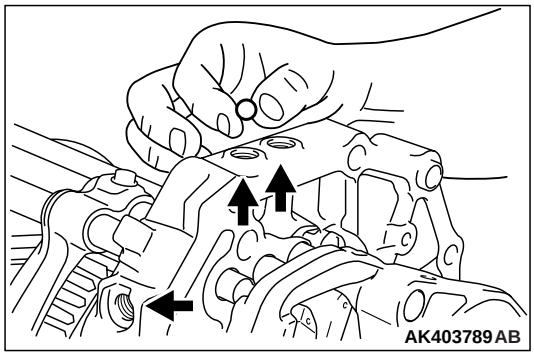
41.Install the gear shift fork No.2 on the transmission hub sleeve No.2.



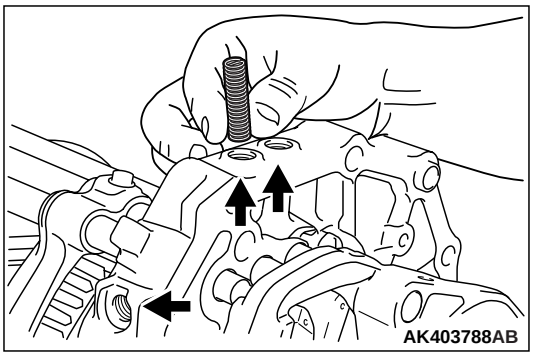
42.Install the gear shift fork shaft No.2 to the intermediate plate, the gear shift fork No.1 and the gear shift fork No.2.



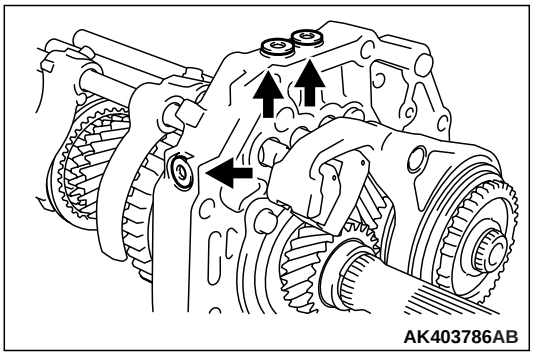
43.Install the shaft snap ring to the gear shift fork shaft No.2. Tighten the washer based hexagon bolt to the specified torque of 19.5 ± 3.9 N·m.



44.Install the ball to the intermediate plate (3 places).



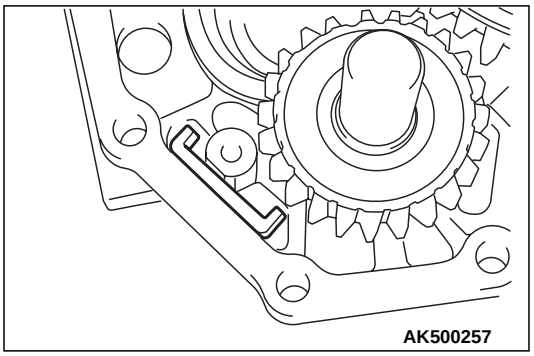
45.Install the compression spring to the intermediate plate (3 places).



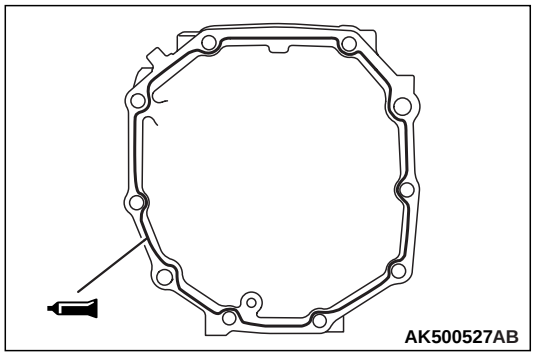
46.Apply sealant to the threads. Tighten the straight screw plug with head to the specified torque of 18.5 ± 5.5 N·m (3 places).

Special sealant: Mitsubishi genuine sealant Part No. MD974421 or equivalent

NOTE: The new bolt does not require sealant application as it is precoated with sealant.



47.Install the transmission magnet to the intermediate plate.

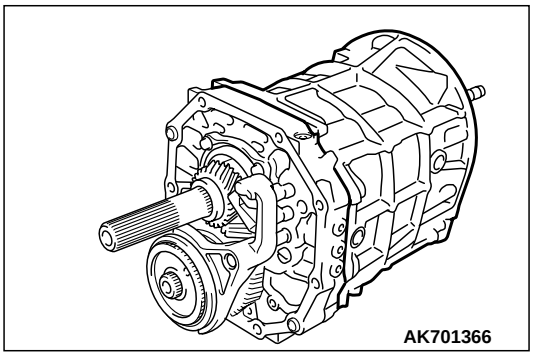


48.Completely degrease the FIPG-applied surface so that water and oil including the old sealant cannot adhere to the surface coated with the sealant.

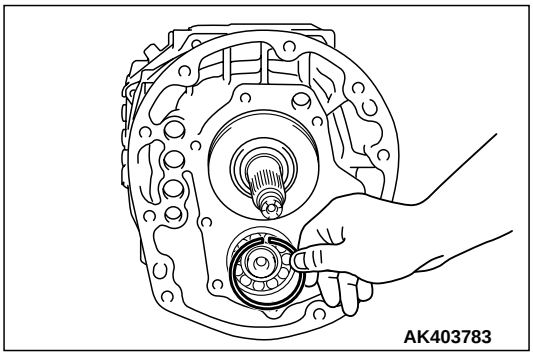
Never touch the degreased surface by hand.

49.Apply a 1.2 mm diameter bead of liquid gasket to the intermediate plate mounting surface of the transmission case sub-assembly.

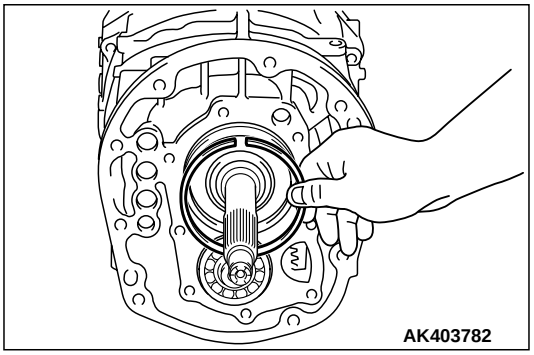
Special sealant: Mitsubishi genuine sealant Part No. MD974421 or equivalent



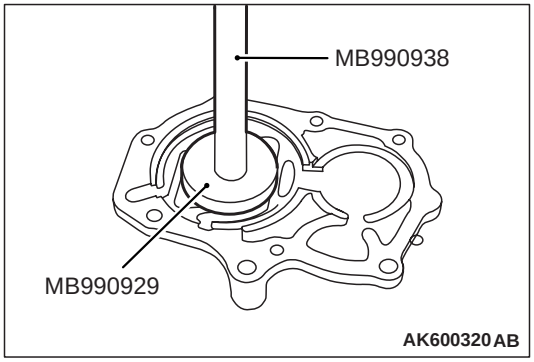
50.Install the transmission case sub-assembly to the intermediate plate.



51.Install the snap ring to the cylindrical roller bearing.

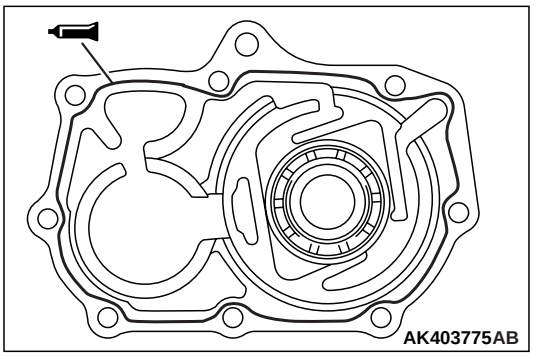


52.Install the snap ring to the radial ball bearing.



53.Using special tool, install the oil seal to the front bearing retainer.

- Installer adapter (MB990929)
- Installer bar (MB990938)

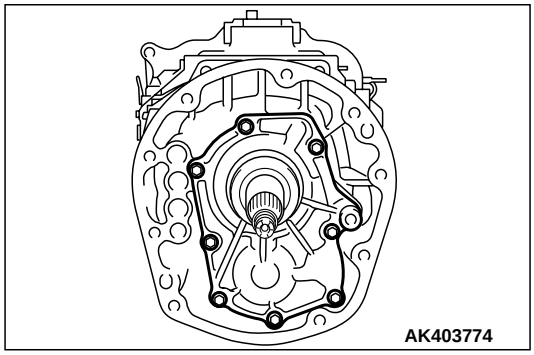


54.Completely degrease the FIPG-applied surface so that water and oil including the old sealant cannot adhere to the surface coated with the sealant.

Never touch the degreased surface by hand.

55.Apply a 1.2 mm diameter bead of liquid gasket to the transmission case sub-assembly mounting surface of the front bearing retainer sub-assembly with seal.

Special sealant: Mitsubishi genuine sealant Part No. MD974421 or equivalent

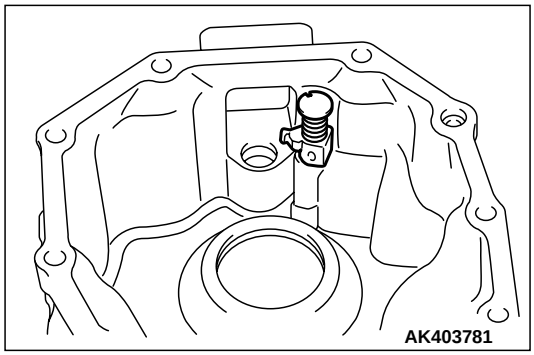


⚠ CAUTION
Do not damage to the oil seal lip during the installation.

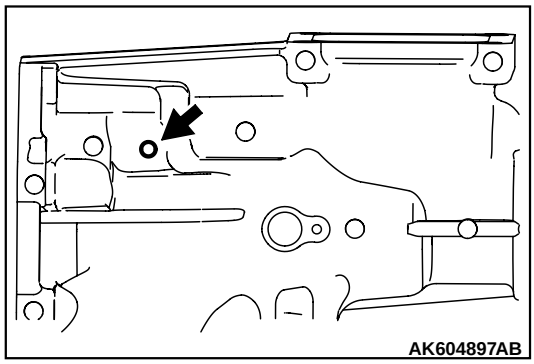
56.Apply sealant to the threads. Install the front bearing retainer to the transmission case sub-assembly and tighten the bolts to the specified torque of 16.5 ± 5.0 N·m.

Special sealant: Mitsubishi genuine sealant Part No. MD974421 or equivalent

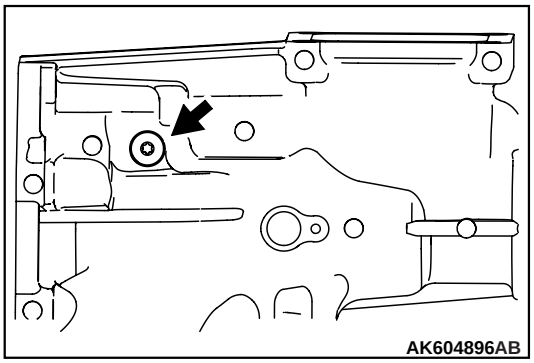
NOTE: The new bolt does not require sealant application as it is precoated with sealant.



57.Install the reverse restrict pin assembly to the extension housing sub-assembly.



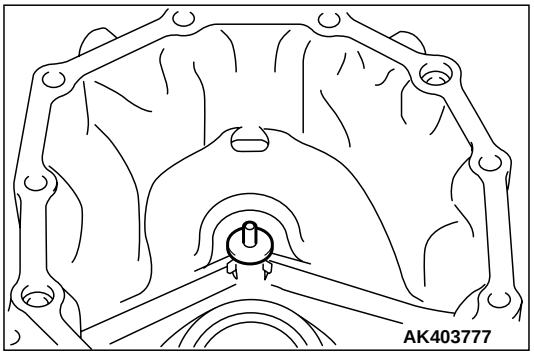
58.Install the slotted spring pin to the reverse restrict pin assembly.



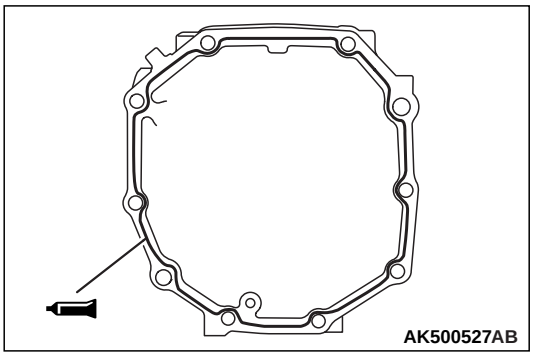
59.Apply sealant to the threads. Tighten the straight screw plug with head to the specified torque of 18.5 ± 5.5 N·m.

Special sealant: Mitsubishi genuine sealant Part No. MD974421 or equivalent

NOTE: The new bolt does not require sealant application as it is precoated with sealant.



60.Install the oil receiver pipe into the extension housing sub-assembly.

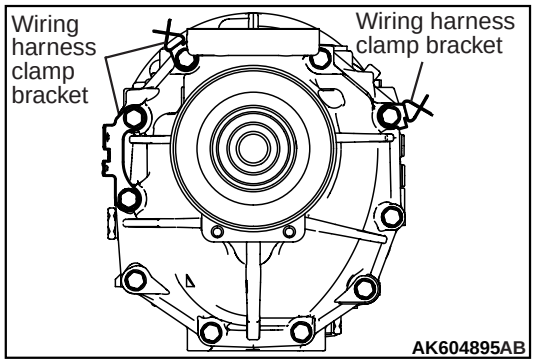


61.Completely degrease the FIPG-applied surface so that water and oil including the old sealant cannot adhere to the surface coated with the sealant.

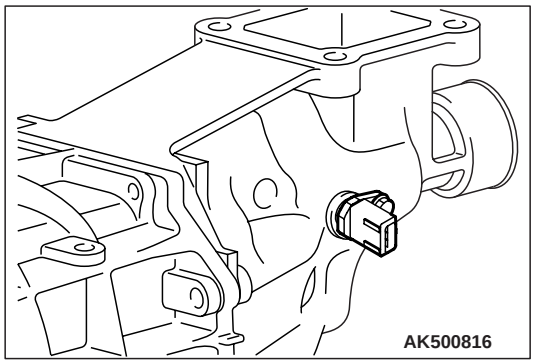
Never touch the degreased surface by hand.

62.Apply a 1.2 mm diameter bead of liquid gasket to the intermediate plate mounting surface of the extension housing sub-assembly.

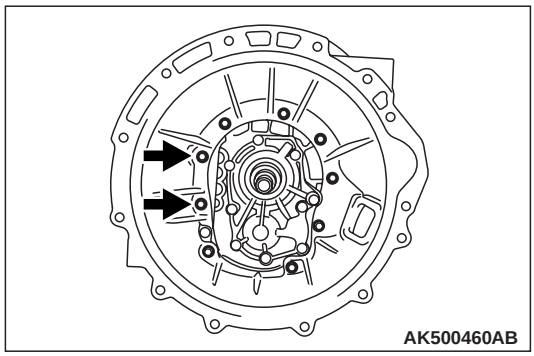
Special sealant: Mitsubishi genuine sealant Part No. MD974421 or equivalent



63.Install the extension housing sub-assembly. Install the wiring harness clamp bracket (3 places) and tighten the bolts to the specified torque of 37 ± 11 N·m.



64.Install the vehicle speed sensor and tighten the bolts to the specified torque of 11 ± 1 N·m.

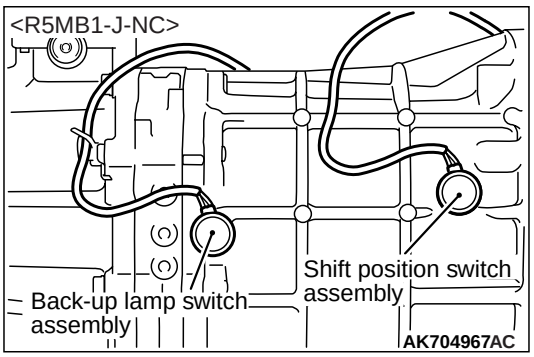


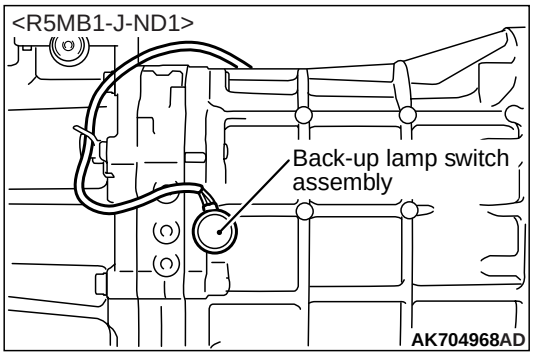
⚠ CAUTION

Install the bolt and washer (with sealant) to the position having the arrow as shown in the illustration.

65.Install the clutch housing into the transmission case sub-assembly. Tighten the bolt with washer to the specified torque of 36 ± 7 N·m (7 places). Tighten the bolt with washer (with sealant) to the specified torque of 34 ± 6 N·m (2 places).

Special sealant: Mitsubishi genuine sealant Part No. MD974421 or equivalent





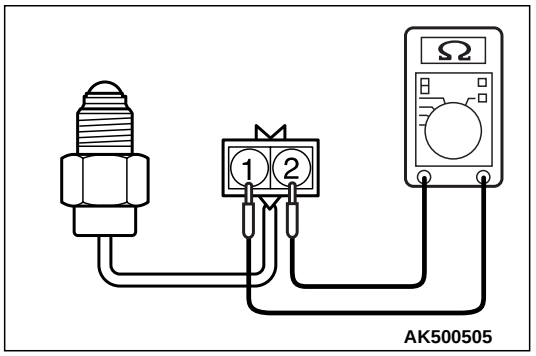
66.Tighten the shift position switch assembly of 34 ± 5 N·m. <R5MB1-J-NC>

67.Tighten the back-up lamp switch assembly and of 44 ± 9 N·m.

INSPECTION

M1222001100491

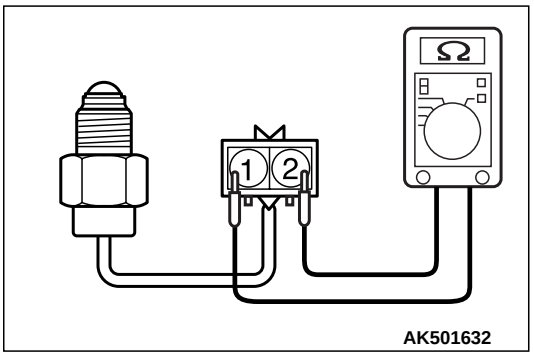
BACK-UP LAMP SWITCH



Check for the continuity between the connector terminals.

Switch condition	Connector terminals	Continuity
Switch end pressed	1 – 2	Conductive
Switch end released	1 – 2	Open

SHIFT POSITION SWITCH



Check for the continuity between the connector terminals.

Switch condition	Connector terminals	Continuity
Switch end pressed	1 – 2	Open
Switch end released	1 – 2	Conductive

SYNCHRONIZER SLEEVE AND HUB

1. Combine the synchronizer sleeve and hub, and check that they slide smoothly.
2. Check that the sleeve is free from damage at its inside splines ends.
3. Using the thickness gauge, check the clearance between the synchronizer ring and the gear.

Standard value: 0.52 – 1.88 mm
Limit: 0.52 mm

NEEDLE ROLLER BEARING

1. Combine the needle roller bearing with the shaft and gear, and check that it rotates smoothly without noise or play.
2. Check the needle roller bearing cage for deformation.

COUNTER SHAFT GEAR No.5

THRUST CLEARANCE

Inspect the thrust clearance of counter shaft gear No.5.

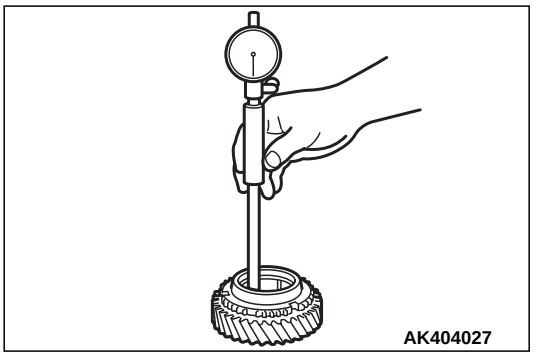
Standard value: 0.10 – 0.35 mm
Limit: 0.35 mm

RADIAL CLEARANCE

1. Fix the output shaft in a vice.
2. Inspect the radial clearance of counter shaft gear No.5.

Standard value: 0.015 – 0.068 mm
Limit: 0.068 mm

INSIDE DIAMETER



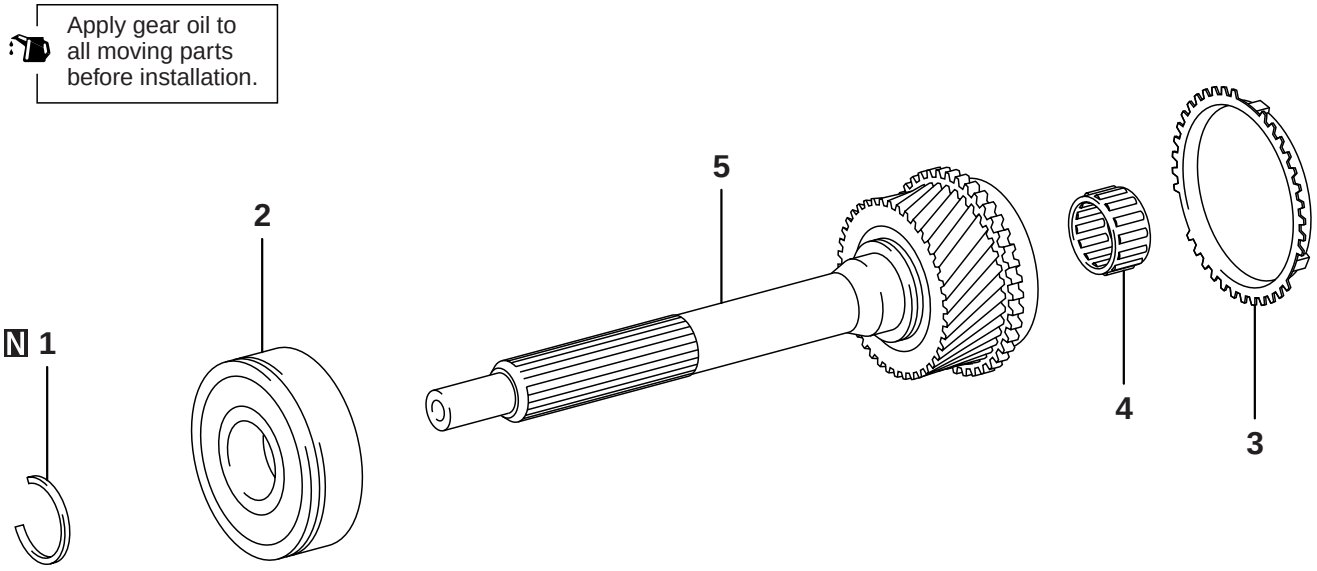
Using the cylinder gauge, check the inside diameter of the counter shaft gear No.5.

Standard value: 38.015 – 38.040 mm
Limit: 38.040 mm

INPUT SHAFT

DISASSEMBLY AND REASSEMBLY

M1222001600526



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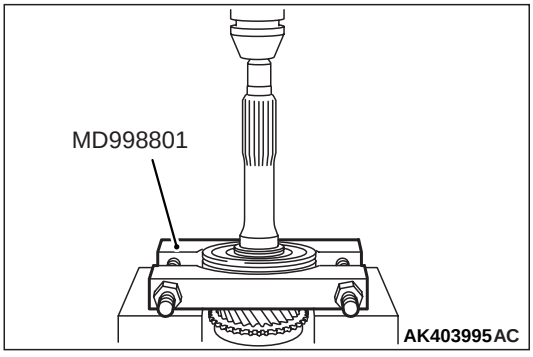
			Disassembly steps
	>>B<<	1.	Shaft snap ring
<<A>>	>>A<<	2.	Radial ball bearing
		3.	Synchronizer ring No.2
		4.	Needle roller bearing
		5.	Input shaft sub-assembly

DISASSEMBLY SERVICE POINT

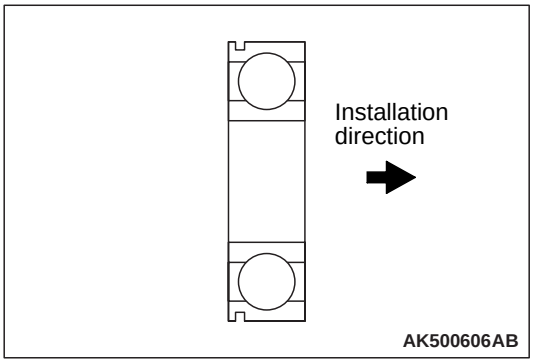
<<A>> RADIAL BALL BEARING REMOVAL



Using special tool Bearing remover (MD998801), support the radial ball bearing and remove it.

REASSEMBLY SERVICE POINTS

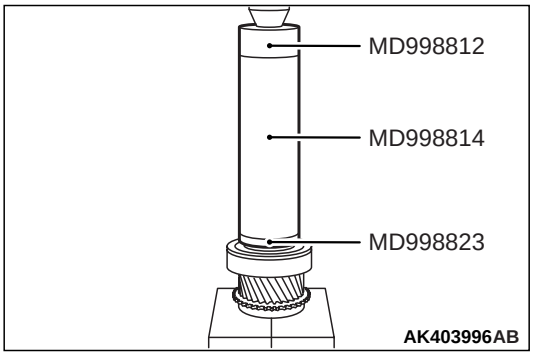
>>A<< RADIAL BALL BEARING INSTALLATION



1. Check the installation direction of the radial ball bearing, and put it on the input shaft.

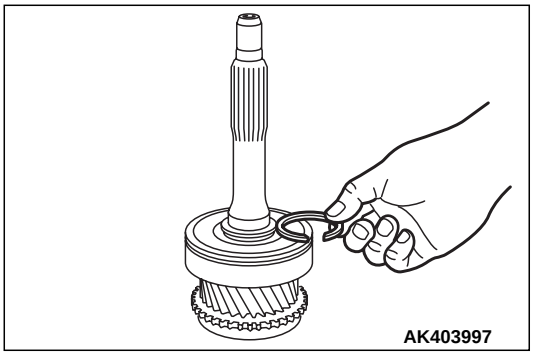
⚠ CAUTION

Never push on the sealing area when installing.



2. Using special tools to install the radial ball bearing.
   - Installer cap (MD998812)
   - Installer-200 (MD998814)
   - Installer adapter (48) (MD998823)

>>B<< SNAP RING INSTALLATION



1. Select a snap ring to secure the standard clearance between the radial ball bearing and the input shaft sub-assembly.

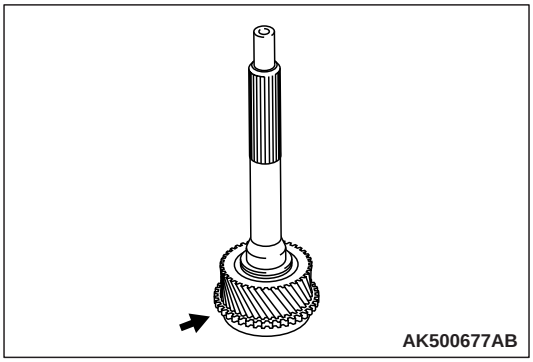
   Standard value: 0 – 0.1 mm

2. Install the selected snap ring.

INSPECTION

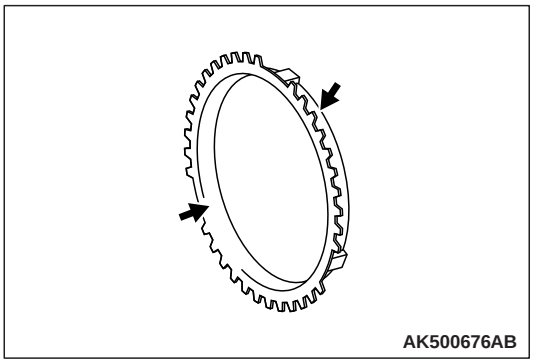
M1222001700222

INPUT SHAFT SUB-ASSEMBLY

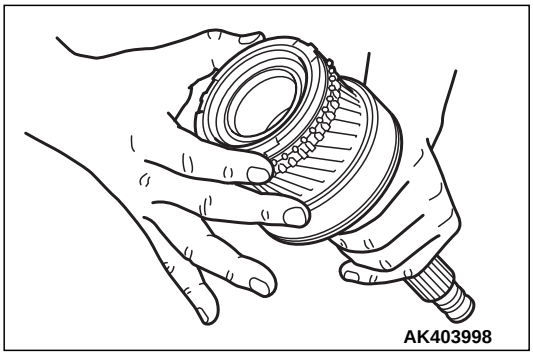


1. Check the helical gear teeth and clutch gear teeth of each input shaft sub-assembly for damage and excessive wear.
2. Check the synchronizer cone surface of each input shaft sub-assembly for roughness, damage, and excessive wear.
3. Check the inside surface and front and back sides of each input shaft sub-assembly for damage and excessive wear.

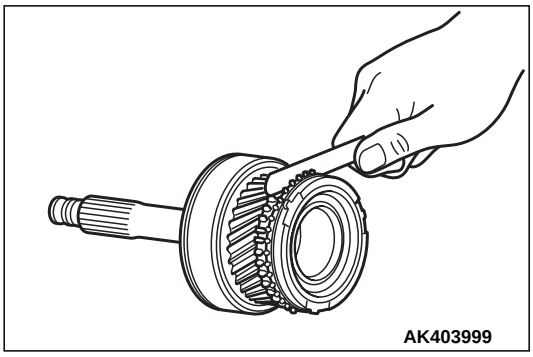
SYNCHRONIZER RING No.2



1. Check the clutch gear on the synchronizer ring for damaged and missing teeth.
2. Check the synchronizer ring inner cone surface for damage or wear. Also check that the inside ridges are intact.



3. After applying oil to the taper portion on gear, press and fit the synchronizer ring by hand. Confirm the synchronizer ring cannot be rotated.



4. Using the thickness gauge, check the clearance between the synchronizer ring and the 4th gear.

   Standard value: 0.70 – 1.70 mm
   Minimum limit: 0.70 mm

NEEDLE ROLLER BEARING

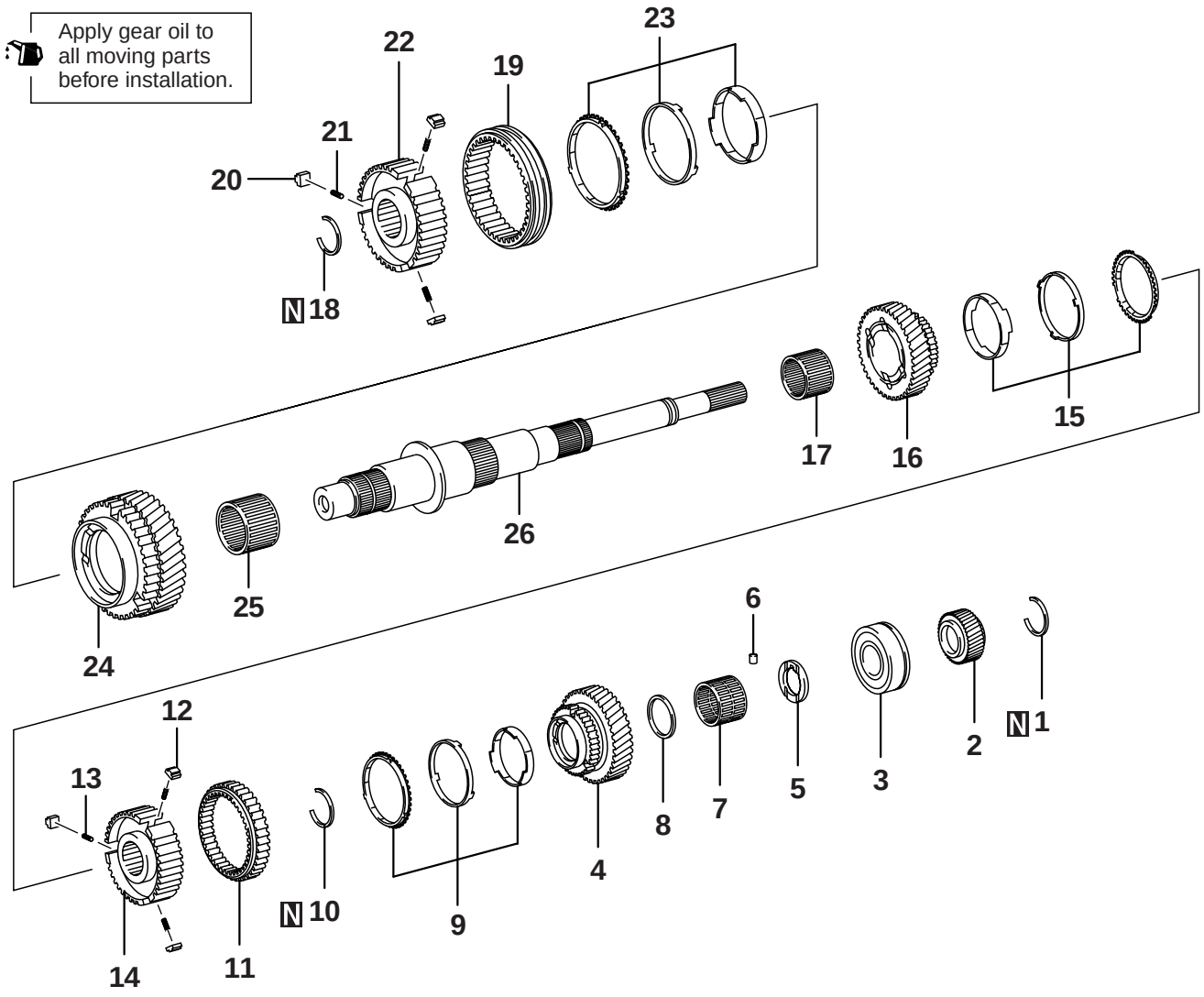
1. Combine the needle roller bearing with the input shaft, and check that it rotates smoothly without noise or play.

2. Check the needle roller bearing cage for deformation.

OUTPUT SHAFT

DISASSEMBLY AND REASSEMBLY

M1222002100160



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Disassembly steps

	>>G<<	1.	Shaft snap ring
<<A>>	>>F<<	2.	5th gear
<<B>>	>>E<<	3.	Radial ball bearing
<<B>>	>>E<<	4.	1st gear sub-assembly
		5.	1st gear thrust washer
		6.	Straight pin
		7.	Needle roller bearing
		8.	D spacer
		9.	Synchronizer ring set No.1
	>>D<<	10.	Shaft snap ring
<<C>>	>>C<<	11.	Reverse gear
<<C>>	>>C<<	12.	Synchronizer shifting key No.1

Disassembly steps (Continued)

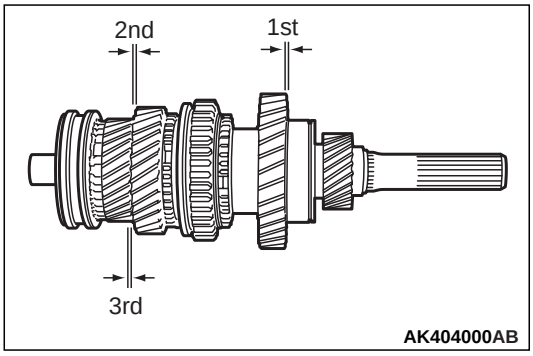
<<C>>	>>C<<	13.	Compression spring
<<C>>	>>C<<	14.	Transmission clutch No.1 hub
<<C>>	>>C<<	15.	Synchronizer ring set No.1
<<C>>	>>C<<	16.	2nd gear sub-assembly
		17.	Needle roller bearing
	>>B<<	18.	Shaft snap ring
<<D>>	>>A<<	19.	Transmission hub sleeve No.2
<<D>>	>>A<<	20.	Synchronizer shifting key No.2
<<D>>	>>A<<	21.	Compression spring
<<D>>	>>A<<	22.	Transmission clutch No.2 hub
<<D>>	>>A<<	23.	Synchronizer ring set No.2
<<D>>	>>A<<	24.	3rd gear sub-assembly

Disassembly steps (Continued)

25. Needle roller bearing
26. Output shaft

INSPECTION BEFORE DISASSEMBLY

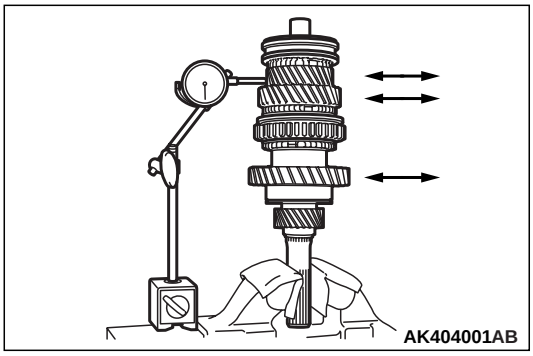
THRUST CLEARANCE FOR EACH GEAR



Inspect the thrust clearance of each gear.

Gear	Standard value mm	Limit mm
1st	0.20 – 0.45	0.45
2nd	0.10 – 0.25	0.25
3rd	0.10 – 0.25	0.25

RADIAL CLEARANCE FOR EACH GEAR

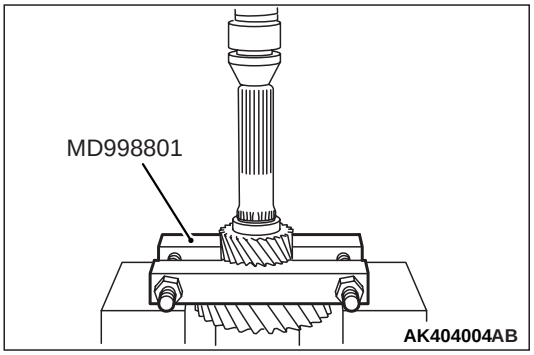


1. Fix the output shaft by a vice.
2. Inspect the radial clearance of each gear.

Gear	Standard value mm	Limit mm
1st	0.020 – 0.073	0.073
2nd	0.015 – 0.068	0.068
3rd	0.015 – 0.068	0.068

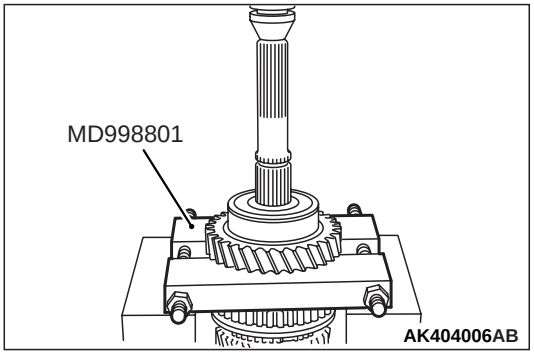
DISASSEMBLY SERVICE POINTS

<<A>> 5TH GEAR REMOVAL



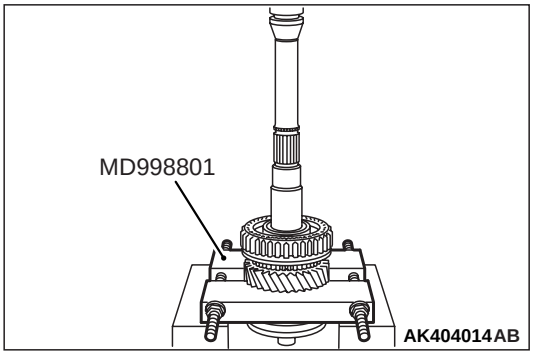
Using special tool Bearing remover (MD998801), support the 5th gear and remove it.

<<B>> RADIAL BALL BEARING / 1ST GEAR SUB-ASSEMBLY REMOVAL



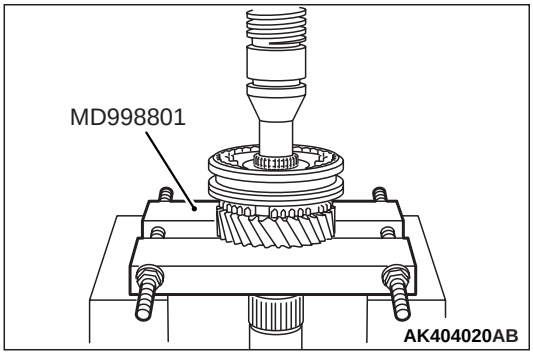
Using special tool Bearing remover (MD998801), support the 1st gear sub-assembly and remove the radial ball bearing and the 1st gear sub-assembly.

<<C>> REVERSE GEAR / SYNCHRONIZER SHIFTING KEY No.1 / COMPRESSION SPRING / TRANSMISSION CLUTCH No.1 HUB / SYNCHRONIZER RING SET No.1 / 2ND GEAR SUB-ASSEMBLY REMOVAL



Using special tool Bearing remover (MD998801), support the 2nd gear sub-assembly and remove the reverse gear, synchronizer shifting key No.1, compression spring, the transmission clutch No.1 hub, synchronizer ring set No.1 and the 2nd gear sub-assembly.

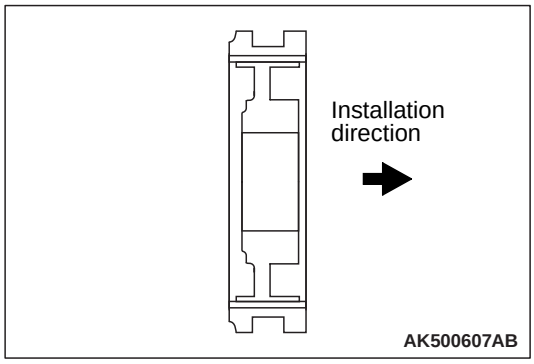
<<D>> TRANSMISSION CLUTCH HUB No.2 / SYNCHRONIZER SHIFTING KEY No.2 / COMPRESSION SPRING / TRANSMISSION HUB SLEEVE No.2 / SYNCHRONIZER RING SET No.2 / 3RD GEAR SUB-ASSEMBLY REMOVAL



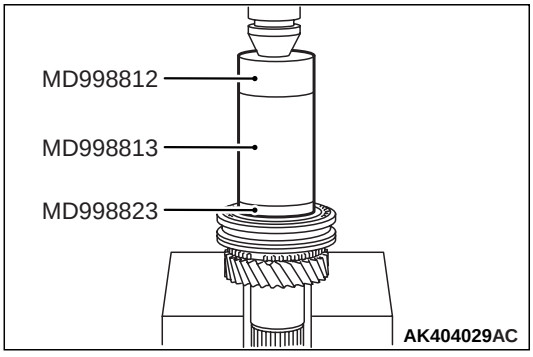
Using special tool Bearing remover (MD998801), support the 3rd gear sub-assembly and remove the transmission clutch hub No.2, synchronizer shifting key No.2, compression spring, the transmission hub sleeve No.2, synchronizer ring set and the 3rd gear sub-assembly.

REASSEMBLY SERVICE POINTS

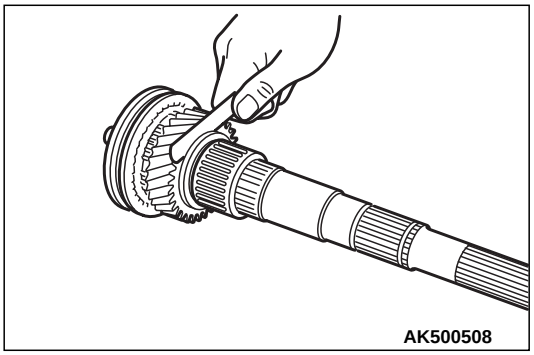
>>A<< TRANSMISSION CLUTCH HUB No. 2 / SYNCHRONIZER SHIFTING KEY No. 2 / COMPRESSION SPRING / TRANSMISSION HUB SLEEVE No. 2 / SYNCHRONIZER RING SET No. 2 / 3RD GEAR SUB-ASSEMBLY INSTALLATION



1. Check the installation direction of the transmission clutch hub No. 2, and put it on the output shaft.



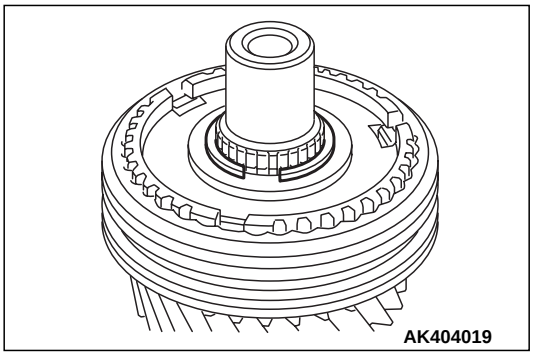
2. Using special tools to install the transmission clutch hub No. 2, synchronizer shifting key No. 2, compression spring, the transmission hub sleeve No. 2, synchronizer ring set No. 2 and the 3rd gear sub-assembly.
   - Installer cap (MD998812)
   - Installer-100 (MD998813)
   - Installer adapter (48) (MD998823)



3. Confirm the thrust clearance of the 3rd gear sub-assembly is within the standard value.

   Standard value: 0.10 – 0.25 mm
   Limit: 0.25 mm

>>B<< SHAFT SNAP RING INSTALLATION

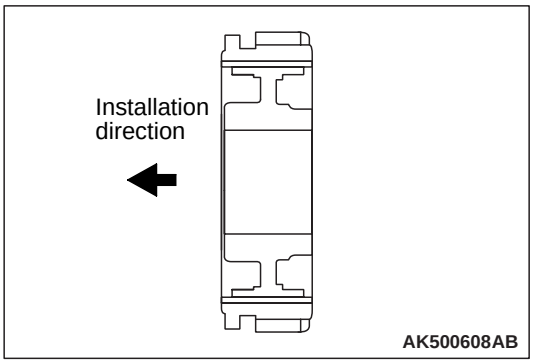


1. Select a shaft snap ring to secure the standard clearance between the transmission clutch hub No.2 and the output shaft.

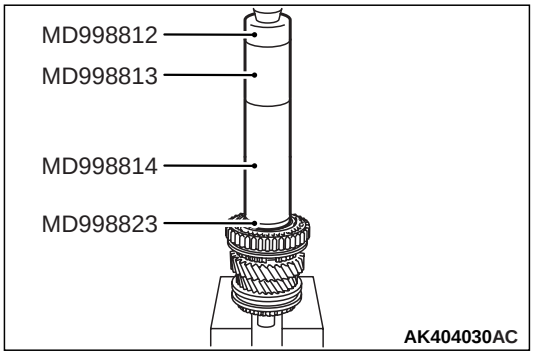
   Standard value: 0 – 0.1 mm

2. Install the selected snap ring.

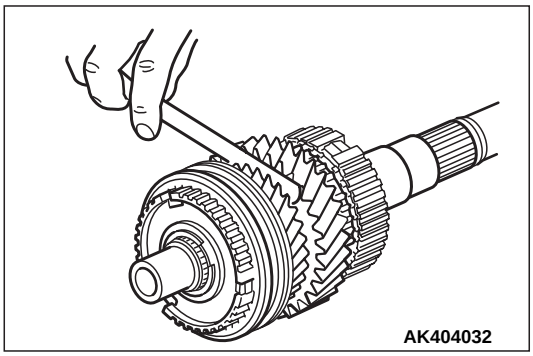
>>C<< REVERSE GEAR / SYNCHRONIZER SHIFTING KEY No. 1 / COMPRESSION SPRING / TRANSMISSION CLUTCH No. 1 HUB / SYNCHRONIZER RING SET No. 1 / 2ND GEAR SUB-ASSEMBLY INSTALLATION



1. Check the installation direction of the reverse gear, and put it on the output shaft.



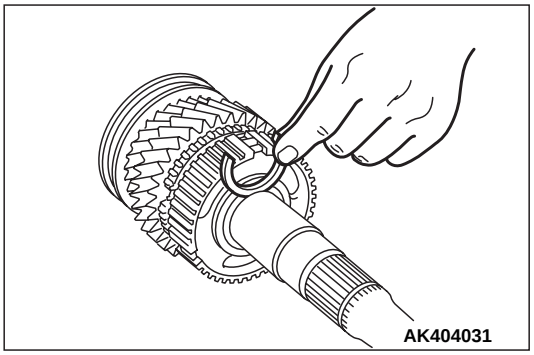
2. Using special tools to install the reverse gear, synchronizer shifting key No. 1, compression spring, the transmission clutch No. 1 hub, synchronizer ring set No. 1 and the 2nd gear sub-assembly.
   - Installer cap (MD998812)
   - Installer-100 (MD998813)
   - Installer-200 (MD998814)
   - Installer adapter (48) (MD998823)



3. Confirm the thrust clearance of the 2nd gear sub-assembly is within the standard value.

   Standard value: 0.10 – 0.25 mm
   Limit: 0.25 mm

>>D<< SHAFT SNAP RING INSTALLATION

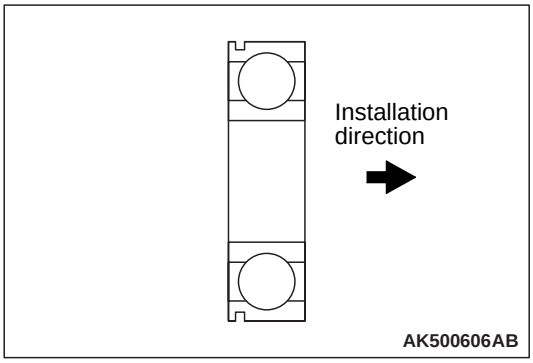


1. Select a snap ring to secure the standard clearance between the transmission clutch No. 1 hub and the output shaft.

   Standard value: 0 – 0.1 mm

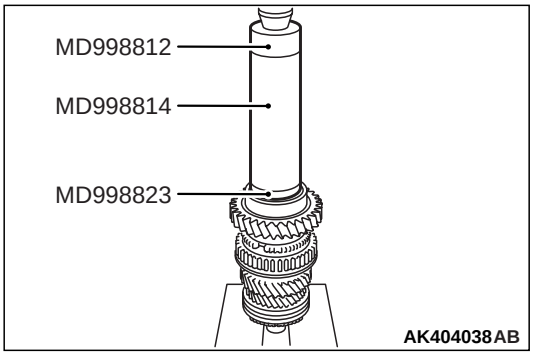
2. Install the selected snap ring.

>>E<< RADIAL BALL BEARING / 1ST GEAR SUB-ASSEMBLY INSTALLATION

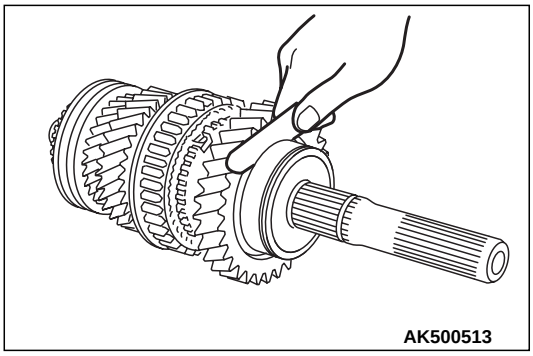


1. Check the installation direction of the radial ball bearing, and put it on the output shaft.

⚠ CAUTION
Never push on the sealing area when installing.



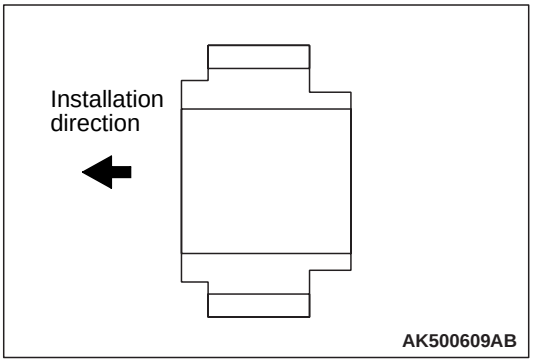
2. Using special tools to install the radial ball bearing and the 1st gear sub-assembly.
   - Installer cap (MD998812)
   - Installer-200 (MD998814)
   - Installer adapter (48) (MD998823)



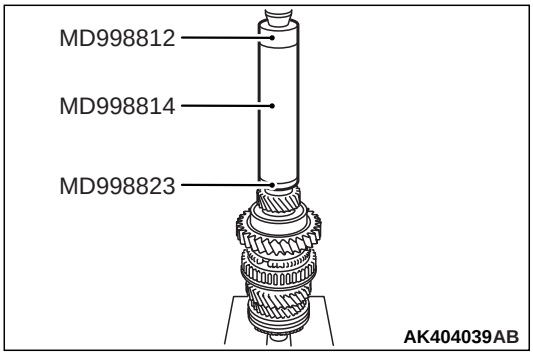
3. Confirm the thrust clearance of the 1st gear sub-assembly is within the standard value.

Standard value: 0.20 – 0.45 mm
Limit: 0.45 mm

>>F<< 5TH GEAR INSTALLATION

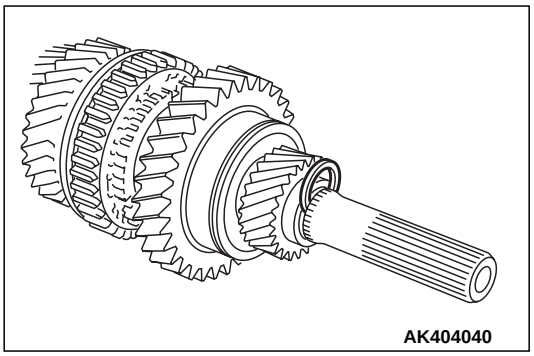


1. Check the installation direction of the 5th gear, and put it on the output shaft.



2. Using special tools to install the 5th gear.
- Installer cap (MD998812)
- Installer-200 (MD998814)
- Installer adapter (48) (MD998823)

>>G<< SHAFT SNAP RING INSTALLATION



1. Select a shaft snap ring to secure the standard clearance between the 5th gear and the output shaft

Standard value: 0 – 0.1 mm

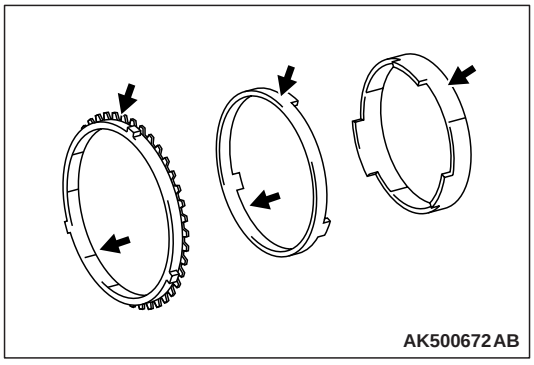
2. Install the selected snap ring.

INSPECTION

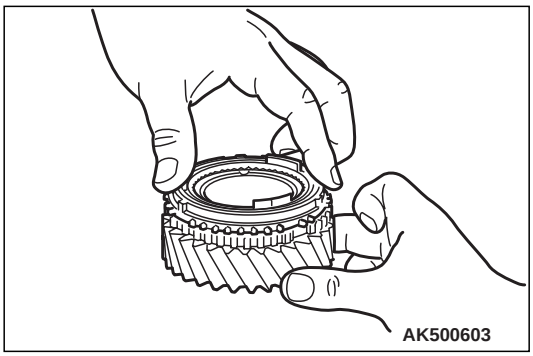
M1222002300261

SYNCHRONIZER RING

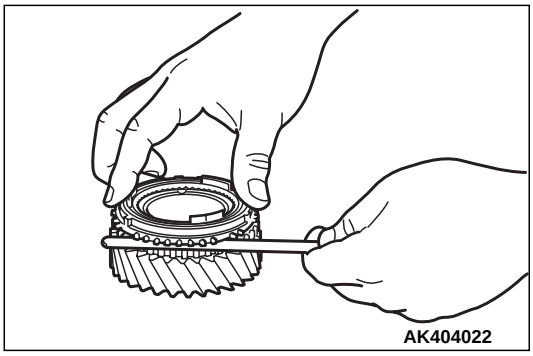
⚠ CAUTION
When any of the outer ring, inner ring or cone has to be replaced, replace them as a set.



1. Check to ensure that the clutch gear tooth surface and cone surface are not damaged and broken.



2. After applying oil to the taper portion on each gear, press and fit the synchronizer ring by hand. Confirm the synchronizer ring cannot be rotated.

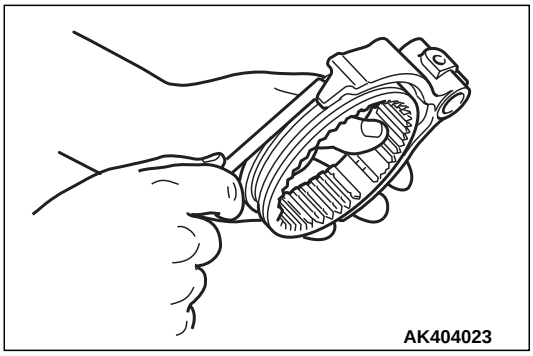

AK404022

3. Using the thickness gauge, check the clearance between the synchronizer ring and the gear.

Gear	Standard value mm	Limit mm
1st	0.65 – 1.75	0.65
2nd	0.65 – 1.75	0.65
3rd	0.65 – 1.75	0.65

HUB SLEEVE AND SHIFT FORK

⚠ CAUTION
When any of the hub sleeve or shift fork has to be replaced, replace them as a set.


AK404023

Using the thickness gauge, check the clearance between the sleeve and the shift fork.

sleeve	Standard value mm	Limit mm
No.1	0.15 – 0.41	0.41
No.2	0.15 – 0.35	0.35
No.3	0.26 – 0.84	0.84

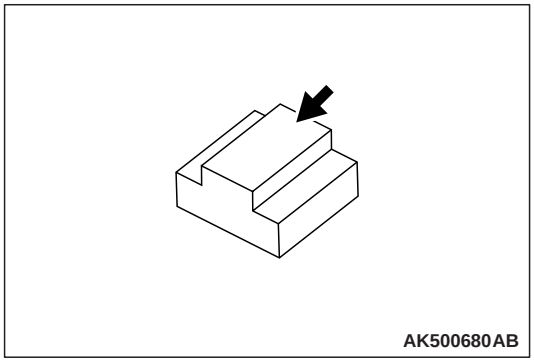
SYNCHRONIZER SLEEVE AND HUB

1. Combine the synchronizer sleeve and hub, and check that they slide smoothly.
2. Check that the sleeve is free from damage at its inside splines ends.

NEEDLE ROLLER BEARING

1. Combine the needle roller bearing with the output shaft and gear, and check that it rotates smoothly without noise or play.
2. Check the needle roller bearing cage for deformation.

SYNCHRONIZER KEYS

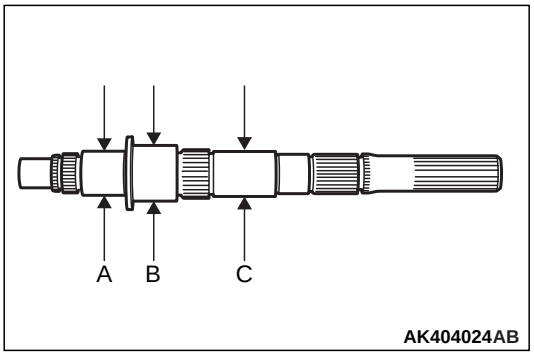

AK500680AB

Check the synchronizer hub contact surfaces of each synchronizer key for damage and excessive wear.

COMPRESSION SPRINGS

Check the compression springs for loss of tension, deformation, and breakage.

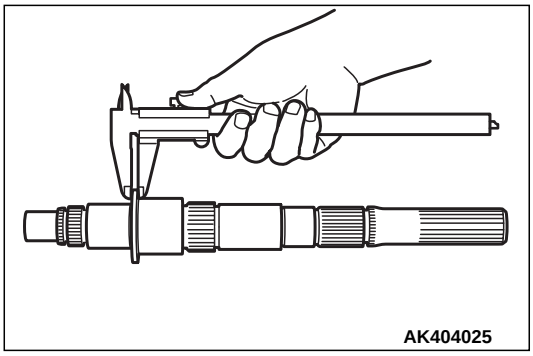
OUTPUT SHAFT



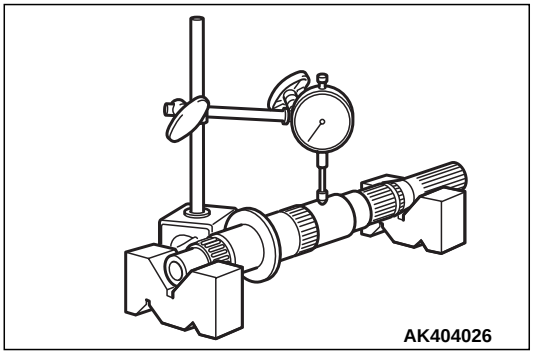
AK404024AB

1. Using the micrometer, check the outer shape of the needle roller bearing race.

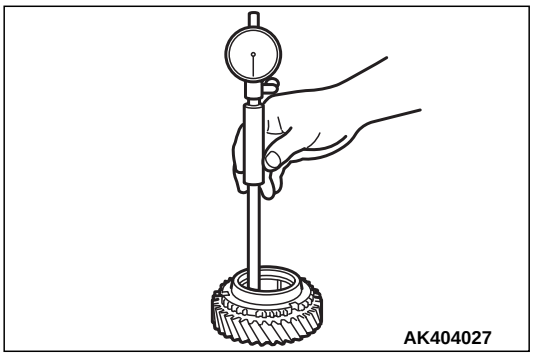
Measurement part	Standard value mm	Limit mm
A	37.984 – 38.000	37.984
B	46.984 – 47.000	46.984
C	38.979 – 38.995	38.979


AK404025

2. Using the slide gauge, check the flange thickness.
   Minimum limit: 4.800 mm


AK404026

3. Using the dial gauge and V-block, check the output shaft runout.
   Limit: 0.015 mm


AK404027

4. Using the cylinder gauge, check the inside diameter of each gear.

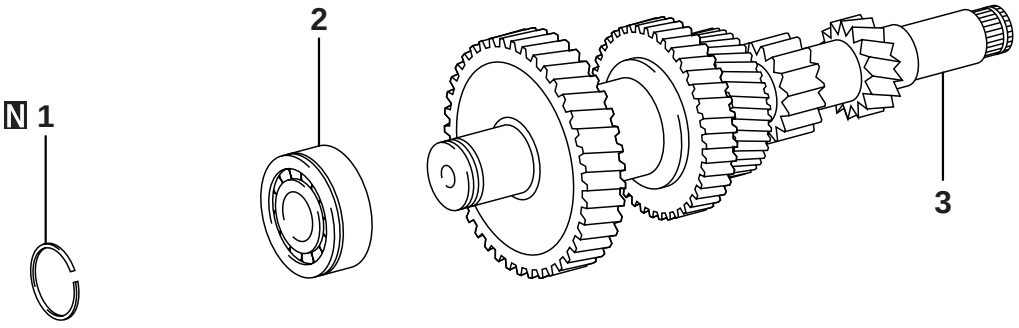
Gear	Standard value mm	Limit mm
1st	46.015 – 46.040	46.040
2nd	53.015 – 53.040	53.040
3rd	44.015 – 44.040	44.040

COUNTERSHAFT

DISASSEMBLY AND REASSEMBLY

M1222007300158

Apply gear oil to all moving parts before installation.



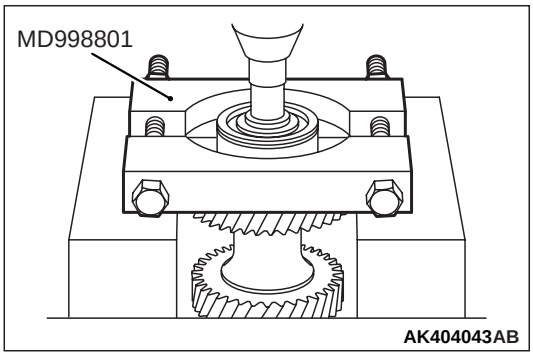
AK500518AB

Disassembly steps

>>B<< 1. Shaft snap ring
<<A>> >>A<< 2. Cylindrical roller bearing
3. Counter gear

DISASSEMBLY SERVICE POINT

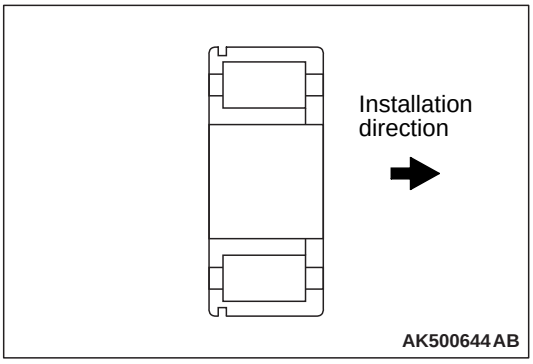
<<A>> CYLINDRICAL ROLLER BEARING REMOVAL



Using special tool Bearing remover (MD998801), support the cylindrical roller bearing and remove it.

REASSEMBLY SERVICE POINTS

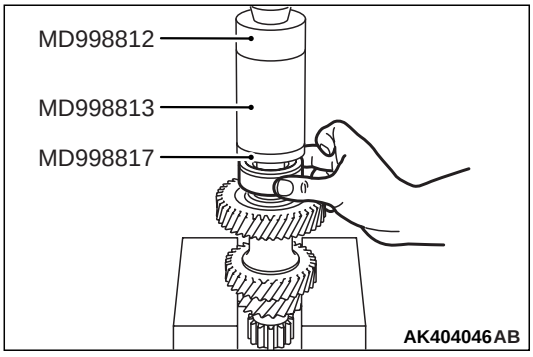
>>A<< CYLINDRICAL ROLLER BEARING INSTALLATION



1. Check the installation direction of the cylindrical roller bearing, and put it on the counter shaft.

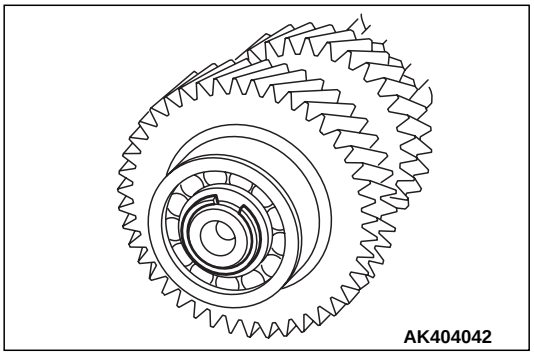
⚠ CAUTION

Never push the sealing area at the press fit.



2. Using special tools to install the cylindrical roller bearing.
   - Installer cap (MD998812)
   - Installer-100 (MD998813)
   - Installer adapter (34) (MD998817)

>>B<< SHAFT SNAP RING INSTALLATION



1. Select a snap ring to secure clearance of standard value between the cylinder roller bearing and counter shaft.

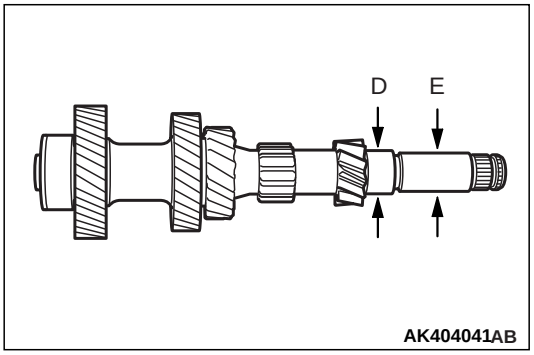
   Standard value: 0 – 0.1 mm

2. Install the selected snap ring.

INSPECTION

M1222007400025

COUNTER GEAR



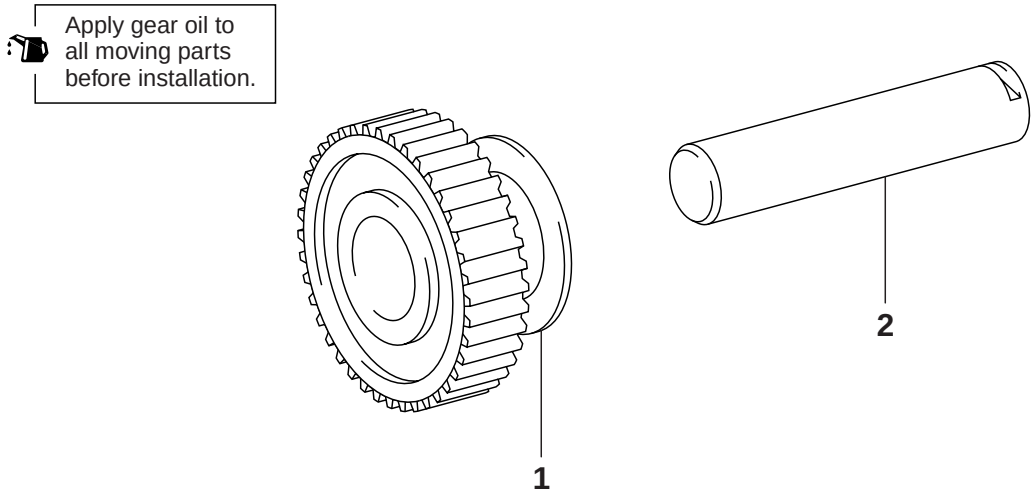
Using the micrometer, check the outer shape of the needle roller bearing race.

Measurement part	Standard value mm	Limit mm
D	34.000 – 34.105	34.000
E	29.984 – 30.000	29.984

REVERSE IDLER GEAR

DISASSEMBLY AND REASSEMBLY

M1222012500233



AK500519AB

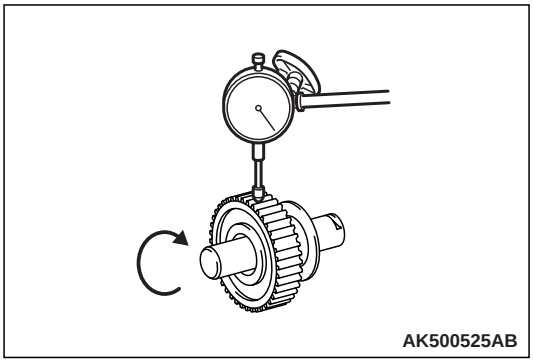
Disassembly steps

1. Reverse idler gear sub-assembly
2. Reverse idler gear shaft

INSPECTION

M1222012400076

REVERSE IDLER GEAR SUB-ASSEMBLY



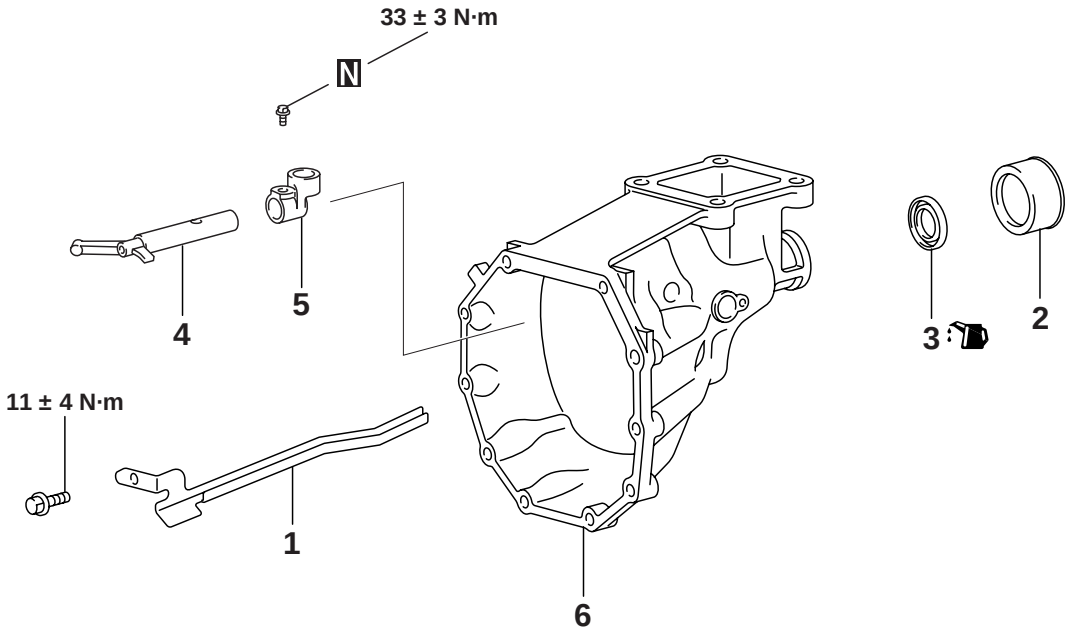
Check the radial clearance of the reverse idler gear.

Standard value: 0.040 – 0.082 mm
Limit: 0.082 mm

EXTENSION HOUSING

DISASSEMBLY AND REASSEMBLY

M1222004300074



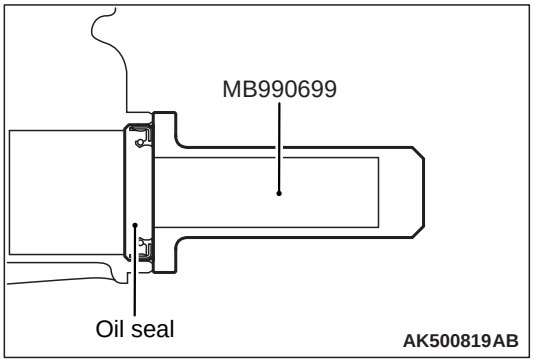
AK500815AB

Disassembly steps

1. Oil receiver pipe
2. Extension housing oil deflector
>>A<< 3. Oil seal
4. Shift & select lever
5. Shift lever housing
6. Extension housing

REASSEMBLY SERVICE POINTS

>>A<< OIL SEAL INSTALLATION



Using the special tool Differential oil seal installer (MB990699), install the oil seal.

GROUP 22C

MANUAL TRANSMISSION OVERHAUL <V5MB1>

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GENERAL INFORMATION

M1222000101606

MANUAL TRANSMISSION MODELS

Transmission model	Speedometer gear ratio	Combined engine	Vehicle model
V5MB1-J-NEZ	25/9	4D56 DI-D DOHC	KB4T
V5MB1-J-ND2	24/9	4D56 DI-D DOHC	KB4T
V5MB1-J-PD2	24/9	4D56 DI-D DOHC	KB4T
V5MB1-J-NEG	25/9	4D56 DI-D DOHC	KB4T
V5MB1-J-JER	25/9	4D56 DI-D DOHC	KB4T

GENERAL SPECIFICATIONS

M1222000201261

Item		Specifications
Transmission model		V5MB1
Applicable engine		4D56
Transmission type		5-speed transmission, floor shift
Transmission gear ratio	1st	4.313
	2nd	2.330
	3rd	1.436
	4th	1.000
	5th	0.788
	Reverse	4.220
Transfer type		Constant mesh
Transfer gear ratio	High	1.000
	Low	1.900

SERVICE SPECIFICATIONS

M1222000300975

Item		Standard value	Limit
Transmission			
Gear spline piece No.5 end play mm		0 – 0.1	–
Clearance between the synchronizer ring and the gear mm		0.52 - 1.88	0.52
Counter shaft gear No.5	thrust clearance mm	0.10 - 0.35	0.35
	radial clearance mm	0.015 – 0.068	0.068
	inside diameter mm	38.015 – 38.040	38.040
Input shaft			

Item		Standard value	Limit
Input shaft radial ball bearing end play mm		0 – 0.1	–
clearance between the synchronizer ring and the 4th gear mm		0.70 – 1.70	0.70
Output shaft			
Thrust clearance mm	1st gear	0.20 – 0.45	0.45
	2nd gear	0.10 – 0.25	0.25
	3rd gear	0.10 – 0.25	0.25
Radial clearance mm	1st gear	0.020 – 0.073	0.073
	2nd gear	0.015 – 0.068	0.068
	3rd gear	0.015 – 0.068	0.068
Transmission clutch hub No.1 end play mm		0 – 0.1	–
Transmission clutch hub No.2 end play mm		0 – 0.1	–
5th gear end play mm		0 – 0.1	–
Clearance between the synchronizer ring and the each gear mm	1st gear	0.65 – 1.75	0.65
	2nd gear	0.65 – 1.75	0.65
	3rd gear	0.65 – 1.75	0.65
Clearance between the each sleeve and the shift fork mm	sleeve No.1	0.15 – 0.41	0.41
	sleeve No.2	0.15 – 0.35	0.35
	sleeve No.3	0.26 – 0.84	0.84
Output shaft outer shape of the needle roller bearing race mm	A	37.984 – 38.000	37.984
	B	46.984 – 47.000	46.984
	C	38.979 – 38.995	38.979
Output shaft flange thickness mm		–	4.800
Output shaft runout mm		–	0.015
Each gear inside diameter mm	1st gear	46.015 – 46.040	46.040
	2nd gear	53.015 – 53.040	53.040
	3rd gear	44.015 – 44.040	44.040
Counter shaft			
Counter gear shaft cylindrical roller bearing end play mm		0 – 0.1	–
Counter shaft outer shape of the needle roller bearing race mm	D	34.000 – 34.105	34.000
	E	29.984 – 30.000	29.984
Reverse idler gear			
Reverse idler gear radial clearance mm		0.040 – 0.082	0.082

Transfer

Item	Standard value	Limit
Countershaft gear end play mm	0 – 0.15	–
H-L clutch hub end play mm	0 – 0.08	–
Differential lock hub end play mm <V5MB1-J-ND2, NEZ, PD2>	0 – 0.08	–

Item		Standard value	Limit
Rear output shaft bearing to rear cover clearance mm	<V5MB1-J-NEG, JER>	0 – 0.1	–
	<V5MB1-J-ND2, NEZ, PD2>	0.025 – 0.150	–
Input gear bearing end play mm		0 – 0.06	–
Counter shaft gear bearing end play mm		0 – 0.08	–
2-4WD synchronizer hub end play mm <V5MB1-J-ND2, NEZ, PD2>		0 – 0.08	–
2-4WD synchronizer ring and gear mm <V5MB1-J-ND2, NEZ, PD2>		–	0.3
Rear output shaft bearing end play mm <V5MB1-J-ND2, NEZ, PD2>		0 – 0.08	–
Drive sprocket and synchronizer ring mm <V5MB1-J-NEG>		–	0.3

SNAP RING, SPACER AND THRUST PLATE FOR ADJUSTMENT

M1222012001059

Transmission

Shaft snap ring (For adjustment of gear spline piece No.5 end play)

Thickness mm	Identification symbol	Thickness mm	Identification symbol
2.80 – 2.85	A	3.00 – 3.05	E
2.85 – 2.90	B	3.05 – 3.10	F
2.90 – 2.95	C	3.10 – 3.15	G
2.95 – 3.00	D		

Shaft snap ring (For adjustment of input shaft radial ball bearing end play)

Thickness mm	Identification symbol	Thickness mm	Identification symbol
2.10 – 2.15	A	2.30 – 2.35	E
2.15 – 2.20	B	2.35 – 2.40	F
2.20 – 2.25	C	2.40 – 2.45	G
2.25 – 2.30	D		

Shaft snap ring (For adjustment of transmission clutch hub No.2 end play)

Thickness mm	Identification symbol	Thickness mm	Identification symbol
1.80 – 1.85	A	2.00 – 2.05	E
1.85 – 1.90	B	2.05 – 2.10	F
1.90 – 1.95	C	2.10 – 2.15	G
1.95 – 2.00	D		

Shaft snap ring (For adjustment of transmission clutch hub No.1 end play)

Thickness mm	Identification symbol	Thickness mm	Identification symbol
2.30 – 2.35	A	2.50 – 2.55	E
2.35 – 2.40	B	2.55 – 2.60	F
2.40 – 2.45	C	2.60 – 2.65	G
2.45 – 2.50	D		

Shaft snap ring (For adjustment of 5th gear end play)

Thickness mm	Identification symbol	Thickness mm	Identification symbol
2.75 – 2.80	C	3.05 – 3.10	J
2.80 – 2.85	D	3.10 – 3.15	K
2.85 – 2.90	E	3.15 – 3.20	L
2.90 – 2.95	F	3.20 – 3.25	M
2.95 – 3.00	G	3.25 – 3.30	N
3.00 – 3.05	H	3.30 – 3.35	P

Shaft snap ring (For adjustment of counter gear shaft cylindrical roller bearing end play)

Thickness mm	Identification symbol	Thickness mm	Identification symbol
2.05 – 2.10	A	2.20 – 2.25	D
2.10 – 2.15	B	2.25 – 2.30	E
2.15 – 2.20	C	2.30 – 2.35	F

Transfer

Snap ring (For adjustment input gear bearing end play)

Thickness mm	Identification color	Thickness mm	Identification color
2.30	None	2.45	Blue
2.35	Red	2.50	Green
2.40	White		

Spacer (For adjustment of countershaft gear end play)

Thickness mm	Identification color	Thickness mm	Identification color
1.77	None	2.19	White
1.91	Blue	2.33	Red
2.05	Brown		

Snap ring (For adjustment of countershaft gear bearing end play)

Thickness mm	Identification color	Thickness mm	Identification color
1.48	Blue	1.62	None

Spacer (For adjustment of rear output shaft to rear cover clearance)

<V5MB1-J-NEG, JER>

Thickness mm	Identification symbol	Thickness mm	Identification symbol
2.75	B75	2.95	B95
2.79	B79	2.99	B99

Thickness mm	Identification symbol	Thickness mm	Identification symbol
2.83	B83	3.03	C03
2.87	B87	3.07	C07
2.91	B91	3.11	C11

<V5MB1-J-ND2, NEZ, PD2>

Thickness mm	Identification symbol	Thickness mm	Identification symbol
0.84	84	1.47	47
0.93	93	1.56	56
1.02	02	1.65	65
1.11	11	1.74	74
1.20	20	1.83	83
1.29	29	1.92	92
1.38	38	2.01	01

Snap ring (For adjustment of H-L clutch hub end play)

Thickness mm	Identification color	Thickness mm	Identification color
2.18	–	2.32	–
2.25	–	2.39	–

Snap ring (For adjustment of differential lock hub end play) <V5MB1-J-ND2, NEZ, PD2>

Thickness mm	IdentificatioN color	Thickness mm	IdentificatioN color
2.56	None	2.84	Yellow
2.63	Red	2.91	Green
2.70	White	2.98	Purple
2.77	Blue		

Snap ring (For adjustment of 2-4WD synchronizer hub end play) <V5MB1-J-ND2, NEZ, PD2>

Thickness mm	IdentificatioN color	Thickness mm	IdentificatioN color
2.56	None	2.77	Blue
2.63	Red	2.84	Yellow
2.70	White		

Snap ring (For adjustment of rear output shaft bearing end play) <V5MB1-J-ND2, NEZ, PD2>

Thickness mm	IdentificatioN color	Thickness mm	IdentificatioN color
2.26	None	2.40	White
2.33	Red	2.47	Blue

TORQUE SPECIFICATIONS

M1222013900632

Transmission

Item	N·m
Reverse shift arm bracket mounting bolt	18 ± 5
Rear bearing output retainer mounting bolt	18 ± 5
Gear shift fork shaft mounting bolt	19.5 ± 3.9
Straight screw plug with head	18.5 ± 5.5
Front bearing retainer sub-assembly mounting bolt	16.5 ± 5.0
Wiring harness clamp bracket mounting bolt	18 ± 3
Transfer adaptor sub-assembly mounting bolt	37 ± 11
Shift lever housing mounting bolt	33 ± 3
Cover mounting bolt	18 ± 5
Reverse restrict pin assembly mounting bolt	37 ± 11
Clutch housing mounting bolt	36 ± 7
Clutch housing mounting bolt (with seal)	34 ± 6
Shift position switch assembly	34 ± 5
Back-up lamp switch assembly	44 ± 9
Transfer mounting bolt and nut	35 ± 6

Transfer

Item	N·m
Side cover tightening bolt	9.0 ± 1.0
Chain cover tightening bolt	35 ± 6
Rear cover tightening bolt	35 ± 6
Plug <V5MB1-J-NEG, JER>	35 ± 6
Transfer case tightening bolt and nut	35 ± 6
Speedometer sleeve clamp mounting bolt	19 ± 3
Vehicle speed sensor	25 ± 4
4WD operation detection switch	34 ± 5
Center differential lock detection switch <V5MB1-J-ND2, NEZ, PD2>	35 ± 6
2WD/4WD detection switch <V5MB1-J-ND2, NEZ, PD2>	35 ± 6
Center differential lock operation detection switch <V5MB1-J-ND2, NEZ, PD2>	34 ± 5
High range/Low range detection switch	34 ± 5
4LLc operation detection switch <V5MB1-J-PD2>	34 ± 5
Bearing retainer mounting bolt	19 ± 3
H-L shift fork mounting bolt	9.0 ± 2.0
Rear output shaft lock nut <V5MB1-J-NEG, JER>	255 ± 10
Rear bearing retainer <V5MB1-J-ND2, NEZ, PD2>	20 ± 2
Oil pool cover <V5MB1-J-ND2, NEZ, PD2>	9.0 ± 1.0

Item	N·m
Plug <V5MB1-J-ND2, NEZ, PD2>	34 ± 5
Plug	32 ± 2
Center differential case mounting bolt <V5MB1-J-ND2, NEZ, PD2>	69 ± 10

SEALANTS

M1222000501251

Transmission

Item	Specified sealant and adhesive
Between transmission case sub-assembly and intermediate plate	Mitsubishi genuine sealant Part No.MD974421 or equivalent
Between front bearing retainer and transmission case sub-assembly	
Between intermediate plate and extension housing sub-assembly	
Between intermediate plate and transfer adaptor sub-assembly	
Between transfer adaptor sub-assembly and cover	
Straight screw plug	
Front bearing retainer mounting bolt	
Clutch housing mounting bolt	

Transfer

Item	Specified sealant and adhesive
Chain cover	Mitsubishi genuine sealant Part No.MD997740 or equivalent
Rear cover	
Control housing	
Transfer case plate	
Plug	3M AAD part No.8672 or equivalent
Return spring plug	3M STUD Looking No.4170 or equivalent
Bearing retainer mounting bolt	

FORM-IN-PLACE GASKET (FIPG)

This transmission has several areas where the form-in-place gasket (FIPG) is used for sealing. To ensure that the FIPG fully serves its purpose, it is necessary to observe some precautions when applying it. Bead size, continuity and location are of paramount importance.

Too thin a bead could cause leaks. Too thick a bead, on the other hand, could be squeezed out of location, causing blocking or narrowing of fluid passages. To prevent leaks or blocking of passages, therefore, it is absolutely necessary to apply the FIPG evenly without a break, while observing the correct bead size.

FIPG hardens as it reacts with the moisture in the atmospheric air, and it is usually used for sealing metallic flange areas.

⚠ CAUTION

When re-applying liquid gasket (FIPG), be sure that:

1. **Residues of FIPG are cleared from all the ins and outs of parts;**
2. **Use Mitsubishi genuine parts cleaner (MZ100387) or equivalent to well degrease the FIPG-applied surface.**
3. **FIPG is correctly applied in accordance with FIPG Application.**

Disassembly
Parts sealed with a FIPG can be easily removed without need for the use of a special method. In some cases, however, the FIPG in joints may have to be broken by tapping parts with a mallet or similar tool.

Surface Preparation
Thoroughly remove all substances deposited on the FIPG application surface, using a gasket scraper. Make sure that the FIPG application surfaces is flat and smooth. Also make sure that the surface is free from oils, greases and foreign substances. Do not fail to remove old FIPG that may remain in the fastener fitting holes.

FIPG Application
Applied FIPG bead should be of the specified size and free of any break. FIPG can be wiped away unless it has completely hardened. Install the mating parts in position while the FIPG is still wet. Do not allow FIPG to spread beyond the sealing areas during installation. Avoid operating the transmission or letting oils or water come in contact with the sealed area before a time sufficient for FIPG to harden (approximately one hour) has passed.
FIPG application method may vary from location to location. Follow the instruction for each particular case described later in this manual.

LUBRICANTS

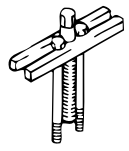
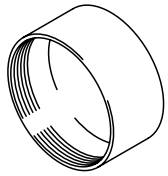
M1222000400381

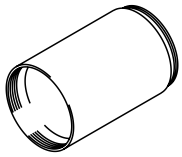
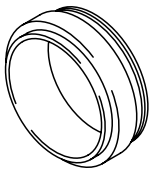
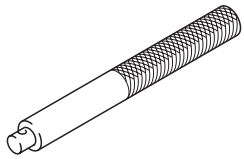
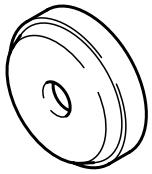
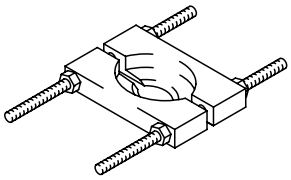
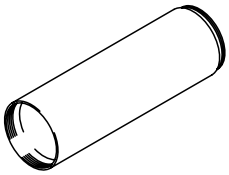
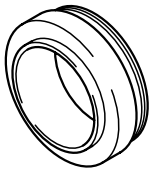
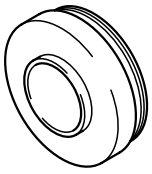
Item	Specified lubricant	Quantity
Transmission oil	Gear oil API classification GL-3 SAE 75W-85W	As required
Transfer oil		
Oil seal	Mitsubishi Part No. 0101011 or equivalent	

SPECIAL TOOLS

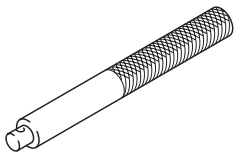
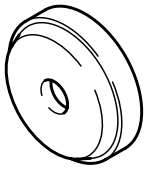
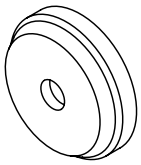
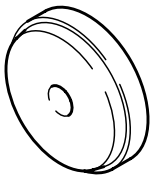
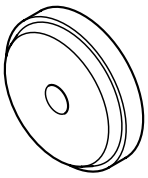
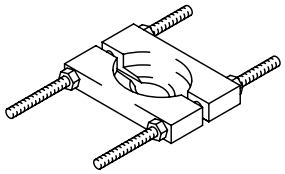
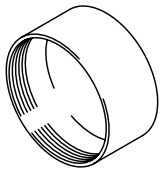
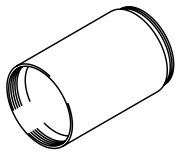
M1222000601139

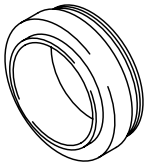
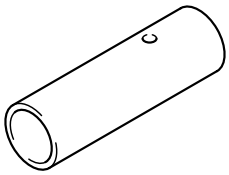
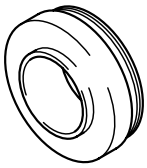
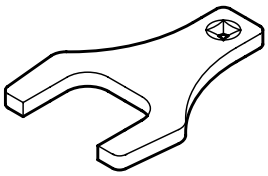
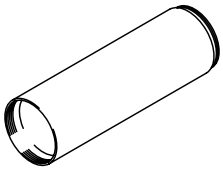
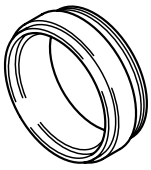
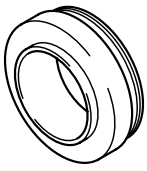
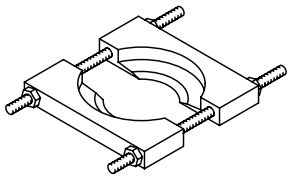
Transmission

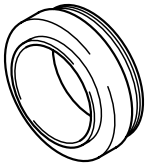
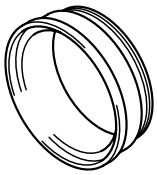
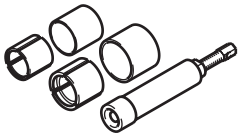
Tool	Tool number	Name	Use
 MB990803	MB990803	Steering wheel puller	Removal of gear spline piece No.5
MB990811	MB990811	Side bearing puller cup	Use with Steering wheel puller
	MD998812	Installer cap	Use with installer and adapter

Tool	Tool number	Name	Use
	MD998813	Installer-100	Use with installer cap and adapter
	MD998827	Installer adapter (56)	Use with installer cap and adapter
	MB990938	Installer bar	Installation of oil seal
	MB990929	Installer adapter	
	MD998801	Remover	Removal of roller bearing and ball bearing, input gear corn ring, transmission clutch hub No.1 and transmission clutch hub No.2
	MD998814	Installer-200	Use with installer cap and adapter
	MD998823	Installer adapter (48)	Installation of ball bearing, 5th gear, transmission clutch hub No.1 and transmission hub No.2
	MD998817	Installer adapter (34)	Use with installer cap and adapter

Transfer

Tool	Number	Name	Use
	MB990938	Installer bar	Installation of oil seal
	MB990929	Installer adapter	
	MB990931	Installer adapter	
	MB990932	Installer adapter	
	MB990933	Installer adapter	
	MD998801	Remover	Removal and installation of bearing
	MD998812	Installer cap	Use with installer and installer adapter
	MD998813	Installer-100	Use with installer cap and installer-200

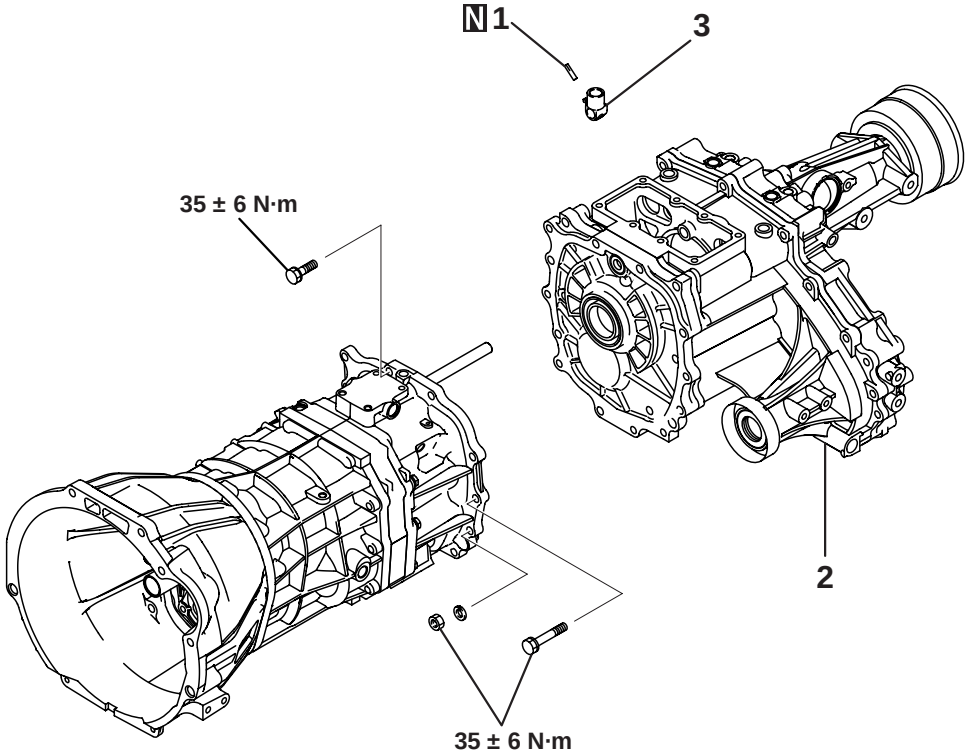
Tool	Number	Name	Use
	MD998824	Installer adapter (50)	Installation of transfer input gear bearing
	MD998368	Bearing Installer	Installation of countershaft gear bearing
	MD998818	Installer adapter (38)	Installation of countershaft gear bearing, front output shaft bearing
	MB991013	power steering lock nut special spanner	Removal and installation of output shaft locking nut
	MD998814	Installer-200	Use with installer cap and installer adapter
	MD998829	Installer adapter (60)	Installation of rear output shaft ball bearing and stopper plate
	MD998821	Installer adapter (44)	Installation of clutch hub and rear output shaft ball bearing
	MD998917	Bearing remover	Removal of rear output shaft bearing <V5MB1-J-ND2, NEZ, PD2>

Tool	Number	Name	Use
	MD998823	Installer adapter (48)	Installation of rear output shaft ball bearing <V5MB1-J-ND2, NEZ, PD2>
	MD998830	Installer adapter (66)	Installation of transfer drive bearing <V5MB1-J-ND2, NEZ, PD2>
	MD998192	Counter shaft bearing puller	Installation of transfer drive bearing <V5MB1-J-ND2, NEZ, PD2>

TRANSMISSION

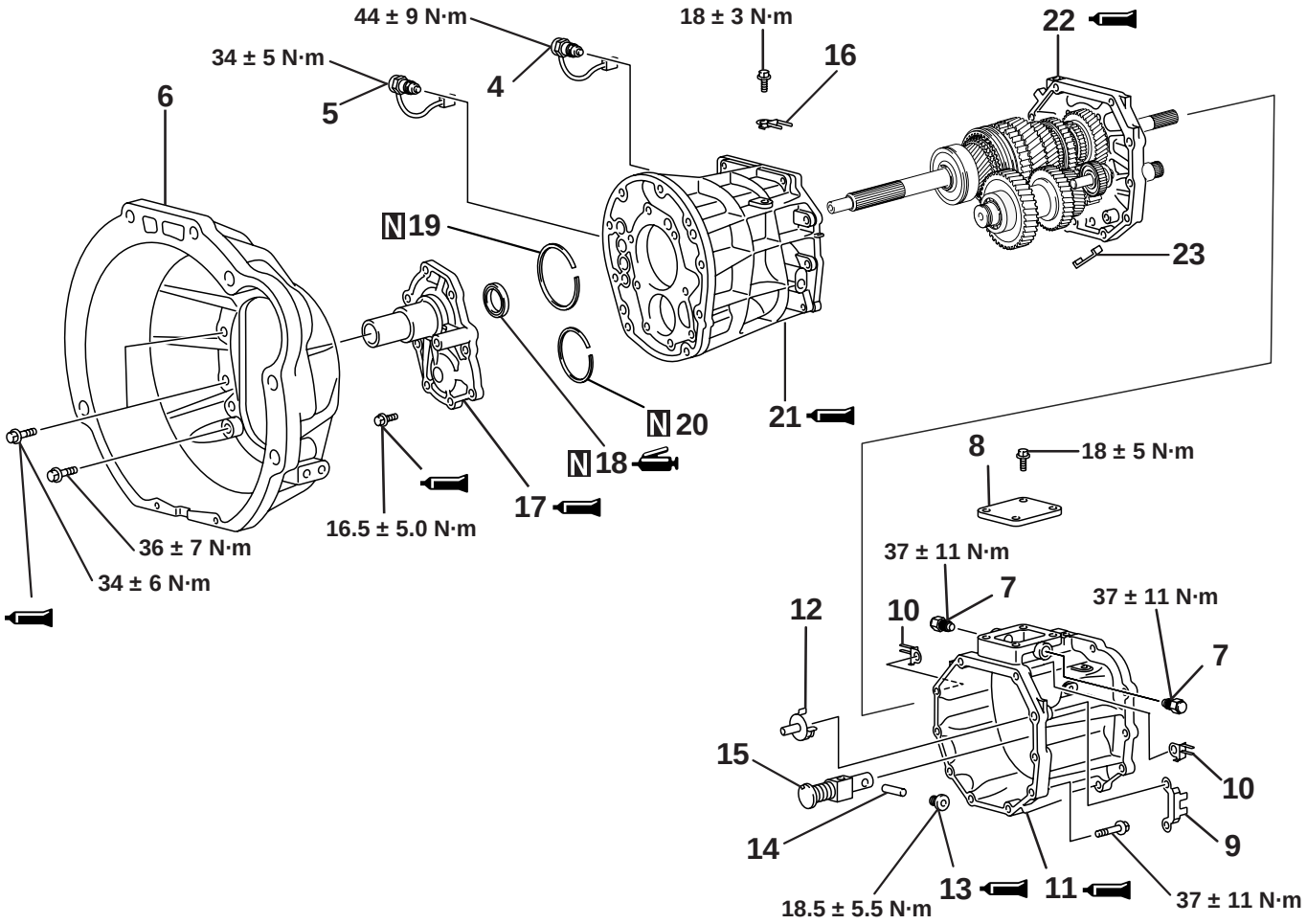
DISASSEMBLY AND REASSEMBLY

M1222001001925



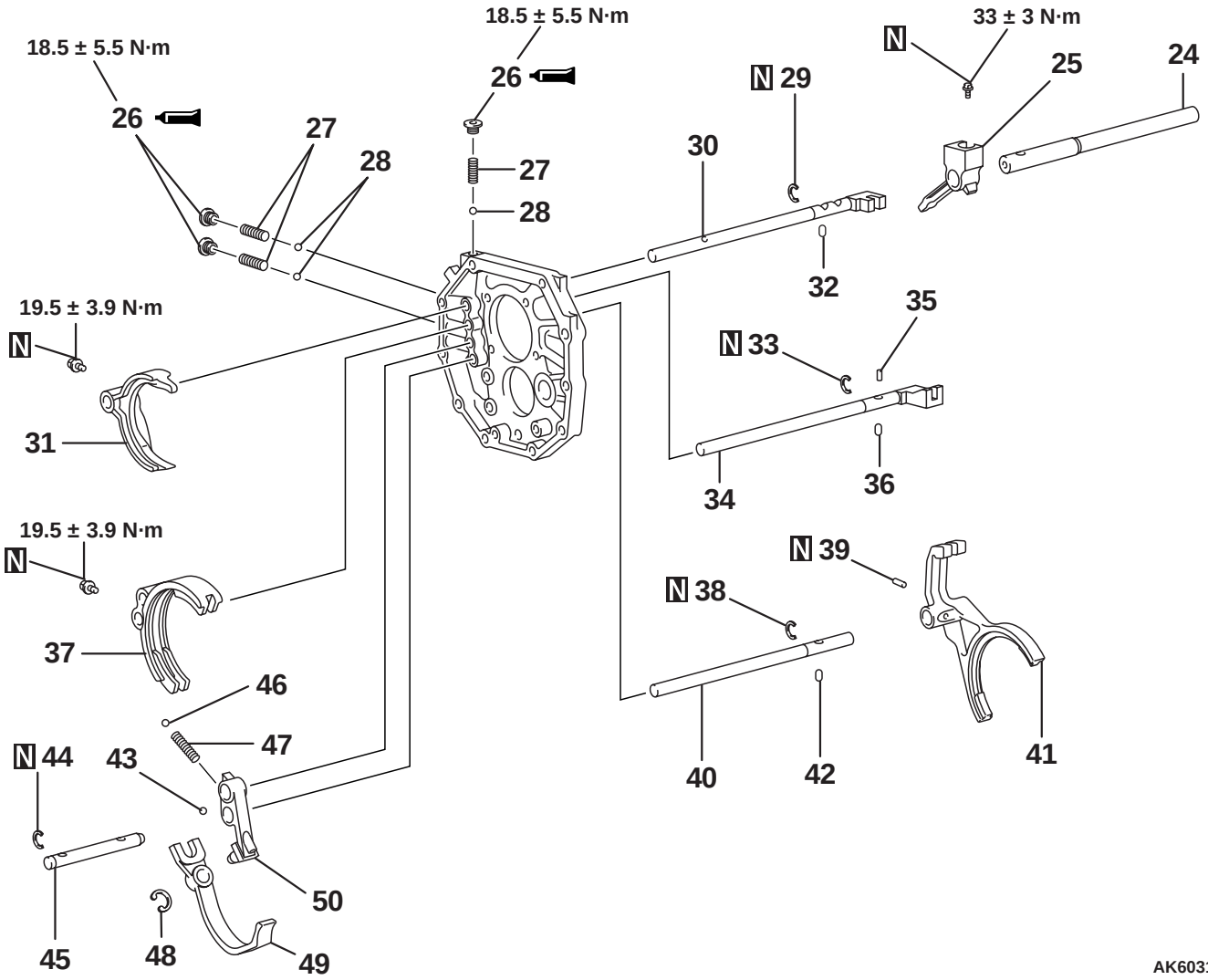
AK500694AB

1. Spring pin
2. Transfer
3. Change shifter



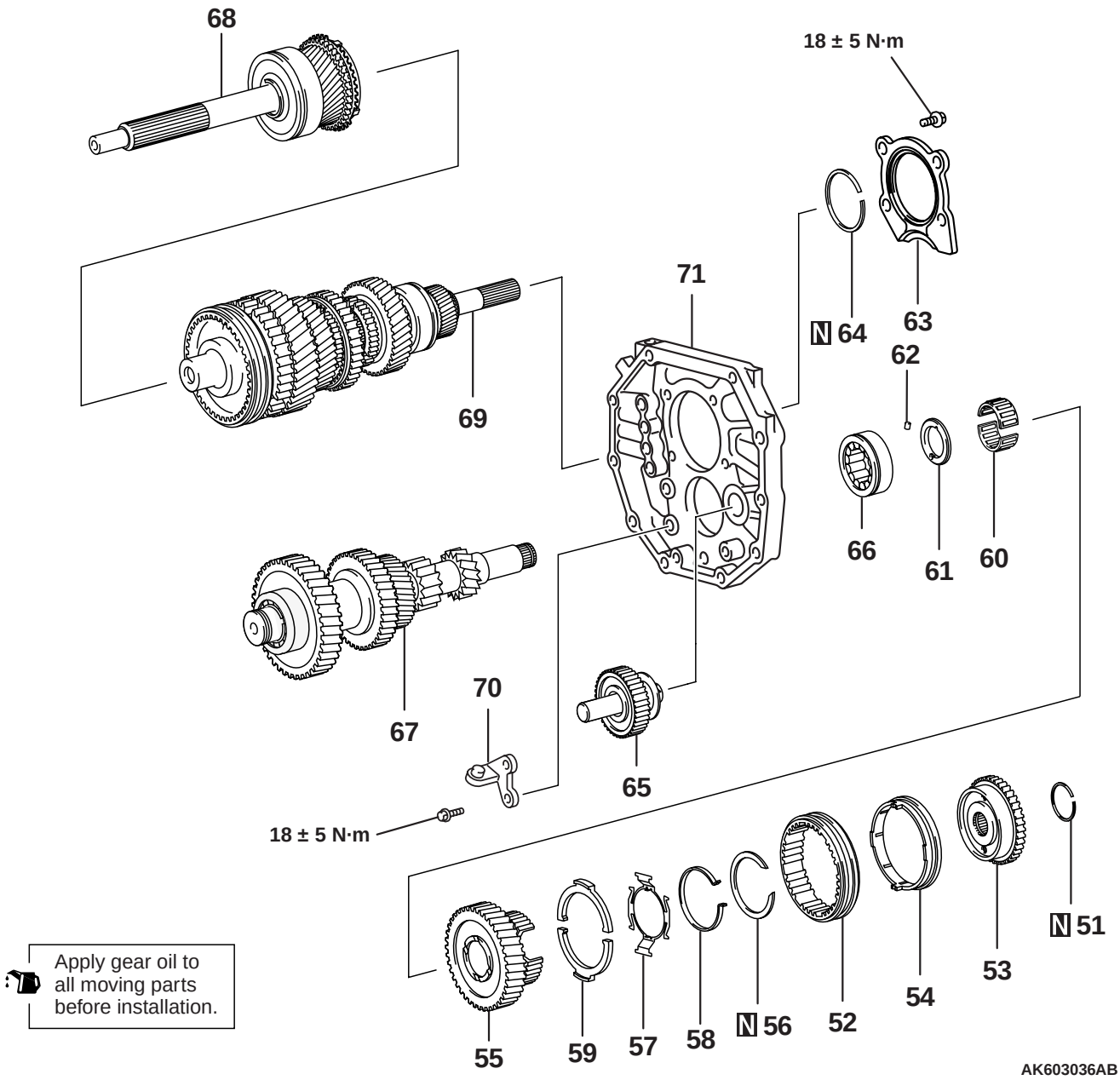
AK603025AH

4. Back-up lamp switch assembly
5. Shift position switch assembly
6. Clutch housing
7. Reverse restrict pin assembly
8. Cover
9. Wiring harness clamp bracket
10. Wiring harness clamp bracket
11. Transfer adaptor sub-assembly
12. Oil receiver pipe
13. Straight screw plug with head
14. Slotted spring pin
15. Reverse restrict pin assembly
16. Wiring harness clamp bracket
17. Front bearing retainer
18. Oil seal
19. Shaft snap ring
20. Shaft snap ring
21. Transmission case sub-assembly
22. Intermediate plate with shaft sub-assembly
23. Transmission magnet



AK603100AB

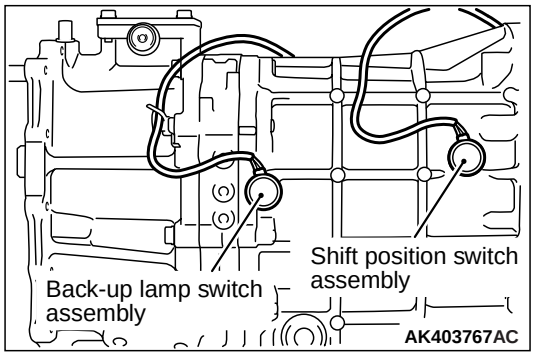
24. Control shaft assembly
25. Shift lever housing
26. Straight screw plug with head
27. Compression spring
28. Ball
29. Shaft snap ring
30. Gear shift fork shaft No.2
31. Gear shift fork No.2
32. Roller A
33. Shaft snap ring
34. Gear shift fork shaft No.1
35. Straight pin
36. Roller A
37. Gear shift fork No.1
38. Shaft snap ring
39. Slotted spring pin
40. Gear shift fork shaft No.3
41. Gear shift fork No.3
42. Roller A
43. Ball
44. Shaft snap ring
45. Gear shift fork shaft No.4
46. Ball
47. Compression spring
48. E ring
49. Reverse shift arm
50. Reverse shift fork



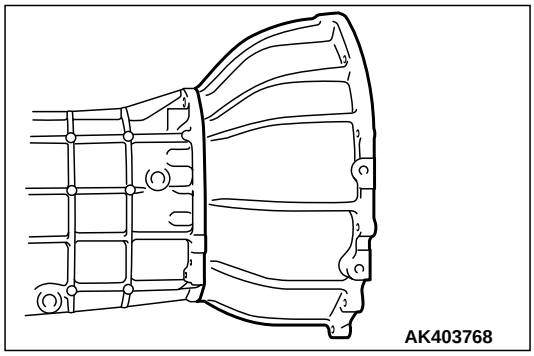
51. Shaft snap ring
52. Transmission hub sleeve No.3
53. Gear spline piece No.5
54. Synchronizer outer race No.3
55. Counter shaft gear No.5
56. Shaft snap ring
57. Synchromesh shifting key spring No.3
58. Synchromesh shifting key spring No.3
59. Synchromesh shifting key No.3
60. Needle roller bearing
61. 5th gear thrust washer
62. Straight pin
63. Rear bearing output shaft retainer
64. Shaft snap ring
65. Reverse idler gear
66. Cylindrical roller bearing
67. Counter shaft sub-assembly
68. Input shaft sub-assembly
69. Output shaft sub-assembly
70. Reverse shift arm bracket
71. Intermediate plate

DISASSEMBLY

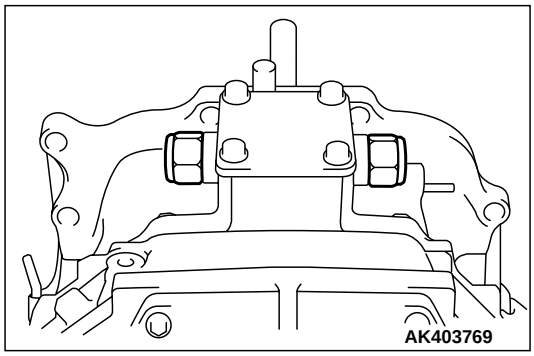
1. Remove the spring pin.
2. Remove the transfer and the gear change shifter.



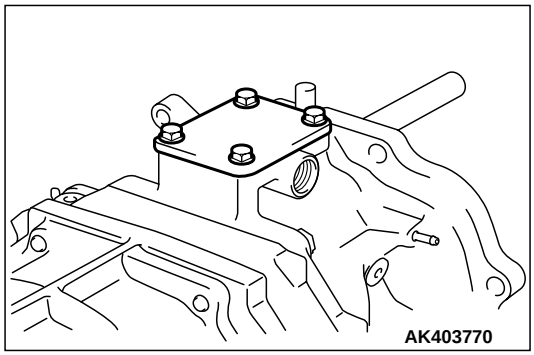
3. Remove the shift position switch assembly and the back-up lamp switch assembly.



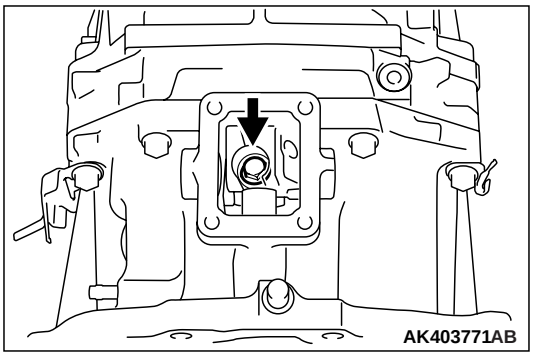
4. Remove the clutch housing.



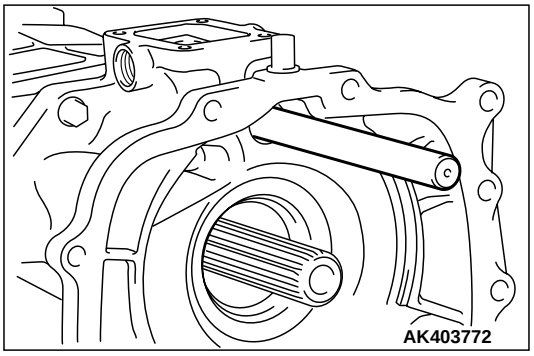
5. Remove the reverse restrict pin assembly (2 places).



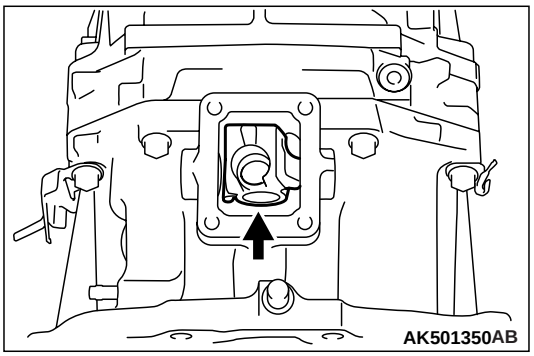
6. Remove the cover.



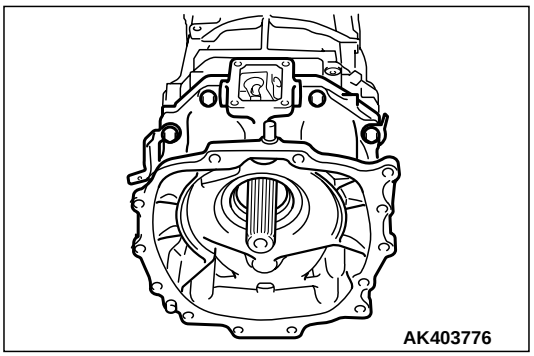
7. Remove the flange bolt.



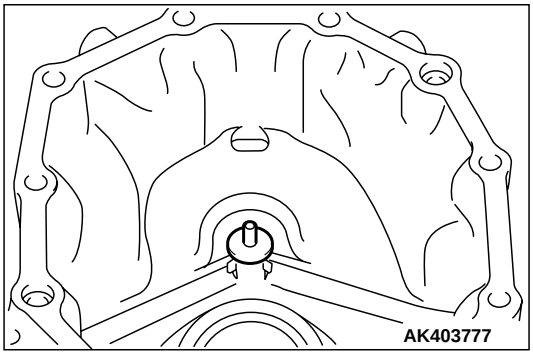
8. Remove the control shaft assembly.



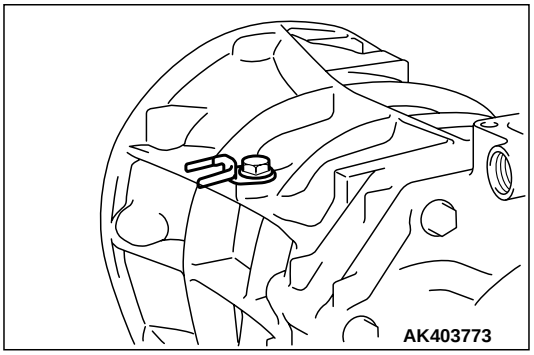
9. Remove the shift lever housing.



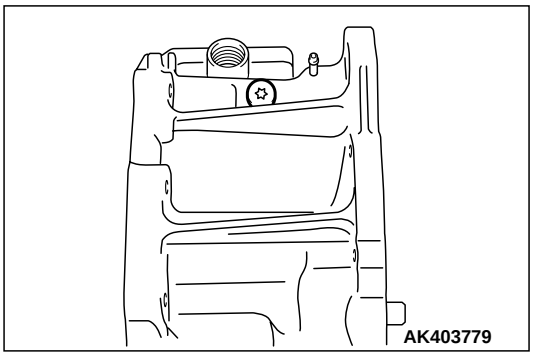
10. Remove the transfer adaptor sub-assembly and the wiring harness clamp bracket (3 places).



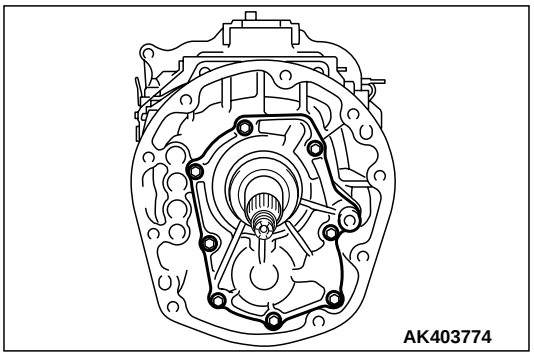
11.Remove the oil receiver pipe.



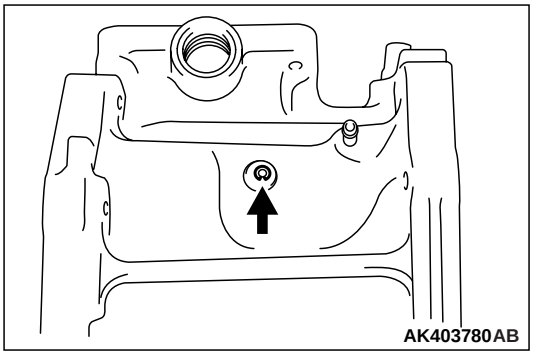
15.Remove the wiring harness clamp bracket.



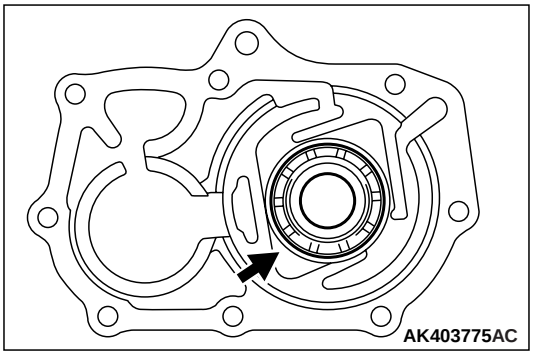
12.Remove the straight screw plug with head.



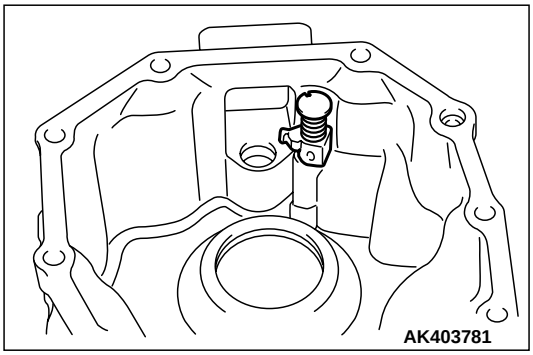
16.Remove the front bearing retainer.



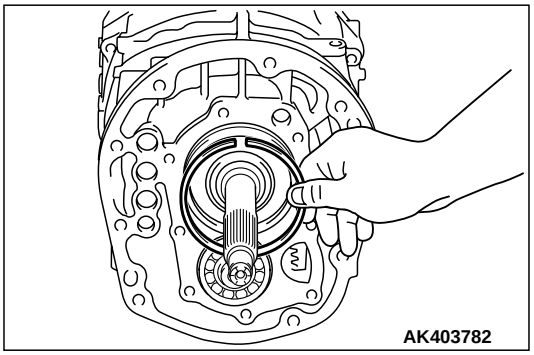
13.Remove the slotted spring pin.



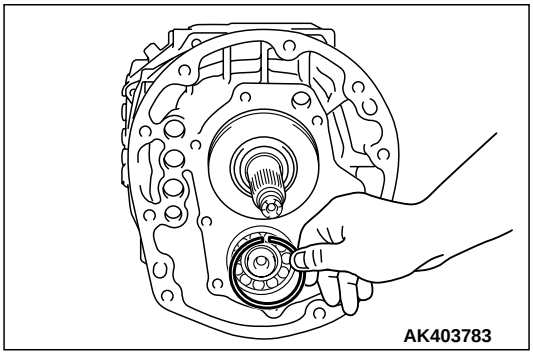
17.Remove the oil seal.



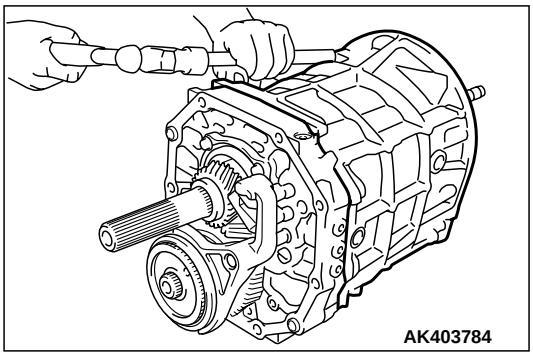
14.Remove the reverse restrict pin assembly.



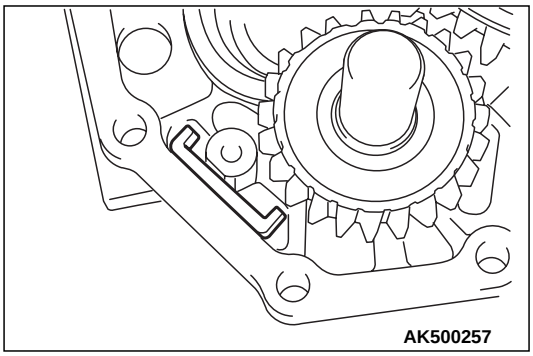
18.Remove the shaft snap ring.



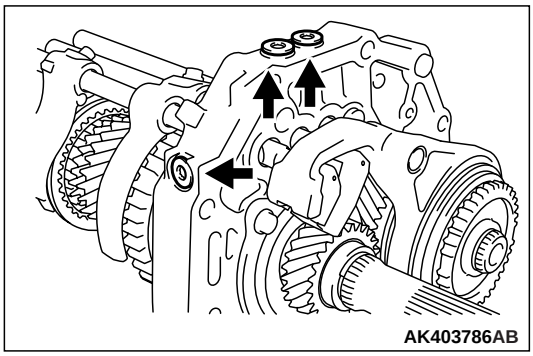
19.Remove the shaft snap ring.



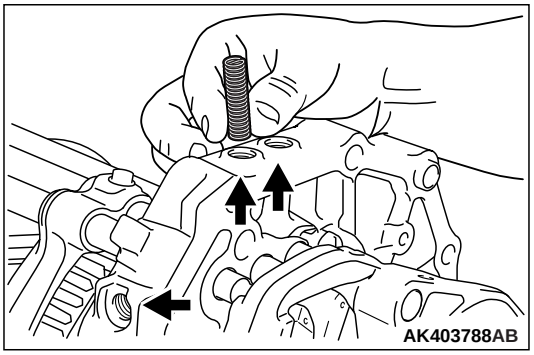
20.Remove the transmission case sub-assembly.



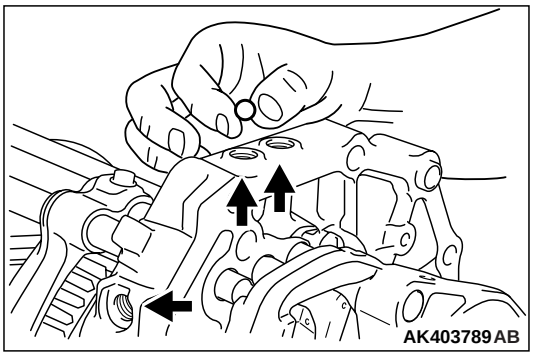
21.Remove the transmission magnet.



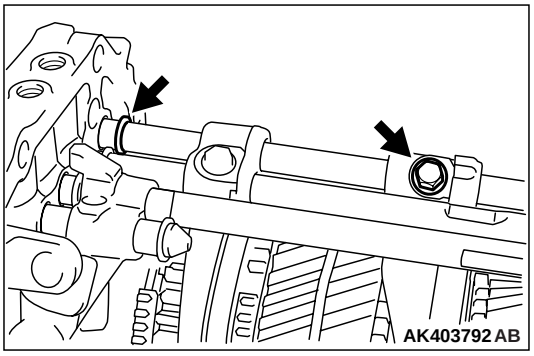
22.Remove the straight screw plug with head (3 places).



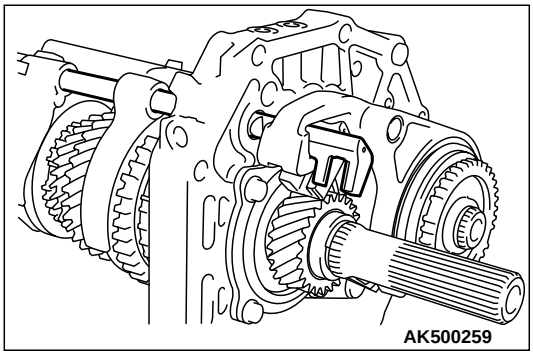
23.Remove the compression spring (3 places).



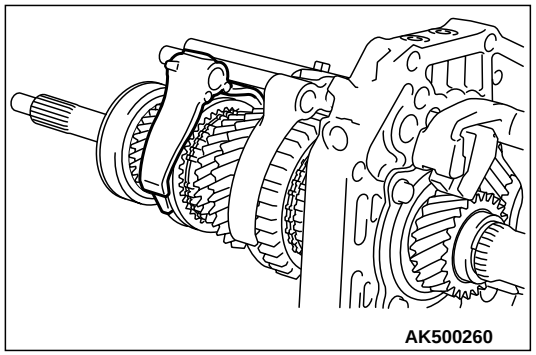
24.Remove the ball (3 places).



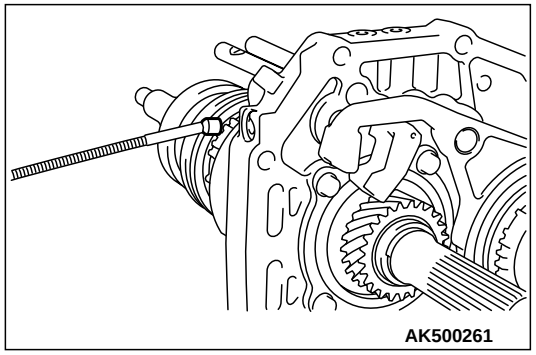
25.Remove the shaft snap ring of the gear shift fork shaft No.2 and the washer based hexagon bolt of the gearshift fork No.2.



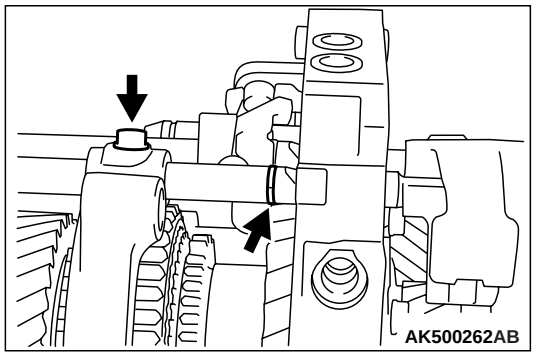
26.Remove the gear shift fork shaft No.2.



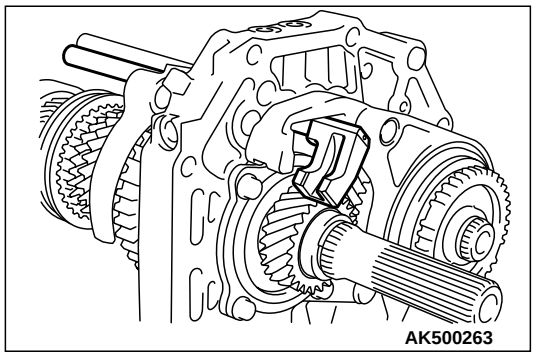
27.Remove the gear shift fork No.2.



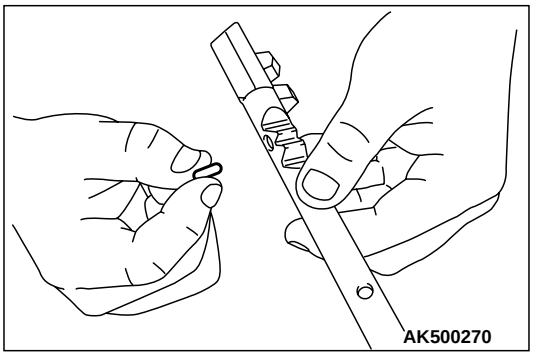
28.Remove the roller A.



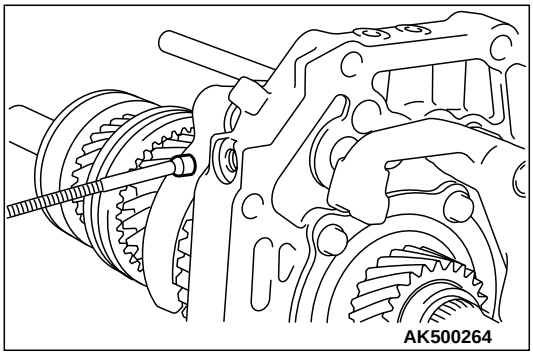
29.Remove the shaft snap ring of the gear shift fork shaft No.1 and the washer based hexagon bolt of the gear shift fork No.1.



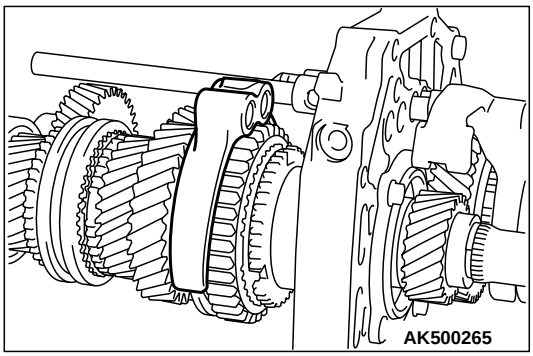
30.Remove the gear shift fork shaft No.1.



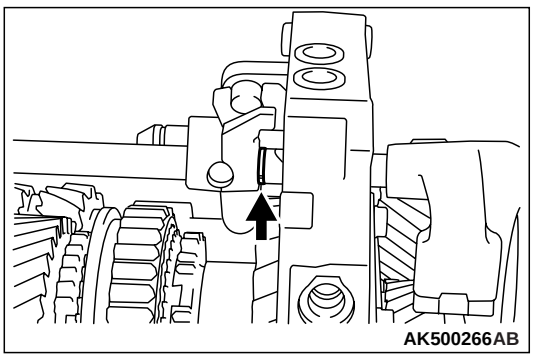
31.Remove the straight pin of the gear shift fork shaft No.1.



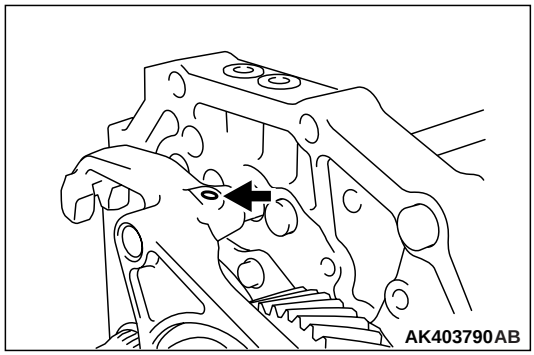
32.Remove the roller A.



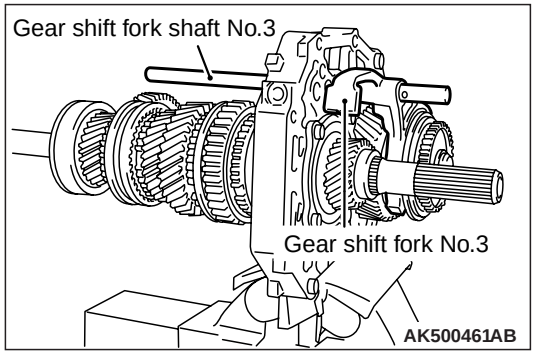
33.Remove the gear shift fork No.1.



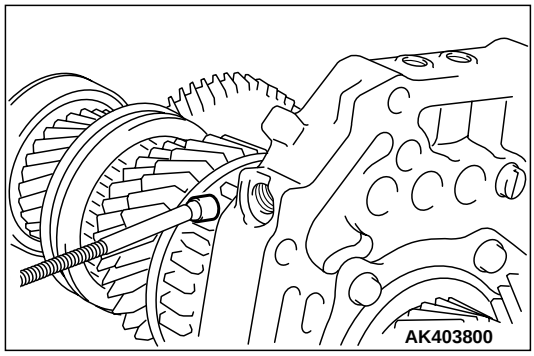
34.Remove the shaft snap ring of the gear shift fork shaft No.3.



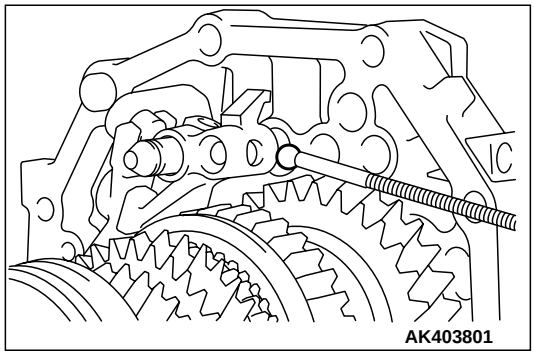
35.Remove the slotted spring pin of the gear shift fork No.3 assembly.



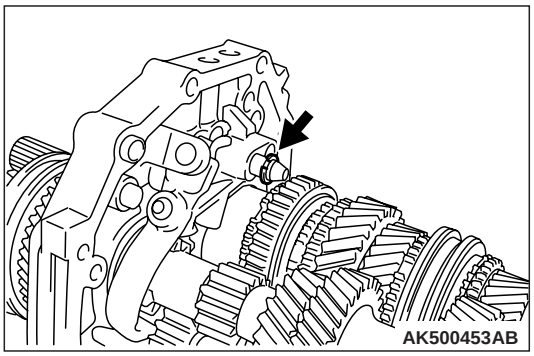
36.Remove the gear shift fork No.3 assembly and the gear shift fork shaft No.3.



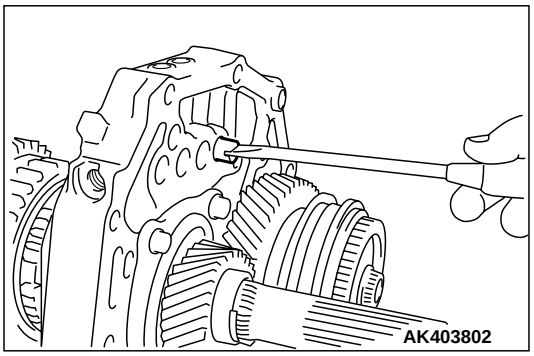
37.Remove the roller A.

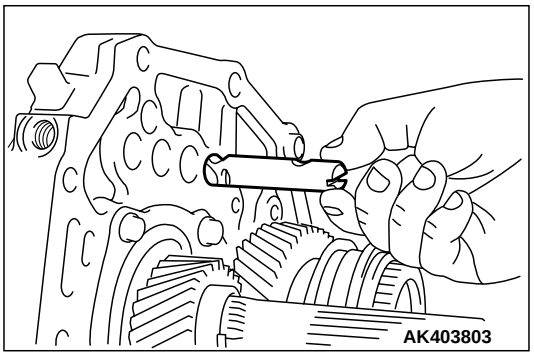


38.Remove the ball.

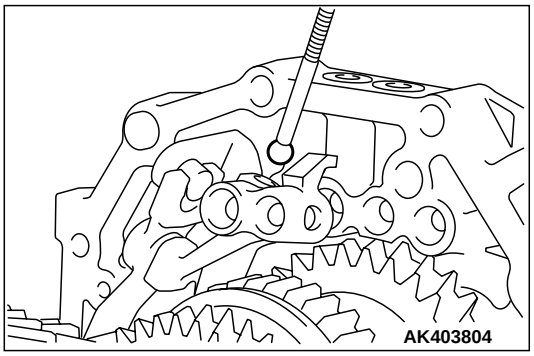


39.Remove the shaft snap ring of the gear shift fork shaft No.4.

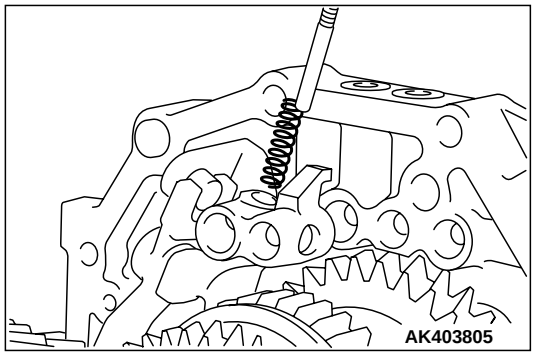




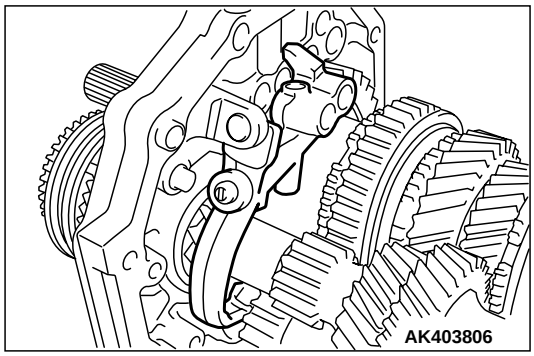
40.Remove the gear shift fork shaft No.4.



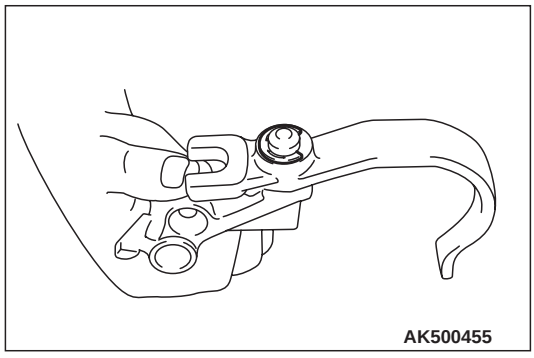
41.Remove the ball.



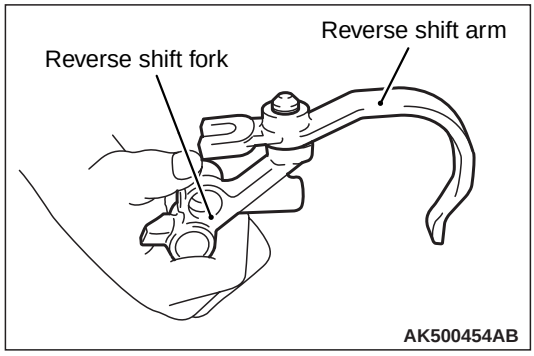
42.Remove the compression spring.



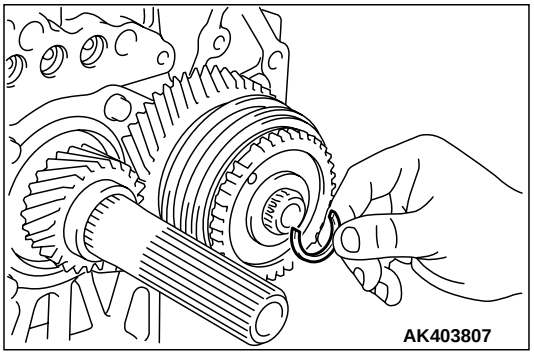
43.Remove the reverse shift fork and the reverse shift arm.



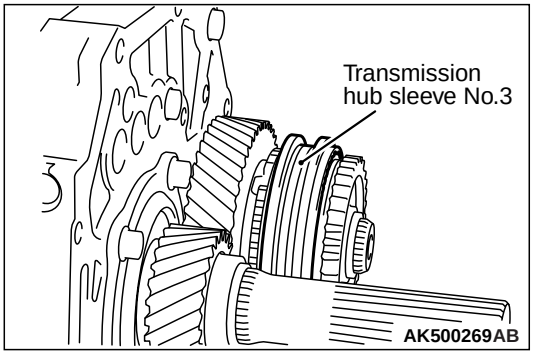
44.Remove the E ring.



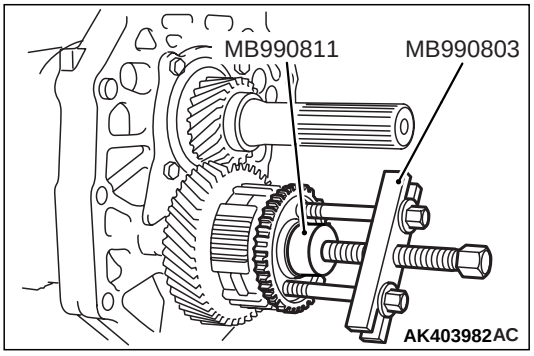
45.Remove the reverse shift arm.



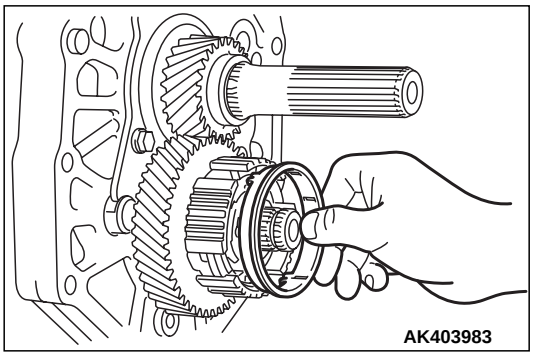
46.Remove the shaft snap ring.



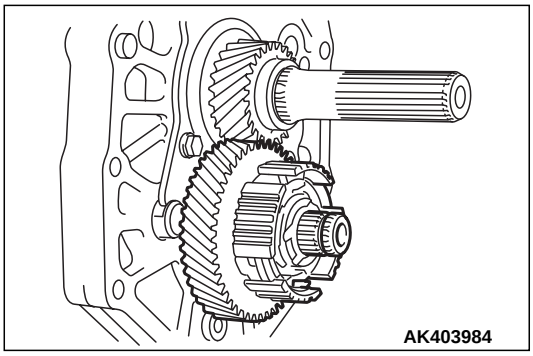
47.Remove the transmission hub sleeve No.3.



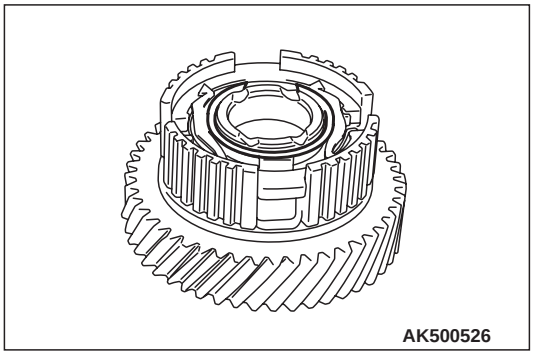
48.Use special tools to remove the gear spline piece No.5.
- Steering wheel puller (MB990803)
- Side bearing puller cup (MB990811)



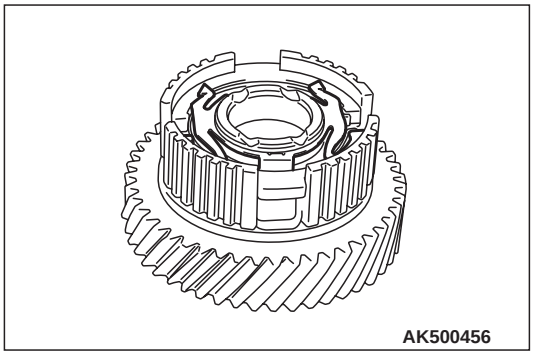
49.Remove the synchronizer outer race No.3.



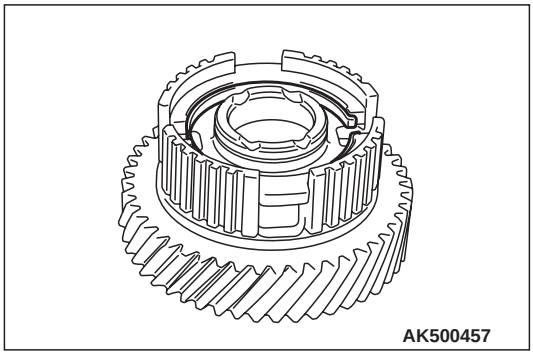
50.Remove the counter shaft gear No.5.



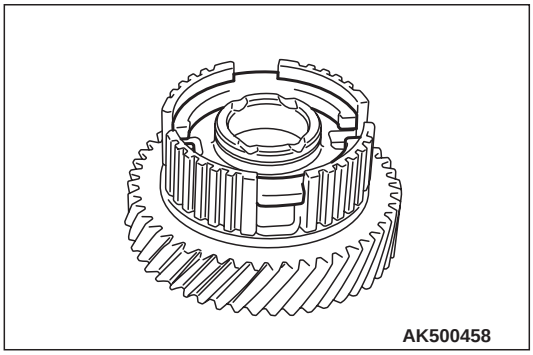
51.Remove the shaft snap ring.



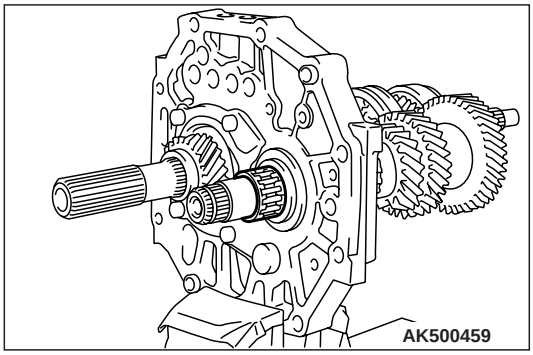
52.Remove the synchromesh shifting key spring No.3.



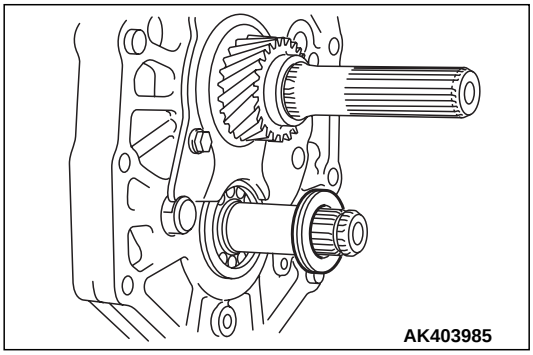
53.Remove the synchromesh shifting key spring No.3.



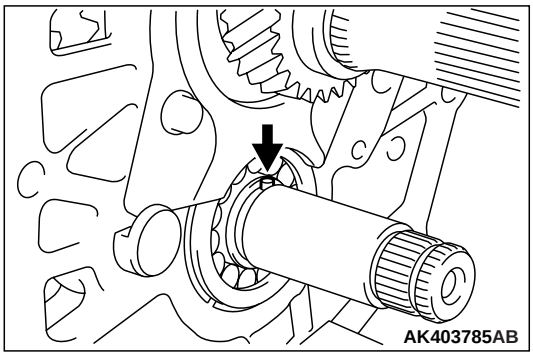
54.Remove the synchromesh shifting key No.3.



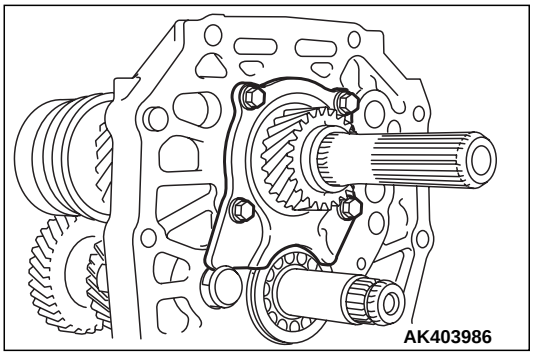
55.Remove the needle roller bearing.



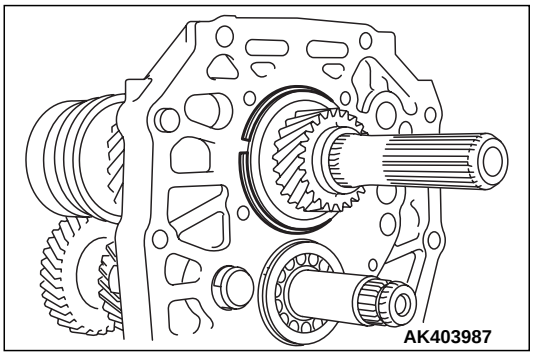
56.Remove the 5th gear thrust washer.



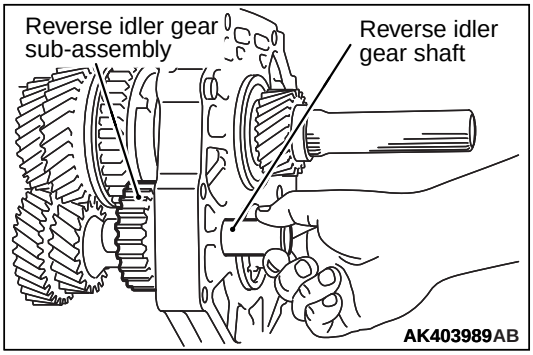
57.Remove the straight pin.



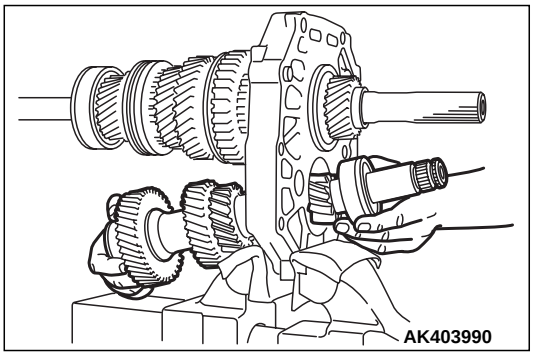
58.Remove the rear bearing output shaft retainer.



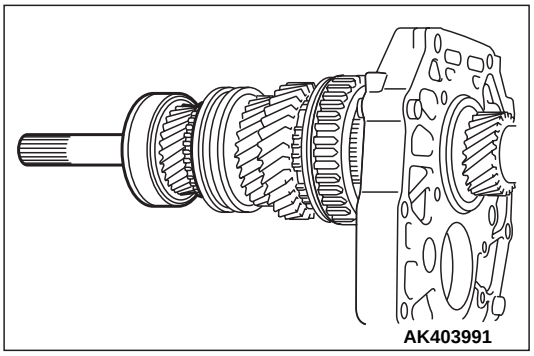
59.Remove the snap ring.



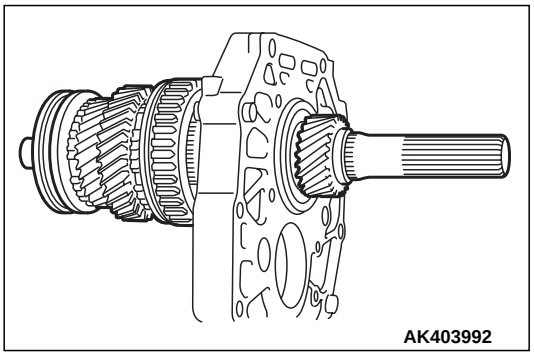
60.Remove the reverse idler gear shaft and reverse idler gear sub-assembly.



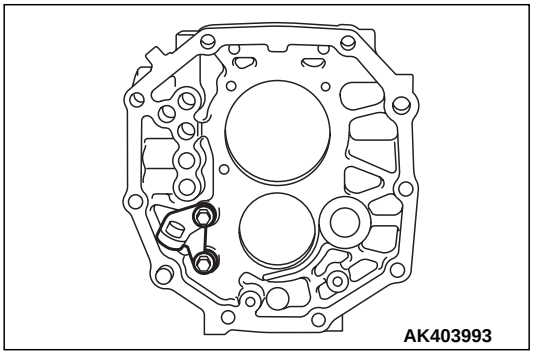
61.Remove the counter gear sub-assembly and cylindrical roller bearing.



62.Remove the input shaft sub-assembly.

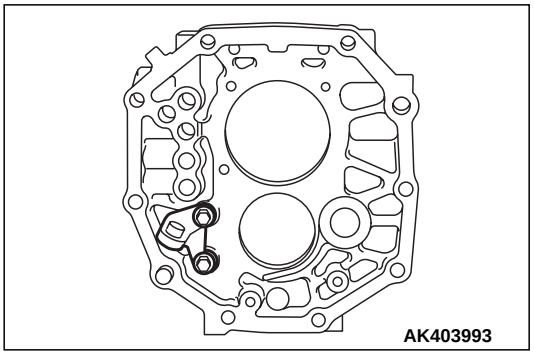


63.Remove the output shaft sub-assembly.

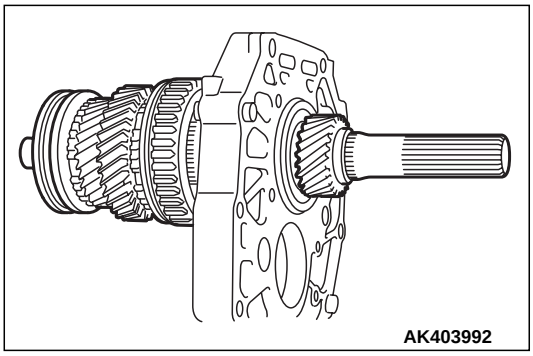


64.Remove the reverse shift arm bracket.

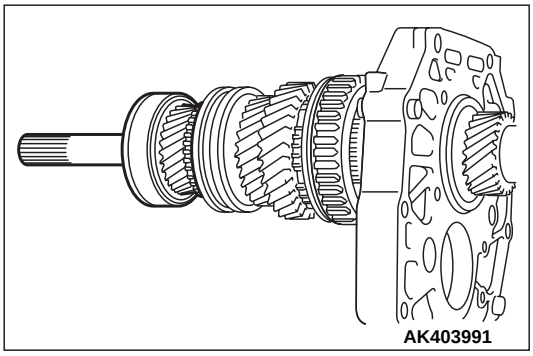
REASSEMBLY



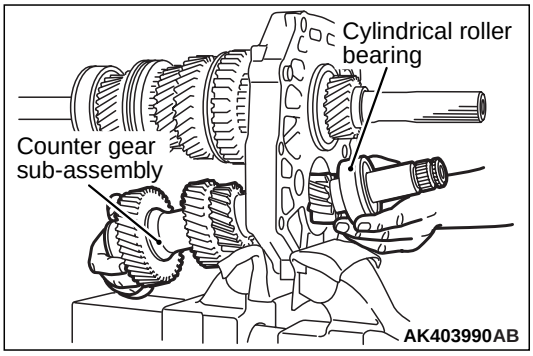
1. Set the reverse shift arm bracket to the intermediate plate and tighten the bolts to the specified torque of 18 ± 5 N·m.



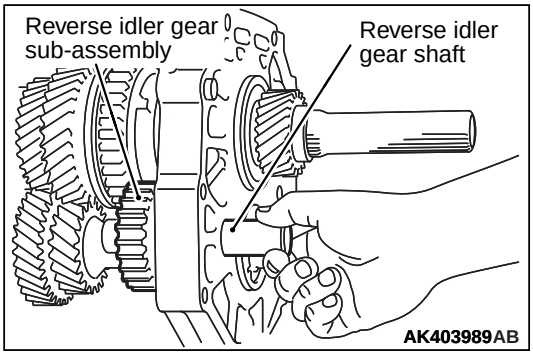
2. Install the output shaft sub-assembly to the intermediate plate.



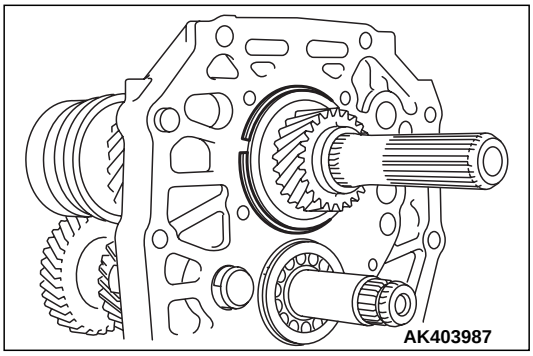
3. Install the input shaft sub-assembly to the output shaft sub-assembly.



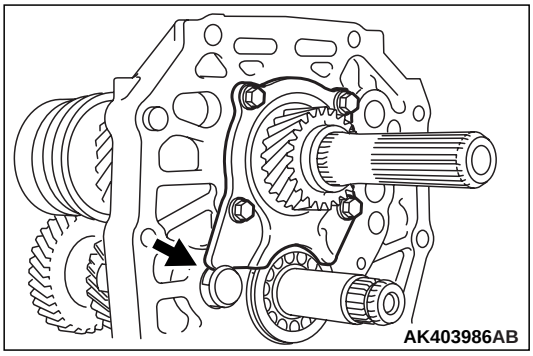
4. Insert the counter gear sub-assembly into the intermediate plate and hold it. Insert the cylindrical roller bearing into the intermediate plate and the counter gear sub-assembly.



5. Install the reverse idler gear shaft and reverse idler gear sub-assembly to the intermediate plate.

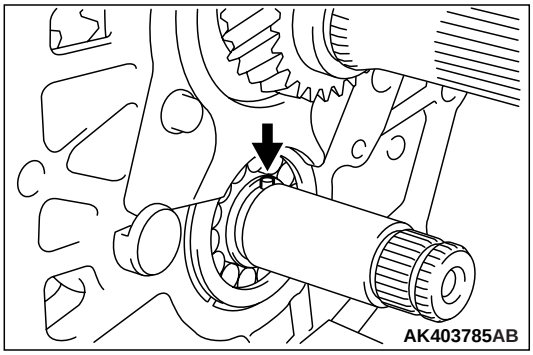


6. Install the shaft snap ring to the radial ball bearing of the input shaft sub-assembly.

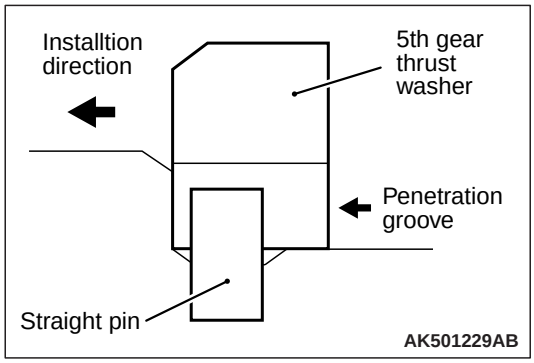


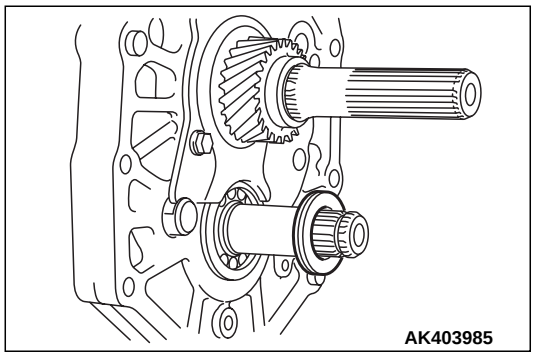
7. Set the rear bearing output shaft retainer and tighten the bolts to the specified torque of 18 ± 5 N·m.

   NOTE: Fit the rear bearing output shaft retainer into the reverse idler gear shaft slot.

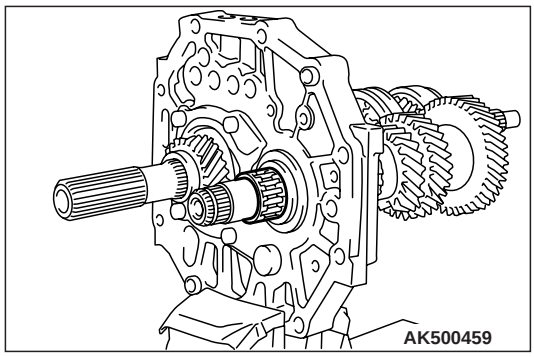


8. Install the straight pin.

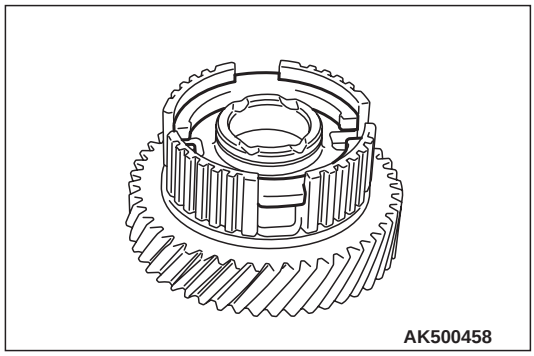




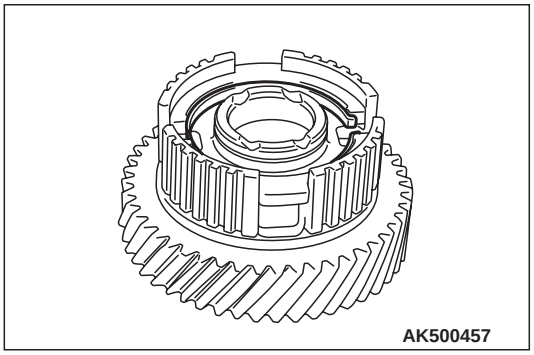
9. Check the installation direction of 5th gear thrust washer, and install it.



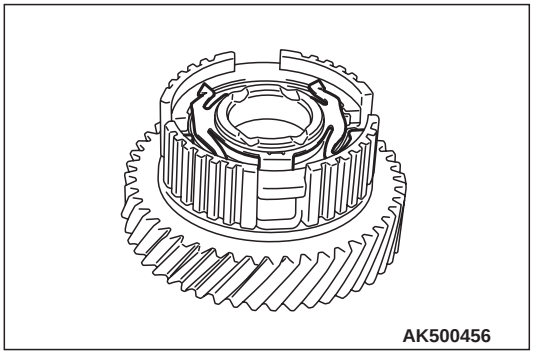
10.Install the needle roller bearing.



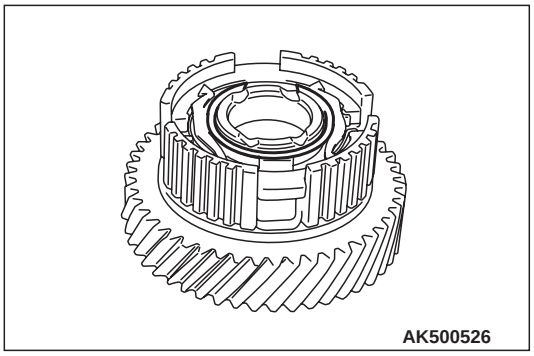
11.Install the synchromesh shifting key No.3 to the counter shaft gear No.5.



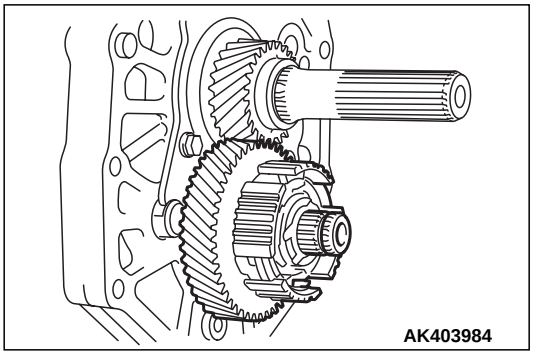
12.Install the synchromesh shifting key spring No.3 to the counter shaft gear No.5.



13.Install the synchromesh shifting key spring No.3 to the counter shaft gear No.5.



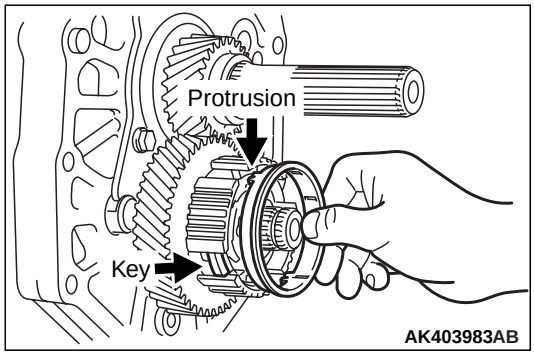
14.Install the shaft snap ring to the counter shaft gear No.5.



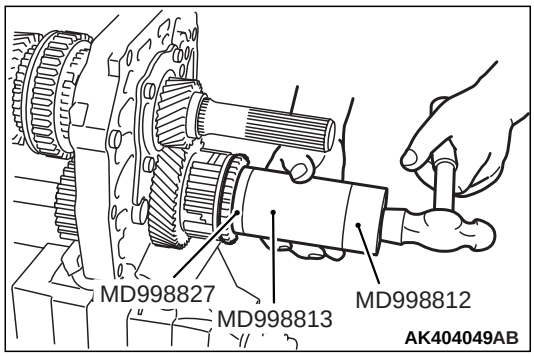
15.Install the counter shaft gear No.5.

⚠ CAUTION

Fit the protrusions of synchronizer ring between keys.

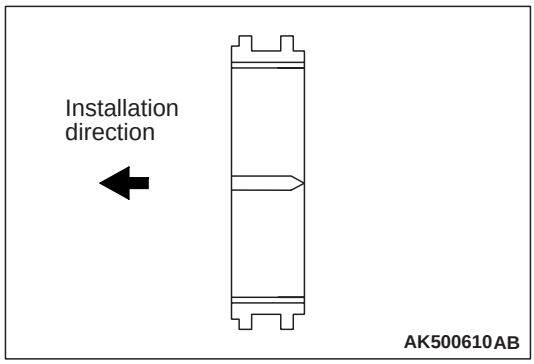


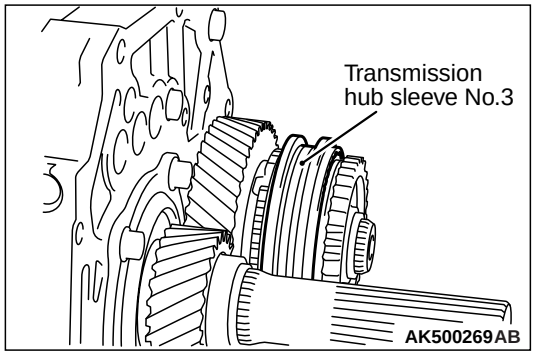
16.Install the synchronizer outer race No.3.



17.Using special tools to install the gear spline piece No.5.

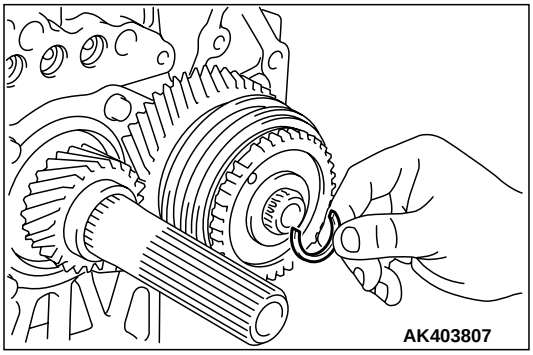
- Installer cap (MD998812)
- Installer-100 (MD998813)
- Installer adapter (56) (MD998827)





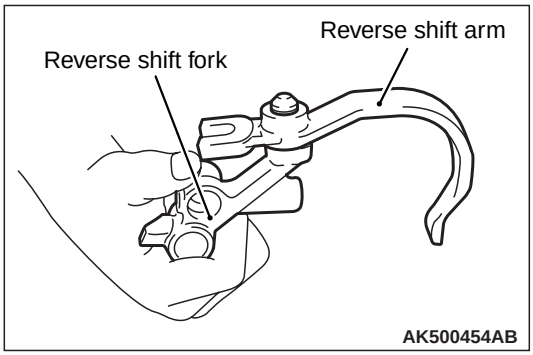
18.Check the installation direction of the transmission hub sleeve No.3 and install it on the counter shaft.

NOTE: After installation, check the sleeve operate smoothly.

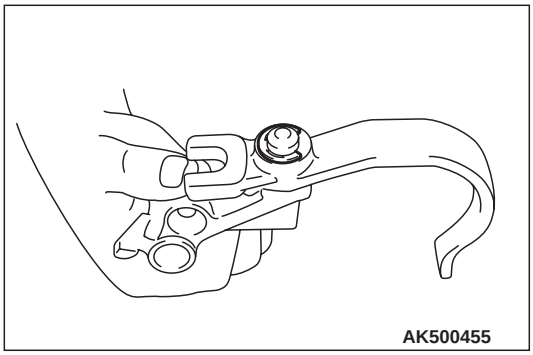


19.Select a snap ring to secure the thrust clearance. Install it into the counter gear sub-assembly.

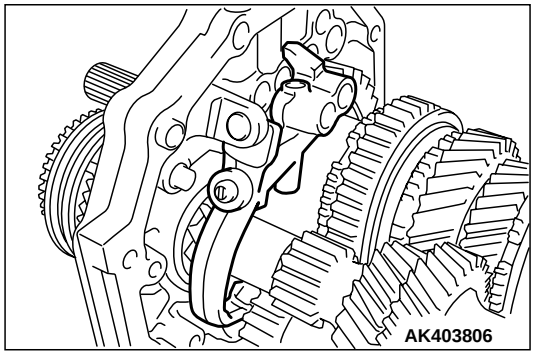
Standard value: 0 – 0.1 mm



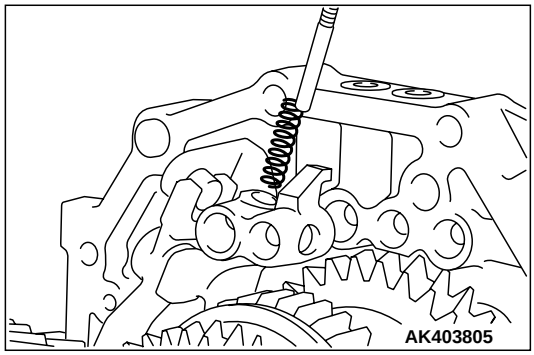
20.Install the reverse shift arm to the reverse shift fork.



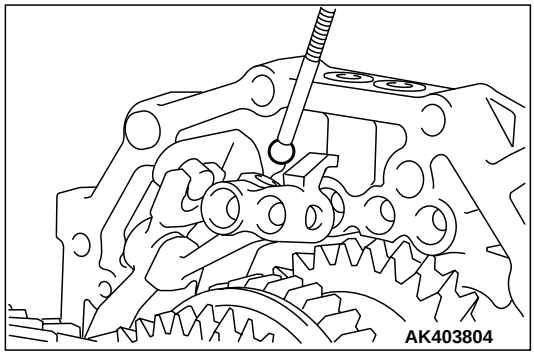
21.Install the E ring.


AK403806

22.Install the reverse shift fork and the reverse shift arm to the intermediate plate.


AK403805

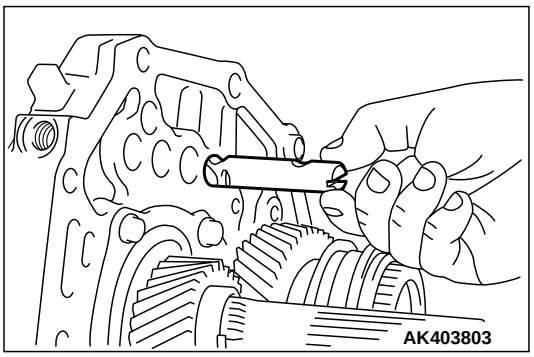
23.Install the compression spring into the reverse shift fork.

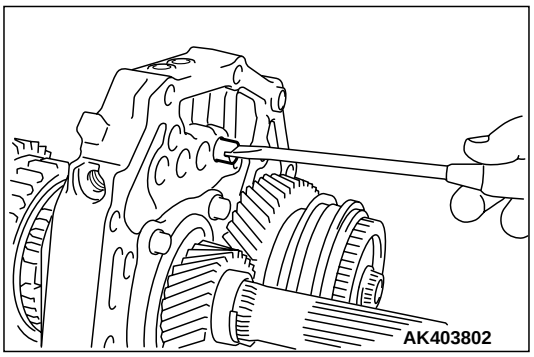

AK403804

24.Install the ball into the reverse shift fork.

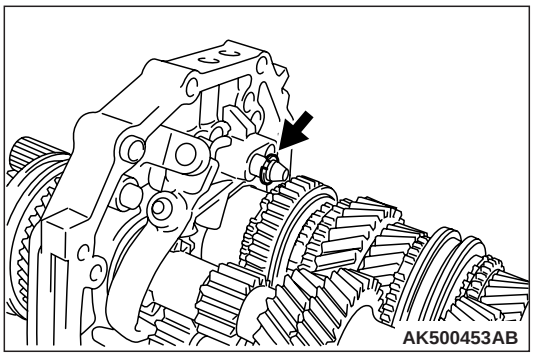
⚠ CAUTION

Install the gear shift fork shaft No.4 carefully in the specified direction. If the installation direction is wrong, the roller would be in the shaft concave and the gearshift fork shaft No.4 would not be installed.

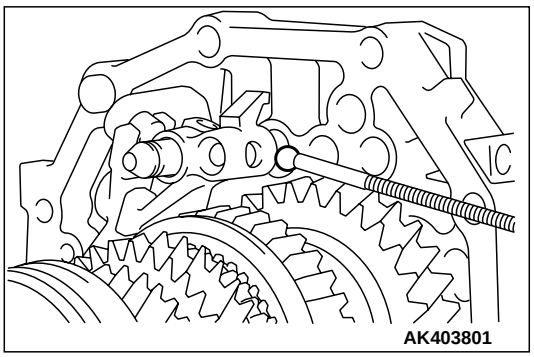

AK403803


AK403802

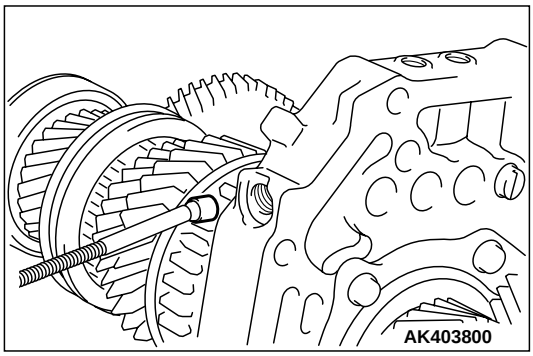
25.Install the gear shift fork shaft No.4 into the intermediate plate and the reverse shift fork.


AK500453AB

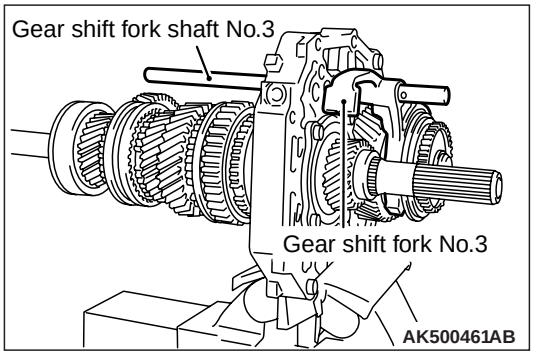
26.Install the shaft snap ring into the gear shift fork shaft No.4.


AK403801

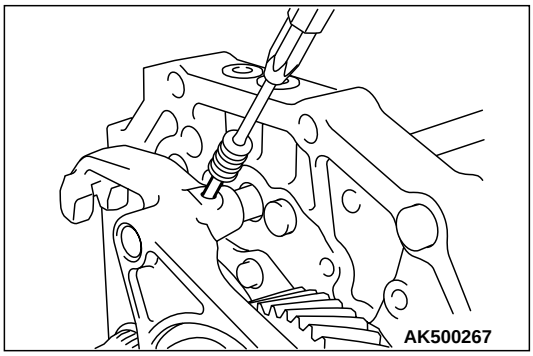
27.Install the ball into the reverse shift fork.



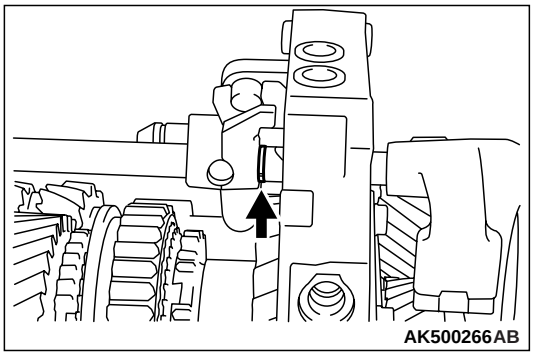
28.Install the roller A to the intermediate plate.



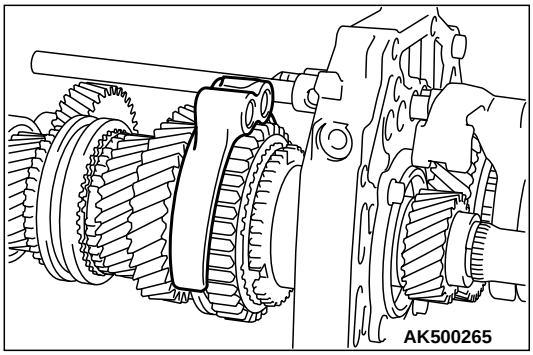
29.Install the gear shift fork No.3 assembly on the transmission hub sleeve No.3 and hold it. Insert the gear shift fork shaft No.3 into the gear shift fork No.3 assembly, the intermediate plate and the reverse shift fork.



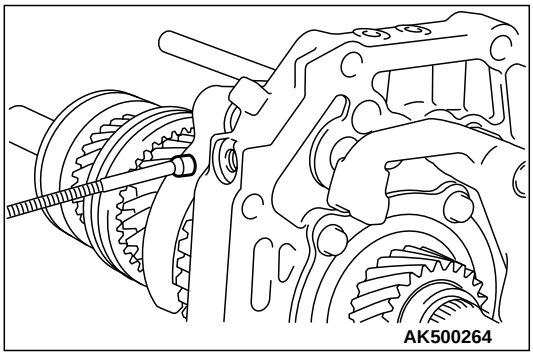
30.Install the slotted spring pin to the gear shift fork No.3 assembly.



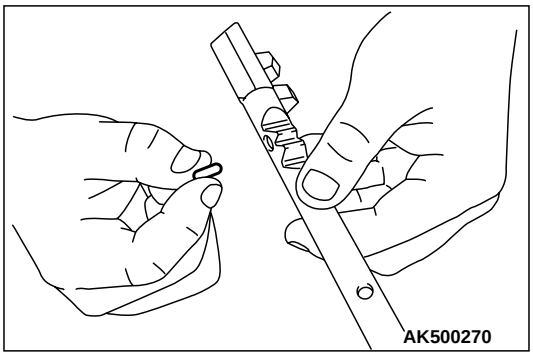
31.Install the snap ring to the gear shift fork shaft No.3.



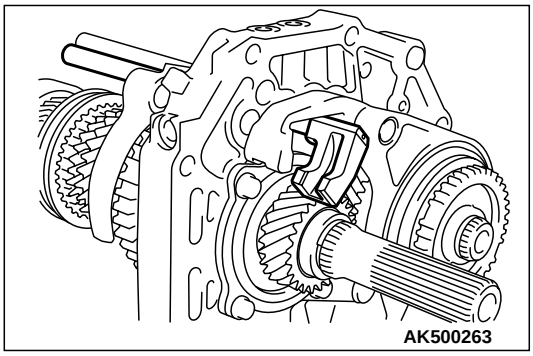
32.Install the gear shift fork No.1 on the reverse gear.



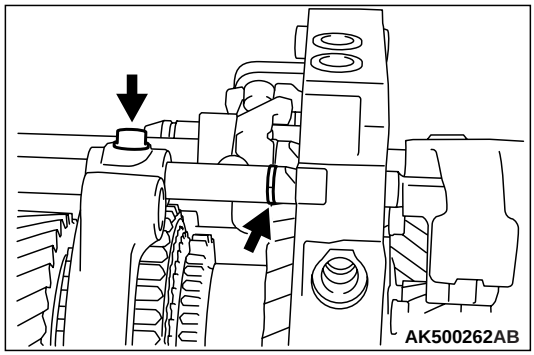
33.Install the roller A to the intermediate plate.



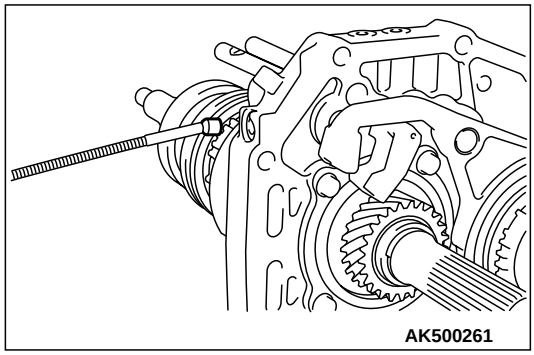
34.Install the straight pin to the gear shift fork shaft No.1.



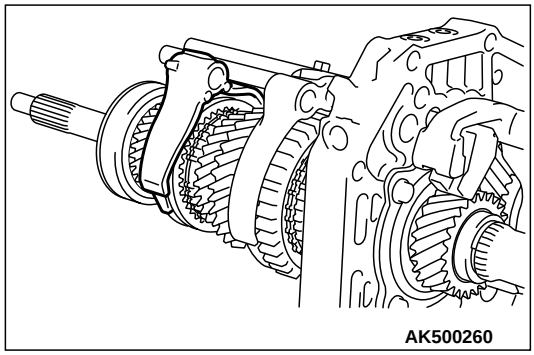
35.Install the gear shift fork shaft No.1 to the intermediate plate and the gear shift fork No.1.



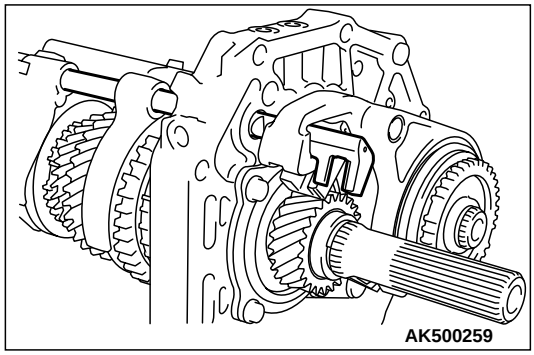
36.Install the shaft snap ring to the gear shift fork shaft No.1. Tighten the washer based hexagon bolt to the specified torque of 19.5 ± 3.9 N·m.



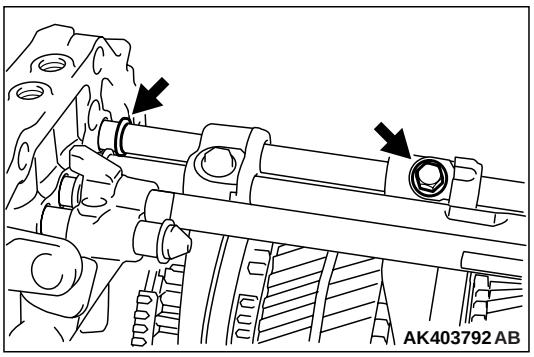
37.Install the roller A to the intermediate plate.



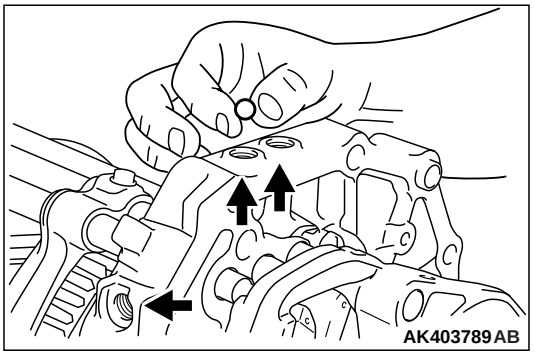
38.Install the gear shift fork No.2 on the transmission hub sleeve No.2.



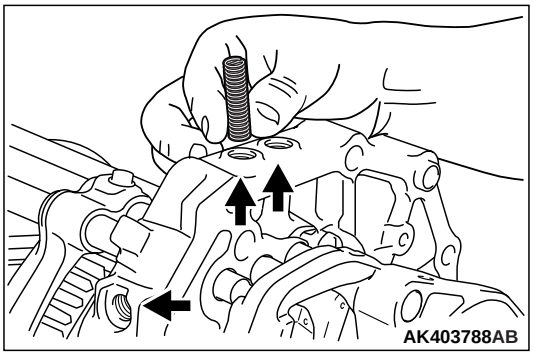
39.Install the gear shift fork shaft No.2 to the intermediate plate, the gear shift fork No.1 and the gear shift fork No.2.



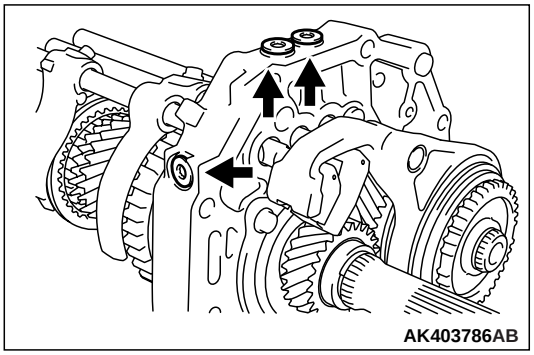
40.Install the shaft snap ring to the gear shift fork shaft No.2. Tighten the washer based hexagon bolt to the specified torque of 19.5 ± 3.9 N·m.



41.Install the ball to the intermediate plate (3 places).



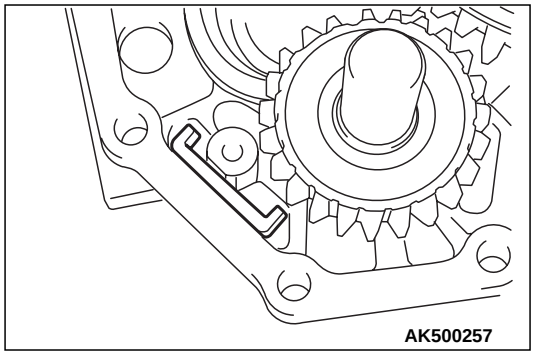
42.Install the compression spring to the intermediate plate (3 places).



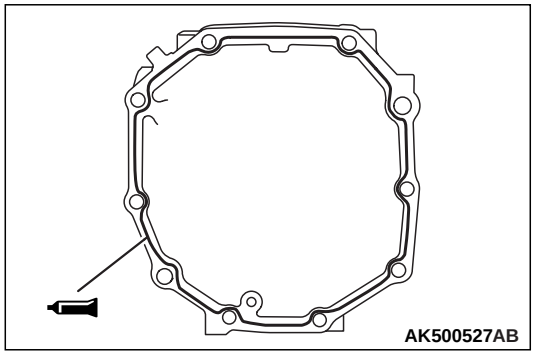
43.Apply sealant to the threads. Tighten the straight screw plug with head to the specified torque of 18.5 ± 5.5 N·m (3 places).

Special sealant: Mitsubishi genuine sealant Part No. MD974421 or equivalent

NOTE: The new bolt does not require sealant application as it is precoated with sealant.



44.Install the transmission magnet to the intermediate plate.

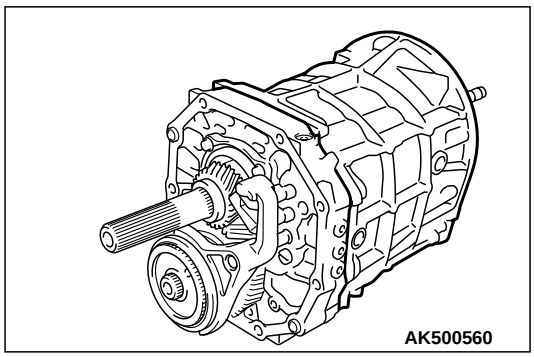


45.Completely degrease the FIPG-applied surface so that water and oil including the old sealant cannot adhere to the surface coated with the sealant.

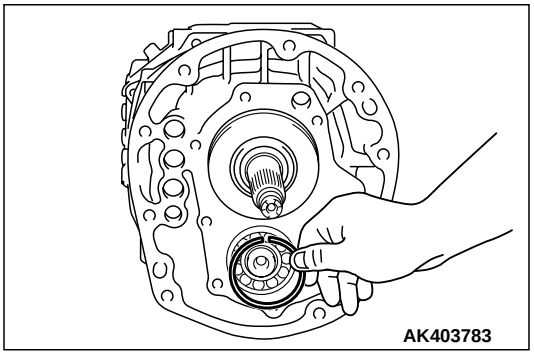
Never touch the degreased surface by hand.

46.Apply a 1.2 mm diameter bead of liquid gasket to the intermediate plate mounting surface of the transmission case sub-assembly.

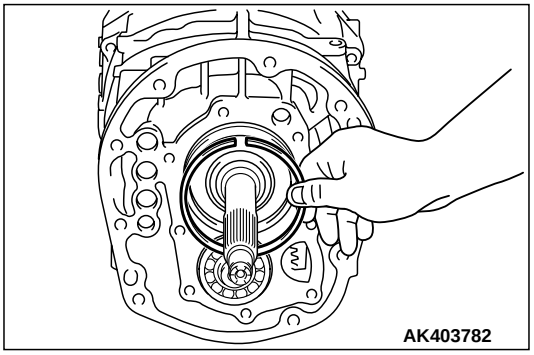
Special sealant: Mitsubishi genuine sealant Part No. MD974421 or equivalent



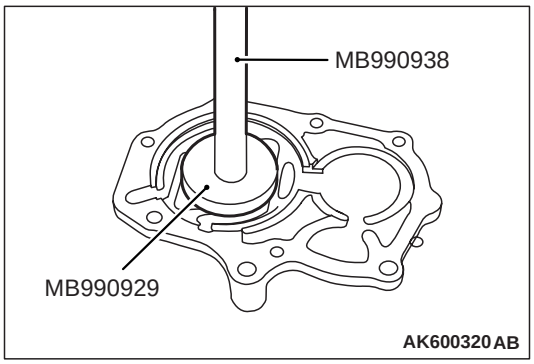
47.Install the transmission case sub-assembly to the intermediate plate.



48.Install the snap ring to the cylindrical roller bearing.

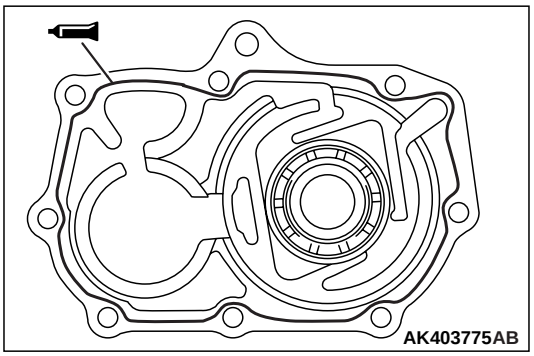


49.Install the snap ring to the radial ball bearing.



50.Using special tool install the oil seal to the front bearing retainer.

- Installer adapter (MB990929)
- Installer bar (MB990938)



51.Completely degrease the FIPG-applied surface so that water and oil including the old sealant cannot adhere to the surface coated with the sealant.

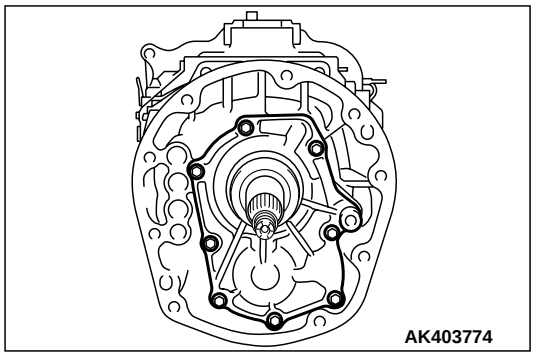
Never touch the degreased surface by hand.

52.Apply a 1.2 mm diameter bead of liquid gasket to the transmission case sub-assembly mounting surface of the front bearing retainer sub-assembly with seal.

Special sealant: Mitsubishi genuine sealant Part No. MD974421 or equivalent

⚠ CAUTION

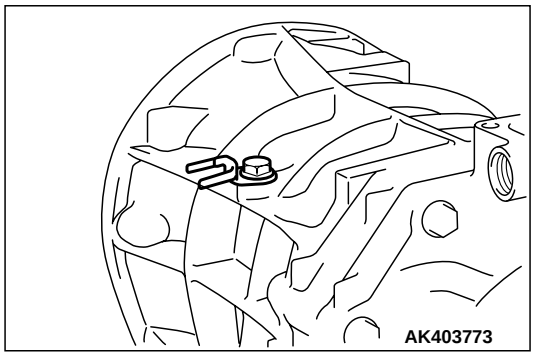
Do not damage to the oil seal lip during the installation.



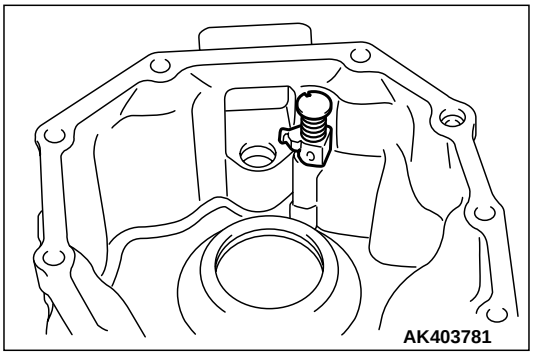
53.Apply sealant to the threads. Install the front bearing retainer to the transmission case sub-assembly and tighten the bolts to the specified torque of 16.5 ± 5.0 N·m.

Special sealant: Mitsubishi genuine sealant Part No. MD974421 or equivalent

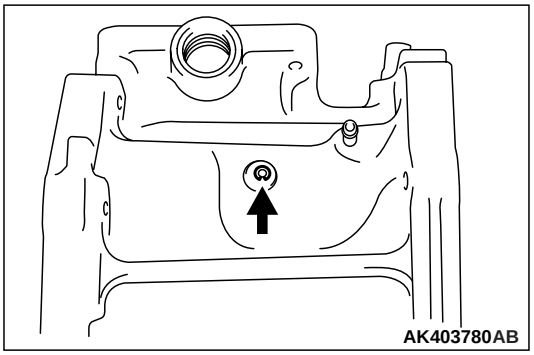
NOTE: The new bolt does not require sealant application as it is precoated with sealant.



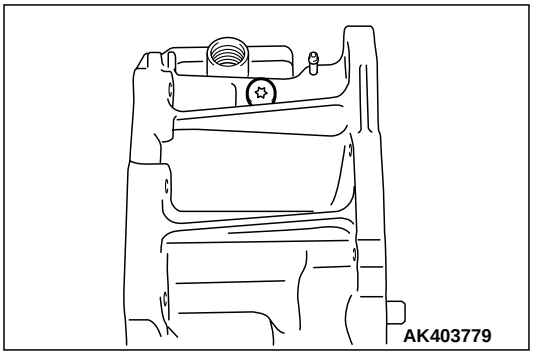
54.Install the wiring harness clamp bracket to the transmission case sub-assembly and tighten the bolt to the specified torque of 18 ± 3 N·m.



55.Install the reverse restrict pin assembly to the transfer adaptor sub-assembly.



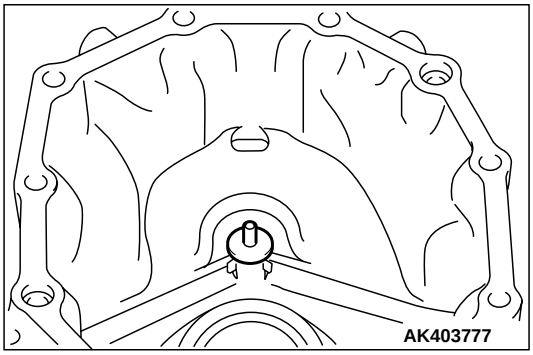
56.Install the slotted spring pin to the reverse restrict pin assembly.



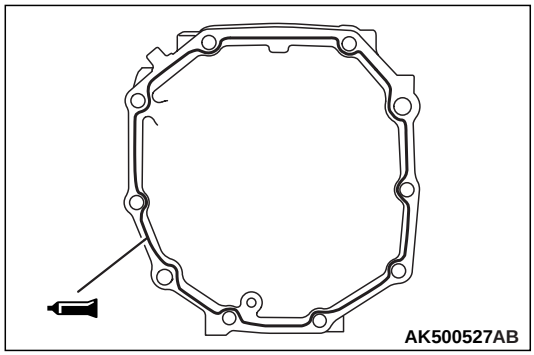
57.Apply sealant to the threads. Tighten the straight screw plug with head to the specified torque of 18.5 ± 5.5 N·m.

Special sealant: Mitsubishi genuine sealant Part No. MD974421 or equivalent

NOTE: The new bolt does not require sealant application as it is precoated with sealant.



58.Install the oil receiver pipe into the transfer adaptor sub-assembly.

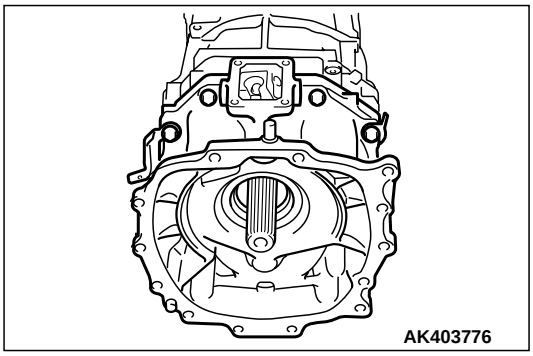


59.Completely degrease the FIPG-applied surface so that water and oil including the old sealant cannot adhere to the surface coated with the sealant.

Never touch the degreased surface by hand.

60.Apply a 1.2 mm diameter bead of liquid gasket to the intermediate plate mounting surface of the transfer adaptor sub-assembly.

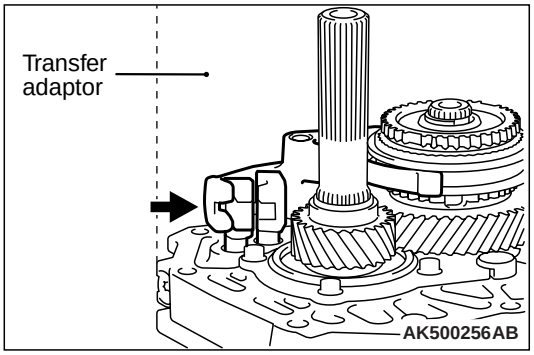
Special sealant: Mitsubishi genuine sealant Part No. MD974421 or equivalent

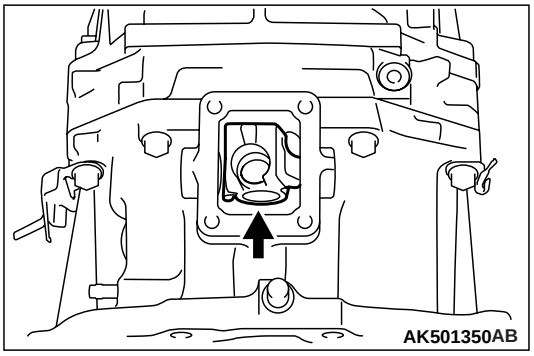


61.Install the transfer adaptor sub-assembly. Install the wiring harness clamp bracket (3 places) and tighten the bolts to the specified torque of 37 ± 11 N·m.

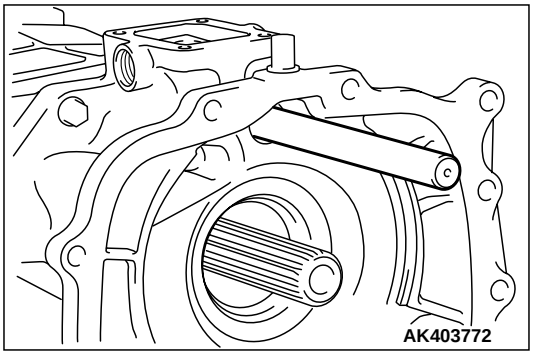
⚠ CAUTION

When installing the shift lever housing, securely fit the shift lever housing into the head of the fork shaft.

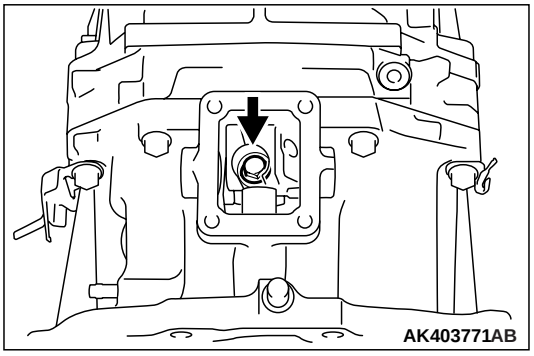




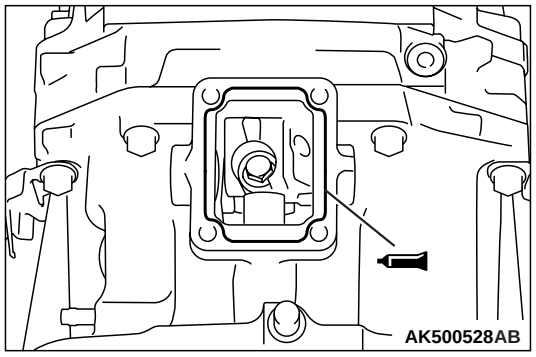
62. Install the shift lever housing to the transfer adaptor sub-assembly.



63.Install the control shaft assembly to the transfer adaptor sub-assembly and the shift lever housing.



64.Tighten the flange bolt to the specified torque of 33 ± 3 N·m.

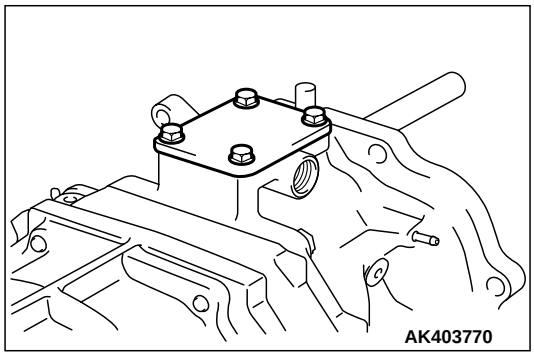


65.Completely degrease the FIPG-applied surface so that water and oil including the old sealant cannot adhere to the surface coated with the sealant.

Never touch the degreased surface by hand.

66.Apply a 1.2 mm diameter bead of liquid gasket to the case mounting surface of the transfer adaptor sub-assembly.

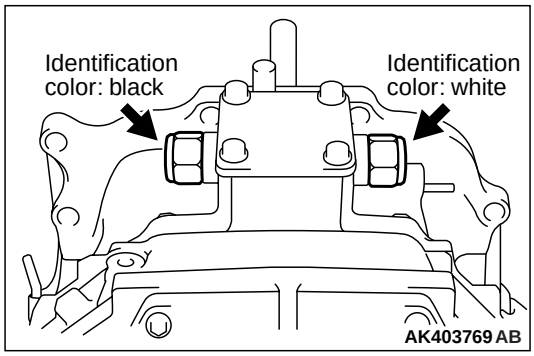
Special sealant: Mitsubishi genuine sealant Part No. MD974421 or equivalent



67.Install the cover to the transfer adaptor sub-assembly and tighten the bolt with washer to the specified torque of 18 ± 5 N·m.

⚠ CAUTION

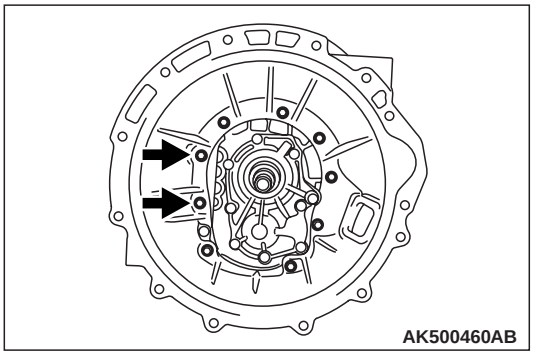
Install the reverse restrict pin assembly carefully in the accordance with the identification color as shown in the illustration.



68.Tighten the reverse restrict pin assembly to the specified torque of 37 ± 11 N·m (2 places).

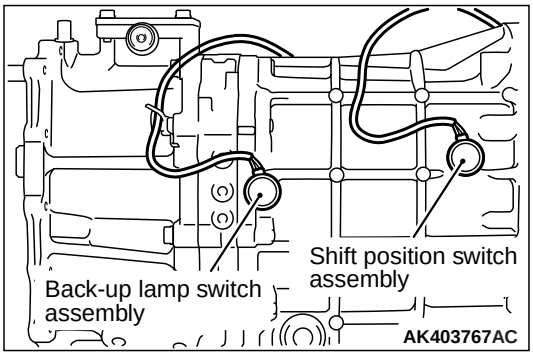
⚠ CAUTION

Install the bolt and washer (with sealant) to the position having the arrow as shown in the illustration.



69.Install the clutch housing into the transmission case sub-assembly. Tighten the bolt with washer to the specified torque of 36 ± 7 N·m (7 places). Tighten the bolt with washer (with sealant) to the specified torque of 34 ± 6 N·m (2 places).

Special sealant: Mitsubishi genuine sealant Part No. MD974421 or equivalent



70.Tighten the shift position switch assembly to the specified torque of 34 ± 5 N·m.

71.Tighten the back-up lamp switch assembly to the specified torque of 44 ± 9 N·m.

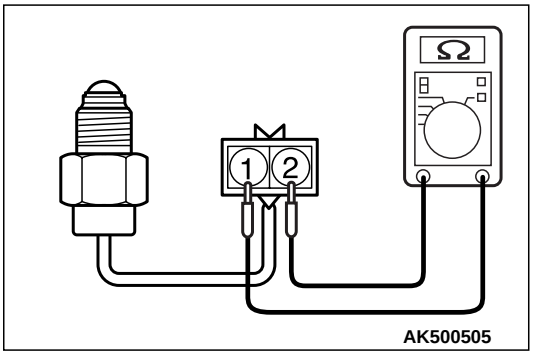
72.Install the transfer and the gear change shifter. Tighten the bolts to the specified torque of 35 ± 6 N·m.

73.Install the spring pin.

INSPECTION

M1222001100899

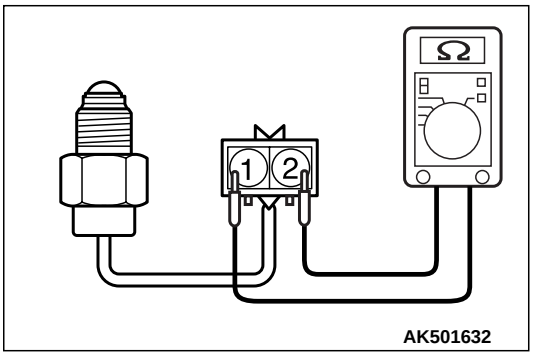
BACK-UP LAMP SWITCH



Check for the continuity between the connector terminals.

Switch condition	Connector terminals	Continuity
Switch end pressed	1 – 2	Conductive
Switch end released	1 – 2	Open

SHIFT POSITION SWITCH



Check for the continuity between the connector terminals.

Switch condition	Connector terminals	Continuity
Switch end pressed	1 – 2	Open
Switch end released	1 – 2	Conductive

SYNCHRONIZER SLEEVE AND HUB

1. Combine the synchronizer sleeve and hub, and check that they slide smoothly.
2. Check that the sleeve is free from damage at its inside splines ends.
3. Using the thickness gauge, check the clearance between the synchronizer ring and the gear.

   Standard value: 0.52 – 1.88 mm
   Limit: 0.52 mm

NEEDLE ROLLER BEARING

1. Combine the needle roller bearing with the shaft and gear, and check that it rotates smoothly without noise or play.
2. Check the needle roller bearing cage for deformation.

COUNTER SHAFT GEAR No.5 THRUST CLEARANCE

Inspect the thrust clearance of counter shaft gear No.5.

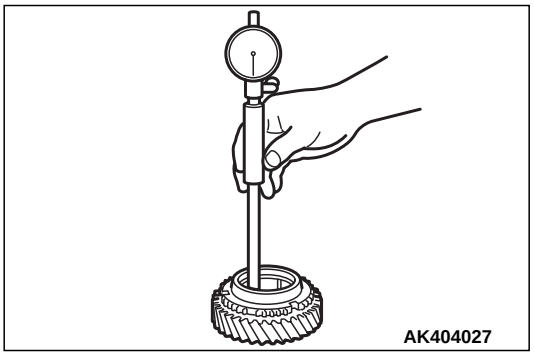
Standard value: 0.10 – 0.35 mm
Limit: 0.35 mm

RADIAL CLEARANCE

1. Fix the output shaft in a vice.
2. Inspect the radial clearance of counter shaft gear No.5.

   Standard value: 0.015 – 0.068 mm
   Limit: 0.068 mm

INSIDE DIAMETER



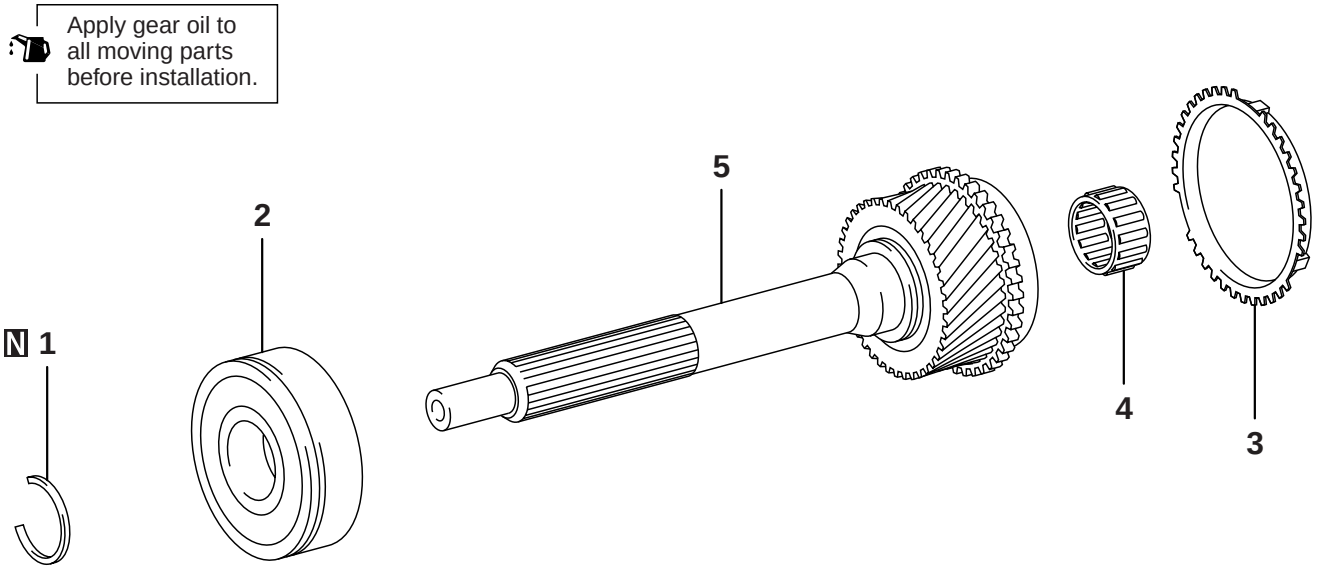
Using the cylinder gauge, check the inside diameter of the counter shaft gear No.5.

Standard value: 38.015 – 38.040 mm
Limit: 38.040 mm

INPUT SHAFT

DISASSEMBLY AND REASSEMBLY

M1222001600526



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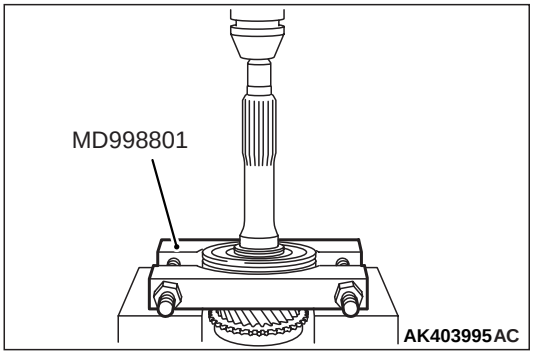
		Disassembly steps	
	>>B<<	1.	Shaft snap ring
<<A>>	>>A<<	2.	Radial ball bearing
		3.	Synchronizer ring No. 2
		4.	Needle roller bearing
		5.	Input shaft sub-assembly

DISASSEMBLY SERVICE POINT

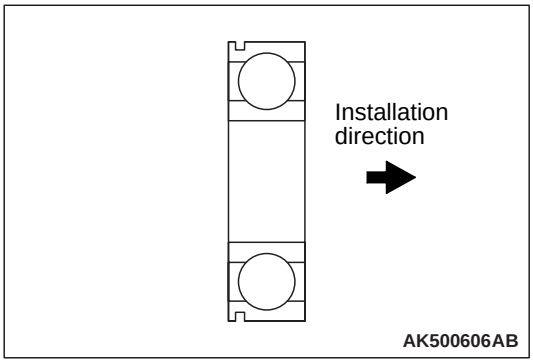
<<A>> RADIAL BALL BEARING REMOVAL



Using special tool Bearing remover (MD998801), support the radial ball bearing and remove it.

REASSEMBLY SERVICE POINTS

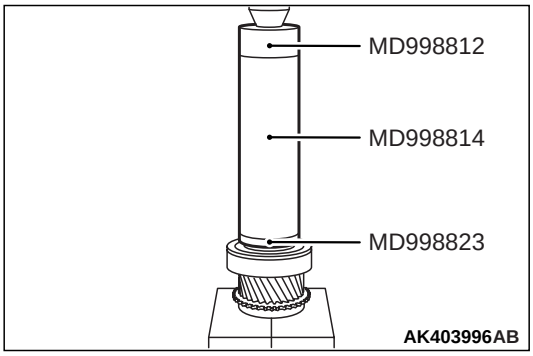
>>A<< RADIAL BALL BEARING INSTALLATION



1. Check the installation direction of the radial ball bearing, and put it on the input shaft.

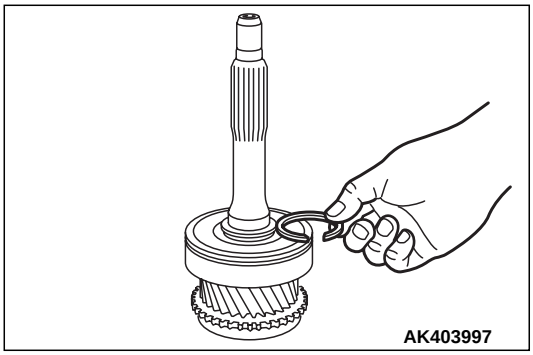
⚠ CAUTION

Never push on the sealing area when installing.



2. Using special tools to install the radial ball bearing.
   - Installer cap (MD998812)
   - Installer-200 (MD998814)
   - Installer adapter (48) (MD998823)

>>B<<SNAP RING INSTALLATION



1. Select a snap ring to secure the standard clearance between the radial ball bearing and the input shaft sub-assembly.

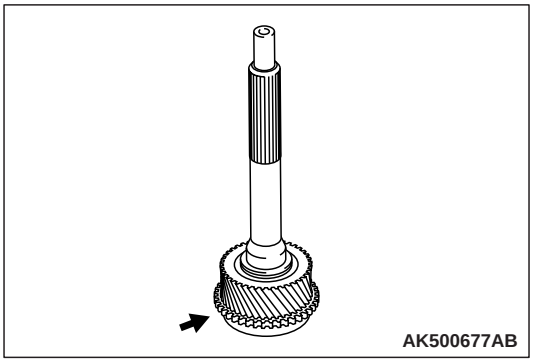
   Standard value: 0 – 0.1 mm

2. Install the selected snap ring.

INSPECTION

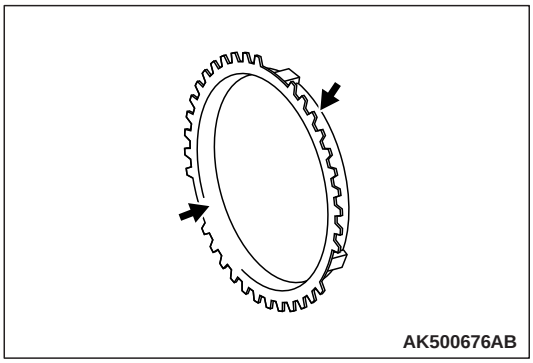
M1222001700222

INPUT SHAFT SUB-ASSEMBLY

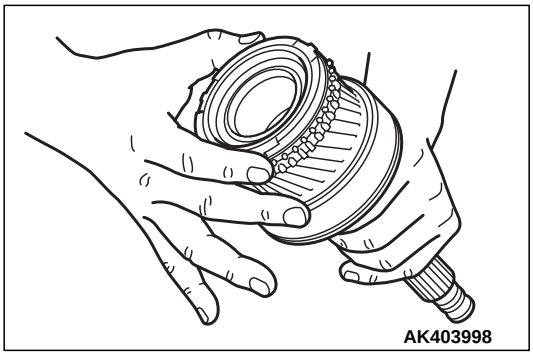


1. Check the helical gear teeth and clutch gear teeth of each input shaft sub-assembly for damage and excessive wear.
2. Check the synchronizer cone surface of each input shaft sub-assembly for roughness, damage, and excessive wear.
3. Check the inside surface and front and back sides of each input shaft sub-assembly for damage and excessive wear.

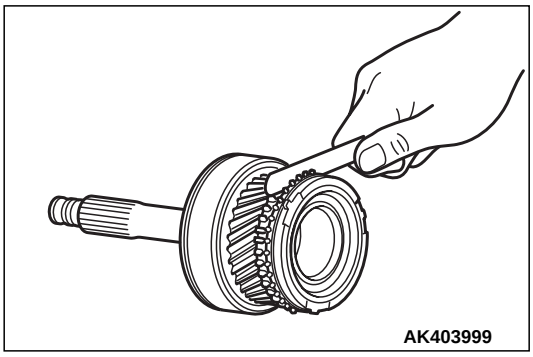
SYNCHRONIZER RING No.2



1. Check the clutch gear on the synchronizer ring for damaged and missing teeth.
2. Check the synchronizer ring inner cone surface for damage or wear. Also check that the inside ridges are intact.



3. After applying oil to the taper portion on gear, press and fit the synchronizer ring by hand. Confirm the synchronizer ring cannot be rotated.



4. Using the thickness gauge, check the clearance between the synchronizer ring and the 4th gear.

   Standard value: 0.70 – 1.70 mm
   Minimum limit: 0.70 mm

NEEDLE ROLLER BEARING

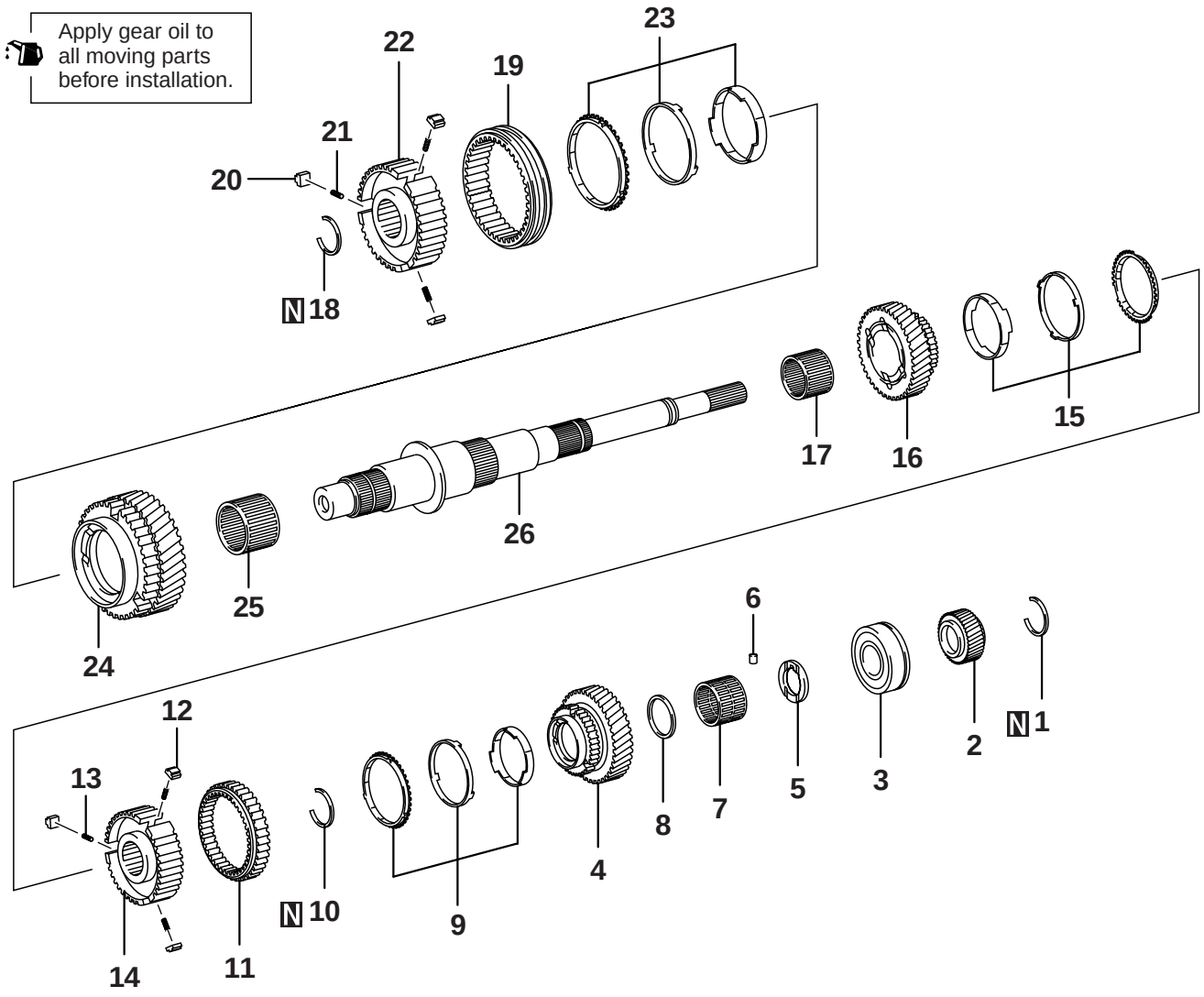
1. Combine the needle roller bearing with the input shaft, and check that it rotates smoothly without noise or play.

2. Check the needle roller bearing cage for deformation.

OUTPUT SHAFT

DISASSEMBLY AND REASSEMBLY

M1222002100160



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Disassembly steps

	>>G<<	1.	Shaft snap ring
<<A>>	>>F<<	2.	5th gear
<<B>>	>>E<<	3.	Radial ball bearing
<<B>>	>>E<<	4.	1st gear sub-assembly
		5.	1st gear thrust washer
		6.	Straight pin
		7.	Needle roller bearing
		8.	D spacer
		9.	Synchronizer ring set No. 1
	>>D<<	10.	Shaft snap ring
<<C>>	>>C<<	11.	Reverse gear
<<C>>	>>C<<	12.	Synchronizer shifting key No. 1

Disassembly steps (Continued)

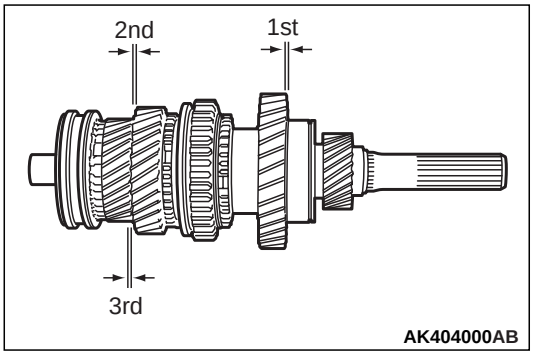
<<C>>	>>C<<	13.	Compression spring
<<C>>	>>C<<	14.	Transmission clutch No. 1 hub
<<C>>	>>C<<	15.	Synchronizer ring set No. 1
<<C>>	>>C<<	16.	2nd gear sub-assembly
		17.	Needle roller bearing
	>>B<<	18.	Shaft snap ring
<<D>>	>>A<<	19.	Transmission hub sleeve No. 2
<<D>>	>>A<<	20.	Synchronizer shifting key No. 2
<<D>>	>>A<<	21.	Compression spring
<<D>>	>>A<<	22.	Transmission clutch No. 2 hub
<<D>>	>>A<<	23.	Synchronizer ring set No. 2
<<D>>	>>A<<	24.	3rd gear sub-assembly

Disassembly steps (Continued)

25. Needle roller bearing
26. Output shaft

INSPECTION BEFORE DISASSEMBLY

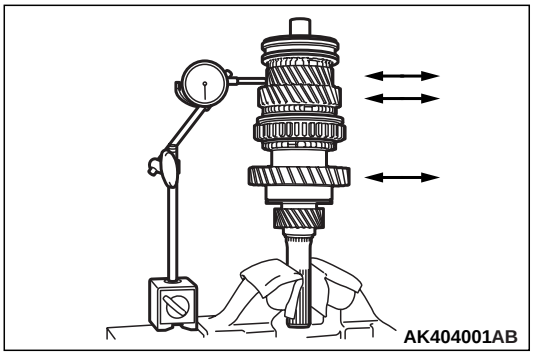
THRUST CLEARANCE FOR EACH GEAR



Inspect the thrust clearance of each gear.

Gear	Standard value mm	Limit mm
1st	0.20 – 0.45	0.45
2nd	0.10 – 0.25	0.25
3rd	0.10 – 0.25	0.25

RADIAL CLEARANCE FOR EACH GEAR

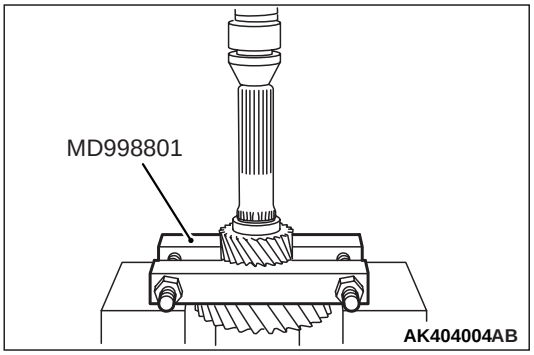


1. Fix the output shaft by a vice.
2. Inspect the radial clearance of each gear.

Gear	Standard value mm	Limit mm
1st	0.020 – 0.073	0.073
2nd	0.015 – 0.068	0.068
3rd	0.015 – 0.068	0.068

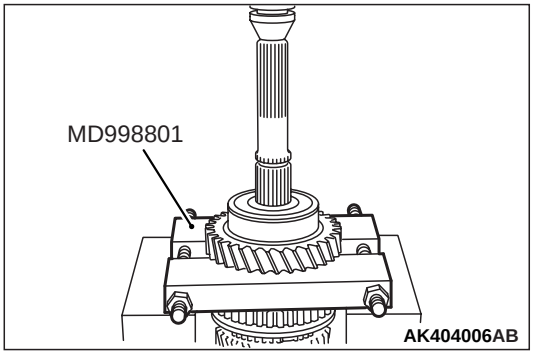
DISASSEMBLY SERVICE POINTS

<<A>> 5TH GEAR REMOVAL



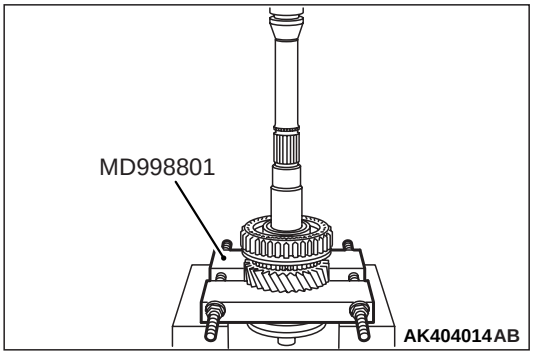
Using special tool Bearing remover (MD998801), support the 5th gear and remove it.

<<B>> RADIAL BALL BEARING / 1ST GEAR SUB-ASSEMBLY REMOVAL



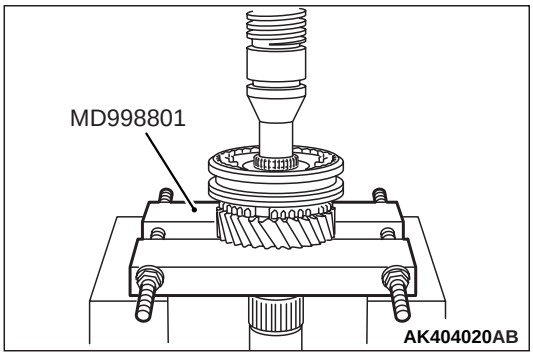
Using special tool Bearing remover (MD998801), support the 1st gear sub-assembly and remove the radial ball bearing and the 1st gear sub-assembly.

<<C>> REVERSE GEAR / SYNCHRONIZER SHIFTING KEY No. 1 / COMPRESSION SPRING / TRANSMISSION CLUTCH No. 1 HUB / SYNCHRONIZER RING SET No. 1 / 2ND GEAR SUB-ASSEMBLY REMOVAL



Using special tool Bearing remover (MD998801), support the 2nd gear sub-assembly and remove the reverse gear, synchronizer shifting key No. 1, compression spring, the transmission clutch No. 1 hub, synchronizer ring set No. 1 and the 2nd gear sub-assembly.

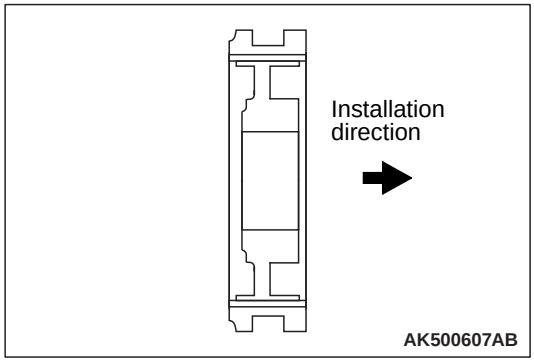
<<D>> TRANSMISSION CLUTCH HUB No. 2 / SYNCHRONIZER SHIFTING KEY No. 2 / COMPRESSION SPRING / TRANSMISSION HUB SLEEVE No. 2 / SYNCHRONIZER RING SET No. 2 / 3RD GEAR SUB-ASSEMBLY REMOVAL



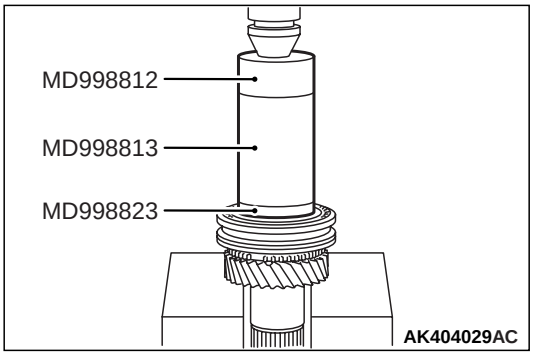
Using special tool Bearing remover (MD998801), support the 3rd gear sub-assembly and remove the transmission clutch hub No. 2, synchronizer shifting key No. 2, compression spring, the transmission hub sleeve No. 2, synchronizer ring set and the 3rd gear sub-assembly.

REASSEMBLY SERVICE POINTS

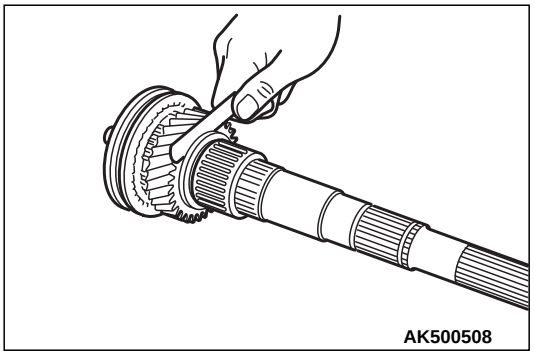
>>A<< TRANSMISSION CLUTCH HUB No. 2 / SYNCHRONIZER SHIFTING KEY No. 2 / COMPRESSION SPRING / TRANSMISSION HUB SLEEVE No. 2 / SYNCHRONIZER RING SET No. 2 / 3RD GEAR SUB-ASSEMBLY INSTALLATION



1. Check the installation direction of the transmission clutch hub No. 2, and put it on the output shaft.



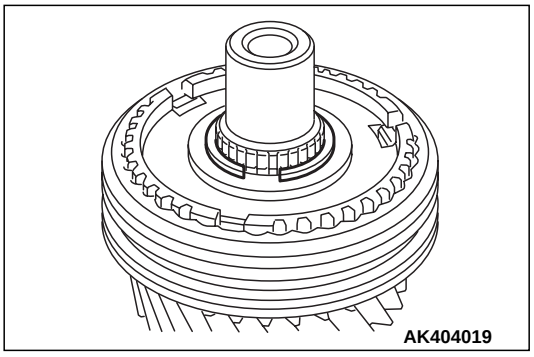
2. Using special tools to install the transmission clutch hub No. 2, synchronizer shifting key No. 2, compression spring, the transmission hub sleeve No. 2, synchronizer ring set No. 2 and the 3rd gear sub-assembly.
   - Installer cap (MD998812)
   - Installer-100 (MD998813)
   - Installer adapter (48) (MD998823)



3. Confirm the thrust clearance of the 3rd gear sub-assembly is within the standard value.

   Standard value: 0.10 – 0.25 mm
   Limit: 0.25 mm

>>B<< SHAFT SNAP RING INSTALLATION

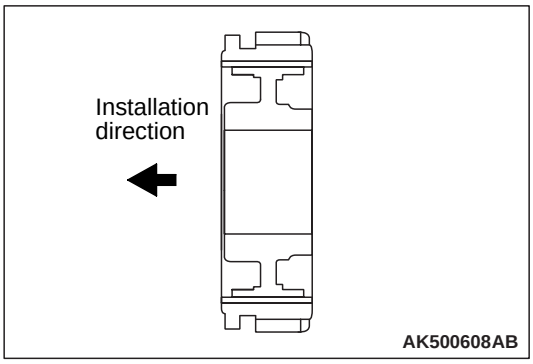


1. Select a shaft snap ring to secure the standard clearance between the transmission clutch hub No.2 and the output shaft.

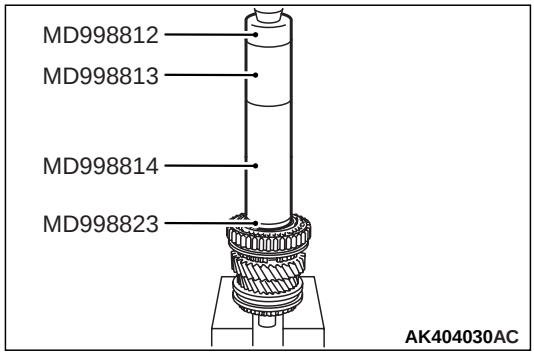
   Standard value: 0 – 0.1 mm

2. Install the selected snap ring.

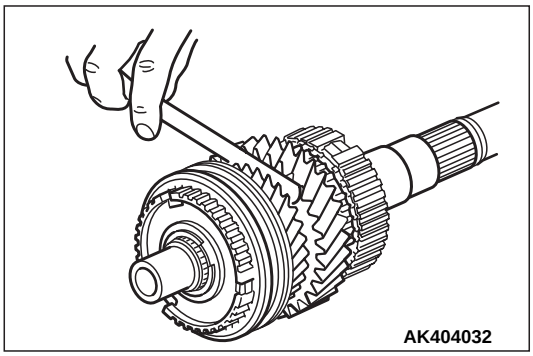
>>C<< REVERSE GEAR / SYNCHRONIZER SHIFTING KEY No. 1 / COMPRESSION SPRING / TRANSMISSION CLUTCH No. 1 HUB / SYNCHRONIZER RING SET No. 1 / 2ND GEAR SUB-ASSEMBLY INSTALLATION



1. Check the installation direction of the reverse gear, and put it on the output shaft.



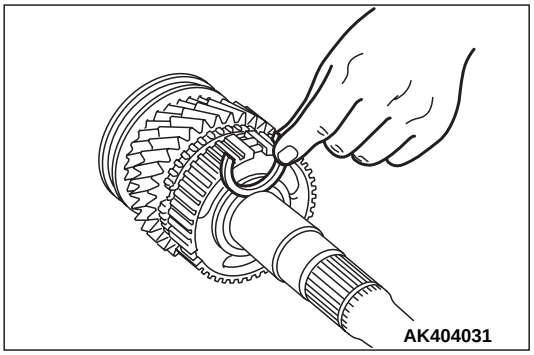
2. Using special tools to install the reverse gear, synchronizer shifting key No. 1, compression spring, the transmission clutch No. 1 hub, synchronizer ring set No. 1 and the 2nd gear sub-assembly.
   - Installer cap (MD998812)
   - Installer-100 (MD998813)
   - Installer-200 (MD998814)
   - Installer adapter (48) (MD998823)



3. Confirm the thrust clearance of the 2nd gear sub-assembly is within the standard value.

   Standard value: 0.10 – 0.25 mm
   Limit: 0.25 mm

>>D<< SHAFT SNAP RING INSTALLATION

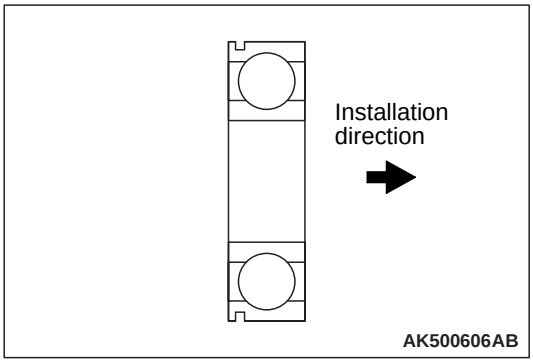


1. Select a snap ring to secure the standard clearance between the transmission clutch No. 1 hub and the output shaft.

   Standard value: 0 – 0.1 mm

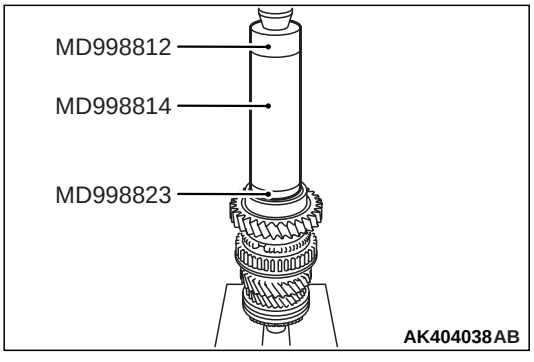
2. Install the selected snap ring.

>>E<< RADIAL BALL BEARING / 1ST GEAR SUB-ASSEMBLY INSTALLATION

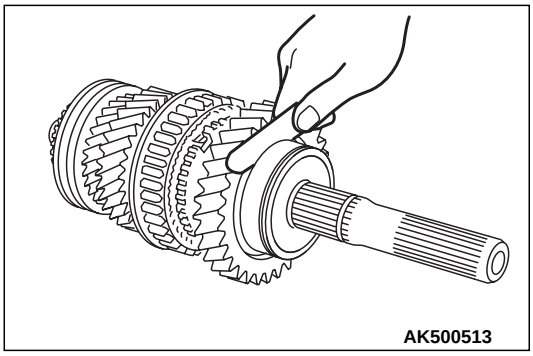


1. Check the installation direction of the radial ball bearing, and put it on the output shaft.

⚠ CAUTION
Never push on the sealing area when installing.



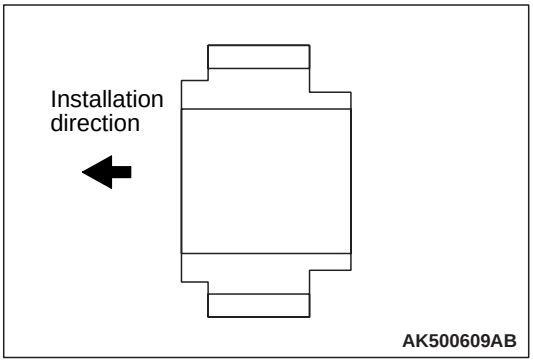
2. Using special tools to install the radial ball bearing and the 1st gear sub-assembly.
   - Installer cap (MD998812)
   - Installer-200 (MD998814)
   - Installer adapter (48) (MD998823)



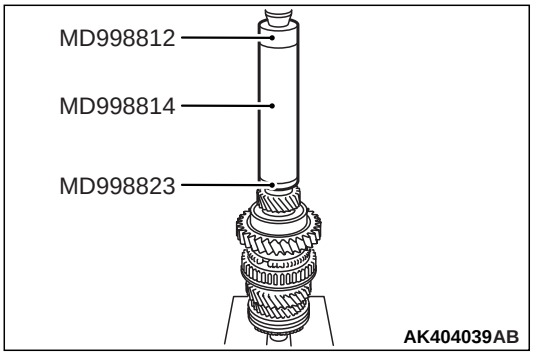
3. Confirm the thrust clearance of the 1st gear sub-assembly is within the standard value.

Standard value: 0.20 – 0.45 mm
Limit: 0.45 mm

>>F<< 5TH GEAR INSTALLATION

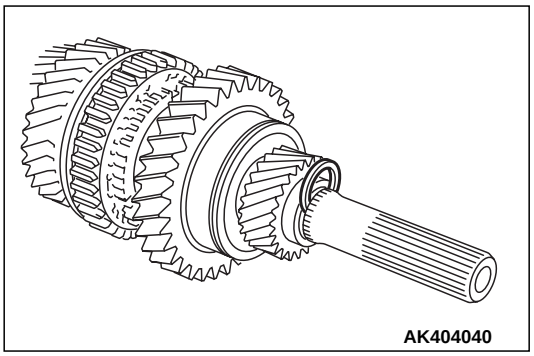


1. Check the installation direction of the 5th gear, and put it on the output shaft.



2. Using special tools to install the 5th gear.
- Installer cap (MD998812)
- Installer-200 (MD998814)
- Installer adapter (48) (MD998823)

>>G<< SHAFT SNAP RING INSTALLATION



1. Select a shaft snap ring to secure the standard clearance between the 5th gear and the output shaft

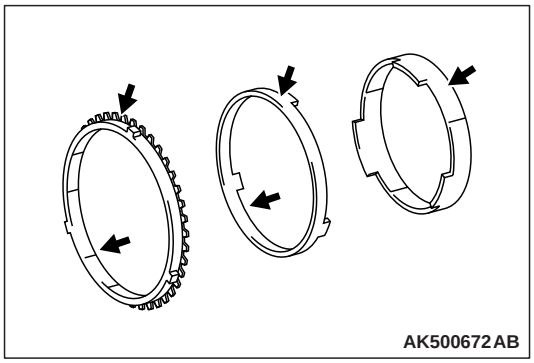
Standard value: 0 – 0.1 mm

2. Install the selected snap ring.

INSPECTION

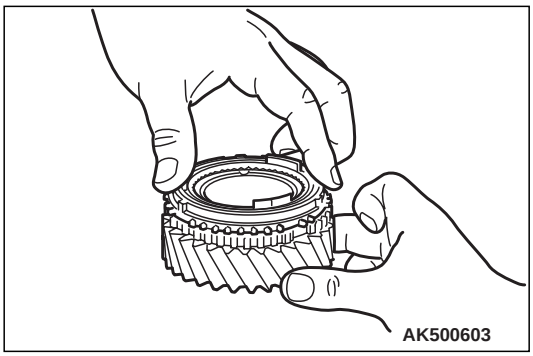
M1222002300261

SYNCHRONIZER RING

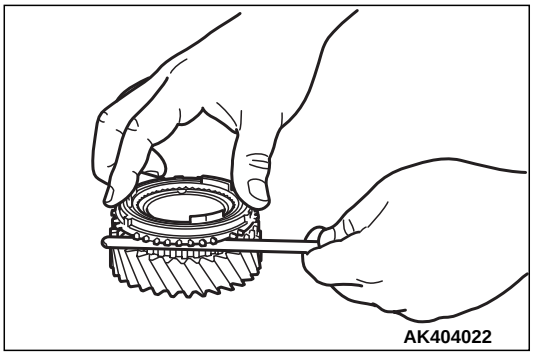


⚠ CAUTION
When any of the outer ring, inner ring or cone has to be replaced, replace them as a set.

1. Check to ensure that the clutch gear tooth surface and cone surface are not damaged and broken.



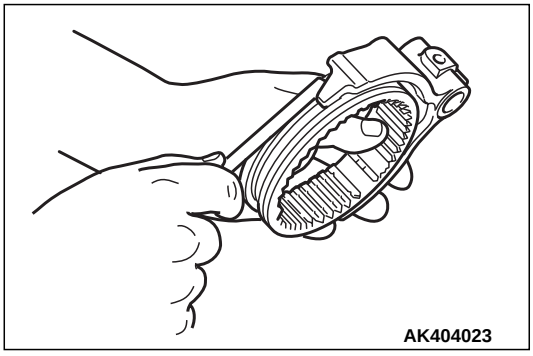
2. After applying oil to the taper portion on each gear, press and fit the synchronizer ring by hand. Confirm the synchronizer ring cannot be rotated.


AK404022

3. Using the thickness gauge, check the clearance between the synchronizer ring and the gear.

Gear	Standard value mm	Limit mm
1st	0.65 – 1.75	0.65
2nd	0.65 – 1.75	0.65
3rd	0.65 – 1.75	0.65

HUB SLEEVE AND SHIFTFORK


AK404023

⚠ CAUTION
When any of the hub sleeve or shift fork has to be replaced, replace them as a set.
Using the thickness gauge, check the clearance between the sleeve and the shift fork.

sleeve	Standard value mm	Limit mm
No.1	0.15 – 0.41	0.41
No.2	0.15 – 0.35	0.35
No.3	0.26 – 0.84	0.84

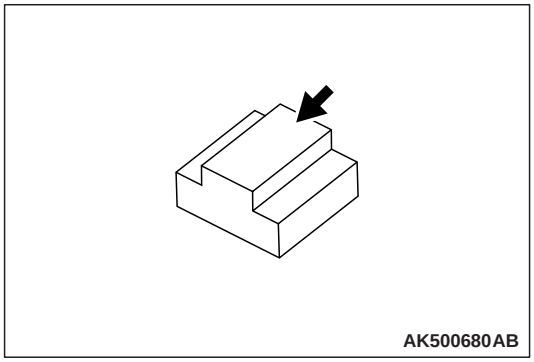
SYNCHRONIZER SLEEVE AND HUB

1. Combine the synchronizer sleeve and hub, and check that they slide smoothly.
2. Check that the sleeve is free from damage at its inside splines ends.

NEEDLE ROLLER BEARING

1. Combine the needle roller bearing with the output shaft and gear, and check that it rotates smoothly without noise or play.
2. Check the needle roller bearing cage for deformation.

SYNCHRONIZER KEYS

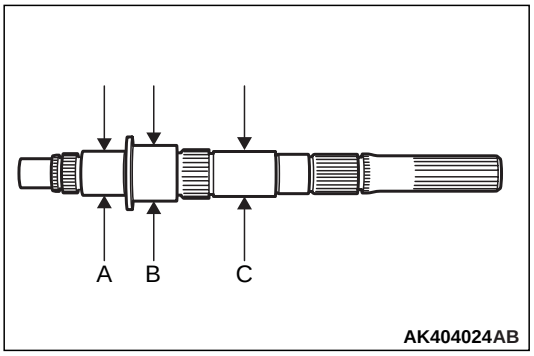

AK500680AB

Check the synchronizer hub contact surfaces of each synchronizer key for damage and excessive wear.

COMPRESSION SPRINGS

Check the compression springs for loss of tension, deformation, and breakage.

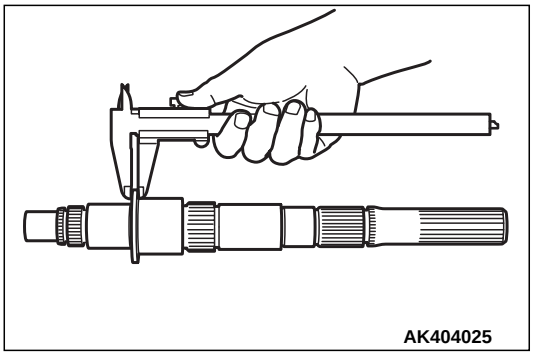
OUTPUT SHAFT



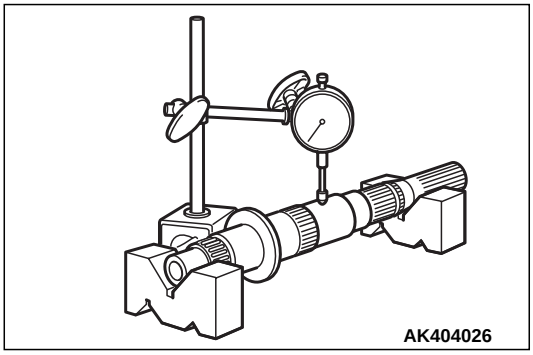
AK404024AB

1. Using the micrometer, check the outer shape of the needle roller bearing race.

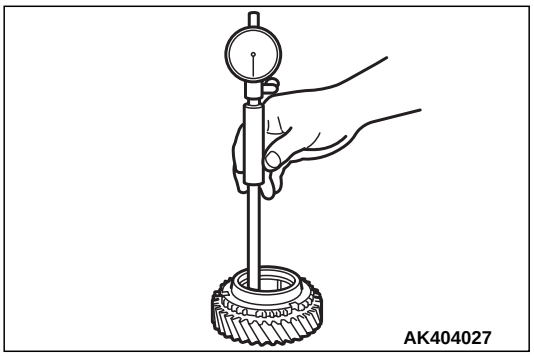
Measurement part	Standard value mm	Limit mm
A	37.984 – 38.000	37.984
B	46.984 – 47.000	46.984
C	38.979 – 38.995	38.979


AK404025

2. Using the slide gauge, check the flange thickness.
   Minimum limit: 4.800 mm


AK404026

3. Using the dial gauge and V-block, check the output shaft runout.
   Limit: 0.015 mm Max


AK404027

4. Using the cylinder gauge, check the inside diameter of each gear.

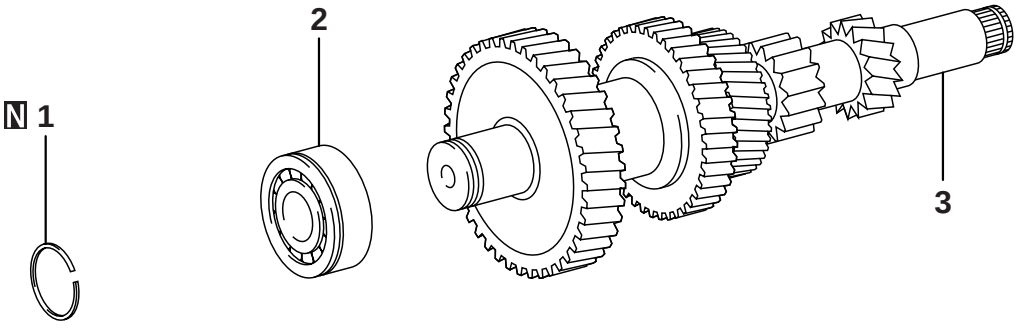
Gear	Standard value mm	Limit mm
1st	46.015 – 46.040	46.040
2nd	53.015 – 53.040	53.040
3rd	44.015 – 44.040	44.040

COUNTERSHAFT

DISASSEMBLY AND REASSEMBLY

M1222007300158

Apply gear oil to all moving parts before installation.



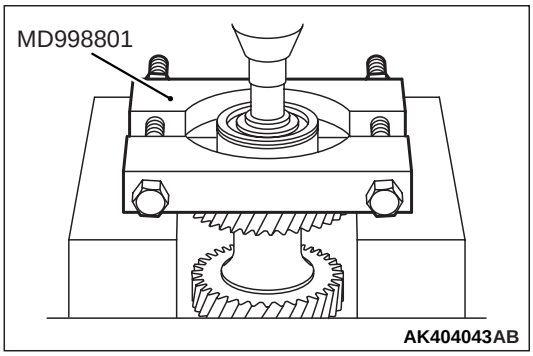
AK500518AB

Disassembly steps

>>B<< 1. Shaft snap ring
<<A>> >>A<< 2. Cylindrical roller bearing
3. Counter gear

DISASSEMBLY SERVICE POINT

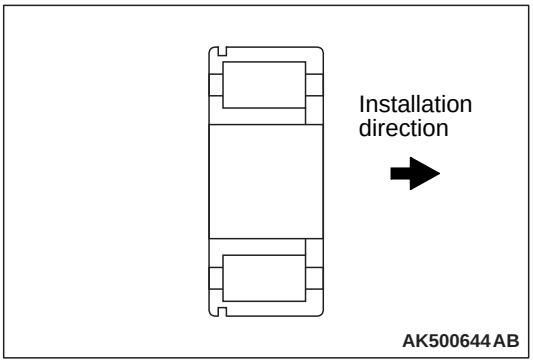
<<A>> CYLINDRICAL ROLLER BEARING REMOVAL



Using special tool Bearing remover (MD998801), support the cylindrical roller bearing and remove it.

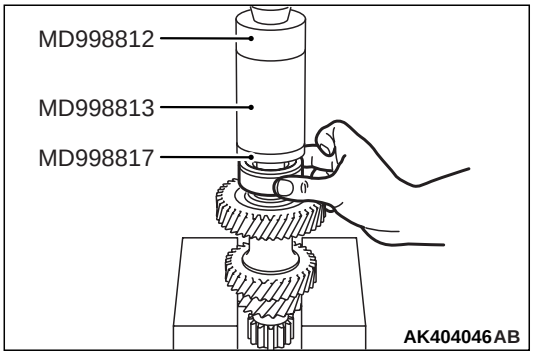
REASSEMBLY SERVICE POINTS

>>A<< CYLINDRICAL ROLLER BEARING INSTALLATION



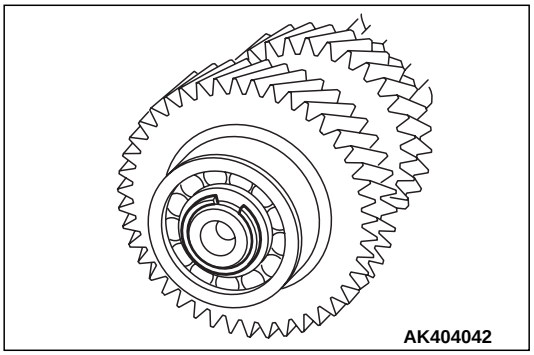
1. Check the installation direction of the cylindrical roller bearing, and put it on the counter shaft.

⚠ CAUTION
Never push the sealing area at the press fit.



2. Using special tools to install the cylindrical roller bearing.
   - Installer cap (MD998812)
   - Installer-100 (MD998813)
   - Installer adapter (34) (MD998817)

>>B<< SHAFT SNAP RING INSTALLATION

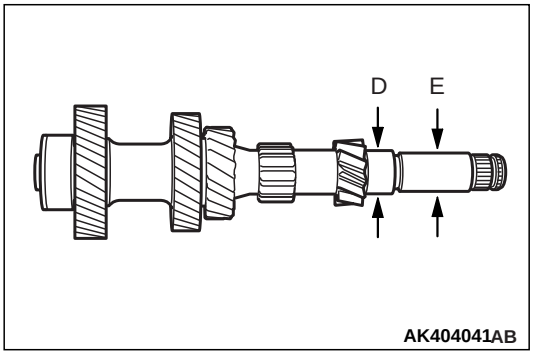


1. Select a snap ring to secure clearance of standard value between the cylinder roller bearing and counter shaft.
   Standard value: 0 – 0.1 mm
2. Install the selected snap ring.

INSPECTION

M1222007400025

COUNTER GEAR



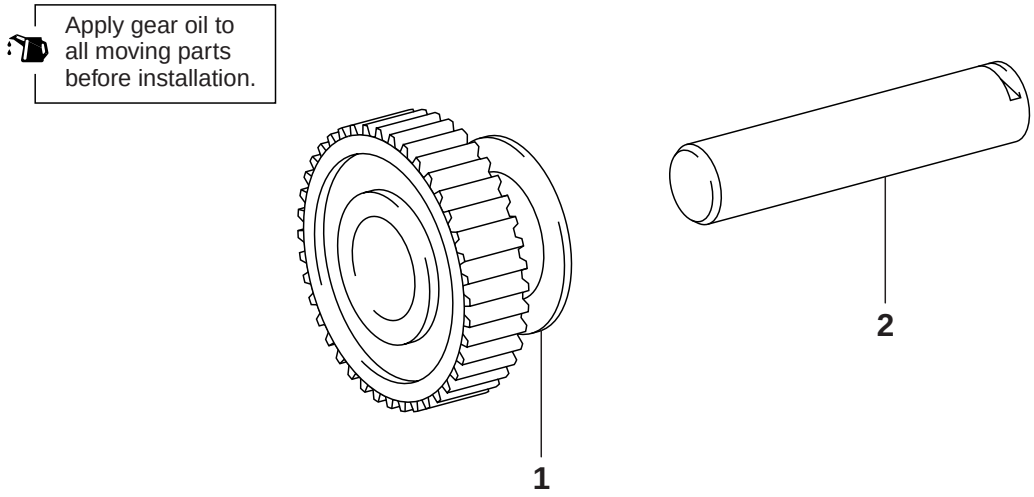
Using the micrometer, check the outer shape of the needle roller bearing race.

Measurement part	Standard value mm	Limit mm
D	34.000 – 34.105	34.000
E	29.984 – 30.000	29.984

REVERSE IDLER GEAR

DISASSEMBLY AND REASSEMBLY

M1222012500233



AK500519AB

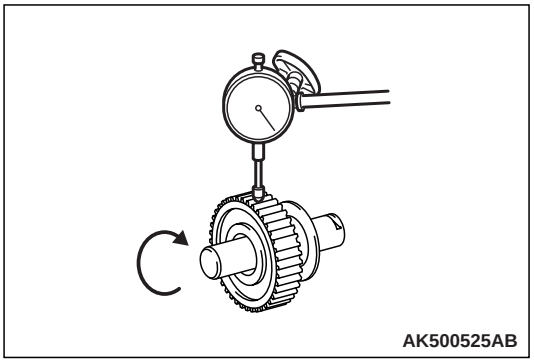
Disassembly steps

1. Reverse idler gear sub-assembly
2. Reverse idler gear shaft

INSPECTION

M1222012400076

REVERSE IDLER GEAR SUB-ASSEMBLY



Check the radial clearance of the reverse idler gear.

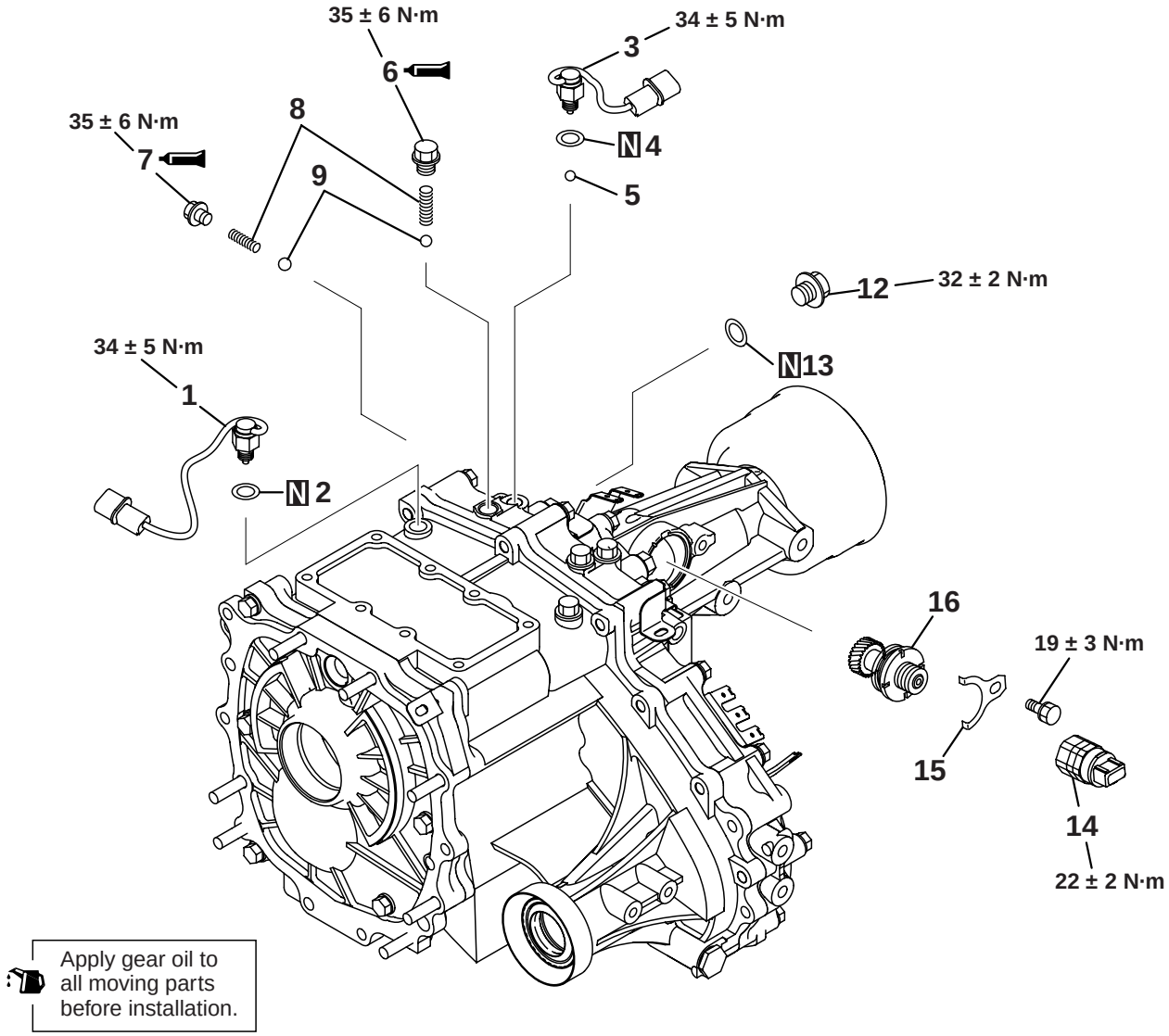
Standard value: 0.040 – 0.082 mm
Limit: 0.082 mm

TRANSFER

DISASSEMBLY AND REASSEMBLY

M1222008800327

<V5MB1-J-NEG, JER>



AKA00412AB

Disassembly steps

1. 4WD operation detection switch
2. Gasket
3. High range/Low range detection switch
4. Gasket
5. Steel ball

>>U<< 6. Plug

>>U<< 7. Plug

Disassembly steps (Continued)

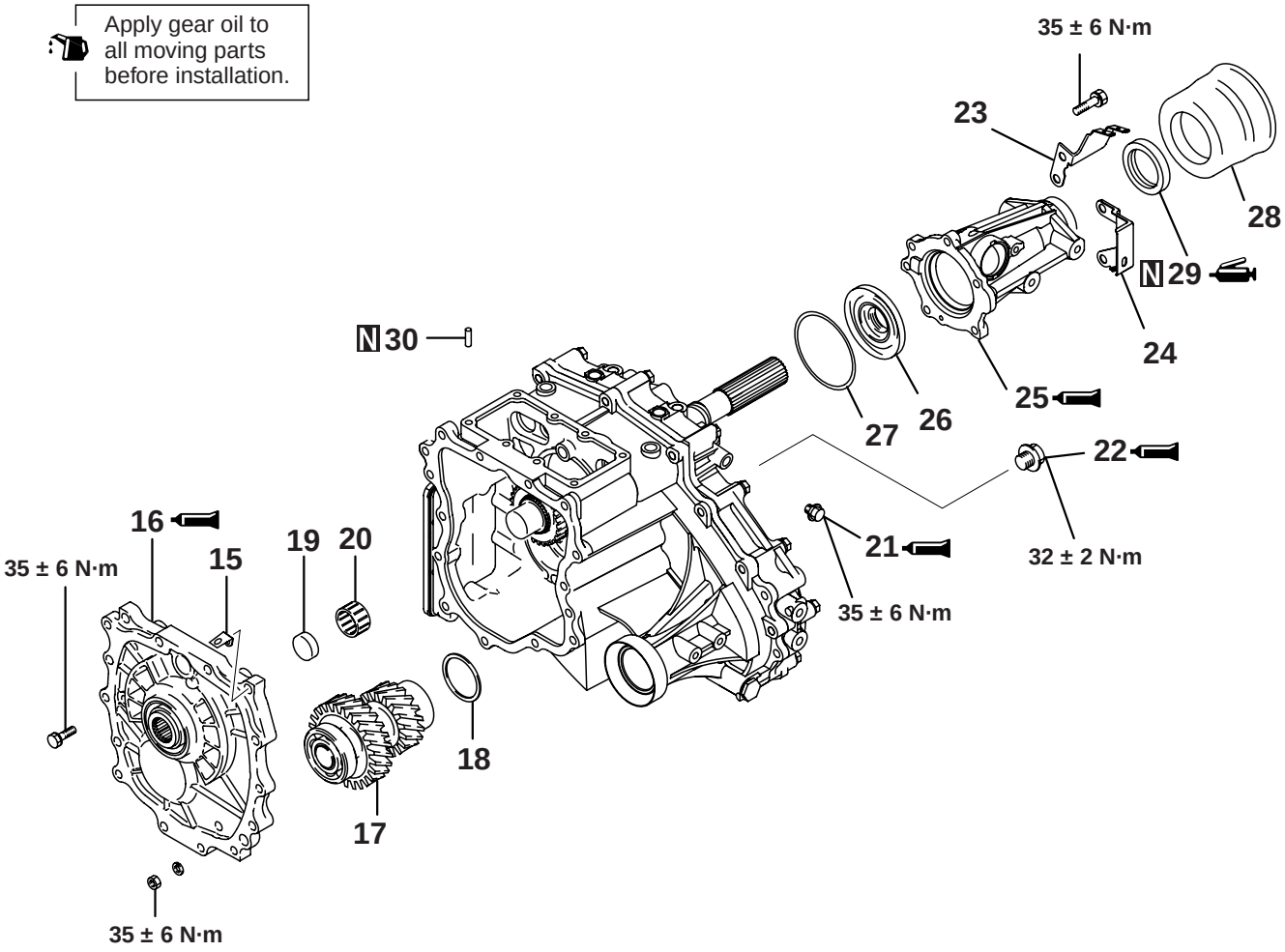
>>T<< 8. Spring

9. Steel ball

>>U<< 10. Plug

11. Gasket
12. Vehicle speed sensor
13. Speedometer sleeve clamp

>>S<< 14. Speedometer driven gear sleeve assembly



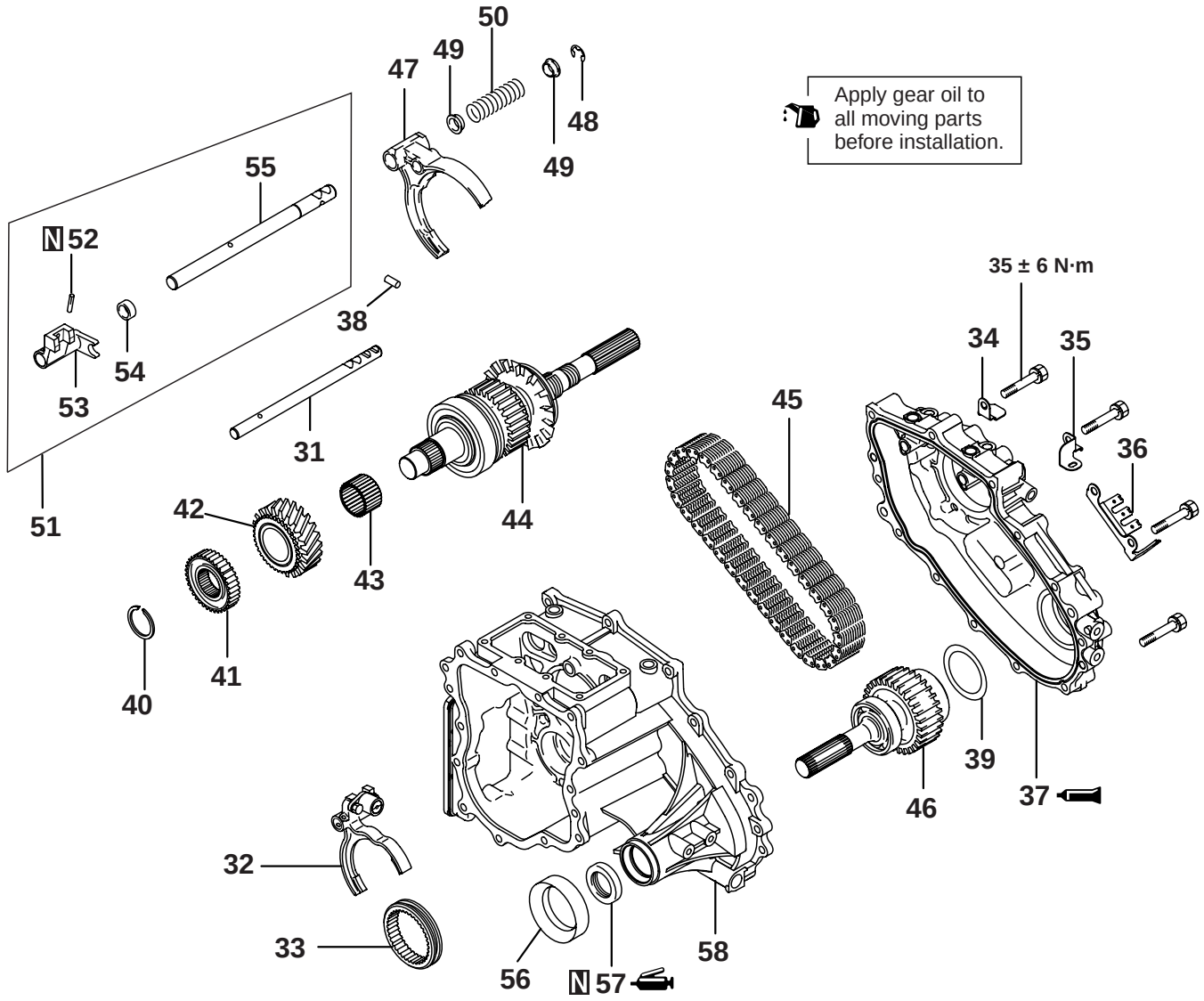
AK900792AB

Disassembly steps

	15.	Bracket
>>**R**<<	16.	Transfer case plate
>>**Q**<<	17.	Countershaft gear
>>**P**<<	18.	Spacer
	19.	Sealing cap
	20.	Needle bearing
>>**U**<<	21.	Plug
>>**U**<<	22.	Plug

Disassembly steps (Continued)

	23.	Connector bracket
	24.	Harness bracket
>>**O**<<	25.	Rear cover
>>**N**<<	26.	Oil cover
>>**M**<<	27.	Spacer
	28.	Dust seal cover
>>**L**<<	29.	Oil seal
>>**K**<<	30.	Spring pin



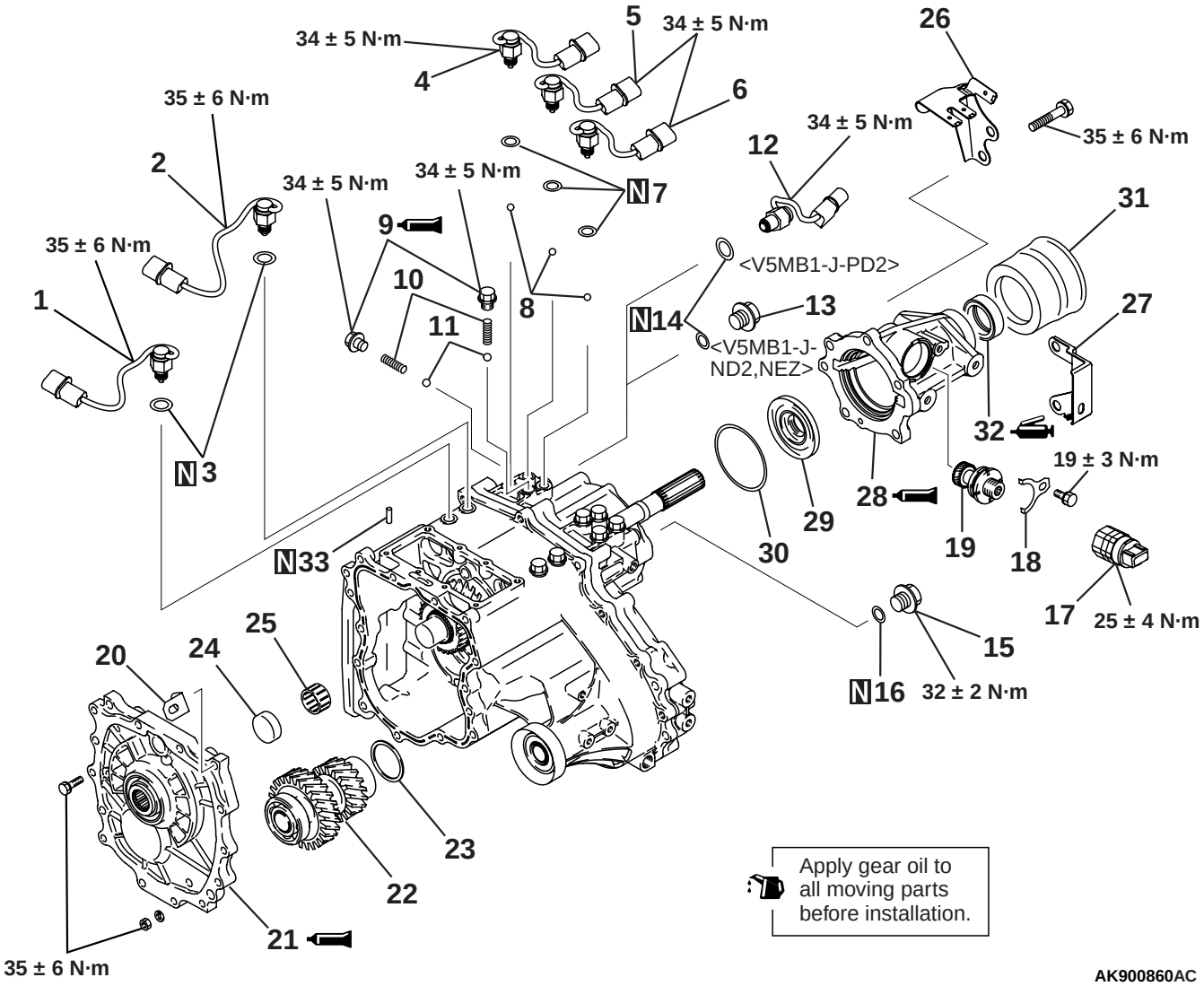
Disassembly steps

<<A>>	>>J<<	31.	H-L shift rail
		32.	H-L shift fork
	>>I<<	33.	H-L clutch sleeve
		34.	Harness bracket
		35.	Harness bracket
		36.	Harness bracket
	>>H<<	37.	Chain cover
		38.	Interlock plunger
		39.	Wave spring
	>>D<<	40.	Snap ring
	>>C<<	41.	H-L clutch hub
		42.	Low speed gear
		43.	Needle bearing
<<B>>	>>B<<	44.	Rear output shaft
<<B>>	>>B<<	45.	Chain

Disassembly steps (Continued)

<<B>>	>>B<<	46.	Front output shaft
		47.	2-4WD shift fork
		48.	Snap ring
		49.	Spring retainer
		50.	Return spring
		51.	2-4WD shift lug and shift rail assembly
	>>F<<	52.	Spring pin
		53.	2-4WD shift lug
		54.	Distance piece
		55.	2-4WD shift rail
		56.	Dust seal guard
	>>A<<	57.	Oil seal
		58.	Transfer case

<V5MB1-J-ND2, NEZ,PD2>



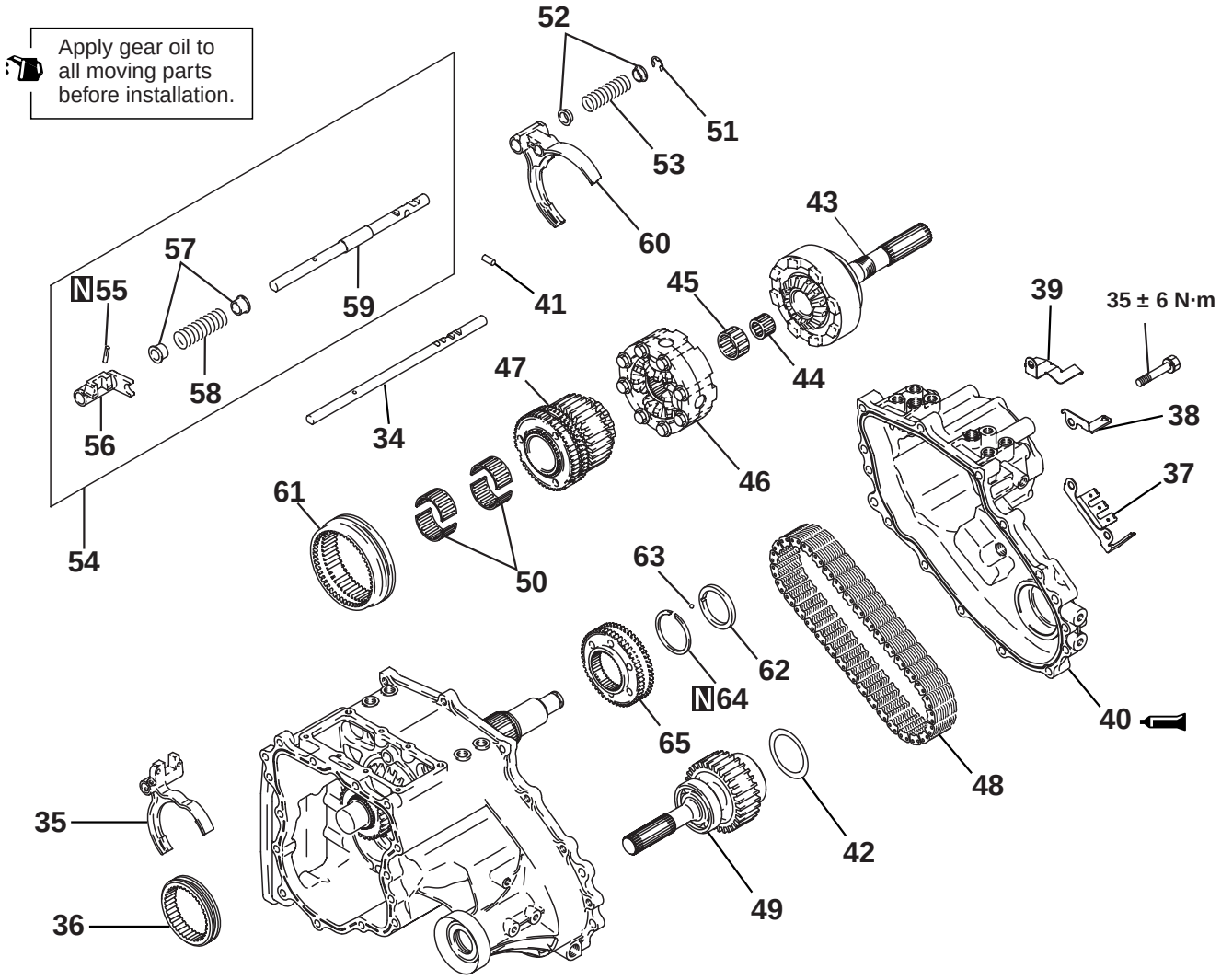
AK900860AC

Disassembly steps

>>**V**<<	1.	Center differential lock detection switch
>>**V**<<	2.	2WD/4WD detection switch
	3.	Gasket
>>**V**<<	4.	Center differential lock operation detection switch
>>**V**<<	5.	4WD operation detection switch
>>**V**<<	6.	High range/Low range detection switch
	7.	Gasket
	8.	Steel ball
>>**U**<<	9.	Plug
>>**T**<<	10.	Spring
	11.	Steel ball
	12.	4LLc operation detection switch
	13.	Plug
	14.	Gasket
	15.	Plug
	16.	Gasket

Disassembly steps (Continued)

	17.	Vehicle speed sensor
	18.	Speedometer clamp
>>**S**<<	19.	Speedometer driven gear sleeve assembly
	20.	Bracket
>>**R**<<	21.	Transfer case plate
>>**Q**<<	22.	Countershaft gear
>>**P**<<	23.	Spacer
	24.	Sealing cap
	25.	Needle bearing
	26.	Connector bracket
	27.	Harness bracket
>>**O**<<	28.	Rear cover
	29.	Oil cover
>>**M**<<	30.	Spacer
	31.	Dust seal cover
>>**L**<<	32.	Oil seal
>>**K**<<	33.	Spring pin



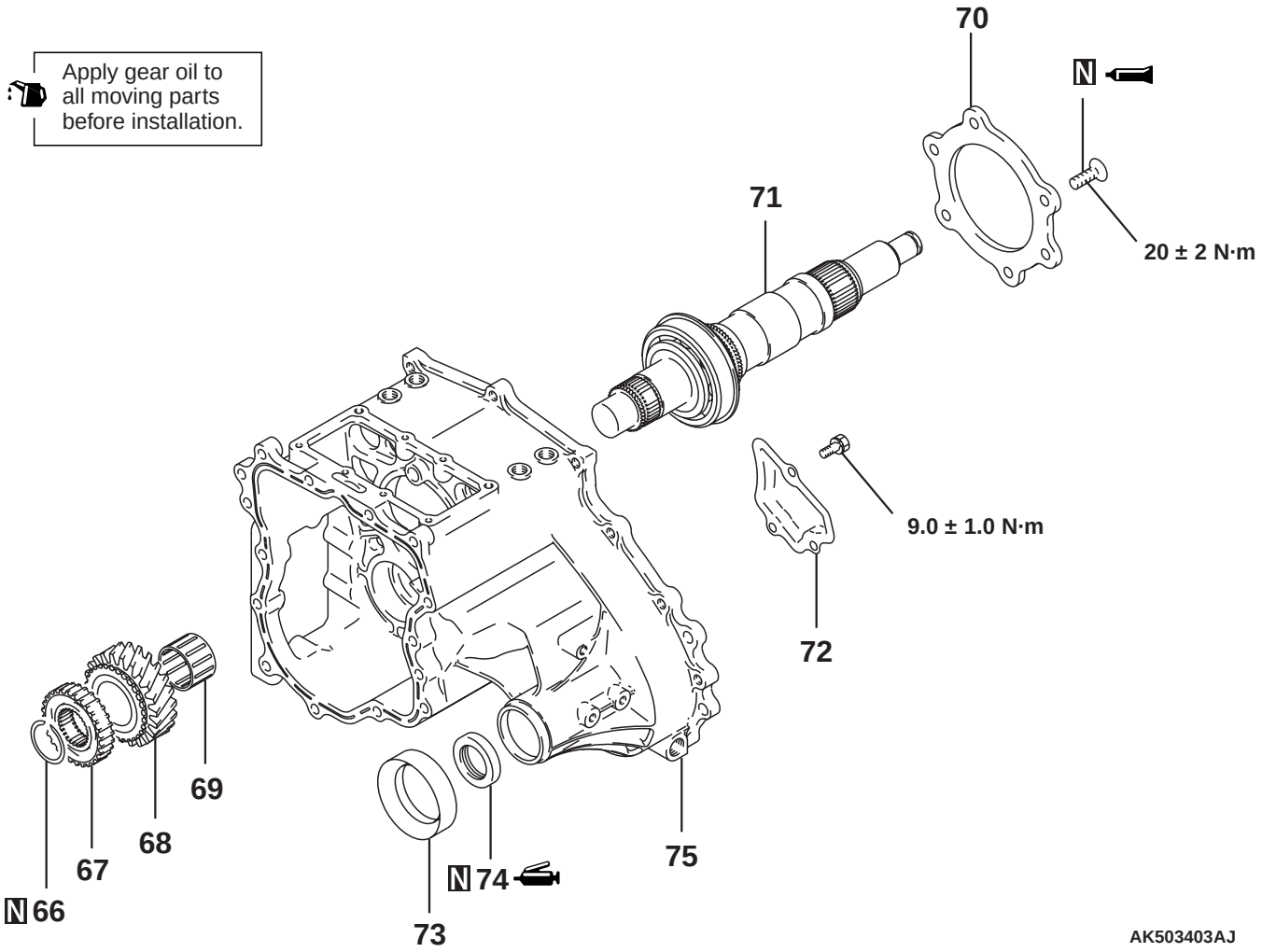
AK801157AE

Disassembly steps

<<A>>	>>J<<	34.	H-L shift rail
		35.	H-L shift fork
	>>I<<	36.	H-L clutch sleeve
		37.	Harness bracket
		38.	Harness bracket
		39.	Harness bracket
	>>H<<	40.	Chain cover
		41.	Interlock plunger
		42.	Wave spring
		43.	Rear output shaft
		44.	Needle bearing
		45.	Needle bearing
		46.	Center differential case
<<C>>	>>G<<	47.	2-4WD synchronizer
<<C>>	>>G<<	48.	Chain
<<C>>	>>G<<	49.	Front output shaft
		50.	Needle bearing

Disassembly steps (Continued)

51.	E-ring	
52.	Spring seat	
53.	Spring	
54.	2-4WD shift lug and shift rail assembly	
>>F<<	55.	Spring pin
	56.	2-4WD shift lug
	57.	Spring seat
	58.	Spring
	59.	2-4WD shift rail
	60.	2-4WD shift fork
	61.	2-4WD synchronizer sleeve
	62.	Spacer
	63.	Steel ball
>>E<<	64.	Snap ring
	65.	Differential lock hub

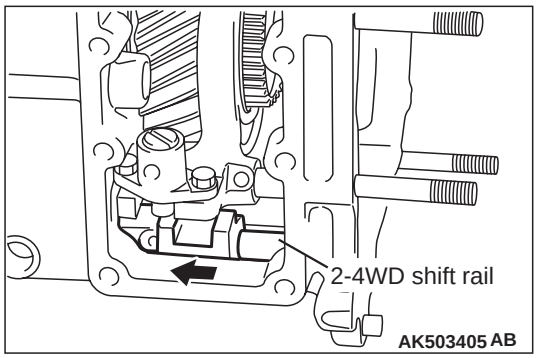


Disassembly steps

- >>**D**<< 66. Snap ring
- >>**C**<< 67. H-L clutch hub
- 68. Low speed gear
- 69. Needle bearing
- 70. Rear bearing retainer
- 71. Transfer drive shaft
- 72. Oil pool cover
- 73. Dust seal guard
- >>**A**<< 74. Oil seal
- 75. Transfer case

DISASSEMBLY SERVICE POINTS

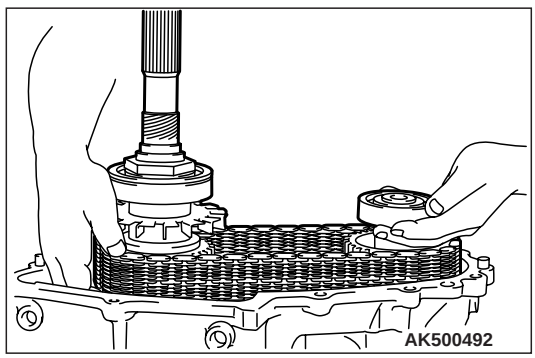
<<A>> H-L SHIFT RAIL REMOVAL



1. Fix the H-L shift rail at the high position.
2. Shift the 2-4WD shift rail at the 4WD position.

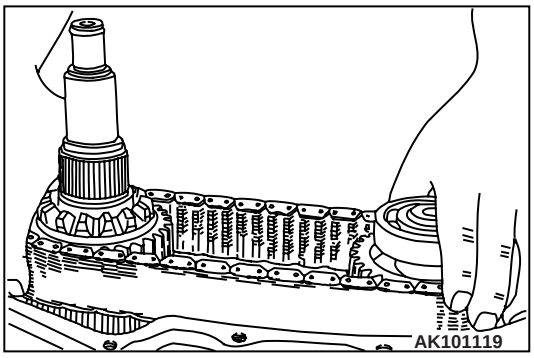
NOTE: If the 2-4WD shift rail is at the 2WD position, the chain cover cannot be removed because interlock is actuated.

<<B>> REAR OUTPUT SHAFT / CHAIN/FRONT OUTPUT SHAFT REMOVAL



Remove the rear output shaft, chain and front output shaft as a set.

<<C>> 2-4WD SYNCHRONIZER / CHAIN/FRONT OUTPUT SHAFT REMOVAL



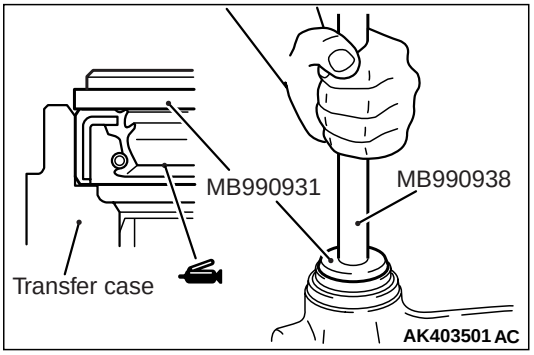
Remove the 2-4WD synchronizer, chain and front output shaft as a set.

ADJUSTMENT BEFORE REASSEMBLY

Spacer selection for adjustment of counter shaft end play. (Refer to ADJUSTMENT OF TRANSFER - SPACER SELECTION FOR ADJUSTMENT OF COUNTER SHAFT END PLAY P.22C-59

REASSEMBLY SERVICE POINTS

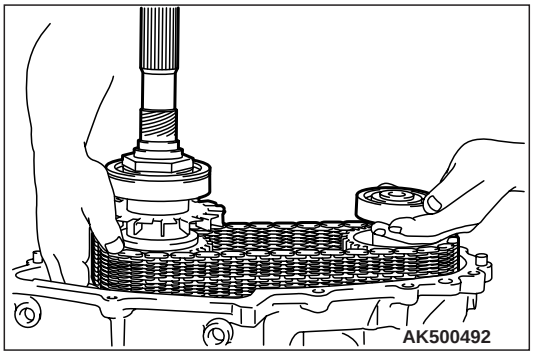
>>A<< OIL SEAL INSTALLATION



1. Use special tools to install the oil seal.
   - Installer adapter (MB990931)
   - Installer bar (MB990938)
2. Apply the specified grease to the lip of oil seal.

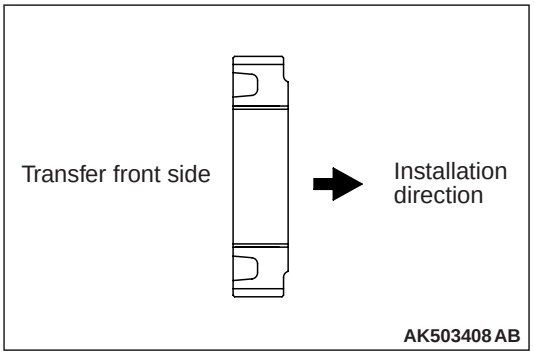
   Specified lubricant: Mitsubishi Part No. 0101011 or equivalent

>>B<< FRONT OUTPUT SHAFT / CHAIN / REAR OUTPUT SHAFT INSTALLATION



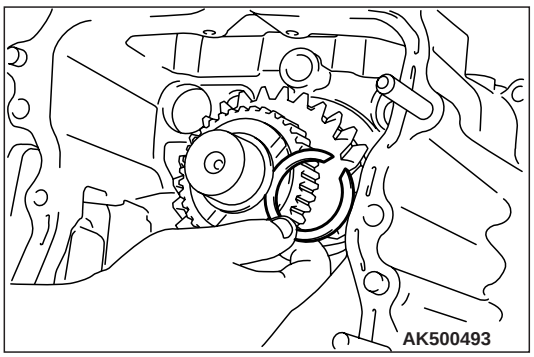
1. Engage the chain precisely with the sprocket of the rear output shaft and the front output shaft.
2. Install the 2-4WD shift fork on the 2-4WD clutch sleeve. While passing them beside the 2-4WD shift rail, install the front output shaft, and chain and rear output shaft.

>>C<< H-L CLUTCH HUB INSTALLATION



Check that the H-L clutch hub is in the correct direction for installation.

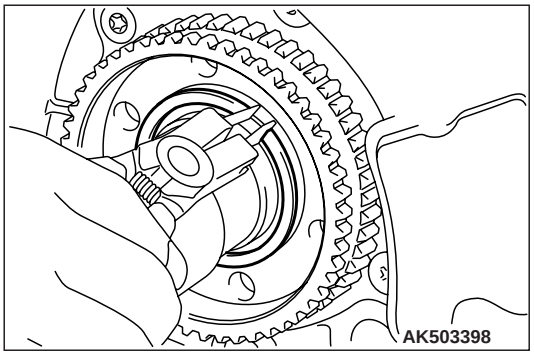
>>D<< SNAP RING INSTALLATION



1. Install the thickest snap ring that can be fitted in the snap ring groove of the rear output shaft.
2. Make sure that the H-L clutch hub end play meets the standard value.

   Standard value: 0 – 0.08 mm

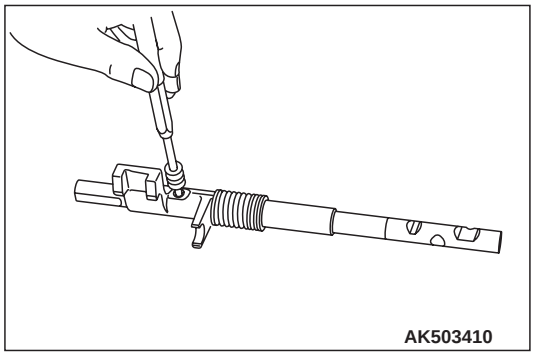
>>E<< SNAP RING INSTALLATION



1. Install the thickest snap ring that can be fitted in the snap ring groove of the transfer drive shaft.
2. Make sure that the differential lock hub end play meets the standard value.

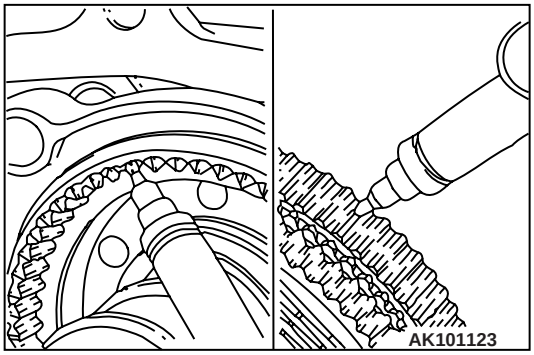
Standard value: 0 – 0.08 mm

>>F<< SPRING PIN INSTALLATION

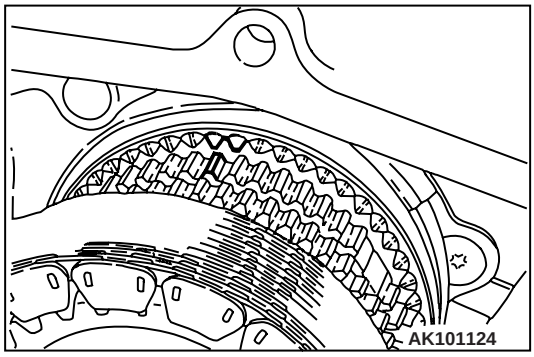


1. Align the e2-4WD shift lug with the 2-4WD shift rail spring pin hole.
2. Hammer in the spring valve so that the spring pin slit matches the center of the shift rail shaft.

>>G<< 2-4WD SYNCHRONIZER/CHAIN/FRONT OUTPUT SHAFT INSTALLATION



1. Make a white paint mark on the deep groove portions (three places) of the 2-4WD synchronizer.
2. Make a white paint mark on the portions (three places) of the 2-4WD synchronizer sleeve splines.

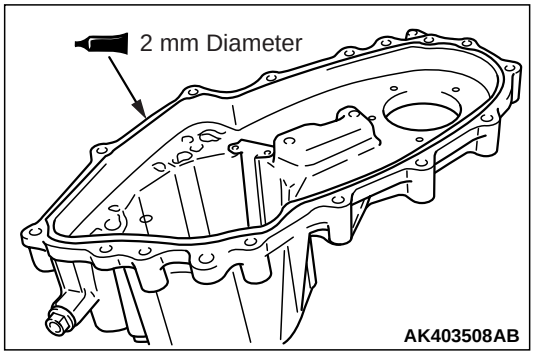


3. Place the chain in tight mesh with the 2-4WD synchronizer and front output shaft sprockets.
4. With both sprockets spaced the farthest apart, install them on the transfer case simultaneously.

>>H<< CHAIN COVER INSTALLATION

⚠ CAUTION

Squeeze the sealant out evenly to apply it in an unbroken, non-excessive quantity.

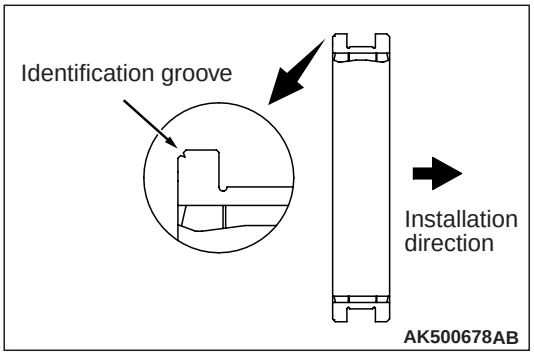


1. Completely degrease the FIPG-applied surface so that water and oil including the old sealant cannot adhere to the surface coated with the sealant.

   Never touch the degreased surface by hand.
2. Apply sealant to the chain cover, and then install the chain cover.

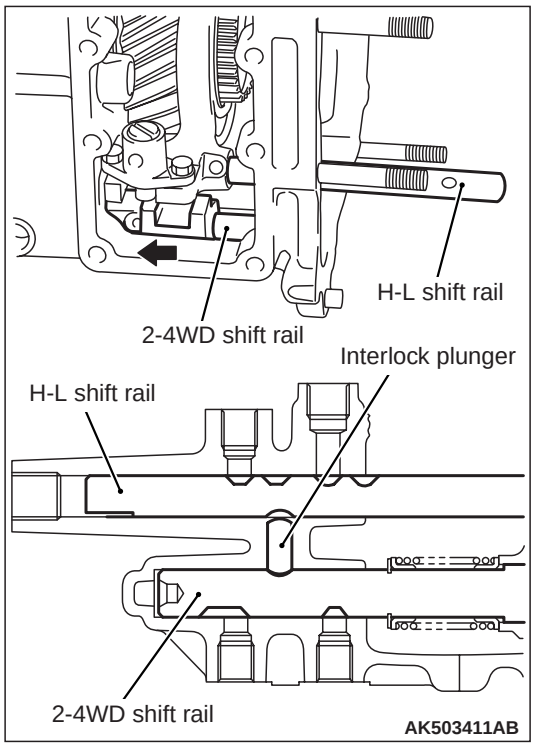
Specified sealant: Mitsubishi genuine sealant Part No. MD997740 or equivalent

>>I<< H-L CLUTCH SLEEVE INSTALLATION



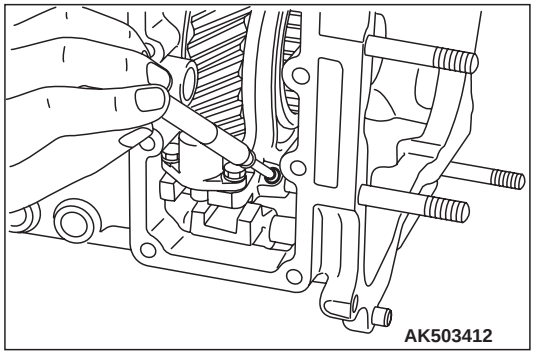
Check that the H-L clutch sleeve is in the correct direction for installation.

>>J<< H-L SHIFT RAIL INSTALLATION



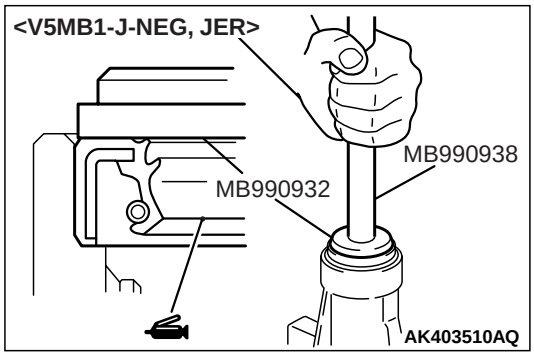
1. Tilt the transfer case with the 2-4WD shift rail downward as shown in the illustration.
2. Move the 2-4WD shift rail in the direction of the arrow fully.
3. After making sure that the plunger is not exposed out of the H-L shift rail hole in the transfer case, install the H-L shift rail.

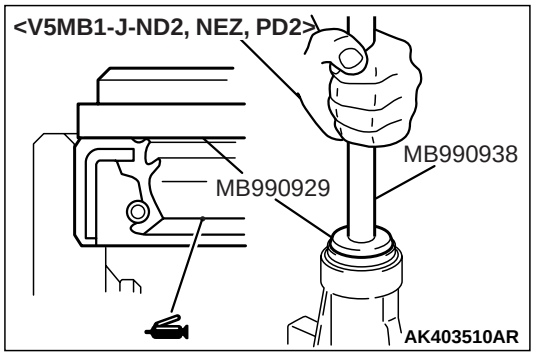
>>K<< SPRING PIN INSTALLATION



1. Align the spring pin holes on the shift rail with the shift fork. Then tap in the spring pin so that the slit of the spring pin is facing the shaft center of the shift rail.

>>L<< OIL SEAL INSTALLATION

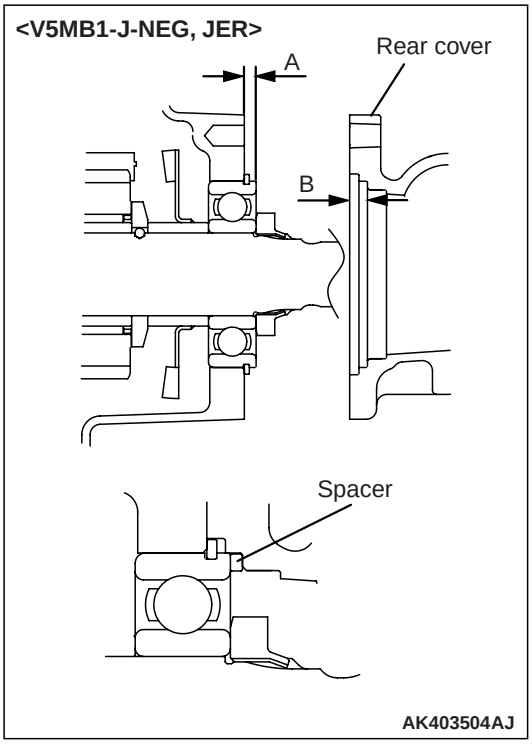


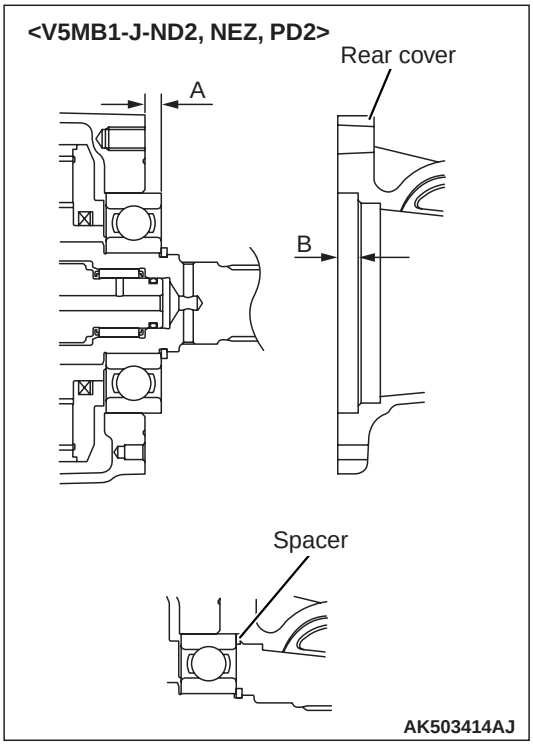


1. Use special tools to install the oil seal.
   - Installer adapter (MB990932) <V5MB1-J-NEG, JER>
   - Installer adapter (MB990929) <V5MB1-J-ND2, NEZ, PD2>
   - Installer bar (MB990938)
2. Apply the specified grease to the lip of oil seal.

   Specified lubricant: Mitsubishi Part No. 0101011 or equivalent

>>M<< SPACER INSTALLATION

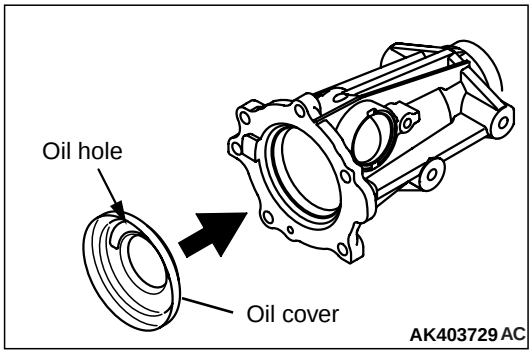




1. Measure projection A of the rear output shaft bearing and depth B of the second stage of the rear cover.
2. Subtract A from B and let the answer be C. Select a spacer so that the subtracted value will be the standard value shown below.

   Standard value:
   0 – 0.1 mm <V5MB1-J-NEG, JER>
   0.025 – 0.150 mm <V5MB1-J-ND2, NEZ, PD2>

>>N<< OIL COVER INSTALLATION

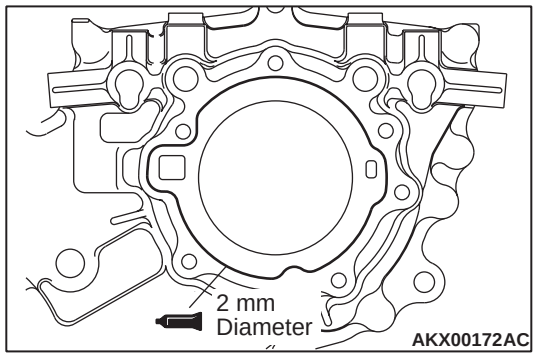


In case of <V5MB1-J-NEG, JER> type, install the oil cover so that the oil hole shown in the illustration.

>>O<< REAR COVER INSTALLATION

⚠ CAUTION

Squeeze the sealant out evenly to apply it in an unbroken, non-excessive quantity.



1. Completely degrease the FIPG-applied surface so that water and oil including the old sealant cannot adhere to the surface coated with the sealant.

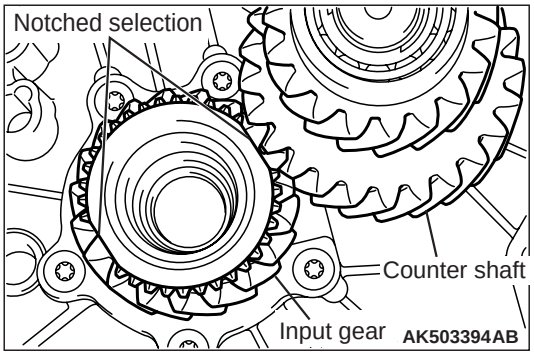
   Never touch the degreased surface by hand.
2. Apply the sealant to the chain cover.

   Specified sealant: Mitsubishi genuine sealant Part No. MD997740 or equivalent

>>P<< SPACER INSTALLATION

Install the previously selected spacer (Refer to ADJUSTMENT BEFORE ASSEMBLY).

>>Q<< COUNTER SHAFT GEAR INSTALLATION

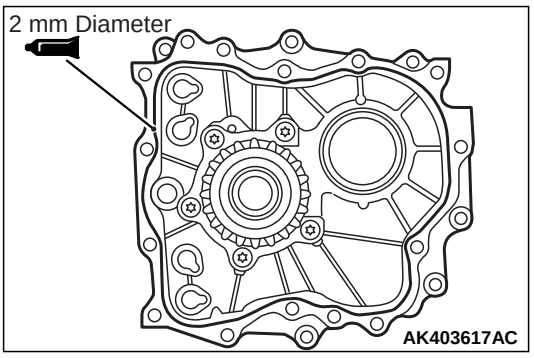


1. Turn the input gear's notched selection surface toward the counter shaft mounting surface. then install the counter shaft.

>>R<< TRANSFER CASE PLATE INSTALLATION

⚠ CAUTION

Squeeze the sealant out evenly to apply it in an unbroken, non-excessive quantity.



1. Completely degrease the FIPG-applied surface so that water and oil including the old sealant cannot adhere to the surface coated with the sealant.

   Never touch the degreased surface by hand.
2. Apply the sealant to the transfer case plate.

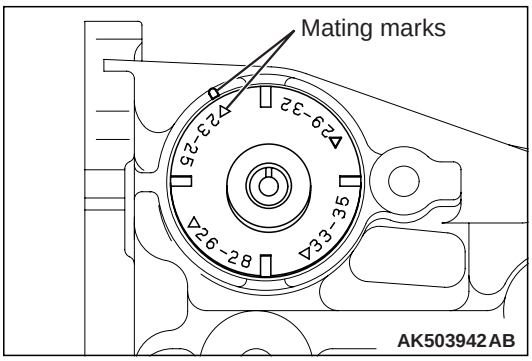
   Specified sealant: Mitsubishi genuine sealant Part No. MD997740 or equivalent

⚠ CAUTION

The transfer case plate must be installed smooth and straight to get a good seal.

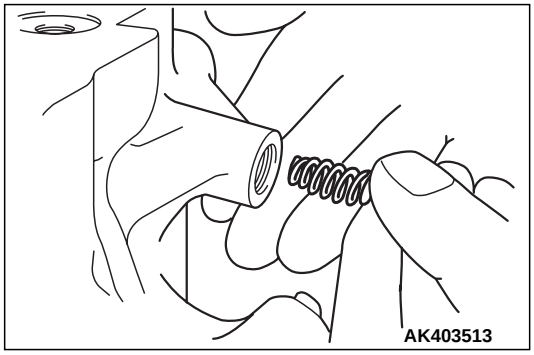
3. Install the transfer case plate together with the input gear and countershaft.

>>S<< SPEEDOMETER DRIVEN GEAR SLEEVE ASSEMBLY INSTALLATION



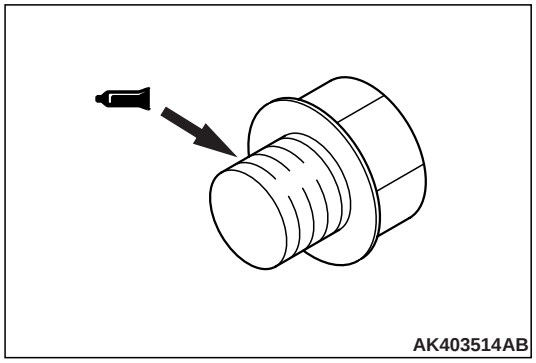
Match the mating marks to the number of teeth.

>>T<< SPRING INSTALLATION



Install the spring with its tapered end toward the ball.

>>U<< PLUG INSTALLATION



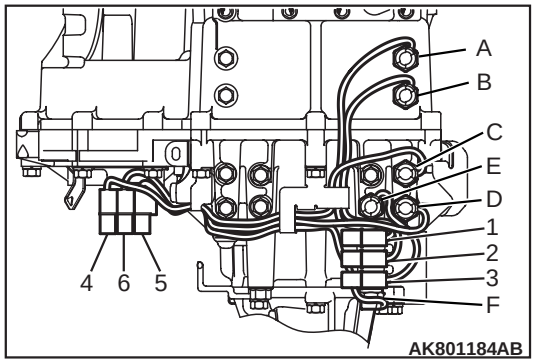
Apply the sealant to the threads.

Specified sealant: 3M AAD Part No. 8672 or equivalent

NOTE:

The new plug is precoated with sealant, so sealant does not need to be applied.

>>V<< DETECTION SWITCH INSTALLATION



Install with care. Do not make mistake when locating each switch.

Detection switch name		Connector No./Color
A	Center differential lock detection switch	1/Brown
B	2WD/4WD detection switch	2/Black
C	Center differential lock operation detection switch	4/Blown
D	4WD operation detection switch	5/Black
E	High range/Low range detection switch	3/white
F	4LLc operation detection switch <V5MB1-J-PD2>	6/white

ADJUSTMENT OF TRANSFER

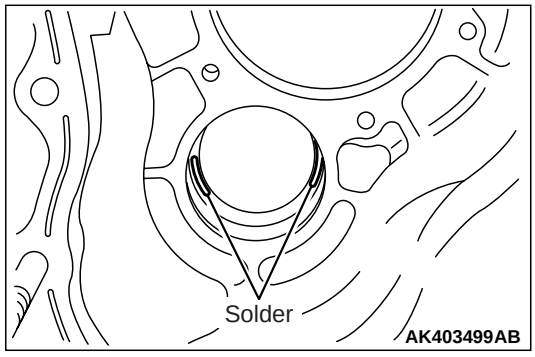
M1222016700013

SPACER SELECTION FOR ADJUSTMENT OF COUNTER SHAFT END PLAY

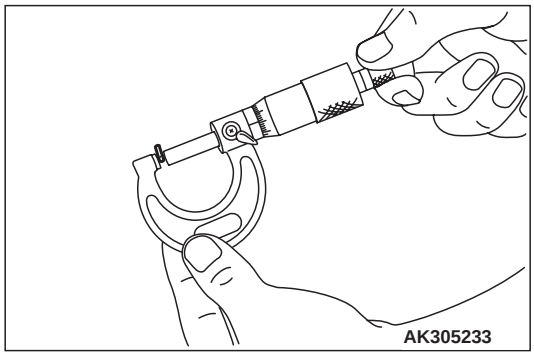
<Measurement using a solder>

⚠ CAUTION

- **f soft solder is not available, select the spacer in accordance with Plastigage method.**
- **If the spacer appropriate for the standard value cannot be selected using soft solder, select the spacer in accordance with Plastigage method.**



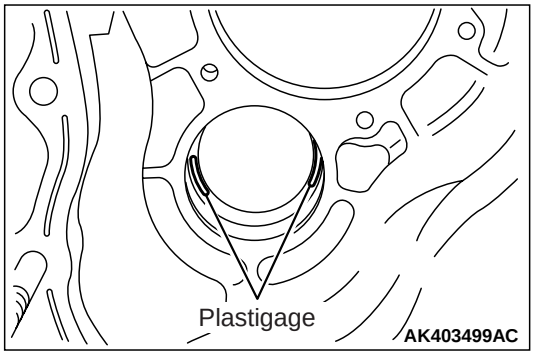
1. Put solders (1.0 mm diameter, about 10 mm long) in the illustrated positions of the transfer case housing.
2. Install the counter shaft into the transfer case.
3. Install the transfer case plate and tighten the bolts to the specified torque of 35 ± 6 N·m.
4. Remove the transfer case plate and the counter shaft, and then take out crushed solders.
5. If the solders have not crushed, use thicker solders (1.6 mm diameter, about 10 mm long) and repeat steps 2 to 4.



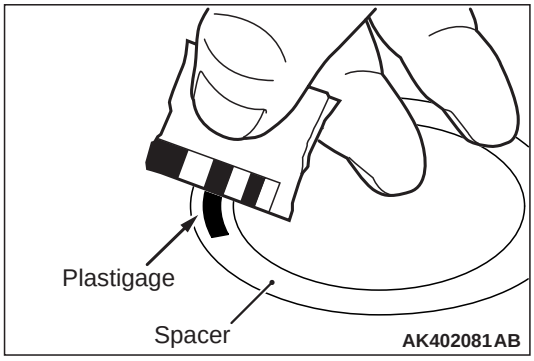
6. Measure the thickness of the crushed solder with a micrometer and select a spacer that will provide the standard value.

   Spacer thickness: (T − 0) to (T − 0.15)
   T: The crushed solder thickness
   Standard value: 0 − 0.15 mm

<Measurement using Plastigage>



1. Put plastigage (about 10 mm long) in the illustrated positions of the transfer case housing.
2. Install the adjusting spacer having the minimum thickness.
3. Install the counter shaft into the transfer case.
4. Install the transfer case plate and tighten the bolts to the specified torque of 35 ± 6 N·m.
5. Remove the transfer case plate and the counter shaft, and then take out crushed solders.
6. If the Plastigages have not crushed, replace the spacer with a thicker one and repeat steps 3 to 5.



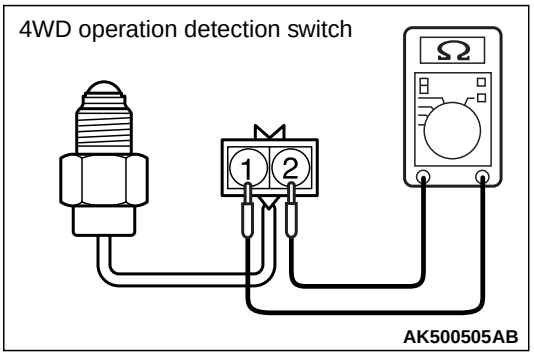
7. Measure the width of the crushed Plastigage at its widest part using a scale printed on the Plastigage package.

Standard value: 0 – 0.15 mm

INSPECTION

M1222008900153

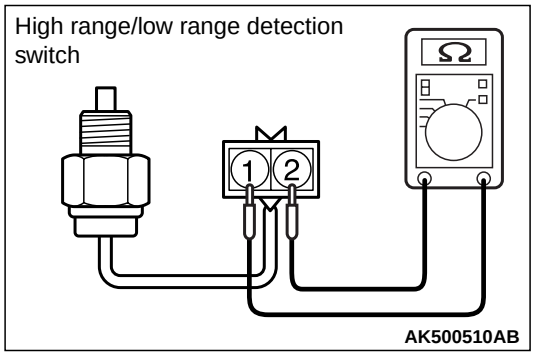
4WD DETECTION SWITCH



Check for the continuity between the connector terminals.

Switch condition	Connector terminals	Continuity
Switch end pressed	1 – 2	Conductive
Switch end released	1 – 2	Open

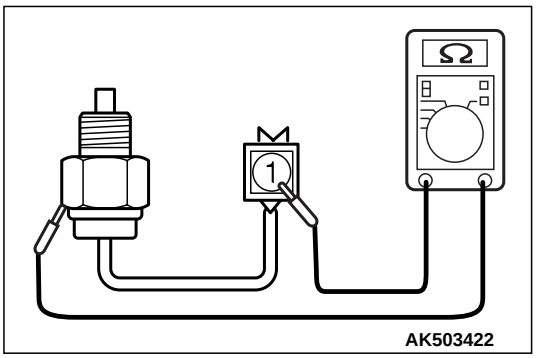
HIGH RANGE/LOW RANGE DETECTION SWITCH



Check for the continuity between the connector terminals.

Switch condition	Connector terminals	Continuity
Switch end pressed	1 – 2	Open
Switch end released	1 – 2	Conductive

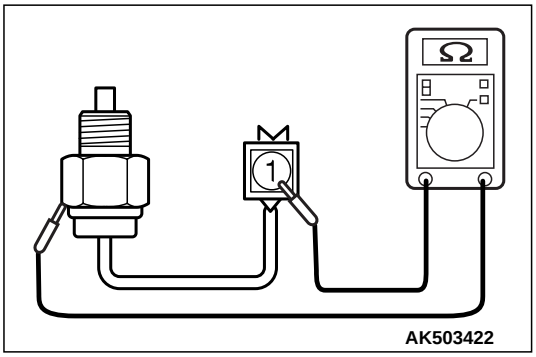
4LLc OPERATION DETECTION SWITCH



Check for the continuity between the connector terminals.

Switch condition	Connector terminals	Continuity
Switch end pressed	1 – Body earth	Open
Switch end released	1 – Body earth	Conductive

DETECTION SWITCH



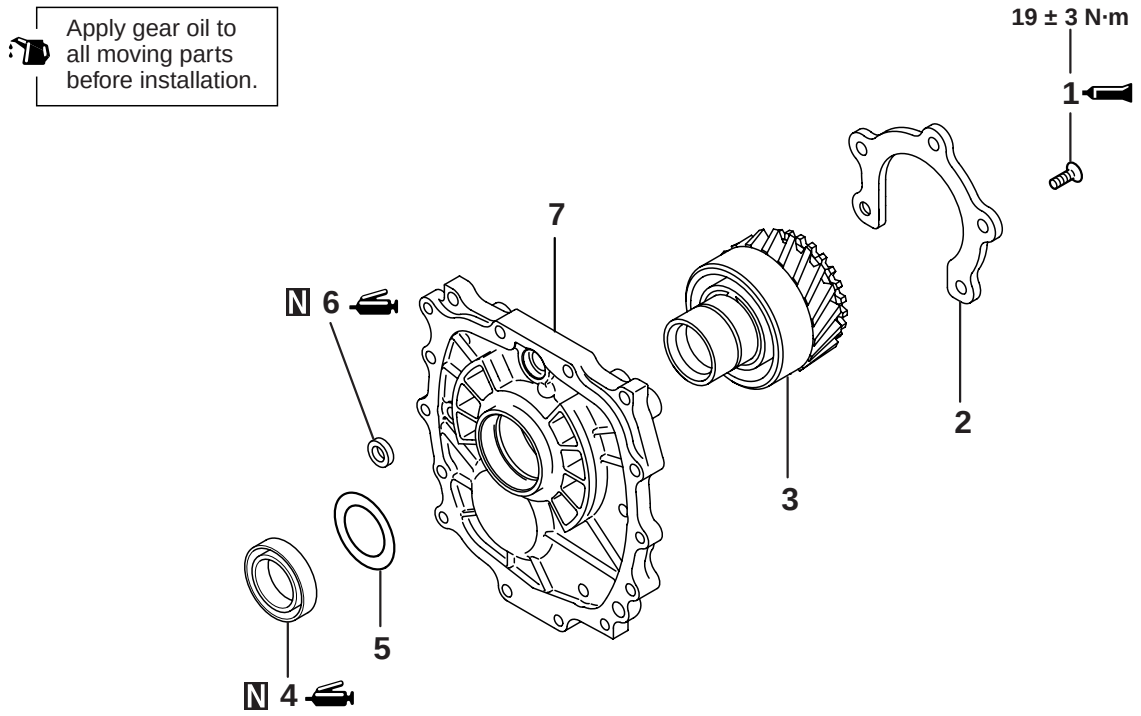
Check for the continuity between the connector terminals.

Switch condition	Connector terminals	Continuity
Switch end pressed	1 – Body earth	Open
Switch end released	1 – Body earth	Conductive

TRANSFER CASE PLATE

DISASSEMBLY AND REASSEMBLY

M1222009100086



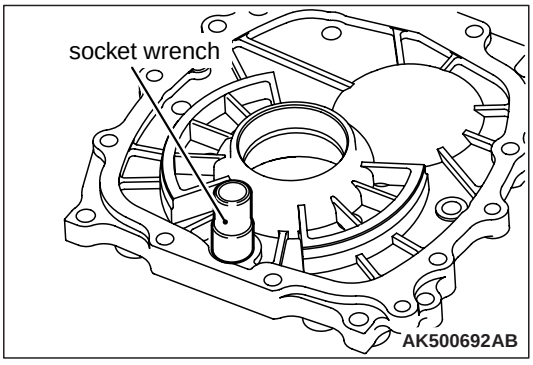
AK500691AD

Disassembly steps

>>C<<	1.	Seal bolt
	2.	Bearing retainer
	3.	Transfer input gear
>>B<<	4.	Oil seal
	5.	Baffle plate
>>A<<	6.	Oil seal
	7.	Transfer case plate

REASSEMBLY SERVICE POINTS

>>A<< OIL SEAL INSTALLATION

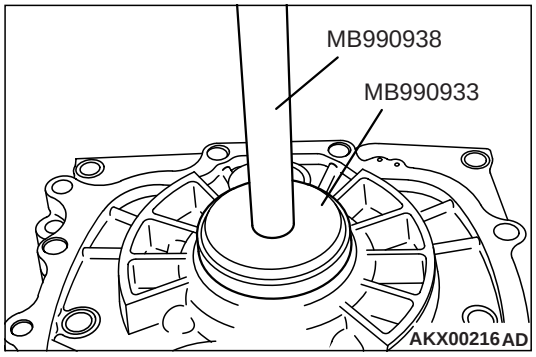


1. Apply specified grease to the lip of the oil seal.

   Specified lubricant: Mitsubishi Part No. 0101011 or equivalent

2. Use socket wrench to install the oil seal.

>>B<< OIL SEAL INSTALLATION

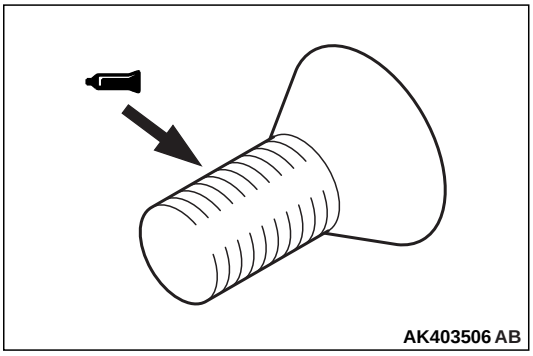


1. Apply specified grease to the lip of the oil seal.

   Specified lubricant: Mitsubishi Part No. 0101011 or equivalent

2. Use special tools to install the oil seal.
   - Installer bar (MB990938)
   - Installer adapter (MB990933)

>>C<< SEAL BOLT INSTALLATION



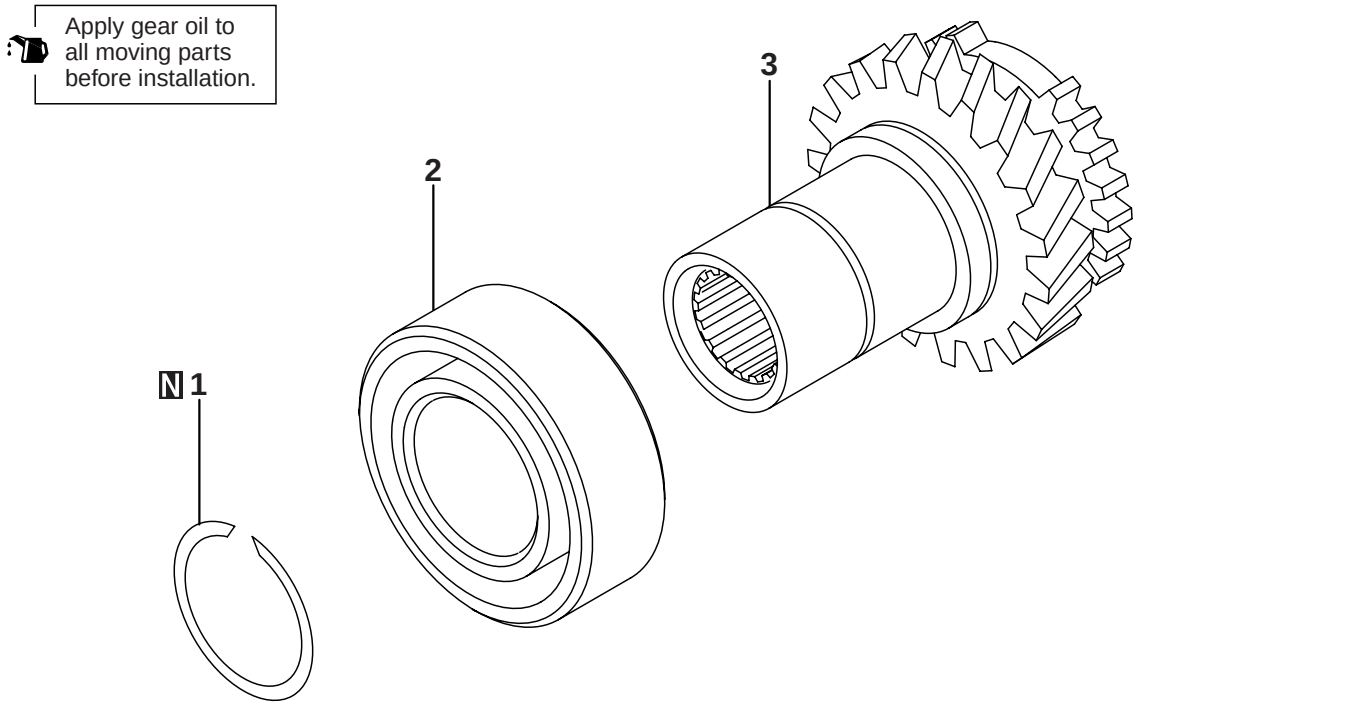
1. Apply the specified sealant to the threads.
   Specified sealant: 3M STUD Locking No. 4170 or equivalent

   NOTE: The new bolt does not require sealant application as it is precoated with sealant.

TRANSFER INPUT GEAR

DISASSEMBLY AND REASSEMBLY

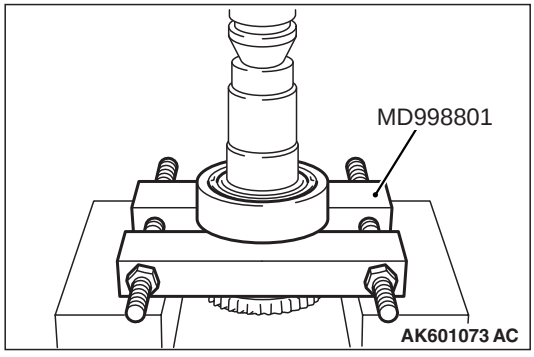
M1222009400139



		Disassembly steps
	>>B<<	1. Snap ring
<<A>>	>>A<<	2. Ball bearing
		3. Transfer input gear

DISASSEMBLY SERVICE POINT

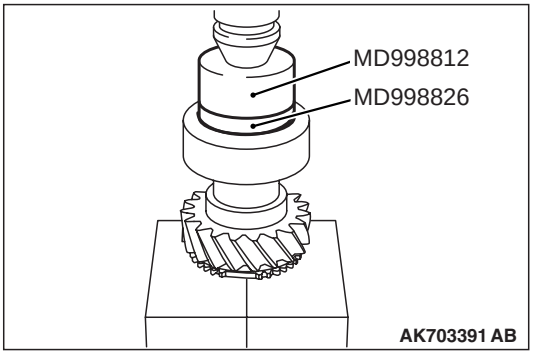
<<A>> BALL BEARING REMOVAL



Use special tool, Bearing remover (MD998801), remove the ball bearing.

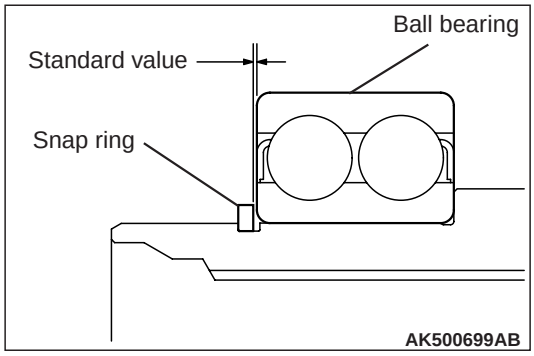
REASSEMBLY SERVICE POINTS

>>A<< BALL BEARING INSTALLATION



Use special tools to install the ball bearing.
- Installer cap (MD998812)
- Installer adapter (54) (MD998826)

>>B<< SNAP RING INSTALLATION



1. Install the thickest snap ring that can be fitted in the snap ring groove of the transfer input gear.
2. Make sure that the transfer input gear bearing end play meets the standard value.

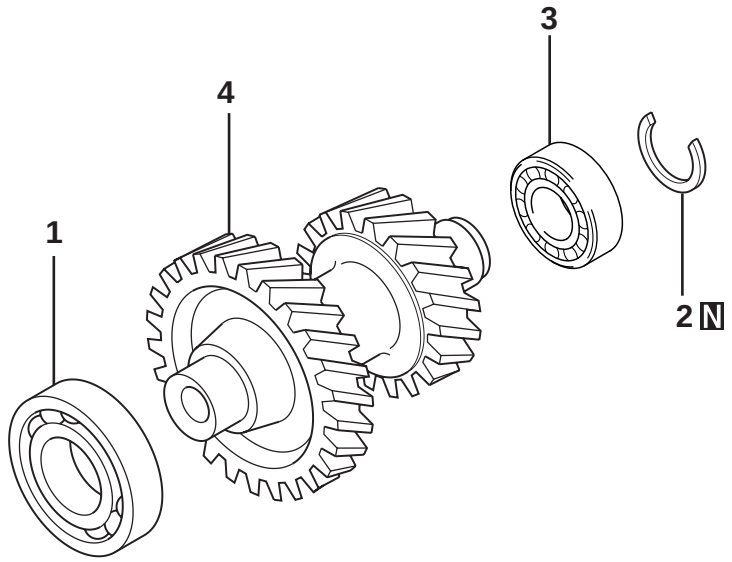
   Standard value: 0 – 0.06 mm

COUNTERSHAFT

DISASSEMBLY AND REASSEMBLY

M1222007300062

Apply gear oil to all moving parts before installation.



Disassembly steps

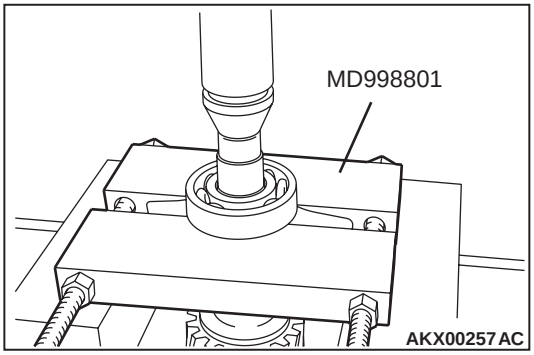
<<A>> >>C<< 1. Ball bearing
>>B<< 2. Snap ring

Disassembly steps (Continued)

<<B>> >>A<< 3. Roller bearing
4. Counter shaft gear

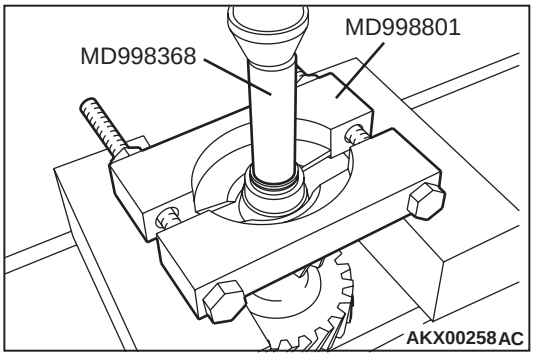
DISASSEMBLY SERVICE POINTS

<<A>> BALL BEARING REMOVAL



Use special tool Remover (MD998801) to remove the ball bearing.

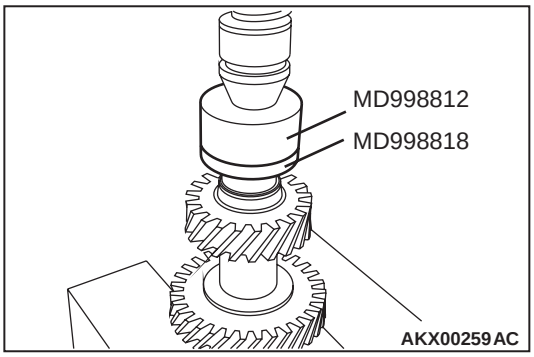
<<B>> ROLLER BEARING REMOVAL



Use special tools to remove the roller bearing.
- Remover (MD998801)
- Bearing installer (MD998368)

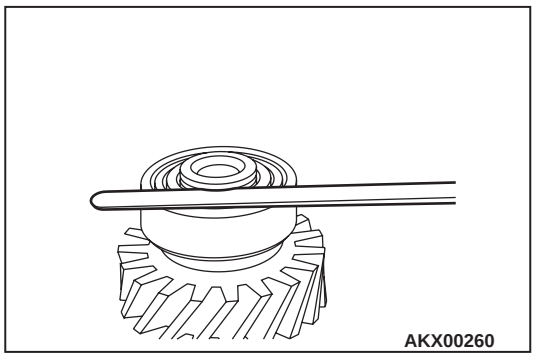
REASSEMBLY SERVICE POINTS

>>A<< ROLLER BEARING INSTALLATION



1. Use special tools to install the roller bearing.
   - Installer cap (MD998812)
   - Installer adapter (38) (MD998818)
2. Install the spacer.

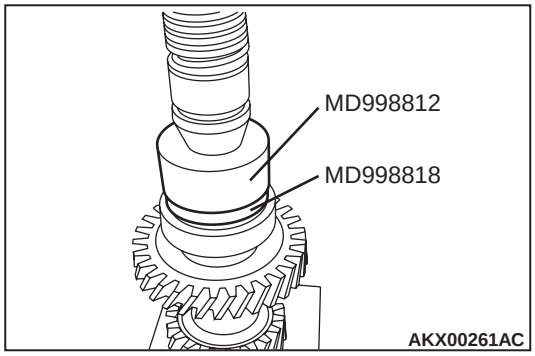
>>B<< SNAP RING INSTALLATION



1. Install the thickest snap ring that can be fitted into the snap ring groove of the counter shaft gear.
2. Make sure that the counter shaft gear roller bearing end play meets the standard value.

   Standard value: 0 – 0.08 mm

>>C<< BALL BEARING INSTALLATION

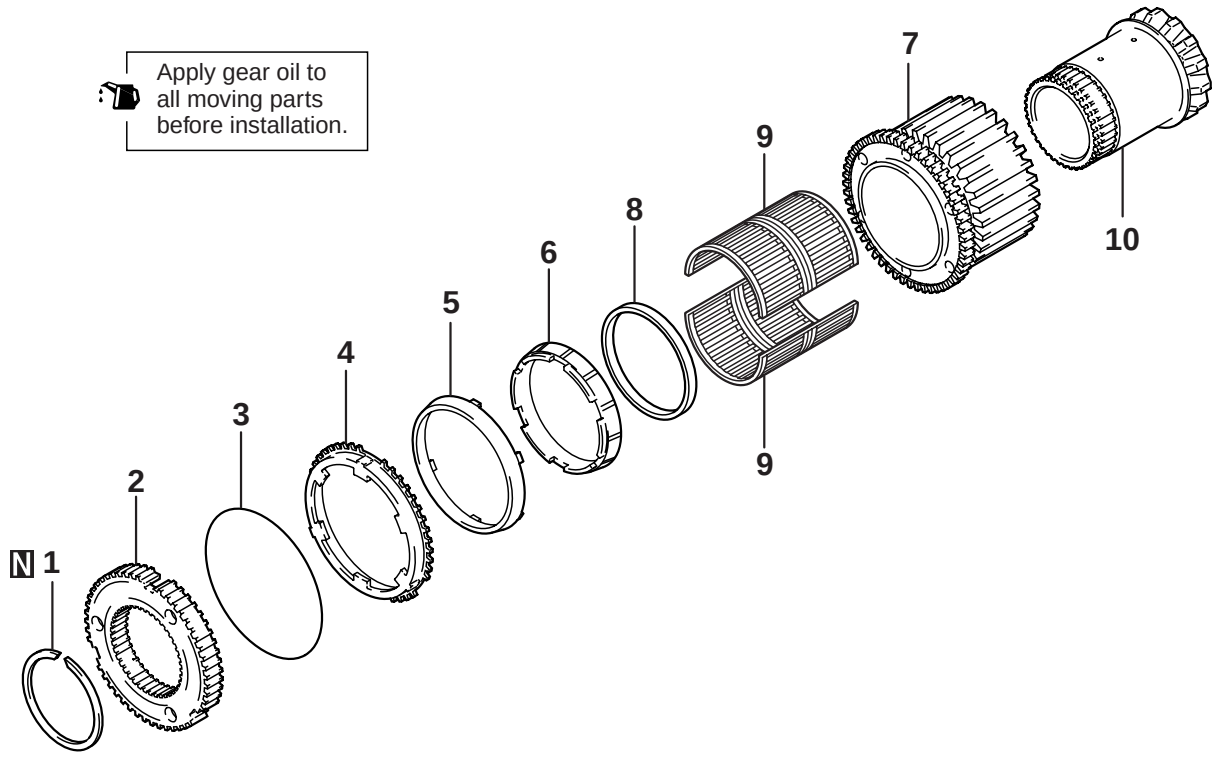


Use special tools to install the ball bearing.
- Installer cap (MD998812)
- Installer adapter (38) (MD998818)

2-4WD SYNCHRONIZER <V5MB1-J-ND2, NEZ, PD2>

DISASSEMBLY AND REASSEMBLY

M1222010900020



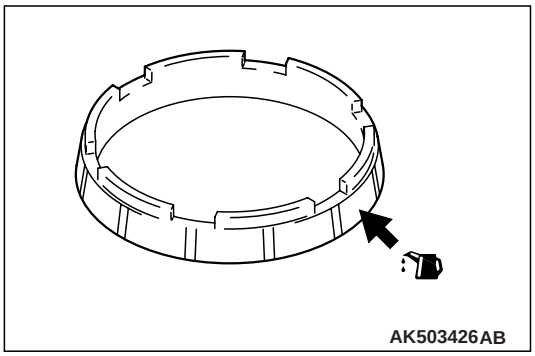
AK503423AB

Disassembly steps

>>**C**<< 1. Snap ring
2. 2-4WD Synchronizer hub
3. 2-4WD Synchronizer spring
>>**B**<< 4. Outer synchronizer ring
5. Synchronizer cone
>>**A**<< 6. Inner synchronizer ring
7. Drive sprocket
8. Bearing spacer
9. Needle bearing
10. Front side gear

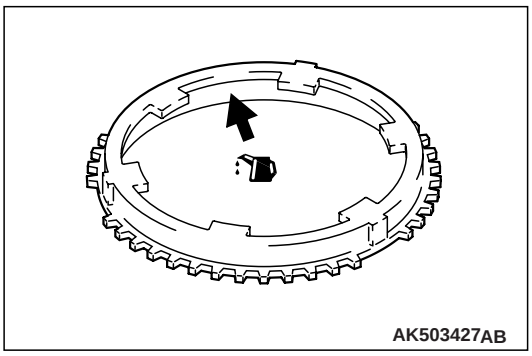
REASSEMBLY SERVICE POINTS

>>A<< INNER SYNCHRONIZER RING INSTALLATION



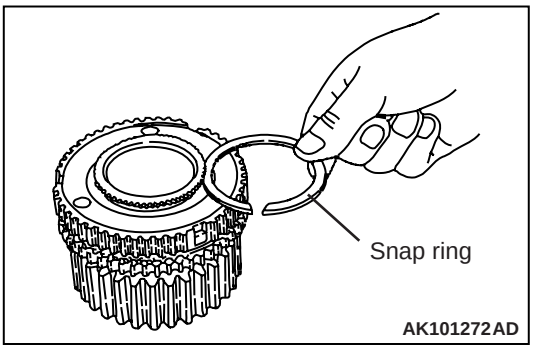
Apply oil the synchronizer ring cone surface before installation.

>>B<<OUTER SYNCHRONIZER RING INSTALLATION



Apply oil the synchronizer ring cone surface before installation.

>>C<<SNAP RING INSTALLATION



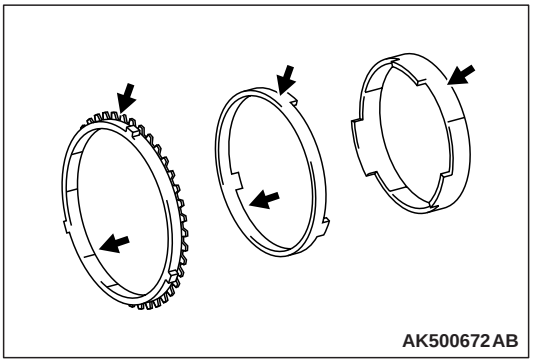
Select and install the snap ring which adjusts the 2-4WD synchronizer hub end play to standard value.

Standard value: 0 – 0.08 mm

INSPECTION

M1222011000020

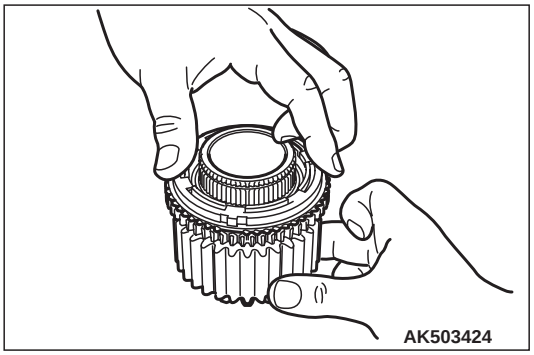
SYNCHRONIZER RING



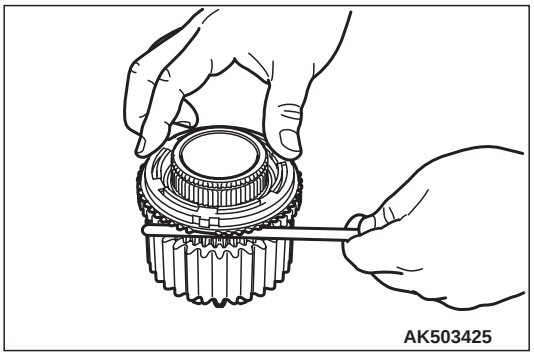
⚠ CAUTION

When any of the outer ring, inner ring or cone has to be replaced, replace them as a set.

1. Check to ensure that the clutch gear tooth surface and cone surface are not damaged and broken.



2. After applying oil to the taper portion on each gear, press and fit the synchronizer ring by hand. Confirm the synchronizer ring cannot be rotated.



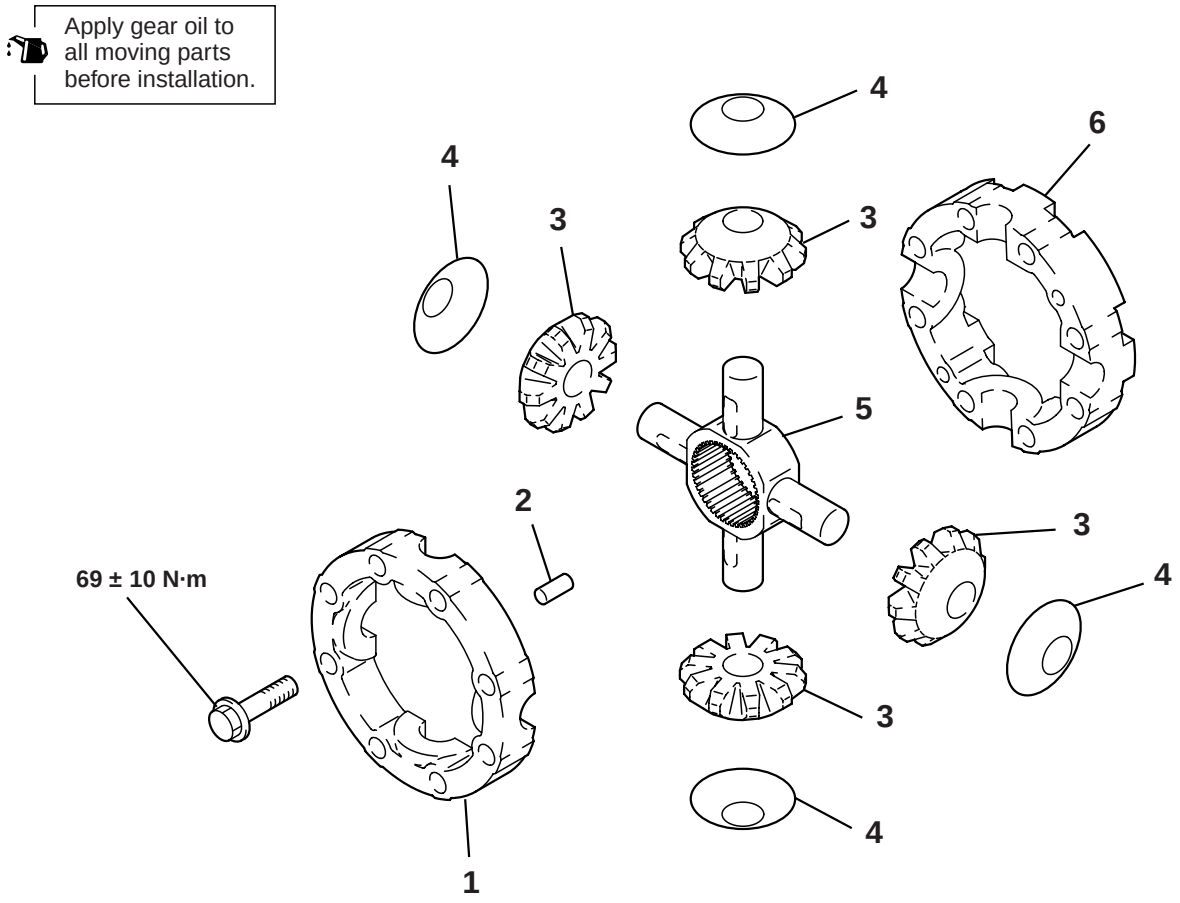
3. Using the thickness gauge, check the clearance between the synchronizer ring and the gear.

Limit: 0.3 mm

CENTRE DIFFERENTIAL CASE <V5MB1-J-ND2, NEZ, PD2>

DISASSEMBLY AND REASSEMBLY

M1222010600041



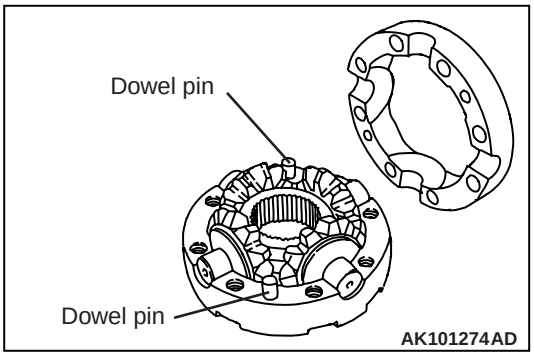
AK503428 AB

Disassembly steps

>>A<< 1. Center differential case A
2. Dowel pin
3. Differential pinion
4. Thrust washer
5. Pinion shaft
6. Center differential case B

REASSEMBLY SERVICE POINT

>>A<<CENTER DIFFERENTIAL CASE B INSTALLATION

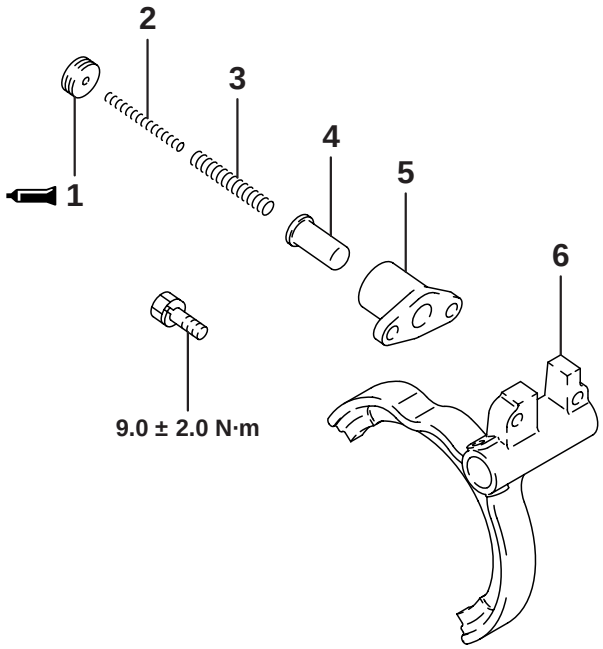


Pay attention to the position of the dowel pins when reassembling, and make sure that the match marks on the outside circumference are in alignment.

H-L SHIFT FORK

DISASSEMBLY AND REASSEMBLY

M1222009700022



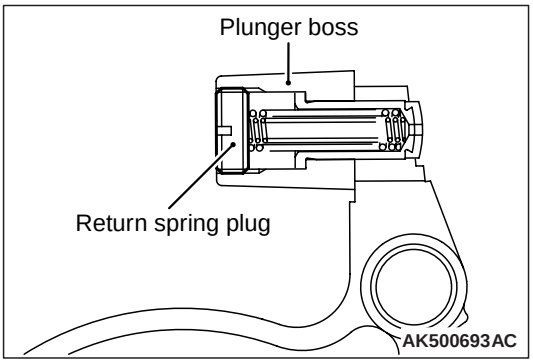
AK500689AB

Disassembly steps

>>A<< 1. Return spring plug
2. Return spring
3. Return spring
4. Select plunger
5. Plunger boss
6. High & low shift fork

REASSEMBLY SERVICE POINT

>>A<< RETURN SPRING PLUG INSTALLATION



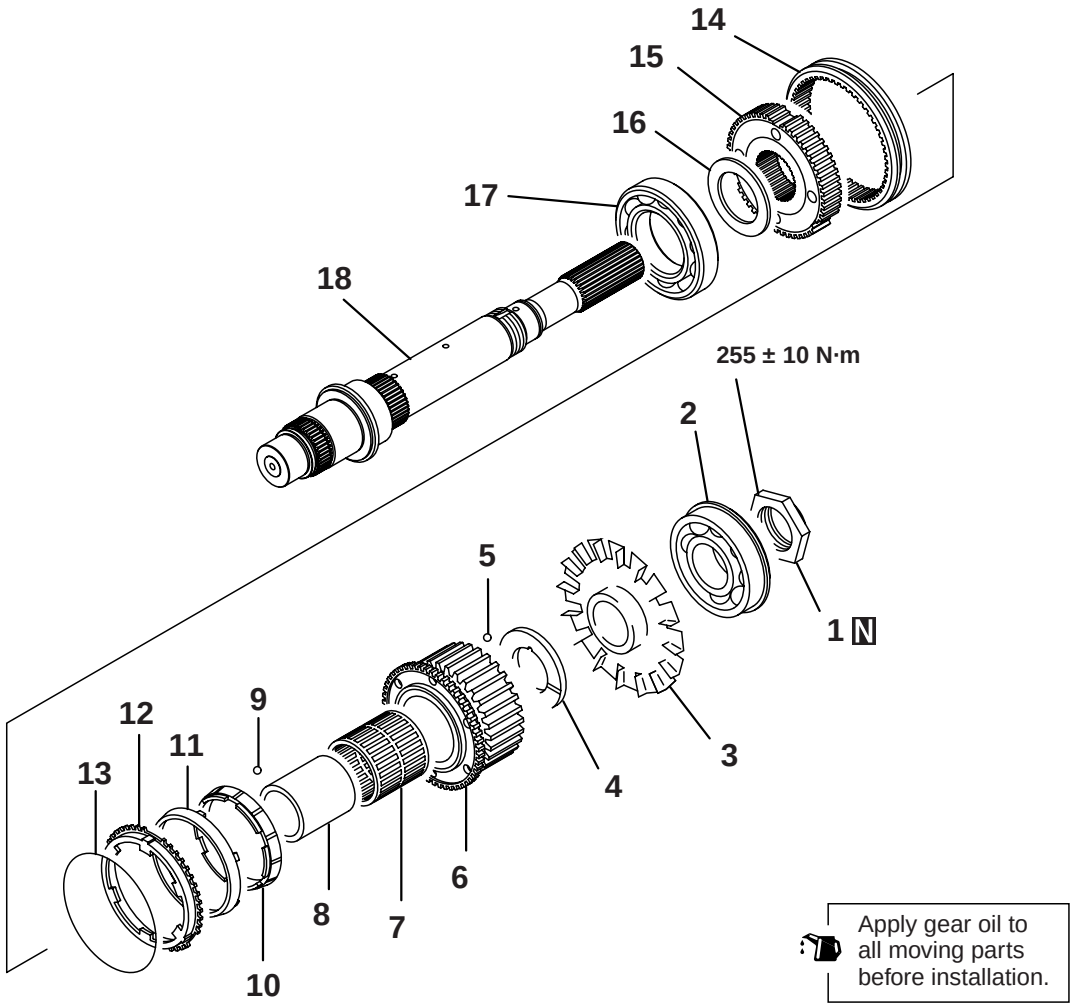
Apply the sealant to the thread and screw the return spring plug to be an even surface between the plunger boss end face and the return spring plug.

Specified sealant: 3M STUD Locking No. 4170 or equivalent

REAR OUTPUT SHAFT <V5MB1-J-NEG, JER>

DISASSEMBLY AND REASSEMBLY

M1222010300181



AK500645AB

Disassembly steps

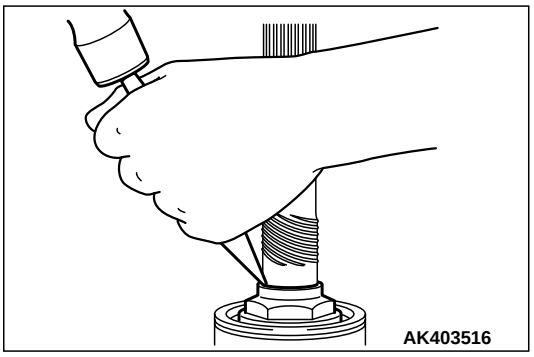
<<A>> >>E<< 1. Lock nut
<<B>> >>D<< 2. Ball bearing
3. Oil guide
4. Sprocket spacer
5. Steel ball
6. Drive sprocket
7. Needle bearing
8. Sprocket sleeve
9. Steel ball
10. Synchronizer inner ring <V5MB1-J-NEG>

Disassembly steps (Continued)

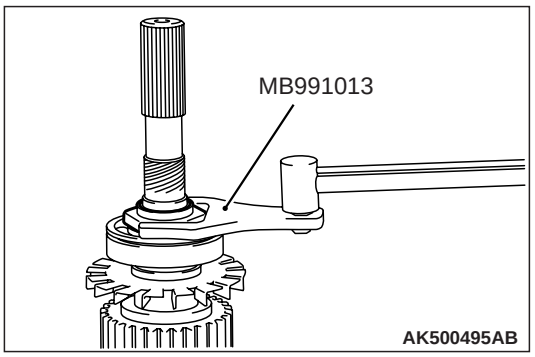
11. Synchronizer cone <V5MB1-J-NEG>
12. Synchronizer outer ring <V5MB1-J-NEG>
13. Synchronizer spring <V5MB1-J-NEG>
>>C<< 14. Clutch sleeve
<<C>> >>B<< 15. Clutch hub
<<C>> >>A<< 16. Stopper plate
<<C>> >>A<< 17. Ball bearing
18. Rear output shaft

DISASSEMBLY SERVICE POINTS

<<A>> LOCK NUT REMOVAL

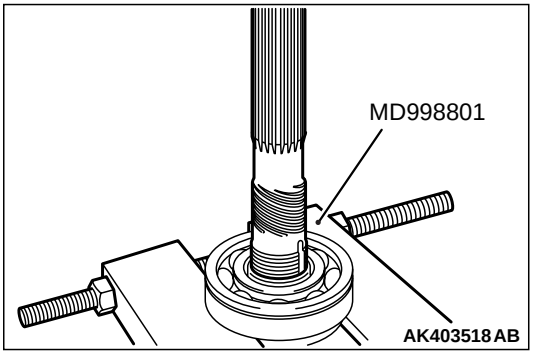


1. Remove the lock nut from the shaft.



2. Hold the drive sprocket in a soft-jaw vice.
3. Shift the clutch sleeve to the drive sprocket side.
4. Use special tool Power steering lock nut special spanner (MB991013) to remove the lock nut.

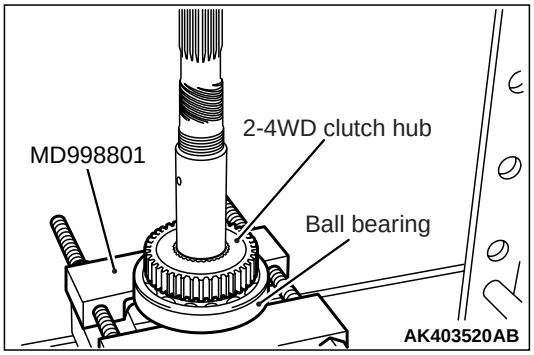
<<B>> BALL BEARING REMOVAL



1. Use special tool Remover (MD998801) to support the ball bearing.
2. Use a press to push at a rear end of the rear output shaft, and then remove the radial ball bearing.

NOTE:
The bearing may fit loosely on the shaft, so that removal is possible without using a press.

<<C>> CLUTCH HUB / STOPPER PLATE / BALL BEARING REMOVAL

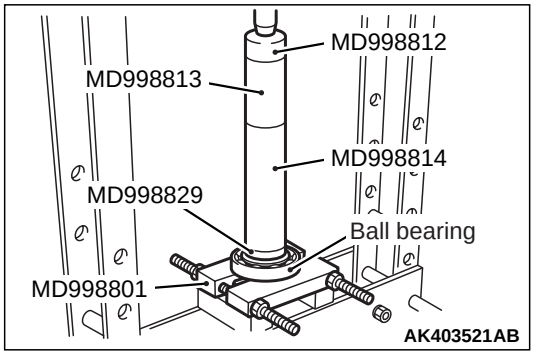


1. Place special tool Remover (MD998801) so that the load is applied at the bearing.
2. Use a press to push at the rear end of the rear output shaft, and then remove the clutch hub and ball bearing.

NOTE:
The clutch hub may fit loosely on the shaft, so that removal is possible without using a press.

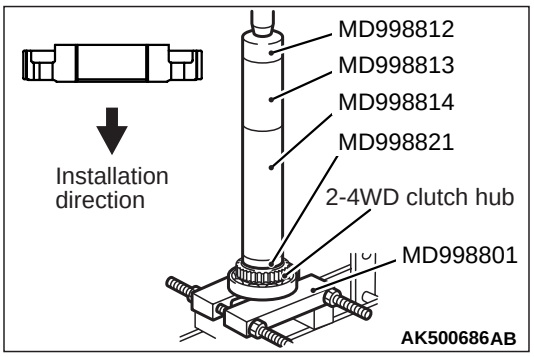
REASSEMBLY SERVICE POINTS

>>A<< BALL BEARING / STOPPER PLATE INSTALLATION



1. Fit the ball bearing and stopper plate onto the rear output shaft.
2. Use special tools to press in the ball bearing.
   - Remover (MD998801)
   - Installer cap (MD998812)
   - Installer-100 (MD998813)
   - Installer-200 (MD998814)
   - Installer adapter (60) (MD998829)

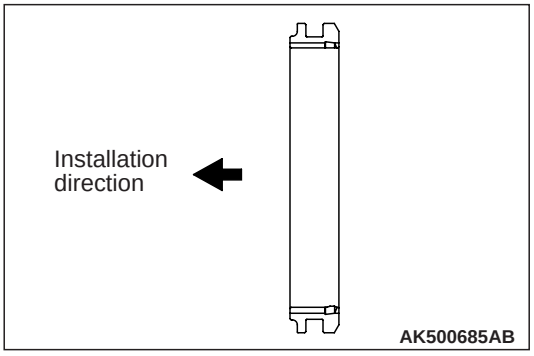
>>B<< CLUTCH HUB INSTALLATION



1. Confirm the clutch hub installation direction, and fit onto the rear output shaft.
2. Use special tools press in the clutch hub.
   - Remover (MD998801)
   - Installer cap (MD998812)
   - Installer-100 (MD998813)
   - Installer-200 (MD998814)
   - Installer adapter (44) (MD998821)

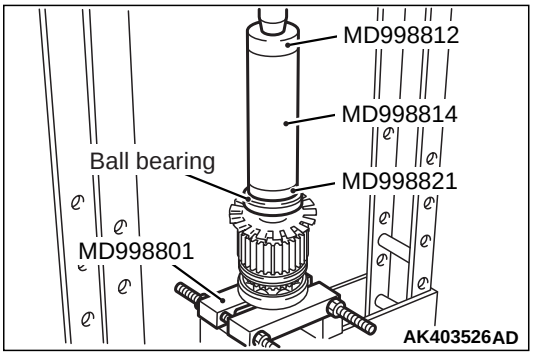
   NOTE:
   The clutch hub may fit loosely on the shaft, so that installation is possible without using a press.

>>C<< CLUTCH SLEEVE INSTALLTION



Check that the clutch sleeve is in the correct direction for installation.

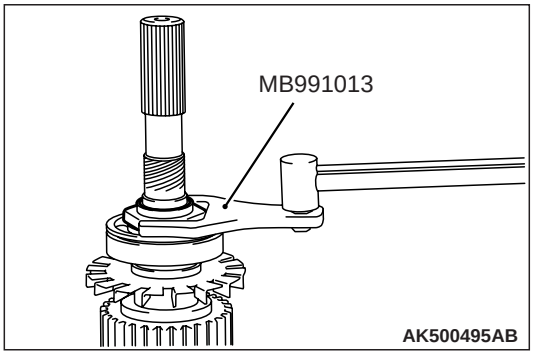
>>D<< BALL BEARING INSTALLATION



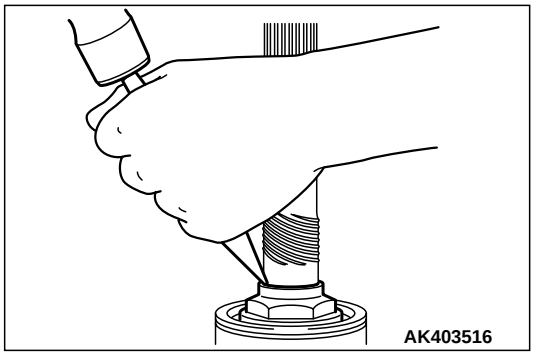
Use special tools to install the radial ball bearing.
- Remover (MD998801)
- Installer cap (MD998812)
- Installer-200 (MD998814)
- Installer adapter (44) (MD998821)

NOTE:
The ball bearing may be fitted loosely on the shaft, so that installation is possible without using a press

>>E<< LOCK NUT INSTALLTION



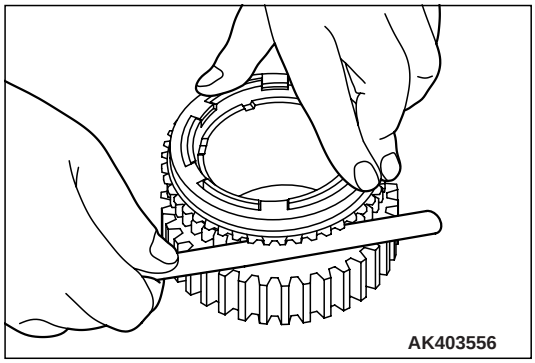
1. Hold the drive sprocket in a soft-jaws vice.
2. Shift the clutch sleeve to the drive sprocket side.
3. Using special tool Power steering lock nut special spanner (MB991013) tighten the lock nut to the specified torque of 255 ± 10 N·m.



4. Stake the two places of the lock nut as shown in illustration.

INSPECTION

M1222010400036



1. Push the synchronizer outer ring, synchronizer cone and the synchronizer inner ring to the drive sprocket in combined state, and then measure the indicated dimension of the drive sprocket and synchronizer outer ring.

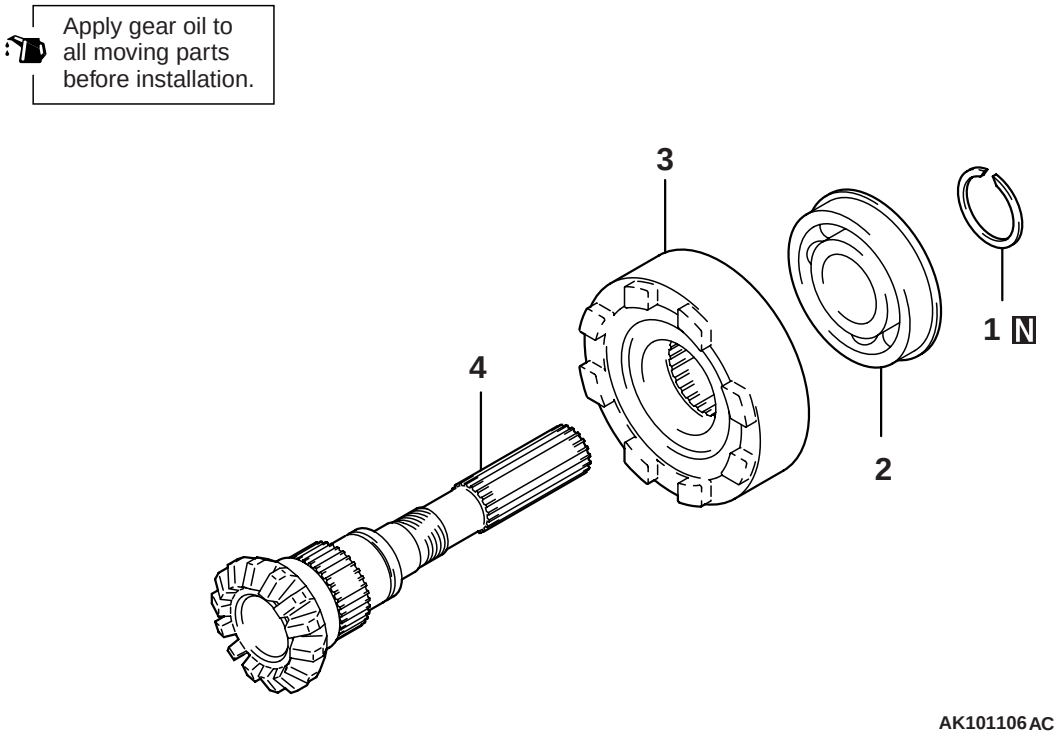
Limit: 0.3 mm

2. In case that value is out of limit, exchange as the synchronizer ring set.

REAR OUTPUT SHAFT <V5MB1-J-ND2, NEZ, PD2>

DISASSEMBLY AND REASSEMBLY

M1222010300114

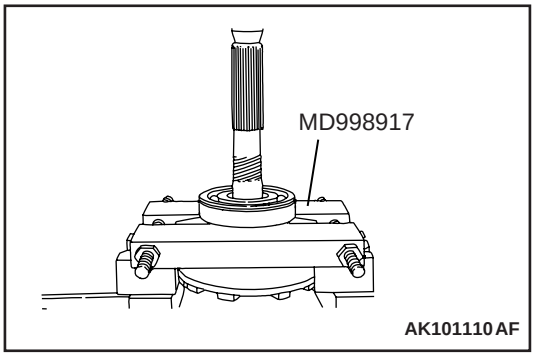


Disassembly steps

	>>**B**<<	1.	Snap ring
<<**A**>>	>>**A**<<	2.	Ball bearing
		3.	Viscous coupling
		4.	Rear output shaft

DISASSEMBLY SERVICE POINT

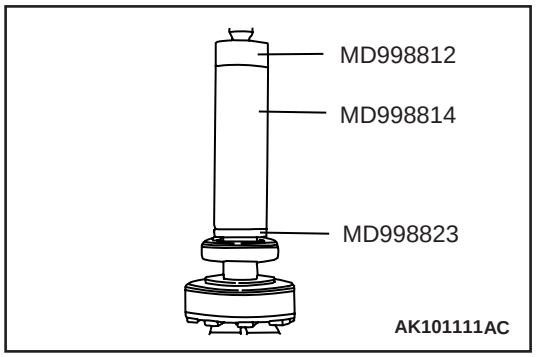
<<A>> BALL BEARING REMOVAL



Use special tool Bearing remover (MD998917) to remove the ball bearing.

REASSEMBLY SERVICE POINTS

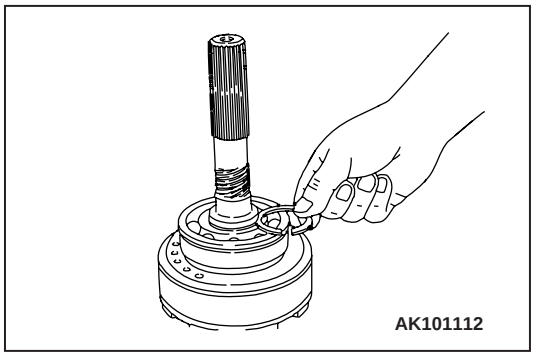
>>A<< BALL BEARING INSTALLATION



Use special tools to install the ball bearing.

- Installer cap (MD998812)
- Installer-200 (MD998814)
- Installer adapter (48) (MD998823)

>>B<< SNAP RING INSTALLATION



1. Install the thickest snap ring that can be fitted in the snap ring groove of the rear output shaft.
2. Make sure that the rear output shaft bearing end play meets the standard value.

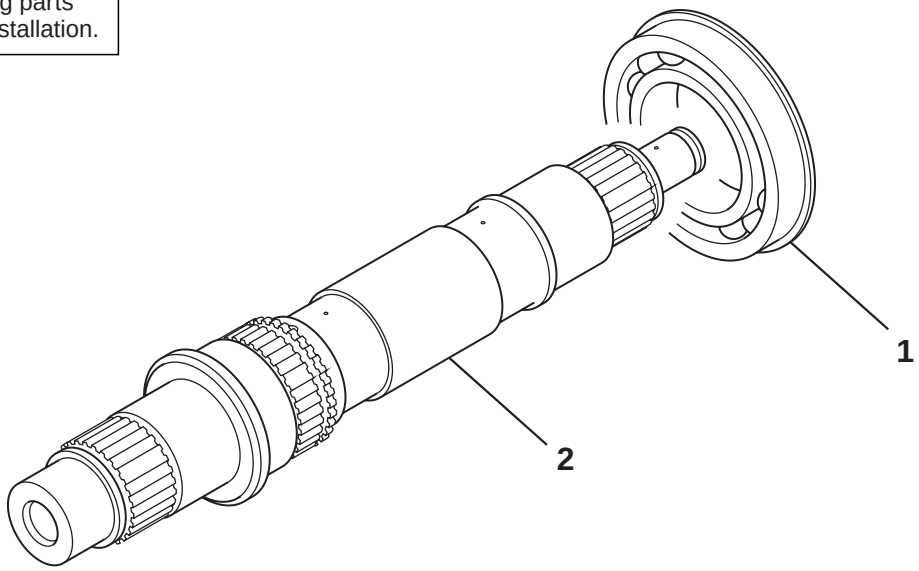
   Standard value: 0 – 0.08 mm

TRANSFER DRIVE SHAFT <V5MB1-J-ND2, NEZ, PD2>

DISASSEMBLY AND REASSEMBLY

M1222011200057

Apply gear oil to all moving parts before installation.



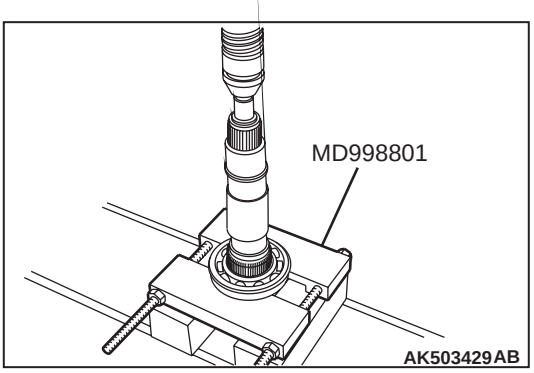
AK503431AB

DIsassembly steps

<<A>> >>A<< 1. Ball bearing
2. Transfer drive shaft

DISASSEMBLY SERVICE POINT

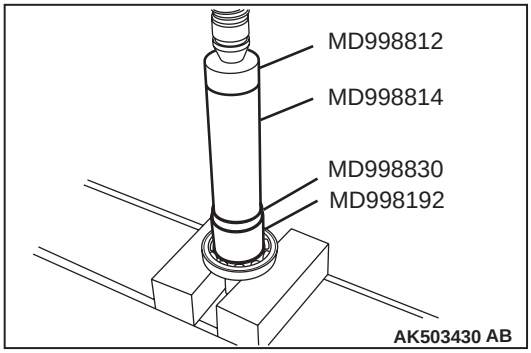
<<A>> BALL BEARING REMOVAL



Use special tool Remover (MD998801) to remove the ball bearing.

REASSEMBLY SERVICE POINT

>>A<< BALL BEARING INSTALLATION



Use special tools to install the inner race.

- Installer cap (MD998812)
- Installer-200 (MD998814)
- Installer adapter (66) (MD998830)
- Counter shaft bearing puller (MD998192)

FRONT OUTPUT SHAFT

DISASSEMBLY AND REASSEMBLY

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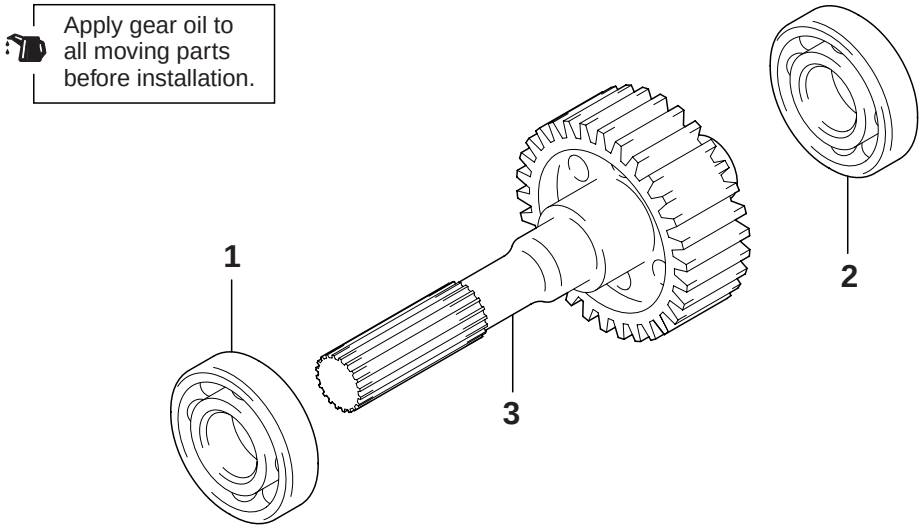
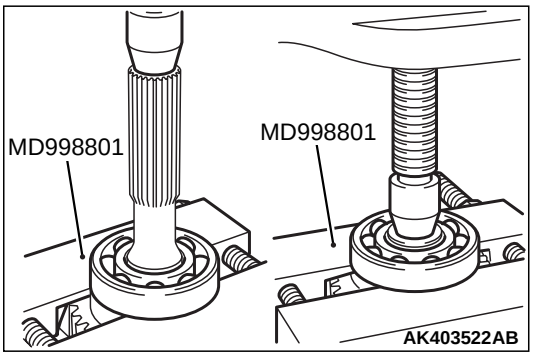


AKX00425AC

			Disassembly steps
<<A>>	>>B<<	1.	Ball bearing
<<A>>	>>A<<	2.	Ball bearing
		3.	Front output shaft

DISASSEMBLY SERVICE POINT

<<A>> BALL BEARING REMOVAL

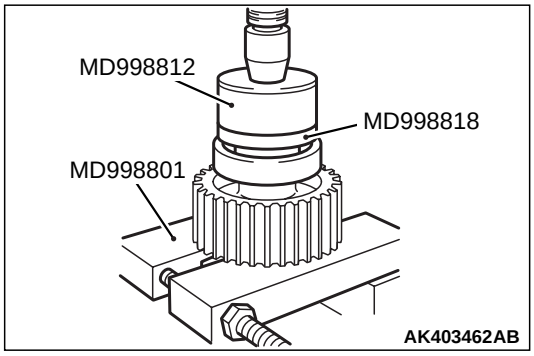


1. Use special tool Remover (MD998801) to support the ball bearing.
2. Press the front output shaft with a press and remove the ball bearings.

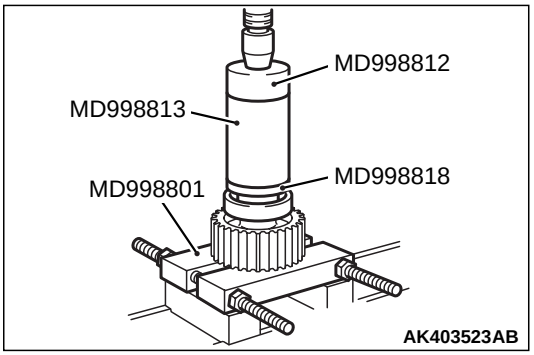
>>B<< BALL BEARING INSTALLATION

REASSEMBLY SERVICE POINTS

>>A<< BALL BEARING INSTALLATION



1. Use special tool Remover (MD998801) to support the front output shaft.
2. Use special tools to install the ball bearing.
   - Installer cap (MD998812)
   - Installer adapter (38) (MD998818)



- Installer cap (MD998812)
- Installer-100 (MD998813)
- Installer adapter (38) (MD998818)

1. Use special tool Remover (MD998801) to support the front output shaft.
2. Use special tools to install the ball bearing.

SPEEDOMETER GEAR

DISASSEMBLY AND REASSEMBLY

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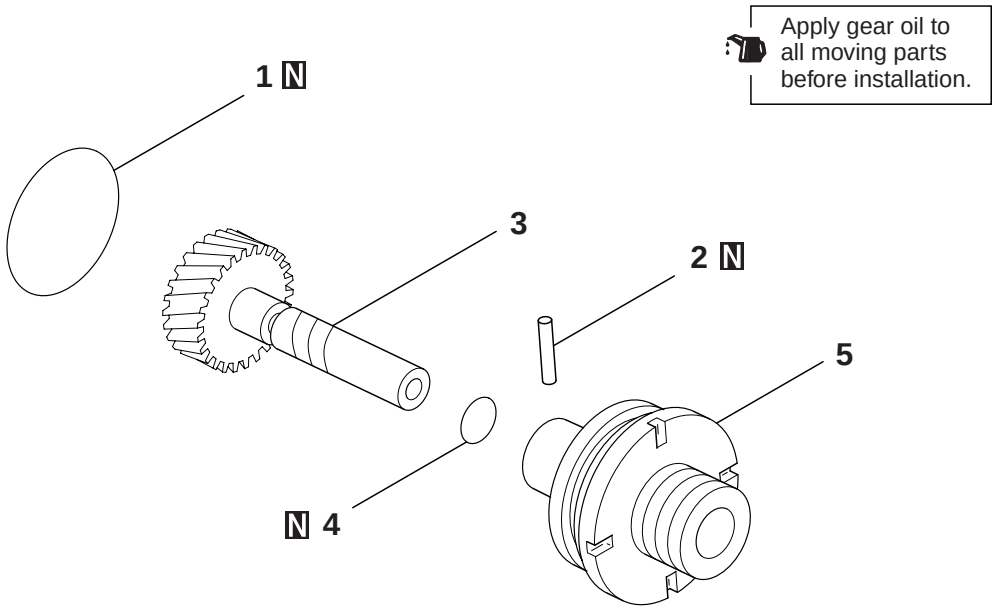


Disassembly steps

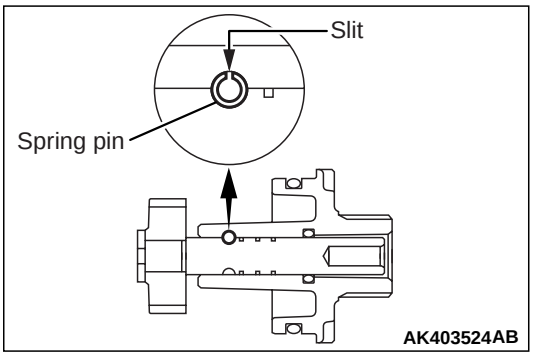
1. O-ring
>>**A**<< 2. Spring pin
3. Driven gear

Disassembly steps (Continued)

4. O-ring
5. Sleeve

REASSEMBLY SERVICE POINT

>>A<< SPRING PIN INSTALLATION



Drive the spring pin in, while making sure that slit does not face gear shaft.

GROUP 23

AUTOMATIC TRANSMISSION

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GROUP 23A

AUTOMATIC TRANSMISSION

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GENERAL

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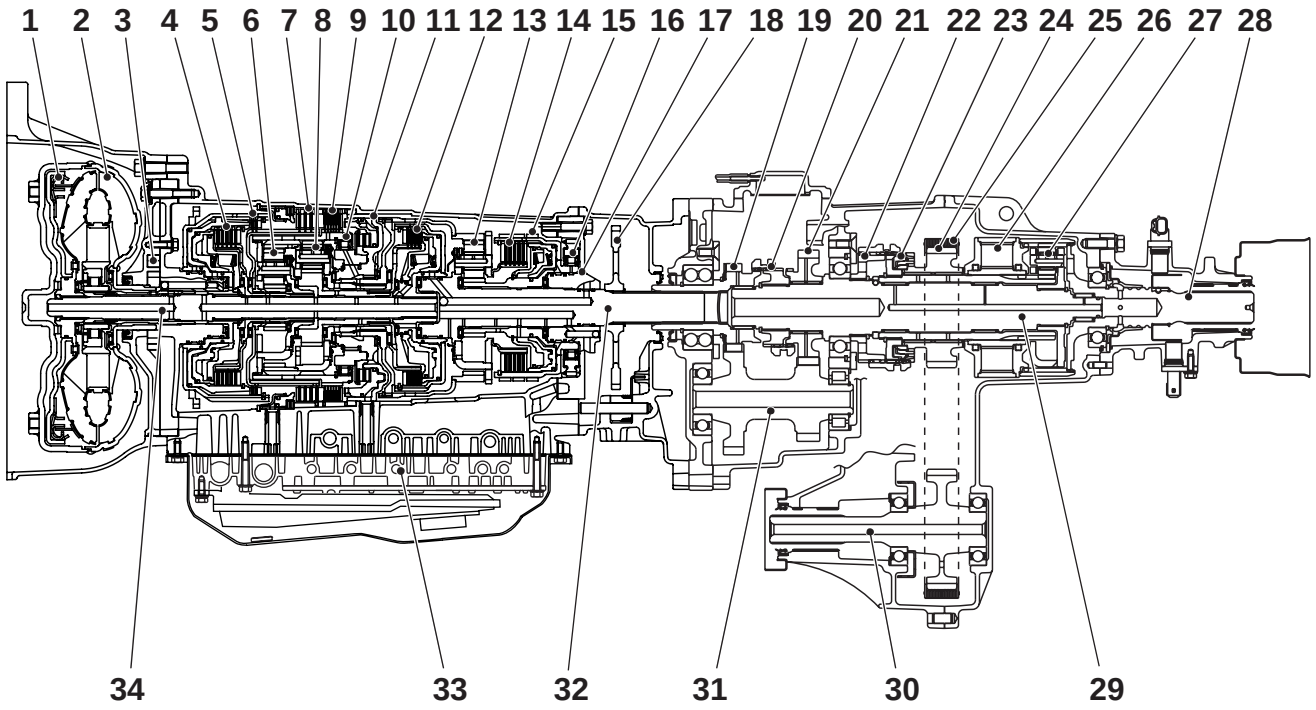
OUTLINE OF CHANGE

V5A5A type automatic transmission (5A/T) has been newly adopted as well as the R4A5A/V4A5A type automatic transmission (4A/T). The items for 5A/T vehicles that differ from 4A/T vehicles are as follows:

SPECIFICATIONS

Item		Specification			
Transmission model		R4A5A	V4A5A-J-LEEP	V4A5A-J-LEEL V4A5A-J-LEEY	V5A5A
Engine model		4D5 (Except high power)			4D5 (High power)
Torque converter	Type	3-element, 1-stage, 2-phase type			
	Lock-up	Provided			
	Stall torque ratio	1.62			
Transmission type		4 forward speeds, 1 reverse speed, fully automatic			5 forward speeds, 1 reverse speed, fully automatic
Transmission gear ratio	1st	2.842			3.789
	2nd	1.495			2.057
	3rd	1.000			1.421
	4th	0.731			1.000
	5th	–			0.731
	Reverse	2.720			3.865
Drive system		2WD	Easy select 4WD	Super select 4WD	
Transfer type		-	2-speed, constant mesh		
Transfer gear ratio	High	-	1.000		
	Low	-	1.900		
Clutch		Multi-disk type × 3 sets			Multi-disc type 4 sets
Brake		Multi-disk type × 2 sets			Multi-disc type 2 sets, band type 1 set
Manual control system		P-R-N-D-2-L + Overdrive (6 positions)			P-R-N-D (4 positions) + Sport mode (up, down)
Shift pattern control		Electronic control			
Hydraulic control during shifting		Electronic control (Each clutch hydraulically independently controlled)			
Lock-up clutch control		Electronic control			

SECTIONAL VIEW



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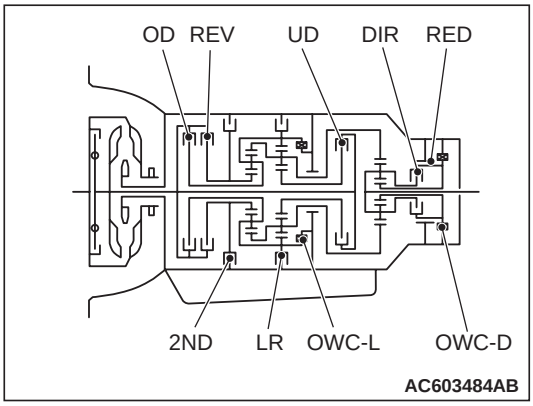
1. Damper clutch
2. Torque converter
3. Oil pump
4. Overdrive clutch
5. Reverse clutch
6. Overdrive planetary carrier
7. Second brake
8. Output planetary carrier
9. Low-reverse brake
10. One-way clutch
11. Centre support
12. Underdrive clutch
13. Direct planetary carrier
14. Direct clutch
15. Reduction brake band
16. One-way clutch
17. Output shaft support
18. Parking gear
19. Transfer input gear
20. High/low clutch
21. Low speed gear
22. Differential lock hub
23. 2WD/4WD synchronizer
24. Drive sprocket
25. Chain
26. Viscous coupling unit
27. Centre differential
28. Rear output shaft
29. Transfer drive shaft
30. Front output shaft
31. Transfer counter gear
32. Output shaft
33. Valve body
34. Input shaft

CONSTRUCTION AND OPERATON



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The gear train consists of four multi-disc clutches, two multi-disc brakes, one band type brake, two one-way clutch, and three planetary gear sets. Each planetary gear set consists of a sun gear, carrier, pinion gears, and annulus gear.

OPERATING ELEMENTS AND THEIR FUNCTIONS

Operating element	Code	Function
Underdrive clutch	UD	Connects input shaft and underdrive sun gear
Reverse clutch	REV	Connects input shaft and reverse sun gear
Overdrive clutch	OD	Connects input shaft and overdrive planetary carrier
Direct clutch	DIR	Connects direct sun gear and direct planetary carrier
Low-reverse brake	LR	Locks low-reverse annulus gear and the overdrive planetary carrier
Second brake	2ND	Locks reverse sun gear
Reduction brake	RED	Locks direct sun gear
One-way clutch (Direct clutch position)	OWC-D	Restricts rotation direction of direct sun gear
One-way clutch (Low reverse brake position)	OWC-L	Restricts rotation direction of low-reverse annulus gear

SELECTOR LEVER POSITIONS AND OPERATING ELEMENTS

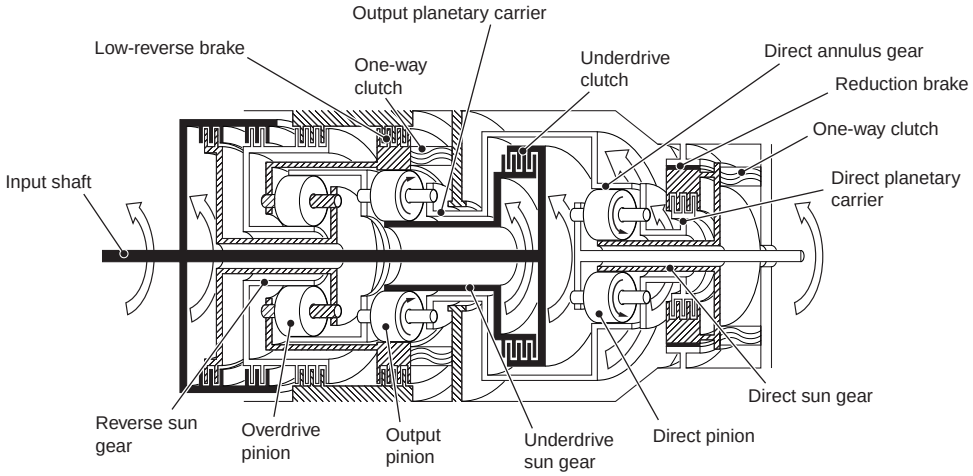
Selector lever position		Operating element								
		Under drive clutch (UD)	Reverse clutch (REV)	Over drive clutch (OD)	Direct clutch (DIR)	Low-reverse brake (LR)	Second brake (2ND)	Reduction brake (RED)	One-way clutch (OWC-D)	One-way clutch (OWC-L)
P	Parking					×		×		
R	Reverse		×			×		×		
N	Neutral					×		×		
D or sport mode	1st	×				×*		×	×	×
	2nd	×					×	×	×	
	3rd	×		×				×	×	
	4th	×		×	×					
	5th			×	×		×			

NOTE:

- *×: Function element.*
- **: Operates only when the vehicle is stationary (at approximately 10 km/h or less) and in the sport mode.*

POWER FLOW

1ST GEAR



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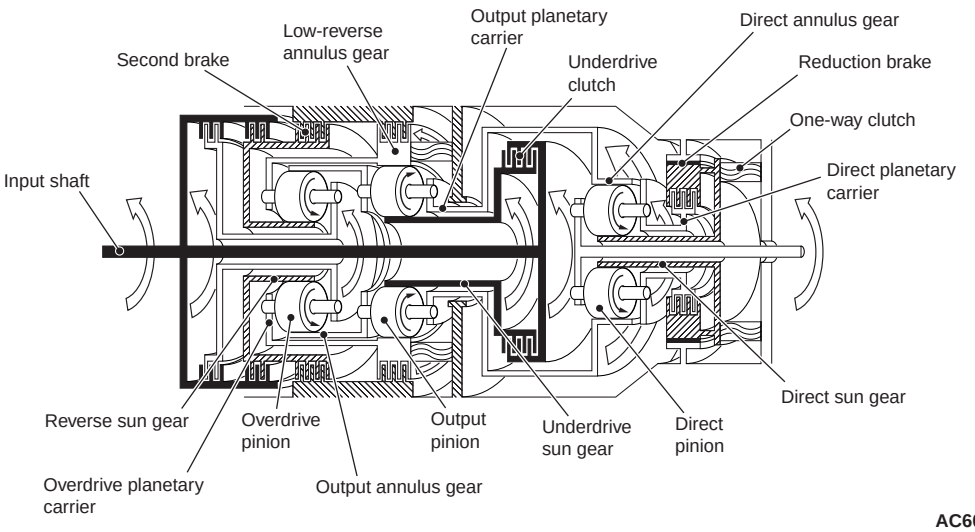
When the 1st gear is selected, the underdrive clutch, the one-way clutch (OWC-L), the low-reverse brake*, the reduction brake and the one-way clutch (OWC-D) are participating. The driving force from the input shaft is transmitted to the underdrive sun gear via the underdrive clutch. The driving force transmitted to the underdrive sun gear via the output pinion turns the low reverse annulus gear clockwise and at the same time turns the output planetary carrier anti-clockwise with the fashion that the output pinion revolves around the underdrive sun gear. However, since the one-way clutch (OWC-L) and the low-reverse brake* are engaged at this time, the low-reverse annulus gear is locked and the output planetary carrier only rotates anti-clockwise. This driving force turns the direct pinion anti-clockwise via the direct annulus gear. Since the direct sun gear is locked by the one-way clutch, the direct planetary carrier rotates anti-clockwise with the fashion that the direct pinion revolves around the direct sun gear to obtain reduction ratio of the first gear. Since the output planetary carrier is connected to the output annulus gear, the overdrive pinion gear is driven at the same time. However, since the overdrive planetary carrier is locked by the one-way clutch (OWC-L) and the reverse sun gear is free to rotate, it runs idle and has no effect on the rotation of the output planetary carrier.

*NOTE: *: The low-reverse brake is activated only when the vehicle is stationary (10 km/h or less) and in the sport mode.*

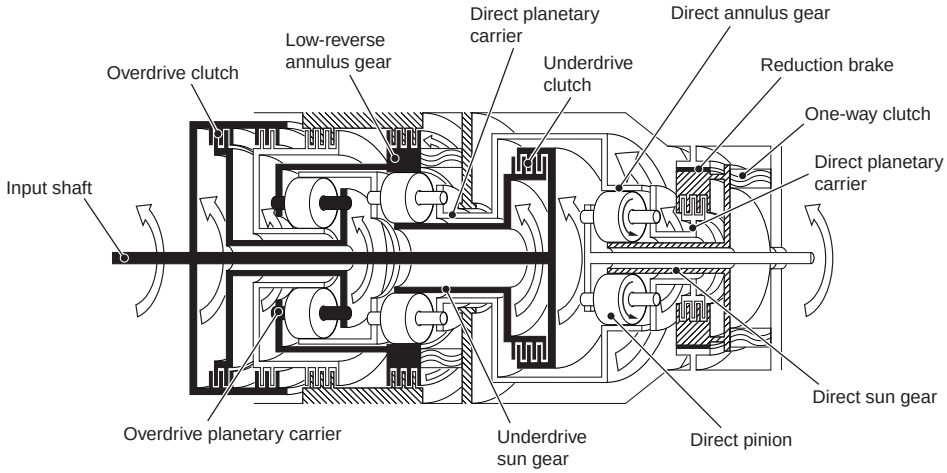
2ND GEAR



AC603607AB

When the 2nd gear is selected, the underdrive clutch, the second brake, the reduction brake and the one-way clutch (OWC-D) are participating. The second brake is operated under the first gear condition, the reverse sun gear is locked and the driving force from the output annulus gear turns the overdrive planetary carrier anti-clockwise with the fashion that the overdrive pinion revolves around the reverse sun gear. Since the overdrive planetary carrier is connected with the low-reverse annulus gear, the low-reverse annulus gear also rotates anti-clockwise. This rotation of the low-reverse annulus gear is transmitted to the direct annulus gear via the output pinion, however, since the elements of the direct planetary gear are the same as that of the first gear, rotation amount of the low-reverse annulus gear is added to the rotation of the output planetary carrier to obtain the reduction ratio of the second gear.

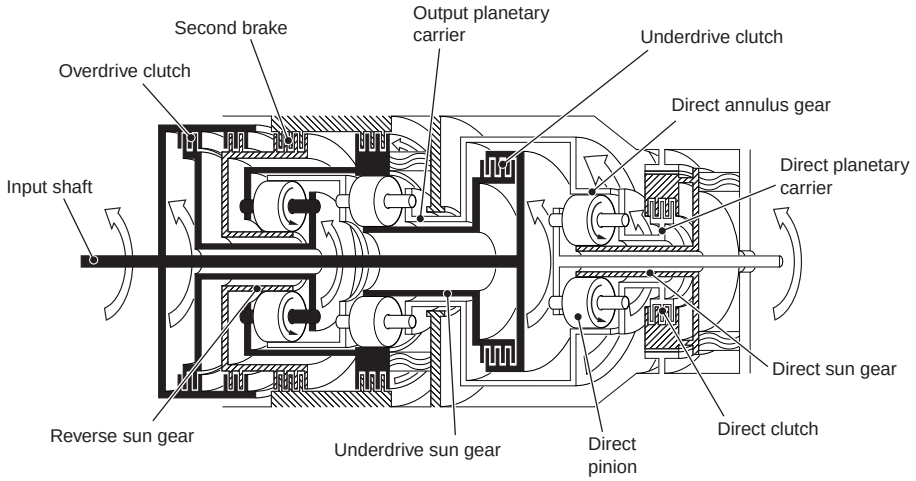
3RD GEAR



AC603608AB

When the 3rd gear is selected, the underdrive clutch, the overdrive clutch, the reduction brake and the one-way clutch (OWC-D) are participating. Since the overdrive clutch connects the input shaft with the overdrive planetary carrier and the low reverse annulus gear, the rotation speed of the underdrive sun gear that is connected with the input shaft by the underdrive clutch and the rotation speed of the low-reverse annulus gear become equal. Under this condition, the planetary gear set is locked and rotates as one body to transmit the driving force to the direct annulus gear. The operation of the direct planetary carrier elements is the same as the first gear, therefore, the reduction ratio of the third gear is obtained by the configuration that the planetary gear set rotates as one body under locked condition.

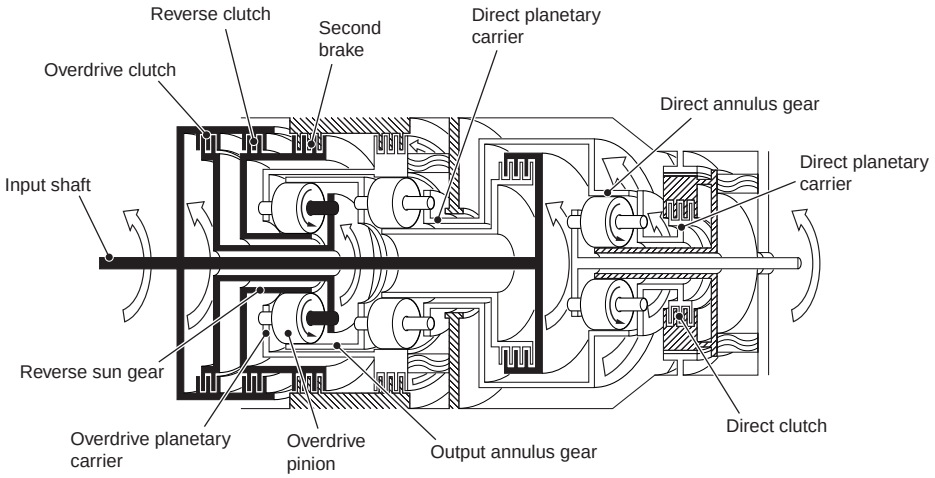
4TH GEAR



AC603609AB

When the 4th gear is selected, the underdrive clutch, the overdrive clutch and the direct clutch are participating. The operating condition of input shaft elements is the same as that of the third gear, where the planetary gear set is locked to rotate as one body. The driving force input to the output planetary carrier is transmitted from the direct annulus gear connected with the output planetary carrier, via the direct pinion, to the direct sun gear and turns it clockwise. On the other hand, since the direct sun gear is connected with the direct planetary carrier by the direct clutch, they rotate anti-clockwise as one body to obtain the reduction ratio of the fourth gear.

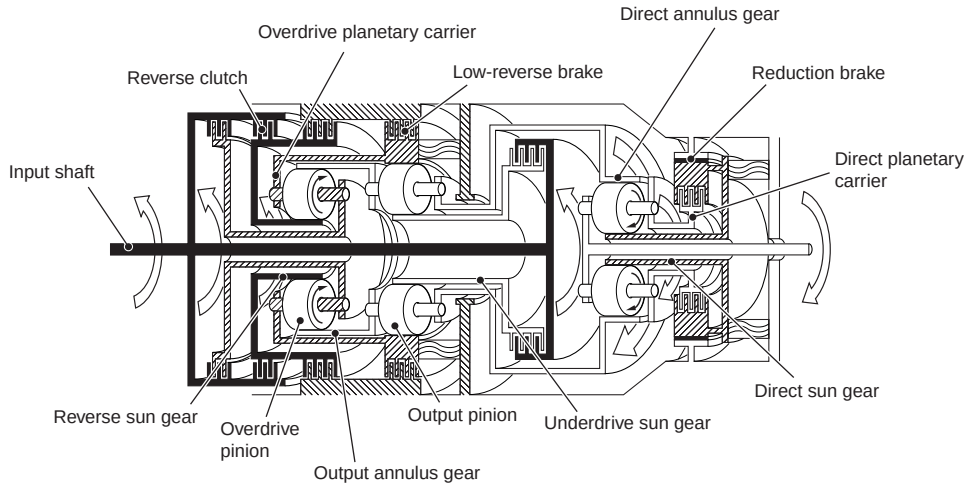
5TH GEAR



AC603610AB

When the 5th gear is selected, the overdrive clutch, the direct clutch and the second brake are participating. The driving force of the input shaft is transmitted to the overdrive planetary carrier via the reverse clutch. On the other hand, since the reverse sun gear is locked by the second brake, rotation amount of the overdrive pinion that revolves around the reverse sun gear is added to the rotation of the overdrive planetary carrier and the resultant rotation is transmitted to the output annulus gear. This driving force is then transmitted to the output planetary carrier that is connected to the overdrive planetary carrier and the direct annulus gear. Since the operating elements of the direct planetary carrier are the same as that of the fourth gear, the reduction ratio of the fifth gear is obtained by the revolution of the overdrive pinion.

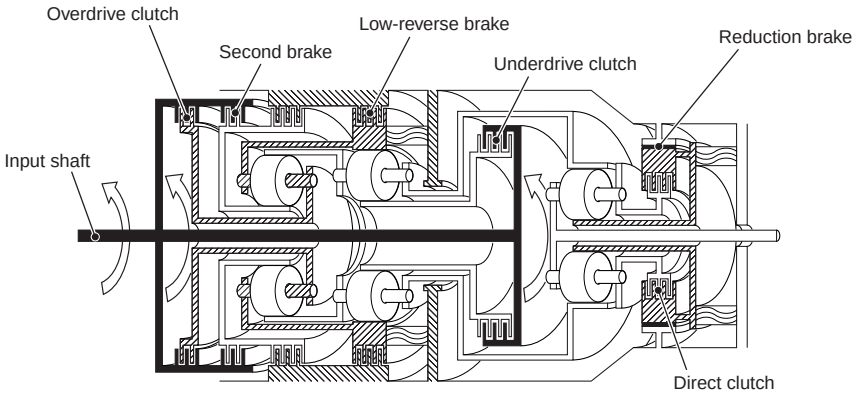
REVERSE



AC603611AB

When the reverse gear is selected, the reverse clutch, the low-reverse brake and the reduction brake are participation. The driving force of the input shaft is transmitted to the reverse sun gear via the reverse clutch. On the other hand, since the overdrive planetary carrier is locked by the low-reverse brake, the driving force of the reverse sun gear is transmitted to the output annulus gear via the overdrive pinion as the clockwise rotating force. This driving force is then transmitted to the direct annulus gear via the output planetary carrier. Since the direct sun gear is locked by the reduction brake, rotation amount of the direct pinion that revolves around the direct sun gear is added to rotate the direct planetary carrier clockwise. Thus the reduction ratio of reverse gear is obtained. At this time, the output pinion is driven by the output planetary carrier, however, since the underdrive sun gear is free to rotate, it runs idle and has no effect on the rotation of the output planetary carrier.

PARKING and NEUTRAL

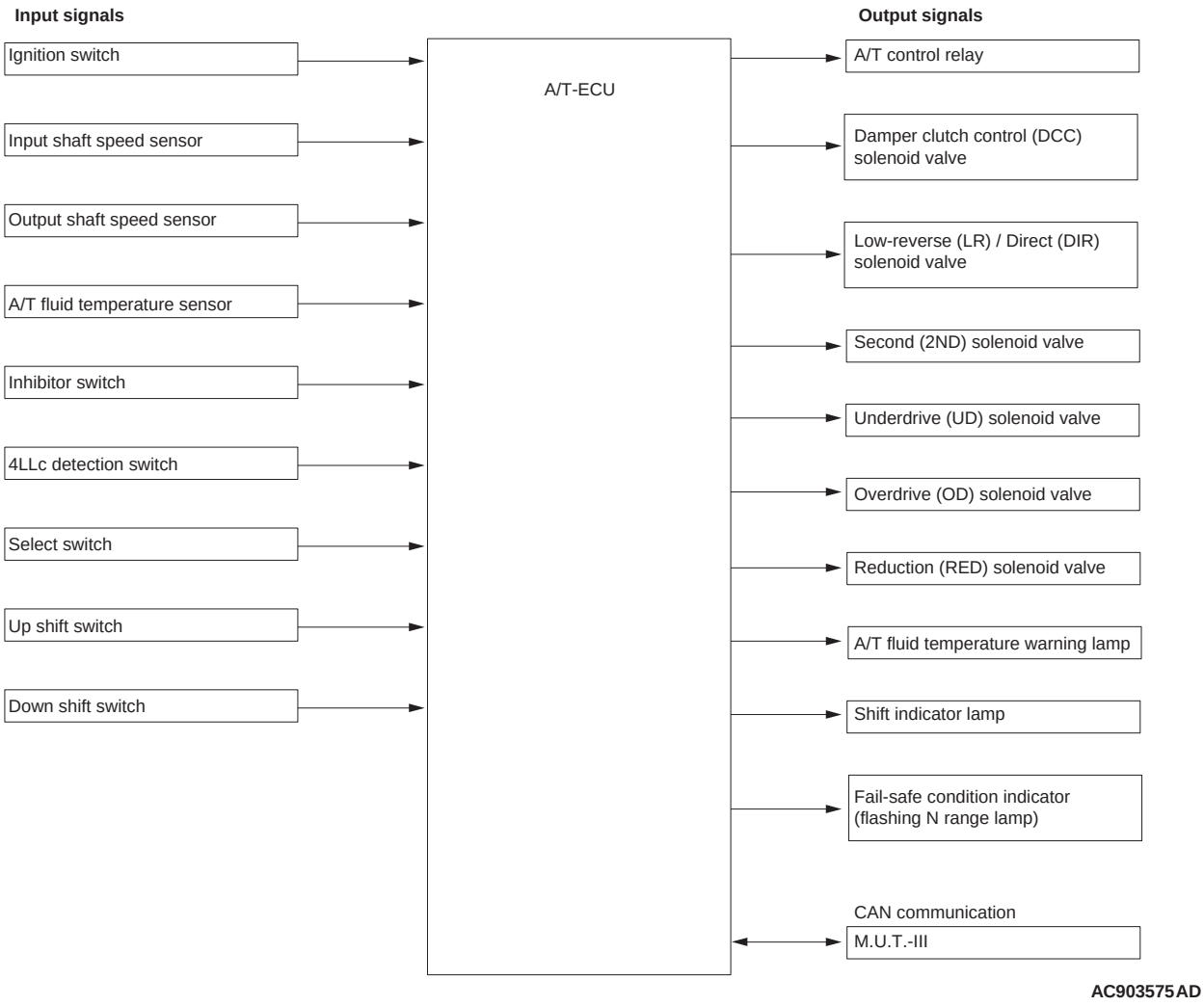


AC603612AB

In parking and neutral, all of the clutches are disengaged and driving force from the input shaft is not transmitted to the planetary carrier. To enable a quick shift to 1st gear or reverse, the low-reverse brake and reduction brake is operational.

Electronic control system

SYSTEM CONFIGURATION DIAGRAM



SENSORS AND ACTUATORS

Item		Function
Sensor	Input shaft speed sensor	Detects when input shaft speed
	Output shaft speed sensor	Detects when output shaft speed
	A/T fluid temperature sensor	Detects A/T fluid temperature
	Inhibitor switch	Detects selector lever position
	4LLc detection switch	Detects that 4LLc is selected
	Select switch	Detects that sport mode is selected
	Up shift switch	Detects up-shift request of sport mode
	Down shift switch	Detects down-shift request of sport mode

Item		Function
Actuator	A/T control relay	Turns solenoid valve power supply circuit ON/OFF
	DCC solenoid valve	Regulates hydraulic pressure to damper clutch control valve
	LR/DIR solenoid valve	Regulates hydraulic pressure to pressure control valve (for gear shift control)
	2ND solenoid valve	
	UD solenoid valve	
	OD solenoid valve	
	RED solenoid valve	
	N range lamp	Indicates that fail-safe is active and shows a diagnosis code
	Shift indicator lamp	Indicates present shift stage by lamp in combination meter
	A/T fluid temperature warning lamp	Gives a warning about A/T fluid temperature

SOLENOID VALVE OPERATION

In each gear, the solenoid valves are controlled as appropriate by instructions from the A/T-ECU.

Gear	LR/DIR	2ND	UD	OD	RED
1st	OFF*/ON <LR>	ON	OFF	ON	OFF
2nd	ON <LR>	OFF	OFF	ON	OFF
3rd	ON <DIR>	ON	OFF	OFF	OFF
4th	OFF <DIR>	ON	OFF	OFF	ON
5th	OFF <DIR>	OFF	ON	OFF	ON
Reverse	OFF <LR>	ON	ON	ON	OFF
Neutral/Parking	OFF <LR>	ON	ON	ON	OFF

*NOTE: *Only when in the sport mode and the vehicle is stationary (approx. 10 km/h or less).*

SERVICE SPECIFICATIONS

M1231100300259

Item		Standard value
A/T fluid temperature sensor resistance kΩ	At 0°C	16.7 – 20.5
	At 20°C	7.3 – 8.9
	At 40°C	3.4 – 4.2
	At 60°C	1.9 – 2.2
	At 80°C	1.0 – 1.2
	At 100°C	0.57 – 0.69
Damper clutch control (DCC) solenoid valve coil resistance (at 20°C) Ω		2.7 – 3.4
Low & reverse (LR) solenoid valve coil resistance (at 20°C) Ω		2.7 – 3.4
Second (2ND) solenoid valve coil resistance (at 20°C) Ω		2.7 – 3.4
Underdrive (UD) solenoid valve coil resistance (at 20°C) Ω		2.7 – 3.4

Item	Standard value
Overdrive (OD) solenoid valve coil resistance (at 20°C) Ω	2.7 – 3.4
Reduction (RED) solenoid valve coil resistance (at 20°C) Ω <5A/T>	2.7 – 3.4
Stall speed r/min	2,200 – 2,700
Line pressure MPa	1.01 – 1.05

LUBRICANTS

M1231100400171

Item	Specified lubricants	Capacity L
A/T fluid	DIA QUEEN ATF SP III	9.7
Transfer oil	Gear oil API classification GL-3 SAE 75W-85 or API classification GL-4 SAE 75W-85	2.5

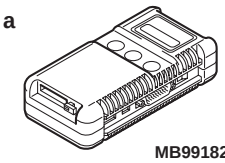
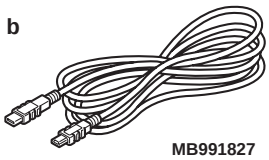
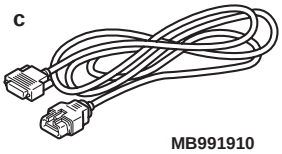
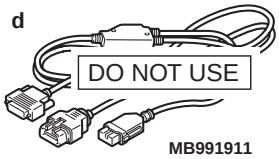
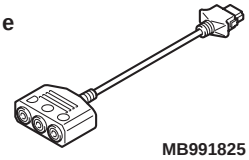
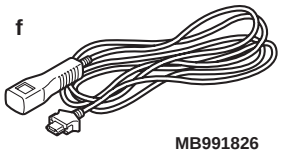
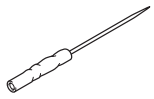
SEALANTS

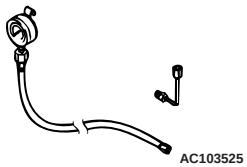
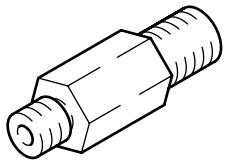
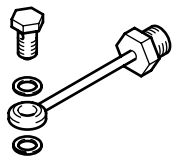
M1231100500145

Item	Specified sealant
Transfer control lever assembly	3M ATD Part No.8660 or equivalent

SPECIAL TOOLS

M1231100600368

Tool	Number	Name	Use
a  MB991824 b  MB991827 c  MB991910 d  MB991911 e  MB991825 f  MB991826 MB991955	MB991955 a. MB991824 b. MB991827 c. MB991910 d. MB991911 e. MB991825 f. MB991826	M.U.T.-III sub-assembly a. Vehicle Communication Interface (V. C. I.) b. M.U.T.-III USB cable c. M.U.T.-III main harness A (Vehicles with CAN communication system) d. M.U.T.-III main harness B (Vehicles without CAN communication system) e. M.U.T.-III measure adapter f. M.U.T.-III trigger harness	⚠ CAUTION **For vehicles with CAN communication, use M.U.T.-III main harness A to send simulated vehicle speed. If you connect M.U.T.-III main harness B instead, the CAN communication does not function correctly.** Checking A/T diagnosis trouble codes
 MB992006	MB992006	Extra fine probe	Continuity check and voltage measurement at harness wire or connector

Tool	Number	Name	Use
 AC103525	MD998330 (including MD998331)	Oil pressure gauge (3.0 MPa)	Hydraulic pressure measurement
	MD998332	Adapter	Oil pressure gauge connection
	MD998900	Joint	

TROUBLESHOOTING

DIAGNOSIS TROUBLESHOOTING FLOW

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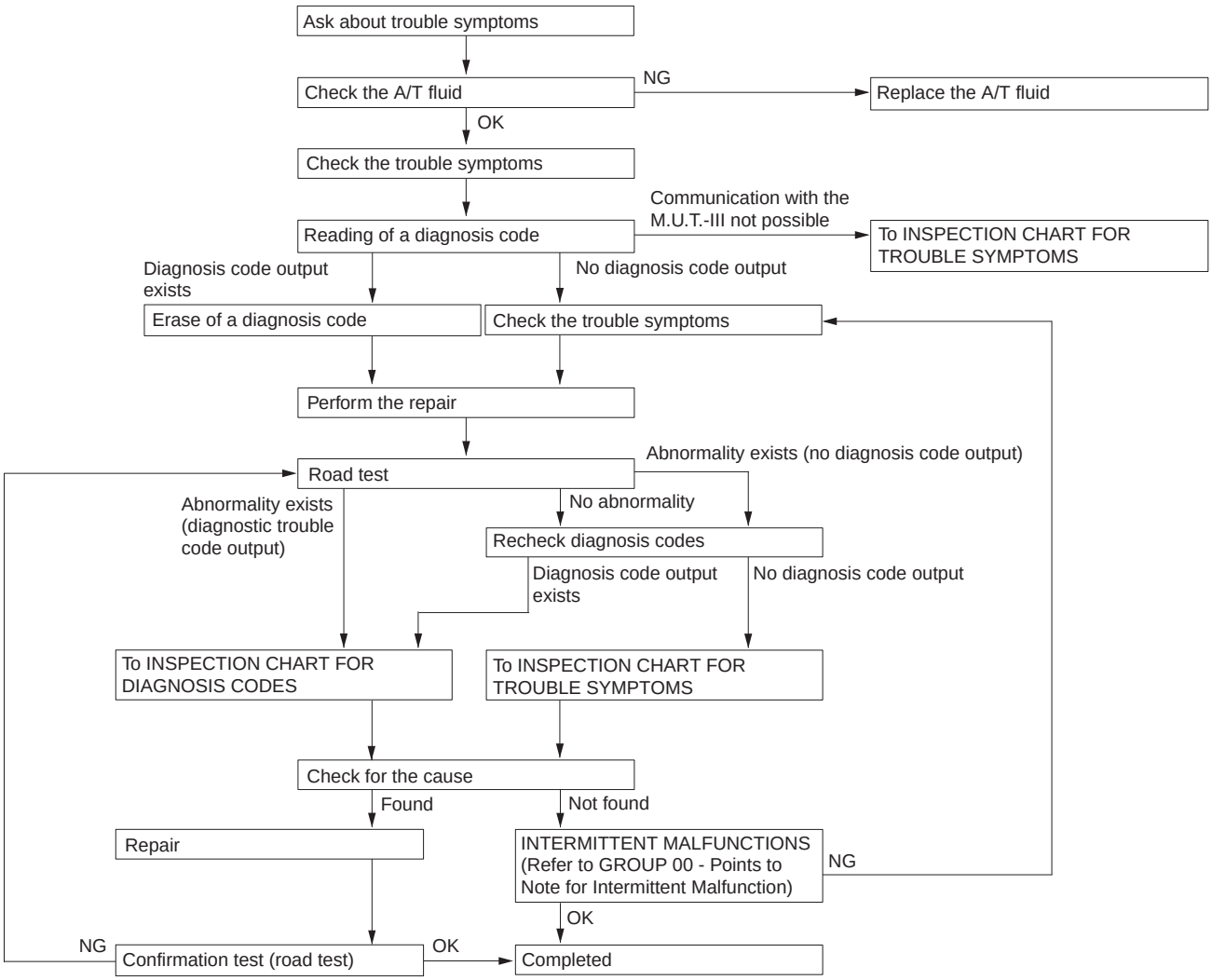

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DIAGNOSTIC FUNCTION

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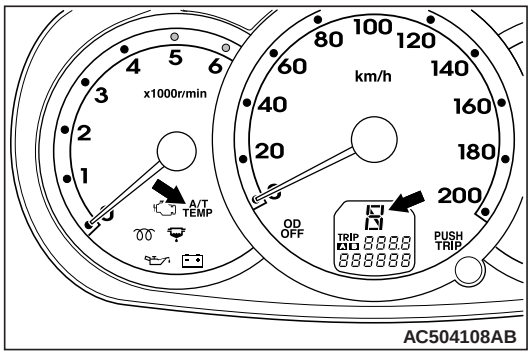
SELECTOR LEVER POSITION INDICATOR LAMP SYSTEM



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If there is a problem with any of the A/T system, the selector lever position indicator lamp will flash at a rate of approximately once per second.
If the selector lever position indicator lamp is flashing at a rate of approximately once per second, check the diagnosis output.

Selector lever position indicator lamp flashing item

- Input shaft speed sensor system
- Output shaft speed sensor system
- Solenoid valves system
- Non-synchronization at various shift ranges
- A/T control relay system

NOTE: If the A/T fluid temperature warning lamp is illuminating, the A/T fluid temperature is high. (It illuminates when the fluid is approximately 135°C or more and goes off when the fluid is approximately 115°C or less.)

METHOD OF READING THE DIAGNOSIS CODE

Use the M.U.T.-III to read the diagnosis code. (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points .)

METHOD OF ERASING THE DIAGNOSIS CODE

Use the M.U.T.-III to erase the diagnosis code. (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points .)

ROAD TEST

M1231100800500

Procedure	Pre-test/ operation conditions	Test/operation	Judgment value	Check item	Diagnosis code No.	Inspection procedure if there is an abnormality
1	Ignition switch: LOCK (OFF) position	Ignition switch (1) ON	Data List No.8 (1) System voltage [V]	A/T control relay	P1788	A/T control relay system

Procedure	Pre-test/ operation conditions	Test/operation	Judgment value	Check item	Diagnosis code No.	Inspection procedure if there is an abnormality
2	Ignition switch: ON Engine: Stopped Selector lever position: P	Selector lever position <4A/T> (1) P (2) R (3) N (4) D (5) 2 (6) L	Data List No.34 (1) P (2) R (3) N (4) D (5) 2 (6) L	Inhibitor switch	P1770, P1771	Inhibitor switch system
		Selector lever position <5A/T> (1) P (2) R (3) N (4) D	Data List No.34 (1) P (2) R (3) N (4) D			
		Selector lever position <5A/T> (1) D (2) Select the sport mode (3) Upshift and hold the selector lever in that position (2nd gear) (4) Downshift and hold the selector lever in that position (1st gear)	Data List No.27 (1) OFF (2) ON (3) ON (4) ON	Select switch	–	Sport mode switch system
			Data List No.28 (1) OFF (2) OFF (3) ON (4) OFF	Upshift switch		
			Data List No.29 (1) OFF (2) OFF (3) OFF (4) ON	Downshift switch		
			Shift indicator lamp (1) Only D illuminates (2) Only 1 illuminates (3) Only 2 illuminates (4) Only 1 illuminates	Shift indicator lamp		
		Overdrive switch <4A/T> (1) ON (2) OFF	Data List No.26 (1) ON (2) OFF	Overdrive switch	–	Overdrive switch system
		Accelerator pedal (1) Fully closed (2) Depressed (3) Fully opened	Data List No.35 (1) 0% (2) Gradually increases from (1) (3) 100%	APS	–	Refer to GROUP 13A – Troubleshooting.
		Transfer shift lever position (1) Except for 4L	Data List No.31 (1) OFF (2) ON	4LLc switch	–	4LLc switch system

Procedure	Pre-test/ operation conditions	Test/operation	Judgment value	Check item	Diagnosis code No.	Inspection procedure if there is an abnormality
3	Ignition switch: START	Starting test at P or N position	Starting should be possible	Starting possible/ not possible	–	Starting not possible
4	Driving after engine has warmed up	Drive for 15 minutes or more until the A/T fluid temperature rises to 70 – 80°C.	Data List No.7 Gradually rises to 70 – 80°C	A/T fluid temperature sensor	P1763, P1764	A/T fluid temperature sensor system
5	Engine: idle Selector lever position: N	A/C switch (1) ON (2) OFF	Data List No.21 (1) ON (2) OFF	A/C compressor relay	–	A/C compressor relay system
		Accelerator pedal (1) Fully closed (2) Depressed	Data List No.1 (1) The engine speed displayed on the tachometer is identical to the engine speed displayed on M.U.T.-III. (2) Gradually increases from (1)	Crank angle sensor	–	Refer to GROUP 13A – Troubleshooting.
		Selector lever position (1) N to D (2) N to R	No abnormal shock during shifting Within 2 seconds of time lag	Malfunction when starting off	–	Engine stalls during shifting
					–	N to D shocks, large time lag
					–	N to R shocks, large time lag
					–	N to D, N to R shocks, large time lag
				Driving not possible	–	Does not move forward
					–	Does not reverse
					–	Does not move (forward or reverse)

Procedure	Pre-test/ operation conditions	Test/operation	Judgment value	Check item	Diagnosis code No.	Inspection procedure if there is an abnormality
6 <4A/T>	Selector lever position: D (Must be done on a level and straight road.)	Selector lever position and vehicle speed (Each condition should be maintained for 10 seconds or more.) (1) Engine idling in 1st gear (vehicle stopped) (2) Driving at constant speed of 10 km/h in 1st gear (3) Driving at constant speed of 20 km/h in 2nd gear (4) Driving at constant speed of 30 km/h in 3rd gear (5) Driving at constant speed of 40 km/h in 4th gear	Data List No.11 (2) 1st (3) 2nd (4) 3rd (5) 4th	Shift position	–	–
			Data List No.12 (2) 0% (3) 100% (4) 100% (5) 100%	LR solenoid valve duty %	P1773	LR solenoid valve system
			Data List No.13 (2) 0% (3) 0% (4) 0% (5) 100%	UD solenoid valve duty %	P1774	UD solenoid valve system
			Data List No.14 (2) 100% (3) 0% (4) 100% (5) 0%	2NDsolenoid valve duty %	P1775	2ND solenoid valve system
			Data List No.15 (2) 100% (3) 100% (4) 0% (5) 0%	OD solenoid valve duty %	P1776	OD solenoid valve system
			Data List No.5 (4) 1,100 – 1,400 r/min	Input shaft speed sensor	P1766	Input shaft speed sensor system
			Data List No.6 (4) 1,100 – 1,400 r/min	Output shaft speed sensor	P1767	Output shaft speed sensor system

Procedure	Pre-test/ operation conditions	Test/operation	Judgment value	Check item	Diagnosis code No.	Inspection procedure if there is an abnormality
6 <5A/T>	Selector lever position: Sport mode (Must be done on a level and straight road.)	Selector lever position and vehicle speed (Each condition should be maintained for 10 seconds or more.) (1) Engine idling in 1st gear (vehicle stopped) (2) Driving at constant speed of 10 km/h in 1st gear (3) Driving at constant speed of 20 km/h in 2nd gear (4) Driving at constant speed of 40 km/h in 3rd gear (5) Driving at constant speed of 60 km/h in 4th gear (6) Driving at constant speed of 70 km/h in 5th gear	Data List No.11 (2) 1st (3) 2nd (4) 3rd (5) 4th (6) 5th	Shift position	–	–
			Data List No.12 (2) 0% (3) 100% (4) 100% (5) 0% (6) 0%	LR solenoid valve duty %	P1773	LR solenoid valve system
			Data List No.13 (2) 0% (3) 0% (4) 0% (5) 0% (6) 100%	UD solenoid valve duty %	P1774	UD solenoid valve system
			Data List No.14 (2) 100% (3) 0% (4) 100% (5) 100% (6) 0%	2NDsolenoid valve duty %	P1775	2ND solenoid valve system
			Data List No.15 (2) 100% (3) 100% (4) 0% (5) 0% (6) 0%	OD solenoid valve duty %	P1776	OD solenoid valve system
			Data List No.16 (2) 0% (3) 0% (4) 0% (5) 100% (6) 100%	RED solenoid valve duty %	P1777	Reduction solenoid valve system
			Data List No.5 (5) 1,600 – 1,900 r/min	Input shaft speed sensor	P1766	Input shaft speed sensor system
			Data List No.6 (5) 1,600 – 1,900 r/min	Output shaft speed sensor	P1767	Output shaft speed sensor system

Procedure	Pre-test/ operation conditions	Test/operation	Judgment value	Check item	Diagnosis code No.	Inspection procedure if there is an abnormality
7	Selector lever position: D (Must be done on a level and straight road.)	Selector lever position and vehicle speed (1) Driving at constant speed 90 km/h in 3rd gear <4A/T> or 100 km/h in 4th gear <5A/T> (2) Driving at 90 km/h in 3rd gear <4A/T> or 100 km/h in 4th gear <5A/T>, then fully close the accelerator pedal	Data List No.17 (1) 70 – 99.6% (2) 70 – 99.6% to 0%	DCC solenoid valve duty %	P1778, P1786, P1787	DCC solenoid valve system
			Data List No.10 (1) –10 to 10 r/min (2) The value changes from (1)	DCC amount of slippage		

Procedure	Pre-test/ operation conditions	Test/operation	Judgment value	Check item	Diagnosis code No.	Inspection procedure if there is an abnormality
8 <4A/T>	Selector lever position: D (Must be done on a level and straight road)	(1) Accelerate to 4th range at an APS output of 1.5 V (opening angle 20%). (2) Slowly decelerate and stop. (3) Accelerate to 4th range at an APS output of 2.5 V (opening angle 50%).	Data List No.35, 6 The shifting points correspond with the M.U.T.-III display and the APS voltage (opening angle) and output shaft speed, which are described in the shift pattern.	Problem during shifting	–	Shocks, engine racing
				Incorrect shift points	–	All points
					–	Some points
				No shifting	–	No diagnosis codes
					P1766	Input shaft speed sensor system
					P1767	Output shaft speed sensor system
		(1) Accelerate from 1st gear to 4th gear. (2) Downshift to 3rd gear at speed of 50 km/h in 4th gear. (3) Downshift to 2nd gear at speed of 30 km/h in 3rd gear. (4) Downshift to 1st gear at speed of 20 km/h in 2nd gear.	Data List No.11 (1) 1st → 2nd → 3rd → 4th (2) 4th → 3rd (3) 3rd → 2nd (4) 2nd → 1st	No shifting from 1st to 2nd, or no shifting from 2nd to 1st	P1773	LR solenoid valve system
					P1775	2ND solenoid valve system
					P1779	1ST without completion of shifting
					P1780	2ND without completion of shifting
				No shifting from 2nd to 3rd, or no shifting from 3rd to 2nd	P1775	2ND solenoid valve system
					P1776	OD solenoid valve system
					P1780	2ND without completion of shifting
					P1781	3RD without completion of shifting
				No shifting from 3rd to 4th, or no shifting from 4th to 3rd	P1774	UD solenoid valve system
					P1775	2ND solenoid valve system
					P1781	3RD without completion of shifting
					P1782	4TH without completion of shifting

Procedure	Pre-test/ operation conditions	Test/operation	Judgment value	Check item	Diagnosis code No.	Inspection procedure if there is an abnormality
8 <5A/T>	Suspends the INVECS-II function using M.U.T.-III Selector lever position: D (Must be done on a level and straight road)	(1) Accelerate to 5th range at an APS output of 1.5 V (opening angle 20%). (2) Slowly decelerate and stop. (3) Accelerate to 5th range at an APS output of 2.5 V (opening angle 50%).	Data List No.2, 6 The shifting points correspond with the M.U.T.-III display and the APS voltage (opening angle) and output shaft speed, which are described in the shift pattern.	Problem during shifting	–	Shocks, engine racing
				Incorrect shift points	–	All points
					–	Some points
				No shifting	–	No diagnosis codes
					P1766	Input shaft speed sensor system
					P1767	Output shaft speed sensor system

Procedure	Pre-test/ operation conditions	Test/operation	Judgment value	Check item	Diagnosis code No.	Inspection procedure if there is an abnormality
8 <5A/T>	Suspends the INVECS-II function using M.U.T.-III Selector lever position: D (Must be done on a level and straight road)	(1) Accelerate from 1st gear to 5th gear. (2) Downshift to 4th gear at speed of 60 km/h in 5th gear. (3) Downshift to 3rd gear at speed of 50 km/h in 4th gear. (4) Downshift to 2nd gear at speed of 30 km/h in 3rd gear. (5) Downshift to 1st gear at speed of 20 km/h in 2nd gear.	Data List No.11 (1) 1st → 2nd → 3rd → 4th → 5th (2) 5th → 4th (3) 4th → 3rd (4) 3rd → 2nd (5) 2nd → 1st	No shifting from 1st to 2nd, or no shifting from 2nd to 1st	P1773	LR solenoid valve system
					P1775	2ND solenoid valve system
					P1779	1ST without completion of shifting
					P1780	2ND without completion of shifting
				No shifting from 2nd to 3rd, or no shifting from 3rd to 2nd	P1775	2ND solenoid valve system
					P1776	OD solenoid valve system
					P1780	2ND without completion of shifting
					P1781	3RD without completion of shifting
				No shifting from 3rd to 4th, or no shifting from 4th to 3rd	P1773	LR solenoid valve system
					P1777	RED solenoid valve system
					P1781	3RD without completion of shifting
					P1782	4TH without completion of shifting
				No shifting from 4th to 5th, or no shifting from 5th to 4th	P1774	UD solenoid valve system
					P1775	2ND solenoid valve system
					P1782	4TH without completion of shifting
					P1783	5TH without completion of shifting

Procedure	Pre-test/ operation conditions	Test/operation	Judgment value	Check item	Diagnosis code No.	Inspection procedure if there is an abnormality
9	Selector lever position: N (Must be done on a level and straight road)	Selector lever position and vehicle speed (1) Select R and drive at 10 km/h	The ration of data list No.5 and No.6 should be the same as the transmission ratio when reversing	No shifting	P1766	Input shaft speed sensor system
					P1767	Output shaft speed sensor system
					P1784	Reverse without completion of shifting

SHIFT PATTERN

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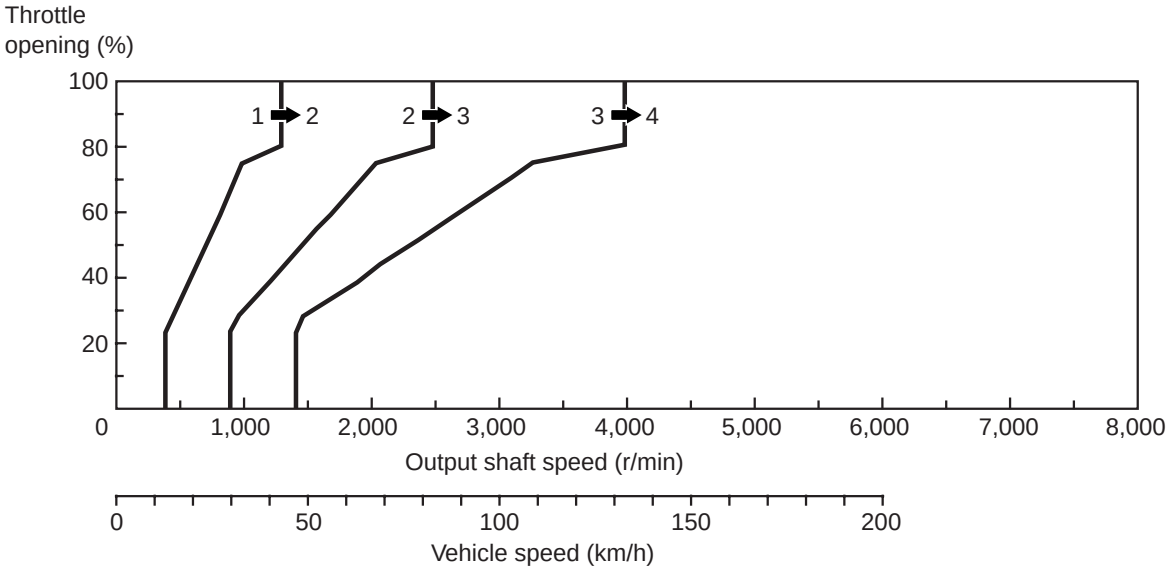
UPSHIFT PATTERN <4A/T>



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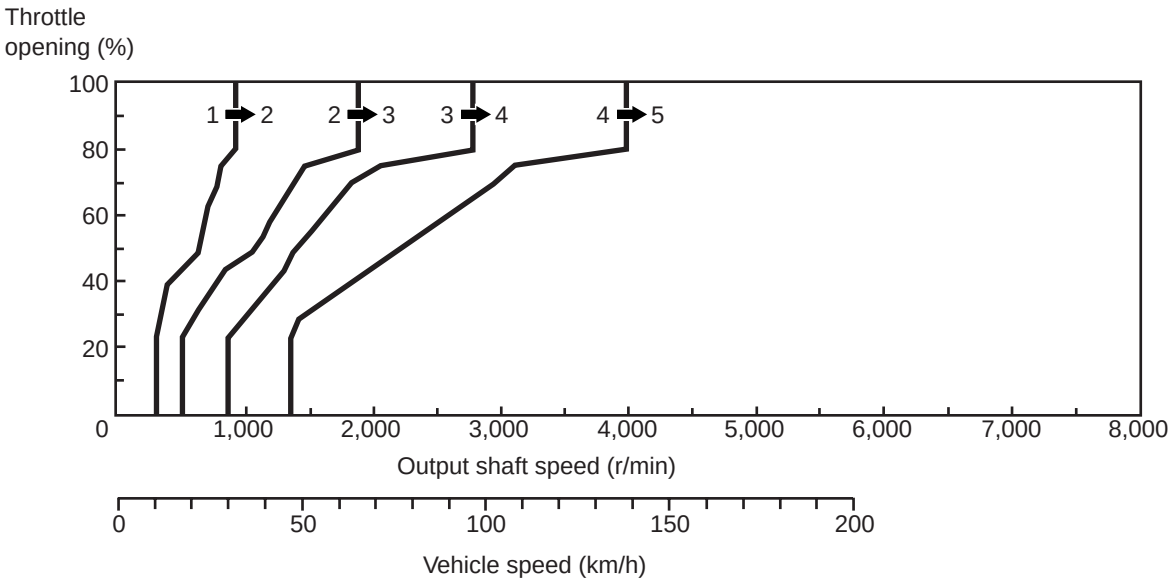
UPSHIFT PATTERN <5A/T>



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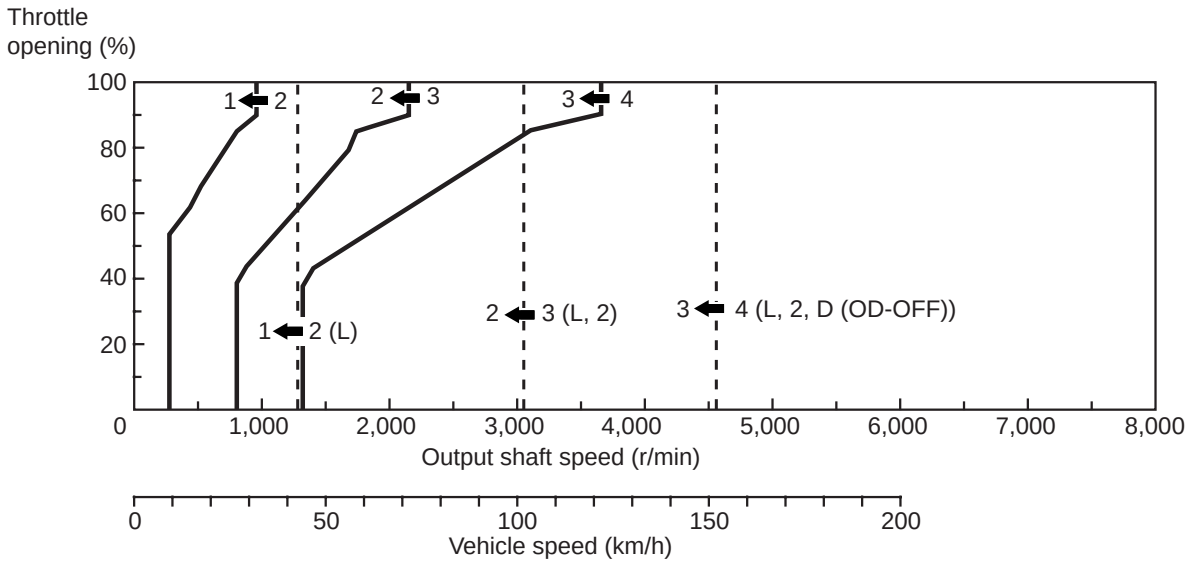
DOWNSHIFT PATTERN <4A/T>



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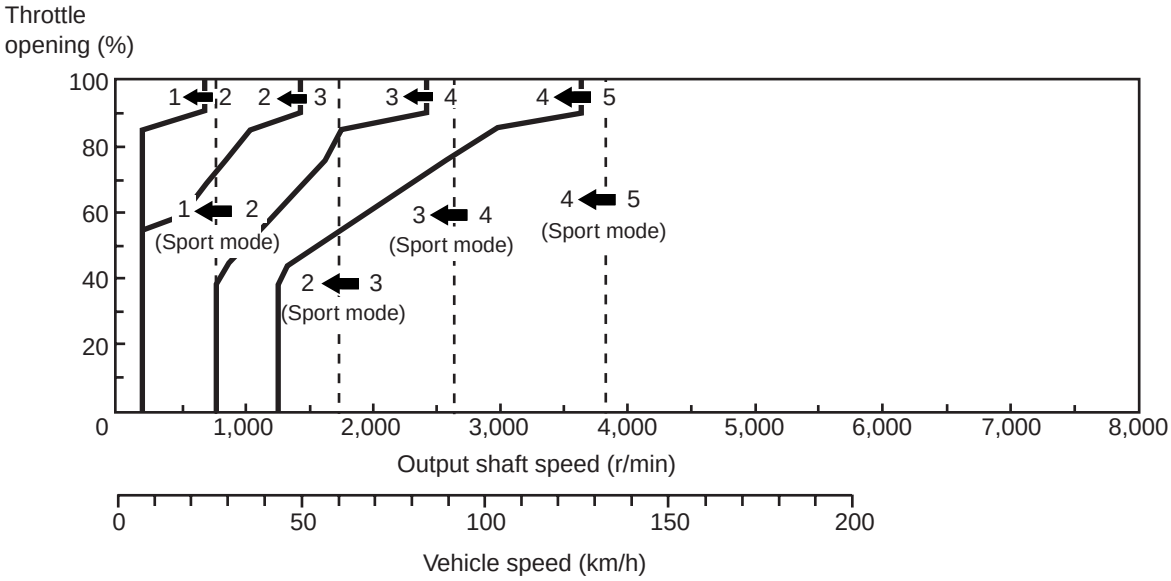

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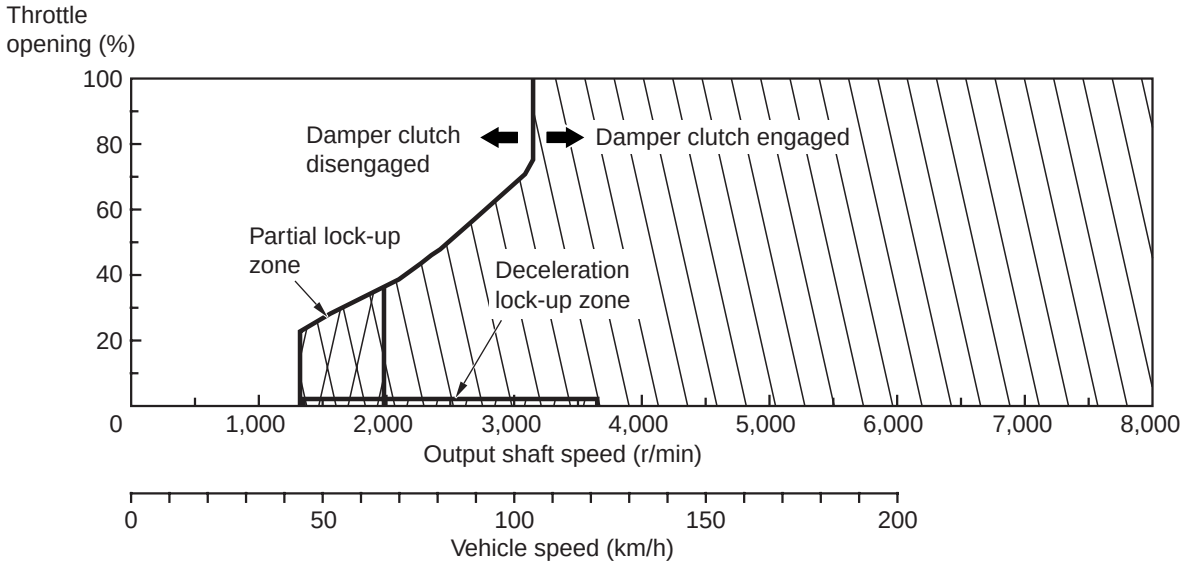
DAMPER CLUTCH CONTROL

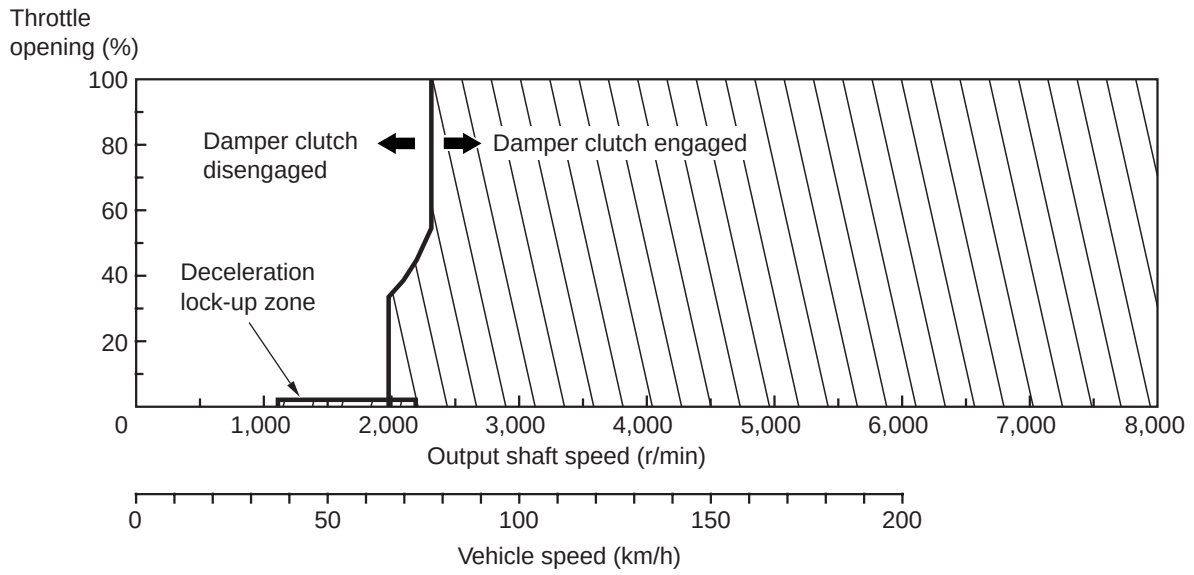
M1231126600603

In 4th range <4A/T>



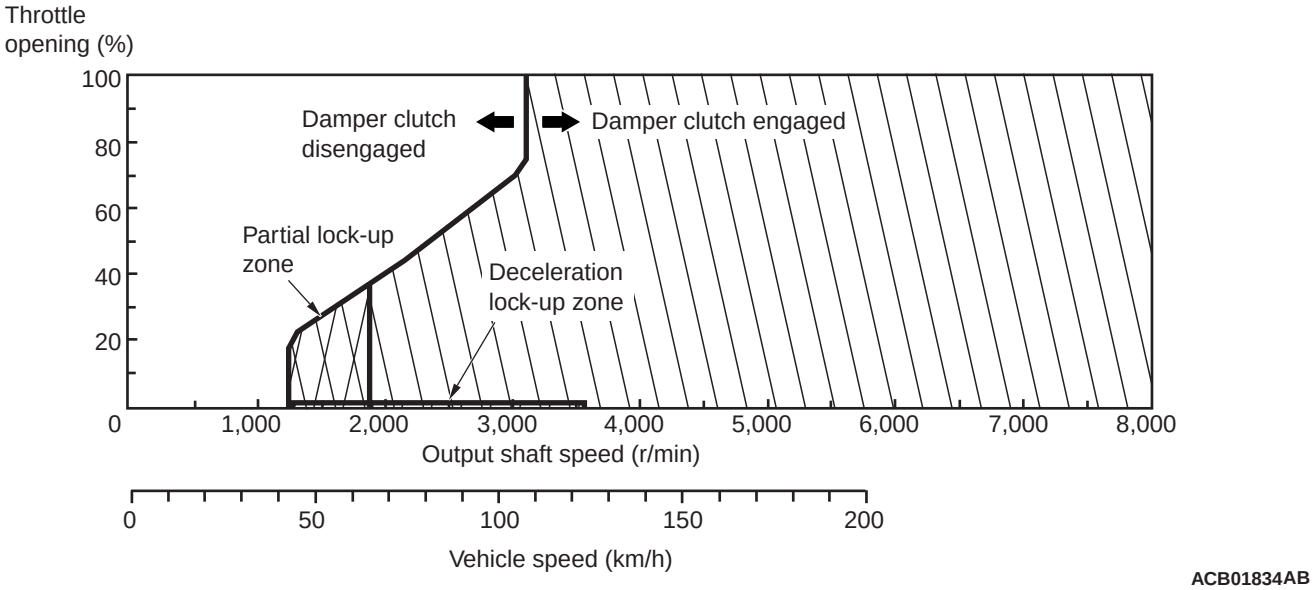
ACB01832AC

In 3rd range <4A/T>



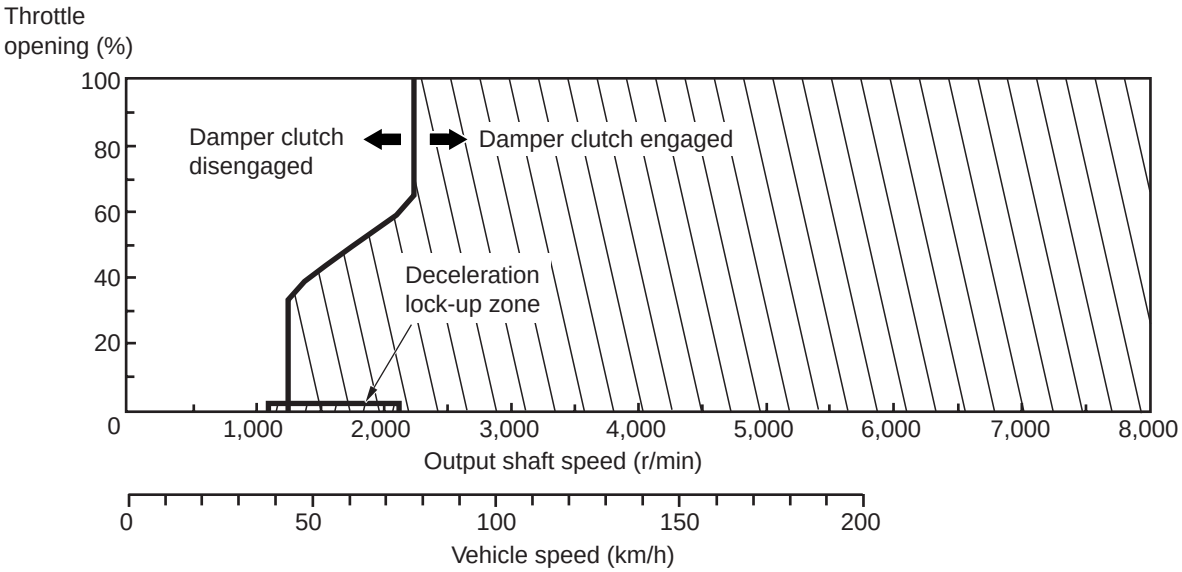
ACB01833AB

In 5th range <5A/T>



ACB01834AB

In 4th range <5A/T>



ACB01835AB

DIAGNOSIS CODE CHART

M1231126700257

Diagnosis code No.		Diagnosis item	Reference page
M.U.T.-III	General scan tool		
P1606	–	EEPROM malfunction (A/T-ECU)	Replace the A/T-ECU
P1763	P0710	A/T fluid temperature sensor system	P.23A-32
P1764			P.23A-34
P1766	P0715	Input shaft speed sensor system	P.23A-36
P1767	P0720	Output shaft speed sensor system	P.23A-41
P1770	P0705	Inhibitor switch system	P.23A-46 <4A/T> P.23A-49 <5A/T>
P1771			P.23A-51 <4A/T> P.23A-52 <5A/T>
P1773	P0750	LR solenoid valve system	P.23A-53
P1774	P0755	UD solenoid valve system	P.23A-57
P1775	P0760	2ND solenoid valve system	P.23A-58
P1776	P0765	OD solenoid valve system	P.23A-60
P1777	P0770	RED solenoid valve system <5A/T>	P.23A-61
P1778	P0740	DCC solenoid valve system	P.23A-62

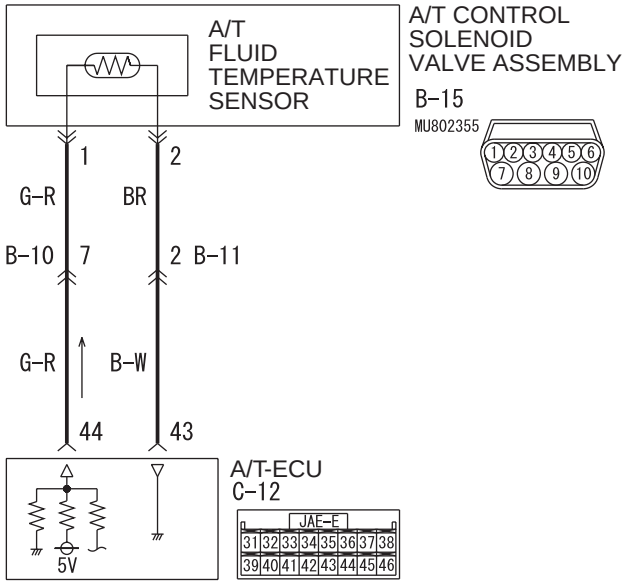
Diagnosis code No.		Diagnosis item	Reference page
M.U.T.-III	General scan tool		
P1779	–	1st gear ratio does not meet the specification	P.23A-64 <4A/T> P.23A-65 <5A/T>
P1780	–	2nd gear ratio does not meet the specification	
P1781	–	3rd gear ratio does not meet the specification	
P1782	–	4th gear ratio does not meet the specification	
P1783	–	5th gear incorrect ratio <5A/T>	
P1784	–	Reverse gear ratio does not meet the specification	
P1786	–	DCC solenoid valve system	P.23A-67
P1787	–		P.23A-68
P1788	P1751	A/T control relay system	P.23A-69
P1790	–	Back up line system	P.23A-73
P1901	–	Can signal time-out (Engine-ECU)	P.23A-74
U1073	–	Bus Off	P.23A-75
U1100*	–	Engine-ECU time-out (related to engine)	P.23A-76
U1102*	–	ASTC-ECU time-out	P.23A-77
U1109*	–	ETACS-ECU time-out	P.23A-78
U1120*	–	Failure information of Engine-ECU	P.23A-79
U1190*	–	Can't receive fault detection control signal	P.23A-80

*NOTE: *: When the diagnosis code related to the CAN communication error is set, check the vehicle equipment. If this system is not equipped, the diagnosis code is always set, but it is not abnormal.*

DIAGNOSIS CODE PROCEDURES

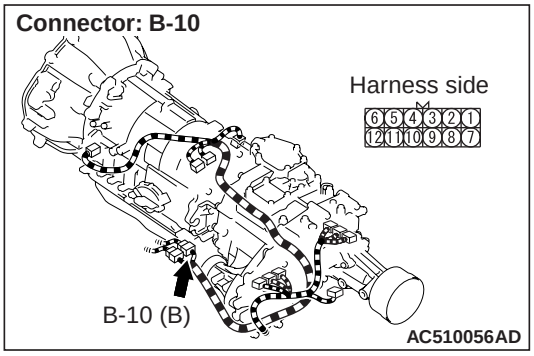
Code No.P1763 (P0710) A/T fluid temperature sensor system

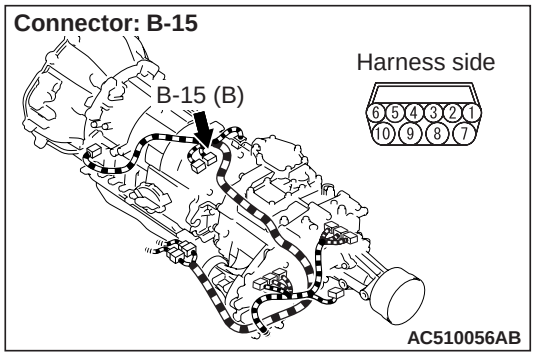
A/T Fluid Temperature Sensor System Circuit

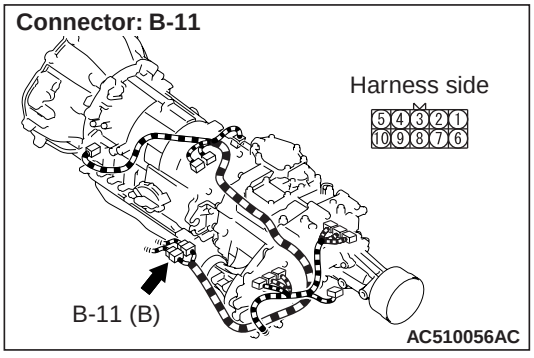


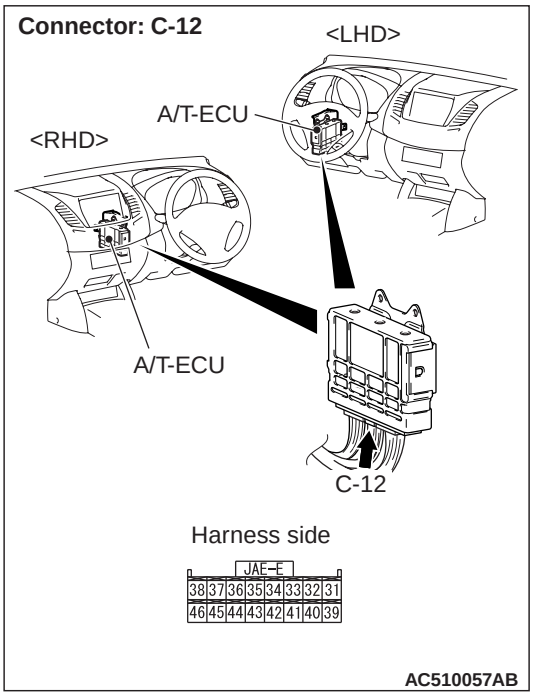
Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

AC903903
W7C23X001A









OPERATION

- The A/T fluid temperature sensor converts the A/T fluid temperature to voltage, and send the information to the A/T-ECU.
- The A/T fluid temperature rises, the resistance decreases. Thus, the sensor output voltage depends on the A/T fluid temperature. As the A/T fluid temperature rises, the output voltage will decrease.

DIAGNOSIS CODE SET CONDITIONS

If the A/T fluid temperature sensor output voltage is 4.5 volts or more after driving for 10 minutes or more, there is an open circuit in the A/T fluid temperature sensor and diagnosis code No.P1763 (P0710) is set.

PROBABLE CAUSES

- Malfunction of the A/T fluid temperature sensor
- Damaged harness wires and connectors
- Malfunction of the A/T-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III data list

Item 07: A/T fluid temperature sensor (Refer to Data List Table P.23A-103).

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction).

NO : Go to Step 2.

STEP 2. Measure the resistance at A/T control solenoid valve assembly connector B-15.

Disconnect the connector, and measure the resistance between terminal 1 and 2 at the sensor side.

OK:

- **16.7 – 20.5 kΩ (at 0°C)**
- **7.3 – 8.9 kΩ (at 20°C)**
- **3.4 – 4.2 kΩ (at 40°C)**
- **1.9 – 2.2 kΩ (at 60°C)**
- **1.0 – 1.2 kΩ (at 80°C)**
- **0.57 – 0.69 kΩ (at 100°C)**

Q: Is the check result normal?

YES : Go to Step 3.

NO : Replace the A/T fluid temperature sensor.

STEP 3. Connector check: B-15 A/T control solenoid valve assembly

Check for the contact with terminals.

Q: Is the check result normal?

YES : Go to Step 4.

NO : Repair the defective connector.

STEP 4. Measure the resistance at A/T control solenoid valve assembly connector B-15.

Disconnect the connector, and measure the resistance between terminal 2 and earth at the wiring harness side.

OK: Continuity (Less than 2 Ω)

Q: Is the check result normal?

YES : Go to Step 9.

NO : Go to Step 5.

STEP 5. Measure the voltage at A/T-ECU connector C-12.

(1) Connect A/T control solenoid valve assembly connector B-15.
(2) Turn the ignition switch to the ON position.
(3) Measure the voltage between A/T-ECU connector C-12 terminal No.43 and earth.

OK: 0.5 V or less

Q: Is the check result normal?

YES : Go to Step 8.

NO : Go to Step 6.

STEP 6. Connector check: C-12 A/T-ECU connector

Check for the contact with terminals.

Q: Is the check result normal?

YES : Go to Step 7.

NO : Repair the defective connector.

STEP 7. M.U.T.-III data list
Item 07: A/T fluid temperature sensor (Refer to Data List Table P.23A-103.)

Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction).
NO : Replace the A/T-ECU.

STEP 8. Connector check: B-11 intermediate connector, C-12 A/T-ECU connector
Check for the contact with terminals.

Q: Is the check result normal?
YES : Go to Step 14.
NO : Repair the defective connector.

STEP 9. Measure the voltage at A/T control solenoid valve assembly connector B-15.
(1) Disconnect the connector, and measure the voltage between terminal 1 and earth at the wiring harness side.
(2) Turn the ignition switch to the ON position.

OK: 4.5 – 4.9 V

Q: Is the check result normal?
YES : Go to Step 7.
NO : Go to Step 10.

STEP 10. Measure the voltage at A/T-ECU connector C-12.
(1) Connect A/T control solenoid valve assembly connector B-15.
(2) Turn the ignition switch to the ON position.
(3) Measure the voltage between A/T-ECU connector C-12 terminal No.44 and earth.

OK:
- **3.8 – 4.0 V (at 20°C)**
- **3.2 – 3.4 V (at 40°C)**
- **1.7 – 1.9 V (at 80°C)**

Q: Is the check result normal?
YES : Go to Step 12.
NO : Go to Step 11.

STEP 11. Connector check: C-12 A/T-ECU connector
Check for the contact with terminals.

Q: Is the check result normal?
YES : Go to Step 7.
NO : Repair the defective connector.

STEP 12. Connector check: B-10 intermediate connector, C-12 A/T-ECU connector
Check for the contact with terminals.

Q: Is the check result normal?
YES : Go to Step 13.
NO : Repair the defective connector.

STEP 13. Check the harness between A/T control solenoid valve assembly connector B-15 terminal No.1 and A/T-ECU connector C-12 terminal No.44.
Check the output line for short-circuited or open circuit.

Q: Is the check result normal?
YES : Go to Step 7.
NO : Repair the wiring harness.

STEP 14. Check the harness between A/T control solenoid valve assembly connector B-15 terminal No.2 and A/T-ECU connector C-12 terminal No.43.
Check the earth line for open circuit.

Q: Is the check result normal?
YES : Go to Step 7.
NO : Repair the wiring harness.

Code No.P1764 (P0710) A/T fluid temperature sensor system

A/T FLUID TEMPERATURE SENSOR SYSTEM CIRCUIT
Refer to P.23A-32.

OPERATION
Refer to P.23A-32.

DIAGNOSIS CODE SET CONDITION
If the A/T fluid temperature sensor output voltage has been approximately 0 V for at least one second (indicating abnormally high oil temperature), it indicates that the A/T fluid temperature sensor circuit is shorted and diagnosis code No.1764 (P0710) is set.

PROBABLE CAUSES

- Malfunction of the A/T fluid temperature sensor
- Damaged harness wires and connectors
- Malfunction of the A/T-ECU

DIAGNOSIS

STEP 1. M.U.T.-III data list

Item 07: A/T fluid temperature sensor (Refer to Data List Table P.23A-103).

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction).

NO : Go to Step 2.

STEP 2. Connector check: B-15 A/T control solenoid valve assembly

Check for the contact with terminals.

Q: Is the check result normal?

YES : Go to Step 3.

NO : Repair the defective connector.

STEP 3. Measure the voltage at A/T control solenoid valve assembly connector B-15.

(1) Disconnect the connector, and measure the voltage between terminal 1 and earth at the wiring harness side.

(2) Turn the ignition switch to the ON position.

OK: 4.5 – 4.9 V

Q: Is the check result normal?

YES : Go to Step 4.

NO : Go to Step 6.

STEP 4. Measure the resistance at A/T control solenoid valve assembly connector B-15.

Disconnect the connector, and measure the resistance between terminal 1 and 2 at the sensor side.

OK:

- **16.7 – 20.5 kΩ (at 0°C)**
- **7.3 – 8.9 kΩ (at 20°C)**
- **3.4 – 4.2 kΩ (at 40°C)**
- **1.9 – 2.2 kΩ (at 60°C)**
- **1.0 – 1.2 kΩ (at 80°C)**
- **0.57 – 0.69 kΩ (at 100°C)**

Q: Is the check result normal?

YES : Go to Step 5.

NO : Replace the A/T fluid temperature sensor.

STEP 5. M.U.T.-III data list

Item 07: A/T fluid temperature sensor (Refer to Data List Table P.23A-103).

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction).

NO : Replace the A/T-ECU.

STEP 6. Measure the voltage at A/T-ECU connector C-12.

(1) Connect A/T control solenoid valve assembly connector B-15.

(2) Turn the ignition switch to the ON position.

(3) Measure the voltage between A/T-ECU connector C-12 terminal No.44 and earth.

OK:

- **3.8 – 4.0 V (at 20°C)**
- **3.2 – 3.4 V (at 40°C)**
- **1.7 – 1.9 V (at 80°C)**

Q: Is the check result normal?

YES : Go to Step 5.

NO : Go to Step 7.

STEP 7. Connector check: B-10 intermediate connector, C-12 A/T-ECU connector

Check for the contact with terminals.

Q: Is the check result normal?

YES : Go to Step 8.

NO : Repair the defective connector.

STEP 8. Check the harness between A/T control solenoid valve assembly connector B-15 terminal No.1 and A/T-ECU connector C-12 terminal No.44.

Check the output line for short-circuited or open circuit.

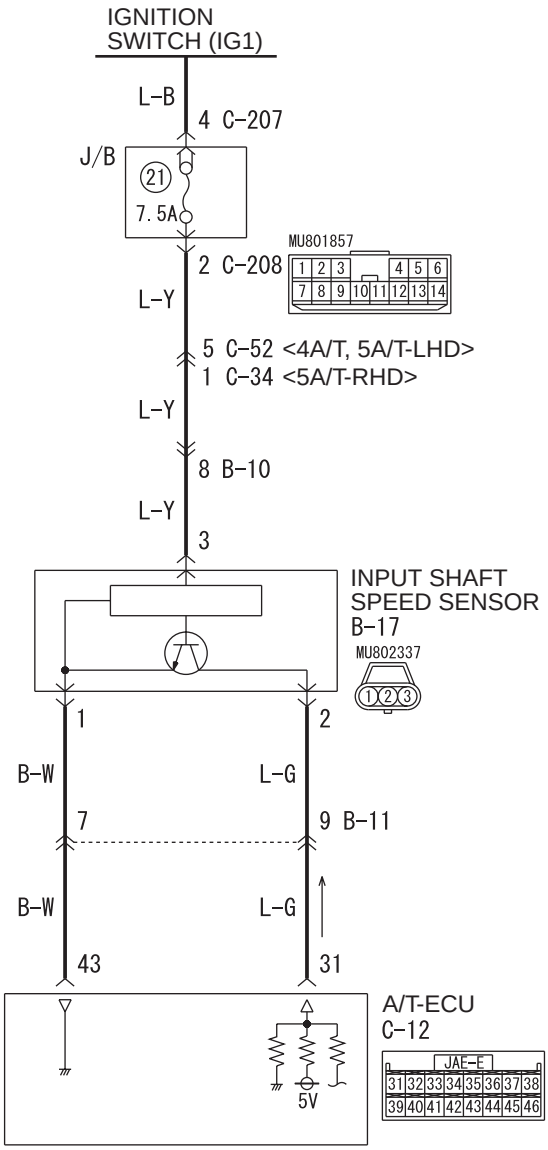
Q: Is the check result normal?

YES : Go to Step 5.

NO : Repair the wiring harness.

Code No.P1766 (P0715) Input shaft speed sensor system

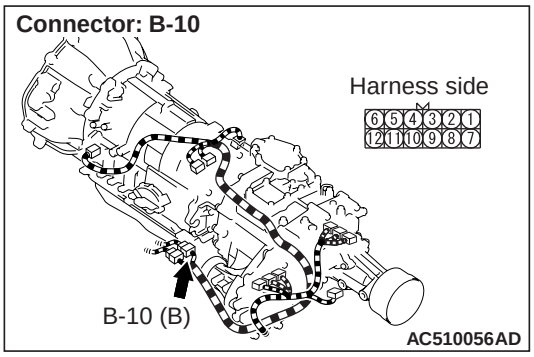
Input Shaft Speed Sensor System Circuit

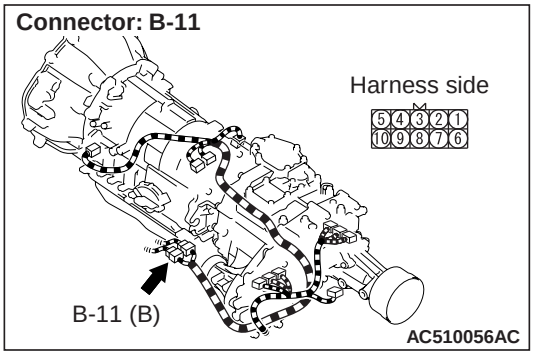


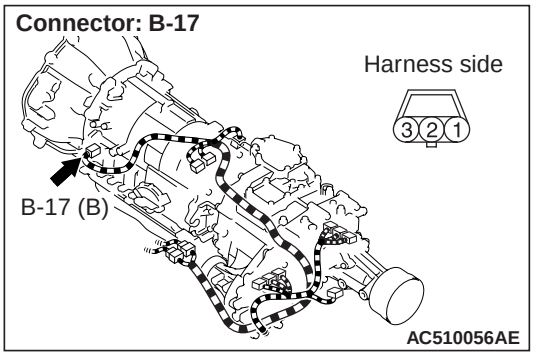
Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

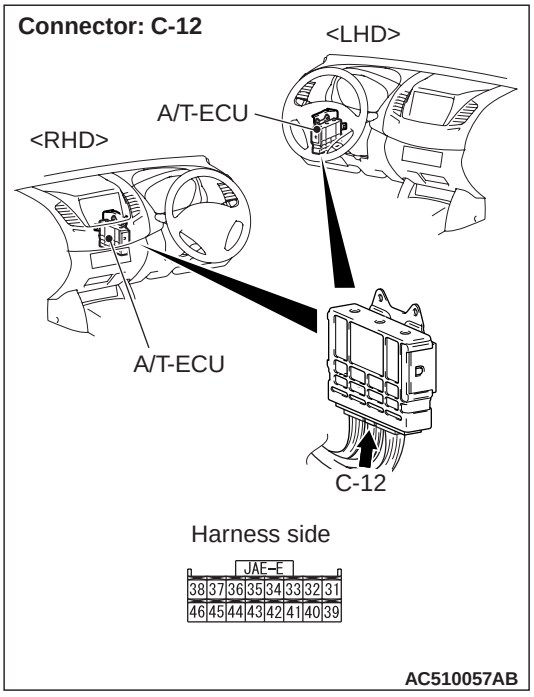
W7C23X003A

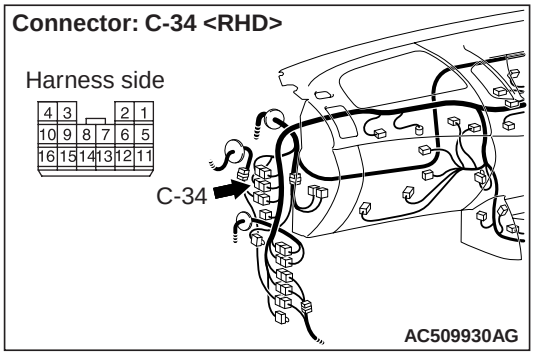
AC903904

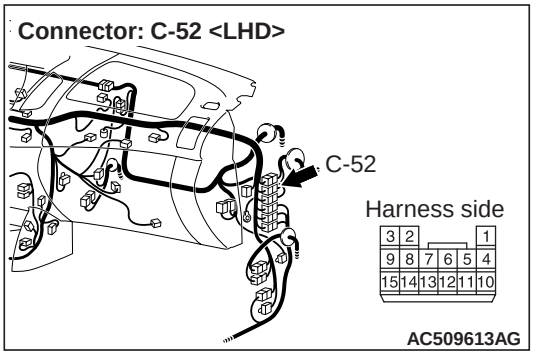


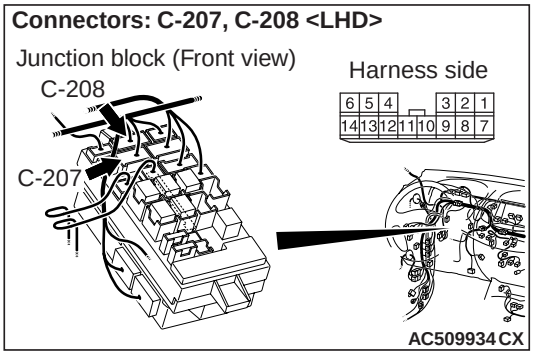


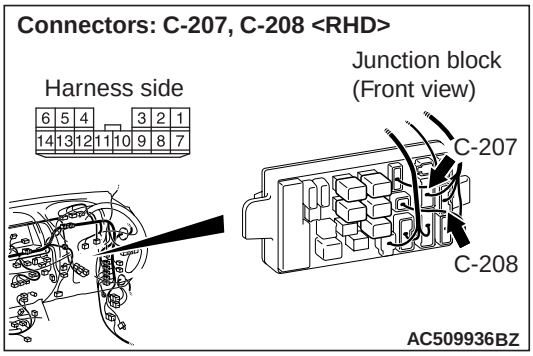












OPERATION

The input shaft speed sensor detects the speed of the underdrive clutch retainer, and sends the information to the A/T-ECU as a pulse signal.

DIAGNOSIS CODE SET CONDITIONS
The diagnosis code No.P1766 (P0715) is set if the input shaft speed sensor does not send a pulse signal for one second or more while the 3rd gears are engaged and the vehicle speed is 40 km/h or more (the output shaft speed sensor speed is 1,000 r/min or more).
If the code No.P1766 (P0715) is set four times, the transmission will be fixed in 3rd gear as a fail-safe measure. However, the transmission can be downshifted to 2nd gear by operating the selector lever.

PROBABLE CAUSES
- Malfunction of input shaft speed sensor
- Malfunction of underdrive clutch retainer
- Damaged harness wires and connectors
- Malfunction of the A/T-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III data list
Item 05: Input shaft speed sensor (Refer to data list reference table P.23A-103).

Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction).
NO : Go to Step 2.

STEP 2. Connector check: B-17 input shaft speed sensor connector
Check for the contact with terminals.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the defective connector.

STEP 3. Measure the resistance at input shaft speed sensor connector B-17.
Disconnect the connector, and measure the resistance between terminal 1 and earth at the wiring harness side.

OK: Continuity (Less than 2 Ω)

Q: Is the check result normal?
YES : Go to Step 9.
NO : Go to Step 4.

STEP 4. Measure the voltage at A/T-ECU connector C-12.
(1) Connect input shaft speed sensor connector B-17.
(2) Turn the ignition switch to the ON position.
(3) Measure the voltage between A/T-ECU connector C-12 terminal No.43 and earth.

OK: 0.5 V or less

Q: Is the check result normal?
YES : Go to Step 7.
NO : Go to Step 5.

STEP 5. Connector check: C-12 A/T-ECU connector
Check for the contact with terminals.

Q: Is the check result normal?
YES : Go to Step 6.
NO : Repair the defective connector.

STEP 6. M.U.T.-III data list
Item 05: Input shaft speed sensor (Refer to data list reference table P.23A-103).

Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction).
NO : Replace the A/T-ECU.

STEP 7. Connector check: B-11 intermediate connector, C-12 A/T-ECU connector
Check for the contact with terminals.

Q: Is the check result normal?
YES : Go to Step 8.
NO : Repair the defective connector.

STEP 8. Check the harness between input shaft speed sensor connector B-17 terminal No.1 and A/T-ECU connector C-12 terminal No.43.
Check the earth line for open circuit.

Q: Is the check result normal?
YES : Go to Step 6.
NO : Repair the wiring harness.

STEP 9. Measure the voltage at input shaft speed sensor connector B-17.
(1) Disconnect the connector, and measure the voltage between terminal 3 and earth at the wiring harness side.
(2) Turn the ignition switch to the ON position.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 12.
NO : Go to Step 10.

STEP 10. Connectors check: C-208 J/B connector, B-10 and C-52 <4A/T, 5A/T-LHD>or C-34 <5A/T-RHD> intermediate connector
Check for the contact with terminals.

Q: Is the check result normal?
YES : Go to Step 11.
NO : Repair the defective connector.

STEP 11. Check the harness between input shaft speed sensor connector B-17 terminal No.3 and junction block connector C-208 terminal No.2.
Check the power supply line for short or open circuit.

Q: Is the check result normal?
YES : Go to Step 6.
NO : Repair the wiring harness.

STEP 12. Measure the voltage at input shaft speed sensor connector B-17.
(1) Disconnect the connector, and measure the voltage between terminal 2 and earth at the wiring harness side.
(2) Turn the ignition switch to the ON position.

OK: 4.5 – 4.9 V

Q: Is the check result normal?
YES : Go to Step 18.
NO : Go to Step 13.

STEP 13. Measure the voltage at A/T-ECU connector C-12.
(1) Disconnect input shaft speed sensor connector B-17.
(2) Turn the ignition switch to the ON position.
(3) Measure the voltage between A/T-ECU connector C-12 terminal No.31 and earth.

OK: 4.5 – 4.9 V

Q: Is the check result normal?
YES : Go to Step 16.
NO : Go to Step 14.

STEP 14. Connector check: B-11 intermediate connector, C-12 A/T-ECU connector
Check for the contact with terminals.

Q: Is the check result normal?
YES : Go to Step 15.
NO : Repair the defective connector.

STEP 15. Check the harness between input shaft speed sensor connector B-17 terminal No.2 and A/T-ECU connector C-12 terminal No.31.
Check the output line for short circuit.

Q: Is the check result normal?
YES : Go to Step 6.
NO : Repair the wiring harness.

STEP 16. Connector check: B-11 intermediate connector, C-12 A/T-ECU connector
Check for the contact with terminals.

Q: Is the check result normal?
YES : Go to Step 17.
NO : Repair the defective connector.

STEP 17. Check the harness between input shaft speed sensor connector B-17 terminal No.2 and A/T-ECU connector C-12 terminal No.31.
Check the output line for open circuit.

Q: Is the check result normal?
YES : Go to Step 6.
NO : Repair the wiring harness.

STEP 18. Measure the output wave pattern of the input shaft speed sensor at A/T-ECU connector C-12 (using an oscilloscope).
(1) Shift the selector lever to the D range.
(2) Accelerate the vehicle to approximately 50 km/h (shift range; 3rd).
(3) Connect an oscilloscope, and measure the voltage between A/T-ECU connector C-12 terminal No.31 and earth.

OK: A wave pattern such as the one shown on P.23A-110 (Check Procedure Using an Oscilloscope) should be output, and the maximum value should be 4.8 V or more and the minimum value should be 0.8 V or less. There should be no noise in the output wave pattern.

Q: Is the check result normal?
YES : Go to Step 6.
NO : Go to Step 19.

STEP 19. Connector check: C-12 A/T-ECU connector
Check for the contact with terminals.

Q: Is the check result normal?
YES : Go to Step 20.
NO : Repair the defective connector.

STEP 20. Replace the input shaft speed sensor and then recheck the diagnosis code.

(1) Replace the input shaft speed sensor.
(2) Test drive the vehicle.
(3) Check if the diagnosis code is set.

Q: Is diagnosis code P1766 set?
YES : Go to Step 21.
NO : The inspection is complete.

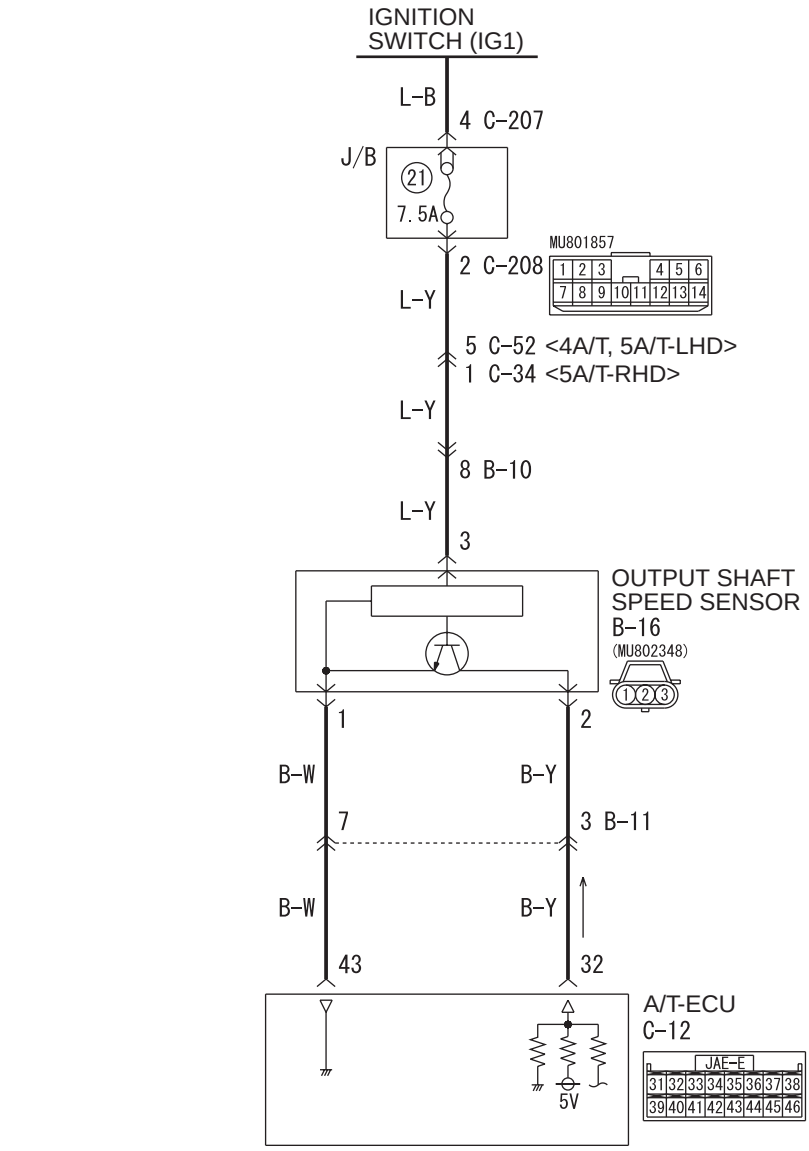
STEP 21. Underdrive clutch retainer inspection

Visually check the underdrive clutch retainer for damage.

Q: Is the check result normal?
YES : Eliminate the cause of the noise.
NO : Replace the underdrive clutch retainer.

Code No.P1767 (P0720) Output shaft speed sensor system

Output Shaft Speed Sensor System Circuit

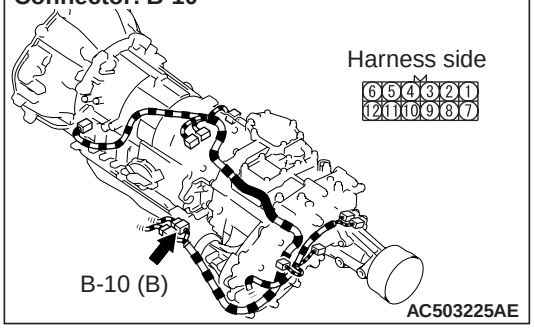


Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

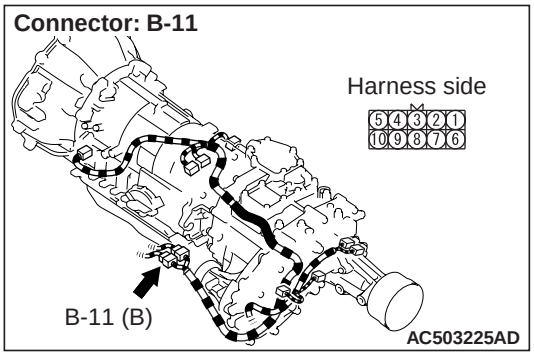
W7C23X005A

AC903905

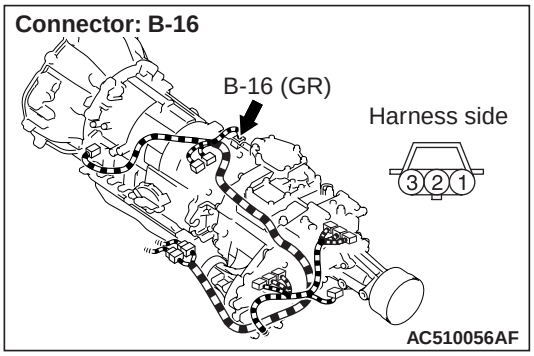
Connector: B-10



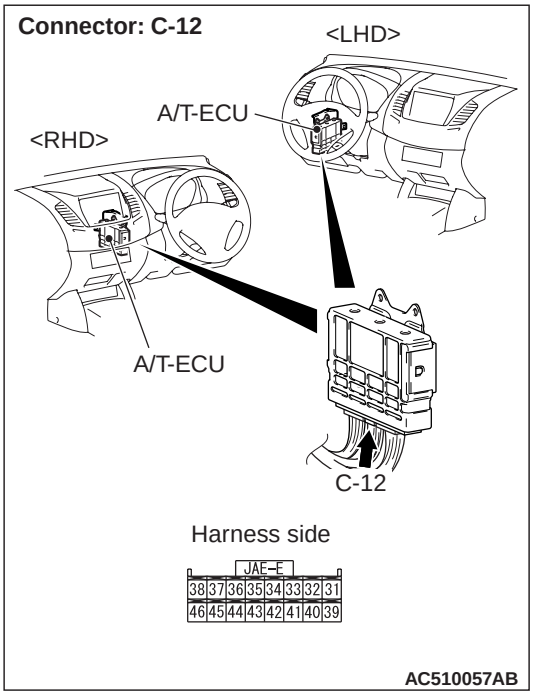
Connector: B-11



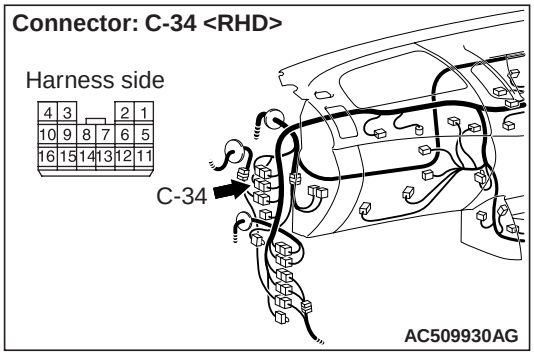
Connector: B-16



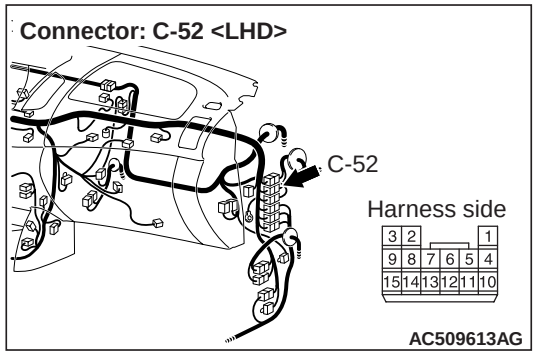
Connector: C-12



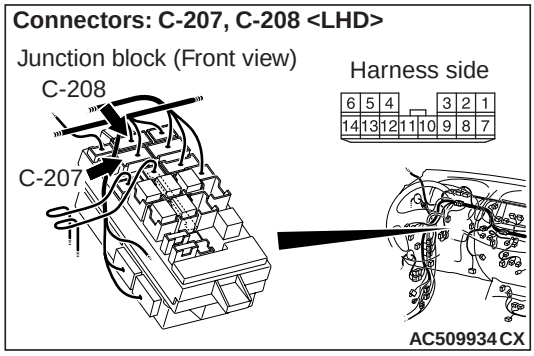
Connector: C-34 <RHD>



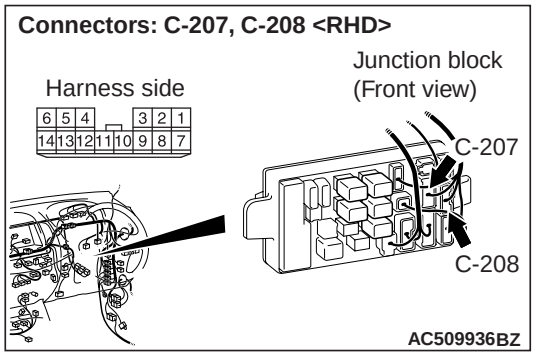
Connector: C-52 <LHD>



Connectors: C-207, C-208 <LHD>



Connectors: C-207, C-208 <RHD>



OPERATION

The output shaft speed sensor detects the speed of the transfer drive gear, and sends the information to the A/T-ECU as a pulse signal.

DIAGNOSIS CODE SET CONDITIONS
If the output pulse from the output shaft speed sensor has been lost for one second or more while the vehicle is being driven, it is judged that there is an open circuit or short circuit in the output shaft speed sensor, and diagnosis code No.P1767 (P0720) is set.
If the code No.P1767 (P0720) is set four times, the transmission will be fixed in 3rd gear as a fail-safe measure. However, the transmission can be downshifted to 2nd gear by operating the selector lever.

PROBABLE CAUSES
- Malfunction of output shaft speed sensor
- Malfunction of output shaft <4A/T>
- Malfunction of direct planetary carrier <5A/T>
- Damaged harness wires and connectors
- Malfunction of the A/T-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III data list
Item 06: Output shaft speed sensor (Refer to data list reference table P.23A-103).

Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction).
NO : Go to Step 2.

STEP 2. Connector check: B-16 output shaft speed sensor connector
Check for the contact with terminals.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the defective connector.

STEP 3. Measure the resistance at output shaft speed sensor connector B-16.
Disconnect the connector, and measure the resistance between terminal 1 and earth at the wiring harness side.

OK: Continuity (Less than 2 Ω)

Q: Is the check result normal?
YES : Go to Step 9.
NO : Go to Step 4.

STEP 4. Measure the voltage at A/T-ECU connector C-12.
(1) Connect output shaft speed sensor connector B-16.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between A/T-ECU connector C-12 terminal No.43 and earth.

OK: 0.5 V or less

Q: Is the check result normal?
YES : Go to Step 7.
NO : Go to Step 5.

STEP 5. Connector check: C-12 A/T-ECU connector
Check for the contact with terminals.

Q: Is the check result normal?
YES : Go to Step 6.
NO : Repair the defective connector.

STEP 6. M.U.T.-III data list
Item 06: Output shaft speed sensor (Refer to data list reference table P.23A-103).

Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction).
NO : Replace the A/T-ECU.

STEP 7. Connector check: B-11 intermediate connector, C-12 A/T-ECU connector
Check for the contact with terminals.

Q: Is the check result normal?
YES : Go to Step 8.
NO : Repair the defective connector.

STEP 8. Check the harness between output shaft speed sensor connector B-16 terminal No.1 and A/T-ECU connector C-12 terminal No.43.
Check the earth line for open circuit.

Q: Is the check result normal?
YES : Go to Step 6.
NO : Repair the wiring harness.

STEP 9. Measure the voltage at output shaft speed sensor connector B-16.
(1) Disconnect the connector, and measure the voltage between terminal 3 and earth at the wiring harness side.
(2) Turn the ignition switch to the ON position.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 12.
NO : Go to Step 10.

STEP 10. Connectors check: C-208 J/B connector, B-10 and C-52 <LHD>or C-34 <RHD> intermediate connector
Check for the contact with terminals.

Q: Is the check result normal?
YES : Go to Step 11.
NO : Repair the defective connector.

STEP 11. Check the harness between output shaft speed sensor connector B-16 terminal No.3 and junction block connector C-208 terminal No.2.
Check the power supply line for short or open circuit.

Q: Is the check result normal?
YES : Go to Step 6.
NO : Repair the wiring harness.

STEP 12. Measure the voltage at output shaft speed sensor connector B-16.
(1) Disconnect the connector, and measure the voltage between terminal 2 and earth at the wiring harness side.
(2) Turn the ignition switch to the ON position.

OK: 4.5 – 4.9 V

Q: Is the check result normal?
YES : Go to Step 18.
NO : Go to Step 13.

STEP 13. Measure the voltage at A/T-ECU connector C-12.
(1) Disconnect output shaft speed sensor connector B-16.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between A/T-ECU connector C-12 terminal No.32 and earth.

OK: 4.5 – 4.9 V

Q: Is the check result normal?
YES : Go to Step 16.
NO : Go to Step 14.

STEP 14. Connector check: B-11 intermediate connector, C-12 A/T-ECU connector
Check for the contact with terminals.

Q: Is the check result normal?
YES : Go to Step 15.
NO : Repair the defective connector.

STEP 15. Check the harness between output shaft speed sensor connector B-16 terminal No.2 and A/T-ECU connector C-12 terminal No.32.
Check the output line for short circuit.

Q: Is the check result normal?
YES : Go to Step 6.
NO : Repair the wiring harness.

STEP 16. Connector check: B-11 intermediate connector, C-12 A/T-ECU connector
Check for the contact with terminals.

Q: Is the check result normal?
YES : Go to Step 17.
NO : Repair the defective connector.

STEP 17. Check the harness between output shaft speed sensor connector B-16 terminal No.2 and A/T-ECU connector C-12 terminal No.32.
Check the output line for open circuit.

Q: Is the check result normal?
YES : Go to Step 6.
NO : Repair the wiring harness.

STEP 18. Measure the output wave pattern of the output shaft speed sensor at A/T-ECU connector C-12 (using an oscilloscope).
(1) Shift the selector lever to the D range.
(2) Accelerate the vehicle to approximately 50 km/h (shift range; 3rd.)
(3) Connect an oscilloscope, and measure the voltage between A/T-ECU connector C-12 terminal No.32 and earth.

OK: A wave pattern such as the one shown on P.23A-110 (Check Procedure Using an Oscilloscope) should be output, and the maximum value should be 4.8 V or more and the minimum value should be 0.8 V or less. There should be no noise in the output wave pattern.

Q: Is the check result normal?
YES : Go to Step 6.
NO : Go to Step 19.

STEP 19. Connector check: C-12 A/T-ECU connector
Check for the contact with terminals.

Q: Is the check result normal?
YES : Go to Step 20.
NO : Repair the defective connector.

STEP 20. Replace the output shaft speed sensor and then recheck the diagnosis code.

(1) Replace the output shaft speed sensor.
(2) Test drive the vehicle.
(3) Check if the diagnosis code is set.

Q: Is diagnosis code P1767 set?
YES : Go to Step 21.
NO : The inspection is complete.

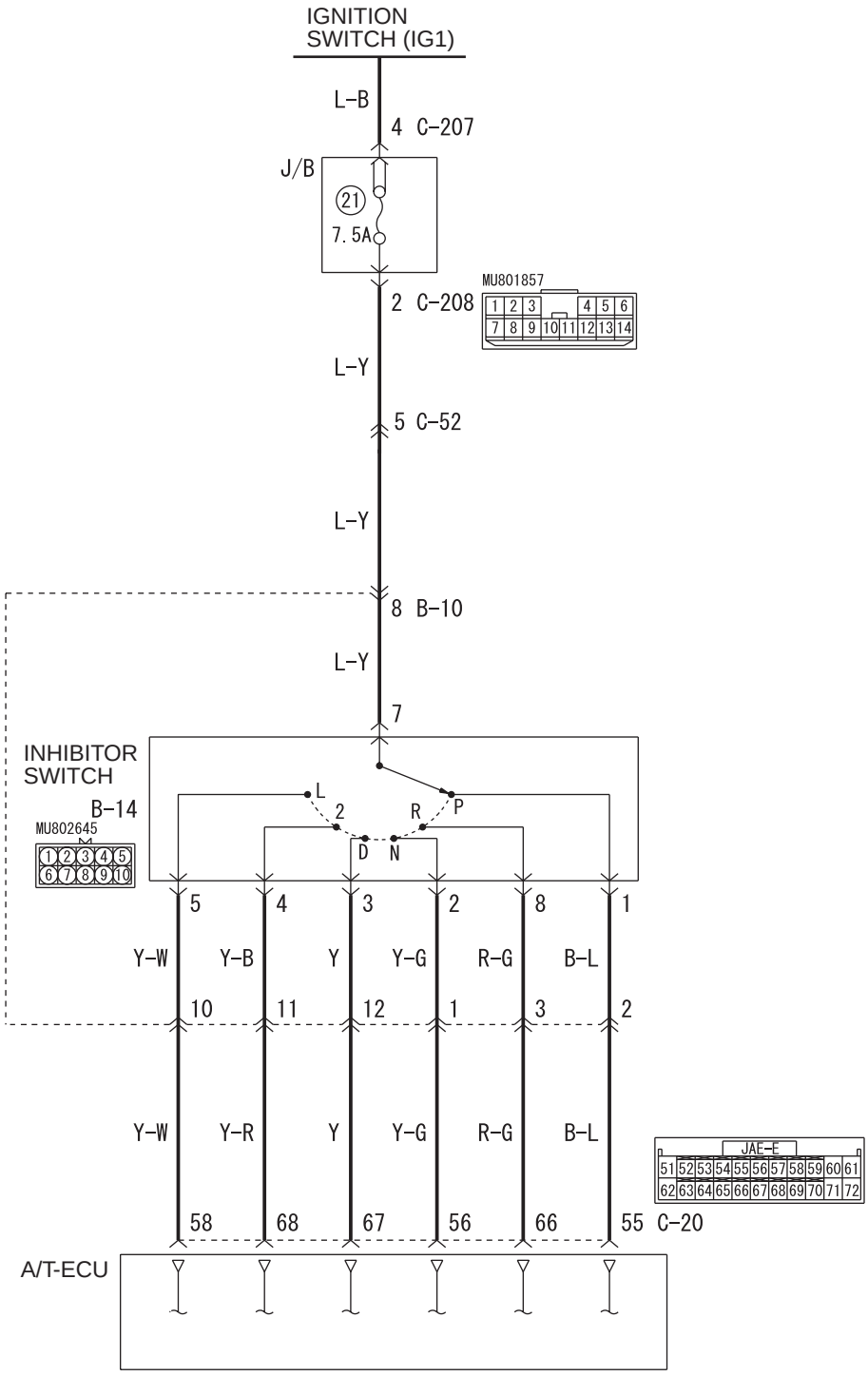
STEP 21. Check the output shaft <4A/T> or direct planetary carrier <5A/T>.

Visually check the output shaft <4A/T> or direct planetary carrier <5A/T> for damage.

Q: Is the check result normal?
YES : Eliminate the cause of the noise.
NO : Replace the output shaft <4A/T> or direct planetary carrier <5A/T>.

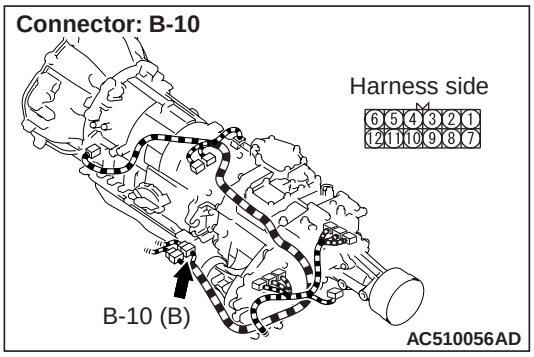
Code No.P1770 (P0705) Inhibitor switch system <4A/T>

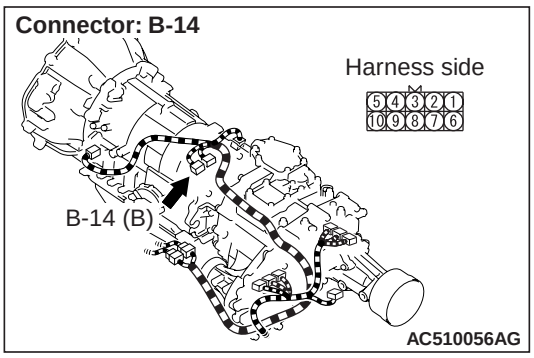
Inhibitor Switch System Circuit

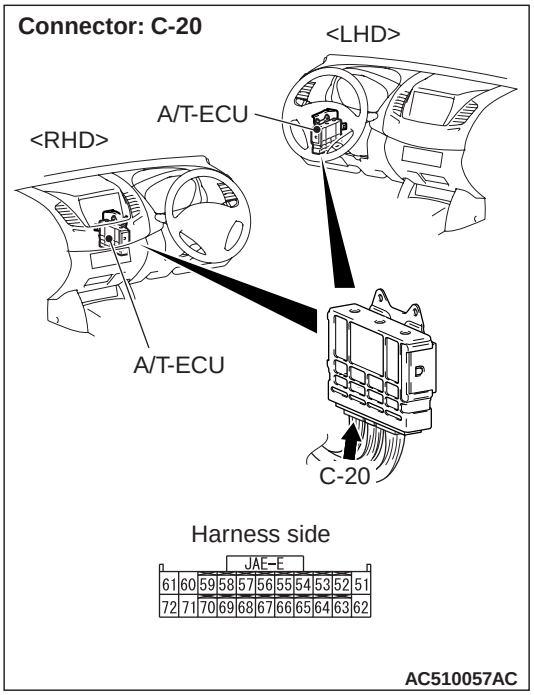


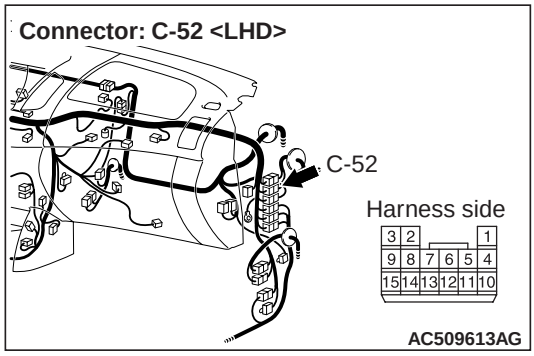
Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

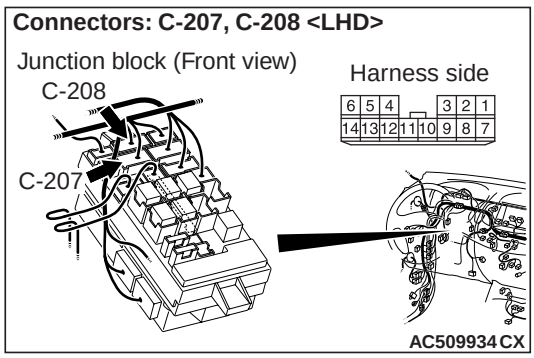
AC903906
W7C23X007A

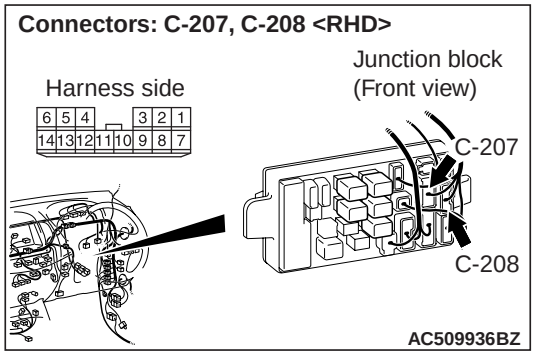












OPERATION

The inhibitor switch detects the selector lever position (P, R, N,D, 2 or L) which the driver has selected, and sends the information to the A/T-ECU.

DIAGNOSIS CODE SET CONDITIONS

If the inhibitor switch has not been sending any signal for at least 30 seconds, an open circuit may be present and diagnosis code No.P1770 (P0705) is set.

PROBABLE CAUSES

- Malfunction of the inhibitor switch
- Damaged harness wires and connectors
- Malfunction of the A/T-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III data list

Item 34: Inhibitor switch P.23A-103 (Refer to data list reference table).

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction).

NO <none of the selector lever positions are displayed on M.U.T.-III> : Go to Step 2.

NO <only one of the selector lever positions is not displayed on M.U.T.-III> : Go to Step 6.

STEP 2. Check the inhibitor switch.
Refer to P.23A-113.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Replace the inhibitor switch.

STEP 3. Connector check: B-14 Inhibitor switch connector, C-208 J/B connector, B-10 and C-52 intermediate connector
Check for the contact with terminals.

Q: Is the check result normal?
YES : Go to Step 4.
NO : Repair the defective connector.

STEP 4. Check the harness between inhibitor switch connector B-14 terminal No.7 and J/B connector C-208 terminal No.2.
Check the power supply line for open circuit.

Q: Is the check result normal?
YES : Go to Step 5.
NO : Repair the wiring harness.

STEP 5. M.U.T.-III data list
Item 34: Inhibitor switch P.23A-103 (Refer to data list reference table).

Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction).
NO : Replace the A/T-ECU.

STEP 6. Check the inhibitor switch.
Refer to P.23A-118.

Q: Is the check result normal?
YES : Go to Step 7.
NO : Replace the inhibitor switch.

STEP 7. Connector check: B-14 inhibitor switch connector, C-20 A/T-ECU connector, B-10 intermediate connector.
Check for the contact with terminals.

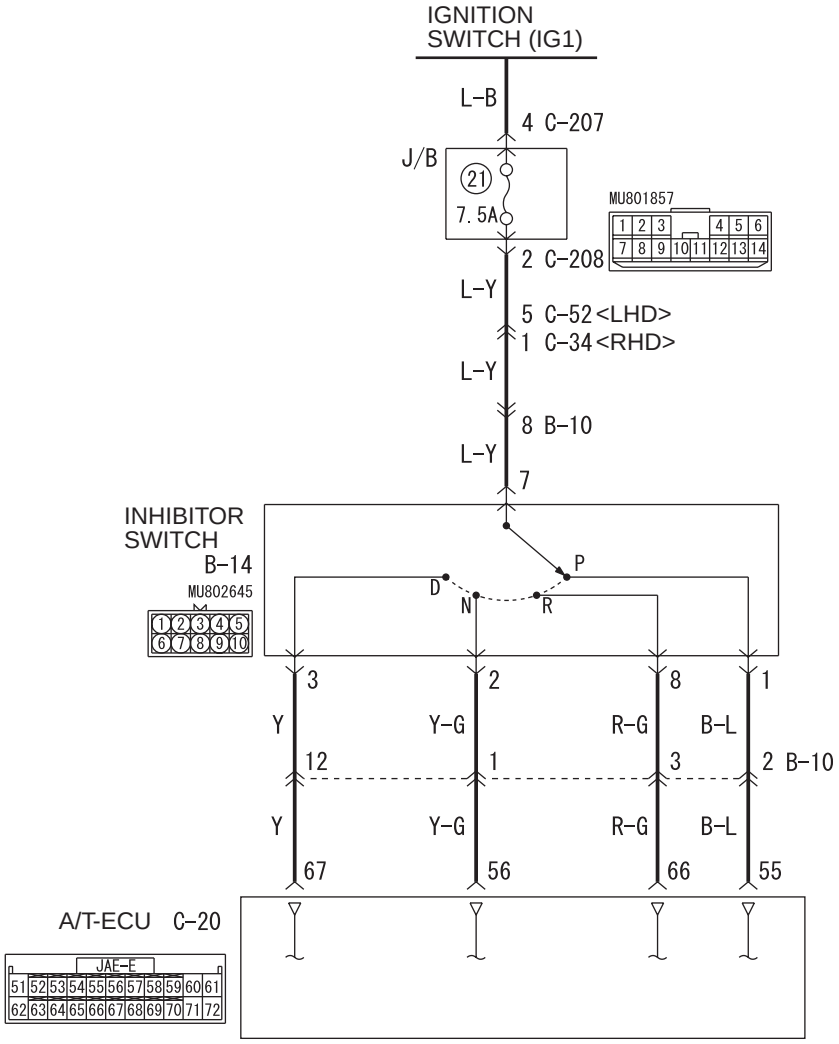
Q: Is the check result normal?
YES : Go to Step 8.
NO : Repair the defective connector.

STEP 8. Check the harness between inhibitor switch connector B-14 terminal No.1, 8, 2, 3, 4, 5 and A/T-ECU connector C-20 terminal No.55, 66, 56, 67, 68, 58.
Check the output line for open circuit.

Q: Is the check result normal?
YES : Go to Step 5.
NO : Repair the wiring harness.

Code No.P1770 (P0705): Inhibitor switch system <5A/T>

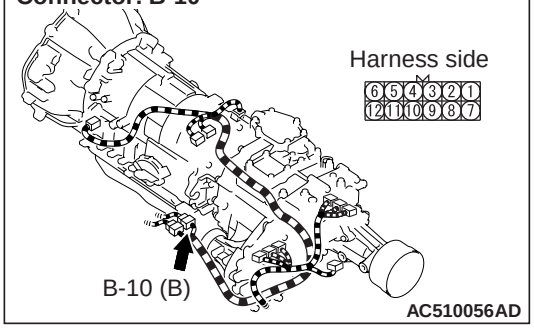
Inhibitor switch system circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

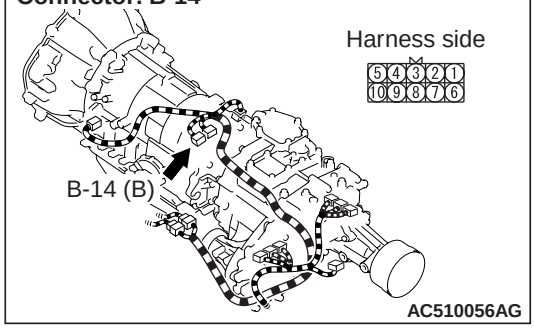
AC903907

Connector: B-10



AC510056AD

Connector: B-14



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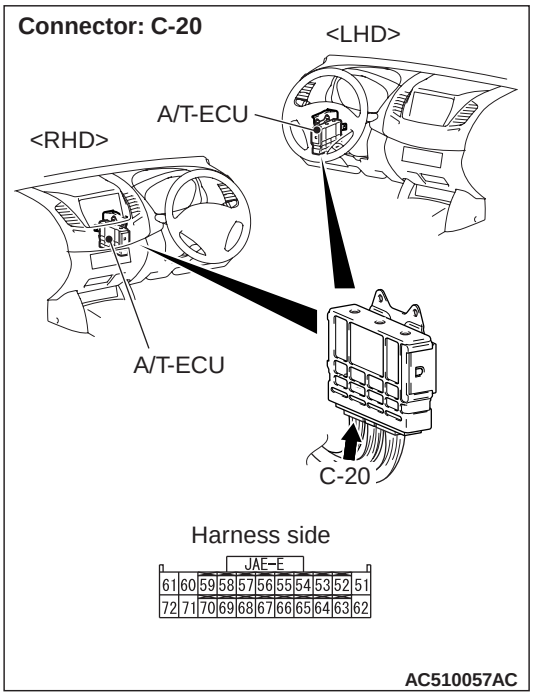
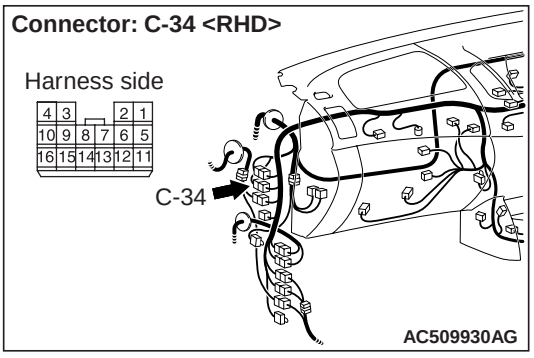
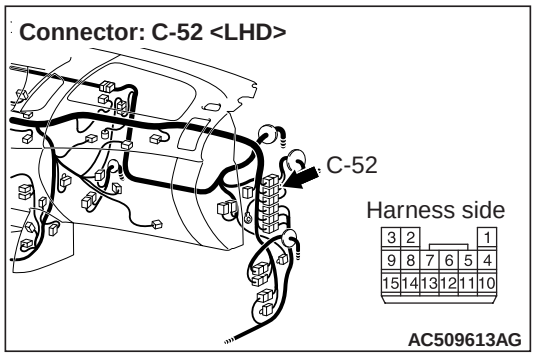
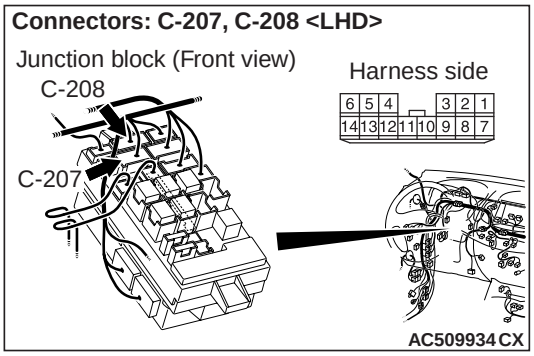
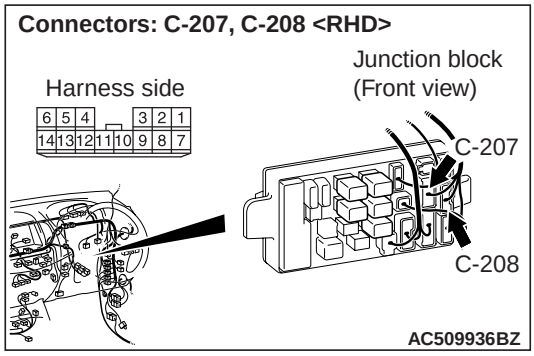










OPERATION

The inhibitor switch detects the selector lever position (P, R, N, D) which the driver has selected, and sends the information to the ECU.

DIAGNOSIS CODE SET CONDITIONS

If the inhibitor switch has not been sending any signal for at least 30 seconds, an open circuit may be present and diagnosis code No.P1770 (P0705) is set.

PROBABLE CAUSES

- Malfunction of the inhibitor switch
- Damaged harness wires and connectors
- Malfunction of the A/T-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III data list

Item 34: Inhibitor switch (Refer to Data List Reference Table P.23A-103).

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction).

NO none of the selector lever positions are displayed on M.U.T.-III : Go to Step 2.

NO only one of the selector lever positions is not displayed on M.U.T.-III : Go to Step 6.

STEP 2. Check the inhibitor switch.

Refer to P.23A-118.

Q: Is the check result normal?

YES : Go to Step 3.

NO : Replace the inhibitor switch.

STEP 3. Connector check: B-14 Inhibitor switch connector, C-208 J/B connector, C-52 <LHD> or C-34 <RHD> and B-10 intermediate connector
Check for the contact with terminals.

Q: Is the check result normal?
YES : Go to Step 4.
NO : Repair the defective connector.

STEP 4. Check the harness between inhibitor switch connector B-14 terminal No.7 and J/B connector C-208 terminal No 2.
Check the power supply line for open circuit.

Q: Is the check result normal?
YES : Go to Step 5.
NO : Repair the wiring harness.

STEP 5. M.U.T.-III data list
Item 34: Inhibitor switch (Refer to Data List Reference Table P.23A-103).

Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction).
NO : Replace the A/T-ECU.

STEP 6. Check the inhibitor switch.
Refer to P.23A-118.

Q: Is the check result normal?
YES : Go to Step 7.
NO : Replace the inhibitor switch.

STEP 7. Connector check: B-14 inhibitor switch connector, C-20 A/T-ECU connector, B-10 intermediate connector.
Check for the contact with terminals.

Q: Is the check result normal?
YES : Go to Step 8.
NO : Repair the defective connector.

STEP 8. Check the harness between inhibitor switch connector B-14 terminal No.3, 2, 8, 1 A/T-ECU connector C-20 terminal No.67, 56, 66, 55.
Check the output line for open circuit.

Q: Is the check result normal?
YES : Go to Step 5.
NO : Repair the wiring harness.

Code No.P1771 (P0705) Inhibitor switch system <4A/T>

INHIBITOR SWITCH SYSTEM CIRCUIT
Refer to P.23A-46.

OPERATION
Refer to P.23A-46.

DIAGNOSIS CODE SET CONDITIONS
If the inhibitor switch has been sending multiple signals for at least 30 seconds, the circuit may be open and diagnosis code No.P1771 (P0705) is set.

PROBABLE CAUSES
- Malfunction of the inhibitor switch
- Damaged harness wires and connectors
- Malfunction of the A/T-ECU

DIAGNOSIS PROCEDURE

STEP 1. Check the inhibitor switch.
Refer to P.23A-113.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Replace the inhibitor switch.

STEP 2. Connector check: B-14 Inhibitor switch connector, B-10 intermediate connector, C-20 A/T-ECU connector
Check for the contact with terminals.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the defective connector.

STEP 3. Check the harness between inhibitor switch connector B-14 terminal No.1, 8, 2, 3, 4, 5 and A/T-ECU connector C-20 terminal No.55, 66, 56, 67, 68, 58.
Check the output line for open circuit or short circuit.

Q: Is the check result normal?
YES : Go to Step 4.
NO : Repair the wiring harness.

STEP 4. M.U.T.-III data list
Item 34: Inhibitor switch P.23A-103 (Refer to data list reference table).

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction).
NO : Replace the A/T-ECU.

Code No.P1771 (P0705): Inhibitor switch system <5A/T>

INHIBITOR SWITCH SYSTEM CIRCUIT
Refer to P.23A-49.

OPERATION
Refer to P.23A-49.

DIAGNOSIS CODE SET CONDITIONS
If the inhibitor switch has been sending multiple signals for at least 30 seconds, the circuit may be open and diagnosis code No.P1771 (P0705) is set.

PROBABLE CAUSES
- Malfunction of the inhibitor switch
- Damaged harness wires and connectors
- Malfunction of the A/T-ECU

DIAGNOSIS PROCEDURE

STEP 1. Check the inhibitor switch.
Refer to P.23A-118.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Replace the inhibitor switch.

STEP 2. Connector check: B-14 Inhibitor switch connector, B-10 intermediate connector C-20 A/T-ECU connector
Check for the contact with terminals.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the defective connector.

STEP 3. Check the harness between inhibitor switch connector B-14 terminal No.3, 2, 8, 1 and A/T-ECU connector C-20 terminal No.67, 56, 66, 55.
Check the output line for open circuit or short circuit.

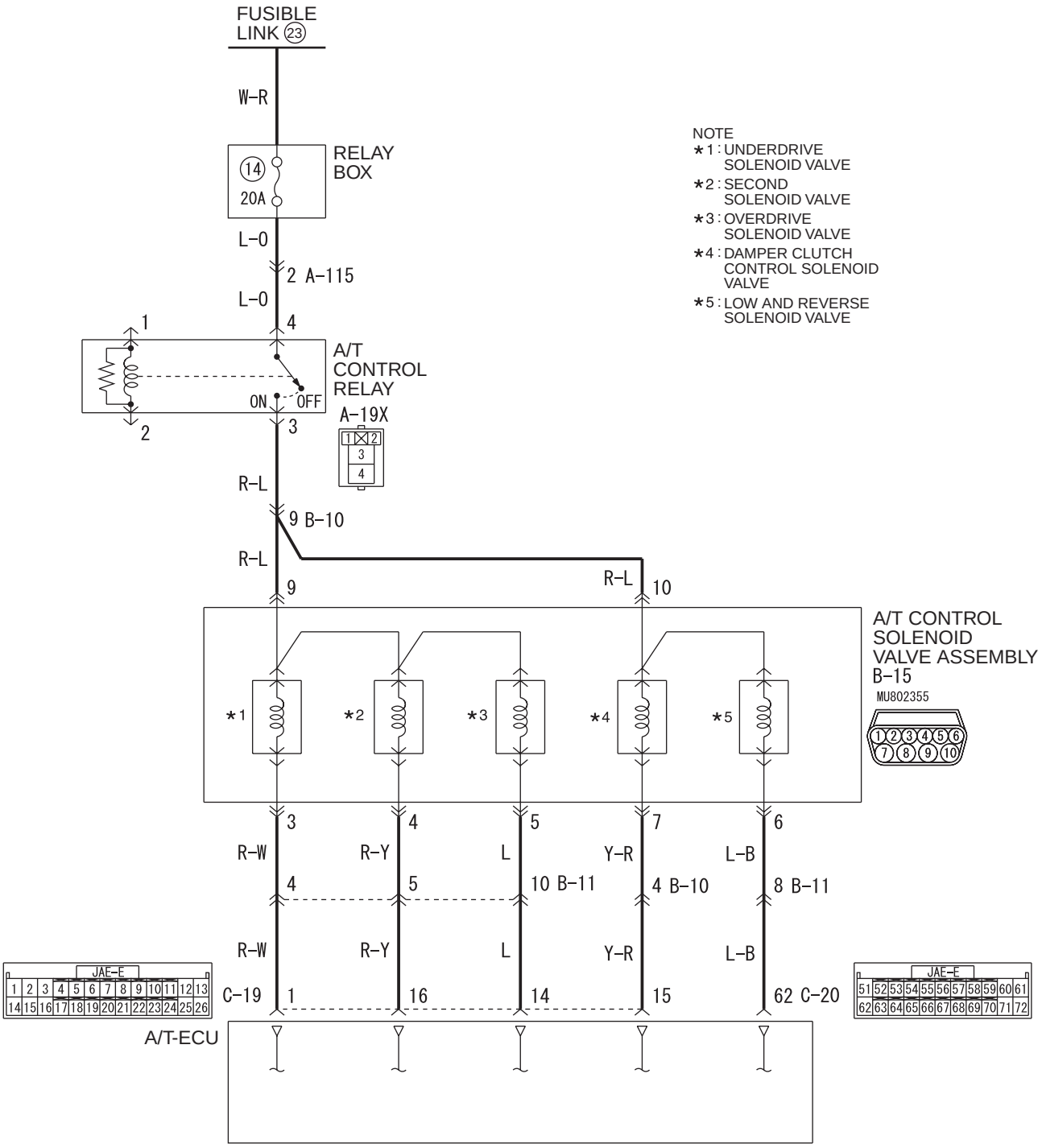
Q: Is the check result normal?
YES : Go to Step 4.
NO : Repair the wiring harness.

STEP 4. M.U.T.-III data list
Item 34: Inhibitor switch (Refer to Data List Reference Table P.23A-103).

Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction).
NO : Replace the A/T-ECU.

Code No.P1773 (P0750) Low-reverse solenoid valve system

Solenoid Valve System Circuit <4A/T>

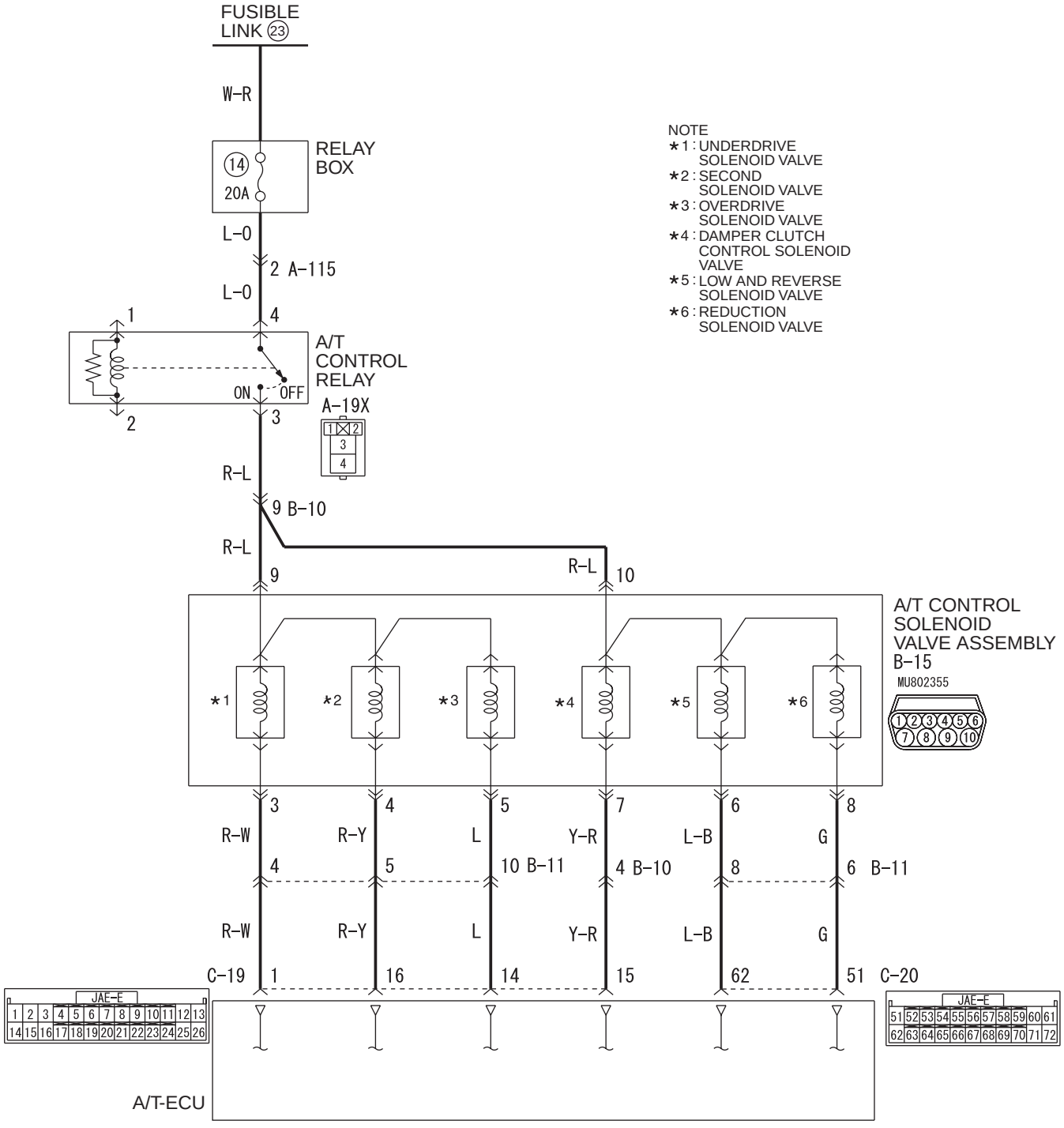


NOTE
*1 : UNDERDRIVE SOLENOID VALVE
*2 : SECOND SOLENOID VALVE
*3 : OVERDRIVE SOLENOID VALVE
*4 : DAMPER CLUTCH CONTROL SOLENOID VALVE
*5 : LOW AND REVERSE SOLENOID VALVE

Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

AC903908
W7C23X010A

Solenoid Valve System Circuit <5A/T>

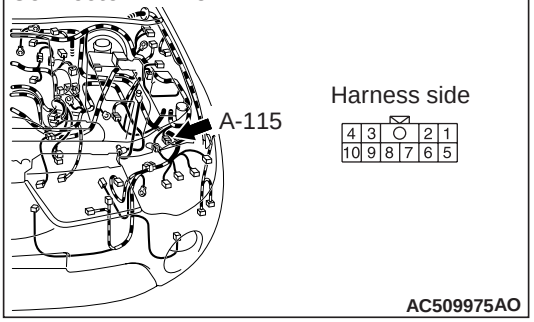


NOTE
*1 : UNDERDRIVE SOLENOID VALVE
*2 : SECOND SOLENOID VALVE
*3 : OVERDRIVE SOLENOID VALVE
*4 : DAMPER CLUTCH CONTROL SOLENOID VALVE
*5 : LOW AND REVERSE SOLENOID VALVE
*6 : REDUCTION SOLENOID VALVE

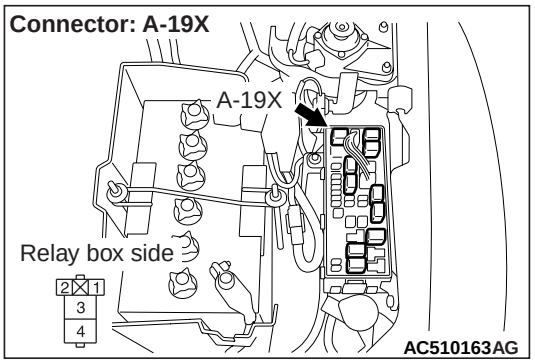
Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

AC903909
W7C23X010A

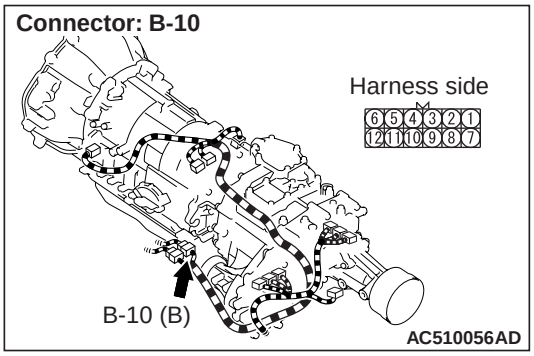
Connector: A-115



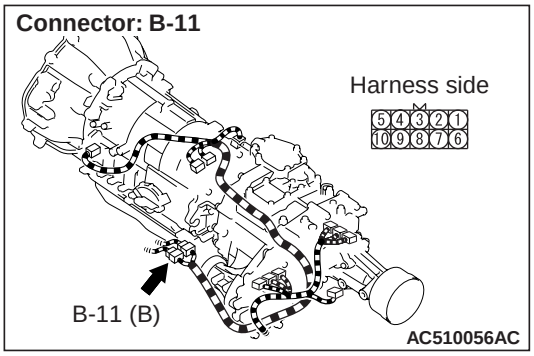
Connector: A-19X



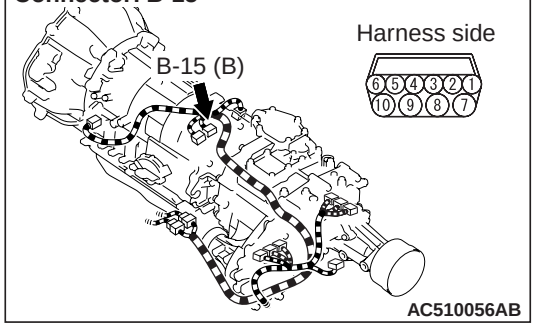
Connector: B-10



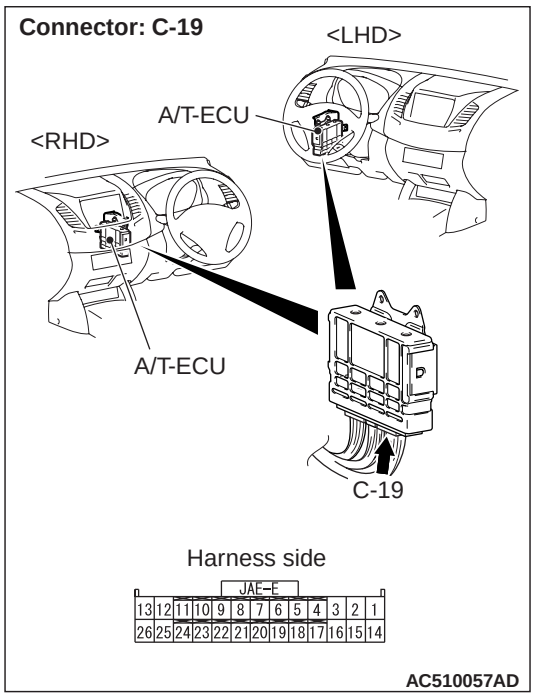
Connector: B-11



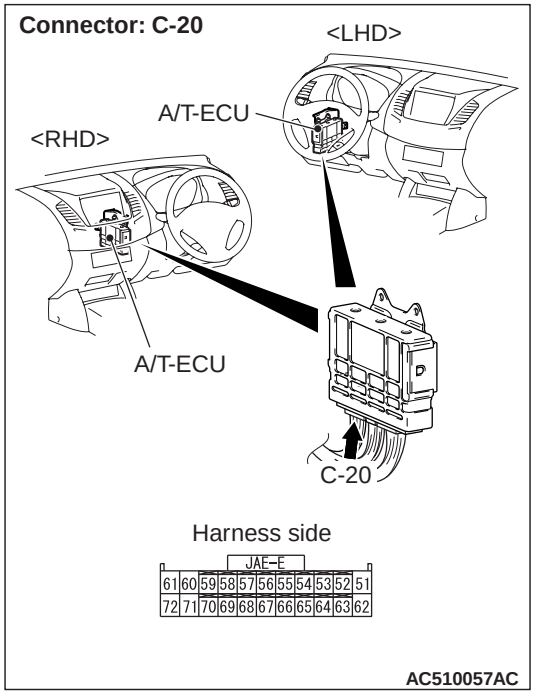
Connector: B-15



Connector: C-19



Connector: C-20



OPERATION
- Solenoid valve closes or opens according to the signals from the A/T-ECU.
- The A/T-ECU energizes or deenergizes solenoid valve, based on input signals such as accelerator pedal position sensor opening angle, inhibitor switch, etc.

DIAGNOSIS CODE SET CONDITIONS
If the drive terminal voltage of the low-reverse solenoid valve is 3.0 V or less, it is judged that there is a short circuit or open circuit in the low-reverse solenoid valve, and diagnosis code No.P1773 (P0750) is set.
If diagnosis code No.P1773 (P0750) is output 4 times, the transmission is fixed in 3rd as a fail-safe measure.

PROBABLE CAUSES
- Malfunction of low-reverse solenoid valve
- Damaged harness wires and connectors
- Malfunction of the A/T-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code

Q: Is diagnosis code P1778 (P0740), P1777 (P0770) <5A/T> set?
YES : Go to Step 9.
NO : Go to Step 2.

STEP 2. M.U.T.-III actuator test
Item 01: Low-reverse solenoid valve

OK: Operating sound can be heard.

Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction .)
NO : Go to Step 3.

STEP 3. Connector check: B-15 A/T control solenoid valve assembly connector
Check for the contact with terminals.

Q: Is the check result normal?
YES : Go to Step 4.
NO : Repair the defective connector.

STEP 4. Measure the resistance at A/T control solenoid valve assembly connector B-15.
Disconnect the connector, and measure the resistance between terminal No.6 and No.10 at the solenoid valve side.

OK: 2.7 – 3.4 Ω (A/T fluid temperature 20°C)

Q: Is the check result normal?
YES : Go to Step 5.
NO : Check the low-reverse solenoid valve and solenoid valve harness.

STEP 5. Measure the voltage at A/T-ECU connector C-20.
(1) Connect A/T control solenoid valve assembly connector B-15.
(2) Turn the ignition switch to the ON position.
(3) Measure the voltage between A/T-ECU connector C-20 terminal No.62 and earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 8.
NO : Go to Step 6.

STEP 6. Connector check: B-11 intermediate connector, C-20 A/T-ECU connector
Check for the contact with terminals.

Q: Is the check result normal?
YES : Go to Step 7.
NO : Repair the defective connector.

STEP 7. Check the harness between A/T control solenoid valve assembly connector B-15 terminal No.6 and A/T-ECU connector C-20 terminal No.62.
Check the output line for short or open circuit.

Q: Is the check result normal?
YES : Go to Step 8.
NO : Repair the wiring harness.

STEP 8. M.U.T.-III actuator test
Item 01: Low-reverse solenoid valve

OK: Operating sound can be heard.

Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction .)
NO : Replace the A/T-ECU.

STEP 9. Connector check: B-15 A/T control solenoid valve assembly connector
Check for the contact with terminals.

Q: Is the check result normal?
YES : Go to Step 10.
NO : Repair the defective connector.

STEP 10. Measure the resistance at A/T control solenoid valve assembly connector B-15.
Disconnect the connector, and measure the resistance between terminal No.6 and No.10 at the solenoid valve side.

OK: 2.7 – 3.4 Ω (A/T fluid temperature 20°C)

Q: Is the check result normal?
YES : Go to Step 11.
NO : Check the solenoid valve harness.

STEP 11. Connector check: A-19X A/T control relay connector, B-10 intermediate connector
Check for the contact with terminals.

Q: Is the check result normal?
YES : Go to Step 12.
NO : Repair the defective connector.

STEP 12. Check the harness between A/T control solenoid valve assembly connector B-15 terminal No.10 and A/T control relay connector A-19X terminal No.3.
Check the power supply line for short or open circuit.

Q: Is the check result normal?
YES : Go to Step 8.
NO : Repair the wiring harness.

Code No.P1774 (P0755) Underdrive solenoid valve system

SOLENOID VALVE SYSTEM CIRCUIT
Refer to P.23A-53.

OPERATION
Refer to P.23A-53.

DIAGNOSIS CODE SET CONDITIONS
If the drive terminal voltage of the underdrive solenoid valve is 3.0 V or less, it is judged that there is a short-circuit or open circuit in the solenoid valve, and diagnosis code No.P1774 (P0755) is output.
If diagnosis code No.P1774 (P0755) is output 4 times, the transmission is fixed in 3rd as a fail-safe measure.

PROBABLE CAUSES
- Malfunction of underdrive solenoid valve
- Damaged harness wires and connectors
- Malfunction of the A/T-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code

Q: Are diagnosis codes P1775 (P0760) and P1776 (P0765) set?
YES : Go to Step 9.
NO : Go to Step 2.

STEP 2. M.U.T.-III actuator test
Item 02: Underdrive solenoid valve

OK: Operating sound can be heard.

Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction .)
NO : Go to Step 3.

STEP 3. Connector check: B-15 A/T control solenoid valve assembly connector
Check for the contact with terminals.

Q: Is the check result normal?
YES : Go to Step 4.
NO : Repair the defective connector.

STEP 4. Measure the resistance at A/T control solenoid valve assembly connector B-15.
Disconnect the connector, and measure the resistance between terminal No.3 and No.9 at the solenoid valve side.

OK: 2.7 – 3.4 Ω (A/T fluid temperature 20°C)

Q: Is the check result normal?
YES : Go to Step 5.
NO : Check the underdrive solenoid valve.

STEP 5. Measure the voltage at A/T-ECU connector C-19.
(1) Connect A/T control solenoid valve assembly

connector B-15.
(2) Turn the ignition switch to the ON position.
(3) Measure the voltage between A/T-ECU connector C-19 terminal No.1 and earth.

OK: 6 – 9 V

Q: Is the check result normal?
YES : Go to Step 8.
NO : Go to Step 6.

STEP 6. Connector check: B-11 intermediate connector, C-19 A/T-ECU connector
Check for the contact with terminals.

Q: Is the check result normal?
YES : Go to Step 7.
NO : Repair the defective connector.

STEP 7. Check the harness between A/T control solenoid valve assembly connector B-15 terminal No.3 and A/T-ECU connector C-19 terminal No.1.
Check the output line for short or open circuit.

Q: Is the check result normal?
YES : Go to Step 8.
NO : Repair the wiring harness.

STEP 8. M.U.T.-III actuator test
Item 02: Underdrive solenoid valve

OK: Operating sound can be heard.

Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction .)
NO : Replace the A/T-ECU.

STEP 9. Connector check: B-15 A/T control solenoid valve assembly connector
Check for the contact with terminals.

Q: Is the check result normal?
YES : Go to Step 10.
NO : Repair the defective connector.

STEP 10. Measure the resistance at A/T control solenoid valve assembly connector B-15.
Disconnect the connector, and measure the resistance between terminal No.3 and No.9 at the solenoid valve side.

OK: 2.7 – 3.4 Ω (A/T fluid temperature 20°C)

Q: Is the check result normal?
YES : Go to Step 11.
NO : Check the solenoid valve harness.

STEP 11. Connector check: A-19X A/T control relay connector, B-10 intermediate connector
Check for the contact with terminals.

Q: Is the check result normal?
YES : Go to Step 12.
NO : Repair the defective connector.

STEP 12. Check the harness between A/T control solenoid valve assembly connector B-15 terminal No.9 and A/T control relay connector A-19X terminal No.3.
Check the power supply line for short or open circuit.

Q: Is the check result normal?
YES : Go to Step 8.
NO : Repair the wiring harness.

Code No.P1775 (P0760) Second solenoid valve system

SOLENOID VALVE SYSTEM CIRCUIT
Refer to P.23A-53.

OPERATION
Refer to P.23A-53.

DIAGNOSIS CODE SET CONDITIONS
If the drive terminal voltage of the second solenoid valve is 3.0 V or less, it is judged that there is a short circuit or open circuit in the second solenoid valve, and diagnosis code No.P1775 (P0760) is output.
If diagnosis code No.P1775 (P0760) is output 4 times, the transmission is fixed in 3rd as a fail-safe measure.

PROBABLE CAUSES
- Malfunction of second solenoid valve
- Damaged harness wires and connectors
- Malfunction of the A/T-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code.

Q: Are diagnosis code P1774 (P0755) and P1776 (P0765) set?
YES : Go to Step 9.
NO : Go to Step 2.

STEP 2. M.U.T.-III actuator test
Item 03: Second solenoid valve

OK: Operating sound can be heard.

Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction .)
NO : Go to Step 3.

STEP 3. Connector check: B-15 A/T control solenoid valve assembly connector
Check for the contact with terminals.

Q: Is the check result normal?
YES : Go to Step 4.
NO : Repair the defective connector.

STEP 4. Measure the resistance at A/T control solenoid valve assembly connector B-15.
Disconnect the connector, and measure the resistance between terminal No.4 and No.9 at the solenoid valve side.

OK: 2.7 – 3.4 Ω (A/T fluid temperature 20°C)

Q: Is the check result normal?
YES : Go to Step 5.
NO : Check the second solenoid valve and solenoid valve harness.

STEP 5. Measure the voltage at A/T-ECU connector C-19.
(1) Connect A/T control solenoid valve assembly connector B-15.
(2) Turn the ignition switch to the ON position.
(3) Measure the voltage between A/T-ECU connector C-19 terminal No.16 and earth.

OK: 6 – 9 V

Q: Is the check result normal?
YES : Go to Step 8.
NO : Go to Step 6.

STEP 6. Connector check: B-11 intermediate connector, C-19 A/T-ECU connector
Check for the contact with terminals.

Q: Is the check result normal?
YES : Go to Step 7.
NO : Repair the defective connector.

STEP 7. Check the harness between A/T control solenoid valve assembly connector B-15 terminal No.4 and A/T-ECU connector C-19 terminal No.16.
Check the output line for short or open circuit.

Q: Is the check result normal?
YES : Go to Step 8.
NO : Repair the wiring harness.

STEP 8. M.U.T.-III actuator test
Item 03: Second solenoid valve

OK: Operating sound can be heard.

Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction .)
NO : Replace the A/T-ECU.

STEP 9. Connector check: B-15 A/T control solenoid valve assembly connector
Check for the contact with terminals.

Q: Is the check result normal?
YES : Go to Step 10.
NO : Repair the defective connector.

STEP 10. Measure the resistance at A/T control solenoid valve assembly connector B-15.
Disconnect the connector, and measure the resistance between terminal No.4 and No.9 at the solenoid valve side.

OK: 2.7 – 3.4 Ω (A/T fluid temperature 20°C)

Q: Is the check result normal?
YES : Go to Step 11.
NO : Check the solenoid valve harness.

STEP 11. Connector check: A-19X A/T control relay connector, B-10 intermediate connector
Check for the contact with terminals.

Q: Is the check result normal?
YES : Go to Step 12.
NO : Repair the defective connector.

STEP 12. Check the harness between A/T control solenoid valve assembly connector B-15 terminal No.9 and A/T control relay connector A-19X terminal No.3.
Check the power supply line for short or open circuit.

Q: Is the check result normal?
YES : Go to Step 8.
NO : Repair the wiring harness.

Code No.P1776 (P0765) Overdrive solenoid valve system

SOLENOID VALVE SYSTEM CIRCUIT
Refer to P.23A-53.

OPERATION
Refer to P.23A-53.

DIAGNOSIS CODE SET CONDITIONS
If the drive terminal voltage of the overdrive solenoid valve is 3.0 V or less, it is judged that there is a short circuit or open circuit in the overdrive solenoid valve, and diagnosis code No.P1776 (P0765) is output.
If diagnosis code No.P1776 (P0765) is output 4 times, the transmission is fixed in 3rd as a fail-safe measure.

PROBABLE CAUSES
- Malfunction of overdrive solenoid valve
- Damaged harness wires and connectors
- Malfunction of the A/T-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code

Q: Are diagnosis codes P1774 (P0755) and P1775 (P0760) set?
YES : Go to Step 9.
NO : Go to Step 2.

STEP 2. M.U.T.-III actuator test
Item 04: Overdrive solenoid valve

OK: Operating sound can be heard.

Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction .)
NO : Go to Step 3.

STEP 3. Connector check: B-15 A/T control solenoid valve assembly connector
Check for the contact with terminals.

Q: Is the check result normal?
YES : Go to Step 4.
NO : Repair the defective connector.

STEP 4. Measure the resistance at A/T control solenoid valve assembly connector B-15.
Disconnect the connector, and measure the resistance between terminal No.5 and No.9 at the solenoid valve side.

OK: 2.7 – 3.4 Ω (A/T fluid temperature 20°C)

Q: Is the check result normal?
YES : Go to Step 5.
NO : Check the overdrive solenoid valve and solenoid valve harness.

STEP 5. Measure the voltage at A/T-ECU connector C-19.
(1) Connect A/T control solenoid valve assembly connector B-15.
(2) Turn the ignition switch to the ON position.
(3) Measure the voltage between A/T-ECU connector C-19 terminal No.14 and earth.

OK: 6 – 9 V

Q: Is the check result normal?
YES : Go to Step 8.
NO : Go to Step 6.

STEP 6. Connector check: B-11 intermediate connector, C-19 A/T-ECU connector
Check for the contact with terminals.

Q: Is the check result normal?
YES : Go to Step 7.
NO : Repair the defective connector.

STEP 7. Check the harness between A/T control solenoid valve assembly connector B-15 terminal No.5 and A/T-ECU connector C-19 terminal No.14.
Check the output line for short or open circuit.

Q: Is the check result normal?
YES : Go to Step 8.
NO : Repair the wiring harness.

STEP 8. M.U.T.-III actuator test
Item 04: Overdrive solenoid valve

OK: Operating sound can be heard.

Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction .)
NO : Replace the A/T-ECU.

STEP 9. Connector check: B-15 A/T control solenoid valve assembly connector
Check for the contact with terminals.

Q: Is the check result normal?
YES : Go to Step 10.
NO : Repair the defective connector.

STEP 10. Measure the resistance at A/T control solenoid valve assembly connector B-15.
Disconnect the connector, and measure the resistance between terminal No.5 and No.9 at the solenoid valve side.

OK: 2.7 – 3.4 Ω (A/T fluid temperature 20°C)

Q: Is the check result normal?
YES : Go to Step 11.
NO : Check the solenoid valve harness.

STEP 11. Connector check: A-19X A/T control relay connector, B-10 intermediate connector
Check for the contact with terminals.

Q: Is the check result normal?
YES : Go to Step 12.
NO : Repair the defective connector.

STEP 12. Check the harness between A/T control solenoid valve assembly connector B-15 terminal No.9 and A/T control relay connector A-19X terminal No.3.
Check the power supply line for short or open circuit.

Q: Is the check result normal?
YES : Go to Step 8.
NO : Repair the wiring harness.

Code No.P1777 (P0770) Reduction solenoid valve system <5A/T>

SOLENOID VALVE SYSTEM CIRCUIT
Refer to P.23A-53.

OPERATION
Refer to P.23A-53.

DIAGNOSIS CODE SET CONDITIONS
If the drive terminal voltage of the reduction solenoid valve is 3.0 V or less, it is judged that there is a short circuit or open circuit in the reduction solenoid valve, and diagnosis code No.P1777 (P0770) is set.
If diagnosis code No.P1777 (P0770) is set, the transmission is fixed in 3rd as a fail-safe measure.

PROBABLE CAUSES
- Malfunction of reduction solenoid valve
- Damaged harness wires and connectors
- Malfunction of the A/T-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code

Q: Are diagnosis codes P1773 (P0750) and P1778 (P0740) set?
YES : Go to Step 9.
NO : Go to Step 2.

STEP 2. M.U.T.-III actuator test
Item 5: Reduction solenoid valve

OK: Operating sound can be heard.

Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction).
NO : Go to Step 3.

STEP 3. Connector check: B-15 A/T control solenoid valve assembly connector
Check for the contact with terminals.

Q: Is the check result normal?
YES : Go to Step 4.
NO : Repair the defective connector.

STEP 4. Measure the resistance at A/T control solenoid valve assembly connector B-15.
Disconnect the connector, and measure the resistance between terminal No.8 and No.10 at the solenoid valve side.

OK: 2.7 – 3.4 Ω (A/T fluid temperature 20°C)

Q: Is the check result normal?
YES : Go to Step 5.
NO : Check the reduction solenoid valve and solenoid valve harness.

STEP 5. Measure the voltage at A/T-ECU connector C-20.
(1) Connect A/T control solenoid valve assembly connector B-15.
(2) Turn the ignition switch to the ON position.
(3) Measure the voltage between A/T-ECU

connector C-20 terminal No.51 and earth.

OK: 6 – 9 V

Q: Is the check result normal?
YES : Go to Step 8.
NO : Go to Step 6.

STEP 6. Connector check: B-11 intermediate connector, C-20 A/T-ECU connector
Check for the contact with terminals.

Q: Is the check result normal?
YES : Go to Step 7.
NO : Repair the defective connector.

STEP 7. Check the harness between A/T control solenoid valve assembly connector B-15 terminal No.8 and A/T-ECU connector C-20 terminal No.51.
Check the output line for short or open circuit.

Q: Is the check result normal?
YES : Go to Step 8.
NO : Repair the wiring harness.

STEP 8. M.U.T.-III actuator test
Item 5: Reduction solenoid valve

OK: Operating sound can be heard.

Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction).
NO : Replace the A/T-ECU.

STEP 9. Connector check: B-15 A/T control solenoid valve assembly connector
Check for the contact with terminals.

Q: Is the check result normal?
YES : Go to Step 10.
NO : Repair the defective connector.

STEP 10. Measure the resistance at A/T control solenoid valve assembly connector B-15.
Disconnect the connector, and measure the resistance between terminal No.8 and No.10 at the solenoid valve side.

OK: 2.7 – 3.4 Ω (A/T fluid temperature 20°C)

Q: Is the check result normal?
YES : Go to Step 11.
NO : Check the solenoid valve harness.

STEP 11. Connector check: A-19X A/T control relay connector, B-10 intermediate connector
Check for the contact with terminals.

Q: Is the check result normal?
YES : Go to Step 12.
NO : Repair the defective connector.

STEP 12. Check the harness between A/T control solenoid valve assembly connector B-15 terminal No.10 and A/T control relay connector A-19X terminal No.3.
Check the power supply line for short or open circuit.

Q: Is the check result normal?
YES : Go to Step 8.
NO : Repair the wiring harness.

Code No.P1778 (P0740) Damper clutch control solenoid valve system

SOLENOID VALVE SYSTEM CIRCUIT
Refer to P.23A-53.

OPERATION
Refer to P.23A-53.

DIAGNOSIS CODE SET CONDITIONS
If the drive terminal voltage of the torque converter control clutch solenoid valve is 3.0 V or less, it is judged that there is a short circuit or open circuit in the torque converter control clutch solenoid valve, and diagnosis code No.P1778 (P0740) is output.
If diagnosis code No.P1778 (P0740) is output 4 times, the transmission is fixed in 3rd as a fail-safe measure.

PROBABLE CAUSES
- Malfunction of damper clutch solenoid valve
- Damaged harness wires and connectors
- Malfunction of the A/T-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code

Q: Is diagnosis code P1773 (P0750), P1777 (P0770) <5A/T> set?
YES : Go to Step 9.
NO : Go to Step 2.

STEP 2. M.U.T.-III actuator test
Item 06: Damper clutch solenoid valve

OK: Operating sound can be heard.

Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction .)
NO : Go to Step 3.

STEP 3. Connector check: B-15 A/T control solenoid valve assembly connector
Check for the contact with terminals.

Q: Is the check result normal?
YES : Go to Step 4.
NO : Repair the defective connector.

STEP 4. Measure the resistance at A/T control solenoid valve assembly connector B-15.
Disconnect the connector, and measure the resistance between terminal No.7 and No.10 at the solenoid valve side.

OK: 2.7 – 3.4 Ω (A/T fluid temperature 20°C)

Q: Is the check result normal?
YES : Go to Step 5.
NO : Check the damper clutch solenoid valve and solenoid valve harness.

STEP 5. Measure the voltage at A/T-ECU connector C-19.
(1) Connect A/T control solenoid valve assembly connector B-15.
(2) Turn the ignition switch to the ON position.
(3) Measure the voltage between A/T-ECU connector C-19 terminal No.15 and earth.

OK: 6 – 9 V

Q: Is the check result normal?
YES : Go to Step 8.
NO : Go to Step 6.

STEP 6. Connector check: B-10 intermediate connector, C-19 A/T-ECU connector
Check for the contact with terminals.

Q: Is the check result normal?
YES : Go to Step 7.
NO : Repair the defective connector.

STEP 7. Check the harness between A/T control solenoid valve assembly connector B-15 terminal No.7 and A/T-ECU connector C-19 terminal No.15.
Check the output line for short or open circuit.

Q: Is the check result normal?
YES : Go to Step 8.
NO : Repair the wiring harness.

STEP 8. M.U.T.-III actuator test
Item 06: Damper clutch solenoid valve

OK: Operating sound can be heard.

Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction .)
NO : Replace the A/T-ECU.

STEP 9. Connector check: B-15 A/T control solenoid valve assembly connector
Check for the contact with terminals.

Q: Is the check result normal?
YES : Go to Step 10.
NO : Repair the defective connector.

STEP 10. Measure the resistance at A/T control solenoid valve assembly connector B-15.
Disconnect the connector, and measure the resistance between terminal No.7 and No.10 at the solenoid valve side.

OK: 2.7 – 3.4 Ω (A/T fluid temperature 20°C)

Q: Is the check result normal?
YES : Go to Step 11.
NO : Check the solenoid valve harness.

STEP 11. Connector check: A-19X A/T control relay connector, B-10 intermediate connector
Check for the contact with terminals.

Q: Is the check result normal?
YES : Go to Step 12.
NO : Repair the defective connector.

STEP 12. Check the harness between A/T control solenoid valve assembly connector B-15 terminal No.10 and A/T control relay connector A-19X terminal No.3.
Check the power supply line for short or open circuit.

Q: Is the check result normal?
YES : Go to Step 8.
NO : Repair the wiring harness.

Code No.P1779 (1st), P1780 (2nd), P1781 (3rd), P1782 (4th), P1784 (reverse): Gear incorrect ratio <4A/T>

OPERATION
The A/T-ECU detects the current gear/speed according to the output signals from the input and output shaft speed sensor.

DIAGNOSIS CODE SET CONDITIONS
If the output from the output shaft speed sensor multiplied by the gear ratio is not the same as the output from the input shaft speed sensor after completing of shifting, the corresponding diagnosis code is output. If each diagnosis code is output 4 times, the transmission is fixed in 3rd as a fail-safe measure.

PROBABLE CAUSES
- Malfunction of input shaft speed sensor
- Malfunction of output shaft speed sensor
- Damaged harness wires and connectors
- Malfunction of the A/T-ECU
- Malfunction of solenoid valve
- Malfunction of underdrive clutch retainer
- Malfunction of valve body
- Malfunction of transfer drive gear or driven gear
- Malfunction of low-reverse brake system (for diagnosis codes P1779, P1784)
- Malfunction of underdrive clutch system (for diagnosis codes P1779, P1780, P1781)
- Malfunction of second brake system (for diagnosis codes P1780, P1782)
- Malfunction of overdrive clutch system (for diagnosis codes P1781, P1782)
- Malfunction of reverse clutch system (for diagnosis code P1784)
- Malfunction of one-way clutch system (for diagnosis code P1779)

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code
Either of diagnosis codes P1779, P1780, P1781, P1782 or P1784 is output, the input shaft speed sensor or output shaft speed sensor is defective.

Q: Are diagnosis codes P1766 (P0715) or P1767 (P0720) output?

YES <diagnosis code P1766 (P0715) is output> : Refer to diagnosis code P1766 (P0715) input shaft speed sensor system P.23A-36.

YES <diagnosis code P1767 (P0720) is output> : Refer to diagnosis code P1767 (P0720) output shaft speed sensor system P.23A-41.

NO : Go to Step 2.

STEP 2. M.U.T.-III diagnosis code
Either of diagnosis codes P1779, P1780, P1781, P1782 or P1784 is output, the corresponding solenoid valve is defective.

Q: Is either of diagnosis code P1773 (P0750), P1774 (P0755), P1775 (P0760), P1776 (P0765) output?

YES <diagnosis code P1773 (P0750) is output> : Refer to diagnosis code P1773 (P0750): Low-reverse solenoid valve system P.23A-53.

YES <diagnosis code P1774 (P0755) is output> : Refer to diagnosis code P1774 (P0755): Underdrive solenoid valve system P.23A-57.

YES <diagnosis code P1775 (P0760) is output> : Refer to diagnosis code P1775 (P0760): Second solenoid valve system P.23A-58.

YES <diagnosis code P1776 (P0765) is output> : Refer to diagnosis code P1776 (P0765): Overdrive solenoid valve system P.23A-60.

NO : Go to Step 3.

STEP 3. Hydraulic pressure test
Each hydraulic pressure of the elements below, which diagnosis codes indicate, should be within the standard value.
- diagnosis code P1779: Underdrive clutch, low-reverse brake
- diagnosis code P1780: Underdrive clutch, second brake
- diagnosis code P1781: Underdrive clutch, overdrive clutch
- diagnosis code P1782: Overdrive clutch, second brake
- diagnosis code P1784: Reverse clutch, low-reverse brake

OK: Refer to Hydraulic Pressure Test P.23A-120.

Q: Is the check result normal?

YES : Go to Step 6.
NO <some hydraulic pressures are abnormal> : Go to Step 5.
NO <all hydraulic pressure are abnormal> : Go to Step 4.

STEP 4. Adjust the line pressure and recheck the diagnosis code.
(1) Adjust the line pressure (Refer to P.23A-129).
(2) Test drive the vehicle.
(3) Check the diagnosis code.

Q: Is the diagnosis code set?
YES : Go to Step 5.
NO : The inspection is complete.

STEP 5. Disassemble, clean and assemble the valve body and recheck the diagnosis code.
(1) Check the mounting bolts for looseness, and the O-ring, solenoid valve and valve body for damage.
Replace the valve body assembly if the damages are thought to be irreparable.
(2) Test drive the vehicle.
(3) Check the diagnosis code.

Q: Is the diagnosis code set?
YES : Go to Step 7.
NO : The inspection is complete.

STEP 6. Replace the A/T-ECU and then recheck the diagnosis code.
(1) Replace the A/T-ECU.
(2) Test drive the vehicle.
(3) Check the diagnosis code.

Q: Is the diagnosis code set?
YES : Go to Step 7.
NO : The inspection is complete.

STEP 7. Check the A/T internal clutch and brake, and then recheck the diagnosis code.
(1) Check the following clutches or brakes according to the output diagnosis codes, replace if necessary.
- If diagnosis code P1779, P1780, P1781 are output individually or in a group, replace the underdrive clutch.
- If diagnosis code P1781, P1782 are output individually or in a group, replace the overdrive clutch.
- If diagnosis code P1784 is output, replace the reverse clutch.
- If diagnosis code P1779, P1784 are output individually or in a group, replace the low-reverse brake.
- If diagnosis code P1780, P1782 are output individually or in a group, replace the second brake.
- If diagnosis code P1779 is output, replace the one-way clutch.

(2) Test drive the vehicle.
(3) Check the diagnosis code.

Q: Is the diagnosis code set?
YES : Eliminate the cause of the noise.
NO : The inspection is complete.

Code No.P1779 (1st), P1780 (2nd), P1781 (3rd), P1782 (4th), P1783 (5th), P1784 (reverse): Gear incorrect ratio <5A/T>

OPERATION
The ECU detects the current gear/speed according to the output signals from the input and output shaft speed sensor.

DIAGNOSIS CODE SET CONDITIONS
If the output from the output shaft speed sensor multiplied by the gear ratio is not the same as the output from the input shaft speed sensor after completing of shifting, the corresponding diagnosis code is set.
If each diagnosis code is set 4 times, the transmission is fixed in 3rd as a fail-safe measure.

PROBABLE CAUSES
- Malfunction of input shaft speed sensor
- Malfunction of output shaft speed sensor
- Damaged harness wires and connectors
- Malfunction of the A/T-ECU
- Malfunction of solenoid valve
- Malfunction of reverse clutch retainer
- Malfunction of valve body
- Malfunction of direct planetary carrier
- Malfunction of low-reverse brake system (for diagnosis codes P1779, P1784)
- Malfunction of underdrive clutch system (for diagnosis codes P1779, P1780, P1781, P1782)
- Malfunction of second brake system (for diagnosis codes P1780, P1783)
- Malfunction of overdrive clutch system (for diagnosis codes P1781, P1782, P1783)

- Malfunction of reverse clutch system (for diagnosis code P1784)
- Malfunction of direct clutch system (for diagnosis codes P1782, P1783)
- Malfunction of reduction brake system (for diagnosis codes P1779, P1780, P1781, P1784)
- Malfunction of one-way clutch (OWC-L) system (for diagnosis code P1779)
- Malfunction of one-way clutch (OWC-D) system (for diagnosis code P1779, P1780, P1781)

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code

Either of diagnosis codes P1779, P1780, P1781, P1782, P1783 or P1784 is set, the input shaft speed sensor or output shaft speed sensor is defective.

Q: Are diagnosis codes P1766 (P0715) or P1767 (P0720) output?

YES diagnosis code P1766 (P0715) is set : Refer to diagnosis code P1766 (P0715) input shaft speed sensor system P.23A-36.

YES diagnosis code P1767 (P0720) is set : Refer to diagnosis code P1767 (P0720) output shaft speed sensor system P.23A-41.

NO : Go to Step 2.

STEP 2. M.U.T.-III diagnosis code

Either of diagnosis codes P1779, P1780, P1781, P1782, P1783 or P1784 is set, the corresponding solenoid valve is defective.

Q: Is either of diagnosis code P1773 (P0750), P1774 (P0755), P1775 (P0760), P1776 (P0765), P1777 (P0770) output?

YES diagnosis code P1773 (P0750) is set : Refer to diagnosis code P1773 (P0750): Low-reverse solenoid valve system P.23A-53.

YES diagnosis code P1774 (P0755) is set : Refer to diagnosis code P1774 (P0755): Underdrive solenoid valve system P.23A-57.

YES diagnosis code P1775 (P0760) is set : Refer to diagnosis code P1775 (P0760): Second solenoid valve system P.23A-58.

YES diagnosis code P1776 (P0765) is set : Refer to diagnosis code P1776 (P0765): Overdrive solenoid valve system P.23A-60.

YES diagnosis code P1777 (P0770) is set : Refer to diagnosis code P1777 (P0770): Reduction solenoid valve system P.23A-61 .

NO : Go to Step 3.

STEP 3. Hydraulic pressure test

Each hydraulic pressure of the elements below, which diagnosis codes indicate, should be within the standard value.

- diagnosis code P1779: Underdrive clutch, low-reverse brake, reduction brake
- diagnosis code P1780: Underdrive clutch, second brake, reduction brake
- diagnosis code P1781: Underdrive clutch, overdrive clutch, reduction brake
- diagnosis code P1782: Underdrive clutch, overdrive clutch, direct clutch
- diagnosis code P1783: Overdrive clutch, direct clutch, second brake
- diagnosis code P1784: Reverse clutch, low-reverse brake, reduction brake

OK: Refer to Hydraulic Pressure Test P.23A-120.

Q: Is the check result normal?

YES : Go to Step 6.

NO some hydraulic pressures are abnormal : Go to Step 5.

NO all hydraulic pressure are abnormal : Go to Step 4.

STEP 4. Adjust the line pressure and recheck the diagnosis code.

(1) Adjust the line pressure (Refer to P.23A-129).
(2) Test drive the vehicle.
(3) Check the diagnosis code.

Q: Is the diagnosis code set?

YES : Go to Step 5.

NO : The inspection is complete.

STEP 5. Disassemble, clean and assemble the valve body and recheck the diagnosis code.

(1) Check the mounting bolts for looseness, and the O-ring, solenoid valve and valve body for damage.
Replace the valve body assembly if the damages are thought to be irreparable.
(2) Test drive the vehicle.
(3) Check the diagnosis code.

Q: Is the diagnosis code set?

YES : Go to Step 7.

NO : The inspection is complete.

STEP 6. Replace the A/T-ECU and then recheck the diagnosis code.

(1) Replace the A/T-ECU.
(2) Test drive the vehicle.

(3) Check the diagnosis code.

Q: Is the diagnosis code set?
YES : Go to Step 7.
NO : The inspection is complete.

STEP 7. Check the A/T internal clutch and brake, and then recheck the diagnosis code.
(1) Check the following clutches or brakes according to the output diagnosis codes, replace if necessary.
- If diagnosis code P1779, P1780, P1781, P1782 are set individually or in a group, replace the underdrive clutch.
- If diagnosis code P1781, P1782, P1783 are set individually or in a group, replace the overdrive clutch.
- If diagnosis code P1784 is set, replace the reverse clutch.
- If diagnosis code P1779, P1784 are set individually or in a group, replace the low-reverse brake.
- If diagnosis code P1780, P1783 are set individually or in a group, replace the second brake.
- If diagnosis code P1782, P1783 are set individually or in a group, replace the direct clutch.
- If diagnosis code P1779, P1780, P1781, P1784 are set individually or in a group, replace the reduction brake.
- If diagnosis code P1779 is set, replace the one-way clutch (OWC-L).
- If diagnosis code P1779, P1780, P1781 are set individually or in a group, replace the one-way clutch (OWC-D).

(2) Test drive the vehicle.
(3) Check the diagnosis code.

Q: Is the diagnosis code set?
YES : Eliminate the cause of the noise.
NO : The inspection is complete.

Code No.P1786 Damper clutch system (stuck off)

OPERATION
The A/T-ECU engages and disengages the damper clutch (incorporated in the torque converter) by operating the DCC solenoid valve in response to driving conditions.

DIAGNOSIS CODE SET CONDITIONS
If the damper clutch solenoid valve drive duty ratio is 100% for a continuous period of 4 seconds or more when the damper clutch starts operating, diagnosis code No.P1786 is output.

PROBABLE CAUSES
- Malfunction of input shaft speed sensor
- Damaged harness wires and connectors
- Malfunction of the A/T-ECU
- Malfunction of damper clutch solenoid valve
- Malfunction of valve body assembly
- Malfunction of torque converter

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code
If diagnosis code P1786 is output, the input shaft speed sensor may be defective.

Q: Is diagnosis code P1766 (P0715) set?
YES : Refer to diagnosis code P1766 (P0715): Input shaft speed sensor system P.23A-36.
NO : Go to Step 2.

STEP 2. M.U.T.-III diagnosis code
If diagnosis code P1786 is output, the damper clutch solenoid valve may be defective.

Q: Is diagnosis code P1778 (P0740) set?

YES : Refer to diagnosis code P1778 (P0740): Damper clutch solenoid valve system P.23A-62.
NO : Go to Step 3.

STEP 3. M.U.T.-III data list
- Item 17: Damper clutch solenoid valve duty ratio (Refer to data list reference table P.23A-103).
- Item 10: Damper clutch slip amount (Refer to data list reference table P.23A-103).

Q: Is the check result normal?
YES : Go to Step 6.
NO : Go to Step 4.

STEP 4. Hydraulic pressure test
Measure the torque converter hydraulic pressure. (Refer to P.23A-120.)

OK: Refer to Hydraulic Pressure Test P.23A-120.

Q: Is the check result normal?
YES : Go to Step 6.
NO : Go to Step 5.

STEP 5. Adjust the line pressure and recheck the diagnosis code.
(1) Adjust the line pressure (Refer to P.23A-129).
(2) Test drive the vehicle.
(3) Check the diagnosis code.

Q: Is the diagnosis code set?
YES : Go to Step 7.
NO : The inspection is complete.

STEP 6. Replace the A/T-ECU and then recheck the diagnosis code.
(1) Replace the A/T-ECU.
(2) Test drive the vehicle.
(3) Check the diagnosis code.

Q: Is the diagnosis code set?
YES : Go to Step 7.
NO : The inspection is complete.

STEP 7. Disassemble, clean and assemble the valve body and recheck the diagnosis code.
(1) Check the mounting bolts for looseness, and the O-ring, solenoid valve and valve body for damage.
Replace the valve body assembly if the damages are thought to be irreparable.
(2) Test drive the vehicle.
(3) Check the diagnosis code.

Q: Is the diagnosis code set?
YES : Check the torque converter and replace it if necessary.
NO : The inspection is complete.

Code No.P1787 Damper clutch system (stuck on)

OPERATION
Refer to P.23A-67.

DIAGNOSIS CODE SET CONDITIONS
If the damper clutch control remains engaged for a continuous period of ten seconds or more when the A/T-ECU is attempting to disengage the damper clutch control, diagnosis code No.P1787 is output.

PROBABLE CAUSES
- Damaged harness wires and connectors
- Malfunction of the A/T-ECU
- Malfunction of damper clutch solenoid valve
- Malfunction of valve body assembly

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code
If diagnosis code P1787 is output, the damper clutch solenoid valve may be defective.

Q: Is diagnosis code P1778 (P0740) set?
YES : Refer to diagnosis code P1778 (P0740): Damper clutch solenoid valve system P.23A-62.
NO : Go to Step 2.

STEP 2. M.U.T.-III data list
Item 10: Damper clutch slip amount (Refer to data list reference table P.23A-103).

Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction .)
NO : Go to Step 3.

STEP 3. Replace the A/T-ECU and then recheck the diagnosis code.

(1) Replace the A/T-ECU.
(2) Test drive the vehicle.
(3) Check the diagnosis code.

Q: Is the diagnosis code set?
YES : Go to Step 4.
NO : The inspection is complete.

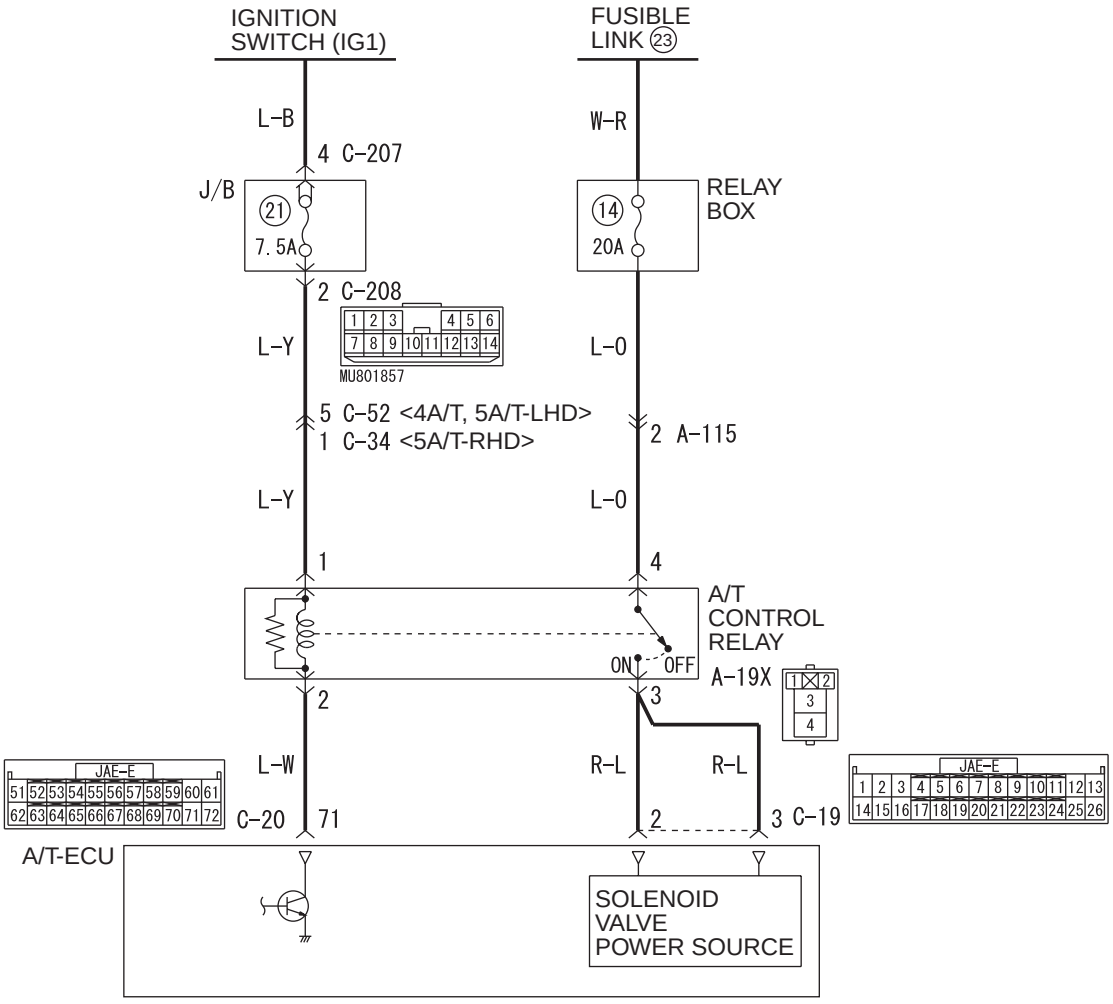
STEP 4. Disassemble, clean and assemble the valve body and recheck the diagnosis code.

(1) Check the mounting bolts for looseness, and the O-ring, solenoid valve and valve body for damage.
Replace the valve body assembly if the damages are thought to be irreparable.
(2) Test drive the vehicle.
(3) Check the diagnosis code.

Q: Is the diagnosis code set?
YES : Check the torque converter and replace it if necessary.
NO : The inspection is complete.

Code No.P1788 (P1751) A/T control relay system

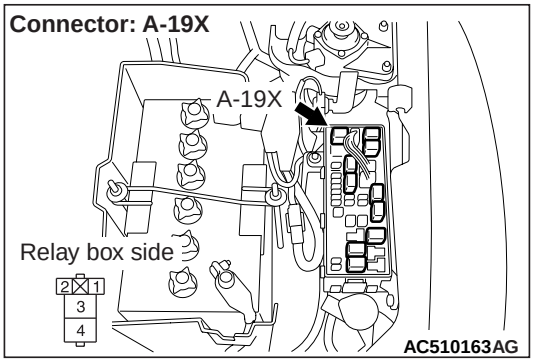
A/T Control Relay System Circuit



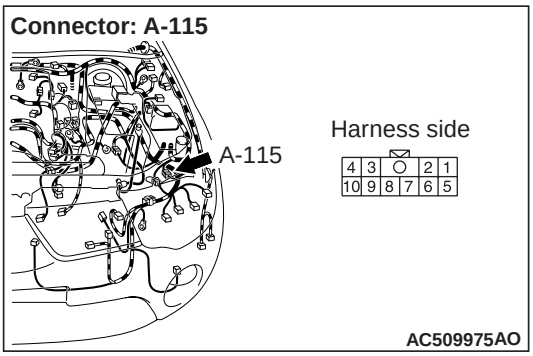
Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

AC903910
W7C23X011A

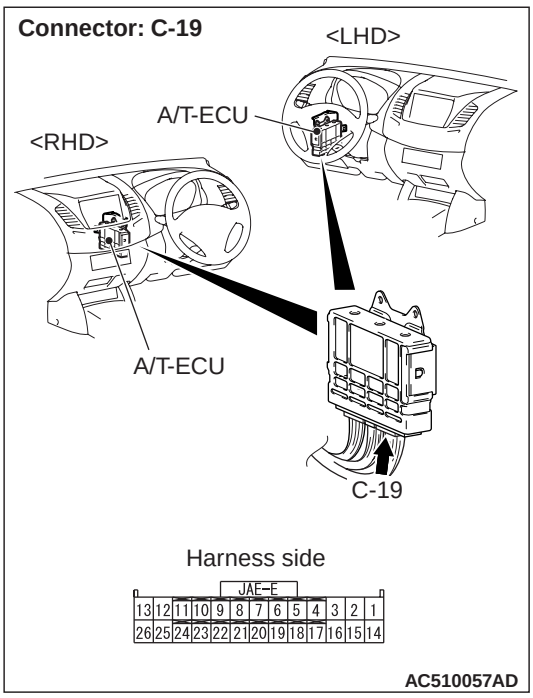
Connector: A-19X



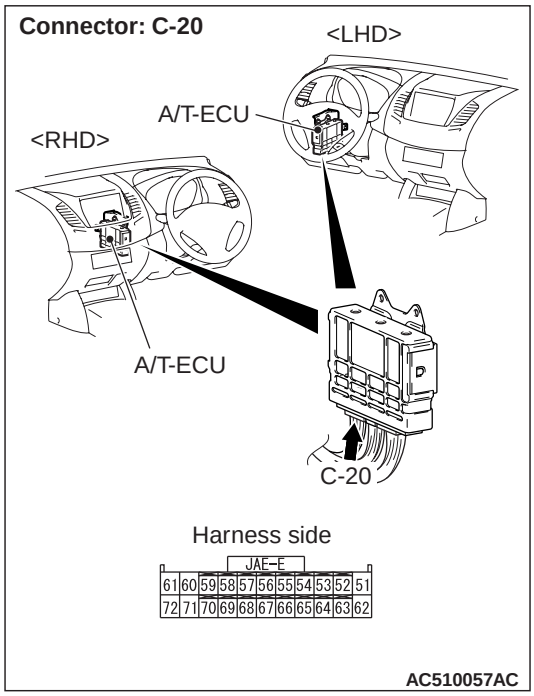
Connector: A-115



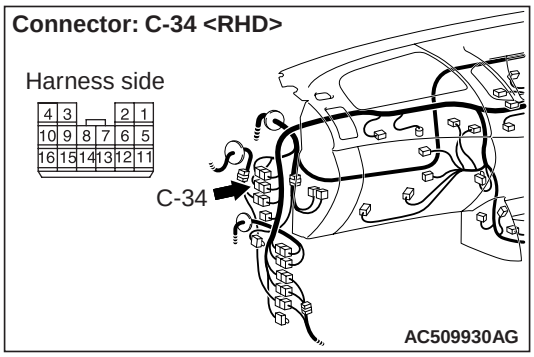
Connector: C-19



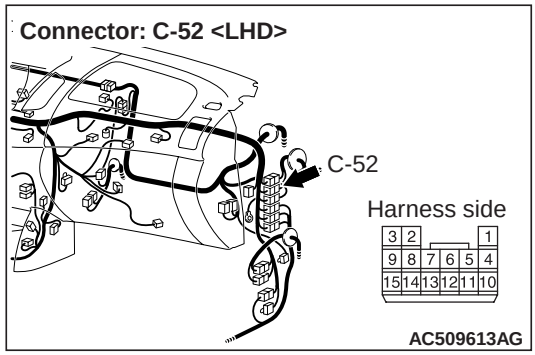
Connector: C-20

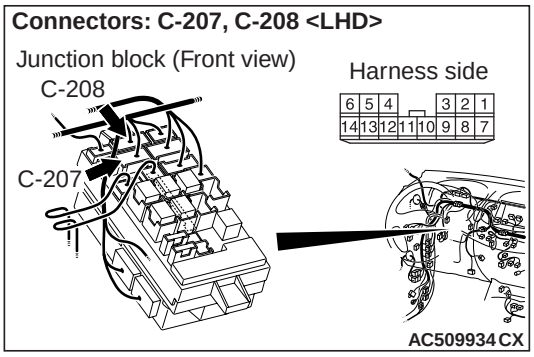


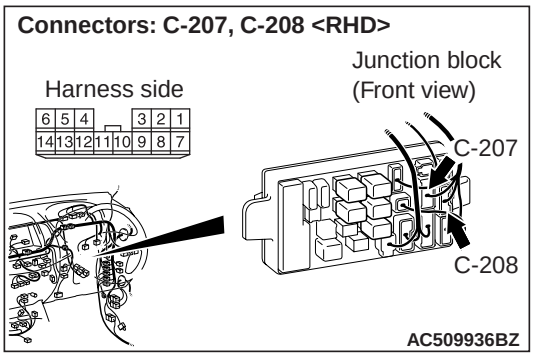
Connector: C-34 <RHD>



Connector: C-52 <LHD>







OPERATION

If a fail-safe operation is activated, the A/T control relay shuts off the power supply to the solenoid valve in accordance with the signal from the A/T-ECU.

DIAGNOSIS CODE SET CONDITION

Code No.P1788 (P1751) will be set if the A/T control voltage is less than 7 V after the ignition switch is turned on.
If code No.P1788 (P1751) is set, the transmission will be held in 3rd gear.

PROBABLE CAUSES

- Malfunction of A/T control relay
- Damaged harness wires and connectors
- Malfunction of the A/T-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III data list

Item 08: Relay voltage (Refer to data list reference table P.23A-103.)

Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction .)
NO : Go to Step 2.

STEP 2. Check the A/T control relay connector

Refer to P.23A-118.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Replace the A/T control relay.

STEP 3. Connector check: A-19X A/T control relay connector

Check for the contact with terminals.

Q: Is the check result normal?
YES : Go to Step 4.
NO : Repair the defective connector.

STEP 4. Measure the voltage at A/T control relay connector A-19X.

Disconnect the A/T control relay, and measure the voltage between terminal No.4 and earth at the relay box side.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 8.
NO : Go to Step 5.

STEP 5. Connector check: A-115 intermediate connector

Check for the contact with terminals.

Q: Is the check result normal?
YES : Go to Step 6.
NO : Repair the defective connector.

STEP 6. Check the harness between A/T control relay connector A-19X terminal No.4 and fusible link (23).

Check the power supply line for short or open circuit.

Q: Is the check result normal?
YES : Go to Step 7.
NO : Repair the wiring harness.

STEP 7. M.U.T.-III data list

Item 08: Relay voltage (Refer to data list reference table P.23A-103.)

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction).
NO : Replace the A/T-ECU.

STEP 8. Measure the voltage at the A/T control relay connector A-19X.
(1) Turn the ignition switch to the ON position.
(2) Disconnect the A/T control relay, and measure the voltage between terminal No.1 and earth at the relay box side.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 11.
NO : Go to Step 9.

STEP 9. Connectors check: C-52 <4A/T, 5A/T-LHD>or C-34 <5A/T-RHD> intermediate connector, C-208 J/B connector
Check for the contact with terminals.

Q: Is the check result normal?
YES : Go to Step 10.
NO : Repair the defective connector.

STEP 10. Check the wiring harness between A/T control relay connector A-19X terminal No.1 and J/B connector C-208 terminal No.2.
Check the power supply line for short or open circuit.

Q: Is the check result normal?
YES : Go to Step 7.
NO : Repair the wiring harness.

STEP 11. Measure the voltage at A/T-ECU connector C-19.
(1) Install the A/T control relay.
(2) Turn the ignition switch to the ON position.
(3) Measure the voltage between A/T-ECU connector C-19 terminal No.2, No.3 and earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 14.
NO : Go to Step 12.

STEP 12. Connector check: C-19 A/T-ECU connector
Check for the contact with terminals.

Q: Is the check result normal?
YES : Go to Step 13.
NO : Repair the defective connector.

STEP 13. Check the harness between A/T control relay connector A-19X terminal No.3 and A/T-ECU connector C-19 terminal No.2, 3.
Check the power supply line for short or open circuit.

Q: Is the check result normal?
YES : Go to Step 7.
NO : Repair the wiring harness.

STEP 14. Connector check: C-20 A/T-ECU connector
Check for the contact with terminals.

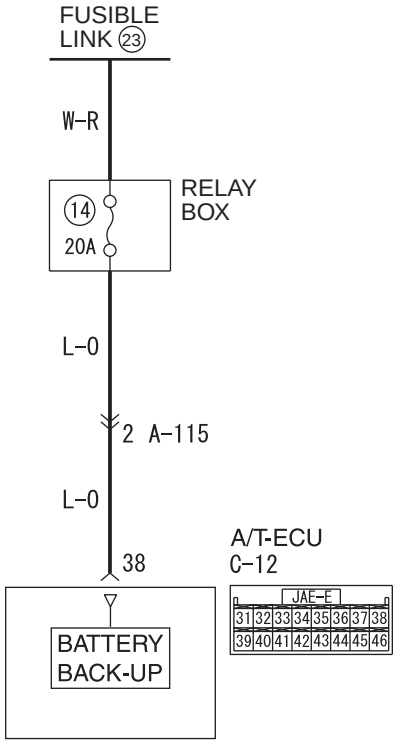
Q: Is the check result normal?
YES : Go to Step 15.
NO : Repair the defective connector.

STEP 15. Check the harness between A/T control relay connector A-19X terminal No.2 and A/T-ECU connector C-20 terminal No.71.
Check the output line for short or open circuit.

Q: Is the check result normal?
YES : Go to Step 7.
NO : Repair the wiring harness.

Code No.P1790 Back up line system

Back Up Line System Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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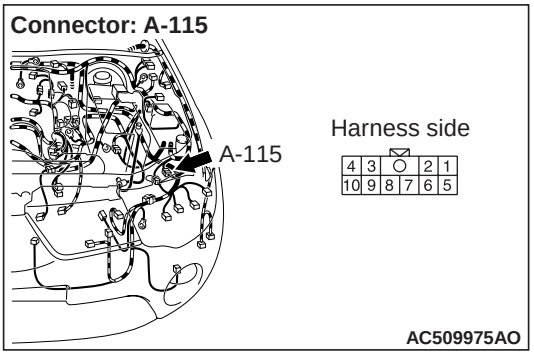
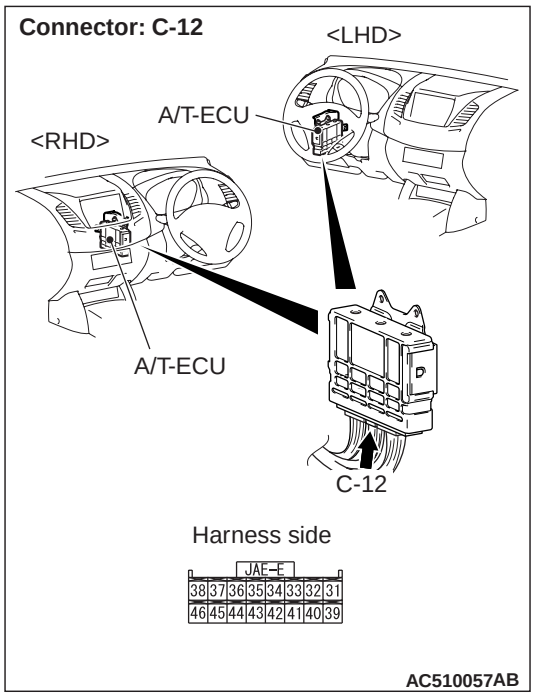




OPERATION
Always power is supplied to the ECU to prevent the reset of A/T-ECU memory when the ignition switch is turned to the LOCK (OFF) position.

DIAGNOSIS CODE SET CONDITION
If the battery voltage is 10 V or more and back-up voltage is less than 6 V while the ignition switch is ON position for 2 seconds or more, it is judged that there is a open circuit in the back-up line and diagnosis code No. P1790 is set.

PROBABLE CAUSES
- Damaged harness wires and connectors
- Malfunction of the A/T-ECU

DIAGNOSIS PROCEDURE

STEP 1. Measure the voltage at A/T-ECU connector C-12.
(1) Measure the voltage between A/T-ECU connector C-12 terminal No.38 and earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 4.
NO : Go to Step 2.

STEP 2. Connectors check: A-115 intermediate connector, C-12 A/T-ECU connector.
Check for the contact with terminals.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the defective connector.

STEP 3. Check the harness between A/T-ECU connector C-12 terminal No.38 and fusible link (23).
Check the power supply line for short or open circuit.

Q: Is the check result normal?
YES : Go to Step 5.
NO : Repair the wiring harness.

STEP 4. Connector check: C-12 A/T-ECU connector.
Check for the contact with terminals.

Q: Is the check result normal?
YES : Go to Step 5.
NO : Repair the defective connector.

STEP 5. Replace the A/T-ECU and then recheck the diagnosis code.
(1) Replace the A/T-ECU.
(2) Test drive the vehicle.
(3) Check the diagnosis code.

Q: Is the diagnosis code set?
YES : Go to Step 1.
NO : The inspection is complete.

Code No.P1901: CAN signal time-out (Engine-ECU)

⚠ CAUTION
- **If diagnosis code P1901 is set in the A/T-ECU, always diagnose the CAN main bus line. If there is any fault in the CAN bus lines, an incorrect diagnosis code may be set.**
- **Whenever the ECU is replaced, ensure that the communication circuit is normal.**

DIAGNOSIS CODE SET CONDITIONS

Current trouble
- Connector(s) or wiring harness in the CAN bus lines between the engine-ECU and the A/T-ECU, the power supply system to the engine-ECU, the engine-ECU itself, or the A/T-ECU may be defective.

Past trouble
- Carry out diagnosis with particular emphasis on connector(s) or wiring harness in the CAN bus lines between the engine-ECU and the A/T-ECU, and the power supply system to the engine-ECU. For diagnosis procedures, refer to "How to cope with past trouble" (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points).

NOTE: For a past trouble, you may not find it by the M.U.T.-III CAN bus diagnostics even if there is any failure in CAN bus lines. In this case, refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points − How to Cope with Intermittent Malfunctions). and check the CAN bus lines.

You can narrow down the possible cause of the trouble by referring to the diagnosis code, which is set regarding the CAN communication-linked ECUs (Refer to GROUP 54C, Explanation about the M.U.T.-III CAN Bus Diagnostics).

PROBABLE CAUSES
- Damaged wiring harness or connector
- Malfunction of the engine-ECU
- Malfunction of the A/T-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics
Using M.U.T.-III, perform CAN busline diagnosis.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the CAN busline (Refer to GROUP54C, Diagnosis – Can Bus Diagnostic Chart), and then go to Step 4.

STEP 2. M.U.T.-III other system diagnosis codes
Check whether the diesel fuel system diagnosis codes are set or not.

Q: Is the diagnosis code output?
YES : Diagnose the diesel fuel system (Refer to GROUP 13A, Troubleshooting).
NO : Go to Step 3.

STEP 3. M.U.T.-III diagnosis code
Reconfirm whether the diagnosis codes are output from A/T-ECU.
(1) Erase the diagnosis code.
(2) Turn the ignition switch to ON position.
(3) Check if the diagnosis code is set.

Q: Is the diagnosis code output?
YES : Go to Step 4.
NO : Intermittent malfunction in CAN busline between engine-ECU and A/T-ECU (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction).

STEP 4. Replace the engine-ECU
After replacing the engine-ECU, re-check the A/T diagnosis code output.

Q: Is the diagnosis code output?
YES : Replace the A/T-ECU.
NO : The check is end.

Code No.U1073: Bus off

⚠ CAUTION
- **If diagnosis code U1073 is set in the A/T-ECU, always diagnose the CAN main bus line. If there is any fault in the CAN bus lines, an incorrect diagnosis code may be set.**
- **Whenever the ECU is replaced, ensure that the communication circuit is normal.**

DIAGNOSIS CODE SET CONDITIONS
The failure is possibly caused by malfunction of the harness and connector in CAN busline or by malfunction in A/T-ECU.

PROBABLE CAUSES
- Damaged wiring harness or connector
- Malfunction of the A/T-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics
Using M.U.T.-III, perform CAN busline diagnosis.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the CAN bus line (Refer to GROUP 54C, CAN bus line Diagnostic flow .) Then go to Step 3.

STEP 2. M.U.T.-III diagnosis code
Check again if the diagnosis code is set.
(1) Turn the ignition switch to the ON position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the LOCK (OFF) position.
(4) Turn the ignition switch to the ON position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the LOCK (OFF) position.

Q: Is code No.U1073 set?
YES : Replace the A/T-ECU. Then go to Step 3.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points).

STEP 3. Check whether the diagnosis code is reset.

Check again if the diagnosis code is set.
(1) Turn the ignition switch to the ON position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the LOCK (OFF) position.
(4) Turn the ignition switch to the ON position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the LOCK (OFF) position.

Q: Is code No.U1073 set?
YES : Go to Step 1.
NO : The procedure is complete.

Code No.U1100: Engine-ECU time-out (related to engine)

⚠ CAUTION
- **If diagnosis code U1100 is set in the A/T-ECU, always diagnose the CAN main bus line. If there is any fault in the CAN bus lines, an incorrect diagnosis code may be set.**
- **Whenever the ECU is replaced, ensure that the communication circuit is normal.**

DIAGNOSIS CODE SET CONDITIONS

Current trouble
- Connector(s) or wiring harness in the CAN bus lines between the engine-ECU and the A/T-ECU, the power supply system to the engine-ECU, the engine-ECU itself, or the A/T-ECU may be defective.

Past trouble
- Carry out diagnosis with particular emphasis on connector(s) or wiring harness in the CAN bus lines between the engine-ECU and the A/T-ECU, and the power supply system to the engine-ECU. For diagnosis procedures, refer to "How to cope with past trouble" (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points).

NOTE: For a past trouble, you may not find it by the M.U.T.-III CAN bus diagnostics even if there is any failure in CAN bus lines. In this case, refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions). and check the CAN bus lines. You can narrow down the possible cause of the trouble by referring to the diagnosis code, which is set regarding the CAN communication-linked ECUs (Refer to GROUP 54C, Explanation about the M.U.T.-III CAN Bus Diagnostics).

PROBABLE CAUSES
- Damaged wiring harness or connector
- Malfunction of the engine-ECU
- Malfunction of the A/T-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics

Using M.U.T.-III, perform CAN busline diagnosis.

Q: Is the check result normal?
YES : Go to Step 2 .
NO : Repair the CAN busline (Refer to GROUP54C, Diagnosis – Can Bus Diagnostic Chart), and then go to Step 6.

STEP 2. M.U.T.-III other system diagnosis codes

Check whether the diesel fuel system diagnosis codes are set or not.

Q: Is the diagnosis code set?
YES : Diagnose the diesel fuel system (Refer to GROUP 13A, Troubleshooting).
NO : Go to Step 3.

STEP 3. M.U.T.-III other system diagnosis codes

Check if a diagnosis code, which relates to CAN communication-linked systems below, is set.
- ETACS-ECU: Code No.U1100

Q: Is the diagnosis code set?
YES : Go to Step 4.
NO : Go to Step 5.

STEP 4. M.U.T.-III diagnosis code

Reconfirm whether the diagnosis codes are output from A/T-ECU.
(1) Erase the diagnosis code.
(2) Turn the ignition switch to ON position.
(3) Check if the diagnosis code is set.

Q: Is the diagnosis code output?
YES : Replace engine-ECU. Then go to Step 6.
NO : Intermittent malfunction in CAN busline between engine-ECU and A/T-ECU (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points).

STEP 5. M.U.T.-III diagnosis code
Reconfirm whether the diagnosis codes are output from A/T-ECU.
(1) Erase the diagnosis codes being output.
(2) Ignition switch: LOCK (OFF) to ON
(3) Confirm whether the diagnosis codes are output.

Q: Is the diagnosis code output?
YES : Replace A/T-ECU. Then go to Step 6.
NO : Intermittent malfunction in CAN busline between engine-ECU and A/T-ECU (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points).

STEP 6. M.U.T.-III diagnosis code
Reconfirm whether the diagnosis codes are output from A/T-ECU.
(1) Erase the diagnosis codes being output.
(2) Ignition switch: LOCK (OFF) to ON
(3) Confirm whether the diagnosis codes are output.

Q: Is the diagnosis code output?
YES : Go to step 1.
NO : The procedure is complete.

Code No. U1102 ASTC-ECU time-out

⚠ CAUTION
- **If diagnosis code U1102 is set in the A/T-ECU, always diagnose the CAN main bus line. If there is any fault in the CAN bus lines, an incorrect diagnosis code may be set.**
- **Whenever the ECU is replaced, ensure that the communication circuit is normal.**

DIAGNOSIS CODE SET CONDITIONS

Current trouble
- Connector(s) or wiring harness in the CAN bus lines between the ASTC-ECU and the A/T-ECU, the power supply system to the ASTC-ECU, the ASTC-ECU itself, or the A/T-ECU may be defective.

Past trouble
- Carry out diagnosis with particular emphasis on connector(s) or wiring harness in the CAN bus lines between the ASTC-ECU and the A/T-ECU, and the power supply system to the ASTC-ECU. For diagnosis procedures, refer to "How to cope with past trouble" (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points).

NOTE: For a past trouble, you may not find it by the M.U.T.-III CAN bus diagnostics even if there is any failure in CAN bus lines. In this case, refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions). and check the CAN bus lines. You can narrow down the possible cause of the trouble by referring to the diagnosis code, which is set regarding the CAN communication-linked ECUs (Refer to GROUP 54C, Explanation about the M.U.T.-III CAN Bus Diagnostics).

PROBABLE CAUSES
- Damaged wiring harness or connector
- Malfunction of the ASTC-ECU
- Malfunction of the A/T-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics
Using M.U.T.-III, perform CAN busline diagnosis.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the CAN busline (Refer to GROUP54C, Diagnosis – Can Bus Diagnostic Chart), and then go to Step 4.

STEP 2. M.U.T.-III other system diagnosis codes
Check whether the ASTC system diagnosis codes are set or not.

Q: Is the diagnosis code output?
YES : Diagnose the ASTC system (Refer to GROUP 35C, Troubleshooting).
NO : Go to Step 3.

STEP 3. M.U.T.-III diagnosis code
Reconfirm whether the diagnosis codes are output from A/T-ECU.
(1) Erase the diagnosis code.
(2) Turn the ignition switch to ON position.
(3) Check if the diagnosis code is set.

Q: Is the diagnosis code output?

YES : Go to Step 4.
NO : Intermittent malfunction in CAN busline between ASTC-ECU and A/T-ECU (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunction).

STEP 4. Replace the ASTC-ECU
After replacing the ASTC-ECU, re-check the A/T diagnosis code output.

Q: Is the diagnosis code output?
YES : Replace the A/T-ECU.
NO : The check is end.

Code No.U1109: ETACS-ECU time-out

⚠ CAUTION
- **If diagnosis code U1109 is set in the A/T-ECU, always diagnose the CAN main bus line. If there is any fault in the CAN bus lines, an incorrect diagnosis code may be set.**
- **Whenever the ECU is replaced, ensure that the communication circuit is normal.**

DIAGNOSIS CODE SET CONDITIONS

Current trouble
- Connector(s) or wiring harness in the CAN bus lines between the ETACS-ECU and the A/T-ECU, the power supply system to the ETACS-ECU, the ETACS-ECU itself, or the A/T-ECU may be defective.

Past trouble
- Carry out diagnosis with particular emphasis on connector(s) or wiring harness in the CAN bus lines between the ETACS-ECU and the A/T-ECU, and the power supply system to the ETACS-ECU. For diagnosis procedures, refer to "How to cope with past trouble" (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points).

NOTE: For a past trouble, you may not find it by the M.U.T.-III CAN bus diagnostics even if there is any failure in CAN bus lines. In this case, refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions). and check the CAN bus lines. You can narrow down the possible cause of the trouble by referring to the diagnosis code, which is set regarding the CAN communication-linked ECUs (Refer to GROUP 54C, Explanation about the M.U.T.-III CAN Bus Diagnostics).

PROBABLE CAUSES
- Damaged wiring harness or connector
- Malfunction of the ETACS-ECU
- Malfunction of the A/T-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics
Using M.U.T.-III, perform CAN busline diagnosis.

Q: Is the check result normal?
YES : Go to Step 2 .
NO : Repair the CAN busline (Refer to GROUP54C, Diagnosis – Can Bus Diagnostic Chart), and then go to Step 6.

STEP 2. M.U.T.-III other system diagnosis codes
Check whether the local interconnect network system diagnosis codes are set or not.

Q: Is the diagnosis code set?
YES : Diagnose the ETACS system (Refer to GROUP 54A, Troubleshooting).
NO : Go to Step 3.

STEP 3. M.U.T.-III other system diagnosis codes
Check if a diagnosis code, which relates to CAN communication-linked systems below, is set.
- Engine-ECU: Code No.U1109

Q: Is the diagnosis code set?
YES : Go to Step 4.
NO : Go to Step 5.

STEP 4. M.U.T.-III diagnosis code
Reconfirm whether the diagnosis codes are output from A/T-ECU.
(1) Erase the diagnosis code.
(2) Turn the ignition switch to ON position.
(3) Check if the diagnosis code is set.

Q: Is the diagnosis code output?
YES : Replace ETACS-ECU. Then go to Step 6.
NO : Intermittent malfunction in CAN busline between ETACS-ECU and A/T-ECU (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points).

STEP 5. M.U.T.-III diagnosis code
Reconfirm whether the diagnosis codes are output from A/T-ECU.
(1) Erase the diagnosis codes being output.
(2) Ignition switch: LOCK (OFF) to ON
(3) Confirm whether the diagnosis codes are output.

Q: Is the diagnosis code output?
YES : Replace A/T-ECU. Then go to Step 6.
NO : Intermittent malfunction in CAN busline between ETACS-ECU and A/T-ECU (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points).

STEP 6. M.U.T.-III diagnosis code
Reconfirm whether the diagnosis codes are output from A/T-ECU.
(1) Erase the diagnosis codes being output.
(2) Ignition switch: LOCK (OFF) to ON
(3) Confirm whether the diagnosis codes are output.

Q: Is the diagnosis code output?
YES : Go to step 1.
NO : The procedure is complete.

Code No.U1120: Failure information of engine-ECU

DIAGNOSIS CODE SET CONDITIONS
A/T-ECU receives the signal from the engine-ECU via the CAN bus line. When the received signal contains failure information, the diagnosis code No. U1120 is stored.

PROBABLE CAUSES
- Damaged wiring harness or connector
- Malfunction of the engine-ECU
- Malfunction of the A/T-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics
Using M.U.T.-III, perform CAN busline diagnosis.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the CAN busline (Refer to GROUP54C, Diagnosis – Can Bus Diagnostic Chart), and then go to Step 5.

STEP 2. M.U.T.-III other system diagnosis codes
Check whether the diesel fuel system diagnosis codes are set or not.

Q: Is the diagnosis code set?
YES : Diagnose the diesel fuel system (Refer to GROUP 13A, Troubleshooting).
NO : Go to Step 3.

STEP 3. M.U.T.-III diagnosis code
Reconfirm whether the diagnosis codes are output from A/T-ECU.
(1) Erase the diagnosis codes being output.
(2) Ignition switch: LOCK (OFF) to ON
(3) Confirm whether the diagnosis codes are output.

Q: Is the diagnosis code output?
YES : Replace engine-ECU. Then go to Step 4.
NO : Intermittent malfunction in CAN busline between engine-ECU and A/T-ECU (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points).

STEP 4. M.U.T.-III diagnosis code
Reconfirm whether the diagnosis codes are output from A/T-ECU.
(1) Erase the diagnosis codes being output.
(2) Ignition switch: LOCK (OFF) to ON
(3) Confirm whether the diagnosis codes are output.

Q: Is the diagnosis code output?
YES : Replace A/T-ECU. Then go to Step 5.
NO : The procedure is complete.

STEP 5. M.U.T.-III diagnosis code
Reconfirm whether the diagnosis codes are output from A/T-ECU.
- Erase the diagnosis codes being output.
- Ignition switch: LOCK (OFF) to ON
- Confirm whether the diagnosis codes are output.

Q: Is the diagnosis code output?
YES : Go to Step 1.
NO : The procedure is complete.

Code No.U1190: Can't receive fault detection control signal

DIAGNOSIS CODE SET CONDITIONS

To each ECU connected to the CAN bus line, ETACS-ECU sends the diagnosis code (U code) detection permission or prohibition signal. When A/T-ECU cannot receive the diagnosis code (U code) detection permission or prohibition signal for 5 seconds, diagnosis code No. U1190 is stored.

PROBABLE CAUSES

- Malfunction of the ETACS-ECU
- Malfunction of the CAN bus

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics

Using M.U.T.-III, perform CAN busline diagnosis.

Q: Is the check result normal?

YES : Go to Step 2.

NO : Repair the CAN busline (Refer to GROUP54C, Diagnosis – Can Bus Diagnostic Chart), and then go to Step 3.

STEP 2. M.U.T.-III diagnosis code

Reconfirm whether the diagnosis codes are output from A/T-ECU.

(1) Erase the diagnosis codes being output.
(2) Ignition switch: LOCK (OFF) to ON
(3) Confirm whether the diagnosis codes are output.

Q: Is the diagnosis code output?

YES : Replace the ETACS-ECU, and then go to Step 3.

NO : The procedure is complete.

STEP 3. M.U.T.-III diagnosis code

Reconfirm whether the diagnosis codes are output from A/T-ECU.

(1) Erase the diagnosis codes being output.
(2) Ignition switch: LOCK (OFF) to ON
(3) Confirm whether the diagnosis codes are output.

Q: Is the diagnosis code output?

YES : Return to Step 1.

NO : The procedure is complete.

TROUBLE SYMPTOMS CHART

M1231128400177

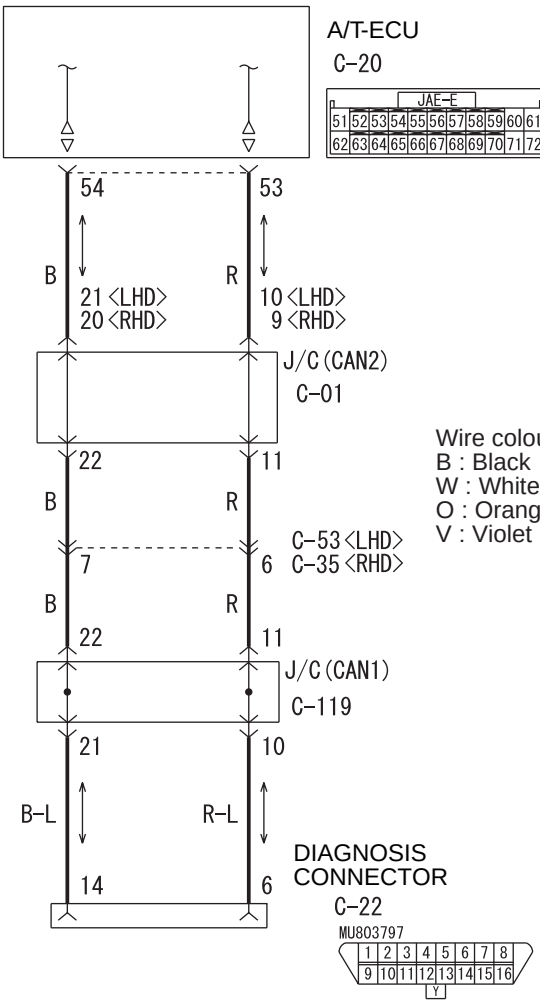
Trouble symptom		Inspection procedure No.	Reference page
Communication with the M.U.T.-III is not possible		1	P.23A-81
Driving not possible	Engine does not start	2	P.23A-83
	Does not move forward	3	P.23A-84
	Does not move backward	4	P.23A-85
	Does not move (forward or backward)	5	P.23A-85
Malfunction when starting off	Engine stalls during shifting	6	P.23A-86
	Shift shock when shifting from N to D and long delay	7	P.23A-87
	Shift shock when shifting from N to R and long delay	8	P.23A-88
	Shift shock when shifting from N to D, N to R and long delay	9	P.23A-89
Problem during shifting	Shift shock and slipping	10	P.23A-90
Incorrect shift points	Does not shift properly (all point)	11	P.23A-90
	Does not shift properly (some point)	12	P.23A-91
No shifting	Does not shift (no diagnosis code)	13	P.23A-91
Problem during driving	Poor acceleration	14	P.23A-92
	Vibration	15	P.23A-92

Trouble symptom	Inspection procedure No.	Reference page
Overdrive switch system <4A/T>	16	P.23A-93
4LLc switch system <4WD>	17	P.23A-96
Shift switch assembly system<5A/T>	18	P.23A-99

SYMPTOM PROCEDURES

Inspection Procedure 1: Communication with the M.U.T.-III is not Possible.

Diagnosis Connector Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue
W : White Y : Yellow SB : Sky blue BR : Brown
O : Orange GR : Grey R : Red P : Pink
V : Violet PU : Purple

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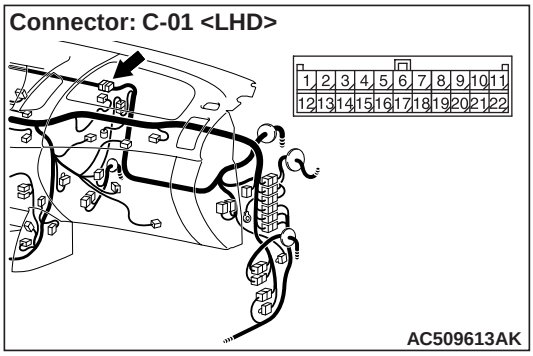
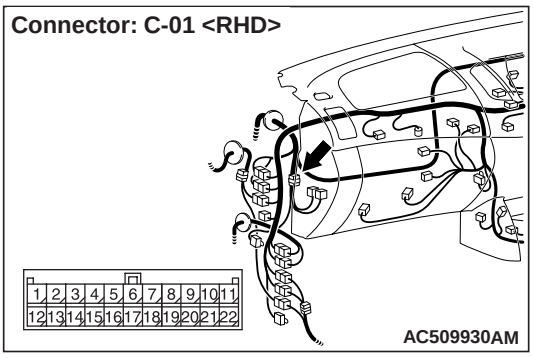
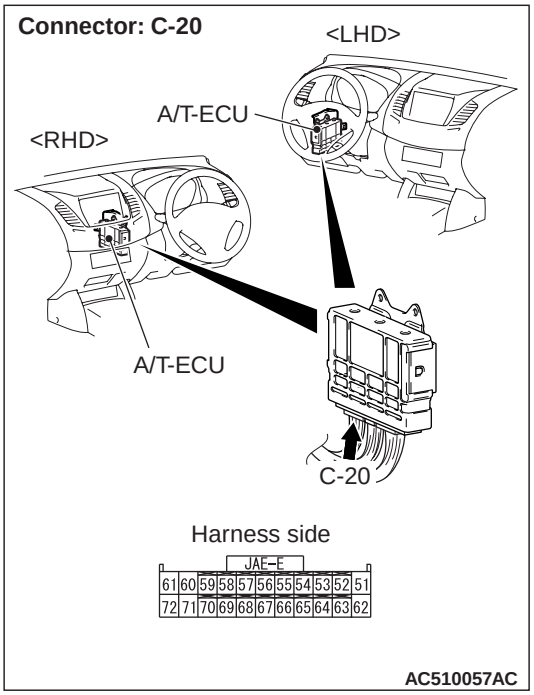
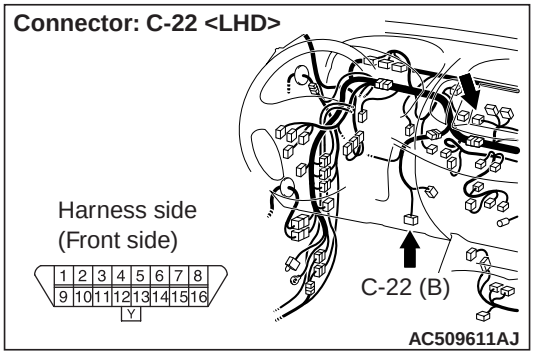
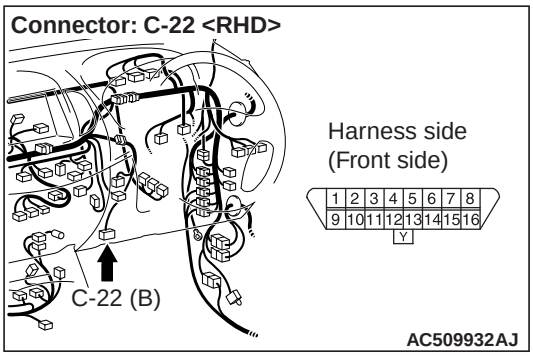
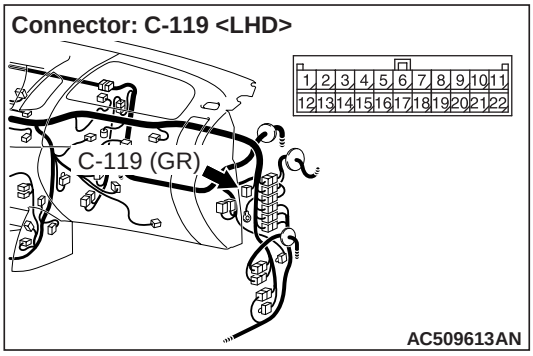


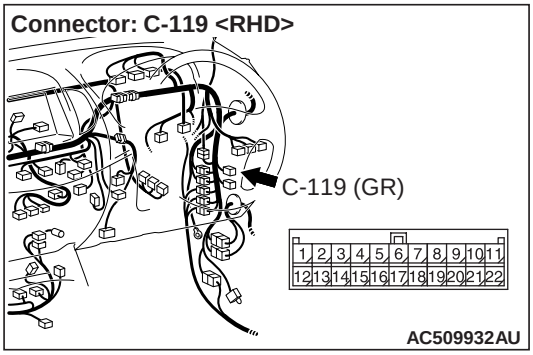












⚠ CAUTION

If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Diagnose the CAN bus lines before the diagnosis codes (Refer to GROUP 54C, CAN bus-line diagnostic flow).

TECHNICAL DESCRIPTION (COMMENT)

If the M.U.T.-III can not communicate with the A/T system, the CAN bus lines may be defective. If the A/T system does not work, the A/T-ECU or its power supply circuit may be defective.

PROBABLE CAUSES

- Damaged wiring harness or connector
- Malfunction of the A/T-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics

Use M.U.T.-III to diagnose the CAN bus lines.

(1) Connect M.U.T.-III to the 16-pin diagnosis connector.
(2) Turn the ignition switch to the ON position.
(3) Diagnose the CAN bus line.

Q: Is the check result normal?

YES : Check and repair the A/T system.

NO : Repair the CAN bus lines (Refer to GROUP 54C, CAN bus line Diagnostic flow).

Inspection Procedure 2: Engine Does not Start

COMMENTS ON TROUBLE SYMPTOM

If the engine does not start when the selector lever is in P or N position, the cause is probably a malfunction of inhibitor switch system, transmission control cable, engine system, torque converter or oil pump.

PROBABLE CAUSES

- Malfunction of inhibitor switch
- Malfunction of transmission control cable
- Malfunction of engine system
- Malfunction of torque converter
- Malfunction of oil pump
- Malfunction of the A/T-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code

Either of diagnosis codes P1770 (P0705) or P1771 (P0705) is set, inhibitor switch is defective.

Q: Are diagnosis codes P1770 (P0705) or P1771 (P0705) output?

YES <diagnosis code P1770 (P0705) is set> : Refer to diagnosis code P1770 (P0705): Inhibitor switch system P.23A-46 <4A/T>, P.23A-49 <5A/T>.

YES <diagnosis code P1771 (P0705) is set> : Refer to diagnosis code P1771 (P0705): Inhibitor switch system P.23A-51 <4A/T>, P.23A-52 <5A/T>.

NO : Go to Step 2.

STEP 2. Transmission control cable check

Check the transmission control cable and inhibitor switch for installation condition.

Q: Is the check result normal?

YES : Go to Step 3.

NO : Adjust the positions of the transmission control cable and inhibitor switch (Refer to P.23A-114).

STEP 3. Engine system check

Q: Is the check result normal?

YES : Go to Step 4.

NO : Repair the engine system.

STEP 4. A/T-ECU replacement

(1) Replace the A/T-ECU.
(2) Test drive the vehicle.
(3) Verify that the condition described by the customer exists.

Q: Does a malfunction take place again?

YES : Go to Step 5.

NO : The inspection is complete.

STEP 5. Torque converter check

Check for damaged drive plate, incorrect installation in the input shaft (inserted at an angle) or damaged splines.

Q: Is the check result normal?

YES : Check the oil pump for incorrect installation, damage and etc., and replace the oil pump assembly if necessary (The oil pump cannot be disassembled).

NO : If repair is possible, repair the damaged part. If repair is not possible because the splines on the drive plate or torque converter are damaged, replace it.

Inspection Procedure 3: Does not Move Forward

COMMENTS ON TROUBLE SYMPTOM
If the vehicle does not move forward when the selector lever is shifted N to D, 2, L range or sport mode (1st, 2nd gear) while the engine is idling, the cause is probably abnormal line pressure or a malfunction of the underdrive clutch or valve body.

PROBABLE CAUSES
- Malfunction of underdrive solenoid valve
- Malfunction of inhibitor switch
- Abnormal line pressure
- Malfunction of the underdrive clutch
- Malfunction of valve body
- Malfunction of the oil pump
- Malfunction of the A/T-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III actuator test
Item 02: Underdrive solenoid valve

OK: Operating sound can be heard.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Replace the underdrive solenoid valve.

STEP 2. M.U.T.-III diagnosis code
Either of diagnosis codes P1770 (P0705) or P1771 (P0705) is set, inhibitor switch is defective.

Q: Are diagnosis codes P1770 (P0705) or P1771 (P0705) output?
YES <diagnosis code P1770 (P0705) is set> : Refer to diagnosis code P1770 (P0705): Inhibitor switch system P.23A-46 <4A/T>, P.23A-49 <5A/T>.
YES <diagnosis code P1771 (P0705) is set> : Refer to diagnosis code P1771 (P0705): Inhibitor switch system P.23A-51 <4A/T>, P.23A-52 <5A/T>.
NO : Go to Step 3.

STEP 3. Underdrive solenoid valve check
(1) Turn the ignition switch to the ON position.
(2) Shift the selector lever from N to D range.
(3) Confirm the operating sound of the underdrive solenoid valve.

OK: Operating sound can be heard.

Q: Is the check result normal?
YES : Go to Step 4.
NO : Replace the A/T-ECU.

STEP 4. Hydraulic pressure test
Measure the hydraulic pressure of the underdrive clutch when the selector lever is at the L range or sport mode (1st gear).

OK: Refer to P.23A-120.

Q: Is the check result normal?
YES : Go to Step 7.
NO : Go to Step 5.

STEP 5. A/T-ECU replacement
(1) Replace the A/T-ECU.
(2) Test drive the vehicle.
(3) Verify that the condition described by the customer exists.

Q: Does a malfunction take place again?
YES : Go to Step 6.
NO : The inspection is complete.

STEP 6. Valve body disassembly clean and assembly
(1) Check the bolts for looseness and the O-ring, solenoid valve and valve body for damage. Replace the valve body assembly if the damages are thought to be irreparable.
(2) Test drive the vehicle.
(3) Verify that the condition described by the customer exists.

Q: Does a malfunction take place again?
YES : Go to Step 7.
NO : The inspection is complete.

STEP 7. Oil pump check
(1) If the damage is in the oil pump assembly, replace the oil pump assembly.
(2) Test drive the vehicle.
(3) Verify that the condition described by the customer exists.

Q: Is the check result normal?
YES : Go to Step 8.
NO : The inspection is complete.

STEP 8. Underdrive clutch check
(1) Check the facing for seizure and the piston seal ring for damage and interference with the retainer.
(2) Test drive the vehicle.
(3) Verify that the condition described by the customer exists.

Q: Is the check result normal?

YES : The inspection is complete.
NO : Repair or replace the underdrive clutch.

Inspection Procedure 4: Does not Move Backward

COMMENTS ON TROUBLE SYMPTOM

If the vehicle does not move backward when the selector lever is shifted to R range while the engine is idling, the cause is probably abnormal pressure of the reverse clutch and low-reverse brake or a malfunction of the reverse clutch, low-reverse brake, or valve body.

PROBABLE CAUSES

- Abnormal reverse clutch pressure
- Abnormal low-reverse brake pressure
- Malfunction of low-reverse solenoid valve
- Malfunction of the reverse clutch
- Malfunction of low-reverse brake
- Malfunction of valve body
- Malfunction of the A/T-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III actuator test

Item 01: Low-reverse solenoid valve

OK: Operating sound can be heard.

Q: Is the check result normal?

YES : Go to Step 2.
NO : Replace the low-reverse solenoid valve.

STEP 2. Hydraulic pressure test

Measure the hydraulic pressure for reverse clutch and low-reverse brake when the selector lever is at the R range.

OK: Refer to P.23A-120.

Q: Is the check result normal?

YES : Go to Step 5.
NO : Go to Step 3.

STEP 3. A/T-ECU replacement

(1) Replace the A/T-ECU.
(2) Test drive the vehicle.
(3) Verify that the condition described by the customer exists.

Q: Does a malfunction take place again?

YES : Go to Step 4.
NO : The inspection is complete.

STEP 4. Valve body disassembly clean and assembly

(1) Check the bolts for looseness and the O-ring, solenoid valve and valve body for damage. Replace the valve body assembly if the damages are thought to be irreparable.
(2) Test drive the vehicle.
(3) Verify that the condition described by the customer exists.

Q: Does a malfunction take place again?

YES : Go to Step 5.
NO : The inspection is complete.

STEP 5. Reverse clutch and low-reverse brake check

Check the facing for seizure and the piston seal ring for damage and interference with the retainer.

Q: Is the check result normal?

YES : The inspection is complete.
NO : Repair or replace the reverse clutch and low-reverse brake.

Inspection Procedure 5: Does not Move (Forward or Backward)

COMMENTS ON TROUBLE SYMPTOM

If the vehicle does not move forward or backward when the selector lever is shifted to any position while the engine is idling, the cause is probably an abnormal line pressure, a malfunction of the power train components, oil pump or valve body.

PROBABLE CAUSES

- Abnormal line pressure
- Malfunction of valve body
- Malfunction of torque converter
- Malfunction of oil pump
- Malfunction of each element
- Malfunction of power train components

DIAGNOSIS PROCEDURE

STEP 1. Hydraulic pressure test
Measure the hydraulic pressure of each element when the selector lever is 2, L range, sport mode (1st, 2nd gear) or reverse.

OK: Refer to P.23A-120.

Q: Is the check result normal?
YES : Go to Step 4.
NO : Go to Step 2.

STEP 2. Valve body disassembly clean and assembly
(1) Check the bolts for looseness and the O-ring, solenoid valve and valve body for damage. Replace the valve body assembly if the damages are thought to be irreparable.
(2) Test drive the vehicle.
(3) Verify that the condition described by the customer exists.

Q: Does a malfunction take place again?
YES : Go to Step 3.
NO : The inspection is complete.

STEP 3. Torque converter check
Check for damaged drive plate, incorrect installation in the input shaft (inserted at an angle) or damaged splines.

Q: Is the check result normal?
YES : Check the oil pump for incorrect installation, damage and etc., and replace the oil pump assembly if necessary (The oil pump cannot be disassembled.)
NO : If repair is possible, repair the damaged part. If repair is not possible because the splines on the drive plate or torque converter are damaged, replace it.

STEP 4. Power train components check
Disassemble the transmission and check the input shaft, planetary carrier, output shaft differential and each element, etc.

Q: Is the check result normal?
YES : The inspection is complete.
NO : Repair or replace each power train components.

Inspection Procedure 6: Engine Stalls During Shifting

COMMENTS ON TROUBLE SYMPTOM
If the engine stalls when the selector lever is shifted from N to D or R range while the engine is idling, the cause is probably a malfunction of the engine system, damper clutch solenoid valve, valve body or torque converter (damper clutch).

PROBABLE CAUSES
- Malfunction of engine system
- Malfunction of damper clutch solenoid valve
- Malfunction of valve body
- Malfunction of torque converter (damper clutch)
- Malfunction of the A/T-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III actuator test
Item 06: Damper clutch solenoid valve

OK: Operating sound can be heard.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Replace the damper clutch solenoid valve.

STEP 2. Valve body disassembly clean and assembly
(1) Check the bolts for looseness and the O-ring, solenoid valve and valve body for damage. Replace the valve body assembly if the damages are thought to be irreparable.
(2) Test drive the vehicle.
(3) Verify that the condition described by the customer exists.

Q: Does a malfunction take place again?
YES : Go to Step 3.
NO : The inspection is complete.

STEP 3. Torque converter check
Check for damaged drive plate, incorrect installation in the input shaft (inserted at an angle), damaged splines or damper clutch sealing.

Q: Is the check result normal?
YES : Go to Step 4.
NO : If repair is possible, repair the damaged part. If repair is not possible because the splines on the drive plate or torque converter are damaged, replace it.

STEP 4. Engine system check

Q: Is the check result normal?

YES : Replace the A/T-ECU.
NO : Repair the engine system.

Inspection Procedure 7: Shift Shock when Shifting from N to D and Long Delay

COMMENTS ON TROUBLE SYMPTOM
If abnormal shock or delay of two seconds or more occurs when the selector lever is shifted from N to D range while the engine is idling, the cause is probably abnormal underdrive clutch pressure or a malfunction of the underdrive clutch, valve body or throttle position sensor.

PROBABLE CAUSES
- Malfunction of underdrive solenoid valve
- Malfunction of input shaft speed sensor
- Abnormal underdrive clutch pressure
- Malfunction of throttle position sensor
- Malfunction of the underdrive clutch
- Malfunction of valve body
- Malfunction of the A/T-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III actuator test
Item 02: Underdrive solenoid valve

OK: Operating sound can be heard.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Replace the underdrive solenoid valve.

STEP 2. M.U.T.-III data list
Item 05: Input shaft speed sensor (Refer to data list reference table P.23A-103).

Q: Is the check result normal?
YES : Go to Step 3.
NO : Refer to diagnosis code P1766: Input shaft speed sensor system P.23A-36.

STEP 3. M.U.T.-III data list
Item 13: Underdrive solenoid valve duty ratio (Refer to data list reference table P.23A-103).

Q: Is the check result normal?
YES : Go to Step 4.
NO : Replace the A/T-ECU.

STEP 4. Check when shift shock occurs.

Q: Does the shift shock occur when the vehicle starts moving?
YES : Go to Step 6.
NO : Go to Step 5.

STEP 5. Hydraulic pressure test
Measure the hydraulic pressure for underdrive clutch when the selector lever is shifted from N to D range.

OK: Refer to P.23A-120.

Q: Is the check result normal?
YES : Go to Step 9.
NO : Go to Step 8.

STEP 6. Check when shift shock occurs.

Q: Does the shift shock always occur?
YES : Go to Step 8.
NO : Go to Step 7.

STEP 7. M.U.T.-III data list
Item 35: Accelerator pedal position sensor (Refer to data list reference table P.23A-103).

Q: Is the check result normal?
YES : Go to Step 8.
NO : Check the throttle position sensor system (Refer to GROUP 13A, Troubleshooting).

STEP 8. Valve body disassembly clean and assembly
(1) Check the bolts for looseness and the O-ring, solenoid valve and valve body for damage. Replace the valve body assembly if the damages are thought to be irreparable.
(2) Test drive the vehicle.
(3) Verify that the condition described by the customer exists.

Q: Does a malfunction take place again?
YES : Go to Step 9.
NO : The inspection is complete.

STEP 9. Underdrive clutch check
Check the facing for seizure and the piston seal ring for damage and interference with the retainer.

Q: Is the check result normal?
YES : The inspection is complete.
NO : Repair or replace the underdrive clutch.

Inspection Procedure 8: Shift Shock when Shifting from N to R and Long Delay

COMMENTS ON TROUBLE SYMPTOM
If abnormal shock or delay of two seconds or more occurs when the selector lever is shifted from N to R range while the engine is idling, the cause is probably abnormal pressure in reverse clutch and low-reverse clutch or a malfunction of the reverse clutch, low-reverse brake, valve body or throttle position sensor.

PROBABLE CAUSES
- Malfunction of low-reverse solenoid valve
- Malfunction of input shaft speed sensor
- Malfunction of the inhibitor switch
- Abnormal reverse clutch pressure
- Abnormal low-reverse brake pressure
- Malfunction of accelerator pedal position sensor
- Malfunction of the reverse clutch
- Malfunction of low-reverse brake
- Malfunction of valve body
- Malfunction of the A/T-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III actuator test
Item 01: Low-reverse solenoid valve

OK: Operating sound can be heard.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Replace the low-reverse solenoid valve.

STEP 2. M.U.T.-III data list
Item 05: Input shaft speed sensor (Refer to data list reference table P.23A-103).

Q: Is the check result normal?
YES : Go to Step 3.
NO : Refer to diagnosis code P1766: Input shaft speed sensor system P.23A-36.

STEP 3. M.U.T.-III diagnosis code
Either of diagnosis codes P1770 (P0705) or P1771 (P0705) is set, inhibitor switch is defective.

Q: Are diagnosis codes P1770 (P0705) or P1771 (P0705) output?
YES <diagnosis code P1770 (P0705) is set> : Refer to diagnosis code P1770 (P0705): Inhibitor switch system P.23A-46 <4A/T>, P.23A-49 <5A/T>.
YES <diagnosis code P1771 (P0705) is set> : Refer to diagnosis code P1771 (P0705): Inhibitor switch system P.23A-51 <4A/T>, P.23A-52 <5A/T>.
NO : Go to Step 4.

STEP 4. M.U.T.-III data list
Item 12: Low-reverse solenoid valve duty ratio (Refer to data list reference table P.23A-103).

Q: Is the check result normal?
YES : Go to Step 5.
NO : Replace the A/T-ECU.

STEP 5. Check when shift shock occurs.

Q: Does the shift shock occur when the vehicle starts moving?
YES : Go to Step 7.
NO : Go to Step 6.

STEP 6. Hydraulic pressure test
Measure the hydraulic pressure for reverse clutch and low-reverse clutch when the selector lever is shifted from N to R range.

OK: Refer to P.23A-120.

Q: Is the check result normal?
YES : Go to Step 10.
NO : Go to Step 9.

STEP 7. Check when shift shock occurs.

Q: Does the shift shock always occur?
YES : Go to Step 9.
NO : Go to Step 8.

STEP 8. M.U.T.-III data list
Item 35: Accelerator pedal position sensor (Refer to data list reference table P.23A-103).

Q: Is the check result normal?
YES : Go to Step 9.
NO : Check the throttle position sensor system (Refer to GROUP 13A, Troubleshooting).

STEP 9. Valve body disassembly clean and assembly
(1) Check the bolts for looseness and the O-ring,

solenoid valve and valve body for damage. Replace the valve body assembly if the damages are thought to be irreparable.
(2) Test drive the vehicle.
(3) Verify that the condition described by the customer exists.

Q: Does a malfunction take place again?
YES : Go to Step 10.
NO : The inspection is complete.

STEP 10. Reverse clutch and low-reverse brake check
Check the facing for seizure and the piston seal ring for damage and interference with the retainer.

Q: Is the check result normal?
YES : The inspection is complete.
NO : Repair or replace the reverse clutch and low-reverse brake.

Inspection Procedure 9: Shift Shock when Shifting from N to D, N to R and Long Delay

COMMENTS ON TROUBLE SYMPTOM
If abnormal shock or delay of two seconds or more occurs when the selector lever is shifted from N to D range and from N to R range while the engine is idling, the cause is probably abnormal line pressure or a malfunction of the oil pump, valve body.

PROBABLE CAUSES
- Abnormal line pressure
- Malfunction of throttle position sensor
- Malfunction of oil pump
- Malfunction of valve body
- Malfunction of the A/T-ECU

DIAGNOSIS PROCEDURE

STEP 1. Hydraulic pressure test
Measure the hydraulic pressure of each element when the selector lever is 2, L range, sport mode (1st, 2nd gear) or reverse.

OK: Refer to P.23A-120.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Go to Step 2.

STEP 2. Line pressure adjustment
(1) Adjust the line pressure (Refer to P.23A-129).
(2) Test drive the vehicle.
(3) Verify that the condition described by the customer exists.

Q: Does a malfunction take place again?
YES : Go to Step 3.
NO : The inspection is complete.

STEP 3. Check when shift shock occurs.

Q: Does the shift shock occur when the vehicle starts moving?
YES : Go to Step 4.
NO : Check the oil pump for incorrect installation, damage and etc., and replace the oil pump assembly if necessary (The oil pump cannot be disassembled.)

STEP 4. Check when shift shock occurs.

Q: Does the shift shock always occur?
YES : Go to Step 7.
NO : Go to Step 5.

STEP 5. M.U.T.-III data list
Item 35: Accelerator pedal position sensor (Refer to data list reference table P.23A-103).

Q: Is the check result normal?
YES : Go to Step 6.
NO : Check the throttle position sensor system (Refer to GROUP 13A, Troubleshooting).

STEP 6. A/T-ECU replacement
(1) Replace the A/T-ECU.
(2) Test drive the vehicle.
(3) Verify that the condition described by the customer exists.

Q: Does a malfunction take place again?
YES : Go to Step 7.
NO : The inspection is complete.

STEP 7. Valve body disassembly clean and assembly
Check the bolts for looseness and the O-ring, solenoid valve and valve body for damage.

Q: Is the check result normal?
YES : The inspection is complete.
NO : Replace the valve body assembly if the damages are thought to be irreparable.

Inspection Procedure 10: Shift Shock and Slipping

COMMENTS ON TROUBLE SYMPTOM
If shift shock when driving are due to upshifting or downshifting and the transmission speed become higher than the engine speed, the cause is probably abnormal line pressure or a malfunction of a solenoid valve, oil pump, valve body or of a brake or clutch.

PROBABLE CAUSES
- Malfunction of each solenoid valve
- Abnormal line pressure
- Malfunction of valve body
- Malfunction of oil pump
- Malfunction of each brake or each clutch
- Malfunction of the A/T-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III actuator test
- Item 01: Low-reverse solenoid valve
- Item 02: Underdrive solenoid valve
- Item 03: Second solenoid valve
- Item 04: Overdrive solenoid valve
- Item 05: Reduction solenoid valve <5A/T>

OK: Operating sound can be heard.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Replace the defective solenoid valve.

STEP 2. M.U.T.-III data list
- Item 11: Shift position (Refer to data list reference table P.23A-103).
- Item 12, 13, 14, 15, 16 <5A/T>: Each solenoid valve duty ratio (Refer to data list reference table P.23A-103).

Q: Is the check result normal?
YES : Go to Step 3.
NO : Replace the A/T-ECU.

STEP 3. Hydraulic pressure test
Check all hydraulic pressures within the standard value.

OK: Refer to P.23A-120.

Q: Is the check result normal?
YES : Go to Step 6.
NO : Go to Step 4.

STEP 4. Line pressure adjustment
(1) Adjust the line pressure (Refer to P.23A-129).
(2) Test drive the vehicle.
(3) Verify that the condition described by the customer exists.

Q: Does a malfunction take place again?
YES : Go to Step 5.
NO : The inspection is complete.

STEP 5. Valve body disassembly clean and assembly
(1) Check the bolts for looseness and the O-ring, solenoid valve and valve body for damage. Replace the valve body assembly if the damages are thought to be irreparable.
(2) Test drive the vehicle.
(3) Verify that the condition described by the customer exists.

Q: Does a malfunction take place again?
YES : Check the oil pump for incorrect installation, damage and etc., and replace the oil pump assembly if necessary (The oil pump cannot be disassembled).
NO : The inspection is complete.

STEP 6. Each clutch and brake check
Check the facing for seizure and the piston seal ring for damage and interference with the retainer.

Q: Is the check result normal?
YES : The inspection is complete.
NO : Repair or replace each clutch and brake.

Inspection Procedure 11: Does not Shift Properly (all Points)

COMMENTS ON TROUBLE SYMPTOM
If all shift points are early or late while driving, the cause is probably a malfunction of the output shaft speed sensor, throttle position sensor, or A/T-ECU.

PROBABLE CAUSES
- Malfunction of output shaft speed sensor
- Malfunction of throttle position sensor
- Malfunction of the A/T-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III data list
Item 06: Output shaft speed sensor (Refer to data list reference table P.23A-103).

Q: Is the check result normal?
YES : Go to Step 2.
NO : Refer to diagnosis code P1767: Output shaft speed sensor system P.23A-41.

STEP 2. M.U.T.-III data list
Item 35: Accelerator pedal position sensor (Refer to data list reference table P.23A-103).

Q: Is the check result normal?
YES : Go to Step 3.
NO : Check the throttle position sensor system (Refer to GROUP 13A, Troubleshooting).

STEP 3. M.U.T.-III actuator test
(1) Test drive the vehicle (Refer to Road Test, Inspection procedure 8 P.23A-17).
(2) Check that the gear shifting corresponds to the standard shift line of the shift pattern diagram.

Q: Is the check result normal?
YES : The inspection is complete.
NO : Replace the A/T-ECU.

Inspection Procedure 12: Does not Shift Properly (some Point)

COMMENTS ON TROUBLE SYMPTOM
If some of the shift points are early or late when driving, the cause is probably a malfunction of valve body.

PROBABLE CAUSES
- Malfunction of the A/T-ECU

DIAGNOSIS PROCEDURE

STEP 1. Check when the shift points early or late.

Q: Are the shift points early or late only when A/T fluid is −20°C or less, or 125°C or more?
YES : Is not abnormal.
NO : Go to Step 2.

STEP 2. M.U.T.-III actuator test
(1) Test drive the vehicle (Refer to Road Test, Inspection procedure 8 P.23A-17).
(2) Check that the gear shifting corresponds to the standard shift line of the shift pattern diagram.

Q: Is the check result normal?
YES : The inspection is complete.
NO : Replace the A/T-ECU.

Inspection Procedure 13: Does not Shift (no Diagnosis Code)

COMMENTS ON TROUBLE SYMPTOM
The gear shifting does not occur while driving. If no diagnosis codes are set, the cause is probably a malfunction of the shift switch assembly or A/T-ECU .

PROBABLE CAUSES
- Malfunction of Shift switch assembly
- Malfunction of the A/T-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III data list
Item 08: A/T control relay (Refer to Data List Reference Table P.23A-103).

Q: Is the check result normal?
YES : Go to Step 2.
NO : Replace the A/T-ECU.

STEP 2. M.U.T.-III data list
Item 34: Inhibitor switch (Refer to Data List Reference Table P.23A-103).

Q: Is the check result normal?
YES : Replace the A/T-ECU.
NO : Refer to diagnosis code P1770 (P0705): Inhibitor switch system P.23A-46 <4A/T>, P.23A-49 <5A/T> and Refer to diagnosis code P1771 (P0705): Inhibitor switch system P.23A-51 <4A/T>, P.23A-52 <5A/T>.

Inspection Procedure 14: Poor Acceleration

COMMENTS ON TROUBLE SYMPTOM
If acceleration is poor when downshifting occurs while driving, the cause is probably a malfunction of the engine system.

PROBABLE CAUSES
- Malfunction of engine system
- Malfunction of the A/T-ECU

DIAGNOSIS PROCEDURE

STEP 1. Engine system check

Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the engine system.

STEP 2. A/T-ECU replacement
(1) Replace the A/T-ECU.
(2) Test drive the vehicle.
(3) Verify that the condition described by the customer exists.

Q: Does a malfunction take place again?
YES : Go to Step 1.
NO : The inspection is complete.

Inspection Procedure 15: Vibration

COMMENTS ON TROUBLE SYMPTOM
If vibration occurs when driving at constant speed or when acceleration in high range, the cause is probably an abnormal torque converter pressure, or a malfunction of the engine system, damper clutch solenoid valve, valve body or torque converter.

PROBABLE CAUSES
- Malfunction of damper clutch solenoid valve
- Malfunction of engine system
- Abnormal torque converter pressure
- Malfunction of valve body
- Malfunction of torque converter
- Malfunction of the A/T-ECU

DIAGNOSIS PROCEDURE

STEP 1. Check when the vibration occurs.

Q: Does the vibration occur when the damper clutch is operating?
YES : Go to Step 3.
NO : Go to Step 2.

STEP 2. Engine system check

Q: Is the check result normal?
YES : The inspection is complete.
NO : Repair the engine system.

STEP 3. A/T-ECU replacement
(1) Replace the A/T-ECU.
(2) Test drive the vehicle.
(3) Verify that the condition described by the customer exists.

Q: Does a malfunction take place again?
YES : Go to Step 4.
NO : The inspection is complete.

STEP 4. Torque converter check
Check for damaged drive plate, incorrect installation in the input shaft (inserted at an angle), damaged splines or damper clutch sealing.

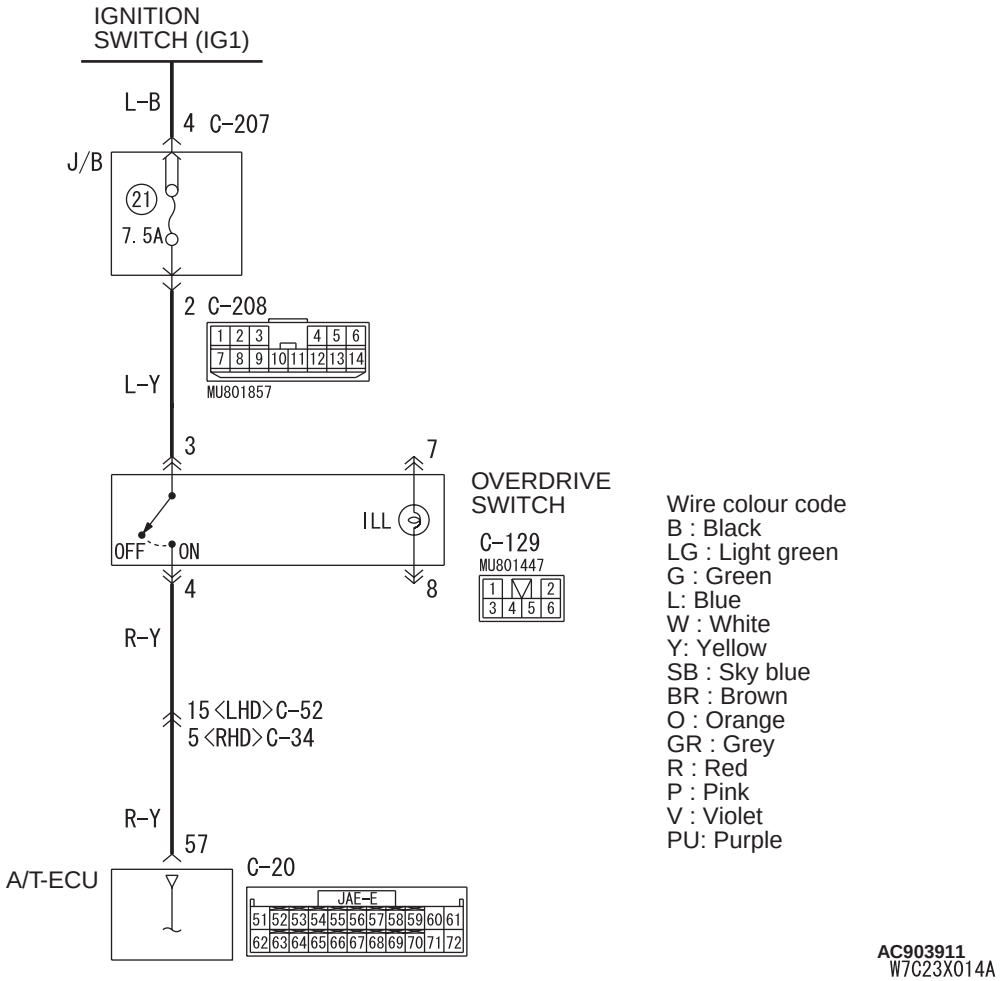
Q: Is the check result normal?
YES : Go to Step 5.
NO : If repair is possible, repair the damaged part. If repair is not possible because the splines on the drive plate or torque converter are damaged, replace it.

STEP 5. Valve body disassembly clean and assembly
Check the bolts for looseness and the O-ring, solenoid valve and valve body for damage.

Q: Is the check result normal?
YES : The inspection is complete.
NO : Replace the valve body assembly if the damages are thought to be irreparable.

Inspection Procedure 16: Overdrive switch system <4A/T>

Overdrive Switch System Circuit



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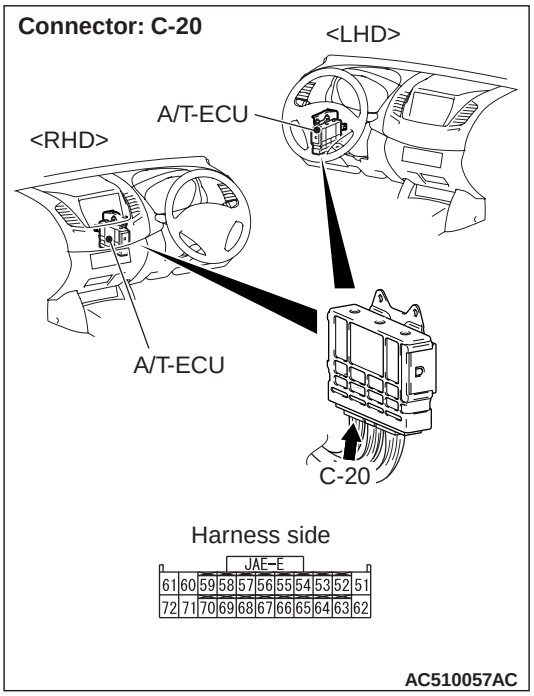
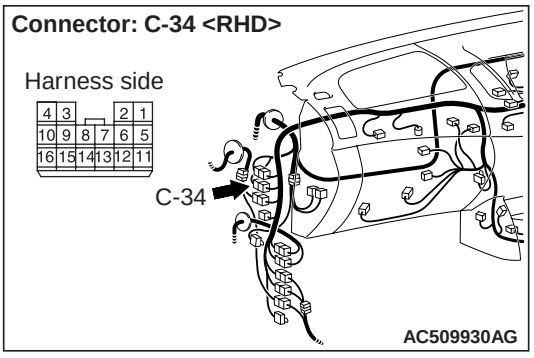
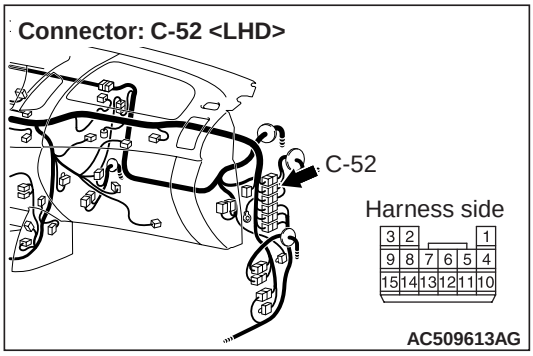
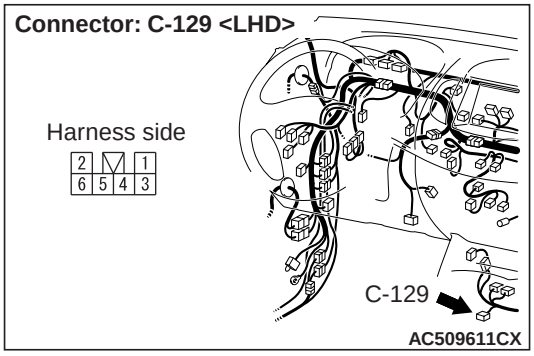
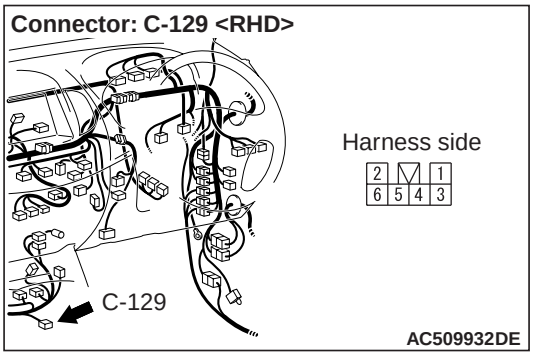
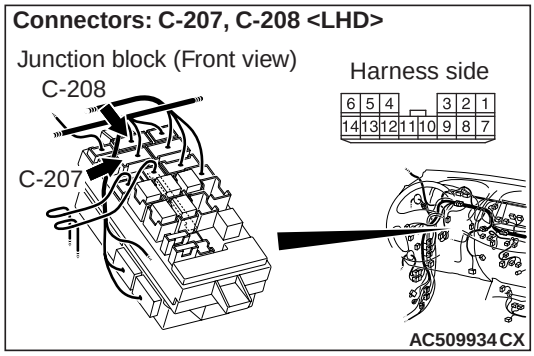


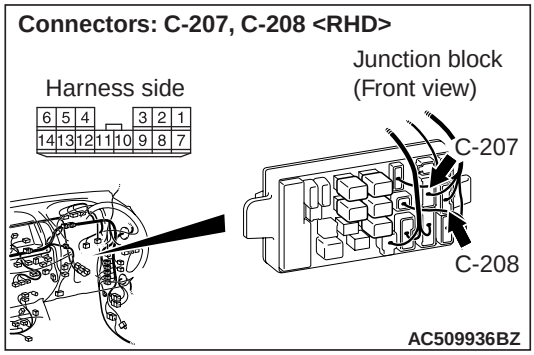












OPERATION

During driving with 4th gear, when the overdrive switch is turned ON, A/T-ECU performs a downshift control to 3rd gear.

COMMENTS ON TROUBLE SYMPTOM

If downshifting does not occur when overdrive switch is turned on while driving in 4th gear, or upshifting does not occur when overdrive switch is turned off while driving in 3rd gear, the cause is probably a problem in the overdrive switch system.

PROBABLE CAUSES

- Malfunction of the overdrive switch
- Damaged harness wires and connectors
- Malfunction of the A/T-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III data list
Item 26: Overdrive switch (Refer to data list reference table P.23A-103).

Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction).
NO : Go to Step 2.

STEP 2. Check the overdrive switch.
Refer to P.23A-132.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Replace the high/low detection switch.

STEP 3. Measure the voltage at overdrive switch connector C-129.
(1) Disconnect the connector, and measure the voltage between terminal 3 and earth at the wiring harness side.
(2) Turn the ignition switch to the ON position.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 6.
NO : Go to Step 4.

STEP 4. Connector check: C-129 overdrive switch connector, C-208 J/B connector
Check for the contact with terminals.

Q: Is the check result normal?
YES : Go to Step 5.
NO : Repair the defective connector.

STEP 5. Check the harness between overdrive switch connector C-129 terminal No.3 and J/B connector C-208 terminal No.2.
Check the power supply line for short or open circuit.

Q: Is the check result normal?
YES : Go to Step 6.
NO : Repair the wiring harness.

STEP 6. Measure the voltage at A/T-ECU connector C-20.
(1) Disconnect high/low detection switch connector C-129.
(2) Turn the ignition switch to the ON position.
(3) Overdrive switch: ON.
(4) Measure the voltage between A/T-ECU connector C-20 terminal No.57 and earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 7.
NO : Go to Step 8.

STEP 7. M.U.T.-III data list
Item 26: Overdrive switch (Refer to data list reference table P.23A-103).

Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction).
NO : Replace the A/T-ECU.

STEP 8. Connector check: C-129 overdrive switch connector, C-52 <LHD>or C-34 <RHD> intermediate connector, C-20 A/T-ECU connector
Check for the contact with terminals.

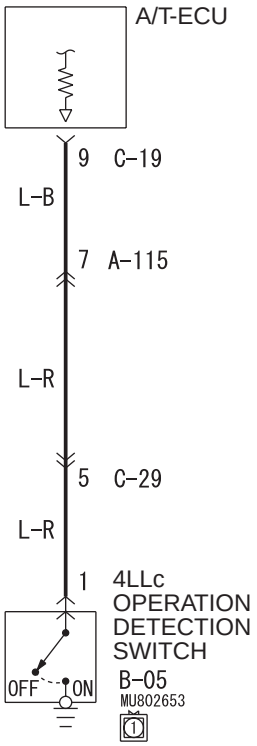
Q: Is the check result normal?
YES : Go to Step 9.
NO : Repair the defective connector.

STEP 9. Check the harness between overdrive switch connector C-129 terminal No.4 and A/T-ECU connector C-20 terminal No.57.
Check the power supply line for short or open circuit.

Q: Is the check result normal?
YES : Go to Step 7.
NO : Repair the wiring harness.

Inspection Procedure 17: 4LLc operation detection switch system <4WD>

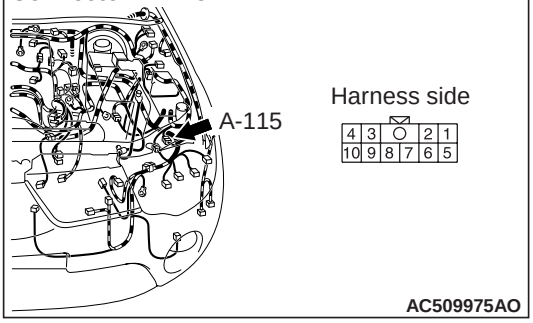
4LLc Operation Detection Switch System Circuit



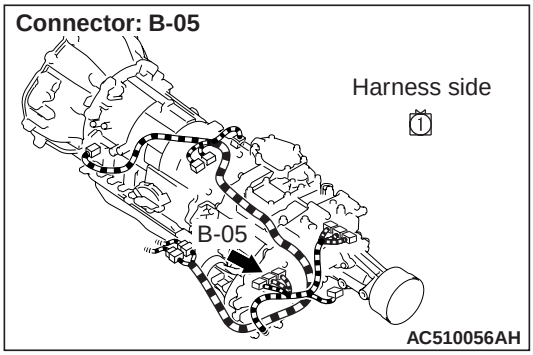
Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

AC903912
W7C23X012A

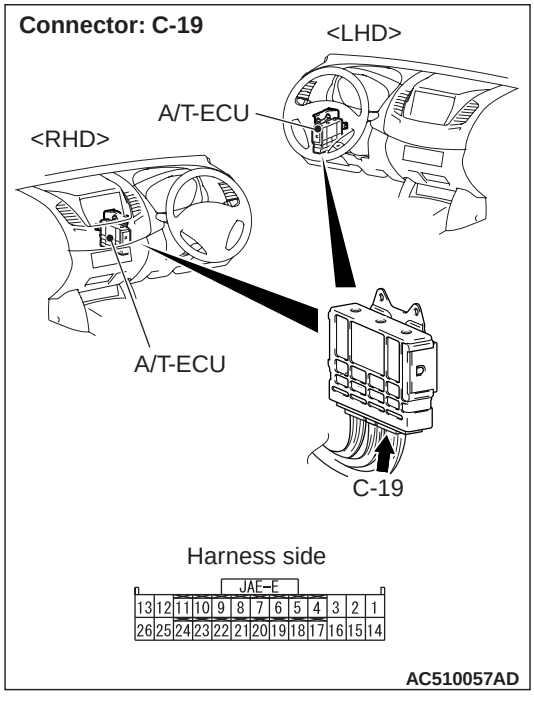
Connector: A-115

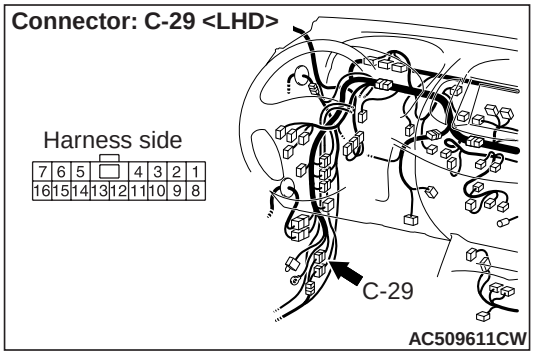


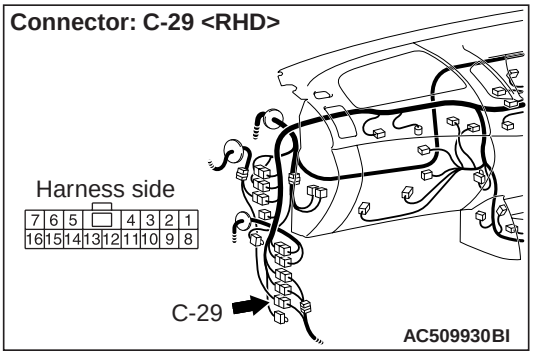
Connector: B-05



Connector: C-19







OPERATION

- A battery voltage is applied to the 4LLc operation detection switch output terminal (terminal 1) from the A/T-ECU (terminal 9) via the resistance in the unit.
- The 4LLc operation detection switch is grounded through the transfer case to the vehicle body.

COMMENTS ON TROUBLE SYMPTOM

If the transmission shifts to 4th gear when the transfer lever is in the 4L position, the cause is probably a malfunction of the 4LLc operation detection switch.

PROBABLE CAUSES

- Malfunction of the 4LLc operation detection switch
- Damaged harness wires and connectors
- Malfunction of the A/T-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III data list

Item 31: 4LLc operation detection switch (Refer to data list reference table P.23A-103).

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction).

NO : Go to Step 2.

STEP 2. Check the 4LLc operation detection switch.

Refer to P.23A-119.

Q: Is the check result normal?

YES : Go to Step 3.

NO : Replace the 4LLc operation detection switch.

STEP 3. Measure the voltage at 4LLc operation detection switch connector B-05.

(1) Disconnect the connector, and measure the resistance between terminal 1 and earth at the wiring harness side.
(2) Turn the ignition switch to the ON position.

OK: System voltage

Q: Is the check result normal?

YES : Go to Step 4.

NO : Go to Step 5.

STEP 4. M.U.T.-III data list

Item 31: 4LLc operation detection switch (Refer to data list reference table P.23A-103).

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction).

NO : Replace the A/T-ECU.

STEP 5. Measure the voltage at A/T-ECU connector C-19.

(1) Disconnect 4LLc operation detection switch connector B-05.
(2) Turn the ignition switch to the ON position.
(3) Measure the voltage between A/T-ECU connector C-19 terminal No.9 and earth.

OK: System voltage

Q: Is the check result normal?

YES : Go to Step 6.

NO : Go to Step 8.

STEP 6. Connector check: B-05 4LLc operation detection switch connector, A-115 and C-29 intermediate connector, C-19 A/T-ECU connector

Check for the contact with terminals.

Q: Is the check result normal?

YES : Go to Step 7.

NO : Repair the defective connector.

STEP 7. Check the harness between 4LLc operation detection switch connector B-05 terminal No.1 and A/T-ECU connector C-19 terminal No.9.

Check the power supply line for open circuit.

Q: Is the check result normal?

YES : Go to Step 4.

NO : Repair the wiring harness.

STEP 8. Connector check: B-05 4LLc operation detection switch connector, A-115 and C-29 intermediate connector, C-19 A/T-ECU connector

Check for the contact with terminals.

Q: Is the check result normal?

YES : Go to Step 9.

NO : Repair the defective connector.

STEP 9. Check the harness between 4LLc operation detection switch connector B-05 terminal No.1 and A/T-ECU connector C-19 terminal No.9.

Check the power supply line for short circuit.

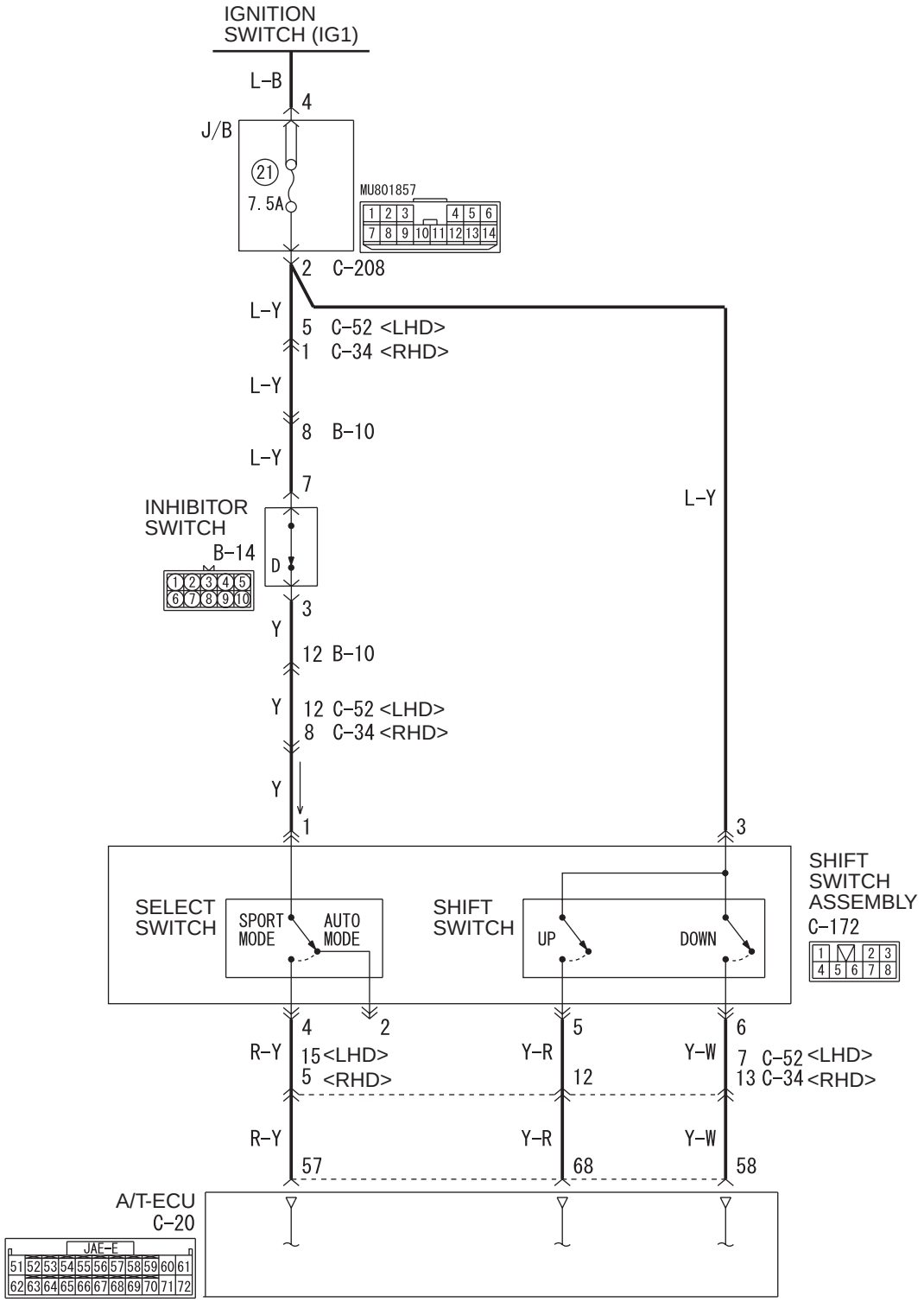
Q: Is the check result normal?

YES : Go to Step 4.

NO : Repair the wiring harness.

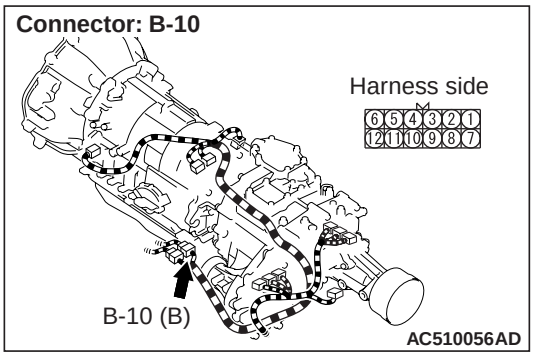
Inspection Procedure 18: Shift Switch Assembly System <5A/T>

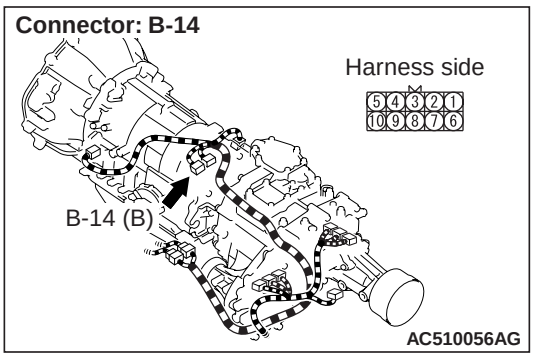
Shift Switch System Circuit

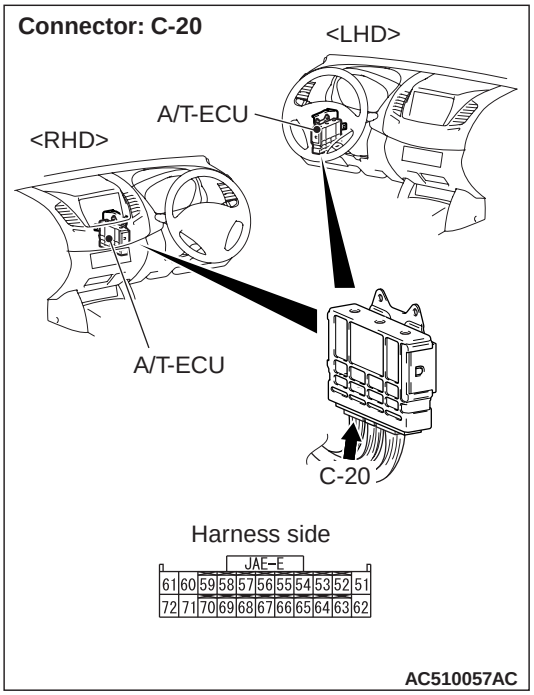


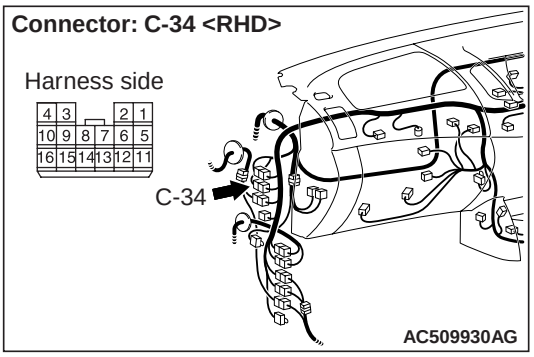
Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

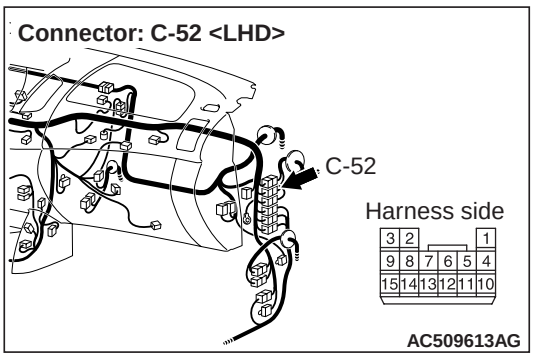
AC903920

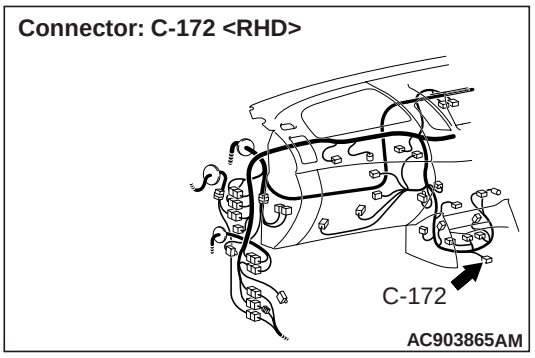


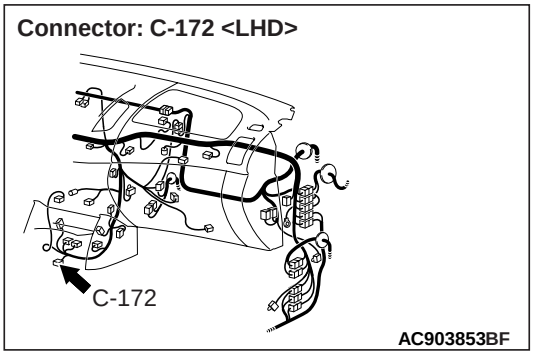


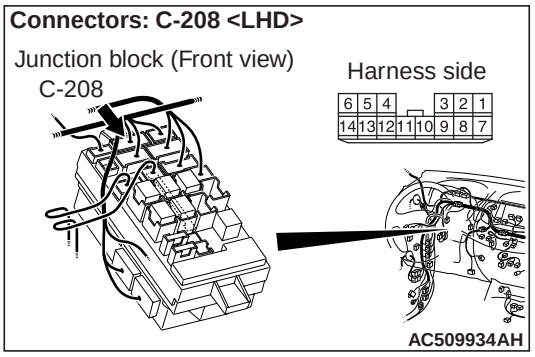












OPERATION

The shift switch assembly detects the shift range (sport mode) which the driver has selected, and sends the information to the A/T-ECU.

COMMENTS ON TROUBLE SYMPTOM

The cause is probably a malfunction of the shift switch and A/T-ECU.

PROBABLE CAUSES

- Malfunction of shift switch assembly
- Damaged harness wires and connectors
- Malfunction of the A/T-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code

Either of diagnosis codes P1770 or P1771 is set, inhibitor switch is defective.

Q: Are diagnosis codes P1770 or P1771 output?

YES <diagnosis code P1770 is set> : Refer to diagnosis code P1770: Inhibitor switch system P.23A-49.

YES <diagnosis code P1771 is set> : Refer to diagnosis code P1771: Inhibitor switch system P.23A-52.

NO : Go to Step 2.

STEP 2. M.U.T.-III data list

- Item 27: Select switch
- Item 28: Shift switch (Up)
- Item 29: Shift switch (Down)

(Refer to data list reference table P.23A-103).

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction).

NO <"NG" for all items> : Go to Step 3.

NO <"NG" for items 28 and 29> : Go to Step 5.

NO <"NG" for item 27> : Go to Step 10.

NO <"NG" for item 28> : Go to Step 17.

NO <"NG" for item 29> : Go to Step 20.

STEP 3. Connectors check: C-172 shift switch assembly connector, C-20 A/T-ECU connector.

Check for the contact with terminals.

Q: Is the check result normal?

YES : Go to Step 4.

NO : Repair the defective connector.

STEP 4. M.U.T.-III data list

- Item 27: Select switch
- Item 28: Shift switch (Up)
- Item 29: Shift switch (Down)

Check the above data list (Refer to data list reference table P.23A-103).

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction).

NO : Replace the A/T-ECU.

STEP 5. Check the shift switch assembly.

Refer to P.23A-134.

Q: Is the check result normal?

YES : Go to Step 6.

NO : Replace the shift lever assembly.

STEP 6. Connector check: C-172 shift switch assembly connector

Check for the contact with terminals.

Q: Is the check result normal?

YES : Go to Step 7.

NO : Repair the defective connector.

STEP 7. Measure the voltage at shift switch assembly connector C-172.

(1) Disconnect the connector, and measure the voltage between terminal 3 and earth at the wiring harness side.

(2) Ignition switch: ON

OK: System voltage

Q: Is the check result normal?

YES : Go to Step 4.

NO : Go to Step 8.

STEP 8. Connectors check: C-208 J/B connector

Check for the contact with terminals.

Q: Is the check result normal?

YES : Go to Step 9.

NO : Repair the defective connector.

STEP 9. Check the harness between shift switch assembly connector C-172 terminal No.3 and J/B connector C-208 terminal No.2.

Check the power supply line for short or open circuit.

Q: Is the check result normal?

YES : Go to Step 4.

NO : Repair the wiring harness.

STEP 10. Check the shift switch assembly.

Refer to P.23A-134.

Q: Is the check result normal?

YES : Go to Step 11.

NO : Replace the shift lever assembly.

STEP 11. Connector check: C-172 shift switch assembly connector
Check for the contact with terminals.

Q: Is the check result normal?
YES : Go to Step 12.
NO : Repair the defective connector.

STEP 12. Measure the voltage at shift switch assembly connector C-172
(1) Disconnect the connector, and measure the voltage between terminal 1 and earth at the wiring harness side.
(2) Selector lever position: D
(3) Ignition switch: ON

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 13.
NO : Go to Step 15.

STEP 13. Connectors check: C-20 A/T-ECU connector, C-34 <RHD> or C-52 <LHD> intermediate connector
Check for the contact with terminals.

Q: Is the check result normal?
YES : Go to Step 14.
NO : Repair the defective connector.

STEP 14. Check the harness between shift switch assembly connector C-172 terminal No.4 and A/T-ECU connector C-20 terminal No.57.
Check the output line for short-circuited or open circuit.

Q: Is the check result normal?
YES : Go to Step 15.
NO : Repair the wiring harness.

STEP 15. Connector check: B-10, C-34 <RHD> or C-52 <LHD> intermediate connector
Check for the contact with terminals.

Q: Is the check result normal?
YES : Go to Step 16.
NO : Repair the defective connector.

STEP 16. Check the harness between shift switch assembly connector C-172 terminal No.1 and inhibitor switch connector B-14 terminal No.3.
Check the power supply line for short or open circuit.

Q: Is the check result normal?
YES : Go to Step 4.
NO : Repair the wiring harness.

STEP 17. Check the shift switch assembly.
Refer to P.23A-134.

Q: Is the check result normal?
YES : Go to Step 18.
NO : Replace the shift switch assembly.

STEP 18. Connectors check: C-172 shift switch assembly connector, C-20 A/T-ECU connector and C-34 <RHD> or C-52 <LHD> intermediate connector
Check for the contact with terminals.

Q: Is the check result normal?
YES : Go to Step 19.
NO : Repair the defective connector.

STEP 19. Check the harness between shift switch assembly connector C-172 terminal No.6 and A/T-ECU connector C-20 terminal No.58.
Check the output line for short-circuited or open circuit.

Q: Is the check result normal?
YES : Go to Step 4.
NO : Repair the wiring harness.

STEP 20. Check the shift switch assembly.
Refer to P.23A-134.

Q: Is the check result normal?
YES : Go to Step 21.
NO : Replace the shift switch assembly.

STEP 21. Connectors check: C-172 shift switch assembly connector, C-20 A/T-ECU connector and C-34 <RHD> or C-52 <LHD> intermediate connector
Check for the contact with terminals.

Q: Is the check result normal?
YES : Go to Step 22.
NO : Repair the defective connector.

STEP 22. Check the harness between shift switch assembly connector C-172 terminal No.5 and A/T-ECU connector C-20 terminal No.68.
Check the output line for short-circuited or open circuit.

Q: Is the check result normal?
YES : Go to Step 4.
NO : Repair the wiring harness.

DATA LIST REFERENCE TABLE

M1231111300208

Data list No.	Check item	Inspection conditions		Normal condition
1	Engine speed	• Engine: Idling • Selector lever position: P	Compare the engine speeds displayed on the tachometer and the M.U.T.-III.	Identical
5	Input shaft speed sensor	Driving at a constant speed of 40 km/h in 3rd gear <4A/T> or 60 km/h in 4th gear <5A/T>		1,100 – 1,400 r/min <4A/T> 1,600 – 1,900 r/min <5A/T>
6	Output shaft speed sensor	Driving at a constant speed of 40 km/h in 3rd gear <4A/T> or 60 km/h in 4th gear <5A/T>		1,100 – 1,400 r/min <4A/T> 1,600 – 1,900 r/min <5A/T>
7	A/T fluid temperature sensor	Driving after engine has warmed up		Gradually increases.
8	A/T control relay output voltage	Ignition switch: ON		System voltage
10	Damper clutch amount of slippage	Driving at a constant speed 60 km/h in 3rd gear		–10 to 10 r/min
		Driving at 60 km/h in 3rd gear, then fully close the accelerator pedal		The value changes from the above value.
11	Shift position	Selector lever position: D, 2, L <4A/T> or Sport mode <5A/T>	Driving at a constant speed of 10 km/h in 1st	1st
			Driving at a constant speed of 20 km/h in 2nd	2nd
			Driving at a constant speed of 40 km/h in 3th	3rd
			Driving at a constant speed of 60 km/h in 4th	4th
			Driving at a constant speed of 70 km/h in 5th <5A/T>	5th
		Selector lever position: P		P, N
		Selector lever position: R	Driving at a constant speed of 5 km/h in reverse	REV
		Selector lever position: N		P, N
12	Low-reverse solenoid valve duty ratio	Driving at a constant speed of 10 km/h in 1st		0%
		Driving at a constant speed of 20 km/h in 2nd		100%
		Driving at a constant speed of 40 km/h in 3rd		100%
		Driving at a constant speed of 60 km/h in 4th		100% <4A/T> 0% <5A/T>
		Driving at a constant speed of 70 km/h in 5th <5A/T>		0%

Data list No.	Check item	Inspection conditions		Normal condition
13	Underdrive solenoid valve duty ratio	Driving at a constant speed of 10 km/h in 1st		0%
		Driving at a constant speed of 20 km/h in 2nd		0%
		Driving at a constant speed of 40 km/h in 3rd		0%
		Driving at a constant speed of 60 km/h in 4th		100% <4A/T> 0% <5A/T>
		Driving at a constant speed of 70 km/h in 5th <5A/T>		100%
14	Second solenoid valve duty ratio	Driving at a constant speed of 10 km/h in 1st		100%
		Driving at a constant speed of 20 km/h in 2nd		0%
		Driving at a constant speed of 40 km/h in 3rd		100%
		Driving at a constant speed of 60 km/h in 4th		0% <4A/T> 100% <5A/T>
		Driving at a constant speed of 70 km/h in 5th <5A/T>		0%
15	Overdrive solenoid valve duty ratio	Driving at a constant speed of 10 km/h in 1st		100%
		Driving at a constant speed of 20 km/h in 2nd		100%
		Driving at a constant speed of 40 km/h in 3rd		0%
		Driving at a constant speed of 60 km/h in 4th		0%
		Driving at a constant speed of 70 km/h in 5th <5A/T>		0%
16	Reduction solenoid valve duty ratio <5A/T>	Driving at a constant speed of 10 km/h in 1st		0%
		Driving at a constant speed of 20 km/h in 2nd		0%
		Driving at a constant speed of 40 km/h in 3rd		0%
		Driving at a constant speed of 60 km/h in 4th		100%
		Driving at a constant speed of 70 km/h in 5th		100%
17	Damper clutch control solenoid valve duty ratio	Driving at a constant speed 90 km/h in 3rd gear <4A/T> or 100 km/h in 4th gear <5A/T>		70 – 99.6%
		Driving at 90 km/h in 3rd gear <4A/T> or 100 km/h in 4th gear <5A/T>, then fully close the accelerator pedal		70 – 99.6% to 0%
21	A/C compressor relay	Engine: Idling	A/C switch: ON	ON
			A/C switch: OFF	OFF
26	Overdrive switch <4A/T>	Ignition switch: ON	Overdrive switch: ON	ON
			Overdrive switch: OFF	OFF

Data list No.	Check item	Inspection conditions		Normal condition
27	Select switch <5A/T>	Ignition switch: ON	Transmission range: D	OFF
			Selector lever operation: Select sport mode	ON
			Selector lever operation: Upshift and hold the selector lever	ON
			Selector lever operation: Downshift and hold the selector lever	ON
28	Shift lever switch (Up) <5A/T>	Ignition switch: ON	Transmission range: D	OFF
			Selector lever operation: Select sport mode	OFF
			Selector lever operation: Upshift and hold the selector lever	ON
			Selector lever operation: Downshift and hold the selector lever	OFF
29	Shift lever switch (Down) <5A/T>	Ignition switch: ON	Transmission range: D	OFF
			Selector lever operation: Select sport mode	OFF
			Selector lever operation: Upshift and hold the selector lever	OFF
			Selector lever operation: Downshift and hold the selector lever	ON
31	4LLc switch <4WD>	Ignition switch: ON	Transfer lever position: 4L <Vehicles with easy select 4WD> or 4LLc <Vehicles with super select 4WD>	ON
			Transfer lever position: Other than the above	OFF
34	Inhibitor switch	Ignition switch: ON	Selector lever position: P	P
			Selector lever position: R	R
			Selector lever position: N	N
			Selector lever position: D	D
			Selector lever position: 2 <4A/T>	2
			Selector lever position: L <4A/T>	L

Data list No.	Check item	Inspection conditions		Normal condition
35	APS	Ignition switch: ON	Accelerator pedal: Fully closed	15 – 35%
			Accelerator pedal: Depressed	Gradually increases from the above value.
36	Engine torque	• Engine: Idling • Selector lever position: N, P	Accelerator pedal: fully closed to depressed	Data changes

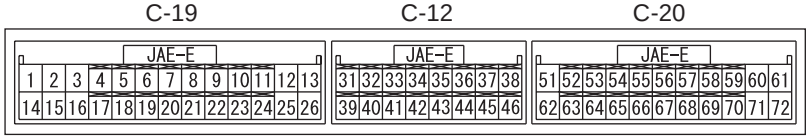
ACTUATOR TEST REFERENCE TABLE

M1231111400153

Item No.	Inspection item	Test description	Inspection condition	Normal status
1	Low-reverse solenoid valve	• Actuate solenoid valve indicated by M.U.T.-III for 5 seconds at duty ratio of 50%. • Other remaining solenoid valve are not ON.	• Ignition switch: ON • Selector lever position: P • Engine: Stopped • Accelerator pedal: Released	When solenoid valve is actuated, operating sound is audible.
2	Underdrive solenoid valve			
3	Second solenoid valve			
4	Overdrive solenoid valve			
5	Reduction solenoid valve <5A/T>			
6	Damper clutch control solenoid valve			
7	1st indicator lamp <5A/T>	Illuminate each indicator lamp for 3 seconds to the signal from the M.U.T.-III.		Shift indicator lamp illuminates.
8	2nd indicator lamp <5A/T>			
9	3rd indicator lamp <5A/T>			
10	4th indicator lamp <5A/T>			
11	5th indicator lamp <5A/T> <5A/T>			
12	A/T control relay	A/T control relay is OFF for three seconds.		• Data list No.8 • During test: 0 V • Normal: System voltage (V)

A/T-ECU TERMINAL VOLTAGE REGERENCE CHART

M1231124500365



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Terminal No.	Check item	Inspection condition	Standard value
1	Underdrive solenoid valve	• Engine: Idling • Gear range: 1st gear	System voltage
		• Engine: Idling • Selector lever position: P	6 – 9 V
2	Solenoid valve power supply	Ignition switch: LOCK (OFF)	1 V or less
		Ignition switch: ON	System voltage
3	Solenoid valve power supply	Ignition switch: LOCK (OFF)	1 V or less
		Ignition switch: ON	System voltage
4	Shift indicator C <5A/T>	Refer to the notes in the margin.*	–
5	Shift indicator A <5A/T>	Refer to the notes in the margin.*	–
7	A/T fluid temperature warning lamp	Ignition switch: ON	1 V or less to system voltage (after several seconds have elapsed)
9	4LLc switch	Ignition switch: ON Transfer lever: 4L <Vehicles with easy select 4WD> or 4LLc <Vehicles with super select 4WD>	1 V or less
		Ignition switch: ON Transfer lever: Other than the above	System voltage
11	Power supply voltage	Always	System voltage
12	Earth	Always	1 V or less
13	Earth	Always	1 V or less
14	Overdrive solenoid valve	• Engine: Idling • Gear range: 3rd gear	System voltage
		• Engine: Idling • Selector lever position: P	6 – 9 V
15	Damper clutch control solenoid valve	• Engine: Idling • Selector lever position: P	System voltage
16	Second solenoid valve	• Engine: Idling • Gear range: 2nd gear	System voltage
		• Engine: Idling • Selector lever position: P	6 – 9 V
17	Shift indicator B <5A/T>	Refer to the notes in the margin.*	–
20	Ignition switch	Ignition switch: LOCK (OFF)	1 V or less
		Ignition switch: LOCK (OFF) to ON	System voltage to 1 V or less (after several seconds have elapsed)
24	Power supply	Always	System voltage
25	Earth	Always	1 V or less
26	Earth	Always	1 V or less

Terminal No.	Check item	Inspection condition	Standard value
31	Input shaft speed sensor	• Measure between terminals 31 and 43 with an oscilloscope. • Engine: 2,000 r/min • Gear range: 3rd gear <4A/T>, 4th gear <5A/T>	Refer to P.23A-110, Inspection Procedure Using an Oscilloscope.
32	Output shaft speed sensor	• Measure between terminals 32 and 43 with an oscilloscope. • Engine: 2,000 r/min • Selector lever position: 3rd gear <4A/T>, 4th gear <5A/T>	Refer to P.23A-110, Inspection Procedure Using an Oscilloscope.
38	Backup power supply	Always	System voltage
43	Sensor earth	Always	1 V or less
44	A/T fluid temperature sensor	A/T fluid temperature: 20°C	3.8 – 4.0 V
		A/T fluid temperature: 40°C	3.2 – 3.4 V
		A/T fluid temperature: 80°C	1.7 – 1.9 V
51	Reduction solenoid valve <5A/T>	• Engine: Idling • Gear range: 5th gear	System voltage
		• Engine: Idling • Selector lever position: P	6 – 9 V
55	Inhibitor switch: P	• Ignition switch: ON • Selector lever position: P	System voltage
		• Ignition switch: ON • Selector lever position: Other than above	1 V or less
56	Inhibitor switch: N	• Ignition switch: ON • Selector lever position: N	System voltage
		• Ignition switch: ON • Selector lever position: Other than above	1 V or less
57	Overdrive switch <4A/T>	• Ignition switch: ON • Overdrive switch: OFF	1 V or less
		• Ignition switch: ON • Overdrive switch: ON	System voltage
	Select switch <5A/T>	• Ignition switch: ON • Selector lever position: Sport mode	System voltage
		• Ignition switch: ON • Selector lever position: Other than above	1 V or less

Terminal No.	Check item	Inspection condition	Standard value
58	Inhibitor switch: L <4A/T>	• Ignition switch: ON • Selector lever position: L	System voltage
		• Ignition switch: ON • Selector lever position: Other than above	1 V or less
	Shift switch (Down) <5A/T>	• Ignition switch: ON • Selector lever operation: Downshift and hold the selector lever	System voltage
		• Ignition switch: ON • Selector lever operation: Other than above	1 V or less
62	Low-reverse solenoid valve	• Engine: Idling • Selector lever position: P	System voltage
		• Engine: Idling • Gear range: 2nd gear	6 – 9 V
66	Inhibitor switch: R	• Ignition switch: ON • Selector lever position: R	System voltage
		• Ignition switch: ON • Selector lever position: Other than above	1 V or less
67	Inhibitor switch: D	• Ignition switch: ON • Selector lever position: D	System voltage
		• Ignition switch: ON • Selector lever position: Other than above	1 V or less
68	Inhibitor switch: 2 <4A/T>	• Ignition switch: ON • Selector lever position: 2	System voltage
		• Ignition switch: ON • Selector lever position: Other than above	1 V or less
	Shift switch (Up) <5A/T>	• Ignition switch: ON • Selector lever operation: Upshift and hold the selector lever	System voltage
		• Ignition switch: ON • Selector lever operation: Other than above	1 V or less
69	Vehicle speed sensor <2WD>	• Measure between terminals 69 and body earth with an oscilloscope. • Engine: 2,000 r/min • Gear range: 3rd gear	Refer to P.23A-110, Inspection Procedure Using an Oscilloscope.

Terminal No.	Check item	Inspection condition	Standard value
71	A/T control relay	Ignition switch: OFF	1 V or less
		Ignition switch: ON	System voltage to 1 V or less (after several seconds have elapsed)
72	Earth	Always	1 V or less

*NOTE: *: Using M.U.T.-III actuator function, check that the terminal voltage when the shift indicator is illuminated is as follows.*

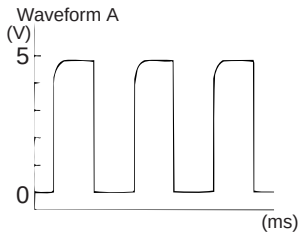
Terminal No.		5	17	4
Check item		Shift indicator A	Shift indicator B	Shift indicator C
Shift indicator	1	9 V	0 V	0 V
	2	0 V	9 V	0 V
	3	9 V	9 V	0 V
	4	0 V	0 V	9 V
	5	9 V	0 V	9 V

OSCILLOSCOPE CHECK PROCEDURE

M1231128500271

Terminal No.	Check item	Inspection conditions		Normal condition (Waveform sample)
31	Input shaft speed sensor	Selector lever position: D	Driving at constant speed of 50 km/h in 3rd <4A/T> or 4th <5A/T> gear (1,400 – 1,700 r/min)	Waveform A
32	Output shaft speed sensor			
69	Vehicle speed signal <2WD>			
62	Low-reverse solenoid valve	• Ignition switch: ON • Selector lever position: P • Engine: Stopped • Throttle (Accelerator) opening voltage: 1 V or less	Force drive each solenoid valve (Actuator test)	Waveform B
1	Underdrive solenoid valve			
16	Second solenoid valve			
14	Overdrive solenoid valve			
15	Damper clutch control solenoid valve			
51	Reduction solenoid valve <5A/T>			

WAVEFORM SAMPLE



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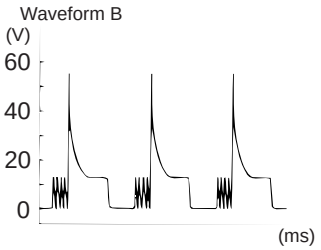

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ON-VEHICLE SERVICE

ESSENTIAL SERVICE

A/T FLUID CHECK

M1231103700212

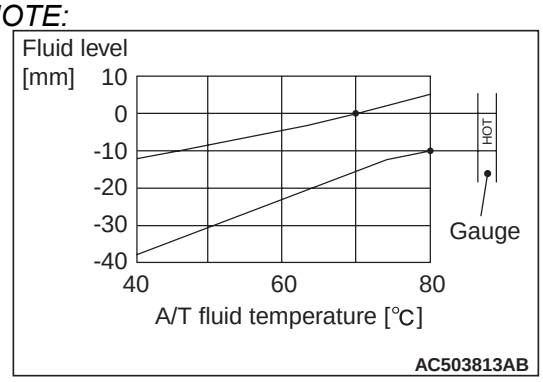
⚠ CAUTION

When replacing the transmission with a new one, overhauling the existing transmission, or driving in a harsh condition, the A/T fluid cooler line should always be flushed out and A/T fluid should be replaced with a new one.

1. Drive the vehicle until the A/T fluid temperature reaches the normal temperature (70 – 80°C)

   NOTE: Measure A/T fluid temperature using M.U.T.III.

   NOTE:



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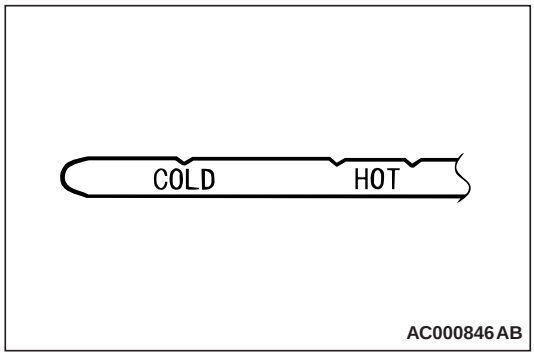
   Check the fluid level referring to the characteristics chart shown at left if it takes some time to reach the normal operation temperature of A/T fluid (70 – 80°C).

2. Park the vehicle on a level surface.
3. Move the selector lever to all positions to fully charge the torque converter and the fluid lines with A/T fluid, and then move the selector lever to the P position.
4. After wiping away any dirt from around the oil level gauge, pull out the oil level gauge and check the level of A/T fluid.

   NOTE: If the A/T fluid has a burnt smell, or if it has become very contaminated or dirty, it means that the A/T fluid has become contaminated by minute particles form bushings (metal) or worn parts. In such a case, the transmission needs to be overhauled and the A/T fluid cooler line needs to be flushed out.



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5. Check that the A/T fluid level is between the HOT marks on the oil level gauge. If the A/T fluid level is too low, add more A/T fluid until the level reaches between the HOT marks.

   Automatic transmission fluid: DIA QUEEN ATF SP III

   NOTE: If the A/T fluid level is too low, the oil pump draws air into the system along with the A/T fluid, and air bubbles will thus from in the fluid circuit. This will cause a drop in fluid pressure and cause the shift points to change and the clutches and brakes to slip.
   If the A/T fluid level is too high, the gear will churn the A/T fluid and cause bubbles to develop, which can then cause the same problems as when the A/T fluid is too low.
   In either case, the air bubbles can cause overheating and oxidation of the A/T fluid, and also

prevent the valves, clutches and brakes from operating normally. In addition, if bubbles develop in the A/T fluid, the A/T fluid can overflow from the transmission vent holes and be mistaken for leaks.

6. Securely re-insert the oil level gauge.

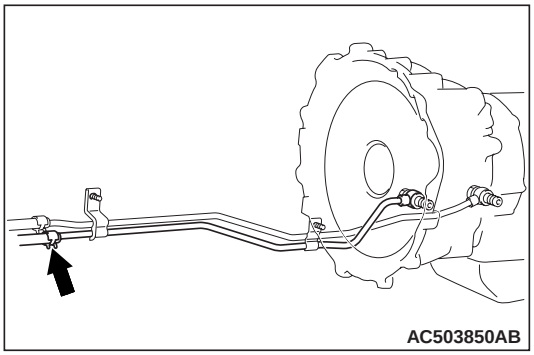
A/T FLUID CHANGE

M1231104100279

⚠ CAUTION

Before replacing the transmission with a new one, overhauling the existing transmission, or connecting the cooler pipe to the transmission, the A/T fluid cooler line should always be flushed out.

In you have an A/T fluid changer, use the A/T fluid changer to flush the A/T fluid. If you do not have an A/T fluid changer, follow the procedure given below.



1. Remove the hose shown in the illustration which allows the A/T fluid to flow from the A/T fluid cooler to the transmission.

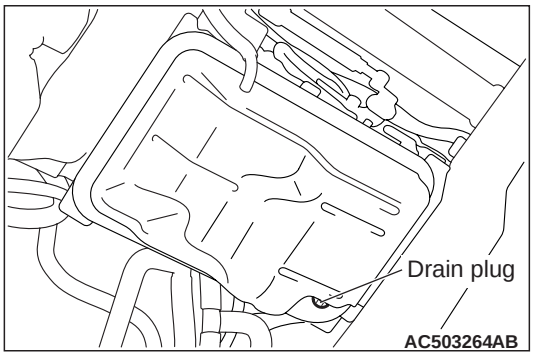
⚠ CAUTION

The engine should be stopped within one minute of it being started. If the A/T fluid has all been discharged before this, stop the engine at that point.

2. Start the engine and discharge the A/T fluid.

   Driving conditions: N range, idling

   Discharge amount: Approx. 3.5 L



3. Remove the drain plug at the bottom of the transmission case to drain out the remaining A/T fluid.

   Discharge amount: Approx. 2.0 L

4. Install the drain plug with a gasket in between, and tighten it to the specified torque.

   Tightening torque: 32 ± 2 N·m

⚠ CAUTION

Stop pouring in the A/T fluid once 5.5 L has been poured in.

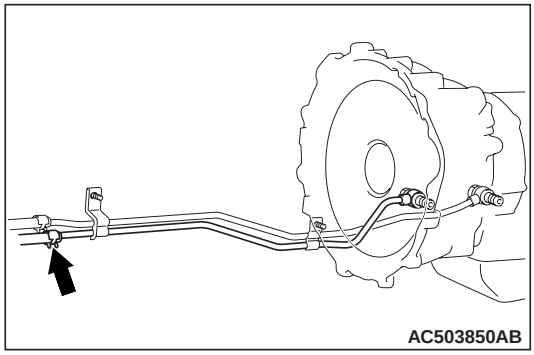
5. Pour the new A/T fluid in through the oil filler tube.

   Amount to add: Approx. 5.5 L

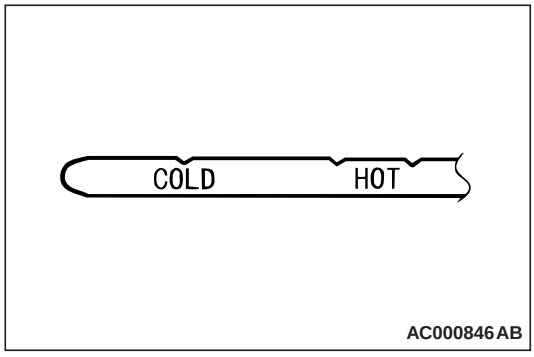
6. Repeat the operation in step 2.
7. Pour in new A/T fluid through the oil filler tube.

   Amount to add: Approx. 3.5 L

   NOTE: Carry out steps 2 and 7 so that at least 8.0 L has been discharged from the cooler hose. After this, discharge a small quantity of A/T fluid and check for contamination. If the A/T fluid is contaminated, repeat steps 6 and 7.



8. Connect the hose which was disconnected in step 1, and then securely re-insert the oil level gauge.
9. Start the engine, and let it run at idle for 1 – 2 minutes.
10. Move the selector lever to all positions once, and then return it to the N position.

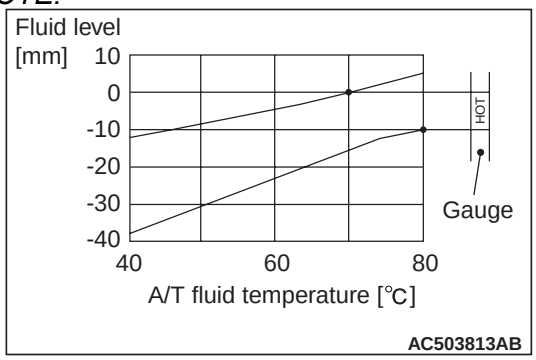


11. Check that the A/T fluid level on the oil level gauge is at the COLD mark. if it is not up to this mark, add more A/T fluid.
12. Drive the vehicle until the A/T fluid temperature reaches the normal temperature (70 – 80°C), and then re check the A/T fluid level.

NOTE: The COLD mark is for reference only; the HOT marks should be used as the standard for judgment.

NOTE: A/T fluid temperature using M.U.T.-III.

NOTE:



Check the fluid level referring to the characteristics chart shown at left if it takes some time until reaching the normal operation temperature of A/T fluid (70 – 80℃.)

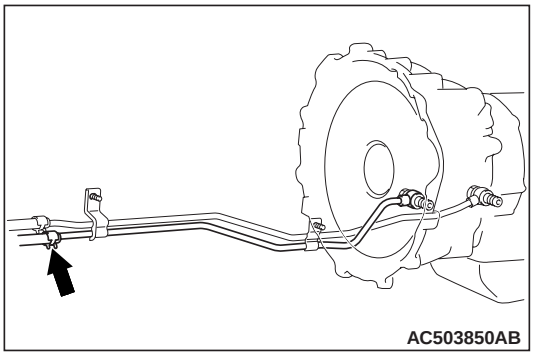
13. When A/T fluid is under the specified level, top up A/T fluid. When A/T fluid is over the specified level, drain the excessive A/T fluid from the drain plug to adjust A/T fluid level to the specified level.
14. Securely insert the oil level gauge into the oil filler tube.

FLUSHING COOLERS AND TUBES

M1231104800193

⚠ CAUTION

If replacing the transmission with a new one, if overhauling the existing transmission, or if the A/T fluid has deteriorated or is contaminated, the A/T fluid cooler line must always be flushed out.



1. Remove the hose shown in the illustration which allows the A/T fluid to flow from the A/T fluid cooler to the transmission.

⚠ CAUTION

The engine should be stopped within one minute of it being started. If the A/T fluid has all been discharged before this, stop the engine at that point.

2. Start the engine and discharge the A/T fluid.

   Driving conditions: N range, idling

   Discharge amount: Approx. 3.5 L

⚠ CAUTION

Stop pouring in the A/T fluid once 3.5 L has been poured in.

3. Pour in new A/T fluid through the oil filler tube.

   Amount to add: Approx. 3.5 L

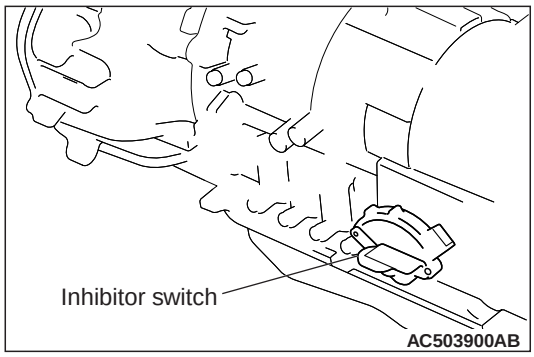
4. Repeat the operation in step 2 and 3.

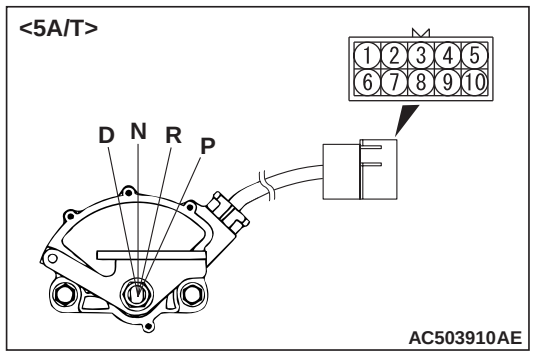
   NOTE: Carry out steps 2 and 3 so that at least 8.0 L has been discharged from the cooler hose. After this, discharge a small quantity of A/T fluid and check for contamination. If the A/T fluid is contaminated, repeat steps 2 and 3.

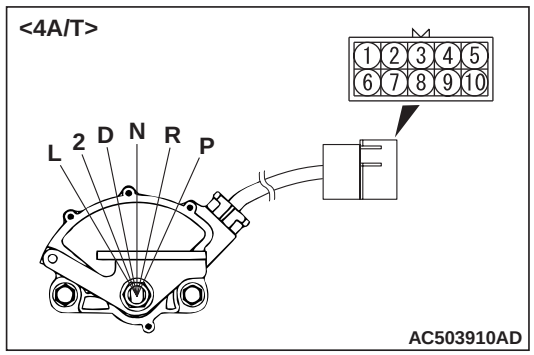
5. Carry out the procedure in "A/T Fluid Change" from step 2 onwards.

INHIBITOR SWITCH CONTINUITY CHECK

M1231101900328





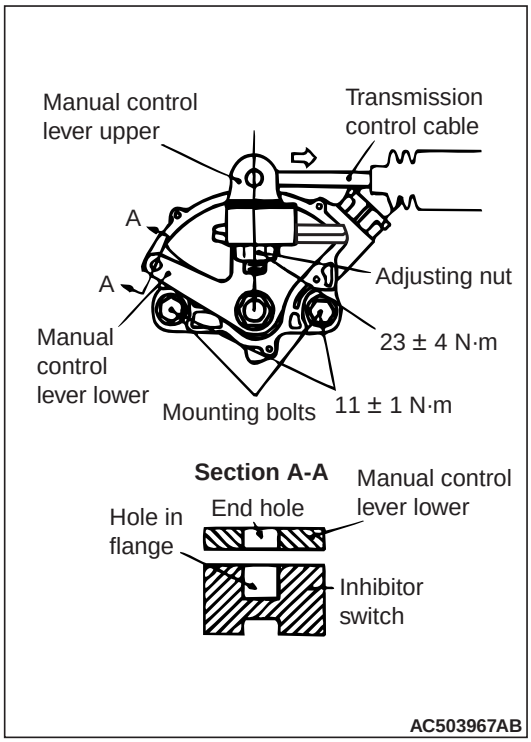


Item	Terminal No.	Resistance
P	1 – 7, 9 – 10	Continuity (Less than 2Ω)
R	7 – 8	
N	2 – 7, 9 – 10	
D	3 – 7	
2 <4A/T>	4 – 7	
L <4A/T>	5 – 7	

INHIBITOR SWITCH AND CONTROL CABLE ADJUSTMENT

M1231109700168

1. Move the selector lever to the N position.
2. Loosen the adjusting nut, and set the manual control lever upper and lower to the free condition.
3. Move the manual control lever lower to the neutral position.



4. Loosen the inhibitor switch mounting bolt, and then turn the inhibitor switch to adjust so that the hole at the end of the manual control lever lower and the hole in the inhibitor switch flange (section A – A in the illustration at left) are aligned.

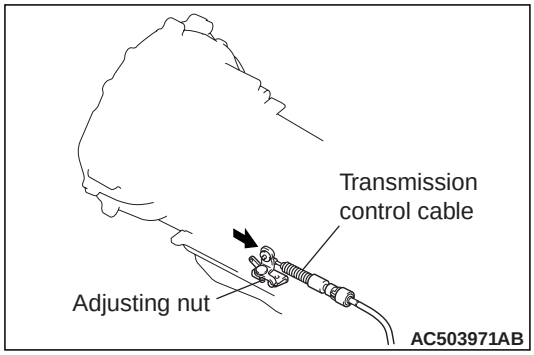
   NOTE: The inhibitor switch can be aligned by hand, because the manual control lever lower end is as wide as the switch flange. Alternatively, the inhibitor switch can also be aligned by inserting a 5-mm bar in the holes of the manual control lever end and the inhibitor switch flange.

⚠ CAUTION

Be careful not let the inhibitor switch slip out of place.

5. Tighten the inhibitor switch mounting bolt to the specified torque.

   Tightening torque: 11 ± 1 N·m



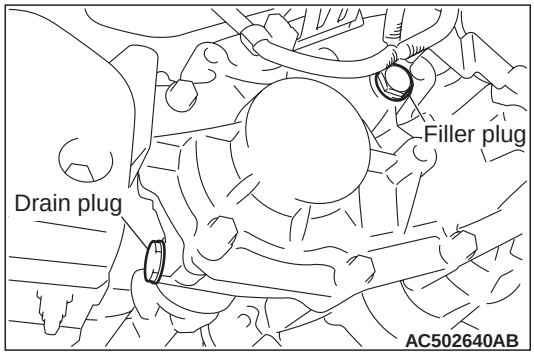
6. Gently push the transmission control cable in the direction as shown in the illustration at left, and tighten the adjusting nut the specified torque.

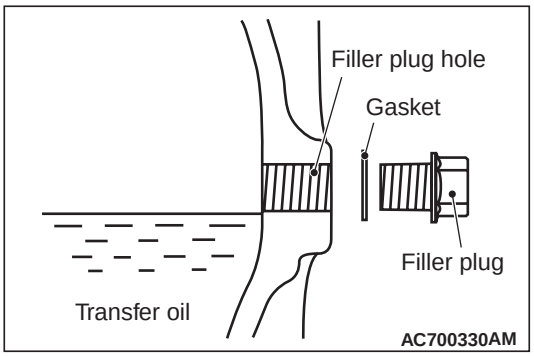
   Tightening torque: 23 ± 4 N·m

7. Check that the selector lever is at the N position.
8. Check that the transmission shifts to the correct range corresponding to the position of the selector lever, and that it functions correctly in that range.

TRANSFER OIL CHECK <4WD>

M1231112400305





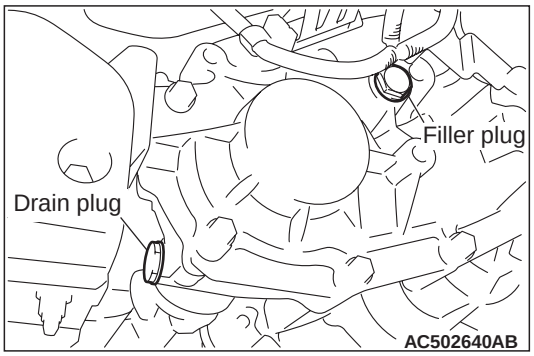
1. Remove the filler plug and gasket.
2. Check that the oil level is up to the lower edge of the filler plug hole.

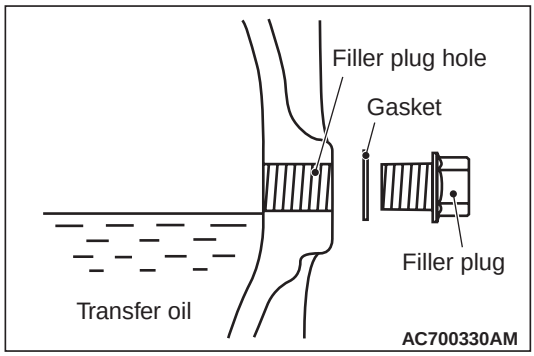
3. Check that the oil is not noticeably dirty.
4. Install the filler plug and new gasket, and tighten them to the specified torque.

   Tightening torque: 32 ± 2 N·m

TRANSFER OIL REPLACEMENT <4WD>

M1231112500357





1. Remove the filler plug and gasket.
2. Remove the drain plug and gasket, and then drain the oil.
3. Install the drain plug and new gasket, then tighten them to the specified torque.

   Tightening torque: 32 ± 2 N·m

4. Fill with gear oil API classification GL-3 SAE 75W-85 or API classification GL-4 SAE 75W-85 until the level comes to the lower portion of filler plug hole.

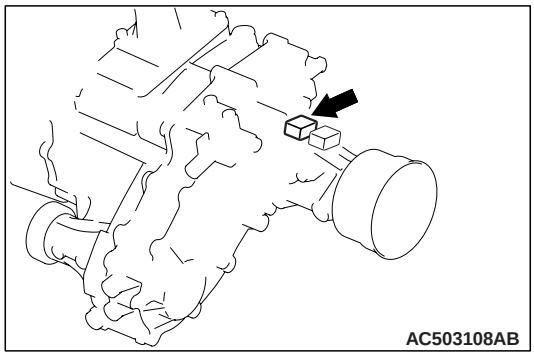
   Quantity: 2.5 L

5. Install the filler plug and new gasket, then tighten them to the specified torque.

   Tightening torque: 32 ± 2 N·m

4WD DETECTION SWITCH CONTINUITY CHECK <EASY SELECT 4WD>

M1231146000023

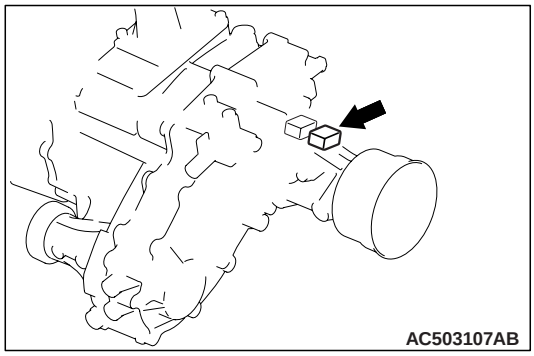


Check the continuity between terminal of the black connector indicated in the illustration.

Transfer lever position	Specified condition
2H	Open circuit
4H, 4L	Continuity (Less than 2 Ω)

HIGH/LOW DETECTION SWITCH CONTINUITY CHECK <EASY SELECT 4WD>

M1231145600022

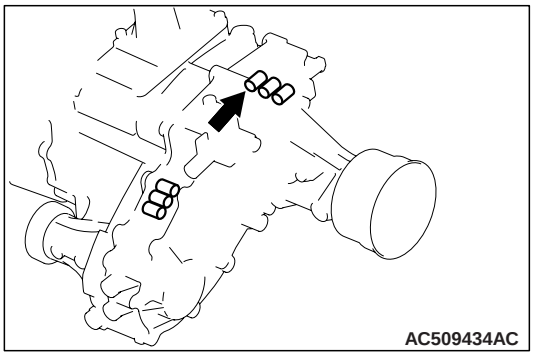


Check the continuity between terminal of the grey connector indicated in the illustration.

Transfer lever position	Specified condition
While switching between 4H and 4L	Open circuit
2H, 4H, 4L	Continuity (Less than 2 Ω)

CENTRE DIFFERENTIAL LOCK DETECTION SWITCH CHECK <SUPER SELECT 4WD>

M1231121300191

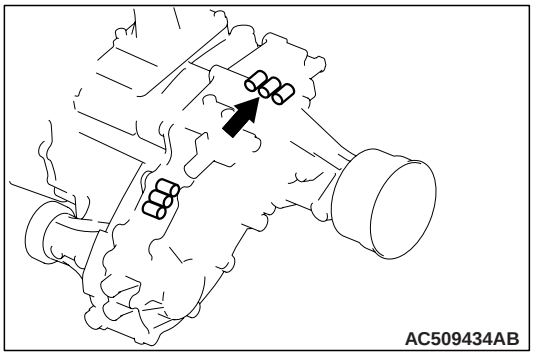


Check the continuity between terminal of the brown connector and earth indicated in the illustration.

Transfer lever position	Specified condition
4HLc and 4LLc	Continuity (Less than 2 Ω)
2H and 4H	Open circuit

2WD/4WD DETECTION SWITCH CHECK <SUPER SELECT 4WD>

M1231111900095

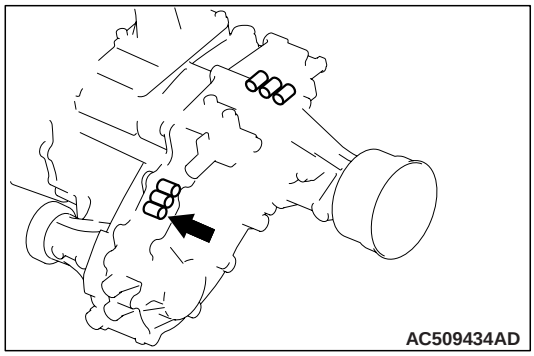


Check the continuity between terminal of the black connector and earth indicated in the illustration.

Transfer lever position	Specified condition
4H, 4HLc and 4LLc	Open circuit
2H	Continuity (Less than 2 Ω)

CENTRE DIFFERENTIAL LOCK OPERATION DETECTION SWITCH CHECK <SUPER SELECT 4WD>

M1231121400121

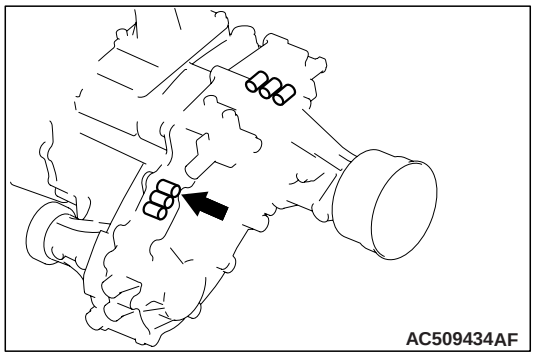


Check the continuity between terminal of the black connector and earth indicated in the illustration.

Transfer lever position	Specified condition
2H and 4H	Open circuit
4HLc and 4LLc	Continuity (Less than 2 Ω)

4WD OPERATION DETECTION SWITCH CONTINUITY CHECK <SUPER SELECT 4WD>

M1231131900086

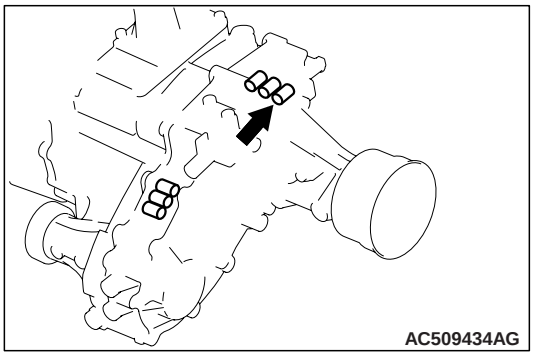


Check the continuity between terminal of the brown connector and earth indicated in the illustration.

Transfer lever position	Specified condition
2H	Open circuit
4H, 4HLc and 4LLc	Continuity (Less than 2 Ω)

HIGH/LOW DETECTION SWITCH CONTINUITY CHECK <SUPER SELECT 4WD>

M1231132100083



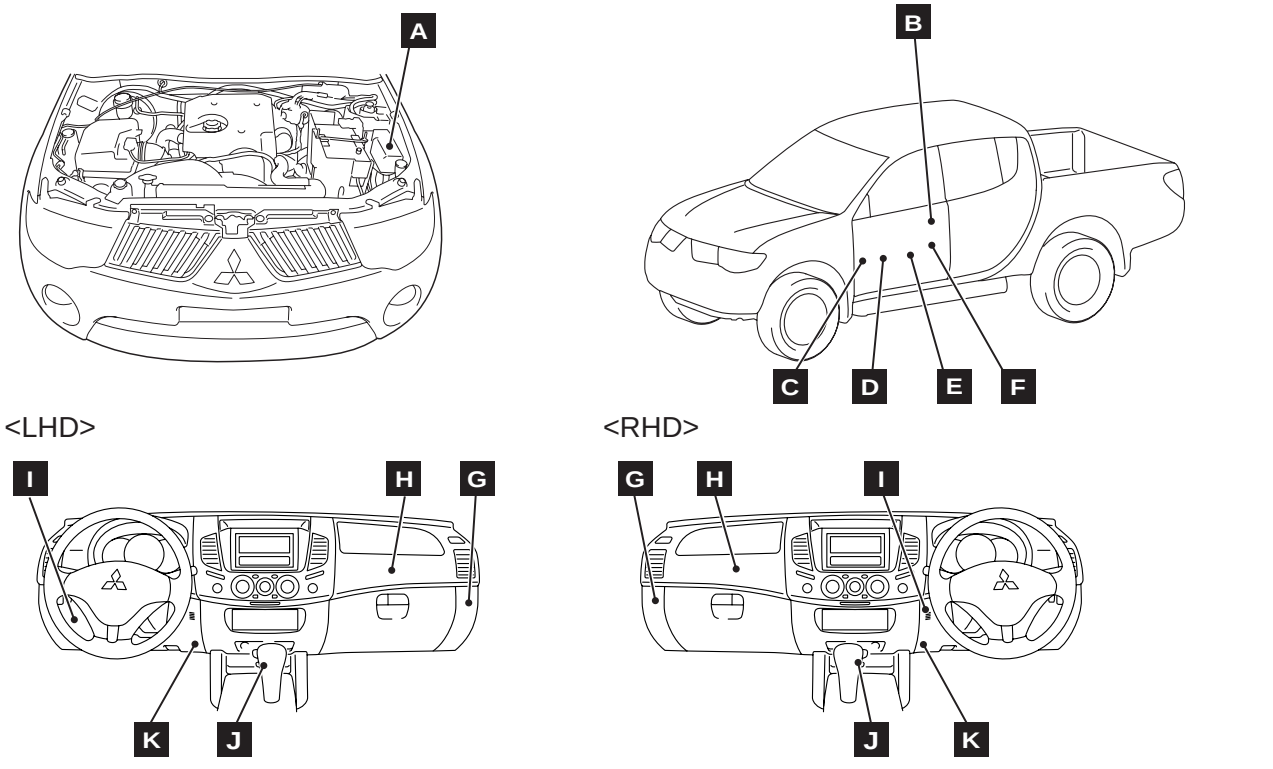
Check the continuity between terminal of the white connector and earth indicated in the illustration.

Transfer lever position	Specified condition
While switching between 4HLc and 4LLc	Open circuit
2H, 4H, 4HLc and 4LLc	Continuity (Less than 2 Ω)

A/T CONTROL COMPONENT LAYOUT

M1231102000511

Name	Symbol	Name	symbol
4WD indicator-ECU	H	Engine-ECU	G
A/T control relay	A	4LLc operation detection switch <4WD>	B
A/T control solenoid valve assembly	E	Inhibitor switch	D
A/T fluid temperature sensor	E	Input shaft speed sensor	C
A/T-ECU	I	Output shaft speed sensor	F
Diagnosis connector	K	Overdrive switch <4A/T>	J



AC509780AB

A/T CONTROL COMPONENT CHECK

Refer to P.23A-132.

OVERDRIVE SWITCH CHECK

M1231121800022

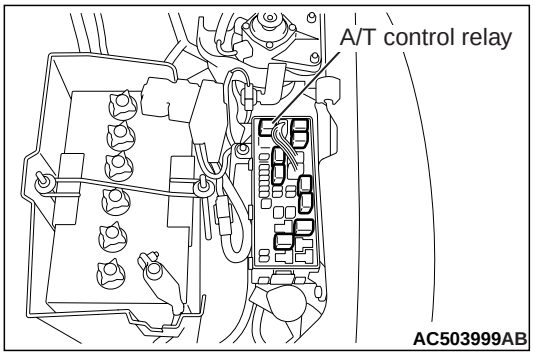
INHIBITOR SWITCH CHECK

M1231112600150

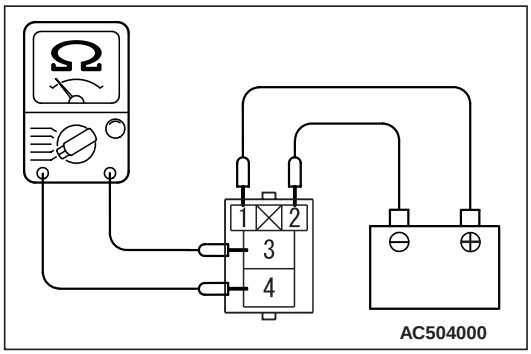
Refer to P.23A-113.

A/T CONTROL RELAY CHECK

M1231110300302



1. Removal the A/T control relay.



2. Use the jumper leads to connect A/T control relay terminal 2 to the negative battery terminal and terminal 1 to the positive battery terminal.
3. Check the continuity between A/T control relay connector terminals 3 and 4 while alternately connecting and disconnecting the jumper leads from the battery terminals.

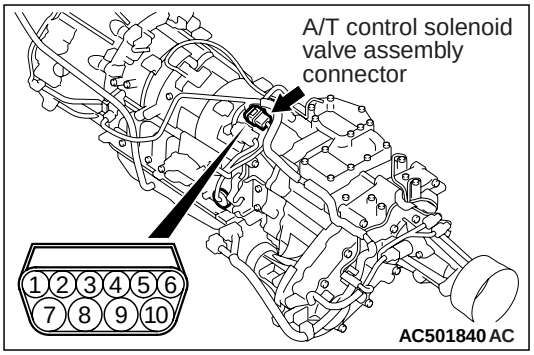
Jumper leads	Continuity between terminals 3 and 4
Connected	Continuity (Less than 2 Ω)
Disconnected	Open circuit

4. If there is a malfunction, replace the A/T control relay.

SOLENOID VALVE CHECK

M1231110400291

1. Use the M.U.T.-III to measure the A/T fluid temperature and check that the A/T fluid temperature is 20°C.

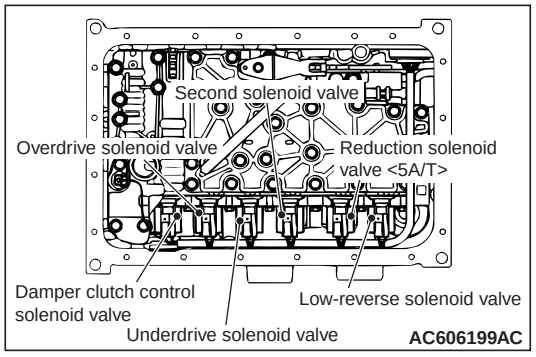


2. Disconnect the A/T control solenoid valve assembly connector.
3. Measure the resistance between the solenoid valve terminals.
4. Check that the measured values are within the standard values at items 1 and 3.

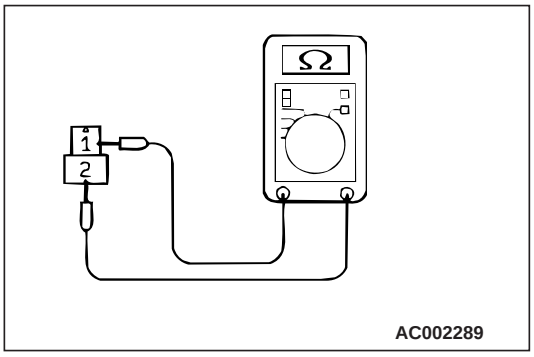
STANDARD VALUE:

Name	Terminal No.	Resistance value
Damper clutch control solenoid valve	7 – 10	2.7 – 3.4 Ω (A/T fluid temperature 20°C)
Low-reverse solenoid valve	6 – 10	
Second solenoid valve	4 – 9	
Underdrive solenoid valve	3 – 9	
Overdrive solenoid valve	5 – 9	
Reduction solenoid valve <5A/T>	8 – 10	

5. If within the standard value, check the power supply and the earth circuits.
6. If not within the standard value, drain the A/T fluid and remove the valve body cover.



7. Disconnect the solenoid valve connectors.



8. Measure the resistance between terminals 1 and 2 at each solenoid valve side.

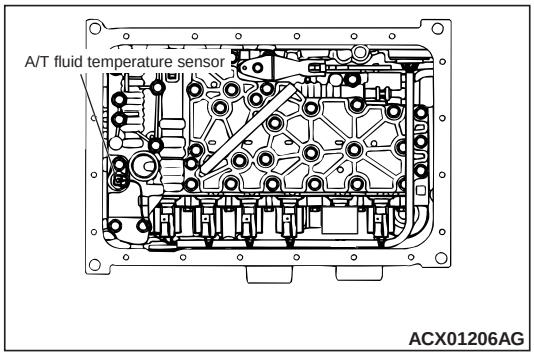
   Standard value: 2.7 – 3.4 Ω (A/T fluid temperature 20°C)

9. If not within the standard value, replace the solenoid valve.
10. If within the standard value, check the harness wire between A/T control solenoid valve assembly connector and each solenoid valve connector. If a problem is not found at the steps above, check the solenoid valve O-rings and replace if necessary.

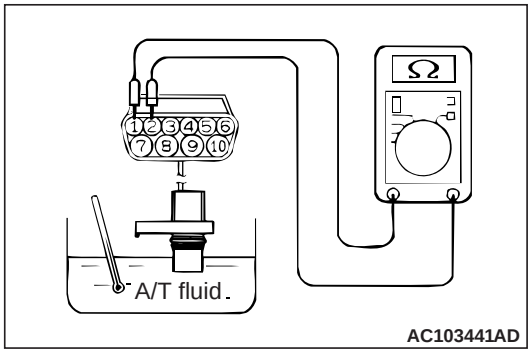
A/T FLUID TEMPERATURE SENSOR CHECK

M1231104200072

1. Drain the A/T fluid and remove the valve body cover.



2. Remove the A/T fluid temperature sensor.



3. Measure the resistance between A/T control solenoid valve assembly connector terminals 1 and 2.

   Standard value:

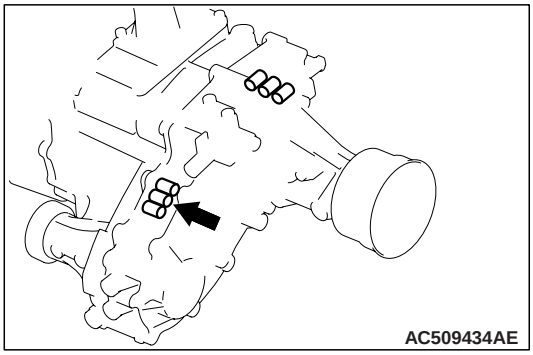
Fluid temperature (°C)	Resistance value (kΩ)
0	16.7 – 20.5
20	7.3 – 8.9
40	3.4 – 4.2
60	1.9 – 2.2
80	1.0 – 1.2
100	0.57 – 0.69

   NOTE: The A/T fluid temperature warning lamp on the combination meter flashes when the temperature reaches approximately 135 °C or higher and then stops flashing when the temperature drops below approximately 115 °C.

4. If the A/T fluid temperature sensor resistance and the temperature when the A/T fluid temperature warning lamp is illuminating or switched off are outside the standard value ranges, replace the A/T fluid temperature sensor.

4LLc SWITCH CONTINUITY CHECK

M1231131800294



Check the continuity between terminal of the white connector indicated in the illustration.

Transfer lever position	Specified condition
4L <Vehicles with easy select 4WD> or 4LLc <Vehicles with super select 4WD>	Continuity (Less than 2 Ω)
Other than the above	Open circuit

TORQUE CONVERTER STALL CHECK

M1231103500177

The purpose of this test is to measure the maximum engine speed when the torque converter stalls in D or R ranges in order to check the torque converter (Stator and one-way clutch operation) and the holding performance of the clutches and brakes which are built into the transmission.

⚠ ***WARNING***

For safety, the front and rear of the vehicle should be kept clear of other people while this test is being carried out.

1. Check the A/T fluid level, the A/T fluid temperature and the engine coolant temperature.
   - A/T fluid level: HOT position on oil level gauge
   - A/T fluid temperature: 70 – 80°C
   - Engine coolant temperature: 80 – 100°C

   NOTE: The A/T fluid temperature is measured with M.U.T.-III.
2. Place wheel locks on both the left and right front wheels.
3. Pull the parking brake lever to apply the parking brake and depress the brake pedal fully.
4. Start the engine.

⚠ **CAUTION**

- **Do not keep the throttle fully open for any longer than 5 seconds.**
- **If you repeat the stall test when the A/T fluid temperature is greater than 80°C, move the selector lever to the "N" position and let the engine run at approximately 1,000 r/min for at least one minute. Wait until the A/T fluid temperature returns to 80°C or less.**

5. Move the selector lever to the D position, fully depress the accelerator pedal and quickly take a reading of the maximum engine speed at this time.

   Standard stalling engine speed: 2, 200 – 2, 700 r/min
6. Move the selector lever to the R position and repeat the test described above.

   Standard stalling engine speed: 2, 200 – 2, 700 r/min

TORQUE CONVERTER STALL TEST JUDGMENT RESULTS

1. Stall speed is too high in both D and R ranges
   - Malfunction of the torque converter (Slippage on the splines of the torque converter and the input shaft)
   - Low line pressure
   - Low-reverse brake slippage and malfunction of the one-way clutch
2. Stall speed is too high in D range only
   - Underdrive clutch slippage
3. Stall speed is too high in R range only
   - Reverse clutch slippage
4. Stall speed is too low in both D and R ranges
   - Malfunction of the torque converter (Slippage of the one-way clutch)
   - Low line pressure
   - Poor engine output

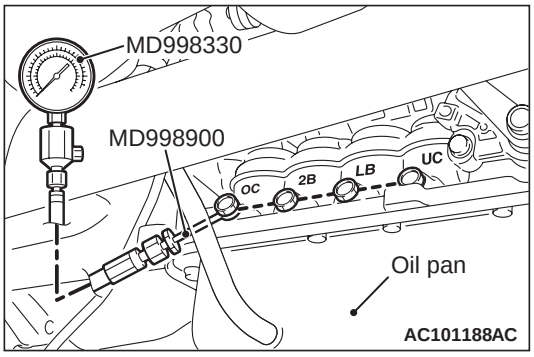
HYDRAULIC PRESSURE TESTS

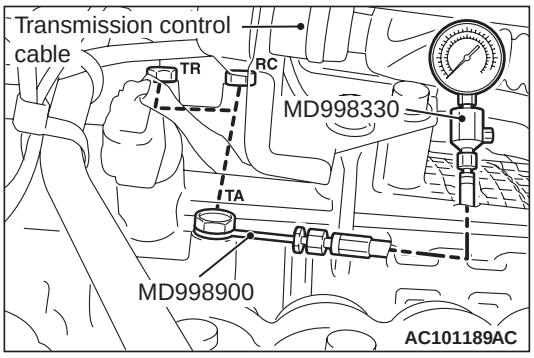
M1231103800305

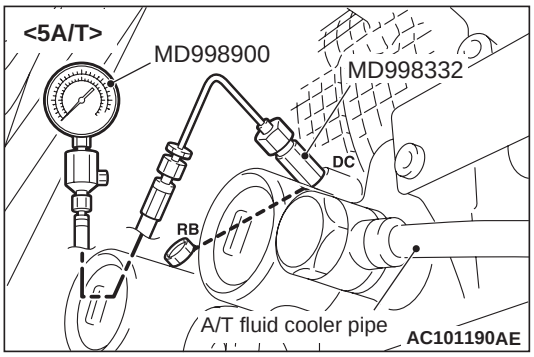
⚠ **CAUTION**

The A/T fluid temperature should be between 70 – 80°C during the test.

1. Check the A/T fluid level, temperature and engine coolant temperature.
   - A/T fluid level: HOT mark on the level gauge
   - A/T fluid temperature: 70 – 80°C
   - Engine coolant temperature: 80 – 100°C
2. Raise the vehicle so that the wheels are free to turn.







3. Connect the special tools (oil pressure gauge (3.0 MPa) [MD998330] and adapters [MD998332, MD998900]) to each pressure discharge port.

NOTE:
- *2B: Second brake pressure port*
- *UC: Underdrive clutch pressure port*
- *LB: Low-reverse brake pressure port*
- *TR: Torque converter release pressure port*
- *TA: Torque converter apply pressure port*
- *RC: Reverse clutch pressure port*
- *OC: Overdrive clutch pressure port*
- *DC: Direct clutch pressure port <5A/T>*
- *RB: Reduction brake pressure port <5A/T>*

4. Restart the engine.
5. Check that there are no leaks around the special tool port adapters.
6. Measure the hydraulic pressure at each port under the conditions given in the standard hydraulic pressure table, and check that the measured values are within the standard value ranges.
7. If the pressure is not within the standard value, stop the engine and refer to the hydraulic pressure test diagnosis table.
8. Remove the O-ring from the port plug and replace it.
9. Remove the special tool, and install the plugs to the hydraulic pressure ports.
10. Start the engine and check that there are no leaks around the plugs.

STANDARD HYDRAULIC PRESSURE TABLE

<4A/T>

Measurement condition			Standard hydraulic pressure MPa					
Selector lever position	Shift position	Engine speed (r/min)	Underdrive clutch pressure [UC]	Reverse clutch pressure [RC]	Overdrive clutch pressure [OC]	Low-reverse brake pressure [LB]	Second brake pressure [2B]	Torque converter pressure [TR]
P	–	2,500	–	–	–	0.26 – 0.36	–	0.22 – 0.36
R	Reverse	2,500	–	1.27 – 1.77	–	1.27 – 1.77	–	0.50 – 0.73
N	–	2,500	–	–	–	0.26 – 0.36	–	0.22 – 0.36

Measurement condition			Standard hydraulic pressure MPa					
Selector lever position	Shift position	Engine speed (r/min)	Underdrive clutch pressure [UC]	Reverse clutch pressure [RC]	Overdrive clutch pressure [OC]	Low-reverse brake pressure [LB]	Second brake pressure [2B]	Torque converter pressure [TR]
D (Overdrive switch: OFF)	1st gear	2,500	0.98 – 1.05	–	–	0.98 – 1.05	–	0.50 – 0.73
	2nd gear	2,500	0.98 – 1.05	–	–	–	0.98 – 1.05	0.50 – 0.73
	3rd gear	2,500	0.78 – 0.90	–	0.78 – 0.90	–	–	0.45 – 0.72
	4th gear	2,500	–	–	0.78 – 0.90	–	0.78 – 0.88	0.45 – 0.72

<5A/T>

Measurement condition			Standard hydraulic pressure MPa							
Selector lever position	Shift position	Engine speed (r/min)	Underdrive clutch pressure [UC]	Reverse clutch pressure [RC]	Overdrive clutch pressure [OC]	Direct clutch pressure [DC]	Low-reverse brake pressure [LB]	Second brake pressure [2B]	Reduction brake pressure [RB]	Torque converter pressure [TR]
P	–	2,500	–	–	–	–	0.26 – 0.36	–	0.26 – 0.36	0.22 – 0.36
R	Reverse	2,500	–	1.27 – 1.77	–	–	1.27 – 1.77	–	1.27 – 1.77	0.50 – 0.73
N	–	2,500	–	–	–	–	0.26 – 0.36	–	0.26 – 0.36	0.22 – 0.36
Sport mode	1st gear	2,500	0.98 – 1.05	–	–	–	0.98 – 1.05	–	0.98 – 1.05	0.50 – 0.73
	2nd gear	2,500	0.98 – 1.05	–	–	–	–	0.98 – 1.05	0.98 – 1.05	0.50 – 0.73
	3rd gear	2,500	0.78 – 0.90	–	0.78 – 0.90	–	–	–	0.78 – 0.88	0.45 – 0.72
	4th gear	2,500	0.78 – 0.90	–	0.78 – 0.90	0.78 – 0.88	–	–	–	0.45 – 0.72
	5th gear	2,500	–	–	0.78 – 0.90	0.78 – 0.88	–	0.78 – 0.88	–	0.45 – 0.72

NOTE: When the torque converter pressure is measured, the engine speed should be 1,500 r/min or less.

HYDRAULIC PRESSURE TEST DIAGNOSIS TABLE

Trouble symptom	Probable cause
All hydraulic pressures are high.	Malfunction of the regulator valve

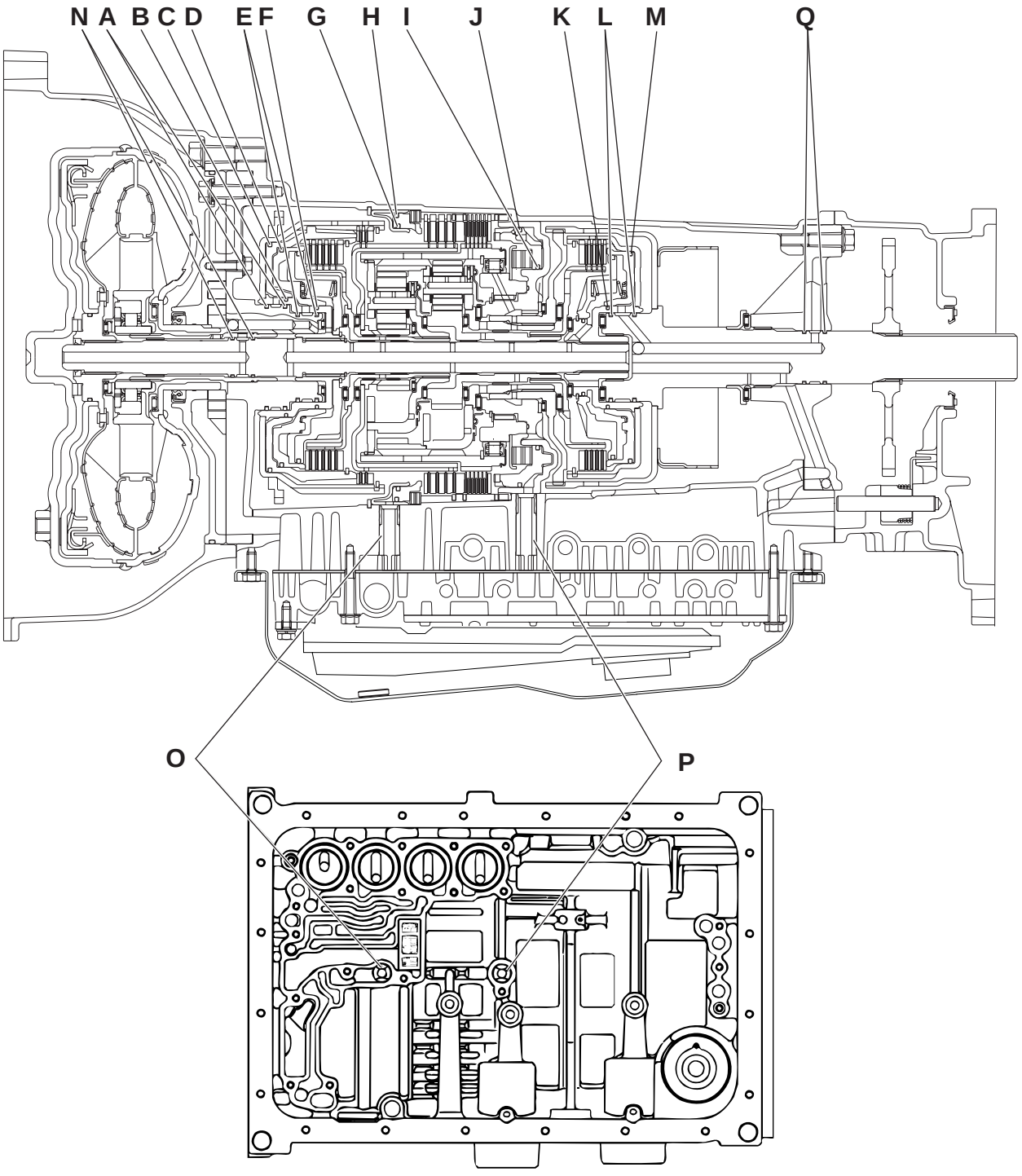
Trouble symptom	Probable cause
All hydraulic pressures are low.	Malfunction of the oil pump
	Clogged internal oil filter
	Clogged oil cooler
	Malfunction of the regulator valve
	Malfunction of the relief valve
	Incorrect valve body installation
	Improperly installed solenoid valves
	Damaged solenoid valve O-rings
Hydraulic pressure is abnormal in reverse gear only.	Malfunction of the regulator valve
	Clogged orifice
	Incorrect valve body installation
Hydraulic pressure is abnormal in 3rd or 4th gear only.	Malfunction of the overdrive solenoid valve
	Malfunction of the overdrive pressure control valve
	Malfunction of the regulator valve
	Malfunction of the switch valve
	Clogged orifice
	Incorrect valve body installation
Only underdrive clutch hydraulic pressure is abnormal.	Malfunction of the oil seal K
	Malfunction of the oil seal L
	Malfunction of the oil seal M
	Malfunction of the oil seal Q
	Malfunction of the underdrive solenoid valve
	Malfunction of the underdrive pressure control valve
	Malfunction of the check ball
	Clogged orifice
	Incorrect valve body installation
Only reverse clutch hydraulic pressure is abnormal.	Malfunction of the oil seal A
	Malfunction of the oil seal B
	Malfunction of the oil seal C
	Clogged orifice
	Incorrect valve body installation
Only overdrive clutch hydraulic pressure is abnormal.	Malfunction of the oil seal D
	Malfunction of the oil seal E
	Malfunction of the oil seal F
	Malfunction of the overdrive solenoid valve
	Malfunction of the overdrive pressure control valve
	Malfunction of the check ball
	Clogged orifice
	Incorrect valve body installation

Trouble symptom	Probable cause
Only direct clutch hydraulic pressure is abnormal. <5A/T>	Malfunction of the oil seal R
	Malfunction of the oil seal S
	Malfunction of the oil seal T
	Malfunction of the low-reverse solenoid valve (Shared with direct clutch)
	Malfunction of the low-reverse pressure control valve
	Malfunction of the switch valve
	Malfunction of the fail safe valve C
	Clogged orifice
	Incorrect valve body installation
Only low-reverse brake hydraulic pressure is abnormal.	Malfunction of the oil seal I
	Malfunction of the oil seal J
	Malfunction of the oil seal P
	Malfunction of the low-reverse solenoid valve
	Malfunction of the low-reverse pressure control valve
	Malfunction of the switch valve
	Malfunction of the fail safe valve A
	Malfunction of all the check ball
	Clogged orifice
	Incorrect valve body installation
Only second brake hydraulic pressure is abnormal.	Malfunction of the oil seal G
	Malfunction of the oil seal H
	Malfunction of the oil seal O
	Malfunction of the second solenoid valve
	Malfunction of the second pressure control valve
	Malfunction of the fail safe valve B
	Clogged orifice
	Incorrect valve body installation
Only reduction brake hydraulic pressure is abnormal. <5A/T>	Malfunction of the oil seal U
	Malfunction of the oil seal V
	Malfunction of the reduction solenoid valve
	Malfunction of the reduction pressure control valve
	Clogged orifice
	Incorrect valve body installation
Only torque converter pressure is abnormal.	Clogged oil cooler
	Malfunction of the oil seal N
	Malfunction of the damper clutch control solenoid valve
	Malfunction of the damper clutch pressure control valve
	Clogged orifice
	Incorrect valve body installation

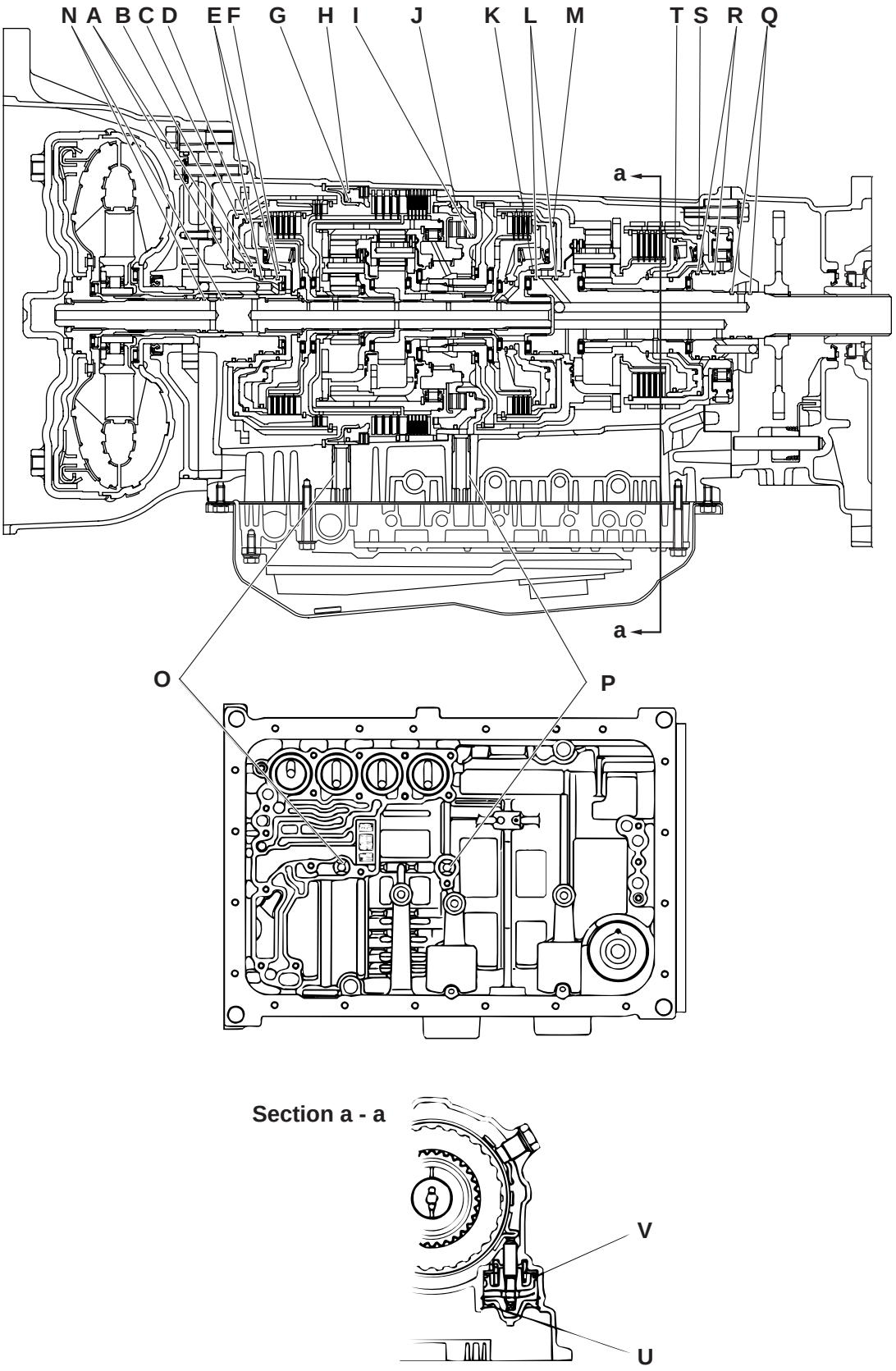
Trouble symptom	Probable cause
Pressure applied to element which should not receive pressure.	Incorrect transmission control cable adjustment
	Malfunction of the manual valve
	Malfunction of the check ball
	Incorrect valve body installation

OIL SEAL LAYOUT

<4A/T>



<5A/T>

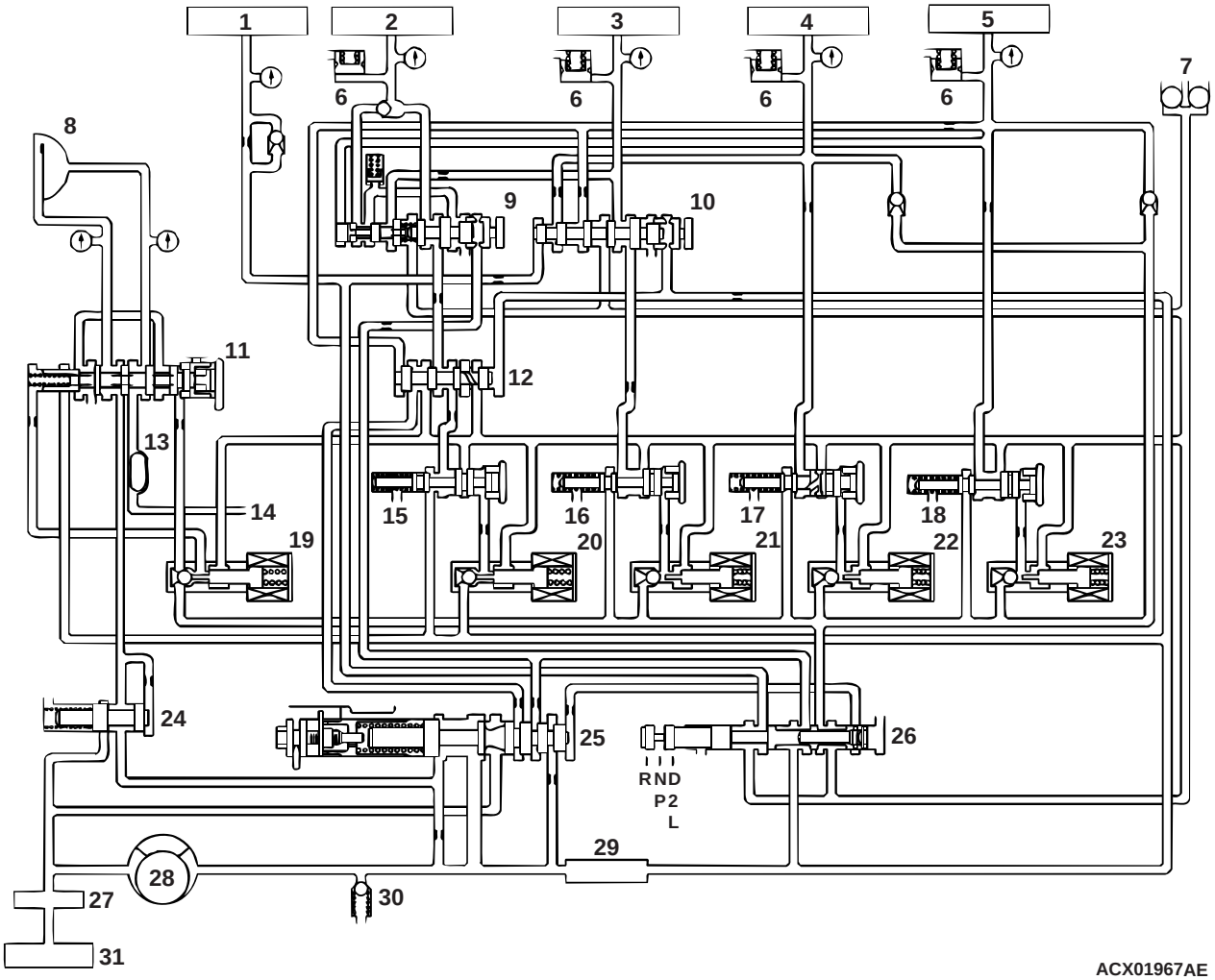


AC904047 AB

HYDRAULIC CIRCUIT

M1231103900250

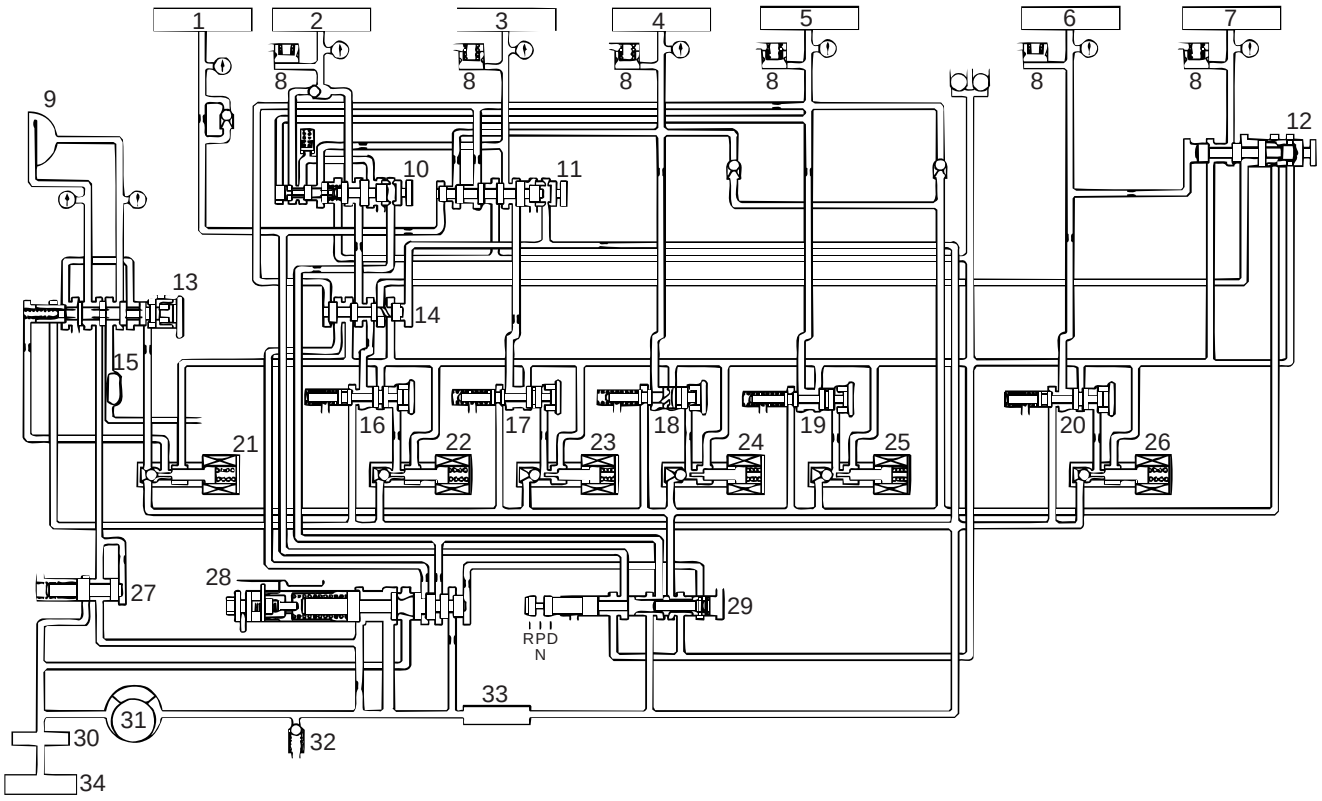
<4A/T> (Neutral)



ACX01967AE

1. Reverse clutch
2. Low-reverse brake
3. Second brake
4. Underdrive clutch
5. Overdrive clutch
6. Accumulator
7. Check ball
8. Damper clutch control
9. Fail-safe valve A
10. Fail-safe valve B
11. Damper clutch control valve
12. Switch valve
13. A/T fluid cooler
14. Lubrication
15. Low-reverse pressure control valve
16. Second pressure control valve
17. Underdrive pressure control valve
18. Overdrive pressure control valve
19. Damper clutch control solenoid valve
20. Low-reverse solenoid valve
21. Second solenoid valve
22. Underdrive solenoid valve
23. Overdrive solenoid valve
24. Damper clutch pressure control valve
25. Regulator valve
26. Manual valve
27. Oil filter
28. Oil pump
29. Oil strainer
30. Relief valve
31. Oil pan

<5A/T> (Neutral)



AC603759AB

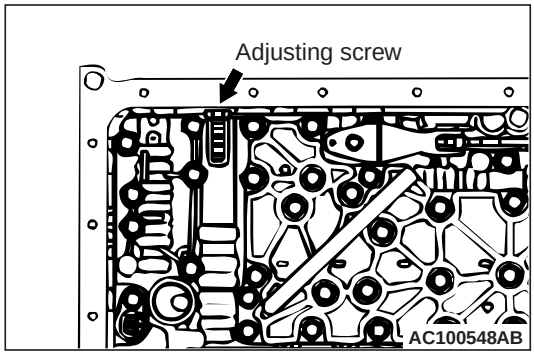
1. Reverse clutch
2. Low-reverse brake
3. Second brake
4. Underdrive clutch
5. Overdrive clutch
6. Reduction brake
7. Direct clutch
8. Accumulator
9. Damper clutch
10. Failsafe valve A
11. Failsafe valve B
12. Failsafe valve C
13. Damper clutch control valve
14. Switch valve
15. A/T fluid cooler
16. Low-reverse pressure control valve
17. Second pressure control valve
18. Underdrive pressure control valve
19. Overdrive pressure control valve
20. Reduction pressure control valve
21. Damper clutch solenoid valve
22. Low-reverse solenoid valve
23. Second solenoid valve
24. Underdrive solenoid valve
25. Overdrive solenoid valve
26. Reduction solenoid valve
27. Damper clutch pressure control valve
28. Regulator valve
29. Manual valve
30. Oil filter
31. Oil pump
32. Relief valve
33. Oil strainer
34. Oil pan

LINE PRESSURE ADJUSTMENT

M1231108700121

1. Drain the A/T fluid.

   NOTE: The hydraulic pressure test must be performed before attempting any adjustments.
2. Remove the valve body cover.



AC100548AB

3. Turn the adjusting screw shown in the illustration to adjust the line pressure to the standard value. The pressure increases when the screw is turned anti-clockwise.

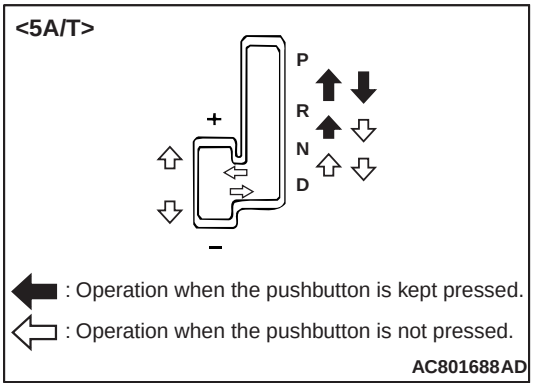
   NOTE: When adjusting the line pressure, adjust to the middle of the standard value range.

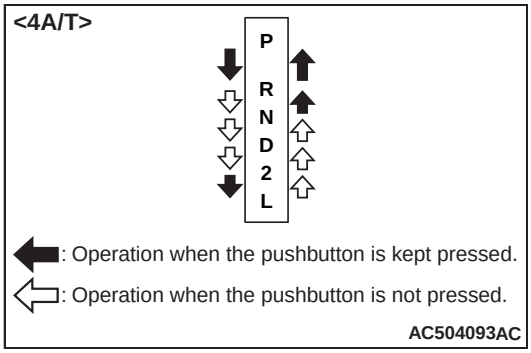
Standard value: 1.01 – 1.05 MPa (Change in pressure for a single full of the adjusting screw: 0.035 MPa)

4. Install the valve body cover, and then pour in the specified amount of A/T fluid.
5. Repeat the hydraulic pressure test (Refer to P.23A-120.) Readjust the line pressure if necessary.

SELECTOR LEVER OPERATION CHECK

M1231101300274





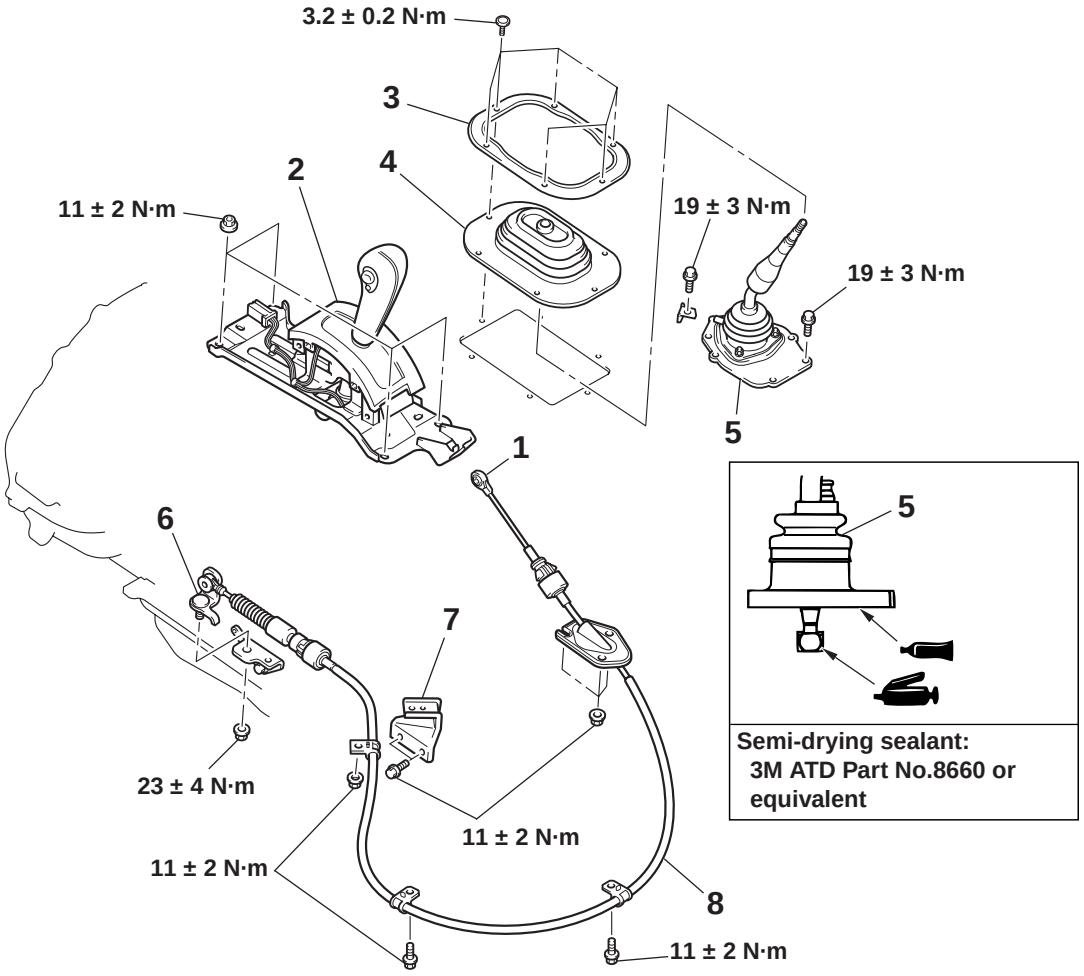
1. Apply the parking brake, and check that the selector lever moves smoothly and accurately to each position.
2. Check that the engine starts when the selector lever is in the N or P position, and that it does not start when the selector lever is in any other position.
3. Start the engine, release the parking brake, and check that the vehicle moves forward when the selector lever is moved from N position to the D, 2, L position or sport mode, and that the vehicle reverses when the selector lever is moved to the R position.
4. Stop the engine.
5. Turn the ignition switch to ON position. Check that the backup lamp illuminates and the buzzer sounds when the selector lever is moved from P position to R position.

TRANSMISSION CONTROL <4A/T>

REMOVAL AND INSTALLATION

M1231117900554

Pre-removal Operation	Post-installation Operation
• Move the selector lever to the N range position. • Front Floor Console Assembly Removal (Refer to GROUP 52A, Floor Consol Assembly .)	• Front Floor Console Assembly Installation (Refer to GROUP 52A, Floor Consol Assembly .) • Transmission Control Cable Adjustment (Refer to P.23A-114). • Check that the selector lever is moved to each position smoothly and correctly.



AC509716AB

Selector lever assembly removal steps

1. Transmission control cable connection
2. Selector lever assembly

Transfer control lever removal steps <4WD>

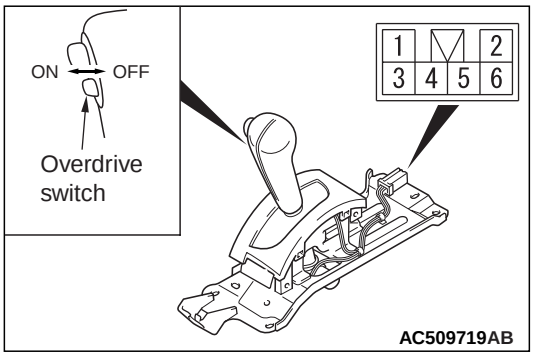
3. Dust cover retaining plate
4. Dust cover
5. Transfer control lever assembly

Transmission control cable assembly removal steps

1. Transmission control cable connection
6. Adjust lever connection
7. Cable bracket
8. Transmission control cable assembly

INSPECTION

M1231130000132

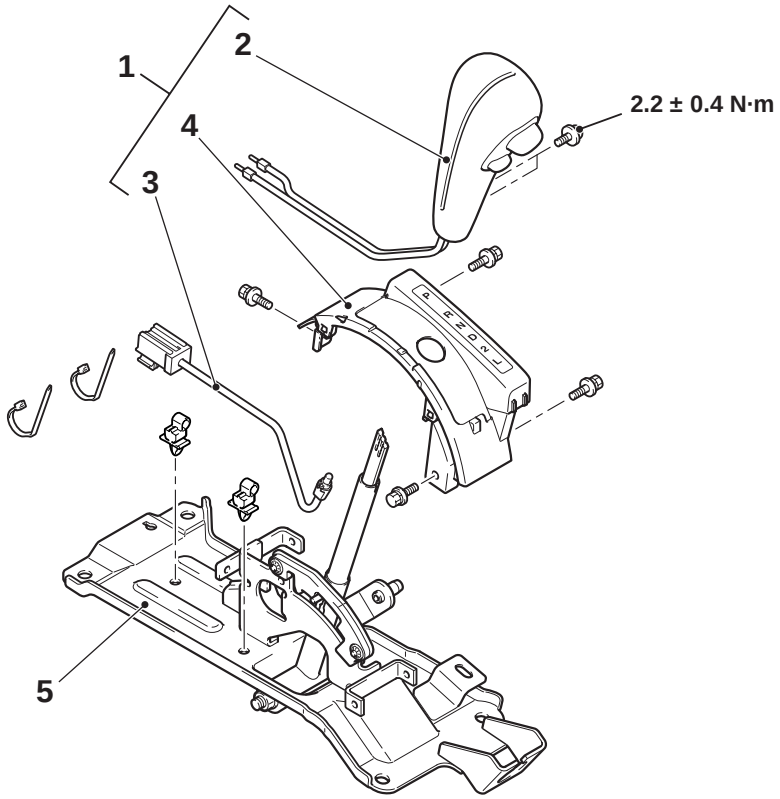


OVERDRIVE SWITCH CHECK

Terminal connection of tester	Operation	Resistance
3 – 4	Overdrive switch: ON	Continuity (Less than 2 Ω)
	Overdrive switch: OFF	Open circuit

DISASSEMBLY AND ASSEMBLY

M1231118100119



Selector lever assembly removal steps

1. Shift knob and Indicator panel assembly
2. Shift knob
3. Shift indicator lamp
4. Indicator panel

Transmission control cable assembly removal steps

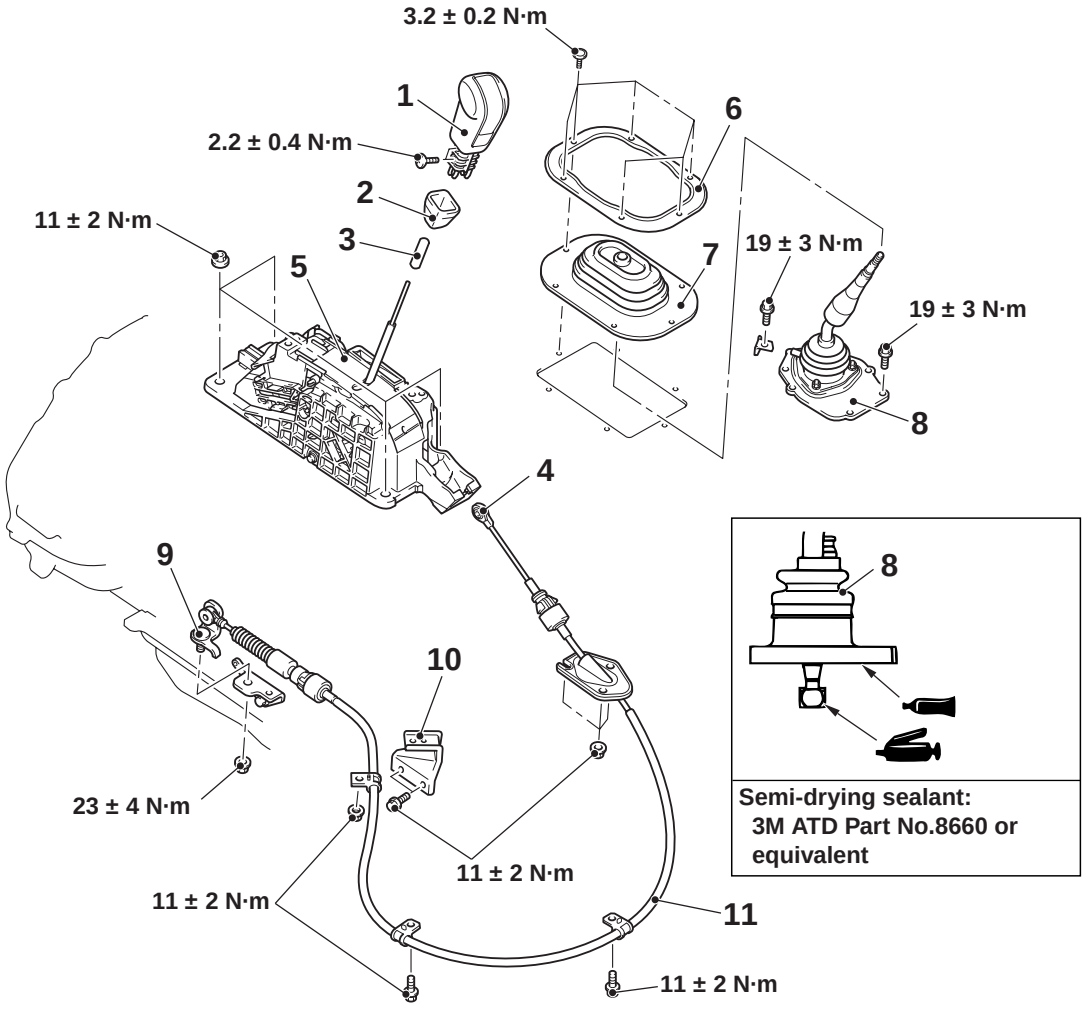
5. Selector lever assembly

TRANSMISSION CONTROL <5A/T>

REMOVAL AND INSTALLATION

M1231117900532

Pre-removal Operation	Post-installation Operation
• Move the transmission control lever and transfer control lever to the following positions. • Transmission control lever : Neutral • Transfer control lever : 4H • Front Floor Console Assembly Removal (Refer to GROUP 52A – Floor Consol Assembly .)	• Front Floor Console Assembly Installation (Refer to GROUP 52A – Floor Consol Assembly .) • Transmission Control Cable Adjustment (Refer to P.23A-114). • Check that the selector lever is moved to each position smoothly and correctly.



AC800082 AB

Selector lever assembly removal steps

1. Shift knob
2. Knob cover
3. Sleeve
4. Transmission control cable connection
5. Selector lever assembly
6. Dust cover retaining plate <4WD>
7. Dust cover <4WD>
8. Transfer control lever assembly <4WD>

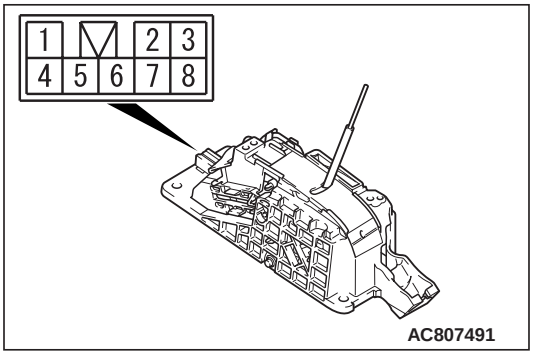
Transmission control cable assembly removal steps

4. Transmission control cable connection
9. Adjust lever connection
10. Cable bracket
- No.2 crossmember (Refer to GROUP 32 – Rear Engine Mounting .)
11. Transmission control cable assembly

INSPECTION

M1231118000286

SHIFT SWITCH ASSEMBLY CONTINUITY CHECK



Selector lever position		Terminal No.	Resistance
Sport mode	Select switch	1 – 4	Continuity (Less than 2Ω)
Auto mode			Open circuit

Selector lever position		Terminal No.	Resistance
Sport mode	Select switch	1 – 2	Open circuit
Auto mode			Continuity (Less than 2Ω)
Up	Shift switch (up shift)	3 – 5	Continuity (Less than 2Ω)
Other than above			Open circuit
Down	Shift switch (down shift)	3 – 6	Continuity (Less than 2Ω)
Other than above			Open circuit

SHIFT LEVER POSITION ILLUMINATION CONTINUITY CHECK

Terminal No.	Resistance
7 – 8	Continuity

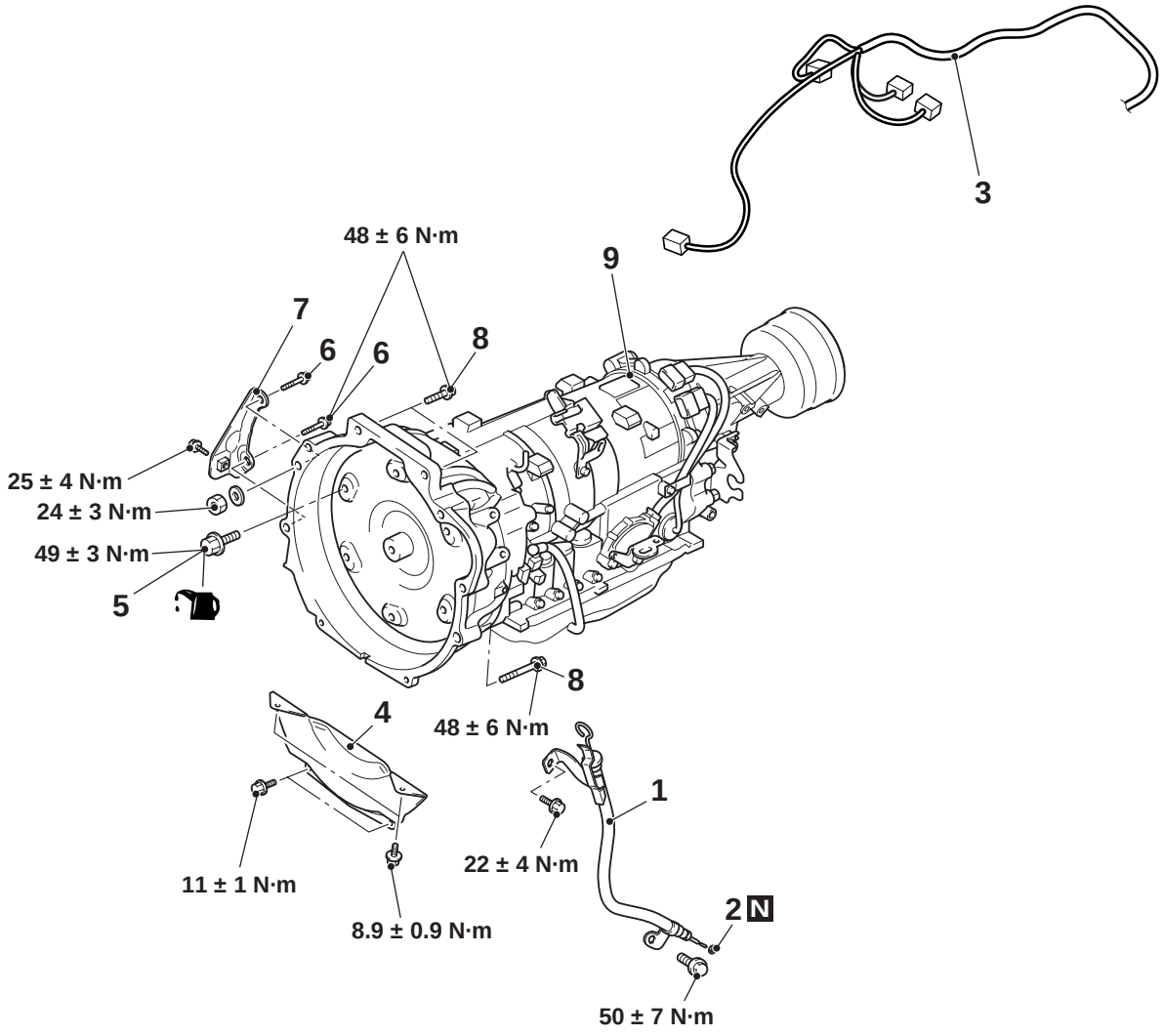
TRANSMISSION ASSEMBLY

REMOVAL AND INSTALLATION <4A/T>

M1231117000562

<2WD>

Pre-removal Operation	Post-installation Operation
• Under Skid Plate and Engine Room Under Cover Removal (Refer to GROUP 51 – Under Cover .) • A/T Fluid Draining (Refer to P.23A-112.) • Propeller Shaft Removal (Refer to GROUP 25 – Propeller Shaft .) • Front Exhaust Pipe Removal (Refer to GROUP 15 – Front Exhaust Pipe Main Muffler .) • Transmission Control Cable Connection Removal (Refer to P.23A-131.) • Pipe Assembly Removal (Refer to P.23A-141.) • Starter Assembly Removal (Refer to GROUP 16 – Starter Motor Assembly). • No.2 Crossmember Assembly Removal (Refer to GROUP 32 – Rear Engine Mounting .)	• No.2 Crossmember Assembly Installation (Refer to GROUP 32 – Rear Engine Mounting .) • Starter Assembly Installation (Refer to GROUP 16 – Starter Motor Assembly). • Pipe Assembly Installation (Refer to P.23A-141.) • Transmission Control Cable Connection Installation (Refer to P.23A-131.) • Front Exhaust Pipe Installation (Refer to GROUP 15 – Front Exhaust Pipe Main Muffler .) • Propeller Shaft Installation (Refer to GROUP 25 – Propeller Shaft .) • A/T Fluid Supplying (Refer to P.23A-112.) • Under Skid Plate and Engine Room Under Cover Installation (Refer to GROUP 51 – Under Cover .)



AC904029AB

Removal steps (Cont.)

1. Oil level gauge assembly
2. O-ring
3. Harness connector connection
4. Bell housing cover

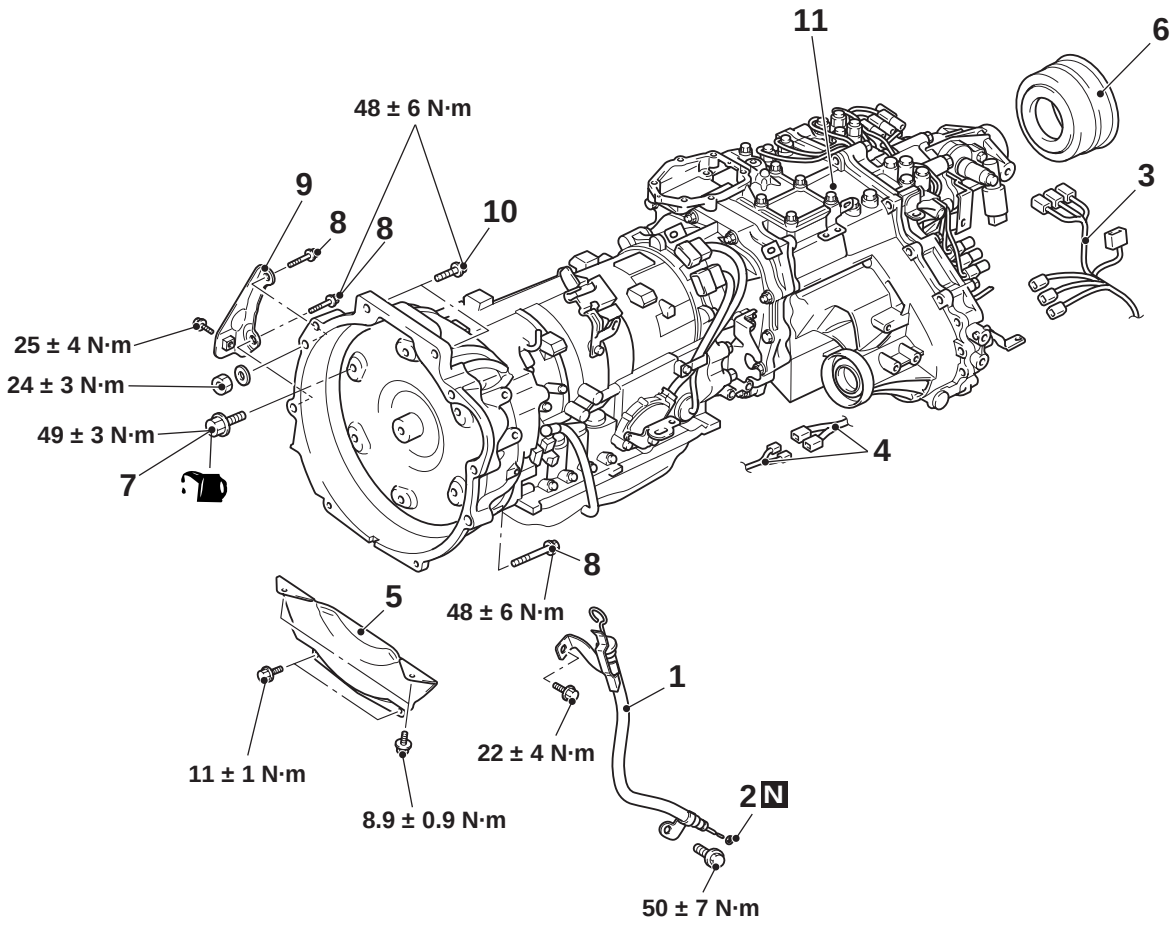
Removal steps (Cont.)

5. Drive plate connecting bolts
- Support the transmission with a transmission jack
6. Transmission assembly lower part coupling bolts
7. Front exhaust pipe bracket
8. Transmission assembly upper part coupling bolts

>>**A**<< 9. Transmission assembly

<4WD>

Pre-removal Operation	Post-installation Operation
• Under Skid Plate and Engine Room Under Cover Removal (Refer to GROUP 51 – Under Cover .) • A/T Fluid Draining (Refer to P.23A-112.) • Transfer Oil Draining (Refer to P.23A-115). • Front and Rear Propeller Shaft Removal (Refer to GROUP 25 – Propeller Shaft .) • Front Exhaust Pipe Removal (Refer to GROUP 15 – Front Exhaust Pipe Main Muffler .) • Transmission Control Cable Connection Removal (Refer to P.23A-131.) • Pipe Assembly Removal (Refer to P.23A-141.) • Starter Assembly Removal (Refer to GROUP 16 – Starter Motor Assembly). • Transfer Control Lever Assembly Removal (Refer to P.23A-131.) • No.2 Crossmember Assembly Removal (Refer to GROUP 32 – Rear Engine Mounting .)	• No.2 Crossmember Assembly Installation (Refer to GROUP 32 – Rear Engine Mounting .) • Transfer Control Lever Assembly Installation (Refer to P.23A-131.) • Starter Assembly Installation (Refer to GROUP 16 – Starter Motor Assembly). • Pipe Assembly Installation (Refer to P.23A-141.) • Transmission Control Cable Connection Installation (Refer to P.23A-131.) • Front Exhaust Pipe Installation (Refer to GROUP 15 – Front Exhaust Pipe Main Muffler .) • Front and Rear Propeller Shaft Installation (Refer to GROUP 25 – Propeller Shaft .) • Transfer Oil Supplying (Refer to P.23A-115). • A/T Fluid Supplying (Refer to P.23A-112.) • Under Skid Plate and Engine Room Under Cover Installation (Refer to GROUP 51 – Under Cover .)



AC904030 AB

Removal steps (Cont.)

1. Oil level gauge assembly
2. O-ring
3. Harness connector connection

Removal steps (Cont.)

4. A/T control harness connector connection
5. Bell housing cover

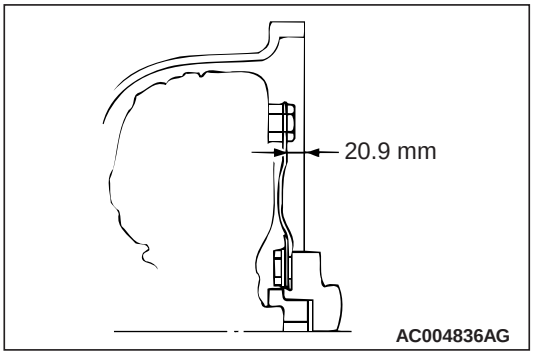
Removal steps (Cont.)

6. Dust seal guard
7. Drive plate connecting bolts
- Support the transmission with a transmission jack
8. Transmission assembly lower part coupling bolts
9. Front exhaust pipe bracket
10. Transmission assembly upper part coupling bolts

>>**A**<< 11. Transmission assembly

INSTALLATION SERVICE POINT

>>A<< TRANSMISSION ASSEMBLY INSTALLATION

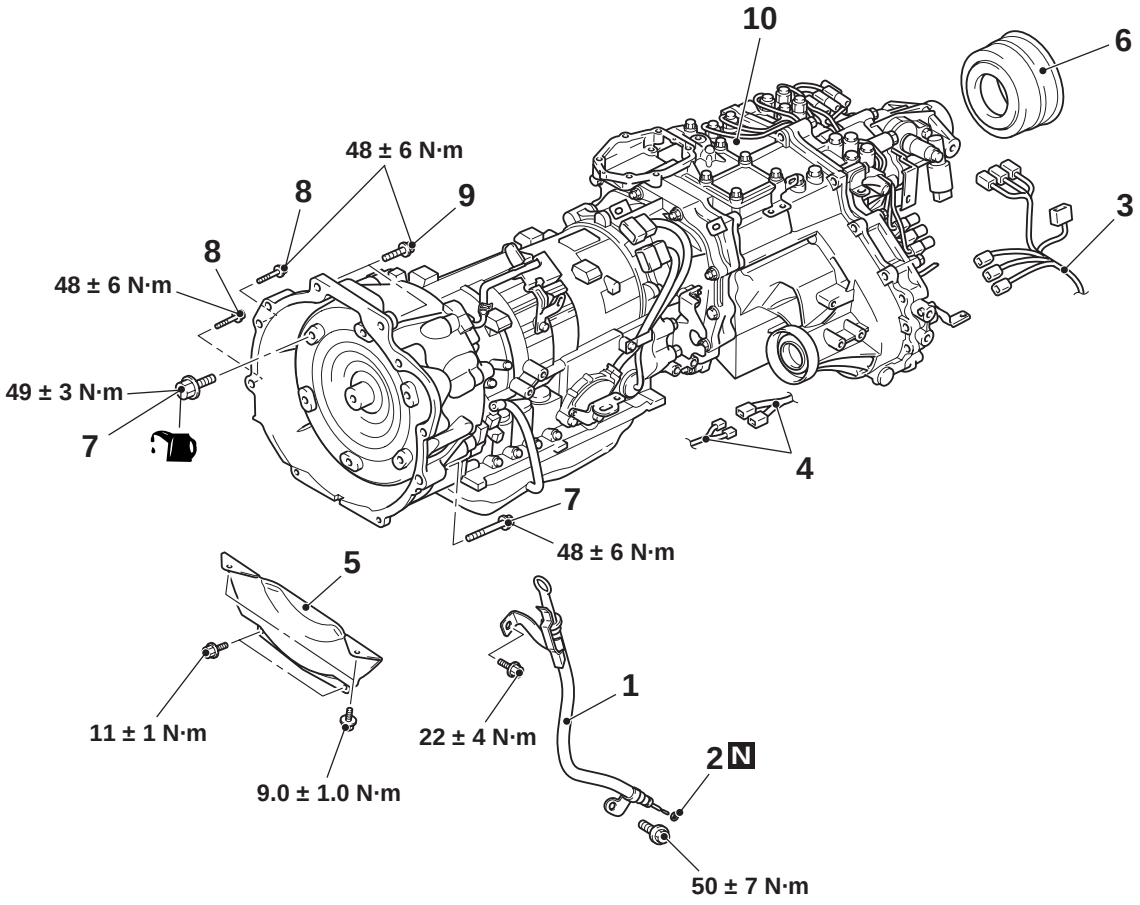


Press the torque converter into the transmission properly, and then assembly into the engine.

REMOVAL AND INSTALLATION <5A/T>

M1231117000551

Pre-removal Operation	Post-installation Operation
• Under Skid Plate and Engine Room Under Cover Removal (Refer to GROUP 51 – Under Cover .) • A/T Fluid Draining (Refer to P.23A-112.) • Transfer Oil Draining (Refer to P.23A-115). • Front and Rear Propeller Shaft Removal (Refer to GROUP 25 – Propeller Shaft .) • Front Exhaust Pipe and Front Exhaust Pipe Bracket Removal (Refer to GROUP 15 – Exhaust Pipe and Main Muffler .) • Transmission Control Cable Connection Removal (Refer to P.23A-133.) • Pipe Assembly Removal (Refer to P.23A-141.) • Starter Assembly Removal (Refer to GROUP 16 – Starter Motor Assembly .) • Transfer Control Lever Assembly Removal (Refer to P.23A-133 .) • No.2 Crossmember Assembly Removal (Refer to GROUP 32 – Rear Engine Mounting .)	• No.2 Crossmember Assembly Installation (Refer to GROUP 32 – Rear Engine Mounting .) • Transfer Control Lever Assembly Installation (Refer to P.23A-133.) • Starter Assembly Installation (Refer to GROUP 16 – Starter Motor Assembly .) • Pipe Assembly Installation (Refer to P.23A-141.) • Transmission Control Cable Connection Installation (Refer to P.23A-133.) • Front Exhaust Pipe and Front Exhaust Pipe Bracket Installation (Refer to GROUP 15 –Exhaust Pipe and Main Muffler .) • Front and Rear Propeller Shaft Installation (Refer to GROUP 25 – Propeller Shaft .) • Transfer Oil Supplying (Refer to P.23A-115). • A/T Fluid Supplying (Refer to P.23A-112.) • Under Skid Plate and Engine Room Under Cover Installation (Refer to GROUP 51 – Under Cover .)



AC903384AD

REMOVAL STEPS

1. Oil level gauge assembly
2. O-ring
3. Harness connector connection
4. A/T control harness connector connection
5. Bell housing cover
6. Dust seal guard
7. Drive plate connecting bolts

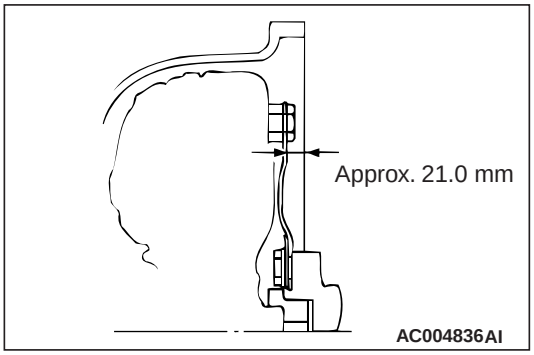
REMOVAL STEPS (Continued)

8. Transmission assembly lower part coupling bolts
   - Support the transmission with a transmission jack
9. Transmission assembly upper part coupling bolts

>>A<< 10. Transmission assembly

INSTALLATION SERVICE POINT

>>A<< TRANSMISSION ASSEMBLY INSTALLATION



Press the torque converter into the transmission properly, and then assembly into the engine.

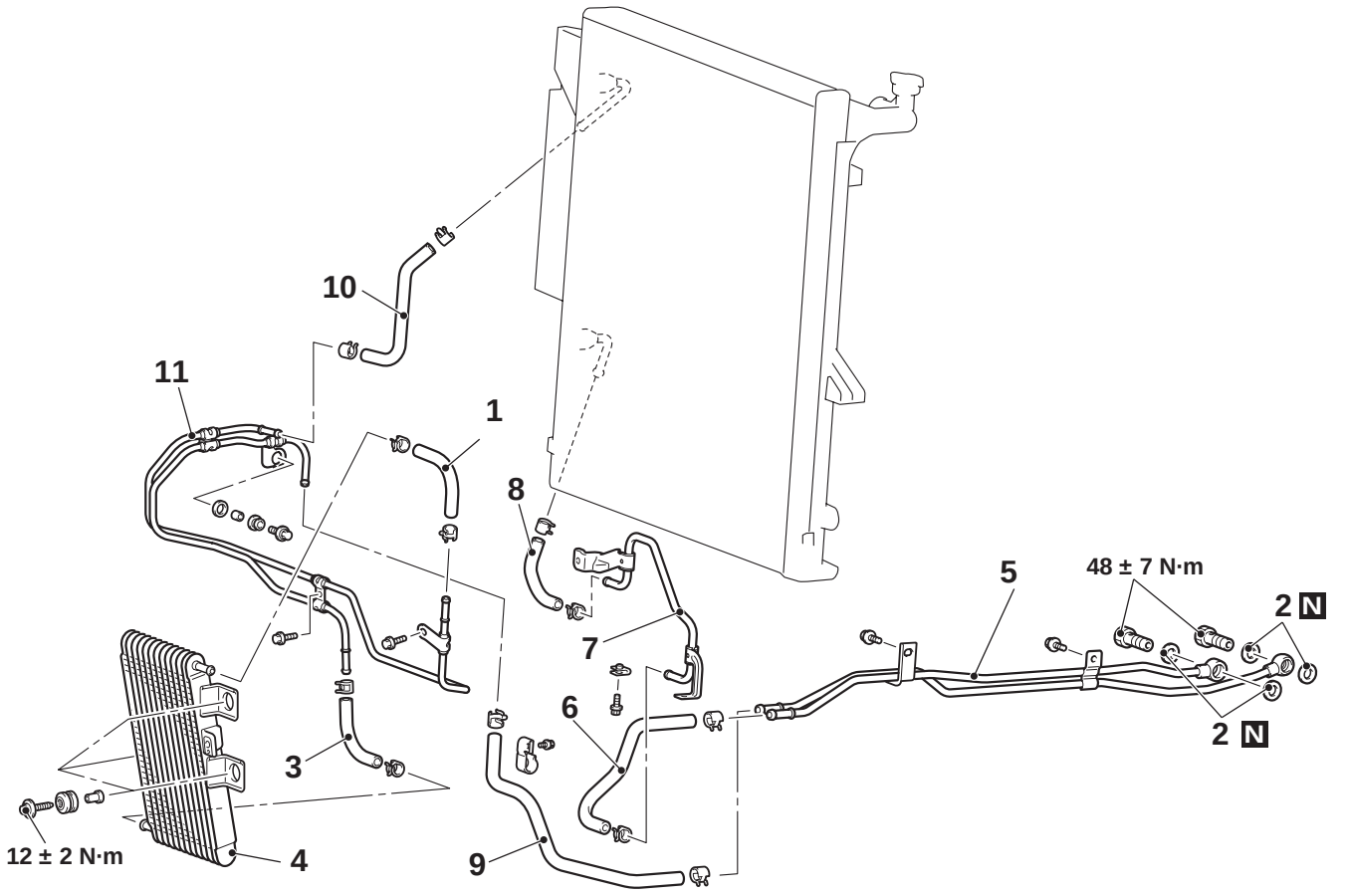
A/T FLUID COOLER

REMOVAL AND INSTALLATION

M1231128700372

Pre-removal and Post-installation Operation
- Under Skid Plate and Engine Room Under Cover Removal and Installation.
- A/T Fluid Draining and Refilling (Refer to P.23A-112).

<Vehicles with air cooled A/T fluid cooler>

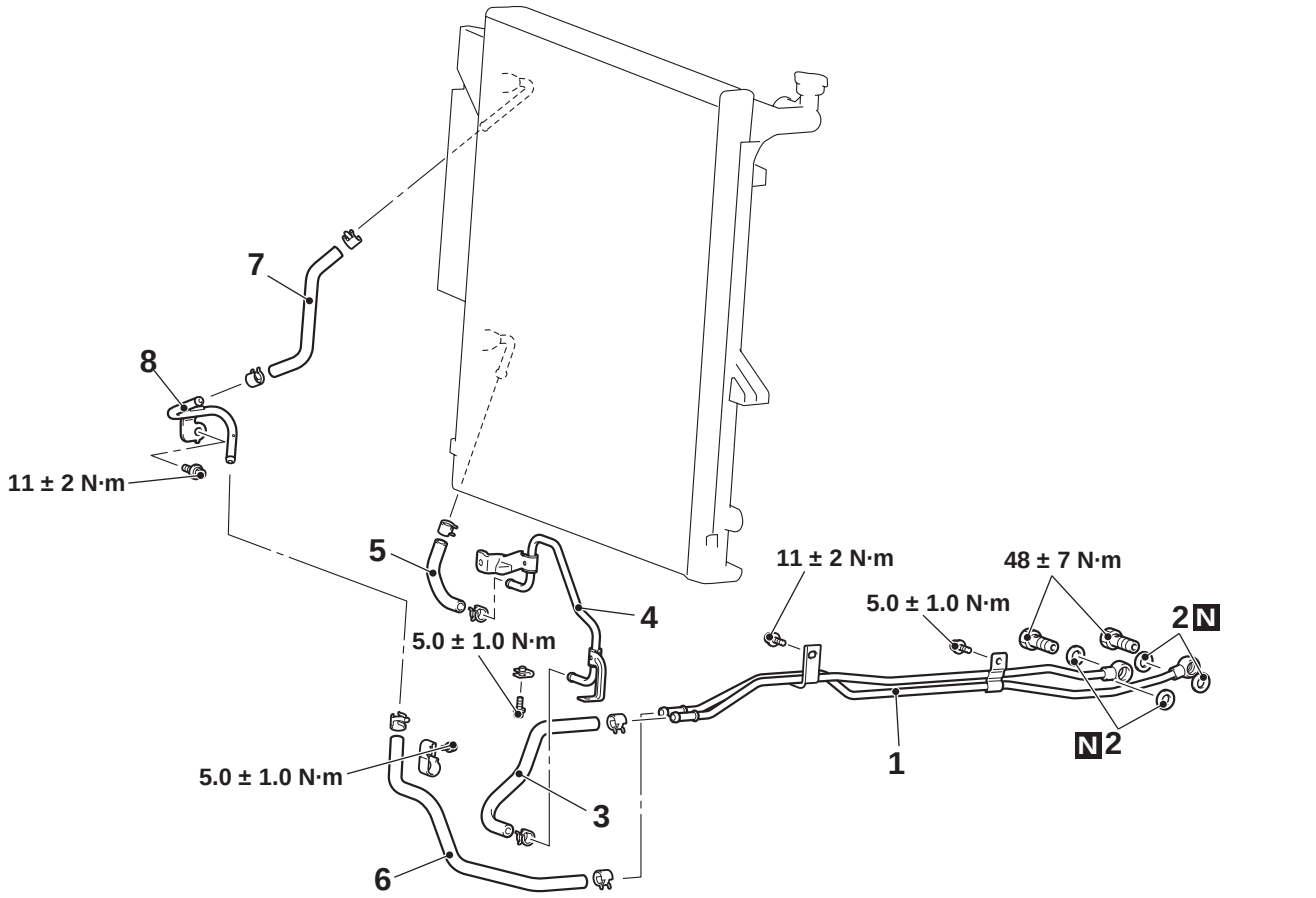


AC509593AE

Removal steps
1. Cooler hose
2. Gasket
3. Hose
4. A/T fluid cooler assembly
5. Pipe assembly
6. Return hose

Removal steps (Continued)
7. Return pipe
8. Hose
9. Feed hose
10. Cooler hose
11. Cooler pipe assembly

<Vehicles without air cooled A/T fluid cooler>



AC807090AC

Removal steps

1. Pipe assembly
2. Gasket
3. Return hose
4. Return pipe

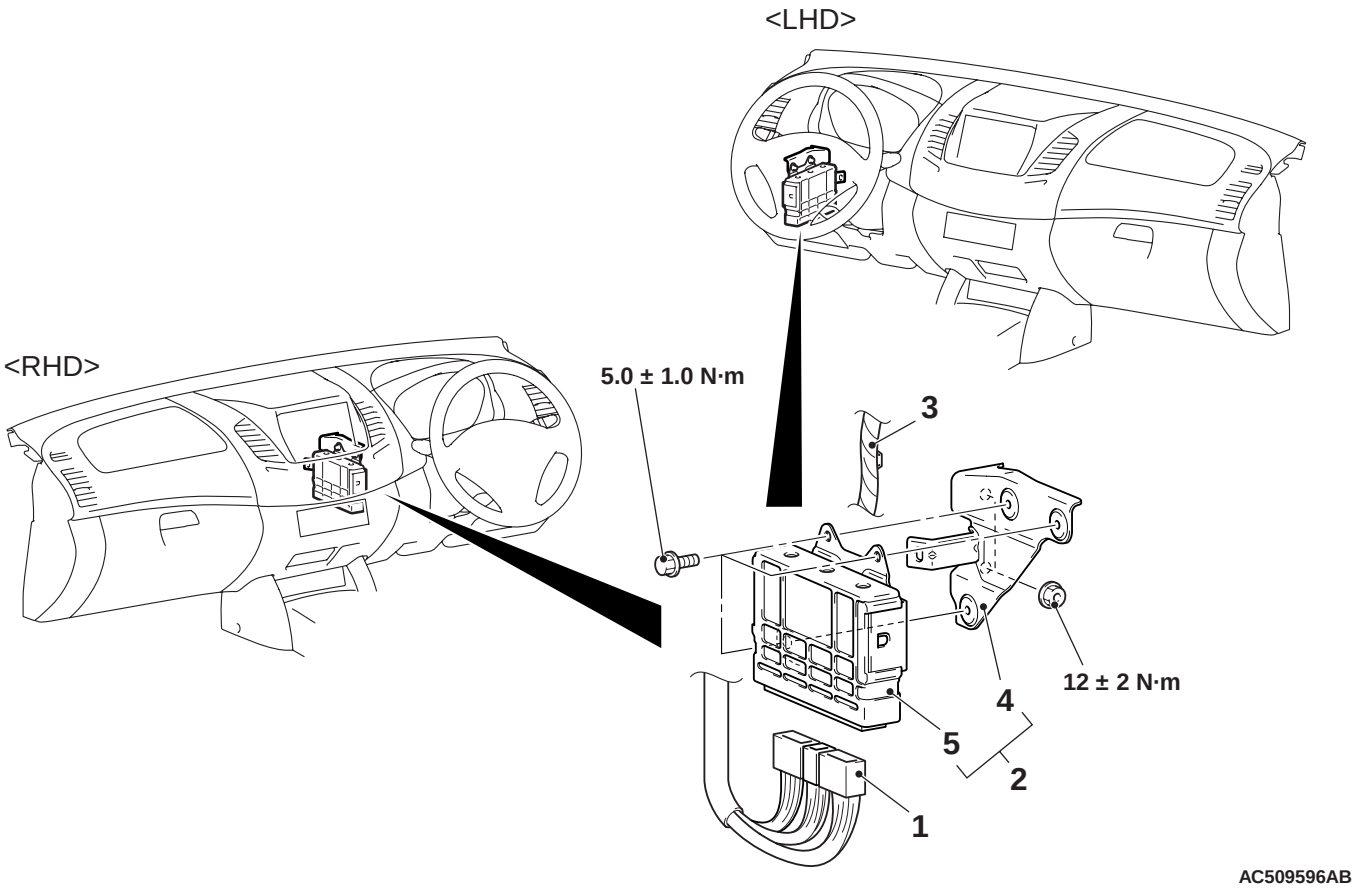
Removal steps (Continued)

5. Hose
6. Feed hose
7. Cooler hose
8. Cooler pipe assembly

A/T-ECU

REMOVAL AND INSTALLATION

M1231130200222



Removal steps

- Driver's side under cover (Refer to GROUP 52A, Instrument Panel Assembly).

1. A/T-ECU connector connection

Removal steps (Continued)

2. A/T-ECU and A/T-ECU bracket assembly
3. Harness connection
4. A/T-ECU bracket
5. A/T-ECU

4WD INDICATOR-ECU

REMOVAL AND INSTALLATION

M1231119100015

Refer to GROUP 22A .

GROUP 23B

AUTOMATIC TRANSMISSION OVERHAUL <R4A5>

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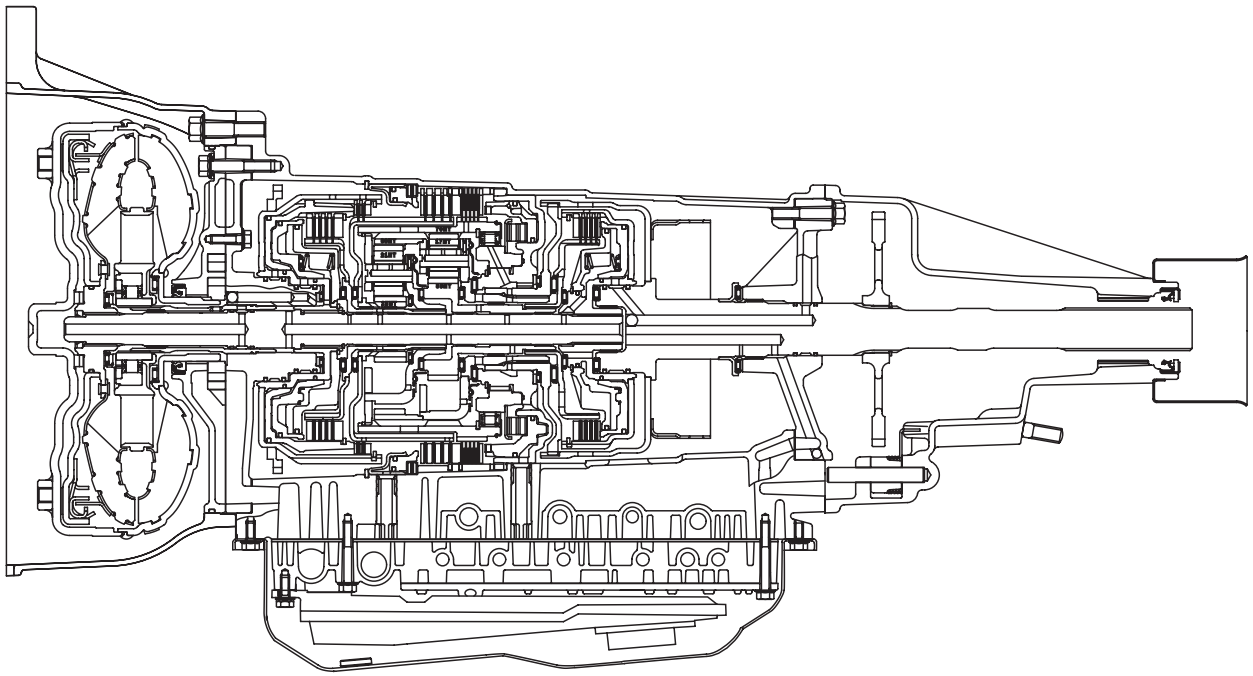
GENERAL INFORMATION

M1233000101848

TRANSMISSION MODEL

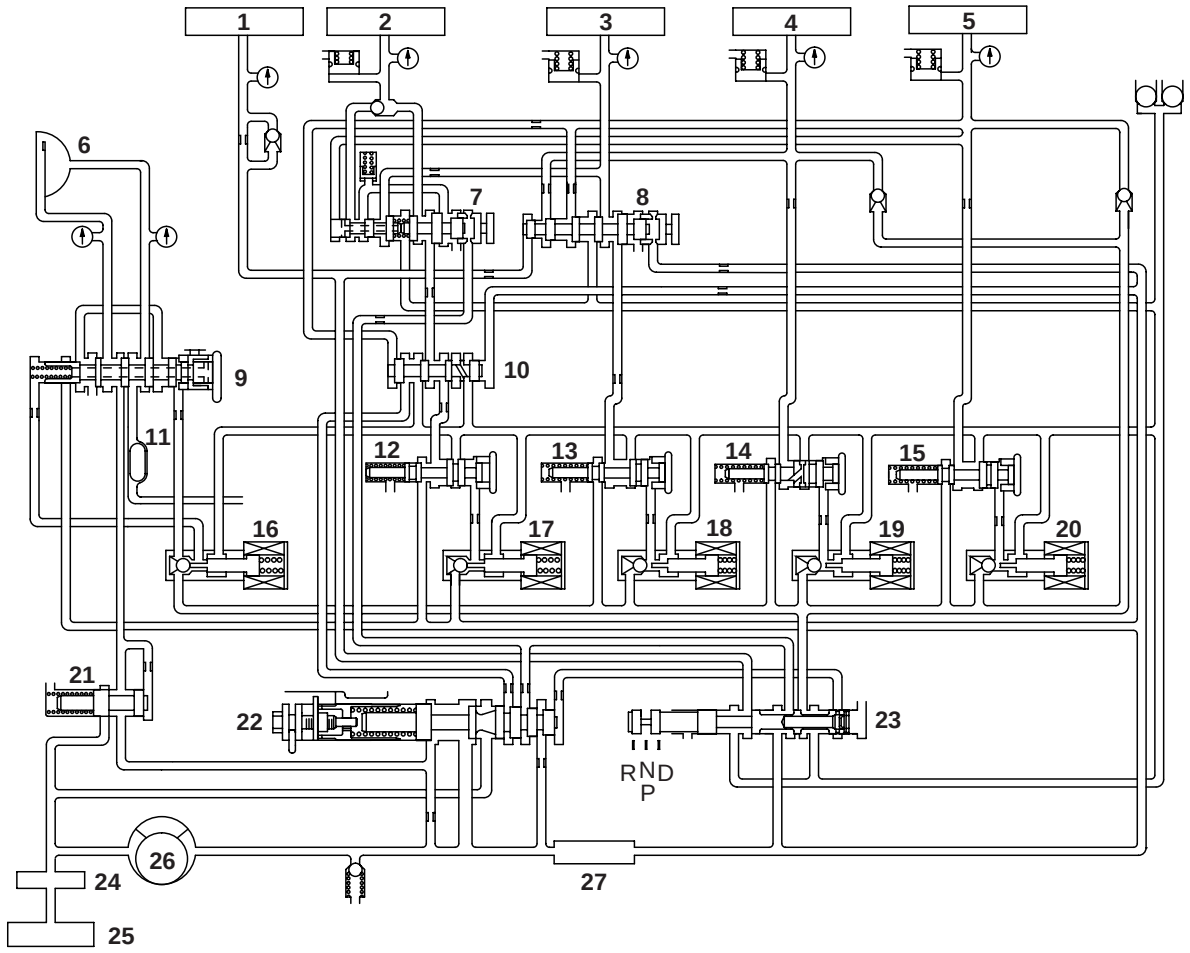
Transmission model	Engine model	Vehicle model
R4A5A-J-LH	4D56 DI-D DOHC	KA4T

SECTIONAL VIEW



AK801605

HYDRAULIC CIRCUIT



AK600223AB

1. Reverse clutch
2. Low/reverse brake
3. Second brake
4. Underdrive clutch
5. Overdrive clutch
6. Damper clutch
7. Fail-safe valve A
8. Fail-safe valve B
9. Damper clutch control valve
10. Switching valve
11. Cooler
12. Low-reverse brake pressure control valve
13. Second brake pressure control valve
14. Underdrive clutch pressure control valve
15. Overdrive clutch pressure control valve
16. Damper clutch control solenoid valve
17. Low-reverse brake solenoid valve
18. Second brake solenoid valve
19. Underdrive clutch solenoid valve
20. Overdrive clutch solenoid valve
21. Torque converter pressure control valve
22. Regulator valve
23. Manual valve
24. Oil filter
25. Oil pan
26. Oil pump
27. Oil strainer

GENERAL SPECIFICATIONS

M1233000201191

Item		Specifications
Transmission model		R4A5A
Torque converter	Type	3-element, 1-stage, 2-phase type
	Stall torque ratio	1.62
	Lock-up	Present
Transmission type		Electronically controlled 4-speed full-automatic
Gear ratio	1st	2.842
	2nd	1.495
	3rd	1.000
	4th	0.731
	Reverse	2.720

SERVICE SPECIFICATIONS

M1233000300979

Item	Standard value
Output shaft end play mm	0.25 – 0.71
Center support end play mm	0 – 0.16
Brake reaction plate end play mm	0 – 0.16
Second brake end play mm	1.49 – 1.95
Low/reverse brake end play mm	1.65 – 2.11
Input shaft end play mm	0.25 – 0.81
Overdrive clutch return spring retainer end play mm	0 – 0.09
Overdrive clutch end play mm	2.0 – 2.2
Reverse clutch end play mm	1.5 – 1.7
Underdrive clutch end play mm	1.6 – 1.8

TORQUE SPECIFICATIONS

M1233023101623

Item	N·m
Transmission case to extension housing mounting bolt	48 ± 6
Cable end bracket mounting bolt	48 ± 6
Clip mounting bolt	11 ± 1
Air breather hose bracket mounting bolt	11 ± 1
Harness clamp bracket mounting bolt	26 ± 5
Oil filler tube mounting bolt	44 ± 8
Output shaft support mounting bolt	23 ± 3
Oil pump mounting bolt	23 ± 3

Item	N·m
Converter housing to transmission case mounting bolt	48 ± 6
Valve body mounting bolt	11 ± 1
Oil temperature sensor mounting bolt	11 ± 1
Detent spring mounting bolt	6.0 ± 1.0
Oil filter mounting bolt	6.0 ± 1.0
Oil pan mounting bolt	11 ± 1
Manual control lever mounting nut	21.5 ± 3.5
Output shaft speed sensor mounting bolt	11 ± 1
Input shaft speed sensor mounting bolt	11 ± 1
Inhibitor switch mounting bolt	11 ± 1
Cover mounting bolt	11 ± 1
Solenoid support mounting bolt	6.0 ± 1.0
Separating plate mounting bolt	6.0 ± 1.0
Lower valve body mounting bolt	11 ± 1
Upper valve body mounting bolt	11 ± 1

VALVE BODY SPRING IDENTIFICATION

M1233022900269

Item	Wire diameter mm	Outside diameter mm	Free height mm	Number of loops
Orifice check ball spring	0.5	4.5	15.4	15
Damper clutch control valve spring	0.7	5.9	28.1	19
Damping valve A spring	1.0	7.7	35.8	17
Torque converter pressure control valve spring	1.6	11.2	29.4	9.5
Fail-safe valve a spring	0.7	8.9	21.9	9.5
Pressure control valve spring	0.7	7.6	37.7	25
Line relief valve spring	1.0	7.0	17.3	10
Regulator valve spring	1.8	13.3	44.6	12.5

SNAP RING, SPACER, THRUST WASHER, THRUST RACE AND PRESSURE PLATE FOR ADJUSTMENT

M1233100500022

Thrust race (For adjustment of output shaft end play)

Thickness mm	Identification symbol	Thickness mm	Identification symbol
1.6	None	2.0	None
1.8	None	2.2	None

Snap ring (For adjustment of underdrive clutch and overdrive clutch end play)

Thickness mm	Identification color	Thickness mm	Identification color
1.6	Brown	2.4	Blue
1.7	None	2.5	Brown
1.8	Blue	2.6	None
1.9	Brown	2.7	Blue
2.0	None	2.8	Brown
2.1	Blue	2.9	None
2.2	Brown	3.0	Blue
2.3	None		

Thrust race (For adjustment of input shaft end play)

Thickness mm	Identification symbol	Thickness mm	Identification symbol
1.4	None	2.2	None
1.6	None	2.4	None
1.8	None	2.6	None
2.0	None		

Snap ring (For adjustment of overdrive clutch return spring retainer end play)

Thickness mm	Identification color	Thickness mm	Identification color
1.48	Brown	1.58	None
1.53	Black	1.63	Brown

Pressure plate (For adjustment of second brake end play)

Thickness mm	Identification symbol	Thickness mm	Identification symbol
1.6	F	2.4	B
1.8	E	2.6	A
2.0	D	2.8	0
2.2	C	3.0	1

Snap ring (For adjustment of center support and brake reaction plate end play)

Thickness mm	Identification color	Thickness mm	Identification color
2.2	None	2.4	Brown
2.3	Blue	2.5	None

Snap ring (For adjustment of reverse clutch end play)

Thickness mm	Identification color	Thickness mm	Identification color
1.6	None	2.3	Blue
1.7	Blue	2.4	Brown
1.8	Brown	2.5	None
1.9	None	2.6	Blue
2.0	Blue	2.7	Brown
2.1	Brown	2.8	None
2.2	None		

Pressure plate (For adjustment low/reverse brake end play)

Thickness mm	Identification symbol	Thickness mm	Identification symbol
1.6	F	2.4	B
1.8	E	2.6	A
2.0	D	2.8	0
2.2	C	3.0	1

SEALANTS

M1233000501114

Item	Specified sealant
Extension housing	Mitsubishi Part No.MZ100389 or equivalent
Converter housing	
Oil pan	
Sealing cap	3M™ ATD Part No.8672 or equivalent

FORM-IN-PLACE GASKET (FIPG)

This transaxle has several areas where the form-in-place gasket (FIPG) is used for sealing. To ensure that the FIPG fully serves its purpose, it is necessary to observe some precautions when applying it. Bead size, continuity and location are of paramount importance.

Too thin a bead could cause leaks. Too thick a bead, on the other hand, could be squeezed out of location, causing blocking or narrowing of fluid passages. To prevent leaks or blocking of passages, therefore, it is absolutely necessary to apply the FIPG evenly without a break, while observing the correct bead size. FIPG hardens as it reacts with the moisture in the atmospheric air, and it is usually used for sealing metallic flange areas.

⚠ CAUTION

When re-applying liquid gasket (FIPG), be sure that:

1. **Residues of FIPG are cleared from all the ins and outs of parts;**
2. **Use Mitsubishi genuine parts cleaner (MZ100387) or equivalent to well degrease the FIPG-applied surface.**
3. **FIPG is correctly applied in accordance with FIPG Application.**

Disassembly

Parts sealed with a FIPG can be easily removed without need for the use of a special method. In some cases, however, the FIPG in joints may have to be broken by tapping parts with a mallet or similar tool.

Surface Preparation

Thoroughly remove all substances deposited on the FIPG application surface, using a gasket scraper. Make sure that the FIPG application surfaces is flat and smooth. Also make sure that the surface is free from oils, greases and foreign substances. Do not fail to remove old FIPG that may remain in the fastener fitting holes.

FIPG Application

Applied FIPG bead should be of the specified size and free of any break. FIPG can be wiped away unless it has completely hardened. Install the mating parts in position while the FIPG is still wet. Do not allow FIPG to spread beyond the sealing areas during installation. Avoid operating the transaxle or letting oils or water come in contact with the sealed area before a time sufficient for FIPG to harden (approximately one hour) has passed.

FIPG application method may vary from location to location. Follow the instruction for each particular case described later in this manual.

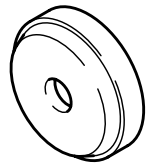
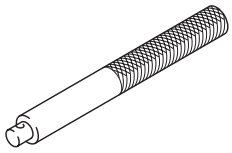
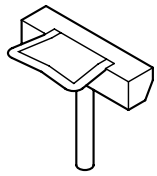
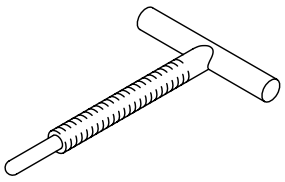
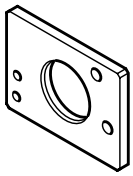
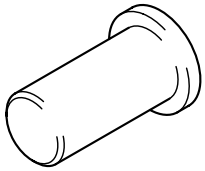
LUBRICANT(S)

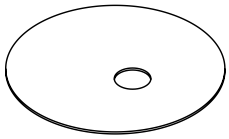
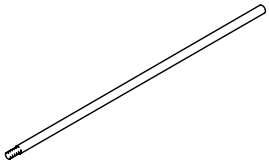
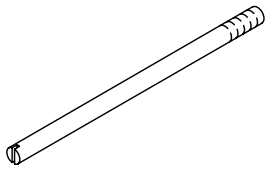
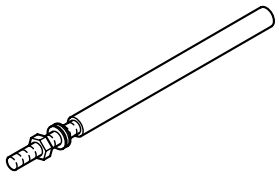
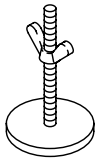
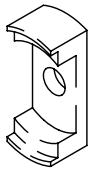
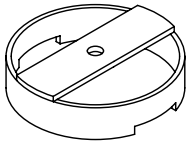
M1233000400415

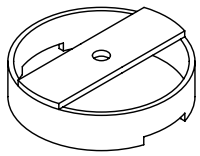
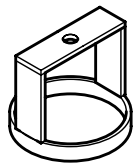
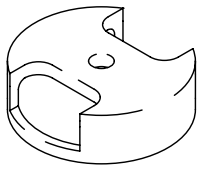
Item	Specified lubricant	Quantity
Transmission oil	DiaQueen ATF SP III	As required
Oil seal	Mitsubishi Part No.0101011 or equivalent	As required

SPECIAL TOOLS

M1233000600743

Tool	Number	Name	Use
	MB990929	Installer adapter	Installation of oil seal
	MB990938	Handle	Use with installer adapter
 D998727	MD998727	Oil pan FIPG cutter	Removal of oil pan
	MD998333	Oil pump remover	Removal of oil pump
	MB991603	Bearing installer stopper	Measurement of output shaft and center support end plays
	MD998029	Oil seal installer	Measurement of output shaft end play

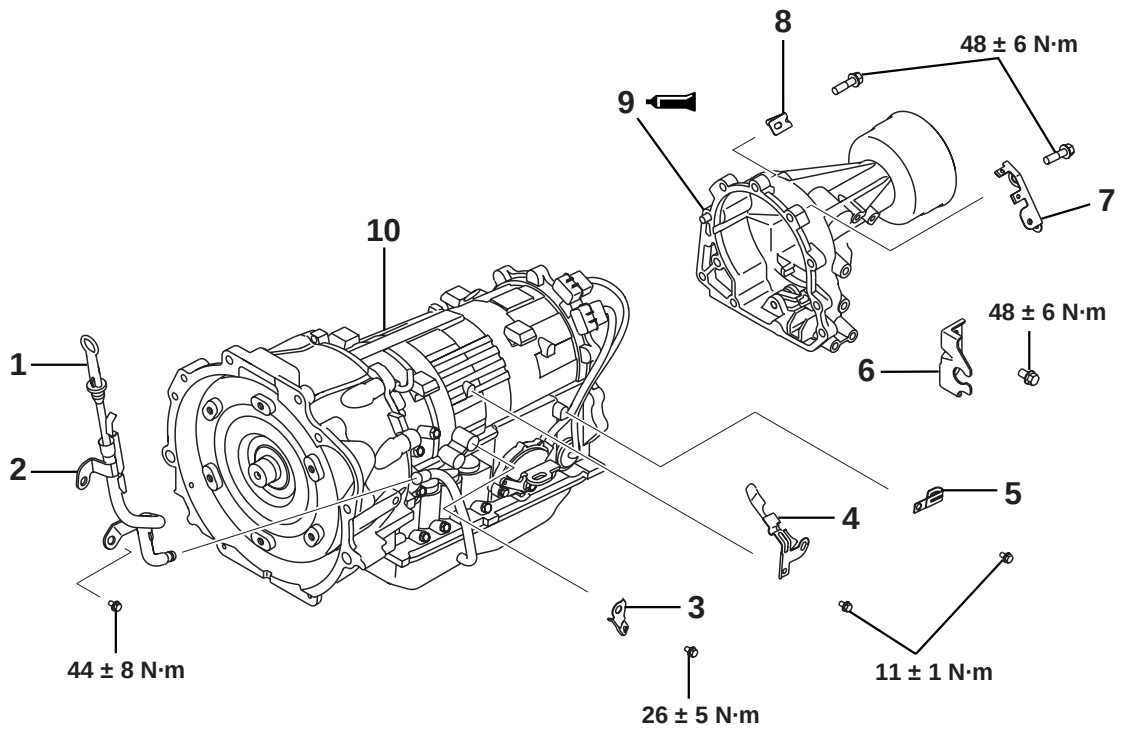
Tool	Number	Name	Use
	MB991632	Clearance dummy plate	Measurement of brake reaction plate, second brake and low/reverse brake end plays
	MD998913	Dial gauge extension	Measurement of brake reaction plate, second brake and low/reverse brake end plays
	MD998412	Guide	Installation of oil pump
	MD998316	Dial gauge support	Measurement of input shaft end play
	MD998924	Spring compressor retainer	Use with spring compressor
	MD999590	Spring compressor	Removal and installation of reverse and overdrive clutch spring retainer snap ring
	MB991629	Spring compressor	Measurement of overdrive clutch and underdrive clutch end plays

Tool	Number	Name	Use
	MB991789	Spring compressor	Adjustment reverse clutch end plays
	MB991630	Spring compressor	Removal and installation of center support snap ring
	MD998907	Spring compressor	Removal and installation of underdrive clutch spring retainer snap ring

TRANSMISSION AND EXTENSION HOUSING

DISASSEMBLY AND ASSEMBLY

M1233126900019



AK800428AB

Disassembly steps

1. Oil level gauge
2. Oil filler tube
3. Harness clamp bracket
4. Air breather hose bracket
5. Clip
6. Cable end bracket
7. Harness bracket
8. Harness bracket

>>**A**<< 9. Extension housing

10. Transmission

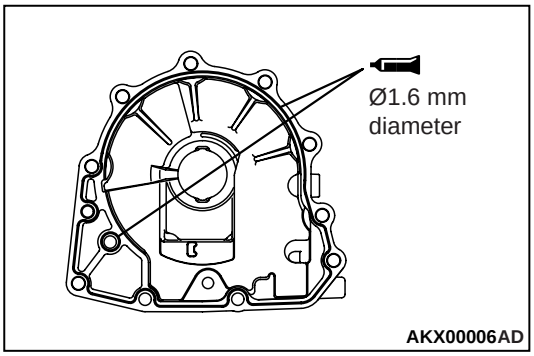
REASSEMBLY SERVICE POINTS

>>A<< EXTENSION HOUSING INSTALLATION

1. Apply vaseline or blue petrolatum jelly on the bushing inside the extension housing.

⚠ CAUTION

- **Completely degrease the FIPG-applied surface so that water and oil including the old sealant cannot adhere to the surface coated with the sealant. Never touch the degreased surface by hand.**
- **Make sure the starting point and the ending point are about the middle between the bolts.**



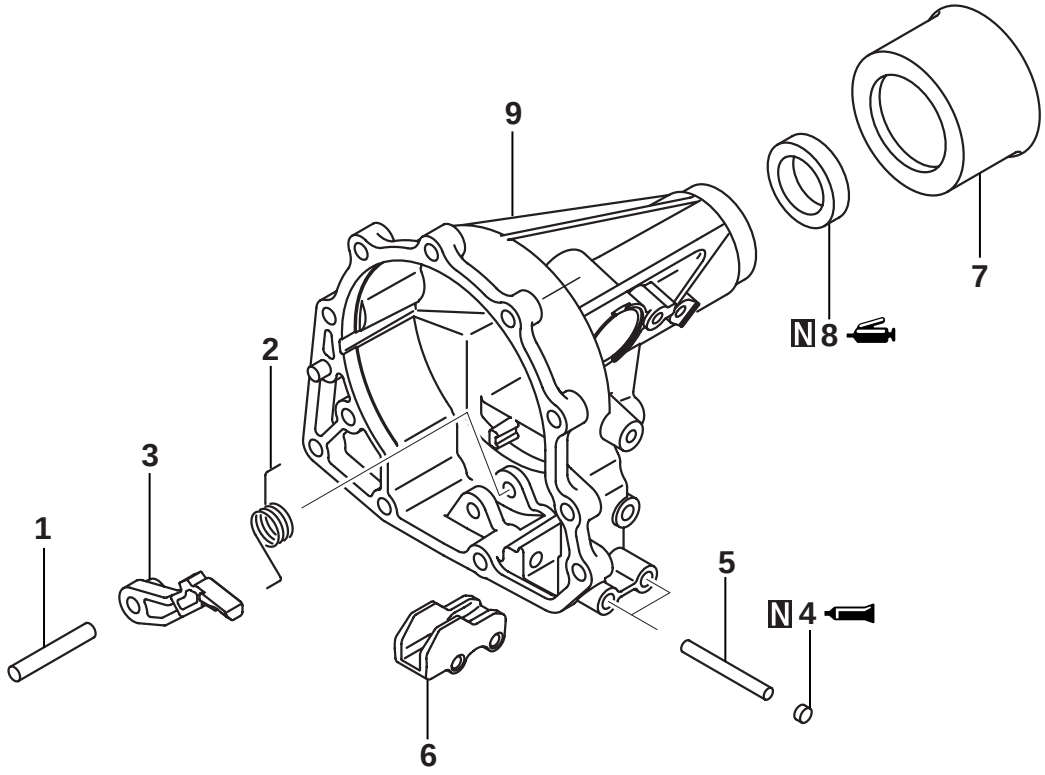
2. After squeezing out and applying the sealant on the extension housing at the section indicated in the illustration, install onto the transmission case.

Specified sealant:
Mitsubishi Part No.MZ100389 or equivalent

EXTENSION HOUSING

DISASSEMBLY AND REASSEMBLY

M1233007600120



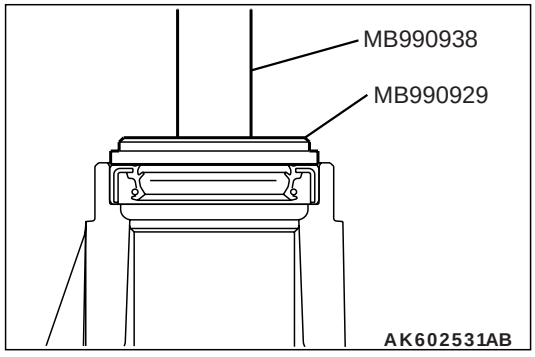
AK602526AB

Disassembly steps

1. Parking sprag shaft
>>C<< 2. Parking sprag spring
3. Parking sprag
>>B<< 4. Sealing cap
5. Parking roller support shaft
6. Parking roller support
7. Dust seal guard
>>A<< 8. Oil seal
9. Extension housing

REASSEMBLY SERVICE POINTS

>>A<< OIL SEAL INSTALLATION

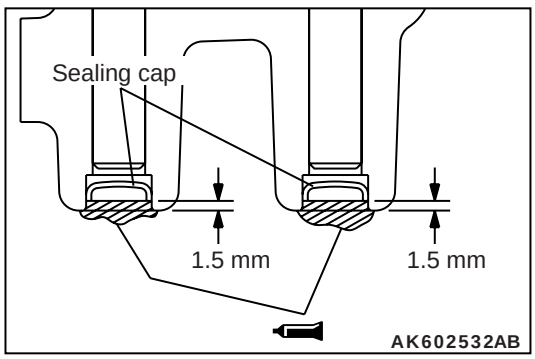


1. Set special tools as shown in the illustration.
   - Installer adapter (MB990929)
   - Handle (MB990938)

>>B<< SEALING CAP INSTALLATION

⚠ CAUTION

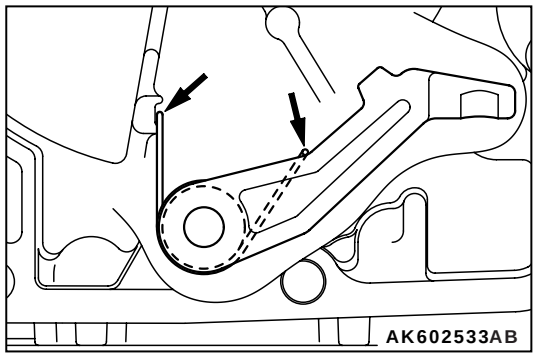
- **Completely degrease the FIPG-applied surface so that water and oil including the old sealant cannot adhere to the surface coated with the sealant. Never touch the degreased surface by hand.**
- **Make sure the starting point and the ending point are about the middle between the bolts.**



1. Press into the dimensions shown in the illustration so that it is not slanted.
2. Apply the sealant as shown in the illustration.

Specified sealant:
3M™ ATD Part No.8672 or equivalent

>>C<< PARKING SPRAG SPRING INSTALLATION

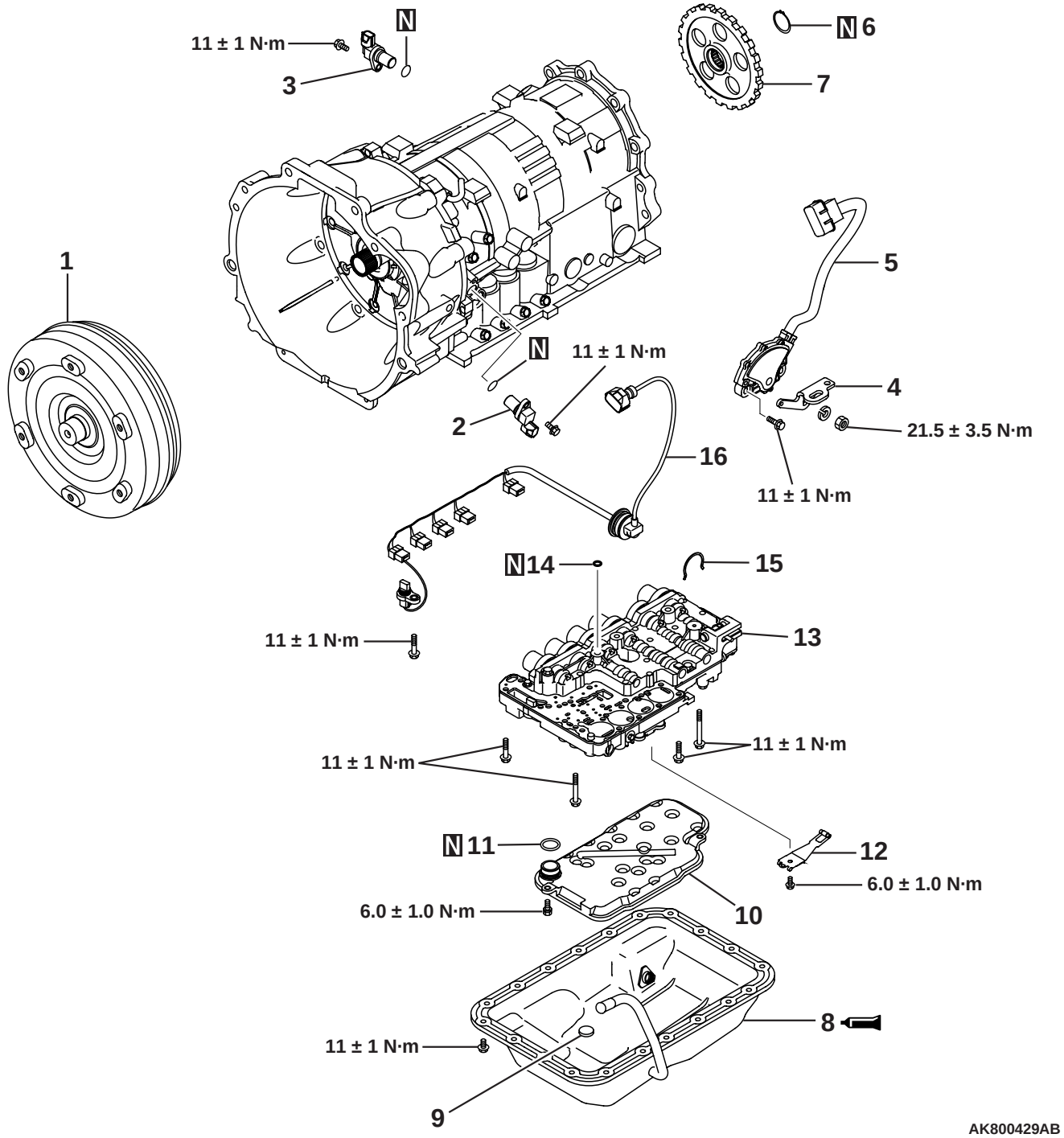


Attach the end of the spring to the position shown in the illustration.

TRANSMISSION

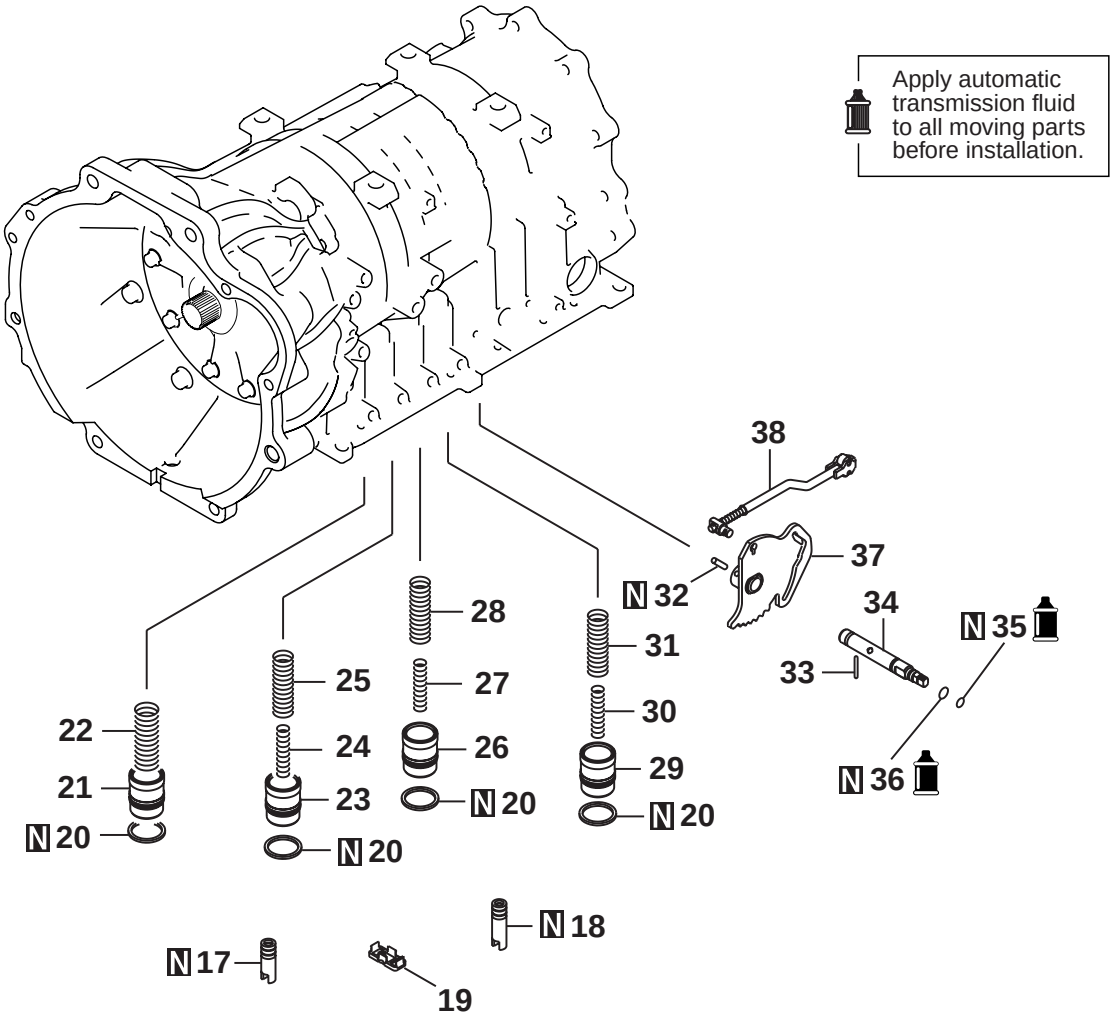
DISASSEMBLY AND REASSEMBLY

M1233101200013



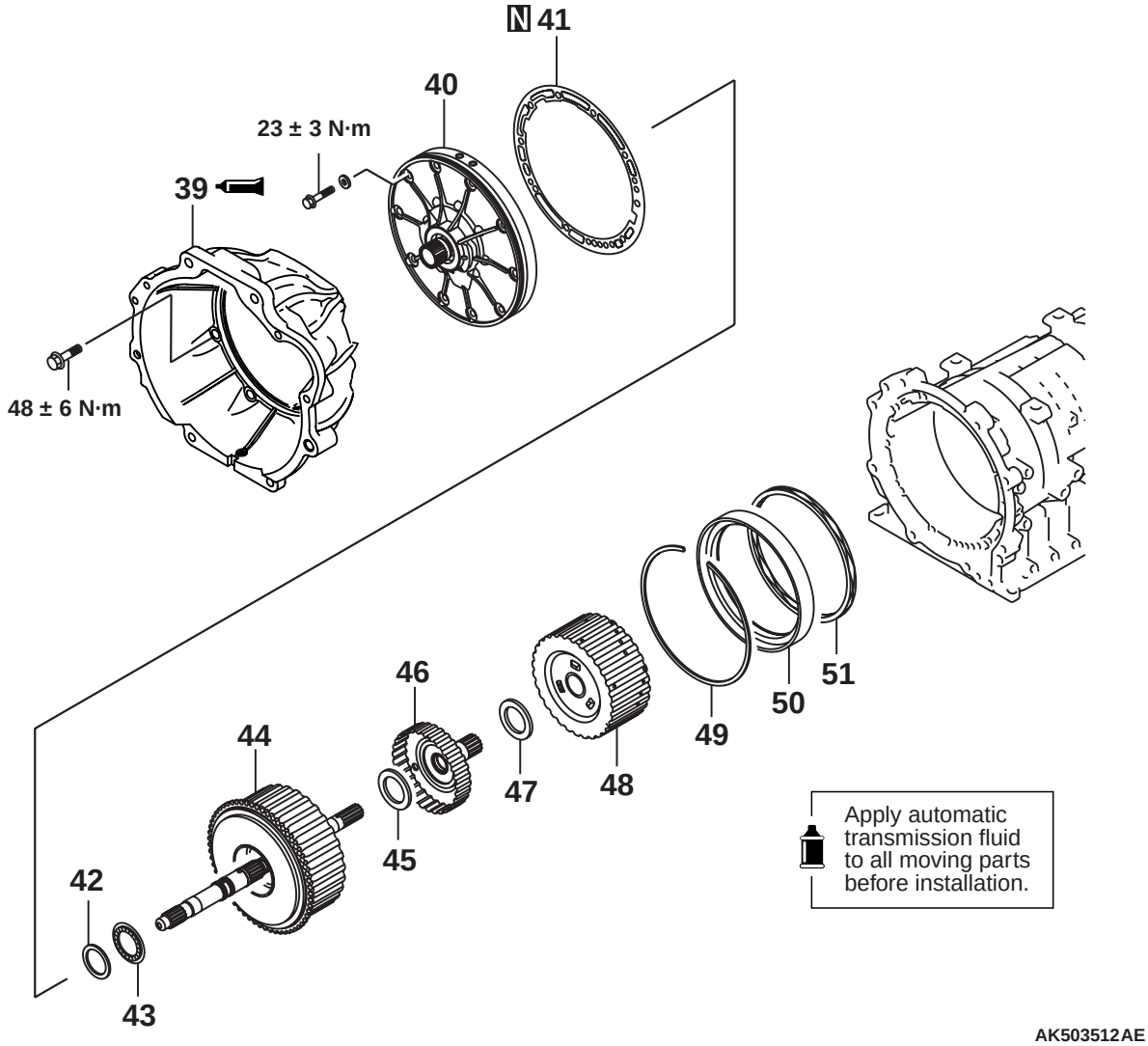
1. Torque converter
2. Input shaft speed sensor
3. Output shaft speed sensor
4. Manual control lever
5. Inhibitor switch
6. Snap ring
7. Parking gear
8. Oil pan
9. Magnet
10. Oil filter
11. O-ring
12. Detent spring
13. Valve body
14. O-ring

15. Snap ring
16. Solenoid valve harness

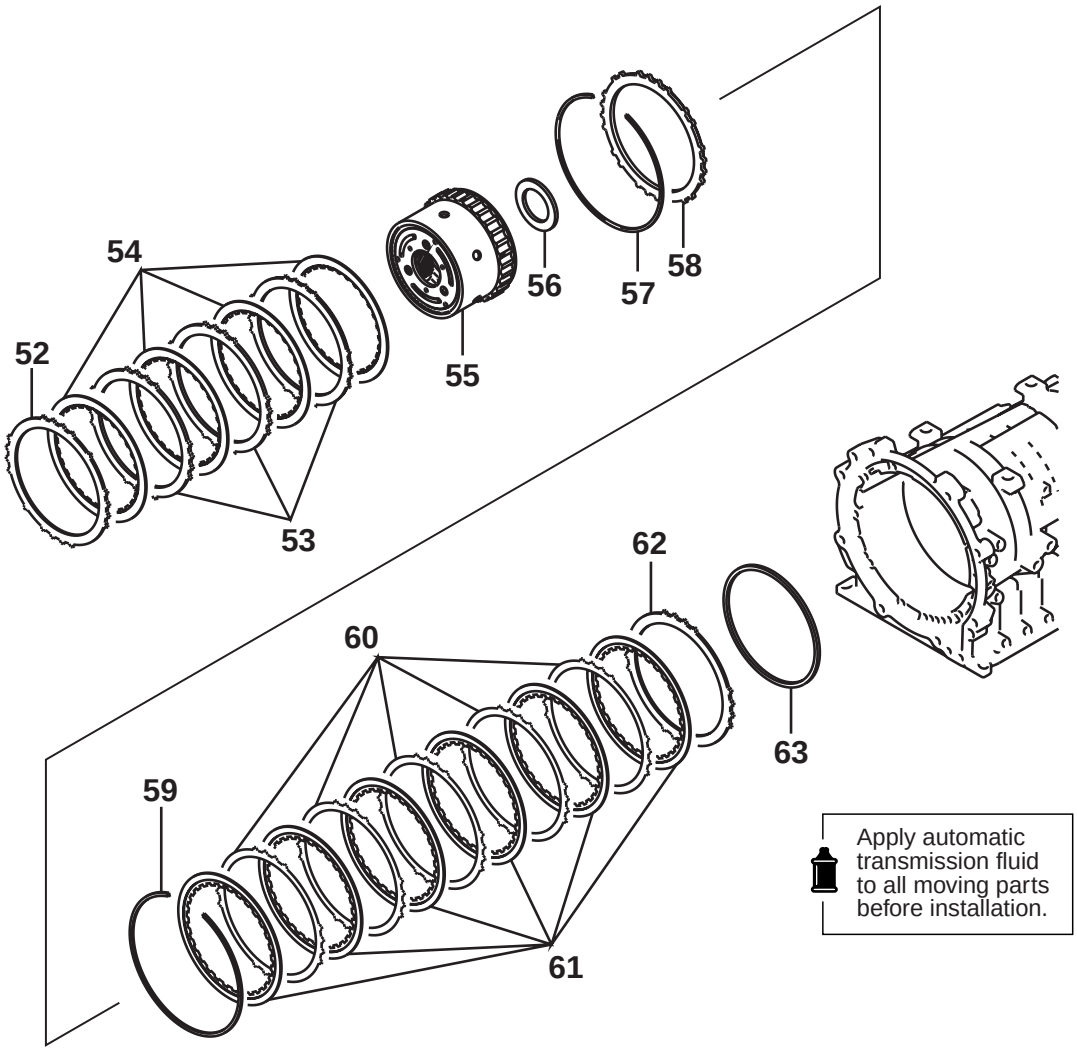


AK503511AD

17. Oil seal
18. Oil seal
19. Oil strainer
20. Seal ring
21. Accumulator piston (for overdrive clutch)
22. Accumulator spring
23. Accumulator piston (for second brake)
24. Inner spring
25. Outer spring
26. Accumulator piston (for low/reverse brake)
27. Inner spring
28. Outer spring
29. Accumulator piston (for underdrive clutch)
30. Inner spring
31. Outer spring
32. Spring pin
33. Pin
34. Manual control shaft
35. O-ring
36. O-ring
37. Detent lever
38. Parking roller rod

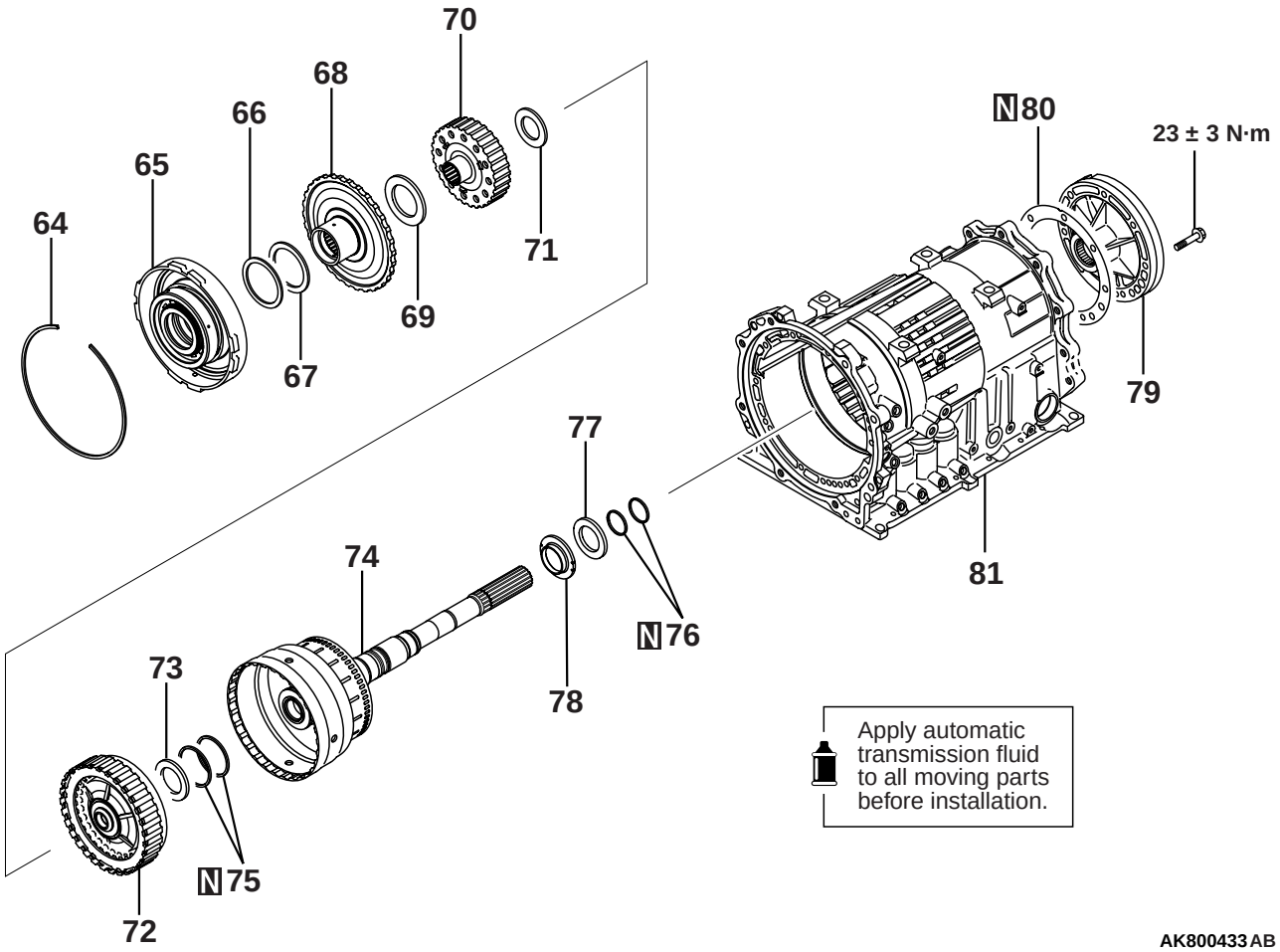


39. Converter housing
40. Oil pump
41. Oil pump gasket
42. Thrust race No.1
43. Thrust bearing No.2
44. Reverse and overdrive clutch
45. Thrust bearing No.3
46. Overdrive clutch hub
47. Thrust bearing No.4
48. Reverse sun gear
49. Snap ring
50. Second brake
51. Return spring



AKX00019AG

52. Pressure plate
53. Brake plate
54. Brake disc
55. Low/reverse annulus gear
56. Thrust bearing No.7
57. Snap ring
58. Reaction plate
59. Snap ring
60. Brake plate
61. Brake disc
62. Pressure plate
63. Wave spring

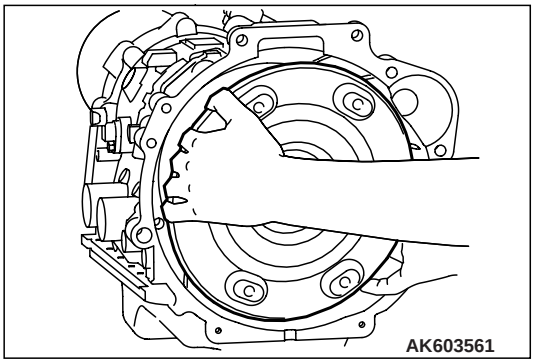


64. Snap ring
65. Center support
66. Thrust race No.8
67. Thrust bearing No.9
68. Output flange
69. Thrust bearing No.10
70. Underdrive clutch hub
71. Thrust bearing No.11
72. Underdrive clutch
73. Thrust bearing No.12
74. Output shaft
75. Seal ring
76. Seal ring
77. Thrust bearing No.13
78. Bearing retainer
79. Output shaft support
80. Output shaft support gasket
81. Transmission case

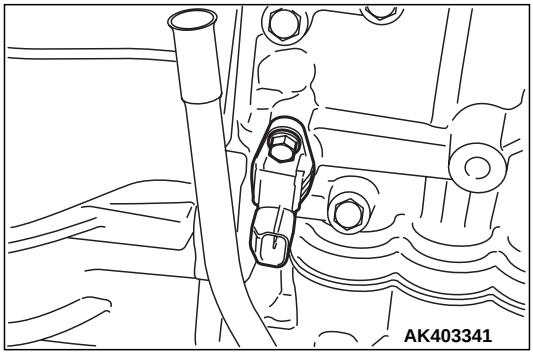
DISASSEMBLY

⚠ CAUTION

- **The automatic transmission includes many high-precision parts. Handle these parts extremely carefully not to scratch or damage them during disassembly and reassembly.**
- **Work bench should be covered with a rubber mat and keep it clean at all times.**
- **Do not wear any cloth gloves and do not use any rags during disassembly. Use only nylon cloth or paper towels if necessary.**
- **All removed parts must be washed clean. Metal parts may be washed in an ordinary solvent, but they should be dried completely using compressed air.**
- **Clutch discs, plastic thrust plates and rubber parts should be washed in automatic transmission fluid (ATF) and keep them free of dirt after washing.**
- **If the transmission has been found damaged and repaired, also disassemble and clean the ATF cooler system.**


AK603561

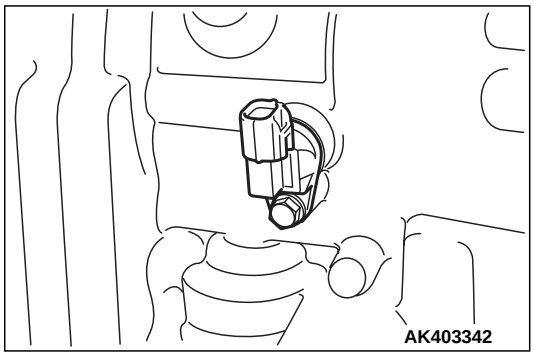
1. Remove the torque converter.


AK403341

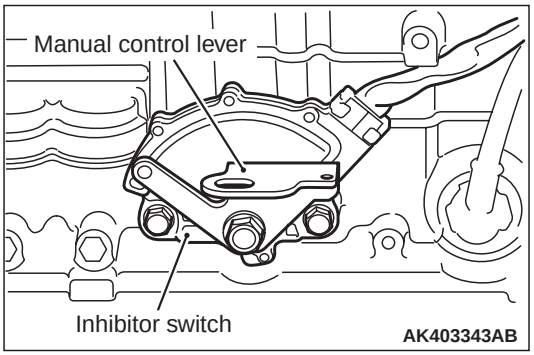
2. Remove the input shaft speed sensor.

⚠ CAUTION

Carefully hammer the special tool so that the oil pan mounting surface is not damaged.

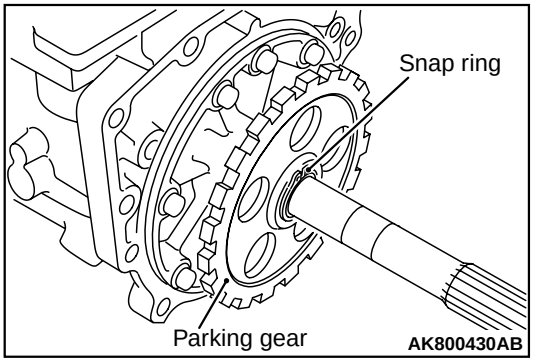

AK403342

3. Remove the output shaft speed sensor.



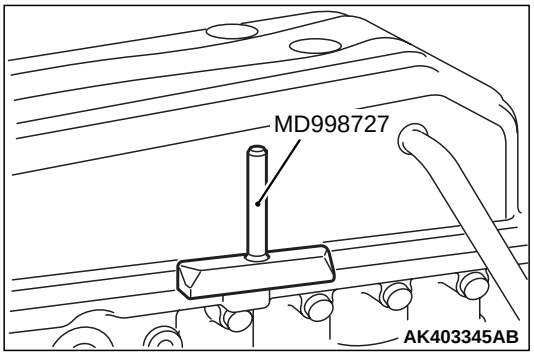
AK403343AB

4. Remove the manual control lever, and then remove the inhibitor switch.

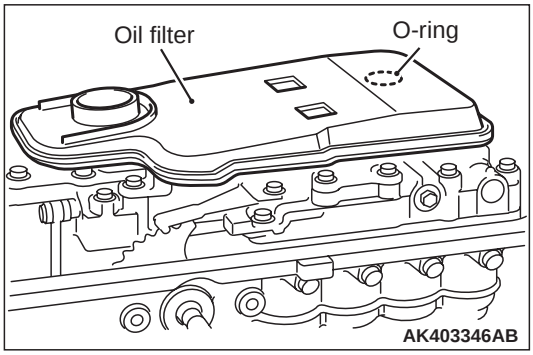


AK800430AB

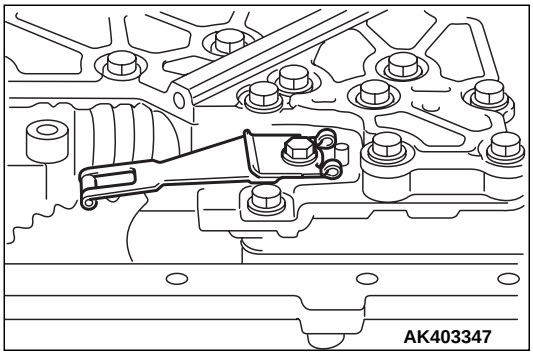
5. Remove the snap ring, and remove the parking gear using a puller (corresponding load approximately 9,800 N).



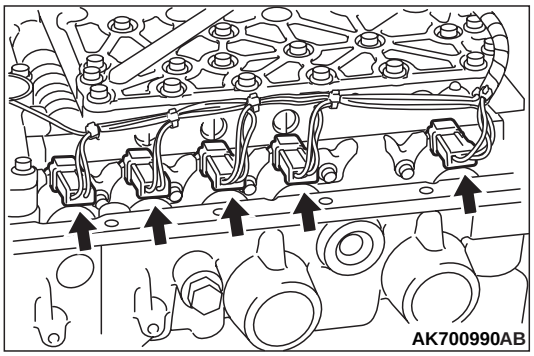
6. Remove the twenty oil pan mounting bolts and then use the special tool Oil pan FIPG cutter (MD998727) to remove the oil pan.



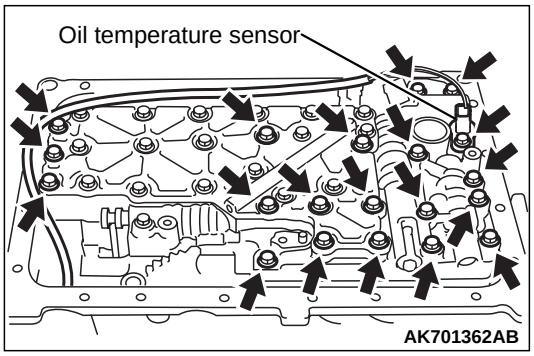
7. Remove the oil filter and O-ring.

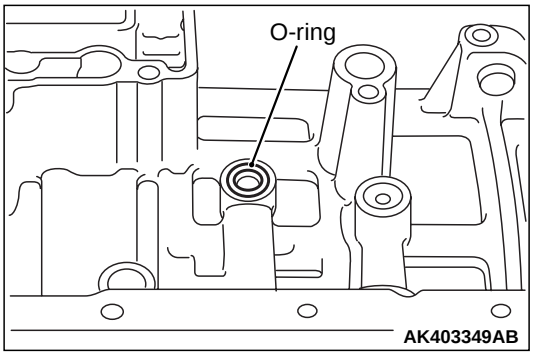


8. Remove the detent spring.



9. Disconnect the valve body harness connectors.

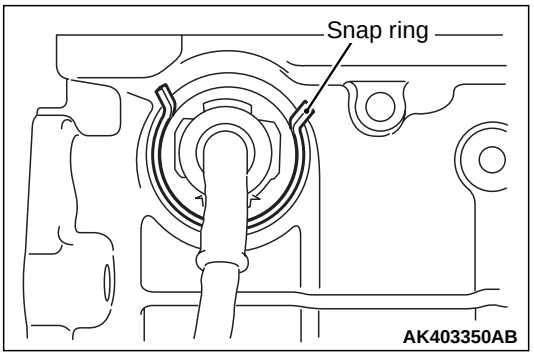




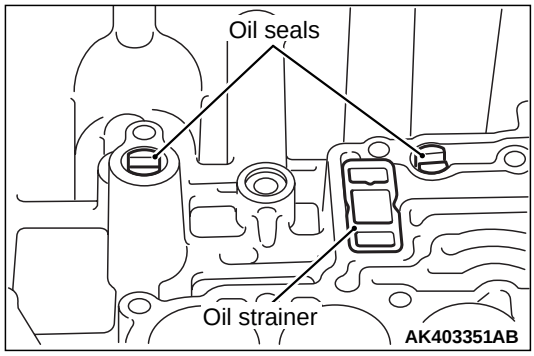
10. Remove the twenty valve body mounting bolts and then remove the valve body, O-ring and oil temperature sensor.

NOTE:

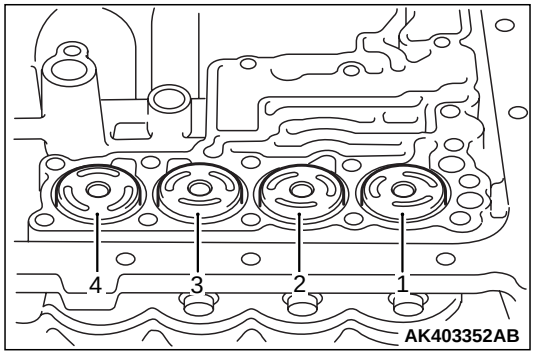
- *The twenty valve body mounting bolts are plated bolts.*
- *The O-ring is mounted on the transmission case side as shown in the illustration. However there may be cases when it will come off with the valve body.*



11. Remove the snap ring and disconnect the solenoid valve harness.



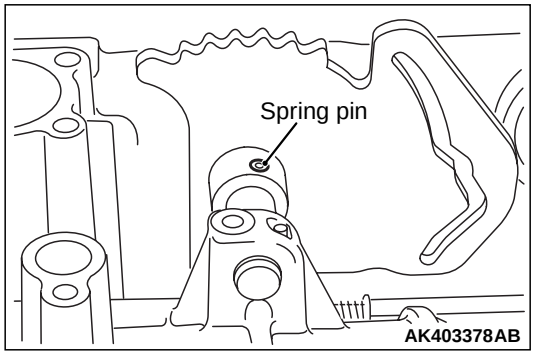
12.Remove the oil strainer and two oil seals.



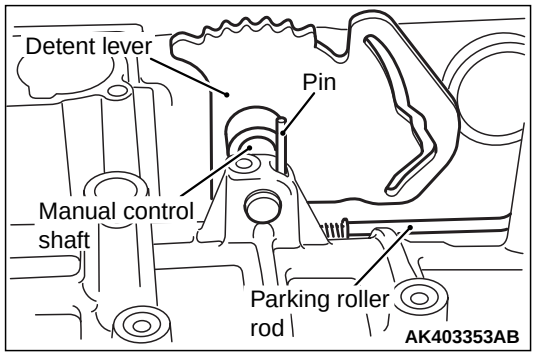
13.Remover each accumulator piston, seal ring and spring.

No.	Name
1	For overdrive clutch
2	For second brake
3	For low/reverse brake
4	For underdrive clutch

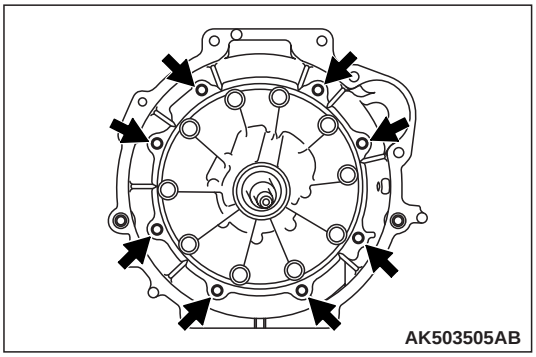
NOTE: To make assembly easier, attach an identification tag on the removed accumulator piston.



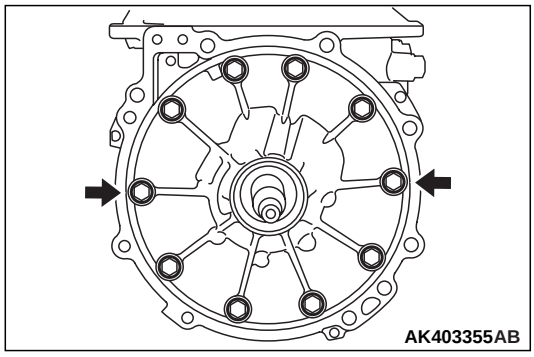
14.Remove the detent lever spring pin.



15.Remove the pin, and then remove the manual control shaft, two O-rings, detent lever and parking roller rod.

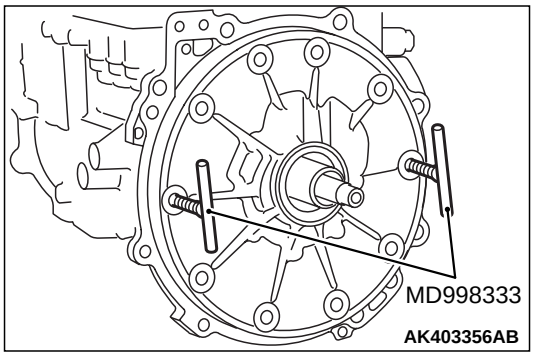


16.Remove the eight converter housing mounting bolts, and then the converter housing.



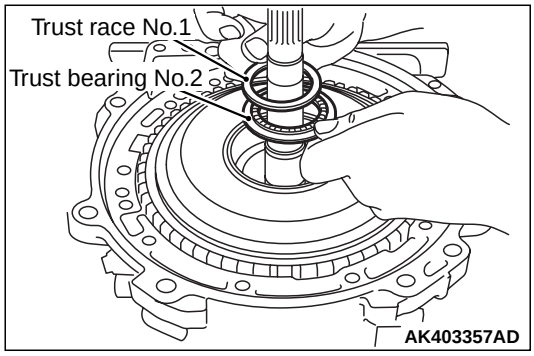
17.Remove the ten oil pump mounting bolts.

18.Install special tool Oil pump remover (MD998333) into the bolt hole shown in the illustration.



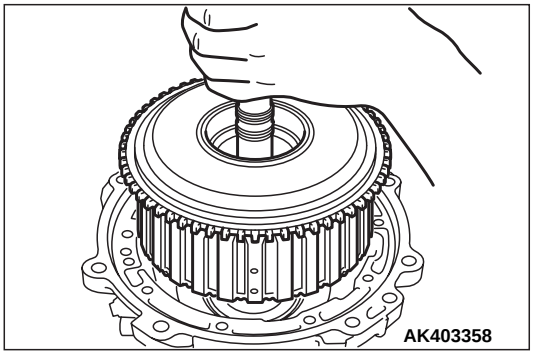
19.While screwing in special tools Oil pump remover (MD998333) evenly, remove the oil pump.

20.Remove the oil pump gasket.

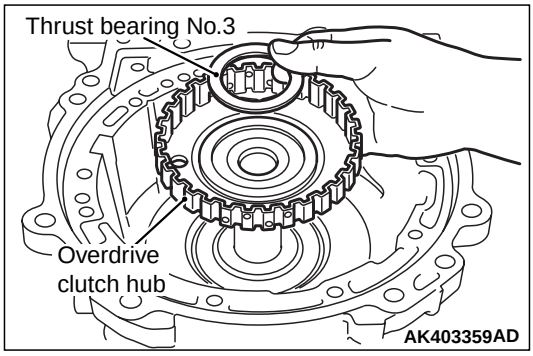


21.Remove the thrust race No.1 and thrust bearing No.2.

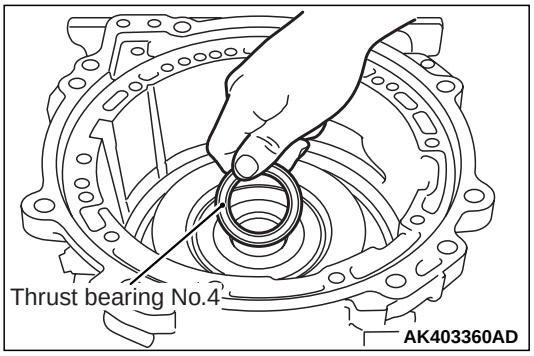
NOTE: The thrust race No.1 may be attached to the oil pump.



22.Remove the reverse overdrive clutch.

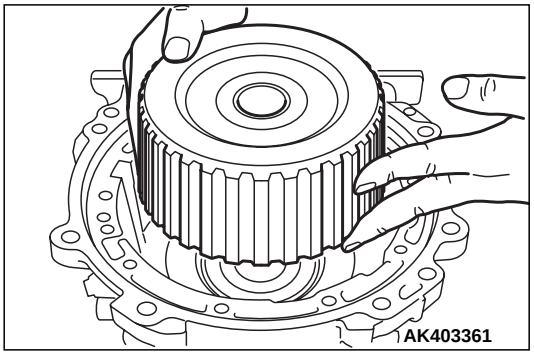


23.Remove the overdrive clutch hub and thrust bearing No.3.

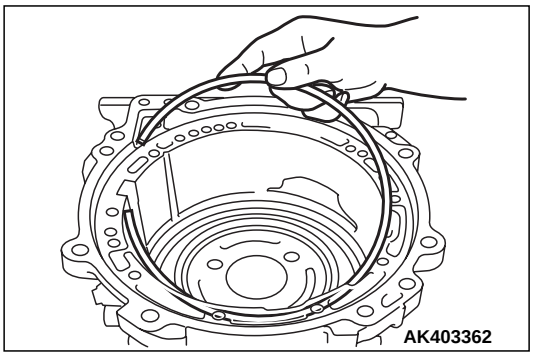


24.Remove the thrust bearing No.4.

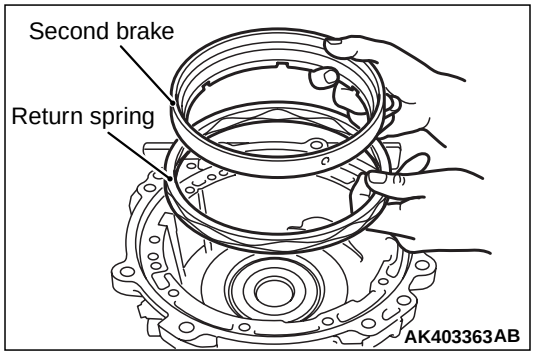
NOTE: The thrust bearing No.4 may be attached to the overdrive clutch hub.



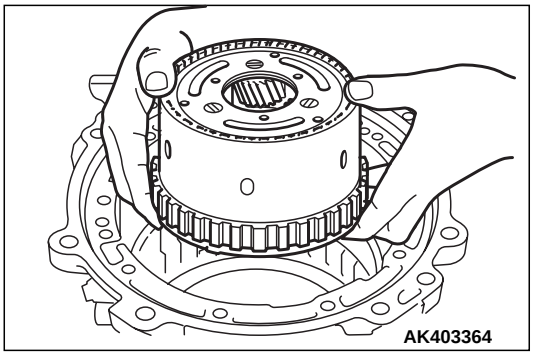
25.Remove the reverse sun gear.



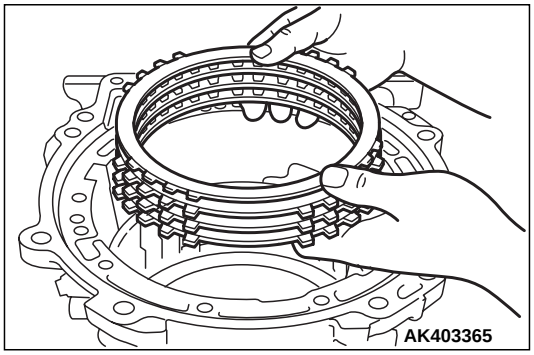
26.Remove the snap ring.



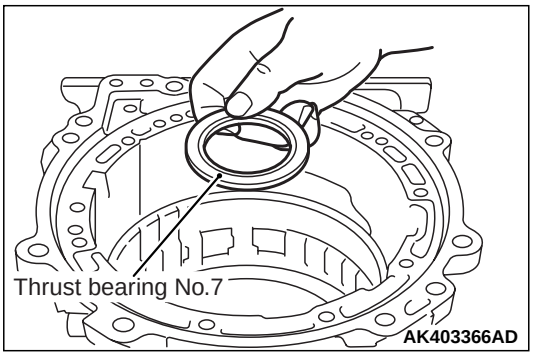
27.Remove the second brake and return spring.



28.Remove the low/reverse annulus gear.

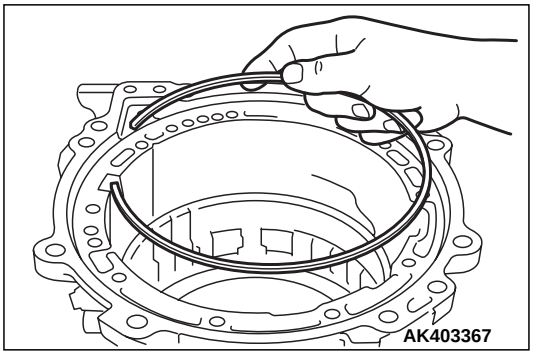


29.Remove the pressure plate, brake plates and brake discs.

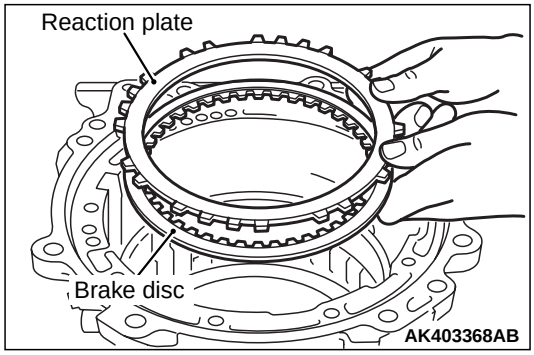


30.Remove the thrust bearing No.7.

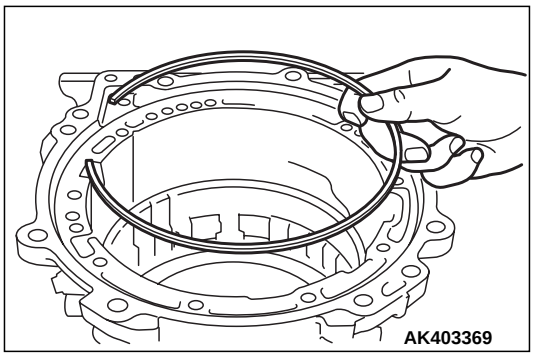
NOTE: The thrust bearing No.7 may be attached to the low/reverse annulus gear.



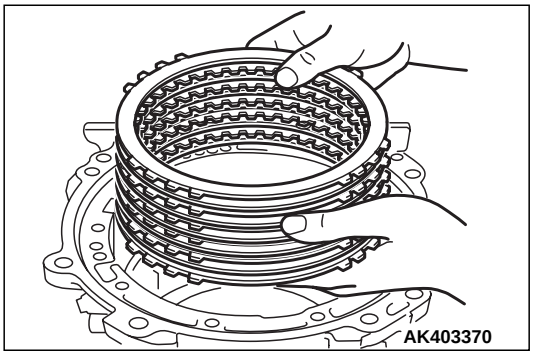
31.Remove the snap ring.



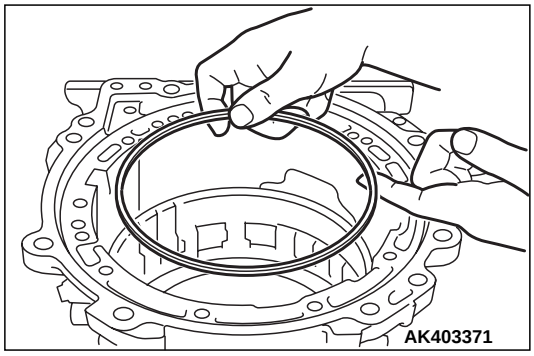
32.Remove the reaction plate and one brake disc.



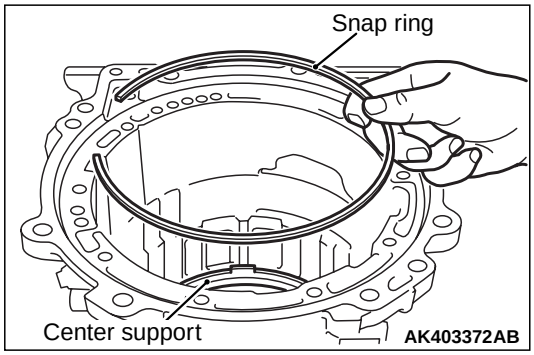
33.Remove the snap ring.



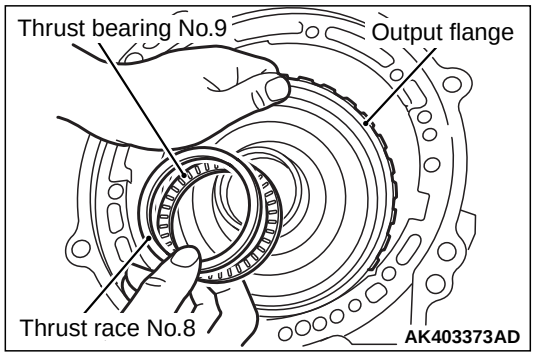
34.Remove the brake plates, brake discs, and pressure plate.



35.Remove the wave spring.

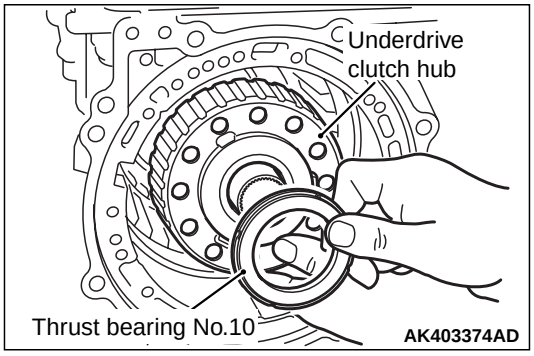


36.Remove the snap ring and center support.

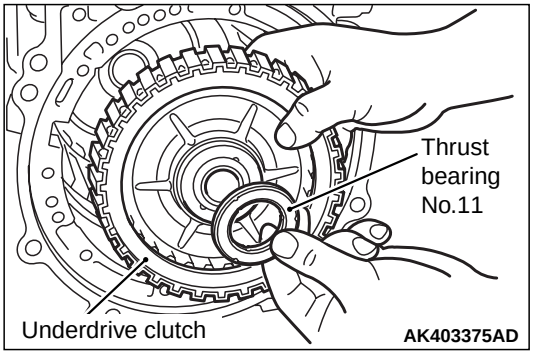


37.Remove the thrust race No.8, thrust bearing No.9 and output flange.

NOTE: The thrust race No.8 may be attached to the center support.

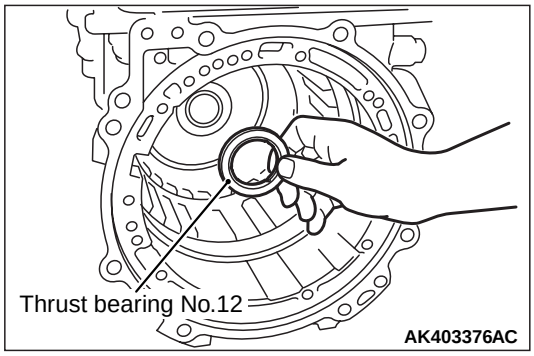


38.Remove the thrust bearing No.10 and underdrive clutch hub.



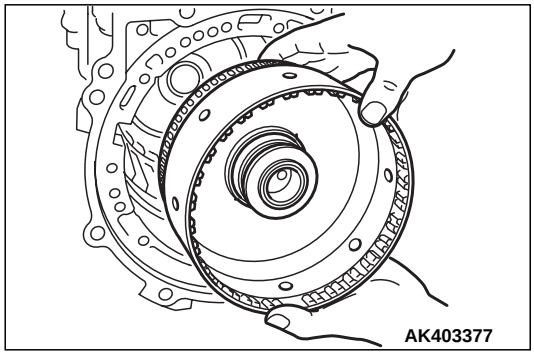
39.Remove the thrust bearing No.11 and underdrive clutch.

NOTE: The thrust bearing No.11 may be attached to the underdrive clutch hub.

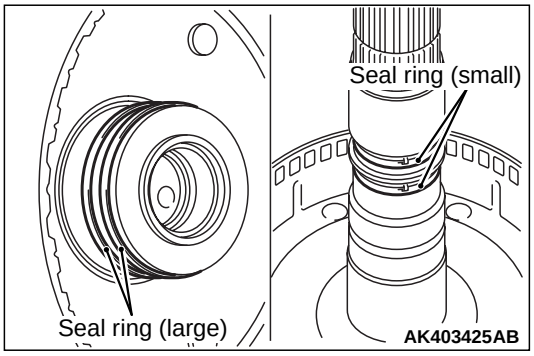


40.Remove the thrust bearing No.12.

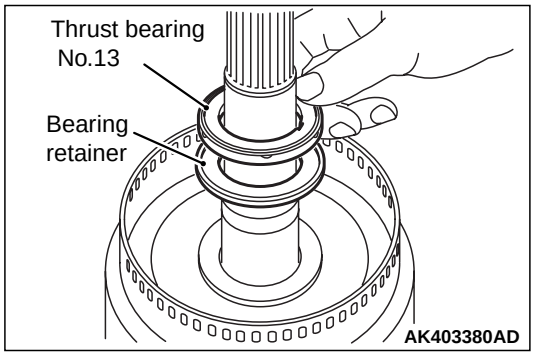
NOTE: The thrust bearing No.12 may be attached to the underdrive clutch.



41.Remove the output shaft.

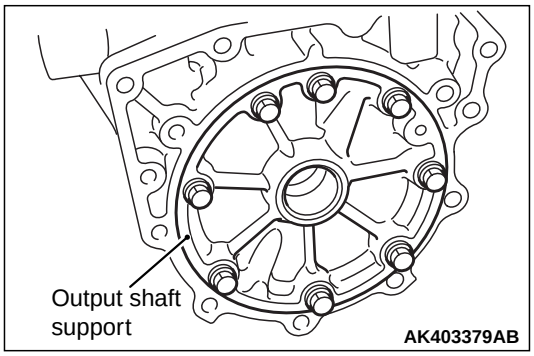


42.Remove the two large and two small seal rings from the output shaft.



43.Remove the thrust bearing No.13 and bearing retainer.

NOTE: The thrust bearing No.13 may be attached to the output shaft support.



44.Remove the eight output shaft support mounting bolts, and then remove the output shaft support and gasket.

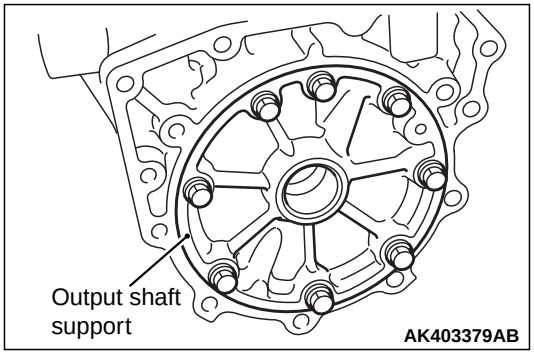
REASSEMBLY

⚠ CAUTION

- **Never reuse any gasket, O-ring, and oil seal. Always replace them with new ones.**
- **Never use any product other than blue petrolatum jelly or white vaseline to lubricate or hold parts during assembly.**
- **Apply ATF to friction elements, rotating parts, and sliding parts before installation.Soak new clutch discs or brake discs in ATF for at least two hours before installing them.**
- **Never apply sealant or adhesive to gaskets.**
- **When a bushing requires replacement, replace the assembly of which the bushing forms a part.**
- **Never use any cloth gloves or any rags during reassembly. Use only nylon cloth or paper towels if necessary.**
- **Change also the ATF in the cooler circuit.**

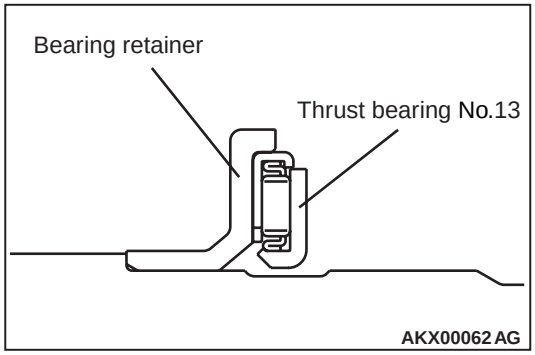
⚠ CAUTION

Never reuse a gasket.

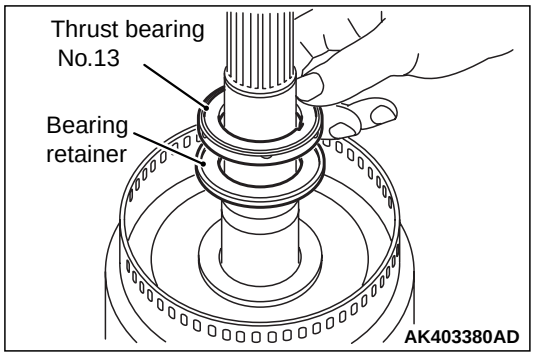


1. Install a new gasket and output shaft support.
2. Tighten the eight output shaft support mounting bolts to the specified torque of 23 ± 3 N·m.

⚠ CAUTION

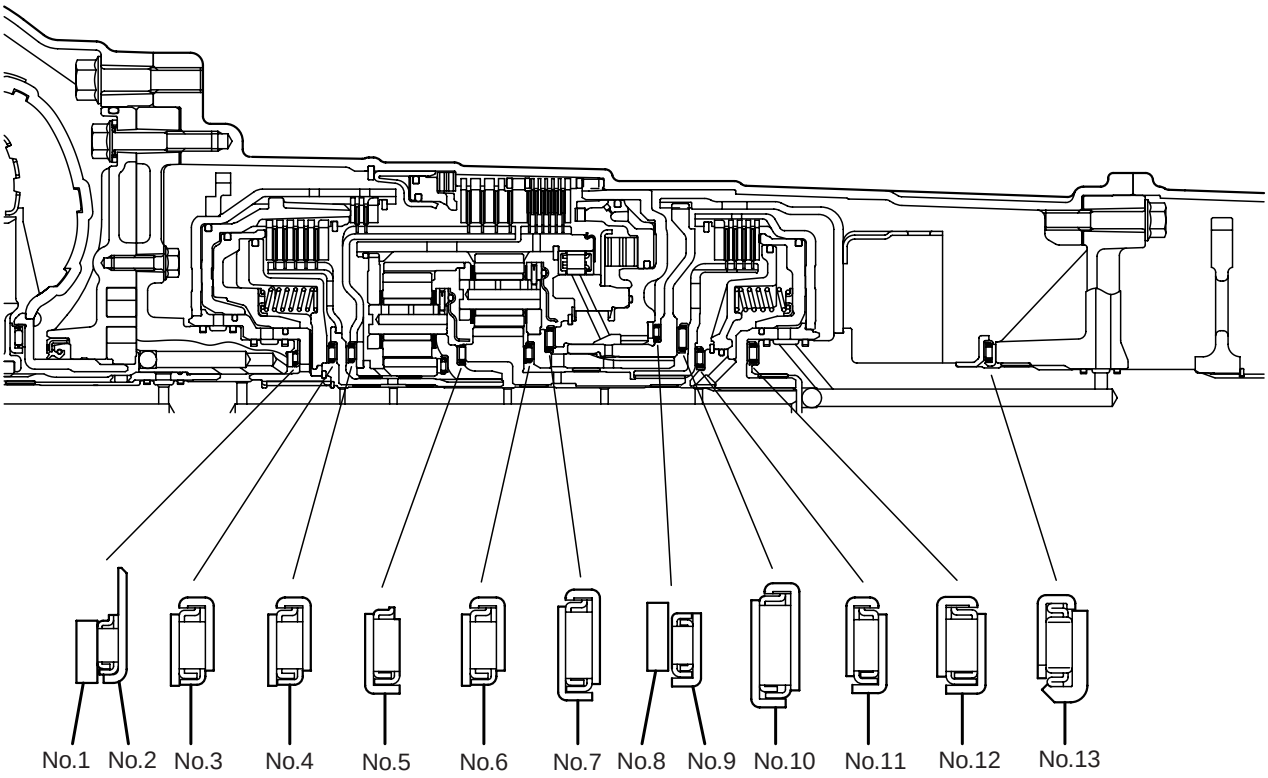


Make sure the thrust bearing is mounted in the correct direction.



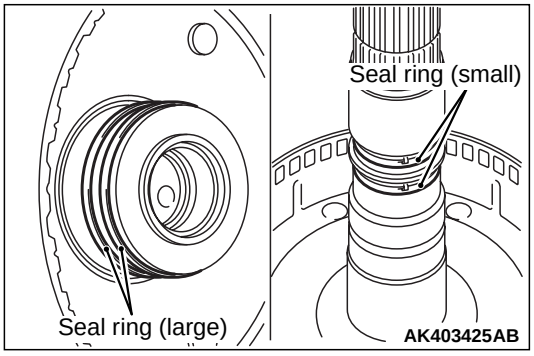
3. Install the bearing retainer and thrust bearing No.13 onto the output shaft.

Identification of thrust bearing and thrust race



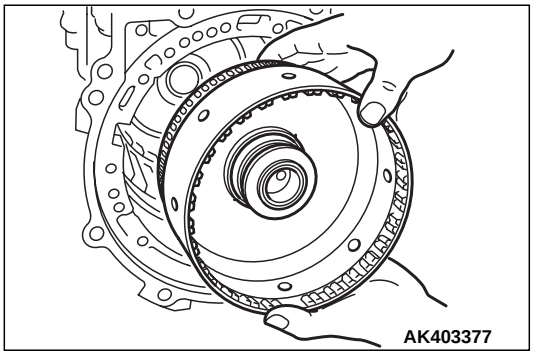
AKX00061AE

Symbol	O.D. mm	I.D. mm	Thickness mm	Symbol	O.D. mm	I.D. mm	Thickness mm
No.1	48.9	37	1.4	No.6	57	38.5	4.12
			1.6	No.7	70	48.8	4.0
			1.8	No.8	73	60	1.6
			2.0				1.8
			2.2				2.0
			2.4				2.2
			2.6	No.9	71.45	57	2.81
No.2	59	37	2.8	No.10	72	48.25	4.6
No.3	57	38.5	4.12	No.11	53	34.7	4.01
No.4	57	38.5	4.12	No.12	57	38.5	4.12
No.5	55.4	38.5	3.31	No.13	58	37.5	4.8



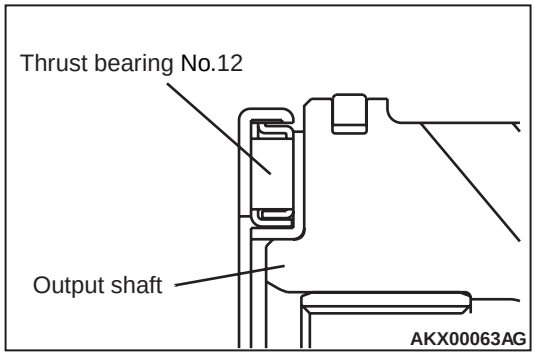
AK403425AB

4. Install new seal rings (two large pieces and two small pieces) onto the output shaft.

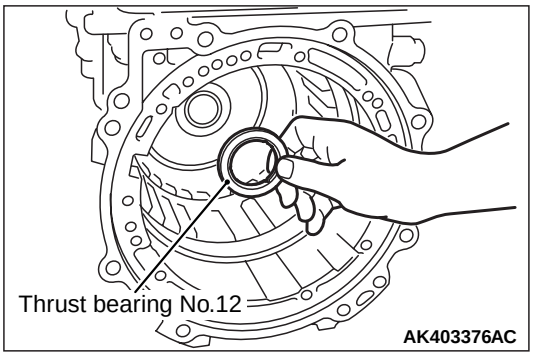


5. Install the output shaft into the output shaft support.

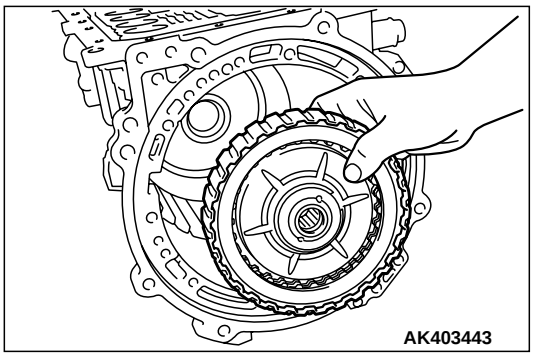
⚠ CAUTION



Make sure thrust bearing No.12 is mounted in the correct direction.

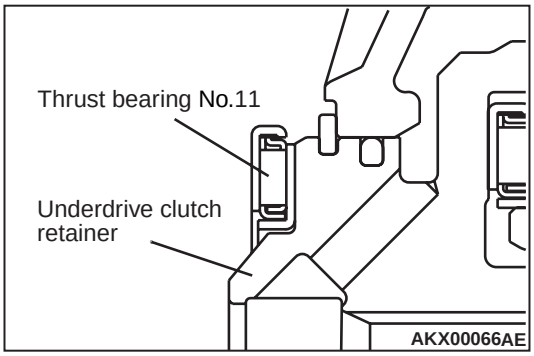


6. Apply vaseline or petroleum jelly on the thrust bearing No.12, and then install on the front end of the output shaft.

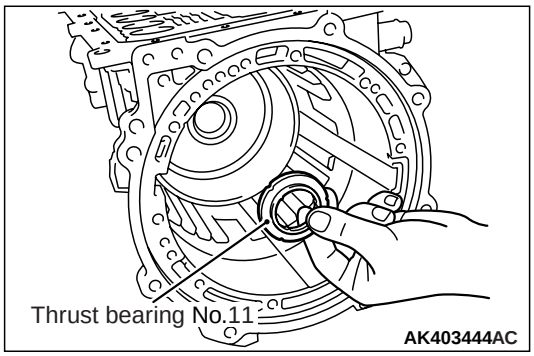


7. Install the underdrive clutch.

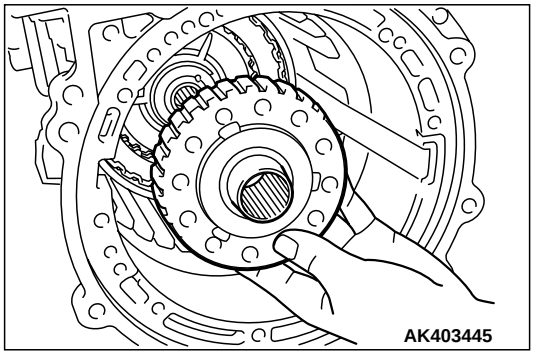
⚠ CAUTION



Make sure thrust bearing No.11 is mounted in the correct direction.

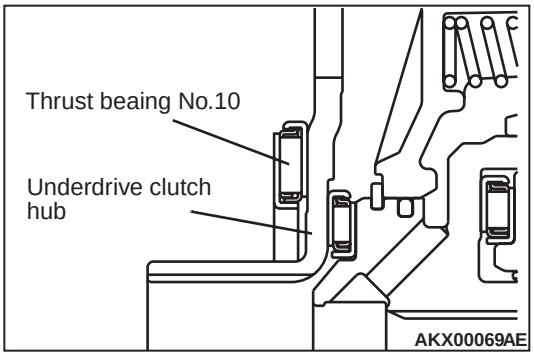


8. Apply vaseline or petroleum jelly on the thrust bearing No.11, and then install on the front end of the underdrive clutch retainer.

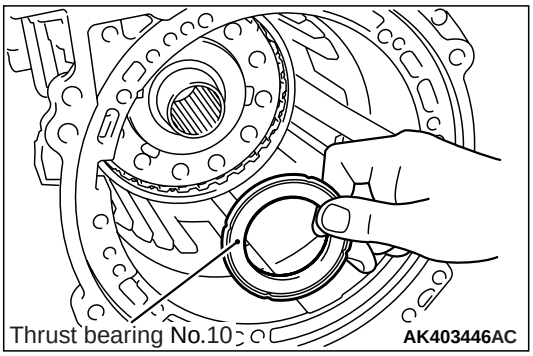


9. Install the underdrive clutch hub.

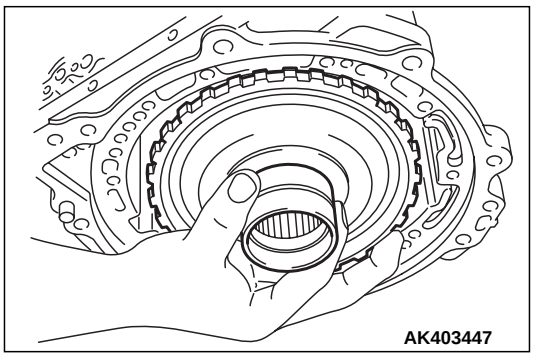
⚠ CAUTION



Make sure thrust bearing No.10 is mounted in the correct direction.

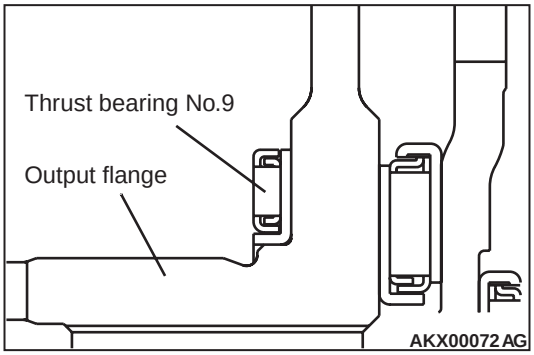


10.Apply vaseline or petroleum jelly on the thrust bearing No.10, and then install it on the underdrive clutch hub.

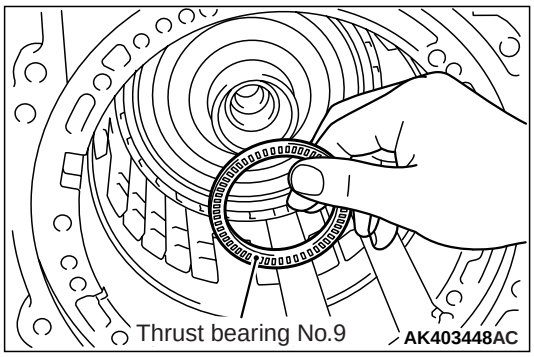


11.Install the output flange.

⚠ CAUTION



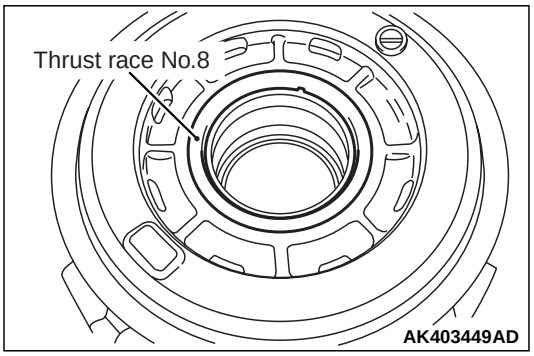
Make sure thrust bearing No.9 is mounted in the correct direction.



12.Apply vaseline or petroleum jelly on the thrust bearing No.9, and then install on the output flange.

⚠ CAUTION

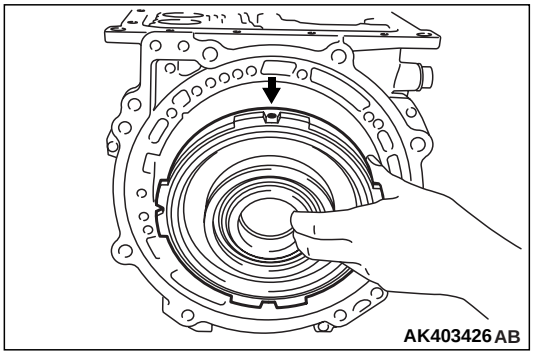
Measure and record the thickness of the thrust race No.8 to be assembled.



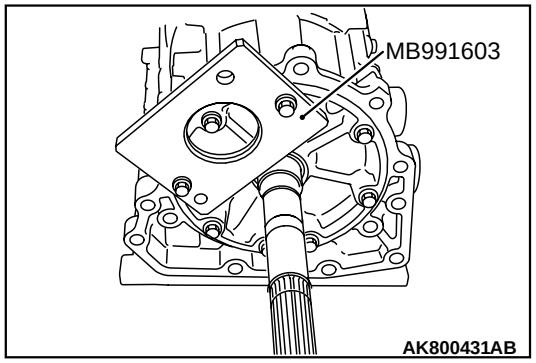
13.Apply vaseline or blue petroleum jelly on the thrust race No.8 being used, and then install it on the rear side of the center support.

⚠ CAUTION

- **Install the center support so that the oil holes shown in the illustration face the lower side of the transmission case.**
- **Make sure that the thrust race No.8 attached to the rear side of the center support does not fall off.**



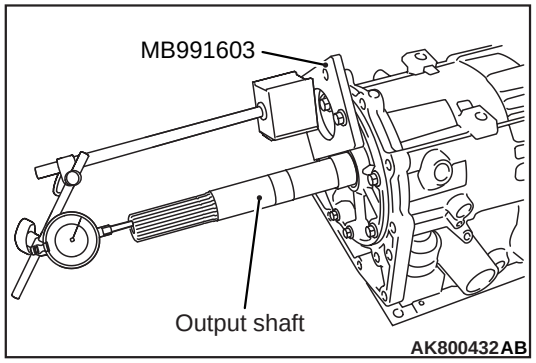
14.Install the center support.



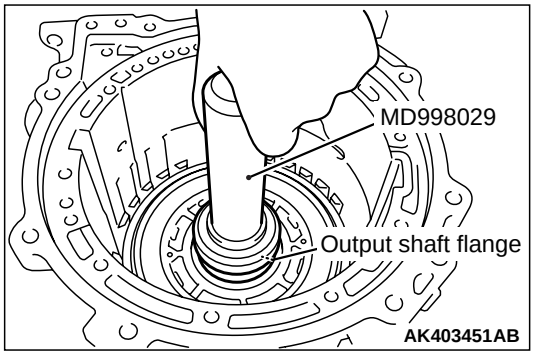
15.Remove the two output shaft support mounting bolts.

16.Using the two removed bolts, install special tool Bearing installer stopper (MB991603) to the specified torque of 23 ± 3 N·m.

17.Select the thrust race No.8 with the following procedure:



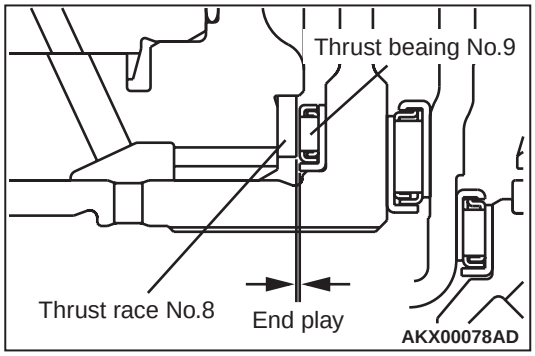
(1) Fix a dial gauge to special tool Bearing installer stopper (MB991603).



(2) Push the output shaft, and the output flange in alternately, and then measure the end play of output shaft.

NOTE:

- *When pushing the output shaft in, take care that the center support does not move.*
- *When pushing the output flange in, use the special tool Oil seal installer (MD998029).*



(3) Reinstall by selecting the thrust race No.8 installed by the procedure (13) so that the end play of output shaft becomes the standard value.

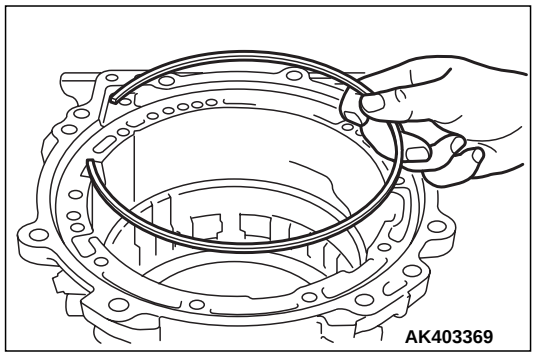
NOTE: Refer to the thickness recorded in step 13.

Standard value: 0.25 – 0.71 mm
(For output shaft end play)

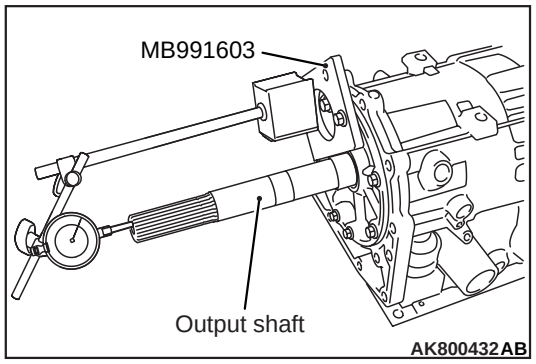
(4) Measure the end play again, and confirm that it is within the standard value.

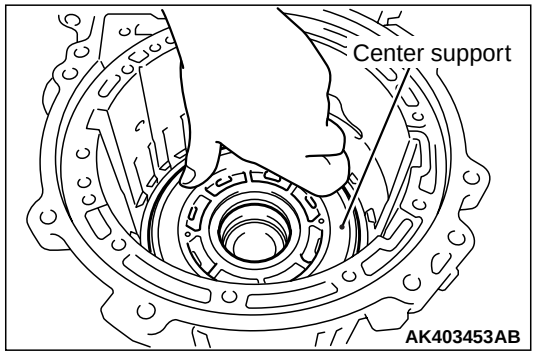
NOTE: Carry this step out with special tool Bearing installer stopper (MB991603) and dial gauge installed.

18.Using the following steps, select the snap ring for fixing the center support.



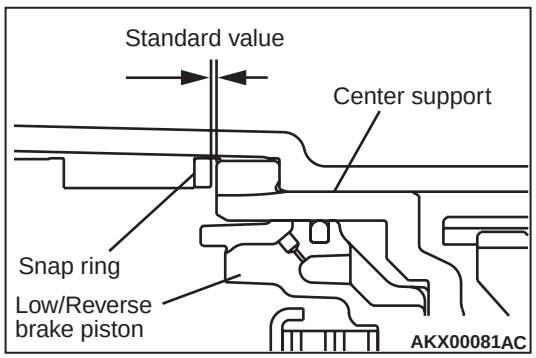
(1) Install the snap ring used for fixing the center support used.





(2) After pushing the output shaft, and the center support in alternately, and then measure the end play of center support.

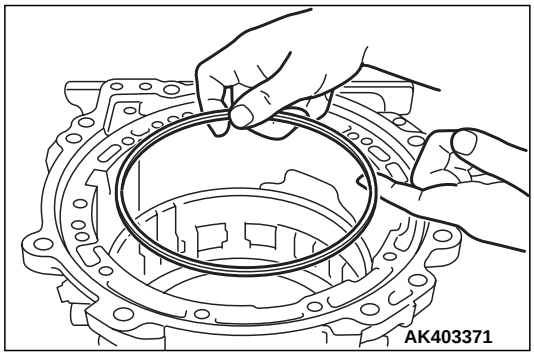
NOTE: When pushing the output shaft in, be sure to push them in to the point where the center support touches the snap ring.



(3) Select the snap ring for fixing the center support installed in step 18 (1) so that the end play of the center support is at the standard value. Then, reassemble.

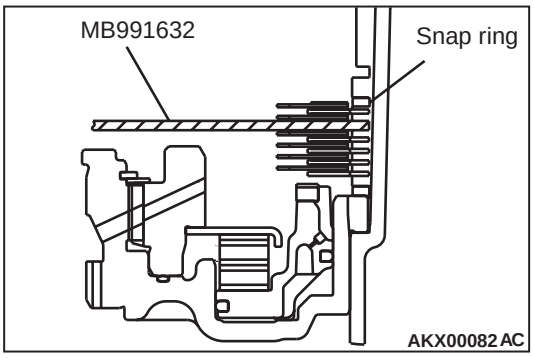
Standard value: 0 – 0.16 mm
(For center support end play)

(4) Measure the end play again, and confirm that it is within the standard value.



19. Using the following steps, select the snap ring for adjusting the brake reaction plate end play and second brake end play, and the pressure plate for adjusting the low/reverse brake end play.

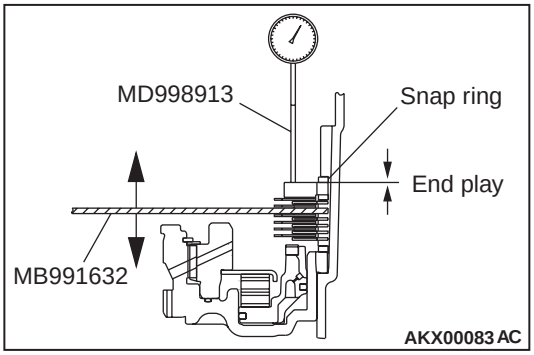
(1) Install the wave spring onto the low/reverse brake piston.



(2) Install special tool Clearance dummy plate (MB991632) onto the position shown in the illustration instead of the pressure plate for the low/reverse brake. Install the six brake disc, five brake plate and snap ring.

⚠ CAUTION

Pay close attention to the assembly direction of the reaction plate.



(3) Install the reaction plate and snap ring that was used.

(4) Install a dial gauge onto special tool Dial gauge extension (MD998913) so that the end contacts the brake reaction plate. Measure the end play by moving special tool Clearance dummy plate (MB991632).

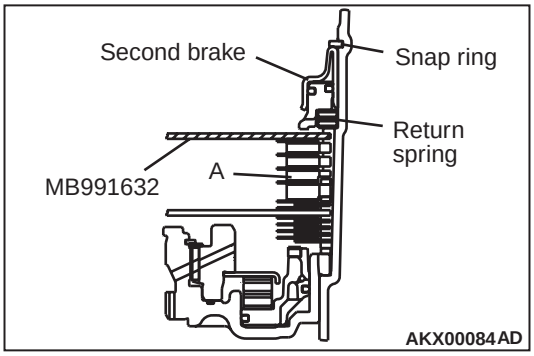
(5) Select the snap ring installed in step 19 (3) so that the end play is within the standard value. Then, reassemble.

Standard value: 0 – 0.16 mm
(For brake reaction plate end play)

(6) Measure the end play again, and confirm that it is within the standard value.

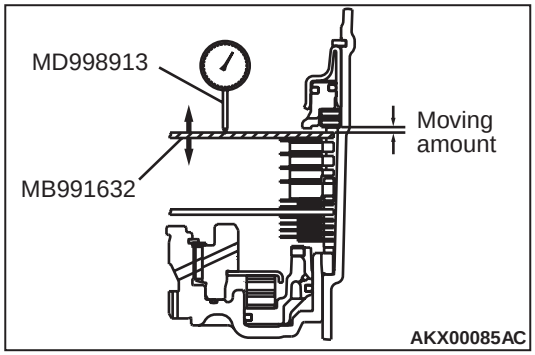
⚠ CAUTION

Pay close attention to the shape and assembly direction of the brake plate A installation.



(7) Next, install special tool Clearance dummy plate (MB991632) instead of the pressure plate for the second brake. Install the four brake discs and three brake plates.

(8) Install the return spring, second brake and snap ring.



(9) Install a dial gauge onto special tool Dial gauge extension (MD998913) so the end contacts the special tool. Move special tool Clearance dummy plate (MB991632) and measure the moving amount. Select a pressure plate with a thickness that corresponds to the measured moving amount from the following table.

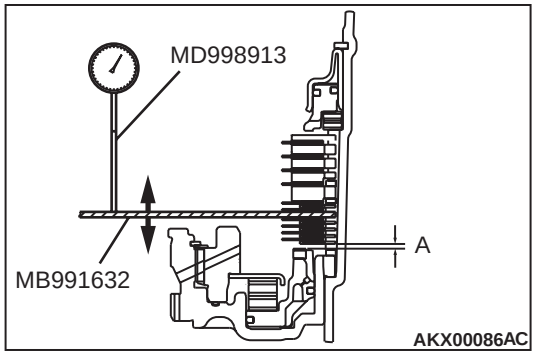
Standard value (reference): 1.49 – 1.95 mm
(For second brake end play)

Moving amount mm	Pressure plate	
	Thickness mm	identification symbol
1.2 or more – less than 1.4	1.6	F
1.4 or more – less than 1.6	1.8	E
1.6 or more – less than 1.8	2.0	D
1.8 or more – less than 2.0	2.2	C
2.0 or more – less than 2.2	2.4	B

Moving amount mm	Pressure plate	
	Thickness mm	identification symbol
2.2 or more – less than 2.4	2.6	A
2.4 or more – less than 2.6	2.8	0
2.6 or more – less than 2.8	3.0	1

(10) Remove the snap ring, second brake, return spring and special tool Clearance dummy plate (MB991632) installed in step (8).

(11)Install the pressure plate selected in step (9), and install the return spring, second brake and snap ring again.



PRESSURE PLATE FOR LOW/REVERSE BRAKE

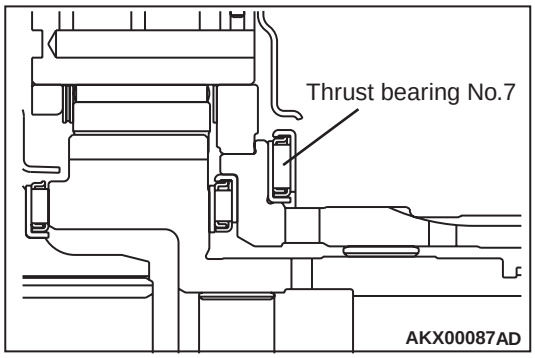
MOVING AMOUNT mm	Pressure plate	
	Thickness mm	Identification symbol
1.3 or more – less than 1.5	1.6	F
1.5 or more – less than 1.7	1.8	E
1.7 or more – less than 1.9	2.0	D
1.9 or more – less than 2.1	2.2	C
2.1 or more – less than 2.3	2.4	B
2.3 or more – less than 2.5	2.6	A
2.5 or more – less than 2.7	2.8	0
2.7 or more – less than 2.9	3.0	1

(13)Remove the parts installed in steps 19 (1) to (12).

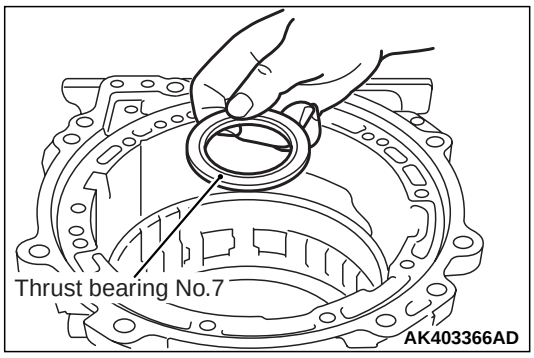
(12)Install a dial gauge onto special tool Dial gauge extension (MD998913) so the end contacts the special tool. Move special tool Clearance dummy plate (MB991632) and measure the moving amount. Select a pressure plate with a thickness that corresponds to the measured moving amount from the following table.

Standard value (reference): 1.65 – 2.11 mm (For low/reverse brake end play)

⚠ CAUTION

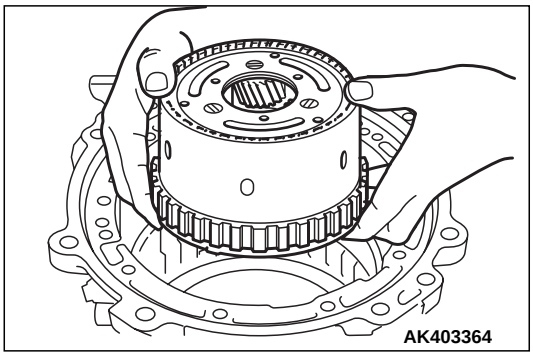


Make sure thrust bearing No.7 is mounted in the correct direction.

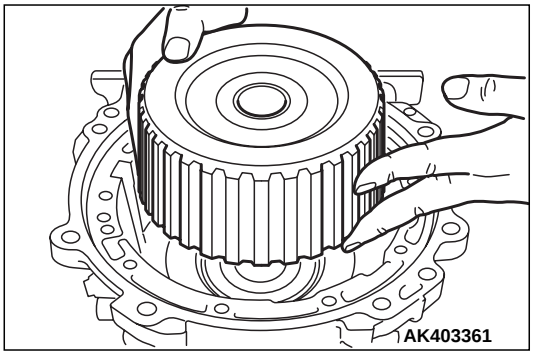


20.Apply vaseline or petroleum jelly on the thrust bearing No.7, and then install on the rear side of the low/reverse annulus gear.

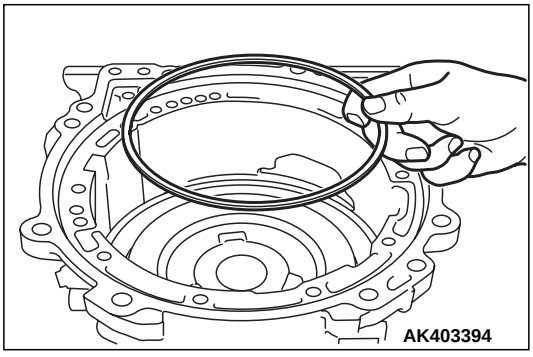
⚠ CAUTION
Make sure that thrust bearing No.7 attached to the rear side of the low/reverse annulus gear does not fall off.


AK403364

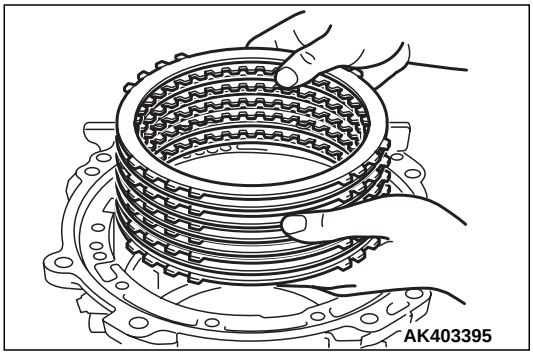
21.Install the low/reverse annulus gear.


AK403361

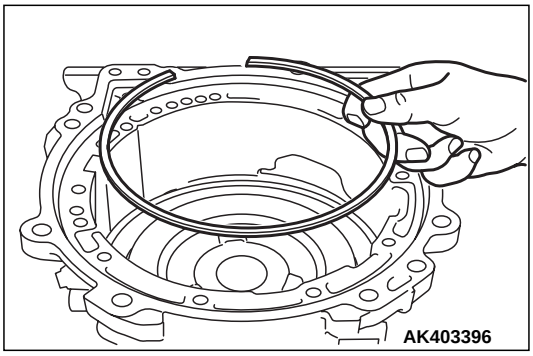
22.Install the reverse sun gear.


AK403394

23.Install the wave spring to the low/reverse brake piston.

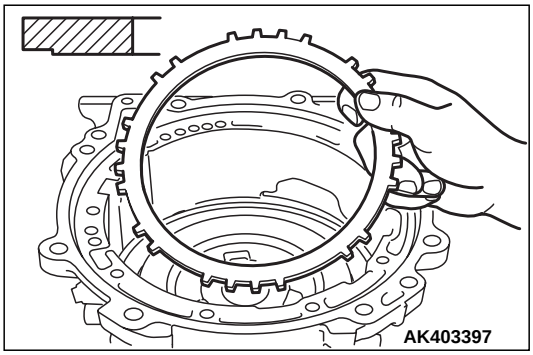

AK403395

24.Install the pressure plate, six brake disc and five brake plate selected in step 19 (12).

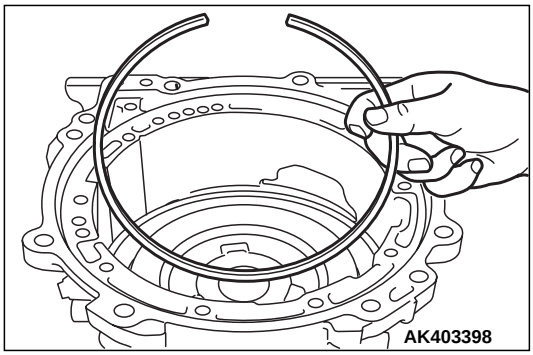

AK403396

25.Install the snap ring.

⚠ CAUTION
Make sure the reaction plate in the proper direction.


AK403397

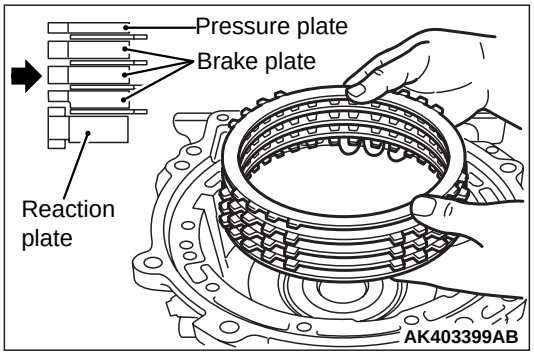
26.Install the reaction plate.


AK403398

27.Install the snap ring selected in step 19 (5).

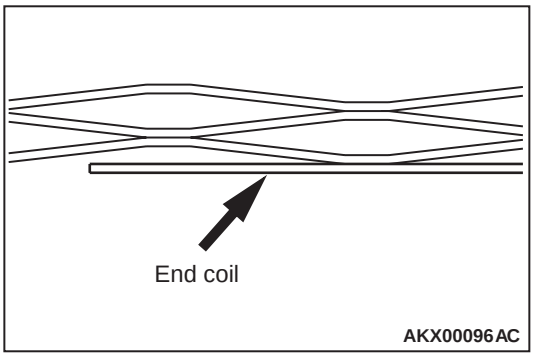
⚠ CAUTION

Make sure the brake plate (reaction plate side) is installed in the proper direction.

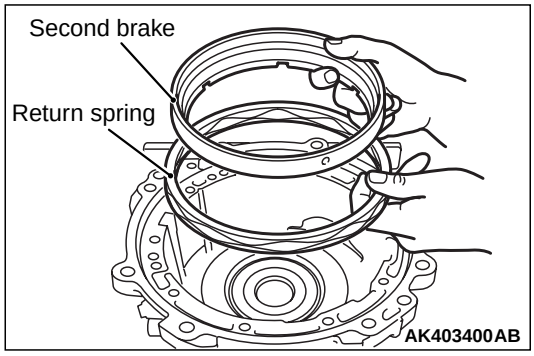


28.Install the brake disc, brake plate and pressure plate selected in step 19 (9).

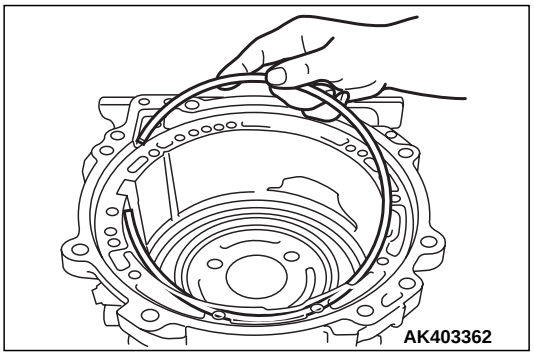
⚠ CAUTION



Install the return spring end coil side so that it faces the back of the transmission. (Only for one side end coil type)

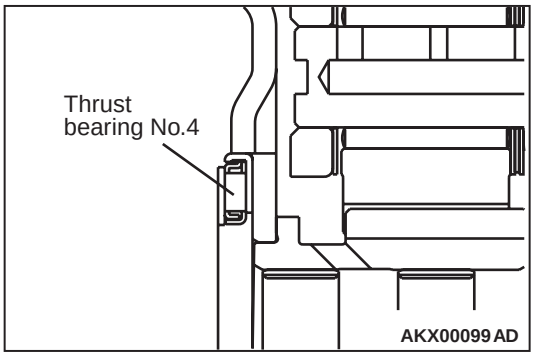


29.Install the return spring and second brake.

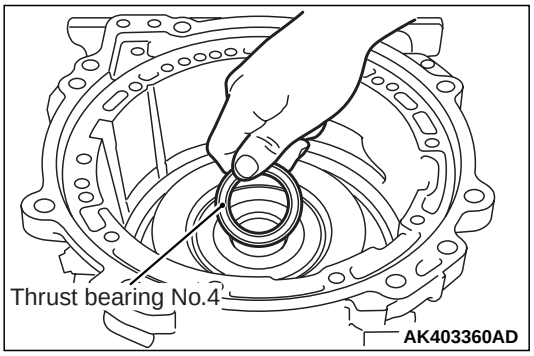


30.Install the snap ring.

⚠ CAUTION

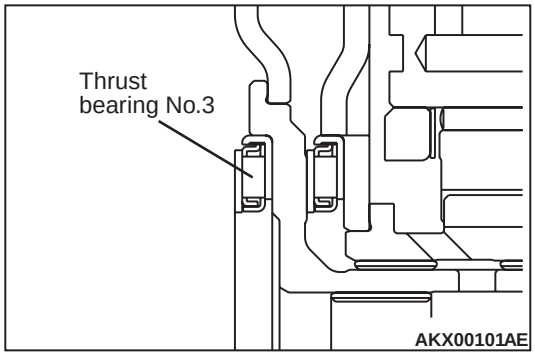


Make sure thrust bearing No.4 is installed in the proper direction.

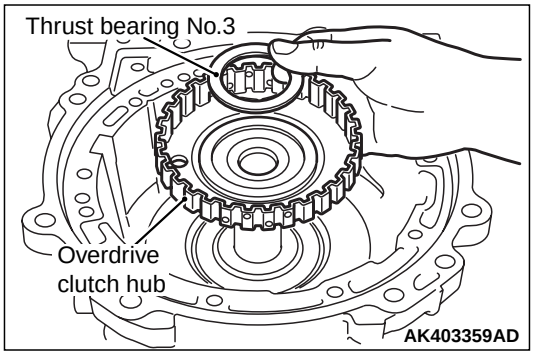


31.Apply vaseline or petroleum jelly on the thrust bearing No.4, and then install on the reverse sun gear.

⚠ CAUTION



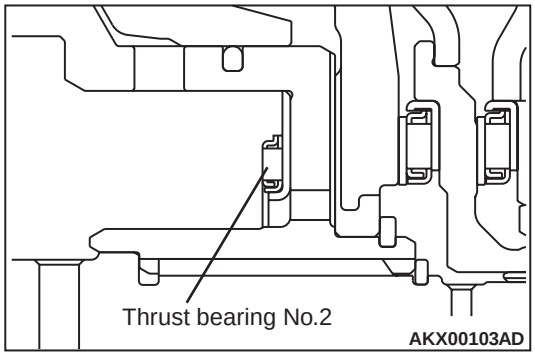
Make sure thrust bearing No.3 is mounted in the correct direction.



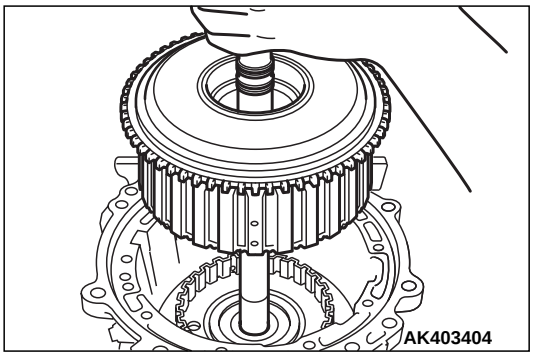
32.Apply vaseline or petroleum jelly on the thrust bearing No.3, and then install on the overdrive clutch hub.

33.Install the overdrive clutch hub.

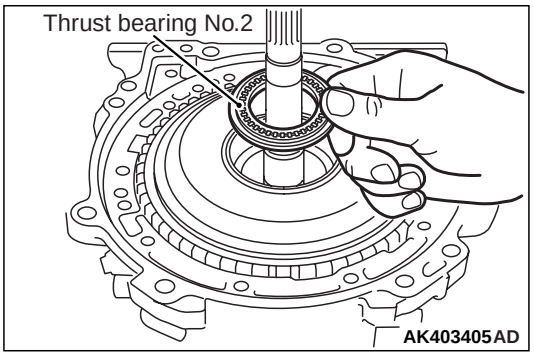
⚠ CAUTION



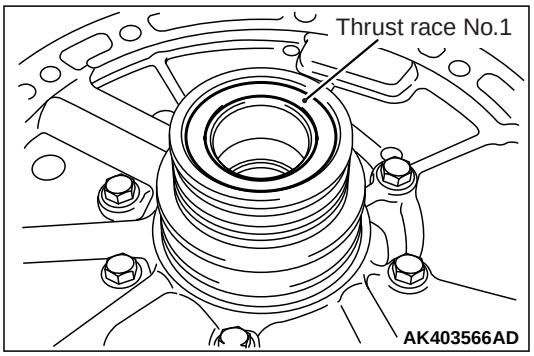
Make sure thrust bearing No.2 is mounted in the correct direction.



34.Install the reverse and overdrive clutch.

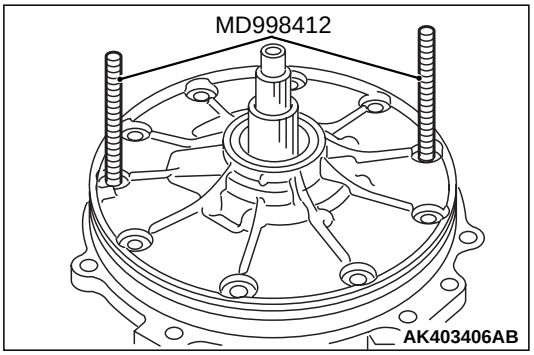


35.Apply vaseline or petroleum jelly on the thrust bearing No.2, and then install on the reverse and overdrive clutch.



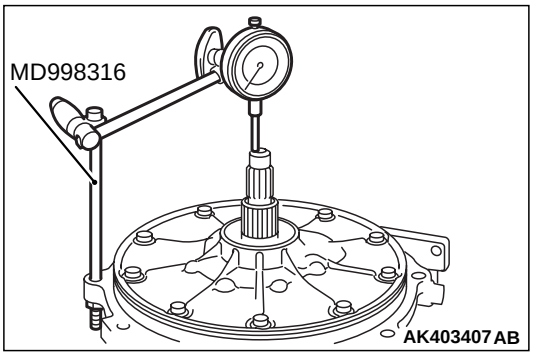
36.Apply vaseline or petroleum jelly on the thrust race No.1 being used, and then install on the oil pump.

⚠ CAUTION
Never reuse a gasket.



37.Install special tools Guide (MD998412) at the position shown in the illustration, and using this as a guide, install the oil pump and gasket.

38.Tighten the ten oil pump mounting bolts to the specified torque of 23 ± 3 N·m.

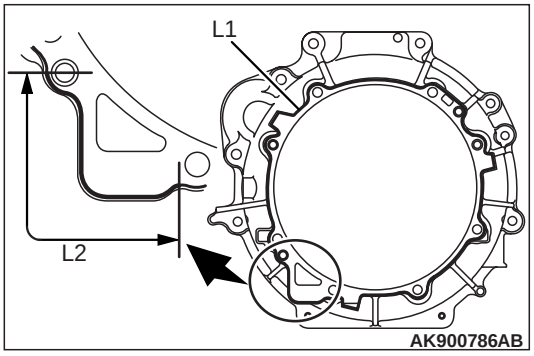


39.Use the special tool Dial gauge support (MD998316), set a dial gauge as shown in the illustration. Measure the end play of the input shaft, and select the thrust race installed in step 36 so that the end play is at the standard value. Then, reassemble.

Standard value: 0.25 – 0.81 mm
(For input shaft end play)

40.Measure the end play again, and confirm that it is within the standard value.

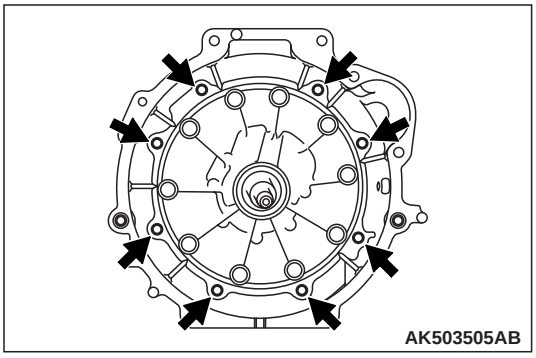
⚠ CAUTION
- **Completely degrease the FIPG-applied surface so that water and oil including the old sealant cannot adhere to the surface coated with the sealant. Never touch the degreased surface by hand.**
- **Evenly squeeze out the sealant so that it is not insufficient or excessive.**



41.Apply the sealant on the converter housing mounting surface of the transmission case in the following way.

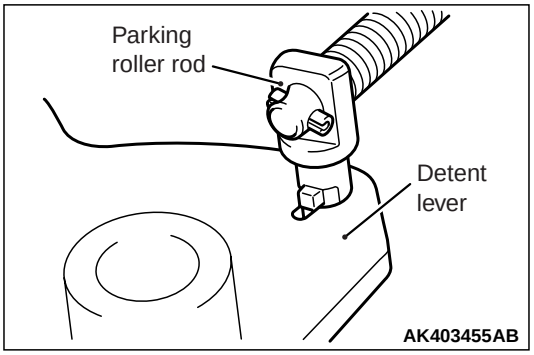
Specified sealant:
Mitsubishi Part No.MZ100389 or equivalent

L1	ϕ1.6 mm
L2	ϕ2.6 mm

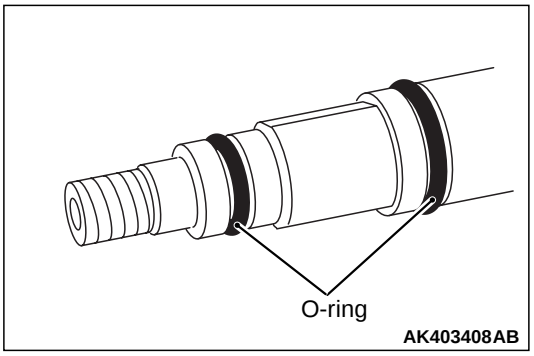


42.Install the converter housing.

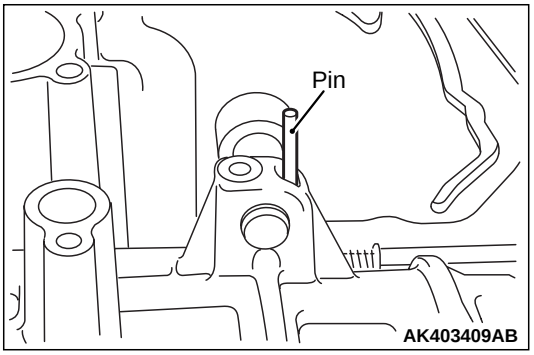
43.Tighten the eight converter housing mounting bolts to the specified torque of 48 ± 6 N·m.



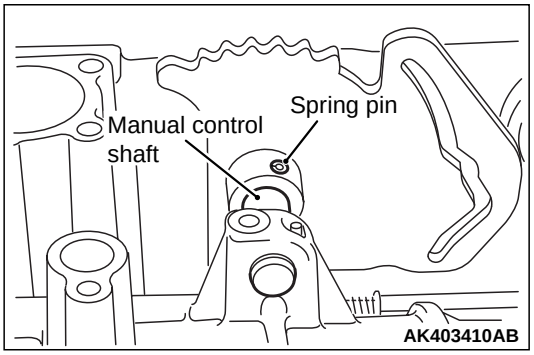
44.Install the parking roller rod to the detent lever.



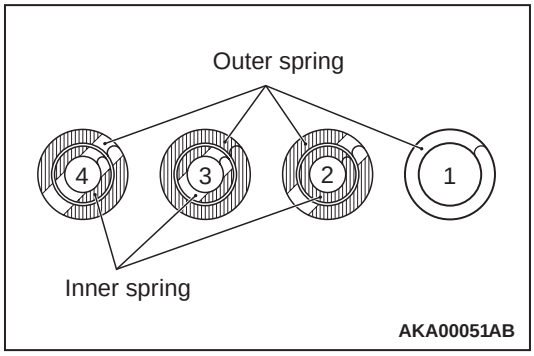
45.Install two new O-rings to the manual control shaft, and assemble onto the transmission case together with the detent lever and parking roller rod.

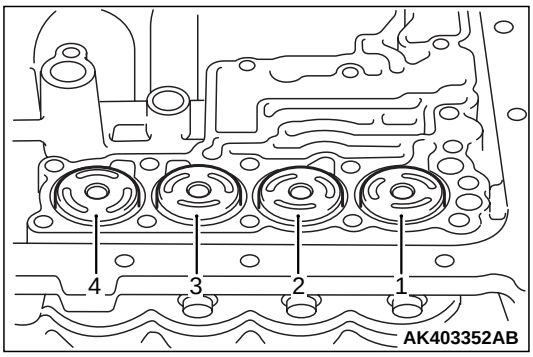


46.Install the pin.



47.Hammer in so that the slit section of the spring valve is perpendicular to the axial direction of the manual control shaft.





48.Install a new seal ring onto each accumulator piston.

49.Install each accumulator piston and spring.

NOTE:

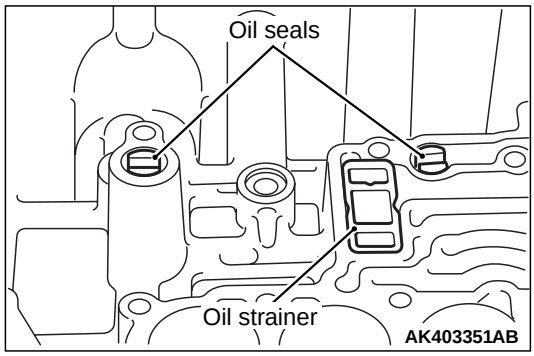
- *Identification colors are applied on the spring as shown below. Assemble following this table.*
- *Install the accumulator pistons to the original positions following the identification tags attached when removed.*

No.	Name	Identification paint application position	
1	For overdrive clutch	None	
2	For second brake	Inner	Applied on all surfaces including both ends
		Outer	Applied on half of surface including both ends

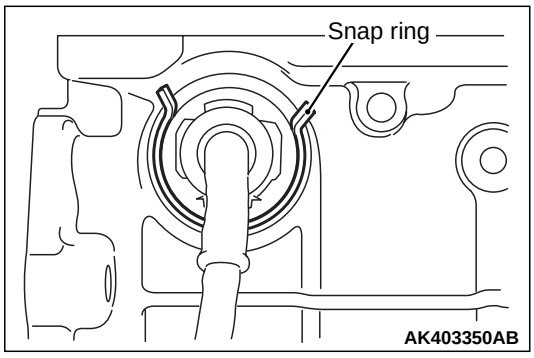
No.	Name	Identification paint application position	
3	For low/ reverse brake	Inner	Applied on half of surface including both ends
		Outer	Applied on entire surface of one side
4	For underdrive clutch	Inner	Applied on half of surface including both ends
		Outer	Applied on half of surface including both ends

⚠ CAUTION

Pay close attention to the installation direction of the oil seal.

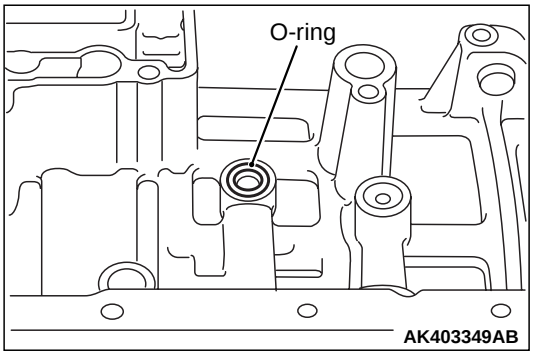


50.Install the oil strainer and two new oil seals. Install the oil seals so that the notched section is oriented as shown in the illustration.

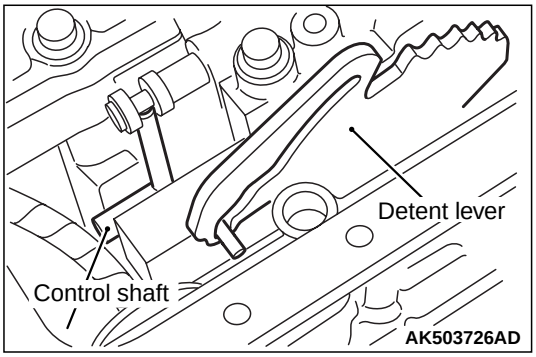


51.Install the solenoid valve harness, and then secure the snap ring into connector groove.

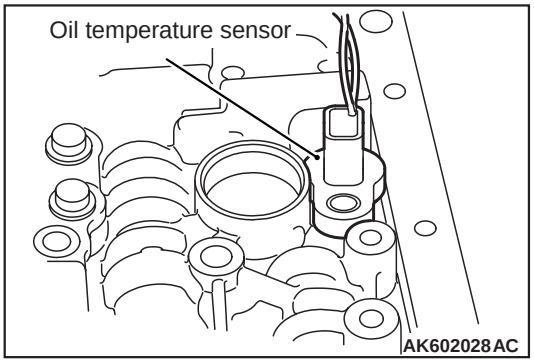
NOTE: Install the harness so that it is oriented as shown in the illustration.



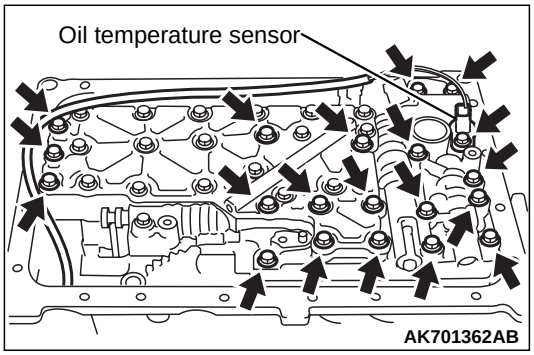
52.Install the new O-ring into the transmission case at the position shown in the illustration.



53.Install the valve body while inserting the manual valve pin into the detent lever groove.

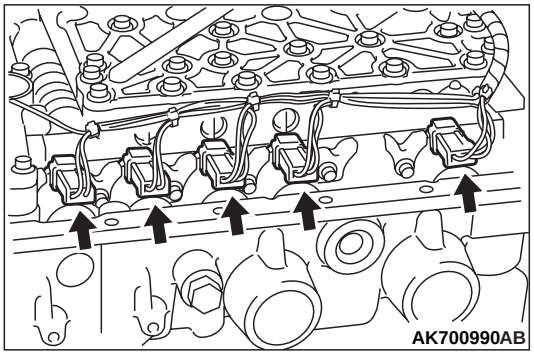


54.Install the oil temperature sensor.

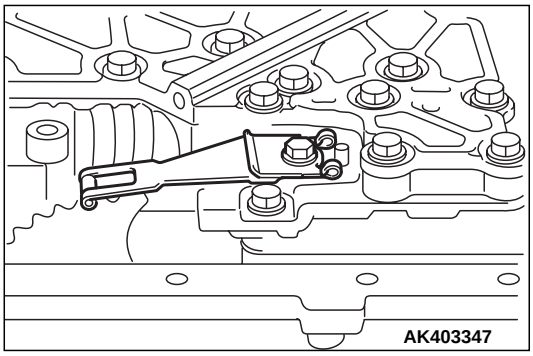


55.Tighten the twenty valve body mounting bolts to the specified torque of 11 ± 1 N·m.

Bolt	Length mm
A	25
B	30
C	40
D	45
E	55

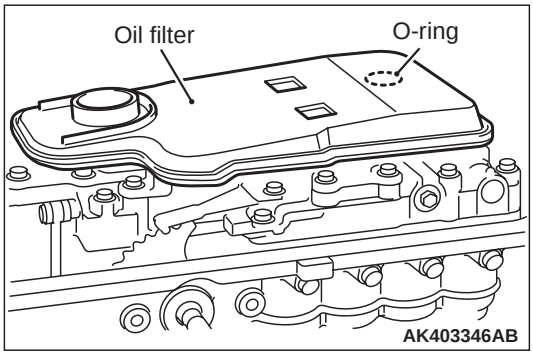

AK700990AB

56.Connect the connector to the valve body.


AK403347

57.Install the detent spring.

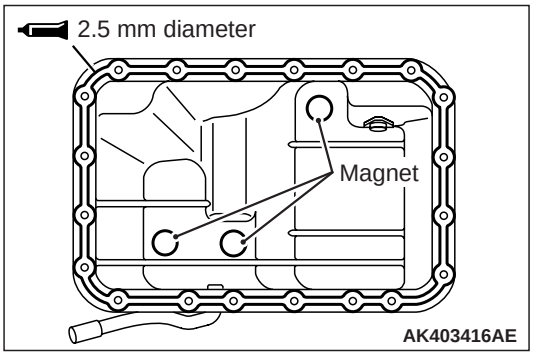
58.Tighten the detent spring mounting bolt to the specified torque of 6.0 ± 1.0 N·m.



AK403346AB

59.Install the oil filter and a new O-ring.

60.Tighten the oil filter mounting bolts to the specified torque of 6.0 ± 1.0 N·m.



AK403416AE

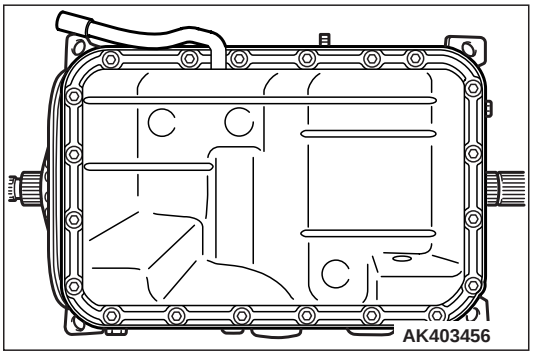
61.Install the magnet.

⚠ CAUTION

- **Completely degrease the FIPG-applied surface so that water and oil including the old sealant cannot adhere to the surface coated with the sealant. Never touch the degreased surface by hand.**
- **Make sure the starting point and the ending point are about the middle between the bolts.**

62.Apply the sealant or equivalent on the oil pan.

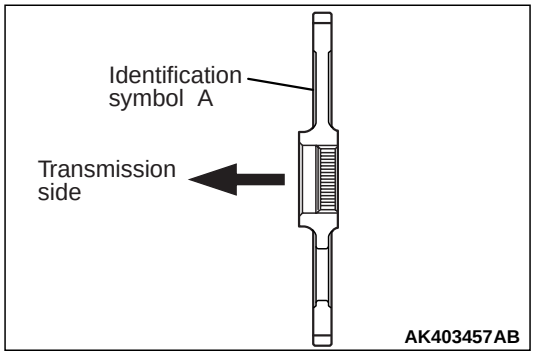
Specified sealant:
Mitsubishi Part No.MZ100389 or equivalent


AK403456

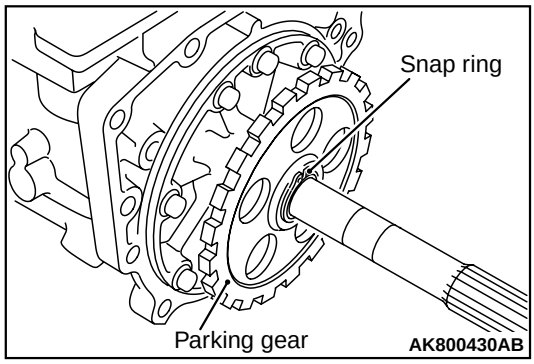
63.Install the oil pan.

64.Tighten the oil pan mounting bolts to the specified torque of 11 ± 1 N·m.

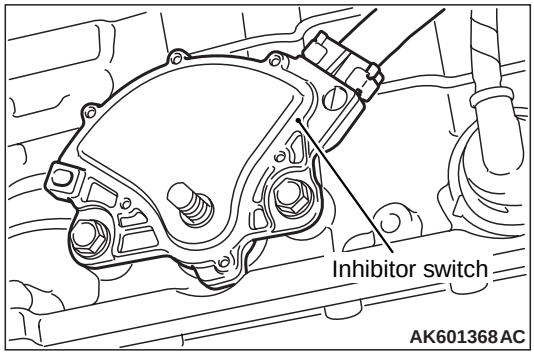
⚠ CAUTION



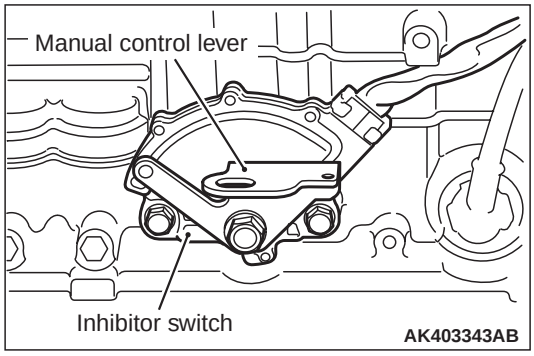
- **Install the parking gear so that the side without the spline cut faces the transmission side.**
- **Heat the parking gear to 160 – 180 °C and shrink fit up to the stepped section of the output shaft. Do not heat for longer than necessary at this time.**



65.Install the parking gear and snap ring.

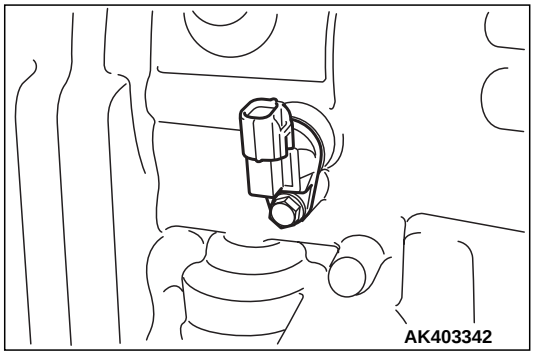


66.Install the inhibitor switch, and fix the fastening bolts temporarily.



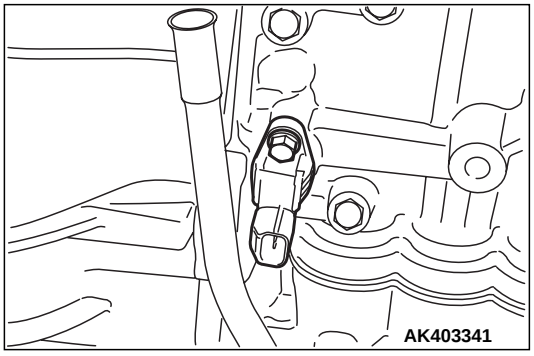
67.Install the manual control lever.

68.Tighten the manual control lever mounting bolts to the specified torque 21.5 ± 3.5 N·m.



69.Install the output shaft speed sensor.

70.Tighten the output shaft speed sensor mounting bolt to the specified torque 11 ± 1 N·m.

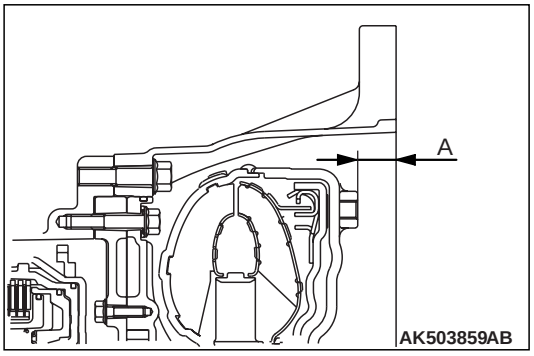


71.Install the input shaft speed sensor.

72.Tighten the input shaft speed sensor mounting bolt to the specified torque 11 ± 1 N·m.

⚠ CAUTION

Apply ATF to the oil pump drive hub before installing the torque converter. Be careful not to damage the oil seal lip when installing the torque converter.



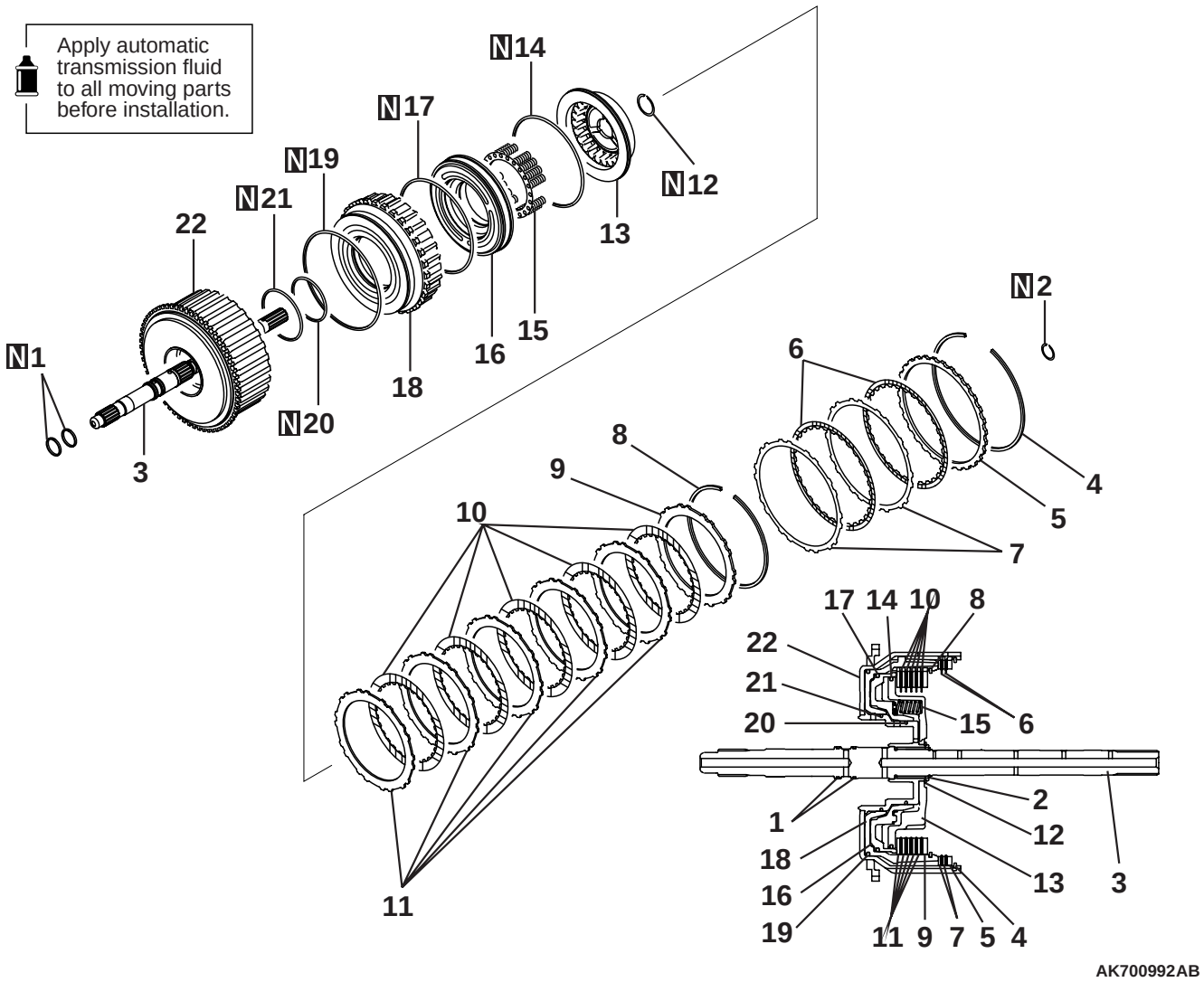
73.Install the torque converter, and secure it so that the dimension (A) indicated in the illustration meets the reference value.

Reference value: 20.9 mm

REVERSE AND OVERDRIVE CLUTCH

DISASSEMBLY AND REASSEMBLY

M1233021200483



AK700992AB

Disassembly steps

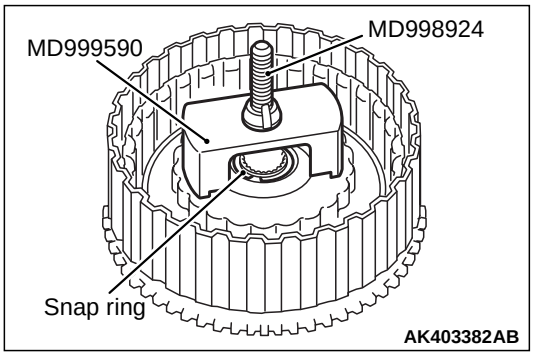
	1.	Seal ring
	2.	Snap ring
	3.	Input shaft
>>H<<	4.	Snap ring
>>G<<	5.	Reaction plate
>>G<<	6.	Clutch disc
>>G<<	7.	Clutch plate
>>F<<	8.	Snap ring
>>E<<	9.	Reaction plate
>>E<<	10.	Clutch disc
>>E<<	11.	Clutch plate

Disassembly steps (Continued)

<<A>>	>>D<<	12. Snap ring
		13. Spring retainer
	>>A<<	14. D-ring
	>>C<<	15. Return spring
		16. Overdrive clutch piston
	>>A<<	17. D-ring
	>>B<<	18. Reverse clutch piston
	>>A<<	19. D-ring
	>>A<<	20. D-ring
	>>A<<	21. D-ring
		22. Reverse clutch retainer

DISASSEMBLY SERVICE POINT

<<A>> SNAP RING REMOVAL



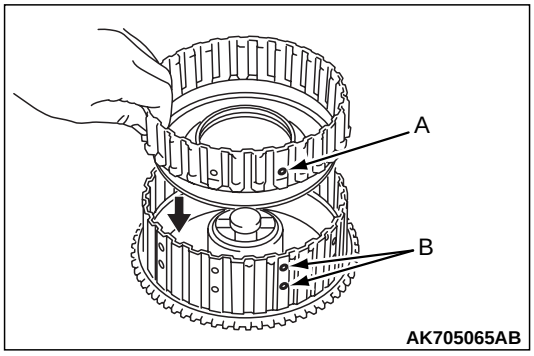
1. Set special tools as shown in the illustration.
   - Spring compressor (MD999590)
   - Spring compressor retainer (MD998924)
2. Compress the return spring, and remove the snap ring.

REASSEMBLY SERVICE POINTS

>>A<< D-RING INSTALLATION

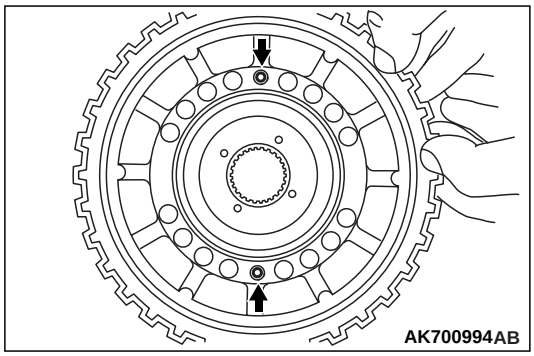
1. Apply ATF to the D-ring.
2. Install the D-ring in the reverse clutch retainer, piston, overdrive clutch piston and spring retainer grooves. Make sure that the D-ring is not twisted or damaged when installing.

>>B<< REVERSE CLUTCH PISTON INSTALLATION



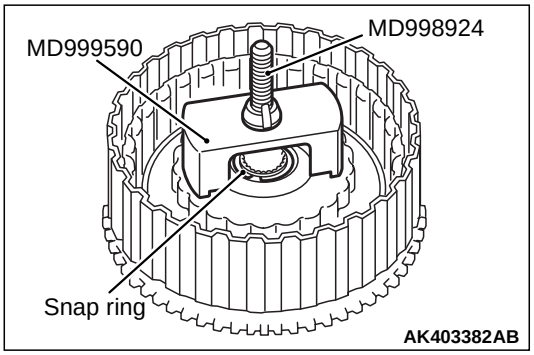
Align the reverse clutch piston and reverse clutch retainer holes (A and B), and then assemble.

>>C<< RETURN SPRING INSTALLATION

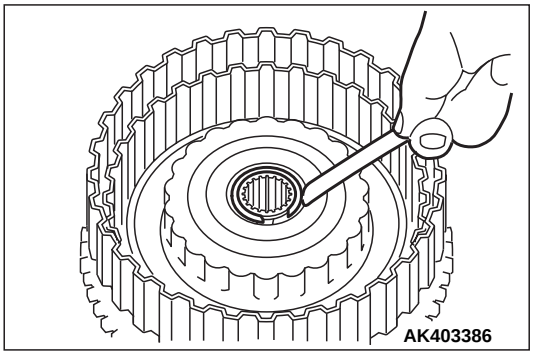


Align the two return spring holes with the two projections on the overdrive clutch piston, and then assemble.

>>D<< SNAP RING INSTALLATION



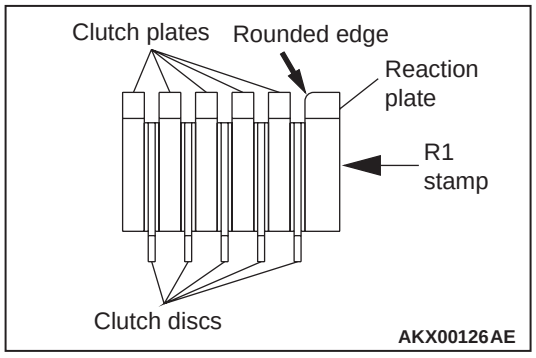
1. Set special tools as shown in the illustration.
   - Spring compressor (MD999590)
   - Spring compressor retainer (MD998924)
2. Tighten the special tool nut, and press the spring retainer against the reverse clutch retainer.
3. Install the thickest snap ring that can be fitted in the snap ring groove of reverse clutch retainer.



4. Check the clearance between the snap ring and spring retainer. If the clearance is not within the standard value range, make adjustment by selecting a snap ring of an appropriate thickness.

   Standard value: 0 – 0.09 mm
   (For overdrive clutch return spring retainer end play)

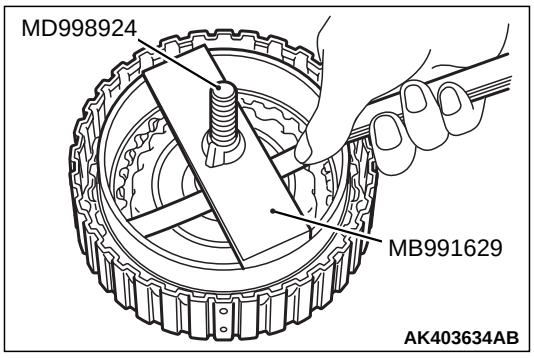
>>E<< CLUTCH PLATE / CLUTCH DISC / REACTION PLATE INSTALLATION



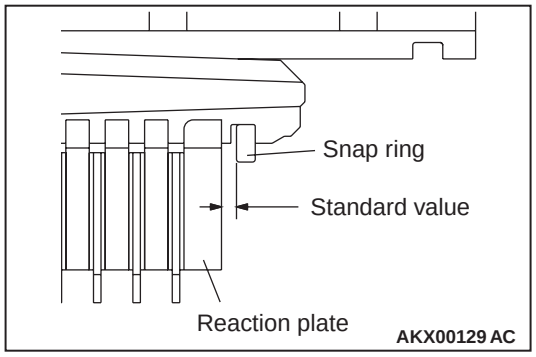
1. Alternately assemble the clutch disc and clutch plate in the reverse clutch piston.
2. Install the reaction plate so that it is oriented as shown in the illustration.

>>F<< SNAP RING INSTALLATION

1. Install the snap ring in the reverse clutch piston groove.



2. Set special tools as shown in the illustration, and compress the clutch element
   - Spring compressor (MB991629)
   - Spring compressor retainer (MD998924)



3. Check the clearance (overdrive clutch end play) of the snap ring and reaction plate is the standard value. If the clearance is not at the standard value, select the snap ring and adjust so that the clearance is within the standard value.

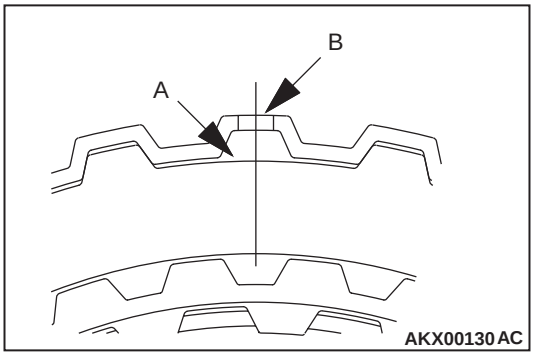
   Standard value: 2.0 – 2.2 mm

(For overdrive clutch end play)

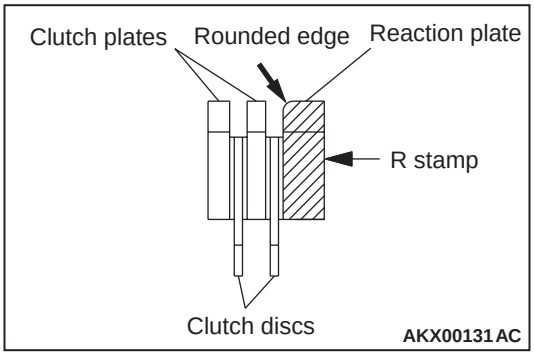
>>G<< CLUTCH PLATE / CLUTCH DISC / REACTION PLATE INSTALLATION

⚠ CAUTION

Soak the clutch discs in ATF before installing them.

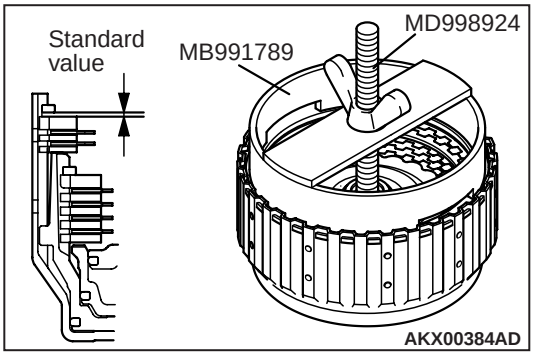


1. Alternately assemble the clutch plate and clutch disc in the reverse clutch retainer. Align and assemble both clutch plates (where there are no teeth) (A in the illustration) with the reverse clutch retainer hole (B in the illustration).



2. Install the reaction plate so that it is oriented as shown in the illustration. Assemble in the same manner as the clutch plate so the section with no teeth (A in the illustration) matches the retainer hole (B in the illustration).

>>H<< SNAP RING INSTALLATION



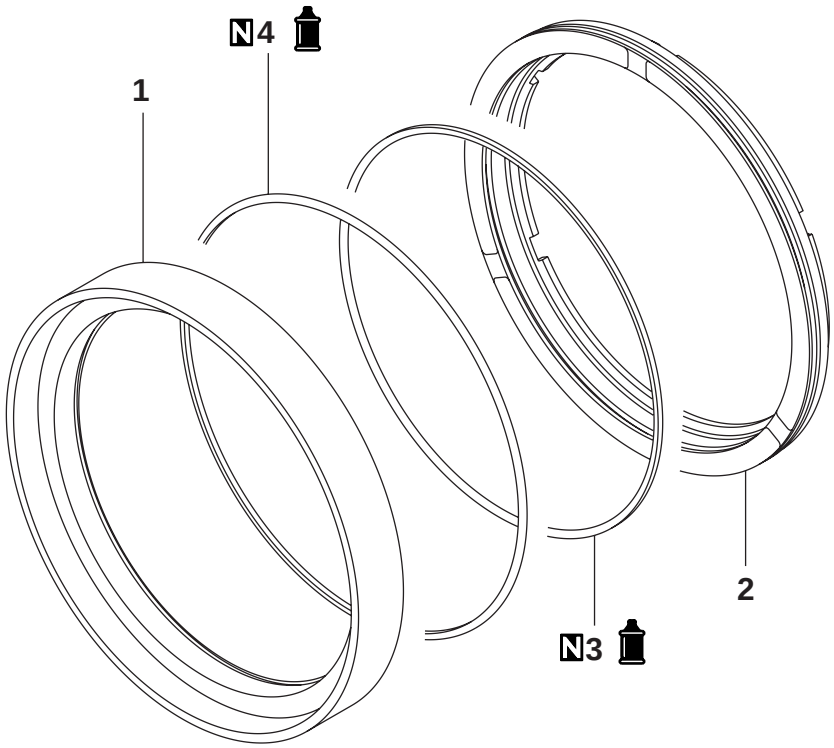
1. Install the snap ring in the reverse clutch retainer groove.
2. Set special tools as shown in the illustration, and compress the clutch element.
   - Spring compressor (MB991789)
   - Spring compressor retainer (MD998924)
3. Check that the clearance between the snap ring and the clutch reaction plate is within the standard valus.if not within the standard value, select a snap ring to adjust.

   Standard value: 1.5 – 1.7 mm
   (For reverse clutch end play)

SECOND BRAKE

DISASSEMBLY AND REASSEMBLY

M1233021800258



AKX00134AB

Disassembly steps

1. Second brake retainer
2. Second brake piston

>>**A**<< 3. D-ring

>>**A**<< 4. D-ring

REASSEMBLY SERVICE POINT

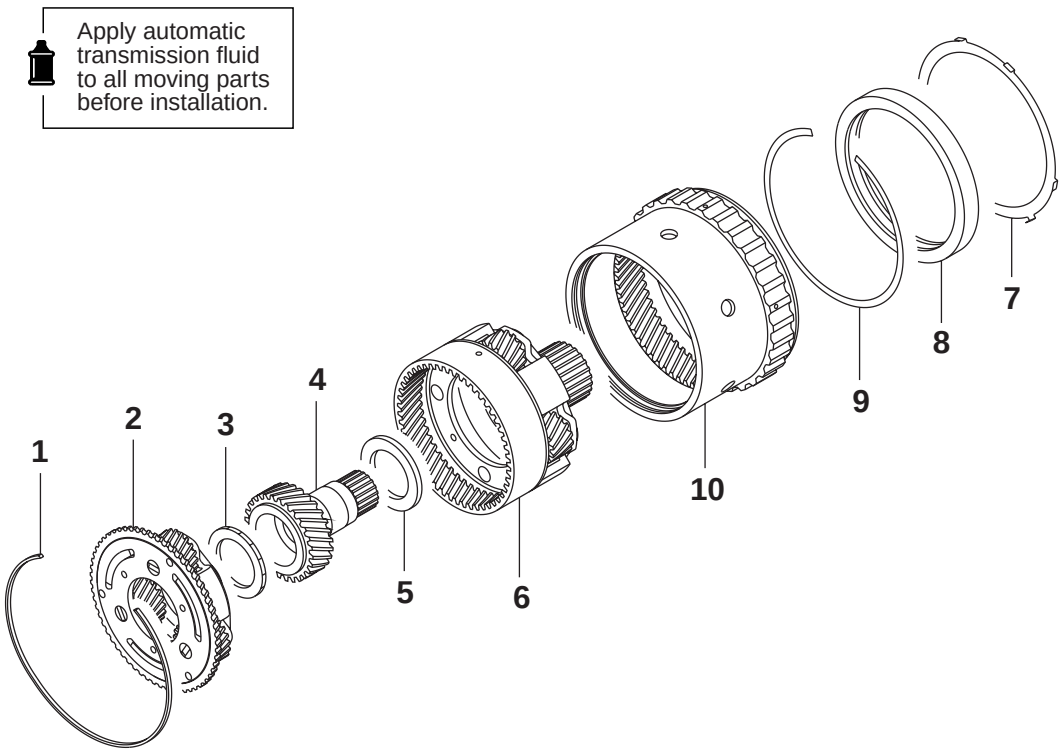
>>A<< D-RING INSTALLATION

1. Apply ATF to the D-ring.
2. Install the D-ring in the grooves on the outer and inner periphery of the piston. Make sure that the D-ring is not twisted or damaged when installing.

LOW REVERSE ANNULUS GEAR

DISASSEMBLY AND REASSEMBLY

M1233027100257



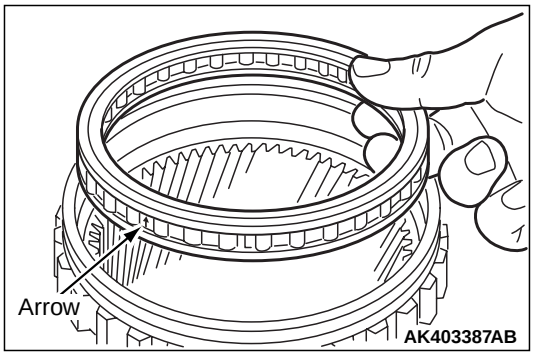
AKX00135AC

Disassembly steps

1. Snap ring
2. Overdrive planetary carrier
>>D<< 3. Thrust bearing No.5
4. Underdrive sun gear
>>C<< 5. Thrust bearing No.6
6. Output planetary carrier
>>B<< 7. Stopper plate
>>A<< 8. One-way clutch
9. Snap ring
10. Low/reverse annulus gear

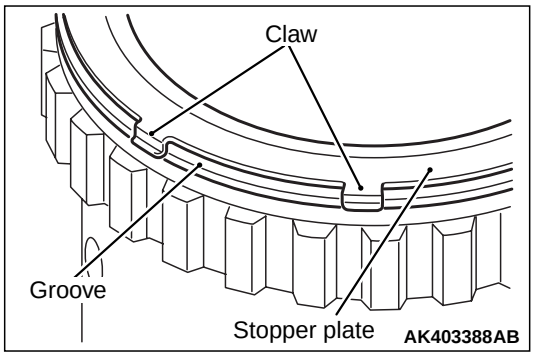
REASSEMBLY SERVICE POINTS

>>A<< ONE-WAY CLUTCH INSTALLATION



Install the one-way clutch so that the arrow stamp is oriented as shown in the illustration.

>>B<< STOPPER PLATE INSTALLATION

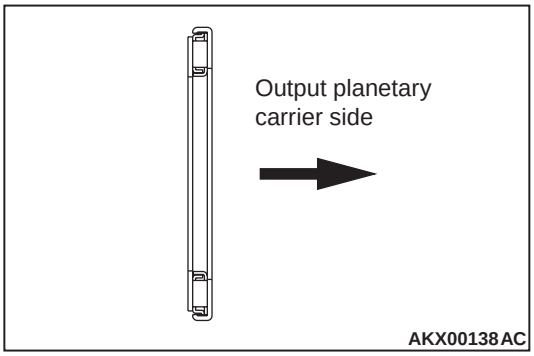


Install the stopper plate onto the low/reverse annulus gear. Make sure that the stopper plate claw is securely engaged in the annulus gear groove.

>>C<< THRUST BEARING No.6 INSTALLATION

⚠ CAUTION

Make sure thrust bearing No.6 is mounted in the correct direction.

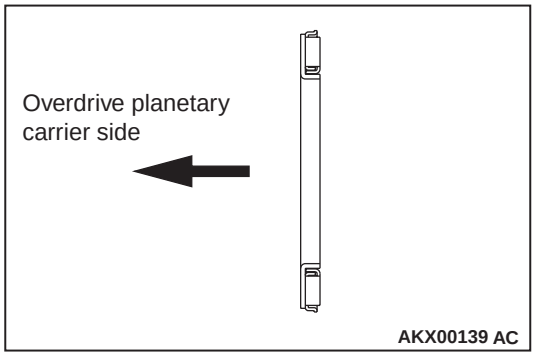


Apply vaseline or petroleum jelly on the thrust bearing No.6, and then install onto the output planetary carrier.

>>D<< THRUST BEARING No.5 INSTALLATION

⚠ CAUTION

Make sure thrust bearing No.5 is mounted in the correct direction.

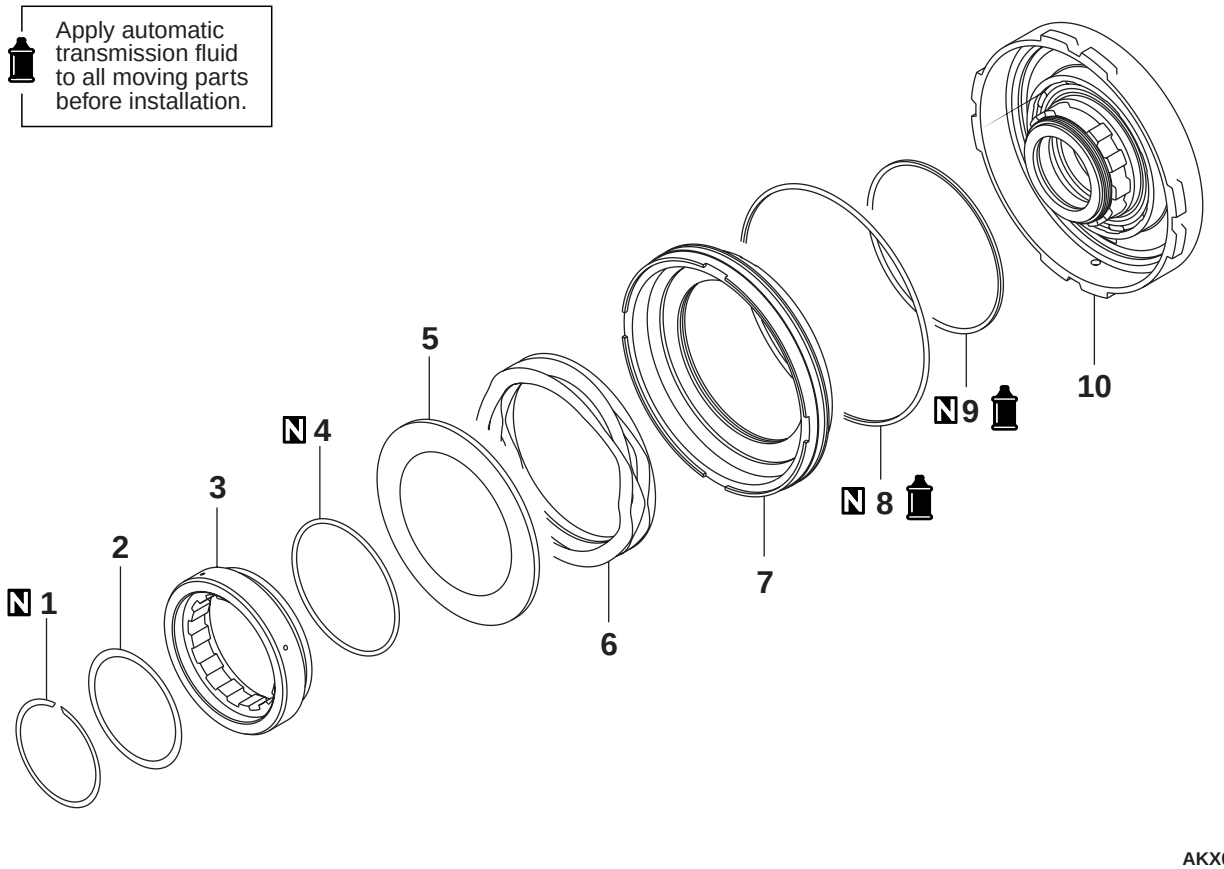


Apply vaseline or petroleum jelly on the thrust bearing No.5, and then install on the overdrive planetary carrier.

CENTRE SUPPORT

DISASSEMBLY AND REASSEMBLY

M1233010000184



			Disassembly steps
<<A>>	>>C<<	1.	Snap ring
		2.	Plate
		3.	One-way clutch inner race
	>>B<<	4.	O-ring

Disassembly steps (Continued)

Disassembly steps (Continued)

5. Spring retainer
6. Return spring
7. Low/reverse brake piston

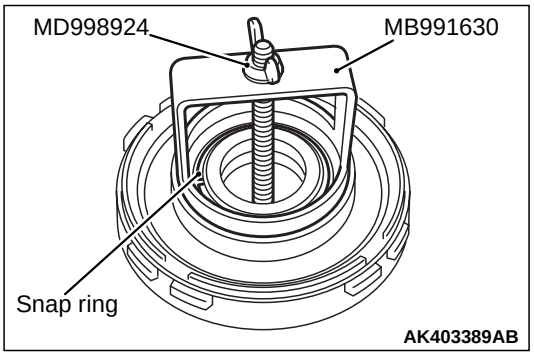
>>**A**<< 8. D-ring

>>**A**<< 9. D-ring

10. Center support

DISASSEMBLY SERVICE POINT

<<A>> SNAP RING REMOVAL



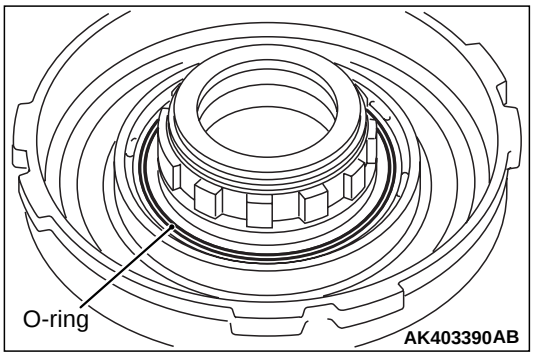
1. Set special tools as shown in the illustration so that they are pressed against the inner race of the one-way clutch.
   - Spring compressor (MB991630)
   - Spring compressor retainer (MD998924)
2. Screw in the special tool nut, and lightly press against the inner race of the one-way clutch.
3. Remove the snap ring.

REASSEMBLY SERVICE POINTS

>>A<< D-RING INSTALLATION

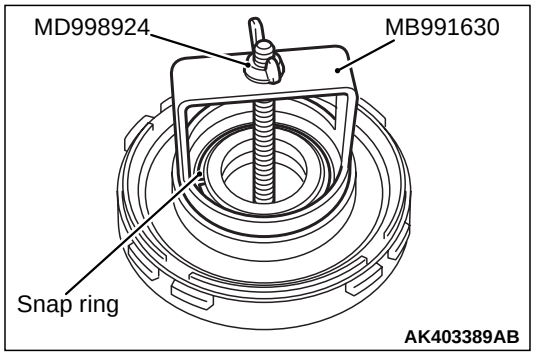
1. Apply ATF to the D-ring.
2. Install the D-ring in the grooves on the outer and inner periphery of the piston. Make sure that the D-ring is not twisted or damaged when installing.

>>B<< O-RING INSTALLATION



Install the O-ring onto the center support at the position shown in the illustration.

>>C<< SNAP RING INSTALLATION

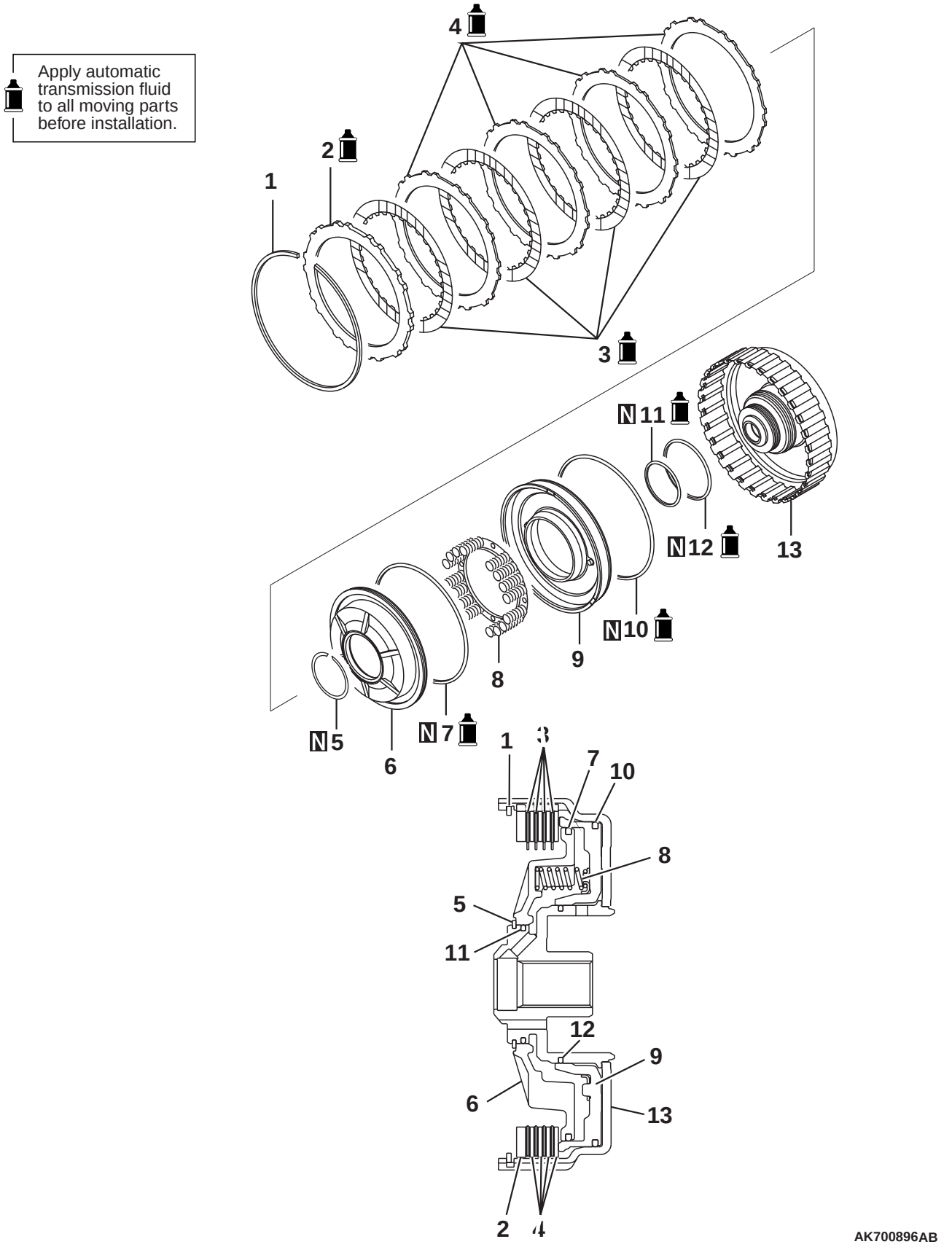


1. Set special tools as shown in the illustration.
   - Spring compressor (MB991630)
   - Spring compressor retainer (MD998924)
2. Screw in the special tool nut, and lightly press against the inner race of the one-way clutch.
3. Install the snap ring.

UNDERDRIVE CLUTCH

DISASSEMBLY AND REASSEMBLY

M1233027300273

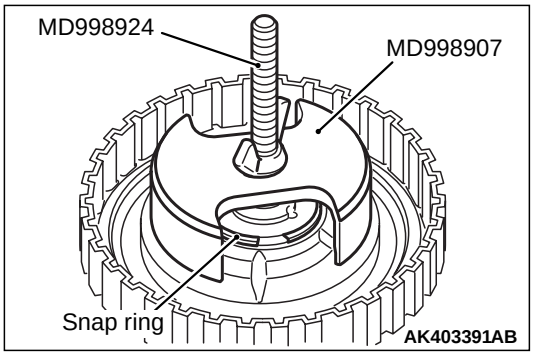


Disassembly steps

	>>E<<	1.	Snap ring
	>>D<<	2.	Reaction plate
	>>D<<	3.	Clutch disc
	>>D<<	4.	Clutch plate
<<A>>	>>C<<	5.	Snap ring
		6.	Spring retainer
	>>A<<	7.	D-ring
	>>B<<	8.	Return spring
		9.	Underdrive clutch piston
	>>A<<	10.	D-ring
	>>A<<	11.	D-ring
	>>A<<	12.	D-ring
		13.	Underdrive clutch retainer

DISASSEMBLY SERVICE POINT

<<A>> SNAP RING REMOVAL



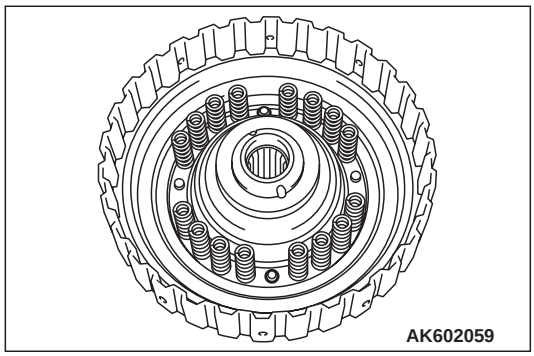
Use the special tools to remove the snap ring.
- Spring compressor retainer (MD998924)
- Spring compressor (MD998907)

REASSEMBLY SERVICE POINTS

>>A<< D-RING INSTALLATION

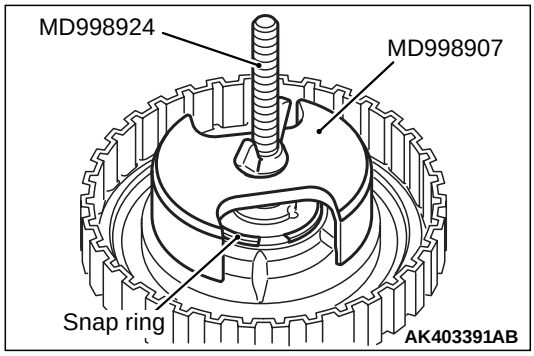
1. Apply ATF to the D-ring.
2. Install the D-ring in the grooves of the underdrive clutch retainer and spring retainer. Make sure that the D-ring is not twisted or damaged when installing.

>>B<< RETURN SPRING INSTALLATION



Align the two return spring holes with the two projections on the underdrive clutch piston, and then assemble.

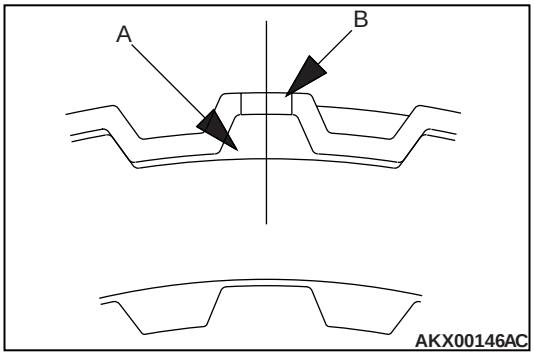
>>C<< SNAP RING INSTALLATION



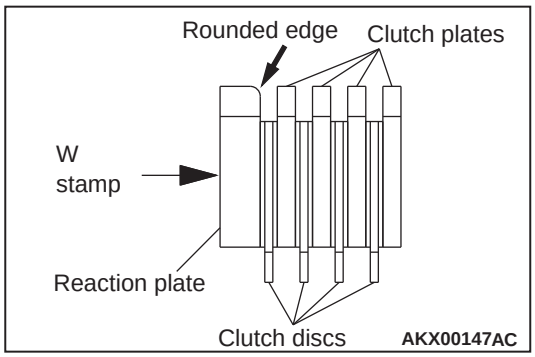
Use the special tools to install the snap ring.
- Spring compressor (MD998924)
- Spring compressor retainer (MD998907)

>>D<< CLUTCH PLATE / CLUTCH DISC / REACTION PLATE INSTALLATION

⚠ CAUTION
Soak the clutch discs in ATF before installing them.



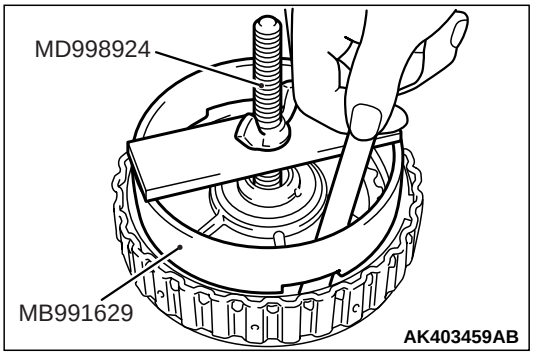
1. Alternately assemble the clutch plate and clutch disc in the underdrive clutch retainer. Align and assemble the four clutch plates (where there are no teeth) (A in the illustration) with the underdrive clutch retainer hole (B in the illustration).



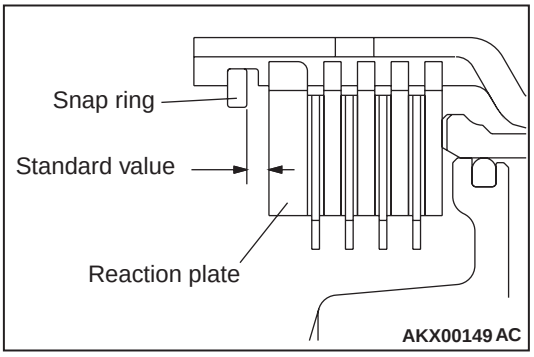
2. Install the reaction plate so that it is oriented as shown in the illustration. Assemble in the same manner as the clutch plate so that the section with no teeth (A in the illustration) matches the retainer hole (B in the illustration).

>>E<< SNAP RING INSTALLATION

1. Install the snap ring in the groove of the underdrive clutch retainer.



2. Set special tools as shown in the illustration, and compress the clutch element.
   - Spring compressor retainer (MD998924)
   - Spring compressor (MB991629)



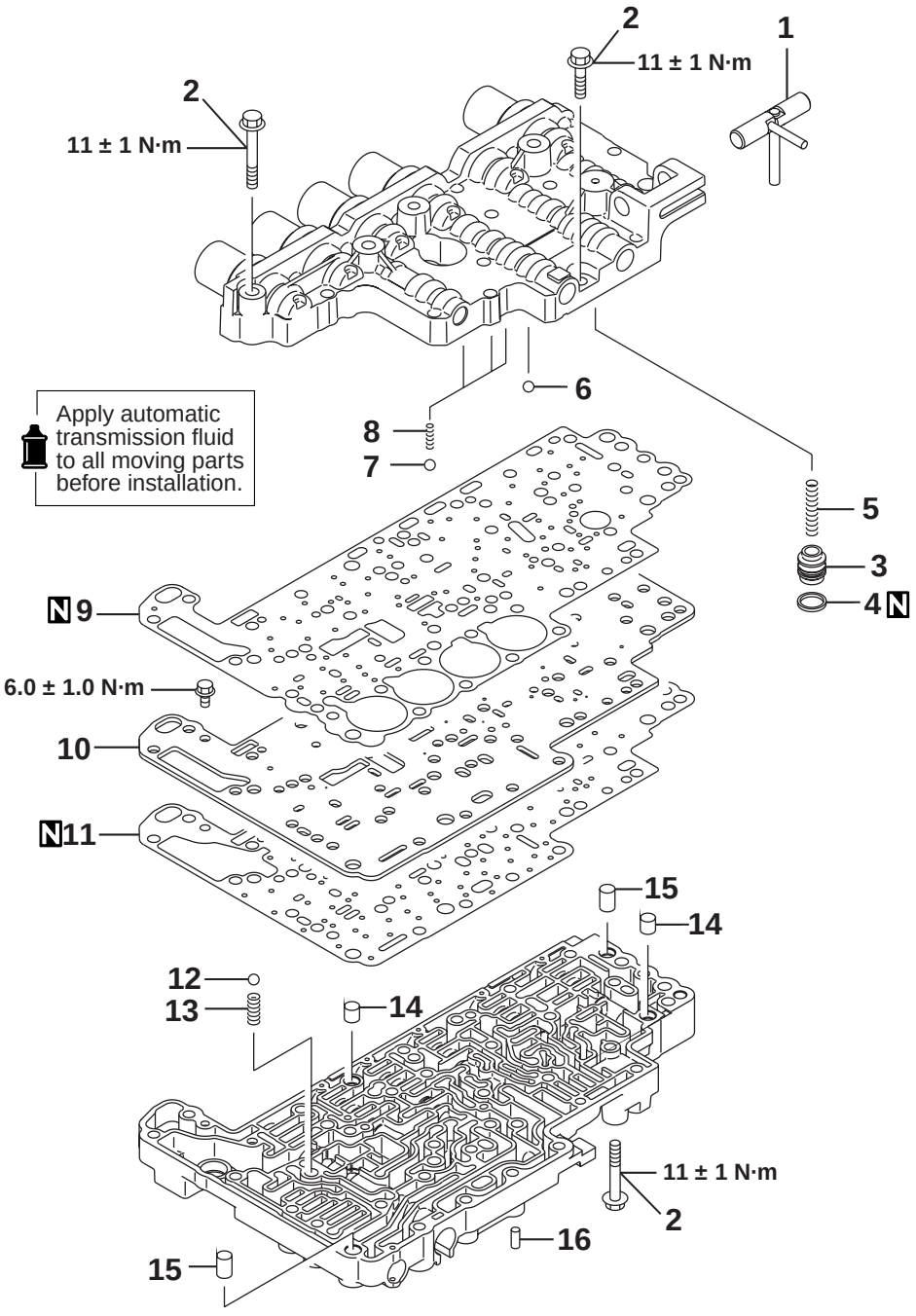
3. Check the clearance (underdrive clutch end play) between the snap ring and reaction plate is the standard value. If the clearance is not at the standard value, select the snap ring and adjust so that the clearance is within the standard value.

   Standard value: 1.6 – 1.8 mm
   (For underdrive clutch end play)

VALVE BODY

DISASSEMBLY AND REASSEMBLY

M1233005500666



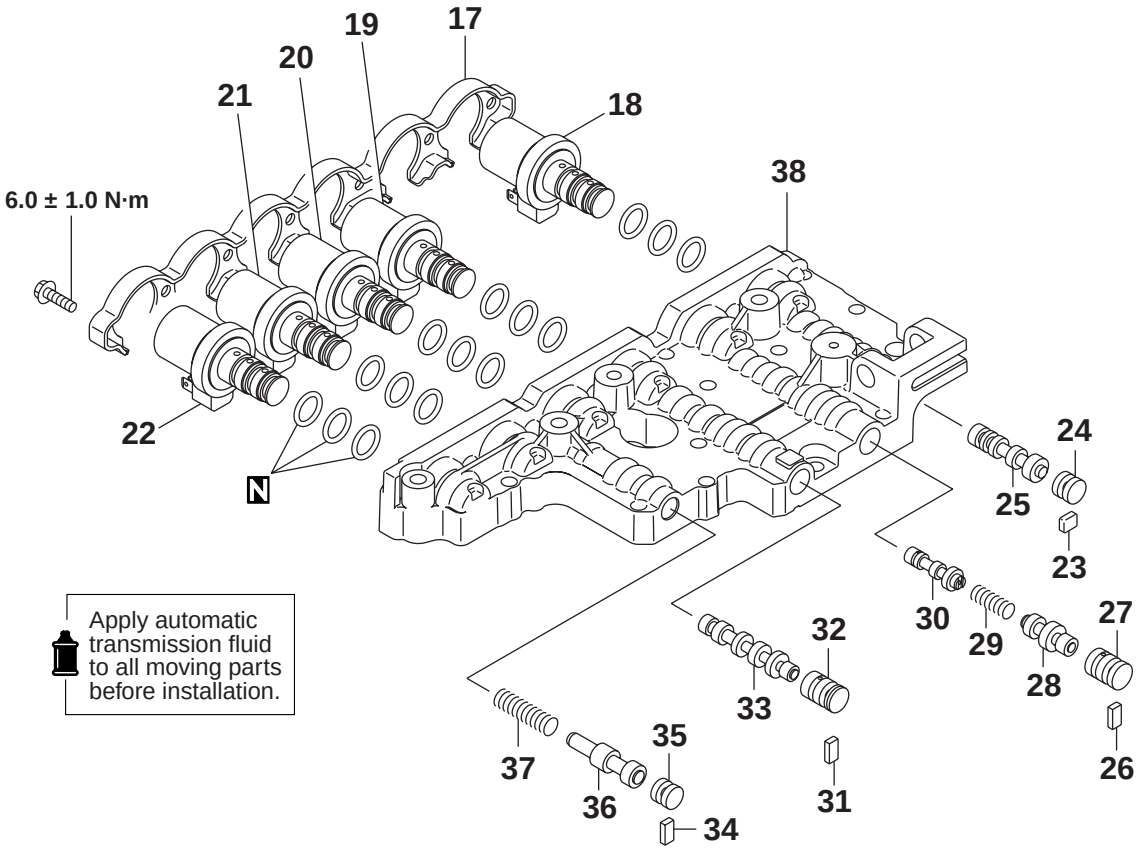
AKX00150AC

Disassembly steps

>>G<<	1.	Control shaft
	2.	Valve body attaching bolt
>>F<<	3.	Damping valve
>>F<<	4.	Seal ring
>>F<<	5.	Damping valve spring
>>F<<	6.	Ball (orifice check ball)
>>F<<	7.	Steel ball (orifice check ball)
>>F<<	8.	Spring

Disassembly steps (Continued)

	9.	Upper valve body gasket
	10.	Separating plate
	11.	Lower valve body gasket
>>E<<	12.	Steel ball (line relief)
>>E<<	13.	Spring
>>D<<	14.	Knock bushing
>>C<<	15.	Knock bushing
>>B<<	16.	Dowel pin



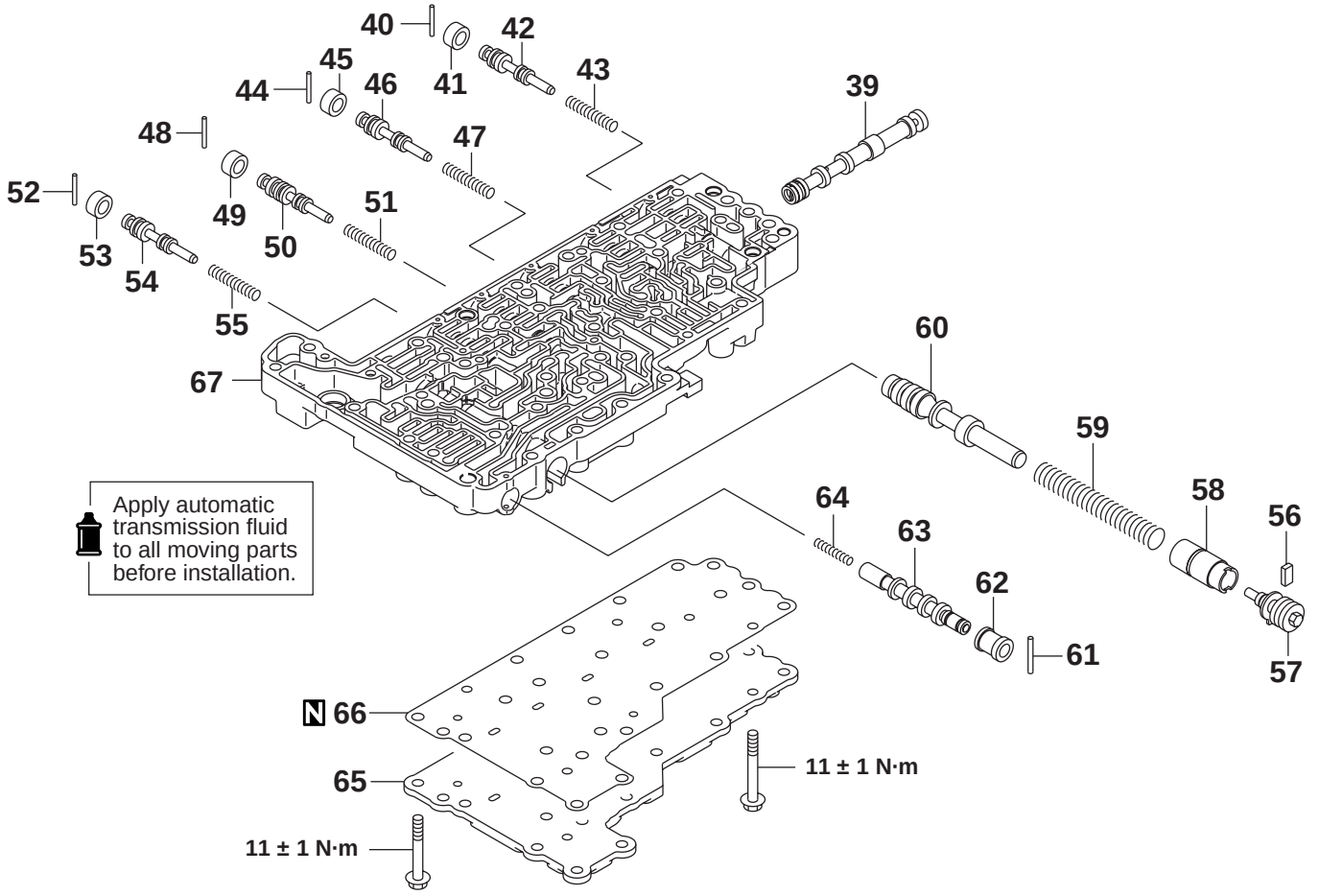
AKX00151AC

Disassembly steps

<<A>> >>A<< 17. Solenoid support
<<A>> >>A<< 18. Low reverse brake solenoid valve
<<A>> >>A<< 19. Second brake solenoid valve
<<A>> >>A<< 20. Underdrive clutch solenoid valve
<<A>> >>A<< 21. Overdrive clutch solenoid valve
<<A>> >>A<< 22. Damper clutch control solenoid valve
23. Stopper plate
24. Stopper plug
25. Switching valve
26. Stopper plate
27. Fail-safe valve A sleeve
28. Fail-safe valve A2

Disassembly steps (Continued)

29. Fail-safe valve A spring
30. Fail-safe valve A1
31. Stopper plate
32. Fail-safe valve B sleeve
33. Fail-safe valve B
34. Stopper plate
35. Stopper plug
36. Torque converter pressure control valve
37. Torque converter pressure control valve spring
38. Upper valve body



AKX00152AC

Disassembly steps

39. Manual valve
40. Roller
41. Low/reverse brake pressure control valve sleeve
42. Low/reverse brake pressure control valve
43. Low/reverse brake pressure control valve spring
44. Roller
45. Second brake pressure control valve sleeve
46. Second brake pressure control valve
47. Second brake pressure control valve spring
48. Roller
49. Underdrive clutch pressure control valve sleeve
50. Underdrive clutch pressure control valve
51. Underdrive clutch pressure control valve spring
52. Roller
53. Overdrive clutch pressure control valve sleeve
54. Overdrive clutch pressure control valve

Disassembly steps (Continued)

55. Overdrive clutch pressure control valve spring
56. Stopper plate
57. Regulator valve adjusting screw
58. Regulator valve sleeve
59. Regulator valve spring
60. Regulator valve
61. Roller
62. Damper clutch control valve sleeve
63. Damper clutch control valve
64. Damper clutch control valve spring
65. Cover
66. Cover gasket
67. Lower valve body

DISASSEMBLY SERVICE POINT

<<A>> SOLENOID VALVE REMOVAL

Before removing the solenoid valves, make marks with white paint, etc., so that the these valves can be reinstalled in the original positions.

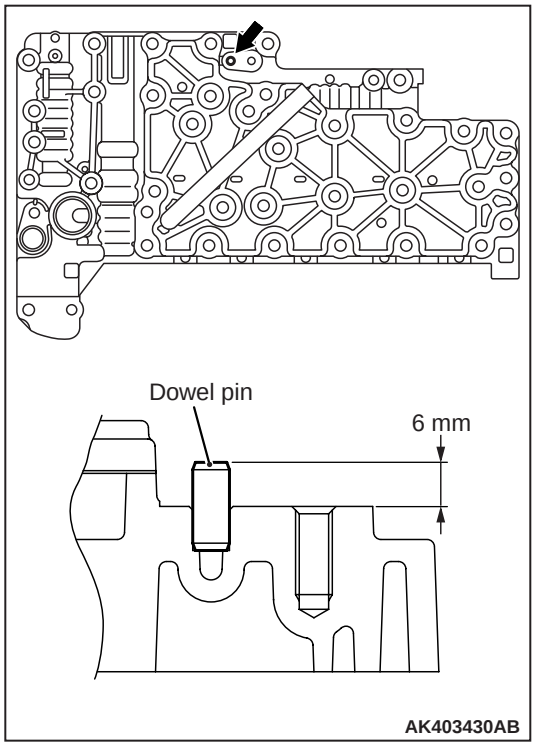
REASSEMBLY SERVICE POINTS

>>A<< SOLENOID VALVE INSTALLATION

1. Apply ATF, vaseline or petroleum jelly to O-ring, and install it to solenoid valves.

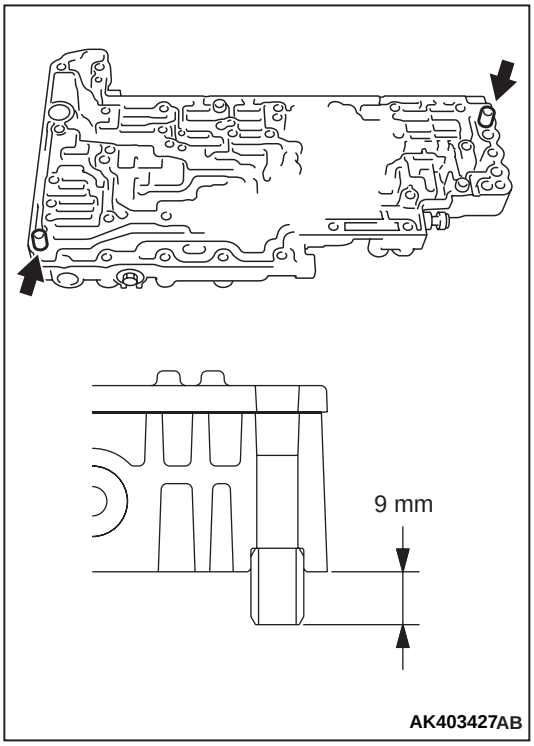
2. Following the marks made when removing, install each solenoid valve in its proper position.

>>B<< DOWEL PIN INSTALLATION



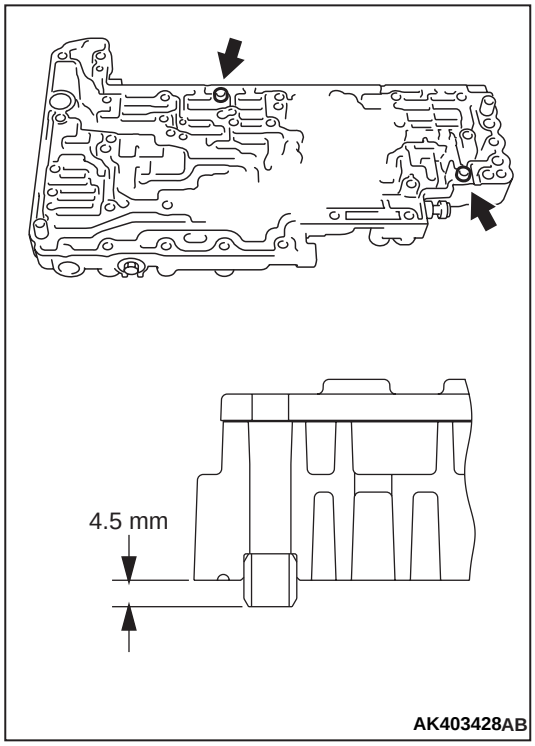
Install the dowel pin at the specified position on the lower valve body.

>>C<< KNOCK BUSHING INSTALLATION



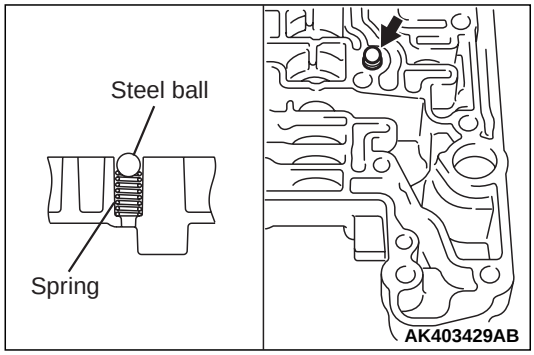
Install the knock bushing onto the lower valve body position shown in the illustration.

>>D<< KNOCK BUSHING INSTALLATION



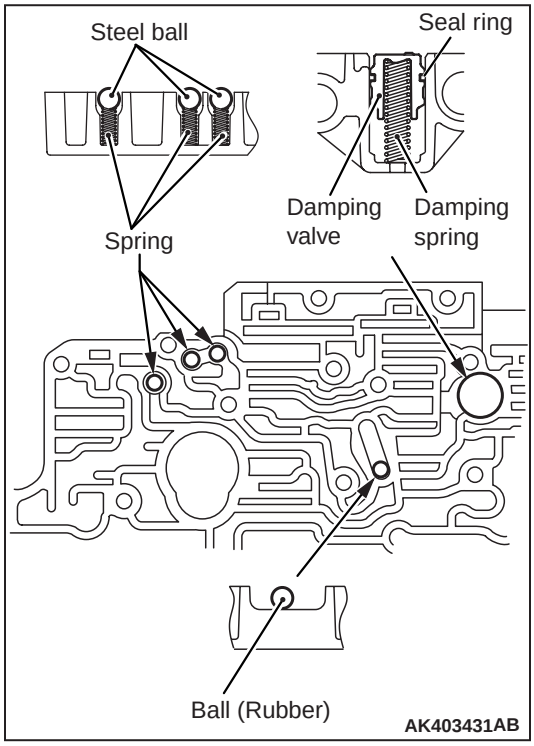
Install the knock bushing onto the lower valve body position shown in the illustration.

>>E<< SPRING / STEEL BALL (LINE RELIEF) INSTALLATION



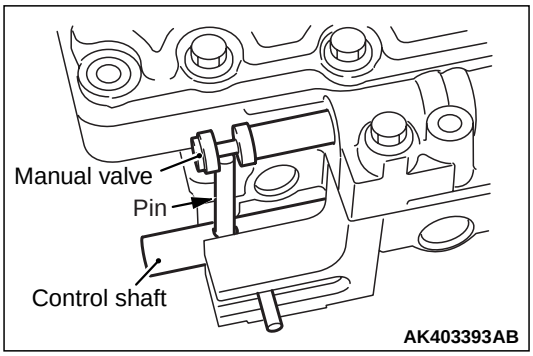
Install the spring (7.0 mm diameter, 17.3 mm length) and the steel ball (6.4 mm diameter) onto the lower valve body position shown in the illustration.

>>F<< SPRING / STEEL BALL (ORIFICE CHECK BALL) / BALL (ORIFICE CHECK BALL) / DAMPING VALVE SPRING / SEAL RING / DAMPING VALVE INSTALLATION



1. Install the spring (4.5 mm diameter, 15.4 mm length) and the steel ball (6.4 mm diameter) onto the upper valve body position shown in the illustration.
2. Install the ball (rubber) (6.4 mm diameter) onto the upper valve body position shown in the illustration.
3. After installing the seal ring onto the damping valve, install together with the damping valve spring (7.7 mm diameter, 35.8 mm length) onto the upper valve body position shown in the illustration.

>>G<< CONTROL SHAFT INSTALLATION



Insert the control shaft into the valve body, putting the pin of the control shaft into the groove of the manual valve.

GROUP 23C

AUTOMATIC TRANSMISSION OVERHAUL <V4A5>

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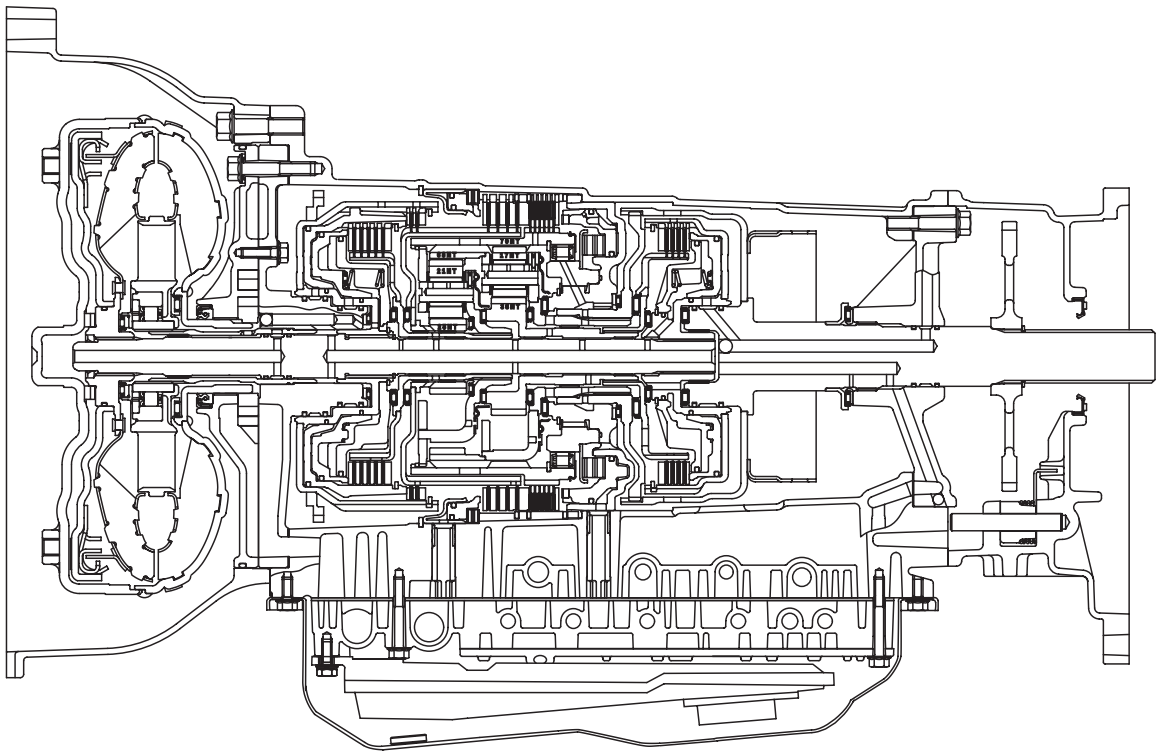
GENERAL INFORMATION

M1233000101859

TRANSMISSION MODELS

Transmission model	Engine model	Vehicle model
V4A5A-J-LE	4D56 DI-D DOHC	KB4T
V4A5A-J-LH	4D56 DI-D DOHC	KB4T

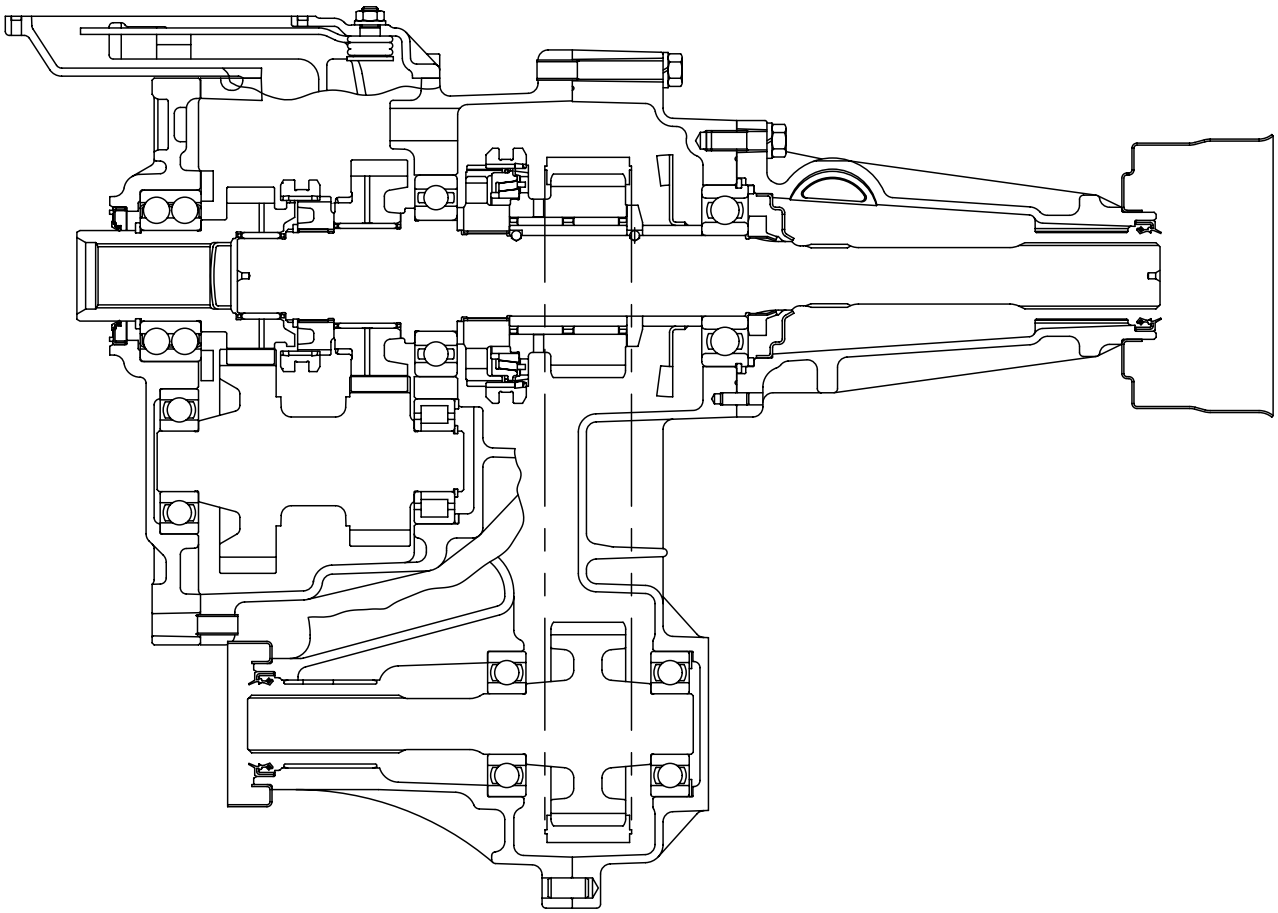
SECTIONAL VIEW <TRANSMISSION>



AK605052

SECTIONAL VIEW <TRANSFER>

<Easy select 4WD>



AK603727

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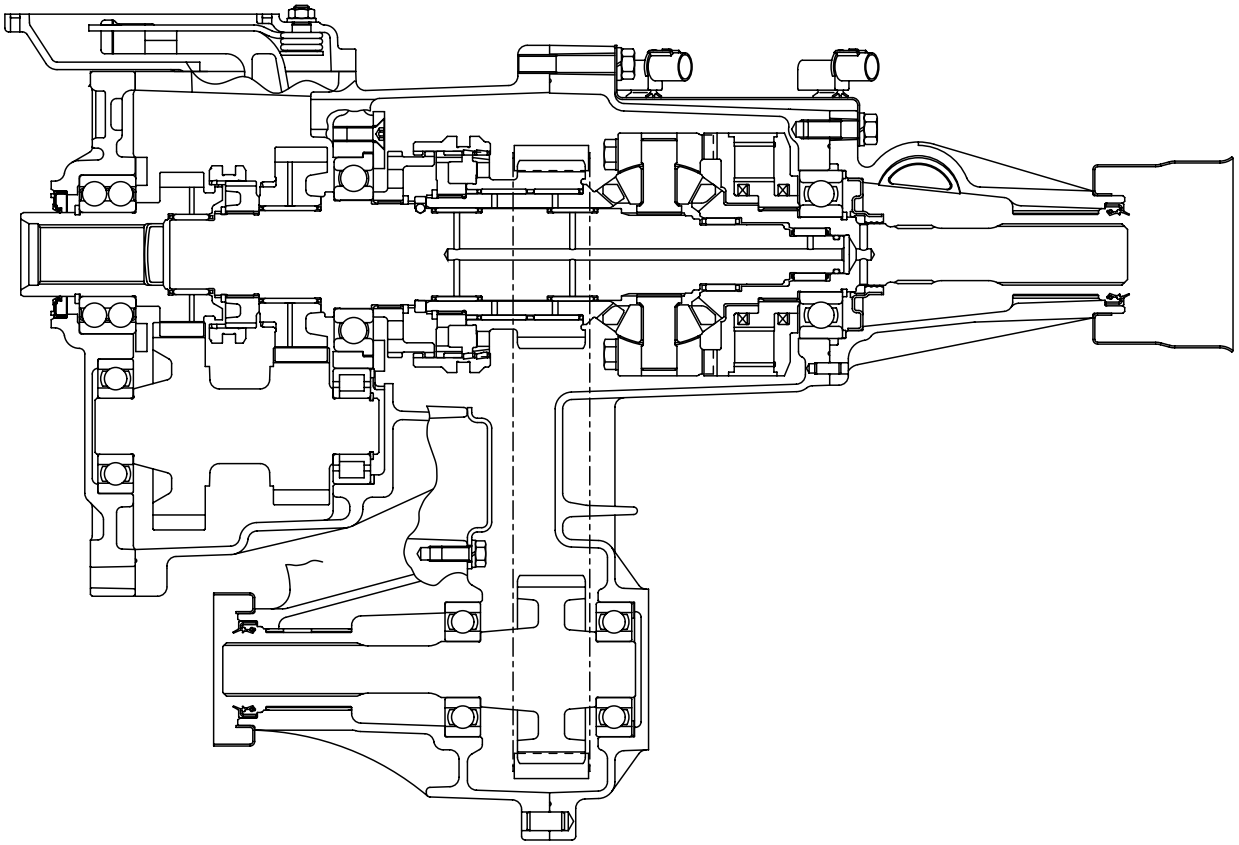
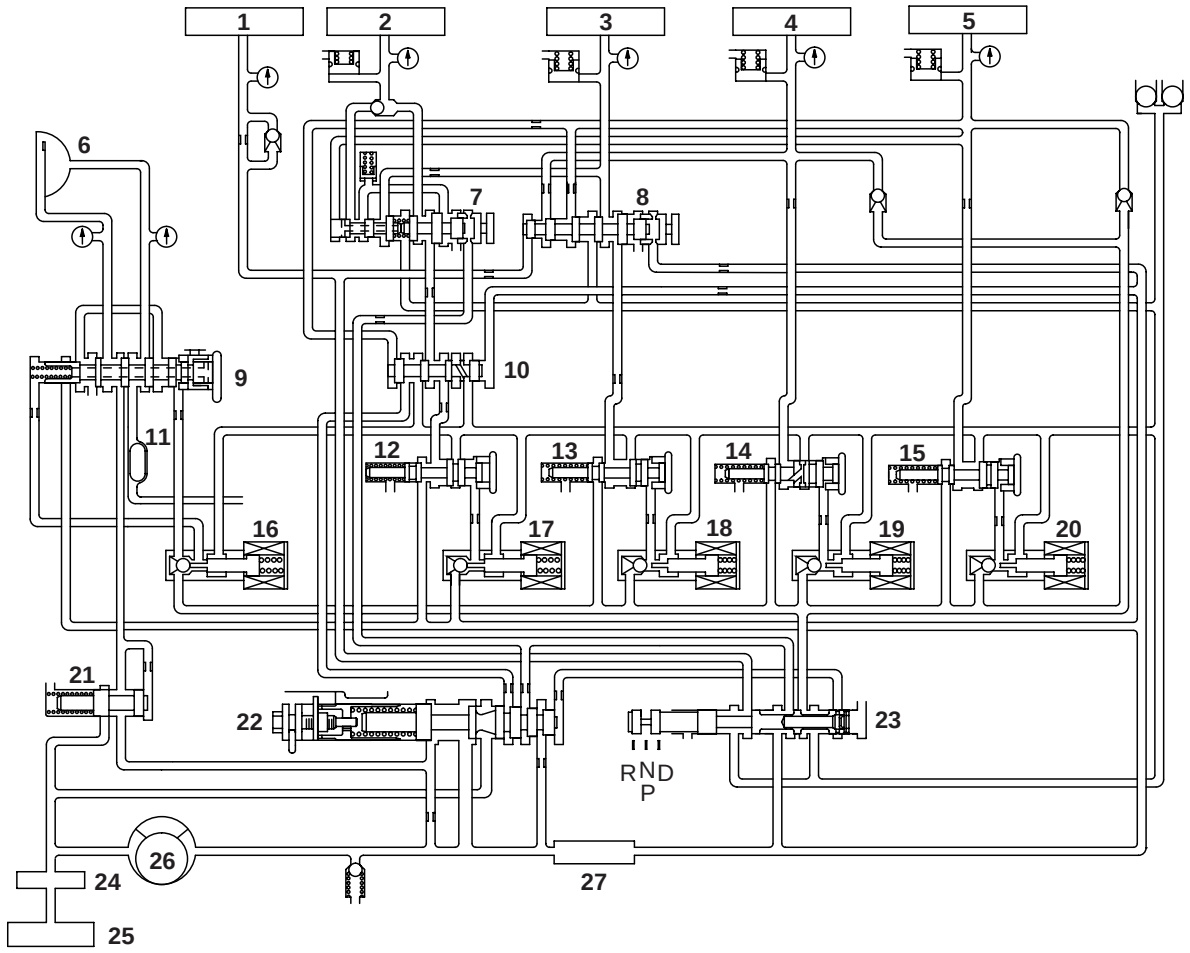


AK403433

HYDRAULIC CIRCUIT



AK600223AB

1. Reverse clutch
2. Low/reverse brake
3. Second brake
4. Underdrive clutch
5. Overdrive clutch
6. Damper clutch
7. Fail-safe valve A
8. Fail-safe valve B
9. Damper clutch control valve
10. Switching valve
11. Cooler
12. Low-reverse brake pressure control valve
13. Second brake pressure control valve
14. Underdrive clutch pressure control valve
15. Overdrive clutch pressure control valve
16. Damper clutch control solenoid valve
17. Low-reverse brake solenoid valve
18. Second brake solenoid valve
19. Underdrive clutch solenoid valve
20. Overdrive clutch solenoid valve
21. Torque converter pressure control valve
22. Regulator valve
23. Manual valve
24. Oil filter
25. Oil pan
26. Oil pump
27. Oil strainer

GENERAL SPECIFICATIONS

M1233000201373

Item		Specifications	
Transmission model		V4A5A-J-LEEL	V4A5A-J-LEEP
Torque converter	Type	3-element, 1-stage, 2-phase type	
	Stall torque ratio	1.62	
	Lock-up	Present	
Transmission type		Electronically controlled 4-speed full-automatic	
Transmission gear ratio	1st	2.842	
	2nd	1.495	
	3rd	1.000	
	4th	0.731	
	Reverse	2.720	
Transfer type		Easy select 4WD	Super select 4WD
Transfer gear ratio	High	1.000	
	Low	1.900	
Speedometer gear ratio (driven/drive)		25/9	

SERVICE SPECIFICATION(S)

M1233000301013

Transmission

Item	Standard value
Output shaft end play mm	0.25 – 0.71
Center support end play mm	0 – 0.16
Brake reaction plate end play mm	0 – 0.16
Second brake end play mm	1.49 – 1.95
Low/reverse brake end play mm	1.65 – 2.11
Input shaft end play mm	0.25 – 0.81
Overdrive clutch return spring retainer end play mm	0 – 0.09
Overdrive clutch end play mm	2.0 – 2.2
Reverse clutch end play mm	1.5 – 1.7
Underdrive clutch end play mm	1.6 – 1.8

Transfer

Item		Standard value	Limit
H-L clutch hub end play mm		0 – 0.08	–
Differential lock hub end play mm <Super select 4WD>		0 – 0.08	–
Rear output shaft bearing to rear cover clearance mm	Easy select 4WD	0 – 0.1	–
	Super select 4WD	0.025 – 0.150	–
Countershaft gear end play mm		0 – 0.15	–

Item	Standard value	Limit
Input gear bearing end play mm	0 – 0.06	–
Countershaft gear bearing end play mm	0 – 0.08	–
2-4WD synchronizer hub end play mm	0 – 0.08	
Synchronizer ring clearance mm	–	0.3
Rear output shaft bearing end play mm	0 – 0.08	–

TORQUE SPECIFICATIONS

M1233023101689

Transmission

Item	N·m
Harness bracket mounting bolt	26 ± 5
Air breather hose bracket mounting bolt	11 ± 1
Cable end bracket mounting bolt	48 ± 6
Transfer to transfer case adapter mounting bolt	35 ± 6
Transmission case to transfer case adapter mounting bolt	48 ± 6
Output shaft support mounting bolt	23 ± 3
Oil pump mounting bolt	23 ± 3
Converter housing to transmission case mounting bolt	48 ± 6
Valve body mounting bolt	11 ± 1
Detent spring mounting bolt	6.0 ± 1.0
Oil filter mounting bolt	6.0 ± 1.0
Oil pan mounting bolt	11 ± 1
Manual control lever mounting nut	21.5 ± 3.5
Output shaft speed sensor mounting bolt	11 ± 1
Input shaft speed sensor mounting bolt	11 ± 1
Inhibitor switch mounting bolt	11 ± 1
Lower valve body cover mounting bolt	11 ± 1
Lower valve body mounting bolt	11 ± 1
Separating plate mounting bolt	6.0 ± 1.0
Solenoid support mounting bolt	6.0 ± 1.0
Upper valve body mounting bolt	11 ± 1

Transfer

Item	N·m
Rear bearing retainer mounting bolt <Super select 4WD>	20 ± 2
Oil pool cover mounting bolt <Super select 4WD>	9.0 ± 1.0
Transfer case – chain cover mounting bolt	35 ± 6
Rear cover – chain cover mounting bolt	35 ± 6
Drain plug	32 ± 2

Item	N·m
Filler plug	32 ± 2
Control housing to transfer case mounting bolt	19 ± 3
Transfer case plate – transfer case mounting bolt and nut	35 ± 6
Speedometer sleeve clamp mounting bolt	19 ± 3
Plug	34 ± 5
Vehicle speed sensor	25 ± 4
4LLc detection switch <Super select 4WD>	35 ± 6
Low detection switch <Easy select 4WD>	35 ± 6
High/low detection switch	34 ± 5
4WD operation detection switch	34 ± 5
Center differential lock detection switch <Super select 4WD>	35 ± 6
2WD/4WD detection switch <Super select 4WD>	35 ± 6
Center differential lock operation detection switch <Super select 4WD>	34 ± 5
Bearing retainer mounting bolt	19 ± 3
Center differential case mounting bolt <Super select 4WD>	69 ± 10
Rear output shaft lock nut <Easy select 4WD>	255 ± 10

VALVE BODY SPRING IDENTIFICATION

M1233022900203

Item	Wire diameter mm	Outside diameter mm	Free height mm	Number of loops
Orifice check ball spring	0.5	4.5	15.4	15
Damper clutch control valve spring	0.7	5.9	28.1	19
Damping valve spring	1.0	7.7	35.8	17
Torque converter pressure control valve spring	1.6	11.2	29.4	9.5
Fail-safe valve A spring	0.7	8.9	21.9	9.5
Pressure control valve spring	0.7	7.6	37.7	25
Line relief valve spring	1.0	7.0	17.3	10
Regulator valve spring	1.8	13.3	44.6	12.5

SNAP RING, SPACER, THRUST RACE AND PRESSURE PLATE FOR ADJUSTMENT

M1233100500044

Transmission

Thrust race (For adjustment of output shaft end play)

Thickness mm	Identification symbol	Thickness mm	Identification symbol
1.6	None	2.0	None
1.8	None	2.2	None

Snap ring (For adjustment of underdrive clutch and overdrive clutch end play)

Thickness mm	Identification symbol	Thickness mm	Identification symbol
1.6	Brown	2.4	Blue
1.7	None	2.5	Brown
1.8	Blue	2.6	None
1.9	Brown	2.7	Blue
2.0	None	2.8	Brown
2.1	Blue	2.9	None
2.2	Brown	3.0	Blue
2.3	None		

Thrust race (For adjustment of input shaft end play)

Thickness mm	Identification symbol	Thickness mm	Identification symbol
1.4	None	2.2	None
1.6	None	2.4	None
1.8	None	2.6	None
2.0	None		

Snap ring (For adjustment of overdrive clutch return spring retainer end play)

Thickness mm	Identification symbol	Thickness mm	Identification symbol
1.48	Brown	1.58	None
1.53	Black	1.63	Brown

Pressure plate (For adjustment of second brake end play)

Thickness mm	Identification symbol	Thickness mm	Identification symbol
1.6	F	2.4	B
1.8	E	2.6	A
2.0	D	2.8	0
2.2	C	3.0	1

Snap ring (For adjustment of center support and brake reaction plate end play)

Thickness mm	Identification symbol	Thickness mm	Identification symbol
2.2	None	2.4	Brown
2.3	Blue	2.5	None

Snap ring (For adjustment of reverse clutch end play)

Thickness mm	Identification symbol	Thickness mm	Identification symbol
1.6	None	2.3	Blue
1.7	Blue	2.4	Brown
1.8	Brown	2.5	None
1.9	None	2.6	Blue
2.0	Blue	2.7	Brown
2.1	Brown	2.8	None
2.2	None		

Pressure plate (For adjustment low/reverse brake end play)

Thickness mm	Identification symbol	Thickness mm	Identification symbol
1.6	F	2.4	B
1.8	E	2.6	A
2.0	D	2.8	0
2.2	C	3.0	1

Transfer

Snap ring (For adjustment input gear bearing end play)

Thickness mm	Identification symbol	Thickness mm	Identification symbol
2.30	None	2.45	Blue
2.35	Red	2.50	Green
2.40	White		

Spacer (For adjustment of counter shaft gear end play)

Thickness mm	Identification symbol	Thickness mm	Identification symbol
1.77	None	2.19	White
1.91	Blue	2.33	Red
2.05	Brown		

Snap ring (For adjustment of counter shaft gear bearing end play)

Thickness mm	Identification symbol	Thickness mm	Identification symbol
1.48	Blue	1.62	None

Spacer (For adjustment of rear output shaft to rear cover clearance) <Easy select 4WD>

Thickness mm	Identification symbol	Thickness mm	Identification symbol
2.75	B75	2.95	B95
2.79	B79	2.99	B99
2.83	B83	3.03	C03
2.87	B87	3.07	C07
2.91	B91	3.11	C11

Snap ring (For adjustment of H-L clutch hub end play)

Thickness mm	Identification symbol	Thickness mm	Identification symbol
2.18	–	2.32	–
2.25	–	2.39	–

Snap ring (For adjustment of differential lock hub end play) <Super select 4WD>

Thickness mm	Identification color	Thickness mm	Identification color
2.56	None	2.84	Yellow
2.63	Red	2.91	Green
2.70	White	2.98	Purple
2.77	Blue		

Snap ring (For adjustment of 2-4WD synchronizer hub end play) <Super select 4WD>

Thickness mm	Identification color	Thickness mm	Identification color
2.56	None	2.77	Blue
2.63	Red	2.84	Yellow
2.70	White		

Snap ring (For adjustment of rear output shaft bearing end play) <Super select 4WD>

Thickness mm	Identification color	Thickness mm	Identification color
2.26	None	2.40	White
2.33	Red	2.47	Blue

SEALANTS AND ADHESIVES

M1233000501103

Transmission

Item	Specified sealant
Transfer case adapter	Mitsubishi Part No. MD997740 or equivalent
Sealing cap	3M™ ATD Part No. 8672 or equivalent
Converter housing	Mitsubishi Part No. MD997740 or equivalent
Oil pan	

Transfer

Item		Specified sealant and adhesive
Chain cover		Mitsubishi Part No. MD997740 or equivalent
Rear cover		
Control housing		
Transfer case plate		
Bearing retainer mounting bolt		
Plug		3M™ ATD Part No. 8672 or equivalent
Support pin	Sealant	3M™ ATD Part No. 8672 or equivalent
	Adhesive	Mitsubishi Part No. MB160450 or equivalent

FORM-IN-PLACE GASKET (FIPG)

This transaxle has several areas where the form-in-place gasket (FIPG) is used for sealing. To ensure that the FIPG fully serves its purpose, it is necessary to observe some precautions when applying it. Bead size, continuity and location are of paramount importance.

Too thin a bead could cause leaks. Too thick a bead, on the other hand, could be squeezed out of location, causing blocking or narrowing of fluid passages. To prevent leaks or blocking of passages, therefore, it is absolutely necessary to apply the FIPG evenly without a break, while observing the correct bead size.

FIPG hardens as it reacts with the moisture in the atmospheric air, and it is usually used for sealing metallic flange areas.

⚠ CAUTION

When re-applying liquid gasket (FIPG), be sure that:

1. **Residues of FIPG are cleared from all the ins and outs of parts;**
2. **Use Mitsubishi genuine parts cleaner (MZ100387) or equivalent to well degrease the FIPG-applied surface.**
3. **FIPG is correctly applied in accordance with FIPG Application.**

Disassembly

Parts sealed with a FIPG can be easily removed without need for the use of a special method. In some cases, however, the FIPG in joints may have to be broken by tapping parts with a mallet or similar tool.

Surface Preparation

Thoroughly remove all substances deposited on the FIPG application surface, using a gasket scraper. Make sure that the FIPG application surfaces is flat and smooth. Also make sure that the surface is free from oils, greases and foreign substances. Do not fail to remove old FIPG that may remain in the fastener fitting holes.

FIPG Application

Applied FIPG bead should be of the specified size and free of any break. FIPG can be wiped away unless it has completely hardened. Install the mating parts in position while the FIPG is still wet. Do not allow FIPG to spread beyond the sealing areas during installation. Avoid operating the transaxle or letting oils or water come in contact with the sealed area before a time sufficient for FIPG to harden (approximately one hour) has passed.

FIPG application method may vary from location to location. Follow the instruction for each particular case described later in this manual.

LUBRICANTS

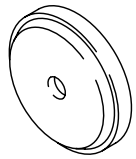
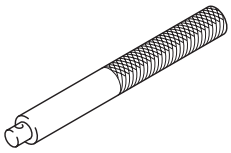
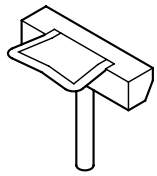
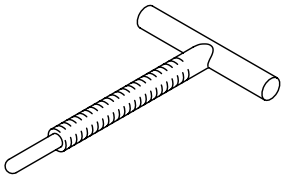
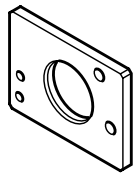
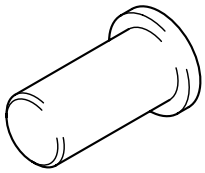
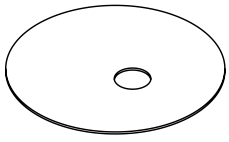
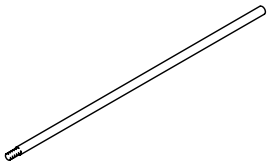
M1233000400448

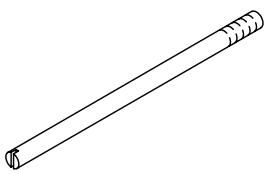
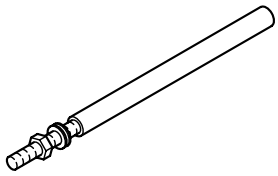
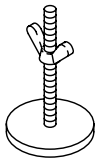
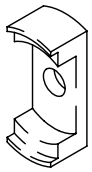
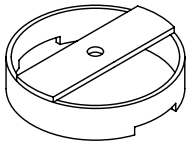
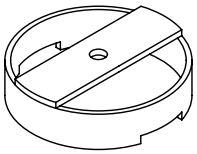
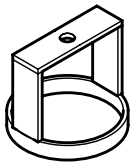
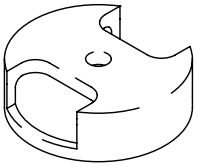
Item	Specified lubricant	Quantity
A/T fluid	DiaQueen ATF SP III	As required
Transfer oil	Gear oil API classification GL-3 SAE 75W-85W	As required
Oil seal	Mitsubishi Part No.0101011 or equivalent	As required

SPECIAL TOOL(S)

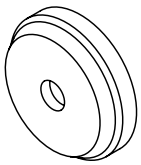
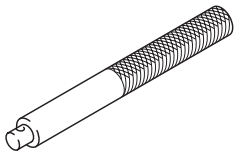
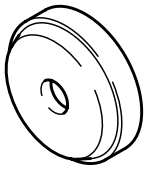
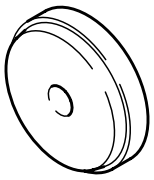
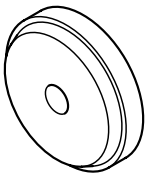
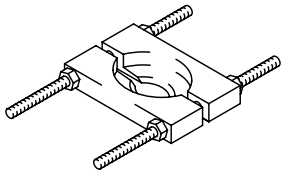
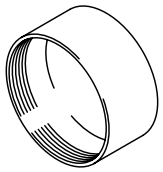
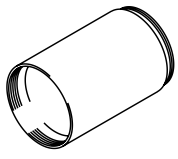
M1233000601092

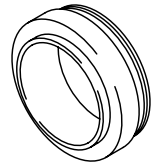
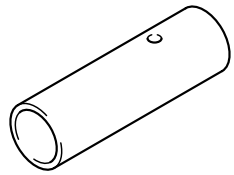
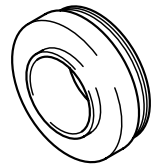
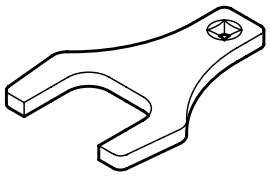
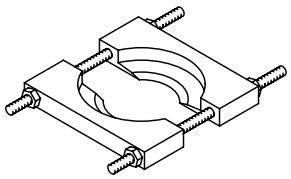
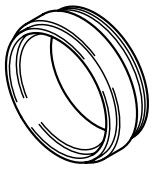
TRANSMISSION

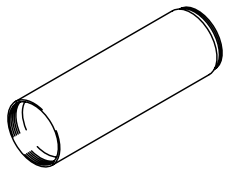
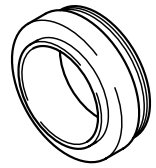
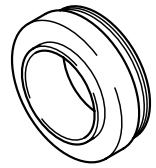
Tool	Number	Name	Use
	MB990936	Installer adapter	Installation of oil seal
	MB990938	Handle	Use with installer adapter
 D998727	MD998727	Oil pan remover	Removal of oil pan
	MD998333	Oil pump remover	Removal of oil pump
	MB991603	Bearing installer stopper	Measurement of output shaft and center support end plays
	MD998029	Oil seal installer	Measurement of output shaft end play
	MB991632	Clearance dummy plate	Measurement of brake reaction plate, second brake and low/reverse brake end plays
	MD998913	Dial gauge extension	Measurement of brake reaction plate, second brake and low/reverse brake end plays

Tool	Number	Name	Use
	MD998412	Guide	Installation of oil pump
	MD998316	Dial gauge support	Measurement of input shaft end play
	MD998924	Spring compressor retainer	Use with spring compressor
	MD999590	Spring compressor	Removal and installation of reverse and overdrive clutch spring retainer snap ring
	MB991629	Spring compressor	Measurement of overdrive clutch and underdrive clutch end plays
	MB991789	Spring compressor	Adjustment reverse clutch end plays
	MB991630	Spring compressor	Removal and installation of center support snap ring
	MD998907	Spring compressor	Removal and installation of underdrive clutch spring retainer snap ring

TRANSFER

Tool	Number	Name	Use
	MB990931	Installer adapter	Installation of oil seal
	MB990938	Handle	Use with installer adapter
	MB990929	Installer adapter	Installation of oil seal <Super select 4WD>
	MB990932	Installer adapter	Installation of oil seal
	MB990933	Installer adapter	Installation of oil seal
	MD998801	Bearing remover	Removal and installation of bearing
	MD998812	Installer cap	Use with installer and installer adapter
	MD998813	Installer-100	Use with installer cap and installer-200

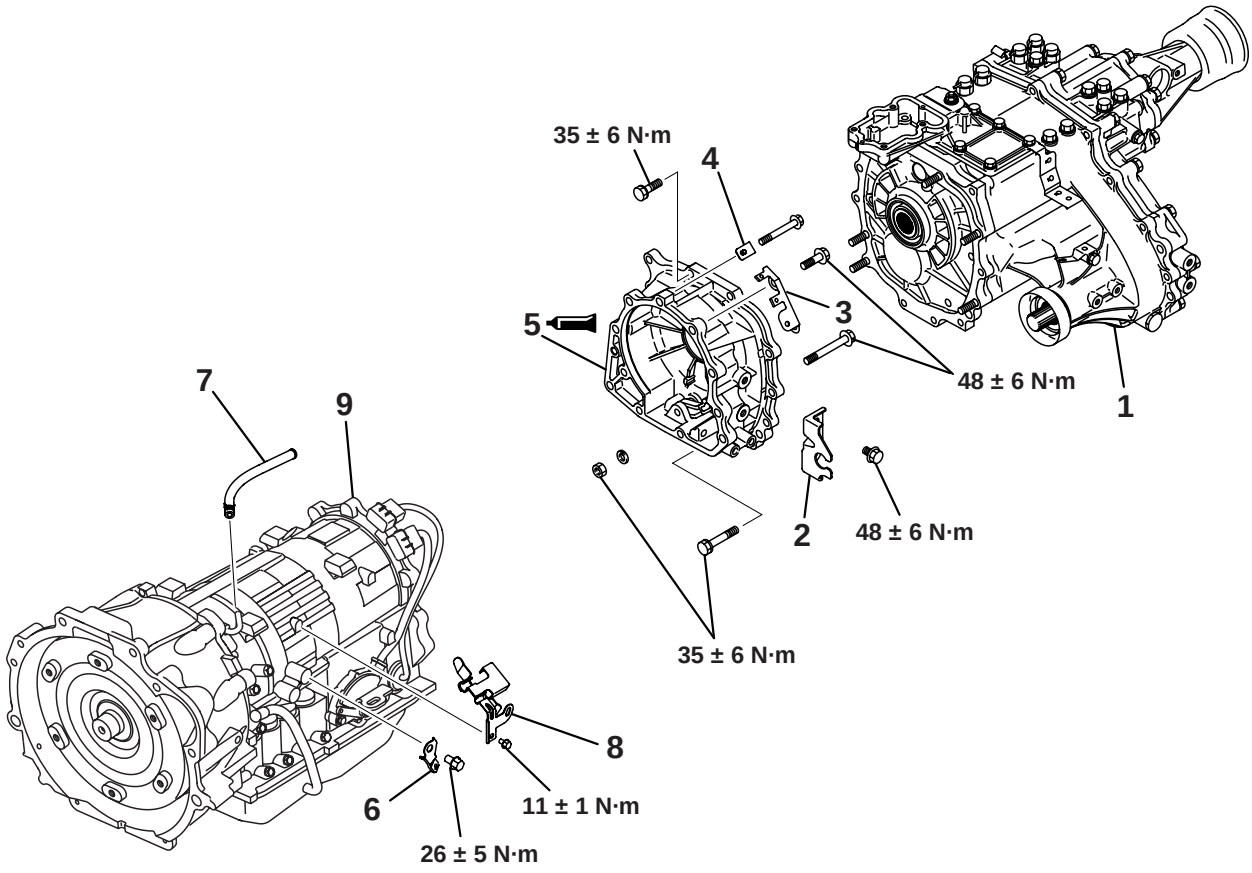
Tool	Number	Name	Use
	MD998824	Installer adapter (50)	Installation of transfer input gear bearing
	MD998368	Bearing Installer	Installation of countershaft gear bearing
	MD998818	Installer adapter (38)	Installation of counter shaft gear bearing, front output shaft bearing <Easy select 4WD>
	MB991013	power steering lock nut special spanner	Removal and installation of output shaft locking nut
	MD998917	Bearing remover	Removal and installation of bearing
	MD998829	Installer adapter (60)	Installation of rear output shaft ball bearing and stopper plate <Easy select 4WD>

Tool	Number	Name	Use
	MD998814	Installer-200	Use with installer cap and installer adapter
	MD998823	Installer adapter	Installation of clutch hub and rear output shaft ball bearing <Super select 4WD>
	MD998821	Installer adapter (44)	Installation of clutch hub and rear output shaft ball bearing <Easy select 4WD>

TRANSMISSION AND TRANSFER

DISASSEMBLY AND REASSEMBLY

M1233023300389



AK801717AB

Disassembly steps

1. Transfer
2. Cable end bracket
3. Harness bracket
4. Harness bracket
>>**A**<< 5. Transfer case adapter

Disassembly steps (Continued)

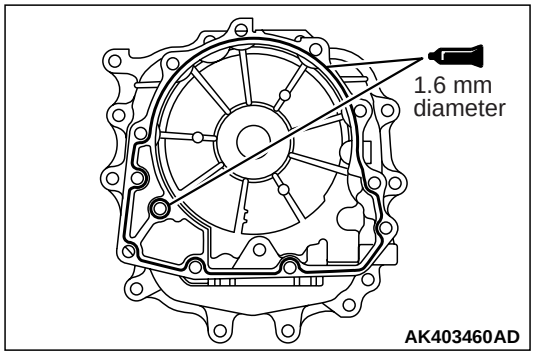
6. Harness bracket
7. Air breather hose
8. Air breather hose bracket
9. Transmission

REASSEMBLY SERVICE POINT

>>A<< TRANSFER CASE ADAPTER INSTALLATION

⚠ CAUTION

- **Completely degrease the FIPG-applied surface so that water and oil including the old sealant cannot adhere to the surface coated with the sealant. Never touch the degreased surface by hand.**
- **Make sure the starting point and the ending point are about the middle between the bolts.**



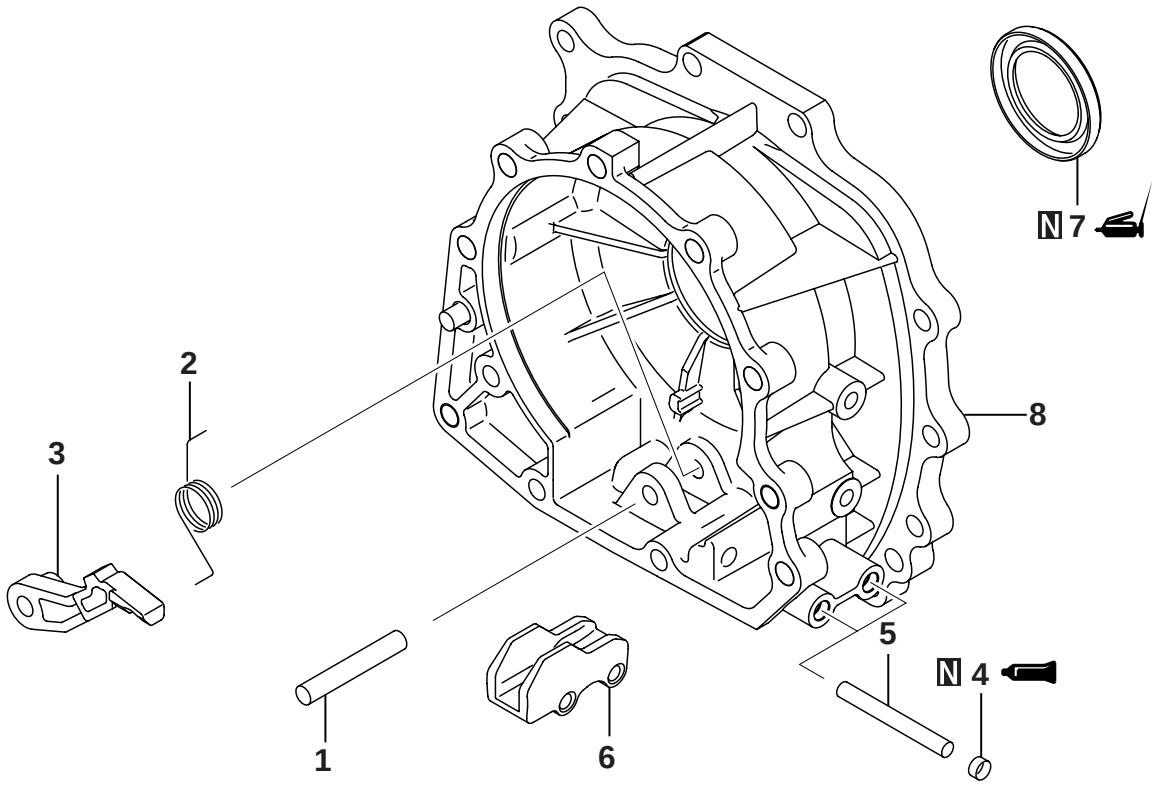
After squeezing out and applying the sealant on the transfer case adapter at the section indicated in the illustration, install onto the transmission case.

Specified sealant:
Mitsubishi Part No.MD997740 or equivalent

TRANSFER CASE ADAPTER

DISASSEMBLY AND REASSEMBLY

M1233007000292



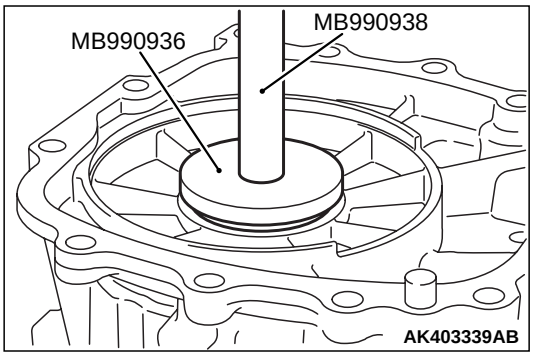
AK602202 AC

Disassembly steps

1. Parking sprag shaft
>>C<< 2. Parking sprag spring
3. Parking sprag
>>B<< 4. Sealing cap
5. Parking roller support shaft
6. Parking roller support
>>A<< 7. Oil seal
8. Transfer case adapter

REASSEMBLY SERVICE POINTS

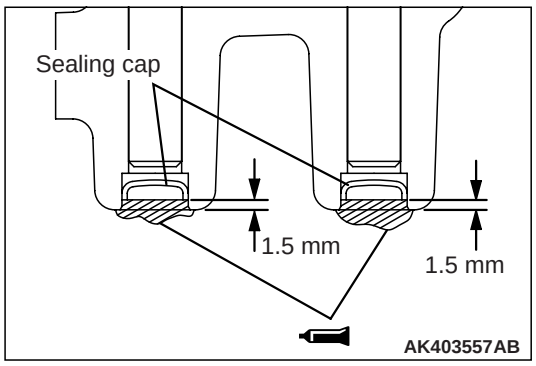
>>A<< OIL SEAL INSTALLATION



1. Use special tools to install the oil seal.
   - Installer adapter (MB990936)
   - Handle (MB990938)
2. Apply specified grease to the lip of the oil seal.

   Specified lubricants:
   Mitsubishi Part No. 0101011 or equivalent

>>B<< SEALING CAP INSTALLATION



1. Press into the dimensions shown in the illustration so that it is not slanted.

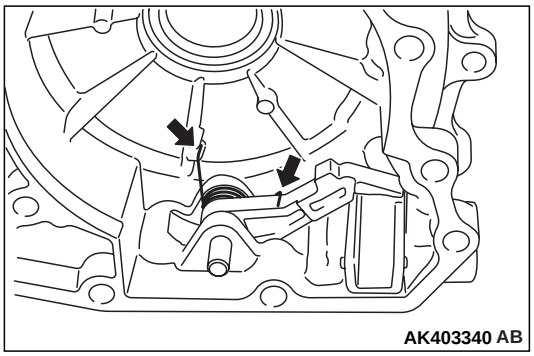
⚠ CAUTION

- **Completely degrease the FIPG-applied surface so that water and oil including the old sealant cannot adhere to the surface coated with the sealant. Never touch the degreased surface by hand.**
- **Make sure the starting point and the ending point are about the middle between the bolts.**

2. Apply the sealant as shown in the illustration.

Specified sealant:
3M™ ATD Part No. 8672 or equivalent

>>C<< PARKING SPRAG SPRING INSTALLATION

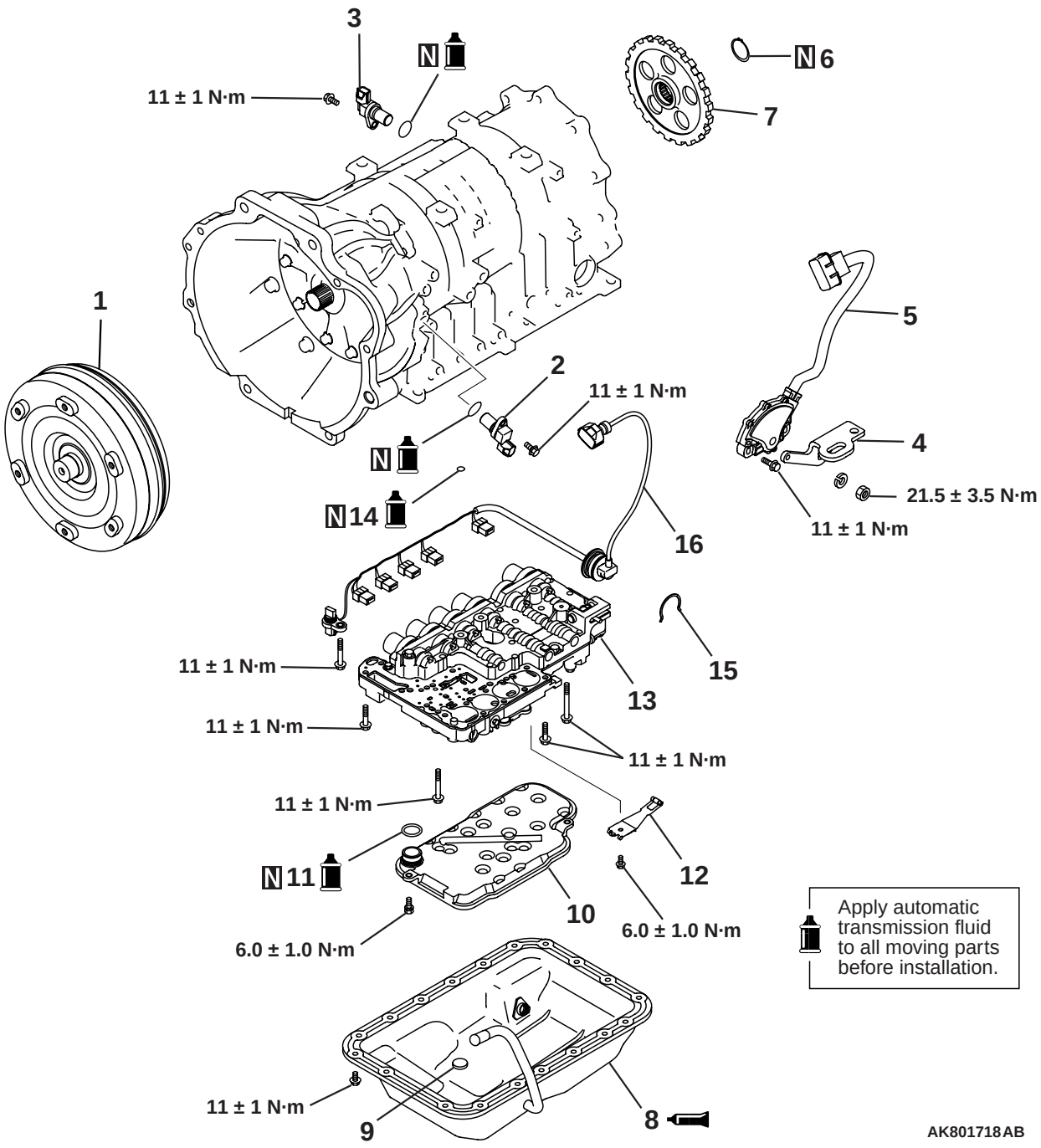


Attach the end of the spring to the position shown in the illustration.

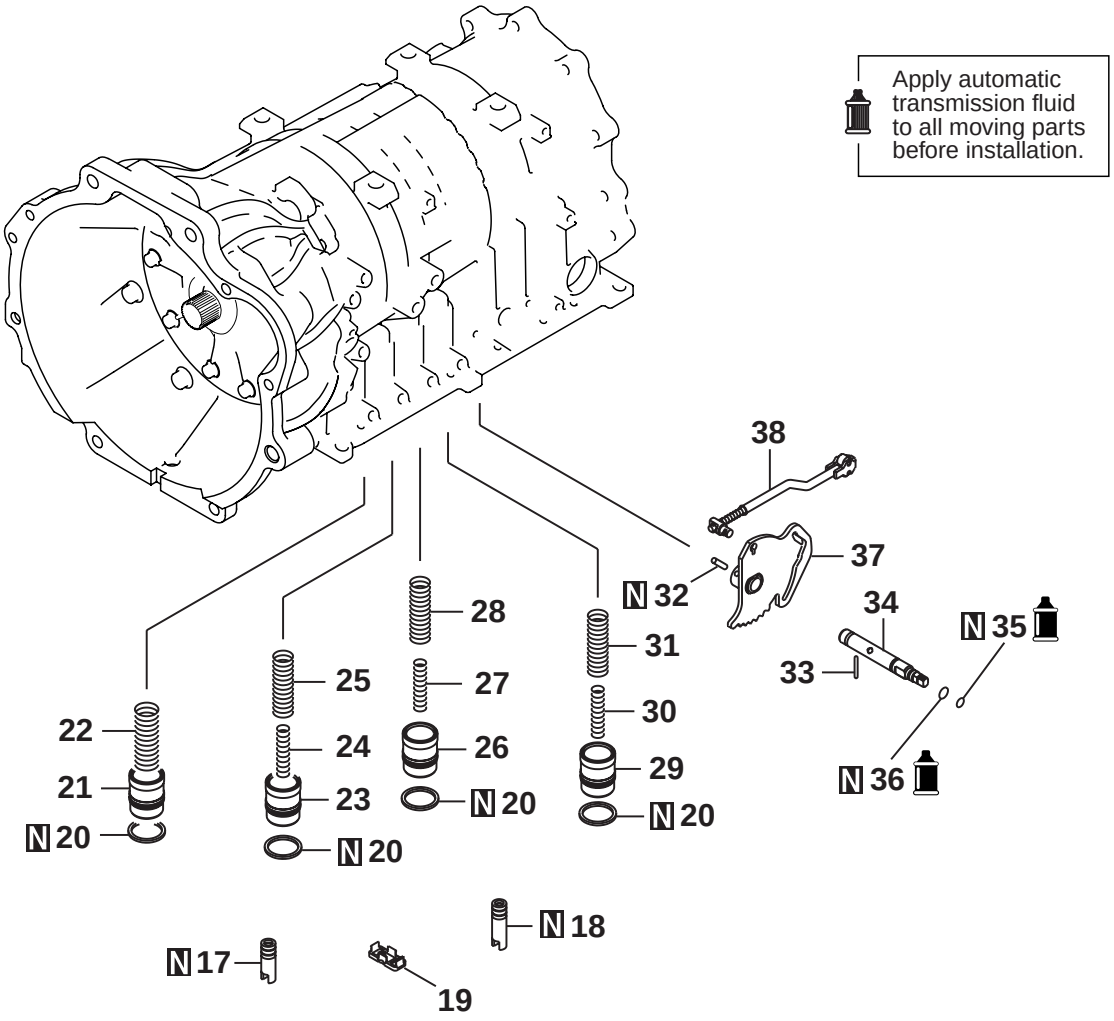
TRANSMISSION

DISASSEMBLY AND REASSEMBLY

M1233101200046

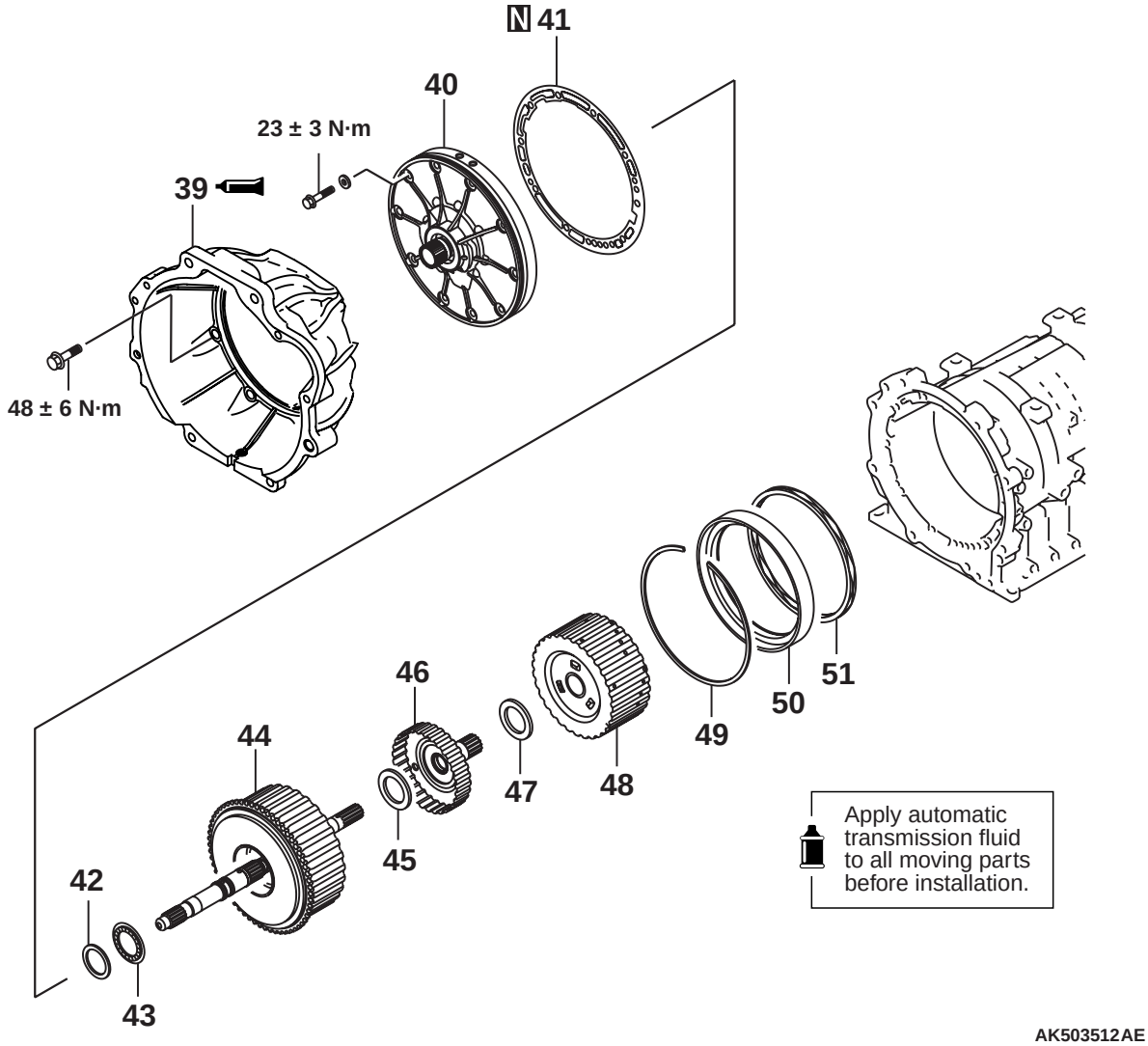


1. Torque converter
2. Input shaft speed sensor
3. Output shaft speed sensor
4. Manual control lever
5. Inhibitor switch
6. Snap ring
7. Parking gear
8. Oil pan
9. Magnet
10. Oil filter
11. O-ring
12. Detent spring
13. Valve body
14. O-ring
15. Snap ring
16. Solenoid valve harness

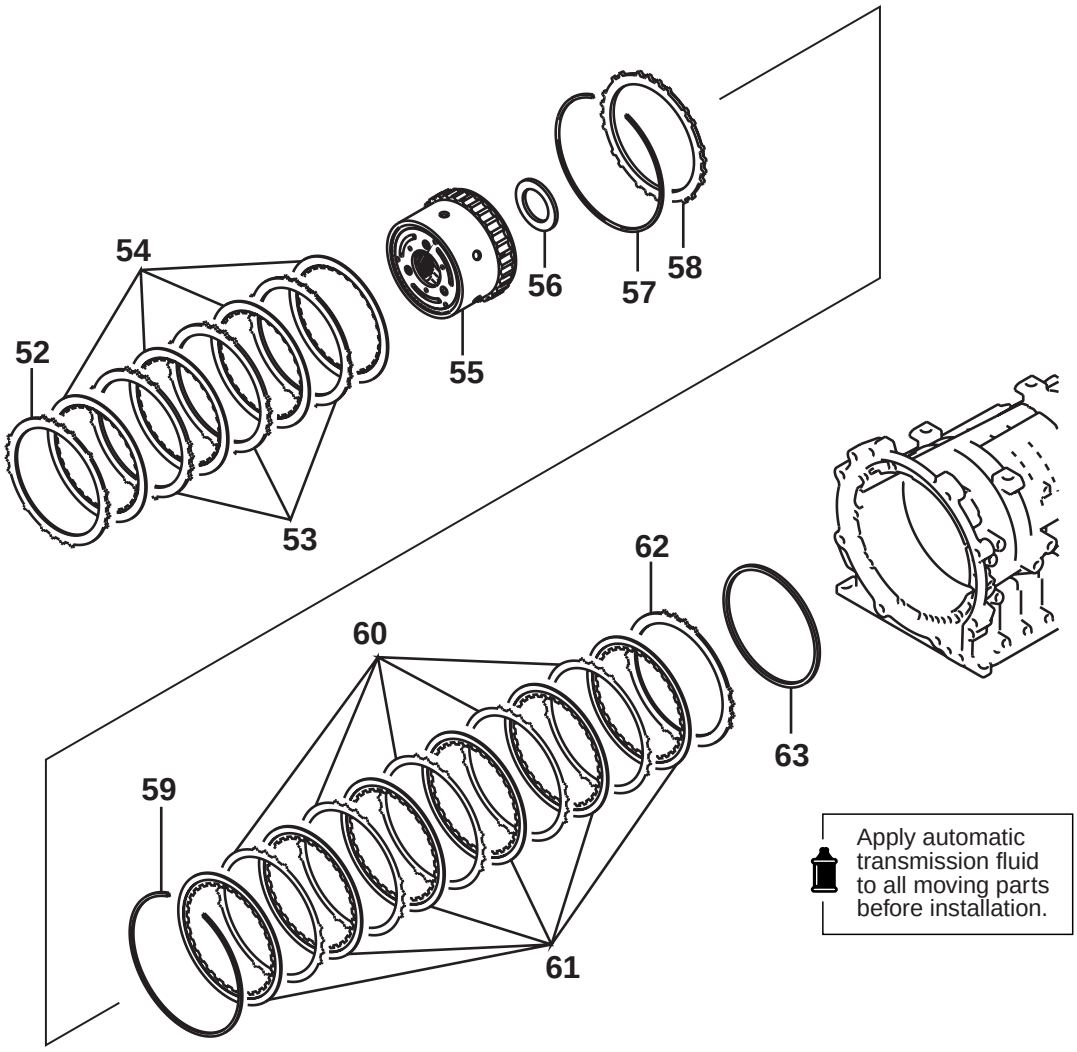


AK503511AD

17. Oil seal
18. Oil seal
19. Oil strainer
20. Seal ring
21. Accumulator piston (for overdrive clutch)
22. Accumulator spring
23. Accumulator piston (for second brake)
24. Inner spring
25. Outer spring
26. Accumulator piston (for low/reverse brake)
27. Inner spring
28. Outer spring
29. Accumulator piston (for underdrive clutch)
30. Inner spring
31. Outer spring
32. Spring pin
33. Pin
34. Manual control shaft
35. O-ring
36. O-ring
37. Detent lever
38. Parking roller rod

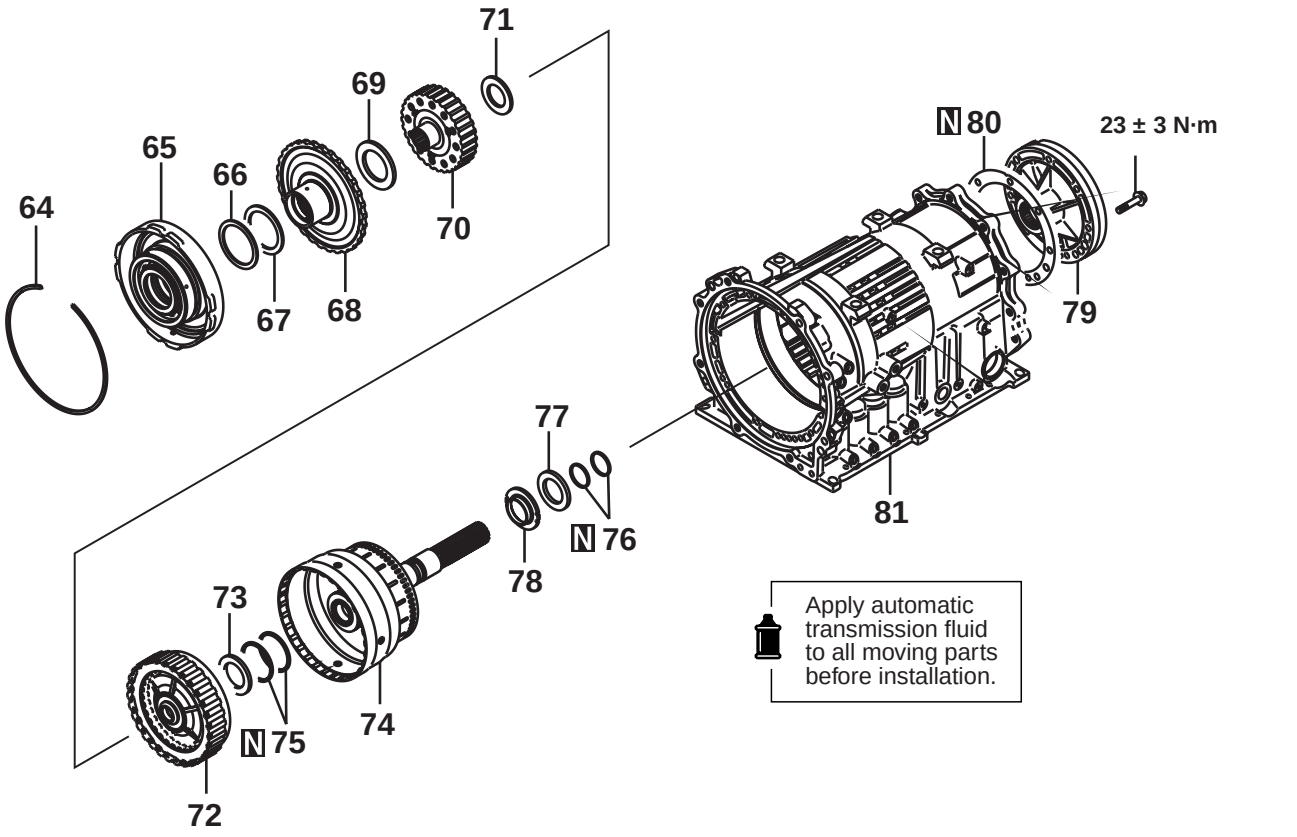


39. Converter housing
40. Oil pump
41. Oil pump gasket
42. Thrust race No.1
43. Thrust bearing No.2
44. Reverse and overdrive clutch
45. Thrust bearing No.3
46. Overdrive clutch hub
47. Thrust bearing No.4
48. Reverse sun gear
49. Snap ring
50. Second brake
51. Return spring



AKX00019AK

52. Pressure plate
53. Brake plate
54. Brake disc
55. Low/reverse annulus gear
56. Thrust bearing No.7
57. Snap ring
58. Reaction plate
59. Snap ring
60. Brake plate
61. Brake disc
62. Pressure plate
63. Wave spring



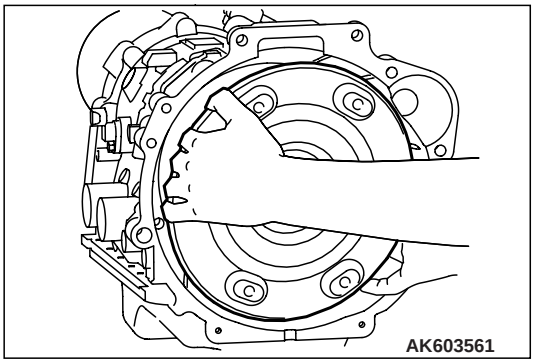
AKX00020AH

64. Snap ring
65. Center support
66. Thrust race No.8
67. Thrust bearing No.9
68. Output flange
69. Thrust bearing No.10
70. Underdrive clutch hub
71. Thrust bearing No.11
72. Underdrive clutch
73. Thrust bearing No.12
74. Output shaft
75. Seal ring
76. Seal ring
77. Thrust bearing No.13
78. Bearing retainer
79. Output shaft support
80. Output shaft support gasket
81. Transmission case

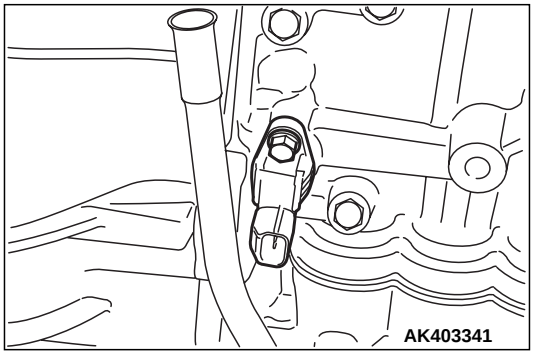
DISASSEMBLY

⚠ CAUTION

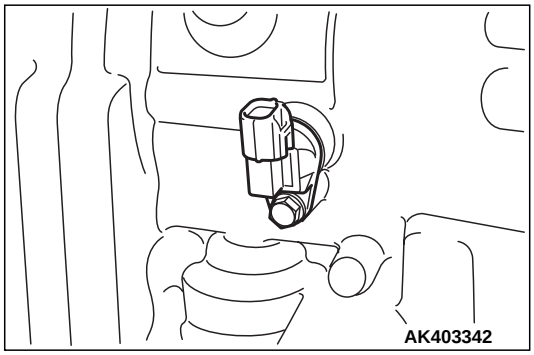
- **The automatic transmission includes many high-precision parts. Handle these parts extremely carefully not to scratch or damage them during disassembly and reassembly.**
- **Work bench should be covered with a rubber mat and keep it clean at all times.**
- **Do not wear any cloth gloves and do not use any rags during disassembly. Use only nylon cloth or paper towels if necessary.**
- **All removed parts must be washed clean. Metal parts may be washed in an ordinary solvent, but they should be dried completely using compressed air.**
- **Clutch discs, plastic thrust plates and rubber parts should be washed in automatic transmission fluid (ATF) and keep them free of dirt after washing.**
- **If the transmission has been found damaged and repaired, also disassemble and clean the ATF cooler system.**


AK603561

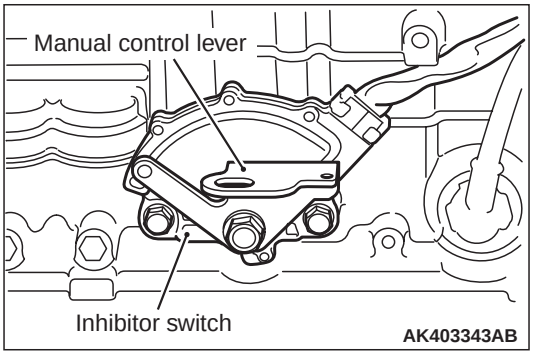
1. Remove the torque converter.


AK403341

2. Remove the input shaft speed sensor.

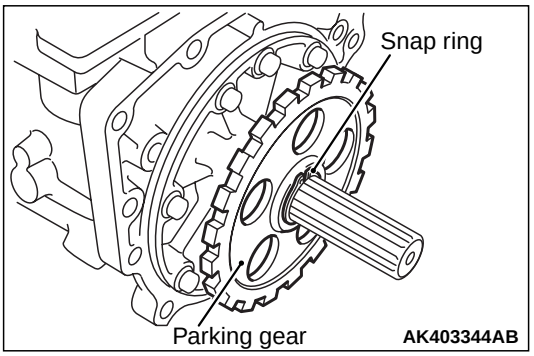

AK403342

3. Remove the output shaft speed sensor.



AK403343AB

4. Remove the manual control lever, and then remove the inhibitor switch.

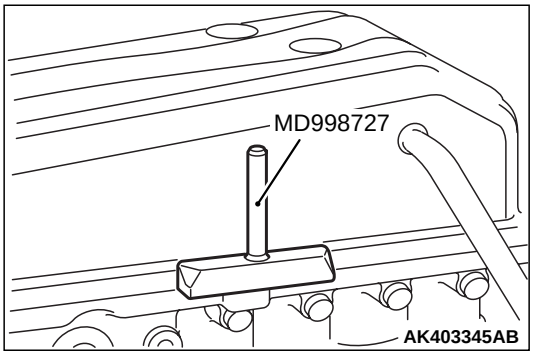


AK403344AB

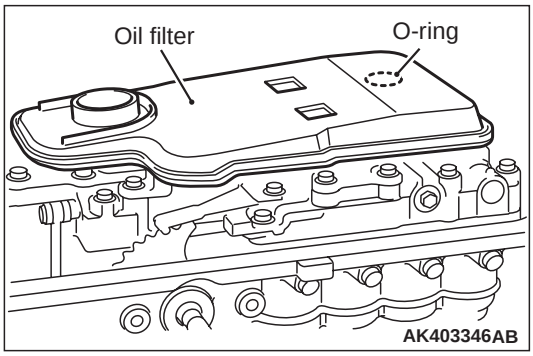
5. Remove the snap ring, and remove the parking gear using a puller (corresponding load approximately 9,800 N).

⚠ CAUTION

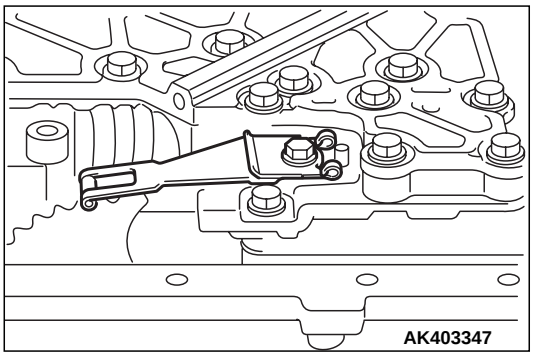
Carefully hammer the special tool so that the oil pan mounting surface is not damaged.



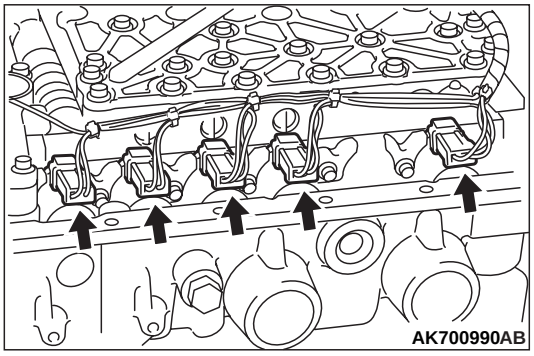
6. Remove the twenty oil pan mounting bolts and then use the special tool Oil pan remover (MD998727) to remove the oil pan.



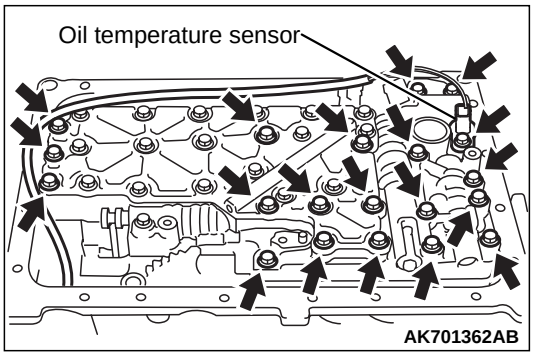
7. Remove the oil filter and O-ring.

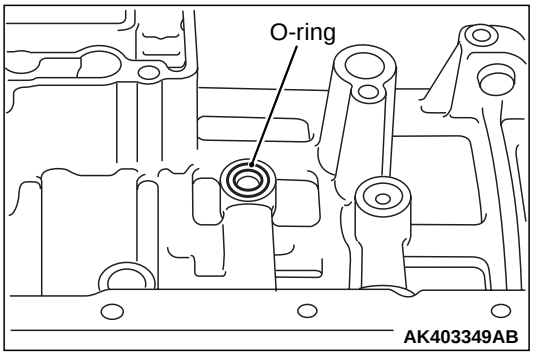


8. Remove the detent spring.



9. Disconnect the valve body harness connectors.

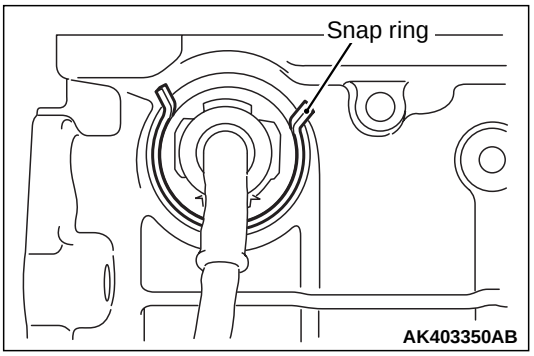




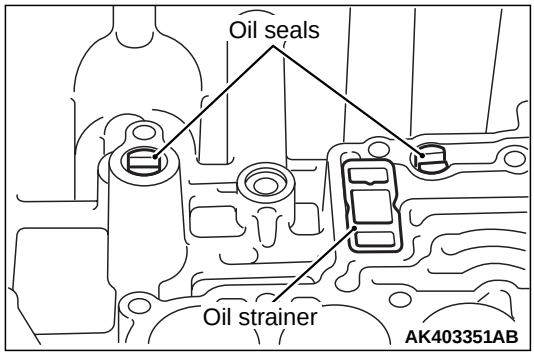
10. Remove the twenty valve body mounting bolts and then remove the valve body, O-ring and oil temperature sensor.

NOTE:

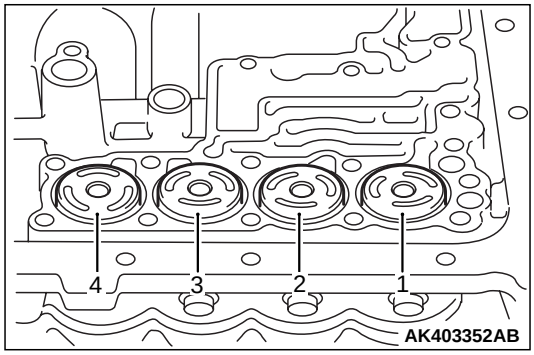
- *The twenty valve body mounting bolts are plated bolts.*
- *The O-ring is mounted on the transmission case side as shown in the illustration. However there may be cases when it will come off with the valve body.*



11. Remove the snap ring and disconnect the solenoid valve harness.



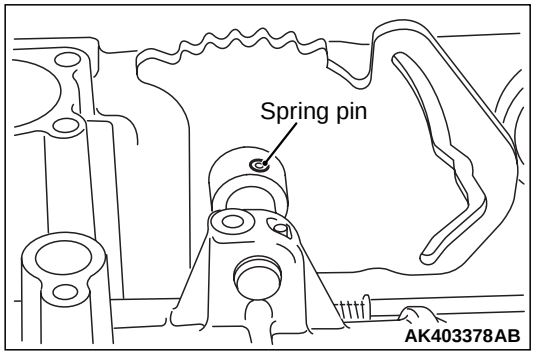
12.Remove the oil strainer and two oil seals.



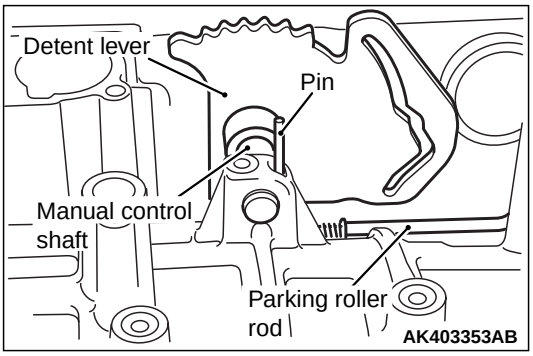
13.Remover each accumulator piston, seal ring and spring.

No.	Name
1	For overdrive clutch
2	For second brake
3	For low/reverse brake
4	For underdrive clutch

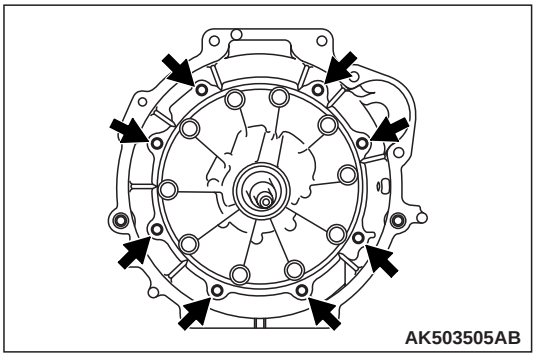
NOTE: To make assembly easier, attach an identification tag on the removed accumulator piston.



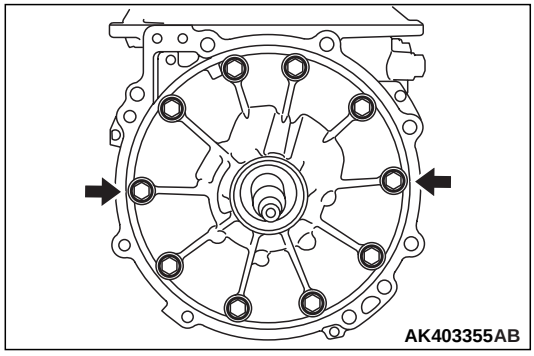
14.Remove the detent lever spring pin.



15.Remove the pin, and then remove the manual control shaft, two O-rings, detent lever and parking roller rod.

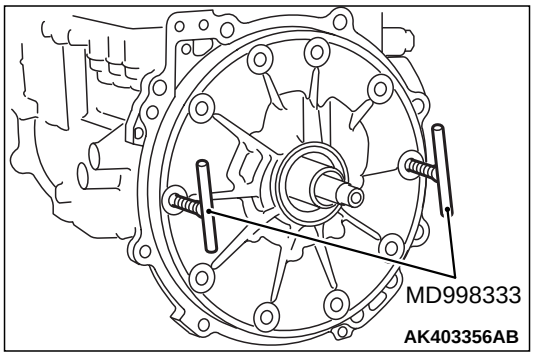


16.Remove the eight converter housing mounting bolts, and then the converter housing.



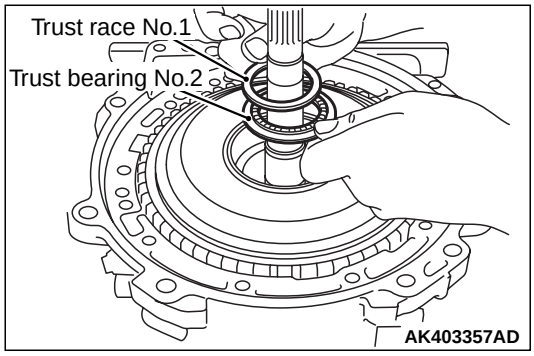
17.Remove the ten oil pump mounting bolts.

18.Install special tool Oil pump remover (MD998333) into the bolt hole shown in the illustration.



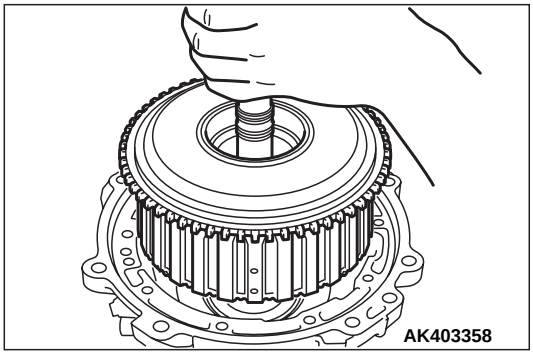
19.While screwing in special tools Oil pump remover (MD998333) evenly, remove the oil pump.

20.Remove the oil pump gasket.

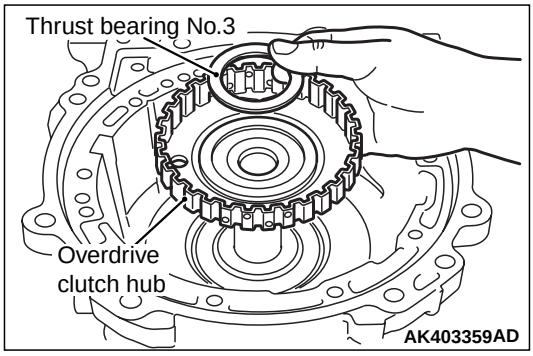


21.Remove the thrust race No.1 and thrust bearing No.2.

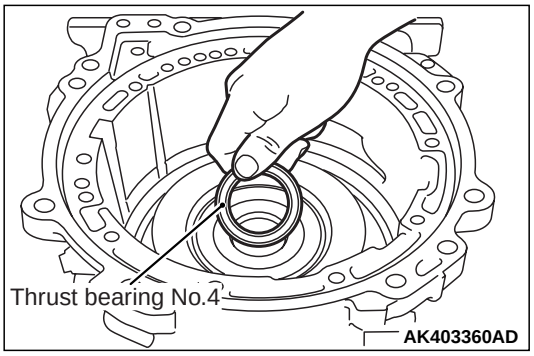
NOTE: The thrust race No.1 may be attached to the oil pump.



22.Remove the reverse overdrive clutch.

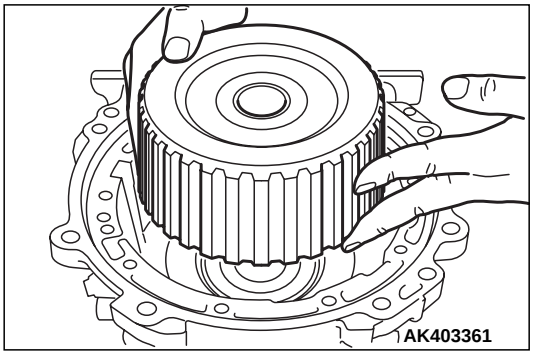


23.Remove the overdrive clutch hub and thrust bearing No.3.

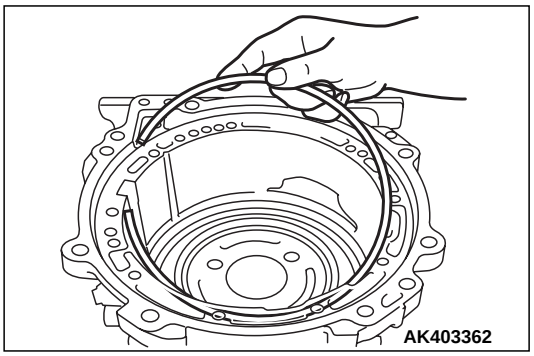


24.Remove the thrust bearing No.4.

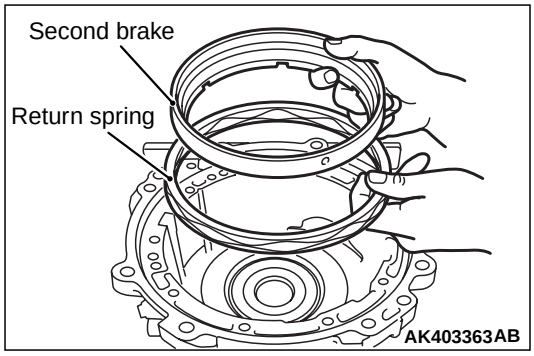
NOTE: The thrust bearing No.4 may be attached to the overdrive clutch hub.



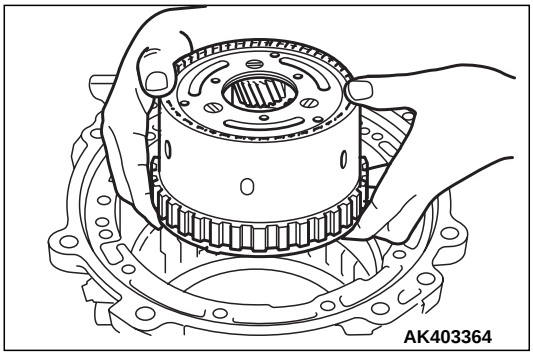
25.Remove the reverse sun gear.



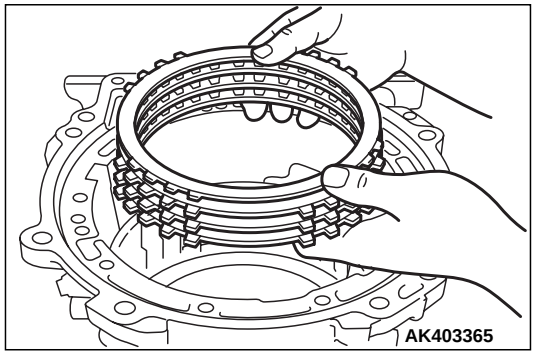
26.Remove the snap ring.



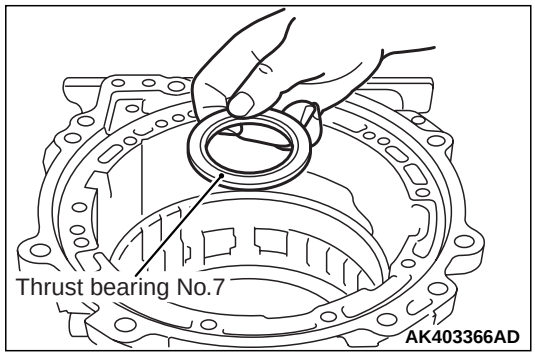
27.Remove the second brake and return spring.



28.Remove the low/reverse annulus gear.

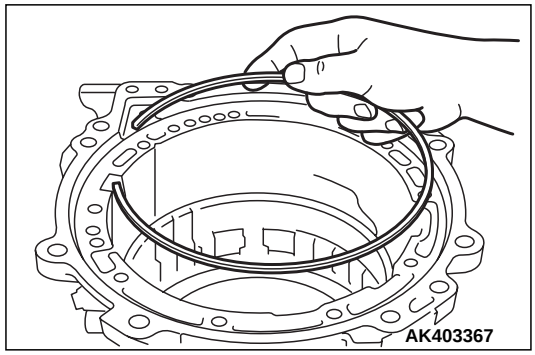


29.Remove the pressure plate, brake plates and brake discs.

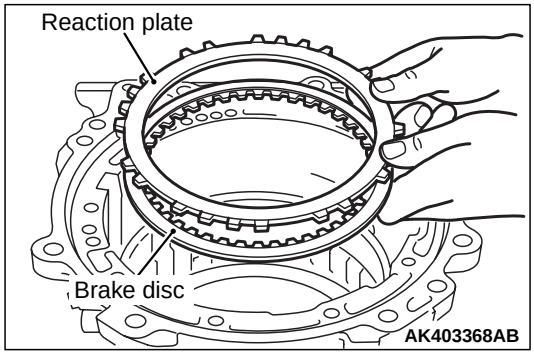


30.Remove the thrust bearing No.7.

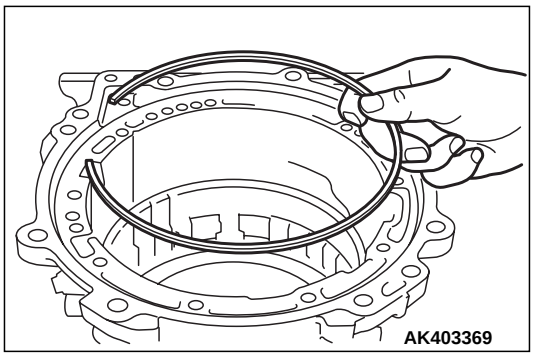
NOTE: The thrust bearing No.7 may be attached to the low/reverse annulus gear.



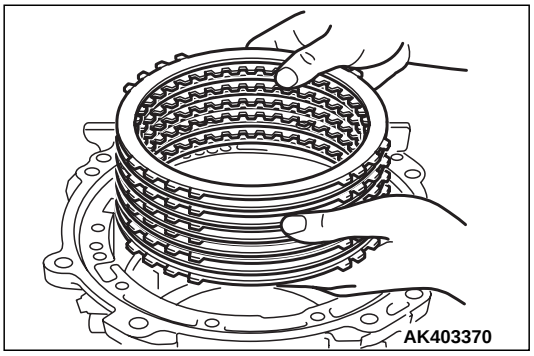
31.Remove the snap ring.



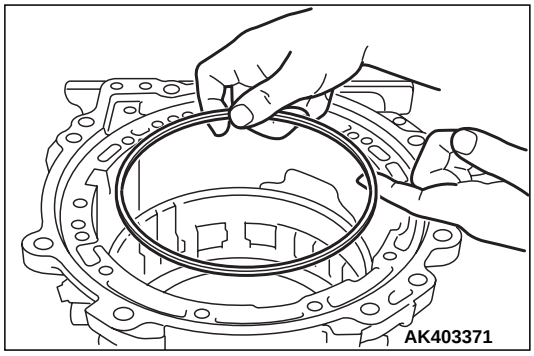
32.Remove the reaction plate and one brake disc.



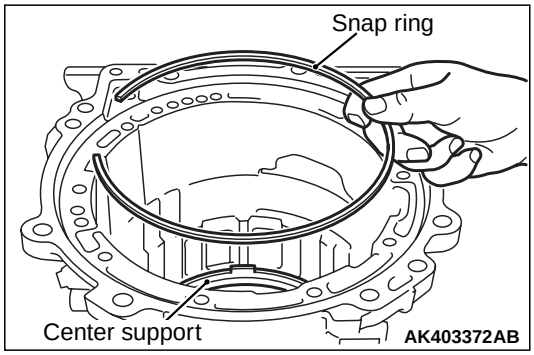
33.Remove the snap ring.



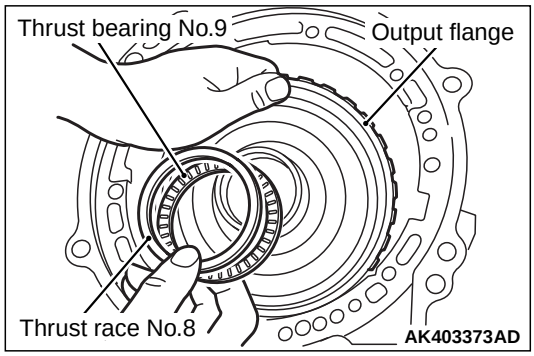
34.Remove the brake plates, brake discs, and pressure plate.



35.Remove the wave spring.

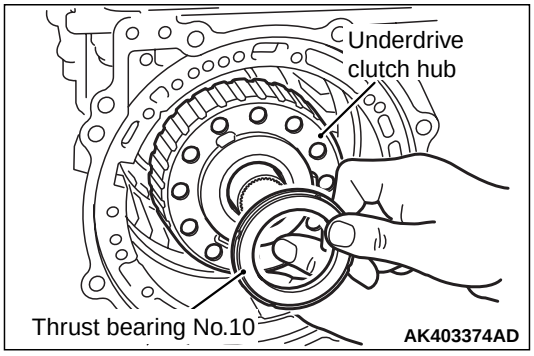


36.Remove the snap ring and center support.

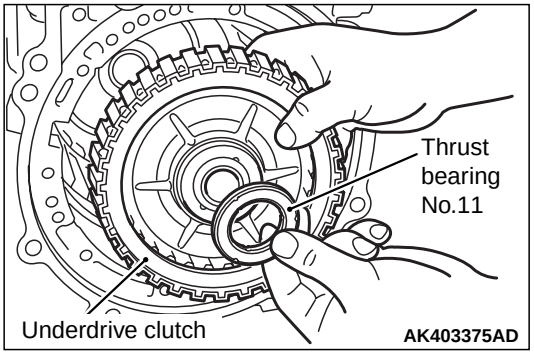


37.Remove the thrust race No.8, thrust bearing No.9 and output flange.

NOTE: The thrust race No.8 may be attached to the center support.

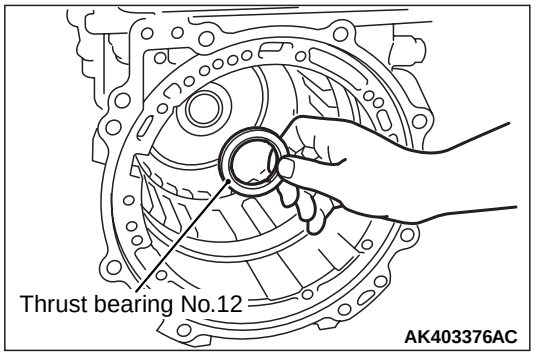


38.Remove the thrust bearing No.10 and underdrive clutch hub.



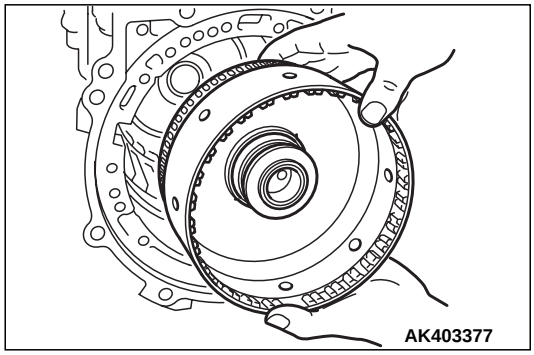
39.Remove the thrust bearing No.11 and underdrive clutch.

NOTE: The thrust bearing No.11 may be attached to the underdrive clutch hub.

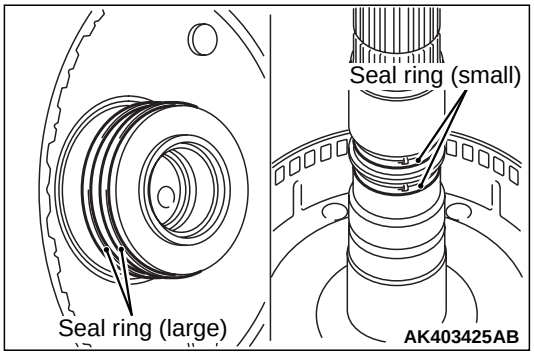


40.Remove the thrust bearing No.12.

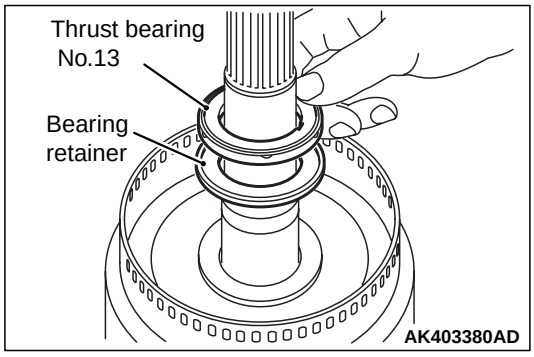
NOTE: The thrust bearing No.12 may be attached to the underdrive clutch.



41.Remove the output shaft.

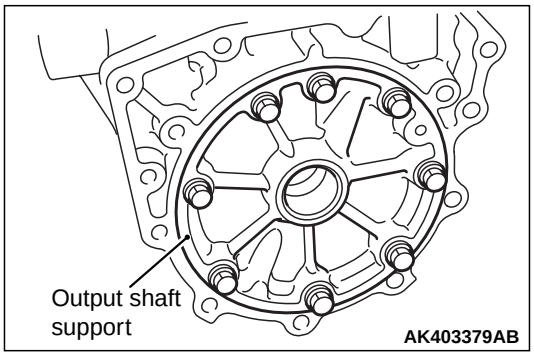


42.Remove the two large and two small seal rings from the output shaft.



43.Remove the thrust bearing No.13 and bearing retainer.

NOTE: The thrust bearing No.13 may be attached to the output shaft support.



44.Remove the eight output shaft support mounting bolts, and then remove the output shaft support and gasket.

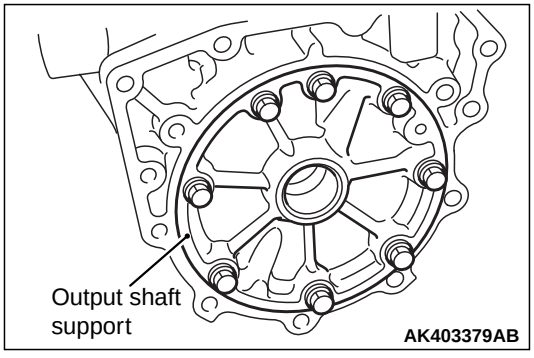
REASSEMBLY

⚠ CAUTION

- **Never reuse any gasket, O-ring, and oil seal. Always replace them with new ones.**
- **Never use any product other than blue petrolatum jelly or white vaseline to lubricate or hold parts during assembly.**
- **Apply ATF to friction elements, rotating parts, and sliding parts before installation.Soak new clutch discs or brake discs in ATF for at least two hours before installing them.**
- **Never apply sealant or adhesive to gaskets.**
- **When a bushing requires replacement, replace the assembly of which the bushing forms a part.**
- **Never use any cloth gloves or any rags during reassembly. Use only nylon cloth or paper towels if necessary.**
- **Change also the ATF in the cooler circuit.**

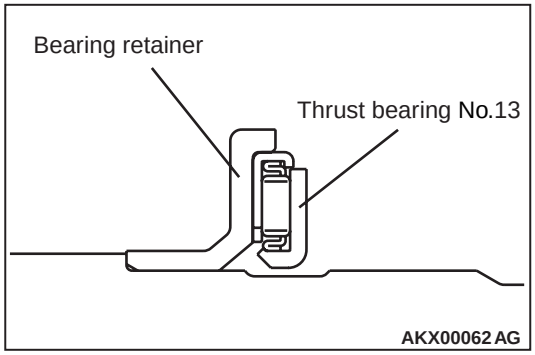
⚠ CAUTION

Never reuse a gasket.

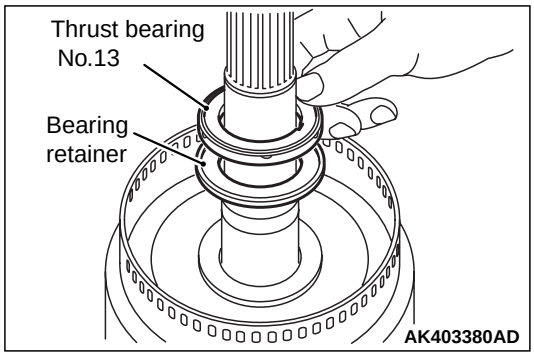


1. Install a new gasket and output shaft support.
2. Tighten the eight output shaft support mounting bolts to the specified torque 23 ± 3 N·m.

⚠ CAUTION

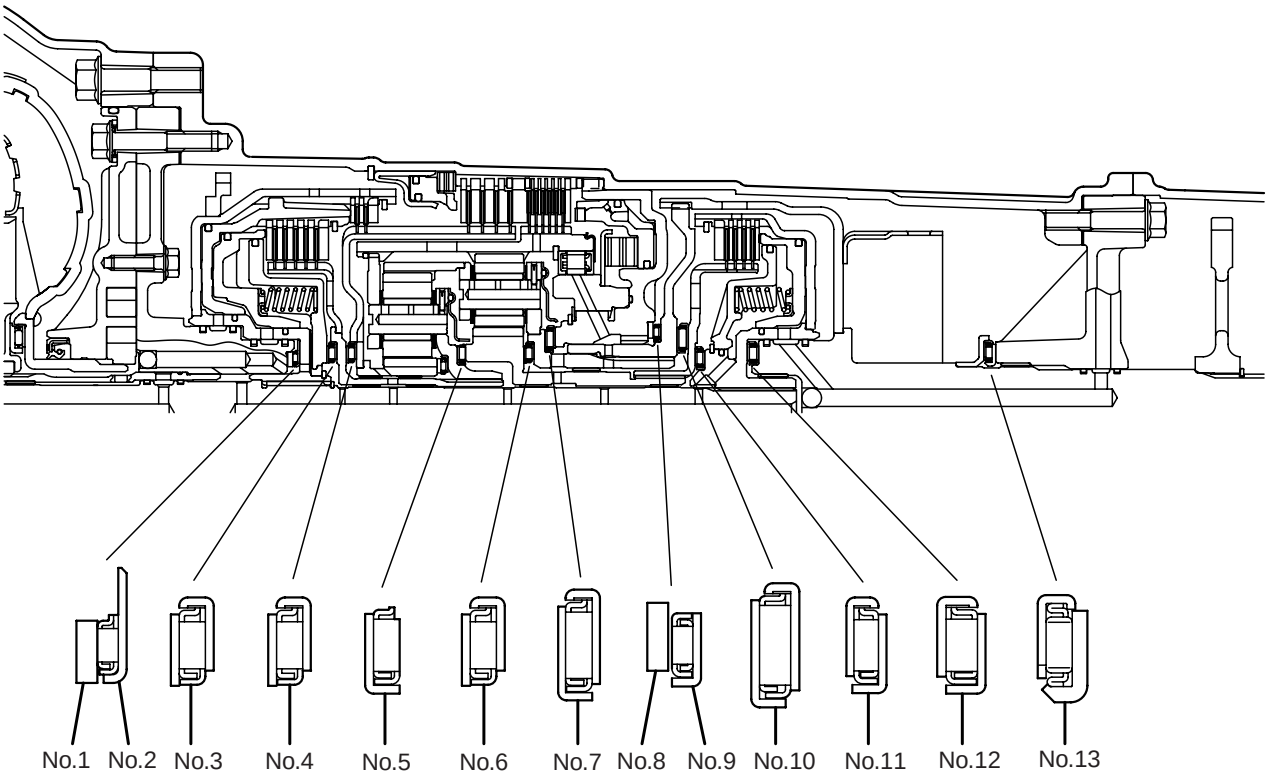


Make sure the thrust bearing is mounted in the correct direction.



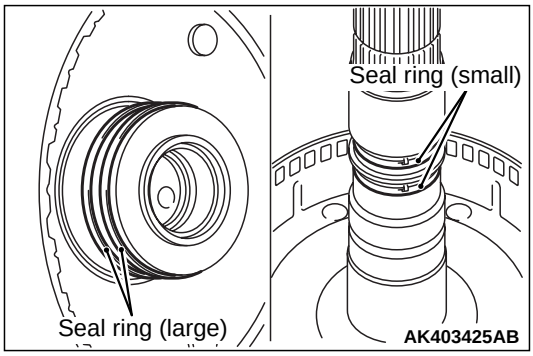
3. Install the bearing retainer and thrust bearing No.13 onto the output shaft.

Identification of thrust bearing and thrust race

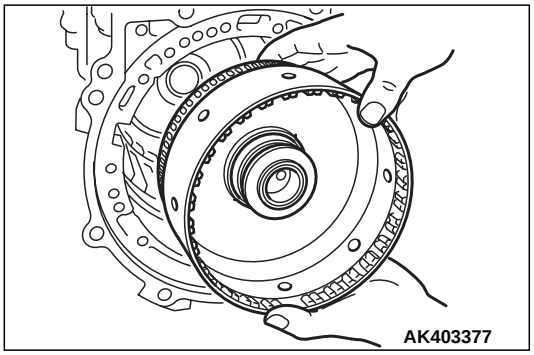


AKX00061AE

Symbol	O.D. mm	I.D. mm	Thickness mm	Symbol	O.D. mm	I.D. mm	Thickness mm
No.1	48.9	37	1.4	No.7	70	48.8	4.0
			1.6	No.8	73	60	1.6
			1.8				1.8
			2.0				2.0
			2.2				2.2
			2.4				2.4
			2.6	No.9	71.45	57	2.81
No.2	59	37	2.8	No.10	72	48.25	4.6
No.3	57	38.5	4.12	No.11	53	34.7	4.01
No.4	57	38.5	4.12	No.12	57	38.5	4.12
No.5	55.4	38.5	3.31	No.13	58	37.5	4.8
No.6	57	38.5	4.12				

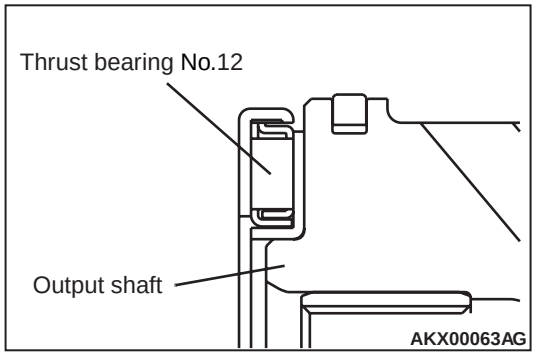


4. Install new seal rings (two large pieces and two small pieces) onto the output shaft.

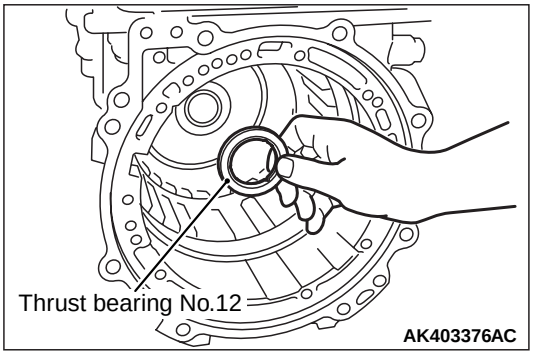


5. Install the output shaft into the output shaft support.

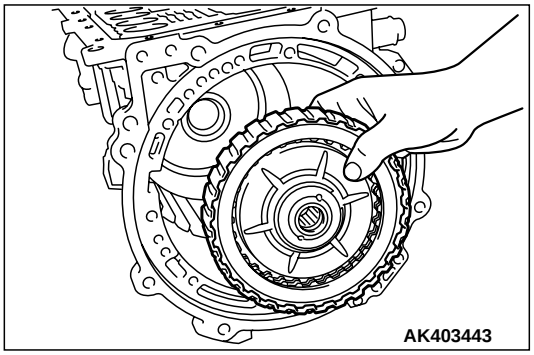
⚠ CAUTION



Make sure thrust bearing No.12 is mounted in the correct direction.

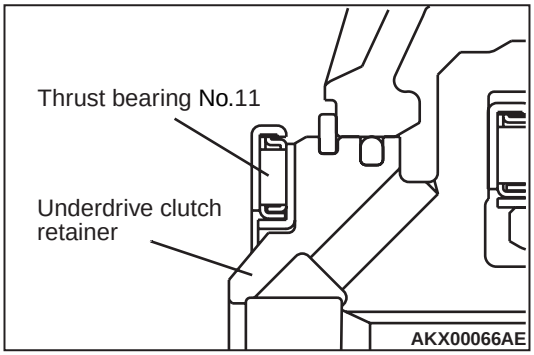


6. Apply vaseline or petroleum jelly on the thrust bearing No.12, and then install on the front end of the output shaft.

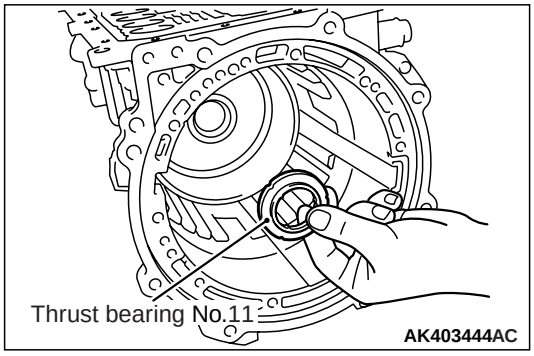


7. Install the underdrive clutch.

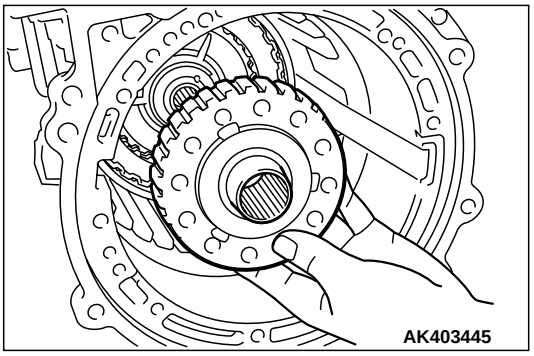
⚠ CAUTION



Make sure thrust bearing No.11 is mounted in the correct direction.

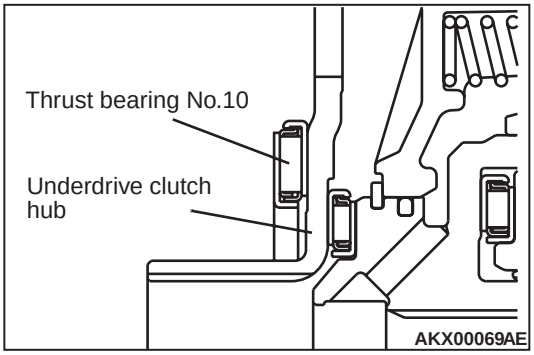


8. Apply vaseline or petroleum jelly on the thrust bearing No.11, and then install on the front end of the underdrive clutch retainer.

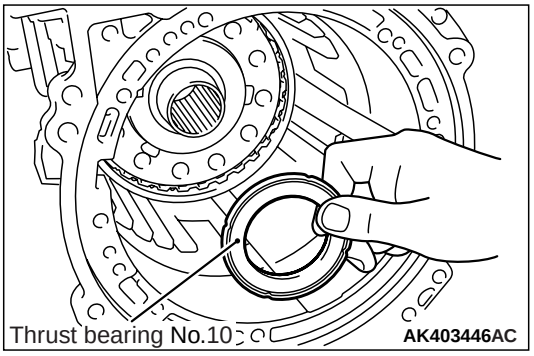


9. Install the underdrive clutch hub.

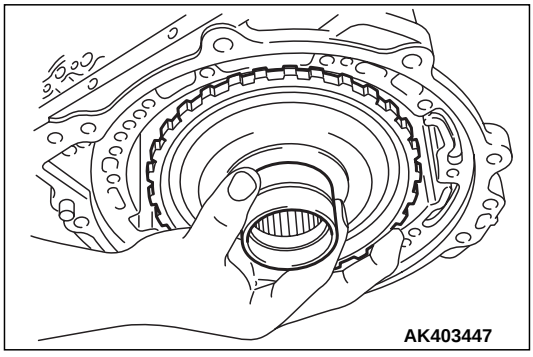
⚠ CAUTION



Make sure thrust bearing No.10 is mounted in the correct direction.

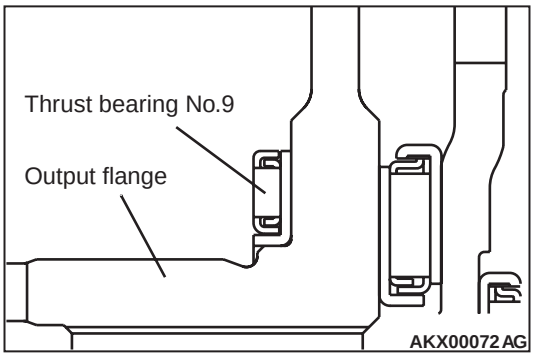


10.Apply vaseline or petroleum jelly on the thrust bearing No.10, and then install it on the underdrive clutch hub.

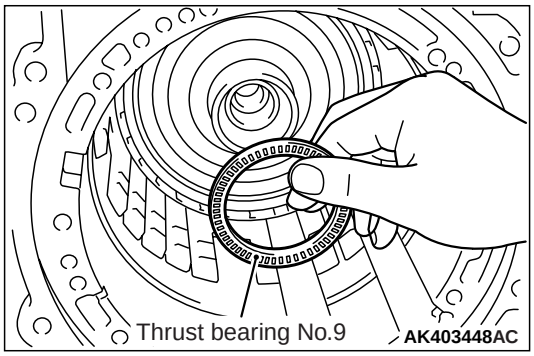


11.Install the output flange.

⚠ CAUTION



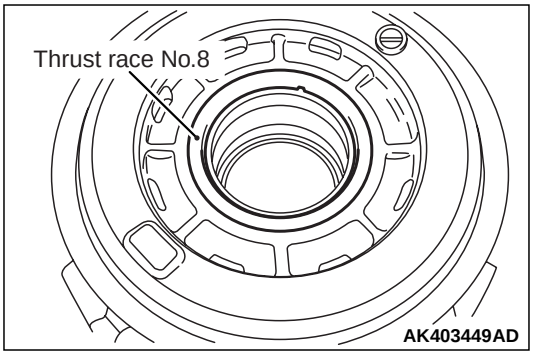
Make sure thrust bearing No.9 is mounted in the correct direction.



12.Apply vaseline or petroleum jelly on the thrust bearing No.9, and then install on the output flange.

⚠ CAUTION

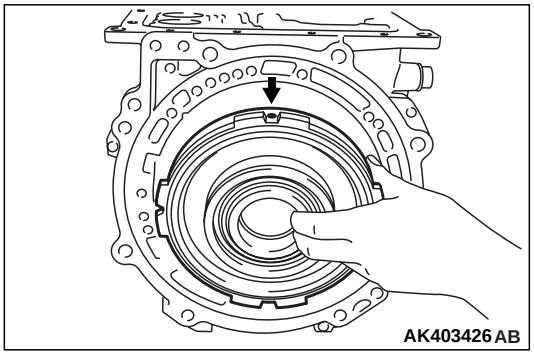
Measure and record the thickness of the thrust race No.8 to be assembled.



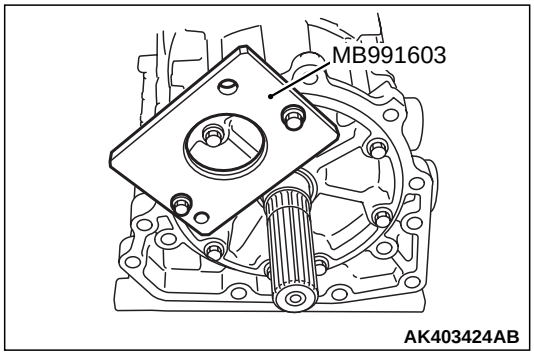
13.Apply vaseline or blue petroleum jelly on the thrust race No.8 being used, and then install it on the rear side of the center support.

⚠ CAUTION

- **Install the center support so that the oil holes shown in the illustration face the lower side of the transmission case.**
- **Make sure that the thrust race No.8 attached to the rear side of the center support does not fall off.**



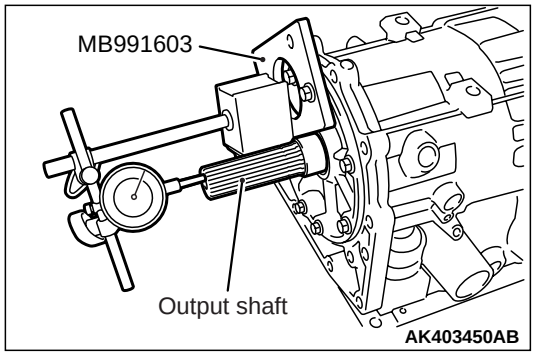
14.Install the center support.



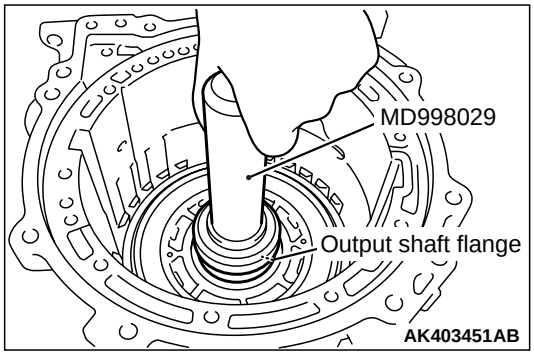
15.Remove the two output shaft support mounting bolts.

16.Using the two removed bolts, install special tool Bearing installer stopper (MB991603) to the specified torque 23 ± 3 N·m.

17.Select the thrust race No.8 with the following procedure.



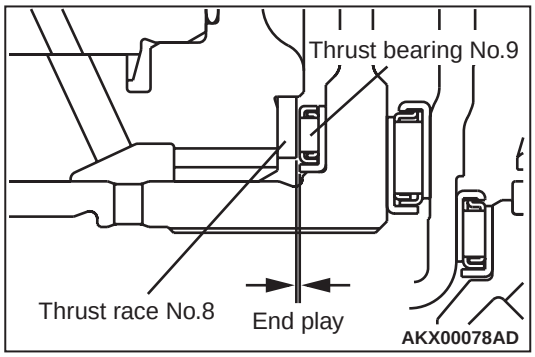
(1) Fix a dial gauge to special tool Bearing installer stopper (MB991603).



(2) Push the output shaft, and the output flange in alternately, and then measure the end play of output shaft.

NOTE:

- *When pushing the output shaft in, take care that the center support does not move.*
- *When pushing the output flange in, use the special tool Oil seal installer (MD998029).*



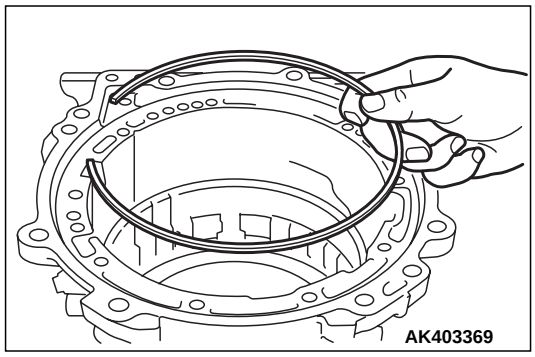
(3) Reinstall by selecting the thrust race No.8 installed by the procedure (13) so that the end play of output shaft becomes the standard value.

NOTE: Refer to the thickness recorded in step 13.

Standard value: 0.25 – 0.71 mm
(For output shaft end play)

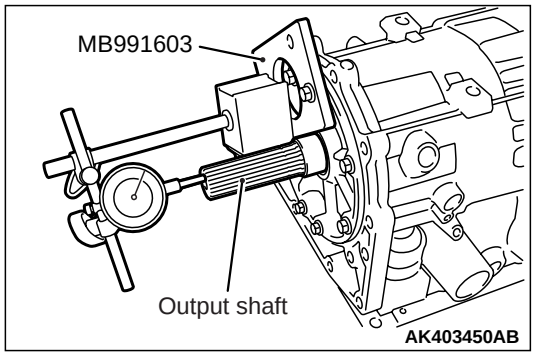
(4) Measure the end play again, and confirm that it is within the standard value.

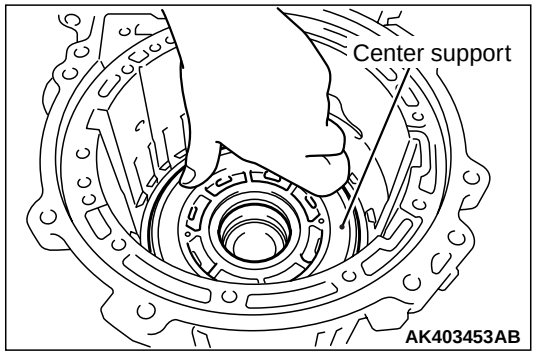
NOTE: Carry this step out with special tool Bearing installer stopper (MB991603) and dial gauge installed.



18.Using the following steps, select the snap ring for fixing the center support.

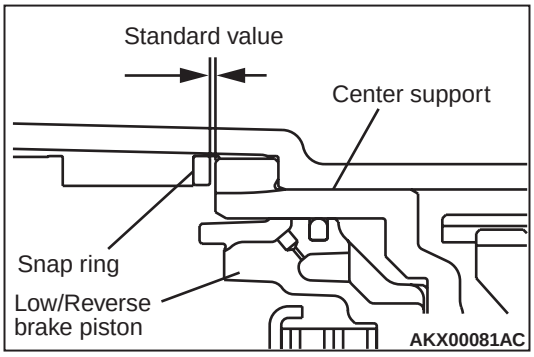
(1) Install the snap ring used for fixing the center support used.





(2) After pushing the output shaft, and the center support in alternately, and then measure the end play of center support.

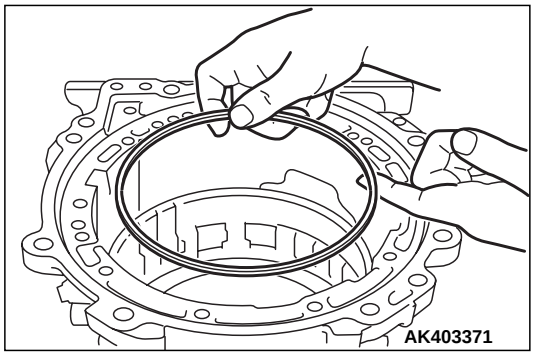
NOTE: When pushing the output shaft in, be sure to push them in to the point where the center support touches the snap ring.



(3) Select the snap ring for fixing the center support installed in step 18 (1) so that the end play of the center support is at the standard value. Then, reassemble.

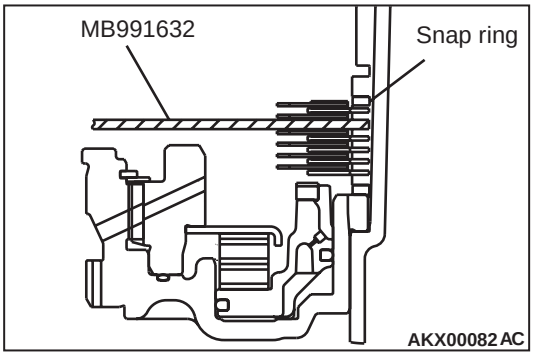
Standard value: 0 – 0.16 mm
(For center support end play)

(4) Measure the end play again, and confirm that it is within the standard value.



19.Using the following steps, select the snap ring for adjusting the brake reaction plate end play and second brake end play, and the pressure plate for adjusting the low/reverse brake end play.

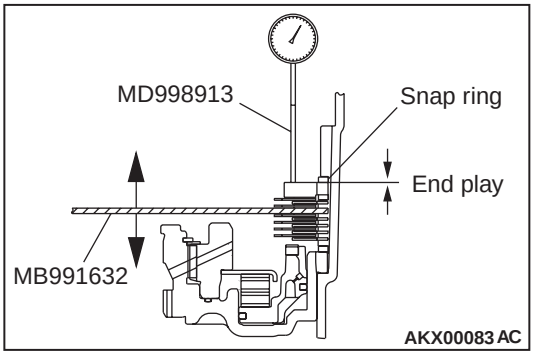
(1) Install the wave spring onto the low/reverse brake piston.



(2) Install special tool Clearance dummy plate (MB991632) onto the position shown in the illustration instead of the pressure plate for the low/reverse brake. Install the six brake disc, five brake plate and snap ring.

⚠ CAUTION

Pay close attention to the assembly direction of the reaction plate.



(3) Install the reaction plate and snap ring that was used.

(4) Install a dial gauge onto special tool Dial gauge extension (MD998913) so that the end contacts the brake reaction plate. Measure the end play by moving special tool Clearance dummy plate (MB991632).

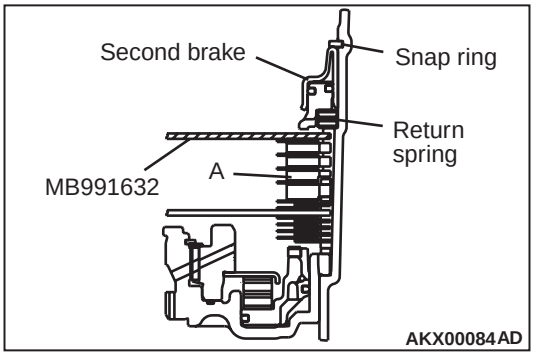
(5) Select the snap ring installed in step 19 (3) so that the end play is within the standard value. Then, reassemble.

Standard value: 0 – 0.16 mm
(For brake reaction plate end play)

(6) Measure the end play again, and confirm that it is within the standard value.

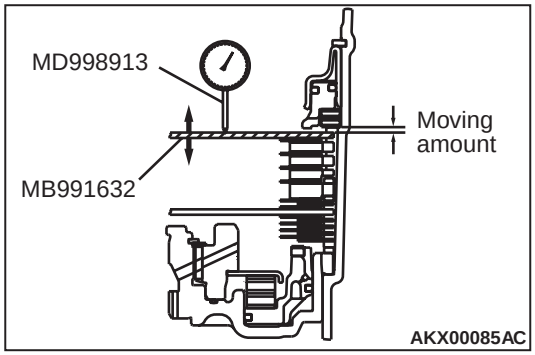
⚠ CAUTION

Pay close attention to the shape and assembly direction of the brake plate A installation.



(7) Next, install special tool Clearance dummy plate (MB991632) instead of the pressure plate for the second brake. Install the four brake discs and three brake plates.

(8) Install the return spring, second brake and snap ring.



(9) Install a dial gauge onto special tool Dial gauge extension (MD998913) so the end contacts the special tool. Move special tool Clearance dummy plate (MB991632) and measure the moving amount. Select a pressure plate with a thickness that corresponds to the measured moving amount from the following table.

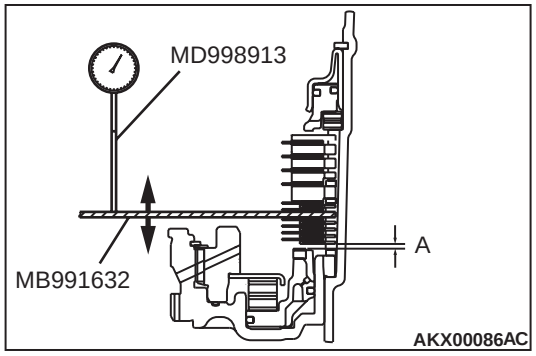
Standard value (reference): 1.49 – 1.95 mm
(For second brake end play)

PRESSURE PLATE FOR SECOND BRAKE

Moving amount mm	Pressure plate	
	Thickness mm	Identification symbol
1.2 or more – less than 1.4	1.6	F
1.4 or more – less than 1.6	1.8	E
1.6 or more – less than 1.8	2.0	D
1.8 or more – less than 2.0	2.2	C
2.0 or more – less than 2.2	2.4	B
2.2 or more – less than 2.4	2.6	A
2.4 or more – less than 2.6	2.8	0
2.6 or more – less than 2.8	3.0	1

(10) Remove the snap ring, second brake, return spring and special tool Clearance dummy plate (MB991632) installed in step (8).

(11)Install the pressure plate selected in step (9), and install the return spring, second brake and snap ring again.



PRESSURE PLATE FOR LOW/REVERSE BRAKE

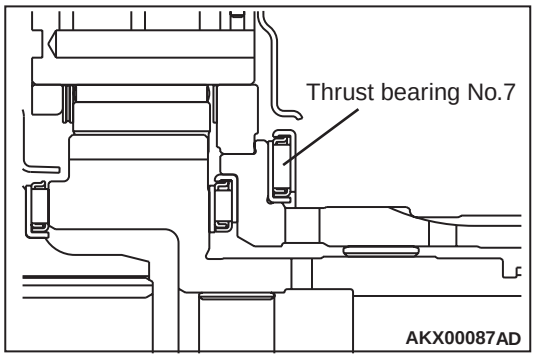
MOVING AMOUNT mm	Pressure plate	
	Thickness mm	Identification symbol
1.3 or more – less than 1.5	1.6	F
1.5 or more – less than 1.7	1.8	E
1.7 or more – less than 1.9	2.0	D
1.9 or more – less than 2.1	2.2	C
2.1 or more – less than 2.3	2.4	B
2.3 or more – less than 2.5	2.6	A
2.5 or more – less than 2.7	2.8	0
2.7 or more – less than 2.9	3.0	1

(13)Remove the parts installed in steps 19 (1) to (12).

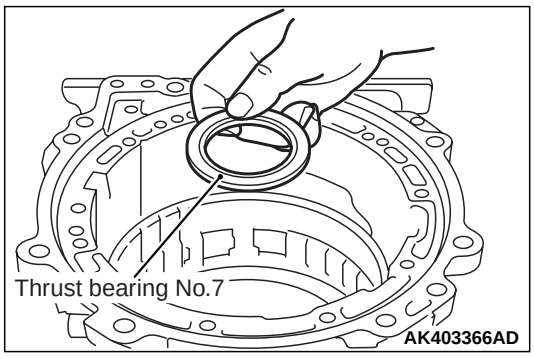
(12)Install a dial gauge onto special tool Dial gauge extension (MD998913) so the end contacts the special tool. Move special tool Clearance dummy plate (MB991632) and measure the moving amount. Select a pressure plate with a thickness that corresponds to the measured moving amount from the following table.

Standard value (reference): 1.65 – 2.11 mm (For low/reverse brake end play)

⚠ CAUTION

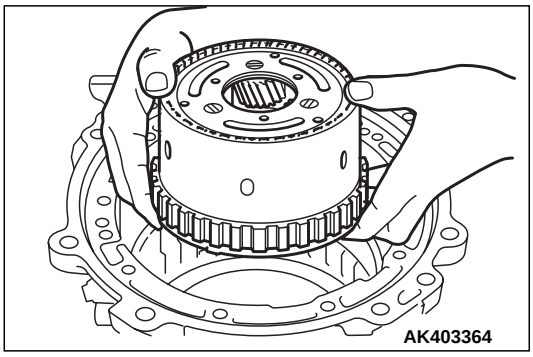


Make sure thrust bearing No.7 is mounted in the correct direction.

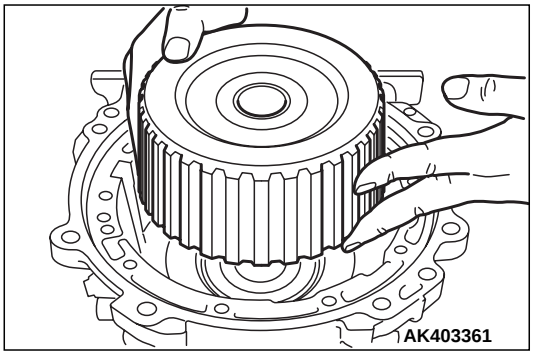


20.Apply vaseline or petroleum jelly on the thrust bearing No.7, and then install on the rear side of the low/reverse annulus gear.

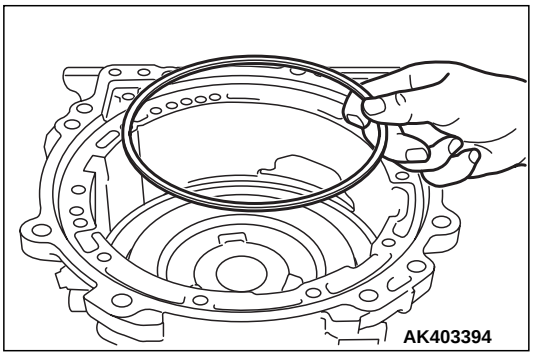
⚠ CAUTION
Make sure that thrust bearing No.7 attached to the rear side of the low/reverse annulus gear does not fall off.


AK403364

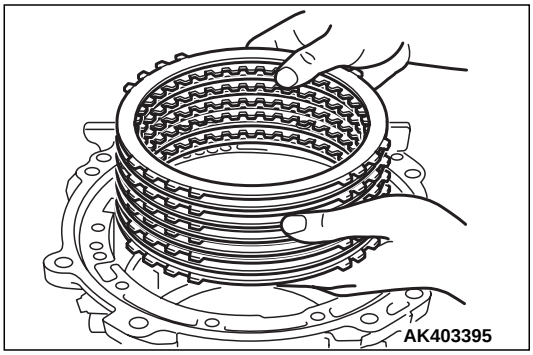
21.Install the low/reverse annulus gear.


AK403361

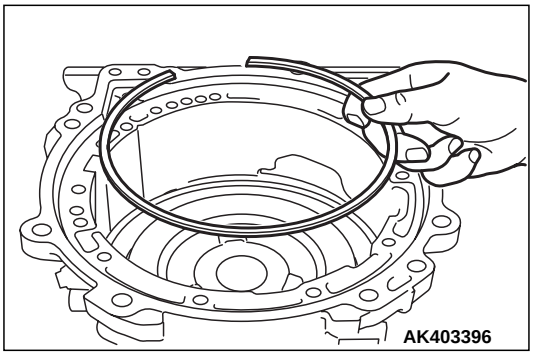
22.Install the reverse sun gear.


AK403394

23.Install the wave spring to the low/reverse brake piston.

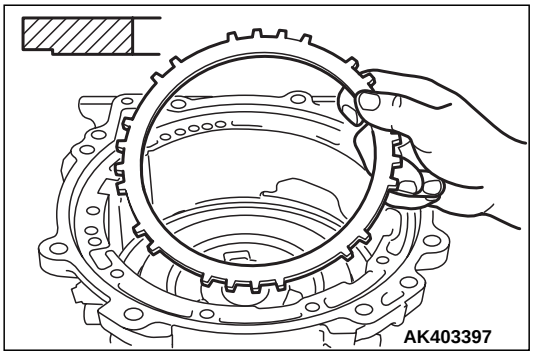

AK403395

24.Install the pressure plate, six brake disc and five brake plate selected in step 19 (12).

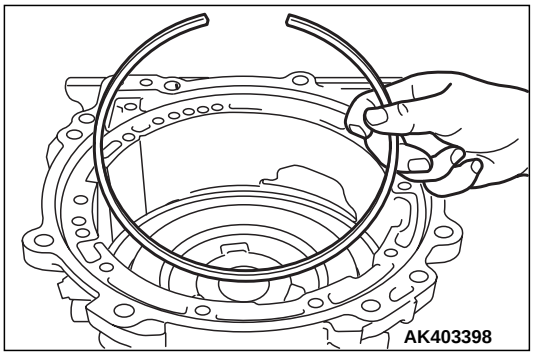

AK403396

25.Install the snap ring.

⚠ CAUTION
Make sure the reaction plate in the proper direction.


AK403397

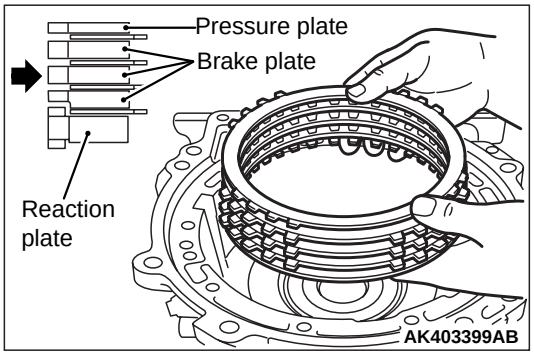
26.Install the reaction plate.


AK403398

27.Install the snap ring selected in step 19 (5).

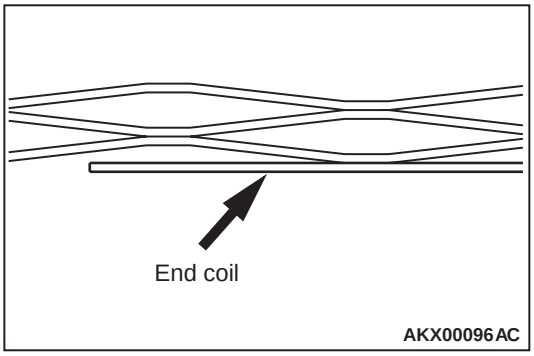
⚠ CAUTION

Make sure the brake plate (reaction plate side) is installed in the proper direction.

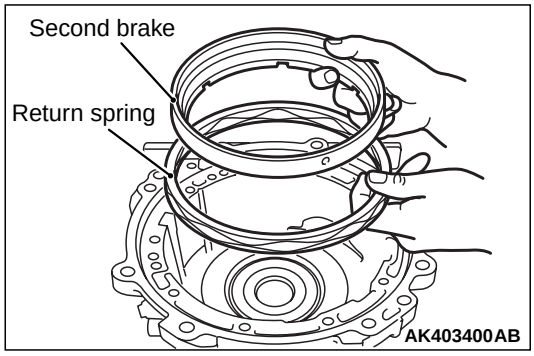


28.Install the brake disc, brake plate and pressure plate selected in step 19 (9).

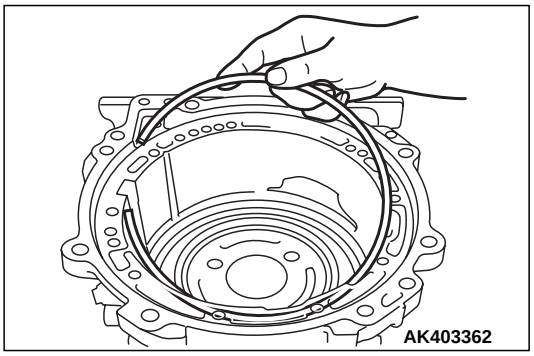
⚠ CAUTION



Install the return spring end coil side so that it faces the back of the transmission. (Only for one side end coil type)

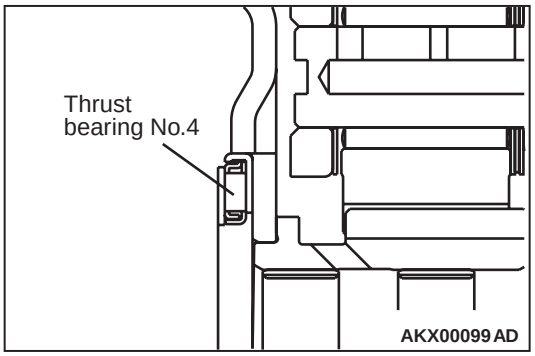


29.Install the return spring and second brake.

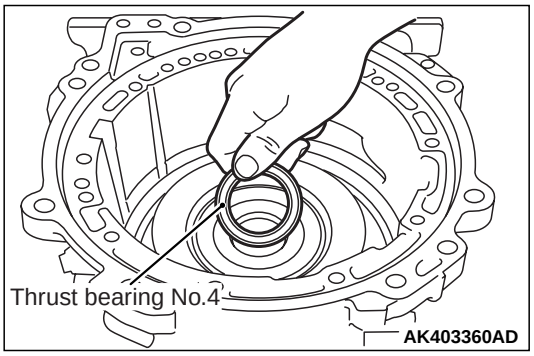


30.Install the snap ring.

⚠ CAUTION

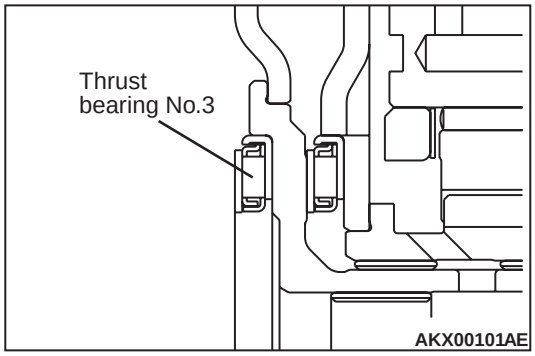


Make sure thrust bearing No.4 is installed in the proper direction.

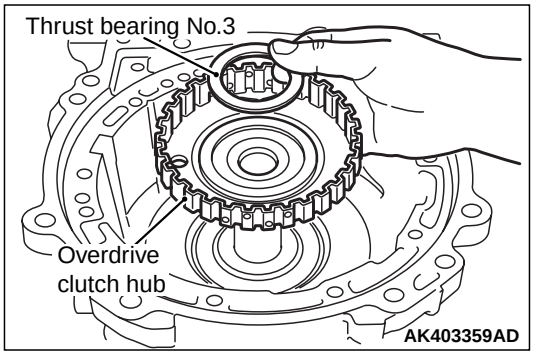


31.Apply vaseline or petroleum jelly on the thrust bearing No.4, and then install on the reverse sun gear.

⚠ CAUTION



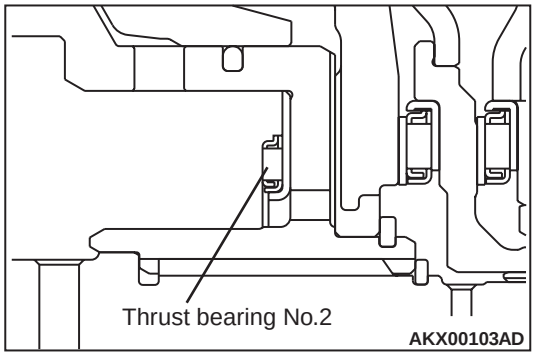
Make sure thrust bearing No.3 is mounted in the correct direction.



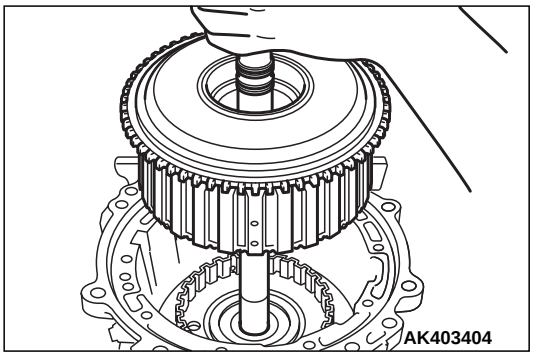
32.Apply vaseline or petroleum jelly on the thrust bearing No.3, and then install on the overdrive clutch hub.

33.Install the overdrive clutch hub.

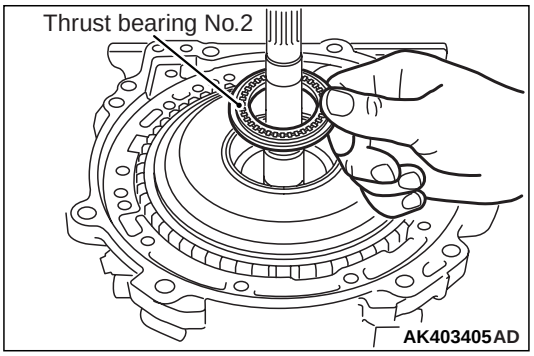
⚠ CAUTION



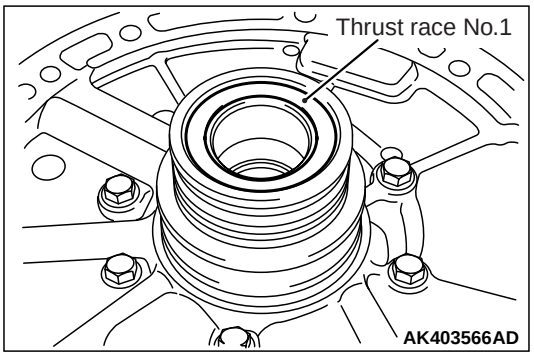
Make sure thrust bearing No.2 is mounted in the correct direction.



34.Install the reverse and overdrive clutch.



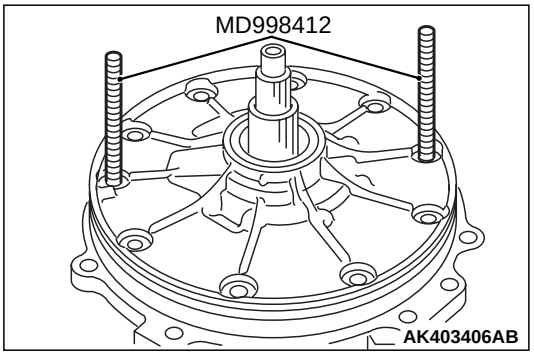
35.Apply vaseline or petroleum jelly on the thrust bearing No.2, and then install on the reverse and overdrive clutch.



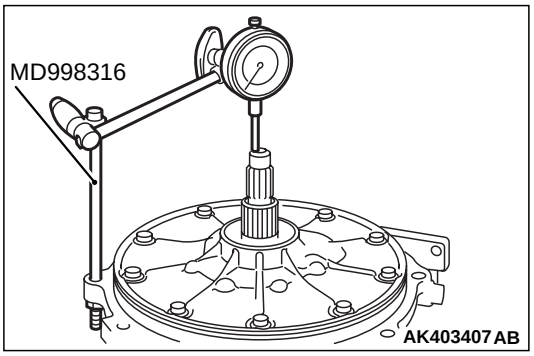
36.Apply vaseline or petroleum jelly on the thrust race No.1 being used, and then install on the oil pump.

⚠ CAUTION

Never reuse a gasket.



37. Install special tools Guide (MD998412) at the position shown in the illustration, and using this as a guide, install the oil pump and gasket.
38. Tighten the ten oil pump mounting bolts to the specified torque 23 ± 3 N·m.



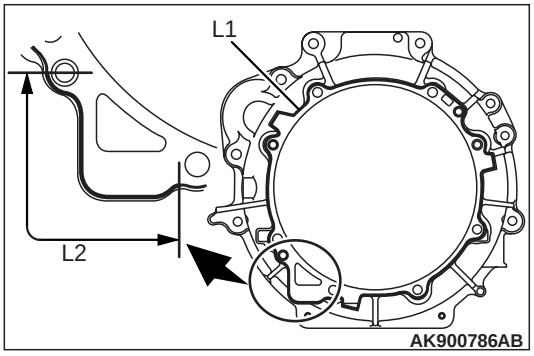
39. Use the special tool Dial gauge support (MD998316), set a dial gauge as shown in the illustration. Measure the end play of the input shaft, and select the thrust race installed in step 36 so that the end play is at the standard value. Then, reassemble.

    Standard value: 0.25 – 0.81 mm
    (For input shaft end play)

40. Measure the end play again, and confirm that it is within the standard value.

⚠ CAUTION

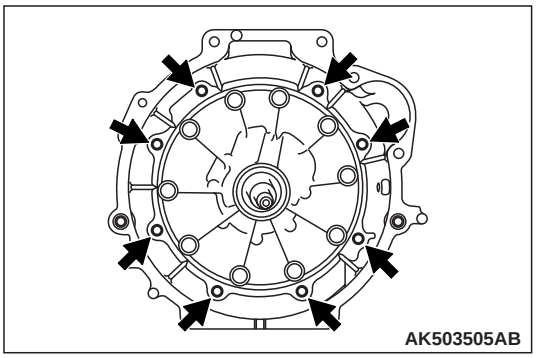
- **Completely degrease the FIPG-applied surface so that water and oil including the old sealant cannot adhere to the surface coated with the sealant. Never touch the degreased surface by hand.**
- **Evenly squeeze out the sealant so that it is not insufficient or excessive.**



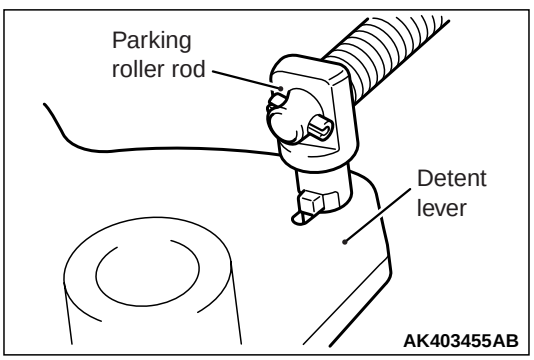
41. Apply the sealant on the converter housing mounting surface of the transmission case in the following way.

L1	ϕ1.6 mm
L2	ϕ2.6 mm

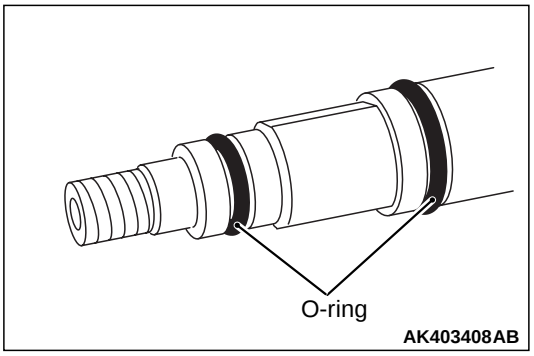
Specified sealant:
Mitsubishi Part No.MD997740 or equivalent



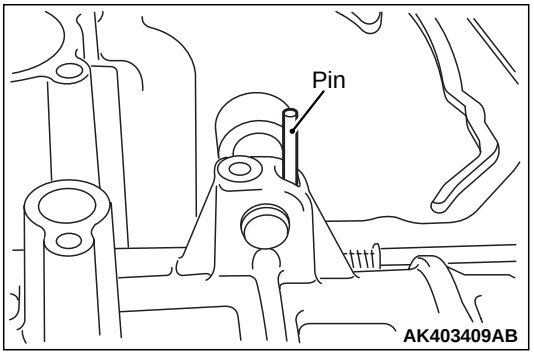
42. Install the converter housing.
43. Tighten the eight converter housing mounting bolts to the specified torque 48 ± 6 N·m.



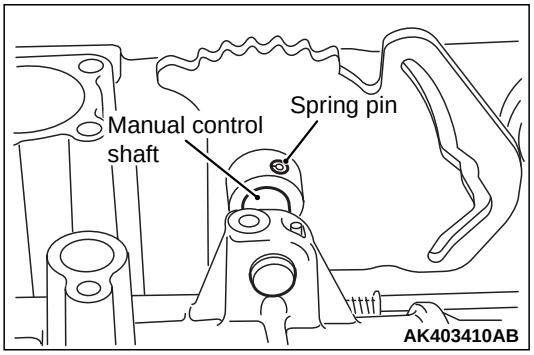
44. Install the parking roller rod to the detent lever.



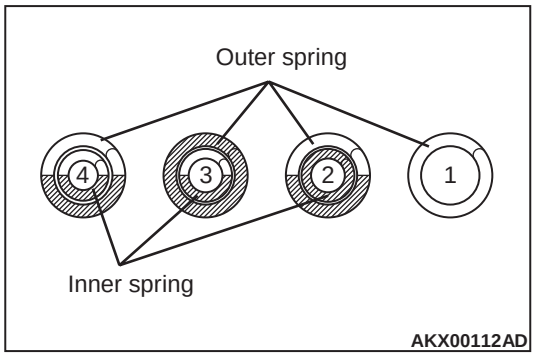
45.Install two new O-rings to the manual control shaft, and assemble onto the transmission case together with the detent lever and parking roller rod.

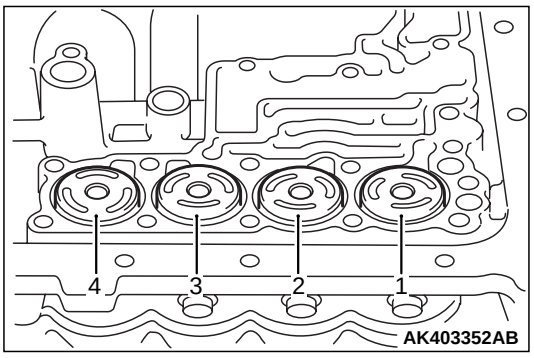


46.Install the pin.



47.Hammer in so that the slit section of the spring valve is perpendicular to the axial direction of the manual control shaft.





48.Install a new seal ring onto each accumulator piston.

49.Install each accumulator piston and spring.

NOTE:

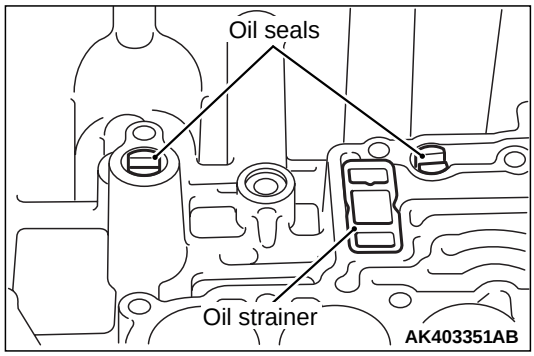
- *Identification colors are applied on the spring as shown below. Assemble following this table.*
- *Install the accumulator pistons to the original positions following the identification tags attached when removed.*

No.	Name	Identification paint application position	
1	For overdrive clutch	None	
2	For second brake	Inner	Applied on all surfaces including both ends
		Outer	Applied on half of surface including both ends

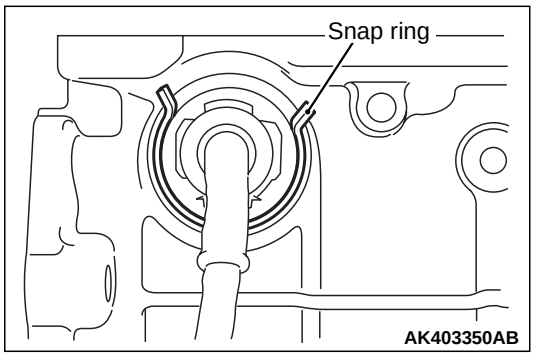
No.	Name	Identification paint application position	
3	For low/ reverse brake	Inner	Applied on half of surface including both ends
		Outer	Applied on entire surface of one side
4	For underdrive clutch	Inner	Applied on half of surface including both ends
		Outer	Applied on half of surface including both ends

⚠ CAUTION

Pay close attention to the installation direction of the oil seal.

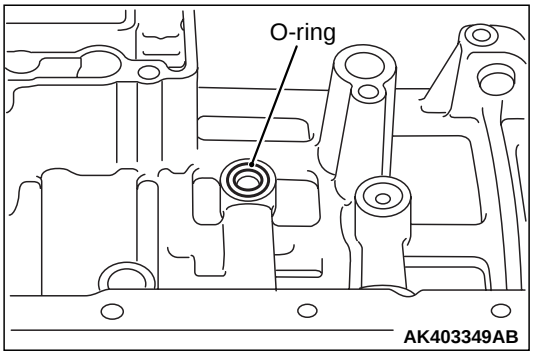


50.Install the oil strainer and two new oil seals. Install the oil seals so that the notched section is oriented as shown in the illustration.

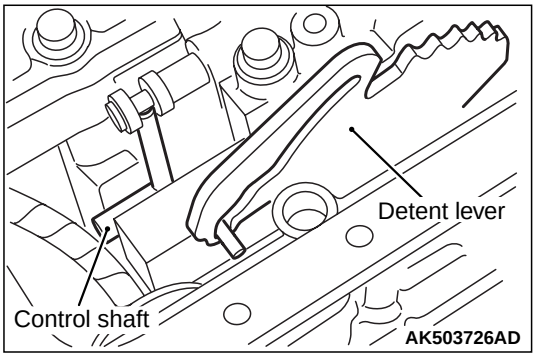


51.Install the solenoid valve harness, and then secure the snap ring into connector groove.

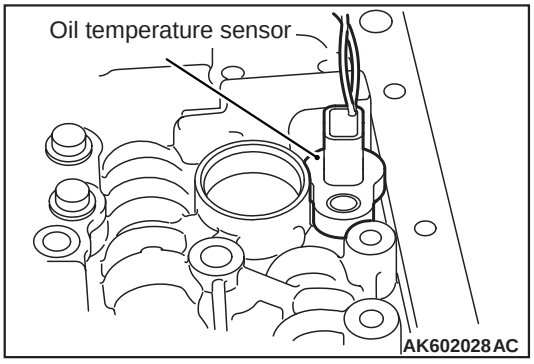
NOTE: Install the harness so that it is oriented as shown in the illustration.



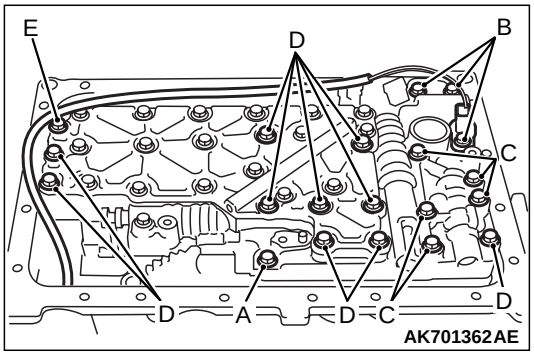
52.Install the new O-ring into the transmission case at the position shown in the illustration.



53.Install the valve body while inserting the manual valve pin into the detent lever groove.

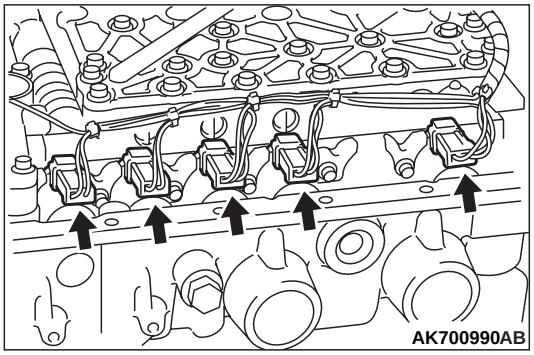


54.Install the oil temperature sensor.

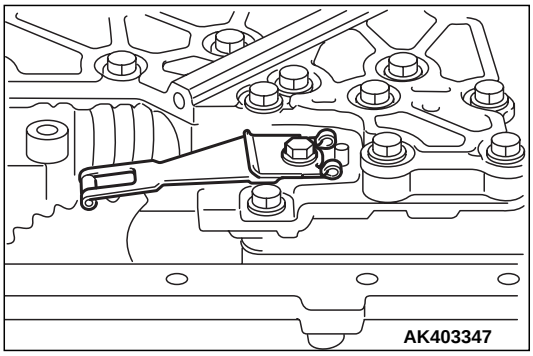


55.Tighten the twenty valve body mounting bolts to the specified torque 11 ± 1 N·m.

Bolt	Length mm
A	25
B	30
C	40
D	45
E	55

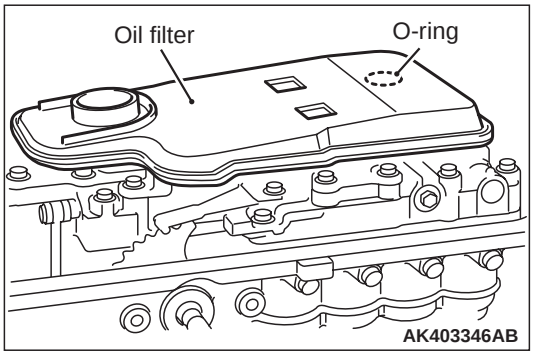


56.Connect the connector to the valve body.



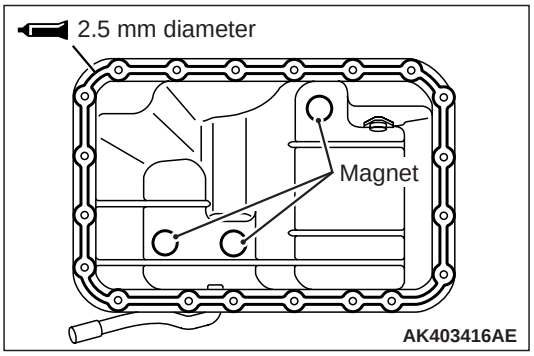
57.Install the detent spring.

58.Tighten the detent spring mounting bolt to the specified torque 6.0 ± 1.0 N·m.



59.Install the oil filter and a new O-ring.

60.Tighten the oil filter mounting bolts to the specified torque 6.0 ± 1.0 N·m.



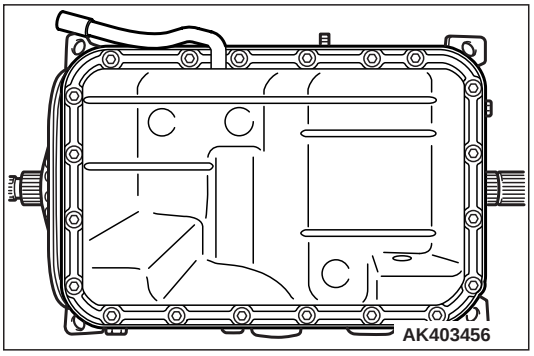
61.Install the magnet.

⚠ CAUTION

- **Completely degrease the FIPG-applied surface so that water and oil including the old sealant cannot adhere to the surface coated with the sealant. Never touch the degreased surface by hand.**
- **Make sure the starting point and the ending point are about the middle between the bolts.**

62.Apply the sealant or equivalent on the oil pan.

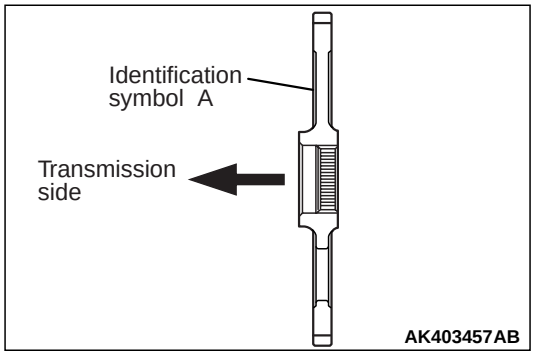
Specified sealant:
Mitsubishi Part No.MD997740 or equivalent



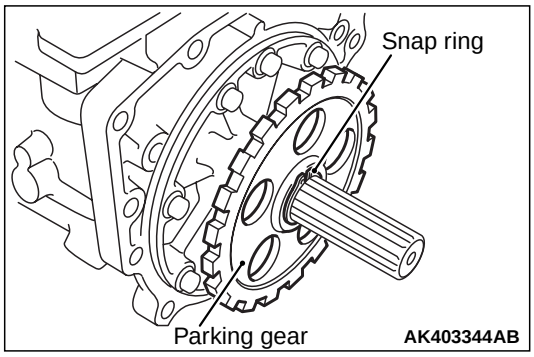
63.Install the oil pan.

64.Tighten the oil pan mounting bolts to the specified torque 11 ± 1 N·m.

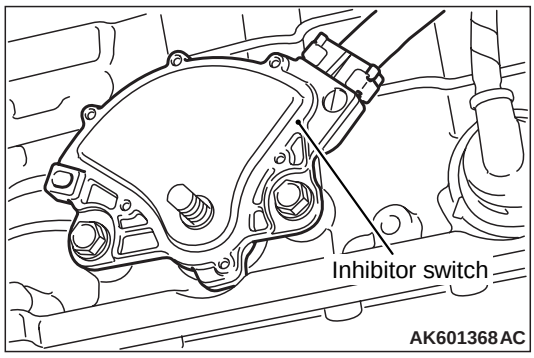
⚠ CAUTION



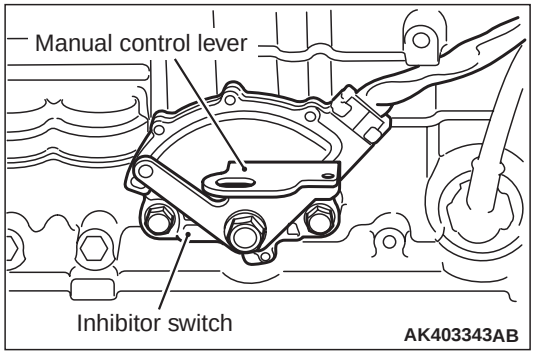
- **Install the parking gear so that the side without the spline cut faces the transmission side.**
- **Heat the parking gear to 160 – 180 °C and shrink fit up to the stepped section of the output shaft. Do not heat for longer than necessary at this time.**



65.Install the parking gear and snap ring.

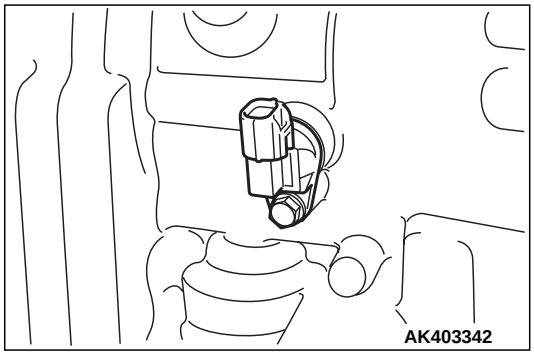


66.Install the inhibitor switch, and fix the fastening bolts temporarily.



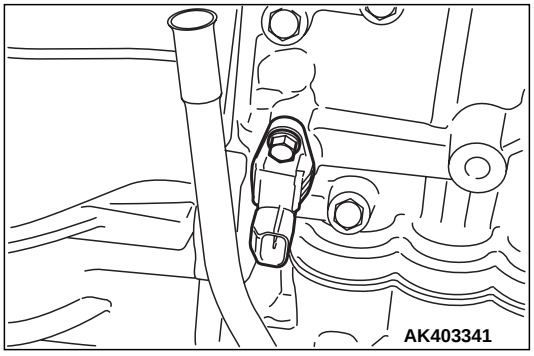
67.Install the manual control lever.

68.Tighten the manual control lever mounting bolts to the specified torque 21.5 ± 3.5 N·m.



69.Install the output shaft speed sensor.

70.Tighten the output shaft speed sensor mounting bolts to the specified torque 11 ± 1 N·m.

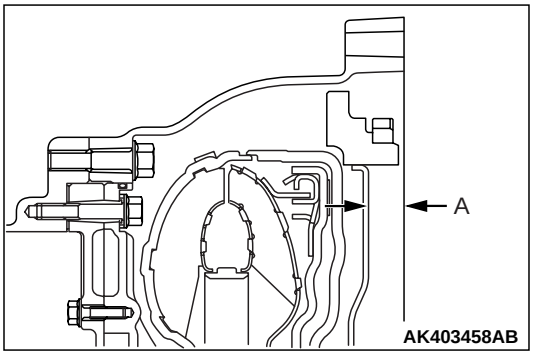


71.Install the input shaft speed sensor.

72.Tighten the input shaft speed sensor mounting bolts to the specified torque 11 ± 1 N·m.

⚠ CAUTION

Apply ATF to the oil pump drive hub before installing the torque converter. Be careful not to damage the oil seal lip when installing the torque converter.



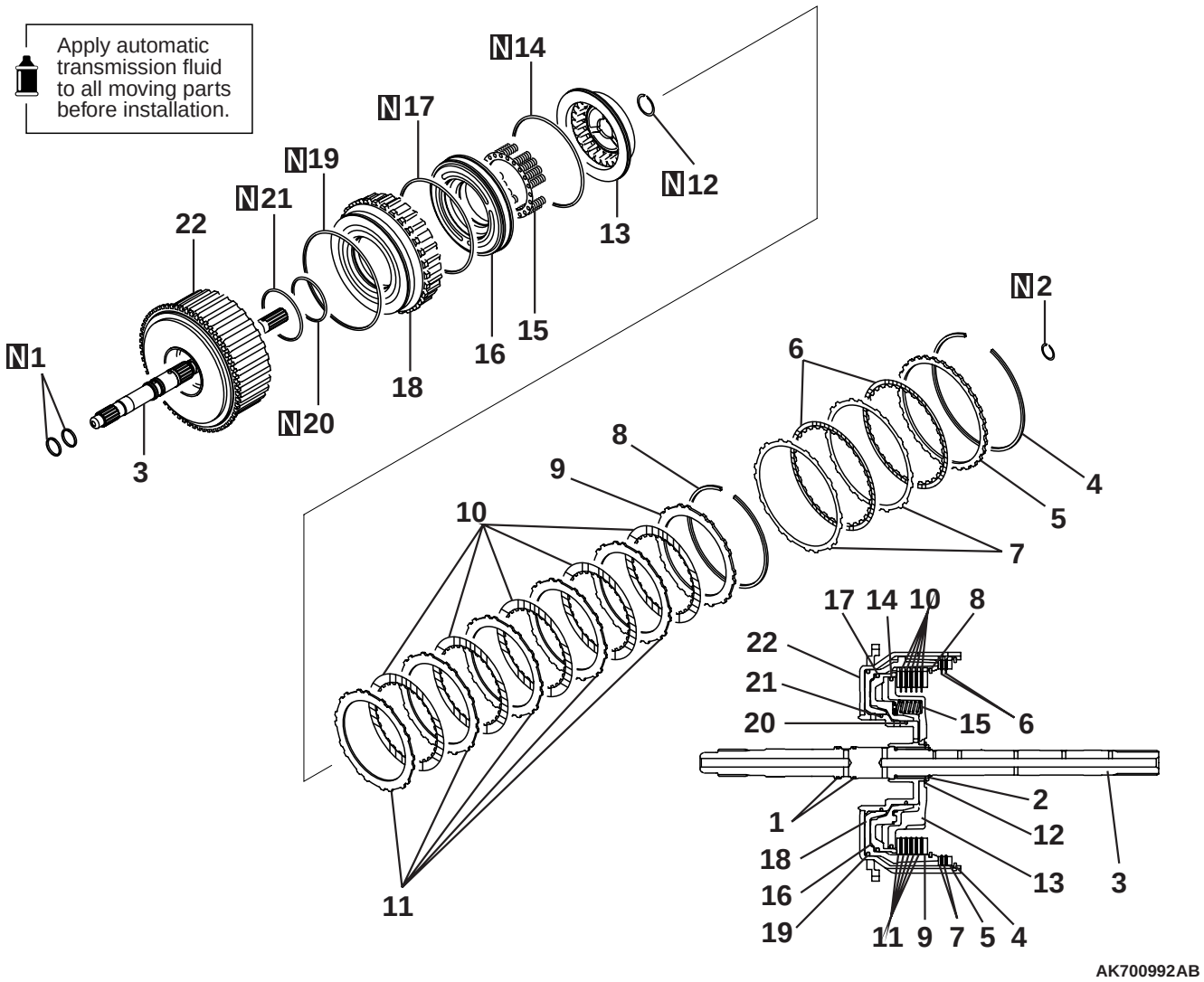
73.Install the torque converter, and secure it so that the dimension (A) indicated in the illustration meets the reference value.

Reference value: 20.9 mm

REVERSE AND OVERDRIVE CLUTCH

DISASSEMBLY AND REASSEMBLY

M1233021200494



AK700992AB

Disassembly steps

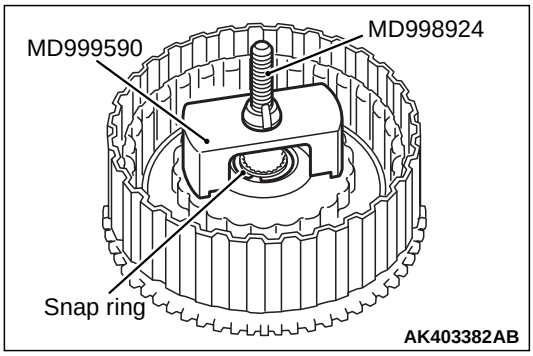
	1.	Seal ring
	2.	Snap ring
	3.	Input shaft
>>**H**<<	4.	Snap ring
>>**G**<<	5.	Reaction plate
>>**G**<<	6.	Clutch disc
>>**G**<<	7.	Clutch plate
>>**F**<<	8.	Snap ring
>>**E**<<	9.	Reaction plate
>>**E**<<	10.	Clutch disc
>>**E**<<	11.	Clutch plate

Disassembly steps (Continued)

<<**A**>> >>**D**<<	12.	Snap ring
	13.	Spring retainer
>>**A**<<	14.	D-ring
>>**C**<<	15.	Return spring
	16.	Overdrive clutch piston
>>**A**<<	17.	D-ring
>>**B**<<	18.	Reverse clutch piston
>>**A**<<	19.	D-ring
>>**A**<<	20.	D-ring
>>**A**<<	21.	D-ring
	22.	Reverse clutch retainer

DISASSEMBLY SERVICE POINT

<<A>> SNAP RING REMOVAL



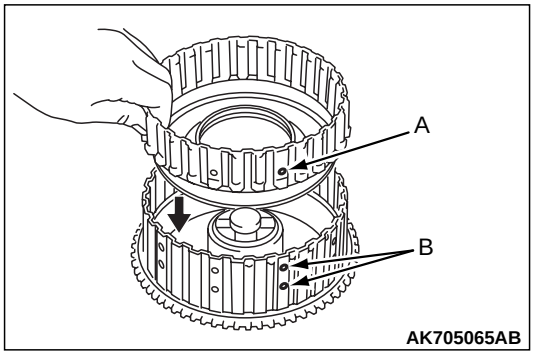
1. Set special tools as shown in the illustration.
   - Spring compressor (MD999590)
   - Spring compressor retainer (MD998924)
2. Compress the return spring, and remove the snap ring.

REASSEMBLY SERVICE POINTS

>>A<< D-RING INSTALLATION

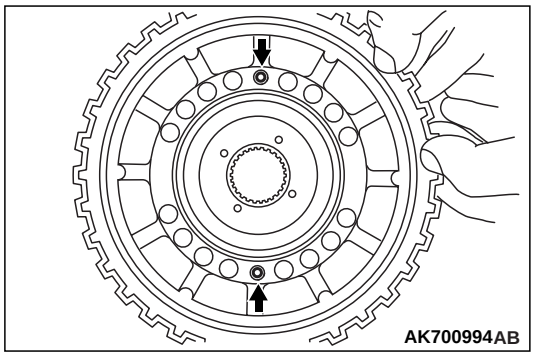
1. Apply ATF to the D-ring.
2. Install the D-ring in the reverse clutch retainer, piston, overdrive clutch piston and spring retainer grooves. Make sure that the D-ring is not twisted or damaged when installing.

>>B<< REVERSE CLUTCH PISTON INSTALLATION



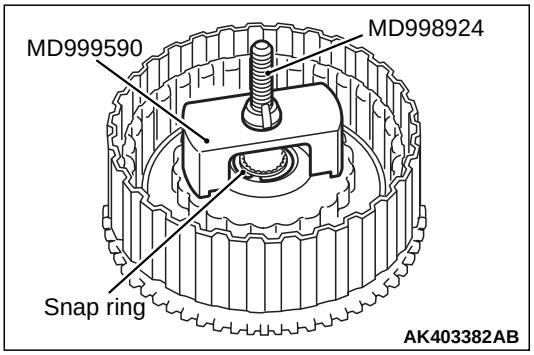
Align the reverse clutch piston and reverse clutch retainer holes (A and B), and then assemble.

>>C<< RETURN SPRING INSTALLATION

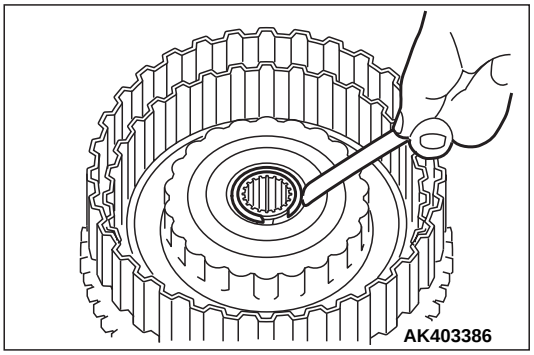


Align the two return spring holes with the two projections on the override clutch piston, and then assemble.

>>D<< SNAP RING INSTALLATION



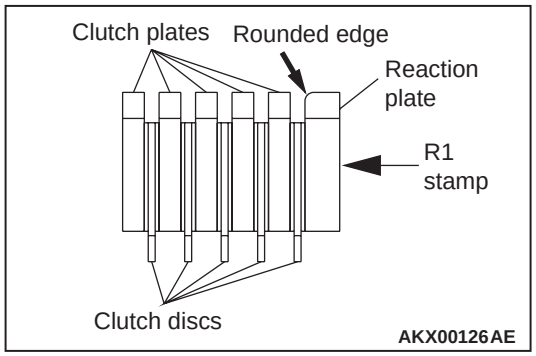
1. Set special tools as shown in the illustration.
   - Spring compressor (MD999590)
   - Spring compressor retainer (MD998924)
2. Tighten the special tool nut, and press the spring retainer against the reverse clutch retainer.
3. Install the thickest snap ring that can be fitted in the snap ring groove of reverse clutch retainer.



4. Check the clearance between the snap ring and spring retainer. If the clearance is not within the standard value range, make adjustment by selecting a snap ring of an appropriate thickness.

   Standard value: 0 – 0.09 mm
   (For overdrive clutch return spring retainer end play)

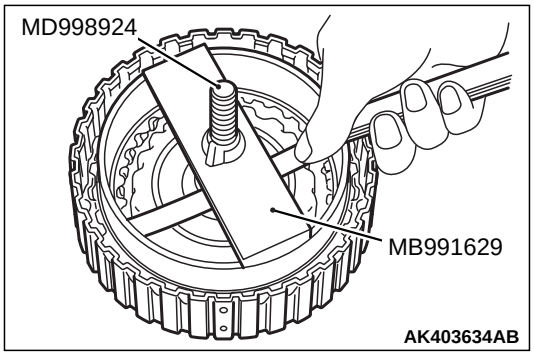
>>E<< CLUTCH PLATE / CLUTCH DISC / REACTION PLATE INSTALLATION



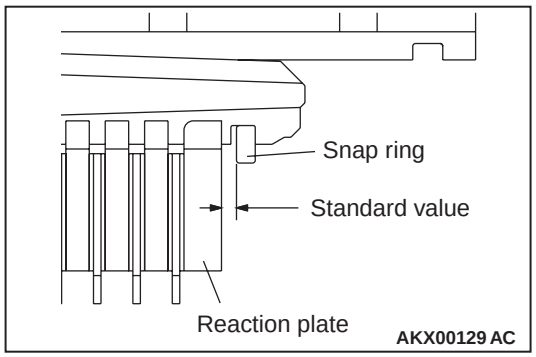
1. Alternately assemble the clutch disc and clutch plate in the reverse clutch piston.
2. Install the reaction plate so that it is oriented as shown in the illustration.

>>F<< SNAP RING INSTALLATION

1. Install the snap ring in the reverse clutch piston groove.



2. Set special tools as shown in the illustration, and compress the clutch element
   - Spring compressor (MB991629)
   - Spring compressor retainer (MD998924)

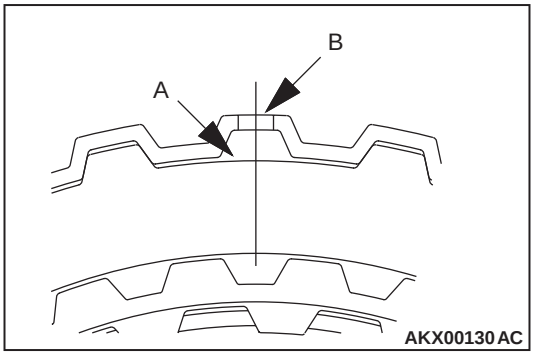


3. Check the clearance (overdrive clutch end play) of the snap ring and reaction plate is the standard value. If the clearance is not at the standard value, select the snap ring and adjust so that the clearance is within the standard value.

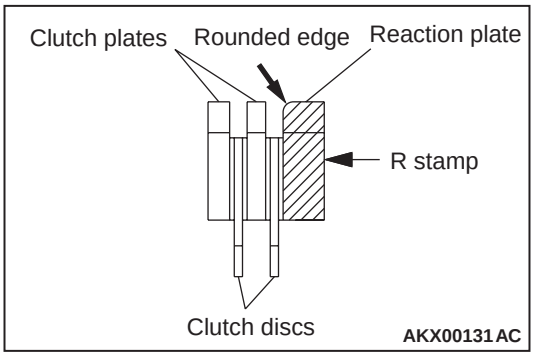
Standard value: 2.0 – 2.2 mm
(For overdrive clutch end play)

>>G<< CLUTCH PLATE / CLUTCH DISC / REACTION PLATE INSTALLATION

⚠ CAUTION
Soak the clutch discs in ATF before installing them.

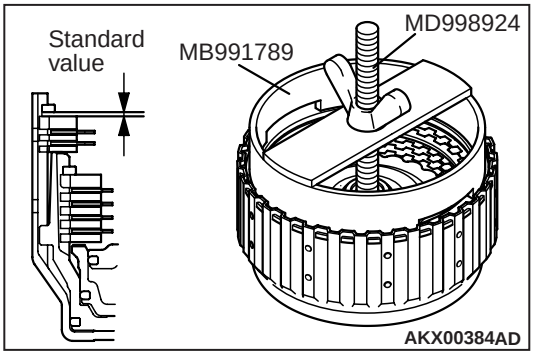


1. Alternately assemble the clutch plate and clutch disc in the reverse clutch retainer. Align and assemble both clutch plates (where there are no teeth) (A in the illustration) with the reverse clutch retainer hole (B in the illustration).



2. Install the reaction plate so that it is oriented as shown in the illustration. Assemble in the same manner as the clutch plate so the section with no teeth (A in the illustration) matches the retainer hole (B in the illustration).

>>H<< SNAP RING INSTALLATION



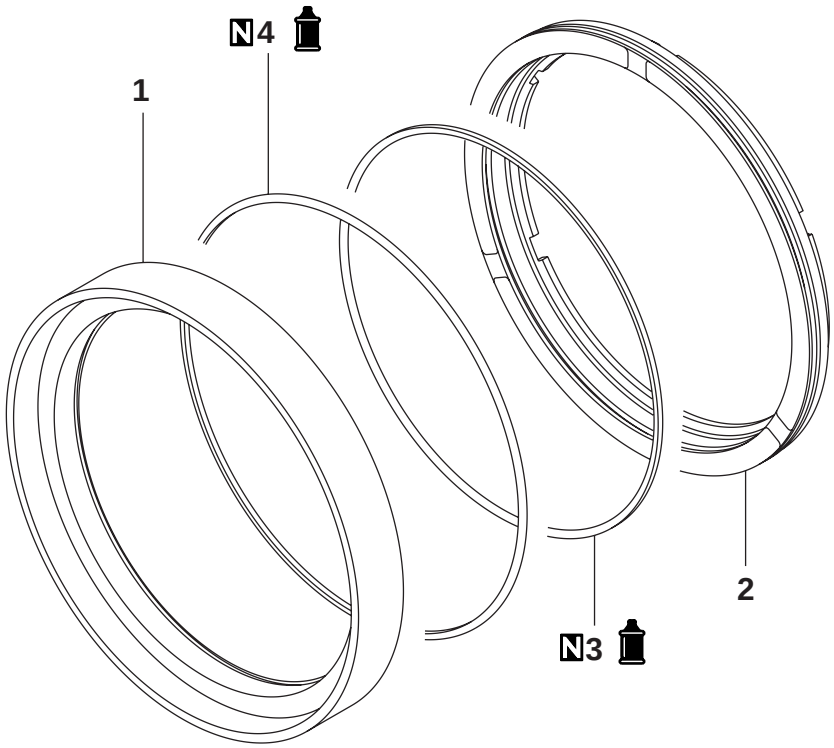
1. Install the snap ring in the reverse clutch retainer groove.
2. Set special tools as shown in the illustration, and compress the clutch element.
   - Spring compressor (MB991789)
   - Spring compressor retainer (MD998924)
3. Check that the clearance between the snap ring and the clutch reaction plate is within the standard valus.If not within the standard value, select a snap ring to adjust.

   Standard value: 1.5 – 1.7 mm
   (For reverse clutch end play)

SECOND BRAKE

DISASSEMBLY AND REASSEMBLY

M1233021800269



AKX00134AB

Disassembly steps

	1.	Second brake retainer
	2.	Second brake piston
>>**A**<<	3.	D-ring
>>**A**<<	4.	D-ring

REASSEMBLY SERVICE POINT

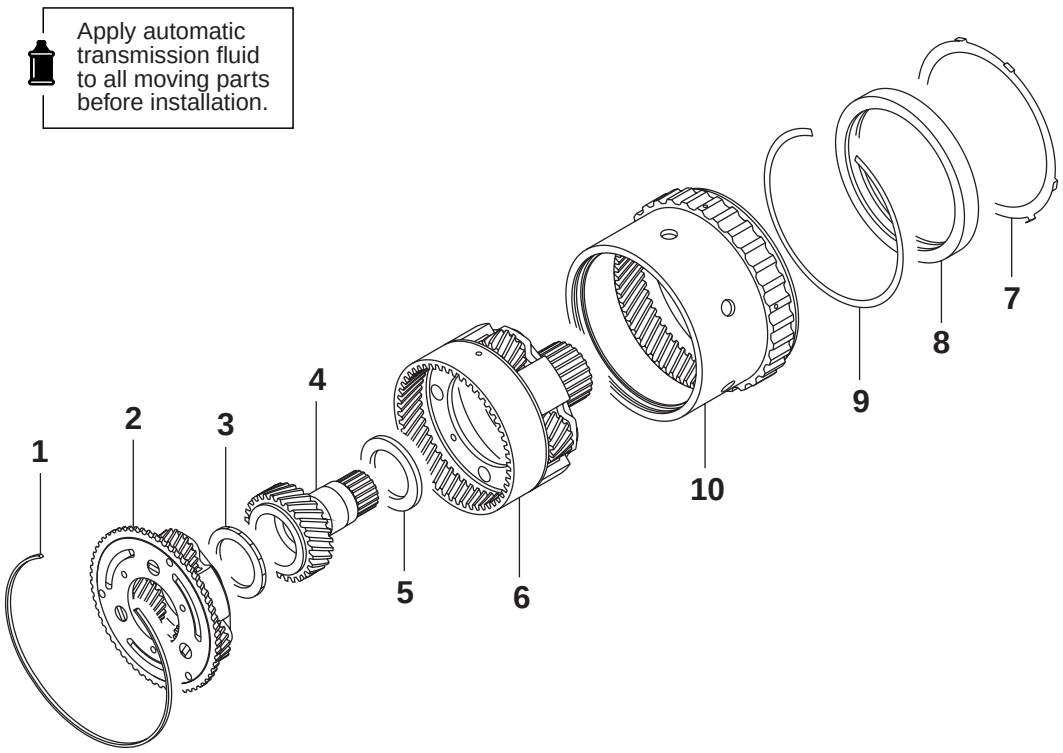
>>A<< D-RING INSTALLATION

1. Apply ATF to the D-ring.
2. Install the D-ring in the grooves on the outer and inner periphery of the piston. Make sure that the D-ring is not twisted or damaged when installing.

LOW REVERSE ANNULUS GEAR

DISASSEMBLY AND REASSEMBLY

M1233027100268



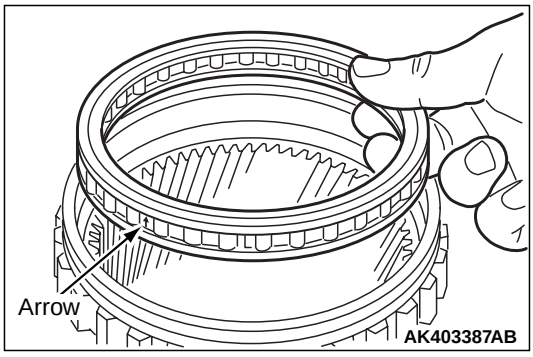
AKX00135AC

Disassembly steps

1. Snap ring
2. Overdrive planetary carrier
>>D<< 3. Thrust bearing No.5
4. Underdrive sun gear
>>C<< 5. Thrust bearing No.6
6. Output planetary carrier
>>B<< 7. Stopper plate
>>A<< 8. One-way clutch
9. Snap ring
10. Low/reverse annulus gear

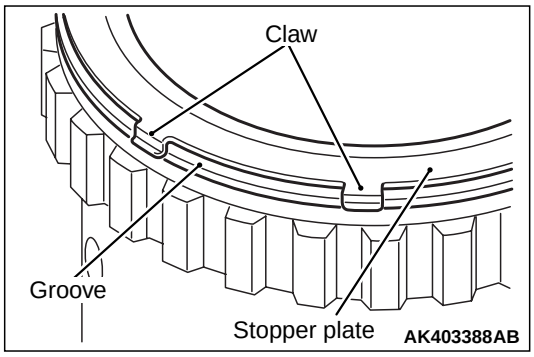
REASSEMBLY SERVICE POINTS

>>A<< ONE-WAY CLUTCH INSTALLATION



Install the one-way clutch so that the arrow stamp is oriented as shown in the illustration.

>>B<< STOPPER PLATE INSTALLATION

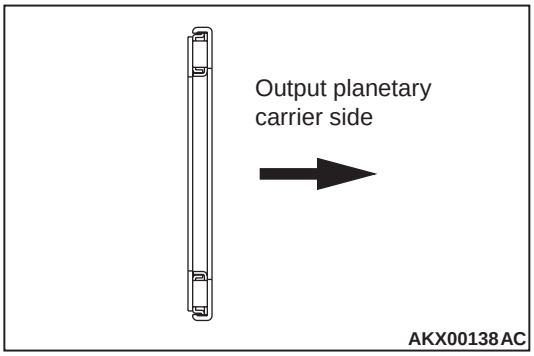


Install the stopper plate onto the low/reverse annulus gear. Make sure that the stopper plate claw is securely engaged in the annulus gear groove.

>>C<< THRUST BEARING No.6 INSTALLATION

⚠ CAUTION

Make sure thrust bearing No.6 is mounted in the correct direction.

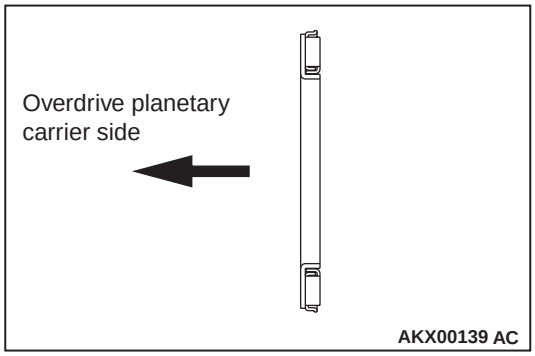


Apply vaseline or petroleum jelly on the thrust bearing No.6, and then install onto the output planetary carrier.

>>D<< THRUST BEARING No.5 INSTALLATION

⚠ CAUTION

Make sure thrust bearing No.5 is mounted in the correct direction.

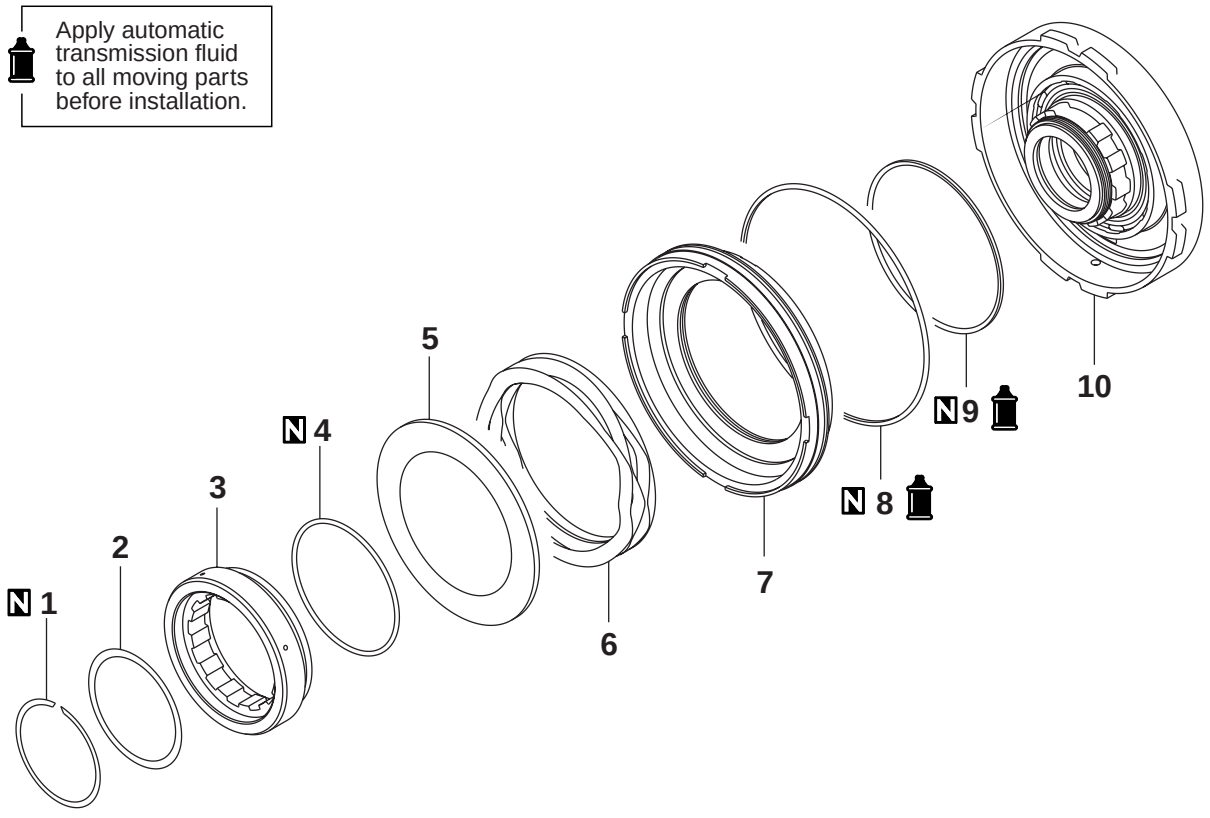


Apply vaseline or petroleum jelly on the thrust bearing No.5, and then install on the overdrive planetary carrier.

CENTRE SUPPORT

DISASSEMBLY AND REASSEMBLY

M1233010000195



AKX00140 AC

Disassembly steps

<<A>> >>C<< 1. Snap ring
2. Plate

Disassembly steps (Continued)

3. One-way clutch inner race
>>B<< 4. O-ring

Disassembly steps (Continued)

5. Spring retainer
6. Return spring
7. Low/reverse brake piston

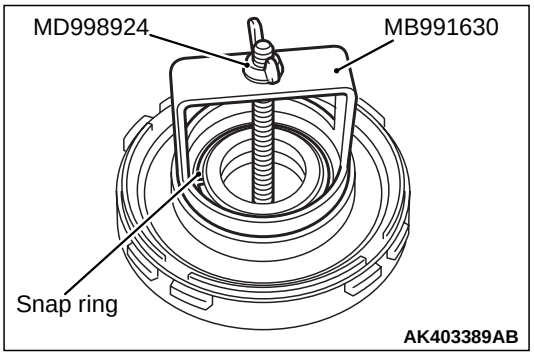
>>**A**<< 8. D-ring

>>**A**<< 9. D-ring

10. Center support

DISASSEMBLY SERVICE POINT

<<A>> SNAP RING REMOVAL



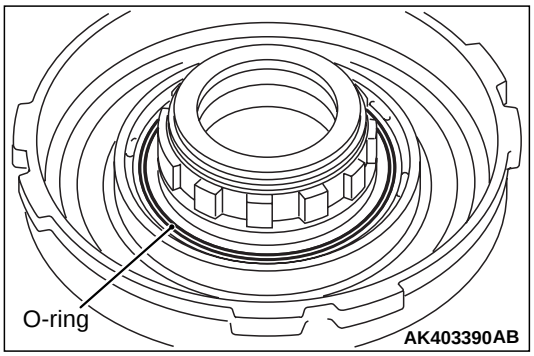
1. Set special tools as shown in the illustration so that they are pressed against the inner race of the one-way clutch.
   - Spring compressor (MB991630)
   - Spring compressor retainer (MD998924)
2. Screw in the special tool nut, and lightly press against the inner race of the one-way clutch.
3. Remove the snap ring.

REASSEMBLY SERVICE POINTS

>>A<< D-RING INSTALLATION

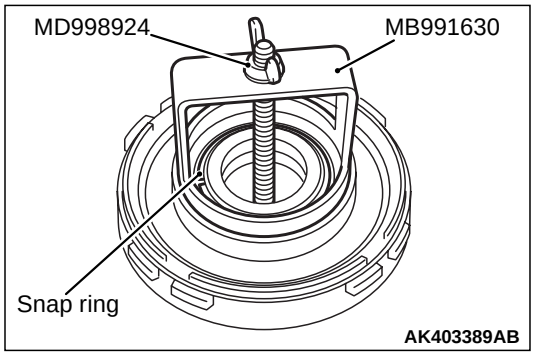
1. Apply ATF to the D-ring.
2. Install the D-ring in the grooves on the outer and inner periphery of the piston. Make sure that the D-ring is not twisted or damaged when installing.

>>B<< O-RING INSTALLATION



Install the O-ring onto the center support at the position shown in the illustration.

>>C<< SNAP RING INSTALLATION

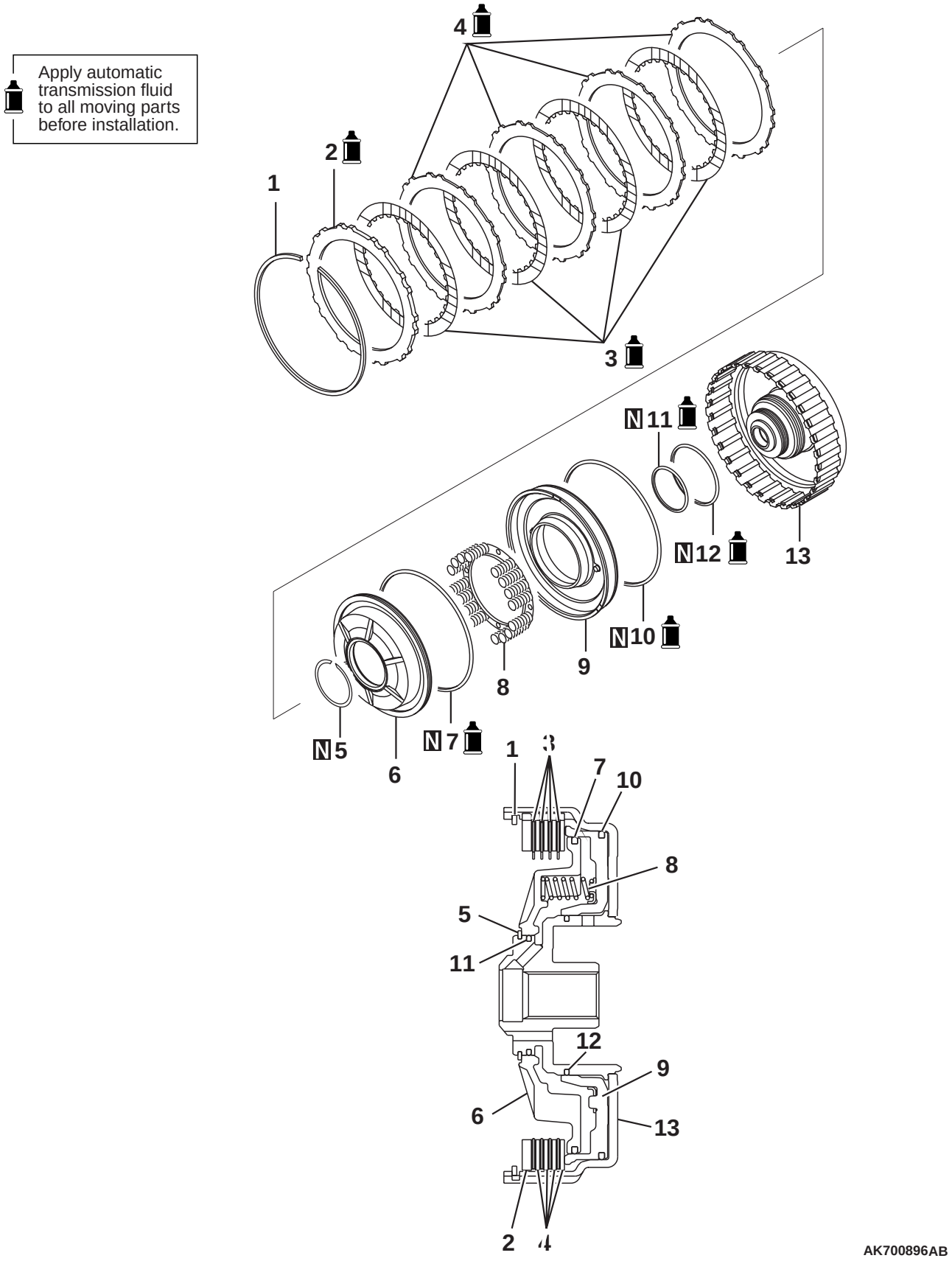


1. Set special tools as shown in the illustration.
   - Spring compressor (MB991630)
   - Spring compressor retainer (MD998924)
2. Screw in the special tool nut, and lightly press against the inner race of the one-way clutch.
3. Install the snap ring.

UNDERDRIVE CLUTCH

DISASSEMBLY AND REASSEMBLY

M1233027300284

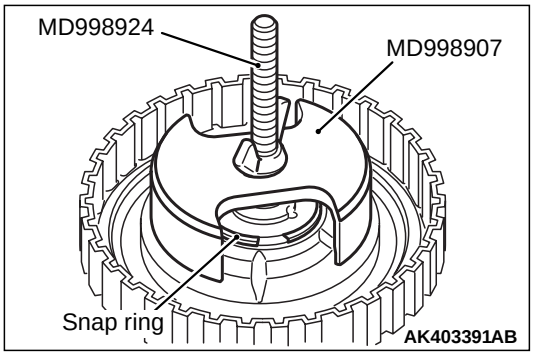


Disassembly steps

	>>E<<	1.	Snap ring
	>>D<<	2.	Reaction plate
	>>D<<	3.	Clutch disc
	>>D<<	4.	Clutch plate
<<A>>	>>C<<	5.	Snap ring
		6.	Spring retainer
	>>A<<	7.	D-ring
	>>B<<	8.	Return spring
		9.	Underdrive clutch piston
	>>A<<	10.	D-ring
	>>A<<	11.	D-ring
	>>A<<	12.	D-ring
		13.	Underdrive clutch retainer

DISASSEMBLY SERVICE POINT

<<A>> SNAP RING REMOVAL



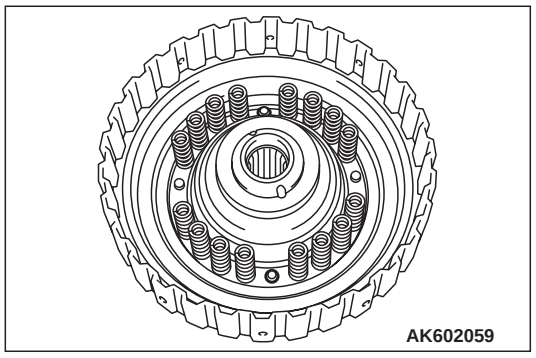
Use the special tools to remove the snap ring.
- Spring compressor retainer (MD998924)
- Spring compressor (MD998907)

REASSEMBLY SERVICE POINTS

>>A<< D-RING INSTALLATION

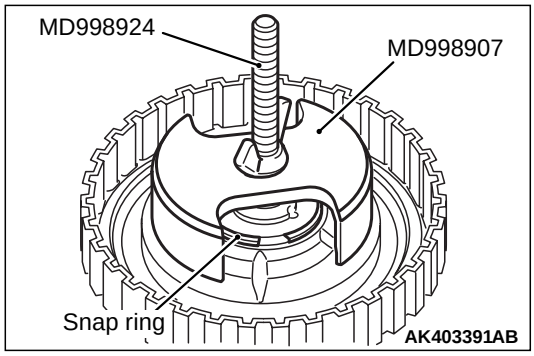
1. Apply ATF to the D-ring.
2. Install the D-ring in the grooves of the underdrive clutch retainer and spring retainer. Make sure that the D-ring is not twisted or damaged when installing.

>>B<< RETURN SPRING INSTALLATION



Align the two return spring holes with the two projections on the underdrive clutch piston, and then assemble.

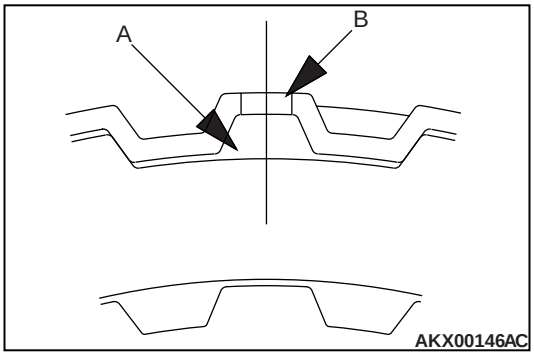
>>C<< SNAP RING INSTALLATION



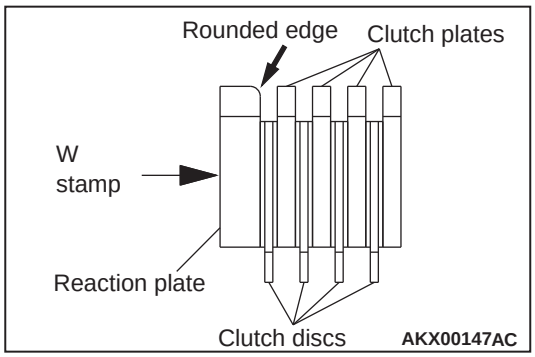
Use the special tools to install the snap ring.
- Spring compressor (MD998924)
- Spring compressor retainer (MD998907)

>>D<< CLUTCH PLATE / CLUTCH DISC / REACTION PLATE INSTALLATION

⚠ CAUTION
Soak the clutch discs in ATF before installing them.



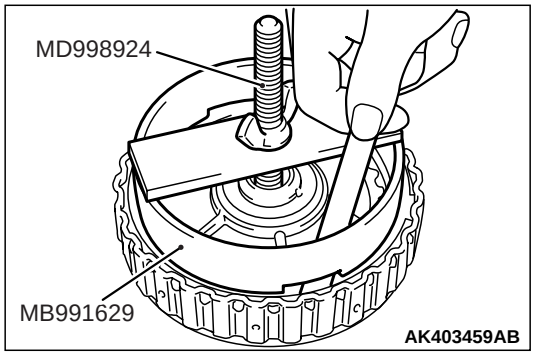
1. Alternately assemble the clutch plate and clutch disc in the underdrive clutch retainer. Align and assemble the four clutch plates (where there are no teeth) (A in the illustration) with the underdrive clutch retainer hole (B in the illustration).



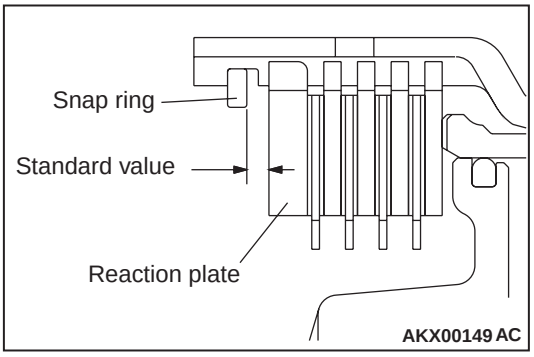
2. Install the reaction plate so that it is oriented as shown in the illustration. Assemble in the same manner as the clutch plate so that the section with no teeth (A in the illustration) matches the retainer hole (B in the illustration).

>>E<< SNAP RING INSTALLATION

1. Install the snap ring in the groove of the underdrive clutch retainer.



2. Set special tools as shown in the illustration, and compress the clutch element.
   - Spring compressor retainer (MD998924)
   - Spring compressor (MB991629)



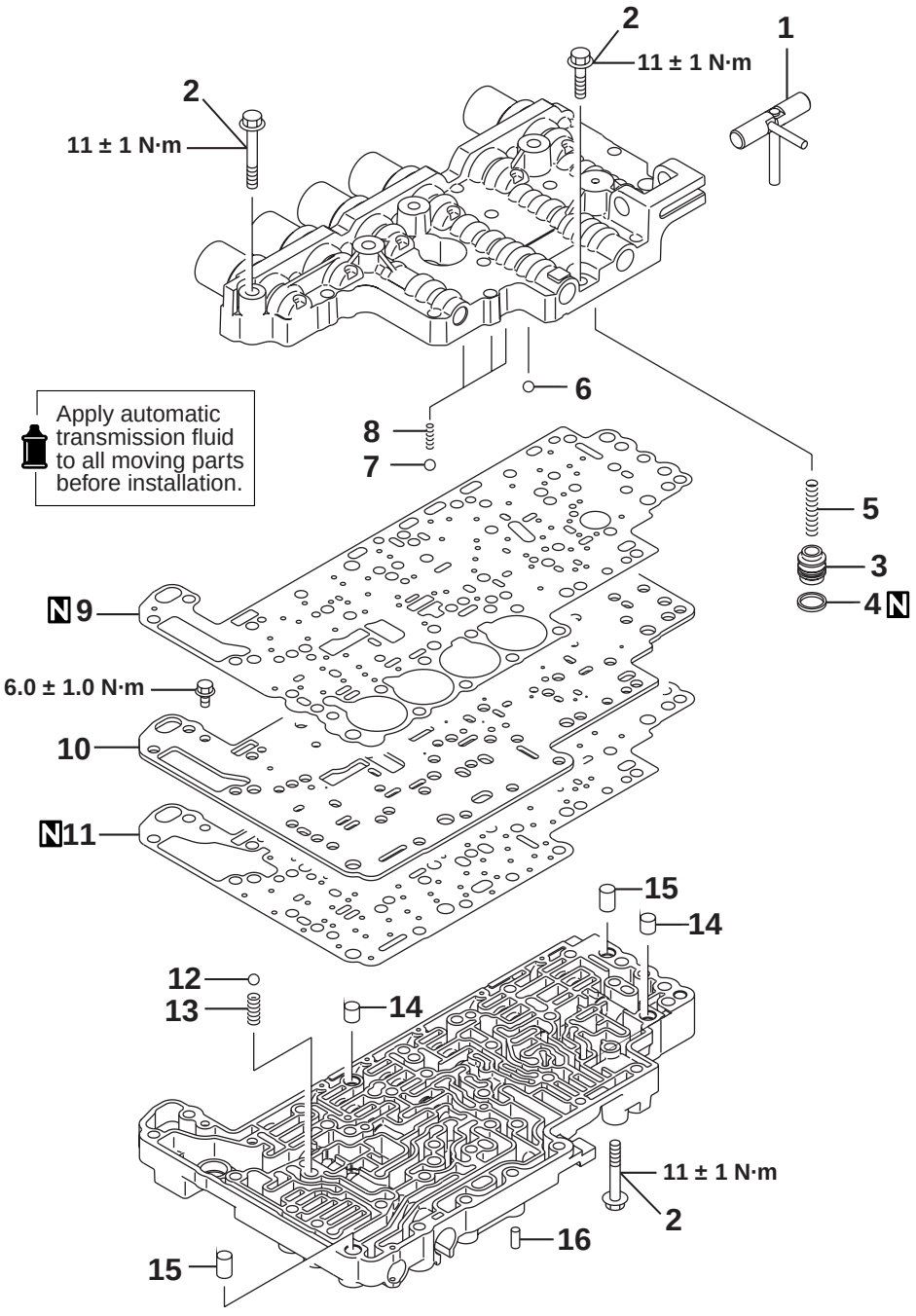
3. Check the clearance (underdrive clutch end play) between the snap ring and reaction plate is the standard value. If the clearance is not at the standard value, select the snap ring and adjust so that the clearance is within the standard value.

   Standard value: 1.6 – 1.8 mm
   (For underdrive clutch end play)

VALVE BODY

DISASSEMBLY AND REASSEMBLY

M1233012100206



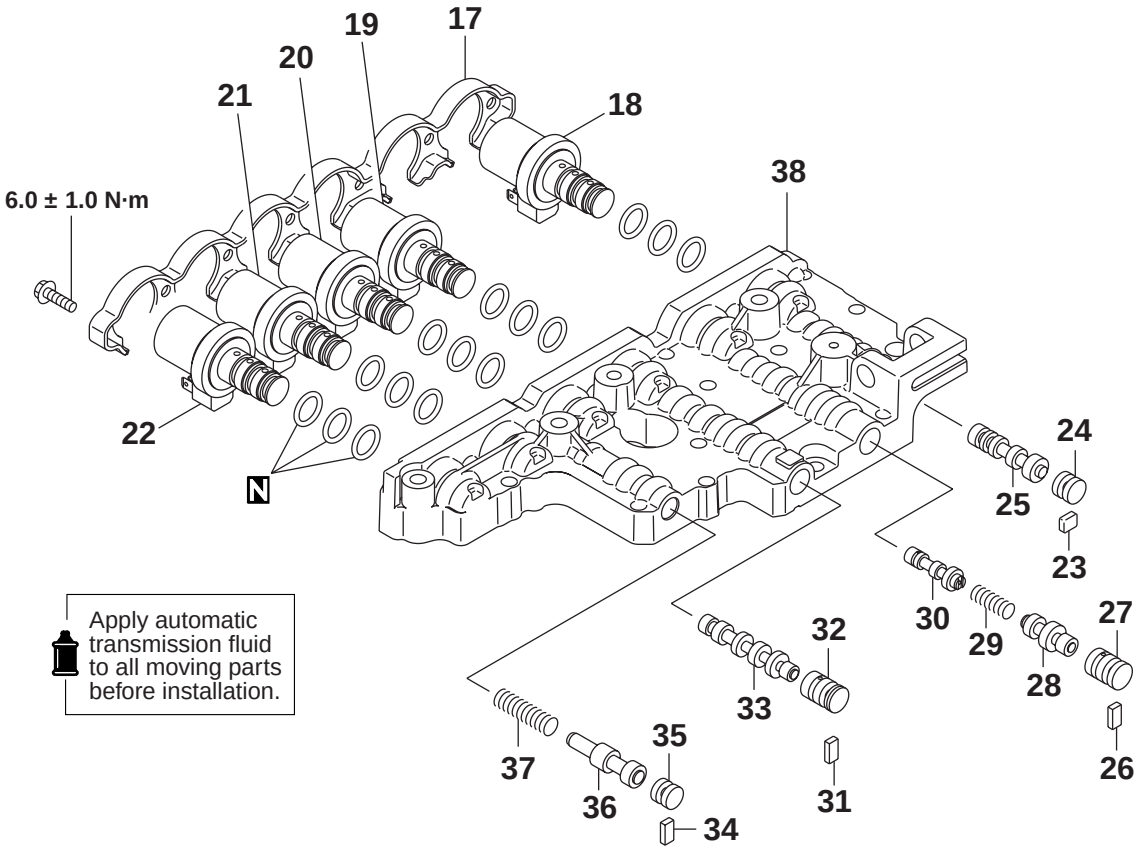
AKX00150AC

Disassembly steps

>>G<<	1.	Control shaft
	2.	Valve body attaching bolt
>>F<<	3.	Damping valve
>>F<<	4.	Seal ring
>>F<<	5.	Damping valve spring
>>F<<	6.	Ball (orifice check ball)
>>F<<	7.	Steel ball (orifice check ball)
>>F<<	8.	Spring

Disassembly steps (Continued)

	9.	Upper valve body gasket
	10.	Separating plate
	11.	Lower valve body gasket
>>E<<	12.	Steel ball (line relief)
>>E<<	13.	Spring
>>D<<	14.	Knock bushing
>>C<<	15.	Knock bushing
>>B<<	16.	Dowel pin



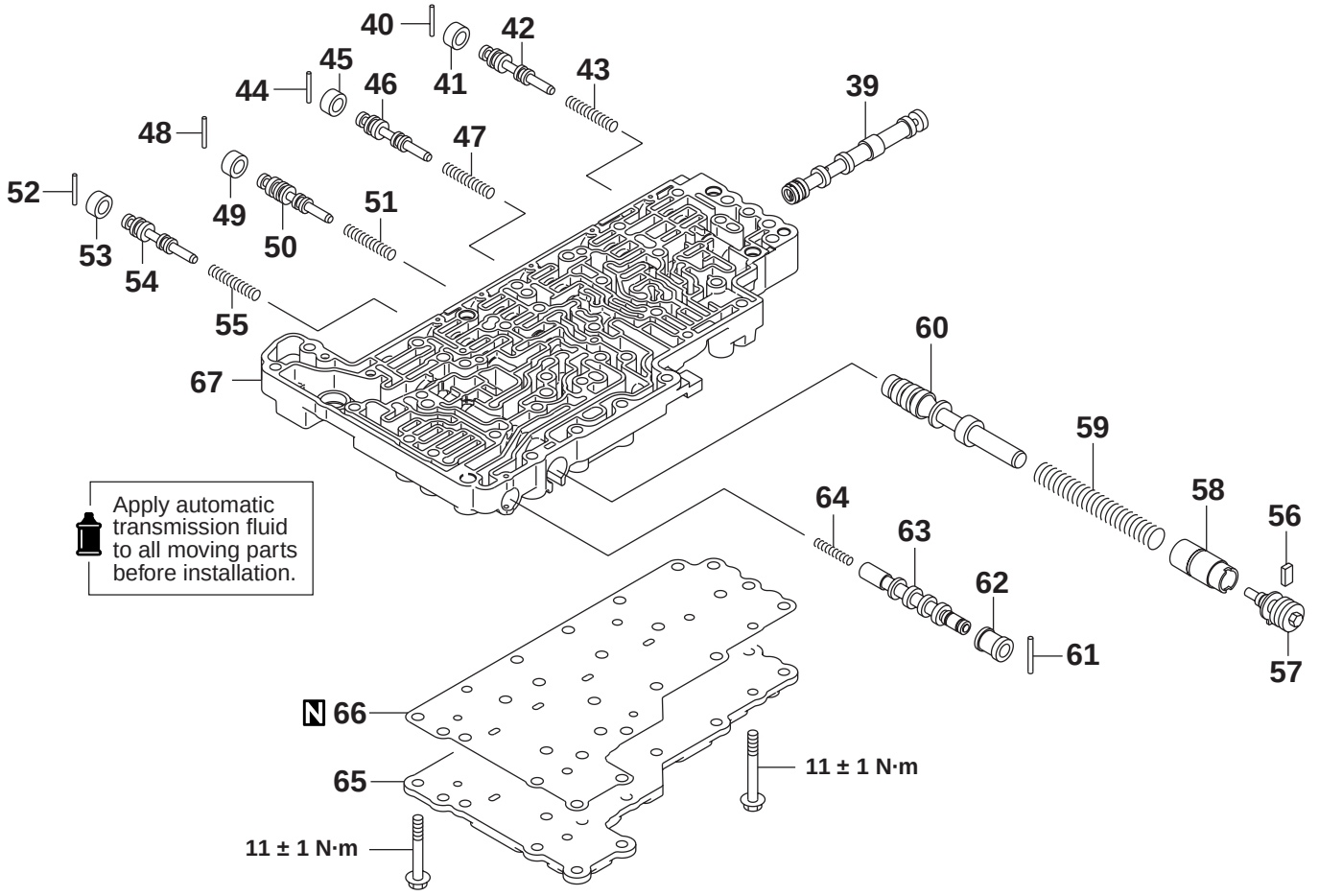
AKX00151AC

Disassembly steps

17. Solenoid support
<<A>> >>A<< 18. Low reverse brake solenoid valve
<<A>> >>A<< 19. Second brake solenoid valve
<<A>> >>A<< 20. Underdrive clutch solenoid valve
<<A>> >>A<< 21. Overdrive clutch solenoid valve
<<A>> >>A<< 22. Torque converter clutch control solenoid valve
23. Stopper plate
24. Stopper plug
25. Switching valve
26. Stopper plate
27. Fail-safe valve a sleeve
28. Fail-safe valve A2

Disassembly steps (Continued)

29. Fail-safe valve A spring
30. Fail-safe valve A1
31. Stopper plate
32. Fail-safe valve B sleeve
33. Fail-safe valve B
34. Stopper plate
35. Stopper plug
36. Torque converter pressure control valve
37. Torque converter pressure control valve spring
38. Upper valve body



AKX00152AC

Disassembly steps

39. Manual valve
40. Roller
41. Low/reverse brake pressure control valve sleeve
42. Low/reverse brake pressure control valve
43. Low/reverse brake pressure control valve spring
44. Roller
45. Second brake pressure control valve sleeve
46. Second brake pressure control valve
47. Second brake pressure control valve spring
48. Roller
49. Underdrive clutch pressure control valve sleeve
50. Underdrive clutch pressure control valve
51. Underdrive clutch pressure control valve spring
52. Roller
53. Overdrive clutch pressure control valve sleeve
54. Overdrive clutch pressure control valve

Disassembly steps (Continued)

55. Overdrive clutch pressure control valve spring
56. Stopper plate
57. Regulator valve adjusting screw
58. Regulator valve sleeve
59. Regulator valve spring
60. Regulator valve
61. Roller
62. Damper clutch control valve sleeve
63. Damper clutch control valve
64. Damper clutch control valve spring
65. Cover
66. Cover gasket
67. Lower valve body

DISASSEMBLY SERVICE POINT

<<A>> SOLENOID VALVE REMOVAL

Before removing the solenoid valves, make marks with white paint, etc., so that the these valves can be reinstalled in the original positions.

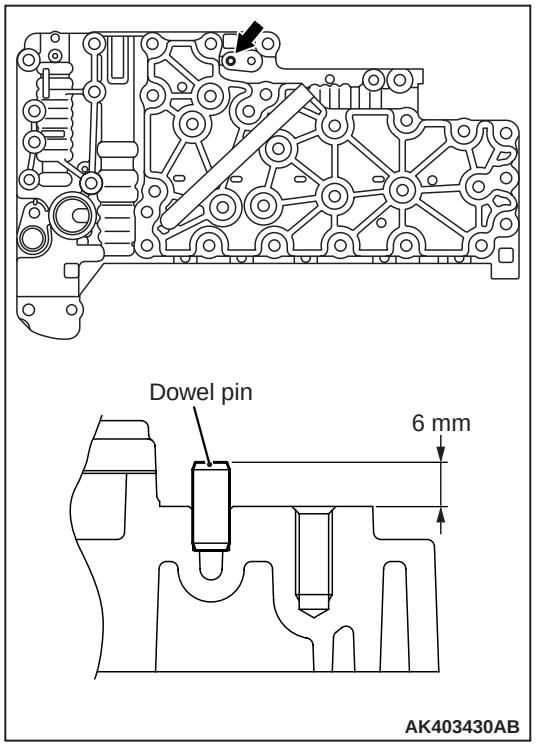
REASSEMBLY SERVICE POINTS

>>A<< SOLENOID VALVE INSTALLATION

1. Apply ATF, vaseline or petroleum jelly to O-ring, and install it to solenoid valves.

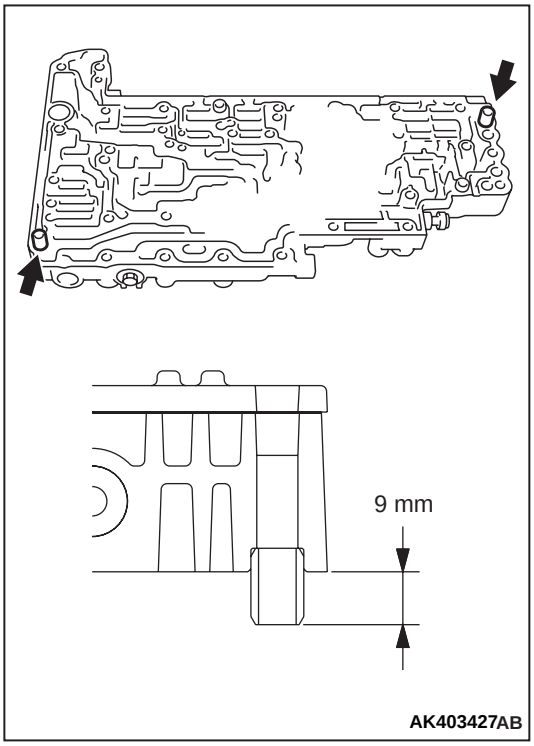
2. Following the marks made when removing, install each solenoid valve in its proper position.

>>B<< DOWEL PIN INSTALLATION



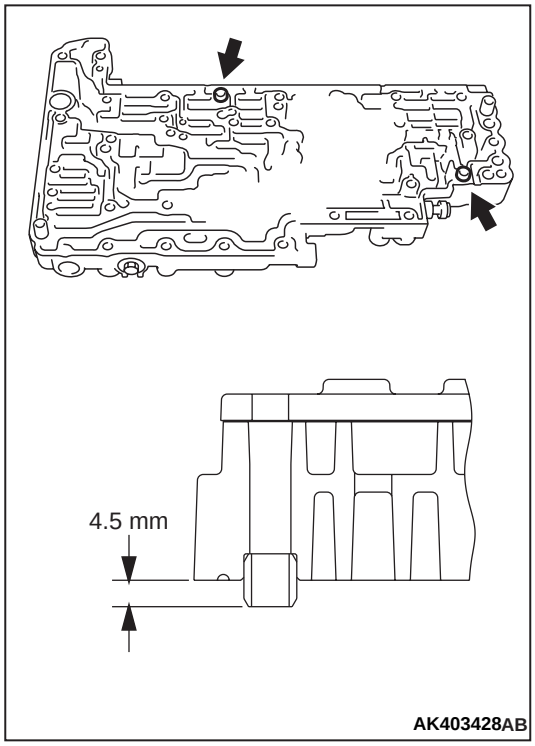
Install the dowel pin at the specified position on the lower valve body.

>>C<< KNOCK BUSHING INSTALLATION



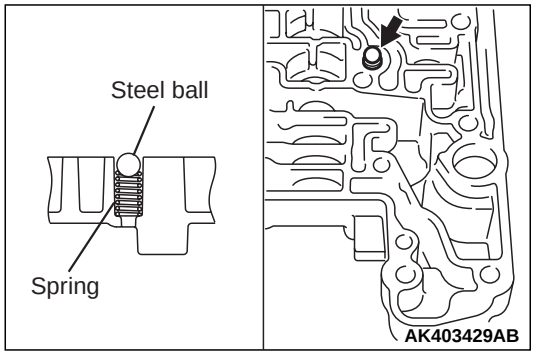
Install the knock bushing onto the lower valve body position shown in the illustration.

>>D<< KNOCK BUSHING INSTALLATION



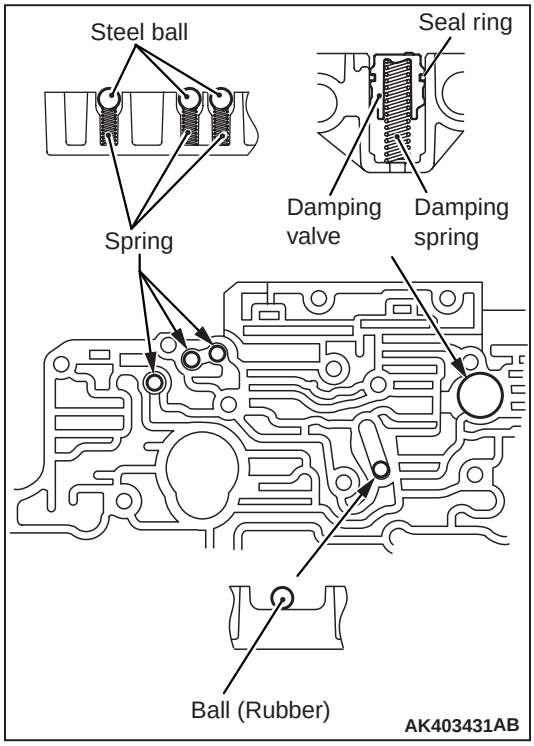
Install the knock bushing onto the lower valve body position shown in the illustration.

>>E<< SPRING / STEEL BALL (LINE RELIEF) INSTALLATION



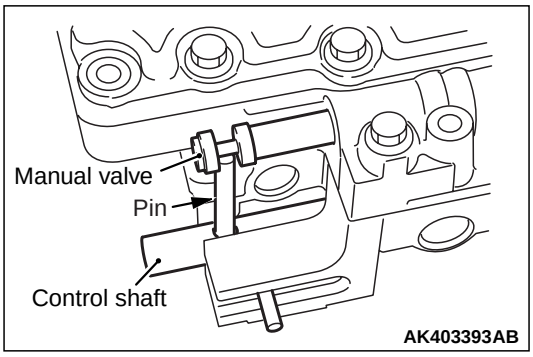
Install the spring 7.0 mm diameter, 17.3 mm length and the steel ball 6.4 mm diameter onto the lower valve body position shown in the illustration.

>>F<< SPRING / STEEL BALL (ORIFICE CHECK BALL) / BALL (ORIFICE CHECK BALL) / DAMPING VALVE SPRING / SEAL RING / DAMPING VALVE INSTALLATION



1. Install the spring (4.5 mm diameter, 15.4 mm length) and the steel ball (6.4 mm diameter) onto the upper valve body position shown in the illustration.
2. Install the ball (rubber) (6.4 mm diameter) onto the upper valve body position shown in the illustration.
3. After installing the seal ring onto the damping valve, install together with the damping valve spring (7.7 mm diameter, 35.8 mm length) onto the upper valve body position shown in the illustration.

>>G<< CONTROL SHAFT INSTALLATION



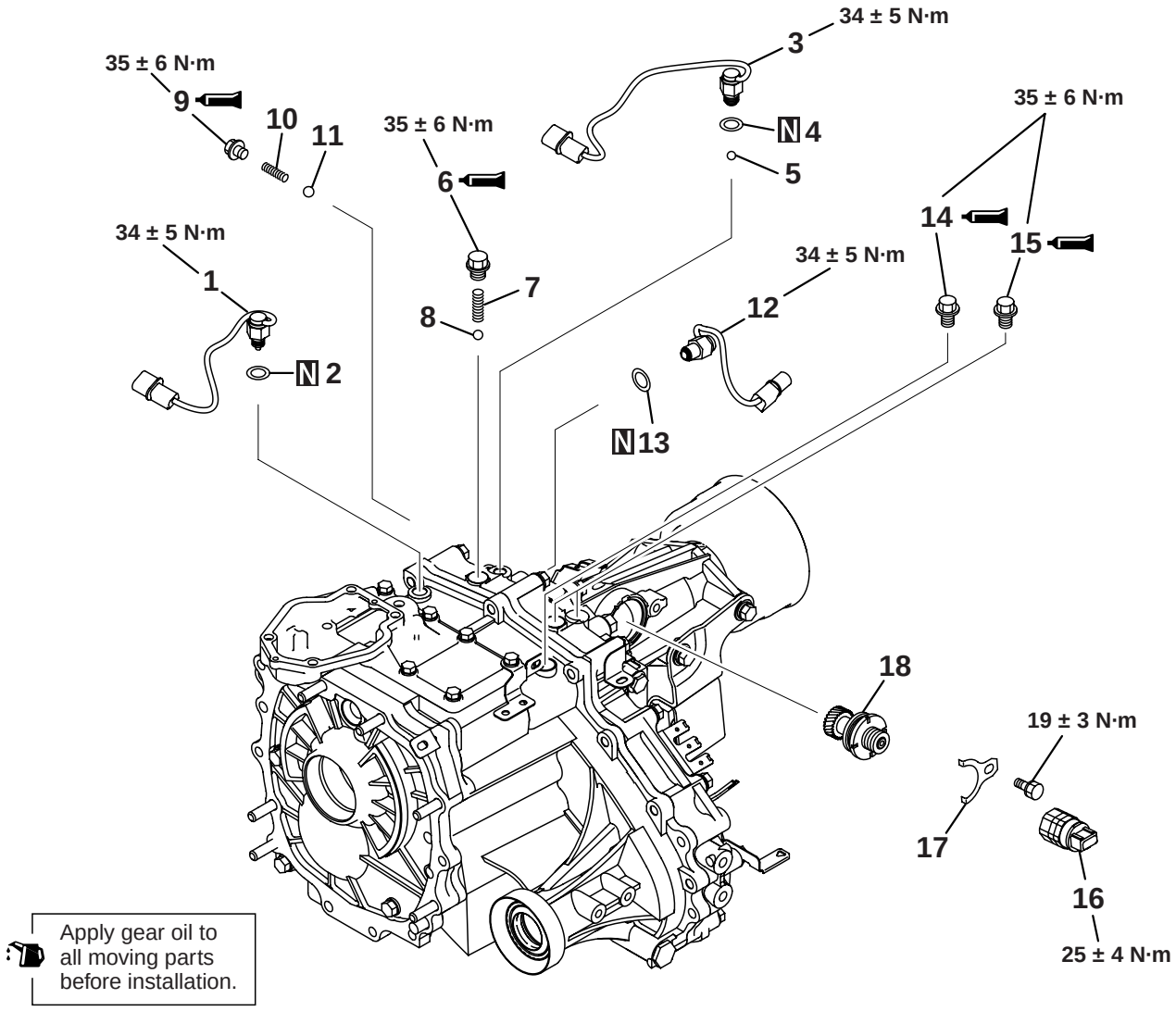
Insert the control shaft into the valve body, putting the pin of the control shaft into the groove of the manual valve.

TRANSFER

DISASSEMBLY AND REASSEMBLY

M1233013300333

<Easy select 4WD>



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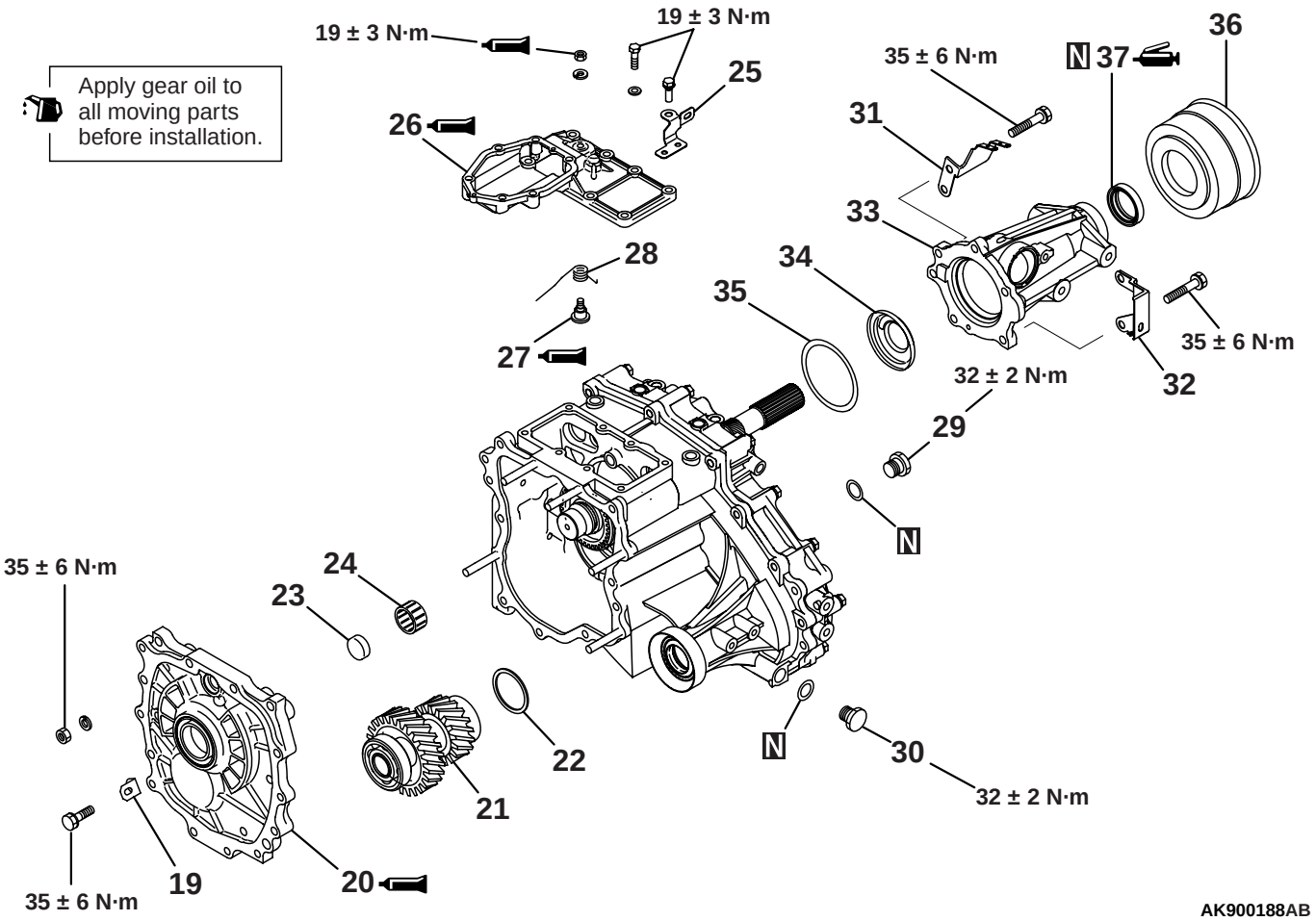
Disassembly steps

1. 4WD operation detection switch
2. Gasket
3. High/low detection switch
4. Gasket
5. Steel ball
- >>**X**<< 6. Plug
- >>**W**<< 7. Spring
8. Steel ball
- >>**X**<< 9. Plug
- >>**W**<< 10. Spring

Disassembly steps (Continued)

11. Steel ball
12. Low detection switch
13. Gasket
- >>**X**<< 14. Plug
- >>**X**<< 15. Plug
16. Vehicle speed sensor
17. Speedometer sleeve clamp
- >>**V**<< 18. Speedometer driven gear sleeve assembly

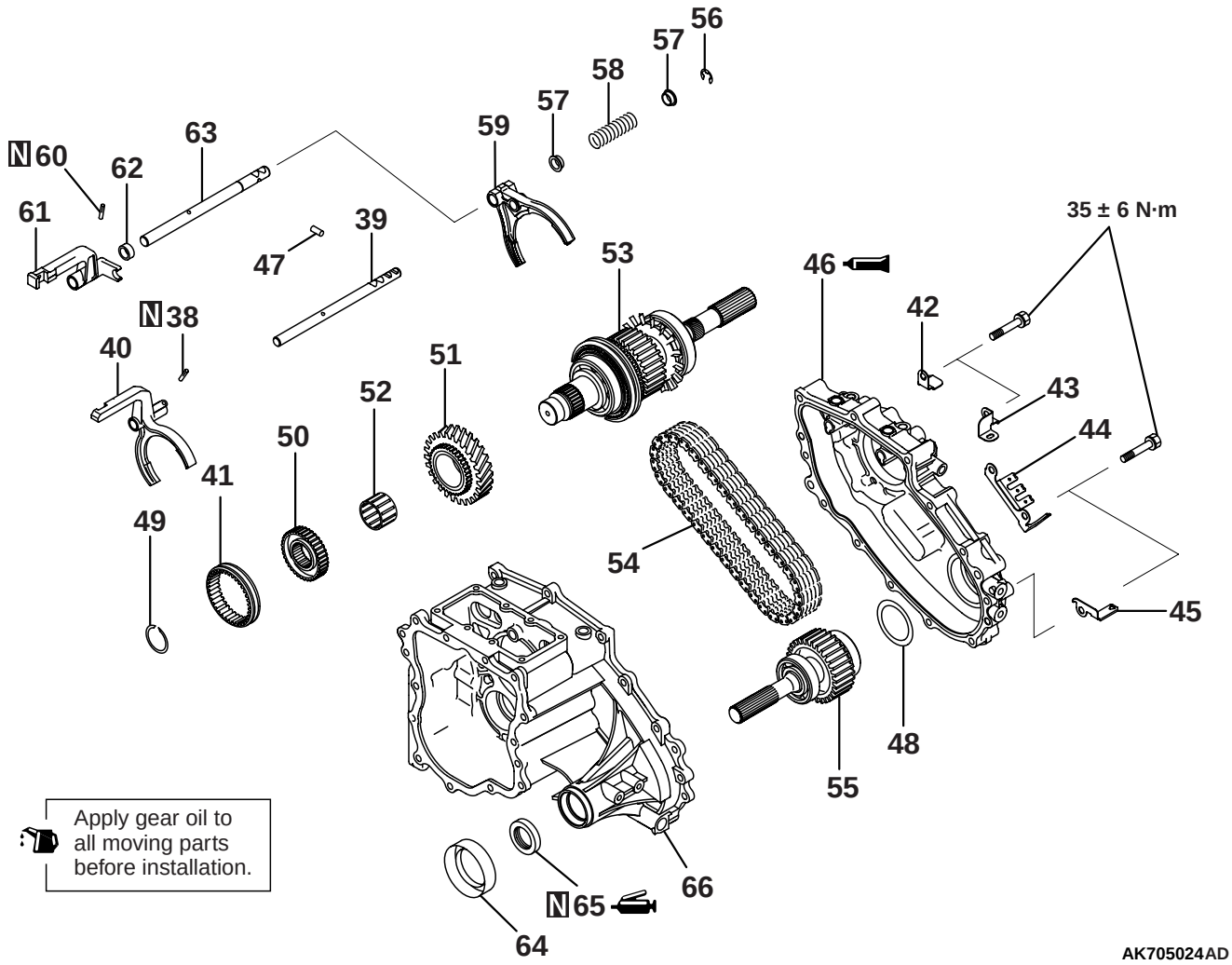


Disassembly steps

	19.	Bracket
>>**U**<<	20.	Transfer case plate
>>**T**<<	21.	Countershaft gear
>>**O**<<	22.	Spacer
	23.	Sealing cap
	24.	Needle bearing
	25.	Harness bracket
>>**R**<<	26.	Control housing
>>**Q**<<	27.	Support pin
>>**Q**<<	28.	Return spring

Disassembly steps (Continued)

	29.	Filler plug
	30.	Drain plug
	31.	Connector bracket
	32.	Harness bracket
>>P<<	33.	Rear cover
>>**O**<<	34.	Oil cover
>>**N**<<	35.	Spacer
>>**J**<<	36.	Dust seal cover
>>M<<	37.	Oil seal



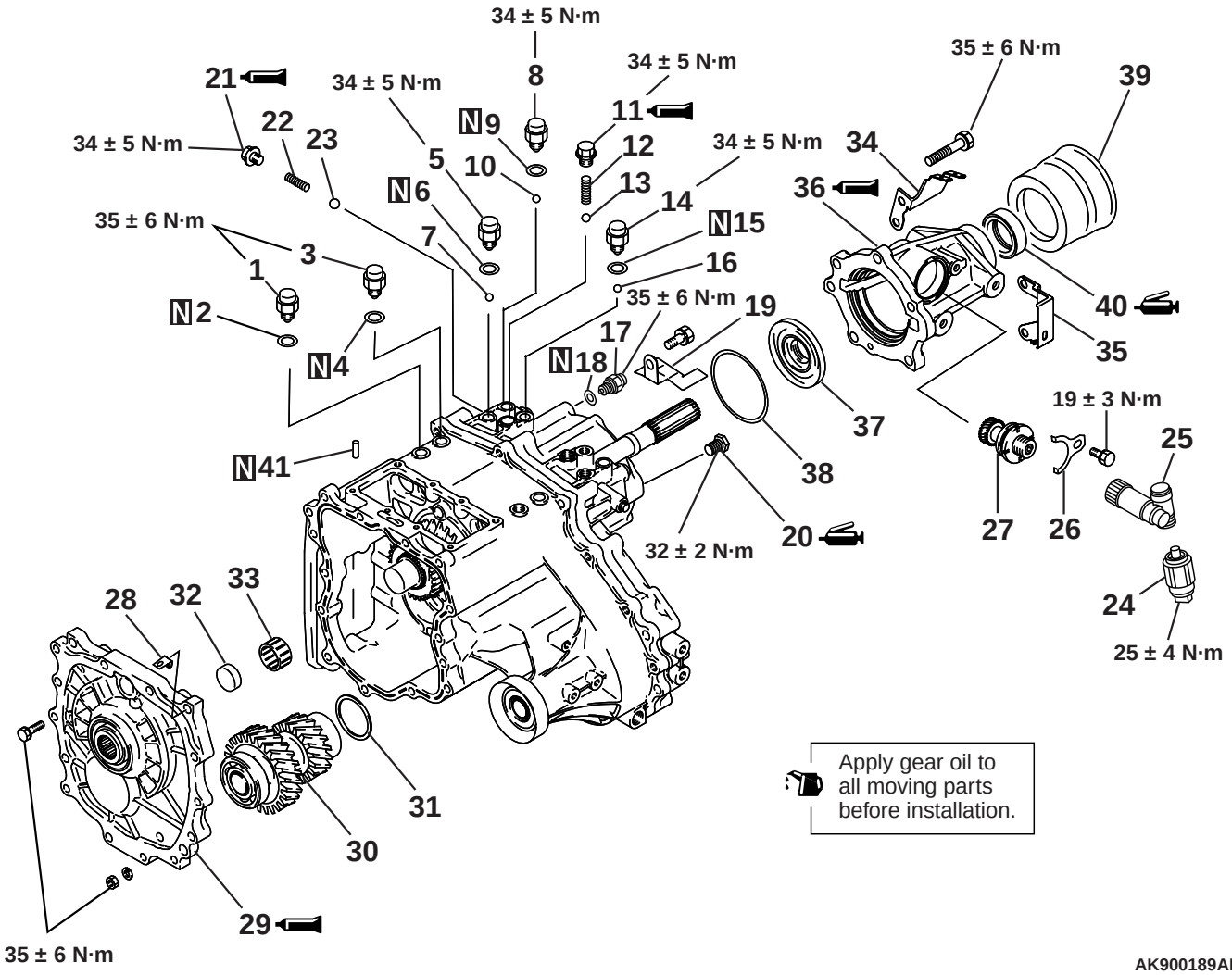
Disassembly steps

	>>L<<	38.	Spring pin
<<A>>	>>K<<	39.	H-L shift rail
		40.	H-L shift fork
	>>J<<	41.	H-L clutch sleeve
		42.	Harness bracket
		43.	Harness bracket
		44.	Harness bracket
		45.	Harness bracket
<<A>>	>>J<<	46.	Chain cover
		47.	Interlock plunger
		48.	Wave spring
	>>E<<	49.	Snap ring
	>>D<<	50.	H-L clutch hub
		51.	Low speed gear
		52.	Needle bearing

Disassembly steps (Continued)

<<B>>	>>C<<	53.	Rear output shaft
<<B>>	>>C<<	54.	Chain
<<B>>	>>C<<	55.	Front output shaft
		56.	Snap ring
		57.	Spring retainer
		58.	Return spring
		59.	2-4WD shift fork
	>>B<<	60.	Spring pin
		61.	2-4WD shift lug
		62.	Spacer
		63.	2-4WD shift rail
		64.	Dust seal guard
	>>A<<	65.	Oil seal
		66.	Transfer case

<Super select 4WD>

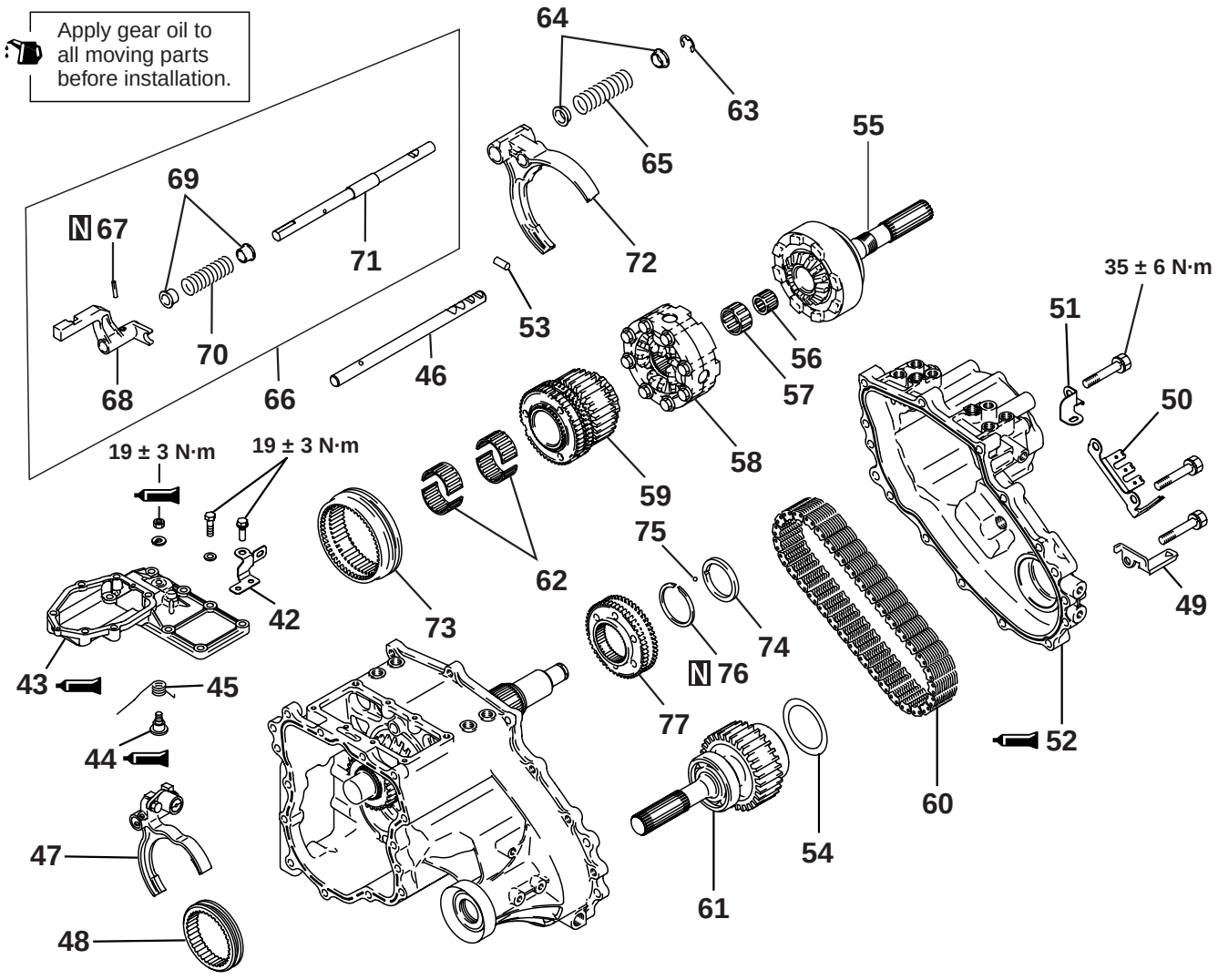


Disassembly steps

>>Y<<	1.	Center differential lock detection switch
	2.	Gasket
>>Y<<	3.	2WD/4WD detection switch
	4.	Gasket
>>Y<<	5.	Center differential lock operation detection switch
	6.	Gasket
	7.	Steel ball
>>Y<<	8.	4WD operation detection switch
	9.	Gasket
	10.	Steel ball
>>X<<	11.	Plug
>>W<<	12.	Spring
	13.	Steel ball
>>Y<<	14.	High/low detection switch
	15.	Gasket
	16.	Steel ball
>>Y<<	17.	4LLc detection switch
	18.	Gasket
	19.	Harness bracket
>>X<<	20.	Plug

Disassembly steps (Continued)

>>X<<	21.	Plug
>>W<<	22.	Spring
	23.	Steel ball
	24.	Vehicle speed sensor
	25.	Gear box
	26.	Speedometer clamp
>>V<<	27.	Speedometer driven gear sleeve assembly
	28.	Bracket
>>U<<	29.	Transfer case plate
>>T<<	30.	Countershaft gear
>>N<<	31.	Spacer
	32.	Sealing cap
	33.	Needle bearing
	34.	Connector bracket
	35.	Harness bracket
>>P<<	36.	Rear cover
	37.	Oil cover
>>N<<	38.	Spacer
	39.	Dust seal cover
>>M<<	40.	Oil seal
>>J<<	41.	Spring pin



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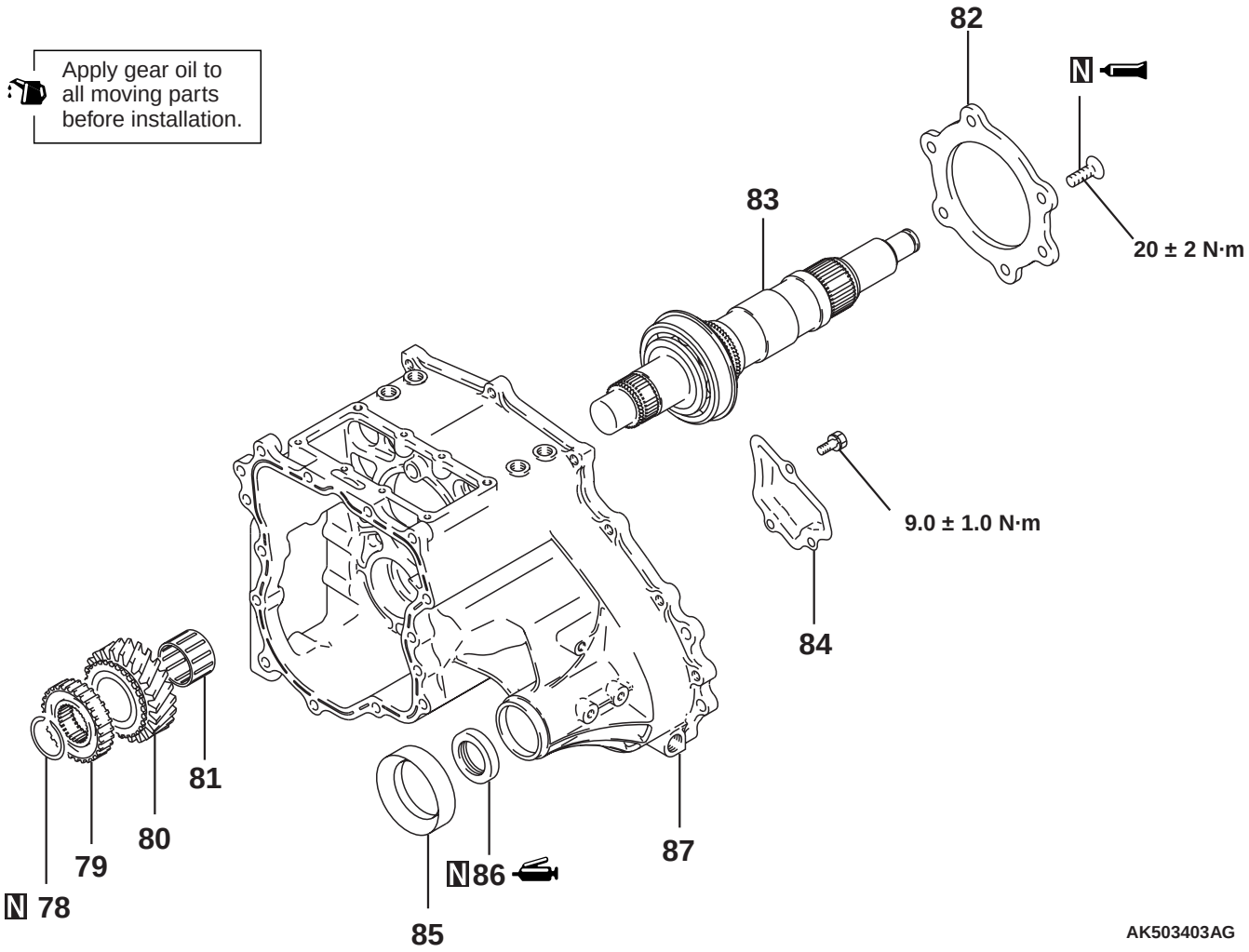
Disassembly steps

		42.	Harness bracket
	>>R<<	43.	Control housing
	>>Q<<	44.	Support pin
	>>Q<<	45.	Return spring
<<**A**>>	>>**K**<<	46.	H-L shift rail
		47.	H-L shift fork
	>>**J**<<	48.	H-L clutch sleeve
		49.	Harness bracket
		50.	Harness bracket
		51.	Harness bracket
<<A>>	>>**I**<<	52.	Chain cover
		53.	Interlock plunger
		54.	Wave spring
		55.	Rear output shaft
		56.	Needle bearing
		57.	Needle bearing
		58.	Center differential case
<<**C**>>	>>**H**<<	59.	2-4WD synchronizer
<<**C**>>	>>**H**<<	60.	Chain

Disassembly steps (Continued)

<<**C**>>	>>**H**<<	61.	Front output shaft
		62.	Needle bearing
		63.	E-ring
		64.	Spring seat
		65.	Spring
		66.	2-4WD shift lug and shift rail assembly
	>>**G**<<	67.	Spring pin
		68.	2-4WD shift lug
		69.	Spring retainer
		70.	Spring
		71.	2-4WD shift rail
		72.	2-4WD shift fork
		73.	2-4WD synchronizer sleeve
		74.	Spacer
		75.	Steel ball
	>>**F**<<	76.	Snap ring
		77.	Differential lock hub

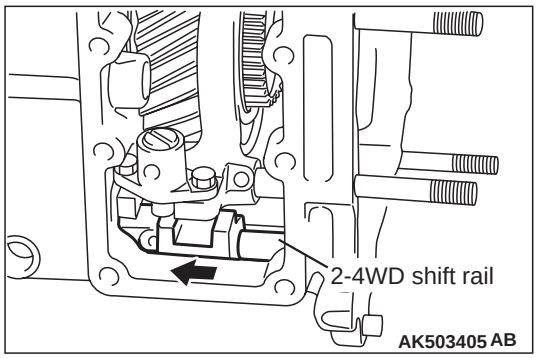


Disassembly steps

- >>**E**<< 78. Snap ring
- >>**D**<< 79. H-L clutch hub
- 80. Low speed gear
- 81. Needle bearing
- 82. Rear bearing retainer
- 83. Transfer drive shaft
- 84. Oil pool cover
- 85. Dust seal guard
- >>**A**<< 86. Oil seal
- 87. Transfer case

DISASSEMBLY SERVICE POINTS

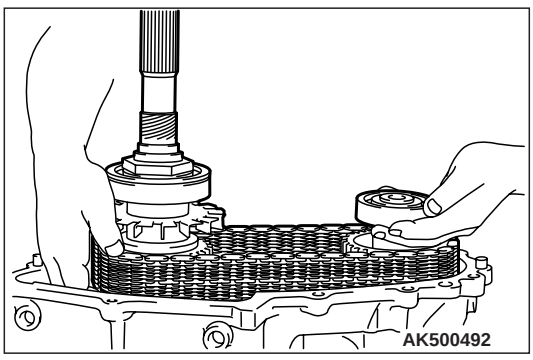
<<A>> H-L SHIFT RAIL REMOVAL



1. Fix the H-L shift rail at the high position.
2. Shift the 2-4WD shift rail at the 4WD position.

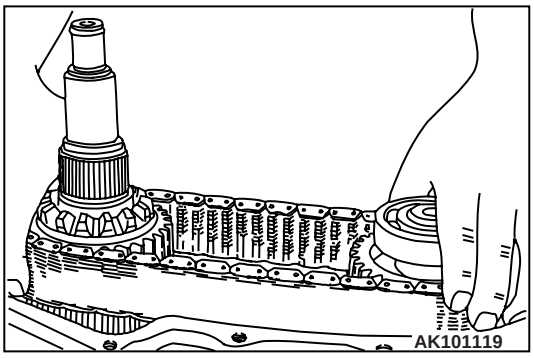
   NOTE: If the 2-4WD shift rail is at the 2WD position, the chain cover cannot be removed because interlock is actuated.

<<B>> REAR OUTPUT SHAFT / CHAIN / FRONT OUTPUT SHAFT REMOVAL



Remove the rear output shaft, chain and front output shaft as a set.

<<C>> 2-4WD SYNCHRONIZER / CHAIN / FRONT OUTPUT SHAFT REMOVEAL



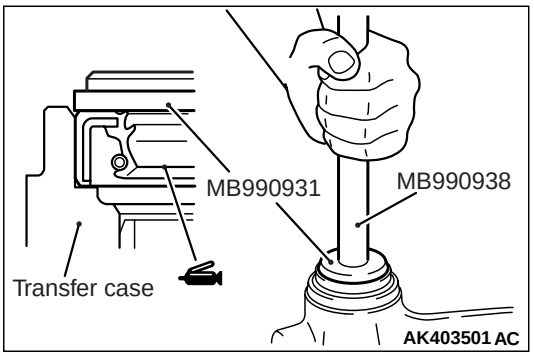
Remove the 2-4WD synchronizer, chain and front output shaft as a set.

ADJUSTMENT BEFORE REASSEMBLY

Spacer selection for adjustment of countershaft gear end play. (Refer to adjustment of transfer - spacer selection for adjustment of countershaft gear end play P.23C-77)

REASSEMBLY SERVICE POINTS

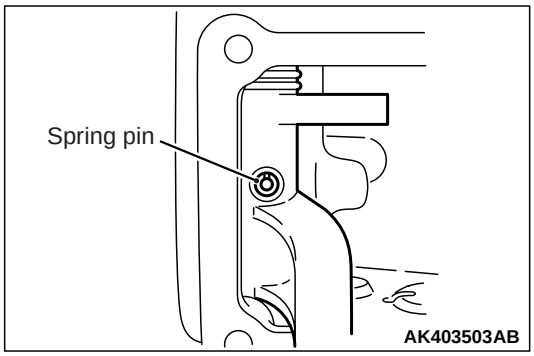
>>A<< OIL SEAL INSTALLATION



1. Use special tools to install the oil seal.
   - Installer adapter (MB990931)
   - Installer bar (MB990938)
2. Apply the specified grease to the lip of oil seal.

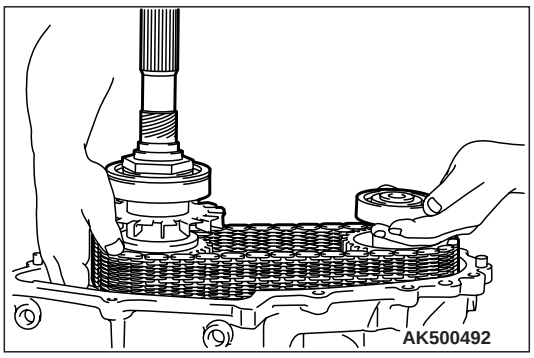
   Specified lubricant:
   Mitsubishi Part No. 0101011 or equivalent

>>B<< SPRING PIN INSTALLATION



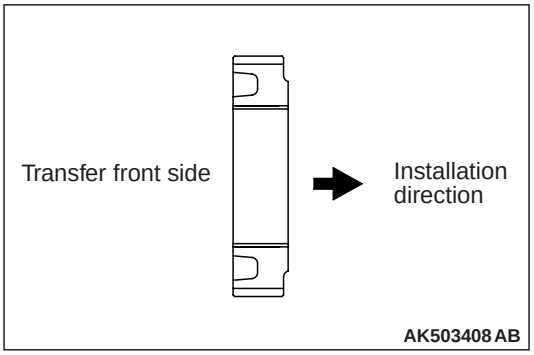
1. Align the 2-4WD shift lug with the 2-4WD shift rail spring pin hole.
2. Hammer in the spring valve so that the spring pin slit matches the center of the shift rail shaft.

>>C<< FRONT OUTPUT SHAFT / CHAIN / REAR OUTPUT SHAFT INSTALLATION



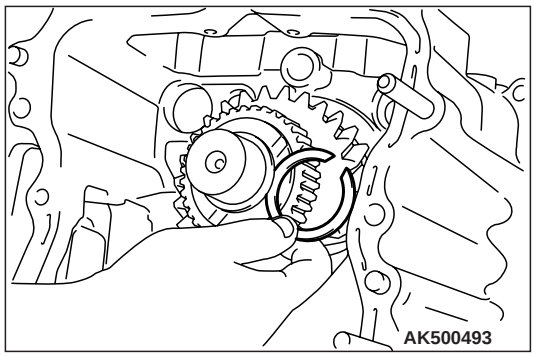
1. Engage the chain precisely with the sprocket of the rear output shaft and the front output shaft.
2. Install the 2-4WD shift fork on the 2-4WD clutch sleeve. While passing them beside the 2-4WD shift rail, install the front output shaft, and chain and rear output shaft.

>>D<< H-L CLUTCH HUB INSTALLATION



Check that the H-L clutch hub is in the correct direction for installation.

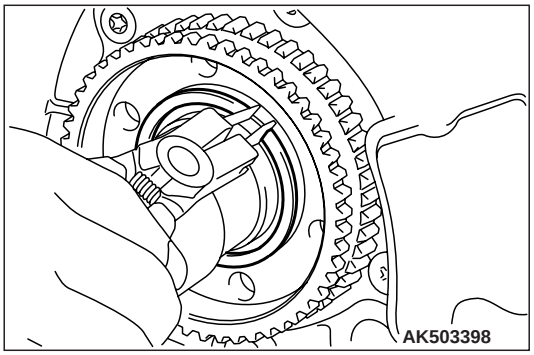
>>E<< SNAP RING INSTALLATION



1. Install the thickest snap ring that can be fitted in the snap ring groove of the rear output shaft.
2. Make sure that the H-L clutch hub end play meets the standard value.

   Standard value: 0 – 0.08 mm
   (For H-L clutch hub end play)

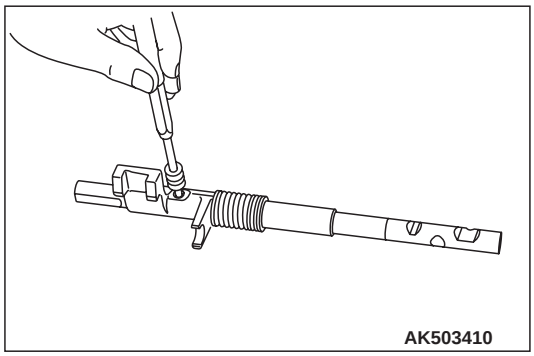
>>F<< SNAP RING INSTALLATION



1. Install the thickest snap ring that can be fitted in the snap ring groove of the transfer drive shaft.
2. Make sure that the differential lock hub end play meets the standard value.

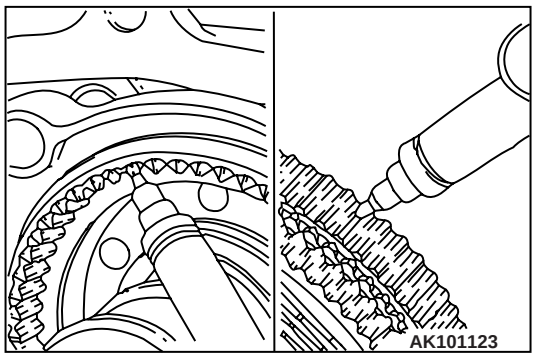
   Standard value: 0 – 0.08 mm
   (For differential lock hub end play)

>>G<< SPRING PIN INSTALLATION

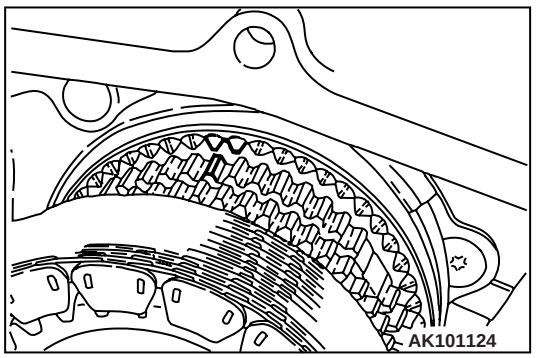


1. Align the 2-4WD shift lug with the 2-4WD shift rail spring pin hole.
2. Hammer in the spring valve so that the spring pin slit matches the center of the shift rail shaft.

>>H<< 2-4WD SYNCHRONIZER / CHAIN / FRONT OUTPUT SHAFT INSTALLATION



1. Make a white paint mark on the deep groove portions (three places) of the 2-4WD synchronizer.
2. Make a white paint mark on the portions (three places) of the 2-4WD synchronizer sleeve splines.

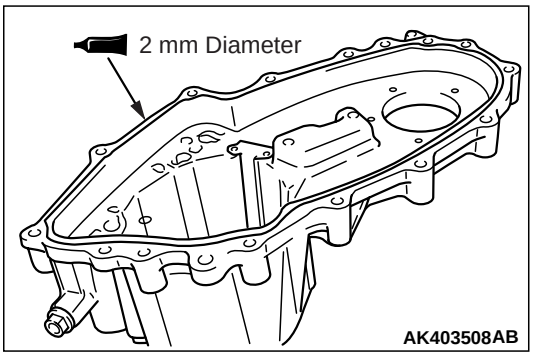


3. Place the chain in tight mesh with the 2-4WD synchronizer and front output shaft sprockets.
4. With both sprockets spaced the farthest apart, install them on the transfer case simultaneously.

>>I<< CHAIN COVER INSTALLATION

⚠ CAUTION

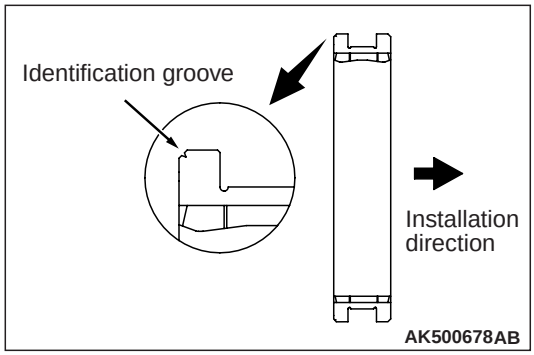
- **Completely degrease the FIPG-applied surface so that water and oil including the old sealant cannot adhere to the surface coated with the sealant. Never touch the degreased surface by hand.**
- **Make sure the starting point and the ending point are about the middle between the bolts.**



1. Apply sealant to the chain cover, and then install the chain cover.

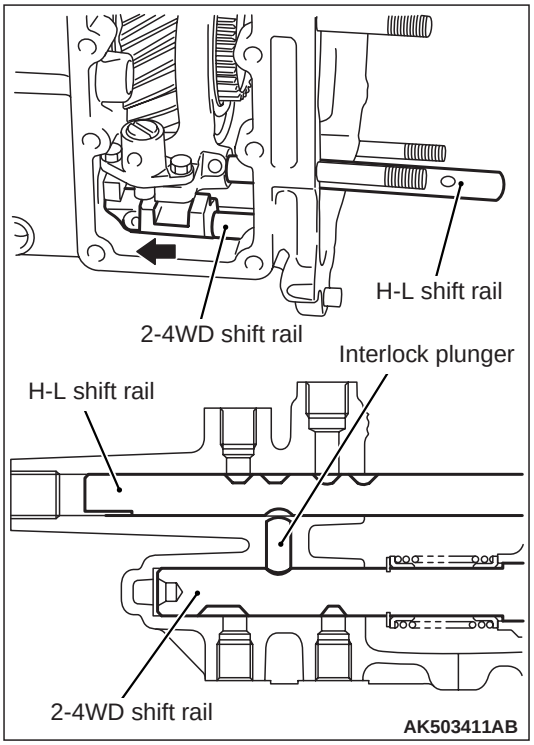
   Specified sealant:
   Mitsubishi Part No. MD997740 or equivalent

>>J<< H-L CLUTCH SLEEVE INSTALLATION



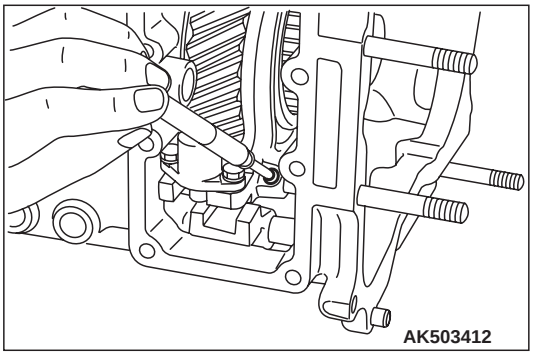
Check that the H-L clutch sleeve is in the correct direction for installation.

>>K<< H-L SHIFT RAIL INSTALLATION



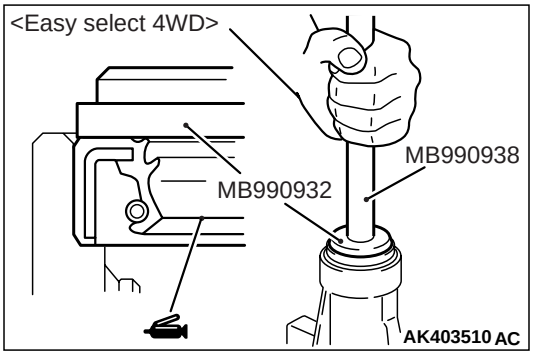
1. Tilt the transfer case with the 2-4WD shift rail downward as shown in the illustration.
2. Move the 2-4WD shift rail in the direction of the arrow fully.
3. After making sure that the plunger is not exposed out of the H-L shift rail hole in the transfer case, install the H-L shift rail.

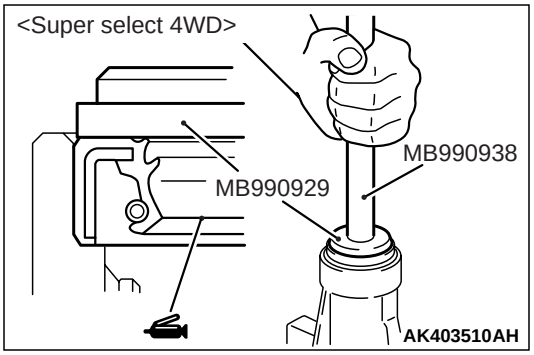
>>L<< SPRING PIN INSTALLATION



1. Align the spring pin holes on the shift rail with the shift fork. Then tap in the spring pin so that the slit of the spring pin is facing the shaft center of the shift rail.

>>M<< OIL SEAL INSTALLATION

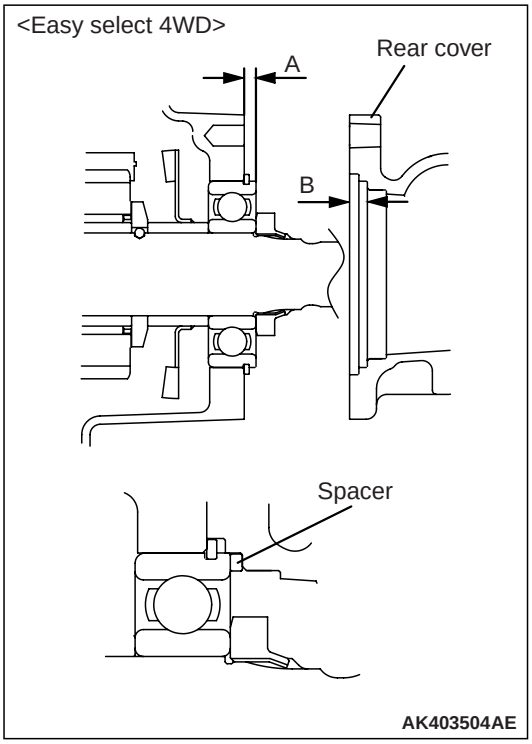


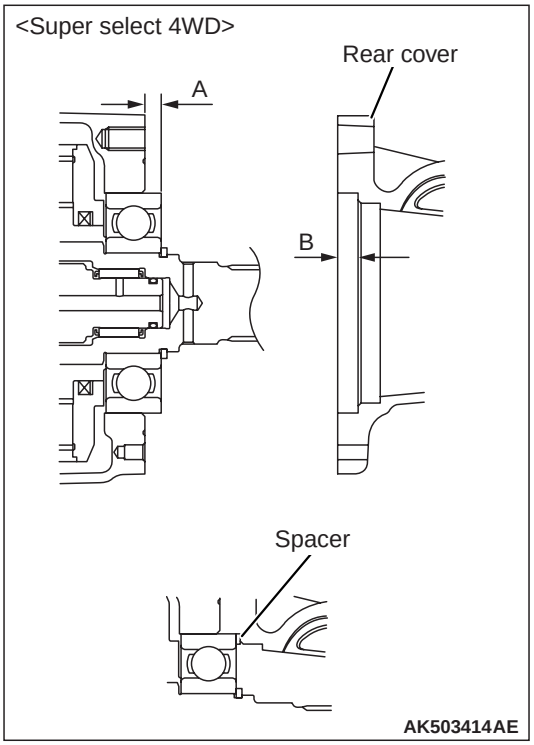


1. Use special tools to install the oil seal.
   - Installer adapter (MB990932) <Easy select 4WD>
   - Installer adapter (MB990929) <Super select 4WD>
   - Installer bar (MB990938)
2. Apply the specified grease to the lip of oil seal.

   Specified lubricant:
   Mitsubishi Part No. 0101011 or equivalent

>>N<< SPACER INSTALLATION



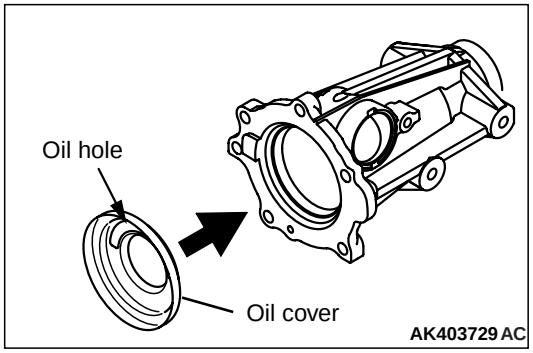


1. Measure projection A of the rear output shaft bearing and depth B of the second stage of the rear cover.
2. Subtract A from B and let the answer be C. Select a spacer so that the subtracted value will be the standard value shown below.

   Standard value:
   - **0 – 0.1 mm <Easy select 4WD>**
   - **0.025 – 0.150 mm <Super select 4WD>**

(For rear output shaft bearing to rear cover clearance)

>>O<< OIL COVER INSTALLATION

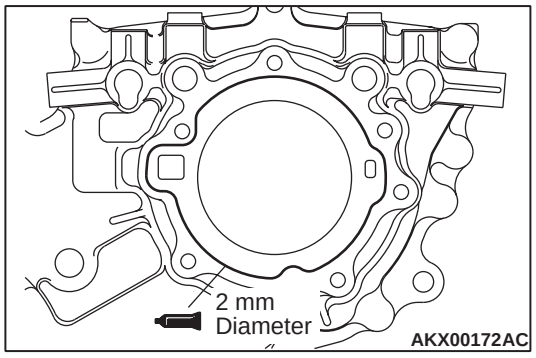


Install the oil cover so that the oil hole shown in the illustration.

>>P<< REAR COVER INSTALLATION

⚠ CAUTION

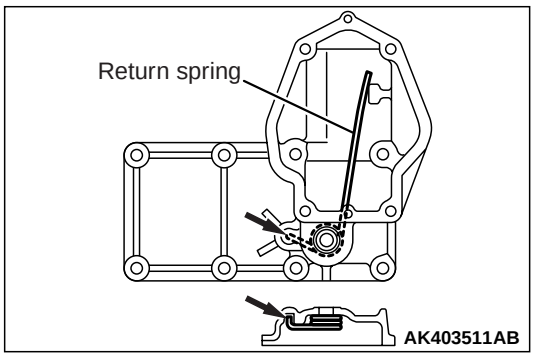
- **Completely degrease the FIPG-applied surface so that water and oil including the old sealant cannot adhere to the surface coated with the sealant. Never touch the degreased surface by hand.**
- **Make sure the starting point and the ending point are about the middle between the bolts.**



Apply the sealant to the chain cover.

Specified sealant:
Mitsubishi Part No. MD997740 or equivalent

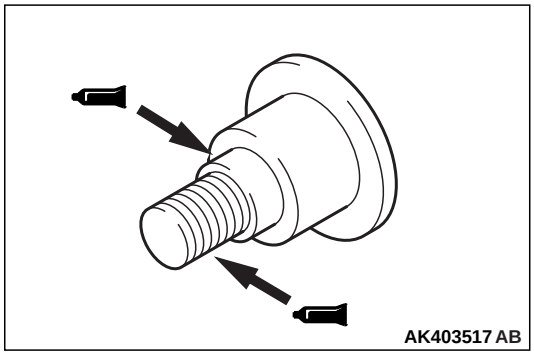
>>Q<< RETURN SPRING / SUPPORT PIN INSTALLATION



1. Insert the bent section of the return spring into the control housing as shown.

⚠ CAUTION

- **Completely degrease the FIPG-applied surface so that water and oil including the old sealant cannot adhere to the surface coated with the sealant. Never touch the degreased surface by hand.**
- **Make sure the starting point and the ending point are about the middle between the bolts.**



2. Apply the sealant to the support pin section and apply the adhesive to the threads.

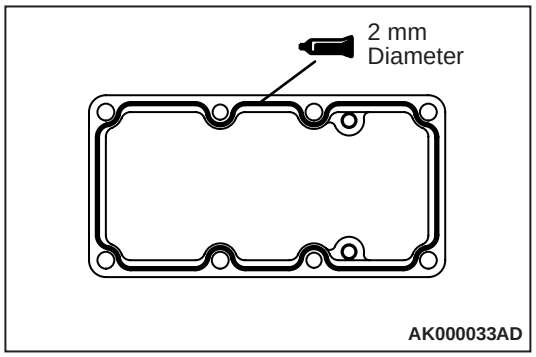
Specified sealant:
3M™ ATD Part No. 8672 or equivalent
Specified adhesive:
Mitsubishi Part No. MB160450 or equivalent

3. Insert the support pin and install the nut.

>>R<< CONTROL HOUSING INSTALLATION

⚠ CAUTION

- **Completely degrease the FIPG-applied surface so that water and oil including the old sealant cannot adhere to the surface coated with the sealant. Never touch the degreased surface by hand.**
- **Make sure the starting point and the ending point are about the middle between the bolts.**



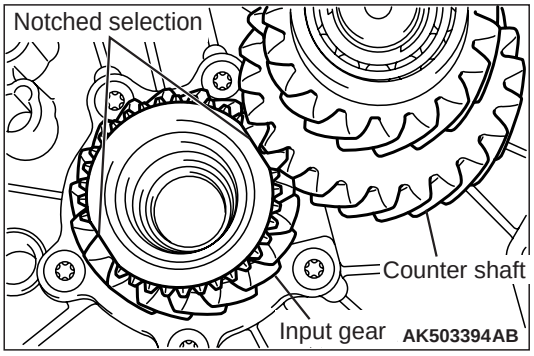
Apply the sealant to the control housing.

Specified sealant:
Mitsubishi Part No. 997740 or equivalent

>>S<< SPACER INSTALLATION

Install the previously selected spacer (Refer to ADJUSTMENT BEFORE ASSEMBLY).

>>T<< COUNTER SHAFT GEAR INSTALLATION

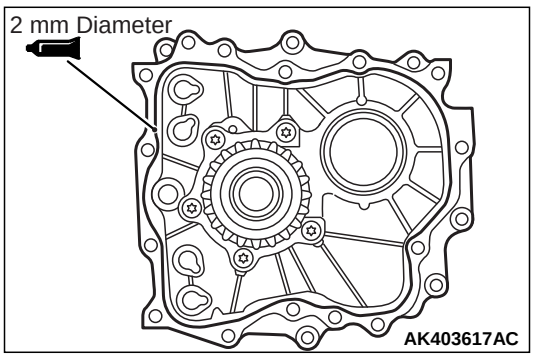


1. Turn the input gear's notched selection surface toward the counter shaft mounting surface. then install the counter shaft.

>>U<< TRANSFER CASE PLATE INSTALLATION

⚠ CAUTION

- **Completely degrease the FIPG-applied surface so that water and oil including the old sealant cannot adhere to the surface coated with the sealant. Never touch the degreased surface by hand.**
- **Make sure the starting point and the ending point are about the middle between the bolts.**



1. Apply the sealant to the transfer case plate.

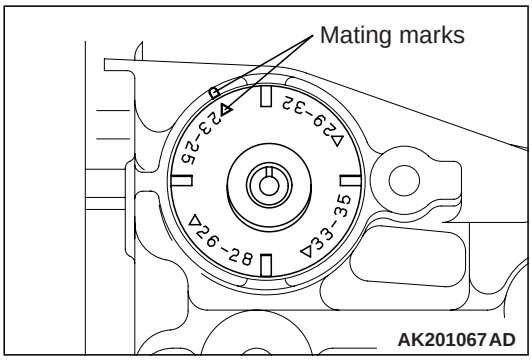
Specified sealant:
Mitsubishi Part No. MD997740 or equivalent

⚠ CAUTION

The transfer case plate must be installed smooth and straight to get a good seal.

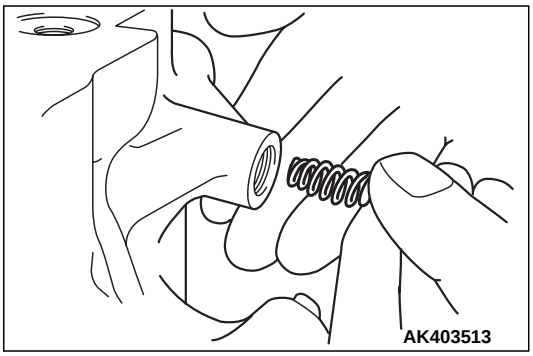
2. Install the transfer case plate together with the input gear and countershaft.

>>V<< SPEEDOMETER DRIVEN GEAR SLEEVE ASSEMBLY INSTALLATION



Match the mating marks to the number of teeth.

>>W<< SPRING INSTALLATION

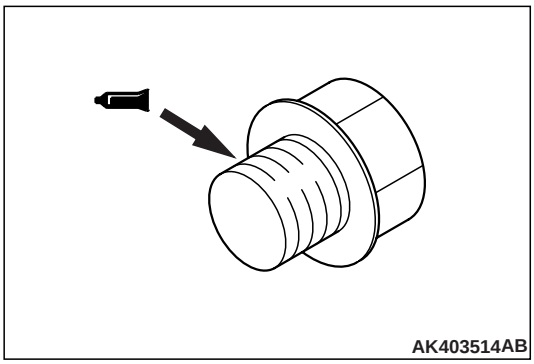


Install the spring with its tapered end toward the ball.

>>X<< PLUG INSTALLATION

⚠ CAUTION

- **Completely degrease the FIPG-applied surface so that water and oil including the old sealant cannot adhere to the surface coated with the sealant. Never touch the degreased surface by hand.**
- **Make sure the starting point and the ending point are about the middle between the bolts.**

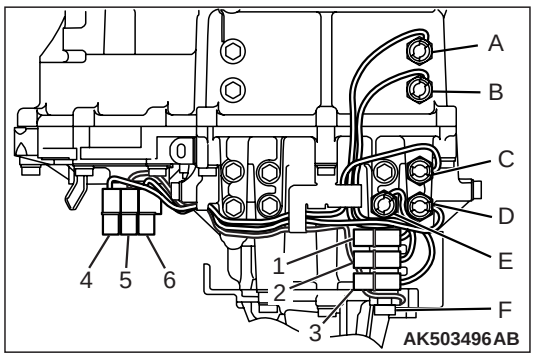


Apply the sealant to the threads.

Specified sealant:
3M™ ATD Part No. 8672 or equivalent

NOTE: The new plug is percolated with sealant, so sealant does not need to be applied.

>>Y<< DETECTION SWITCH INSTALLATION



Install with care. Do not make mistake when locating each switch.

Detection switch name		Connector No. / Color
A	Center differential lock detection switch	1 / Brown
B	2WD/4WD detection switch	2 / Black
C	Center differential lock operation detection switch	4 / Blown
D	4WD operation detection switch	6 / Black
E	High/low detection switch	3 / white
F	4LLc detection switch	5 / White

ADJUSTMENT OF TRANSFER

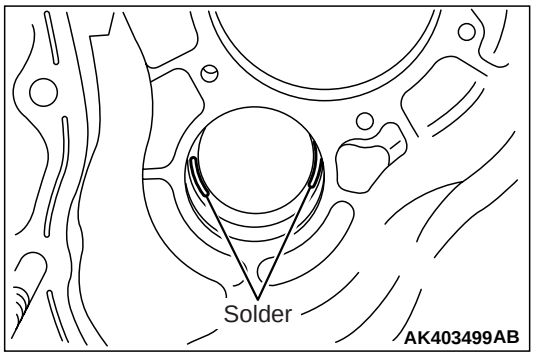
M1233030900060

SPACER SELECTION FOR ADJUSTMENT OF COUNTERSHAFT GEAR END PLAY

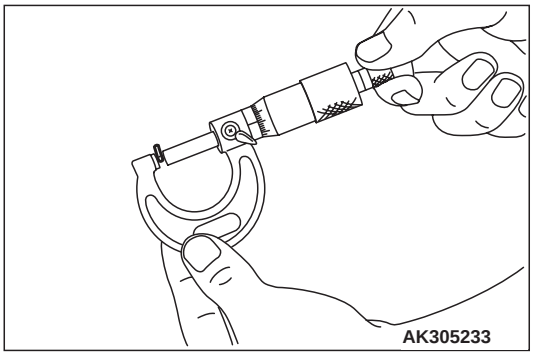
<Measurement using a solder>

⚠ CAUTION

- **If soft solder is not available, select the spacer in accordance with Plastigage method.**
- **If the spacer appropriate for the standard value cannot be selected using soft solder, select the spacer in accordance with Plastigage method.**



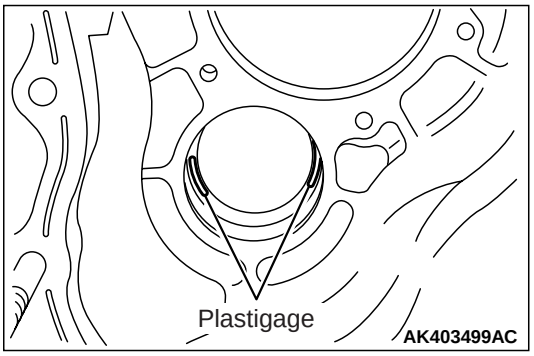
1. Put solders (1.0 mm diameter, about 10 mm long) in the illustrated positions of the transfer case housing.
2. Install the countershaft gear into the transfer case.
3. Install the transfer case plate and tighten the bolts to the specified torque of 35 ± 6 N·m.
4. Remove the transfer case plate and the countershaft gear, and then take out crushed solders.
5. If the solders have not crushed, use thicker solders (1.6 mm diameter, about 10 mm long) and repeat steps 2 to 4.



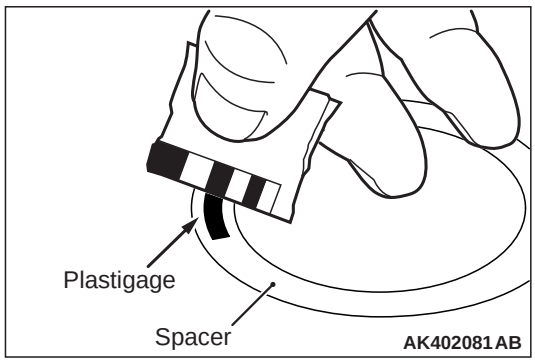
6. Measure the thickness of the crushed solder with a micrometer and select a spacer that will provide the standard value.

Spacer thickness: (T – 0) to (T – 0.15)
T: The crushed solder thickness
Standard value: 0 – 0.15 mm
(For countershaft gear end play)

<Measurement using Plastigage>



1. Put plastigage (about 10 mm long) in the illustrated positions of the transfer case housing.
2. Install the adjusting spacer having the minimum thickness.
3. Install the countershaft gear into the transfer case.
4. Install the transfer case plate and tighten the bolts to the specified torque of 35 ± 6 N·m.
5. Remove the transfer case plate and the countershaft gear, and then take out crushed solders.
6. If the Plastigages have not crushed, replace the spacer with a thicker one and repeat steps 3 to 5.



7. Measure the width of the crushed Plastigage at its widest part using a scale printed on the Plastigage package.

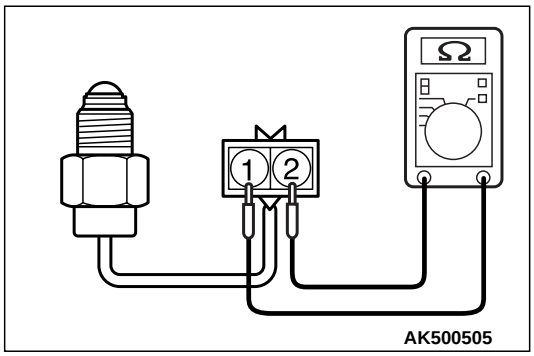
Standard value: 0 – 0.15 mm
(For countershaft gear end play)

INSPECTION

M1233013400114

<Easy select 4WD>

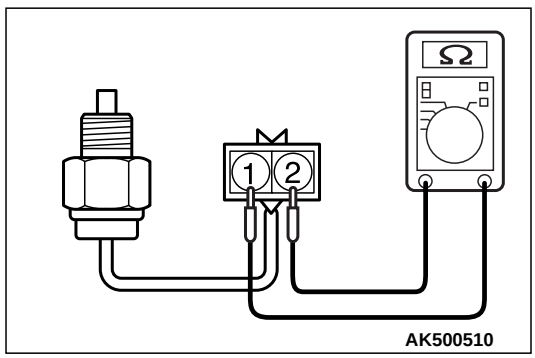
4WD OPERATION DETECTION SWITCH



Check for the continuity between the connector terminals.

Switch condition	Connector terminals	Continuity
Switch end pressed	1 – 2	Conductive
Switch end released	1 – 2	Open

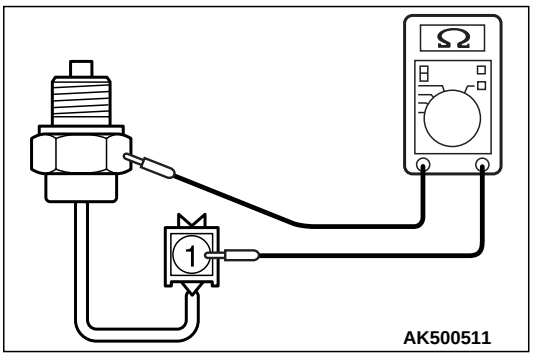
HIGH/LOW DETECTION SWITCH



Check for the continuity between the connector terminals.

Switch condition	Connector terminals	Continuity
Switch end pressed	1 – 2	Open
Switch end released	1 – 2	Conductive

LOW DETECTION SWITCH

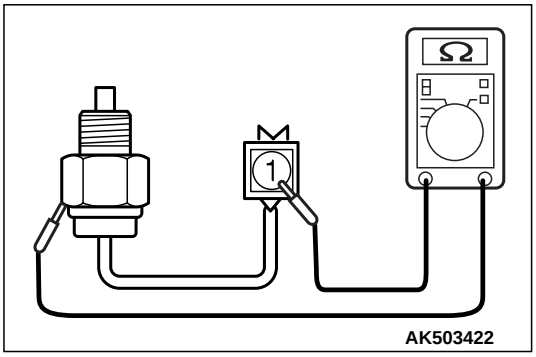


Check for the continuity between the connector terminals.

Switch condition	Connector terminals	Continuity
Switch end pressed	1 – 2	Open
Switch end released	1 – 2	Conductive

<Super select 4WD>

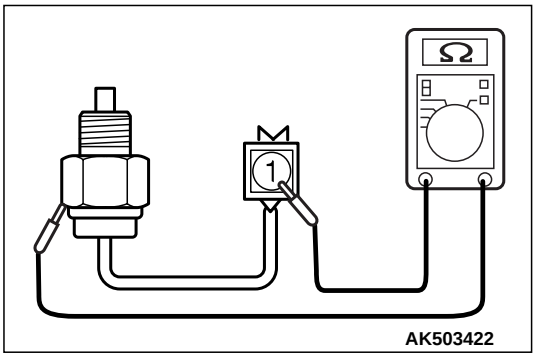
CENTER DIFFERENTIAL LOCK DETECTION SWITCH, 2WD/4WD DETECTION SWITCH, CENTER DIFFERENTIAL LOCK OPERATION DETECTION SWITCH, 4WD OPERATION DETECTION SWITCH, HIGH/LOW DETECTION SWITCH



Check for the continuity between the connector terminals.

Switch condition	Connector terminals	Continuity
Switch end pressed	1 – Body earth	Open
Switch end released	1 – Body earth	Conductive

4LLc DETECTION SWITCH



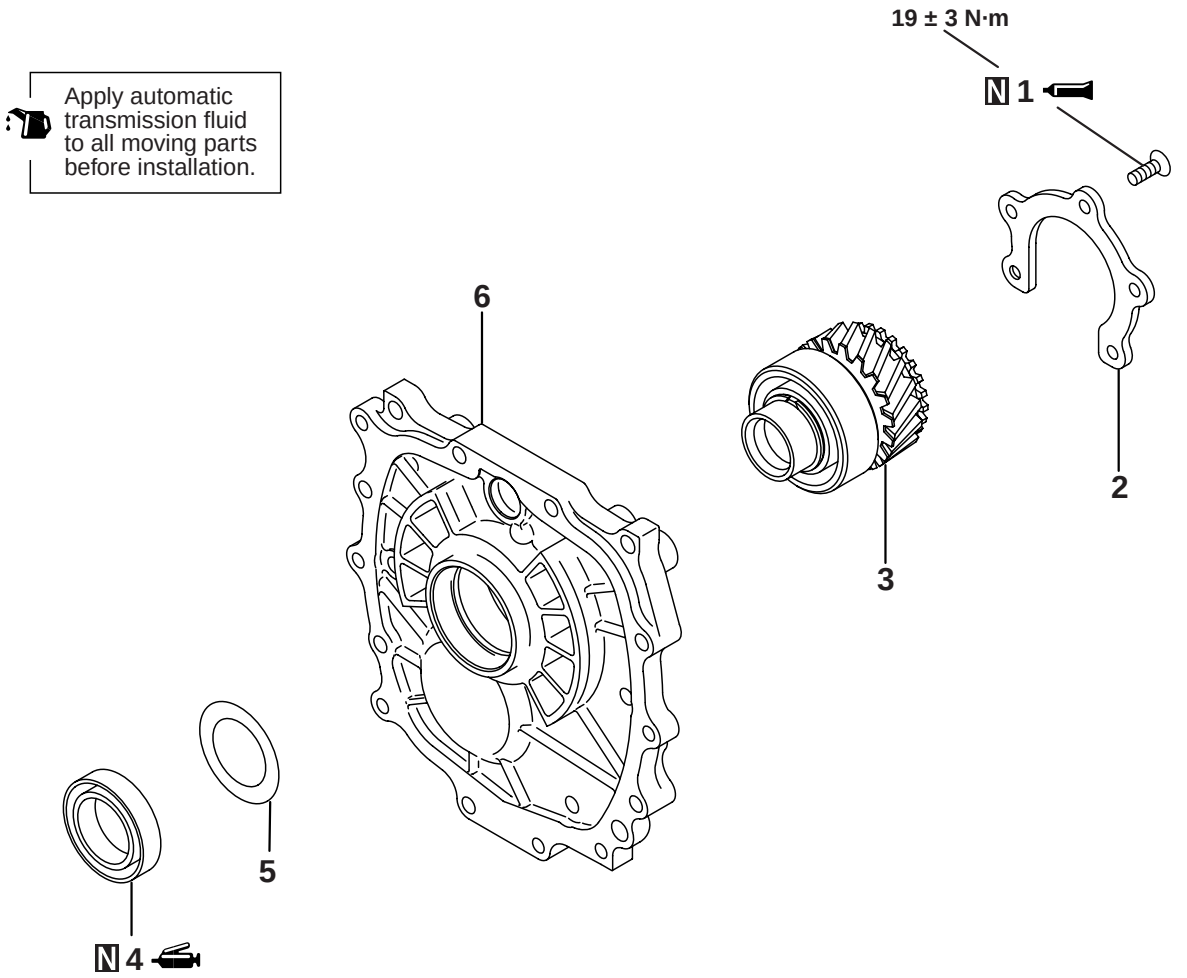
Check for the continuity between the connector terminals.

Switch condition	Connector terminals	Continuity
Switch end pressed	1 – Body earth	Conductive
Switch end released	1 – Body earth	Open

TRANSFER CASE PLATE

DISASSEMBLY AND REASSEMBLY

M1233024200222



AK700641AB

Disassembly steps

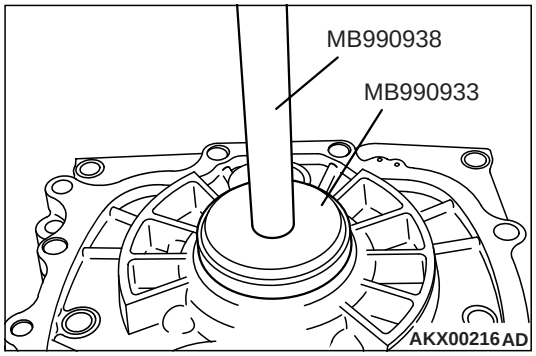
>>**B**<< 1. Bolt
2. Bearing retainer
3. Transfer input gear
>>**A**<< 4. Oil seal
5. Baffle plate
6. Transfer case plate

REASSEMBLY SERVICE POINT

>>A<< OIL SEAL INSTALLATION

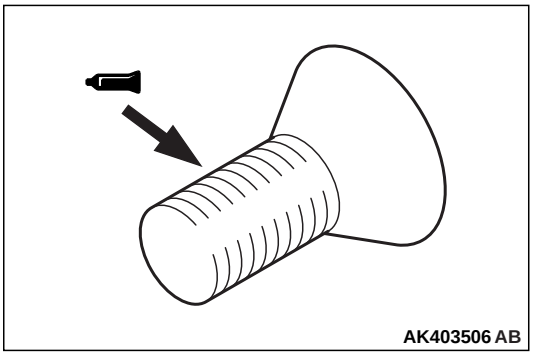
1. Use socket wrench to install the oil seal.

Specified lubricant:
Mitsubishi Part No. 0101011 or equivalent



2. Use special tools to install the oil seal.
   - Installer bar (MB990938)
   - Installer adapter (MB990933)

>>B<< BOLT INSTALLATION



Specified sealant:
Mitsubishi Part No. MD997740 or equivalent

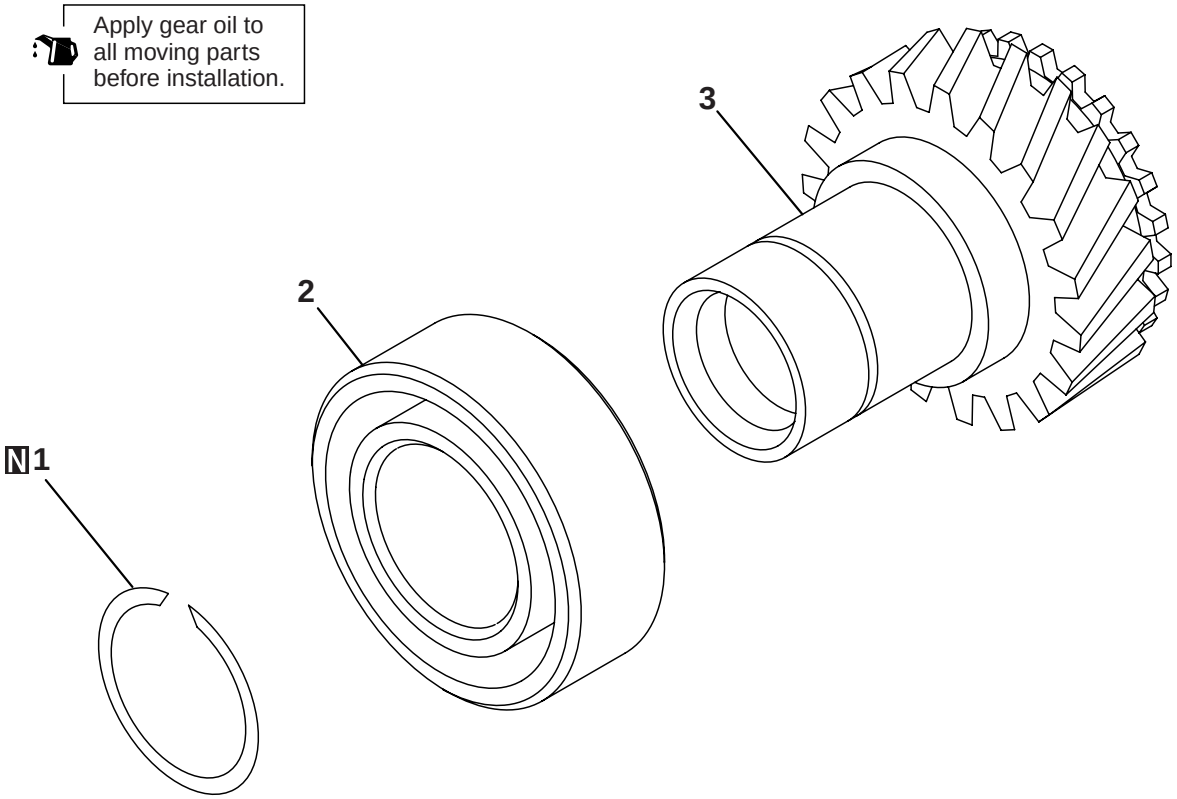
NOTE: The new bolt is percolate with sealant, so sealant does not need to be applied.

Apply the sealant to the threads.

INPUT GEAR

DISASSEMBLY AND REASSEMBLY

M1233015100249



AK700643AB

Disassembly steps

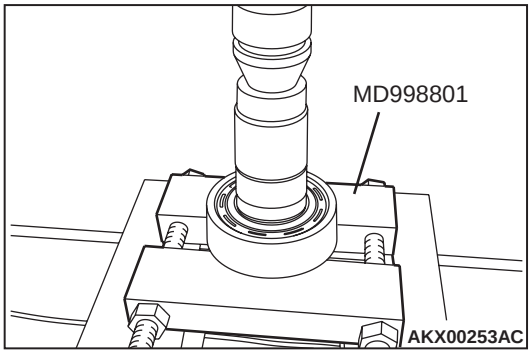
>>**B**<< 1. Snap ring

Disassembly steps (Continued)

<<**A**>> >>**A**<< 2. Ball bearing
3. Input gear

DISASSEMBLY SERVICE POINT

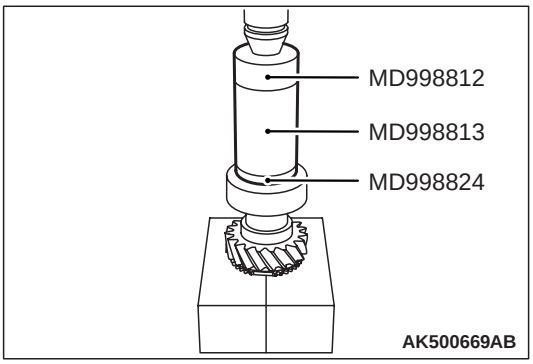
<<A>> BALL BEARING REMOVAL



Use special tool Bearing remover (MD998801) to remove the ball bearing.

REASSEMBLY SERVICE POINTS

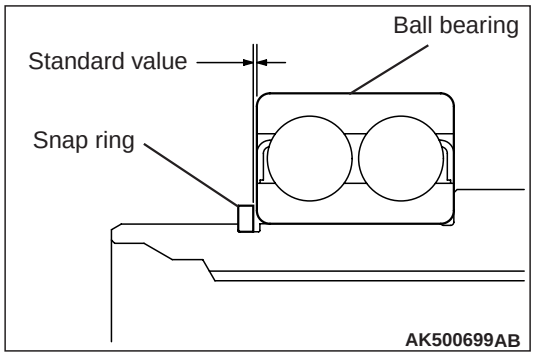
>>A<< BALL BEARING INSTALLATION



Use special tools to install the ball bearing.

- Installer cap (MD998812)
- Installer-100 (MD998813)
- Installer adapter (MD998824)

>>B<< SNAP RING INSTALLATION



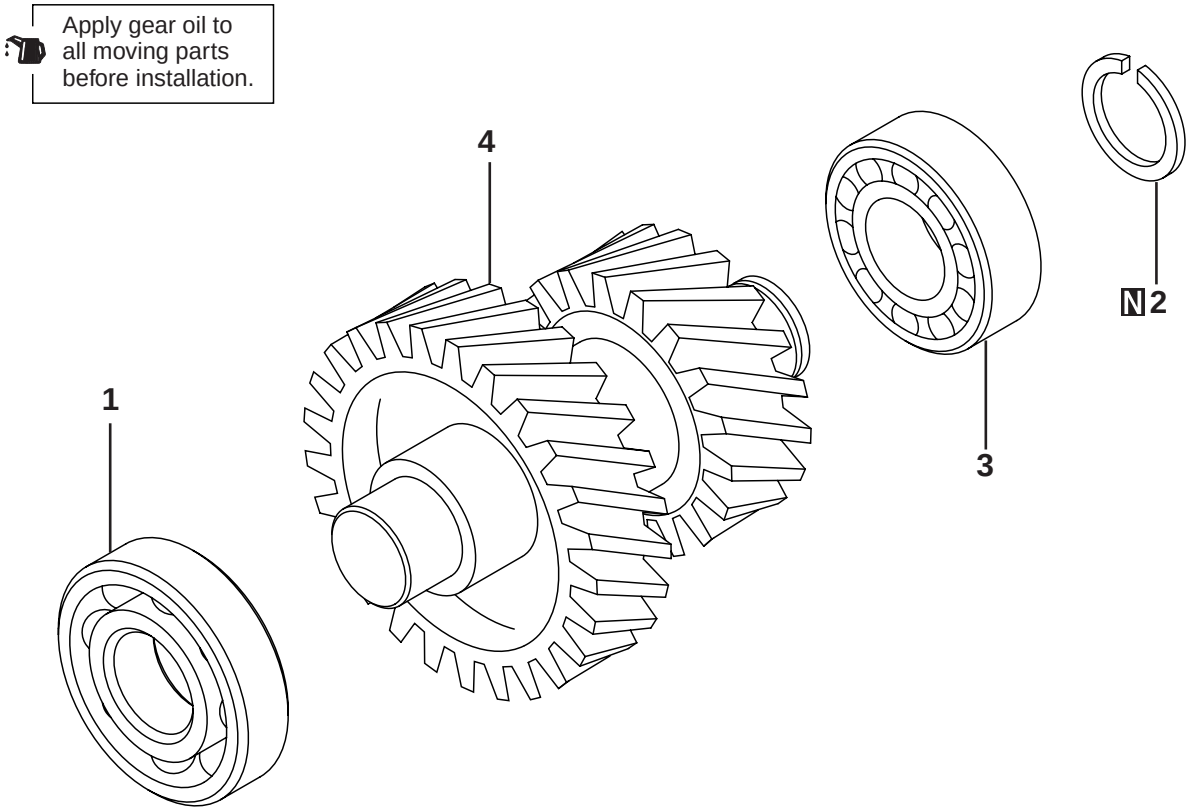
1. Install the thickest snap ring that can be fitted in the snap ring groove of the transfer input gear.
2. Make sure that the transfer input gear bearing end play meets the standard value.

   Standard value: 0 – 0.06 mm
   (For input gear bearing end play)

COUNTERSHAFT GEAR

DISASSEMBLY AND REASSEMBLY

M1233024000273

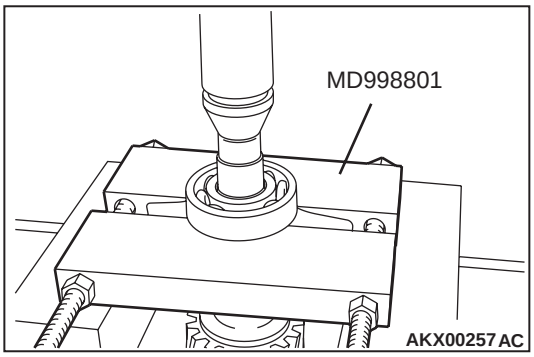


AK700644AB

			Disassembly steps
<<A>>	>>C<<	1.	Ball bearing
	>>B<<	2.	Snap ring
<<B>>	>>A<<	3.	Roller bearing
		4.	Counter shaft gear

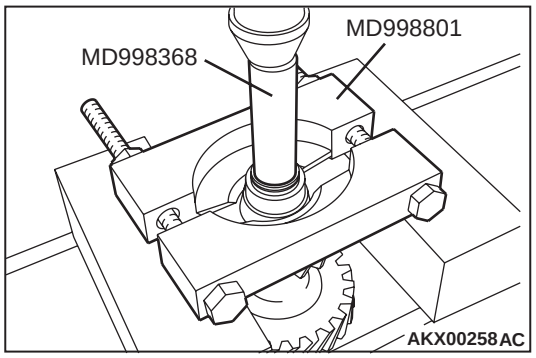
DISASSEMBLY SERVICE POINTS

<<A>> BALL BEARING REMOVAL



Use special tool Bearing remover (MD998801) to remove the ball bearing.

<<B>> ROLLER BEARING REMOVAL

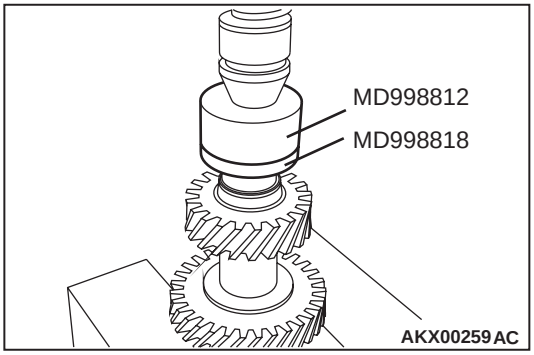


Use special tools to remove the roller bearing.

- Bearing remover (MD998801)
- Bearing installer (MD998368)

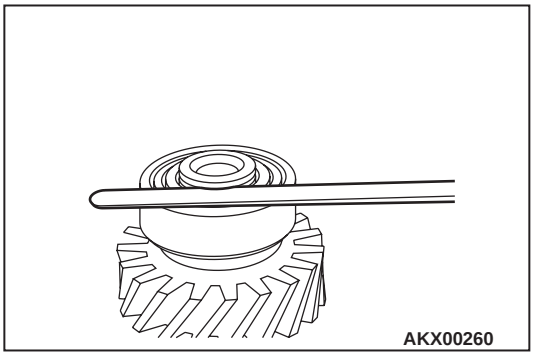
REASSEMBLY SERVICE POINTS

>>A<< ROLLER BEARING INSTALLATION



1. Use special tools to install the roller bearing.
   - Installer cap (MD998812)
   - Installer adapter (MD998818)
2. Install the spacer.

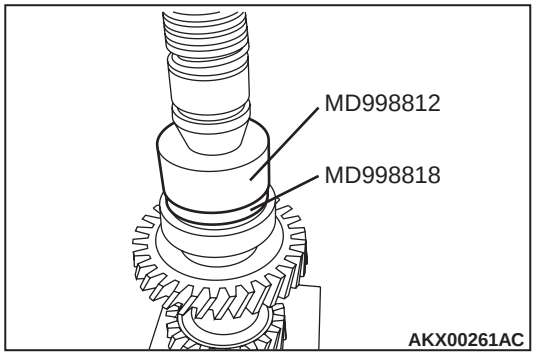
>>B<< SNAP RING INSTALLATION



1. Install the thickest snap ring that can be fitted into the snap ring groove of the counter shaft gear.
2. Make sure that the countershaft gear roller bearing end play meets the standard value.

   Standard value: 0 – 0.08 mm
   (For countershaft gear bearing end play)

>>C<< BALL BEARING INSTALLATION

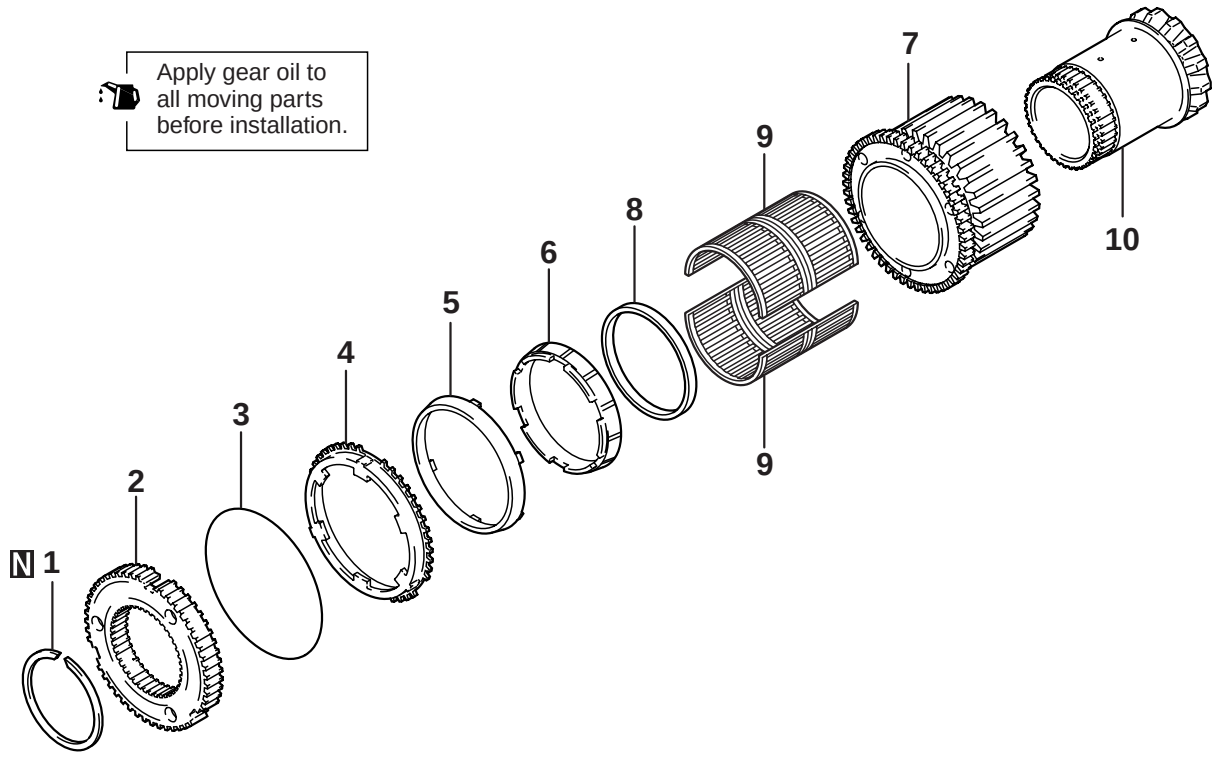


Use special tools to install the ball bearing.
- Installer cap (MD998812)
- Installer adapter (MD998818)

2-4WD SYNCHRONIZER

DISASSEMBLY AND REASSEMBLY

M1233014200072



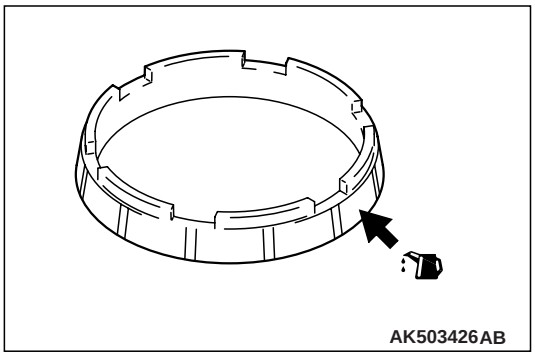
AK503423AB

Disassembly steps

>>**C**<< 1. Snap ring
2. 2-4WD Synchronizer hub
3. 2-4WD Synchronizer spring
>>**B**<< 4. Outer synchronizer ring
5. Synchronizer cone
>>**A**<< 6. Inner synchronizer ring
7. Drive sprocket
8. Bearing spacer
9. Needle bearing
10. Front side gear

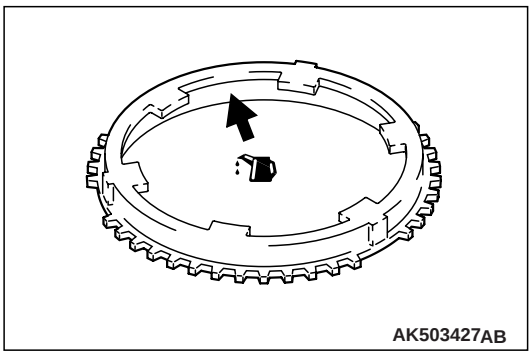
REASSEMBLY SERVICE POINTS

>>A<< INNER SYNCHRONIZER RING INSTALLATION



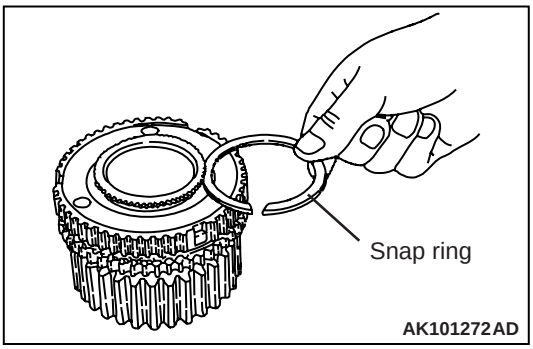
Apply oil the synchronizer ring cone surface before installation.

>>B<< OUTER SYNCHRONIZER RING INSTALLATION



Apply oil the synchronizer ring cone surface before installation.

>>C<< SNAP RING INSTALLATION



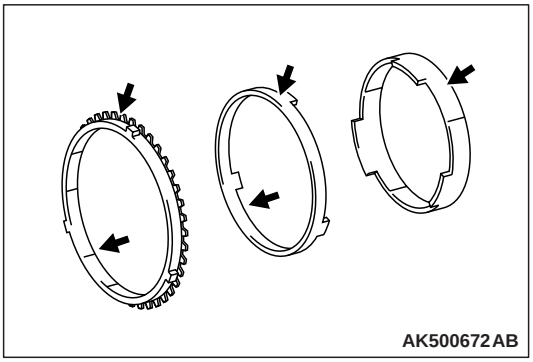
Select and install the snap ring which adjusts the 2-4WD synchronizer hub end play to standard value.

Standard value: 0 – 0.08 mm
(For 2-4WD synchronizer hub end play)

INSPECTION

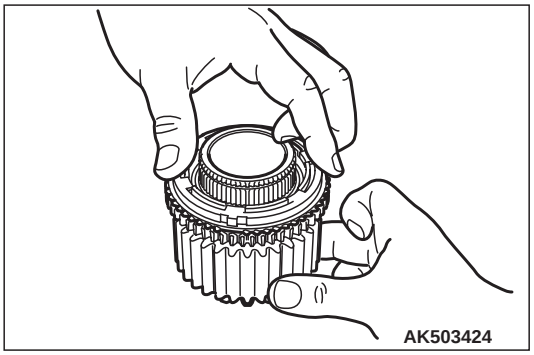
M1233014300057

SYNCHRONIZER RING

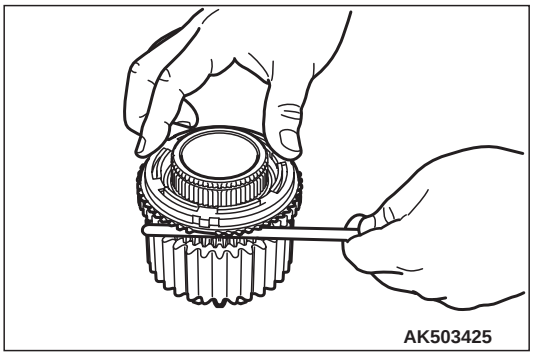


⚠ CAUTION
When any of the outer ring, inner ring or cone has to be replaced, replace them as a set.

1. Check to ensure that the clutch gear tooth surface and cone surface are not damaged and broken.



2. After applying oil to the taper portion on each gear, press and fit the synchronizer ring by hand. Confirm the synchronizer ring cannot be rotated.



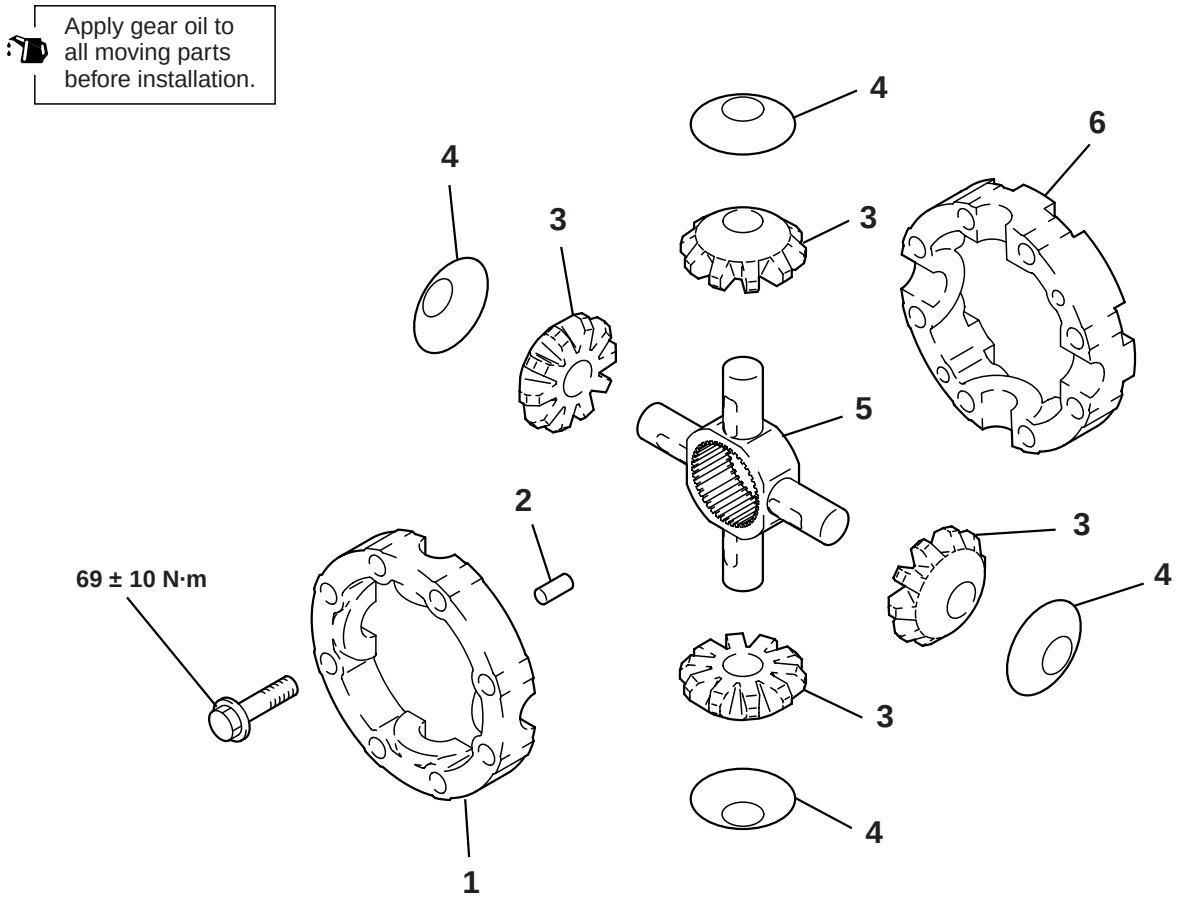
3. Using the thickness gauge, check the clearance between the synchronizer ring and the gear.

Limit: 0.3 mm
(For synchronizer ring clearance)

CENTRE DIFFERENTIAL CASE

DISASSEMBLY AND REASSEMBLY

M1233013900056



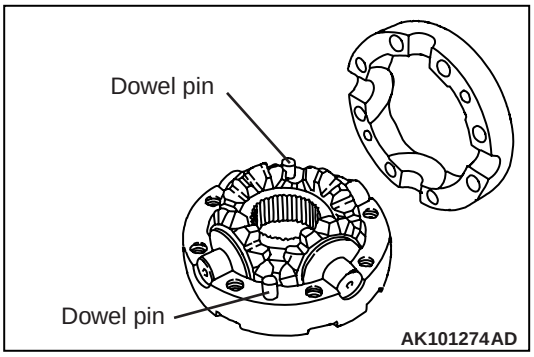
AK503428 AB

Disassembly steps

>>A<< 1. Center differential case B
2. Dowel pin
3. Differential pinion
4. Thrust washer
5. Pinion shaft
6. Center differential case B

REASSEMBLY SERVICE POINT

>>A<< CENTER DIFFERENTIAL CASE B INSTALLATION



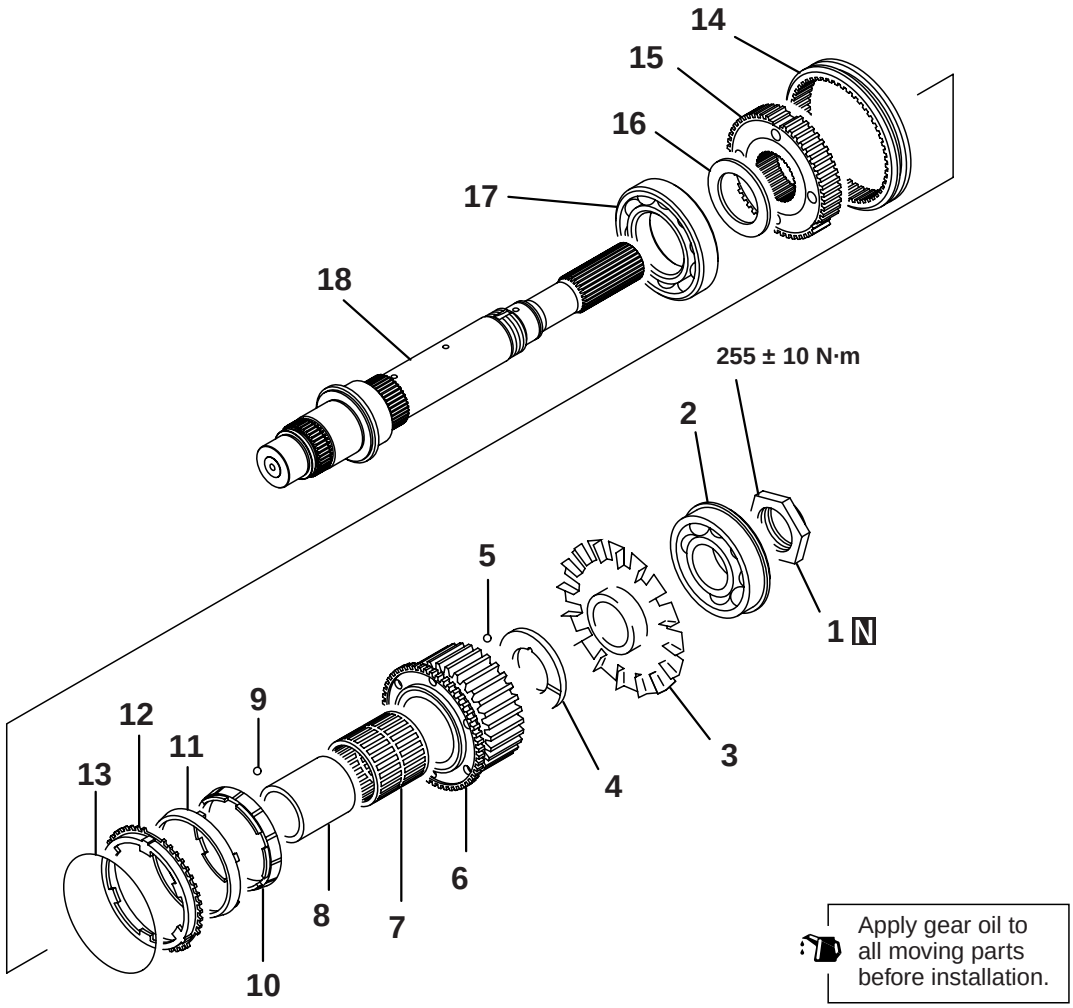
Pay attention to the position of the dowel pins when reassembling, and make sure that the match marks on the outside circumference are in alignment.

REAR OUTPUT SHAFT

DISASSEMBLY AND REASSEMBLY

M1233013600141

<Easy select 4WD>

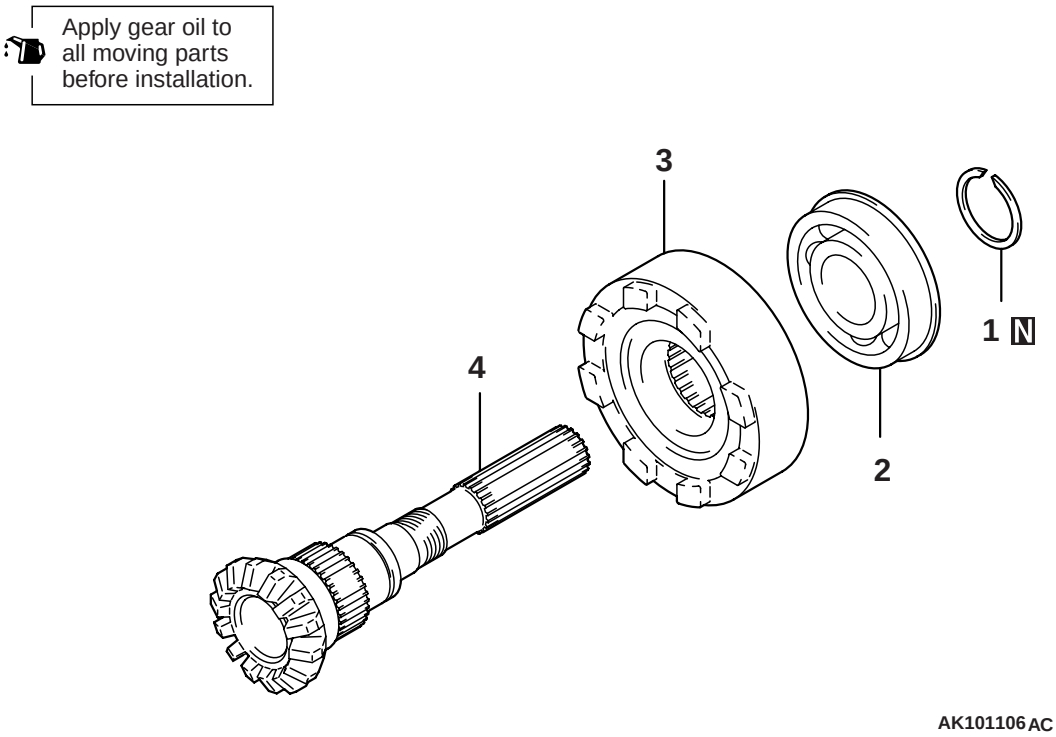


AK500645AB

			Disassembly steps
<<**A**>>	>>**F**<<	1.	Lock nut
<<**B**>>	>>**E**<<	2.	Ball bearing
		3.	Oil guide
		4.	Sprocket spacer
		5.	Steel ball
		6.	Drive sprocket
		7.	Needle bearing
		8.	Sprocket sleeve
		9.	Steel ball

			Disassembly steps (Continued)
		10.	Synchronizer inner ring
		11.	Synchronizer cone
		12.	Synchronizer outer ring
		13.	Synchronizer spring
	>>**D**<<	14.	Clutch sleeve
<<**C**>>	>>**C**<<	15.	Clutch hub
<<**C**>>	>>**A**<<	16.	Stopper plate
<<**C**>>	>>**A**<<	17.	Ball bearing
		18.	Rear output shaft

<Super select 4WD>

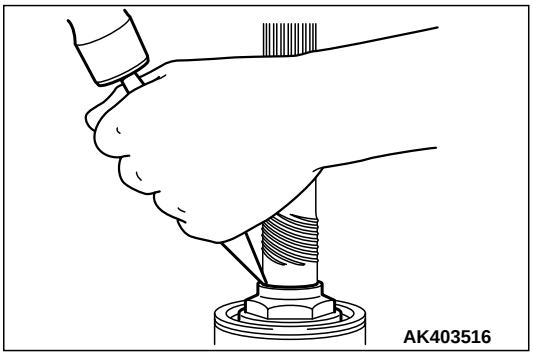


Disassembly steps

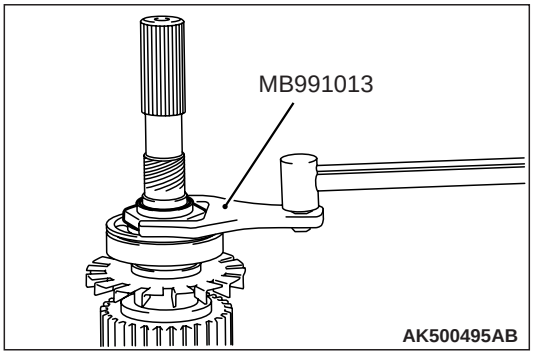
	>>**B**<<	1.	Snap ring
<<**B**>>	>>**A**<<	2.	Ball bearing
		3.	Viscous coupling
		4.	Rear output shaft

DISASSEMBLY SERVICE POINTS

<<A>> LOCK NUT REMOVAL

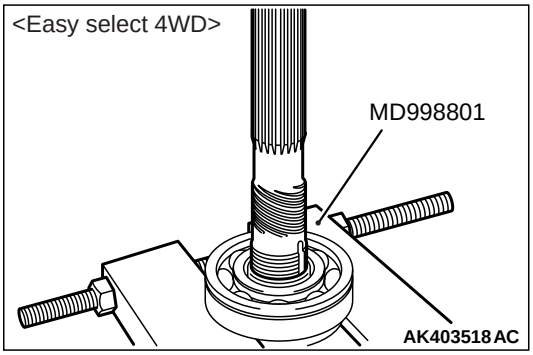


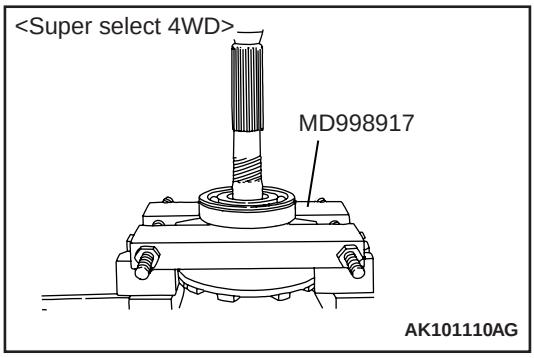
1. Remove the lock nut from the shaft.



2. Hold the drive sprocket in a soft-jaw vise.
3. Shift the clutch sleeve to the drive sprocket side.
4. Use special tool Power steering lock nut special spanner (MB991013) to remove the lock nut.

<<B>> BALL BEARING REMOVAL

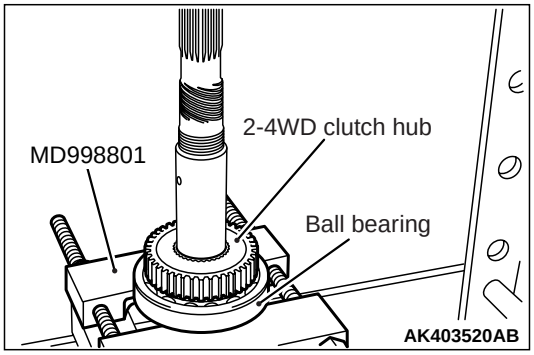




1. Use special tool to support the ball bearing.
   - Bearing remover (MD998801) <Easy select 4WD>
   - Bearing remover (MD998817) <Super select 4WD>
2. Use a press to push at a rear end of the rear output shaft, and then remove the radial ball bearing.

   NOTE: The bearing may fit loosely on the shaft, so that removal is possible without using a press.

<<C>> CLUTCH HUB / STOPPER PLATE / BALL BEARING REMOVAL

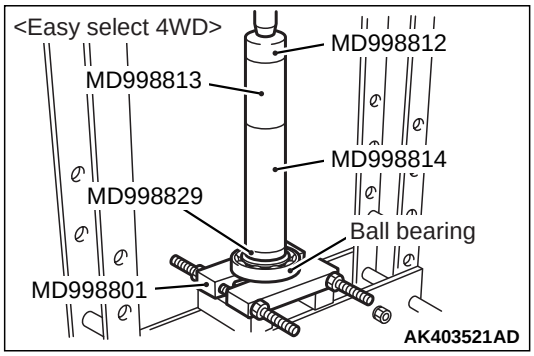


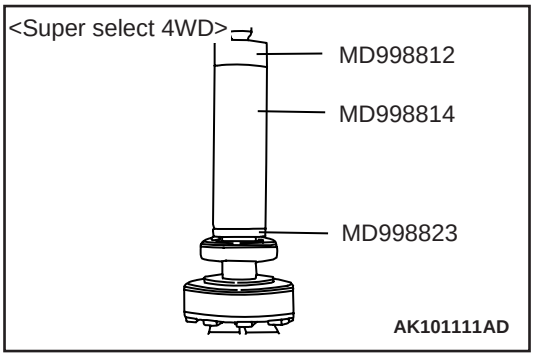
1. Place special tool Bearing remover (MD998801) so that the load is applied at the bearing.
2. Use a press to push at the rear end of the rear output shaft, and then remove the clutch hub and ball bearing.

NOTE: The clutch hub may fit loosely on the shaft, so that removal is possible without using a press.

REASSEMBLY SERVICE POINTS

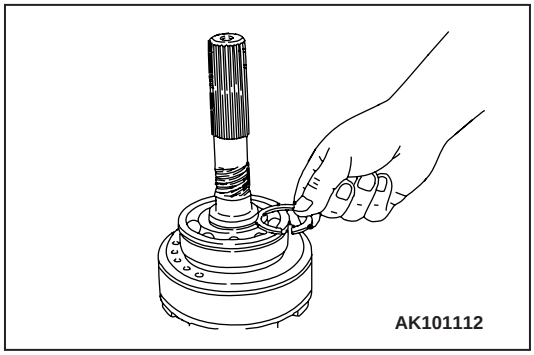
>>A<< BALL BEARING / STOPPER PLATE INSTALLATION





1. Fit the ball bearing and stopper plate onto the rear output shaft.
2. Use special tools to press in the ball bearing.
   - Bearing remover (MD998801) <Easy select 4WD>
   - Installer cap (MD998812)
   - Installer-100 (MD998813) <Easy select 4WD>
   - Installer-200 (MD998814)
   - Installer adapter (MD998823) <Super select 4WD>
   - Installer adapter (MD998829) <Easy select 4WD>

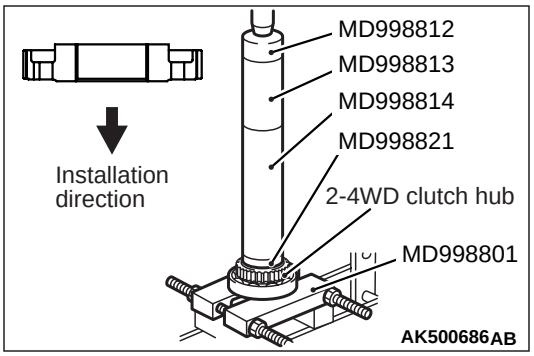
>>B<< SNAP RING INSTALLATION



1. Install the thickest snap ring that can be fitted in the snap ring groove of the rear output shaft.
2. Make sure that the rear output shaft bearing end play meets the standard value.

   Standard value: 0 – 0.08 mm
   (For rear output shaft end play)

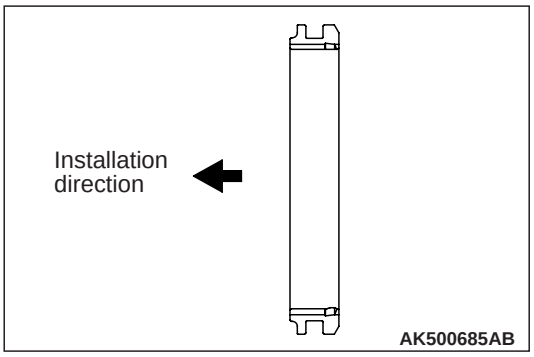
>>C<< CLUTCH HUB INSTALLATION



1. Confirm the clutch hub installation direction, and fit onto the rear output shaft.
2. Use special tools press in the clutch hub.
   - Bearing remover (MD998801)
   - Installer cap (MD998812)
   - Installer-100 (MD998813)
   - Installer-200 (MD998814)
   - Installer adapter (MD998821)

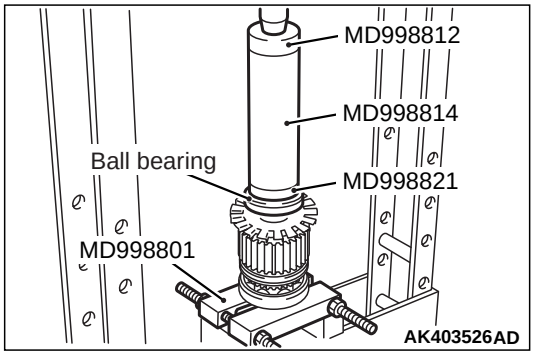
   NOTE: The clutch hub may fit loosely on the shaft, so that installation is possible without using a press.

>>D<< CLUTCH SLEEVE INSTALLTION



Check that the clutch sleeve is in the correct direction for installation.

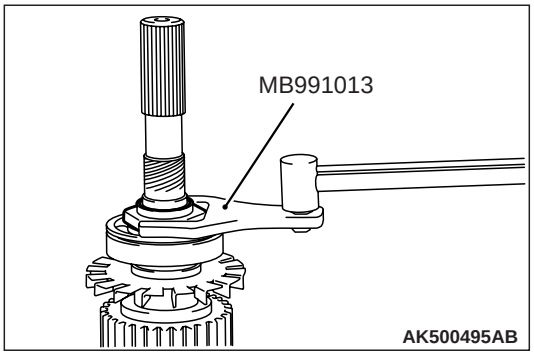
>>E<< BALL BEARING INSTALLATION



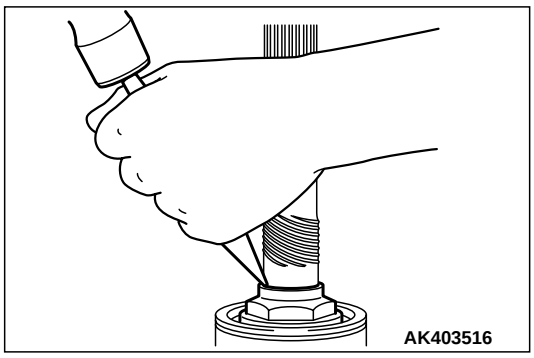
1. Use special tools to install the radial ball bearing.
   - Bearing remover (MD998801)
   - Installer cap (MD998812)
   - Installer-200 (MD998814)
   - Installer adapter (MD998821)

   NOTE: The ball bearing may be fitted loosely on the shaft, so that installation is possible without using a press

>>F<< LOCK NUT INSTALLTION



1. Hold the drive sprocket in a soft-jaws vise.
2. Shift the clutch sleeve to the drive sprocket side.
3. Using special tool Power steering lock nut special spanner (MB991013) tighten the lock nut to the specified torque 255 ± 10 N·m.

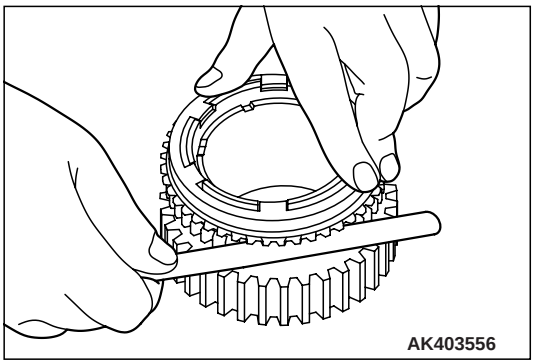


4. Stake the two places of the lock nut as shown in illustration.

INSPECTION

M1233013700052

SYNCHRONIZER OUTER RING/SYNCHRONIZER CONE/SYNCHRONIZER INNER RING INSTALLATION


AK403556

1. Push the synchronizer outer ring, synchronizer cone and the synchronizer inner ring to the drive sprocket in combined state, and then measure the indicated dimension of the drive sprocket and synchronizer outer ring.

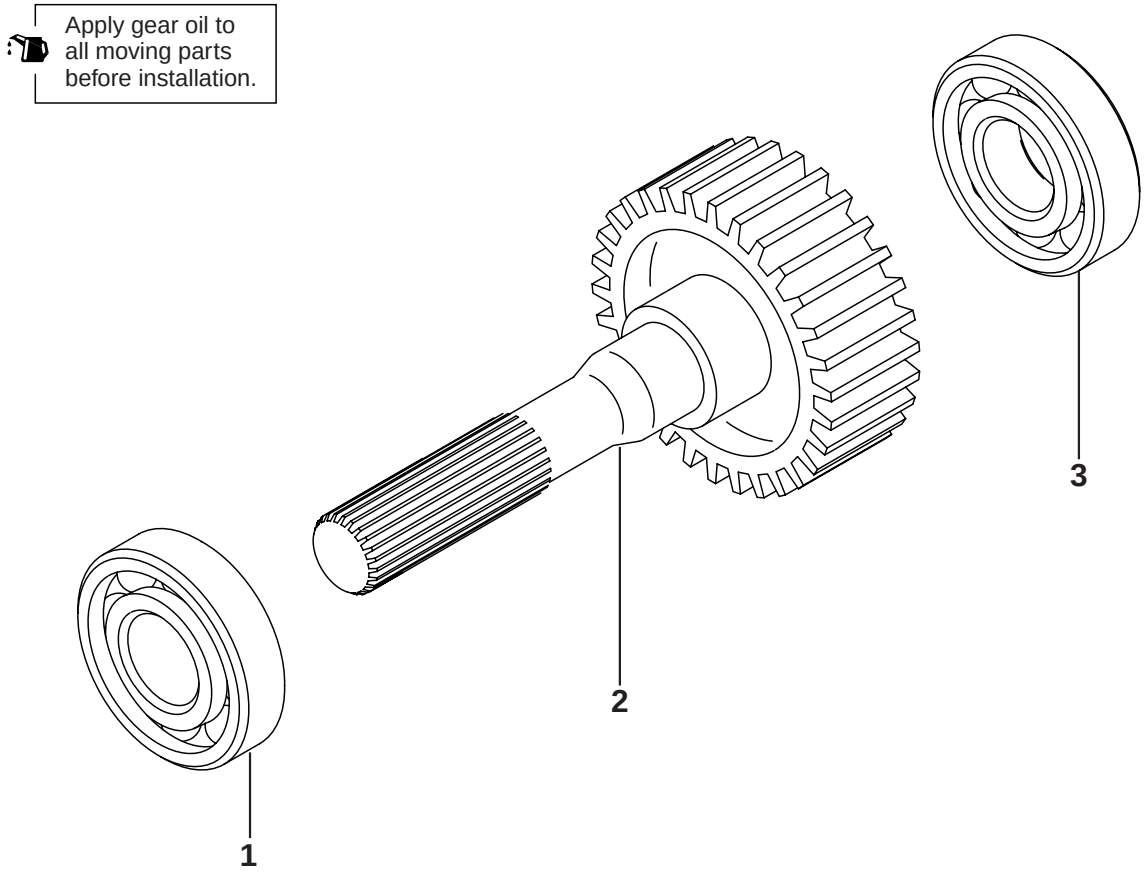
   Limit: 0.3mm
   (For synchronizer ring clearance)

2. In case that value is out of limit, exchange as the synchronizer ring set.

FRONT OUTPUT SHAFT

DISASSEMBLY AND REASSEMBLY

M1233006100081



AK700646AB

Disassembly steps

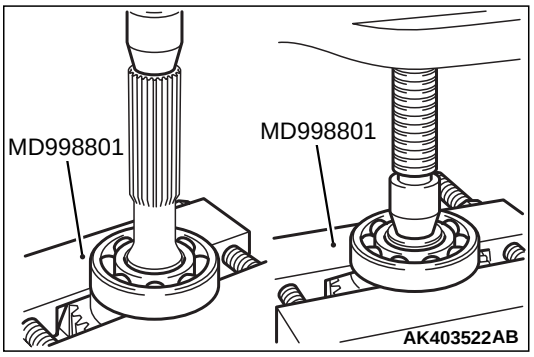
<<**A**>> >>**B**<< 1. Ball bearing

Disassembly steps (Continued)

<<**A**>> >>**A**<< 2. Ball bearing
3. Front output shaft

DISASSEMBLY SERVICE POINT

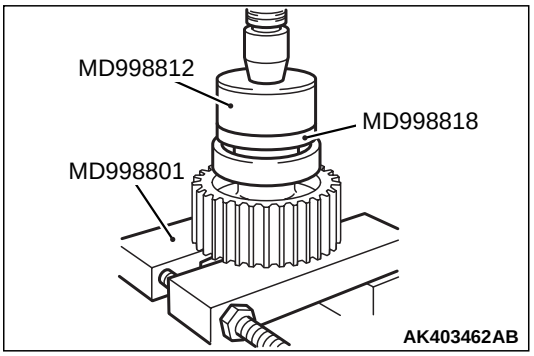
<<A>> BALL BEARING REMOVAL



1. Use special tool Bearing remover (MD998801) to support the ball bearing.
2. Press the front output shaft with a press and remove the ball bearings.

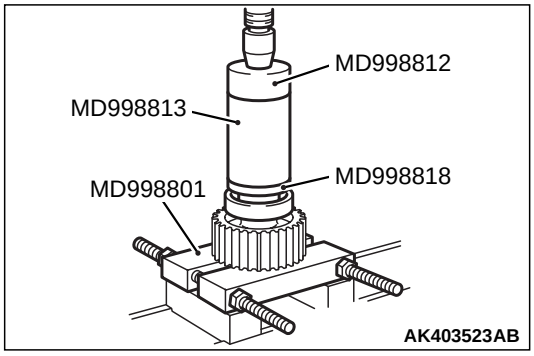
REASSEMBLY SERVICE POINTS

>>A<< BALL BEARING INSTALLATION



1. Use special tool Bearing remover (MD998801) to support the front output shaft.
2. Use special tools to install the ball bearing.
   - Installer cap (MD998812)
   - Installer adapter (MD998818)

>>B<< BALL BEARING INSTALLATION

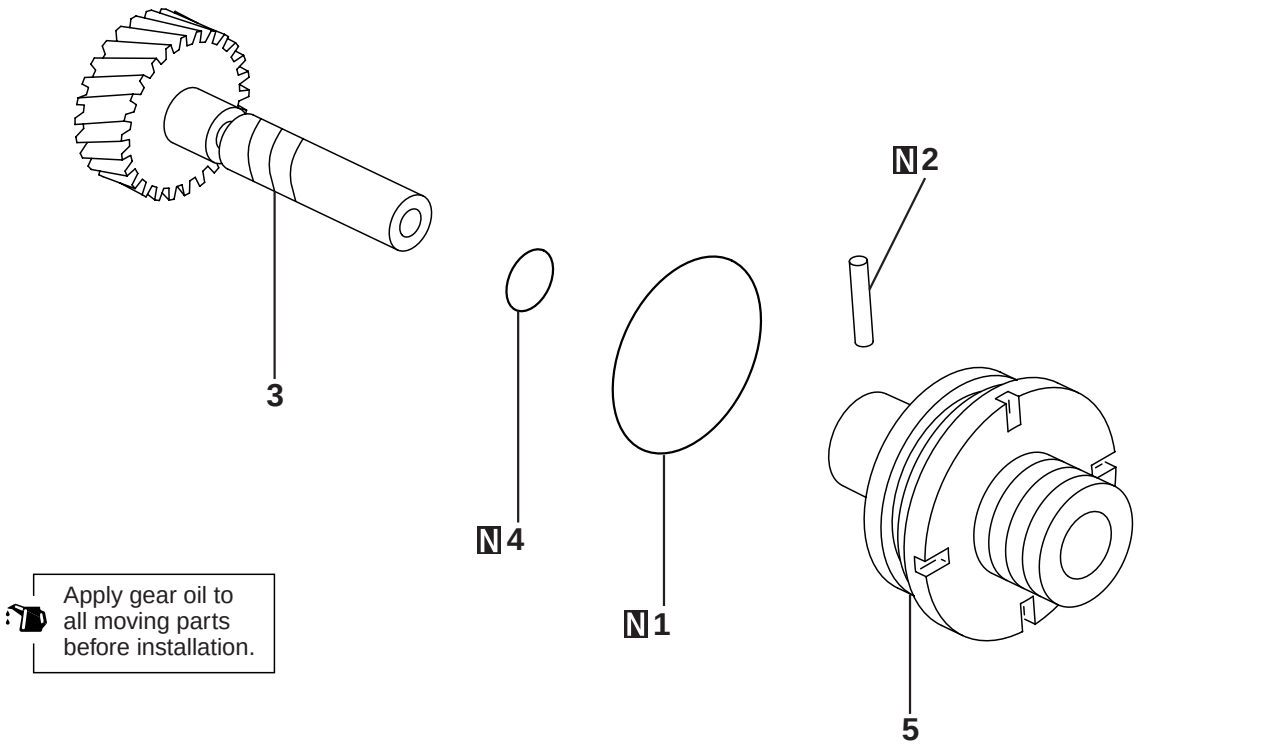


1. Use special tool Bearing remover (MD998801) to support the front output shaft.
2. Use special tools to install the ball bearing.
   - Installer cap (MD998812)
   - Installer-100 (MD998813)
   - Installer adapter (MD998818)

SPEEDOMETER GEAR

DISASSEMBLY AND REASSEMBLY

M1233015700092



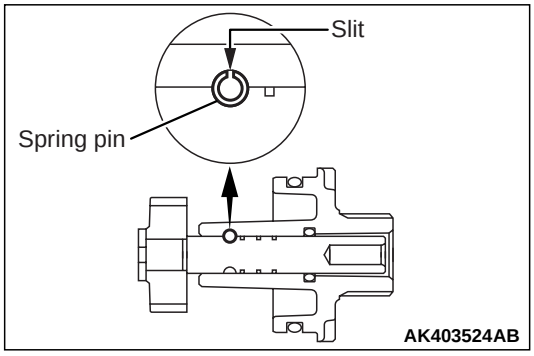
AK700647AB

Disassembly steps

1. O-ring
>>A<< 2. Spring pin
3. Driven gear
4. O-ring
5. Sleeve

REASSEMBLY SERVICE POINT

>>A<< SPRING PIN INSTALLATION



Drive the spring pin in, while making sure that slit does not face gear shaft.

GROUP 23D

AUTOMATIC TRANSMISSION OVERHAUL <V5A5>

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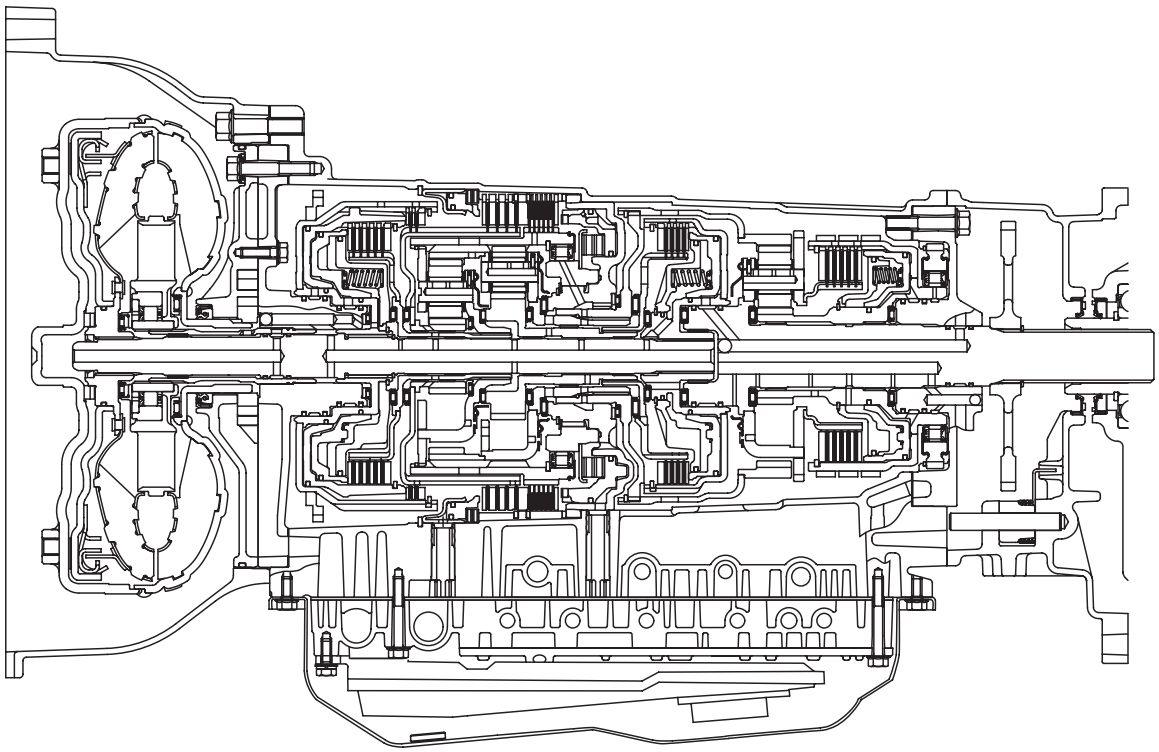
GENERAL INFORMATION

M1233000101860

TRANSMISSION MODEL

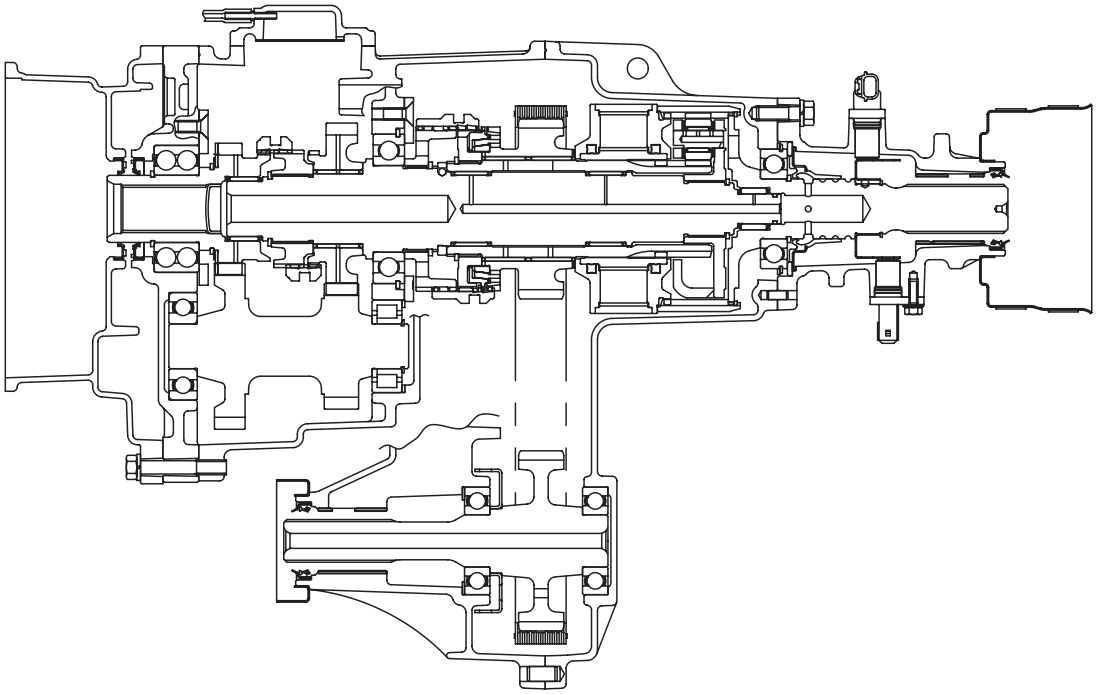
Transmission model	Engine model	Vehicle model
V5A5A-J-LH	4D56 DI-DC I/T	KB4T

SECTIONAL VIEW <TRANSMISSION>



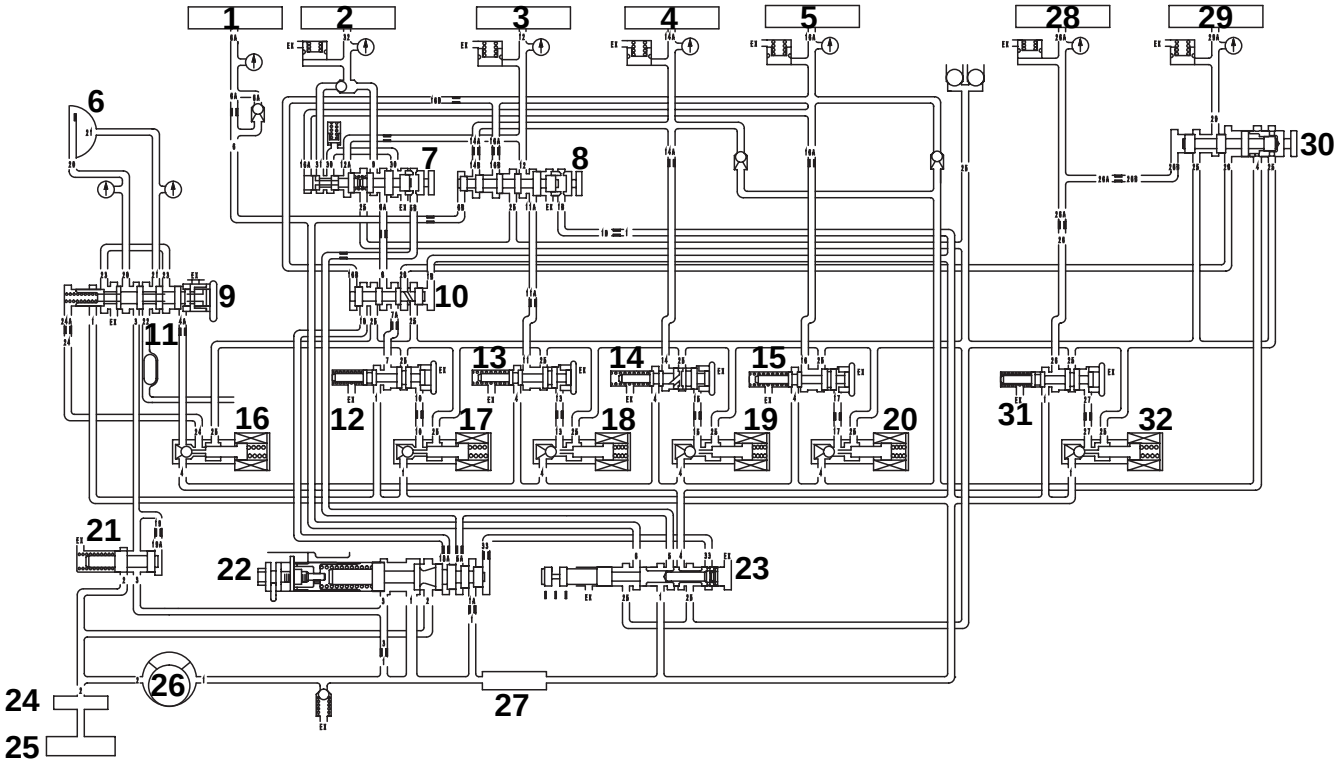
AK900017

SECTIONAL VIEW <TRANSFER>



AK602539

HYDRAULIC CIRCUIT



AK603794AB

1. Reverse clutch
2. Low/reverse brake
3. Second brake
4. Underdrive clutch
5. Overdrive clutch
6. Damper clutch
7. Fail-safe valve A
8. Fail-safe valve B
9. Damper clutch control valve
10. Switching valve
11. Cooler
12. Low-reverse brake pressure control valve
13. Second brake pressure control valve
14. Underdrive clutch pressure control valve
15. Overdrive clutch pressure control valve
16. Torque converter damper clutch control solenoid valve
17. Low-reverse brake solenoid valve
18. Second brake solenoid valve
19. Underdrive clutch solenoid valve
20. Overdrive clutch solenoid valve
21. Torque converter pressure control valve
22. Regulator valve
23. Manual valve
24. Oil filter
25. Oil pan
26. Oil pump
27. Oil strainer
28. Reduction brake
29. Direct clutch
30. Fail-safe valve C
31. Reduction brake pressure control valve
32. Reduction brake solenoid valve

GENERAL SPECIFICATIONS

M1233000201287

Item		Specifications
Transmission model		V5A5A
Torque converter	Type	3-element, 1-stage, 2-phase type
	Stall torque ratio	1.62
	Lock-up	Present
Transmission type		5 forward speeds, 1 reverse speed, fully automatic
Gear ratio	1st	3.789
	2nd	2.057
	3rd	1.421
	4th	1.000
	5th	0.731
	Reverse	3.865
Transfer type		2-speed, constant mesh
Gear ratio	High	1.000
	Low	1.900

SERVICE SPECIFICATIONS

M1233000301035

Transmission

Item	Standard value
Direct planetary carrier end play mm	0.25 – 0.71
Center support end play mm	0 – 0.16
Brake reaction plate end play mm	0 – 0.16
Second brake end play mm	1.49 – 1.95
Low/reverse brake end play mm	1.65 – 2.11
Input shaft end play mm	0.25 – 0.81
Overdrive clutch return spring retainer end play mm	0 – 0.09
Overdrive clutch end play mm	2.0 – 2.2
Reverse clutch end play mm	1.5 – 1.7
Underdrive clutch end play mm	1.6 – 1.8
Direct clutch end play mm	1.0 – 1.2

Transfer

Item	Standard value	Limit
H-L clutch hub end play mm	0 – 0.08	–
Differential lock hub end play mm	0 – 0.08	–
2-4WD clutch hub end play mm	0 – 0.08	–
Clearance between outer synchronizer ring and drive sprocket mm	–	0.3
Rear output shaft preload mm	0.12 – 0.24	–

Item	Standard value	Limit
Rear output shaft end play mm	0 – 0.12	–
Countershaft gear end play mm	0 – 0.15	–
Countershaft gear bearing end play mm	0 – 0.08	–
Rear output shaft bearing end play mm	0 – 0.08	–
Rear output shaft annulus gear end play mm	0 – 0.08	–
Input gear bearing end play mm	0 – 0.06	–

TORQUE SPECIFICATIONS

M1233023101407

Transmission

Item	N·m
Transfer to transfer case adapter tightening bolt	35 ± 6
Transmission case to transfer case adapter tightening bolt	48 ± 6
Output shaft support mounting bolt	23 ± 3
Anchor plug	98 ± 15
Reduction brake piston nut	18.5 ± 3.5
Oil pump mounting bolt	23 ± 3
Converter housing to transmission case tightening bolt	48 ± 6
Valve body mounting bolt	11 ± 1
Detent spring mounting bolt	6.0 ± 1.0
Oil filter mounting bolt	6.0 ± 1.0
Oil pan mounting bolt	11 ± 1
Inhibitor switch mounting bolt	11 ± 1
Manual control lever mounting nut	21.5 ± 3.5
Output shaft speed sensor mounting bolt	11 ± 1
Input shaft speed sensor mounting bolt	11 ± 1
Cable end bracket mounting bolt	48 ± 6
Clamp	11 ± 1
Harness bracket	11 ± 1
Lower valve body mounting bolt	11 ± 1
Lower valve body cover mounting bolt	11 ± 1
Upper valve body mounting bolt	11 ± 1
Separating plate mounting bolt	6.0 ± 1.0
Solenoid support mounting bolt	6.0 ± 1.0

Transfer

Item	N·m
Rear bearing retainer mounting bolt	19 ± 2
Transfer case plate to transfer case tightening bolt and nut	35 ± 6
Transfer case to chain cover tightening bolt	35 ± 6

Item	N·m
Connector bracket	21 ± 4
Transmission wiring harness protector	5.0 ± 1.0
Rear cover to chain cover tightening bolt	35 ± 6
Shift actuator mounting bolt	11 ± 1
Front output sensor mounting bolt	11 ± 1
Rear output sensor mounting bolt	11 ± 1
Vehicle speed sensor mounting bolt	11 ± 1
Transfer case cover tightening bolt	19 ± 3
2WD-4WD switch	35 ± 6
4H switch	35 ± 6
Center differential lock switch	35 ± 6
2WD switch	35 ± 6
4LLC switch	35 ± 6

VALVE BODY SPRING IDENTIFICATION

M1233030300091

Item	Wire diameter mm	Outside diameter mm	Free height mm	Number of loops
Orifice check ball spring	0.5	4.5	15.4	15
Damper clutch control valve spring	0.7	5.9	28.1	19
Damping valve spring	1.0	7.7	35.8	17
Torque converter pressure control valve spring	1.6	11.2	29.4	9.5
Fail-safe valve A spring	0.7	8.9	21.9	9.5
Pressure control valve spring	0.7	7.6	37.7	25
Line relief valve spring	1.0	7.0	17.3	10
Regulator valve spring	1.8	13.3	44.6	12.5

SNAP RING, SPACER, THRUST WASHER, THRUST RACE AND PRESSURE PLATE FOR ADJUSTMENT

M1233023000980

Transmission

Thrust race (For adjustment of direct planetary carrier end play)

Thickness mm	Identification symbol
1.6	None
1.8	None
2.0	None
2.2	None

Snap ring (For adjustment of underdrive clutch and overdrive clutch end play)

Thickness mm	Identification symbol
1.6	Brown
1.7	None
1.8	Blue
1.9	Brown
2.0	None
2.1	Blue
2.2	Brown
2.3	None
2.4	Blue
2.5	Brown
2.6	None
2.7	Blue
2.8	Brown
2.9	None
3.0	Blue

Thrust race (For adjustment of input shaft end play)

Thickness mm	Identification symbol
1.4	None
1.6	None
1.8	None
2.0	None
2.2	None
2.4	None
2.6	None

Snap ring (For adjustment of overdrive clutch return spring retainer end play)

Thickness mm	Identification symbol
1.48	Brown
1.53	Black
1.58	None
1.63	Brown

Pressure plate (For adjustment of second brake end play)

Thickness mm	Identification symbol
1.6	F
1.8	E
2.0	D
2.2	C
2.4	B

Thickness mm	Identification symbol
2.6	A
2.8	0
3.0	1

Snap ring (For adjustment of center support and brake reaction plate end play)

Thickness mm	Identification symbol
2.2	None
2.3	Blue
2.4	Brown
2.5	None

Snap ring (For adjustment of reverse clutch end play)

Thickness mm	Identification symbol
1.6	None
1.7	Blue
1.8	Brown
1.9	None
2.0	Blue
2.1	Brown
2.2	None
2.3	Blue
2.4	Brown
2.5	None
2.6	Blue
2.7	Brown
2.8	None

Snap ring (For adjustment of direct clutch end play)

Thickness mm	Identification symbol
1.9	Brown
2.0	None
2.1	Blue
2.2	Brown
2.3	None
2.4	Blue
2.5	Brown
2.6	None
2.7	Blue
2.8	Brown
2.9	None
3.0	Blue

Pressure plat (For adjustment of low/reverse brake end play)

Thickness mm	Identification symbol
1.8	E
2.0	D
2.2	C
2.4	B
2.6	A
2.8	0
3.0	1

Transfer

Spacer (For adjustment of input gear bearing end play)

Thickness mm	Identification symbol
2.30	None
2.35	Red
2.40	White
2.45	Blue
2.50	Green

Spacer (For adjustment of countershaft gear end play)

Thickness mm	Identification symbol
1.77	None
1.91	Blue
2.05	Brown
2.19	White
2.33	Red

Snap ring (For adjustment of countershaft gear bearing end play)

Thickness mm	Identification symbol
1.48	Blue
1.62	None

Snap ring (For adjustment of H-L clutch hub end play)

Thickness mm	Identification symbol
2.18	None
2.25	None
2.32	None
2.39	None

Snap ring (For adjustment of differential lock hub end play)

Thickness mm	Identification symbol
2.56	None
2.63	Red
2.70	White
2.77	Blue
2.84	Yellow
2.91	Green
2.98	Brown

Snap ring (For adjustment of 2-4WD clutch hub end play)

Thickness mm	Identification symbol
2.56	None
2.63	Red
2.70	White
2.77	Blue
2.84	Yellow

Snap ring (For adjustment of rear output shaft bearing end play)

Thickness mm	Identification symbol
2.26	None
2.33	Red
2.40	White
2.47	Blue

Snap ring (For adjustment of rear output shaft annulus gear end play)

Thickness mm	Identification symbol
1.90	None
1.94	None
1.98	None
2.02	None
2.06	None
2.10	None

Snap ring (For adjustment of rear output shaft preload)

Thickness mm	Identification symbol
1.57	None
1.63	None
1.69	None
1.75	None
1.81	None
1.87	None
1.93	None

Thickness mm	Identification symbol
1.99	None
2.05	None
2.11	None
2.17	None
2.23	None
2.29	None
2.35	None
2.41	None
2.47	None
2.53	None
2.59	None
2.65	None
2.71	None

Spacer (For adjustment of rear output shaft end play)

Thickness mm	Identification symbol
2.57	None
2.63	None
2.69	None
2.75	None
2.81	None
2.87	None
2.93	None
2.99	None
3.05	None
3.11	None
3.17	None
3.23	None
3.29	None
3.35	None
3.41	None
3.47	None
3.53	None
3.59	None
3.65	None
3.71	None
3.77	None
3.83	None
3.89	None
3.95	None

SEALANTS

M1233000501170

Transmission

Item	Specified sealant
Transfer case adapter (transmission side)	Mitsubishi Part No. MR166584 or equivalent
Sealing cap	3M™ AAD part No. 8672 or equivalent
Converter housing	Mitsubishi Part No. MR166584 or equivalent
Oil pan	

Transfer

Item	Specified sealant
Bearing retainer mounting bolt	3M™ STUD locking No. 4170 or equivalent
Transfer case	Mitsubishi Part No. MD997740 or equivalent
Chain cover	
Rear cover	
Transfer case cover	

FORM-IN-PLACE GASKET (FIPG)

This transmission has several areas where the form-in-place gasket (FIPG) is used for sealing. To ensure that the FIPG fully serves its purpose, it is necessary to observe some precautions when applying it. Bead size, continuity and location are of paramount importance.

Too thin a bead could cause leaks. Too thick a bead, on the other hand, could be squeezed out of location, causing blocking or narrowing of fluid passages. To prevent leaks or blocking of passages, therefore, it is absolutely necessary to apply the FIPG evenly without a break, while observing the correct bead size.

FIPG hardens as it reacts with the moisture in the atmospheric air, and it is usually used for sealing metallic flange areas.

⚠ CAUTION

When re-applying liquid gasket (FIPG), be sure that:

1. **Residues of FIPG are cleared from all the ins and outs of parts;**
2. **Use Mitsubishi genuine parts cleaner (MZ100387) or equivalent to well degrease the FIPG-applied surface.**
3. **FIPG is correctly applied in accordance with FIPG Application.**

Disassembly

Parts sealed with a FIPG can be easily removed without need for the use of a special method. In some cases, however, the FIPG in joints may have to be broken by tapping parts with a mallet or similar tool.

Surface Preparation

Thoroughly remove all substances deposited on the FIPG application surface, using a gasket scraper. Make sure that the FIPG application surfaces is flat and smooth. Also make sure that the surface is free from oils, greases and foreign substances. Do not fail to remove old FIPG that may remain in the fastener fitting holes.

FIPG Application

Applied FIPG bead should be of the specified size and free of any break. FIPG can be wiped away unless it has completely hardened. Install the mating parts in position while the FIPG is still wet. Do not allow FIPG to spread beyond the sealing areas during installation. Avoid operating the transmission or letting oils or water come in contact with the sealed area before a time sufficient for FIPG to harden (approximately one hour) has passed.

FIPG application method may vary from location to location. Follow the instruction for each particular case described later in this manual.

LUBRICANTS

M1233000400374

Transmission

Item	Specified lubricant
Transmission oil	DiaQueen ATF SP III
Vaseline application parts	White vaseline or Blue petrolatum
Oil seal	Mitsubishi Part No. 0101011 or equivalent

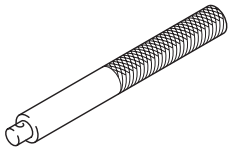
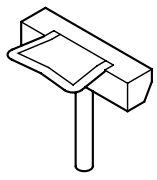
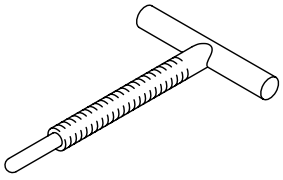
Transfer

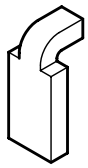
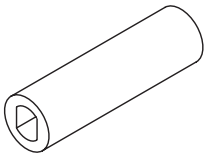
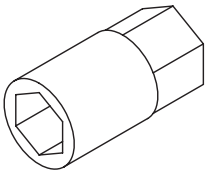
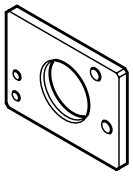
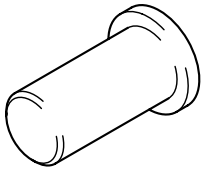
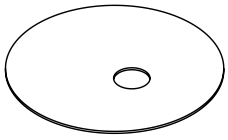
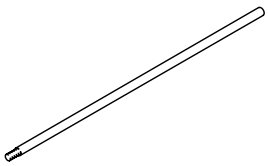
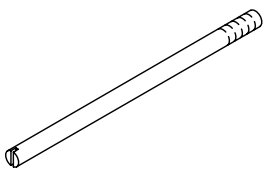
Item	Specified lubricant
Transfer oil	Gear oil API classification GL-4 SAE 75W-85W
Oil seal	Mitsubishi Part No. 0101011 or equivalent
O-ring	
Shift fork and shift rail	

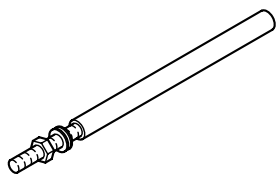
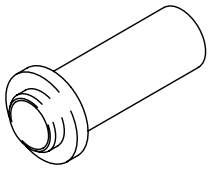
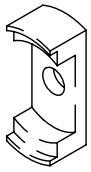
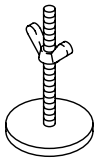
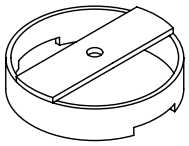
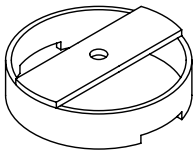
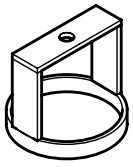
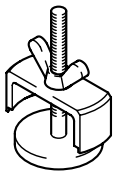
SPECIAL TOOLS

M1233000601122

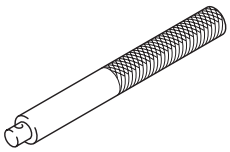
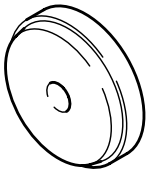
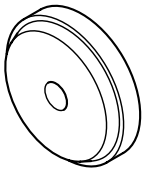
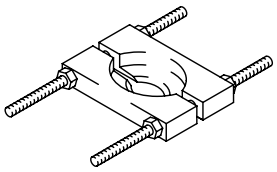
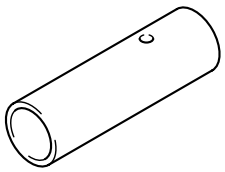
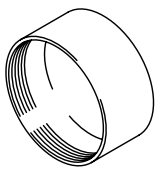
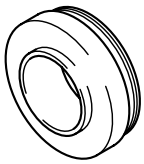
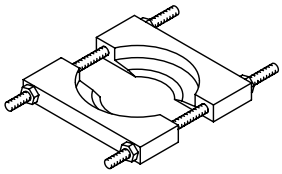
Transmission

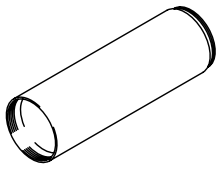
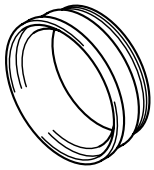
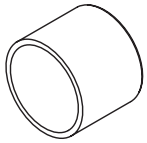
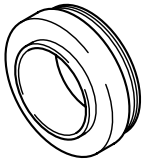
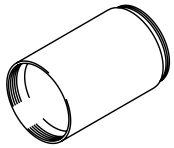
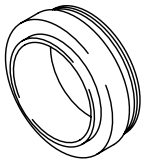
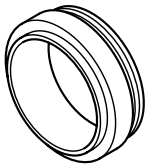
Tool	Number	Name	Use
	MB990929	Installer adapter	Installation of transfer case adapter oil seal
	MB990938	Installer bar	Use with installer adapter
 D998727	MD998727	Oil pan FIPG cutter	Removal of oil pan
	MD998333	Oil pump remover	Removal of oil pump

Tool	Number	Name	Use
	MB991693	Reduction brake stopper	Adjustment reduction brake piston
	MB991635	Socket	Adjustment reduction brake piston
	MB991634	Wrench	Adjustment reduction brake piston
	MB991603	Bearing installer stopper	Measurement of direct planetary carrier and center support end plays
	MD998304	Oil seal installer	Measurement of direct planetary carrier end play
	MB991632	Clearance dummy plate	Measurement of brake reaction plate, second brake and low/reverse brake end plays
	MD998913	Dial gauge extension	Measurement of brake reaction plate, second brake and low/reverse brake end plays
	MD998412	Guide	Installation of oil pump

Tool	Number	Name	Use
	MD998316	Dial gauge support	Measurement of input shaft end play
	MD998334	Oil pump oil seal installer	Installation of oil pump oil seal
	MD999590	Spring compressor	Removal and installation of reverse and overdrive clutch spring retainer snap ring
	MD998924	Spring compressor retainer	Use with spring compressor
	MB991629	Spring compressor	Measurement of overdrive clutch and underdrive clutch end plays
	MB991789	Spring compressor	Adjustment reverse clutch end play
	MB991630	Spring compressor	Removal and installation of center support snap ring and direct clutch snap ring
	MD998337	Spring compressor	Removal and installation of underdrive clutch spring retainer snap ring

Transfer

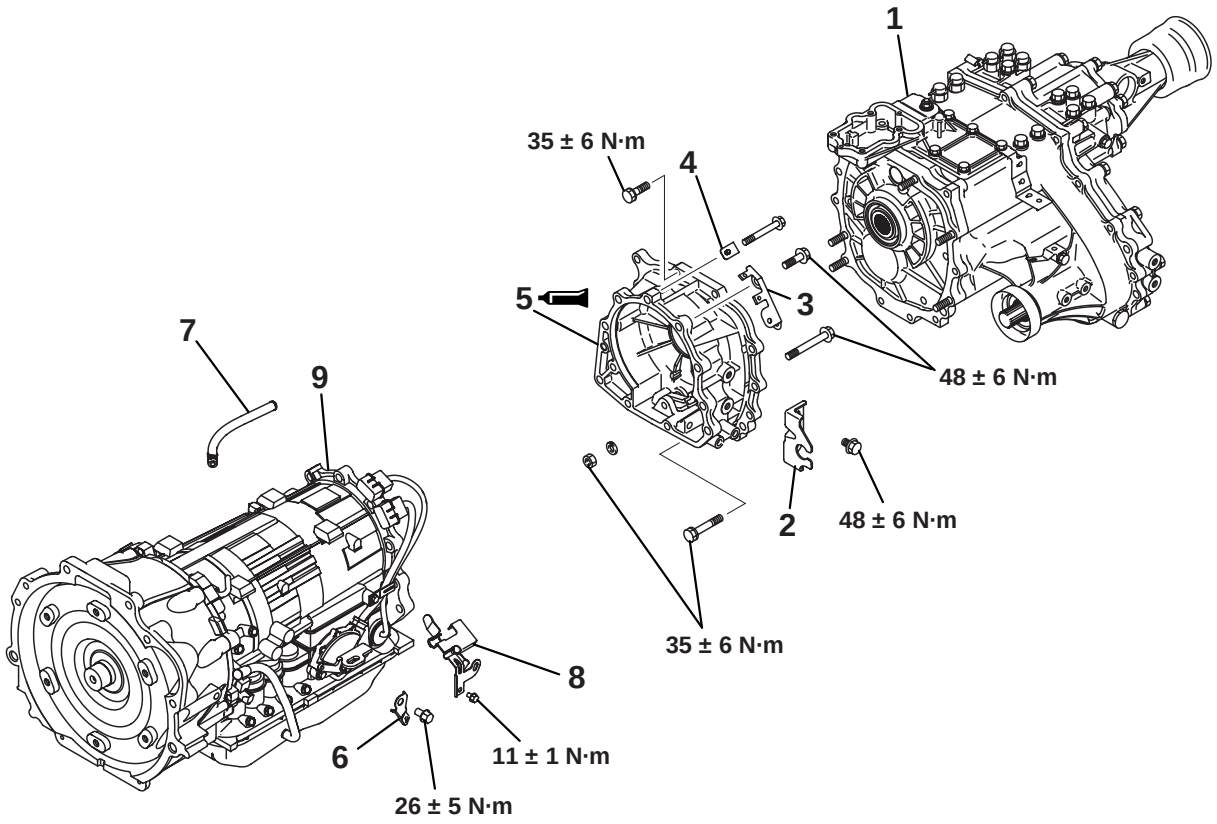
Tool	Number	Name	Use
	MB990938	Installer bar	Use with installer adapter
	MB990932	Installer adapter	Installation of oil seal
	MB990933	Installer adapter	Installation of oil seal
	MD998801	Bearing remover	Removal and installation of bearing
	MD998368	Bearing installer	Installation of bearing
	MD998812	Installer cap	Use with installer and installer adapter
	MD998818	Installer adapter (38)	Installation of countershaft gear bearing, front output shaft bearing
	MD998917	Bearing remover	Removal and installation of bearing

Tool	Number	Name	Use
	MD998814	Installer-200	Use with installer cap and installer adapter
	MD998830	Installer adapter (66)	Installation of transfer drive shaft bearing
	MD998198	Puller	Installation of transfer drive shaft bearing
	MD998821	Installer adapter (44)	Installation of front output shaft bearing
	MD998813	Installer-100	Use with installer cap and installer adapter
	MD998824	Installer adapter (50)	Installation of rear output shaft bearing
	MD998826	Installer adapter (54)	Installation of transfer input gear bearing

TRANSMISSION AND TRANSFER

DISASSEMBLY AND REASSEMBLY

M1233123300018



AK900862AB

Disassembly steps

1. Transfer
2. Cable end bracket
3. Harness bracket
4. Harness bracket

>>**A**<< 5. Transfer case adapter

Disassembly steps (Continued)

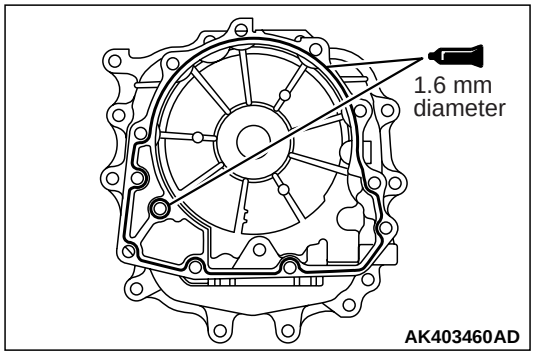
6. Harness bracket
7. Air breather hose
8. Air breather hose bracket
9. Transmission

REASSEMBLY SERVICE POINT

>>A<< TRANSFER CASE ADAPTER INSTALLATION

⚠ CAUTION

- **Completely degrease the FIPG-applied surface so that water and oil including the old sealant cannot adhere to the surface coated with the sealant. Never touch the degreased surface by hand.**
- **Evenly squeeze out and apply the sealant so that it is not excessive and dose not ooze out.**



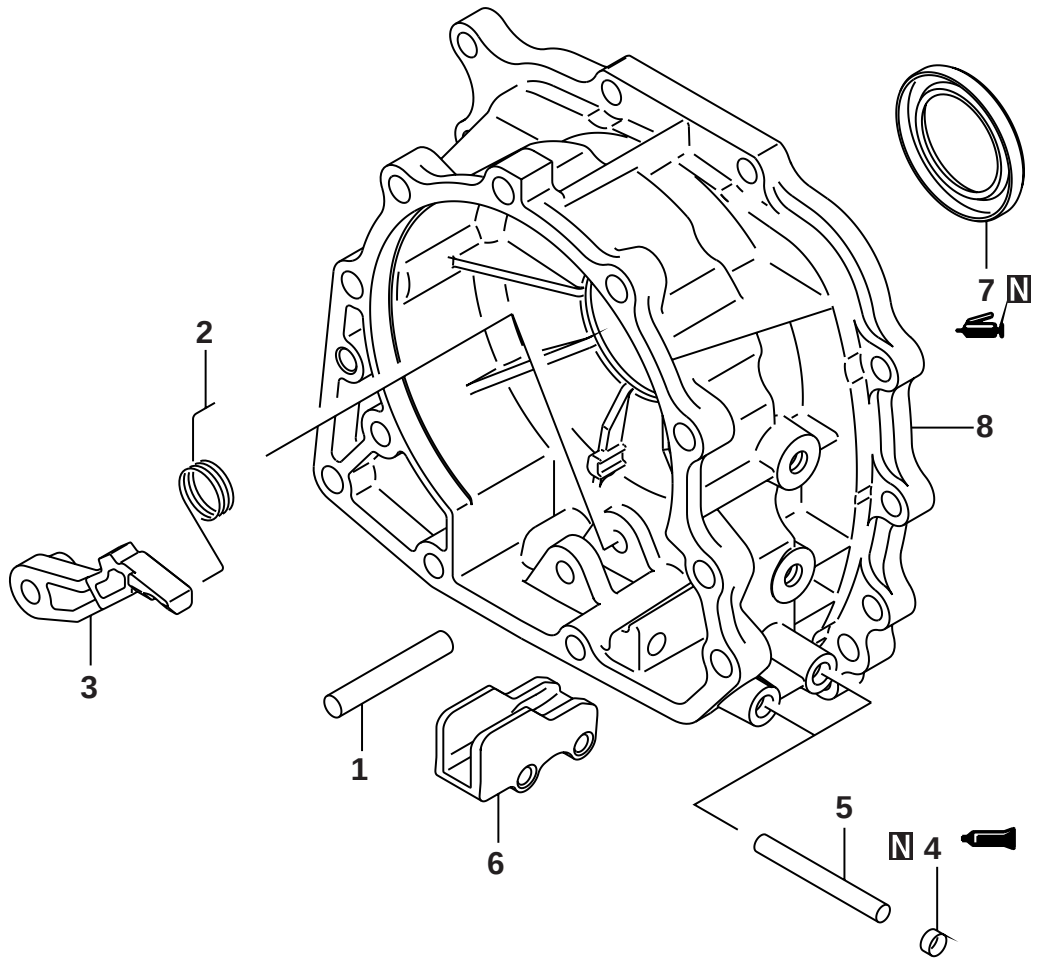
After squeezing out and applying the sealant on the transfer case adapter at the section indicated in the illustration, install onto the transmission case.

Specified sealant:
Mitsubishi Part No.MD997740 or equivalent

TRANSFER CASE ADAPTER

DISASSEMBLY AND REASSEMBLY

M1233007000258



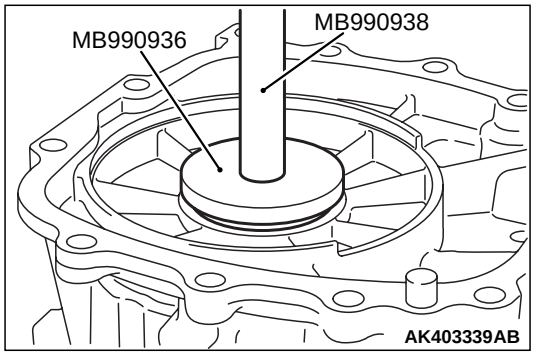
AKX00014AC

Disassembly steps

1. Parking sprag shaft
>>C<< 2. Parking sprag spring
3. Parking sprag
>>B<< 4. Sealing cap
5. Parking roller support shaft
6. Parking roller support
>>A<< 7. Oil seal
8. Transfer case adapter

REASSEMBLY SERVICE POINTS

>>A<< OIL SEAL INSTALLATION

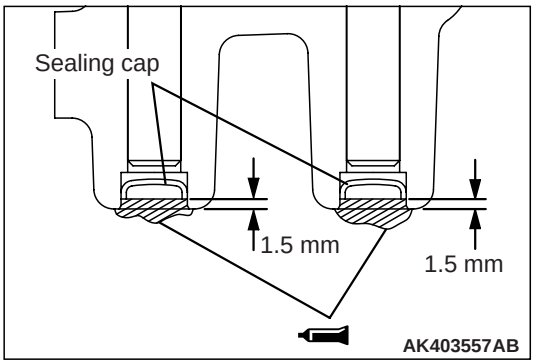


1. Use special tools to install the oil seal.
   - Installer adapter (MB990936)
   - Handle (MB990938)
2. Apply the specified grease to the lip of oil seal.

Specified lubricant:
Mitsubishi Part No.0101011 or equivalent

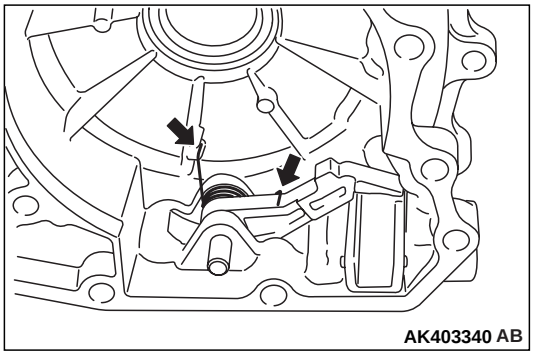
Specified sealant:
Mitsubishi 3M™ ATD Part No.8672 or equivalent

>>B<< SEALING CAP INSTALLATION



1. Press into the dimensions shown in the illustration so that it is not slanted.
2. Apply the sealant as shown in the illustration.

>>C<< PARKING SPRAG SPRING INSTALLATION

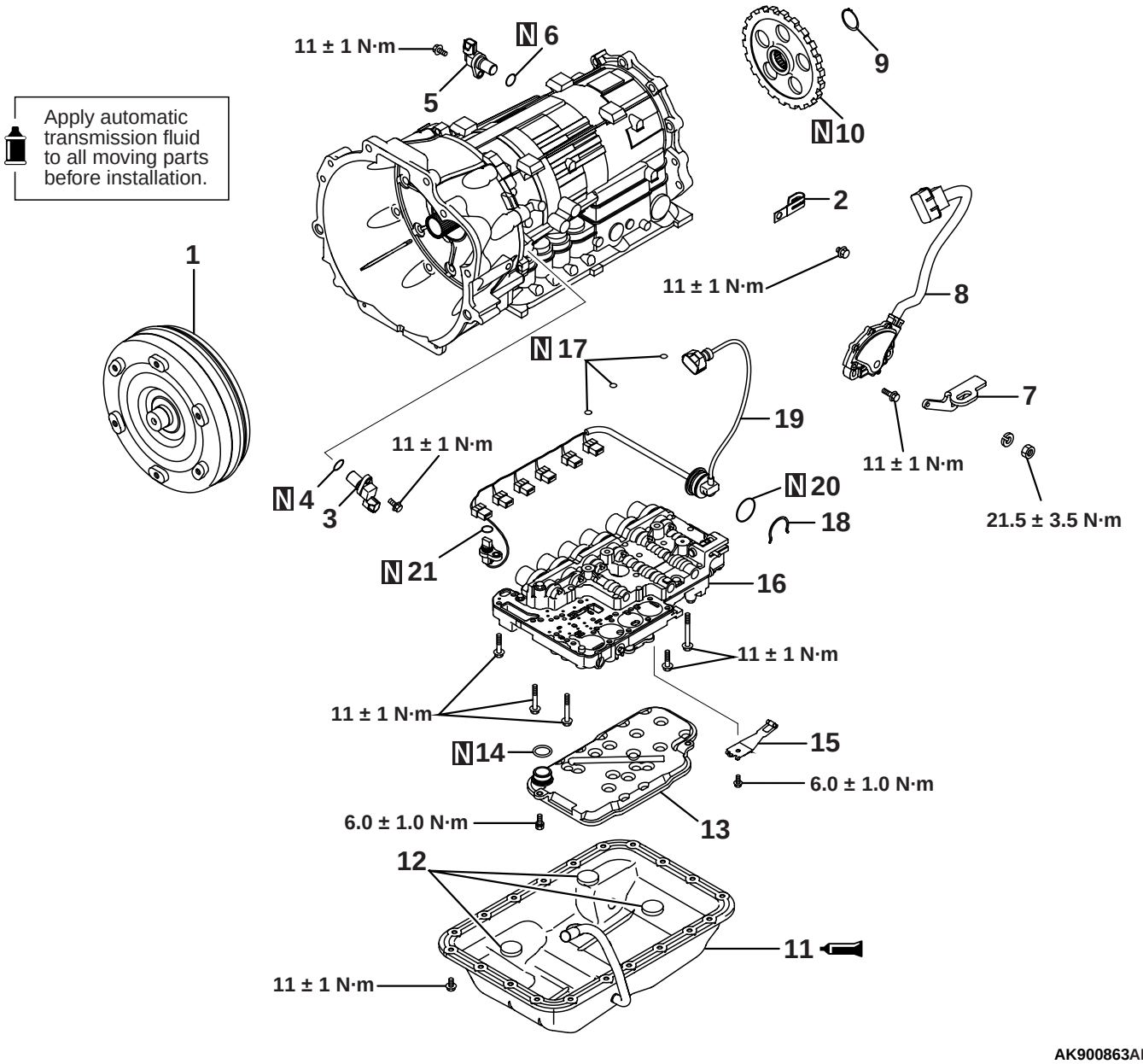


Attach the end of the spring to the position shown in the illustration.

TRANSMISSION

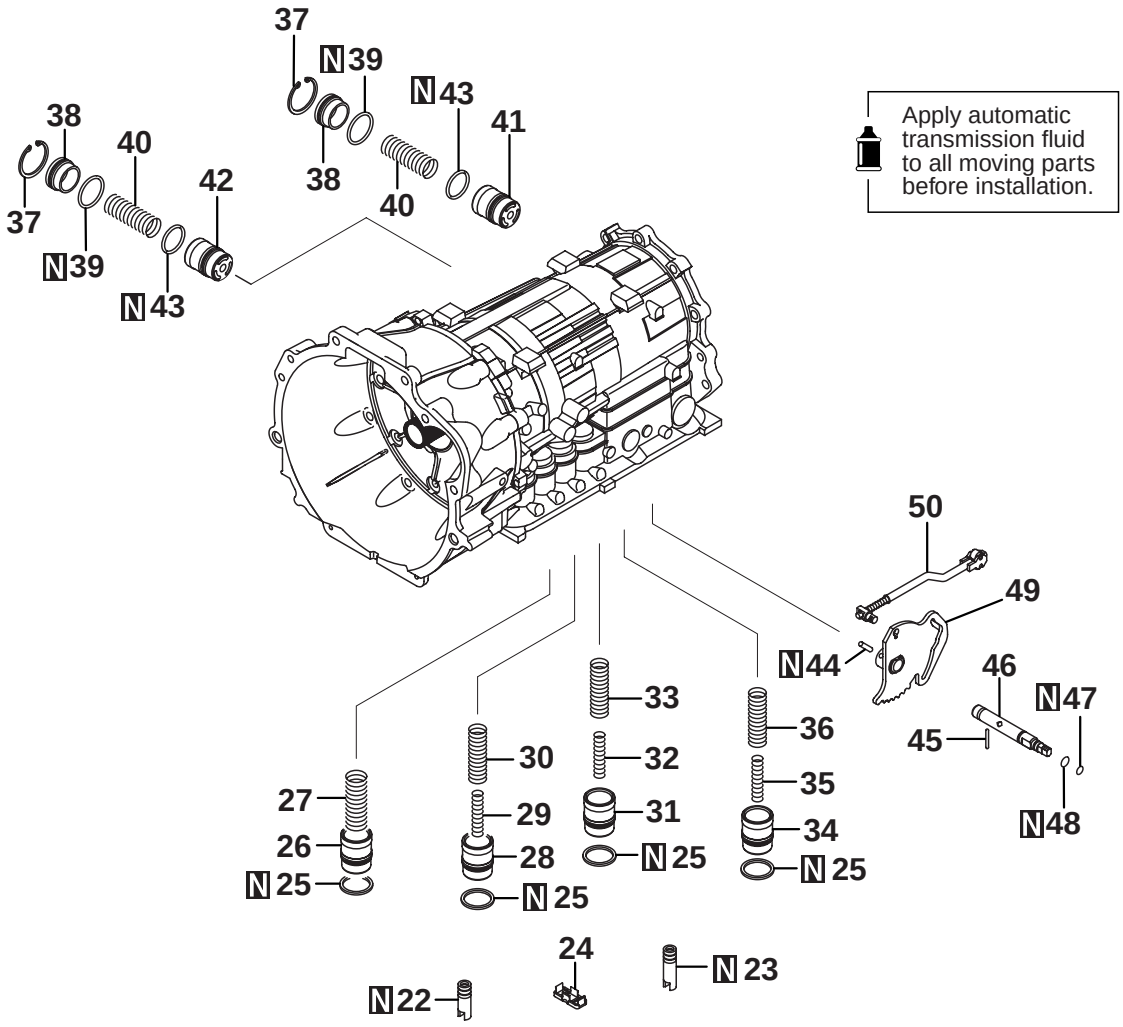
DISASSEMBLY AND REASSEMBLY

M1233101200024



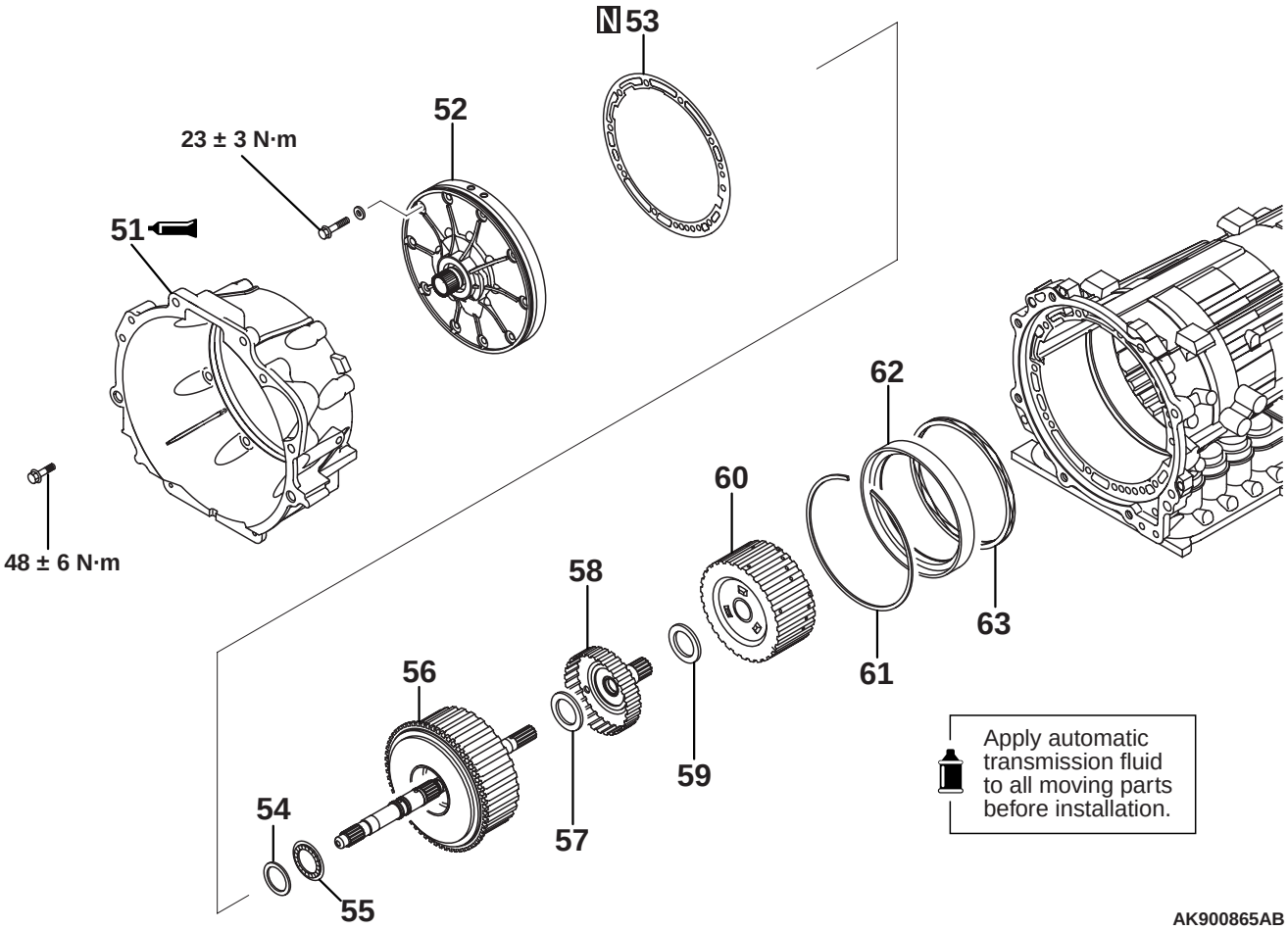
AK900863AB

1. Torque converter
2. Clamp
3. Input shaft speed sensor
4. O-ring
5. Output shaft speed sensor
6. O-ring
7. Manual control lever
8. Inhibitor switch
9. Snap ring
10. Parking gear
11. Oil pan
12. Magnet
13. Oil filter
14. O-ring
15. Detent spring
16. Valve body
17. O-ring
18. Snap ring
19. Solenoid valve harness
20. O-ring
21. O-ring

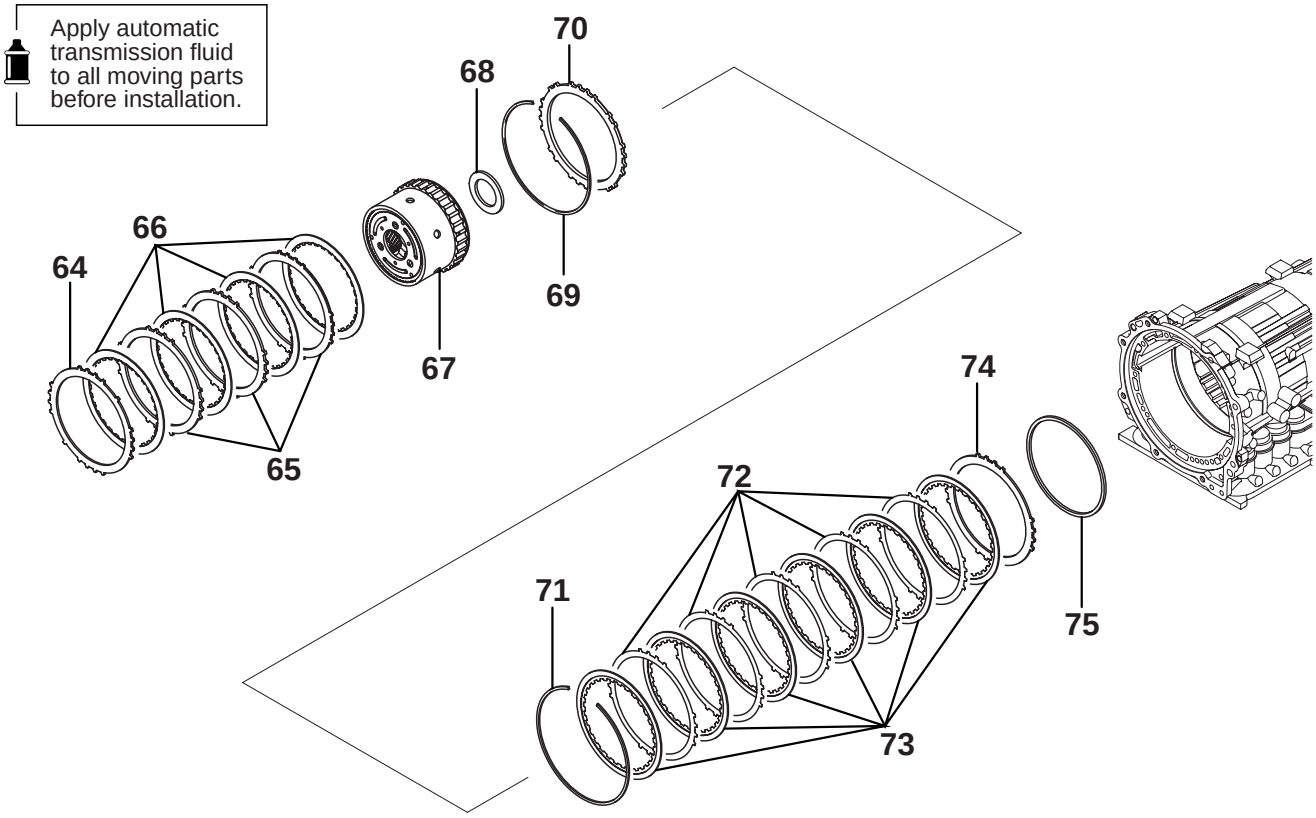


AK900864AB

22. Oil seal
23. Oil seal
24. Oil strainer
25. Seal ring
26. Accumulator piston (for overdrive clutch)
27. Accumulator spring
28. Accumulator piston (for second brake)
29. Inner spring
30. Outer spring
31. Accumulator piston (for Low/reverse brake)
32. Inner spring
33. Outer spring
34. Accumulator piston (for underdrive clutch)
35. Inner spring
36. Outer spring
37. Snap ring
38. Accumulator cover
39. O-ring
40. Accumulator spring
41. Accumulator piston (for reduction brake)
42. Accumulator piston (for direct clutch)
43. Seal ring
44. Spring pin
45. Pin
46. Manual control shaft
47. O-ring
48. O-ring
49. Detent lever
50. Parking roller rod

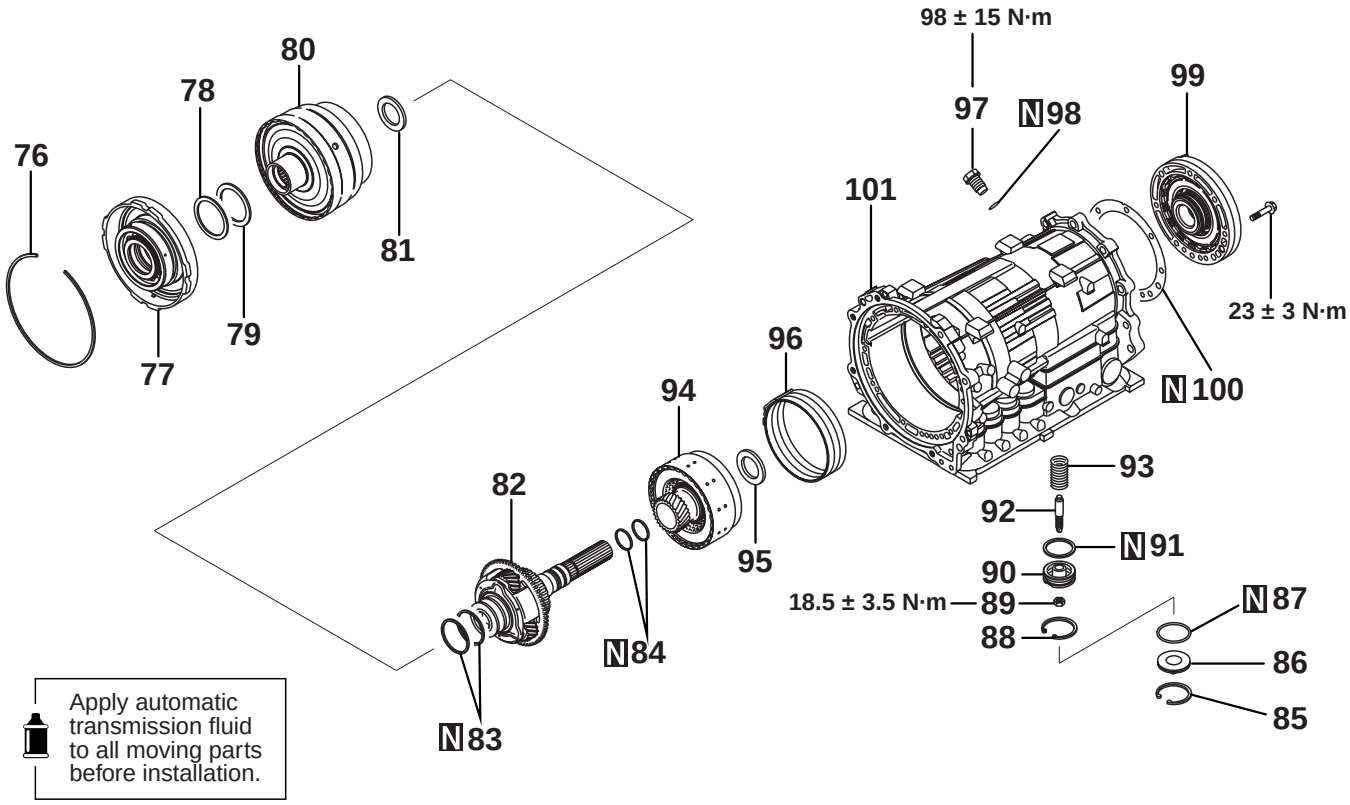


51. Converter housing
52. Oil pump
53. Oil pump gasket
54. Thrust race No.1
55. Thrust bearing No.2
56. Reverse and overdrive clutch
57. Thrust bearing No.3
58. Overdrive clutch hub
59. Thrust bearing No.4
60. Reverse sun gear
61. Snap ring
62. Second brake
63. Return spring



AK900817AB

64. Pressure plate
65. Brake plate
66. Brake disc
67. Low/reverse annulus gear
68. Thrust bearing No.7
69. Snap ring
70. Reaction plate
71. Snap ring
72. Brake plate
73. Brake disc
74. Pressure plate
75. Wave spring



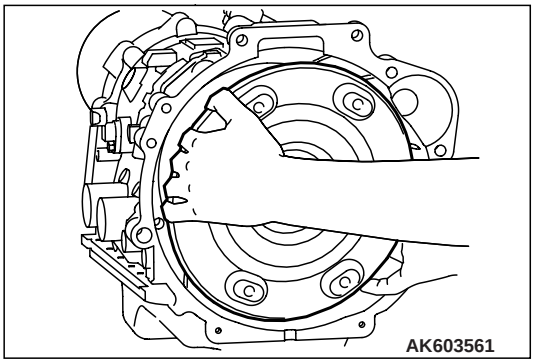
AK900818AB

76. Snap ring
77. Center support
78. Thrust race No.8
79. Thrust bearing No.9
80. Direct annulus gear
81. Thrust bearing No.12
82. Direct planetary carrier
83. Seal ring
84. Seal ring
85. Snap ring
86. Reduction brake cover
87. O-ring
88. Snap ring
89. Reduction brake piston nut
90. Reduction brake piston
91. Seal ring
92. Reduction brake piston adjusting rod
93. Reduction brake spring
94. Direct clutch
95. Thrust bearing No.13
96. Reduction brake band
97. Anchor plug
98. O-ring
99. Output shaft support
100. Output shaft support gasket
101. Transmission case

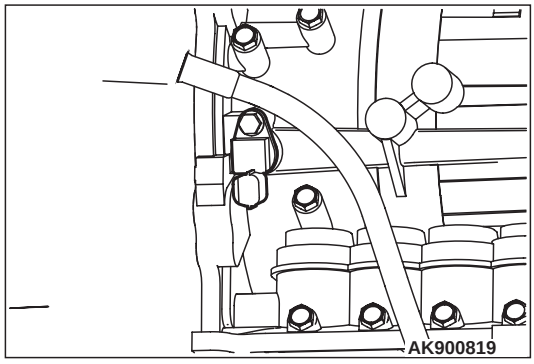
DISASSEMBLY

⚠ CAUTION

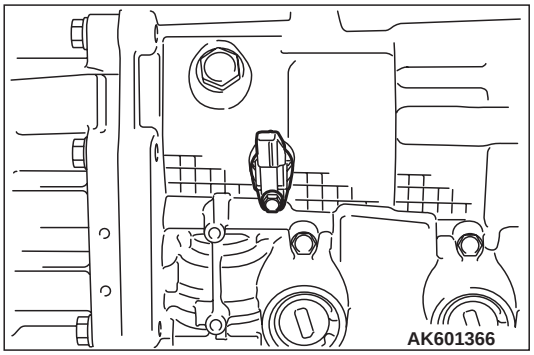
- **The automatic transmission includes many high-precision parts. Handle these parts extremely carefully not to scratch or damage them during disassembly and reassembly.**
- **Work bench should be covered with a rubber mat and keep it clean at all times.**
- **Do not wear any cloth gloves and do not use any rags during disassembly. Use only nylon cloth or paper towels if necessary.**
- **All removed parts must be washed clean. Metal parts may be washed in an ordinary solvent, but they should be dried completely using compressed air.**
- **Clutch discs, plastic thrust plates and rubber parts should be washed in automatic transmission fluid (ATF) and keep them free of dirt after washing.**
- **If the transmission has been found damaged and repaired, also disassemble and clean the ATF cooler system.**


AK603561

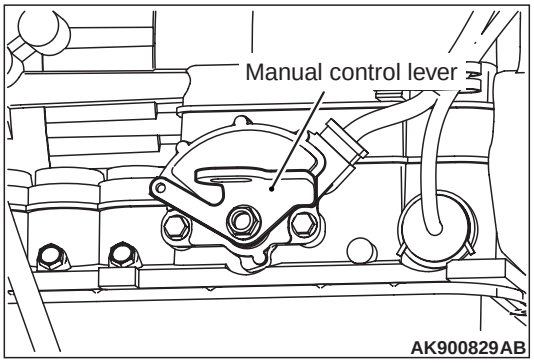
1. Remove the torque converter.
2. Remove the clamp.


AK900819

3. Remove the input shaft speed sensor, and detach the O-ring from the input shaft speed sensor.

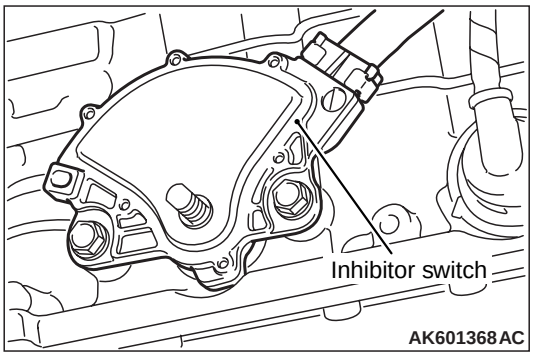

AK601366

4. Remove the output shaft speed sensor, and detach the O-ring from the output shaft speed sensor.



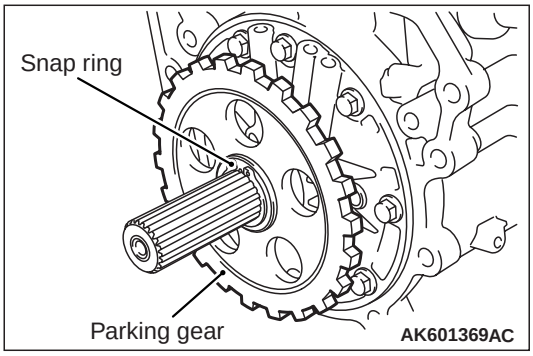
AK900829AB

5. Remove the manual control lever.



AK601368AC

6. Remove the inhibitor switch.

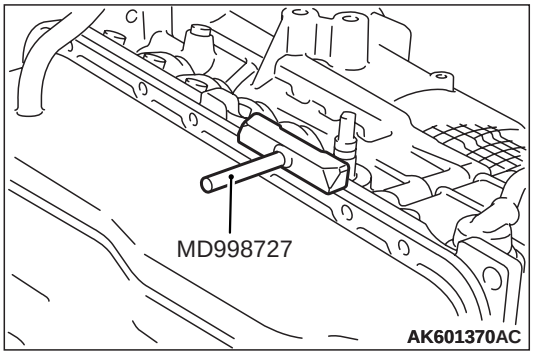


AK601369AC

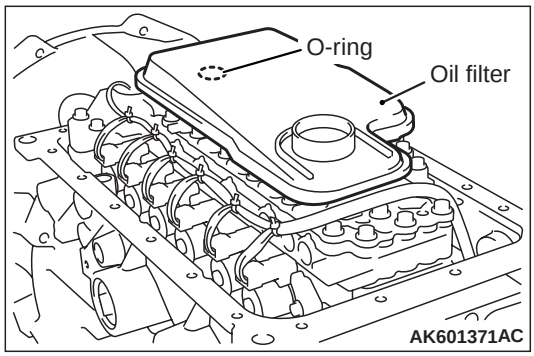
7. Remove the snap ring, and remove the parking gear using a puller (corresponding load approximately 9,800 N).

NOTE: The parking gear may be removed without using a puller.

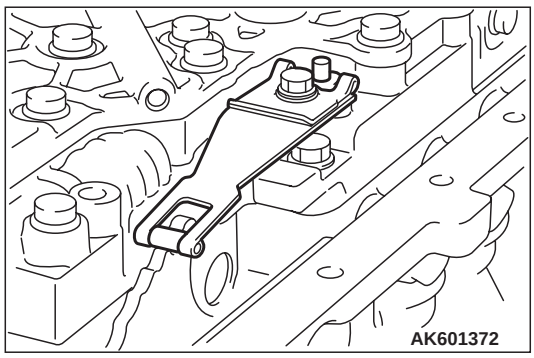
⚠ CAUTION
Carefully hammer the special tool so that the oil pan mounting surface is not damaged.



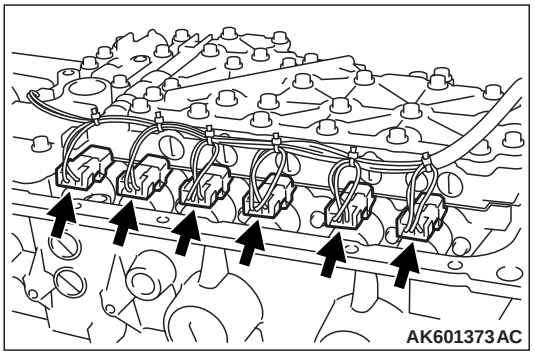
8. Remove the twenty oil pan mounting bolts and then remove the oil pan using the special tool Oil pan FIPG cutter (MD998727) to remove the oil pan.



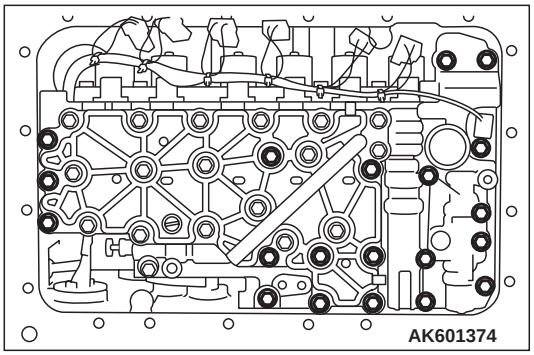
9. Remove the oil filter and O-ring.

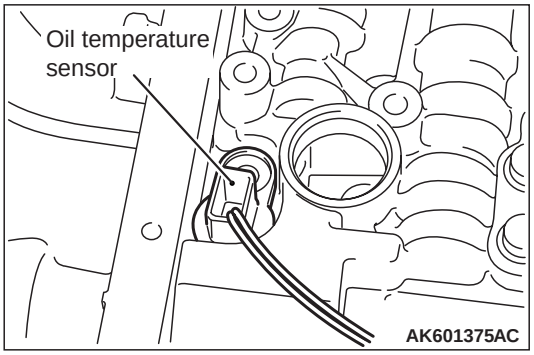


10. Remove the detent spring.



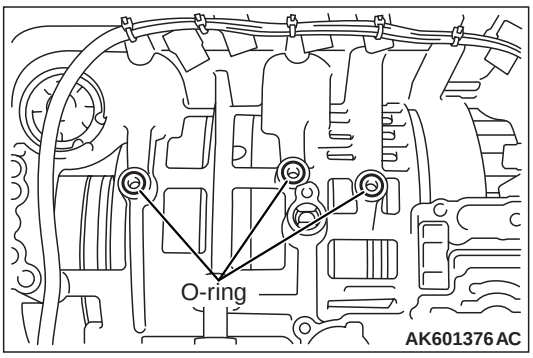
11. Disconnect the harness connectors of the valve body.



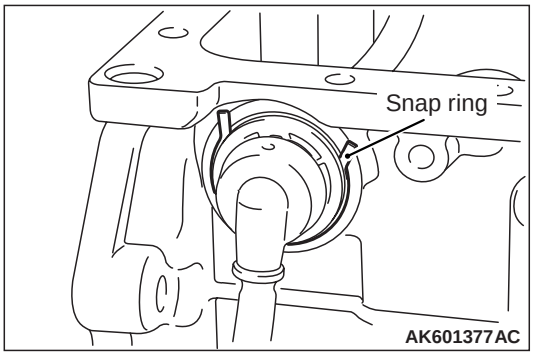


12. Remove the twenty valve body mounting bolts and then remove the valve body, three O-rings and oil temperature sensor.

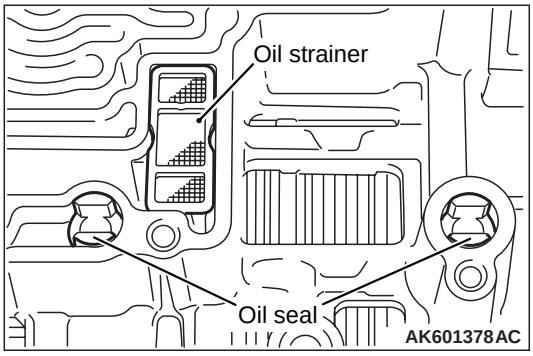
NOTE: The twenty valve body mounting bolts are plated bolts.



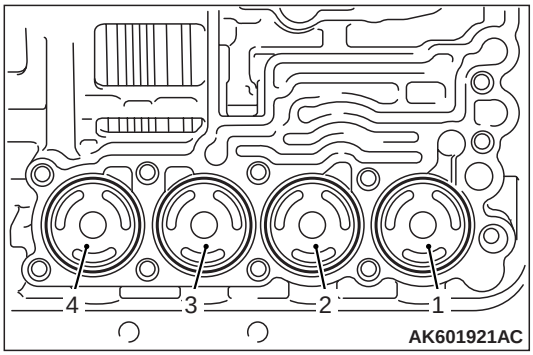
NOTE: The O-rings are mounted on the transmission case side as shown in the illustration. However there may be cases where they will come off with the valve body.

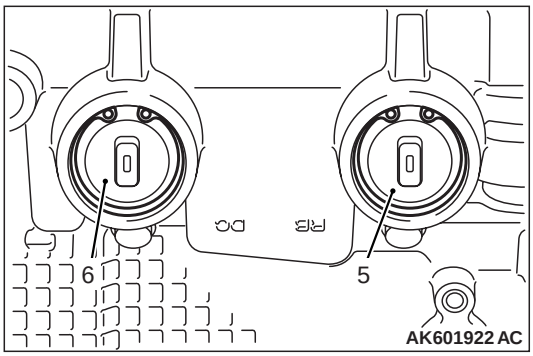


13.Remove the snap ring and disconnect the solenoid valve harness.



14.Remove the oil strainer and two oil seals.



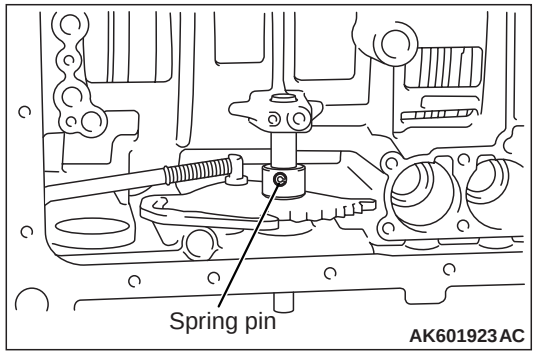


15.Remove each accumulator piston, seal ring and spring.

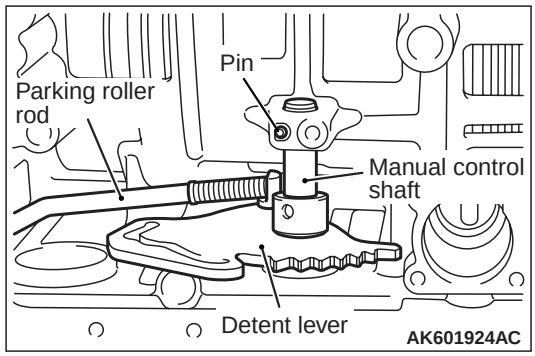
Remove the snap ring, then remove the accumulator cover, O-ring and spring.

No.	Name
1	For overdrive clutch
2	For second brake
3	For low/reverse brake
4	For underdrive clutch
5	For reduction brake
6	For direct clutch

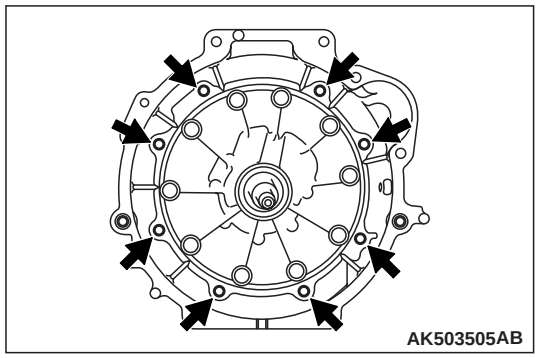
NOTE: To make assembly easier, attach an identification tag on the removed accumulator piston.



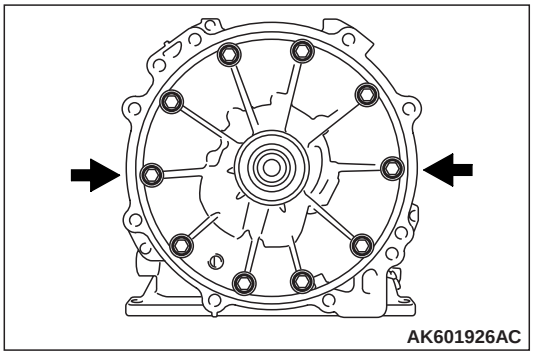
16.Remove the detent lever spring pin.



17.Remove the pin, and then remove the manual control shaft, two O-rings, detent lever and parking roller rod.

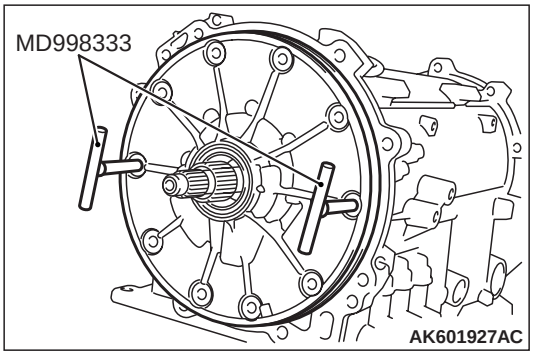


18.Remove the eight converter housing mounting bolts, and then converter housing.



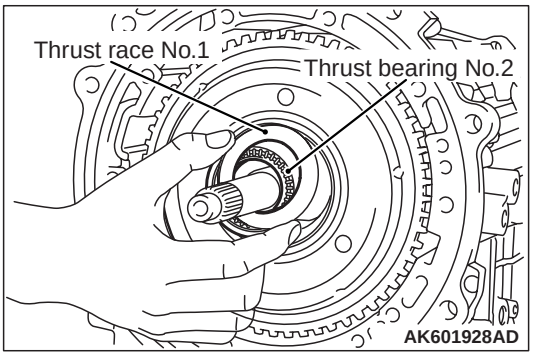
19.Remove the ten oil pump mounting bolts.

20.Install the special tool into the bolt hole shown in the illustration.



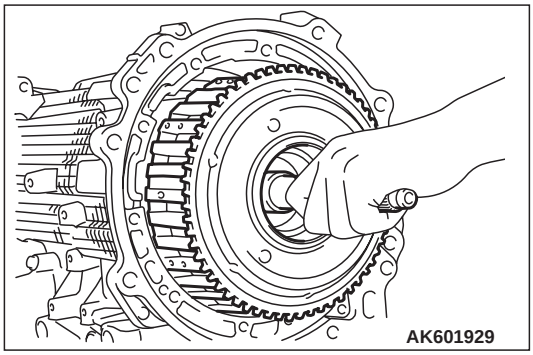
21.While screwing in special tools Oil pump remover (MD998333) evenly, remove the oil pump.

22.Remove the oil pump gasket.

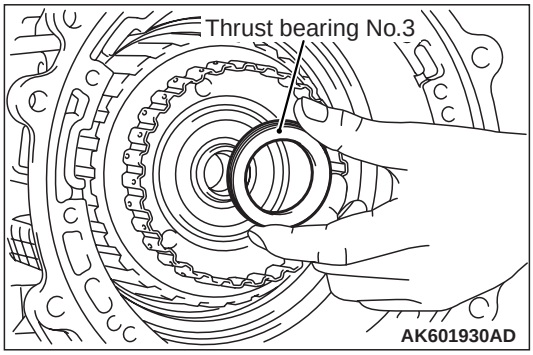


23.Remove the thrust race No.1 and thrust bearing No.2.

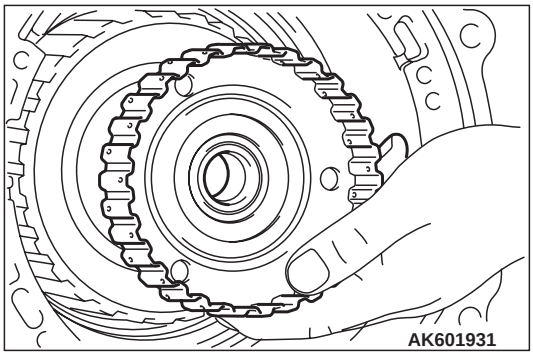
NOTE: The thrust race No.1 may be attached to the oil pump.



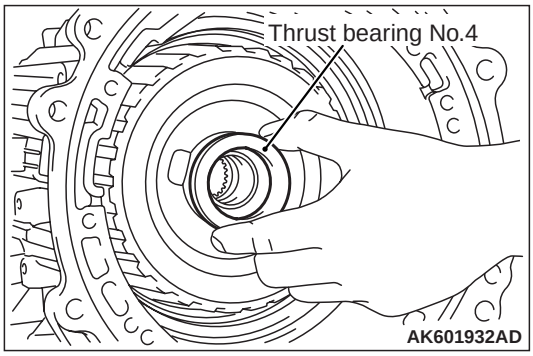
24.Remove the reverse and overdrive clutch.



25.Remove the thrust bearing No.3.

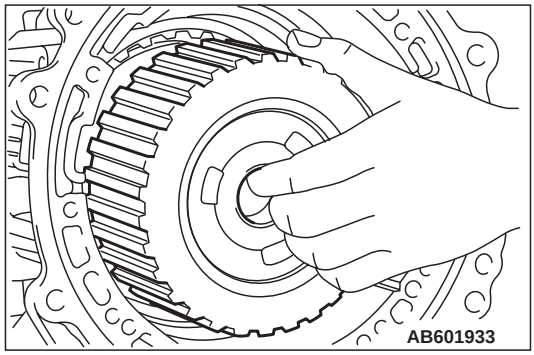


26.Remove the overdrive clutch hub.

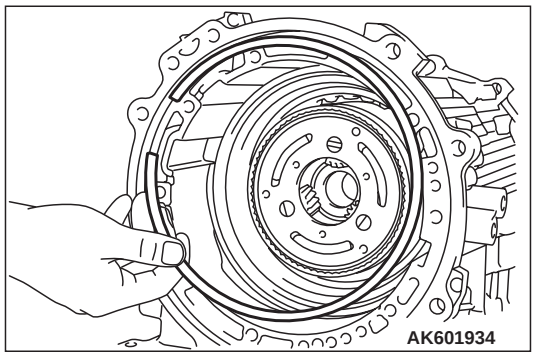


27.Remove the thrust bearing No.4.

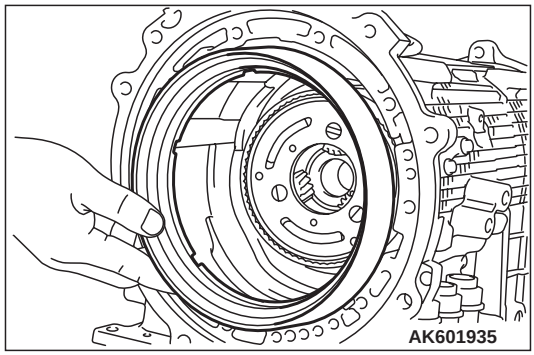
NOTE: The thrust bearing No.4 may be attached to the overdrive clutch hub.



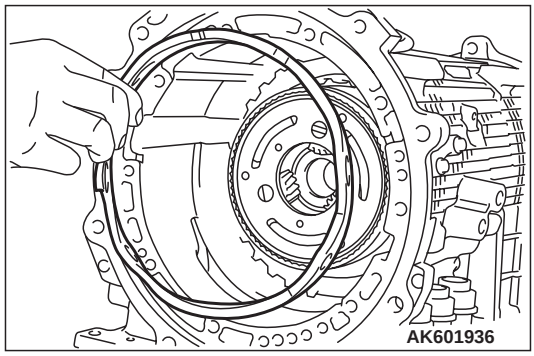
28.Remove the reverse sun gear.



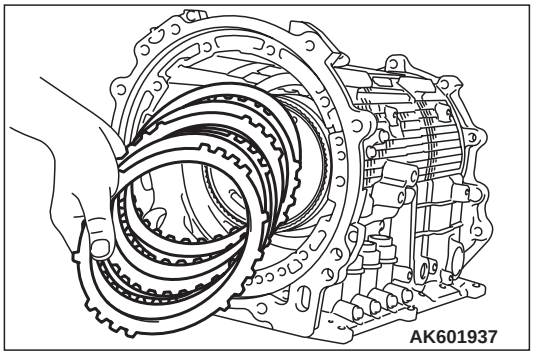
29.Remove the snap ring.



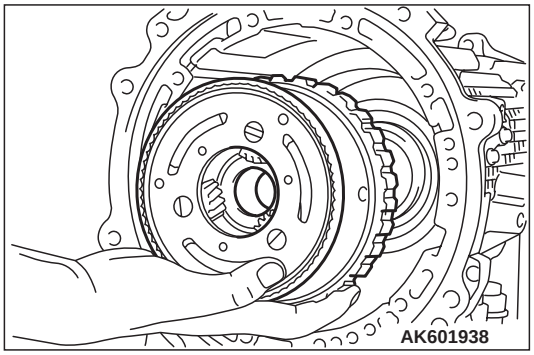
30.Remove the second brake.



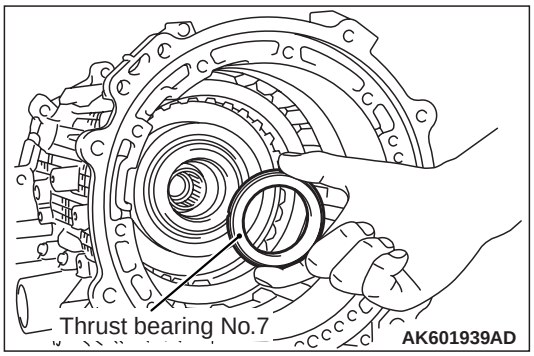
31.Remove the return spring.



32.Remove the pressure plate, brake plates and brake discs.

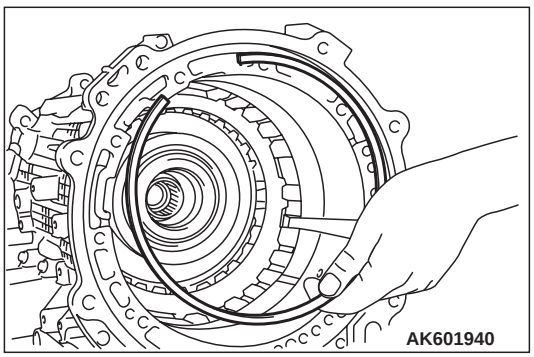


33.Remove the low/reverse annulus gear.

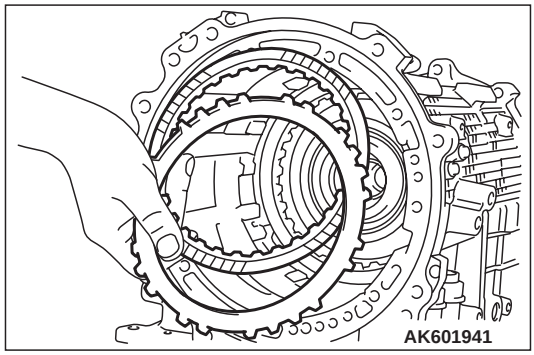


34.Remove the thrust bearing No.7.

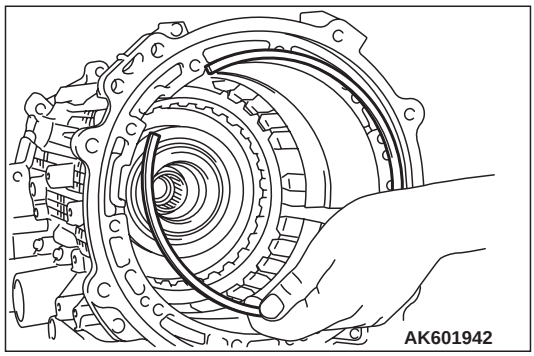
NOTE: The thrust bearing No.7 may be attached to the low/reverse annulus gear.



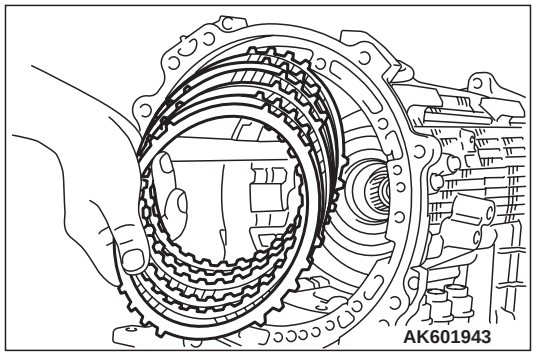
35.Remove the snap ring.



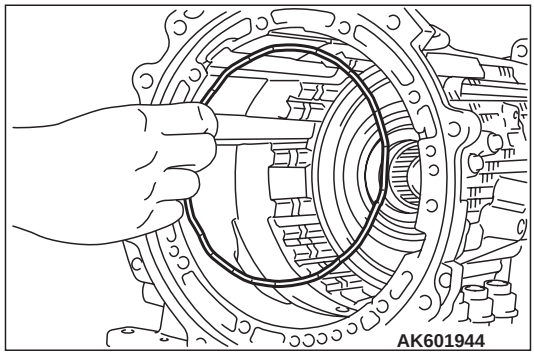
36.Remove the reaction plate and one brake disc.



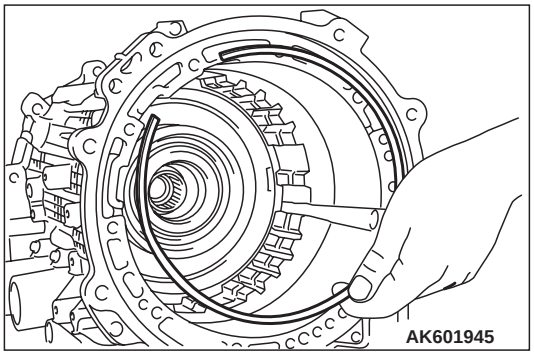
37.Remove the snap ring.



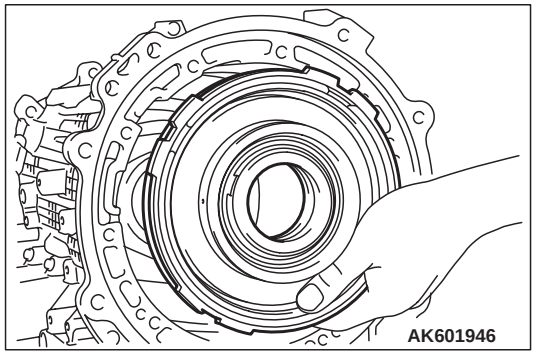
38.Remove the brake plates, brake discs, and pressure plate.



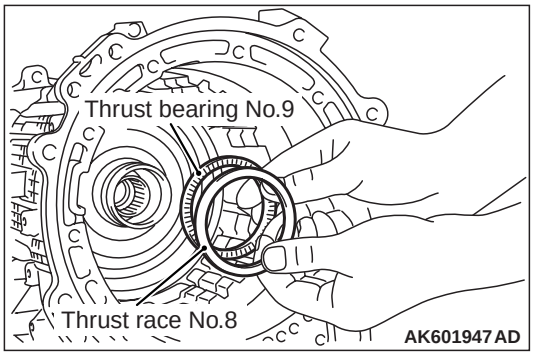
39.Remove the wave spring.



40.Remove the snap ring.

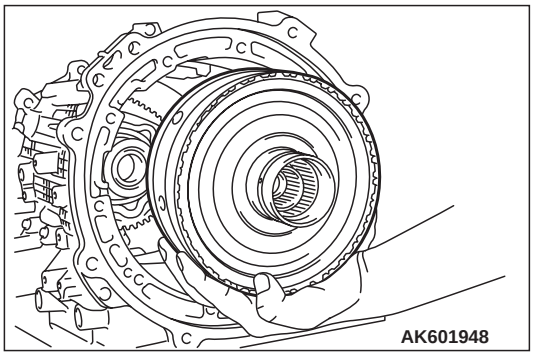


41.Remove the center support.

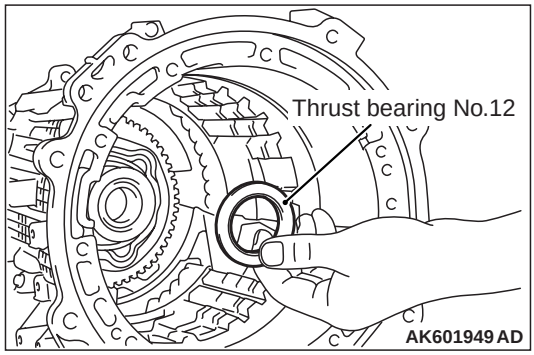


42.Remove the thrust race No.8 and thrust bearing No.9.

NOTE: The thrust race No.8 may be attached to the center support.

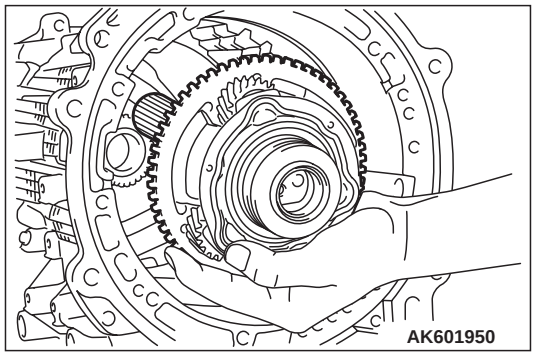


43.Remove the direct annulus gear.

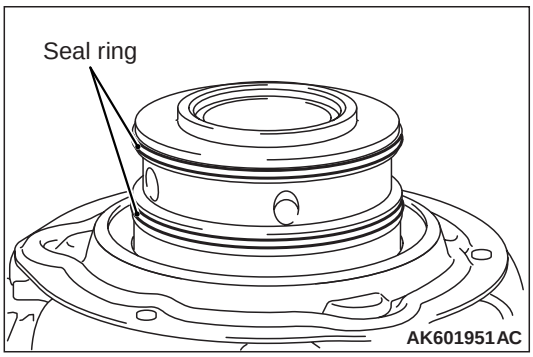


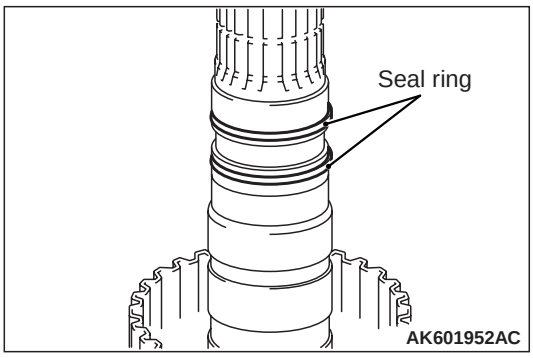
44.Remove the thrust bearing No.12.

NOTE: The thrust bearing No.12 may be attached to the direct annulus gear.

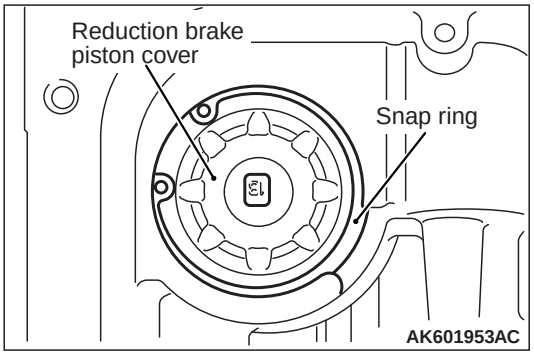


45.Remove the direct planetary carrier.

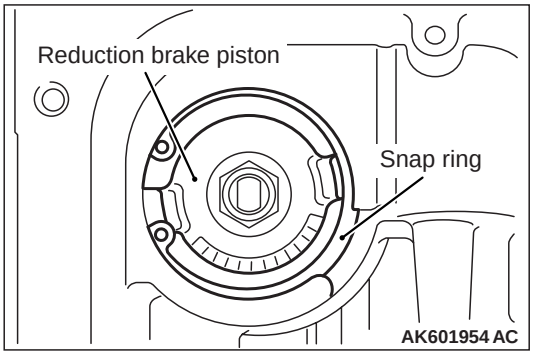




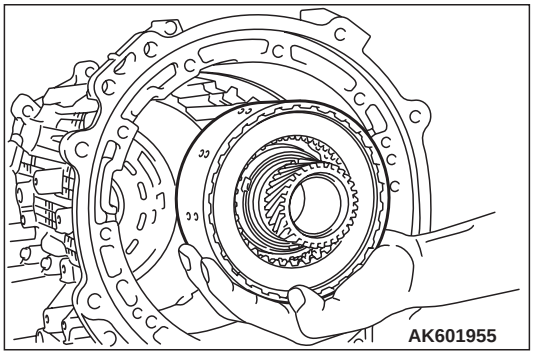
46.Remove the two large and two small seal rings from the direct planetary carrier.



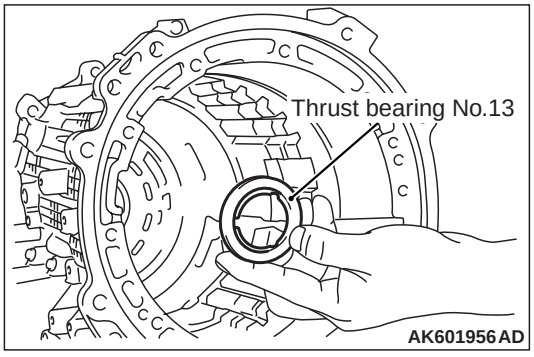
47.Remove the snap ring and then the reduction brake piston cover and O-ring.



48.Remove the snap ring and then the nut, reduction brake piston, seal ring, adjusting rod and spring.

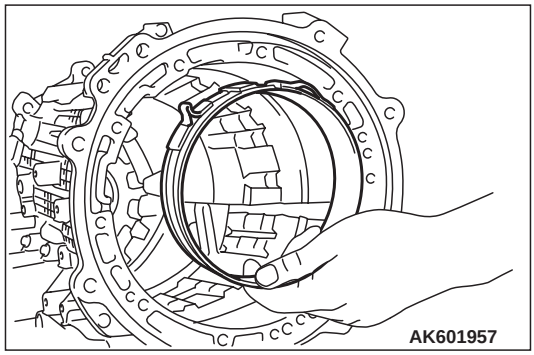


49.Remove the direct clutch.

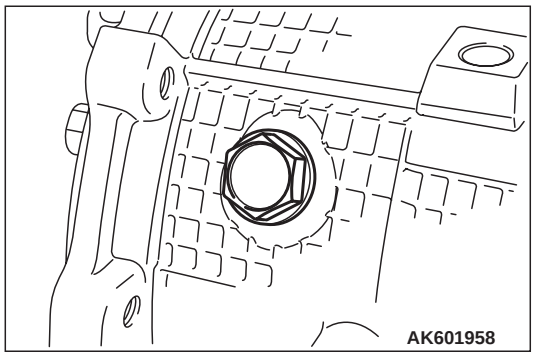


50.Remove the thrust bearing No.13.

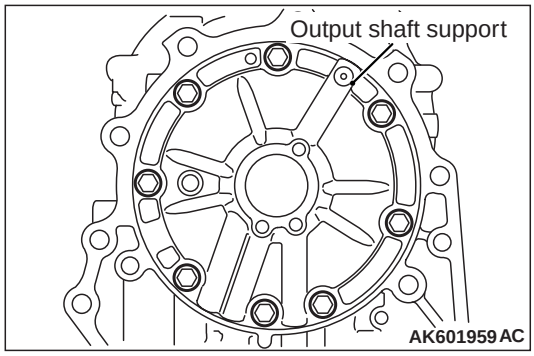
NOTE: The thrust bearing No.13 may be attached to the direct clutch.



51.Remove the reduction brake band.



52.Remove the anchor plug and the O-ring.



53.Remove the eight output shaft support mounting bolts, and then remove the output shaft support and gasket.

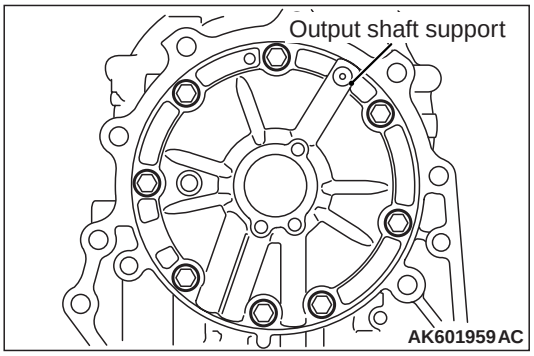
RESASSEMBLY

⚠ CAUTION

- **Never reuse the gasket, O-ring, oil seal, etc. Always replace with a new one when reassembling.**
- **Never use grease other than blue petrolatum jelly and white vaseline.**
- **Apply ATF to friction components, rotating parts, and sliding parts before installation. Immerse a new clutch disc or brake disc in ATF for at least two hours before assembling them.**
- **Never apply sealant or adhesive to gaskets.**
- **When replacing a bushing, replace the reassembly which it belongs to.**
- **During the work, always use bare hands or vinyl gloves. Do not use cotton gloves. Use nylon cloth or paper towels when necessary. Do not use shop towel.**
- **Change the oil in the cooler system.**

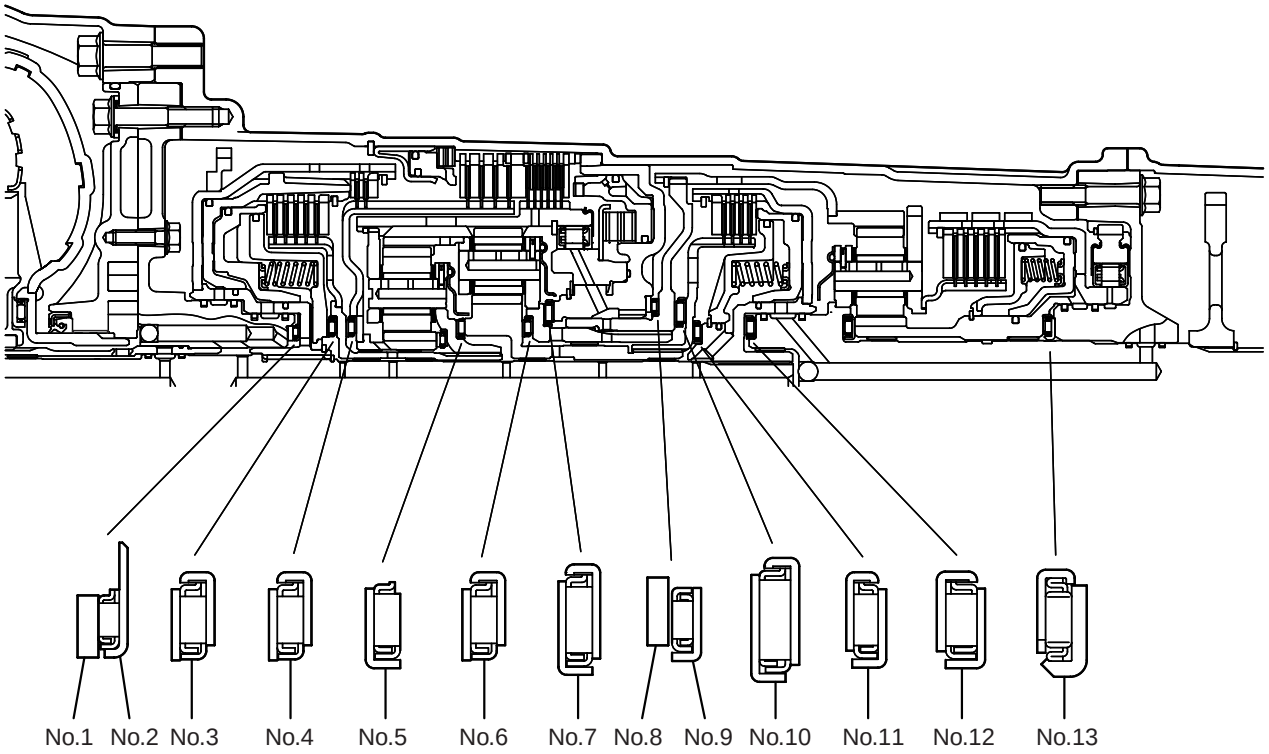
⚠ CAUTION

Never reuse a gasket.



1. Install a new gasket and output shaft support.
2. Tighten the eight output shaft support mounting bolts to the specified torque 23 ± 3 N·m.

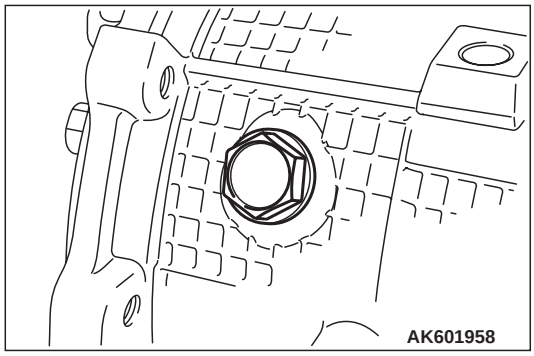
Identification of thrust bearings and thrust races



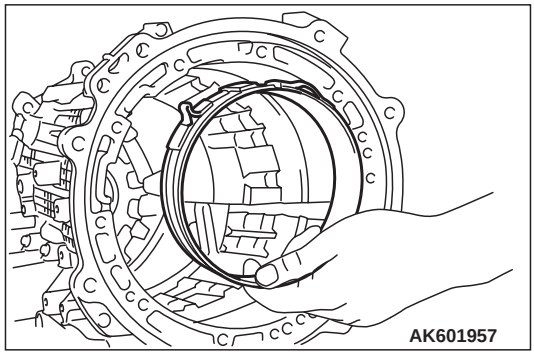
AK900857AC

Symbol	OD mm	ID mm	Thickness mm
No.1	48.9	37	1.4
			1.6
			1.8
			2.0
			2.2
			2.4
			2.6
No.2	59	37	2.8
No.3	57	38.5	4.12
No.4	57	38.5	4.12
No.5	54.4	38.5	3.31
No.6	57	38.5	4.12
No.7	70	48.8	4.0
No.8	73	60	1.6
			1.8
			2.0
			2.2
No.9	71.45	57	2.81
No.10	72	48.25	4.6

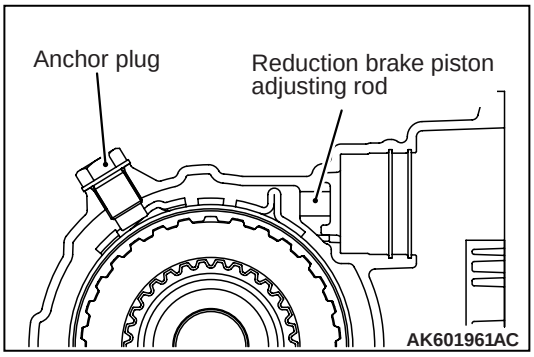
Symbol	OD mm	ID mm	Thickness mm
No.11	53	34.7	4.01
No.12	57	38.5	4.12
No.13	58	37.5	4.8



3. Install a new O-ring on the anchor plug and tighten the anchor plug to the specified torque 98 ± 15 N·m.

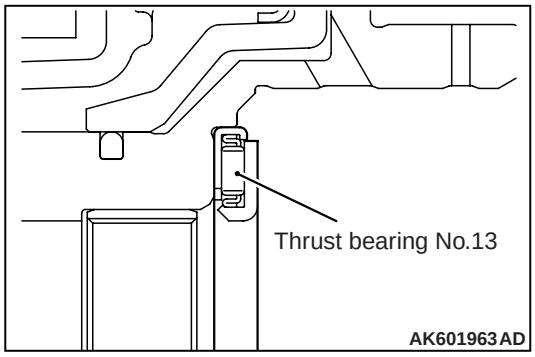


4. Install the reduction brake band.

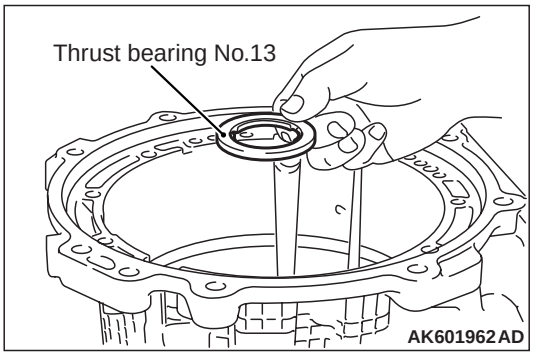


Fit the anchor bracket hole of the brake band onto the anchor plug tip, and then insert the apply bracket part into the hole for reduction brake piston adjusting rod.

⚠ CAUTION



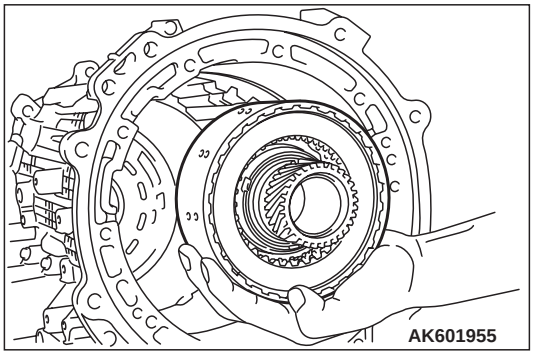
Take care not to mistake the thrust bearing No.13 mounting direction.



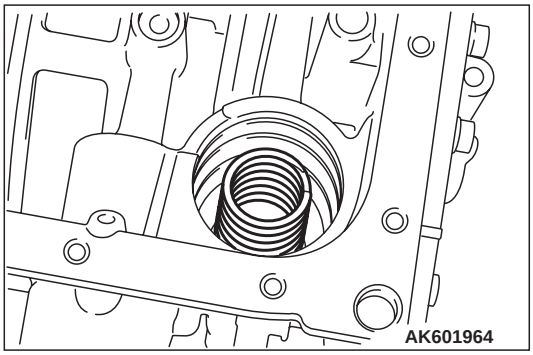
5. Install the thrust bearing No.13 onto the direct clutch retainer.

⚠ CAUTION

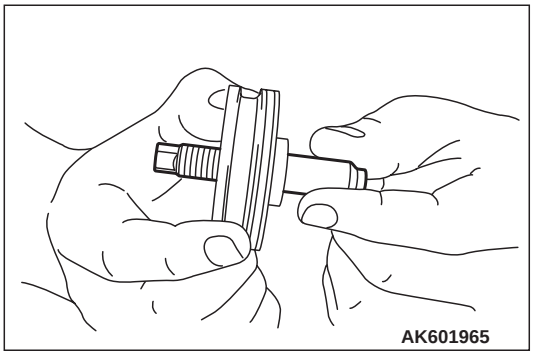
Take care that the reduction brake band does not come off the anchor plug and the hole for the reduction brake piston adjusting rod.



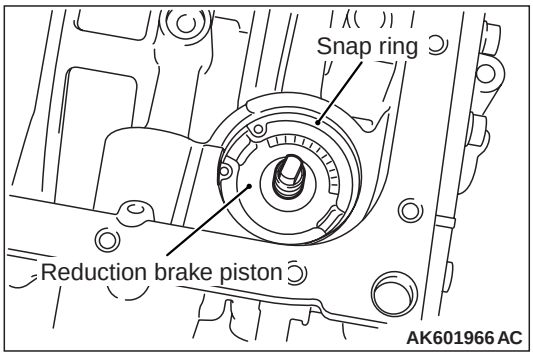
6. Install the direct clutch.



7. Install the reduction brake spring.

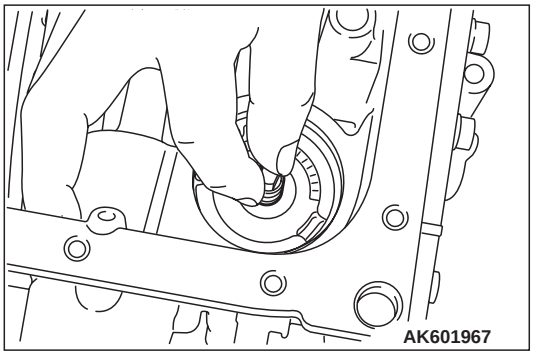


8. Screw the reduction brake piston adjusting rod into the reduction brake piston manually to the full.
9. Install new seal ring on the piston.

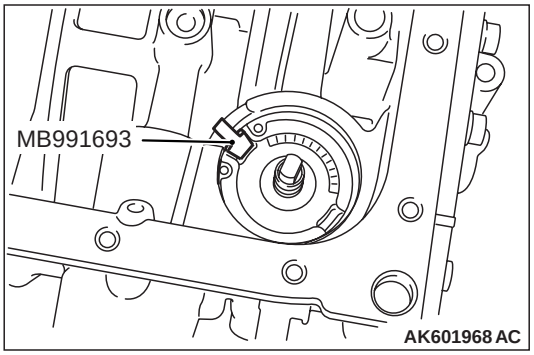


10. Press the reduction brake piston into the transmission case, and then install the snap ring.

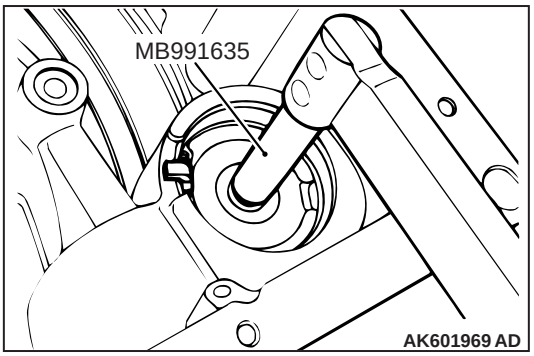
NOTE: Set the open of the snap ring at indicated location.



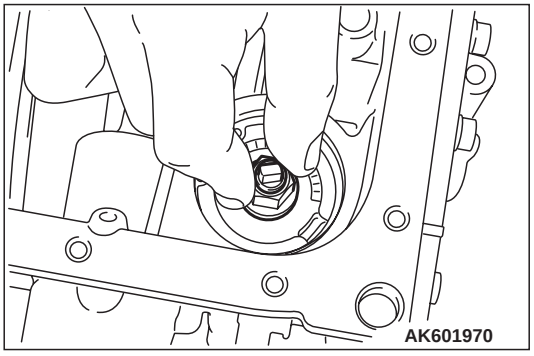
11. Tighten the reduction brake piston adjusting rod manually to the full.



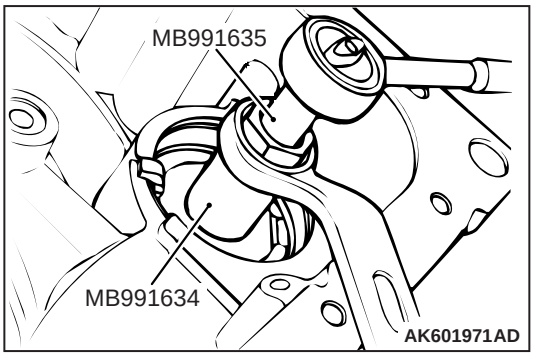
12. Adjust the reduction brake piston by the following procedure.
    (1) Mount the special tool Reduction brake stopper (MB991693) so that the reduction brake piston does not rotate.



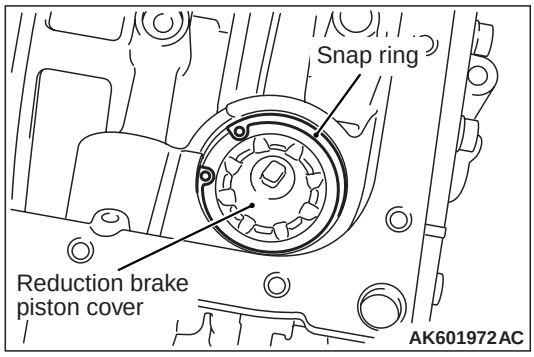
    (2) Mount the torque wrench to the special tool Socket (MB991635), and after repeating tightening and turning back with a torque of 10 N·m twice, tighten the reduction brake piston adjusting rod to the specified torque of 5 N·m. Then turn the reduction brake piston adjusting rod 5 1/2 to 5 3/4 turns back.



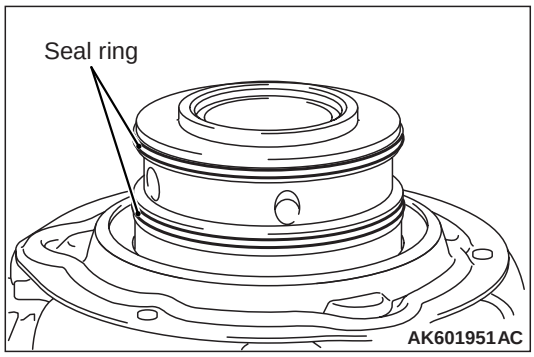
    (3) Remove the special tool and tighten the reduction brake piston nut manually.

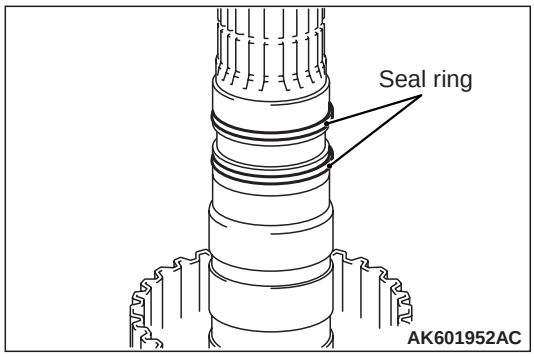


(4) Using the special tool Wrench (MB991634), tighten the reduction brake piston nut to the specified torque 18.5 ± 3.5 N·m while fixing the special tool Socket (MB991635) so as not to rotate.

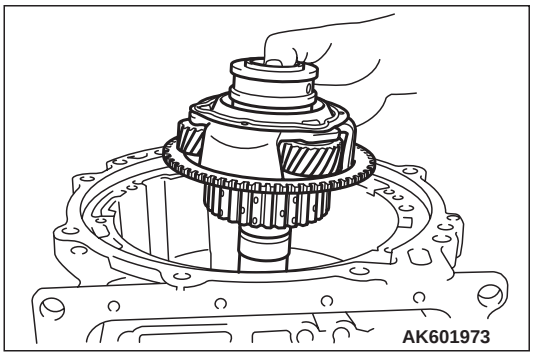


13.Install a new O-ring on the reduction brake piston cover, and then install the cover and the snap ring on the transmission case.



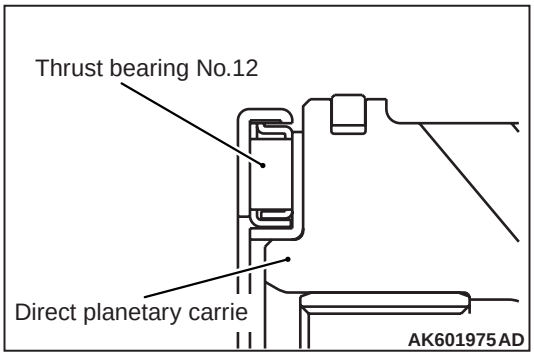


14.Install new seal rings (two large pieces) onto the front end of the direct planetary carrier, and new seal rings (two small pieces) onto the shaft of the direct planetary carrier.

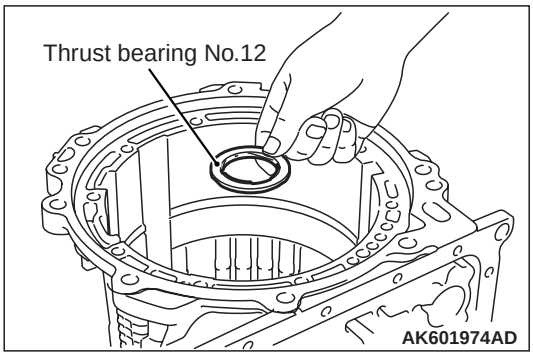


15.Insert the direct planetary carrier into the output shaft support.

⚠ CAUTION



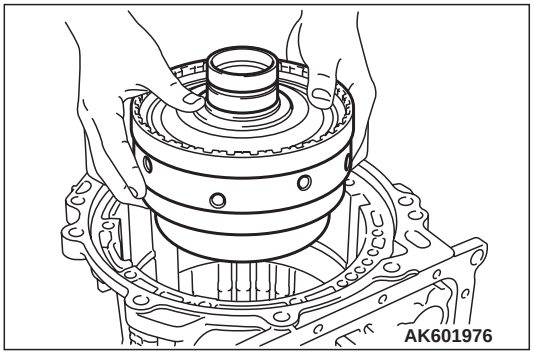
Take care not to mistake the thrust bearing No.12 mounting direction.



16.Apply vaseline or petrolatum jelly on the thrust bearing No.12, and then install on the front end of the direct planetary carrier.

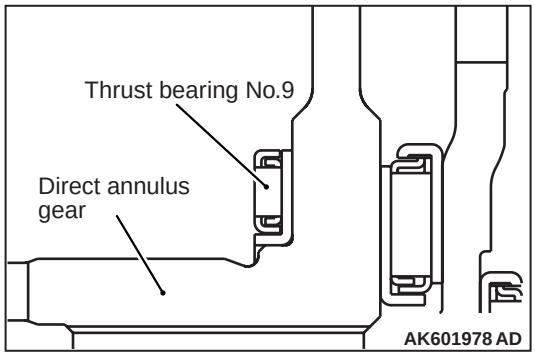
⚠ CAUTION

Confirm that the thrust bearing No.10 in the direct annulus gear is still at the specified location.

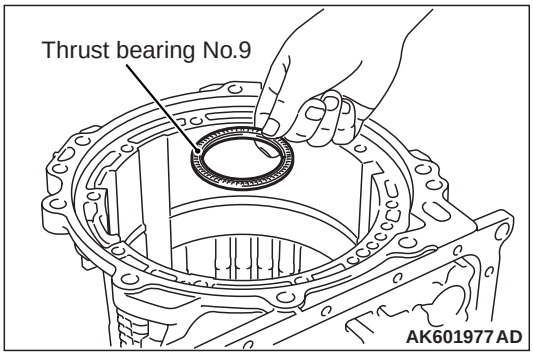


17.Install the direct annulus gear.

⚠ CAUTION



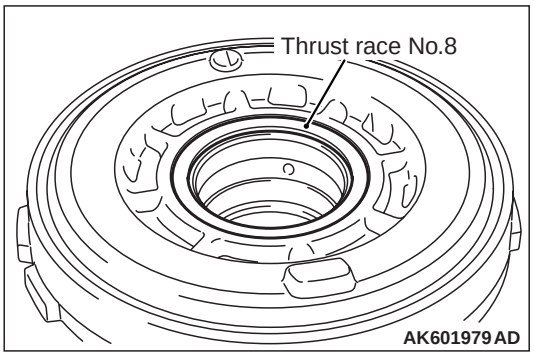
Take care not to mistake the thrust bearing No.9 mounting direction.



18.Apply vaseline or petrolatum jelly to the thrust bearing No.9, and then install on the direct annulus gear.

⚠ CAUTION

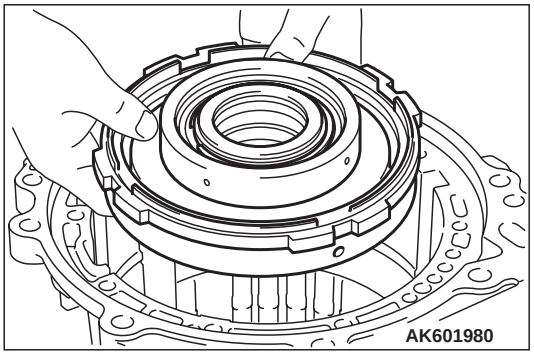
Measure and record the thickness of the thrust race No.8 before assembling.



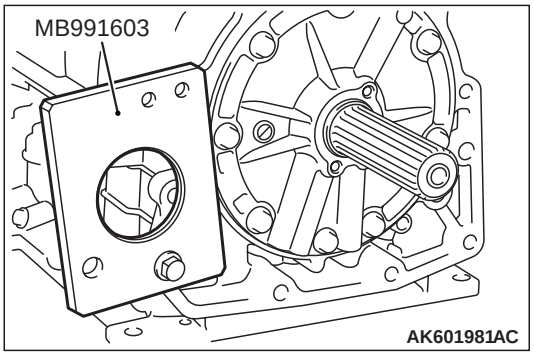
19.Apply vaseline or blue petrolatum jelly on the thrust race No.8 removed, and then install it on the rear side of the center support.

⚠ CAUTION

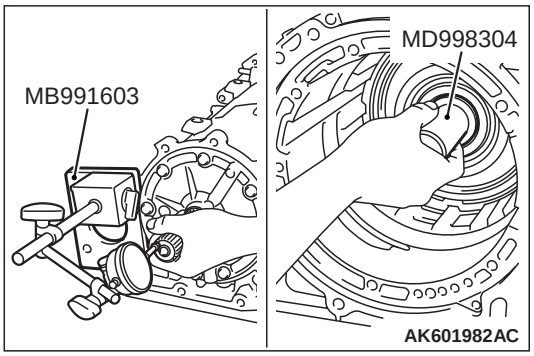
- **Install the center support so that the oil hole shown in the illustration faces the lower side of the transmission case.**
- **Use care that the thrust race No.8 attached to the rear side of the center support does not fall off.**



20.Install the center support.

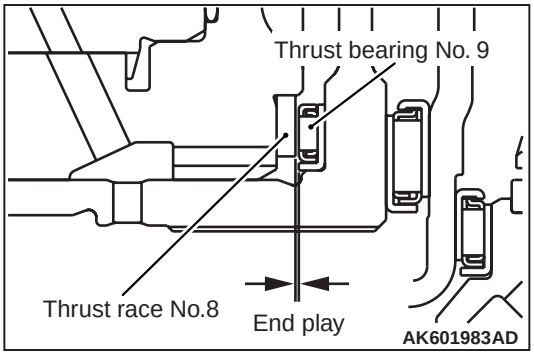


21.Using the transfer case adapter bolt, install special tool Bearing installer stopper (MB991603).



22.Select the thrust race No.8 with the following procedure.
(1) Fix a dial gauge to the special tool Bearing installer stopper (MB991603).
(2) Push the direct planetary carrier and direct annulus gear in alternately, and measure the end play of the direct planetary carrier.

NOTE:
- *When pushing in the direct planetary carrier, make sure that the center support does not move.*
- *When pushing in the direct annulus gear, use the special tool Oil seal installer (MD998304).*



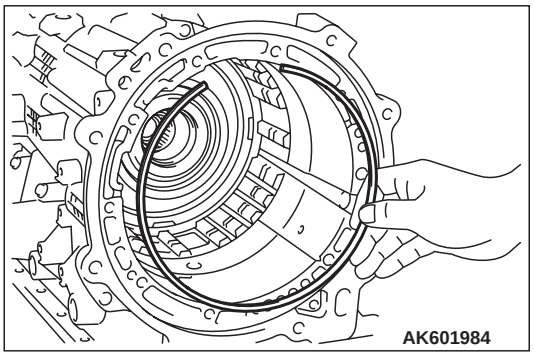
(3) Replace the thrust race No.8 installed in step 19 with a suitable one which can bring the end play of the direct planetary carrier to the standard value. Then, reassemble.

NOTE: Refer to the thickness recorded in step 19.

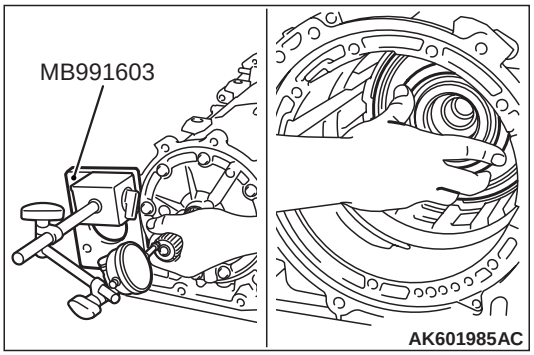
Standard value: 0.25 – 0.71 mm
(For direct planetary carrier end play)

(4) Measure the end play again, and confirm that it is within the standard value.

NOTE: Carry this step out with the special tool and dial gauge installed.

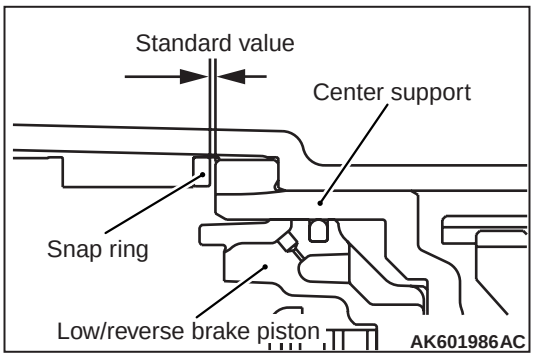


23.Using the following steps, select a suitable snap ring for fixing the center support.
(1) Install the snap ring which has been used for fixing the center support.



(2) Alternately push in the direct planetary carrier and center support, and measure the end play of the center support.

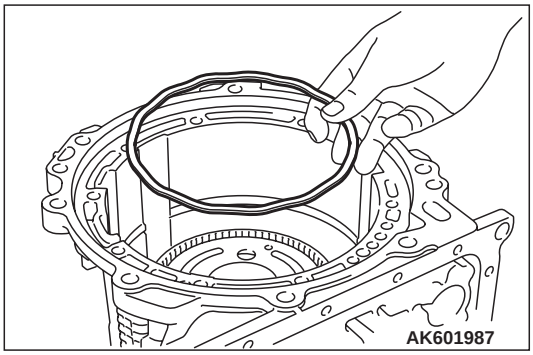
NOTE: Be sure to push the direct planetary carrier in fully until the center support contacts the snap ring.



(3) Replace the snap ring for fixing the center support installed in step 23 (1) with a suitable one so that the end play of the center support is at the standard value. Then, reassemble.

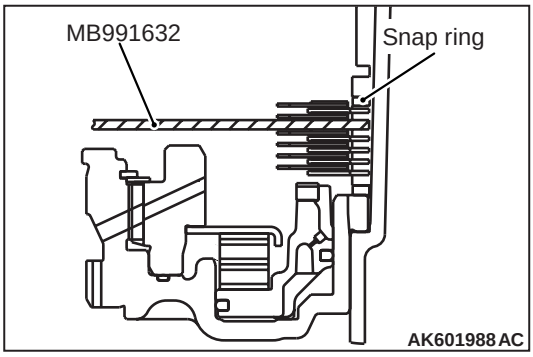
Standard value: 0 – 0.16 mm
(For center support end play)

(4) Measure the end play again, and confirm that it is within the standard value.



24.Using the following steps, select a snap ring for adjusting the brake reaction plate end play and second brake end play, and a pressure plate for adjusting the low/reverse brake end play.

(1) Install the wave spring onto the low/reverse brake piston.

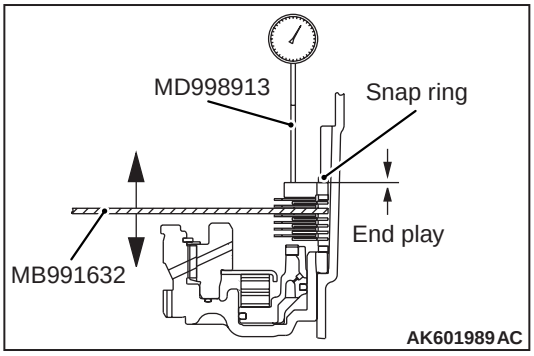


(2) Install the special tool (MB991632) in the position shown in the illustration instead of the pressure plate for the low/reverse brake. Install the brake discs, brake plates and snap ring.

(3) Install the reaction plate and snap ring that was used.

⚠ CAUTION

Take care to the assembly direction of the reaction plate.



(4) Install a dial gauge onto special tool (MD998913) so that the tool end contacts the brake reaction plate. Measure the end play by moving special tool (MB991632).

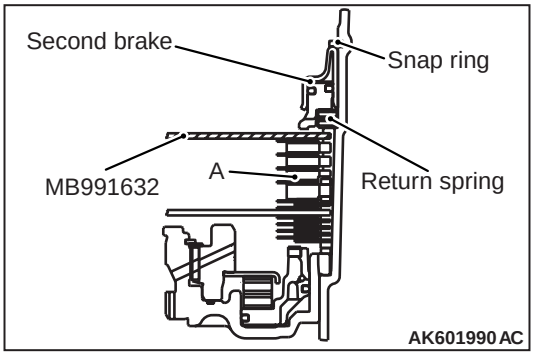
(5) Replace the snap ring installed in step 24 (3) with a suitable one so that the end play may fall within the standard value. Then, reassemble.

Standard value: 0 – 0.16 mm
(For brake reaction plate end play)

(6) Measure the end play again, and confirm that it is within the standard value.

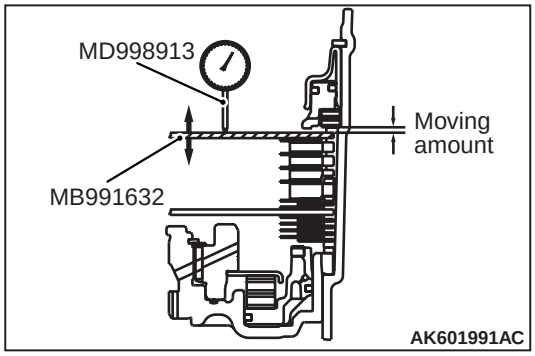
⚠ CAUTION

Take care to the shape and assembly direction of the brake plates installed at section "A" shown in the illustration.



(7) Next, install the special tool instead of the pressure plate for the second brake. Install the four brake discs and three brake plates.

(8) Install the return spring, second brake and snap ring.



(9) Install a dial gauge onto special tool (MD998913) so that the end contacts the special tool (MB991632). Move special tool (MB991632) and measure the moving amount.

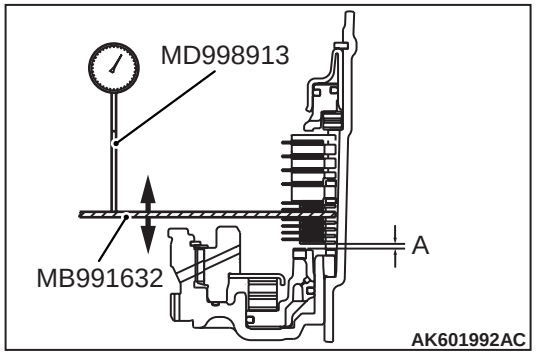
Select a pressure plate with a thickness that corresponds to the measured moving amount from the following table.

Standard value (reference): 1.49 – 1.95 mm
(For second brake end play)

Moving amount mm	Pressure plate	
	Thickness mm	ID Symbol
1.2 or more – less than 1.4	1.6	F
1.4 or more – less than 1.6	1.8	E
1.6 or more – less than 1.8	2.0	D
1.8 or more – less than 2.0	2.2	C
2.0 or more – less than 2.2	2.4	B
2.2 or more – less than 2.4	2.6	A
2.4 or more – less than 2.6	2.8	0
2.6 or more – less than 2.8	3.0	1

(10)Remove the snap ring, second brake, return spring and special tool installed in step (8).

(11)Install the pressure plate selected in step (9), and install the return spring, second brake and snap ring again.



(12)Install a dial gauge onto special tool (MD998913) so that the end contacts the special tool (MB991632). Move special tool (MB991632) and measure the moving amount.

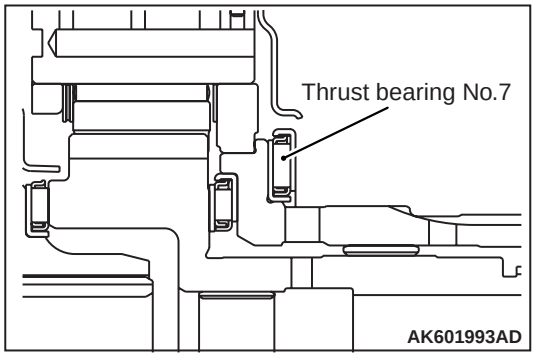
Select a pressure plate with a thickness that corresponds to the measured moving amount from the following table.

Standard value (reference): 1.65 – 2.11 mm (For low/reverse brake end play)

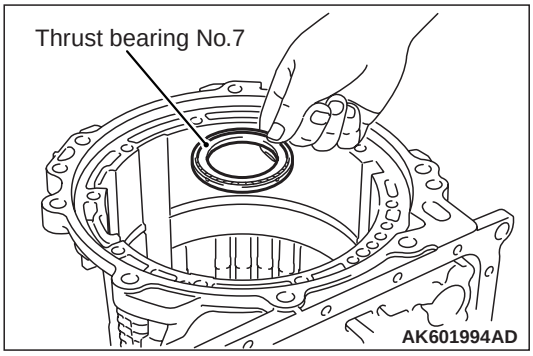
Moving amount mm	Pressure plate	
	Thickness mm	ID Symbol
1.5 or more – less than 1.7	1.8	E
1.7 or more – less than 1.9	2.0	D
1.9 or more – less than 2.1	2.2	C
2.1 or more – less than 2.3	2.4	B
2.3 or more – less than 2.5	2.6	A
2.5 or more – less than 2.7	2.8	0
2.7 or more – less than 2.9	3.0	1

(13)Remove the parts installed in steps 24 (1) to (12).

⚠ CAUTION



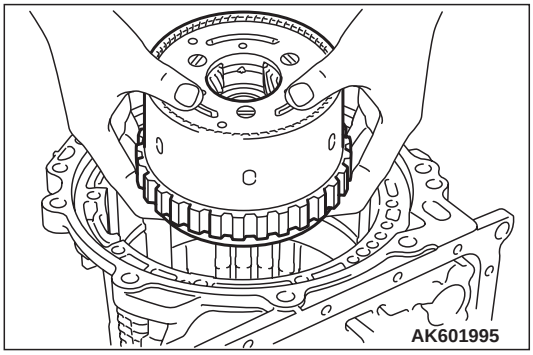
Take care not to mistake the thrust bearing No.7 mounting direction.



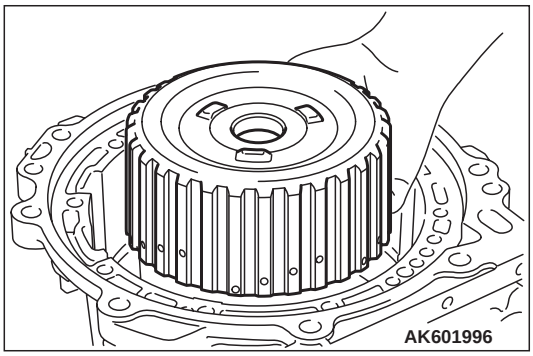
25.Apply vaseline or petrolatum jelly on the thrust bearing No.7, and then install the bearing on the rear side of the low/reverse annulus gear.

⚠ CAUTION

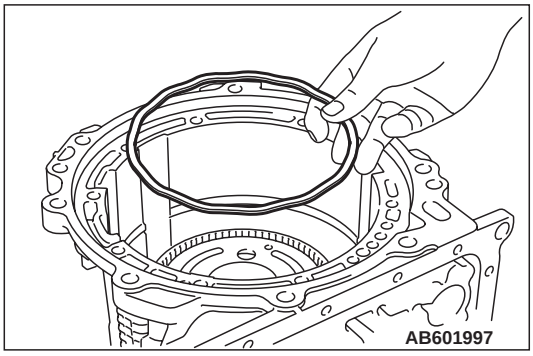
Make sure that the thrust bearing No.7 attached to the rear side of the low/reverse annulus gear does not fall off.



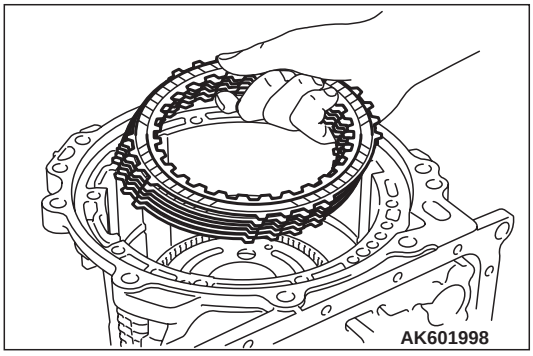
26.Install the low/reverse annulus gear.



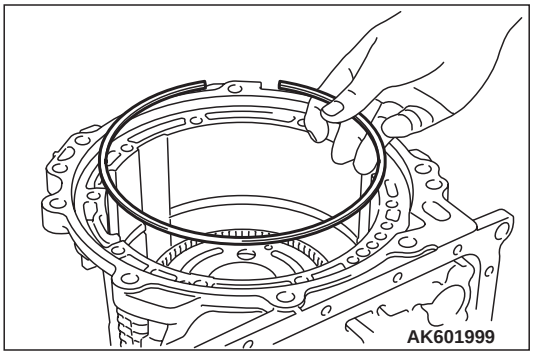
27.Install the reverse sun gear.



28.Install the wave spring onto the low/reverse brake piston.



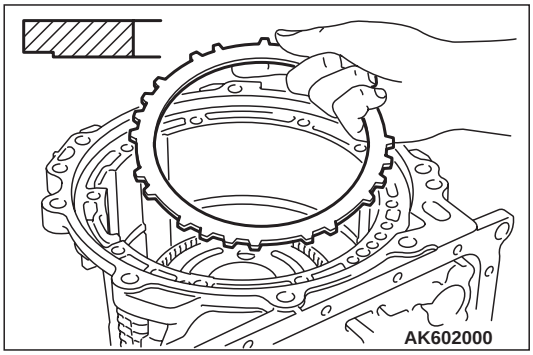
29.Install the pressure plate selected in step 24 (12), brake discs and brake plates.



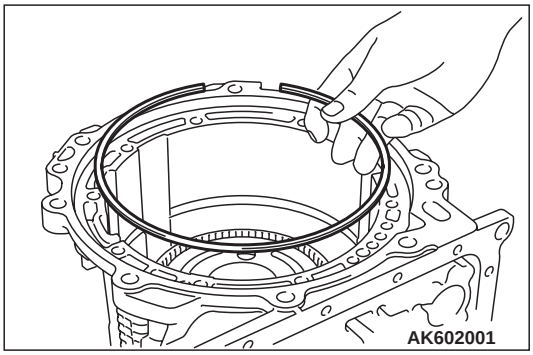
30.Install the snap ring.

⚠ CAUTION

Take care not to mistake the reaction plate installation direction.



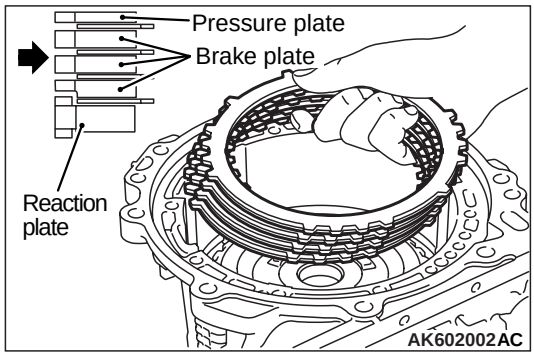
31.Install the reaction plate.



32.Install the snap ring selected in step 24 (5).

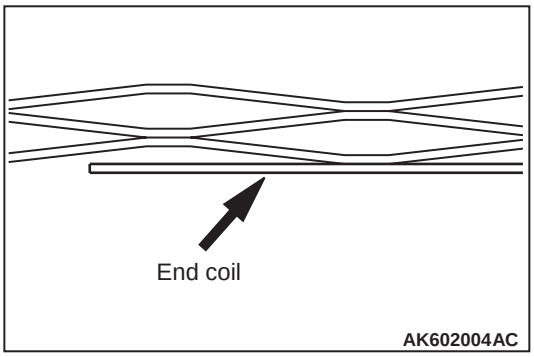
⚠ CAUTION

Take care not to mistake the brake plate (reaction plate side) installation direction.

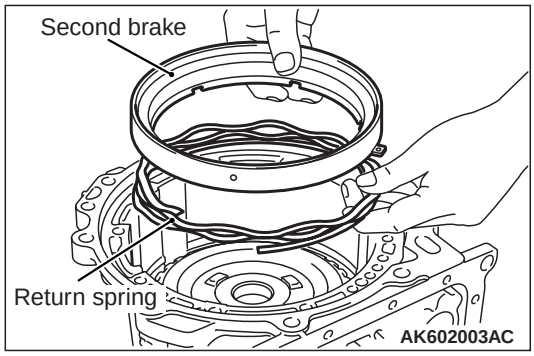


33.Install the brake discs, brake plates and pressure plate selected in step 24 (9).

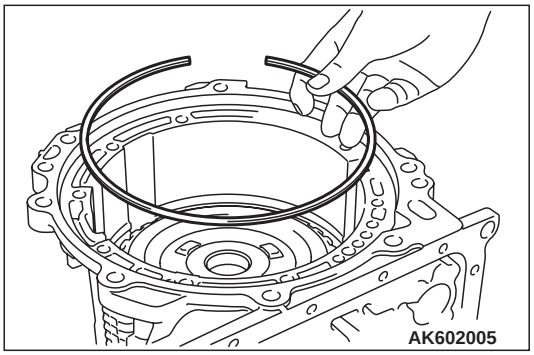
⚠ CAUTION



Install the return spring so that the flat side faces the back of the transmission.

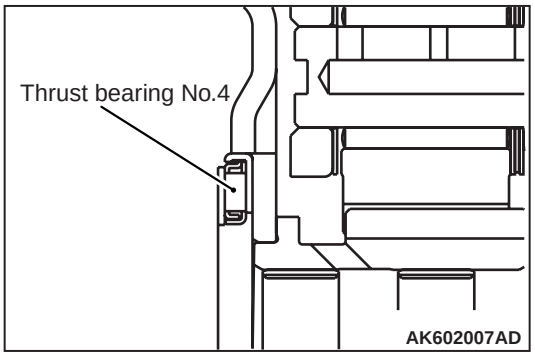


34.Install the return spring and second brake.

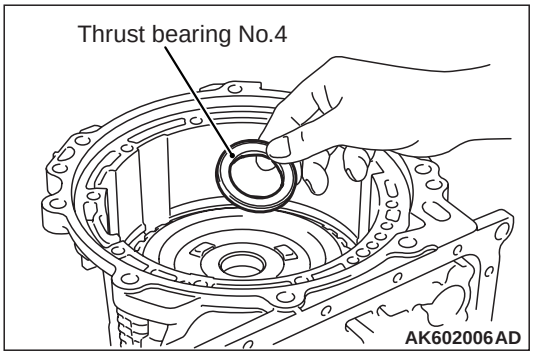


35.Install the snap ring.

⚠ CAUTION

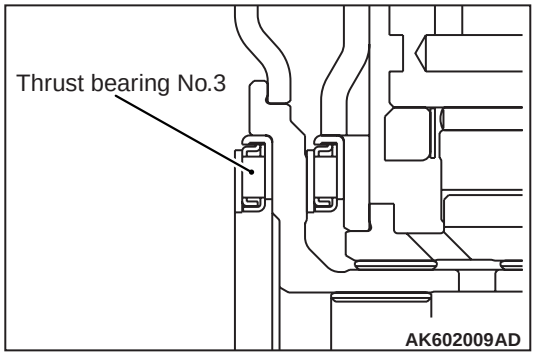


Take care not to mistake the thrust bearing No.4 installation direction.

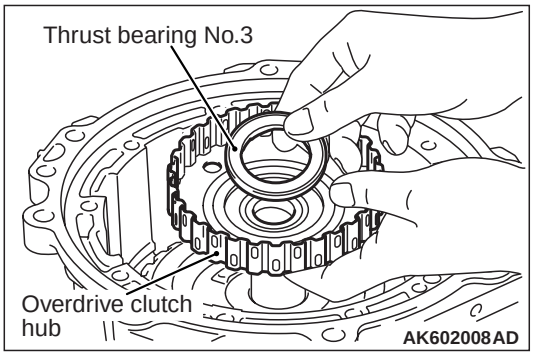


36.Apply vaseline or petrolatum jelly on the thrust bearing No.4, and then install on the reverse sun gear.

⚠ CAUTION

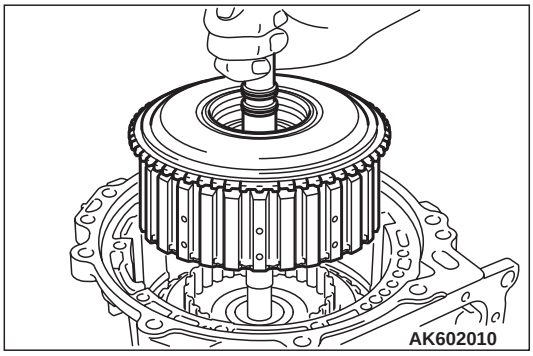


Take care not to mistake the thrust bearing No.3 mounting direction.



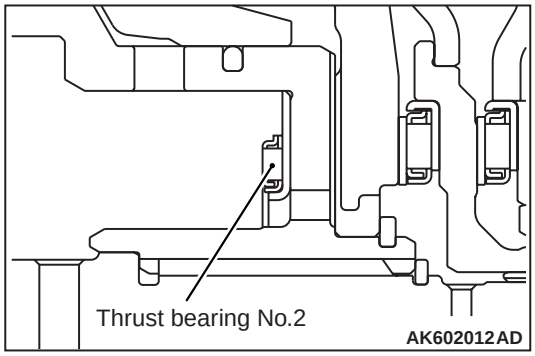
37.Apply vaseline or petrolatum jelly on the thrust bearing No.3, and then install on the overdrive clutch hub.

38.Install the overdrive clutch hub.

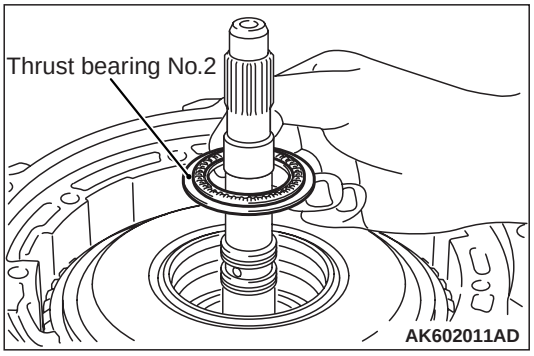


39.Install the reverse and overdrive clutch.

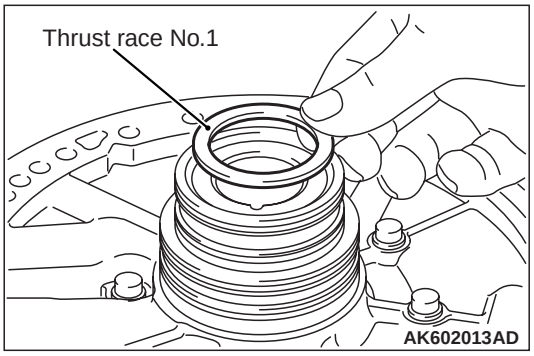
⚠ CAUTION



Take care not to mistake the thrust bearing No.2 mounting direction.

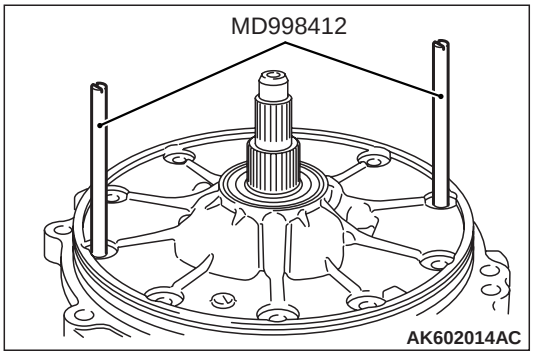


40.Apply vaseline or petrolatum jelly on the thrust bearing No.2, and then install on the reverse and overdrive clutch.

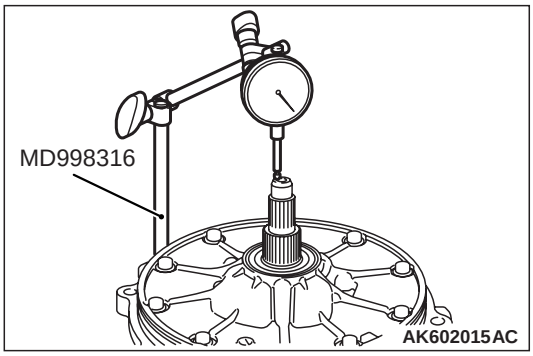


41.Apply vaseline or petrolatum jelly on the thrust race No.1, and then install on the oil pump.

⚠ CAUTION
Never reuse the gasket.

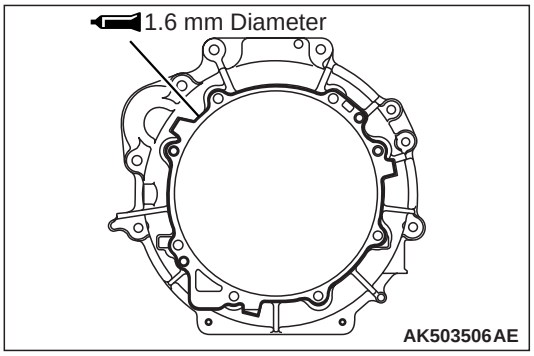


42.Install the special tool Guide (MD998412) at the position shown in the illustration, and using this as a guide, install the oil pump and gasket.
43.Tighten the ten oil pump mounting bolts to the specified torque 23 ± 3 N·m.

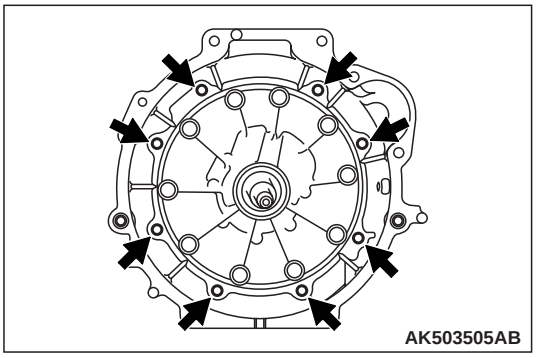


44.Using the special tool Dial gauge support (MD998316), set a dial gauge as shown in the illustration. Measure the end play of the input shaft, and replace the thrust race installed in step 41 with a suitable one so that the end play may meet the standard value. Then, reassemble.
Standard value: 0.25 – 0.81 mm
(For input shaft end play)
45.Measure the end play again, and confirm that it is within the standard value.

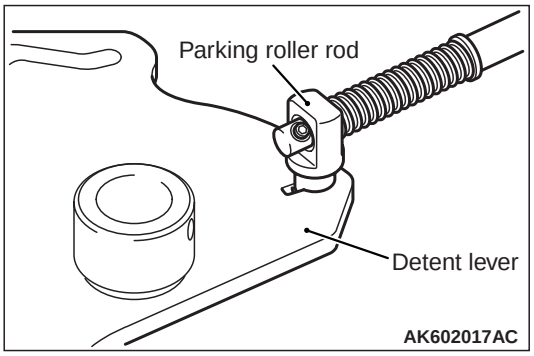
⚠ CAUTION
Evenly squeeze out the sealant so that it is not insufficient or excessive.



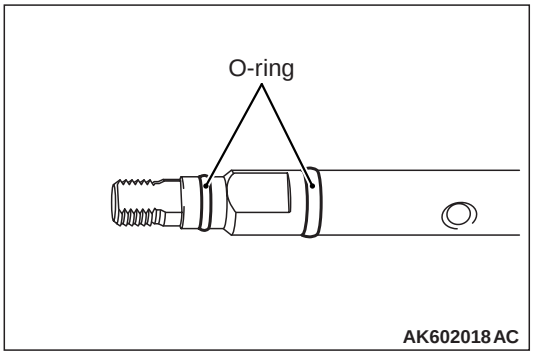
46.Apply sealant on the converter housing.
Specified sealant:
Mitsubishi Part No. MR166584 or equivalent



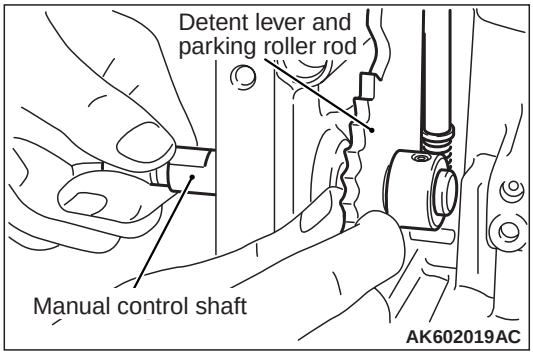
47.Install the converter housing.
48.Tighten the eight converter housing mounting bolts to the specified torque 48 ± 6 N·m.



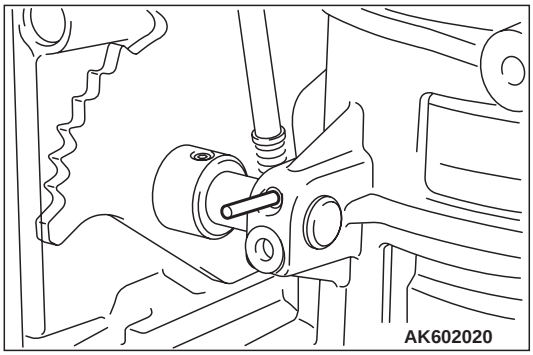
49.Install the parking roller rod to the detent lever.



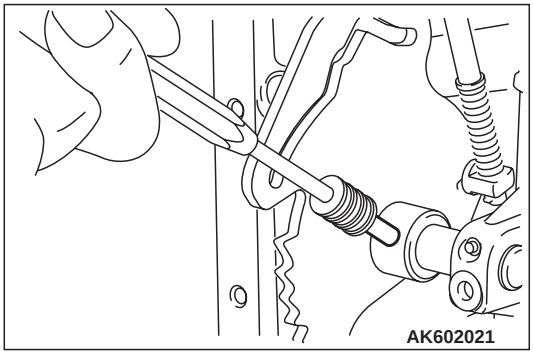
50.Install two new O-rings to the manual control shaft.



51.Install the assemble into the transmission case together with the detent lever and parking roller rod.

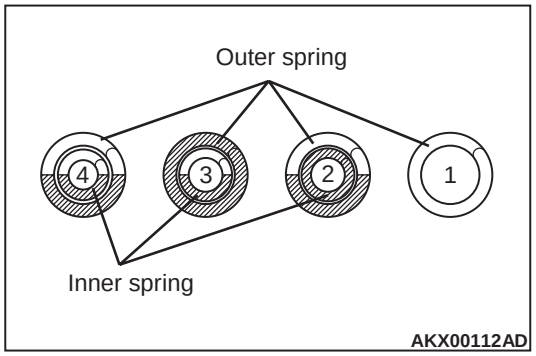


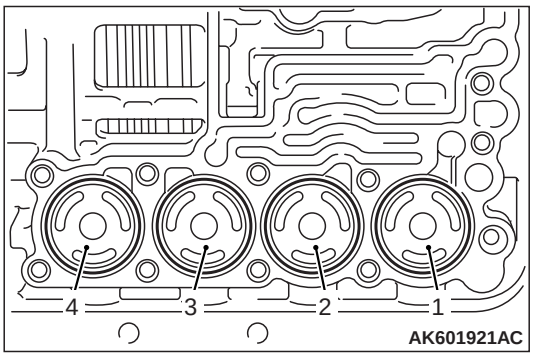
52.Install the pin.

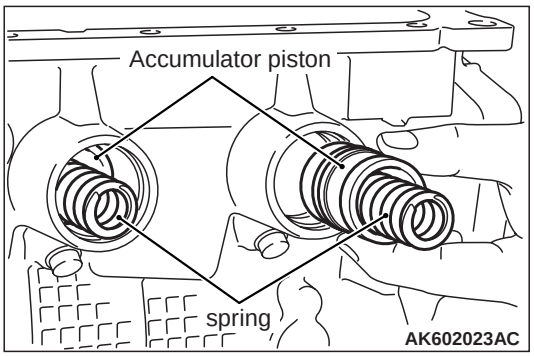


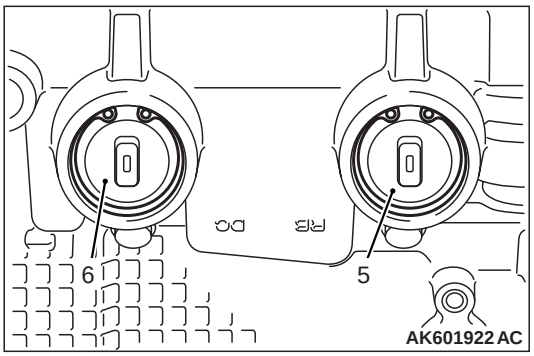
53.Hammer in the spring pin so that its slit is perpendicular to the axial direction of the manual control shaft.

54.Install a new seal ring onto each accumulator piston.







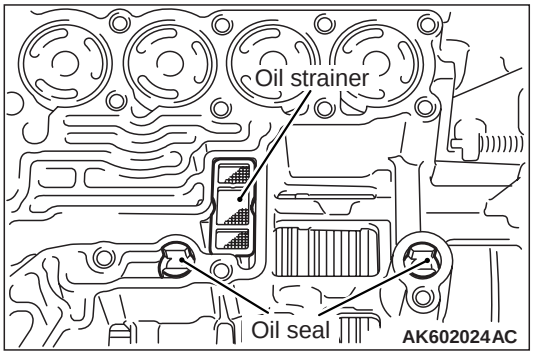


55.Install each accumulator piston and spring, then install accumulator cover with O-ring and snap ring.

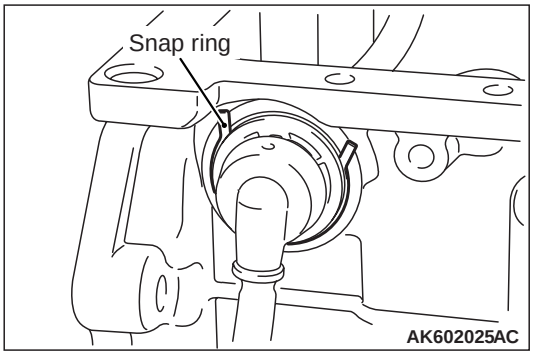
NOTE:
- *Install the accumulator pistons to the original positions following the identification tags attached when they were removed.*
- *The springs are identified by paint application position as shown below. Assemble following this table.*

No.	Name	Identification paint application position	
1	For overdrive clutch	None	
2	For second brake	Inner	Applied on all surface including both ends
		Outer	Applied on half of surface including both ends
3	For low/ reverse brake	Inner	Applied on half of surface including both ends
		Outer	Applied on entire surface of one side
4	For underdrive clutch	Inner	Applied on half of surface including both ends
		Outer	Applied on half of surface including both ends
5	For reduction brake	None	
6	For direct clutch	None	

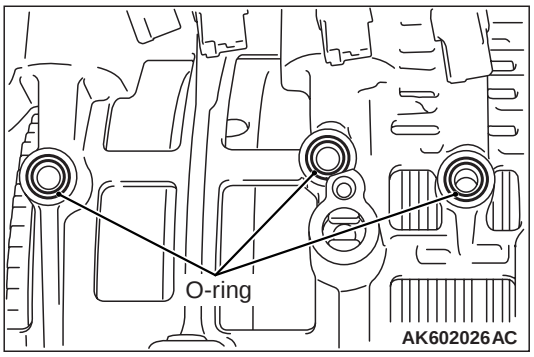
⚠ CAUTION
Take care to the installation direction of the oil seal.



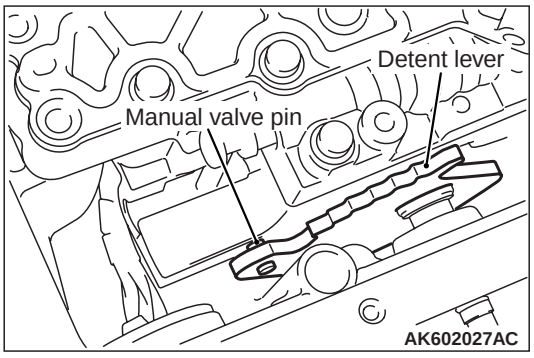
56.Install the oil strainer and two new oil seals. Install the oil seals so that the notched section is oriented as shown in the illustration.



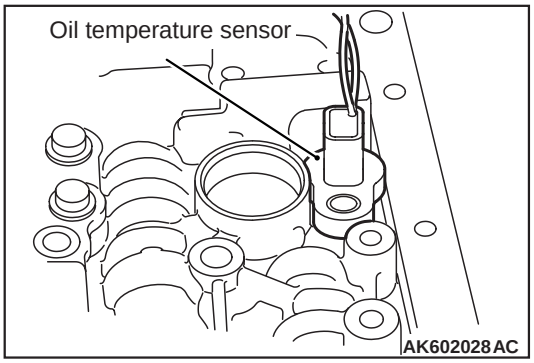
57.Install the solenoid valve harness, and then secure the snap ring to connector groove.
NOTE: Install the harness so that it is oriented as shown in the illustration.



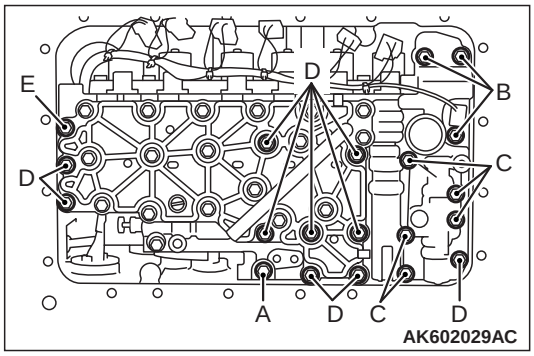
58.Install new three O-rings onto the transmission case at the positions shown in the illustration.



59.Install the valve body while inserting the manual valve pin into the detent lever groove.

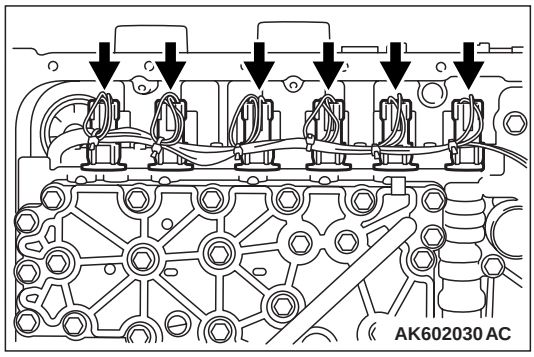


60.Install the oil temperature sensor.

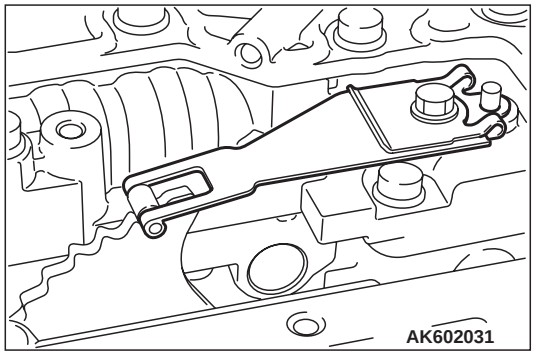


61.Tighten the twenty valve body mounting bolts to the specified torque 11 ± 1 N·m.

Bolt	Length mm
A	25
B	30
C	40
D	45
E	55

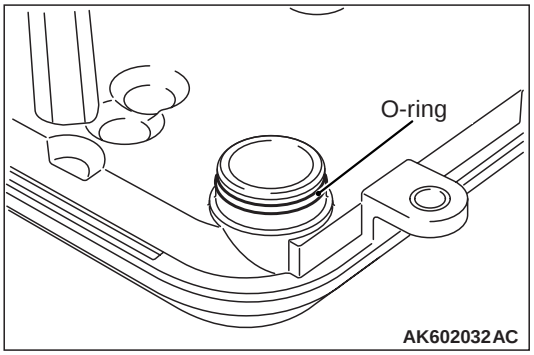


62.Connect the connector to the valve body.

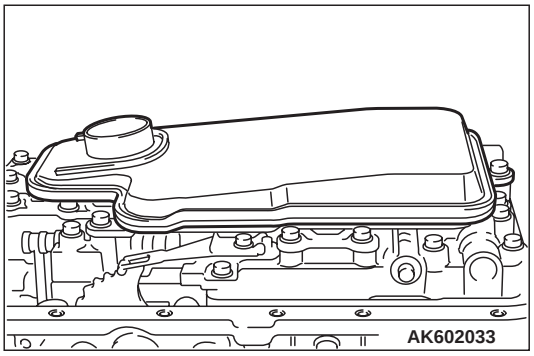


63.Install the detent spring.

64.Tighten the detent spring mounting bolt to the specified torque 6.0 ± 1.0 N·m.

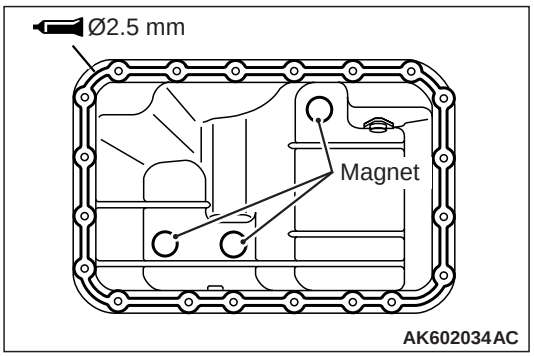


65.Install the new O-ring to the oil filter.



66.Install the oil filter.

67.Tighten the oil filter mounting bolt to the specified torque 6.0 ± 1.0 N·m.



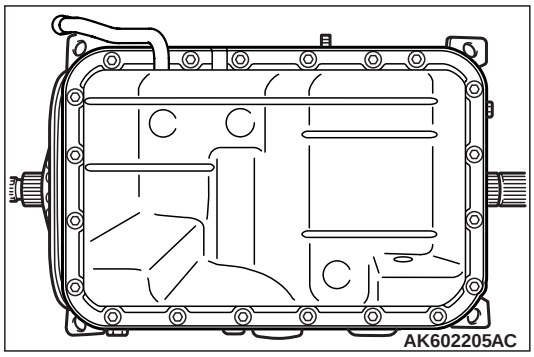
68.Install three magnets.

⚠ CAUTION

Evenly squeeze out the sealant so that it is not insufficient or excessive.

69.Apply sealant on the oil pan.

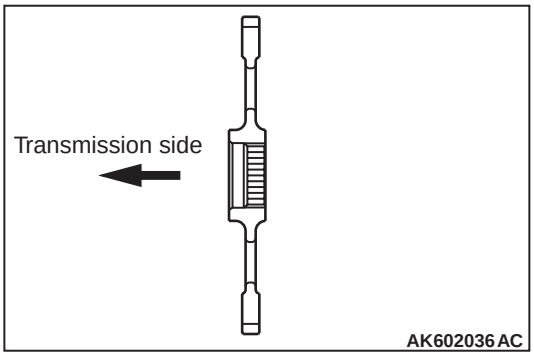
Specified sealant:
Mitsubishi Part No. MR166584 or equivalent


AK602205AC

70.Install the oil pan.

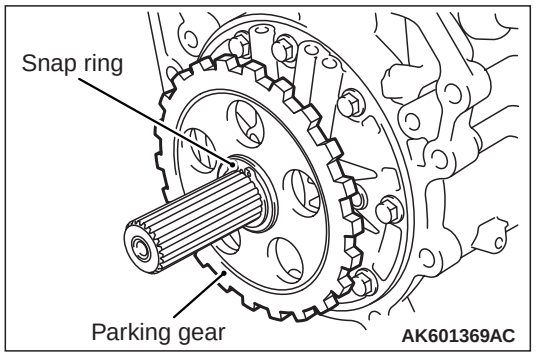
71.Tighten the twenty oil pan mounting bolts to the specified torque 11 ± 1 N·m.

⚠ CAUTION



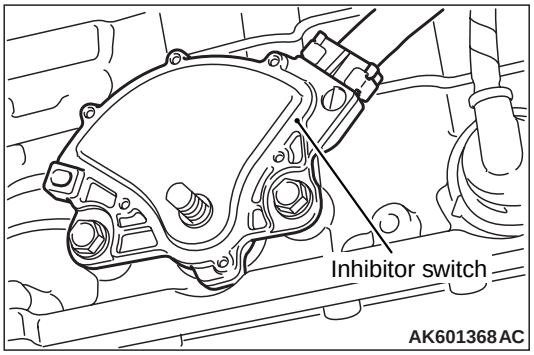
AK602036AC

- **Install the parking gear so that the side without the spline cut faces the transmission side.**
- **Heat the parking gear to 160 – 180°C, and shrink fit up to the stepped section of the output shaft.**



AK601369AC

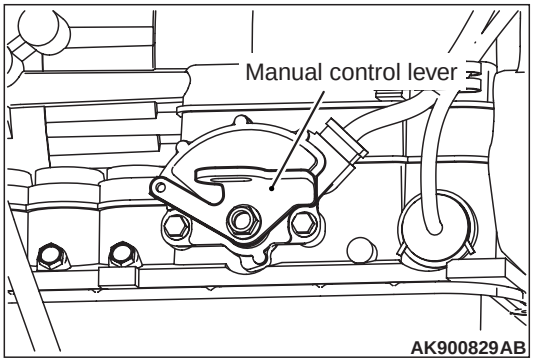
72.Install the parking gear and snap ring.



AK601368AC

73.Install the inhibitor switch.

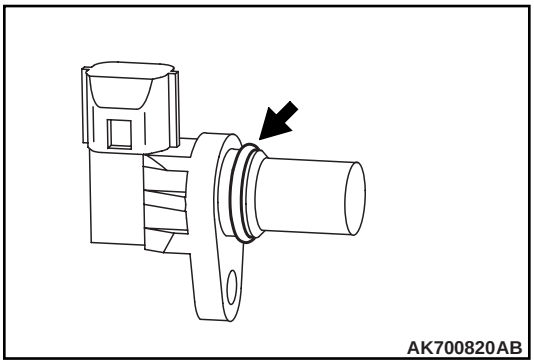
74.Tighten the two inhibitor switch mounting bolts to the specified torque 11 ± 1 N·m.



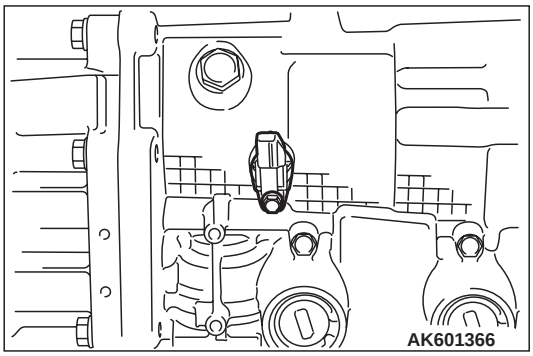
AK900829AB

75.Install the manual control lever.

76.Tighten the manual control lever mounting nut to the specified torque 21.5 ± 3.5 N·m.

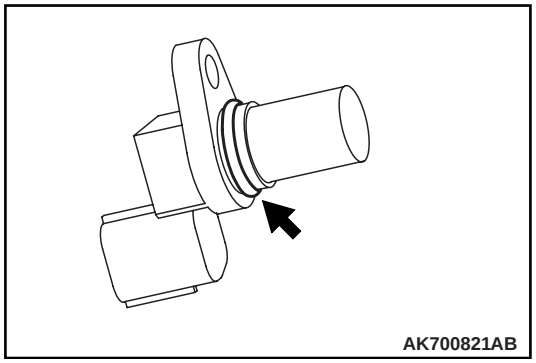

AK700820AB

77.Install the O-ring to the output shaft.

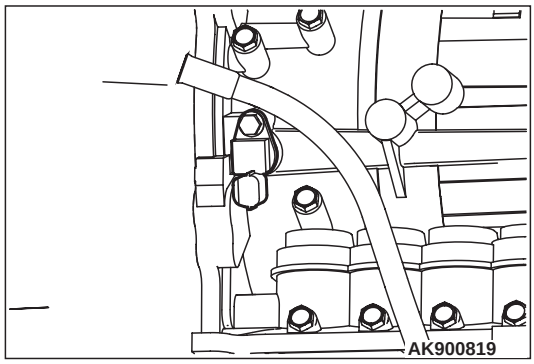

AK601366

78.Install the output shaft speed sensor.

79.Tighten the output shaft speed sensor mounting bolts to the specified torque 11 ± 1 N·m.



80.Install the O-ring to the input shaft.



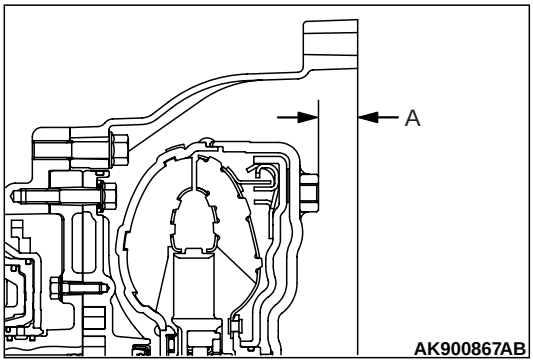
81.Install the input shaft speed sensor.

82.Tighten the input shaft speed sensor mounting bolts to the specified torque 11 ± 1 N·m.

83.Install the Clamp.

⚠ CAUTION

Apply ATF to the oil pump drive hub before installing the torque converter. Be careful not to damage the oil seal lip when installing the torque converter.



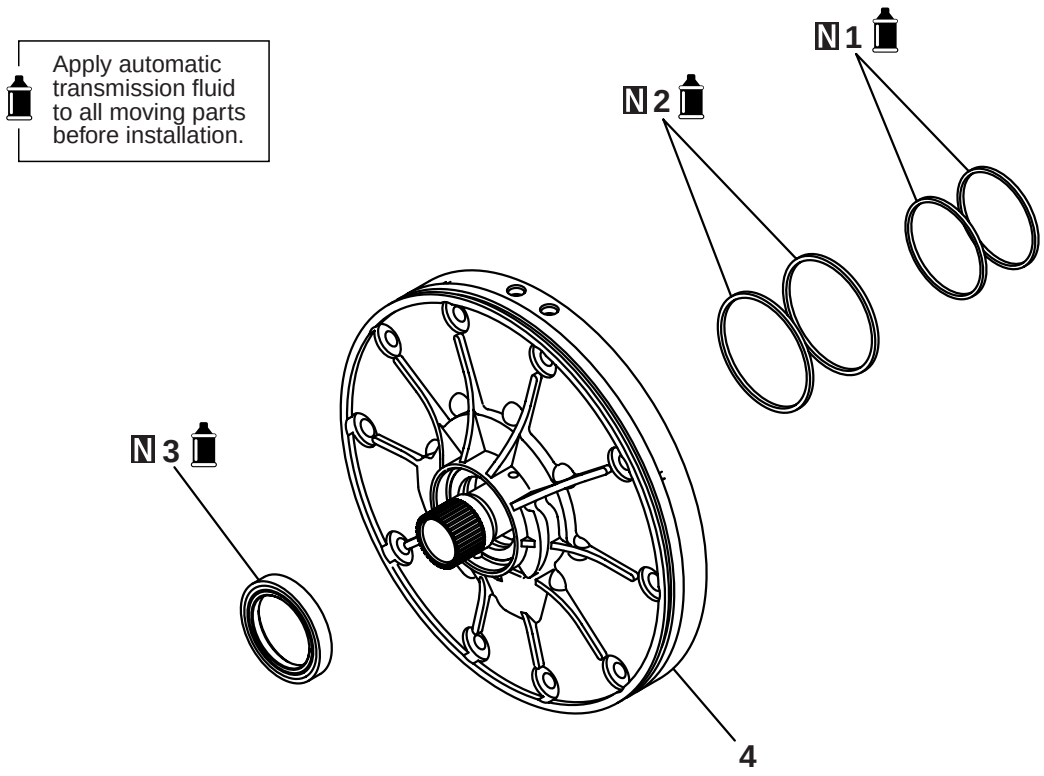
84.Install the torque converter, and secure it so that the dimension (A) indicated in the illustration meets the reference value.

Reference value: 20.9 mm

OIL PUMP

DISASSEMBLY AND REASSEMBLY

M1233001300358



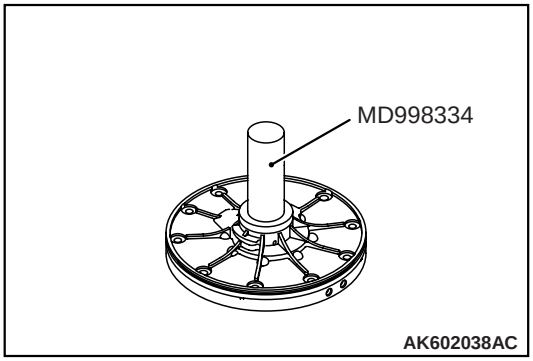
AK602037AC

Disassembly steps

>>B<<	1.	Seal ring
>>B<<	2.	Seal ring
>>A<<	3.	Oil seal
	4.	Oil pump

REASSEMBLY SERVICE POINTS

>>A<< OIL SEAL INSTALLATION



1. Use the special tool Oil seal installer (MD998334) to install the oil seal.
2. Apply ATF to the lip of the oil seal.

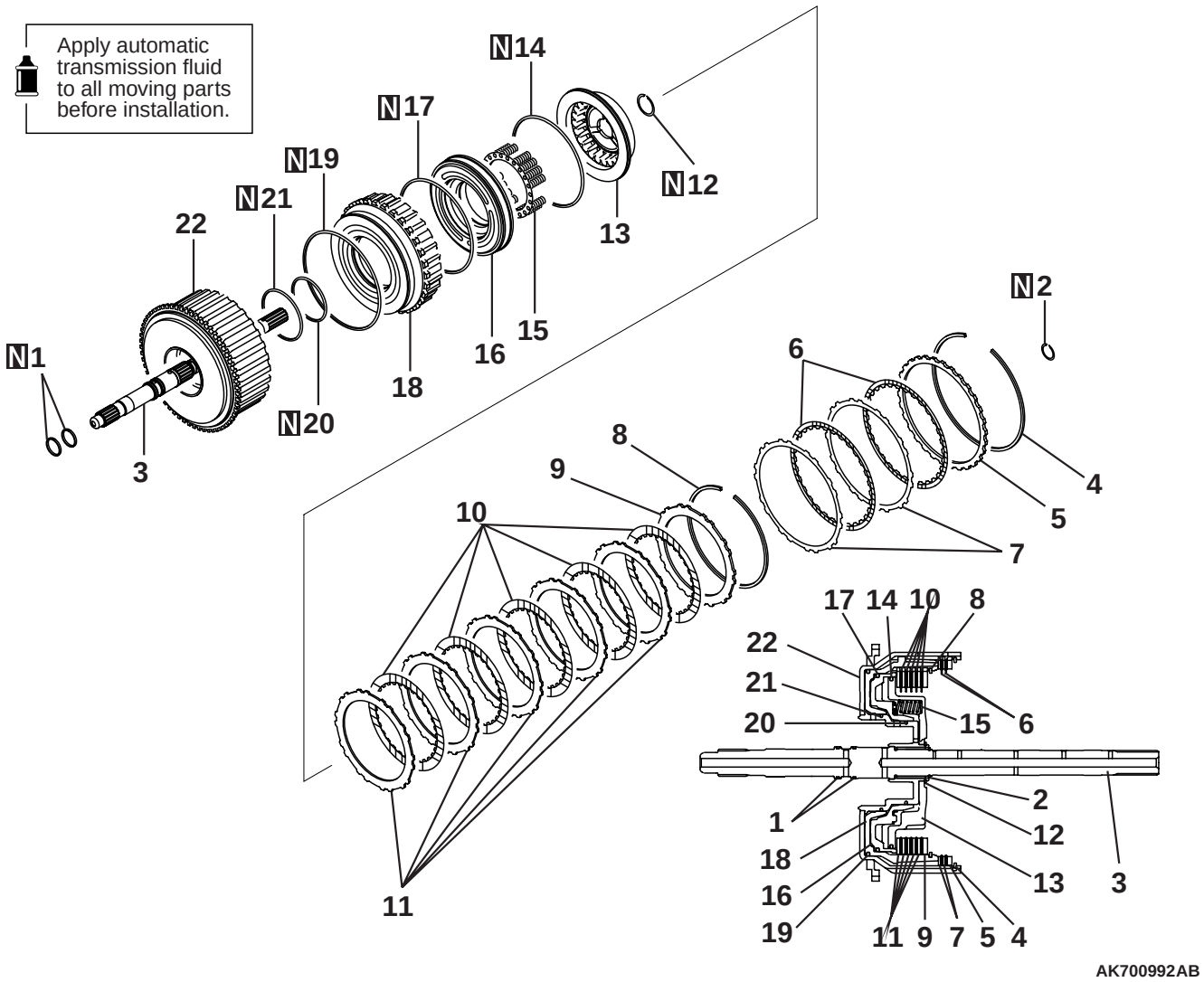
>>B<< SEAL RING INSTALLATION

Install four new seal rings to the outer groove of the oil pump, and apply ATF to the seal ring.

REVERSE AND OVERDRIVE CLUTCH

DISASSEMBLY AND REASSEMBLY

M1233021200513



AK700992AB

Disassembly steps

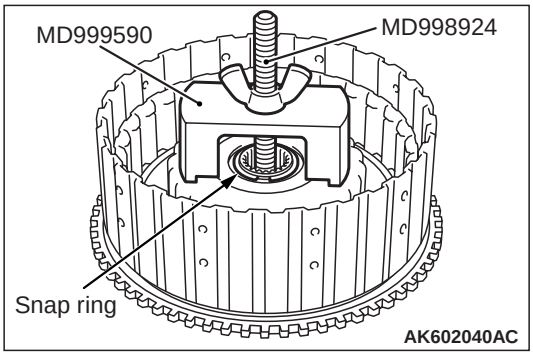
	1.	Seal ring
	2.	Snap ring
	3.	Input shaft
>>H<<	4.	Snap ring
>>G<<	5.	Reaction plate
>>G<<	6.	Clutch disc
>>G<<	7.	Clutch plate
>>F<<	8.	Snap ring
>>E<<	9.	Reaction plate
>>E<<	10.	Clutch disc
>>E<<	11.	Clutch plate

Disassembly steps (Continued)

<<A>>	**>>D<<**	12. Snap ring
		13. Spring retainer
	>>A<<	14. D-ring
	>>C<<	15. Return spring
		16. Overdrive clutch piston
	>>A<<	17. D-ring
	>>B<<	18. Reverse clutch piston
	>>A<<	19. D-ring
	>>A<<	20. D-ring
	>>A<<	21. D-ring
		22. Reverse clutch retainer

DISASSEMBLY SERVICE POINT

<<A>> SNAP RING REMOVAL



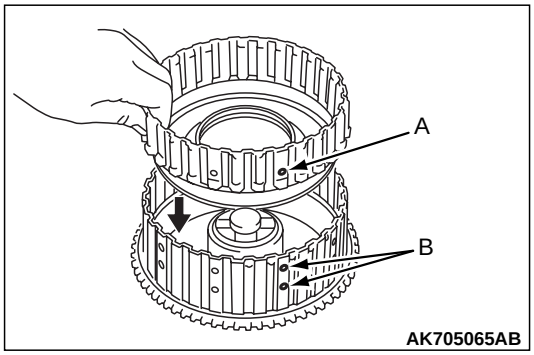
1. Set the special tools as shown in the illustration.
   - Spring compressor (MD999590)
   - Spring compressor retainer (MD998924)
2. Compress the return spring, and remove the snap ring.

REASSEMBLY SERVICE POINTS

>>A<< D-RING INSTALLATION

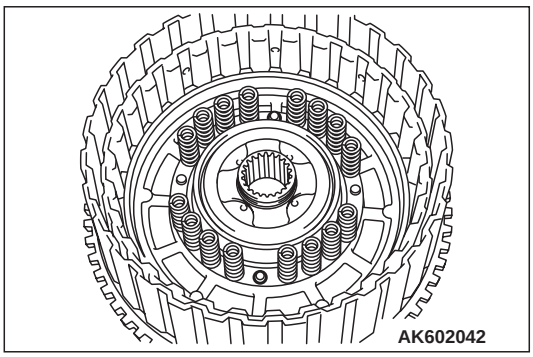
1. Apply ATF to the D-ring.
2. Install the D-rings in the reverse clutch retainer, piston, overdrive clutch piston and spring retainer grooves. Make sure that they are not twisted or damaged when installing.

>>B<< REVERSE CLUTCH PISTON INSTALLATION



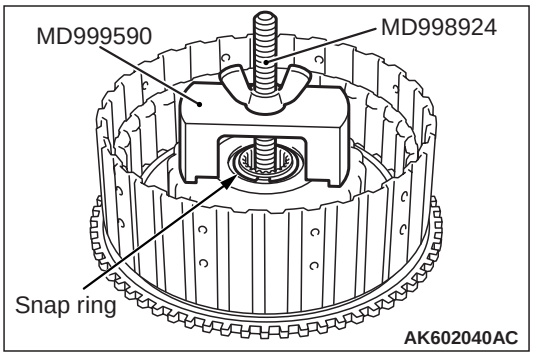
Align the holes ("A" and "B") in the reverse clutch piston and reverse clutch retainer and then assemble.

>>C<< RETURN SPRING INSTALLATION



Align the two return spring holes with the two projections on the overdrive clutch piston, and then assemble the return springs.

>>D<< SNAP RING INSTALLATION

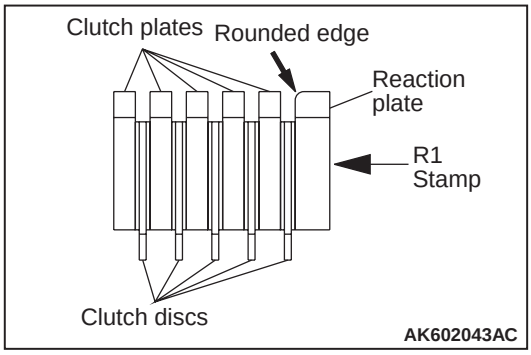


1. Set the special tools as shown in the illustration.
   - Spring compressor (MD999590)
   - Spring compressor retainer (MD998924)
2. Tighten the special tool nut, and press the spring retainer against the reverse clutch retainer.
3. Install the thickest snap ring that can be fitted in the snap ring groove of the reverse clutch retainer.
4. Confirm that clearance between the snap ring and spring retainer is the standard value.

   Standard value: 0 – 0.09 mm
   (For overdrive clutch return spring retainer end play)

>>E<< CLUTCH PLATE / CLUTCH DISC / REACTION PLATE INSTALLATION

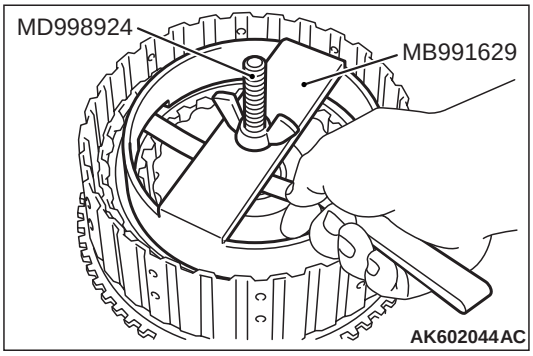
1. Alternately assemble the clutch discs and clutch plates in the reverse clutch piston.

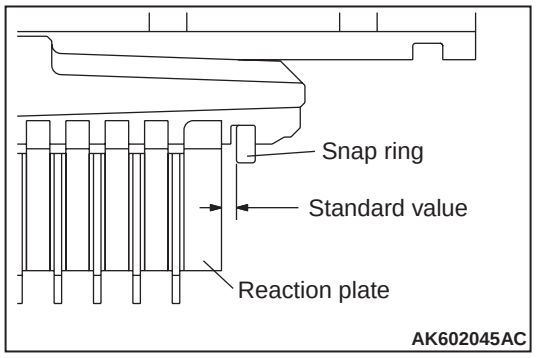


2. Install the reaction plate so that it is oriented as shown in the illustration.

>>F<< SNAP RING INSTALLATION

1. Install the snap ring in the reverse clutch piston groove.

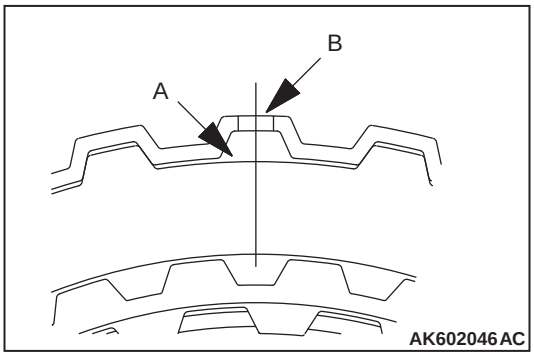


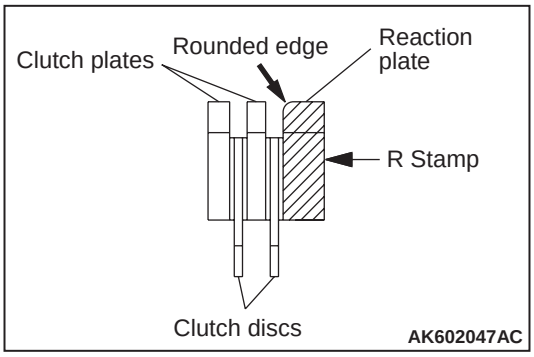


2. Set the special tools as shown in the illustration, and compress the clutch element.
   - Spring compressor (MB991629)
   - Spring compressor retainer (MD998924)
3. Confirm that the clearance between the snap ring and reaction plate (overdrive clutch end play) is the standard value. If the clearance is not at the standard value, select a suitable snap ring and adjust so that the clearance is within the standard value.

   Standard value: 2.0 – 2.2 mm
   (For overdrive clutch end play)

>>G<< CLUTCH PLATE / CLUTCH DISC / REACTION PLATE INSTALLATION





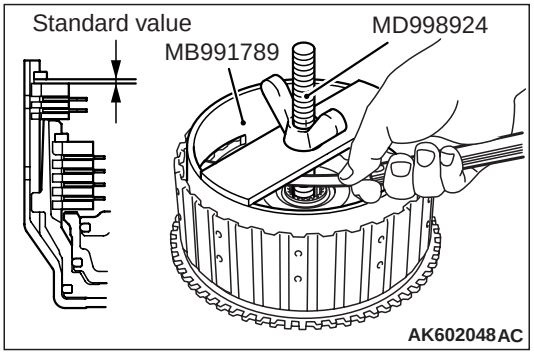
1. Alternately assemble the clutch plates and clutch discs in the reverse clutch retainer.

   When assembling the clutch plates, align the section having no teeth (A in the illustration) with the reverse clutch retainer hole (B in the illustration).
2. Install the reaction plate so that it is oriented as shown in the illustration.

   Assemble in the same manner as the clutch plate so that the section with no teeth ("A" in the illustration) matches the retainer hole ("B" in the illustration).

>>H<< SNAP RING INSTALLATION

1. Install the snap ring in the reverse clutch retainer groove.



2. Set the special tools as shown in the illustration, and compress the clutch element.

- Spring compressor (MB991789)
- Spring compressor retainer (MD998924)

3. Check that the clearance between the snap ring and reaction plate (reverse clutch end play) is the standard value.

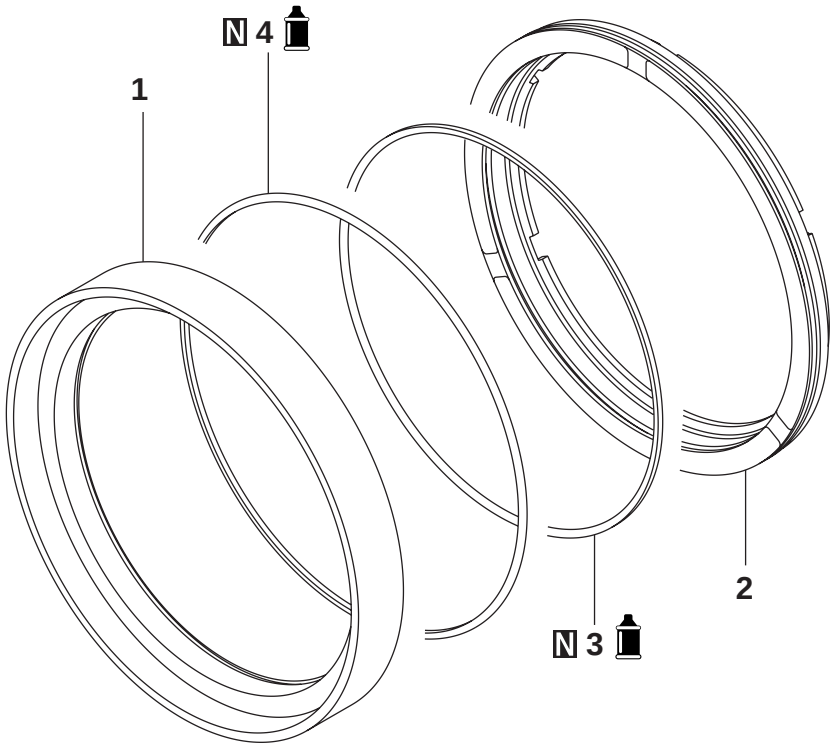
If the clearance is not at the standard value, select a suitable snap ring and adjust so that the clearance is within the standard value.

Standard value: 1.5 – 1.7 mm
(For reverse clutch end play)

SECOND BRAKE

DISASSEMBLY AND REASSEMBLY

M1233021800236



AK602178 AC

Disassembly steps

1. Second brake retainer
2. Second brake piston
- **>>A<<** 3. D-ring
- **>>A<<** 4. D-ring

REASSEMBLY SERVICE POINTS

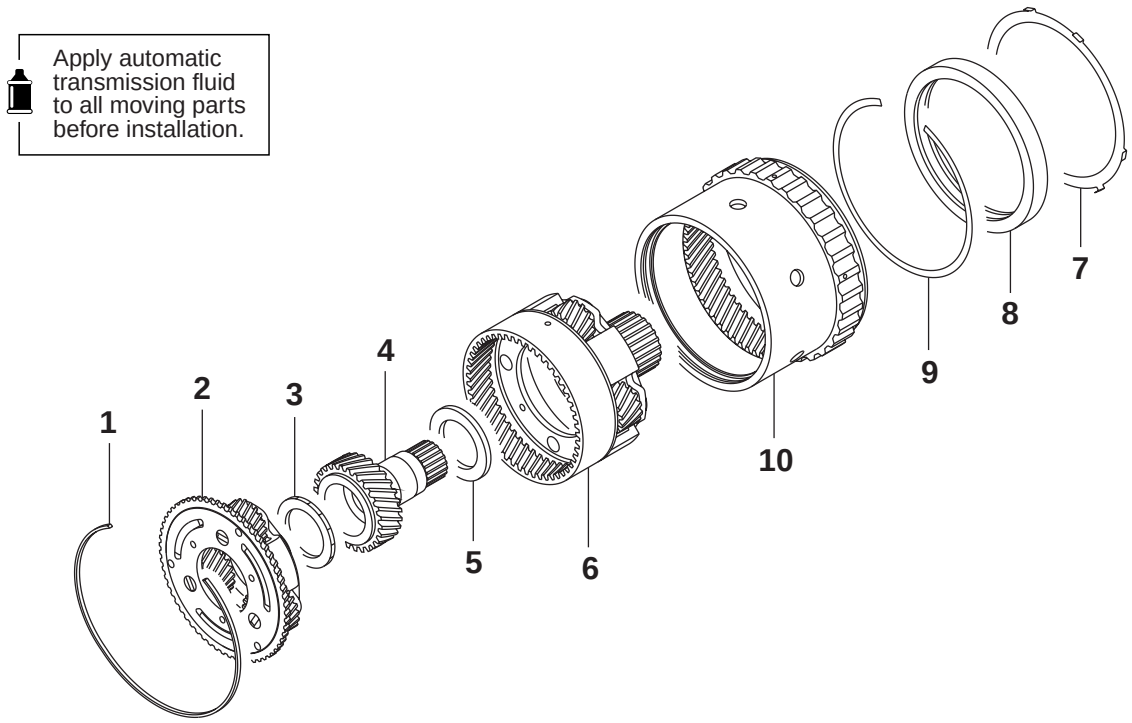
>>A<< D-RING INSTALLATION

1. Apply ATF to the D-ring.
2. Install the D-ring in the groove on the outer and inner periphery of the piston. Make sure that the D-ring is not twisted or damaged when installing.

LOW REVERSE ANNULUS GEAR

DISASSEMBLY AND REASSEMBLY

M1233027100202



AK602049AC

Disassembly steps

1. Snap ring
2. Overdrive planetary carrier

>>D<< 3. Thrust bearing No.5

4. Underdrive sun gear

>>C<< 5. Thrust bearing No.6

6. Output planetary carrier

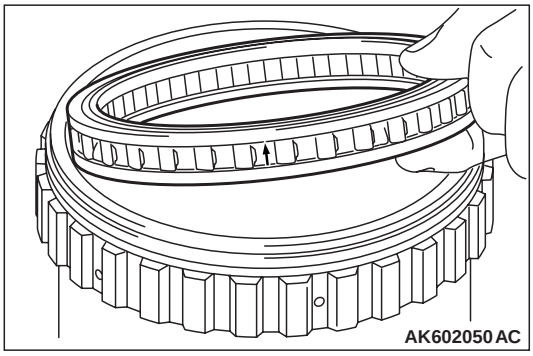
>>B<< 7. Stopper plate

>>A<< 8. One-way clutch

9. Snap ring
10. Low/reverse annulus gear

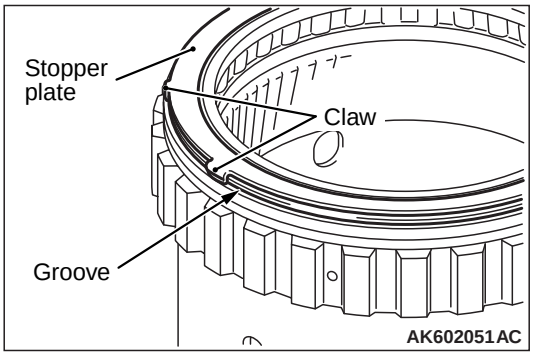
REASSEMBLY SERVICE POINTS

>>A<< ONE-WAY CLUTCH INSTALLATION



Install the one-way clutch so that the arrow stamp is oriented as shown in the illustration.

>>B<< STOPPER PLATE INSTALLATION

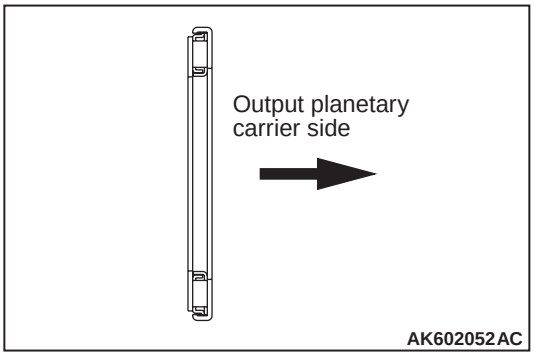


Install the stopper plate onto the low/reverse annulus gear. Make sure that the stopper plate claws are securely engaged in the annulus gear groove.

>>C<< THRUST BEARING No.6 INSTALLATION

⚠ CAUTION

Take care not to mistake the thrust bearing No.6 mounting direction.

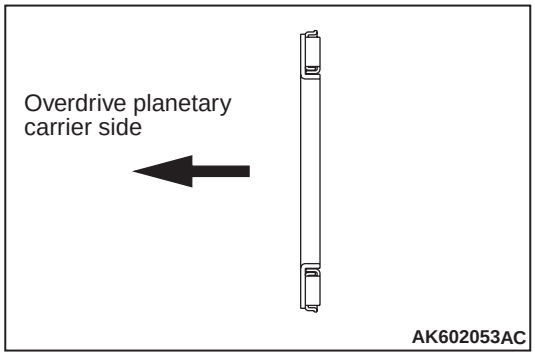


Apply vaseline or petrolatum jelly on the thrust bearing No.6, and then install on the output planetary carrier.

>>D<< THRUST BEARING No.5 INSTALLATION

⚠ CAUTION

Take care not to mistake the thrust bearing No.5 mounting direction.

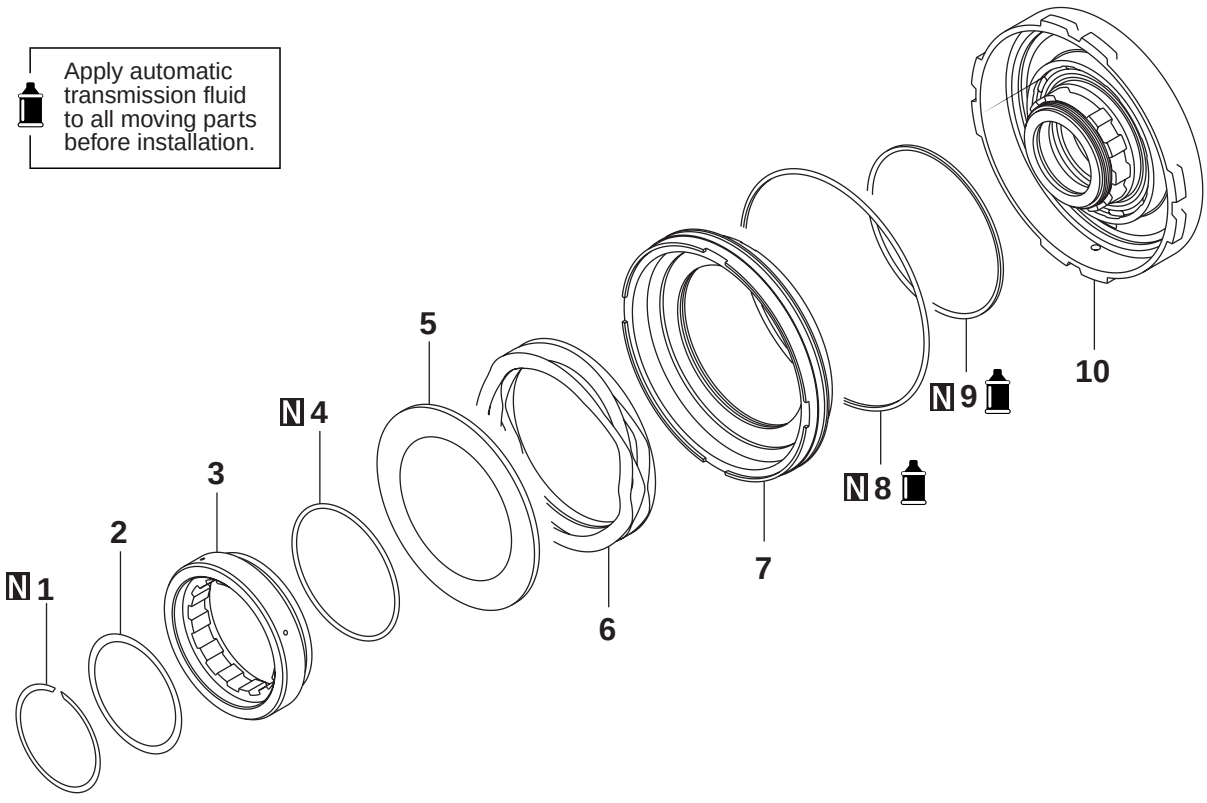


Apply vaseline or petrolatum jelly on the thrust bearing No.5, and then install on the overdrive planetary carrier.

CENTRE SUPPORT

DISASSEMBLY AND REASSEMBLY

M1233010000162



Disassembly steps

<<A>> **>>C<<** 1. Snap ring
2. Plate

Disassembly steps (Continued)

3. One-way clutch inner race

>>B<< 4. O-ring

Disassembly steps (Continued)

5. Spring retainer
6. Return spring
7. Low/reverse brake piston

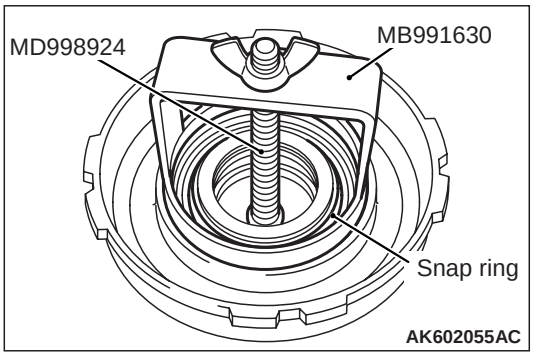
>>A<< 8. D-ring

>>A<< 9. D-ring

10. Center support

DISASSEMBLY SERVICE POINT

<<A>> SNAP RING REMOVAL



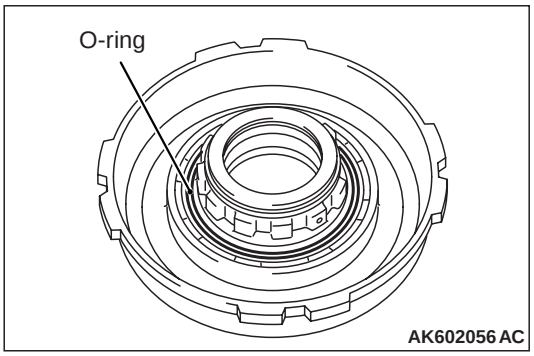
1. Set the special tools as shown in the illustration so that they are pressed against the inner race of the one-way clutch.
   - Spring compressor (MB991630)
   - Spring compressor retainer (MD998924)
2. Screw in the special tool nut, and lightly press against the inner race of the one-way clutch.
3. Remove the snap ring.

REASSEMBLY SERVICE POINTS

>>A<< D-RING INSTALLATION

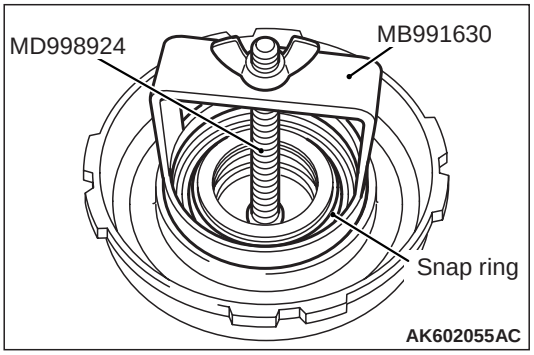
1. Apply ATF to the D-ring.
2. Install the D-ring in the groove on the outer and inner periphery of the piston. Make sure that the D-ring is not twisted or damaged when installing.

>>B<< O-RING INSTALLATION



Install the O-ring onto the center support at the position shown in the illustration.

>>C<< SNAP RING INSTALLATION

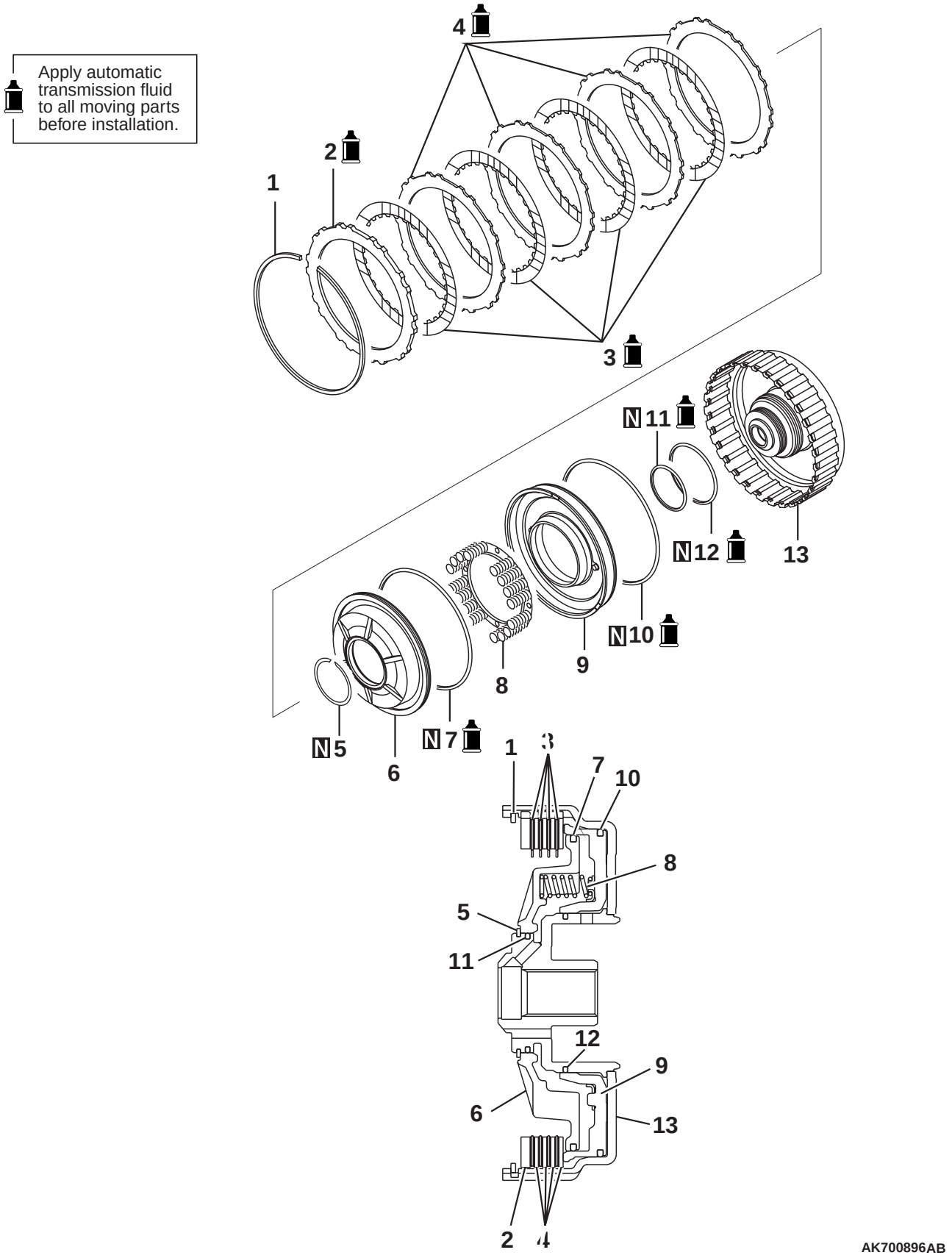


1. Set the special tools as shown in the illustration.
   - Spring compressor (MB991630)
   - Spring compressor retainer (MD998924)
2. Screw in the special tool nut, and lightly press against the inner race of the one-way clutch.
3. Install the snap ring.

UNDERDRIVE CLUTCH

DISASSEMBLY AND REASSEMBLY

M1233027300314

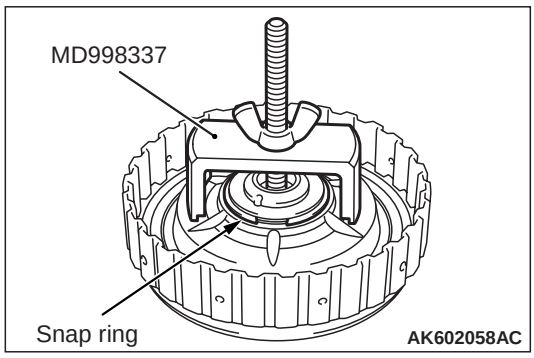


Disassembly steps

	>>E<<	1. Snap ring
	>>D<<	2. Reaction plate
	>>D<<	3. Clutch disc
	>>D<<	4. Clutch plate
<<A>>	>>C<<	5. Snap ring
		6. Spring retainer
	>>A<<	7. D-ring
	>>B<<	8. Return spring
		9. Underdrive clutch piston
	>>A<<	10. D-ring
	>>A<<	11. D-ring
	>>A<<	12. D-ring
		13. Underdrive clutch retainer

DISASSEMBLY SERVICE POINT

<<A>> SNAP RING REMOVAL



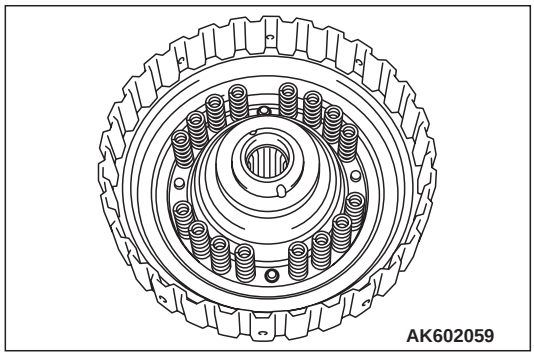
1. Set the special tool Spring compressor (MD998337) as shown in the illustration.
2. Compress the return spring, and remove the snap ring.

REASSEMBLY SERVICE POINTS

>>A<< D-RING INSTALLATION

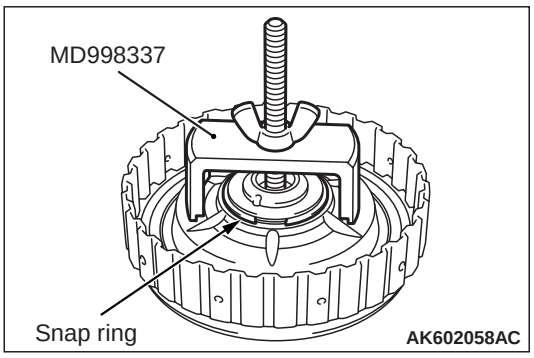
1. Apply ATF to the D-ring.
2. Install the D-ring in the groove of the underdrive clutch retainer and spring retainer. Make sure that the D-ring is not twisted or damaged when installing.

>>B<< RETURN SPRING INSTALLATION



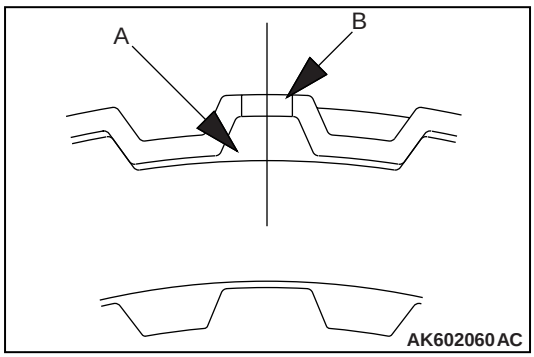
Align the two return spring holes with the two projections on the underdrive clutch piston, and then assemble the return springs.

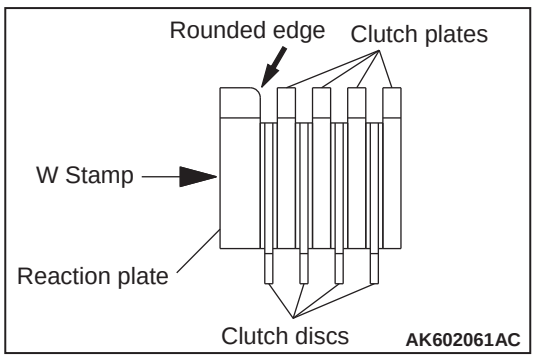
>>C<< SNAP RING INSTALLATION



1. Set the special tool Spring compressor (MD998337) as shown in the illustration.
2. Compress the return spring, and install the snap ring.

>>D<< CLUTCH PLATE / CLUTCH DISC / REACTION PLATE INSTALLATION





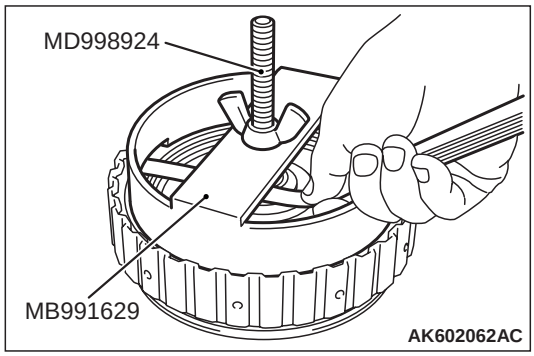
1. Alternately assemble the clutch plates and clutch discs in the underdrive clutch retainer.

   When assembling the four clutch plates, align the section having no teeth (A in the illustration) with the underdrive clutch retainer hole (B in the illustration).
2. Install the reaction plate so that it is oriented as shown in the illustration.

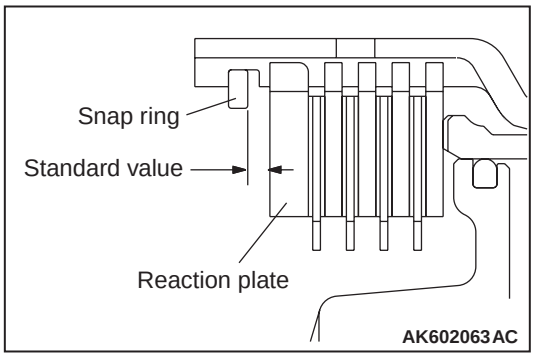
Assemble in the same manner as the clutch plate so that the section with no teeth ("A" in the illustration) matches the retainer hole ("B" in the illustration).

>>E<< SNAP RING INSTALLATION

1. Install the snap ring in the groove of the underdrive clutch retainer.



2. Set the special tools as shown in the illustration, and compress the clutch element.
   - Spring compressor retainer (MD998924)
   - Spring compressor (MB991629)



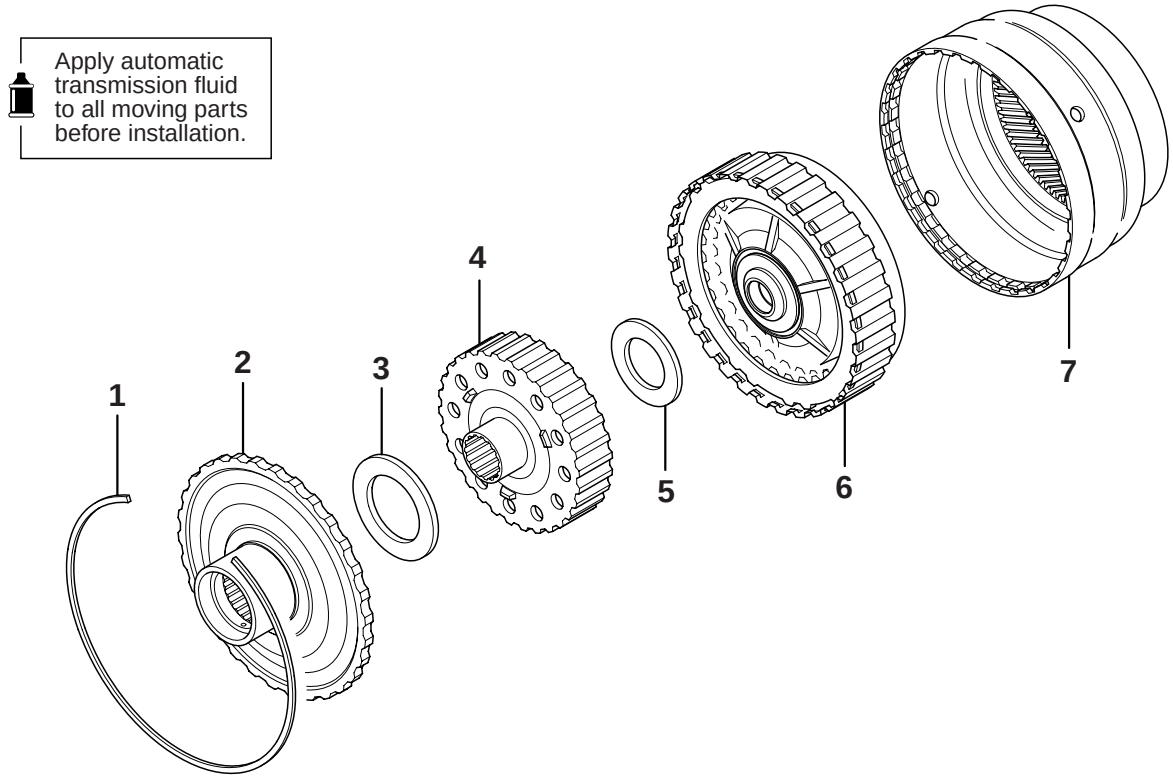
3. Confirm that the clearance between the snap ring and reaction plate (underdrive clutch end play) is the standard value. If the clearance is not at the standard value, select a suitable snap ring and adjust so that the clearance is within the standard value.

   Standard value: 1.6 – 1.8 mm
   (For underdrive clutch end play)

DIRECT ANNULUS GEAR

DISASSEMBLY AND REASSEMBLY

M1233028000048



Disassembly steps

1. Snap ring
2. Output flange

>>B<< 3. Thrust bearing No.10

4. Underdrive clutch hub

>>A<< 5. Thrust bearing No.11

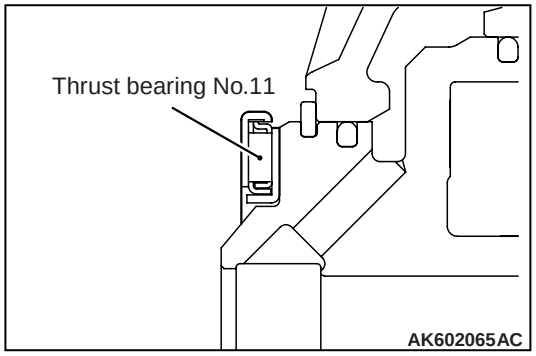
6. Underdrive clutch
7. Direct annulus gear

REASSEMBLY SERVICE POINTS

>>A<< THRUST BEARING No.11 INSTALLATION

⚠ CAUTION

Take care not to mistake the thrust bearing No.11 mounting direction.

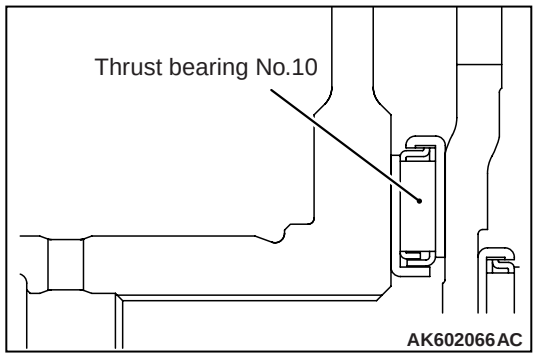


Apply vaseline or petrolatum jelly on the thrust bearing No.11, and then install on the underdrive clutch.

>>B<< THRUST BEARING No.10 INSTALLATION

⚠ CAUTION

Take care not to mistake the thrust bearing No.10 mounting direction.

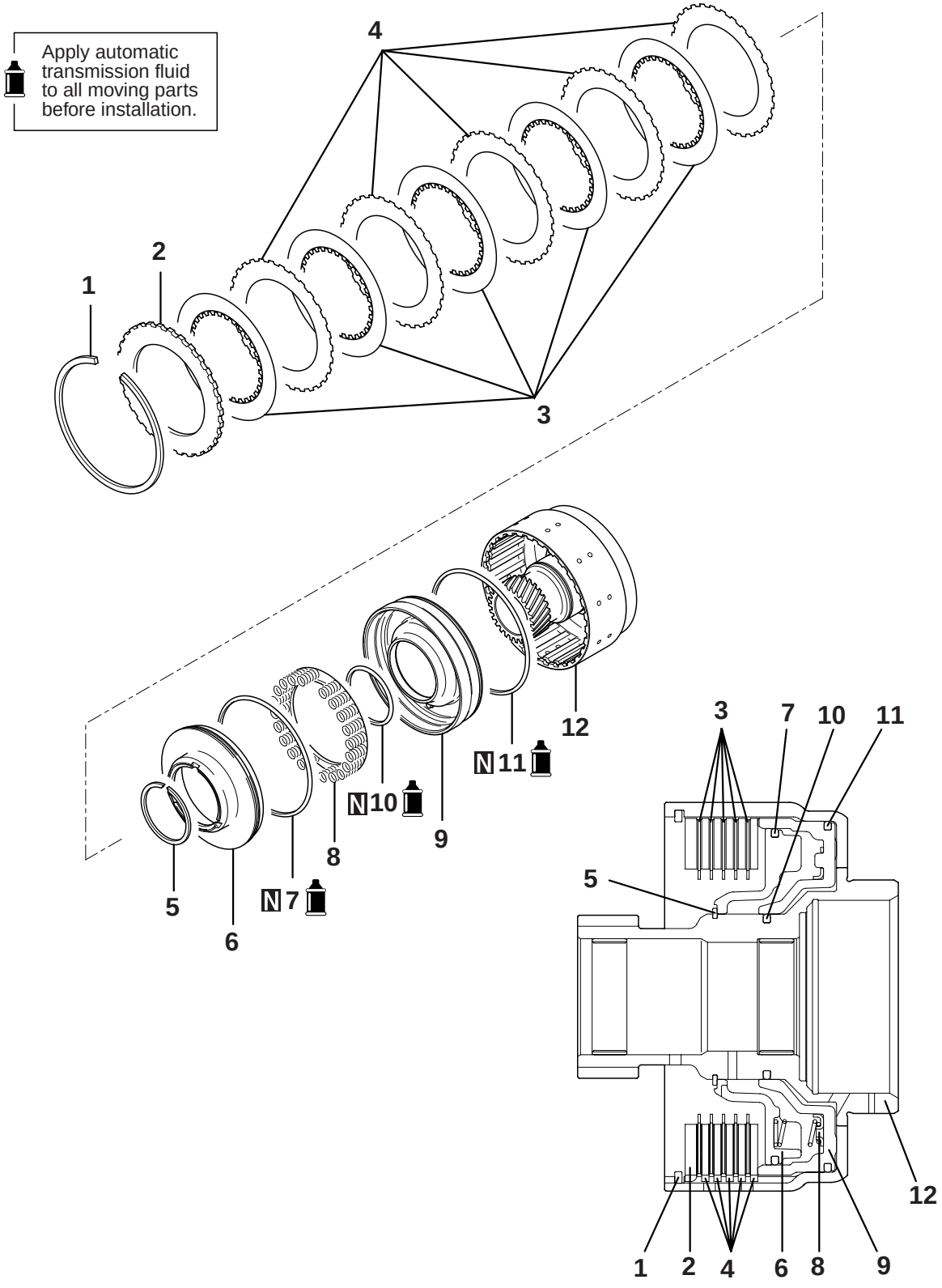


Apply vaseline or petrolatum jelly on the thrust bearing No.10, and then install on the underdrive clutch hub.

DIRECT CLUTCH

DISASSEMBLY AND REASSEMBLY

M1233019400167



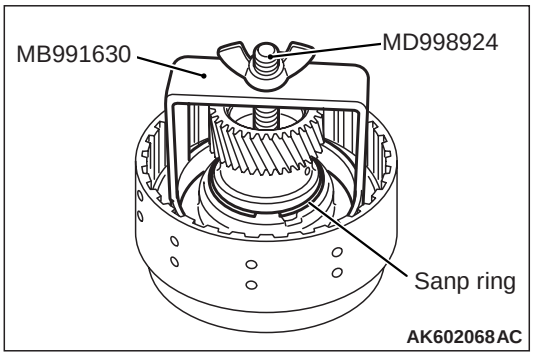
AK602067AC

Disassembly steps

>>D<<	1.	Snap ring
>>C<<	2.	Reaction plate
>>C<<	3.	Clutch disc
>>C<<	4.	Clutch plate
<<A>> >>B<<	5.	Snap ring
	6.	Spring retainer
>>A<<	7.	D-ring
	8.	Return spring
	9.	Direct clutch piston
>>A<<	10.	D-ring
>>A<<	11.	D-ring
	12.	Direct clutch retainer

DISASSEMBLY SERVICE POINT

<<A>> SNAP RING REMOVAL



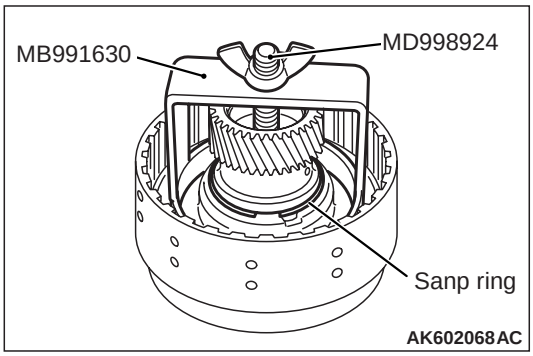
1. Set the special tools as shown in the illustration.
   - Spring compressor (MB991630)
   - Spring compressor retainer (MD998924)
2. Compress the return spring, and remove the snap ring.

REASSEMBLY SERVICE POINTS

>>A<< D-RING INSTALLATION

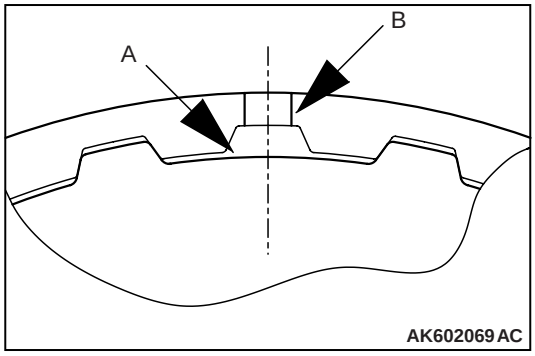
1. Apply ATF to the D-ring.
2. Install the D-ring in the direct clutch piston and spring retainer groove. Make sure that the D-ring is not twisted or damaged when installing.

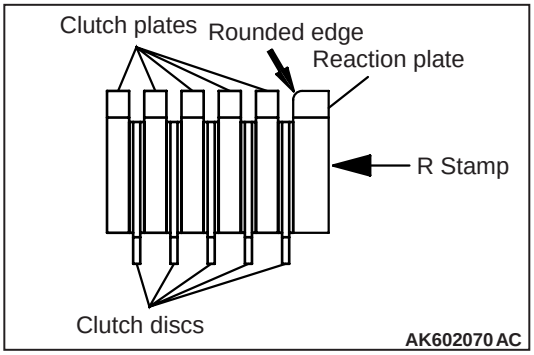
>>B<< SNAP RING INSTALLATION



1. Set the special tools as shown in the illustration.
   - Spring compressor (MB991630)
   - Spring compressor retainer (MD998924)
2. Compress the return spring, and install the snap ring.

>>C<< CLUTCH PLATE / CLUTCH DISC / REACTION PLATE INSTALLATION

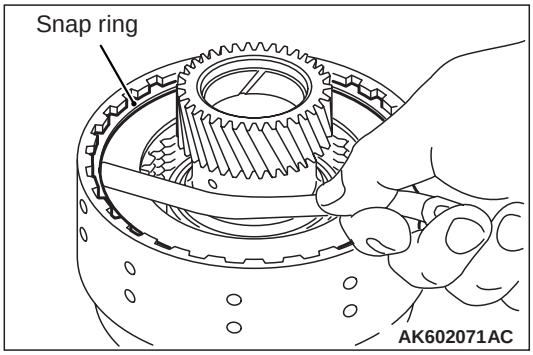


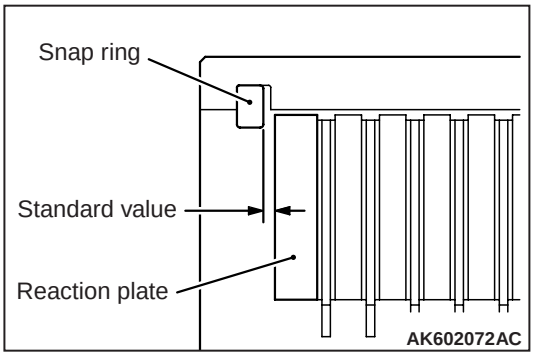


1. Alternately assemble the clutch plates and clutch discs in the reverse clutch retainer. Align the section having no teeth of the clutch plates (A in the illustration) with the reverse clutch retainer hole (B in the illustration).
2. Install the reaction plate so that it is oriented as shown in the illustration. Assemble in the same manner as the clutch plate so that the section with no teeth (A in the illustration) matches the retainer hole (B in the illustration).

>>D<< SNAP RING INSTALLATION

1. Install the snap ring in the direct clutch retainer groove.





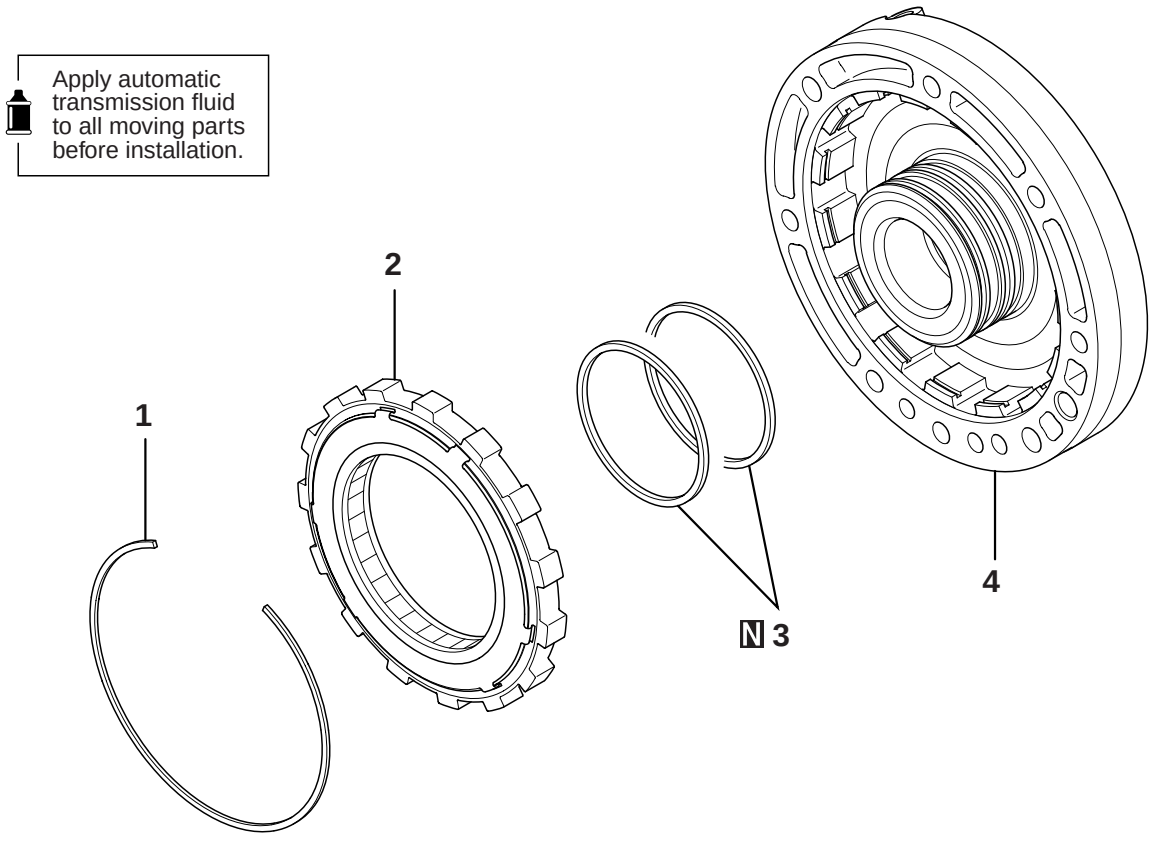
2. Press the entire periphery of the reaction plate with a force of 49 N, and confirm that the clearance between the snap ring and reaction plate (direct clutch end play) is the standard value. If the clearance is not at the standard value, select a suitable snap ring and adjust so that the clearance is within the standard value.

   Standard value: 1.0 – 1.2 mm
   (For direct clutch end play)

OUTPUTSHAFT SUPPORT

DISASSEMBLY AND REASSEMBLY

M1233029000052

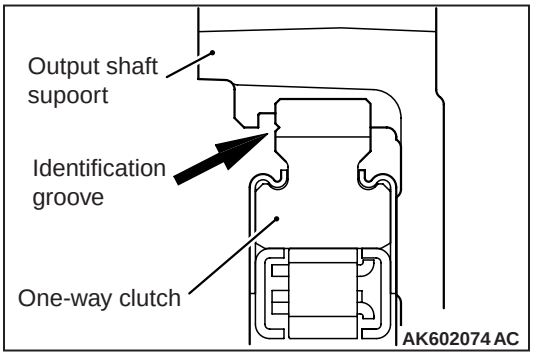


Disassembly steps

1. Snap ring
>>A<< 2. One-way clutch
3. Seal ring
4. Output shaft support

REASSEMBLY SERVICE POINTS

>>A<< ONE-WAY CLUTCH INSTALLATION

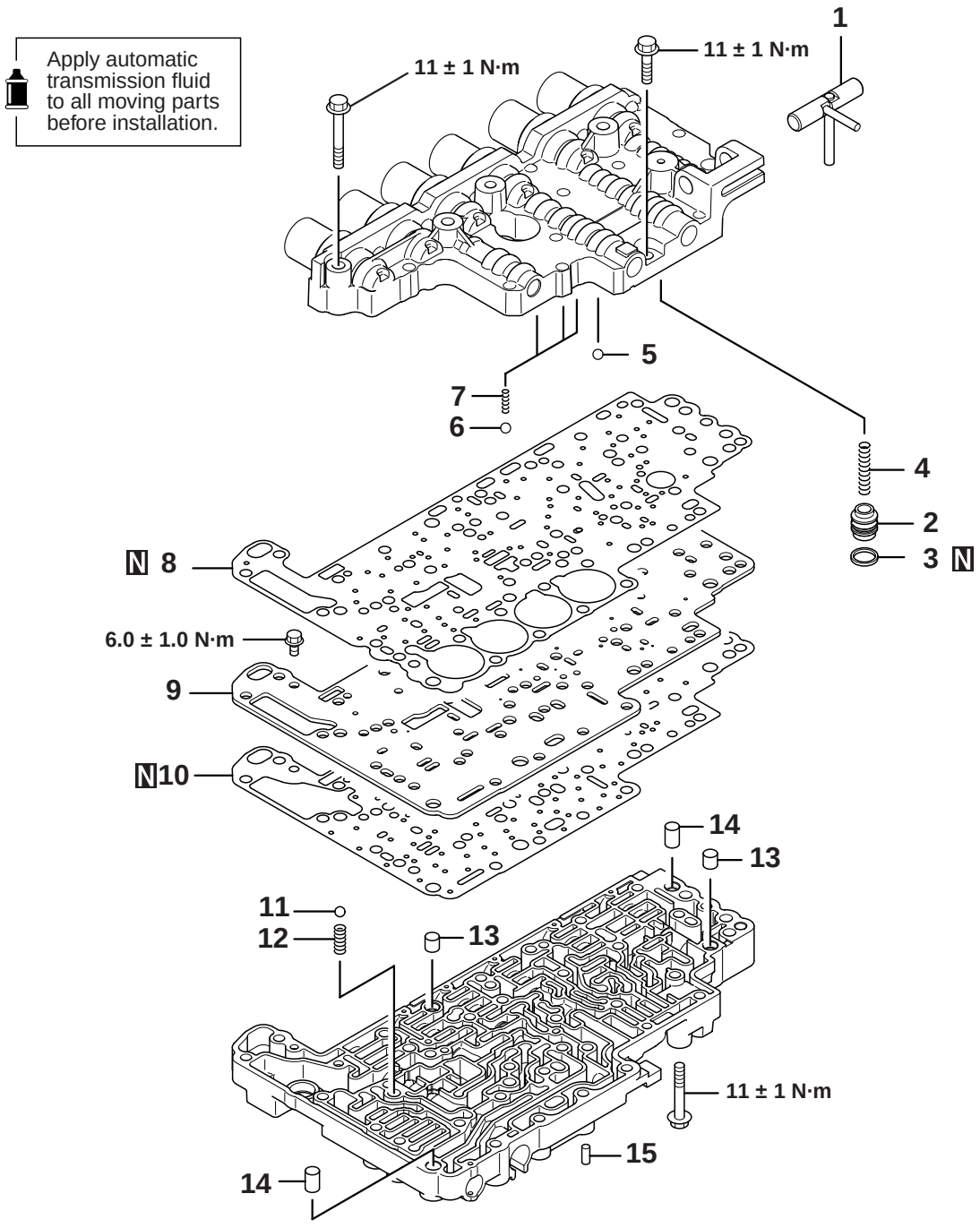


Install the one-way clutch in such a way that it will be oriented in the direction shown.

VALVE BODY

DISASSEMBLY AND REASSEMBLY

M1233005500600



AK602075AC

Disassembly steps

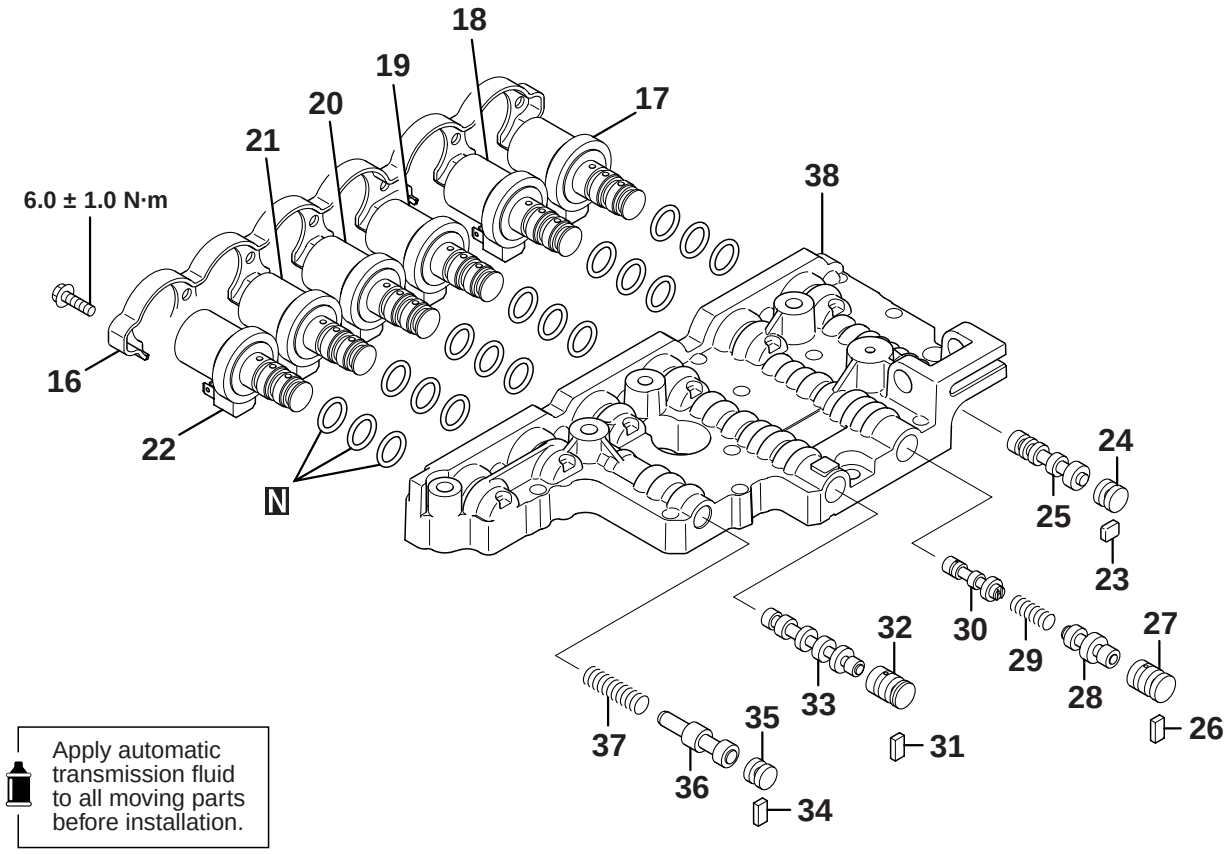
>>G<<	1.	Control shaft
>>F<<	2.	Damping valve
>>F<<	3.	Seal ring
>>F<<	4.	Damping valve spring
>>F<<	5.	Ball (orifice check ball)
>>F<<	6.	Steel ball (orifice check ball)
>>F<<	7.	Spring

Disassembly steps (Continued)

	8.	Upper valve body gasket
	9.	Separating plate
	10.	Lower valve body gasket
>>E<<	11.	Steel ball (line relief)
>>E<<	12.	Spring
>>D<<	13.	Knock bushing

Disassembly steps (Continued)

>>C<< 14. Knock bushing
>>B<< 15. Dowel pin



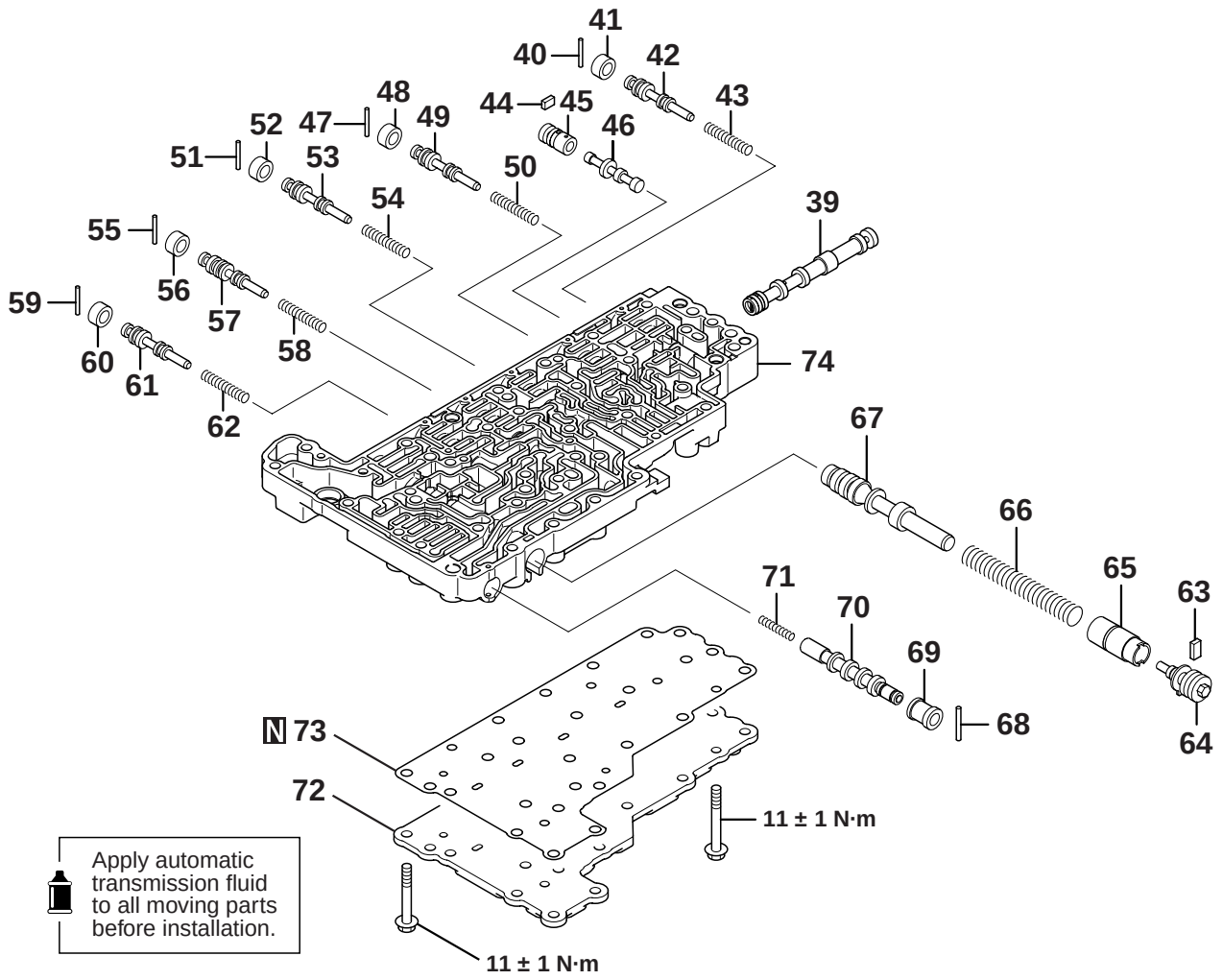
AK602076AC

Disassembly steps

<<A>> >>A<< 16. Solenoid support
<<A>> >>A<< 17. Low/reverse brake solenoid valve
<<A>> >>A<< 18. Reduction brake solenoid valve
<<A>> >>A<< 19. Second brake solenoid valve
<<A>> >>A<< 20. Underdrive clutch solenoid valve
<<A>> >>A<< 21. Overdrive clutch solenoid valve
<<A>> >>A<< 22. Damper clutch control solenoid valve
23. Stopper plate
24. Stopper plug
25. Switching valve
26. Stopper plate
27. Fail-safe valve A sleeve

Disassembly steps (Continued)

28. Fail-safe valve A2
29. Fail-safe valve A spring
30. Fail-safe valve A1
31. Stopper plate
32. Fail-safe valve B sleeve
33. Fail-safe valve B
34. Stopper plate
35. Stopper plug
36. Torque converter pressure control valve
37. Torque converter pressure control valve spring
38. Upper valve body



AK602077AC

Disassembly steps

39. Manual valve
40. Roller
41. Low/reverse brake pressure control valve sleeve
42. Low/reverse brake pressure control valve
43. Low/reverse brake pressure control valve spring
44. Stopper plate
45. Fail-safe valve C sleeve
46. Fail-safe valve C
47. Roller
48. Reduction brake pressure control valve sleeve
49. Reduction brake pressure control valve
50. Reduction brake pressure control valve spring
51. Roller
52. Second brake pressure control valve sleeve

Disassembly steps (Continued)

53. Second brake pressure control valve
54. Second brake pressure control valve spring
55. Roller
56. Underdrive clutch pressure control valve sleeve
57. Underdrive clutch pressure control valve
58. Underdrive clutch pressure control valve spring
59. Roller
60. Overdrive clutch pressure control valve sleeve
61. Overdrive clutch pressure control valve
62. Overdrive clutch pressure control valve spring
63. Stopper plate
64. Regulator valve adjusting screw
65. Regulator valve sleeve
66. Regulator valve spring

Disassembly steps (Continued)

67. Regulator valve
68. Roller
69. Damper clutch control valve sleeve
70. Damper clutch control valve
71. Damper clutch control valve spring
72. Cover
73. Cover gasket
74. Lower valve body

DISASSEMBLY SERVICE POINT

<<A>> SOLENOID VALVE REMOVAL

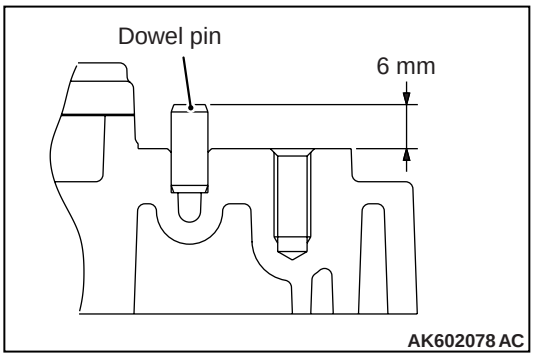
Before removing the solenoid valves, make marks with white paint, etc., so that these valves can be reinstalled in the original positions.

REASSEMBLY SERVICE POINTS

>>A<< SOLENOID VALVE INSTALLATION

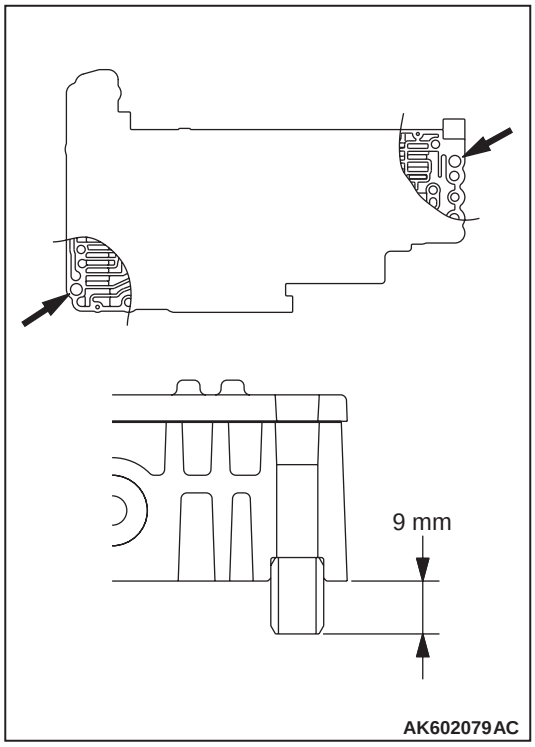
1. Apply ATF, petrolatum jelly or vaseline to O-rings, and install them to solenoid valves.
2. Following the marks made during removal, install each solenoid valve.

>>B<< DOWEL PIN INSTALLATION



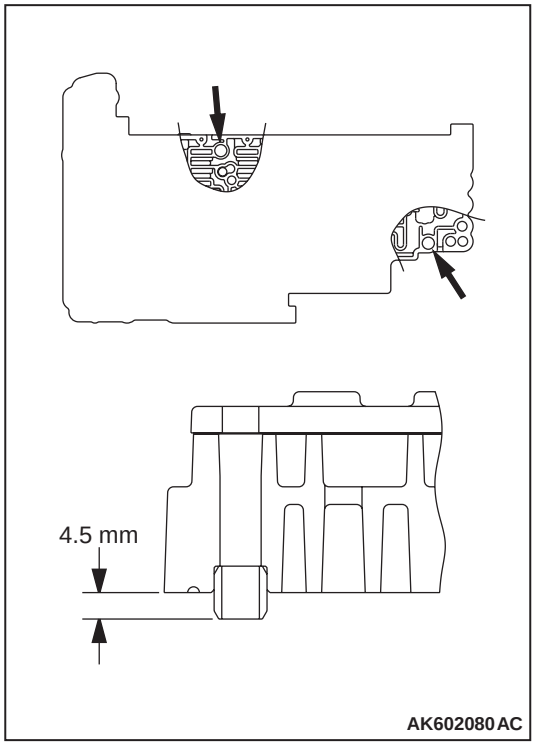
Install the dowel pin at the specified position on the lower valve body.

>>C<< KNOCK BUSHING INSTALLATION



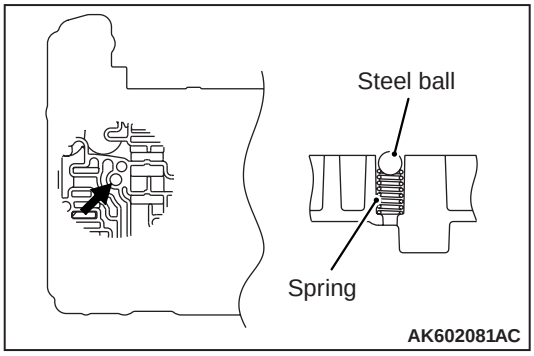
Install the knock bushing onto the lower valve body position shown in the illustration.

>>D<< KNOCK BUSHING INSTALLATION



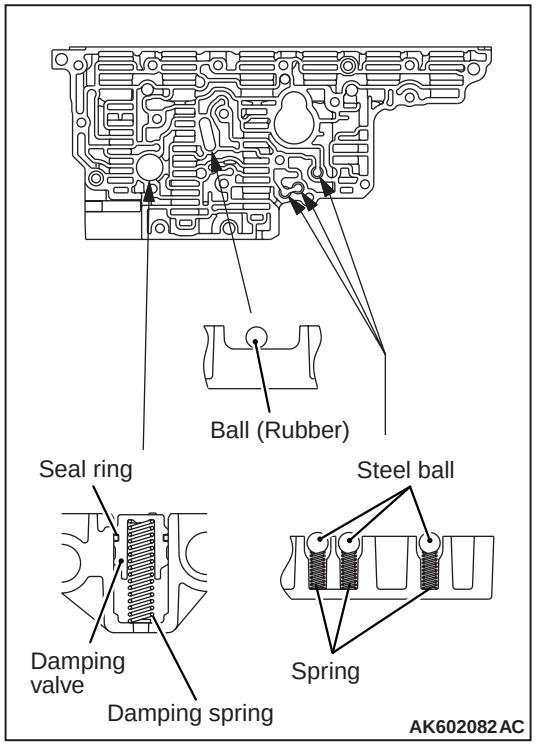
Install the knock bushing onto the lower valve body position shown in the illustration.

>>E<< SPRING / STEEL BALL (LINE RELIEF) INSTALLATION



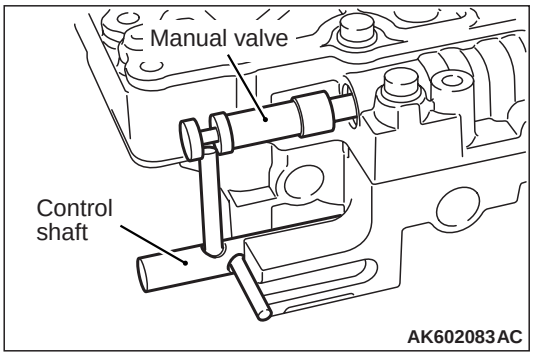
Install the spring (7 mm in diameter, 17.3 mm in length) and the steel ball (6.4 mm in diameter) onto the lower valve body position shown in the illustration.

>>F<< SPRING / STEEL BALL (ORIFICE CHECK BALL) / BALL (ORIFICE CHECK BALL) / DAMPING VALVE SPRING / SEAL RING / DAMPING VALVE INSTALLATION



1. Install the spring (4.5 mm in diameter, 15.4 mm in length) and the steel ball (6.4 mm in diameter) onto the upper valve body position shown in the illustration.
2. Install the ball (rubber) (6.4 mm in diameter) onto the upper valve body position shown in the illustration.
3. After installing the seal ring onto the damping valve, install together with the damping valve spring (7.7 mm in diameter, 35.8 mm in length) onto the upper valve body position shown in the illustration.

>>G<< CONTROL SHAFT INSTALLATION

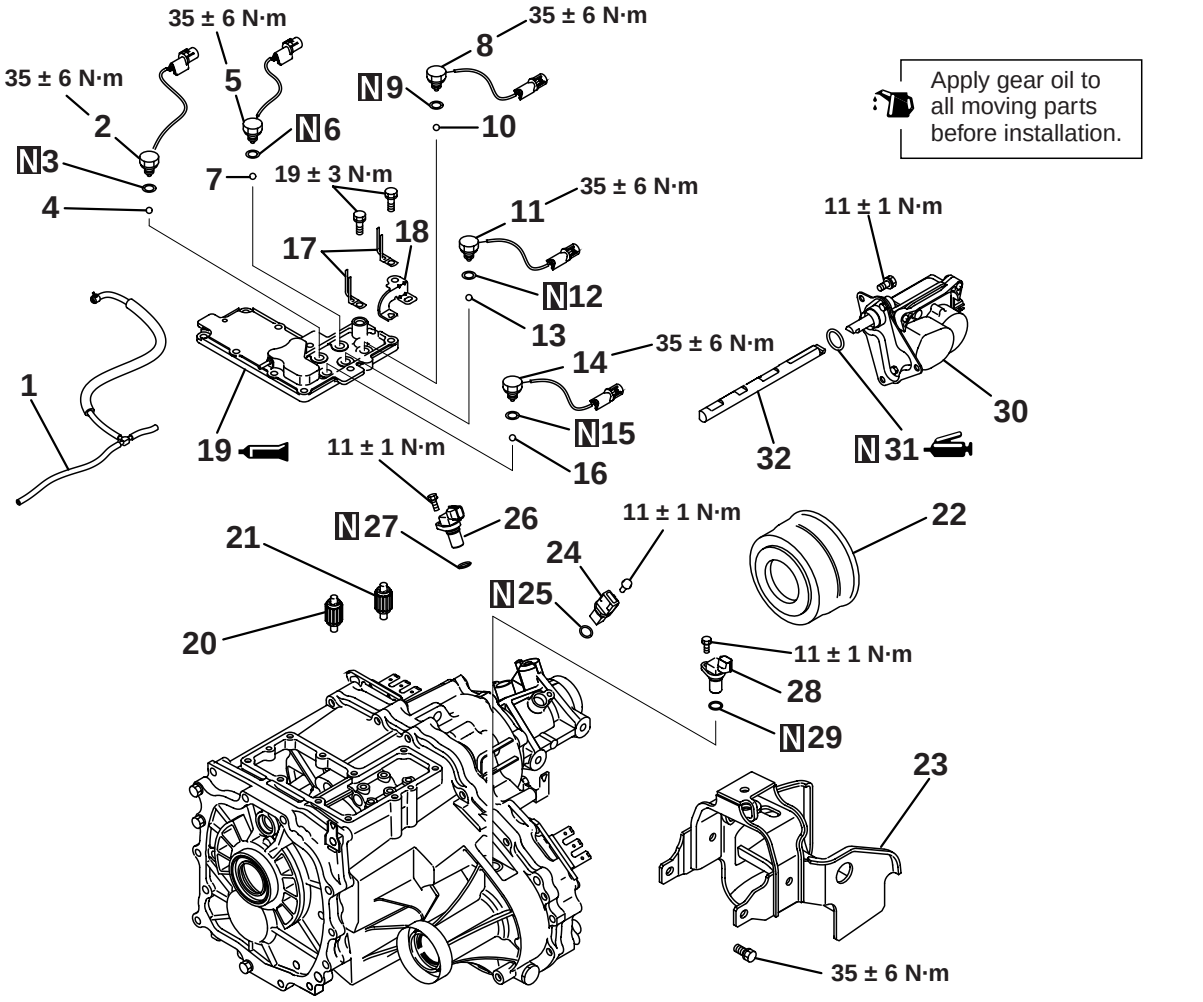


Insert the control shaft into the valve body, putting the pin of the control shaft into the groove of the manual valve.

TRANSFER

DISASSEMBLY AND REASSEMBLY

M1233006700674



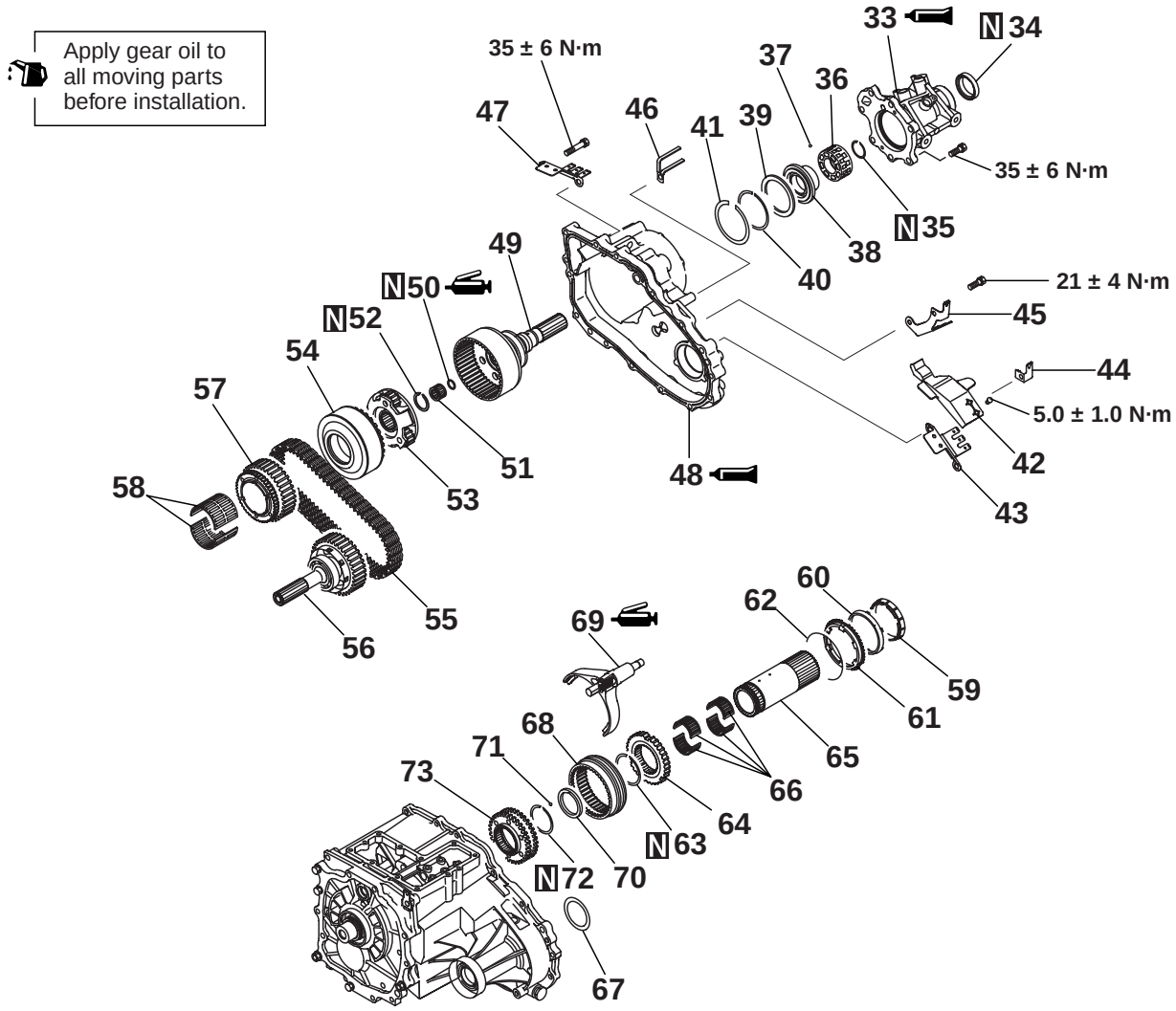
AK602084AC

Removal steps

- 1. Vacuum hose
- **>>X<<** 2. 4LLC switch
- 3. Gasket
- 4. Steel ball
- **>>X<<** 5. 2WD switch
- 6. Gasket
- 7. Steel ball
- **>>X<<** 8. Center differential lock switch
- 9. Gasket
- 10. Steel ball
- **>>X<<** 11. 4H switch
- 12. Gasket
- 13. Steel ball
- **>>X<<** 14. 2WD/4WD switch
- 15. Gasket
- 16. Steel ball

Removal steps (Continued)

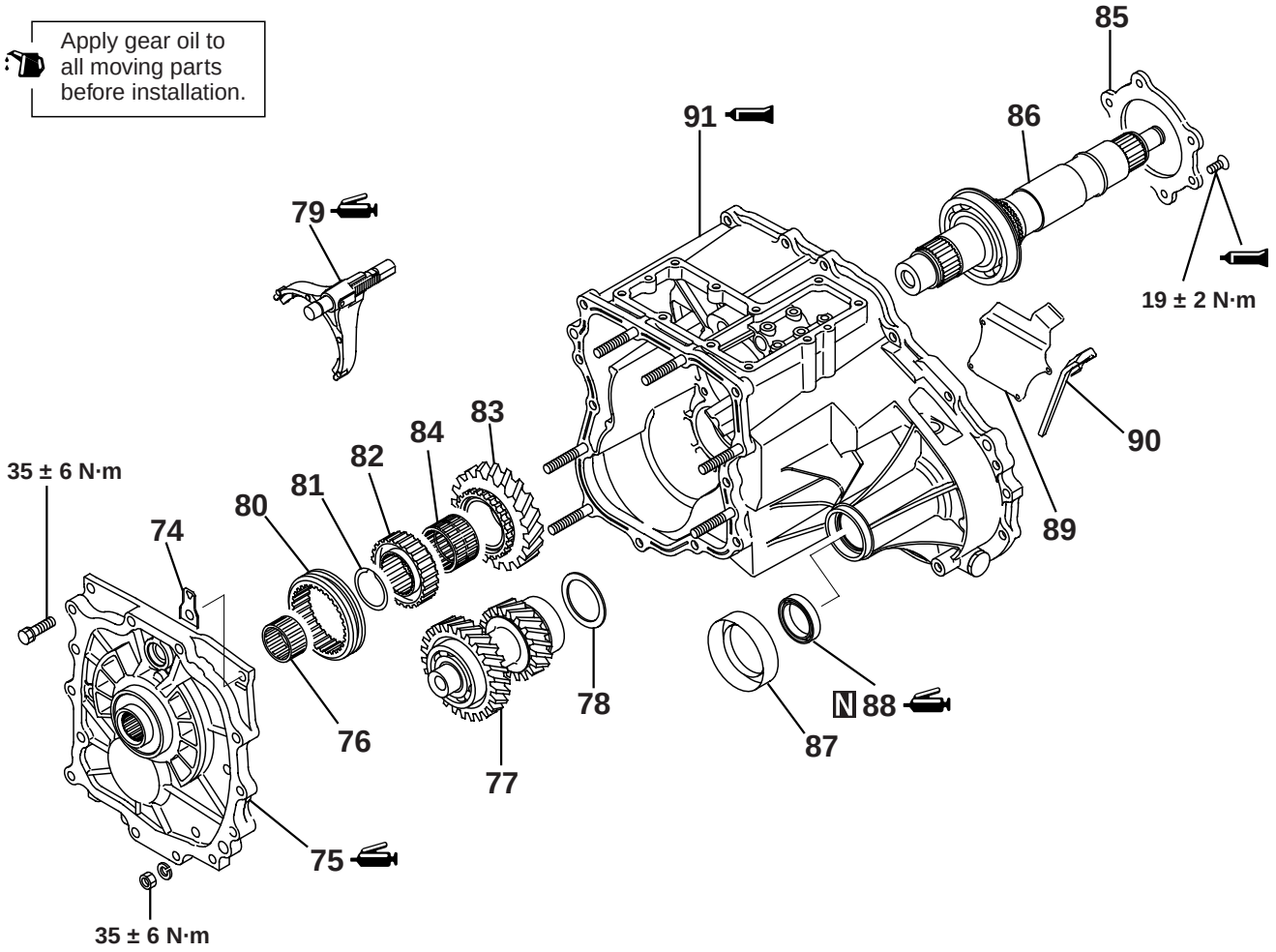
- 17. Clip
- 18. Harness bracket
- **>>W<<** 19. Transfer case cover
- **>>V<<** 20. Shift rail drive gear
- **>>V<<** 21. Shift rail drive gear
- 22. Dust seal guard
- 23. Dynamic damper
- 24. Vehicle speed sensor
- 25. O-ring
- 26. Rear output sensor
- 27. O-ring
- 28. Front output sensor
- 29. O-ring
- **>>U<<** 30. Shift actuator
- 31. O-ring
- **>>U<<** 32. Main shaft rail



AK602085AC

		Removal steps
>>T<<	33.	Rear cover
>>S<<	34.	Oil seal
	35.	Snap ring
	36.	Sensor rotor
	37.	Steel ball
>>R<<	38.	Oil guide
>>Q<<	39.	Spacer
	40.	Snap ring
>>P<<	41.	Snap ring
	42.	Transmission wiring harness protector
	43.	Connector bracket
	44.	Connector bracket
	45.	Connector bracket
	46.	Clip
	47.	Connector bracket
>>O<<	48.	Chain cover
>>N<<	49.	Rear output shaft
	50.	O-ring
	51.	Needle bearing
	52.	Snap ring

		Removal steps (Continued)
	53.	Center differential planetary carrier
	54.	Viscous coupling
<<A>> >>M<<	55.	Chain
<<A>> >>M<<	56.	Front output shaft
>>M<<	57.	Drive sprocket
	58.	Needle bearing
>>L<<	59.	Synchronizer inner ring
>>L<<	60.	Synchronizer inner cone
>>L<<	61.	Synchronizer outer ring
	62.	Synchronizer inner spring
>>K<<	63.	Snap ring
>>K<<	64.	2-4WD clutch
<<A>> >>K<<	65.	Sun gear
	66.	Needle bearing
	67.	Wave spring
>>J<<	68.	2-4WD clutch sleeve
>>J<<	69.	2-4WD shift fork
>>I<<	70.	Spacer
>>I<<	71.	Steel ball
>>H<<	72.	Snap ring
	73.	Differential lock hub



AK602086AC

Removal steps

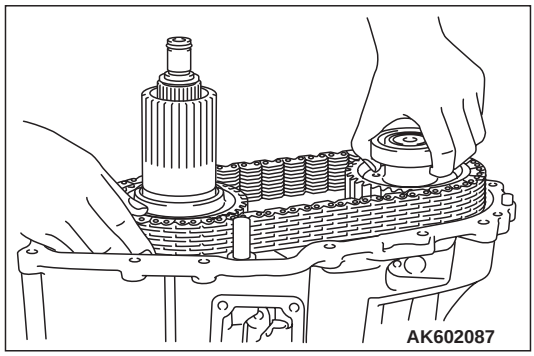
- 74. Harness bracket
- >>G<< 75. Transfer case plate
- 76. Needle bearing
- 77. Countershaft gear
- >>F<< 78. Spacer
- >>E<< 79. H-L shift fork
- >>E<< 80. H-L clutch sleeve
- >>D<< 81. Snap ring
- 82. H-L clutch hub

Removal steps (Continued)

- 83. Low speed gear
- 84. Needle bearing
- >>C<< 85. Rear bearing retainer
- 86. Transfer drive shaft
- 87. Dust seal guard
- >>B<< 88. Oil seal
- <<B>> >>A<< 89. Oil pool cover
- 90. Oil guide
- 91. Transfer case

DISASSEMBLY SERVICE POINTS

<<A>> CHAIN / FORNT OUTPUT SHAFT / SUN GEAR REMOVAL

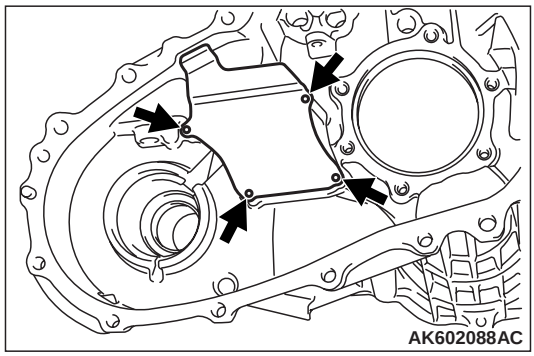


Remove the chain, front output shaft and sun gear as a set from the transfer case.

<<B>> OIL POOL COVER REMOVAL

⚠ CAUTION

The oil pool cover normally does not require disassembly. Once it is removed, the transfer case cannot be reused.



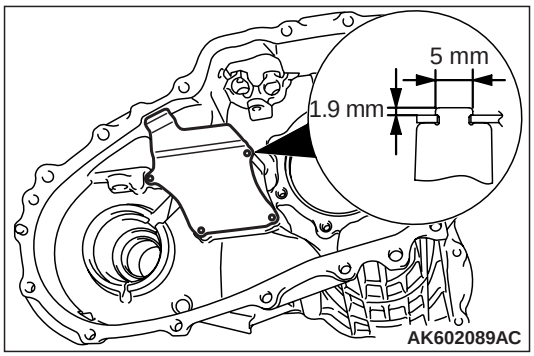
Unstake the positions shown in the illustration to remove the oil pool cover.

ADJUSTMENT BEFORE REASSEMBLY

Spacer selection for adjustment of countershaft gear end play. (Refer to adjustment of transfer - spacer selection for adjustment of countershaft gear end play P.23D-84)

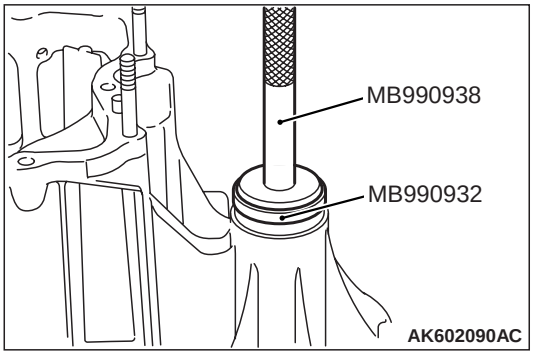
RESASSEMBLY SERVICE POINTS

>>A<< OIL POOL COVER INSTALLATION



Install the oil pool cover on a new transfer case. Stake the projecting portions of the transfer so that the dimensions will be as illustrated.

>>B<< OIL SEAL INSTALLATION

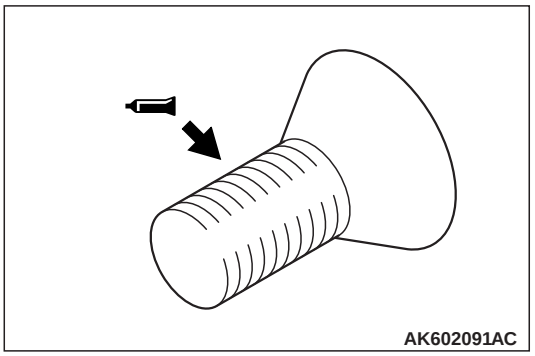


1. Use special tools to install the oil seal.
   - Handle (MB990938)
   - Installer adapter (MB990932)
2. Apply the specified grease to the lip of oil seal.

   Specified lubricant:

   Mitsubishi Part No. 0101011 or equivalent

>>C<< SEAL BOLT INSTALLATION



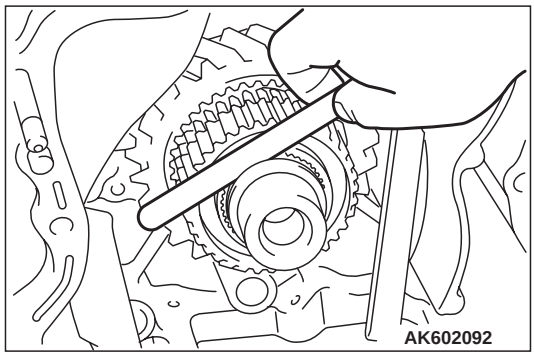
1. Apply the specified sealant to the threads.

   Specified sealant:

   3M STUD locking No. 4170 or equivalent

NOTE: The new bolt does not require sealant application as it is precoated with sealant.

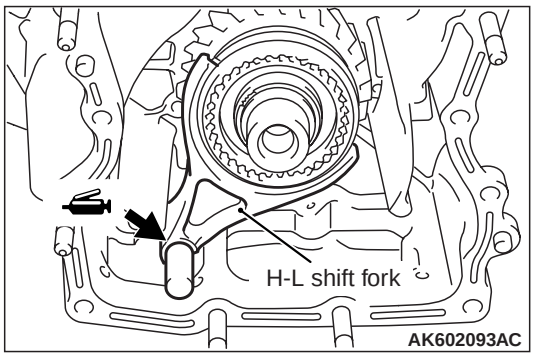
>>D<< SNAP RING INSTALLATION



1. Select a proper snap ring so that the end play of the H-L clutch hub will have the standard value, and install the snap ring on the transfer drive shaft.

   Standard value: 0 – 0.08 mm
   (For H-L clutch hub end play)

>>E<< H-L SHIFT FORK AND H-L CLUTCH SLEEVE INSTALLATION



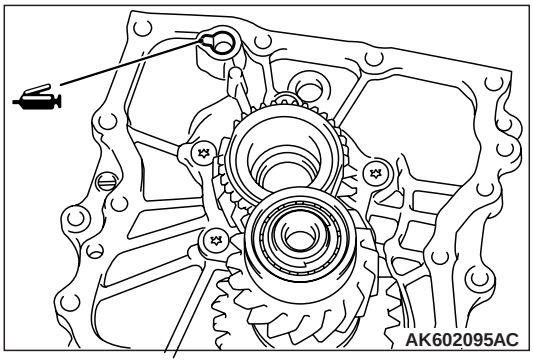
1. Apply the specified grease to the H-L shift fork shaft inserting portion, and install the H-L shift fork and H-L clutch sleeve in combined state in the transfer case.

   Specified lubricant:
   Mitsubishi Part No. 0101011 or equivalent

>>F<< SPACER INSTALLATION

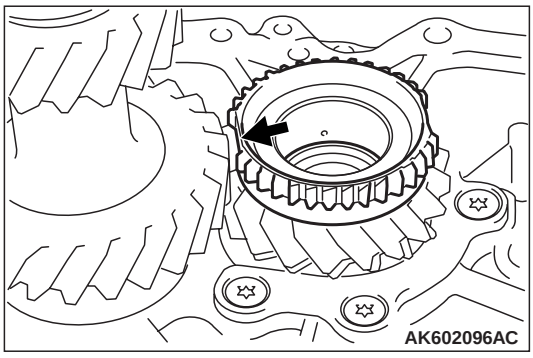
Install the previously selected spacer (Refer to ADJUSTMENT BEFORE REASSEMBLY.)

>>G<< TRANSFER CASE PLATE INSTALLATION

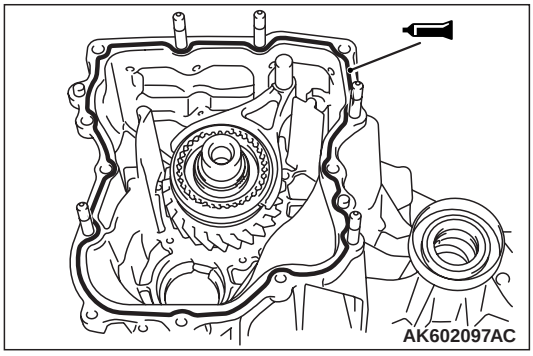


1. Apply the specified grease to the illustrated position of the H-L shift rail inserting portion of the transfer case plate.

   Specified lubricant:
   Mitsubishi Part No. 0101011 or equivalent



2. Face the notched portion of the input gear in the illustrated direction (in the direction of the countershaft gear bearing hole).



3. Apply the specified sealant to the transfer case.

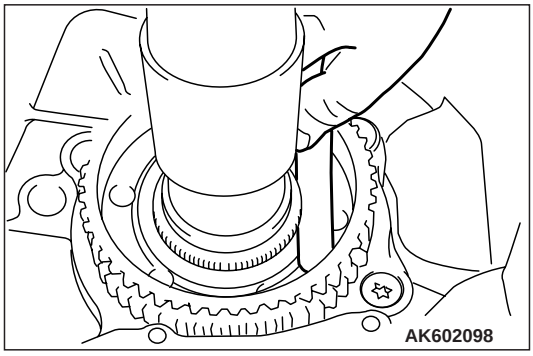
   Specified sealant:
   Mitsubishi Part No. MD997740 or equivalent

⚠ CAUTION

If the sub gear does not readily come in mesh with the countershaft gear, rote the transfer drive shaft, etc. to securely engage it.

4. While making sure that the notched portion of the input gear positioned in Step 2 is in alignment with the gear portion of the countershaft, install the transfer case palate.

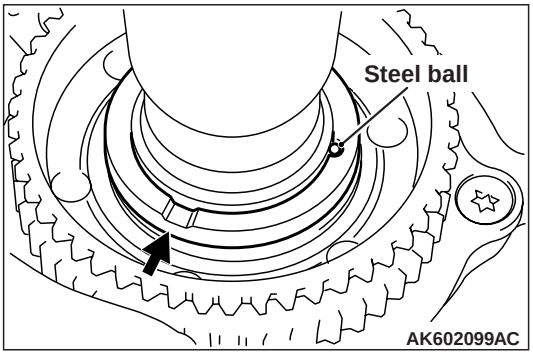
>>H<< SNAP RING INSTALLATION



Select a proper snap ring so that the end play of the differential lock hub will have standard value, and install it on the transfer drive shaft.

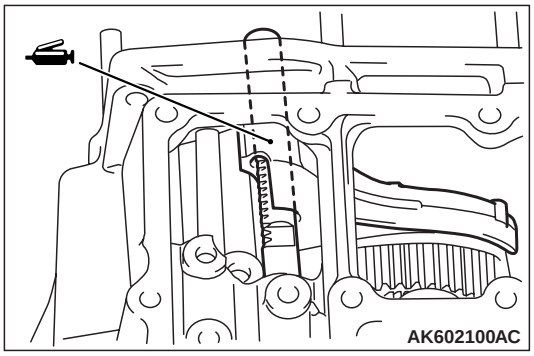
Standard value: 0 – 0.08 mm
(For differential lock hub end play)

>>I<< STEEL BALL AND SPACER INSTALLATION



Install the steel ball in the illustrated position of the transfer drive shaft and install the spacer with its oil groove toward the chain cover.

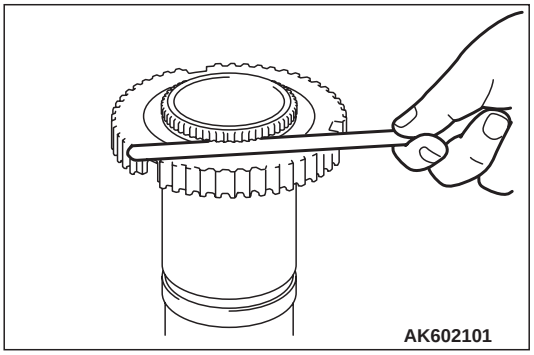
>>J<< 2-4WD SHIFT FORK AND 2-4WD CLUTCH SLEEVE INSTALLATION



Apply the specified grease to the 2-4WD shift fork shaft inserting position and install the 2-4WD shift fork and 2-4WD clutch sleeve in combined state in the transfer case.

Specified lubricant:
Mitsubishi Part No. 0101011 or equivalent

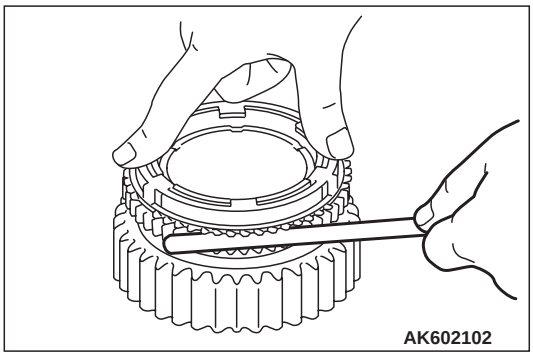
>>K<< SUN GEAR / 2-4WD CLUTCH HUB / SNAP RING INSTALLATION



1. Install the 2-4WD clutch hub on the sun gear.
2. Select the proper snap ring so that the end of play of the 2-4WD clutch hub will have the standard value, and install it on the sun gear.

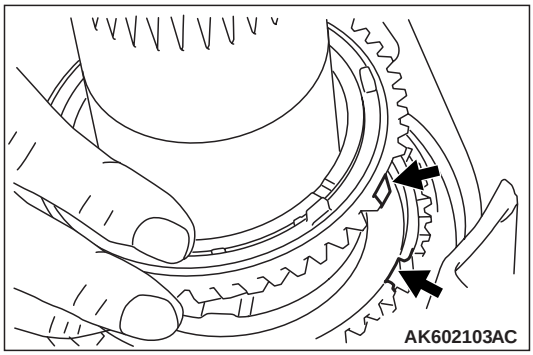
Standard value: 0 – 0.08 mm
(For 2-4WD clutch hub end play)

>>L<< SYNCHRONIZER OUTER RING / SYNCHRONIZER CONE / SYNCHRONIZER INNER RING INSTALLATION


AK602102

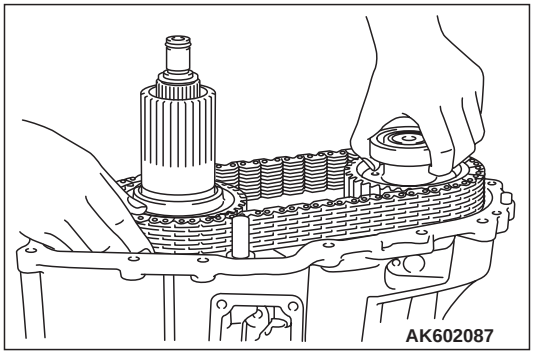
1. Combine the synchronizer outer ring, synchronizer cone and synchronizer inner ring, press then against the drive sprocket, and measure the dimension shown in the illustration.

   Limit: 0.3 mm
   (For clearance between synchronizer outer ring and drive sprocket)
2. If the dimension is out of the limit value, replace them with a synchronizer ring set.
3. Apply gear oil to the synchronizer outer ring and synchronizer inner ring.

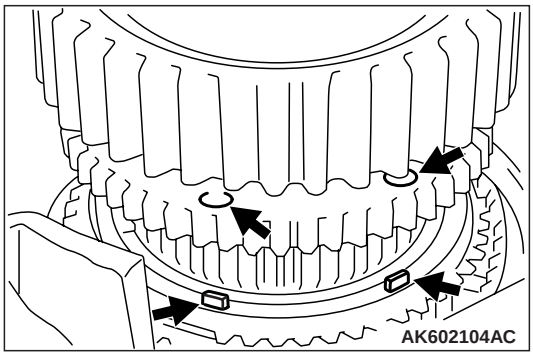

AK602103AC

4. Line up the notched portion of the 2-4WD clutch hub with the projecting portion of the synchronizer ring and install the ring on the 2-4WD clutch hub.

>>M<< DRIVE SPROCKET / FRONT OUTPUT SHAFT / CHAIN INSTALLATION

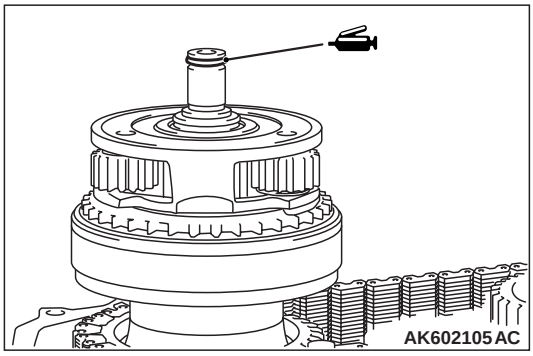

AK602087

1. Set the chain in mesh with the drive sprocket and front output shaft sprocket and install them in the transfer case.


AK602104AC

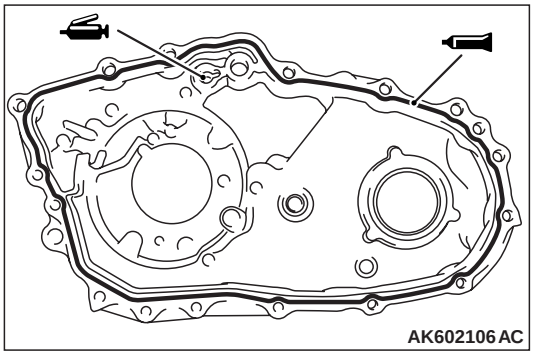
2. Install the drive sprocket so that its illustrated holes will mach the projecting portions of the synchronizer cone.

>>N<< REAR OUTPUT SHAFT INSTALLATION


AK602105 AC

Specified lubricant:
Mitsubishi Part No. 0101011 or equivalent

>>O<< CHAIN COVER INSTALLATION

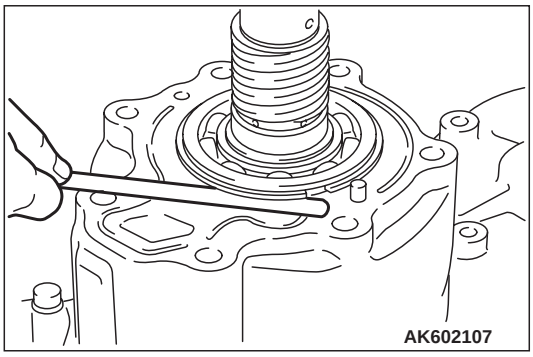

AK602106 AC

1. Apply the specified grease to the indicated 2-4WD shift rail inserting portion.

   Specified lubricant:
   Mitsubishi Part No. 0101011 or equivalent
2. Apply the specified sealant to the illustration of the chain cover.

   Specified sealant:
   Mitsubishi Part No. MD997740 or equivalent

>>P<< SNAP RING INSTALLATION

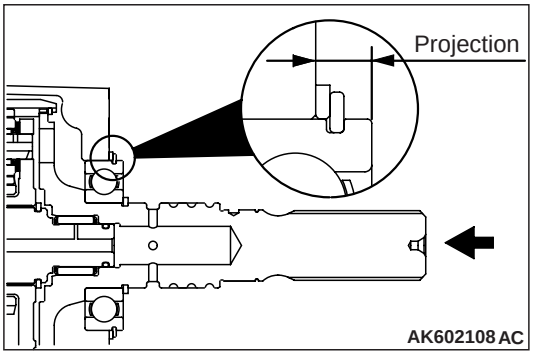


1. Install the snap ring in the bearing groove of the rear output shaft.
2. With the rear output shaft pressed against the chain cover, measure the clearance between the chain cover and snap ring.
3. Select a snap ring whose thickness is the dimension of the measured clearance plus the standard value.

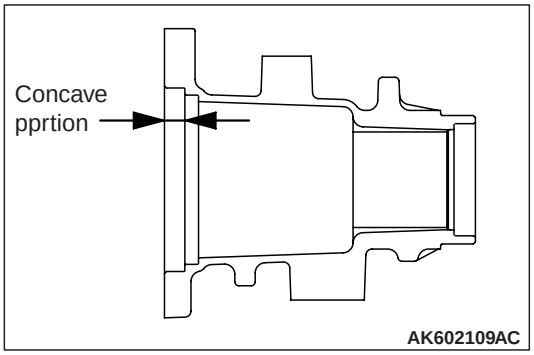
   Standard value: 0.12 – 0.24 mm
   (For rear output shaft preload)
4. Remove the snap ring from the bearing groove of the rear output shaft, install the selected snap ring, and reinstall the removed snap ring in the bearing groove of the rear output shaft.

>>Q<< SAPCER INSTALLTION

⚠ CAUTION
Measure the projection with the snap ring installed.



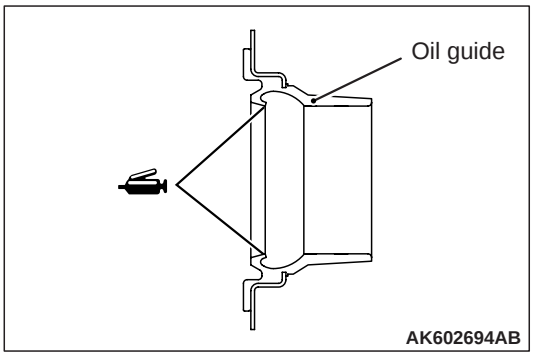
1. With the output shaft pressed toward the chain cover, measure the projection of the bearing from the chain cover.



2. Measure the dimension of the rear cover concave portion at the illustrated position.

   Standard value: 0 – 0.12 mm
   (For rear output shaft end play)

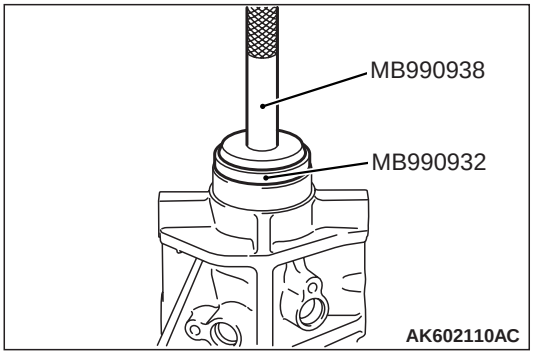
>>R<< OIL GUIDE INSTALLATION



Apply specified grease to the lip of the oil seal.

Specified lubricant:
Mitsubishi Part No. 0101011 or equivalent

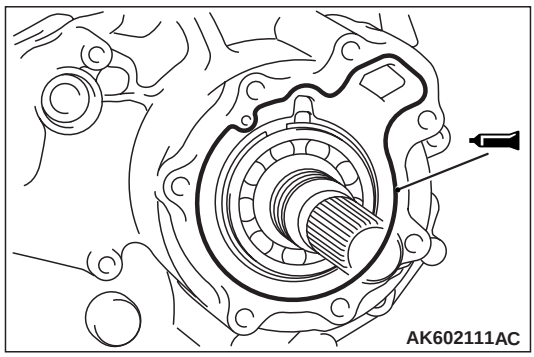
>>S<< OIL SEAL INSTALLATION



Use special tools to install the oil seal in the rear cover.

- Installer adapter (MB990932)
- Handle (MB990938)

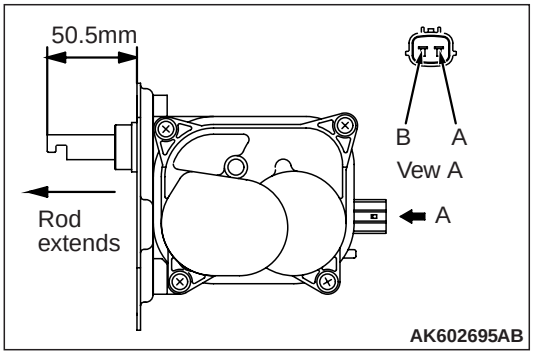
>>T<< REAR COVER INSTALLTION



Apply the specified sealant to the illustration of the chain cover.

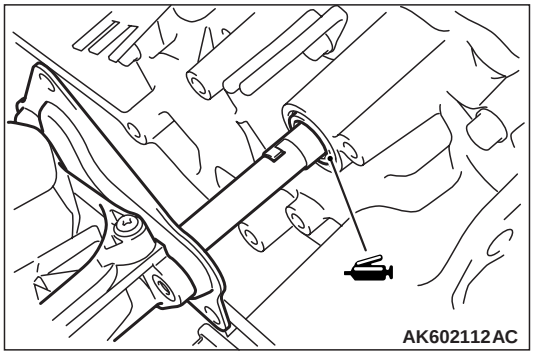
Specified sealant:
Mitsubishi Part No. MD997740 or equivalent

>>U<< MAIN SHIFT RAIL AND SHIFT ACTUATOR INSTALLATION



1. Contact a 12 voltage power supply across the terminals of the actuator connector in a polarity appropriate for causing the actuator motor to move in the rod extending direction or retracting direction until the amount of extension of the rod is as indicated in the drawing.

Terminal A	Terminal B	Rod movement
Power supply (+)	Power supply (-)	Extension
Power supply (-)	Power supply (+)	Retraction

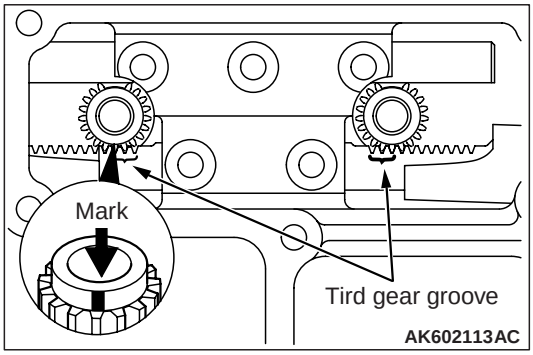


2. Apply the specified grease to the O-ring.

Specified lubricant:
Mitsubishi Part No. 0101011 or equivalent

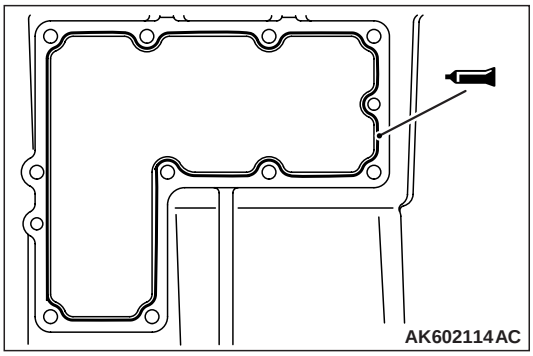
3. Combine the main shift rail key with actuator key and insert them in the transfer case.

>>V<< SHIFT RAIL DRIVE GEAR INSTALLATION



Install the shift rail drive gear with its marked tooth in mesh with the third gear groove of the each shift rail.

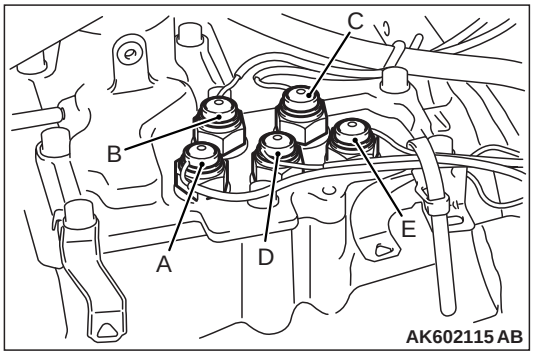
>>W<< TRANSFER CASE COVER INSTALLATION



Apply specified sealant to the illustrated position of the transfer case cover.

Specified sealant:
Mitsubishi Part No. MD997740 or equivalent

>>X<< SWITCH INSTALLATION



Install the switches as illustrated.

Mounting position	Switch name	Tube color	Connector color
A	2WD/4WD switch	Blue	Black
B	4LLC switch	Black	Brown
C	2WD switch	Black	Black
D	4H switch	Green	White
E	Center differential lock switch	Blue	Brown

ADJUSTMENT OF TRANSFER

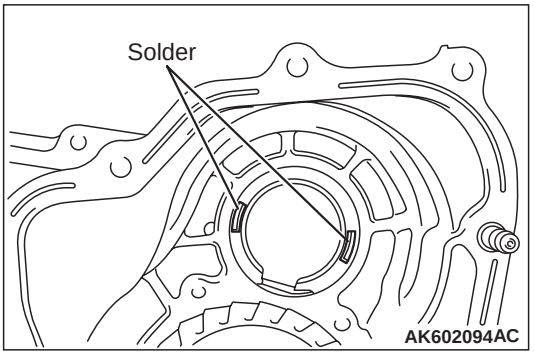
M1233030900071

SPACER SELECTION FOR ADJUSTMENT OF COUNTERSHAFT GEAR END PLAY

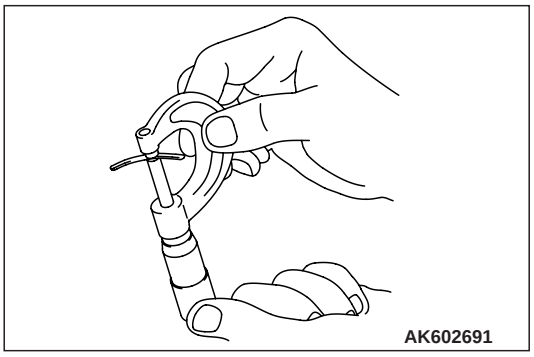
<Measurement using a solder>

⚠ CAUTION

- **If soft solder is not available, select the spacer in accordance with Plastigage method.**
- **If the spacer appropriate for the standard value cannot be selected using soft solder, select the spacer in accordance with Plastigage method.**



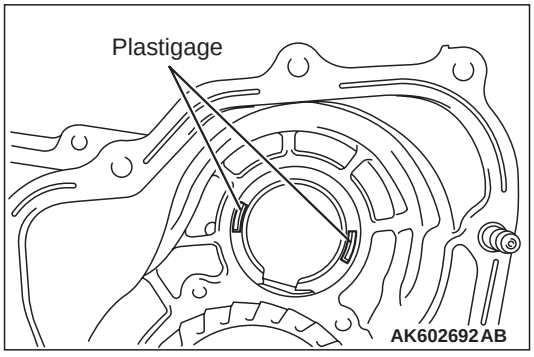
1. Put solders (1.0 mm diameter, about 10 mm long) in the illustrated positions of the transfer case housing.
2. Install the countershaft gear into the transfer case.
3. Install the transfer case plate and tighten the bolts to the specified torque of 35 ± 6 N·m.
4. Remove the transfer case plate and the countershaft gear, and then take out crushed solders.
5. If the solders have not crushed, use thicker solders (1.6 mm diameter, about 10 mm long) and repeat steps 2 to 4.



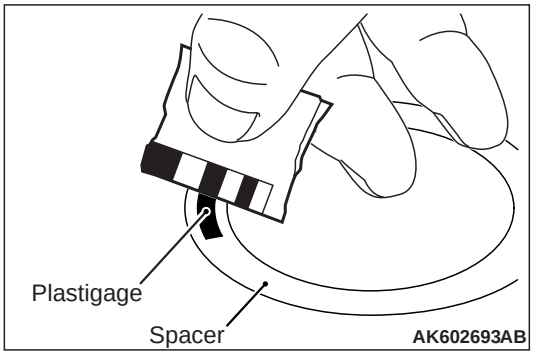
6. Measure the thickness of the crushed solder with a micrometer and select a spacer that will provide the standard value.

Spacer thickness: (T − 0) to (T − 0.15)
T: The crushed solder thickness
Standard value: 0 − 0.15 mm
(For counter shaft gear end play)

<Measurement using plastigage>



1. Put plastigage (about 10 mm long) in the illustrated positions of the transfer case housing.
2. Install the adjusting spacer having the minimum thickness.
3. Install the countershaft gear into the transfer case.
4. Install the transfer case plate and tighten the bolts to the specified torque of 35 ± 6 N·m.
5. Remove the transfer case plate and the countershaft gear, and then take out crushed solders.
6. If the plastigages have not crushed, replace the spacer with a thicker one and repeat steps 3 to 5.



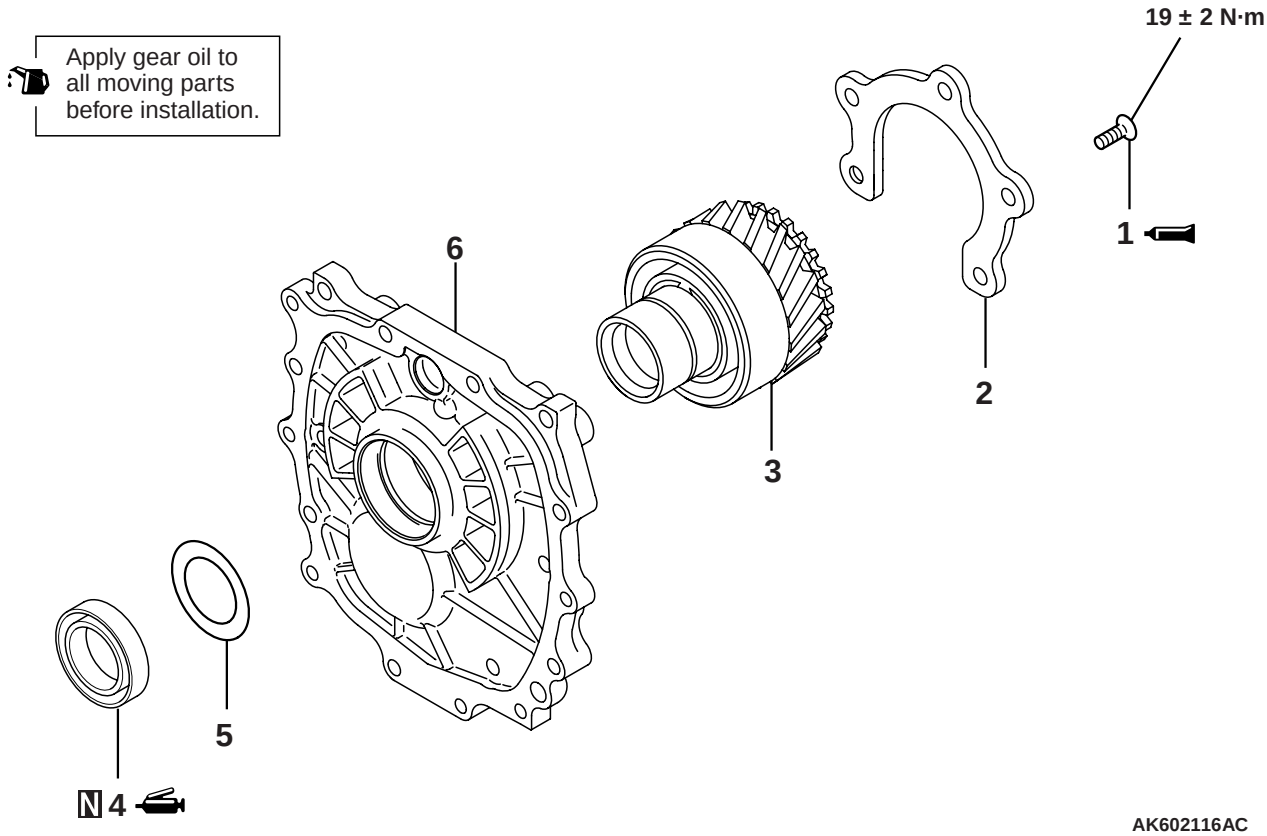
7. Measure the width of the crushed plastigage at its widest part using a scale printed on the plastigage package.

Spacer thickness: (T – 0) to (T – 0.15)
T: The crushed solder thickness
Standard value: 0 – 0.15 mm
(For counter shaft gear end play)

TRANSFER CASE PLATE

DISASSEMBLY AND REASSEMBLY

M1233024200244



Disassembly steps

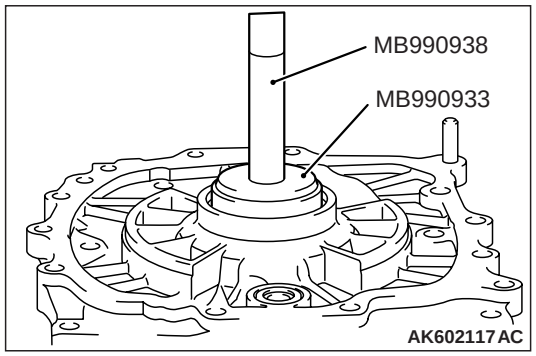
>>B<< 1. Seal bolt
2. Bearing retainer
3. Transfer input gear

Disassembly steps (Continued)

>>A<< 4. Oil seal
5. Baffle plate
6. Transfer case plate

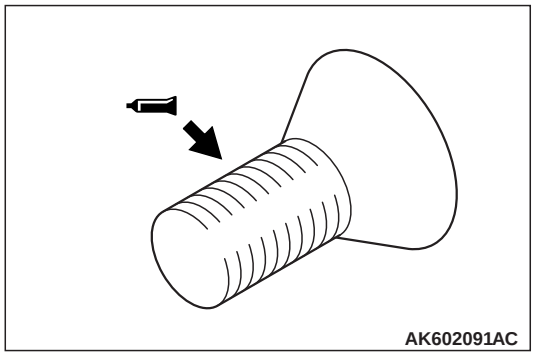
REASSEMBLY SERVICE POINTS

>>A<< OIL SEAL INSTALLATION



1. Apply specified grease to the lip of the oil seal.
   Specified lubricant:
   Mitsubishi Part No. 0101011 or equivalent
2. Use special tools to install the oil seal.
   - Handle (MB990938)
   - Installer adapter (MB990933)

>>B<< SEAL BOLT INSTALLATION



Apply the specified sealant to the threads.

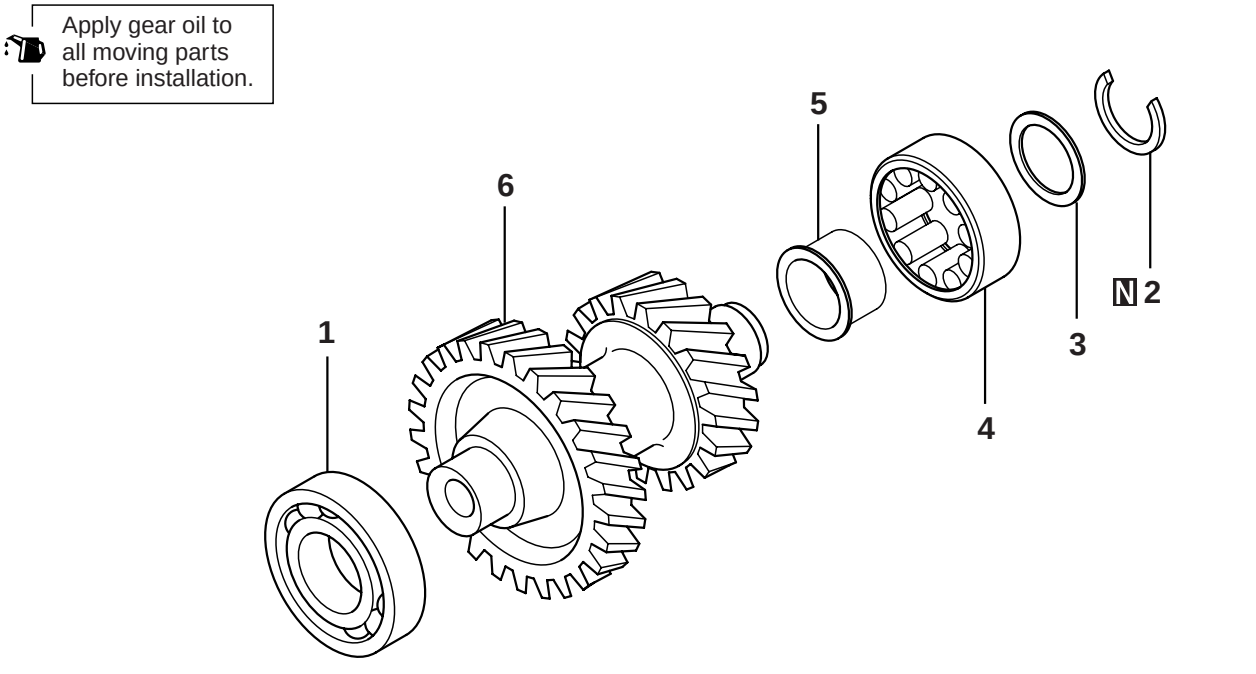
Specified sealant:
3M STUD Locking No. 4170 or equivalent

NOTE: The new bolt does not require sealant application as it is precoated with sealant.

COUNTERSHAFT GEAR

DISASSEMBLY AND REASSEMBLY

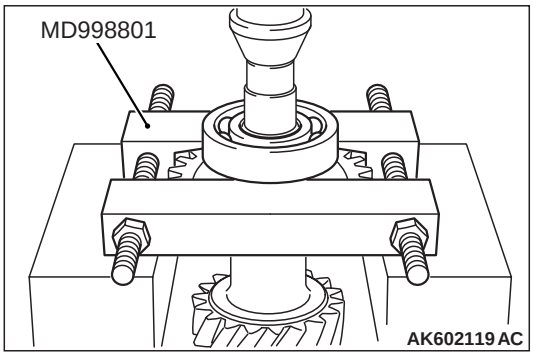
M1233024000284



			Disassembly steps
<<A>>	>>C<<	1.	Ball bearing
	>>B<<	2.	Snap ring
	>>A<<	3.	Spacer
<<B>>	>>A<<	4.	Roller bearing
<<B>>	>>A<<	5.	Inner race
		6.	Counter shaft gear

DISASSEMBLY SERVICE POINTS

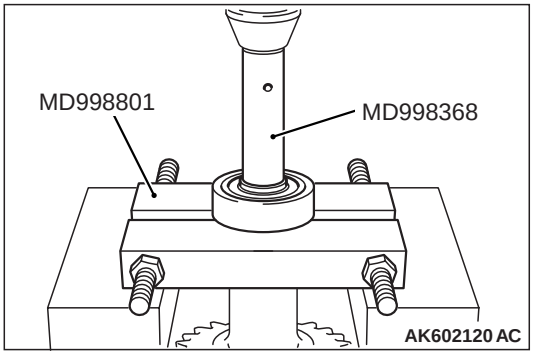
<<A>> BALL BEARING REMOVAL



Use special tool Bearing remover (MD998801) to remove the ball bearing.

<<B>> SPACER / ROLLER BEARING / INNER RACE REMOVAL

1. Remove the spacer and bearing.

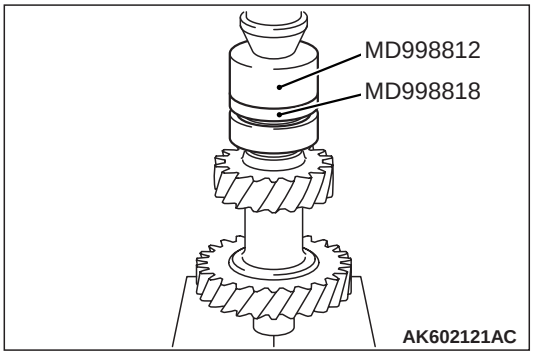


2. Using special tool, remove the inner race.
   - Remover (MD998801)
   - Bearing installer (MD998368)

   NOTE: The removal sequence of roller bearing parts vary depending on the direction that the roller bearing was installed, In come cases, the inner race, roller bearing and spacer may have to be simultaneously removed.

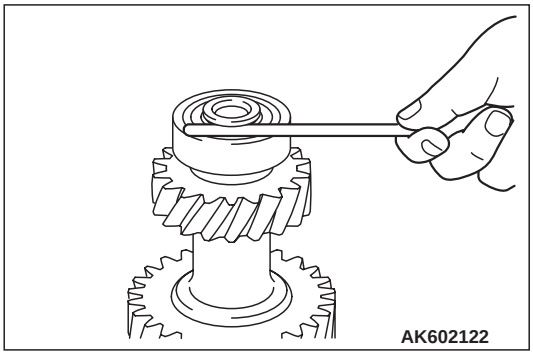
REASSEMBLY SERVICE POINTS

>>A<< INNER RACE / ROLLER BEARING / SPACER INSTALLATION



1. Use special tools to install the inner race.
   - Installer cap (MD998812)
   - Installer adapter (38) (MD998818)
2. Install the roller bearing and spacer.

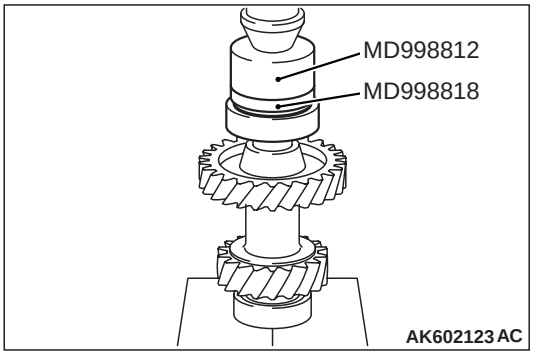
>>B<< SNAP RING INSTALLATION



1. Install the thickest snap ring that can be fitted into the snap ring groove of the counter shaft gear.
2. Make sure that the counter shaft gear roller bearing end play meets the standard value.

   Standard value: 0 – 0.08 mm
   (For counter shaft gear bearing end play)

>>C<< BALL BEARING INSTALLATION

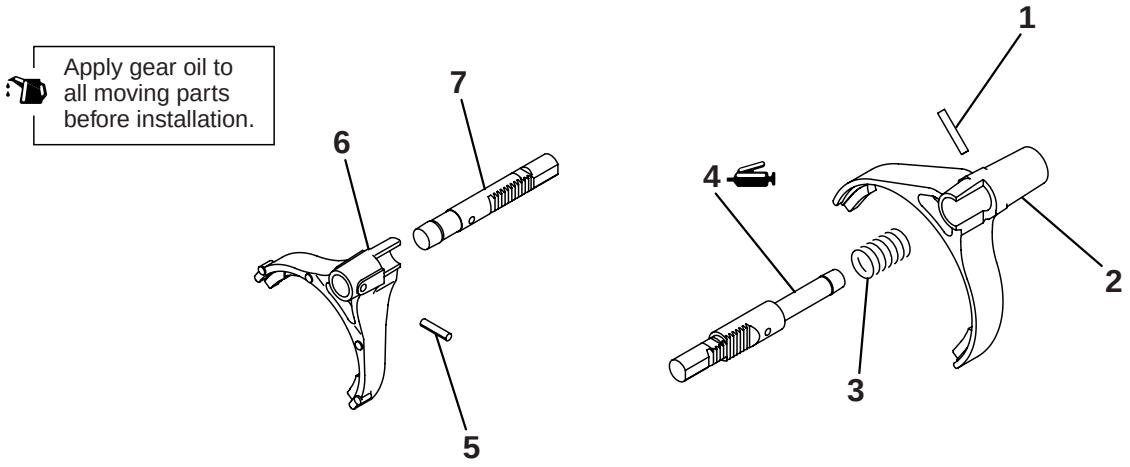


1. Use special tools to install the ball bearing.
   - Installer cap (MD998812)
   - Installer adapter (38) (MD998818)

2-4 SHIFT RAIL/H-L SHIFT RAIL

DISASSEMBLY AND REASSEMBLY

M1233031500054

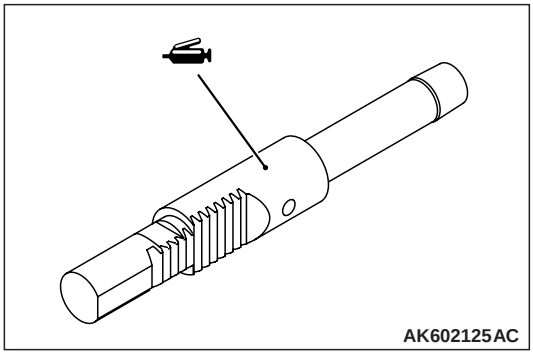


AK602124AC

		Disassembly steps
>>B<<	1.	Spring pin
>>A<<	2.	2-4WD shift fork
	3.	Spring
>>A<<	4.	2-4WD shift rail
>>B<<	5.	Spring pin
>>A<<	6.	H-L shift fork
>>A<<	7.	H-L shift rail

REASSEMBLY SERVICE POINTS

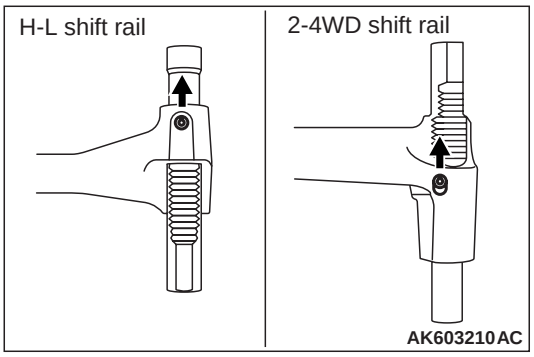
>>A<< SHIFT RAIL AND SHIT FORK INSTALLATION



Apply the specified grease to the outer periphery of the shift fork mounting portion of the shift rail and then assemble the shift fork and shift rail.

Specified lubricant:
Mitsubishi Part No. 0101011 or equivalent

>>B<< SPRING PIN INSTALLATION

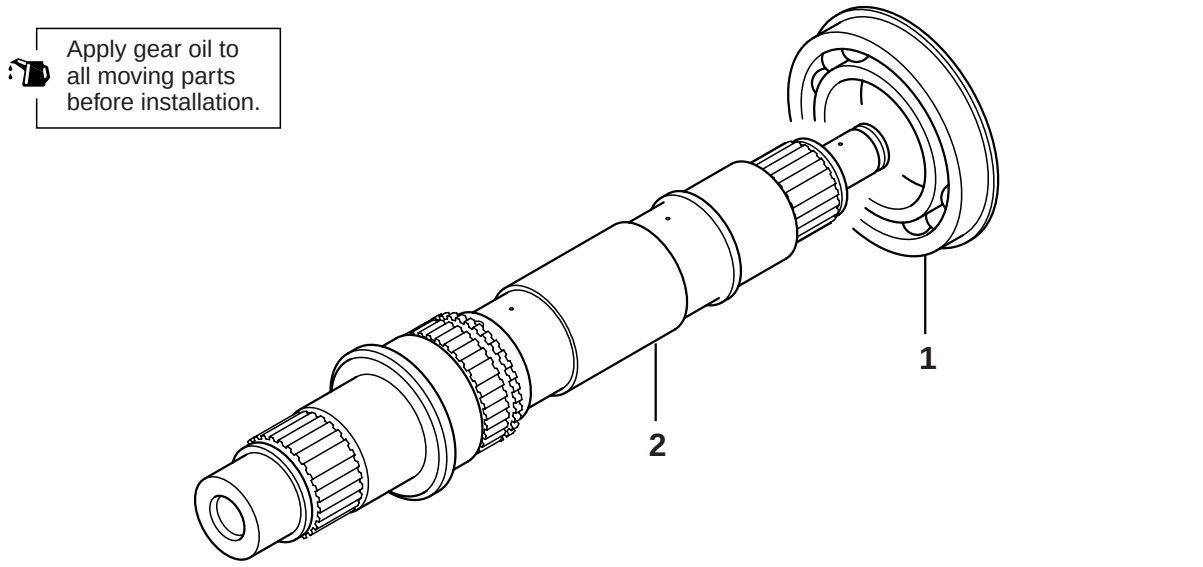


Install the spring pin with its split toward the forward end of the transfer.

TRANSFER DRIVE SHAFT

DISASSEMBLY AND REASSEMBLY

M1233014500095

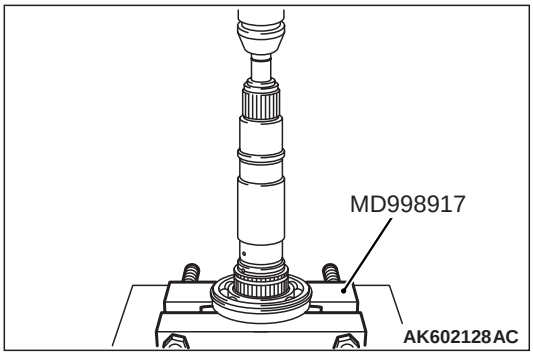


AK602127AC

		Disassembly steps
<<A>>	>>A<<	1. Ball bearing
		2. Transfer drive shaft

DISASSEMBLY SERVICE POINT

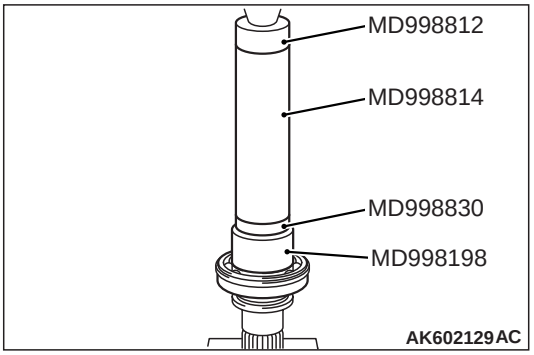
<<A>> BALL BEARING REMOVAL



1. Use special tool Bearing remover (MD998917) to support the ball bearing.
2. Press the transfer drive shaft with a press and remove the ball bearing.

REASSEMBLY SERVICE POINT

>>A<< BALL BEARING INSTALLATION



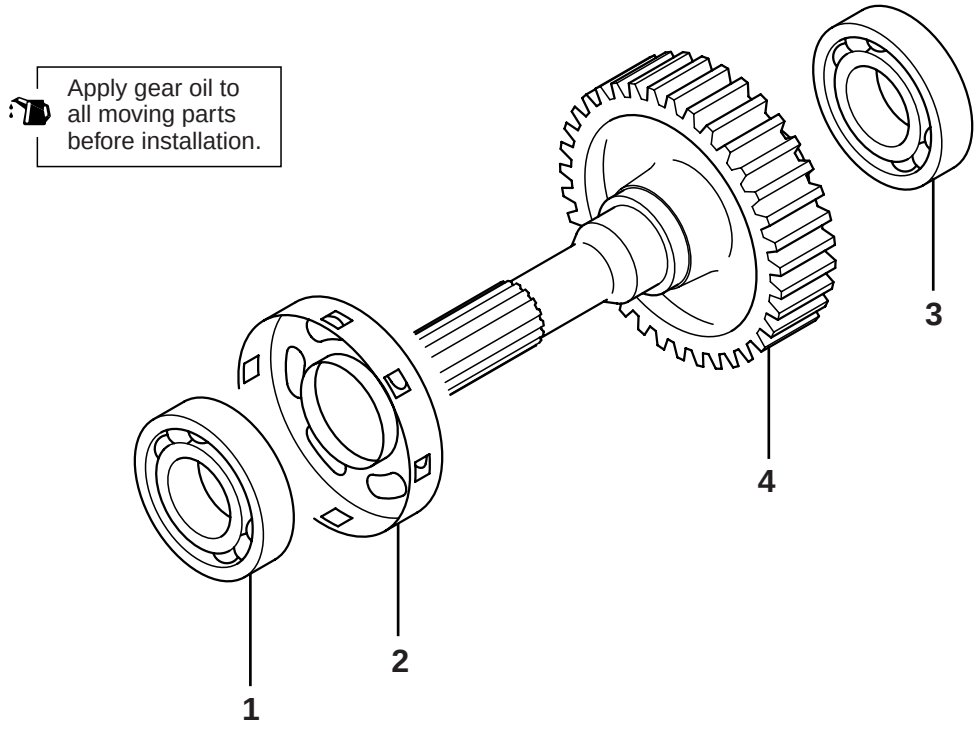
Use the special tools to install the ball bearing.

- Installer cap (MD998812)
- Installer-200 (MD998814)
- Installer adapter (66) (MD998830)
- Puller (MD998198)

FRONT OUTPUT SHAFT

DISASSEMBLY AND REASSEMBLY

M1233006100070

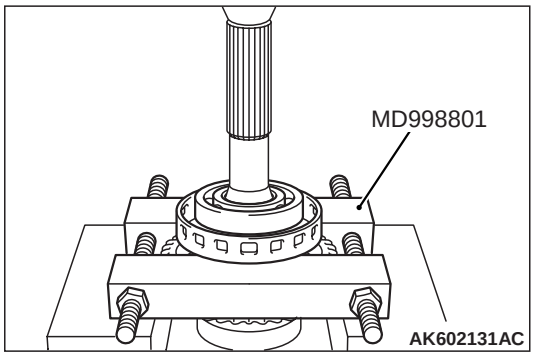


AK602130AC

		Disassembly steps
<<A>>	>>B<<	1. Ball bearing
		2. Sensor rotor
<<B>>	>>A<<	3. Ball bearing
		4. Front output shaft

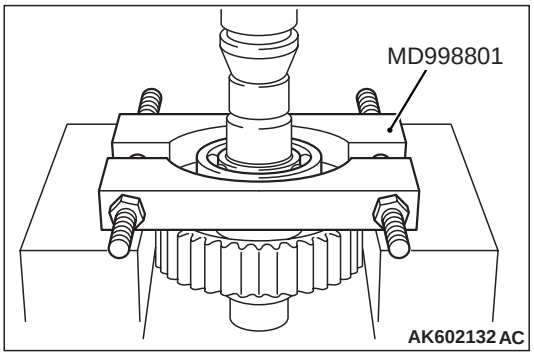
DISASSEMBLY SERVICE POINTS

<<A>> BALL BEARING REMOVAL



1. Use special tool Bearing remover (MD998801) to support the ball bearing.
2. Press the front output shaft with a press and remove the ball bearing with sensor rotor.

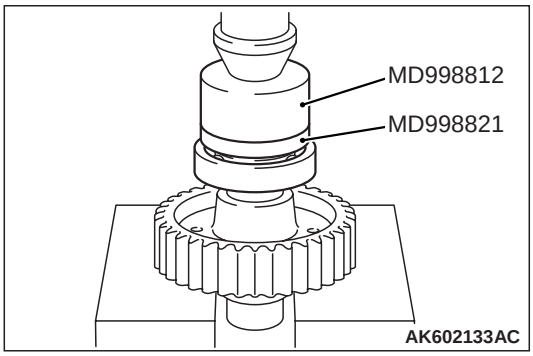
<<B>> BALL BEARING REMOVAL



1. Use special tool Bearing remover (MD998801) to support the ball bearing.
2. Press the front output shaft with a press and remove the ball bearing.

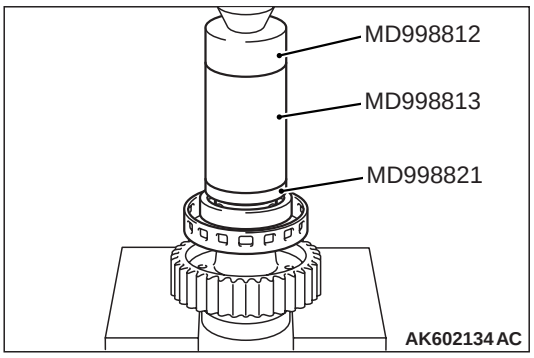
REASSEMBLY SERVICE POINTS

>>A<< BALL BEARING INSTALLATION



Use special tool to install the ball bearing.
- Installer cap (MD998812)
- Installer adapter (44) (MD998821)

>>B<< BALL BEARING INSTALLATION

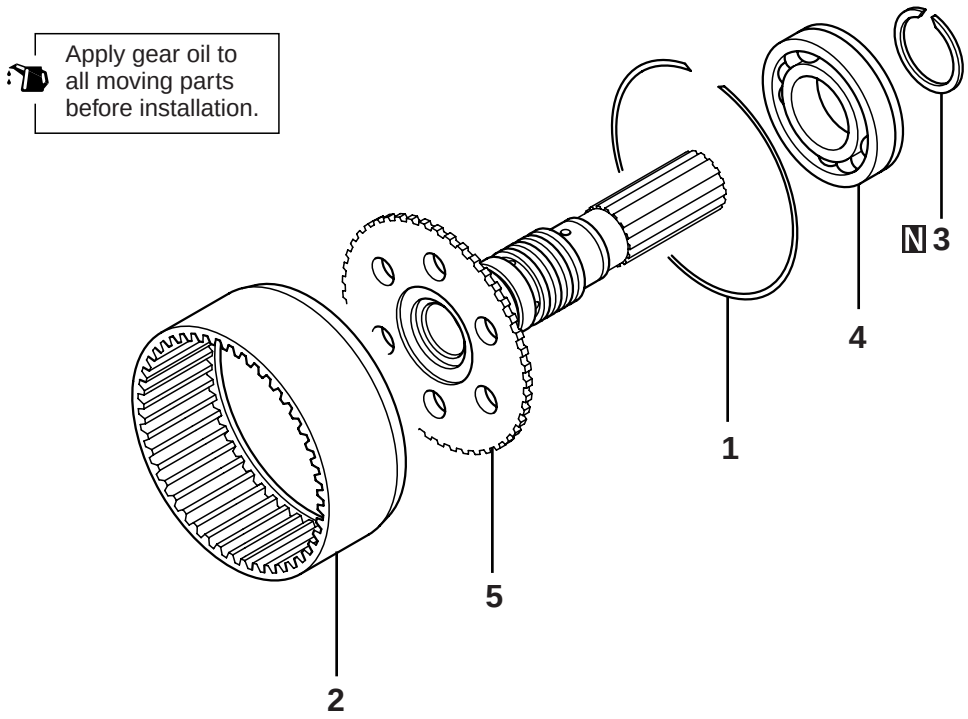


Use special tool to install the ball bearing with sensor rotor.
- Installer cap (MD998812)
- Installer-100 (MD998813)
- Installer adapter (44) (MD998821)

REAR OUTPUT SHAFT

DISASSEMBLY AND REASSEMBLY

M1233006400220

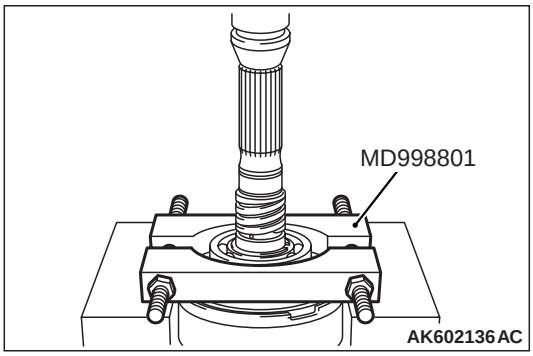


Disassembly steps

>>C<< 1. Snap ring
2. Annulus gear
>>B<< 3. Snap ring
<<A>> >>A<< 4. Ball bearing
5. Rear output shaft

DISASSEMBLY SERVICE POINT

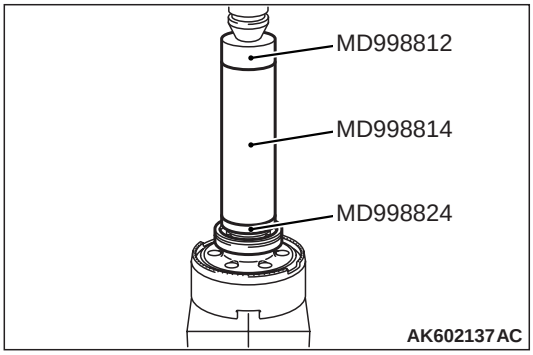
<<A>> BALL BEARING REMOVAL



Use special tool Bearing remover (MD998801), remove the ball bearing.

REASSEMBLY SERVICE POINTS

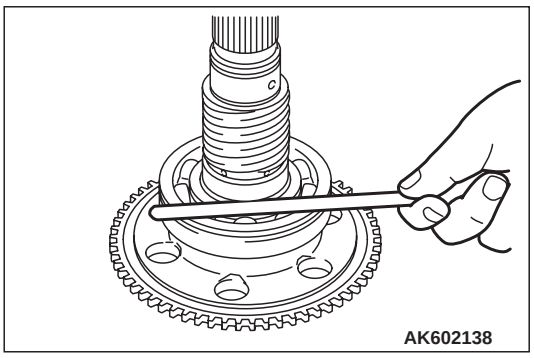
>>A<< BALL BEARING INSTALLATION



Use special tools to install the ball bearing.

- Installer cap (MD998812)
- Installer-200 (MD998814)
- Installer adapter (50) (MD998824)

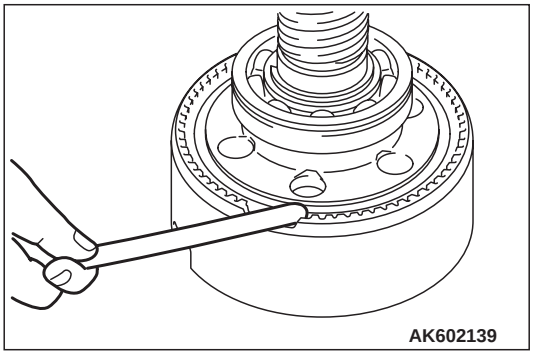
>>B<< SNAP RING INSTALLATION



Select and install a proper snap ring so that the end play of the rear output shaft bearing will have the standard value.

Standard value: 0 – 0.08 mm
(For rear output shaft bearing end play)

>>C<< SNAP RING INSTALLATION



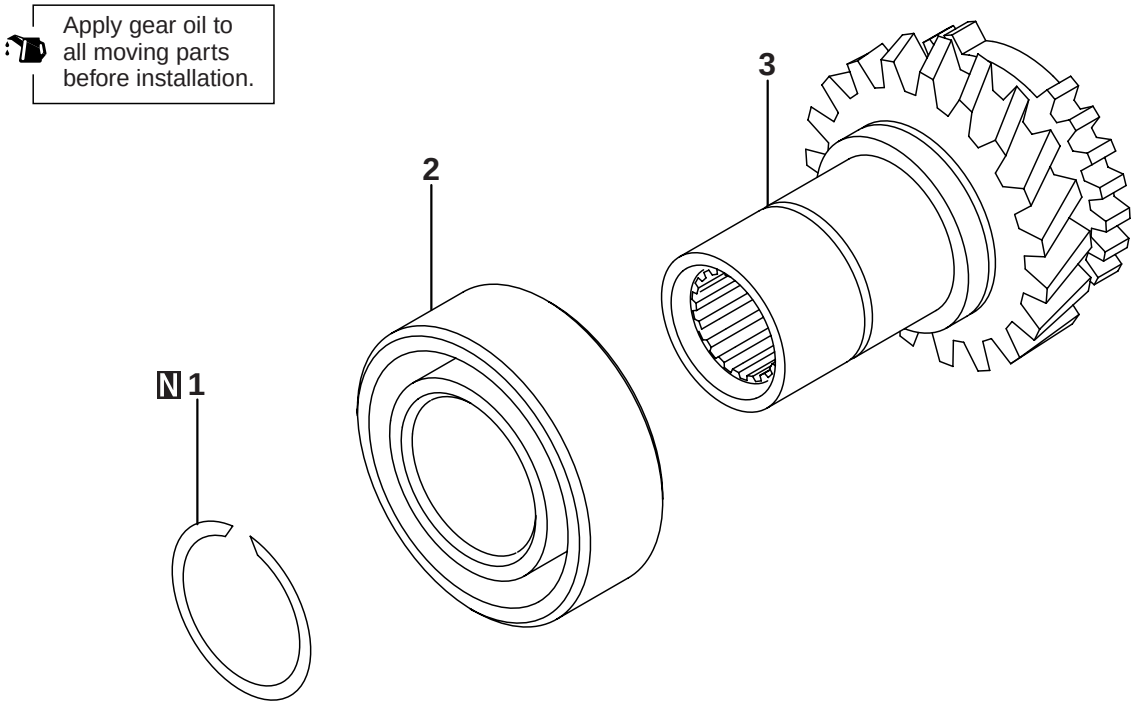
Select and install a proper snap ring so that the clearance between the annulus gear and rear output shaft will have the standard value.

Standard value: 0 – 0.08 mm
(For rear output shaft annulus gear end play)

INPUT GEAR

DISASSEMBLY AND REASSEMBLY

M1233015100272

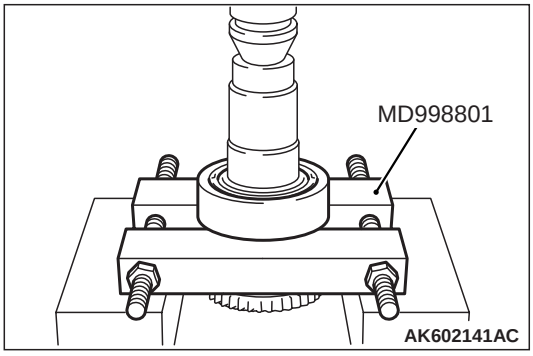


AK800993AB

		Disassembly steps
	>>B<<	1. Snap ring
<<A>>	>>A<<	2. Ball bearing
		3. Transfer input gear

DISASSEMBLY SERVICE POINT

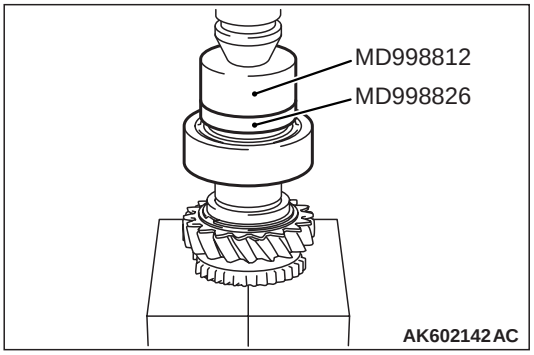
<<A>> BALL BEARING REMOVAL



Use special tool Bearing remover (MD998801) to remove the ball bearing.

REASSEMBLY SERVICE POINTS

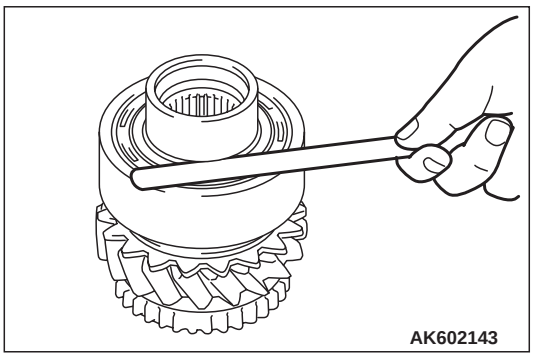
>>A<< BALL BEARING INSTALLATION



Use special tools to install the ball bearing.

- Installer cap (MD998812)
- Installer adapter (54) (MD998826)

>>B<< SNAP RING INSTALLATION



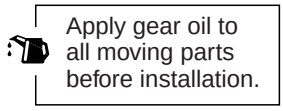
1. Install the thickest snap ring that can be fitted in the snap ring groove of the transfer input gear.
2. Make sure that the transfer input gear bearing end play meets the standard value.

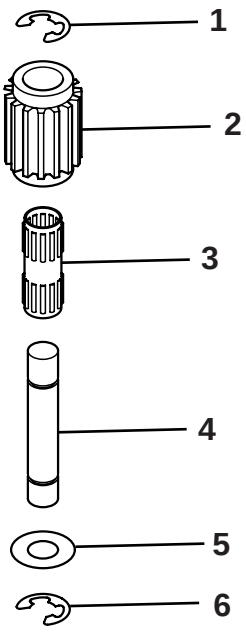
Standard value: 0 – 0.06 mm
(For input gear bearing end play)

SHIFTRAIL DRIVE GEAR

DISASSEMBLY AND REASSEMBLY

M1233030500051





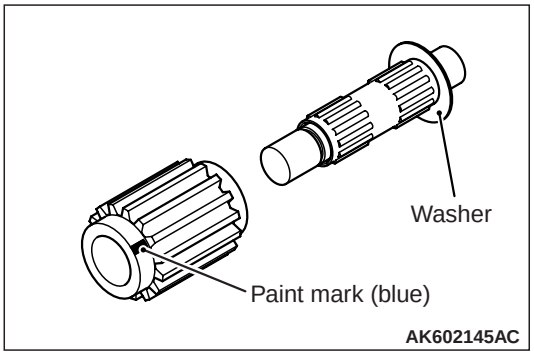
AK602144AC

Disassembly steps

	1.	Spring pin
>>A<<	2.	Shift rail drive gear
	3.	Bearing
	4.	Shift rail drive gear shaft
	5.	Washer
	6.	Spring pin

REASSEMBLY SERVICE POINT

>>A<< SIFT RAIL DRIVE GEAR INSTALLATION



Install the shift rail drive gear such that its mark does not face the washer.

GROUP 25

PROPELLER SHAFT

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PROPELLER SHAFT DISASSEMBLY AND REASSEMBLY 25-10

GENERAL INFORMATION

M1251000100562

<2WD>

- A 2 way split 3-joint type propeller shaft with centre bearing is adopted.
- A snap ring method of securing the journal bearing for the universal joint is adopted.

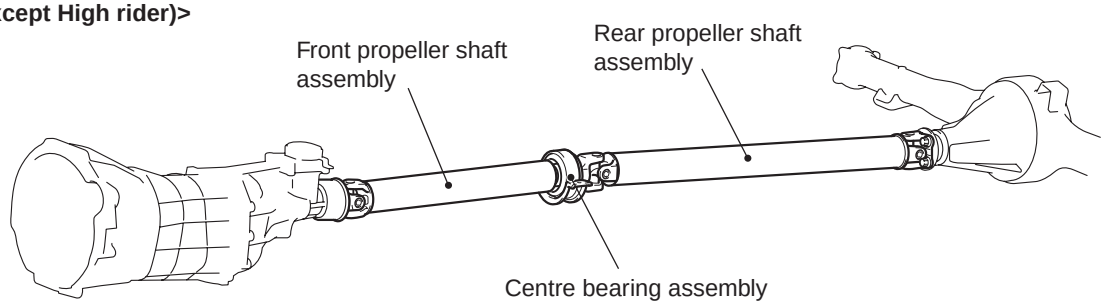
<4WD>

- A 2-joint type propeller shaft for front propeller shaft, a 2 way split 3-joint type propeller shaft with centre bearing for rear propeller shaft are adopted. <Vehicles with Easy select 4WD-M/T>
- A 2-joint type propeller shaft for front propeller shaft, a 2-joint type propeller shaft for rear propeller shaft are adopted. <Vehicles with Easy select 4WD-A/T, Vehicles with Super select 4WD>
- A snap ring method of securing the journal bearing for the universal joint is adopted.
- BJ is adopted for front propeller shaft. <Vehicles with Super select 4WD>

NOTE: BJ: Birfield Joint

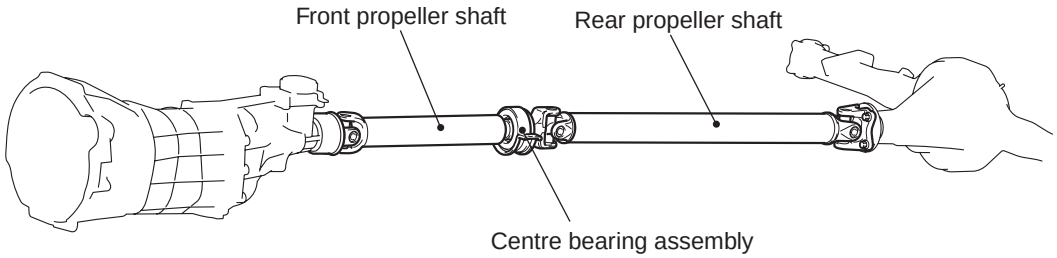
CONSTRUCTION DIAGRAM

<2WD (except High rider)>



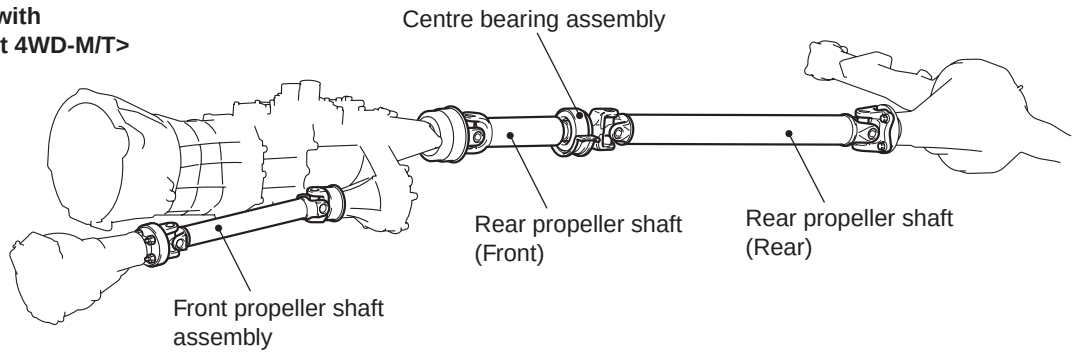
AC407335AC

<2WD (High rider)>



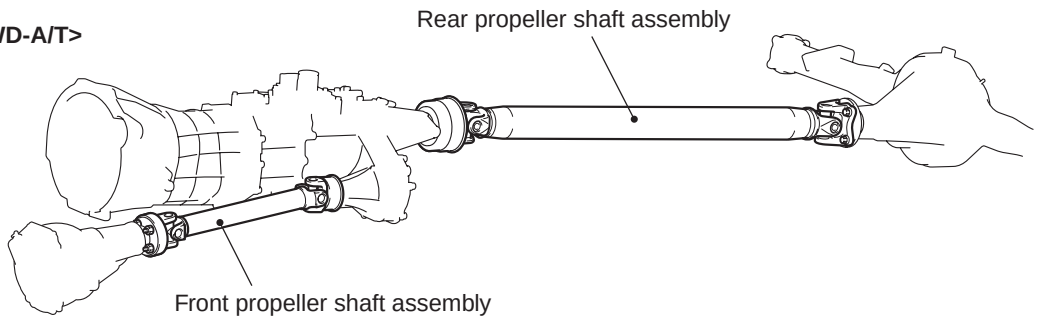
AC607601AE

<Vehicles with Easy select 4WD-M/T>



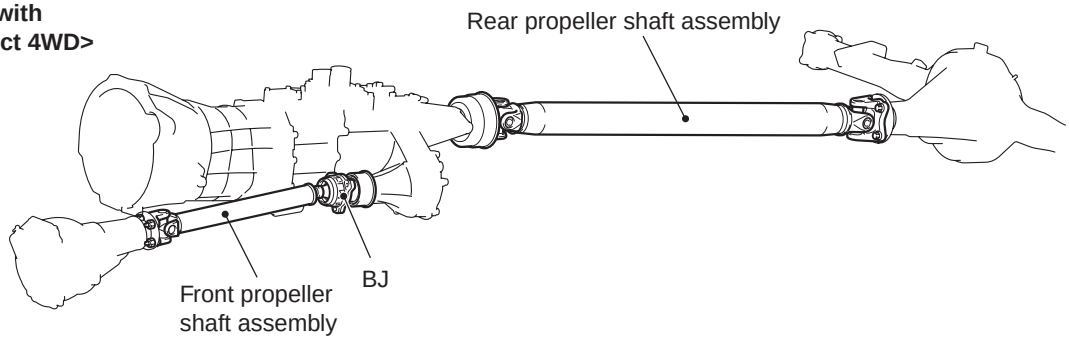
AC407336 AC

<Vehicles with Easy select 4WD-A/T>



AC407337AE

<Vehicles with Super select 4WD>



AC510097AB

SERVICE SPECIFICATIONS

M1251000300265

Item	Standard value	Limit
Propeller shaft run-out mm	–	0.6
Clearance between snap ring and snap ring groove mm	0.06 or less	–

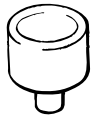
LUBRICANT

M1251000400347

Item	Specified lubricant	Quantity
Sleeve yoke	Gear oil API classification GL-3 SAE 75W-85	As required

SPECIAL TOOLS

M1251000600266

Tool	Number	Name	Use
MB990810	MB990810	Side bearing puller	Centre bearing removal
MB990840	MB990840	Universal joint remover and installer	Disassembly and reassembly of universal joint
 MB991410	MB991410	Collar	

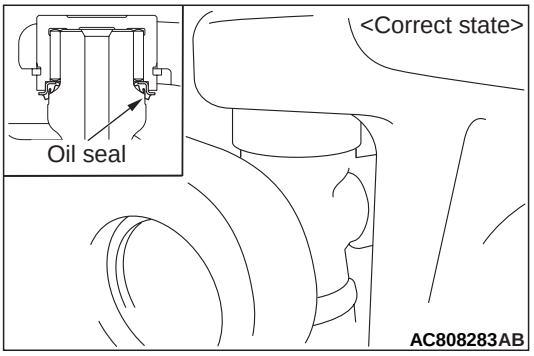
ON-VEHICLE SERVICE

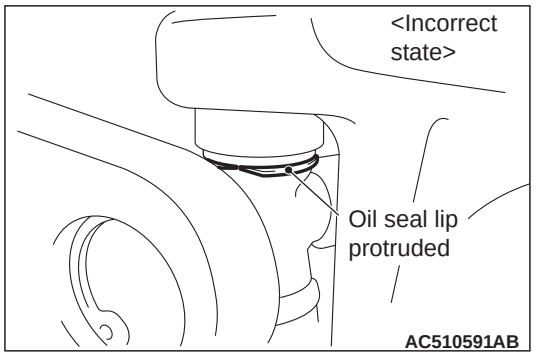
PROPELLER SHAFT UNIVERSAL JOINT CHECK

M1251002400086

PROPELLER SHAFT VISUAL CHECK

1. Place the gearshift lever to the "N" (neutral position) <M/T> or the selector lever to the "N" position <A/T>.
2. Then place the transfer shift lever to the "2WD" position. <4WD>
3. Check the propeller shaft for dent, damage or crack.

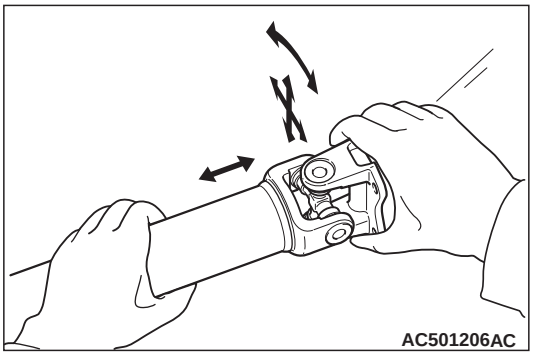




4. Check the propeller shaft universal joint, oil seal for crack or damage. If abnormality is recognized, replace the universal joint with a new one.

PROPELLER SHAFT UNIVERSAL JOINT PLAY CHECK

1. Place the gearshift lever to the "N" (neutral position) <M/T> or the selector lever to the "N" position <A/T>.
2. Then place the transfer shift lever to the "2WD" position. <4WD>



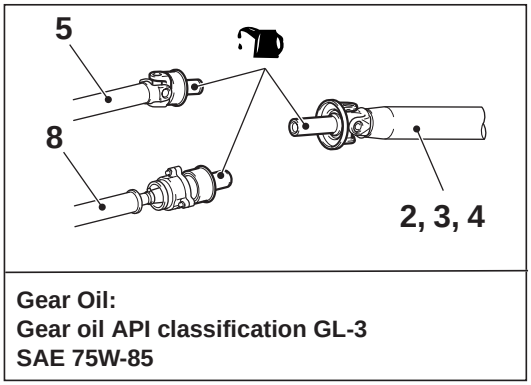
3. Hold the tube of propeller shaft by one hand, and apply force by the other hand to the flange yoke or sleeve yoke in rotating direction, axial direction, and perpendicular direction for checking looseness. If looseness is recognized, replace the universal joint with a new one.

PROPELLER SHAFT

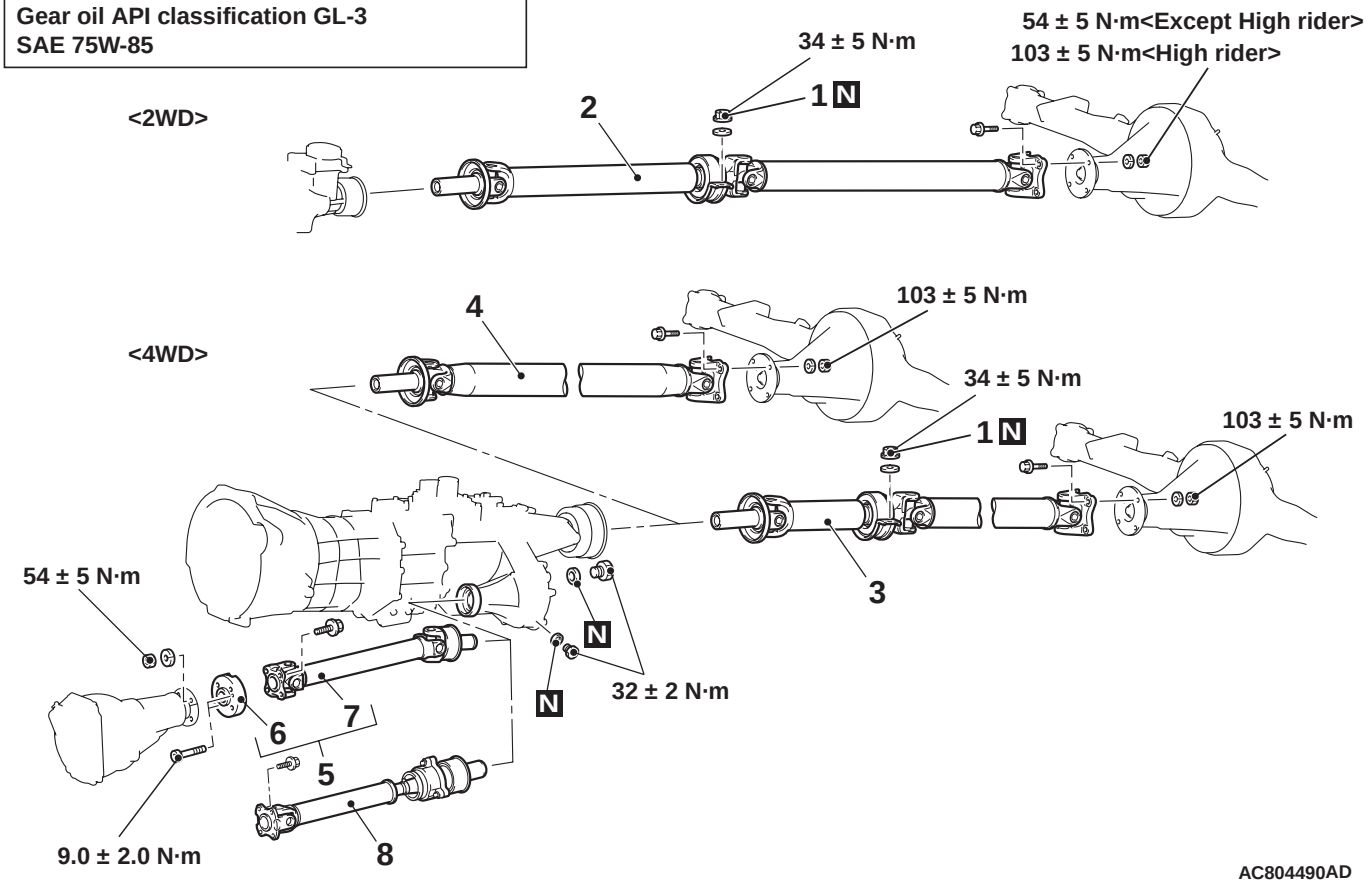
REMOVAL AND INSTALLATION

M1251001001118

Pre-removal Operation	Post-installation Operation
• Transmission Oil Draining (Refer to GROUP 22A, On-vehicle service , GROUP 23A,On-vehicle service.) • Set the Transfer Shift Lever to "2H." <4WD> • Transfer Gear Oil Draining (Refer to GROUP 22A, On-vehicle service , GROUP 23A,On-vehicle service .) <4WD>	• Transfer Gear Oil Supplying (Refer to GROUP 22A, On-vehicle service , GROUP 23A,On-vehicle service .) <4WD> • Transmission Oil Supplying (Refer to GROUP 22A, On-vehicle service , GROUP 23A,On-vehicle service.)



Gear Oil:
Gear oil API classification GL-3
SAE 75W-85



AC804490AD

Removal steps

1. Self-locking nut
<<**A**>> >>**A**<< 2. Propeller shaft assembly
<<**A**>> >>**A**<< 3. Rear propeller shaft assembly <Vehicles with Easy select 4WD-M/T>

Removal steps (Continued)

<<**A**>> >>**A**<< 4. Rear propeller shaft assembly <Vehicles with Easy select 4WD-A/T, Vehicles with Super select 4WD>
<<**A**>> >>**A**<< 5. Front propeller shaft assembly <Vehicles with Easy select 4WD>
6. Spacer <Vehicles with Easy select 4WD>

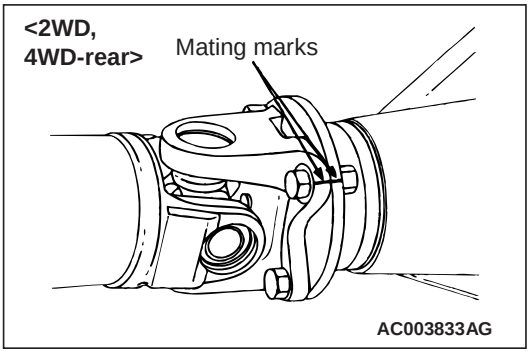
Removal steps (Continued)

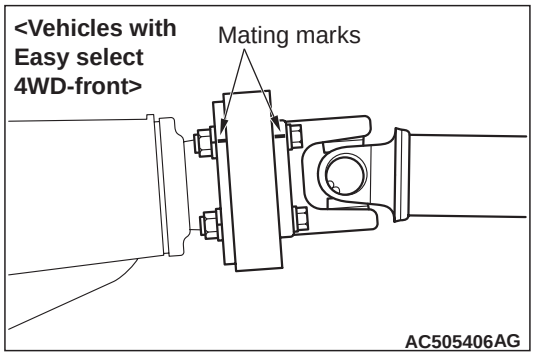
7. Front propeller shaft <Vehicles with Easy select 4WD>

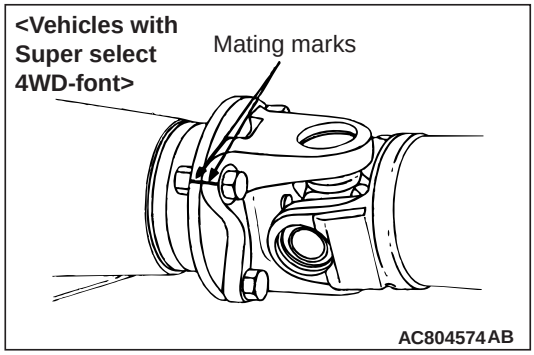
<<**A**>> >>**A**<< 8. Front propeller shaft assembly <Vehicles with Super select 4WD>

REMOVAL SERVICE POINT

<<A>> PROPELLER SHAFT ASSEMBLY/REAR PROPELLER SHAFT ASSEMBLY/FRONT PROPELLER SHAFT ASSEMBLY REMOVAL







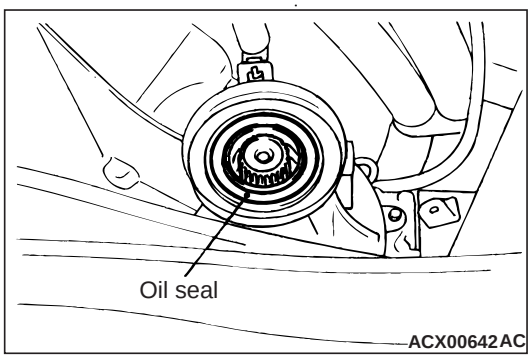
Make mating marks on the differential companion flange and flange yoke and remove the propeller shaft.

INSTALLATION SERVICE POINT

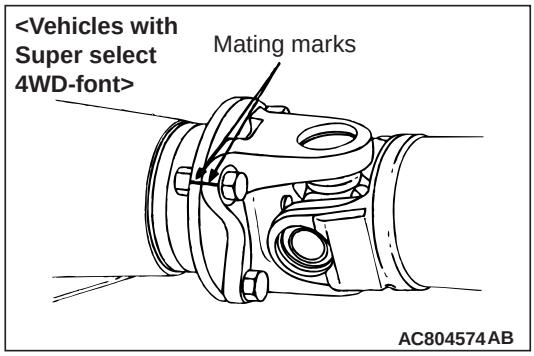
>>A<< FRONT PROPELLER SHAFT ASSEMBLY/ REAR PROPELLER SHAFT ASSEMBLY/PROPELLER SHAFT ASSEMBLY INSTALLATION

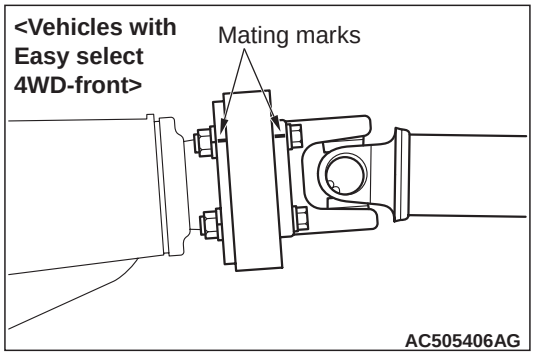
⚠ CAUTION

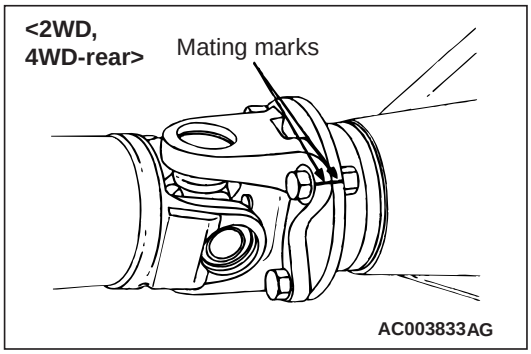
- **Tighten the installation bolts after removing oil and grease from threads to prevent them from loosening due to lubrication.**



Be careful not to damage the lip section of the transmission case or transfer case oil seal when installing the propeller shaft.







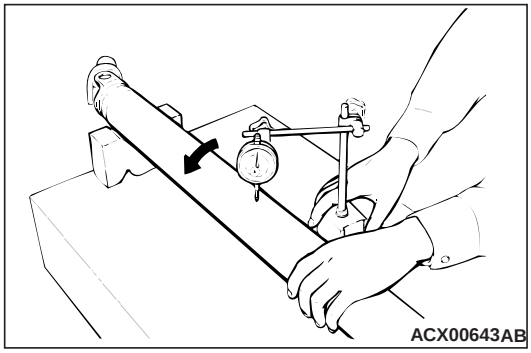
1. To reuse the propeller shaft, align the mating marks that were made during removal, and then install the propeller shaft assembly to the companion flange.
2. When installing a new rear propeller shaft assembly, if there is no phase alignment mark on the companion flange at the differential side, assemble while adjusting the hole phases of propeller shaft flange and differential companion flange.

INSPECTION

M1251001100394

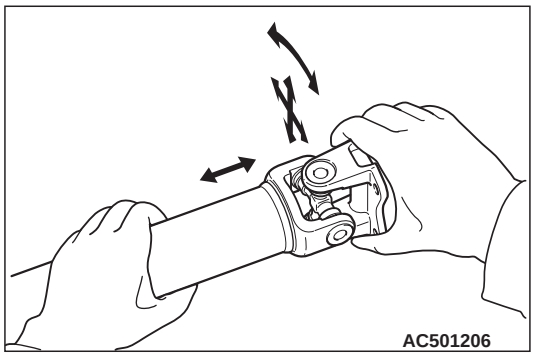
- Check the sleeve yoke, centre yoke and flange yoke for wear, damage or cracks.
- Check the propeller shaft for bends, twisting or damage.
- Check the universal joint for smooth operation in all directions.
- Check the centre bearing for smooth movement.

PROPELLER SHAFT RUN-OUT



Limit: 0.6 mm

PROPELLER SHAFT UNIVERSAL JOINT PLAY CHECK

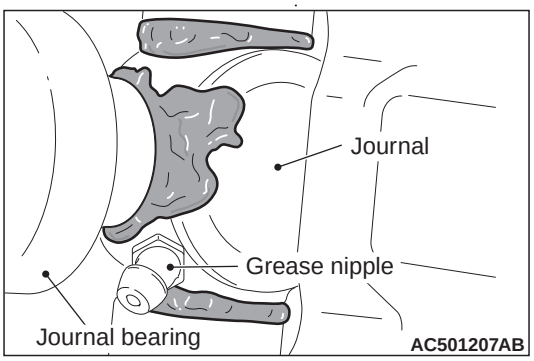


1. Hold the tube of propeller shaft by one hand, and apply force by the other hand to the flange yoke or sleeve yoke in rotative direction, axial direction, and perpendicular direction for checking looseness.
2. If looseness is recognized, perform service work or replace the propeller shaft with a new one.

PROPELLER SHAFT UNIVERSAL GREASE CHECK

Perform grease-up with a grease gun, and check the grease ejected from the oil seal when grease-up is completed.

Judgement standard



If blackish grease is evenly ejected from the oil seal periphery, it is normal.

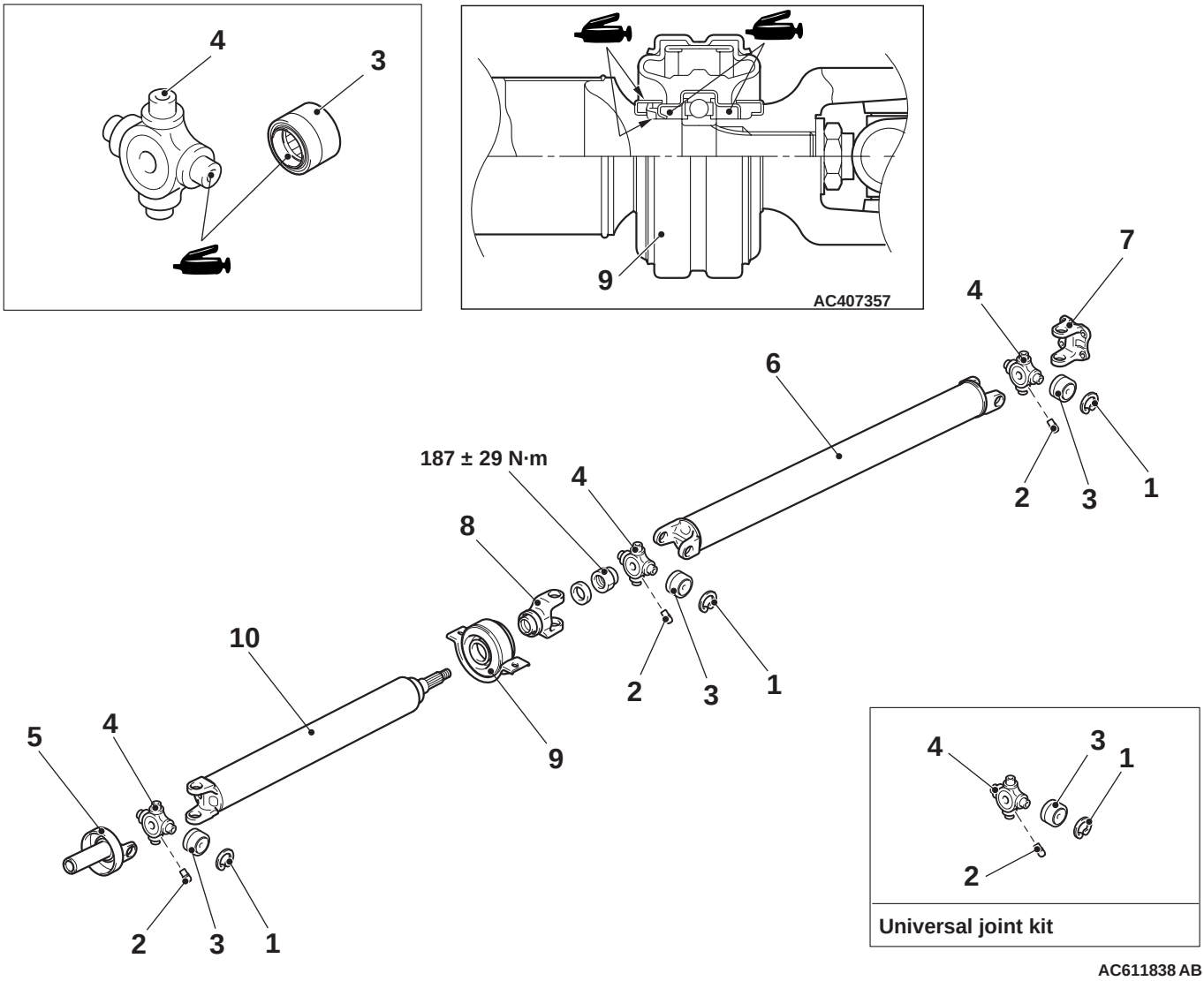
- If non-discoloured grease is ejected from the specific area (partially), the grease amount is insufficient and the oil seal is worn. Perform service work or replace the propeller shaft with a new one.
- If the white cloudy grease is ejected, water has been mixed in grease. Replace the propeller shaft with a new one.

DISASSEMBLY AND REASSEMBLY

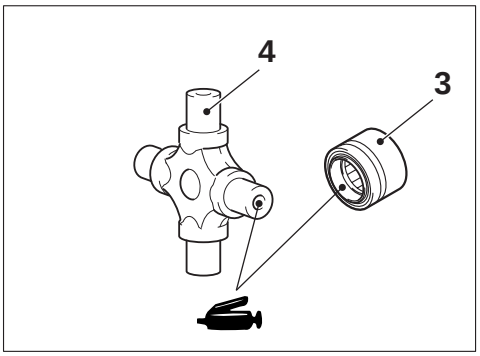
M1251001200625

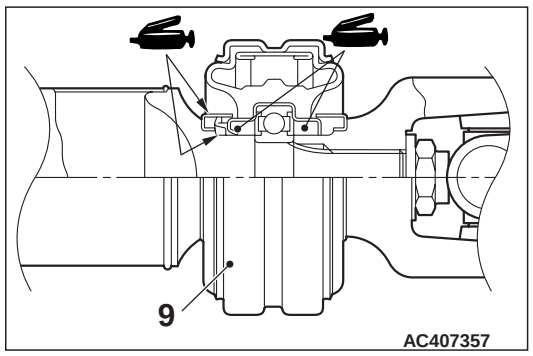
<2WD>

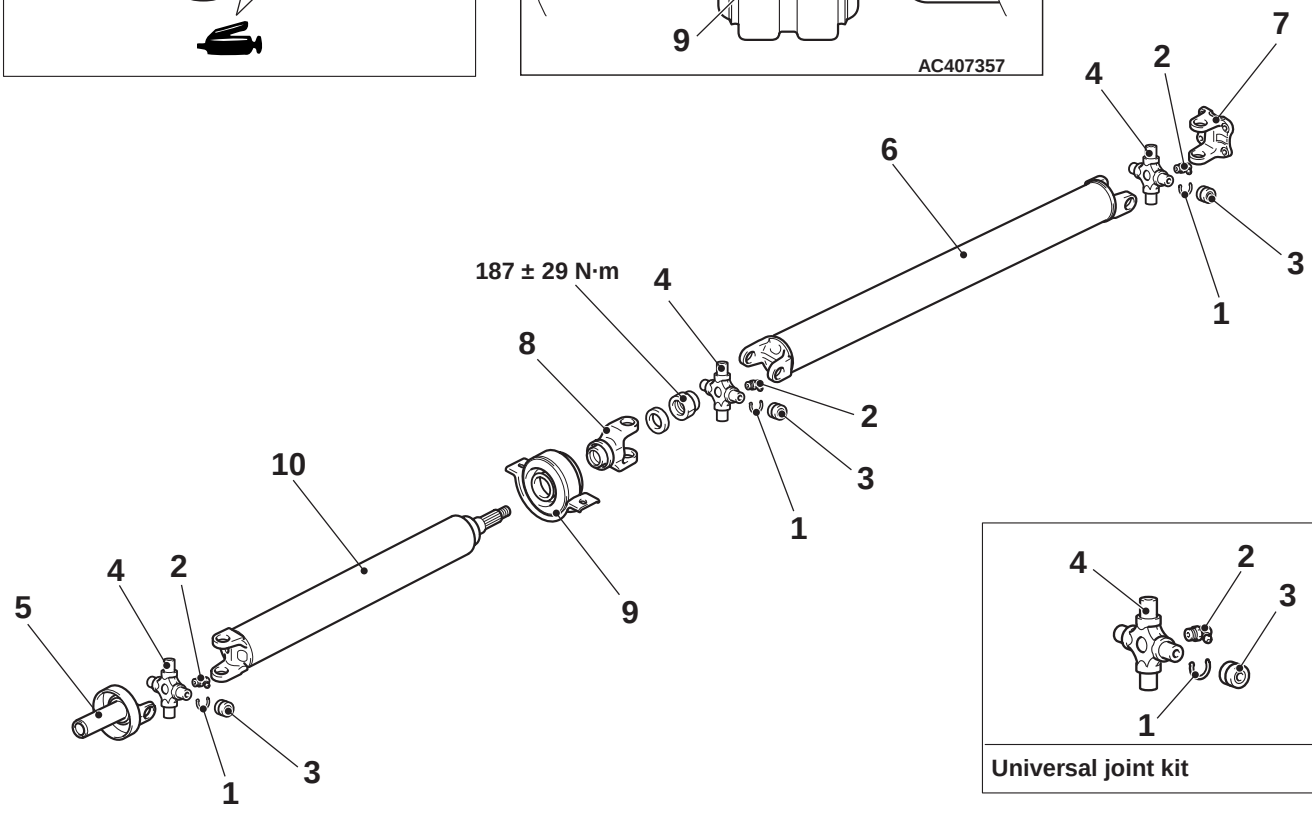
<Except High rider>

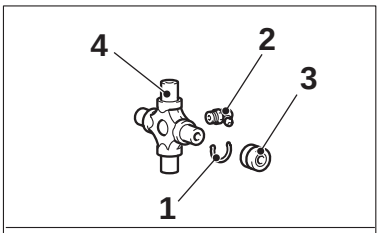


<High rider>









Universal joint kit

AC807773AB

Disassembly steps

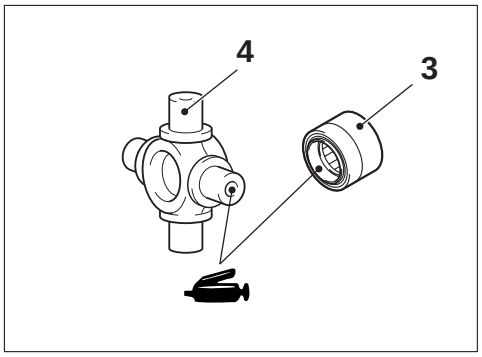
<<A>>	>>C<<	1.	Snap ring
		2.	Grease nipple
<<B>>	>>B<<	3.	Journal bearing
	>>B<<	4.	Journal
		5.	Sleeve yoke

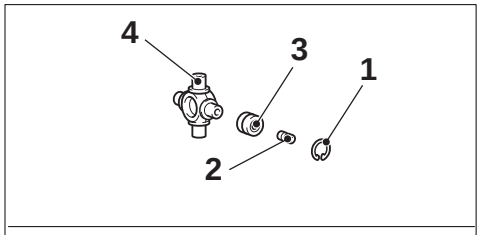
Disassembly steps (Continued)

		6.	Rear propeller shaft
		7.	Flange yoke
<<C>>	>>A<<	8.	Centre yoke
<<D>>	>>A<<	9.	Centre bearing assembly
		10.	Front propeller shaft

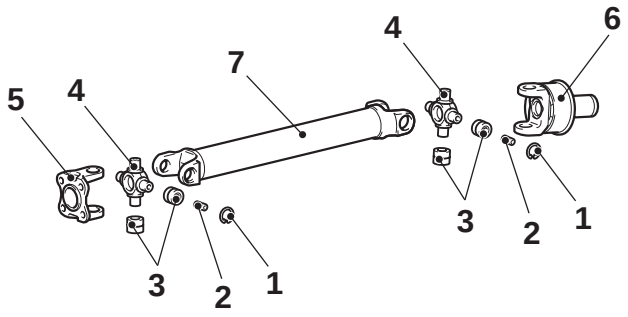
<4WD>

<Front propeller shaft: Vehicles with Easy select 4WD>



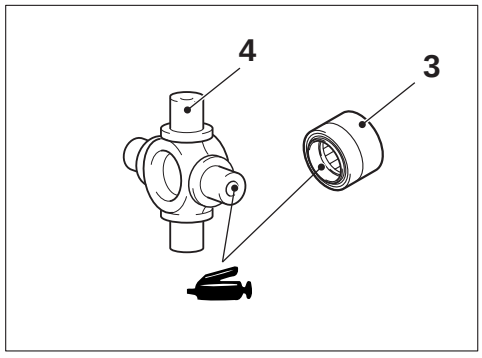


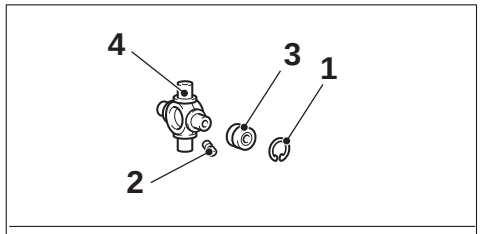
Universal joint kit



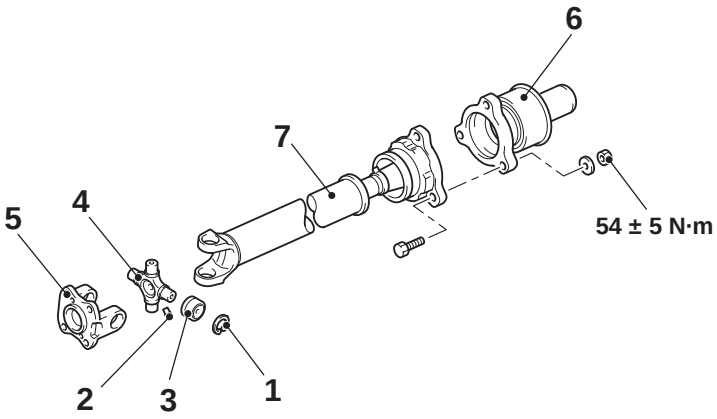
AC611900AC

<Front propeller shaft: Vehicles with Super select 4WD>



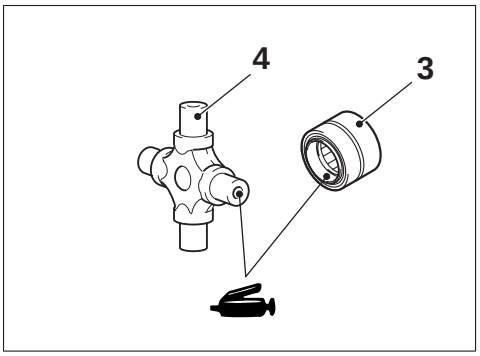


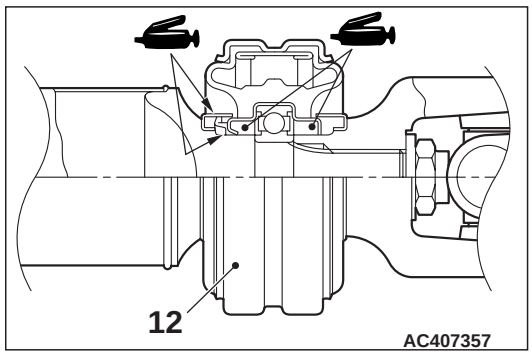
Universal joint kit



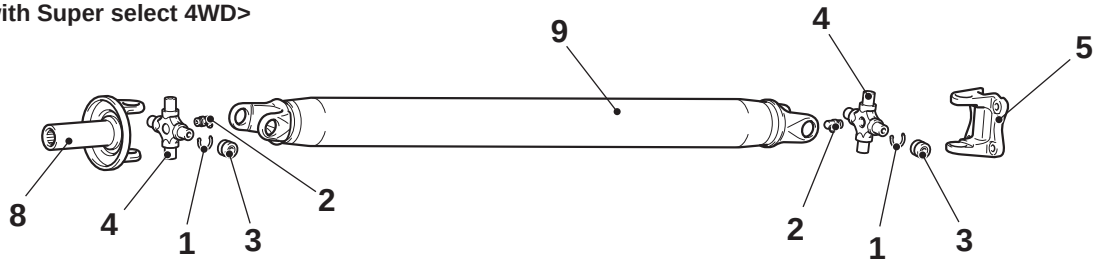
AC800360AC

<Rear propeller shaft>

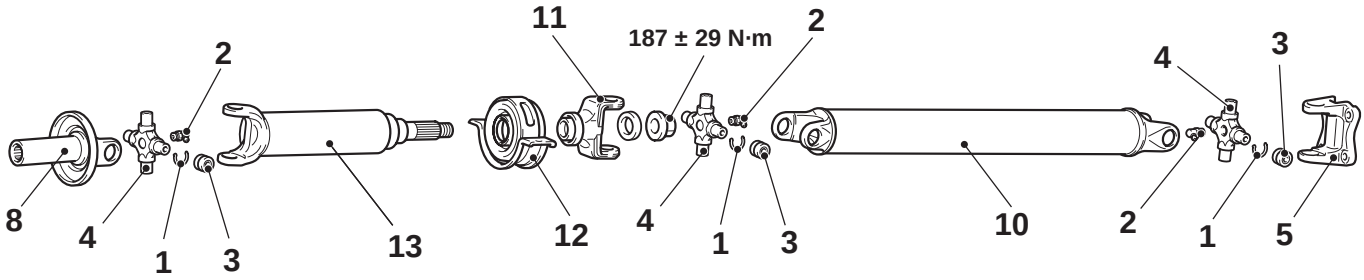


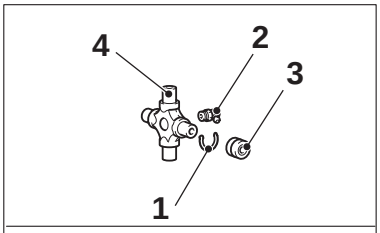


**<Vehicles with Easy select 4WD-A/T,
Vehicles with Super select 4WD>**



<Vehicles with Easy select 4WD-M/T>





Universal joint kit

AC800582 AB

Disassembly steps

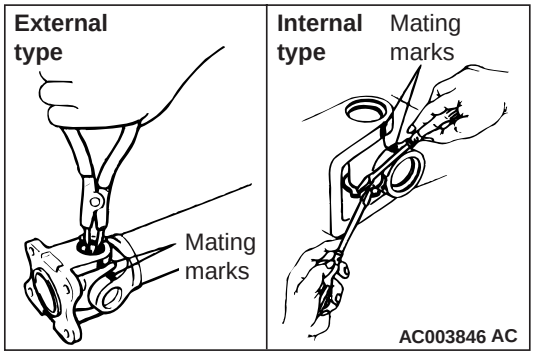
<<A>>	>>C<<	1.	Snap ring
		2.	Grease nipple
<<B>>	>>B<<	3.	Journal bearing
	>>B<<	4.	Journal
		5.	Flange yoke
		6.	Sleeve yoke
		7.	Front propeller shaft

Disassembly steps (Continued)

		8.	Sleeve yoke
		9.	Rear propeller shaft
		10.	Rear propeller shaft (rear)
<<C>>	>>A<<	11.	Centre yoke
<<D>>	>>A<<	12.	Centre bearing assembly
		13.	Rear propeller shaft (front)

DISASSEMBLY SERVICE POINTS

<<A>> SNAP RING REMOVAL

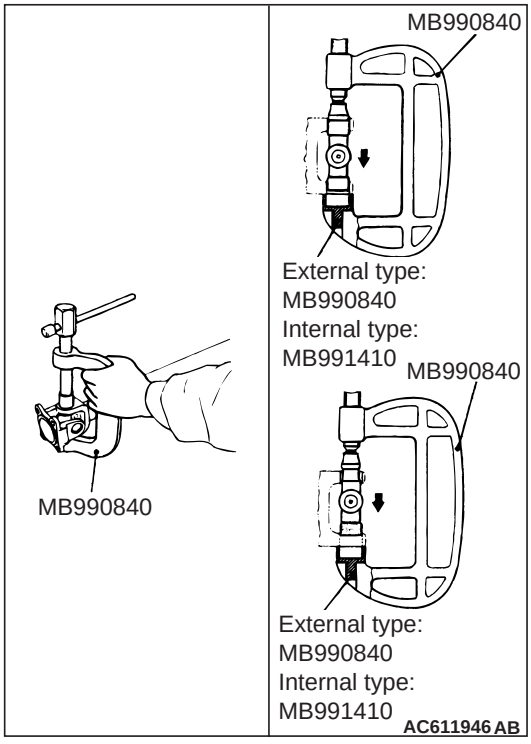


Make mating marks on the flange yoke and propeller shaft. Then, remove the snap rings.

<<B>> JOURNAL BEARING REMOVAL

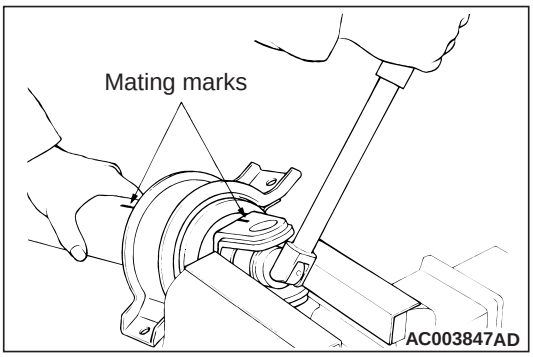
⚠ CAUTION

Do not tap the journal bearings to remove them, as this will upset the balance of the propeller shaft.



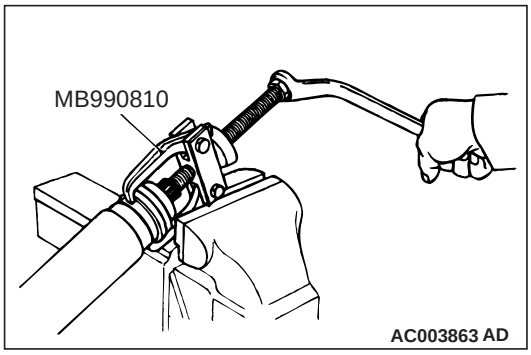
1. Use the following special tools to press in the journal bearing on one side, and take out the journal bearing on the opposite side.
   - Universal joint remover and installer (MB990840)
   - Collar (MB991410)
2. Insert the special tools into the other side and press the journal to remove the first journal bearing that was pushed.

<<C>> CENTRE YOKE REMOVAL



Make mating marks on the centre yoke and propeller shaft, and then remove the centre yoke.

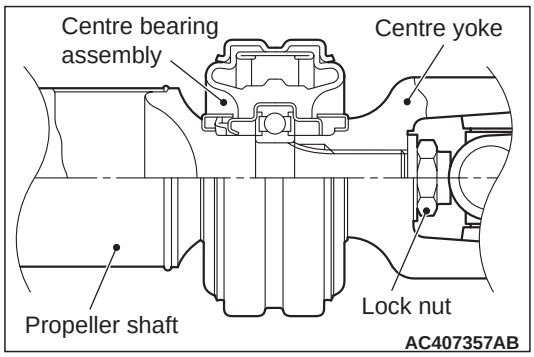
<<D>>CENTRE BEARING ASSEMBLY REMOVAL



After removing the rubber mount, use special tool side bearing puller (MB990810) to remove the centre bearing assembly.

REASSEMBLY SERVICE POINTS

>>A<<CENTRE BEARING ASSEMBLY/CENTRE YOKE INSTALLATION

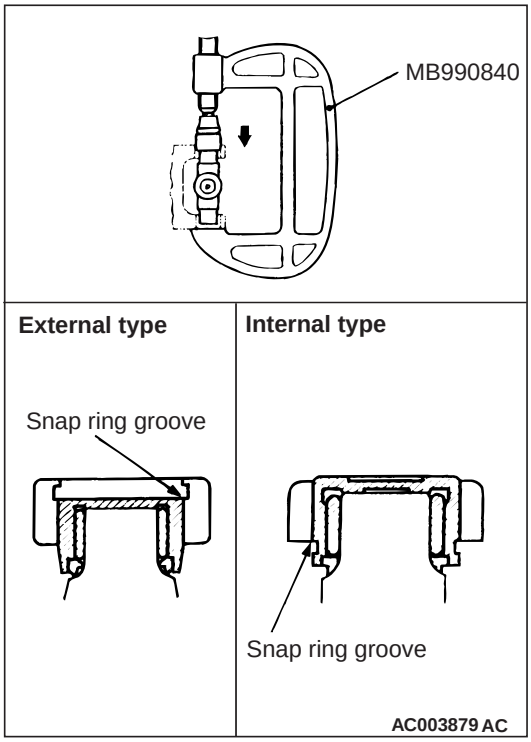


1. Set the centre bearing assembly in the direction shown in the figure and install it to the propeller shaft.
2. Install, lining up the mating marks on the centre yoke and the propeller shaft.
3. While tightening the nut, install the centre bearing assembly with the centre yoke.

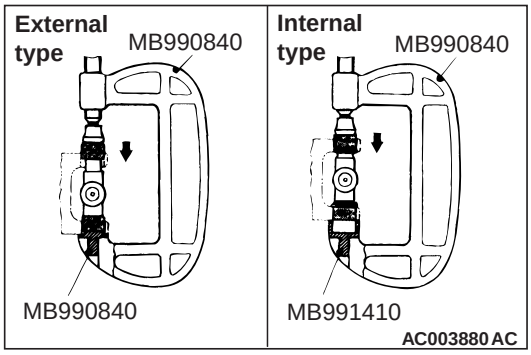
>>B<< JOURNAL/JOURNAL BEARING INSTALLATION

⚠ CAUTION

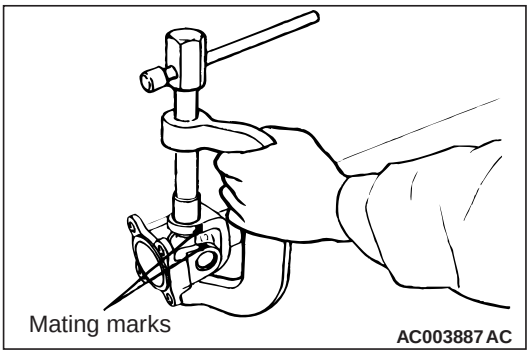
Be careful when pressing the journal bearings. If they are pressed at an angle, the inside of the journal bearings will be damaged.



1. Use special tool universal joint remover and installer (MB990840) to press the journal bearing into the centre yoke, sleeve yoke or flange yoke until the snap ring groove is fully visible.

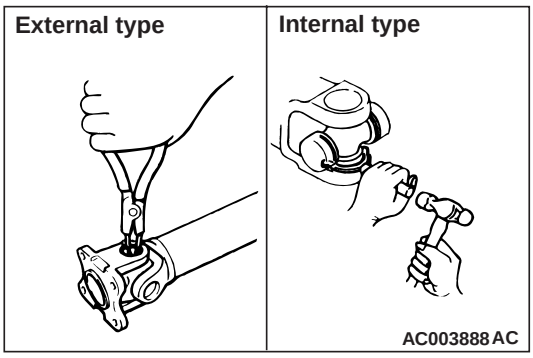


2. Use the following special tools to press the opposite side journal bearing into the yoke.
   - Universal joint remover and installer (MB990840)
   - Collar (MB991410)

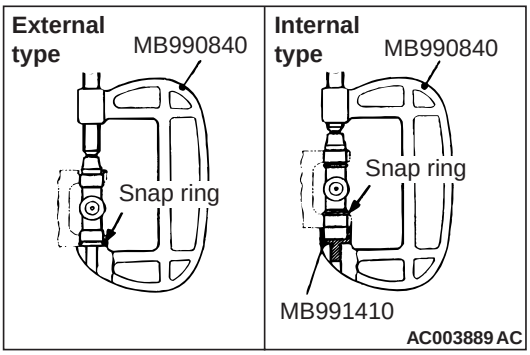


3. Align the mating marks on the yoke and propeller shaft, and install the propeller shaft journal bearings.

>>C<< SNAP RING INSTALLATION



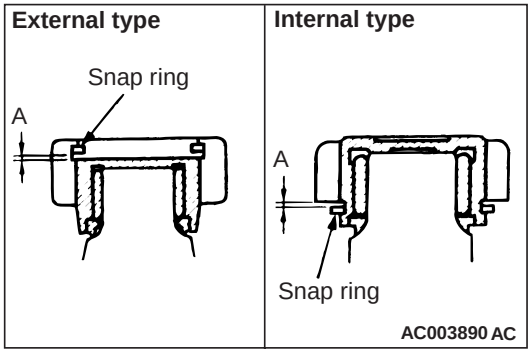
1. Install a snap ring to one side of the journal.



2. Use the following special tools at the opposite side of the installed snap ring to press in the journal bearing toward the snap ring.
   - Universal joint remover and installer (MB990840)
   - Collar (MB991410)

⚠ CAUTION

Always use snap rings of equal thickness on both sides.



3. Install the snap ring on the opposite side, and measure the clearance of the snap ring groove with a thickness gauge.

   Standard value (A): 0.06 mm or less

4. If the clearance exceeds the standard value, adjust by changing the thickness of the snap ring.

Thickness type 1 (mm)	Thickness type 2 (mm)	Identification colour
1.28	1.50	–
1.31	1.55	Yellow
1.34	1.60	Blue
1.37	1.65	Purple
1.40	–	Brown
–	1.70	Black
–	1.75	Grey
–	1.80	Brown
–	1.85	Blue
–	1.90	–

GROUP 26

FRONT AXLE

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GENERAL INFORMATION

M1261000101555

<2WD>

- The front hub assembly which uses a unit bearing (double tapered roller bearing) is mounted on the knuckle.
- ABS rotor for detecting the wheel speed is press-fitted into the front hub. <Vehicles with ABS>

<4WD>

The front axle consists of the front hub assembly, driveshaft, inner shaft, front differential, and it has the following features:

- A free-wheel mechanism that allows changeover between 2WD and 4WD while the vehicle is travelling.
- The wheel bearing uses a unit bearing (double tapered roller bearing) with strong transverse load bearing ability.
- The driveshaft incorporates BJ-DOJ type constant velocity joints with high transmission efficiency for low vibration and noise.
- Due to the use of the inner shaft, the right and left driveshafts are approximately the same in length. This reduces noise, vibration and torque steer.
- ABS rotor for detecting the wheel speed is press-fitted to the BJ outer wheel. <Vehicles with ABS>

BJ: Birfield Joint
DOJ: Double Offset Joint

SPECIFICATIONS

<2WD>

Item			**Specification**
Wheel bearing	Type		Unit bearing (double taper roller bearing)
	Bearing (OD × ID) mm	Except High rider	75 × 40
		High rider	88 × 50

<4WD>

Item			**Specification**	
			Vehicles with Easy select 4WD	**Vehicles with Super select 4WD**
Wheel bearing	Type		Unit bearing (double tapered roller bearing)	Unit bearing (double tapered roller bearing)
	Bearing (OD × ID) mm		88 × 50	88 × 50
Driveshaft	Joint type	Outer	BJ	BJ
		Inner	DOJ	DOJ
	Length (joint to joint) × diameter mm	LH	323 × 24	323 × 24
		RH	327.6 × 24	327.6 × 24
Inner shaft	Length × diameter mm		342.7 × 31.5	342.7 × 31.5
	Bearing (OD × ID) mm		62 × 35	62 × 35

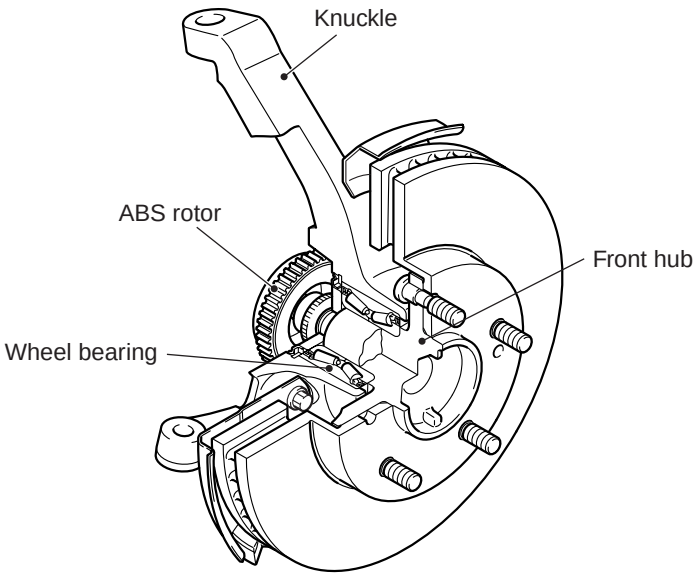
Item			Specification	
			Vehicles with Easy select 4WD	Vehicles with Super select 4WD
Differential	Reduction gear type		Hypoid gear	Hypoid gear
	Reduction ratio		3.917	4.100*1, 3.917*2
	Differential gear type (Type × number of gears)	Side gear	Straight bevel gear × 2	Straight bevel gear × 2
		Pinion gear	Straight bevel gear × 2	Straight bevel gear × 2
	Number of teeth	Drive gear	47	41*1, 47*2
		Drive pinion	12	10*1, 12*2
		Side gear	14	14
		Pinion gear	10	10
	Bearing (OD × ID) mm	Side	80.0 × 45.2	80.0 × 45.2
		Front	68.3 × 30.2	68.3 × 30.2
		Rear	76.2 × 36.5	76.2 × 36.5

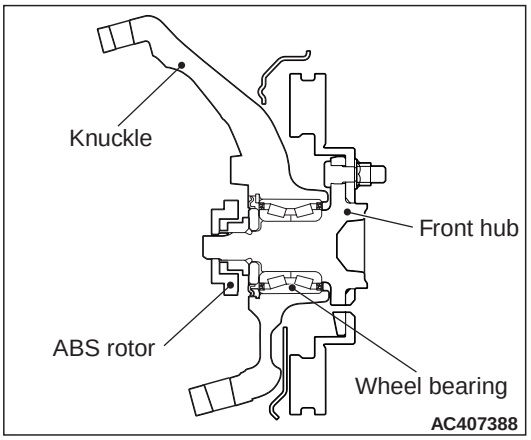
NOTE:

- **1: Vehicles for Europe (4AT) and Russia*
- **2: Vehicles for Europe (Except 4AT)*

CONSTRUCTION DIAGRAM

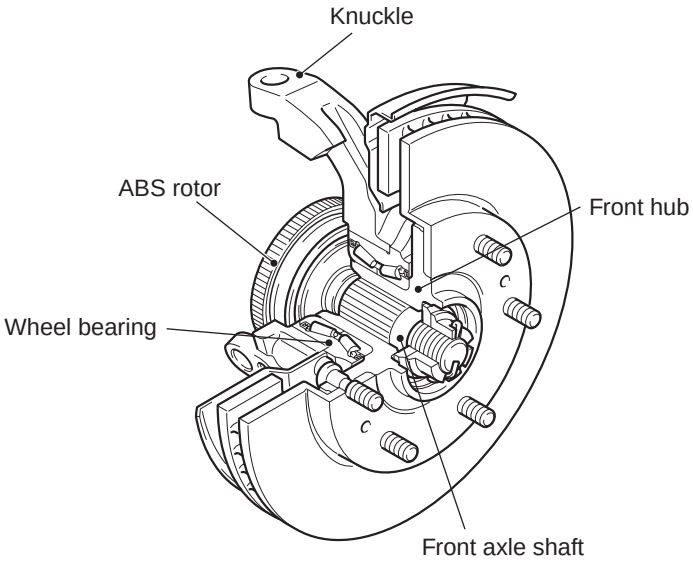
<Except High rider>

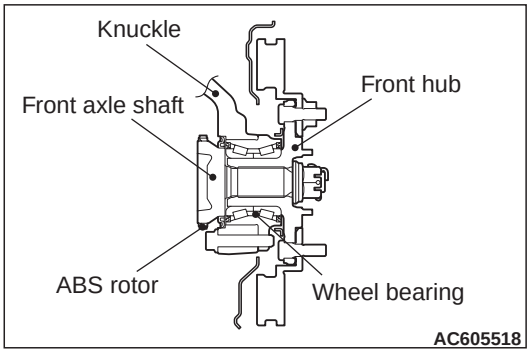




AC407387AC

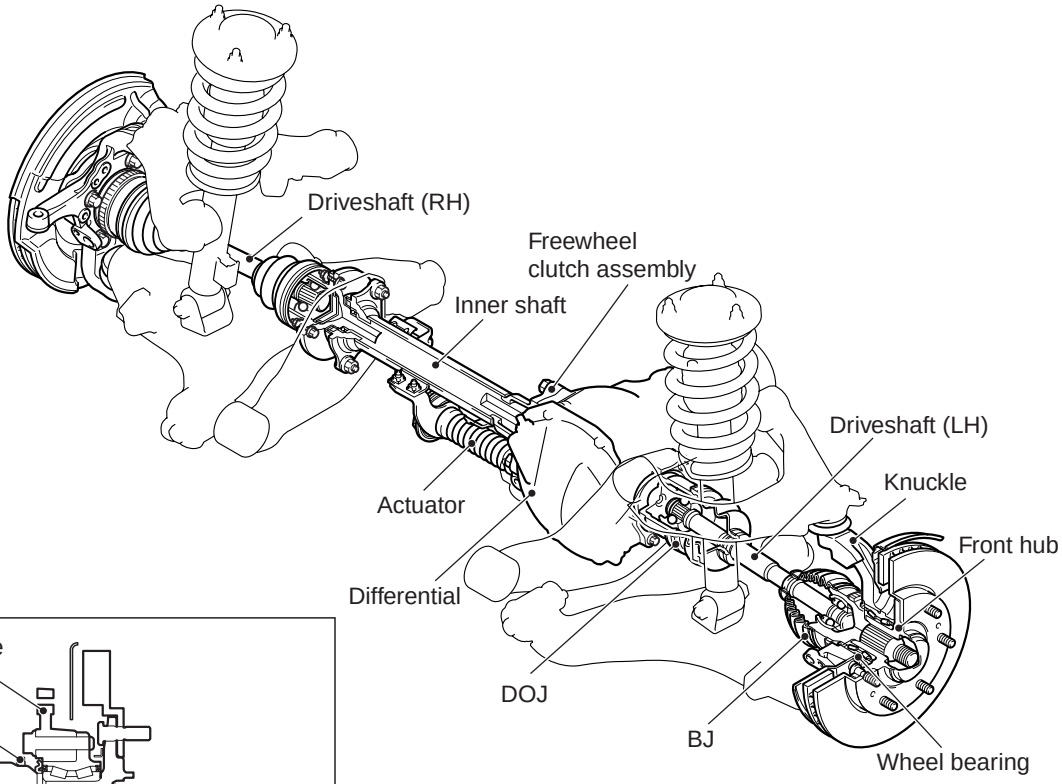
<High rider>

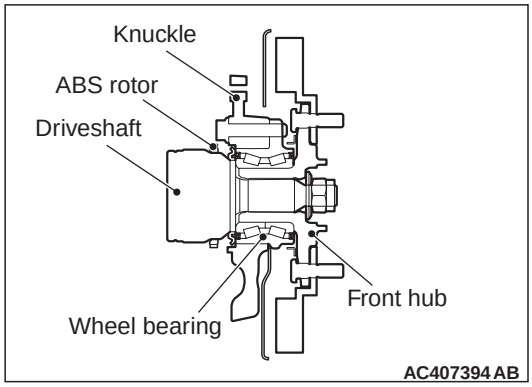




AC605517AB

<4WD>





AC805155AB

SERVICE SPECIFICATIONS

M1261000301258

Item			Standard value	Limit
Front axle total backlash <4WD> mm			–	11
Solenoid valve resistance <4WD> Ω			36 – 46	–
Wheel bearing axial play mm			–	0
Hub rotary sliding resistance <2WD (except High rider)> N (N·m)			–	77 (4.4)
Hub starting torque <2WD (High rider), 4WD> N·m			–	2.5
Setting of DOJ boot length <4WD> mm			85 ± 3	–
Opening dimension of the special tool (MB991561) <4WD> mm	When the BJ boot band (small) is crimped		2.9	–
	When the BJ boot band (large) is crimped		3.2	–
Crimped width of the BJ boot band <4WD> mm			2.4 – 2.8	–
Clearance between the BJ boot (larger diameter side) and the stepped phase of the BJ housing <4WD> mm			0.05 – 1.55	–
Clearance between the main shaft assembly and the clutch gear <4WD> mm			0.05 – 0.3	–
Drive gear backlash <4WD> mm			0.11 – 0.16	–
Drive gear runout <4WD> mm			–	0.05
Differential gear backlash <4WD> mm			0.01 – 0.250	–
Drive pinion turning torque <4WD> N·m	Without oil seal		0.83 – 1.19	–
	With oil seal	Companion flange (oil seal contacting area) with anti-rust agent	0.89 – 1.78	–
		Companion flange (oil seal contacting area) with gear oil applied	0.97 – 1.32	–

LUBRICANTS

M1261000401697

Item	Specified lubricant	Quantity
Dust seal	Multipurpose grease SAE J310, NLGI No.2 or equivalent	Inside of dust seal: approx. 0.7g Lip: approx. 0.5g
Differential gear oil	Gear oil API classification GL-5 or higher SAE 80W	1.2 L
DOJ boot grease	Repair kit grease	125 ± 10 g
BJ boot grease	Repair kit grease	120 ± 10 g

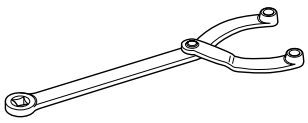
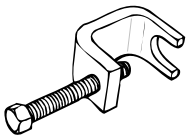
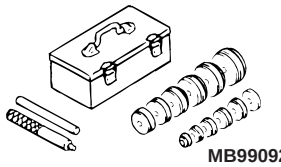
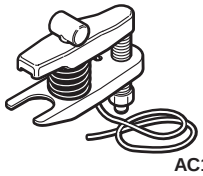
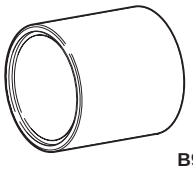
SEALANT AND ADHESIVE <4WD>

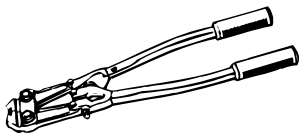
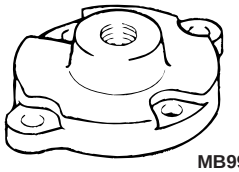
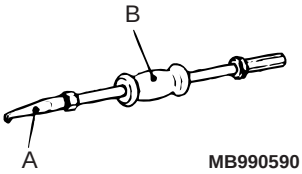
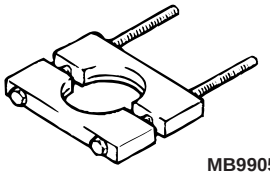
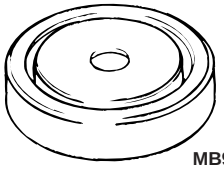
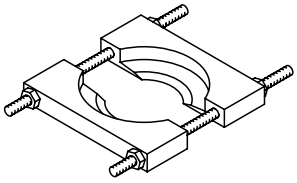
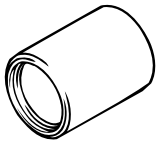
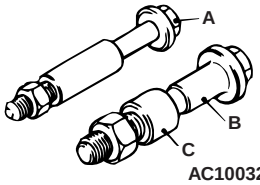
M1261000500204

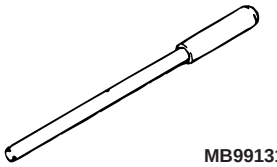
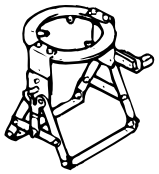
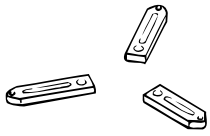
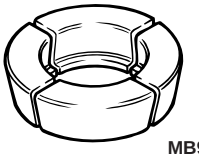
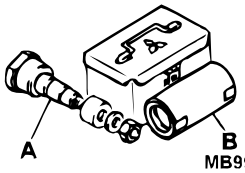
Item	Specified sealant and adhesive	Remark
Differential cover and differential carrier	ThreeBond 1217 or equivalent	Semi-drying sealant
Housing tube and differential carrier		
Vent plug		
Drive gear threaded hole	LOCKTITE No.271 or No.270 or equivalent	Anaerobic adhesive

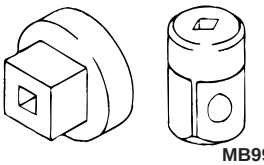
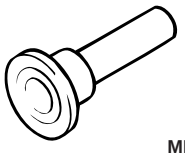
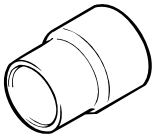
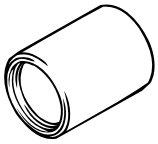
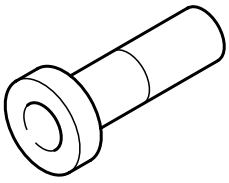
SPECIAL TOOLS

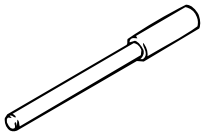
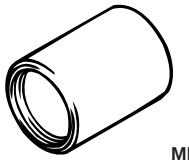
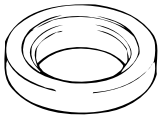
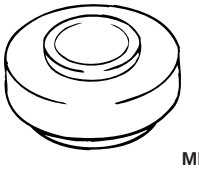
M1261000601691

Tool	Number	Name	Use
 B990767	MB990767	Front hub and flange yoke holder	Fixing of the hub
 MB991618	MB991618	Hub bolt remover	Removal of the hub bolt
 MB990925	MB990925	Bearing and oil seal installer set	• Wheel bearing inner race (outside) removal • Press-fitting of wheel bearing • Press-fitting of oil seal (differential carrier) • Press-fitting of drive pinion rear bearing outer race • Press-fitting of drive pinion front bearing outer race
 AC106827	MB991897 or MB992011	Ball joint remover	Ball joint removal *NOTE: Use MB992011 to remove lower arm upper arm ball joint.* *NOTE: Steering linkage puller (MB990635 or MB991113) is also used to disconnect knuckle and tie rod end ball joint.*
 B991033	MB991033	Mount bushing remover and installer base	Press-fitting of the dust seal <Vehicles for Russia (Option)>

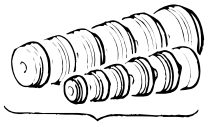
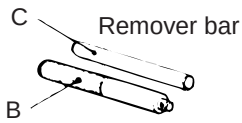
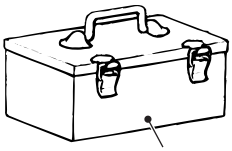
Tool	Number	Name	Use
 MB991561	MB991561	Boot band crimping tool	Resin boot band installation <4WD>
 MB990906	MB990906	Driveshaft attachment	Removal and installation of inner shaft <4WD> (Used together with MB990211)
 MB990590	MB990590 A: MB990212 B: MB990211	Rear axle shaft oil seal remover A: Adapter B: Slide hammer	• Removal of differential carrier oil seal <4WD> • Removal and installation of inner shaft <4WD> (Used together with MB990906)
 MB990560	MB990560	Bearing remover	• Removal of ABS rotor <2WD (except High rider)> • Removal and press-fitting of inner shaft bearing <4WD>
 MB990955	MB990955	Oil seal installer	Dust seal installation <4WD>
	MD998917	Bearing remover	Removal of front hub <2WD (except High rider)>
 MB991576	MB991576	Base	Wheel bearing installation <2WD (except High rider)>
 AC100320AB	A: MB991017 B: MB990998 C: MB991000	A, B: Front hub remover and installer C: Spacer	• Measurement of hub starting torque <2WD (High rider), 4WD> • Measurement of wheel bearing axial play <2WD (High rider), 4WD> *NOTE: MB991000, which belongs to MB990998, should be used as a spacer.*

Tool	Number	Name	Use
 MB991318	MB991318	Lower arm bush arbour	Removal of clutch gear and bearing <4WD>
 MB990909	MB990909	Working base	Supporting of front differential carrier assembly <4WD>
	MB991116	Adapter	
MB990810	MB990810	Side bearing puller	Differential side bearing inner race removal <4WD>
MB990811	MB990811	Differential side bearing cap	
MB990339	MB990339	Bearing puller	Removal of drive pinion rear bearing inner race <4WD>
 MB990648	MB990648	Bearing remover	
 A B MB990835	MB991171 A: MB990819 B: MB991170	Pinion height gauge set A: Drive pinion gauge assembly B: Cylinder gauge	Measurement of drive pinion height <4WD>

Tool	Number	Name	Use
 MB990326	MB990326	Preload socket	Measurement of wheel bearing turning torque <2WD (High rider), 4WD>
	MB990685	Torque wrench	• Measurement of wheel bearing turning torque <2WD (High rider), 4WD> • Measurement of drive pinion turning torque <4WD>
 MB990031	MB990031 or MB990699	Drive pinion oil seal installer	Press-fitting of drive pinion oil seal <4WD>
 MB990799	MB990799	Ball joint remover and installer	• Installation of freewheel clutch bearing <4WD> • Installation of freewheel clutch oil seal <4WD>
 MB990890	MB990890 or MB990891	Rear suspension bushing base	Installation of freewheel clutch bearing <4WD>
	MD999547	Transmission rear oil seal installer	Removal of front differential mount insulator <4WD>

Tool	Number	Name	Use
 MB990947	MB990947	Lower arm bushing arbour	Installation of front differential mount insulator <4WD>
 MB990847	MB990847	Rear suspension bushing remover and installer base	
 MB990981	MB990981	Mount bushing remover and installer	
 MB990802	MB990802	Bearing installer	Press-fitting of the drive pinion rear bearing inner race, and the side bearing inner race <4WD>

MB990925 Bearing and oil seal installer set

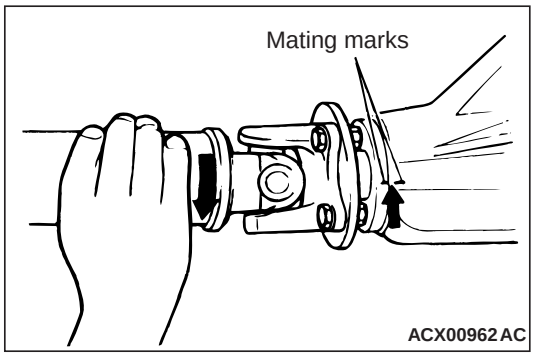
Tool	Type	Number	O D mm
MB990925  A Installer adapter  C Remover bar B Installer bar (Snap-in type)  Toolbox ACX02372AE	A	MB990926	39.0
		MB990927	45.0
		MB990928	49.5
		MB990929	51.0
		MB990930	54.0
		MB990931	57.0
		MB990932	61.0
		MB990933	63.5
		MB990934	67.5
		MB990935	71.5
		MB990936	75.5
		MB990937	79.0
	B	MB990938	-
	C	MB990939	-

ON-VEHICLE SERVICE

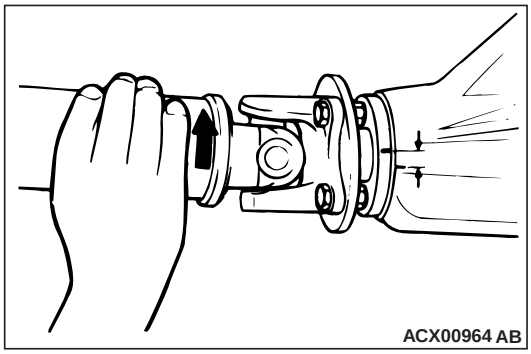
FRONT AXLE TOTAL BACKLASH CHECK <4WD>

M1261001300151

1. If the vehicle vibrates and produces a booming sound due to an imbalance in the drive system, measure the front axle total backlash by the following procedure to see if the differential carrier assembly requires removal.
   (1) Park the vehicle on a flat, level surface.
   (2) Move the transmission control lever to the neutral position or the selector lever to the "N" position. Then place the transfer shift lever to the "2H" position. Apply the parking brake. Raise the vehicle on a jack.



   (3) Turn the companion flange clockwise as far as it will go. Make the mating mark on the dust cover of the companion flange and on the differential carrier.



   (4) Turn the companion flange anti-clockwise as far as it will go, and measure the amount of distance the mating marks moved.

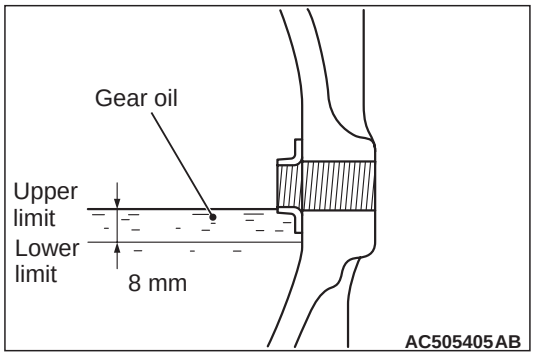
   Limit: 11 mm

2. If the backlash exceeds the limit, remove the differential carrier assembly and final drive gear. Then check the differential gear meshing condition and the looseness of the driveshaft or inner shaft splines.

FRONT AXLE GEAR OIL LEVEL CHECK <4WD>

M1262000900238

1. Remove the under cover and filler plug.



2. Check that gear oil level is not 8 mm below the bottom of filler plug hole.
3. If the gear oil level is lower than the lower limit, add the specified gear oil until the level comes to the lower portion of the filler plug hole.

   Specified gear oil:
   Gear oil API classification GL-5 or higher SAE 80W

4. Tighten the filler plug to the specified torque (Refer to P.26-43).

GEAR OIL REPLACEMENT <4WD>

M1262005100196

1. Remove the under cover and filler plug.
2. Remove the drain plug and drain oil.
3. Tighten the drain plug to the specified torque (Refer to P.26-43).
4. Add the oil until the level comes to the lower portion of the filler plug hole.

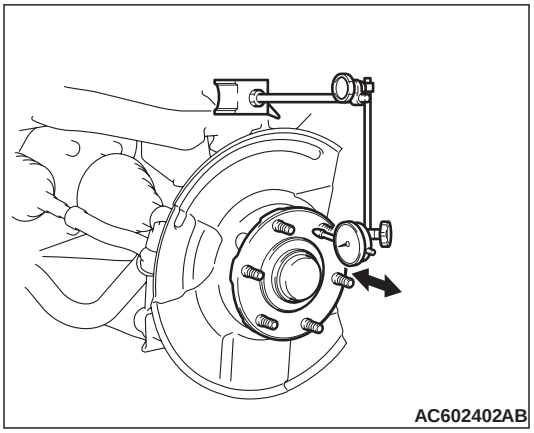
   Specified gear oil:
   Gear oil API classification GL-5 or higher SAE 80W
   Amount to use: 1.2L

5. Tighten the filler plug to the specified torque (Refer to P.26-43).

WHEEL BEARING AXIAL PLAY CHECK

M1261001100544

1. Remove the caliper assembly and brake disc, and retain the caliper assembly with a wire and the like to prevent from falling (Refer to P.26-14, P.26-16).


AC602402AB

2. Attach a dial gauge as shown in the illustration, and then measure the axial play while moving the hub in the axial direction.

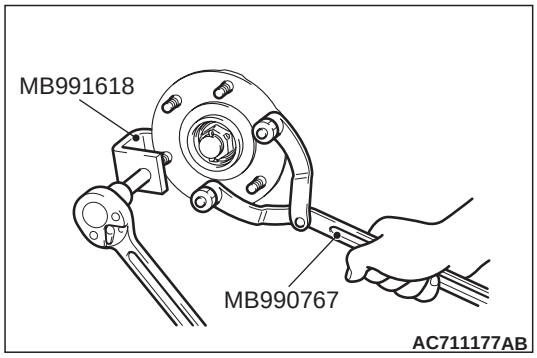
   Limit: 0 mm

3. If axial play exceeds the limit, disassemble the front hub assembly and check the parts.
4. After checking, install the brake disc and the caliper assembly (Refer to P.26-14, P.26-16).

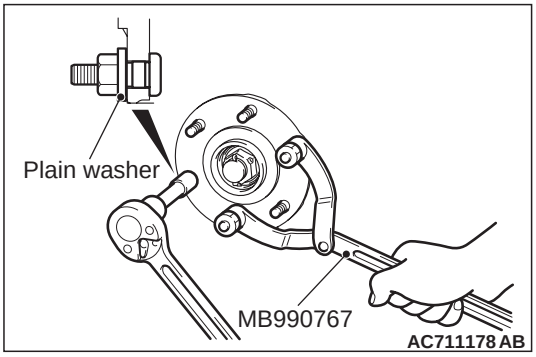
HUB BOLT REPLACEMENT

M1261001000718

1. Remove the caliper assembly and brake disc, and retain the caliper assembly with a wire and the like to prevent from falling (Refer to P.26-14, P.26-16).



2. Use the following special tools to remove the hub bolts.
   - Front hub and flange yoke holder (MB990767)
   - Hub bolt remover (MB991618)

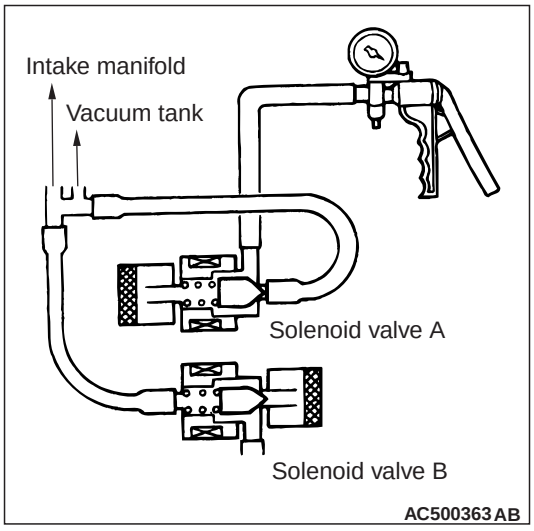


3. Install the plain washer to the new hub bolt, and install the bolt with a nut.
4. Install the brake disc and the caliper assembly (Refer to P.26-14, P.26-16).

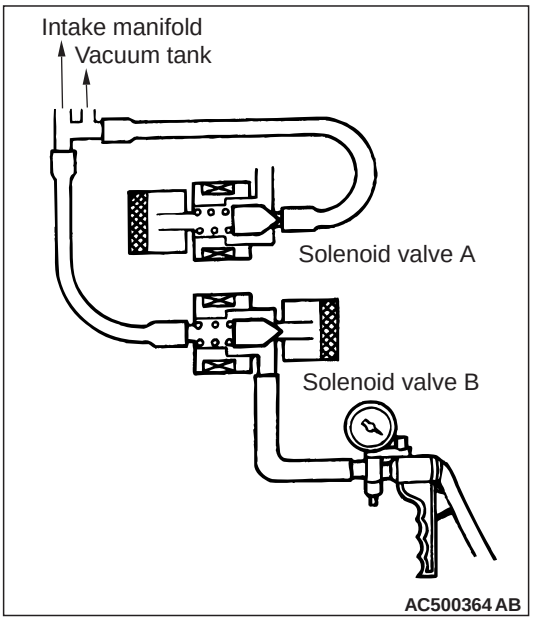
FREE WHEEL SOLENOID VALVE OPERATION CHECK <4WD: VEHICLES FOR EUROPE (EXCEPT FOR RUSSIA)>

M1261001500155

1. Remove the vacuum hoses (blue stripe, yellow stripe) from the solenoid valves.
2. Disconnect the harness connectors.



3. Connect a hand vacuum pump to solenoid valve A and carry out the following inspections.
   (1) Even if the hand pump is operated with no other operation, no negative pressure develops.
   (2) Negative pressure does not develop when battery voltage is applied to solenoid valve A. Meanwhile, negative pressure is maintained when the vacuum hose of solenoid valve B is blocked by bending.
   (3) When battery voltage is applied to solenoid valves A and B, negative pressure is maintained.



4. Connect the hand vacuum pump to solenoid valve B. Apply negative pressure and carry out the following inspections.
   (1) With no other operation, negative pressure is maintained.
   (2) When battery voltage is applied to solenoid valve B, negative pressure disappears.
   (3) When battery voltage is applied to solenoid valve A, negative pressure disappears.
5. Measure the resistance of the solenoid valves.
   Standard value: 36 –46 Ω

FRONT AXLE HUB ASSEMBLY

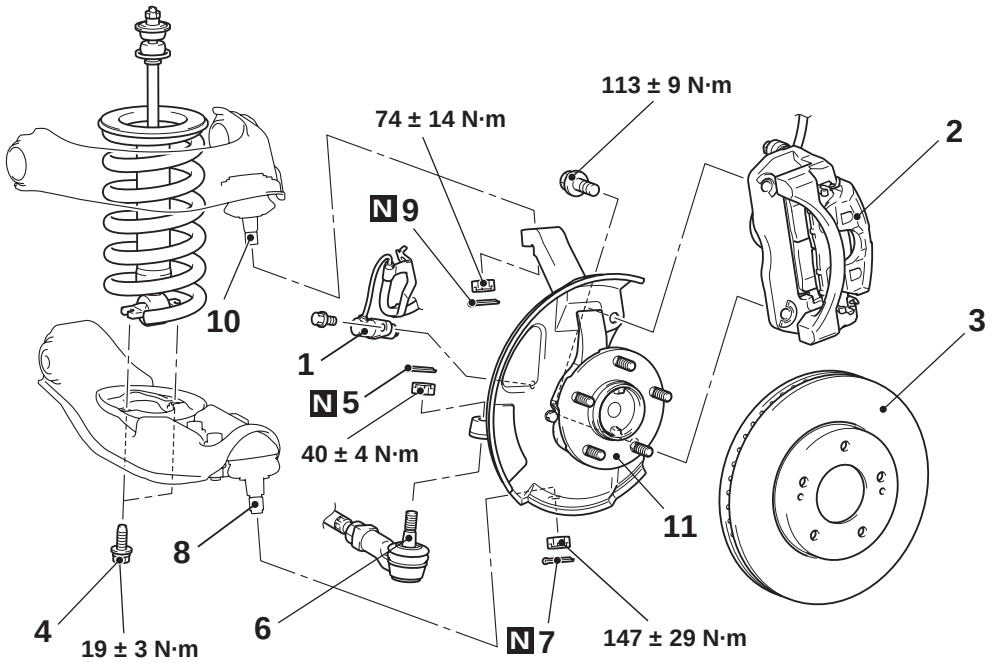
REMOVAL AND INSTALLATION <2WD (EXCEPT HIGH RIDER)>

M1261001701215

⚠ CAUTION

- **For vehicles with ABS, do not strike the ABS rotors installed to the front hub assembly against other parts when removing or installing the front hub assembly. Otherwise the ABS rotors will be damaged.**
- **For vehicles with ABS, be careful not to strike the pole piece at the tip of the front wheel speed sensor with tools during servicing work.**

Post-installation Operation
- Check the dust cover for cracks or damage by pushing it with your finger.



AC500366AB

Removal steps

1. Front wheel speed sensor <Vehicles with ABS>

<<A>> 2. Caliper assembly

<<B>> 3. Brake disc

4. Shock absorber lower mounting bolt
5. Split pin

<<C>> 6. Tie rod end connection
7. Split pin

<<C>> 8. Lower arm ball joint connection
9. Split pin

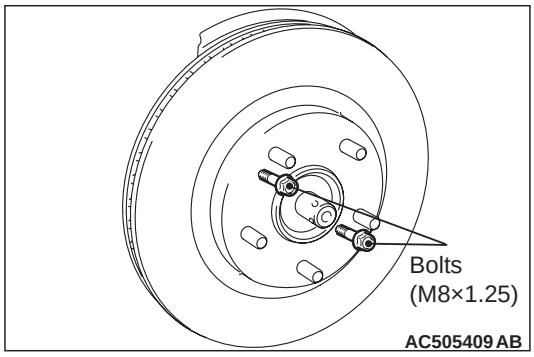
<<C>> 10. Upper arm ball joint connection
11. Hub and knuckle assembly

REMOVAL SERVICE POINTS

<<A>> CALIPER ASSEMBLY REMOVAL

1. Remove the caliper assembly with brake hose.
2. Secure the removed caliper assembly with a wire or other similar material at a position where it will not interfere with the removal and installation of the hub and knuckle assembly.

<<B>> BRAKE DISC REMOVAL



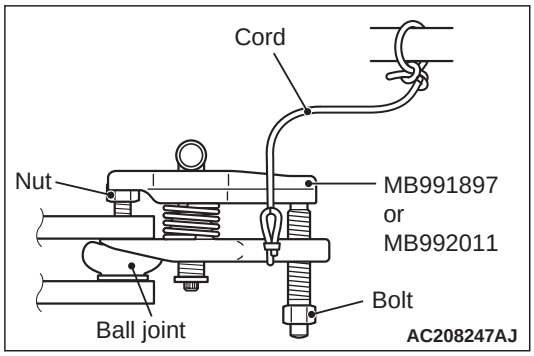
AC505409AB

If the brake disc is seized, install a M8 × 1.25-mm bolts as shown, and remove the disc by tightening the bolts evenly and gradually.

<<C>>TIE ROD END/LOWER ARM BALL JOINT/ UPPER ARM BALL JOINT DISCONNECTION

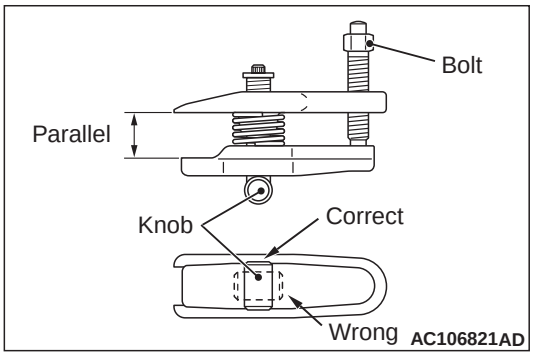
⚠ CAUTION

- **Do not remove the nut from ball joint. Loosen it and use the special tool to avoid possible damage to ball joint threads.**
- **Hang the special tool with cord to prevent it from falling.**



1. Install special tool ball joint remover (MB991897 or MB992011) as shown in the figure.

   NOTE: Use MB992011 to remove lower and upper arm ball joint.



2. Turn the bolt and knob as necessary to make the jaws of special tool parallel, tighten the bolt by hand and confirm that the jaws are still parallel.

   NOTE: When adjusting the jaws in parallel, make sure the knob is in the position shown in the figure.

3. Tighten the bolt with a wrench to disconnect the tie rod end.

REMOVAL AND INSTALLATION <2WD (HIGH RIDER), 4WD>

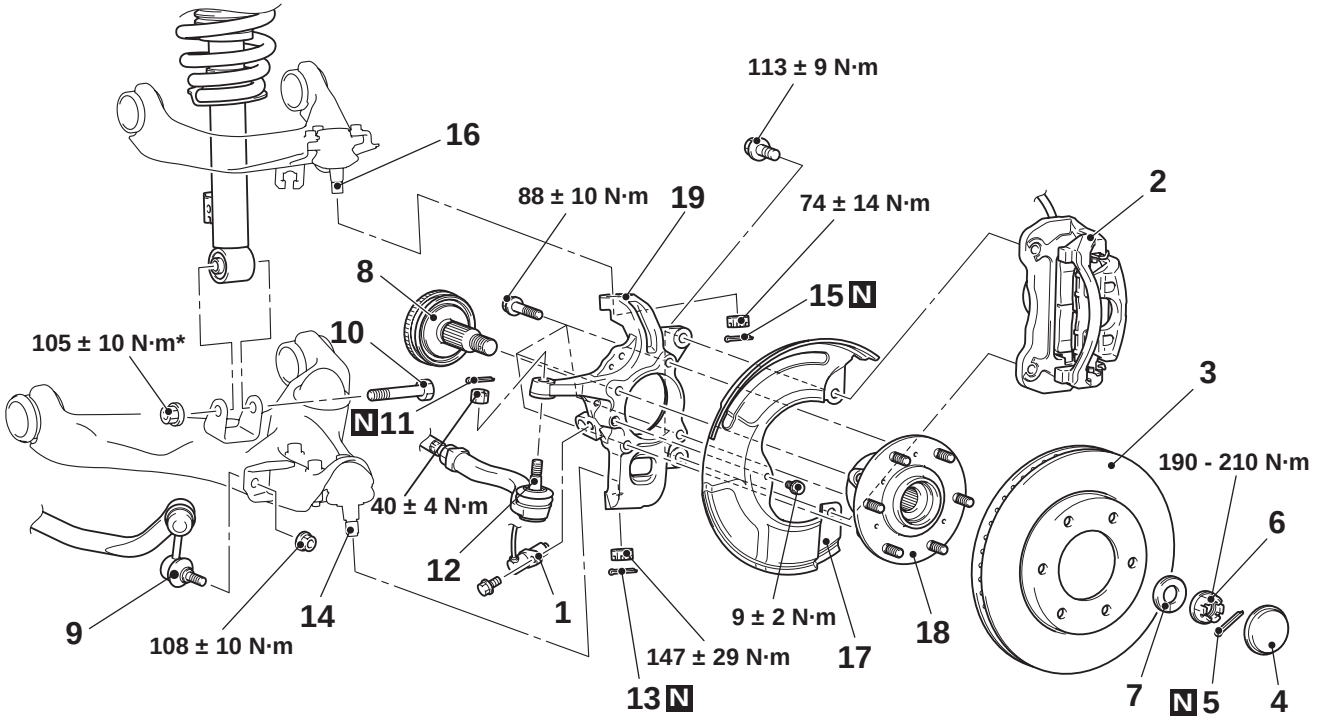
M1261001701226

⚠ CAUTION

- **For vehicles with ABS, do not strike the ABS rotors installed to the BJ outer race of driveshaft against other parts when removing or installing the driveshaft. Otherwise the ABS rotors will be damaged.**
- **For vehicles with ABS, be careful not to strike the pole piece at the tip of the front wheel speed sensor with tools during servicing work.**
- ***:Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the earth in the unladen condition.**

Post-installation Operation
- Check the dust cover for cracks or damage by pushing it with your finger.

<2WD (HIGH RIDER)>

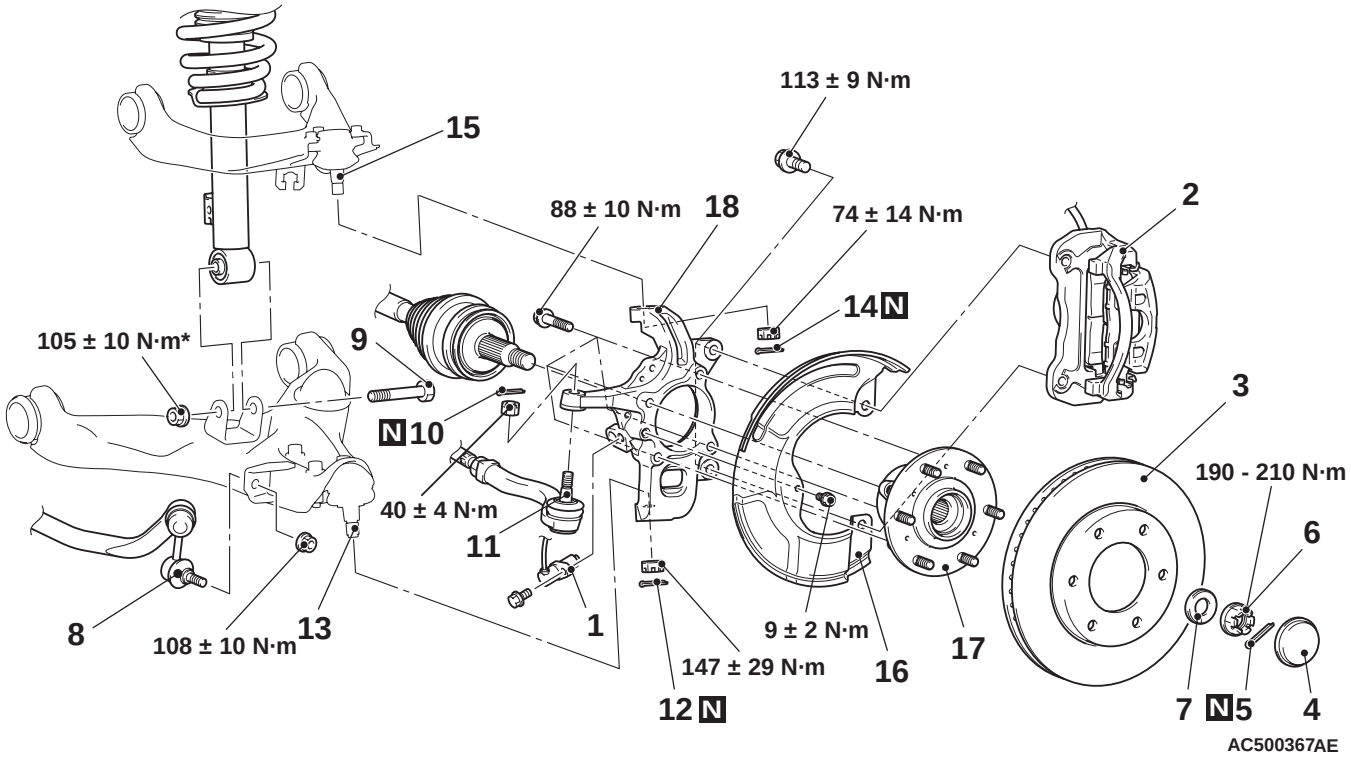


AC605728AD

Removal steps
1. Front wheel speed sensor <Vehicles with ABS>
2. <<A>> Caliper assembly
3. Brake disc
4. Hub cap
5. Split pin
6. <<B>> >>A<< Front hub nut
7. >>A<< Washer
8. Front axle shaft assembly
9. Stabilizer link assembly to lower arm connection

Removal steps (Continued)
10. Shock absorber mounting bolt
11. Split pin
12. <<C>> Tie rod end connection
13. Split pin
14. <<C>> Lower arm ball joint connection
15. Split pin
16. <<C>> Upper arm ball joint connection
17. Dust cover
18. Front hub assembly
19. Knuckle

<4WD>



Removal steps

1. Front wheel speed sensor <Vehicles with ABS>
<<A>> 2. Caliper assembly
3. Brake disc
4. Hub cap
5. Split pin
<<B>> >>A<< 6. Driveshaft nut
>>A<< 7. Washer
8. Stabilizer link assembly to lower arm connection
9. Shock absorber mounting bolt
10. Split pin
<<C>> 11. Tie rod end connection
12. Split pin
<<C>> 13. Lower arm ball joint connection
14. Split pin
<<C>> 15. Upper arm ball joint connection
16. Dust cover
17. Front hub assembly
<<D>> 18. Knuckle

REMOVAL SERVICE POINTS

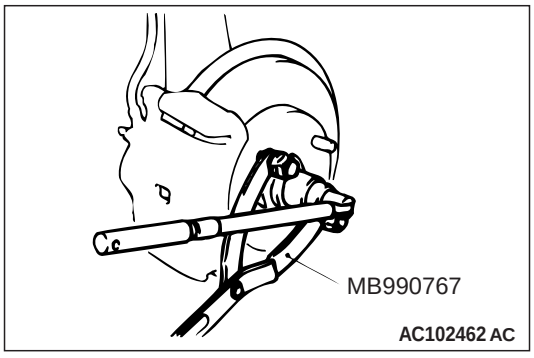
<<A>> CALIPER ASSEMBLY REMOVAL

1. Remove the caliper assembly with brake hose.
2. Secure the removed caliper assembly with a wire or other similar material at a position where it will not interfere with the removal and installation of the hub assembly and knuckle.

<<B>> FRONT HUB NUT/DRIVESHAFT NUT REMOVAL

⚠ CAUTION

Do not apply pressure to wheel bearing by the vehicle weight to avoid possible damage when driveshaft nut is loosened.

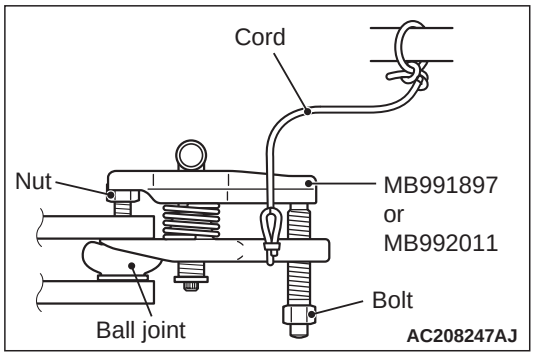


Use special tool front hub and flange yoke holder (MB990767) to fix the hub and remove the front hub nut or driveshaft nut.

<<C>> TIE ROD END/LOWER ARM BALL JOINT/ UPPER ARM BALL JOINT DISCONNECTION

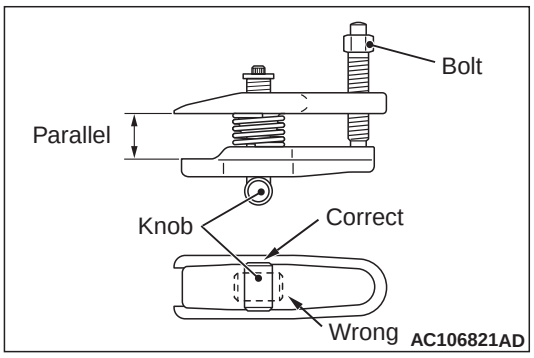
⚠ CAUTION

- **Do not remove the nut from ball joint. Loosen it and use the special tool to avoid possible damage to ball joint threads.**
- **Hang the special tool with cord to prevent it from falling.**



1. Install special tool ball joint remover (MB991897 or MB992011) as shown in the figure.

   NOTE: Use MB992011 to remove lower and upper arm ball joint.



2. Turn the bolt and knob as necessary to make the jaws of special tool parallel, tighten the bolt by hand and confirm that the jaws are still parallel.

   NOTE: When adjusting the jaws in parallel, make sure the knob is in the position shown in the figure.

3. Tighten the bolt with a wrench to disconnect the tie rod end.

<<D>> KNUCKLE REMOVAL

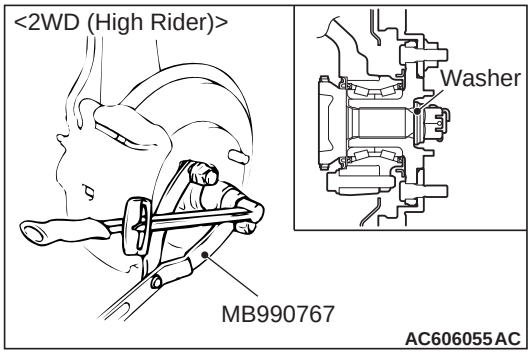
When removing the knuckle, retain the driveshaft with a wire and the like to prevent from falling.

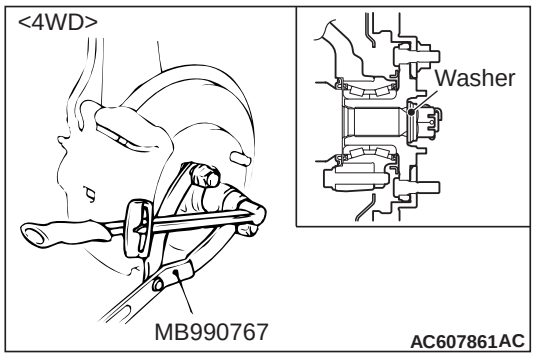
INSTALLATION SERVICE POINT

>>A<< WASHER/ FRONT HUB NUT/DRIVESHAFT NUT INSTALLATION

⚠ CAUTION

Before securely tightening the front hub nut or driveshaft nuts, make sure there is no load on the wheel bearings. Otherwise the wheel bearings will be damaged.





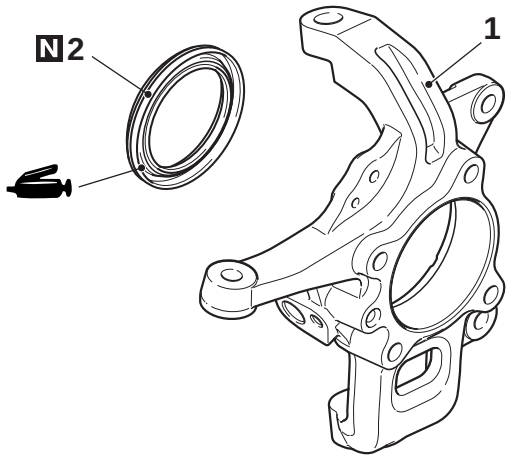
1. Be sure to install the washer in the specified direction.
2. Using special tool front hub and flange yoke holder (MB990767), tighten the front hub nut or driveshaft nut to the specified torque. At this time, tighten the front hub nut or driveshaft nut to the specified torque in expectation of final tightening.

   Tightening torque: 190 – 210 N·m

3. If the pin hole do not align with the pins, tighten the driveshaft nut (less than 210 N·m) and find the nearest hole then bend the split pin to fit it.

KNUCKLE DISASSEMBLY AND REASSEMBLY <VEHICLES FOR RUSSIA (OPTION)>

M1261003200105



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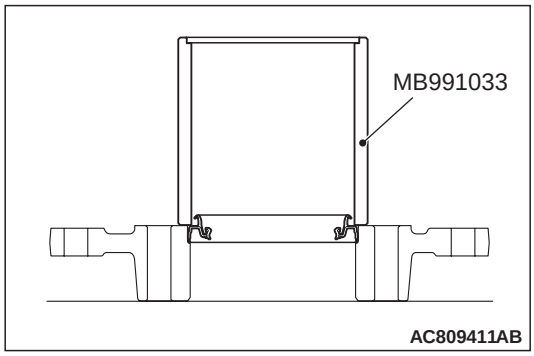
Disassembly steps

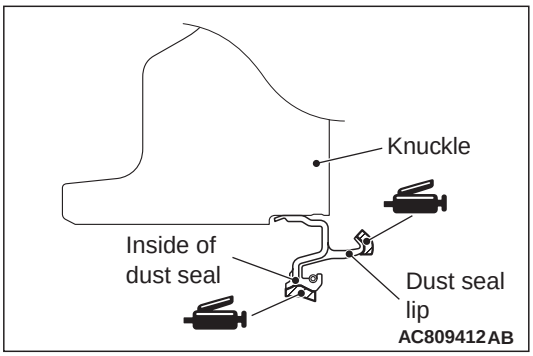
1. Knuckle
>>A<< 2. Dust seal

REASSEMBLY SERVICE POINT

>>A<< DUST SEAL INSTALLATION



1. Press-fit the new dust seal into the knuckle by using special tool mount bushing remover and installer base (MB991033).



2. Apply the multi-purpose grease around the inside and lip of the dust seal.

Specified grease: Multipurpose grease SAE J310, NLGI No.2 or equivalent
Amount to use: Inside of dust seal: Approx. 0.7 g, Lip: Approx. 0.5g

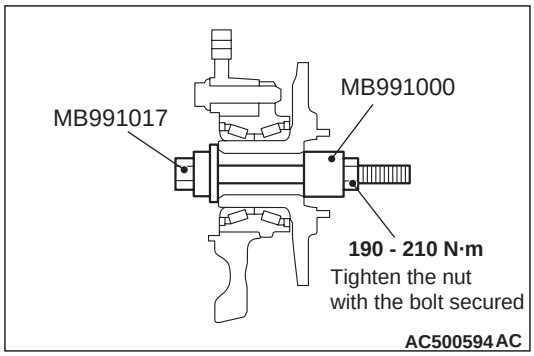
INSPECTION

M1261001800338

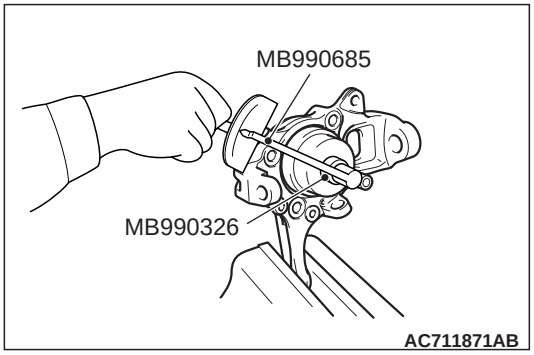
- Check the hub for cracks and spline for wear.
- Check the knuckle for cracks.
- Check for defective bearing.

NOTE: If the meshing of the wheel bearing outer race and the knuckle, or of the wheel bearing inner race and the hub, is loose, replace the bearing or damaged parts.

HUB STARTING TORQUE CHECK <2WD (HIGH RIDER), 4WD>



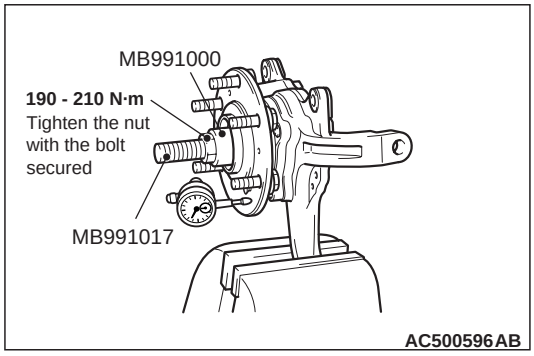
1. Tighten the following special tools to the specified torque, and then press-in the hub into the knuckle.
   - Front hub remover and installer (MB991017)
   - Spacer (MB991000)
2. Rotate the hub in order to seat the bearing.



3. Measure the hub starting torque by using the following special tools.
   - Torque wrench (MB990685)
   - Preload socket (MB990326)

   Limit: 2.5 N·m
4. The starting torque must be within the limit and the hub rotation must be smooth.

WHEEL BEARING AXIAL PLAY CHECK <2WD (HIGH RIDER), 4WD>

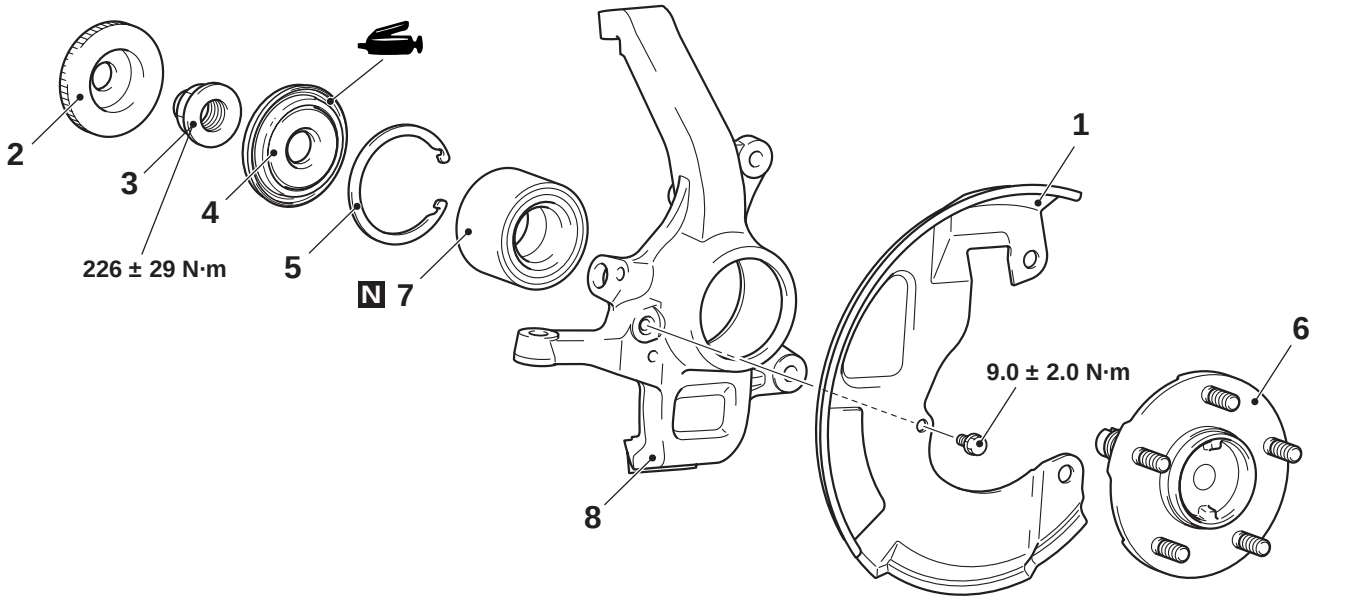


1. Measure to determine whether the wheel bearing axial play is within the limit or not by using the following special tools.
   - Front hub remover and installer (MB991017)
   - Spacer (MB991000)

   Limit: 0 mm
2. If the play is not within the limit range while the nut is tightened to 190 – 210 N·m, the bearing, hub and/or knuckle have probably not been installed correctly. Replace the bearing and re-install.

DISASSEMBLY AND REASSEMBLY <2WD (EXCEPT HIGH RIDER)>

M1261001900540



Disassembly steps

1. Dust cover

<<A>>

2. ABS rotor
3. Nut
4. Washer assembly
5. Snap ring

<<B>>

6. Hub

<<C>>

7. Wheel bearing
8. Knuckle

Reassembly steps

8. Knuckle

>>A<<

7. Wheel bearing
6. Hub

Reassembly steps (Continued)

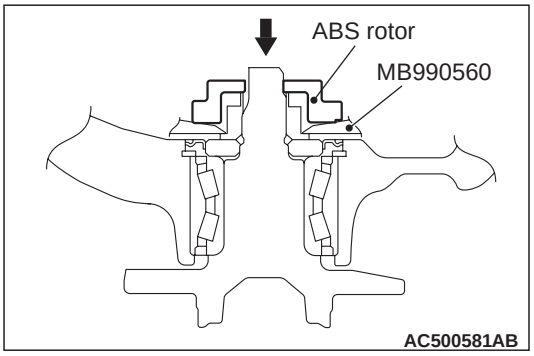
5. Snap ring
4. Washer assembly
3. Nut
2. ABS rotor
1. Dust cover

>>B<< • Hub rotary sliding torque check

>>C<< • Wheel bearing axial play check

DISASSEMBLY SERVICE POINTS

<<A>> ABS ROTOR REMOVAL

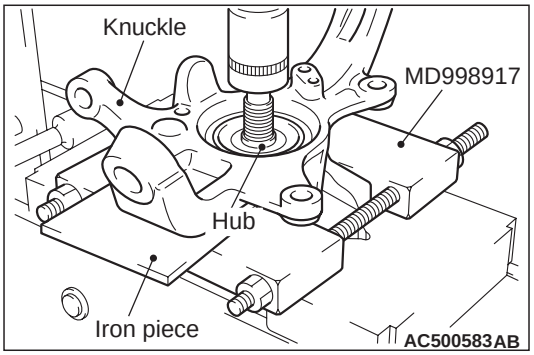


Use special tool bearing remover (MB990560) to pull out the ABS rotor from the hub.

<<B>> HUB REMOVAL

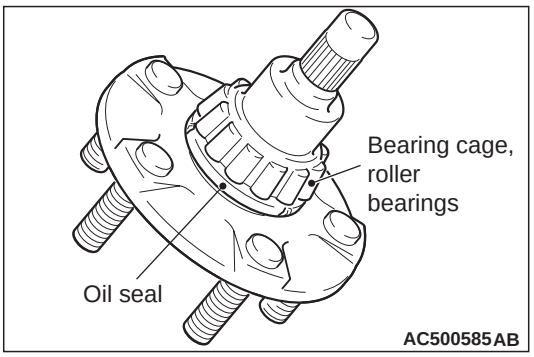
⚠ CAUTION

When the hub has been removed, always replace the wheel bearing with a new part because wheel bearing frictional surface will be damaged when removing the hub.



Use special tool bearing remover (MD998917) and iron piece to press out the hub as shown in the illustration.

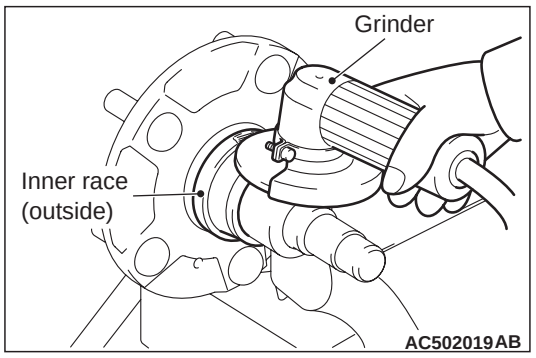
<<C>> WHEEL BEARING REMOVAL



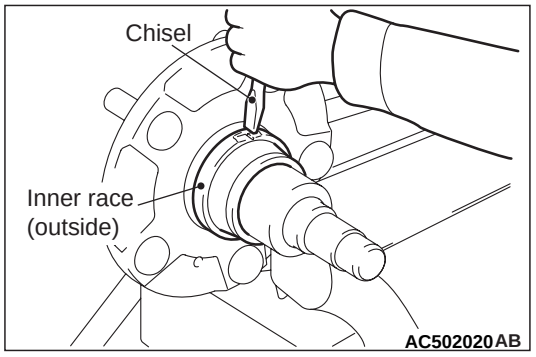
1. Crush the bearing cage by using chisel etc., and remove roller bearings from the wheel bearing inner race (outside).
2. Remove the oil seal.

⚠ CAUTION

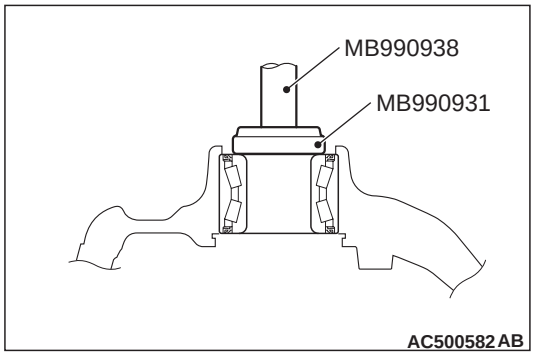
When removing the inner race (outside) from the hub, be careful not to damage the hub.



3. Fix the hub and shave off the wheel bearing inner race (outside).



4. Cut in with a chisel the place where the wheel bearing inner race (outside) has been shaven and remove the wheel bearing inner race (outside)



5. Install the inner race (outside) that was removed from the hub to the wheel bearing, and then use the following special tools to remove the wheel bearing.
   - Installer bar (MB990938)
   - Installer adapter (MB990931)

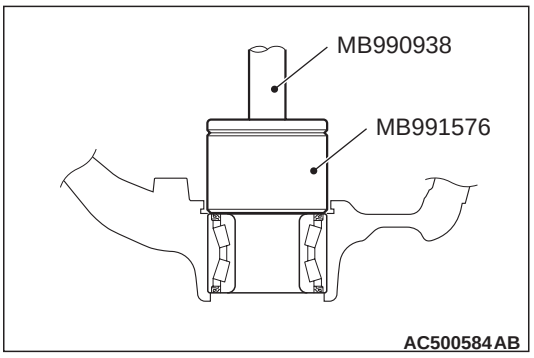
REASSEMBLY SERVICE POINTS

>>A<< WHEEL BEARING INSTALLATION

1. Fill the wheel bearing with multipurpose grease.
2. Apply a thin coating of multipurpose grease to the knuckle and bearing contact surfaces.

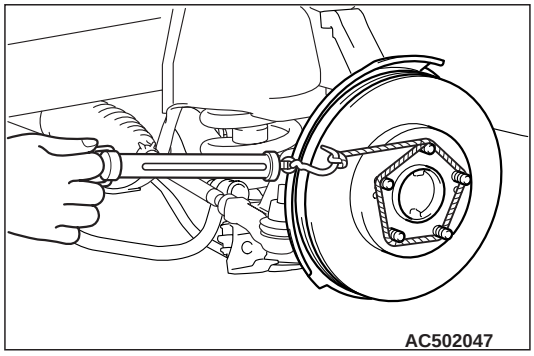
⚠ CAUTION

Press the outer race when pressing-in the wheel bearing. Otherwise the wheel bearing will be damaged.



3. Press-in the bearing by using the following special tools.
   - Installer bar (MB990938)
   - Base (MB991576)

>>B<< HUB ROTARY SLIDING RESISTANCE CHECK

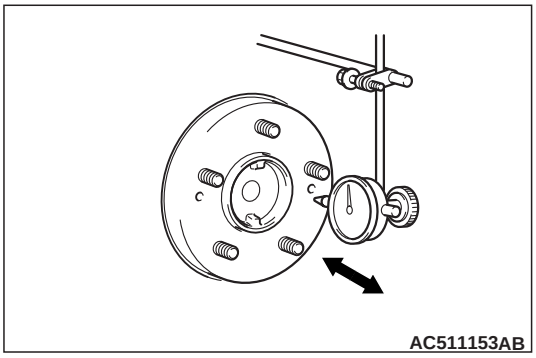


1. Use a spring balance to measure the hub rotary sliding resistance (hub rotation starting torque) as shown in the illustration.

   Limit: 77 N (4.4 N·m)

2. If the rotary sliding resistance is not within the standard value, replace the bearing.

>>C<< WHEEL BEARING AXIAL PLAY CHECK



1. Measure to determine whether the wheel bearing axial play is within the limit or not.

   Limit: 0 mm

2. If the play is not within the limit range, replace the bearing and re-install.

INSPECTION

M1261002000120

- Check the front hub and brake disc mounting surfaces for galling and contamination.
- Check the knuckle inner surface for galling and cracks.

DRIVESHAFT ASSEMBLY <4WD>

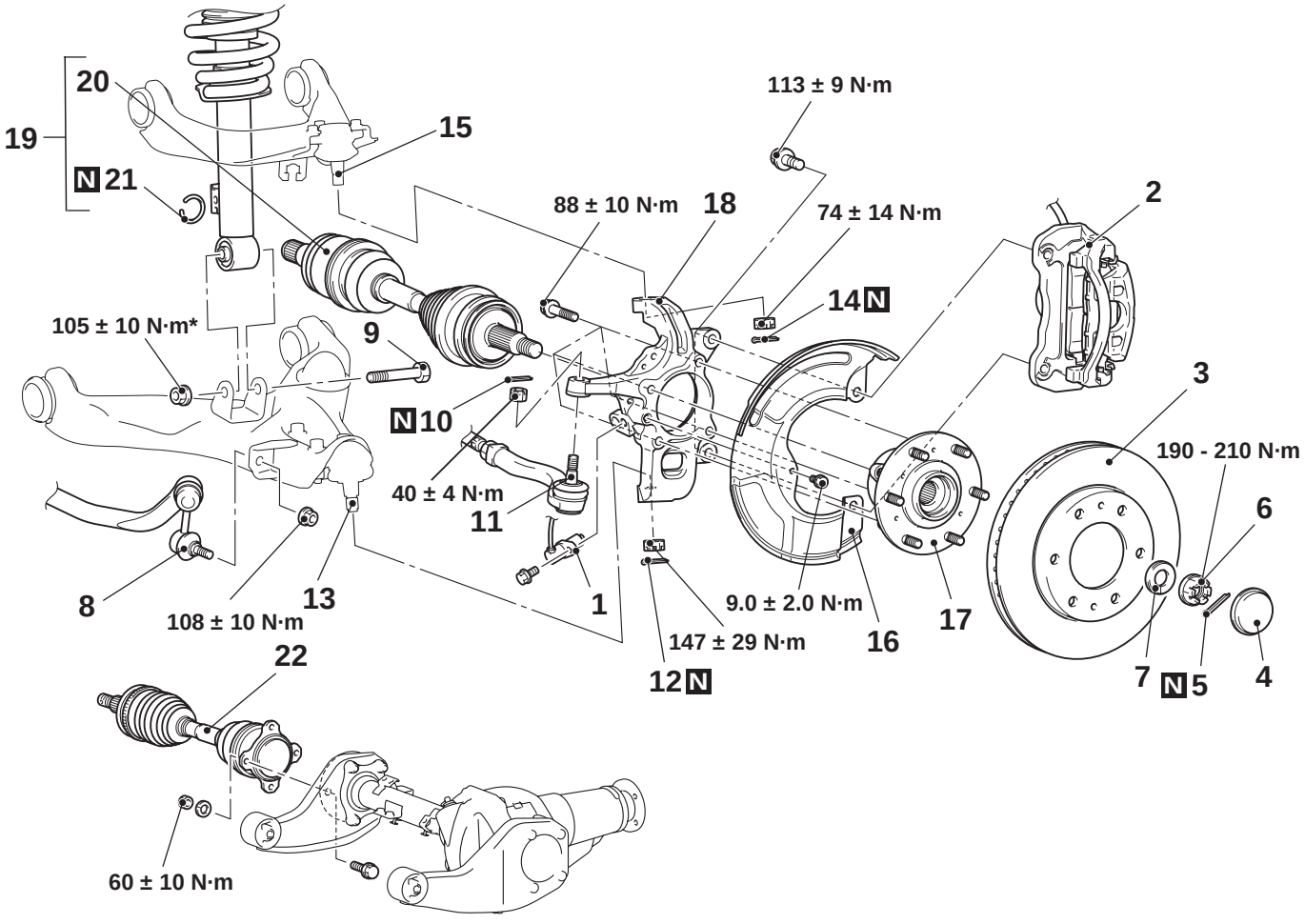
REMOVAL AND INSTALLATION

M1261003501723

⚠ CAUTION

- ***: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the earth in an unladen condition.**

Pre-removal Operation	Post-installation Operation
• Under Cover Removal (Refer to GROUP 51, Under Cover). • Gear Oil Draining (Refer to P.26-11).	• Press the dust cover with a finger to check whether the dust cover is cracked or damaged. • Gear Oil Supplying (Refer to P.26-11). • Under Cover Installation (Refer to GROUP 51, Under Cover). • Wheel Alignment Check and Adjustment (Refer to GROUP 33, On-vehicle Service).



AC500629

AC500411AE

Removal steps

1. Front wheel speed sensor <Vehicles with ABS>
<<A>> 2. Caliper assembly
3. Brake disc
4. Hub cap
5. Split pin
<<B>> >>A<< 6. Driveshaft nut
>>A<< 7. Washer

Removal steps (Continued)

8. Stabilizer link assembly to lower arm connection
9. Shock absorber mounting bolt
10. Split pin
<<C>> 11. Tie rod end connection
12. Split pin
<<C>> 13. Lower arm ball joint connection
14. Split pin
<<C>> 15. Upper arm ball joint connection

Removal steps (Continued)

16. Dust cover
17. Front hub assembly
18. Knuckle
19. LH driveshaft assembly
20. LH driveshaft
21. Circlip
22. RH driveshaft assembly

REMOVAL SERVICE POINTS

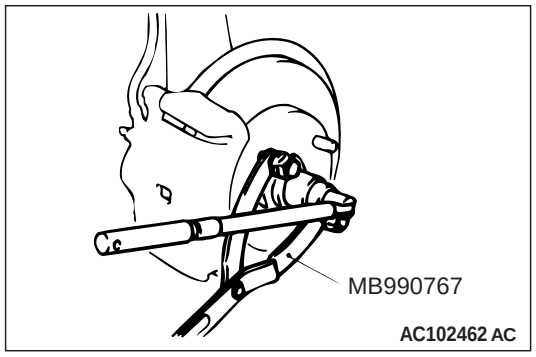
<<A>> CALIPER ASSEMBLY REMOVAL

1. Remove the caliper assembly with brake hose.
2. Secure the removed caliper assembly with a wire or other similar material at a position where it will not interfere with the removal and installation of the hub assembly and knuckle.

<<B>> DRIVESHAFT NUT REMOVAL

⚠ CAUTION

Do not apply pressure to wheel bearing by the vehicle weight to avoid possible damage when driveshaft nut is loosened.

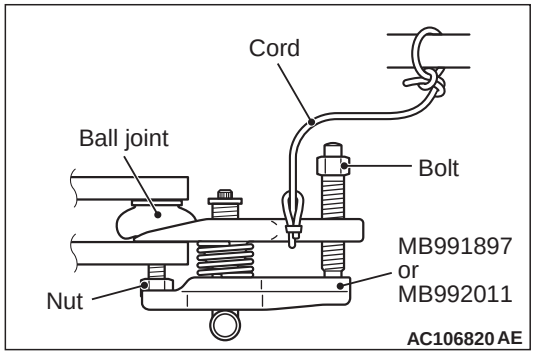


Use special tool front hub and flange yoke holder (MB990767) to fix the hub and remove the driveshaft nut.

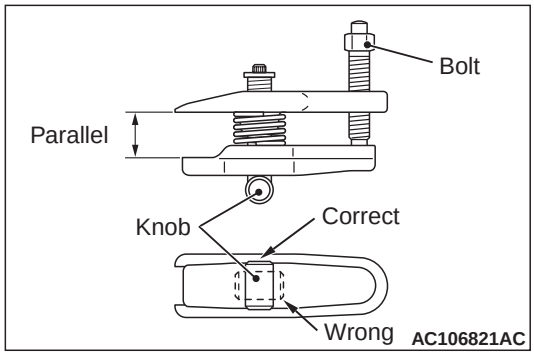
<<C>> TIE ROD END /LOWER ARM BALL JOINT / UPPER ARM BALL JOINT DISCONNECTION

⚠ CAUTION

- **Do not remove the nut from the ball joint. Loosen it and use the special tool to avoid possible damage to ball joint threads.**
- **Hang the special tool with a cord to prevent from falling.**



1. Install special tool ball joint remover (MB991897 or MB992011) as shown in the figure.



2. Turn the bolt and knob as necessary to make the jaws of special tool parallel, tighten the bolt by hand and confirm that the jaws are still parallel.

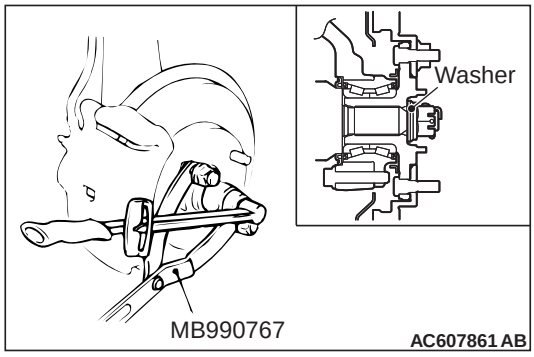
   NOTE: When adjusting the jaws in parallel, make sure the knob is in the position shown in the figure.
3. Tighten the bolt with a wrench to disconnect the tie rod end.

INSTALLATION SERVICE POINT

>>A<<WASHER/ DRIVESHAFT NUT INSTALLATION

⚠ CAUTION

Before securely tightening the driveshaft nuts, make sure there is no load on the wheel bearings. Otherwise the wheel bearings will be damaged.



1. Be sure to install the driveshaft washer in the specified direction.
2. Using special tool front hub and flange yoke holder (MB990767), tighten the driveshaft nut. At this time, tighten the driveshaft nut to the specified torque in expectation of final tightening.

Tightening torque: 190 – 210 N·m

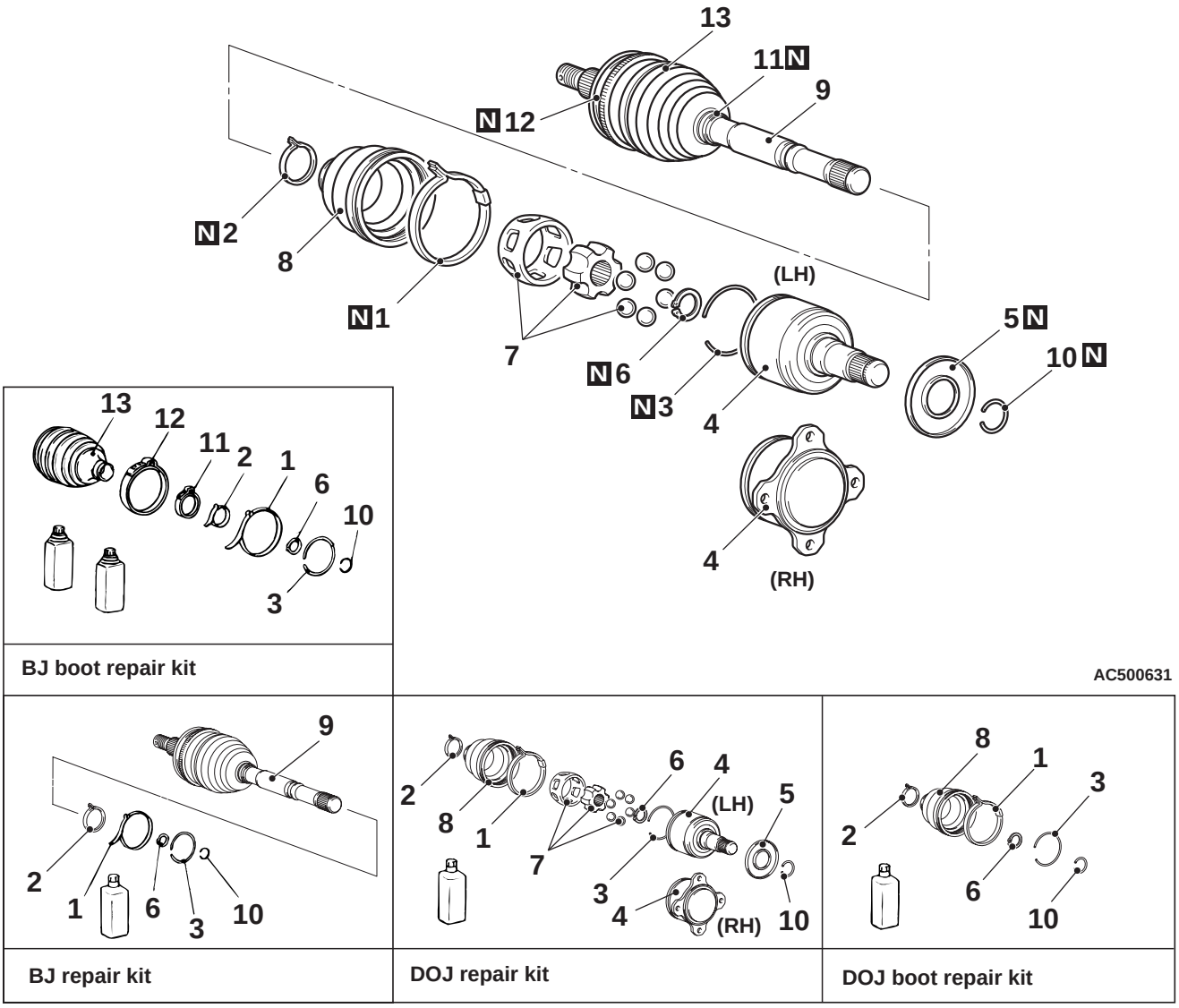
3. If the pin hole do not align with the pins, tighten the driveshaft nut (less than 210 N·m) and find the nearest hole then bend the split pin to fit it.

DISASSEMBLY AND REASSEMBLY

M1261003701147

⚠ CAUTION

Never disassemble the BJ assembly except when replacing the BJ boot.



Disassembly steps

1. DOJ boot band (large)
2. DOJ boot band (small)
3. Circlip
4. DOJ outer race
5. Dust cover
6. Snap ring

<<A>> 7. DOJ assembly

<<B>> 8. DOJ boot

9. BJ assembly
10. Circlip

Disassembly steps (Continued)

11. BJ boot band (small)
12. BJ boot band (large)
13. BJ boot

Reassembly steps

10. Circlip
9. BJ assembly

>>A<< 7. DOJ assembly

>>A<< 6. Snap ring

>>B<< 4. DOJ outer race

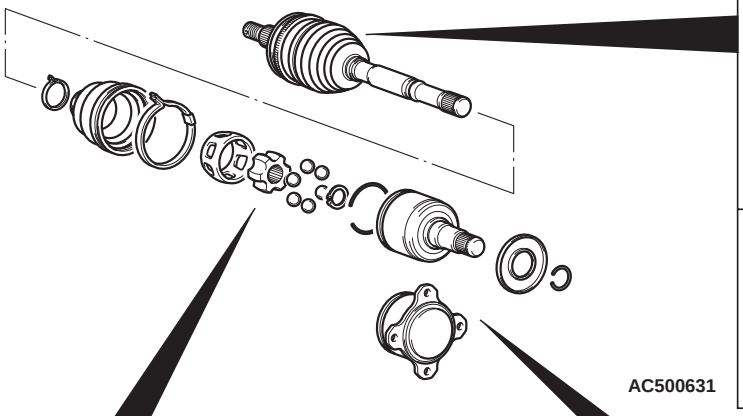
5. Dust cover
3. Circlip

Reassembly steps (Continued)

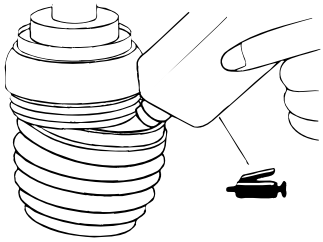
>>C<< 8. DOJ boot
>>C<< 2. DOJ boot band (small)
>>C<< 1. DOJ boot band (large)

NOTE:
- *DOJ: Double Offset Joint*
- *BJ: Birfield Joint*

LUBRICATION POINTS



AC500631



Grease:
Repair kit grease: 120 ± 10 g
Note
The grease in the repair kit should be divided in half for use, respectively, at the joint and inside the boot.

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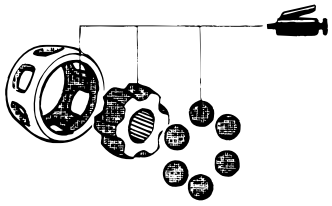
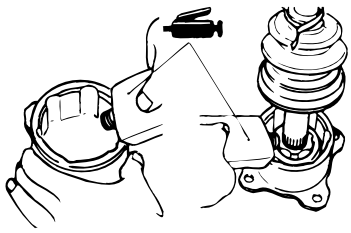


Grease: Repair kit grease

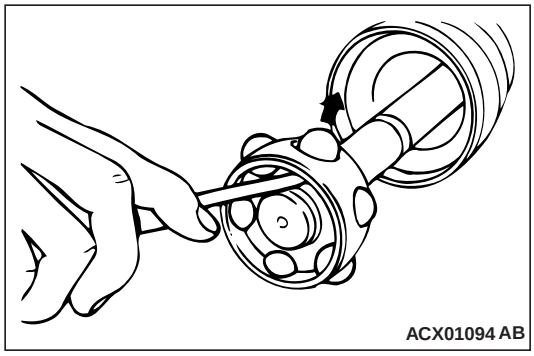


Grease:
Repair kit grease: 125 ± 10 g (joint: 80 g, boot: 45 g)
Note
The grease in the repair kit should be divided in half for use, respectively, at the joint and inside the boot.

⚠ CAUTION
Do not mix old and new or different types of grease, as a special grease is used in the joint.

DISASSEMBLY SERVICE POINTS

<<A>> DOJ ASSEMBLY REMOVAL



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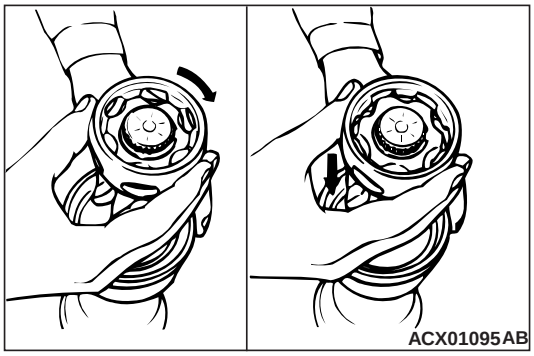
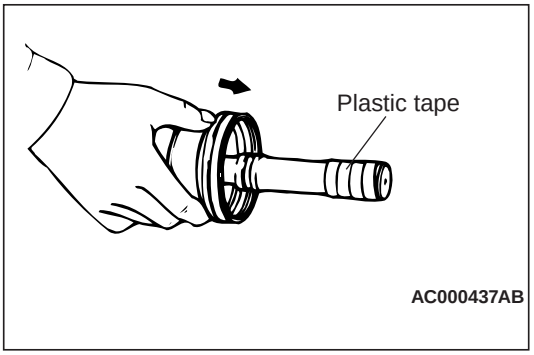
1. Remove the balls from the DOJ cage.



ACX01095AB

2. Remove the DOJ cage from the DOJ inner race in the direction shown in the illustration.

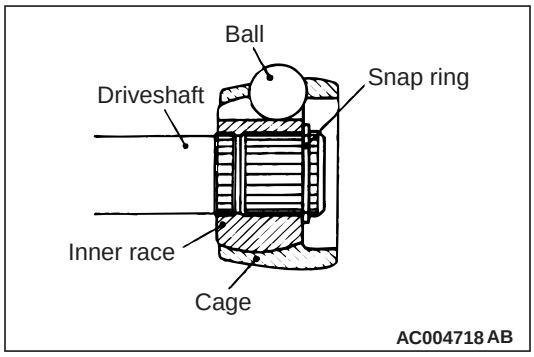
<<B>> DOJ BOOT REMOVAL



Wrap plastic tape around the spline part on the DOJ side of the driveshaft so that DOJ boot is not damaged when removed.

REASSEMBLY SERVICE POINTS

>>A<< DOJ ASSEMBLY/SNAP RING INSTALLATION

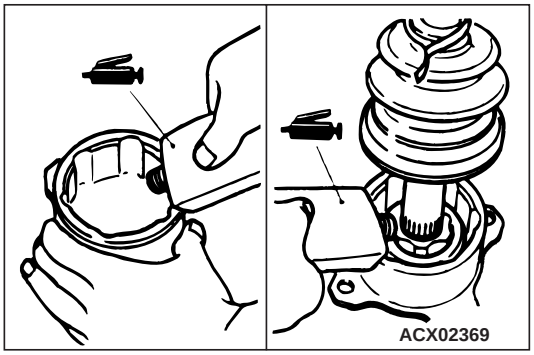


Install each part of the DOJ assembly (ball, cage and inner race) to the driveshaft, and fit the snap ring securely to the groove in the driveshaft.

>>B<< DOJ OUTER RACE INSTALLATION

⚠ CAUTION

The driveshaft joint use special grease. Do not mix old and new or different types of grease.



1. Fill the inside of the DOJ outer race and DOJ boot with the specified grease.

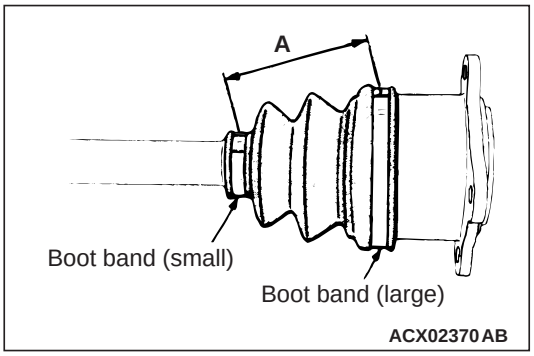
   Specified grease: Repair kit grease 125 ± 10 g

⚠ CAUTION

Do not secure the boot band (large).

2. Install the circlip onto the DOJ outer race. Place the DOJ boot over the DOJ outer race, and then use a boot band (small) to secure the boot.

>>C<< DOJ BOOT/DOJ BOOT BAND INSTALLATION

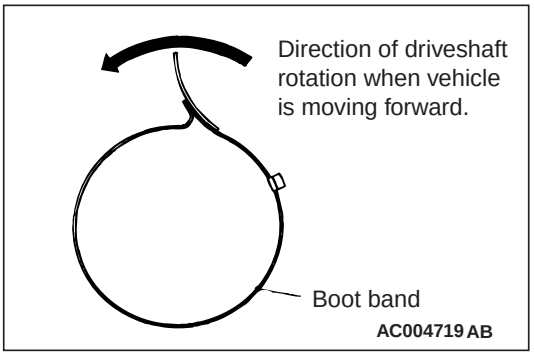


1. Position the DOJ outer race so that the distance between the boot bands is at the standard value.

   Standard value (A): 85 ± 3 mm

2. Remove part of the DOJ boot from the DOJ outer race to release the air pressure inside the boot.

⚠ CAUTION



Be sure that the installation direction of the boot bands is correct.

3. Secure the boot band (large) on DOJ boot.

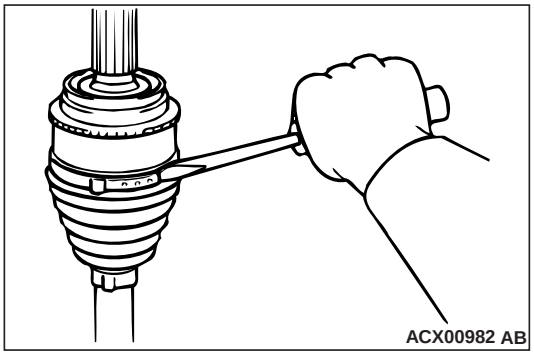
INSPECTION

M1261003800271

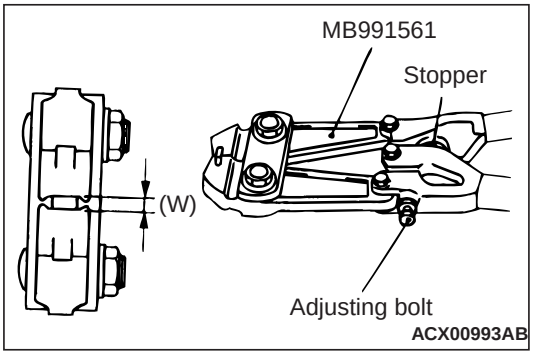
- Check the driveshaft for damage, bending or corrosion.
- Check the driveshaft spline part for wear or damage.
- Check the boots for deterioration, damage or cracking.
- Check the dust cover for damage or deterioration.

BJ BOOT (RESIN BOOT) REPLACEMENT

M1261005200662



1. Remove the boot bands (large and small).
   NOTE: The BJ boot bands cannot be re-used.
2. Remove the BJ boot.

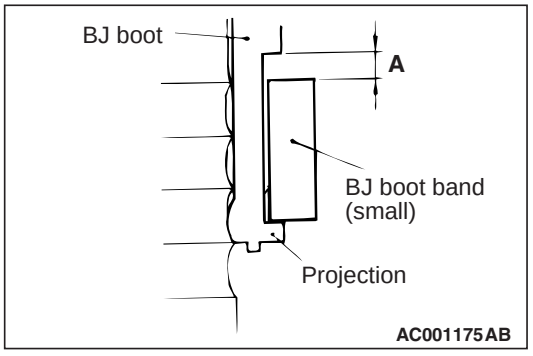


3. Turn the adjusting bolt on special tool boot band clipping tool (MB991561) so that the size of the opening (W) is at the standard value.

   Standard value (W): 2.9 mm
   <If it is larger than 2.9 mm> Tighten the adjusting bolt.
   <If it is smaller than 2.9 mm> Loosen the adjusting bolt.

   NOTE: The value of W will change by approximately 0.7 mm for each turn of the adjusting bolt.

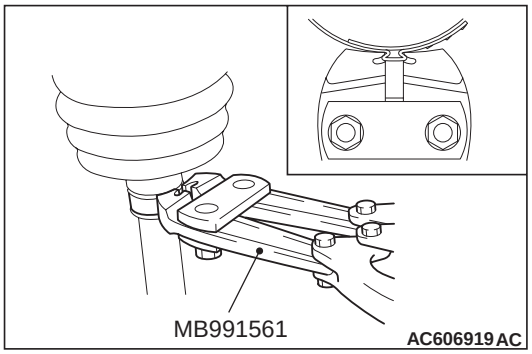
   NOTE: The adjusting bolt should not be turned more than once.



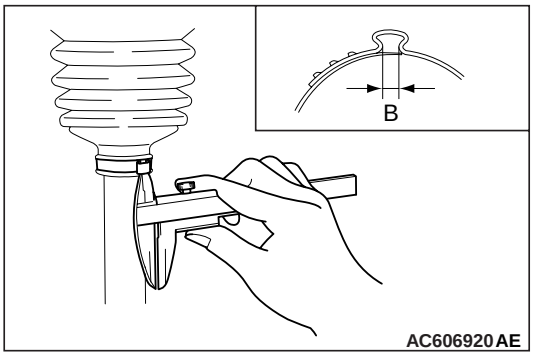
4. Place the BJ boot band (small) against the projection at the edge of the boot, and then secure it so that there is a clearance left as shown by (A) in the illustration.

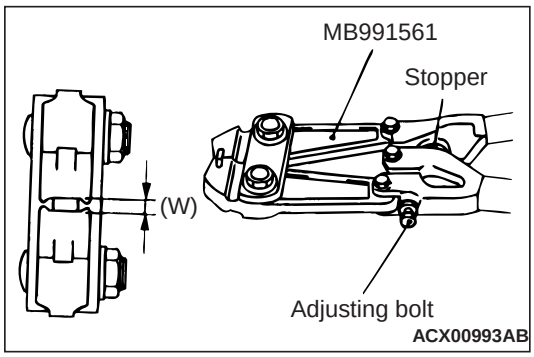
⚠ CAUTION

- **Secure the drive shaft in an upright position and clamp the part of the BJ boot band to be crimped securely in the jaws of the special tool MB991561.**
- **Crimp the BJ boot band until the special tool touches the stopper.**



5. Use the special tool to crimp the BJ boot band (small).





6. Check that crimping amount (B) of the BJ boot band is at the standard value.

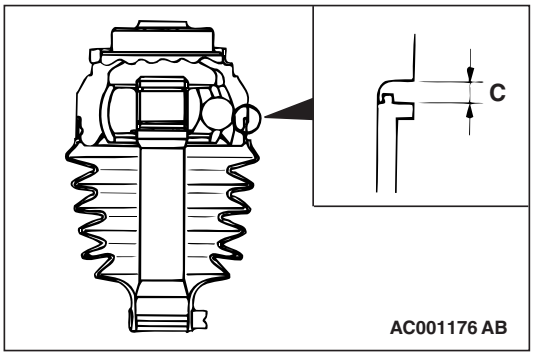
   Standard value (B): 2.4 – 2.8 mm
   <If the crimping amount is larger than 2.8 mm>
   Readjust the value of (W) in step 3 according to the following formula, and then repeat the operation in step 5.

W = 5.5 mm − B
Example: If B = 2.9 mm, then W = 2.6 mm.
<If the crimping amount is smaller than 2.4 mm>
Remove the BJ boot band, readjust the value of (W) in step 3 according to the following formula, and then repeat the operations in steps 4 and 5 using a new BJ boot band.
W = 5.5 mm − B
Example: If B = 2.3 mm then W = 3.2 mm.

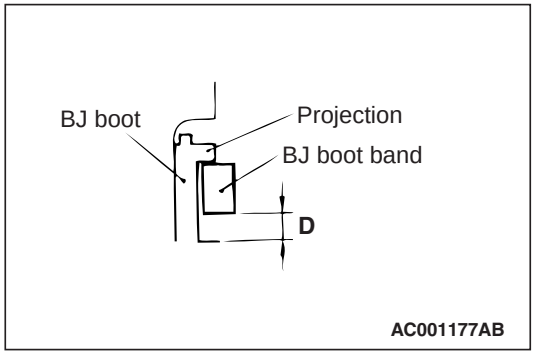
7. Check that the BJ boot band is not protruding past the place where it has been installed. If so, remove it and then repeat the operations in steps 4 to 6 using a new BJ boot band.

⚠ CAUTION
The driveshaft joint uses special grease. Do not mix old and new grease or different types of grease.

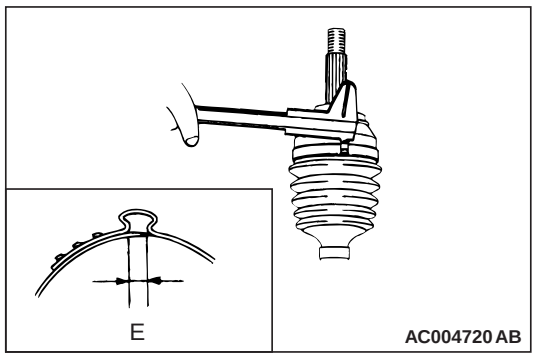
8. Fill the inside of the BJ boot with the specified amount of the specified grease.
   Specified grease: Repair kit grease 120 ± 10 g

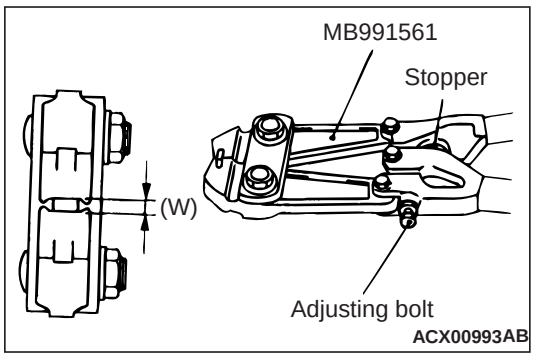


9. Install the BJ boot band (large) so that there is the clearance (C) between it and the BJ housing is at the standard value.
   Standard value (C): 0.05 − 1.55 mm
10. Follow the same procedure as in step 3 to adjust the size of the opening (W) shown on special tool MB991561 so that it is at the standard value.
    Standard value (W): 3.2 mm



11. Place the BJ boot band (large) against the projection at the edge of the boot, and then secure it so that there is a clearance left as shown by (D) in the illustration.
12. Use special tool MB991561 to crimp the BJ boot band (large) in the same way as in step 5.





13. Check that the crimping amount (E) of the BJ boot band is at the standard value.
    Standard value (E): 2.4 − 2.8 mm
    <If the crimping amount is larger than 2.8 mm>
    Readjust the value of (W) in step 10 according to the following formula, and then repeat the operation in step 12.
    W = 5.8 mm − E
    Example: If E = 2.9 mm, then W = 2.9 mm.
    <If the crimping amount is smaller than 2.4 mm>
    Remove the BJ boot band, readjust the value of (W) in step 10 according to the following formula, and then repeat the operating in steps 11 and 12 using a new BJ boot band.

W = 5.8 mm − E
Example: If E = 2.3 mm, then W = 3.5mm.

14. Check that the BJ boot band is not protruding past the place where it has been installed. If so, remove it and repeat the operations in steps 11 to 13 using a new BJ boot band.

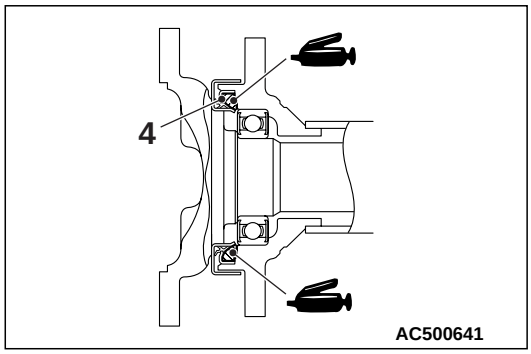
INNER SHAFT ASSEMBLY <4WD>

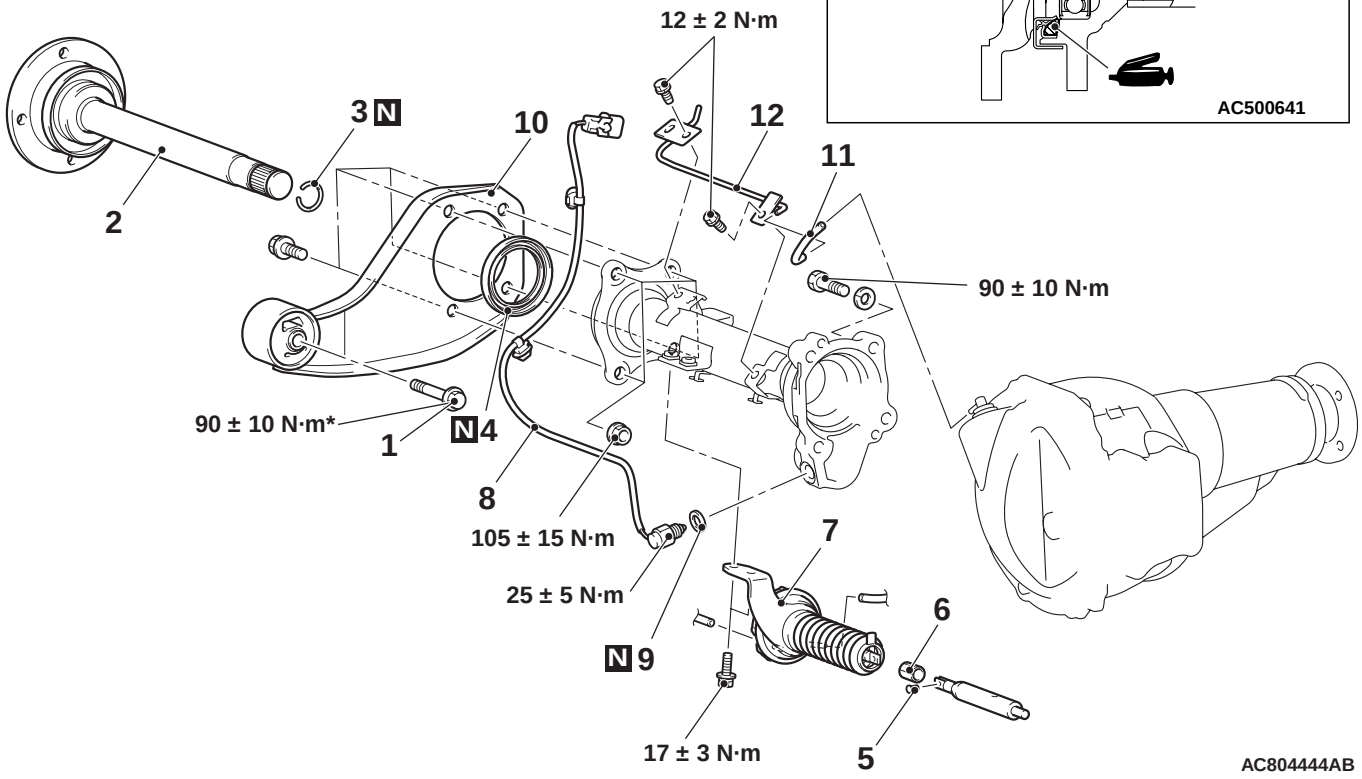
REMOVAL AND INSTALLATION

M1261004000201

⚠ CAUTION
***:Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the earth in the unladen condition.**

Pre-removal and Post-installation Operation
- Under Cover Removal and Installation (Refer to GROUP 51, Under Cover .)
- Gear Oil Draining and Supplying (Refer to P.26-11.)
- Driveshaft <RH> Removal and Installation (Refer to P.26-23).
- Shock absorber assembly <RH> Removal and Installation (Refer to GROUP 33, Shock Absorber Assembly .)





Removal steps
1. Bolt
<<A>> >>B<< 2. Inner shaft assembly
3. Circlip

Removal steps (Continued)
>>A<< 4. Dust seal
5. Pin <Except for Russia>
6. Collar <Except for Russia>

Removal steps (Continued)

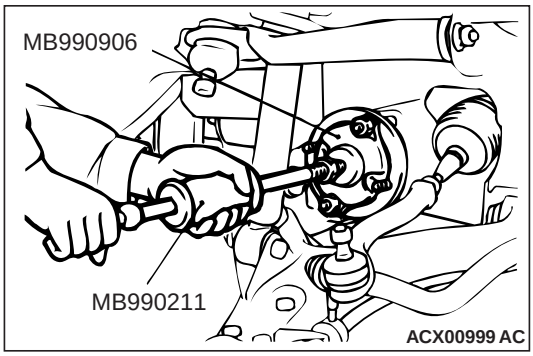
7. Actuator assembly <Except for Russia>
8. Free wheel engage switch assembly <Except for Russia>
   - Support the differential with a transmission jack
9. Gasket <Except for Russia>
10. Differential mounting bracket <RH>
11. Breather hose
12. Breather pipe

REMOVAL SERVICE POINT

<<A>> INNER SHAFT ASSEMBLY REMOVAL

⚠ CAUTION

When pulling the inner shaft out from the front differential carrier, be careful that the spline part of the inner shaft does not damage the oil seal.

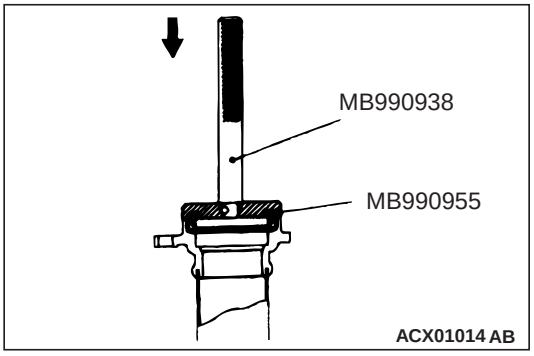


Pull the inner shaft from the differential carrier by using the following special tools.

- driveshaft attachment (MB990906)
- Sliding hammer (MB990211)

INSTALLATION SERVICE POINTS

>>A<< DUST SEAL INSTALLATION



Press-fit the new dust seal into the housing tube by using the following special tools, until it is flush with the housing tube end face.

- Installer bar (MB990938)
- Oil seal installer (MB990955)

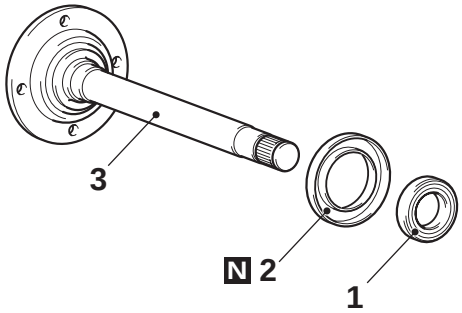
>>B<< INNER SHAFT ASSEMBLY INSTALLATION

⚠ CAUTION

Be careful not to damage the lip of the dust seal and oil seal.

DISASSEMBLY AND REASSEMBLY

M1261004200131



Disassembly steps

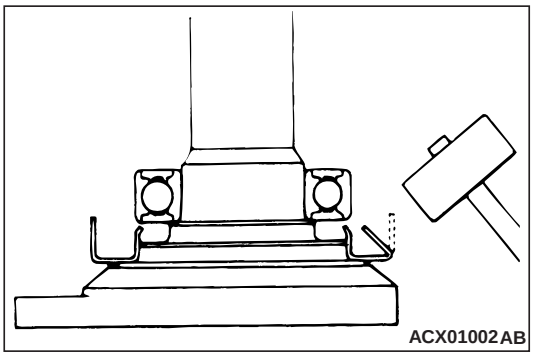
<<**A**>> >>**B**<< 1. Bearing

Disassembly steps (Continued)

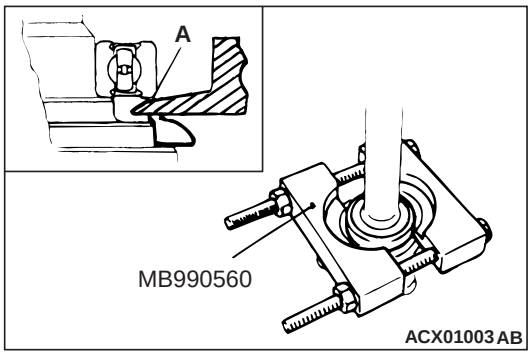
>>**A**<< 2. Dust cover
3. Inner shaft

DISASSEMBLY SERVICE POINT

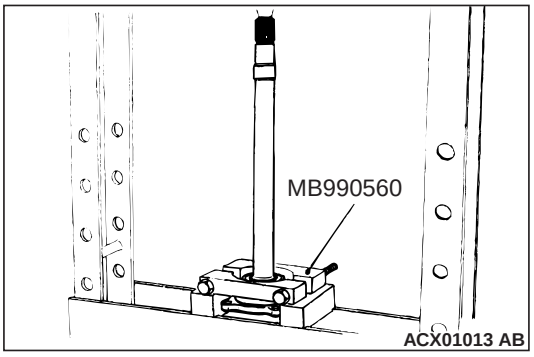
<<A>> BEARING REMOVAL



1. Bend the outside periphery of dust cover inward with a wooden hammer.



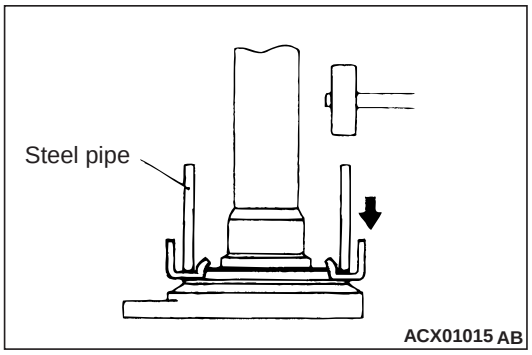
2. After special tool bearing remover (MB990560) has been installed as shown, tighten the nut of the special tool until the portion of the special tool touches the bearing outer race.



3. Press out the inner shaft from the bearing.

REASSEMBLY SERVICE POINTS

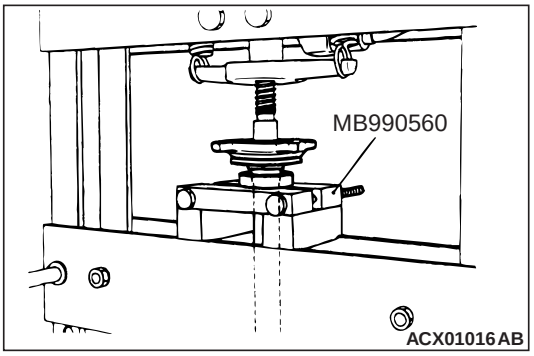
>>A<< DUST COVER INSTALLATION



Using a steel pipe, install a new dust cover onto the inner shaft.

Steel pipe	mm
Overall length	50
Outside diameter	75
Wall thickness	4

>>B<< BEARING INSTALLATION



Use special tool bearing remover (MB990560) to press-fit the bearing onto the inner shaft.

DIFFERENTIAL CARRIER AND FREE WHEELING CLUTCH <4WD>

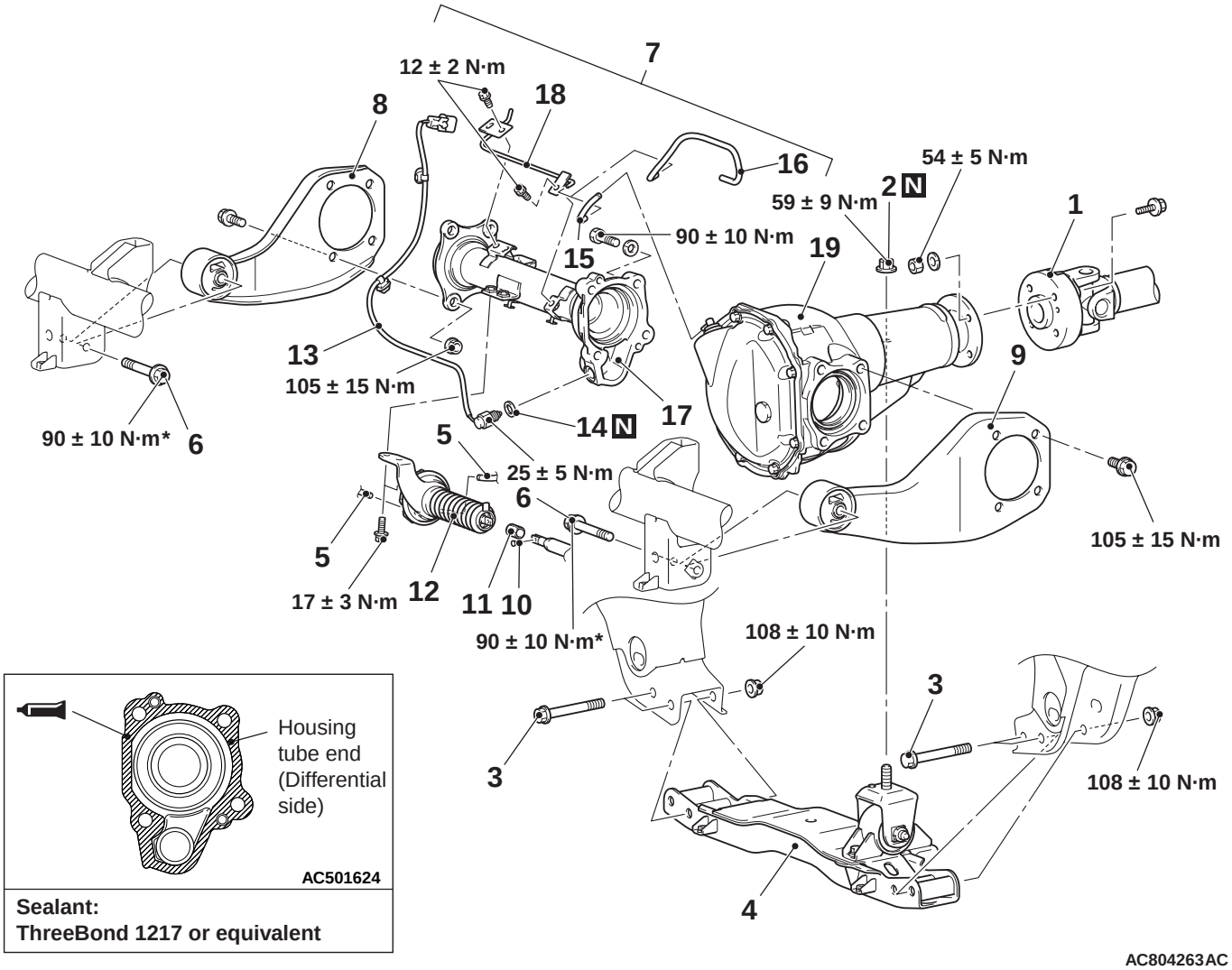
REMOVAL AND INSTALLATION

M1262001800201

⚠ CAUTION

***:Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the earth in the unladen condition.**

Pre-removal and Post-installation Operation
- Under Cover Removal and Installation (Refer to GROUP 51, Under Cover .)
- Front Axle Gear Oil Level Check (Refer to P.26-11.)
- Driveshaft Removal and Installation (Refer to P.26-23.)
- Inner Shaft Removal and Installation (Refer to P.26-30.)



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Removal steps

<<A>> >>B<< 1. Front propeller shaft connection
- Support the differential by a transmission jack

2. Self-locking nut
3. Front suspension rear crossmember assembly mounting bolt

Removal steps (Continued)

4. Front suspension rear crossmember assembly

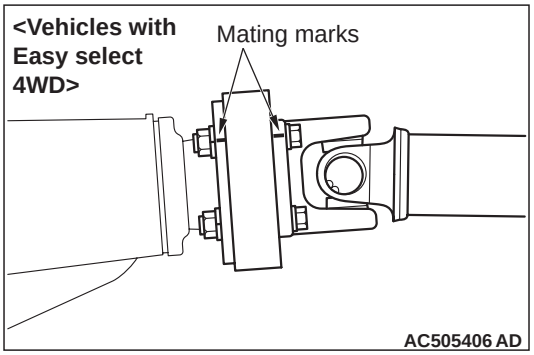
>>A<< 5. Vacuum hose connection
6. Differential mounting bracket bolt
7. Housing tube, front differential carrier and differential mounting bracket

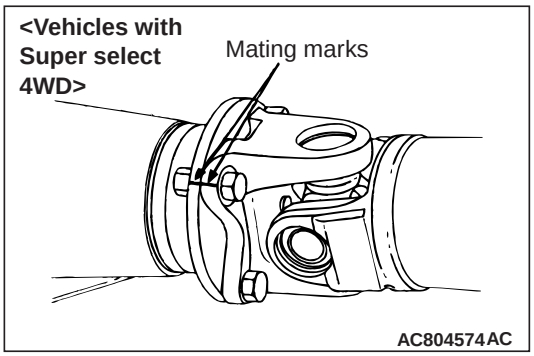
Removal steps (Continued)

8. Differential mounting bracket <RH>
9. Differential mounting bracket <LH>
10. Pin <Except for Russia>
11. Collar <Except for Russia>
12. Actuator assembly <Except for Russia>
13. Free wheel engage switch assembly <Except for Russia>
14. Gasket <Except for Russia>
15. Breather hose <Vehicles with Easy select 4WD>
16. Breather hose <Vehicles with Super select 4WD>
17. Housing tube assembly
18. Breather pipe
19. Front differential carrier assembly

REMOVAL SERVICE POINT

<<A>> FRONT PROPELLER SHAFT REMOVAL

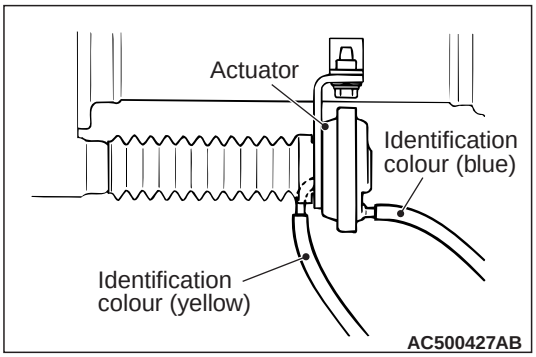




Make mating marks on the flange yoke and the differential carrier companion flange. Remove the front propeller shaft.

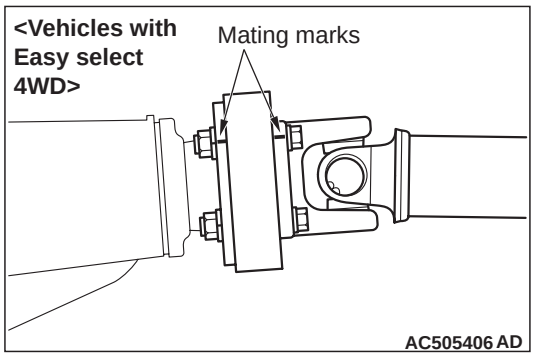
INSTALLATION SERVICE POINTS

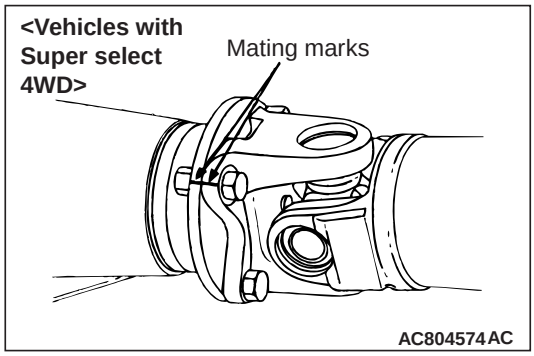
>>A<< VACUUM HOSE INSTALLATION



Install the vacuum hoses so that they match the identification colours of the actuator assembly nipple.

>>B<< FRONT PROPELLER SHAFT INSTALLATION



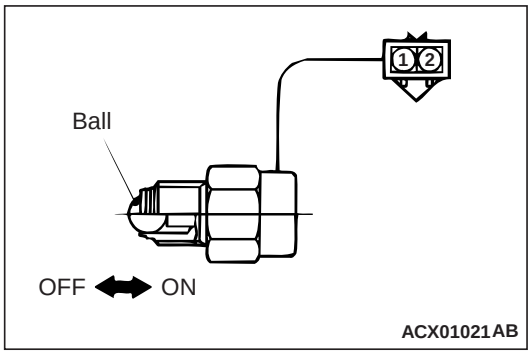


Install the front propeller shaft so that the mating marks of the flange yoke and the differential carrier companion flange are aligned.

INSPECTION

M1262001900123

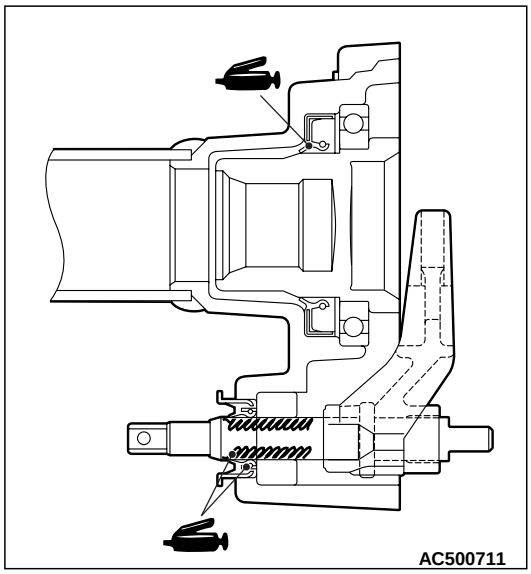
FREEWHEEL ENGAGE SWITCH CHECK <Except for Russia>

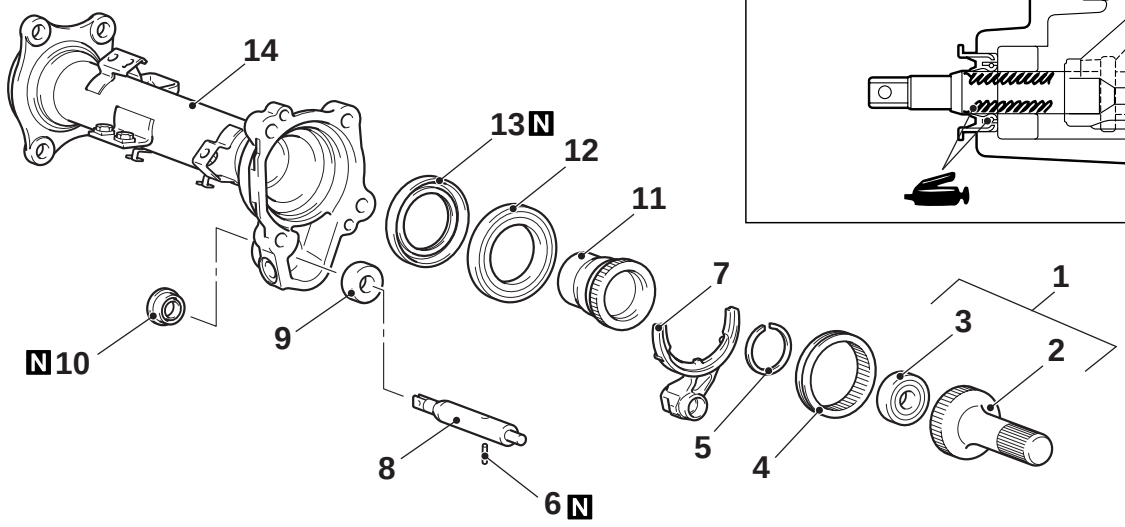


Shaft (Switch) position	Tester connection	Specified condition
Pressed (ON)	1-2	Continuity (Less than 2 Ω)
Released (OFF)	-	Open circuit

FREE WHEEL CLUTCH DISASSEMBLY AND REASSEMBLY <Except for Russia>

M1262002900159





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Disassembly steps

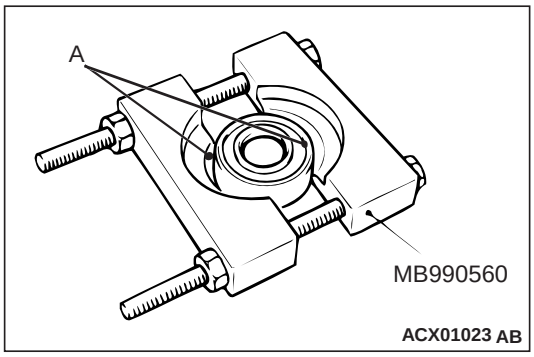
1. Main shaft assembly
<<A>> >>F<< 2. Main shaft
<<A>> >>F<< 3. Bearing
4. Clutch sleeve
>>E<< 5. Spacer
>>D<< 6. Spring pin
7. Shift fork

Disassembly steps (Continued)

8. Shift rod
9. Bushing
>>C<< 10. Oil seal
<<B>> >>B<< 11. Clutch gear
<<B>> >>B<< 12. Bearing
>>A<< 13. Oil seal
14. Housing tube

DISASSEMBLY SERVICE POINTS

<<A>> MAIN SHAFT/BEARING REMOVAL



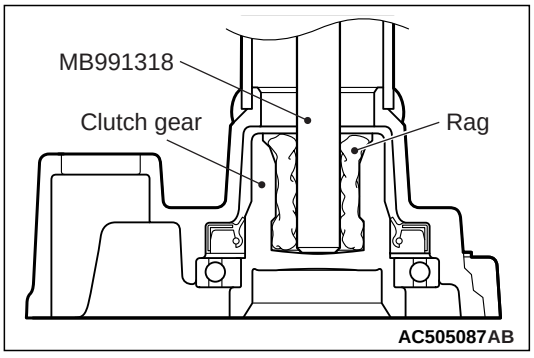
1. After special tool bearing remover (MB990560) has been installed as shown, tighten the nut of special tool until portion "A" of special tool touches the bearing outer race.

⚠ CAUTION

Do not allow the mainshaft to drop.

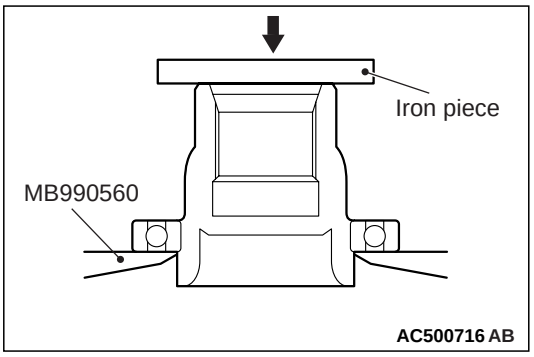
2. Press out the mainshaft from the bearing.

<<B>> CLUTCH GEAR/BEARING REMOVAL



1. Use special tool lower arm bush arbour (MB991318) to remove the clutch gear and bearing together.

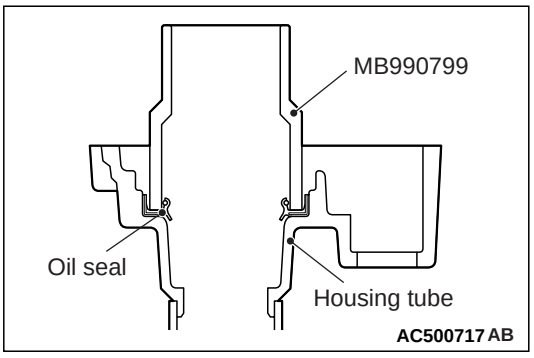
   NOTE: Apply rag inside of the clutch gear so as not to damage spline part.



2. Using a press and special tool bearing remover (MB990560), hold the supports against the bearing inner race, and separate the clutch gear and bearing.

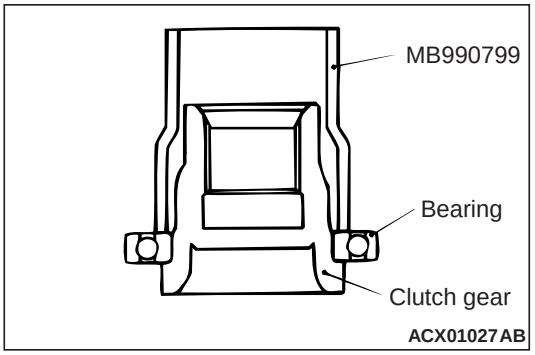
REASSEMBLY SERVICE POINTS

>>A<< OIL SEAL INSTALLATION



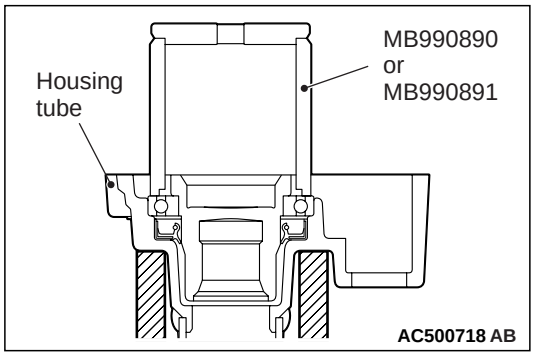
Use special tool ball joint remover and installer A (MB990799) to tap the oil seal until it is flush with the clutch housing.

>>B<< BEARING/CLUTCH GEAR INSTALLATION



1. Use special tool ball joint remover and installer A (MB990799) to press-fit the bearing to the shoulder of the clutch gear.

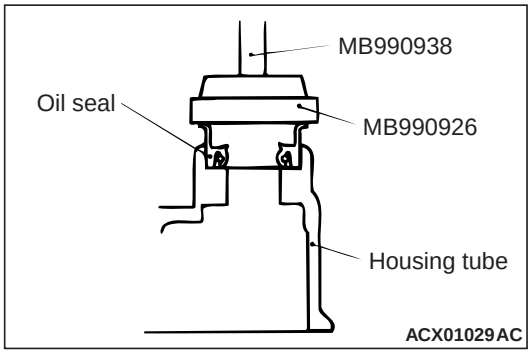
⚠ CAUTION



Place the special tool against the outer race of the bearing.

2. Use special tool rear suspension housing base (MB990890 or MB990891) to press-fit the bearing to the side of the clutch housing.

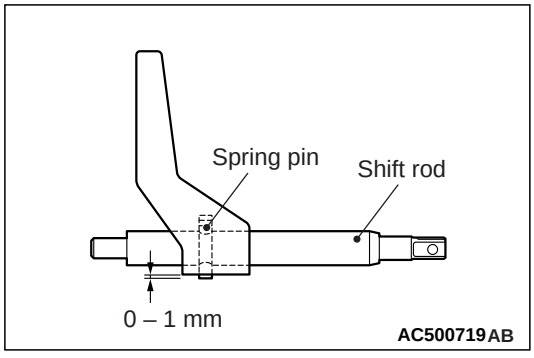
>>C<<OIL SEAL INSTALLATION



Use the following special tools to press-fit the oil seal to the clutch housing.

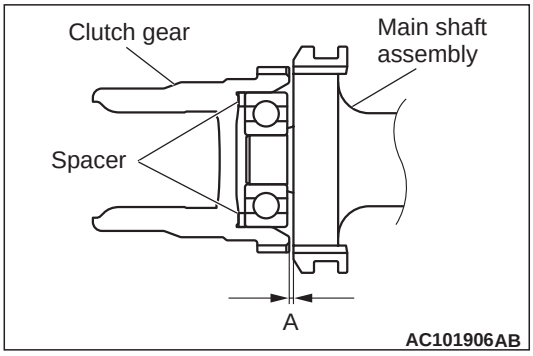
- Installer adapter (MB990926)
- Bar (MB990938)

>>D<< SPRING PIN INSTALLATION



Tap the spring pin from the chamfered side of the shaft rod until the projection length becomes the length shown in the illustration.

>>E<< SPACER INSTALLATION



1. Place the current spacer in the area shown in the illustration to check that the dimensions shown in the illustration are within the standard values.

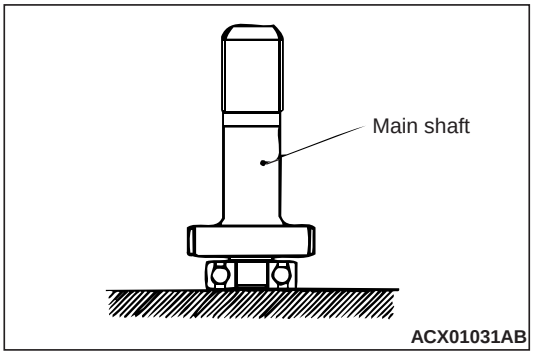
   Standard Value (A): 0.05 – 0.3 mm

2. If the dimensions are outside of the standard values, select the correct spacer type to fit in the standard values.

   Spacer type

Part Number	Thickness mm	Part Number	Thickness mm
MR111526	1.1	MR111530	2.1
MR111527	1.35	MR111531	2.35
MR111528	1.6	MR111532	2.6
MR111529	1.85	MR111533	2.85

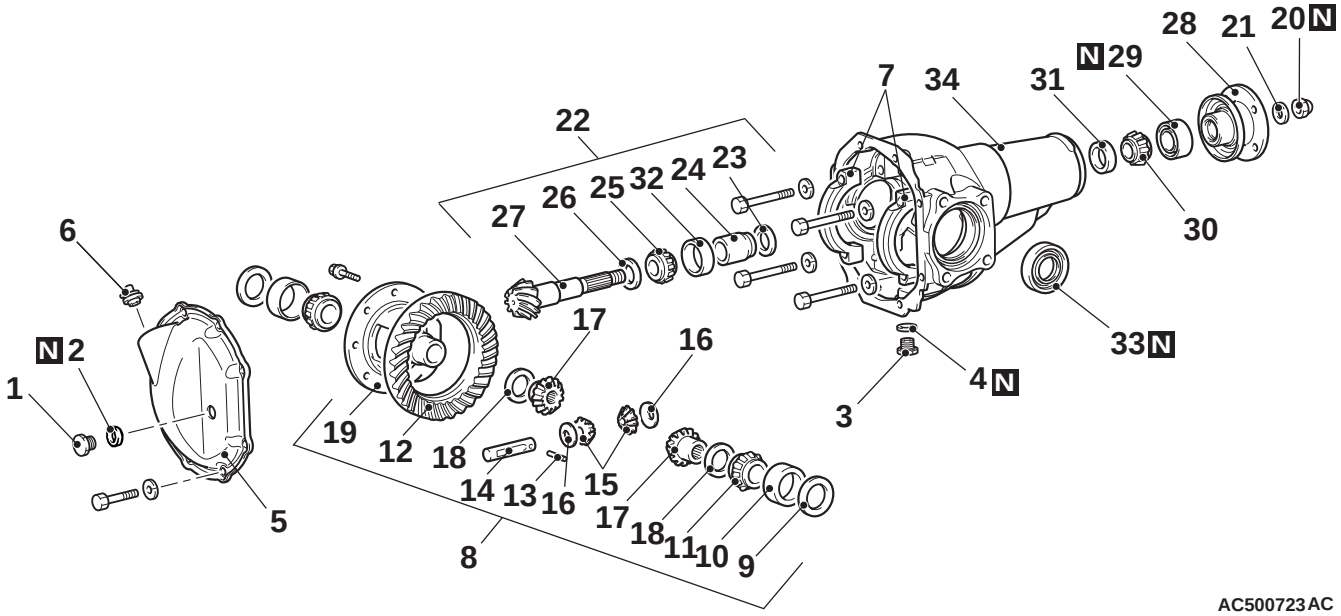
>>F<< BEARING/MAIN SHAFT INSTALLATION



Press-fit the bearing to the shoulder of the mainshaft.

DISASSEMBLY

M1262002300146



AC500723 AC

Disassembly steps

<<A>> • Inspection before disassembly
1. Filler plug
2. Gasket
3. Drain plug
4. Packing
5. Differential cover
6. Vent plug <Vehicles with Easy select 4WD>
7. Bearing cap

<<B>> 8. Differential case assembly
<<B>> 9. Differential side bearing adjusting spacer
<<B>> 10. Differential side bearing outer race
<<C>> 11. Differential side bearing inner race
<<D>> 12. Drive gear
<<E>> 13. Lock pin
14. Pinion shaft
15. Pinion gear
16. Pinion washer
17. Side gear
18. Side gear spacer
19. Differential case
<<F>> 20. Self-locking nut
21. Washer
<<G>> 22. Drive pinion assembly
23. Drive pinion front shim (for turning torque adjustment)
24. Drive pinion spacer
<<H>> 25. Drive pinion rear bearing inner race
26. Drive pinion rear shim (For pinion height adjustment)
27. Drive pinion

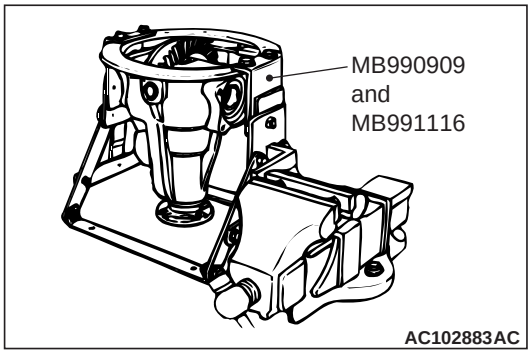
Disassembly steps (Continued)

28. Companion flange
29. Oil seal
30. Drive pinion front bearing inner race
<<I>> 31. Drive pinion front bearing outer race
<<J>> 32. Drive pinion rear bearing outer race
<<K>> 33. Oil seal
34. Differential carrier

DISASSEMBLY SERVICE POINTS

<<A>> INSPECTION BEFORE DISASSEMBLY

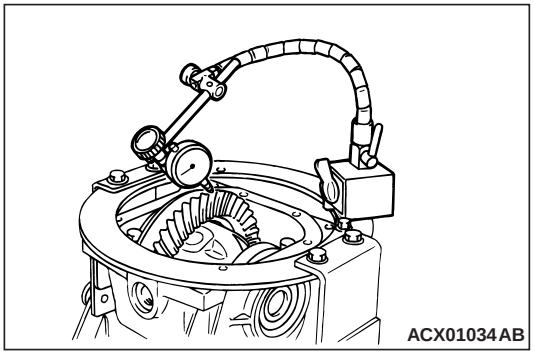
1. Remove the cover.



AC102883 AC

2. Hold the following special tools in a vise, and install the differential carrier assembly to the special tool.
   - Working base (MB990909)
   - Working base adapter (MB991116)

DRIVE GEAR BACKLASH

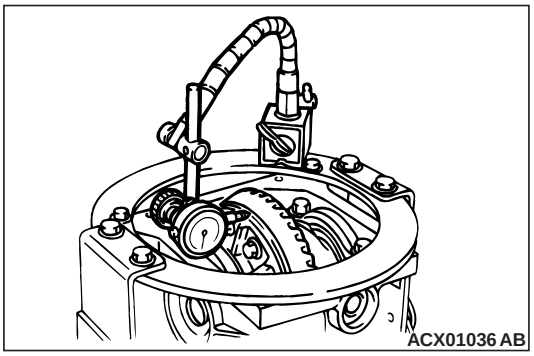


1. With the drive pinion locked in place, use a dial gauge to measure the drive gear backlash in four or more places on the drive gear.

   Standard value: 0.11 – 0.16 mm

2. If the backlash is not within the standard value, adjust the final drive gear backlash (Refer to).
3. After the adjustment, inspect the final drive gear tooth contact.

DRIVE GEAR RUNOUT

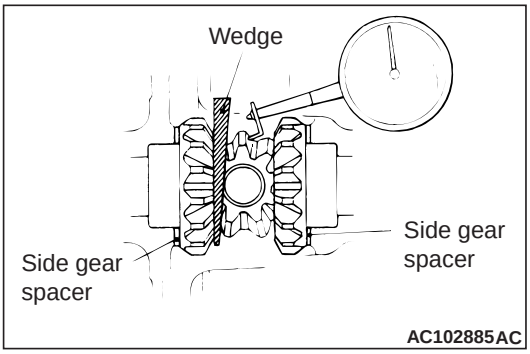


1. Measure the drive gear runout at the shoulder on the reverse side of the drive gear.

   Limit: 0.05 mm

2. When the runout exceeds the limit value, check for foreign material between drive gear rear side and differential case, and for loose drive gear installation bolts.
3. When check (2) gives normal results, reposition drive gear and differential case and remeasure.
4. If adjustment is impossible, replace differential case, or replace drive gear and pinion as a set.

DIFFERENTIAL GEAR BACKLASH



1. Insert a wedge between the side gear and the pinion shaft to lock the side gear.
2. While locking the side gear with the wedge, measure the differential gear backlash with a dial indicator on the pinion gear.

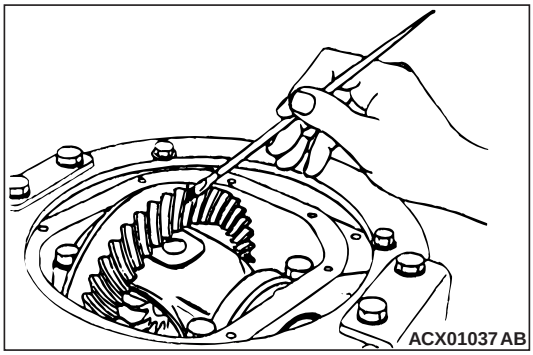
   Use the measurement procedure for the other pinion gear.

   Standard value: 0.01 – 0.250 mm

3. If the backlash exceeds the standard value, adjust it by replacing the side gear spacers.
4. If adjustment is not possible, replace the side gears and pinion gears as a set.

DRIVE GEAR TOOTH CONTACT

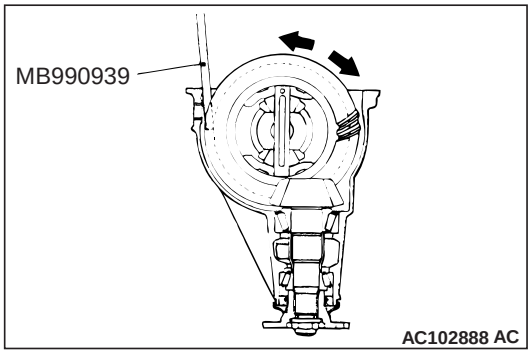
Check the tooth contact of drive gear by following the steps below.



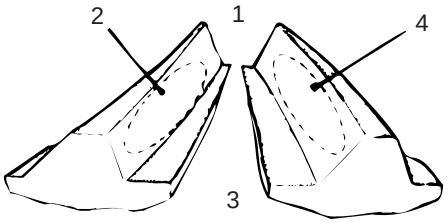
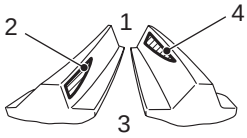
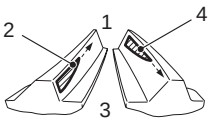
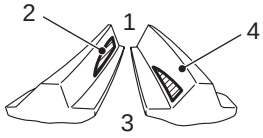
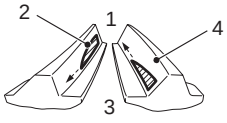
1. Apply a thin, uniform coat of machine blue to both surfaces of the drive gear teeth.

⚠ CAUTION

If the drive gear is rotated too much, the tooth contact pattern will become unclear and difficult to check.



2. Insert special tool remover bar (MB990939) between the differential carrier and the differential case, and then rotate the companion flange by hand (once in the normal direction, and then once in the reverse direction) while applying a load to the drive gear so that the revolution torque (approximately 2.5 – 3.0 N·m) is applied to the drive pinion.
3. Check the tooth contact condition of the drive gear and drive pinion.

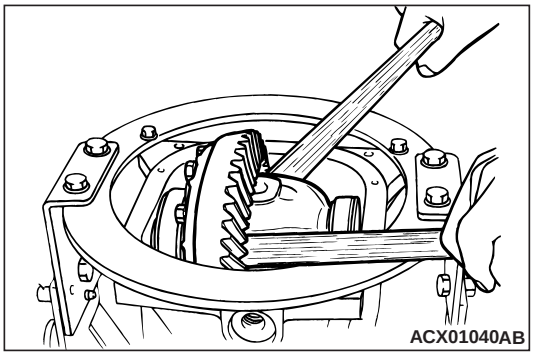
Standard tooth contact pattern	Problem	Solution
1. Narrow tooth side 2. Drive-side tooth surface (the side applying power during forward movement) 3. Wide tooth side 4. Coast-side tooth surface (the side applying power during reverse movement)  ACX01039 AF	Tooth contact pattern resulting from excessive pinion height  AC107260 AB The drive pinion is positioned too far from the centre of the drive gear.	 AC107261AB Increase the thickness of the drive pinion rear shim, and position the drive pinion closer to the centre of the drive gear. Also, for backlash adjustment, position the drive gear farther from the drive pinion.
	Tooth contact pattern resulting from insufficient pinion height.  AC107262 AB The drive pinion is positioned too close to the centre of the drive gear.	 AC107263 AB Decrease the thickness of the drive pinion rear shim, and position the drive pinion farther from the centre of the drive gear. Also, for backlash adjustment, position the drive gear closer to the drive pinion.

NOTE: Check the tooth contact pattern to confirm that the adjustments of the pinion height and backlash have been done properly. Continue to adjust the pinion height and backlash until the tooth contact pattern resembles the standard pattern. If, even after adjustments have been made, the correct tooth contact pattern cannot be obtained, it means that the drive gear and the drive pinion have become worn beyond the allowable limit. Replace the gear set.

<<B>> DIFFERENTIAL CASE ASSEMBLY/ DIFFERENTIAL SIDE BEARING SPACER/ DIFFERENTIAL SIDE BEARING OUTER RACE REMOVAL

⚠ CAUTION

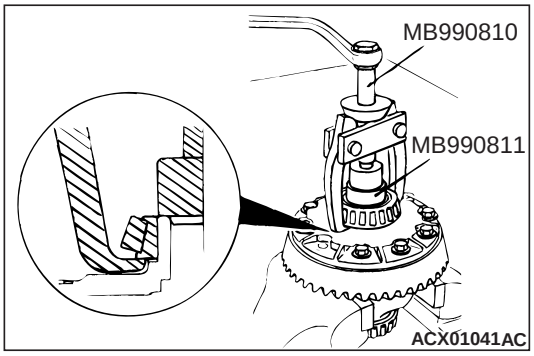
When taking out the differential case assembly, be careful not to drop and damage the differential side bearing spacers and differential side bearing outer races.



Use the wooden handle of a hammer to remove the differential case assembly, differential side bearing spacers and differential side bearing outer races.

NOTE: Keep the right and left side bearings and side bearing adjusting spacers separate, so that they do not become mixed during assembly.

<<C>> DIFFERENTIAL SIDE BEARING INNER RACE REMOVAL

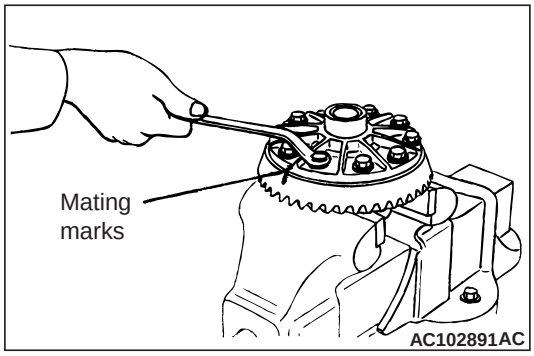


Use the following special tools to pull out the side bearing inner races.

- Side bearing puller (MB990810)
- Differential side bearing cap (MB990811)

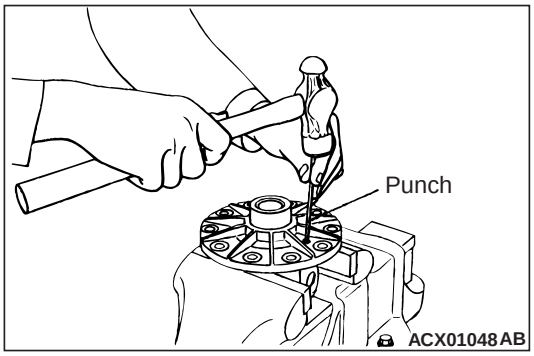
NOTE: There are two notches provided (at the differential case side) for the claw part of the special tools; use special tools at that position.

<<D>> DRIVE GEAR REMOVAL



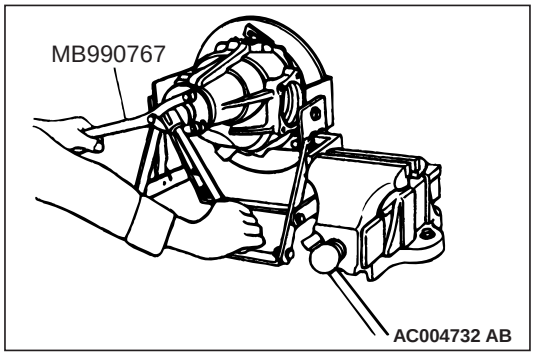
1. Make the mating marks to the differential case and the drive gear.
2. Loosen the drive gear attaching bolts in diagonal sequence to remove the drive gear.

<<E>> LOCK PIN REMOVAL



Drive out the lock pin with a punch.

<<F>> SELF-LOCKING NUT REMOVAL

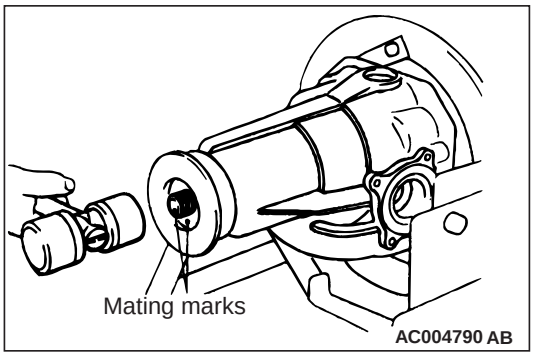


Use special tool front hub and flange yoke holder (MB990767) to hold the companion flange, and then remove the companion flange self-locking nut.

<<G>> DRIVE PINION ASSEMBLY REMOVAL

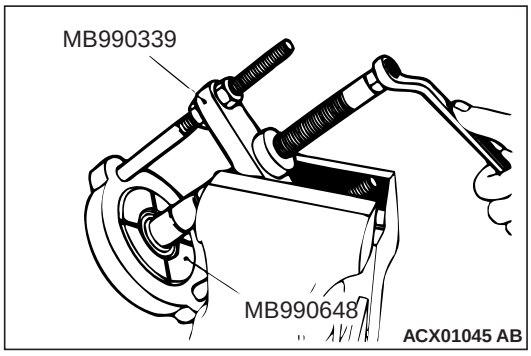
⚠ CAUTION

The mating mark made on the companion flange must not be on the coupling surface of the flange yoke and the front propeller shaft.



1. Make mating marks on the drive pinion and companion flange.
2. Drive out the drive pinion together with the drive pinion spacer and drive pinion shims.

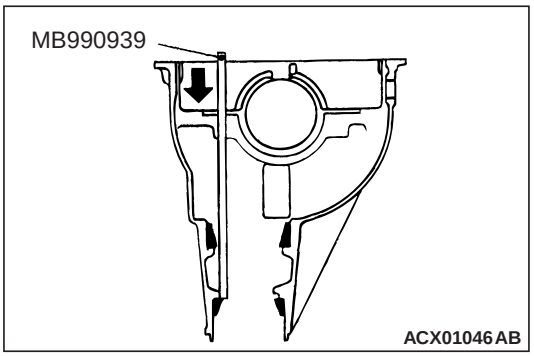
<<H>> DRIVE PINION REAR BEARING INNER RACE REMOVAL



Use the following special tools to pull out the front bearing inner race.

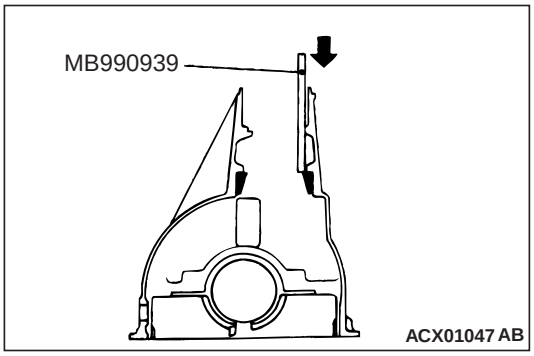
- Bearing puller (MB990339)
- Bearing remover (MB990648)

<<I>> DRIVE PINION FRONT BEARING OUTER RACE REMOVAL



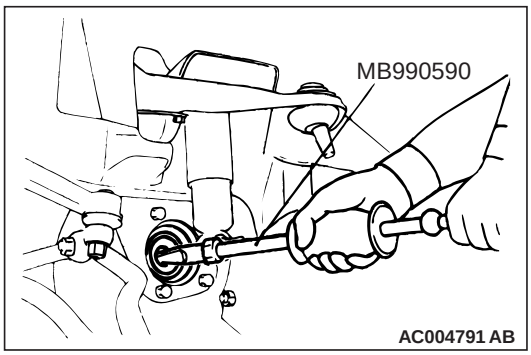
Use special tool remover bar (MB990939) to remove the drive pinion front bearing outer race.

<<J>> DRIVE PINION REAR BEARING OUTER RACE REMOVAL



Use special tool remover bar (MB990939) to remove the drive pinion rear bearing outer race.

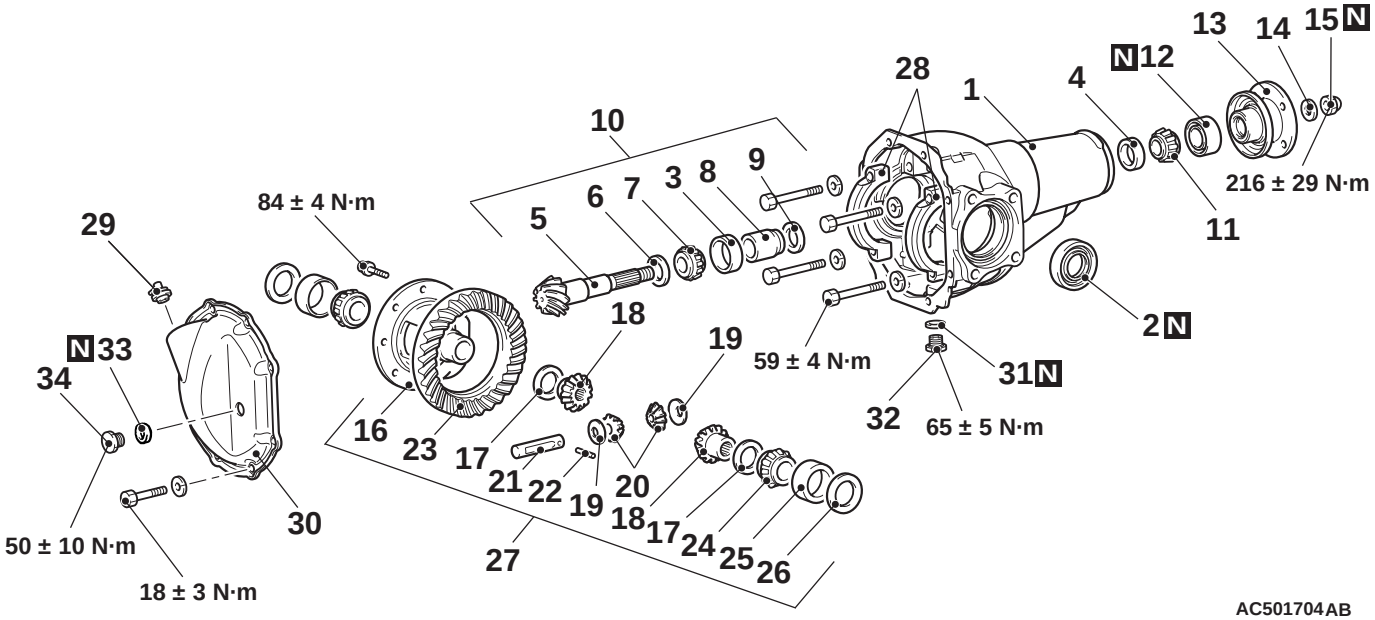
<<K>> OIL SEAL REMOVAL

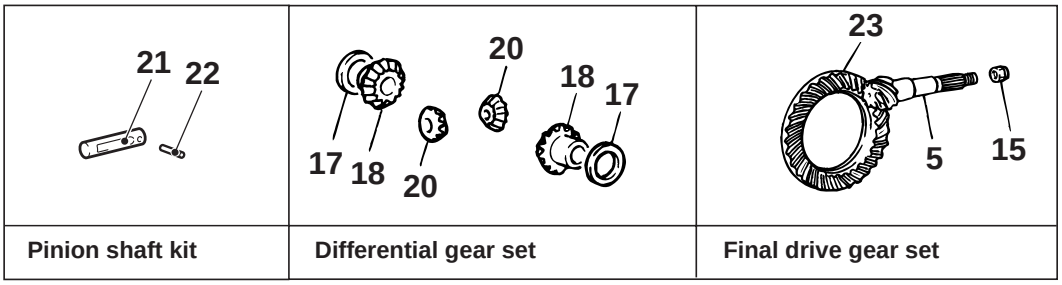


Use special tool rear axle shaft oil seal remover (MB990590) to remove the oil seal.

REASSEMBLY

M1262002500258





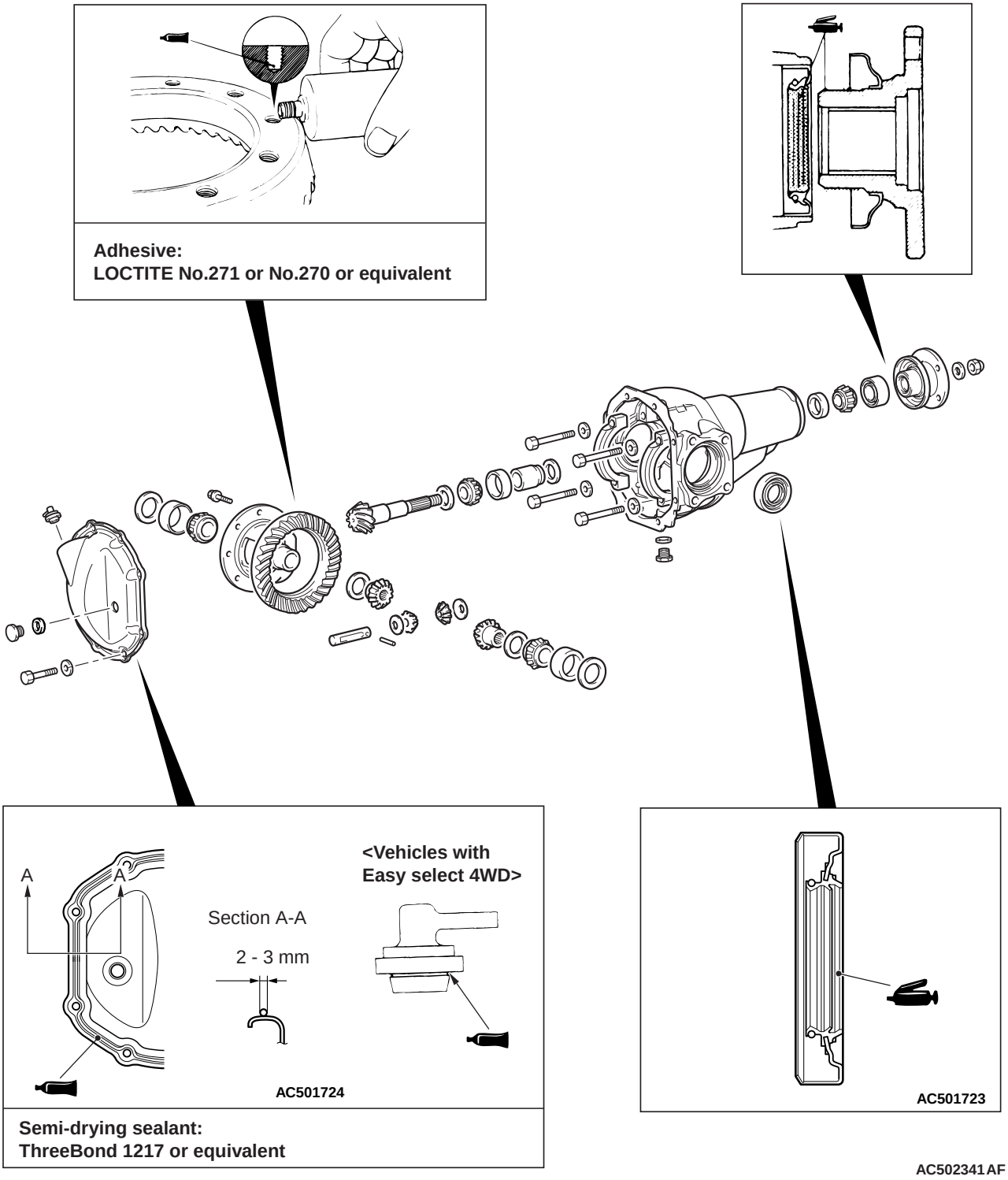
Reassembly steps

1. Differential carrier
- >>**A**<< 2. Oil seal
- >>**B**<< 3. Drive pinion rear bearing outer race
- >>**C**<< 4. Drive pinion front bearing outer race
- >>**D**<< • Drive pinion height adjustment
5. Drive pinion
6. Drive pinion rear shim (for pinion height adjustment)
7. Drive pinion rear bearing inner race
- >>**E**<< • Drive pinion turning torque adjustment
8. Drive pinion spacer
9. Drive pinion front shim (for turning torque adjustment)
10. Drive pinion assembly
11. Drive pinion front bearing inner race
12. Oil seal
13. Companion flange
14. Washer
15. Self-locking nut
16. Differential case
17. Side gear spacer

Reassembly steps (Continued)

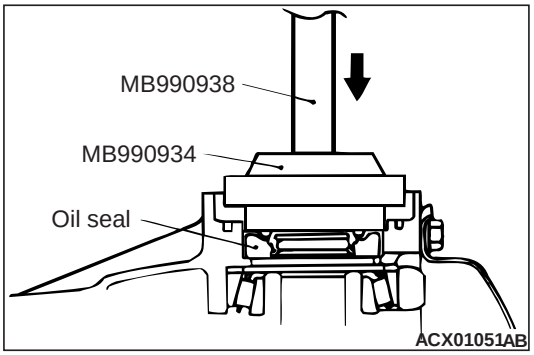
18. Side gear
19. Pinion washer
20. Pinion gear
- >>**F**<< • Differential gear backlash adjustment
21. Pinion shaft
- >>**G**<< 22. Lock pin
- >>**H**<< 23. Drive gear
- >>**I**<< 24. Differential side bearing inner race
25. Differential side bearing outer race
26. Differential side bearing adjusting spacer
- >>**J**<< • Drive gear backlash adjustment
27. Differential case assembly
28. Bearing cap
29. Vent plug <Vehicles with Easy select 4WD>
30. Differential cover
31. Packing
32. Drain plug
33. Gasket
34. Filler plug

LUBRICATION, SEALING AND ADHESIVE POINTS



REASSEMBLY SERVICE POINTS

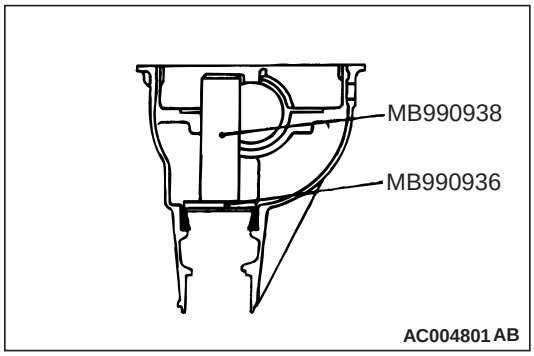
>>A<< OIL SEAL INSTALLATION



Use the following special tools to insert the oil seal, and then apply a thin coat of multipurpose grease to the lip of the oil seal.

- Installer bar (MB990938)
- Installer adapter (MB990934)

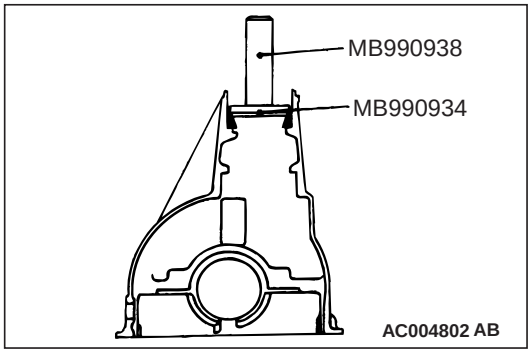
>>B<< DRIVE PINION REAR BEARING OUTER RACE INSTALLATION



Use the following special tools to press-fit the drive pinion rear bearing outer races into the gear carrier.

- Installer bar (MB990938)
- Installer adapter (MB990936)

>>C<< DRIVE PINION FRONT BEARING OUTER RACE INSTALLATION

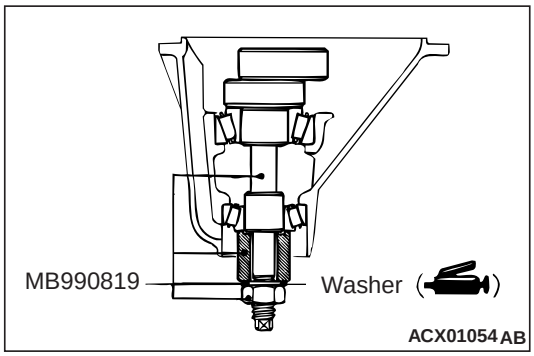


Use the following special tools to press-fit the drive pinion rear bearing outer races into the gear carrier.

- Installer bar (MB990938)
- Installer adapter (MB990934)

>>D<< DRIVE PINION HEIGHT ADJUSTMENT

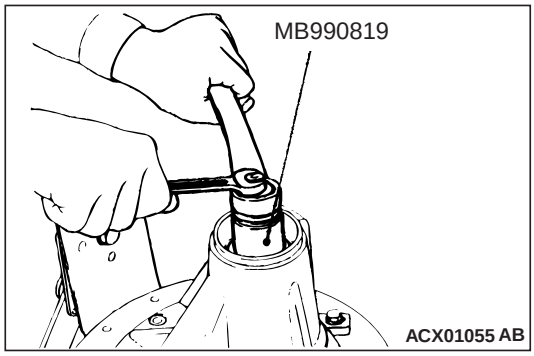
Adjust the drive pinion height as follows:

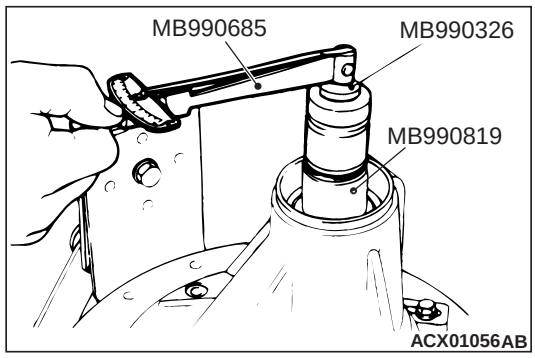


1. Apply multipurpose grease to the washer of special tool drive pinion gauge assembly (MB990819).
2. Install special tool, drive pinion front and rear bearing inner races to the gear carrier.

⚠ CAUTION

There should be no gear oil adhered to the bearing.





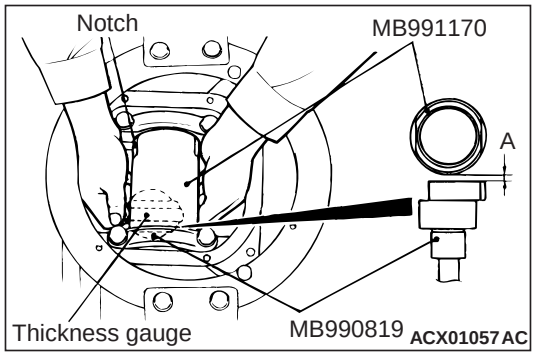
3. Tighten the nut of special tool while measuring the turning torque of the drive pinion by using the following special tools. Gradually keep tightening the nut of special tool until the turning torque of the drive pinion (without oil seal) is at the standard value.
   - Preload socket (MB990326)
   - Torque wrench (MB990685)
   - Drive pinion gauge assembly (MB990819)

Standard value:

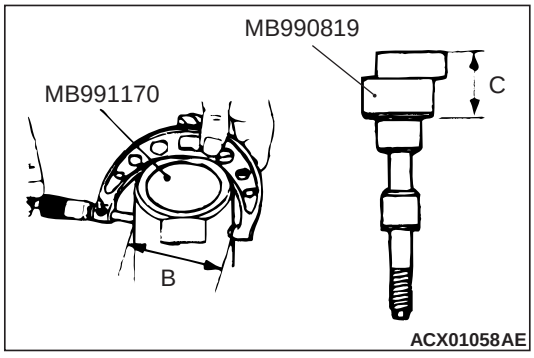
Bearing division	Bearing lubrication	Turning torque
New	None (with anti-rust agent)	0.83 – 1.19 N·m

NOTE: Because special tool preload socket (MB990326) cannot be turned one turn, turn it several times within the range that it can be turned; then, after fitting to the bearing, measure the turning torque.

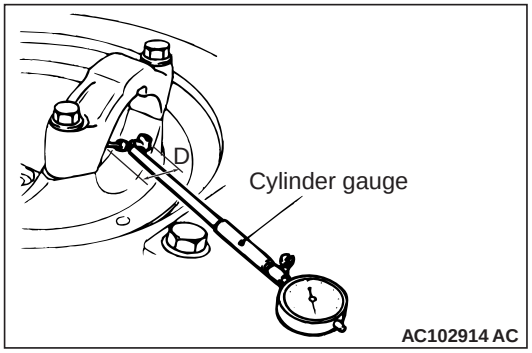
4. Clean the side bearing seat of the differential carrier and bearing caps.



5. Place the following special tools in the side bearing seat of the differential carrier, and position the notch as shown in the illustration. Then install the bearing caps.
   - Cylinder gauge (MB991170)
   - Drive pinion gauge assembly (MB990819)
6. Use a thickness gauge to measure the clearance (A) between special tools.
7. Remove the bearing caps and special tools.

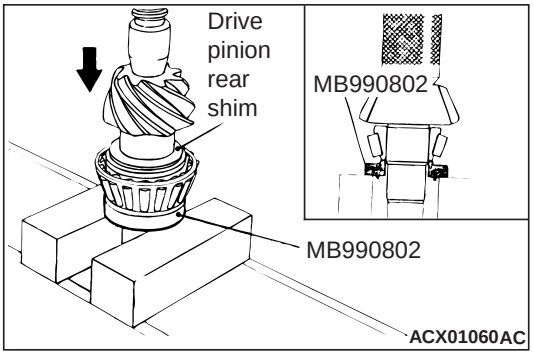


8. Use a micrometer to measure the shown dimensions (B, C) of special tools.



9. Install the bearing cap, and then use a cylinder gauge and micrometer to measure the inside diameter (D) of the bearing cap as shown in the illustration.
10. Calculate the thickness (E) of the required drive pinion rear shim by the following formula, and then select a shim which most closely matches this thickness.

E = A + B + C - 1/2D - 100.0 mm



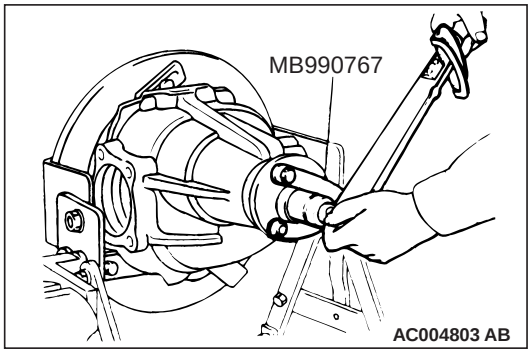
11. Fit the selected drive pinion rear shim(s) to the drive pinion, and press-fit the drive pinion front bearing inner race by using special tool bearing installer (MB990802).

>>E<< DRIVE PINION TURNING TORQUE ADJUSTMENT

Adjust the drive pinion turning torque by using the following procedure:

1. Insert the drive pinion into the gear carrier, and then install the drive pinion spacer, the drive pinion front shim, the drive pinion front bearing inner race, and the companion flange in that order.

   NOTE: Do not install the oil seal.

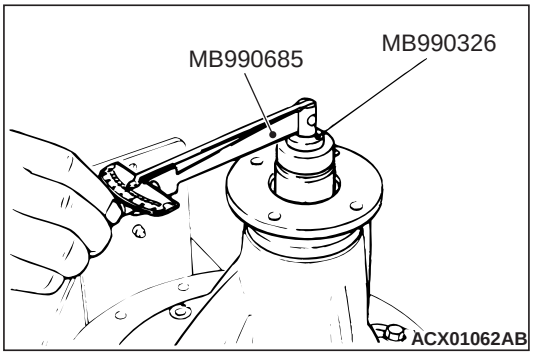


2. Tighten the companion flange self-locking nut to the specified torque while holding the companion flange with special tool front hub and flange yoke holder (MB990767).

Tightening torque: 216 ± 29 N·m

⚠ CAUTION

There should be no gear oil adhered to the bearing.



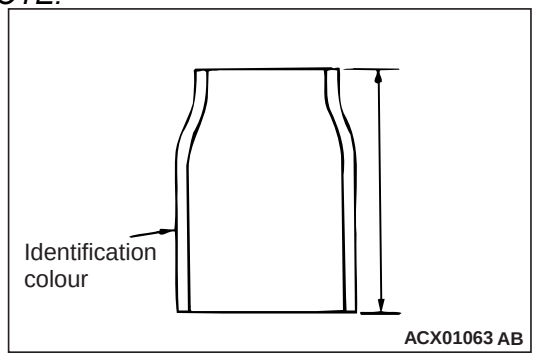
3. Use the following special tools to measure the drive pinion turning torque (without the oil seal).
   - Preload socket (MB990326)
   - Torque wrench (MB990685)

Standard value:

Bearing division	Bearing lubrication	Turning torque
New	None (with anti-rust agent)	0.83 – 1.19 N·m

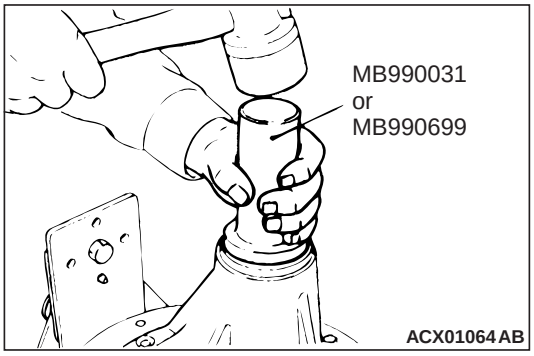
4. If the drive pinion turning torque is not within the range of the standard value, adjust the preload by replacing the drive pinion front shim(s) or the drive pinion spacer.

NOTE:

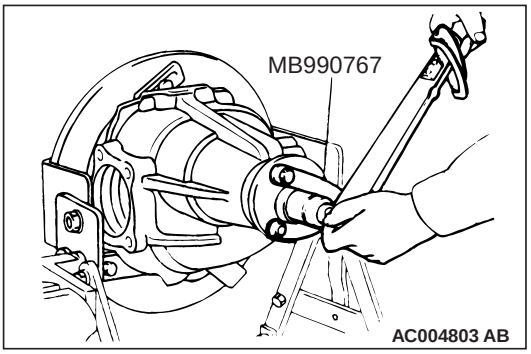


When selecting the drive pinion front shims, if the number of shims is large, reduce the number of shims to a minimum by selecting the drive pinion spacers.
Select the drive pinion spacer from the following two types.

Height of drive pinion spacer mm	Identification colour
56.67	White
57.01	–

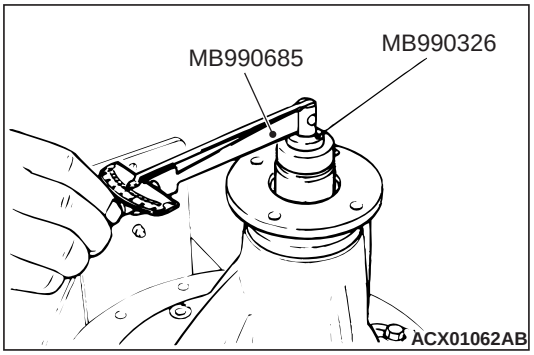


5. Remove the companion flange and drive pinion again. Then, after inserting the drive pinion front bearing inner race into the gear carrier, use special tool oil seal installer (MB990031 or MB990699) to press-fit the oil seal.



6. Install the drive pinion assembly and companion flange with the mating marks properly aligned. Tighten the companion flange self-locking nut to the specified torque while holding the companion flange with special tool.

   Tightening torque: 216 ± 29 N·m



7. Use special tools to measure the drive pinion turning torque (with drive pinion oil seal) to verify that the drive pinion turning torque complies with the standard value.

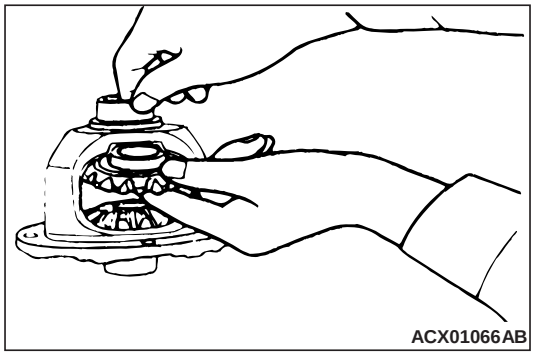
   Standard value:

Bearing division	Bearing lubrication	Turning torque
New	None (with anti-rust agent)	0.89 – 1.78 N·m
	Gear oil applied	0.97 – 1.32 N·m

8. If the turning torque is not within the standard value, check the tightening torque of the companion flange self-locking nut, and the installation of the oil seal.

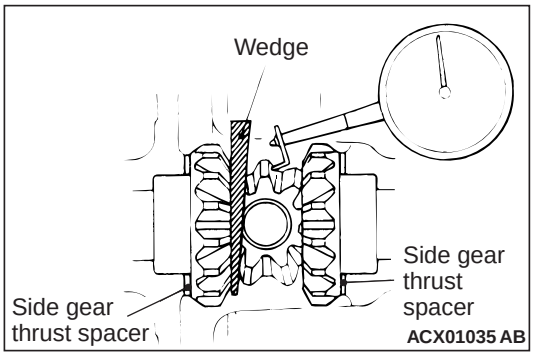
>>F<< DIFFERENTIAL GEAR BACKLASH ADJUSTMENT

Adjust the differential gear backlash by the following procedure:



1. Assemble the side gears, side gear spacers, pinion gears and pinion washers into the differential case.
2. Temporarily install the pinion shaft.

   NOTE: Do not drive in the lock pin yet.



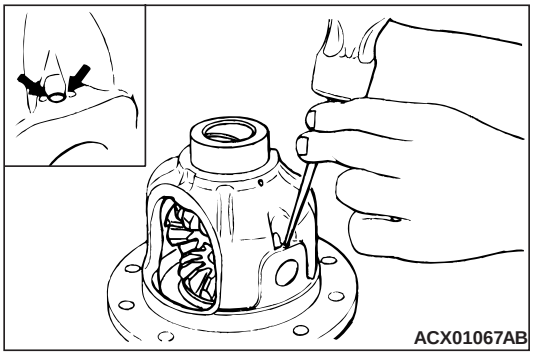
3. Insert a wedge between the side gear and the pinion shaft to lock the side gear.
4. While locking the side gear with the wedge, measure the differential gear backlash with a dial indicator on the pinion gear.

   Measure by the same procedure for the other pinion gear.

   Standard value: 0.01 – 0.250 mm

5. If the backlash exceeds the standard value, adjust it by replacing the side gear spacers.
6. If adjustment is not possible, replace the side gears and pinion gears as a set.
7. Measure the differential gear backlash once again, and confirm that it is within the standard.

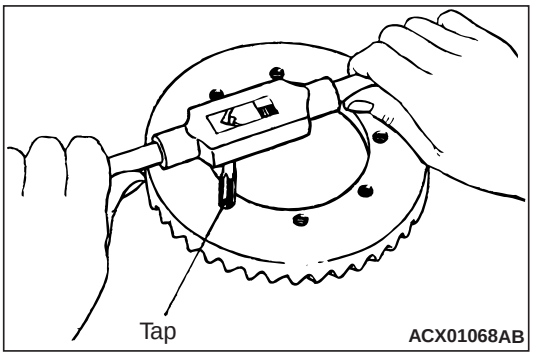
>>G<< LOCK PIN INSTALLATION



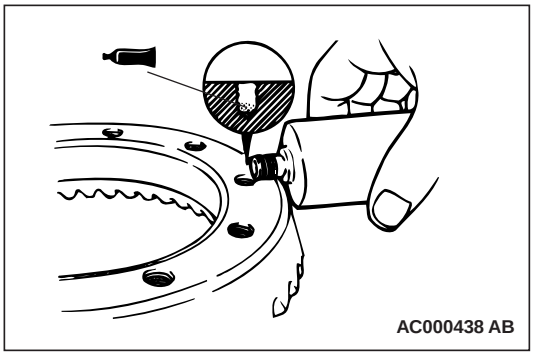
1. Align the pinion shaft lock pin hole with the differential case lock pin hole, and drive in the lock pin.
2. Stake the lock pin with a punch at two points.

>>H<< DRIVE GEAR INSTALLATION

1. Clean the drive gear attaching bolts.



2. Remove the adhesive adhered to the threaded holes of the drive gear by turning the tap (M10 x 1.25), and then clean the threaded holes by applying compressed air.



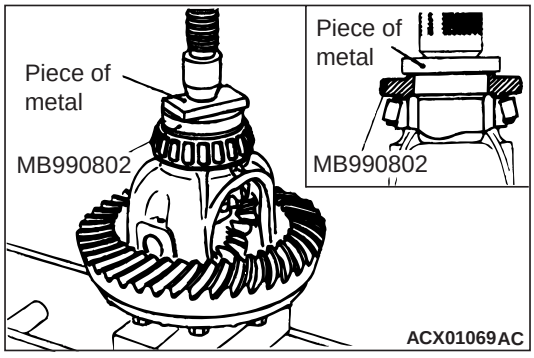
3. Apply the specified adhesive to the threaded holes of the drive gear.

   Specified adhesive:: LOCKTITE No.271 or No.270 or equivalent

4. Install the drive gear onto the differential case with the mating marks properly aligned. Tighten the bolts to the specified torque in a diagonal sequence.

   Tightening torque: 84 ± 4 N·m

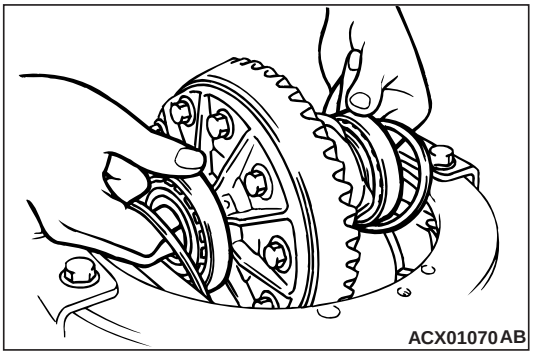
>>I<< DIFFERENTIAL SIDE BEARING INNER RACE INSTALLATION



Use special tool bearing installer (MB990802) to press-fit the differential side bearing inner races into the differential case.

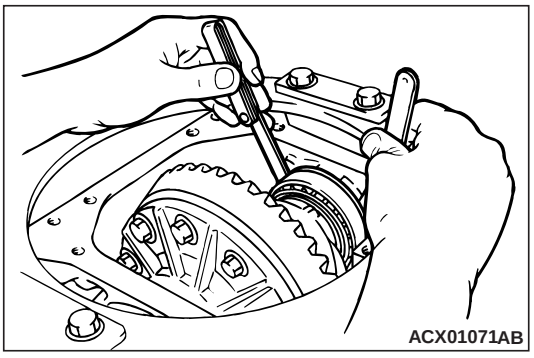
>>J<< DRIVE GEAR BACKLASH ADJUSTMENT

Adjust the drive gear backlash by the following procedures:

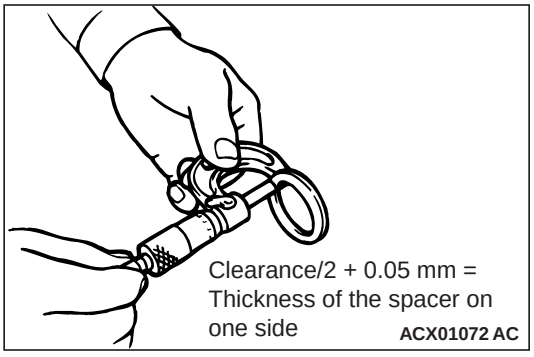


1. Install the side bearing spacers, which are thinner than those removed, to the side bearing outer races, and then mount the differential case assembly into the gear carrier.

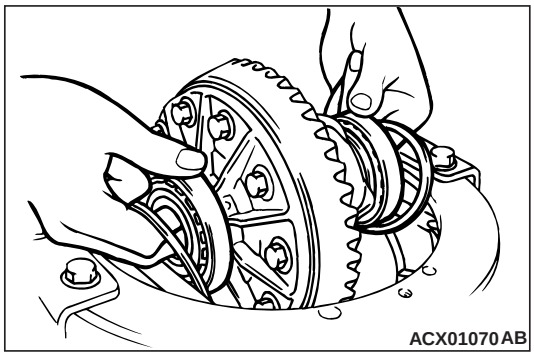
   NOTE: Select side bearing spacers with the same thickness for both the drive pinion side and the drive gear side.



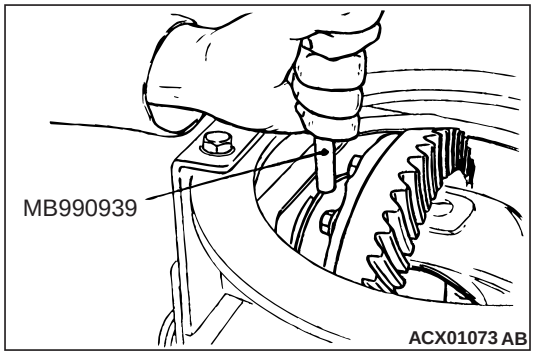
2. Push the differential case assembly to one side, and measure the clearance between the gear carrier and the side bearing adjusting spacer with a feeler gauge.



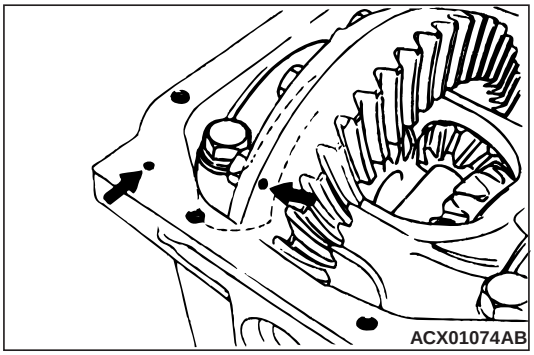
3. Measure the thickness of the side bearing adjusting spacers on one side, select two pairs of spacers which correspond to that thickness plus one half of the clearance plus 0.05 mm, and then install one pair each to the drive pinion side and the drive gear side.



4. Install the side bearing adjusting spacers and differential case assembly, as shown in the illustration, to the gear carrier.

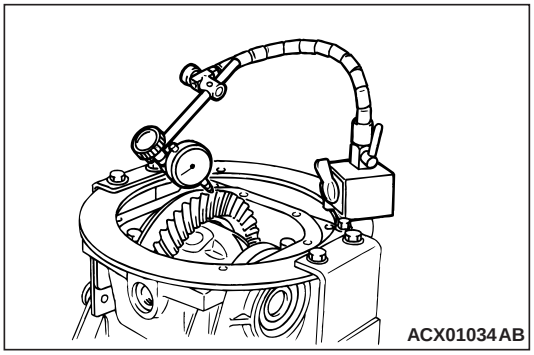


5. Tap the side bearing adjusting spacers with special tool remover bar (MB990939) to fit them to the side bearing outer race.



6. Align the mating marks on the gear carrier and the bearing cap, and then tighten the bearing cap.

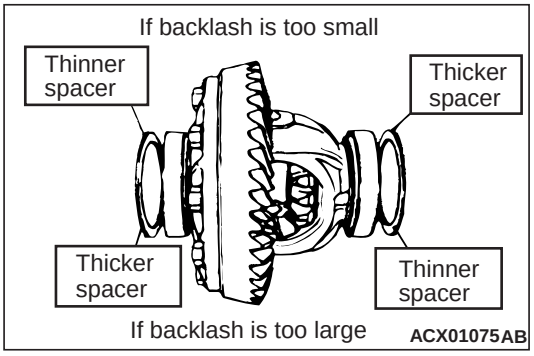
Tightening torque: 59 ± 4 N·m



7. With the drive pinion locked in place, measure the drive gear backlash with a dial indicator on the drive gear.

NOTE: Measure at four points or more on the circumference of the drive gear.

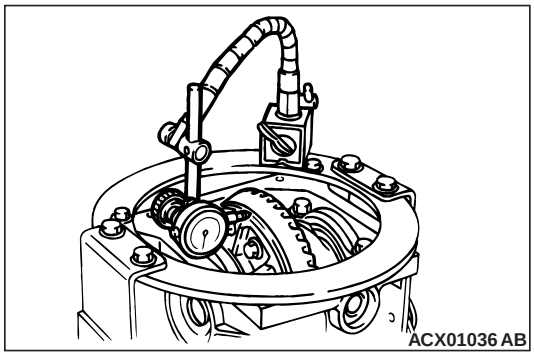
Standard value: 0.11 – 0.16 mm



8. Change the side bearing adjusting spacers as illustrated, and then adjust the drive gear backlash between the drive gear and the drive pinion.

NOTE: When increasing the number of side bearing adjusting spacers, use the same number for each, and as few as possible.

9. Check the drive gear and drive pinion for tooth contact. If poor contact is evident, make adjustment. (Refer to P.26-38.)



10. Measure the drive gear runout at the shoulder on the reverse side of the drive gear.

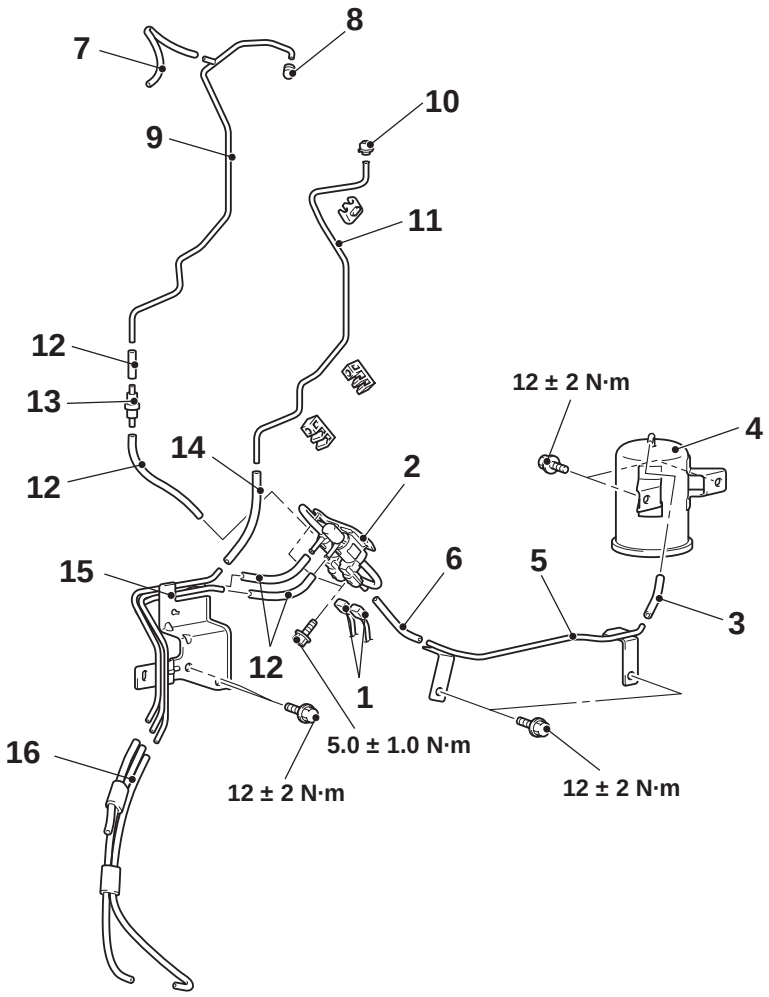
Limit: 0.05 mm

11. If the drive gear runout exceeds the limit, reinstall by changing the phase of the drive gear and differential case, and remeasure.
12. If adjustment is not possible, replace the differential case or replace the drive gear and drive pinion as a set.

SOLENOID VALVE AND VACUUM HOSE <4WD except for RUSSIA>

REMOVAL AND INSTALLATION

M1262004500083



AC903982 AB

Solenoid valve assembly removal steps
1. Solenoid valve connector
2. Solenoid valve assembly

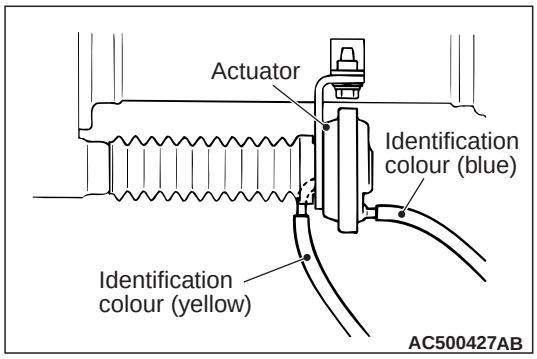
Vacuum tank and vacuum hose assembly and vacuum pipe assembly removal steps
3. Vacuum hose
4. Vacuum tank
5. Vacuum pipe assembly
6. Vacuum hose
7. Vacuum hose

Vacuum tank and vacuum hose assembly and vacuum pipe assembly removal steps (Continued)
8. Vacuum valve cap
9. Vacuum hose
10. Breather cap
11. Vacuum pipe
12. Vacuum hose

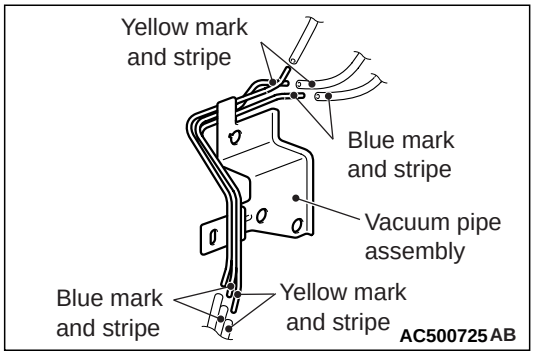
>>**B**<< 13. Check valve
>>**A**<< 14. Vacuum hose
>>**A**<< 15. Vacuum pipe assembly
>>**A**<< 16. Vacuum hose assembly

INSTALLATION SERVICE POINTS

>>A<< VACUUM HOSE ASSEMBLY/VACUUM PIPE ASSEMBLY/VACUUM HOSE INSTALLATION

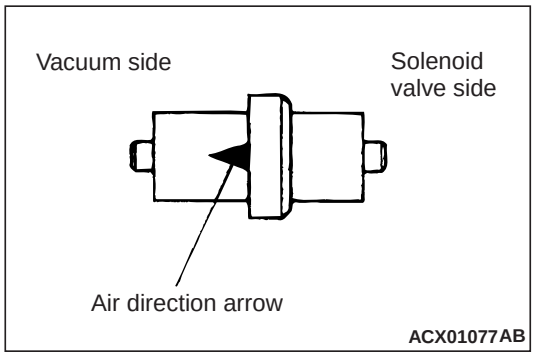


1. Install the vacuum hoses so that they match the identification colours of the actuator assembly nipple.



2. Install the vacuum hose assembly and the vacuum hoses to the vacuum pipe assembly, so that colour mark (yellow or blue) of the vacuum pipe assembly will match colour stripe (yellow or blue) at the vacuum hose assembly and vacuum hoses.

>>B<< CHECK VALVE INSTALLATION



Install so that the air direction arrow points to the vacuum side.

FRONT DIFFERENTIAL MOUNT <4WD>

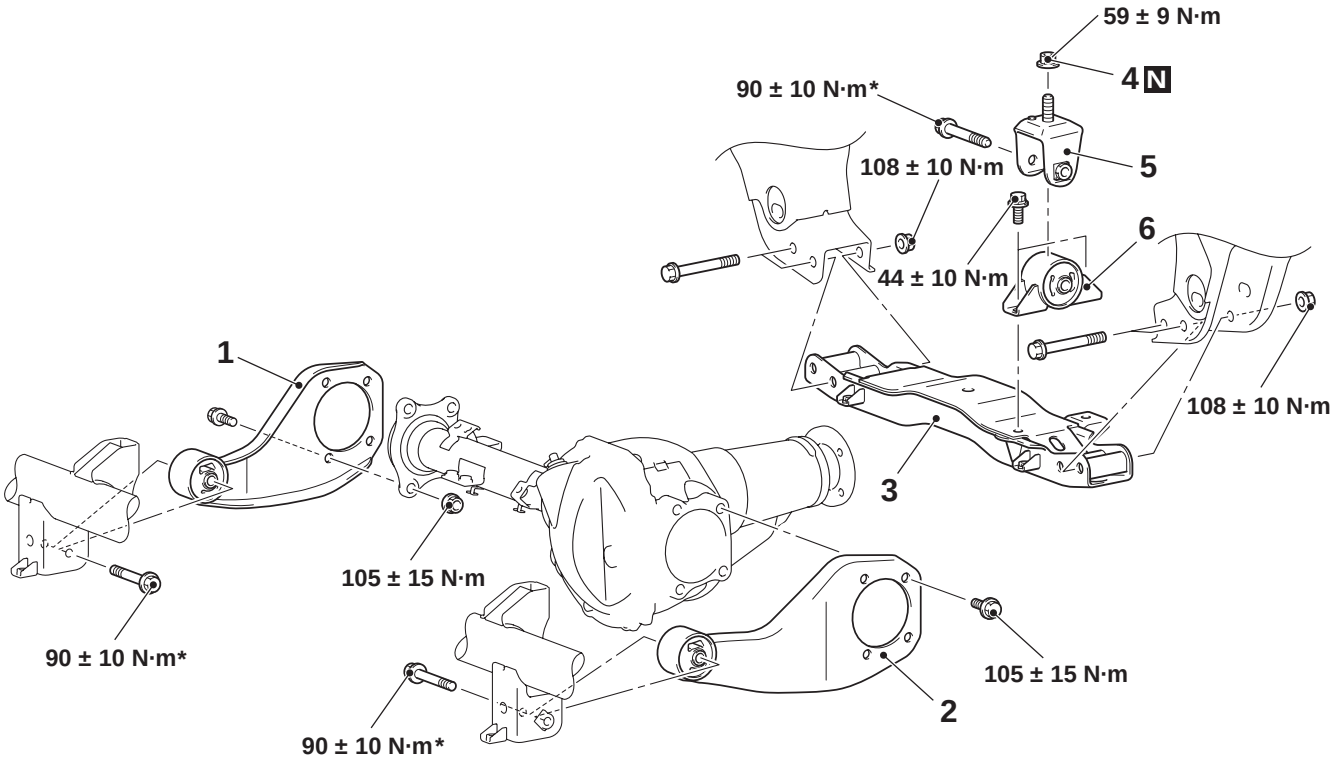
REMOVAL AND INSTALLATION

M1262001500095

⚠ CAUTION

***:Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the earth in the unladen condition.**

Pre-removal and Post-installation Operation
- Under Cover Removal and Installation (Refer to GROUP 51, Under Cover .)
- Gear Oil Draining and Refill (Refer to P.26-11.)
- Driveshaft Removal and Installation (Refer to P.26-23.)
- Inner Shaft Removal and Installation (Refer to P.26-30.)



AC804264AB

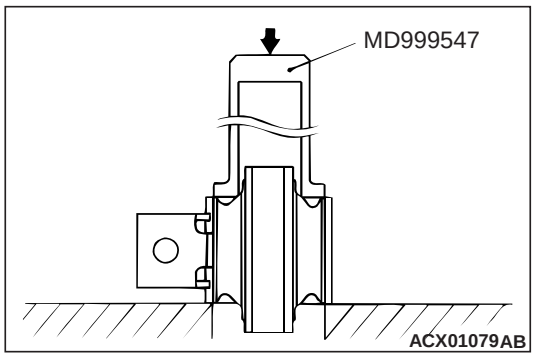
Differential mount bracket assembly (LH/RH) removal steps
1. Differential mount bracket assembly (RH)
2. Differential mount bracket assembly (LH)

Differential mount bracket assembly (rear) removal steps
3. Front suspension rear crossmember
4. Self-locking nut
5. Differential support bracket
- Differential carrier and housing assembly
6. Differential mount bracket assembly (rear)

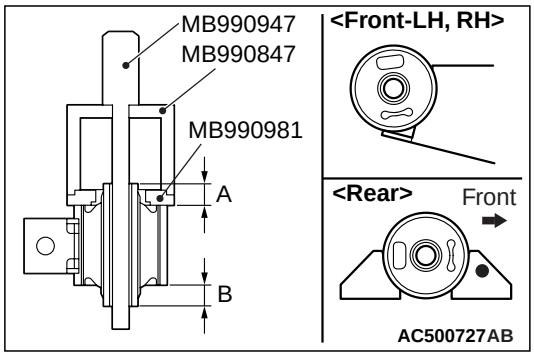
DIFFERENTIAL MOUNTING INSULATOR REPLACEMENT

M1262004900069

DIFFERENTIAL MOUNT BRACKET <FRONT-LH, FRONT- RH, REAR>



1. Remove insulator with special tool transmission rear oil seal installer (MD999547).



2. Using the following special tools with a hydraulic press, press fit each insulator to adjust until the hollow part faces as shown and the difference between A and B is 0.7 mm.
   - Lower Arm Bushing Arbour (MB990947)
   - Rear Suspension Bushing Remover and Installer Base (MB990847)
   - Mount Bushing Remover and Installer (MB990981)
3. Install the differential mount bracket (rear) as shown, so that the marking is located forward.

GROUP 27

REAR AXLE

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- GEAR OIL CHANGE. 27-9
- AXLE SHAFT AXIAL PLAY CHECK. 27-10
- AXLE SHAFT AXIAL PLAY ADJUSTMENT 27-10
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REAR DIFFERENTIAL LOCK <4WD> 27-21

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- REAR DIFFERENTIAL LOCK CONTROL UNIT CHECK 27-22
- REAR DIFFERENTIAL LOCK AIR PUMP CHECK 27-23
- REAR DIFFERENTIAL LOCK DETECTION SWITCH CHECK 27-23

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- REAR DIFFERENTIAL LOCK DISASSEMBLY AND REASSEMBLY 27-40

GENERAL INFORMATION

M1271000101426

The rear axle has the following features:
- A banjo type semi-flowing type axle has been incorporated.
- The wheel bearing is a double taper roller bearing and is highly resistant to a thrust load.
- ABS rotor for detecting the wheel speed is press-fitted to the retainer. <Vehicles with ABS>
- Helical limited slip differential has been adopted as optional. <2WD except High rider>
- Hybrid limited slip differential has been adopted as optional.
- Rear differential lock system has been adopted as optional.<4WD>

REAR AXLE

Item			Specification
Axle housing	Type		Banjo
Axle shaft	Type		Semi-floating
	Shaft outer diameter (bearing part × centre part) × length mm	Vehicles without rear differential lock	40.0 × 34.5 × 736
		Vehicles with rear differential lock – LH	40.0 × 34.5 × 715*2 40.0 × 34.5 × 718.5*3
		Vehicles with rear differential lock – RH	40.0 × 34.5 × 752.25*2 40.0 × 34.5 × 749.5*3
	Bearing type		Double taper roller
	Bearing (Outside diameter × inside diameter) mm		80 × 40

DIFFERENTIAL

<2WD>

Item		Except High rider	High rider
Reduction gear type		Hypoid gear	Hypoid gear
Reduction ratio		3.909	3.917
Differential type	Standard equipment	Normal differential	Normal differential
	Optional equipment	Helical limited slip differential	Hybrid (Helical gear + Viscous coupling unit) limited slip differential
Differential gear type (Type × number of gears)	Side gear	Straight bevel gear × 2	Straight bevel gear × 2
	Pinion gear	Straight bevel gear × 2	Straight bevel gear × 2
Number of teeth	Drive gear	43	47
	Drive pinion	11	12
	Side gear*1	14	19
	Pinion gear*1	10	10
Bearing (Outside diameter × inside diameter) mm	Side	80.0 × 45.2	80.0 × 45.2
	Front	68.3 × 30.2	68.3 × 30.2
	Rear	76.2 × 36.5	79.4 × 36.5

<Easy select 4WD>

Item		Specification
Reduction gear type		Hypoid gear
Reduction ratio		3.917
Differential type	Standard equipment	Normal differential
	Optional equipment	Hybrid (Helical gear + Viscous coupling unit) limited slip differential or Differential lock system
Number of teeth	Drive gear	47
	Drive pinion	12
	Side gear*1	19
	Pinion gear*1	10
Bearing (Outside diameter × inside diameter) mm	Side	80.0 × 45.2
	Front	68.3 × 30.2
	Rear	79.4 × 36.5

<Super select 4WD>

Item		Except 5A/T	5A/T
Reduction gear type		Hypoid gear	Hypoid gear
Reduction ratio		4.100*4, 3.917*5	3.917
Differential type	Standard equipment	Normal differential	Normal differential
	Optional equipment	Hybrid (Helical gear + Viscous coupling unit) limited slip differential or Differential lock system	Hybrid (Helical gear + Viscous coupling unit) limited slip differential or Differential lock system
Number of teeth	Drive gear	41*4, 47*5	47
	Drive pinion	10*4, 12*5	12
	Side gear*1	19*4,18*5	19
	Pinion gear*1	10	10
Bearing (Outside diameter × inside diameter) mm	Side	80.0 × 45.2*4, 90.0 × 55.0*5	80.0 × 45.2
	Front	68.3 × 30.2	68.3 × 30.2
	Rear	79.4 × 36.5*4, 90.0 × 36.5*5	79.4 × 36.5

NOTE:

- **1: This indicates vehicles with normal differential, but there was no reference made to vehicles with Helical LSD, Hybrid LSD or Rear differential lock system.*
- **2:5A/T or except vehicles with High power engine*
- **3:Vehicles with High power engine except 5A/T*
- **4:Vehicles for Europe (4AT) and Russia*
- **5:Vehicles for Europe (Except 4AT)*

SERVICE SPECIFICATIONS

M1271000301204

Item			Standard value	Limit
Rear axle total backlash mm			–	5
Axle shaft axial play mm			0 – 0.25	–
Axle shaft retainer press-fitting force N			Initial press-fitting force 29,400 or more	–
			Final press-fitting force 98,000 – 107,800	–
Clearance between axial shaft retainer and snap ring mm			0 – 0.166	–
Rear differential lock air pump pressure kPa			24.5 – 39 (-30 – 0°C), 24.5 – 34 (0 – 100°C)	–
Drive gear backlash mm	2WD	except High rider	0.07 – 0.13	–
		High rider	0.08 – 0.18	
	4WD		0.08 – 0.18	
Drive gear run-out mm			–	0.05
Differential gear backlash mm			0.01 – 0.25	–
Drive pinion turning torque N·m	Without oil seal	Bearing (oil seal contacting area) with anti-rust agent	0.59 – 0.88	–
		Bearing (oil seal contacting area) with gear oil applied	0.39 – 0.49	–
	With oil seal	Companion flange (oil seal contacting area) with anti-rust agent	0.84 – 1.12	–
		Companion flange (oil seal contacting area) with gear oil applied	0.64 – 0.73	–
Clearance between differential case and side gear <rear differential lock (5A/T or except vehicles with High power engine)> mm			0.05 – 0.20	–

LUBRICANT

M1271000400907

Item	Specified lubricant			Quantity
Rear differential gear oil	Gear oil API classification GL-5 or higher SAE 80W	2WD	except High rider	1.5 L
			High rider	2.6 L <Up to September> 2.1 L <From October>
		4WD	5A/T or except vehicles with High power engine	2.6 L <Up to September> 2.1 L <From October>
			Vehicles with High power engine except 5A/T	3.2 L <Up to September> 2.1 L <From October>

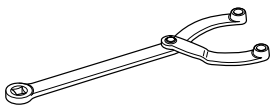
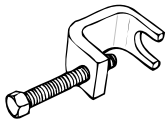
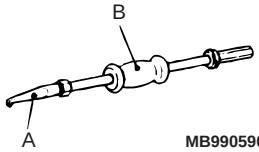
SEALANT AND ADHESIVE

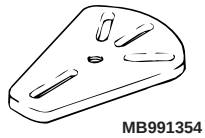
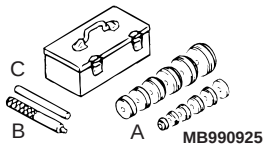
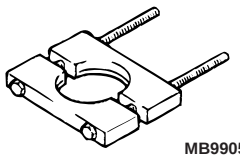
M1271000500506

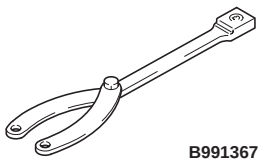
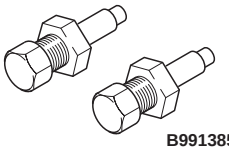
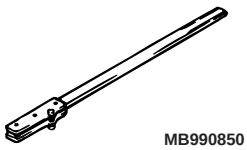
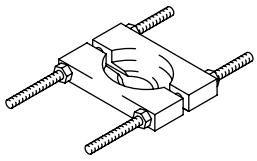
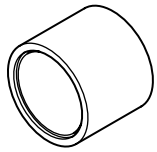
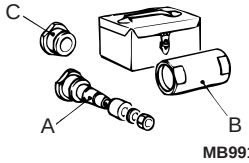
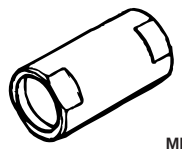
Item	Specified sealant and adhesive	Remark
Axle shaft bearing case	ThreeBond 1217 or equivalent	Semi-drying sealant
Axle housing (differential carrier mounting part)		
Drive gear and differential case mounting part	LOCTITE No.271 or No.270 or equivalent	Anaerobic adhesive

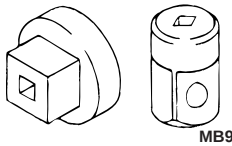
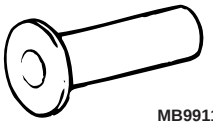
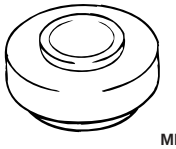
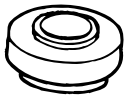
SPECIAL TOOLS

M1271000601186

Tool	Number	Name	Use
 B990767	MB990767	Front hub and flange yoke holder	Fixing of the axle shaft assembly
 MB991618	MB991618	Hub bolt remover	Removal of the hub bolt
 MB990590	MB990590 A: MB990212 B: MB990211	Rear axle shaft oil seal remover A: Adapter B: Slide hammer	• Removal of axle shaft (use together with MB990241, MB990211) • Removal of axle housing oil seal

Tool	Number	Name	Use
 MB991354	MB991354	Puller body	Removal of axle shaft (use together with MB990211)
MB990241	MB990241	Rear axle shaft puller	Removal of axle shaft (use together with MB990211)
 MB990925	MB990925 A: MB990926 – MB990937 B: MB990938 C: MB990939	Bearing and oil seal installer set A:Installer adapter B: Installer bar C: Remover bar	• Installation of axle housing oil seal • Press-fitting of bearing outer race • Press fitting of oil seal • Press-fitting of drive pinion front bearing outer race For details of each installer, refer to GROUP 26 – Special Tools .
MB991522	MB991552	Axle shaft bearing and case remover	Removal of the axle shaft bearing and bearing case
 MB990560	MB990560	Rear axle shaft bearing remover	Removal of bearing inner race
MB990799	MB990799	Ball joint remover and installer A	Removal of bearing case, bearing outer race Press-fitting of bearing inner race Press-fitting of retainer
MB990890	MB990890 or MB990891	Rear suspension bushing base	Press-fitting of bearing outer race

Tool	Number	Name	Use
 B991367	MB991367	Special spanner	Removal and adjustment of the side bearing nut
 B991385	MB991385	Pin	
MB990810	MB990810	Side bearing puller	Removal of the side bearing inner race
MB991407	MB991407	Differential rear support arbour	Removal of the side bearing inner race
 MB990850	MB990850	End yoke holder	Removal of the companion flange
	MD998801	Bearing remover	Removal of the drive pinion rear bearing inner race
	MB991445	Bushing remover and installer base	Press-fitting of the drive pinion rear bearing outer race (Use together with MB990938) <Vehicles with High power engine except 5A/T>
 MB991171	MB991171 A: MB990819 B: MB991170 C: MB991169	Pinion height gauge set A: Pinion gauge B: Cylinder gauge C: Drive pinion gauge attachment	Measurement of the pinion height
 MB991534	MB991534	Cylinder gauge	

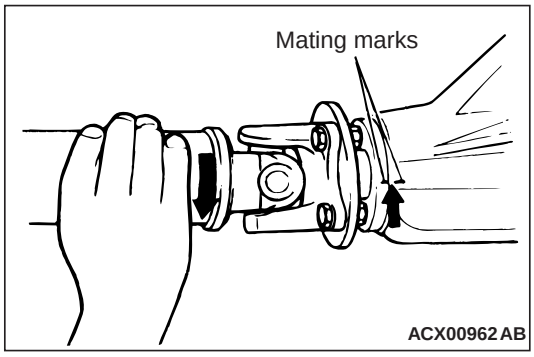
Tool	Number	Name	Use
 MB990326	MB990326	Preload socket	Measurement of drive pinion turning torque
	MB990685	Torque wrench	
 MB991168	MB991168	Differential oil seal installer	Press-fitting of the drive pinion oil seal
 MB990802	MB990802	Bearing installer	Press-fitting of the drive pinion rear bearing inner race
 MB990728	MB990728	Side and rear bearing inner race installer	Installation of side bearing inner race

ON-VEHICLE SERVICE

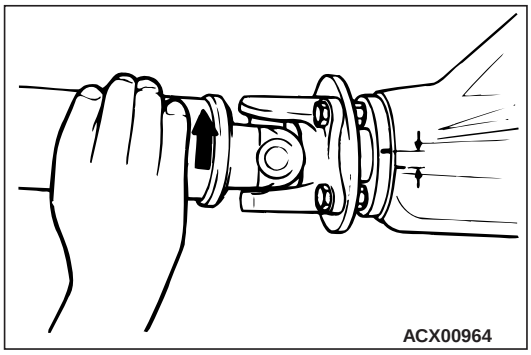
REAR AXLE TOTAL BACKLASH CHECK

M1271001200393

1. Park the vehicle on a flat, level surface.
2. Move the transmission control lever to the neutral position or the selector lever to the "N" position. Then place the transfer sift lever to the "2H" position <4WD>. Apply the parking brake. Raise the vehicle on a jack.



3. Turn the companion flange clockwise as far as it will go. Make the mating mark on the dust cover of the companion flange and on the differential carrier.



4. Turn the companion flange anti-clockwise as far as it will go, and measure the amount of distance the mating marks moved.

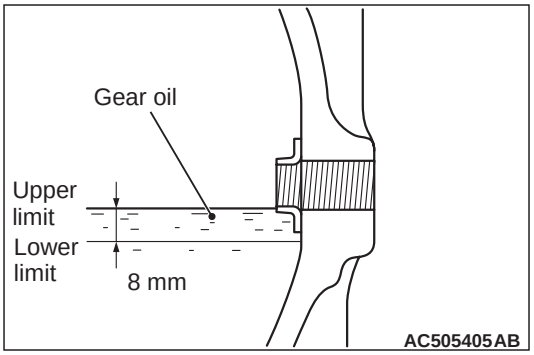
Limit: 5 mm

5. If the backlash exceeds the limit value, remove the differential carrier assembly and check the following.
   - Drive gear backlash (Refer to P.27-27)
   - Differential gear backlash (Refer to P.27-27)

GEAR OIL LEVEL CHECK

M1272001200556

<Up to September>

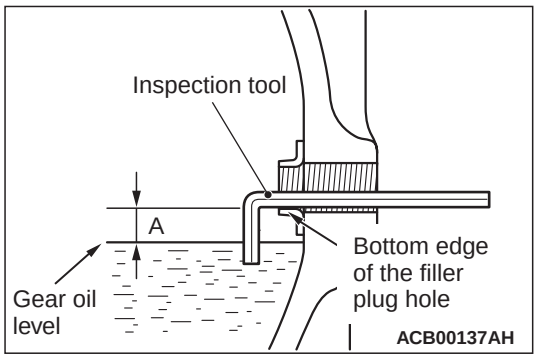


1. Check that gear oil level is not 8 mm below the bottom of filler plug hole.
2. If the gear oil level is lower than the lower limit, add the specified gear oil until the level comes to the lower portion of the filler plug hole.

   Specified gear oil:
   Gear oil API classification GL-5 or higher SAE 80W
3. Tighten the filler plug to the specified torque (Refer to P.27-24).

<From October>

⚠ CAUTION
Be careful not to drop the inspection tool into the differential.



1. Insert an inspection tool as shown so that it touches the bottom of the filler plug. The inspection tool: 6 mm-diameter L shaped bar (e.g. 6 mm-diameter angled hexagon wrench).
2. Pull out the wrench, and then check that the dimension to the gear oil level is within 24 mm.

   Specified gear oil:
   Gear oil API classification GL-5 or higher SAE 80W
3. Tighten the filler plug to the specified torque (Refer to P.27-24).

GEAR OIL REPLACEMENT

M1272004600683

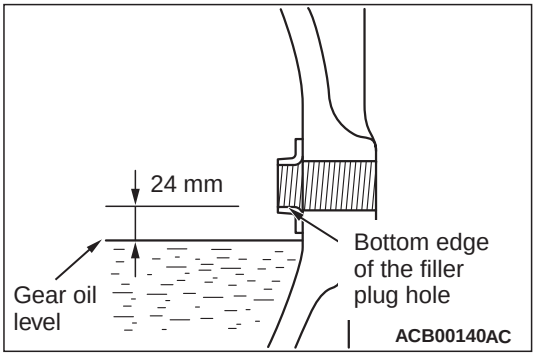
<Up to September>

1. Remove the filler plug.
2. Remove the drain plug and drain oil.
3. Tighten the drain plug to the specified torque (Refer to P.27-24).
4. Add the oil until the level comes to the lower portion of the filler plug hole.

   Specified gear oil:
   Gear oil API classification GL-5 or higher SAE 80W
   Amount to use:
   1.5 L <2WD (except High rider)>
   2.6 L <2WD (High rider), 4WD (5A/T or except vehicles with High power engine)>
   3.2 L <Vehicles with High power engine except 5A/T>
5. Tighten the filler plug to the specified torque (Refer to P.27-24).

<From October>

1. Remove the filler plug.
2. Remove the drain plug and drain oil.
3. Tighten the drain plug to the specified torque (Refer to P.27-24).



4. Refill the gear oil until the level satisfies the specification.

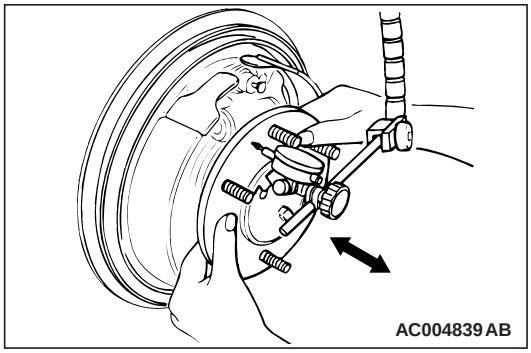
   Specified gear oil:
   Gear oil API classification GL-5 or higher SAE 80W
   Amount to use:
   1.5 L <2WD (except High rider)>

2.1 L <2WD (High rider), 4WD (5A/T or except vehicles with High power engine)>
2.1 L <Vehicles with High power engine except 5A/T>

5. Tighten the filler plug to the specified torque (Refer to P.27-24).

AXLE SHAFT AXIAL PLAY CHECK

M1271001300107



1. Measure the axle shaft axial play by using a dial indicator.

   Standard value: 0 – 0.25 mm

2. If not within specifications, replace the axle shaft assembly.

AXLE SHAFT AXIAL PLAY ADJUSTMENT

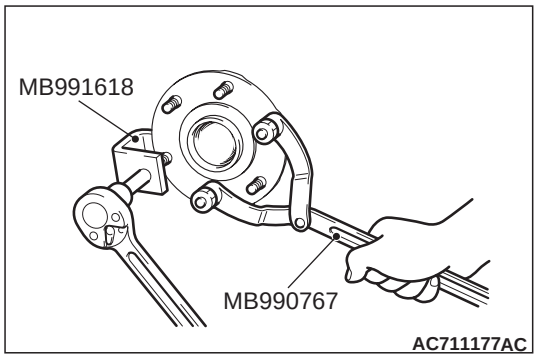
M1271001400104

The axle shaft axial play is preset at factory. It can not be adjusted.

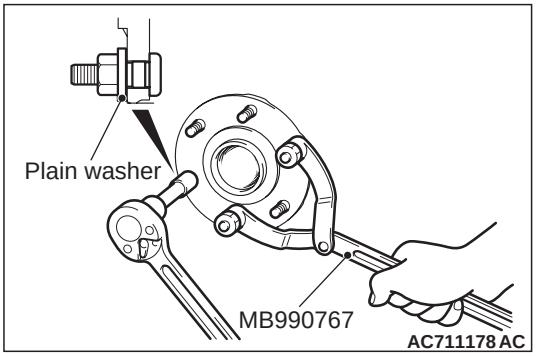
HUB BOLT REPLACEMENT

M1271001000623

1. Remove the brake drum.



2. Use the following special tools to remove the hub bolts.
   - Front hub and flange yoke holder (MB990767)
   - Hub bolt remover (MB991618)

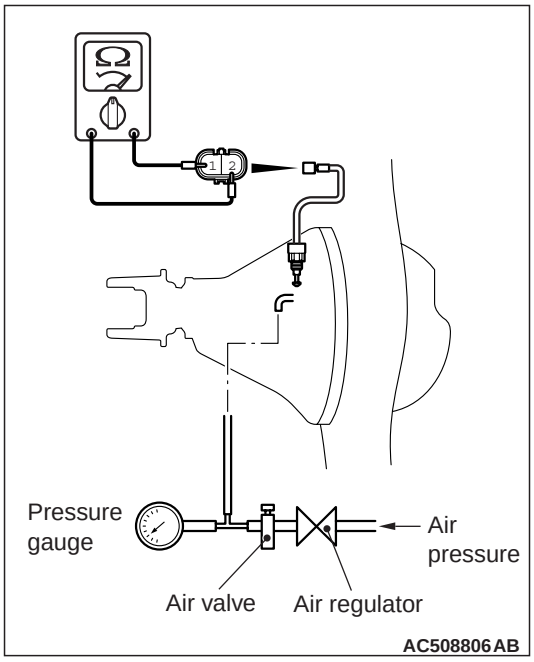


3. Install the plain washer to the new hub bolt, and install the bolt with a nut.
4. Install the brake drum.

REAR DIFFERENTIAL LOCK DETECTION SWITCH CHECK <4WD>

M1272001000091

1. Jack up the vehicle.
2. Remove the air pipe and air hose connection.



3. Connect a pressure gauge and air regulator to the air pipe.

⚠ CAUTION
Do not apply a higher pressure so as not to damage the air regulator.

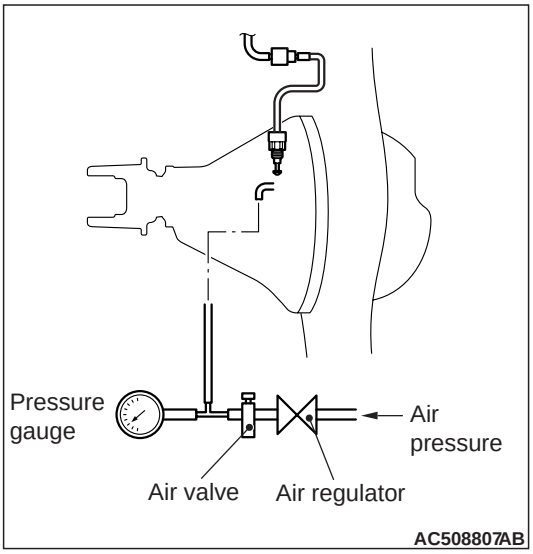
4. Adjust the outside air pressure with the air regulator until the pressure gauge shows approx. 24.5 kPa.
5. Lock the wheel on one side of the vehicle, and slowly turn the wheel on the other side.
6. Check for continuity in the rear differential lock detection switch.

Measurement conditions	Specified condition
When air is applied	Continuity (less than 2 Ω)
When air is released	Open circuit

REAR DIFFERENTIAL LOCK SYSTEM AIR LEAKAGE CHECK <4WD>

M1272001100065

1. Remove the rear differential lock air pump and remove the air hose from the air pump.



2. Connect a pressure gauge and air regulator to the air hose.

⚠ CAUTION

Do not apply a higher pressure so as not to damage the air regulator.

3. Adjust the outside air pressure with the air regulator until the pressure gauge shows approx. 34 kPa.
4. Shut off the air valve.
5. If the pressure has not dropped more than 10 kPa after 10 minutes have passed, there can be no air leakage from the air hose etc.

AXLE ASSEMBLY

REMOVAL AND INSTALLATION

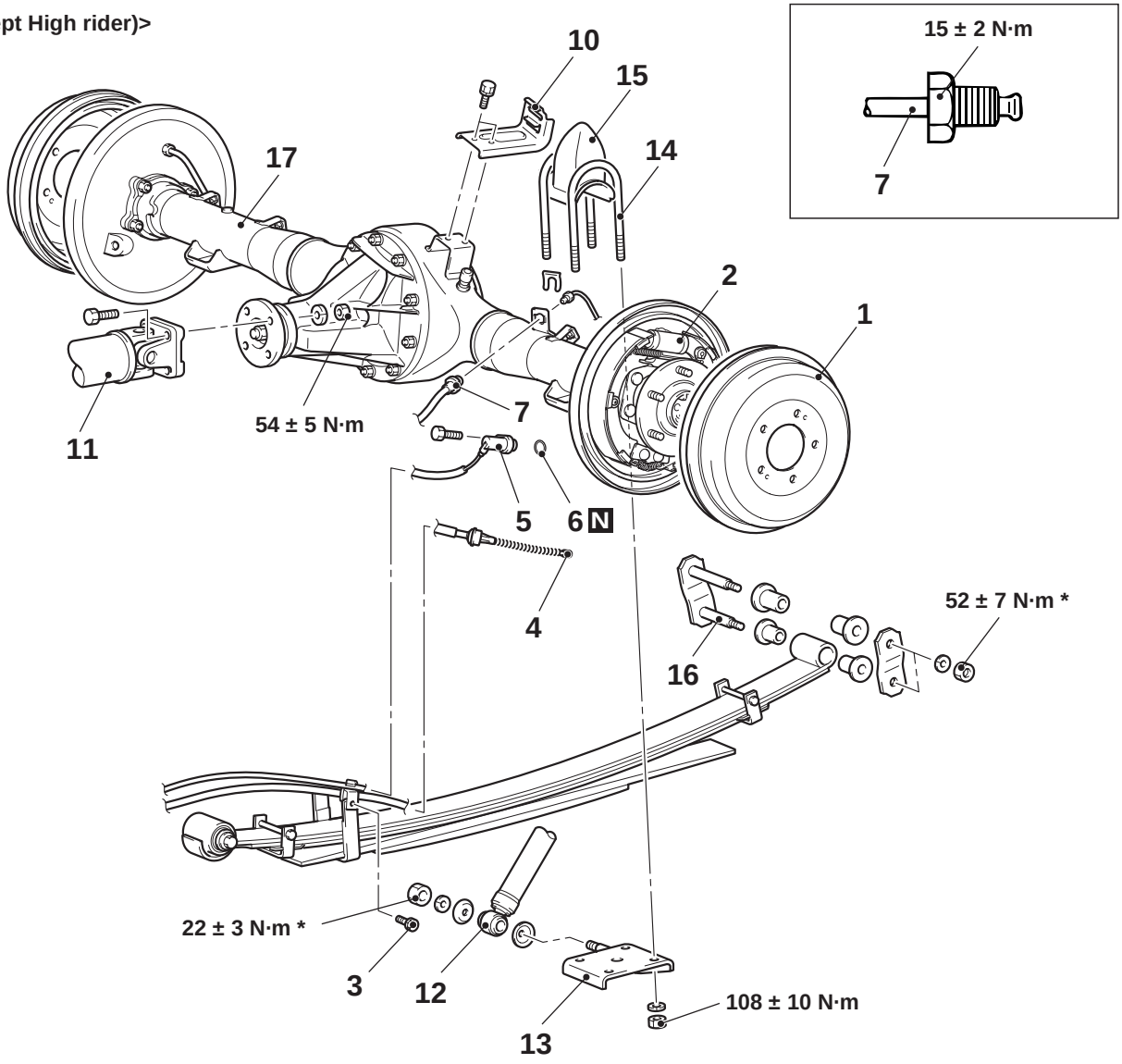
M1271001700569

⚠ CAUTION

- **For vehicles with ABS, be careful not to strike the pole piece at the tip of the front wheel speed sensor with tools during servicing work.**
- ***: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in an unladen condition.**

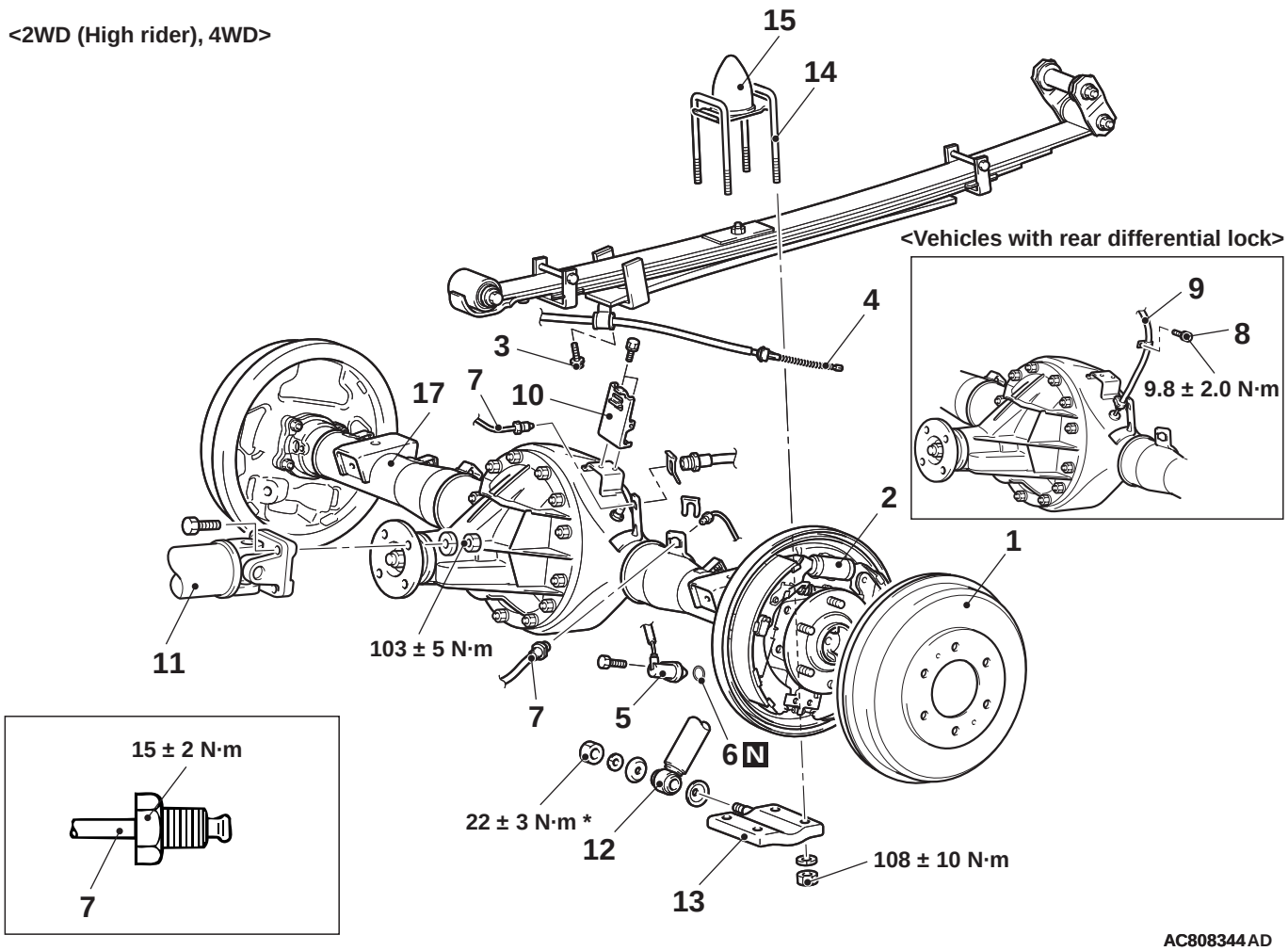
Pre-removal Operation	Post-installation Operation
• Brake Fluid Draining	• Brake Fluid Filling and Air Bleeding (Refer to GROUP 35A, On-vehicle Service .) • Parking Brake Lever Stroke Adjustment (Refer to GROUP 36, On-vehicle Service .)

<2WD (Except High rider)>



AC500808AG

<2WD (High rider), 4WD>



Removal steps

1. Brake drum
2. Shoe and lining assembly (Refer to GROUP 35A, Rear Drum Brake , .)
3. Parking brake cable attaching bolt
4. Parking brake cable connection
5. Rear wheel speed sensor <Vehicles with ABS>
6. O-ring <Vehicles with ABS>
7. Brake hose and brake tube connection
8. Bolt <Vehicles with rear differential lock>
9. Breather hose <Vehicles with rear differential lock>
10. Bracket

<<A>> >>B<< 11. Propeller shaft connection

<<B>> >>A<< 12. Shock absorber connection

13. U bolt seat
14. U bolt
15. Bump stopper
16. Shackle assembly

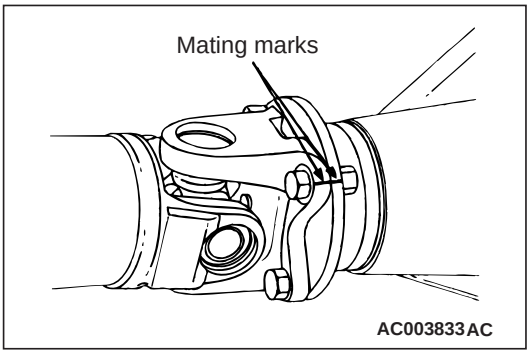
<<C>> 17. Axle assembly

REMOVAL SERVICE POINTS

<<A>> PROPELLER SHAFT REMOVAL

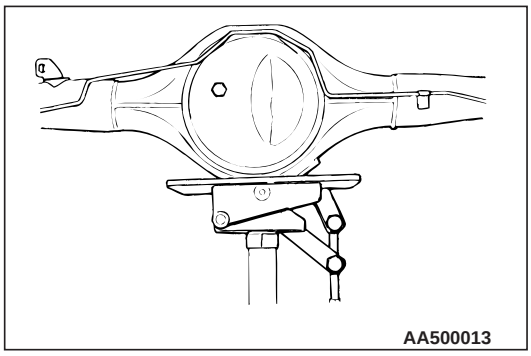
⚠ CAUTION

Suspend the propeller shaft from the body with wire, etc. to prevent it from falling.



Make the mating marks on the flange yoke of the propeller shaft and the companion flange of the differential carrier.

<<B>> SHOCK ABSORBER DISCONNECTION



Support the axle housing with a jack before removing the shock absorber lower mounting nut.

<<C>> AXLE ASSEMBLY REMOVAL

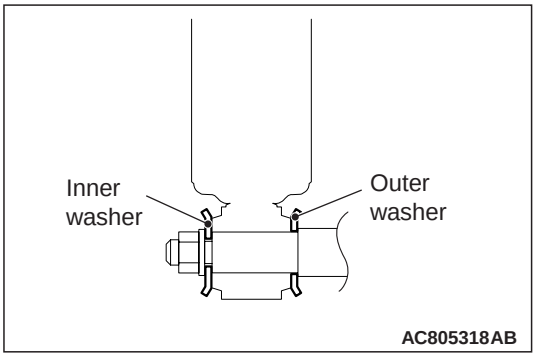
⚠ WARNING

Secure the axle assembly to the jack or equivalent. The axle assembly is heavy and unstable and may fall causing damage to the assembly, surrounding equipment, or injuring the installer.

Take out the axle assembly from the rear of the vehicle.

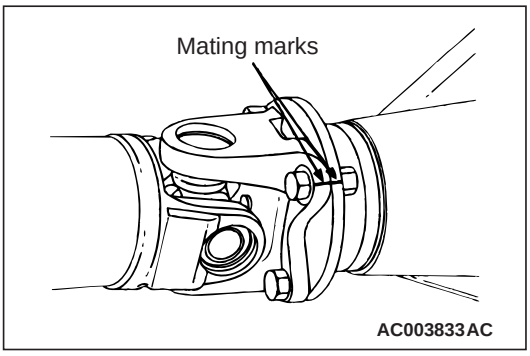
INSTALLATION SERVICE POINTS

>>A<< SHOCK ABSORBER CONNECTION



Be sure to install the shock absorber washers (outer and inner) in the specified direction.

>>B<< PROPELLER SHAFT INSTALLATION



Align the mating marks on the flange yoke and the companion flange to install the propeller shaft.

AXLE SHAFT ASSEMBLY

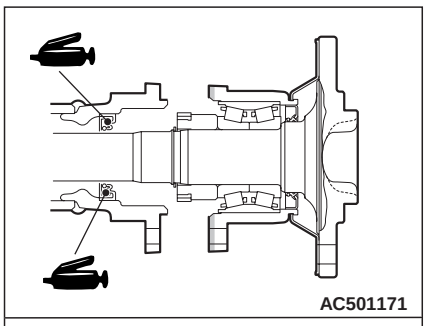
REMOVAL AND INSTALLATION

M1271002500267

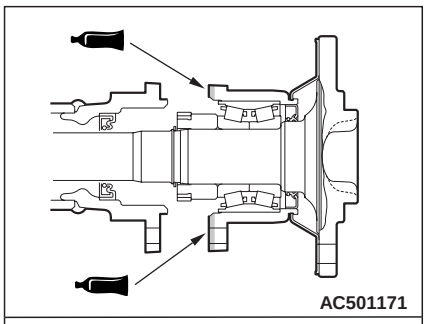
⚠ CAUTION

For vehicles with ABS, be careful not to strike the pole piece at the tip of the front wheel speed sensor with tools during servicing work.

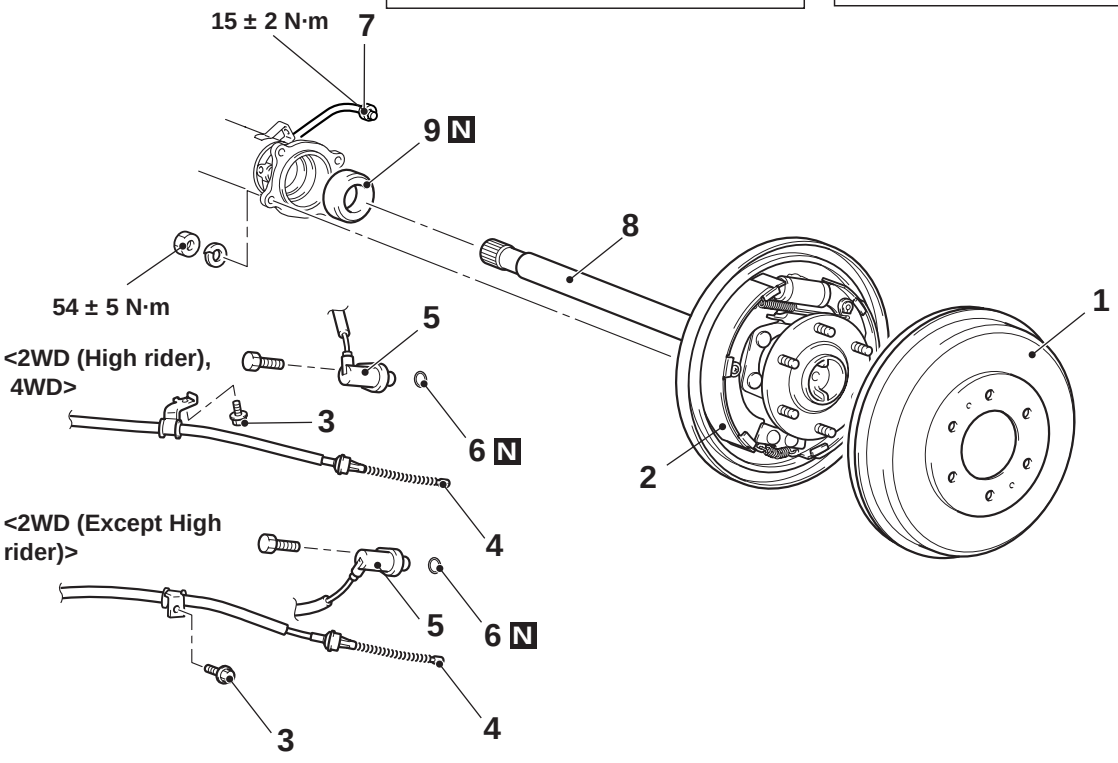
Pre-removal Operation	Post-installation Operation
• Brake Fluid Draining	• Brake Fluid Filling and Bleeding (Refer to GROUP 35A, On-vehicle Service .) • Parking Brake Lever Stroke Adjustment (Refer to GROUP 36, On-vehicle Service .)



Apply to entire inside diameter of oil seal lip



Sealant: Three Bond 1217 or equivalent



Removal steps

1. Brake drum
2. Shoe and lining assembly (Refer to GROUP 35A, Rear Drum Brake , .)
3. Parking brake cable attaching bolt
4. Parking brake cable connection

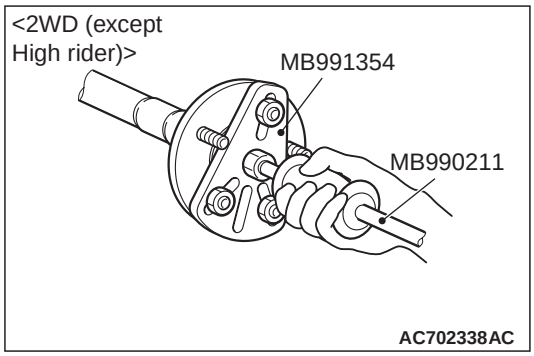
Removal steps (Continued)

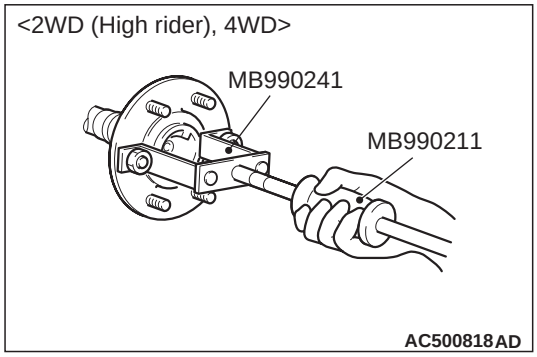
5. Rear wheel speed sensor <Vehicles with ABS>
6. O-ring <Vehicles with ABS>
7. Brake tube connection
8. Axle shaft assembly
9. Oil seal

<<**A**>>
<<**B**>> >>**A**<<

REMOVAL SERVICE POINTS

<<A>> AXLE SHAFT ASSEMBLY REMOVAL

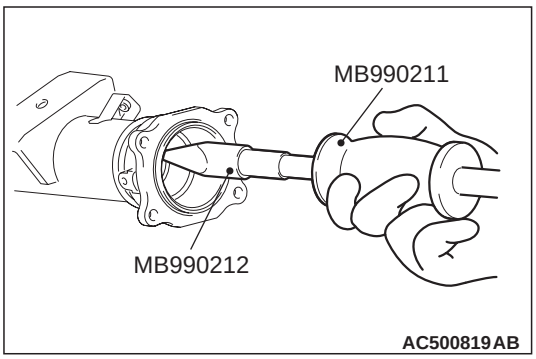




Pull the rear axle shaft from axle housing. If the rear axle shaft is hard to remove, use the following special tools.

- Slide hammer (MB990211)
- Puller body (MB991354) <2WD (except High rider)>
- Rear axle shaft puller (MB990241) <2WD (High rider), 4WD>

<<B>> OIL SEAL REMOVAL

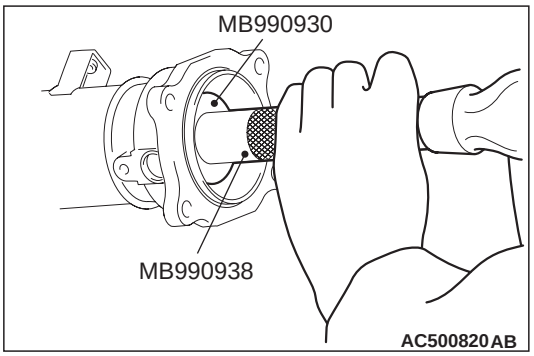


Use the following special tools with hook attached to remove the oil seal.

- Slide hammer (MB990211)
- Adapter (MB990212)

INSTALLATION SERVICE POINT

>>A<< OIL SEAL INSTALLATION

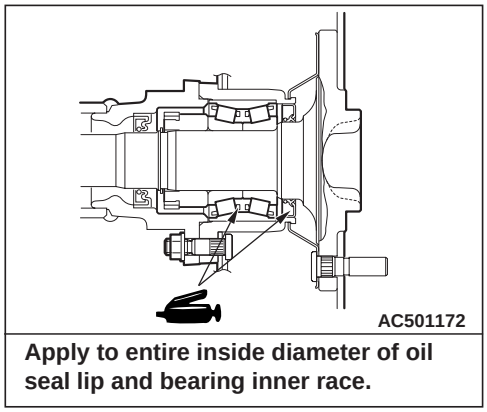


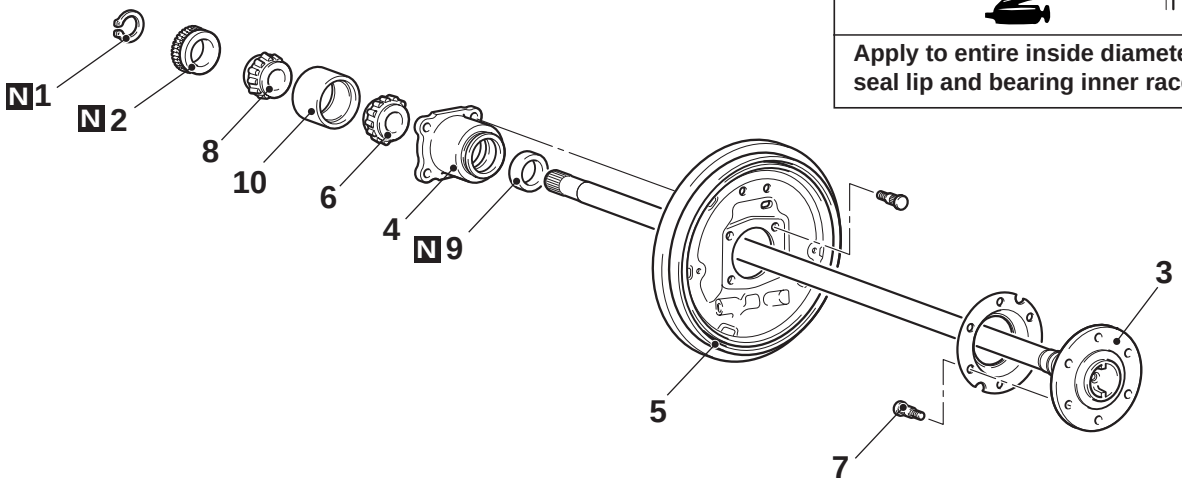
Drive the new oil seal into the rear axle housing end by using the following special tools.

- Installation adapter (MB990930)
- Installer bar (MB990938)

DISASSEMBLY AND REASSEMBLY

M1271002700186





Disassembly steps

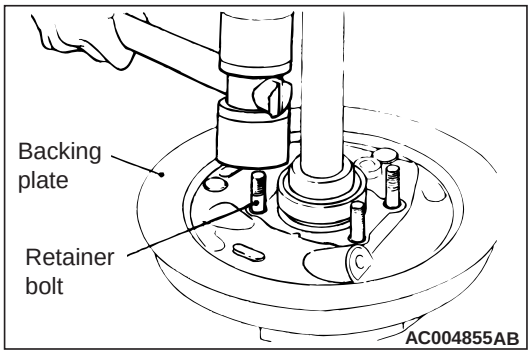
1. Snap ring
<<A>> 2. Retainer
<<B>> 3. Axle shaft
4. Bearing case
5. Backing plate
<<C>> 6. Outer bearing inner race
7. Hub bolt
8. Inner bearing inner race
9. Oil seal
<<D>> 10. Bearing outer race

Reassembly steps

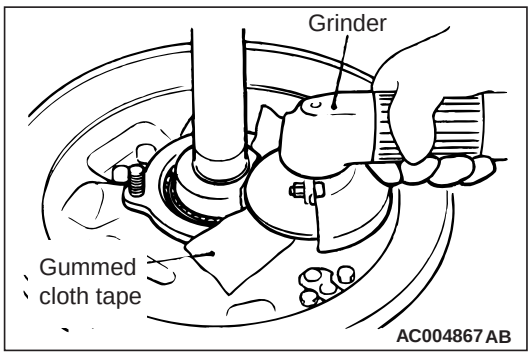
>>A<< 10. Bearing outer race
>>B<< 9. Oil seal
>>C<< 6. Outer bearing inner race
>>C<< 8. Inner bearing inner race
7. Hub bolt
5. Backing plate
4. Bearing case
3. Axle shaft
>>D<< 2. Retainer
>>E<< 1. Snap ring

DISASSEMBLY SERVICE POINTS

<<A>> RETAINER REMOVAL



1. Remove one retainer bolt from the backing plate.

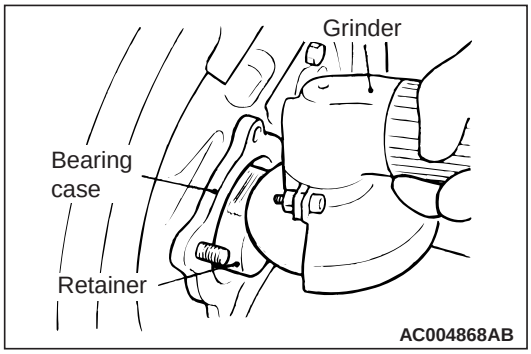


2. Apply gummed cloth tape around the edge of the bearing case for protection.

⚠ CAUTION
Be careful not to damage the bearing case and the axle shaft.

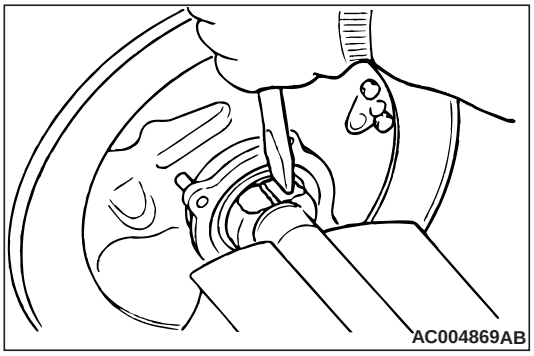
3. As shown in the figure, hold the axle shaft. Using a grinder, shave off a point of its circumference locally until the wall thickness become as follows:
   - 1.0 – 1.5 mm for axle shaft side
   - 2.0 mm for bearing side

⚠ CAUTION
Be careful not to damage the bearing case and the axle shaft.



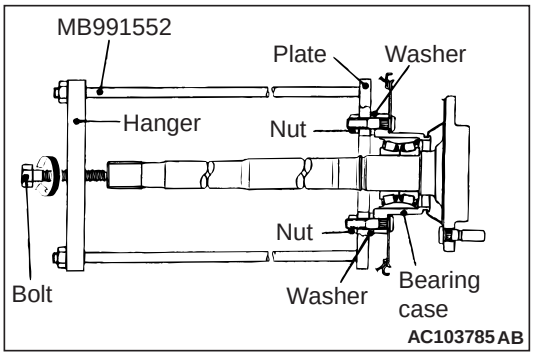
4. Fix the axle shaft and shave off the remaining 2.0 mm on the side of the retainer bearing.

⚠ CAUTION
Be careful not to damage the axle shaft.



5. Cut in with a chisel the place where the retainer ring has been shaven and remove the retainer ring.

<<B>> AXLE SHAFT REMOVAL



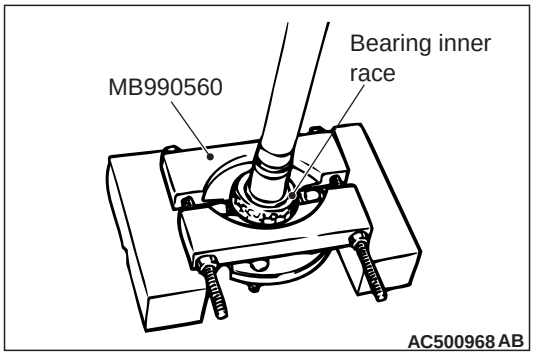
1. Secure special tool axle shaft bearing and case remover (MB991552) to the bearing case bolts with the nuts and adjust the height of the hanger. Then install the washers, plate and nuts in that order.

   NOTE: The washers are used to eliminate the difference in height of the bearing case so that the plate and the bearing case are parallel.

⚠ CAUTION
The hanger and plate should be placed so that they are parallel.

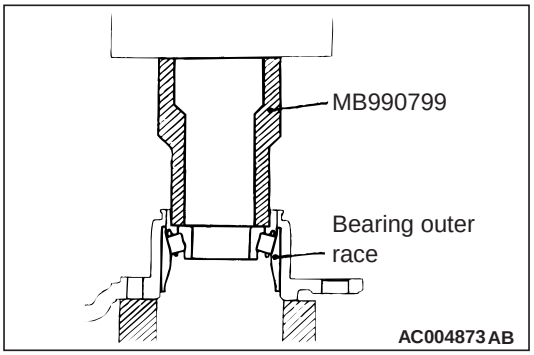
2. Place the end of the bolt against the centre of the axle shaft, and then tighten the bolt to remove the axle shaft from the bearing case assembly.

<<C>> OUTER BEARING INNER RACE REMOVAL



Install special tool rear axle shaft bearing remover (MB990560) as shown in the illustration, and then use a press to remove the outer bearing inner race from the axle shaft.

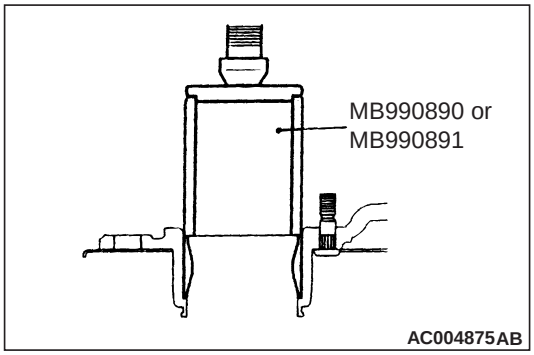
<<D>> BEARING OUTER RACE REMOVAL



Reinstall the outer bearing inner race that was removed previously. Use special tool ball joint remover and installer A (MB990799) and a press to remove the bearing outer race.

REASSEMBLY SERVICE POINTS

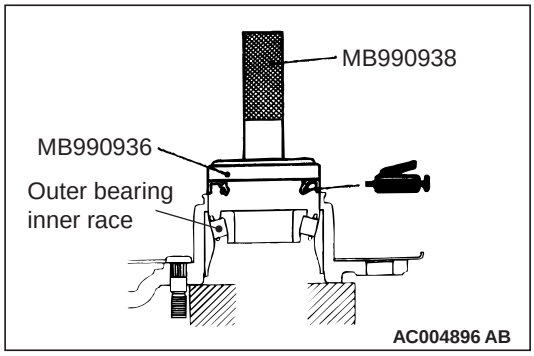
>>A<< BEARING OUTER RACE INSTALLATION



Use special tool rear suspension bushing base (MB990890 or MB990891) to press-fit the bearing outer race to the bearing case.

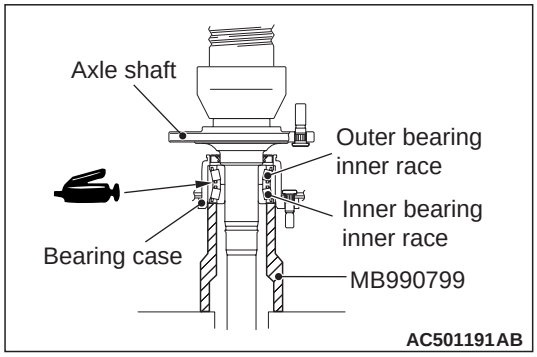
>>B<< OIL SEAL INSTALLATION

1. Set the outer bearing inner race.



2. Apply multipurpose grease to the outside of the oil seal.
3. Use the following special tools, press-fit the oil seal into the bearing case until it is flush with the face of the bearing case.
   - Installer adapter (MB990936)
   - Installer bar (MB990938)
4. Apply multipurpose grease to the lips of the oil seal.

>>C<< INNER BEARING INNER RACE/OUTER BEARING INNER RACE INSTALLATION



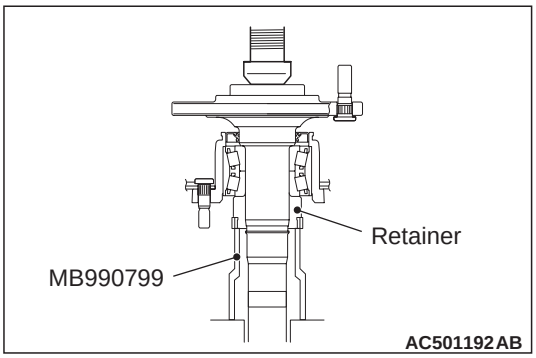
1. Apply multipurpose grease to the roller surface and ends of the bearing.
2. Pass the axle shaft through the bearing case and the inner bearing inner race and outer bearing inner race.

⚠ CAUTION

Both the inner bearing inner race and outer bearing inner race should be press-fitted together.

3. Use special tool ball joint remover and installer A (MB990799) to press-fit the inner bearing inner race and outer bearing inner race to the axle shaft.

>>D<< RETAINER/ABS ROTOR INSTALLATION

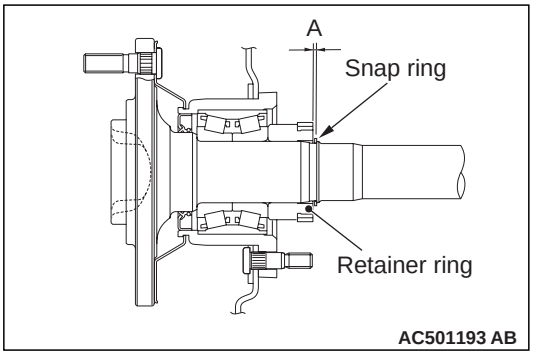


1. Use special tool ball joint remover and installer A (MB990799) to press-fit the retainer with ABS rotor to the axle shaft. Check that the press-fitting force is at the standard value.
2. If the initial press-fitting force is less that the standard value, replace the axle shaft.

Standard value:

Initial press-fitting force N	29,400 or more
Final press-fitting force N	98,000 – 107,800

>>E<< SNAP RING INSTALLATION



1. After installing the snap ring, measure clearance (A) between the snap ring and the retainer with a feeler gauge. Check that it is within the standard value.

   Standard value (A): 0 – 0.166 mm

2. If the clearance exceeds the standard value, change the snap ring so that the clearance is at the standard value.

Thickness of snap ring mm	Identification colour
2.17	–
2.01	Yellow
1.85	Blue
1.69	Purple
1.53	Red

Example:

Clearance 2.0 mm

Standard value 0 – 0.166 mm

Thickness of snap ring 1.85 mm

INSPECTION

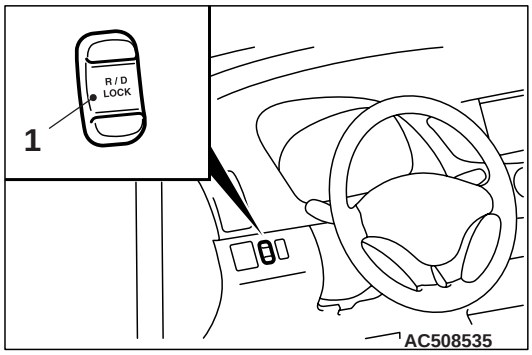
M1271002800150

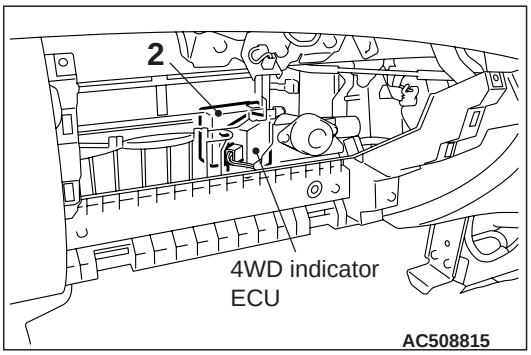
- Check the dust cover for deformation and damage.
- Check the inner and outer bearings for seizure, discolouration and rough raceway surface.
- Check the axle shaft for cracks, wear and damage.

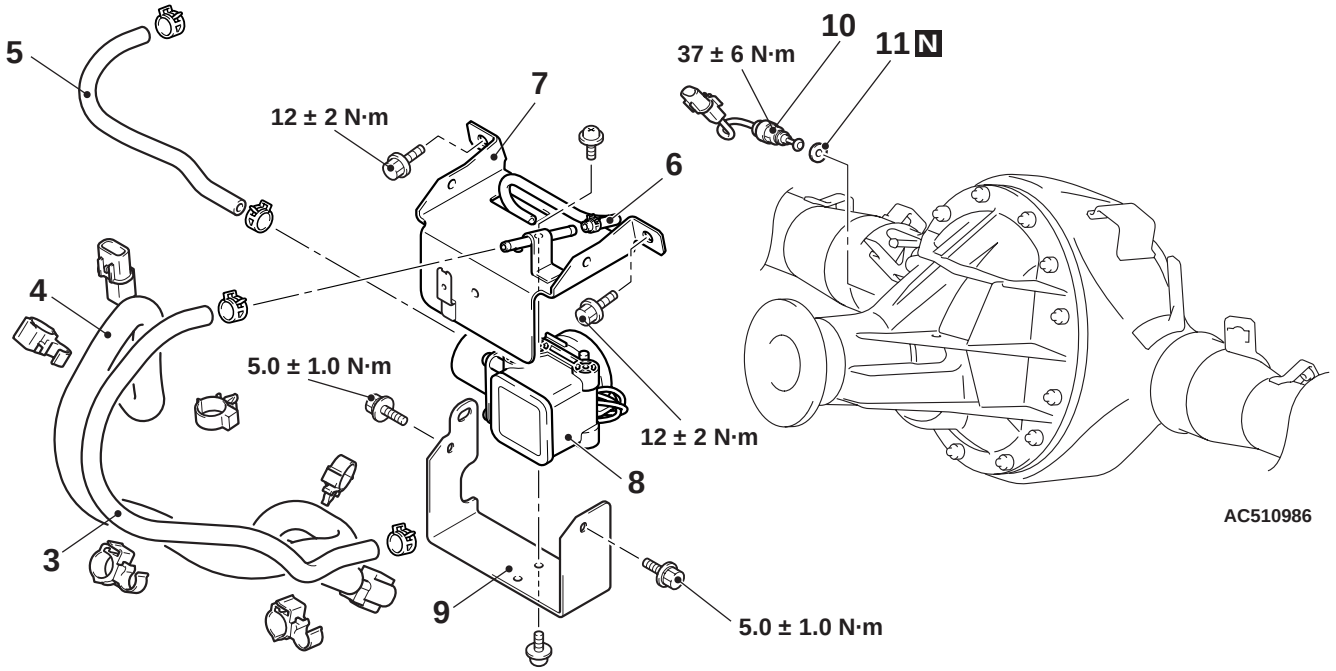
REAR DIFFERENTIAL LOCK <4WD>

REMOVAL AND INSTALLATION

M1272002700190







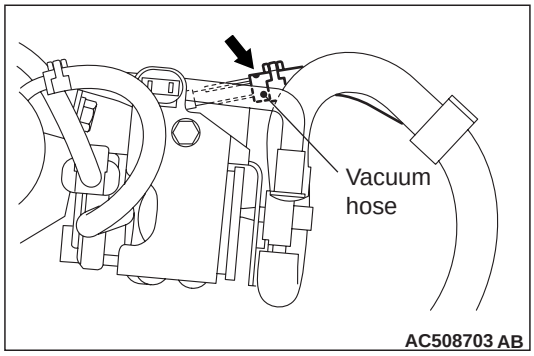
AC608183 AB

Removal steps

1. Rear differential lock switch
   - Glove box cover (Refer to GROUP 52A, Instrument Panel .)
2. Rear differential lock-ECU
3. >>A<< Vacuum hose
4. Rear differential lock harness
5. Vapour hose
6. Hose
7. Bracket
8. Rear differential lock air pump
9. Bracket
10. Rear differential lock detection switch (Refer to P.27-24.)
11. Gasket

INSTALLATION SERVICE POINT

>>A<< VACUUM HOSE CONNECTION

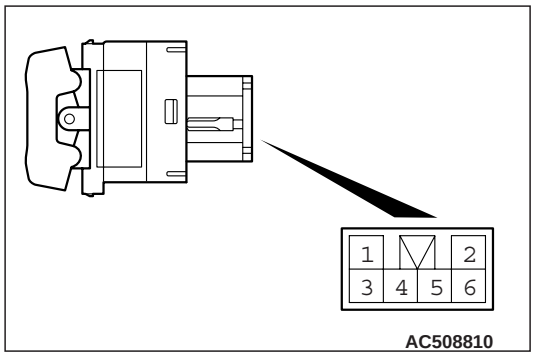


Connect the vacuum hose so that the white mark is located upward.

INSPECTION

M1272003300032

REAR DIFFERENTIAL LOCK SWITCH CHECK

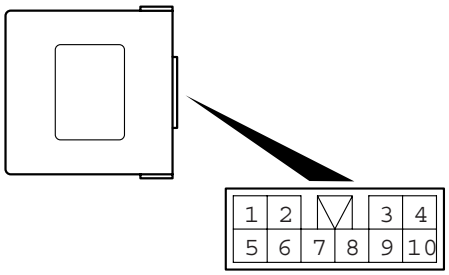


Check for continuity between the terminals of the switch.

Switch position	Tester connection	Specified condition
ON switch operation (push the upper part of switch)	3 - 6	Continuity (less than 2 Ω)
N (released switch position)	3 - 6 and 2 - 3	Open circuit
OFF switch operation (push the lower part of switch)	2 - 3	Continuity (less than 2 Ω)

REAR DIFFERENTIAL LOCK-ECU CHECK

M1272003200079



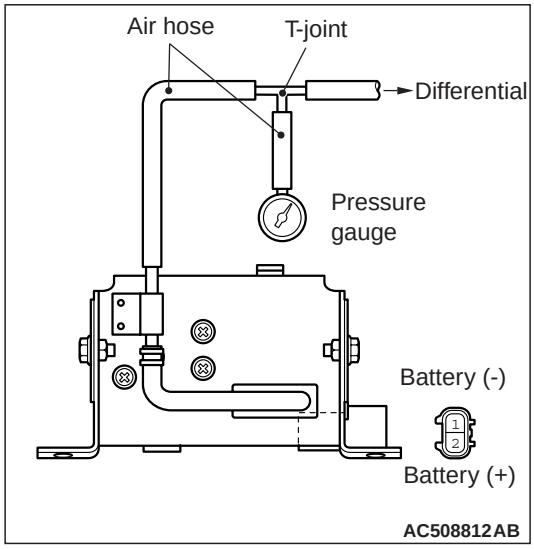
Terminal No.	Item	Condition		Terminal voltage
2	Vehicle speed reed switch	Select "D" <A/T>, or "1st"<M/T> and drive forward slowly.		5 V
3	Ignition switch (IG1)	Ignition switch: OFF		1 V or less
		Ignition switch: ON		System voltage
4	Rear differential lock air pump	Ignition switch: ON	When filling or holding	System voltage
			When releasing	1 V or less
5	Free wheel engage switch	Ignition switch: ON	4WD	1 V or less
			2WD	System voltage
6	Earth	–	–	–
8	Rear differential lock detection switch	Ignition switch: ON	Rear differential lock is locked	1 V or less
			Rear differential is free	System voltage
9	Rear differential lock switch (On position)	Ignition switch: ON	Rear differential lock switch is pushed.	1 V or less
			Rear differential lock switch is not pushed.	System voltage

Terminal No.	Item	Condition		Terminal voltage
1	Rear differential lock switch (OFF position)	Ignition switch: ON	Rear differential lock switch is pushed.	1 V or less
			Rear differential lock switch is not pushed.	System voltage
10	Rear differential lock indicator lamp	Ignition switch: ON	Rear differential is locked	1 V or less
			Rear differential is free	System voltage

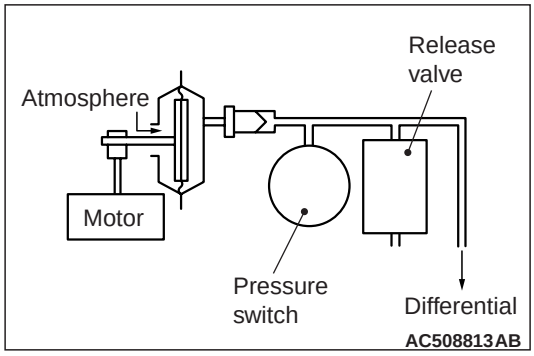
REAR DIFFERENTIAL LOCK AIR PUMP CHECK

M1272003100038

1. Install the air hose to the differential.



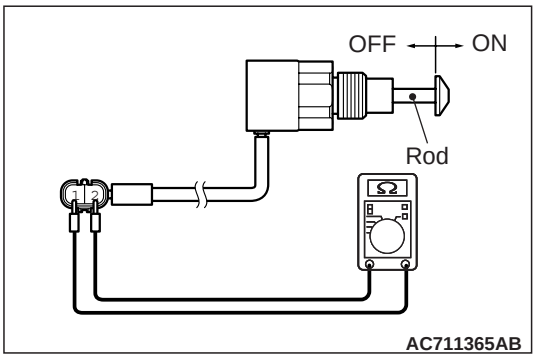
2. Connect a pressure gauge to the air pump discharge outlet nozzle, via the air hose and T-joint.
3. Apply battery voltage to the air pump connector.



4. Measure the time when the pump starts and stops operating, and if it stops within 5 seconds, the pressure switch inside the pump is normal.
5. Measure the pressure 10 – 20 seconds after the pump has stopped.
   Standard value: 24.5 – 39 kPa (-30 – 0°C), 24.5 – 34 kPa (0 – 100°C)
6. If the pressure is within the standard value, the release valve inside the pump is normal.
7. Check the pump does not begin operating for 5 minutes after it has stopped.
8. If the inspection for steps 4-7 is normal, the pump is fully operational.

REAR DIFFERENTIAL LOCK DETECTION SWITCH CHECK

M1272001000057



Check for continuity between the terminals of the switch.

Measurement condition	Terminal connector of tester	Specified condition
When the rod is pulled	1 - 2	Continuity (less than 2 Ω)
When the rod is returned to its normal position		Open circuit

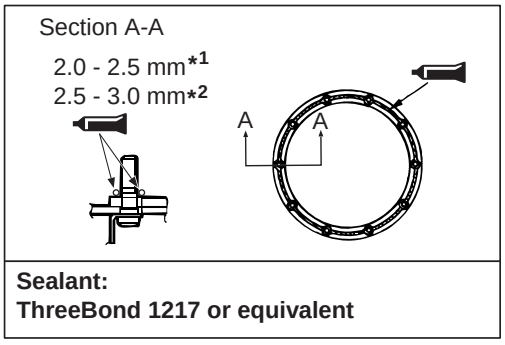
DIFFERENTIAL CARRIER ASSEMBLY

REMOVAL AND INSTALLATION

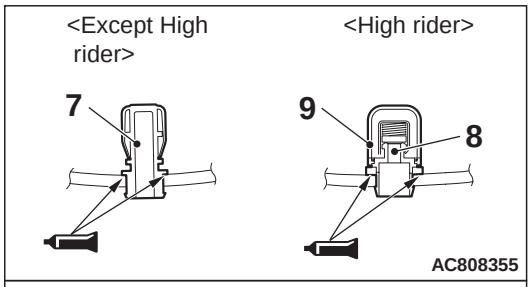
M1272002000867

Pre-removal Operation	Post-installation Operation
• Differential Gear Oil Draining • Axle Shaft Assembly Removal (Refer to P.27-15.)	• Axle Shaft Assembly Installation (Refer to P.27-15.) • Differential Gear Oil Filling (Refer to P.27-9.)

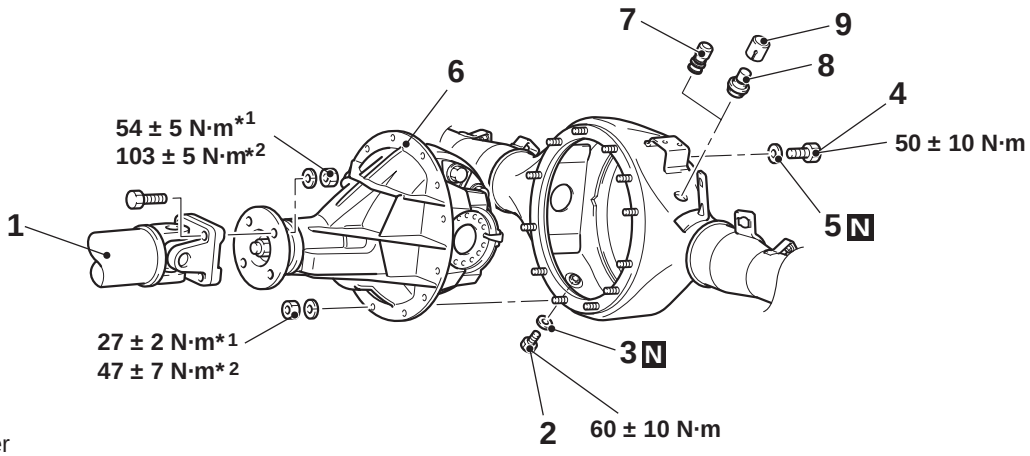
<2WD>



Sealant:
ThreeBond 1217 or equivalent



Sealant:
ThreeBond 1217 or equivalent



NOTE:
*1: Except High rider
*2: High rider

AC808347AD

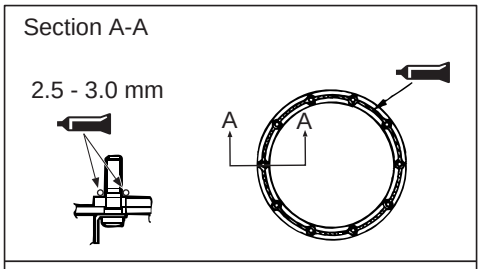
Removal steps

<<A>> >>C<< 1. Propeller shaft
2. Drain plug
3. Packing
4. Filler plug
5. Gasket

Removal steps (Continued)

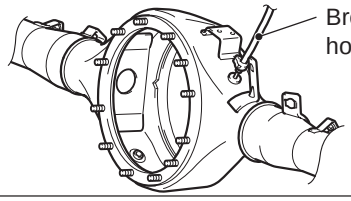
<<B>> 6. Differential carrier assembly
7. Vent plug <Except High rider>
>>A<< 8. Vent plug <High rider>
>>A<< 9. Plug cover <High rider>

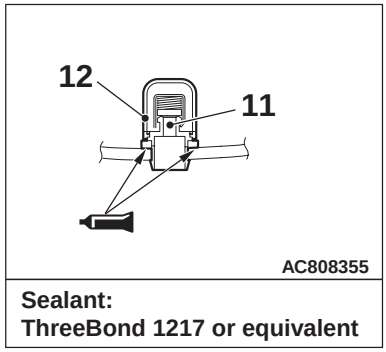
<4WD>



Sealant:
ThreeBond 1217 or equivalent

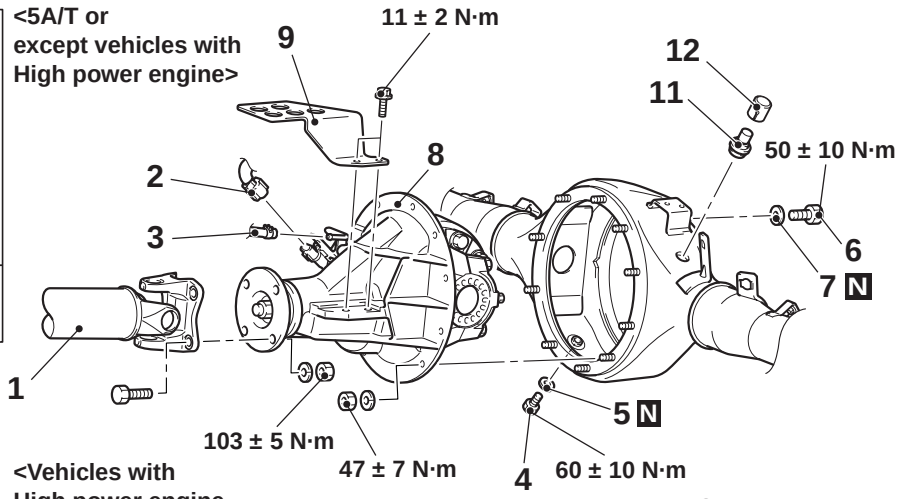
<Vehicles with rear differential lock>



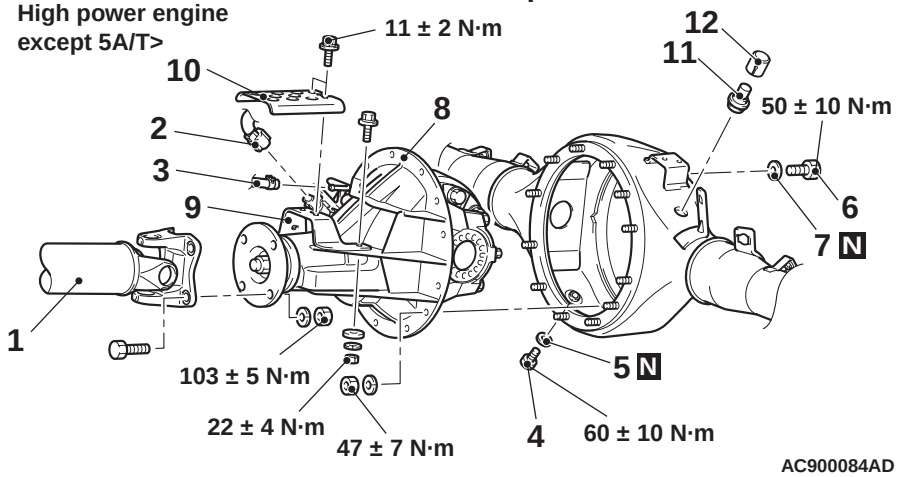


Sealant:
ThreeBond 1217 or equivalent

<5A/T or except vehicles with High power engine>



<Vehicles with High power engine except 5A/T>



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Removal steps

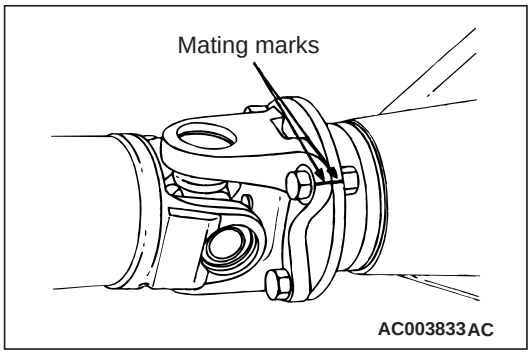
<<A>> >>C<< 1. Propeller shaft
2. Rear differential lock detection switch connector connection <Vehicles with rear differential lock>
>>B<< 3. Vacuum hose connection <Vehicles with rear differential lock>
4. Drain plug
5. Packing
6. Filler plug
7. Gasket
<<B>> 8. Differential carrier assembly
9. Protector <Vehicles with rear differential lock>
10. Protector <Vehicles with rear differential lock>
>>A<< 11. Vent plug <Vehicles without rear differential lock>
>>A<< 12. Plug cover <Vehicles without rear differential lock>

REMOVAL SERVICE POINTS

<<A>> PROPELLER SHAFT REMOVAL

⚠ CAUTION

Suspend the propeller shaft from the body with wire, etc. to avoid spilling transmission fluid and to avoid injury from falling propeller shaft when not secured.

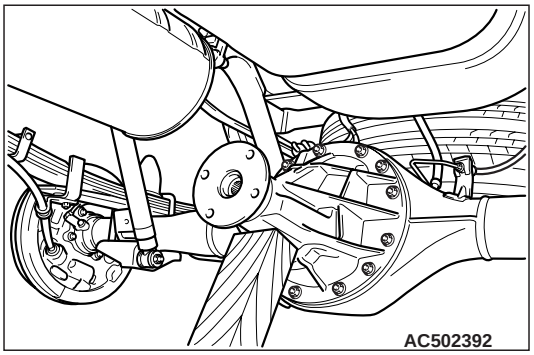


Make the mating marks on the flange yoke of the propeller shaft and the companion flange of the differential carrier.

<<B>> DIFFERENTIAL CARRIER REMOVAL

⚠ CAUTION

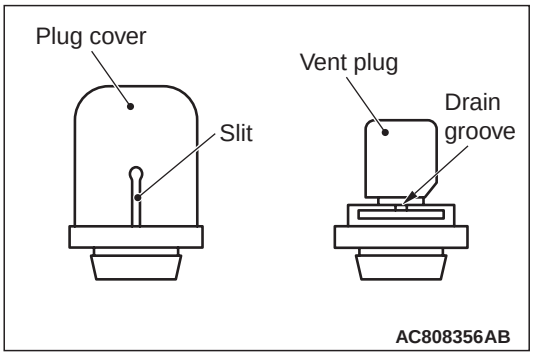
Use care not to strike the companion flange.



Remove the attaching nuts. Strike the lower part of differential carrier assembly with a piece of wood several times to loosen the assembly. Remove the assembly.

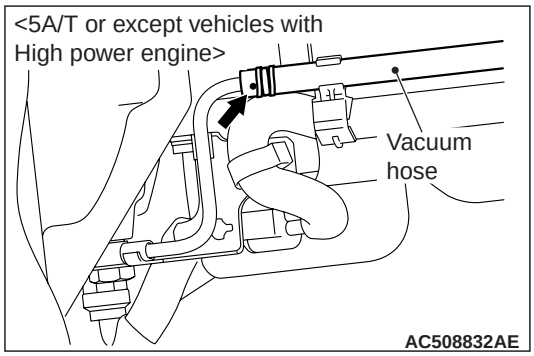
INSTALLATION SERVICE POINTS

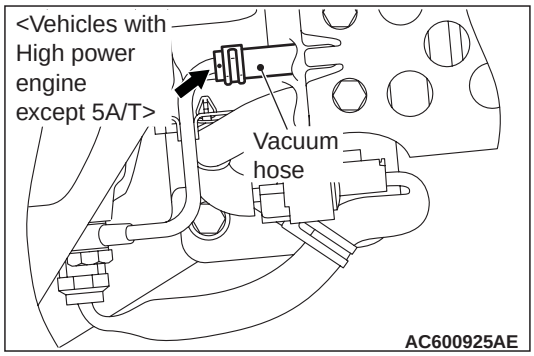
>>A<< PLUG COVER/VENT PLUG INSTALLATION



1. Place the drain groove of vent plug towards vehicle wheel side and install it on the axle housing.
2. Place the plug cover slit towards the vehicle rear side and install it.

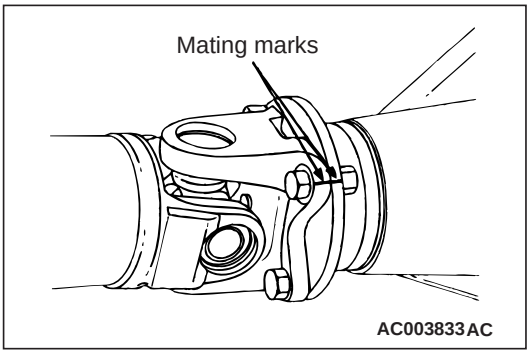
>>B<< VACUUM HOSE CONNECTION





Connect the vacuum hose so that the red mark is located upward.

>>C<< PROPELLER SHAFT INSTALLATION



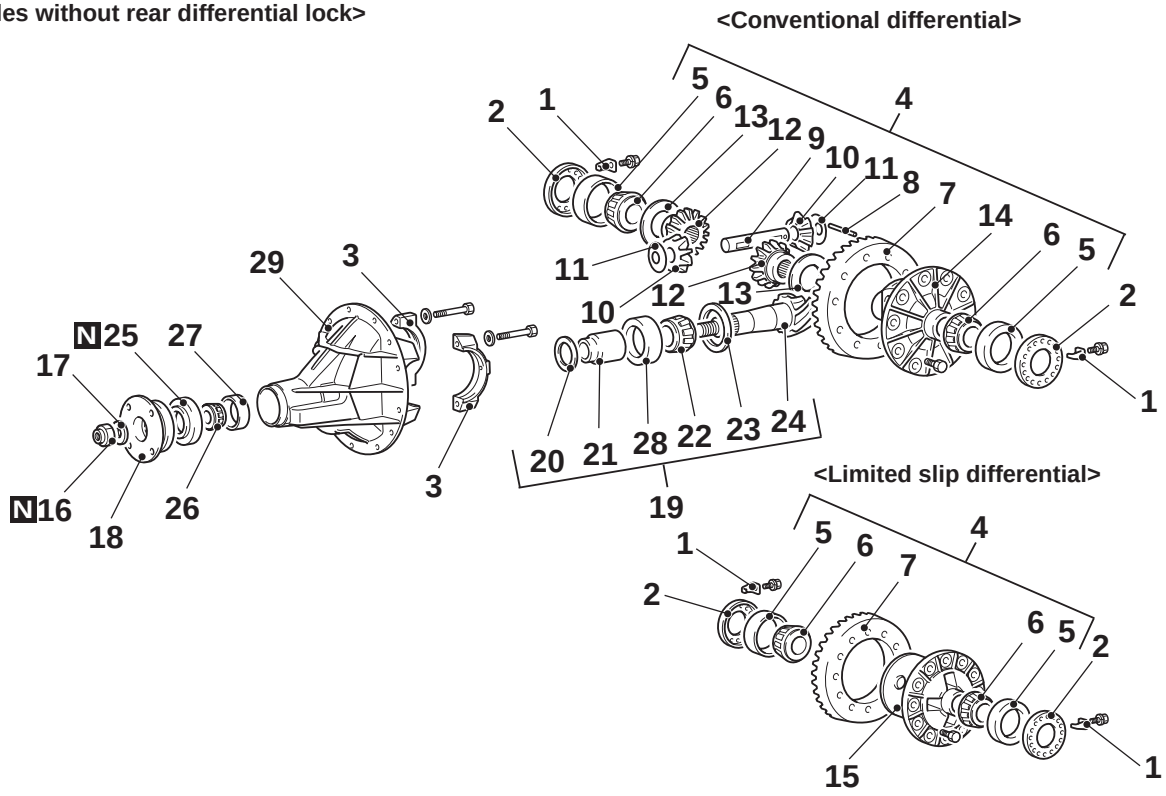
Align the mating marks on the flange yoke and the companion flange to install the propeller shaft.

DISASSEMBLY

M1272002200560

⚠ CAUTION

Do not disassemble the limited slip differential case assembly.



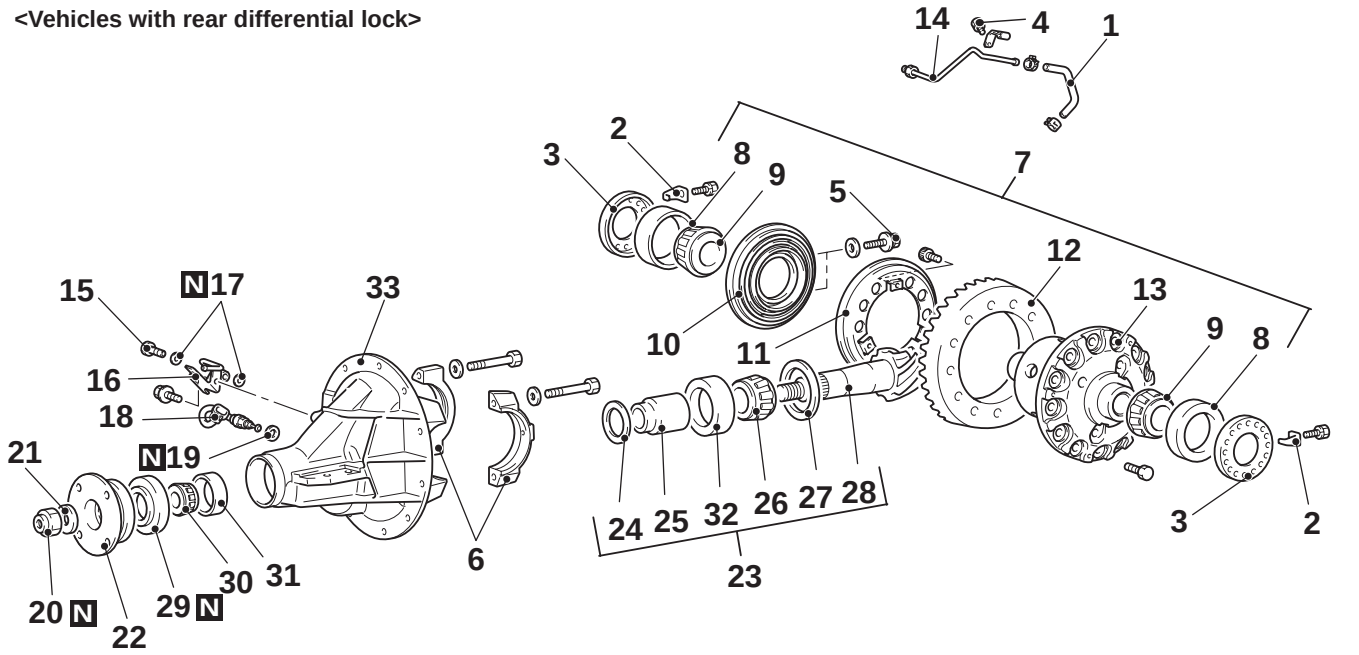
Disassembly steps

- <<A>> • Inspection before disassembly
1. Lock plate
- <<B>> 2. Side bearing nut
3. Bearing cap
- <<C>> 4. Differential case assembly
5. Differential side bearing outer race
- <<D>> 6. Differential side bearing inner race
- <<E>> 7. Drive gear
- <<F>> 8. Lock pin
9. Pinion shaft
10. Pinion gear
11. Pinion washer
12. Side gear
13. Side gear spacer
14. Differential case
15. Limited slip differential case assembly

Disassembly steps (Continued)

- <<G>> 16. Self-locking nut
17. Washer
- <<H>> 18. Companion flange
- <<H>> 19. Drive pinion assembly
20. Drive pinion front shim (For adjusting preload of drive pinion)
21. Drive pinion spacer
- <<I>> 22. Drive pinion rear bearing inner race
23. Drive pinion rear shim (for adjusting drive pinion height)
24. Drive pinion
- <<J>> 25. Oil seal
- <<J>> 26. Drive pinion front bearing inner race
- <<J>> 27. Drive pinion front bearing outer race
- <<K>> 28. Drive pinion rear bearing outer race
29. Differential carrier

<Vehicles with rear differential lock>



AC804640AB

Disassembly steps

<<A>> • Inspection before disassembly
1. Hose
2. Lock plate

<<B>> 3. Side bearing nut
4. Bolt
5. Bolt
6. Bearing cap

<<C>> 7. Differential case assembly
8. Differential side bearing outer race

<<D>> 9. Differential side bearing inner race
10. Actuator assembly
11. Pressure plate

<<E>> 12. Drive gear
13. Differential case
14. Air pipe assembly (A)
15. Eye bolt
16. Air pipe assembly (B)
17. Gasket
18. Rear differential lock detection switch
19. Gasket

<<G>> 20. Self-locking nut
21. Washer

<<H>> 22. Companion flange

<<H>> 23. Drive pinion assembly
24. Drive pinion front shim (for adjusting preload of drive pinion)
25. Drive pinion spacer

<<I>> 26. Drive pinion rear bearing inner race
27. Drive pinion rear shim (for adjusting drive pinion height)
28. Drive pinion

<<J>> 29. Oil seal

<<J>> 30. Drive pinion front bearing inner race

<<J>> 31. Drive pinion front bearing outer race

Disassembly steps (Continued)

<<K>> 32. Drive pinion rear bearing outer race
33. Differential carrier

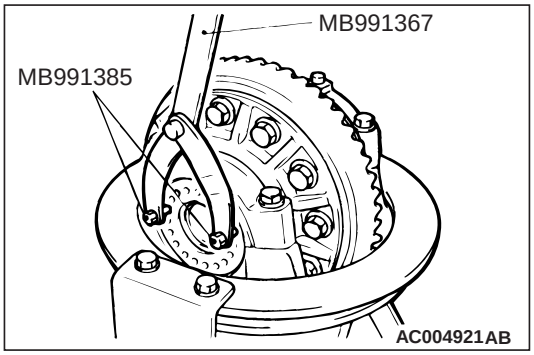
DISASSEMBLY SERVICE POINTS

<<A>> INSPECTION BEFORE DISASSEMBLY

Except for the following standard values, inspection procedure is the same as GROUP 26, inspection before disassembly .

Drive gear backlash
Standard value:
0.07 – 0.13 mm <2WD (except High rider)>
0.08 – 0.18 mm <2WD High rider, 4WD>

<<B>> SIDE BEARING NUT REMOVAL



Use the following special tools, remove the side bearing nut.

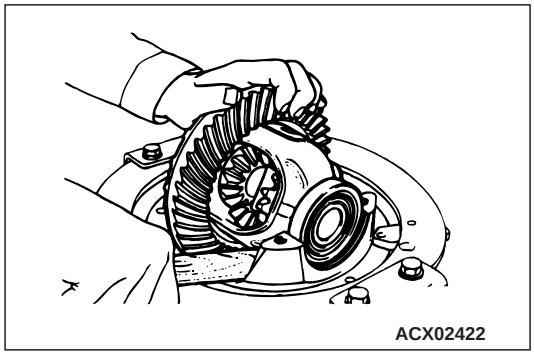
- Special spanner (MB991367)
- Pin (MB991385)

NOTE: Keep the right and left side bearings and side bearing nuts separate, so that they do not become mixed at the time of assembly.

<<C>> DIFFERENTIAL CASE ASSEMBLY REMOVAL

⚠ CAUTION

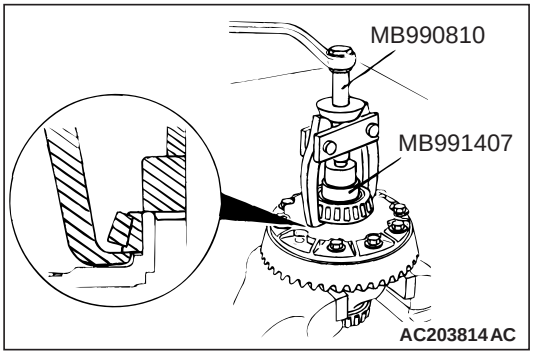
When taking out the differential case assembly, be careful not to drop and damage the differential side shims or the side bearing outer races.



Use the wooden handle of a hammer to remove the differential case assembly, differential side shims and side bearings.

NOTE: Keep the right and left side bearings and side bearing outer race separated, so that they do not become mixed at the time of assembly.

<<D>> SIDE BEARING INNER RACE REMOVAL

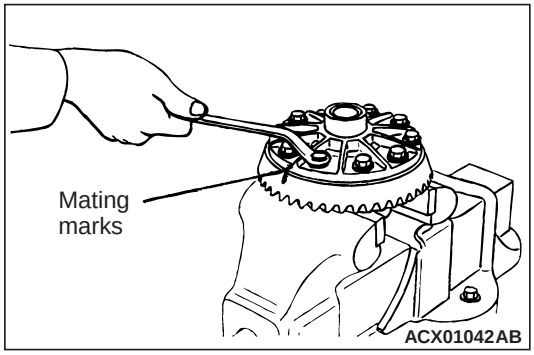


Use the following special tools to pull out the side bearing inner race.

- Side bearing puller (MB990810)
- Differential support bush arbour (MB991407)

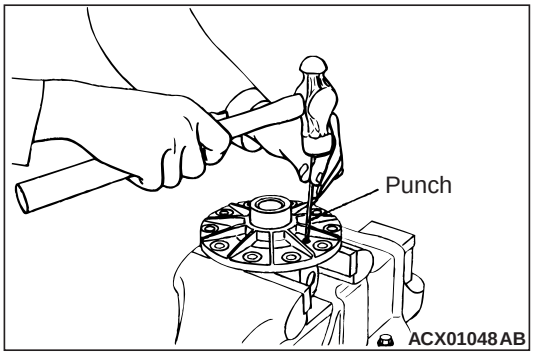
NOTE: Attach the prongs of special tools to the inner race of the side bearing through the openings in the differential case.

<<E>> DRIVE GEAR REMOVAL



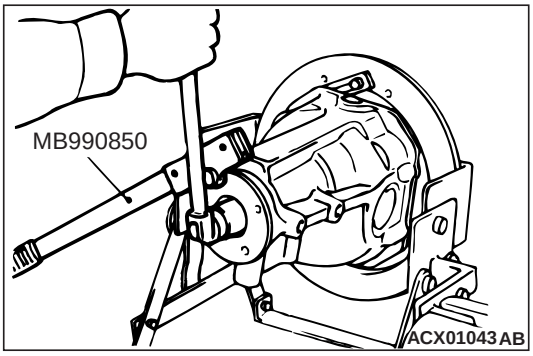
1. Make mating marks to the differential case and the drive gear.
2. Loosen the drive gear attaching bolts in diagonal sequence to remove the drive gear.

<<F>> LOCK PIN REMOVAL



Drive out the lock pin with a punch.

<<G>> SELF-LOCKING NUT REMOVAL



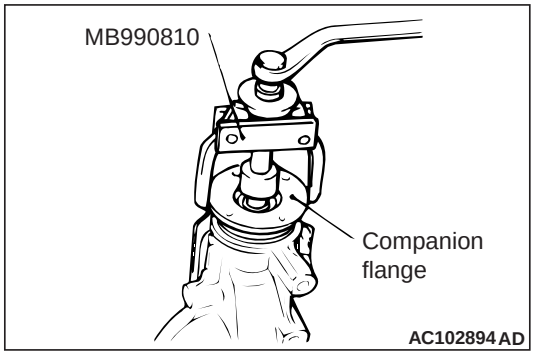
Use special tool end yoke holder (MB990850) to hold the companion flange, and then remove the companion flange self-locking nut.

<<H>> DRIVE PINION ASSEMBLY/COMPANION FLANGE REMOVAL

⚠ CAUTION

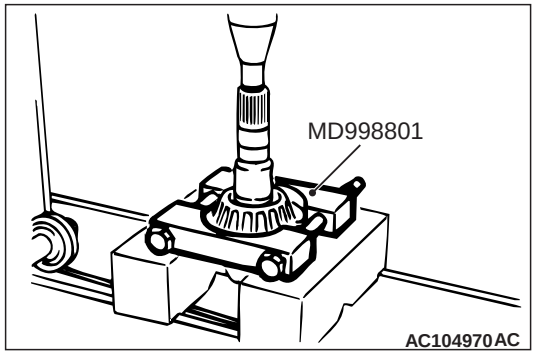
Do not make mating marks on the contact surfaces of the companion flange and propeller shaft.

1. Make mating marks to the drive pinion and companion flange.



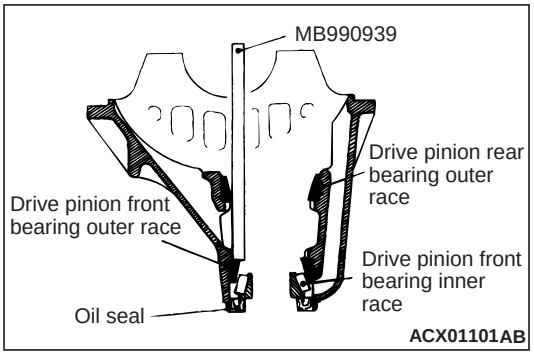
2. Use special tool side bearing puller (MB990810) to pull out the companion flange.

<<I>> DRIVE PINION REAR BEARING INNER RACE REMOVAL



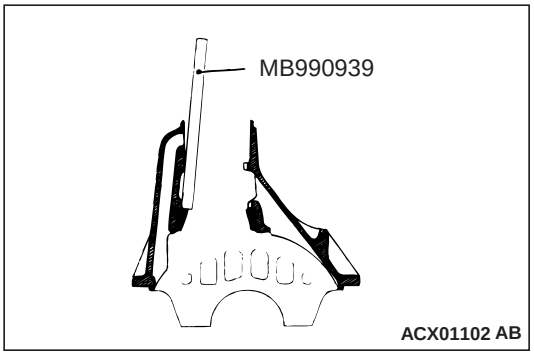
Use special tool remover (MD998801) to pull out the front bearing inner race.

<<J>> OIL SEAL/DRIVE PINION FRONT BEARING INNER RACE/DRIVE PINION FRONT BEARING OUTER RACE REMOVAL



Use special tool brass bar (MB990939) to remove the drive pinion front bearing outer race.

<<K>> DRIVE PINION REAR BEARING OUTER RACE REMOVAL

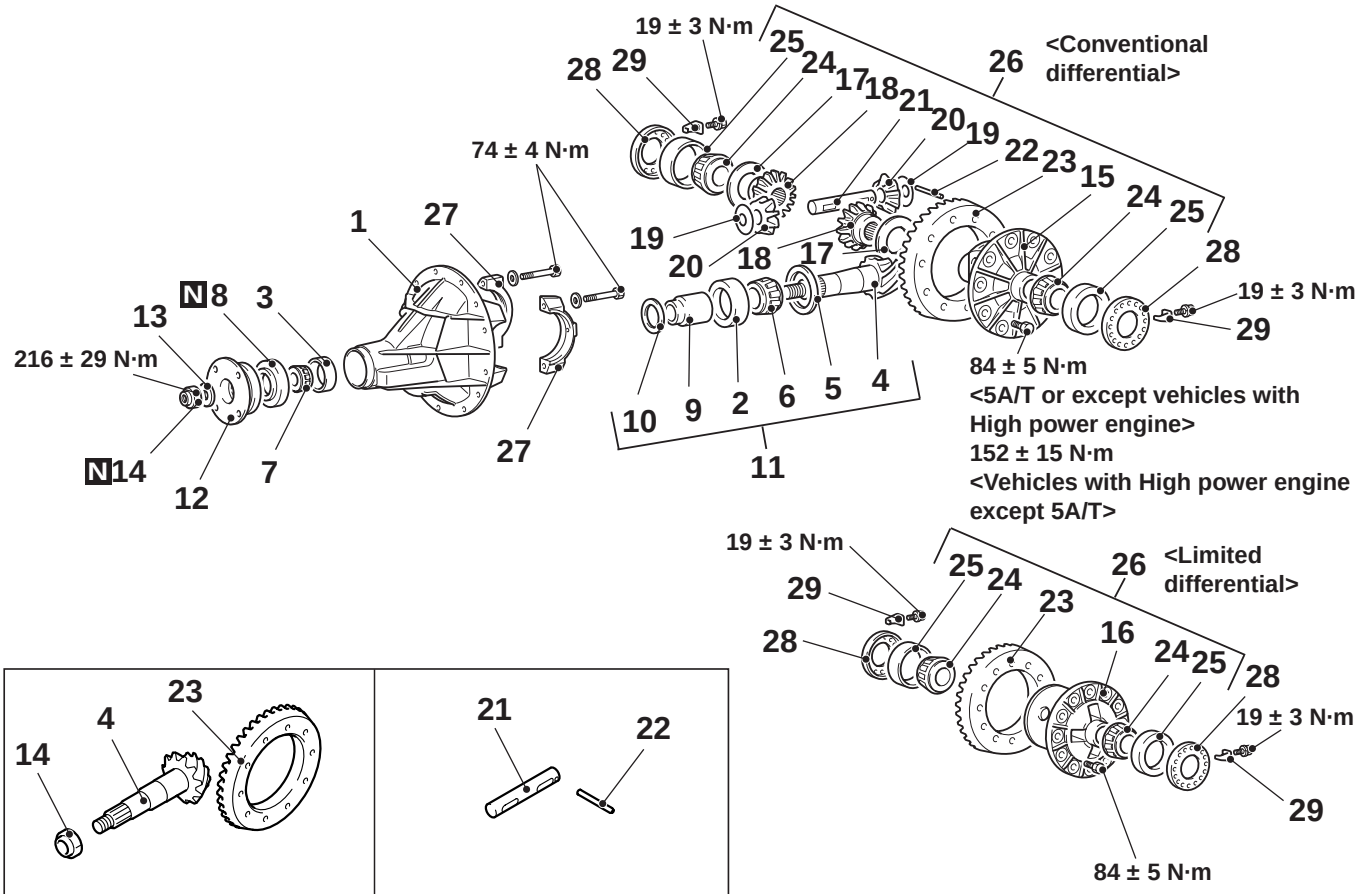


Use special tool brass bar (MB990939) to remove the drive pinion rear bearing outer race.

REASSEMBLY

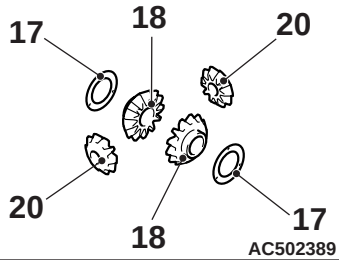
M1272002300664

<Vehicles without rear differential lock>

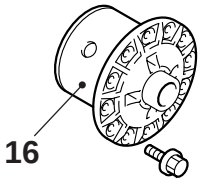


Final drive gear kit

Pinion shaft kit



Differential gear kit



Limited slip differential kit

AC508818AD

Reassembly steps

1. Differential carrier
- >>**A**<< 2. Drive pinion rear bearing outer race
- >>**B**<< 3. Drive pinion front bearing outer race
- >>**C**<< • Drive pinion height adjustment
4. Drive pinion
5. Drive pinion rear shim (for adjusting drive pinion height)
6. Drive pinion rear bearing inner race
- >>**D**<< • Drive pinion preload adjustment
7. Drive pinion front bearing inner race
- >>**D**<< 8. Oil seal
9. Drive pinion spacer

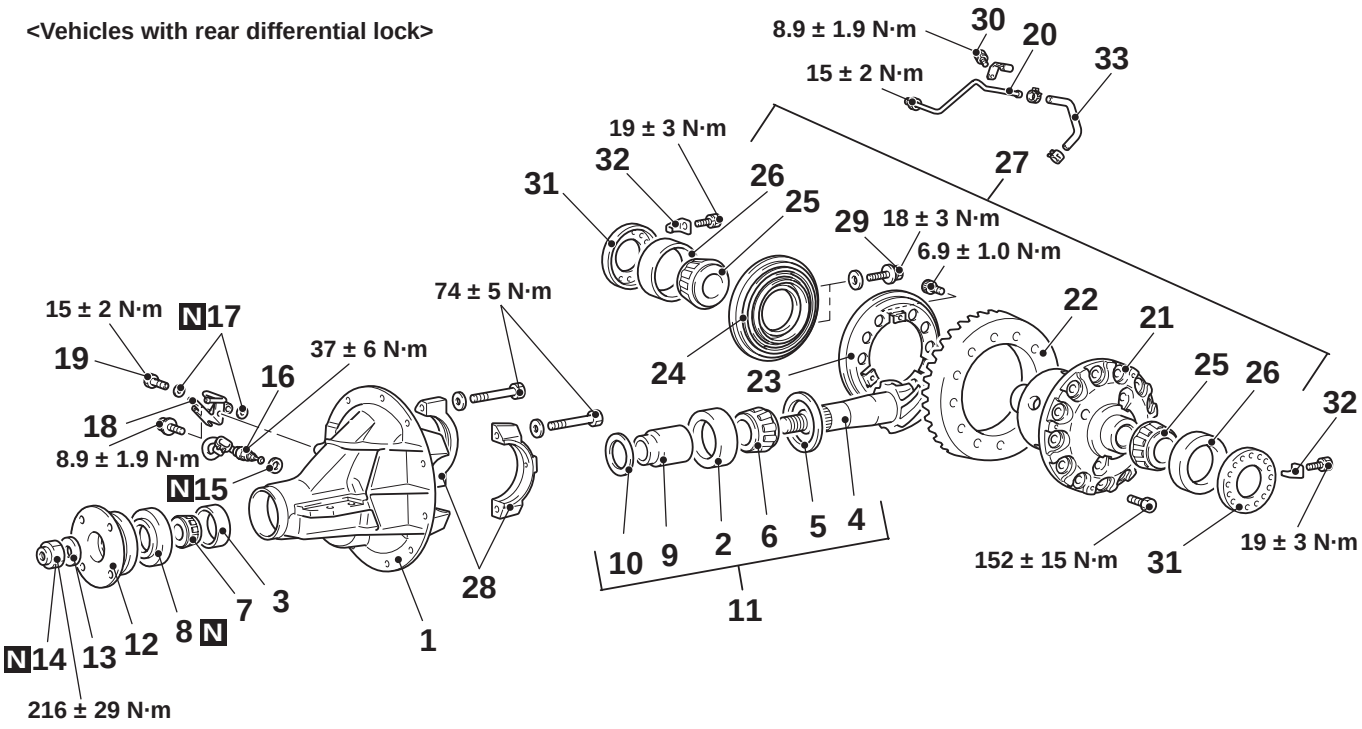
Reassembly steps (Continued)

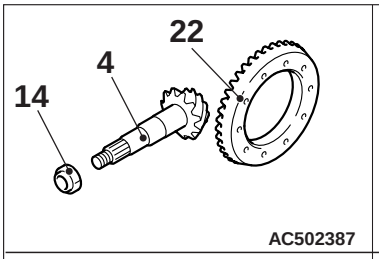
10. Drive pinion front shim (for adjusting drive pinion preload)
11. Drive pinion assembly
12. Companion flange
13. Washer
14. Self-locking nut
15. Differential case
16. Limited slip differential case assembly
17. Side gear spacer
18. Side gear
19. Pinion washer
20. Pinion gear
- >>**E**<< • Differential gear backlash adjustment
21. Pinion shaft

Reassembly steps (Continued)

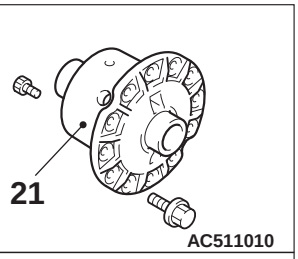
>>F<< 22. Lock pin
>>G<< 23. Drive gear
>>H<< 24. Differential side bearing inner race
25. Differential side bearing outer race
26. Differential case assembly
>>I<< 27. Bearing cap
>>J<< • Drive gear backlash adjustment
28. Side bearing nut
29. Lock plate

<Vehicles with rear differential lock>





Final drive gear kit



Differential kit

AC804648AB

Reassembly steps

1. Differential carrier
>>A<< 2. Drive pinion rear bearing outer race
>>B<< 3. Drive pinion front bearing outer race
>>C<< • Drive pinion height adjustment
4. Drive pinion
5. Drive pinion rear shim (for adjusting drive pinion height)
6. Drive pinion rear bearing inner race
>>D<< • Drive pinion preload adjustment
7. Drive pinion front bearing inner race
>>D<< 8. Oil seal
9. Drive pinion spacer
10. Drive pinion front shim (for adjusting drive pinion preload)

Reassembly steps (Continued)

11. Drive pinion assembly
12. Companion flange
13. Washer
14. Self-locking nut
15. Gasket
16. Rear differential lock detection switch
17. Gasket
18. Air pipe assembly (B)
19. Eye bolt
20. Air pipe assembly (A)
21. Differential case
>>G<< 22. Drive gear
23. Pressure plate
24. Actuator assembly

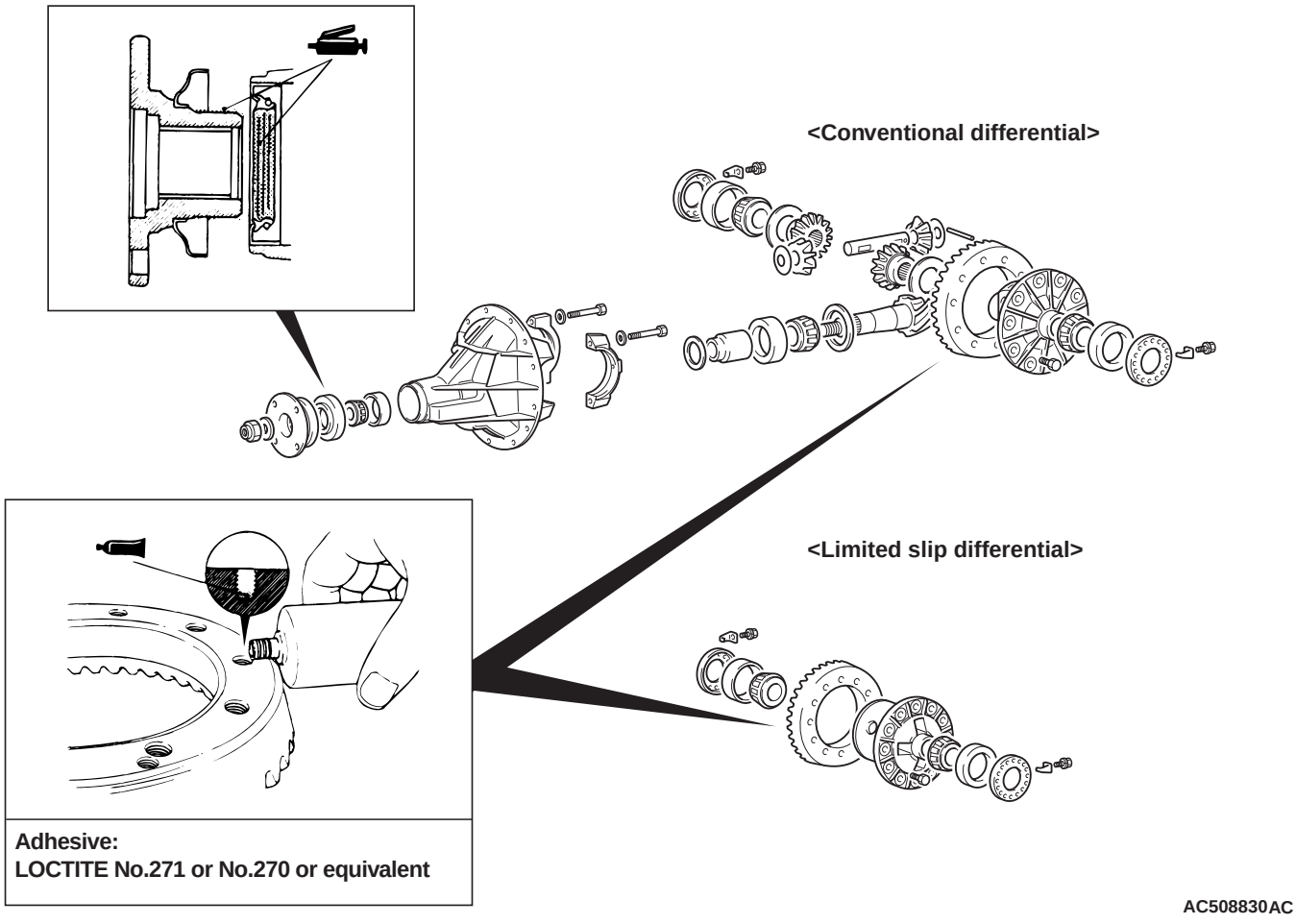
Reassembly steps (Continued)

>>H<< 25. Differential side bearing inner race
26. Differential side bearing outer race
27. Differential case assembly
>>I<< 28. Bearing cap
>>J<< • Drive gear backlash adjustment
29. Bolt

Reassembly steps (Continued)

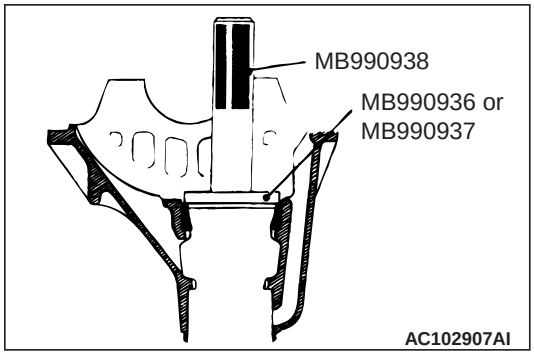
30. Bolt
31. Side bearing nut
32. Lock plate
33. Hose

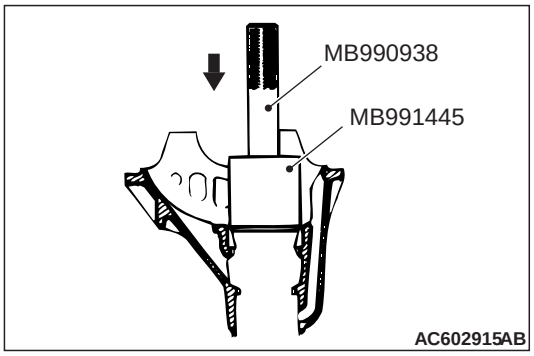
LUBRICATION AND ADHESIVE POINTS



REASSEMBLY SERVICE POINTS

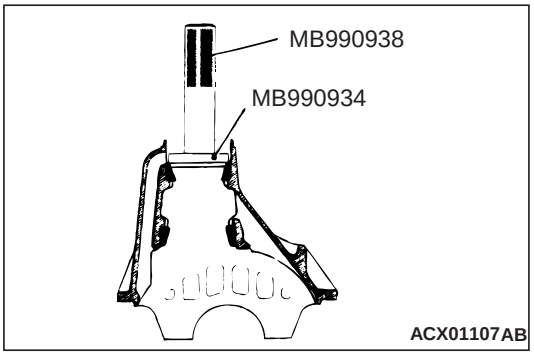
>>A<< DRIVE PINION REAR BEARING OUTER RACE PRESS-FITTING





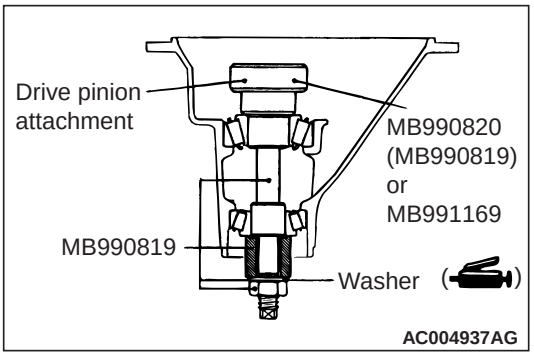
Use the following special tools to press-fit the drive pinion rear bearing outer races into the gear carrier.
- Installer bar (MB990938)
- Installer adapter (MB990936) <2WD (except High rider)>
- Installer adapter (MB990937) <2WD High rider, 5A/T or except vehicles with High power engine>
- Bushing remover and installer base (MB991445) <Vehicles with High power engine except 5A/T>

>>B<< DRIVE PINION FRONT BEARING OUTER RACE PRESS-FITTING

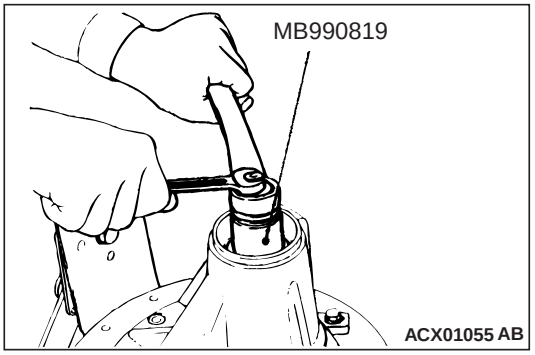


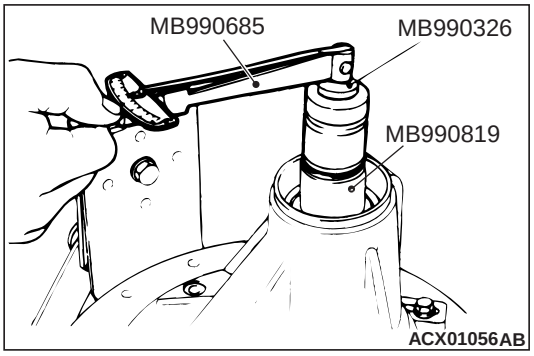
Use the following special tools to press-fit the drive pinion front bearing outer race.
- Installer bar (MB990938)
- Installer adapter (MB990934)

>>C<< DRIVE PINION HEIGHT ADJUSTMENT
Adjust the drive pinion height by the following procedures:



1. Apply multipurpose grease to the washer of special tool pinion gauge (MB990819).
2. Install the following special tools and drive pinion front and rear bearing inner races to the gear carrier as shown in the illustration.
   - Pinion [MB990820 (MB990819)] <2WD (except High rider)>
   - Drive pinion gauge attachment (MB991169) <2WD High rider, 4WD>
   - Pinion gauge (MB990819)





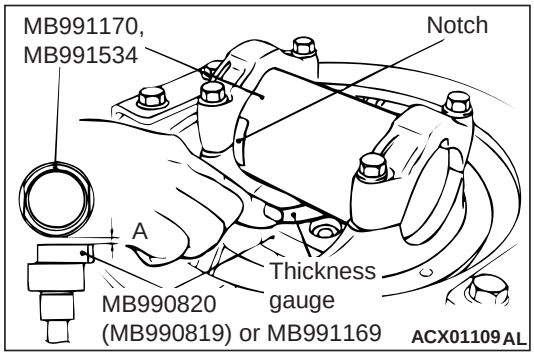
3. Tighten the nut of special tool a little at a time while measuring the turning torque of the drive pinion by using the following special tools. Then confirm that the turning torque (without oil seal) is at the standard value.
   - Preload socket (MB990326)
   - Torque wrench (MB990685)

   Standard value:

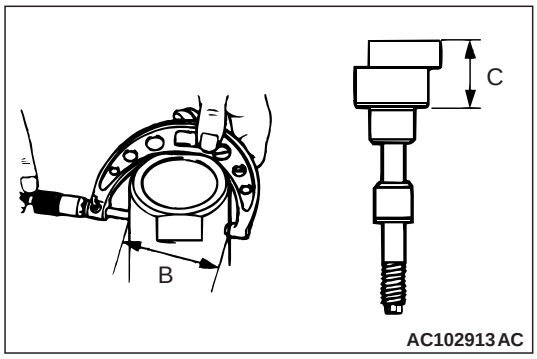
Bearing type	Bearing lubrication	Turning torque
New	None (with anti-rust agent)	0.59 – 0.88 N·m
New or reuse	Gear oil applied	0.39 – 0.49 N·m

NOTE: Because special tool preload socket (MB990326) cannot be turned one turn, turn it several times within the range that it can be turned; then, after fitting to the bearing, measure the turning torque.

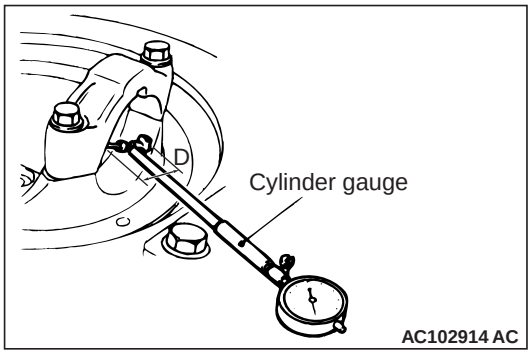
4. Clean the side bearing hub.



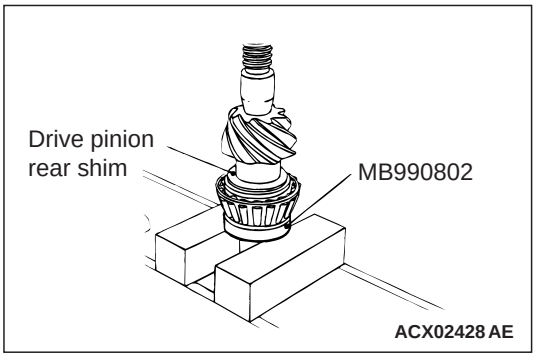
5. Place the following special tools between the side bearing hub of the gear carrier, and position the notch as shown in the illustration. Then tighten side bearing mounting bolt.
   - Cylinder gauge (MB991170) <5A/T or except vehicles with High power engine>
   - Cylinder gauge (MB991534) <Vehicles with High power engine except 5A/T>
   - Pinion [MB990820 (MB990819)] <2WD (except High rider)>
   - Drive pinion gauge attachment (MB991169) <2WD High rider, 4WD>
6. Use a thickness gauge to measure the clearance (A) between the special tools.
7. Remove the special tools.



8. Use a micrometer to measure the shown dimensions (B, C) of special tools.



9. Install the bearing cap, and then use a cylinder gauge to measure the inside diameter (D) of the bearing cap.
10. Calculate thickness (F) of the required drive pinion rear shim twice by the following formula. Select a shim which most closely matches this thickness.
    F = A + B + C – 1/2D – 100.00 mm <2WD (except High rider)>
    F = A + B + C – 1/2D – 115.00 mm <2WD High rider, 5A/T or except vehicles with High power engine>
    F = A + B + C – 1/2D – 120.00 mm <Vehicles with High power engine except 5A/T>

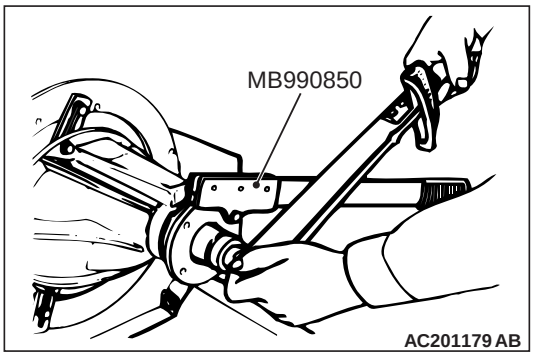


11. Fit the selected drive pinion rear shim(s) to the drive pinion, and press-fit the drive pinion rear bearing inner race by using special tool bearing installer (MB990802).

>>D<< DRIVE PINION PRELOAD ADJUSTMENT

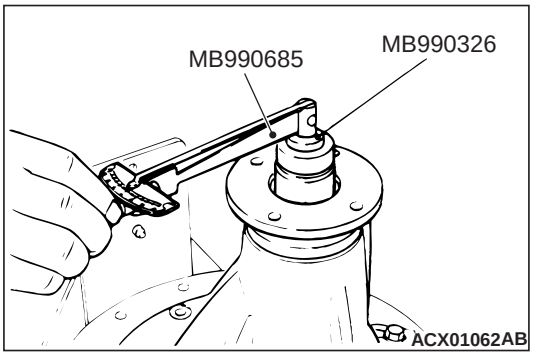
1. Insert the drive pinion into the gear carrier, and then install the following parts in sequence from the carrier rear side. Drive pinion spacer, drive pinion front shim and drive pinion front bearing inner race, companion flange.

   NOTE: Do not install the oil seal.



2. Tighten the companion flange to the specified torque by using special tool end yoke holder (MB990850).

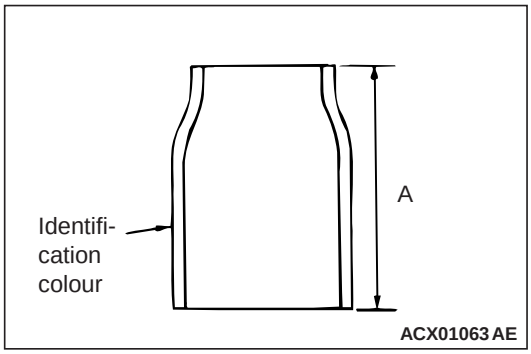
   Tightening torque: 216 ± 29 N·m



3. Use the following special tools to measure the drive pinion turning torque (without oil seal).
   - Preload socket (MB990326)
   - Torque wrench (MB990685)

   Standard value:

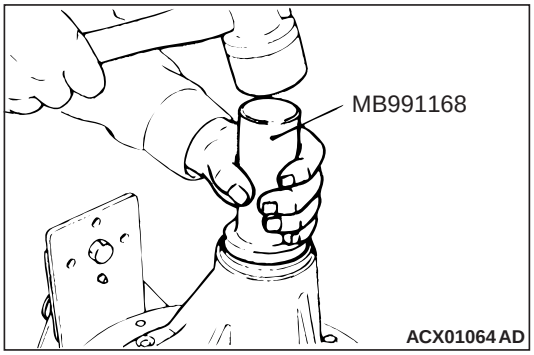
Bearing type	Bearing lubrication	Turning torque
New	None (with anti-rust agent)	0.59 – 0.88 N·m
New or reuse	Gear oil applied	0.39 – 0.49 N·m



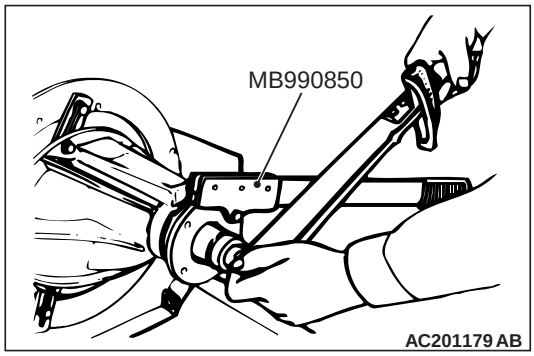
4. If the drive pinion turning torque is not within the standard value, adjust the turning torque by replacing the drive pinion front shim(s) or the drive pinion spacer.

   NOTE: When selecting the drive pinion front shims, if the number of shims is large, reduce the number of shims to a minimum by selecting the drive pinion spacers.
   Also, select the drive pinion spacer from the following two types.

Height of drive pinion spacer (A) mm	Identification colour	Applicable model
56.67	–	5A/T or except vehicles with High power engine
57.01	White	
52.50	Yellow	Vehicles with High power engine except 5A/T
52.84	Red	

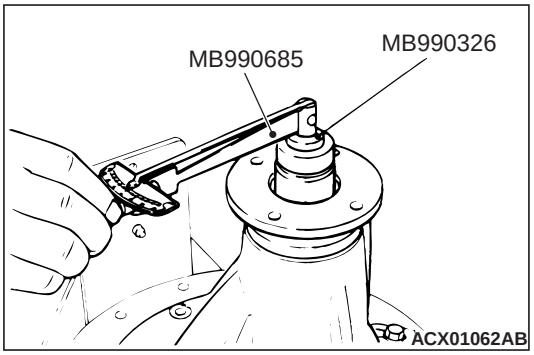


5. Remove the companion flange and drive pinion again. Then insert the drive pinion front bearing inner race into the gear carrier. Use special tool differential oil seal installer (MB991168) to press-fit the oil seal.



6. Install the drive pinion assembly and companion flange with mating marks properly aligned. Tighten the companion flange self-locking nut to the specified torque using special tool end yoke holder (MB990850).

   Tightening torque: 216 ± 29 N·m



7. Use special tools to measure the drive pinion turning torque (with oil seal) to verify that the drive pinion turning torque complies with the standard value.

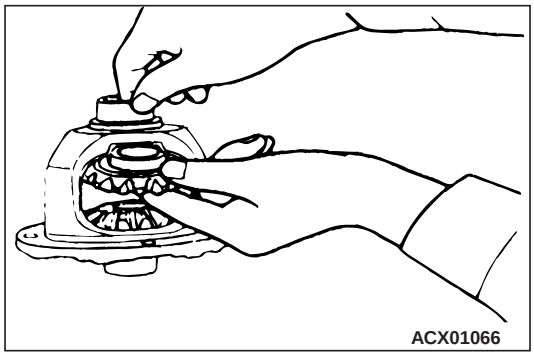
Standard value:

Bearing division	Companion flange lubrication	Turning torque
New	None (with anti-rust agent)	0.84 – 1.12 N·m
	Gear oil applied	0.64 – 0.73 N·m

8. If the turning torque is not within the standard value, check the tightening torque of the companion flange self-locking nut, and the installation of the oil seal.

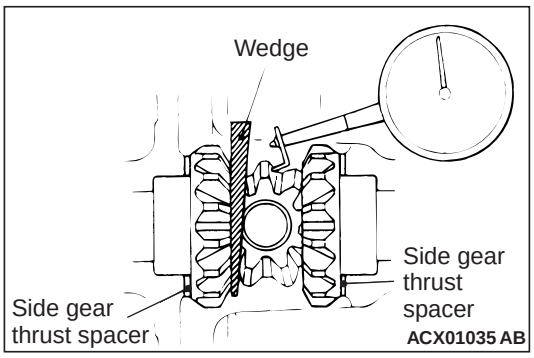
>>E<< DIFFERENTIAL GEAR BACKLASH ADJUSTMENT

Adjust the differential gear backlash by the following procedure:



1. Assemble the side gears, side gear thrust spacers, pinion gears, and pinion washers into the differential case.
2. Temporarily install the pinion shaft.

NOTE: Do not assemble the thrust block and lock pin yet.



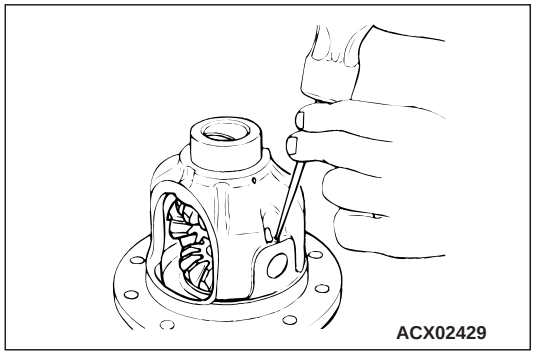
3. Insert a wedge between the side gear and the pinion shaft to lock the side gear.
4. While locking the side gear with the wedge, measure the differential gear backlash with a dial indicator on the pinion gear.

Standard value: 0.01 – 0.25 mm

5. Measure by the same procedure for the other pinion gear.
6. If the backlash exceeds the limit value, replace side bearing adjustment spacers.
7. If adjustment is not possible, replace the side gears and pinion gears as a set.
8. Check that the backlash is within the limit value and that the differential gear turns smoothly.

>>F<< LOCK PIN INSTALLATION

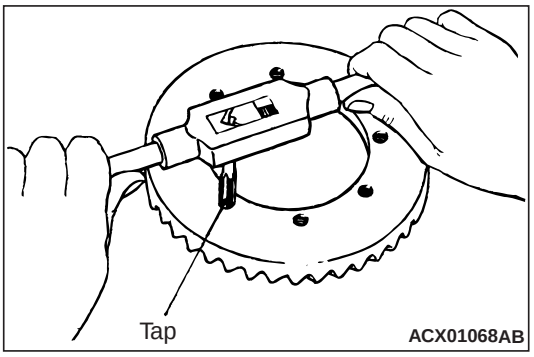
1. Align the pinion shaft lock pin hole with the differential case lock pin hole, and drive in the lock pin.



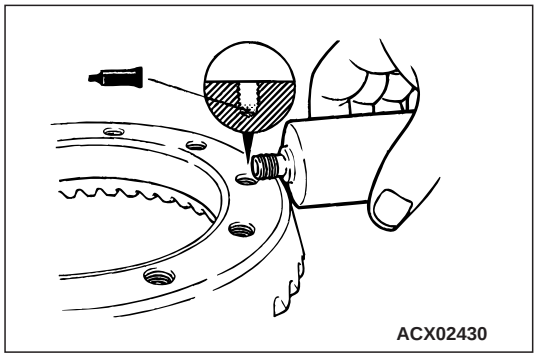
2. Stake the lock pin with a punch on both sides.

>>G<< DRIVE GEAR INSTALLATION

1. Clean the drive gear attaching bolts.



2. Remove the adhesive adhered to the threaded holes of the drive gear by turning the tap (M10 x 1.25). Clean the threaded holes by applying compressed air.



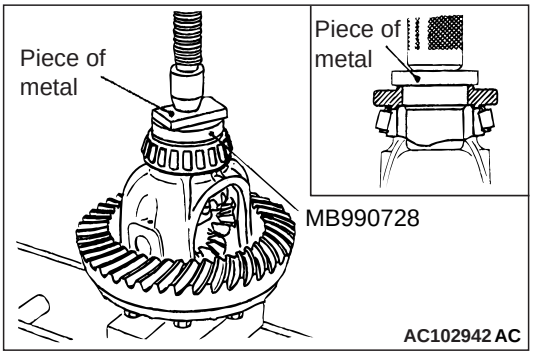
3. Apply specified adhesive to the threaded holes of the drive gear.

   Specified adhesive: LOCTITE No.271 or No.270 or equivalent

4. Install the drive gear onto the differential case with the mating marks properly aligned. Tighten the bolts to the specified torque in a diagonal sequence.

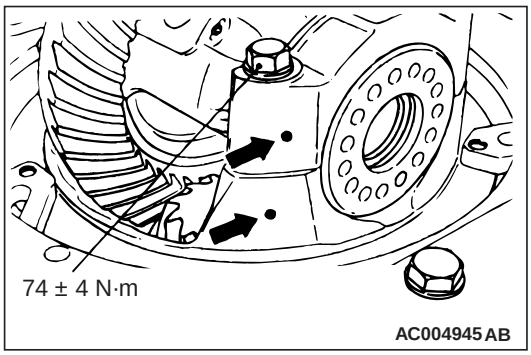
   Tightening torque:
   84 ± 5 N·m <5A/T or except vehicles with High power engine>
   152 ± 15 N·m <Vehicles with High power engine except 5A/T>

>>H<< SIDE BEARING INNER RACE INSTALLATION



Use special tool side and rear bearing inner race installer (MB990728) to press-fit the side bearing inner races into the differential case.

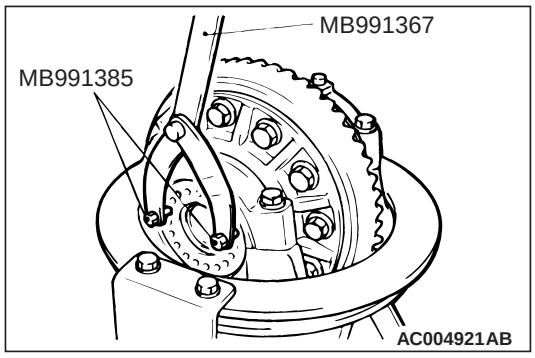
>>I<< BEARING CAP INSTALLATION



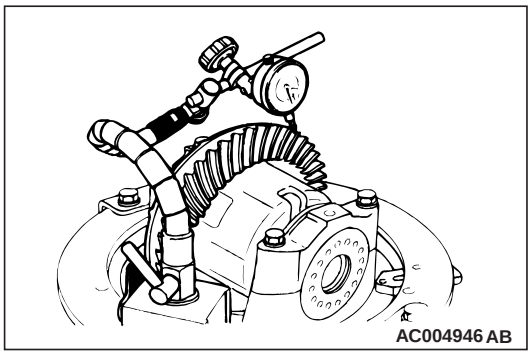
Align the mating marks on the gear carrier and the bearing cap, and then tighten the bearing cap.

>>J<< DRIVE GEAR BACKLASH ADJUSTMENT

Adjust drive gear backlash as follows:

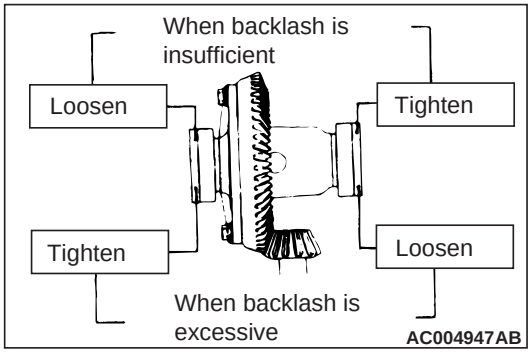


1. Using the following special tools, temporarily tighten the side bearing nut to just before preloading of the side bearing.
   - Special spanner (MB991367)
   - Pin (MB991385)



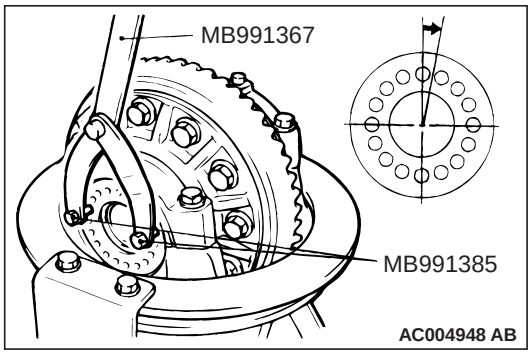
2. Measure the drive gear backlash.

   Standard value:
   0.07 – 0.13 mm <2WD (except High rider)>
   0.08 – 0.18 mm <2WD High rider, 4WD>

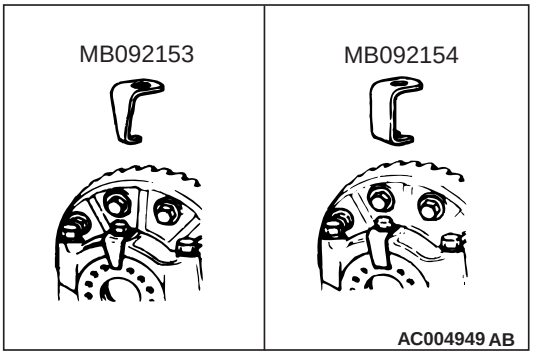


3. Using special tools, adjust the backlash to standard value by moving the side bearing nut as shown.

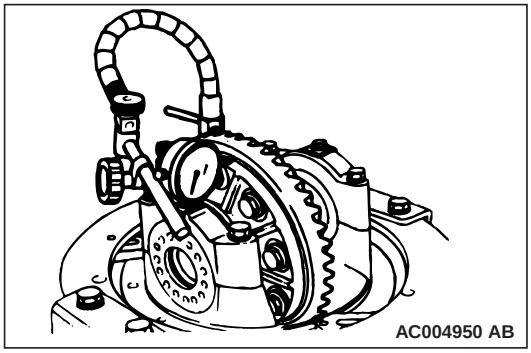
   NOTE: First loosen the side bearing nut then tighten the side bearing nut the same amount as when it was loosened.



4. Using special tools, apply the preload, turn down both right and left side bearing nuts on half the distance between centres of two neighboring holes.



5. Choose and install the lock plate (two kinds).
6. Check the final drive gear tooth contact. If poor contact is evident, make adjustment. (Refer to GROUP 26, Inspection Before Disassembly .)



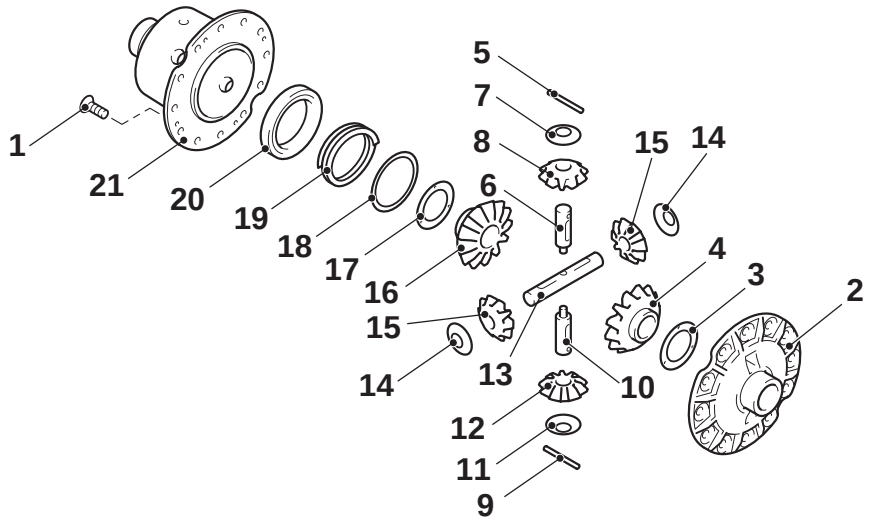
7. Measure the drive gear run-out.

   Limit: 0.05 mm

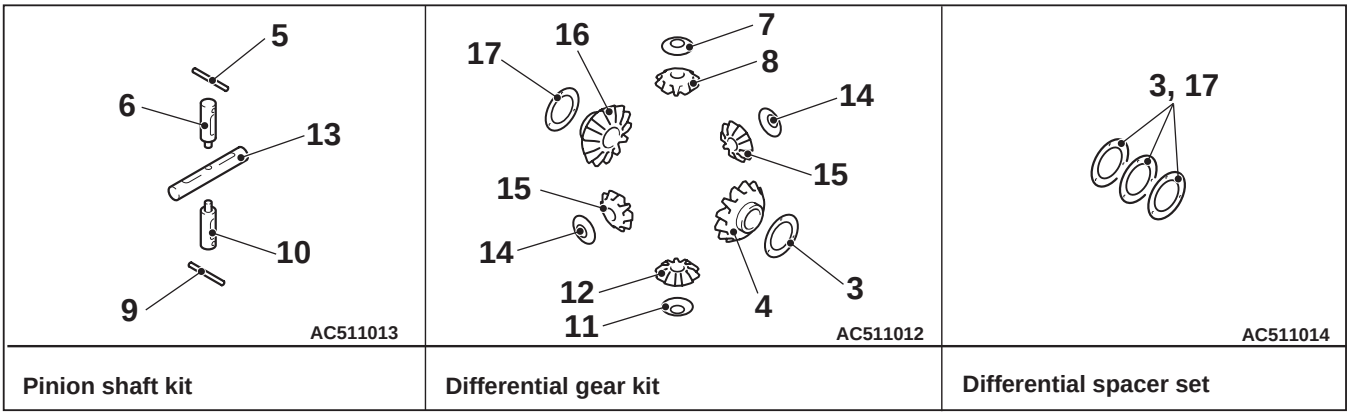
8. When drive gear run-out exceeds the limit, remove the differential case and then the drive gears, moving them to different positions and reinstall them.
9. If adjustment is not possible, replace the differential case or drive gear and drive pinion as a set.

DIFFERENTIAL CASE DISASSEMBLY AND REASSEMBLY <5A/T or EXCEPT 4WD WITH HIGH POWER ENGINE>

M1274200100051



AC511011



Pinion shaft kit	Differential gear kit	Differential spacer set

AC511057AB

Disassembly steps

<<A>> >>B<< 1. Screw
2. Differential case (A)
3. Differential spacer
4. Side gear LH
5. Differential pin
6. Differential pinion shaft
7. Differential washer
8. Differential pinion gear
9. Differential pin
10. Differential pinion shaft
11. Differential washer
12. Differential pinion gear
13. Differential pinion shaft
14. Differential washer
15. Differential pinion gear
16. Side gear RH
17. Differential spacer
18. Spring washer
19. Spring
20. Drive cam

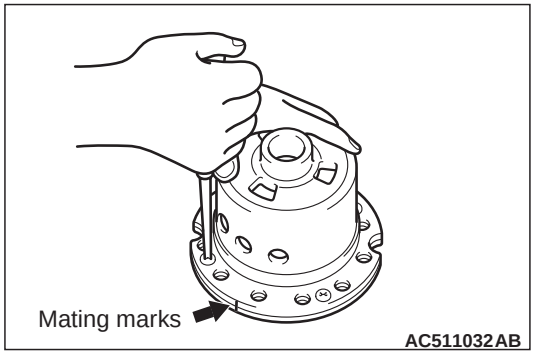
Disassembly steps (Continued)

21. Differential case (B)

>>A<< • Differential case and side gear clearance adjustment

DISASSEMBLY SERVICE POINT

<<A>> SCREW REMOVAL



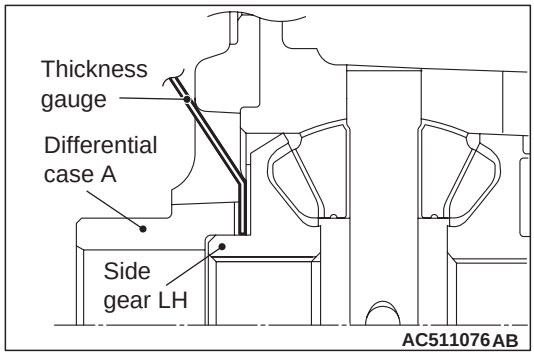
AC511032AB

1. Make the mating marks.

2. Loosen the mounting screws for differential case (A) and (B) evenly step by step.
3. Separate differential case (B) and differential case (A), and take out the parts inside. Do not confuse the side gear LH/RH for further reassembly.

REASSEMBLY SERVICE POINTS

>>A<< DIFFERENTIAL CASE AND SIDE GEAR CLEARANCE ADJUSTMENT

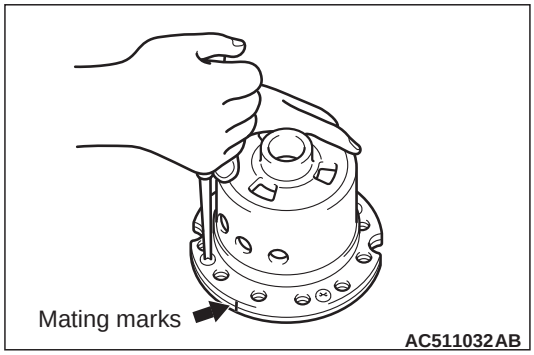


1. Insert a thickness gauge from the hole of differential case (A) between the differential case (A) and side gear LH and measure the clearance.
2. Select the spacer so that the clearance will meet the standard value.

Standard value: 0.05 – 0.20 mm

Spacer thickness mm
1.1
1.2
1.3
1.4
1.5

>>B<< SCREW INSTALLATION



1. Align the mating marks (the same numeral on each case) of differential case (A) and differential case (B).
2. Tighten the screw so that the cases are in close contact.

GROUP 31

WHEEL AND TYRE

CONTENTS

SERVICE SPECIFICATION(S) 31-2

TROUBLESHOOTING 31-2
- TROUBLESHOOTING 31-2
- WHEEL BALANCE ACCURACY 31-3

ON-VEHICLE SERVICE 31-6
- TYRE INFLATION PRESSURE CHECK . . 31-6
- TYRE WEAR CHECK 31-6
- WHEEL RUNOUT CHECK 31-6

WHEEL AND TYRE 31-6
- WHEEL AND TYRE REMOVAL AND INSTALLATION 31-6

SPARE TYRE CARRIER 31-7
- SPARE TYRE CARRIER REMOVAL AND INSTALLATION 31-7

SERVICE SPECIFICATIONS

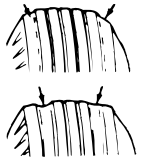
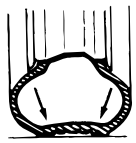
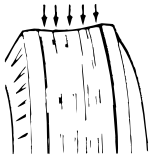
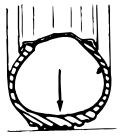
M1311000300644

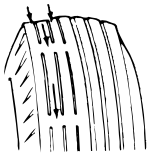
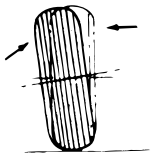
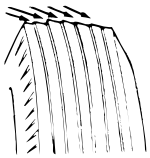
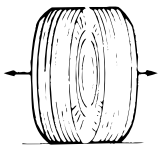
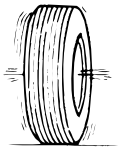
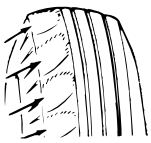
Item		Limit
Tread depth of tyre mm		Minimum 1.6
Wheel runout <Steel wheel>	Radial runout mm	1.2 or less
	Lateral runout mm	1.2 or less
Wheel runout <Aluminium wheel>	Radial runout mm	1.0 or less
	Lateral runout mm	1.0 or less

TROUBLESHOOTING

DIAGNOSIS

M1311000700835

Symptom		Probable cause		Remedy	Reference page
Rapid wear at shoulders	 ACX00923AB	Under-inflation or lack of rotation	 ACX00924AE	Adjust the tyre pressure.	For tyre inflation pressure, refer to the label on the driver's side centre pillar.
Rapid wear at centre	 ACX00925AE	Over-inflation or lack of rotation	 ACX00926AI		
Cracked treads	ACX00927AB	Under-inflation			

Symptom		Probable cause		Remedy	Reference page
Wear on one side	 ACX00928AB	Excessive camber	 ACX00929AE	Check the camber.	Refer to GROUP 33, On-vehicle service – Front wheel alignment check and adjustment <2WD (Except HIGH RIDER) > , <2WD (HIGH RIDER) and 4WD> .
Feathered edge	 ACX00930AB	Incorrect toe-in	 ACX00931AE	Adjust the toe-in.	
Bald spots	ACX00932AB	Unbalanced wheel	 ACX00933AB	Balance the wheel.	Refer to P.31-3.
Scalloped wear	 ACX00934	Lack of rotation of tyre or worn or out-of-alignment suspension		Rotate the tyre, and check the front suspension alignment.	Refer to GROUP 33, On-vehicle service – Front wheel alignment check and adjustment <2WD (Except HIGH RIDER) > , <2WD (HIGH RIDER) and 4WD> .

WHEEL BALANCE ACCURACY

M1311001700537

PURPOSE

This section contains tips and procedures for achieving accurate wheel balance. Steering wheel vibration and/or body shake can result if any of these procedures are not carefully observed.

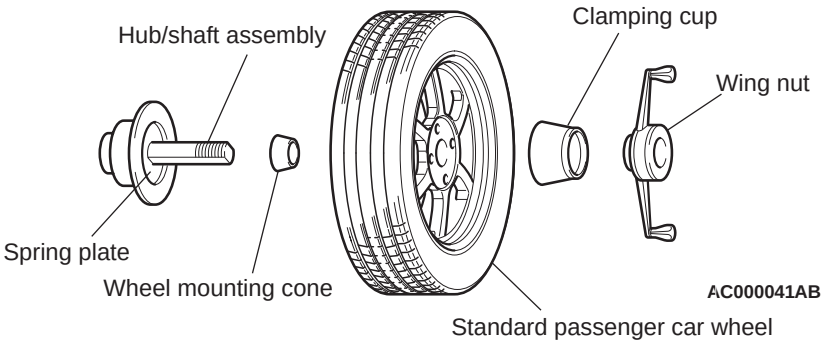
1. Wheels and tyres must be properly mounted on a balancer in order to achieve correct balance. Centring the wheel on the shaft of the balancer is essential for proper mounting.
2. Off-the-car wheel balancers must be calibrated periodically to ensure good balancing results. An inaccurately calibrated balancer could cause unnecessary replacement of tyres, shocks, suspension components, or steering components.

Check your balancer's calibration approximately every 100 balances. Your wheel balancer's instruction manual should include calibration procedures. If the calibration procedures specifically for your balancer are missing, use the generic steps in this section for zero calibration, static balance, and dynamic balance checks. The wheel balancer calibration checks are also described in the flowchart (Refer to).

PROCEDURE <BALANCING TIPS>

1. Confirm that the balancer's cone and the wheel mounting cone are undamaged and free of dirt and rust.
2. On this vehicle, the wheel's centre hole on the hub side has a chamfered edge. Use a back-mounting cone on your wheel balancer to centre the wheel on the balancer shaft.

3. Install a wheel mounting cone. The appropriate size cone for this vehicle is 56.0 mm.
4. Before balancing the wheel, remove any wheel weights from both sides. Also check both sides for any damage.
5. When installing wheel weights, hammer them at a straight (not diagonal) angle.



<CONFIRMING PROPER BALANCE>

1. After balancing the wheel, loosen the wing nut and turn the wheel 180° against the balancer's hub. Then re-tighten the wing nut and check the balance again. Repeat wheel balance if necessary.
2. Turn the wheel again 180° against the balancer's hub. If the wheel becomes out-of-balance each time it is turned against the balancer's hub, the wheel balancer may require calibration.

<WHEEL BALANCER CALIBRATION CHECKS>

1. Mount an undamaged original-equipment alloy rim and tyre assembly (wheel) onto your off-the-car wheel balancer. Balance the wheel.
2. <<Zero Calibration Check>>

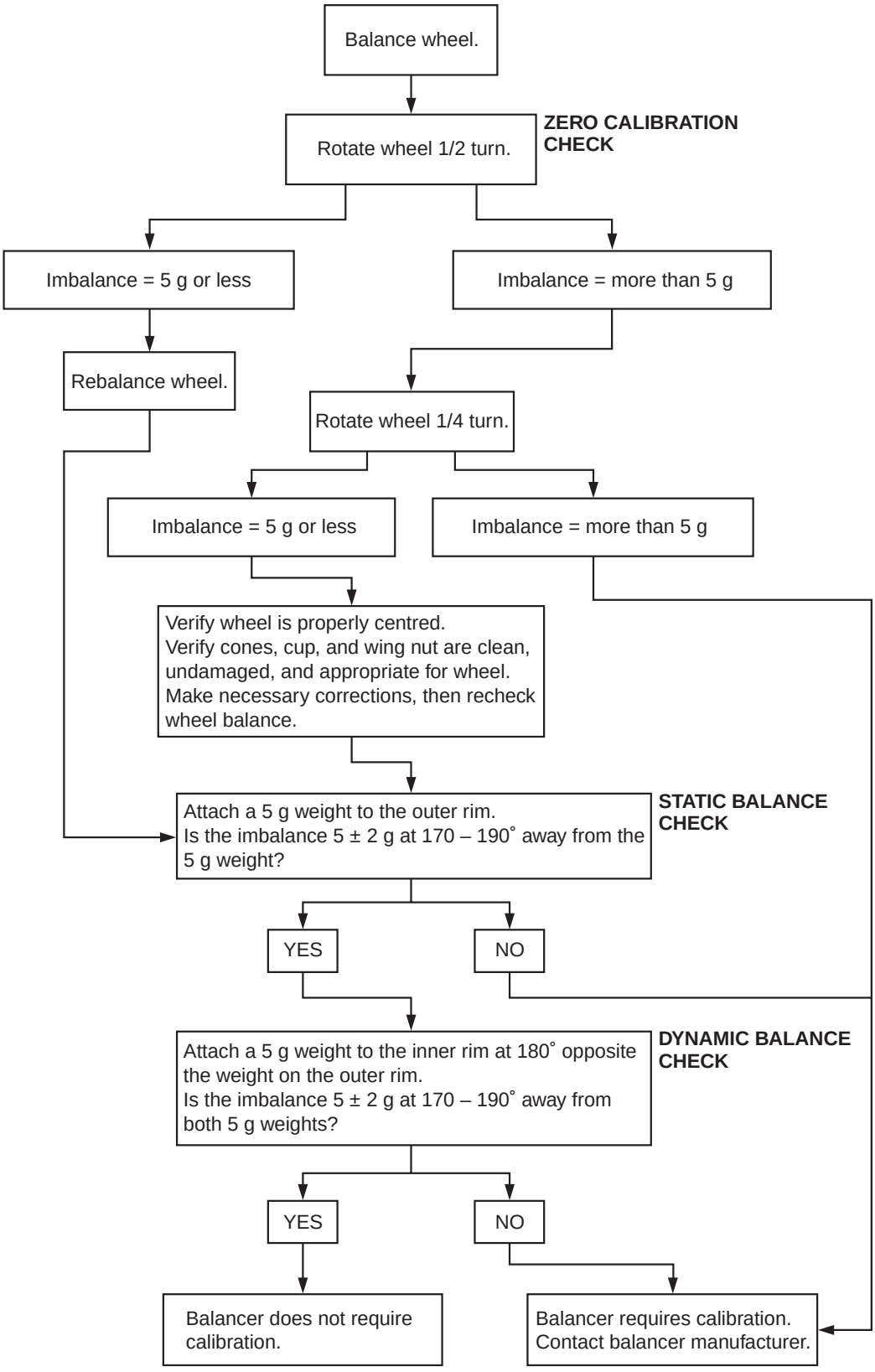
   Loosen the balancer wing nut, rotate the wheel a half-turn (180°), and retighten the nut. Recheck the balance.
   - If the imbalance is 5 g or less, the zero calibration is OK. Rebalance the wheel, then go to Step 4 to check static balance.
   - If the imbalance is more than 5 g, go to Step 3.
3. Loosen the balancer wing nut, rotate the wheel 1/4 turn (90°), and retighten the nut. Recheck the wheel balance.
   - If the imbalance is 5 g or less, the wheel may not be centred on the balancer, or the balancing cones, the cup, and/or wing nut are damaged, dirty, or inappropriate for the wheel. You may need to refer to the balancer manufacturer's instructions to verify the correct attachments. After making the necessary corrections, recheck the wheel balance. If OK, then go to Step 4.
   - If the imbalance is more than 5 g, the balancer requires calibration. Contact the balancer manufacturer for calibration by their repair representative.
4. <<Static Balance Check>>

   Attach a 5 g weight to the outer rim. Recheck the balancer. The balancer should detect 5 ± 2 g of imbalance 170 to 190° away from the 5 g weight.
   - If the imbalance is within specification, the static balance calibration is correct. Go to Step 5 to check the dynamic balance.
   - If the imbalance is out of specification, the balancer requires calibration. Contact the balancer manufacturer for calibration by their repair representative.
5. <<Dynamic Balance Check>>

   Attach a 5 g weight to the inner rim at 180° opposite the 5 g weight that was added in Step 4. Recheck the balance. The balancer should detect 5 ± 2 g of imbalance 170 to 190° away from both the inner and outer 5 g weights.
   - If the imbalance is within specification, the dynamic balance calibration is correct. The balancer calibration checks are complete.

- If the imbalance is out of specification, the balancer requires calibration. Contact the balancer manufacturer for calibration by their repair representative.

WHEEL BALANCER CALIBRATION CHECKING FLOW CHART



AC502720AB

ON-VEHICLE SERVICE

TYRE INFLATION PRESSURE CHECK

M1311000900516

NOTE: For information on tyre inflation pressure, refer to the label attached to the centre pillar on the driver's side.

TYRE WEAR CHECK

M1311001000594

Measure the tread depth of the tyres.

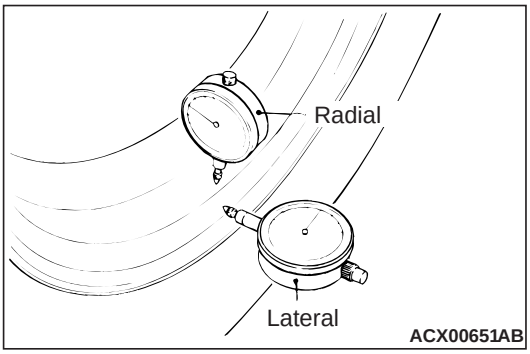
Minimum limit: 1.6 mm

If the remaining tread depth is less than the minimum limit, replace the tyre.

NOTE: When the tread depth of the tyres is reduced to 1.6 mm or less, wear indicators will appear.

WHEEL RUNOUT CHECK

M1311001100609



Jack up the vehicle so that the wheels are clear of the floor. While slowly turning the wheel, measure wheel runout with a dial indicator.

Limit:

Item	Steel wheel	Aluminium wheel
Radial runout mm	1.2 or less	1.0 or less
Lateral runout mm	1.2 or less	1.0 or less

If wheel runout exceeds the limit, replace the wheel.

WHEEL AND TYRE

INSTALLATION SERVICE POINT

M1311001300476

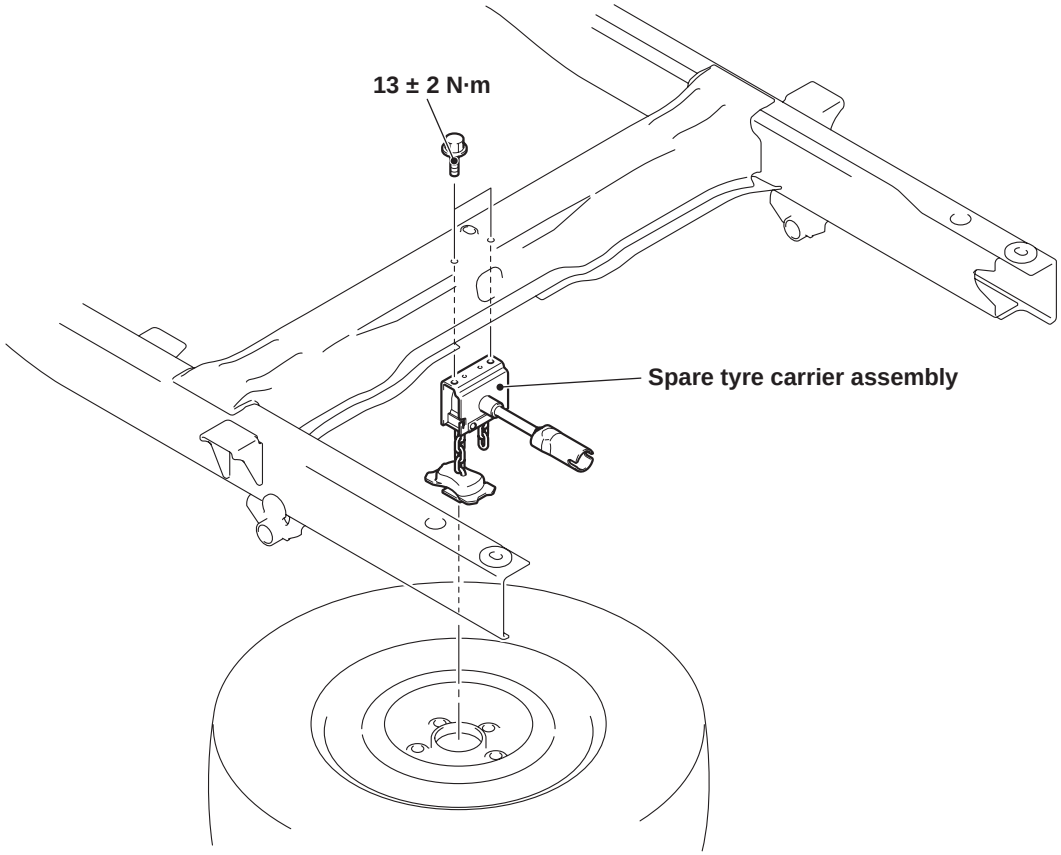
Tighten the wheel nuts to the specified torque.

Tightening torque:
147 ± 10 N·m <Steel wheel>
128 ± 9 N·m <Aluminium wheel>

SPARE TYRE CARRIER

REMOVAL AND INSTALLATION

M1311006700071



AC501849AB

GROUP 32

POWER PLANT MOUNT

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FRONT ENGINE MOUNTING REMOVAL AND INSTALLATION. 32-3

FRONT ENGINE MOUNTING INSPECTION 32-4

REAR ENGINE MOUNTING 32-5

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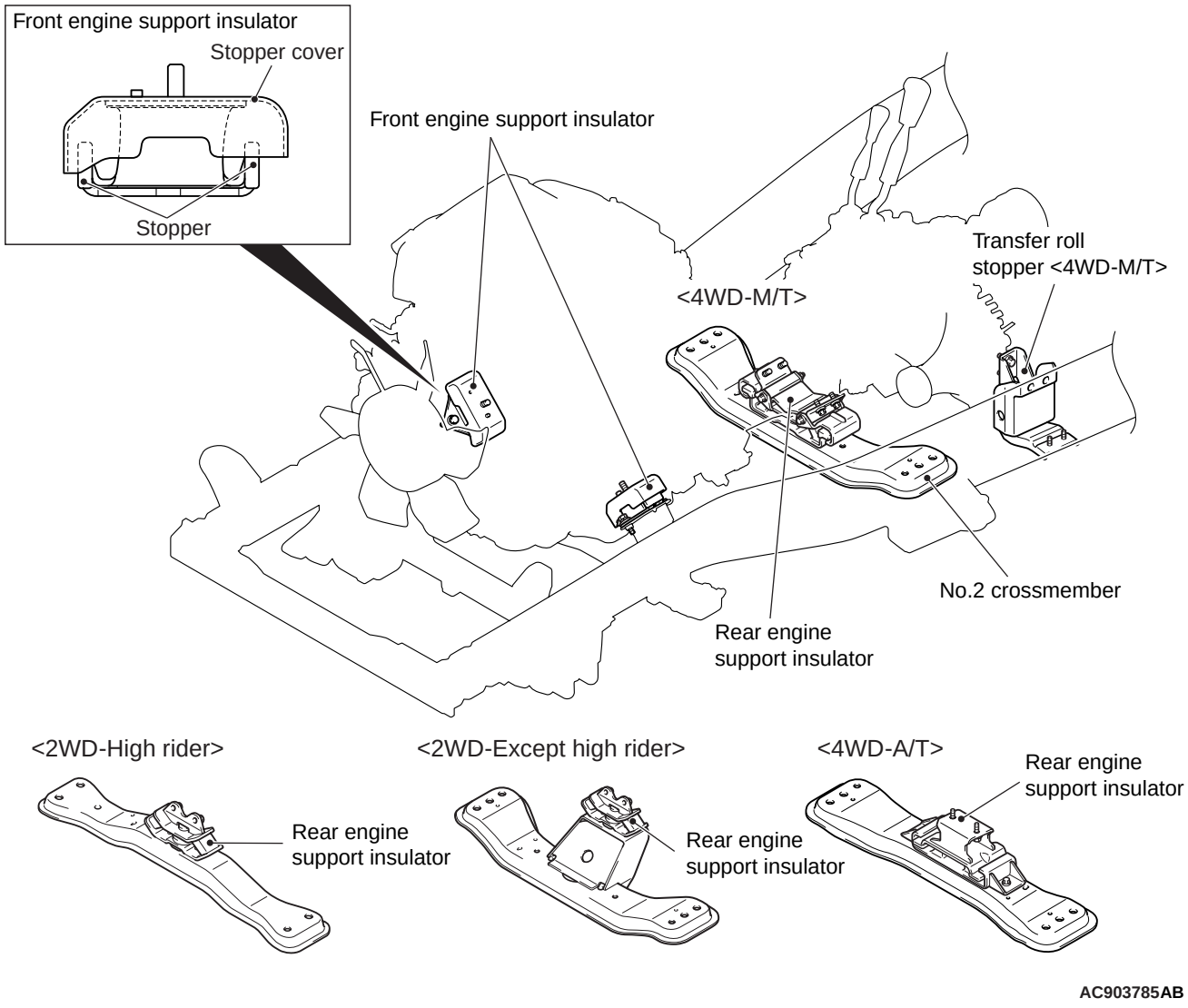
GENERAL INFORMATION

M1321000101699

For engine and transmission mounts, gravity-centre support engine type has been adopted as follows: 3-point support type (two places at the engine and one place at the transmission) for A/T vehicles, and 4-point support type (two places at the engine, one place at the transmission and one place at the transfer) for 4WD-M/T vehicles.

- The clearance of the stopper for front engine support insulator has been enlarged to improve vibration at the vehicle start-up.
- Cup-type stopper cover made of heat-resistant material has been adopted to abolish the heat protector for light weighting.
- Low-speed action spring material has been adopted for front engine support insulator and rear engine support insulator to reduce vibration transmission ratio of the power plant.

CONSTRUCTION DIAGRAM



FRONT ENGINE MOUNTING

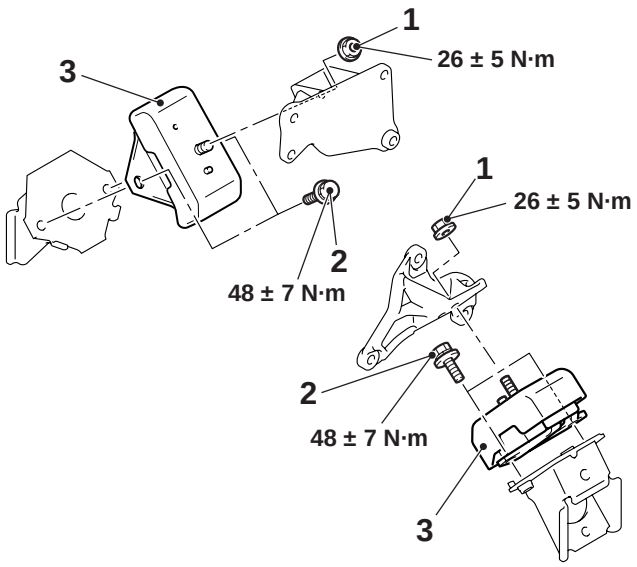
REMOVAL AND INSTALLATION

M1321006600020

⚠ CAUTION

Do not distort rubber portions, and never stain rubber portions with fuel oil.

Pre-removal and Post-installation Operation
- Engine Assembly Removal and Installation (Refer to GROUP 11A – Engine Assembly).



AC505370AC

Removal steps

1. Engine mounting nut
2. Engine mounting bolt

>>A<< 3. Front engine support insulator

INSTALLATION SERVICE POINT

>>A<< FRONT ENGINE SUPPORT INSULATOR INSTALLATION

⚠ CAUTION

Do not distort rubber portions, and never stain rubber portions with fuel or oil.

INSPECTION

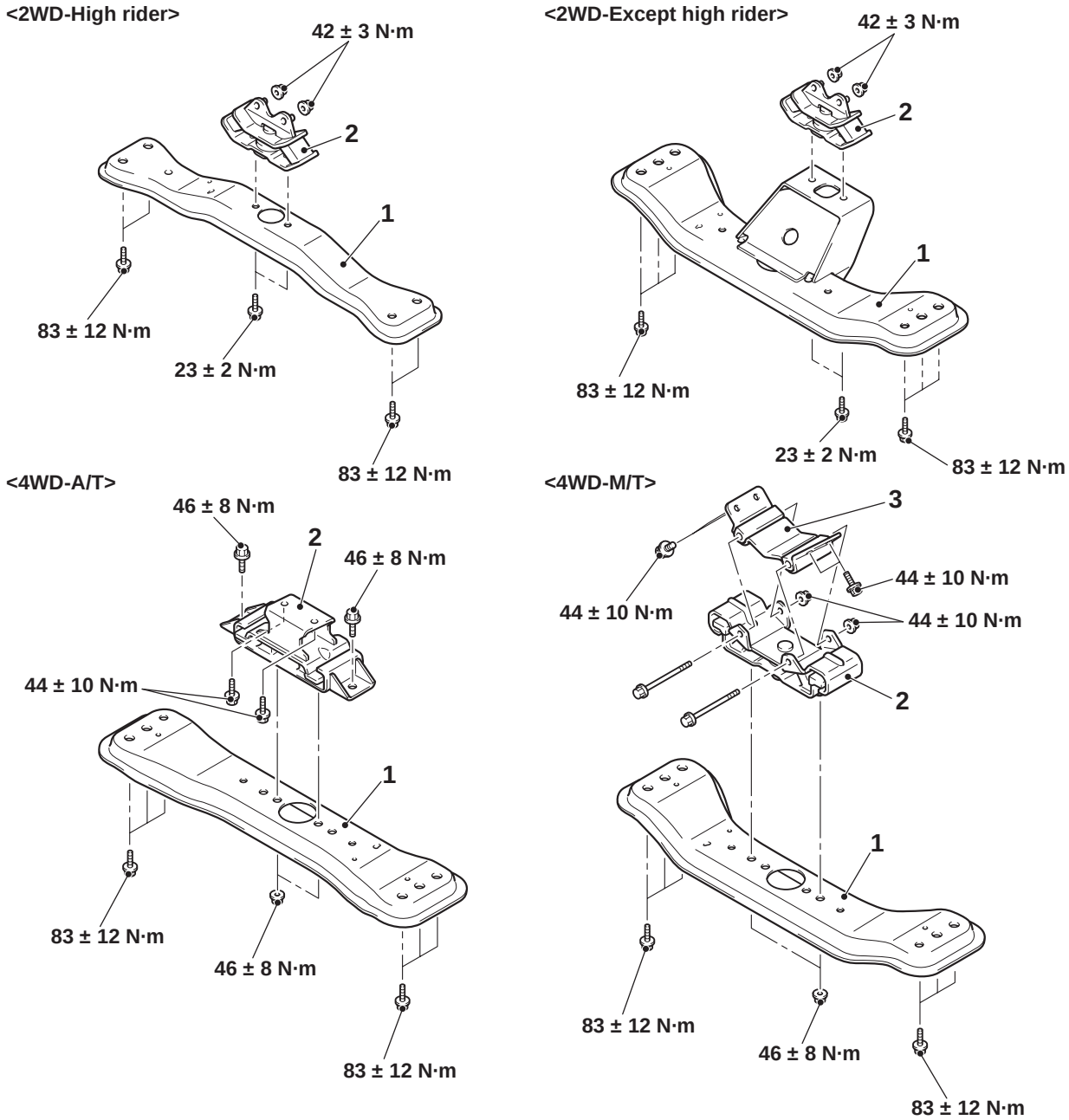
M1321006700016

Check the front engine support insulator for cracks, separation or deformation.

REAR ENGINE MOUNTING

REMOVAL AND INSTALLATION

M1321005600232



AC903789AB

<<**A**>>

Removal steps

- Support the manual transmission assembly or automatic transmission assembly.

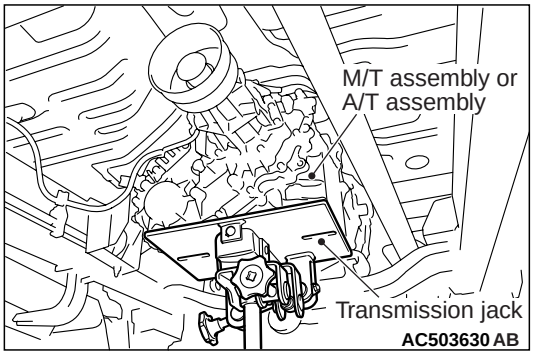
1. No.2 crossmember

Removal steps (Continued)

2. Rear engine support insulator
3. Transmission bracket <4WD-M/T>

REMOVAL SERVICE POINT

<<A>> SUPPORT THE MANUAL TRANSMISSION ASSEMBLY OR AUTOMATIC TRANSMISSION ASSEMBLY



Use a transmission jack to support the manual transmission assembly or automatic transmission assembly.

INSPECTION

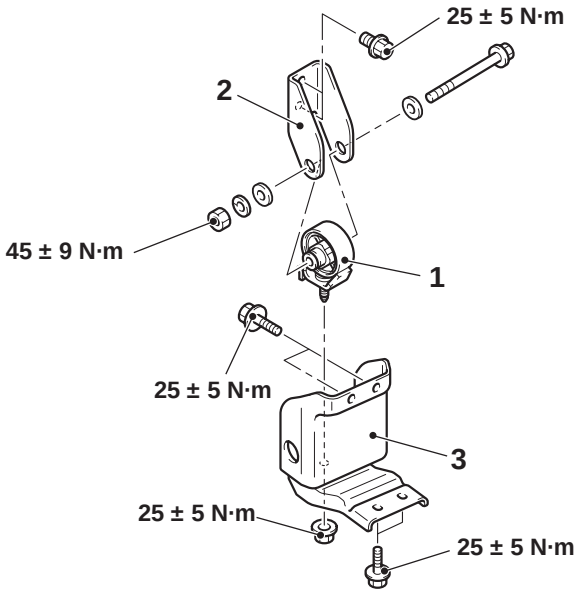
M1321005700079

Check the rear engine support insulator for cracks, separation or deformation.

TRANSFER MOUNTING <4WD-M/T>

REMOVAL AND INSTALLATION

M1321005300208



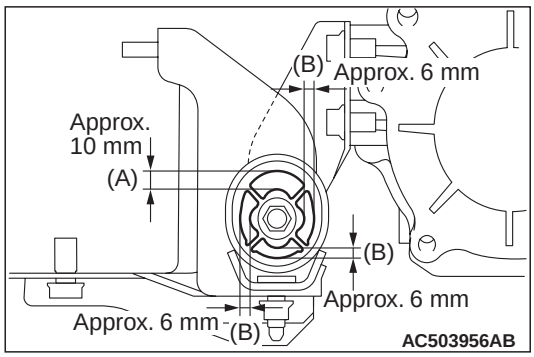
Removal steps

>>A<< 1. Transfer roll stopper
2. Transfer mount bracket
3. Transfer mount bracket assembly

INSTALLATION SERVICE POINT

>>A<< TRANSFER ROLL STOPPER INSTALLATION

1. Tighten the transfer roll stopper provisionally.



2. Tighten the transfer roll stopper inner and outer so that the clearance (A) between them is as shown in the illustration.

3. Check that the clearance (B) between the stoppers are the same.

NOTE: When new, a transfer roll stopper consists of one part, but will separate into outer and inner part during use.This is normal.

INSPECTION

M1321005400078

- Check the transfer roll stopper for cracks, separation or deformation.
- Check the transfer mount bracket for deformation or corrosion.
- Check the transfer mount bracket assembly for deformation or corrosion.

GROUP 33

FRONT SUSPENSION

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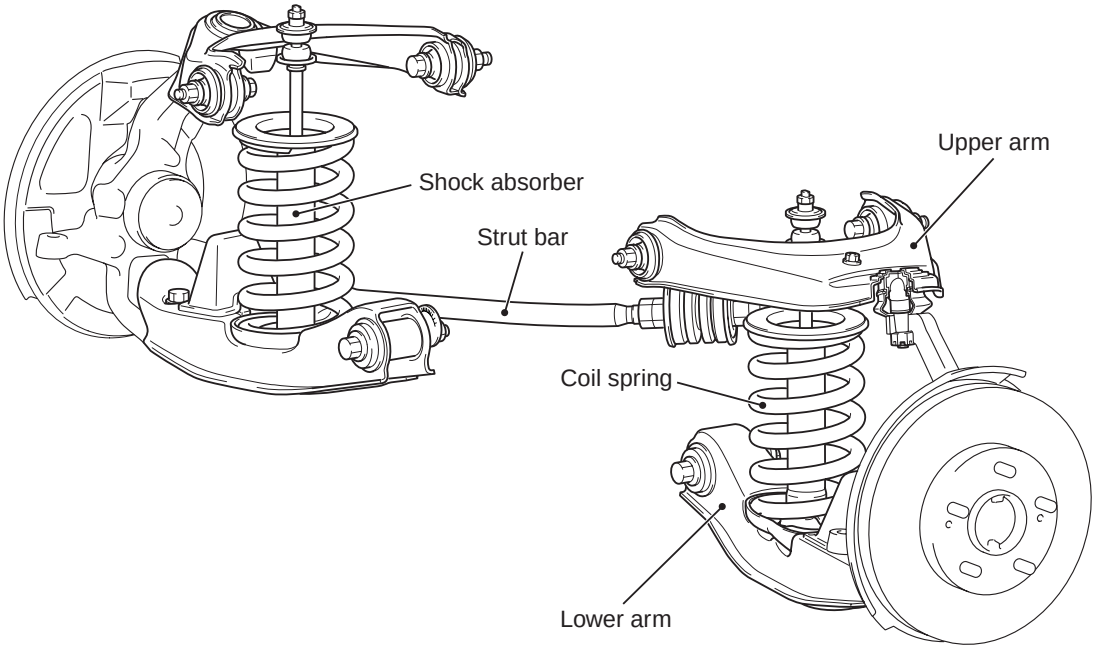
GENERAL INFORMATION

M1332000102168

The Independent-wishbone, coil springs has been adopted.

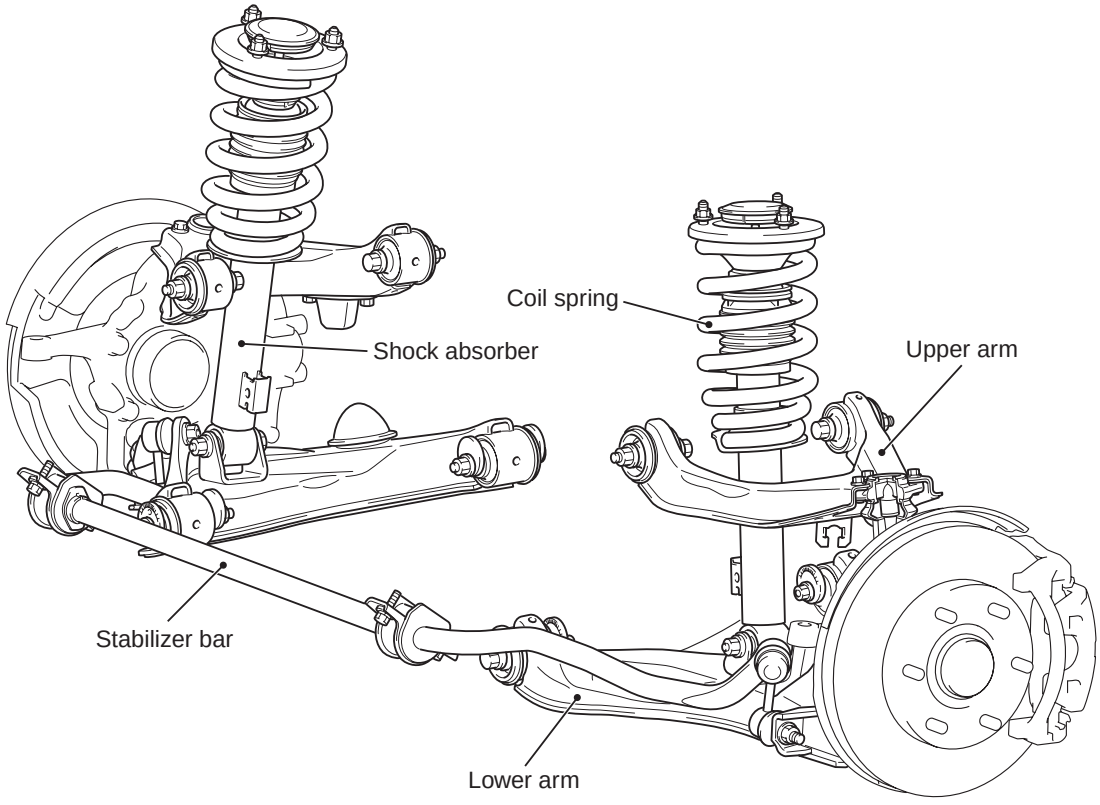
CONSTRUCTION DIAGRAM

<2WD (except High rider)>



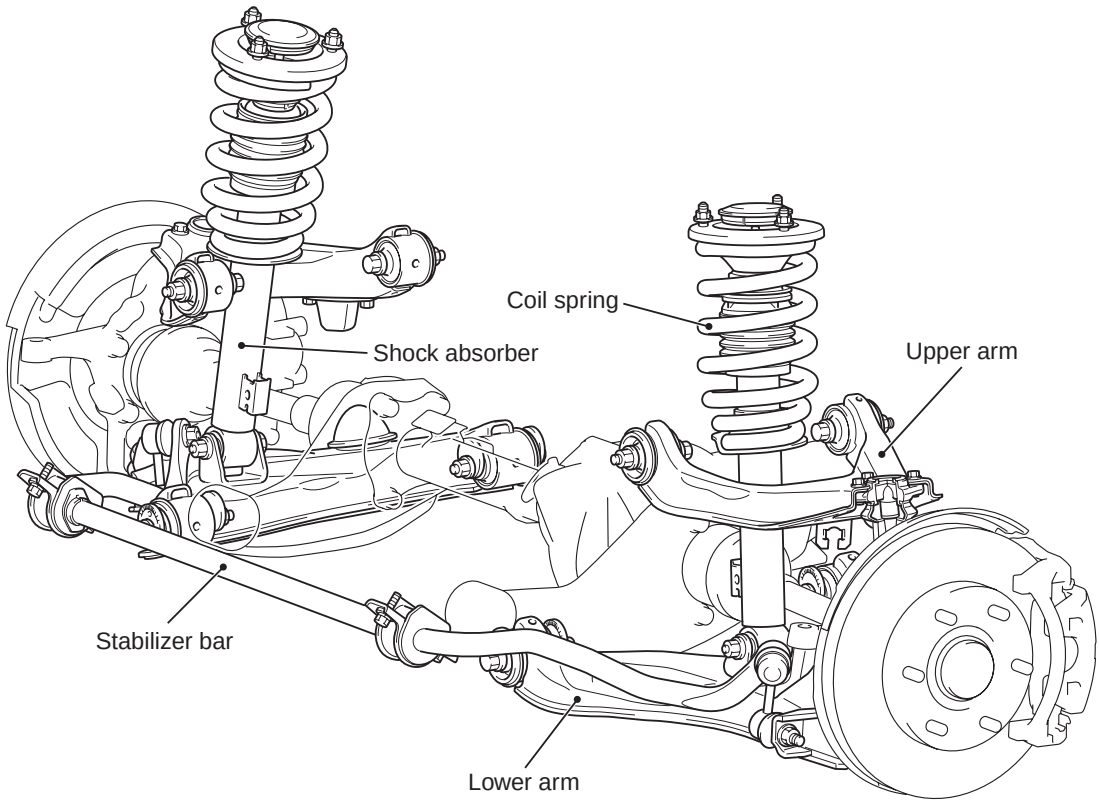
AC501759 AB

<2WD (High rider)>



AC608652 AC

<4WD>



SERVICE SPECIFICATIONS

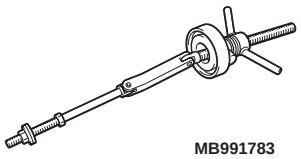
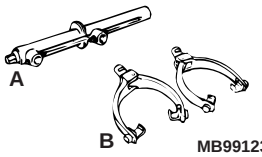
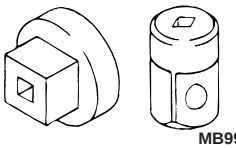
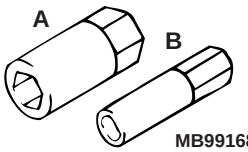
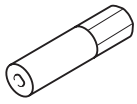
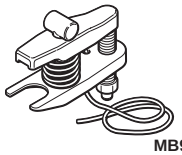
M1332000301954

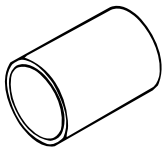
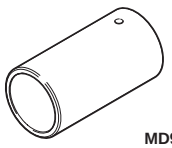
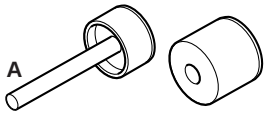
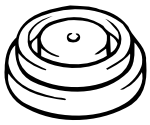
Item		Standard value
Toe-in	At the centre of tyre tread mm	0 – 5
Toe-angle (per wheel)		0°00' – 0°12'
Camber		0°00' ± 0°30'*
Caster	2WD (except High rider)	3°48' ± 1°00'*
	2WD (High rider), 4WD	3°48' ± 1°00'*
Kingpin inclination	2WD (except High rider)	15°24'
	2WD (High rider), 4WD	12°45'
Upper arm ball joint starting torque N·m		1.0 – 5.6
Protruding length of shock absorber thread part mm		2 – 3
Lower arm ball joint starting torque N·m		2.9 – 6.9
Strut bar installation dimension mm		99.5
Stabilizer link ball joint turning torque N·m		0.2 – 3.5

*NOTE: *: Difference between right and left wheels must be 0°30' or less.*

SPECIAL TOOLS

M1332000601063

Tool	Number	Name	Use
 MB991783	MB992058	Coil spring compressor	Compression of front suspension coil spring <2WD (except High rider)>
 A B MB991237	A: MB991237 B: MB991238	A: Spring compressor body B: Arm set, large	Compression of front suspension coil spring <2WD (High rider), 4WD>
 MB990326	MB990326	Preload socket	Ball joint starting torque check
 A B MB991680	MB991680 A: MB991681	Wrench and socket set A: Wrench	Shock absorber assembly disassembly and reassembly
 MB992047	MB992047	Socket	
 MB992011	MB992011	Ball joint remover	Upper arm and lower arm ball joint disconnection

Tool	Number	Name	Use
	MB991172	Inner shaft installer base	Lower arm bushing removal and press-fitting <2WD (except High rider)>
 MD998911	MD998911	Bearing installer	
 A MB990645	MB990645 A: MB990647	Installer and remover control arm bushing A: Bar	Lower arm bushing removal and press-fitting <2WD (High rider), 4WD>
 MB991015	MB991015	Knuckle oil seal installer	

ON-VEHICLE SERVICE

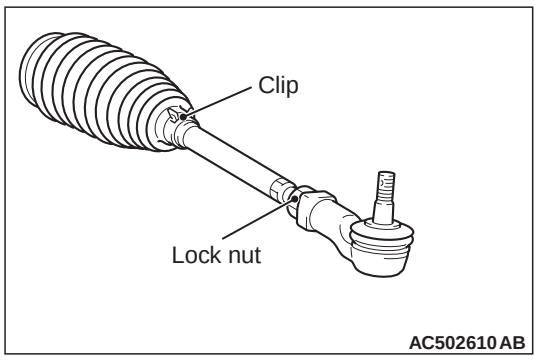
FRONT WHEEL ALIGNMENT CHECK AND ADJUSTMENT <2WD (except High rider)>

M1331000901715

Measure wheel alignment with alignment equipment on a level surface. The front suspension, steering system, wheels, and tyres should be serviced to normal condition before measuring wheel alignment.

TOE-IN

Standard value:
At the centre of tyre tread: 0 – 5 mm
Toe angle (per wheel): 0°00' – 0°12'



1. Adjust the toe-in by undoing the clip and lock nut, and turning the left and right tie rod turnbuckles by the same amount (in opposite directions).

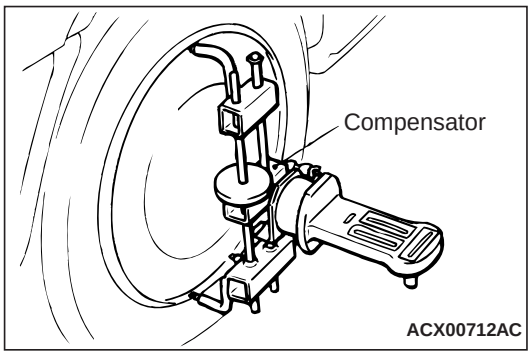
NOTE: The toe will move out as the left turnbuckle is turned toward the front of the vehicle and the right turnbuckle is turned toward the rear of the vehicle.

2. Install the clip and tighten the lock nut to the specified torque.

   Tightening torque: 93 ± 15 N·m

3. Confirm that the toe-in is at the standard value.
4. Use a turning radius gauge to check that the steering angle is at the standard value (Refer to GROUP 37 – On-vehicle Service, Steering Angle Check).

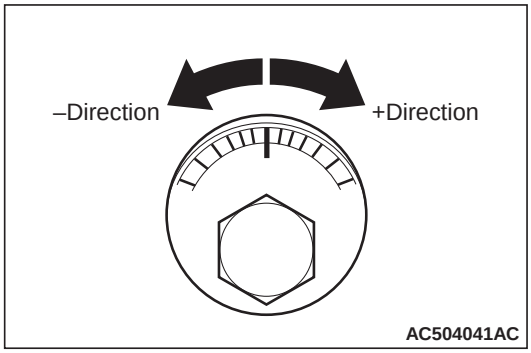
CAMBER, CASTER AND KINGPIN INCLINATION



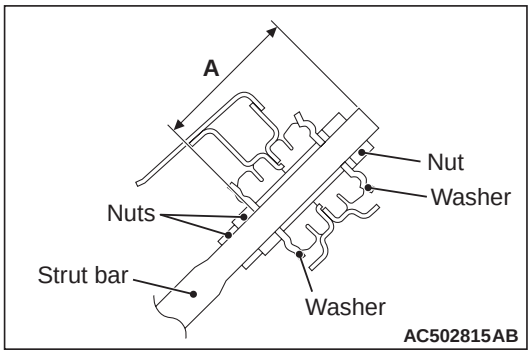
Standard value:

Camber	0°00' ± 0°30'*
Caster	3°48' ± 1°00'*
Kingpin inclination	15°24'

*NOTE: *: Difference between right and left wheels must be 0°30' or less.*



1. Adjust the camber and caster until they meets the standard value by turning the lower arm camber adjusting bolt according to the camber and caster reference table (Refer to).
2. After adjusting the camber, the toe should be adjusted.



3. If the caster is not within the standard value, adjust by turning the nut on the strut bar bushing.

Relation of variation:

Dimension (A)	+1.0 mm
Caster angle	–0°13'

NOTE: Turning the nut on the strut bar one turn clockwise will increase the dimension by 1.5 mm (A).

4. Measure the camber again to confirm that its value is within the standard value. If the value is not within the standard value, repeat the adjustment.

CAMBER AND CASTER REFERENCE TABLE

RELATION OF VARIATION

Bolt scale	**–4**	**–3**	**–2**	**–1**	**0**	**+1**	**+2**	**+3**	**+4**
Camber angle	+0°56'	+0°41'	+0°28'	+0°15'	0°	–0°15'	–0°28'	–0°40'	–0°54'
Caster angle	+1°11'	+0°53'	+0°36'	+0°20'	0°	–0°20'	–0°36'	–0°53'	–1°11'

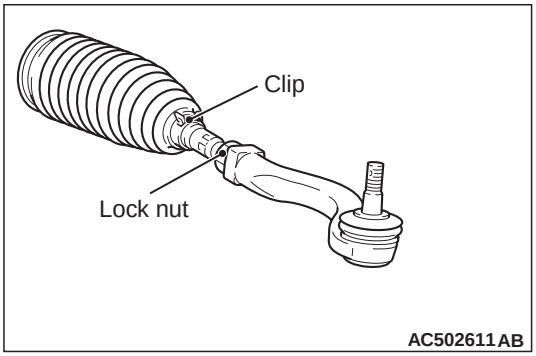
FRONT WHEEL ALIGNMENT CHECK AND ADJUSTMENT <2WD (High rider), 4WD>

M1331000901867

Measure wheel alignment with alignment equipment on a level surface. The front suspension, steering system, wheels, and tyres should be serviced to normal condition before measuring wheel alignment.

TOE-IN

Standard value:
At the centre of tyre tread: 0 – 5 mm
Toe-angle (per wheel): 0°00' – 0°12'



1. Adjust the toe-in by undoing the clip and lock nut, and turning the left and right tie rod turnbuckles by the same amount (in opposite directions).

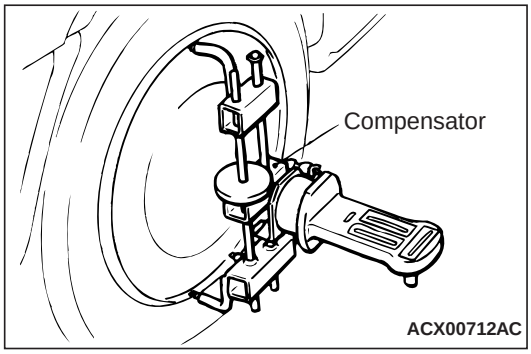
   NOTE: The toe will move out as the left turnbuckle is turned toward the front of the vehicle and the right turnbuckle is turned toward the rear of the vehicle.

2. Install the clip and tighten the lock nut to the specified torque.

   Tightening torque: 93 ± 15 N·m

3. Confirm that the toe-in is at the standard value.
4. Use a turning radius gauge to check that the steering angle is at the standard value (Refer to GROUP 37 – On-vehicle Service, Steering Angle Check).

CAMBER, CASTER AND KINGPIN INCLINATION



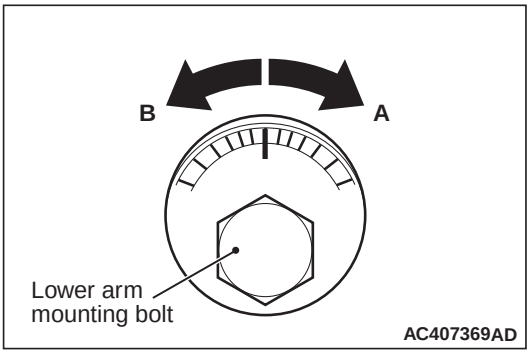
Standard value:

Camber	0°00' ± 0°30'*
Caster	3°48' ± 1°00'*
Kingpin inclination	12°45'

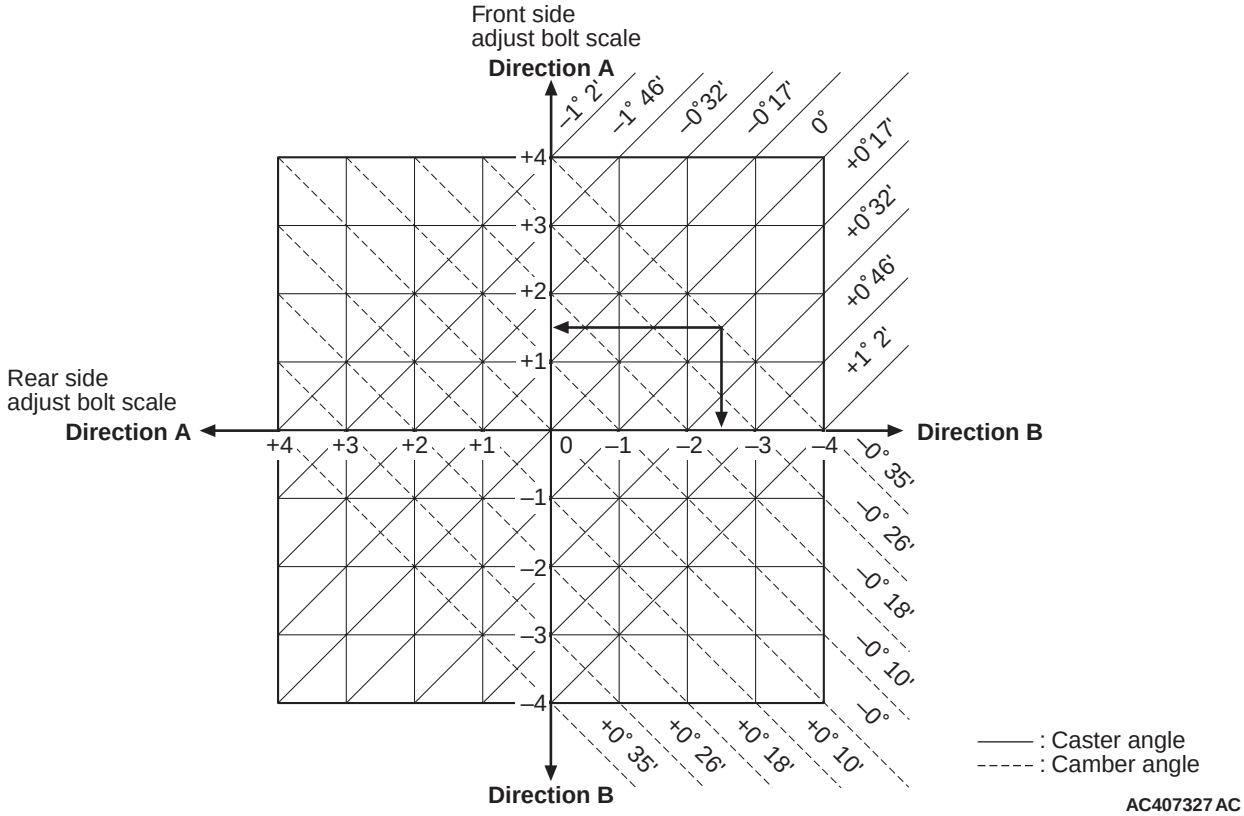
*NOTE: *: Difference between right and left wheels must be 0°30' or less.*

CAMBER AND CASTER REFERENCE TABLE

HOW TO READ THIS TABLE (EXAMPLE)



If the camber difference –0°35' and the caster difference is 0°17' by comparing the measurement value with the standard value, rotate the front adjusting cam by 1.5 graduations to the "B" direction and the rear adjusting cam by 2.5 graduations to the "A" direction.



NOTE: Solid lines show caster, broken lines show camber.

LOWER ARM BALL JOINT AXIAL PLAY CHECK

M1332011300416

1. Raise the vehicle.
2. Remove the stabilizer link from the lower arm.
3. Move the lower arm up and down with your hands to check for an excessive play in the axial direction of the ball joint. If there is an excessive play, replace the lower arm assembly (Refer to P.33-19 <2WD (except High rider)> or P.33-20 <2WD (High rider), 4WD>).

LOWER ARM BALL JOINT COVER CHECK

M1332008601056

1. Press the lower arm ball joint cover with your finger to check that there are no cracks or damage in the lower arm ball joint cover.
2. If the lower arm ball joint cover is cracked or damaged, replace the lower arm assembly (Refer to P.33-19 <2WD (except High rider)> or P.33-20 <2WD (High rider), 4WD>).

   NOTE: If the lower arm ball joint cover is cracked or damaged, it is possible that there may also be damage to the ball joint.

UPPER ARM ASSEMBLY

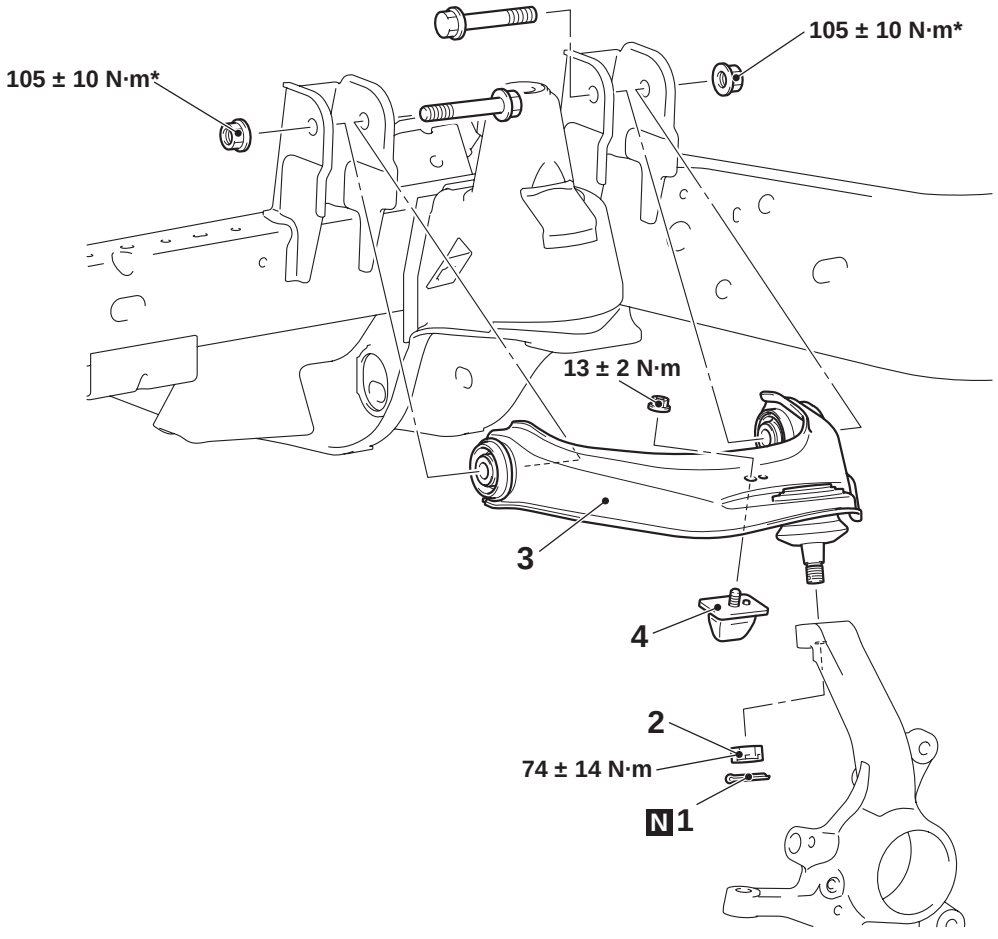
REMOVAL AND INSTALLATION <2WD (except High rider)>

M1332004300373

⚠ CAUTION

***: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the earth in an unladen condition.**

Post-installation Operation
- Check the dust cover for cracks or damage by pushing it with your finger.
- Wheel Alignment Check and Adjustment (Refer to P.33-5).



AC502846AB

Removal steps
1. Split pin
2. Upper arm ball joint and knuckle connection

<<A>>

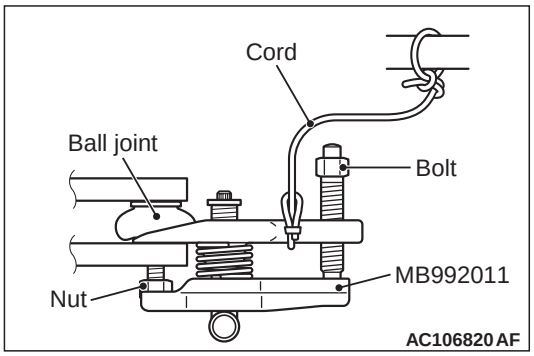
Removal steps (Continued)
3. Upper arm assembly
4. Rebound stopper

REMOVAL SERVICE POINT

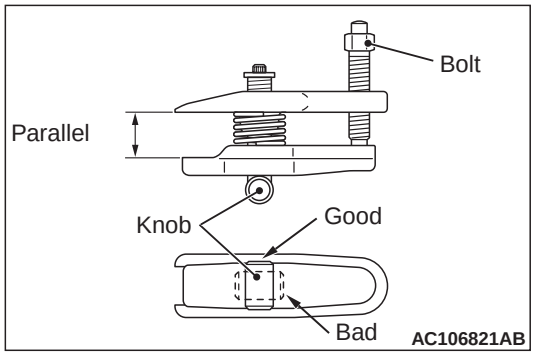
<<A>> UPPER ARM BALL JOINT AND KNUCKLE CONNECTION REMOVAL

⚠ CAUTION

- **Do not remove the nut from ball joint. Loosen it and use special tool to avoid possible damage to ball joint threads.**
- **Hang special tool with a cord to prevent it from falling.**
- **Because it is very dangerous when the ball joint comes off, raise the lower arm using a jack or similar device, making sure that the rebound stopper is free from any reaction force.**



1. Install special tool ball joint remover (MB992011) as shown in the figure.



2. Turn the bolt and knob as necessary to make the jaws of special tool parallel, tighten the bolt by hand and confirm that the jaws are still parallel.

   NOTE: When adjusting the jaws in parallel, make sure the knob is in the position shown in the figure.

3. Tighten the bolt with a wrench to disconnect the ball joint.

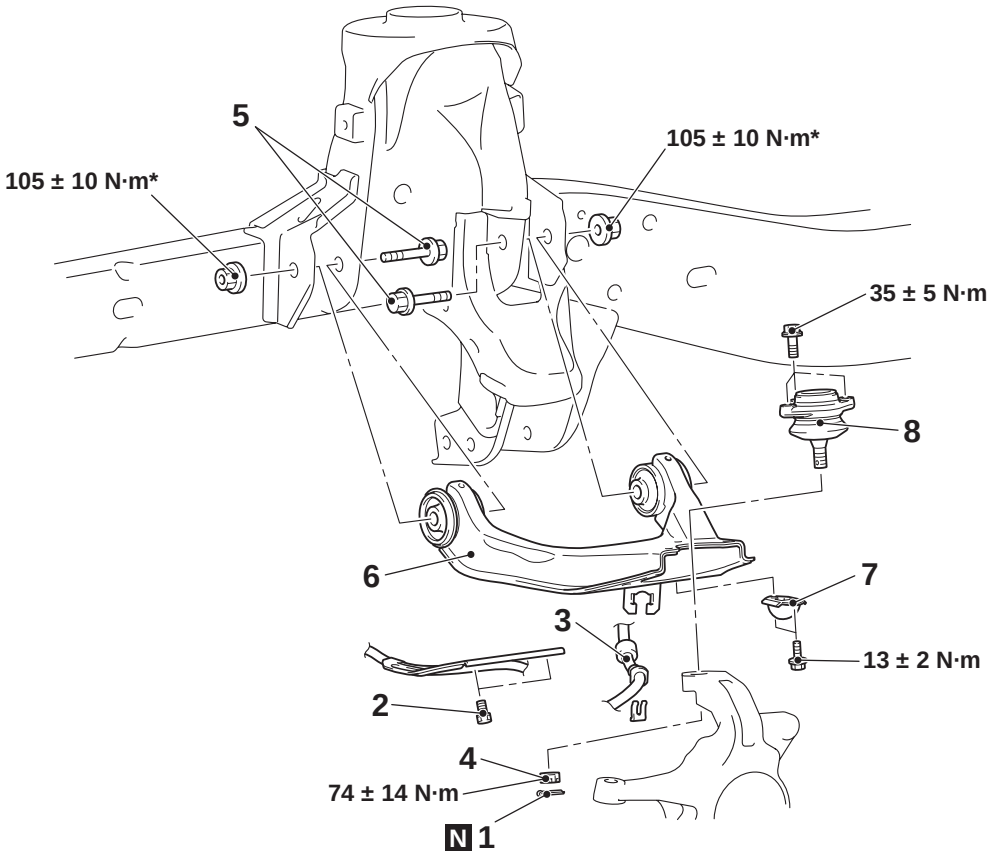
REMOVAL AND INSTALLATION <2WD (High rider), 4WD>

M1332004300362

⚠ CAUTION

- ***: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the earth in an unladen condition.**
- **When the suspension is adjusted or replaced, the calibration of steering wheel sensor must be performed. (Refer to GROUP 35C, On-vehicle Service). <Vehicles with ASTC>**

Post-installation Operation
- Check the Dust Cover for Cracks or Damage by pushing it with your finger.
- Wheel Alignment Check and Adjustment (Refer to P.33-6).



AC501886AC

Removal steps
1. Split pin
2. Front wheel speed sensor bracket mounting bolt <Vehicles with ABS or ASTC>
3. Brake hose
4. Upper arm ball joint and knuckle connection

<<A>>

<<B>>

Removal steps (Continued)
5. Upper arm assembly and front frame connection
6. Upper arm assembly
7. Rebound stopper
8. Upper arm ball joint assembly

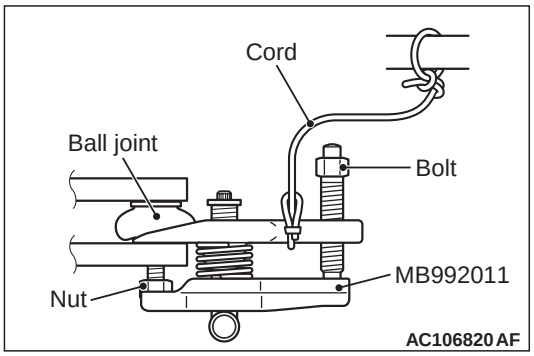
>>A<<

REMOVAL SERVICE POINTS

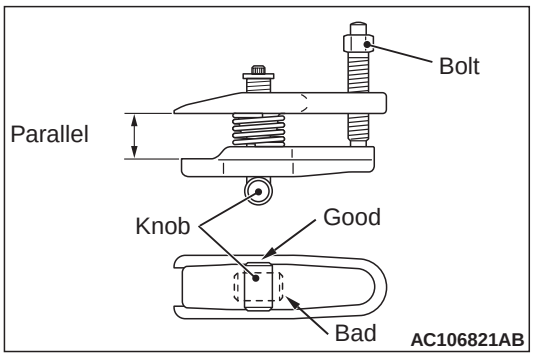
<<A>> UPPER ARM BALL JOINT AND KNUCKLE DISCONNECTION

⚠ CAUTION

- **Do not remove the nut from ball joint. Loosen it and use special tool to avoid possible damage to ball joint threads.**
- **Hang special tool with a cord to prevent it from falling.**
- **Because it is very dangerous when the ball joint comes off, raise the lower arm using a jack or similar device, making sure that the rebound stopper is free from any reaction force.**



1. Install special tool ball joint remover (MB992011) as shown in the figure.



2. Turn the bolt and knob as necessary to make the jaws of special tool parallel, tighten the bolt by hand and confirm that the jaws are still parallel.

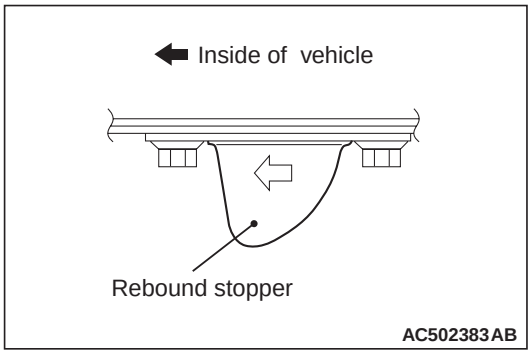
   NOTE: When adjusting the jaws in parallel, make sure the knob is in the position shown in the figure.
3. Tighten the bolt with a wrench to disconnect the ball joint.

<<B>> UPPER ARM ASSEMBLY AND FRONT FRAME CONNECTION REMOVAL

Remove the mounting bolts and nuts from the shock absorber assembly, and secure a working space.

INSTALLATION SERVICE POINT

>>A<< REBOUND STOPPER INSTALLATION



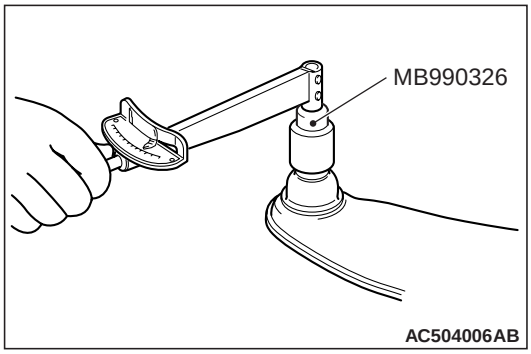
Install the rebound stopper with its arrow mark pointing toward inside the vehicle.

INSPECTION

M1332004400176

- Check the bushing for wear and deterioration.
- Check the upper arm for bend or breakage.
- Check all bolts for condition and straightness.

UPPER ARM BALL JOINT STARTING TORQUE CHECK



1. After shaking the ball joint stud several times, install the nut to the stud and use special tool preload socket (MB990326) to measure the starting torque of the ball joint.

   NOTE: Rotation starting torque measurement should be carried out with parts temperature above 0℃.

   Standard value: 1.0 – 5.6 N·m
2. If the measured value exceeds the standard value, replace the upper arm ball joint assembly (Refer to P.33-9 <2WD (except High rider)> or P.33-11 <2WD (High rider), 4WD>).
3. If the measured value is lower than the standard value, check that the upper arm ball joint turns smoothly without excessive play. If so, it is possible to use that ball joint.

UPPER ARM BALL JOINT DUST COVER CHECK

1. Press the dust cover with your finger to check that there are no cracks or damage in the dust cover.
2. If the dust cover is cracked or damaged, replace the upper arm ball joint assembly (Refer to P.33-9 <2WD (except High rider)> or P.33-11 <2WD (High rider), 4WD>).

NOTE: If the dust cover is cracked or damaged, it is possible that there may also be damage to the ball joint.

SHOCK ABSORBER AND COIL SPRING <2WD (except High rider)>

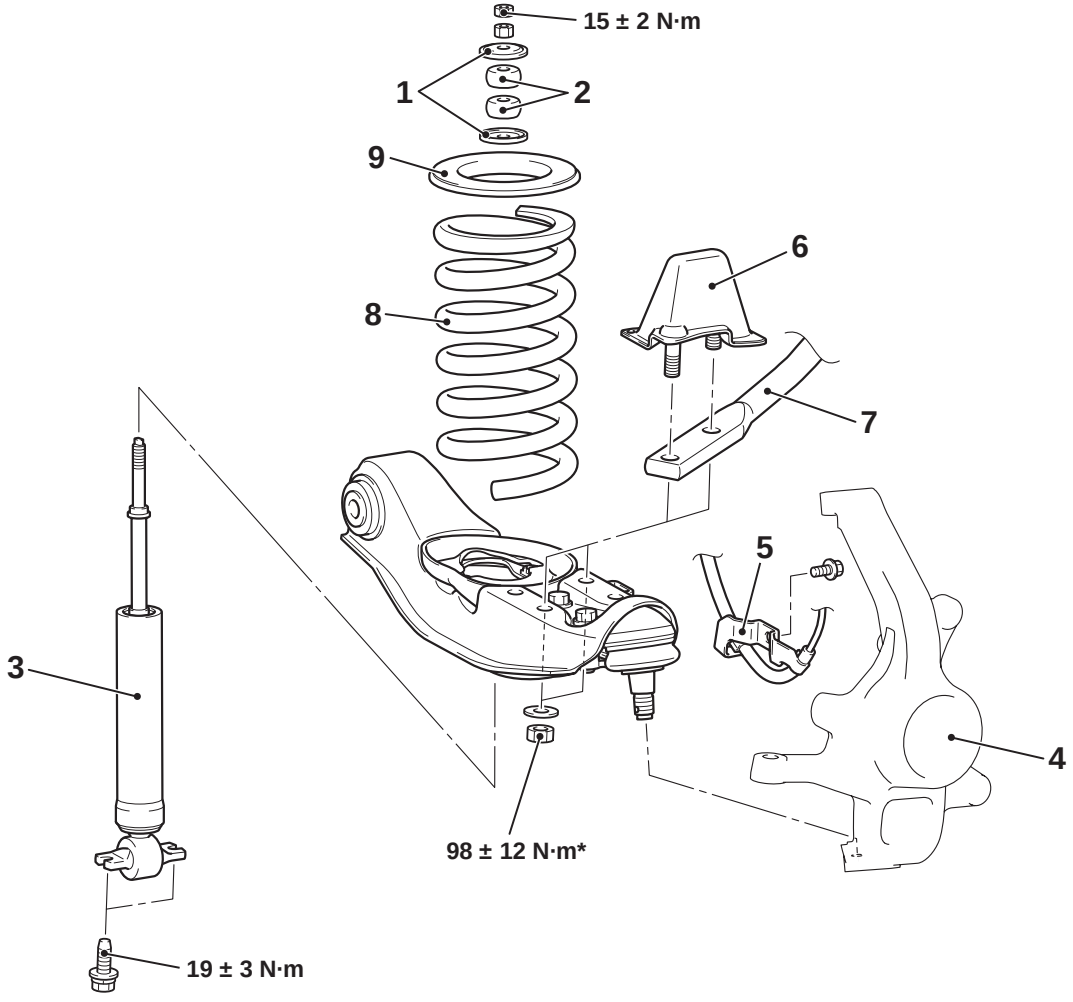
REMOVAL AND INSTALLATION

M1332012200036

⚠ CAUTION

***: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the earth in an unladen condition.**

Post-installation Operation
- Check the dust cover for cracks or damage by pushing it with finger.
- Front wheel alignment check and adjustment (Refer to P.33-5).



AC501937AE

Removal steps

1. Washer
2. Shock absorber bushing

>>B<< 3. Shock absorber

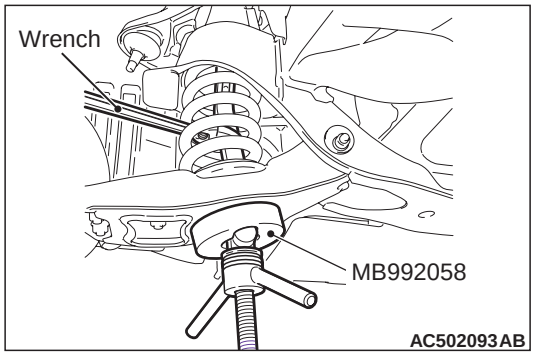
4. Hub and knuckle assembly (Refer to GROUP 26, Hub and knuckle assembly).
5. Front wheel speed sensor bracket <Vehicles with ABS>
6. Bump stopper
7. Strut bar

<<A>> >>A<< 8. Coil spring

9. Spring pad

REMOVAL SERVICE POINT

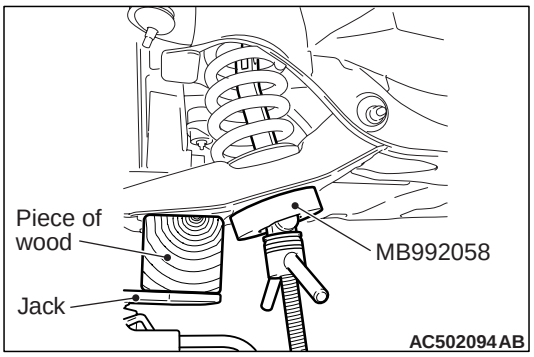
<<A>> COIL SPRING REMOVAL



Install as shown in the figure. Then, use a wrench to hold the special tool Coil spring compressor (MB992058), and remove the coil spring.

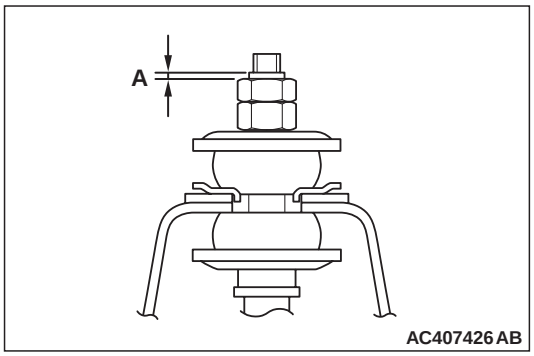
INSTALLATION SERVICE POINTS

>>A<< COIL SPRING INSTALLATION



Support the lower arm by the special tool Coil spring compressor (MB992058), and install the coil spring by compressing it using a jack.

>>B<< SHOCK ABSORBER INSTALLATION



Tighten the nuts until its protruding length meets the standard value (A).

Standard value (A): 2 – 3 mm

INSPECTION

M1332012300011

- Check for oil leaks from the shock absorber assembly.
- Check the shock absorber assembly for damage or deformation.

SHOCK ABSORBER ASSEMBLY <2WD (High rider), 4WD>

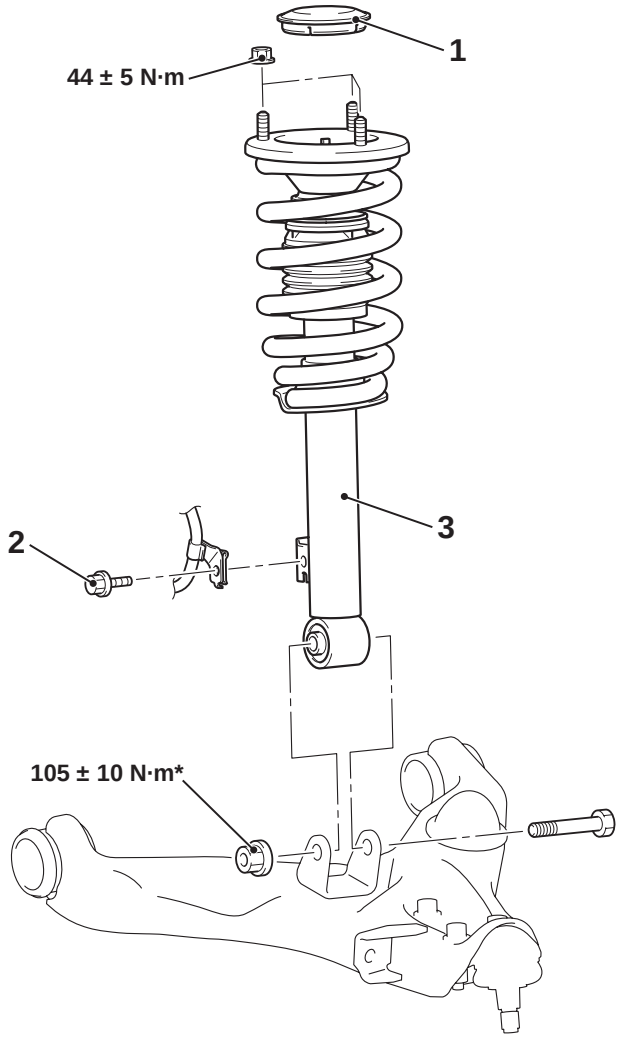
REMOVAL AND INSTALLATION

M1332004600233

⚠ CAUTION

- ***: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the earth in an unladen condition.**
- **When the suspension is adjusted or replaced, the calibration of steering wheel sensor must be performed. (Refer to GROUP 35C, On-vehicle Service). <Vehicles with ASTC>**

Pre-removal Operation	Post-installation Operation
• Upper arm assembly (Refer to P.33-11).	• Upper arm assembly (Refer to P.33-11). • Front wheel alignment check and adjustment (Refer to P.33-6).



AC502982 AB

Removal steps

1. Cap
2. Front wheel speed sensor harness clamp <Vehicles with ABS or ASTC>
3. Shock absorber assembly

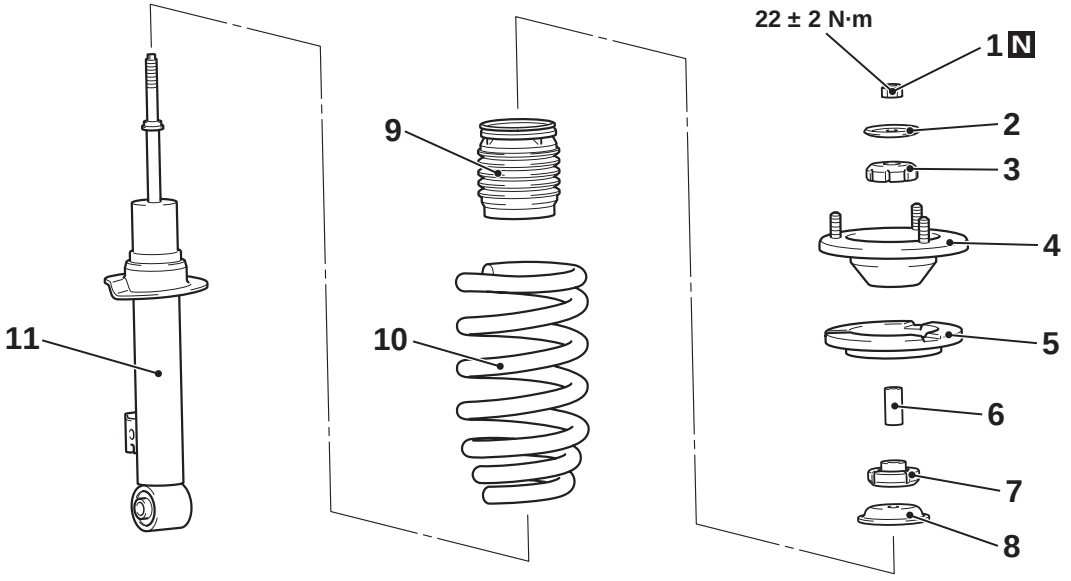
INSPECTION

M1332004700025

- Check for oil leaks from the shock absorber assembly.
- Check the shock absorber assembly for damage or deformation.

DISASSEMBLY AND REASSEMBLY

M1332004800204



AC502848AB

Disassembly steps

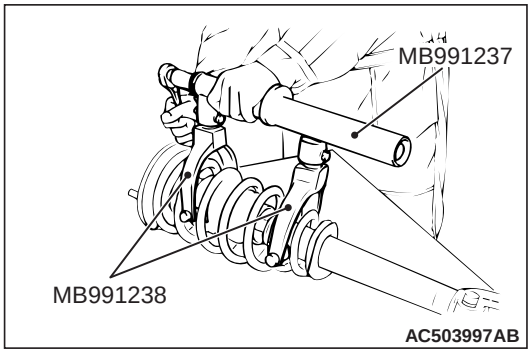
<<**A**>>>>**C**<<1. Self-locking nut
2. Seat
3. Upper bushing
>>**B**<<4. Spring bracket assembly
5. Spring upper pad
6. Collar
7. Upper bushing
8. Cup
9. Dust cover
>>**A**<<10. Coil spring
11. Shock absorber

DISASSEMBLY SERVICE POINT

<<A>> SELF-LOCKING NUT REMOVAL

⚠ CAUTION

- **Install special tool arm set (MB991238) evenly, and so that the maximum length will be attained within the installation range.**
- **Do not use an impact wrench to tighten the bolt of special tool spring compressor body (MB991237), otherwise the special tool will break.**

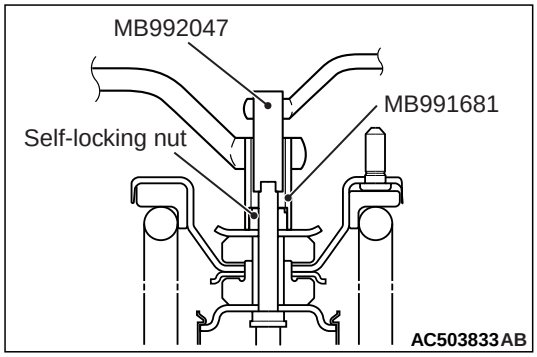


AC503997AB

1. Use following special tools to compress the coil spring.
   - Spring compressor body (MB991237)
   - Arm set (MB991238)

⚠ *WARNING*

Do not use an impact wrench to remove the self-locking nut. Vibration of the impact wrench will cause special tools (MB991237 and MB991238) to slip and cause personal injury.



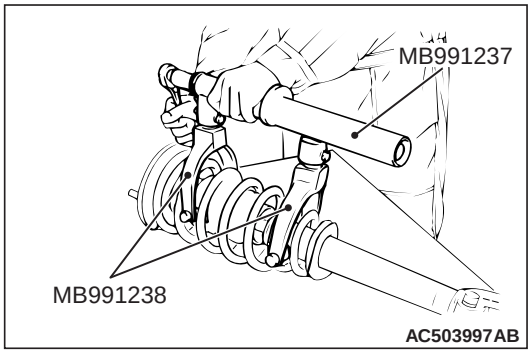
2. Use following special tools to secure the strut, and then remove the self-locking nut.
- Wrench (MB991681)
- Socket (MB992047)

REASSEMBLY SERVICE POINTS

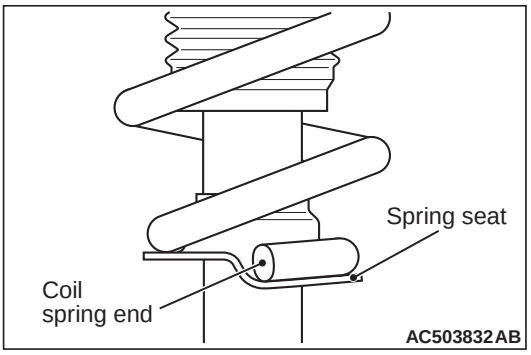
>>A<< COIL SPRING INSTALLATION

⚠ **CAUTION**

- **Do not tighten the special tool bolt too tight. The tool will be broken if the bolt is tightened over the allowable torque 74 N·m.**
- **Install the special tools evenly, and so that the maximum length will be attained within the installation range.**
- **Do not use an impact wrench, as it will cause the bolt of the special tool to be seized.**

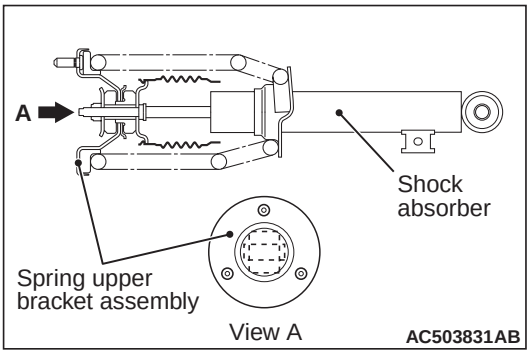


1. Install the special tools same as its removal and compress the coil spring to install to the shock absorber.
- Spring compressor body (MB991237)
- Arm set (MB991238)



2. Align the coil spring lower end with the shock absorber spring seat stepped part.

>>B<< SPRING BRACKET ASSEMBLY INSTALLATION



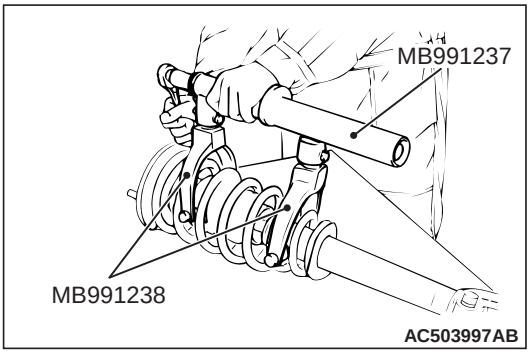
install the spring bracket assembly which faces the shock absorber as shown in the illustration.

>>C<< SELF-LOCKING NUT INSTALLATION

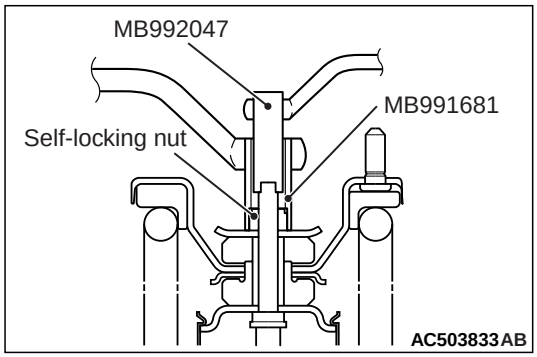
1. Tighten the self-locking nut loosely.

⚠ **CAUTION**

Do not use an impact wrench, as it will cause the bolt of the special tool to be seized.



2. Install the special tools same as its removal and compress the coil spring to install to the shock absorber.
- Spring compressor body (MB991237)
- Arm set (MB991238)



3. Using following special tools tighten the self-locking nut 22 ± 2 N·m.
   - Wrench (MB991681)
   - Socket (MB992047)

   Tightening torque: 22 ± 2N·m

INSPECTION

M1332004900029

- Check the rubber parts for damage or deterioration.
- Check the coil spring for deformation, deterioration or damage.
- Check the shock absorber assembly for deformation.

LOWER ARM

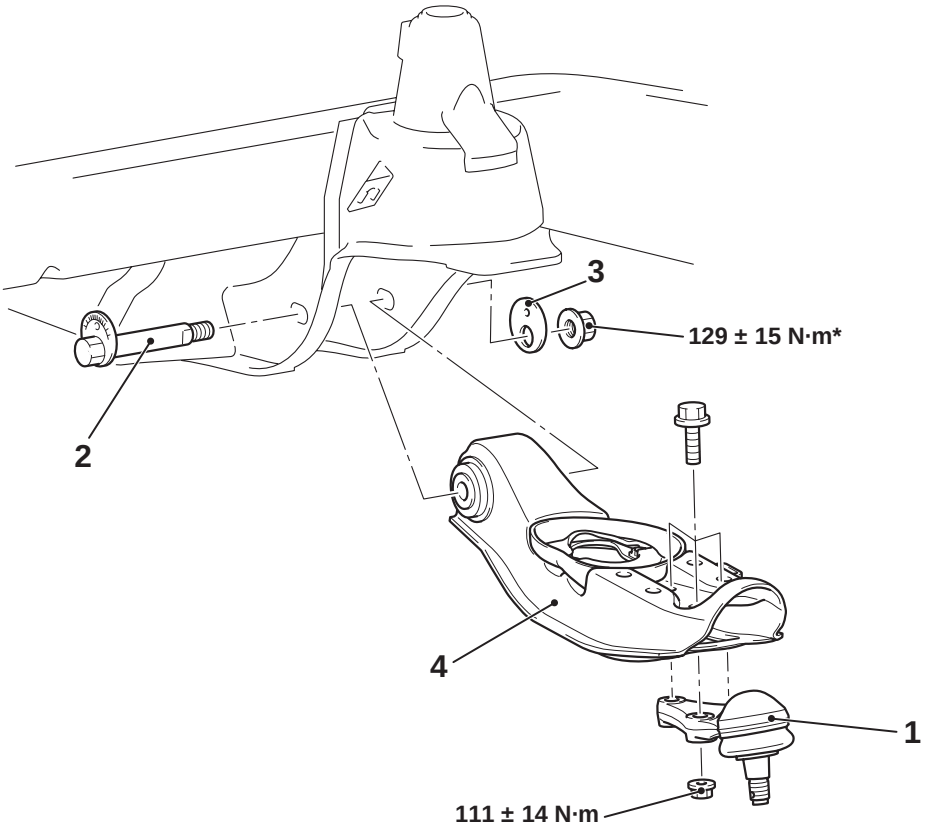
REMOVAL AND INSTALLATION
<2WD (except High rider)>

M1332001601668

⚠ CAUTION

***: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the earth in an unladen condition.**

Post-installation Operation
- Check the Dust Cover for Cracks or Damage by Pushing it with Finger.
- Front Wheel Alignment Check and Adjustment (Refer to P.33-5).



AC502908AC

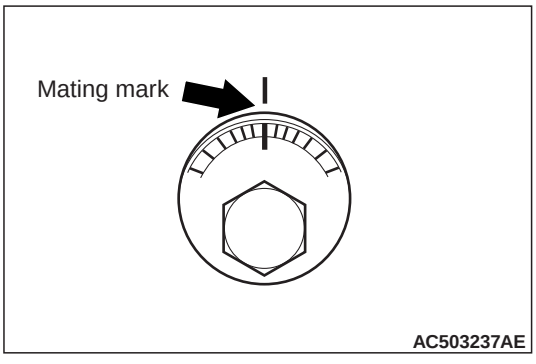
Removal steps
- Coil spring (Refer to P.33-13).

1. Lower arm ball joint
2. Lower arm adjusting bolt
3. Plate
4. Lower arm assembly

<<A>>

REMOVAL SERVICE POINT

<<A>> LOWER ARM ADJUSTING BOLT REMOVAL



AC503237AE

After making a mating mark on the lower arm adjusting bolt, remove the lower arm adjusting bolt.

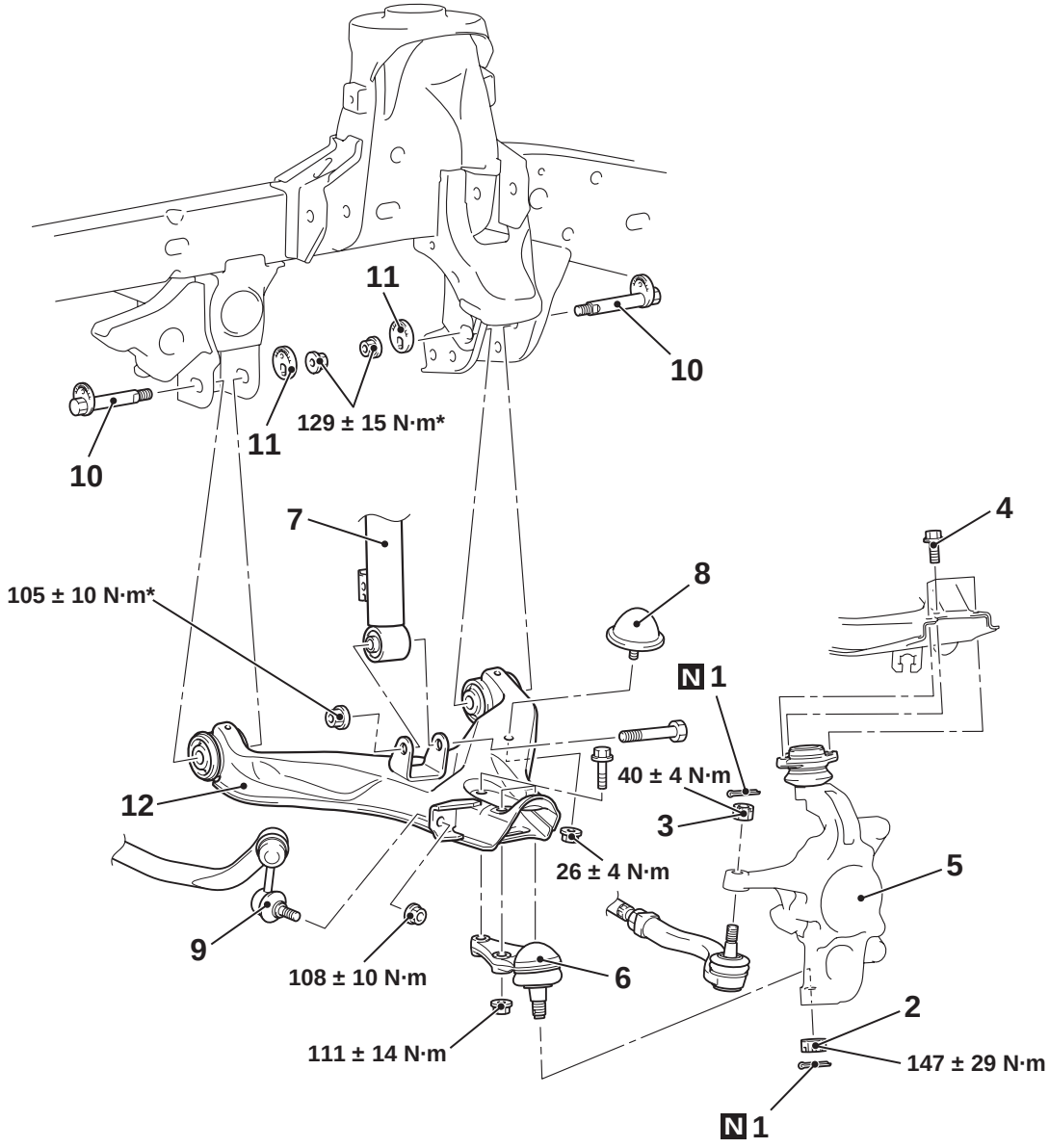
REMOVAL AND INSTALLATION <2WD (High rider), 4WD>

M1332001601657

⚠ CAUTION

- ***: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the earth in an unladen condition.**
- **When the suspension is adjusted or replaced, the calibration of steering wheel sensor must be performed. (Refer to GROUP 35C – On-vehicle Service). <Vehicles with ASTC>**

Post-installation Operation
- Check the Dust Cover for Cracks or Damage by pushing it with finger.
- Front Wheel Alignment Check and Adjustment (Refer to P.33-6).



AC600978AD

Removal steps
1. Split pin

<<A>>
2. Lower arm ball joint and knuckle assembly connection

Removal steps (Continued)

<<A>>
3. Tie rod end and knuckle assembly connection

Removal steps (Continued)

4. Upper arm and upper arm ball joint connection
5. Knuckle (Refer to GROUP 26 – Front axle hub assembly <2WD>, <4WD>).
6. Lower arm ball joint
7. Shock absorber and lower arm assembly connection
8. Bump stopper
9. Lower arm assembly and stabilizer link connection

<<B>>

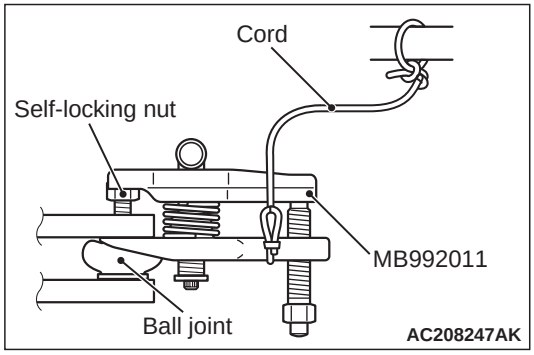
10. Lower arm mounting bolt
11. Plate
12. Lower arm assembly

REMOVAL SERVICE POINTS

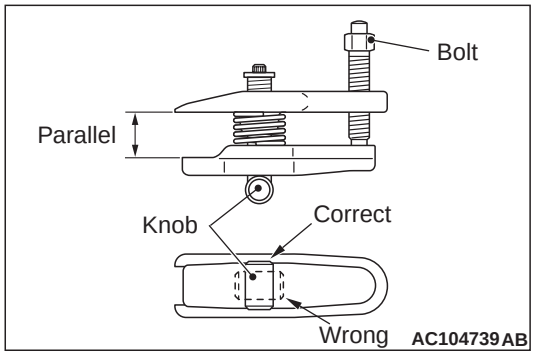
<<A>> LOWER ARM BALL JOINT AND KNUCKLE ASSEMBLY/ TIE ROD END AND KNUCKLE ASSEMBLY DISCONNECTION

⚠ CAUTION

- **The self-locking nut must be only loosened but not removed from the ball joint. Be sure to use the special tool.**
- **To prevent the special tool from dropping off, suspend it with a cord.**



1. Install special tool ball joint remover (MB992011) as shown in the figure.

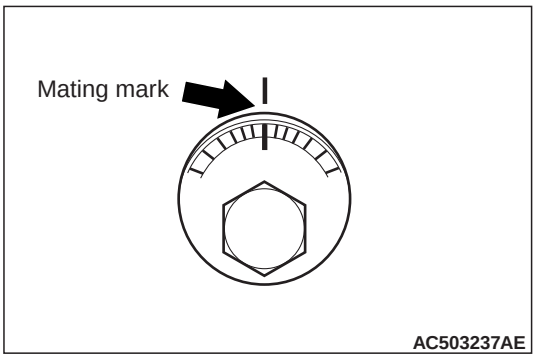


2. Turn the bolt and knob to make the special tool insert horizontal, then hand-tighten the bolt. After tightening, verify that the insert is still horizontal.

NOTE: When adjusting the special tool wedge horizontally, position the knob as shown.

3. Turn the bolt to disengage the lower arm ball joint from the knuckle.

<<B>> LOWER ARM MOUNTING BOLT REMOVAL



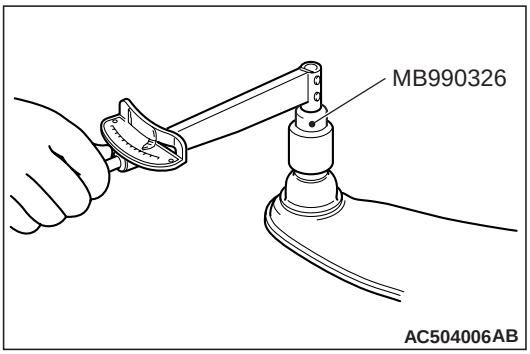
After making a mating mark on the adjusting bolt, remove the lower arm mounting bolt.

INSPECTION

M1332001701096

- Check the lower arm bushing for wear and deterioration.
- Check the lower arm assembly for bend or breakage.
- Check all bolts for condition and straightness.

LOWER ARM BALL JOINT STARTING TORQUE CHECK



1. After shaking the ball joint stud several times, use special tool preload socket (MB990326) to measure the starting torque of the ball joint.

   NOTE: Rotation starting torque measurement should be carried out with parts temperature above 0℃.

   Standard value: 2.9 – 6.9 N·m

2. If the measured value is not within the standard value, or if the ball joint is difficult to turn or does not turn smoothly, replace the lower arm assembly (Refer to P.33-19 <2WD (except High rider)> or P.33-20 <2WD (High rider), 4WD>).

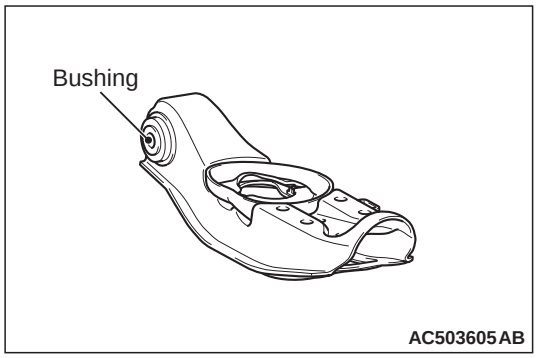
LOWER ARM BALL JOINT DUST COVER CHECK

1. Check the lower arm ball joint dust cover for cracks or damage by pushing it with your finger.
2. If the lower arm ball joint dust cover is cracked or damaged, replace the lower arm assembly (Refer to P.33-19 <2WD (except High rider)> or P.33-20 <2WD (High rider), 4WD>).

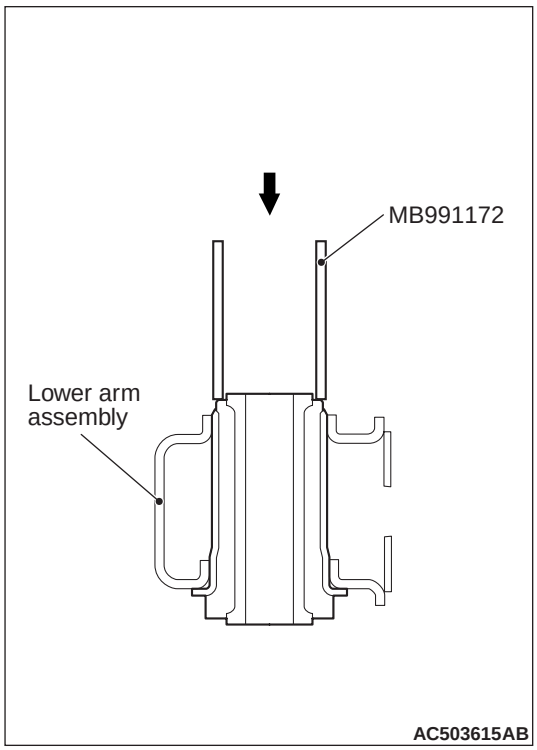
   NOTE: If the dust cover is cracked or damaged, it is possible that there may also be damage to the ball joint.

LOWER ARM BUSHING REPLACEMENT <2WD (except High rider)>

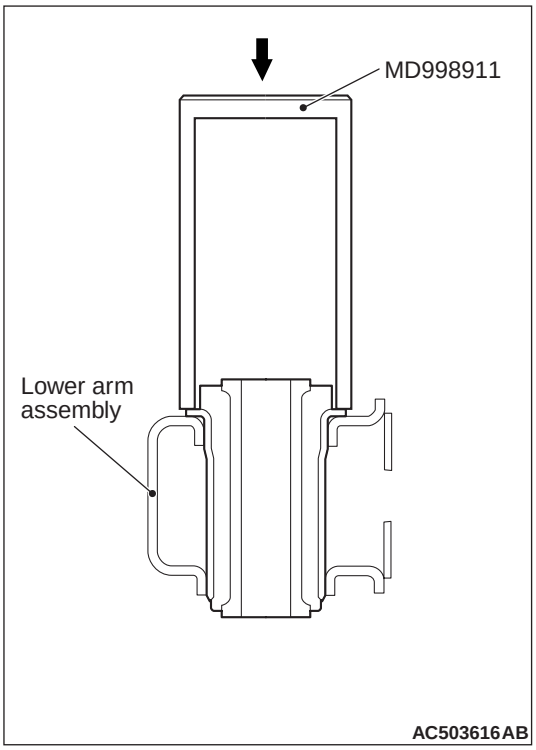
M1332008100995



Replace the bushing as follows:



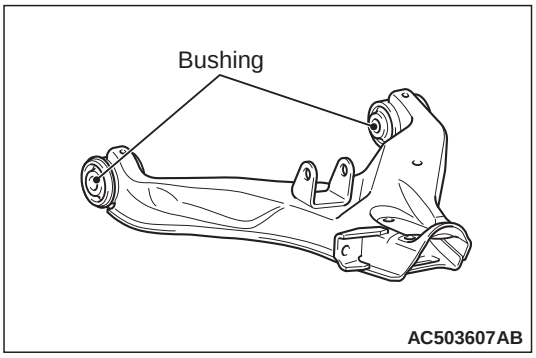
1. Use the special tool inner shaft installer base (MB991172) to drive out the bushing.



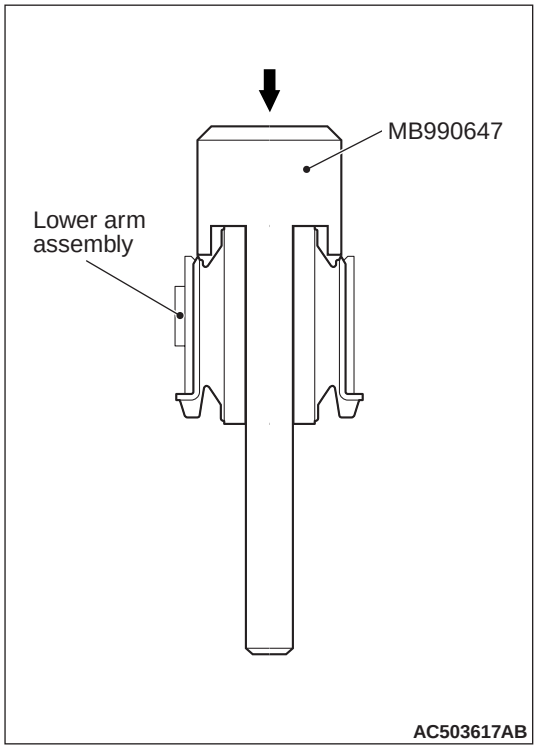
2. Use the special tool bearing installer (MD998911) to press in the bushing.

LOWER ARM BUSHING REPLACEMENT <2WD (High rider), 4WD>

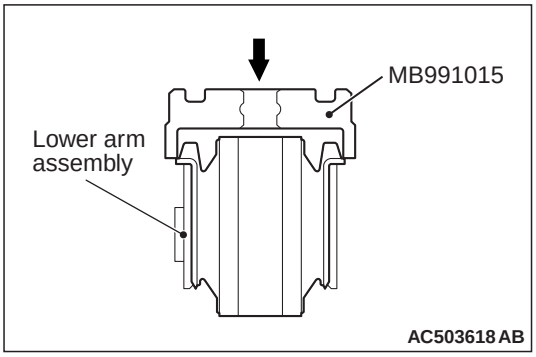
M1332008101006



Replace the bushing as follows:



1. Use the special tool bar (MB990647) to drive out the bushing.



2. Use the special tool knuckle oil seal installer (MB991015) to press in the bushing.

STRUT BAR <2WD (except High rider)>

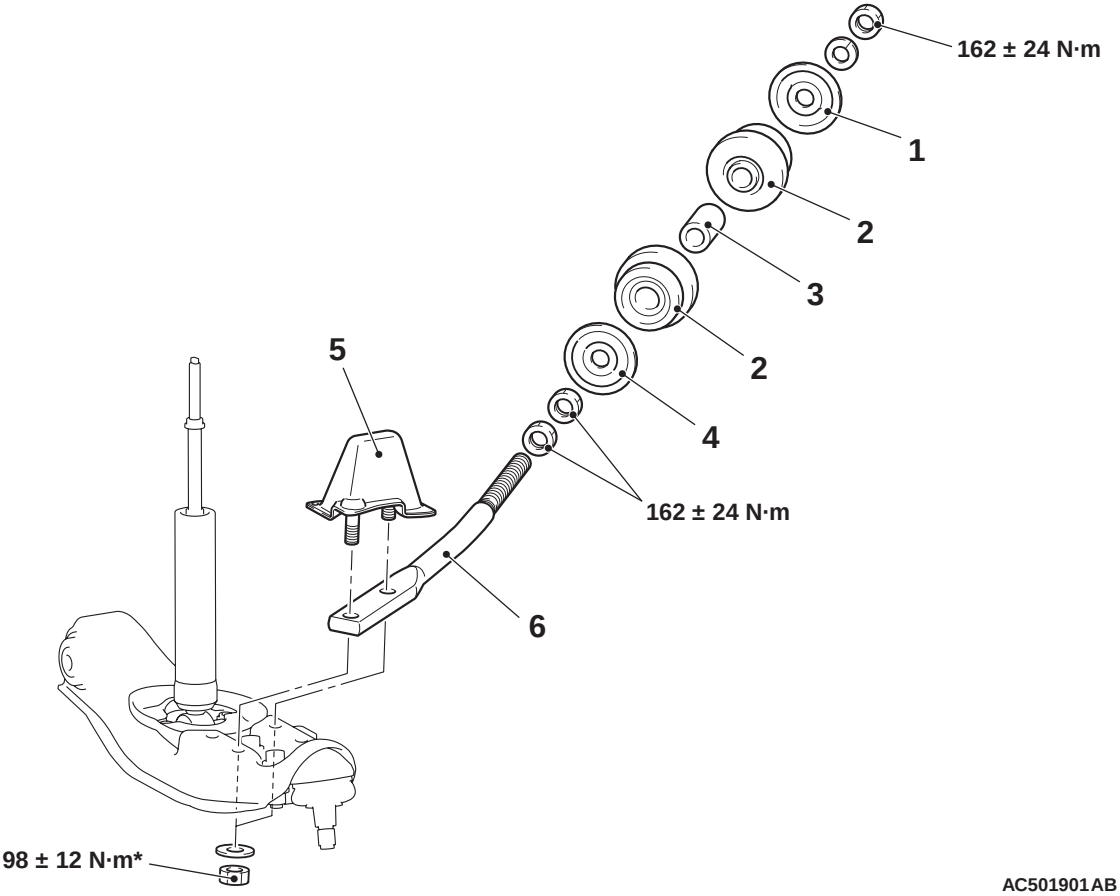
REMOVAL AND INSTALLATION

M1332011900043

⚠ CAUTION

***: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the earth in an unladen condition.**

Post-installation Operation
- Front Wheel Alignment Check and Adjustment (Refer to P.33-5).



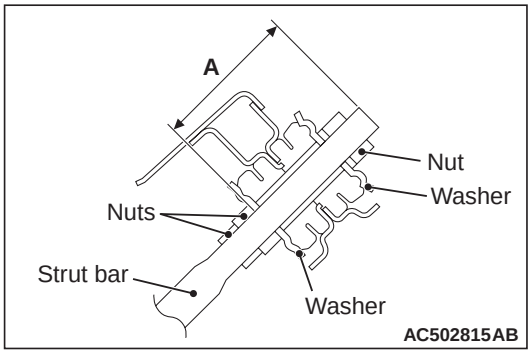
AC501901AB

Removal steps

>>A<< 1. Washer
>>A<< 2. Strut bar bushing
3. Collar
>>A<< 4. Washer
5. Bump stopper
6. Strut bar

INSTALLATION SERVICE POINT

>>A<< WASHER/STRUT BAR BUSHING INSTALLATION



AC502815AB

1. Install the washer and strut bar bushing to the direction as shown in the figure.

2. Install so that the dimension (A) shown in the figure will meet the standard value.

Standard value (A): 99.5 mm

STABILIZER BAR <2WD (High rider), 4WD>

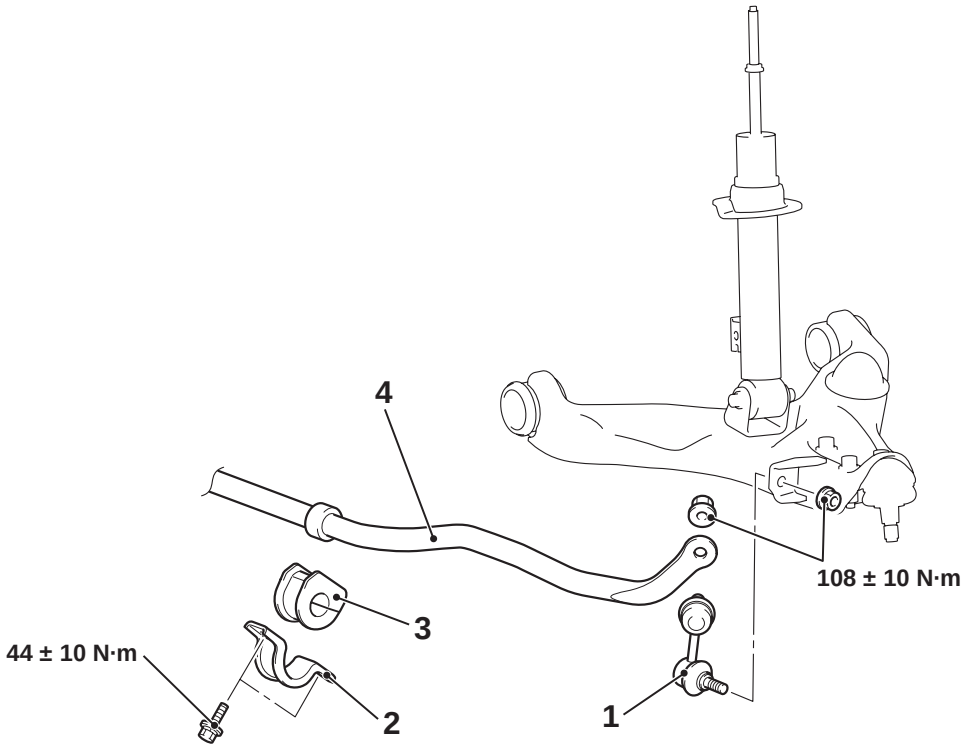
REMOVAL AND INSTALLATION

M1332004000703

⚠ CAUTION

When the suspension is adjusted or replaced, the calibration of steering wheel sensor must be performed. (Refer to GROUP 35C, On-vehicle Service). <Vehicles with ASTC>

Pre-removal Operation	Post-installation Operation
• Engine Room Under Cover (Refer to GROUP 51, Under Cover).	• Check the Dust Cover for Cracks or Damage by Pushing it with Finger. • Engine Room Under Cover (Refer to GROUP 51, Under Cover).



AC502730 AB

Removal steps

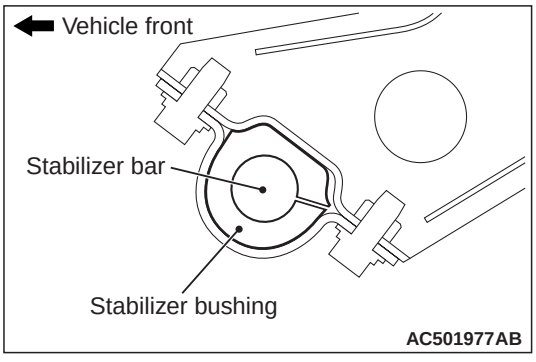
1. Stabilizer link assembly
2. Stabilizer clamp

>>A<< 3. Stabilizer bushing

4. Stabilizer bar

INSTALLATION SERVICE POINT

>>A<< STABILIZER BUSHING INSTALLATION



AC501977AB

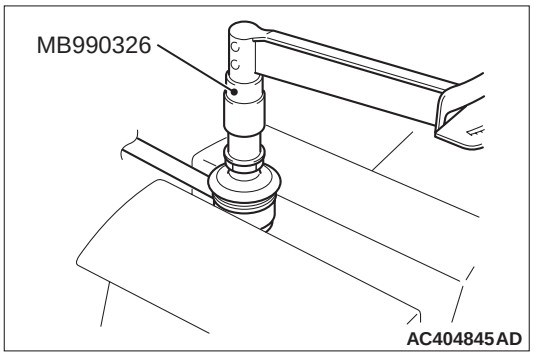
Install the bushing with its cut line located as shown in the figure.

INSPECTION

M1332002000901

- Check the stabilizer rubbers and stabilizer bushings for wear and deterioration.
- Check the stabilizer bar for deterioration or damage.
- Check all bolts for condition and straightness.

STABILIZER LINK BALL JOINT TURNING TORQUE CHECK



1. After shaking the ball joint stud several times, install the nut to the stud and use special tool preload socket (MB990326) to measure the turning torque of the ball joint.

   Standard value: 0.2 – 3.5 N·m

2. When the measured value exceeds the standard value, replace the stabilizer link (Refer to P.33-25).
3. When the measured value is lower than the standard value, check that the ball joint turns smoothly without excessive play. If so, it is possible to re-use that ball joint.

STABILIZER LINK BALL JOINT DUST COVER CHECK

1. Check the dust cover for cracks or damage by pushing it with your finger.
2. If the dust cover is cracked or damaged, replace the stabilizer link (Refer to P.33-25).

   NOTE: Cracks or damage of the dust cover may cause damage to the ball joint.

GROUP 34

REAR SUSPENSION

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REAR SUSPENSION ASSEMBLY REMOVAL AND INSTALLATION 34-3

INSPECTION. 34-5

GENERAL INFORMATION

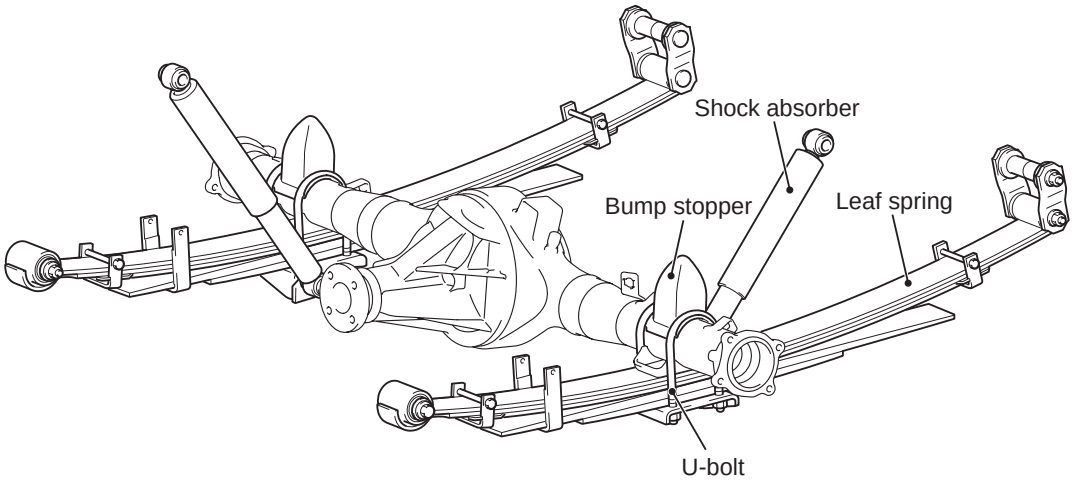
M1341000101914

The leaf spring type rear suspension featuring the simple structure and outstanding strength has been adopted.

- The spring is fixed at the top to increase ground clearance of the leaf spring. <2WD (High rider), 4WD>
- The suspension geometry has been optimized to assure stability under loaded condition and to improve adhesion under unladen condition, and the SUV-like steering stability has been achieved. <2WD (High rider), 4WD>

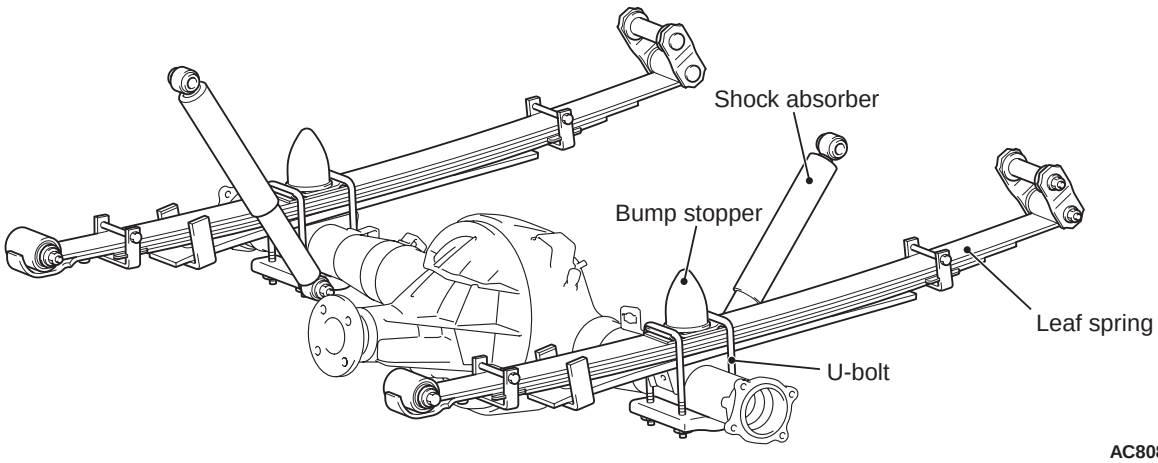
CONSTRUCTION DIAGRAM

<2WD (except High rider)>



AC501757AB

<2WD (High rider), 4WD>



AC808337AB

REAR SUSPENSION ASSEMBLY

REMOVAL AND INSTALLATION

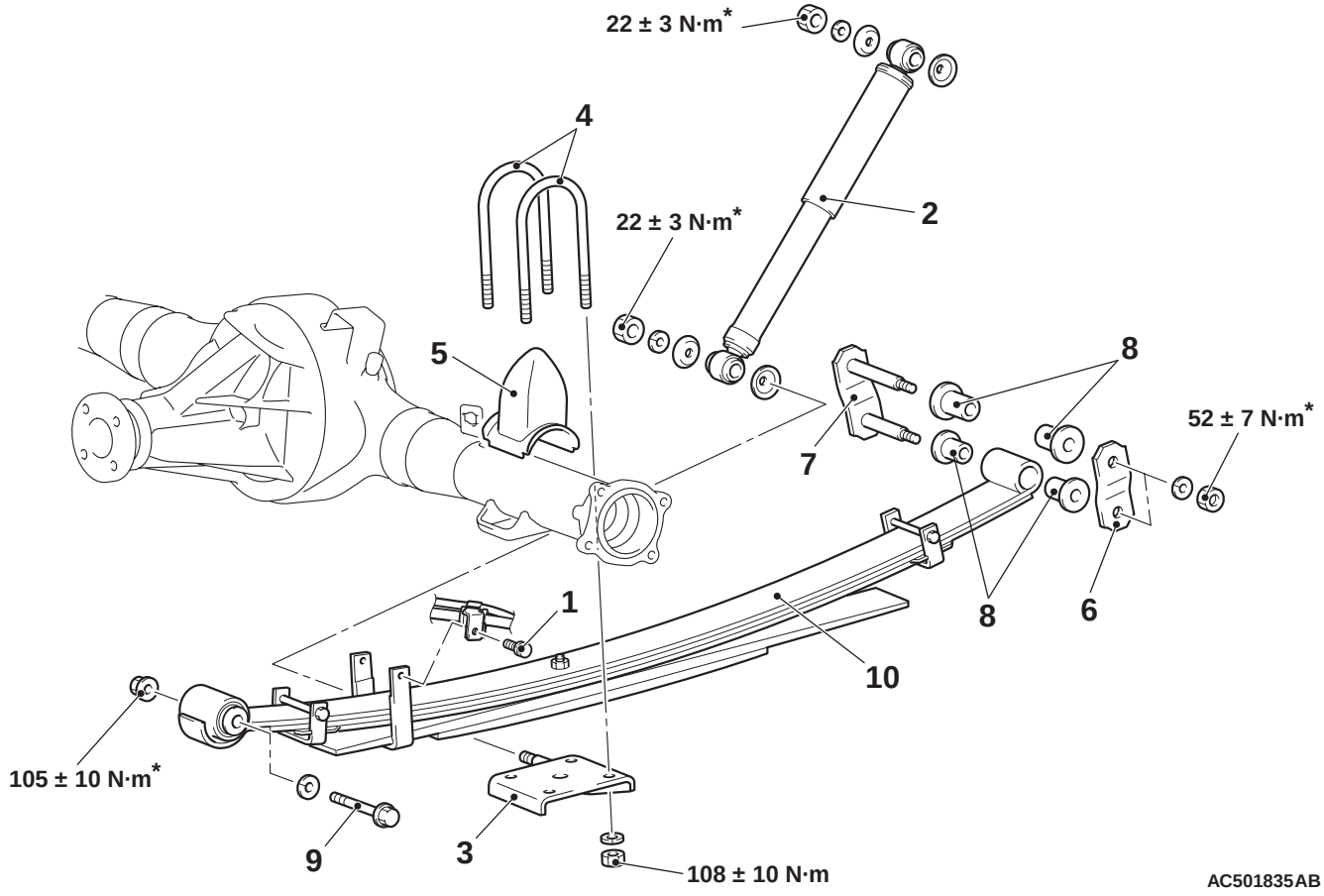
M1341001000359

⚠ CAUTION

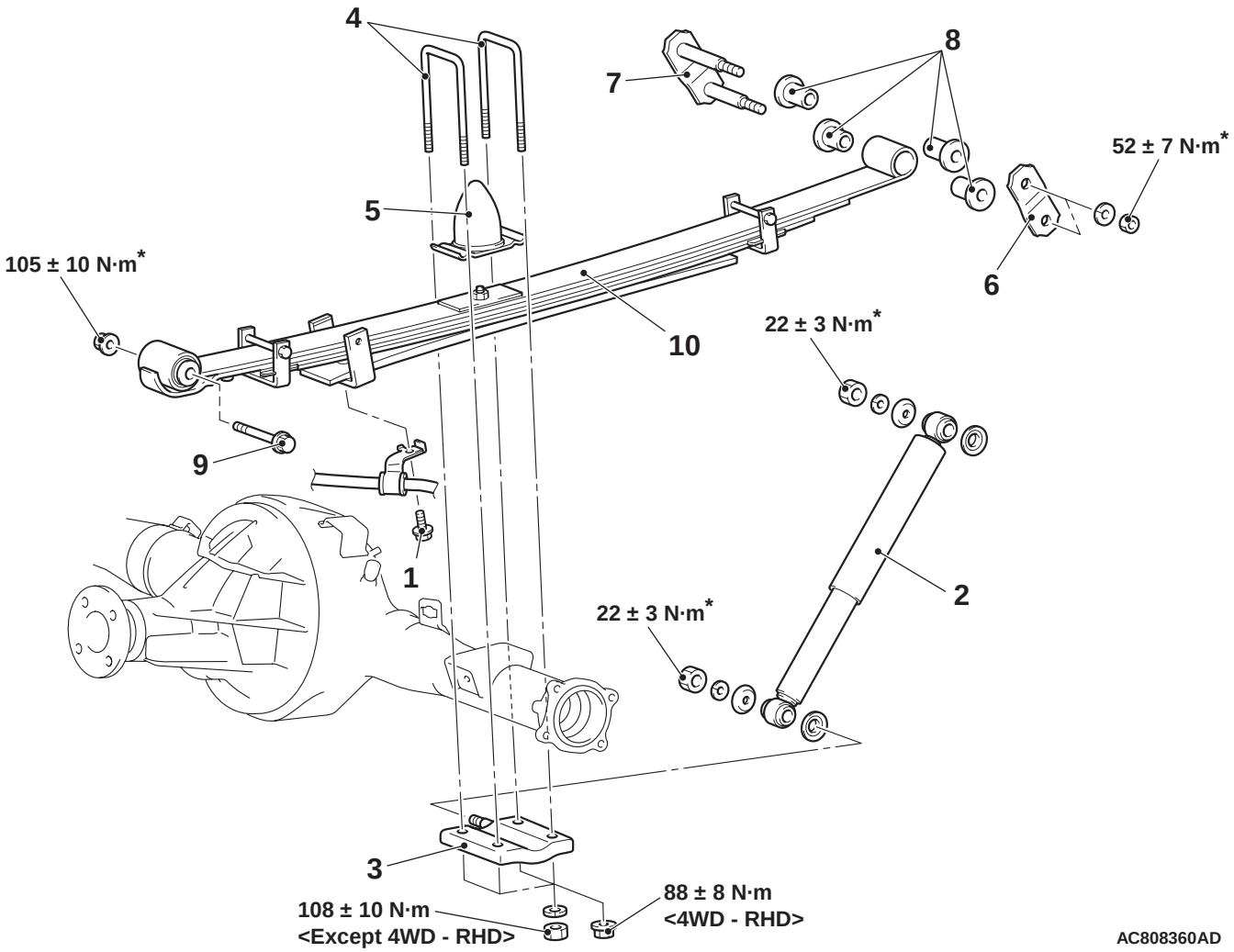
- ***: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the earth in the unladen condition.**

Pre-installation Operation
- Support the axle housing with a garage jack etc..

<2WD (EXCEPT HIGH RIDER)>



<2WD (HIGH RIDER), 4WD>

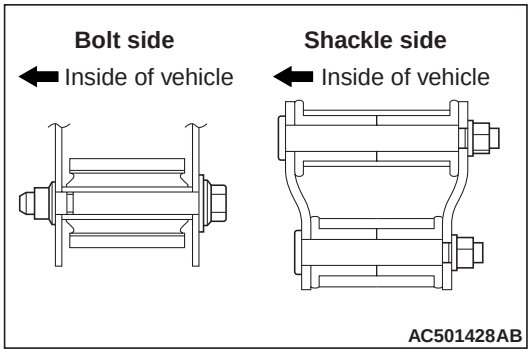


Removal steps

1. Parking brake cable attaching bolt
>>**C**<< 2. Shock absorber
3. U-bolt seat
>>**B**<< 4. U-bolts
5. Bump stopper
- Spare tyre (LH only)
6. Shackle plate
>>**A**<< 7. Shackle assembly
8. Rubber bushings
>>**A**<< 9. Bolt
10. Rear spring

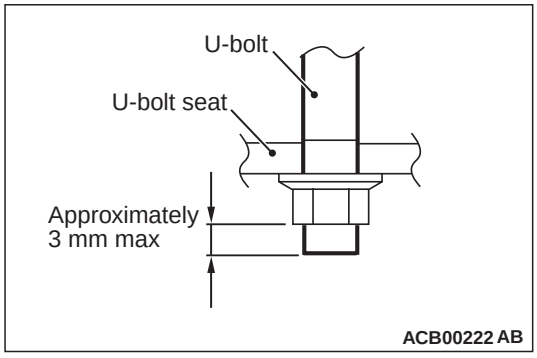
INSTALLATION SERVICE POINTS

>>A<< BOLT/SHACKLE ASSEMBLY INSTALLATION



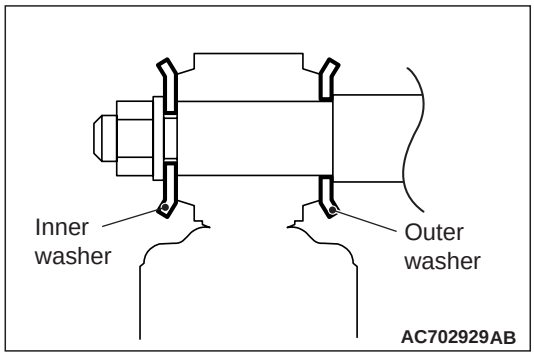
1. Install the bolt from the outside toward the inside of vehicle.
2. Install the shackle assembly from the inside toward the outside of vehicle.

>>B<< U-BOLTS INSTALLATION <2WD (HIGH RIDER), 4WD>



Install the u-bolts as shown in the figure.

>>C<< SHOCK ABSORBER INSTALLATION



Be sure to install the shock absorber washers (outer and inner) in the specified direction.

INSPECTION

M1341015500175

- Check the rubber parts for cracks and wear.
- Check the shock absorber for malfunction, oil leakage, or abnormal noise.
- Check the leaf springs for damage or deterioration.
- Check the U-bolt for cracks or bends.

GROUP 35

SERVICE BRAKES

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ACTIVE STABILITY & TRACTION CONTROL SYSTEM (ASTC) 35C

GROUP 35A

BASIC BRAKE

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GENERAL INFORMATION

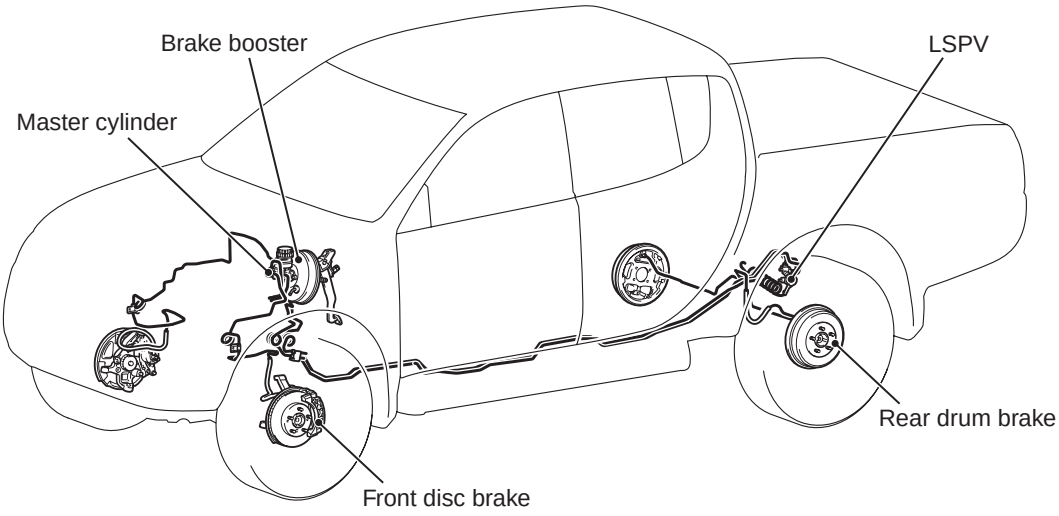
M1351000101421

Brake system with high reliability and durability have achieved distinguished braking performance.

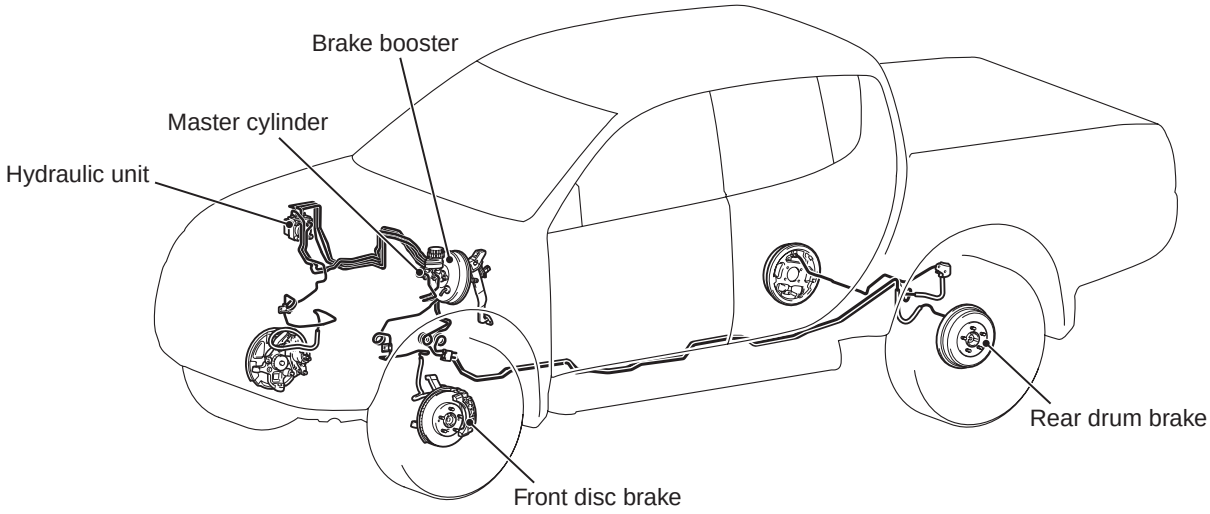
CONFIGURATION DIAGRAM

<2WD (except High rider)>

<Vehicles without ABS>



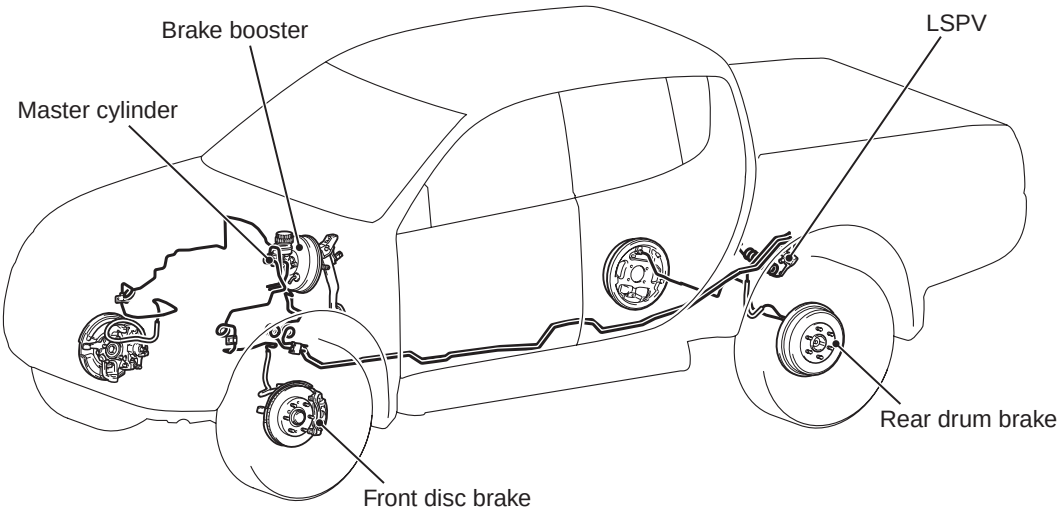
<Vehicles with ABS>



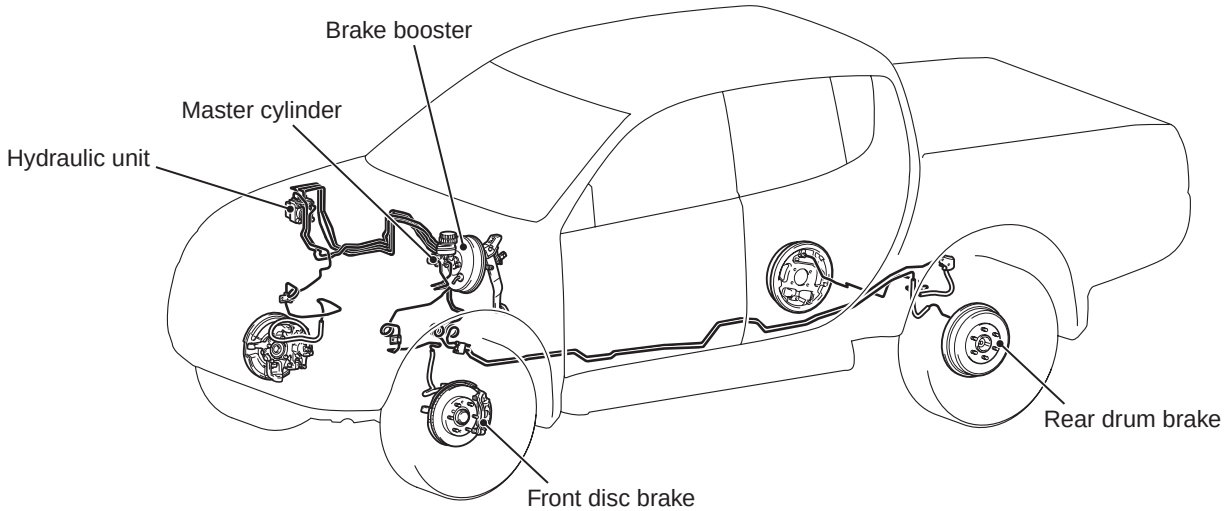
AC809217AB

<2WD (High rider), 4WD>

<Vehicles without ABS>



<Vehicles with ABS>



AC809218AB

SERVICE SPECIFICATIONS

M1351000302257

Item	Standard value	Limit
Brake pedal height mm	178.3 – 181.3	–
Brake pedal free play mm	3 – 8	–
Brake pedal to floor board clearance mm	75 or more	–

Item				Standard value	Limit
Load sensing proportioning valve (LSPV) output fluid pressure MPa	2WD (except High rider)	Spring length: 193.2 mm	Front disc brake caliper output fluid pressure: 8.12 MPa	4.98	–
			Front disc brake caliper output fluid pressure: 17.64 MPa	6.25 – 7.53	–
		Spring length: 223.0 mm	Front disc brake caliper output fluid pressure: 13.52 MPa	10.38	–
	2WD (High rider)	Spring length: 168.8 mm	Front disc brake caliper output fluid pressure: 5.72 MPa	2.58	–
			Front disc brake caliper output fluid pressure: 17.64 MPa	4.33 – 5.61	–
		Spring length: 213.5 mm	Front disc brake caliper output fluid pressure: 12.02 MPa	8.88	–
	2WD (High rider)-Heavy duty rear suspension	Spring length: 169.0 mm	Front disc brake caliper output fluid pressure: 4.96 MPa	1.82	–
			Front disc brake caliper output fluid pressure: 17.64 MPa	3.72 – 5.00	–
		Spring length: 194.1 mm	Front disc brake caliper output fluid pressure: 11.52 MPa	8.38	–
	4WD	Spring length: 168.2 mm	Front disc brake caliper output fluid pressure: 5.92 MPa	2.78	–
			Front disc brake caliper output fluid pressure: 17.64 MPa	4.49 – 5.77	–
		Spring length: 213.6 mm	Front disc brake caliper output fluid pressure: 12.32 MPa	9.18	–

Item				Standard value	Limit
Load sensing proportioning valve (LSPV) spring length mm		2WD (except High rider)		188 – 192	–
		2WD (High rider), 4WD	Vehicles with rear body	165 – 169	–
			Vehicles without rear body	161 – 165	–
Front disc brake	Disc brake pad thickness mm			9.5	1.5
	Disc brake disc thickness mm			28.0	26.4
	Disc brake disc run-out mm			–	0.06
	Disc brake drags force N	2WD (except High rider)		69 or less	–
		2WD (High rider), 4WD		56 or less	–
Rear drum brake	Drum brake lining thickness mm	2WD (except High rider)		4.7	1.0
		2WD (High rider), 4WD		5.0	1.0
	Rear drum inside diameter mm	2WD (except High rider)		254	256
		2WD (High rider), 4WD		295	297
Brake booster push rod protruding length mm (When applying negative pressure of 66.7 kPa to the brake booster)		Vehicles without ASTC		10.0 – 10.1	–
		Vehicles with ASTC		6.6 – 6.9	–

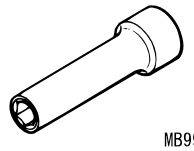
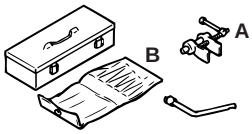
LUBRICANTS

M1351000401529

Item		Specified lubricant
Brake fluid		DOT3 or DOT4
Pin		Repair kit grease (Colour: Translucent red), Niglube RX-2 or equivalent
Pin boot inner surface		
Piston boot mounting grooves		Repair kit grease
Piston boot inner surface		
Rear brake shoe and backing plate contact surface	2WD (except High rider)	Hyrex No.2 or equivalent
	2WD (High rider), 4WD	Solvest 842M or Molycort 44MA or equivalent
Rear brake shoe and adjuster lever contact surface	2WD (except High rider)	Hyrex No.2 or equivalent
	2WD (High rider), 4WD	Cosmo rubber grease or equivalent
Rear brake shoe and auto adjuster assembly contact surface	2WD (except High rider)	Hyrex No.2 or equivalent
	2WD (High rider), 4WD	Cosmo rubber grease or equivalent
Auto adjuster assembly	2WD (except High rider)	Hyrex No.2 or equivalent
	2WD (High rider), 4WD	Cosmo rubber grease or equivalent
Wheel cylinder boot	2WD (except High rider)	Repair kit grease, Hyrex No.2 or equivalent
	2WD (High rider), 4WD	Repair kit grease

SPECIAL TOOLS

M1351000600780

Tool	Tool number	Name	Use
	MB991568	Push rod adjusting socket	Adjustment of the brake booster push rod protrusion amount
	MB990964 A: MB990520 B: MB990621 <2WD (High rider), 4WD>, MB990623 <2WD (except High rider)>	Brake tool set A: Disc brake piston expander B: Installer	• Pushing-in of the disc brake piston • Installation of the drum brake wheel cylinder piston cup

ON-VEHICLE SERVICE

BRAKE PEDAL CHECK AND ADJUSTMENT

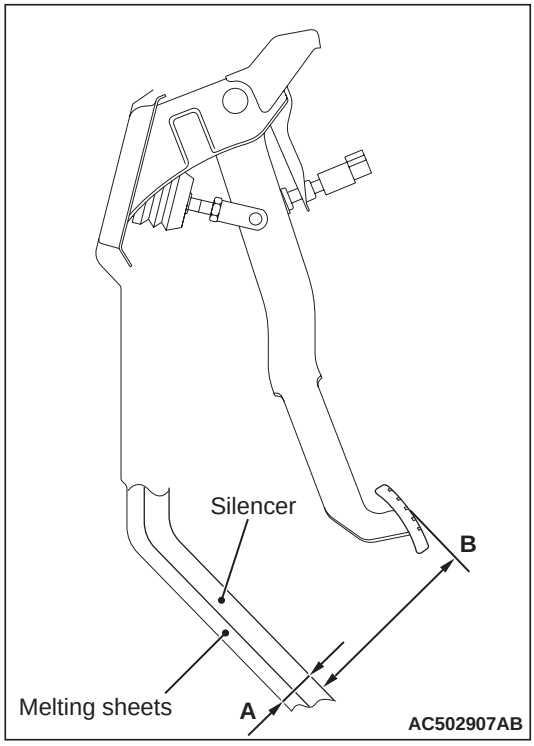
M1351000900770

⚠ CAUTION

Do not apply grease or lubricant to the switch and the switch installation section to avoid malfunction of the switch. In addition, do not use gloves which have grease on them.

BRAKE PEDAL HEIGHT

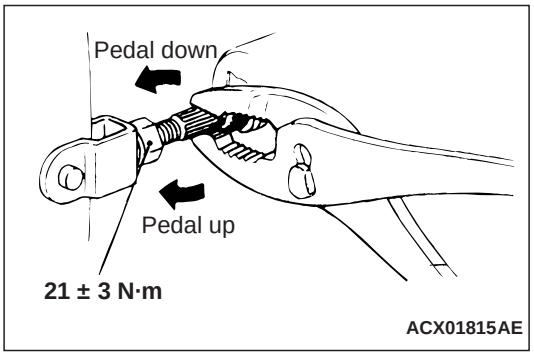
1. Turn up the carpet, etc. under the brake pedal.



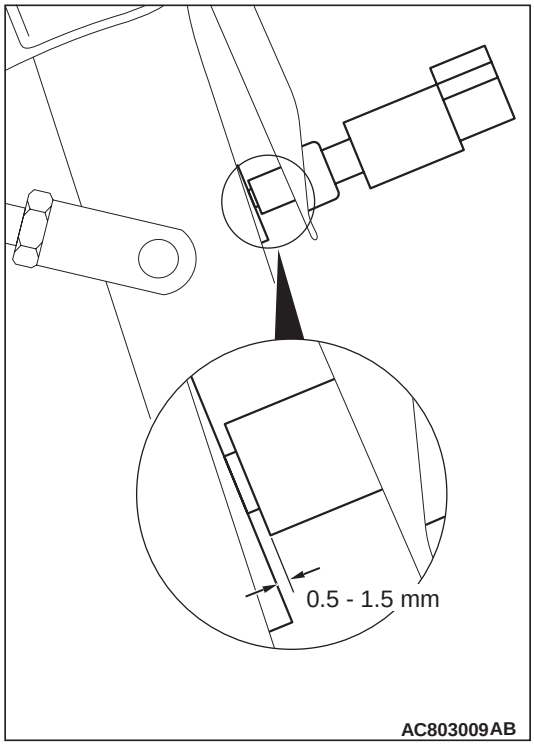
2. Pierce a needle or similar material to the silencer and melting sheets, and measure the thickness of "A" shown in the figure.
3. Measure the distance between the silencer and brake pedal "B" shown in the figure.
4. Check that the total value of "A" and "B" measured in the previous items 2 and 3 is within the standard value.

   Standard value (A + B): 178.3 – 181.3 mm [From the surface of dash panel to the face of pedal pad]

5. If the brake pedal height is not within the standard value, follow the procedure below.
   (1) Disconnect the stop lamp switch connector, loosen the lock nut, and move the stop lamp switch to a position where it dose not contact the brake pedal arm.



   (2) Adjust the brake pedal height by turning the operating rod with pliers (with the operating rod lock nut loosen).



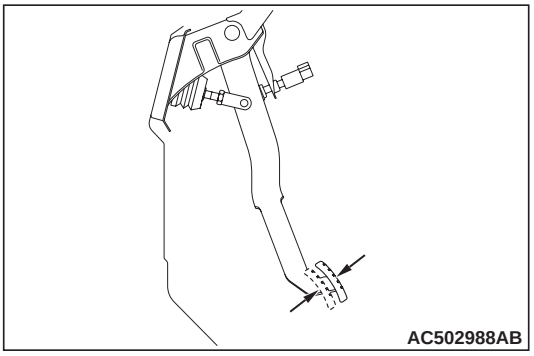
(3) Screw in the stop lamp switch until its thread contacts the stopper, and fix the stop lamp switch by turning it approximately one eighth of a turn clockwise.
(4) Check that the clearance between the stop lamp switch and the stopper is as shown.

⚠ CAUTION
Check that the stop lamp does not illuminate when the brake pedal is not depressed.

(5) Connect the connector at the stop lamp switch.

6. Return the carpet, etc.

BRAKE PEDAL FREE PLAY



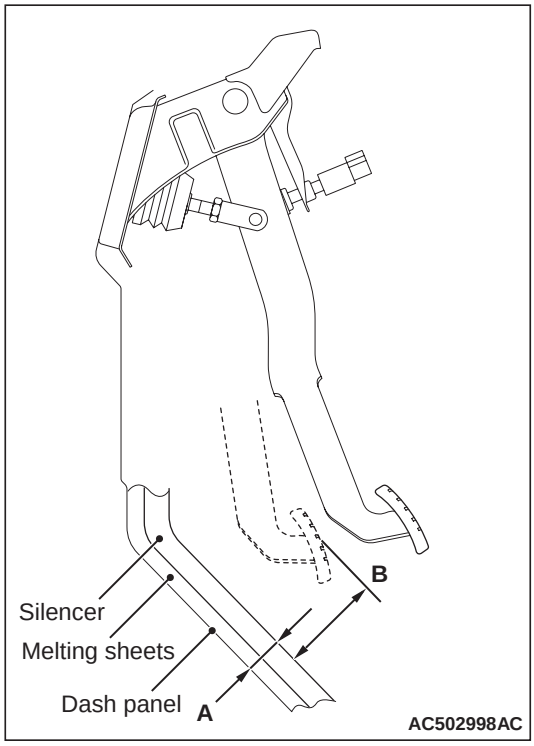
1. Turn the ignition switch to the "LOCK" (OFF) position, depress the brake pedal two or three times. After eliminating the vacuum in the brake booster, press the pedal down by hand, and confirm that the amount of movement before resistance is met (free play) is within the standard value range.

   Standard value: 3 – 8 mm

2. If the brake pedal play is not within the standard value, check the following, and adjust or replace if necessary:
   - Excessive play between the brake pedal and the clevis pin, or between the clevis pin and the brake booster operating rod
   - Brake pedal height
   - Installation position of the stop lamp switch, etc.

CLEARANCE BETWEEN BRAKE PEDAL AND DASH PANEL

1. Turn up the carpet, etc. under the brake pedal.



2. Pierce a needle or similar material to the silencer and melting sheets, and measure the thickness of "A" shown in the figure.
3. Start the engine, depress the brake pedal with approximately 490 N of force, and measure the distance "B" between the silencer and brake pedal shown in the figure.
4. Check that the total value of "A" and "B" measured in the previous items 2 and 3 is within the standard value.

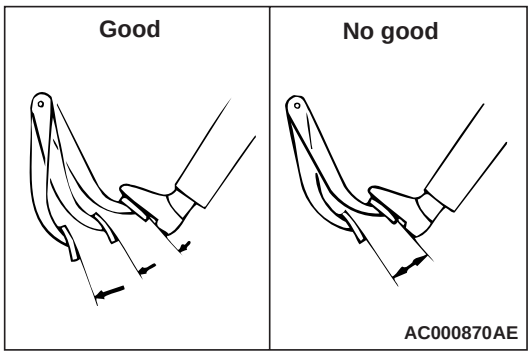
Standard value (A + B): 75 mm or more [From the surface of dash panel to the face of pedal pad]

5. If the clearance is outside the standard value, check for air trapped in the brake line, thickness of the disc brake pad, clearance between the lining and the drum and dragging in the parking brake. And then adjust and replace defective parts as required.
6. Return the carpet etc. to its original position.

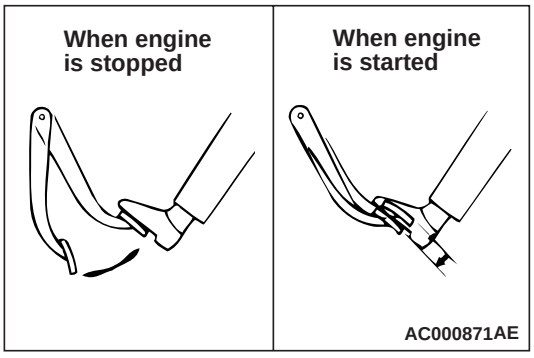
BRAKE BOOSTER OPERATING TEST

M1351001000576

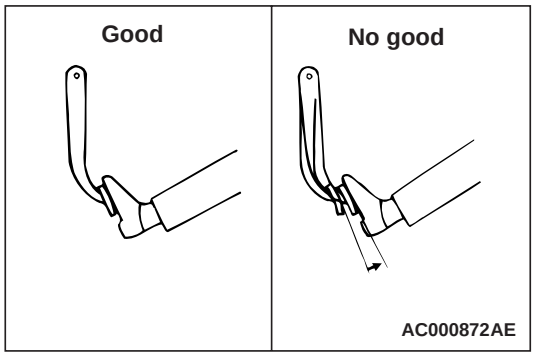
1. For simple checking of the brake booster operation, carry out the following tests:



(1) Run the engine for one or two minutes, and then stop it. If the pedal depresses fully the first time but gradually becomes higher when depressed succeeding times, the booster is operating properly. If the pedal height remains unchanged, the booster is defective. Go to step 2.



(2) With the engine stopped, step on the brake pedal several times. Then step on the brake pedal and start the engine. If the pedal moves downward slightly, the booster is in good condition. If there is no change, the booster is defective. Go to step 3.



(3) With the engine running, step on the brake pedal and then stop the engine. Hold the pedal depressed for 30 seconds. If the pedal height does not change, the booster is in good condition, if the pedal rises, the booster is defective.

2. If the above three tests are OK, the booster is OK. If one of the above three tests is not OK, the check valve, vacuum hose, or booster is defective. Check the check valve (Refer to P.35A-9), vacuum hose for leaks, high volume engine vacuum applied to booster. Repair or replace as necessary. If these are OK, replace booster and repeat this test starting at Step 1.

CHECK VALVE OPERATION CHECK

M1351009000893

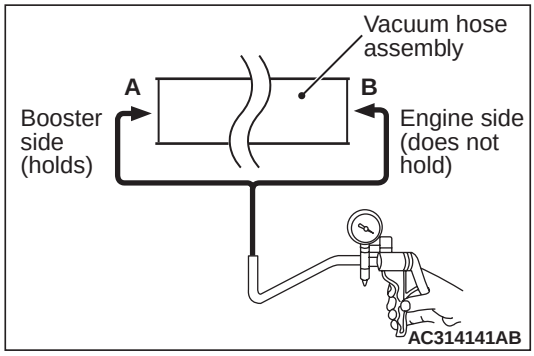
⚠ CAUTION

The check valve should not be removed from the vacuum hose.

1. Remove the vacuum hose (Refer to P.35A-20 <LHD> or P.35A-23 <RHD>).

⚠ CAUTION

If the check valve is defective, replace it as an assembly unit together with the vacuum hose.



2. Check the operation of the check valve by using a vacuum pump.

Vacuum pump connection	Normal condition
When connected to the booster side (A)	Vacuum is generated and maintained.
When connected to the engine side (B)	No vacuum is generated.

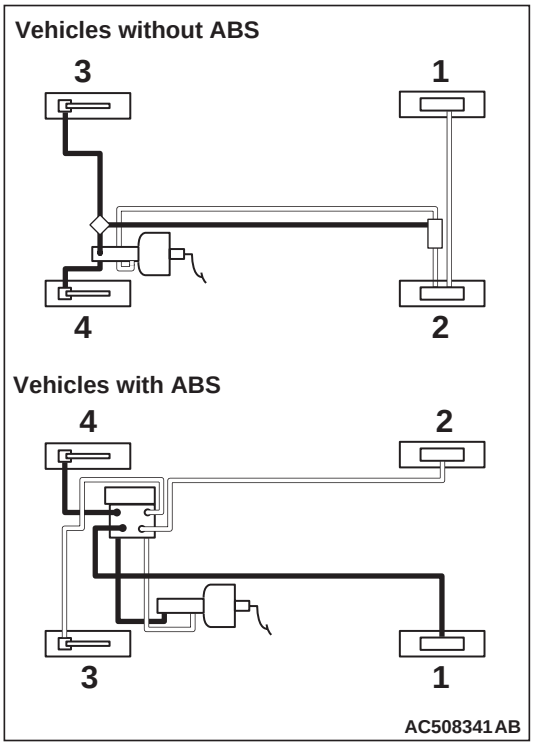
BLEEDING

M1351001400734

⚠ CAUTION

Use only brake fluid DOT 3 or DOT 4. Never mix the specified brake fluid with other fluid as it will influence the braking performance significantly.

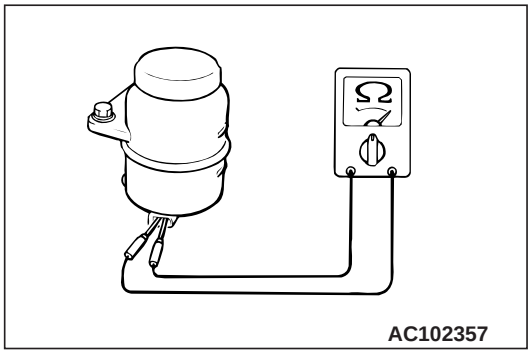
BRAKE LINE BLEEDING



Start the engine and bleed the air in the sequence shown in the figure.

BRAKE FLUID LEVEL SENSOR CHECK

M1351009100588



The brake fluid level sensor is in good condition if there is no continuity when the float surface is above "MIN" and if there is continuity when the float surface is below "MIN".

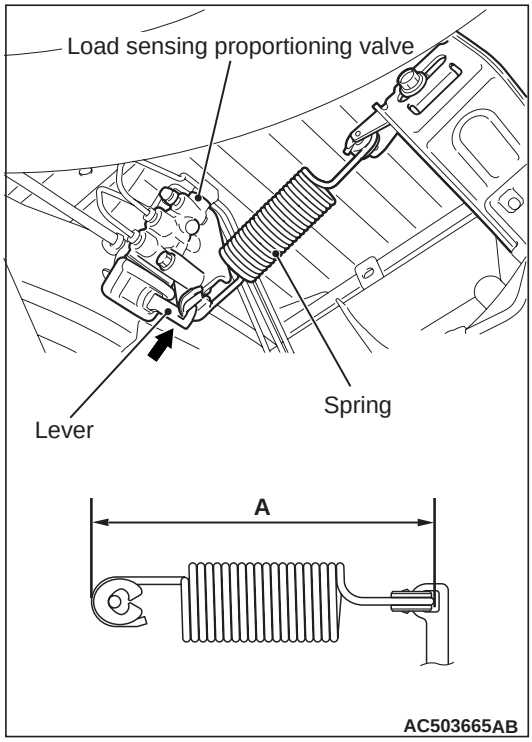
LOAD SENSING SPRING LENGTH CHECK AND ADJUSTMENT <Vehicles without ABS>

M1351001200161

⚠ CAUTION

- **Perform without any parcels placed in the vehicle (in the state of delivery).**
- **Do not raise the vehicle using a jack or similar device.**

1. Park the vehicle on a level surface.



2. While pushing the lever in the arrowed direction fully, measure the length A (the length between the both ends of the spring) shown in the figure.

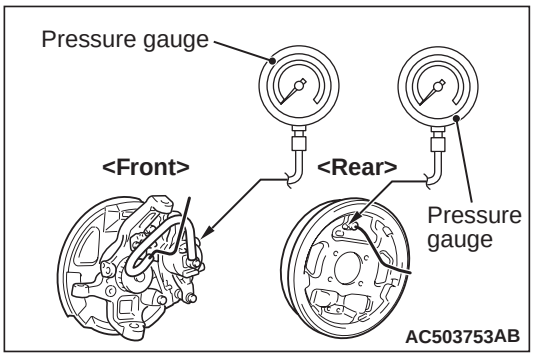
   Standard value (A):
   188 – 192 mm <2WD (except High rider)>
   165 – 169 mm <2WD (High rider), 4WD (Vehicles with rear body)>
   161 – 165 mm <2WD (High rider), 4WD (Vehicles without rear body)>

3. If the value is not within the standard value in the item 2, loosen the spring support and adjust to set within the standard value.

LOAD-SENSING PROPORTIONING VALVE FUNCTION TEST <Vehicles without ABS>

M1351001300191

1. Load sensing spring length check (Refer to P.35A-10).

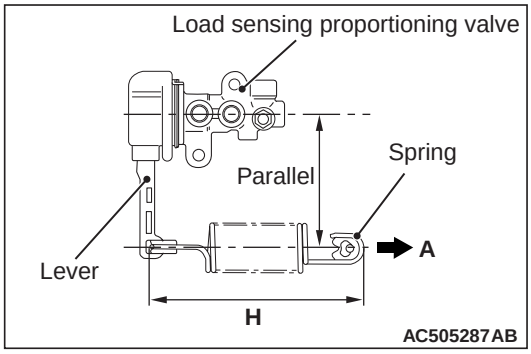


2. Remove the bleeder from the front disk brake calliper and rear drum brake cylinder, and connect a pres

   sure gauge.
3. Air bleeding (Refer to P.35A-10).
4. Unhook the spring support side.

⚠ CAUTION

The lever should be fully compressed toward the load sensing proportioning valve side.



5. Pull the spring toward the "A" direction in parallel with the load sensing proportioning valve. Adjust the length "H" as shown in the illustration to the specified dimension. At this time, check that the front disc brake caliper output fluid pressure and rear drum brake cylinder output fluid pressure are within the standard value.

   Standard value:

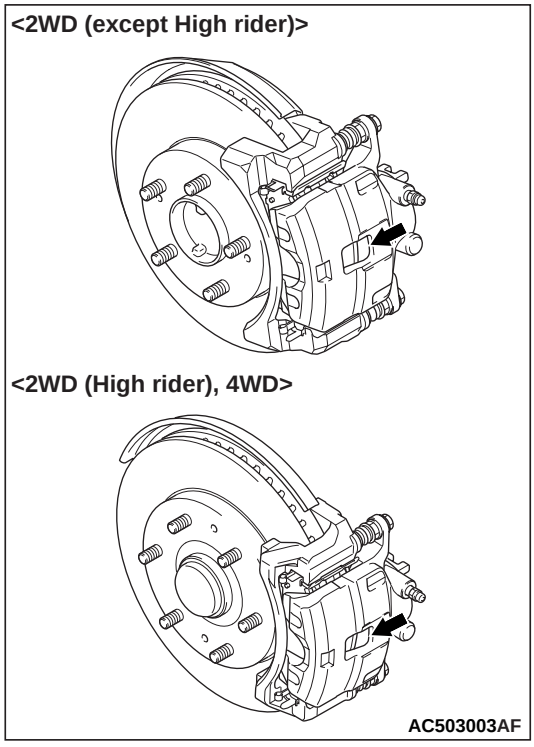
Item	Length H mm	Front disc brake caliper output fluid pressure MPa	Rear drum brake cylinder output fluid pressure MPa
2WD (except High rider)	193.2	8.12	4.98
		17.64	6.25 – 7.53
	223.0	13.52	10.38
2WD (High rider)	168.8	5.72	2.58
		17.64	4.33 – 5.61
	213.5	12.02	8.88
2WD (High rider)-Heavy duty rear suspension	169.0	4.96	1.82
		17.64	3.72 – 5.00
	194.1	11.52	8.38
4WD	168.2	5.92	2.78
		17.64	4.49 – 5.77
	213.6	12.32	9.18

BRAKE PAD CHECK

M1351017300587

⚠ CAUTION

If there is a significant difference in thickness between the brake pads at right and left, check the sliding area and the run-out of the brake disc (Refer to P.35A-14).



1. Visually check the thickness of brake pad from the inspection hole of the caliper body.

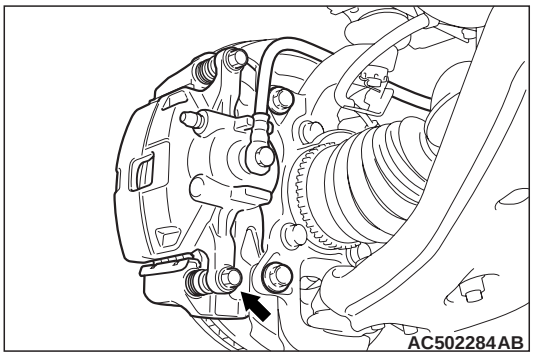
   Standard value: 9.5 mm
   Limit: 1.5 mm

2. If the brake pad thickness is less than the limit value, replace the brake pad (Refer to P.35A-12).

BRAKE PAD REPLACEMENT

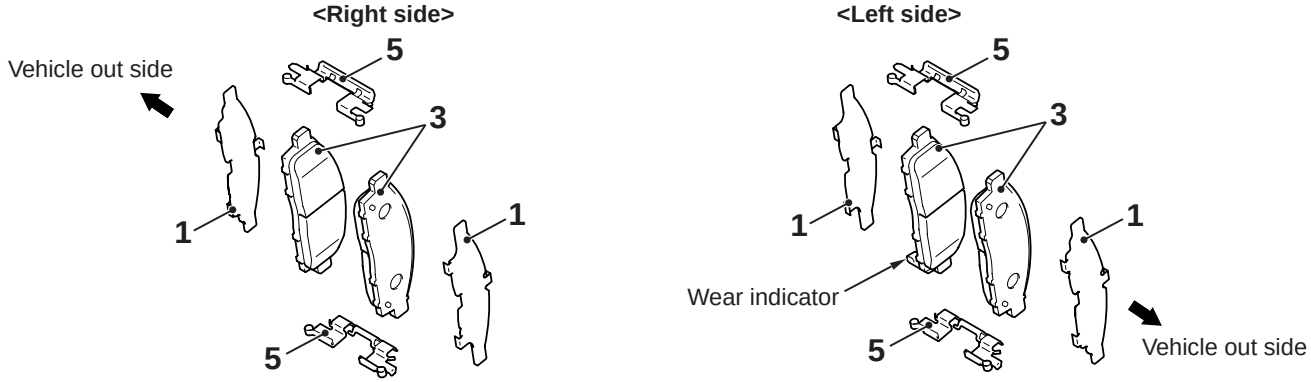
M1351017400681

⚠ CAUTION
When replacing, replace both brake pads (right and left) as a set.



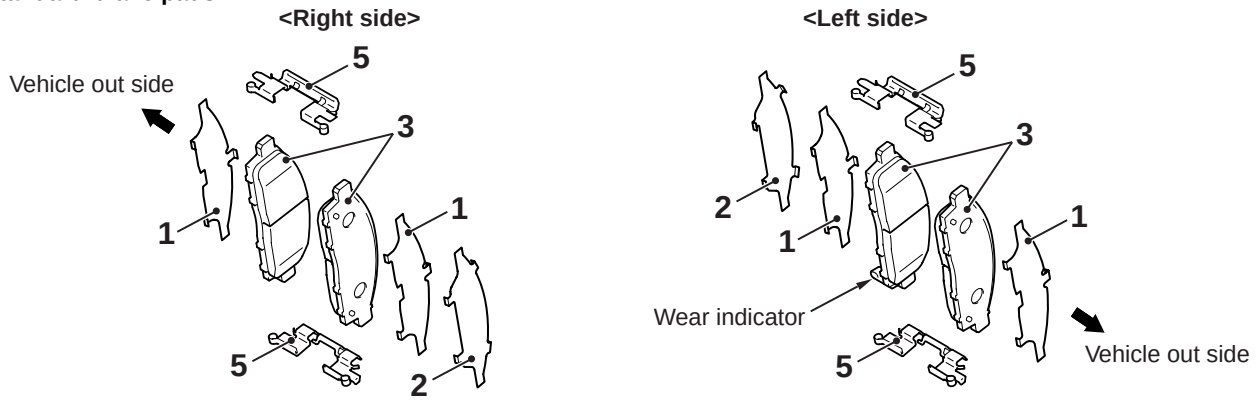
1. Remove the parts indicated in the figure, swivel the caliper body upward and retain it with a wire or similar tool.

<2WD (except High rider)>

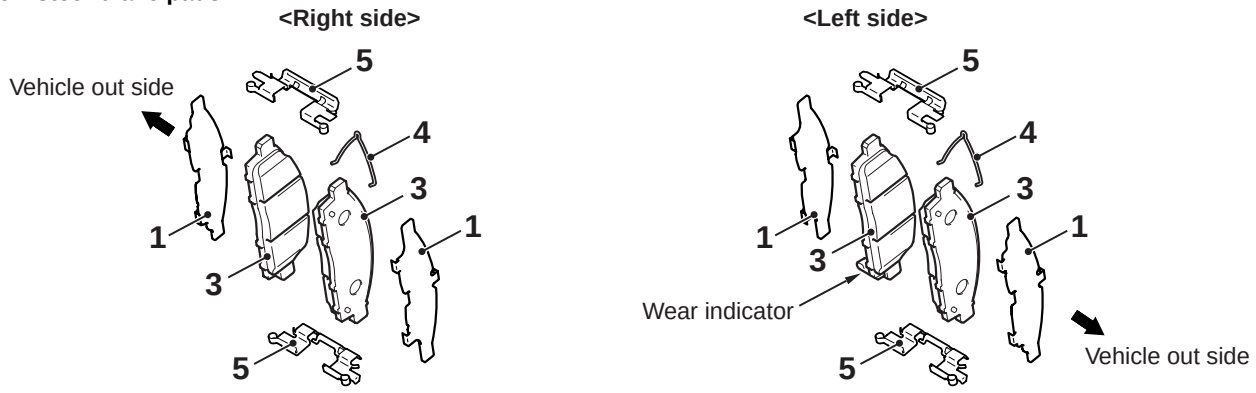


<2WD (High rider), 4WD>

<Standard brake pads>



<Low steel brake pads>



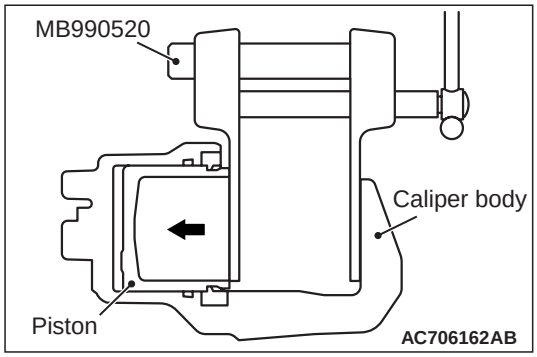
AC903812 AB

2. Remove the following parts from the caliper body.
   (1) Shim
   (2) Shim cover
   (3) Brake pad assembly
   (4) V spring
   (5) Clip

NOTE: The brake pad assembly with wear indicator is installed only to the inner side of the brake disc of the left-side brake at factory.

⚠ CAUTION

Keep grease or other soiling off the pad and brake disc friction surfaces.

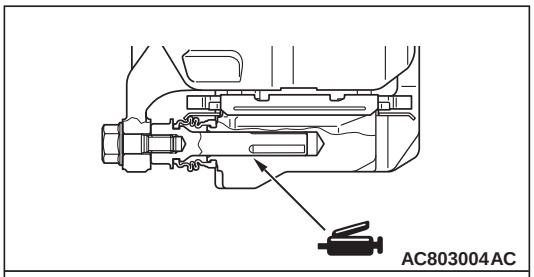


3. Clean the piston part, and press the piston into the cylinder using the special tool piston expander (MB990520).
4. Assemble the shim, shim cover, brake pad assembly, v spring and clip to the caliper support, and tighten the pin bolt to the specified torque.

   Tightening torque: 27 ± 4 N·m

   NOTE: Install the brake pad assembly (with wear indicator) to the inner side of the brake disc, making sure that the wear indicator is located on the bottom.

LUBRICATION POINT



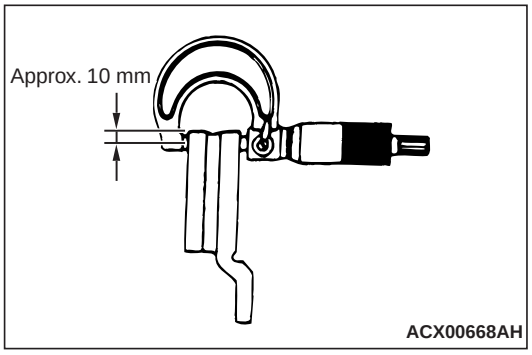
Grease: Repair kit grease (Colour: Translucent red), Niglube RX-2 or equivalent

BRAKE DISC CHECK

M1351018600138

BRAKE DISC THICKNESS CHECK

1. Remove contaminants or corrosion from the brake disc surface.



2. Use a micrometer to measure the brake disc thickness at minimum eight points which are 10 mm inward from its circumference.

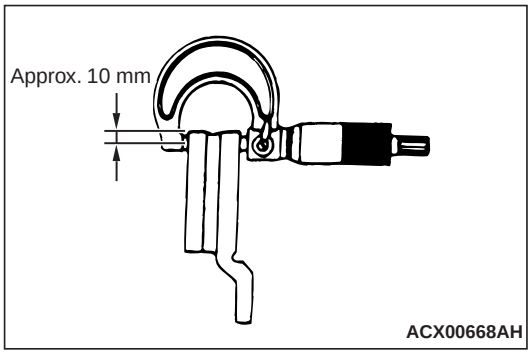
   Standard value: 28.0 mm

   Limit: 26.4 mm

3. If the brake disc thickness is worn beyond the limit value at more than one point, replace the brake disc and check its run-out.

BRAKE DISC THICKNESS UNEVENNESS CHECK AND CORRECTION

1. Remove contaminants or corrosion from the brake disc surface.

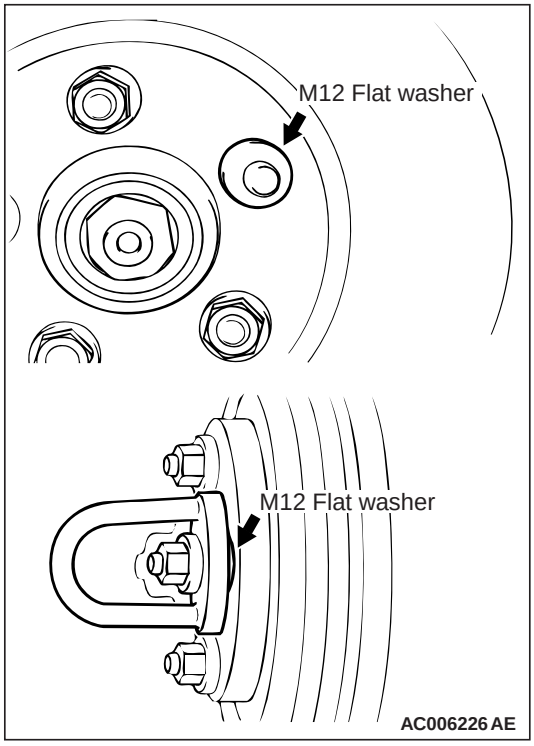


2. Use a micrometer to measure the brake disc thickness at minimum eight points which are 10 mm inward from its circumference. Then record the measurements.
3. If the brake disc thickness unevenness (the difference between the maximum and minimum values measured above) is 0.015 mm or less, it is within the standard value.
4. If the brake disc thickness unevenness exceeds the standard value, grind it according to the procedure below while it is mounted on the vehicle.

   NOTE: If it is suspected that the brake disc thickness will become less than the limit value after the grinding, replace the brake disc and check its run-out.

(1) Check for wheel bearing looseness in the axial direction (Refer to GROUP 26 – On-vehicle Service, Wheel bearing axial play check).

⚠ CAUTION



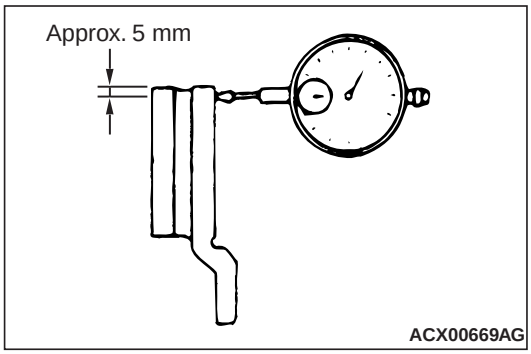
Insert M12 plain washer and then install the adapter as shown before grinding. Failure to use the M12 plain washer will cause the brake disc to be deformed and ground incorrectly.

- **To grind the brake disc, ensure that all the nuts (M12 X 1.5) are tightened evenly and in a diagonal sequence to the specified torque (100 N·m). Failure to use all the nuts (M12×1.5), excessive or uneven tightening torque will cause the brake disc to deform or judder.**

(2) Correct the brake disc uneven thickness by grinding it while in place on the vehicle.

BRAKE DISC RUN-OUT CHECK AND CORRECTION

1. Check for wheel bearing looseness in the axial direction (Refer to GROUP 26 – On-vehicle Service, Wheel bearing axial play check).
2. If the axial play is within the limit value, secure the brake disc by tightening the nut (M12×1.5) evenly to the specified torque (100 N·m).If the axial play still exceeds the limit value, replace the wheel bearing. Then secure the brake disc by tightening the nut (M12×1.5) evenly to the specified torque (100 N·m).

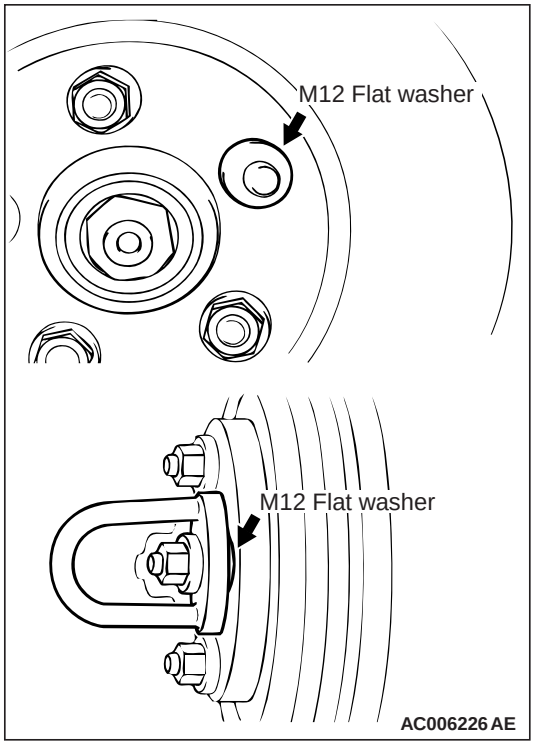


3. Place a dial gauge ca. 5 mm inward from the circumference of the brake disc to measure its run-out.

   Limit: 0.06 mm

4. If the brake disc run-out exceeds the limit value, rephase the brake disc to the hub so that the minimum brake disc run-out is obtained.

⚠ CAUTION



Insert M12 plain washer and then install the adapter as shown before grinding. Failure to use the M12 plain washer will cause the brake disc to be deformed and ground incorrectly.

- **To grind the brake disc, ensure that all the nuts (M12 X 1.5) are tightened evenly and in a diagonal sequence to the specified torque (100 N·m). Failure to use all the nuts (M12×1.5), excessive or uneven tightening torque will cause the brake disc to deform or judder.**

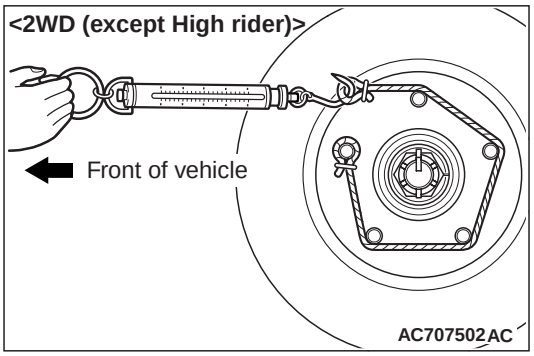
5. If the brake disc run-out exceeds the limit value after rephasing, grind the disc while in place on the vehicle so that the brake disc run-out is within the limit value.

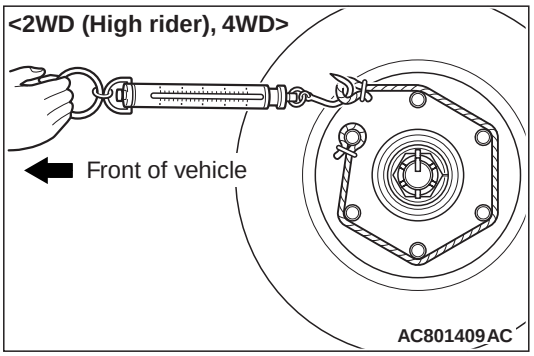
   NOTE: If it is suspected that the brake disc thickness will be below the limit value, replace the brake disc.Then rephase the brake disc so that the minimum brake disc run-out is obtained, or grind the disc while in place on the vehicle so that its run-out is below the limit value.

BRAKE DRAG FORCE CHECK

M1351017200331

1. Remove the brake pad, shim, shim cover <2WD (High rider), 4WD> and clip (Refer to P.35A-12).





2. Using a spring scale, measure the hub sliding torque in the forward direction with the brake pad assembly, shim, shim cover <2WD (High rider), 4WD> and clip removed.
3. Install the brake pad assembly, shim, shim cover and clip (Refer to P.35A-12).
4. Start the engine, and depress the brake pedal lightly two or three times. Then stop the engine. (Depressing force : approximately 50 – 100 N)
5. Turn the brake disc 10 times in the forward direction.
6. Using a spring scale, measure the hub sliding torque in the forward direction with the brake pad assembly, shim, shim cover and clip installed.
7. Obtain the disc brake drag force (difference between measured values of item 2 and item 6).

   Standard value:
   69 N or less <2WD (except High rider)>
   56 N or less <2WD (High rider), 4WD>

8. If the brake drag force exceeds the standard value, disassemble the front brake assembly to check for fouling/rust on the piston sliding section, piston seal and piston boot deterioration, and confirm whether the pin slide properly (Refer to P.35A-30 <2WD (except High rider)> or P.35A-33 <2WD (High rider), 4WD>).

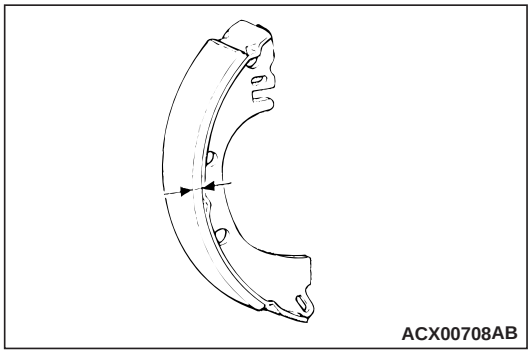
BRAKE LINING THICKNESS CHECK

M1351003000691

⚠ CAUTION

- **Whenever the shoe and lining assembly is replaced, replace both RH and LH assemblies as a set to prevent the car from pulling to one side when braking.**
- **If there is a significant difference in the thickness of the shoe and lining assemblies on the left and right sides, check the sliding condition of the piston.**

1. Remove the brake drum.



2. Measure the thickness of the brake lining at the area with the worst wear.

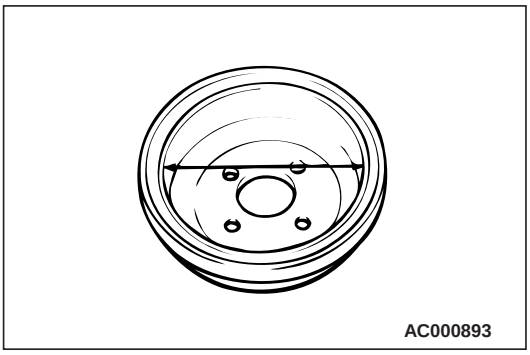
   Standard value:
   4.7 mm <2WD (except High rider)>
   5.0 mm <2WD (High rider), 4WD>
   Limit: 1.0 mm

3. Replace the shoe and lining assembly if the brake lining thickness is less than the limit or if it is not worn evenly. For installation procedures for the shoe and lining assembly, refer to P.35A-37 <2WD (except High rider)> or P.35A-39 <2WD (High rider), 4WD>.

BRAKE DRUM INSIDE DIAMETER CHECK

M1351003200725

1. Remove the brake drum.



2. Measure the inside diameter of the brake drum at two or more locations.

   Standard value:
   254 mm <2WD (except High rider)>
   295 mm <2WD (High rider), 4WD>

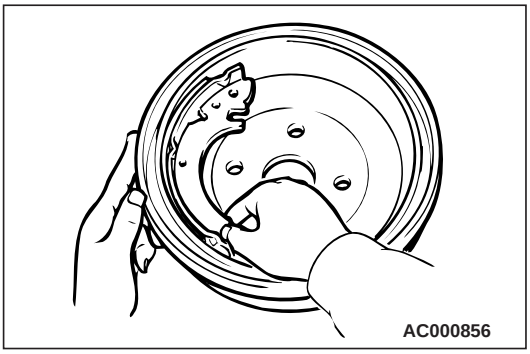
   Limit:
   256 mm <2WD (except High rider)>
   297 mm <2WD (High rider), 4WD>

3. Replace the brake drums, shoe and lining assembly when wear exceeds the limit value or is badly imbalanced.

BRAKE LINING AND BRAKE DRUM CONTACT CHECK

M1351003100557

1. Remove the brake drum.
2. Remove the shoe and lining assembly [Refer to P.35A-37 <2WD (except High rider)> or P.35A-39 <2WD (High rider, 4WD)>].



3. Chalk the inner surface of the brake drum and rub with the shoe and lining assembly.
4. Replace the shoe and lining assembly or brake drums if there are any irregular contact areas.

   NOTE: Clean off chalk after check.

BRAKE PEDAL

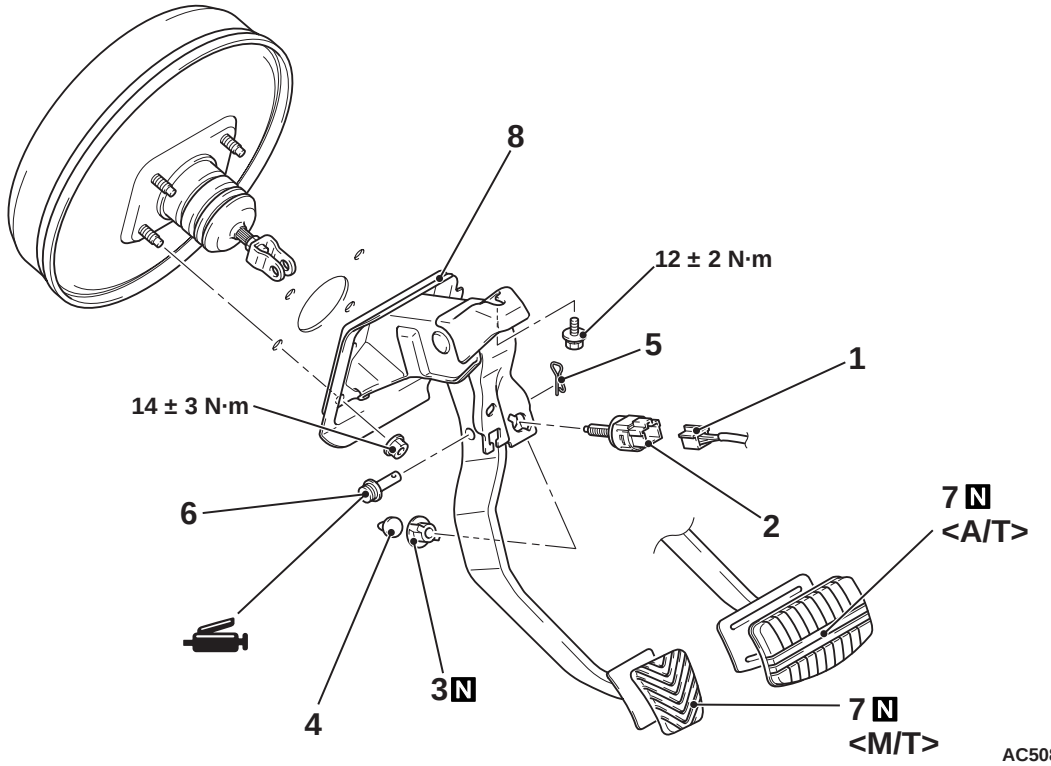
REMOVAL AND INSTALLATION

M1351003400688

⚠ CAUTION

Do not apply grease or lubricant to the switch and the switch installation section to avoid malfunction of the switch. In addition, do not use gloves which have grease on them.

Post-installation Operation
Brake pedal adjustment (Refer to P.35A-7).

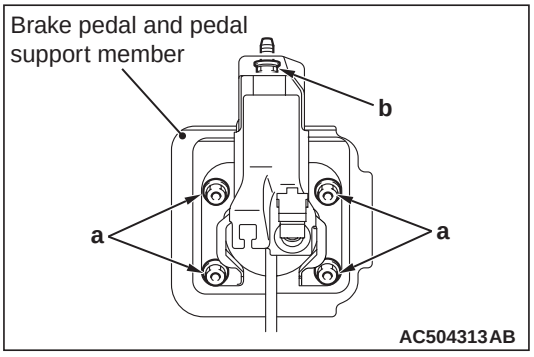


Removal steps
1. Stop lamp switch connector connection
2. Stop lamp switch
3. Adjuster
4. Pedal stopper
5. Snap pin
6. Pin assembly
7. Pedal pad

>>A<< 8. Brake pedal and pedal support member

INSTALLATION SERVICE POINT

>>A<< BRAKE PEDAL AND PEDAL SUPPORT MEMBER INSTALLATION



Tighten the bolt "a" first, and then tighten the bolt "b."

INSPECTION

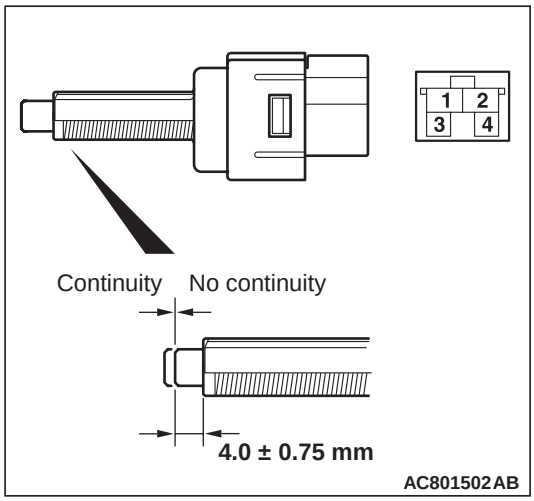
STOP LAMP SWITCH CHECK

M1351008900451

<VEHICLES WITHOUT CRUISE CONTROL SYSTEM>

⚠ CAUTION

Do not apply grease or lubricant to the switch and the switch installation section to avoid malfunction of the switch. In addition, do not use gloves which have grease on them.



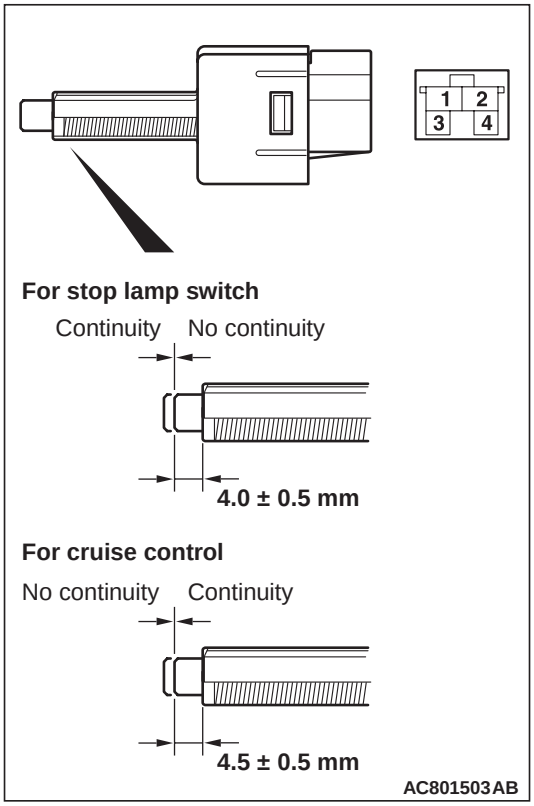
Check for continuity between the terminals of the switch.

Check condition	Terminal connector of tester	Normal condition
At free position	1 – 2	Continuity exists (2 Ω or less)
Press the plunger from the edge of the outer case by the dimension shown in the figure.	1 – 2	No continuity

<VEHICLES WITH CRUISE CONTROL SYSTEM>

⚠ CAUTION

Do not apply grease or lubricant to the switch and the switch installation section to avoid malfunction of the switch. In addition, do not use gloves which have grease on them.



Check for continuity between the terminals of the switch.

Check condition	Terminal connector of tester	Normal condition
At free position	1 – 2 (for stop lamp switch)	Continuity exists (2 Ω or less)
	3 – 4 (for cruise control)	No continuity
Press the plunger from the edge of the outer case by the dimension shown in the figure.	1 – 2 (for stop lamp switch)	No continuity
	3 – 4 (for cruise control)	Continuity exists (2 Ω or less)

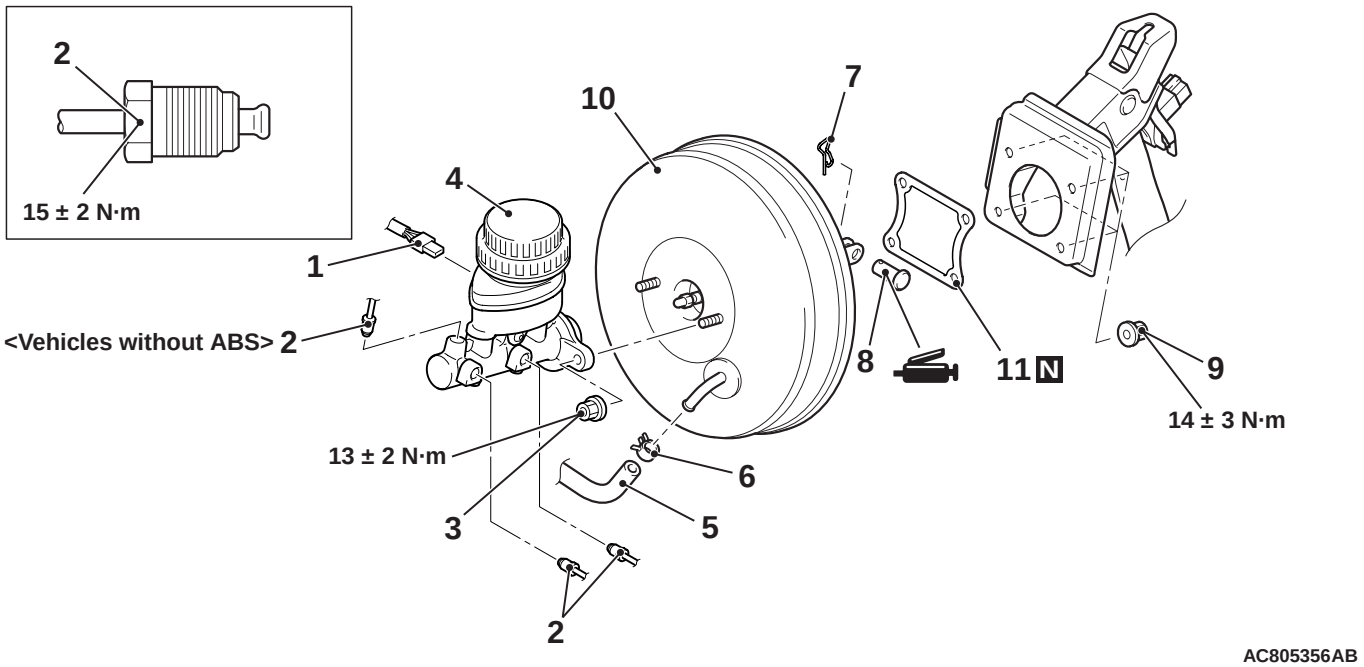
MASTER CYLINDER ASSEMBLY AND BRAKE BOOSTER ASSEMBLY

REMOVAL AND INSTALLATION <LHD>

M1351003702663

MASTER CYLINDER AND BRAKE BOOSTER

Pre-removal Operation	Post-installation Operation
Brake fluid draining	• Brake fluid supplying and air bleeding (Refer to P.35A-10). • Brake pedal adjustment (Refer to P.35A-7).



AC805356AB

Removal steps

1. Brake fluid level switch connector connection
2. Master cylinder and brake pipe connection

>>C<<
- Bleeding of master cylinder assembly (only at installation)

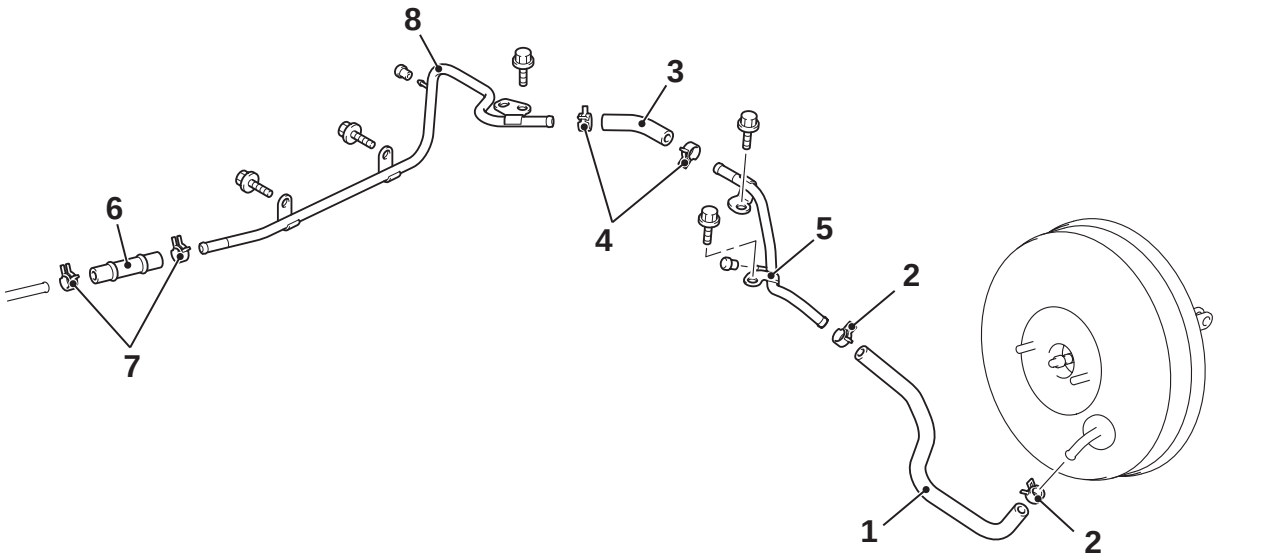
3. Master cylinder mounting nut
4. Master cylinder assembly

>>B<<
- Push rod protrusion amount check and adjustment (only at installation)

Removal steps (Continued)

>>A<< 5. Vacuum hose connection (with built-in check valve)
6. Hose clip
7. Snap pin
8. Pin assembly
9. Brake booster mounting nut
10. Brake booster assembly
11. Sealer

VACUUM HOSE AND VACUUM PIPE



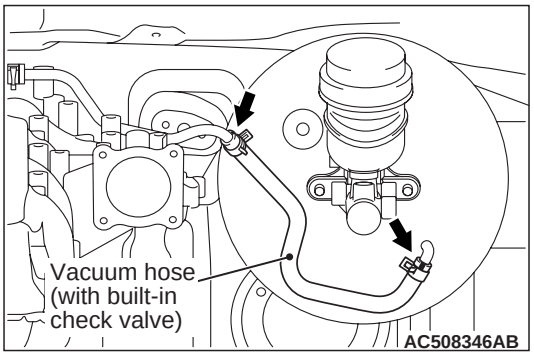
AC805357AB

Removal steps

>>A<< 1. Vacuum hose (with built-in check valve)
2. Hose clip
3. Vacuum hose
4. Hose clip
5. Vacuum pipe
6. Vacuum hose
7. Hose clip
8. Vacuum pipe

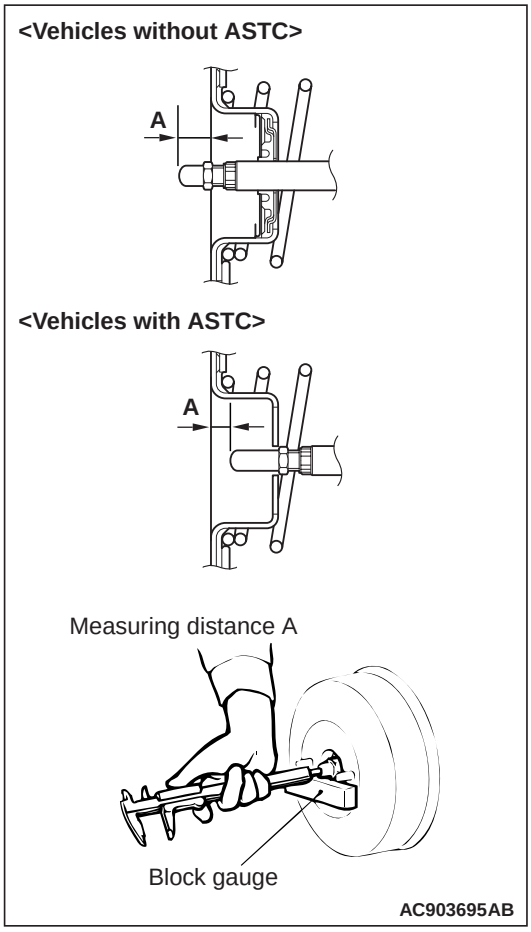
INSTALLATION SERVICE POINTS

>>A<< VACUUM HOSE INSTALLATION



Install the vacuum hose and the clip so that the paint mark on the vacuum hose and the clip are in the position shown in the figure.

>>B<< PUSH ROD PROTRUSION AMOUNT CHECK AND ADJUSTMENT

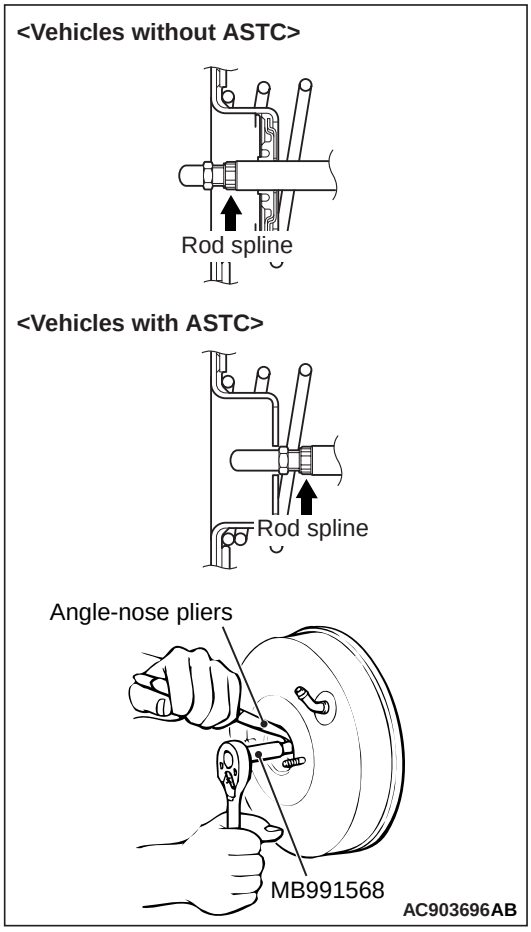


1. Use the vacuum pump to measure dimension "A" applying a negative pressure of 66.7 kPa to the brake booster.

   Standard value (A):
   10.0 – 10.1 mm <Vehicles without ASTC>

6.6 – 6.9 mm <Vehicles with ASTC>

NOTE: When a negative pressure of 66.7 kPa is not applied to the brake booster, the push rod protrusion amount (A) should be 9.0 – 9.1 mm <Vehicles without ASTC> , 7.7 – 7.9 mm <Vehicles with ASTC>.



2. If the protrusion amount is not within the standard value range, adjust the push rod length by turning the push rod. Use the special tool push rod adjusting socket (MB991568) to turn the push rod while holding the rod spline with angle-nose pliers.

>>C<< BLEEDING OF MASTER CYLINDER ASSEMBLY

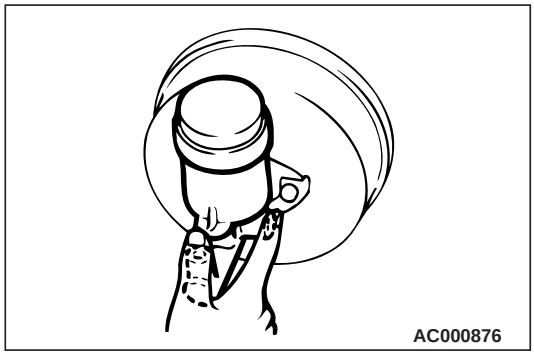
⚠ CAUTION

Be sure to use the specified brand and type of brake fluid. Avoid mixing with other type of brake fluid.

Brake fluid: DOT3 or DOT4

When removed the master cylinder assembly, bleed the master cylinder in the following procedure to make bleeding of the brake pipeline easier (When no brake fluid is in the master cylinder).

1. Fill the brake fluid reservoir with the brake fluid.
2. Depress and hold the brake pedal.



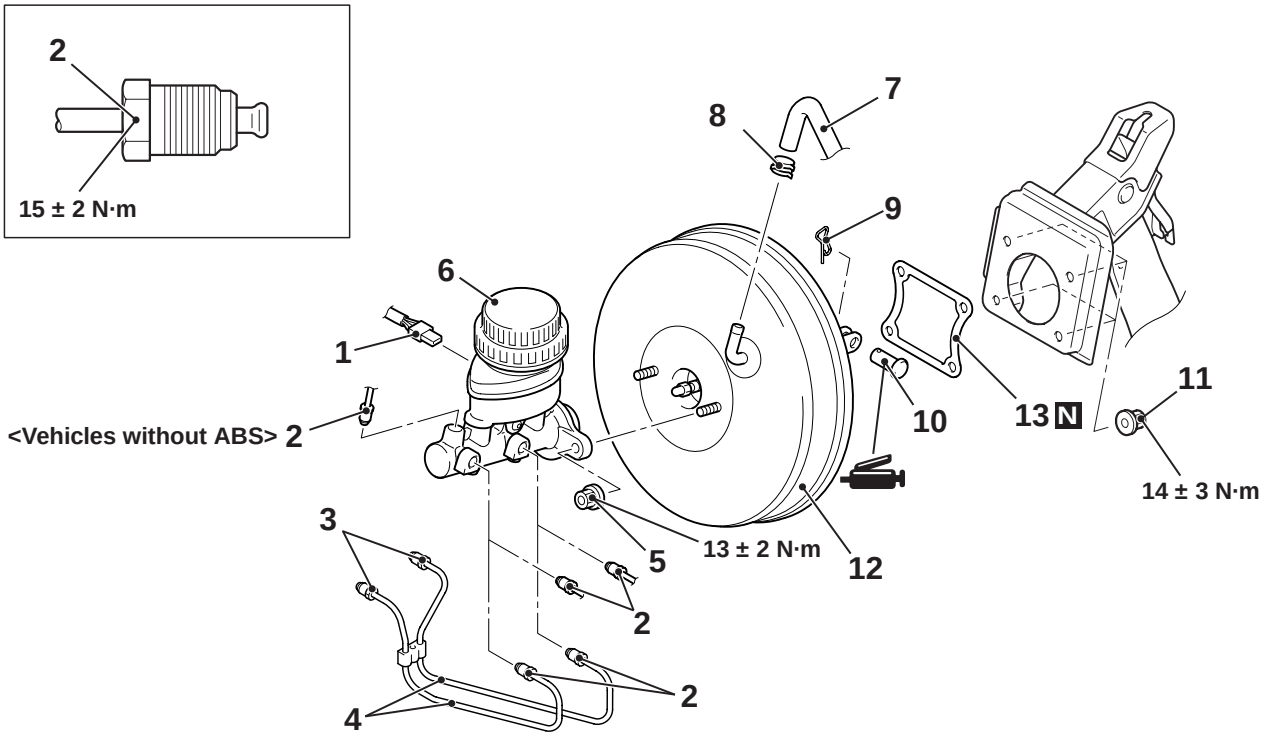
3. Another operator closes the master cylinder outlets with his fingers.
4. In this condition, release the brake pedal.
5. Repeat Steps 2 to 4 for 3 or 4 times to fill the master cylinder with the brake fluid.

REMOVAL AND INSTALLATION <RHD>

M1351003702674

MASTER CYLINDER AND BRAKE BOOSTER

Pre-removal Operation	Post-installation Operation
Brake Fluid Draining	• Brake Fluid Supplying and Air Bleeding (Refer to P.35A-10). • Brake Pedal Adjustment (Refer to P.35A-7).



AC805358AB

Removal steps

1. Brake fluid level switch connector connection
2. Master cylinder and brake pipe connection
3. Hydraulic unit assembly and brake pipe connection <vehicles with ABS>
4. Brake pipe assembly <vehicles with ABS>

>>C<<
- Bleeding of master cylinder assembly (only at installation)

5. Master cylinder mounting nut

Removal steps (Continued)

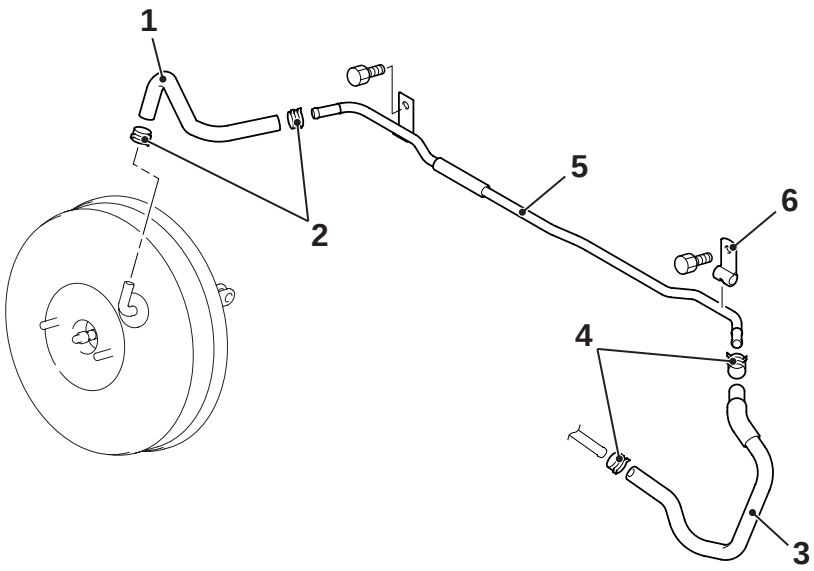
6. Master cylinder assembly

>>B<<
- Push rod protrusion amount check and adjustment (only at installation)

>>A<<

7. Vacuum hose connection (with built-in check valve)
8. Hose clip
9. Snap pin
10. Pin assembly
11. Brake booster mounting nut
12. Brake booster assembly
13. Sealer

VACUUM HOSE AND VACUUM PIPE



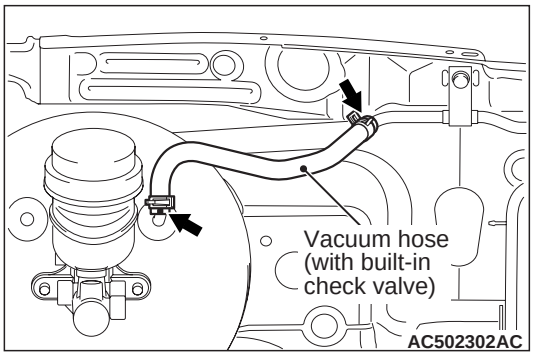
AC805359AB

Removal steps

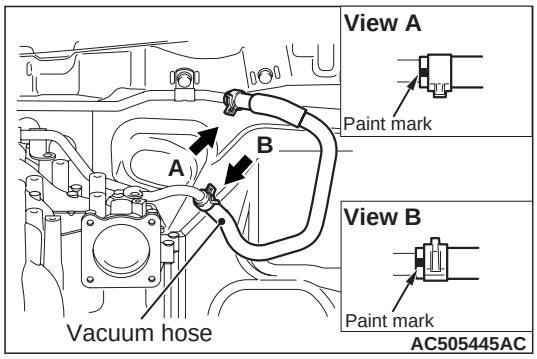
>>**A**<< 1. Vacuum hose (with built-in check valve)
2. Hose clip
>>**A**<< 3. Vacuum hose
4. Hose clip
5. Vacuum pipe
6. Clamp

INSTALLATION SERVICE POINTS

>>A<< VACUUM HOSE INSTALLATION



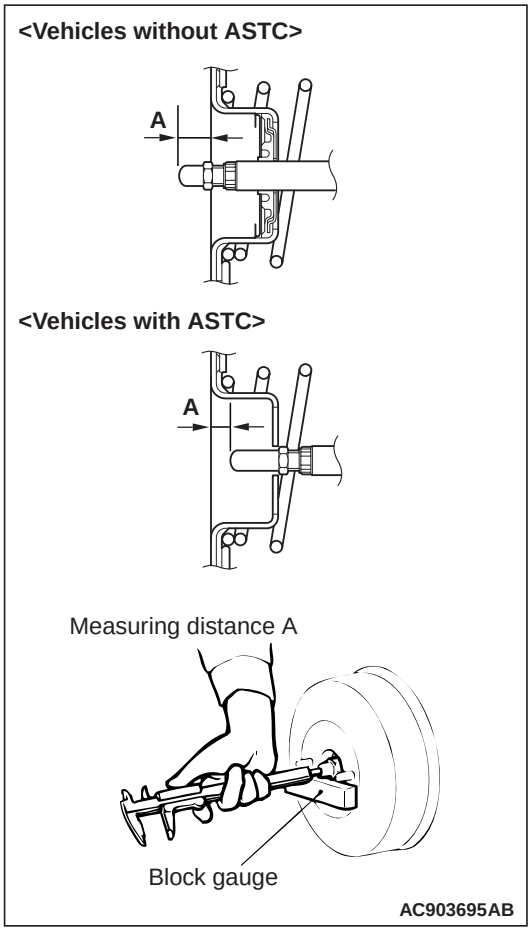
AC502302AC



AC505445AC

Install the vacuum hose and the clip so that the paint mark on the vacuum hose and the clip are in the position shown in the figure.

>>B<< PUSH ROD PROTRUSION AMOUNT CHECK AND ADJUSTMENT

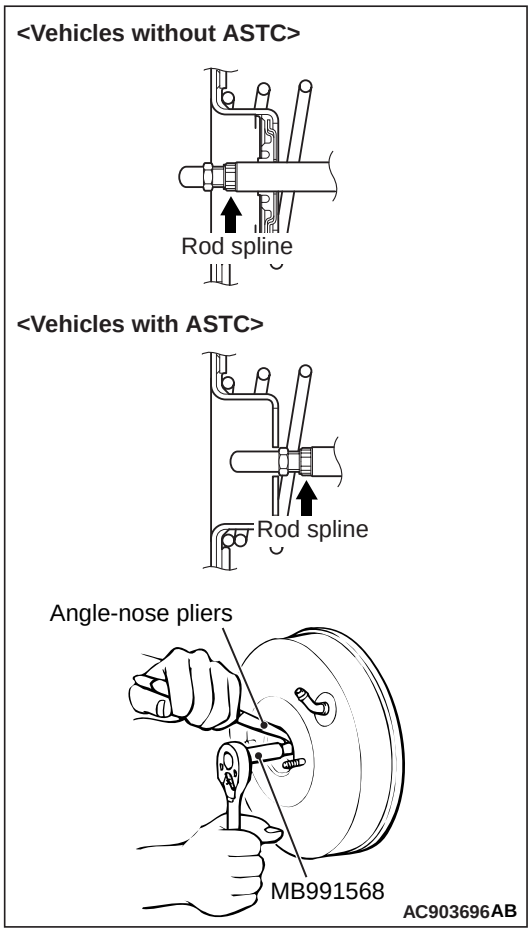


AC903695AB

1. Use the vacuum pump to measure dimension "A" applying a negative pressure of 66.7 kPa to the brake booster.

   Standard value (A):
   10.0 – 10.1 mm <Vehicles without ASTC>
   6.6 – 6.9 mm <Vehicles with ASTC>

   NOTE: When a negative pressure of 66.7 kPa is not applied to the brake booster, the push rod protrusion amount (A) should be 9.0 – 9.1 mm <Vehicles without ASTC> , 7.7 – 7.9 mm <Vehicles with ASTC>.



2. If the protrusion amount is not within the standard value range, adjust the push rod length by turning the push rod. Use the special tool push rod adjusting socket (MB991568) to turn the push rod while holding the rod spline with angle-nose pliers.

>>C<< BLEEDING OF MASTER CYLINDER ASSEMBLY

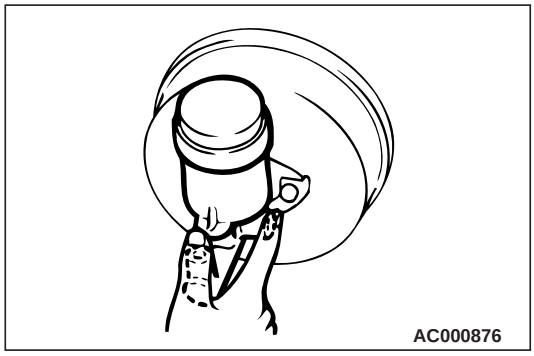
⚠ CAUTION

Be sure to use the specified brand and type of brake fluid. Avoid mixing with other type of brake fluid.

Brake fluid: DOT3 or DOT4

When removed the master cylinder assembly, bleed the master cylinder in the following procedure to make bleeding of the brake pipeline easier (When no brake fluid is in the master cylinder).

1. Fill the brake fluid reservoir with the brake fluid.
2. Depress and hold the brake pedal.



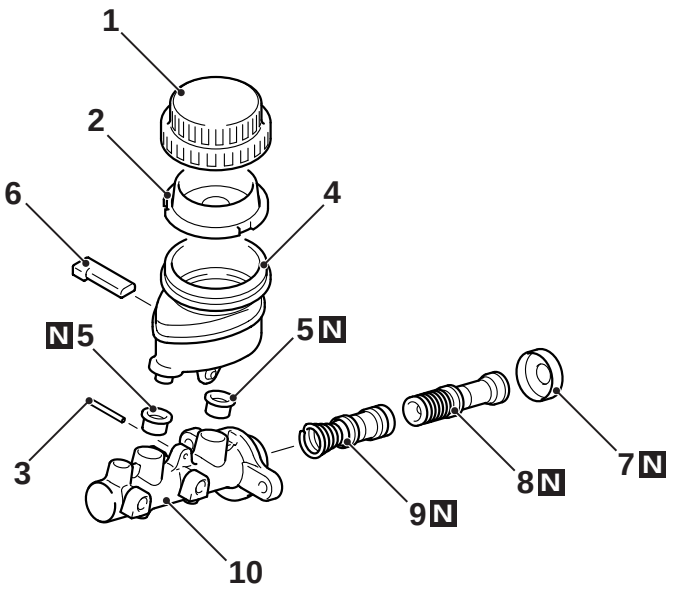
3. Another operator closes the master cylinder outlets with his fingers.
4. In this condition, release the brake pedal.
5. Repeat Steps 2 to 4 for 3 or 4 times to fill the master cylinder with the brake fluid.

MASTER CYLINDER

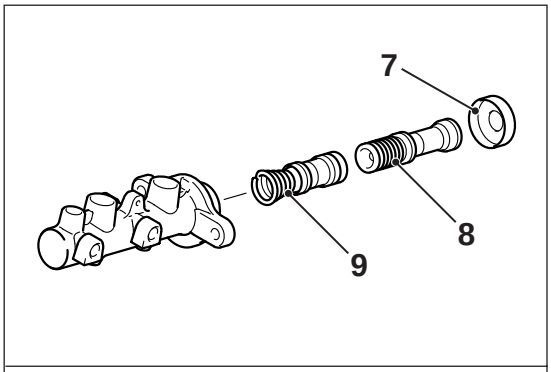
M1351004200580

DISASSEMBLY AND REASSEMBLY

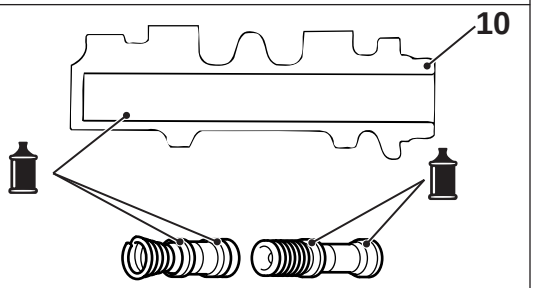
<Vehicles without ASC>



AC503739AB



Master cylinder kit



Brake fluid: DOT 3 or DOT 4

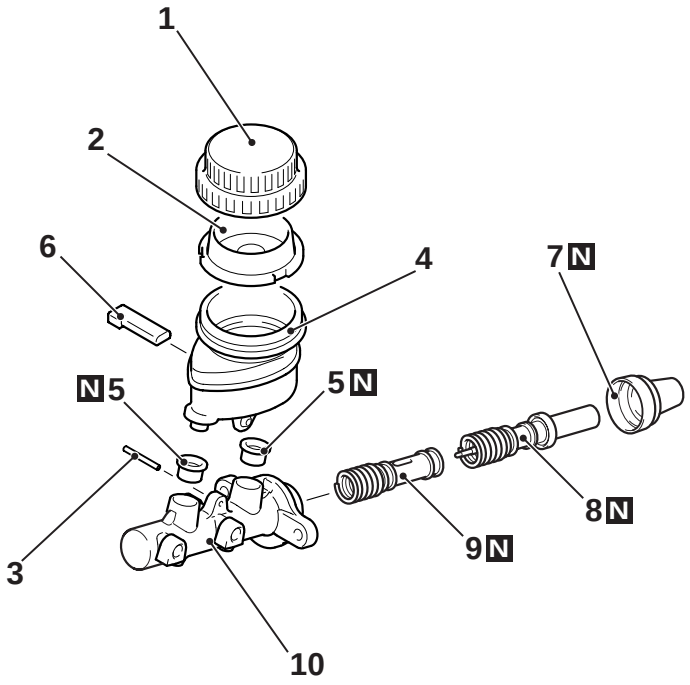
Disassembly steps

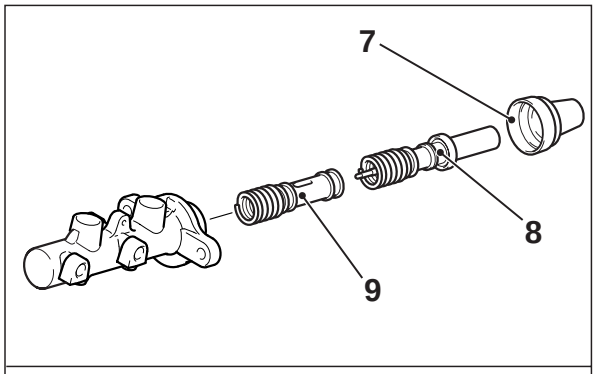
1. Reservoir cap
2. Diaphragm
3. pin
4. Reservoir
5. Reservoir seal

Disassembly steps (Continued)

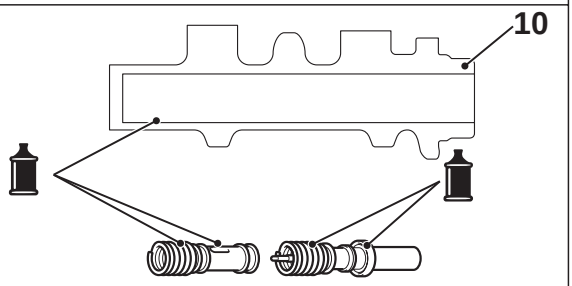
6. Brake fluid level switch
7. Piston retainer
8. Primary piston assembly
9. Secondary piston assembly
10. Master cylinder body

<Vehicles with ASC>





Master cylinder kit



Brake fluid: DOT 3 or DOT 4

AC508347AB

Disassembly steps

1. Reservoir cap
2. Diaphragm
3. pin
4. Reservoir
5. Reservoir seal
6. Brake fluid level switch
7. Piston retainer
8. Primary piston assembly
9. Secondary piston assembly
10. Master cylinder body

INSPECTION

M1351004300413

- Check the inner surface of master cylinder body for rust or pitting.
- Check the primary and secondary pistons for rust, scoring, wear or damage.
- Check the diaphragm for cracks and wear.

LOAD-SENSING PROPORTIONING VALVE

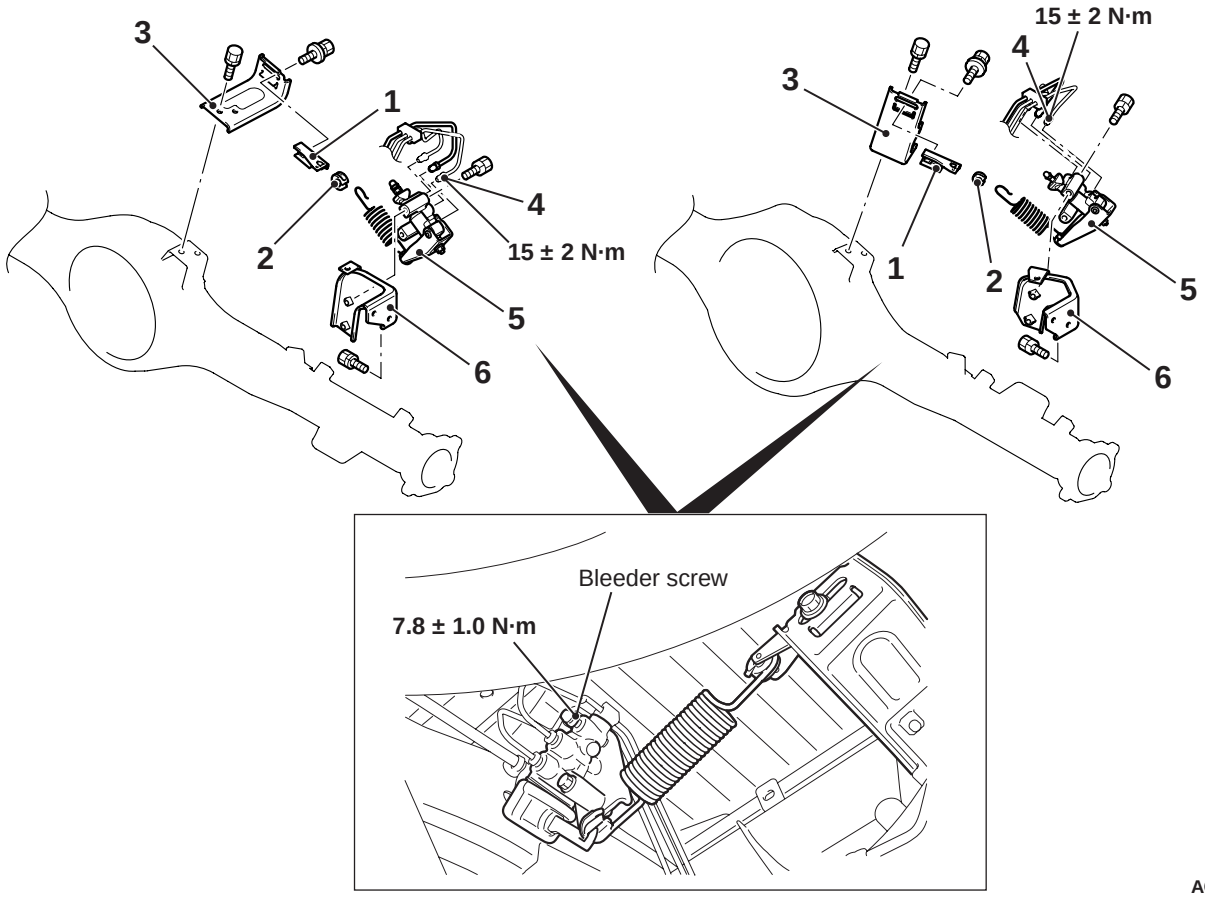
REMOVAL AND INSTALLATION

M1351005400134

Pre-removal Operation	Post-installation Operation
Brake fluid draining	• Brake fluid supplying and air bleeding (Refer to P.35A-10). • Load sensing spring length check (Refer to P.35A-10).

<2WD (except High rider)>

<2WD (High rider), 4WD>



ACA00566AB

Removal steps

1. Spring support
2. Spring holder
3. Bracket

Removal steps (Continued)

4. Brake tube connection
5. Load sensing proportioning valve
6. Bracket

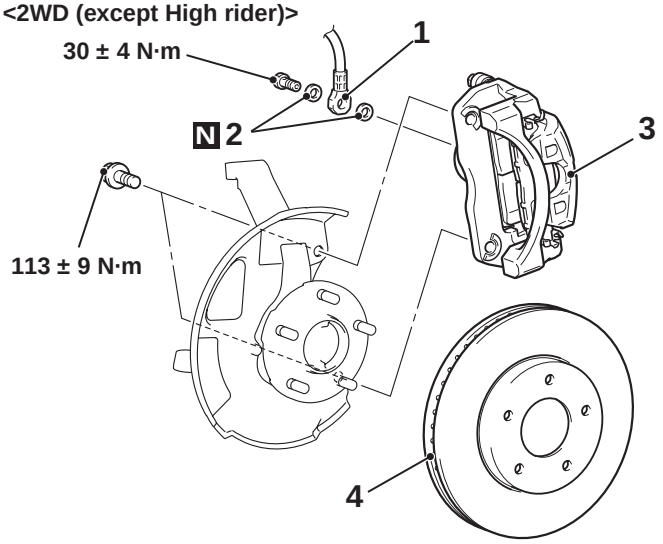
FRONT DISC BRAKE ASSEMBLY

REMOVAL AND INSTALLATION

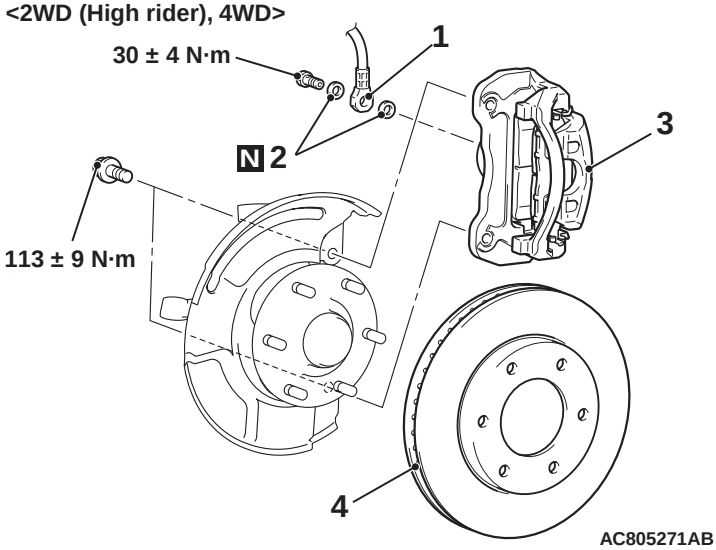
M1351006001693

Pre-removal operation	Post-installation operation
Brake Fluid Draining	Brake Fluid Supplying and Air Bleeding (Refer to P.35A-10).

<2WD (except High rider)>



<2WD (High rider), 4WD>



AC805271AB

Removal steps

1. Brake hose connection
2. Brake fluid line gasket
3. Front brake caliper assembly
   - Brake disc run-out check and correction (only at installation) (Refer to P.35A-14).
4. Front brake disc

INSPECTION

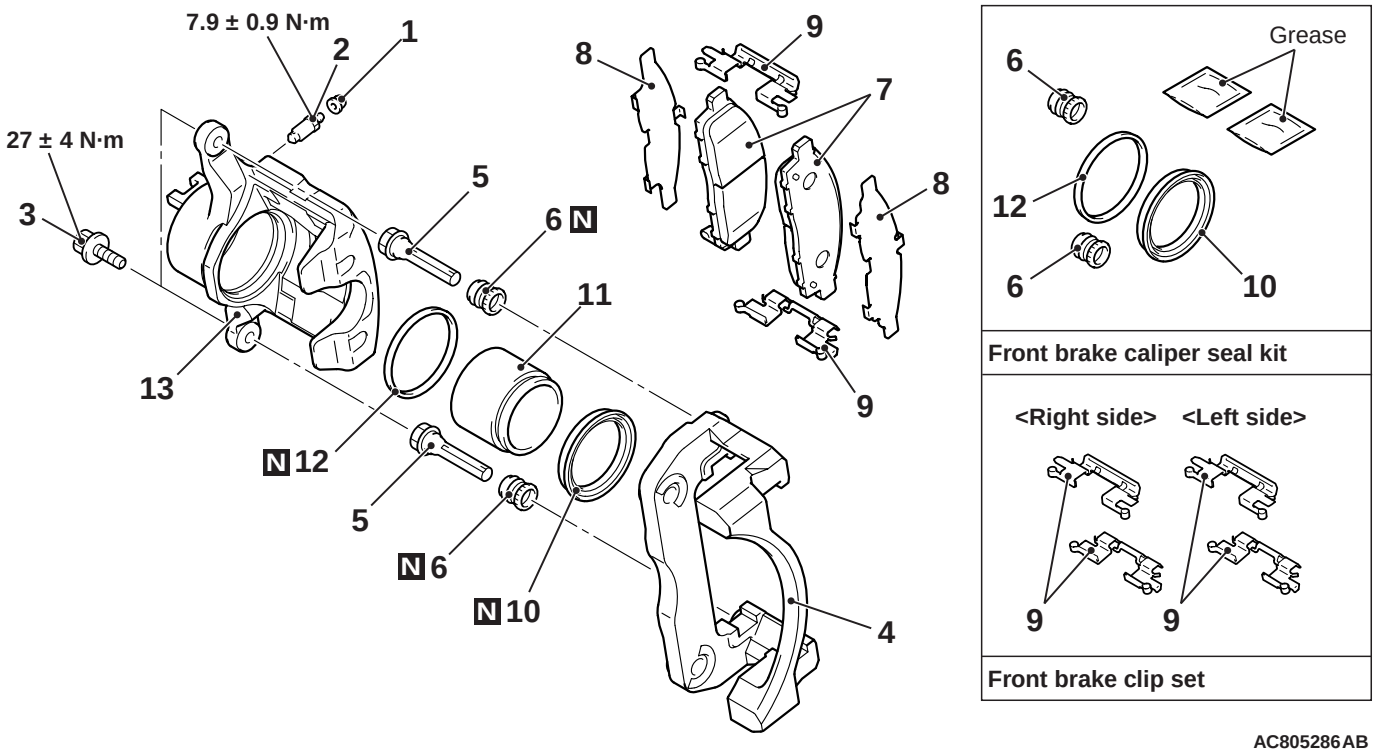
M1351006100501

BRAKE DISC CHECK

Disc wear (Refer to P.35A-14).
Disc run-out (Refer to P.35A-14).

DISASSEMBLY AND REASSEMBLY <2WD (except High rider)>

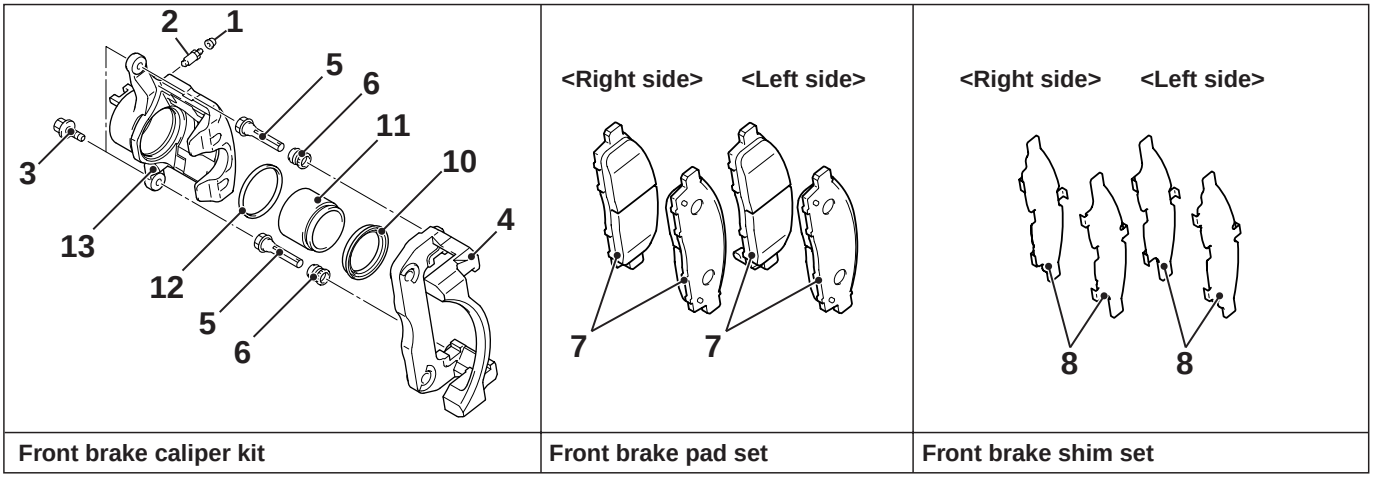
M1351006202098



Front brake caliper seal kit

Front brake clip set

AC805286AB



Front brake caliper kit | Front brake pad set | Front brake shim set

Disassembly steps

1. Bleeder cap
2. Bleeder
3. Pin bolt
4. Caliper support (including pad, clip, and shim)
5. Pin
6. Pin boot
7. Brake pad assembly
8. Shim
9. Clip

<<**A**>> 10. Piston boot
<<**A**>> 11. Piston

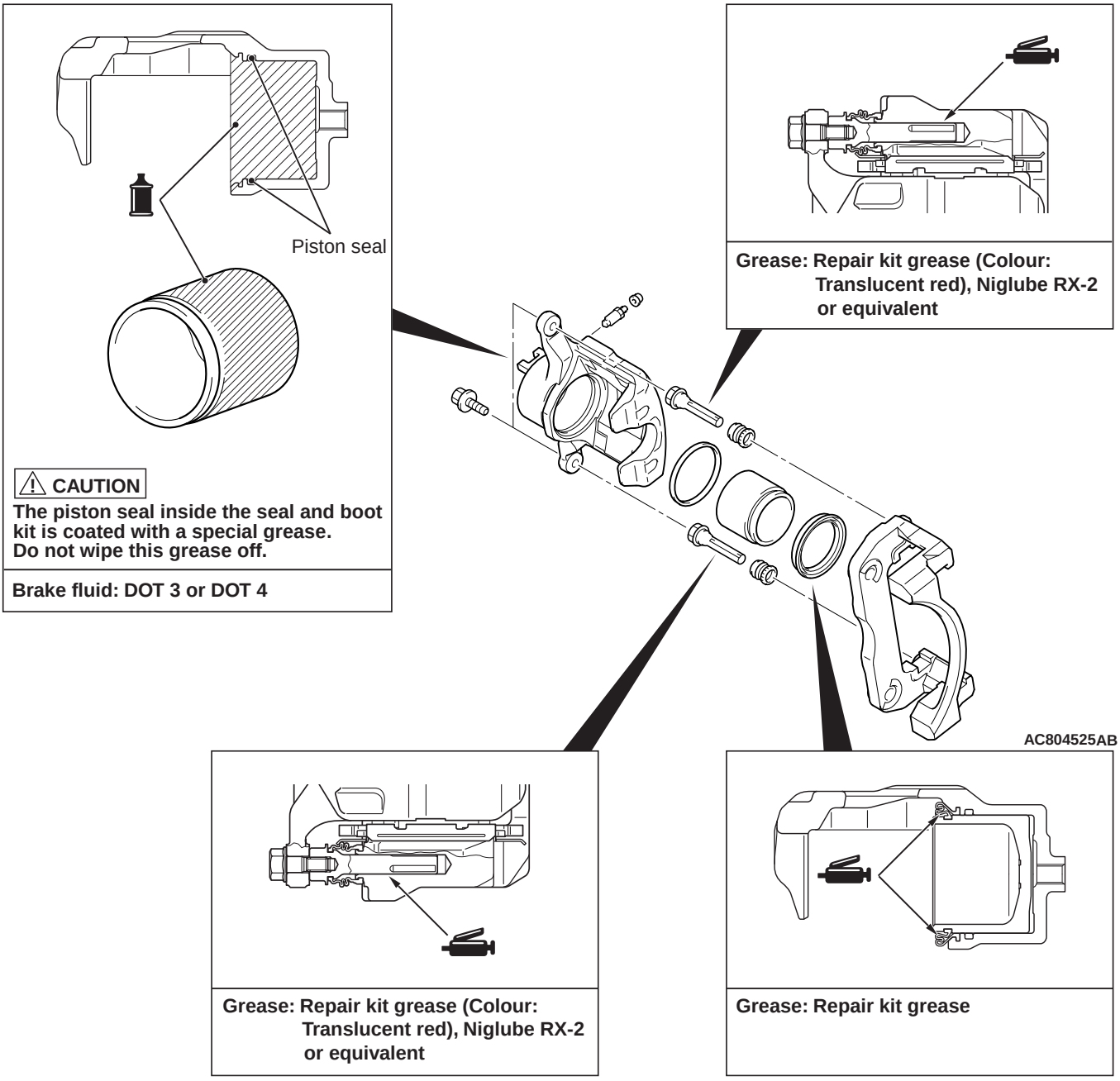
Disassembly steps (Continued)

<<**B**>> 12. Piston seal
13. Caliper body

NOTE:

- *The brake pad assembly with wear indicator is installed only to the inner side of the brake disc of the left-side brake at factory.*
- *Install the brake pad assembly (with wear indicator) to the inner side of the brake disc, making sure that the wear indicator is located on the bottom.*

LUBRICATION POINTS



⚠ CAUTION
The piston seal inside the seal and boot kit is coated with a special grease. Do not wipe this grease off.

Brake fluid: DOT 3 or DOT 4

Grease: Repair kit grease (Colour: Translucent red), Niglube RX-2 or equivalent

Grease: Repair kit grease (Colour: Translucent red), Niglube RX-2 or equivalent

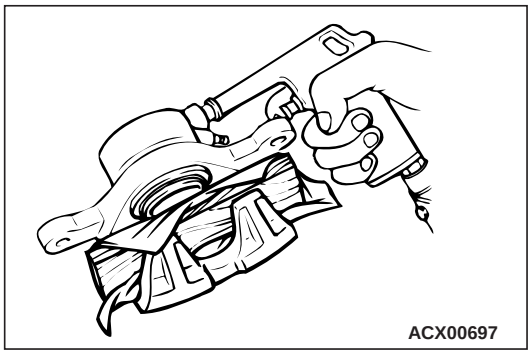
Grease: Repair kit grease

DISASSEMBLY SERVICE POINTS

When disassembling the disc brakes, disassemble both sides (left and right) as a set.

<<A>> PISTON BOOT/PISTON REMOVAL

⚠ CAUTION



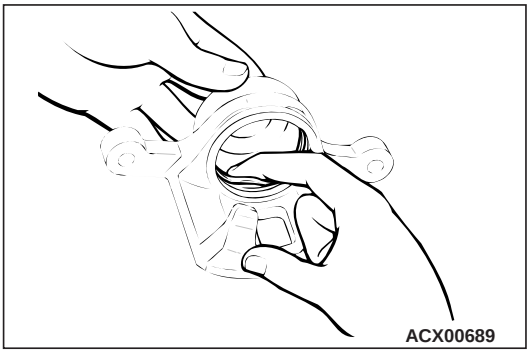
Blow air little by little to remove the piston. The piston will rush out if a force of air is applied suddenly.

Place a piece of wood, etc. against the caliper body as shown. Blow compressed air through the brake hose to remove the piston boot and piston.

<<B>> PISTON SEAL REMOVAL

⚠ CAUTION

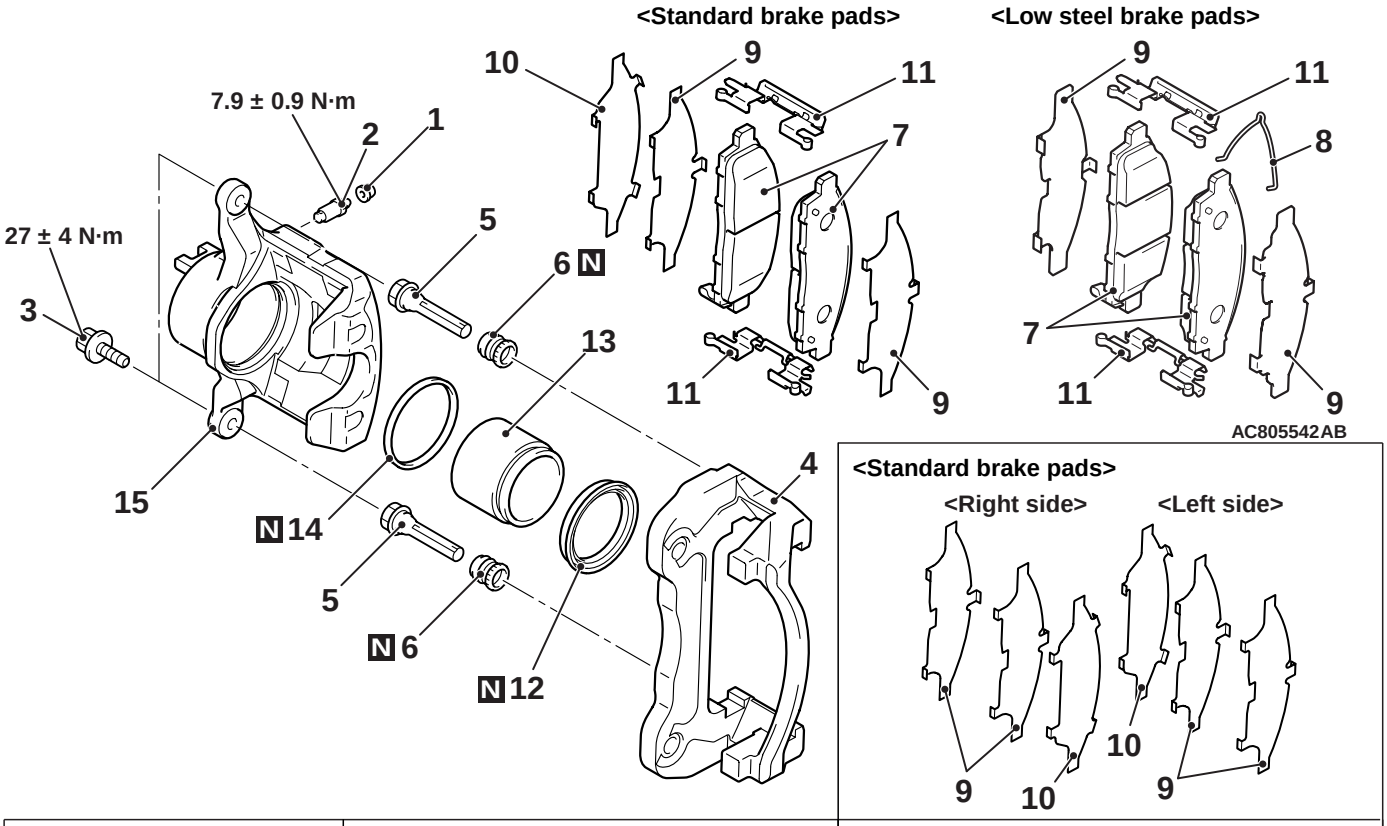
Do not use a flat-tipped screwdriver or similar tool to remove piston seal. These may damage the inner side of the cylinder.

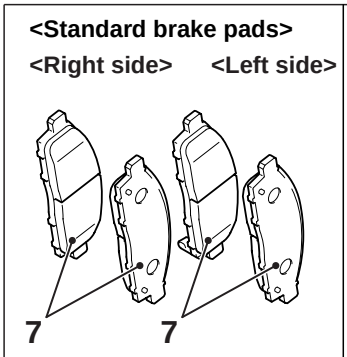


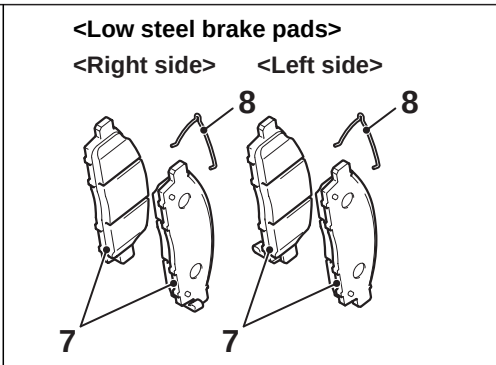
1. Remove the piston seal with your finger tip.
2. Clean the piston surface and inner cylinder with alcohol or brake fluid DOT 3 or DOT 4.

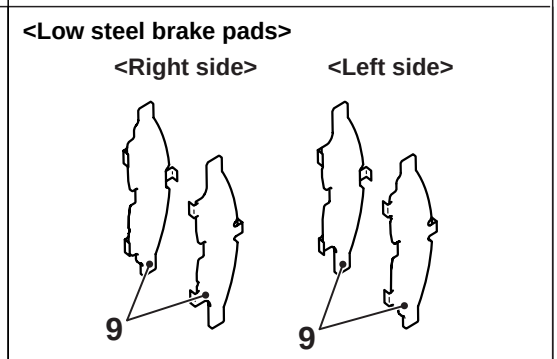
DISASSEMBLY AND REASSEMBLY <2WD (High rider), 4WD>

M1351006202087



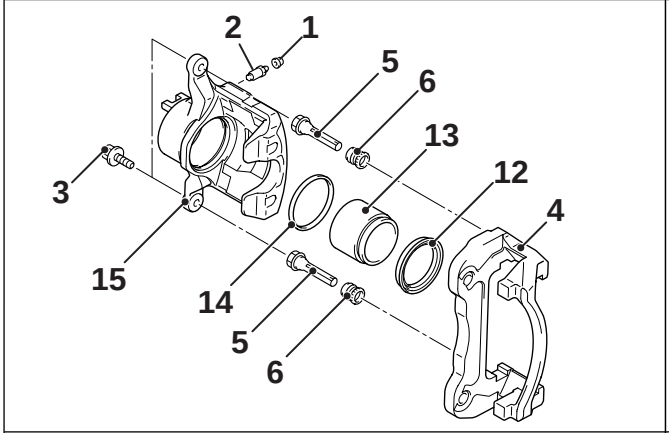


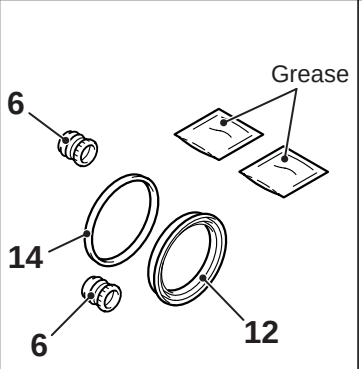


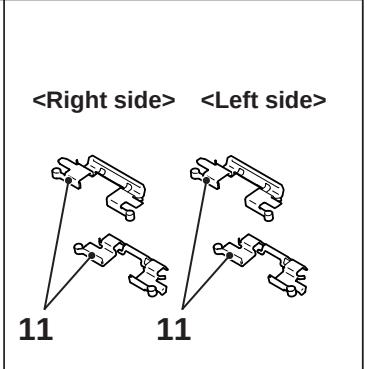


Front brake pad set

Front brake shim set







Front brake caliper kit

Front brake caliper seal kit

Front brake clip set

Disassembly steps

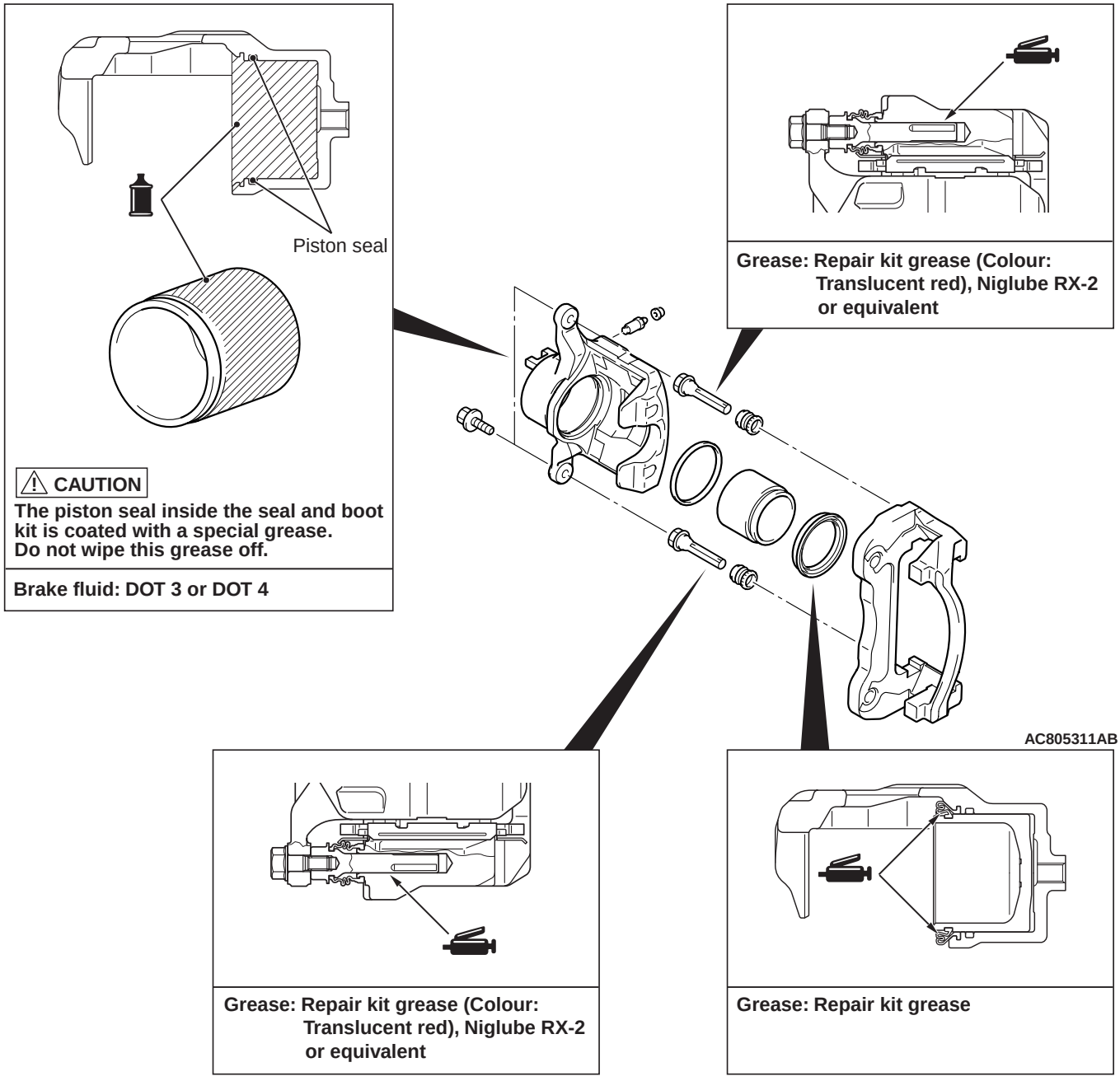
1. Bleeder cap
2. Bleeder
3. Pin bolt
4. Caliper support (including pad, clip, and shim)
5. Pin
6. Pin boot
7. Brake pad assembly
8. V spring
9. Shim
10. Shim cover
11. Clip

<<**A**>> 12. Piston boot
<<**A**>> 13. Piston
<<**B**>> 14. Piston seal
15. Caliper body

NOTE:

- *The brake pad assembly with wear indicator is installed only to the inner side of the brake disc of the left-side brake at factory.*
- *As for the accessory pad set, the brake pad with wear indicator has been established to the inner side of the brake disc on both right side brake and left side brake. <Vehicles with low steel brake pads>*
- *Install the brake pad assembly (with wear indicator) to the inner side of the brake disc, making sure that the wear indicator is located on the bottom.*

LUBRICATION POINTS

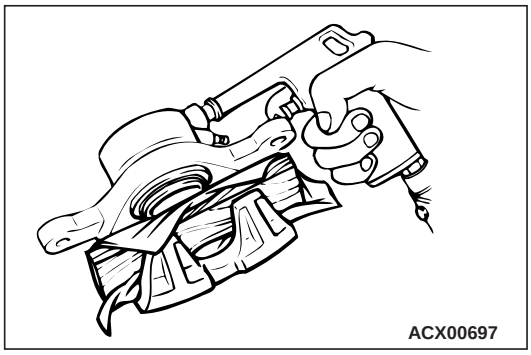


DISASSEMBLY SERVICE POINTS

When disassembling the disc brakes, disassemble both sides (left and right) as a set.

<<A>> PISTON BOOT/PISTON REMOVAL

⚠ CAUTION



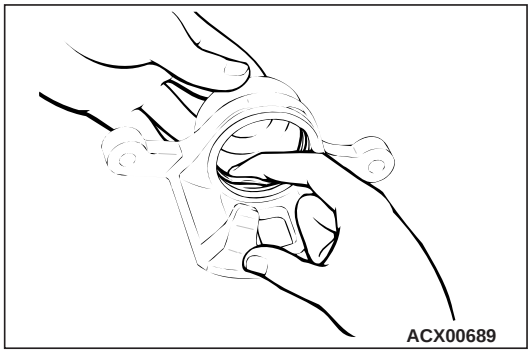
Blow air little by little to remove the piston. The piston will rush out if a force of air is applied suddenly.

Place a piece of wood, etc. against the caliper body as shown. Blow compressed air through the brake hose to remove the piston boot and piston.

<<B>> PISTON SEAL REMOVAL

⚠ CAUTION

Do not use a flat-tipped screwdriver or similar tool to remove piston seal. These may damage the inner side of the cylinder.



1. Remove the piston seal with your finger tip.
2. Clean the piston surface and inner cylinder with alcohol or brake fluid DOT 3 or DOT 4.

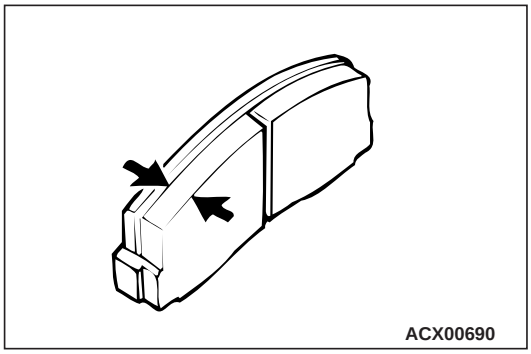
INSPECTION

M1351006300709

BRAKE PAD WEAR INSPECTION

⚠ CAUTION

- **When replacing, replace both brake pad assembly (right and left) as a set.**
- **If there is a significant difference in thickness between the brake pads at right and left, check the sliding area of the brake caliper.**



Measure the brake pad thickness at the most worn area. If the brake pad thickness is less than the limit value, replace the brake pad.

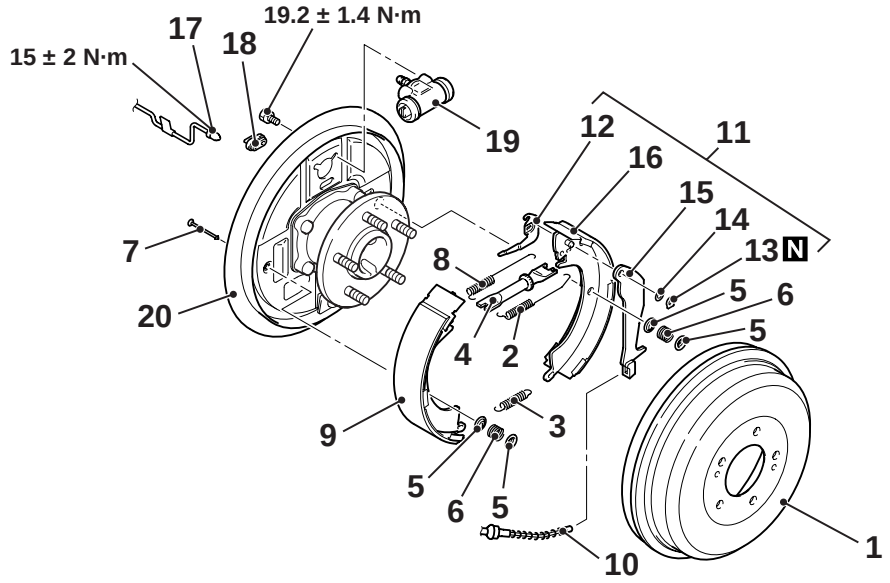
Standard value: 9.5 mm
Limit: 1.5 mm

REAR DRUM BRAKE

REMOVAL AND INSTALLATION <2WD (except High rider)>

M1351007500933

Pre-removal Operation	Post-installation Operation
• Loosening the parking brake cable adjusting nut (Refer to GROUP 36 – On-vehicle Service, Parking Brake Lever Stroke Check and Adjustment). • Brake fluid draining	• Brake fluid filling and air bleeding (Refer to P.35A-10). • Parking brake lever stroke adjustment (Refer to GROUP 36 – On-vehicle Service, Parking Brake Lever Stroke Check and Adjustment).<Vehicles with front separate seat> • Parking brake pull rod stroke adjustment (Refer to GROUP 36 – On-vehicle Service, Parking Brake Pull Rod Stroke Adjustment).<Vehicles with front bench seat>



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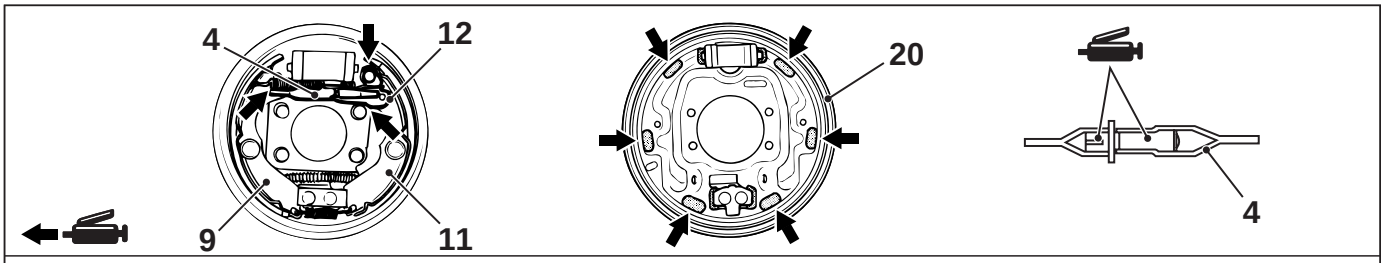


Specified grease: Hyrex No.2 or equivalent

Removal steps

1. Brake drum
2. Shoe-to-shoe spring
3. Retainer spring
4. Auto adjuster assembly
5. Shoe hold-down cup
6. Shoe hold-down spring
7. Shoe hold-down pin
8. Shoe-to-lever spring
9. Shoe and lining assembly
10. Parking brake cable connection
11. Shoe and lever assembly
12. Adjuster lever

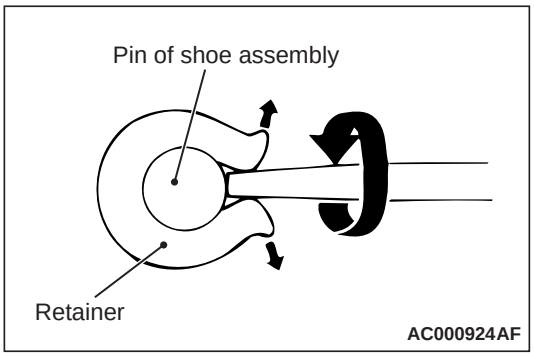
<<A>> >>B<< 13. Retainer

Removal steps (Continued)

>>A<< 14. Wave washer
15. Parking lever
16. Shoe and lining assembly
17. Brake pipe connection
18. Plug
19. Wheel cylinder assembly
20. Backing plate (Refer to GROUP 27 – Axle Shaft Assembly).

REMOVAL SERVICE POINT

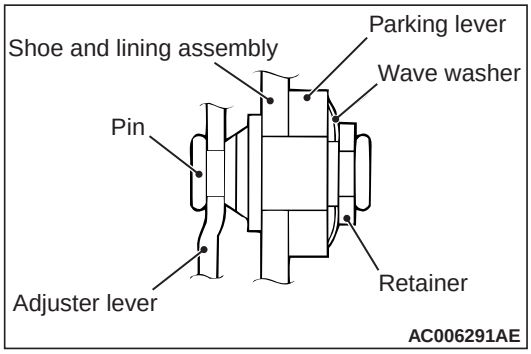
<<A>> RETAINER REMOVAL



Use a flat-tipped screwdriver or a similar tool to open up the retainer joint. Then remove the retainer.

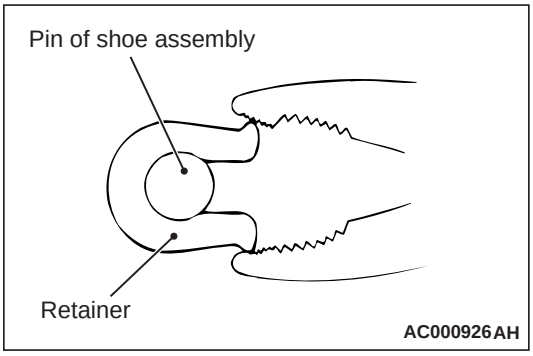
INSTALLATION SERVICE POINTS

>>A<< WAVE WASHER INSTALLATION



Install the wave washer in the direction shown in the illustration.

>>B<< RETAINER INSTALLATION

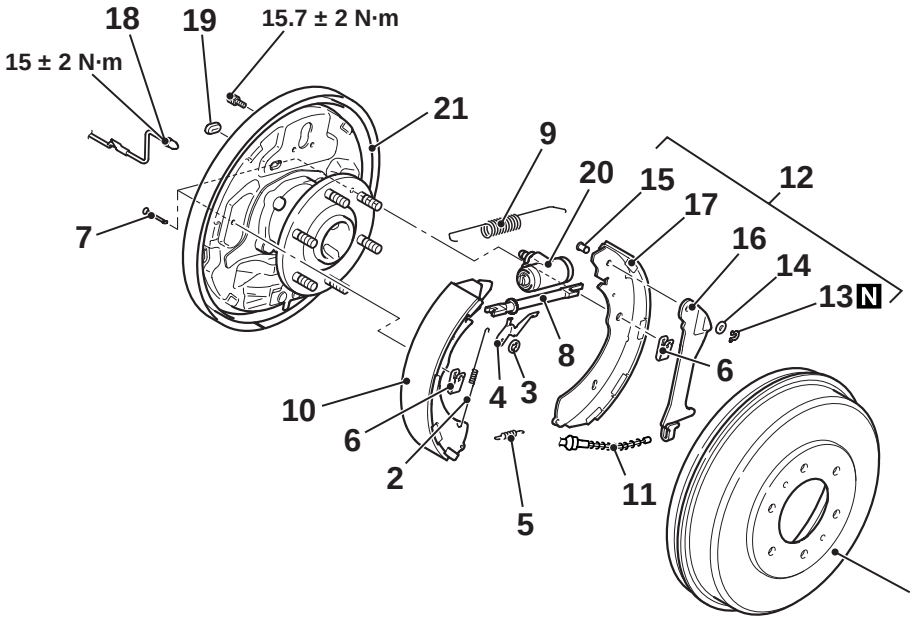


Use pliers or a similar tool to close the retainer end onto the pin.

REMOVAL AND INSTALLATION <2WD (High rider), 4WD>

M1351007500944

Pre-removal Operation	Post-installation Operation
• Loosening the parking brake cable adjusting nut (Refer to GROUP 36 – On-vehicle Service, Parking Brake Lever Stroke Check and Adjustment). • Brake fluid draining	• Brake fluid filling and air bleeding (Refer to P.35A-10). • Parking brake lever stroke adjustment (Refer to GROUP 36 – On-vehicle Service, Parking Brake Lever Stroke Check and Adjustment).<Vehicles with front separate seat> • Parking brake pull rod stroke adjustment (Refer to GROUP 36 – On-vehicle Service, Parking Brake Pull Rod Stroke Adjustment).<Vehicles with front bench seat>



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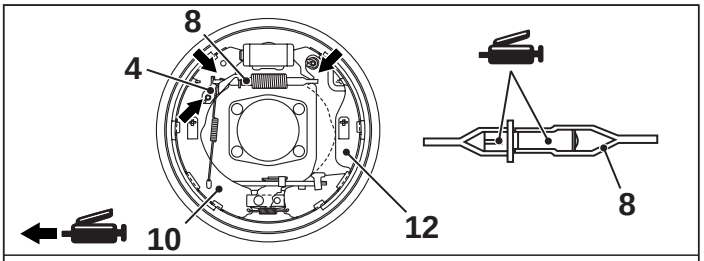
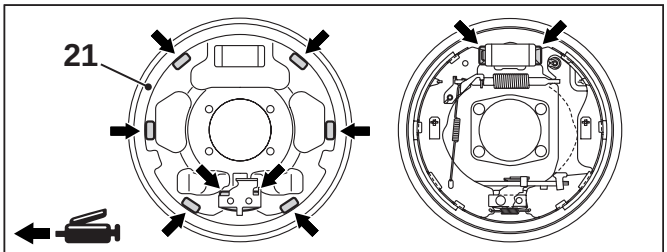


Specified grease: Cosmo rubber grease or equivalent



Specified grease: Solvest 842M or Molycort 44MA or equivalent

Removal steps

1. Brake drum
2. Shoe lever spring
3. Snap ring
4. Adjuster lever
5. Anchor spring
6. Shoe hold-down spring
7. Shoe hold-down pin
8. Auto adjuster assembly
9. Piston spring
10. Shoe and lining assembly
11. Parking brake cable connection
12. Shoe and lever assembly

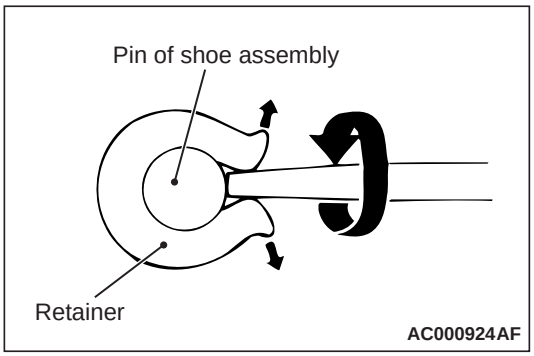
<<A>> >>B<< 13. Retainer

Removal steps (Continued)

>>A<< 14. Wave washer
15. Pin
16. Parking brake lever
17. Shoe and lining assembly
18. Brake pipe connection
19. Plug
20. Wheel cylinder assembly
21. Backing plate (Refer to GROUP 27 – Axle Shaft Assembly).

REMOVAL SERVICE POINT

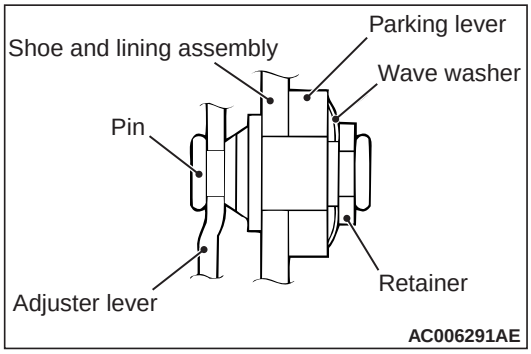
<<A>> RETAINER REMOVAL



Use a flat-tipped screwdriver or a similar tool to open up the retainer joint. Then remove the retainer.

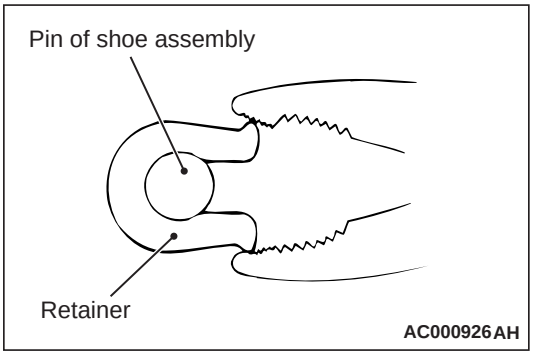
INSTALLATION SERVICE POINTS

>>A<< WAVE WASHER INSTALLATION



Install the wave washer in the direction shown in the illustration.

>>B<< RETAINER INSTALLATION



Use pliers or a similar tool to close the retainer end onto the pin.

INSPECTION

M1351007600190

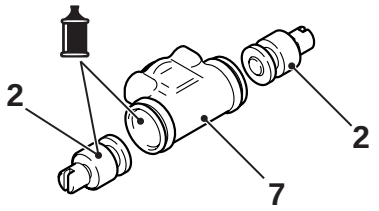
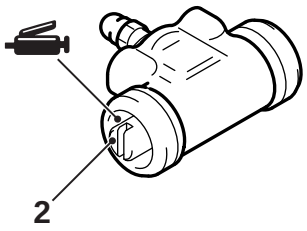
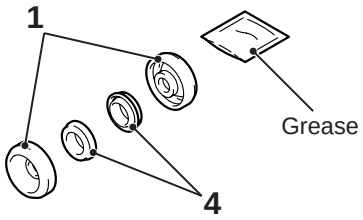
BRAKE LINING THICKNESS CHECK
Refer to P.35A-17.

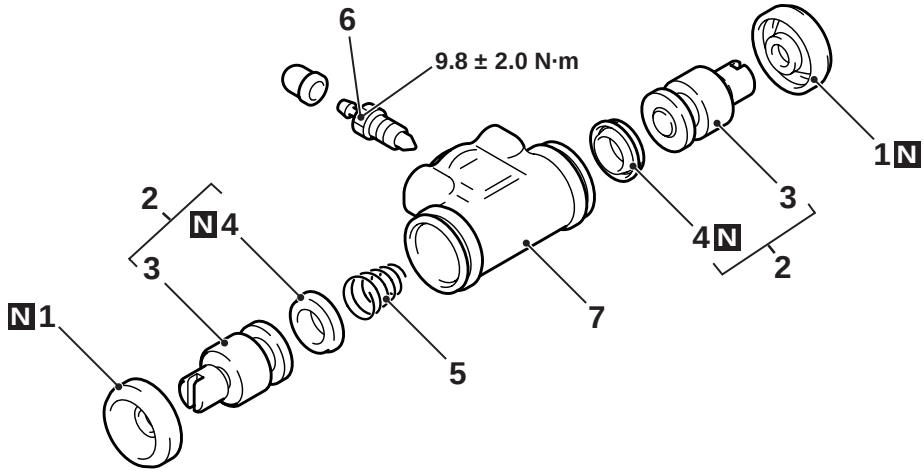
BRAKE DRUM INSIDE DIAMETER CHECK
Refer to P.35A-17.

BRAKE LINING AND BRAKE DRUM CONTACT CHECK
Refer to P.35A-17.

DISASSEMBLY AND REASSEMBLY <2WD (except High rider)>

M1351007700711

		
Brake fluid: DOT 3 or DOT 4	**Grease: Repair kit grease, Hyrex No.2 or equivalent**	**Wheel cylinder repair kit**



AC903970AB

Disassembly steps

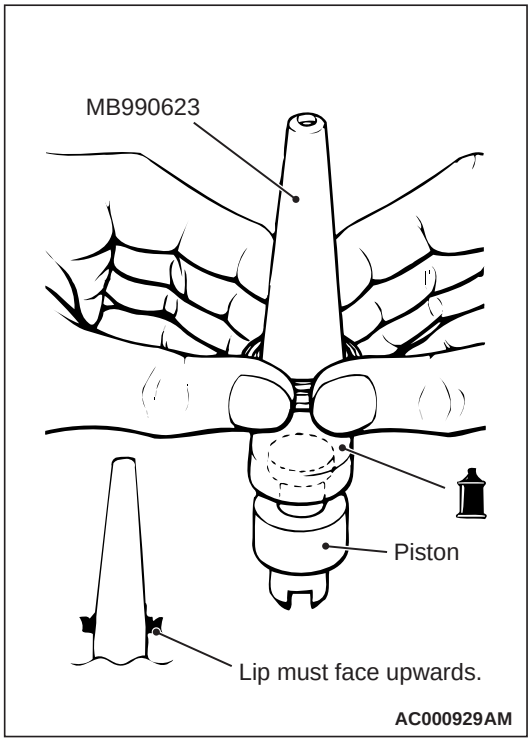
1. Boots
2. Piston assembly
>>**A**<< 3. Piston
>>**A**<< 4. Piston cup
5. Spring
6. Bleeder screw
7. Wheel cylinder body

REASSEMBLY SERVICE POINT

>>A<< PISTON CUP/PISTON ASSEMBLY

1. Use brake fluid DOT 3 or DOT 4 to clean the wheel cylinder and the piston.

⚠ CAUTION

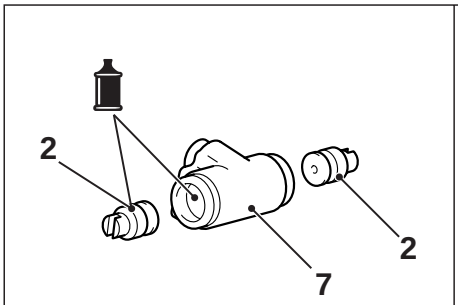


In order to keep the piston cup from becoming twisted or slanted, slide the piston cup down special tool MB990623 slowly and carefully, without stopping.

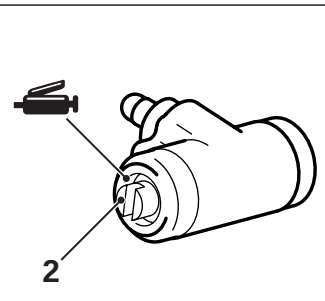
2. Apply brake fluid DOT 3 or DOT 4 to the piston cups and special tool installer (MB990623).
3. Set the piston cup on special tool with the lip of the cup facing up. Fit the cup onto special tool, and then slide it down the outside of special tool into the piston groove.

DISASSEMBLY AND REASSEMBLY <2WD (High rider), 4WD>

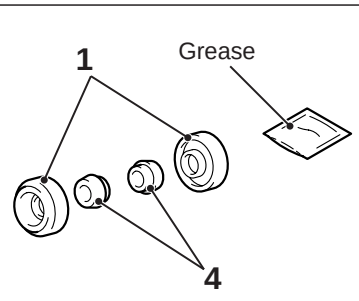
M1351007700722



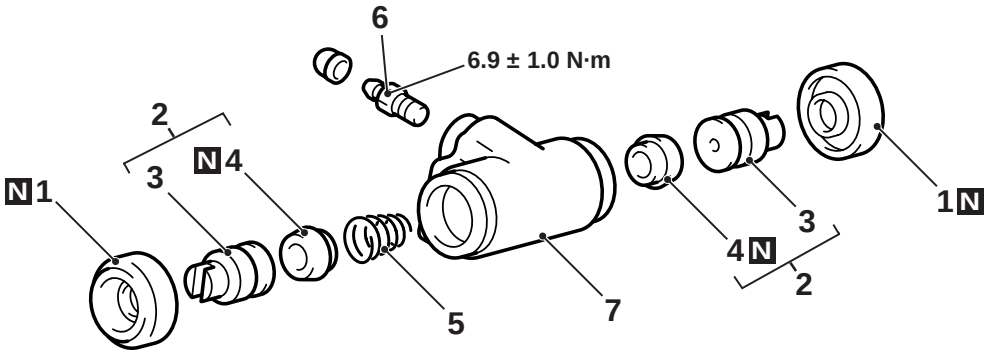
Brake fluid: DOT 3 or DOT 4



Grease: Repair kit grease



Wheel cylinder repair kit



Disassembly steps

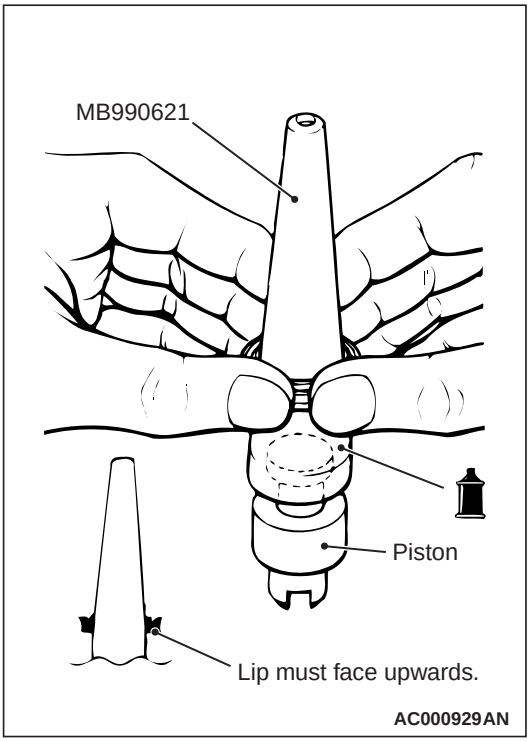
1. Boots
2. Piston assembly
>>A<< 3. Piston
>>A<< 4. Piston cup
5. Spring
6. Bleeder screw
7. Wheel cylinder body

REASSEMBLY SERVICE POINT

>>A<< PISTON CUP/PISTON ASSEMBLY

1. Use brake fluid DOT 3 or DOT 4 to clean the wheel cylinder and the piston.

⚠ CAUTION



In order to keep the piston cup from becoming twisted or slanted, slide the piston cup down special tool MB990621 slowly and carefully, without stopping.

2. Apply brake fluid DOT 3 or DOT 4 to the piston cups and special tool installer (MB990621).
3. Set the piston cup on special tool with the lip of the cup facing up. Fit the cup onto special tool, and then slide it down the outside of special tool into the piston groove.

INSPECTION

M1351007800309

Check the piston and wheel cylinder walls for rust, pitting, or damage. If there is any abnormality, replace the entire wheel cylinder assembly.

GROUP 35B

ANTI-SKID BRAKING SYSTEM (ABS)

CONTENTS

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- NOTES WITH REGARD TO DIAGNOSIS . 35B-8
- ABS WARNING LAMP INSPECTION. 35B-9
- DIAGNOSIS FUNCTION. 35B-9
- DIAGNOSIS CODE CHART 35B-14
- DIAGNOSIS CODE PROCEDURES 35B-16
- CODE NO. C1200, C1205, C1210, C1215 ABS SENSOR (OPEN CIRCUIT OR SHORT CIRCUIT) 35B-16
- CODE NO. C1201, C1206, C1211, C1216 ABS SENSOR. 35B-20
- CODE NO. C1202, C1207, C1212, C1217 WHEEL SPEED SENSOR SYSTEM MALFUNCTION (POWER CIRCUIT) 35B-26
- CODE NO. C1225 ABS SENSOR SYSTEM (OUTPUT SIGNAL MALFUNCTION). 35B-30
- CODE NO. C1226, C1231, C1236, C1241, C1246, C1251, C1256, C1261, C1278, C1279 CONTROL SOLENOID VALVE PRESSURE HOLDING SYSTEM 35B-31
- CODE NO. C1266, C1273, C1274 MOTOR SYSTEM 35B-32
- CODE NO. C1340 STOP LAMP SWITCH OPEN CIRCUIT 35B-35
- CODE NO. C1365 IMPROPER G-SENSOR POWER SUPPLY <4WD>. 35B-39
- CODE NO. C1381 G-SENSOR SYSTEM <4WD> 35B-42
- CODE NO. C1382, C1383 IMPLAUSIBLE G-SENSOR VOLTAGE VALUE <4WD> 35B-43
- CODE NO. C1860 ABS-ECU POWER SUPPLY HIGH VOLTAGE 35B-45
- CODE NO. C1861 ABS-ECU POWER SUPPLY LOW VOLTAGE 35B-47
- CODE NO. C1395 BRAKE FLUID NOT REFILLED 35B-50
- CODE NO. U1073 BUS OFF. 35B-50
- SYMPTOM CHART 35B-50
- SYMPTOM PROCEDURES 35B-51
- M.U.T.-III cannot communicate with ABS-ECU 35B-51
- ABS WARNING LAMP REMAINS ON AFTER ENGINE IS STARTED. 35B-52
- FAULTY ABS OPERATION 35B-53
- THE INITIAL CHECK SOUND OF HYDRAULIC UNIT LOUD. 35B-54
- DATA LIST REFERENCE TABLE. 35B-54
- ACTUATOR TEST REFERENCE TABLE . . 35B-54
- CHECK AT ECU TERMINAL. 35B-55

ON-VEHICLE SERVICE 35B-57

- WHEEL SPEED SENSOR OUTPUT CURRENT MEASUREMENT. 35B-57
- HYDRAULIC UNIT CHECK. 35B-57
- REMEDY FOR A DISCHARGED BATTERY 35B-59

HYDRAULIC UNIT 35B-60

HYDRAULIC UNIT REMOVAL AND INSTALLATION 35B-60

WHEEL SPEED SENSOR 35B-62

WHEEL SPEED SENSOR REMOVAL AND INSTALLATION. 35B-62

ABS SENSOR INSPECTION 35B-63

G-SENSOR <4WD> 35B-64

G-SENSOR REMOVAL AND INSTALLATION <4WD> 35B-64

G-SENSOR INSPECTION <4WD> 35B-65

GENERAL INFORMATION

M1352000101446

FEATURES

The ABS ensures directional stability and controllability during hard braking.
For vehicles with this type of ABS, 4 sensors are installed on front and rear wheels allowing independent left and right control.

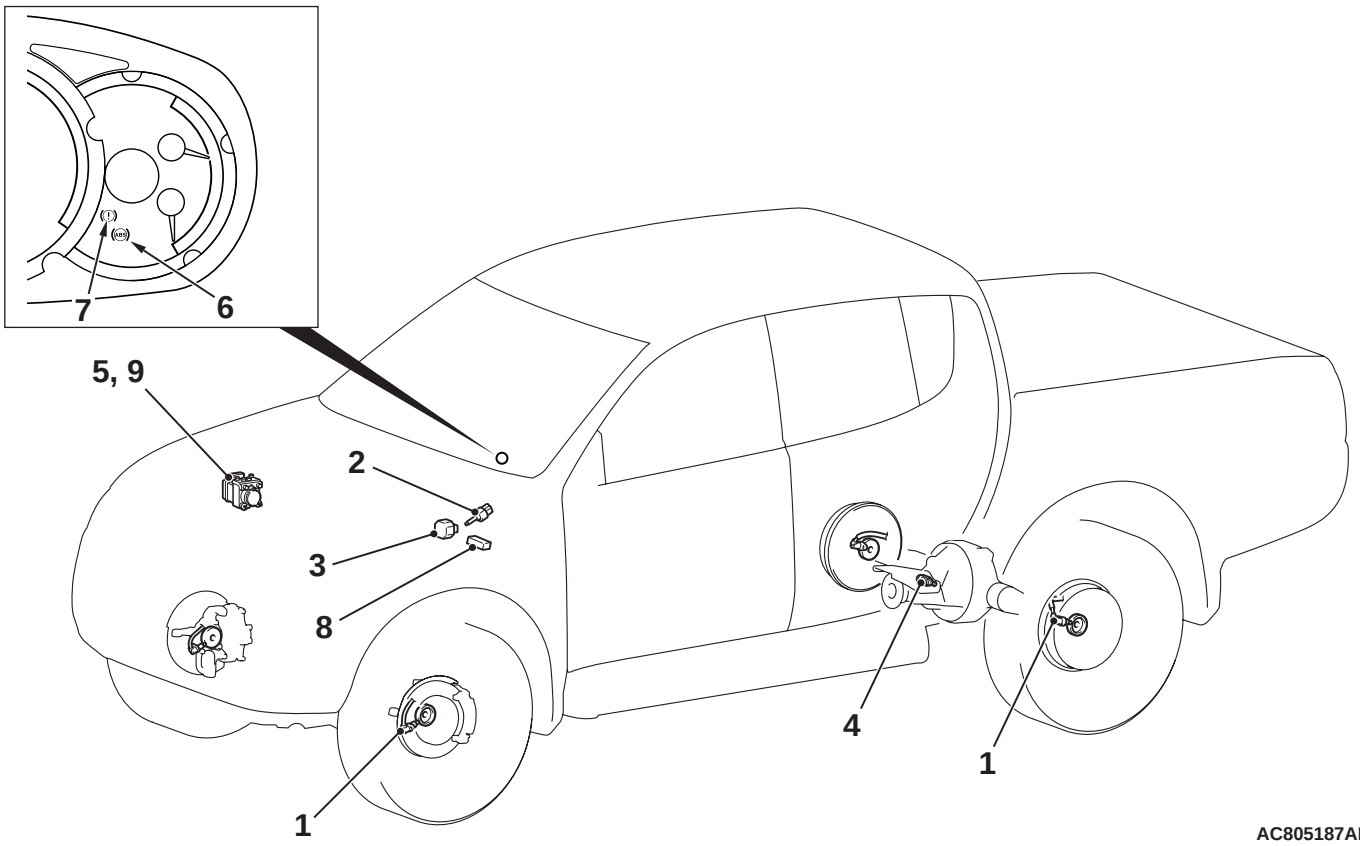
The system has the following features:

- EBD (Electronic Brake-force Distribution system) control has been added to provide the ideal braking force for the rear wheels.
- Fail-safe function which ensures that safety is maintained

SPECIFICATIONS

Item		Specification
ABS control method		4-sensor
No. of ABS rotor teeth	Front	47
	Rear	47
Wheel speed sensor	Type	Semiconductor

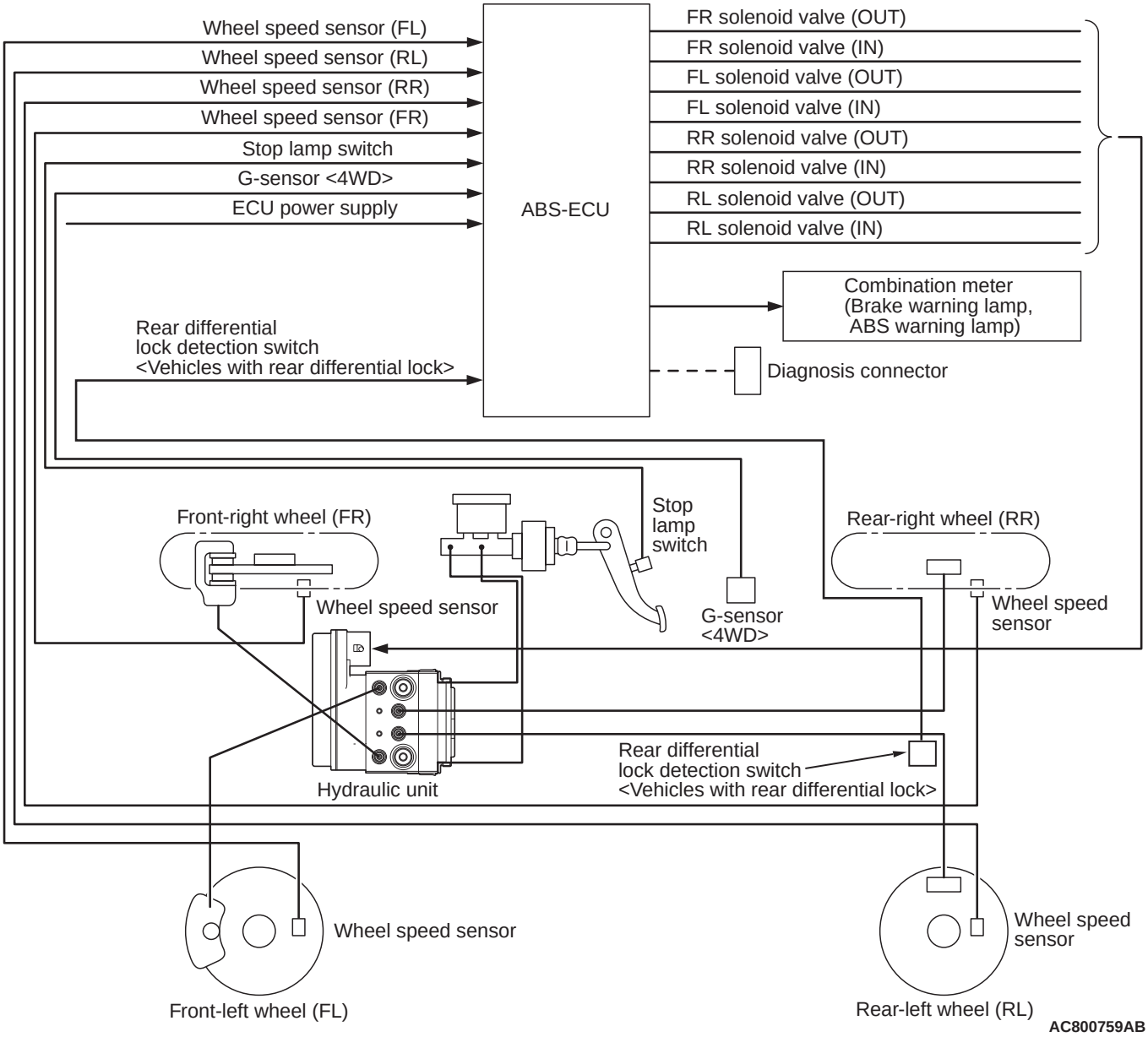
CONSTRUCTION DIAGRAM



AC805187AB

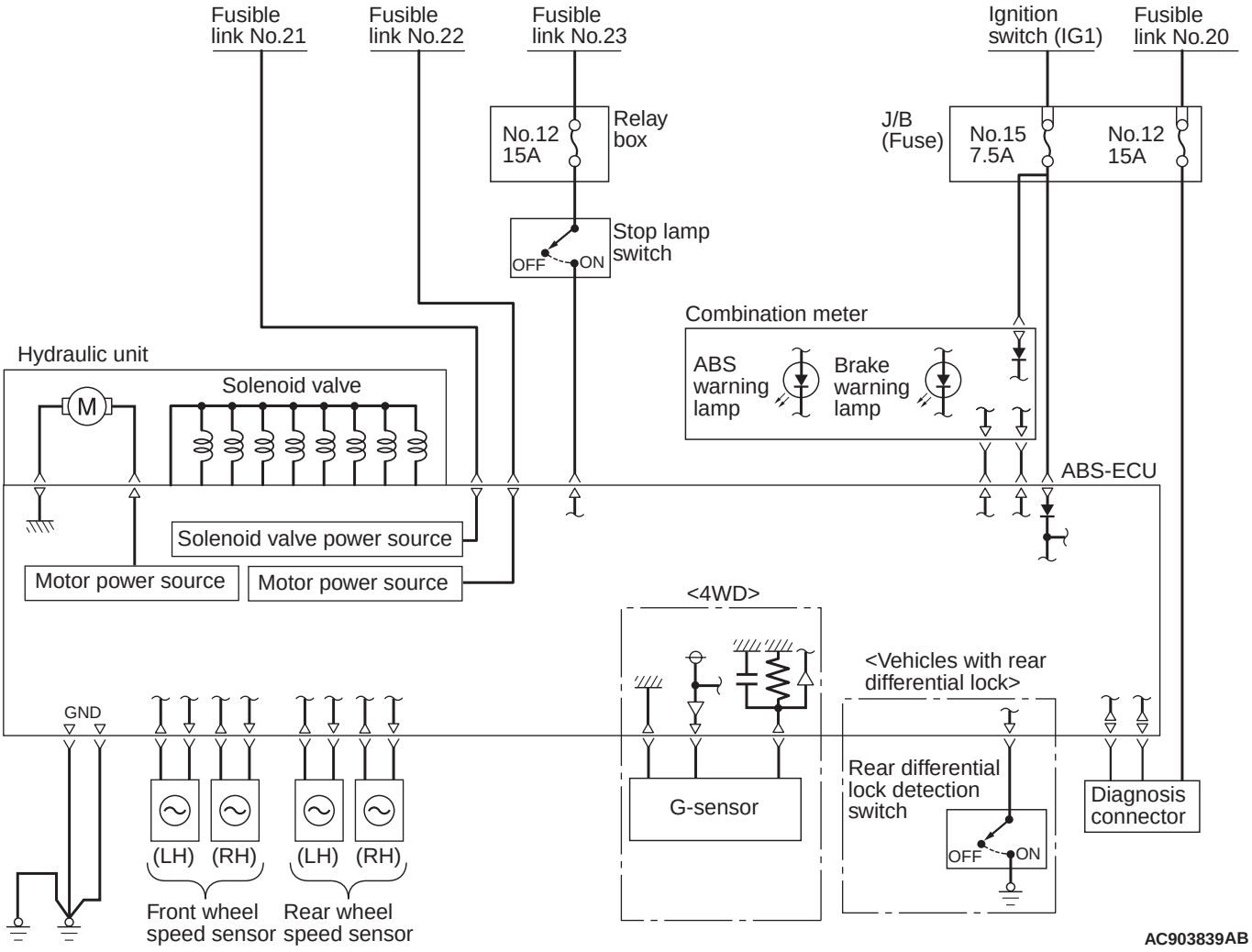
Name of part		Number	Outline of function
Sensor	Wheel speed sensor	1	Send alternating current signals at frequencies which are proportional to the rotation speeds of each wheel to the ABS-ECU.
	Stop lamp switch	2	Sends a signal to the ABS-ECU to indicate whether the brake pedal is depressed or not.
	G-sensor <4WD>	3	Detects acceleration in the travel direction of the vehicle and sends a signal that is converted to a voltage value to the ABS-ECU.
	Rear differential lock detection switch < Vehicles with rear differential lock>	4	ABS-ECU detects the rear differential lock state.
Actuator	Hydraulic unit	5	Drives the solenoid valves according to signals from the ABS-ECU in order to control the brake hydraulic pressure for each wheel.
	ABS warning lamp	6	Informs the driver of the system status by flash, illuminating or turning off the warning lamp according to the signal from ABS-ECU.
	Brake warning lamp	7	Used as the warning lamp for the parking brake, brake fluid level, and EBD control. For the EBD control, this warning lamp informs the driver of the system status by turning on and off the lamp according to the signal from ABS-ECU.
Diagnosis connector		8	Outputs the diagnosis codes and allows communication with the M.U.T.-III.
ABS-ECU		9	Controls actuators (described above) based on the signals coming from each sensor.
			Controls the self-diagnosis and fail-safe functions.
			Controls the diagnosis function (M.U.T-III compatible).

SYSTEM CONFIGURATION DIAGRAM



NOTE: Broken lines show CAN-bus line.

ABS ELECTRICAL CIRCUIT DIAGRAM



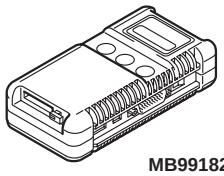
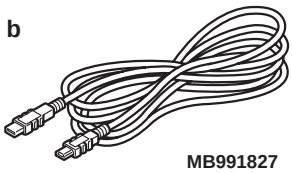
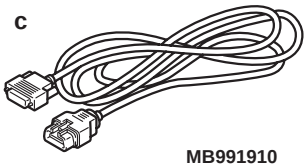
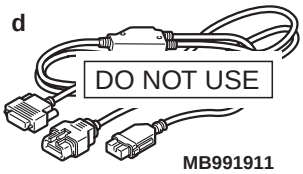
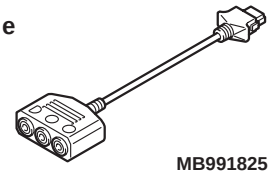
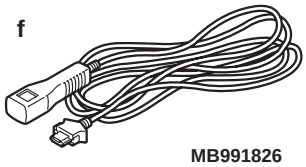
SERVICE SPECIFICATIONS

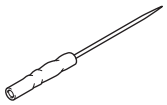
M1352000301150

Item		Standard value
Wheel speed sensor current mA		5 – 9 or 11 – 17
Wheel speed sensor insulation resistance MΩ		1.5 or more
G-sensor voltage V <4WD>	Stationary vehicles	2.4 – 2.6
	Arrow mark downward	3.55 – 3.95
	Power supply from the ABS-ECU	4.75 – 5.25

SPECIAL TOOLS

M1352000601850

Tool	Number	Name	Use
a  MB991824 b  MB991827 c  MB991910 d  MB991911 e  MB991825 f  MB991826 MB991955	MB991955 a. MB991824 b. MB991827 c. MB991910 d. MB991911 e. MB991825 f. MB991826	M.U.T.-III sub-assembly a. Vehicle Communication Interface (V. C. I.) b. M.U.T.-III USB cable c. M.U.T.-III main harness A (Vehicles with CAN communication system) d. M.U.T.-III main harness B (Vehicles without CAN communication system) e. M.U.T.-III measurement adapter f. M.U.T.-III trigger harness	⚠ CAUTION **For vehicles with CAN communication, use M.U.T.-III main harness A to send simulated vehicle speed. If you connect M.U.T.-III main harness B instead, the CAN communication does not function correctly.** ABS check (Diagnosis code display, and data list display by M.U.T.-III)

Tool	Number	Name	Use
	MB991709	Wiring harness set	Checking the ABS-ECU and output current measure at the wheel speed sensor
MB991348	MB991348	Test harness set	Checking the G-sensor <4WD>
 MB992006	MB992006	Extra fine probe	Continuity check and voltage measurement at harness wire or connector

TROUBLESHOOTING

STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING

M1352011100867

Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points .

NOTES WITH REGARD TO DIAGNOSIS

M1352012600296

1. The ABS is a system which controls the brake pressure by means of the operation of the ECU. Accordingly, the following symptoms may occur at times, but these are a sign of normal ABS operation, and do not indicate a malfunction.

Phenomenon	Explanation of phenomenon
When the engine starts, a knocking sound can be heard coming from the engine compartment.	This sound occurs as a result of system operation checking, and is not a malfunction.
• Sound of the motor inside the ABS hydraulic unit operation. (whine) • Sound is generated along with vibration of the brake pedal. (scraping) • When ABS operates, sound is generated from the vehicle chassis due to repeated brake application and release. (Thump: suspension; squeak: tyres)	This is the sound of normal system operation, and is not a malfunction.
Shocks are felt if the brake pedal is depressed when driving at low speed.	This is due to system operation checking (starting-of check when the vehicle speed reaches a certain number of km/h) and is not a malfunction.

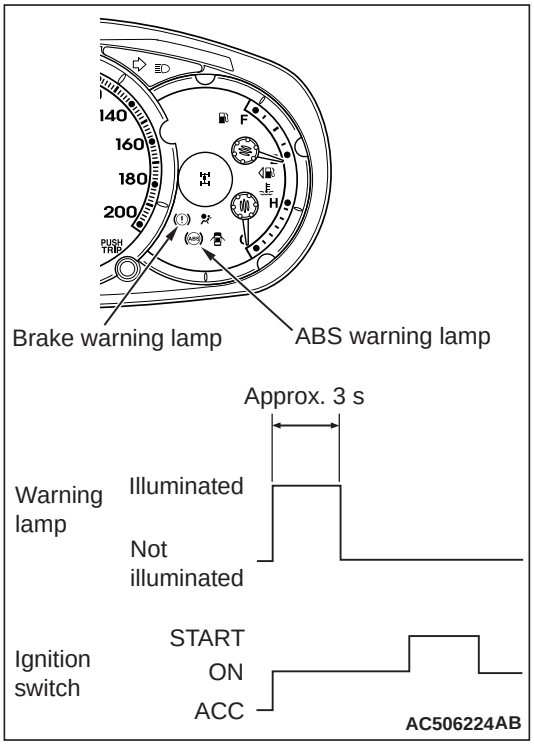
2. For road surfaces such as snow-covered roads and gravel roads, the braking distance for vehicles with ABS can sometimes be longer than that for other vehicles. Accordingly, advise the customer to drive safely on such roads by lowering the vehicle speed and not being too overconfident.
3. Diagnosis detection condition can vary depending on the diagnosis code. Make sure that checking requirements listed in the "Comment" are satisfied when checking the trouble symptom again.

ABS WARNING LAMP AND BRAKE WARNING LAMP CHECK

M1352012000799

Check that ABS and brake warning lamps illuminate as follows.

NOTE: The EBD warning lamp is also used as the brake warning lamp.



1. When the ignition switch is turned to the ON position, ABS and brake warning lamps illuminate.
2. The ABS and brake warning lamps illuminate for three seconds*1 and then turn OFF*2.
3. Otherwise, check the diagnosis code.

NOTE:

- **1: The ABS warning lamp may stay ON until the vehicle speed reaches 10 km/h. As far as ABS-ECU stores any diagnosis code related to the wheel speed sensor malfunction or the motor malfunction as past trouble, ABS-ECU continues illuminating the ABS warning lamp until it verifies that the malfunction for that code is resolved (startup check).*
- **2: The brake warning lamp does not turn OFF when the parking brake is applied or the brake fluid level is lowered.*

DIAGNOSIS FUNCTION

M1352011201696

ABS-ECU has the following functions for easier system checks. The following items can be diagnosed using M.U.T-III.

- Diagnosis code set (Refer to P.35B-14).
- Service data output (Refer to P.35B-54).
- Actuator test (Refer to P.35B-54).

CHECK OF FREEZE FRAME DATA

To detect fault and store the diagnosis code, the ABS-ECU obtains data before the confirmation of the diagnosis code and data when the diagnosis code is confirmed, and then stores the current condition of the ABS-ECU. By analysing each data from M.U.T.-III, the troubleshooting can be performed more efficiently. Display items of the freeze frame data are as follows.

Display item list

Item No.	Item name	Data item	Unit
02	Ignition cycle	Number of times the ignition switch is turned "ON" or "LOCK (OFF)" after the past failure transition.	Number of counts is displayed.
03	Elapsed time	Total elapsed time after a diagnosis code is generated	min*
04	Accumulated minute	Cumulative time for current malfunction of diagnosis code	min

*NOTE: *: Total elapsed time can be stored up to 65534 minutes. The display of M.U.T.-III is fixed to 65534 minutes after 65534 minutes have elapsed. Or, if the battery is disconnected, the total elapsed time cannot be measured properly. Thus, 65535 minutes (null value) is displayed. Since the value is calculated according to the information from the ABS-ECU, a proper value may not be displayed when the ABS-ECU time-out has occurred.*

FAIL-SAFE FUNCTION

If any malfunction is detected by the self-diagnostic function, ABS-ECU illuminates the ABS warning lamp and brake warning lamp*, and it disables ABS and EBD control.

*NOTE: *: The brake warning lamp is used as EBD control warning lamp.*

Illumination condition of warning lamp in case of failure

Diagnosis code No.	Item		Countermeasures for failure	
			Brake warning lamp	ABS warning lamp
C1200	Wheel speed sensor (FR)	Signal open circuit	Extinguished*1 Illuminated*2	Illuminated
C1205	Wheel speed sensor (FL)	Signal open circuit		
C1210	Wheel speed sensor (RR)	Signal open circuit		
C1215	Wheel speed sensor (RL)	Signal open circuit		
C1201	Wheel speed sensor (FR)	Signal short circuit	Extinguished*1 Illuminated*2	Illuminated
C1206	Wheel speed sensor (FL)	Signal short circuit		
C1211	Wheel speed sensor (RR)	Signal short circuit		
C1216	Wheel speed sensor (RL)	Signal short circuit		

Diagnosis code No.	Item		Countermeasures for failure	
			Brake warning lamp	ABS warning lamp
C1202	Wheel speed sensor (FR)	Malfunction power circuit	Extinguished[*1] Illuminated[*2]	Illuminated
C1207	Wheel speed sensor (FL)	Malfunction power circuit		
C1212	Wheel speed sensor (RR)	Malfunction power circuit		
C1217	Wheel speed sensor (RL)	Malfunction power circuit		
C1225[*3]	Wheel speed sensor malfunction	Abnormality in tyre size	Extinguished	Illuminated
C1226	Control solenoid valve (FR) pressure holding system		Illuminated	Illuminated
C1236	Control solenoid valve (FL) pressure holding system			
C1246	Control solenoid valve (RR) pressure holding system			
C1256	Control solenoid valve (RL) pressure holding system			
C1231	Control solenoid valve (FR) pressure reducing system		Illuminated	Illuminated
C1241	Control solenoid valve (FL) pressure reducing system			
C1251	Control solenoid valve (RR) pressure reducing system			
C1261	Control solenoid valve (RL) pressure reducing system			
C1266[*4]	Motor malfunction	Motor stick or open circuit	Illuminated	Illuminated
C1273[*4]	Motor relay malfunction	Open circuit	Illuminated	Illuminated
C1274	Motor relay malfunction	Short circuit	Illuminated	Illuminated
C1278	Valve relay malfunction	Open circuit	Illuminated	Illuminated
C1279	Valve relay malfunction	Short circuit	Illuminated	Illuminated
C1340	Stop lamp switch malfunction	Short circuit (short to power supply)	Extinguished	Illuminated
C1365[*5]	G-sensor malfunction	Power supply error	Extinguished	Illuminated
C1381[*5, *6]	G-sensor malfunction	Abnormal seizure or output error	Extinguished	Illuminated
C1382[*5]	G-sensor malfunction	Low voltage	Extinguished	Illuminated
C1383[*5]	G-sensor malfunction	High voltage	Extinguished	Illuminated

Diagnosis code No.	Item		Countermeasures for failure	
			Brake warning lamp	ABS warning lamp
C1860	ABS-ECU power supply system malfunction	high voltage	Illuminated	Illuminated
C1861	ABS-ECU power supply system malfunction	Low voltage	Illuminated	Illuminated
C1395	Brake fluid charging incompletion		Flashes	Flashes
U1073	Trouble in CAN bus system		Extinguished	Extinguished

NOTE:

- **1: Normality on rear wheels (both right or left)*
- **2: Abnormality on rear wheels (both right and left)*
- **3: This diagnosis code is not set within the vehicle speed of 30 km/h or less.*
- **4: This diagnosis code is not set within the vehicle speed of 10 km/h or less.*
- **5: 4WD*
- **6: This diagnosis code is not set within the vehicle speed of 30 km/h or less.*

Under EBD and ABS control in case of failure

Diagnosis code No.	Item		Countermeasures for failure	
			EBD control	ABS control
C1200	Wheel speed sensor (FR)	Open circuit	Executed*1 Prohibited*2	Prohibited
C1205	Wheel speed sensor (FL)	Open circuit		
C1210	Wheel speed sensor (RR)	Open circuit		
C1215	Wheel speed sensor (RL)	Open circuit		
C1201	Wheel speed sensor (FR) system	Short circuit	Executed*1 Prohibited*2	Prohibited
C1206	Wheel speed sensor (FL) system	Short circuit		
C1211	Wheel speed sensor (RR) system	Short circuit		
C1216	Wheel speed sensor (RL) system	Short circuit		
C1202	Wheel speed sensor (FR)	Malfunction power circuit	Executed*1 Prohibited*2	Prohibited
C1207	Wheel speed sensor (FL)	Malfunction power circuit		
C1212	Wheel speed sensor (RR)	Malfunction power circuit		
C1217	Wheel speed sensor (RL)	Malfunction power circuit		

Diagnosis code No.	Item		Countermeasures for failure	
			EBD control	ABS control
C1225*3	Wheel speed sensor malfunction	Abnormality in tyre size	Executed	Prohibited
C1226	Control solenoid valve (FR) pressure holding system		Prohibited	Prohibited
C1236	Control solenoid valve (FL) pressure holding system			
C1246	Control solenoid valve (RR) pressure holding system			
C1256	Control solenoid valve (RL) pressure holding system			
C1231	Control solenoid valve (FR) pressure reducing system		Prohibited	Prohibited
C1241	Control solenoid valve (FL) pressure reducing system			
C1251	Control solenoid valve (RR) pressure reducing system			
C1261	Control solenoid valve (RL) pressure reducing system			
C1266*4	Motor malfunction	Motor stick or open circuit	Prohibited	Prohibited
C1273*4	Motor relay malfunction	Open circuit	Prohibited	Prohibited
C1274	Motor relay malfunction	Short circuit	Prohibited	Prohibited
C1278	Valve relay malfunction	Open circuit	Prohibited	Prohibited
C1279	Valve relay malfunction	Short circuit	Prohibited	Prohibited
C1340	Stop lamp switch malfunction	Short circuit (short to power supply)	Executed	Prohibited
C1365*5	G-sensor malfunction	Power supply error	Executed	Prohibited
C1381*5, *6	G-sensor malfunction	Abnormal seizure or output error	Executed	Prohibited
C1382*5	G-sensor malfunction	Low voltage	Executed	Prohibited
C1383*5	G-sensor malfunction	High voltage	Executed	Prohibited
C1860	ABS-ECU power supply system malfunction	high voltage	Prohibited	Prohibited
C1861	ABS-ECU power supply system malfunction	Low voltage	Prohibited	Prohibited
C1395	Brake fluid charging incompletion		Prohibited	Prohibited
U1073	Trouble in CAN bus system		Executed	Executed

NOTE:

- *[*1]: Normality on rear wheels (both right or left)*
- *[*2]: Abnormality on rear wheels (both right and left)*
- *[*3]: This diagnosis code is not set within the vehicle speed of 30 km/h or less.*
- *[*4]: This diagnosis code is not set within the vehicle speed of 10 km/h or less.*
- *[*5]: 4WD*
- *[*6]: This diagnosis code is not set within the vehicle speed of 30 km/h or less.*

HOW TO READ DIAGNOSIS CODE

Refer to GROUP 00 – How to Use Troubleshooting and Inspection Service Points .

HOW TO ERASE DIAGNOSIS CODE

Refer to GROUP 00 – How to Use Troubleshooting and Inspection Service Points .

DIAGNOSIS CODE CHART

M1352011301905

⚠ CAUTION

During diagnosis, a diagnosis code associated with other system may be set when the ignition switch is turned on with connector(s) disconnected. On completion, confirm all systems for diagnosis code(s). If diagnosis code(s) are set, erase them all.

Diagnosis code No.	Item		Reference page
C1200	Wheel speed sensor (FR)	Signal open circuit	P.35B-16
C1205	Wheel speed sensor (FL)	Signal open circuit	
C1210	Wheel speed sensor (RR)	Signal open circuit	
C1215	Wheel speed sensor (RL)	Signal open circuit	
C1201	Wheel speed sensor (FR)	Signal short circuit	P.35B-20
C1206	Wheel speed sensor (FL)	Signal short circuit	
C1211	Wheel speed sensor (RR)	Signal short circuit	
C1216	Wheel speed sensor (RL)	Signal short circuit	
C1202	Wheel speed sensor (FR)	Malfunction power circuit	P.35B-26
C1207	Wheel speed sensor (FL)	Malfunction power circuit	
C1212	Wheel speed sensor (RR)	Malfunction power circuit	
C1217	Wheel speed sensor (RL)	Malfunction power circuit	
C1225[*1]	Wheel speed sensor malfunction	Abnormality in tyre size	P.35B-30
C1226	Control solenoid valve (FR) pressure holding system		P.35B-31
C1236	Control solenoid valve (FL) pressure holding system		
C1246	Control solenoid valve (RR) pressure holding system		
C1256	Control solenoid valve (RL) pressure holding system		
C1231	Control solenoid valve (FR) pressure reducing system		
C1241	Control solenoid valve (FL) pressure reducing system		
C1251	Control solenoid valve (RR) pressure reducing system		
C1261	Control solenoid valve (RL) pressure reducing system		

Diagnosis code No.	Item		Reference page
C1266*3	Motor malfunction	Motor stick or open circuit	P.35B-32
C1273*3	Motor relay malfunction	Open circuit	
C1274	Motor relay malfunction	Short circuit	
C1278	Valve relay malfunction	Open circuit	P.35B-31
C1279	Valve relay malfunction	Short circuit	
C1340	Stop lamp switch malfunction	Short circuit (short to power supply)	P.35B-35
C1365*2	G-sensor malfunction	Power supply error	P.35B-39
C1381*2, *4	G-sensor malfunction	Abnormal seizure or output error	P.35B-42
C1382*2	G-sensor malfunction	Low voltage	P.35B-43
C1383*2	G-sensor malfunction	High voltage	
C1860	ABS-ECU power supply system malfunction	High voltage	P.35B-45
C1861	ABS-ECU power supply system malfunction	Low voltage	P.35B-47
C1395	Brake fluid charging incompletion		P.35B-50
U1073	Trouble in CAN bus system		P.35B-50

NOTE:

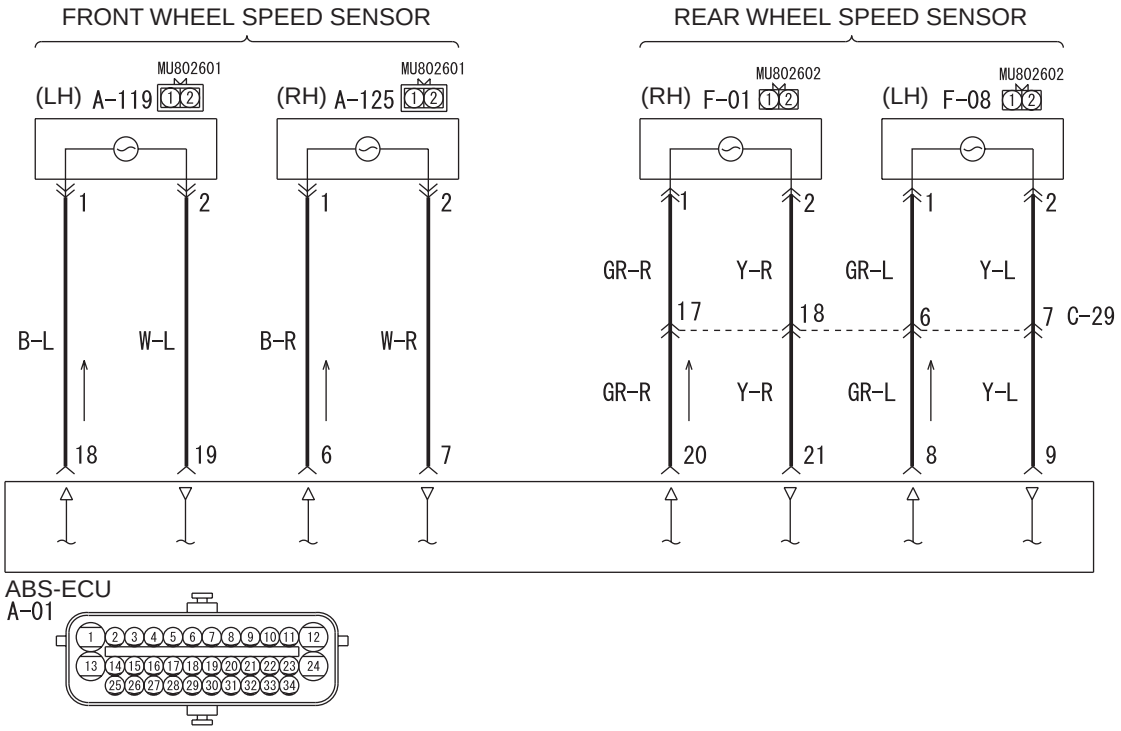
- **1: This diagnosis code is not set within the vehicle speed of 30 km/h or less.*
- **2: 4WD*
- **3: This diagnosis code is not set within the vehicle speed of 10 km/h or less.*
- **4: This diagnosis code is not set within the vehicle speed of 30 km/h or less.*

DIAGNOSIS CODE PROCEDURES

Code No.C1200: Wheel speed sensor (FR) (signal open circuit)
Code No.C1205: Wheel speed sensor (FL) (signal open circuit)
Code No.C1210: Wheel speed sensor (RR) (signal open circuit)
Code No.C1215: Wheel speed sensor (RL) (signal open circuit)

<2WD (Except High rider)>

Wheel Speed Sensor Circuit

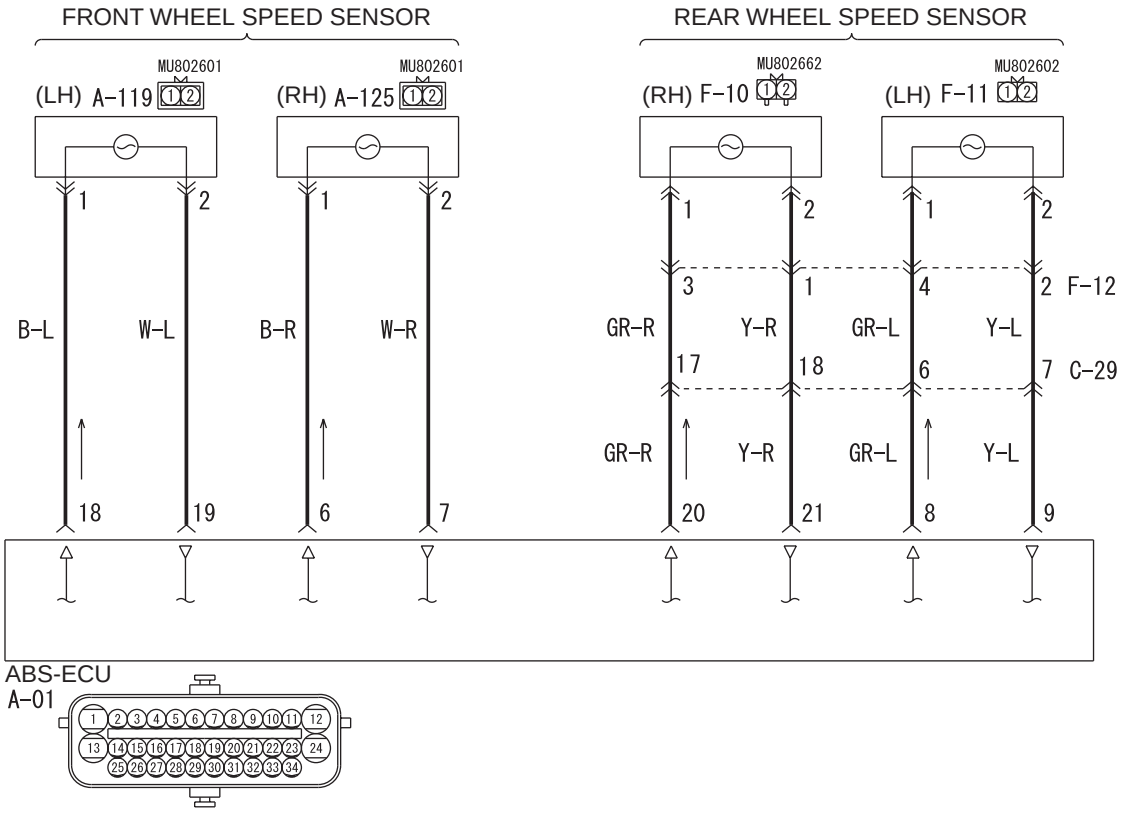


Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

ACB00766

<2WD (High rider), 4WD>

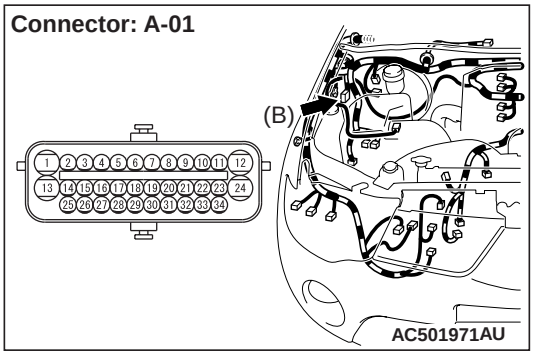
Wheel Speed Sensor Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

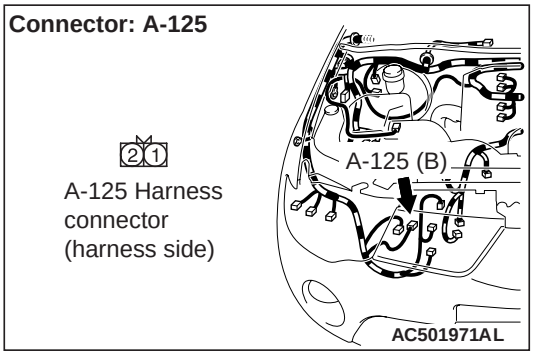
ACB00767

Connector: A-01



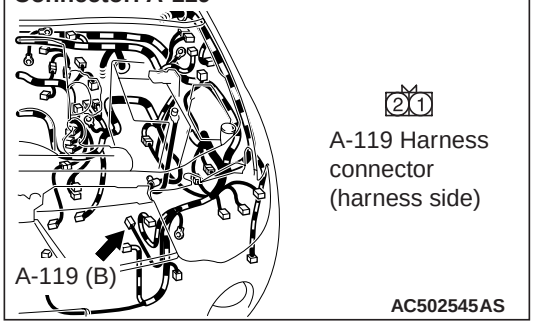
AC501971AU

Connector: A-125



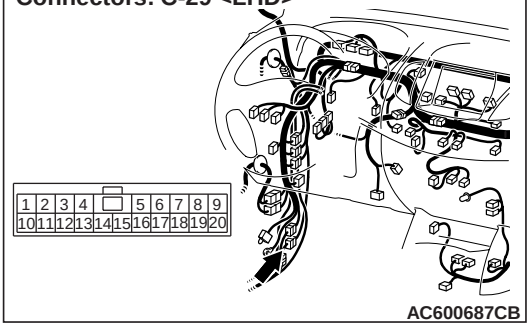
AC501971AL

Connector: A-119



AC502545AS

Connectors: C-29 <LHD>



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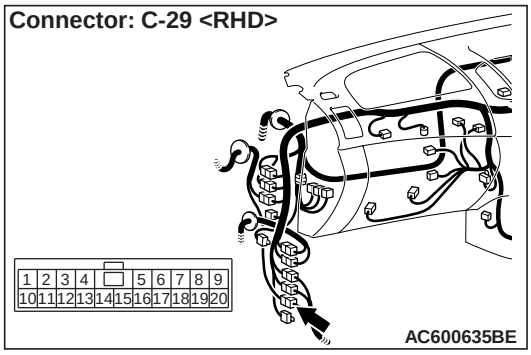
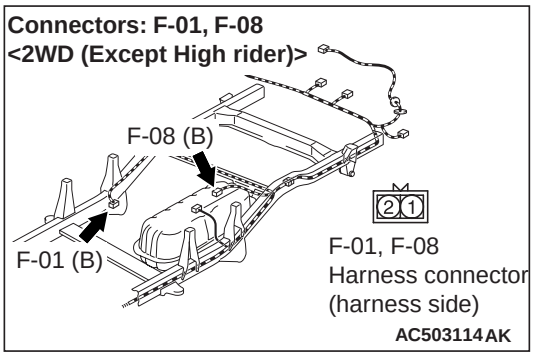
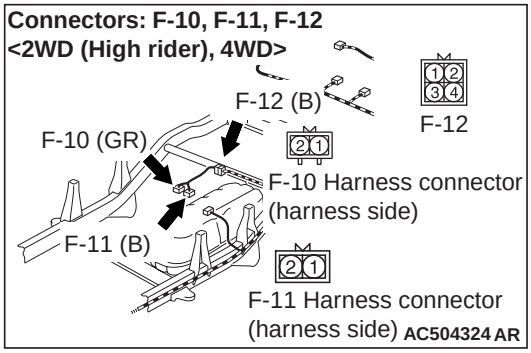






⚠ CAUTION

- **If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table .).**
- **Before replacing the ECU, ensure that the communication circuit is normal.**

OPERATION

- A toothed ABS rotor generates a voltage pulse as it moves across the pickup field of each wheel speed sensor.
- The wheel speed sensors transmit the frequency of the pulses to the ABS-ECU.
- The hydraulic unit assembly (integrated with ABS-ECU) modulates the amount of braking force individually applied to each wheel cylinder.

DIAGNOSIS CODE SET CONDITION

Diagnosis codes No.C1200, C1205, C1210 or C1215 is set when signal is not input due to breakage of the wires of the four wheel speed sensors without the outputs of the codes No.C1202, C1207, C1212 or C1217.

PROBABLE CAUSES

Current trouble

- Damaged wiring harness and connectors
- Wheel speed sensor malfunction
- ABS-ECU malfunction

Past trouble

- Carry out diagnosis with particular emphasis on wiring harness and connector failures between ABS-ECU and the wheel speed sensor. For diagnosis procedures, refer to How to treat past trouble (GROUP 00 – How to Cope with Intermittent Malfunctions .).

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnosis

Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?

YES : Go to Step 3.

NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table .). On completion, go to Step 2.

STEP 2. Diagnosis code recheck after resetting CAN bus lines

(1) Erase the diagnosis code.

(2) Drive the vehicle at 15 km/h or more.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 15 km/h or higher.

Q: Is diagnosis code No.C1200, C1205, C1210 or C1215 set?

YES : Go to Step 3.

NO : The procedure is complete.

STEP 3. M.U.T.-III diagnosis code

Check that diagnosis codes No.C1202, C1207, C1212 or C1217 are also set.

Q: Are diagnosis codes No.C1202, C1207, C1212 or C1217 also set?

YES : Perform the diagnosis for diagnosis codes No.C1202, C1207, C1212 or C1217 (Refer to P.35B-63.).

NO : Go to Step 4.

STEP 4. M.U.T.-III data list

Check the following data list (Refer to P.35B-54.).

- Item No.01: FL wheel speed sensor
- Item No.02: FR wheel speed sensor
- Item No.03: RL wheel speed sensor
- Item No.04: RR wheel speed sensor

Q: Is the check result normal?

YES : Go to Step 8.
NO : Go to Step 5.

STEP 5. Connector check: A-01 ABS-ECU connector, A-125 front wheel speed sensor (RH) connector, A-119 front wheel speed sensor (LH) connector, F-01 rear wheel speed sensor (RH) connector <2WD (Except High rider)> or F-10 rear wheel speed sensor (RH) connector <2WD (High rider), 4WD>, F-08 rear wheel speed sensor (LH) connector <2WD (Except High rider)> or F-11 rear wheel speed sensor (LH) connector <2WD (High rider), 4WD>, C-29 intermediate connector and F-12 intermediate connector <2WD (High rider), 4WD>

Q: Is the check result normal?

YES : Go to Step 6.
NO : Repair the defective connector. Then go to Step 9.

STEP 6. Resistance measurement at the A-01 ABS-ECU connector

(1) Disconnect the A-01 ABS-ECU connector.
(2) Measure the resistance between the A-01 ABS-ECU connector terminals.

Code No.C1200 is set

- Between terminal No.6 and No.7

Code No.C1205 is set

- Between terminal No.18 and No.19

Code No.C1210 is set

- Between terminal No.20 and No.21

Code No.C1215 is set

- Between terminal No.8 and No.9

OK: Continuity

Q: Is the check result normal?

YES : Go to Step 7.
NO : Repair the wiring harness. Then go to Step 9.

STEP 7. Check for wheel speed sensor as a single unit

Refer to P.35B-62.

Q: Is the check result normal?

YES : Go to Step 8.
NO : Replace the wheel speed sensor (Refer to P.35B-60.). Then go to Step 9.

STEP 8. Check whether the diagnosis code is reset.

(1) Erase the diagnosis code.
(2) Drive the vehicle at 15 km/h or more.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 15 km/h or higher.

Q: Are diagnosis codes No.C1200, C1205, C1210 or C1215 set?

YES : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-60.). Then go to Step 9.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunctions .).

STEP 9. Check whether the diagnosis code is reset.

(1) Erase the diagnosis code.
(2) Drive the vehicle at 15 km/h or more.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 15 km/h or higher.

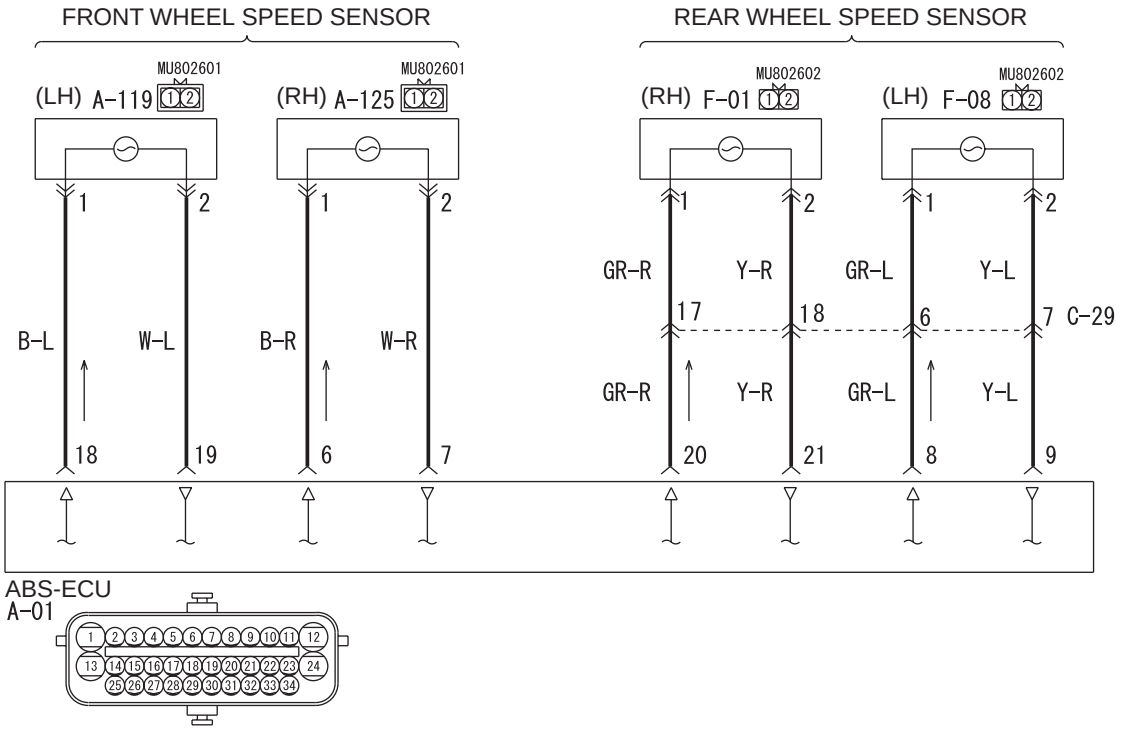
Q: Are diagnosis codes No.C1200, C1205, C1210 or C1215 set?

YES : Return to Step 1.
NO : This diagnosis is complete.

Code No.C1201: Wheel speed sensor (FR) (signal short circuit)
Code No.C1206: Wheel speed sensor (FL) (signal short circuit)
Code No.C1211: Wheel speed sensor (RR) (signal short circuit)
Code No.C1216: Wheel speed sensor (RL) (signal short circuit)

<2WD (Except High rider)>

Wheel Speed Sensor Circuit

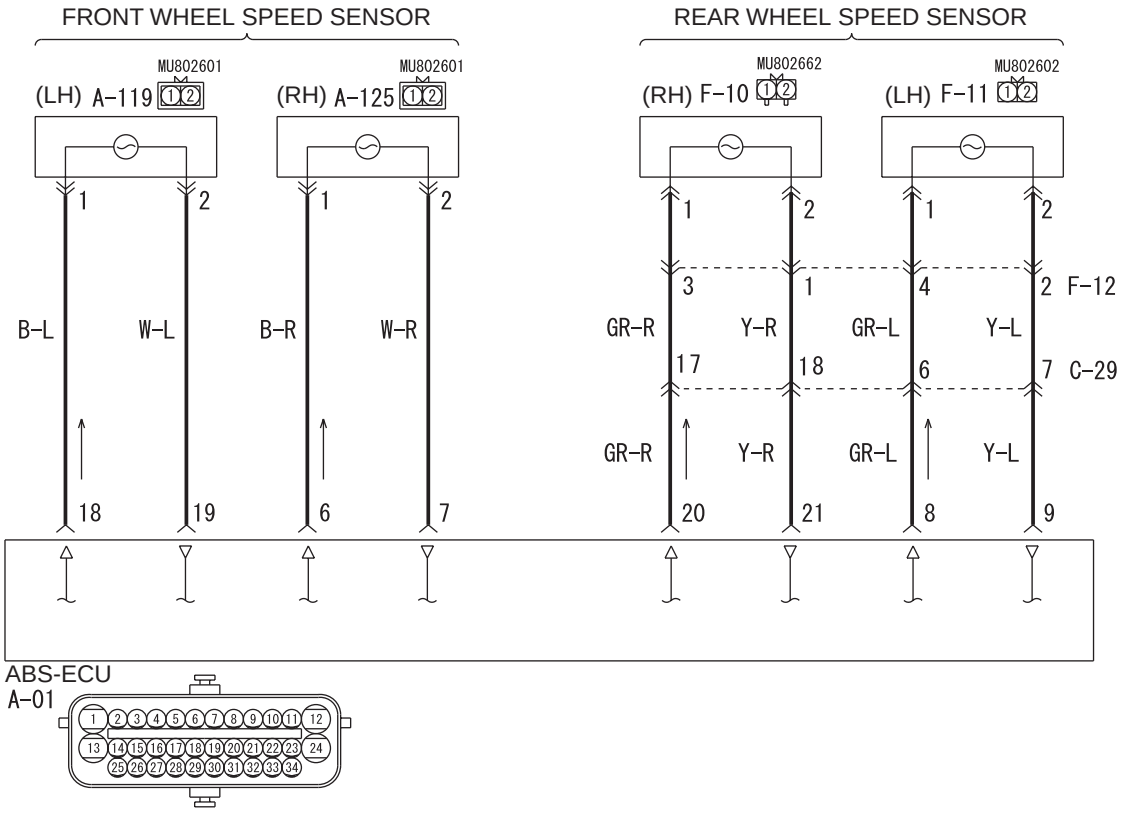


Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

ACB00766

<2WD (High rider), 4WD>

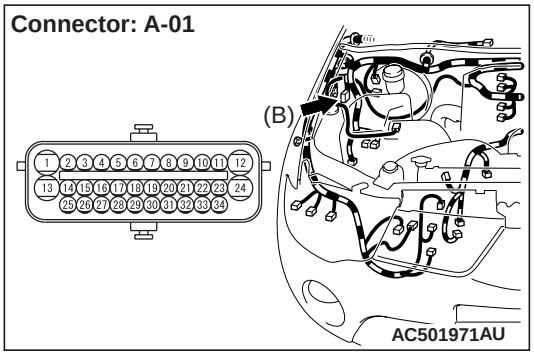
Wheel Speed Sensor Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

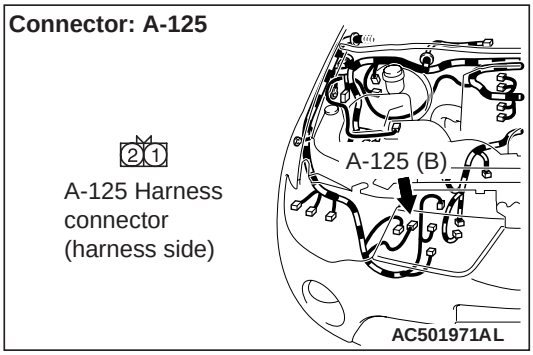
ACB00767

Connector: A-01



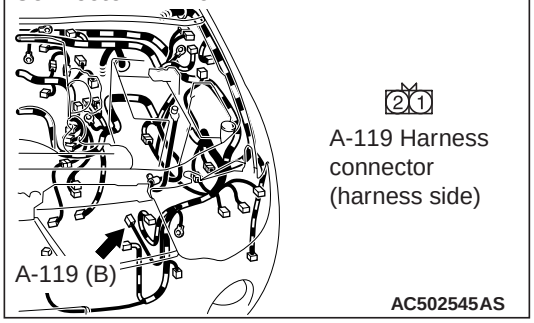
AC501971AU

Connector: A-125



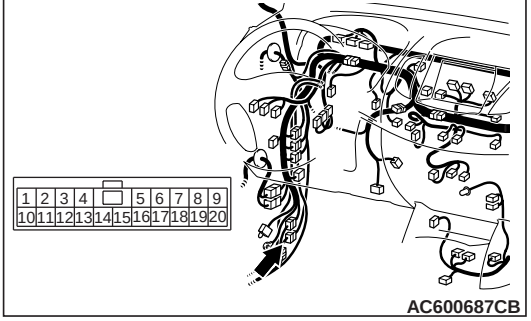
AC501971AL

Connector: A-119



AC502545AS

Connectors: C-29 <LHD>



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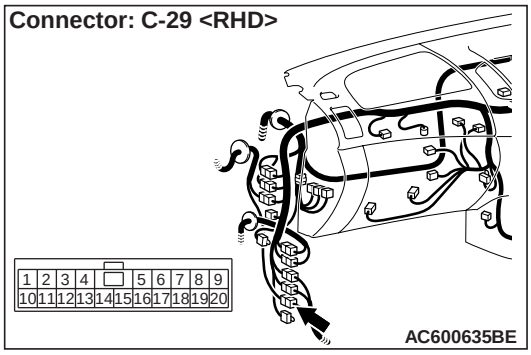
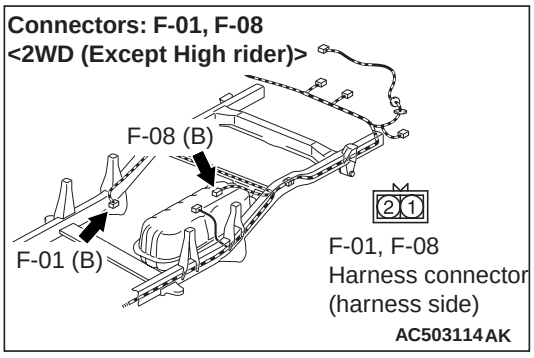
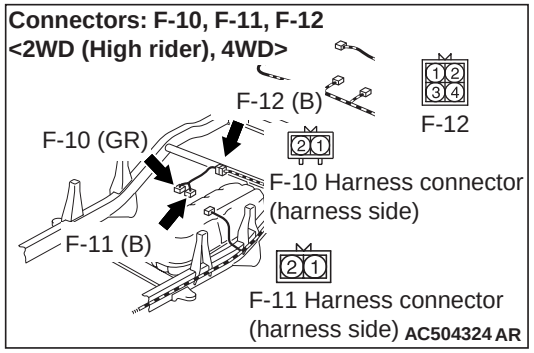






⚠ CAUTION

- **If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table .).**
- **Before replacing the ECU, ensure that the communication circuit is normal.**

OPERATION

- A toothed ABS rotor generates a voltage pulse as it moves across the pickup field of each wheel speed sensor.
- The wheel speed sensors transmit the frequency of the pulses to the ABS-ECU.
- The hydraulic unit assembly (integrated with ABS-ECU) modulates the amount of braking force individually applied to each wheel cylinder.

DIAGNOSIS CODE SET CONDITION

Diagnosis codes No.C1201, C1206, C1211 or C1216 is set if any abnormal voltage from the wheel speed sensor is detected without the outputs of the codes No.C1200, C1202, C1205, C1207, C1210, C1212, C1215 or C1217.

PROBABLE CAUSES

Current trouble

- Damaged wiring harness and connectors
- Teeth lack or clogging of the ABS rotor
- Malfunction of the wheel bearing <Front: 2WD (Except High rider)>
- Malfunction of the front hub assembly <Front: 2WD (High rider), 4WD>
- Malfunction of the axle shaft bearing <Rear>
- Noise interference
- Wheel speed sensor malfunction
- ABS-ECU malfunction

Past trouble

- Carry out diagnosis with particular emphasis on wiring harness and connector failures between ABS-ECU and the wheel speed sensor. For diagnosis procedures, refer to How to treat past trouble (GROUP 00 – How to Cope with Intermittent Malfunctions .).

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnosis

Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?

YES : Go to Step 3.

NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table .). On completion, go to Step 2.

STEP 2. Diagnosis code recheck after resetting CAN bus lines

(1) Erase the diagnosis code.

(2) Drive the vehicle at 15 km/h or more.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 15 km/h or higher.

Q: Are diagnosis codes No.C1201, C1206, C1211 or C1216 set?

YES : Go to Step 3.

NO : This diagnosis is complete.

STEP 3. M.U.T.-III diagnosis code

Check that diagnosis codes No.C1200, C1202, C1205, C1207, C1210, C1212, C1215 or C1217 is also set.

Q: Are diagnosis codes No.C1200, C1202, C1205, C1207, C1210, C1212, C1215 or C1217 also set?

YES : Perform the diagnosis for diagnosis codes No.C1200, C1202, C1205, C1207, C1210, C1212, C1215 or C1217 (Refer to P.35B-16, P.35B-26.).

NO : Go to Step 4.

STEP 4. M.U.T.-III data list

Check the following data list (Refer to P.35B-54.).

- Item No.01: FL wheel speed sensor
- Item No.02: FR wheel speed sensor
- Item No.03: RL wheel speed sensor
- Item No.04: RR wheel speed sensor

Q: Is the check result normal?

YES : Go to Step 12.

NO : Go to Step 5.

STEP 5. Check for wheel speed sensor installation

Check how the wheel speed sensor is installed correctly (Disconnection of wheel speed sensor, loose mounting bolt, etc.).

- Code No.C1201 is set: Wheel speed sensor (FR)
- Code No.C1206 is set: Wheel speed sensor (FL)
- Code No.C1211 is set: Wheel speed sensor (RR)
- Code No.C1216 is set: Wheel speed sensor (RL)

Q: Is the check result normal?

YES : Go to Step 6.

NO : Reinstall the wheel speed sensor correctly (Refer to P.35B-62.). Then go to Step 13.

STEP 6. Check for wheel speed sensor output current

Refer to P.35B-57.

- Code No.C1201 is check: Wheel speed sensor (FR)
- Code No.C1206 is check: Wheel speed sensor (FL)
- Code No.C1211 is check: Wheel speed sensor (RR)
- Code No.C1216 is check: Wheel speed sensor (RL)

Q: Is the check result normal?

YES : Go to Step 7.

NO : Replace the wheel speed sensor (Refer to P.35B-62.). Then go to Step 13.

STEP 7. Check the wheel bearing [Front: <2WD (Except High rider)>] or front hub [Front: <2WD (High rider), 4WD)>] or axle shaft bearing <Rear> for looseness.

NOTE: If the wheel bearing or front hub or axle shaft bearing are loose, the gap between the wheel speed sensor and ABS rotor may become excessive. Check the wheel bearing [Front: <2WD (Except High rider)>] or front hub [Front: <2WD (High rider), 4WD)>] or axle shaft bearing <Rear>, which diagnosis code indicates, for looseness.

Code No.C1201 is set

- *Check the wheel bearing [Front right: <2WD (Except High rider)>] or front hub [Front right: <2WD (High rider), 4WD)>] (Refer to GROUP 26 – On-vehicle service – Wheel bearing axial play check .).*

Code No.C1206 is set

- *Check the wheel bearing [Front left: <2WD (Except High rider)>] or front hub [Front left: <2WD (High rider), 4WD)>] (Refer to GROUP 26 – On-vehicle service – Wheel bearing axial play check .).*

Code No.C1211 is set

- *Check the axle shaft bearing <Rear right> (Refer to GROUP 27 – On-vehicle service – Axle shaft axial play check .).*

Code No.C1216 is set

- *Check the axle shaft bearing <Rear left> (Refer to GROUP 27 – On-vehicle service – Axle shaft axial play check .).*

Q: Is the check result normal?

YES : Go to Step 8.

NO (wheel bearing axial play is not within the standard value) <2WD (Except High rider)> : Replace the wheel bearing (Refer to GROUP 26 – Front axle hub assembly .). Then go to Step 13.

NO (wheel bearing axial play is not within the standard value) <2WD (High rider), 4WD> : Replace the front hub assembly (Refer to GROUP 26 – Front axle hub assembly .). Then go to Step 13.

NO (rear wheel bearing axial play is not within the standard value) : Replace the rear axle shaft bearing (Refer to GROUP 27 – Axle shaft assembly .). Then go to Step 13.

STEP 8. Check the ABS rotor.

Check the ABS rotor, which diagnosis code indicates, for foreign material or deformation.

Code No.C1201 is set
- ABS rotor (FR)

Code No.C1206 is set
- ABS rotor (FL)

Code No.C1211 is set
- ABS rotor (RR)

Code No.C1216 is set
- ABS rotor (RL)

Q: Is the check result normal?

YES : Go to Step 9.

NO <ABS rotor (FR, FL) abnormal> <2WD (Except High rider)> : If the ABS rotor is contaminated with foreign material, clean it. If the wheel bearing is deformed, replace it (Refer to GROUP 26 – Front axle hub assembly .). Then go to Step 13.

NO <ABS rotor (FR, FL) abnormal> <2WD (High rider), 4WD> : If the ABS rotor is contaminated with foreign material, clean it. If the front hub assembly is deformed, replace it (Refer to GROUP 26 – Front axle hub assembly .). Then go to Step 13.

NO <ABS rotor (RR, RL) abnormal> : If the ABS rotor is contaminated with foreign material, clean it. If the rear axle shaft bearing is deformed, replace it (Refer to GROUP 27 – Axle shaft assembly .). Then go to Step 13.

STEP 9. Connector check: A-01 ABS-ECU connector, A-125 front wheel speed sensor (RH) connector <C1201>, A-119 front wheel speed sensor (LH) connector <C1206>, F-01 rear wheel speed sensor (RH) connector <C1211, 2WD (Except High rider)> or F-10 rear wheel speed sensor (RH) connector <C1211, 2WD (High rider), 4WD>, F-08 rear wheel speed sensor (LH) connector <C1216, 2WD (Except High rider)> or F-11 rear wheel speed sensor (LH) connector <C1216, 2WD (High rider), 4WD>, C-29 intermediate connector and F-12 intermediate connector <C1211 or C1216, 2WD (High rider), 4WD>

Q: Is the check result normal?

YES : Go to Step 10.

NO : Repair the defective connector. Then go to Step 13.

STEP 10. Voltage measurement at the A-01 ABS-ECU connector

(1) Disconnect the A-01 ABS-ECU connector, A-125 front wheel speed sensor (RH) connector <C1201>, A-119 front wheel speed sensor (LH) connector <C1206>, F-01 rear wheel speed sensor (RH) connector <C1211, 2WD (Except High rider)> or F-10 rear wheel speed sensor (RH) connector <C1211, 2WD (High rider), 4WD>, F-08 rear wheel speed sensor (LH) connector <C1216, 2WD (Except High rider)> or F-11 rear wheel speed sensor (LH) connector <C1216, 2WD (High rider), 4WD>.

(2) Turn the ignition switch to the "ON" position.

(3) Measure the voltage between the A-01 ABS-ECU connector terminals.

Code No.C1200 is set
- Between terminal No.7 and body earth

Code No.C1205 is set
- Between terminal No.19 and body earth

Code No.C1210 is set
- Between terminal No.21 and body earth

Code No.C1215 is set
- Between terminal No.9 and body earth

OK: 1 V or less

Q: Is the check result normal?

YES : Go to Step 11.

NO : Repair the wiring harness. Then go to Step 13.

STEP 11. Resistance measurement at the A-01 ABS-ECU connector

(1) Disconnect the A-01 ABS-ECU connector, A-125 front wheel speed sensor (RH) connector <C1201>, A-119 front wheel speed sensor (LH) connector <C1206>, F-01 rear wheel speed sensor (RH) connector <C1211, 2WD (Except High rider)> or F-10 rear wheel speed sensor (RH) connector <C1211, 2WD (High rider), 4WD>, F-08 rear wheel speed sensor (LH) connector <C1216, 2WD (Except High rider)> or F-11 rear wheel speed sensor (LH) connector <C1216, 2WD (High rider), 4WD>.

(2) Measure the resistance between the A-01 ABS-ECU connector terminals.

Code No.C1200 is set
- Between terminal No.7 and body earth

Code No.C1205 is set
- Between terminal No.9 and body earth

Code No.C1210 is set
- Between terminal No.21 and body earth

Code No.C1215 is set
- Between terminal No.9 and body earth

OK: No continuity

Q: Is the check result normal?
YES : Go to Step 12.
NO : Repair the wiring harness. Then go to Step 13.

STEP 12. Check whether the diagnosis code is reset.
(1) Erase the diagnosis code.
(2) Drive the vehicle at 15 km/h or more.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 15 km/h or higher.

Q: Are diagnosis codes No.C1201, C1206, C1211 or C1216 set?
YES : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-60.). Then go to Step 13.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunctions .).

STEP 13. Check whether the diagnosis code is reset.
(1) Erase the diagnosis code.
(2) Drive the vehicle at 15 km/h or more.

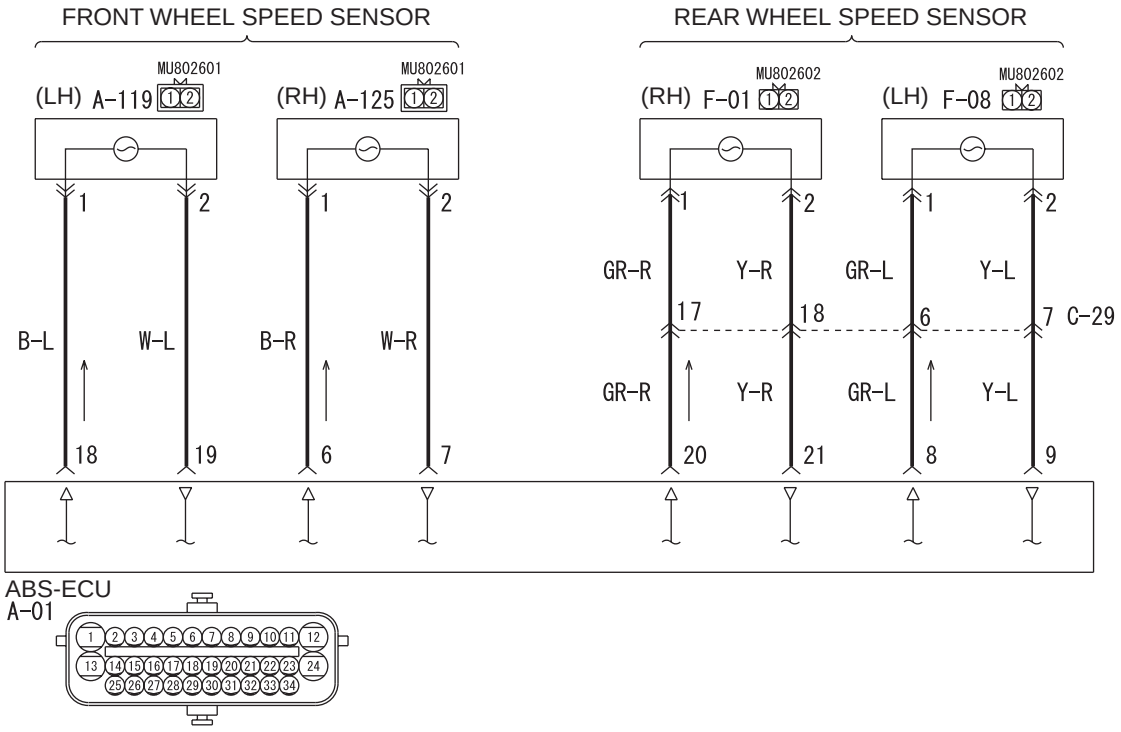
NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 15 km/h or higher.

Q: Are diagnosis codes No.C1201, C1206, C1211 or C1216 set?
YES : Return to Step 1.
NO : This diagnosis is complete.

Code No.C1202: Wheel speed sensor (FR) (malfunction power circuit)
Code No.C1207: Wheel speed sensor (FL) (malfunction power circuit)
Code No.C1212: Wheel speed sensor (RR) (malfunction power circuit)
Code No.C1217: Wheel speed sensor (RL) (malfunction power circuit)

<2WD (Except High rider)>

Wheel Speed Sensor Circuit

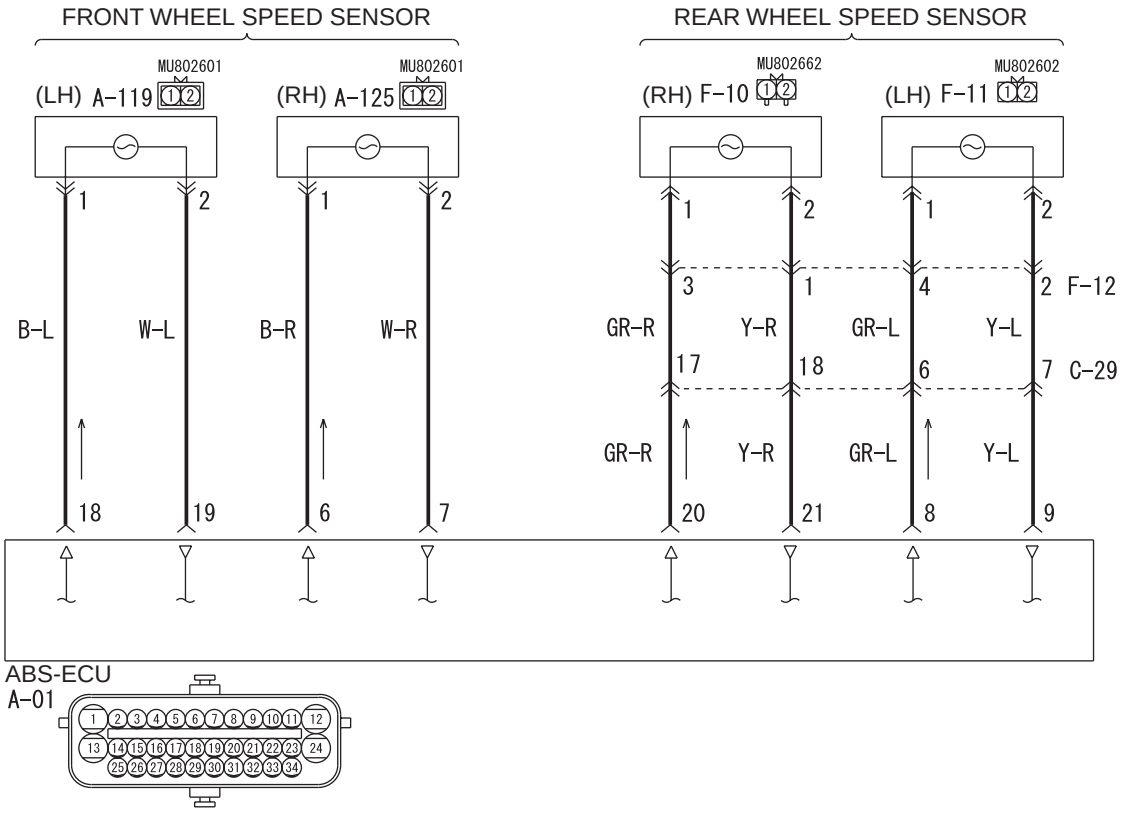


Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

ACB00766

<2WD (High rider), 4WD>

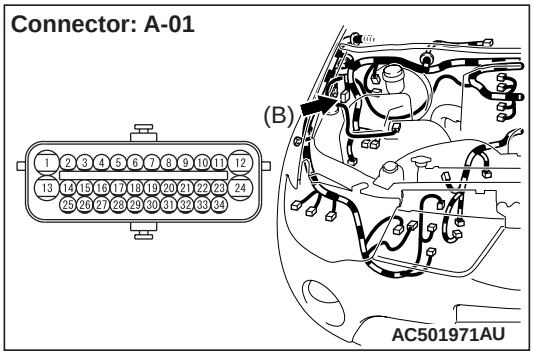
Wheel Speed Sensor Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

ACB00767

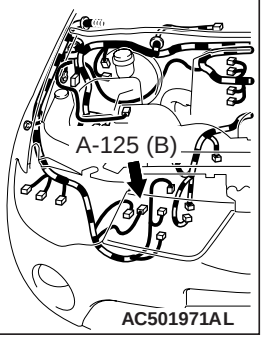
Connector: A-01



AC501971AU

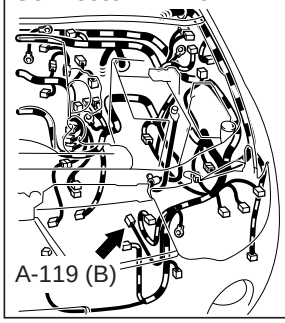
Connector: A-125

A-125 Harness connector (harness side)



AC501971AL

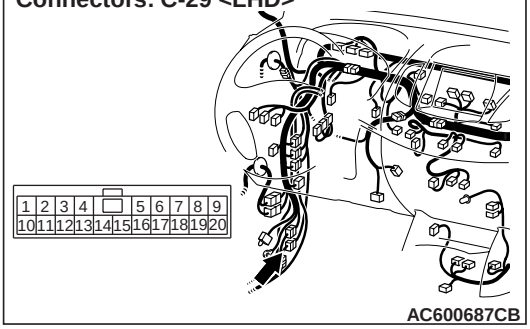
Connector: A-119



A-119 Harness connector (harness side)

AC502545AS

Connectors: C-29 <LHD>



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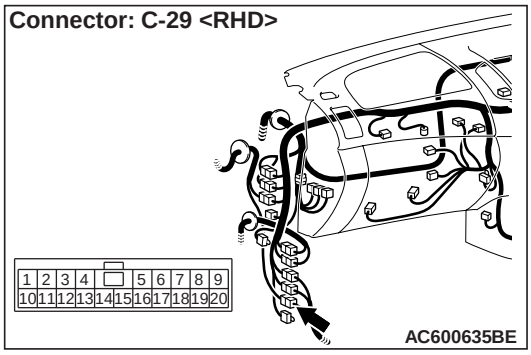
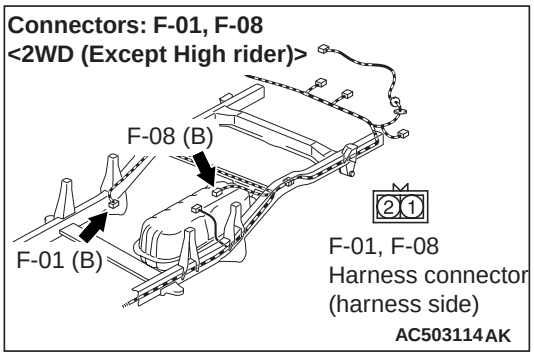
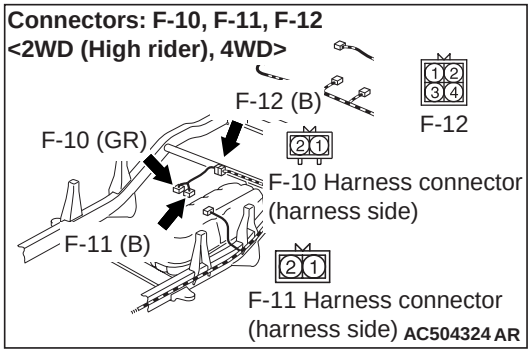






⚠ CAUTION

- **If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table .).**
- **Before replacing the ECU, ensure that the communication circuit is normal.**

OPERATION

- A toothed ABS rotor generates a pulse signal as it moves across the pickup field of each wheel speed sensor.
- The wheel speed sensors transmit the frequency of the pulses to the ABS-ECU.
- The hydraulic unit assembly (integrated with ABS-ECU) modulates the amount of braking force individually applied to each wheel cylinder.

DIAGNOSIS CODE SET CONDITION

Diagnosis codes No.C1202, C1207, C1212 or C1217 is set when the supply voltage to each wheel speed sensor has decreased.

PROBABLE CAUSES

Current trouble

- Damaged wiring harness and connectors
- Noise interference
- Wheel speed sensor malfunction
- ABS-ECU malfunction

Past trouble

- Carry out diagnosis with particular emphasis on wiring harness and connector failures between ABS-ECU and the wheel speed sensor. For diagnosis procedures, refer to How to treat past trouble (GROUP 00 – How to Cope with Intermittent Malfunctions .).

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnosis

Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?

YES : Go to Step 3.

NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table .). On completion, go to Step 2.

STEP 2. Diagnosis code recheck after resetting CAN bus lines

(1) Erase the diagnosis code.

(2) Drive the vehicle at 15 km/h or more.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 15 km/h or higher.

Q: Are diagnosis codes No.C1202, C1207, C1212 or C1217 set?

YES : Go to Step 3.

NO : This diagnosis is complete.

STEP 3. M.U.T.-III data list

Check the following data list (Refer to P.35B-54.).

- Item No.01: FL wheel speed sensor
- Item No.02: FR wheel speed sensor
- Item No.03: RL wheel speed sensor
- Item No.04: RR wheel speed sensor

Q: Is the check result normal?

YES : Go to Step 8.

NO : Go to Step 4.

STEP 4. Connector check: A-01 ABS-ECU connector, A-125 front wheel speed sensor (RH) connector <C1202>, A-119 front wheel speed sensor (LH) connector <C1207>, F-01 rear wheel speed sensor (RH) connector <C122, 2WD (Except High rider)> or F-10 rear wheel speed sensor (RH) connector <C1212, 2WD (High rider), 4WD>, F-08 rear wheel speed sensor (LH) connector <C1217, 2WD (Except High rider)> or F-11 rear wheel speed sensor (LH) connector <C1217, 2WD (High rider), 4WD>, C-29 intermediate connector and F-12 intermediate connector <C1212 or C1217, 2WD (High rider), 4WD>

Q: Is the check result normal?
YES : Go to Step 5.
NO : Repair the defective connector. Then go to Step 9.

STEP 5. Voltage measurement at the A-01 ABS-ECU connector
(1) Disconnect the A-01 ABS-ECU connector, A-125 front wheel speed sensor (RH) connector <C1202>, A-119 front wheel speed sensor (LH) connector <C1207>, F-01 rear wheel speed sensor (RH) connector <C1212, 2WD (Except High rider)> or F-10 rear wheel speed sensor (RH) connector <C1212, 2WD (High rider), 4WD>, F-08 rear wheel speed sensor (LH) connector <C1217, 2WD (Except High rider)> or F-11 rear wheel speed sensor (LH) connector <C1217, 2WD (High rider), 4WD>.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between the A-01 ABS-ECU connector terminals.

Code No.C1202 is set
- Between terminal No.6 and body earth

Code No.C1207 is set
- Between terminal No.18 and body earth

Code No.C1212 is set4
- Between terminal No.20 and body earth

Code No.C1217 is set
- Between terminal No.8 and body earth

OK: 1 V or less

Q: Is the check result normal?
YES : Go to Step 6.
NO : Repair the wiring harness. Then go to Step 9.

STEP 6. Resistance measurement at the A-01 ABS-ECU connector
(1) Disconnect the A-01 ABS-ECU connector, A-125 front wheel speed sensor (RH) connector <C1202>, A-119 front wheel speed sensor (LH) connector <C1207>, F-01 rear wheel speed sensor (RH) connector <C1212, 2WD (Except High rider)> or F-10 rear wheel speed sensor (RH) connector <C1212, 2WD (High rider), 4WD>, F-08 rear wheel speed sensor (LH) connector <C1217, 2WD (Except High rider)> or F-11 rear wheel speed sensor (LH) connector <C1217, 2WD (High rider), 4WD>.
(2) Measure the resistance between the A-01 ABS-ECU connector terminals.

Code No.C1202 is set
- Between terminal No.6 and body earth

Code No.C1207 is set
- Between terminal No.18 and body earth

Code No.C1212 is set
- Between terminal No.20 and body earth

Code No.C1217 is set
- Between terminal No.8 and body earth

OK: No continuity

Q: Is the check result normal?
YES : Go to Step 7.
NO : Repair the wiring harness. Then go to Step 9.

STEP 7. Check for wheel speed sensor as a single unit
Refer to P.35B-63.

Q: Is the check result normal?
YES : Go to Step 8.
NO : Replace the wheel speed sensor (Refer to P.35B-62.). Then go to Step 9.

STEP 8. Check whether the diagnosis code is reset.
(1) Erase the diagnosis code.
(2) Drive the vehicle at 15 km/h or more.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 15 km/h or higher.

Q: Are diagnosis codes No.C1202, C1207, C1212 or C1217 set?

YES : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-60.). Then go to Step 9.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunctions .).

STEP 9. Check whether the diagnosis code is reset.
(1) Erase the diagnosis code.
(2) Drive the vehicle at 15 km/h or more.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 15 km/h or higher.

Q: Are diagnosis codes No.C1202, C1207, C1212 or C1217 set?
YES : Return to Step 1.
NO : This diagnosis is complete.

Code No.C1225: Wheel speed sensor malfunction (Abnormality in tyre size)

⚠ CAUTION
- **If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table .).**
- **Before replacing the ECU, ensure that the communication circuit is normal.**

OPERATION
- A toothed ABS rotor generates a voltage pulse as it moves across the pickup field of each wheel speed sensor.
- The amount of voltage generated at each wheel is determined by the clearance between the ABS rotor teeth and the wheel speed sensor, and by the speed of rotation.
- The wheel speed sensors transmit the frequency of the voltage pulses and the amount of voltage generated by each pulse to the ABS-ECU.
- The hydraulic unit assembly (integrated with ABS-ECU) modulates the amount of braking force individually applied to each wheel cylinder.

DIAGNOSIS CODE SET CONDITION
This diagnosis code is set when the average speed of the front wheels differs from that of the rear wheel by 20 % or more after the vehicle speed exceeds 30 km/h.

PROBABLE CAUSES
- Installation of different size tyres
- Damaged wiring harness or connector
- ABS-ECU malfunction

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnosis
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table .). On completion, go to Step 2.

STEP 2. Diagnosis code recheck after resetting CAN bus lines
(1) Erase the diagnosis code.
(2) Drive the vehicle at 30 km/h or more.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 30 km/h or higher.

Q: Is diagnosis code No.C1225 set?
YES : Go to Step 3.
NO : This diagnosis is complete.

STEP 3. Check the installation condition of the wheel and tyres.

Q: Is the check result normal?
YES : Go to Step 4.
NO : Install the correct size tyres. Then go to Step 5.

STEP 4. Check whether the diagnosis code is reset.
(1) Erase the diagnosis code.
(2) Drive the vehicle at 30 km/h or more.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 30 km/h or higher.

Q: Is diagnosis code No.C1225 set?

YES : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-60.). Then go to Step 5.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunctions .).

STEP 5. Check whether the diagnosis code is reset.
(1) Erase the diagnosis code.
(2) Drive the vehicle at 30 km/h or more.
NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 30 km/h or higher.

Q: Is diagnosis code No.C1225 set?
YES : Return to Step 1.
NO : The procedure is complete.

Code No.C1226: Control solenoid valve (FR) pressure holding system
Code No.C1231: Control solenoid valve (FR) pressure reducing system
Code No.C1236: Control solenoid valve (FL) pressure holding system
Code No.C1241: Control solenoid valve (FL) pressure reducing system
Code No.C1246: Control solenoid valve (RR) pressure holding system
Code No.C1251: Control solenoid valve (RR) pressure reducing system
Code No.C1256: Control solenoid valve (RL) pressure holding system
Code No.C1261: Control solenoid valve (RL) pressure reducing system
Code No.C1278: Valve relay malfunction (open circuit)
Code No.C1279: Valve relay malfunction (short circuit)

⚠ CAUTION
- **If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table .).**
- **Before replacing the ECU, ensure that the communication circuit is normal.**

OPERATION
- ABS-ECU contains the power supply circuit (terminal No.1) for the solenoid valve. The solenoid valve is energised by the valve relay, which is incorporated in ABS-ECU.
- The valve relay, which is incorporated in ABS-ECU, is always energising the solenoid valve unless the initial check is in progress when the ignition switch is turned on, or the recurrent system check is in progress.
- ABS-ECU activates the solenoid valve by turning on its driving transistor.

DIAGNOSIS CODE SET CONDITIONS
These diagnosis codes will be set under the cases below.

Code No.C1226, C1231, C1236, C1241, C1246, C1251, C1256, C1261
- The output of the each solenoid valve does not change when the solenoid valve is "ON" and the solenoid valve monitor is "ON"

Code No.C1278
- The solenoid valve relay monitor is "OFF" when the solenoid valve relay is "ON"

Code No.C1279
- The solenoid valve relay monitor is "ON" when the solenoid valve relay is "OFF"

PROBABLE CAUSES
- Damaged wiring harness or connector
- ABS-ECU malfunction

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnosis
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table .). On completion, go to Step 2.

STEP 2. Check whether the diagnosis code is reset.
Erase the diagnosis code.

Q: Are diagnosis codes No.C1226, C1231, C1236, C1241, C1246, C1251, C1256, C1261, C1278 or C1279 set?

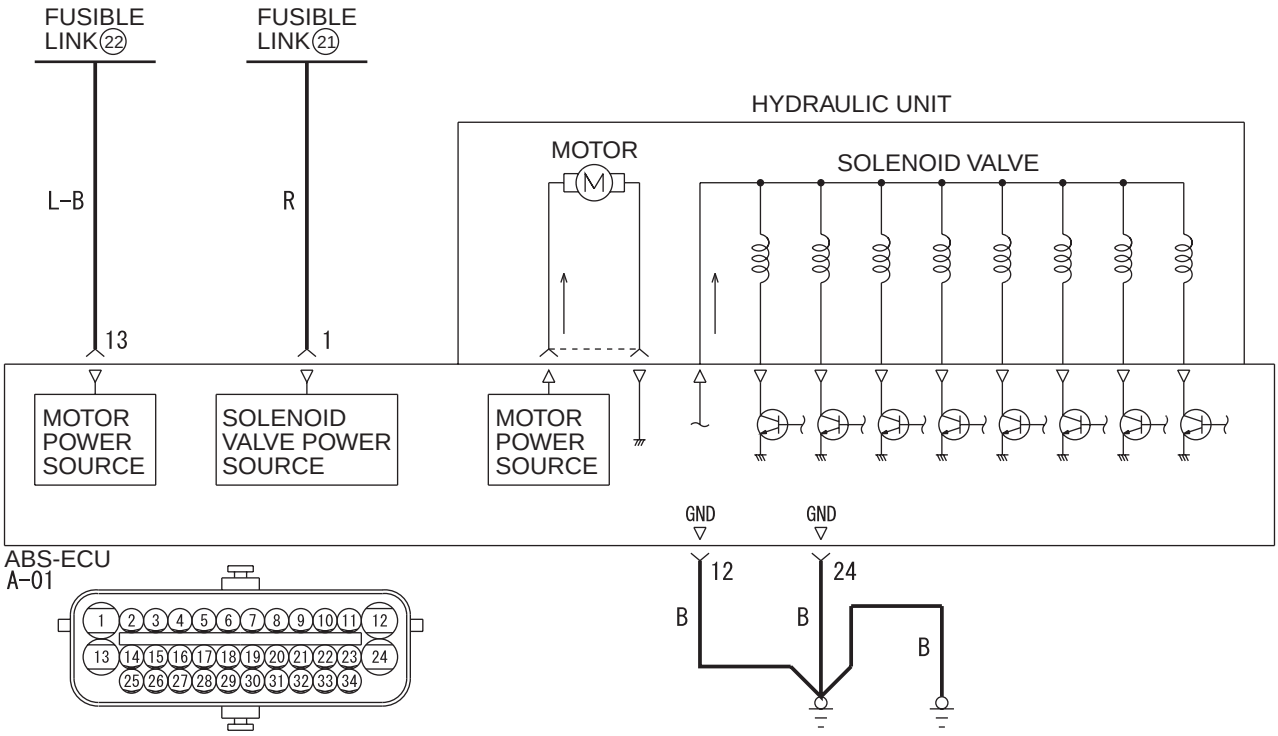
YES : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-60.). Then go to Step 3.
NO : This diagnosis is complete.

STEP 3. Check whether the diagnosis code is reset.
Erase the diagnosis code.

Q: Are diagnosis codes No.C1226, C1231, C1236, C1241, C1246, C1251, C1256, C1261, C1278 or C1279 set?
YES : Return to Step 1.
NO : This diagnosis is complete.

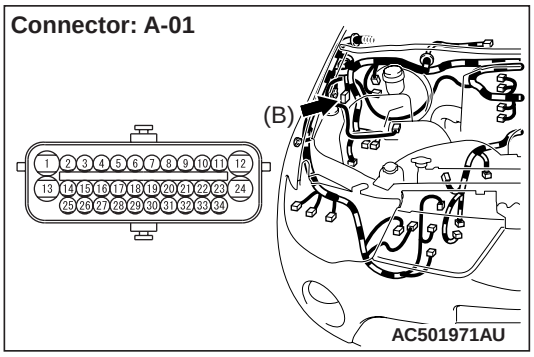
Code No.C1266: Motor malfunction (motor stick or open circuit)
Code No.C1273: Motor relay malfunction (open circuit)
Code No.C1274: Motor relay malfunction (short circuit)

Solenoid Valve and Motor Power Supply Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

ACB00768



⚠ CAUTION
- **If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table .).**
- **Before replacing the ECU, ensure that the communication circuit is normal.**

OPERATION
- ABS-ECU contains the power supply circuit (terminal No.13) for the pump motor. The pump motor is energised by the motor switch, which is incorporated in ABS-ECU.
- The pump motor switch, which is incorporated in ABS-ECU, is always off unless the ABS operating or the motor solenoid valve check is activated when the vehicle is started.
- ABS-ECU activates the pump motor by turning on the ECU built-in pump motor switch.

DIAGNOSIS CODE SET CONDITIONS
These diagnosis codes will be set under the cases below.

Code No. C1266
- An open circuit has occurred to motor relay monitor.
- Motor is seized.

Code No. C1273
- At an initial start, the motor relay monitor judges the status of the motor relay as "OFF," and the motor is driven.

Code No. C1274
- When the motor relay monitor judges that the motor relay is "ON" while it is "OFF".

PROBABLE CAUSES

Current trouble
- Fusible link malfunction
- Damaged wiring harness and connectors
- ABS-ECU malfunction

Past trouble
- Carry out diagnosis with particular emphasis on wiring harness and connector failures between the power supply circuit (A-01 ABS-ECU connector terminal No.13) to the ABS-ECU motor and the earth circuit (A-01 ABS-ECU connector terminal No.12 and No.24). For diagnosis procedures, refer to How to treat past trouble (GROUP 00 – How to Cope with Intermittent Malfunctions).

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnosis
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnosis Table .). On completion, go to Step 2.

STEP 2. Diagnosis code recheck after resetting CAN bus lines
- Erase the diagnosis code.
- Drive the vehicle at 10 km/h or more.

Q: Are diagnosis codes No.C1266, C1273 or C1274 set?
YES : Go to Step 3.
NO : This diagnosis is complete.

STEP 3. Connector check: A-01 ABS-ECU connector

Q: Is the check result normal?
YES : Go to Step 4.
NO : Repair the defective connector. Then go to Step 9.

STEP 4. Fusible link check: Check the fusible link No.22

Q: Is the check result normal?
YES : Go to Step 6.
NO : Go to Step 5.

STEP 5. Resistance measurement at A-01 ABS-ECU connector
(1) Removal the fusible link No.22.
(2) Disconnect the A-01 ABS-ECU connector.
(3) Measure the resistance between the terminal No.13 and the body earth.

OK: No continuity

Q: Is the check result normal?
YES : Replace the fusible link No.22. Then go to Step 9.
NO : Repair the harness between the fusible link No.22 and A-01 ABS-ECU connector terminal No.13. Then replace the fusible link No.22. Then go to Step 9.

STEP 6. Voltage measurement at the A-01 ABS-ECU connector
(1) Disconnect the A-01 ABS-ECU connector.

(2) Measure the voltage between the terminal No.13 and the body earth.

OK: Battery voltage

Q: Is the check result normal?

YES : Go to Step 7.

NO : The open circuit may be present in the pump motor power supply circuit. Repair the wiring harness between the A-01 ABS-ECU connector terminal No.13 and the fusible link No.22. Then go to Step 9.

STEP 7. Resistance measurement at A-01 ABS-ECU connector

(1) Disconnect the A-01 ABS-ECU connector.

(2) Measure the resistance between the terminal No.12 and the body earth, and between the terminal No.24 and the body earth

OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?

YES : Go to Step 8.

NO : An open circuit may be present in the earth circuit. Repair the wiring harness between the A-01 ABS-ECU terminal No.12 and the body earth, and between the A-01 ABS-ECU terminal No.24 and the body earth. Then go to Step 9.

STEP 8. Check whether the diagnosis code is reset.

- Erase the diagnosis code.
- Drive the vehicle at 10 km/h or more.

Q: Are diagnosis codes No.C1266, C1273 or C1274 set?

YES : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-60). Then go to Step 9.

NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunctions .).

STEP 9. Check whether the diagnosis code is reset.

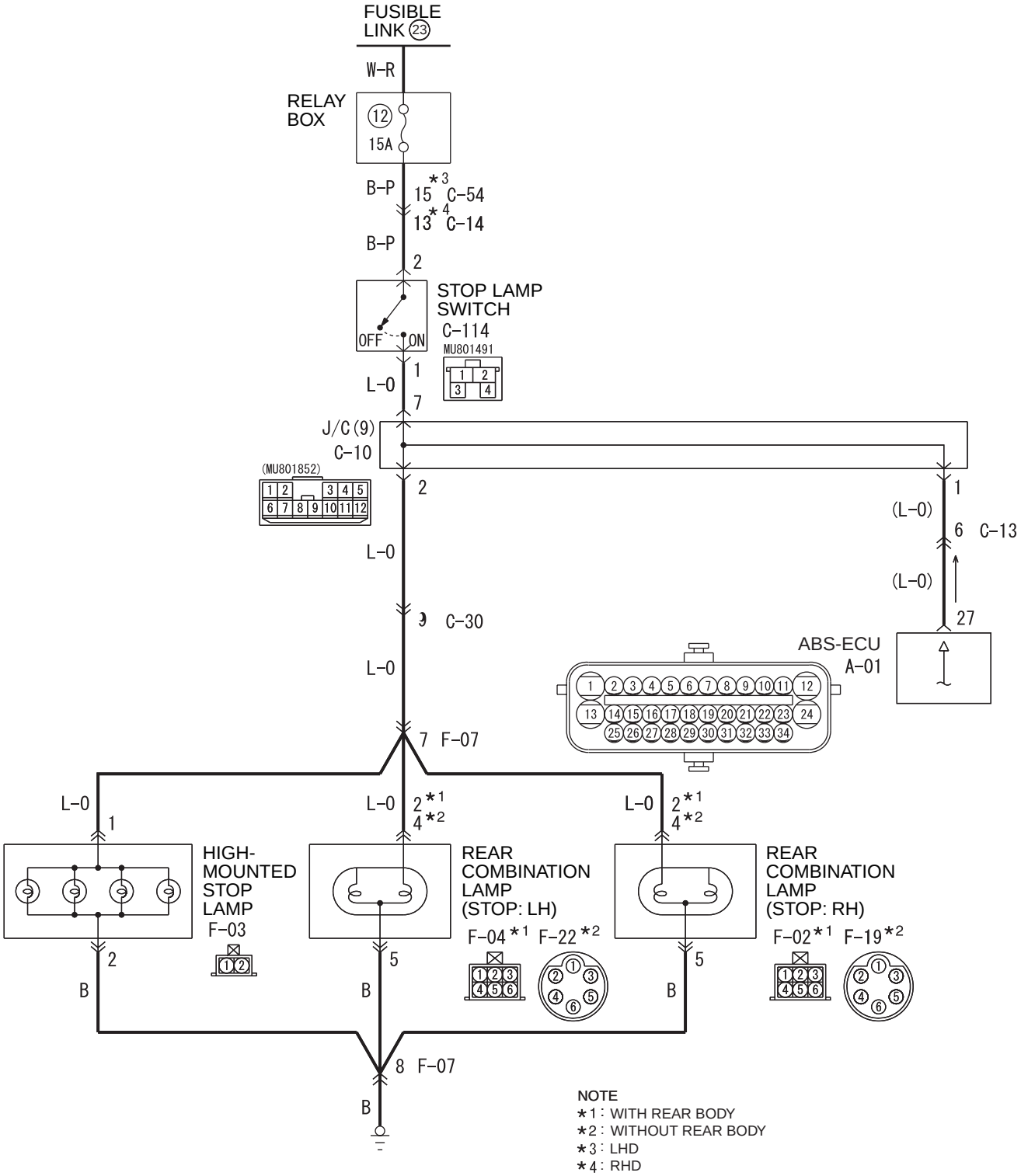
- Erase the diagnosis code.
- Drive the vehicle at 10 km/h or more.

Q: Are diagnosis codes No.C1266, C1273 or C1274 set?

YES : Return to Step 1.

NO : This diagnosis is complete.

Code No. C1340: Stop lamp switch malfunction <short circuit (short to power supply)>



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

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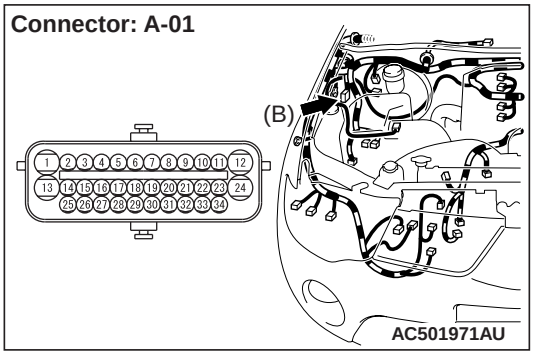
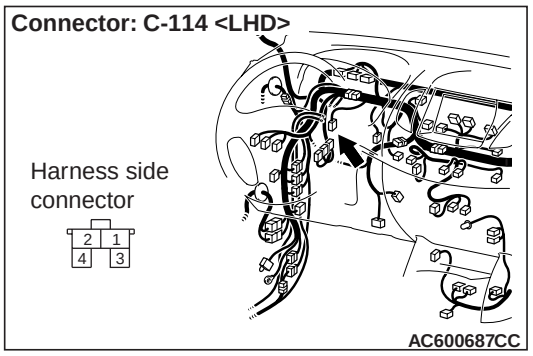
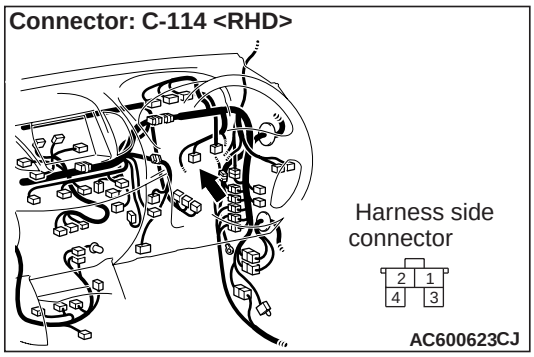
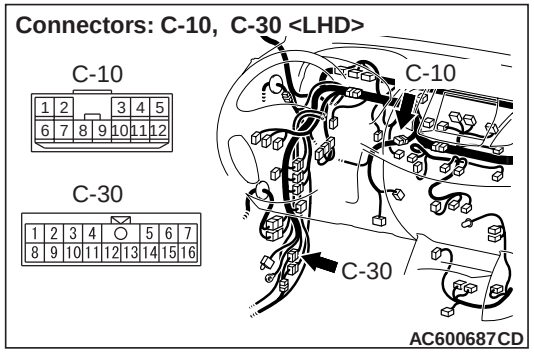
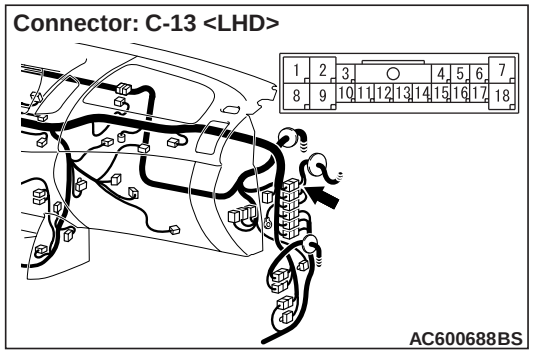
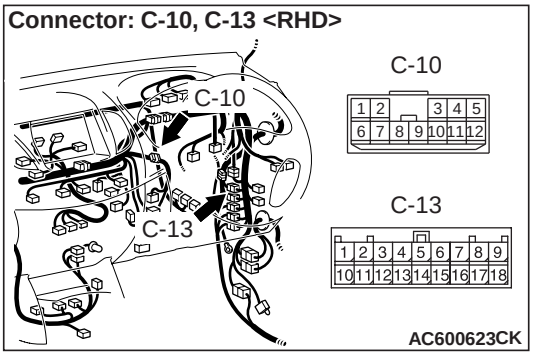


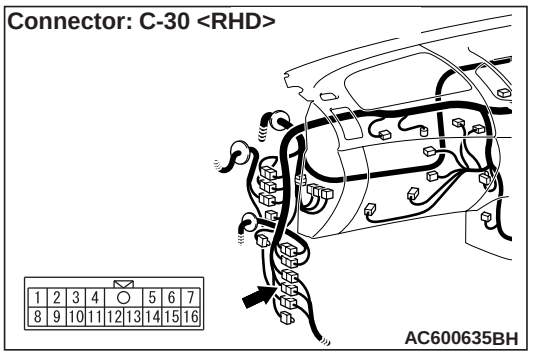


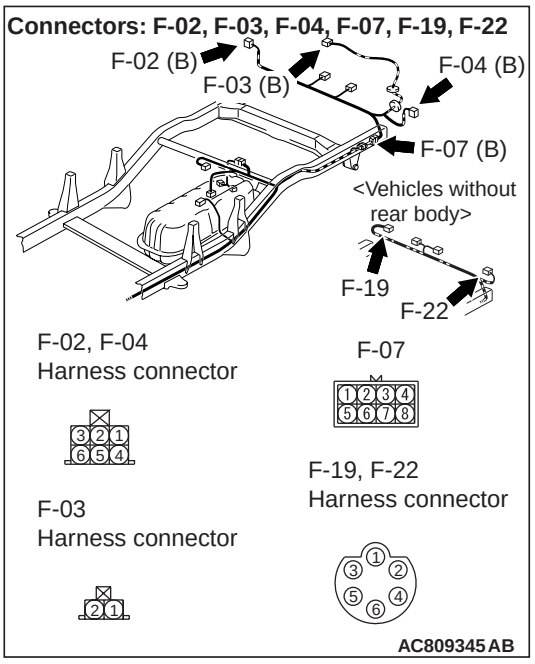












⚠ CAUTION

- **If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table .).**
- **Before replacing the ECU, ensure that the communication circuit is normal.**

OPERATION

ABS-ECU monitors whether the stop lamp switch is "ON" or "OFF."

DIAGNOSIS CODE SET CONDITION
This diagnosis code will be set if the vehicle speed is 15 km/h or more with the stop lamp switch "ON" continuously for 15 minutes or more.

PROBABLE CAUSES
- Improper adjustment of stop lamp switch installation position
- Malfunction of the stop lamp switch
- Damaged wiring harness and connectors
- Malfunction of the ABS-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the CAN bus lines. (Refer to GROUP 54C – CAN Bus Diagnostics Table .). On completion, go to Step 2.

STEP 2. Diagnosis code recheck after resetting CAN bus lines
Erase the diagnosis code.

Q: Is diagnosis code No.C1340 set?
YES : Go to Step 3.
NO : This diagnosis is complete.

STEP 3. Stop lamp and high-mount stop lamp operation check
Check the stop lamp and high-mount stop lamp operation when the brake pedal is depressed. Check that the stop lamp and high-mount stop lamp illuminate when the brake pedal is depressed and that it goes out when the brake pedal is released.

OK:
When the brake pedal is released: OFF
When the brake pedal is depressed: ON

Q: Is the check result normal?
YES : Go to Step 10.
NO : Go to Step 4.

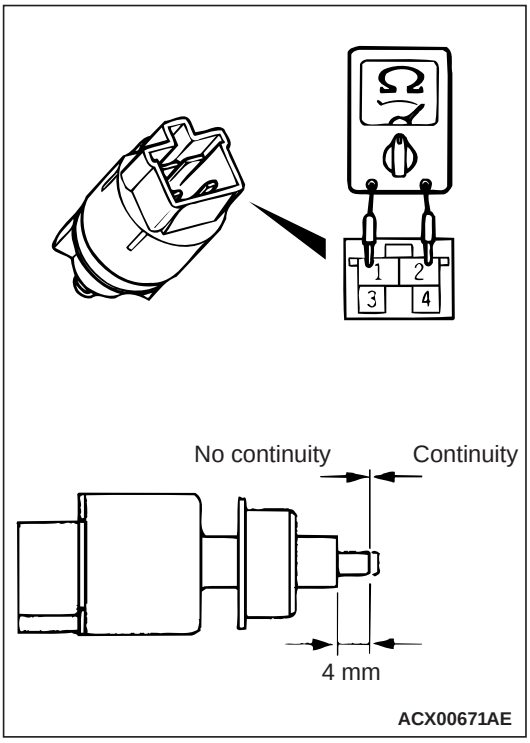
STEP 4. Connector check: C-114 stop lamp switch connector

Q: Is the check result normal?
YES : Go to Step 5.
NO : Repair or replace it, and go to Step 11.

STEP 5. Check for stop lamp switch installation
Refer to GROUP 35A – Brake Pedal – Stop Lamp Switch Check .

Q: Is the check result normal?
YES : Go to Step 6.
NO : Install the stop lamp switch correctly (Refer to GROUP 35A – Brake Pedal – Stop Lamp Switch Check .). Then go to Step 11.

STEP 6. Stop lamp switch continuity check
(1) Remove the stop lamp switch (Refer to GROUP 35A – Brake Pedal .).



(2) Connect the circuit tester (Ω range) to the stop lamp switch connector terminals No.1 and No.2.
(3) When no continuity is detected with the plunger pressed from the edge of the outer case by the dimension shown in the figure and when continuity is detected with the plunger released, the stop lamp switch is in good condition.

Q: Is the check result normal?
YES : Go to Step 7.
NO : Replace the stop lamp switch (Refer to GROUP 35A – Brake Pedal .). Then go to Step 11.

STEP 7. Connector check: A-01 ABS-ECU connector, C-13,C-10 joint connector, C-30 intermediate connector, F-02 rear combination lamp (stop: RH) connector (with rear body), F-19 rear combination lamp (stop: RH) connector (without rear body), F-03 high mounted stop lamp connector, F-04 rear combination lamp (stop: LH) connector (with rear body), F-22 rear combination lamp (stop: LH) connector (without rear body), F-07 intermediate connector

Q: Is the check result normal?
YES : Go to Step 8.
NO : Repair or replace it, and go to Step 11.

STEP 8. Voltage measurement at A-01 ABS-ECU connector.
(1) Disconnect the A-01 ABS-ECU connector.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No.27 and body earth.

OK: 1 V or less

Q: Is the check result normal?
YES : Go to Step 9.
NO : A short to power supply has occurred in the wiring harness between A-01 ABS-ECU connector terminal No.27, C-10 joint connector terminal No.1 and C-13 intermediate connector terminal No.2, therefore, repair it.Then go to Step 11.

STEP 9. Voltage measurement at C-114 stop lamp switch connector.
(1) Disconnect the A-01 ABS-ECU connector, C-114 stop lamp switch connector, F-02 rear combination lamp (stop: RH) connector (with rear body), F-19 rear combination lamp (stop: RH) connector (without rear body), F-03 high mounted stop lamp connector, F-04 rear combination lamp (stop: LH) connector (with rear body), F-22 rear combination lamp (stop: LH) connector (without rear body), and measure the voltage at C-114 stop lamp switch connector harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No.1 and body earth.

OK: 1 V or less

Q: Is the check result normal?
YES : Go to Step 10.
NO : A short to power supply has occurred in the wiring harness between C-114 stop lamp switch connector terminal No.1 and F-02 rear combination lamp (stop: RH) connector (with rear body) terminal No.2 or F-19 rear combination lamp (stop: RH) connector (without rear body) terminal No.4, or between C-114 stop lamp switch connector terminal No.1 and F-03 high mounted stop lamp connector terminal No.1, or between C-114 stop lamp switch connector terminal No.1 and F-04 rear combination lamp (stop: LH) connector (with rear body) terminal No.2 or F-22 rear combination lamp (stop: LH) connector (without rear body) terminal No.4, therefore, repair it.Then go to Step 11.

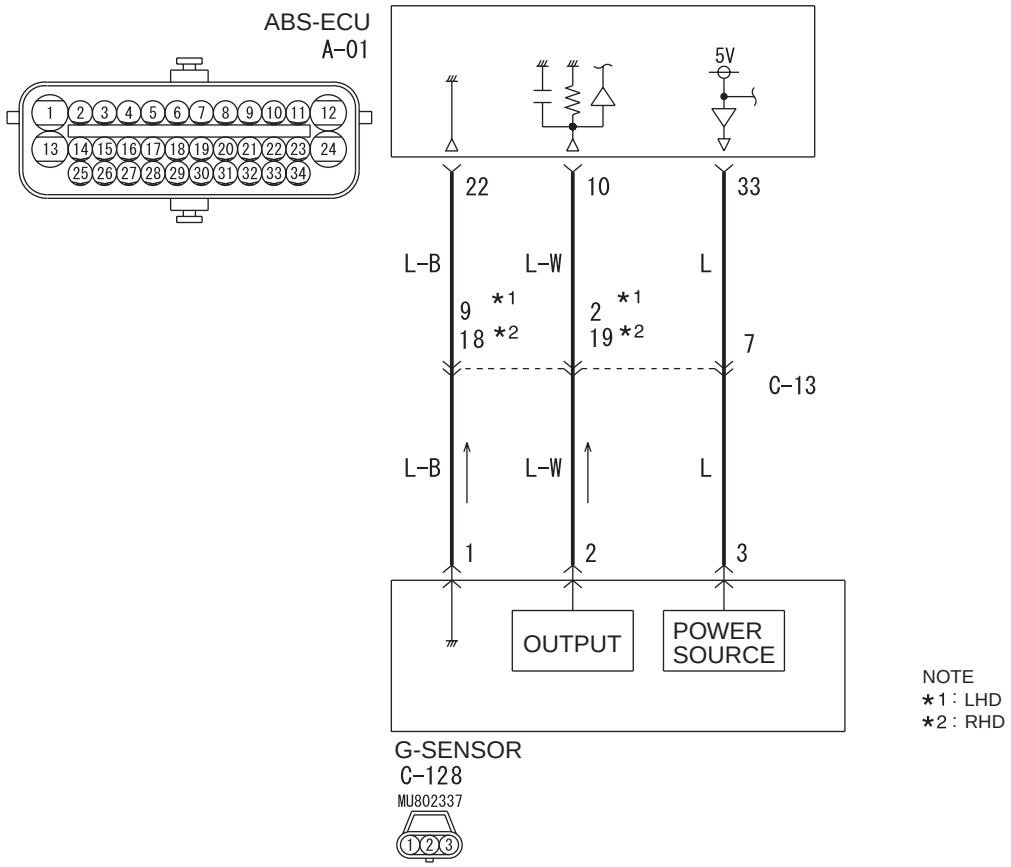
STEP 10. Diagnosis code recheck
Erase the diagnosis code.

Q: Is diagnosis code No.C1340 set?
YES : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-60.). Then go to Step 11.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunctions .).

STEP 11. Diagnosis code recheck
Erase the diagnosis code.

Q: Is diagnosis code No.C1340 set?
YES : Return to Step 1.
NO : This diagnosis is complete.

Code No.C1365: G-sensor malfunction (abnormal power supply) <4WD>



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

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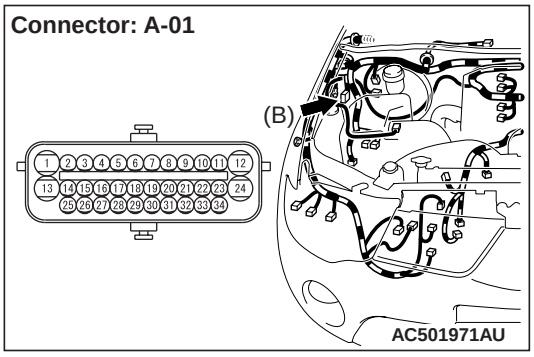
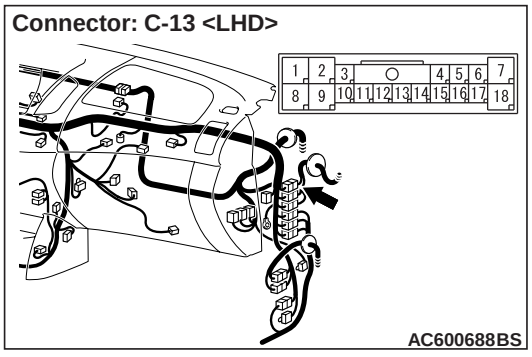
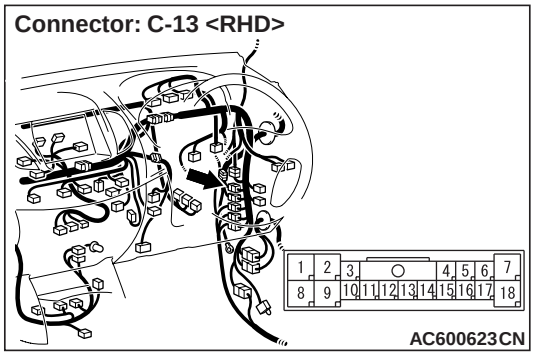
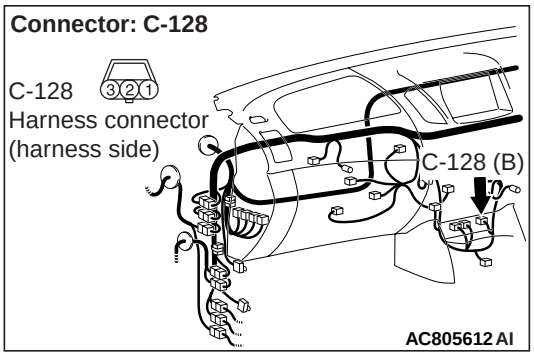








⚠ CAUTION

- **If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table .).**
- **Before replacing the ECU, ensure that the communication circuit is normal.**

OPERATION

The G-sensor detects the acceleration level in the forward/reverse direction of the vehicle, converts the signals into voltage signals and then sends that signal to the ABS-ECU.

DIAGNOSIS CODE SET CONDITION

This diagnosis code will be set when G-sensor power supply voltage continues to be 4.4 V or lower, or 5.6 V or higher.

PROBABLE CAUSES

The most likely causes for these diagnosis codes to set are:

- Damaged wiring harness or connector
- Malfunction of the G-sensor
- Malfunction of the ABS-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics.

Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?

YES : Go to Step 3.
NO : Repair the CAN bus line (Refer to GROUP 54C – CAN Bus Diagnostics Table .). Then go to Step 2.

STEP 2. Diagnosis code recheck after resetting CAN bus lines

Erase the diagnosis code.

Q: Is diagnosis code No.C1365 set?

YES : Go to Step 3.
NO : The procedure is complete.

STEP 3. M.U.T.-III data list

Check the following data list (Refer to P.35B-54.).

- Item 09: G sensor

Q: Is the check result normal?

YES : Go to Step 12.
NO : Go to Step 4.

STEP 4. Connector check: A-01 ABS-ECU connector, C-13 intermediate connector, C-128 G-sensor connector

Q: Is the check result normal?

YES : Go to Step 5.
NO : Repair or replace it. Then go to Step 13.

STEP 5. Voltage measurement at C-128 G-sensor connector.

(1) Disconnect the C-128 G-sensor connector, and measurement at the wiring harness-side connector.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No.3 and body earth.

OK: Approximately 5 V

Q: Is the check result normal?

YES : Go to Step 10.
NO : Go to Step 6.

STEP 6. Resistance measurement at A-01 ABS-ECU connector

(1) Disconnect the A-01 ABS-ECU connector.
(2) Disconnect the C-128 G-sensor connector.
(3) Measure the resistance between the A-01 ABS-ECU connector terminal No.33 and the body earth.

OK: No continuity

Q: Is the check result normal?

YES : Go to Step 7.
NO : A short circuit may be present. Repair the wiring harness between the A-01 ABS-ECU terminal No.33 and the C-128 G-sensor connector terminal No.3. Then go to Step 13.

STEP 7. Resistance measurement between A-01 ABS-ECU connector and C-128 G-sensor connector
(1) Disconnect the A-01 ABS-ECU connector.
(2) Disconnect the C-128 G-sensor connector.
(3) Measure the resistance between the A-01 ABS-ECU connector terminal No.33 and the C-128 G-sensor connector terminal No.3.

OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?
YES : Go to Step 8.
NO : An open circuit may be present. Repair the wiring harness between the A-01 ABS-ECU terminal No.33 and the C-128 G-sensor connector terminal No.3. Then go to Step 13.

STEP 8. Voltage measurement at C-128 G-sensor connector.
(1) Disconnect the C-128 G-sensor connector and A-01 ABS-ECU connector, and measurement at the wiring harness-side connector.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No.3 and body earth.

OK: 0.5 V or less

Q: Is the check result normal?
YES : Go to Step 9.
NO : A short circuit may be present in the power supply circuit. Repair the wiring harness between the A-01 ABS-ECU terminal No.33 and the C-128 G-sensor connector terminal No.3. Then go to Step 13.

STEP 9. Voltage measurement at C-128 G-sensor connector.
(1) Disconnect the C-128 G-sensor connector, and measurement at the wiring harness-side connector.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No.1 and body earth.

OK: 0.5 V or less

Q: Is the check result normal?
YES : Go to Step 13.
NO : A short circuit may be present in the earth circuit. Repair the wiring harness between the A-01 ABS-ECU terminal No.22 and the C-128 G-sensor connector terminal No.1. Then go to Step 13.

STEP 10. Resistance measurement between A-01 ABS-ECU connector and C-128 G-sensor connector
(1) Disconnect the A-01 ABS-ECU connector.
(2) Disconnect the C-128 G-sensor connector.
(3) Measure the resistance between the A-01 ABS-ECU connector terminal No.22 and the C-128 G-sensor connector terminal No.1.

OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?
YES : Go to Step 11.
NO : An open circuit may be present in the earth circuit. Repair the wiring harness between the A-01 ABS-ECU terminal No.22 and the C-128 G-sensor connector terminal No.1. Then go to Step 13.

STEP 11. G-sensor check
Refer to P.35B-65.

Q: Is the check result normal?
YES : Go to Step 12.
NO : Replace the G-sensor (Refer to P.35B-64.). Then go to Step 12 .

STEP 12. Check whether the diagnosis code is reset.
Erase the diagnosis code.

Q: Is diagnosis code No.C1365 set?
YES : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-60.). Then go to Step 13.
NO : This diagnosis is complete.

STEP 13. Check whether the diagnosis code is reset.
Erase the diagnosis code.

Q: Is diagnosis code No.C1365 set?
YES : Return to Step 1.
NO : This diagnosis is complete.

Code No.C1381: G-sensor malfunction (abnormal seizure or output error) <4WD>

⚠ CAUTION

- **If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table).**
- **Before replacing the ECU, ensure that the communication circuit is normal.**

OPERATION

The G-sensor detects the acceleration level in the forward/reverse direction of the vehicle, converts the signals into voltage signals and then sends that signal to the ABS-ECU.

DIAGNOSIS CODE SET CONDITIONS

This diagnosis code will be set under the cases below.

- With diagnosis codes No. C1365, C1382, and C1383 being not set, the output value of the G-sensor does not change.
- With diagnosis codes No. C1365, C1382, and C1383 being not set, the acceleration calculated from the G-sensor and the acceleration calculated from the vehicle speed are not equal.

PROBABLE CAUSES

- Malfunction of the G-sensor
- Malfunction of the ABS-ECU

DIAGNOSIS

STEP 1. M.U.T.-III CAN bus diagnostics.

Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?

YES : Go to Step 3

NO : Repair the CAN bus line (Refer to GROUP 54C – CAN Bus Diagnostics Table). Then go to Step 2.

STEP 2. Diagnosis code recheck after resetting CAN bus lines

(1) Erase the diagnosis code.

(2) Drive the vehicle at 30 km/h or more.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 30 km/h or higher.

Q: Is diagnosis code No.C1381 set?

YES : Go to Step 3

NO : The procedure is complete.

STEP 3. Check the G-sensor.

Refer to P.35B-65.

Q: Is the check result normal?

YES : Go to Step 4

NO : Replace the G-sensor (Refer to P.35B-65.) Then go to Step 5.

STEP 4. Diagnosis code recheck

(1) Erase the diagnosis code.

(2) Drive the vehicle at 30 km/h or more.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 30 km/h or higher.

Q: Is diagnosis code No.C1381 set?

YES : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-60.) Then go to Step 5.

NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction .)

STEP 5. Diagnosis code recheck

(1) Erase the diagnosis code.

(2) Drive the vehicle at 30 km/h or more.

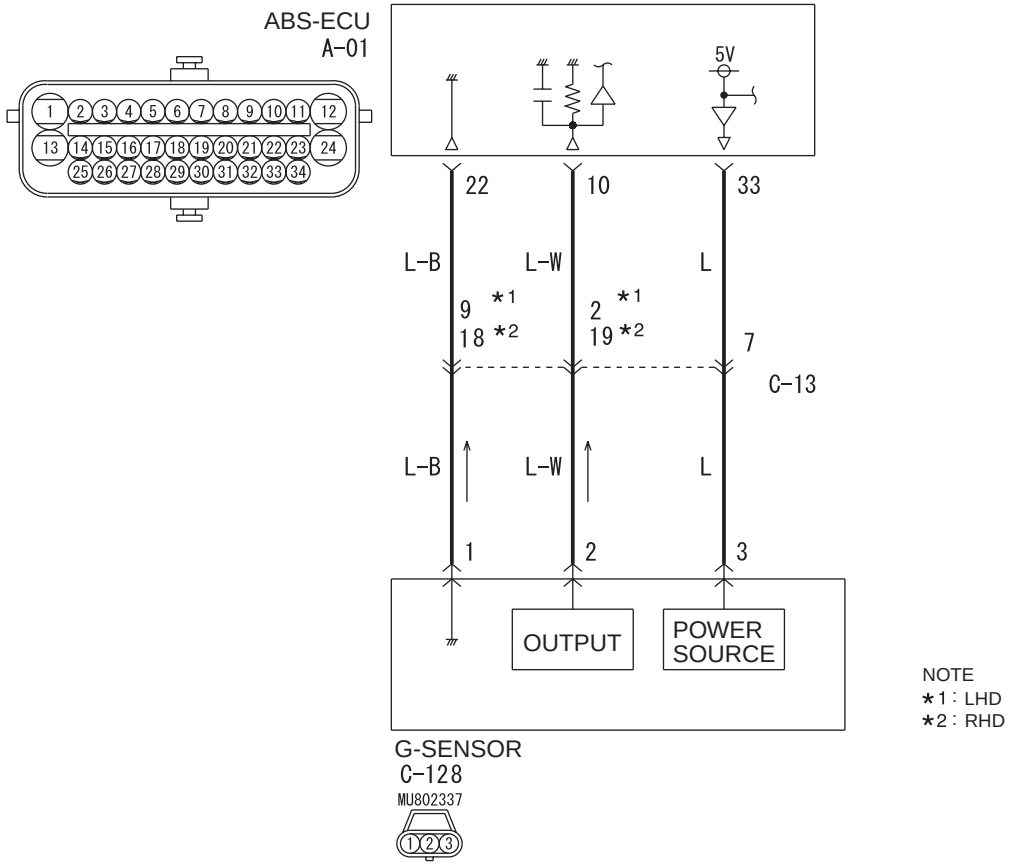
NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 30 km/h or higher.

Q: Is diagnosis code No.C1381 set?

YES : Return to Step 1.

NO : This diagnosis is complete.

Code No.C1382: G-sensor malfunction (low voltage) <4WD>
Code No.C1383: G-sensor malfunction (high voltage) <4WD>



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

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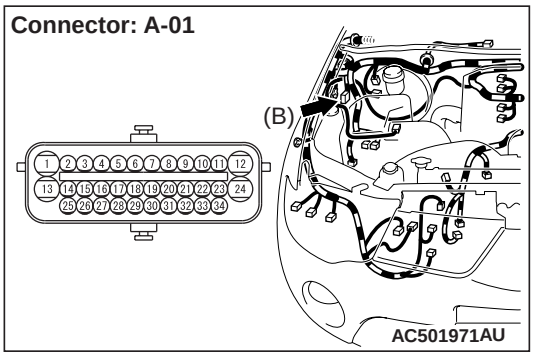
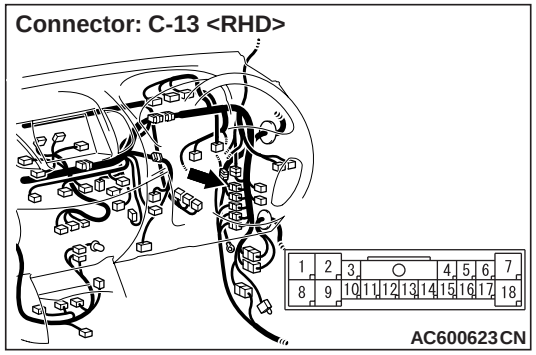
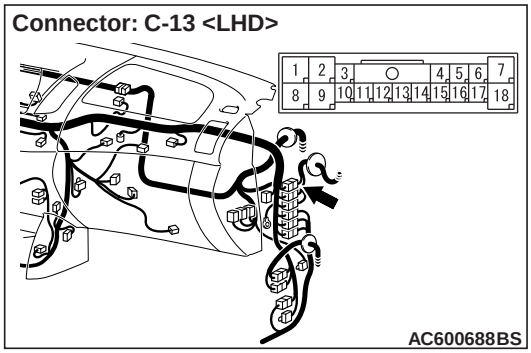
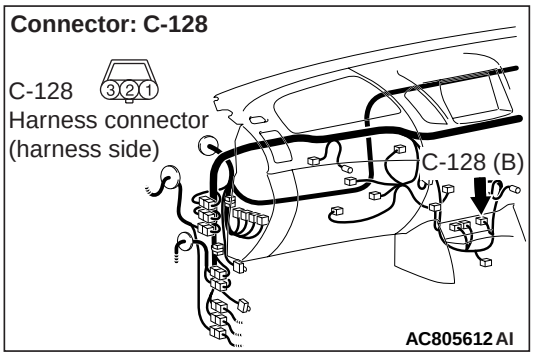
Connector: A-01



Connector: C-13 <RHD>







⚠ CAUTION

- **If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table .).**
- **Before replacing the ECU, ensure that the communication circuit is normal.**

OPERATION

The G-sensor detects the acceleration level in the forward/reverse direction of the vehicle, converts the signals into voltage signals and then sends that signal to the ABS-ECU.

DIAGNOSIS CODE SET CONDITIONS

This diagnosis codes will be set under the cases below.

Code No.C1382

- With diagnosis code No. C1365 being not set, the input value from the G-sensor is excessive low.

Code No.C1383

- With diagnosis code No. C1365 being not set, the input value from the G-sensor is excessive high.

PROBABLE CAUSES

- Damaged wiring harness or connector
- Malfunction of the G-sensor
- Malfunction of the ABS-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnosis.

Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?

YES : Go to Step 3.

NO : Repair the CAN bus line (Refer to GROUP 54C – CAN Bus Diagnostics Table .). Then go to Step 2.

STEP 2. Diagnosis code recheck after resetting CAN bus lines

Q: Are diagnosis codes No.C1382 or No.C1383 set?

YES : Go to Step 3.

NO : The procedure is complete.

STEP 3. M.U.T.-III data list

Check the following data list (Refer to P.35B-54.).

- Item 09: G sensor

Q: Is the check result normal?

YES : Go to Step 9.

NO : Go to Step 4.

STEP 4. Connector check: A-01 ABS-ECU connector, C-13 intermediate connector, C-128 G-sensor connector

Q: Is the check result normal?

YES : Go to Step 5.

NO : Repair or replace it. Then go to Step 10.

STEP 5. Resistance measurement at A-01 ABS-ECU connector

(1) Disconnect the A-01 ABS-ECU connector.
(2) Disconnect the C-128 G-sensor connector.
(3) Measure the resistance between the A-01 ABS-ECU connector terminal No.10 and the body earth.

OK: No continuity

Q: Is the check result normal?

YES : Go to Step 6.

NO : A short circuit may be present in the signal circuit. Repair the wiring harness between the A-01 ABS-ECU terminal No.10 and the C-128 G-sensor connector terminal No.2. Then go to Step 10.

STEP 6. Resistance measurement between A-01 ABS-ECU connector and C-128 G-sensor connector

(1) Disconnect the A-01 ABS-ECU connector.

(2) Disconnect the C-128 G-sensor connector.
(3) Measure the resistance between the A-01 ABS-ECU connector terminal No.10 and the C-128 G-sensor connector terminal No.2.

OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?
YES : Go to Step 7.
NO : An open circuit may be present in the signal circuit. Repair the wiring harness between the A-01 ABS-ECU terminal No.10 and the C-128 G-sensor connector terminal No.2. Then go to Step 10.

STEP 7. Voltage measurement at C-128 G-sensor connector.
(1) Disconnect the C-128 G-sensor connector and A-01 ABS-ECU connector, and measurement at the harness-side connector.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No.2 and body earth.

OK: 0.5 V or less

Q: Is the check result normal?
YES : Go to Step 8.
NO : A short circuit may be present. Repair the wiring harness between the A-01 ABS-ECU terminal No.10 and the C-128 G-sensor connector terminal No.2. Then go to Step 10.

STEP 8. G-sensor check
Refer to P.35B-65.

Q: Is the check result normal?
YES : Go to Step 9.
NO : Replace the G-sensor (Refer to P.35B-64.). Then go to Step 10 .

STEP 9. Diagnosis code recheck
Erase the diagnosis code.

Q: Are diagnosis codes No.C1382 or No.C1383 set?
YES : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-60). Then go to Step 10.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunctions .).

STEP 10. Diagnosis code recheck
Erase the diagnosis code.

Q: Are diagnosis codes No.C1382 or No.C1383 set?
YES : Return to Step 1.
NO : This diagnosis is complete.

Code No. C1860: ABS-ECU power supply system malfunction (high voltage)

⚠ CAUTION
- **If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table .).**
- **Before replacing the ECU, ensure that the communication circuit is normal.**

OPERATION
- The ABS-ECU is energized by the ignition switch (IG1) through J/B fuse No.15 and the ABS-ECU terminal No.25.
- The wheel speed sensors are energised via ABS-ECU terminal No. 25.

DIAGNOSIS CODE SET CONDITION
This diagnosis code is set when the power supply voltage of the ABS-ECU is abnormally high.

PROBABLE CAUSES
- Battery abnormality
- ABS-ECU malfunction
- Charging system failed

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnosis
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table .). On completion, go to Step 2.

STEP 2. Diagnosis code recheck after resetting CAN bus lines

Q: Is diagnosis code No. C1860 set?
YES : Go to Step 3.
NO : This diagnosis is complete.

STEP 3. Battery check
Refer to GROUP 54A – Battery Test .

Q: Is the battery in good condition?
YES : Go to Step 5.
NO : Charge or replace the battery. Then go to Step 4.

STEP 4. Charging system check
Refer to GROUP 16 – Charging System .

Q: Is the check result normal?
YES : Go to Step 5.
NO : Repair or replace the charging system component(s).

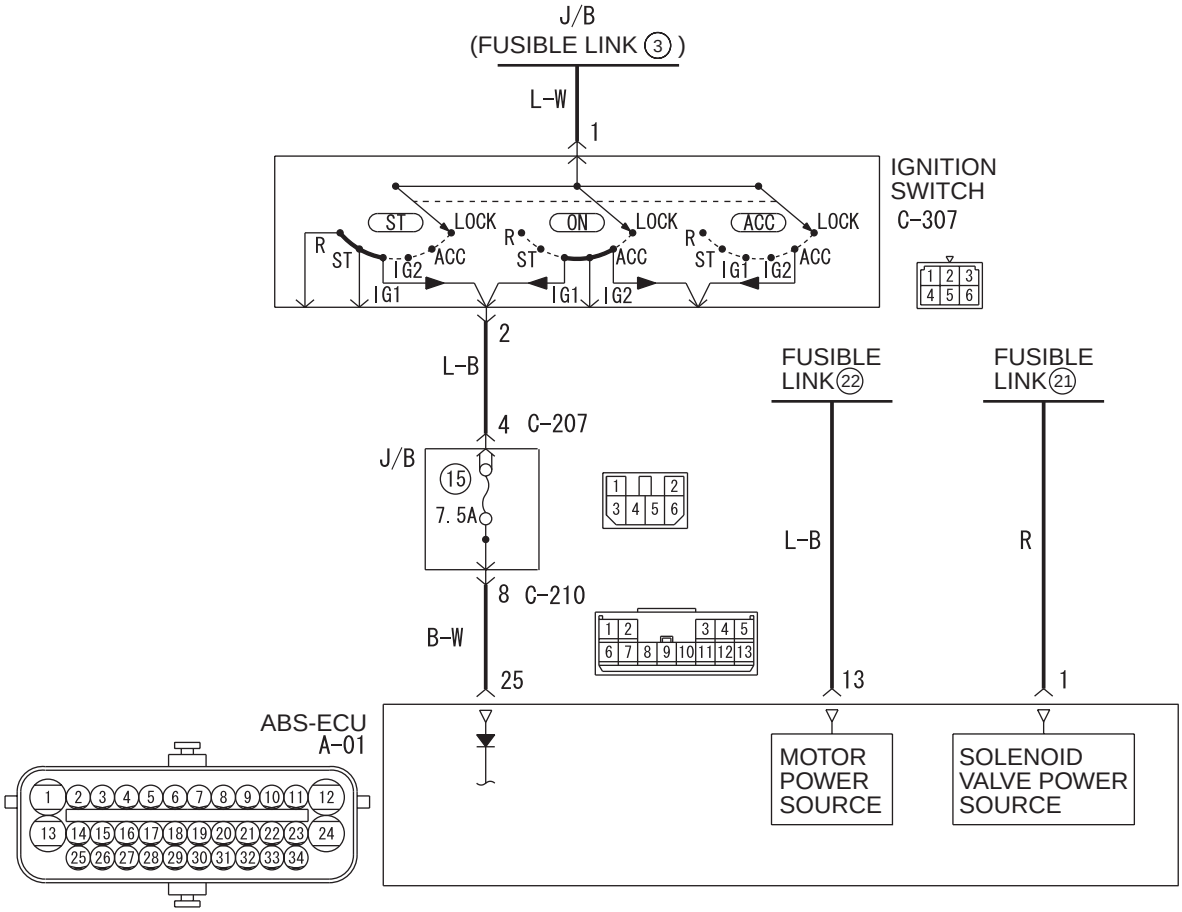
STEP 5. Check whether the diagnosis code is reset.
Erase the diagnosis code.

Q: Is diagnosis code No. C1860 set?
YES : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-60.). Then go to Step 6.
NO : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/How to Cope with Intermittent Malfunctions .).

STEP 6. Check whether the diagnosis code is reset.
Erase the diagnosis code.

Q: Is diagnosis code No. C1860 set?
YES : Return to Step 1.
NO : This diagnosis is complete.

Code No.C1861: ABS-ECU power supply system malfunction (low voltage)



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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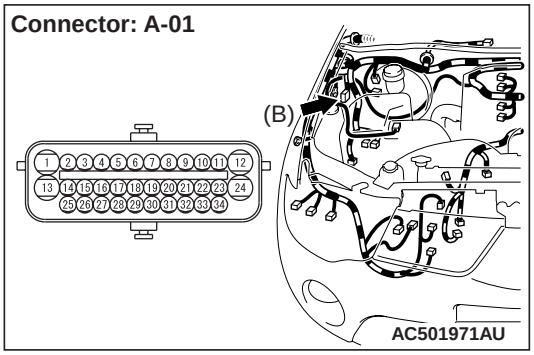
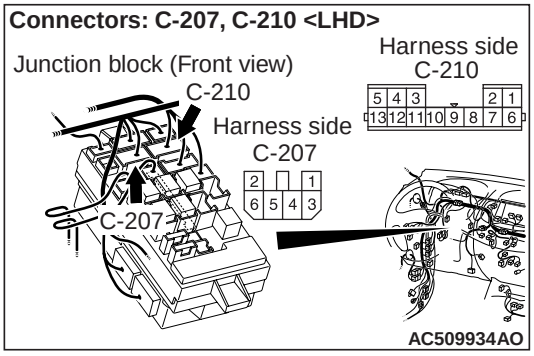
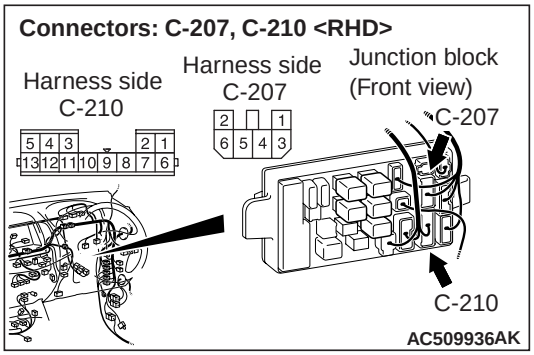
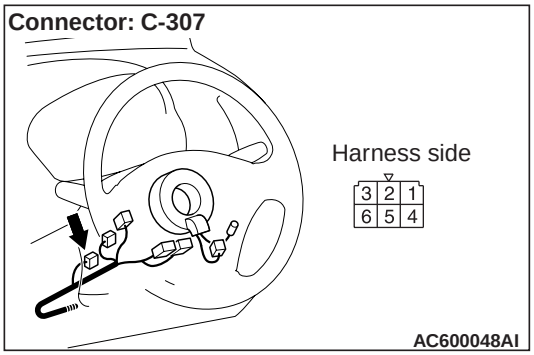








⚠ CAUTION

- **If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table).**
- **Before replacing the ECU, ensure that the communication circuit is normal.**

OPERATION

- The ABS-ECU is energized by the ignition switch (IG1) through J/B fuse No.15 and the ABS-ECU terminal No.25.
- Power supply for ABS solenoid valve is supplied to the ABS-ECU terminal No.1 via fusible link No.21.
- Power supply for ABS motor is supplied to the ABS-ECU terminal No.13 via fusible link No.22.
- The wheel speed sensors are energised via ABS-ECU terminal No. 25.

DIAGNOSIS CODE SET CONDITION

This code is set if the solenoid valve power supply circuit drops abnormally.

PROBABLE CAUSES

- Damaged wiring harness or connector
- Battery abnormality
- Charging system failed
- ABS-ECU malfunction
- Battery terminal looseness

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnosis

Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?

YES : Go to Step 3.

NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table .). Then go to Step 2.

STEP 2. Diagnosis code recheck after resetting CAN bus lines

(1) Erase the diagnosis code.
(2) Turn the ignition switch to the "LOCK" (OFF) position.
(3) Turn the ignition switch to the "ON" position.
(4) Check if the diagnosis code is set.

Q: Is diagnosis code No.C1861 set?

YES : Go to Step 3.

NO : This diagnosis is complete.

STEP 3. Check the fusible link No.21, No.22 or the fuse No.15.
Visually check for open circuit in the fusible link No.21, No.22 or the fuse No.15.

Q: Is the check result normal?
YES : Go to Step 4.
NO : Replace the fusible link or fuse. Then go to Step 10.

STEP 4. Battery check
Refer to GROUP 54A – Battery Test .

Q: Is the battery in good condition?
YES : Go to Step 5.
NO : Charge or replace the battery. Then go to Step 10.

STEP 5. Charging system check
Refer to GROUP 16 – Charging System .

Q: Is the charging system in good condition?
YES : Go to Step 6.
NO : Repair or replace the charging system component(s). Then go to Step 10.

STEP 6. Connector check: A-01 ABS-ECU connector, C-207 junction block connector, C-210 junction block connector, C-307 ignition switch (IG1) connector

Q: Is the check result normal?
YES : Go to Step 7.
NO : Repair the damaged connector. Then go to Step 10.

STEP 7. Resistance measurement at A-01 ABS-ECU connector
(1) Disconnect the C-210 junction block connector.
(2) Disconnect the fusible link No.21 and No.22.
(3) Disconnect the A-01 ABS-ECU connector, and measure at the wiring harness-side connector.
(4) Measure the resistance between the A-01 ABS-ECU connector terminal No.1, No.13, No.25 and the body earth.

OK: No continuity

Q: Is the check result normal?
YES : Go to Step 8.
NO : The short circuit may be present in the power supply circuit. Repair the wiring harness between the A-01 ABS-ECU connector terminal No.1, No.13, No.25 and the fusible link No.21, No.22, the C-210 junction block connector terminal No.8. Then go to Step 10.

STEP 8. Voltage measurement at A-01 ABS-ECU connector
(1) Disconnect the A-01 ABS-ECU connector.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the resistance between the A-01 ABS-ECU connector terminal No.1, No.13, No.25 and the body earth.

OK: Battery voltage

Q: Is the check result normal?
YES : Go to Step 9.
NO : The open circuit may be present in the power supply circuit. Repair the wiring harness between the A-01 ABS-ECU connector terminal No.1, No.13, No.25 and the fusible link No.21, No.22, the C-210 junction block connector terminal No.8. Then go to Step 10.

STEP 9. Check whether the diagnosis code is reset.
(1) Erase the diagnosis code.
(2) Turn the ignition switch to the "LOCK" (OFF) position.
(3) Turn the ignition switch to the "ON" position.
(4) Check if the diagnosis code is set.

Q: Is diagnosis code No. C1861 set?
YES : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-60.). Then go to Step 10.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunctions .).

STEP 10. Check whether the diagnosis code is reset.
(1) Erase the diagnosis code.
(2) Turn the ignition switch to the "LOCK" (OFF) position.
(3) Turn the ignition switch to the "ON" position.
(4) Check if the diagnosis code is set.

Q: Is diagnosis code No. C1861 set?
YES : Return to Step 1.
NO : This diagnosis is complete.

Code No. C1395 Brake fluid charging incompletion

⚠ CAUTION

If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table).

DIAGNOSIS CODE SET CONDITIONS

This diagnosis code is set when the brake fluid is not filled in the hydraulic unit.

PROBABLE CAUSES

- Different hydraulic unit (For delivery to factory)
- ABS-ECU malfunction

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnosis

Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?

YES : Go to Step 2.

NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table). On completion, go to Step 2.

STEP 2. Check whether the diagnosis code is reset.

Q: Is the diagnosis code No. C1395 set?

YES : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-60).

NO : This diagnosis is complete.

Code No.U1073: Trouble in CAN bus system

⚠ CAUTION

- **If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table).**
- **Before replacing the ECU, ensure that the communication circuit is normal.**

TROUBLE JUDGEMENT

This code is stored when the ABS-ECU has ceased the CAN communication (bus off). Then, if a penalty mode is entered after approximately five minutes, regular data transmission will be cancelled.

PROBABLE CAUSES

- Damaged wiring harness or connector
- Malfunction of the ABS-ECU

DIAGNOSIS

STEP 1. M.U.T.-III CAN bus diagnostics

Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?

YES : Go to Step 2.

NO : Repair the CAN bus line (Refer to GROUP 54C – CAN Bus Diagnostics Table). Then go to Step 3.

STEP 2. M.U.T.-III diagnosis code

Erase the diagnosis code.

Q: Is the diagnosis code No.U1073 set?

YES : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-60.) Then go to Step 3.

NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction .)

STEP 3. Diagnosis code recheck

Erase the diagnosis code.

Q: Is the diagnosis code No.U1073 set?

YES : Go to Step 1.

NO : The procedure is complete.

INSPECTION CHART FOR TROUBLE SYMPTOMS

M1352011401452

NOTE: If steering movements are made when driving at high speed, or when driving on road surfaces with low frictional resistance, or when passing over bumps, the ABS may operate although sudden braking is not being applied. Because of this, when getting information from the customer, check if the problem occurred while driving under such conditions as these.

NOTE: During ABS operation, the brake pedal may vibrate a little or may not be able to be pressed. Such conditions are due to intermittent changes in hydraulic pressure inside the brake line to prevent the wheels from locking. This is normal.

Symptom	Inspection procedure No.	Reference page
Communication between M.U.T.-III and the ABS-ECU is not possible.	1	P.35B-51
The ABS warning lamp remains illuminated after the engine is started.	2	P.35B-52
ABS system does not operate.	3	P.35B-53
The initial check sound of hydraulic unit is loud.	4	P.35B-54

SYMPTOM PROCEDURES

Inspection Procedure 1: Communication between M.U.T.-III and the ABS-ECU is not possible.

⚠ CAUTION
- **If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C, CAN Bus Diagnostics Table).**
- **Before replacing the ECU, ensure that the communication circuit is normal.**

TECHNICAL DESCRIPTION (COMMENT)
If the M.U.T.-III cannot communicate with the ABS system, the CAN bus lines may be defective. If the ABS system does not work, the ABS-ECU or its power supply circuit may be defective.

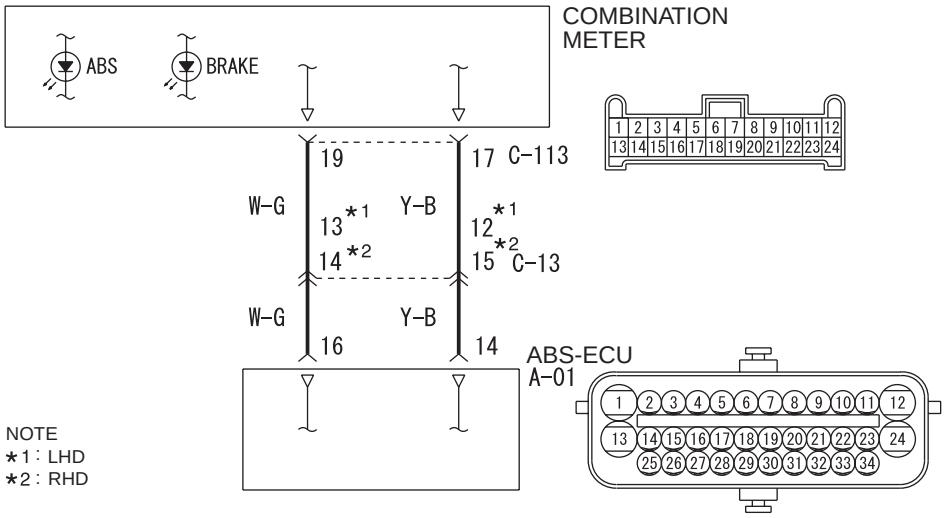
PROBABLE CAUSES
- Damaged wiring harness and connectors
- ABS-ECU malfunction
- Wrong routing of M.U.T.-III harness
- Abnormality in power supply voltage to ABS-ECU
- ECU malfunction of other system

DIAGNOSIS

STEP 1. M.U.T.-III CAN bus diagnostics
Use M.U.T.-III to diagnose the CAN bus lines.

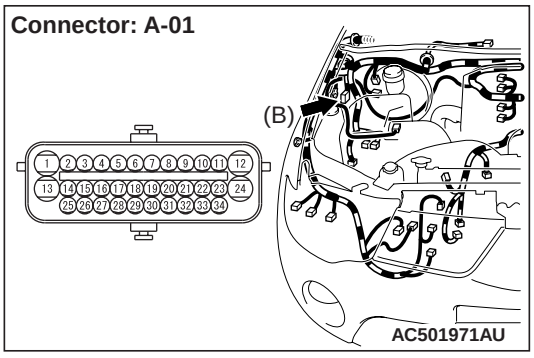
Q: Is the check result normal?
YES : Check and repair the power supply circuit of ABS-ECU system.
NO : Repair the CAN bus lines (Refer to GROUP 54C, CAN Bus Diagnostics Table).

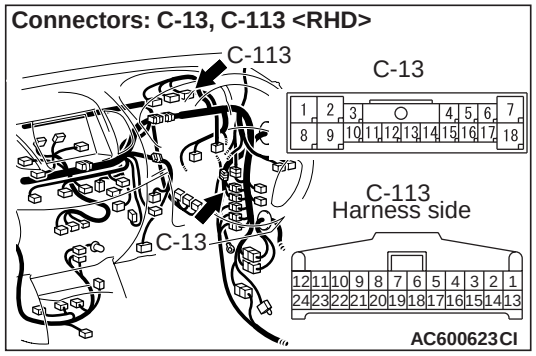
Inspection Procedure 2: The ABS warning lamp remains illuminated after the engine is started.

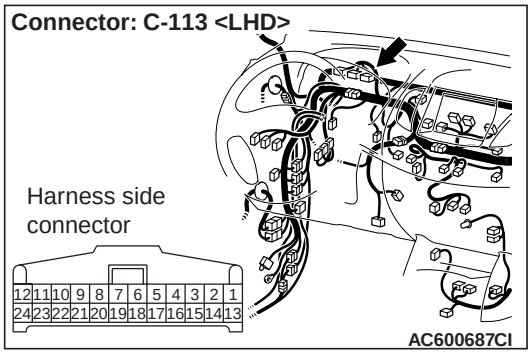


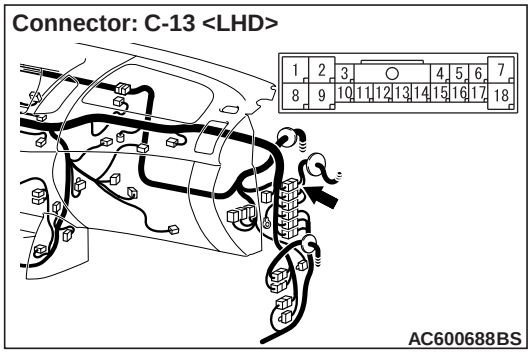
Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

ACB00771









⚠ CAUTION

If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Diagnose the CAN bus lines before the diagnosis codes (Refer to GROUP 54C, CAN Bus Diagnostics Table .).

OPERATION

- ABS-ECU send the illumination signal of ABS warning lamp to the combination meter.
- ABS-ECU operates the ABS warning lamp and the ABS warning lamp for three seconds after the ignition switch is turned "ON" position for bulb check.

COMMENT

This may be caused by faults in the signal line, the combination meter or the ABS-ECU.

PROBABLE CAUSES

- Malfunction of the combination meter
- Damaged wiring harness and connectors
- Malfunction of the ABS-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the CAN bus lines (Refer to GROUP 54C, CAN Bus Diagnostics Table .). Then go to Step 6.

STEP 2. Connector check: A-01 ABS-ECU connector, C-13 intermediate connector, C-113 combination meter connector

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair or replace it. Then go to Step 6.

STEP 3. Resistance measurement at C-113 combination meter connector
(1) Disconnect the A-01 ABS-ECU connector and C-113 combination meter connector.
(2) Resistance between the C-113 combination meter connector terminal No.19 and the body earth.

OK: No continuity

Q: Is the check result normal?
YES : Go to Step 4.
NO : A short circuit may be present in the earth circuit. Repair the wiring harness between the A-01 ABS-ECU terminal No.16 and the C-113 combination meter connector terminal No.19. Then go to Step 6.

STEP 4. M.U.T.-III diagnosis code

Q: Is any diagnosis code set?
YES : Refer to Diagnosis Code Chart (Refer to P.35B-14.). Then go to Step 6.
NO : Replace the combination meter assembly (Refer to GROUP 54A, Combination Meter Assembly .). Then go to Step 5.

STEP 5. Retest the system

Q: Turn the ignition switch to the "ON" position. Does the ABS warning lamp illuminate for three seconds, and then go out after the engine starts?
YES : The procedure is complete.
NO : Replace the hydraulic unit (integrated with ABS-ECU) (Refer to P.35B-60.). Then go to Step 6.

STEP 6. Retest the system

Q: Turn the ignition switch to the "ON" position. Does the ABS warning lamp illuminate for three seconds, and then go out after the engine starts?
YES : The procedure is complete.
NO : Return to Step 1.

Inspection Procedure 3: ABS system does not operate.

COMMENT
The fail-safe function is probably cancelling ABS system. In this case, M.U.T.-III can be used to retest each system by checking the diagnosis codes.

PROBABLE CAUSES
- Malfunction of the CAN bus line.
- Malfunction of the brake system.
- Malfunction of the ABS-ECU.

DIAGNOSIS

STEP 1. Hydraulic unit check
Refer to P.35B-57.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Connect the brake pipes correctly, repair the external brake lines, or replace the hydraulic unit.

STEP 2. Verify that the condition described by the customer exists.

Q: Can any faults be found with the brake operation?
YES : Check the brake system related components except the ABS system.
NO : The procedure is complete.

Inspection procedure 4: The initial check sound of hydraulic unit is loud.

⚠ CAUTION

When installing brake tube, match the axial centre of flare nut and brake tube with the centre of hole at the hydraulic unit side, and check that the fluid does not leak.

COMMENT ON TROUBLE SYMPTOM

The operation sound may be decreased by reducing the load at the rubber mount portion of the brake tube and hydraulic unit.

PROBABLE CAUSES

- Improper installation of the hydraulic unit
- Improper installation of the brake tube

DIAGNOSIS PROCEDURE

DRIVING CHECK

(1) Turn the ignition switch from the "LOCK" (OFF) position to the "ON" position.
(2) When vehicle speed reaches 10 km/h, check the operating sound volume and compare it with that of the same model.

OK: The operating sound is the same volume or less by comparing with that of the same model.

Q: Is the check result normal?

YES : This diagnosis is complete.
NO : Carry out adjustment for hydraulic unit installation. (Refer to P.35B-57).

DATA LIST REFERENCE TABLE

M1352011501318

The following items can be read by the M.U.T.-III from the ABS-ECU input data.

When the system is normal.

Item No.	Check item	Check condition	Normal condition
01	FL wheel speed sensor	Perform a test run of the vehicle	Speedometer display and M.U.T.-III display almost agree with each other.
02	FR wheel speed sensor		
03	RL wheel speed sensor		
04	RR wheel speed sensor		
05	Power supply voltage	Always	System voltage
09*1	G-sensor	Vehicle is stopped (on a level surface)	0 G
		Vehicle is running	-1.0 – 1.0 G
13	Stop lamp switch	The brake pedal is depressed	ON
		The brake pedal is released	OFF
63*2	Rear diff lock switch	When rear differential lock switch is ON	ON
		When rear differential lock switch is OFF	OFF

NOTE:

- **1:4WD*
- **2:Vehicles with rear differential lock*

When the ABS-ECU shut off ABS operation.

When the diagnosis system stops the ABS-ECU, the M.U.T.-III display data will be unreliable.

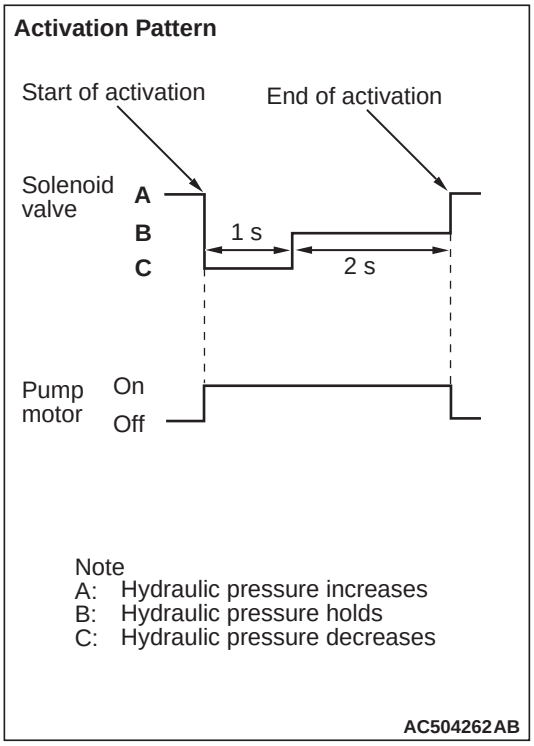
ACTUATOR TEST REFERENCE TABLE

M1352011600851

The M.U.T.-III activates the following actuators for testing.

NOTE:
- *When ABS-ECU is disabled, the actuator test cannot be performed.*
- *The actuator test can be performed only when the vehicle is stationary. When the vehicle speed reaches 10km/h, the forcible actuator operation is disabled.*
- *During actuator test, the ABS warning lamp illuminates, and ABS control is prohibited.*

ACTUATOR TEST SPECIFICATIONS

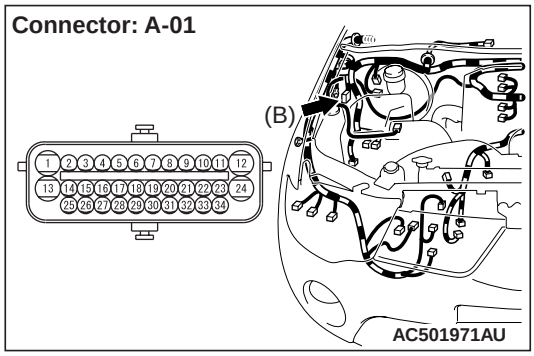


Item No.	Check item	Drive Contents
01	Solenoid valve for front-left wheel	Solenoid valves and pump motor in the hydraulic unit (simple inspection mode)
02	Solenoid valve for front-right wheel	
03	Solenoid valve for rear-left wheel	
04	Solenoid valve for rear-right wheel	

CHECK AT ABS-ECU

M1352011801449

TERMINAL VOLTAGE CHECK CHART



1. Disconnect the A-01 ABS-ECU connector, and measure the voltages between earth terminal No.12 or No.24 and each respective terminal.
2. The terminal layout is shown in the illustration.

NOTE: Do not measure terminal voltage for approximately three seconds after the ignition switch is turned to the "ON" position. The ABS-ECU performs the initial check during that period.

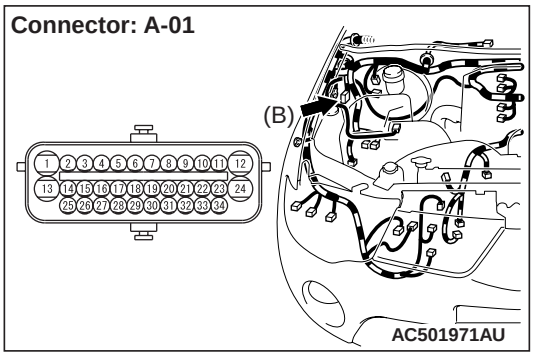
Terminal No.	Check item	Checking requirements	Normal condition
1	Solenoid valve power supply	Always	Battery voltage
4*2	Rear differential lock detection switch input	Rear differential lock detection switch: "OFF"	Approximately 5 V
		Rear differential lock detection switch: "ON"	0.5 V or less
7	Wheel speed sensor (FR) power supply	Ignition switch: "ON"	Approximately system voltage
9	Wheel speed sensor (RL) power supply	Ignition switch: "ON"	Approximately system voltage
10*1	G-sensor (signal)	• Ignition switch: "ON" • Vehicle on a level surface	2.4 – 2.6 V
13	Motor power supply	Always	Battery voltage

Terminal No.	Check item	Checking requirements	Normal condition
14	Brake warning lamp output	Ignition switch: "ON" (When brake warning lamp is ON.)	1 V or less
		Ignition switch: "ON" (When the brake warning lamp is OFF, the brake fluid level is normal and the parking brake is "OFF" position.)	Approximately system voltage
16	ABS warning lamp output	Ignition switch: "ON" (When ABS warning lamp is ON.)	1 V or less
		Ignition switch: "ON" (When ABS warning lamp is OFF.)	Approximately system voltage
19	Wheel speed sensor (FL) power supply	Ignition switch: "ON"	Approximately system voltage
21	Wheel speed sensor (RR) power supply	Ignition switch: "ON"	Approximately system voltage
22*1	G-sensor (earth)	Always	0.5 V or less
25	ABS-ECU power supply(IG1)	Ignition switch: "ON"	Battery voltage
		Ignition switch: "OFF"	1 V or less
27	Stop lamp switch input	Stop lamp switch: "ON"	Approximately system voltage
		Stop lamp switch: "OFF"	1 V or less
33*1	G-sensor (power source)	Ignition switch: "ON"	Approximately 5 V

NOTE:

- **1: 4WD*
- **2: Vehicles with rear differential lock*

RESISTANCE AND CONTINUITY BETWEEN HARNESS-SIDE CONNECTOR TERMINALS



1. Turn the ignition switch to the "LOCK" (OFF) position and disconnect the A-01 ABS-ECU connector before checking resistance and continuity.
2. Check the resistance and continuity between the terminals indicated in the table below.
3. The terminal layout is shown in the illustration.

ABS-ECU terminal No.	Signal	Normal condition
12 to body earth	Earth	Continuity exists (2 Ω or less)
24 to body earth	Earth	Continuity exists (2 Ω or less)

ON-VEHICLE SERVICE

WHEEL SPEED SENSOR OUTPUT CURRENT MEASUREMENT

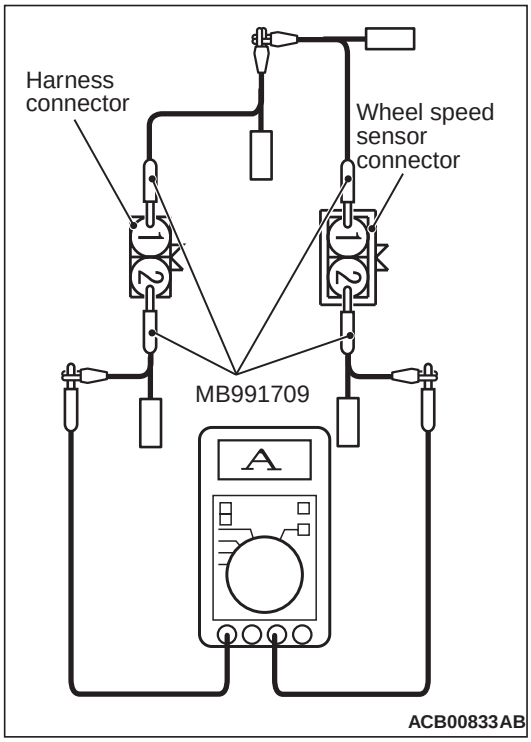
M1352032800065

The relevant wheel, on which the wheel speed sensor is fitted, should be free to run.

1. Remove the wheel speed sensor connector to be checked.

⚠ CAUTION

For precise measurement, do not connect to the wheel speed sensor-side connector and the wiring harness side connector terminal No.1.



2. Use the special tool test harness (MB991709) to connect a multimeter between the wheel speed sensor-side connector and the wiring harness connector terminal No.2.
3. Turn the ignition switch to the "ON" position.

⚠ CAUTION

Do not rotate the wheel too quickly. Output current changes significantly as the wheel speed detection magnetic encoder comes near or goes away from the wheel speed sensor.

4. Rotate the wheel, on which the wheel speed sensor is fitted, quite slowly to measure the output current with the multimeter.

Standard value: 5 to 9 mA or 11 to 17 mA

5. If the measurement is not within the standard value, or the output current does not change in proportion to the wheel rotation, replace the wheel speed sensor (Refer to P.35B-62).

HYDRAULIC UNIT CHECK

M1352001701106

⚠ CAUTION

- **The roller of the braking force tester and the tyre should be dry during testing.**
- **When testing the front brakes, apply the parking brake. When testing the rear brakes, stop the front wheels with chocks.**

1. Jack up the vehicle. Then support the vehicle with rigid racks at the specified jack-up points or place the front or rear wheels on the rollers of the braking force tester.
2. Release the parking brake, and feel the drag force (drag torque) on each road wheel. When using the braking force tester, take a reading of the brake drag force.

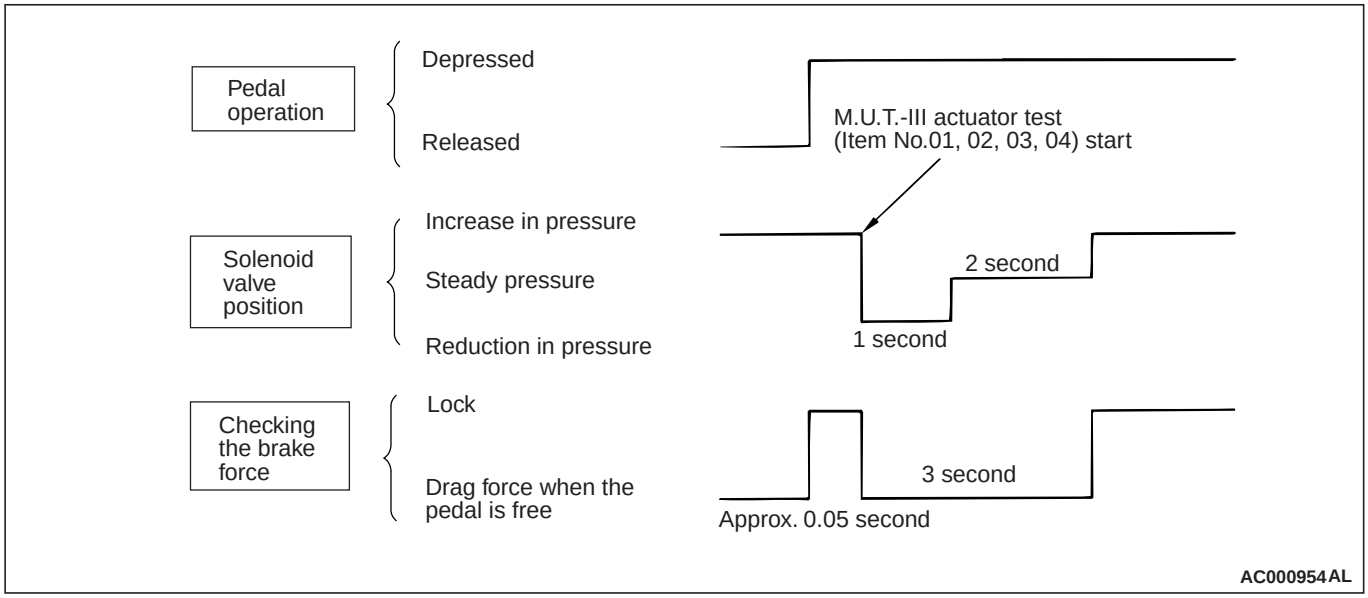
⚠ CAUTION

To prevent damage to M.U.T.-III, always turn the ignition switch to the "LOOK" (OFF) position before connecting or disconnecting the M.U.T.-III.

3. Turn the ignition switch to the "LOCK" (OFF) position and set the M.U.T.-III as shown in the illustration.
4. After checking that the selector lever is in neutral, start the engine.
5. Use the M.U.T.-III to force-drive the actuator.

   NOTE: The ABS system will switch to the M.U.T.-III mode and the ABS warning lamp will illuminate.

   NOTE: When the ABS has been interrupted by the fail-safe function, the M.U.T.-III actuator testing cannot be used.



6. Turn the wheel by hand and check the change in braking force when the brake pedal is depressed. When using the braking force tester, depress the brake pedal until the braking force is at the following values, and check that the braking force changes to the brake drag force inspected in step 2 when the actuator is force-driven. The result should be as shown in the diagram above.

Front wheel	785 to 981 N
Rear wheel	588 to 784 N

7. If the result of inspection is abnormal, repair according to the Diagnosis Table below.

Diagnosis table

M.U.T.-III display	Operation	Inspection result	Judgement	Probable cause	Remedy
1 FL wheel ABS drive 2 FR wheel ABS drive 3 RL wheel ABS drive 4 RR wheel ABS drive	• Depress brake pedal to lock wheel. • Using the M.U.T.-III, select the wheel to be checked and force the actuator to operate. • Turn the selected wheel manually to check the change of brake force.	Brake force is released for three seconds after wheels have been locked.	Normal	–	–
		Wheel does not lock when brake pedal is depressed.	Abnormal	Clogged brake line other than hydraulic unit	Check and clean brake line
				Clogged hydraulic circuit in hydraulic unit	Replace hydraulic unit assembly
		Brake force is not released		Incorrect hydraulic unit brake tube connection	Connect correctly
				Hydraulic unit solenoid valve not functioning correctly	Replace hydraulic unit assembly

8. After inspection, disconnect the M.U.T.-III immediately after turning the ignition switch to the "LOCK" (OFF) position.

Hydraulic unit installation adjustment
Refer to P.35B-60.

1. Operate the pre-removal steps for the hydraulic unit.
2. Remove all brake tubes.
3. Loosen the mounting bolt and nut of the hydraulic unit bracket.
4. Install all brake tubes temporarily.
5. Shake hydraulic unit to all directions with both hands to make the hydraulic unit bracket insulator fit with the unit.
6. Install the the hydraulic unit bracket with mounting bolt and nut not to load the brake tube.
7. Install all brake tubes securely.
   NOTE: Install the flare nut taking care not to let the brake tube turn together.
8. Operate the post-installation steps of the hydraulic unit.

IN THE EVENT OF A DISCHARGED BATTERY

M1352003500484

⚠ WARNING

If the ABS is not operating, the vehicle posture will be unstable during braking, Do not drive the vehicle with the ABS-ECU connector disconnected or with the ABS not operating for any other reason.

If the engine is started using a booster cable when the battery is completely flat, and the vehicle is then driven without waiting for the battery to be recharged, the engine may misfire and it may not be possible to drive the vehicle. This is because the ABS consumes a large amount of current when carrying out its initial checks. If this happens, recharge the battery fully.

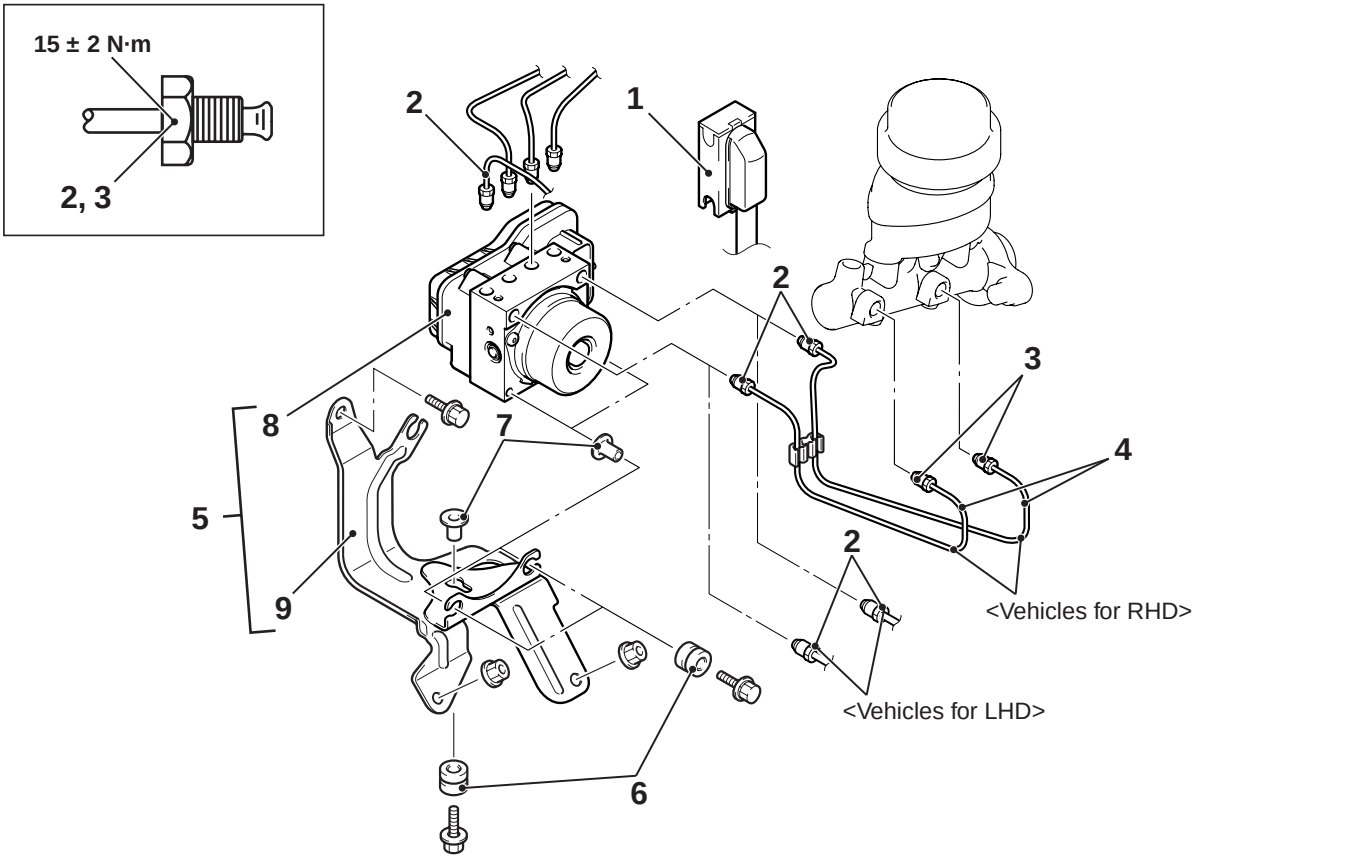
HYDRAULIC UNIT

REMOVAL AND INSTALLATION

M1352008601199

NOTE: The ABS-ECU is integrated in the hydraulic unit.

Pre-removal Operation	Post-installation Operation
• Brake Fluid Draining	• Brake Fluid Filling • Brake Line Bleeding (Refer to GROUP 35A, On-vehicle Service – Bleeding .) • Hydraulic Unit Check (Refer to P.35B-57.)



ACB00499 AB

Removal steps

1. Harness connector
>>A<< 2. Brake pipe and hydraulic unit assembly connection
3. Brake pipe and master cylinder connection <RHD>
4. Brake pipe <RHD>
5. Hydraulic unit assembly and hydraulic unit bracket assembly
6. Insulator
7. Collar
<<A>> 8. Hydraulic unit assembly (integrated with ABS-ECU)
9. Hydraulic unit bracket assembly

REMOVAL SERVICE POINT

<<A>> HYDRAULIC UNIT ASSEMBLY (INTEGRATED WITH ABS-ECU) REMOVAL

⚠ ***WARNING***

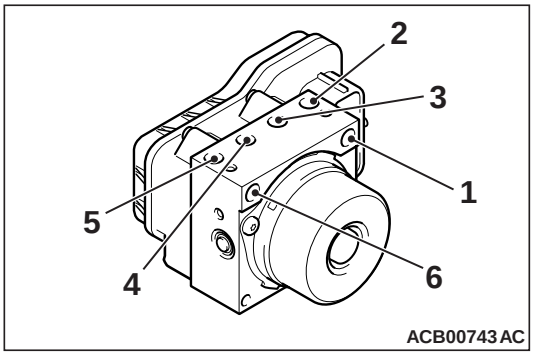
The hydraulic unit is heavy. Use care when removing it.

⚠ **CAUTION**

- **The hydraulic unit cannot be disassembled. Never loosen its nuts or bolts.**
- **Do not drop or shock the hydraulic unit.**
- **Do not turn the hydraulic unit upside down or lay it on its side.**

INSTALLATION SERVICE POINT

>>A<< BRAKE PIPE AND HYDRAULIC UNIT CONNECTION



Connect the pipes to the hydraulic unit assembly as shown in the illustration.

1. From the master cylinder (primary)
2. To the front brake (LH)
3. To the rear brake (RH)
4. To the rear brake (LH)
5. To the front brake (RH)
6. From the master cylinder (secondary)

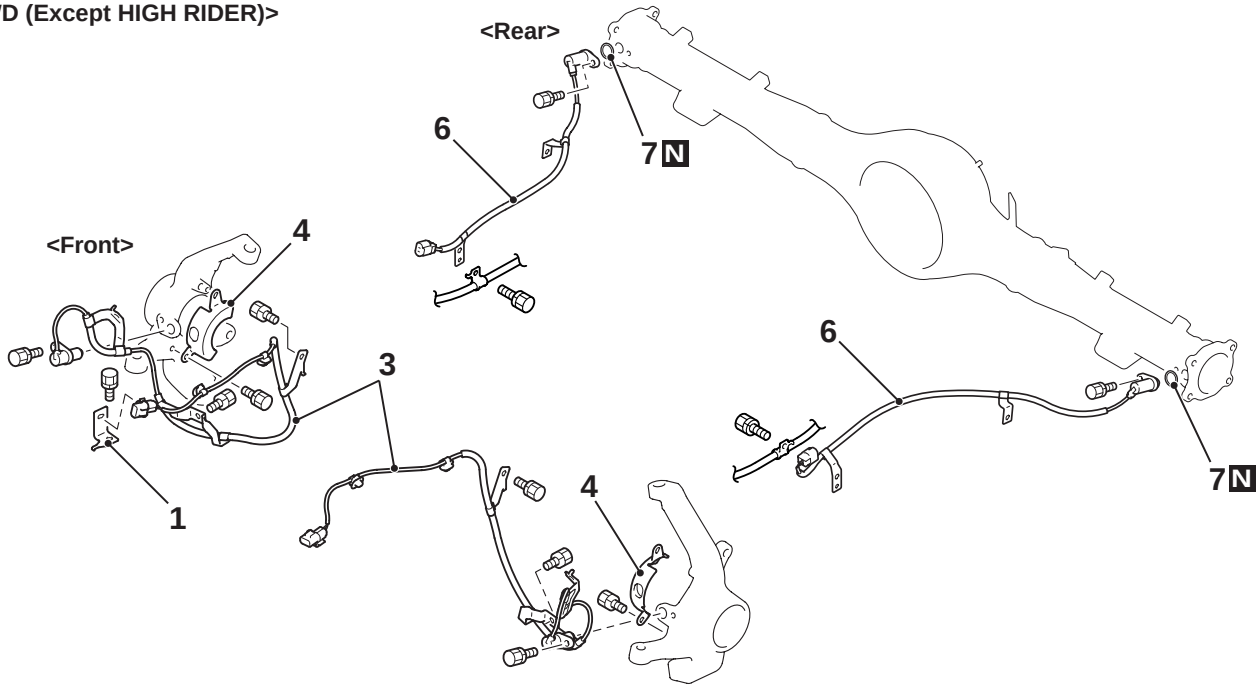
WHEEL SPEED SENSOR

REMOVAL AND INSTALLATION

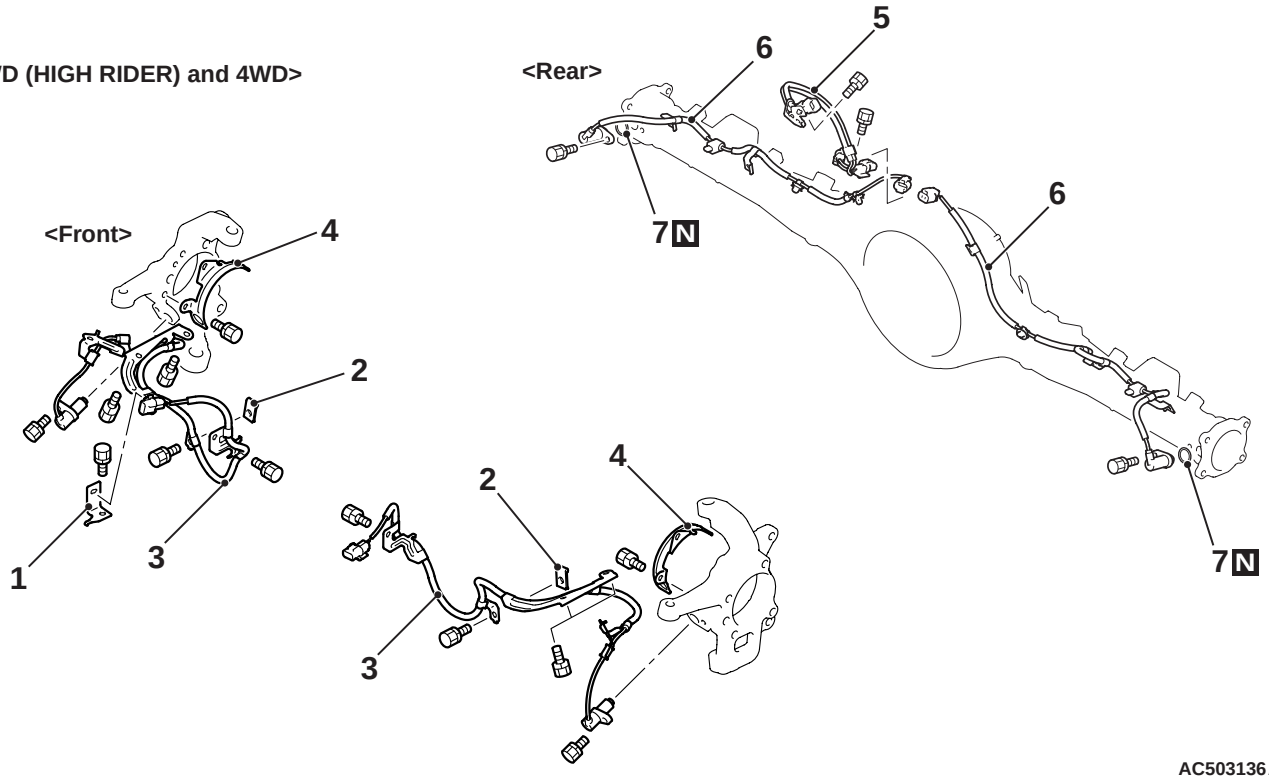
M1352020700232

Post-installation Operation
- Wheel Speed Sensor Output Current Measurement (Refer to P.35B-57.)

<2WD (Except HIGH RIDER)>



<2WD (HIGH RIDER) and 4WD>



AC503136AD

Front wheel speed sensor removal steps
1. Bracket
2. Equip nut

<<A>>

Front wheel speed sensor removal steps (Continued)
3. Front wheel speed sensor

Front wheel speed sensor removal steps (Continued)

4. Protector
- Front rotor [Refer to GROUP 26, Front Axle Hub Assembly . <2WD (Except High rider)> or GROUP 26, Drive Shaft Assembly . <2WD (High rider), 4WD>]

Rear wheel speed sensor removal steps

5. Harness

<<**A**>> 6. Rear wheel speed sensor

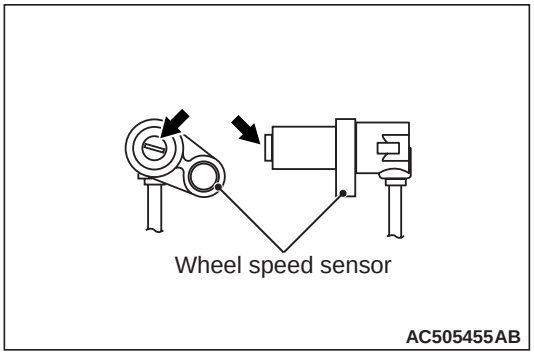
7. O-ring
- Rear rotor (Refer to GROUP 27, Axle Shaft Assembly .)

NOTE: The front rotor is integrated with the BJ assembly, which cannot be disassembled. <2WD (High rider) and 4WD>

REMOVAL SERVICE POINT

<<A>> FRONT WHEEL SPEED SENSOR/REAR WHEEL SPEED SENSOR REMOVAL

⚠ CAUTION



Be careful when handling the projection at the tip of the wheel speed sensor and the toothed edge of the rotor so as not to damage them by contacting other parts.

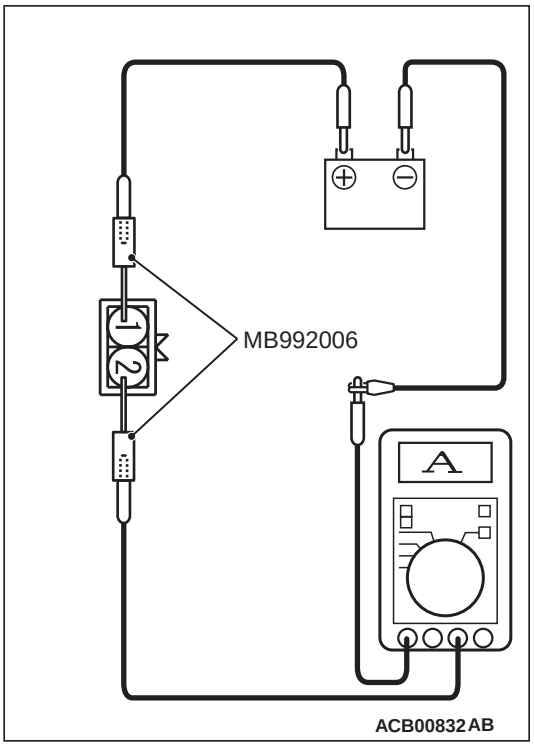
INSPECTION

M1352020800176

WHEEL SPEED SENSOR CURRENT CHECK

⚠ CAUTION

- **Do not connect the battery terminals in reverse as the wheel speed sensor may be damaged.**
- **When the current value is measured by the wheel speed sensor connector, measure it with the wheel speed sensor installed in the vehicle.**

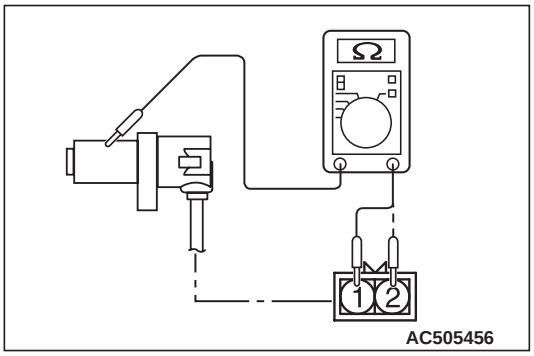


1. Connect the circuit tester to the wheel speed sensor using the special tool extra fine probe (MB992006), and measure the sensor current as a single unit.

   Standard value: 5 to 9 mA or 11 to 17 mA

2. If the measurement value is not within the standard value range, replace the wheel speed sensor with a new one.

WHEEL SPEED SENSOR INSULATION CHECK

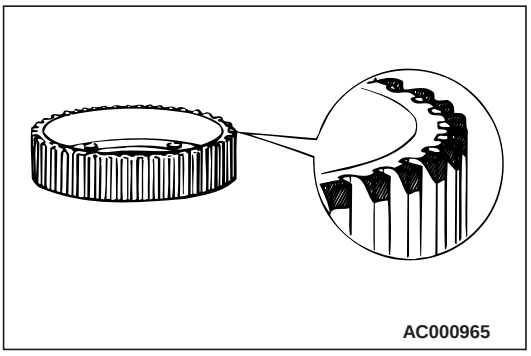


1. Connect the circuit tester to the wheel speed sensor using the special tool extra fine probe (MB992006), and measure the insulation resistance between the terminal No. 1/2 and the wheel speed sensor body as a single unit.

   Standard value: 1.5 MΩ or more

2. If the insulation resistance is not within the standard value range, replace the wheel speed sensor with a new one.

TOOTHED ROTOR CHECK



Check whether the rotor teeth are broken or deformed. Replace the driveshaft assembly for the front side, or the retainer for the rear side, respectively, if the teeth are damaged or deformed.

G-SENSOR <4WD>

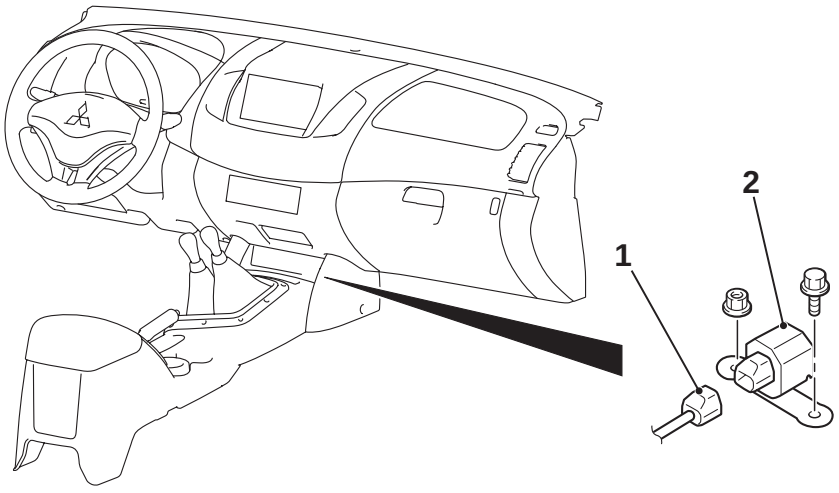
REMOVAL AND INSTALLATION

M1352010100604

⚠ CAUTION

Do not drop or apply a shock on the G-sensor.

Pre-removal and Post-installation Operation
- Rear Floor Console Assembly removal and installation (Refer to GROUP 52A – Rear Floor Console Assembly .)
- Front Floor Console Assembly removal and installation (Refer to GROUP 52A – Front Floor Console Assembly .)

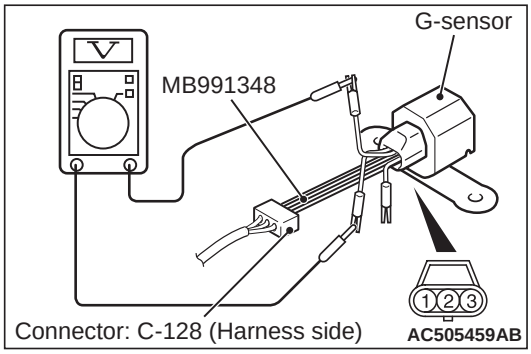


Removal steps
1. Harness connector
2. G-sensor

INSPECTION

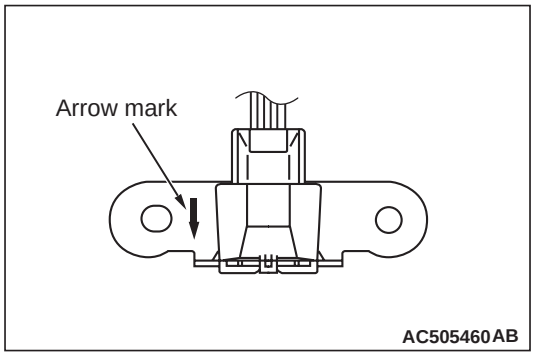
M1352018000117

G-SENSOR CHECK



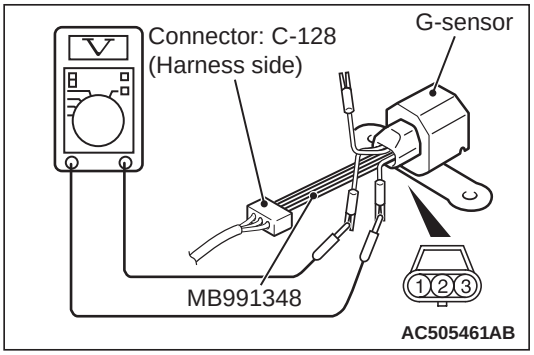
1. Disconnect the G-sensor connector and connect special tool test harness set (MB991348), between terminals of the disconnected connector.
2. With the ignition switch turned to the "ON" position, read the voltage between terminals number 1 and 2.

   Standard value: 2.4 – 2.6 V



3. With special tool test harness set (MB991348) connected, rotate so that the arrow mark straight down. Read output voltage between terminals number 1 and 2.

   Standard value: 3.55 – 3.95 V



4. When the measured values in step 2 and step 3 are not within the standard value, measure the voltage between terminal No. 3 and terminal No. 1.

   Standard value: 4.75 – 5.25 V

   NOTE: When there is an open or short circuit in the G-sensor circuit, the power supply to the G-sensor is stopped in approximately 2 seconds after the ignition switch is turned on.
5. If the measured values in step 2 and step 3 are out of the standard value and the measured value in step 4 is within the standard value, replace the G-sensor.
6. When all the measured values in steps 2, 3 and 4 are out of the standard value, check the wiring harness and repair if necessary. When the wiring harness is normal, the ABS-ECU may be defective.

GROUP 35C

ACTIVE STABILITY & TRACTION CONTROL SYSTEM (ASTC)

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GENERAL INFORMATION

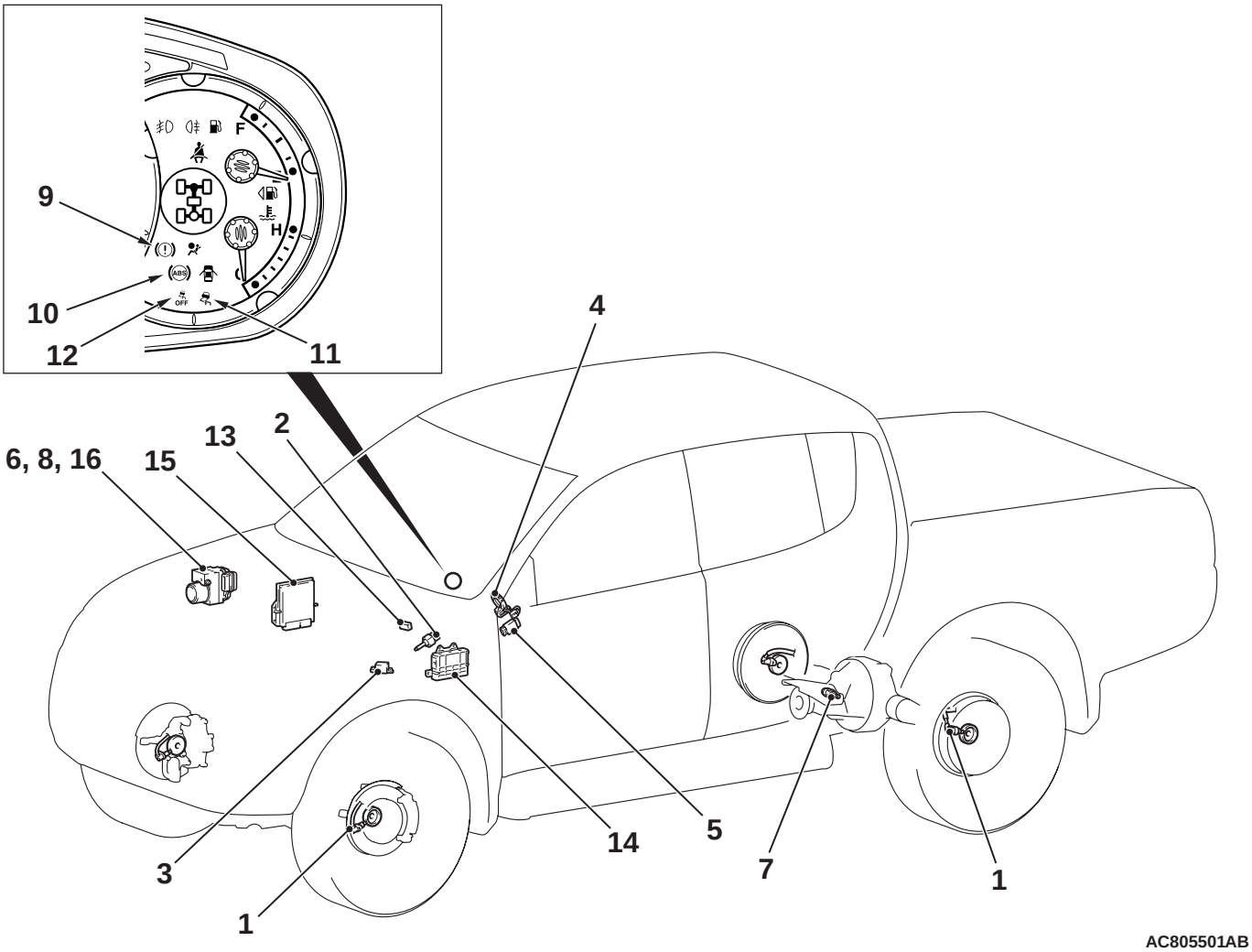
M1355000200193

Active Stability & Traction Control System (ASTC) is available as optional equipment.

- ASTC is a system combining the functions of Active Stability Control System (ASC) and Active Traction Control System (ATC).
- When ATC detects the slip of the driving wheel (ex. during startup on low μ road), it automatically applies the brakes to the slipping driving wheel. At the same time, ATC reduces the engine output and prevents the wheel spin when it determines that the engine torque is too high for the road surface μ.
- When the ASC determines that the vehicle is in a dangerous condition, it reduces the engine output and applies brake force to four wheels independently to control the vehicle behaviour, avoiding the critical state.

NOTE: On vehicles with ASC, the ASTC-ECU controls ABS as well.

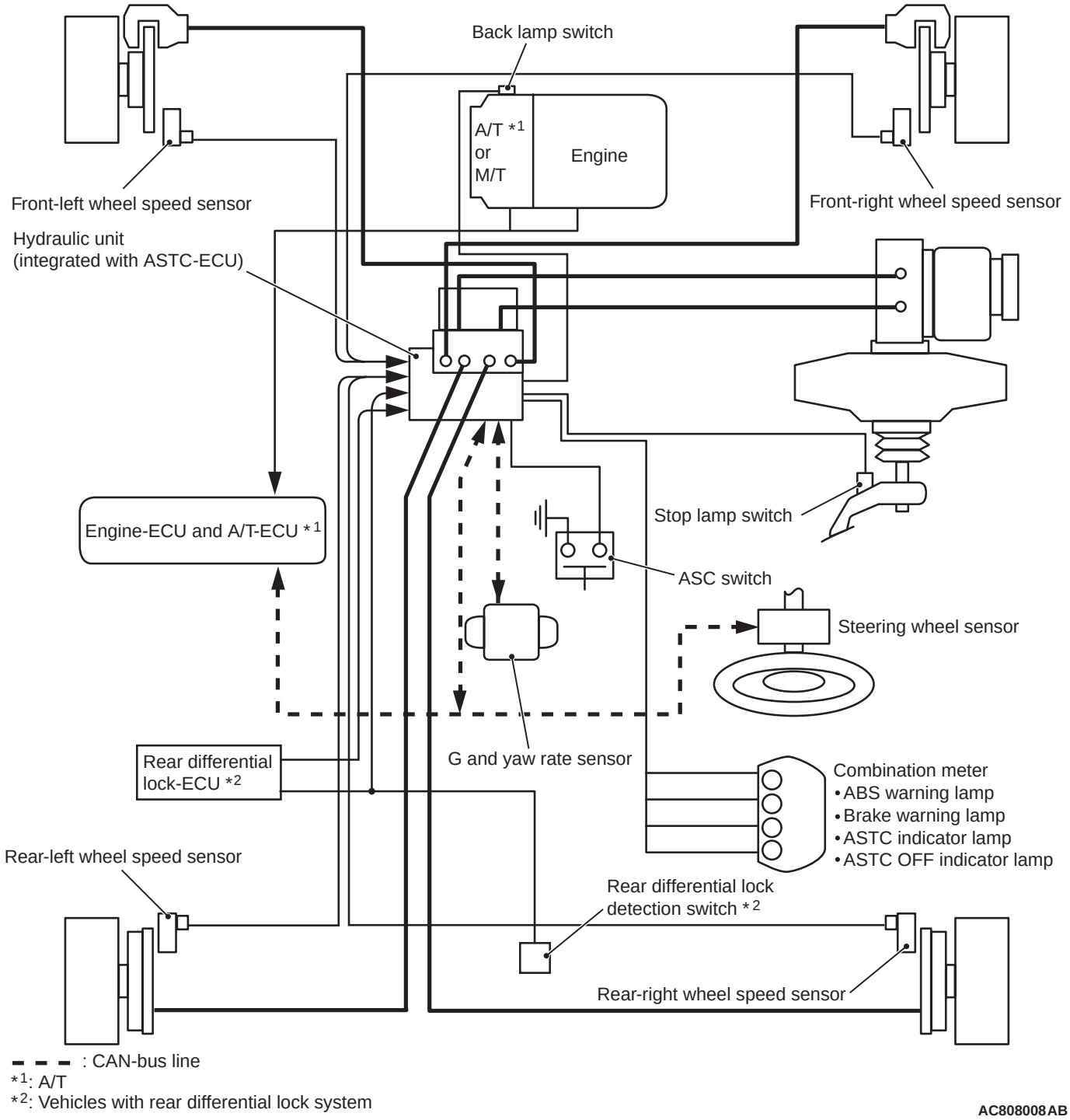
CONSTRUCTION DIAGRAM



Name of part		Number	Outline of function
Sensor	Wheel speed sensor	1	Send alternating current signals at frequencies which are proportional to the rotation speeds of each wheel to the ASTC-ECU.
	Stop lamp switch	2	Sends a signal to the ASTC-ECU to indicate whether the brake pedal is depressed or not.
	G and yaw rate sensor	3	It detects the acceleration in cross and lateral direction, and yaw rate of the vehicle. Then it sends a signal through the CAN bus line to the ASTC-ECU.
	Steering wheel sensor	4	Detects the steering wheel angle, and sends a signal to the ASTC-ECU through the CAN bus line.
	ASC switch	5	Sends a signal to the ASTC-ECU to turn on and off the active stability control and traction control (engine control only).
	Pressure sensor	6	Is incorporated in the hydraulic unit, and informs the ASTC-ECU of the brake fluid pressure in the master cylinder.
	Rear differential lock detection switch < Vehicles with rear differential lock>	7	ASTC-ECU detects the rear differential lock state.
Actuator	Hydraulic unit	8	Drives the solenoid valves according to signals from the ASTC-ECU in order to control the brake hydraulic pressure for each wheel.
	Brake warning lamp	9	Used as the warning lamp for the parking brake, brake fluid level, and EBD control. For the EBD control, this warning lamp informs the driver of the system status by turning on and off the lamp according to the signal from ASTC-ECU.
	ABS warning lamp	10	Illuminates in response to signals from the ASTC-ECU when a problem develops in the system.
	ASTC indicator lamp	11	Receives a signal from the ASTC-ECU, and flashes to inform the driver that the system is operating, or illuminates to inform the driver of system failure.
	ASTC OFF indicator lamp	12	Receives a signal from the ASTC-ECU, and illuminates to inform the driver that the system is not operating or defective, or flashes to inform system over heat.
Diagnosis connector		13	Sets the diagnosis codes and allows communication with the M.U.T.-III.
A/T-ECU*		14	Sends the gear condition to ASTC-ECU.
Engine-ECU		15	Receives a signal from the ASTC-ECU to control the engine output.
Active Stability & Traction Control System control unit (ASTC-ECU)		16	Controls actuators (described above) based on the signals coming from each sensor.
			Controls the self-diagnostics and fail-safe functions.
			Controls the diagnostic function (M.U.T.-III compatible).

*NOTE: *A/T*

SCHEMATIC DIAGRAM



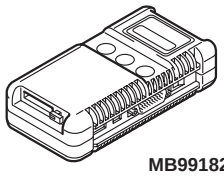
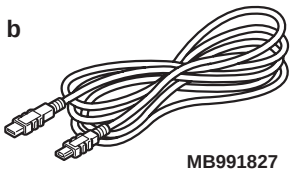
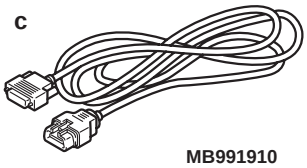
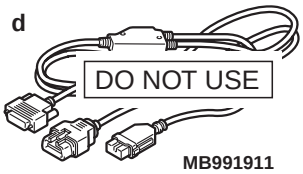
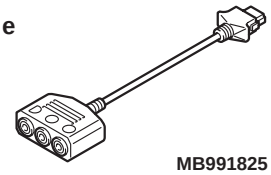
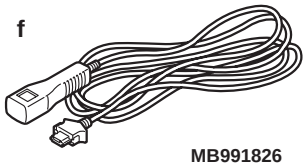
SERVICE SPECIFICATIONS

M1355000400045

Item	Standard value
Wheel speed sensor current mA	5 – 9 or 11 – 17
Wheel speed sensor insulation resistance MΩ	1.5 or more

SPECIAL TOOLS

M1355005800361

Tool	Number	Name	Use
a  MB991824 b  MB991827 c  MB991910 d  MB991911 e  MB991825 f  MB991826 MB991955	MB991955 a. MB991824 b. MB991827 c. MB991910 d. MB991911 e. MB991825 f. MB991826	M.U.T.-III sub-assembly a. Vehicle Communication Interface (V. C. I.) b. M.U.T.-III USB cable c. M.U.T.-III main harness A (Vehicles with CAN communication system) d. M.U.T.-III main harness B (Vehicles without CAN communication system) e. M.U.T.-III measurement adapter f. M.U.T.-III trigger harness	⚠ CAUTION **For vehicles with CAN communication, use M.U.T.-III main harness A to send simulated vehicle speed. If you connect M.U.T.-III main harness B instead, the CAN communication does not function correctly.** ASTC check (Diagnosis code display, and data list display by M.U.T.-III)
	MB991709	Wiring harness set	Checking the ASTC-ECU and output current measure at the wheel speed sensor

TROUBLESHOOTING

STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING

Inspection Service Points .

M1355000900084

Refer to GROUP 00, How to Use Troubleshooting/

NOTES WITH REGARD TO DIAGNOSIS

M1355009500061

1. The ASTC is a system which controls the brake pressure and engine power by means of the operation of the ECU. Accordingly, the following symptoms may occur at times, but these are a sign of normal ASTC operation, and do not indicate a malfunction.

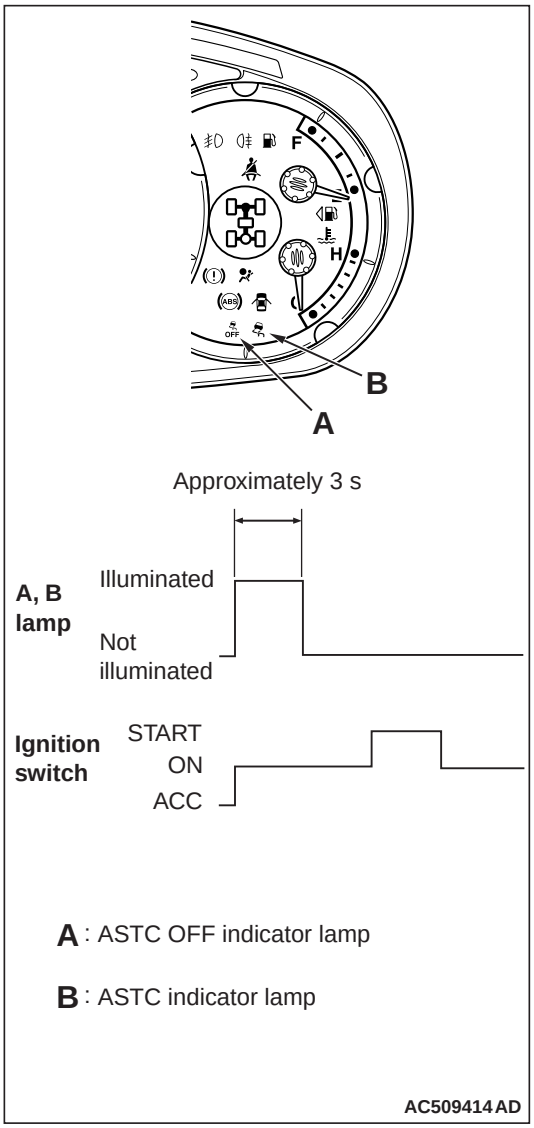
Phenomenon	Explanation of phenomenon
When the engine starts, a knocking sound can be heard coming from the engine compartment.	This sound occurs as a result of system operation checking, and is not a malfunction.
Although the accelerator pedal is depressed, the engine speed does not increase or drops.	This occurs as a result of the ASC or ATC operation, and is not a malfunction.
• Sound of the motor inside the ABS hydraulic unit operation. (whine) • When ASTC operates, sound is generated from the vehicle chassis due to repeated brake application and release. (Thump: suspension; squeak: tyres)	This is the sound of normal system operation, and is not a malfunction.
Shocks are felt if the brake pedal is depressed when driving at low speed.	This is due to system operation checking (starting-of check when the vehicle speed reaches a certain number of km/h) and is not a malfunction.

2. ASTC is system for assisting driver's operation. Accordingly, advise the customer to drive safely on such roads by lowering the vehicle speed and not being too overconfident.
3. Diagnosis detection condition can vary depending on the diagnosis code. Make sure that checking requirements listed in the "Comment" are satisfied when checking the trouble symptom again.

BRAKE WARNING LAMP, ABS WARNING LAMP, ASTC INDICATOR LAMP, ASTC OFF INDICATOR LAMP INSPECTION

M1353007000042

For the brake warning lamp and ABS warning lamp, refer to GROUP 35B – Brake Warning Lamp and ABS Warning Lamp Check .



Check that the ASTC indicator lamp and ASTC OFF indicator lamp illuminates as follows.

1. When the ignition switch is turned to the "ON" position, the ASTC indicator lamp and ASTC OFF indicator lamp illuminates for approximately 3 seconds and then switches off.
2. If the illumination is other than the above, check the diagnosis codes.

Display item list

Item No.	Item name	Data item	Unit
02	Ignition cycle	Number of times the ignition switch is turned "ON" or "LOCK (Extinguished)" after the past failure transition.	Number of counts is displayed.
03	Elapsed time	Total elapsed time after a diagnosis code is generated	min*
04	Accumulated minute	Cumulative time for current malfunction of diagnosis code	min

DIAGNOSIS FUNCTION

M1355001000835

ASTC-ECU has the following functions for easier system checks. The following items can be diagnosed using M.U.T-III.

- Diagnosis code set (Refer to).
- Service data output (Refer to).
- Actuator test (Refer to).

CHECK OF FREEZE FRAME DATA

To detect fault and store the diagnosis code, the ASTC-ECU obtains data before the confirmation of the diagnosis code and data when the diagnosis code is confirmed, and then stores the current condition of the ASTC-ECU. By analysing each data from M.U.T.-III, the troubleshooting can be performed more efficiently. Display items of the freeze frame data are as follows.

*NOTE: *: Total elapsed time can be stored up to 65534 minutes. The display of M.U.T.-III is fixed to 65534 minutes after 65534 minutes have elapsed. Or, if the battery is disconnected, the total elapsed time cannot be measured properly. Thus, 65535 minutes (null value) is displayed. Since the value is calculated according to the information from the ASTC-ECU, a proper value may not be displayed when the ASTC-ECU time-out has occurred.*

FAIL-SAFE FUNCTION

If any malfunction is detected by the self-diagnostic function, ASTC-ECU Illuminates the ABS warning lamp, brake warning lamp*, ASTC indicator lamp and ASTC OFF indicator lamp, and it disables ABS, EBD and ASTC control.

*NOTE: *: The brake warning lamp and display are used as EBD control warning lamp.*

Illumination condition of warning lamp in case of failure

Diagnosis code No.	Item	ABS warning lamp	Brake warning lamp	ASTC indicator lamp	ASTC OFF indicator lamp
C1200	Wheel speed sensor (FR) (signal open circuit)	Illuminated	Extinguished*1 Illuminated*2	Illuminated	Illuminated
C1205	Wheel speed sensor (FL) (signal open circuit)				
C1210	Wheel speed sensor (RR) (signal open circuit)		Extinguished*3 Illuminated*2		
C1215	Wheel speed sensor (RL) (signal open circuit)				
C1201	Wheel speed sensor (FR) (signal short circuit)	Illuminated	Extinguished*1 Illuminated*2	Illuminated	Illuminated
C1206	Wheel speed sensor (FL) (signal short circuit)				
C1211	Wheel speed sensor (RR) (signal short circuit)		Extinguished*3 Illuminated*2		
C1216	Wheel speed sensor (RL) (signal short circuit)				

Diagnosis code No.	Item	ABS warning lamp	Brake warning lamp	ASTC indicator lamp	ASTC OFF indicator lamp
C1202	Wheel speed sensor (FR) (malfunction power circuit)	Illuminated	Extinguished*1 Illuminated*2	Illuminated	Illuminated
C1207	Wheel speed sensor (FL) (malfunction power circuit)				
C1212	Wheel speed sensor (RR) (malfunction power circuit)		Extinguished*3 Illuminated*2		
C1217	Wheel speed sensor (RL) (malfunction power circuit)				
C1223	G and yaw rate sensor (active check error)	Illuminated	Extinguished	Illuminated	Illuminated
C1225*4	Wheel speed sensor malfunction (abnormality in tyre size)	Illuminated	Extinguished	Illuminated	Illuminated

Diagnosis code No.	Item	ABS warning lamp	Brake warning lamp	ASTC indicator lamp	ASTC OFF indicator lamp
C1226	Control solenoid valve (FR) pressure holding system	Illuminated	Illuminated	Illuminated	Illuminated
C1231	Control solenoid valve (FR) decompressing system				
C1236	Control solenoid valve (FL) pressure holding system				
C1241	Control solenoid valve (FL) pressure reducing system				
C1246	Control solenoid valve (RR) pressure holding system				
C1251	Control solenoid valve (RR) pressure reducing system				
C1256	Control solenoid valve (RL) pressure holding system				
C1261	Control solenoid valve (RL) decompressing system				
C1266*5	Motor system	Illuminated	Illuminated	Illuminated	Illuminated
C1273*5	Motor relay (stuck off)	Illuminated	Illuminated	Illuminated	Illuminated
C1274	Motor relay (stuck on)	Illuminated	Illuminated	Illuminated	Illuminated
C1278	Solenoid valve relay (open circuit)	Illuminated	Illuminated	Illuminated	Illuminated
C1279	Solenoid valve relay (short circuit)	Illuminated	Illuminated	Illuminated	Illuminated
C1280	Motor fail-safe relay (short circuit)	Illuminated	Illuminated	Illuminated	Illuminated
C1291	Reverse signal (seizure)	Extinguished	Extinguished	Illuminated	Illuminated
C1292	CAN communication error	Extinguished (Illuminated when the G-sensor CAN communication error occurs.)	Extinguished	Illuminated	Illuminated

Diagnosis code No.	Item	ABS warning lamp	Brake warning lamp	ASTC indicator lamp	ASTC OFF indicator lamp
C1293*5, *6	Abnormal rear differential lock detection circuit	Illuminated	Extinguished	Illuminated	Illuminated
C1300	Linear valve (secondly)	Illuminated	Illuminated	Illuminated	Illuminated
C1310	Linear valve (primary)				
C1340	Abnormal stop lamp switch circuit	Illuminated	Extinguished	Illuminated	Illuminated
C1361	Abnormal pressure sensor characteristics	Extinguished	Extinguished	Illuminated	Illuminated
C1362	Abnormal pressure sensor (abnormal output value, open or short circuit)	Extinguished	Extinguished	Illuminated	Illuminated
C1364	Pressure sensor malfunction	Extinguished	Extinguished	Illuminated	Illuminated
C1369*5	G and yaw rate sensor (bank run record error)	Extinguished	Extinguished	Illuminated	Illuminated
C1371	Yaw rate sensor (output error, oscillation error, zero-point error)	Extinguished	Extinguished	Illuminated	Illuminated
C1381*5	G-sensor (output error, seizure)	Illuminated	Extinguished	Illuminated	Illuminated
C1385	Yaw rate sensor (internal error)	Extinguished	Extinguished	Illuminated	Illuminated
C1386	G-sensor (internal error)	Illuminated	Extinguished	Illuminated	Illuminated
C1388	Yaw rate sensor (active check error)	Extinguished	Extinguished	Illuminated	Illuminated
C1389	G-sensor (active check error)	Illuminated	Extinguished	Illuminated	Illuminated
C1393	G and yaw rate sensor (zero-point not calibrated)	Flashes (Turns Extinguished when the yaw rate sensor learned the neutral point.)	Flashes (Turns Extinguished when the yaw rate sensor learned the neutral point.)	Flashes	Flashes
C1394	Steering wheel sensor neutral point not learned	Flashes	Flashes	Flashes	Flashes

Diagnosis code No.	Item	ABS warning lamp	Brake warning lamp	ASTC indicator lamp	ASTC OFF indicator lamp
C1395	Brake fluid charging incompletion	Flashes	Flashes	Flashes	Flashes
C1396	Engine-ECU malfunction	Extinguished	Extinguished	Illuminated	Illuminated
C1505	Steering wheel sensor abnormality (detected at ASTC-ECU-side)	Extinguished	Extinguished	Illuminated	Illuminated
C1506	Steering wheel sensor abnormality (self-detection at steering wheel sensor-side)				
C1620	Engine-ECU communication error	Extinguished	Extinguished	Illuminated	Illuminated
C1860	High voltage at ASTC-ECU power supply	Illuminated	Illuminated	Illuminated	Illuminated
C1861	Low voltage at ASTC-ECU power supply	Illuminated	Illuminated	Illuminated	Illuminated
U1073	Bus-off	Illuminated	Extinguished	Illuminated	Illuminated
U1100	Engine-ECU timeout error	Extinguished	Extinguished	Illuminated	Illuminated
U1101*7	A/T-ECU timeout error	Extinguished	Extinguished	Illuminated	Illuminated
U1104	Steering wheel sensor timeout error	Extinguished	Extinguished	Illuminated	Illuminated
U1105	G & yaw rate sensor timeout error	Illuminated	Extinguished	Illuminated	Illuminated
U1109	ETACS-ECU timeout error	Extinguished	Extinguished	Extinguished	Extinguished
U1120	Engine malfunction detected	Extinguished	Extinguished	Illuminated	Illuminated
U1190	ETACS signal receiving error	Extinguished	Extinguished	Extinguished	Extinguished
U1200	Steering wheel sensor communication error	Extinguished	Extinguished	Illuminated	Illuminated
U1201	Yaw rate sensor parity error	Extinguished	Extinguished	Illuminated	Illuminated

Diagnosis code No.	Item	ABS warning lamp	Brake warning lamp	ASTC indicator lamp	ASTC OFF indicator lamp
U1202	G-sensor parity error	Illuminated	Extinguished	Illuminated	Illuminated
U1204	Steering wheel sensor communication error	Extinguished	Extinguished	Illuminated	Illuminated
U1205	G and yaw rate sensor message counter error	Illuminated	Extinguished	Illuminated	Illuminated

NOTE:

- **1: Normality on rear wheels (both right and left)*
- **2: Abnormality on rear wheels (both right and left)*
- **3: Abnormality on rear wheel (right or left)*
- **4: This diagnosis code is not set within the vehicle speed of 30 km/h or less.*
- **5: This diagnosis code is not set within the vehicle speed of 10 km/h or less.*
- **6: Vehicle with rear differential lock system.*
- **7: A/T*

System control in case of failure

Diagnosis code No.	Item	ABS	EBD	Active stability control	Active traction control
C1200	Wheel speed sensor (FR) system (open circuit)	Executed	Backup EBD control*1 Prohibited*2	Executed	Executed
C1205	Wheel speed sensor (FL) system (open circuit)				
C1210	Wheel speed sensor (RR) system (open circuit)		Backup EBD control*3 Prohibited*2		
C1215	Wheel speed sensor (RL) system (open circuit)				

Diagnosis code No.	Item	ABS	EBD	Active stability control	Active traction control
C1201	Wheel speed sensor (FR) system (sensor transmitting error)	Executed	Backup EBD control[*1] Prohibited[*2]	Executed	Executed
C1206	Wheel speed sensor (FL) system (sensor transmitting error)				
C1211	Wheel speed sensor (RR) system (sensor transmitting error)		Backup EBD control[*3] Prohibited[*2]		
C1216	Wheel speed sensor (RL) system (sensor transmitting error)				
C1202	Wheel speed sensor (FR) system malfunction (power circuit)	Executed	Backup EBD control[*1] Prohibited[*2]	Executed	Executed
C1207	Wheel speed sensor (FL) system malfunction (power circuit)				
C1212	Wheel speed sensor (RR) system malfunction (power circuit)		Backup EBD control[*3] Prohibited[*2]		
C1217	Wheel speed sensor (RL) system malfunction (power circuit)				
C1223	G and yaw rate sensor (active check error)	Executed	Backup EBD control	Executed	Executed
C1225[*4]	Wheel speed sensor malfunction (abnormality in tyre size)	Executed	Backup EBD control	Executed	Executed

Diagnosis code No.	Item	ABS	EBD	Active stability control	Active traction control
C1226	Control solenoid valve (FR) pressure holding system	Executed	Executed	Executed	Executed
C1231	Control solenoid valve (FR) decompressing system				
C1236	Control solenoid valve (FL) pressure holding system				
C1241	Control solenoid valve (FL) pressure reducing system				
C1246	Control solenoid valve (RR) pressure holding system				
C1251	Control solenoid valve (RR) pressure reducing system				
C1256	Control solenoid valve (RL) pressure holding system				
C1261	Control solenoid valve (RL) decompressing system				
C1266*5	Motor system	Executed	Executed	Executed	Executed
C1273*5	Motor relay (stuck off)	Executed	Executed	Executed	Executed
C1274	Motor relay (stuck on)	Executed	Executed	Executed	Executed
C1278	Solenoid valve relay (open circuit)	Executed	Executed	Executed	Executed
C1279	Solenoid valve relay (short circuit)	Executed	Executed	Executed	Executed
C1280	Motor fail-safe relay (short circuit)	Executed	Executed	Executed	Executed
C1291	Reverse signal (seizure)	Normal control	Normal control	Executed	Executed
C1292	CAN communication error	Normal control	Normal control	Executed	Executed

Diagnosis code No.	Item	ABS	EBD	Active stability control	Active traction control
C1293*5, *6	Abnormal rear differential lock detection circuit	Executed	Backup EBD control	Executed	Executed
C1300	Linear valve (secondly)	Executed	Executed	Executed	Executed
C1310	Linear valve (primary)				
C1340	Abnormal stop lamp switch circuit	Executed	Backup EBD control	Executed	Executed
C1361	Abnormal pressure sensor characteristics	Normal control	Normal control	Executed	Executed
C1362	Abnormal pressure sensor (abnormal output value, open or short circuit)	Normal control	Normal control	Executed	Executed
C1364	Pressure sensor malfunction	Normal control	Normal control	Executed	Executed
C1369*5	G and yaw rate sensor (bank run record error)	Normal control	Normal control	Executed	Normal control
C1371	Yaw rate sensor (output error, oscillation error, zero-point error)	Normal control	Normal control	Executed	Executed
C1381*5	G-sensor (output error, seizure)	Executed	Backup EBD control	Executed	Executed
C1385	Yaw rate sensor (internal error)	Normal control	Normal control	Executed	Executed
C1386	G-sensor (internal error)	Executed	Backup EBD control	Executed	Executed
C1388	Yaw rate sensor (active check error)	Normal control	Normal control	Executed	Executed
C1389	G-sensor (active check error)	Executed	Backup EBD control	Executed	Executed
C1393	G and yaw rate sensor (zero-point not calibrated)	Normal control	Normal control	Executed	Executed
C1394	Steering wheel sensor neutral point not learned	Normal control	Normal control	Executed	Executed
C1395	Brake fluid charging incompletion	Executed	Executed	Executed	Executed

Diagnosis code No.	Item	ABS	EBD	Active stability control	Active traction control
C1396	Engine-ECU malfunction	Normal control	Normal control	Executed	Executed
C1505	Steering wheel sensor abnormality (detected at ASTC-ECU-side)	Normal control	Normal control	Executed	Executed
C1506	Steering wheel sensor abnormality (self-detection at steering wheel sensor-side)				
C1620	Engine-ECU communication error	Normal control	Normal control	Executed	Executed
C1860	High voltage at ASTC-ECU power supply	Executed	Executed	Executed	Executed
C1861	Low voltage at ASTC-ECU power supply	Executed	Executed	Executed	Executed
U1073	Bus-off	Executed	Backup EBD control	Executed	Executed
U1100	Engine-ECU timeout error	Normal control	Normal control	Executed	Executed
U1101*7	A/T-ECU timeout error	Normal control	Normal control	Executed	Executed
U1104	Steering wheel sensor timeout error	Normal control	Normal control	Executed	Executed
U1105	G and yaw rate sensor timeout error	Executed	Backup EBD control	Executed	Executed
U1109	ETACS-ECU timeout error	Normal control	Normal control	Normal control	Normal control
U1120	Engine malfunction detected	Normal control	Normal control	Executed	Executed
U1190	ETACS signal receiving error	Normal control	Normal control	Normal control	Normal control
U1200	Steering wheel sensor communication error	Normal control	Normal control	Executed	Executed
U1201	Yaw rate sensor parity error	Normal control	Normal control	Executed	Executed

Diagnosis code No.	Item	ABS	EBD	Active stability control	Active traction control
U1202	G-sensor parity error	Executed	Backup EBD control	Executed	Executed
U1204	Steering wheel sensor communication error	Normal control	Normal control	Executed	Executed
U1205	G and yaw rate sensor message counter error	Executed	Backup EBD control	Executed	Executed

NOTE:

- *[*1]: Normality on rear wheels (both right and left)*
- *[*2]: Abnormality on rear wheels (both right and left)*
- *[*3]: Abnormality on rear wheel (right or left)*
- *[*4]: This diagnosis code is not set within the vehicle speed of 30 km/h or less.*
- *[*5]: This diagnosis code is not set within the vehicle speed of 10 km/h or less.*
- *[*6]: Vehicle with rear differential lock system.*
- *[*7]: A/T*

HOW TO READ DIAGNOSIS CODE

Refer to GROUP 00 – How to Use Troubleshooting and Inspection Service Points .

HOW TO ERASE DIAGNOSIS CODE

Refer to GROUP 00 – How to Use Troubleshooting and Inspection Service Points .

DIAGNOSIS CODE CHART

M1355001101277

⚠ CAUTION

During diagnosis, a diagnosis code associated with other system may be set when the ignition switch is turned on with connector(s) disconnected. On completion, confirm all systems for diagnosis code(s). If diagnosis code(s) are set, erase them all.

Follow the inspection chart that is appropriate for the diagnosis code.

Diagnosis code No.	Inspection item	Reference page
C1200	Wheel speed sensor (FR) (signal open circuit)	P.35C-23
C1205	Wheel speed sensor (FL) (signal open circuit)	P.35C-25
C1210	Wheel speed sensor (RR) (signal open circuit)	P.35C-28
C1215	Wheel speed sensor (RL) (signal open circuit)	P.35C-31
C1201	Wheel speed sensor (FR) (signal short circuit)	P.35C-34
C1206	Wheel speed sensor (FL) (signal short circuit)	P.35C-37
C1211	Wheel speed sensor (RR) (signal short circuit)	P.35C-40
C1216	Wheel speed sensor (RL) (signal short circuit)	P.35C-43
C1202	Wheel speed sensor (FR) (malfunction power circuit)	P.35C-47
C1207	Wheel speed sensor (FL) (malfunction power circuit)	P.35C-50

Diagnosis code No.	Inspection item	Reference page
C1212	Wheel speed sensor (RR) (malfunction power circuit)	P.35C-53
C1217	Wheel speed sensor (RL) (malfunction power circuit)	P.35C-56
C1223	G and yaw rate sensor (active check error)	P.35C-59
C1225*1	Wheel speed sensor malfunction (abnormality in tyre size)	P.35C-62
C1226	Control solenoid valve (FR) pressure holding system	P.35C-63
C1231	Control solenoid valve (FR) decompressing system	
C1236	Control solenoid valve (FL) pressure holding system	
C1241	Control solenoid valve (FL) pressure reducing system	
C1246	Control solenoid valve (RR) pressure holding system	
C1251	Control solenoid valve (RR) pressure reducing system	
C1256	Control solenoid valve (RL) pressure holding system	
C1261	Control solenoid valve (RL) decompressing system	
C1266	Motor system	P.35C-64
C1273	Motor relay (stuck off)	
C1274	Motor relay (stuck on)	
C1278	Solenoid valve relay (open circuit)	P.35C-67
C1279	Solenoid valve relay (short circuit)	
C1280	Motor fail-safe relay (short circuit)	P.35C-64
C1291	Reverse signal (seizure)	P.35C-70
C1292	CAN communication error	P.35C-72
C1293*2	Abnormal rear differential lock detection circuit	P.35C-73
C1300	Linear valve (secondly)	P.35C-63
C1310	Linear valve (primary)	
C1340	Abnormal stop lamp switch circuit	P.35C-78
C1361	Abnormal pressure sensor characteristics	P.35C-83
C1362	Abnormal pressure sensor (abnormal output value, open or short circuit)	P.35C-87
C1364	Pressure sensor malfunction	P.35C-88
C1369	G and yaw rate sensor (bank run record error)	P.35C-89
C1371	Yaw rate sensor (output error, oscillation error, zero-point error)	P.35C-89
C1381	G-sensor (output error, seizure)	P.35C-90
C1385	Yaw rate sensor (internal error)	P.35C-91
C1386	G-sensor (internal error)	P.35C-92
C1388	Yaw rate sensor (active check error)	P.35C-93
C1389	G-sensor (active check error)	
C1393	G and yaw rate sensor (zero-point not calibrated)	P.35C-94
C1394	Steering wheel sensor neutral point not learned	P.35C-95

Diagnosis code No.	Inspection item	Reference page
C1395	Brake fluid charging incompletion	Replace the hydraulic unit (ASTC-ECU) (Refer to P.35C-140)
C1396	Engine-ECU malfunction	P.35C-96
C1505	Steering wheel sensor (signal seizure or abnormal neutral point)	P.35C-97
C1506	Steering wheel sensor (steering wheel sensor malfunction)	
C1620	Engine-ECU communication error	P.35C-98
C1860	High voltage at ASTC-ECU power supply	P.35C-99
C1861	Low voltage at ASTC-ECU power supply	P.35C-100
U1073	Bus-off	P.35C-103
U1100	Engine-ECU timeout error	P.35C-103
U1101*3	A/T-ECU timeout error	P.35C-104
U1104	Steering wheel sensor timeout error	P.35C-105
U1105	G and yaw rate sensor timeout error	P.35C-106
U1109	ETACS-ECU timeout error	P.35C-107
U1120	Engine malfunction detected	P.35C-108
U1190	ETACS signal receiving error	P.35C-108
U1200	Steering wheel sensor communication error	P.35C-109
U1201	Yaw rate sensor parity error	P.35C-110
U1202	G-sensor parity error	
U1204	Steering wheel sensor communication error	P.35C-111
U1205	G and yaw rate sensor message counter error	P.35C-112

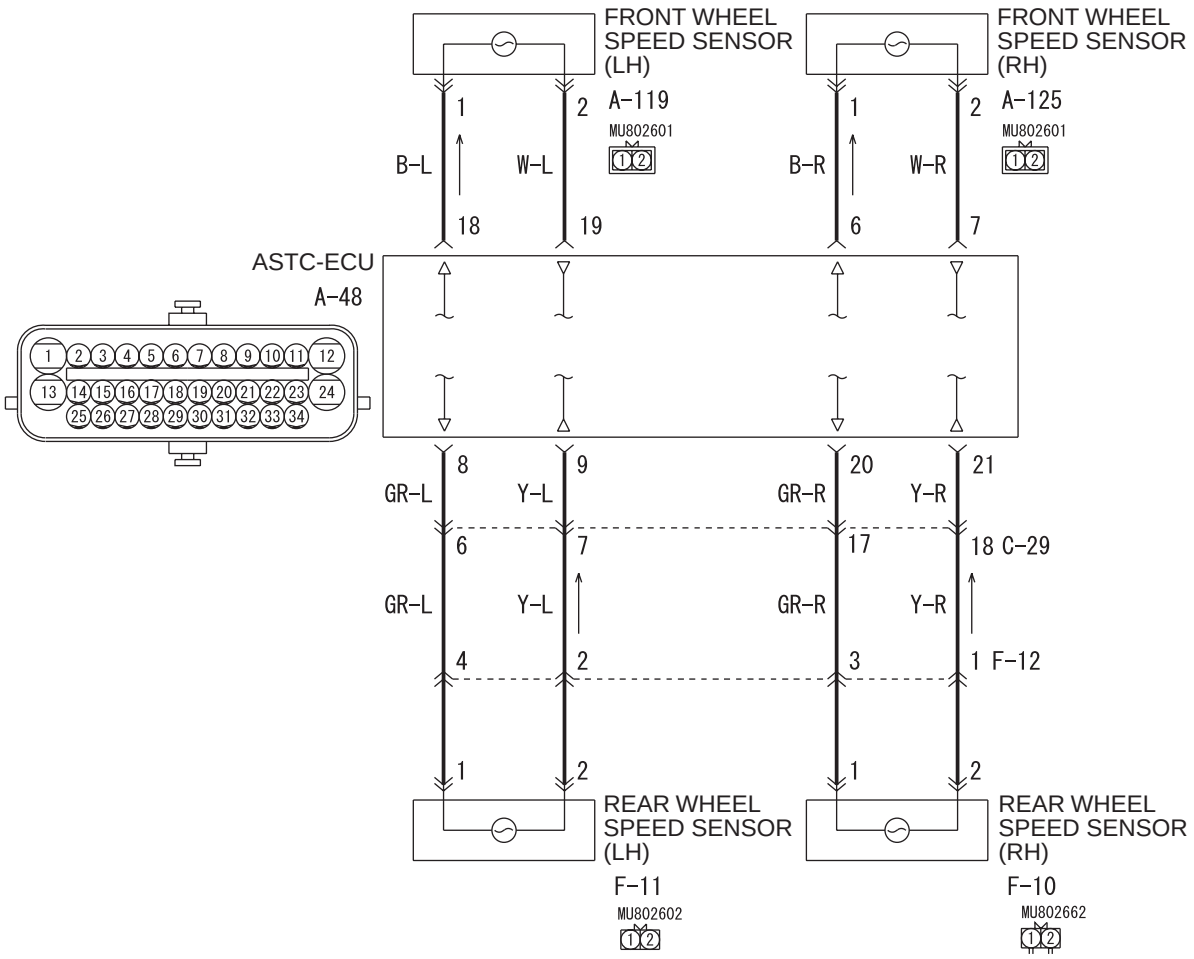
NOTE:

- **1: This diagnosis code is not set within the vehicle speed of 30 km/h or less.*
- **2: Vehicle with rear differential lock system.*
- **3: A/T*

DIAGNOSIS CODE PROCEDURES

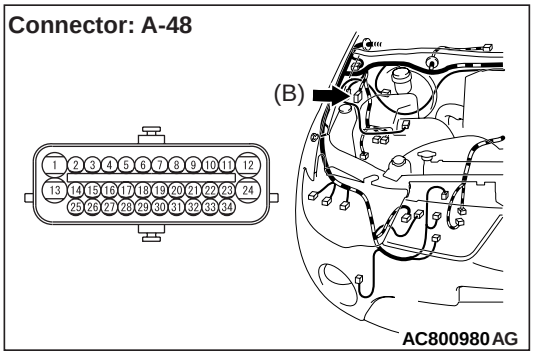
Code No.C1200: Wheel speed sensor (FR) (signal open circuit)

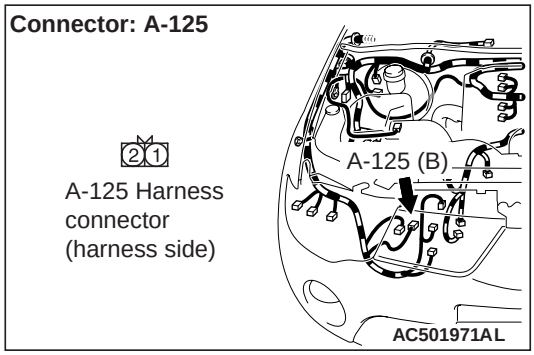
Wheel Speed Sensor Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

ACB00772





⚠ CAUTION
- **If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table .).**
- **Before replacing the ECU, ensure that the communication circuit is normal.**

OPERATION
- A toothed ABS rotor generates a voltage pulse as it moves across the pickup field of each wheel speed sensor.
- The wheel speed sensor transmit the frequency of the pulses to the ASTC-ECU.
- The hydraulic unit assembly (integrated with ASTC-ECU) modulates the amount of braking force individually applied to each wheel cylinder.

DIAGNOSIS CODE SET CONDITION
Diagnosis code No.C1200 is set when signal is not input due to breakage of the wire of the wheel speed sensor without the output of the code No.C1202.

PROBABLE CAUSES

Current trouble
- Damaged wiring harness and connectors
- Wheel speed sensor malfunction
- ASTC-ECU malfunction

Past trouble
- Carry out diagnosis with particular emphasis on wiring harness and connector failures between ASTC-ECU and the wheel speed sensor. For diagnosis procedures, refer to How to treat past trouble (GROUP 00 – How to Cope with Intermittent Malfunctions .).

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnosis
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table .). On completion, go to Step 2.

STEP 2. Diagnosis code recheck after resetting CAN bus lines
(1) Erase the diagnosis code.
(2) Drive the vehicle at 15 km/h or more.
NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 15 km/h or higher.

Q: Is the diagnosis code No.C1200 set?
YES : Go to Step 3.
NO : The procedure is complete.

STEP 3. M.U.T.-III diagnosis code
Check that the diagnosis code No.C1202 are also set.

Q: Is the diagnosis code No.C1202 also set?
YES : Perform the diagnosis for the diagnosis code No.C1202 (Refer to P.35C-47.).
NO : Go to Step 4.

STEP 4. M.U.T.-III data list
Check the following data list (Refer to P.35C-131.).
- Item No.02: FR wheel speed sensor

Q: Is the check result normal?
YES : Go to Step 8.
NO : Go to Step 5.

STEP 5. Connector check: A-48 ASTC-ECU connector, A-125 front wheel speed sensor (RH) connector

Q: Is the check result normal?
YES : Go to Step 6.
NO : Repair the defective connector. Then go to Step 9.

STEP 6. Resistance measurement at the A-48 ASTC-ECU connector
(1) Disconnect the A-48 ASTC-ECU connector.
(2) Measure the resistance between the A-48 ASTC-ECU connector terminal No.6 and terminal No.7.

OK: Continuity

Q: Is the check result normal?
YES : Go to Step 7.
NO : Repair the wiring harness. Then go to Step 9.

STEP 7. Check for wheel speed sensor as a single unit
Refer to P.35C-141.

Q: Is the check result normal?
YES : Go to Step 8.
NO : Replace the wheel speed sensor (Refer to P.35C-141.). Then go to Step 9.

STEP 8. Check whether the diagnosis code is reset.

(1) Erase the diagnosis code.
(2) Drive the vehicle at 15 km/h or more.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 15 km/h or higher.

Q: Is the diagnosis code No.C1200 set?

YES : Replace the hydraulic unit (integrated with ASTC-ECU) (Refer to P.35C-140.). Then go to Step 9.

NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunctions .).

STEP 9. Check whether the diagnosis code is reset.

(1) Erase the diagnosis code.
(2) Drive the vehicle at 15 km/h or more.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 15 km/h or higher.

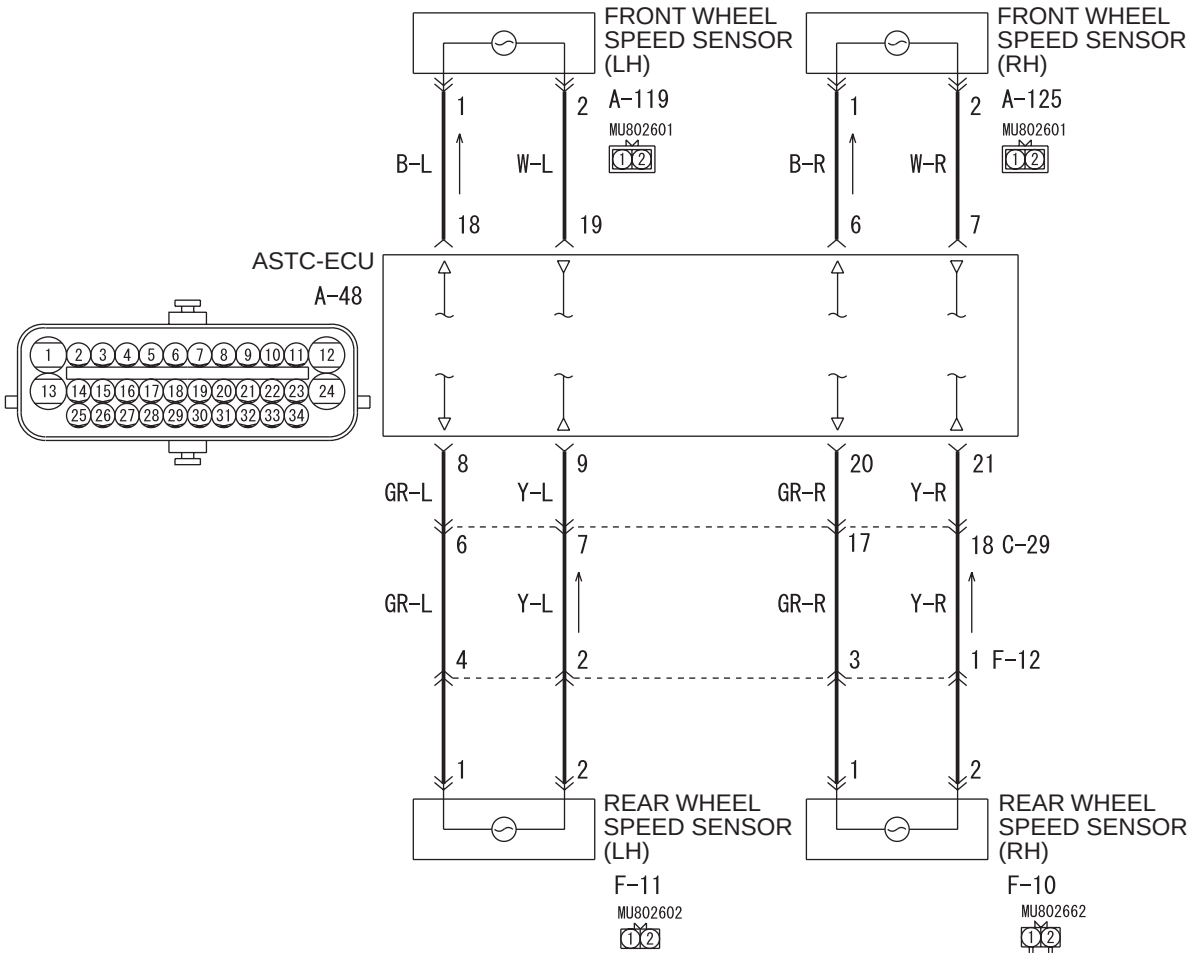
Q: Is the diagnosis code No.C1200 set?

YES : Return to Step 1.

NO : This diagnosis is complete.

Code No.C1205: Wheel speed sensor (FL) (signal open circuit)

Wheel Speed Sensor Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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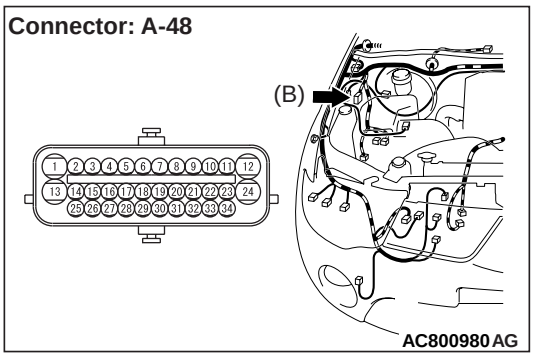
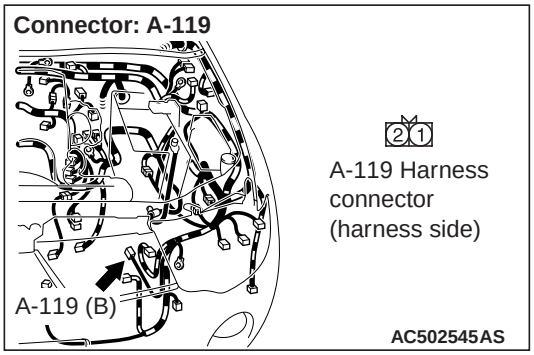




⚠ CAUTION

- **If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table .).**
- **Before replacing the ECU, ensure that the communication circuit is normal.**

OPERATION

- A toothed ABS rotor generates a voltage pulse as it moves across the pickup field of each wheel speed sensor.
- The wheel speed sensor transmit the frequency of the pulses to the ASTC-ECU.
- The hydraulic unit assembly (integrated with ASTC-ECU) modulates the amount of braking force individually applied to each wheel cylinder.

DIAGNOSIS CODE SET CONDITION

Diagnosis code No.C1205 is set when signal is not input due to breakage of the wire of the wheel speed sensor without the output of the code No.C1207.

PROBABLE CAUSES

Current trouble

- Damaged wiring harness and connectors
- Wheel speed sensor malfunction
- ASTC-ECU malfunction

Past trouble

- Carry out diagnosis with particular emphasis on wiring harness and connector failures between ASTC-ECU and the wheel speed sensor. For diagnosis procedures, refer to How to treat past trouble (GROUP 00 – How to Cope with Intermittent Malfunctions .).

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnosis

Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?

YES : Go to Step 3.

NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table .). On completion, go to Step 2.

STEP 2. Diagnosis code recheck after resetting CAN bus lines

(1) Erase the diagnosis code.

(2) Drive the vehicle at 15 km/h or more.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 15 km/h or higher.

Q: Is the diagnosis code No.C1205 set?

YES : Go to Step 3.

NO : The procedure is complete.

STEP 3. M.U.T.-III diagnosis code

Check that the diagnosis code No.C1207 are also set.

Q: Is the diagnosis code No.C1207 also set?

YES : Perform the diagnosis for the diagnosis code No.C1207 (Refer to P.35C-50.).

NO : Go to Step 4.

STEP 4. M.U.T.-III data list

Check the following data list (Refer to P.35C-131.).

- Item No.01: FL wheel speed sensor

Q: Is the check result normal?

YES : Go to Step 8.

NO : Go to Step 5.

STEP 5. Connector check: A-48 ASTC-ECU connector, A-119 front wheel speed sensor (LH) connector

Q: Is the check result normal?

YES : Go to Step 6.
NO : Repair the defective connector. Then go to Step 9.

STEP 6. Resistance measurement at the A-48 ASTC-ECU connector
(1) Disconnect the A-48 ASTC-ECU connector.
(2) Measure the resistance between the A-48 ASTC-ECU connector terminal No.18 and terminal No.19.

OK: Continuity

Q: Is the check result normal?
YES : Go to Step 7.
NO : Repair the wiring harness. Then go to Step 9.

STEP 7. Check for wheel speed sensor as a single unit
Refer to P.35C-141.

Q: Is the check result normal?
YES : Go to Step 8.
NO : Replace the wheel speed sensor (Refer to P.35C-141.). Then go to Step 9.

STEP 8. Check whether the diagnosis code is reset.
(1) Erase the diagnosis code.
(2) Drive the vehicle at 15 km/h or more.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 15 km/h or higher.

Q: Is the diagnosis code No.C1205 set?
YES : Replace the hydraulic unit (integrated with ASTC-ECU) (Refer to P.35C-140.). Then go to Step 9.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunctions .).

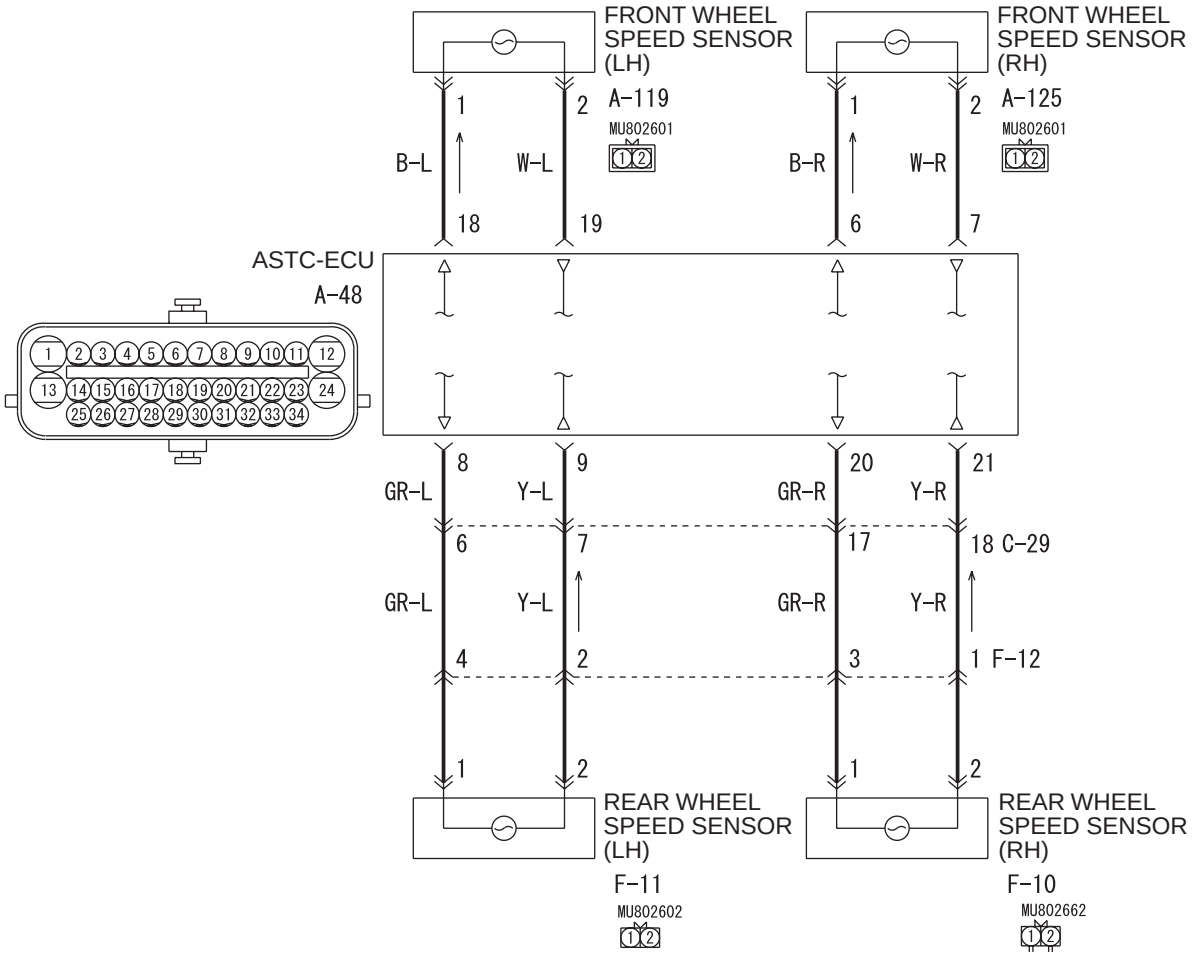
STEP 9. Check whether the diagnosis code is reset.
(1) Erase the diagnosis code.
(2) Drive the vehicle at 15 km/h or more.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 15 km/h or higher.

Q: Is the diagnosis code No.C1205 set?
YES : Return to Step 1.
NO : This diagnosis is complete.

Code No.C1210: Wheel speed sensor (RR) (signal open circuit)

Wheel Speed Sensor Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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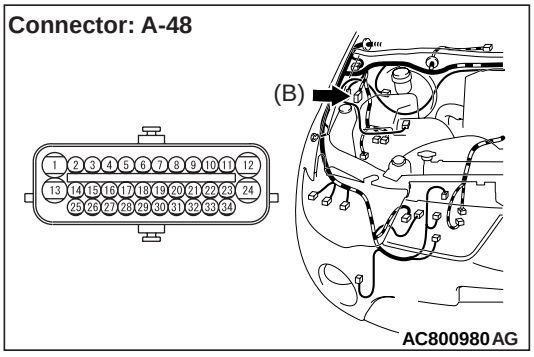
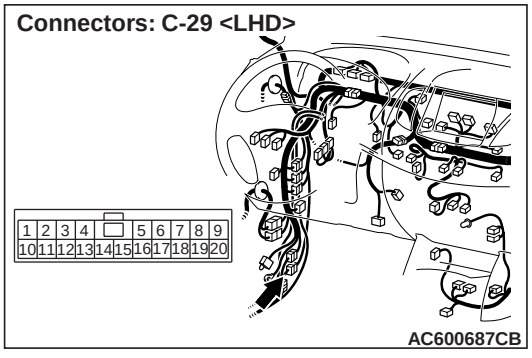
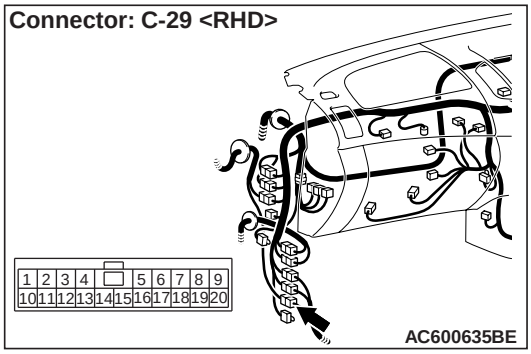
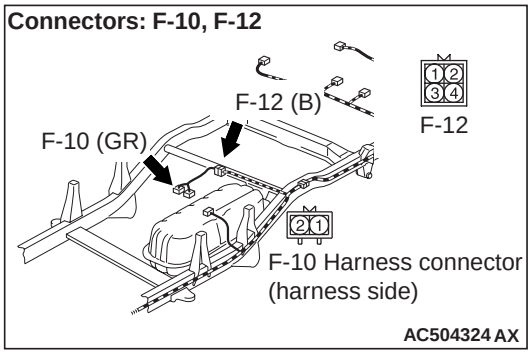








⚠ CAUTION

- **If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table .).**
- **Before replacing the ECU, ensure that the communication circuit is normal.**

OPERATION

- A toothed ABS rotor generates a voltage pulse as it moves across the pickup field of each wheel speed sensor.
- The wheel speed sensor transmit the frequency of the pulses to the ASTC-ECU.
- The hydraulic unit assembly (integrated with ASTC-ECU) modulates the amount of braking force individually applied to each wheel cylinder.

DIAGNOSIS CODE SET CONDITION

Diagnosis code No.C1210 is set when signal is not input due to breakage of the wire of the wheel speed sensor without the output of the code No.C1212.

PROBABLE CAUSES

Current trouble

- Damaged wiring harness and connectors
- Wheel speed sensor malfunction
- ASTC-ECU malfunction

Past trouble

- Carry out diagnosis with particular emphasis on wiring harness and connector failures between ASTC-ECU and the wheel speed sensor. For diagnosis procedures, refer to How to treat past trouble (GROUP 00 – How to Cope with Intermittent Malfunctions .).

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnosis

Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?

YES : Go to Step 3.

NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table .). On completion, go to Step 2.

STEP 2. Diagnosis code recheck after resetting CAN bus lines

(1) Erase the diagnosis code.
(2) Drive the vehicle at 15 km/h or more.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 15 km/h or higher.

Q: Is the diagnosis code No.C1210 set?

YES : Go to Step 3.

NO : The procedure is complete.

STEP 3. M.U.T.-III diagnosis code

Check that the diagnosis code No.C1212 are also set.

Q: Is the diagnosis code No.C1212 also set?

YES : Perform the diagnosis for the diagnosis code No.C1212 (Refer to P.35C-53.).

NO : Go to Step 4.

STEP 4. M.U.T.-III data list

Check the following data list (Refer to P.35C-131.).

- Item No.04: RR wheel speed sensor

Q: Is the check result normal?

YES : Go to Step 8.

NO : Go to Step 5.

STEP 5. Connector check: A-48 ASTC-ECU connector, C-29 intermediate connector, F-12 intermediate connector, F-10 rear wheel speed sensor (RH) connector

Q: Is the check result normal?

YES : Go to Step 6.
NO : Repair the defective connector. Then go to Step 9.

STEP 6. Resistance measurement at the A-48 ASTC-ECU connector
(1) Disconnect the A-48 ASTC-ECU connector.
(2) Measure the resistance between the A-48 ASTC-ECU connector terminal No.20 and terminal No.21.

OK: Continuity

Q: Is the check result normal?
YES : Go to Step 7.
NO : Repair the wiring harness. Then go to Step 9.

STEP 7. Check for wheel speed sensor as a single unit
Refer to P.35C-141.

Q: Is the check result normal?
YES : Go to Step 8.
NO : Replace the wheel speed sensor (Refer to P.35C-141.). Then go to Step 9.

STEP 8. Check whether the diagnosis code is reset.
(1) Erase the diagnosis code.
(2) Drive the vehicle at 15 km/h or more.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 15 km/h or higher.

Q: Is the diagnosis code No.C1210 set?
YES : Replace the hydraulic unit (integrated with ASTC-ECU) (Refer to P.35C-140.). Then go to Step 9.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunctions .).

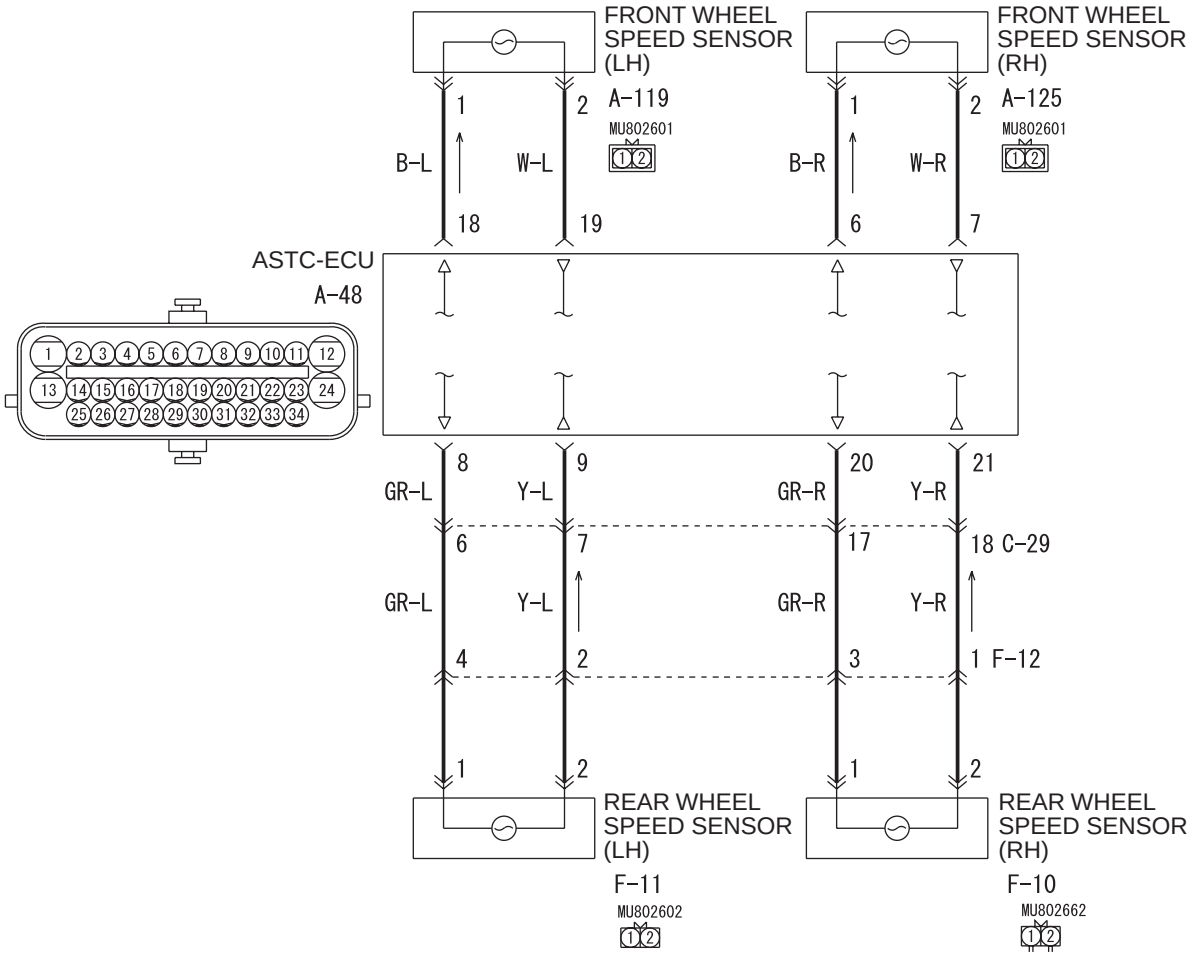
STEP 9. Check whether the diagnosis code is reset.
(1) Erase the diagnosis code.
(2) Drive the vehicle at 15 km/h or more.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 15 km/h or higher.

Q: Is the diagnosis code No.C1210 set?
YES : Return to Step 1.
NO : This diagnosis is complete.

Code No.C1215: Wheel speed sensor (RL) (signal open circuit)

Wheel Speed Sensor Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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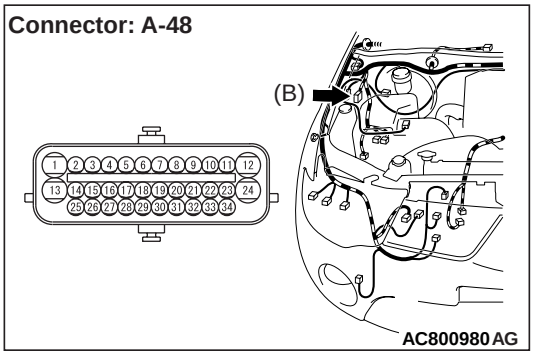
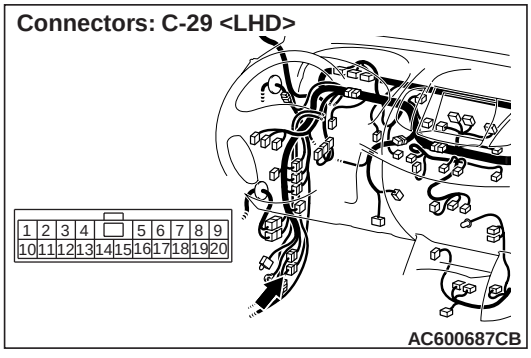
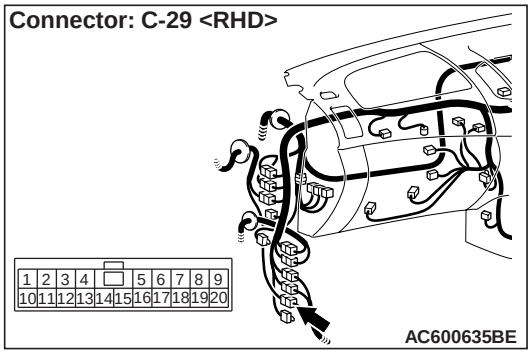
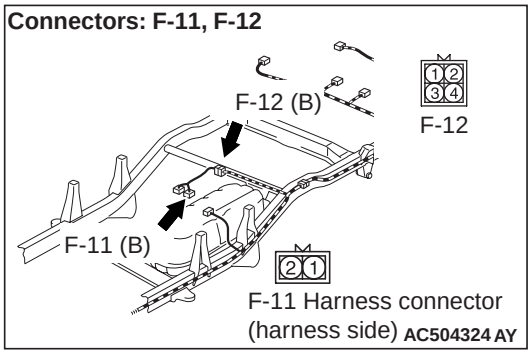








⚠ CAUTION

- **If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table .).**
- **Before replacing the ECU, ensure that the communication circuit is normal.**

OPERATION

- A toothed ABS rotor generates a voltage pulse as it moves across the pickup field of each wheel speed sensor.
- The wheel speed sensor transmit the frequency of the pulses to the ASTC-ECU.
- The hydraulic unit assembly (integrated with ASTC-ECU) modulates the amount of braking force individually applied to each wheel cylinder.

DIAGNOSIS CODE SET CONDITION

Diagnosis code No.C1215 is set when signal is not input due to breakage of the wire of the wheel speed sensor without the output of the code No.C1217.

PROBABLE CAUSES

Current trouble

- Damaged wiring harness and connectors
- Wheel speed sensor malfunction
- ASTC-ECU malfunction

Past trouble

- Carry out diagnosis with particular emphasis on wiring harness and connector failures between ASTC-ECU and the wheel speed sensor. For diagnosis procedures, refer to How to treat past trouble (GROUP 00 – How to Cope with Intermittent Malfunctions .).

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnosis

Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?

YES : Go to Step 3.

NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table .). On completion, go to Step 2.

STEP 2. Diagnosis code recheck after resetting CAN bus lines

(1) Erase the diagnosis code.
(2) Drive the vehicle at 15 km/h or more.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 15 km/h or higher.

Q: Is the diagnosis code No.C1215 set?

YES : Go to Step 3.

NO : The procedure is complete.

STEP 3. M.U.T.-III diagnosis code

Check that the diagnosis code No.C1217 are also set.

Q: Is the diagnosis code No.C1217 also set?

YES : Perform the diagnosis for the diagnosis code No.C1217 (Refer to P.35C-56.).

NO : Go to Step 4.

STEP 4. M.U.T.-III data list

Check the following data list (Refer to P.35C-131.).

- Item No.03: RL wheel speed sensor

Q: Is the check result normal?

YES : Go to Step 8.

NO : Go to Step 5.

STEP 5. Connector check: A-48 ASTC-ECU connector, C-29 intermediate connector, F-12 intermediate connector, F-11 rear wheel speed sensor (LH) connector

Q: Is the check result normal?

YES : Go to Step 6.
NO : Repair the defective connector. Then go to Step 9.

STEP 6. Resistance measurement at the A-48 ASTC-ECU connector
(1) Disconnect the A-48 ASTC-ECU connector.
(2) Measure the resistance between A-48 ASTC-ECU connector terminal No.8 and terminal No.9.

OK: Continuity

Q: Is the check result normal?
YES : Go to Step 7.
NO : Repair the wiring harness. Then go to Step 9.

STEP 7. Check for wheel speed sensor as a single unit
Refer to P.35C-141.

Q: Is the check result normal?
YES : Go to Step 8.
NO : Replace the wheel speed sensor (Refer to P.35C-141.). Then go to Step 9.

STEP 8. Check whether the diagnosis code is reset.
(1) Erase the diagnosis code.
(2) Drive the vehicle at 15 km/h or more.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 15 km/h or higher.

Q: Is the diagnosis code No.C1215 set?
YES : Replace the hydraulic unit (integrated with ASTC-ECU) (Refer to P.35C-140.). Then go to Step 9.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunctions .).

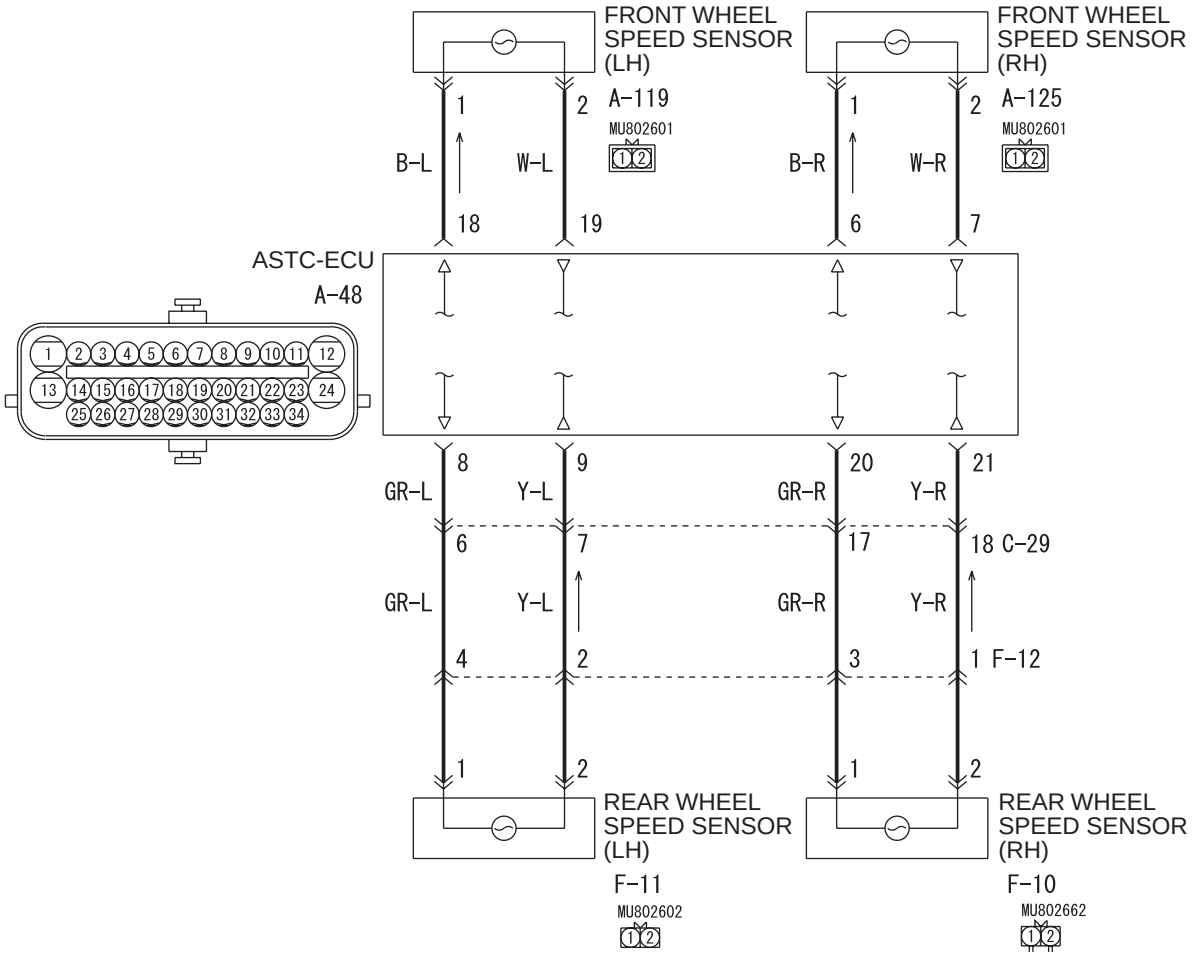
STEP 9. Check whether the diagnosis code is reset.
(1) Erase the diagnosis code.
(2) Drive the vehicle at 15 km/h or more.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 15 km/h or higher.

Q: Is the diagnosis code No.C1215 set?
YES : Return to Step 1.
NO : This diagnosis is complete.

Code No.C1201: Wheel speed sensor (FR) (signal short circuit)

Wheel Speed Sensor Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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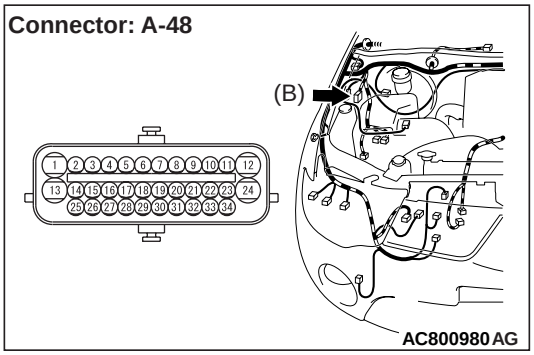
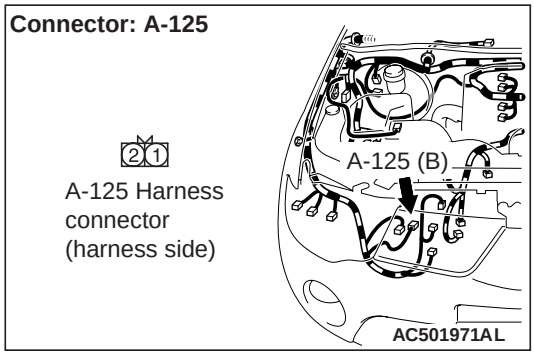
Connector: A-48



Connector: A-125



⚠ CAUTION
- **If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table .).**
- **Before replacing the ECU, ensure that the communication circuit is normal.**

OPERATION
- A toothed ABS rotor generates a voltage pulse as it moves across the pickup field of each wheel speed sensor.
- The wheel speed sensor transmit the frequency of the pulses to the ASTC-ECU.
- The hydraulic unit assembly (integrated with ASTC-ECU) modulates the amount of braking force individually applied to each wheel cylinder.

DIAGNOSIS CODE SET CONDITION
Diagnosis code No.C1201 is set if any abnormal voltage from the wheel speed sensor is detected without the outputs of the codes No.C1200 or C1202.

PROBABLE CAUSES

Current trouble
- Damaged wiring harness and connectors
- Teeth lack or clogging of the ABS rotor
- Malfunction of the front hub assembly
- Noise interference
- Wheel speed sensor malfunction
- ASTC-ECU malfunction

Past trouble
- Carry out diagnosis with particular emphasis on wiring harness and connector failures between ASTC-ECU and the wheel speed sensor. For diagnosis procedures, refer to How to treat past trouble (GROUP 00 – How to Cope with Intermittent Malfunctions .).

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnosis
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table .). On completion, go to Step 2.

STEP 2. Diagnosis code recheck after resetting CAN bus lines
(1) Erase the diagnosis code.
(2) Drive the vehicle at 15 km/h or more.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 15 km/h or higher.

Q: Is the diagnosis code No.C1201 set?
YES : Go to Step 3.
NO : This diagnosis is complete.

STEP 3. M.U.T.-III diagnosis code
Check that the diagnosis codes No.C1200 or C1202 is also set.

Q: Are the diagnosis codes No.C1200 or C1202 also set?
YES : Perform the diagnosis for the diagnosis codes No.C1200 or C1202 (Refer to P.35C-23, P.35C-47.).
NO : Go to Step 4.

STEP 4. M.U.T.-III data list
Check the following data list (Refer to P.35C-131.).
- Item No.02: FR wheel speed sensor

Q: Is the check result normal?
YES : Go to Step 12.
NO : Go to Step 5.

STEP 5. Check for wheel speed sensor (FR) installation
Check how the wheel speed sensor (FR) is installed correctly (Disconnection of wheel speed sensor (FR), loose mounting bolt, etc.).

Q: Is the check result normal?
YES : Go to Step 6.
NO : Reinstall the wheel speed sensor (FR) correctly (Refer to P.35C-141.). Then go to Step 13.

STEP 6. Check for wheel speed sensor (FR) output current
Refer to P.35C-135.

Q: Is the check result normal?
YES : Go to Step 7.
NO : Replace the wheel speed sensor (FR) (Refer to P.35C-141.). Then go to Step 13.

STEP 7. Check the front hub for looseness.

NOTE:
- *If the wheel bearing or front hub or axle shaft bearing are loose, the gap between the wheel speed sensor and ABS rotor may become excessive.*
- *Check the front hub, which diagnosis code indicates, for looseness. (Refer to GROUP 26, On-vehicle service – Wheel bearing axial play check .).*

Q: Is the check result normal?
YES : Go to Step 8.
NO : Replace the front hub assembly (Refer to GROUP 26, Front axle hub assembly .). Then go to Step 13.

STEP 8. Check the ABS rotor.

Check the ABS rotor (FR), which diagnosis code indicates, for foreign material or deformation.

Q: Is the check result normal?
YES : Go to Step 9.
NO : If the ABS rotor (FR) is contaminated with foreign material, clean it. If the front hub assembly is deformed, replace it (Refer to GROUP 26, Front axle hub assembly .). Then go to Step 13.

STEP 9. Connector check: A-48 ASTC-ECU connector, A-125 front wheel speed sensor (RH) connector.

Q: Is the check result normal?
YES : Go to Step 10.
NO : Repair the defective connector. Then go to Step 13.

STEP 10. Voltage measurement at the A-48 ASTC-ECU connector

(1) Disconnect the A-48 ASTC-ECU connector, the A-125 front wheel speed sensor (RH) connector.
(2) Measure the voltage between the A-48 ASTC-ECU connector terminal No.7 and body earth.

OK: 1V or less

Q: Is the check result normal?
YES : Go to Step 11.
NO : Repair the harness wire. Then go to Step 13.

STEP 11. Resistance measurement at the A-48 ASTC-ECU connector

(1) Disconnect the A-125 front wheel speed sensor (RH) connector, and measure the resistance at the harness connector side.
(2) Disconnect the A-48 ASTC-ECU connector.
(3) Measure the resistance between the A-48 ASTC-ECU connector terminal No.7 and body earth.

OK: No continuity

Q: Is the check result normal?
YES : Go to Step 12.
NO : Repair the harness wire. Then go to Step 13 .

STEP 12. Check whether the diagnosis code is reset.

(1) Erase the diagnosis code.
(2) Drive the vehicle at 15 km/h or more.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 15 km/h or higher.

Q: Is the diagnosis code No.C1201 set?
YES : Replace the hydraulic unit (integrated with ASTC-ECU) (Refer to P.35C-140.). Then go to Step 13.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunctions .).

STEP 13. Check whether the diagnosis code is reset.

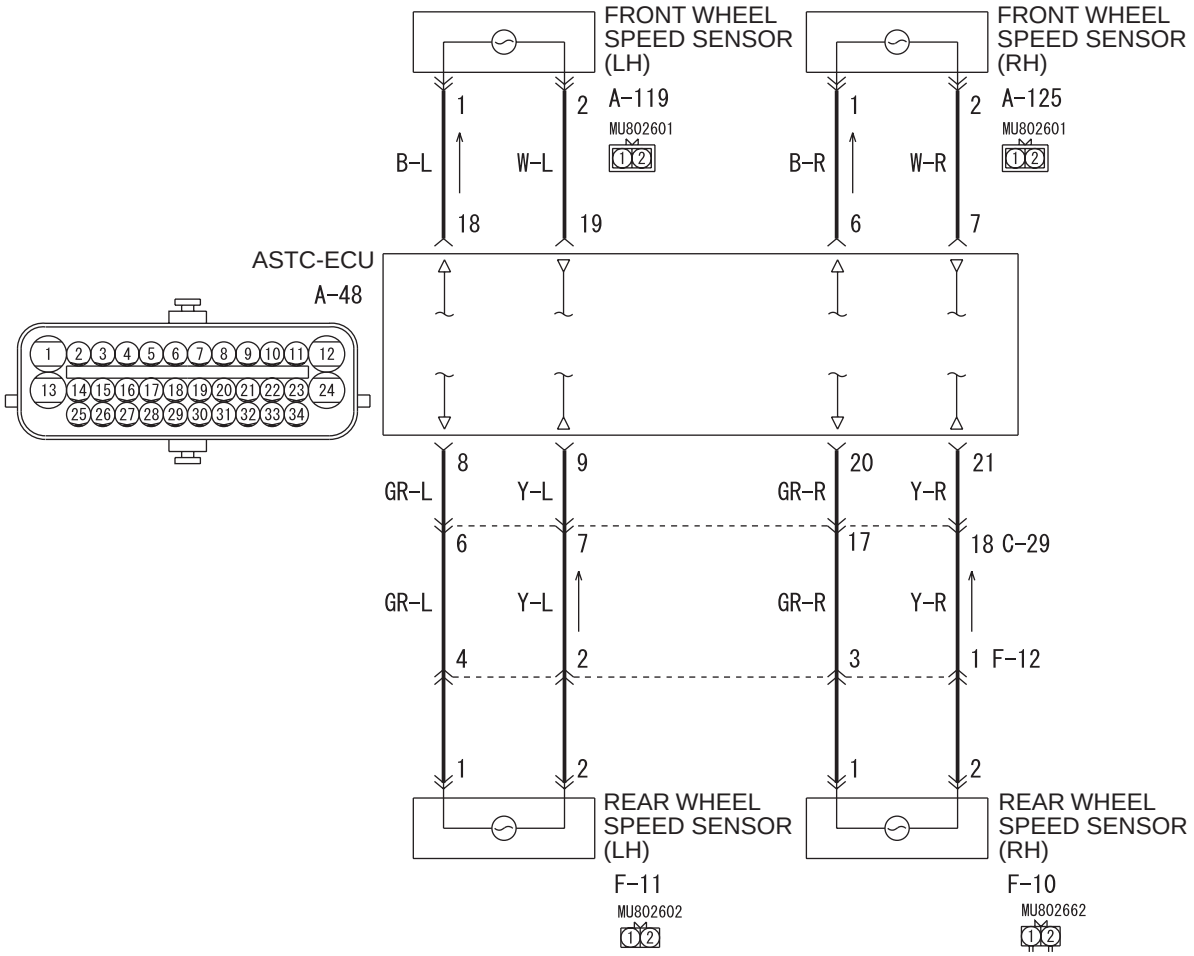
(1) Erase the diagnosis code.
(2) Drive the vehicle at 15 km/h or more.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 15 km/h or higher.

Q: Is the diagnosis code No.C1201 set?
YES : Return to Step 1.
NO : This diagnosis is complete.

Code No.C1206: Wheel speed sensor (FL) (signal short circuit)

Wheel Speed Sensor Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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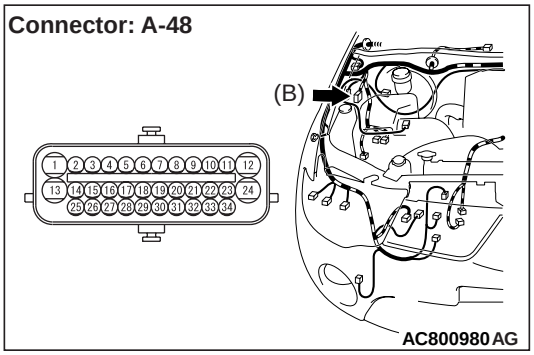
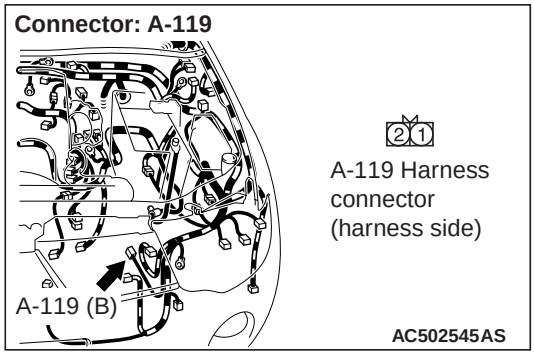
Connector: A-48



Connector: A-119



⚠ CAUTION
- **If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table .).**
- **Before replacing the ECU, ensure that the communication circuit is normal.**

OPERATION
- A toothed ABS rotor generates a voltage pulse as it moves across the pickup field of each wheel speed sensor.
- The wheel speed sensor transmit the frequency of the pulses to the ASTC-ECU.
- The hydraulic unit assembly (integrated with ASTC-ECU) modulates the amount of braking force individually applied to each wheel cylinder.

DIAGNOSIS CODE SET CONDITION
Diagnosis code No.C1206 is set if any abnormal voltage from the wheel speed sensor is detected without the outputs of the codes No.C1205 or C1207.

PROBABLE CAUSES

Current trouble
- Damaged wiring harness and connectors
- Teeth lack or clogging of the ABS rotor
- Malfunction of the front hub assembly
- Noise interference
- Wheel speed sensor malfunction
- ASTC-ECU malfunction

Past trouble
- Carry out diagnosis with particular emphasis on wiring harness and connector failures between ASTC-ECU and the wheel speed sensor. For diagnosis procedures, refer to How to treat past trouble (GROUP 00 – How to Cope with Intermittent Malfunctions .).

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnosis
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table .). On completion, go to Step 2.

STEP 2. Diagnosis code recheck after resetting CAN bus lines
(1) Erase the diagnosis code.
(2) Drive the vehicle at 15 km/h or more.
NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 15 km/h or higher.

Q: Is the diagnosis code No.C1206 set?
YES : Go to Step 3.
NO : This diagnosis is complete.

STEP 3. M.U.T.-III diagnosis code
Check that the diagnosis codes No.C1205 or C1207 is also set.

Q: Are the diagnosis codes No.C1205 or C1207 also set?
YES : Perform the diagnosis for the diagnosis codes No.C1205 or C1207 (Refer to P.35C-25, P.35C-50.).
NO : Go to Step 4.

STEP 4. M.U.T.-III data list
Check the following data list (Refer to P.35C-131.).
- Item No.01: FL wheel speed sensor

Q: Is the check result normal?
YES : Go to Step 12.
NO : Go to Step 5.

STEP 5. Check for wheel speed sensor (FL) installation
Check how the wheel speed sensor (FL) is installed correctly (Disconnection of wheel speed sensor (FL), loose mounting bolt, etc.).

Q: Is the check result normal?
YES : Go to Step 6.
NO : Reinstall the wheel speed sensor (FL) correctly (Refer to P.35C-141). Then go to Step 13.

STEP 6. Check for wheel speed sensor (FL) output current
Refer to P.35C-135.

Q: Is the check result normal?
YES : Go to Step 7.
NO : Replace the wheel speed sensor (FL) (Refer to P.35C-141.). Then go to Step 13.

STEP 7. Check the front hub for looseness.

NOTE:
- *If the wheel bearing or front hub or axle shaft bearing are loose, the gap between the wheel speed sensor and ABS rotor may become excessive.*
- *Check the front hub, which diagnosis code indicates, for looseness. (Refer to GROUP 26, On-vehicle service – Wheel bearing axial play check .).*

Q: Is the check result normal?
YES : Go to Step 8.
NO : Replace the front hub assembly (Refer to GROUP 26, Front axle hub assembly .). Then go to Step 13.

STEP 8. Check the ABS rotor.

Check the ABS rotor (FL), which diagnosis code indicates, for foreign material or deformation.

Q: Is the check result normal?
YES : Go to Step 9.
NO : If the ABS rotor (FL) is contaminated with foreign material, clean it. If the front hub assembly is deformed, replace it (Refer to GROUP 26, Front axle hub assembly .). Then go to Step 13.

STEP 9. Connector check: A-48 ASTC-ECU connector, A-119 front wheel speed sensor (LH) connector.

Q: Is the check result normal?
YES : Go to Step 10.
NO : Repair the defective connector. Then go to Step 13.

STEP 10. Voltage measurement at the A-48 ASTC-ECU connector

(1) Disconnect the A-48 ASTC-ECU connector, the A-119 front wheel speed sensor (LH) connector,.
(2) Measure the voltage between the A-48 ASTC-ECU connector terminal No.19 and body earth.

OK: 1V or less

Q: Is the check result normal?
YES : Go to Step 11.
NO : Repair the harness wire. Then go to Step 13.

STEP 11. Resistance measurement at the A-48 ASTC-ECU connector

(1) Disconnect the A-119 front wheel speed sensor (LH) connector, and measure the resistance at the harness connector side.
(2) Disconnect the A-48 ASTC-ECU connector.
(3) Measure the resistance between the A-48 ASTC-ECU connector terminal No.19 and body earth.

OK: No continuity

Q: Is the check result normal?
YES : Go to Step 12.
NO : Repair the harness wire. Then go to Step 13 .

STEP 12. Check whether the diagnosis code is reset.

(1) Erase the diagnosis code.
(2) Drive the vehicle at 15 km/h or more.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 15 km/h or higher.

Q: Is the diagnosis code No.C1206 set?
YES : Replace the hydraulic unit (integrated with ASTC-ECU) (Refer to P.35C-140.). Then go to Step 13.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunctions .).

STEP 13. Check whether the diagnosis code is reset.

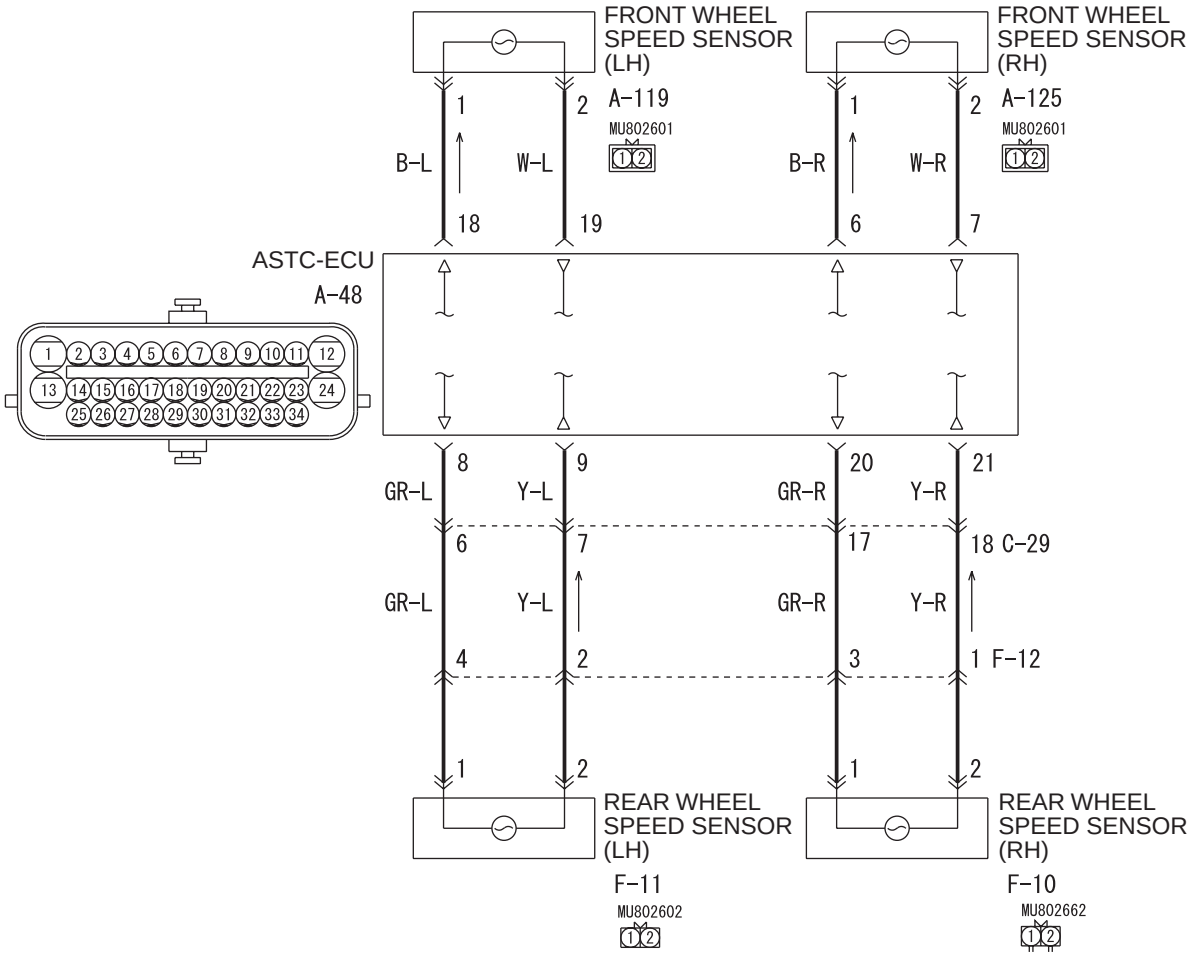
(1) Erase the diagnosis code.
(2) Drive the vehicle at 15 km/h or more.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 15 km/h or higher.

Q: Is the diagnosis code No.C1206 set?
YES : Return to Step 1.
NO : This diagnosis is complete.

Code No.C1211: Wheel speed sensor (RR) (signal short circuit)

Wheel Speed Sensor Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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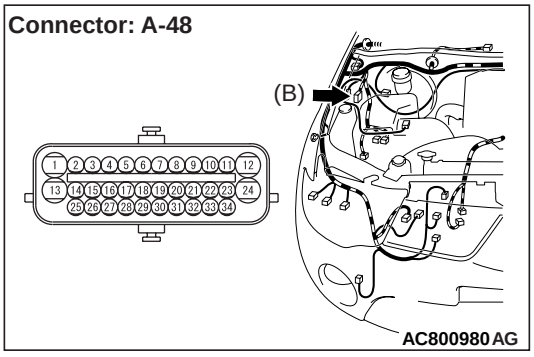
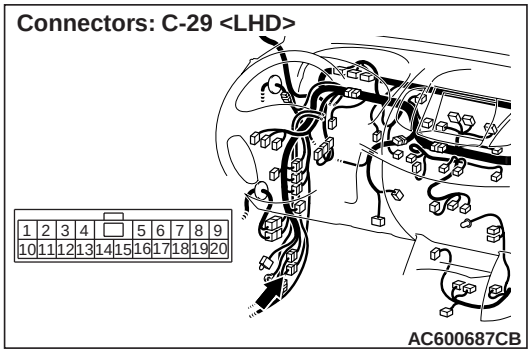
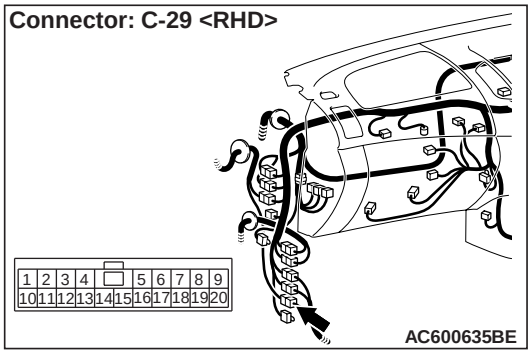
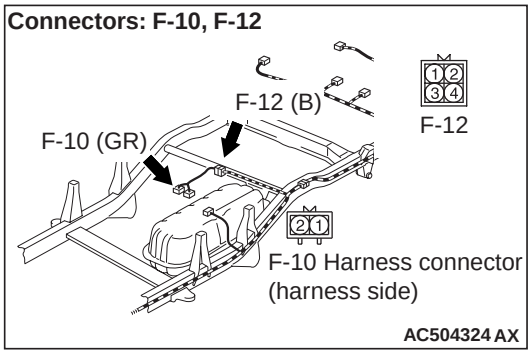








⚠ CAUTION

- **If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table .).**
- **Before replacing the ECU, ensure that the communication circuit is normal.**

OPERATION

- A toothed ABS rotor generates a voltage pulse as it moves across the pickup field of each wheel speed sensor.
- The wheel speed sensor transmit the frequency of the pulses to the ASTC-ECU.
- The hydraulic unit assembly (integrated with ASTC-ECU) modulates the amount of braking force individually applied to each wheel cylinder.

DIAGNOSIS CODE SET CONDITION

Diagnosis code No.1211 is set if any abnormal voltage from the wheel speed sensor is detected without the outputs of the codes No.C1210 or C1212.

PROBABLE CAUSES

Current trouble

- Damaged wiring harness and connectors
- Teeth lack or clogging of the ABS rotor
- Malfunction of the axle shaft bearing
- Noise interference
- Wheel speed sensor malfunction
- ASTC-ECU malfunction

Past trouble

- Carry out diagnosis with particular emphasis on wiring harness and connector failures between ASTC-ECU and the wheel speed sensor. For diagnosis procedures, refer to How to treat past trouble (GROUP 00 – How to Cope with Intermittent Malfunctions .).

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnosis

Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?

YES : Go to Step 3.

NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table .). On completion, go to Step 2.

STEP 2. Diagnosis code recheck after resetting CAN bus lines

(1) Erase the diagnosis code.

(2) Drive the vehicle at 15 km/h or more.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 15 km/h or higher.

Q: Is the diagnosis code No.C1211 set?

YES : Go to Step 3.

NO : This diagnosis is complete.

STEP 3. M.U.T.-III diagnosis code

Check that the diagnosis codes No.C1210 or C1212 is also set.

Q: Are the diagnosis codes No.C1210 or C1212 also set?

YES : Perform the diagnosis for the diagnosis codes No.C1210 (Refer to P.35C-28).

NO : Go to Step 4.

STEP 4. M.U.T.-III data list

Check the following data list (Refer to P.35C-131.).

- Item No.04: RR wheel speed sensor

Q: Is the check result normal?

YES : Go to Step 12.

NO : Go to Step 5.

STEP 5. Check for wheel speed sensor (RR) installation

Check how the wheel speed sensor (RR) is installed correctly (Disconnection of wheel speed sensor (RR), loose mounting bolt, etc.).

Q: Is the check result normal?

YES : Go to Step 6.

NO : Reinstall the wheel speed sensor (RR) correctly (Refer to P.35C-141.). Then go to Step 13.

STEP 6. Check for wheel speed sensor (RR) output current

Refer to P.35C-135.

Q: Is the check result normal?

YES : Go to Step 7.

NO : Replace the wheel speed sensor (RR) (Refer to P.35C-141.). Then go to Step 13.

STEP 7. Check the axle shaft bearing for looseness.

NOTE:

- *If the wheel bearing or front hub or axle shaft bearing are loose, the gap between the wheel speed sensor and ABS rotor may become excessive.*
- *Check the axle shaft bearing, which diagnosis code indicates, for looseness. (Refer to GROUP 27, On-vehicle service – Axle shaft axial play check .).*

Q: Is the check result normal?

YES : Go to Step 8.

NO : Replace the rear axle shaft bearing (Refer to GROUP 27, Axle shaft assembly .). Then go to Step 13.

STEP 8. Check the ABS rotor.

Check the ABS rotor (RR), which diagnosis code indicates, for foreign material or deformation.

Q: Is the check result normal?

YES : Go to Step 9.

NO : If the ABS rotor (RR) is contaminated with foreign material, clean it. If the rear axle shaft bearing is deformed, replace it (Refer to GROUP 27, Axle shaft assembly .). Then go to Step 13.

STEP 9. Connector check: A-48 ASTC-ECU connector, F-10 rear wheel speed sensor (RH), C-29 intermediate connector and F-12 intermediate connector

Q: Is the check result normal?

YES : Go to Step 10.

NO : Repair the defective connector. Then go to Step 13.

STEP 10. Voltage measurement at the A-48 ASTC-ECU connector

(1) Disconnect the A-48 ASTC-ECU connector, the F-10 rear wheel speed sensor (RH) connector.
(2) Measure the voltage between the A-48 ASTC-ECU connector terminal No.21 and body earth.

OK: 1V or less

Q: Is the check result normal?

YES : Go to Step 11.

NO : Repair the harness wire. Then go to Step 13.

STEP 11. Resistance measurement at the A-48 ASTC-ECU connector

(1) Disconnect the F-10 rear wheel speed sensor (RH) connector, and measure the resistance at the harness connector side.
(2) Disconnect the A-48 ASTC-ECU connector.
(3) Measure the resistance between the A-48 ASTC-ECU connector terminal No.21 and body earth.

OK: No continuity

Q: Is the check result normal?

YES : Go to Step 12.

NO : Repair the harness wire. Then go to Step 13.

STEP 12. Check whether the diagnosis code is reset.

(1) Erase the diagnosis code.
(2) Drive the vehicle at 15 km/h or more.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 15 km/h or higher.

Q: Is the diagnosis code No.C1211 set?

YES : Replace the hydraulic unit (integrated with ASTC-ECU) (Refer to P.35C-140.). Then go to Step 13.

NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunctions .).

STEP 13. Check whether the diagnosis code is reset.

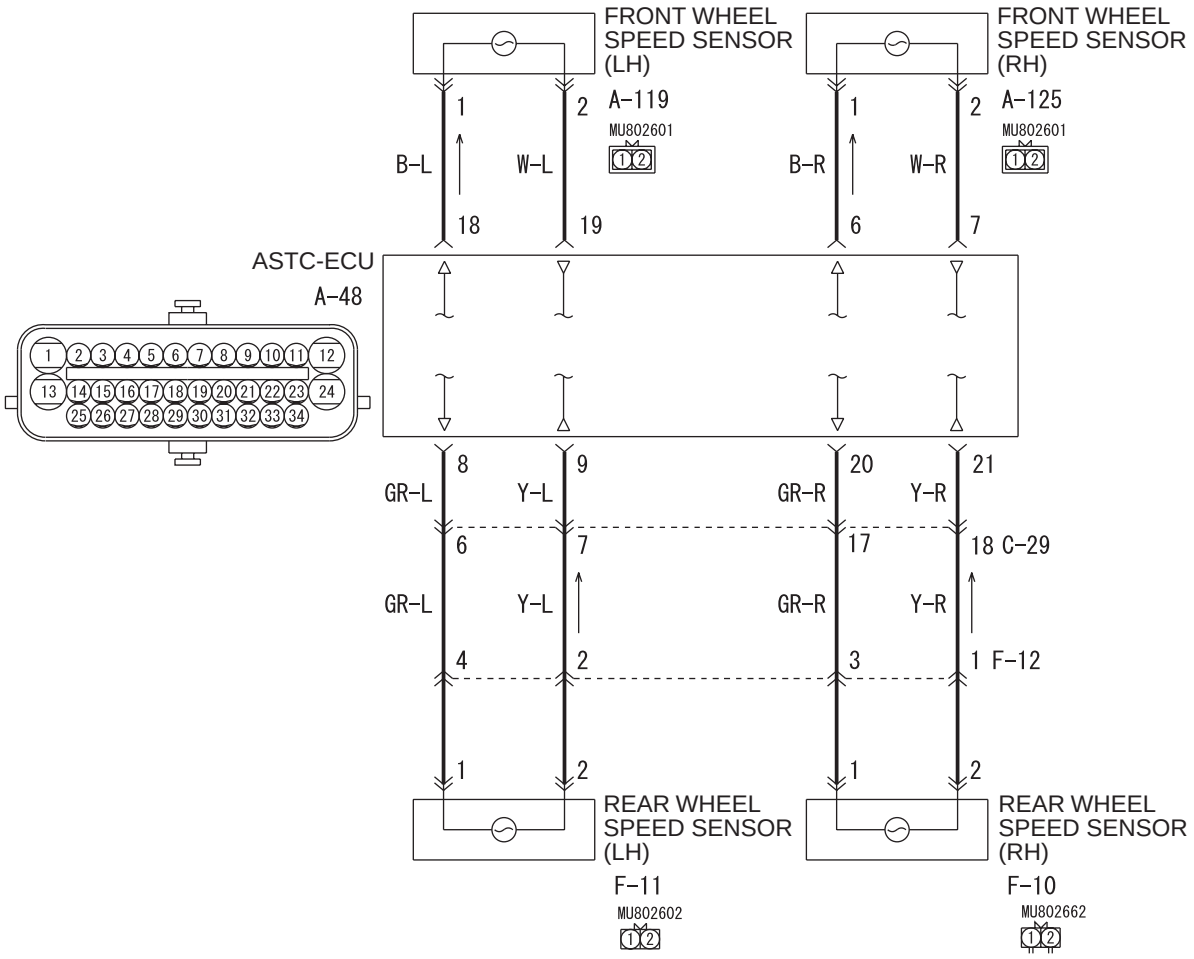
(1) Erase the diagnosis code.
(2) Drive the vehicle at 15 km/h or more.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 15 km/h or higher.

Q: Is the diagnosis code No.C1211 set?
YES : Return to Step 1.
NO : This diagnosis is complete.

Code No.C1216: Wheel speed sensor (RL) (signal short circuit)

Wheel Speed Sensor Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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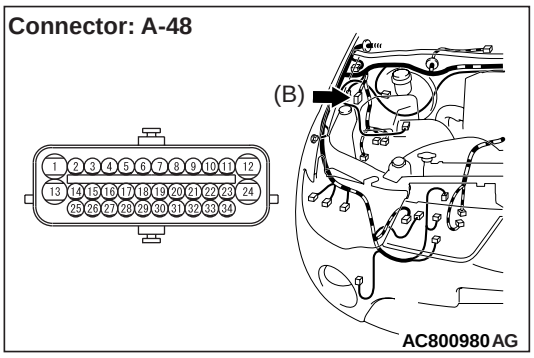
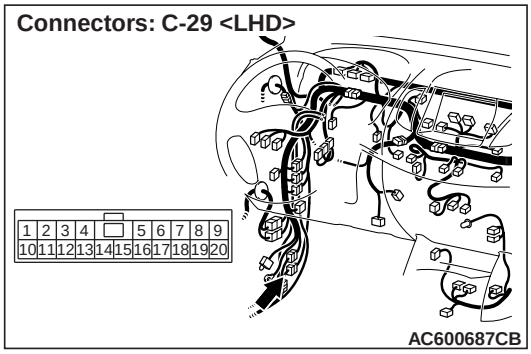
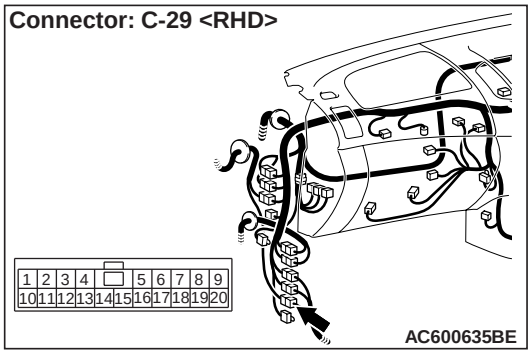
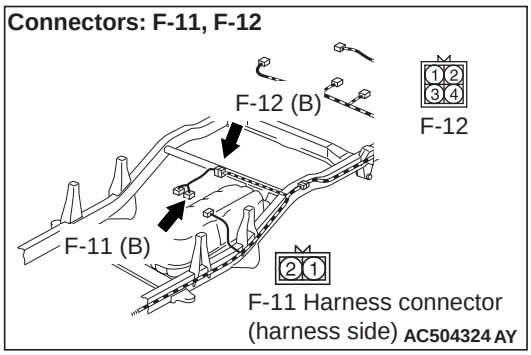








⚠ CAUTION

- **If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table .).**
- **Before replacing the ECU, ensure that the communication circuit is normal.**

OPERATION

- A toothed ABS rotor generates a voltage pulse as it moves across the pickup field of each wheel speed sensor.
- The wheel speed sensor transmit the frequency of the pulses to the ASTC-ECU.
- The hydraulic unit assembly (integrated with ASTC-ECU) modulates the amount of braking force individually applied to each wheel cylinder.

DIAGNOSIS CODE SET CONDITION

Diagnosis code No.1216 is set if any abnormal voltage from the wheel speed sensor is detected without the outputs of the codes No.C1215 or C1217.

PROBABLE CAUSES

Current trouble

- Damaged wiring harness and connectors
- Teeth lack or clogging of the ABS rotor
- Malfunction of the axle shaft bearing
- Noise interference
- Wheel speed sensor malfunction
- ASTC-ECU malfunction

Past trouble

- Carry out diagnosis with particular emphasis on wiring harness and connector failures between ASTC-ECU and the wheel speed sensor. For diagnosis procedures, refer to How to treat past trouble (GROUP 00 – How to Cope with Intermittent Malfunctions .).

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnosis

Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?

YES : Go to Step 3.

NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table .). On completion, go to Step 2.

STEP 2. Diagnosis code recheck after resetting CAN bus lines

(1) Erase the diagnosis code.

(2) Drive the vehicle at 15 km/h or more.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 15 km/h or higher.

Q: Is the diagnosis code No.C1216 set?
YES : Go to Step 3.
NO : This diagnosis is complete.

STEP 3. M.U.T.-III diagnosis code
Check that the diagnosis codes No.C1215 or C1217 is also set.

Q: Are the diagnosis codes No.C1215 or C1217 also set?
YES : Perform the diagnosis for the diagnosis codes No.C1215 or C1217 (Refer to P.35C-141, P.35C-56.).
NO : Go to Step 4.

STEP 4. M.U.T.-III data list
Check the following data list (Refer to P.35C-131.).
- Item No.03: RL wheel speed sensor

Q: Is the check result normal?
YES : Go to Step 12.
NO : Go to Step 5.

STEP 5. Check for wheel speed sensor (RL) installation
Check how the wheel speed sensor (RL) is installed correctly (Disconnection of wheel speed sensor (RL), loose mounting bolt, etc.).

Q: Is the check result normal?
YES : Go to Step 6.
NO : Reinstall the wheel speed sensor (RL) correctly (Refer to P.35C-141.). Then go to Step 13.

STEP 6. Check for wheel speed sensor (RL) output current
Refer to P.35C-135.

Q: Is the check result normal?
YES : Go to Step 7.
NO : Replace the wheel speed sensor (RL) (Refer to P.35C-141.). Then go to Step 13.

STEP 7. Check the axle shaft bearing for looseness.
NOTE:
- *If the wheel bearing or front hub or axle shaft bearing are loose, the gap between the wheel speed sensor and ABS rotor may become excessive.*
- *Check the axle shaft bearing, which diagnosis code indicates, for looseness. (Refer to GROUP 27, On-vehicle service – Axle shaft axial play check .).*

Q: Is the check result normal?
YES : Go to Step 8.
NO : Replace the rear axle shaft bearing (Refer to GROUP 27, Axle shaft assembly .). Then go to Step 13.

STEP 8. Check the ABS rotor.
Check the ABS rotor (RL), which diagnosis code indicates, for foreign material or deformation.

Q: Is the check result normal?
YES : Go to Step 9.
NO : If the ABS rotor (RL) is contaminated with foreign material, clean it. If the rear axle shaft bearing is deformed, replace it (Refer to GROUP 27, Axle shaft assembly .). Then go to Step 13.

STEP 9. Connector check: A-48 ASTC-ECU connector, F-11 rear wheel speed sensor (LH), C-29 intermediate connector and F-12 intermediate connector

Q: Is the check result normal?
YES : Go to Step 10.
NO : Repair the defective connector. Then go to Step 13.

STEP 10. Voltage measurement at the A-48 ASTC-ECU connector
(1) Disconnect the connector the A-48 ASTC-ECU connector, the F-11 rear wheel speed sensor (LH) connector.
(2) Measure the voltage between the A-48 ASTC-ECU connector terminal No.9 and body earth.

OK: 1V or less

Q: Is the check result normal?
YES : Go to Step 11.
NO : Repair the harness wire. Then go to Step 13.

STEP 11. Resistance measurement at the A-48 ASTC-ECU connector

(1) Disconnect the F-11 rear wheel speed sensor (LH) connector, and measure the resistance at the harness connector side.
(2) Disconnect the A-48 ASTC-ECU connector.
(3) Measure the resistance between the A-48 ASTC-ECU connector terminal No.9 and body earth.

OK: No continuity

Q: Is the check result normal?

YES : Go to Step 12.
NO : Repair the harness wire. Then go to Step 13.

STEP 12. Check whether the diagnosis code is reset.

(1) Erase the diagnosis code.
(2) Drive the vehicle at 15 km/h or more.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 15 km/h or higher.

Q: Is the diagnosis code No.C1216 set?

YES : Replace the hydraulic unit (integrated with ASTC-ECU) (Refer to P.35C-140.). Then go to Step 13.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunctions .).

STEP 13. Check whether the diagnosis code is reset.

(1) Erase the diagnosis code.
(2) Drive the vehicle at 15 km/h or more.

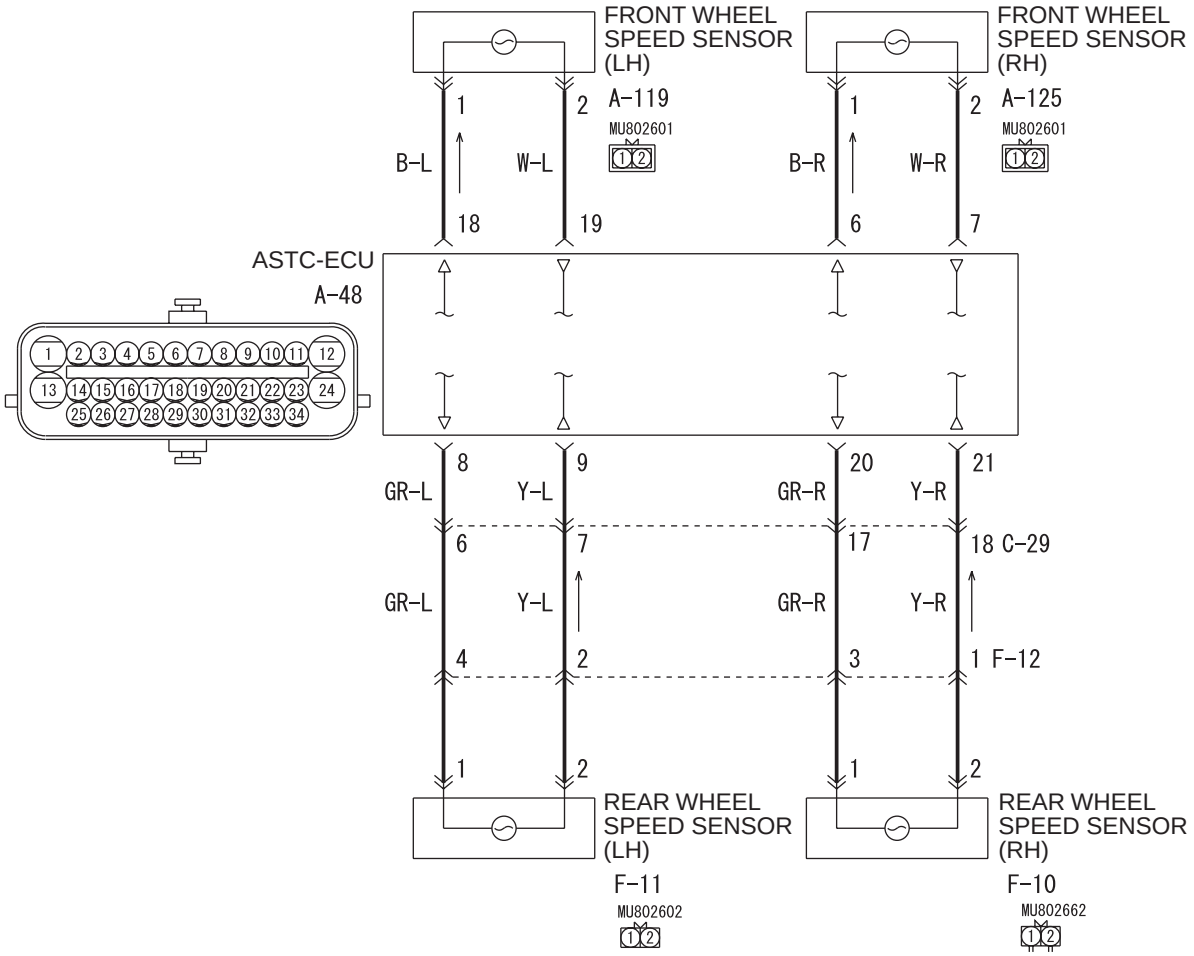
NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 15 km/h or higher.

Q: Is the diagnosis code No.C1216 set?

YES : Return to Step 1.
NO : This diagnosis is complete.

Code No.C1202: Wheel speed sensor (FR) (malfunction power circuit)

Wheel Speed Sensor Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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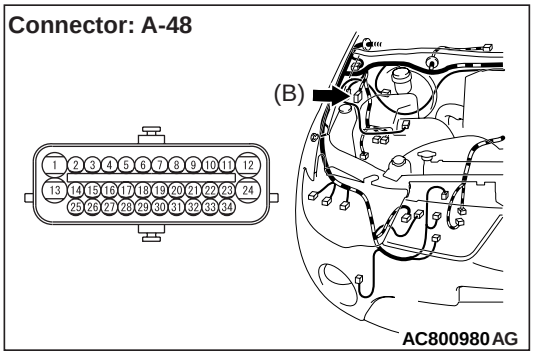
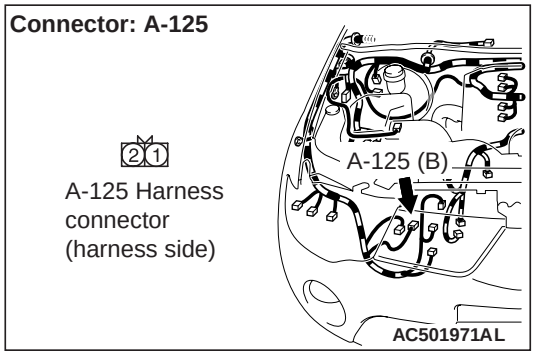
Connector: A-48



Connector: A-125



⚠ CAUTION
- **If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table .).**
- **Before replacing the ECU, ensure that the communication circuit is normal.**

OPERATION
- A toothed ABS rotor generates a pulse signal as it moves across the pickup field of each wheel speed sensor.
- The wheel speed sensor transmit the frequency of the pulses to the ASTC-ECU.
- The hydraulic unit assembly (integrated with ASTC-ECU) modulates the amount of braking force individually applied to each wheel cylinder.

DIAGNOSIS CODE SET CONDITION
Diagnosis code No.C1202 is set when the supply voltage to wheel speed sensor has decreased.

PROBABLE CAUSES

Current trouble
- Damaged wiring harness and connectors
- Noise interference
- Wheel speed sensor malfunction
- ASTC-ECU malfunction

Past trouble
- Carry out diagnosis with particular emphasis on wiring harness and connector failures between ASTC-ECU and the wheel speed sensor. For diagnosis procedures, refer to How to treat past trouble (GROUP 00 – How to Cope with Intermittent Malfunctions .).

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnosis
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table .). On completion, go to Step 2.

STEP 2. Diagnosis code recheck after resetting CAN bus lines
(1) Erase the diagnosis code.
(2) Drive the vehicle at 15 km/h or more.
NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 15 km/h or higher.

Q: Is the diagnosis code No.C1202 set?
YES : Go to Step 3.
NO : This diagnosis is complete.

STEP 3. M.U.T.-III data list
Check the following data list P.35C-131.
- Item No.02: FR wheel speed sensor

Q: Is the check result normal?
YES : Go to Step 8.
NO : Go to Step 4.

STEP 4. Connector check: A-48 ASTC-ECU connector, A-125 front wheel speed sensor (RH) connector

Q: Is the check result normal?
YES : Go to Step 5.
NO : Repair the defective connector. Then go to Step 9.

STEP 5. Voltage measurement at the A-48 ASTC-ECU connector
(1) Disconnect the A-48 ASTC-ECU connector, the A-125 front wheel speed sensor (RH) connector.
(2) Measure the voltage between the A-48 ASTC-ECU connector terminal No.6 and body earth.

OK: 1 V or less

Q: Is the check result normal?
YES : Go to Step 6.
NO : Repair the wiring harness. Then go to Step 9.

STEP 6. Resistance measurement at the A-48 ASTC-ECU connector
(1) Disconnect the A-48 ASTC-ECU connector and the A-125 front wheel speed sensor (RH) connector.
(2) Measure the resistance between the A-48 ASTC-ECU connector terminal No.6 and body earth.

OK: No continuity

Q: Is the check result normal?
YES : Go to Step 7.
NO : Repair the wiring harness. Then go to Step 9.

STEP 7. Check for wheel speed sensor as a single unit

Refer to P.35C-141.

Q: Is the check result normal?

YES : Go to Step 8.

NO : Replace the wheel speed sensor (Refer to P.35C-141.). Then go to Step 9.

STEP 8. Check whether the diagnosis code is reset.

(1) Erase the diagnosis code.

(2) Drive the vehicle at 15 km/h or more.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 15 km/h or higher.

Q: Is the diagnosis code No.C1202 set?

YES : Replace the hydraulic unit (integrated with ASTC-ECU) (Refer to P.35C-140.). Then go to Step 9.

NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunctions .).

STEP 9. Check whether the diagnosis code is reset.

(1) Erase the diagnosis code.

(2) Drive the vehicle at 15 km/h or more.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 15 km/h or higher.

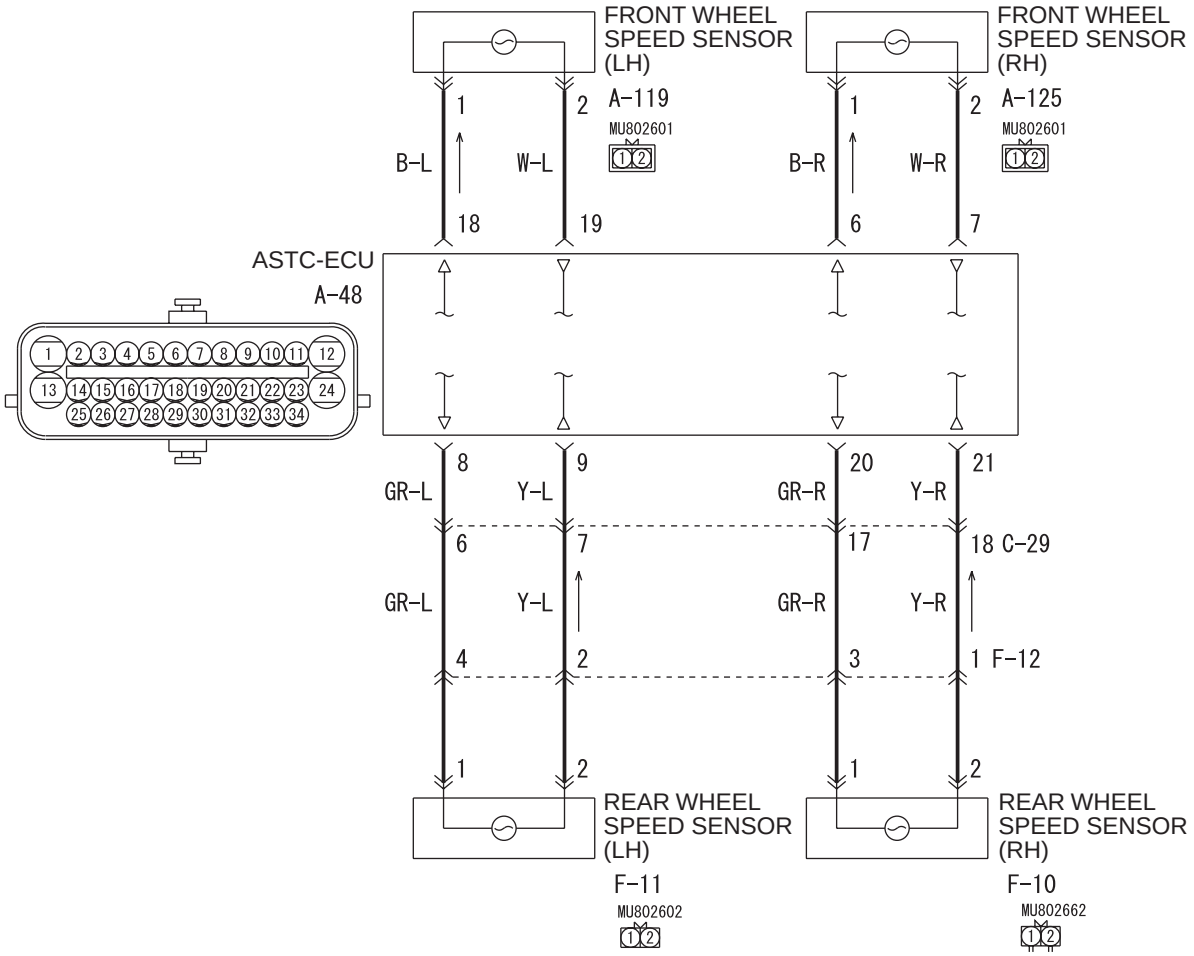
Q: Is the diagnosis code No.C1202 set?

YES : Return to Step 1.

NO : This diagnosis is complete.

Code No.C1207: Wheel speed sensor (FL) (malfunction power circuit)

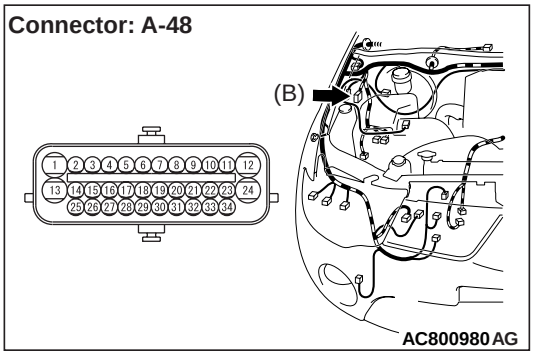
Wheel Speed Sensor Circuit



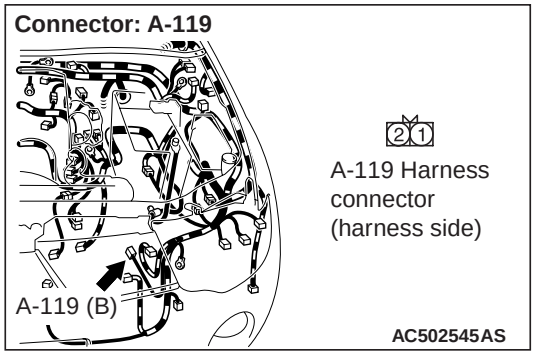
Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

ACB00772

Connector: A-48



Connector: A-119



⚠ CAUTION
- **If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table .).**
- **Before replacing the ECU, ensure that the communication circuit is normal.**

OPERATION
- A toothed ABS rotor generates a pulse signal as it moves across the pickup field of each wheel speed sensor.
- The wheel speed sensor transmit the frequency of the pulses to the ASTC-ECU.
- The hydraulic unit assembly (integrated with ASTC-ECU) modulates the amount of braking force individually applied to each wheel cylinder.

DIAGNOSIS CODE SET CONDITION
Diagnosis code No.C1207 is set when the supply voltage to wheel speed sensor has decreased.

PROBABLE CAUSES

Current trouble
- Damaged wiring harness and connectors
- Noise interference
- Wheel speed sensor malfunction
- ASTC-ECU malfunction

Past trouble
- Carry out diagnosis with particular emphasis on wiring harness and connector failures between ASTC-ECU and the wheel speed sensor. For diagnosis procedures, refer to How to treat past trouble (GROUP 00 – How to Cope with Intermittent Malfunctions .).

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnosis
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table .). On completion, go to Step 2.

STEP 2. Diagnosis code recheck after resetting CAN bus lines
(1) Erase the diagnosis code.
(2) Drive the vehicle at 15 km/h or more.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 15 km/h or higher.

Q: Is the diagnosis code No.C1207 set?
YES : Go to Step 3.
NO : This diagnosis is complete.

STEP 3. M.U.T.-III data list
Check the following data list (Refer to P.35C-131.
- Item No.01: FL wheel speed sensor

Q: Is the check result normal?
YES : Go to Step 8.
NO : Go to Step 4.

STEP 4. Connector check: A-48 ASTC-ECU connector, A-119 front wheel speed sensor (LH) connector

Q: Is the check result normal?
YES : Go to Step 5.
NO : Repair the defective connector. Then go to Step 9.

STEP 5. Voltage measurement at the A-48 ASTC-ECU connector
(1) Disconnect the A-48 ASTC-ECU connector, the A-119 front wheel speed sensor (LH) connector.
(2) Measure the voltage between the A-48 ASTC-ECU connector terminal No.18 and body earth.

OK: 1V or less

Q: Is the check result normal?
YES : Go to Step 6.
NO : Repair the wiring harness. Then go to Step 9.

STEP 6. Resistance measurement at the A-48 ASTC-ECU connector
(1) Disconnect the A-48 ASTC-ECU connector, the A-119 front wheel speed sensor connector.
(2) Measure the resistance between the A-48 ASTC-ECU connector terminal No.18 and body earth.

OK: No continuity

Q: Is the check result normal?
YES : Go to Step 7.
NO : Repair the wiring harness. Then go to Step 9.

STEP 7. Check for wheel speed sensor as a single unit
Refer to P.35C-141.

Q: Is the check result normal?

YES : Go to Step 8.
NO : Replace the wheel speed sensor (Refer to P.35C-141.). Then go to Step 9.

STEP 8. Check whether the diagnosis code is reset.
(1) Erase the diagnosis code.
(2) Drive the vehicle at 15 km/h or more.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 15 km/h or higher.

Q: Is the diagnosis code No.C1207 set?
YES : Replace the hydraulic unit (integrated with ASTC-ECU) (Refer to P.35C-140.). Then go to Step 9.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunctions .).

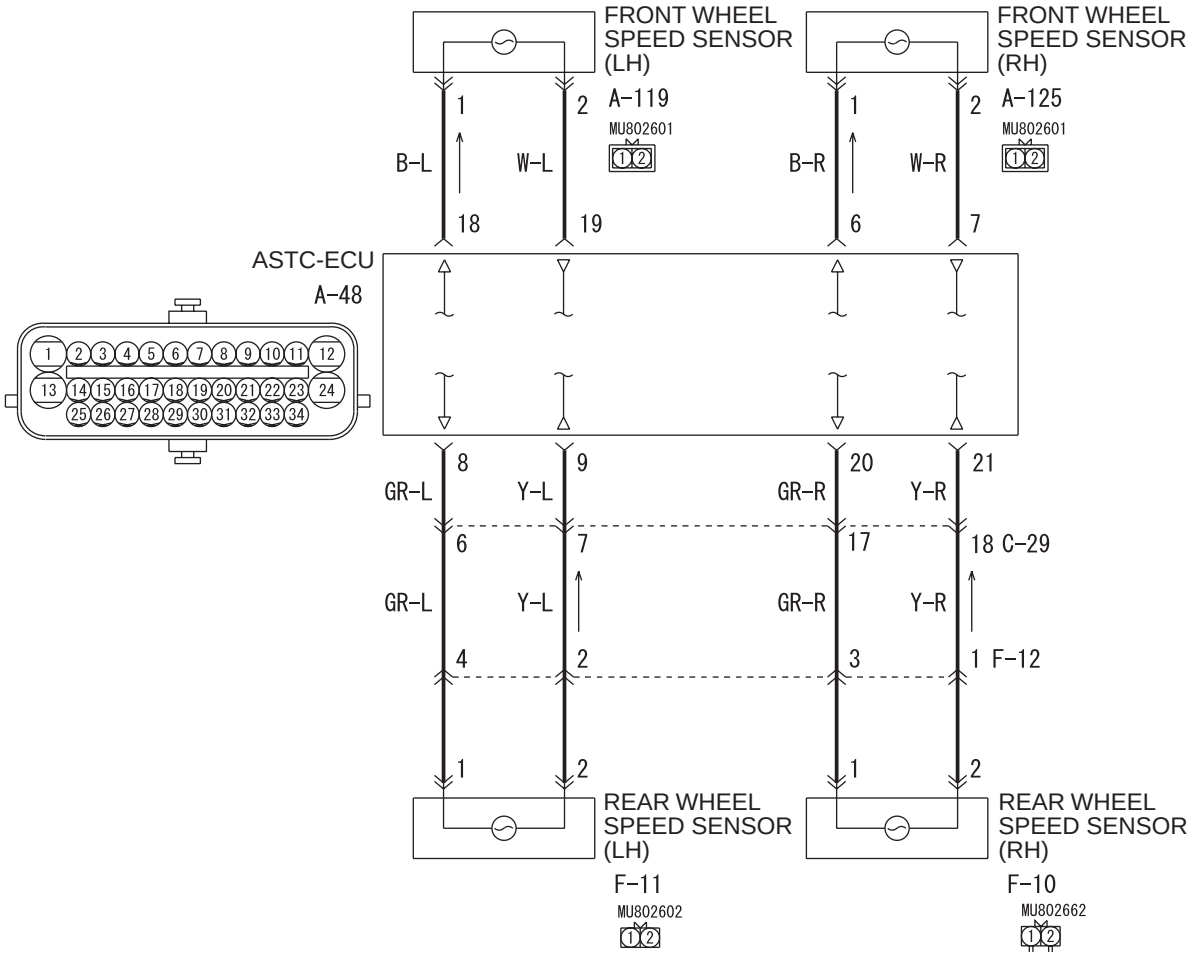
STEP 9. Check whether the diagnosis code is reset.
(1) Erase the diagnosis code.
(2) Drive the vehicle at 15 km/h or more.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 15 km/h or higher.

Q: Is the diagnosis code No.C1207 set?
YES : Return to Step 1.
NO : This diagnosis is complete.

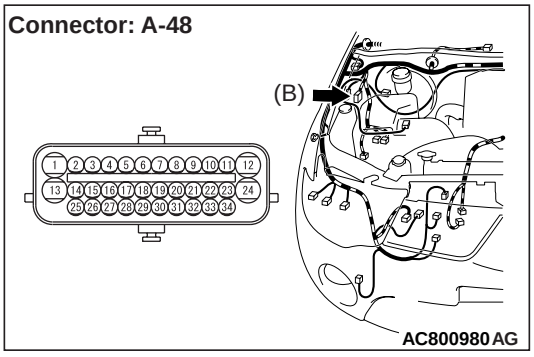
Code No.C1212: Wheel speed sensor (RR) (malfunction power circuit)

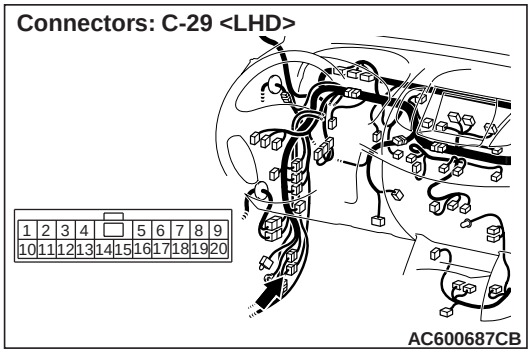
Wheel Speed Sensor Circuit

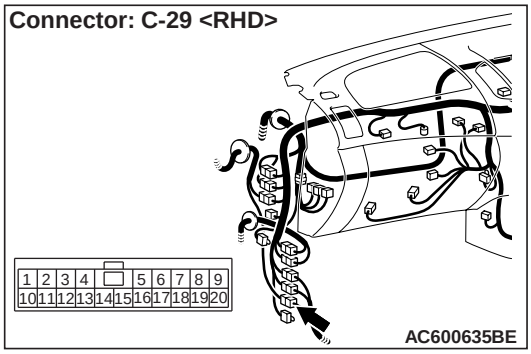


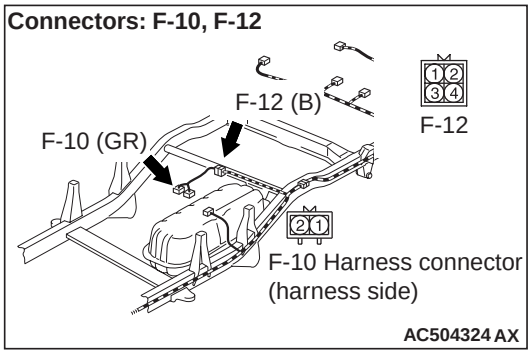
Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

ACB00772









⚠ CAUTION

- **If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table .).**
- **Before replacing the ECU, ensure that the communication circuit is normal.**

OPERATION

- A toothed ABS rotor generates a pulse signal as it moves across the pickup field of each wheel speed sensor.
- The wheel speed sensor transmit the frequency of the pulses to the ASTC-ECU.
- The hydraulic unit assembly (integrated with ASTC-ECU) modulates the amount of braking force individually applied to each wheel cylinder.

DIAGNOSIS CODE SET CONDITION

Diagnosis code No.C1212 is set when the supply voltage to wheel speed sensor has decreased.

PROBABLE CAUSES

Current trouble

- Damaged wiring harness and connectors
- Noise interference
- Wheel speed sensor malfunction
- ASTC-ECU malfunction

Past trouble

- Carry out diagnosis with particular emphasis on wiring harness and connector failures between ASTC-ECU and the wheel speed sensor. For diagnosis procedures, refer to How to treat past trouble (GROUP 00 – How to Cope with Intermittent Malfunctions .).

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnosis

Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?

YES : Go to Step 3.

NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table .). On completion, go to Step 2.

STEP 2. Diagnosis code recheck after resetting CAN bus lines

(1) Erase the diagnosis code.

(2) Drive the vehicle at 15 km/h or more.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 15 km/h or higher.

Q: Is the diagnosis code No.C1212 set?

YES : Go to Step 3.

NO : This diagnosis is complete.

STEP 3. M.U.T.-III data list

Check the following data list (Refer to P.35C-131.).

- Item No.04: RR wheel speed sensor

Q: Is the check result normal?

YES : Go to Step 8.

NO : Go to Step 4.

STEP 4. Connector check: A-48 ASTC-ECU connector, C-29 intermediate connector, F-12 intermediate connector, F-10 rear wheel speed sensor (RH) connector

Q: Is the check result normal?

YES : Go to Step 5.

NO : Repair the defective connector. Then go to Step 9.

STEP 5. Voltage measurement at the A-48 ASTC-ECU connector

(1) Disconnect the A-48 ASTC-ECU connector, the F-10 rear wheel speed sensor (RH) connector.

(2) Measure the voltage between the A-48 ASTC-

ECU connector terminal No.20 and body earth.

OK: 1V or less

Q: Is the check result normal?
YES : Go to Step 6.
NO : Repair the wiring harness. Then go to Step 9.

STEP 6. Resistance measurement at the A-48 ASTC-ECU connector
(1) Disconnect the A-48 ASTC-ECU connector, the F-10 rear wheel speed sensor (RH) connector.
(2) Measure the resistance between the A-48 ASTC-ECU connector terminal No.20 and body earth.

OK: No continuity

Q: Is the check result normal?
YES : Go to Step 7.
NO : Repair the wiring harness. Then go to Step 9.

STEP 7. Check for wheel speed sensor as a single unit
Refer to P.35C-141.

Q: Is the check result normal?
YES : Go to Step 8.
NO : Replace the wheel speed sensor (Refer to P.35C-141.). Then go to Step 9.

STEP 8. Check whether the diagnosis code is reset.
(1) Erase the diagnosis code.
(2) Drive the vehicle at 15 km/h or more.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 15 km/h or higher.

Q: Is the diagnosis code No.C1212 set?
YES : Replace the hydraulic unit (integrated with ASTC-ECU) (Refer to P.35C-140.). Then go to Step 9.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunctions .).

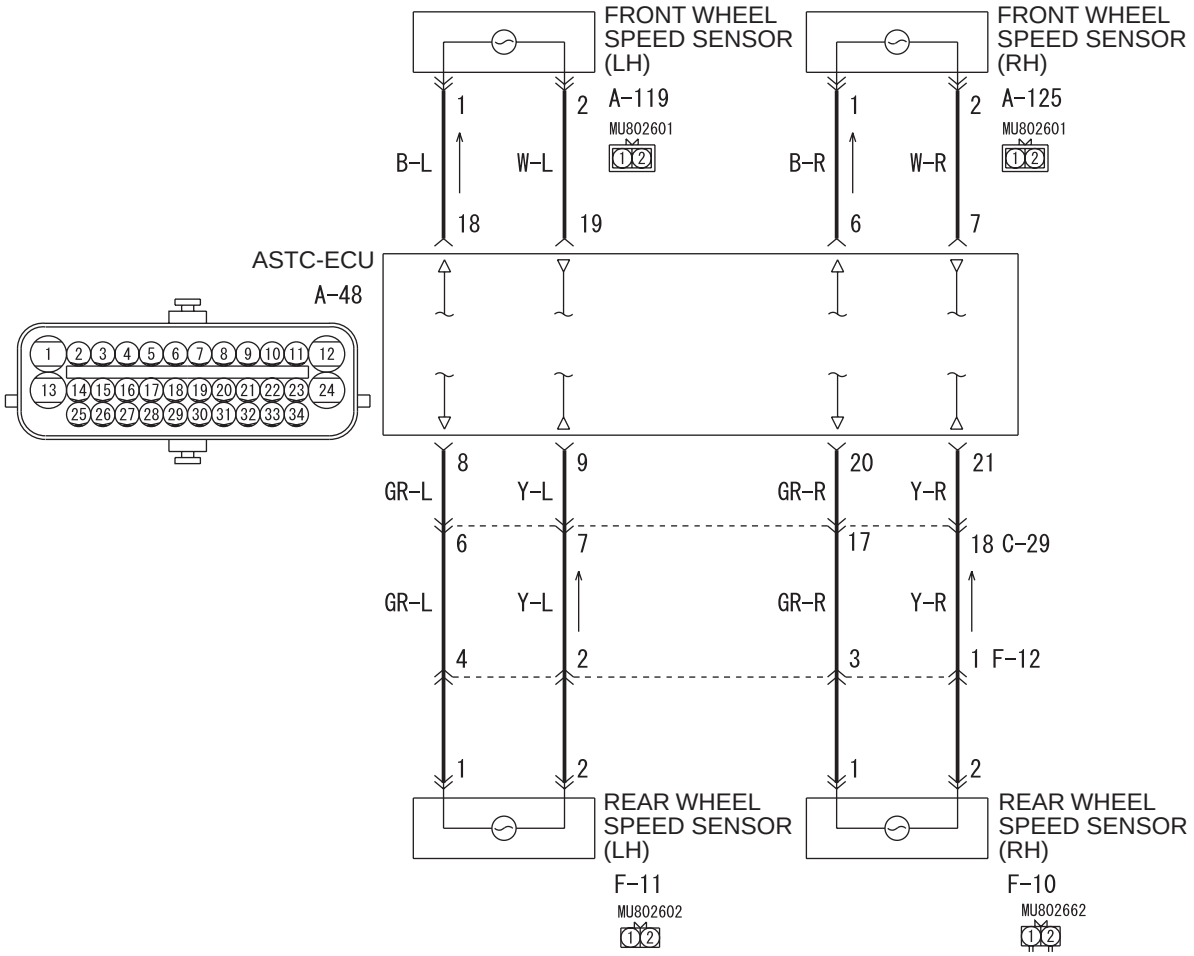
STEP 9. Check whether the diagnosis code is reset.
(1) Erase the diagnosis code.
(2) Drive the vehicle at 15 km/h or more.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 15 km/h or higher.

Q: Is the diagnosis code No.C1212 set?
YES : Return to Step 1.
NO : This diagnosis is complete.

Code No.C1217: Wheel speed sensor (RL) (malfunction power circuit)

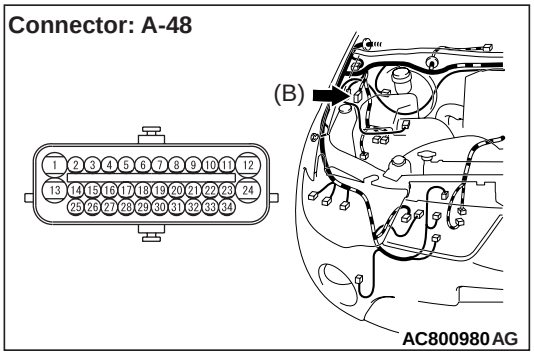
Wheel Speed Sensor Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

ACB00772

Connector: A-48



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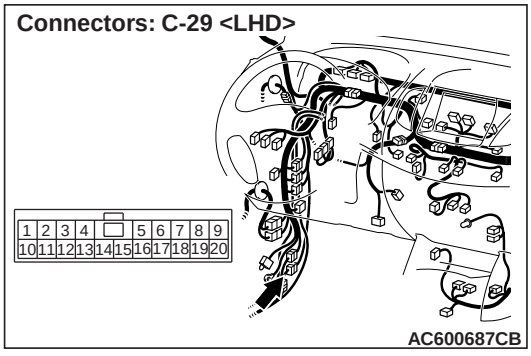
Connectors: C-29 <LHD>



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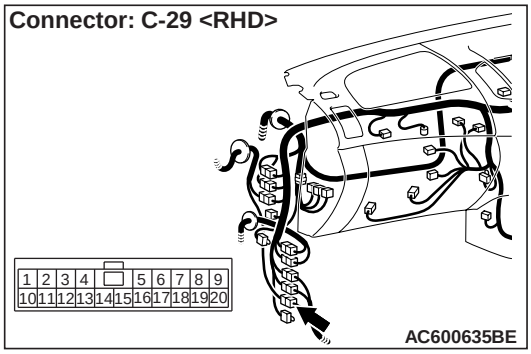
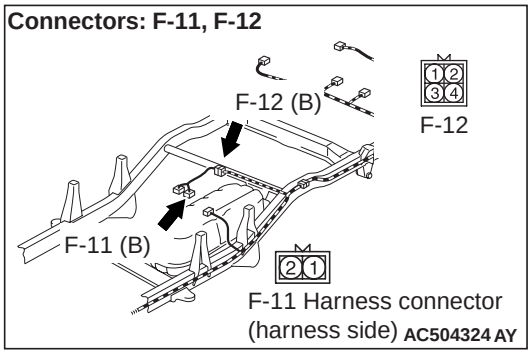




⚠ CAUTION

- **If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table .).**
- **Before replacing the ECU, ensure that the communication circuit is normal.**

OPERATION

- A toothed ABS rotor generates a pulse signal as it moves across the pickup field of each wheel speed sensor.
- The wheel speed sensor transmit the frequency of the pulses to the ASTC-ECU.
- The hydraulic unit assembly (integrated with ASTC-ECU) modulates the amount of braking force individually applied to each wheel cylinder.

DIAGNOSIS CODE SET CONDITION

Diagnosis code No.C1217 is set when the supply voltage to wheel speed sensor has decreased.

PROBABLE CAUSES

Current trouble

- Damaged wiring harness and connectors
- Noise interference
- Wheel speed sensor malfunction
- ASTC-ECU malfunction

Past trouble

- Carry out diagnosis with particular emphasis on wiring harness and connector failures between ASTC-ECU and the wheel speed sensor. For diagnosis procedures, refer to How to treat past trouble (GROUP 00 – How to Cope with Intermittent Malfunctions .).

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnosis

Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?

YES : Go to Step 3.

NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table .). On completion, go to Step 2.

STEP 2. Diagnosis code recheck after resetting CAN bus lines

(1) Erase the diagnosis code.

(2) Drive the vehicle at 15 km/h or more.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 15 km/h or higher.

Q: Is the diagnosis code No.C1217 set?

YES : Go to Step 3.

NO : This diagnosis is complete.

STEP 3. M.U.T.-III data list

Check the following data list (Refer to P.35C-131.).

- Item No.03: RL wheel speed sensor

Q: Is the check result normal?

YES : Go to Step 8.

NO : Go to Step 4.

STEP 4. Connector check: A-48 ASTC-ECU connector, C-29 intermediate connector, F-12 intermediate connector, F-11 rear wheel speed sensor (LH) connector

Q: Is the check result normal?

YES : Go to Step 5.

NO : Repair the defective connector. Then go to Step 9.

STEP 5. Resistance measurement at the A-48 ASTC-ECU connector

(1) Disconnect the A-48 ASTC-ECU connector, the F-11 rear wheel speed sensor (LH) connector.

(2) Measure the resistance between the A-48 ASTC-

ECU connector terminal No.8 and body earth.

OK: 1V or less

Q: Is the check result normal?
YES : Go to Step 6.
NO : Repair the wiring harness. Then go to Step 9.

STEP 6. Resistance measurement at the A-48 ASTC-ECU connector
(1) Disconnect the A-48 ASTC-ECU connector, the F-11 rear wheel speed sensor (LH) connector.
(2) Measure the resistance between the A-48 ASTC-ECU connector terminal No.8 and body earth.

OK: No continuity

Q: Is the check result normal?
YES : Go to Step 7.
NO : Repair the wiring harness. Then go to Step 9.

STEP 7. Check for wheel speed sensor as a single unit
Refer to P.35C-141.

Q: Is the check result normal?
YES : Go to Step 8.
NO : Replace the wheel speed sensor (Refer to P.35C-141.). Then go to Step 9.

STEP 8. Check whether the diagnosis code is reset.
(1) Erase the diagnosis code.
(2) Drive the vehicle at 15 km/h or more.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 15 km/h or higher.

Q: Is the diagnosis code No.C1217 set?
YES : Replace the hydraulic unit (integrated with ASTC-ECU) (Refer to P.35C-140.). Then go to Step 9.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunctions .).

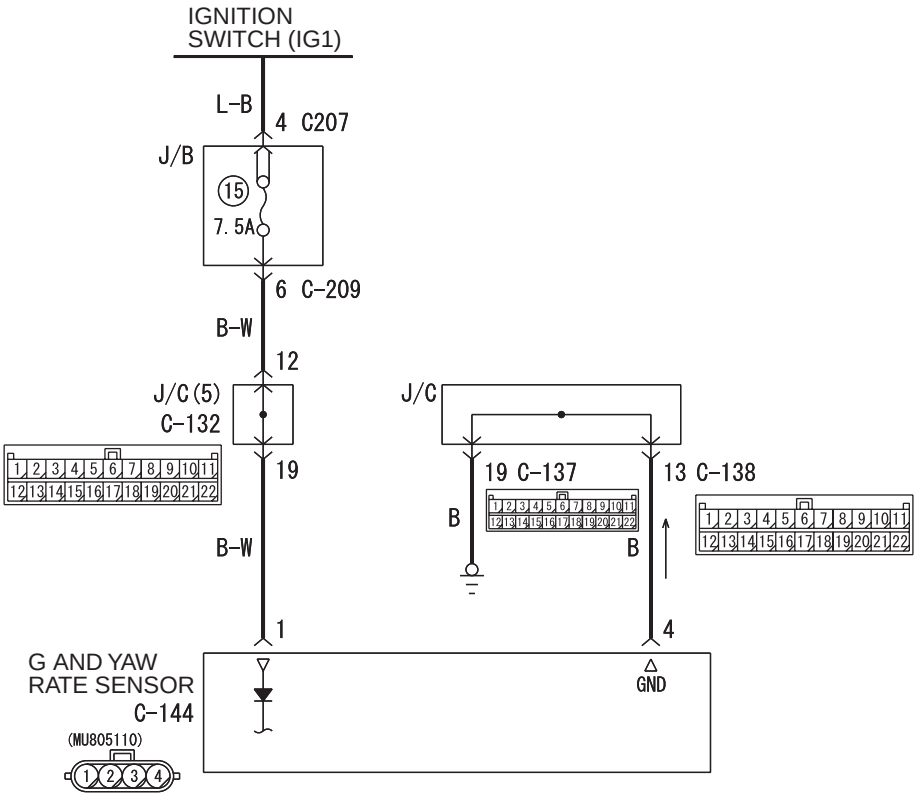
STEP 9. Check whether the diagnosis code is reset.
(1) Erase the diagnosis code.
(2) Drive the vehicle at 15 km/h or more.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 15 km/h or higher.

Q: Is the diagnosis code No.C1217 set?
YES : Return to Step 1.
NO : This diagnosis is complete.

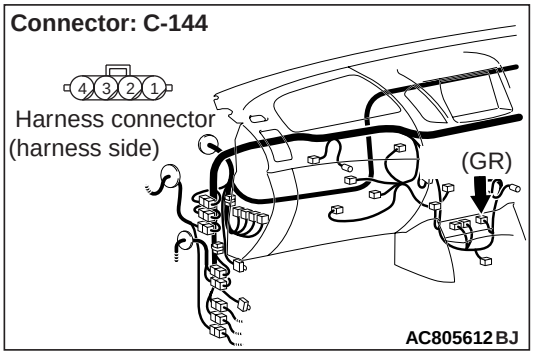
Code No.C1223: G and yaw rate sensor (active check error)

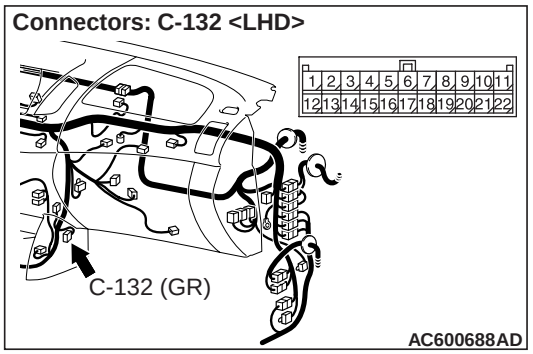
G and Yaw Rate Sensor Circuit

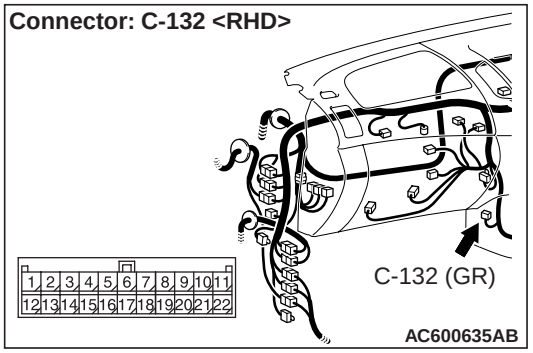


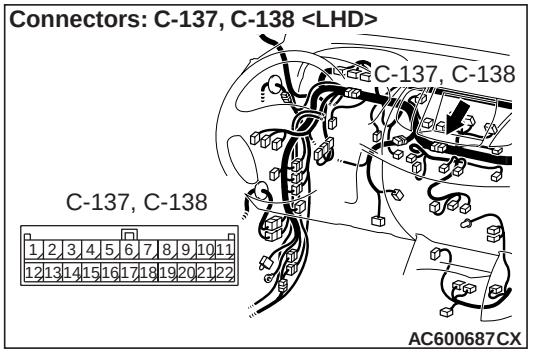
Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

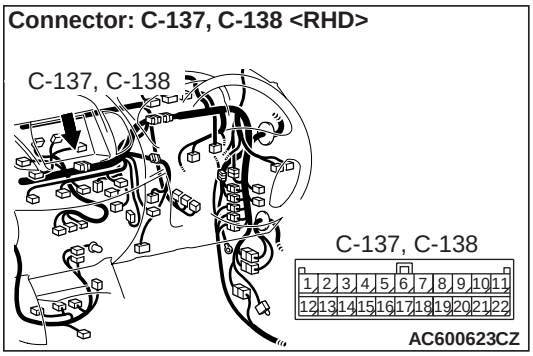
AC903991AC











⚠ CAUTION

If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Diagnose the CAN bus lines before the diagnosis code (Refer to GROUP 54C – CAN Bus Diagnostics Table).

OPERATION

- The G and yaw rate sensor is energized by the ignition switch (IG1) and the G and yaw rate sensor terminal 1.
- The G and yaw rate sensor output signal is sent to the ASTC-ECU via the private CAN bus line.

DIAGNOSIS CODE SET CONDITION

The diagnosis code is set if the first G and yaw rate sensor check is not completed within the specified time although ASTC-ECU input voltage is normal when the ignition switch is turned ON.

PROBABLE CAUSES

- Malfunction of the G and yaw rate sensor
- Damaged wiring harness or connector
- Malfunction of the hydraulic unit (integrated with ASTC-ECU)

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnosis

Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?

YES : Go to Step 3.

NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics table). On completion, go to Step 2.

STEP 2. Diagnosis code recheck after resetting CAN bus lines

Q: Is the diagnosis code No.C1223 set?

YES : Go to Step 3.

NO : This diagnosis is complete.

STEP 3. Connector check: C-144 G and yaw rate sensor connector, C-132 joint connector, C-137 joint connector and C-138 joint connector

Q: Is the check result normal?

YES : Go to Step 4.

NO : Repair the defective connector. Then go to Step 9.

STEP 4. Resistance measurement at the C-144 G and yaw rate sensor connector

(1) Disconnect the connector C-144 G and yaw rate

sensor connector and measurement at the harness-side connector.
(2) Measure the resistance between the C-144 G and yaw rate sensor connector terminal No.4 and body earth.

OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?
YES : Go to Step 6.
NO : Go to Step 5.

STEP 5. Resistance measurement at the C-137 joint connector
(1) Disconnect the connector C-137 joint connector and measurement at the harness-side connector.
(2) Measure the resistance between the C-144 G and yaw rate sensor connector terminal No.19 and body earth.

OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?
YES : An open circuit may be present. Repair the harness wire between C-138 joint connector terminal No.13 and C-144 G and yaw rate sensor connector terminal No.4. Then go to Step 9.
NO : An open circuit may be present. Repair the harness wire between C-137 joint connector terminal No.19 and body earth. Then go to Step 9.

STEP 6. Voltage measurement at the C-144 G and yaw rate sensor connector
(1) Disconnect the connector C-144 G and yaw rate sensor connector and measurement at the harness-side connector.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between the C-144 G and yaw rate sensor connector terminal No.1 and body earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 7.
NO : An open circuit may be present. Repair the wiring harness between the C-144 G and yaw rate sensor connector terminal No.1 and the C-132 joint connector terminal No.19. Then go to Step 9.

STEP 7. Check whether the diagnosis code is reset.
Check again if the diagnosis code is set.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1223 set?
YES : Replace the G and yaw rate sensor (Refer to P.35C-142). Then go to Step 8.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction).

STEP 8. Check whether the diagnosis code is reset.
Check again if the diagnosis code is set.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1223 set?
YES : Replace the hydraulic unit (integrated with ASTC-ECU) (Refer to P.35C-140). Then go to Step 9.
NO : The procedure is complete.

STEP 9. Recheck for diagnosis code.
Check again if the diagnosis code is set.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1223 set?
YES : Go to Step 1.
NO : The procedure is complete.

Code No.C1225: Wheel Speed Sensor Malfunction (Abnormality in tyre size)

⚠ CAUTION
- **If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table .).**
- **Before replacing the ECU, ensure that the communication circuit is normal.**

OPERATION
- A toothed ABS rotor generates a voltage pulse as it moves across the pickup field of each wheel speed sensor.
- The amount of voltage generated at each wheel is determined by the clearance between the ABS rotor teeth and the wheel speed sensor, and by the speed of rotation.
- The wheel speed sensors transmit the frequency of the voltage pulses and the amount of voltage generated by each pulse to the ASTC-ECU.
- The hydraulic unit assembly (integrated with ASTC-ECU) modulates the amount of braking force individually applied to each wheel cylinder.

DIAGNOSIS CODE SET CONDITION
This diagnosis code is set when the average speed of the front wheels differs from that of the rear wheel by 20 % or more after the vehicle speed exceeds 30 km/h.

PROBABLE CAUSES
- Installation of different size tyres
- Damaged wiring harness or connector
- ASTC-ECU malfunction

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnosis
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table .). On completion, go to Step 2.

STEP 2. Diagnosis code recheck after resetting CAN bus lines
(1) Erase the diagnosis code.
(2) Drive the vehicle at 30 km/h or more.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 30 km/h or higher.

Q: Is the diagnosis code No.C1225 set?
YES : Go to Step 3.
NO : This diagnosis is complete.

STEP 3. Check the installation condition of the wheel and tyres.

Q: Is the check result normal?
YES : Go to Step 4.
NO : Install the correct size tyres. Then go to Step 5.

STEP 4. Check whether the diagnosis code is reset.
(1) Erase the diagnosis code.
(2) Drive the vehicle at 30 km/h or more.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 30 km/h or higher.

Q: Is the diagnosis code No.C1225 set?
YES : Replace the hydraulic unit assembly (integrated with ASTC-ECU) (Refer to P.35C-140.). Then go to Step 5.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunctions .).

STEP 5. Check whether the diagnosis code is reset.
(1) Erase the diagnosis code.
(2) Drive the vehicle at 30 km/h or more.

NOTE: The ABS warning lamp does not turn OFF in some cases unless the vehicle runs at 30 km/h or higher.

Q: Is the diagnosis code No.C1225 set?
YES : Return to Step 1.
NO : The procedure is complete.

Code No.C1226: Control solenoid valve (FR) pressure holding system
Code No.C1236: Control solenoid valve (FL) pressure holding system
Code No.C1246: Control solenoid valve (RR) pressure holding system
Code No.C1256: Control solenoid valve (RL) pressure holding system
Code No.C1231: Control solenoid valve (FR) decompressing system
Code No.C1241: Control solenoid valve (FL) pressure reducing system
Code No.C1251: Control solenoid valve (RR) pressure reducing system
Code No.C1261: Control solenoid valve (RL) decompressing system
Code No.C1300: Linear valve (secondly)
Code No.C1310: Linear valve (primary)

⚠ CAUTION
If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Diagnose the CAN bus lines before the diagnosis codes (Refer to GROUP 54C – CAN Bus Diagnostics Table).

OPERATION

- The ASTC-ECU contains the power supply circuit for the solenoid valve. The solenoid valve is energized by the valve relay, which is incorporated in the ASTC-ECU.
- The valve relay, which is incorporated in the ASTC-ECU, is always energizing the solenoid valve unless the initial check is in progress when the ignition switch is turned on.
- The ASTC-ECU activates the solenoid valve by turning on its driving transistor.

DIAGNOSIS CODE SET CONDITIONS

These diagnosis codes will be set under the cases below.

Code No.C1226, C1231, C1236, C1241, C1246, C1251, C1256, C1261

- The output of the each solenoid valve does not change when the solenoid valve is "ON" and the solenoid valve monitor is "ON"

Code No.C1300, C1310

- The linear valve monitor is "OFF" when the linear valve has an open circuit.
- The linear valve monitor is "OFF" when the linear valve is "ON"

PROBABLE CAUSES

The most likely causes for these diagnosis codes to set are:

- Malfunction of the hydraulic unit assembly (integrated with ASTC-ECU)

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnosis.

Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics table). On completion, go to Step 2.

STEP 2. Check whether the diagnosis code is reset.

(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1226, C1231, C1236, C1241, C1246, C1251, C1256, C1261, C1300 or C1310 set?
YES : Replace the hydraulic unit assembly (integrated with ASTC-ECU) (Refer to P.35C-140). Then go to Step 3.
NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction .

STEP 3. Check whether the diagnosis code is reset.

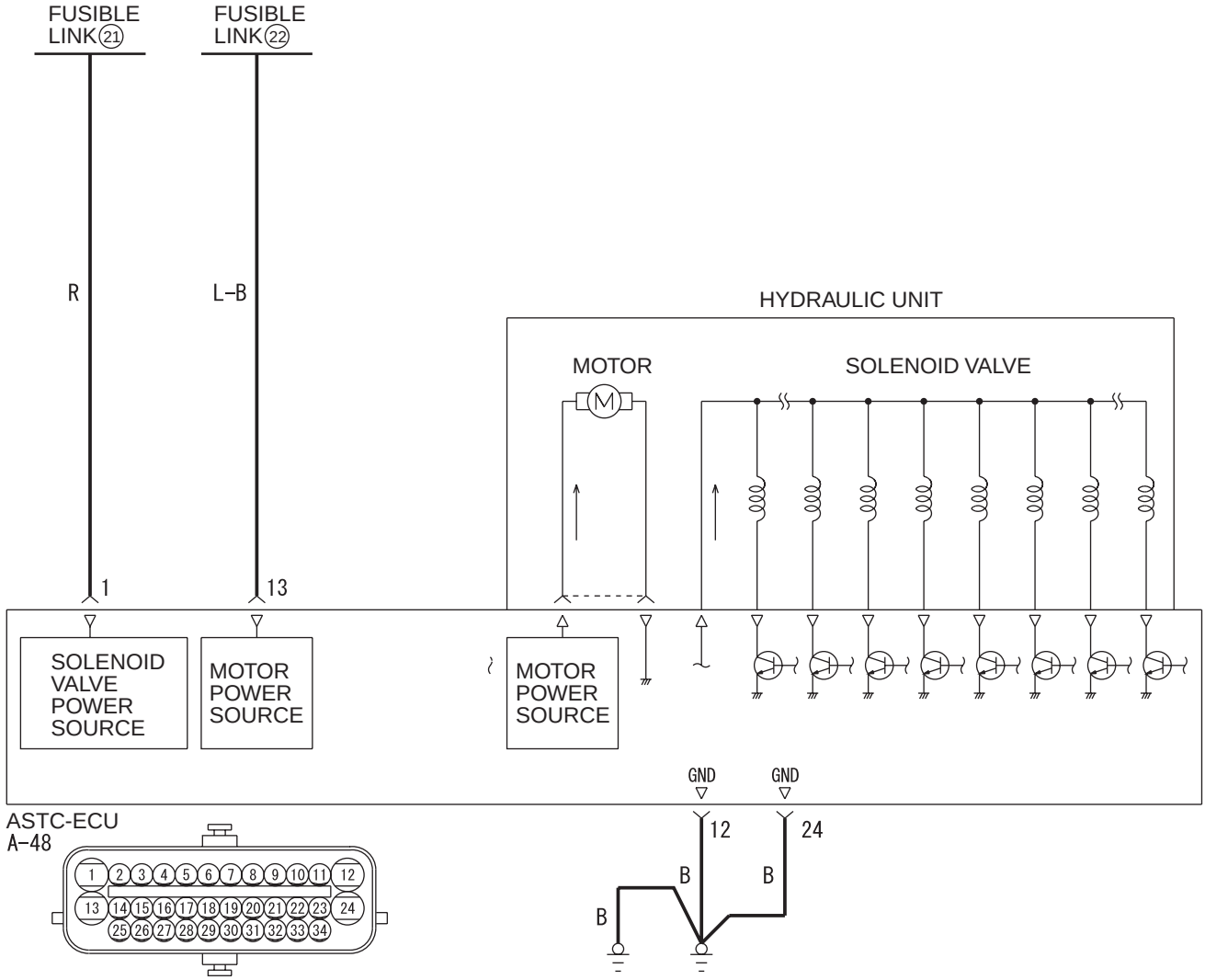
Check again if the diagnosis code is set.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.

(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1226, C1231, C1236, C1241, C1246, C1251, C1256, C1261, C1300 or C1310 set?
YES : Go to Step 1.
NO : The procedure is complete.

Code No.C1266: Motor system
Code No.C1273: Motor relay (stuck off)
Code No.C1274: Motor relay (stuck on)
Code No.C1280: Motor fail-safe relay (short circuit)

Solenoid Valve and Motor Power Supply Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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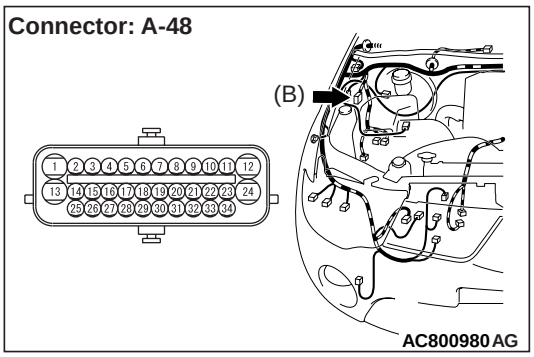


⚠ CAUTION

If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Diagnose the CAN bus lines before the diagnosis codes (Refer to GROUP 54C – CAN Bus Diagnostics Table .).

OPERATION

- The ASTC-ECU contains the power supply circuit (terminal 13) for the motor. ACTS-ECU incorporates a monitor to check if power is supplied to the motor for running.
- The pump motor switch, which is incorporated in ASTC-ECU, is always off unless the ABS operating or the motor solenoid valve check is activated when the vehicle is started.
- ASTC-ECU activates the pump motor by turning on the ECU built-in pump motor switch.

DIAGNOSIS CODE SET CONDITIONS

These diagnosis code will be set under the cases below.

Code No. C1266

- An open circuit has occurred to motor relay monitor.
- Motor is seized.

Code No. C1273

- At an initial start, the motor relay monitor judges the status of the motor relay as "OFF," and the motor is driven.

Codes No. C1274 or C1280

- When the motor relay monitor judges that the motor relay is "ON" while it is "OFF".

PROBABLE CAUSES

The most likely causes for these diagnosis codes to set are:

- Fusible link malfunction
- Damaged wiring harness or connector
- Malfunction of the hydraulic unit assembly (integrated with ASTC-ECU)

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnosis.

Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?

YES : Go to Step 3.

NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table .). On completion, go to Step 2.

STEP 2. Diagnosis code recheck after resetting CAN bus lines.

(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Drive the vehicle at 10 km/h or more.
(6) Check if the diagnosis code is set.
(7) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are diagnosis codes No.C1266, C1273, C1274 or C1280 set?

YES : Go to Step 3.

NO : The procedure is complete.

STEP 3. Connector check: A-48 ASTC-ECU connector

Q: Is the check result normal?

YES : Go to Step 4.

NO : Repair or replace the damaged component(s). Then go to Step 9.

STEP 4. Fusible link check: Check the fusible link No.22

Q: Is the check result normal?

YES : Go to Step 6.

NO : Go to Step 5.

STEP 5. Resistance measurement at A-48 ASTC-ECU connector

(1) Removal the fusible link No.22.
(2) Disconnect the A-48 ASTC-ECU connector.
(3) Measure the resistance between the A-48 ASTC-ECU connector terminal No.13 and body earth.

OK: No continuity

Q: Is the check result normal?

YES : Replace the fusible link No.22. Then go to Step 9.
NO : Repair the wiring harness between the fusible link No.22 and A-48 ASTC-ECU connector terminal No.13. Then replace the fusible link No.22. Then go to Step 9.

STEP 6. Voltage measurement at the A-48 ASTC-ECU connector

(1) Disconnect the A-48 ASTC-ECU connector.
(2) Measure the voltage between the A-48 ASTC-ECU connector terminal No.13 and the body earth.

OK: Battery voltage

Q: Is the check result normal?
YES : Go to Step 7.
NO : The open circuit may be present in the motor power supply circuit. Repair the wiring harness between the A-48 ASTC-ECU connector terminal No.13 and the fusible link No.22. Then go to Step 9.

STEP 7. Resistance measurement at A-48 ASTC-ECU connector

(1) Disconnect the A-48 ASTC-ECU connector.
(2) Measure the resistance between the A-48 ASTC-ECU connector terminal No.12 and the body earth, and between the terminal No.24 and body earth.

OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?
YES : Go to Step 8.
NO : The open circuit may be present in the earth circuit. Repair the wiring harness between the A-48 ASTC-ECU connector terminal No.12 and the body earth, and between the A-48 ASTC-ECU connector terminal No.24 and the body earth. Then go to Step 9.

STEP 8. Check whether the diagnosis code is reset.

Check again if the diagnosis code is set.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Drive the vehicle at 10 km/h or more.
(6) Check if the diagnosis code is set.
(7) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are diagnosis codes No.C1266, C1273, C1274 or C1280 set?
YES : Replace the hydraulic unit assembly (integrated with ASTC-ECU) (Refer to P.35C-140.). Then go to Step 9.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunctions .).

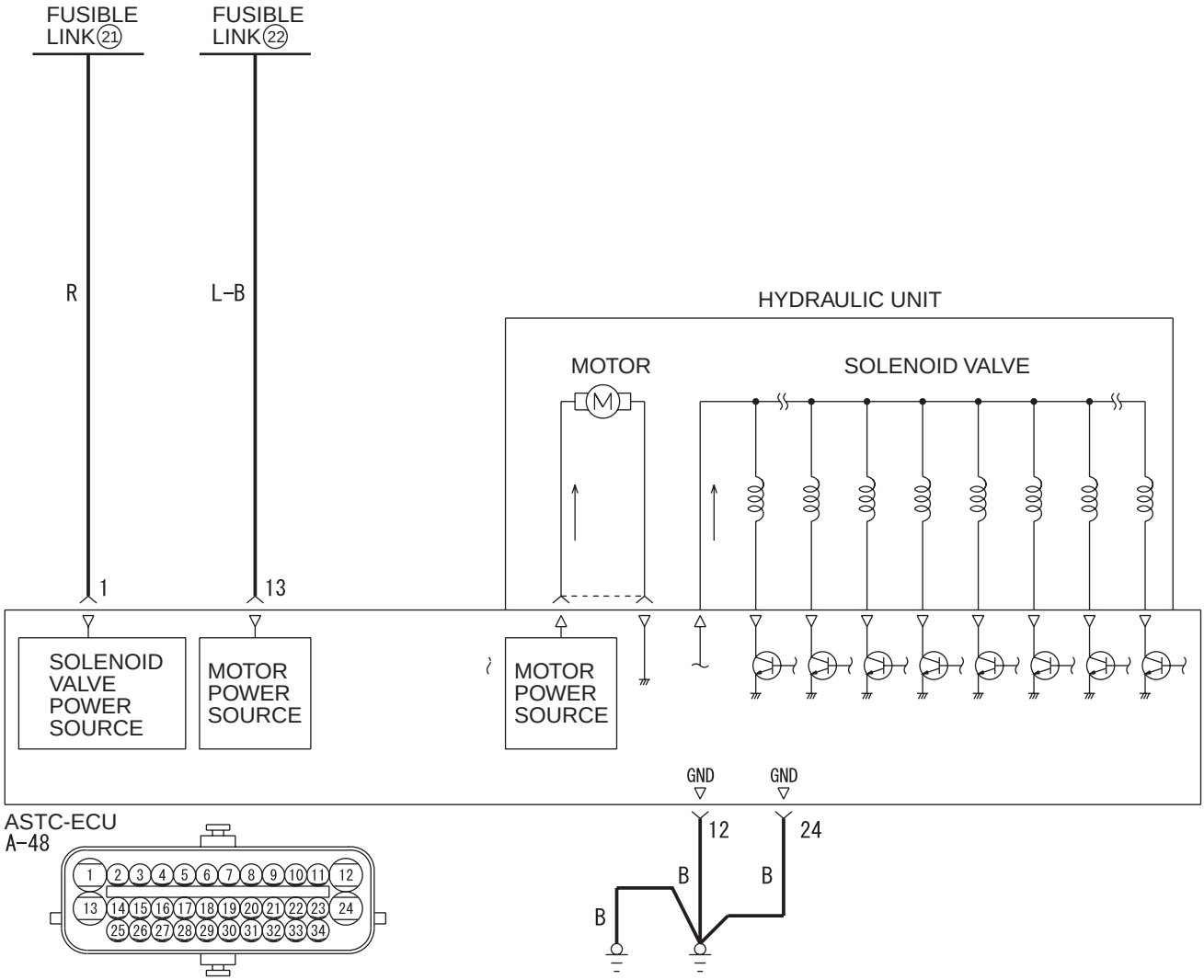
STEP 9. Check whether the diagnosis code is reset.

Check again if the diagnosis code is set.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Drive the vehicle at 10 km/h or more.
(6) Check if the diagnosis code is set.
(7) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are diagnosis codes No.C1266, C1273, C1274 or C1280 set?
YES : Go to Step 1.
NO : This diagnosis is complete.

Code No.C1278: Solenoid valve relay (open circuit)
Code No.C1279: Solenoid valve relay (short circuit)

Solenoid Valve and Motor Power Supply Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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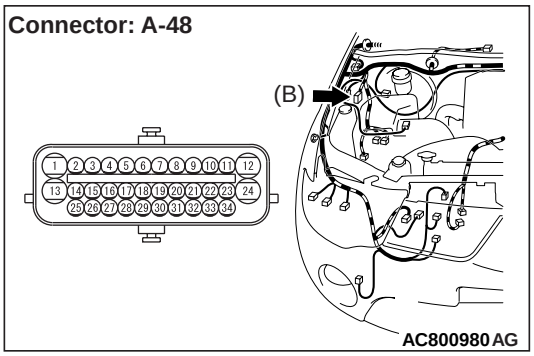


⚠ CAUTION

If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Diagnose the CAN bus lines before the diagnosis codes (Refer to GROUP 54C – CAN Bus Diagnostics Table .).

OPERATION

ASTC-ECU receives the power supply to drive the incorporated solenoid valves at terminal No.1. Each solenoid valve has a relay for driving. ASTC-ECU turns the relay of the solenoid valve to be driven ON or OFF to switch the hydraulic circuit.

DIAGNOSIS CODE SET CONDITIONS
These diagnosis code will be set under the cases below.

Code No. C1278
- When the solenoid valve relay monitor judges that the solenoid valve relay is turned "ON" although it actually is turned "OFF"

Code No. C1279
- When the solenoid valve relay monitor judges that the solenoid valve relay is turned "OFF" although it actually is turned "ON"

PROBABLE CAUSES
The most likely causes for these diagnosis codes to set are:
- Fusible link malfunction
- Damaged wiring harness or connector
- Malfunction of the hydraulic unit assembly (integrated with ASTC-ECU)

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnosis.
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table .). On completion, go to Step 2.

STEP 2. Diagnosis code recheck after resetting CAN bus lines.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are the diagnosis codes No.C1278 or C1279 set?
YES : Go to Step 3.
NO : The procedure is complete.

STEP 3. Connector check: A-48 ASTC-ECU connector

Q: Is the check result normal?
YES : Go to Step 4.
NO : Repair or replace the damaged component(s). Then go to Step 9.

STEP 4. Fusible link check: Check the fusible link No.21

Q: Is the check result normal?
YES : Go to Step 6.
NO : Go to Step 5.

STEP 5. Resistance measurement at A-48 ASTC-ECU connector
(1) Remove the fusible link No.21.
(2) Disconnect the A-48 ASTC-ECU connector.
(3) Measure the resistance between the A-48 ASTC-ECU connector terminal No.1 and body earth.

OK: No continuity

Q: Is the check result normal?
YES : Replace the fusible link No.21. Then go to Step 9.
NO : Repair the wiring harness between the fusible link No.21 and the A-48 ASTC-ECU connector terminal No.1. Then replace the fusible link No.21. Then go to Step 9.

STEP 6. Voltage measurement at A-48 ASTC-ECU connector
(1) Disconnect the A-48 ASTC-ECU connector.
(2) Measure the voltage between the A-48 ASTC-ECU connector terminal No.1 and the body earth.

OK: Battery voltage

Q: Is the check result normal?
YES : Go to Step 7.
NO : The open circuit may be present in the solenoid valve power supply circuit. Repair the wiring harness between the fusible link No.21 and the A-48 ASTC-ECU connector terminal No.1. Then go to Step 9.

STEP 7. Resistance measurement at A-48 ASTC-ECU connector
(1) Disconnect the A-48 ASTC-ECU connector.
(2) Measure the resistance between the A-48 ASTC-ECU connector terminal No.12 and the body earth, and between the terminal No.24 and body earth.

OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?
YES : Go to Step 8.
NO : The open circuit may be present in the earth circuit. Repair the wiring harness between the A-48 ASTC-ECU connector terminal No.12 and the body earth, and between the A-48 ASTC-ECU connector terminal No.24 and the body earth. Then go to Step 9.

STEP 8. Check whether the diagnosis code is reset.

(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check that the ABS warning lamp, Brake warning lamp, ASTC indicator lamp and ASTC OFF indicator lamp goes out.
(6) Check if the diagnosis code is set.
(7) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are the diagnosis code No.C1278 or C1279 set?

YES : Replace the hydraulic unit assembly (integrated with ASTC-ECU) (Refer to P.35C-140.). Then go to Step 9.

NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunctions .).

STEP 9. Check whether the diagnosis code is reset.

(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check that the ABS warning lamp, Brake warning lamp, ASTC indicator lamp and ASTC OFF indicator lamp goes out.
(6) Check if the diagnosis code is set.
(7) Turn the ignition switch to the "LOCK" (OFF) position.

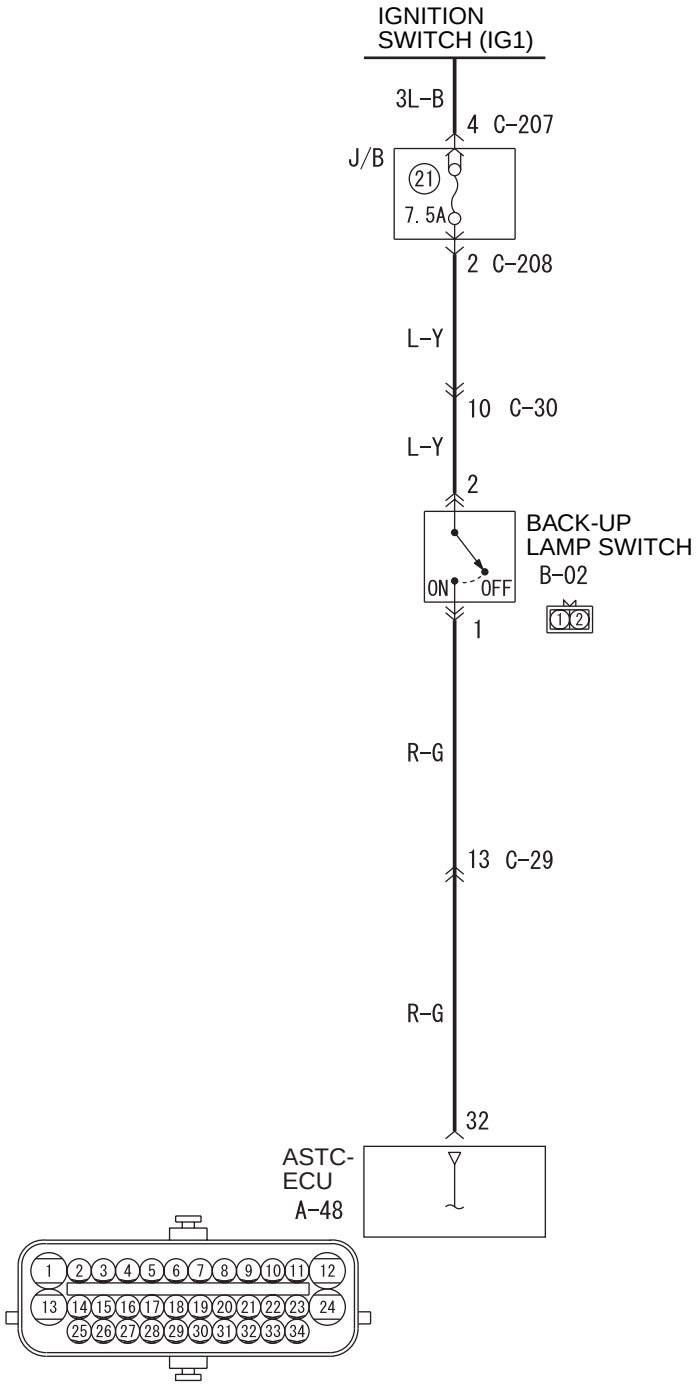
Q: Are the diagnosis code No.C1278 or C1279 set?

YES : Go to Step 1.

NO : This diagnosis is complete.

Code No.C1291: Reverse signal (seizure)

Reverse signal Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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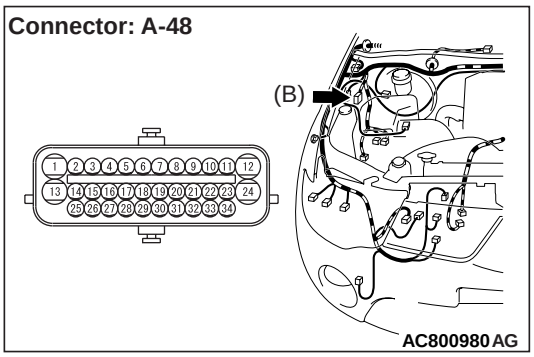
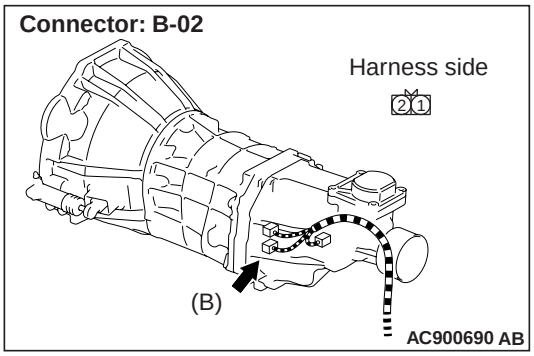




⚠ CAUTION

If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Diagnose the CAN bus lines before the diagnosis codes (Refer to GROUP 54C – CAN Bus Diagnostics Table .).

OPERATION

ASTC-ECU monitors if the lever is shifted to the reverse position.

DIAGNOSIS CODE SET CONDITION

This code is set when the power supply and wheel speed sensor are normal and ASTC-ECU receives the signal that the shift lever is at the reverse position while the vehicle drives at 50 km/h or more.

PROBABLE CAUSES

The most likely causes for this diagnosis code to set is:

- Damaged wiring harness or connector
- Malfunction of the back-up lamp switch
- Malfunction of the hydraulic unit assembly (integrated with ASTC-ECU)

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnosis.

Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?

YES : Go to Step 3.

NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnosis Table .). On completion, go to Step 2.

STEP 2. Check whether the diagnosis code is reset.

(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1291 set?

YES : Go to Step 3.

NO : The procedure is complete.

STEP 3. Check ASTC-ECU connector A-48 and back-lamp switch connector B-02 for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Is the check result normal?

YES : Go to Step 4.

NO : Check the back-lamp switch (Refer to GROUP 22C, Transmission Inspection .). Then go to Step 6.

STEP 4. Check the harness wires between ASTC-ECU connector A-48 terminal No.32 and back-lamp switch connector B-02 terminal 1.

Check the short to power supply between each harness connector.

Q: Is the check result normal?

YES : Go to Step 5.

NO : Repair the wiring harness. Then go to Step 6.

STEP 5. Check whether the diagnosis code is reset.

Check again if the diagnosis code is set.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1291 set?

YES : Replace the hydraulic unit assembly (integrated with ASTC-ECU) (Refer to P.35C-140.). Then go to Step 6.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunctions .).

STEP 6. Check whether the diagnosis code is reset.
Check again if the diagnosis code is set.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1291 set?
YES : Go to Step 1.
NO : The procedure is complete.

Code No.C1292: CAN communication error

⚠ CAUTION
- **If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Diagnose the CAN bus lines before the diagnosis codes (Refer to GROUP 54C – CAN Bus Diagnostics Table).**
- **Whenever the ECU is replaced, ensure that the communication circuit is normal.**

OPERATION
ASTC-ECU communicates with other systems and sensor via CAN-bus, and shares the necessary information for the system operation.

DIAGNOSIS CODE SET CONDITIONS
This code is set if there is a problem in the CAN-bus line, or if a problem is found in any ECU or sensor, which uses the CAN communication.

PROBABLE CAUSES
The most likely causes for this diagnosis code to set is:
- Damaged CAN-bus line
- Damaged wiring harness or connector
- Malfunction of the Engine-ECU.
- Malfunction of the A/T-ECU.
- Malfunction of the steering wheel sensor.
- Malfunction of the G and yaw rate sensor.
- Malfunction of the hydraulic unit assembly (integrated with ASTC-ECU)

DIAGNOSIS

STEP 1. M.U.T.-III CAN bus diagnostics
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table). Then go to Step 4.

STEP 2. M.U.T.-III other diagnosis code
(1) Turn the ignition switch to the "ON" position.
(2) Check if the diagnosis code is set from all system.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is any diagnosis code set?
YES : Diagnose the set diagnosis code, then go the Step 4.
NO : Go to Step 3.

STEP 3. M.U.T.-III diagnosis code
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1292 set?

YES : Check the engine-ECU, A/T-ECU, ETACS-ECU, steering wheel sensor and G and yaw rate sensor power voltage and earth circuit connection. If there is no malfunction, replace the hydraulic unit (integrated with ASTC−ECU) (Refer to P.35C-140). Then go to Step 4.

NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points − How to Cope with Intermittent Malfunction .

STEP 4. Check whether the diagnosis code is reset.

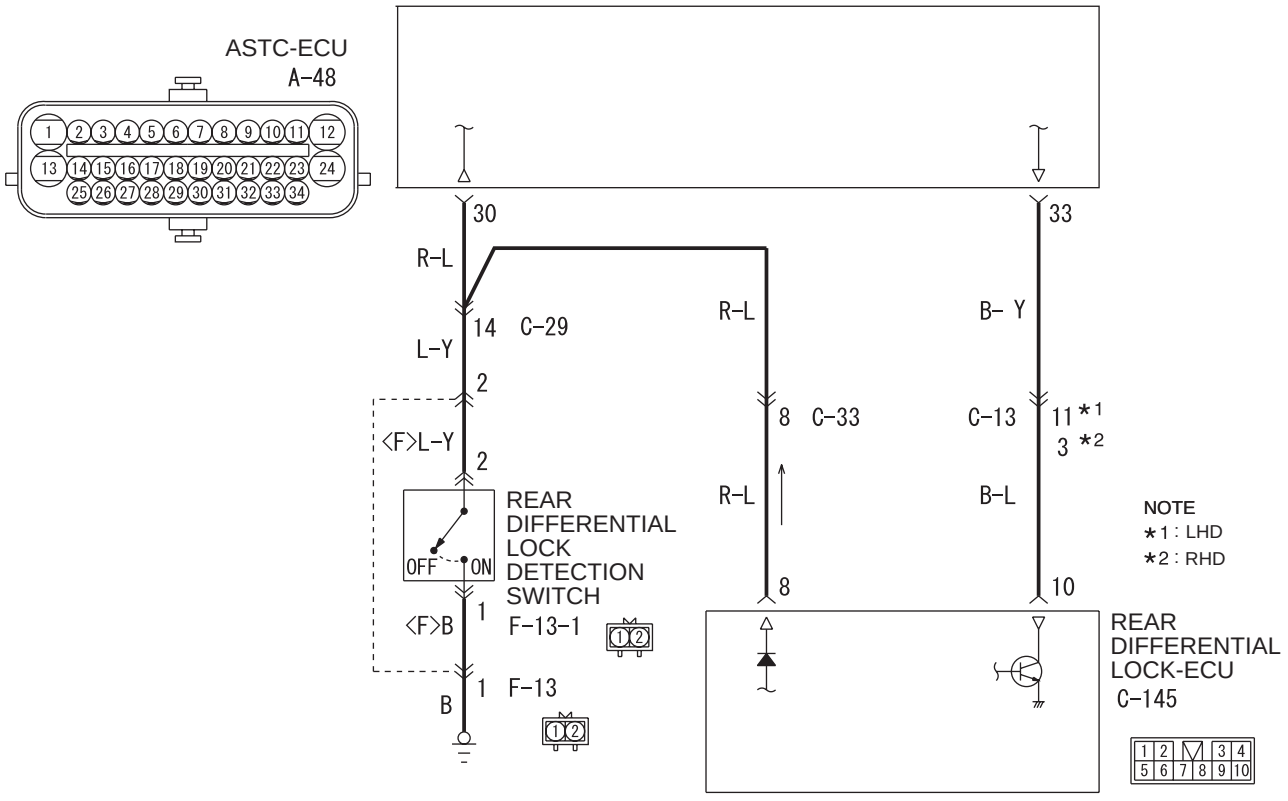
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1292 set?

YES : Go to Step 1.
NO : The procedure is complete.

Code No.C1293: Abnormal rear differential lock detection circuit <Vehicle with rear differential lock system>

Rear differential lock Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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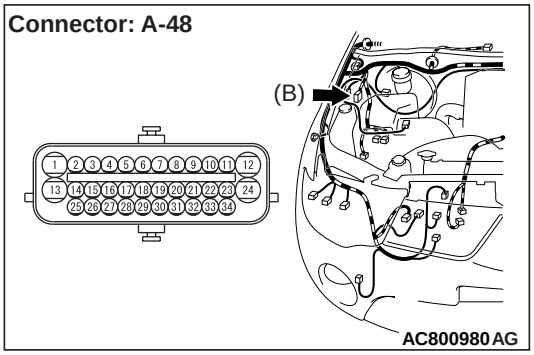
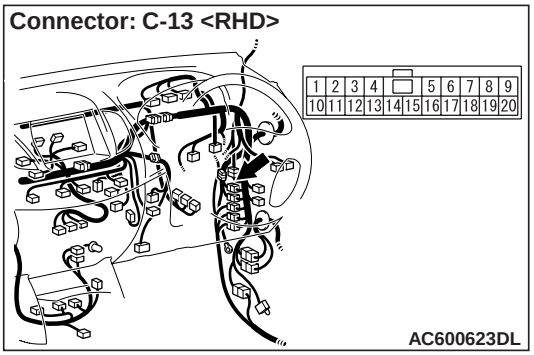
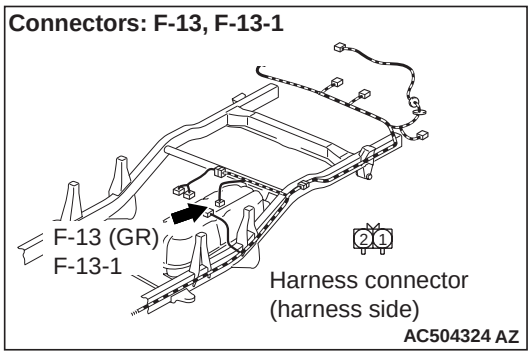
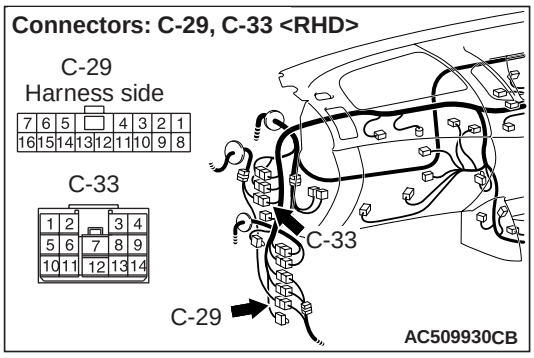
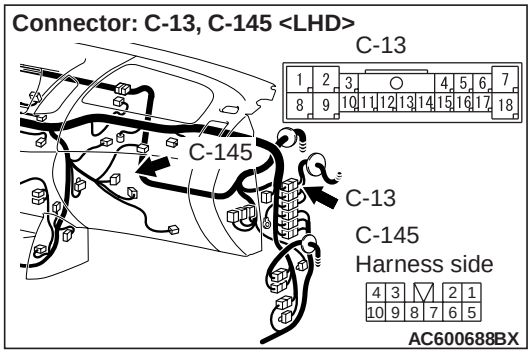
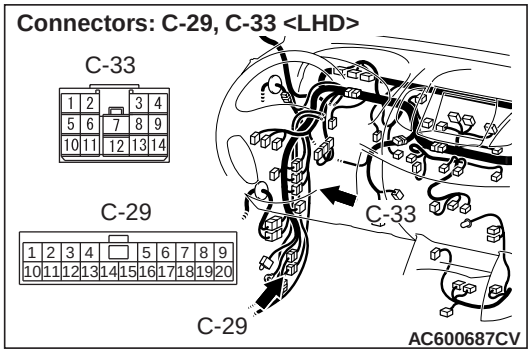


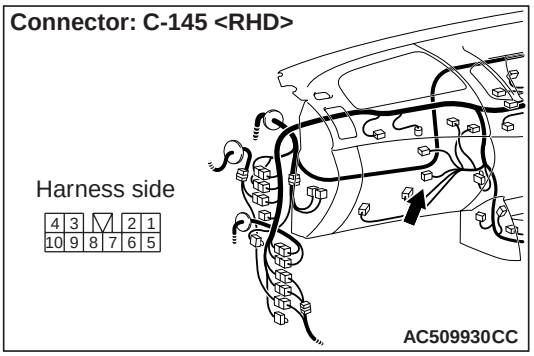












⚠ CAUTION

- **If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Diagnose the CAN bus lines before the diagnosis codes (Refer to GROUP 54C – CAN Bus Diagnostics Table .).**
- **Whenever the ECU is replaced, ensure that the communication circuit is normal.**

OPERATION

ASTC-ECU detects the rear differential lock operation status by the following information.

- Rear differential lock detection switch: "ON"
- Rear differential lock indicator lamp: illuminates or flashes

If these signals become effective, it is judged that the rear differential lock is activated and ABS (EBD)/ ASC/TCL control is prohibited. The ASC indicator lamp, the ASC OFF indicator lamp, the ABS warning lamp, and brake warning lamp illuminate at the same time.

DIAGNOSIS CODE SET CONDITIONS

This diagnosis code is set in the following cases.

- Rear differential lock detection switch: "ON", Rear differential lock indicator signal: When the "OFF" signal is received for a certain period at the same time
- Rear differential lock detection switch: "OFF", Rear differential lock indicator signal: When the "ON" signal is received for a certain period at the same time

PROBABLE CAUSES

- Damaged wiring harness or connector
- Malfunction of rear differential lock detection switch
- Malfunction of rear differential lock-ECU
- Malfunction of ASTC-ECU

DIAGNOSIS

STEP 1. M.U.T.-III CAN bus diagnostics

Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?

YES : Go to Step 3.

NO : Repair the CAN bus line (Refer to GROUP 54C – CAN Bus Diagnostics Table .). Then go to Step 2.

STEP 2. Check whether the diagnosis code is reset.

(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Start the engine.
(6) Turn the rear differential lock switch to the "ON" position.
(7) Drive the vehicle more than 10 seconds at the speed exceeds 10 km/h.
(8) Check if the diagnosis code is set.

Q: Is code No.C1293 set?

YES : Go to Step 3.

NO : The procedure is complete.

STEP 3. Check the M.U.T.-III data list.

(1) Turn the ignition switch to the "ON" position.
(2) Operate the rear differential lock switch, and check if the operation status matches the data list output.
   - Item No.63: Rear differential lock switch

   OK:
   (Rear differential lock switch: ON): ON
   (Rear differential lock switch: OFF): OFF

Q: Is the check result normal?

YES : Go to Step 13.

NO : Go to Step 4.

STEP 4. Connector check: A-48 ASTC-ECU connector, F-13-1 rear differential lock detection switch connector, C-145 rear differential lock-ECU connector, C-13 intermediate connector, C-29 intermediate connector, C-33 intermediate connector, F-13 intermediate connector.

Q: Is the check result normal?

YES : Go to Step 5.

NO : Repair or replace the damaged component(s). Then go to Step 15.

STEP 5. Rear differential lock detection switch check

Refer to GROUP 27 – On-vehicles service, Rear differential Lock Detection Switch Check .

Q: Is the check result normal?

YES : Go to Step 6.

NO : Replace the Rear differential lock detection switch (Refer to GROUP 27 – Rear differential lock .). Then go to Step 15.

STEP 6. Resistance measurement at the C-145 rear differential lock-ECU connector

(1) Disconnect the C-145 rear differential lock-ECU connector and measure the resistance at the harness side.
(2) Disconnect the A-48 ASTC-ECU connector.
(3) Measure the resistance between the C-145 rear differential lock-ECU connector terminal No.10 and body earth.

OK: No continuity

Q: Is the check result normal?

YES : Go to Step 7.

NO : Repair the wiring harness. Then go to Step 15.

STEP 7. Voltage measurement at the C-145 rear differential lock-ECU connector

(1) Disconnect the C-145 rear differential lock-ECU connector and measure the voltage at the harness side.
(2) Disconnect the A-48 ASTC-ECU connector.
(3) Measure the voltage between the C-145 rear differential lock-ECU connector terminal No.10 and body earth.

OK: 1 V or less

Q: Is the check result normal?

YES : Go to Step 8.

NO : Repair the wiring harness. Then go to Step 15.

STEP 8. Resistance measurement at the A-48 ASTC-ECU connector and C-145 rear differential lock-ECU connector
(1) Disconnect the A-48 ASC-ECU connector.
(2) Disconnect the C-145 rear differential lock-ECU connector.
(3) Measure the resistance between the A-48 ASTC-ECU connector terminal No.33 and C-145 rear differential lock-ECU connector terminal No.10.

OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?
YES : Go to Step 9.
NO : Repair the wiring harness. Then go to Step 15.

STEP 9. Resistance measurement at the C-145 rear differential lock-ECU connector
(1) Disconnect the C-145 rear differential lock-ECU connector and measure the resistance at the harness side.
(2) Disconnect the A-48 ASTC-ECU connector and F-13-1 rear differential lock detection switch connector.
(3) Measure the resistance between the C-145 rear differential lock-ECU connector terminal No.8 and body earth.

OK: No continuity

Q: Is the check result normal?
YES : Go to Step 10.
NO : Repair the wiring harness. Then go to Step 15.

STEP 10. Resistance measurement at the A-48 ASTC-ECU connector and C-145 rear differential lock-ECU connector
(1) Disconnect the A-48 ASTC-ECU connector.
(2) Disconnect the C-145 rear differential lock-ECU connector.
(3) Measure the resistance between the A-48 ASTC-ECU connector terminal No.30 and C-145 rear differential lock-ECU connector terminal No.8.

OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?
YES : Go to Step 11.
NO : Repair the wiring harness. Then go to Step 15.

STEP 11. Resistance measurement at the A-48 ASTC-ECU connector and F-13-1 rear differential lock detection switch connector
(1) Disconnect the A-48 ASTC-ECU connector.
(2) Disconnect the F-13-1 rear differential detection switch connector.
(3) Measure the resistance between the A-48 ASTC-ECU connector terminal No.30 and F-13-1 rear differential detection switch connector terminal No.2.

OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?
YES : Go to Step 12.
NO : Repair the wiring harness. Then go to Step 15.

STEP 12. Resistance measurement at the F-13-1 rear differential lock detection switch connector
(1) Disconnect the F-13-1 rear differential lock detection switch connector and measure the resistance at the harness side.
(2) Measure the resistance between the F-13-1 rear differential lock detection switch connector terminal No.1 and body earth.

OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?
YES : Go to Step 13.
NO : Repair the wiring harness. Then go to Step 15.

STEP 13. Check whether the diagnosis code is reset.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Start the engine.
(6) Turn the rear differential lock switch to the "ON" position.
(7) Drive the vehicle more than 10 seconds at the speed exceeds 10 km/h.
(8) Check if the diagnosis code is set.

Q: Is code No.C1292 set?
YES : Replace the Rear differential lock-ECU (Refer to GROUP 27 – Rear differential lock-ECU .). Then go to Step 14.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunctions .).

STEP 14. Check whether the diagnosis code is reset.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF)

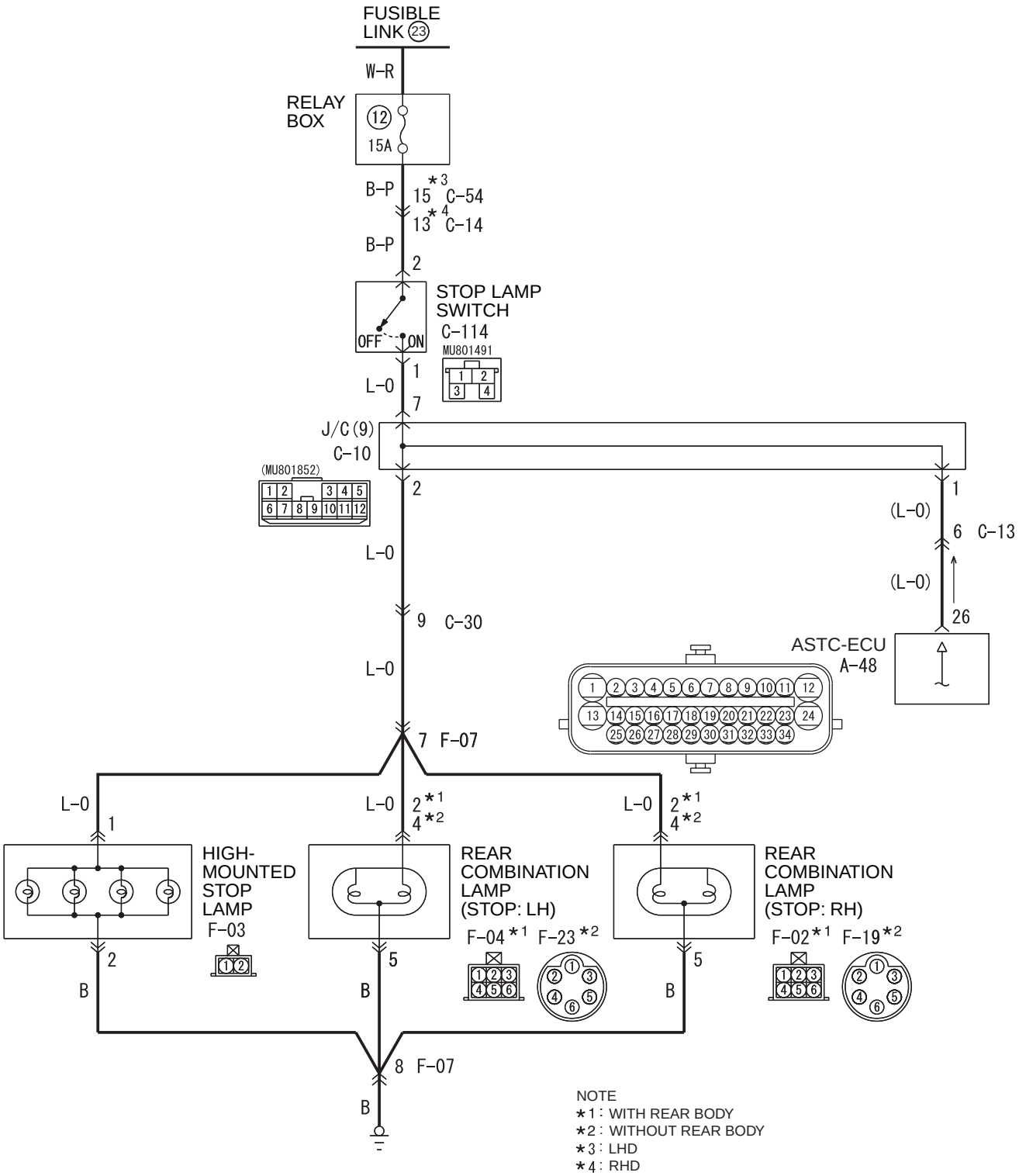
position.
(4) Turn the ignition switch to the "ON" position.
(5) Start the engine.
(6) Turn the rear differential lock switch to the "ON" position.
(7) Drive the vehicle more than 10 seconds at the speed exceeds 10 km/h.
(8) Check if the diagnosis code is set.

Q: Is code No.C1292 set?
YES : Replace the hydraulic unit assembly (integrated with ASTC-ECU) (Refer to P.35C-140.). Then go to Step 15.
NO : This diagnosis is complete.

STEP 15. Check whether the diagnosis code is reset.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Start the engine.
(6) Turn the rear differential lock switch to the "ON" position.
(7) Drive the vehicle more than 10 seconds at the speed exceeds 10 km/h.
(8) Check if the diagnosis code is set.

Q: Is code No.C1292 set?
YES : Return to Step 1.
NO : This diagnosis is complete.

Code No.C1340: Stop lamp switch circuit malfunction



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

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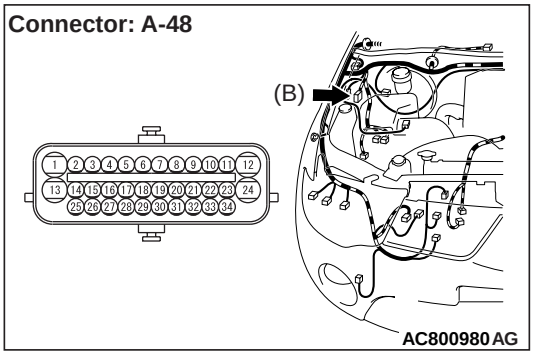
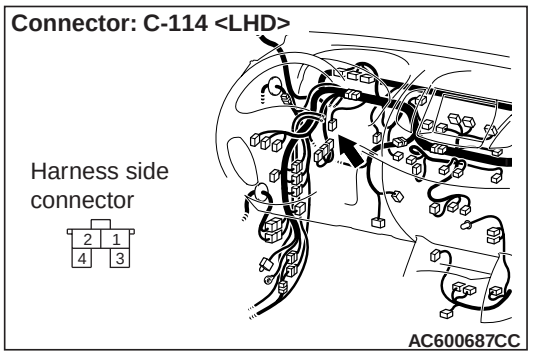
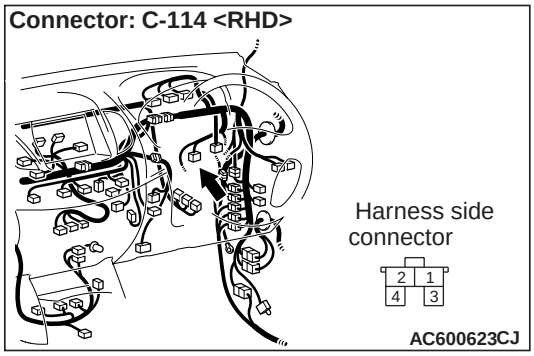
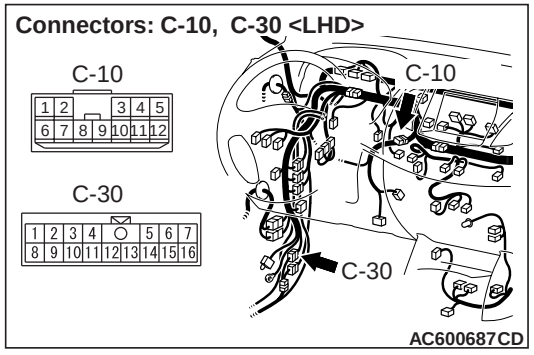
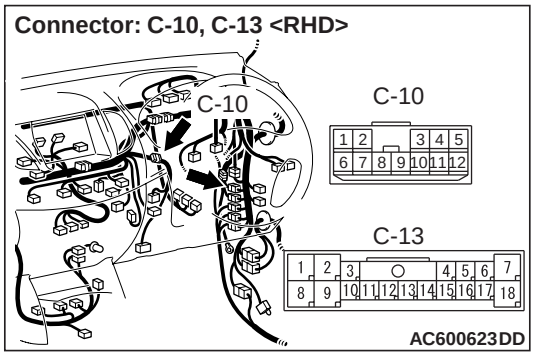
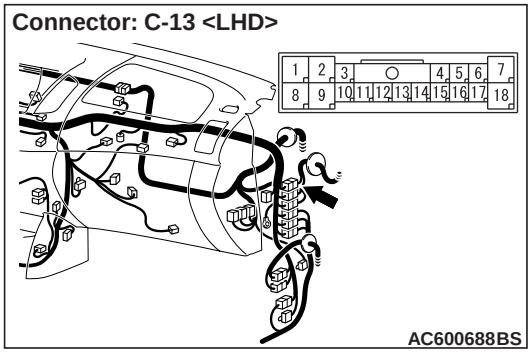


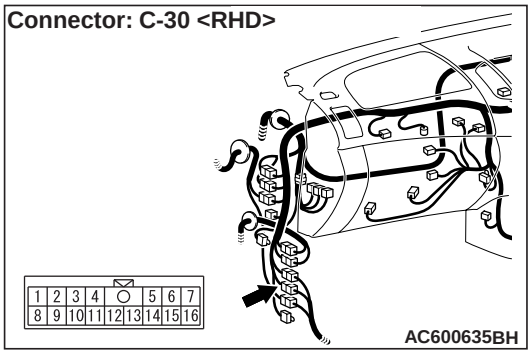


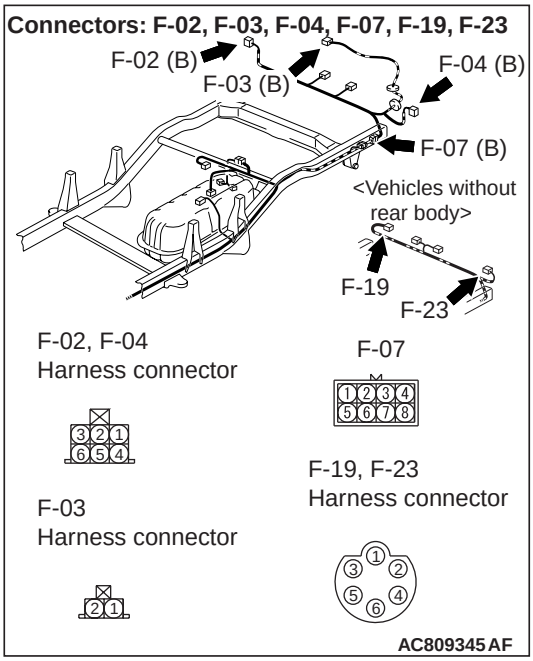












⚠ CAUTION

If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Diagnose the CAN bus lines before the diagnosis codes (Refer to GROUP 54C – CAN Bus Diagnostics Table .).

OPERATION

- ASTC-ECU monitors whether the stop lamp switch is "ON" or "OFF."

DIAGNOSIS CODE SET CONDITIONS

This diagnosis code is set in the following case.

- When the vehicle has been driving at a vehicle speed of 15 km/h or more for 15 minutes or longer with the stop lamp switch turned "ON".
- With the stop lamp switch "OFF", the decelerated speed G is occurred at the specified value or more.

PROBABLE CAUSES

The most likely causes for these diagnosis codes to set are:

- Malfunction of the stop lamp switch
- Damaged wiring harness or connector
- Malfunction of the hydraulic unit assembly (integrated with ASTC-ECU)

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics

Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?

YES : Go to Step 3.

NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table .). On completion, go to Step 2.

STEP 2. Diagnosis code recheck after resetting CAN bus lines

Erase the diagnosis code.

Q: Is the diagnosis code No.C1340 set?

YES : Go to Step 3.

NO : This diagnosis is complete.

STEP 3. Stop lamp and high-mount stop lamp operation check

Check the stop lamp and high-mount stop lamp operation when the brake pedal is depressed. Check that the stop lamp and high-mount stop lamp illuminates when the brake pedal is depressed and that it goes out when the brake pedal is released.

OK:

When the brake pedal is released: OFF

When the brake pedal is depressed: ON

Q: Is the check result normal?

YES : Go to Step 11.

NO : Go to Step 4.

STEP 4. Connector check: C-114 stop lamp switch connector

Q: Is the check result normal?

YES : Go to Step 5.

NO : Repair or replace it, and go to Step 13.

STEP 5. Check for stop lamp switch installation

Refer to GROUP 35A – On-vehicle Service/Brake Pedal Check and Adjustment .

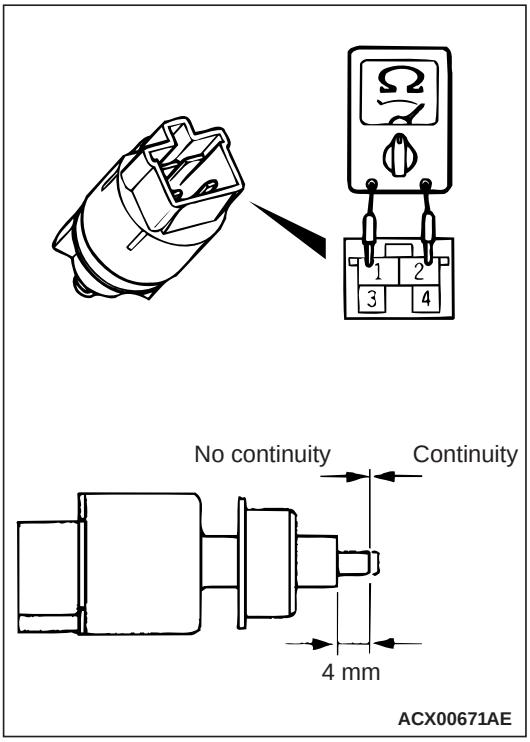
Q: Is the check result normal?

YES : Go to Step 6.

NO : Install the stop lamp switch correctly (Refer to GROUP 35A – On-vehicle Service/Brake Pedal Check and Adjustment .). Then go to Step 13 .

STEP 6. Stop lamp switch continuity check

(1) Remove the stop lamp switch (Refer to GROUP 35A – Brake Pedal .).



(2) Connect the circuit tester (Ω range) to the stop lamp switch connector terminals No.1 and No.2.

(3) When no continuity is detected with the plunger pressed from the edge of the outer case by the dimension shown in the figure and when continuity is detected with the plunger released, the stop lamp switch is in good condition.

Q: Is the check result normal?

YES : Go to Step 7.

NO : Replace the stop lamp switch (Refer to GROUP 35A – Brake Pedal .). Then go to Step 13.

STEP 7. Connector check: A-48 ASTC-ECU connector, C-13,C-10 joint connector, C-30 intermediate connector, F-02 rear combination lamp (stop: RH) connector (with rear body), F-19 rear combination lamp (stop: RH) connector (without rear body), F-03 high mounted stop lamp connector (with rear body), F-04 rear combination lamp (stop: LH) connector (with rear body), F-23 rear combination lamp (stop: LH) connector (without rear body), F-07 intermediate connector

Q: Is the check result normal?
YES : Go to Step 8.
NO : Repair or replace it, and go to Step 13.

STEP 8. Voltage measurement at C-114 stop lamp switch connector.
(1) Remove C-114 stop lamp switch connector, and measure at the wiring harness connector side.
(2) Measure the voltage between terminal No.2 and body earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 9.
NO : An open or short to power supply has occurred in the wiring harness between fusible link No.23 and C-114 stop lamp switch connector terminal No.2, and fuse No.12, therefore, repair it. Then go to Step 13.

STEP 9. Resistance measurement at C-114 stop lamp switch connector.
(1) Disconnect the A-48 ASTC-ECU connector, C-114 stop lamp switch connector, F-02 rear combination lamp (stop: RH) connector (with rear body), F-19 rear combination lamp (stop: RH) connector (without rear body), F-03 high mounted stop lamp connector (with rear body), F-04 rear combination lamp (stop: LH) connector (with rear body), F-23 rear combination lamp (stop: LH) connector (without rear body), and measure the voltage at C-114 stop lamp switch connector harness side.
(2) Measure the resistance between terminal No.1 and body earth.

OK: No continuity

Q: Is the check result normal?
YES : Go to Step 10.
NO : A short to power supply has occurred in the wiring harness between C-114 stop lamp switch connector terminal No.1 and F-02 rear combination lamp (stop: RH) connector (with rear body) terminal No.2 or F-19 rear combination lamp (stop: RH) connector (without rear body) terminal No.4, or between C-114 stop lamp switch connector terminal No.1 and F-03 high mounted stop lamp connector (with rear body) terminal No.1, or between C-114 stop lamp switch connector terminal No.1 and F-04 rear combination lamp (stop: LH) connector (with rear body) terminal No.2 or F-23 rear combination lamp (stop: LH) connector (without rear body) terminal No.4, therefore, repair it.Then go to Step 13 .

STEP 10. Resistance measurement at C-114 stop lamp switch connector and C-10 joint connector.
(1) Disconnect the C-114 stop lamp switch connector and C-10 joint connector, and measure at the harness side.
(2) Measure the resistance between C-114 stop lamp switch connector terminal No.1 and C-10 joint connector terminal No.7.

OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?
YES : Go to Step 12.
NO : Repair the wiring harness, and then go to Step 13.

STEP 11. Voltage measurement at A-48 ASTC-ECU connector.
(1) Disconnect the A-48 ASTC-ECU connector.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No.26 and body earth.

OK:
- **When the brake pedal is released: 1 V or less**
- **When the brake pedal is depressed: System voltage**

Q: Is the check result normal?
YES : Go to Step 12.
NO : An open circuit in signal line has occurred in the wiring harness between A-48 ASTC-ECU connector terminal No.26 and C-10 joint connector terminal No.1, therefore, repair it. Then go to Step 13.

STEP 12. Diagnosis code recheck

Q: Is the diagnosis code No.C1340 set?

YES : Replace the hydraulic unit (integrated with ASTC-ECU) (Refer to P.35C-140.). Then go to Step 13.

NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunctions .).

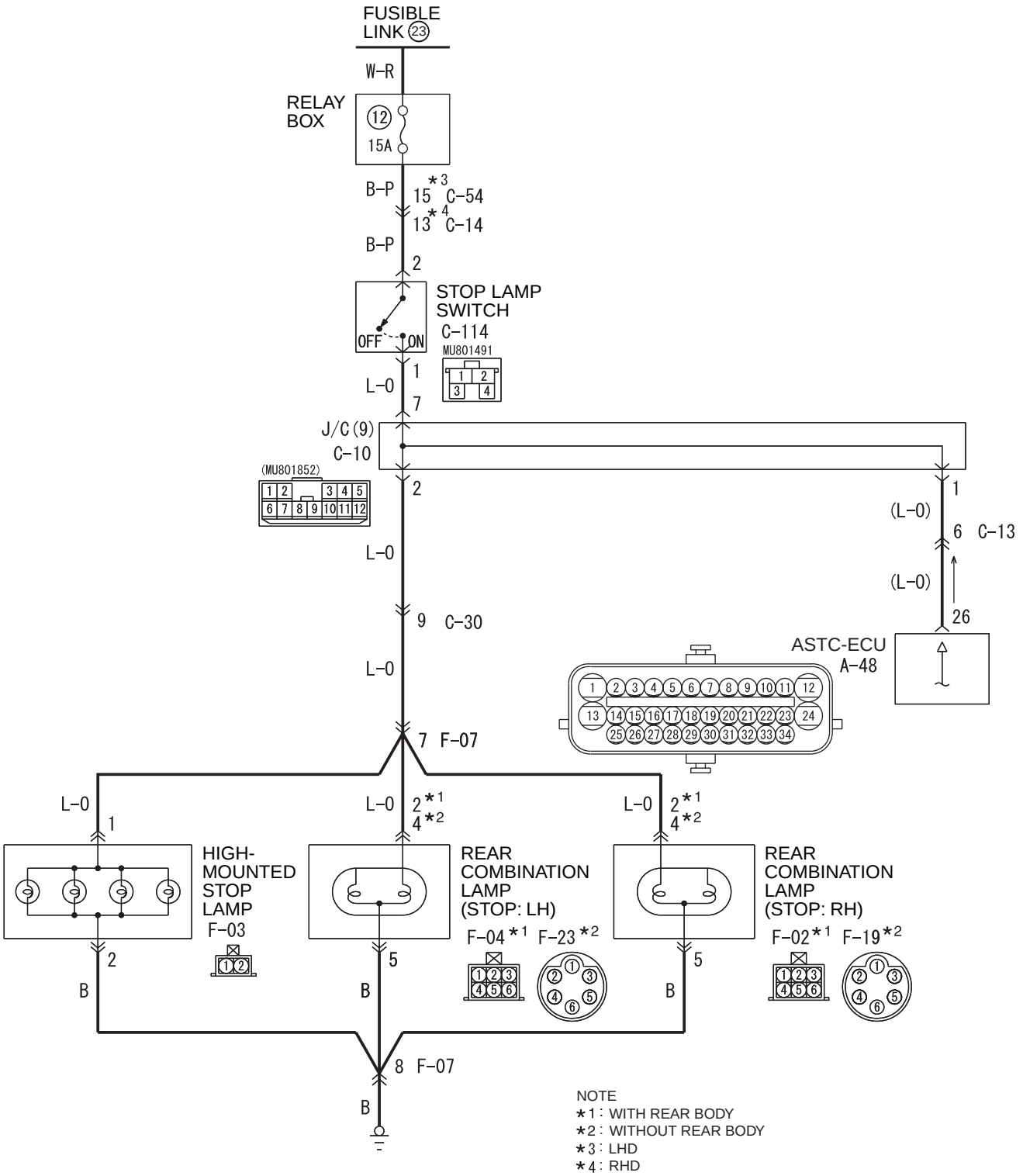
STEP 13. Diagnosis code recheck

Q: Is the diagnosis code No.C1340 set?

YES : Return to Step 1.

NO : This diagnosis is complete.

Code No.C1361: Abnormal pressure sensor characteristics



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

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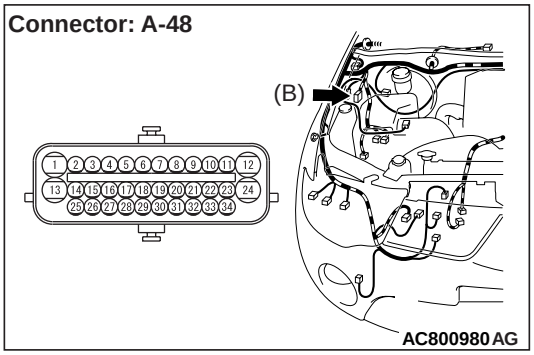
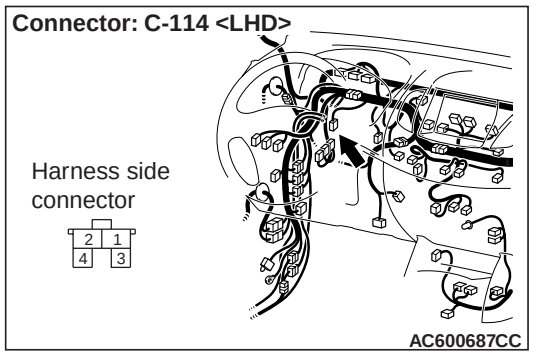
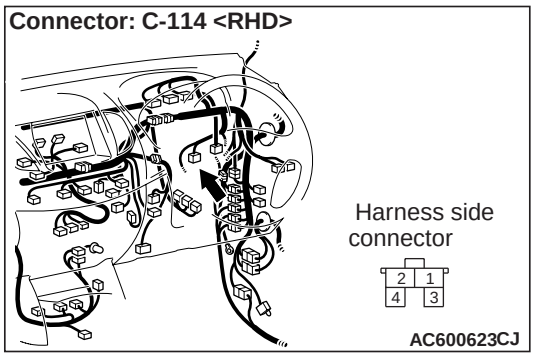
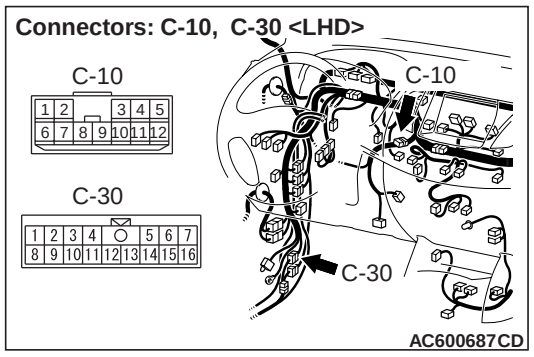
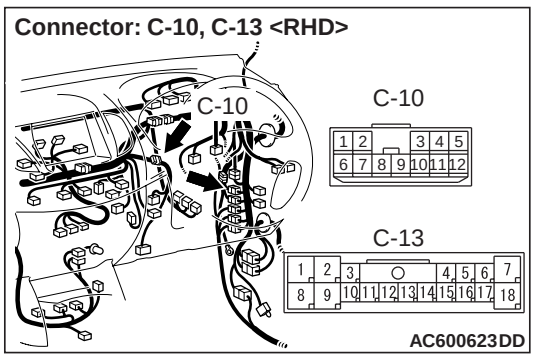
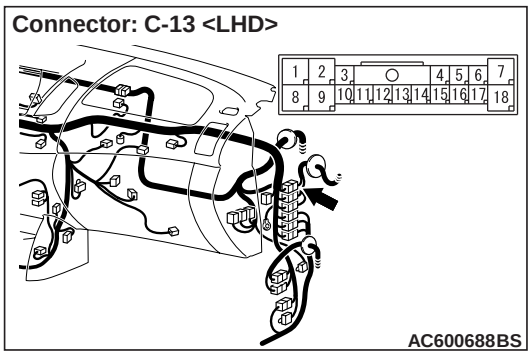


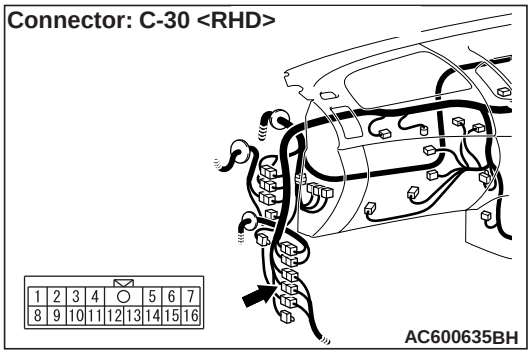


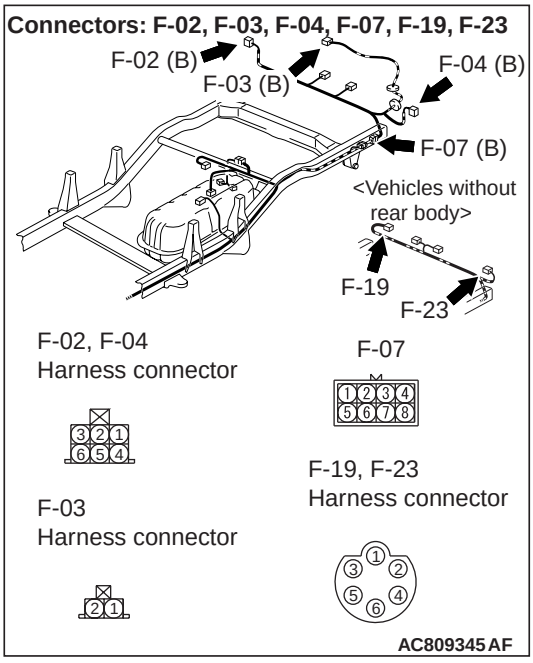












⚠ CAUTION

If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Diagnose the CAN bus lines before the diagnosis codes (Refer to GROUP 54C – CAN Bus Diagnostics Table .).

OPERATION

ASTC-ECU monitors the fluid pressure in the hydraulic unit using the incorporated pressure sensor, and adjusts the fluid pressure for the ASC or ATC drive based on this data.

DIAGNOSIS CODE SET CONDITIONS

This diagnosis code is set in the following cases:

- The output value of the pressure sensor does not change at the vehicle speed of 7 km/h or more when the brake pedal is depressed.
- When the vehicle drives at the speed of 40 km/h or more, the amount of the change of the pressure sensor output values during the time from the brake pedal depression to the vehicle stop is less than the specified value.
- The output value of the pressure sensor is abnormal.

PROBABLE CAUSES

The most likely causes for these diagnosis codes to set are:

- Damaged wiring harness or connector
- Malfunction of the hydraulic unit assembly (integrated with ASTC-ECU)
- Incorrect stop lamp switch installation or malfunction
- Residual brake fluid pressure

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics.

Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?

YES : Go to Step 3.

NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table .). Then go to Step 2.

STEP 2. Check whether the diagnosis code is reset.

(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1361 set?

YES : Go to Step 3.

NO : The procedure is complete.

STEP 3. Check for stop lamp switch installation

Refer to GROUP 35A – On-vehicle Service/Brake Pedal Check and Adjustment .

Q: Is the check result normal?

YES : Go to Step 4.

NO : Install the stop lamp switch correctly (Refer to GROUP 35A – On-vehicle Service/Brake Pedal Check and Adjustment .). Then go to Step 14 .

STEP 4. M.U.T.-III data list

Check the following data list (Refer to P.35C-131).

- Item No.13: Stop lamp switch

Q: Is the check result normal?

YES : Go to Step 5.

NO : Go to Step 6.

STEP 5. Check protrusion amount of the booster

Refer to GROUP 35A – Master cylinder Assembly and Brake Booster Assembly <LHD>, <RHD>.

Q: Is the check result normal?

YES : Go to Step 13.

NO : Push rod protrusion amount adjustment (Refer to GROUP 35A – Master cylinder Assembly and Brake Booster Assembly <LHD>, <RHD>.). Then go to Step 14.

STEP 6. Stop lamp and high-mount stop lamp operation check

Check the stop lamp and high-mount stop lamp operation when the brake pedal is depressed. Check that the stop lamp and high-mount stop lamp illuminates when the brake pedal is depressed and that it goes out when the brake pedal is released.

OK:
When the brake pedal is released: OFF
When the brake pedal is depressed: ON

Q: Is the check result normal?

YES : Go to Step 12.

NO : Go to Step 7.

STEP 7. Connector check: C-114 stop lamp switch connector

Q: Is the check result normal?

YES : Go to Step 8.

NO : Repair or replace it, and go to Step 14.

STEP 8. Connector check: A-48 ASTC-ECU connector, C-13,C-10 joint connector, C-30 intermediate connector, F-02 rear combination lamp (stop: RH) connector (with rear body), F-19 rear combination lamp (stop: RH) connector (without rear body), F-03 high mounted stop lamp connector (with rear body), F-04 rear combination lamp (stop: LH) connector (with rear body), F-23 rear combination lamp (stop: LH) connector (without rear body), F-07 intermediate connector

Q: Is the check result normal?
YES : Go to Step 9.
NO : Repair or replace it, and go to Step 14.

STEP 9. Voltage measurement at C-114 stop lamp switch connector.
(1) Remove C-114 stop lamp switch connector, and measure at the wiring harness connector side.
(2) Measure the voltage between terminal No.2 and body earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 10.
NO : An open or short to power supply has occurred in the wiring harness between fusible link No.23 and C-114 stop lamp switch connector terminal No.2, and fuse No.12, therefore, repair it. Then go to Step 14.

STEP 10. Resistance measurement at C-114 stop lamp switch connector.
(1) Disconnect the A-48 ASTC-ECU connector, C-114 stop lamp switch connector, F-02 rear combination lamp (stop: RH) connector (with rear body), F-19 rear combination lamp (stop: RH) connector (without rear body), F-03 high mounted stop lamp connector (with rear body), F-04 rear combination lamp (stop: LH) connector (with rear body), F-23 rear combination lamp (stop: LH) connector (without rear body), and measure the voltage at C-114 stop lamp switch connector harness side.
(2) Measure the resistance between terminal No.1 and body earth.

OK: No continuity

Q: Is the check result normal?
YES : Go to Step 11.
NO : A short to power supply has occurred in the wiring harness between C-114 stop lamp switch connector terminal No.1 and F-02 rear combination lamp (stop: RH) connector (with rear body) terminal No.2 or F-19 rear combination lamp (stop: RH) connector (without rear body) terminal No.4, or between C-114 stop lamp switch connector terminal No.1 and F-03 high mounted stop lamp connector (with rear body) terminal No.1, or between C-114 stop lamp switch connector terminal No.1 and F-04 rear combination lamp (stop: LH) connector (with rear body) terminal No.2 or F-23 rear combination lamp (stop: LH) connector (without rear body) terminal No.4, therefore, repair it.Then go to Step 14 .

STEP 11. Resistance measurement at C-114 stop lamp switch connector and C-10 joint connector.
(1) Disconnect the C-114 stop lamp switch connector and C-10 joint connector, and measure at the harness side.
(2) Measure the resistance between C-114 stop lamp switch connector terminal No.1 and C-10 joint connector terminal No.7.

OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?
YES : Go to Step 13.
NO : Repair the wiring harness, and then go to Step 14.

STEP 12. Voltage measurement at A-48 ASTC-ECU connector.
(1) Disconnect the A-48 ASTC-ECU connector.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No.26 and body earth.

OK:
- **When the brake pedal is released: 1 V or less**
- **When the brake pedal is depressed: System voltage**

Q: Is the check result normal?
YES : Go to Step 13.
NO : An open circuit in signal line has occurred in the wiring harness between A-48 ASTC-ECU connector terminal No.26 and C-10 joint connector terminal No.1, therefore, repair it. Then go to Step 14.

STEP 13. Check whether the diagnosis code is reset.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1361 set?
YES : Replace the hydraulic unit assembly (integrated with ASTC-ECU). (Refer to P.35C-140.). Then go to Step 14.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunctions .).

STEP 14. Check whether the diagnosis code is reset.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1361 set?
YES : Go to Step 1.
NO : The procedure is complete.

Code No.C1362: Abnormal pressure sensor (output error, open or short circuit)

⚠ CAUTION
If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Diagnose the CAN bus lines before the diagnosis codes (Refer to GROUP 54C – CAN Bus Diagnostics Table).

OPERATION
ASTC-ECU monitors the fluid pressure in the hydraulic unit using the incorporated pressure sensor, and adjusts the fluid pressure for the ASC or ATC drive based on this data.

DIAGNOSIS CODE SET CONDITIONS
This diagnosis code is set in the following cases:
- The deceleration calculated from the output value of the pressure sensor at the vehicle speed of 7 km/h or more is one quarter of the normal value or less than that.
- The power supply voltage of ASTC-ECU is normal, but the output voltage of the pressure sensor is out of the specified range.

PROBABLE CAUSES
The most likely causes for these diagnosis codes to set are:
- Damaged wiring harness or connector
- Malfunction of the hydraulic unit assembly (integrated with ASTC-ECU)

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics.
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result?
YES : Go to Step 3.
NO : Repair the CAN bus line (Refer to GROUP 54C – CAN Bus Diagnostics Table). Then go to Step 2.

STEP 2. Check whether the diagnosis code is reset.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Drive the vehicle at 7 km/h or more for 5 seconds or more.
(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Turn the ignition switch to the "ON" position.
(6) Check if the diagnosis code is set.
(7) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1362 set?
YES : Go to Step 3.
NO : The procedure is complete.

STEP 3. Check whether the diagnosis code is reset.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.

(3) Drive the vehicle at 7 km/h or more for 5 seconds or more.
(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Turn the ignition switch to the "ON" position.
(6) Check if the diagnosis code is set.
(7) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1362 set?
YES : Replace the hydraulic unit assembly (integrated with ASTC-ECU). (Refer to P.35C-140). Then go to Step 4.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction .)

STEP 4. Check whether the diagnosis code is reset.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Drive the vehicle at 7 km/h or more for 5 seconds or more.
(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Turn the ignition switch to the "ON" position.
(6) Check if the diagnosis code is set.
(7) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1362 set?
YES : Go to Step 1.
NO : The procedure is complete.

Code No.C1364: Pressure sensor malfunction

⚠ CAUTION
If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Diagnose the CAN bus lines before the diagnosis codes (Refer to GROUP 54C – CAN Bus Diagnostics Table).

OPERATION
ASTC-ECU monitors the fluid pressure in the hydraulic unit using the incorporated pressure sensor, and adjusts the fluid pressure for the ASC or ATC drive based on this data.

DIAGNOSIS CODE SET CONDITION
This diagnosis code is set when the vehicle speed is 10 km/h or more and the output value of the pressure sensor is more than the specified value.

PROBABLE CAUSES
The most likely causes for these diagnosis codes to set are:
- Damaged wiring harness or connector
- Malfunction of the hydraulic unit assembly (integrated with ASTC-ECU)

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics.
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result?
YES : Go to Step 3.
NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table). Then go to Step 2.

STEP 2. Check whether the diagnosis code is reset.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1364 set?
YES : Go to Step 3.
NO : The procedure is complete.

STEP 3. Check whether the diagnosis code is reset.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1364 set?
YES : Replace the hydraulic unit assembly (integrated with ASTC-ECU). (Refer to P.35C-140). Then go to Step 4.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction .)

STEP 4. Check whether the diagnosis code is reset.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1364 set?
YES : Go to Step 1.
NO : The procedure is complete.

Code No. C1369: G and yaw rate sensor (bank run record)

⚠ CAUTION
If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Diagnose the CAN bus lines before the diagnosis codes (Refer to GROUP 54C – CAN Bus Diagnostics Table .).

OPERATION
The G and yaw rate sensor detects longitudinal acceleration, lateral acceleration, and yaw rate for the vehicle, and sends them to ASTC-ECU via the CAN bus line.

DIAGNOSIS CODE SET CONDITION
This diagnosis code is set when the vehicle is driven under special conditions (laterally inclined road, etc).
NOTE: The ASTC indicator lamp turns off when the ignition switch is in the OFF position, or by the normal driving at the vehicle speed of 10 km/h or more.

Code No. C1371: Yaw rate sensor (output error, oscillation error, zero-point error)

⚠ CAUTION
If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Diagnose the CAN bus lines before the diagnosis codes (Refer to GROUP 54C – CAN Bus Diagnostics Table).

OPERATION
The G and yaw rate sensor detects longitudinal acceleration, lateral acceleration, and yaw rate for the vehicle, and sends them to ASTC-ECU via the CAN bus line.

DIAGNOSIS CODE SET CONDITION
This diagnosis code is set in the following cases:
- The input voltage of ASTC-ECU is normal, but the output of the yaw rate sensor at the vehicle speed of 15 km/h or more is abnormal.
- The input voltage of ASTC-ECU is normal, but the yaw rate output when the vehicle is driving at the speed of 10 km/h or more is abnormal.
- The input voltage of ASTC-ECU is normal, but the yaw rate sensor outputs acceleration or deceleration when the vehicle is stopped.

PROBABLE CAUSES
The most likely causes for these diagnosis codes to set are:
- Malfunction of G and yaw rate sensor
- Damaged wiring harness or connector
- Malfunction of the hydraulic unit assembly (integrated with ASTC-ECU)

DIAGNOSIS

STEP 1. M.U.T.-III CAN bus diagnostics.
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result?
YES : Go to Step 2.
NO : Repair the CAN bus line (Refer to GROUP 54C – CAN Bus Diagnostics Table). Then go to Step 2.

STEP 2. Check whether the diagnosis code is reset.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.

(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1371 set?
YES : Replace the G and yaw rate sensor.Then go to Step 3.
NO : The procedure is complete.

STEP 3. Check whether the diagnosis code is reset.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1371 set?
YES : Replace the hydraulic unit assembly (integrated with ASTC-ECU). (Refer to P.35C-140). Then go to Step 4.
NO : The procedure is complete.

STEP 4. Check whether the diagnosis code is reset.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1371 set?
YES : Go to Step 1.
NO : The procedure is complete.

Code No. C1381: G-sensor (output error, seizure)

⚠ CAUTION
If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Diagnose the CAN bus lines before the diagnosis codes (Refer to GROUP 54C – CAN Bus Diagnostics Table).

OPERATION
The G and yaw rate sensor detects longitudinal acceleration, lateral acceleration, and yaw rate for the vehicle, and sends them to ASTC-ECU via the CAN bus line.

DIAGNOSIS CODE SET CONDITION
This diagnosis code is set in the following cases:
- The input voltage of ASTC-ECU is normal, but the G-sensor output is more than specified value when the vehicle is stopped.
- The input voltage of ASTC-ECU is normal, but the G-sensor outputs nothing during the time form the vehicle driving at the vehicle speed of 30 km/h or more to the vehicle stop.
- The input voltage of ASTC-ECU is normal, but the acceleration output when the vehicle is driving at the speed of 10 km/h or more is abnormal.

PROBABLE CAUSES
The most likely causes for these diagnosis codes to set are:
- Malfunction of G and yaw rate sensor
- Damaged wiring harness or connector
- Malfunction of the hydraulic unit assembly (integrated with ASTC-ECU)

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics.
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result?
YES : Go to Step 2.
NO : Repair the CAN bus line (Refer to GROUP 54C – CAN Bus Diagnostics Table). Then go to Step 2.

STEP 2. Check whether the diagnosis code is reset.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Drive the vehicle at 10 km/h or more for 5 seconds or more.
(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Turn the ignition switch to the "ON" position.
(6) Check if the diagnosis code is set.
(7) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1381 set?

YES : Replace the G and yaw rate sensor (Refer to P.35C-142). Then go to Step 3.
NO : The procedure is complete.

STEP 3. Check whether the diagnosis code is reset.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Drive the vehicle at 10 km/h or more for 5 seconds or more.
(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Turn the ignition switch to the "ON" position.
(6) Check if the diagnosis code is set.
(7) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1381 set?
YES : Replace the hydraulic unit assembly (integrated with ASTC-ECU). (Refer to P.35C-140). Then go to Step 4.
NO : The procedure is complete.

STEP 4. Check whether the diagnosis code is reset.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Drive the vehicle at 10 km/h or more for 5 seconds or more.
(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Turn the ignition switch to the "ON" position.
(6) Check if the diagnosis code is set.
(7) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1381 set?
YES : Go to Step 1.
NO : The procedure is complete.

Code No.C1385: Yaw rate sensor (internal error)

⚠ CAUTION
If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Diagnose the CAN bus lines before the diagnosis codes (Refer to GROUP 54C – CAN Bus Diagnostics Table).

OPERATION
The G and yaw rate sensor detects longitudinal acceleration, lateral acceleration, and yaw rate for the vehicle, and sends them to ASTC-ECU via the CAN bus line.

DIAGNOSIS CODE SET CONDITION
This diagnosis code is set when the yaw rate sensor is abnormal.

PROBABLE CAUSES
The most likely causes for these diagnosis codes to set are:
- Malfunction of G and yaw rate sensor
- Damaged wiring harness or connector
- Malfunction of the hydraulic unit assembly (integrated with ASTC-ECU)

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics.
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result?
YES : Go to Step 2.
NO : Repair the CAN bus line (Refer to GROUP 54C – CAN Bus Diagnostics Table). Then go to Step 2.

STEP 2. Check whether the diagnosis code is reset.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1385 set?
YES : Replace the G and yaw rate sensor (Refer to P.35C-142). Then go to Step 3.
NO : The procedure is complete.

STEP 3. Check whether the diagnosis code is reset.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1385 set?
YES : Replace the hydraulic unit assembly (integrated with ASTC-ECU). (Refer to P.35C-140). Then go to Step 4.
NO : The procedure is complete.

STEP 4. Check whether the diagnosis code is reset.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1385 set?
YES : Go to Step 1.
NO : The procedure is complete.

Code No.C1386: G-sensor (internal error)

⚠ CAUTION
If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Diagnose the CAN bus lines before the diagnosis codes (Refer to GROUP 54C – CAN Bus Diagnostics Table).

OPERATION
The G and yaw rate sensor detects longitudinal acceleration, lateral acceleration, and yaw rate for the vehicle, and sends them to ASTC-ECU via the CAN bus line.

DIAGNOSIS CODE SET CONDITION
This diagnosis code is output when the G-sensor is abnormal.

PROBABLE CAUSES
The most likely causes for these diagnosis codes to set are:
- Malfunction of G and yaw rate sensor
- Damaged wiring harness or connector
- Malfunction of the hydraulic unit assembly (integrated with ASTC-ECU)

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics.
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result?
YES : Go to Step 2.
NO : Repair the CAN bus line (Refer to GROUP 54C – CAN Bus Diagnostics Table). Then go to Step 2.

STEP 2. Check whether the diagnosis code is reset.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1386 set?
YES : Replace the G and yaw rate sensor (Refer to P.35C-142). Then go to Step 3.
NO : The procedure is complete.

STEP 3. Check whether the diagnosis code is reset.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1386 set?
YES : Replace the hydraulic unit assembly (integrated with ASTC-ECU). (Refer to P.35C-140). Then go to Step 4.
NO : The procedure is complete.

STEP 4. Check whether the diagnosis code is reset.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1386 set?
YES : Go to Step 1.
NO : The procedure is complete.

Code No.C1388: Yaw rate sensor (active check error)
Code No.C1389: G-sensor (active check error)

⚠ CAUTION
If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Diagnose the CAN bus lines before the diagnosis codes (Refer to GROUP 54C – CAN Bus Diagnostics Table).

OPERATION
The G and yaw rate sensor detects longitudinal, lateral, and yaw rate G for the vehicle, and sends them to ASTC-ECU via the CAN bus line.

DIAGNOSIS CODE SET CONDITION
These diagnosis codes are set when the power supply voltage of ASTC-ECU is normal but the G and yaw rate sensor operates abnormally.

PROBABLE CAUSES
The most likely causes for these diagnosis codes to set are:
- Malfunction of G and yaw rate sensor
- Damaged wiring harness or connector
- Malfunction of the hydraulic unit assembly (integrated with ASTC-ECU)

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics.
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the CAN bus line (Refer to GROUP 54C – CAN Bus Diagnostics Table). Then go to Step 2.

STEP 2. Check whether the diagnosis code is reset.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1388 or C1389 set?
YES : Replace the G and yaw rate sensor (Refer to P.35C-142). Then go to Step 3.
NO : The procedure is complete.

STEP 3. Check whether the diagnosis code is reset.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1388 or C1389 set?
YES : Replace the hydraulic unit (integrated with ASTC-ECU) (Refer to P.35C-140). Then go to Step 4.
NO : The procedure is complete.

STEP 4. Check whether the diagnosis code is reset.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1388 or C1389 set?
YES : Go to Step 1.
NO : The procedure is complete.

Code No.C1393: G rate sensor (zero-point not calibrated)

⚠ CAUTION
If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Diagnose the CAN bus lines before the diagnosis codes (Refer to GROUP 54C – CAN Bus Diagnostics Table).

OPERATION
The G and yaw rate sensor detects longitudinal acceleration, lateral acceleration, and yaw rate for the vehicle, and sends them to ASTC-ECU via the CAN bus line.

DIAGNOSIS CODE SET CONDITION
This diagnosis code is set when the calibration for the G and yaw rate sensor is incomplete.

PROBABLE CAUSES
The most likely causes for these diagnosis codes to set are:
- The calibration for the G and yaw rate sensor is incomplete.
- Malfunction of G and yaw rate sensor
- Damaged wiring harness or connector
- Malfunction of the hydraulic unit assembly (integrated with ASTC-ECU)

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics.
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the CAN bus line (Refer to GROUP 54C – CAN Bus Diagnostics Table). Then go to Step 2.

STEP 2. Check whether the diagnosis code is reset.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1393 set?
YES : Perform the calibration for the G and yaw rate sensor (Refer to P.35C-138).Then go to Step 3.
NO : The procedure is complete.

STEP 3. Check whether the diagnosis code is reset.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1393 set?
YES : Replace the G and yaw rate sensor (Refer to P.35C-142). Then go to Step 4.
NO : The procedure is complete.

STEP 4. Check whether the diagnosis code is reset.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1393 set?
YES : Replace the hydraulic unit (integrated with ASTC-ECU) (Refer to P.35C-140). Then go to Step 5.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction).

STEP 5. Check whether the diagnosis code is reset.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1393 set?

YES : Go to Step 1.
NO : The procedure is complete.

Code No.C1394: Steering wheel sensor neutral point not learned

⚠ CAUTION
If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Diagnose the CAN bus lines before the diagnosis codes (Refer to GROUP 54C – CAN Bus Diagnostics Table).

OPERATION
The steering wheel sensor detects a steering wheel angle and sends it to ASTC-ECU via the CAN bus line.

DIAGNOSIS CODE SET CONDITION
This diagnosis code is set when the calibration for the steering wheel sensor is incomplete.

PROBABLE CAUSES
The most likely causes for these diagnosis codes to set are:
- Incomplete calibration of the steering wheel sensor
- Malfunction of steering wheel sensor
- Damaged wiring harness or connector
- Malfunction of the hydraulic unit assembly (integrated with ASTC-ECU)

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics.
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table). Then go to Step 2.

STEP 2. Check whether the diagnosis code is reset.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1394 set?
YES : Perform the calibration for the steering wheel sensor. (Refer to P.35C-138.) Then go to Step 3.
NO : The procedure is complete.

STEP 3. Check whether the diagnosis code is reset.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1394 set?
YES : Replace the steering wheel sensor (Refer to P.35C-143). Then go to Step 4.
NO : The procedure is complete.

STEP 4. Check whether the diagnosis code is reset.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1394 set?
YES : Replace the hydraulic unit (integrated with ASTC-ECU) (Refer to P.35C-140). Then go to Step 5.
NO : The procedure is complete.

STEP 5. Check whether the diagnosis code is reset.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1394 set?

YES : Go to Step 1.
NO : The procedure is complete.

Code No.C1396: Engine-ECU malfunction

⚠ CAUTION
If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Diagnose the CAN bus lines before the diagnosis codes (Refer to GROUP 54C – CAN Bus Diagnostics Table).

OPERATION
The hydraulic unit (integrated with ASTC-ECU) communicates with the engine-ECU via the CAN bus line. ASTC-ECU sends the command to the engine-ECU to reduce the engine power at the ASC or ATC operation.

DIAGNOSIS CODE SET CONDITION
This diagnosis code is set when the ASTC-ECU power supply voltage is normal but the engine-ECU is abnormal after the engine is started.

PROBABLE CAUSES
The most likely causes for this diagnosis code to set are:
- Malfunction of the engine-ECU
- Damaged wiring harness or connector
- Malfunction of the hydraulic unit assembly (integrated with ASTC-ECU)

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics.
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the CAN bus line (Refer to GROUP 54C – CAN Bus Diagnostics Table). Then go to Step 2.

STEP 2. Check whether the diagnosis code is reset.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1396 set?
YES : Check if a diagnosis code is set by the engine-ECU. (Refer to 13A – Inspection Chart for Diagnosis Codes .)Then go to Step 3.
NO : The procedure is complete.

STEP 3. Check whether the diagnosis code is reset.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1396 set?
YES : Replace the hydraulic unit (integrated with ASTC-ECU) (Refer to P.35C-140). Then go to Step 4.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunctions).

STEP 4. Check whether the diagnosis code is reset.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1396 set?
YES : Go to Step 1.
NO : The procedure is complete.

Code No.C1505: Steering Wheel Sensor (Signal Seizure or Abnormal Neutral Point)
Code No.C1506: Steering Wheel Sensor (Steering Wheel Sensor Malfunction)

⚠ CAUTION

- **If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Diagnose the CAN bus lines before the diagnosis codes (Refer to GROUP 54C – CAN Bus Diagnostics Table).**
- **The steering wheel sensor-related diagnosis code may be set when diagnosis code No.C1506 is set. Diagnose the steering wheel sensor first when the steering wheel sensor-related diagnosis code is set.**

OPERATION

The steering wheel sensor detects a steering wheel angle and sends it to ASTC-ECU via the CAN bus line.

DIAGNOSIS CODE SET CONDITION

These diagnosis codes are set in the following cases:

Code No.C1505

- The power supply voltage of ASTC-ECU is normal, but when the vehicle is driving at the speed of 20 to 65 km/h, the G and yaw rate sensor outputs the signal of cornering and the steering wheel sensor does not change the output.
- The power supply voltage of ASTC-ECU is normal, but when the vehicle is driving straight at the speed of 35 km/h or more, the output of the steering wheel sensor indicates a turning state.

Code No.C1506

- The power supply voltage of ASTC-ECU is normal, but the steering wheel sensor is abnormal.

PROBABLE CAUSES

The most likely causes for these diagnosis codes to set are:

- Malfunction of steering wheel sensor
- Damaged wiring harness or connector
- Malfunction of the hydraulic unit assembly (integrated with ASTC-ECU)

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics.

(1) Connect M.U.T.-III to the 16-pin diagnosis connector.
(2) Turn the ignition switch to the "ON" position.
(3) Diagnose the CAN bus line.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the check result normal?

YES : Go to Step 2.
NO : Repair the CAN bus line (Refer to GROUP 54C – CAN Bus Diagnostics Table). Then go to Step 2.

STEP 2. Check whether the diagnosis code is reset.

(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1505 or C1506 set?

YES : Replace the steering wheel sensor (Refer to P.35C-143). Then go to Step 4.
NO : The procedure is complete.

STEP 3. Check whether the diagnosis code is reset.

(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1505 or C1506 set?

YES : Replace the hydraulic unit (integrated with ASTC-ECU) (Refer to P.35C-140). Then go to Step 4.
NO : The procedure is complete.

STEP 4. Check whether the diagnosis code is reset.

(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.No.C1505 or C1506 set?

YES : Go to Step 3.
NO : The procedure is complete.

Code No.C1620: Engine-ECU communication error

⚠ CAUTION
If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Diagnose the CAN bus lines before the diagnosis codes (Refer to GROUP 54C – CAN Bus Diagnostics Table).

OPERATION
The hydraulic unit (integrated with ASTC-ECU) communicates with the engine-ECU via the CAN bus line. ASTC-ECU sends the command to the engine-ECU to reduce the engine power at the ASC or ATC operation.

DIAGNOSIS CODE SET CONDITION
This diagnosis code is set when the ASTC-ECU power supply voltage is normal but the communication error with the engine-ECU is present after the engine is started.

PROBABLE CAUSES
The most likely causes for this diagnosis code to set are:
- Malfunction of the engine-ECU
- Damaged wiring harness or connector
- Malfunction of the hydraulic unit assembly (integrated with ASTC-ECU)

DIAGNOSIS

STEP 1. M.U.T.-III CAN bus diagnostics.
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the CAN bus line (Refer to GROUP 54C – CAN Bus Diagnostics Table). Then go to Step 2.

STEP 2. Check whether the diagnosis code is reset.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1620 set?
YES : Check if a diagnosis code is set by the engine-ECU (Refer to 13A – Inspection Chart for Diagnosis Codes). Then go to Step 3.
NO : The procedure is complete.

STEP 3. Check whether the diagnosis code is reset.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1620 set?
YES : Replace the hydraulic unit (integrated with ASTC-ECU) (Refer to P.35C-140). Then go to Step 4.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunctions).

STEP 4. Check whether the diagnosis code is reset.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1620 set?
YES : Go to Step 1.
NO : The procedure is complete.

Code No. C1860: High voltage at ASTC-ECU power supply

⚠ CAUTION
- **If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table .).**
- **Before replacing the ECU, ensure that the communication circuit is normal.**

OPERATION
- The ASTC-ECU is energized by the ignition switch (IG1) through multi-purpose fuse No.15 and the ASTC-ECU terminal 25.
- The wheel speed sensors are energised via ASTC-ECU terminal No. 25.

DIAGNOSIS CODE SET CONDITION
This diagnosis code is set when the power supply voltage of the ASTC-ECU is abnormally high.

PROBABLE CAUSES
- Battery abnormality
- ASTC-ECU malfunction
- Charging system failed

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnosis
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table .). On completion, go to Step 2.

STEP 2. Diagnosis code recheck after resetting CAN bus lines

Q: Is the diagnosis code No. C1860 set?
YES : Go to Step 3.
NO : This diagnosis is complete.

STEP 3. Battery check
Refer to GROUP 54A – Battery Test .

Q: Is the battery in good condition?
YES : Go to Step 5.
NO : Charge or replace the battery. Then go to Step 4.

STEP 4. Charging system check
Refer to GROUP 16 – Charging System .

Q: Is the check result normal?
YES : Go to Step 5.
NO : Repair or replace the charging system component(s).

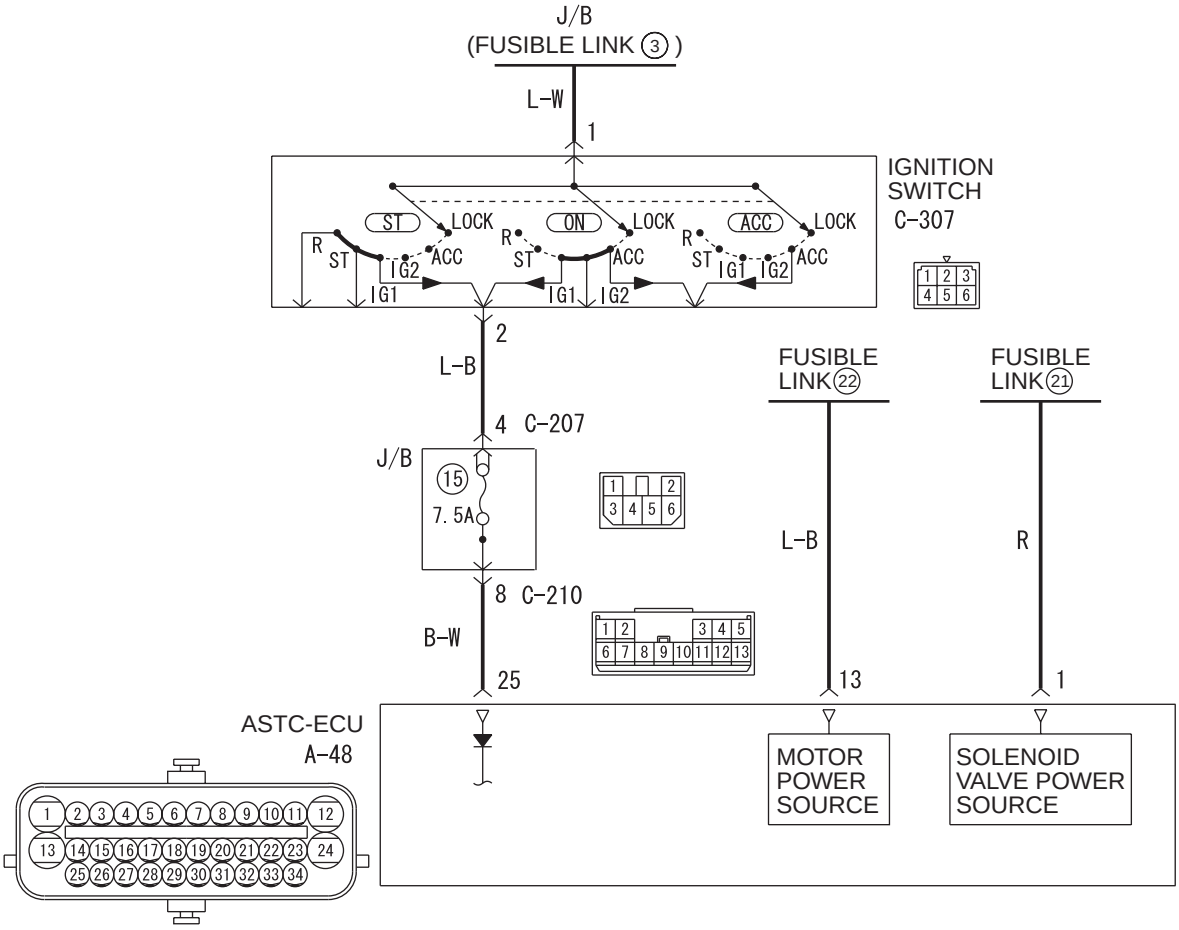
STEP 5. Check whether the diagnosis code is reset.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the diagnosis code No. C1860 set?
YES : Replace the hydraulic unit (integrated with ASTC-ECU) (Refer to P.35C-140.). Then go to Step 6.
NO : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting, How to Cope with Intermittent Malfunctions .).

STEP 6. Check whether the diagnosis code is reset.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

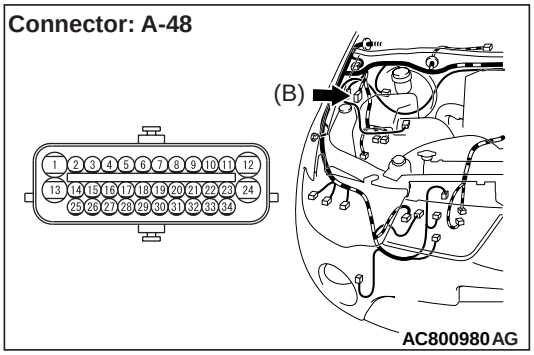
Q: Is the diagnosis code No. C1860 set?
YES : Return to Step 1.
NO : This diagnosis is complete.

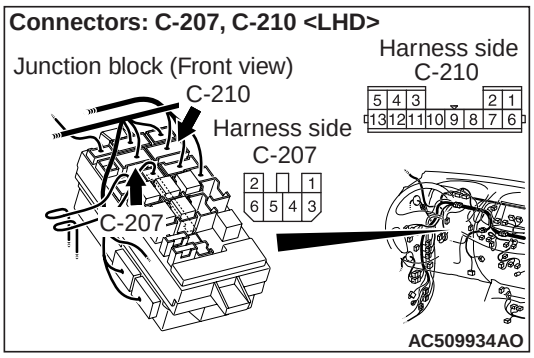
Code No.C1861: Low voltage at ASTC-ECU power supply

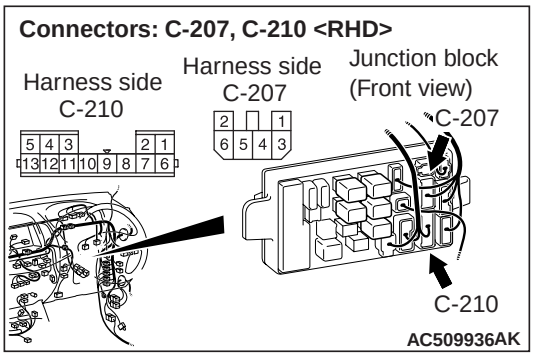


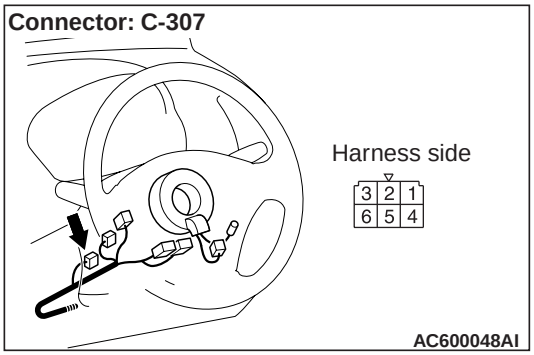
Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

ACB00777









⚠ CAUTION

If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Diagnose the CAN bus lines before the diagnosis codes (Refer to GROUP 54C – CAN Bus Diagnostics Table .).

OPERATION

- The ASTC-ECU is energized by the ignition switch (IG1) through multi-purpose fuse No.15 and the ASTC-ECU terminal 25.
- Power supply for control solenoid valve and linear valve are supplied to the ASTC-ECU terminal 1 via fusible link 21.
- Power supply for ABS motor is supplied to the ASTC-ECU terminal 13 via fusible link 22.
- The wheel speed sensors are energised via ASTC-ECU terminal No. 25.

DIAGNOSIS CODE SET CONDITION

This code is set if the supply power voltage drops abnormally.

PROBABLE CAUSES

The most likely causes for this diagnosis code to set are:

- Battery abnormality
- Charging system failed
- Damaged wiring harness or connector
- Malfunction of the hydraulic unit assembly (integrated with ASTC-ECU)
- Battery terminal looseness

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnosis

Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?

YES : Go to Step 3.

NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table .). On completion, go to Step 2.

STEP 2. Diagnosis code recheck after resetting CAN bus lines

(1) Erase the diagnosis code.
(2) Turn the ignition switch to the "LOCK" (OFF) position.
(3) Turn the ignition switch to the "ON" position.
(4) Check if the diagnosis code is set.

Q: Is the diagnosis code No.C1861 set?

YES : Go to Step 3.

NO : This diagnosis is complete.

STEP 3. Check the fusible link No.21, No.22 or the fuse No.15.

Visually check for open circuit in the fusible link No.21, No.22 or the fuse No.15.

Q: Is the check result normal?

YES : Go to Step 4.

NO : Replace the fusible link or fuse. Then go to Step 10.

STEP 4. Battery check
Refer to GROUP 54A – Battery Test .

Q: Is the battery in good condition?
YES : Go to Step 5.
NO : Charge or replace the battery. Then go to Step 10.

STEP 5. Charging system check
Refer to GROUP 16 – Charging System .

Q: Is the charging system in good condition?
YES : Go to Step 6.
NO : Repair or replace the charging system component(s). Then go to Step 10.

STEP 6. Connector check: A-48 ASTC-ECU connector, C-207 junction block connector, C-210 junction block connector, C-307 ignition switch (IG1) connector

Q: Is the check result normal?
YES : Go to Step 7.
NO : Repair the damaged connector. Then go to Step 10.

STEP 7. Resistance measurement at A-48 ASTC-ECU connector
(1) Disconnect the C-210 junction block connector.
(2) Disconnect the fusible link No.21 and No.22.
(3) Disconnect the A-48 ASTC-ECU connector, and measure at the wiring harness-side connector.
(4) Measure the resistance between the A-48 ASTC-ECU connector terminal No.1, No.13, No.25 and the body earth.

OK: No continuity

Q: Is the check result normal?
YES : Go to Step 8.
NO : The short circuit may be present in the power supply circuit. Repair the wiring harness between the A-48 ASTC-ECU connector terminal No.1, No.13, No.25 and the fusible link No.21, No.22, the C-210 junction block connector terminal No.8. Then go to Step 10.

STEP 8. Voltage measurement at A-48 ASTC-ECU connector
(1) Disconnect the A-48 ASTC-ECU connector.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the resistance between the A-48 ASTC-ECU connector terminal No.1, No.13, No.25 and the body earth.

OK: Battery voltage

Q: Is the check result normal?
YES : Go to Step 9.
NO : The open circuit may be present in the power supply circuit. Repair the wiring harness between the A-48 ASTC-ECU connector terminal No.1, No.13, No.25 and the fusible link No.21, No.22, the C-210 junction block connector terminal No.8. Then go to Step 10.

STEP 9. Check whether the diagnosis code is reset.
(1) Erase the diagnosis code.
(2) Turn the ignition switch to the "LOCK" (OFF) position.
(3) Turn the ignition switch to the "ON" position.
(4) Check if the diagnosis code is set.

Q: Is the diagnosis code No. C1861 set?
YES : Replace the hydraulic unit (integrated with ASTC-ECU) (Refer to P.35C-140.). Then go to Step 10.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunctions .).

STEP 10. Check whether the diagnosis code is reset.
(1) Erase the diagnosis code.
(2) Turn the ignition switch to the "LOCK" (OFF) position.
(3) Turn the ignition switch to the "ON" position.
(4) Check if the diagnosis code is set.

Q: Is the diagnosis code No. C1861 set?
YES : Return to Step 1.
NO : This diagnosis is complete.

Code No.U1073: Bus-off

⚠ CAUTION
- **If diagnosis code U1073 is set in the ASTC-ECU, always diagnose the CAN main bus line. If there is any fault in the CAN bus lines, an incorrect diagnosis code may be set.**
- **Whenever the ECU is replaced, ensure that the communication circuit is normal.**

TROUBLE JUDGEMENT
This code is stored when the ASTC-ECU has ceased the CAN communication (bus off). Then, if a penalty mode is entered after approximately five minutes, regular data transmission will be cancelled.

PROBABLE CAUSES
- Damaged wiring harness or connector
- Malfunction of the hydraulic unit (integrated with ASTC-ECU)

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table). Then go to Step 2.

STEP 2. M.U.T.-III diagnosis code
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.U1073 set?
YES : Replace the hydraulic unit (integrated with ASTC-ECU) (Refer to P.35C-140). Then go to Step 3.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction).

STEP 3. Check whether the diagnosis code is reset.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.U1073 set?
YES : Go to Step 1.
NO : The procedure is complete.

Code No.U1100: Engine-ECU timeout error

⚠ CAUTION
- **If diagnosis code No.U1100 is set in the ASTC-ECU, always diagnose the CAN main bus line. If there is any fault in the CAN bus lines, an incorrect diagnosis code may be set.**
- **Whenever the ECU is replaced, ensure that the communication circuit is normal.**

DIAGNOSIS CODE SET CONDITIONS
This diagnosis code is set if ASTC-ECU cannot receive the signal sent from the Engine-ECU for a certain period.

PROBABLE CAUSES
- Damaged harness or connector.
- Malfunction of the Engine-ECU.
- Malfunction of the ASTC-ECU.

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the CAN bus line (Refer to GROUP 54C – CAN Bus Diagnostics Table). Then go to Step 5.

STEP 2. M.U.T.-III other diagnosis code
Check whether the diagnosis code No. U1100 is set by another ECU.

Q: Is the diagnosis code set?
YES : Replace the Engine-ECU (Refer to GROUP 13A – Engine-ECU). Then go to Step 5.
NO : Go to Step 3.

STEP 3. M.U.T.-III other diagnosis code
Check whether the diagnosis code is set by the Engine-ECU.

Q: Is any diagnosis code set?
YES : Perform troubleshooting for Engine-ECU (Refer to GROUP 13A – Troubleshooting). Then go to Step 5.
NO : Go to Step 4.

STEP 4. M.U.T.-III diagnosis code
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.U1100 set?
YES : Replace the hydraulic unit (integrated with ASTC-ECU) (Refer to P.35C-140). Then go to Step 5.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction).

STEP 5. Check whether the diagnosis code is reset.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.U1100 set?
YES : Go to Step 1.
NO : The procedure is complete.

Code No.U1101: A/T-ECU timeout error

⚠ CAUTION
- **If diagnosis code No.U1101 is set in the ASTC-ECU, always diagnose the CAN main bus line. If there is any fault in the CAN bus lines, an incorrect diagnosis code may be set.**
- **Whenever the ECU is replaced, ensure that the communication circuit is normal.**

DIAGNOSIS CODE SET CONDITIONS
This diagnosis code is set if ASTC-ECU cannot receive the signal sent from the A/T-ECU for a certain period.

PROBABLE CAUSES
- Damaged harness or connector.
- Malfunction of the A/T-ECU.
- Malfunction of the ASTC-ECU.

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the CAN bus line (Refer to GROUP 54C – CAN Bus Diagnostics Table). Then go to Step 5.

STEP 2. M.U.T.-III other diagnosis code
Check whether the diagnosis code No. U1101 is set by another ECU.

Q: Is the diagnosis code set?
YES : Replace the A/T-ECU (Refer to GROUP 23A – A/T-ECU) Then go to Step 5.
NO : Go to Step 3.

STEP 3. M.U.T.-III other diagnosis code
Check whether the diagnosis code is set by A/T-ECU.

Q: Is any diagnosis code set?
YES : Perform troubleshooting for A/T-ECU (Refer to GROUP 23A – Troubleshooting). Then go to Step 5.
NO : Go to Step 4.

STEP 4. M.U.T.-III diagnosis code
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.U1101 set?
YES : Replace the hydraulic unit (integrated with ASTC-ECU) (Refer to P.35C-140). Then go to Step 5.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction).

STEP 5. Check whether the diagnosis code is reset.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.U1101 set?
YES : Go to Step 1.
NO : The procedure is complete.

Code No.U1104: Steering wheel sensor timeout error

⚠ CAUTION
- **If diagnosis code No.U1104 is set in the ASTC-ECU, always diagnose the CAN main bus line. If there is any fault in the CAN bus lines, an incorrect diagnosis code may be set.**
- **Whenever the ECU is replaced, ensure that the communication circuit is normal.**

DIAGNOSIS CODE SET CONDITIONS
This diagnosis code is set if ASTC-ECU cannot receive the signal sent from the steering wheel sensor for a certain period.

PROBABLE CAUSES
- Damaged harness or connector.
- Malfunction of the steering wheel sensor.
- Malfunction of the ASTC-ECU.

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the CAN bus line (Refer to GROUP 54C – CAN Bus Diagnostics Table). Then go to Step 4.

STEP 2. Check whether the diagnosis code is reset.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1104 set?
YES : Replace the steering wheel sensor (Refer to P.35C-143). Then go to Step 3.
NO : The procedure is complete.

STEP 3. M.U.T.-III diagnosis code
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.U1104 set?
YES : Replace the hydraulic unit (integrated with ASTC-ECU) (Refer to P.35C-140). Then go to Step 4.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunctions).

STEP 4. Check whether the diagnosis code is reset.
(1) Turn the ignition switch to the "ON" position.

(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.U1104 set?
YES : Go to Step 1.
NO : The procedure is complete.

Code No.U1105: G and yaw rate sensor timeout error

⚠ CAUTION
- **If diagnosis code No.U1105 is set in the ASTC-ECU, always diagnose the CAN main bus line. If there is any fault in the CAN bus lines, an incorrect diagnosis code may be set.**
- **Whenever the ECU is replaced, ensure that the communication circuit is normal.**

DIAGNOSIS CODE SET CONDITIONS
This diagnosis code is set if ASTC-ECU cannot receive the signal sent from the G and yaw rate sensor for a certain period.

PROBABLE CAUSES
- Damaged harness or connector.
- Malfunction of the G and yaw rate sensor.
- Malfunction of the ASTC-ECU.

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the CAN bus line (Refer to GROUP 54C – CAN Bus Diagnostics Table). Then go to Step 4.

STEP 2. Check whether the diagnosis code is reset.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.C1105 set?
YES : Replace the G and yaw rate sensor (Refer to P.35C-142). Then go to Step 3.
NO : The procedure is complete.

STEP 3. M.U.T.-III diagnosis code
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.U1105 set?
YES : Replace the hydraulic unit (integrated with ASTC-ECU) (Refer to P.35C-140). Then go to Step 4.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunctions).

STEP 4. Check whether the diagnosis code is reset.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.U1105 set?
YES : Go to Step 1.
NO : The procedure is complete.

Code No.U1109: ETACS-ECU timeout error

⚠ CAUTION
- **If diagnosis code No.U1109 is set in the ASTC-ECU, always diagnose the CAN main bus line. If there is any fault in the CAN bus lines, an incorrect diagnosis code may be set.**
- **Whenever the ECU is replaced, ensure that the communication circuit is normal.**

DIAGNOSIS CODE SET CONDITIONS
This diagnosis code is set if ASTC-ECU cannot receive the signal sent from the ETACS-ECU for a certain period.

PROBABLE CAUSES
- Damaged harness or connector.
- Malfunction of the ETACS-ECU.
- Malfunction of the ASTC-ECU.

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the CAN bus line (Refer to GROUP 54C, CAN bus line Diagnostic flow). Then go to Step 5.

STEP 2. M.U.T.-III other diagnosis code
Check whether the diagnosis code No. U1109 is set by another ECU.

Q: Is the diagnosis code set?
YES : Replace the ETACS-ECU. Then go to Step 5.
NO : Go to Step 3.

STEP 3. M.U.T.-III other diagnosis code
Check whether the diagnosis code is set by the ETACS-ECU.

Q: Is any diagnosis code set?
YES : Perform troubleshooting for ETACS-ECU (Refer to GROUP 54A – Troubleshooting). Then go to Step 5.
NO : Go to Step 4.

STEP 4. M.U.T.-III diagnosis code
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.U1109 set?
YES : Replace the hydraulic unit (integrated with ASTC-ECU) (Refer to P.35C-140). Then go to Step 5.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction).

STEP 5. Check whether the diagnosis code is reset.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.U1109 set?
YES : Go to Step 1.
NO : The procedure is complete.

Code No.U1120: Engine malfunction detection

⚠ CAUTION
- **If diagnosis code No.U1120 is set in the ASTC-ECU, always diagnose the CAN main bus line. If there is any fault in the CAN bus lines, an incorrect diagnosis code may be set.**
- **Whenever the ECU is replaced, ensure that the communication circuit is normal.**

DIAGNOSIS CODE SET CONDITION
The ASTC-ECU receives engine system-related signals from the Engine-ECU via CAN bus lines. If a fail-safe related data is contained in the signal from the Engine-ECU, diagnosis code No.U1120 will be stored.

PROBABLE CAUSES
- Damaged harness or connector.
- Malfunction of the Engine-ECU.
- Malfunction of the ASTC-ECU.

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the CAN bus line (Refer to GROUP 54C – CAN Bus Diagnostics Table). Then go to Step 5.

STEP 2. M.U.T.-III other diagnosis code
Check whether the diagnosis code No. U1120 is set by another ECU.

Q: Is the diagnosis code set?
YES : Replace the Engine-ECU (Refer to GROUP 13A – Engine-ECU). Then go to Step 5.
NO : Go to Step 3.

STEP 3. M.U.T.-III other diagnosis code
Check whether the diagnosis code is set by the Engine-ECU.

Q: Is any diagnosis code set?
YES : Perform troubleshooting for Engine-ECU (Refer to GROUP 13A – Troubleshooting). Then go to Step 5.
NO : Go to Step 4.

STEP 4. M.U.T.-III diagnosis code
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.U1120 set?
YES : Replace the hydraulic unit (integrated with ASTC-ECU) (Refer to P.35C-140). Then go to Step 5.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction).

STEP 5. Check whether the diagnosis code is reset.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.U1120 set?
YES : Go to Step 1.
NO : The procedure is complete.

Code No.U1190: ETACS signal receiving error

⚠ CAUTION
- **If diagnosis code No.U1190 is set in the ASTC-ECU, always diagnose the CAN main bus line. If there is any fault in the CAN bus lines, an incorrect diagnosis code may be set.**
- **Whenever the ECU is replaced, ensure that the communication circuit is normal.**

DIAGNOSIS CODE SET CONDITIONS
This diagnosis code is set if ASTC-ECU cannot receive the signal sent from the ETACS-ECU for a certain period.

PROBABLE CAUSES
- Damaged harness or connector.
- Malfunction of the ETACS-ECU.
- Malfunction of the ASTC-ECU.

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the CAN bus line (Refer to GROUP 54C – CAN Bus Diagnostics Table). Then go to Step 5.

STEP 2. M.U.T.-III other diagnosis code
Check whether the diagnosis code No. U1190 is set by another ECU.

Q: Is the diagnosis code set?
YES : Replace the ETACS-ECU and register the ID codes. Then go to Step 5.
NO : Go to Step 3.

STEP 3. M.U.T.-III other diagnosis code
Check whether the diagnosis code is set by the ETACS-ECU.

Q: Is any diagnosis code set?
YES : Perform troubleshooting for ETACS-ECU (Refer to GROUP 54A – Diagnosis Code Chart). Then go to Step 5.
NO : Go to Step 4.

STEP 4. M.U.T.-III diagnosis code
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.U1190 set?
YES : Replace the hydraulic unit (integrated with ASTC-ECU) (Refer to P.35C-140). Then go to Step 5.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction).

STEP 5. Check whether the diagnosis code is reset.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.U1190 set?
YES : Go to Step 1.
NO : The procedure is complete.

Code No.U1200: Steering wheel sensor communication error

⚠ CAUTION
- **If diagnosis code No.U1200 is set in the ASTC-ECU, always diagnose the CAN main bus line. If there is any fault in the CAN bus lines, an incorrect diagnosis code may be set.**
- **Whenever the ECU is replaced, ensure that the communication circuit is normal.**

DIAGNOSIS CODE SET CONDITIONS
This diagnosis code is set if ASTC-ECU cannot receive the signal sent from the steering wheel sensor for a certain period.

PROBABLE CAUSES
- Damaged harness or connector.
- Malfunction of the steering wheel sensor.
- Malfunction of the ASTC-ECU.

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the CAN bus line (Refer to GROUP 54C – CAN Bus Diagnostics Table). Then go to Step 4.

STEP 2. M.U.T.-III diagnosis code
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.U1200 set?
YES : Replace the steering wheel sensor (Refer to P.35C-143). Then go to Step 3.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunctions).

STEP 3. M.U.T.-III diagnosis code
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.U1200 set?
YES : Replace the hydraulic unit (integrated with ASTC-ECU) (Refer to P.35C-140). Then go to Step 4.
NO : The procedure is complete.

STEP 4. Check whether the diagnosis code is reset.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.U1200 set?
YES : Go to Step 1.
NO : The procedure is complete.

Code No.U1201: Yaw rate sensor (parity error)
Code No.U1202: G-sensor parity error

⚠ CAUTION
- **If diagnosis codes No.U1201 and U1202 are set in the ASTC-ECU, always diagnose the CAN main bus line. If there is any fault in the CAN bus lines, an incorrect diagnosis code may be set.**
- **Whenever the ECU is replaced, ensure that the communication circuit is normal.**

OPERATION
ASTC-ECU receives the longitudinal and lateral G detected by the G and yaw rate sensor via the CAN bus line.

DIAGNOSIS CODE SET CONDITION
These diagnosis codes are set in the following cases:

Code No.U1201
- The yaw rate signal output by G and yaw rate sensor is abnormal.

Code No.U1202
- The longitudinal G signal output by G and yaw rate sensor is abnormal.

PROBABLE CAUSES
- Noise generated in the CAN bus line
- Damaged harness or connector.
- Malfunction of the G and yaw rate sensor.
- Malfunction of the ASTC-ECU.

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table). Then go to Step 4.

STEP 2. M.U.T.-III diagnosis code
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.U1201 or U1202 set?

YES : Replace the G and yaw rate sensor (Refer to P.35C-142). Then go to Step 3.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction).

STEP 3. M.U.T.-III diagnosis code
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.U1201 or U1202 set?
YES : Replace the hydraulic unit (integrated with ASTC-ECU) (Refer to P.35C-140). Then go to Step 4.
NO : The procedure is complete.

STEP 4. Check whether the diagnosis code is reset.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.U1201 or U1202 set?
YES : Go to Step 1.
NO : The procedure is complete.

Code No.U1204: Steering wheel sensor communication error

⚠ CAUTION
- **If diagnosis code No.U1204 is set in the ASTC-ECU, always diagnose the CAN main bus line. If there is any fault in the CAN bus lines, an incorrect diagnosis code may be set.**
- **Whenever the ECU is replaced, ensure that the communication circuit is normal.**

OPERATION
The steering wheel sensor detects a steering wheel angle and sends it to ASTC-ECU via the CAN bus line.

DIAGNOSIS CODE SET CONDITION
This diagnosis code is set when the ASTC-ECU power supply voltage is normal but the signal sent from the steering wheel sensor differs from the signal sent at the previous time by more than the specified value.

PROBABLE CAUSES
- Noise generated in the CAN bus line
- Damaged harness or connector.
- Malfunction of the steering wheel sensor.
- Malfunction of the ASTC-ECU.

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table). Then go to Step 4.

STEP 2. M.U.T.-III diagnosis code
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.U1204 set?
YES : Replace the steering wheel sensor (Refer to P.35C-143). Then go to Step 3.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunctions).

STEP 3. M.U.T.-III diagnosis code
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.U1204 set?
YES : Replace the hydraulic unit (integrated with ASTC-ECU) (Refer to P.35C-140). Then go to Step 4.
NO : The procedure is complete.

STEP 4. Check whether the diagnosis code is reset.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.U1204 set?
YES : Go to Step 1.
NO : The procedure is complete.

Code No.U1205: G and yaw rate sensor message counter error

⚠ CAUTION
- **If diagnosis code No.U1205 is set in the ASTC-ECU, always diagnose the CAN main bus line. If there is any fault in the CAN bus lines, an incorrect diagnosis code may be set.**
- **Whenever the ECU is replaced, ensure that the communication circuit is normal.**

OPERATION
ASTC-ECU receives the longitudinal and lateral G detected by the G and yaw rate sensor via the CAN bus line.

DIAGNOSIS CODE SET CONDITION
This diagnosis code is set when the ASTC-ECU power supply voltage is normal but the signal sent from the G and yaw rate sensor differs from the signal sent at the previous time by more than the specified value.

PROBABLE CAUSES
- Noise generated in the CAN bus line
- Damaged harness or connector.
- Malfunction of the G and yaw rate sensor.
- Malfunction of the ASTC-ECU.

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table). Then go to Step 4.

STEP 2. M.U.T.-III diagnosis code
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.U1205 set?
YES : Replace the G and yaw rate sensor (Refer to P.35C-142). Then go to Step 3.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction).

STEP 3. M.U.T.-III diagnosis code
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.U1205 set?
YES : Replace the hydraulic unit (integrated with ASTC-ECU) (Refer to P.35C-140). Then go to Step 4.
NO : The procedure is complete.

STEP 4. Check whether the diagnosis code is reset.
(1) Turn the ignition switch to the "ON" position.
(2) Erase the diagnosis code.
(3) Turn the ignition switch to the "LOCK" (OFF) position.
(4) Turn the ignition switch to the "ON" position.
(5) Check if the diagnosis code is set.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is code No.U1205 set?
YES : Go to Step 1.
NO : The procedure is complete.

TROUBLE SYMPTOM CHART

M1355006900435

⚠ CAUTION

- **ABS may operate in the following conditions without hard braking: Low mu road surface, high-speed turn, and bumpy road surface. When asking the customers, confirm that they have/have not encountered ABS operation in corresponding conditions.**
- **During ABS operation, the brake pedal is pulled forward gradually, and the noise occurs at the same time. This is because the brake line pressure varies intermittently to prevent the wheel lock, and not a system malfunction.**
- **During diagnosis, a diagnosis code associated with other system may be set when the ignition switch is turned on with connector(s) disconnected. On completion, confirm all systems for diagnosis code(s). If diagnosis code(s) are set, erase them all.**

Trouble symptom		Inspection procedure number	Reference page
M.U.T.-III cannot communicate with the ASTC system.	M.U.T.-III cannot communicate with all systems.	–	Refer to GROUP 54C – Troubleshooting .
	M.U.T.-III cannot communicate only with ASTC-ECU.	1	P.35C-113
ASTC OFF indicator lamp flashes at a rate of 2Hz.		2	P.35C-114
Brake warning lamp stays ON with the parking brake lever or the parking brake stick released (ABS warning lamp is OFF).		3	P.35C-115
ABS warning lamp remains illuminated after the engine is started.		4	P.35C-119
ASTC indicator lamp stays ON after the engine is started.		5	P.35C-122
ASTC OFF indicator lamp stays ON after the engine is started.		6	P.35C-125
The ASTC system cannot be disabled when ASC OFF switch is pressed to turn the system OFF.		7	P.35C-128
ASTC system dose not operate.		8	P.35C-130
The initial check sound of hydraulic unit is loud.		9	P.35C-131

SYMPTOM PROCEDURES

Inspection Procedure 1: M.U.T.-III cannot communicate only with ASTC-ECU.

⚠ CAUTION

- **If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Prior to this diagnosis, diagnose the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table).**
- **Before replacing the ECU, ensure that the communication circuit is normal.**

TECHNICAL DESCRIPTION (COMMENT)
If the M.U.T.-III cannot communicate with the ASTC system, the CAN bus lines may be defective. If the ASTC system does not work, the ASTC-ECU or its power supply circuit may be defective.

PROBABLE CAUSES
- Damaged wiring harness and connectors
- ASTC-ECU malfunction

- Wrong routing of M.U.T.-III harness
- Abnormality in battery or alternator
- Abnormality in power supply voltage to ASTC-ECU
- ECU malfunction of other system

DIAGNOSIS

STEP 1. M.U.T.-III CAN bus diagnostics
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Check the power supply circuit system (Refer to P.35C-100).
NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table).

Inspection Procedure 2: ASTC OFF indicator lamp flashes at a rate of 2Hz

OPERATION
When the ASTC OFF indicator lamp flashes at a rate of 2 Hz, the ASTC is prohibited.

COMMENTS ON TROUBLE SYMPTOM
This operation is performed for the following reasons and is not a malfunction.

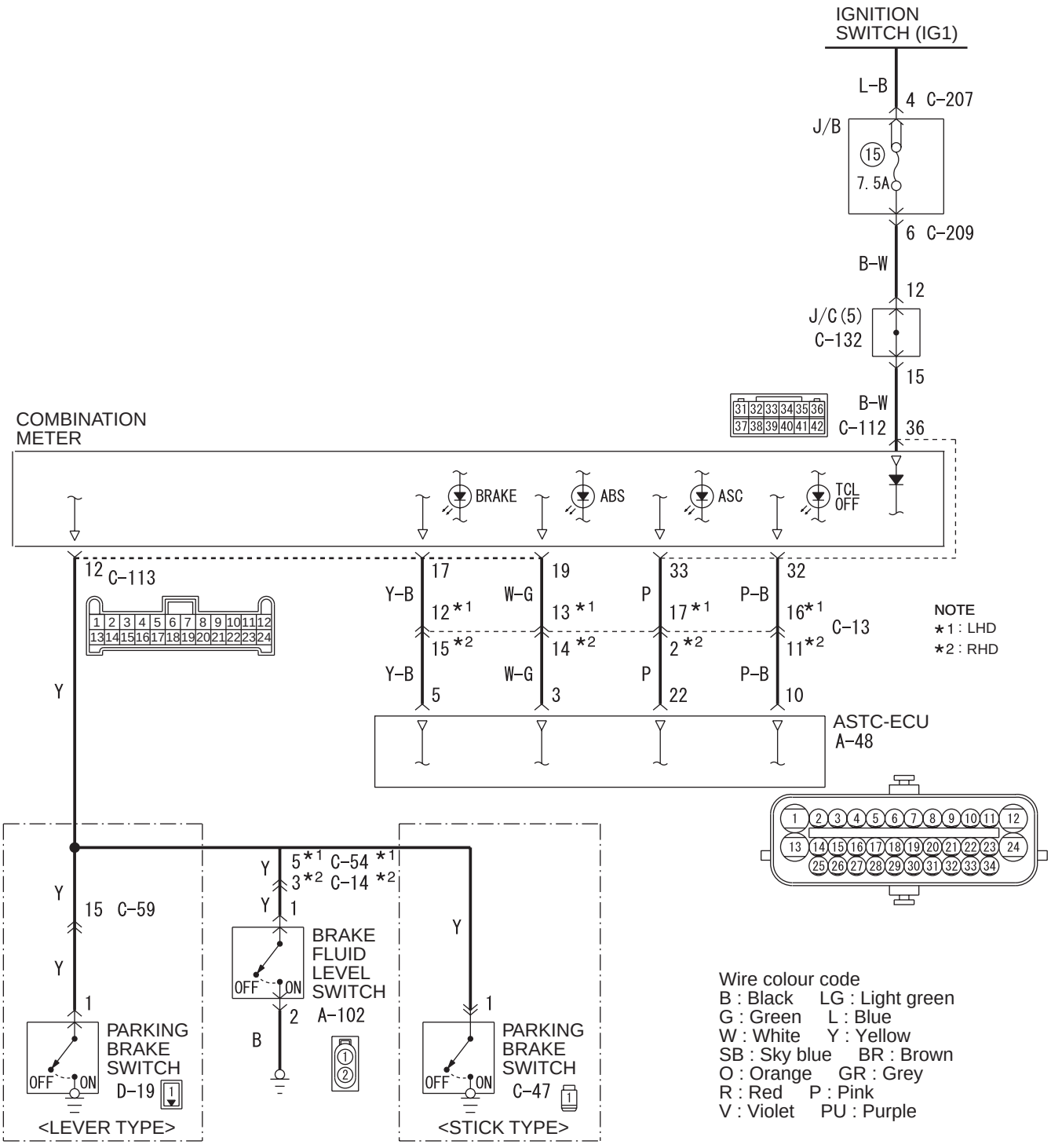
- ASTC-ECU calculates the estimated temperature of the brake pad. In general, as the brake pad temperature increases, the coefficient of friction for the brake pad becomes smaller, resulting in the reduced braking force. When the estimated temperature of the brake pad reaches the specified value or more, ASTC-ECU flashes the ASTC OFF indicator lamp at a rate of 2 Hz to warn the driver that the brake controllability by ASTC is decreased by the reduced braking force. Consequently, ASTC-ECU prohibits the ASTC control until it determines that the estimated temperature of the brake pad is normal.

PROBABLE CAUSES

- Overheat of brake pad

Inspection Procedure 3: Brake warning lamp stays ON with the parking brake lever or the parking brake stick released (ABS warning lamp is OFF).

Combination Meter Circuit



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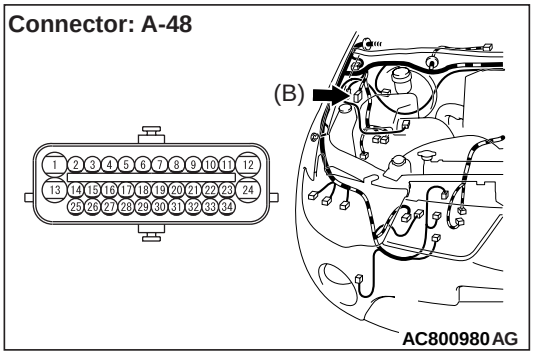
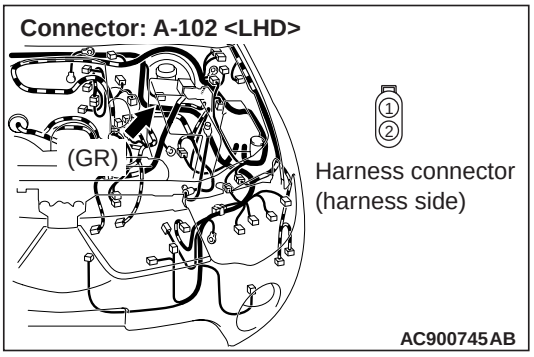
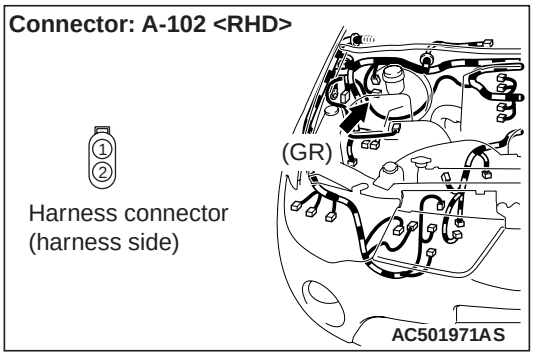
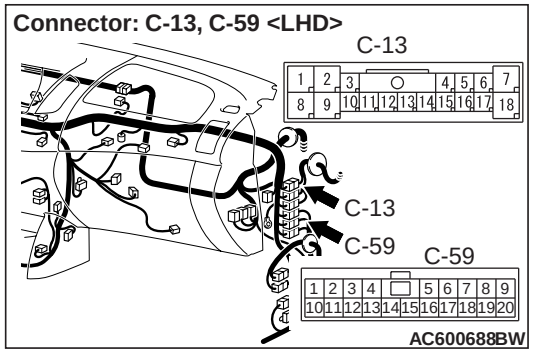
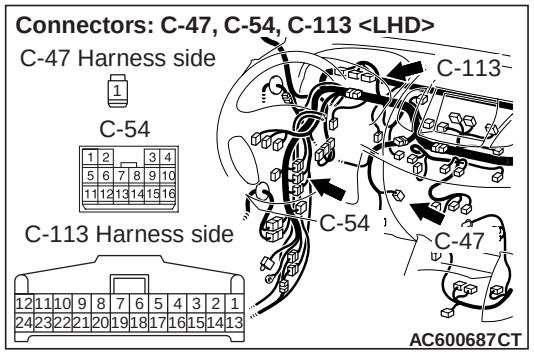
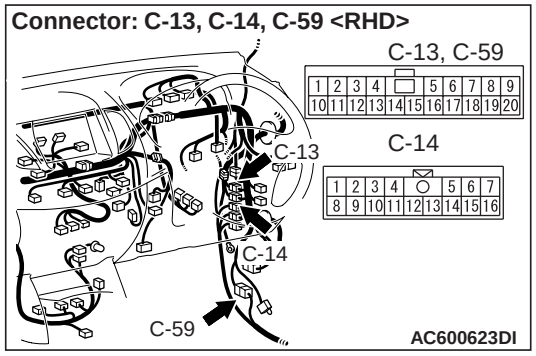


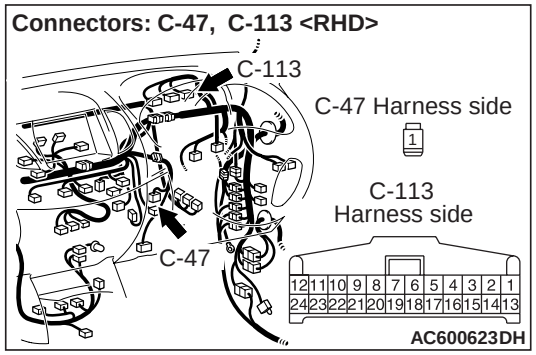


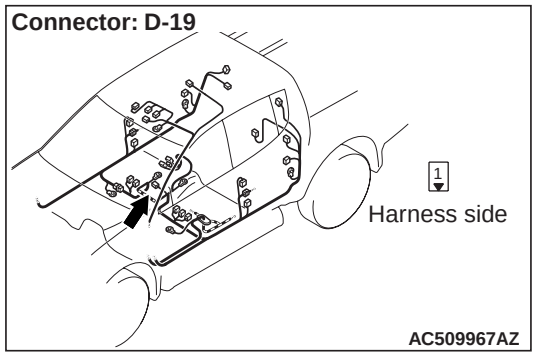












⚠ CAUTION

If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Diagnose the CAN bus lines before the diagnosis codes (Refer to GROUP 54C – CAN Bus Diagnostics Table .).

OPERATION

- ASTC-ECU send the illumination signal of Brake warning lamp to the combination meter via the CAN communication.
- ASTC-ECU operates the Brake warning lamp and the Brake warning lamp for three seconds after the ignition switch is turned "ON" position for bulb check.

COMMENT

This may be caused by faults in the signal line, the combination meter or the ASTC-ECU.

PROBABLE CAUSES

- Malfunction of the combination meter

- Damaged wiring harness and connectors
- Malfunction of the hydraulic unit assembly (integrated with ASTC-ECU)

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics
Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table .). Then go to Step 13.

STEP 2. Brake fluid level check
Check that the brake fluid is filled up to the "MIN" level or higher.

Q: Is the check result normal?
YES : Go to Step 4.
NO : Go to Step 3.

STEP 3. Brake pad check
Refer to GROUP 35A – On-vehicle Service, Brake Pad Check .

Q: Is the check result normal?
YES : Fill the brake fluid up to the "MAX" level. Then go to Step 12.
NO : Replace the brake pad. (Refer to GROUP 35A – On-vehicle Service, Brake Pad Replacement .). Then go to Step 13.

STEP 4. Brake fluid level sensor check
Refer to GROUP 35A – On-vehicle Service, Brake Fluid Level Sensor Check .

Q: Is the check result normal?
YES : Go to Step 5.
NO : Replace the brake fluid level sensor (Refer to GROUP 35A – Master Cylinder Assembly and Brake Booster Assembly .) .Then go to Step 13.

STEP 5. Connector check: A-48 ASTC-ECU connector, A-102 brake fluid level switch connector, C-13 intermediate connector, C-14 intermediate connector, C-15 intermediate connector, C-47 parking brake switch connector <stick type>, C-113 combination meter connector, D-19 parking brake switch connector <lever type>

Q: Is the check result normal?
YES : Go to Step 6.
NO : Repair or replace it. Then go to Step 13.

STEP 6. Check the wiring harness between A-102 brake fluid level switch connector and C-113 combination meter connector for short to earth.
Check the wiring harness between A-102 brake fluid level switch connector terminal No.1 and C-113 combination meter connector terminal No.12 for short to earth.

Q: Is the check result normal?
YES : Go to Step 7.
NO : Repair the wiring harness between the A-102 brake fluid level switch connector terminal No.1 and the C-113 combination meter connector terminal No.12. Then go to Step 13.

STEP 7. Check for open circuit in the wiring harness between A-48 ASTC-ECU connector and C-113 combination meter connector.
Check for open circuit in the wiring harness between A-48 ASTC-ECU connector terminal No.5 and C-113 combination meter connector terminal No.17.

Q: Is the check result normal?
YES : Go to Step 8.
NO : Repair the wiring harness between the A-48 ASTC-ECU terminal No.5 and the C-113 combination meter connector terminal No.17. Then go to Step 13.

STEP 8. Parking brake switch check
Refer to GROUP 36 – On-vehicles Service, Parking Brake Switch Check <lever type>, <stick type>.

Q: Is the check result normal?
YES : Go to Step 9.
NO : Replace it. Then go to Step 13.

STEP 9. Resistance measurement at C-113 combination meter connector
(1) Disconnect the C-113 combination meter connector and measure the harness-side connector.
(2) Keep the parking brake stick <stick type> or parking brake lever <lever type> released from being pulled.
(3) Measure the resistance between the C-113 combination meter connector terminal No.12 and the body earth.

OK: No continuity

Q: Is the check result normal?

YES : Go to Step 10.
NO : A short circuit may be present in the signal line circuit. Repair the wiring harness between the C-113 combination meter connector terminal No.12 and the A-102 brake fluid level switch connector terminal No.1 and C-47 parking brake switch connector terminal No.1 <stick type> or D-19 parking brake switch connector terminal No.1 <lever type>. Then go to Step 13.

STEP 10. Brake fluid level sensor check

Refer to GROUP 35A – On-vehicles Service, Brake Fluid Level Sensor Check .

Q: Is the check result normal?
YES : Go to Step 11.
NO : Repair it. Then go to Step 13.

STEP 11. M.U.T.-III other diagnosis code

Check whether the diagnosis code is set by the combination meter assembly.

Q: Is any diagnosis code set?
YES : Refer to Diagnosis Code Chart (Refer to .). Then go to Step 13.
NO : Replace the combination meter assembly (Refer to GROUP 54A, Combination Meter .). Then go to Step 12.

STEP 12. Retest the system

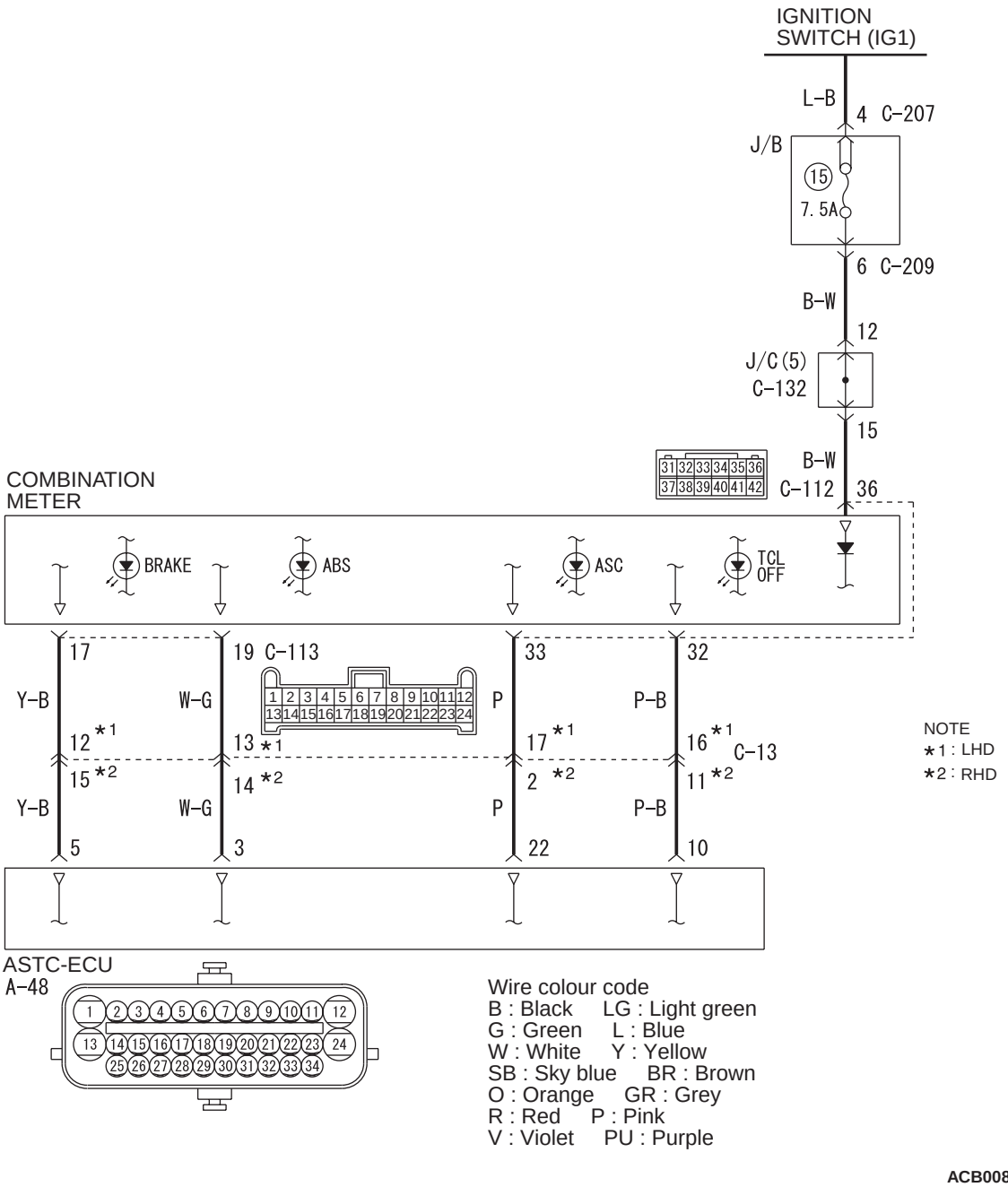
Q: Turn the ignition switch to the "ON" position. Does the brake warning lamp illuminate for three seconds, and then go out after the engine starts?
YES : The procedure is complete.
NO : Replace the hydraulic unit (integrated with ASTC-ECU) (Refer to P.35C-140.). Then go to Step 13.

STEP 13. Retest the system

Q: Turn the ignition switch to the "ON" position. Does the brake warning lamp illuminate for three seconds, and then go out after the engine starts?
YES : The procedure is complete.
NO : Return to Step 1.

Inspection Procedure 4: ABS warning lamp remains illuminated after the engine is started.

Combination Meter Circuit



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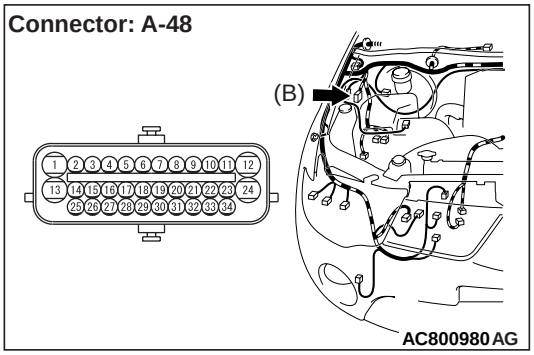
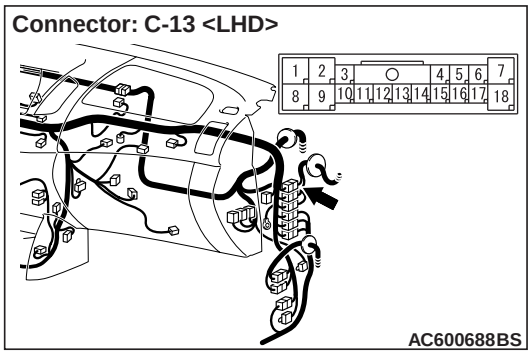
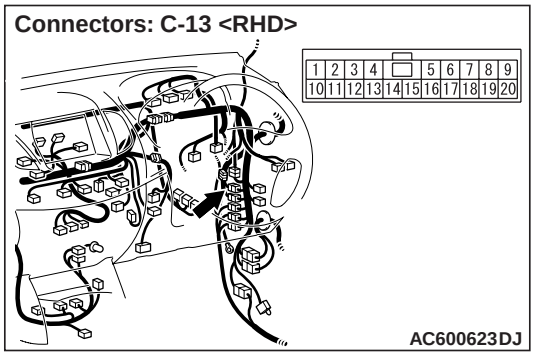
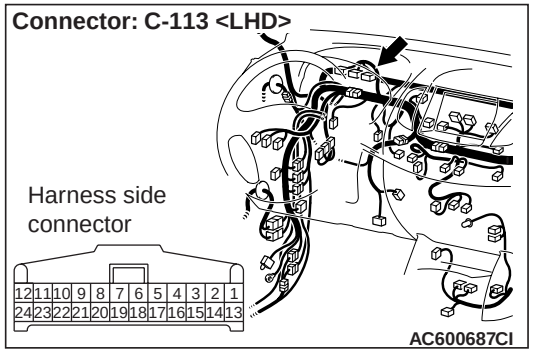
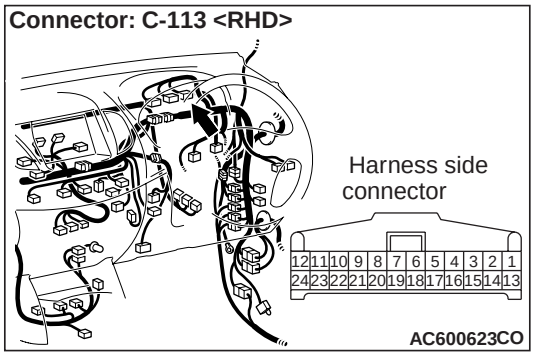










⚠ CAUTION

If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Diagnose the CAN bus lines before the diagnosis codes (Refer to GROUP 54C – CAN Bus Diagnostics Table .).

OPERATION

- ASTC-ECU send the illumination signal of ABS warning lamp to the combination meter via the CAN communication.
- ASTC-ECU operates the ABS warning lamp and the ABS warning lamp for three seconds after the ignition switch is turned "ON" position for bulb check.

COMMENT

This may be caused by faults in the signal line, the combination meter or the ASTC-ECU.

PROBABLE CAUSES

- Malfunction of the combination meter
- Damaged wiring harness and connectors
- Malfunction of the hydraulic unit assembly (integrated with ASTC-ECU)

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics

Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?

YES : Go to Step 2.

NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table .). Then go to Step 6.

STEP 2. Connector check: A-48 ASTC-ECU connector, C-13 intermediate connector, C-113 combination meter connector

Q: Is the check result normal?

YES : Go to Step 3.

NO : Repair or replace it. Then go to Step 6.

STEP 3. Check for open circuit in the wiring harness between A-48 ASTC-ECU connector and C-113 combination meter connector.

Check for open circuit in the wiring harness between A-48 ASTC-ECU connector terminal No.3 and C-113 combination meter connector terminal No.19.

Q: Is the check result normal?

YES : Go to Step 4.
NO : Repair the wiring harness between the A-48 ASTC-ECU terminal No.3 and the C-113 combination meter connector terminal No.19. Then go to Step 6.

STEP 4. M.U.T.-III diagnosis code

Q: Is any diagnosis code set?
YES : Refer to Diagnosis Code Chart (Refer to .). Then go to Step 6.
NO : Replace the combination meter assembly (Refer to GROUP 54A, Combination Meter .). Then go to Step 5.

STEP 5. Retest the system

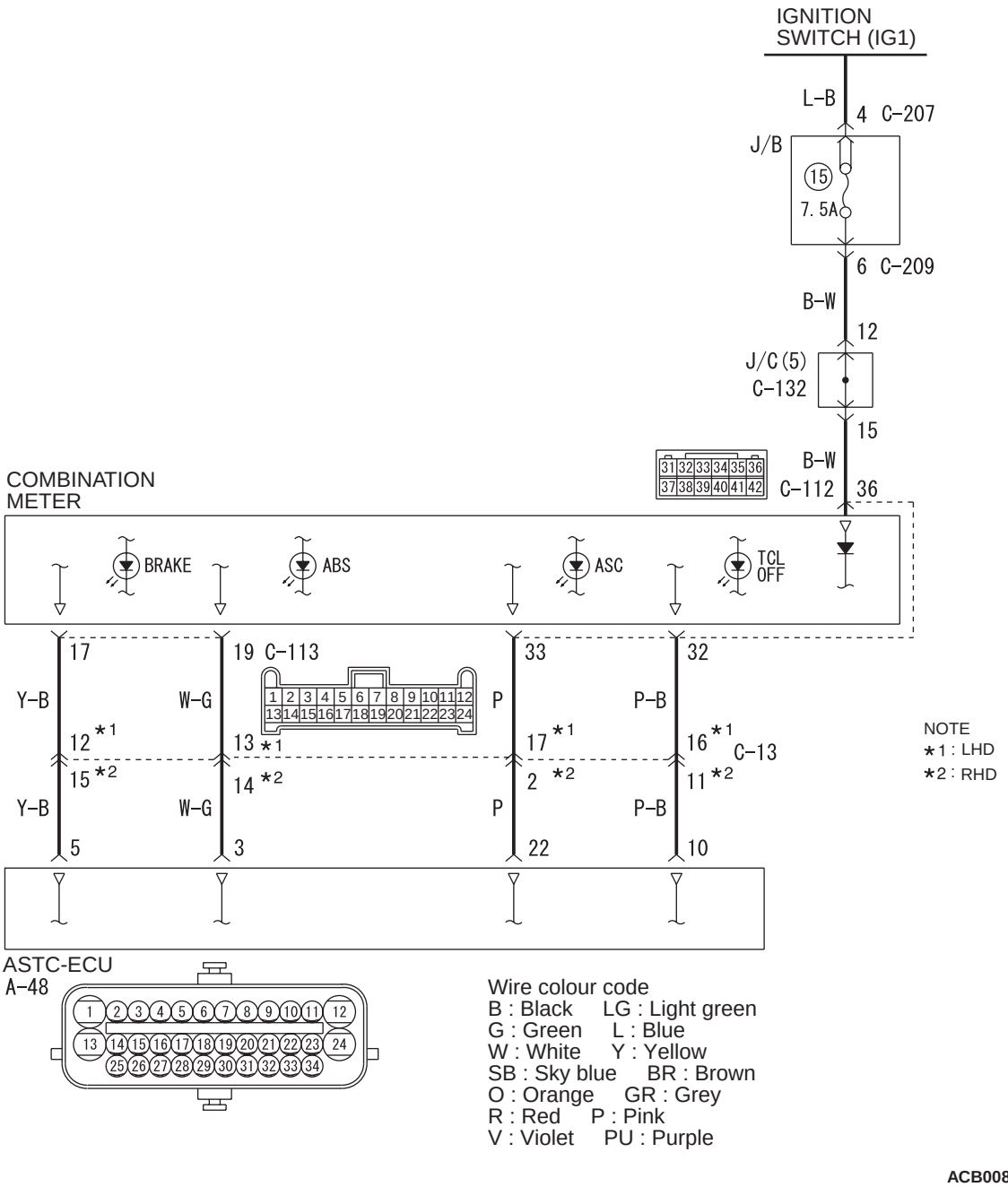
Q: Turn the ignition switch to the "ON" position. Does the ABS warning lamp illuminate for three seconds, and then go out after the engine starts?
YES : The procedure is complete.
NO : Replace the hydraulic unit (integrated with ASTC-ECU) (Refer to P.35C-140.). Then go to Step 6.

STEP 6. Retest the system

Q: Turn the ignition switch to the "ON" position. Does the ABS warning lamp illuminate for three seconds, and then go out after the engine starts?
YES : The procedure is complete.
NO : Return to Step 1.

Inspection Procedure 5: ASTC indicator lamp stays ON after the engine is started.

Combination Meter Circuit



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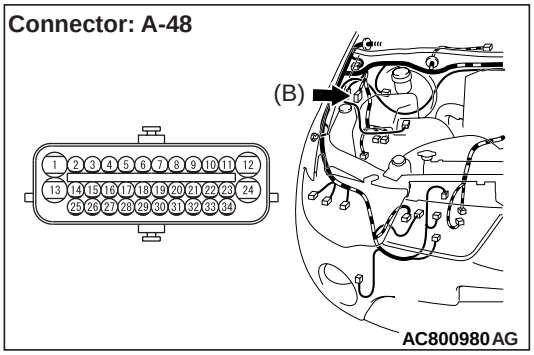
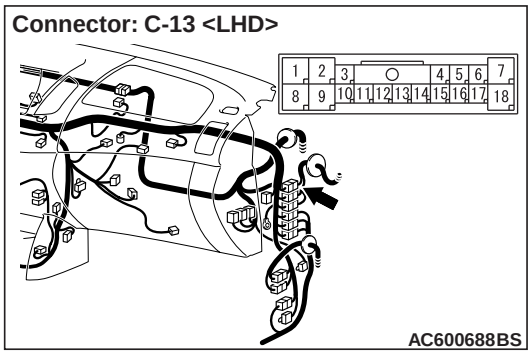
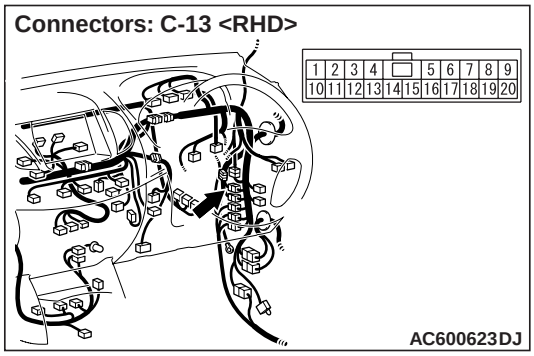
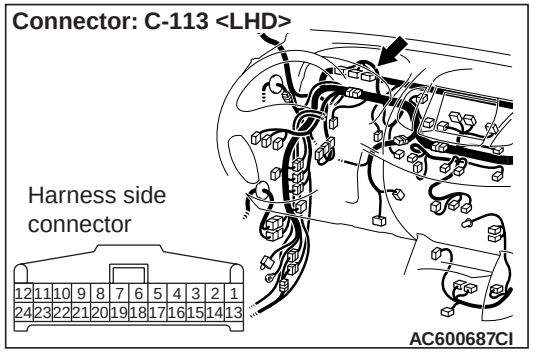
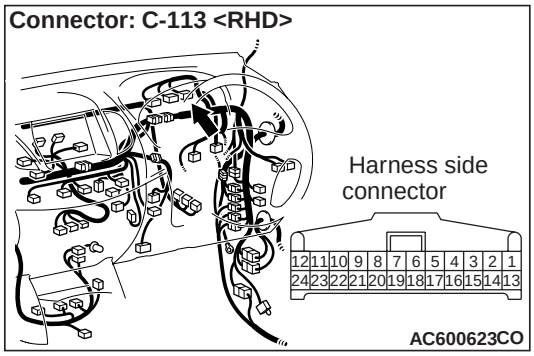










⚠ CAUTION

If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Diagnose the CAN bus lines before the diagnosis codes (Refer to GROUP 54C – CAN Bus Diagnostics Table .).

OPERATION

By the input from the ASTC indicator lamp circuit, ASTC-ECU controls ON/OFF of the ASTC indicator lamp.

COMMENT

This may be caused by faults in wiring harness or connectors between the ASTC-ECU and ASTC indicator lamp, combination meter or ASTC-ECU.

PROBABLE CAUSES

- Malfunction of the combination meter
- Damaged harness, connector
- Malfunction of the hydraulic unit assembly (integrated with ASTC-ECU)

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics

Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?

YES : Go to Step 2.

NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table .). Then go to Step 6.

STEP 2. Connector check: A-48 ASTC-ECU connector, C-13 intermediate connector, C-113 combination meter connector

Q: Is the check result normal?

YES : Go to Step 3.

NO : Repair or replace it. Then go to Step 6.

STEP 3. Check for open circuit in the wiring harness between A-48 ASTC-ECU connector and C-113 combination meter connector.

Check for open circuit in the wiring harness between A-48 ASTC-ECU connector terminal No.22 and C-113 combination meter connector terminal No.33.

Q: Is the check result normal?

YES : Go to Step 4.

NO : Repair the wiring harness between the A-48 ASTC-ECU terminal No.22 and the C-113 combination meter connector terminal No.33. Then go to Step 6.

STEP 4. M.U.T.-III diagnosis code

Q: Is any diagnosis code set?

YES : Refer to Diagnosis Code Chart (Refer to .). Then go to Step 6.

NO : Replace the combination meter assembly (Refer to GROUP 54A, Combination Meter .). Then go to Step 5.

STEP 5. Retest the system

Q: Turn the ignition switch to the "ON" position. Does the ASTC indicator lamp illuminate for three seconds, and then go out after the engine starts?

YES : The procedure is complete.

NO : Replace the hydraulic unit (integrated with ASTC-ECU) (Refer to P.35C-140.). Then go to Step 6.

STEP 6. Retest the system

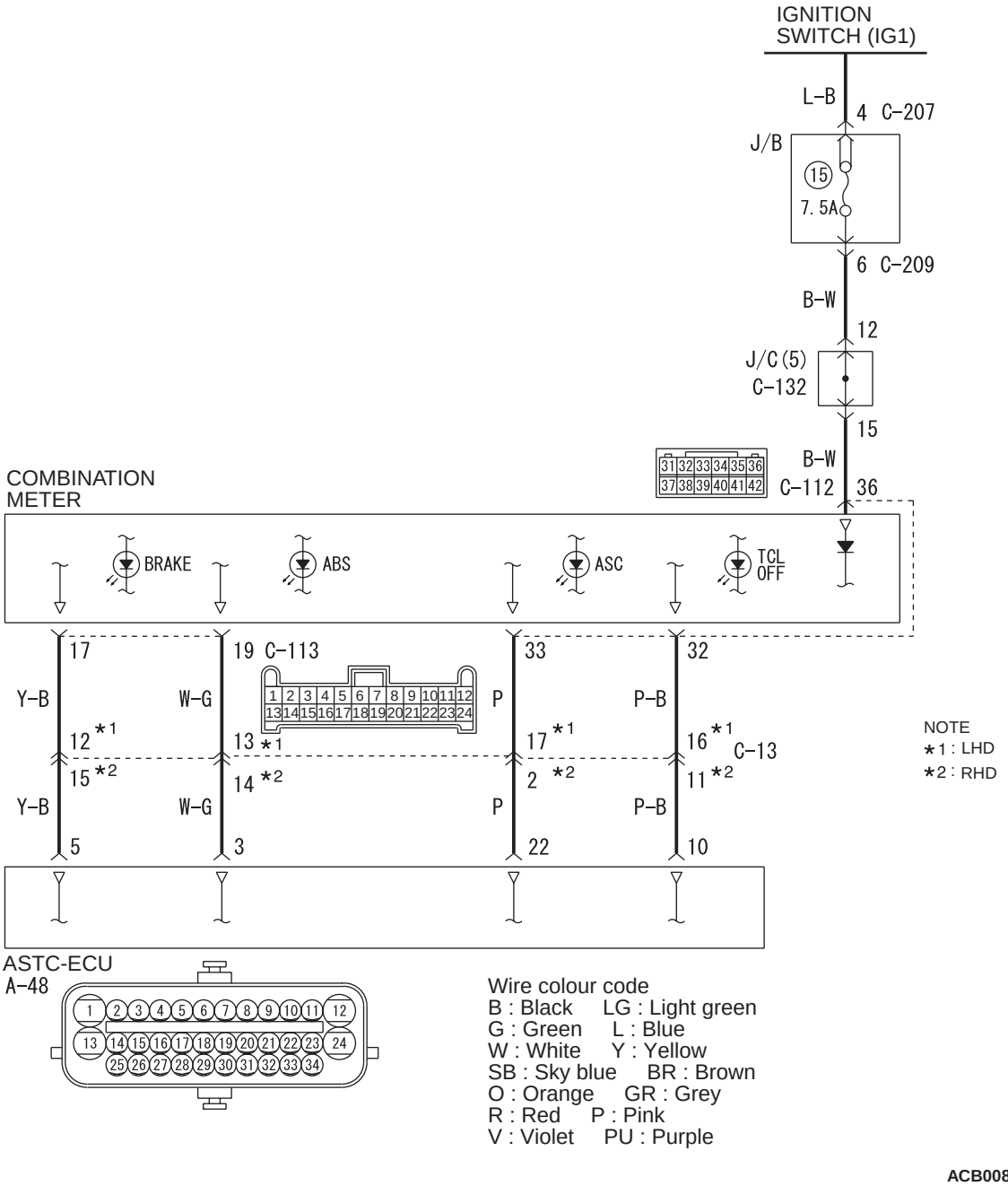
Q: Turn the ignition switch to the "ON" position. Does the ASTC indicator lamp illuminate for three seconds, and then go out after the engine starts?

YES : The procedure is complete.

NO : Return to Step 1.

Inspection Procedure 6: ASTC OFF indicator lamp stays ON after the engine is started.

Combination Meter Circuit



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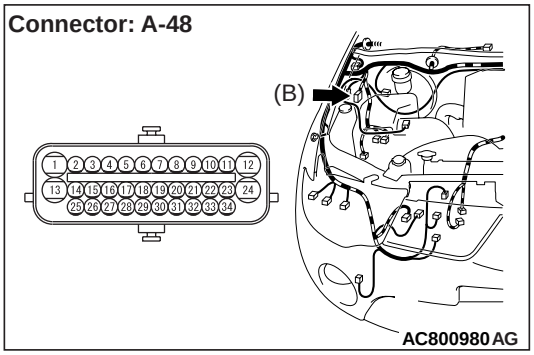
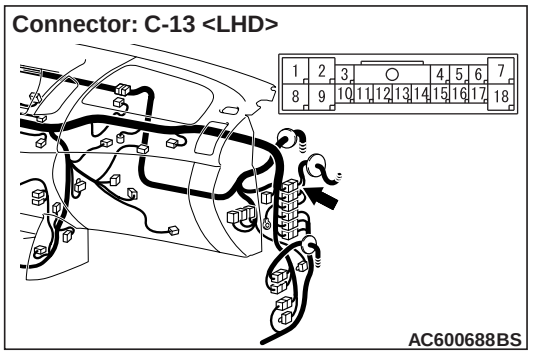
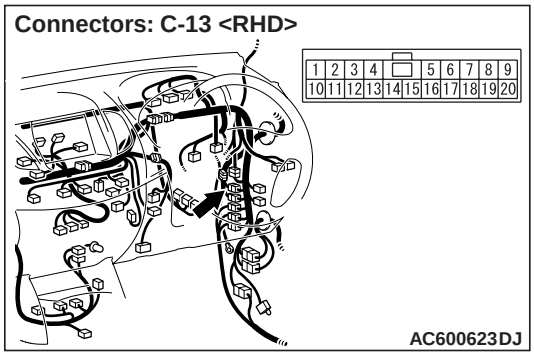
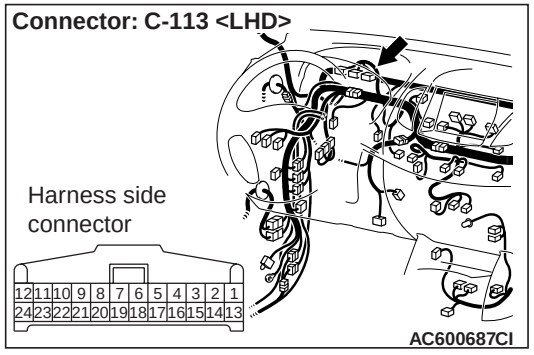
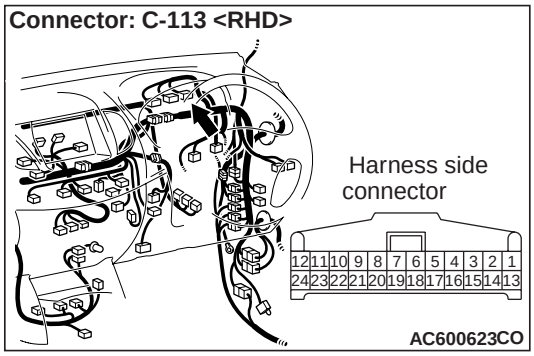










⚠ CAUTION

If there is any problem in the CAN bus lines, an incorrect diagnosis code may be set. Diagnose the CAN bus lines before the diagnosis codes (Refer to GROUP 54C – CAN Bus Diagnostics Table .).

OPERATION

By the input from the ASTC OFF indicator lamp circuit, ASTC-ECU controls ON/OFF of the ASTC indicator lamp.

COMMENT

This may be caused by faults in wiring harness or connectors between the ASTC-ECU and ASTC OFF indicator lamp, combination meter or ASTC-ECU.

PROBABLE CAUSES

- Malfunction of the combination meter
- Damaged harness, connector
- Malfunction of the hydraulic unit assembly (integrated with ASTC-ECU)

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics

Use M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?

YES : Go to Step 2.

NO : Repair the CAN bus lines (Refer to GROUP 54C – CAN Bus Diagnostics Table .). Then go to Step 6.

STEP 2. Connector check: A-48 ASTC-ECU connector, C-13 intermediate connector, C-113 combination meter connector

Q: Is the check result normal?

YES : Go to Step 3.

NO : Repair or replace it. Then go to Step 6.

STEP 3. Check for open circuit in the wiring harness between A-48 ASTC-ECU connector and C-113 combination meter connector.

Check for open circuit in the wiring harness between A-48 ASTC-ECU connector terminal No.10 and C-113 combination meter connector terminal No.32.

Q: Is the check result normal?

YES : Go to Step 4.

NO : Repair the wiring harness between the A-48 ASTC-ECU terminal No.10 and the C-113 combination meter connector terminal No.32. Then go to Step 6.

STEP 4. M.U.T.-III diagnosis code

Q: Is any diagnosis code set?

YES : Refer to Diagnosis Code Chart (Refer to .). Then go to Step 6.

NO : Replace the combination meter assembly (Refer to GROUP 54A, Combination Meter .). Then go to Step 5.

STEP 5. Retest the system

Q: Turn the ignition switch to the "ON" position. Does the ASTC OFF indicator lamp illuminate for three seconds, and then go out after the engine starts?

YES : The procedure is complete.

NO : Replace the hydraulic unit (integrated with ASTC-ECU) (Refer to P.35C-140.). Then go to Step 6.

STEP 6. Retest the system

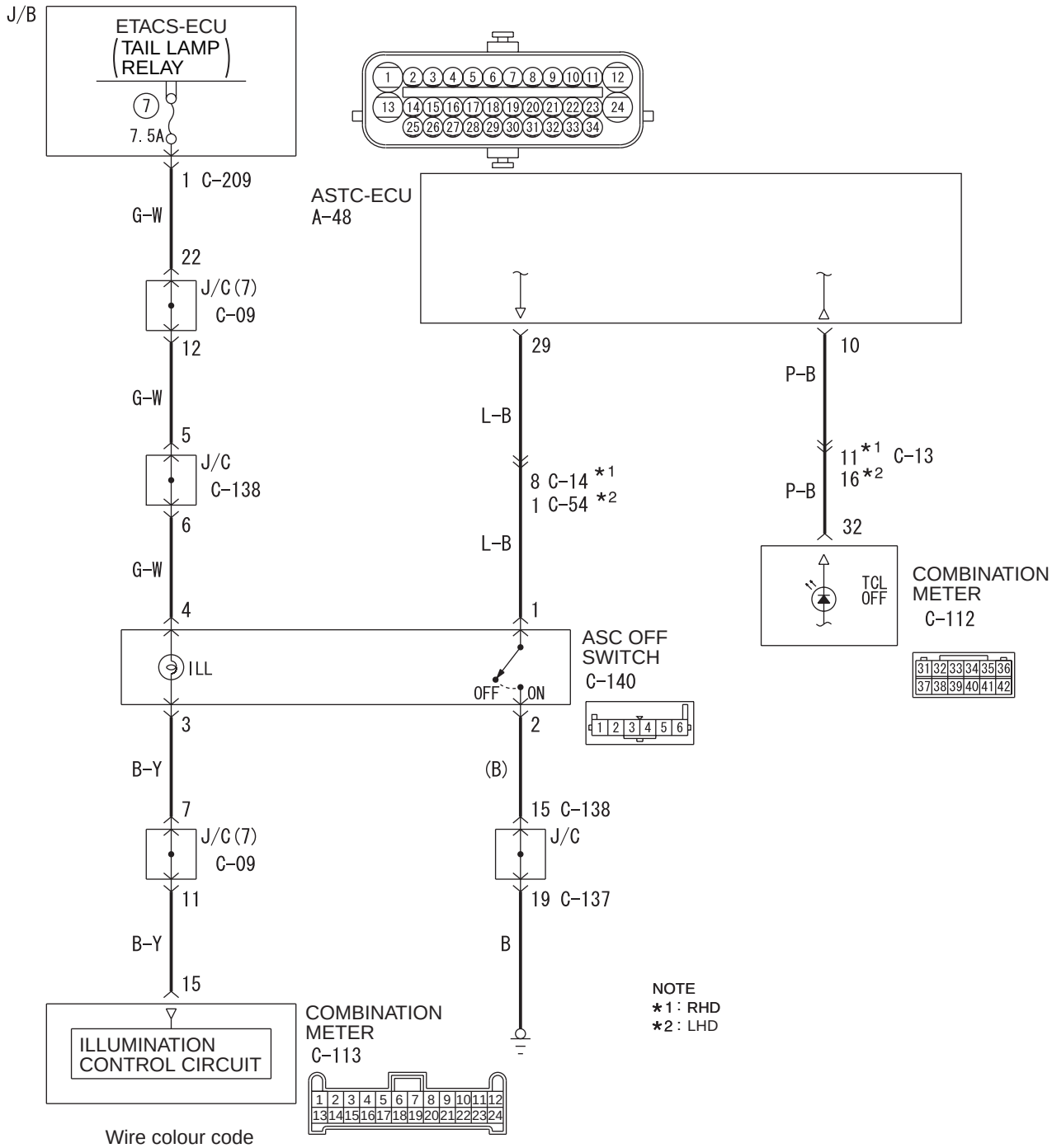
Q: Turn the ignition switch to the "ON" position. Does the ASTC OFF indicator lamp illuminate for three seconds, and then go out after the engine starts?

YES : The procedure is complete.

NO : Return to Step 1.

Inspection Procedure 7: The ASTC system cannot be disabled when ASC OFF switch is pressed to turn the system OFF.

ASC Switch Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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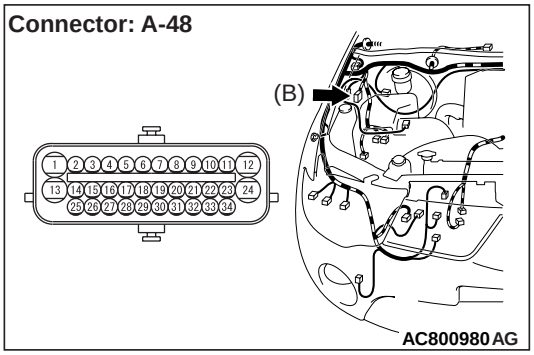
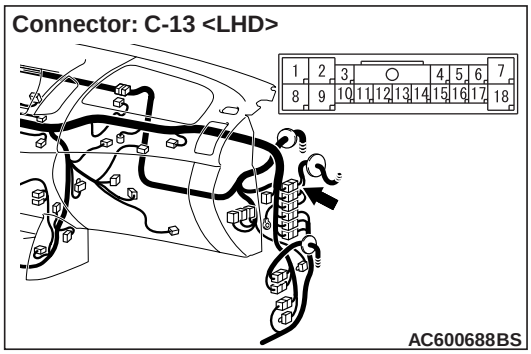
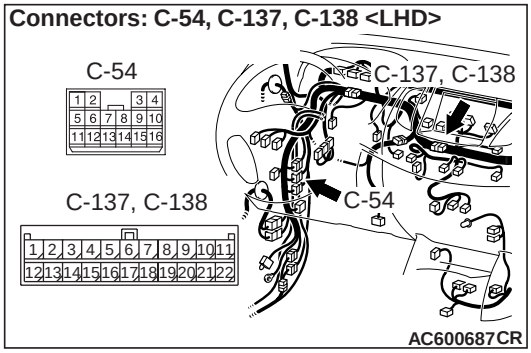
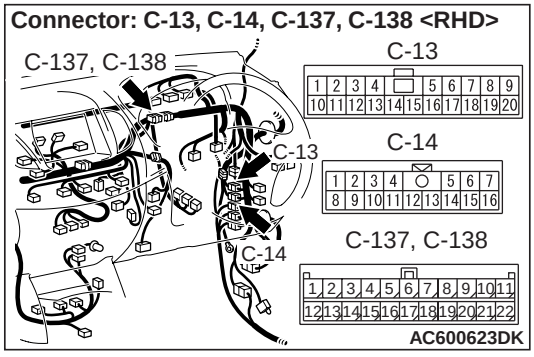
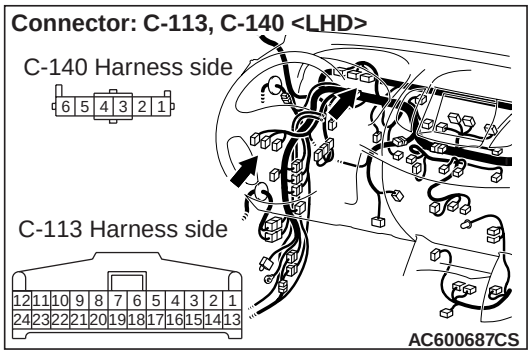
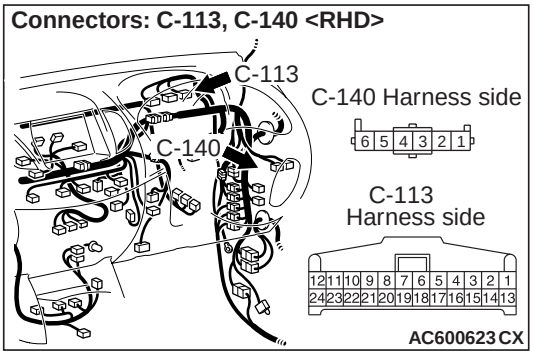












OPERATION

ASTC-ECU terminal No.29 is earthed every time the ASC OFF switch is pressed. ASTC-ECU monitors this operation state and turns the ASC and ATC system ON or OFF.

COMMENT

The cause is probably an open-circuit in the ASC OFF switch circuit.

PROBABLE CAUSES

- Malfunction of the ASC OFF switch
- Damaged harness, connector
- Malfunction of the hydraulic unit assembly (integrated with ASTC-ECU)

DIAGNOSIS PROCEDURE

STEP 1. Connector check: A-48 ASTC-ECU connector, C-13 intermediate connector, C-14 intermediate connector <RHD>, C-54 intermediate connector <LHD>, C-113 combination meter connector, C-137 joint connector, C-138 joint connector, C-140 ASC OFF switch connector

Q: Is the check result normal?

YES : Go to Step 2.

NO : Repair or replace it. Then go to Step 7.

STEP 2. Check the ASC OFF switch.

Refer to P.35C-139.

Q: Is the check result normal?

YES : Go to Step 3.

NO : Replace the ASC OFF switch (Refer to P.35C-139.). Then go to Step 7.

STEP 3. Check for open circuit in the wiring harness between A-48 ASTC-ECU connector and C-140 ASC OFF switch connector.

Check for open circuit in the wiring harness between A-48 ASTC-ECU connector terminal No.29 and C-140 ASC OFF switch connector terminal No.1.

Q: Is the check result normal?

YES : Go to Step 4.

NO : Repair the wiring harness between the A-48 ASTC-ECU terminal No.29 and the C-140 ASC OFF switch connector terminal No.1. Then go to Step 7.

STEP 4. Voltage measurement at A-48 ASTC-ECU connector.

(1) Disconnect the A-48 ASTC-ECU connector.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between the A-48 ASTC-ECU connector terminal No.29.

OK:

- **When the ASC OFF switch is not pressed: System voltage**
- **When the ASC OFF switch is pressed: 1 V or less**

Q: Is the check result normal?

YES : Go to Step 5.

NO : Go to Step 6.

STEP 5. Check for open circuit in the wiring harness between C-140 ASC OFF switch connector and the body earth.

Check for open circuit in the wiring harness between C-140 ASC OFF switch connector terminal No.2 and the body earth.

Q: Is the check result normal?

YES : Go to Step 6.

NO : Repair the wiring harness between the C-140 ASC OFF switch connector terminal No.2 and the body earth. Then go to Step 7.

STEP 6. Retest the system

Q: Does ASC system cancelled, when the ASC OFF switch is push on?

YES : It can be assumed that this malfunction is intermittent. (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction).

NO : Replace the hydraulic unit (integrated with ASTC-ECU) (Refer to P.35C-140.). Then go to Step 7.

STEP 7. Retest the system

Q: Does ASC system cancelled, when the ASC OFF switch is push on?

YES : The procedure is complete.

NO : Return to Step 1.

Inspection Procedure 8: ASTC System dose not operate.

COMMENT

The fail-safe function is probably cancelling ASTC system. In this case, M.U.T.-III can be used to Retest each system by checking the diagnosis codes.

PROBABLE CAUSES

- Malfunction of the CAN bus line.
- Malfunction of the ASTC-ECU.
- Battery voltage low.

DIAGNOSIS

STEP 1. Hydraulic unit check

Refer to P.35C-135.

Q: Is the check result normal?

YES : Go to Step 2.

NO : Connect the brake pipes correctly, repair the external brake lines, or replace the hydraulic unit.

STEP 2. Verify that the condition described by the customer exists.

Q: Can any faults be found with the brake operation?

YES : Check the brake system related components except the ASTC system.

NO : The procedure is complete.

Inspection procedure 9: The initial check sound of hydraulic unit is loud.

⚠ CAUTION

When installing brake tube, match the axial centre of flare nut and brake tube with the centre of hole at the hydraulic unit side, and check that the fluid does not leak.

COMMENT ON TROUBLE SYMPTOM

The operation sound may be decreased by reducing the load at the rubber mount portion of the brake tube and hydraulic unit.

PROBABLE CAUSES

- Improper installation of the hydraulic unit
- Improper installation of the brake tube

DIAGNOSIS PROCEDURE

DRIVING CHECK

(1) Turn the ignition switch from the "LOCK" (OFF) position to the "ON" position.
(2) When vehicle speed reaches 10 km/h, check the operating sound volume and compare it with that of the same model.

OK: The operating sound is the same volume or less by comparing with that of the same model.

Q: Is the check result normal?

YES : This diagnosis is complete.
NO : Carry out adjustment for hydraulic unit installation. (Refer to P.35C-135).

DATA LIST REFERENCE TABLE

M1355001500700

The following items can be read by the M.U.T.-III from the ASTC-ECU input data.

When the system is normal.

Item No.	Check item	Check condition	Normal condition
01	FL wheel speed sensor	Perform a test run of the vehicle	Speedometer display and M.U.T.-III display almost agree with each other.
02	FR wheel speed sensor		
03	RL wheel speed sensor		
04	RR wheel speed sensor		
05	Power supply voltage	Always	System voltage
08	Lateral G sensor	Vehicle is stopped (on a level surface)	0 m/s^2
		Vehicle is running	-14.7 – 14.7 m/s^2
09	G-sensor	Vehicle is stopped (on a level surface)	0 m/s^2
		Vehicle is running	-14.7 – 14.7 m/s^2
10	Master cylinder pressure		-10 – 30 MPa
11	Steering angle		-900 – 900 deg
12	Yaw rate sensor		-130 – 130 deg/s
13	Stop lamp switch	The brake pedal is depressed	ON
		The brake pedal is released	OFF
28	TCL off switch	TCL off switch: ON	ON
		TCL off switch: OFF	OFF
40	Under Cranking	Engine cranking	YES
		Not engine cranking	NO
57	Lateral G sensor without Cal.		-20 to 20 m/s^2

Item No.	Check item	Check condition	Normal condition
58	G-sensor without Cal.		-20 to 20 m/s^2
61	ASC disable state	ASC switch: ON	Disable
		ASC switch: OFF	Enable
63*	Rear diff lock switch	When rear differential lock switch is ON	ON
		When rear differential lock switch is OFF	OFF
64	Sum of ASC disable state		–

*NOTE: *:Vehicles with rear differential lock*

When the ASTC-ECU shut off ABS operation.
When the diagnosis system stops the ASTC-ECU, the M.U.T.-III display data will be unreliable.

ACTUATOR TEST TABLE

M1355001600280

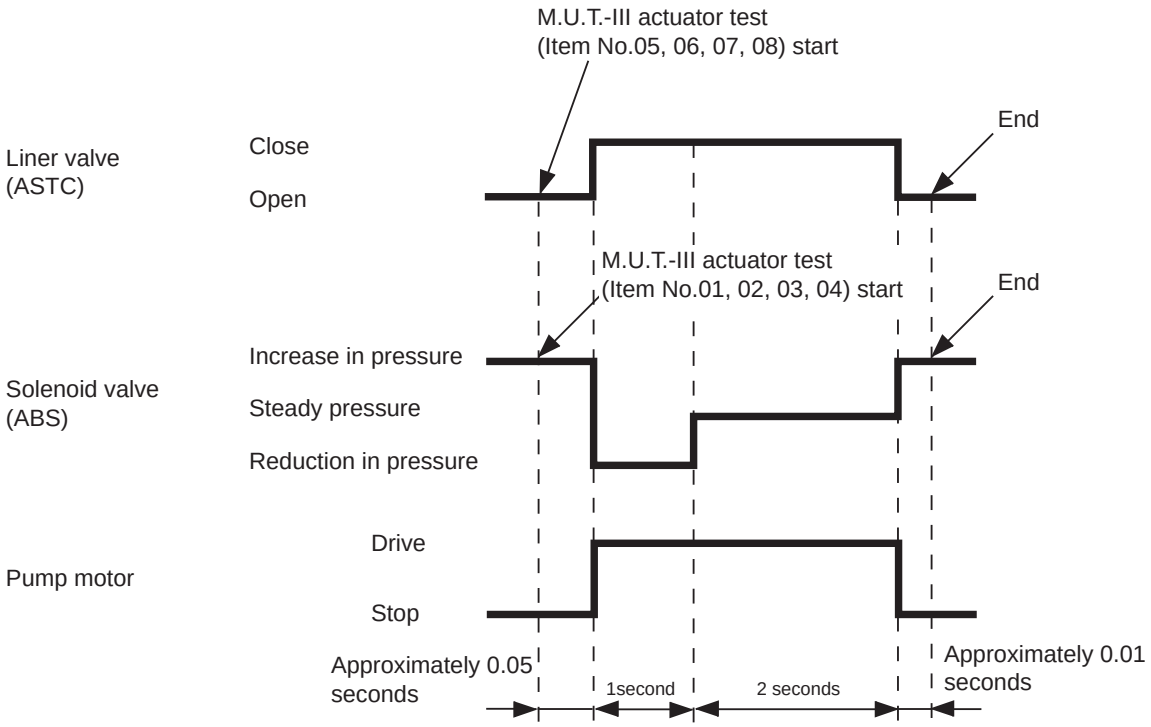
Using M.U.T.-III, the following actuators can be forcibly operated:

NOTE:
- *ABS and ASTC are operated by ASTC-ECU.*
- *When ASTC-ECU is disabled due to the fail-safe function, the actuator test cannot be performed.*
- *The actuator test can be performed only when the vehicle is stationary.*
- *While the actuator test is performed, the ABS warning lamp flashes at a rate of 2 Hz.*
- *After the actuator test has been performed, the brake warning lamp, ABS warning lamp, ASTC indicator lamp, and ASTC OFF indicator lamp illuminate until the ignition switch is turned to ON again or the communication between M.U.T.-III and ASTC-ECU is terminated.*

Actuator test specifications

Item No.	Check item	Driven component
01	FL wheel ABS drive	Solenoid valve for the corresponding channel of the hydraulic unit and pump motor (simplified inspection mode)
02	FR wheel ABS drive	
03	RL wheel ABS drive	
04	RR wheel ABS drive	
05	FL wheel TCL drive	
06	FR wheel TCL drive	
07	RL wheel TCL drive	
08	RR wheel TCL drive	
09	Engine TCL Drive	Outputs the engine torque control signal (engine torque = 0 N·m) to the engine ECU for three seconds.

Operation pattern of items 01 to 08



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CHECK AT ASTC-ECU

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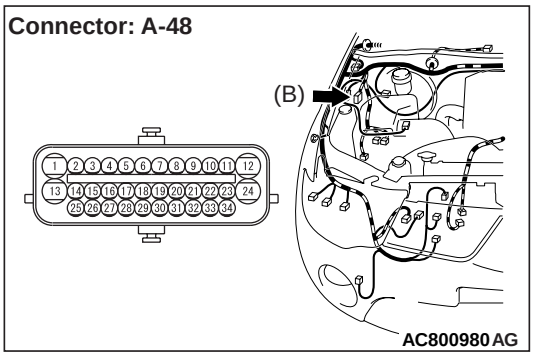
TERMINAL VOLTAGE CHECK CHART



1. Disconnect the ASTC-ECU connector A-48, and measure the voltages between terminal No.12 and each terminal other than terminal No.24 as well as between terminal No.12 and each terminal other than terminal No.24.
2. The terminal layouts are shown in the illustrations below.

NOTE: Do not measure terminal voltage for approximately three seconds after the ignition switch is turned "ON." The ASTC-ECU performs the initial check during that period.

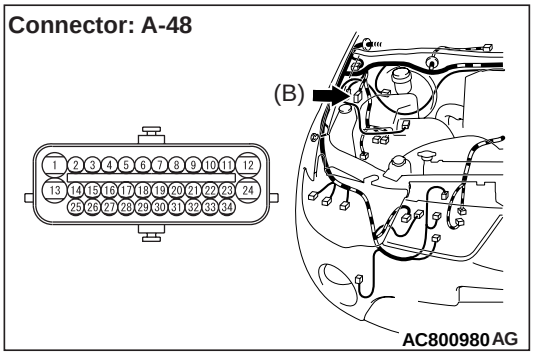
Terminal No.	Check item	Checking requirements	Normal condition
1	Solenoid valve power supply	Always	Battery voltage
3	ABS warning lamp output	Ignition switch: "ON" (When ABS warning lamp is ON.)	1 V or less
		Ignition switch: "ON" (When ABS warning lamp is OFF.)	Approximately system voltage

Terminal No.	Check item	Checking requirements		Normal condition
5	Brake warning lamp output	Ignition switch: "ON" (When brake warning lamp is ON.)		1 V or less
		Ignition switch: "ON" (When the brake warning lamp is OFF, the brake fluid level is normal and the parking brake is "OFF" position.)		Approximately system voltage
7	Wheel speed sensor (FR) power supply	Ignition switch: "ON"		Approximately system voltage
9	Wheel speed sensor (RL) power supply	Ignition switch: "ON"		Approximately system voltage
10	ASC OFF lamp output	Ignition switch: "ON" (When ASC OFF switch is not pushed.)		1 V or less
		Ignition switch: "ON" (When ASC OFF switch is pushed.)		Approximately system voltage
13	Motor power supply	Always		Battery voltage
19	Wheel speed sensor (FL) power supply	Ignition switch: "ON"		Approximately system voltage
21	Wheel speed sensor (RR) power supply	Ignition switch: "ON"		Approximately system voltage
22	ASC warning lamp output	Ignition switch: "ON" (When ASC warning lamp is ON.)		1 V or less
		Ignition switch: "ON" (When ASC warning lamp is OFF.)		Approximately system voltage
25	ASTC-ECU power supply	Ignition switch: "ON"		Battery voltage
		Ignition switch: "OFF"		1 V or less
26	Stop lamp switch input	Ignition switch: "ON"	Stop lamp switch: "ON"	Approximately system voltage
			Stop lamp switch: "OFF"	1 V or less
29	ASC switch output	Ignition switch: "ON"	When the ASC OFF switch is not pushed (Not being operated)	Approximately system voltage
			When the ASC OFF switch is pushed (being operated)	1 V or less
30*1	Rear differential lock detection switch input	Rear differential lock detection switch: "OFF"		Approximately system voltage
		Rear differential lock detection switch: "ON"		1 V or less
32*2	Back-up lamp switch input	Ignition switch: "ON"	Shift lever: Other than reverse position	Approximately system voltage
			Shift lever: Reverse position	1 V or less

NOTE:

- **1: Vehicles with rear differential lock*
- **2: Vehicles for M/T only*

RESISTANCE AND CONTINUITY BETWEEN HARNESS-SIDE CONNECTOR TERMINALS



1. Disconnect the A-48 ASTC-ECU connector.
2. Measure the resistance and continuity between the terminals indicated in the table below.

Terminal No.	Signal	Normal condition
12 to body earth	Earth	Continuity exists (2 Ω or less)
24 to body earth	Earth	Continuity exists (2 Ω or less)

ON-VEHICLE SERVICE

WHEEL SPEED SENSOR OUTPUT CURRENT MEASUREMENT

M1355027300104

Refer to GROUP 35B – Wheel Speed Sensor Output Current Measurement .

HYDRAULIC UNIT CHECK

M1355006100075

⚠ CAUTION

- **The roller of the braking force tester and the tyre should be dry during testing.**
- **When testing the front brakes, apply the parking brake. When testing the rear brakes, stop the front wheels with chocks.**

1. Jack up the vehicle. Then support the vehicle with rigid racks at the specified jack-up points or place the front or rear wheels on the rollers of the braking force tester.
2. Release the parking brake, and feel the drag force (drag torque) on each road wheel. When using the braking force tester, take a reading of the brake drag force.

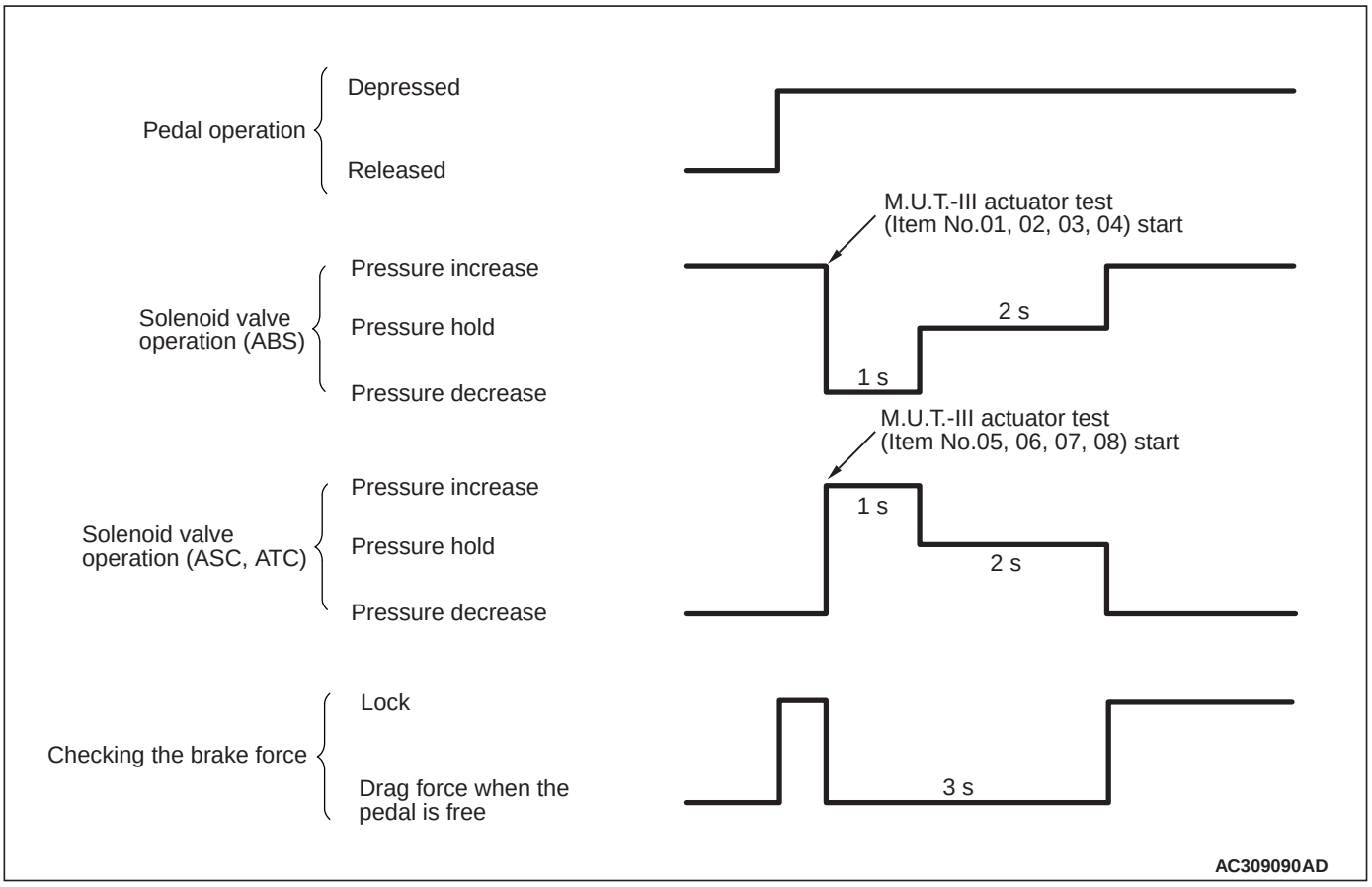
⚠ CAUTION

Before connecting or disconnecting the M.U.T.-III, turn the ignition switch to the "LOCK" (OFF) position.

3. Connect M.U.T.-III to the diagnosis connector.
4. After checking that the selector lever is in "P" range, start the engine.
5. Select "Interactive Diagnosis" from the start-up screen.
6. Select "System Select."
7. Choose "ABS/ASC/ASTC" from the "CHASSIS" tab.
8. Select "Actuator Test" from "ABS/ASC/ASTC" screen.
9. Choose an appropriate item for hydraulic unit check.

   NOTE: The ASTC system will switch to the M.U.T.-III mode and the ABS warning lamp, ASTC indicator lamp and ASTC OFF indicator lamp will illuminates.

   NOTE: When the ABS and ASTC has been interrupted by the fail-safe function, M.U.T.-III actuator testing cannot be used.



10. Turn the wheel by hand and check the change in braking force when the brake pedal is depressed. When using the braking force tester, depress the brake pedal until the braking force is at the following values, and check that the braking force changes to the brake drag force reading taken in step 2 when the actuator is force-driven. The result should be as shown in the diagram above.

Front wheel	785 – 981 N
Rear wheel	588 – 784 N

11. If the result of inspection is abnormal, repair according to the Diagnosis Table below.

Diagnosis Table					
M.U.T.-III Display	**Operation**	**Inspection result**	**Judgement**	**Probable cause**	**Remedy**
01 FL wheel ABS drive 02 FR wheel ABS drive 03 RL wheel ABS drive 04 RR wheel ABS drive	• Depress brake pedal to lock wheel. • Using M.U.T.-III, select the wheel to be checked and force the actuator to operate. • Turn the selected wheel manually to check the change of brake force.	Brake force is released for three seconds after wheels have been locked.	Normal	–	–
		Wheel does not lock when brake pedal is depressed.	Abnormal	Clogged brake line other than hydraulic unit	Check and clean brake line
				Clogged hydraulic circuit in hydraulic unit	Replace hydraulic unit assembly
		Brake force is not released		Incorrect hydraulic unit brake tube connection	Connect correctly
				Hydraulic unit solenoid valve not functioning correctly	Replace hydraulic unit assembly
05 FL wheel TCL drive 06 FR wheel TCL drive 07 RL wheel TCL drive 08 RR wheel TCL drive	• Using M.U.T.-III, select the wheel to be checked and force the actuator to operate. • Turn the selected wheel manually to check the change of brake force.	The wheel is locked for three seconds from the state without braking force.	Normal	–	–
		The wheel is not locked.	Abnormal	• Incorrect hydraulic unit brake tube connection • Clogged brake line other than hydraulic unit	Check and clean brake line
				Clogged hydraulic circuit in hydraulic unit	Replace hydraulic unit assembly

12. After inspection, disconnect M.U.T.-III immediately after turning the ignition switch to the "LOCK" (OFF) position.

Hydraulic unit installation adjustment

Refer to P.35C-140.

1. Operate the pre-removal steps for the hydraulic unit.
2. Remove all brake tubes.
3. Remove the protector.
4. Loosen the mounting bolt and nut of the hydraulic unit bracket.
5. Install all brake tubes temporarily.
6. Shake hydraulic unit to all directions with both hands to make the hydraulic unit bracket insulator fit with the unit.

7. Install the the hydraulic unit bracket with mounting bolt and nut not to load the brake tube.
8. Install the protector.
9. Install all brake tubes securely.

   NOTE: Install the flare nut taking care not to let the brake tube turn together.
10. Operate the post-installation steps of the hydraulic unit.

IN THE EVENT OF A DISCHARGED BATTERY

M1355006200072

⚠ ***WARNING***

If the ABS is not operating, the vehicle will be unstable during braking, Do not drive the vehicle with the ASTC-ECU connector disconnected or with the ASC/ATC not operating for any other reason.

If the engine is started using a booster cable when the battery is completely flat, and the vehicle is then driven without waiting for the battery to be recharged, the engine may misfire and it may not be possible to drive the vehicle. This is because the ABS consumes a large amount of current when carrying out its initial checks. If this happens, recharge the battery fully.

G AND YAW RATE SENSOR CALIBRATION

M1355009300078

⚠ **CAUTION**

If the work below is done, finally calibrate the G and yaw rate sensor. This is necessary because the ASTC-ECU should update the G and yaw rate sensor neutral point.

- **G and yaw rate sensor replacement**
- **ASTC-ECU replacement**

1. Park the vehicle on a level surface.

⚠ **CAUTION**

Before connecting or disconnecting the M.U.T.-III, turn the ignition switch to the "LOCK" (OFF) position.

2. Connect M.U.T.-III to the diagnosis connector.
3. Turn the ignition switch to the "ON" position.
4. Select "System Select".
5. Select "ABS/ASC/ASTC/WSS".
6. Select "Special function".
7. Select "Lateral G Sensor Calibration".
8. Turn the ignition switch to the "LOCK" (OFF) position.
9. Disconnect M.U.T.-III.

STEERING WHEEL SENSOR CALIBRATION

M1355009200071

⚠ **CAUTION**

If the work below is done, finally calibrate the steering wheel sensor. This is necessary because the ASTC-ECU should update the steering wheel sensor neutral point.

- **Front alignment adjustment**
- **Steering wheel sensor removal and installation**

1. Park the vehicle on a level surface.

⚠ **CAUTION**

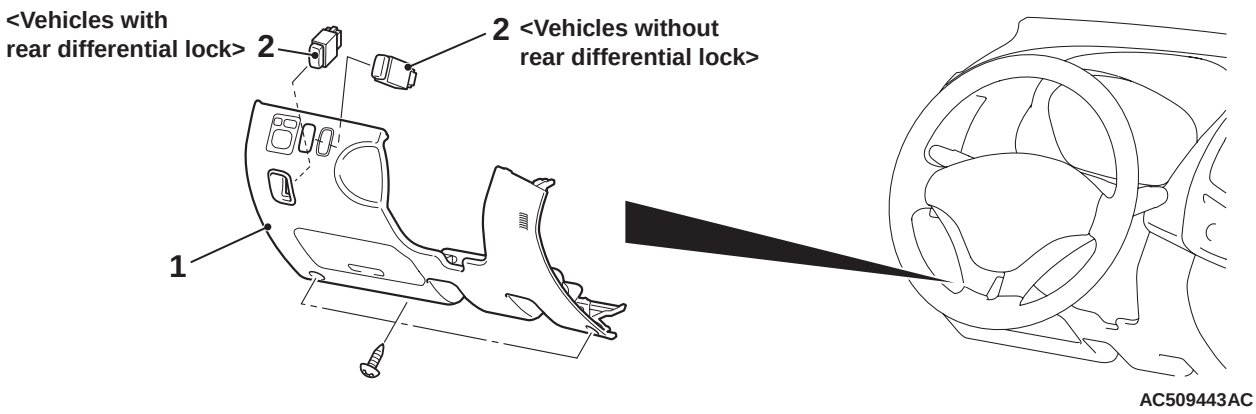
Before connecting or disconnecting the M.U.T.-III, turn the ignition switch to the "LOCK" (OFF) position.

2. Connect M.U.T.-III to the diagnosis connector.
3. Turn the ignition switch to the "ON" position.
4. Select "System Select".
5. Select "Steering angle sensor".
6. Select "Special function".
7. Select "SAS Calibration".
8. Turn the ignition switch to the "LOCK" (OFF) position.
9. Disconnect M.U.T.-III.

ASC SWITCH

REMOVAL AND INSTALLATION

M1353006900042



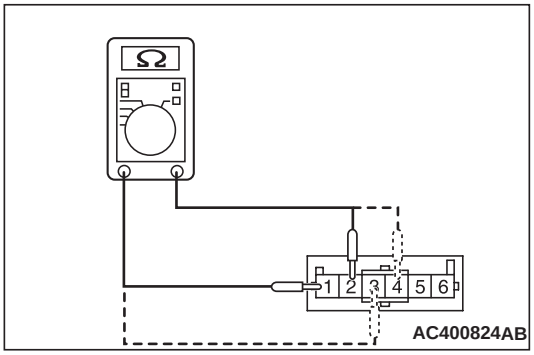
Removal steps

1. Lower panel assembly (Refer to GROUP 52A, Instrument panel assembly).
2. ASC switch

INSPECTION

M1353007100027

ASC SWITCH CONTINUITY CHECK



1. As shown in the figure, connect the circuit tester to the ASC switch as a single unit.
2. Check the continuity status when the ASC switch is pressed and when the switch is released.

Item	When the ASC switch is released (Not being operated)	When the ASC switch is pressed
Continuity between terminal No. 1 and No. 2	No continuity	Continuity exists (2 Ω or less)
Continuity between terminal No. 3 and No. 4	Continuity exists	Continuity exists

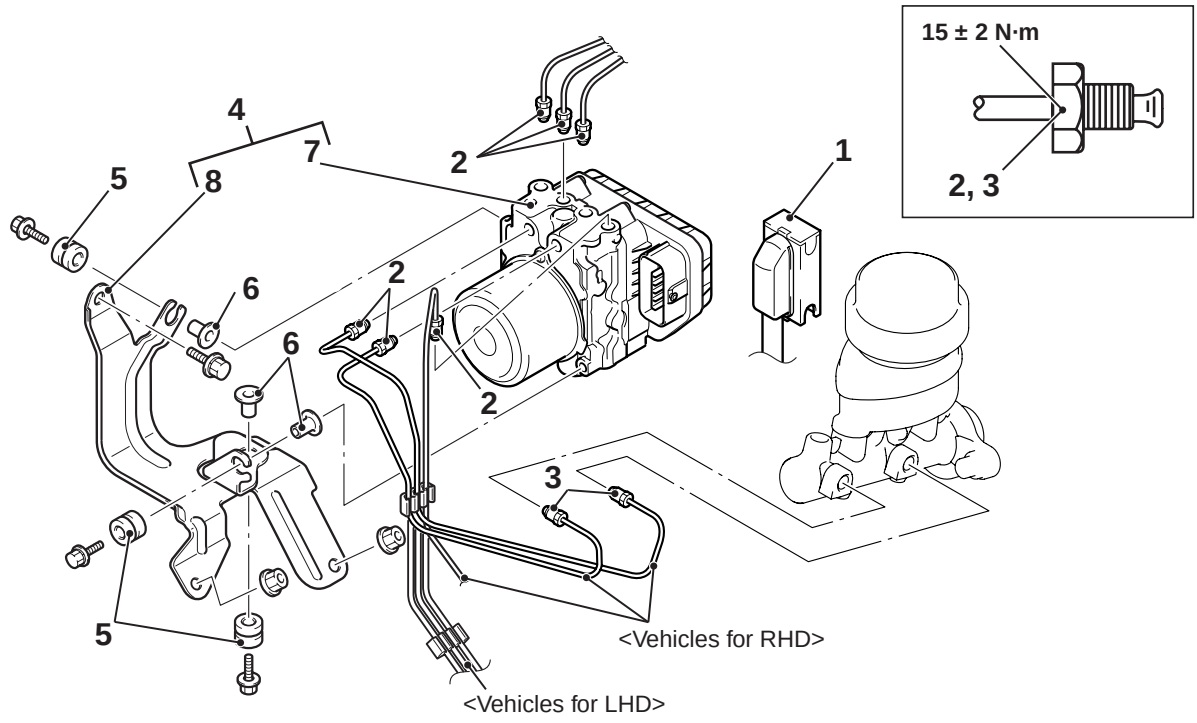
HYDRAULIC UNIT

REMOVAL AND INSTALLATION

M1355005600862

NOTE: The ASTC-ECU is integrated in the hydraulic unit.

Pre-removal Operation	Post-installation Operation
• Brake Fluid Draining • Battery removal <LHD> • Air cleaner removal (Refer to GROUP 15, Air Cleaner .)	• Brake Fluid Filling • Air cleaner installation (Refer to GROUP 15, Air Cleaner .) • Battery installation <LHD> • Brake Line Bleeding (Refer to GROUP 35A, On-vehicle Service – Bleeding .) • Hydraulic Unit Check (Refer to .)



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Removal steps

1. Harness connector
>>**A**<< 2. Brake pipe and hydraulic unit assembly connection
3. Brake pipe and master cylinder connection <RHD>
4. Hydraulic unit assembly and hydraulic unit bracket assembly
5. Insulator
6. Collar
<<**A**>> 7. Hydraulic unit assembly (integrated with ASTC-ECU)
8. Hydraulic unit bracket assembly

REMOVAL SERVICE POINT

<<A>> HYDRAULIC UNIT ASSEMBLY (INTEGRATED WITH ASTC-ECU) REMOVAL

⚠ ***WARNING***

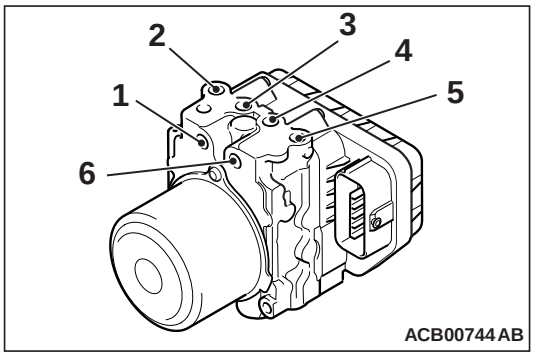
The hydraulic unit is heavy. Use care when removing it.

⚠ **CAUTION**

- **The hydraulic unit cannot be disassembled. Never loosen its nuts or bolts.**
- **Do not drop or shock the hydraulic unit.**
- **Do not turn the hydraulic unit upside down or lay it on its side.**

INSTALLATION SERVICE POINT

>>A<< BRAKE PIPE CONNECTION



Connect the pipes to the hydraulic unit assembly as shown in the illustration.

1. From the master cylinder (primary)
2. To the front brake (LH)
3. To the rear brake (RH)
4. To the rear brake (LH)
5. To the front brake (RH)
6. From the master cylinder (secondary)

WHEEL SPEED SENSOR

REMOVAL AND INSTALLATION

M1355005300087

Refer to GROUP 35B, Wheel Speed Sensor .

WHEEL SPEED SENSOR INSPECTION

M1355005400017

Refer to GROUP 35B, Wheel Speed Sensor Inspection .

G AND YAW RATE SENSOR

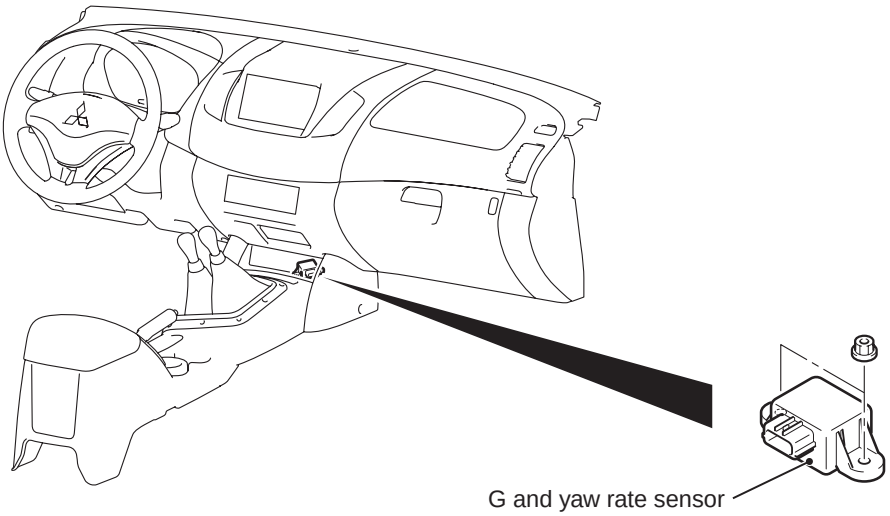
REMOVAL AND INSTALLATION

M1355004500442

⚠ CAUTION

- **Do not drop or shock the G and yaw rate sensor.**
- **Always carry out calibration (Refer to P.35C-138) if G and yaw rate sensor is replaced. This is necessary because the ASTC-ECU should update the G and yaw late sensor neutral point.**

Pre-removal and Post-installation Operation
- Rear Floor Console Assembly Removal and Installation (Refer to GROUP 52A, Rear Floor Console Assembly .)
- Front Floor Console Assembly Removal and Installation (Refer to GROUP 52A, Font Floor Console Assembly .)



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STEERING WHEEL SENSOR

REMOVAL AND INSTALLATION

M1355005100522

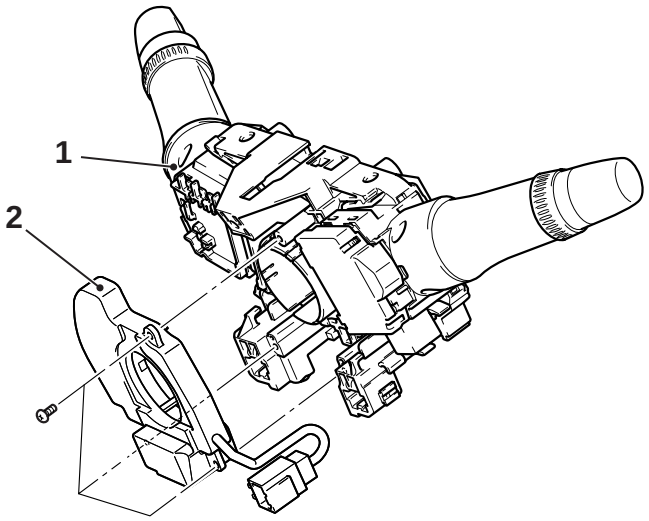
⚠ *WARNING*

Before removing the steering wheel and air bag module assembly, refer to GROUP 52B, Service Precautions and Air Bag Module and Clock Spring .

⚠ CAUTION

- **Because the steering wheel sensor may be damaged, be sure to align the centre of the clock spring before installing the steering wheel sensor.**
- **If the centre of the clock spring is not correctly aligned, the steering wheel may not be turned fully or the cable inside the clock spring may be broken, causing the SRS air bag to be inoperative or operated incorrectly.**
- **When the steering wheel sensor is replaced or installed, always carry out calibration to make ASC-ECU learn the neutral point (Refer to P.35C-138).**

Pre-removal and Post-installation Operation
Steering Wheel and Air Bag Module Assembly Removal and Installation (Refer to GROUP 37 – Steering Wheel).



ACA02951AG

Removal steps

- Turn the front wheels to the straight-ahead position.

1. Column switch assembly (Refer to GROUP 54A – Ignition Switch).

<<A>> 2. Steering wheel sensor

REMOVAL SERVICE POINT

<<A>> STEERING WHEEL SENSOR REMOVAL

⚠ CAUTION

After removing the steering wheel sensor, do not rotate the sensor rotating part.

GROUP 36

PARKING BRAKES

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PARKING BRAKE REAR CABLE AND LEVER ASSEMBLY <Vehicles with front bench seat> 36-10

PARKING BRAKE REAR CABLE AND LEVER ASSEMBLY REMOVAL AND INSTALLATION 36-10

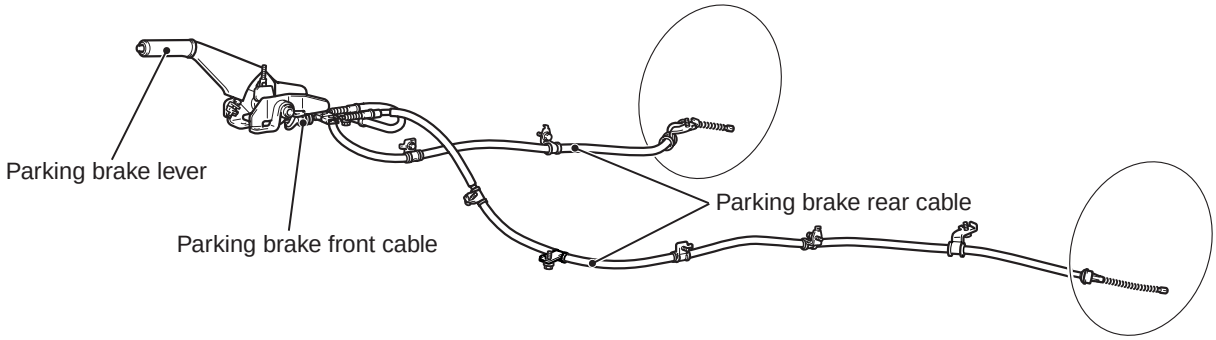
GENERAL INFORMATION

M1361000100612

- The parking brake is a mechanical rear-wheel acting type, and its operation utilizes a parking brake lever. <Vehicles with front separate seat>
- The parking brake is a mechanical rear-wheel acting type, and its operation utilizes a parking brake pull rod. <Vehicles with front bench seat>

CONSTRUCTION DIAGRAM

Vehicles with front separate seat



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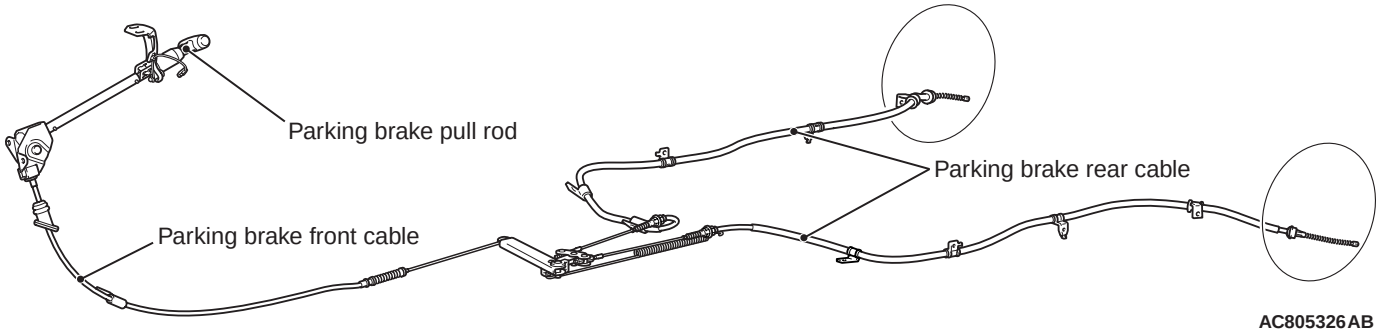
Vehicles with front bench seat

<LHD>



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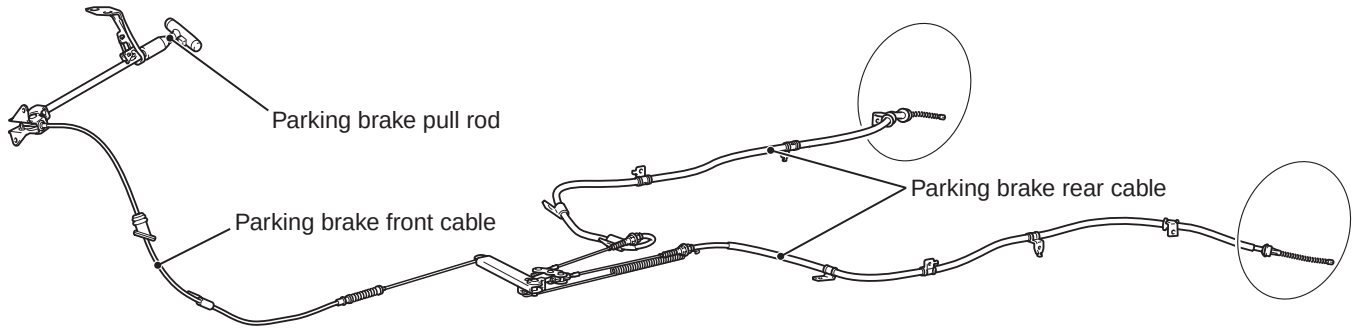
<RHD>



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SERVICE SPECIFICATIONS

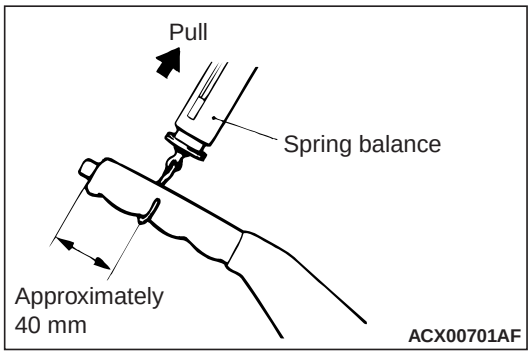
M1361000300939

Item	Standard value	Limit
Parking brake lever stroke (Operation force: approximately 200 N)	8 – 9 notches	–
Parking brake pull rod stroke (Operation force: approximately 200 N)	11 – 13 notches	–

ON-VEHICLE SERVICE

PARKING BRAKE LEVER STROKE CHECK AND ADJUSTMENT <VEHICLES WITH FRONT SEPARATE SEAT>

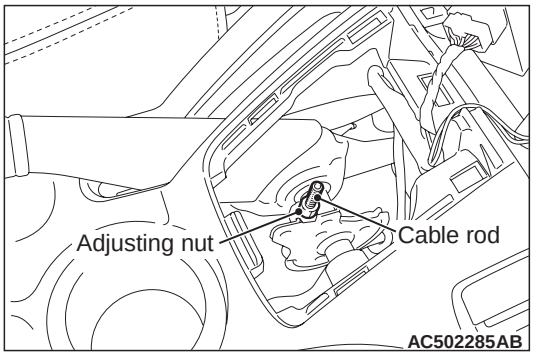
M1361000901127



1. Attach the spring scale to the centre of the parking brake lever grip. Then, check that the stroke is within the standard value when the parking brake lever is pulled to the vertical direction of the lever with a force of approximately 200 N.

   Standard value: 8 – 9 notches

2. If the parking brake lever stroke is not the standard value, adjust as described below.
   (1) Remove the service panel (Refer to GROUP 52A – Rear Floor Console Assembly).



   (2) Loosen the adjuster to move it to the cable rod end so that the cable will be free.
   (3) Turn the ignition switch to "ON" position, and start the engine.
   (4) Repeatedly depress the brake pedal until the pedal stroke no longer changes with the engine running.

   NOTE: If the pedal stroke stops changing, the automatic-adjustment mechanism is functioning normally, and the clearance between the shoe and drum is correct.

   (5) Turn the ignition switch to "OFF" position, and stop the engine.

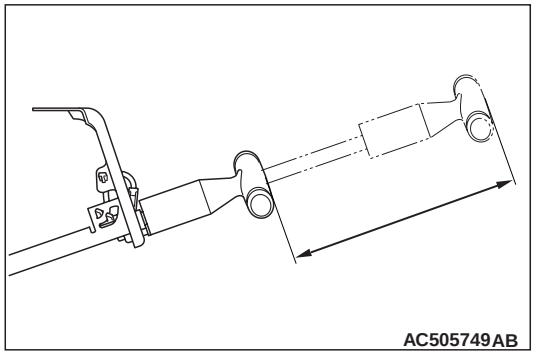
⚠ CAUTION

If the parking brake lever stroke is below the standard value and the braking is too firm, the rear brakes may drag.

   (6) Turn the adjuster to adjust the parking brake lever stroke to the standard value. After adjusting, check that there is no space between the adjuster and the parking brake lever. Check that the adjuster is secured with the adjuster holder.
   (7) After adjusting the parking brake lever stroke, jack up the rear end of the vehicle, and then release the parking brake and turn the rear wheels to check that the rear brakes are not dragging.

PARKING BRAKE PULL ROD STROKE ADJUSTMENT <VEHICLES WITH FRONT BENCH SEAT>

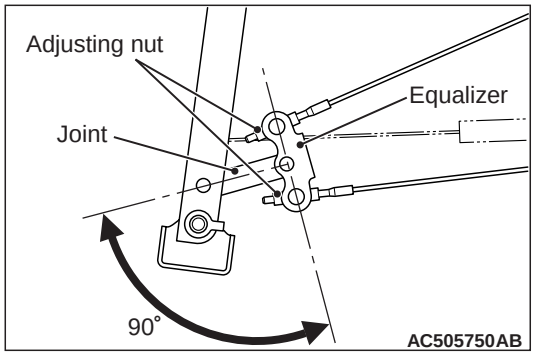
M1361005700040



1. Pull the parking brake pull rod with a force of approximately 200 N and count the number of notches.

   Standard value: 11 – 13 notches

2. If the parking brake pull rod stroke is not the standard value, adjust as described below.



   (1) Loosen the adjusting nut to move it to the cable rod end so that the cable will be free.

(2) Turn the ignition switch to "ON" position, and start the engine.
(3) Repeatedly depress the brake pedal until the pedal stroke no longer changes with the engine running.

NOTE: Depressing the brake pedal repeatedly adjusts shoe clearance correctly.

(4) Turn the ignition switch to "OFF" position, and stop the engine.

⚠ CAUTION

If the parking brake pull rod stroke is below the standard value and the braking is too firm, the rear brakes may drag.

(5) Adjust with the adjusting nut so that the joint and the equalizer are vertical as shown in the figure.
(6) After adjusting the parking brake pull rod stroke, jack up the rear end of the vehicle, and then release the parking brake and turn the rear wheels to check that the rear brakes are not dragging.

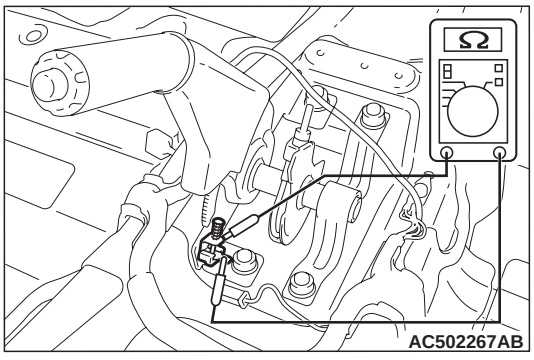
PARKING BRAKE SWITCH CHECK <VEHICLES WITH FRONT SEPARATE SEAT>

M1361003300745

⚠ CAUTION

Do not apply grease or lubricant to the switch and the switch installation section to avoid malfunction of the switch. In addition, do not use gloves which have grease on them.

1. Remove the rear floor console assembly (Refer to GROUP 52A – Rear Floor Console Assembly).



2. Check for continuity between the parking brake switch terminal and the switch mounting bolt.

Check condition	Normal condition
When parking brake lever is pulled.	Continuity exists (2 Ω or less)
When parking brake lever is released.	Open circuit

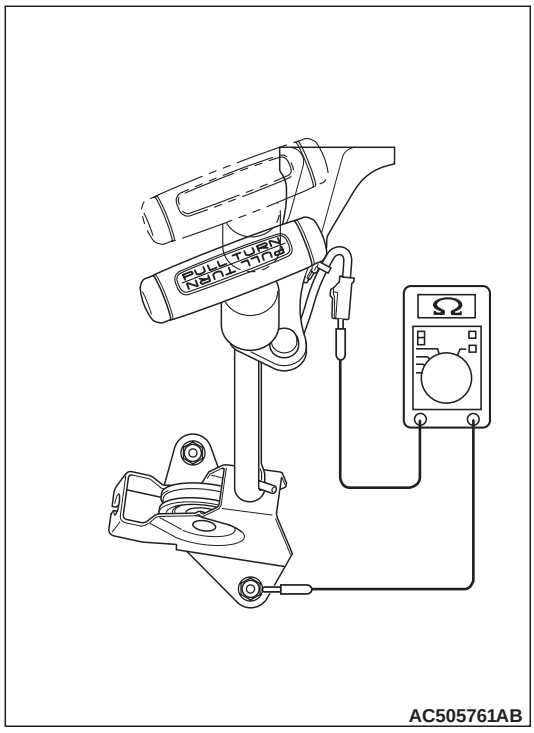
PARKING BRAKE SWITCH CHECK <VEHICLES WITH FRONT BENCH SEAT>

M1361003300734

⚠ CAUTION

Do not apply grease or lubricant to the switch and the switch installation section to avoid malfunction of the switch. In addition, do not use gloves which have grease on them.

1. Remove the lower panel assembly (Refer to GROUP 52A – Instrument Panel Assembly).



2. Check for continuity between the parking brake switch terminal and the switch mounting nut.

Check condition	Normal condition
When parking brake pull rod is pulled.	Continuity exists (2 Ω or less)
When parking brake pull rod is released.	Open circuit

PARKING BRAKE LEVER <Vehicles with front separate seat>

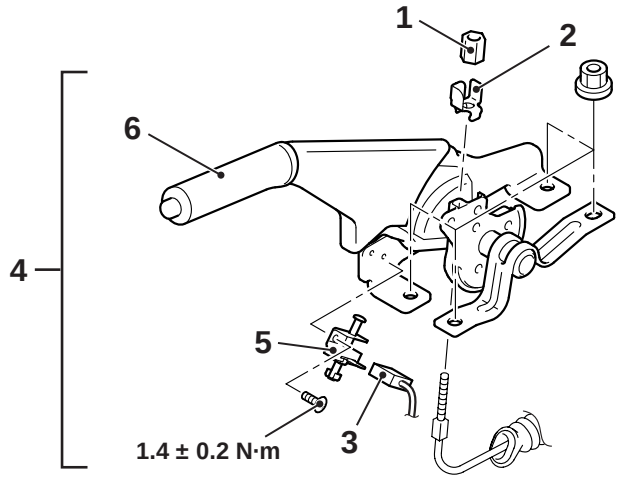
REMOVAL AND INSTALLATION

M1361001300556

⚠ CAUTION

Do not apply grease or lubricant to the switch and the switch installation section to avoid malfunction of the switch. In addition, do not use gloves which have grease on them.

Pre-removal Operation	Post-installation Operation
Rear floor console assembly removal (Refer to GROUP 52A – Rear Floor Console Assembly).	• Parking brake lever stroke adjustment (Refer to P.36-4). • Rear floor console assembly installation (Refer to GROUP 52A – Rear Floor Console Assembly).



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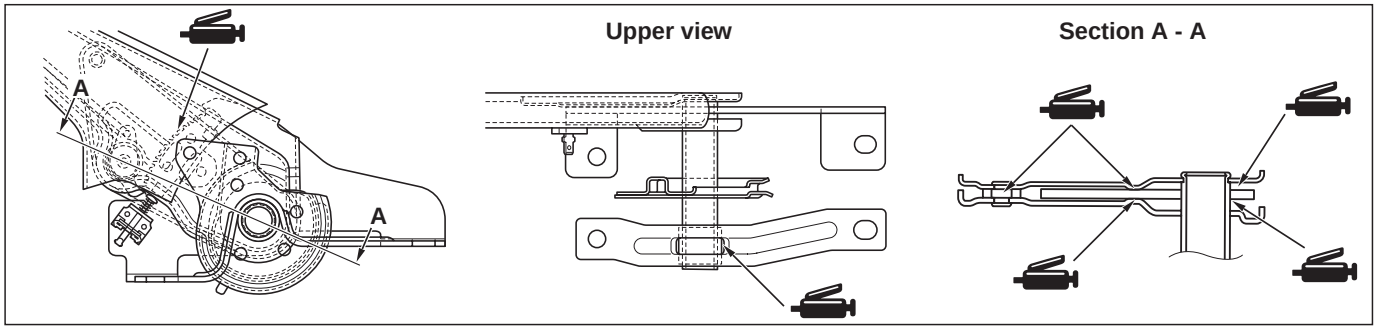


Removal steps

1. Adjuster
2. Adjuster holder
3. Parking brake switch connector connection

Removal steps (Continued)

4. Parking brake lever assembly (including parking brake switch)
5. Parking brake switch
6. Parking brake lever assembly

PARKING BRAKE PULL ROD AND PARKING BRAKE FRONT CABLE <Vehicles with front bench seat>

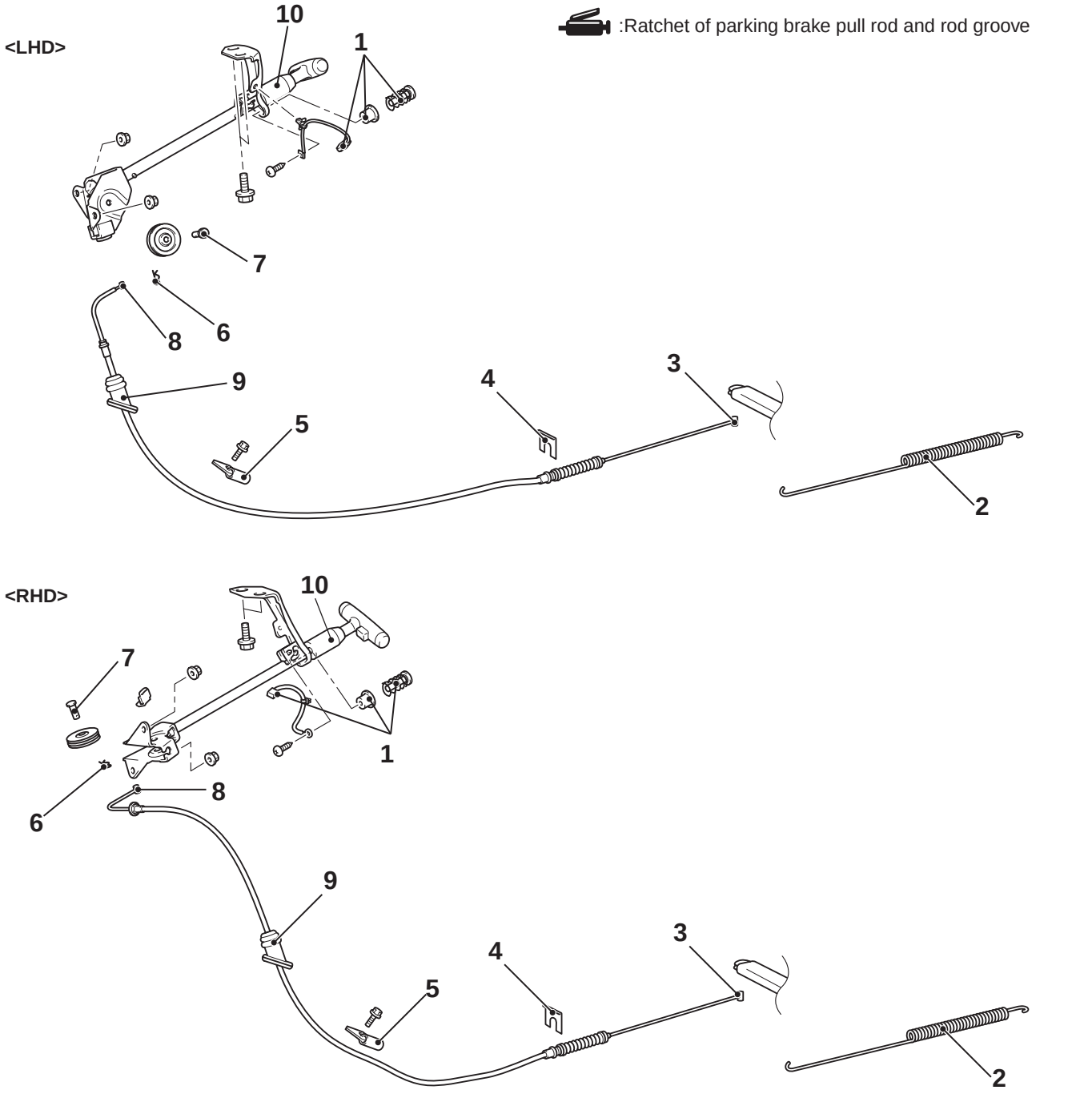
REMOVAL AND INSTALLATION

M1361002800060

⚠ CAUTION

Do not apply grease or lubricant to the switch and the switch installation section to avoid malfunction of the switch. In addition, do not use gloves which have grease on them.

Pre-removal Operation	Post-installation Operation
Lower panel assembly removal (Refer to GROUP 52A – Instrument Panel Assembly).	• Parking brake pull rod stroke adjustment (Refer to P.36-4). • Lower panel assembly installation (Refer to GROUP 52A – Instrument Panel Assembly).

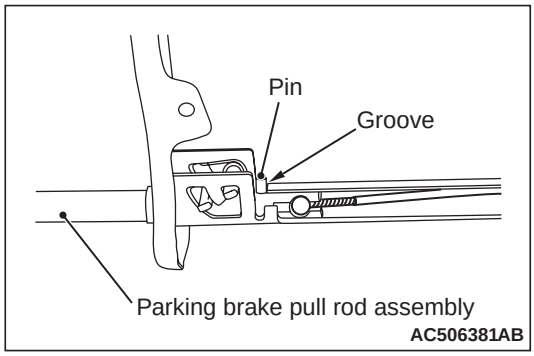


Removal steps
1. Parking brake switch
2. Return spring
3. Parking brake front cable connection (lever side)
4. Clip
5. Clip
6. Pin
7. Pin
8. Parking brake front cable connection (parking brake pull rod side)

<<A>> 9. Parking brake front cable assembly
10. Parking brake pull rod assembly

REMOVAL SERVICE POINT

<<A>> PARKING BRAKE FRONT CABLE AND PARKING BRAKE PULL ROD ASSEMBLY CONNECTION



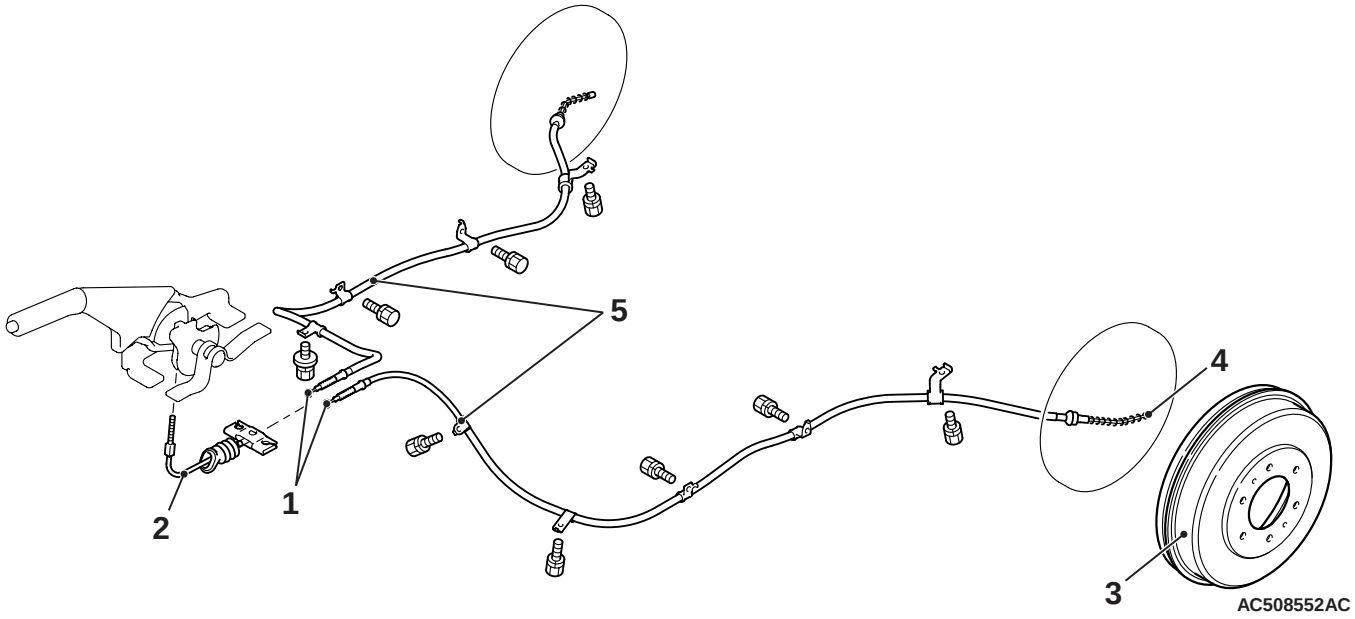
Pull the parking brake pull rod to the position shown in the figure. Then, fit the pin to the groove and remove the parking brake front cable.

PARKING BRAKE CABLE <Vehicles with front separate seat>

REMOVAL AND INSTALLATION

M1361001900989

Post-installation Operation
Parking brake lever stroke adjustment (Refer to P.36-4).



Parking brake front cable removal steps

- Parking brake lever assembly (including parking brake switch) (Refer to P.36-6.)

>>A<< 1. Parking brake rear cable connection (parking brake lever side)

2. Parking brake front cable

Parking brake rear cable removal steps

- Rear floor console cover assembly (Refer to GROUP 52A – Rear Floor Console Assembly .)
- Loosen the adjusting nuts.

>>A<< 1. Parking brake rear cable connection (parking brake lever side)

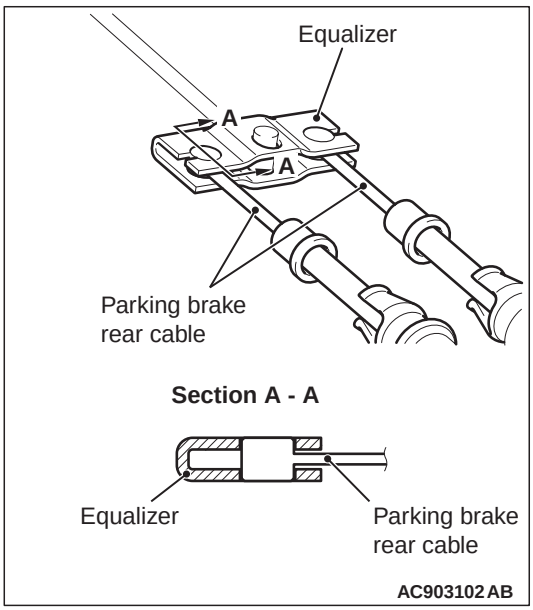
3. Brake drum
4. Parking brake rear cable connection (rear drum brake side)
5. Parking brake rear cable

INSTALLATION SERVICE POINT

>>A<< PARKING BRAKE REAR CABLE INSTALLATION

⚠ CAUTION

Check that the equaliser and the parking brake rear cable are connected correctly. If the parking brake is applied with the equaliser and the parking brake rear cable connected improperly, the equaliser may be damaged.



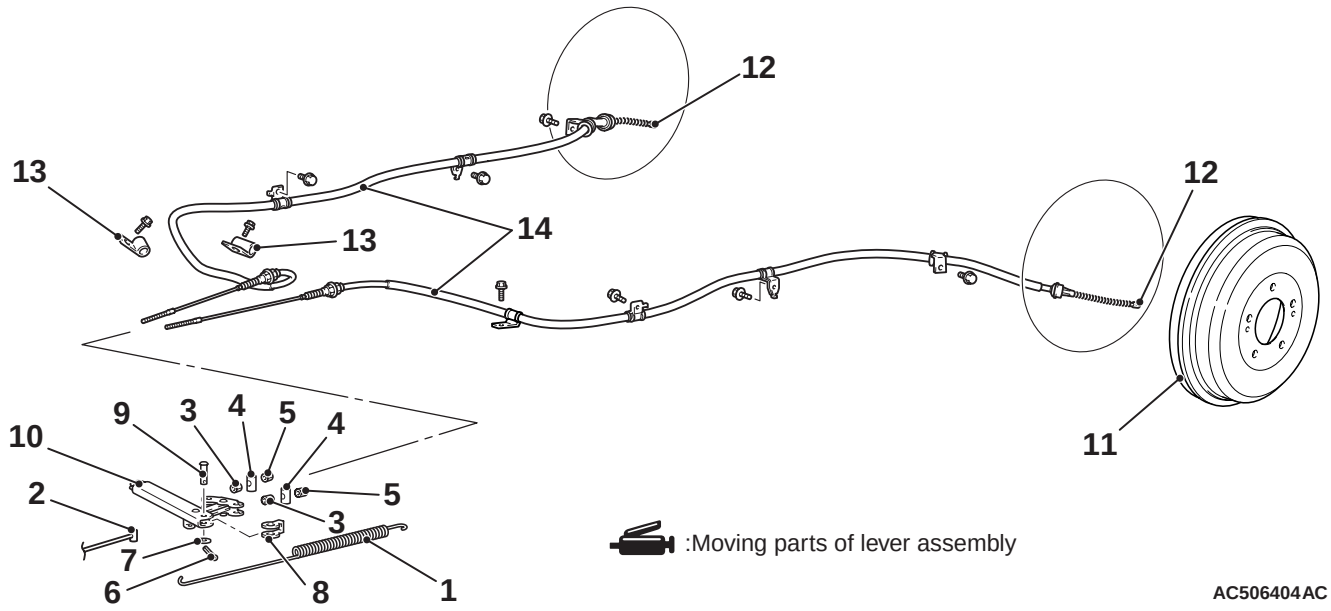
Connect the parking brake rear cable to the equaliser as shown in the figure.

PARKING BRAKE REAR CABLE AND LEVER ASSEMBLY <Vehicles with front bench seat>

REMOVAL AND INSTALLATION

M1361003100053

Post-installation Operation
Parking brake pull rod stroke adjustment (Refer to P.36-4).



Removal steps
1. Return spring
2. Parking brake front cable connection (lever side)
3. Adjusting nut
4. Pin
5. Adjusting nut
6. Split pin
7. Plain washer
8. Spacer

Removal steps (Continued)
9. Clevis pin
10. Lever assembly
11. Brake drum
12. Parking brake rear cable connection (rear drum brake side)
13. Clip
14. Parking brake rear cable assembly

GROUP 37

POWER STEERING

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GENERAL INFORMATION

M1372000101846

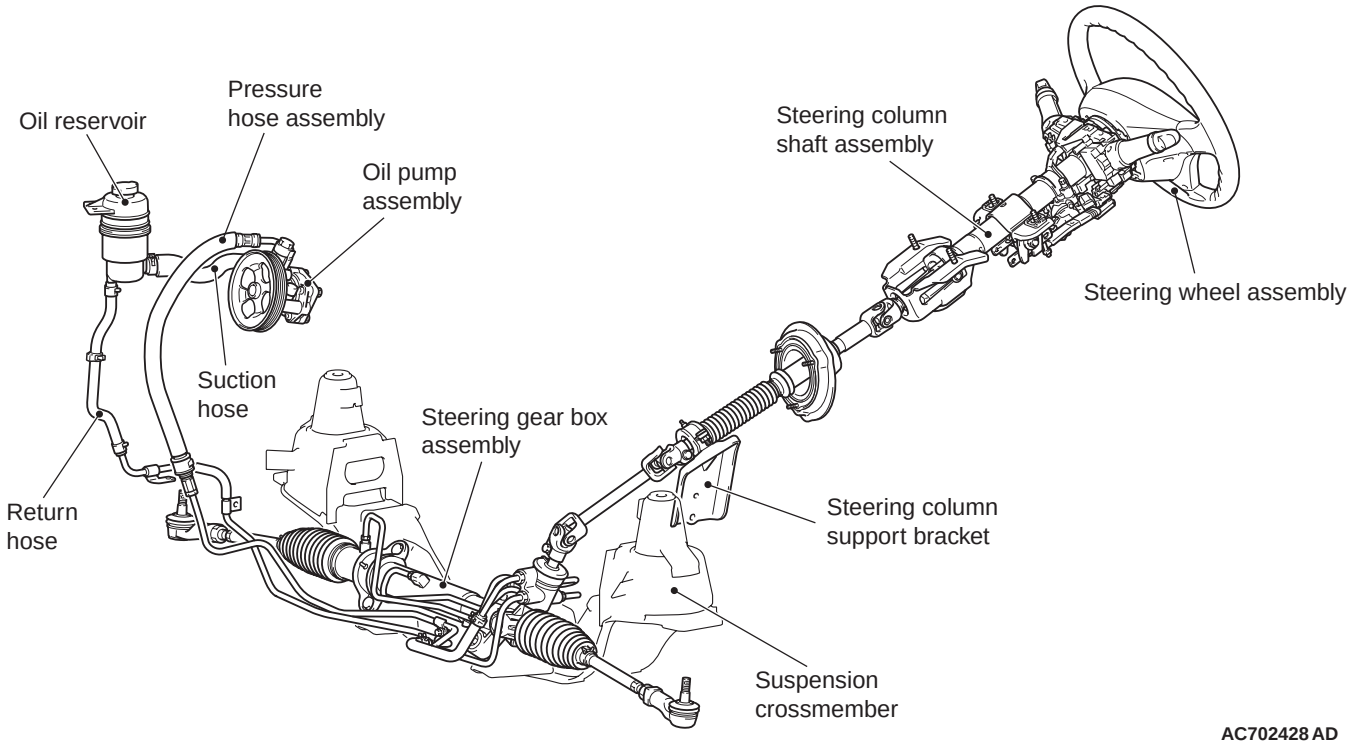
FEATURES

Power steering has been adopted in all vehicles to make the steering system easier to handle.

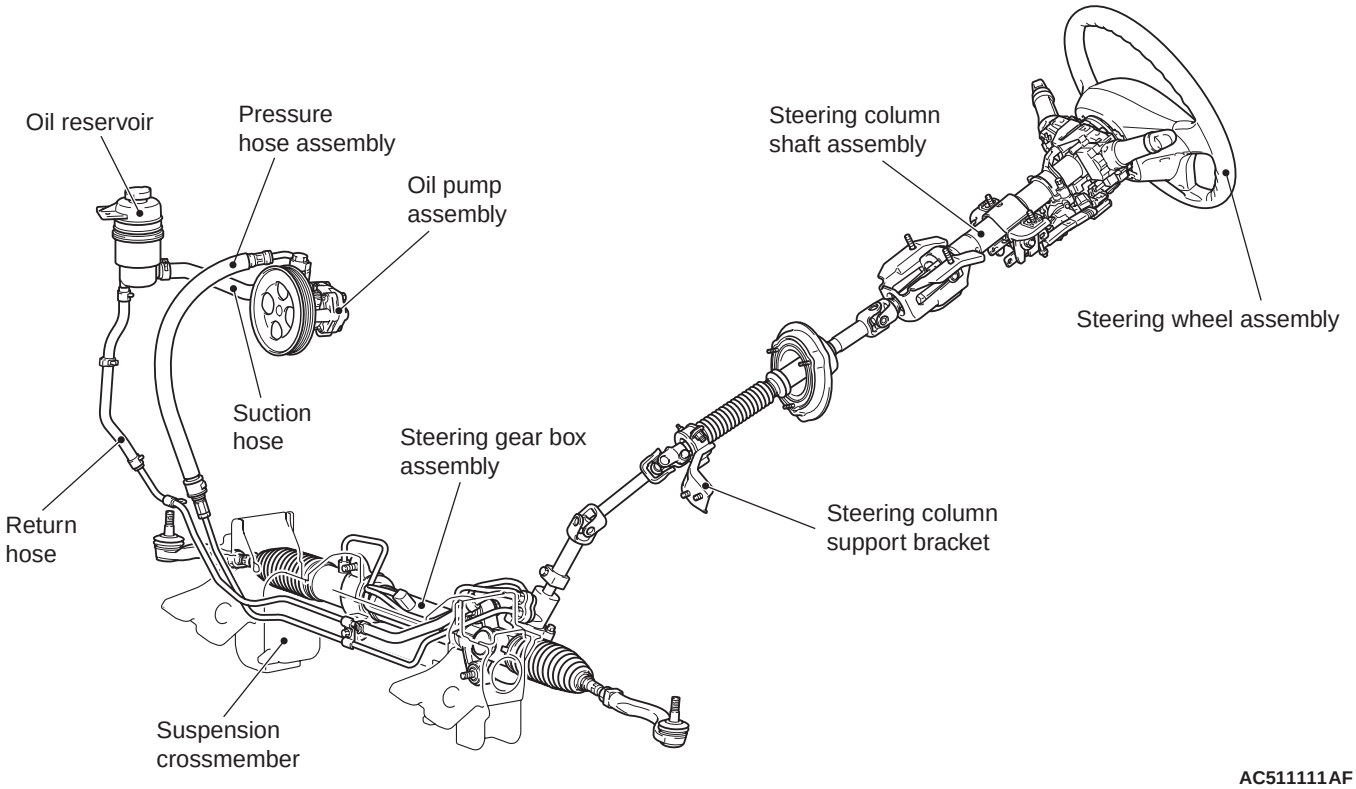
- A 4-spoke steering wheel is used.
- A 3-spoke steering wheel is used. <Option>
- A steering column has a shock absorbing mechanism and a tilt steering mechanism.
- A rack and pinion steering gear is used for steering that feels more direct and for ample handling performance.
- The steering angle has been enlarged to reduce the minimum turning radius.
- An oil pump responsive to engine rpm is used for stable steering at high speed.
- The separate plastic resin oil reservoir is used to reduce weight and to make the fluid level checking easier.
- The flexible tube has been adopted for the pressure hose and the hose length has been optimised to reduce noise and vibration.

CONSTRUCTION DIAGRAM

2WD (Except High rider)-LHD

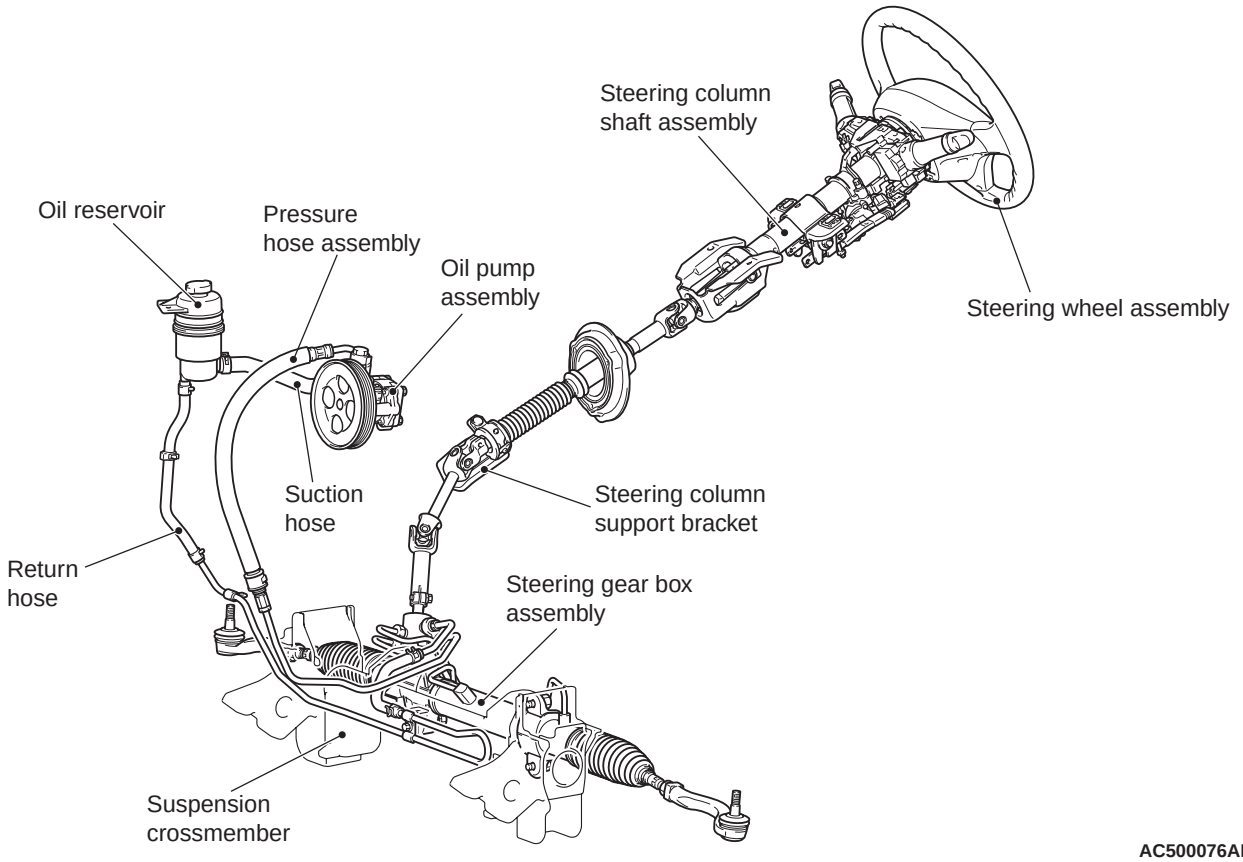


2WD (High rider), 4WD-LHD



AC511111AF

2WD (High rider), 4WD-RHD



AC500076AL

GENERAL SPECIFICATIONS

Item		2WD	4WD
Steering wheel	Type	4-spoke type	4-spoke type, 3-spoke type <Option>
	Outside diameter mm	390	390 <4-spoke type>, 375 <3-spoke type>
	Maximum number of turns	4.3	
Steering column	Column mechanism	Shock absorbing mechanism and tilt steering mechanism	
Power steering type		Integral type	
Oil pump	Type	Vane pump	
	Basic discharge amount cm^3/rev.	9.6	
	Relief pressure MPa	8.8	
	Reservoir type	Separate type (plastic)	
	Pressure switch	equipped	equipped
Steering gear	Type	Rack and pinion	
	Stroke ratio (Rack stroke/Steering wheel maximum number of turns) mm/rev	33.8 <Except High rider> 40 <High rider>	40
	Rack stroke mm	146 <Except High rider> 172 <High rider>	172

SERVICE SPECIFICATIONS

M1372000302036

Item			Standard value	Limit
Steering wheel free play mm	With engine running		–	30 or less
	With engine stopped		10 or less	–
Steering angle	Inner wheel	2WD (except High rider)	39°10' ± 2°00'*	–
		2WD (High rider), 4WD	36°50' ± 2°00'*	–
	Outer wheel (reference value)	2WD (except High rider)	34°10'	–
		2WD (High rider), 4WD	32°40'	–
Toe-in	At the centre of tyre tread mm		0 – 5	–
Toe-angle (per wheel)			0°00' – 0°12'	–
Tie rod end ball joint starting torque N·m			1.47 – 2.94	–
Stationary steering force N		Steering force	39.2 or less	–
		Fluctuation band	5.9 or less	–
Oil pump pressure MPa	Oil pump relief pressure		8.5 – 9.0	–
	Pressure under no-load conditions		0.5	–
	Steering gear retention hydraulic pressure		8.5 – 9.0	–

Item		Standard value	Limit
Oil pressure switch operating pressure MPa	OFF → ON	1.8 – 2.4	–
	ON → OFF	0.8 – 2.4	–
Steering gear total pinion torque N·m [Torque fluctuation N·m]		0.6 – 1.7 [0.4 or less]	–
Band crimped width mm		2.4 – 2.8	–

*NOTE: *: Difference between right and left wheels must be 2°00' or less.*

LUBRICANTS

M1372000400510

Item		Specified lubricant	Quantity
Power steering fluid		ATF DEXRON III or DEXRON II	Approximately 1.0 L
Steering gear	Bearing	ATF DEXRON III or DEXRON II	As required
	O-ring and seal ring		
	Oil seal		
	Pinion and valve assembly seal ring part		
	Bellows	Silicon grease	As required
	Pinion and valve assembly, rack assembly	Repair kit grease	As required
Oil pump	Friction surface of rotor vane, cam ring and pump cover	ATF DEXRON III or DEXRON II	As required
	O-ring		

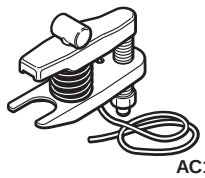
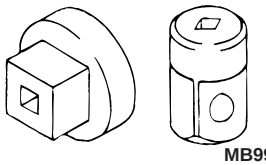
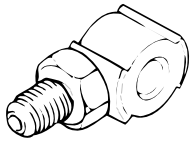
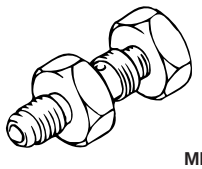
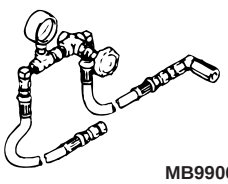
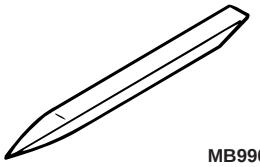
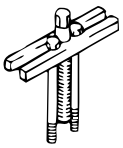
SEALANTS

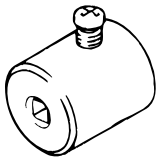
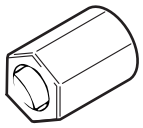
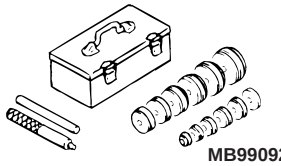
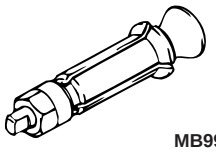
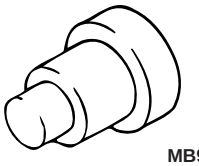
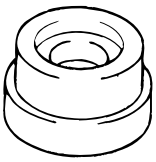
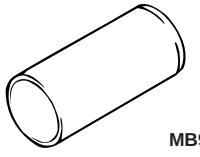
M1372000500551

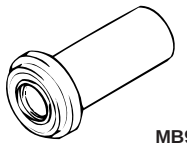
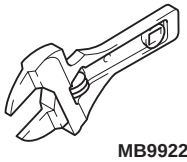
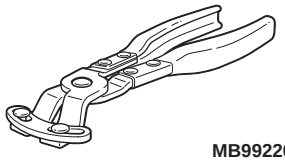
Item		Specified sealant
Steering shaft cover assembly bolt hole on the toeboard		3M ATD Part No.8513 or equivalent
Steering gear	End plug	3M ATD Part No.8663 or equivalent
	Rack support cover	

SPECIAL TOOLS

M1372000601700

Tool	Number	Name	Use
 AC106827	MB991897 or MB992011	Ball joint remover	Knuckle and tie rod end ball joint disconnection *NOTE: Steering linkage puller (MB990635 or MB991113) is also available to disconnect knuckle and tie rod end ball joint.*
 MB990326	MB990326	Preload socket	Tie rod end ball joint starting torque check
 MB991548	MB991548	Power steering oil pressure gauge adapter (Pump side)	Oil pump pressure test
 MB991549	MB991549	Power steering oil pressure gauge adapter (Hose side)	
 MB990662	MB990662	Power steering oil pressure gauge	
 MB990784	MB990784	Ornament remover	Cover removal <vehicles with SRS>
 MB990803	MB990803	Steering wheel puller	Steering wheel removal

Tool	Number	Name	Use
 MB991006	MB991006	Preload socket	Steering gear total pinion torque check and adjustment
MB991621	MB991621	Rack support cover wrench	• Rack support cover removal <2WD (except High rider)> • Rack support adjustment <2WD (except High rider)>
 MB992351	MB992351	Torque wrench socket	• Rack support cover removal <2WD (High rider), 4WD> • Rack support adjustment <2WD (High rider), 4WD>
 MB990925	MB990925	Bearing and oil seal installer set	• Oil seal and bearing removal and installation • MB990927, MB990938, MB990939 (For details, refer to GROUP 26, Special Tools .)
 MB991120	MB991120	Needle bearing puller	Needle roller bearing removal
 MB991202	MB991202	Oil seal and bearing installer	• Needle bearing installation • Lower bearing installation
 MB991203	MB991203	Oil seal and bearing installer	Oil seal and bearing installation
 MB991317	MB991317	Seal ring installer	Seal ring installation

Tool	Number	Name	Use
 MB990941	MB990941	Torque tube bearing installer	Lower oil seal installation
 MB992249	MB992249	Variable spanner	Tie-rod and lock nut removal and installation
 MB992209	MB992209	Bellows band clipping tool	Bellows band installation

ON-VEHICLE SERVICE

STEERING WHEEL FREE PLAY CHECK

M1372001000559

1. With the engine running (hydraulic operation), set the front wheels straight ahead.
2. Measure the play on the steering wheel circumference before the wheels start to move when slightly moving the steering wheel in both directions.

   Maximum limit: 30 mm or less
3. When the play exceeds the limit, check for the play on the steering shaft and steering linkage connection. Correct or replace.
4. If the free play still exceeds the limit value, set the steering wheel straight ahead with the engine stopped. Load 5 N towards the steering wheel circumference and check the play.

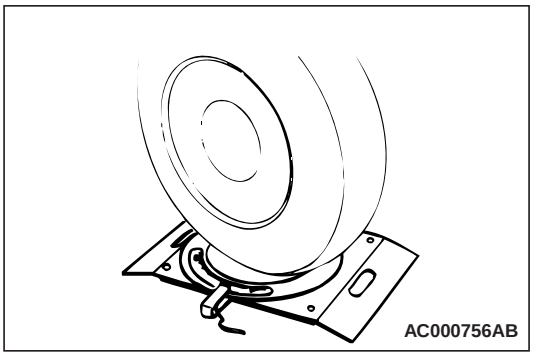
   Standard value (steering wheel play with the engine stopped): 10 mm or less
5. If the play exceeds the standard value, remove the steering gear (Refer to P.37-22) and check the total pinion torque (Refer to P.37-26).

STEERING ANGLE CHECK

M1372001101634

⚠ CAUTION

- **When the steering angle is adjusted, the calibration of steering wheel sensor must be performed. (Refer to GROUP 35C, On-vehicle Service). <Vehicles with ASTC>**


AC000756AB

1. Place the front wheel on a turning radius gauge and measure the steering angle.

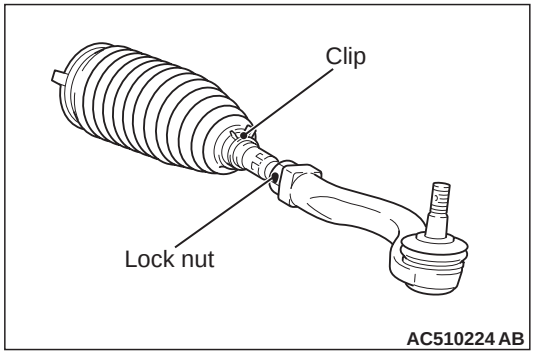
   Standard value:

Item	2WD (except High rider)	2WD (High rider), 4WD
Inner wheel	39°10' ± 2°00'*	36°50' ± 2°00'*
Outer wheel (reference value)	34°10'	32°40'

*NOTE: *: Difference between right and left wheels must be 2°00' or less.*

2. If the steering angle is not within the standard value, adjust the toe-in as follows.

   Standard value:
   at the centre of tyre tread: 0 – 5 mm
   Toe-angle (per wheel): 0° 00' – 0°12'



3. Adjust the toe-in by undoing the clip and lock nut, and turning the left and right tie rod turnbuckles by the same amount (in opposite directions).

   NOTE: The toe will move out as the left turnbuckle is turned toward the front of the vehicle and the right turnbuckle is turned toward the rear of the vehicle.

4. Tighten the lock nut to the specified torque, and tighten the bellows by the clip.

   Tightening torque: 93 ± 15 N·m

5. Recheck the steering angle.

TIE ROD END BALL JOINT DUST COVER CHECK

M1372008600444

1. Press the dust cover with your finger to check whether the dust cover is cracked or damaged.
2. If the dust cover is cracked or damaged, replace the tie rod end (Refer to P.37-26).

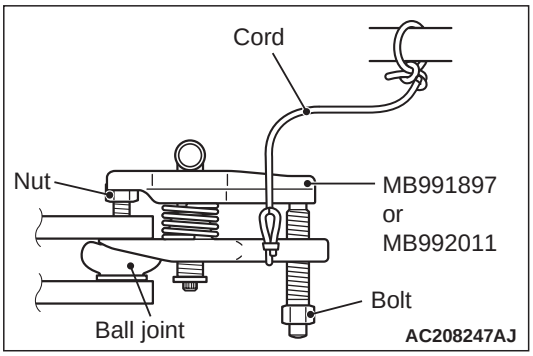
   NOTE: If the dust cover is cracked or damaged, the ball joint could be damaged.

TIE ROD END BALL JOINT STARTING TORQUE CHECK

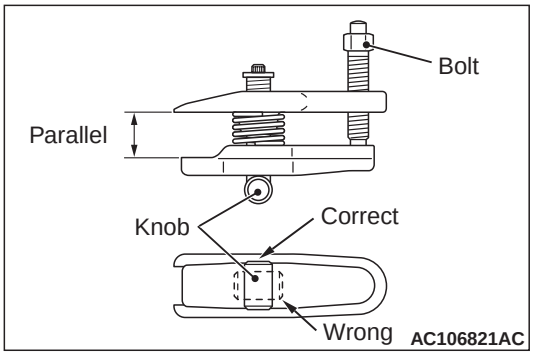
M1372001500598

⚠ CAUTION

- **Do not remove the nut from ball joint. Loosen it and use the special tool to avoid possible damage to the ball joint threads.**
- **Hang the special tool with cord to prevent it from falling.**



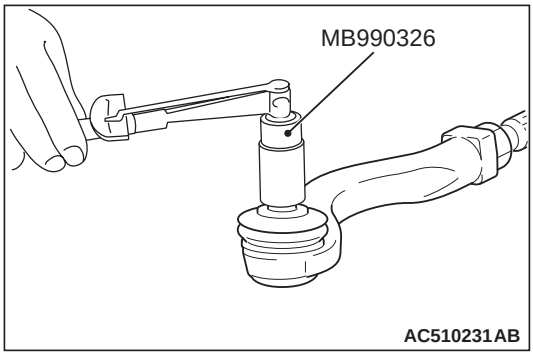
1. Install special tool ball joint remover (MB991897 or MB992011) as shown in the figure.



2. Turn the bolt and knob as necessary to make the jaws of special tool parallel, tighten the bolt by hand and confirm that the jaws are still parallel.

   NOTE: When adjusting the jaws in parallel, make sure the knob is in the position shown in the figure.

3. Tighten the bolt with a wrench to disconnect the tie rod end.



4. Move the ball joint stud several times and install the nut on the stud. Using special tool preload socket (MB990326), measure the ball joint starting torque.

   Standard value: 1.47 – 2.94 N·m

5. If the starting torque exceeds the standard value, replace the tie rod end (Refer to P.37-26).
6. If the starting torque is under the standard value, check the ball joint for axial play or ratcheting. If no axial play or ratcheting, the ball joint can be re-used.

⚠ CAUTION

Always use a new ball joint nut as it is a self-locking nut.

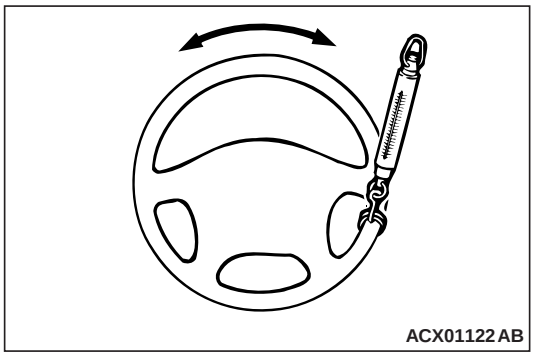
7. Install the tie rod end to the knuckle, then tighten a nut to the specified torque.

   Tightening torque: 40 ± 4 N·m

STATIONARY STEERING EFFORT CHECK

M1372001700644

1. With the vehicle stopped on a flat and paved surface, turn the steering wheel to the straight ahead position.
2. Start the engine and allow it to idle.



3. Attach a spring balance to the outer circumference of the steering wheel and measure the steering force required to turn the steering wheel from the straight ahead position to the left and right (within a range of 1.5 turns). Also check to be sure that there is no significant change in the required steering effort.

   Standard value:
   Steering effort: 39.2 N or less
   Fluctuation allowance: 5.9 N or less

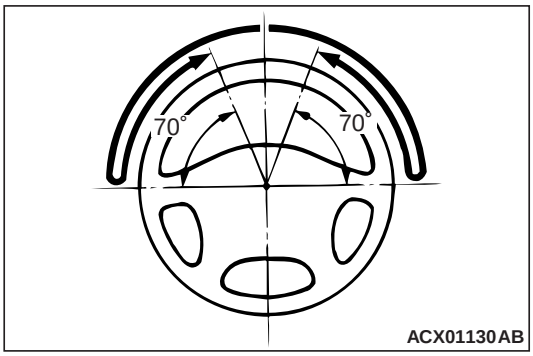
4. If the measured value exceeds the standard value, check and adjust the related parts.

STEERING WHEEL RETURN TO CENTRE CHECK

M1372001800470

Conduct a road test:

1. Make both gradual and sudden turns and see by your own feeling that the steering effort and returnability have no difference between the left and right turns.



2. At a vehicle speed of approximately 35 km/h, turn the steering wheel 90°, hold a few seconds, then release. If the steering wheel then returns 70° or more, the return can be judged satisfactory.

   NOTE: There will be a momentary feeling or heaviness when the wheel is turned quickly, but this is not abnormal. (Oil pump discharge amount is especially apt to be insufficient during idling.)

DRIVE BELT TENSION CHECK

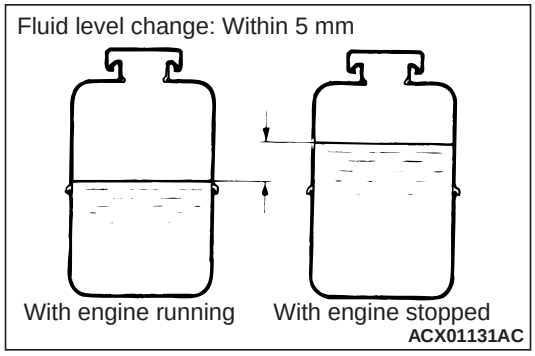
M1372001900507

Refer to GROUP 11A, On-vehicle Service – Drive Belt Tension Check and Adjustment .

FLUID LEVEL CHECK

M1372002000433

1. Park the vehicle on a flat, level surface.
2. Start the engine, and then turn the steering wheel several times to raise the temperature of the fluid to approximately 50 – 60°C.
3. With the engine running, turn the wheel all the way to the left and right several times.

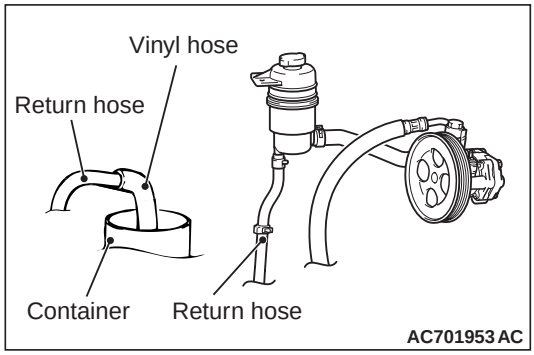


4. Check the fluid in the oil reservoir for foaming or milkiness. Check the difference of the fluid level when the engine is stopped, and while it is running. If the change of the fluid level is 5 mm or more, air bleeding should be done (Refer to P.37-11).

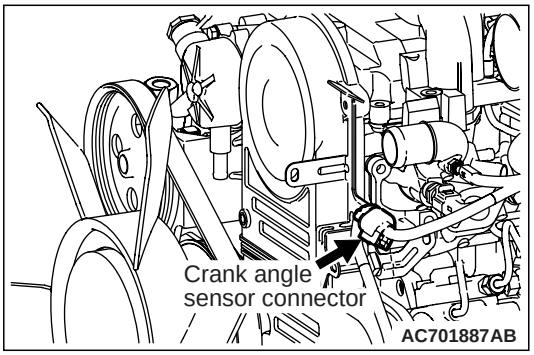
FLUID REPLACEMENT

M1372002101284

Raise and support the front wheels.



1. Disconnect the return hose connection, and then connect a vinyl hose to the return hose, and drain the fluid into a container.



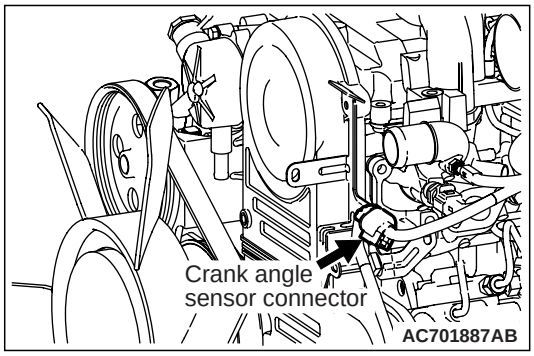
2. Disconnect the crank angle sensor connector.
   NOTE: Doing this will prevent carrying out fuel injection.
3. While operating the starter motor intermittently, turn the steering wheel all the way to the left and right several times to drain all of the fluid.
4. Connect the return hose securely, and then secure with the clip.
5. Fill the oil reservoir with specified fluid up to between "MAX" and "MIN" marks, and then bleed the air (Refer to P.37-11).

   Specified fluid: ATF DEXRON III or DEXRON II

POWER STEERING SYSTEM AIR BLEEDING

M1372002201270

Perform air bleeding procedure as necessary after replacing the steering gear or the steering fluid lines.



1. Disconnect the crank angle sensor connector.
   NOTE: Doing this will prevent carrying out fuel injection.
2. Raise and support the front wheels.

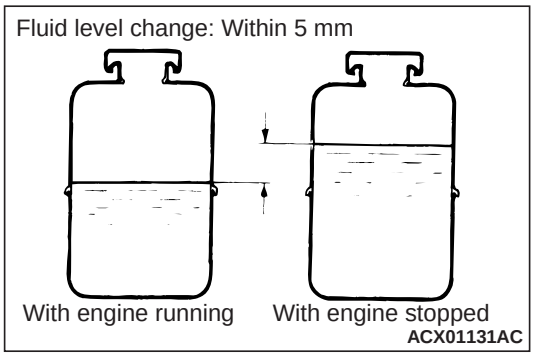
⚠ CAUTION

Perform air bleeding only while cranking the engine. If air bleeding is performed while the engine is running, air could enter the fluid. During air bleeding, refill the steering fluid supply so that the level never falls below the "MIN" mark on the oil reservoir.

3. Turn the steering wheel all the way to the left and right five or six times while using the starter motor to crank the engine intermittently several times (for 15 to 20 seconds).
4. Connect the crank angle sensor connector, start the engine, and let it idle.
5. Turn the steering wheel to the left and right until there are no air bubbles in the oil reservoir.
6. Confirm that the fluid is not milky, and that the level is between "MAX" and "MIN" marks.
7. Confirm that there is very little change in the fluid level when the steering wheel is turned left and right.

⚠ CAUTION

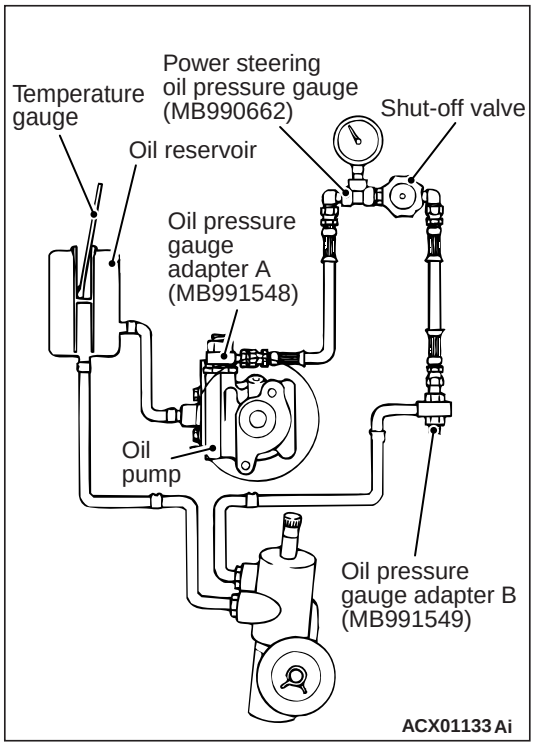
If the fluid level rises suddenly after the engine is stopped, the air has not been completely bled. If air bleeding is not complete, there will be abnormal noises from the pump and the flow-control valve, and this condition could cause reduce the life of the power steering components.



8. Confirm that the change in the fluid level is no more than 5 mm when the engine is stopped and when it is running.
9. If the change of the fluid level is 5 mm or more, the air has not been completely bled from the system. The air bleeding procedure must be repeated.
10. Use M.U.T-III to check if the diagnosis code is set. If the diagnosis code is set, erase it (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points – Diagnosis Function).

OIL PUMP PRESSURE TEST

M1372002300638



1. Disconnect the pressure hose from the oil pump, and then connect following special tools.
   - Power steering oil pressure gauge (MB990662)
   - Oil pressure gauge adapter A (pump side) (MB991548)
   - Oil pressure gauge adapter B (hose side) (MB991549)
2. Bleed air, then turn the steering wheel several times while the vehicle is not moving so that the temperature of the fluid rises to approximately 50 – 60°C.
3. Start the engine and allow it to idle.

⚠ CAUTION

The pressure gauge shut-off valve must not remain closed for more than 10 seconds.

4. Fully close the shut-off valve of the pressure gauge and measure the oil pump relief pressure to confirm that it is within the standard value range. Open it again immediately after checking the pressure.

   Standard value: 8.5 – 9.0 MPa
5. If it is not within the standard value, replace the oil pump.
6. Check whether or not the hydraulic pressure is the standard value when no-load conditions are created by fully opening the shut-off valve of the pressure gauge.

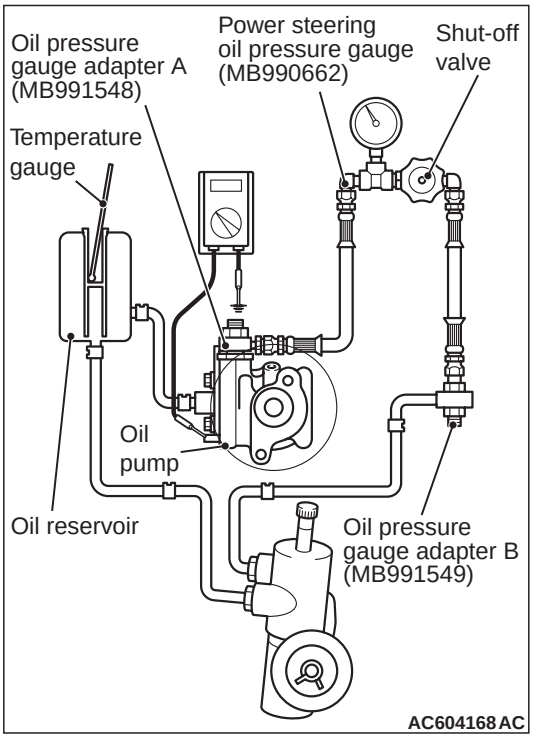
   Standard value: 0.5 MPa
7. If it is not within the standard value, the probable cause is a malfunction of the oil line or steering gear, so check these parts and repair as necessary.
8. Turn the steering wheel all the way to the left or right; then check whether or not the retention hydraulic pressure is the standard value.

   Standard value: 8.5 – 9.0 MPa
9. If not the standard value, overhaul the steering gear. Remeasure fluid pressure.
10. Remove the special tools, and then tighten the pressure hose to the specified torque.

    Tightening torque: 57 ± 7 N·m
11. Bleed the system (Refer to P.37-11).

POWER STEERING PRESSURE SWITCH CHECK

M1372007200540



1. Disconnect the pressure hose from the oil pump, and then connect following special tools.
   - Power steering oil pressure gauge (MB990662)
   - Oil pressure gauge adapter A (pump side) (MB991548)
   - Oil pressure gauge adapter B (hose side) (MB991549)
2. Bleed air, and then turn the steering wheel several times while the vehicle is not moving so that the temperature of the fluid rises to approximately 50 – 60°C.
3. The engine should be idling.
4. Disconnect the connector for the oil pressure switch, and place an ohmmeter at the switch.

⚠ CAUTION

The pressure gauge shut-off valve must not remain closed for more than 10 seconds.

5. Gradually close the shut-off valve of the pressure gauge and increase the hydraulic pressure, then check whether or not the hydraulic pressure that activates the switch is the standard value.

   Standard value: 1.8 – 2.4 MPa

6. Gradually open the shut-off valve and reduce the hydraulic pressure; then check whether or not the hydraulic pressure that deactivates the switch is the standard value.

   Standard value: 0.8 – 2.4 MPa

7. Remove the special tools, and then tighten the pressure hose to the specified torque.

   Tightening torque: 57 ± 7 N·m

8. Bleed the system (Refer to P.37-11).

STEERING COLUMN SHAFT ASSEMBLY SHOCK ABSORBING MECHANISM CHECK

M1372013500335

If a collision accident occurs or severe impact is applied on the steering wheel, the collision energy absorbing mechanism may have operated. Once the mechanism has operated, it will be inoperative even it has suffered no apparent damage. Determine if the steering column shaft can be reused by the following procedure. If the collision energy absorbing mechanism has already operated, replace the steering column shaft assembly (Refer to P.37-18).
If any excessive radial free play on the steering wheel is found with the tilt lever in the lock position, always check the steering shaft assembly.

⚠ WARNING

- ***If the vehicle continues to be driven after the collision absorbing mechanism has operated, the steering column shaft may be damaged while it is in use.***
- ***If there is a slack in the one-way capsule, do not attempt to repair it but replace the steering column shaft assembly.***

INSPECTION PROCEDURE

1. Remove the lower and upper column covers.

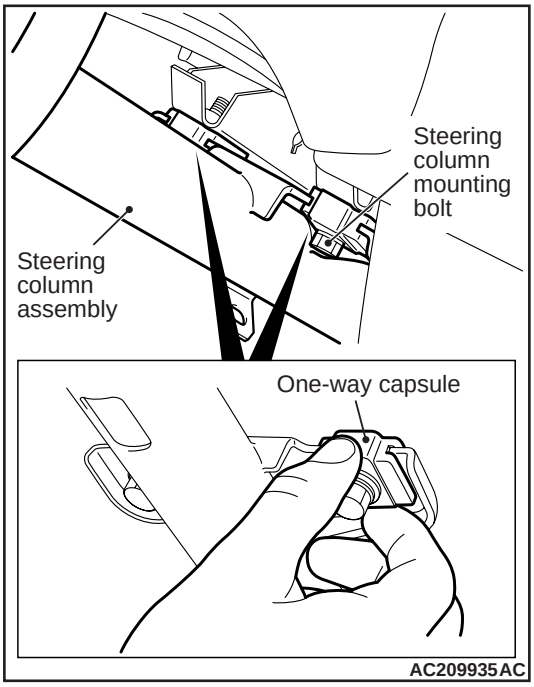
⚠ CAUTION

Do not release the tilt lever until the steering column has been installed to complete this inspection procedure. Confirm that the tilt position is uppermost position.

2. Ensure that the tilt lever is in the lock position.

   NOTE: If not, place the tilt lever in the lock position.

3. Loosen the two upper steering column mounting bolts by two turns.



4. Hold the one-way capsule as shown, and then try to lock them. If there is a slack in either of the capsules, replace the steering column shaft assembly (Refer to P.37-18).

   NOTE: Installing a new steering column shaft assembly, place the tilt lever in the lock position.

⚠ CAUTION

- **Be careful that nothing is pinched between the one-way capsules and the body.**
- **Do not release the tilt lever until the steering column has been installed to complete this inspection procedure.**

5. If no problem is found during the inspection, tighten the steering column mounting bolts (Refer to P.37-18).

STEERING WHEEL

REMOVAL AND INSTALLATION

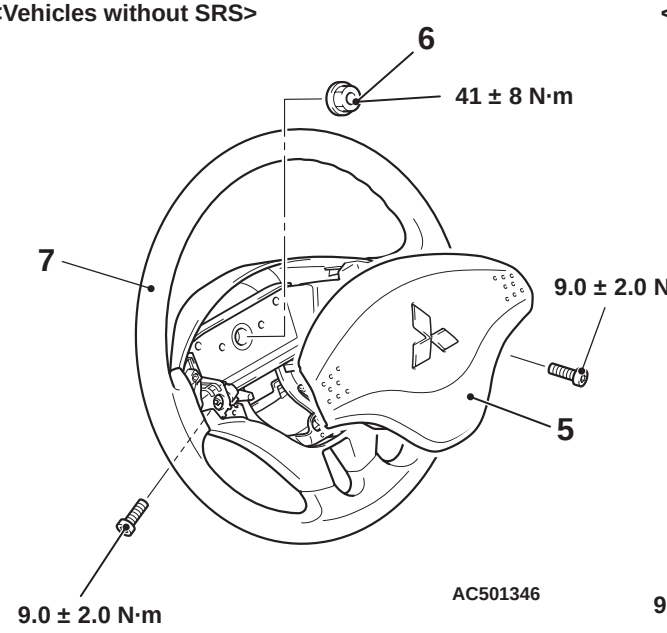
M1372011401937

⚠ ***WARNING***

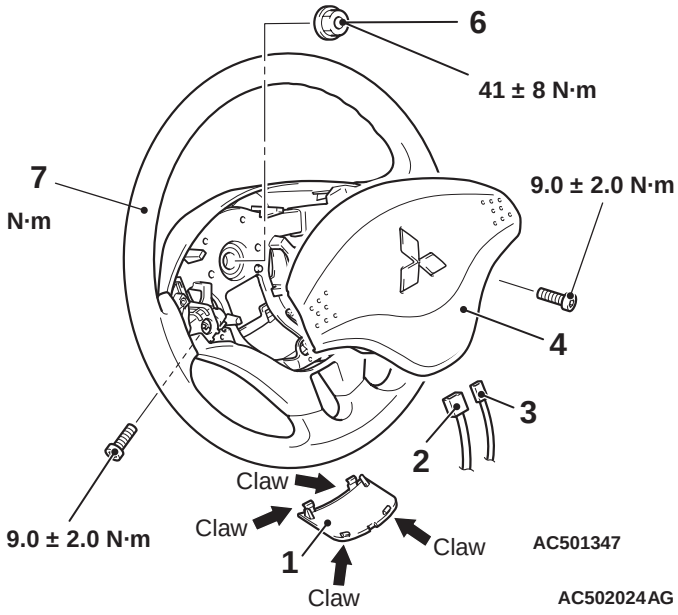
- ***For vehicles with SRS, before removing the steering wheel and driver's air bag module assembly, refer to GROUP 52B, Service Precautions () and Driver's Air Bag Module(s) and Clock Spring ().***
- ***For vehicles with SRS, when removing and installing the steering wheel, do not let it bump against the air bag module.***
- ***After the installation, perform a calibration for the ASTC-ECU to learn the steering wheel sensor neutral point. (Refer to GROUP 35C – On-vehicle Service – Steering Wheel Sensor Calibration).<Vehicles with ASTC>***

Post-installation Operation
- Checking Steering Wheel Position with Wheels Straight Ahead
- Steering Wheel Play Check (Refer to P.37-8).

<Vehicles without SRS>



<Vehicles with SRS (without steering switch or steering wheel upper cover)>



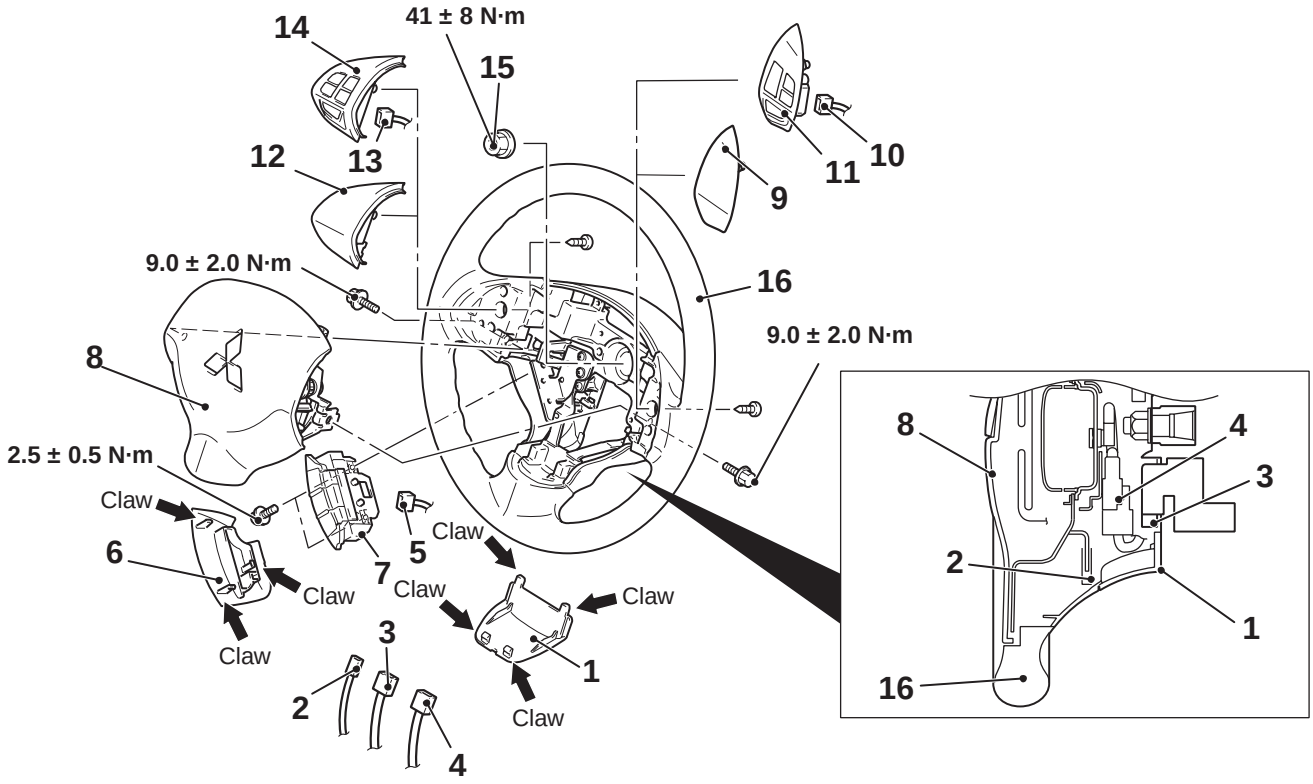
Removal steps

<<A>>		1.	Cover
	>>B<<	2.	Horn connector connection
<<B>>	>>B<<	3.	Driver's air bag module connector connection
<<C>>		4.	Driver's air bag module assembly

Removal steps (Continued)

		5.	Steering wheel pad assembly
		6.	Flange nut
<<D>>	>>A<<	7.	Steering wheel

<3-spoke type>



AC903412 AD

Removal steps

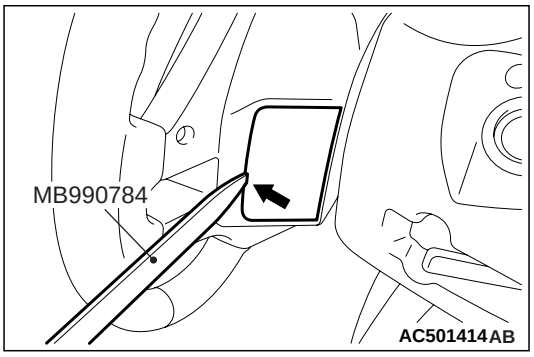
<<A>> 1. Cover
>>B<< 2. Horn connector connection
>>B<< 3. Steering switch connector connection
<<B>> >>B<< 4. Driver's air bag module connector connection
5. Steering wheel voice control switch connector connection <Vehicles with steering wheel voice control switch>
6. Steering wheel voice control switch cover <Vehicles with steering wheel voice control switch>
7. Steering wheel voice control switch <Vehicles with steering wheel voice control switch>
<<C>> 8. Driver's air bag module
9. Steering wheel upper cover (RH) <Vehicles without cruise control switch>
10. Steering wheel cruise control switch connector connection <Vehicles with cruise control switch>
11. Steering wheel cruise control switch <Vehicles with cruise control switch>

Removal steps (Continued)

12. Steering wheel upper cover (LH) <Vehicles without steering wheel audio remote control switch>
13. Steering wheel audio remote control switch connector connection<Vehicles with steering wheel audio remote control switch>
14. Steering wheel audio remote control switch<Vehicles with steering wheel audio remote control switch>
15. Flange nut
<<D>> >>A<< 16. Steering wheel assembly

REMOVAL SERVICE POINTS

<<A>> COVER REMOVAL

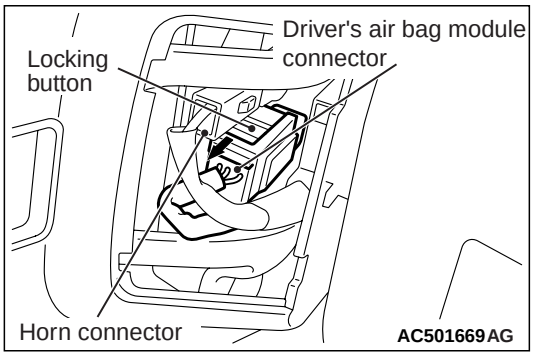


Insert special tool ornament remover (MB990784) at the indicated position to remove the cover.

NOTE: The special tool can be inserted through the notch behind the area shown.

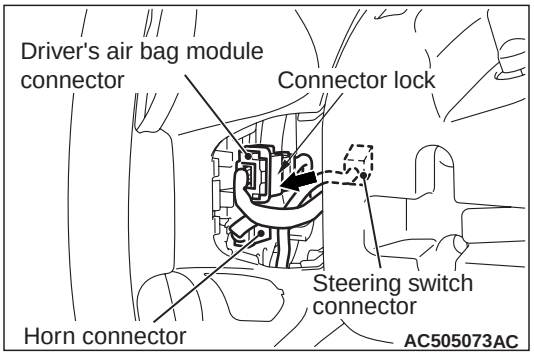
<<B>>DRIVER'S AIR BAG MODULE CONNECTOR DISCONNECTION

<Vehicles with 4-spoke type steering wheel>



Disconnect the driver's air bag module connector while compressing its locking button and sliding it to the direction of an arrow.

<Vehicles with 3-spoke type steering wheel>



Disconnect the connector while sliding the part shown in the figure (connector lock) of the driver's air bag module connector in the direction of an arrow.

<<C>> DRIVER'S AIR BAG MODULE REMOVAL

⚠ CAUTION

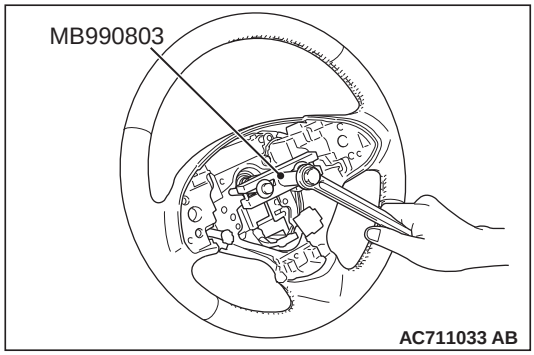
- **Never use an electric tester to diagnose the air bag module circuit. Never attempt to disassemble the air bag module.**
- **Be sure to store the removed air bag module in a clean and dry place with a pad surface facing upward.**

<<D>> STEERING WHEEL REMOVAL

⚠ CAUTION

Make sure that use the special tool to remove the steering wheel. Otherwise the steering column shaft assembly shock absorbing mechanism will be damaged.

1. Position the steering wheel in the straight-ahead position.



2. Use special tool steering wheel puller (MB990803) to remove the steering wheel.

INSTALLATION SERVICE POINTS

>>A<< STEERING WHEEL INSTALLATION

After centring the clock spring (Refer to GROUP 52B – Air Bag Module Clock Spring), install the steering wheel.

>>B<< DRIVER'S AIR BAG MODULE CONNECTOR / STEERING SWITCH CONNECTOR / HORN CONNECTOR CONNECTION

Connect the connector securely and route the harnesses not to lie off the cover hole.

STEERING COLUMN SHAFT ASSEMBLY

REMOVAL AND INSTALLATION

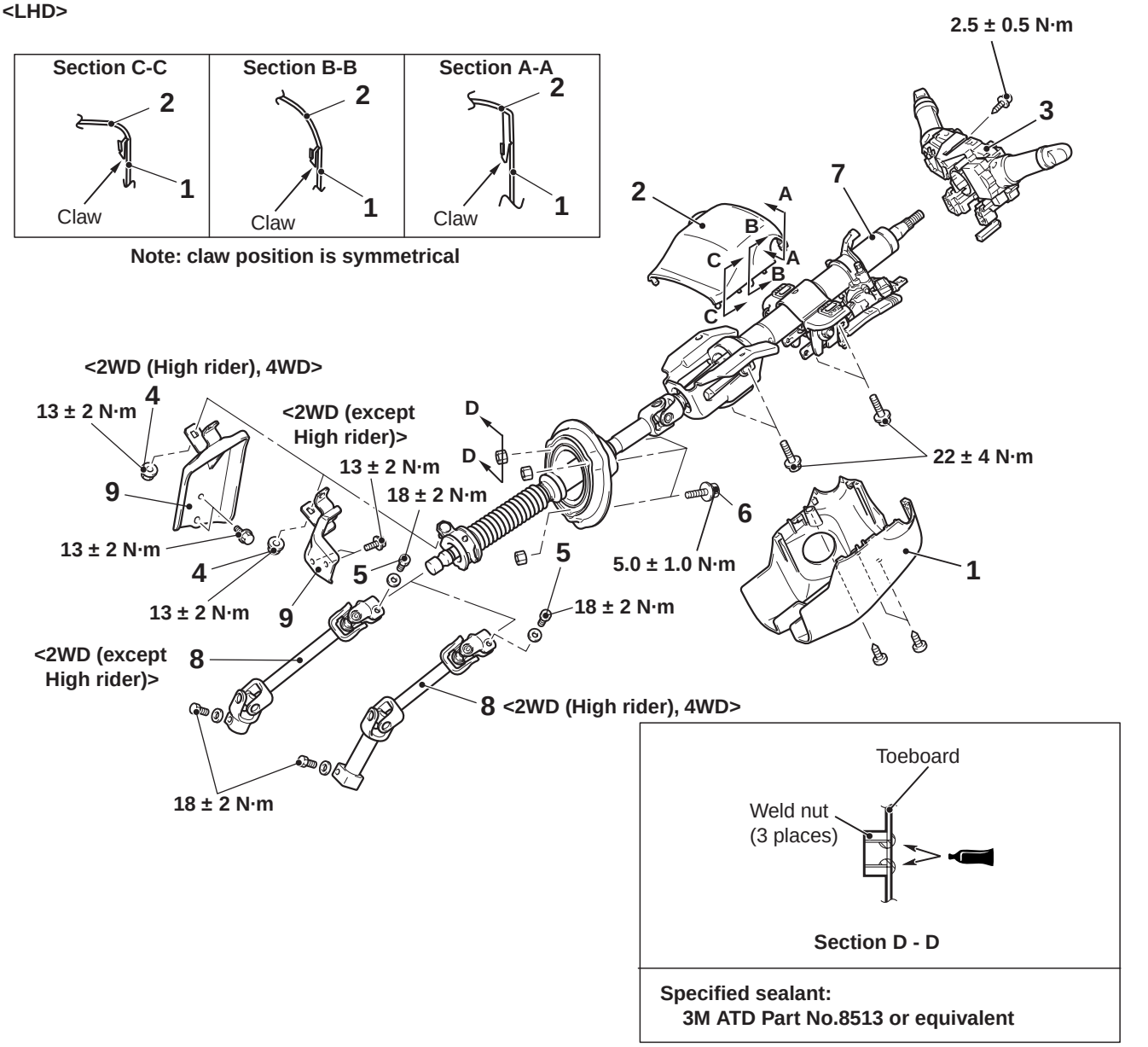
M1372003100433

⚠ WARNING

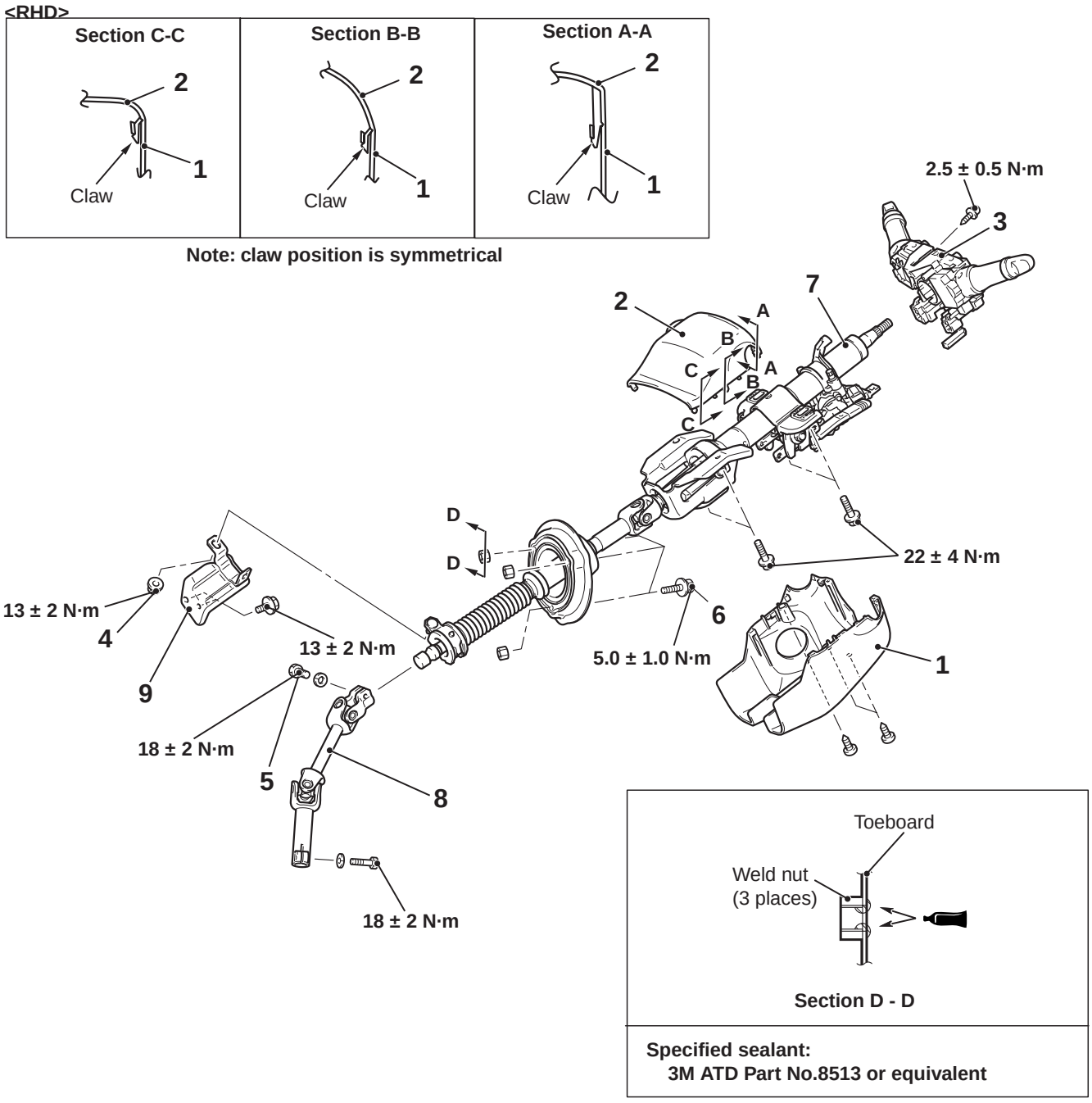
For vehicles with SRS, before removing the steering wheel and driver's air bag module assembly, refer to GROUP 52B – Service Precautions () and Driver's Air Bag Module(s) and Clock Spring ().

Pre-removal Operation	Post-installation Operation
• Steering Wheel and Driver's Air bag Module Assembly Removal (Refer to P.37-15). • Instrument Lower Panel Removal (Refer to GROUP 52A – Instrument Panel Assembly).	• Instrument Lower Panel Installation (Refer to GROUP 52A – Instrument Panel Assembly). • Steering Wheel and Driver's Air bag Module Assembly Installation (Refer to P.37-15).

<LHD>



AC511177AG



AC805707 AC

Removal steps

1. Lower column cover
2. Upper column cover
3. Column switch assembly
4. Nut
5. Bolt
6. Bolt

>>A<<

Removal steps (Continued)

7. Steering column shaft assembly
8. Shaft assembly
9. Steering column support bracket

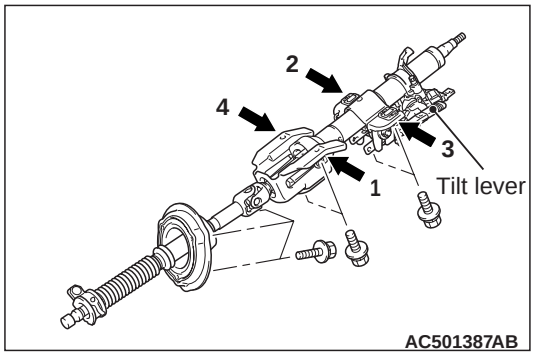
INSTALLATION SERVICE POINT

>>A<< STEERING COLUMN SHAFT ASSEMBLY INSTALLATION

⚠ CAUTION

- **When reusing the steering column, do not release the tilt lever until the steering column shaft has been installed. Confirm that tilt position is uppermost position.**
- **When the steering column is replaced, do not release the tilt lever until it has been installed. Do not remove the tilt lever fixing band until the installation has completed.**
- **When installing the steering column, do not leave it fixed temporarily at only one point and make sure the column shaft is not shaken strongly. If you fail to do, the collision absorbing mechanism at the column shaft mounting location may be damaged.**

1. Ensure that the tilt lever is in the lock position, and install the steering column.

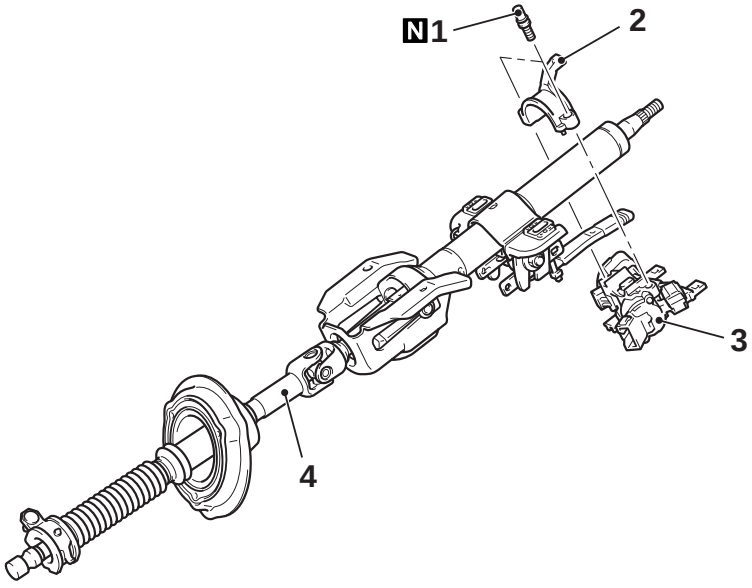


2. Tighten the three bolts (1 to 3) in the order shown by hand, and then tighten the bolt (4) to the specified torque. Tighten also the three bolts (1 to 3) to the specified torque in the order shown.

Tightening torque: 22 ± 4 N·m

DISASSEMBLY AND REASSEMBLY

M1372015000121

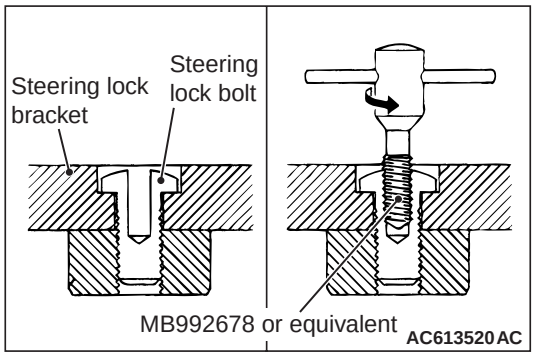


		Disassembly steps
<<**A**>> >>**A**<<	1.	Special bolt
>>**A**<<	2.	Steering lock bracket
>>**A**<<	3.	Steering lock cylinder assembly
	4.	Steering column shaft assembly

DISASSEMBLY SERVICE POINT

<<A>> SPECIAL BOLT REMOVAL

1. Use a drill to make a hole just deeply enough for the tap to stand on the steering lock bolt.



2. Remove the steering lock bolt using the screw extractor (Recommended tool: MB992678), or equivalent.

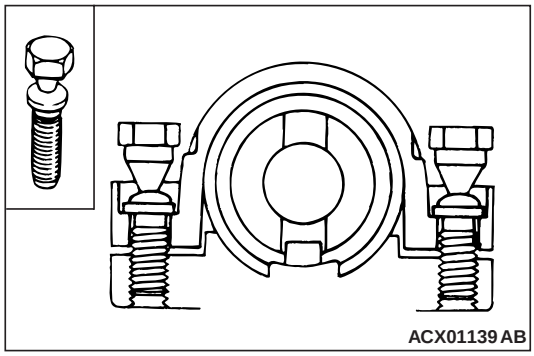
REASSEMBLY SERVICE POINT

>>A<< STEERING LOCK CYLINDER ASSEMBLY/ STEERING LOCK BRACKET/SPECIAL BOLT INSTALLATION

⚠ CAUTION

The steering lock bracket and bolts must be replaced with new ones when the steering lock is installed.

1. When installing the steering lock cylinder assembly and steering lock bracket to the column tube, temporarily install the steering lock in alignment with the column boss.



2. After checking that the lock works properly, tighten the special bolts until the head twists off.

POWER STEERING GEAR BOX AND LINKAGE

REMOVAL AND INSTALLATION

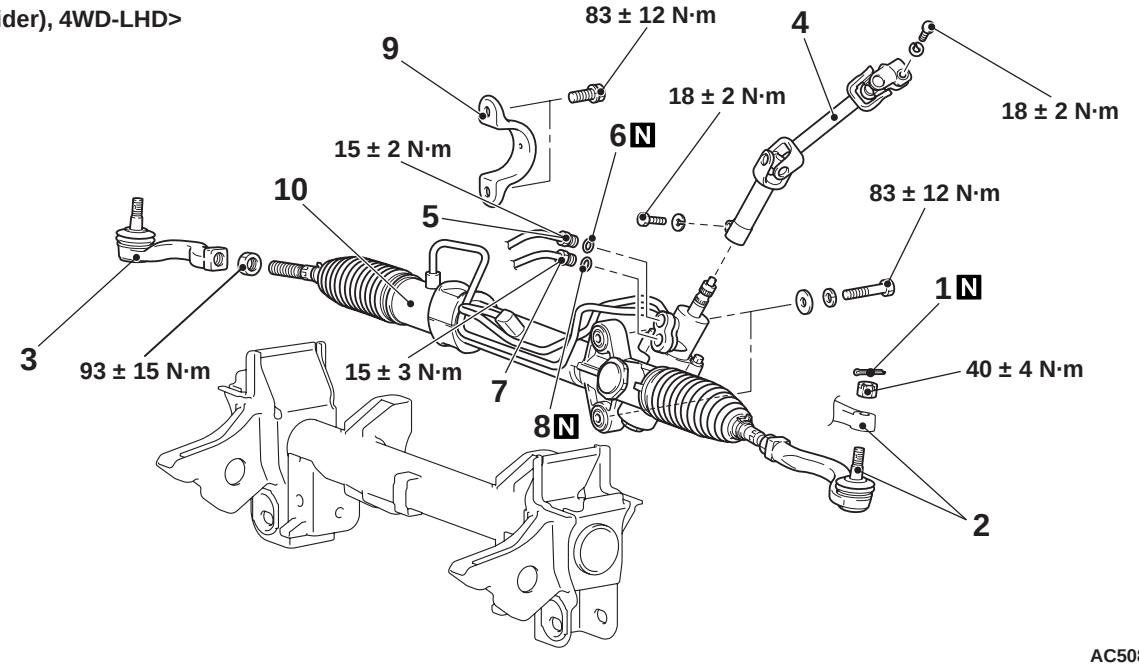
M1372010901995

⚠ WARNING

For vehicles with SRS, before removing the steering gear, refer to GROUP 52B, Service Precautions () and Driver's Air Bag Module(s) and Clock Spring (). Centre the front wheels. Failure to do so may damage the SRS clock spring and render the SRS system inoperative, risking serious injury.

Pre-removal Operation	Post-installation Operation
• Power Steering Fluid Draining (Refer to P.37-11). • Front Differential and Propeller Shaft disconnection (Refer to GROUP 25 – Propeller Shaft). • Wheel Speed Sensor Harness Bracket, Free Wheel Actuator Connector and Hose disconnection (Refer to GROUP 26 – Differential Carrier and Free Wheeling Clutch). • Differential Mount Bracket Front Mounting Bolts removal (Refer to GROUP 26 – Front Differential Mount).	• Differential Mount Bracket Front Mounting Bolts installation (Refer to GROUP 26 – Front Differential Mount). • Wheel Speed Sensor Harness Bracket, Free Wheel Actuator Connector and Hose connection (Refer to GROUP 26 – Differential Carrier and Free Wheeling Clutch). • Front Differential and Propeller Shaft Connection (Refer to GROUP 25 – Propeller Shaft). • Fill Power Steering Fluid and bleed air (Refer to P.37-11). • Check the Dust Cover for Cracks or Damage by Pushing it with Finger. • Check the Steering Angle (Refer to P.37-8).

<2WD (High rider), 4WD-LHD>



AC508372AG

Removal steps

1. Split pin
2. Tie rod end and knuckle connection
3. Tie rod end
4. Shaft assembly
5. Return tube connection

Removal steps (Continued)

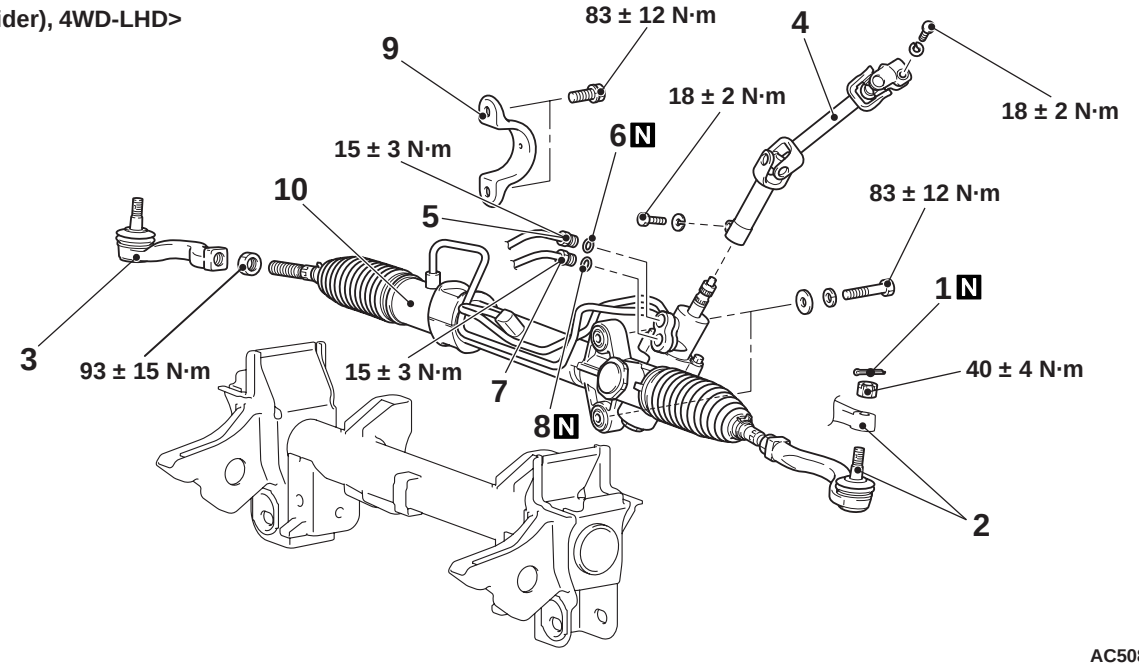
6. O-ring
7. Pressure tube connection
8. O-ring
9. Clamp
10. Power steering gear box assembly

<<A>>

>>A<<

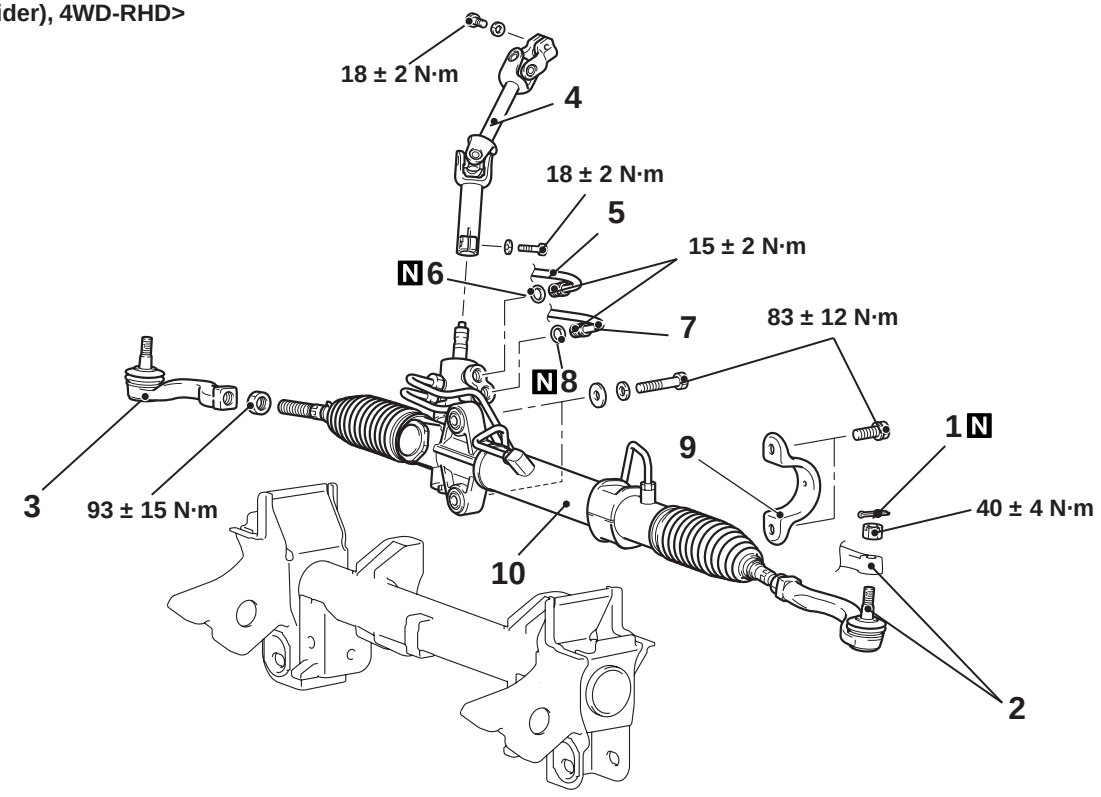
>>A<<

<2WD (High rider), 4WD-LHD>



AC508372AG

<2WD (High rider), 4WD-RHD>



AC509027AI

Removal steps

1. Split pin
2. Tie rod end and knuckle connection
3. Tie rod end
4. Shaft assembly
5. Return tube connection

Removal steps (Continued)

6. O-ring
7. Pressure tube connection
8. O-ring
9. Clamp
10. Power steering gear box assembly

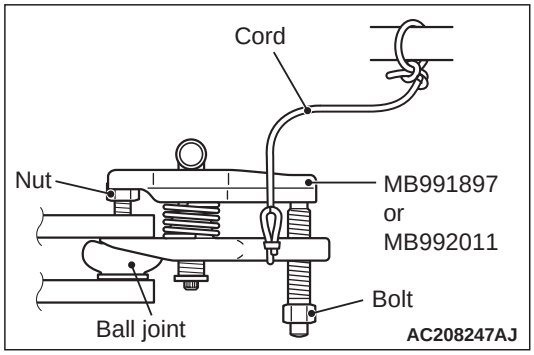
<<A>>
>>A<<
<<B>>

REMOVAL SERVICE POINTS

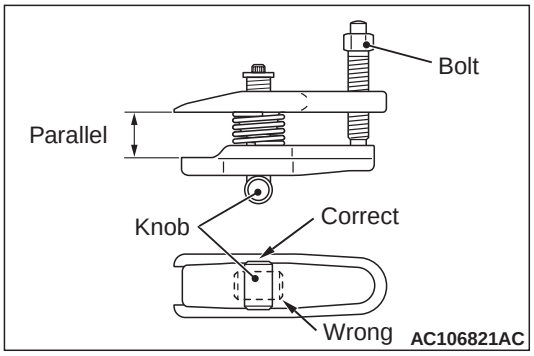
<<A>> TIE ROD END AND KNUCKLE DISCONNECTION

⚠ CAUTION

- **Do not remove the nut from ball joint. Loosen it and use the special tool to avoid possible damage to ball joint threads.**
- **Hang the special tool with a cord to prevent it from falling.**



1. Install the special tool ball joint remover (MB991897 or MB992011) as shown in the figure.



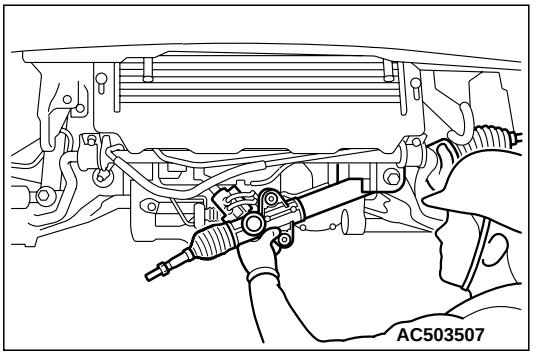
2. Turn the bolt and knob as necessary to make the jaws of the special tool parallel, tighten the bolt by hand and confirm that the jaws are still parallel.

   NOTE: When adjusting the jaws in parallel, make sure the knob is in the position shown in the figure.

3. Tighten the bolt with a wrench to disconnect the tie rod end.

<<B>> POWER STEERING GEAR BOX ASSEMBLY REMOVAL

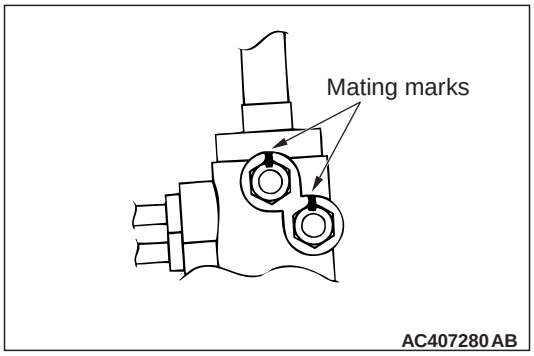
⚠ CAUTION



Be sure not to damage the bellows and the tie rod end dust cover when removing the gear box assembly.

INSTALLATION SERVICE POINT

>>A<< PRESSURE TUBE/ RETURN TUBE CONNECTION



Align the paint marks of the steering gear box, pressure tube and return tube.

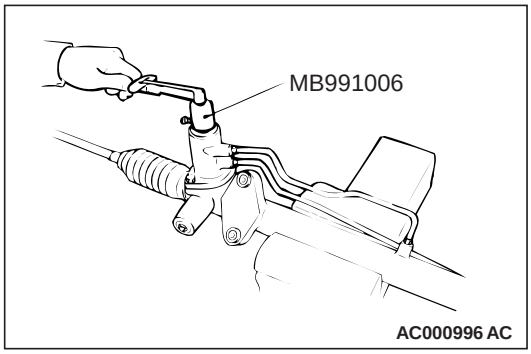
INSPECTION

M1372011000743

STEERING GEAR TOTAL PINION TORQUE CHECK

⚠ CAUTION

When holding the steering gear in a vice, secure its mounting positions. If it is secured in any other place, the gear housing may become deformed or damaged.



Using special tool preload socket (MB991006), rotate the pinion gear at the rate of one rotation in approximately 4 to 6 seconds to check the total pinion torque.

Standard value: 0.6 – 1.7 N·m
[Torque fluctuation: 0.4 N·m or less]

NOTE: When measuring, remove the bellows from the rack housing. Measure the pinion torque through the whole stroke of the rack.
If the measured value is not within the standard range, first adjust the rack support cover, and then check the total pinion torque again.
If the total pinion torque cannot be adjusted to within the standard range by adjusting the rack support cover, check the rack support cover, rack support spring, rack support and replace any parts if necessary.

TIE ROD END BALL JOINT DUST COVER CHECK

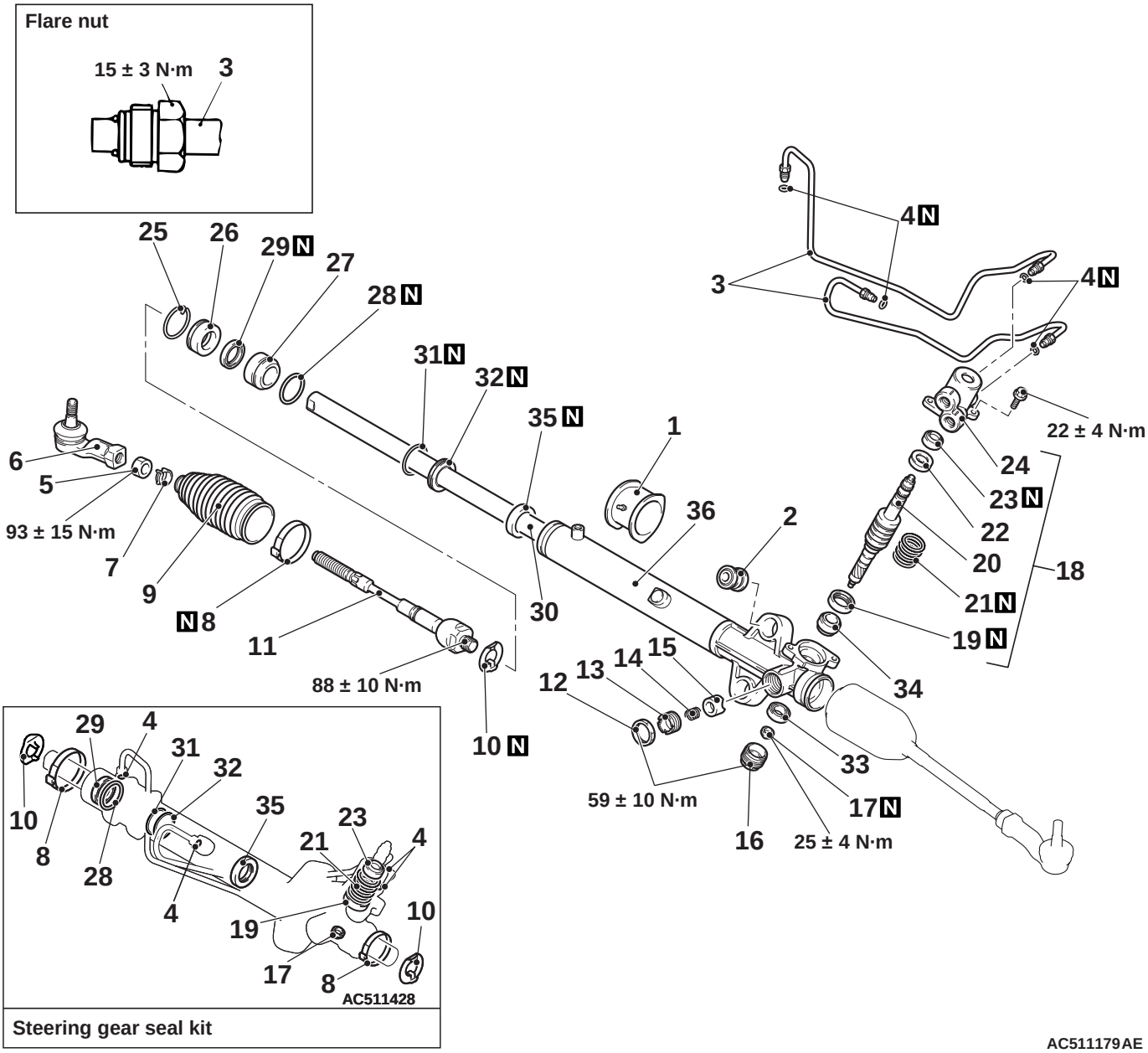
1. Check the dust cover for cracks or damage by pushing it with your finger.
2. If the dust cover is cracked or damaged, replace the tie rod end. (Refer to P.37-26.)

   NOTE: Cracks or damage of the dust cover may damage the ball joint. If it is damaged during service work, replace the tie rod end. (Refer to P.37-26.)

DISASSEMBLY AND REASSEMBLY

M1372011101549

<2WD (except High rider) - LHD>



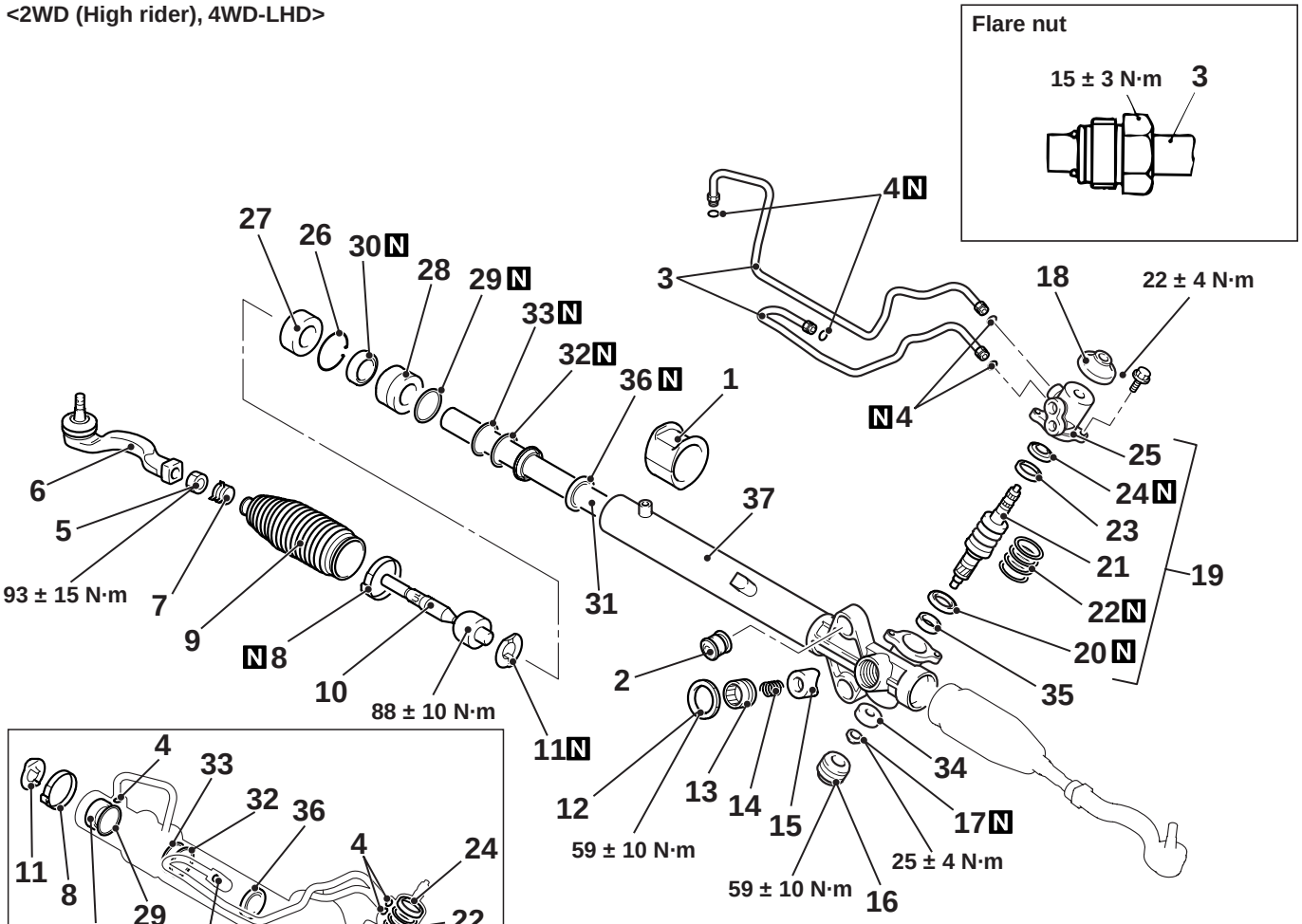
			Disassembly steps
	>>P<<	1.	Gear mounting rubber
		2.	Gear housing mounting bushing
		3.	Feed pipe
		4.	O-ring
	>>O<<	5.	Lock nut
	>>O<<	6.	Tie rod end
		7.	Clip
	>>N<<	8.	Bellows band
		9.	Bellows
<<A>>	>>M<<	10.	Tab washer
<<B>>	>>L<<	11.	Tie rod
	>>K<<	•	Total pinion torque adjustment

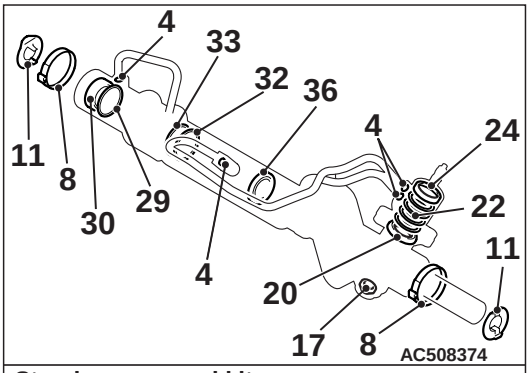
			Disassembly steps
	>>J<<	12.	Lock nut
<<C>>	>>J<<	13.	Rack support cover
		14.	Support spring
		15.	Rack support
	>>I<<	16.	End plug
		17.	Lock nut
		18.	Valve housing assembly
<<D>>	>>H<<	19.	Lower oil seal
<<D>>		20.	Pinion and valve assembly
<<E>>	>>G<<	21.	Seal ring
<<F>>	>>F<<	22.	Upper bearing
<<F>>	>>F<<	23.	Upper oil seal
		24.	Valve housing
<<G>	>>E<<	25.	Circlip

Disassembly steps

<<H>>		26. Rack stopper
<<H>>	>>D<<	27. Rack bushing assembly
<<H>>	>>D<<	28. O-ring
<<H>>	>>D<<	29. Oil seal
<<H>>	>>C<<	30. Rack assembly
<<E>>		31. Seal ring
		32. O-ring
<<I>>	>>B<<	33. Lower bearing
<<J>>	>>B<<	34. Needle bearing
<<K>>	>>A<<	35. Oil seal
		36. Gear housing

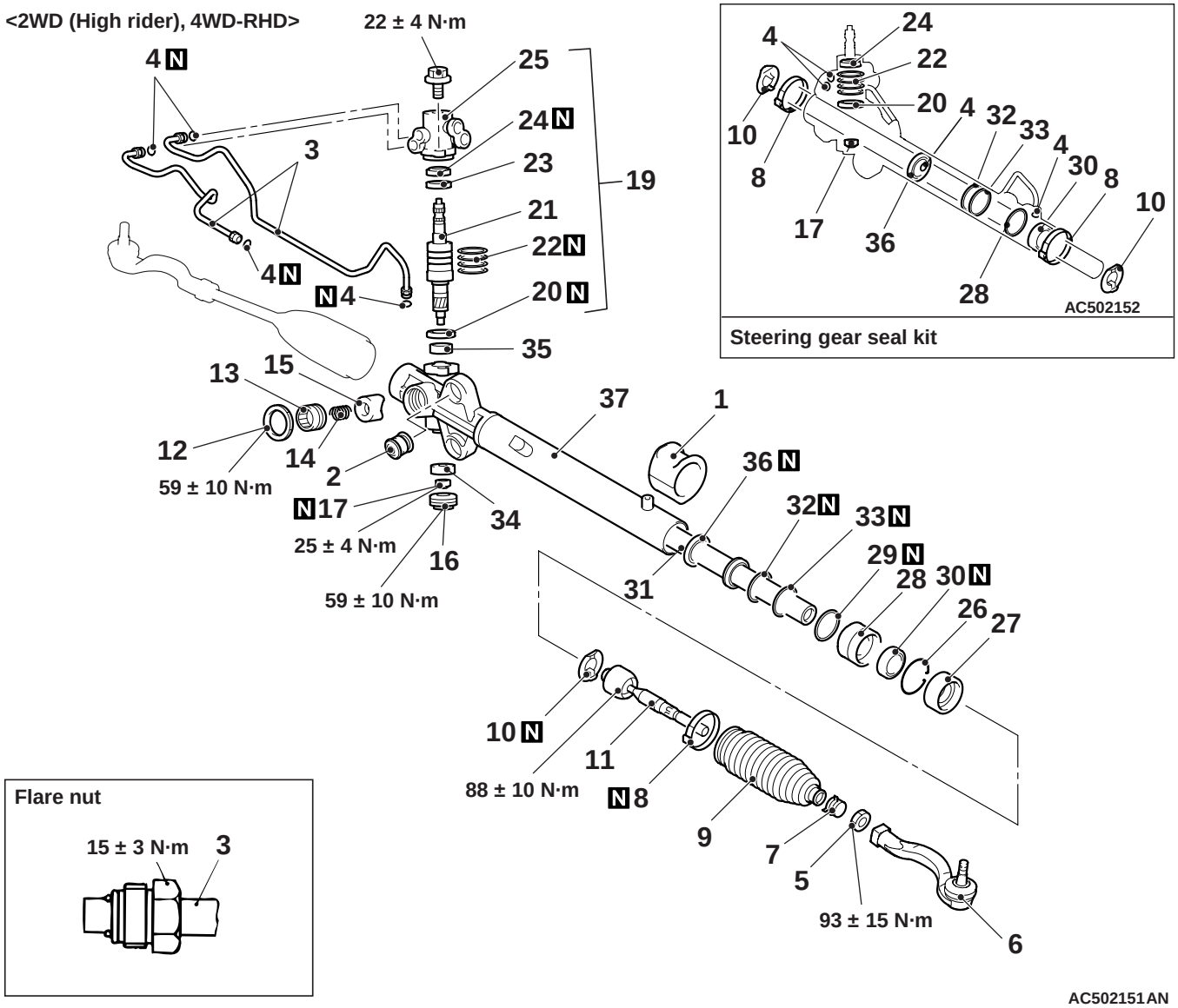
<2WD (High rider), 4WD-LHD>





Steering gear seal kit

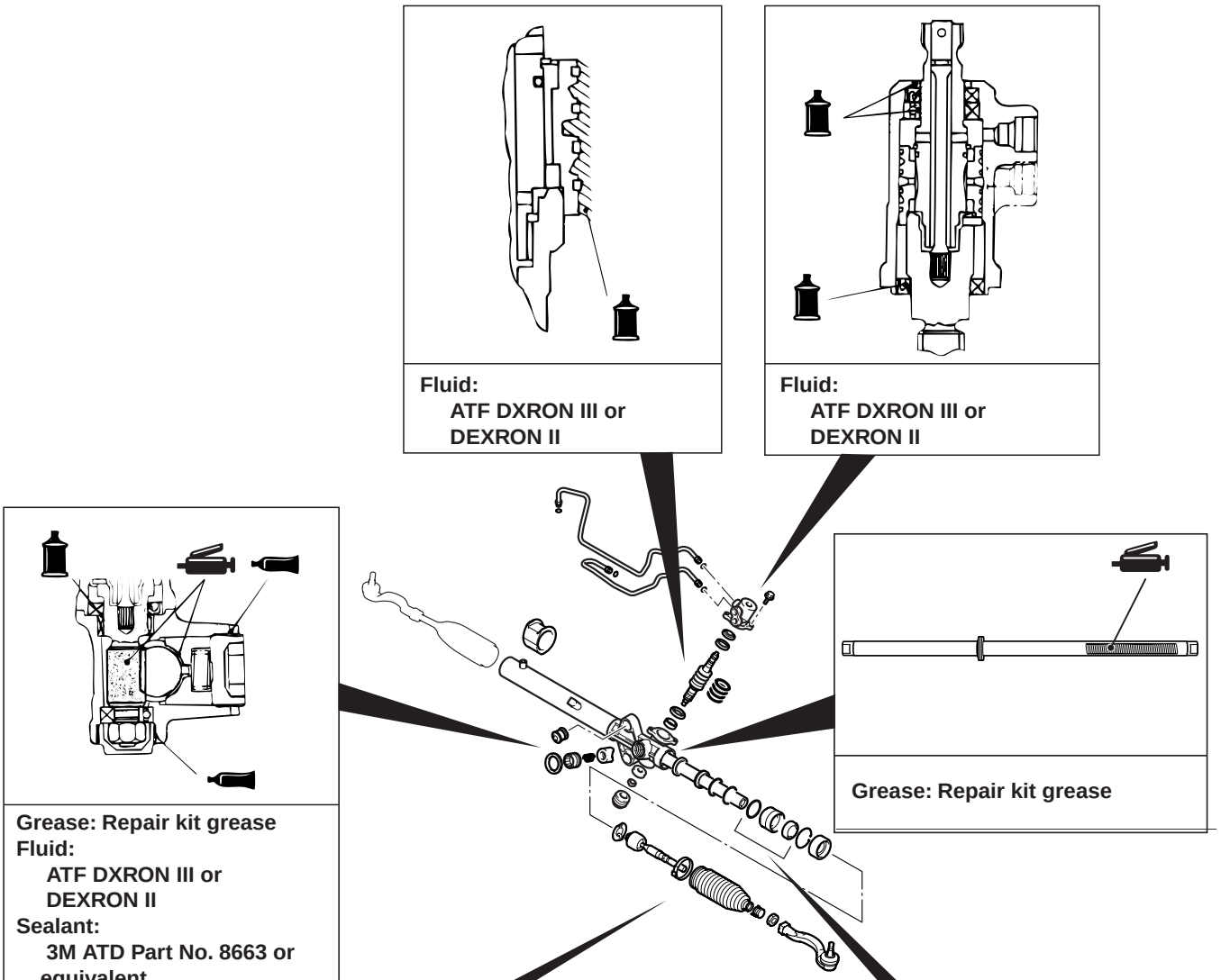
AC809363 AC



			Disassembly steps
	>>P<<	1.	Gear mounting rubber
		2.	Gear housing mounting bushing
		3.	Feed pipe
		4.	O-ring
	>>O<<	5.	Lock nut
	>>O<<	6.	Tie rod end
		7.	Clip
	>>N<<	8.	Bellows band
		9.	Bellows
<<A>>	>>M<<	10.	Tab washer
<<B>>	>>L<<	11.	Tie rod
	>>K<<	•	Total pinion torque adjustment
	>>J<<	12.	Lock nut
<<C>>	>>J<<	13.	Rack support cover
		14.	Support spring
		15.	Rack support
	>>I<<	16.	End plug
		17.	Lock nut

			Disassembly steps
		18.	Dust cover (Option) <Vehicles for RUSSIA>
		19.	Valve housing assembly
<<D>>	>>H<<	20.	Lower oil seal
<<D>>		21.	Pinion and valve assembly
<<E>>	>>G<<	22.	Seal ring
<<F>>	>>F<<	23.	Upper bearing
<<F>>	>>F<<	24.	Upper oil seal
		25.	Valve housing
<<G>	>>E<<	26.	Circlip
<<H>>		27.	Rack stopper
<<H>>	>>D<<	28.	Rack bushing assembly
<<H>>	>>D<<	29.	O-ring
<<H>>	>>D<<	30.	Oil seal
<<H>>	>>C<<	31.	Rack assembly
<<E>>		32.	Seal ring
		33.	O-ring
<<I>>	>>B<<	34.	Lower bearing
<<J>>	>>B<<	35.	Needle bearing
<<K>>	>>A<<	36.	Oil seal
		37.	Gear housing

LUBRICATION AND SEALING POINTS



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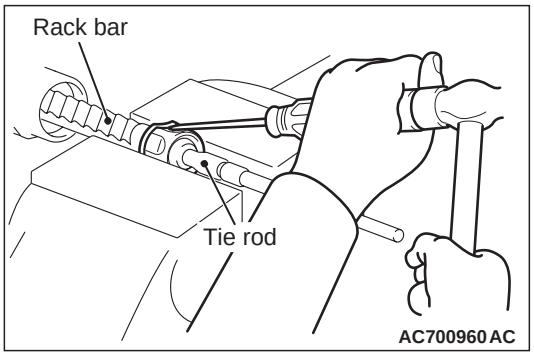
DISASSEMBLY SERVICE POINTS

<<A>> TAB WASHER REMOVAL

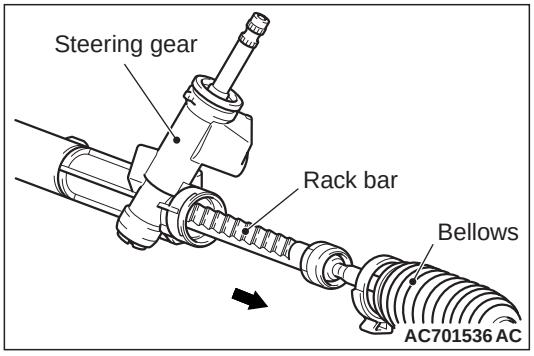
⚠ CAUTION

- **Do not tighten the vise strongly in order not to damage the tie rod.**
- **Do not make an impact to the rack bar.**



1. Fix the tie rod ball joint part with a vise.
2. Use a screw driver and hammer to lift right and left tab washer caulked edges.

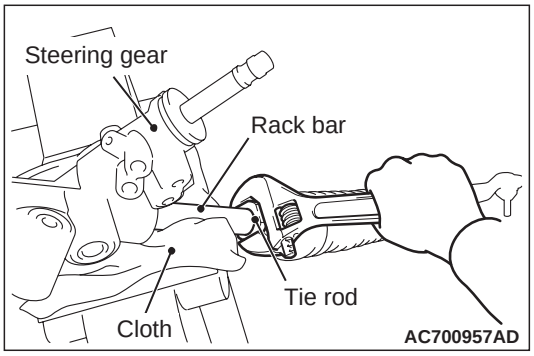
<<B>> TIE ROD REMOVAL



1. Move the bellows and pull the rack bar toward arrow direction.

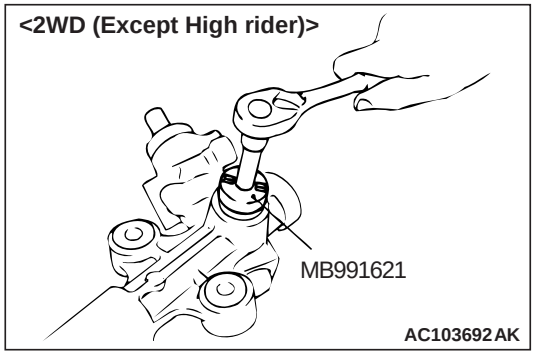
⚠ CAUTION

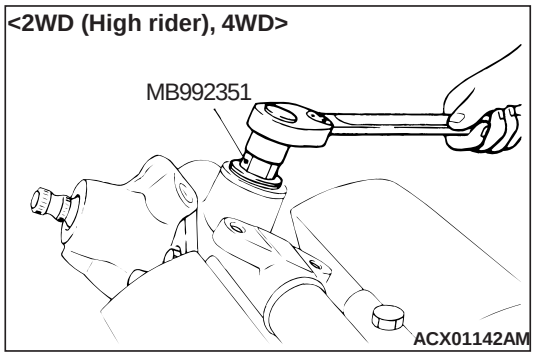
Do not tighten the vise strongly in order not to damage the rack bar.



2. Wrap rack bar with cloth in order not to damage, and fix the rack bar with a vise.
3. Use the tool to remove the tie rod.

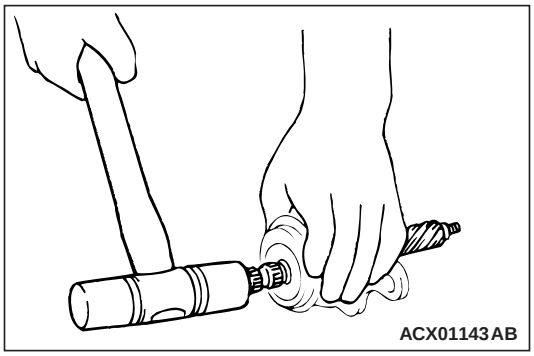
<<C>> RACK SUPPORT COVER REMOVAL





Using special tool rack support cover wrench (MB991621) <2WD (except High rider)>, torque wrench socket (MB992351) <2WD (High rider), 4WD>, remove the rack support cover from the steering gear.

<<D>> LOWER OIL SEAL/PINION AND VALVE ASSEMBLY REMOVAL

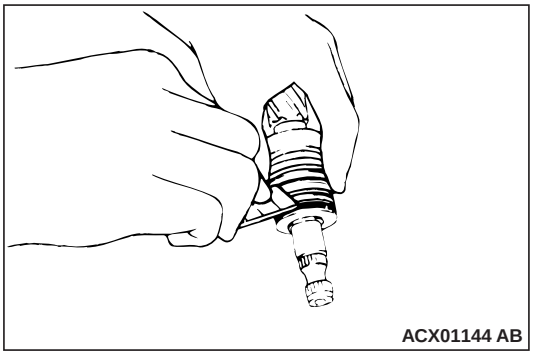


Using a plastic hammer, gently tap the pinion to remove it.

<<E>> SEAL RING REMOVAL

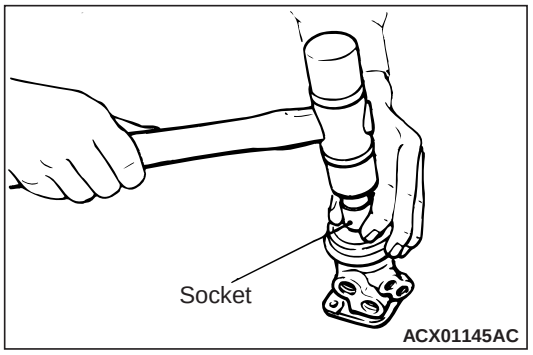
⚠ CAUTION

When cutting the seal ring, be careful not to damage the pinion and valve assembly or the rack.



Cut the seal ring and remove it from the pinion and valve assembly or the rack.

<<F>> UPPER BEARING/UPPER OIL SEAL REMOVAL

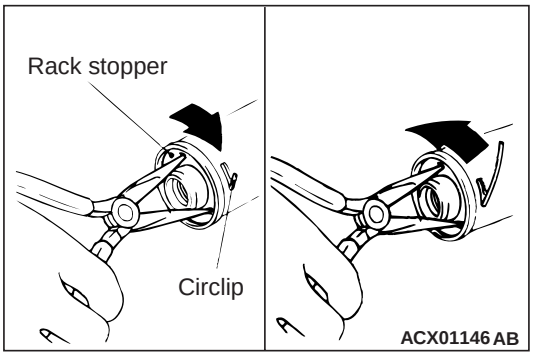


Using a socket, remove the oil seal and the ball bearing from the valve housing simultaneously.

<<G>> CIRCLIP REMOVAL

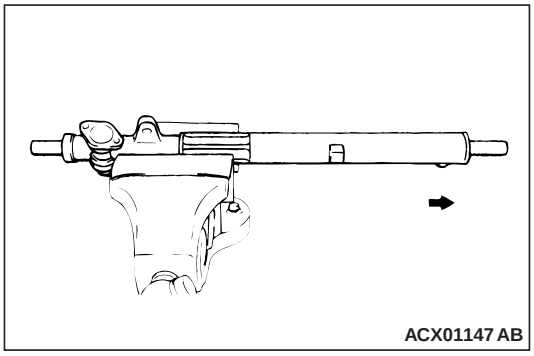
⚠ CAUTION

If the rack stopper is first turned anticlockwise, the circlip will get caught in the slot in the housing and the rack stopper will not turn.



1. Turn the rack stopper clockwise until the end of the circlip comes out of the slot in the rack housing.
2. Turn the rack stopper anticlockwise to remove the circlip.

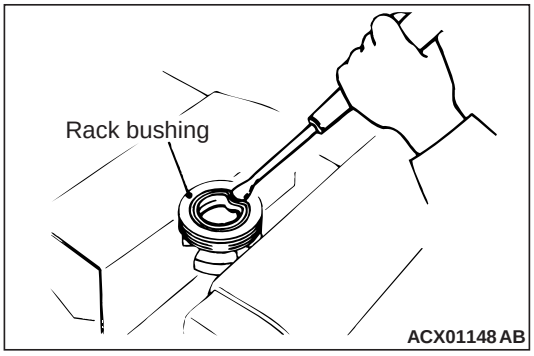
<<H>> RACK STOPPER/RACK BUSHING ASSEMBLY/O-RING/OIL SEAL/RACK ASSEMBLY REMOVAL



1. Pull out the rack slowly. Take out the rack stopper and the rack bushing at the same time.

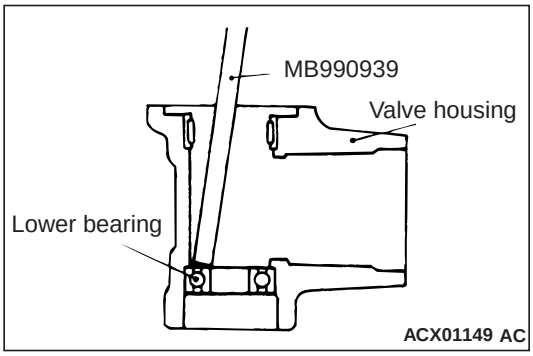
⚠ CAUTION

Do not damage the oil seal press fitting surface.



2. Partially bend the oil seal and remove it from the rack bushing.

<<I>> LOWER BEARING REMOVAL

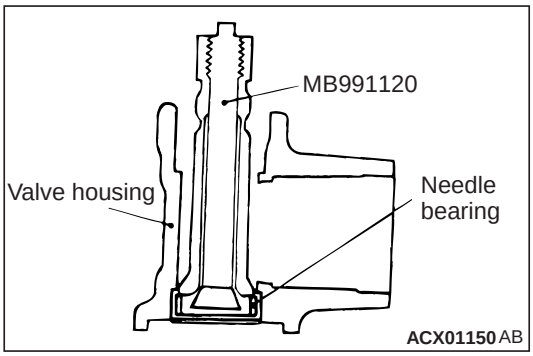


Use a brass bar or special tool brass bar (MB990939) to remove the ball bearing from the gear housing.

<<J>> NEEDLE BEARING REMOVAL

⚠ CAUTION

Do not open special tool needle bearing puller (MB991120) excessively to prevent damaging housing interior.

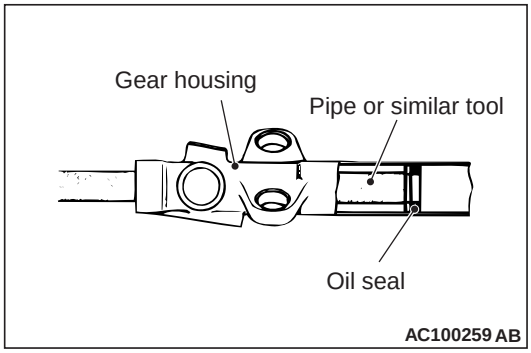


Use special tool needle bearing puller (MB991120) to remove the needle bearing from the rack housing.

<<K>> OIL SEAL REMOVAL

⚠ CAUTION

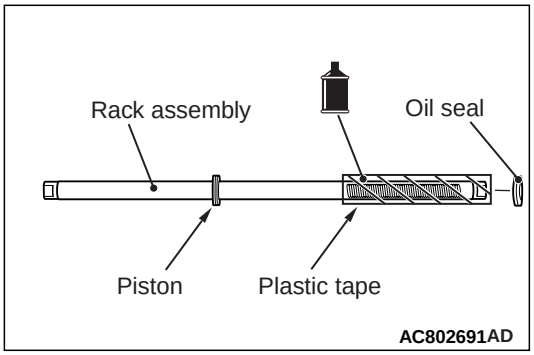
Be careful not to damage the inner surface of the rack cylinder of the gear housing.



Use a piece of pipe or similar tool to remove the oil seal from the gear housing.

REASSEMBLY SERVICE POINTS

>>A<< OIL SEAL INSTALLATION



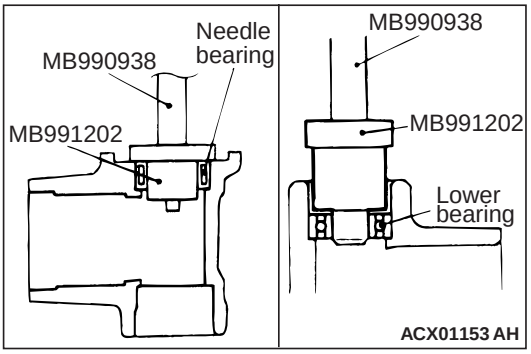
1. Wrap the rack assembly teeth face with plastic tape, and apply a coating of ATF DEXRON III or DEXRON II.
2. Insert the oil seal in rack assembly, and move to the piston.

>>B<< NEEDLE BEARING/LOWER BEARING INSTALLATION

1. Apply ATF DEXRON III or DEXRON II to housing, bearing and oil seal press fitting surface.

⚠ CAUTION

Press-fit straight. The valve housing is aluminium, and may become deformed if press-fit on an angle.

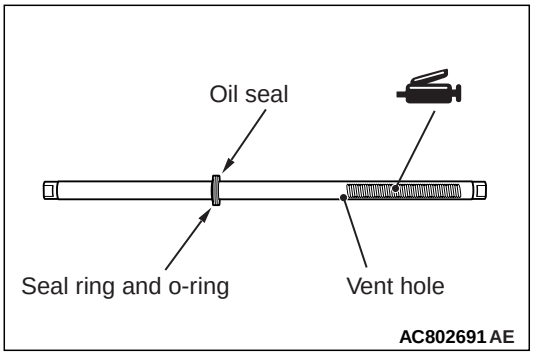


2. Press fit needle bearing with following special tools.
   - Bar (snap-in type) (MB990938)
   - Oil seal and bearing installer (MB991202)

>>C<< RACK ASSEMBLY INSTALLATION

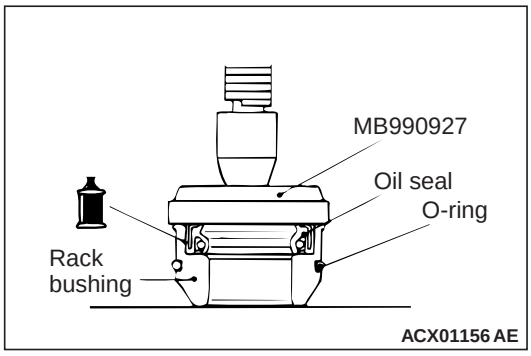
⚠ CAUTION

Do not plug the vent hole in the rack with grease.

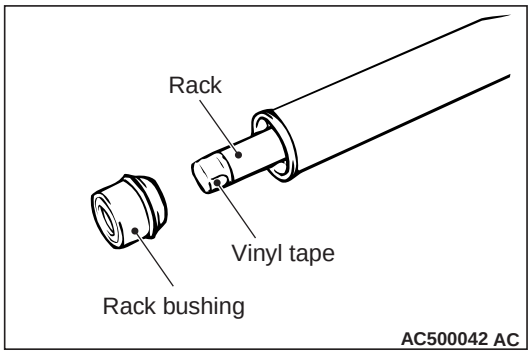


1. Removal the plastic tape, and apply a coating of multipurpose grease to the rack teeth face.
2. Apply a coating of ATF DEXRON III or DEXRON II to the outer surface of the seal ring and the O-ring.
3. Slowly insert the rack from power cylinder side.

>>D<< OIL SEAL/O-RING/RACK BUSHING ASSEMBLY INSTALLATION



1. Apply ATF DEXRON III or DEXRON II to the outer surface of the oil seal. Using the special tool installer adapter (MB990927), press in the oil seal until it is flush with the bushing end face.

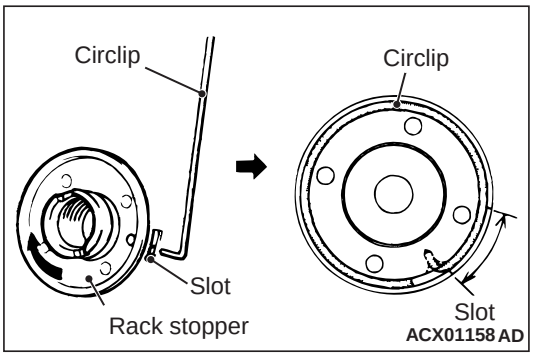


2. Apply ATF DEXRON III or DEXRON II to the oil seal inner surface and the O-ring.
3. Wrap the rack end with plastic tape, and push the rack bushing onto the rack.

>>E<< CIRCLIP INSTALLATION

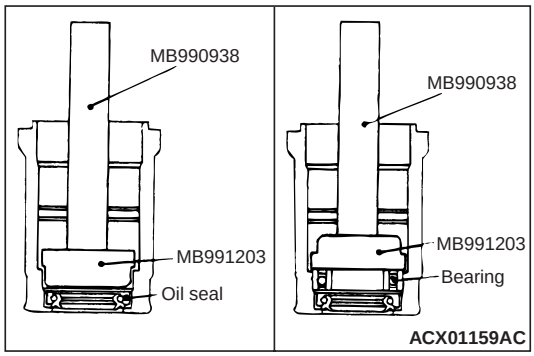
⚠ CAUTION

Insert the circlip to the rack stopper hole while turning the rack stopper clockwise.



Insert the circlip to the rack stopper hole through cylinder hole. Turn the rack stopper clockwise and insert the circlip firmly.

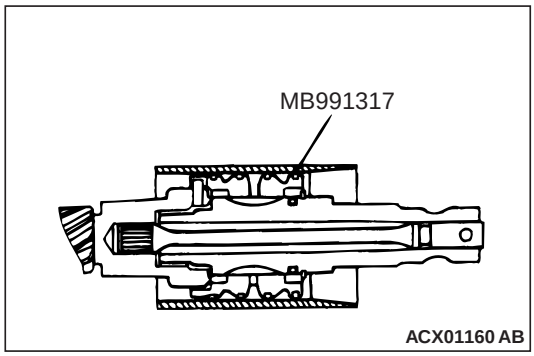
>>F<< UPPER OIL SEAL/UPPER BEARING INSTALLATION



Apply a coating of ATF DEXRON III or DEXRON II to the outside of the upper oil seal/upper bearing. Using following special tools, press the upper oil seal/upper bearing into the valve housing.

- MB990938: Bar (Snap-in type)
- MB991203: Oil Seal and Bearing Installer

>>G<< SEAL RING INSTALLATION

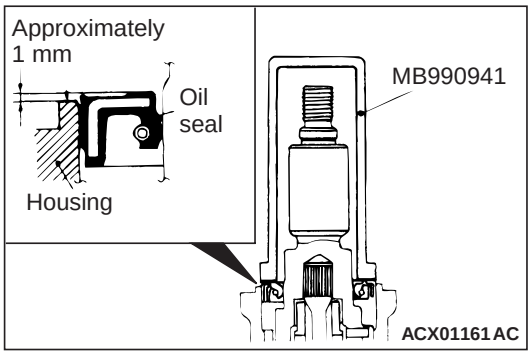


Because the seal rings expand after installation, tighten after installing by using special tool seal ring installer (MB991317) to compress the rings, or press down by hand.

>>H<< LOWER OIL SEAL INSTALLATION

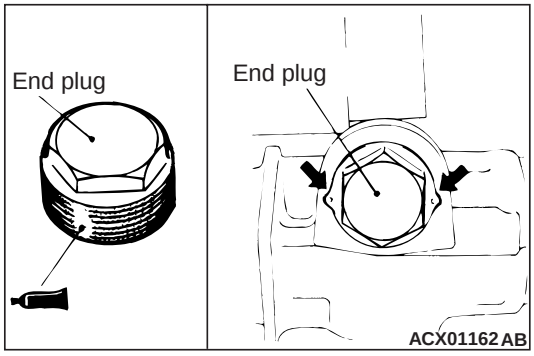
⚠ CAUTION

To eliminate a seal malfunction at the valve housing alignment surface, the upper surface of the oil seal should project outward approximately 1 mm from the housing edge surface.



Using special tool torque tube bearing installer (MB990941), press the oil seal into the valve housing.

>>I<< END PLUG INSTALLATION



1. Apply specified sealant to the threaded part of the end plug.

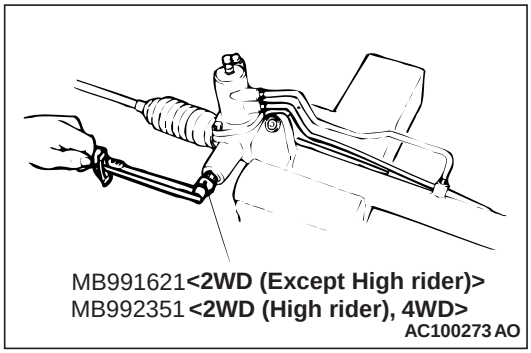
   Specified sealant:
   3M ATD Part No. 8663 or equivalent

2. Secure the threaded portion of the end plug at two places by using a punch.

>>J<< RACK SUPPORT COVER/LOCK NUT INSTALLATION

1. Position the rack at its centre.
2. Apply specified sealant to the threaded part of the rack support cover.

   Specified sealant:
   3M ATD Part No. 8663 or equivalent

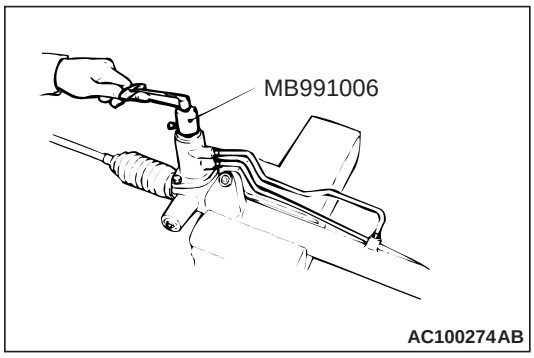


3. Use special tool rack support cover wrench (MB991621) <2WD (except High rider)>, torque wrench socket (MB992351) <2WD (High rider), 4WD> to tighten the rack support cover.
4. Use the special tools to hold the rack support cover, and then tighten the lock nut to 59 ± 10 N·m.

>>K<< TOTAL PINION TORQUE ADJUSTMENT

⚠ CAUTION

- **Be sure there is no ratcheting or catching when operating the rack towards the shaft.**
- **Measure the total pinion torque through the whole stroke of the rack.**



1. Using special tool preload socket (MB991006), rotate the pinion shaft at the rate of one rotation in four to six seconds to check the total pinion torque and the change in torque.

   Standard value:
   Total pinion torque: 0.6 – 1.7 N·m
   [Torque fluctuation: 0.4 N·m or less]

⚠ CAUTION

When adjusting, set at the highest value of the standard value range.

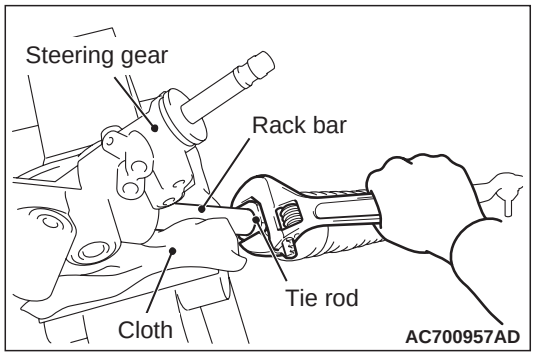
NOTE: If the total pinion toque cannot be adjusted to the standard value within the specified return angle, check the rack support cover components and replace any parts if necessary.

2. If the total pinion torque or the change in torque is outside the standard value, move the rack support cover 0 – 30°, and adjust the pinion torque again.

>>L<< TIE ROD INSTALLATION

⚠ CAUTION

Do not tighten the vise strongly in order not to damage the rack bar.

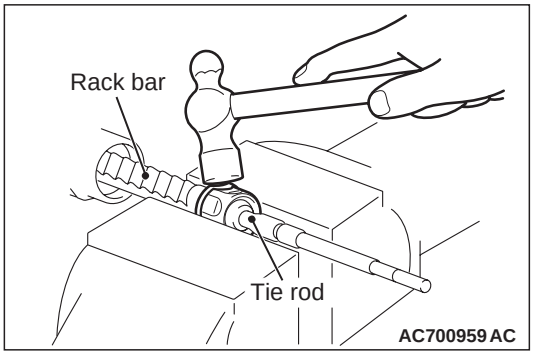


1. Wrap rack bar with cloth in order not to damage, and fix the rack bar with a vise.

2. Use the tool to install the tie rod.
   Tightening torque: 88 ± 10 N·m

>>M<< TAB WASHER INSTALLATION

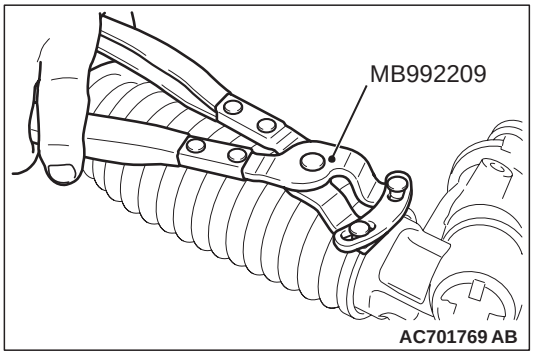
⚠ CAUTION
- **Do not tighten the vise strongly in order not to damage the tie rod.**
- **Do not make an impact to the rack bar.**



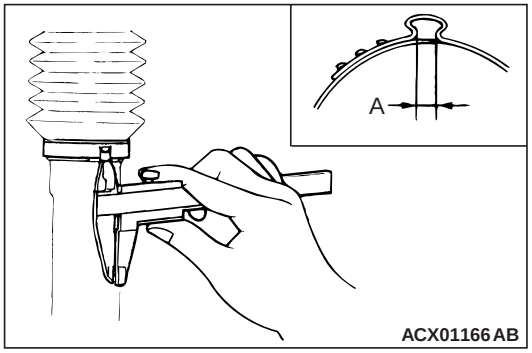
1. Fix the tie rod ball joint part with a vise.
2. Use a hammer to caulk the right and left tab washer at two places.

>>N<< BELLOWS BAND INSTALLATION

⚠ CAUTION
- **Hold the rack housing, and use special tool bellows band crimping tool (MB992209) to crimp the bellows band securely.**
- **Crimp the bellows band until special tool (MB992209) touches the stopper.**

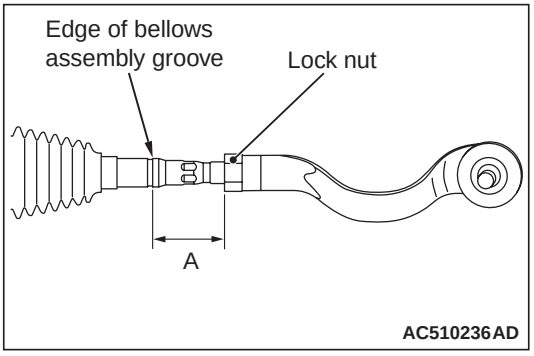


1. Use special tool (MB992209) to crimp the bellows band.



2. Check that crimped width (A) is within the standard value.
   Standard value (A): 2.4 – 2.8 mm

>>O<< TIE ROD END/LOCK NUT INSTALLATION

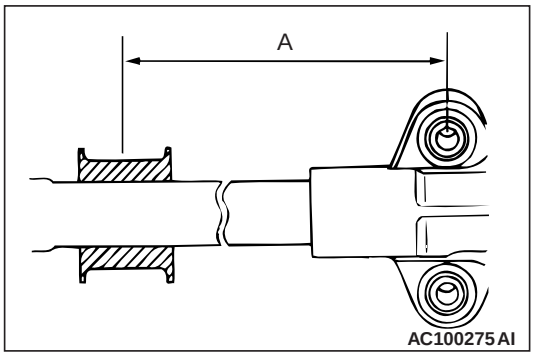


Screw in the tie rod end to achieve the right and left length as illustrated. Lock with the lock nut.

Reference value (A):
- **165.6mm <2WD (except High rider)>**
- **53.1mm <2WD (High rider), 4WD>**

NOTE: The lock nuts must be tightened securely only after the steering gear is installed to the vehicle and toe-in is adjusted.

>>P<< GEAR MOUNTING RUBBER INSTALLATION



Install the gear mounting rubber to the rack housing so that the distance is as shown in the illustration.

Reference value (A):
- **326mm <2WD (except High rider)>**

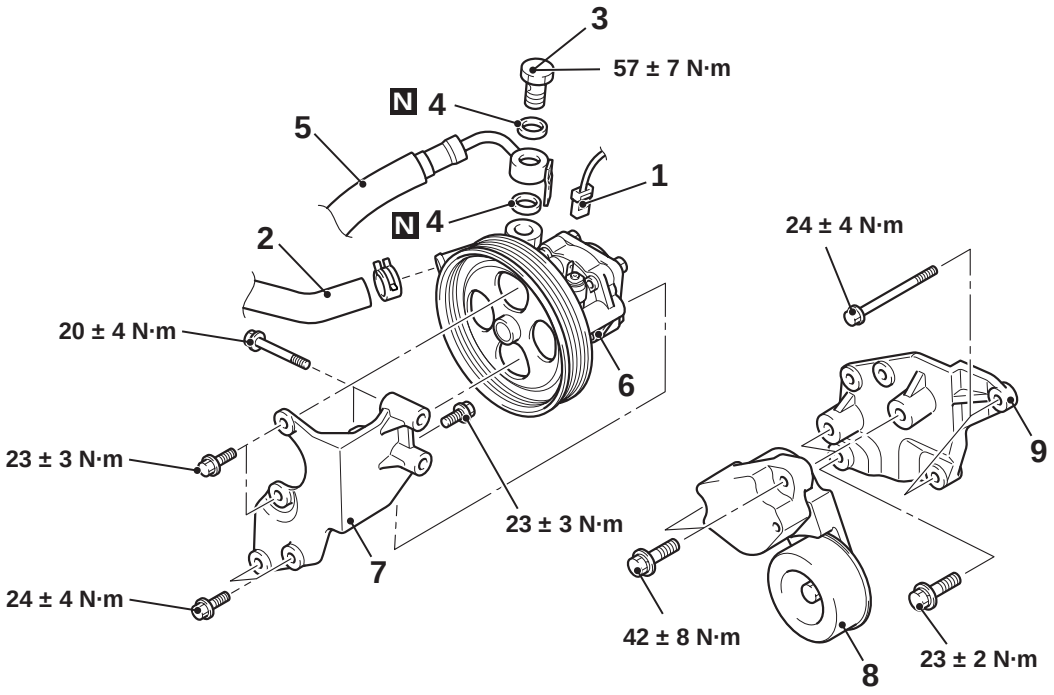
- **337mm <2WD (High rider), 4WD>**

POWER STEERING OIL PUMP ASSEMBLY

REMOVAL AND INSTALLATION

M1372005201666

Pre-removal Operation	Post-installation Operation
• Power Steering Fluid Draining (Refer to P.37-11). • Front Under Cover (RH) and Side Under Cover (RH) Removal (Refer to GROUP 51 – Under Cover). • Alternator and Others Belt Removal (Refer to GROUP 11A – Crankshaft Pulley).	• Alternator and Others Belt Installation (Refer to GROUP 11A – Crankshaft Pulley). • Front Under Cover (RH) and Side Under Cover (RH) Installation (Refer to GROUP 51 – Under Cover). • Drive Belt Tension Check (Refer to GROUP 11A – On-vehicle Service – Alternator and Power Steering Oil Pump Drive Belt Tension Check). • Power Steering Fluid Supplying and Bleeding (Refer to P.37-11).



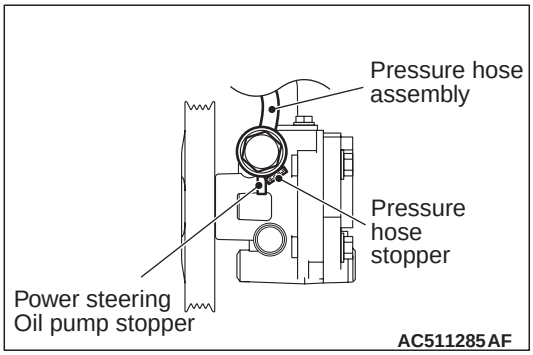
AC711265 AF

Removal steps

1. Pressure switch connector connection
>>B<< 2. Suction hose connection
3. Eye bolt
4. Gasket
>>A<< 5. Pressure hose assembly connection
6. Oil pump assembly
7. Power steering pump bracket A
8. Auto tensioner
9. Power steering pump bracket B

INSTALLATION SERVICE POINTS

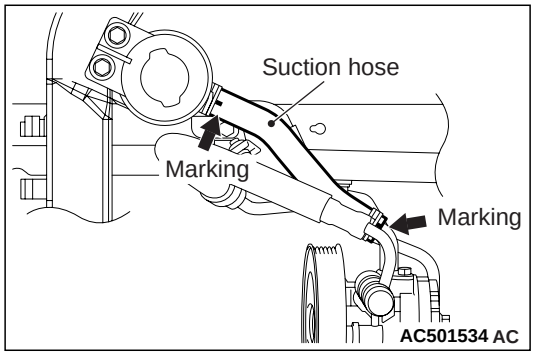
>>A<< PRESSURE HOSE ASSEMBLY CONNECTION INSTALLATION



AC511285 AF

Place the pressure hose stopper to touch the power steering oil pump stopper, and install the pressure hose assembly.

>>B<< SUCTION HOSE CONNECTION INSTALLATION



Install the suction hose so that the marking is positioned upward.

INSPECTION

M1372005300314

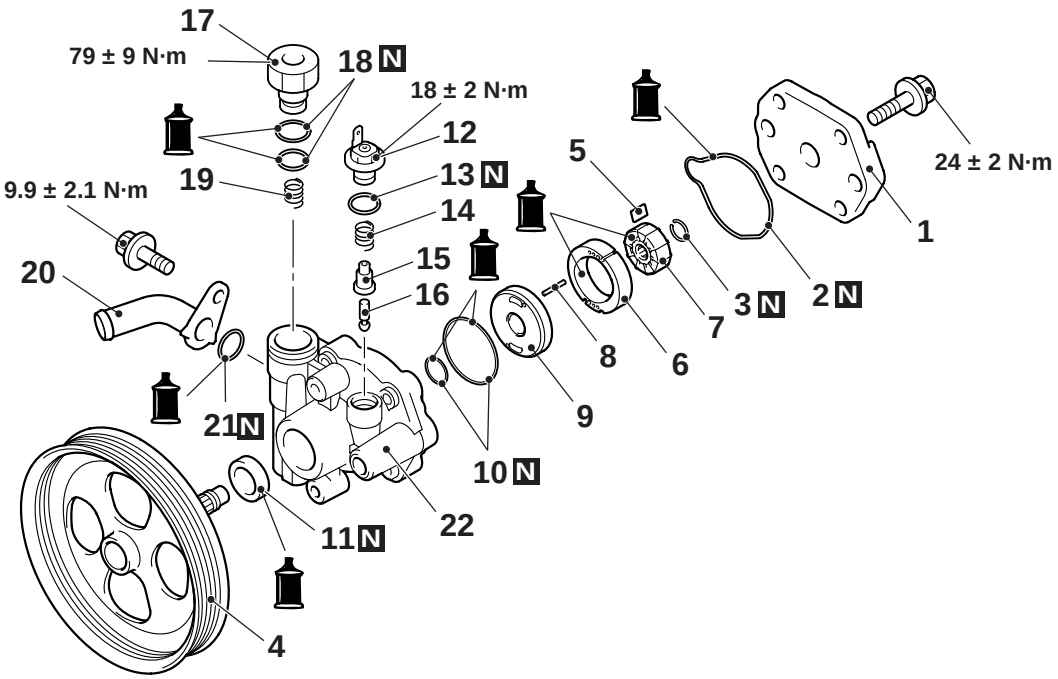
- Check the drive belt for cracks.
- Check the pulley for uneven rotation.

DISASSEMBLY AND REASSEMBLY

M1372005400559

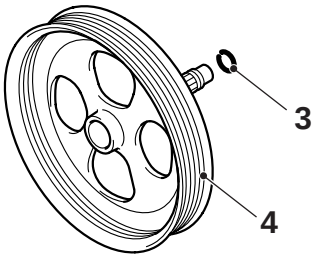
⚠ CAUTION

Never disassemble the terminal assembly. It cannot be reassembled.



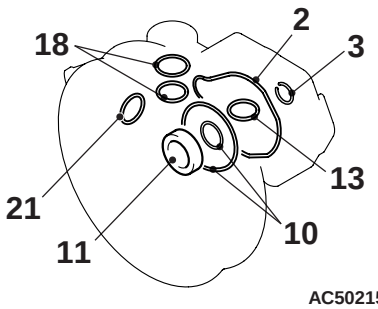
AC502153 AE

: ATF DEXRON III or DEXRON II



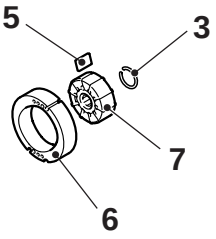
AC502154

Oil pump pulley and shaft kit



AC502155

Oil pump seal kit



AC502156

Oil pump cartridge kit

Disassembly steps

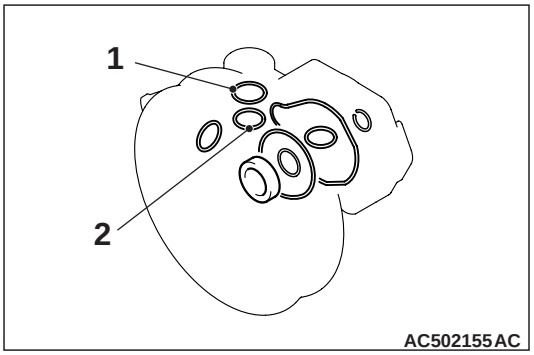
1. Pump cover
2. O-ring
3. Snap ring
4. Pulley and shaft
5. Vanes
- >>**C**<< 6. Cam ring
7. Rotor
8. Pin
9. Side plate
10. O-ring
- >>**B**<< 11. Oil seal
12. Terminal assembly

Disassembly steps (Continued)

13. O-ring
14. Spring
15. Plunger
16. Piston rod assembly
17. Flow joint kit
- >>**A**<< 18. O-ring
19. Flow control spring
20. Suction joint kit
21. O-ring
22. Oil pump case

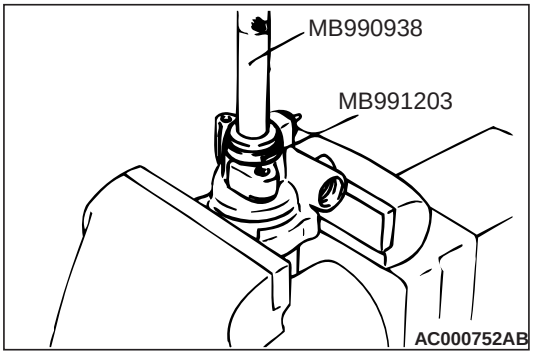
REASSEMBLY SERVICE POINTS

>>A<< O-RING INSTALLATION



No.	ID × Width mm
1	17.8 × 2.4
2	13.5 × 1.5

>>B<< OIL SEAL INSTALLATION



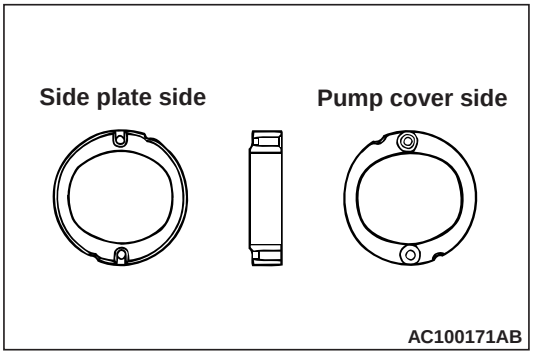
Use following special tool to install the oil seal.

- Bar (MB990938)
- Oil seal and bearing installer (MB991203)

>>C<< CAM RING INSTALLATION

⚠ CAUTION

Be sure to install the cam ring in the correct direction as shown.



Install the cam ring as shown in the illustration.

INSPECTION

M1372005500329

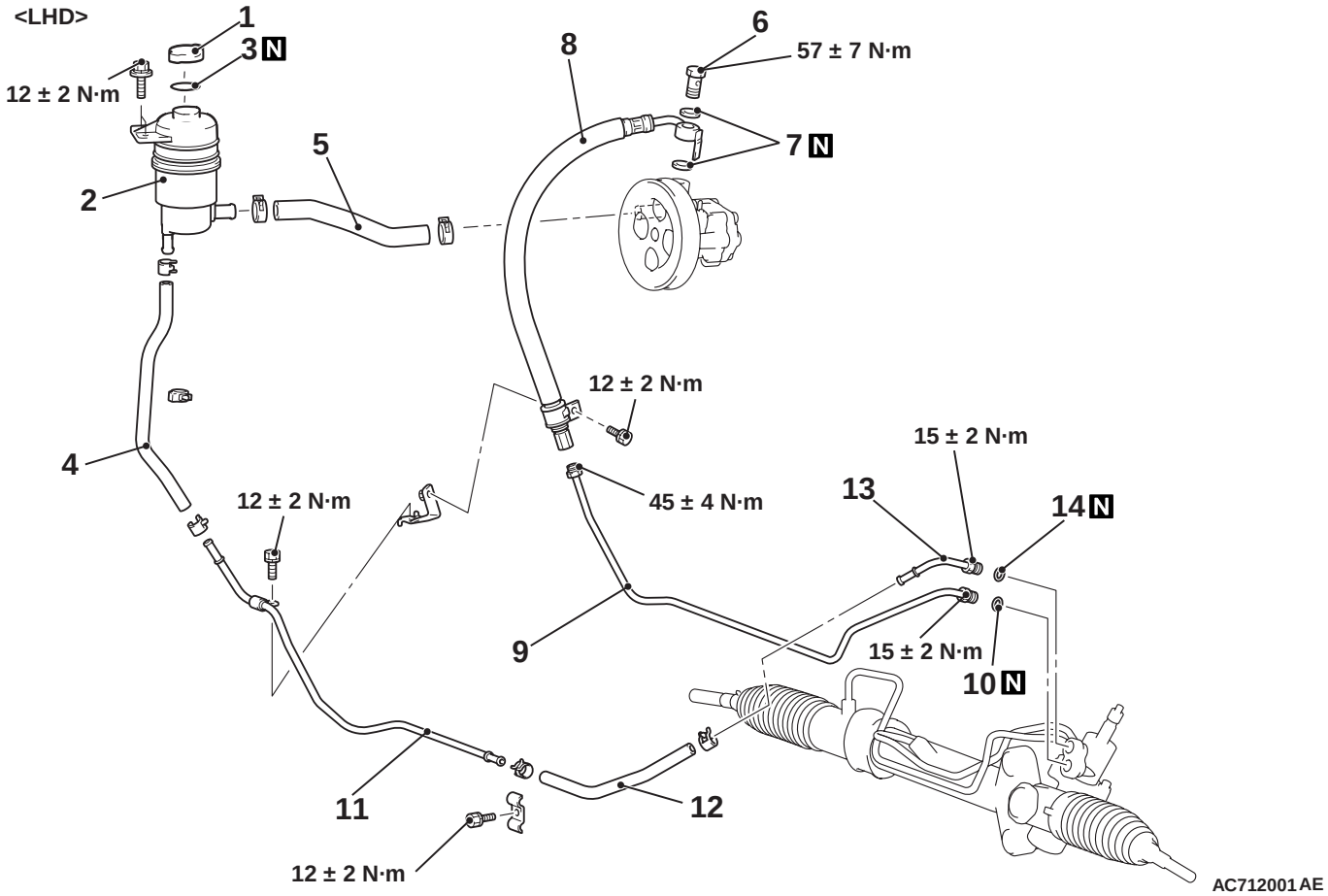
- Check the flow control valve of the pump body for clogging.
- Check the pulley and shaft for wear or damage.
- Check the rotor and vane groove for "stepped" wear.
- Check the contact surface of cam ring and vanes for "stepped" wear.
- Check the vanes for damage.

POWER STEERING HOSES

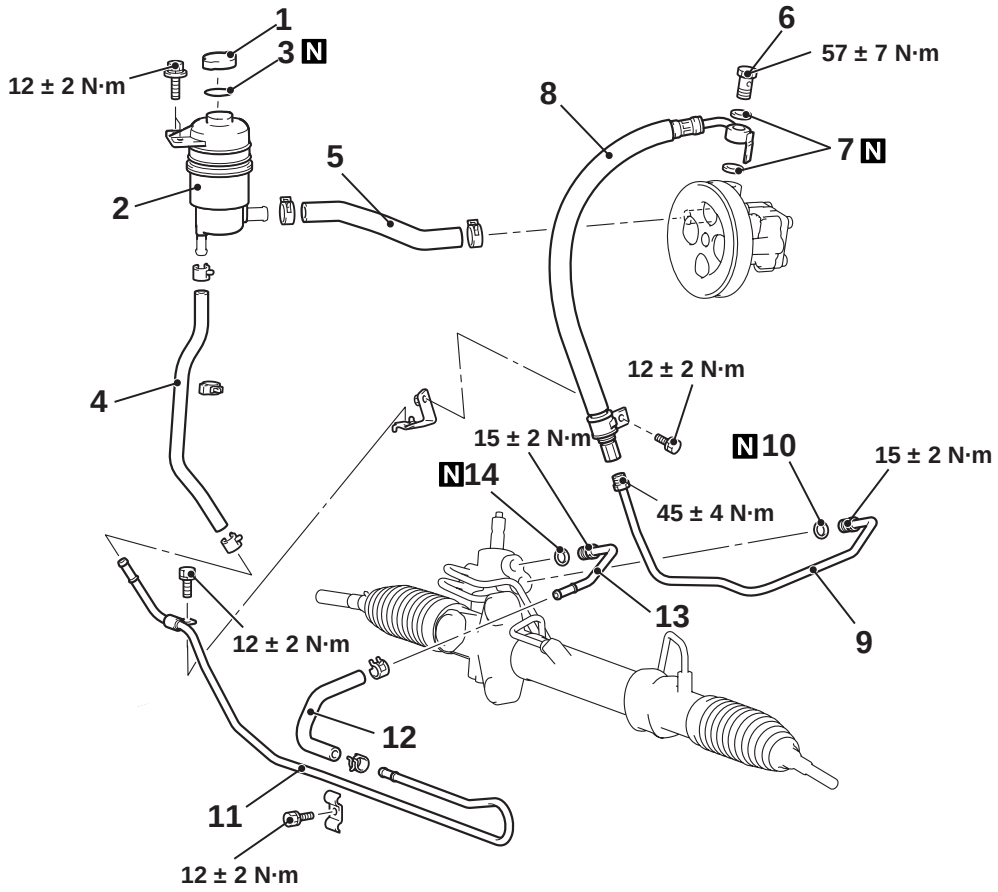
REMOVAL AND INSTALLATION

M1372005702426

Pre-removal and Post-installation Operation
- Power Steering Fluid Draining and Refilling (Refer to P.37-11) and Bleeding (Refer to P.37-11).



<RHD>



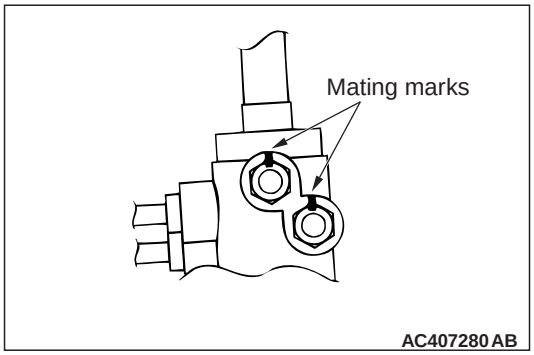
AC501430 AO

Removal steps

1. Cap
2. Oil reservoir
3. O-ring
>>E<< 4. Return hose
>>D<< 5. Suction hose
6. Eye bolt
7. Gasket
>>C<< 8. Pressure hose assembly
>>A<< 9. Pressure tube assembly
10. O-ring
11. Return tube assembly
>>B<< 12. Return hose
>>A<< 13. Return tube assembly
14. O-ring

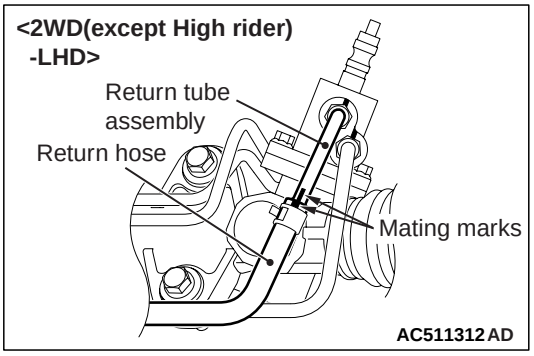
INSTALLATION SERVICE POINTS

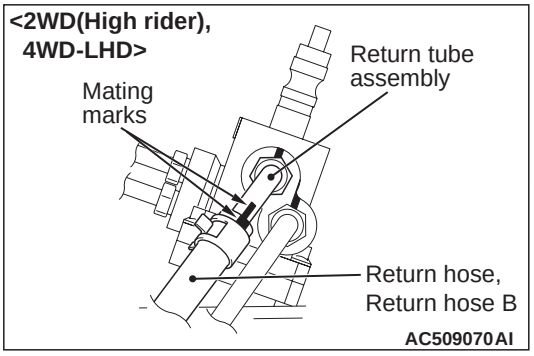
>>A<< RETURN TUBE ASSEMBLY/PRESSURE TUBE ASSEMBLY INSTALLATION

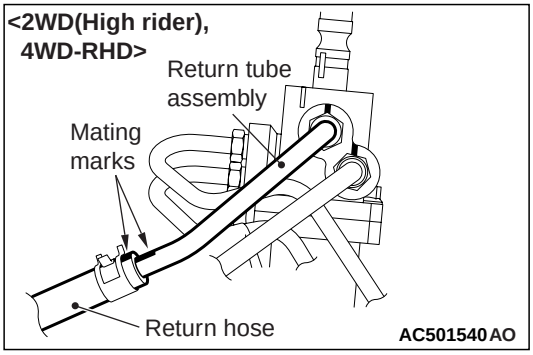


Align the mating marks on the gear box, return tube assembly and pressure tube assembly when installing.

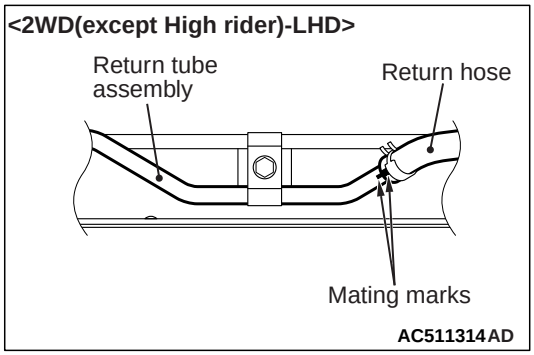
>>B<< RETURN HOSE INSTALLATION

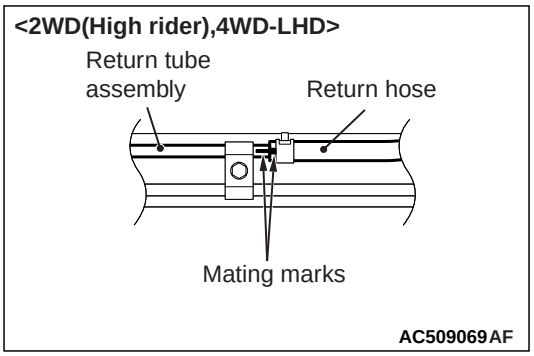


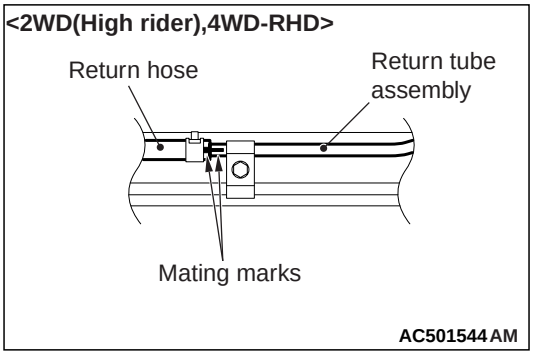




1. Install the return hose and return tube assembly so that the mating marks and facing forward <Except 2WD (High rider), 4WD-RHD>, or upward <2WD (High rider), 4WD-RHD>.

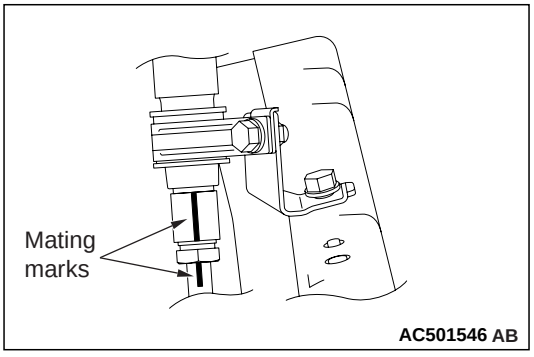




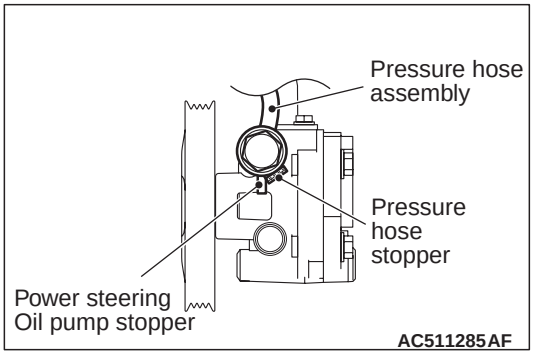


2. Install so that the mating marks are faced forward.

>>C<< PRESSURE HOSE ASSEMBLY INSTALLATION

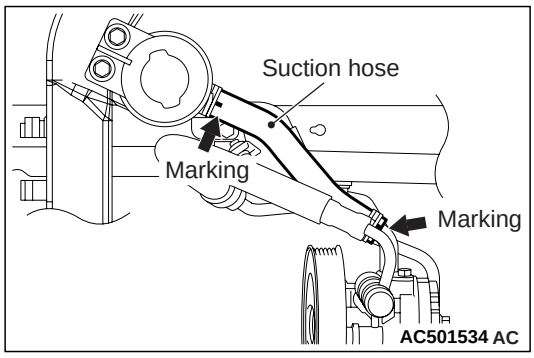


1. Install so that the mating marks are facing rearward.



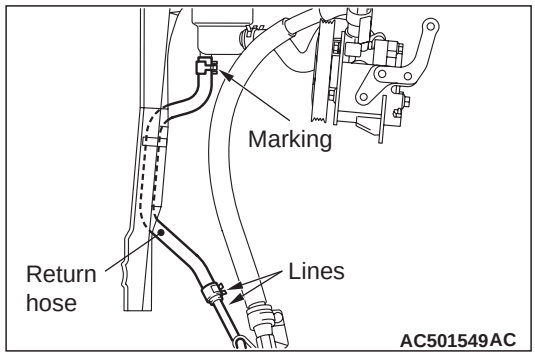
2. Place the pressure hose stopper to touch the power steering oil pump stopper, and install the pressure hose assembly.

>>D<< SUCTION HOSE INSTALLATION



Install so that the markings are faced upward.

>>E<< RETURN HOSE INSTALLATION



Install the return hose so that the markings and lines are faced rearward.

GROUP 42

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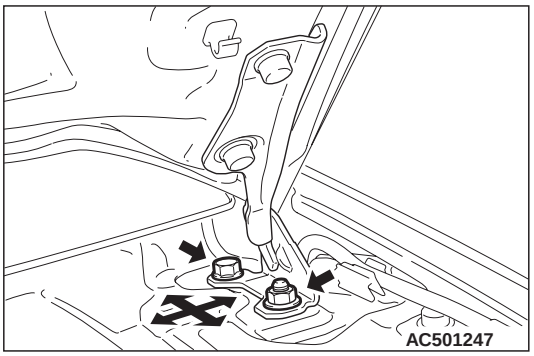
HOOD

ON-VEHICLE SERVICE

ADJUSTMENT OF CLEARANCE AROUND HOOD

M1421007200301

1. Remove the front deck garnish (Refer to GROUP 51, Windshield Wiper).

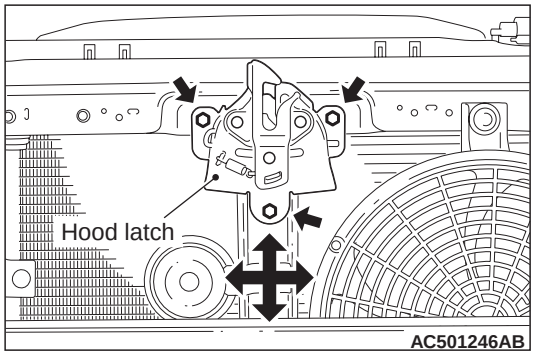


2. Loosen the hood hinge mounting bolt and nut but do not remove them. Move the hood front/rear and left/right to align the hood level and adjust the clearance between the hood and body.
3. After the adjustment, tighten the hood hinge mounting bolt and nut.
4. Install the front deck garnish (Refer to GROUP 51, Windshield Wiper).

ADJUSTMENT OF ALIGNMENT OF HOOD STEPPED PORTION AND HOOD STRIKER

M1421007300665

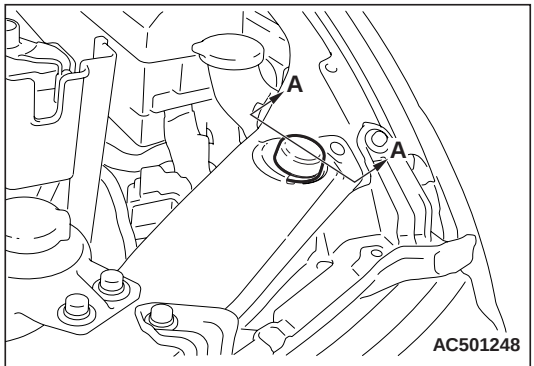
1. Remove the radiator grille (Refer to GROUP 51, Radiator Grille).



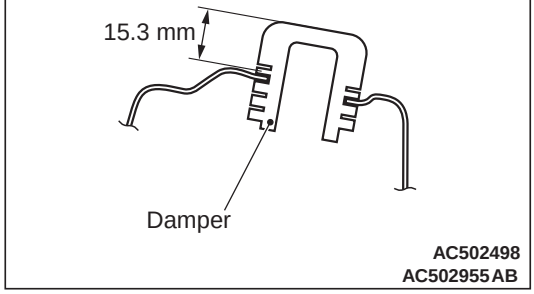
2. Loosen the hood latch mounting bolts but do not remove them. Then move the hood latch up/down and left/right to align the hood level and adjust the hood striker engagement.
3. After the adjustment, tighten the hood latch mounting bolts.
4. Install the radiator grille (Refer to GROUP 51, Radiator Grille).

ADJUSTMENT OF HOOD HEIGHT

M1421007400349



Section A – A



Turn the damper to the shown dimension to adjust the hood height. If the hood height is still not even, turn the damper again until the height is even. The damper height is altered by roughly 3 mm when the damper is rotated once.

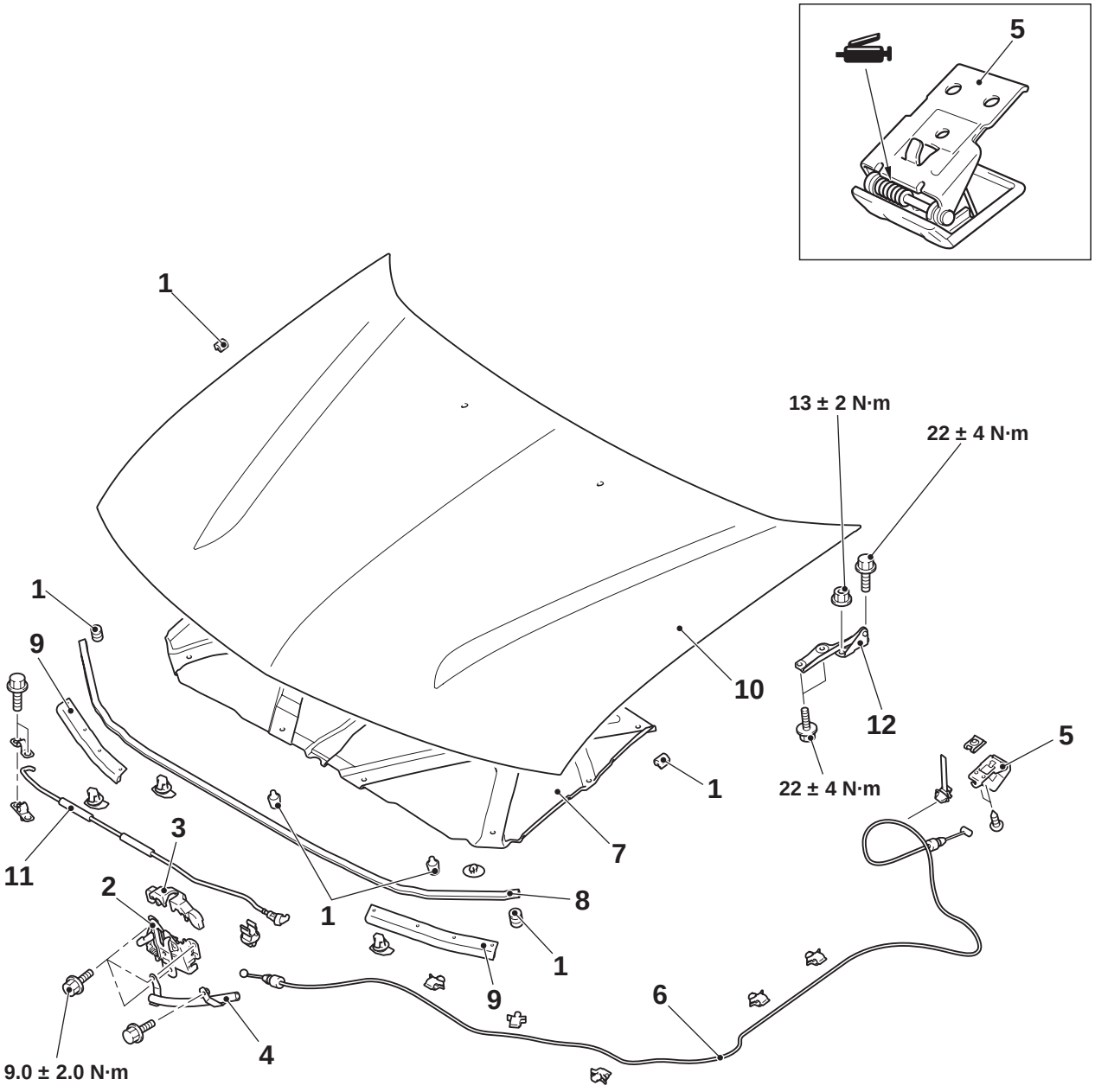
NOTE: If a rattling noise is heard due to the vibration of the hood when the vehicle is being driven, adjust the damper height until the damper is seated on the hood.

HOOD

REMOVAL AND INSTALLATION

M1421001602192

Post-installation Operation
- Adjustment of Clearance Around Hood (Refer to P.42-5.)
- Adjustment of Alignment of Hood Stepped Portion and Hood Striker (Refer to P.42-5.)
- Adjustment of Hood Height (Refer to P.42-5.)



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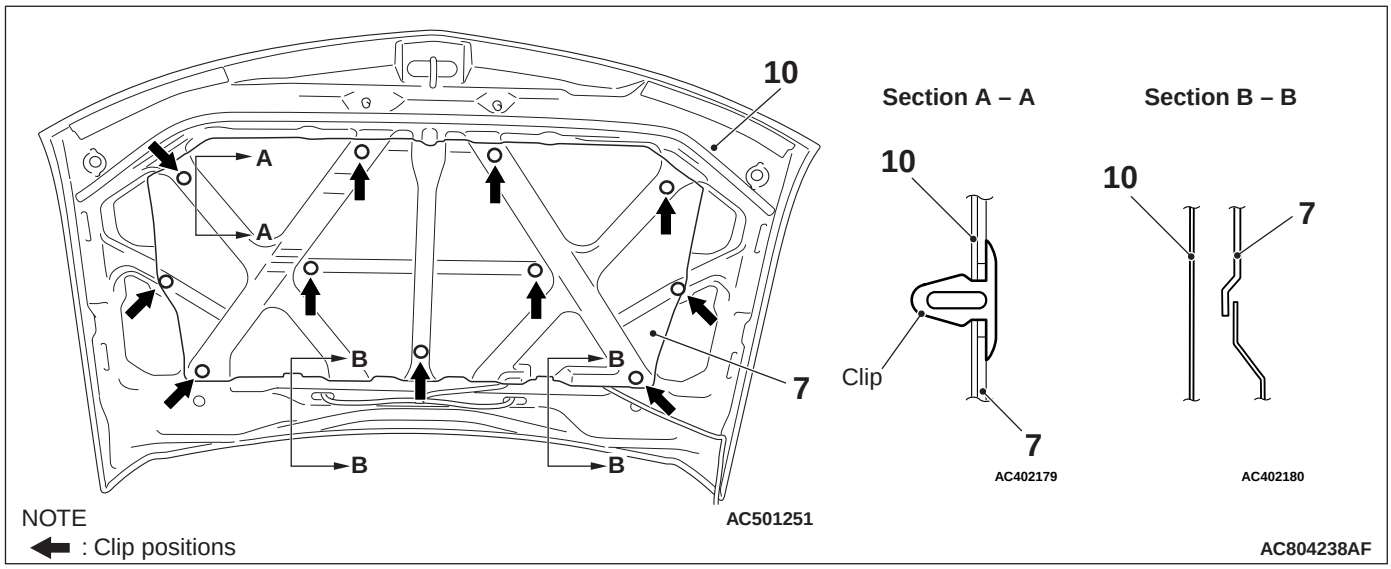


Damper removal

1. Damper

Hood latch and hood lock release cable removal steps

- Radiator grille (Refer to GROUP 51, Radiator Grille .)

2. Hood latch
3. Hood latch cover <Some models>
4. Hood lock release cable protector
5. Hood lock release handle
- Front splash shield (Refer to P.42-13.)

6. Hood lock release cable

Hood removal steps

7. Hood insulator
8. Hood weatherstrip
9. Hood weatherstrip front
- Windshield washer hose and windshield washer nozzle (Refer to GROUP 51, Windshield Washer .)

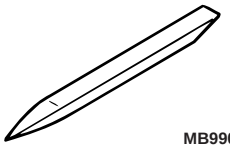
10. Hood
11. Hood support rod
- Front deck garnish (Refer to GROUP 51, Windshield Wiper .)

12. Hood hinge

FENDER

SPECIAL TOOL

M1421000600461

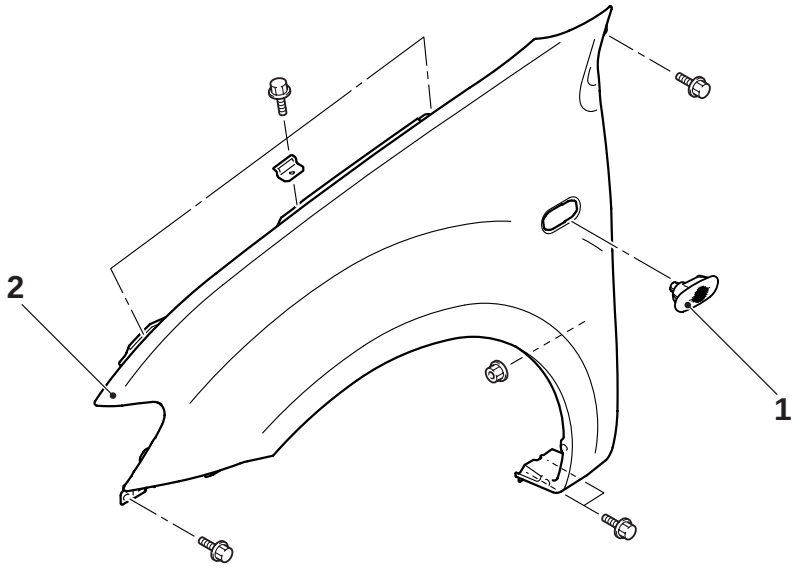
Tool	Number	Name	Use
 MB990784	MB990784	Ornament remover	Side turn-signal lamp removal

FENDER

REMOVAL AND INSTALLATION

M1421001901543

Pre-removal and Post-installation Operation
- Front Splash Shield Removal and Installation (Refer to P.42-13).
- Front Deck Garnish Removal and Installation (Refer to GROUP 51, Windshield Wiper).
- Headlamp Assembly Removal and Installation (Refer to GROUP 54A, Headlamp).
- Front Overfender Removal and Installation <Vehicles with wide fender> (Refer to GROUP 51, Overfender .)
- Front Bumper Support Bracket Removal and Installation (Refer to GROUP 51, Front Bumper Assembly).



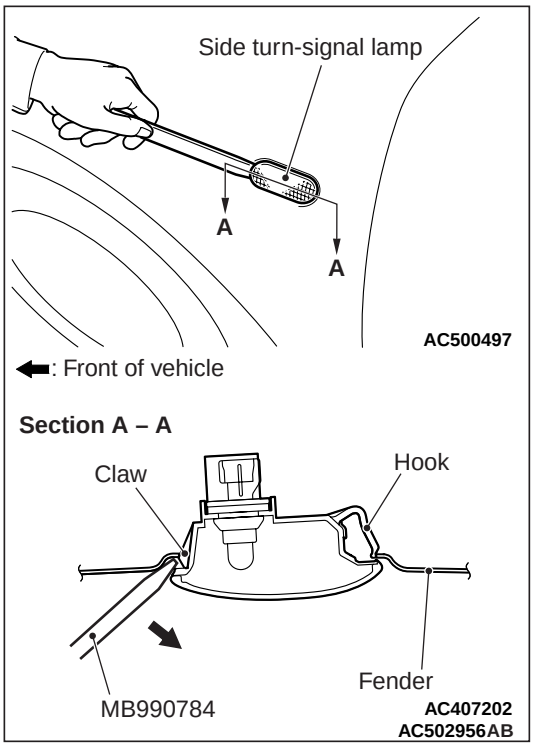
AC501252AB

Removal steps

<<**A**>> >>**A**<< 1. Side turn-signal lamp
2. Fender

REMOVAL SERVICE POINT

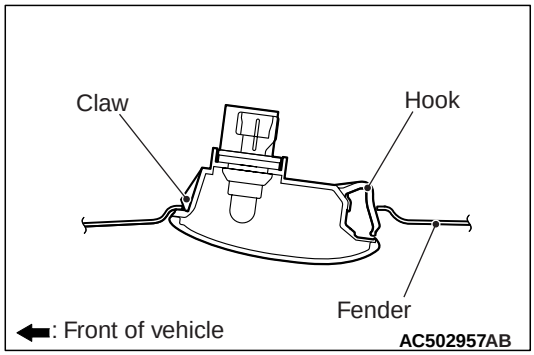
<<A>> SIDE TURN-SIGNAL LAMP REMOVAL



Insert the special tool ornament remover (MB990784) as shown to compress the hook and disengage the claw. Remove the side turn-signal lamp.

INSTALLATION SERVICE POINT

>>A<< SIDE TURN-SIGNAL LAMP INSTALLATION

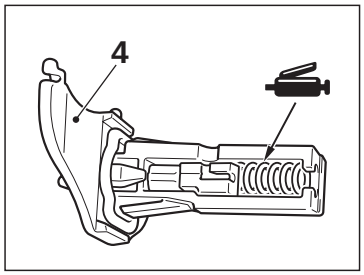


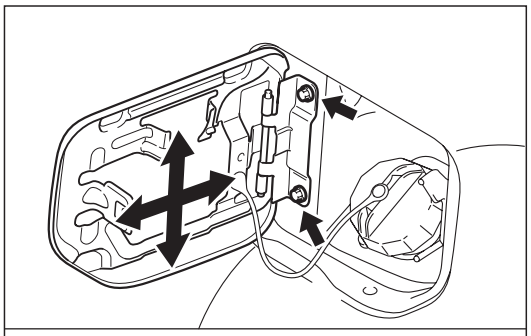
Engage the claw and the hook onto the fender to install the side turn-signal lamp.

FUEL FILLER LID

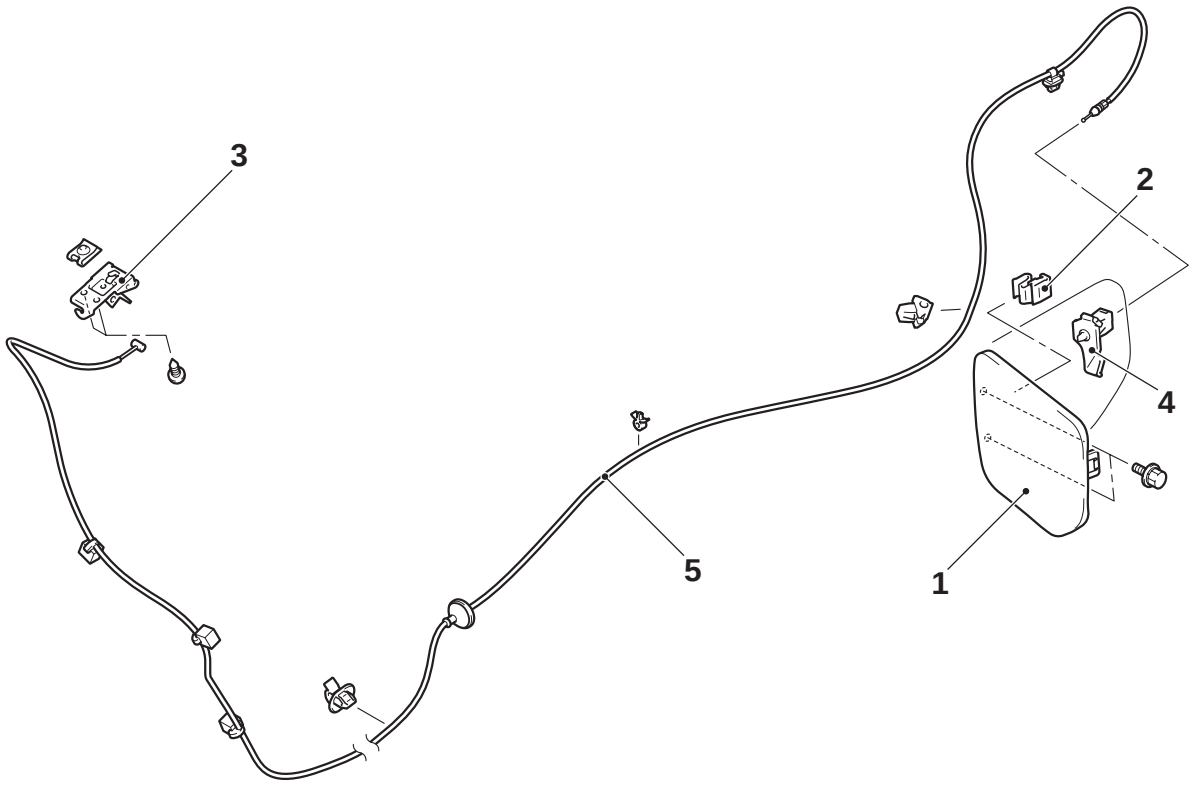
REMOVAL AND INSTALLATION <SINGLE CAB>

M1421002501098





Fuel filler lid height and clearance adjustment



AC509874AB

Fuel filler lid removal steps

1. Fuel filler lid assembly
2. Fuel filler lid locking clip

Fuel filler lid lock release handle removal

3. Fuel filler lid lock release handle

Fuel filler lid lock release cable removal steps

- Rear splash shield (Refer to P.42-13.)

4. Fuel filler lid hook

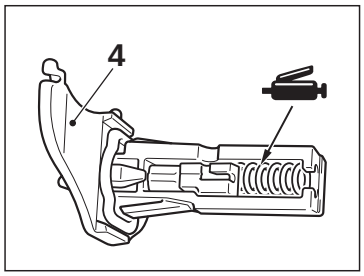
Fuel filler lid lock release cable removal steps (Continued)

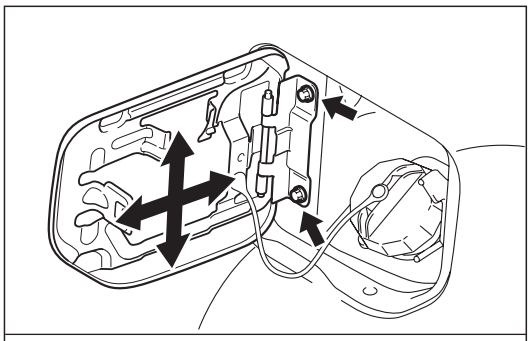
- Front scuff plate and rear pillar trim (Refer to GROUP 52A, Interior Trim .)
- A/C cooling unit (Refer to GROUP 55A, Heater Unit and Cooling Unit .)

5. Fuel filler lid lock release cable

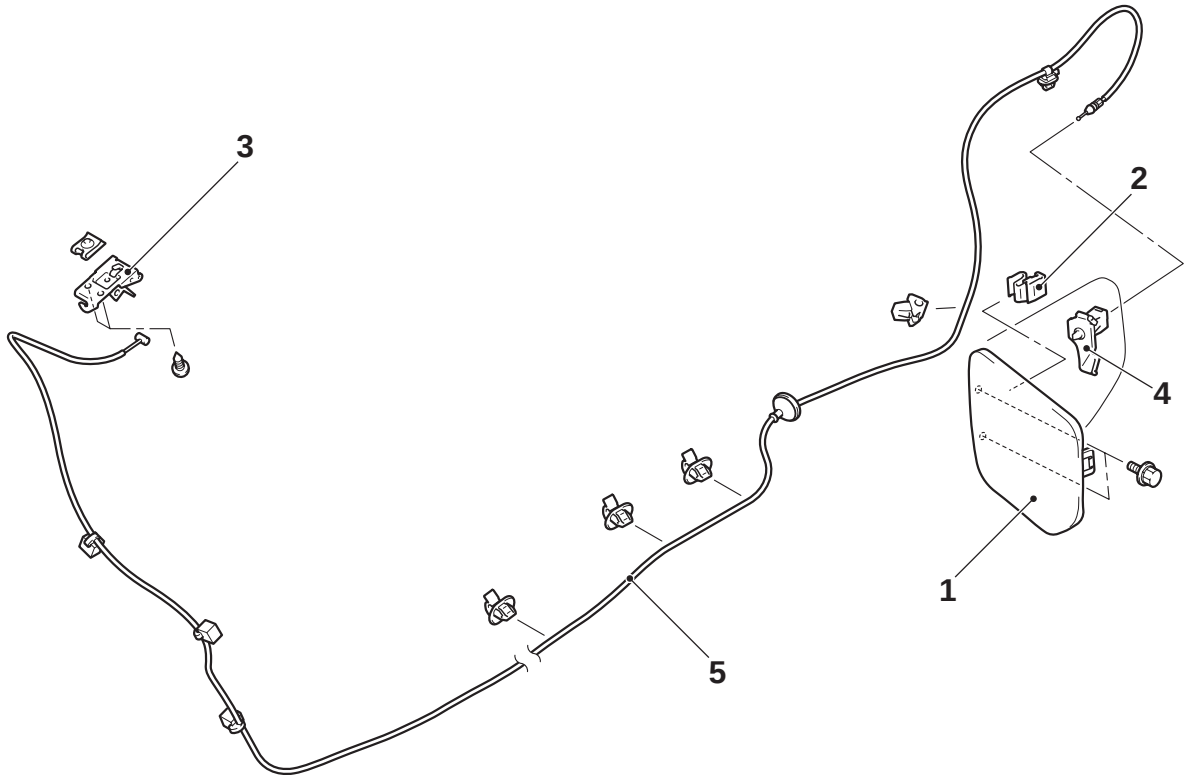
REMOVAL AND INSTALLATION <CLUB CAB>

M1421002501106





Fuel filler lid height and clearance adjustment



AC509875AB

Fuel filler lid removal steps

1. Fuel filler lid assembly
2. Fuel filler lid locking clip

Fuel filler lid lock release handle removal

3. Fuel filler lid lock release handle

Fuel filler lid lock release cable removal steps

- Rear splash shield (Refer to P.42-13.)

4. Fuel filler lid hook

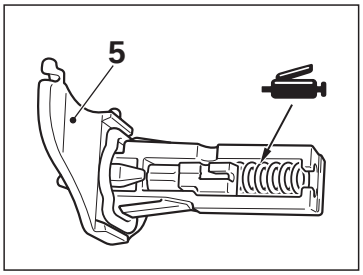
Fuel filler lid lock release cable removal steps (Continued)

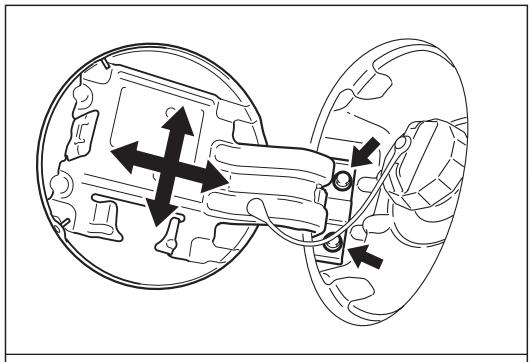
- Front scuff plate and quarter trim lower (Refer to GROUP 52A, Interior Trim .)
- A/C cooling unit (Refer to GROUP 55A, Heater Unit and Cooling Unit .)

5. Fuel filler lid lock release cable

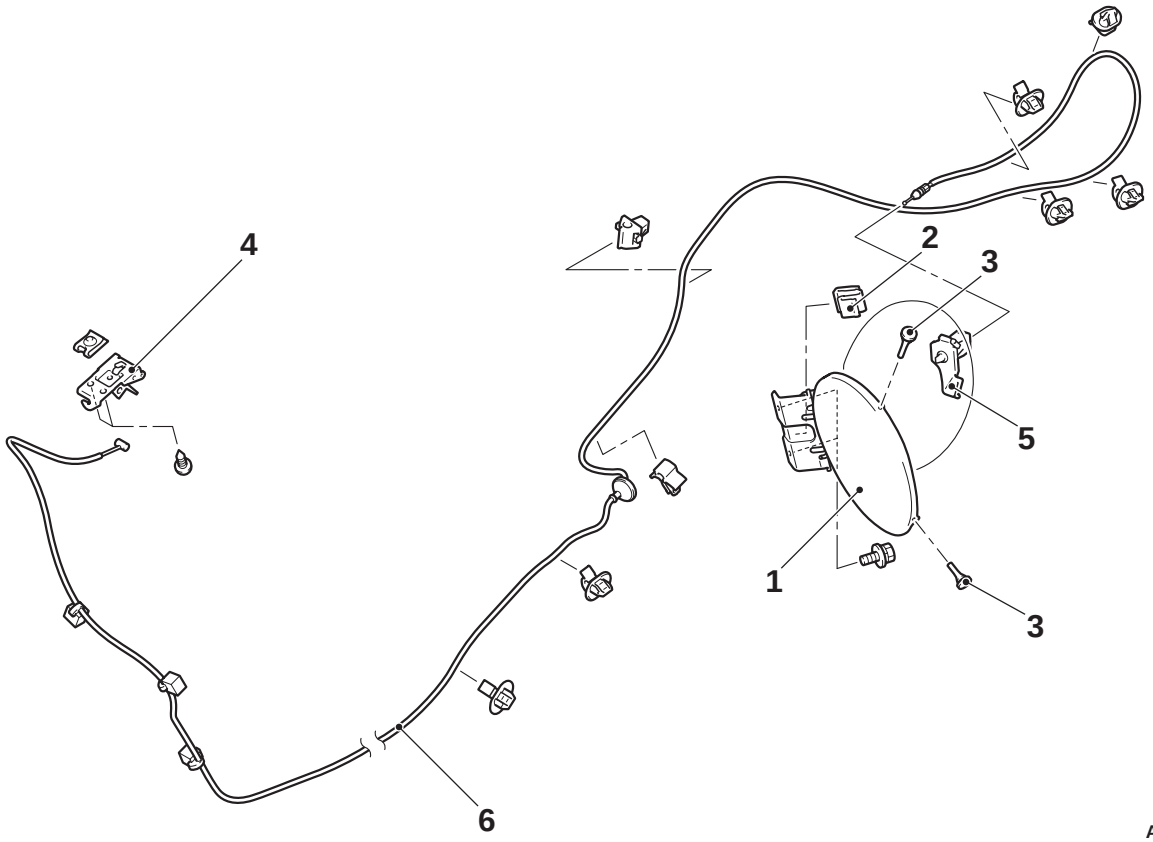
REMOVAL AND INSTALLATION <DOUBLE CAB>

M1421002501117





Fuel filler lid height and clearance adjustment



AC509876 AB

Fuel filler lid removal steps

1. Fuel filler lid assembly
2. Fuel filler lid locking clip
3. Damper

Fuel filler lid lock release handle removal

4. Fuel filler lid lock release handle

Fuel filler lid lock release cable removal steps

- Rear splash shield (Refer to P.42-13.)

5. Fuel filler lid hook

Fuel filler lid lock release cable removal steps (Continued)

- Front scuff plate, rear scuff plate, centre pillar lower trim and rear pillar lower trim (Refer to GROUP 52A, Interior Trim .)
- A/C cooling unit (Refer to GROUP 55A, Heater Unit and Cooling Unit .)

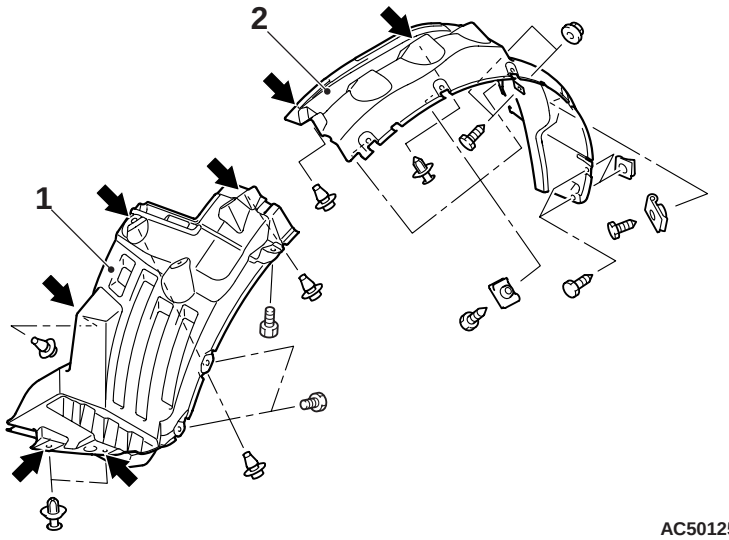
6. Fuel filler lid lock release cable

SPLASH SHIELD

REMOVAL AND INSTALLATION

M1421009700551

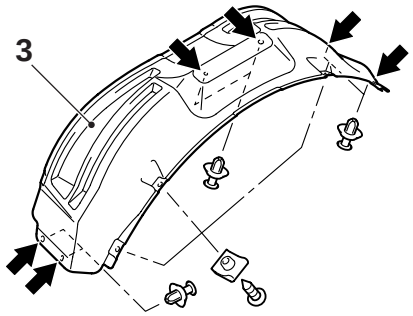
<Front splash shield>



AC501253

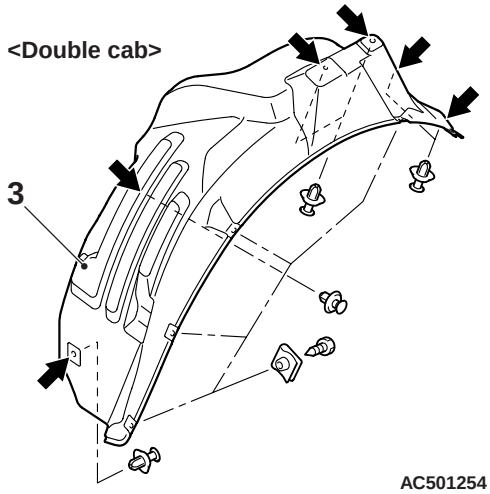
<Rear splash shield>

<Single cab and club cab>



AC501253

<Double cab>



AC501254

Note
⬅ : Clip positions

AC903518AD

Front splash shield removal steps

- Front overfender <Vehicles with wide fender> (Refer to GROUP 51, Overfender .)
- Front mud guard (Refer to GROUP 51, Mud Guard .)

1. Front splash shield (Front bumper side)
2. Front splash shield (Fender side)

Rear splash shield removal steps

- Rear overfender <Vehicles with wide fender> (Refer to GROUP 51, Overfender .)

3. Rear splash shield

WINDOW GLASS

ADHESIVE

M1422000500627

ADHESIVE

Item	Specified adhesive
Windshield glass	• 3M ATD Part No.8609 Super Fast Urethane Auto Glass Sealant or equivalent • 3M ATD Part No.8608 Super Fast Urethane Primer or equivalent
Side window glass <Club cab>	
Rear window glass	

DOUBLE-SIDED TAPE

Item	Specified adhesive
Windshield moulding	Double-sided tape: 6.0 mm width and 0.14mm thickness

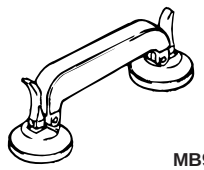
LUBRICANT

M1421000400036

Item		Specified lubricant	Quantity
Degrease agent	Grease and dirt removal from parts surface	Parts cleaner (MZ100387 or equivalent)	As required

SPECIAL TOOL

M1422000600453

Tool	Number	Name	Use
 MB990480	MB990480	Window glass holder	Window glass removal and installation

GENERAL INFORMATION

M1422000100942

The windshield and back door window glass are attached by an urethane-base adhesive to the window frame. This adhesive provides improved glass holding and sealing, and also gives body openings a greater structural strength.

ITEMS

Name	Remark
Adhesive	3M ATD Part No.8609 Super Fast Urethane Auto Glass Sealant or equivalent
Primer	3M ATD Part No.8608 Super Fast Urethane Primer or equivalent
Spacers	Available as service part
Dam	Available as service part
Anti-rust solvent (or Tectyl 506T.Valvoline Oil Company)	For rust prevention
Degrease agent	Parts cleaner (MZ100387 or equivalent) (For grease removal from bonded surface)

Name	Remark
Steel piano wire	Dia. × length. 0.6mm × 1m For cutting adhesive
Glass adhesive knife	For cutting adhesive
Adhesive gun	For pressing-out adhesive

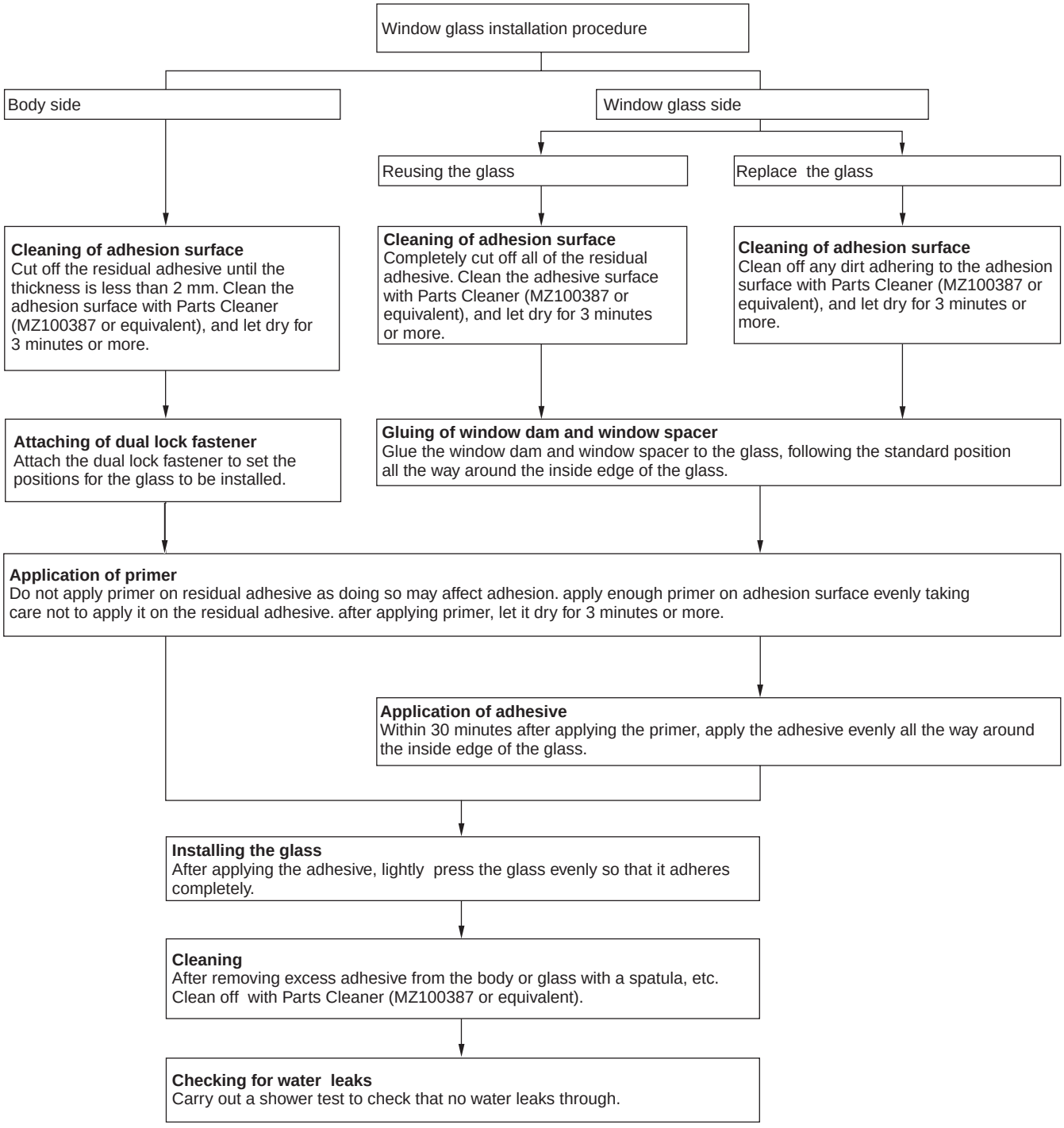
HANDLING OF AUTO WINDOW SEALER

Keep the sealant in a cool place, not exposed to the direct rays of the sun. Do not place any heavy article on the sealant nor press it, otherwise it will become deformed. Avoid storing the sealant for more than 6 months, because it will lose its sealing effect.

BODY PINCH-WELD FLANGE SERVICING

Before servicing the body pinch-weld flange, remove old adhesive completely. If the flange requires painting, bake it after painting is completed.

WINDOW GLASS INSTALLATION



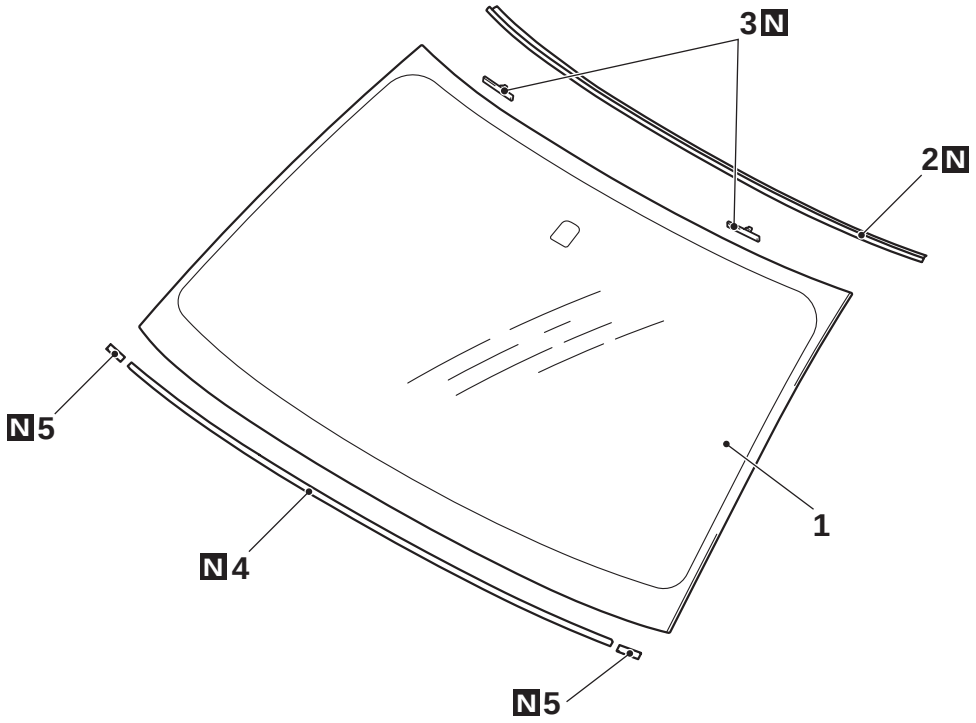
AC306636AI

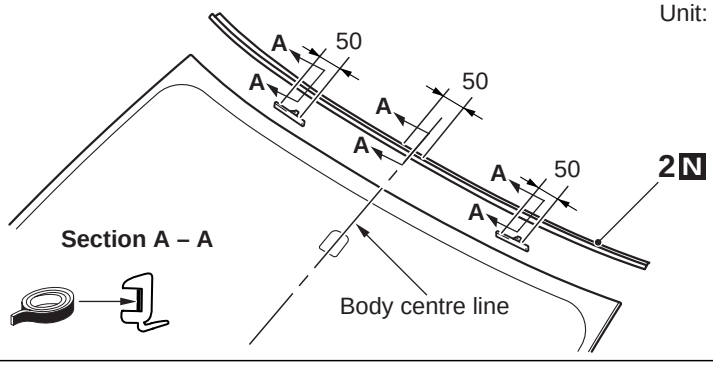
WINDSHIELD

REMOVAL AND INSTALLATION

M1422001001639

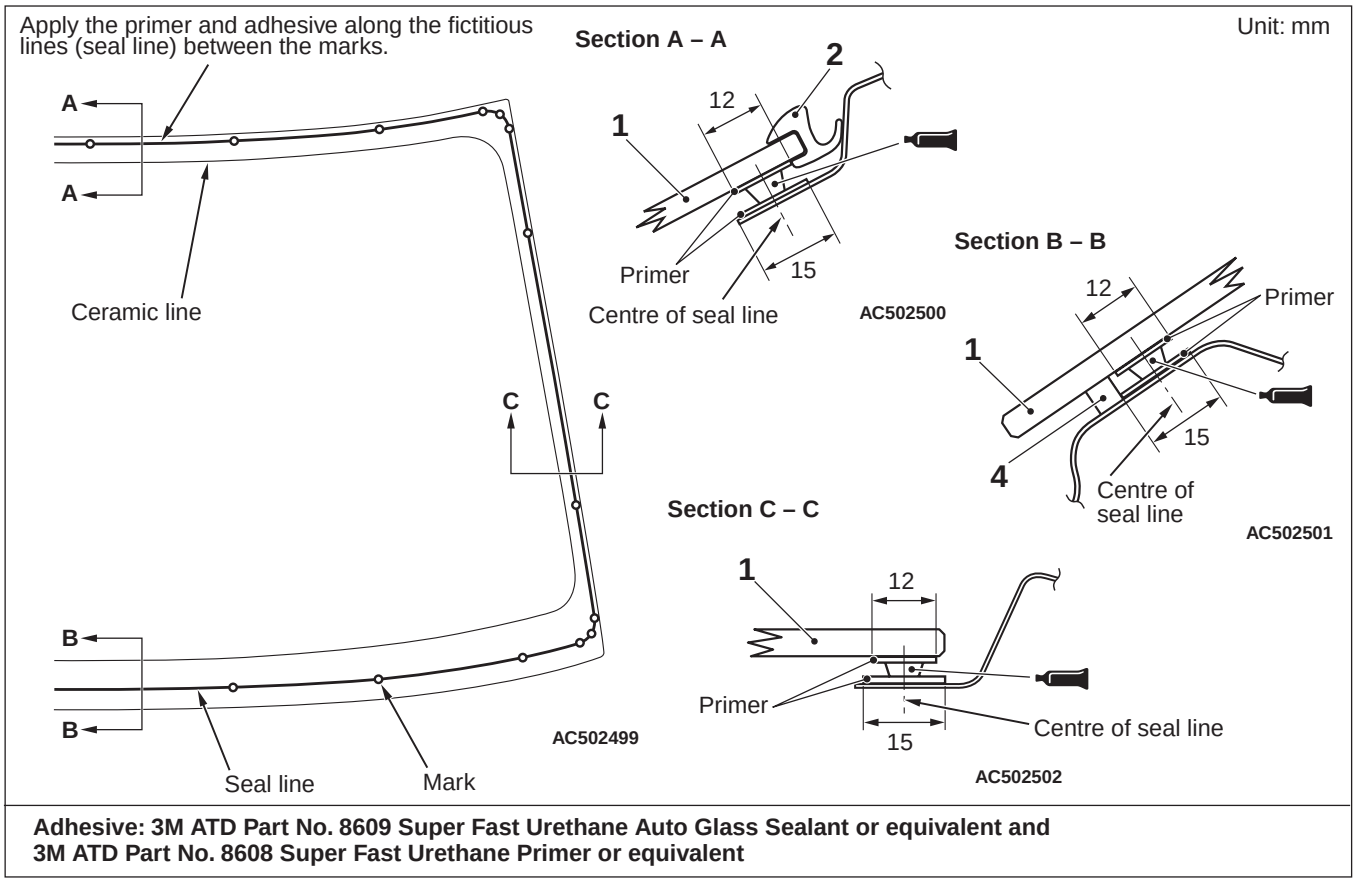
Pre-removal and Post-installation Operation
- Front Deck Garnish Removal and Installation (Refer to GROUP 51, Windshield Wiper .)
- Roof Drip Moulding Removal and Installation (Refer to GROUP 51, Moulding .)
- Front Pillar Trim Removal and Installation (Refer to GROUP 52A, Interior Trim <Single Cab>, <Club Cab> or <Double Cab>.)
- Inside Rear View Mirror Removal and Installation (Refer to GROUP 52A, Inside Rear View Mirror .)
- Lighting control sensor removal and installation <Vehicles with lighting control sensor> (Refer to GROUP 54A – Headlamp .)





Adhesive tape: Double-sided tape (6.0 mm width and 0.14 mm thickness)

ACA00289AB



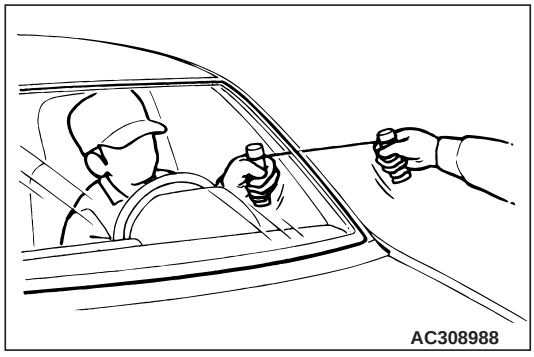
Removal steps

<<**A**>>	>>**B**<<	1.	Windshield glass
		2.	Windshield moulding
	>>**A**<<	3.	Glass stopper
	>>**A**<<	4.	Windshield spacer
	>>**A**<<	5.	Fastener

REMOVAL SERVICE POINT

<<A>> WINDSHIELD GLASS REMOVAL

1. To protect the body (paint surface), apply cloth tape to all body areas around the installed windshield glass.
2. Using piano wire.
   (1) Use a knife to cut away the moulding.
   (2) Using a sharp-point drill, make a hole in the windshield adhesive.
   (3) Pass the piano wire from the inside of the vehicle through the hole.

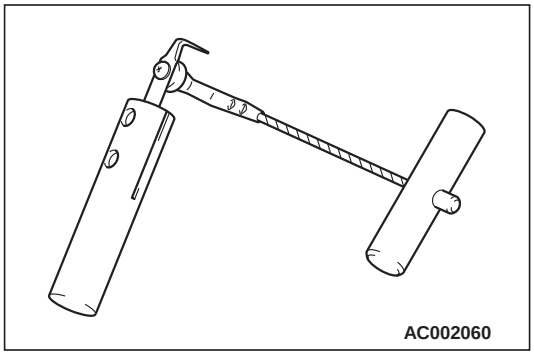


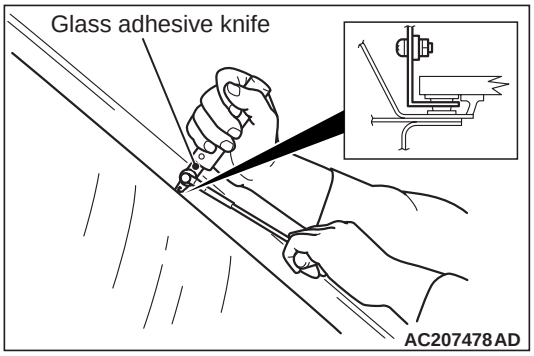
⚠ CAUTION

Do not let the piano wire touch the edge of the windshield glass.

   (4) Pull the piano wire alternately from the inside and outside along the windshield glass to cut the adhesive.

⚠ CAUTION

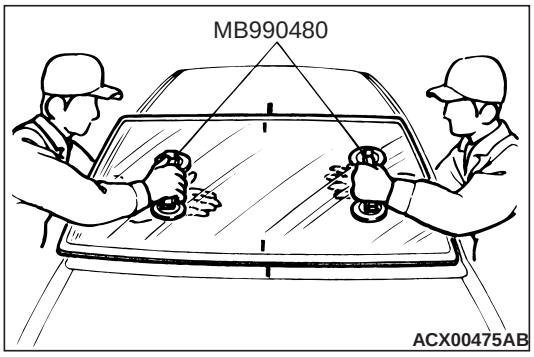




Inserting the glass adhesive knife too deeply into windshield adhesive may damage windshield glass.

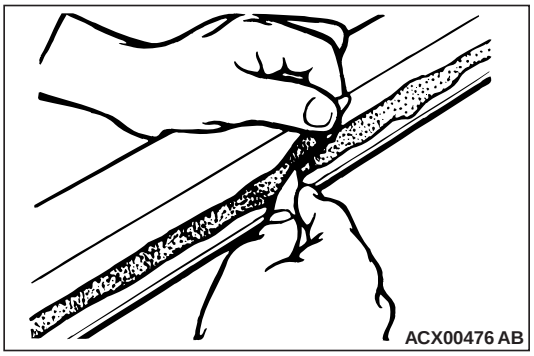
3. Using glass adhesive knife

   Keep glass adhesive knife at right angles with the windshield glass edge, and put the blade at windshield glass edge and surface. Then cut away adhesive along the windshield glass edge.



4. Use special tool window glass holder (MB990480) to remove the windshield glass.

⚠ CAUTION



- **Be careful not to remove more adhesive than is necessary.**
- **Be careful also not to damage the paintwork on the body surface with the knife. If the paintwork is damaged, repair the damaged area with repair paint or anti-rust agent.**

5. Use a knife to cut away the remaining adhesive so that the thickness is within 2 mm around the entire circumference of the body flange.
6. Finish the flange surfaces so that they are smooth.
7. If the windshield glass is reused, scrape away all traces of old adhesive from the windshield glass.

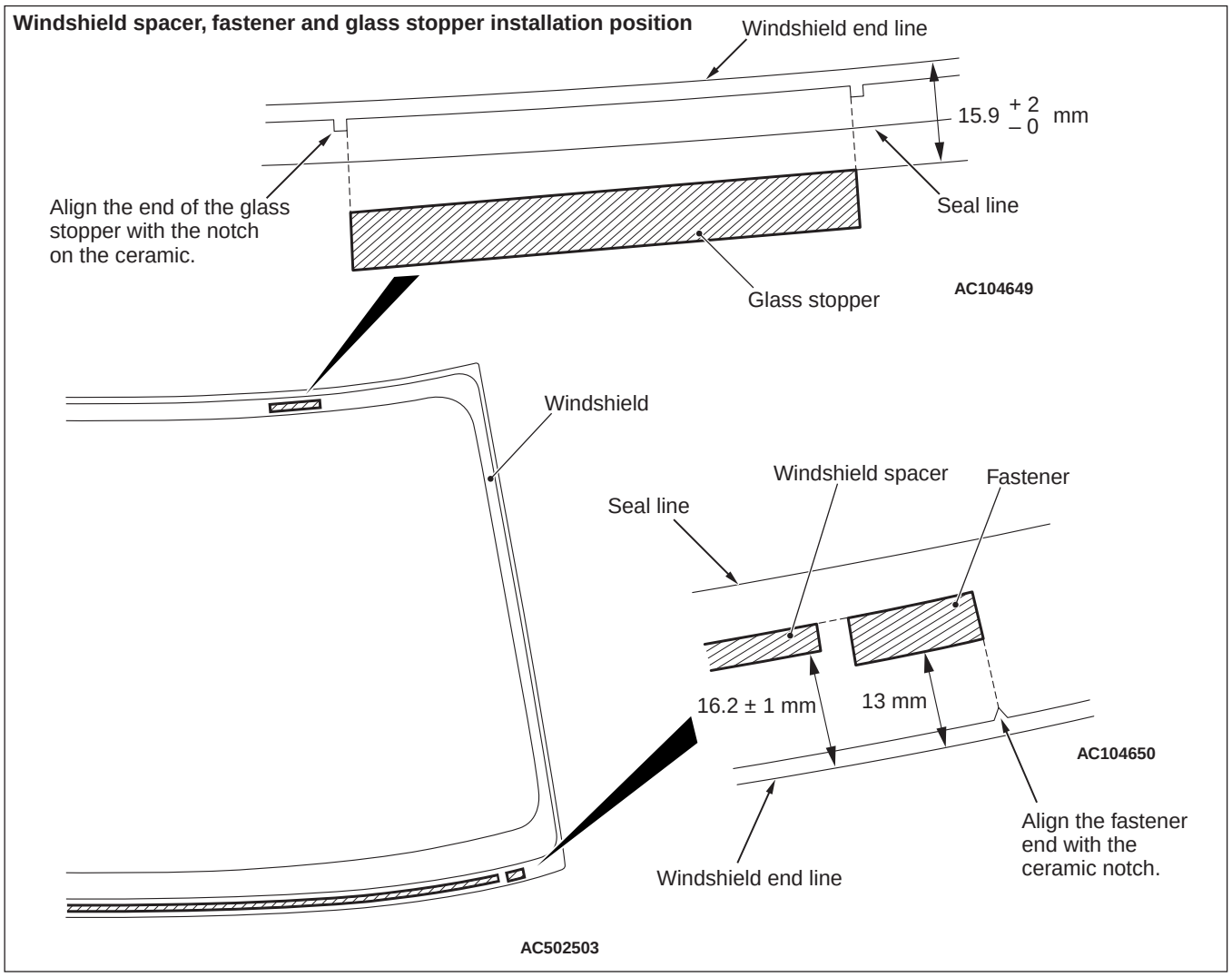
INSTALLATION SERVICE POINTS

>>A<< FASTENER/WINDSHIELD SPACER/GLASS STOPPER INSTALLATION

⚠ CAUTION

Leave the degreased parts for 3 or more minutes to dry well, before starting on the next step. Do not touch the degreased parts.

1. Use parts cleaner (MZ100387 or equivalent) to degrease the inside and outside of the windshield glass and the body flanges.



AC600964AB

2. Install the fastener and the glass stopper to the specified position on the windshield glass.
3. Assemble the fastener to the body flange relative to the windshield fastener.
4. Position the windshield spacer, ensuring that there are no bends or warpage inside the windshield glass.

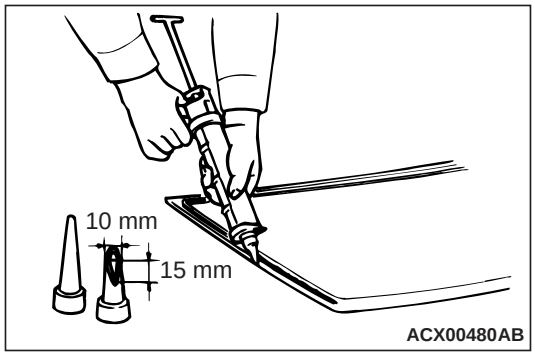
>>B<< WINDSHIELD GLASS INSTALLATION

1. Apply double-sided tapes to the concaved part of the windshield moulding.
2. Install the windshield moulding to the windshield glass.
3. When replacing the windshield glass, temporarily set the windshield glass against the body, and place a mating marks on the windshield glass and body.

⚠ CAUTION

- **The primer strengthens the adhesive, so be sure to apply it evenly around the entire circumference. However, a too thick application will weaken the adhesive.**
- **Do not touch the coated surface.**
- **Do not apply the primer on the remaining adhesive because of weakening the adhesive.**

4. Soak a sponge in the primer, and apply evenly to the windshield glass and the body in the specified places. If the old adhesive does not remain on the body flange because of the body panel or others, also apply the primer to the specified body side.
5. Allow the windshield glass to dry for at least three minutes after applying primer.



6. Fill a sealant gun with adhesive. Then apply the adhesive evenly around the windshield glass within 30 minutes after applying the primer.

   NOTE: Cut the tip of the sealant gun nozzle into a V shape to simplify adhesive application.

7. Align the mating marks on the windshield glass and the body, and lightly press the windshield glass evenly so that it adheres completely.
8. Use spatula or the like to remove any excessive adhesive. Then clean the surface with parts cleaner (MZ100387 or equivalent).

⚠ CAUTION

- **Do not move the vehicle unless absolutely necessary.**
- **When testing for water leakage, do not pinch the end of the hose to spray the water.**

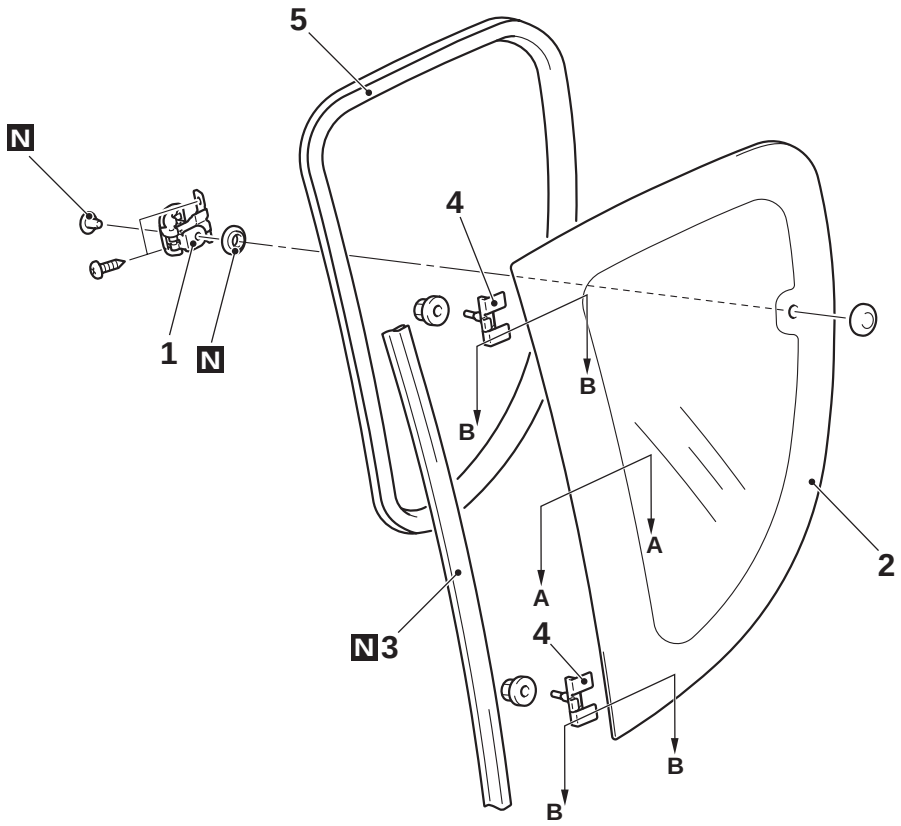
9. Wait 30 minutes or more, and then test for water leakage.

SIDE WINDOW GLASS <CLUB CAB>

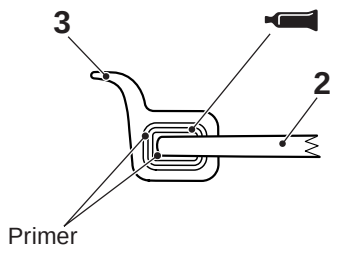
REMOVAL AND INSTALLATION

M1422002200075

Pre-removal and Post-installation Operation
- Quarter Trim Upper Removal and Installation (Refer to GROUP 52A, Interior Trim).

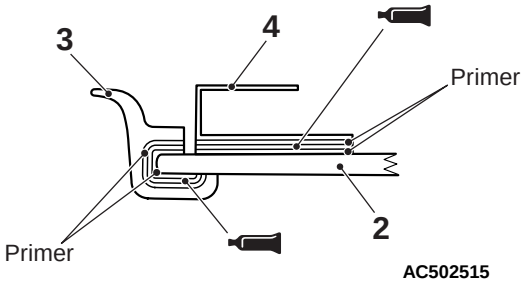


Section A – A



AC502516

Section B – B



AC502515

Adhesive: 3M ATD Part No. 8609 Super Fast Urethane Auto Glass Sealant or equivalent and 3M ATD Part No. 8608 Super Fast Urethane Primer or equivalent

AC503692AB

Removal steps

1. Link
2. Side window glass

<<A>> >>A<< 3. Moulding

<<A>> >>A<< 4. Hinge

5. Weatherstrip

REMOVAL SERVICE POINT

<<A>> MOULDING/HINGE REMOVAL

⚠ CAUTION

Prying with a knife may damage the side window glass.

1. Using a knife, remove the moulding and hinge.
2. When reusing the side window glass, remove the adhesive still adhering to the side window glass, and clean with parts cleaner (MZ100387 or equivalent).

INSTALLATION SERVICE POINT

>>A<<HINGE/MOULDING INSTALLATION

⚠ CAUTION

Leave the degreased parts for 3 or more minutes to dry well, before starting on the next step. Do not touch the degreased parts.

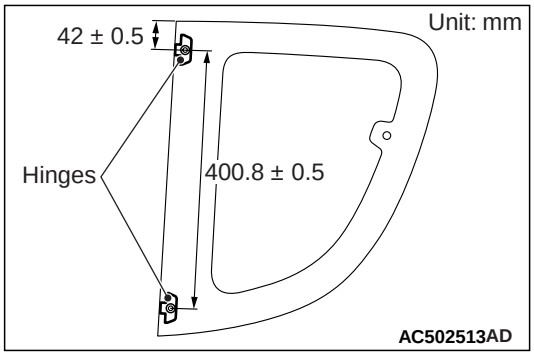
1. Use parts cleaner (MZ100387 or equivalent) to degrease the inside and outside of the side window glass.

⚠ CAUTION

- **The primer strengthens the adhesive, so be sure to apply it evenly around the entire circumference. However, a too thick application will weaken the adhesive.**
- **Do not touch the coated surface.**
- **Do not apply the primer on the remaining adhesive because of weakening the adhesive.**

2. Soak a sponge in the primer, and apply evenly to the hinge, moulding and side window glass in the specified places. If the old adhesive does not remain on the side window glass because of the side window glass or others, also apply the primer to the specified side window glass side.
3. Allow the hinge, moulding and side window glass to dry for at least 3 minutes after applying primer.
4. Fill a sealant gun with adhesive. Then apply the adhesive evenly around the hinge and moulding within 30 minutes after applying the primer.

   NOTE: Cut the tip of the sealant gun nozzle into a V-shape to simplify adhesive application.



AC502513AD

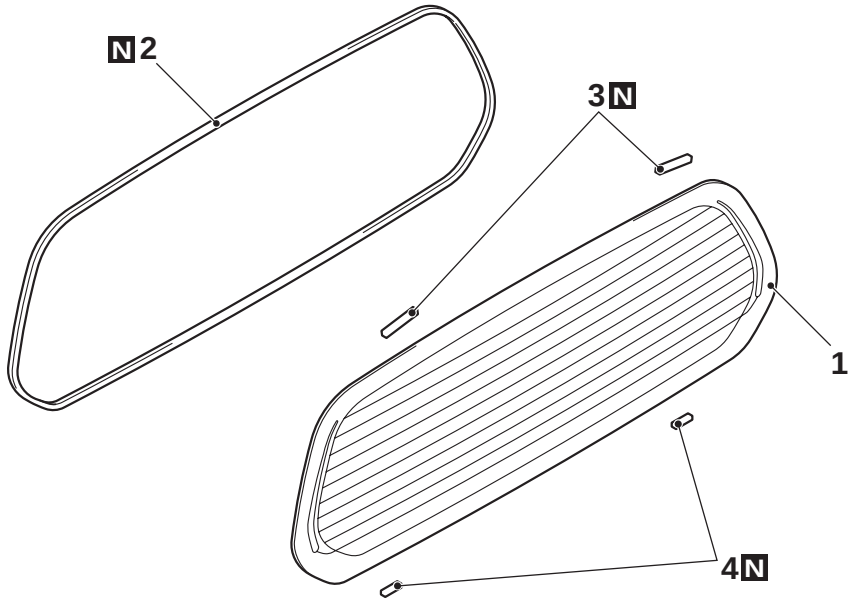
5. Install the hinges to the specified positions of the side window glass.
6. Install the moulding to the specified position of the side window glass.
7. Use spatula or the like to remove any excessive adhesive. Then clean the surface with parts cleaner (MZ100387 or equivalent).

REAR WINDOW GLASS <Vehicles without rear panel power window>

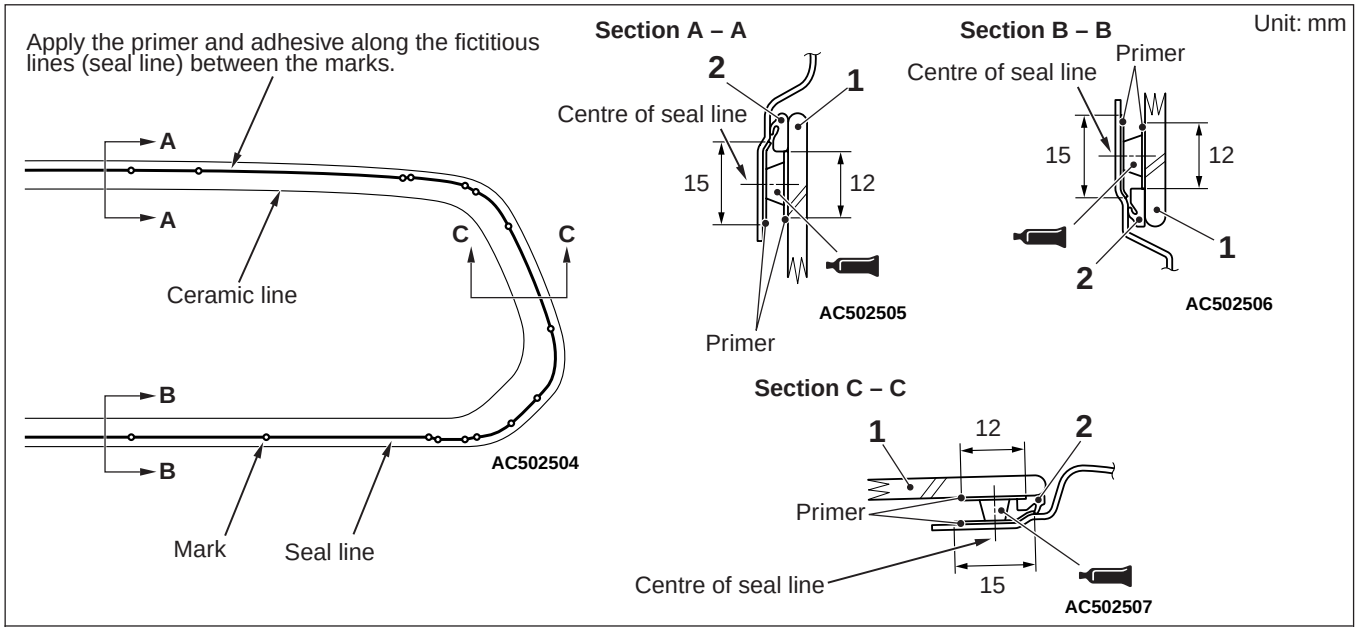
REMOVAL AND INSTALLATION

M1422001600467

Pre-removal and Post-installation Operation
- Roof Drip Moulding Removal and Installation (Refer to GROUP 51, Moulding).
- Quarter Upper Trim and Cab Rear End Trim Removal and Installation (Refer to GROUP 52A, Interior Trim <Club Cab>).
- Rear Pillar Upper Trim Removal and Installation (Refer to GROUP 52A, Interior Trim <Double Cab>).



AC501241AB



Adhesive: 3M ATD Part No. 8609 Super Fast Urethane Auto Glass Sealant or equivalent and 3M ATD Part No. 8608 Super Fast Urethane Primer or equivalent

AC502950AC

Removal steps

<<A>> >>B<< 1. Rear window glass
>>A<< 2. Window dam
>>A<< 3. Glass stopper
>>A<< 4. Fastener

REMOVAL SERVICE POINT

<<A>> REAR WINDOW GLASS REMOVAL

Remove the rear window glass in the same procedure as for the windshield glass removal (Refer to P.42-17).

INSTALLATION SERVICE POINTS

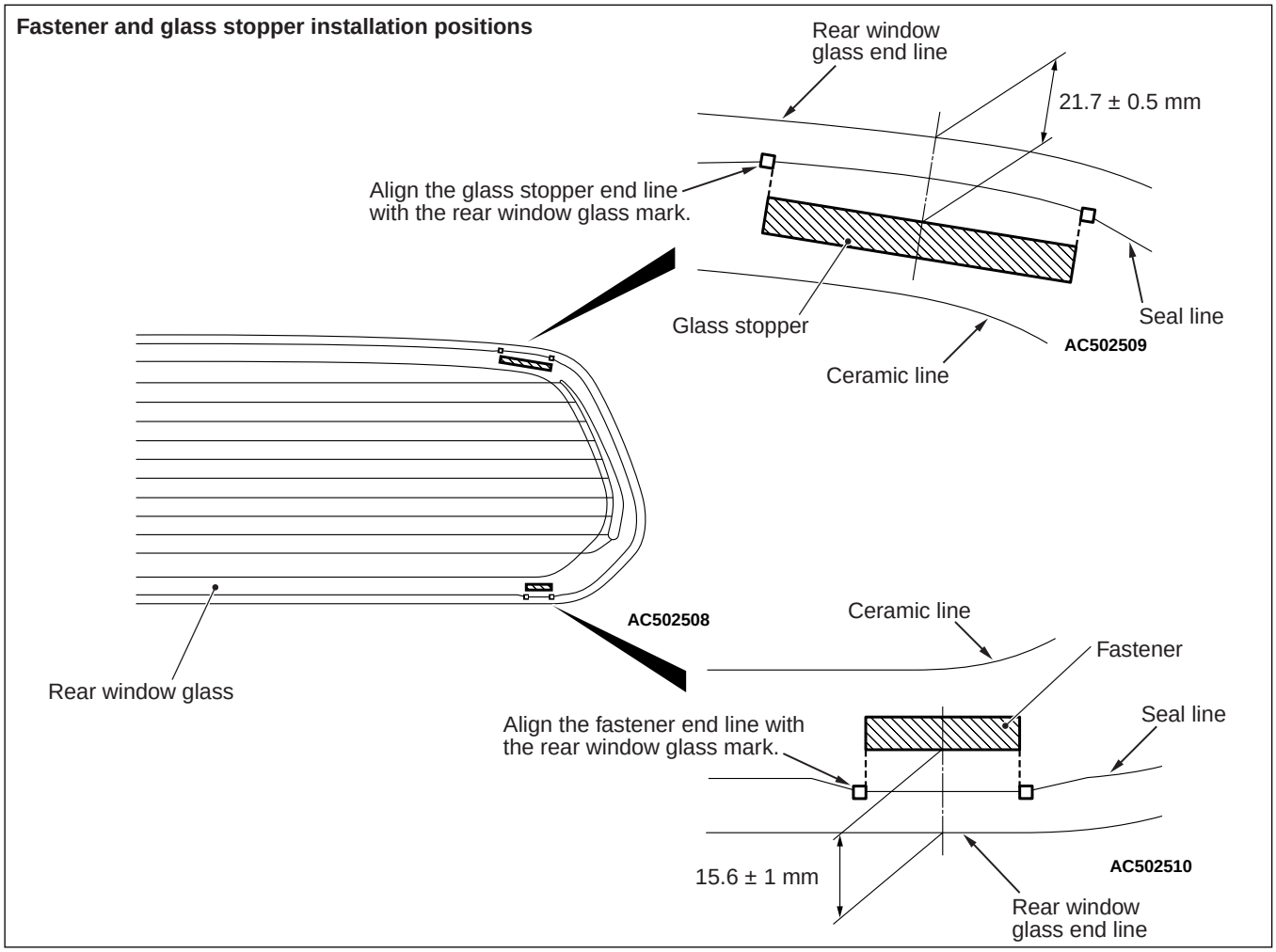
>>A<< FASTENER/GLASS STOPPER/WINDOW DAM INSTALLATION

⚠ CAUTION

Leave the degreased parts for 3 or more minutes to dry well, before starting on the next step. Do not touch the degreased parts.

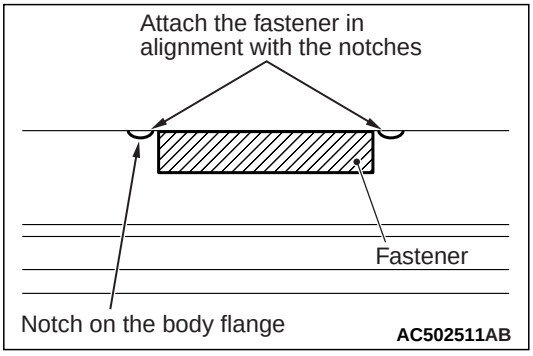
1. Use the parts cleaner (MZ100387 or equivalent) to degrease the inside and outside edges of the rear window glass and the surface of the body flange.

Fastener and glass stopper installation positions



AC502951AC

2. Install the fasteners and glass stoppers to the specified positions of the rear window glass.



3. Install the fasteners to the left and right lower corner of the body flange.
4. Install the window dam.

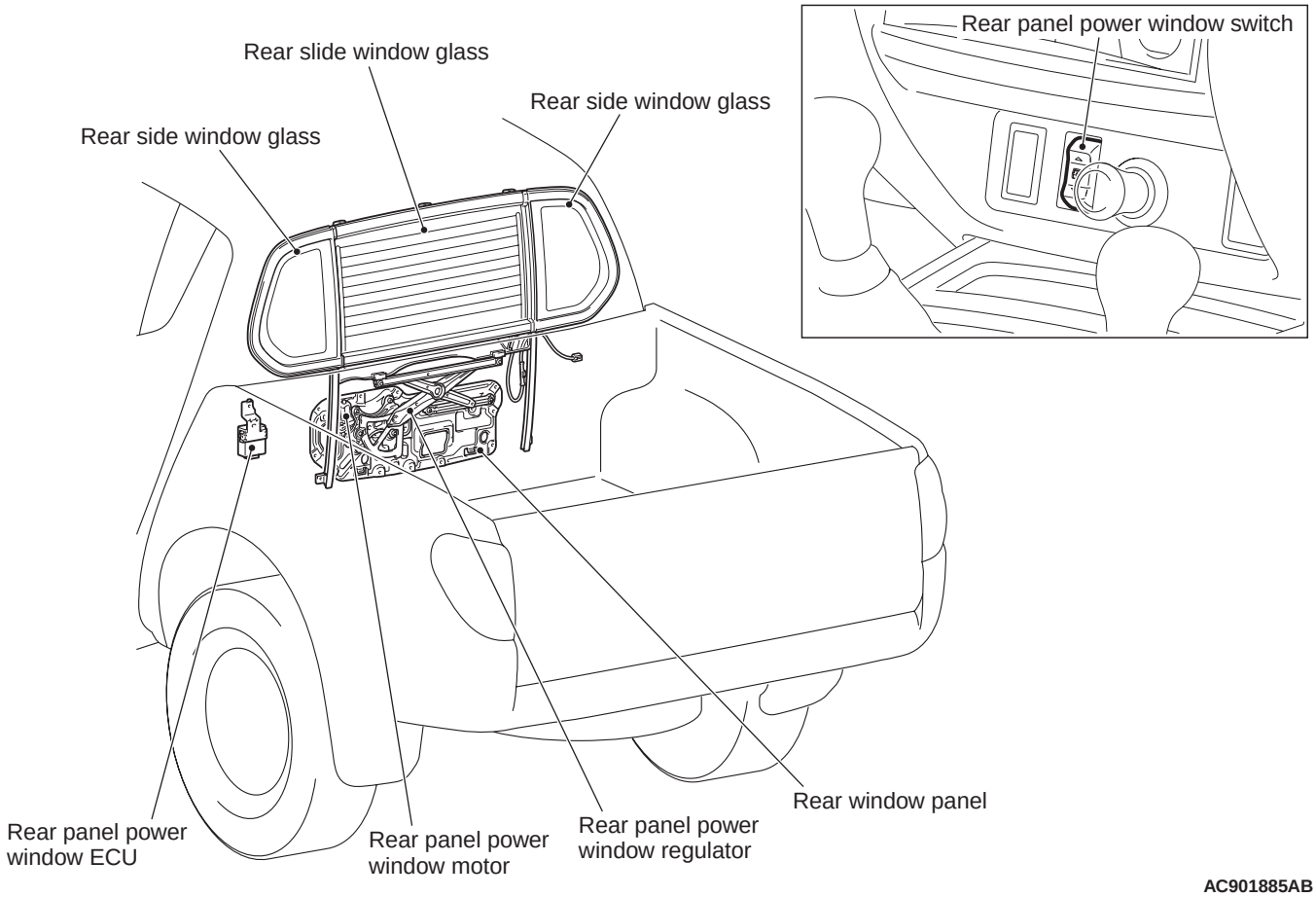
>>B<< REAR WINDOW GLASS INSTALLATION
Install the rear window glass in the same way as for the windshield glass installation (Refer to P.42-17).

REAR PANEL POWER WINDOW <Vehicles with rear panel power window>

GENERAL INFORMATION

M1421000100701

REAR PANEL POWER WINDOW



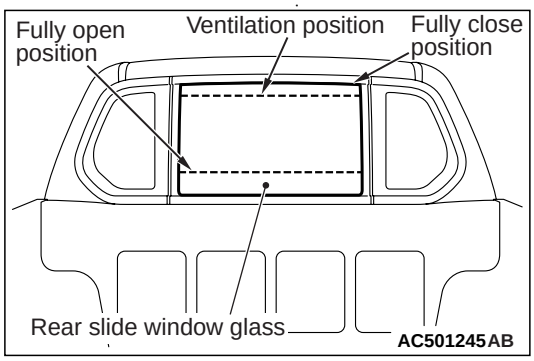
AC901885AB

A rear panel power window has been installed in the double cab to improve open airy feeling and ventilation performance <Vehicles with rear panel power window>. The rear panel power window has the following features.

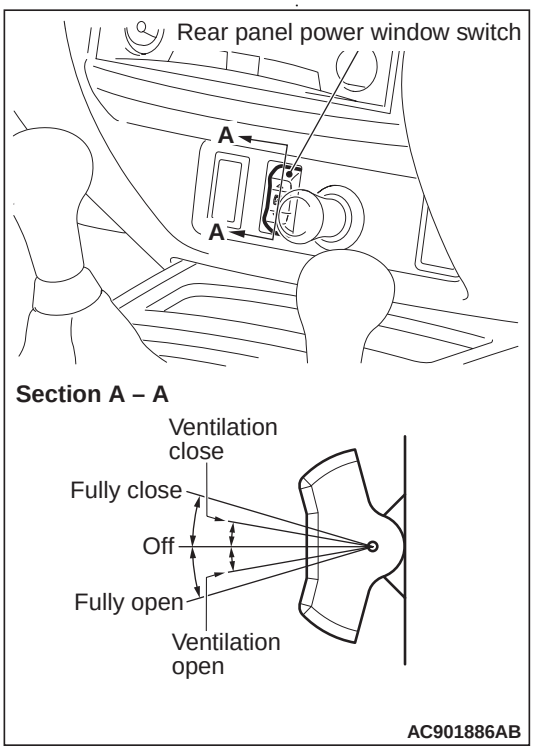
- The anti-trapping function is adopted.
- The power window timer function is adopted.

DESCRIPTION OF STRUCTURE AND OPERATION

REAR PANEL POWER WINDOW FUNCTION



As for the rear panel power window, the rear slide window glass moves in 3 levels by operating the rear power window switch.



The rear panel power window switch employs the push operation method to improve safety. To open a rear slide window glass, press in the switch knob lower side, and to close, press in the upper side.

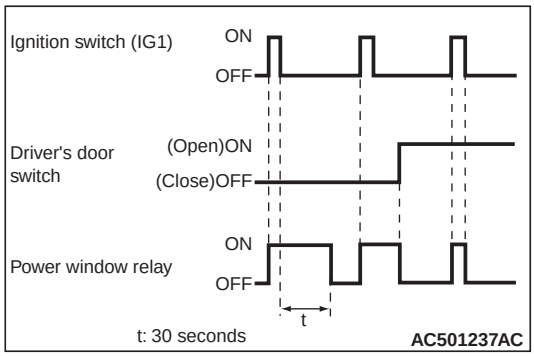
- The one-touch mechanism is adopted to the rear panel power window switch to fully open or close rear slide window glass in a single operation.

ANTI-TRAPPING FUNCTION

The rear panel power window with the safety mechanism is adopted. If any obstacle such as a hand or a head is detected to be trapped during a window glass closing operation, the window glass is opened by approximately 150 mm to improve safety.

NOTE: If anti-trapping function is activated consecutively three times or more, the fully closed position that power window switch has learned will be erased. With this state, auto-up/down function becomes ineffective. To make the rear panel power window switch learn the fully closed position, the initialisation is required. Refer to P.42-55.

REAR PANEL POWER WINDOW TIMER FUNCTION



The rear panel power window can be opened or closed by a timer function after the ignition switch is turned to the OFF position (The timer delay is extended for 30 seconds if the driver's door is opened while the timer is on. The timer operation, however, is cancelled when the driver's door is closed before the timer ends).

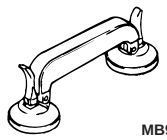
SEALANTS

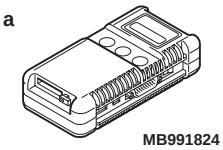
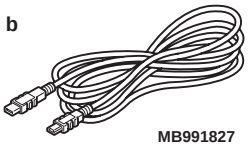
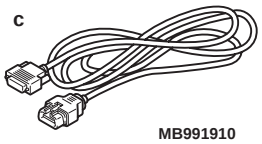
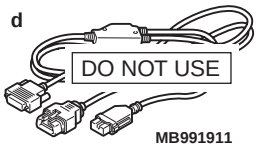
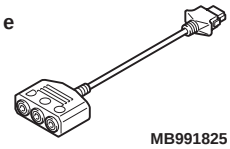
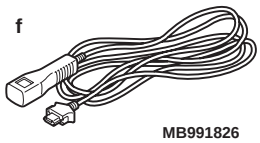
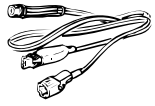
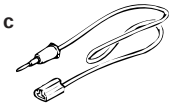
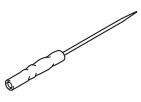
M1429000500059

Item	Specified sealant
Rear side window glass assembly	3M ATD Part No.3509 or equivalent
Waterproof film	3M ATD Part No.8625 or equivalent

SPECIAL TOOLS

M1429000600078

Tool	Number	Name	Use
 MB990480	MB990480	Window glass holder	Removal of rear panel window regulator

Tool	Number	Name	Use
a  MB991824 b  MB991827 c  MB991910 d  MB991911 e  MB991825 f  MB991826 MB991955	MB991955 a. MB991824 b. MB991827 c. MB991910 d. MB991911 e. MB991825 f. MB991826	M.U.T.-III sub-assembly a. Vehicle Communication Interface (V.C.I.) b. M.U.T.-III USB cable c. M.U.T.-III main harness A (Vehicles with CAN communication system) d. M.U.T.-III main harness B (Vehicles without CAN communication system) e. M.U.T.-III measure adapter f. M.U.T.-III trigger harness	⚠ CAUTION **For vehicles with CAN communication, use M.U.T.-III main harness A to send simulated vehicle speed. If you connect M.U.T.-III main harness B instead, the CAN communication does not function correctly.** Communication line check (service data and diagnosis codes)
a b  c  d DO NOT USE MB991223	MB991223 a. MB991219 b. MB991220 c. MB991221 d. MB991222	Harness set a. Test harness b. LED harness c. LED harness adapter d. Probe	Terminal voltage measurement a. For checking connector pin contact pressure b. For checking power supply circuit c. For checking power supply circuit d. For connecting a locally sourced tester
 MB992006	MB992006	Extra fine probe	Continuity check and voltage measurement at harness wire or connector

TROUBLESHOOTING

DIAGNOSIS TROUBLESHOOTING FLOW

M1429002700190

Refer to GROUP 00, Contents of Troubleshooting .

DIAGNOSIS CODE CHART

M1429006000041

Code No.	Symptom	Reference page
5001	P/W (RP) SW pulse1 disconnection	P.42-30
5002	P/W (RP) SW pulse2 disconnection	P.42-32
5003	P/W (RP) Above window position	P.42-33
5004	P/W (RP) Sensor fail (ground)	P.42-34
5005	P/W (RP) 3 Times jumm - protection	P.42-35
5008	P/W (RP) Parameter read fail	P.42-36
5009	P/W (RP) Position read fail	

NOTE:

- *P/W: Power window*
- *RP: Rear panel*
- *SW: Switch*

TROUBLE SYMPTOM CHART

M1429002800283

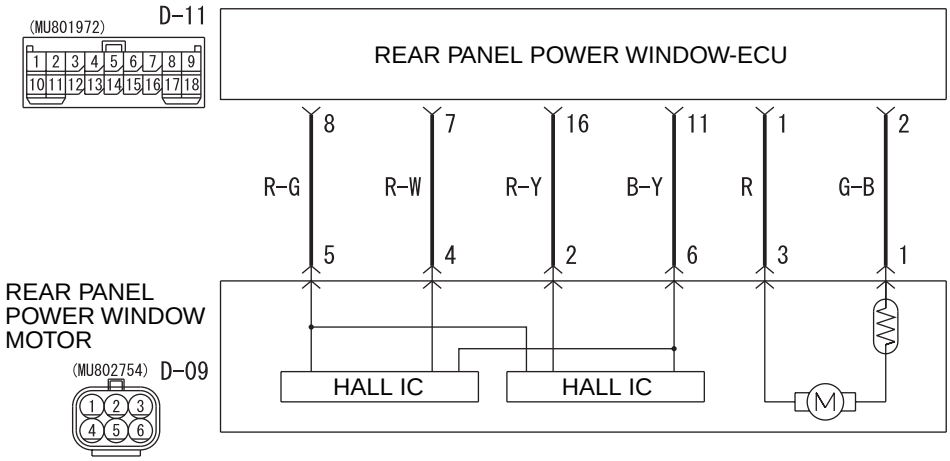
Symptom	Inspection procedure number	Reference page
Rear panel power window do not work at all.	1	P.42-37
Any of the rear panel power window switch positions is defective.	2	P.42-45
Rear panel power window anti-trap function does not work normally.	3	P.42-48
Rear panel power window-ECU cannot communicate with ETACS-ECU.	4	P.42-49
Rear panel power window timer function does not work normally	5	P.42-53

DIAGNOSIS CODE PROCEDURES

Code No. 5001: P/W (RP) SW pulse 1 disconnection

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Rear Panel Power Window Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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COMMENTS ON TROUBLE SYMPTOM

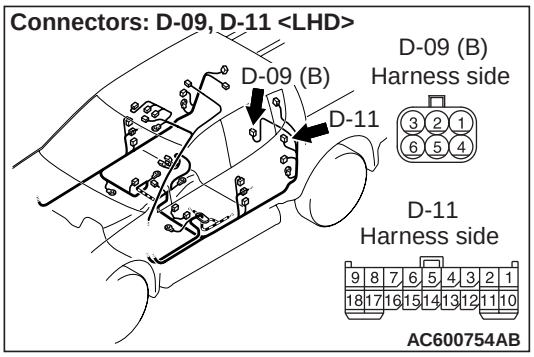
- During the rear panel power window motor operation, if only the power window position sensor signal is detected successively 20 times, rear panel power window-ECU stores the diagnosis code No. 5001.

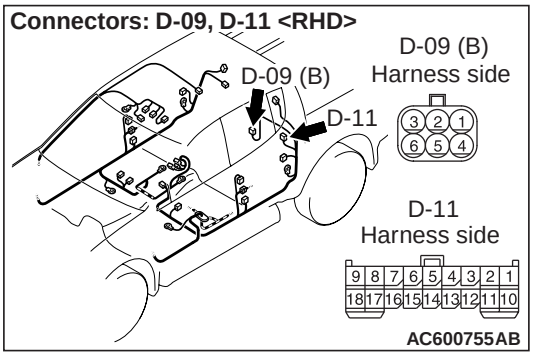
PROBABLE CAUSES

- Malfunction of the rear panel power window motor
- Malfunction of the rear panel power window-ECU
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

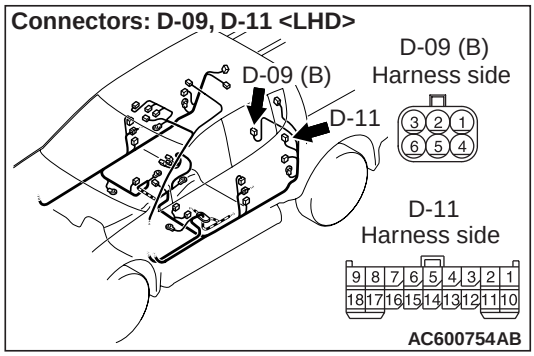
STEP 1. Connector check: D-11 rear panel power window-ECU connector and D-09 rear panel power window motor connector

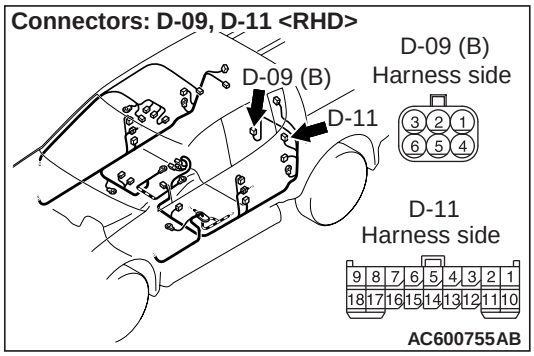




Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the connector.

STEP 2. Check the wiring harness between D-11 rear panel power window-ECU connector terminal Nos. 7, 8, 11 and D-09 rear panel power window motor connector terminal Nos. 4, 5, 6.





- Check the input and output lines for open and short circuit.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the wiring harness.

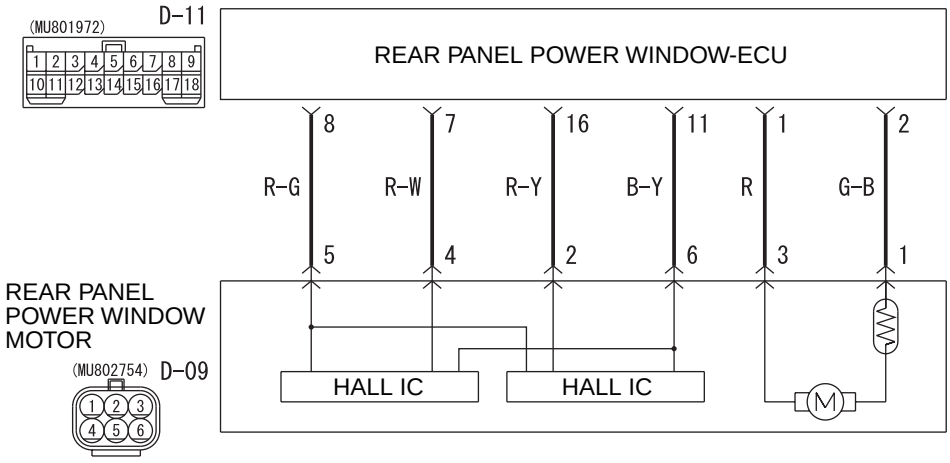
STEP 3. Check whether the diagnosis code is reset.
(1) Replace the rear panel power window motor.
(2) Check that diagnosis code is not reset.

Q: Is diagnosis code set?
YES : Replace the rear panel power window-ECU.
NO : The procedure is complete.

Code No. 5002: P/W (RP) SW pulse 2 disconnection

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Rear Panel Power Window Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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COMMENTS ON TROUBLE SYMPTOM

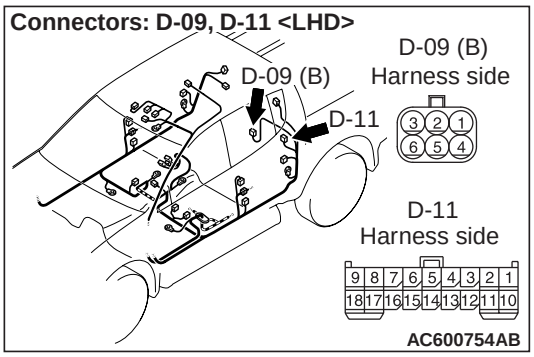
- During the rear panel power window motor operation, if only the anti-trap sensor signal is detected successively 20 times, rear panel power window-ECU stores the diagnosis code No. 5002.

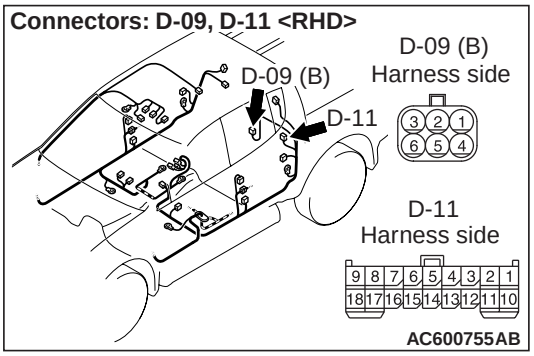
PROBABLE CAUSES

- Malfunction of the rear panel power window motor
- Malfunction of the rear panel power window-ECU
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

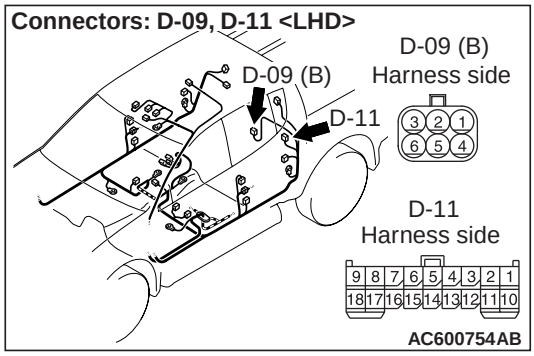
STEP 1. Connector check: D-11 rear panel power window-ECU connector and D-09 rear panel power window motor connector

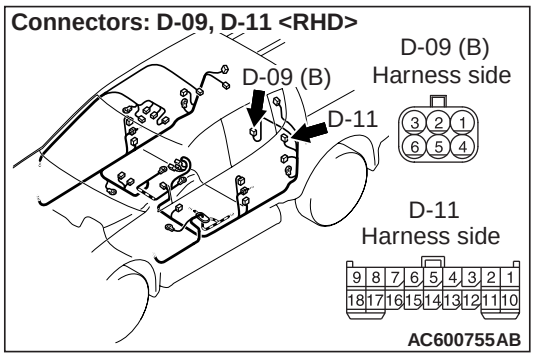




Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the connector.

STEP 2. Check the wiring harness between D-11 rear panel power window-ECU connector terminal Nos. 8, 11, 16 and D-09 rear panel power window motor connector terminal Nos. 5, 6 and 2.





- Check the input and output lines for open and short circuit.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the wiring harness.

STEP 3. Check whether the diagnosis code is reset.
(1) Replace the rear panel power window motor.
(2) Check that diagnosis code is not reset.

Q: Is diagnosis code set?
YES : Replace the rear panel power window-ECU.
NO : The procedure is complete.

Code No. 5003: P/W (RP) Above window position

⚠ CAUTION
- **Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.**
- **Do not remove the battery within approximately one minute after the ignition switch is turned to the "LOCK" (OFF) position because the rear panel power window-ECU may set diagnosis code No. 5003 mistakenly when the battery is removed immediately after the ignition switch is turned to the "LOCK" (OFF) position.**

COMMENTS ON TROUBLE SYMPTOM
If the rear panel window glass travels further in the close direction exceeding the fully-closed position, rear panel power window-ECU stores the diagnosis code No. 5003.

PROBABLE CAUSES
- Malfunction of the rear panel power window motor
- Malfunction of the rear panel power window-ECU
- The battery has been removed immediately after the ignition switch is turned to the "LOCK (OFF)" position.

DIAGNOSIS PROCEDURE

STEP 1. Confirm the rear panel power window learning function.
(1) Check that the rear panel power window switch has learned the fully closed position of the window (Refer to P.42-55).
(2) On completion, check that diagnosis code No.5003 is not reset.

Q: Is the check result normal?
YES : The procedure is complete.
NO : Go to Step 2.

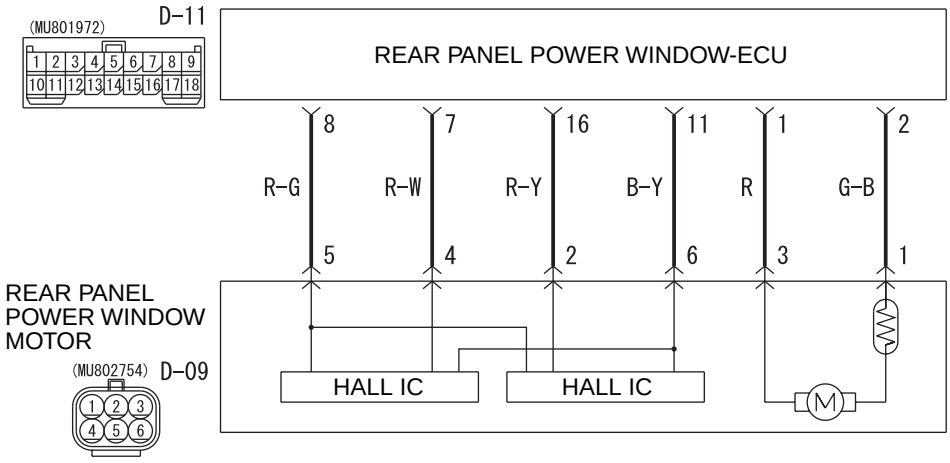
STEP 2. Check whether the diagnosis code is reset.
(1) Replace the rear panel power window motor.
(2) Check that diagnosis code is not reset.

Q: Is diagnosis code set?
YES : Replace the rear panel power window-ECU.
NO : The procedure is complete.

Code No. 5004: P/W (RP) Sensor fail (earth)

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Rear Panel Power Window Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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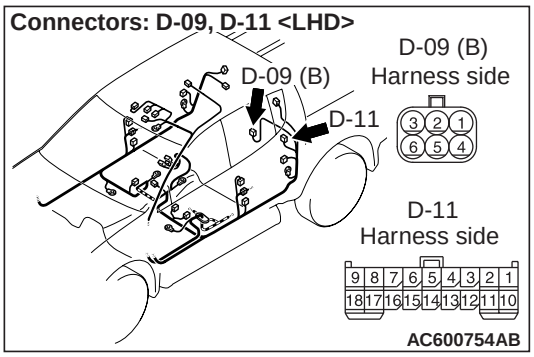
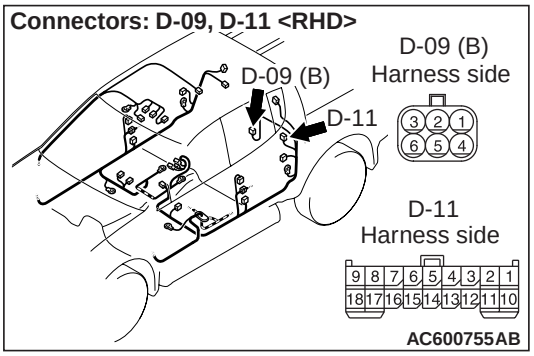
COMMENTS ON TROUBLE SYMPTOM
If the rear panel power window motor is driven during the short-to-earth detection of the sensor power supply for rear panel power window motor, rear panel power window-ECU stores the diagnosis code No. 5004.

PROBABLE CAUSES
- Malfunction of the rear panel power window motor
- Malfunction of the rear panel power window-ECU
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

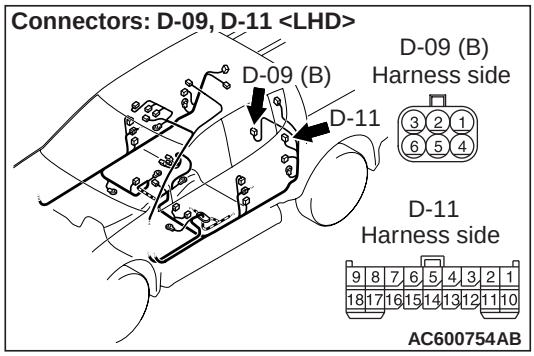
STEP 1. Connector check: D-11 rear panel power window-ECU connector and D-09 rear panel power window motor connector

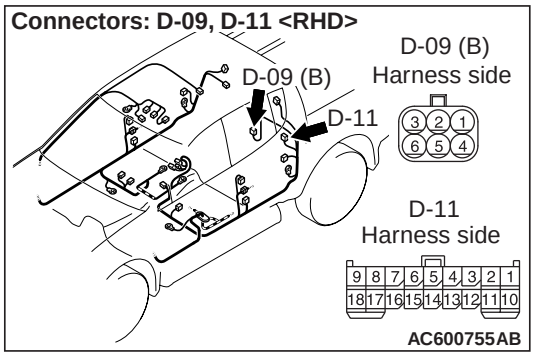




Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the connector.

STEP 2. Check the wiring harness between D-11 rear panel power window-ECU connector terminal No. 8 and D-09 rear panel power window motor connector terminal 5.





- Check the input and output lines for open and short circuit.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the wiring harness.

STEP 3. Check whether the diagnosis code is reset.
(1) Replace the rear panel power window motor.
(2) Check that diagnosis code is not reset.

Q: Is diagnosis code set?
YES : Replace the rear panel power window-ECU.
NO : The procedure is complete.

Code No. 5005: P/W (RP) 3 Times jam-protection

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

COMMENTS ON TROUBLE SYMPTOM
If the anti-trap function is activated successively 3 times, rear panel power window-ECU stores the diagnosis code No. 5005.

PROBABLE CAUSES
- Malfunction of the rear panel power window motor
- Malfunction of the rear panel power window-ECU

DIAGNOSIS PROCEDURE

STEP 1. Confirm the rear panel power window learning function.

(1) Check that the rear panel power window switch has learned the fully closed position of the window (Refer to P.42-55).
(2) On completion, check that diagnosis code No.5005 is not reset.

Q: Is the check result normal?

YES : The procedure is complete.
NO : Go to Step 2.

STEP 2. Check whether the diagnosis code is reset.

(1) Replace the rear panel power window motor.
(2) Check that diagnosis code is not reset.

Q: Is diagnosis code set?

YES : Replace the rear panel power window-ECU.
NO : The procedure is complete.

Code No. 5008: P/W (RP) Parameter read fail,
Code No. 5009: P/W (RP) Position read fail

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

COMMENTS ON TROUBLE SYMPTOM

- At the engine startup, if a signal reception of the rear panel power window-ECU information fails, rear panel power window-ECU stores the diagnosis code No. 5008.
- At the engine startup, if a signal reception of the rear panel window glass position information fails, rear panel power window-ECU stores the diagnosis code No. 5009.

PROBABLE CAUSES

- Malfunction of the rear panel power window-ECU

DIAGNOSIS PROCEDURE

Check whether the diagnosis code is reset.

Check that the diagnosis code is not reset.

Q: Is diagnosis code set?

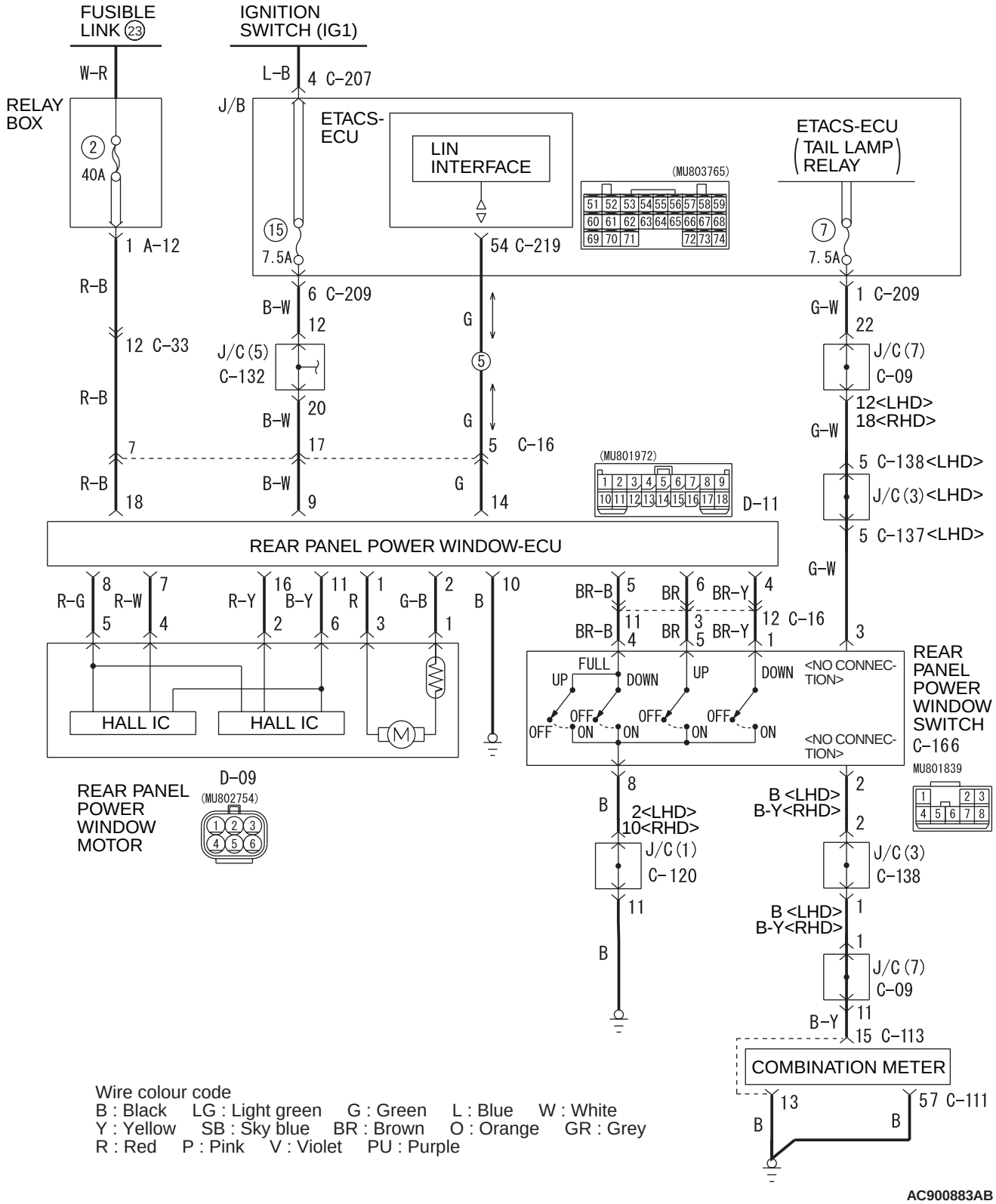
YES : Replace the rear panel power window-ECU.
NO : The procedure is complete.

SYMPTOM PROCEDURES

Inspection Procedure 1: Rear Panel Power Window does not Work at All.

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Rear Panel Power Window Circuit



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COMMENTS ON TROUBLE SYMPTOM

If the rear panel power window do not work at all, the rear panel power window switch, the rear panel power window motor or the rear panel power window-ECU may be defective.

PROBABLE CAUSES

- Malfunction of the rear panel power window switch
- Malfunction of the rear panel power window motor

- Malfunction of the rear panel power window-ECU
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code.

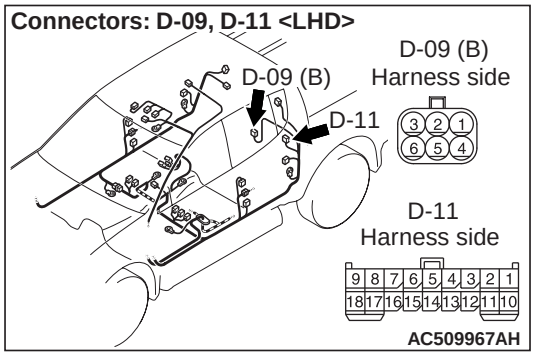
When the ignition switch is turned to the "ON" position, check that the ETACS-ECU does not set the diagnosis code.

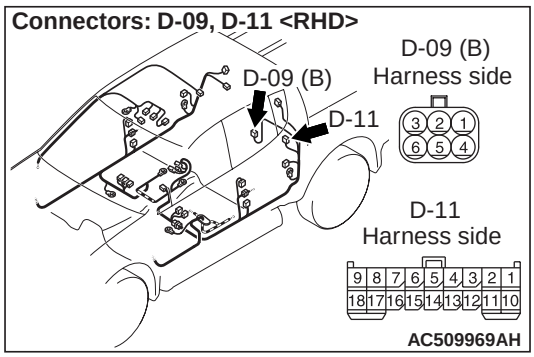
Q: Is the diagnosis code set?

YES : Refer to P.42-29.

NO : Go to Step 2.

STEP 2. Connector check: D-11 rear panel power window-ECU connector and D-09 rear panel power window motor connector



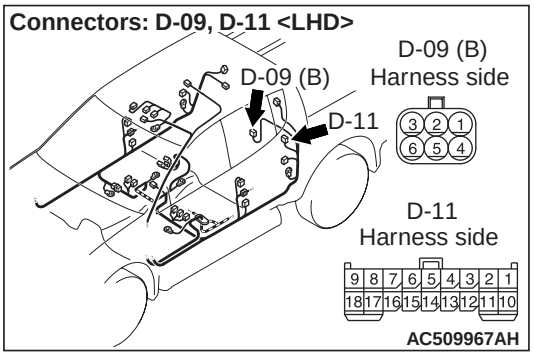


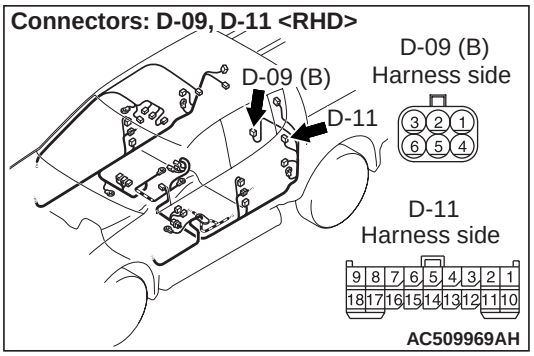
Q: Is the check result normal?

YES : Go to Step 3.

NO : Repair the connector.

STEP 3. Check the wiring harness between D-11 rear panel power window-ECU connector terminal No.1, 2, 8, 11 and D-09 rear panel power window motor connector terminal No.3, 1, 5, 6.





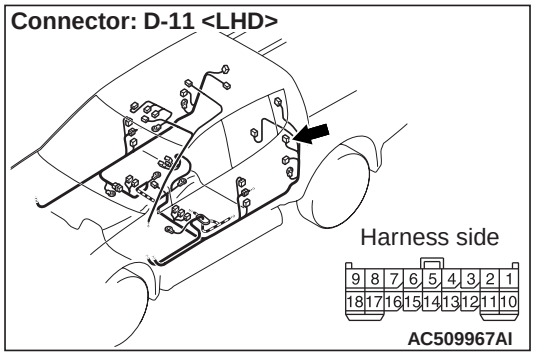
- Check the input and output lines for open and short circuit.

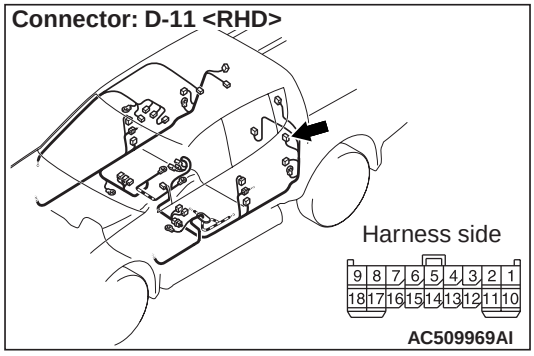
Q: Is the check result normal?

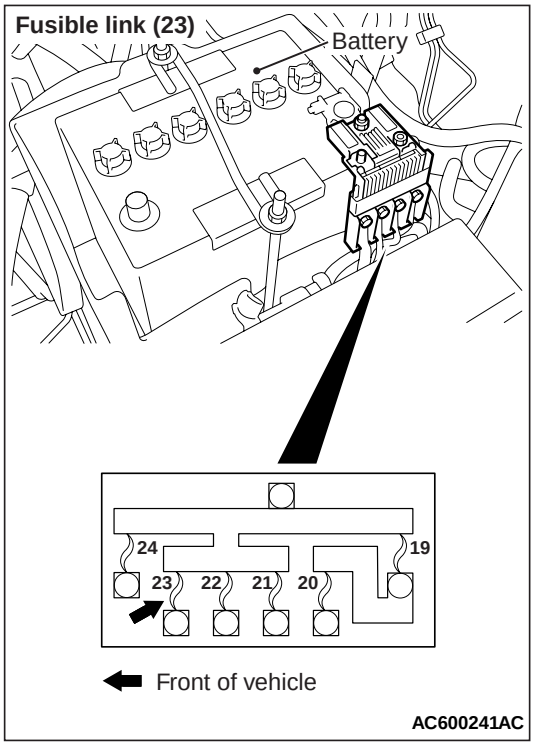
YES : Go to Step 4.

NO : Repair the wiring harness.

STEP 4. Check the wiring harness between D-11 rear panel power window-ECU connector terminal No.18 and fusible link (23).







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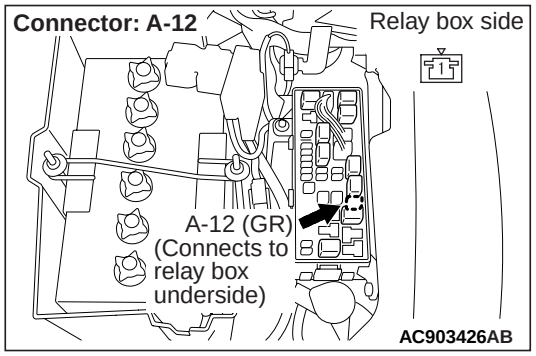
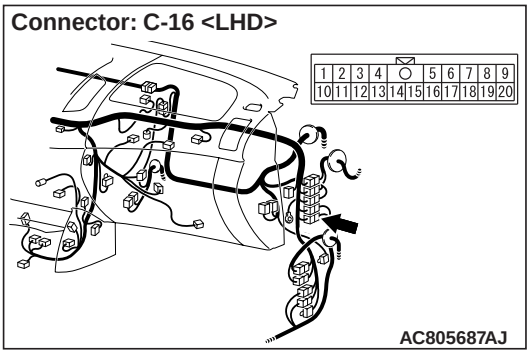
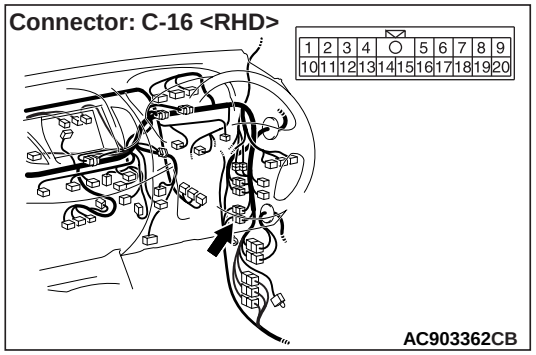
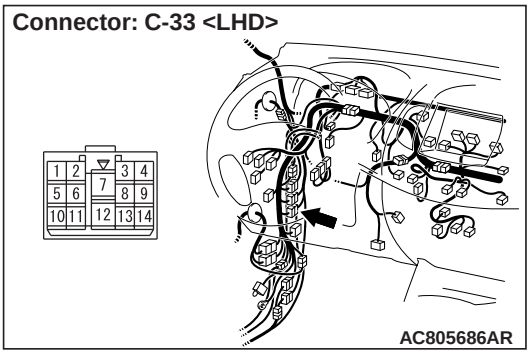
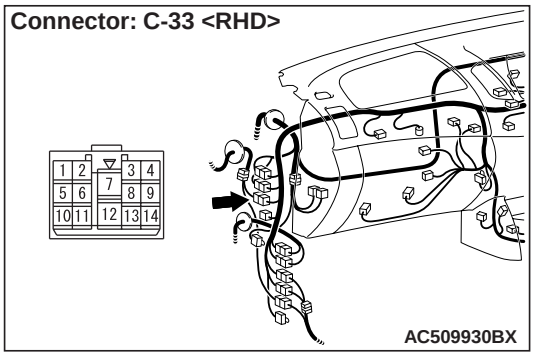










Prior to the wiring harness inspection, check interme-

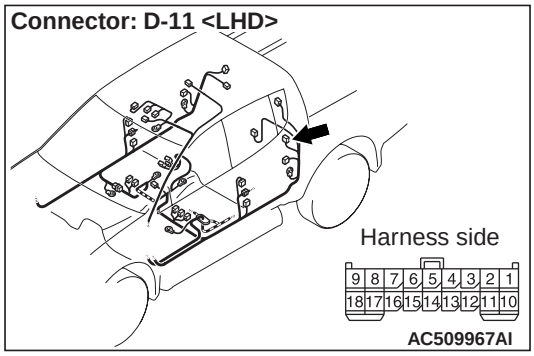
diate connectors C-16, C-33 and relay box connector A-12, and repair if necessary.

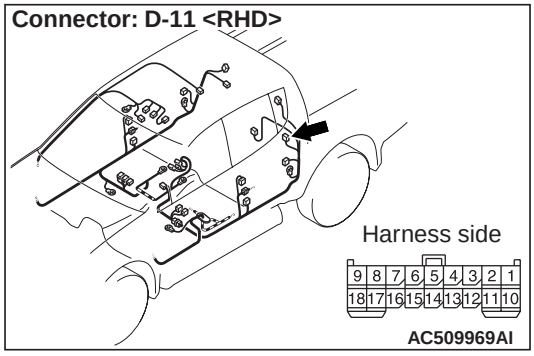
- Check the power supply line for open circuit.

Q: Is the check result normal?

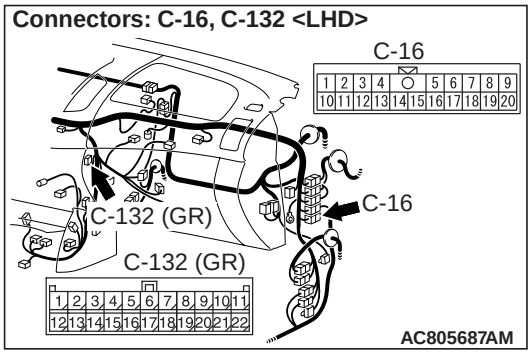
YES : Go to Step 5.
NO : Repair the wiring harness.

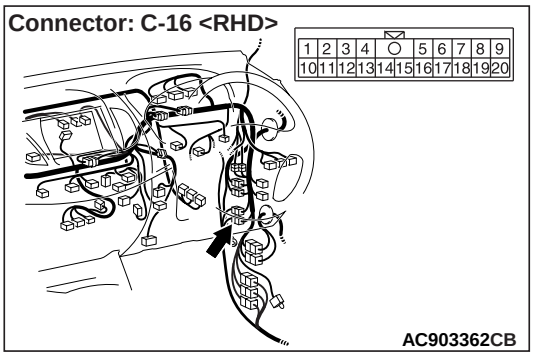
STEP 5. Check the wiring harness between D-11 rear panel power window-ECU connector terminal No.9 and ignition switch (IG1).

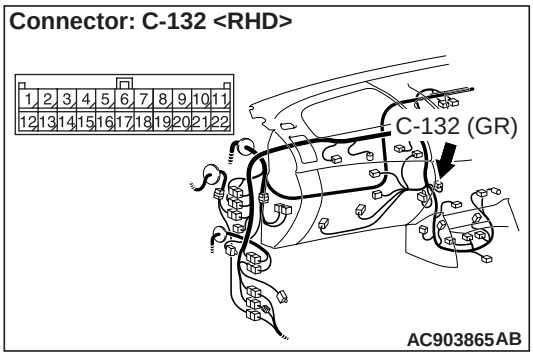


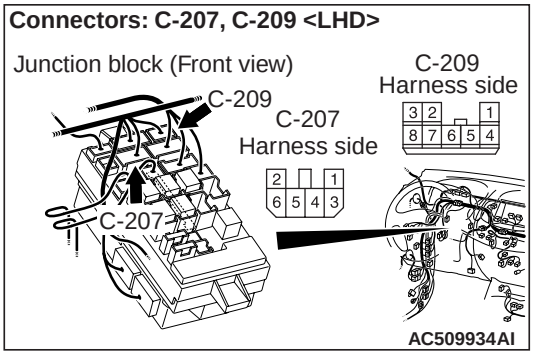


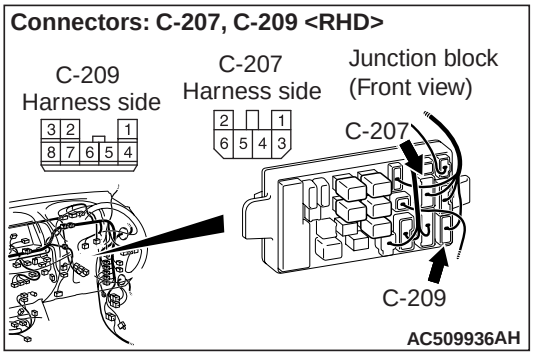
NOTE:











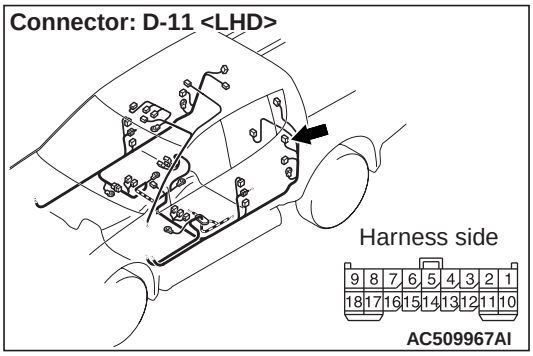
Prior to the wiring harness inspection, check interme-

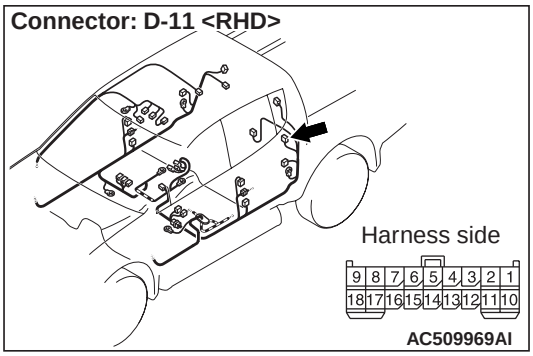
diate connector C-16, joint connector C-132 and junction block connectors C-207, C-209, and repair if necessary.

- Check the power supply line for open circuit.

Q: Is the check result normal?
YES : Go to Step 6.
NO : Repair the wiring harness.

STEP 6. Check the wiring harness between D-11 rear panel power window-ECU connector terminal No.10 and body earth.

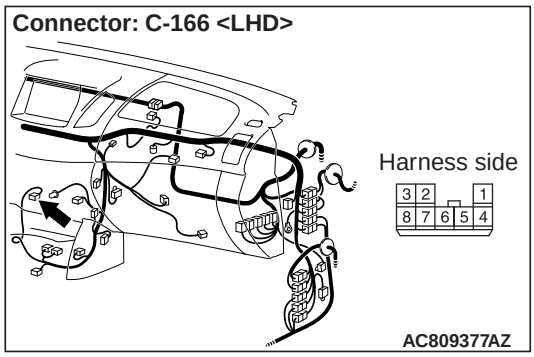


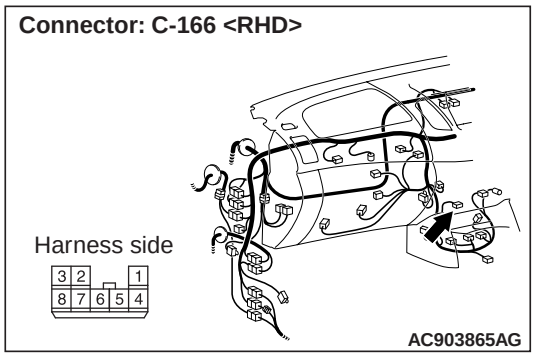


- Check the earth wires for open circuit.

Q: Is the check result normal?
YES : Go to Step 7.
NO : Repair the wiring harness.

STEP 7. Connector check: C-166 rear panel power window switch connector





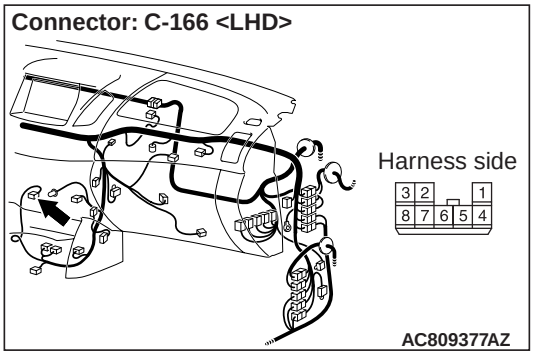
Q: Is the check result normal?
YES : Go to Step 8.
NO : Repair the connector.

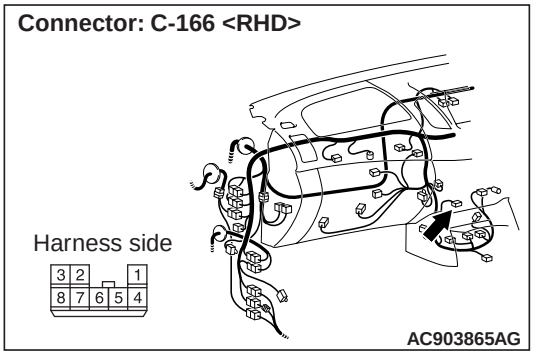
STEP 8. Check the rear panel power window switch.

Refer to P.42-60.

Q: Is the check result normal?
YES : Go to Step 9.
NO : Replace the rear panel power window switch.

STEP 9. Check the wiring harness between C-166 rear panel power window switch connector terminal No.2 and body earth.





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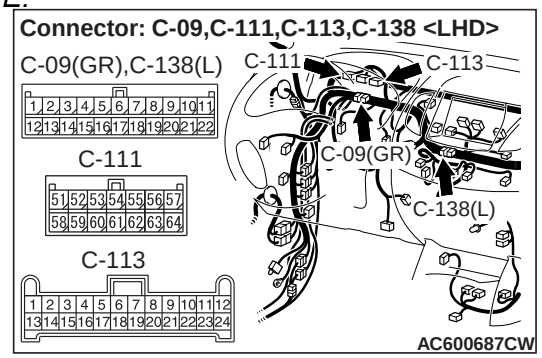
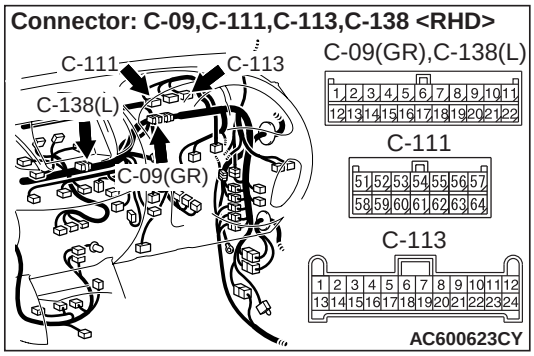




Prior to the wiring harness inspection, check the joint connector (7) C-09, joint connector (3) C-138 and combination meter connectors C-111, C-113 and repair if necessary.

- Check the earth wires for open circuit.

Q: Is the check result normal?

YES : Go to Step 10.
NO : Repair the wiring harness.

STEP 10. Retest the system.

(1) Replace the rear panel power window motor.
(2) Check that the rear panel power window works normally.

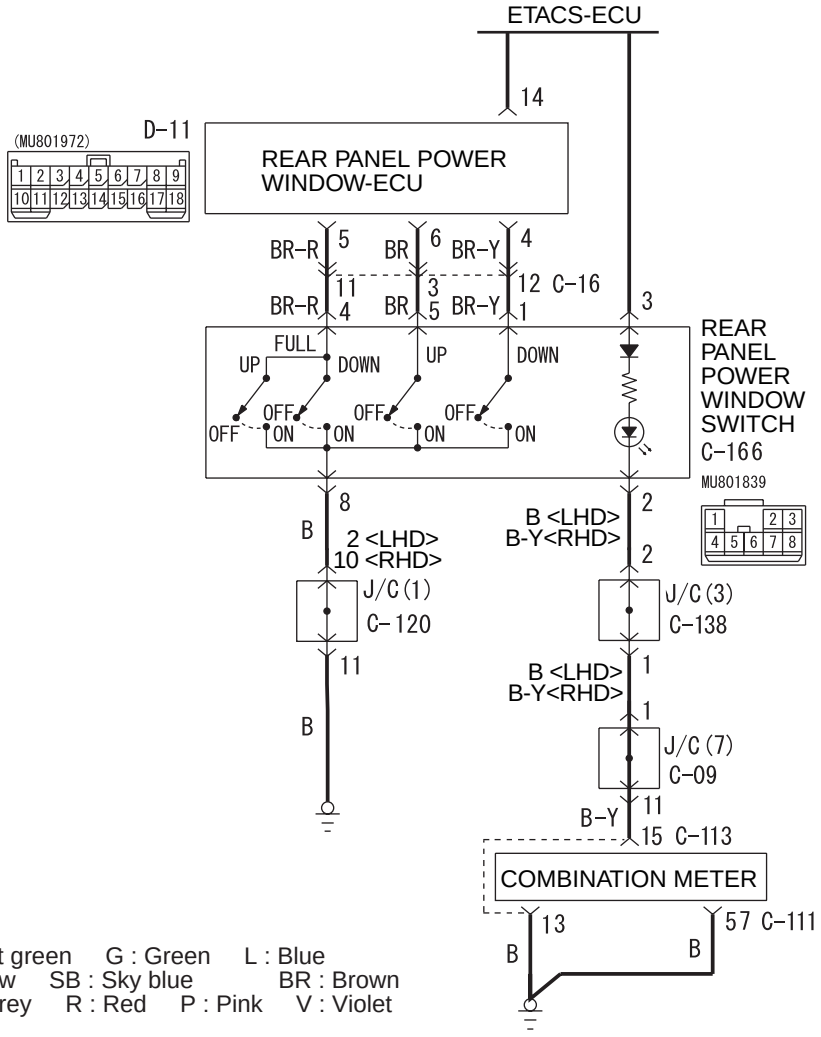
Q: Is the check result normal?

YES : The procedure is complete.
NO : Replace the rear panel power window-ECU.

Inspection Procedure 2: Any of The Rear Panel Power Window Switch Position is defective.

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Rear Panel Power Window Switch Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue
W : White Y : Yellow SB : Sky blue BR : Brown
O : Orange GR : Grey R : Red P : Pink V : Violet
PU : Purple

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COMMENTS ON TROUBLE SYMPTOM
If the rear panel power window does not work at all, the rear panel power window switch, the rear panel power window motor or the rear panel power window-ECU may be defective.

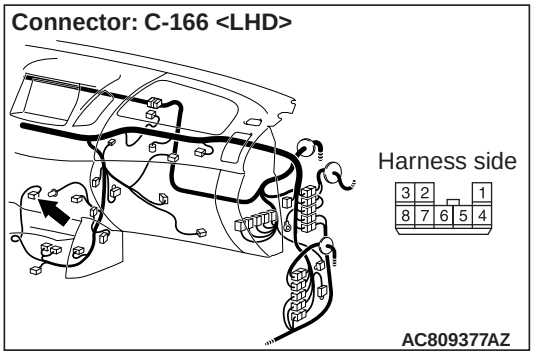
PROBABLE CAUSES
- Malfunction of the rear panel power window switch
- Malfunction of the rear panel power window motor
- Malfunction of the rear panel power window-ECU
- Damaged harness wires and connectors

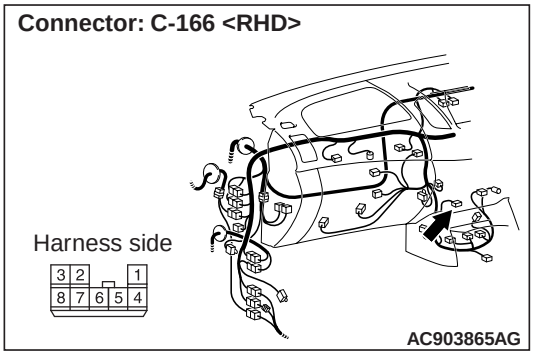
DIAGNOSIS PROCEDURE

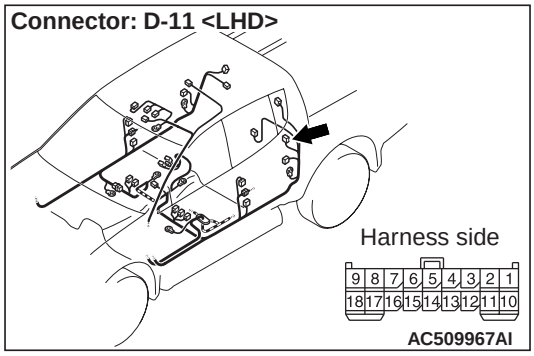
STEP 1. M.U.T.-III diagnosis code.
When the ignition switch is turned to the "ON" position, check that the ETACS-ECU does not set the diagnosis code.

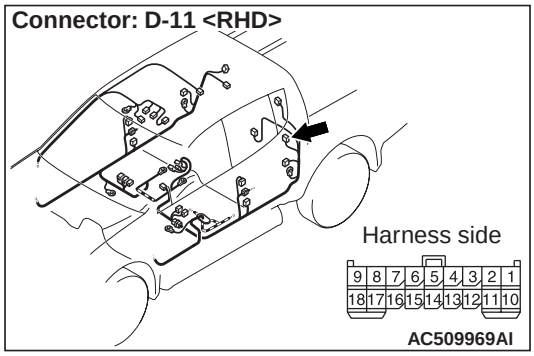
Q: Is the diagnosis code set?
YES : Refer to P.42-29.
NO : Go to Step 2.

STEP 2. Connector check: D-11 rear panel power window-ECU connector and C-166 rear panel power window switch connector









Q: Is the check result normal?

YES : Go to Step 3.
NO : Repair the connector.

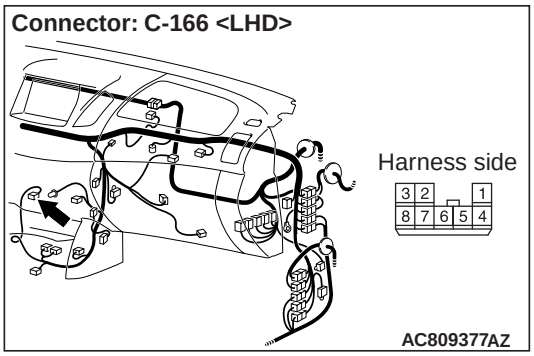
STEP 3. Check the rear panel power window switch.

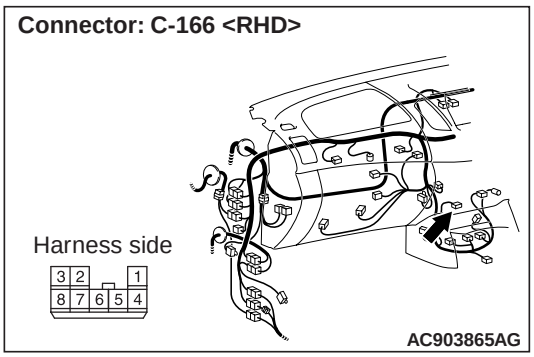
Refer to P.42-60.

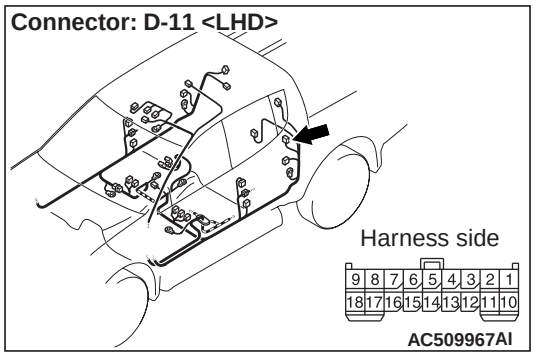
Q: Is the check result normal?

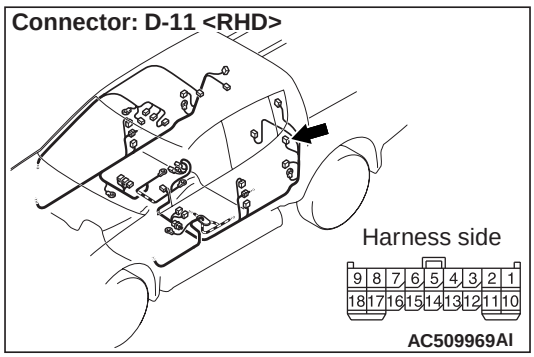
YES : Go to Step 4.
NO : Replace the rear panel power window switch.

STEP 4. Check the wiring harness between D-11 rear panel power window-ECU connector terminal Nos. 4, 5, 6 and C-166 rear panel power window switch connector terminal Nos. 1, 4, 5.









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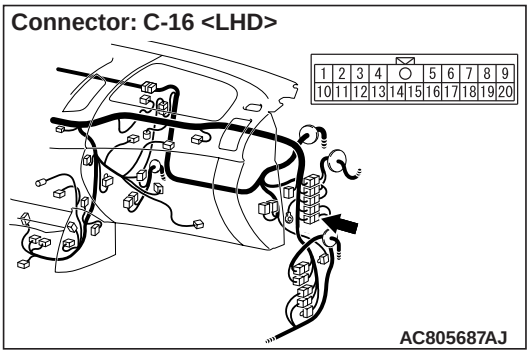
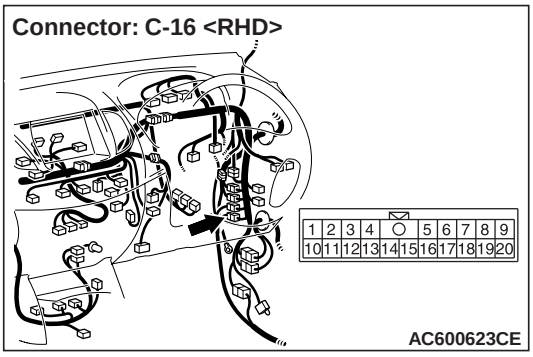




Prior to the wiring harness inspection, check the intermediate connector C-16 and repair if necessary.

- Check the input and output wires for open and short circuit.

Q: Is the check result normal?
YES : Go to Step 5.
NO : Repair the wiring harness.

STEP 5. Retest the system.

(1) Replace the rear panel power window motor.
(2) Check that the rear panel power window works normally.

Q: Is the check result normal?
YES : The procedure is complete.
NO : Replace the rear panel power window-ECU.

Inspection Procedure 3: Rear Panel Power Window Anti-trap Function does not Work Normally.

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

COMMENTS ON TROUBLE SYMPTOM
If the rear panel power window anti-trap function does not work, the rear panel power window motor and the rear panel power window-ECU may be defective.

PROBABLE CAUSES
- Malfunction of the rear panel power window motor
- Malfunction of the rear panel power window-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code.
When the ignition switch is turned to the "ON" position, check that the ETACS-ECU does not set the diagnosis code.

Q: Is the diagnosis code set?
YES : Refer to P.42-29.
NO : Go to Step 2.

STEP 2. Confirm the rear panel power window learning function.
Check that the rear panel power window-ECU has learned the fully closed position of the window (Refer to P.42-54).

Q: Is the check result normal?
YES : Go to Step 3.
NO : Refer to P.42-55.

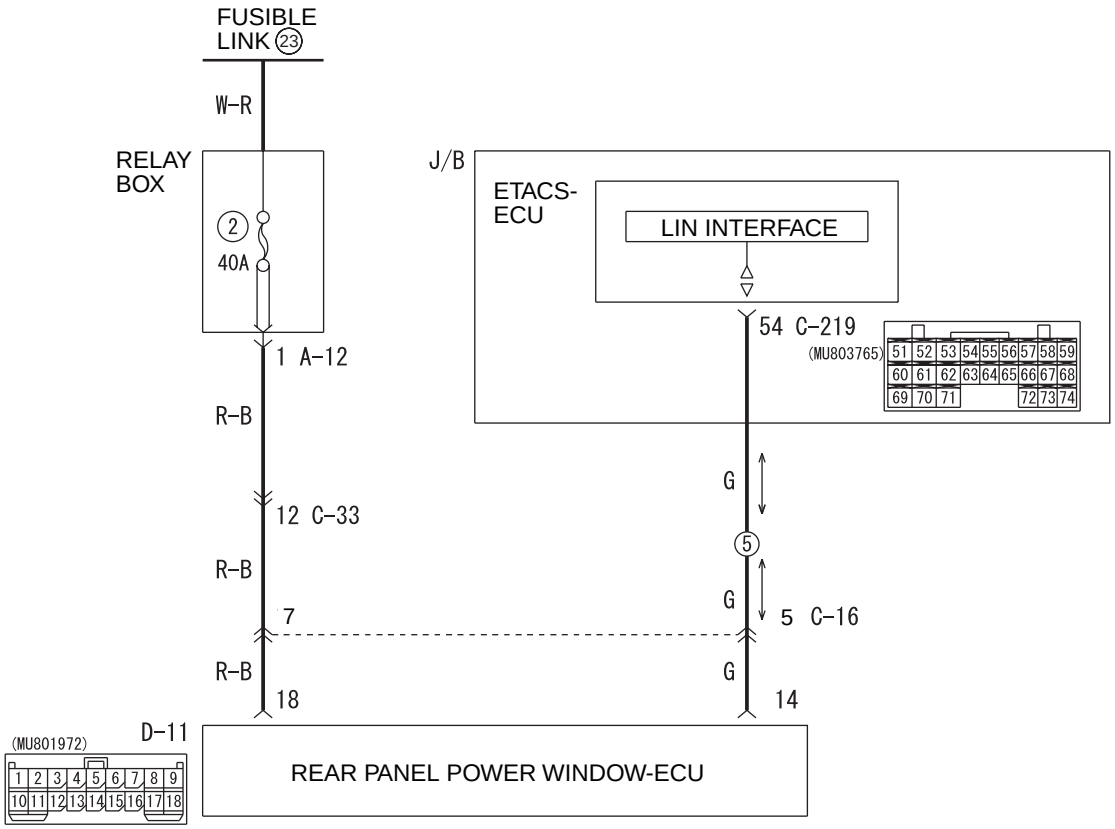
STEP 3. Retest the system.
(1) Replace the rear panel power window motor.
(2) Check that the rear panel power window anti-trap function works normally.

Q: Is the check result normal?
YES : The procedure is complete.
NO : Replace the rear panel power window-ECU.

Inspection Procedure 4: Rear Panel Power Window-ECU cannot Communicate with ETACS-ECU.

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Communication Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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COMMENTS ON TROUBLE SYMPTOM
The power supply circuit of rear panel power window-ECU may have a trouble. Also, check the battery power supply circuit harness of rear panel power window-ECU, and repair if necessary.

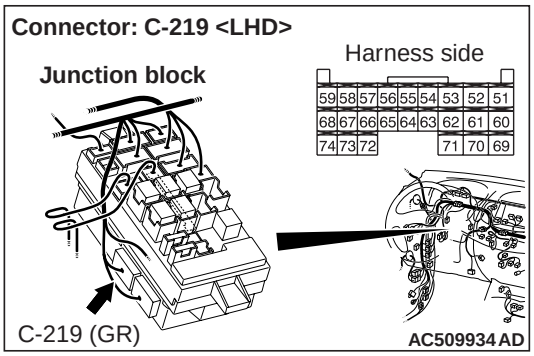
PROBABLE CAUSES
- Malfunction of the rear panel power window-ECU
- Malfunction of the ETACS-ECU
- Damaged harness wires and connectors

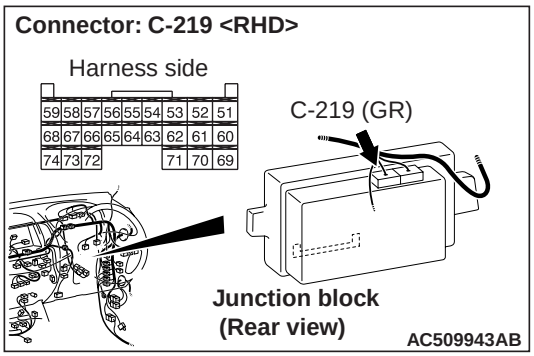
STEP 2. Connector check: C-219 ETACS-ECU connector and D-11 rear panel power window-ECU connector

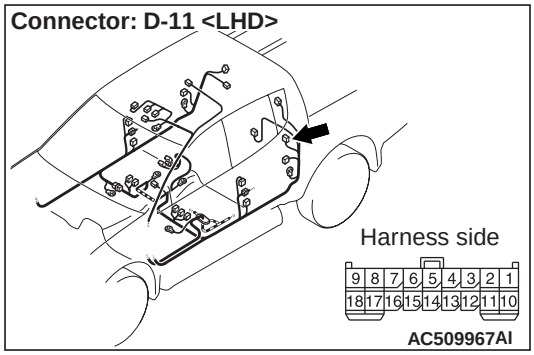
DIAGNOSIS PROCEDURE

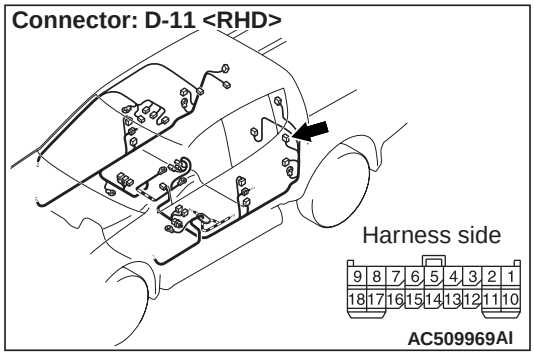
STEP 1. M.U.T.-III diagnosis code.
When the ignition switch is turned to the "ON" position, check that the ETACS-ECU does not set the diagnosis code.

Q: Is the diagnosis code set?
YES : Refer to P.42-29.
NO : Go to Step 2.





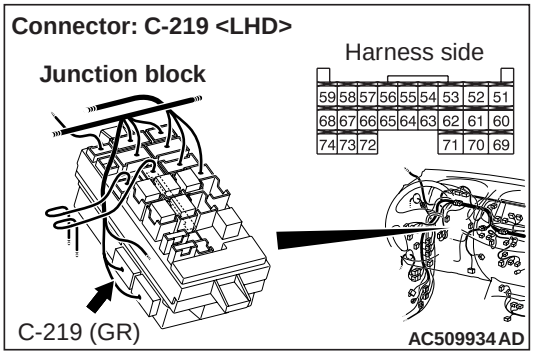


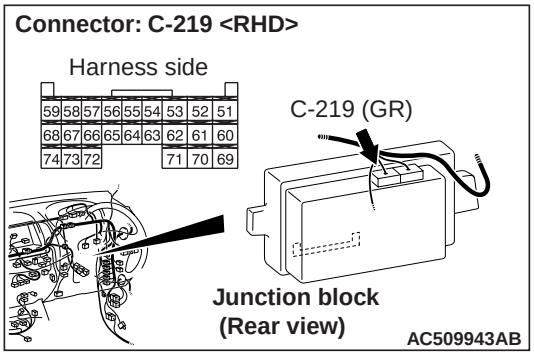


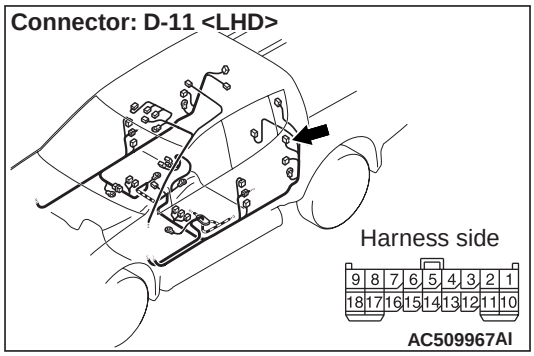
Q: Is the check result normal?

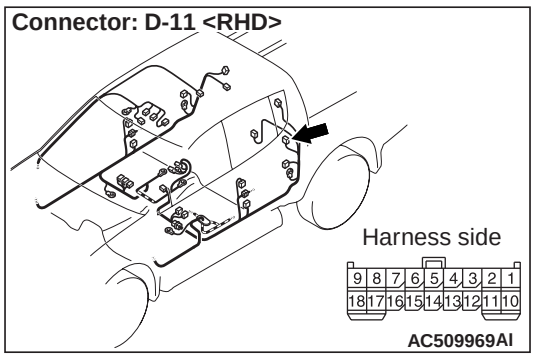
YES : Go to Step 3.
NO : Repair the connector.

STEP 3. Check the wiring harness between C-219 ETACS-ECU connector terminal No.54 and D-11 rear panel power window-ECU connector terminal No.14.









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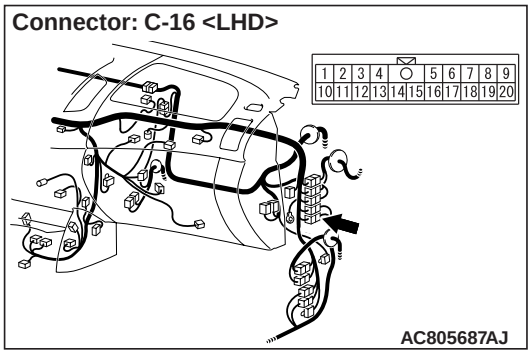
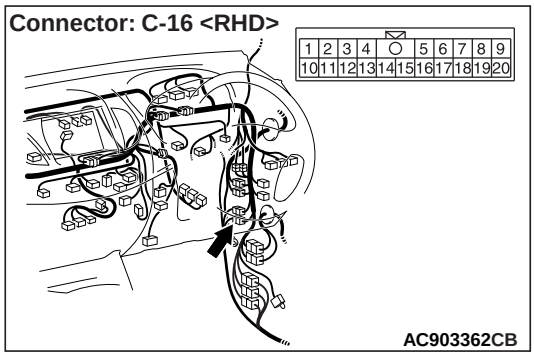




Prior to the wiring harness inspection, check intermediate connector C-16, and repair if necessary.

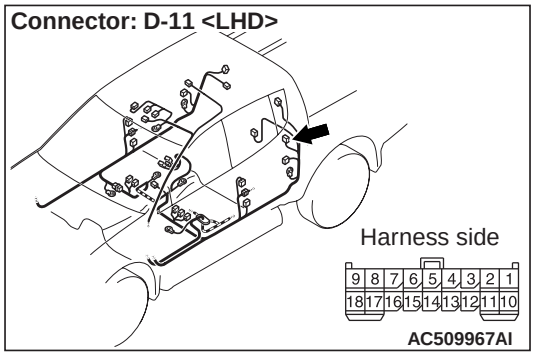
- Check the communication line for open circuit.

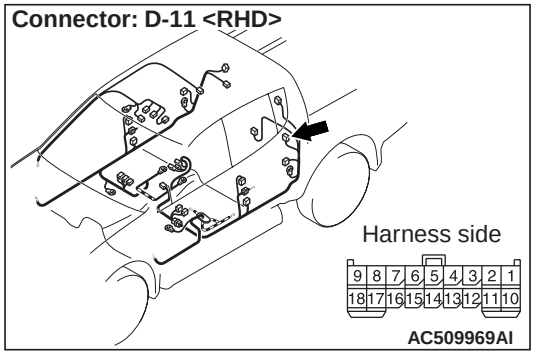
Q: Is the check result normal?

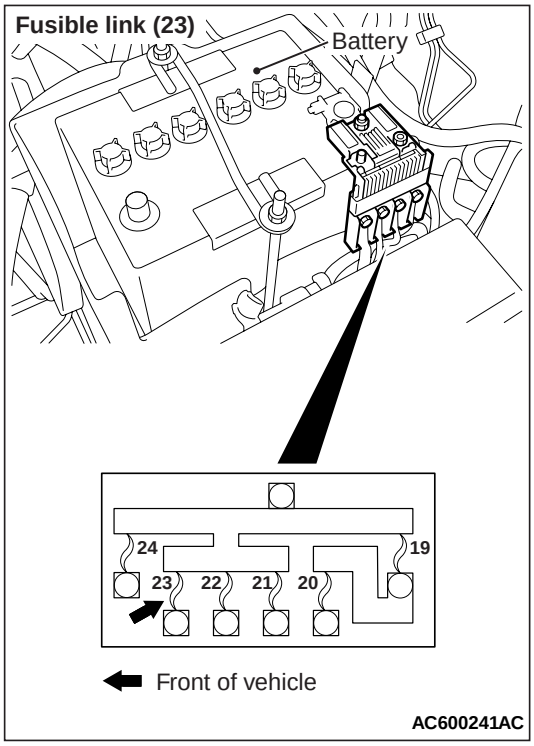
YES : Go to Step 4.

NO : Repair the wiring harness.

STEP 4. Check the wiring harness between D-11 rear panel power window-ECU connector terminal No.18 and fusible link (23).







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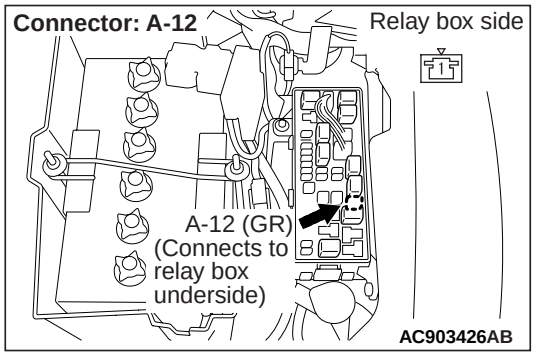

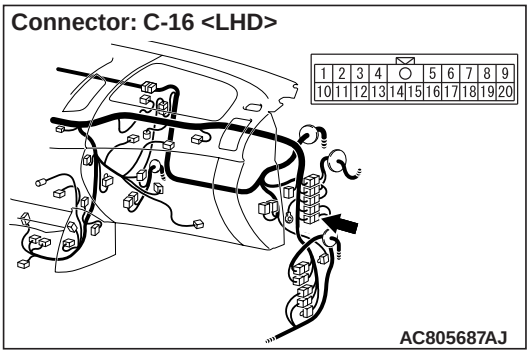

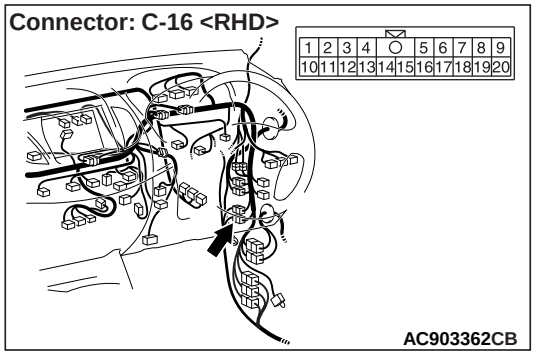

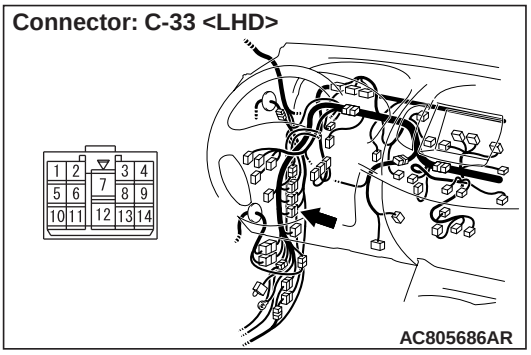

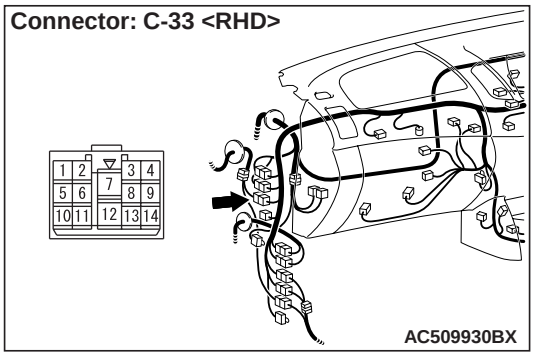

Prior to the wiring harness inspection, check interme-

diate connectors C-16, C-33 and relay box connector A-12, and repair if necessary.

- Check the power supply line for open circuit.

Q: Is the check result normal?
YES : Go to Step 5.
NO : Repair the wiring harness.

STEP 5. Retest the system.
(1) Replace the rear panel power window-ECU.
(2) Check that the rear panel power window works normally.

Q: Is the check result normal?
YES : The procedure is complete.
NO : Replace the ETACS-ECU and register the ID codes (Refer to GROUP 54A, How to Register Encrypted Code).

Inspection Procedure 5: Rear Panel Power Window Timer Function does not Work Normally.

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

COMMENTS ON TROUBLE SYMPTOM
If the rear panel power window timer function does not work, the input circuit from the ignition switch (IG1) or the driver's door switch, the communication lines between the ETACS-ECU and the rear panel power window-ECU, the rear panel power window-ECU or the ETACS-ECU may be defective.

PROBABLE CAUSES
- Malfunction of ETACS-ECU
- Malfunction of the rear panel power window-ECU
- Malfunction of the power window main switch
- Malfunction of the rear panel power window switch
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code.
When the ignition switch is turned to the "ON" position, check that the ETACS-ECU does not set the diagnosis code.

Q: Is the diagnosis code set?
YES : Refer to P.42-29.
NO : Go to Step 2.

STEP 2. Check the rear panel power window.
Check that the rear panel power window can operate by means of the rear panel power window switch.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Refer to P.42-29.

STEP 3. Check the power window timer function.
Check that the power window timer function works normally.

Q: Is the check result normal?
YES : Go to Step 4.
NO : Carry out relevant troubleshooting. Refer to P.42-29.

STEP 4. Retest the system.
Check that the rear panel power window timer function works normally.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Replace the rear panel power window-ECU.

ON-VEHICLE SERVICE

REAR SLIDE WINDOW GLASS ADJUSTMENT

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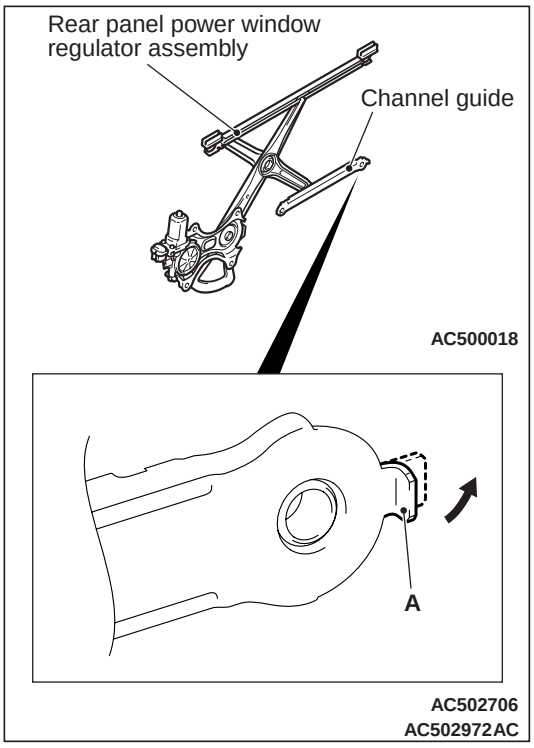
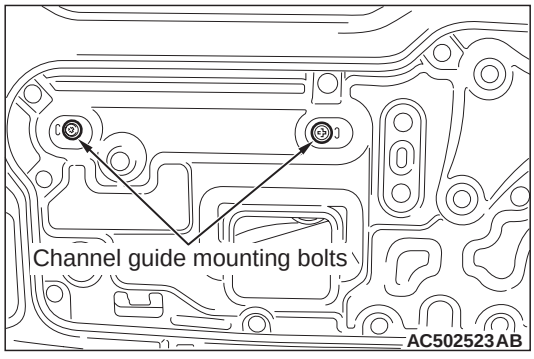
Check that the window glass operates smoothly and moves along the rear slide window glass runchannel when the rear slide window glass is fully raised and fully lowered. If there is a problem, adjust by the following procedures:

1. Remove the cab rear end lower trim (Refer to GROUP 52A, Interior trim).
2. Remove the waterproof film and rear panel power window regulator assembly (Refer to P.42-56).



3. Stretch the both bends ("A" shown in the figure) of channel guide on the rear panel window regulator assembly.

   NOTE: The bend of part "A" shown in the figure is used for positioning the rear panel window regulator assembly. However, stretching the part "A" enables the adjustment of rear slide window glass. In addition, keep the part "A" stretched.
4. Install the rear panel power window regulator assembly (Refer to P.42-56).
5. Activate the anti-trap function successively 3 times; this makes the anti-trap function deactivate.



6. Raise the rear slide window glass and loosen the channel guide mounting bolts to adjust the window glass slants appropriately.
7. Set the anti-trap function (Refer to P.42-55).

   NOTE: If the anti-trap function (safety mechanism) is activated consecutively 3 times or more, make the rear panel power window-ECU learn the fully closed position of the rear panel power window (Refer to P.42-55).

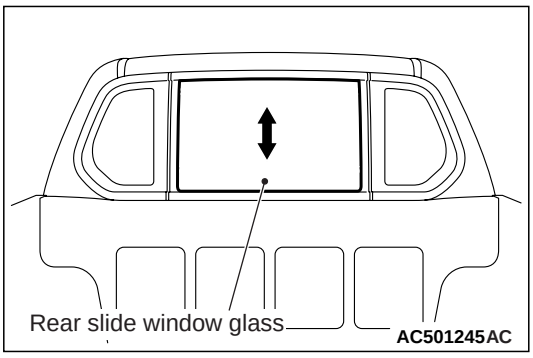
GLASS SLIDING MECHANISM CHECK AND ADJUSTMENT

M1429000900325

If the window glass automatically starts moving downwards at the wrong time while it is being raised, carry out the following adjustment or replacement procedures:

1. Remove the cab rear end lower trim (Refer to GROUP 52A, Interior trim).
2. Remove the waterproof film (Refer to P.42-56).
3. Remove the window regulator assembly from the rear slide window glass, and then raise and lower the rear slide window glass by hand to check the operation force.

   NOTE: Insert a cushion or similar object to prevent damage to the glass if it should happen to fall down.



4. If the rear slide window glass does not move up and down smoothly, check or repair the following points:
   - Check the installation condition of the runchannel.
   - Check the installation condition of the rear slide window sash side and the rear slide window sash upper.
5. If a repair or an adjustment does not make sense, replace the rear slide window sash side and the rear slide window sash upper.

REAR PANEL POWER WINDOW ANTI-TRAP FUNCTION INSPECTION

M1429007500027

1. Place a wooden board of about 10 mm thickness. Raise the rear slide window glass with the rear panel power window switch.
2. Check that the window lowers by fully open position when the window glass clamps the board. If this does not happen, carry out troubleshooting. Refer to P.42-29.

REAR PANEL POWER WINDOW INITIAL SET

M1429007600024

HOW TO MAKE THE REAR PANEL POWER WINDOW-ECU LEARN THE FULLY CLOSED POSITION OF THE REAR PANEL POWER WINDOW

How to make the rear panel power window-ECU learn the fully closed position when the rear panel power window-ECU is removed, or the rear panel power window regulator assembly is removed or replaced

1. If the anti-trap function (safety mechanism) is activated consecutively three times or more, the fully closed position that the rear panel power window-ECU has learned will be erased (initialised).
2. Operate the rear panel power window switch and fully open the rear slide window glass.

⚠ CAUTION

The anti-trap function does not work until the rear panel power window-ECU completes learning the fully closed position (It is because the anti-trap function is reset).

3. Operate the rear panel power window switch and fully close the rear slide window glass. The rear panel power window activates for 0.7 second and stops automatically when the rear panel power window switch is pressed once. Repeat this operation until the rear slide window glass fully closes and release the rear panel power window switch once. Then, hold the rear panel power window switch to the fully closed side again for one second so that the rear panel power window switch completes learning the fully closed position.

   NOTE: If the rear panel power window switch is operated to open the rear slide window glass while the rear panel power window-ECU is learning, learning will be cancelled. If this happens, return to step 2.

How to make the rear panel power window-ECU learn the fully closed position when the rear panel power window-ECU is replaced with a new one

⚠ CAUTION

The anti-trap function does not work until the rear panel power window-ECU completes learning the fully closed position (It is because the anti-trap function is reset).

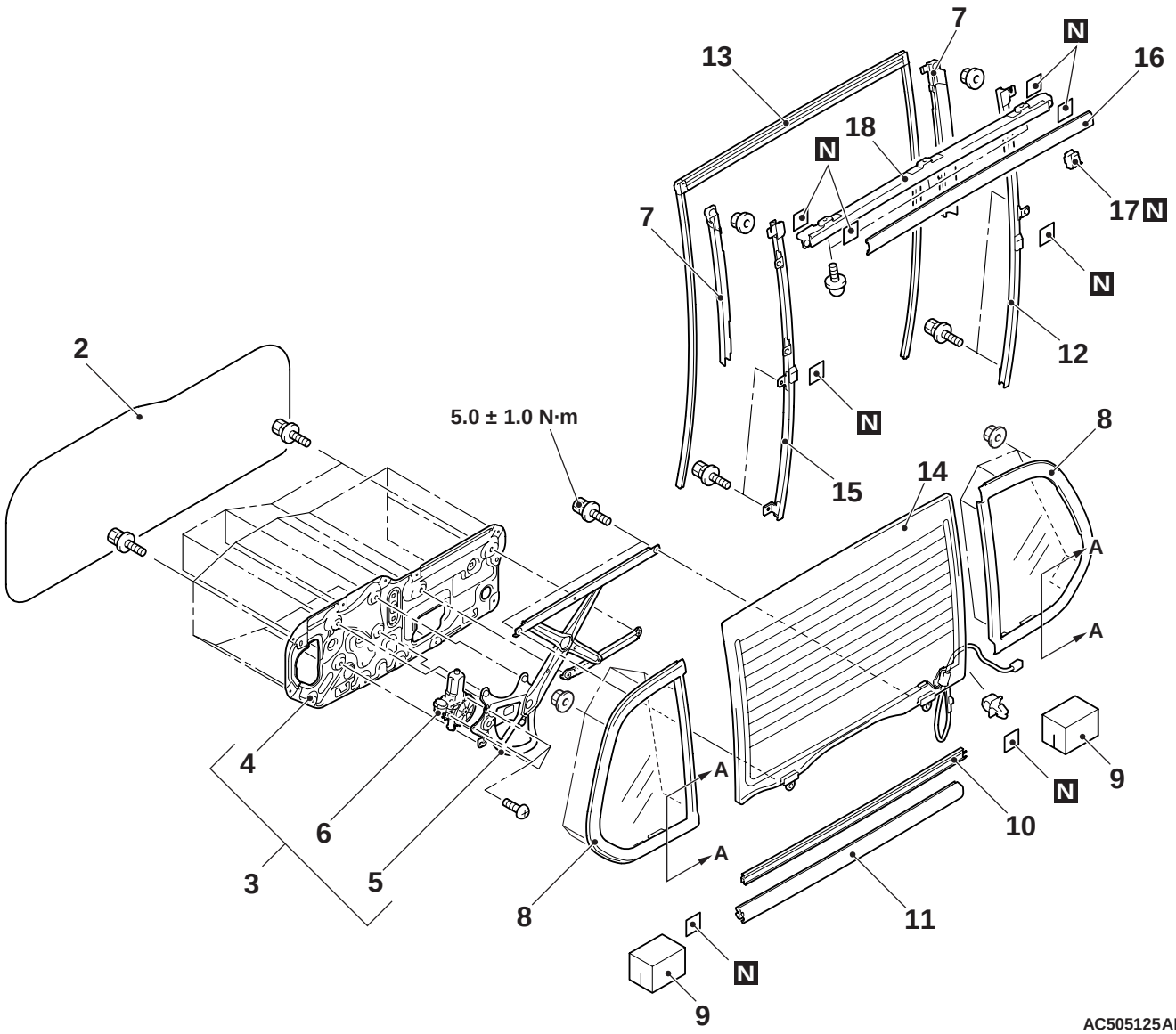
Operate the rear panel power window switch to fully close the rear slide window glass by one-shot up action so that the rear panel power window-ECU will complete learning (Initialisation is not needed).

REAR PANEL WINDOW REGULATOR

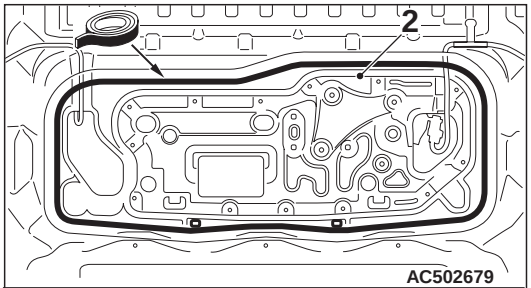
REMOVAL AND INSTALLATION

M1429005800099

Post-installation Operation
- Rear Panel Power Window Glass Adjustment (Refer to P.42-53).
- Rear Panel Power Window Initial Set (Refer to P.42-55).

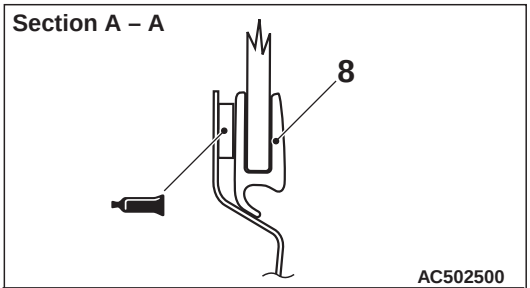


AC505125AB



AC502679

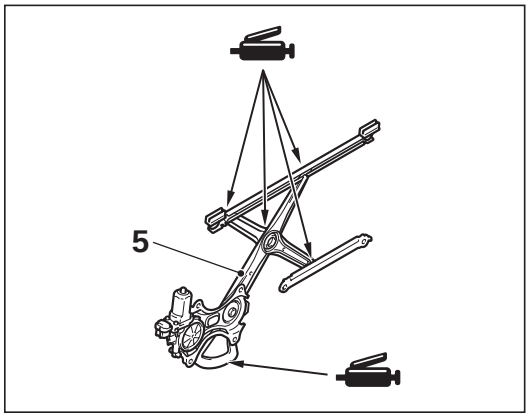
Sealant: 3M ATD Part No. 8625 or equivalent

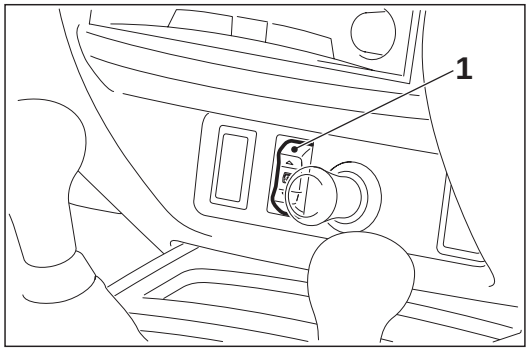


AC502500

Sealant: 3M ATD Part No. 3509 or equivalent

AC505196AC





AC901903AB

Rear panel power window switch removal

1. Rear panel power window switch (Refer to GROUP 52A, Centre lower panel assembly, Instrument Panel Assembly .)

Rear panel power window regulator assembly removal steps

- Cab rear end lower trim (Refer to GROUP 52A, Interior Trim .)

>>**B**<< 2. Waterproof film

<<**A**>> 3. Rear window panel assembly
4. Rear window panel
5. Rear panel power window regulator
6. Rear panel power window motor

Rear slide window glass and rear side window glass removal steps

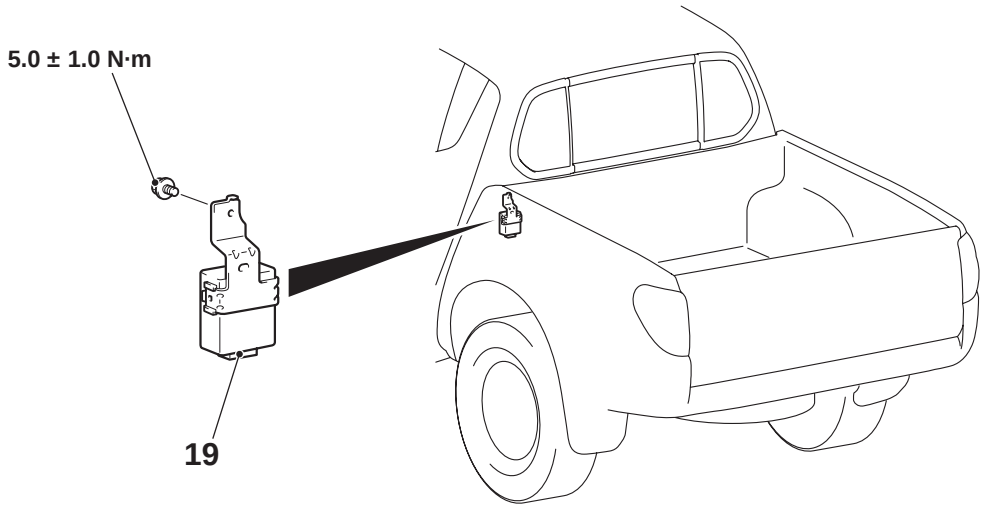
- Headlining (Refer to GROUP 52A, Headlining .)
- Cab rear end lower trim (Refer to GROUP 52A, Interior Trim .)

>>**B**<< 2. Waterproof film
7. Rear window side moulding
8. Rear side window glass assembly
9. Rear body cushion
10. Cab rear window weatherstrip
11. Rear window moulding lower
12. Rear slide window sash side (RH side)
13. Rear slide window glass runchannel
14. Rear slide window glass
15. Rear slide window sash side (LH side)
16. Rear slide window sash upper

>>**A**<< 17. Clip
18. Rear window moulding upper

Post-installation Operation

- Rear Panel Power Window Initial Set (Refer to P.42-55).



AC502521AB

Rear panel power window-ECU removal steps

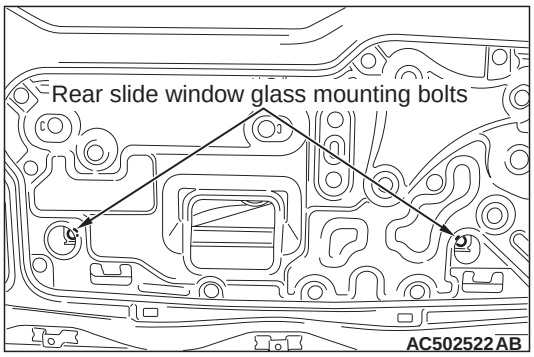
- Rear pillar trim (Refer to GROUP 52A, Interior Trim .)

19. Rear panel power window-ECU

REMOVAL SERVICE POINT

<<A>> REAR WINDOW PANEL ASSEMBLY REMOVAL

1. Activate the anti-trap function successively 3 times to deactivate the anti-trapping function.

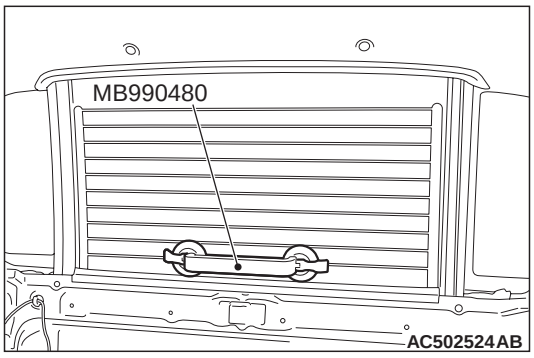


2. Lower the rear slide window glass until the rear slide window glass mounting bolts are seen.
3. Remove the rear slide window glass mounting bolts.

>>B<< WATERPROOF FILM INSTALLATION

⚠ CAUTION

If tinting film is adhered to the rear slide window glass, attach the special tool, window glass holder (MB990480) to the outside of the glass to prevent the film from peeling off.



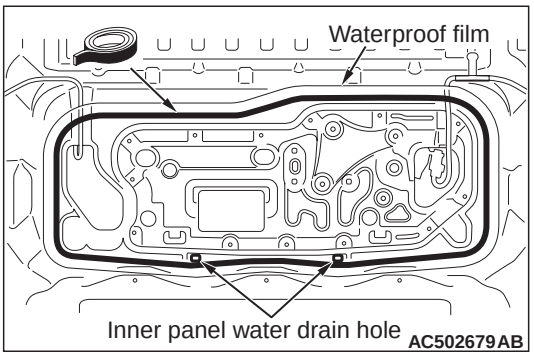
4. Lift the rear slide window glass, and attach the special tool, window glass holder (MB990480) to the glass as shown to prevent the glass from falling.
5. Remove the rear window panel assembly.

INSTALLATION SERVICE POINTS

>>A<< CLIP INSTALLATION

Since the clip is damaged when the rear slide window sash upper is removed, replace the clip (6137A009) and install it to the body.

⚠ CAUTION



When sticking the waterproof film, ensure that the sealant is applied under the inner panel water drain hole.

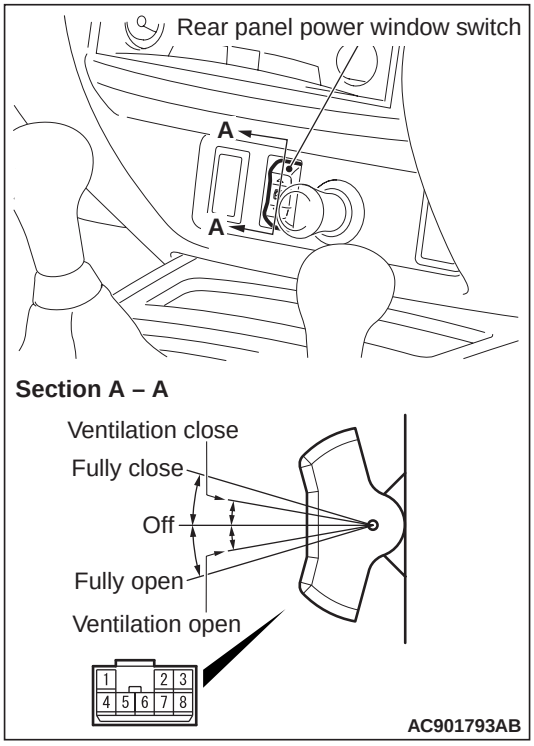
Apply the specified sealant to the waterproof film as shown and stick the film.

Specified sealant: 3M ATD Part No.8625 or equivalent

INSPECTION

M1429005900096

REAR PANEL POWER WINDOW SWITCH CONTINUITY CHECK

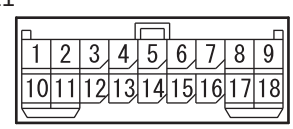


Remove the rear panel power window switch (Refer to GROUP 52A, Centre lower panel assembly, Instrument Panel assembly .).

Switch position	Tester connection	Specified condition
Ventilation open	1 – 8	Continuity exists (2 Ω or less)
Ventilation close	5 – 8	Continuity exists (2 Ω or less)
OFF	1 – 8, 4 – 8, 5 – 8	Open circuit
Fully open/Fully close	4 – 8	Continuity exists (2 Ω or less)

REAR PANEL POWER WINDOW-ECU TERMINAL INSPECTION

D-11



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Terminal No.	Check item	Check condition	Normal condition
1	Output to rear panel power window motor	–	–
2	Output to rear panel power window motor	–	–
3	–	–	–
4	Output to rear panel power window switch	Rear panel power window switch (Ventilation open): ON	12 V
5	Output to rear panel power window switch	Rear panel power window switch (Fully open/Fully close): ON	12 V
6	Output to rear panel power window switch	Rear panel power window switch (Ventilation close): ON	12 V
7	Input from rear panel power window motor (pulse sensor signal)	When the rear panel power window are operating	0 to 5 V (pulse signal)
8	Input from rear panel power window motor (power supply to pulse sensor)	When the rear panel power window are operating	5 V
9	Power supply from ignition switch (IG1)	Ignition switch: ON	System voltage
10	Earth	Always	1 V or less
11	Input from rear panel power window motor (pulse sensor earth)	–	0.5 V or less
12	–	–	–
13	–	–	–
14	LIN communication line	Always	0 to 12 V (pulse signal)
15	–	–	–
16	Input from rear panel power window motor (pulse sensor signal)	When the rear panel power window are operating	0 to 5 V (pulse signal)
17	–	–	–
18	Battery power supply	Always	System voltage

DOOR

SERVICE SPECIFICATIONS

M1423000300604

Item		Standard value
Power window operation current (Power supply voltage 14.5 ± 0.5 V at 25 °C) A		5 ± 1
Door outside handle play mm	Front door	0.1 – 5.9 (target value: 2.5)
	Rear door	0.0 – 4.8 (target value: 2.1)
Door inside handle knob play mm		5.2 – 19.6 (target value: 10.9)
Door inside handle lock knob stroke mm	Front door	14.5 – 16.0 (target value: 15)
	Rear door	14.5 – 15.5

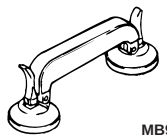
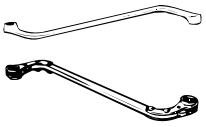
SEALANT

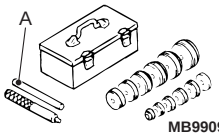
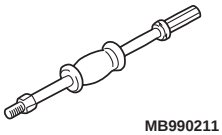
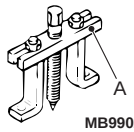
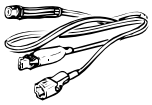
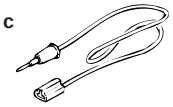
M1423000500501

Item	Specified sealant
Door waterproof film	3M ATD Part No.8625 or equivalent

SPECIAL TOOLS

M1423000601114

Tool	Number	Name	Use
 MB990480	MB990480	Window glass holder	Removal of window regulator assembly
 MB990900	MB990834 or MB991163	Door hinge adjusting wrench	Door alignment

Tool	Number	Name	Use
 MB990925AF	MB990925 A: MB990939	Bearing and oil seal installer set A: Remover bar	Door striker adjustment
 MB990211	MB990211	Sliding hammer	
 MB990241AE	MB990241 A: MB990243	Axle shaft puller A: Body puller	
a b  c  d MB991223	MB991223 a. MB991219 b. MB991220 c. MB991221 d. MB991222	Harness set a. Test harness b. LED harness c. LED harness adapter d. Probe	Terminal voltage measurement a. For checking connector pin contact pressure b. For checking power supply circuit c. For checking power supply circuit d. For connecting a locally sourced tester
MB992006	MB992006	Extra fine probe	Continuity check and voltage measurement at harness wire or connector

TROUBLESHOOTING

DIAGNOSIS TROUBLESHOOTING FLOW

M1423006700321

Refer to GROUP 00, Contents of Troubleshooting .

TROUBLE SYMPTOM CHART <CENTRAL DOOR LOCKING SYSTEM>

M1427001800121

Symptom	Inspection procedure number	Reference page
Central door locking system does not work at all.	A-1	P.42-66
A door cannot be locked or unlocked by the central door locking system <LH drive vehicles>.	A-2	P.42-69
A door cannot be locked or unlocked by the central door locking system <RH drive vehicles>.	A-3	P.42-76
Selector "P" position-linked door unlock function does not operate normally. <Vehicles with automatic transmission with keyless entry system>	A-4	P.42-83

DIAGNOSIS CODE CHART <POWER WINDOWS>

M1429006000052

⚠ CAUTION

On troubleshooting, if the ignition switch is turned ON while disconnecting connector(s), diagnosis code(s) associated with other system may be set. On completion, confirm all systems for diagnosis code(s). If diagnosis code(s) are set, erase them all.

Code No.	Symptom	Reference page
1001	P/W (DR) SW pulse1 disconnection <LH drive vehicles>	P.42-84
	P/W (DR) SW pulse1 disconnection <RH drive vehicles>	P.42-86
1002	P/W (DR) SW pulse2 disconnection <LH drive vehicles>	P.42-87
	P/W (DR) SW pulse2 disconnection <RH drive vehicles>	P.42-89
1003	P/W (DR) Above window position	P.42-90
1004	P/W (DR) Sensor fail (earth) <LH drive vehicles>	P.42-91
	P/W (DR) Sensor fail (earth) <RH drive vehicles>	P.42-92
1005	P/W (DR) 3 times jam - protection	P.42-93
1008	P/W (DR) Parameter read fail	P.42-94
1009	P/W (DR) Position read fail	
2001	P/W (AS) SW pulse1 disconnection <LH drive vehicles>	P.42-94
	P/W (AS) SW pulse1 disconnection <RH drive vehicles>	P.42-96
2002	P/W (AS) SW pulse2 disconnection <LH drive vehicles>	P.42-97
	P/W (AS) SW pulse2 disconnection <RH drive vehicles>	P.42-99
2003	P/W (AS) Above window position	P.42-100
2004	P/W (AS) Sensor fail (earth) <LH drive vehicles>	P.42-101
	P/W (AS) Sensor fail (earth) <RH drive vehicles>	P.42-102
2005	P/W (AS) 3 times jam - protection	P.42-103
2008	P/W (AS) Parameter read fail	P.42-104
2009	P/W (AS) Position read fail	
3001	P/W (RL) SW pulse1 disconnection <Double cab>	P.42-104
3002	P/W (RL) SW pulse2 disconnection <Double cab>	P.42-106

Code No.	Symptom	Reference page
3003	P/W (RL) Above window position <Double cab>	P.42-107
3004	P/W (RL) Sensor fail (earth) <Double cab>	P.42-108
3005	P/W (RL) 3 times jam - protection <Double cab>	P.42-109
3008	P/W (RL) Parameter read fail <Double cab>	P.42-109
3009	P/W (RL) Position read fail <Double cab>	
4001	P/W (RR) SW pulse1 disconnection <Double cab>	P.42-110
4002	P/W (RR) SW pulse2 disconnection <Double cab>	P.42-112
4003	P/W (RR) Above window position <Double cab>	P.42-113
4004	P/W (RR) Sensor fail (earth) <Double cab>	P.42-114
4005	P/W (RR) 3 times jam - protection <Double cab>	P.42-115
4008	P/W (RR) Parameter read fail <Double cab>	P.42-115
4009	P/W (RR) Position read fail <Double cab>	

NOTE: P/W: Power window

TROUBLE SYMPTOM CHART <POWER WINDOWS>

M1429002800294

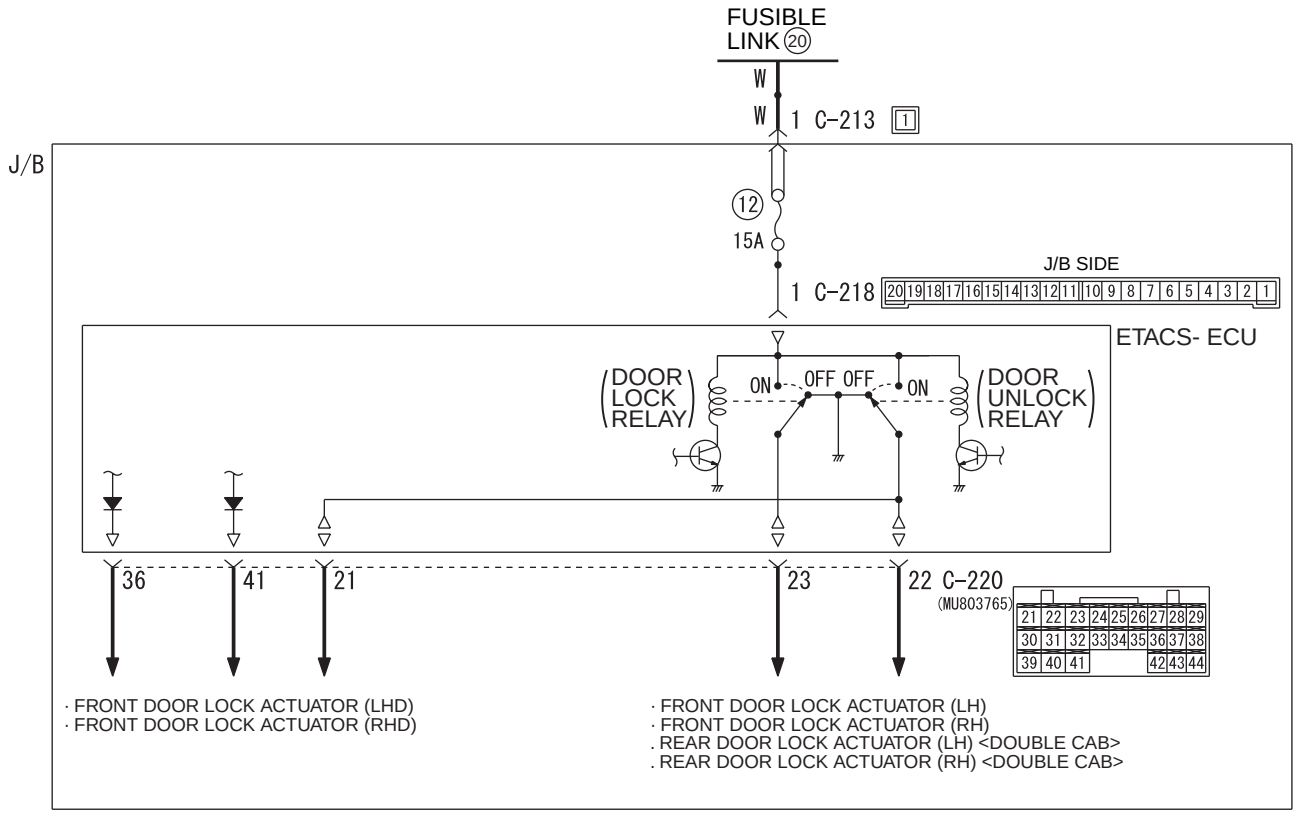
Symptom	Inspection procedure number	Reference page
Power windows do not work at all.	B-1	P.42-117
Driver's power window does not work by means of the power window main switch. <LH drive vehicles>	B-2	P.42-128
Driver's power window does not work by means of the power window main switch. <RH drive vehicles>	B-3	P.42-130
Relevant power window(s) do not work by means of the front passenger's power window sub switch or rear power window sub switches. <LH drive vehicles>	B-4	P.42-133
Relevant power window(s) do not work by means of the front passenger's power window sub switch or rear power window sub switches. <RH drive vehicles>	B-5	P.42-143
Front passenger's and/or rear power window do not work by means of the power window main switch.	B-6	P.42-152
Power window timer function does not work normally.	B-7	P.42-153
Power window anti-trap function does not work normally. <LH drive vehicles>	B-8	P.42-154
Power window anti-trap function does not work normally. <RH drive vehicles>	B-9	P.42-161
The window glass lowers automatically while it is rising.	B-10	P.42-167

SYMPTOM PROCEDURES <CENTRAL DOOR LOCKING SYSTEM>

Inspection Procedure A-1: Central Door Locking System does not Work at all.

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Central Door Lock Power Supply Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

AC511806AC

COMMENT ON TROUBLE SYMPTOM
If the central door locking system does not work at all, the ETACS-ECU may be defective.

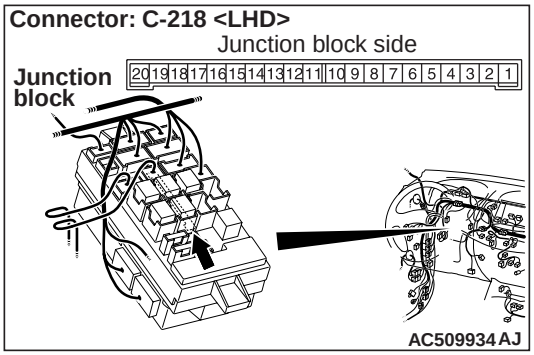
PROBABLE CAUSES
- Malfunction of the ETACS-ECU
- Damaged harness wires and connectors

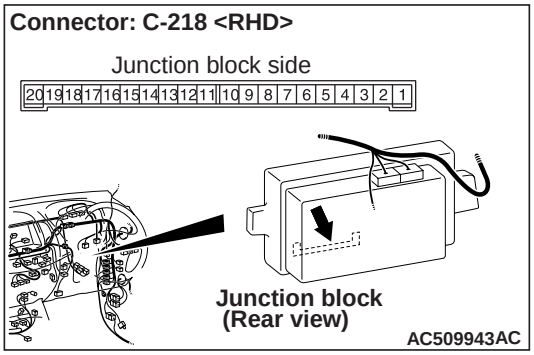
DIAGNOSIS PROCEDURE

STEP 1. Check the power supply circuit.
When the ignition switch is turned to the LOCK (OFF) position, check if the hazard warning lamps illuminate.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Refer to GROUP 54A, Inspection Procedure A-1 "Check the battery power supply circuit to the ETACS-ECU" .

STEP 2. Connector check: C-218 ETACS-ECU connector

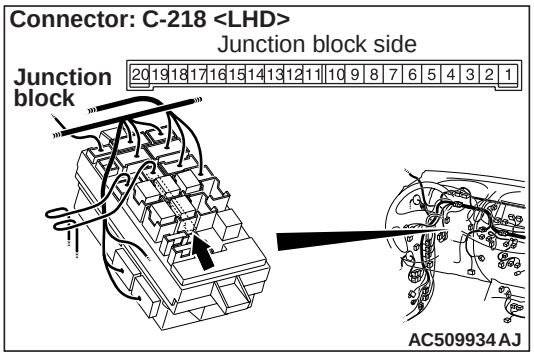


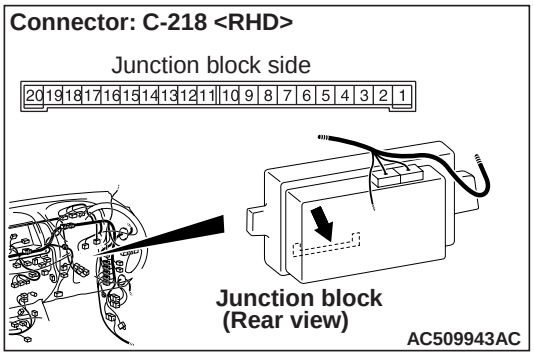


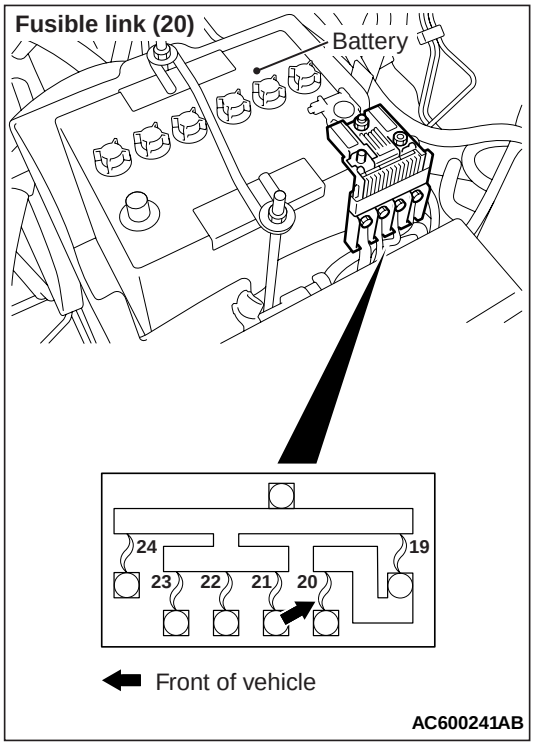
Q: Is the check result normal?

YES : Go to Step 3.
NO : Repair the defective connector.

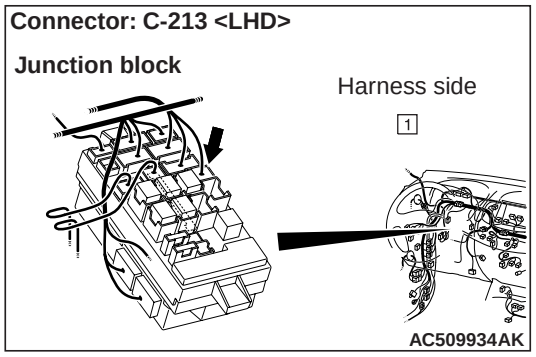
STEP 3. Check the wiring harness between C-218 ETACS-ECU connector terminal No.1 and fusible link (20).

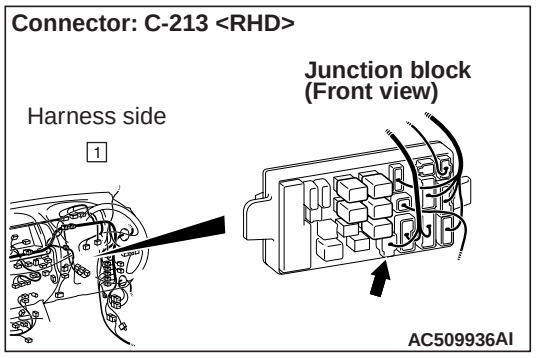






NOTE:





Prior to the wiring harness inspection, check junction block connector C-213, and repair if necessary.

- Check the power supply line for open and short circuit.

Q: Is the check result normal?
YES : Go to Step 4.
NO : Repair the wiring harness.

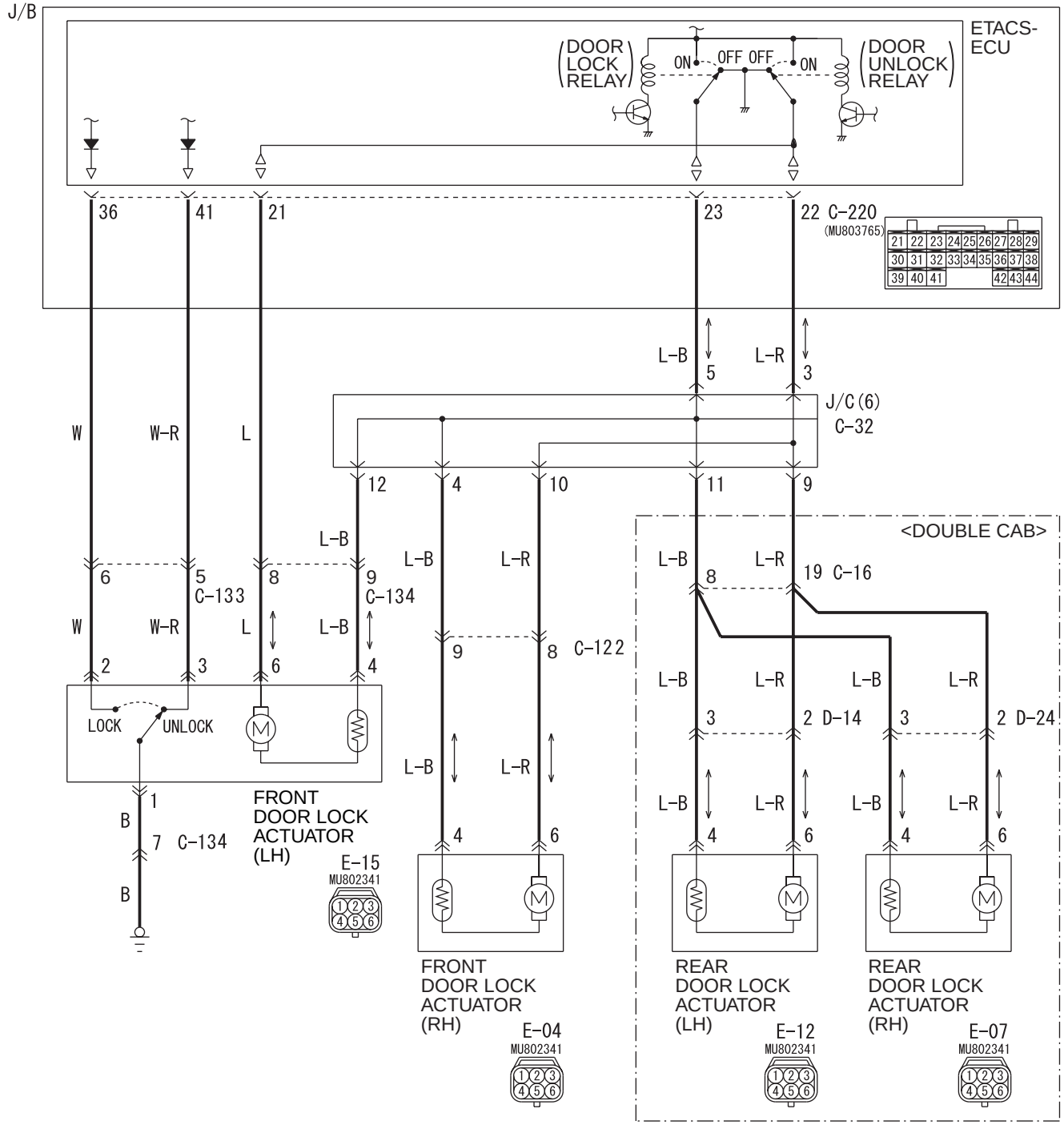
STEP 4. Retest the system.

Check that the central door locking system works normally.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Replace the ETACS-ECU and register the ID codes (Refer to GROUP 54A, How to Register Encrypted Code).

Inspection Procedure A-2: A Door cannot be Locked or Unlocked by the Central Door Locking System <LH drive vehicles>.

Central Door Lock Circuit (LHD)



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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COMMENT ON TROUBLE SYMPTOM

If a door cannot be locked or unlocked by the central door locking system, the door lock actuator may be defective.

PROBABLE CAUSES

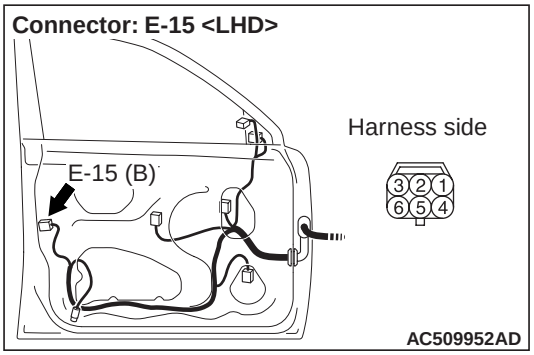
- Malfunction of the door lock actuator
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. Confirm which door lock actuator is defective.

Q: Which door fails to lock correctly?
Driver's door : Go to Step 2.
Front passenger's door : Go to Step 6.
Rear right door <Double cab> : Go to Step 10.
Rear left door <Double cab> : Go to Step 14.

STEP 2. Connector check: E-15 front door lock actuator (LH) connector

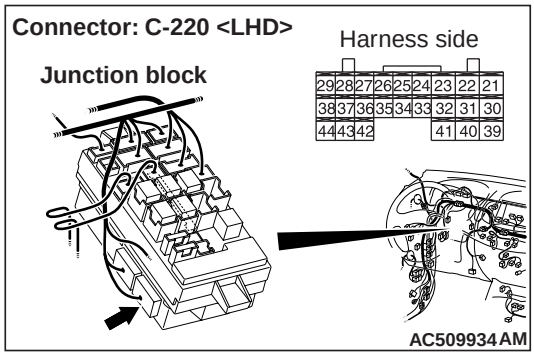


Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the defective connector.

STEP 3. Check the front door lock actuator (LH)
Check that the front door lock actuator (LH) works normally. Refer to P.42-194.

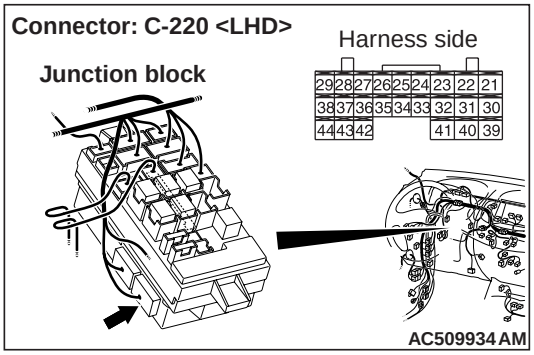
Q: Is the check result normal?
YES : Go to Step 4.
NO : Replace the front door lock actuator (LH).

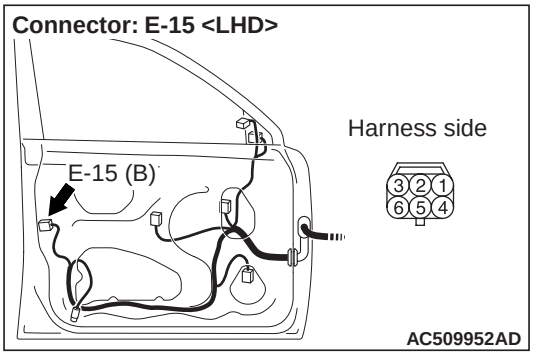
STEP 4. Connector check: C-220 ETACS-ECU connector



Q: Is the check result normal?
YES : Go to Step 5.
NO : Repair the defective connector.

STEP 5. Check the wiring harness between C-220 ETACS-ECU connector terminal Nos. 21, 23 and E-15 front door lock actuator (LH) connector terminal Nos. 6, 4.





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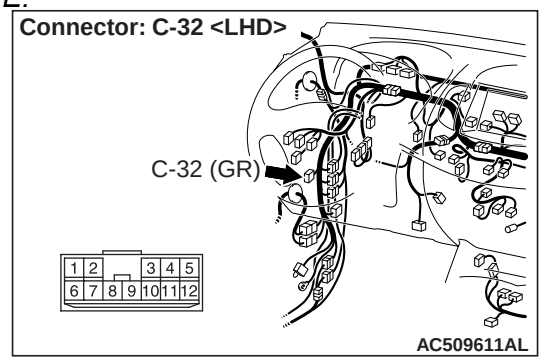
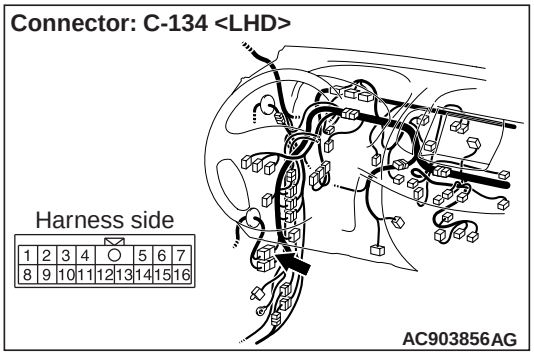




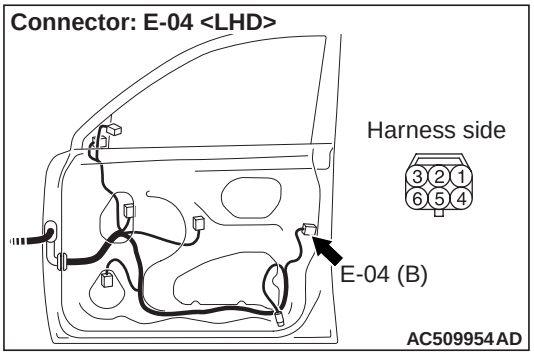
Prior to the wiring harness inspection, check intermediate connector C-134 and junction block connector C-32, and repair if necessary.

- Check the power supply line for open and short circuit.

Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness.

STEP 6. Connector check: E-04 front door lock actuator (RH) connector

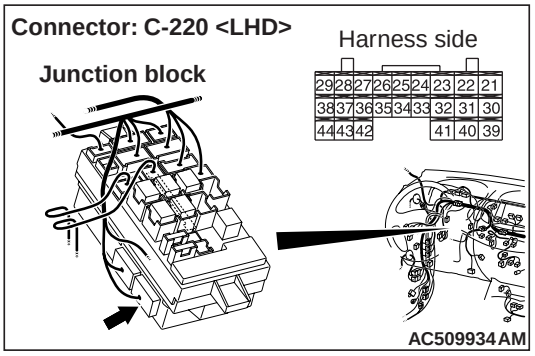


Q: Is the check result normal?
YES : Go to Step 7.
NO : Repair the defective connector.

STEP 7. Check the front door lock actuator (RH).
Check that the front door lock actuator (RH) works normally. Refer to P.42-194.

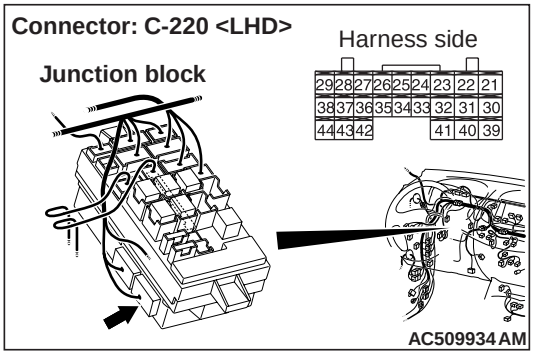
Q: Is the check result normal?
YES : Go to Step 8.
NO : Replace the front door lock actuator (RH).

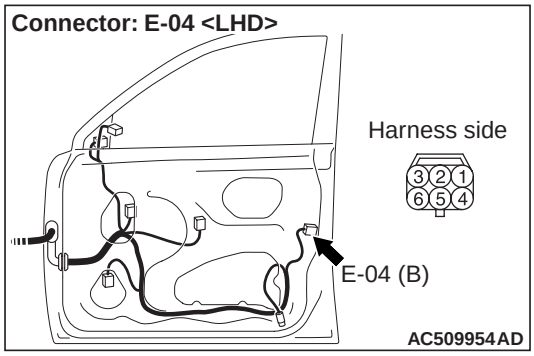
STEP 8. Connector check: C-220 ETACS-ECU connector



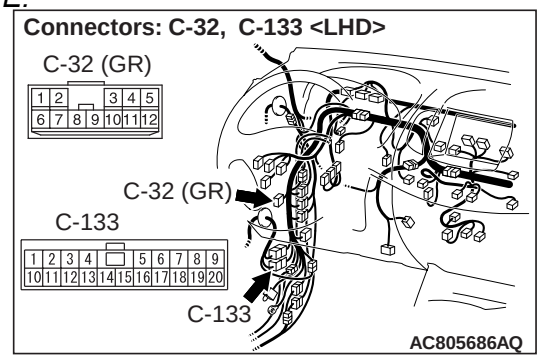
Q: Is the check result normal?
YES : Go to Step 9.
NO : Repair the defective connector.

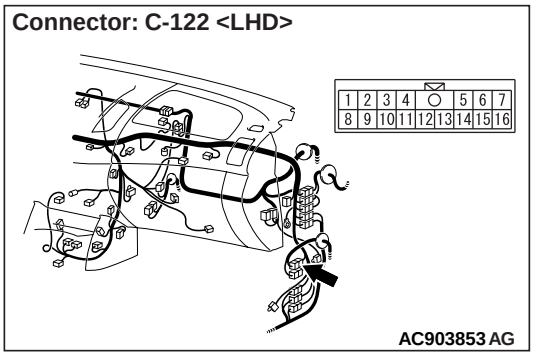
STEP 9. Check the wiring harness between C-220 ETACS-ECU connector terminal Nos. 22, 23 and E-04 front door lock actuator (RH) connector terminal Nos. 6, 4.





NOTE:





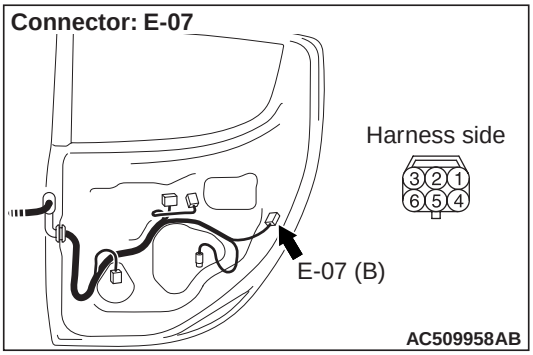
Prior to the wiring harness inspection, check intermediate connector C-122 and junction block connector C-32, and repair if necessary.

- Check the power supply line for open and short circuit.

Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness.

STEP 10. Connector check: E-07 rear door lock actuator (RH) connector

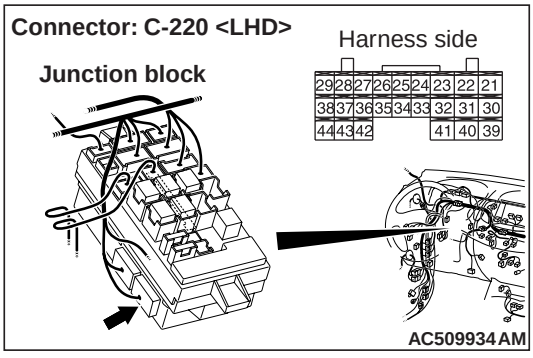


Q: Is the check result normal?
YES : Go to Step 11.
NO : Repair the defective connector.

STEP 11. Check the rear door lock actuator (RH).
Check that the rear door lock actuator (RH) is in good condition. Refer to P.42-194.

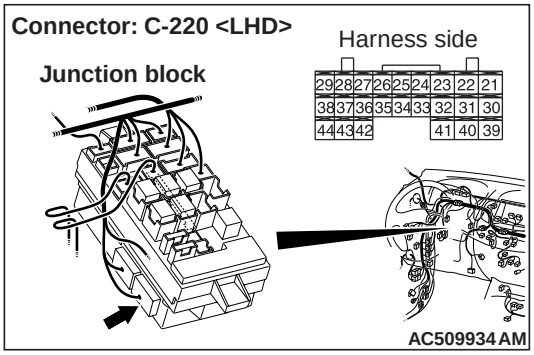
Q: Is the check result normal?
YES : Go to Step 12.
NO : Replace the tailgate lock actuator.

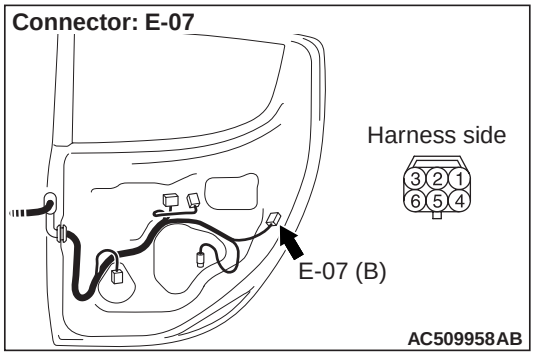
STEP 12. Connector check: C-220 ETACS-ECU connector



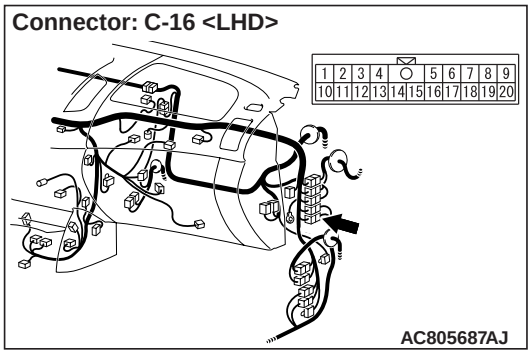
Q: Is the check result normal?
YES : Go to Step 13.
NO : Repair the defective connector.

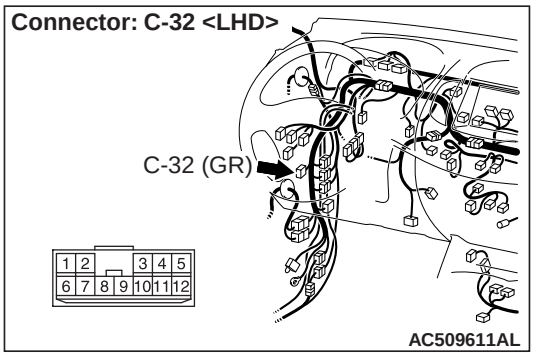
STEP 13. Check the wiring harness between C-220 ETACS-ECU connector terminal Nos. 22, 23 and E-07 rear door lock actuator (RH) connector terminal Nos. 6, 4.

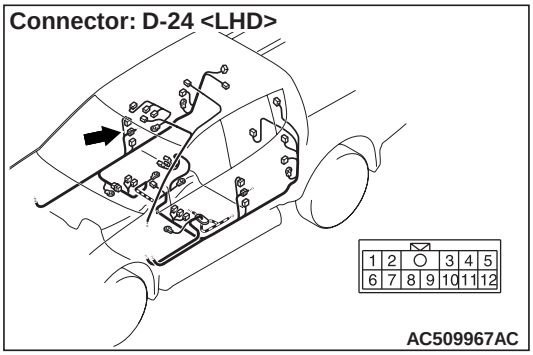




NOTE:







Prior to the wiring harness inspection, check intermediate connectors C-16, D-24 and junction block connector C-32, and repair if necessary.

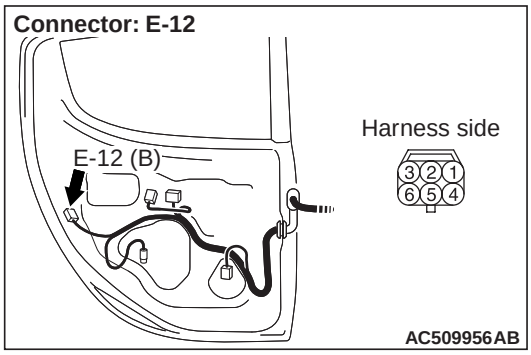
- Check the power supply line for open and short circuit.

Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

NO : Repair the wiring harness.

STEP 14. Connector check: E-12 rear door lock actuator (LH) connector

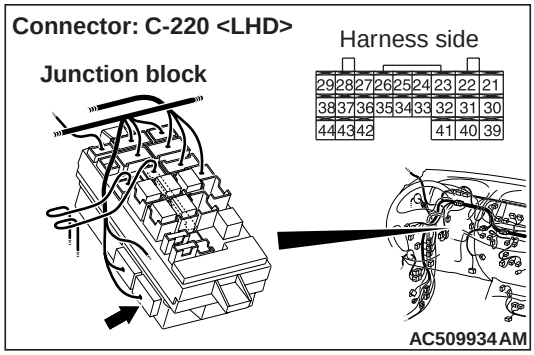


Q: Is the check result normal?
YES : Go to Step 15.
NO : Repair the defective connector.

STEP 15. Check the rear door lock actuator (LH).
Check that the rear door lock actuator (LH) is in good condition. Refer to P.42-194.

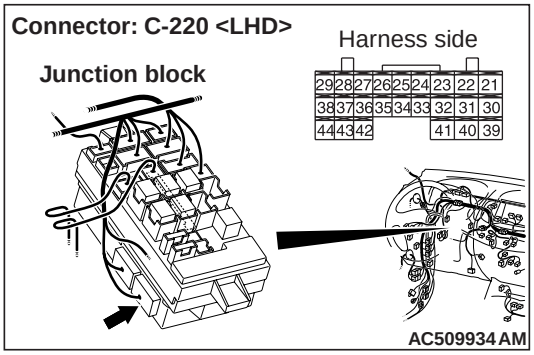
Q: Is the check result normal?
YES : Go to Step 16.
NO : Replace the tailgate lock actuator.

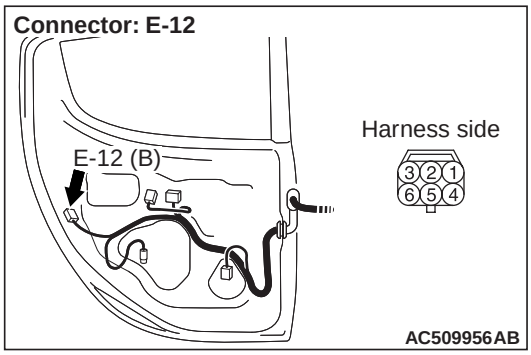
STEP 16. Connector check: C-220 ETACS-ECU connector



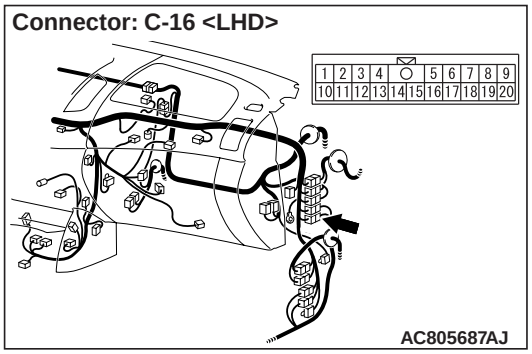
Q: Is the check result normal?
YES : Go to Step 17.
NO : Repair the defective connector.

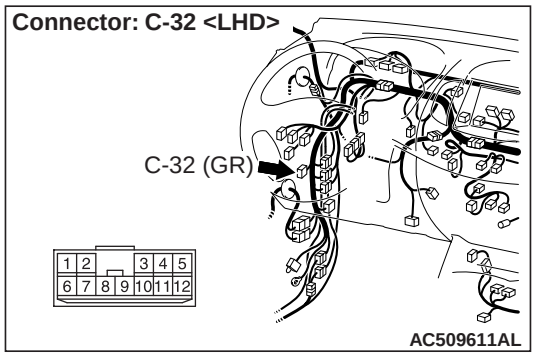
STEP 17. Check the wiring harness between C-220 ETACS-ECU connector terminal Nos. 22, 23 and E-12 rear door lock actuator (LH) connector terminal Nos. 6, 4.

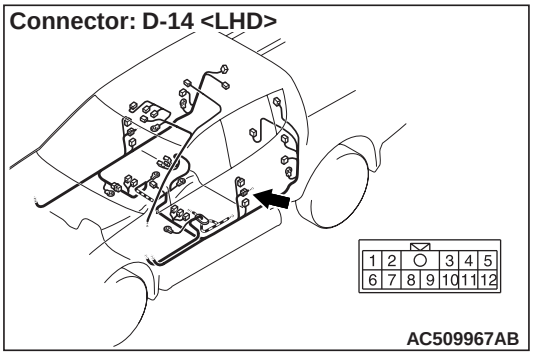




NOTE:







Prior to the wiring harness inspection, check intermediate connectors C-16, D-14 and junction block connector C-32, and repair if necessary.

- Check the power supply line for open and short circuit.

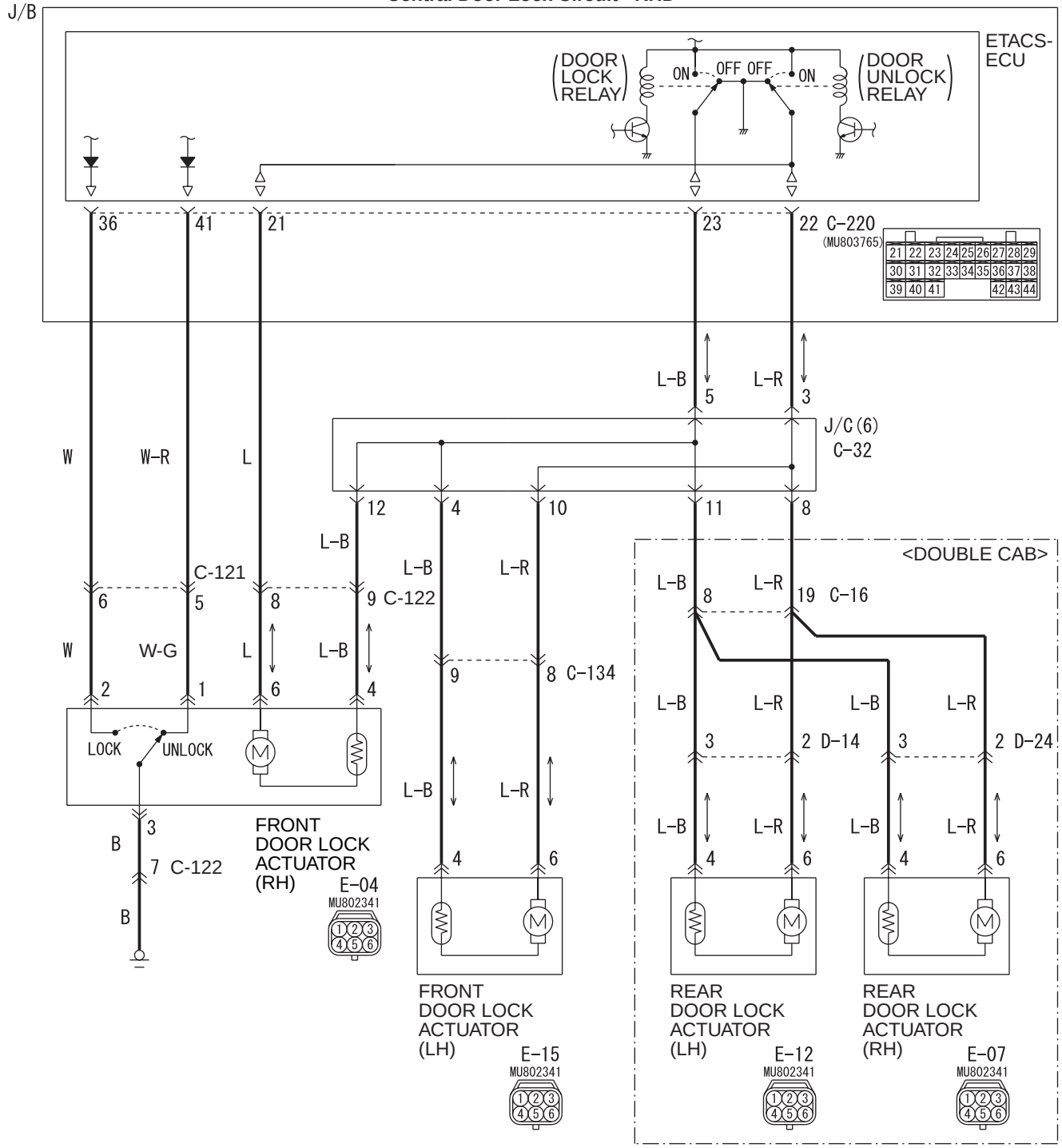
Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

NO : Repair the wiring harness.

Inspection Procedure A-3: A Door cannot be Locked or Unlocked by the Central Door Locking System <RH drive vehicles>.

Central Door Lock Circuit <RHD>



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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COMMENT ON TROUBLE SYMPTOM

If a door cannot be locked or unlocked by the central door locking system, the door lock actuator may be defective.

PROBABLE CAUSES

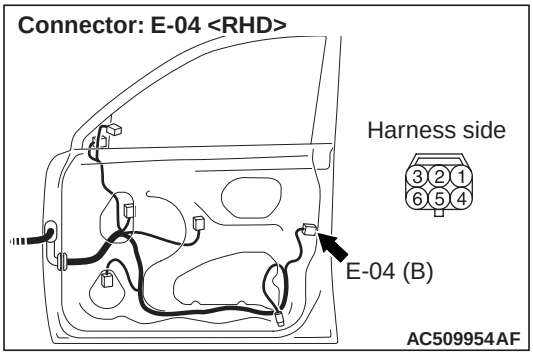
- Malfunction of the door lock actuator
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. Confirm which door lock actuator is defective.

Q: Which door fails to lock correctly?
Driver's door : Go to Step 2.
Front passenger's door : Go to Step 6.
Rear right door <Double cab> : Go to Step 10.
Rear left door <Double cab> : Go to Step 14.

STEP 2. Connector check: E-04 front door lock actuator (RH) connector



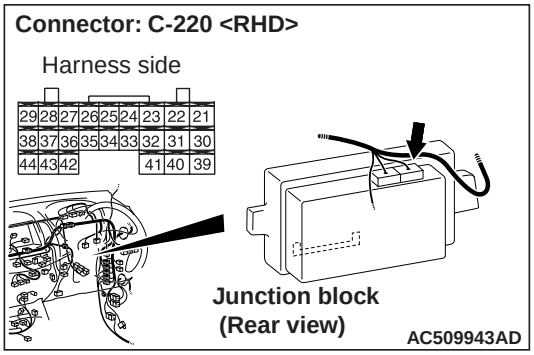
Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the defective connector.

STEP 3. Check the front door lock actuator (RH)

Check that the front door lock actuator (RH) works normally. Refer to P.42-194.

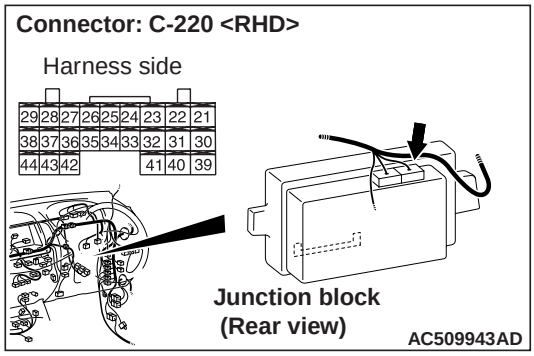
Q: Is the check result normal?
YES : Go to Step 4.
NO : Replace the front door lock actuator (RH).

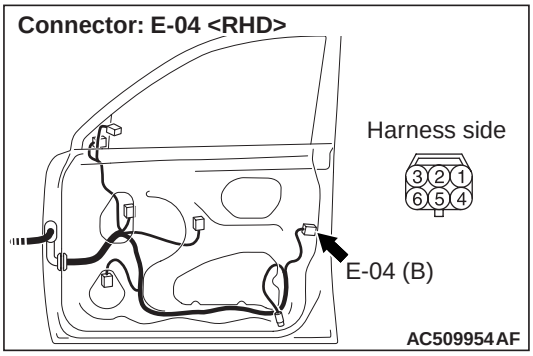
STEP 4. Connector check: C-220 ETACS-ECU connector



Q: Is the check result normal?
YES : Go to Step 5.
NO : Repair the defective connector.

STEP 5. Check the wiring harness between C-220 ETACS-ECU connector terminal Nos. 21, 23 and E-04 front door lock actuator (RH) connector terminal Nos. 6, 4.





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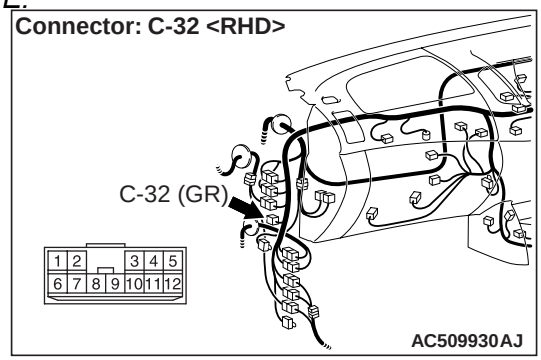
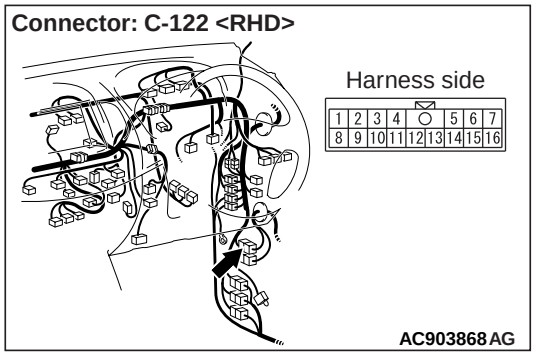




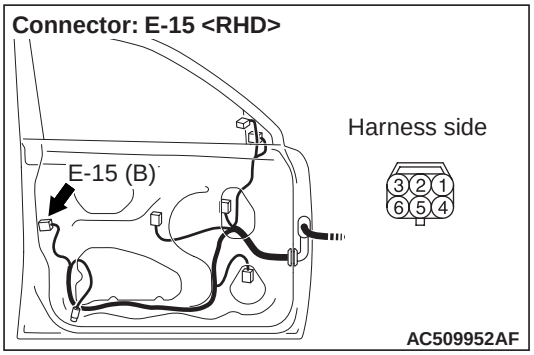
Prior to the wiring harness inspection, check intermediate connector C-122 and junction block connector C-32, and repair if necessary.

- Check the power supply line for open and short circuit.

Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness.

STEP 6. Connector check: E-15 front door lock actuator (LH) connector



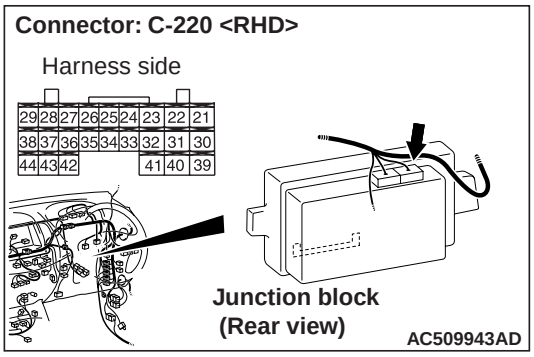
Q: Is the check result normal?
YES : Go to Step 7.
NO : Repair the defective connector.

STEP 7. Check the front door lock actuator (LH).

Check that the front door lock actuator (LH) works normally. Refer to P.42-194.

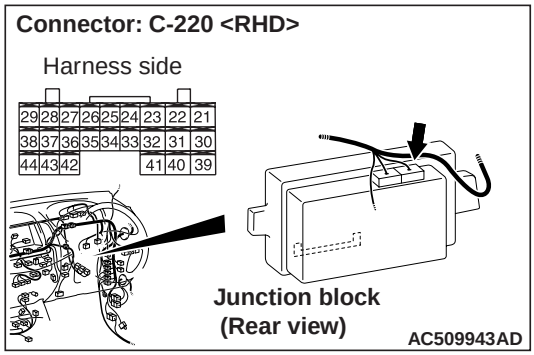
Q: Is the check result normal?
YES : Go to Step 8.
NO : Replace the front door lock actuator (LH).

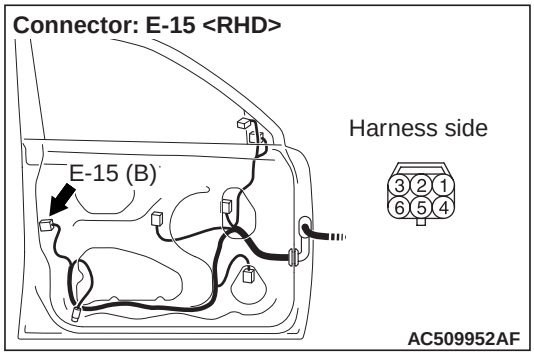
STEP 8. Connector check: C-220 ETACS-ECU connector



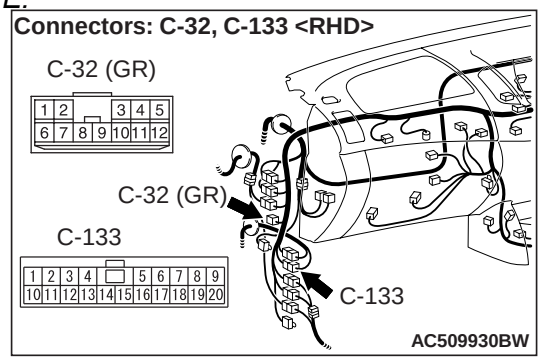
Q: Is the check result normal?
YES : Go to Step 9.
NO : Repair the defective connector.

STEP 9. Check the wiring harness between C-220 ETACS-ECU connector terminal Nos. 22, 23 and E-15 front door lock actuator (LH) connector terminal Nos. 6, 4.





NOTE:

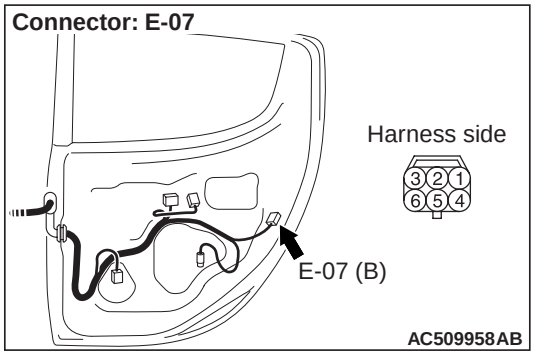


Prior to the wiring harness inspection, check intermediate connector C-133 and junction block connector C-32, and repair if necessary.

- Check the power supply line for open and short circuit.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness.

STEP 10. Connector check: E-07 rear door lock actuator (RH) connector

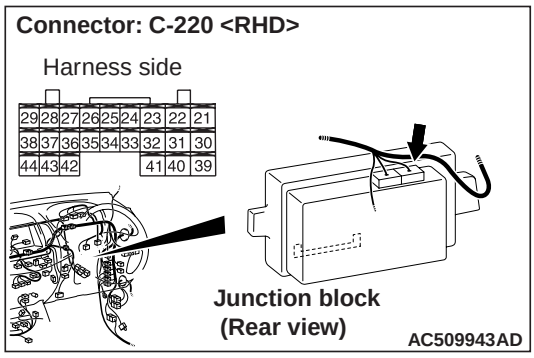


Q: Is the check result normal?
YES : Go to Step 11.
NO : Repair the defective connector.

STEP 11. Check the rear door lock actuator (RH).
Check that the rear door lock actuator (RH) is in good condition. Refer to P.42-194.

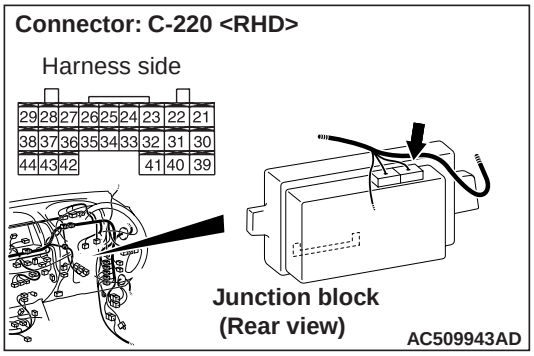
Q: Is the check result normal?
YES : Go to Step 12.
NO : Replace the tailgate lock actuator.

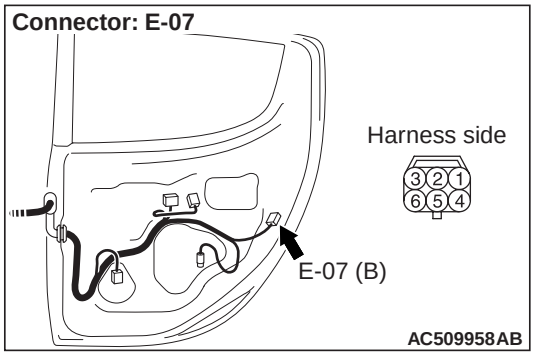
STEP 12. Connector check: C-220 ETACS-ECU connector



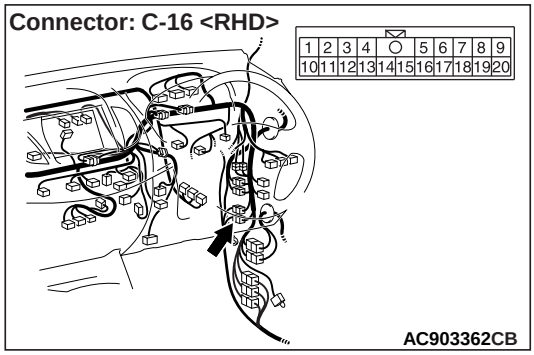
Q: Is the check result normal?
YES : Go to Step 13.
NO : Repair the defective connector.

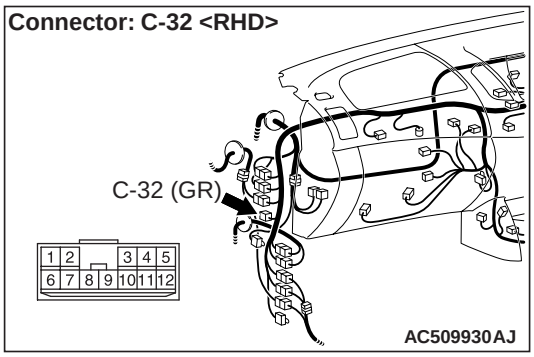
STEP 13. Check the wiring harness between C-220 ETACS-ECU connector terminal Nos. 22, 23 and E-07 rear door lock actuator (RH) connector terminal Nos. 6, 4.

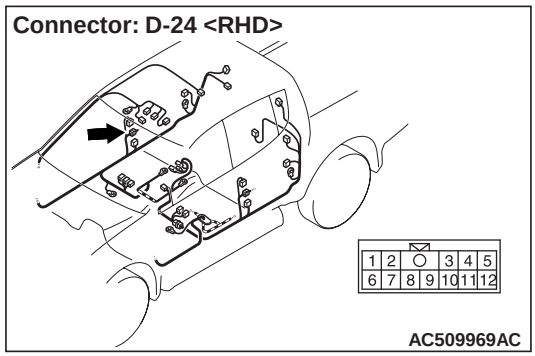




NOTE:







Prior to the wiring harness inspection, check intermediate connectors C-16, D-24 and junction block connector C-32, and repair if necessary.

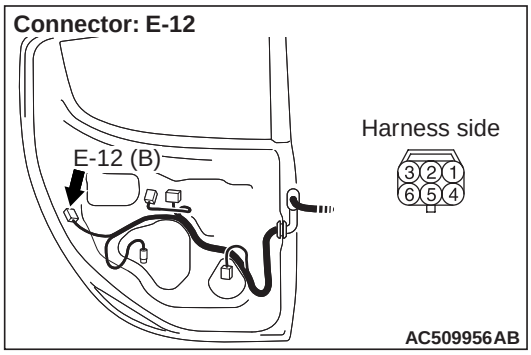
- Check the power supply line for open and short circuit.

Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

NO : Repair the wiring harness.

STEP 14. Connector check: E-12 rear door lock actuator (LH) connector

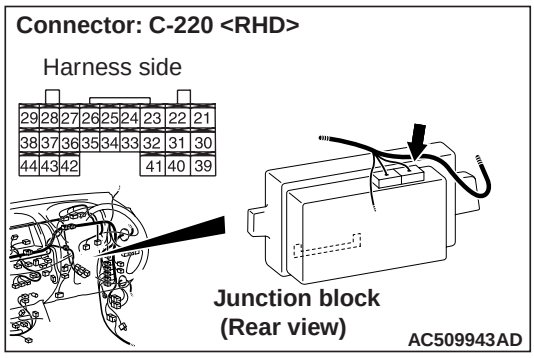


Q: Is the check result normal?
YES : Go to Step 15.
NO : Repair the defective connector.

STEP 15. Check the rear door lock actuator (LH).
Check that the rear door lock actuator (LH) is in good condition. Refer to P.42-194.

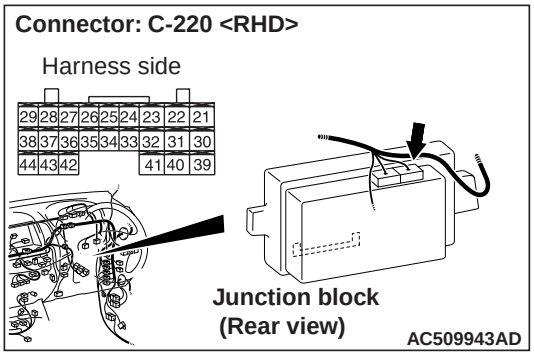
Q: Is the check result normal?
YES : Go to Step 16.
NO : Replace the tailgate lock actuator.

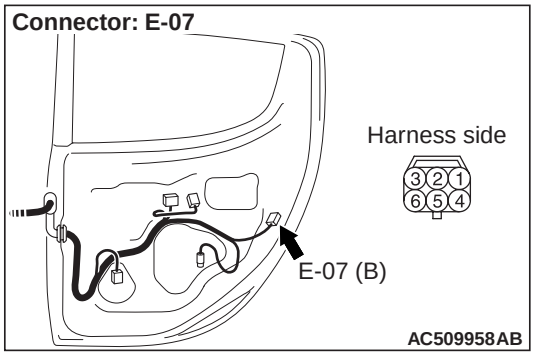
STEP 16. Connector check: C-220 ETACS-ECU connector



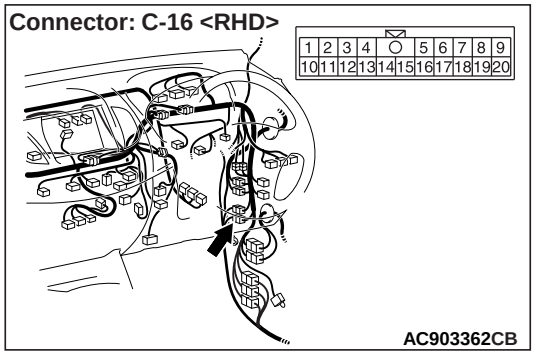
Q: Is the check result normal?
YES : Go to Step 17.
NO : Repair the defective connector.

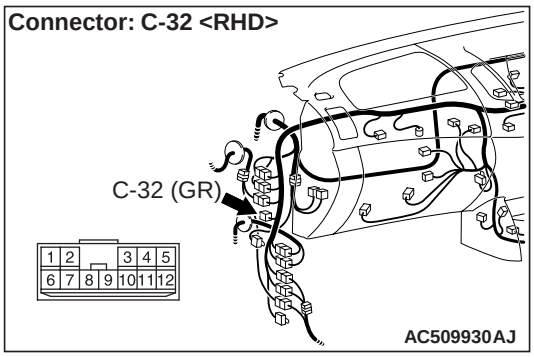
STEP 17. Check the wiring harness between C-220 ETACS-ECU connector terminal Nos. 22, 23 and E-12 rear door lock actuator (LH) connector terminal Nos. 6, 4.

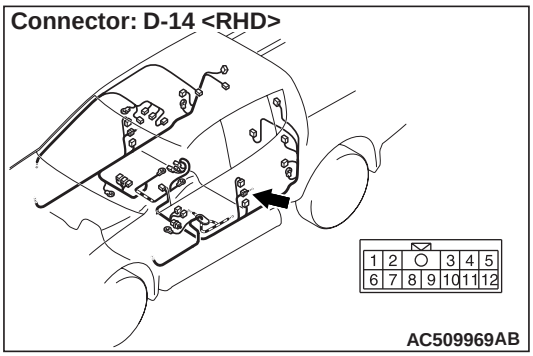




NOTE:







Prior to the wiring harness inspection, check intermediate connectors C-16, D-14 and junction block connector C-32, and repair if necessary.

- Check the power supply line for open and short circuit.

Q: Is the check result normal?

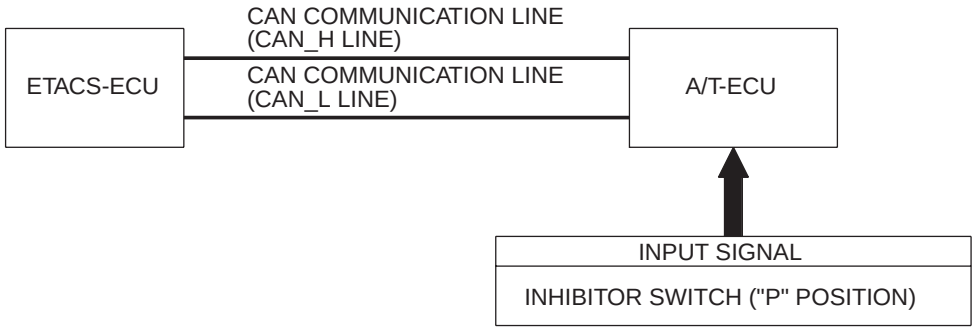
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

NO : Repair the wiring harness.

Inspection Procedure A-4: Selector "P" position-linked door unlock function does not operate normally. <Vehicles with automatic transmission with keyless entry system>

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Selector "P" Position-linked Door Unlock Function



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COMMENT ON TROUBLE SYMPTOM
If the doors are not unlocked when the selector lever is shifted to the "P" position, the shift position signal input circuit(s) or the ETACS-ECU may be defective. Also, the function to interlock the shift P position with door unlocking may have been disabled with a customise function.

POSSIBLE CAUSES
- Malfunction of the ETACS-ECU
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. Checking central door unlocking operation
Check that the central door locking system works normally.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Refer to P.42-64.

STEP 2. Customise function by using the M.U.T.-III
Use the M.U.T.-III to confirm that the following other than "Inhibit" is set to the customise function.
- Operation

Q: Is the check result normal?
YES : Go to Step 3.
NO : Use the M.U.T.-III customise function to set "Operation" (Refer to P.42-244).

STEP 3. M.U.T.-III CAN bus diagnostics
Using the M.U.T.-III, diagnose the CAN bus lines.

Q: Is the CAN bus normal?
YES : Go to Step 4.
NO : Correct the CAN bus line (Refer to GROUP 54C, Troubleshooting).

STEP 4. M.U.T.-III other system diagnosis code
Check whether the A/T-ECU-related diagnosis code is set.

Q: Is the diagnosis code set?
YES : Diagnose the A/T (Refer to GROUP 23A, Troubleshooting).
NO : Go to Step 5.

STEP 5. Retest the system.
Check that shifting the selector lever to the P position unlocks the doors.

Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

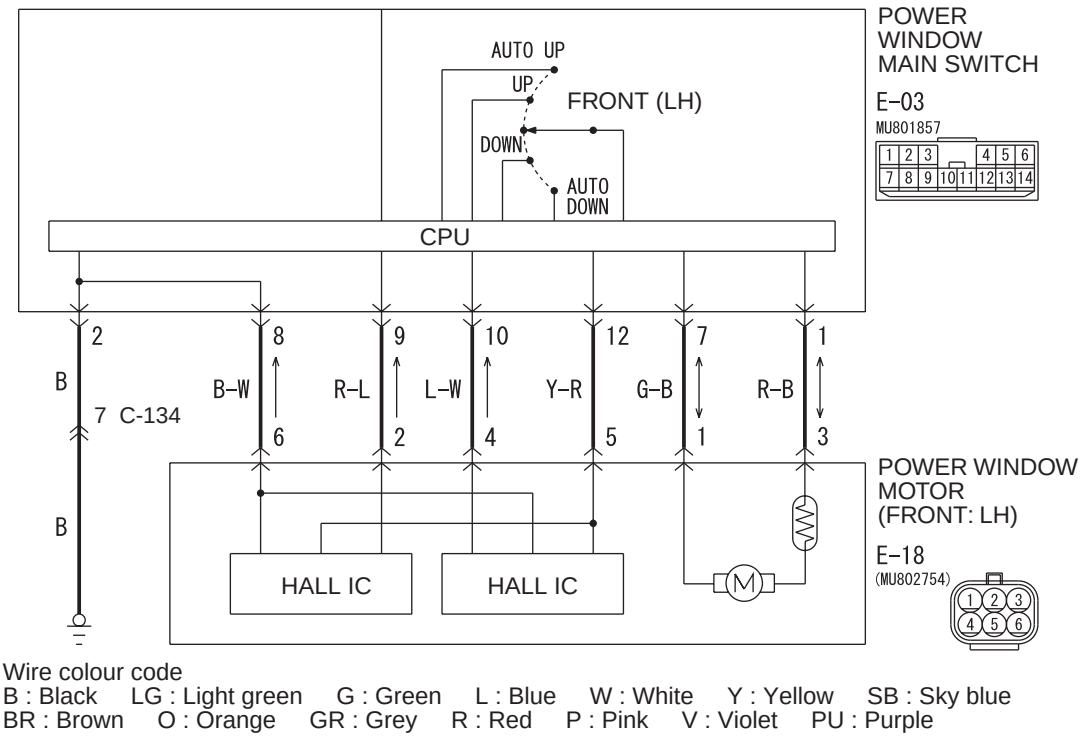
NO : Replace the ETACS-ECU and register the ID codes (Refer to GROUP 54A, How to Register Encrypted Code).

DIAGNOSIS CODE PROCEDURES <POWER WINDOWS>

Code No.1001: P/W (DR) SW pulse1 disconnection <LH drive vehicles>

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Power Window (Front: LH) Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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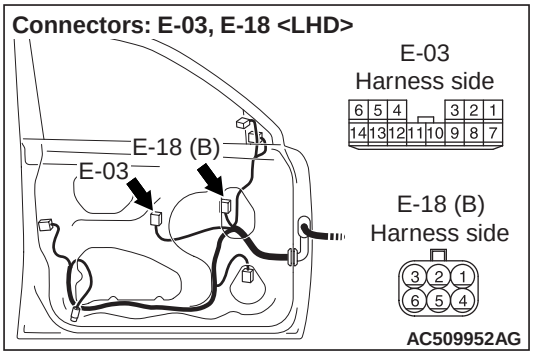
COMMENTS ON TROUBLE SYMPTOM
If the pulse 1 signal from the power window motor (front: LH) cannot be received, the power window main switch sets the diagnosis trouble code No. 1001.

PROBABLE CAUSES
- Malfunction of the front power window motor (LH)
- Malfunction of the power window main switch
- Damaged harness wires and connectors

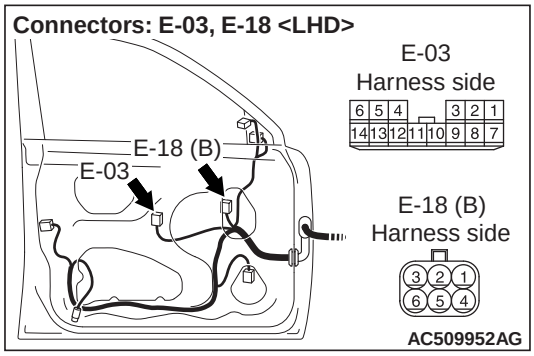
DIAGNOSIS PROCEDURE

STEP 1. Connector check: E-03 power window main switch connector and E-18 front power window motor (LH) connector



Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the connector.

STEP 2. Check the wiring harness between E-03 power window main switch connector terminal Nos.8, 1, 12 and E-18 front power window motor (LH) connector terminal Nos.6, 3, 5.



- Check the input and output lines for open or short circuit.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the wiring harness.

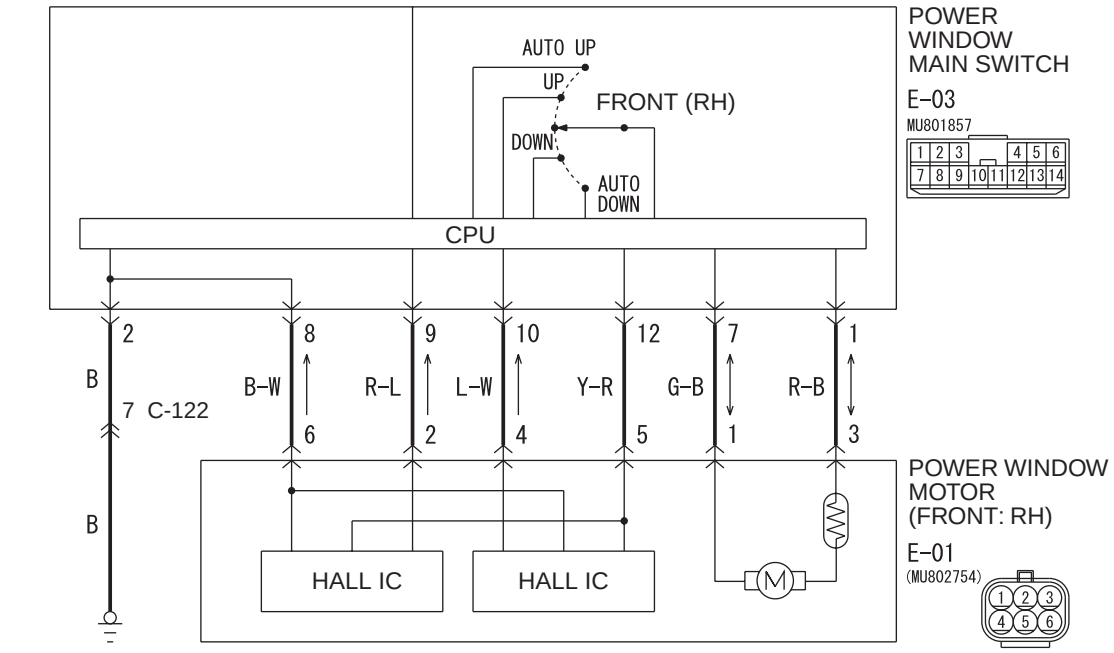
STEP 3. Check whether the diagnosis code is reset.
(1) Replace the front power window motor (LH).
(2) Check that diagnosis code is not reset.

Q: Is diagnosis code set?
YES : Replace the power window main switch.
NO : The procedure is complete.

Code No.1001: P/W (DR) SW pulse1 disconnection <RH drive vehicles>

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Power Window (Front: RH) Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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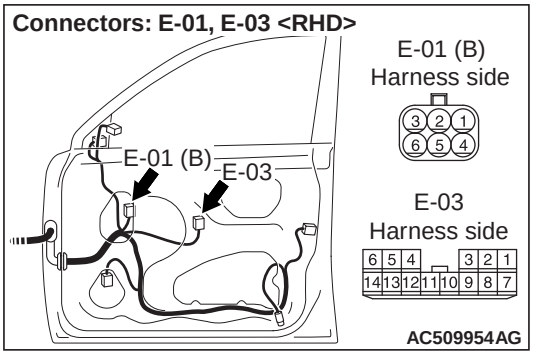
COMMENTS ON TROUBLE SYMPTOM
If the pulse 1 signal from the power window motor (front: RH) cannot be received, the power window main switch sets the diagnosis trouble code No. 1001.

PROBABLE CAUSES
- Malfunction of the front power window motor (RH)
- Malfunction of the power window main switch
- Damaged harness wires and connectors

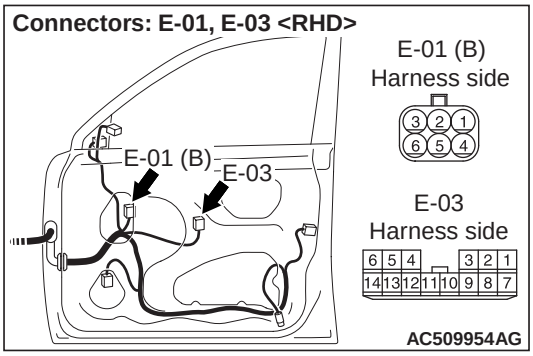
DIAGNOSIS PROCEDURE

STEP 1. Connector check: E-03 power window main switch connector and E-01 front power window motor (RH) connector



Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the connector.

STEP 2. Check the wiring harness between E-03 power window main switch connector terminal Nos.8, 10, 12 and E-01 front power window motor (RH) connector terminal Nos.6, 4, 5.



- Check the input and output lines for open or short circuit.

Q: Is the check result normal?

YES : Go to Step 3.
NO : Repair the wiring harness.

STEP 3. Check whether the diagnosis code is reset.

(1) Replace the front power window motor (RH).
(2) Check that diagnosis code is not reset.

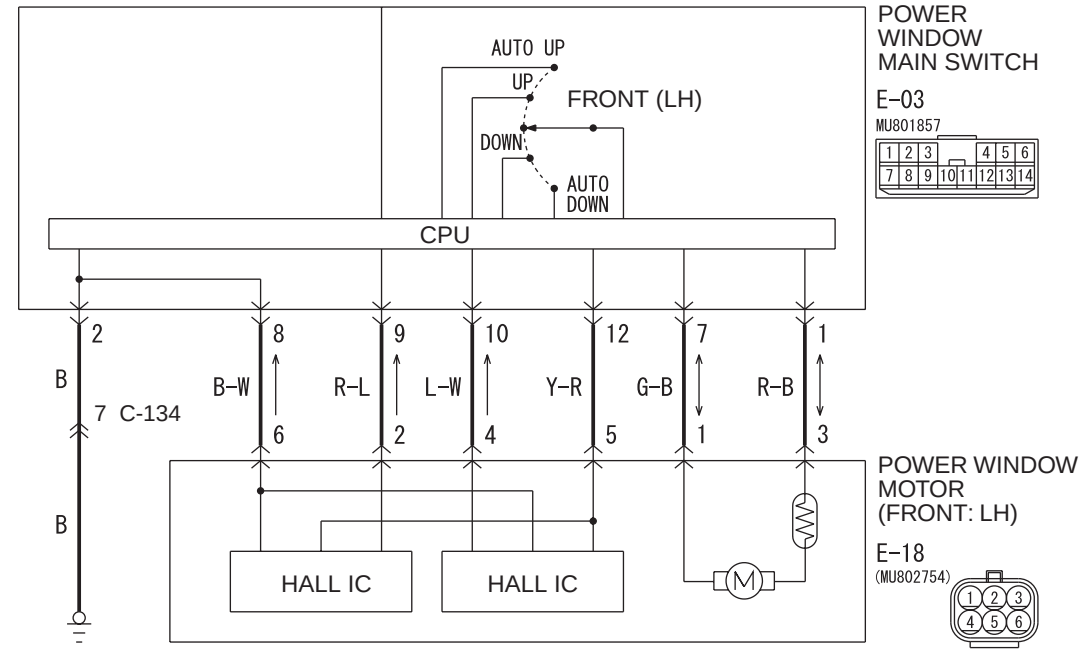
Q: Is diagnosis code set?

YES : Replace the power window main switch.
NO : The procedure is complete.

Code No.1002: P/W (DR) SW pulse2 disconnection <LH drive vehicles>

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Power Window (Front: LH) Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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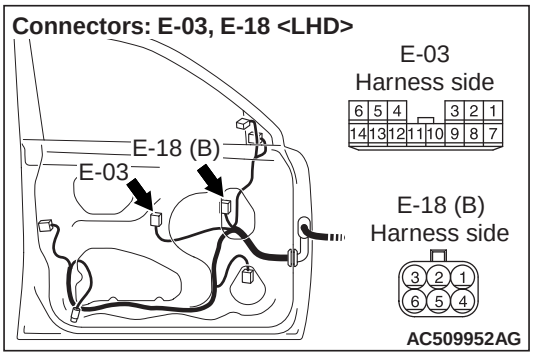
COMMENTS ON TROUBLE SYMPTOM
If the pulse 2 signal from the power window motor (front: LH) cannot be received, the power window main switch sets the diagnosis trouble code No. 1002.

PROBABLE CAUSES
- Malfunction of the front power window motor (LH)
- Malfunction of the power window main switch
- Damaged harness wires and connectors

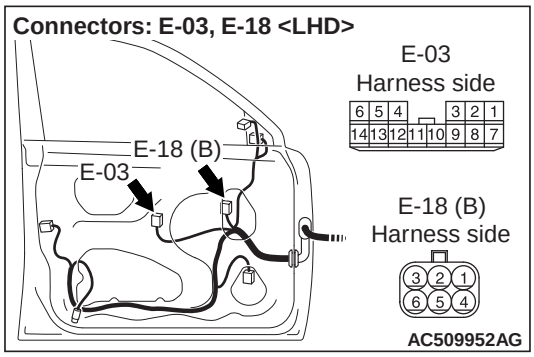
DIAGNOSIS PROCEDURE

STEP 1. Connector check: E-03 power window main switch connector and E-18 front power window motor (LH) connector



Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the connector.

STEP 2. Check the wiring harness between E-03 power window main switch connector terminal Nos.8, 9, 12 and E-18 front power window motor (LH) connector terminal Nos.6, 2, 5.



- Check the input and output lines for open or short circuit.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the wiring harness.

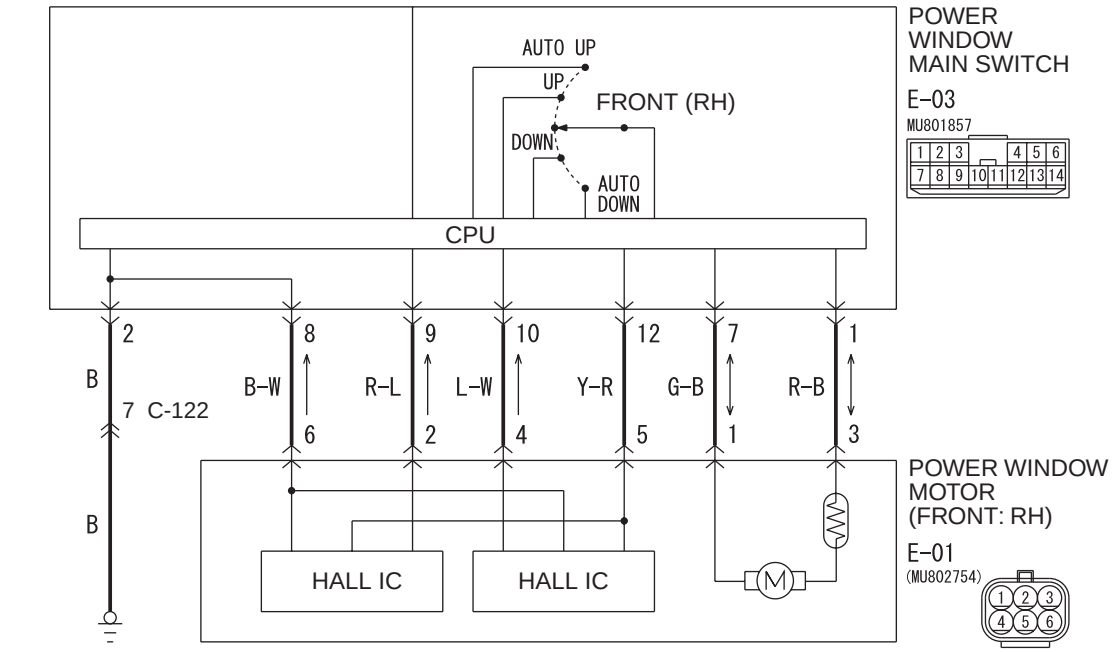
STEP 3. Check whether the diagnosis code is reset.
(1) Replace the front power window motor (LH).
(2) Check that diagnosis code is not reset.

Q: Is diagnosis code set?
YES : Replace the power window main switch.
NO : The procedure is complete.

Code No.1002: P/W (DR) SW pulse2 disconnection <RH drive vehicles>

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Power Window (Front: RH) Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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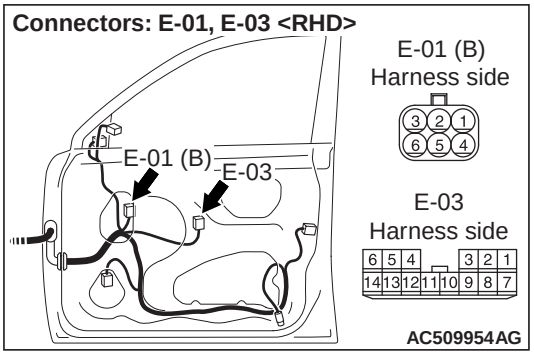
COMMENTS ON TROUBLE SYMPTOM
If the pulse 2 signal from the power window motor (front: RH) cannot be received, the power window main switch sets the diagnosis trouble code No. 1002.

PROBABLE CAUSES
- Malfunction of the front power window motor (RH)
- Malfunction of the power window main switch
- Damaged harness wires and connectors

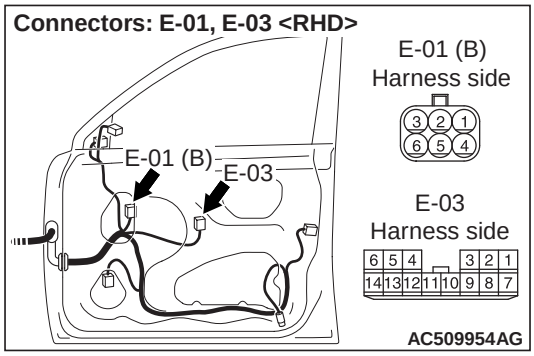
DIAGNOSIS PROCEDURE

STEP 1. Connector check: E-03 power window main switch connector and E-01 front power window motor (RH) connector



Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the connector.

STEP 2. Check the wiring harness between E-03 power window main switch connector terminal Nos.8, 9, 12 and E-01 front power window motor (RH) connector terminal Nos.6, 2, 5.



- Check the input and output lines for open or short circuit.

Q: Is the check result normal?

YES : Go to Step 3.
NO : Repair the wiring harness.

STEP 3. Check whether the diagnosis code is reset.

(1) Replace the front power window motor (RH).
(2) Check that diagnosis code is not reset.

Q: Is diagnosis code set?

YES : Replace the power window main switch.
NO : The procedure is complete.

Code No.1003: P/W (DR) Above window position

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

COMMENTS ON TROUBLE SYMPTOM

If the driver's door window glass exceeds the fully closed position, power window main switch sets the diagnosis code No. 1003. And, if the driver's door window glass is removed or installed with the power is supplied to the power window main switch sets this diagnosis code.

PROBABLE CAUSES

- Malfunction of the front power window motor <driver's side>
- Malfunction of the power window main switch

DIAGNOSIS PROCEDURE

STEP 1. Confirm the front power window <driver's side> learning function.

(1) Check that the power window main switch has learned the fully closed position of the window (Refer to P.42-172).
(2) On completion, check that diagnosis code No.1003 is not reset.

Q: Is the check result normal?

YES : The procedure is complete.
NO : Go to Step 2.

STEP 2. Check whether the diagnosis code is reset.

(1) Replace the front power window motor <driver's side>.
(2) Check that diagnosis code is not reset.

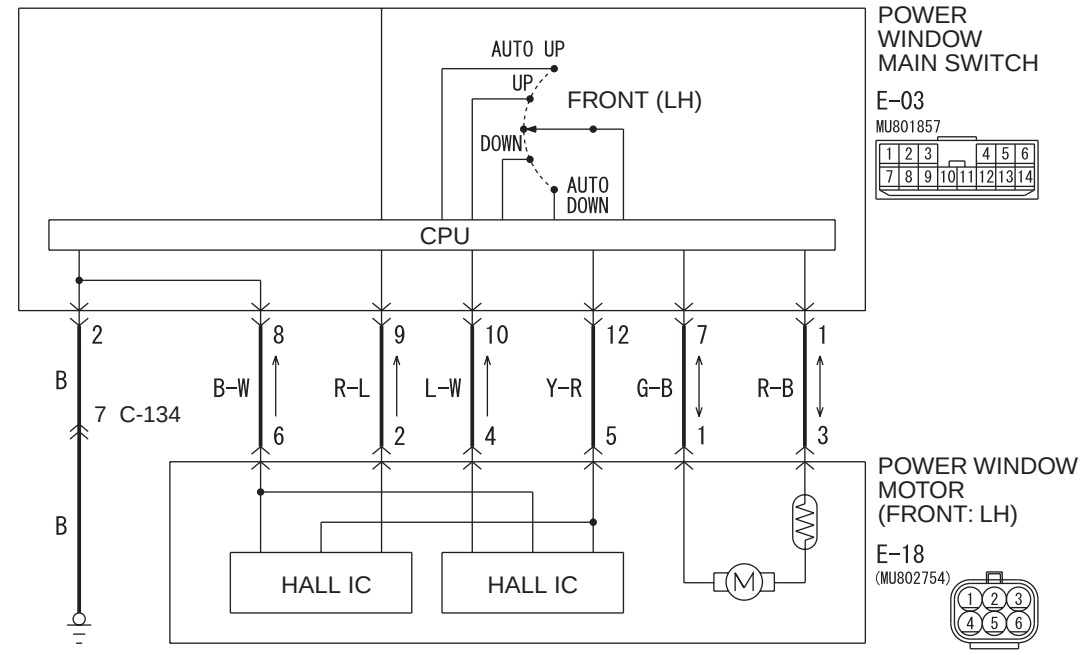
Q: Is diagnosis code set?

YES : Replace the power window main switch.
NO : The procedure is complete.

Code No.1004: P/W (DR) Sensor fail (earth) <LH drive vehicles>

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Power Window (Front: LH) Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

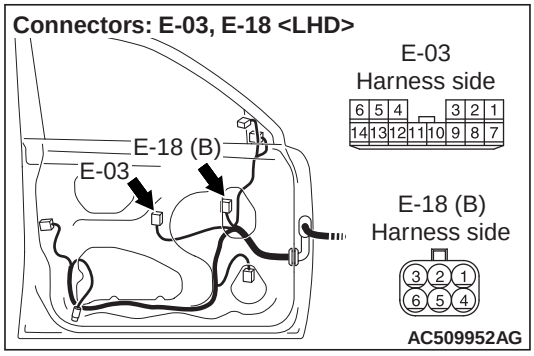
AC806142AC

COMMENTS ON TROUBLE SYMPTOM
If the earth fault of the power window motor (front: LH) sensor power supply is detected, power window main switch sets the diagnosis trouble code No. 1004.

PROBABLE CAUSES
- Malfunction of the front power window motor (LH)
- Malfunction of the power window main switch
- Damaged harness wires and connectors

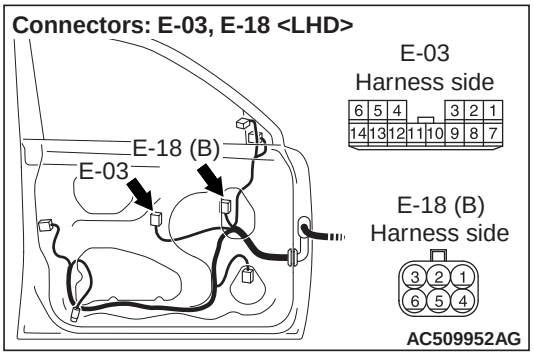
DIAGNOSIS PROCEDURE

STEP 1. Connector check: E-03 power window main switch connector and E-18 front power window motor (LH) connector



Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the connector.

STEP 2. Check the wiring harness between E-03 power window main switch connector terminal No. 12 and E-18 front power window motor (LH) connector terminal No. 5.



- Check the power supply line for open or short circuit.

Q: Is the check result normal?

YES : Go to Step 3.
NO : Repair the wiring harness.

STEP 3. Check whether the diagnosis code is reset.

(1) Replace the front power window motor (LH).
(2) Check that diagnosis code is not reset.

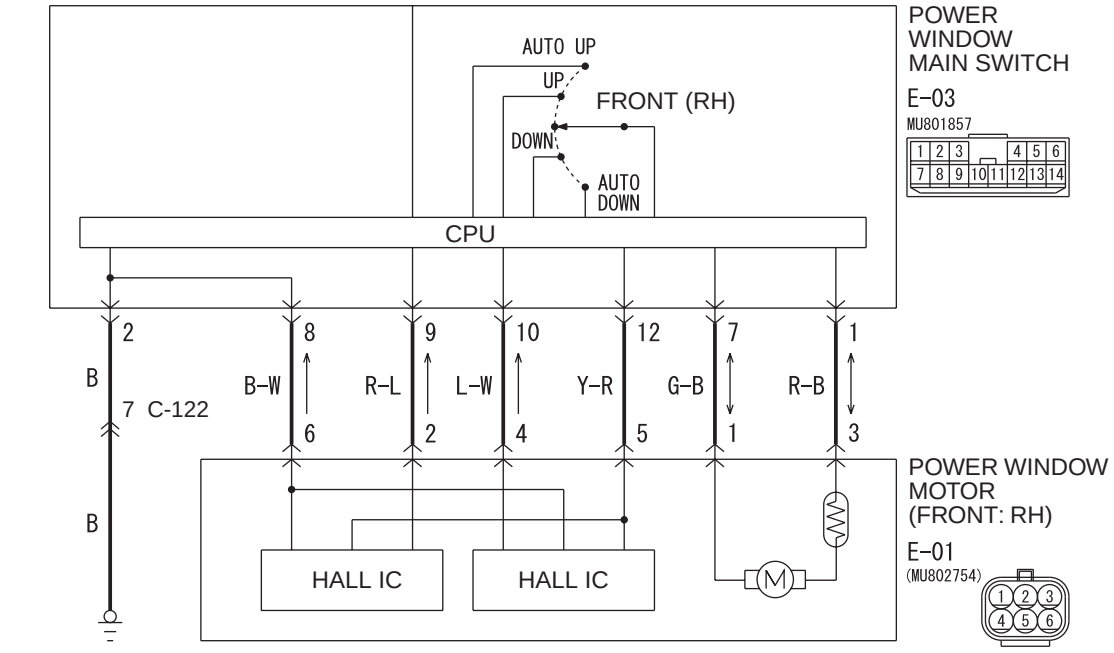
Q: Is diagnosis code set?

YES : Replace the power window main switch.
NO : The procedure is complete.

Code No.1004: P/W (DR) Sensor fail (earth) <RH drive vehicles>

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Power Window (Front: RH) Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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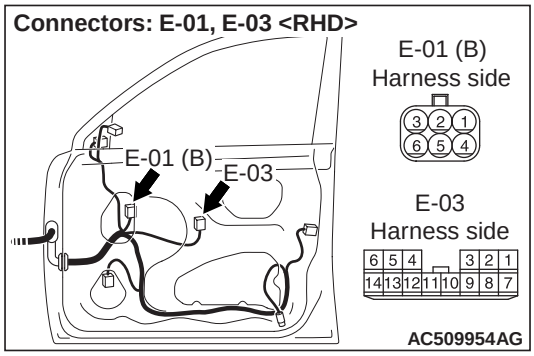
COMMENTS ON TROUBLE SYMPTOM
If the earth fault of the power window motor (front: RH) sensor power supply is detected, power window main switch sets the diagnosis trouble code No. 1004.

PROBABLE CAUSES
- Malfunction of the front power window motor (RH)
- Malfunction of the power window main switch
- Damaged harness wires and connectors

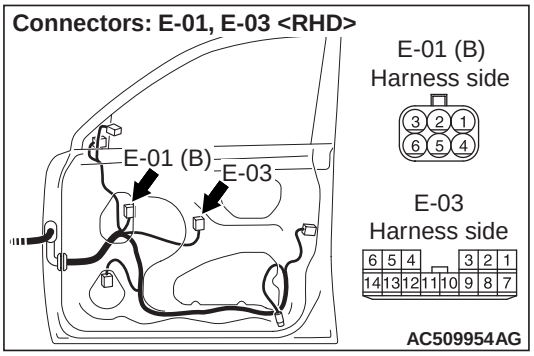
DIAGNOSIS PROCEDURE

STEP 1. Connector check: E-03 power window main switch connector and E-01 front power window motor (RH) connector



Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the connector.

STEP 2. Check the wiring harness between E-03 power window main switch connector terminal No. 12 and E-01 front power window motor (RH) connector terminal No. 5.



- Check the power supply line for open or short circuit.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the wiring harness.

STEP 3. Check whether the diagnosis code is reset.
(1) Replace the front power window motor (RH).
(2) Check that diagnosis code is not reset.

Q: Is diagnosis code set?
YES : Replace the power window main switch.
NO : The procedure is complete.

Code No.1005: P/W (DR) 3 Times jam-protection

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

COMMENTS ON TROUBLE SYMPTOM
If the anti-trap function is activated consecutively three times or more, power window main switch sets the diagnosis code No. 1005.

PROBABLE CAUSES
- Malfunction of the front power window motor <driver's side>
- Malfunction of the power window main switch

DIAGNOSIS PROCEDURE

STEP 1. Confirm the front power window <driver's side> learning function.
(1) Check that the power window main switch has learned the fully closed position of the window (Refer to P.42-172).
(2) On completion, check that diagnosis code No.1005 is not reset.

Q: Is the check result normal?
YES : The procedure is complete.
NO : Go to Step 2.

STEP 2. Check whether the diagnosis code is reset.
(1) Replace the front power window motor <driver's side>.

(2) Check that diagnosis code is not reset.

Q: Is diagnosis code set?

YES : Replace the power window main switch.
NO : The procedure is complete.

Code No.1008: P/W (DR) Parameter read fail
Code No.1009: P/W (DR) Position read fail

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

COMMENTS ON TROUBLE SYMPTOM

- If the power window main switch information signals cannot be read, power window main switch sets the diagnosis code No. 1008.
- If the driver's door window glass position cannot be read, power window main switch sets the diagnosis code No. 1009.

PROBABLE CAUSES

- Malfunction of the power window main switch

DIAGNOSIS PROCEDURE

Check whether the diagnosis code is reset.
Check that the diagnosis code is not reset.

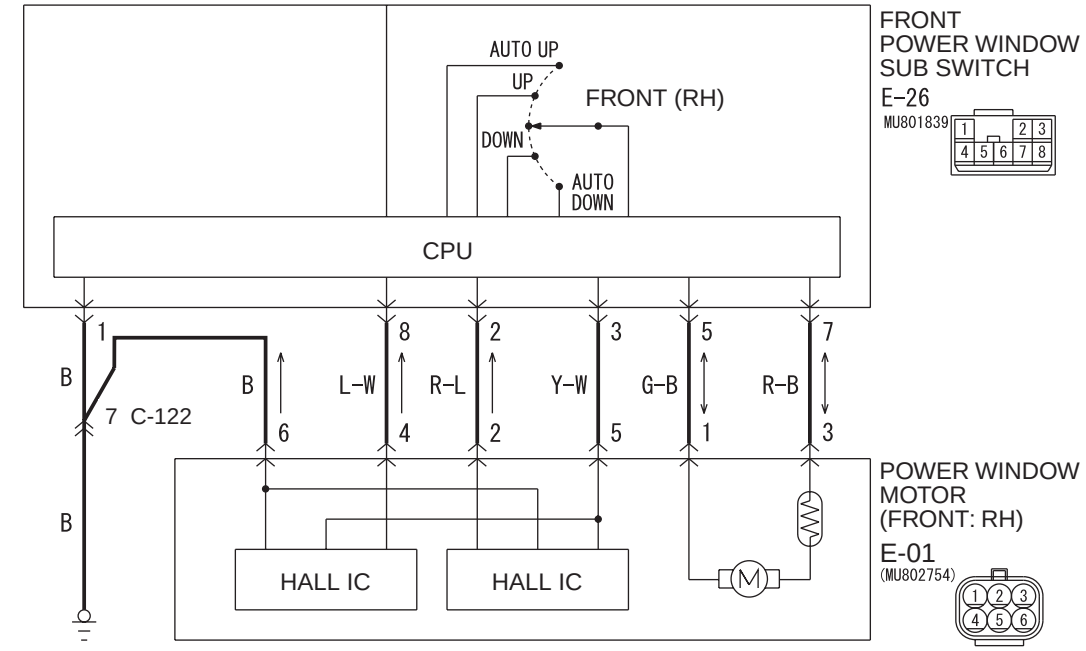
Q: Is diagnosis code set?

YES : Replace the power window main switch.
NO : The procedure is complete.

Code No.2001: P/W (AS) SW pulse1 disconnection <LH drive vehicles>

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Power Window (Front: RH) Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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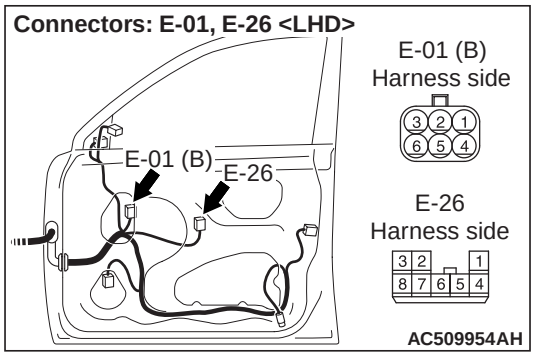
COMMENTS ON TROUBLE SYMPTOM
If the pulse 1 signal from the power window motor (front: RH) cannot be received, power window sub switch (front: RH) sets the diagnosis code No. 2001.

PROBABLE CAUSES
- Malfunction of the front power window motor (RH)
- Malfunction of the front power window sub switch
- Damaged harness wires and connectors

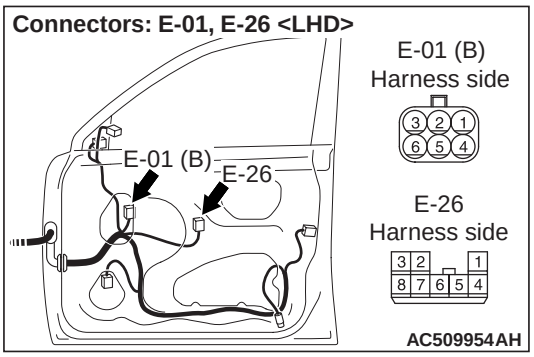
DIAGNOSIS PROCEDURE

STEP 1. Connector check: E-26 front power window sub switch connector and E-01 front power window motor (RH) connector



Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the connector.

STEP 2. Check the wiring harness between E-26 front power window sub switch connector terminal Nos.8, 3 and E-01 front power window motor (RH) connector terminal Nos.4, 5.



- Check the input and output lines for open or short circuit.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the wiring harness.

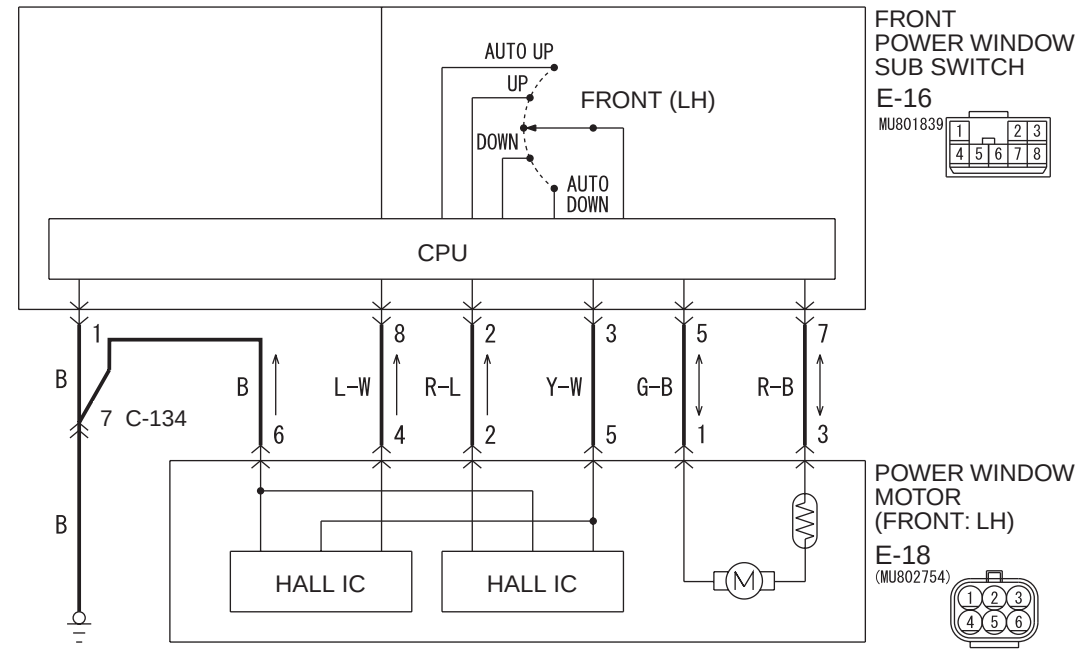
STEP 3. Check whether the diagnosis code is reset.
(1) Replace the front power window motor (RH).
(2) Check that diagnosis code is not reset.

Q: Is diagnosis code set?
YES : Replace the front power window sub switch.
NO : The procedure is complete.

Code No.2001: P/W (AS) SW pulse1 disconnection <RH drive vehicles>

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Power Window (Front: LH) Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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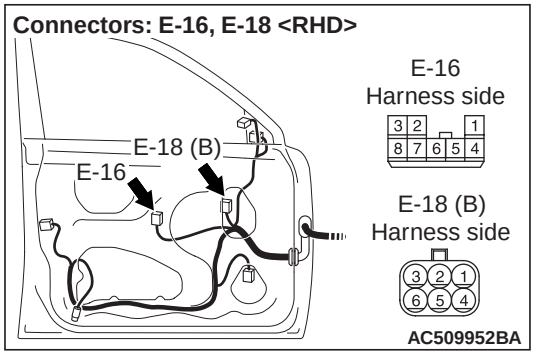
COMMENTS ON TROUBLE SYMPTOM
If the pulse 1 signal from the power window motor (front: LH) cannot be received, power window sub switch (front: LH) sets the diagnosis code No. 2001.

PROBABLE CAUSES
- Malfunction of the front power window motor (LH)
- Malfunction of the front power window sub switch
- Damaged harness wires and connectors

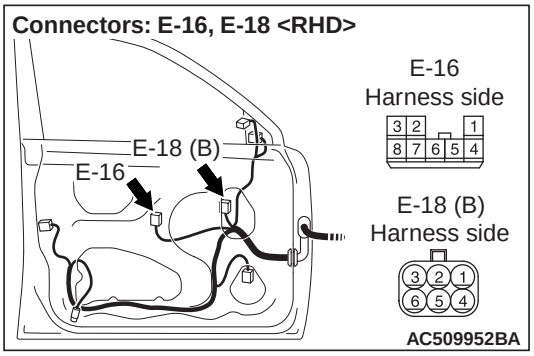
DIAGNOSIS PROCEDURE

STEP 1. Connector check: E-16 front power window sub switch connector and E-18 front power window motor (LH) connector



Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the connector.

STEP 2. Check the wiring harness between E-16 front power window sub switch connector terminal Nos.8, 3 and E-18 front power window motor (LH) connector terminal Nos.4, 5.



- Check the input and output lines for open or short circuit.

Q: Is the check result normal?

YES : Go to Step 3.
NO : Repair the wiring harness.

STEP 3. Check whether the diagnosis code is reset.

(1) Replace the front power window motor (LH).
(2) Check that diagnosis code is not reset.

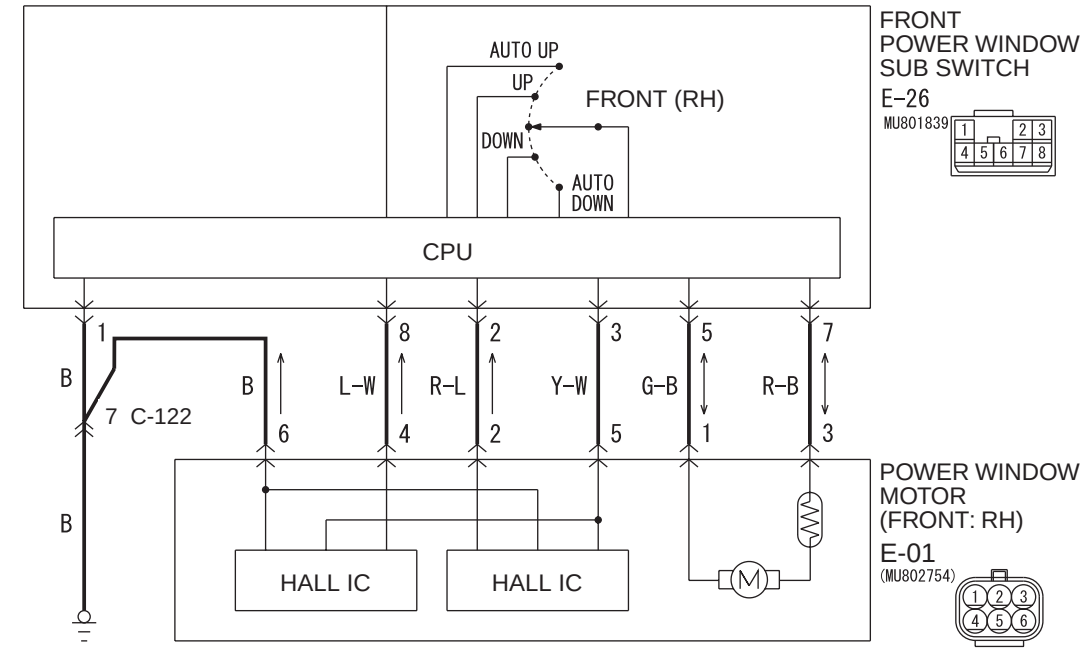
Q: Is diagnosis code set?

YES : Replace the front power window sub switch.
NO : The procedure is complete.

Code No.2002 P/W (AS) SW pulse 2 disconnection <LH drive vehicles>

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Power Window (Front: RH) Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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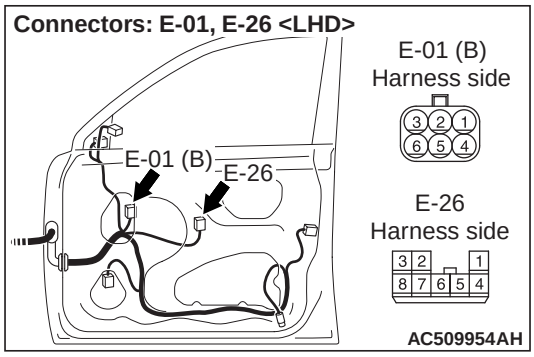
COMMENTS ON TROUBLE SYMPTOM
If the pulse 2 signal from the power window motor (front: RH) cannot be received, power window sub switch (front: RH) sets the diagnosis code No. 2002.

PROBABLE CAUSES
- Malfunction of the front power window motor (RH)
- Malfunction of the front power window sub switch
- Damaged harness wires and connectors

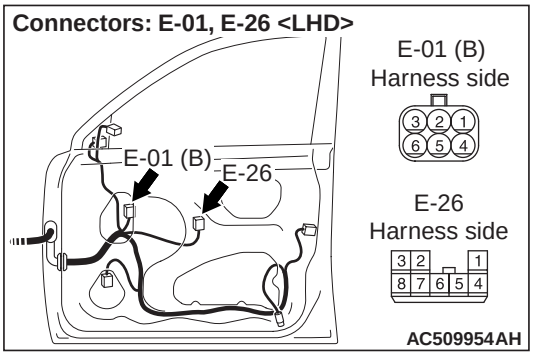
DIAGNOSIS PROCEDURE

STEP 1. Connector check: E-26 front power window sub switch connector and E-01 front power window motor (RH) connector



Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the connector.

STEP 2. Check the wiring harness between E-26 front power window sub switch connector terminal Nos.2, 3 and E-01 front power window motor (RH) connector terminal Nos.2, 5.



- Check the input and output lines for open or short circuit.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the wiring harness.

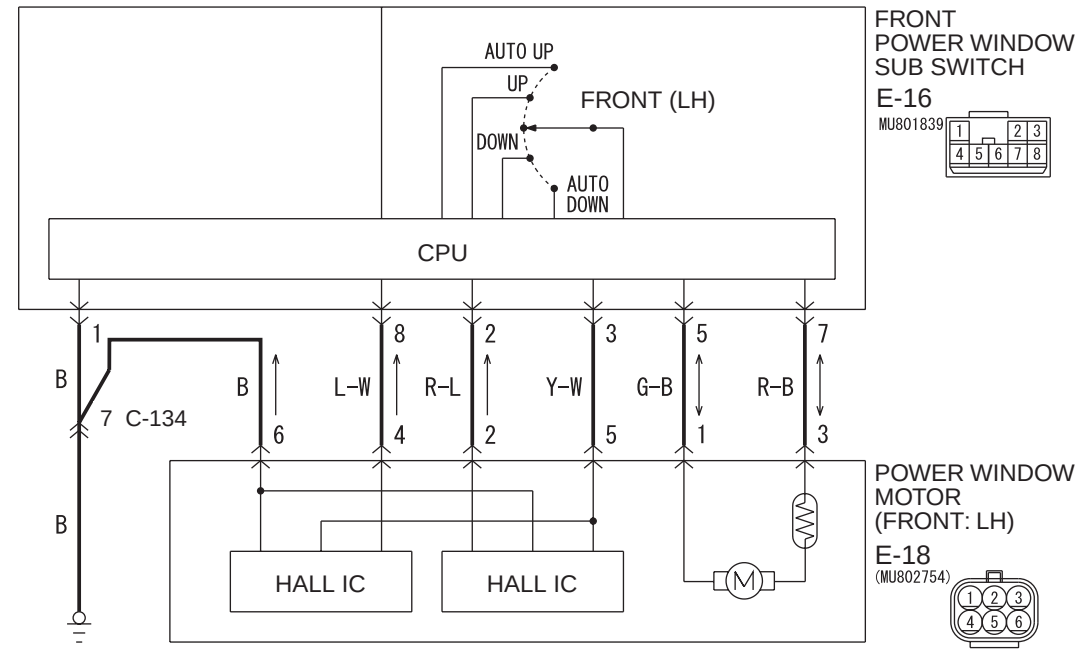
STEP 3. Check whether the diagnosis code is reset.
(1) Replace the front power window motor (RH).
(2) Check that diagnosis code is not reset.

Q: Is diagnosis code set?
YES : Replace the front power window sub switch.
NO : The procedure is complete.

Code No.2002 P/W (AS) SW pulse 2 disconnection <RH drive vehicles>

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Power Window (Front: LH) Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

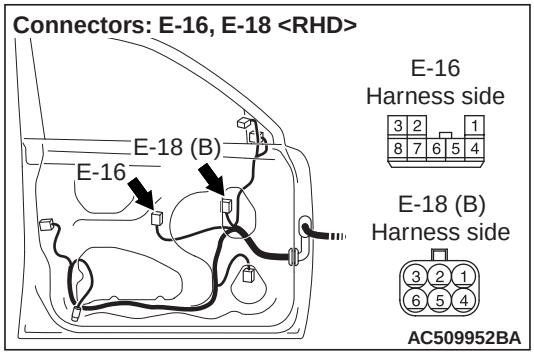
AC903692AB

COMMENTS ON TROUBLE SYMPTOM
If the pulse 2 signal from the power window motor (front: LH) cannot be received, power window sub switch (front: LH) sets the diagnosis code No. 2002.

PROBABLE CAUSES
- Malfunction of the front power window motor (LH)
- Malfunction of the front power window sub switch
- Damaged harness wires and connectors

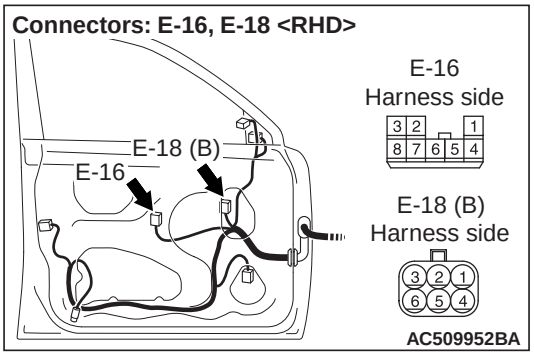
DIAGNOSIS PROCEDURE

STEP 1. Connector check: E-16 front power window sub switch connector and E-18 front power window motor (LH) connector



Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the connector.

STEP 2. Check the wiring harness between E-16 front power window sub switch connector terminal Nos.2, 3 and E-18 front power window motor (LH) connector terminal Nos.2, 5.



- Check the input and output lines for open or short circuit.

Q: Is the check result normal?

YES : Go to Step 3.
NO : Repair the wiring harness.

STEP 3. Check whether the diagnosis code is reset.

(1) Replace the front power window motor (LH).
(2) Check that diagnosis code is not reset.

Q: Is diagnosis code set?

YES : Replace the front power window sub switch.
NO : The procedure is complete.

Code No.2003: P/W (AS) Above window position

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

COMMENTS ON TROUBLE SYMPTOM

If the front passenger's door window glass exceeds the fully closed position, power window sub switch (front: RH) sets the diagnosis code No. 2003. And, if the passenger's door window glass is removed or installed with the power is supplied to the power window sub switch (front: RH) sets this diagnosis code.

PROBABLE CAUSES

- Malfunction of the front power window motor <passenger's side>
- Malfunction of the front power window sub switch

DIAGNOSIS PROCEDURE

STEP 1. Confirm the front power window <passenger's side> learning function.

(1) Check that the front power window sub switch has learned the fully closed position of the window (Refer to P.42-172).
(2) On completion, check that diagnosis code No.2003 is not reset.

Q: Is the check result normal?

YES : The procedure is complete.
NO : Go to Step 2.

STEP 2. Check whether the diagnosis code is reset.

(1) Replace the front power window motor <passenger's side>.
(2) Check that diagnosis code is not reset.

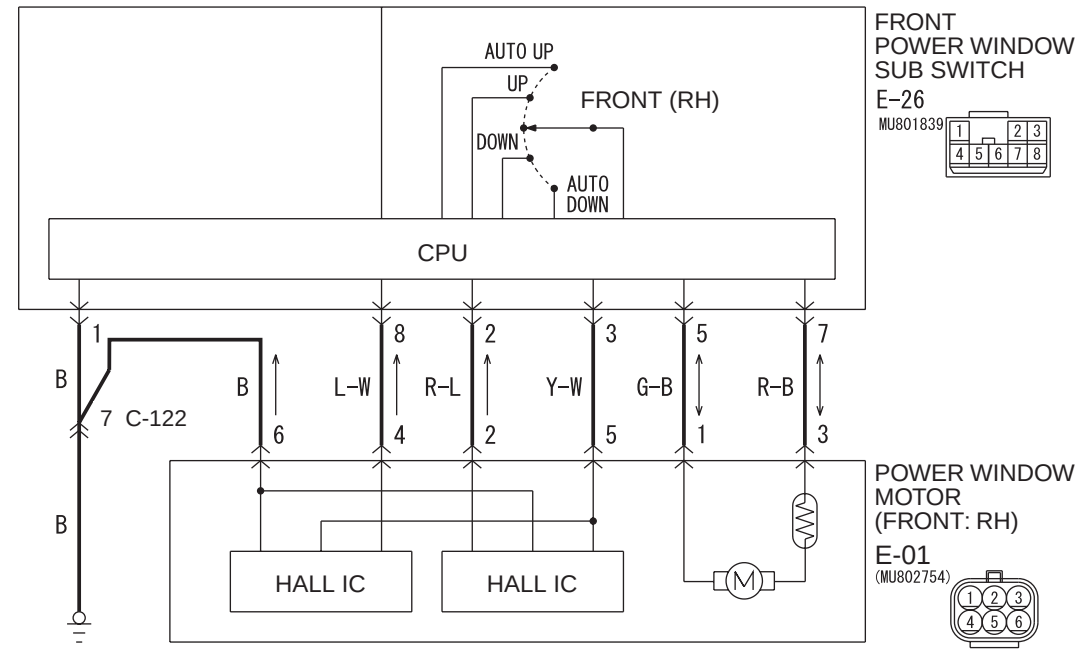
Q: Is diagnosis code set?

YES : Replace the front power window sub switch.
NO : The procedure is complete.

Code No.2004: P/W (AS) Sensor fail (earth) <LH drive vehicles>

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Power Window (Front: RH) Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

AC903690AB

COMMENTS ON TROUBLE SYMPTOM

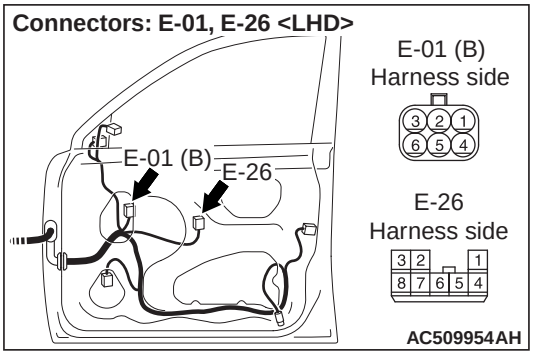
If the earth fault of the power window motor (front: RH) sensor power supply is detected, power window sub switch (front: RH) sets the diagnosis code No. 2004.

PROBABLE CAUSES

- Malfunction of the front power window motor (RH)
- Malfunction of the front power window sub switch
- Damaged harness wires and connectors

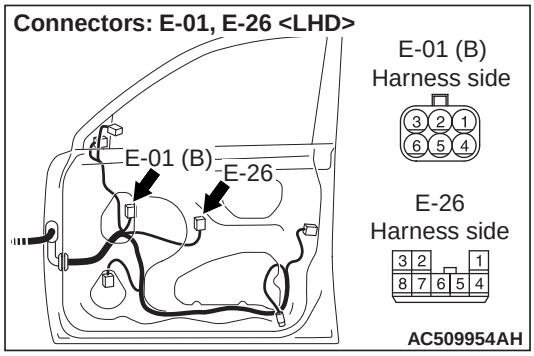
DIAGNOSIS PROCEDURE

STEP 1. Connector check: E-26 front power window sub switch connector and E-01 front power window motor (RH) connector



Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the connector.

STEP 2. Check the wiring harness between E-26 front power window sub switch connector terminal No. 3 and E-01 front power window motor (RH) connector terminal No. 5.



- Check the power supply line for open or short circuit.

Q: Is the check result normal?

YES : Go to Step 3.
NO : Repair the wiring harness.

STEP 3. Check whether the diagnosis code is reset.

(1) Replace the front power window motor (RH).
(2) Check that diagnosis code is not reset.

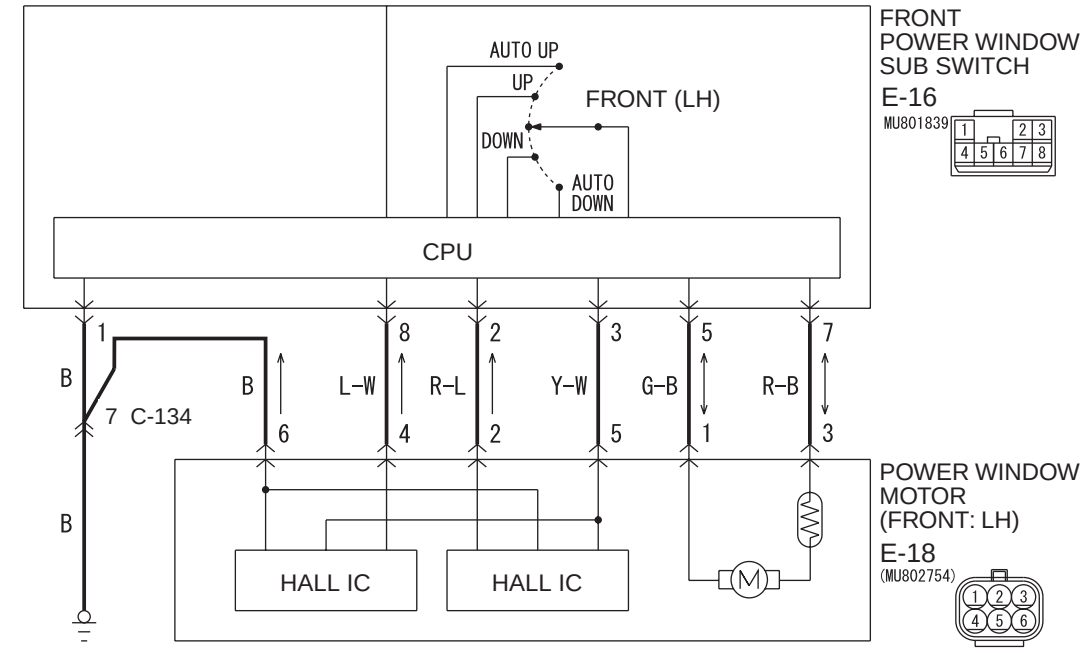
Q: Is diagnosis code set?

YES : Replace the front power window sub switch.
NO : The procedure is complete.

Code No.2004: P/W (AS) Sensor fail (earth) <RH drive vehicles>

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Power Window (Front: LH) Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

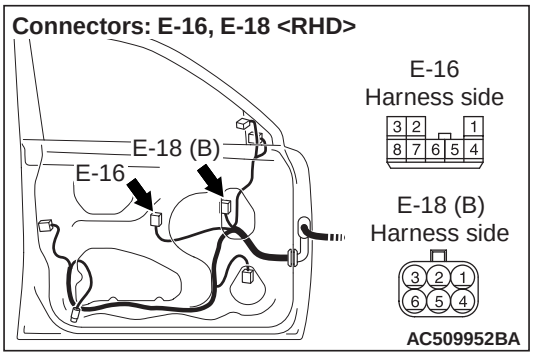
AC903692AB

COMMENTS ON TROUBLE SYMPTOM
If the earth fault of the power window motor (front: LH) sensor power supply is detected, power window sub switch (front: LH) sets the diagnosis code No. 2004.

PROBABLE CAUSES
- Malfunction of the front power window motor (LH)
- Malfunction of the front power window sub switch
- Damaged harness wires and connectors

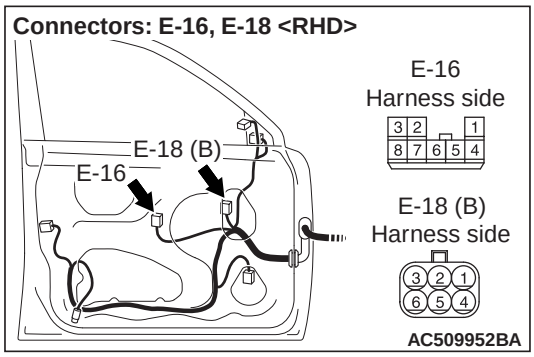
DIAGNOSIS PROCEDURE

STEP 1. Connector check: E-16 front power window sub switch connector and E-18 front power window motor (LH) connector



Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the connector.

STEP 2. Check the wiring harness between E-16 front power window sub switch connector terminal No. 3 and E-18 front power window motor (LH) connector terminal No. 5.



- Check the power supply line for open or short circuit.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the wiring harness.

STEP 3. Check whether the diagnosis code is reset.
(1) Replace the front power window motor (LH).
(2) Check that diagnosis code is not reset.

Q: Is diagnosis code set?
YES : Replace the front power window sub switch.
NO : The procedure is complete.

Code No.2005: P/W (AS) 3 Times jam-protection

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

COMMENTS ON TROUBLE SYMPTOM
If the anti-trap function is activated consecutively three times or more, power window sub switch (passenger's side) sets the diagnosis code No. 2005.

PROBABLE CAUSES
- Malfunction of the front power window motor <passenger's side>
- Malfunction of the front power window sub switch

DIAGNOSIS PROCEDURE

STEP 1. Confirm the front power window <passenger's side> learning function.
(1) Check that the front power window sub switch has learned the fully closed position of the window (Refer to P.42-172).
(2) On completion, check that diagnosis code No.2005 is not reset.

Q: Is the check result normal?
YES : The procedure is complete.
NO : Go to Step 2.

STEP 2. Check whether the diagnosis code is reset.
(1) Replace the front power window motor <passenger's side>.
(2) Check that diagnosis code is not reset.

Q: Is diagnosis code set?
YES : Replace the front power window sub switch.
NO : The procedure is complete.

Code No.2008: P/W (AS) Parameter read fail
Code No.2009: P/W (AS) Position read fail

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

COMMENTS ON TROUBLE SYMPTOM
- If the power window sub switch (front: RH) information cannot be read, power window sub switch (front: RH) sets the diagnosis code No. 2008.
- If the front passenger's door window glass position cannot be read, power window sub switch (front: RH) sets the diagnosis code No. 2009.

PROBABLE CAUSES
- Malfunction of the front power window sub switch

DIAGNOSIS PROCEDURE

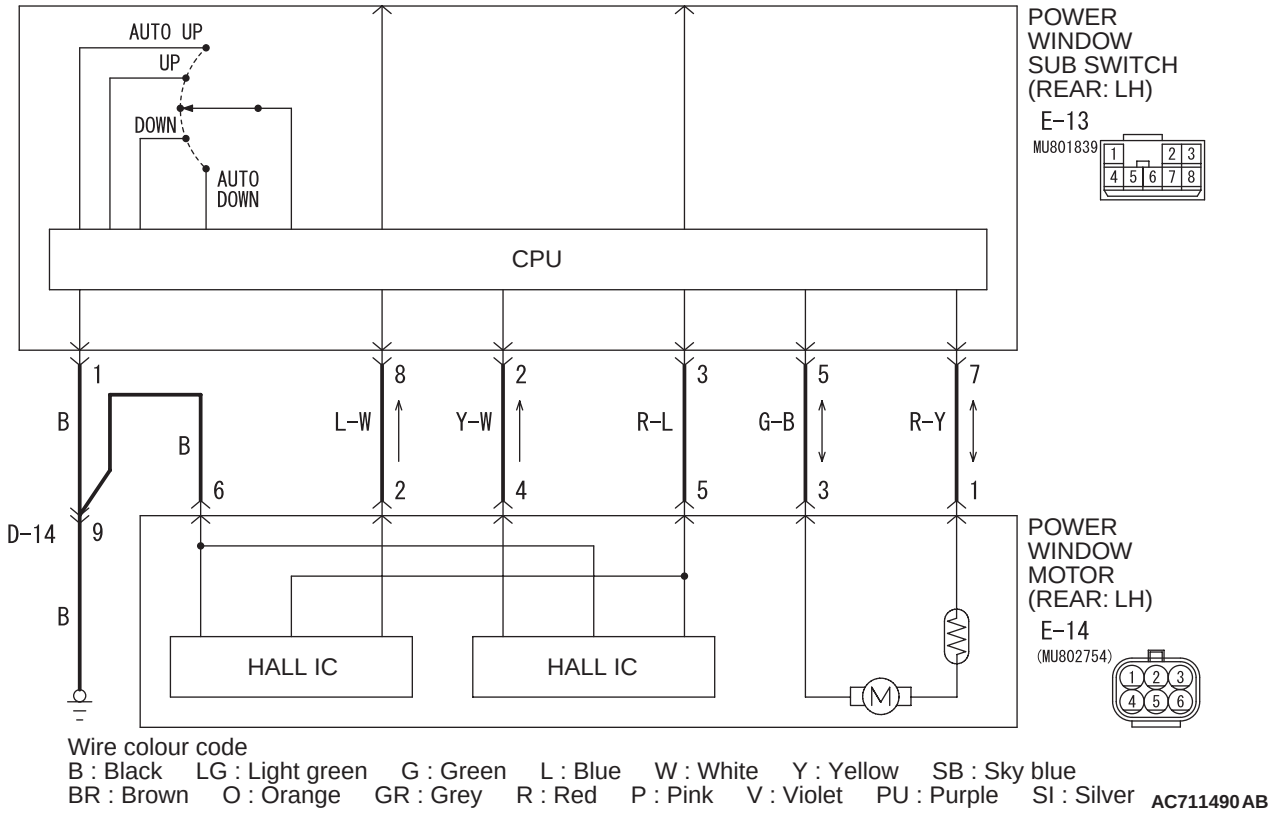
Check whether the diagnosis code is reset.
Check that the diagnosis code is not reset.

Q: Is diagnosis code set?
YES : Replace the front power window sub switch.
NO : The procedure is complete.

Code No.3001: P/W (RL) SW pulse1 disconnection <Double cab>

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Power Window (Rear: LH) Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

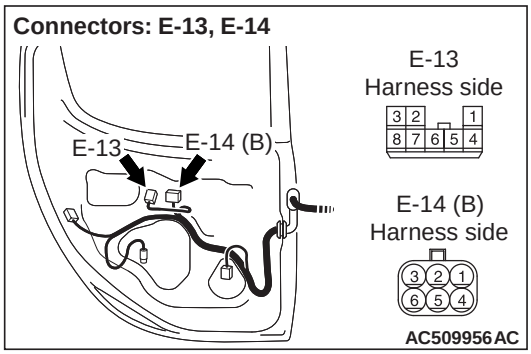
AC711490 AB

COMMENTS ON TROUBLE SYMPTOM
If the pulse 1 signal from the power window motor (rear: LH) cannot be received, power window sub switch (rear: LH) sets the diagnosis code No. 3001.

PROBABLE CAUSES
- Malfunction of the rear power window motor (LH)
- Malfunction of the rear power window sub switch (LH)
- Damaged harness wires and connectors

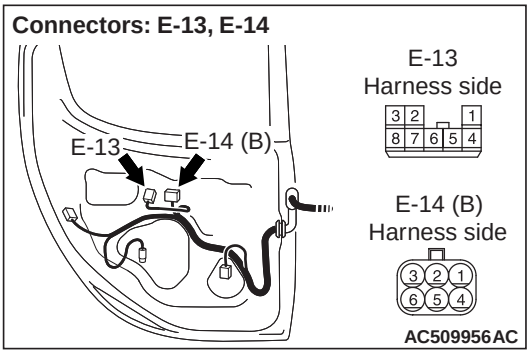
DIAGNOSIS PROCEDURE

STEP 1. Connector check: E-13 rear power window sub switch (LH) connector and E-14 rear power window motor (LH) connector



Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the connector.

STEP 2. Check the wiring harness between E-13 rear power window sub switch (LH) connector terminal Nos.8, 3 and E-14 rear power window motor (LH) connector terminal Nos.2, 5.



- Check the input and output lines for open or short circuit.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the wiring harness.

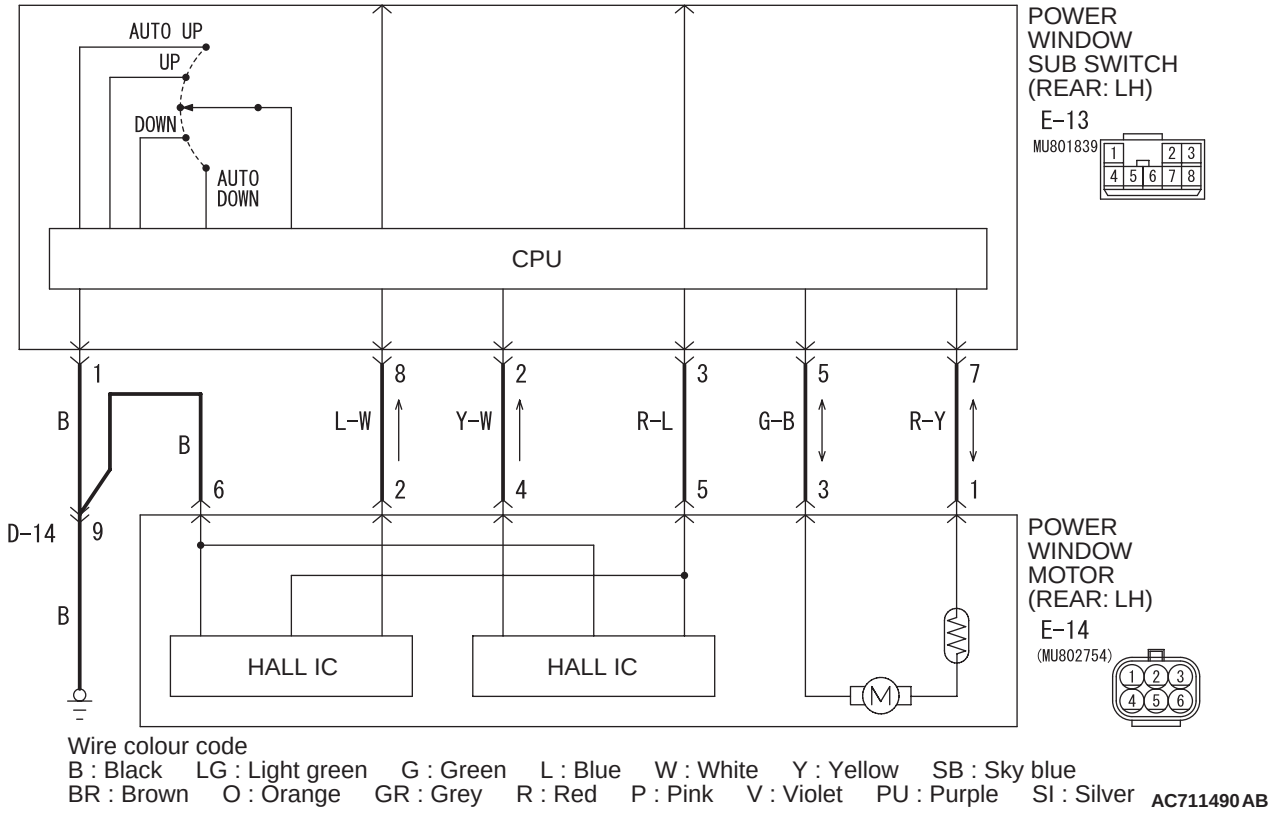
STEP 3. Check whether the diagnosis code is reset.
(1) Replace the rear power window motor (LH).
(2) Check that diagnosis code is not reset.

Q: Is diagnosis code set?
YES : Replace the rear power window sub switch (LH).
NO : The procedure is complete.

Code No.3002 P/W (RL) SW pulse 2 disconnection <Double cab>

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Power Window (Rear: LH) Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

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COMMENTS ON TROUBLE SYMPTOM

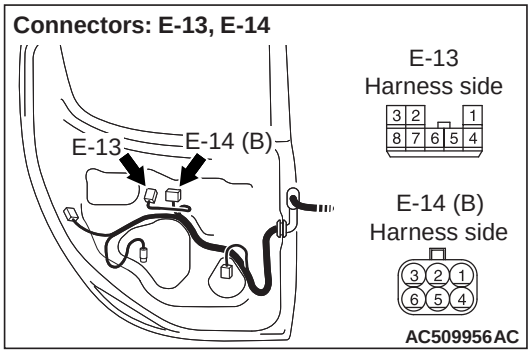
If the pulse 2 signal from the power window motor (rear: LH) cannot be received, power window sub switch (rear: LH) sets the diagnosis code No. 3002.

PROBABLE CAUSES

- Malfunction of the rear power window motor (LH)
- Malfunction of the rear power window sub switch (LH)
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. Connector check: E-13 rear power window sub switch (LH) connector and E-14 rear power window motor (LH) connector



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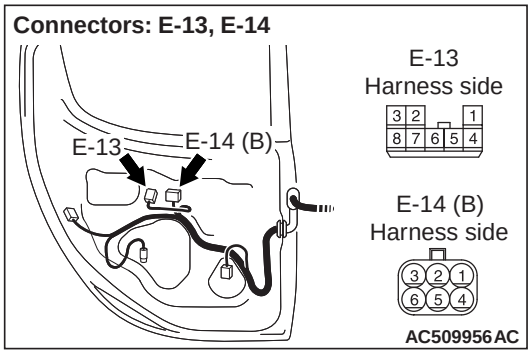
Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the connector.

STEP 2. Check the wiring harness between E-13 rear power window sub switch (LH) connector terminal Nos.2, 3 and E-14 rear power window motor (LH) connector terminal Nos.4, 5.



- Check the input and output lines for open or short circuit.

Q: Is the check result normal?

YES : Go to Step 3.
NO : Repair the wiring harness.

STEP 3. Check whether the diagnosis code is reset.

(1) Replace the rear power window motor (LH).
(2) Check that diagnosis code is not reset.

Q: Is diagnosis code set?

YES : Replace the rear power window sub switch (LH).
NO : The procedure is complete.

Code No.3003: P/W (RL) Above window position <Double cab>

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

COMMENTS ON TROUBLE SYMPTOM

If the rear-left door window glass exceeds the fully closed position, power window sub switch (rear: LH) sets the diagnosis code No. 3003. And, if the rear door window glass (LH) is removed or installed with the power is supplied to the power window sub switch (rear: LH) sets this diagnosis code.

PROBABLE CAUSES

- Malfunction of the rear power window motor (LH)
- Malfunction of the rear power window sub switch (LH)

DIAGNOSIS PROCEDURE

STEP 1. Confirm the rear power window <left side> learning function.

(1) Check that the rear power window sub switch (LH) has learned the fully closed position of the window (Refer to P.42-172).
(2) On completion, check that diagnosis code No.3003 is not reset.

Q: Is the check result normal?

YES : The procedure is complete.
NO : Go to Step 2.

STEP 2. Check whether the diagnosis code is reset.

(1) Replace the rear power window motor (LH).
(2) Check that diagnosis code is not reset.

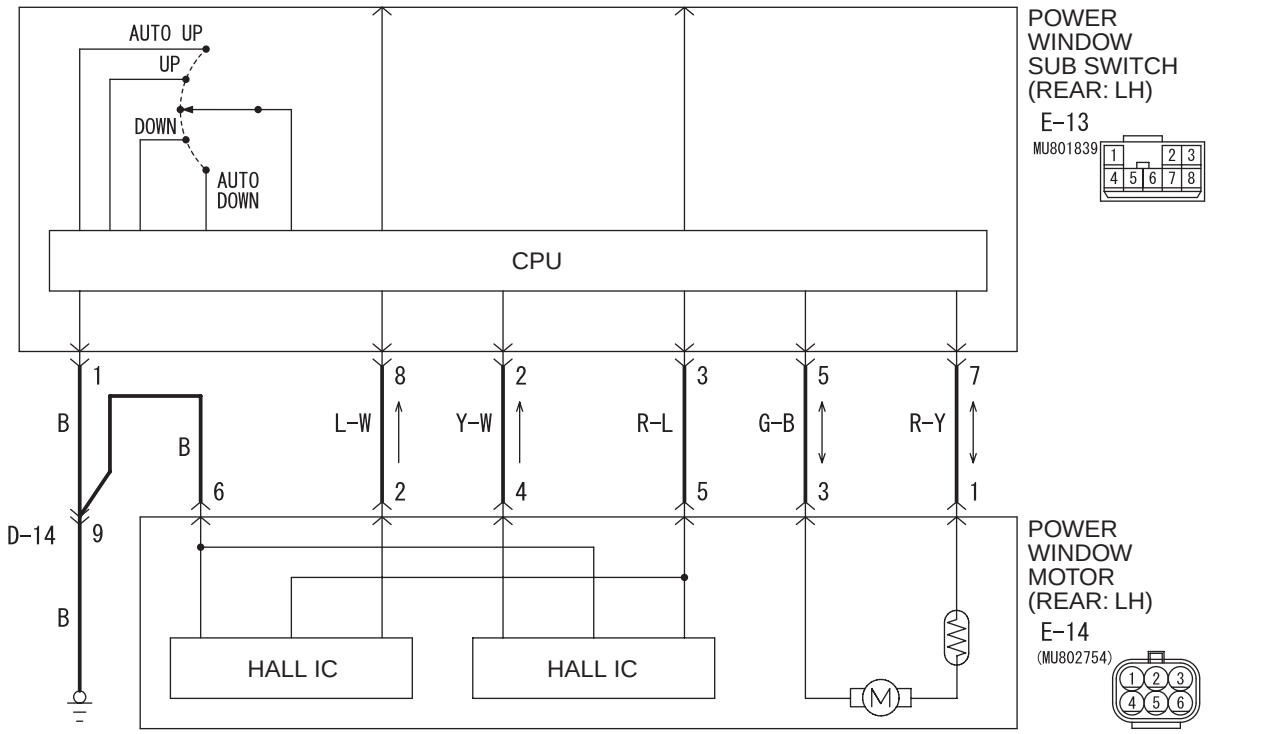
Q: Is diagnosis code set?

YES : Replace the rear power window sub switch (LH).
NO : The procedure is complete.

Code No.3004: P/W (RL) Sensor fail (earth) <Double cab>

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Power Window (Rear: LH) Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

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COMMENTS ON TROUBLE SYMPTOM

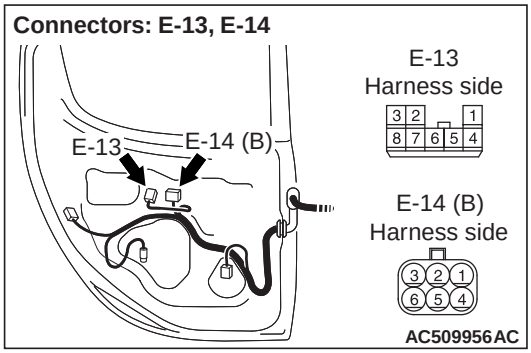
If the earth fault of the power window motor (rear: LH) sensor power supply is detected, power window sub switch (rear: LH) sets the diagnosis code No. 3004.

PROBABLE CAUSES

- Malfunction of the rear power window motor (LH)
- Malfunction of the rear power window sub switch (LH)
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. Connector check: E-13 rear power window sub switch (LH) connector and E-14 rear power window motor (LH) connector



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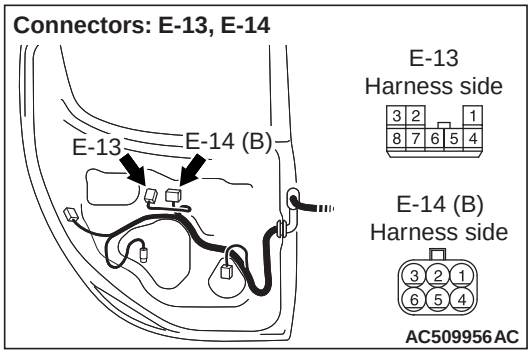
Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the connector.

STEP 2. Check the wiring harness between E-13 rear power window sub switch (LH) connector terminal No. 3 and E-14 rear power window motor (LH) connector terminal No. 5.



- Check the power supply line for open or short circuit.

Q: Is the check result normal?

YES : Go to Step 3.
NO : Repair the wiring harness.

STEP 3. Check whether the diagnosis code is reset.

(1) Replace the rear power window motor (LH).
(2) Check that diagnosis code is not reset.

Q: Is diagnosis code set?

YES : Replace the rear power window sub switch (LH).
NO : The procedure is complete.

Code No.3005: P/W (RL) 3 Times jam-protection <Double cab>

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

COMMENTS ON TROUBLE SYMPTOM

If the anti-trap function is activated consecutively three times or more, power window sub switch (rear: LH) sets the diagnosis code No. 3005.

PROBABLE CAUSES

- Malfunction of the rear power window motor (LH)
- Malfunction of the rear power window sub switch (LH)

DIAGNOSIS PROCEDURE

STEP 1. Confirm the rear power window <left side> learning function.

(1) Check that the rear power window sub switch (LH) has learned the fully closed position of the window (Refer to P.42-172).
(2) On completion, check that diagnosis code No.3005 is not reset.

Q: Is the check result normal?

YES : The procedure is complete.
NO : Go to Step 2.

STEP 2. Check whether the diagnosis code is reset.

(1) Replace the rear power window motor (LH).
(2) Check that diagnosis code is not reset.

Q: Is diagnosis code set?

YES : Replace the rear power window sub switch (LH).
NO : The procedure is complete.

Code No.3008: P/W (RL) Parameter read fail
Code No.3009: P/W (RL) Position read fail

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

COMMENTS ON TROUBLE SYMPTOM

- If the power window sub switch (rear: LH) information cannot be read, power window sub switch (rear: LH) sets the diagnosis code No. 3008.
- If the rear-left door window glass position cannot be read, power window sub switch (rear: LH) sets the diagnosis code No. 3009.

PROBABLE CAUSES

- Malfunction of the rear power window sub switch (rear: LH)

DIAGNOSIS PROCEDURE

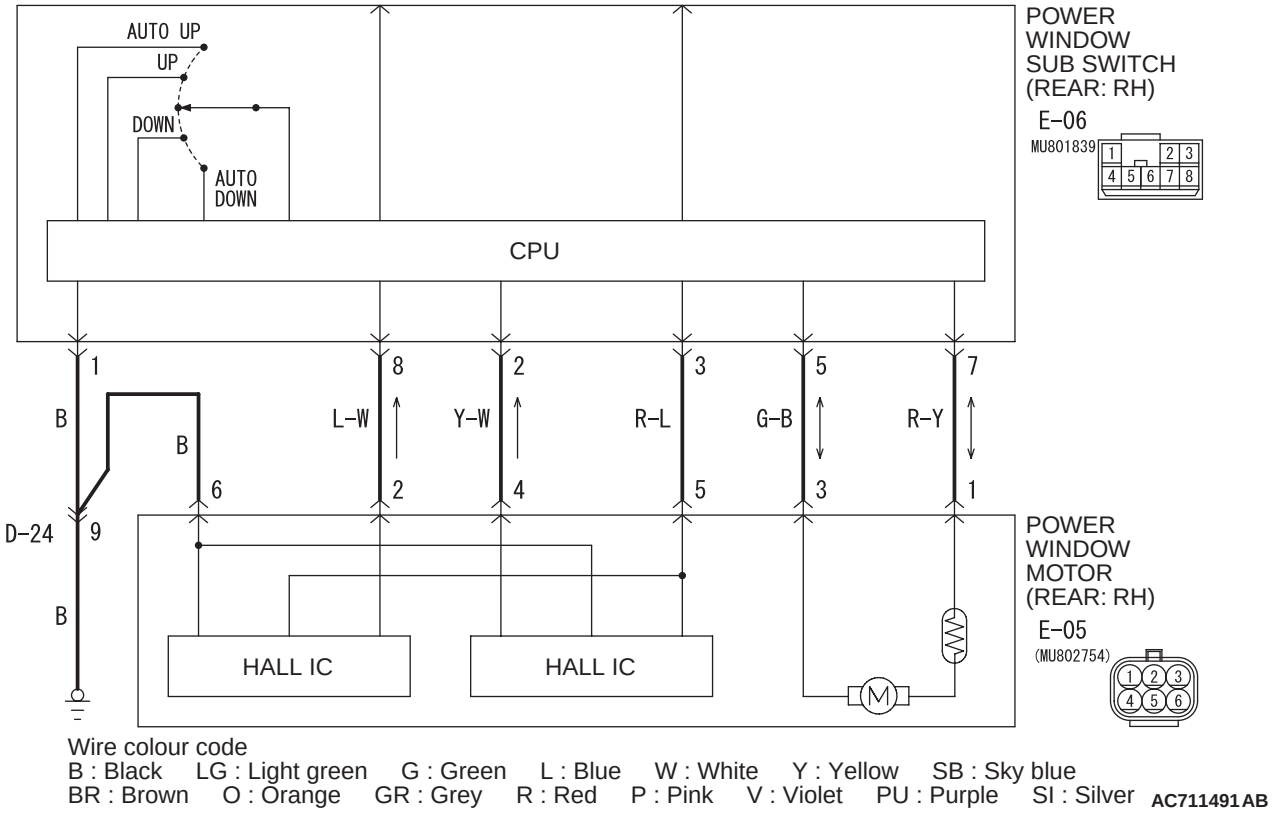
Check whether the diagnosis code is reset.
Check that the diagnosis code is not reset.

Q: Is diagnosis code set?
YES : Replace the rear power window sub switch (LH).
NO : The procedure is complete.

Code No.4001: P/W (RR) SW pulse1 disconnection <Double cab>

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Power Window (Rear: RH) Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

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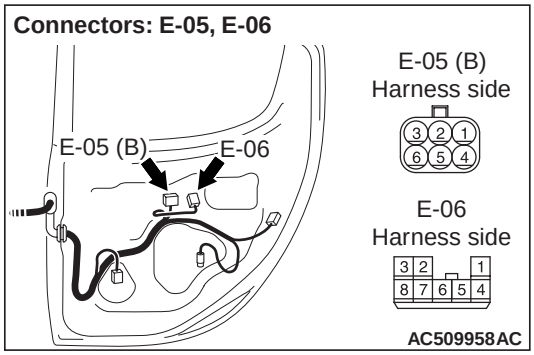
COMMENTS ON TROUBLE SYMPTOM
If the pulse 1 signal from the power window motor (rear: RH) cannot be received, power window sub switch (rear: RH) sets the diagnosis code No. 4001.

PROBABLE CAUSES

- Malfunction of the rear power window motor (rear: RH)
- Malfunction of the rear power window sub switch (rear: RH)
- Damaged harness wires and connectors

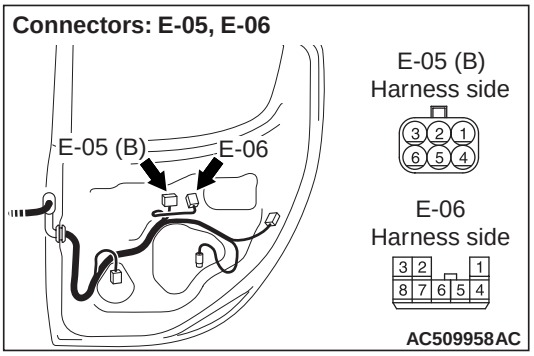
DIAGNOSIS PROCEDURE

STEP 1. Connector check: E-06 rear power window sub switch (RH) connector and E-05 rear power window motor (RH) connector



Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the connector.

STEP 2. Check the wiring harness between E-06 rear power window sub switch (RH) connector terminal Nos.8, 3 and E-05 rear power window motor (RH) connector terminal Nos.2, 5.



- Check the input and output lines for open or short circuit.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the wiring harness.

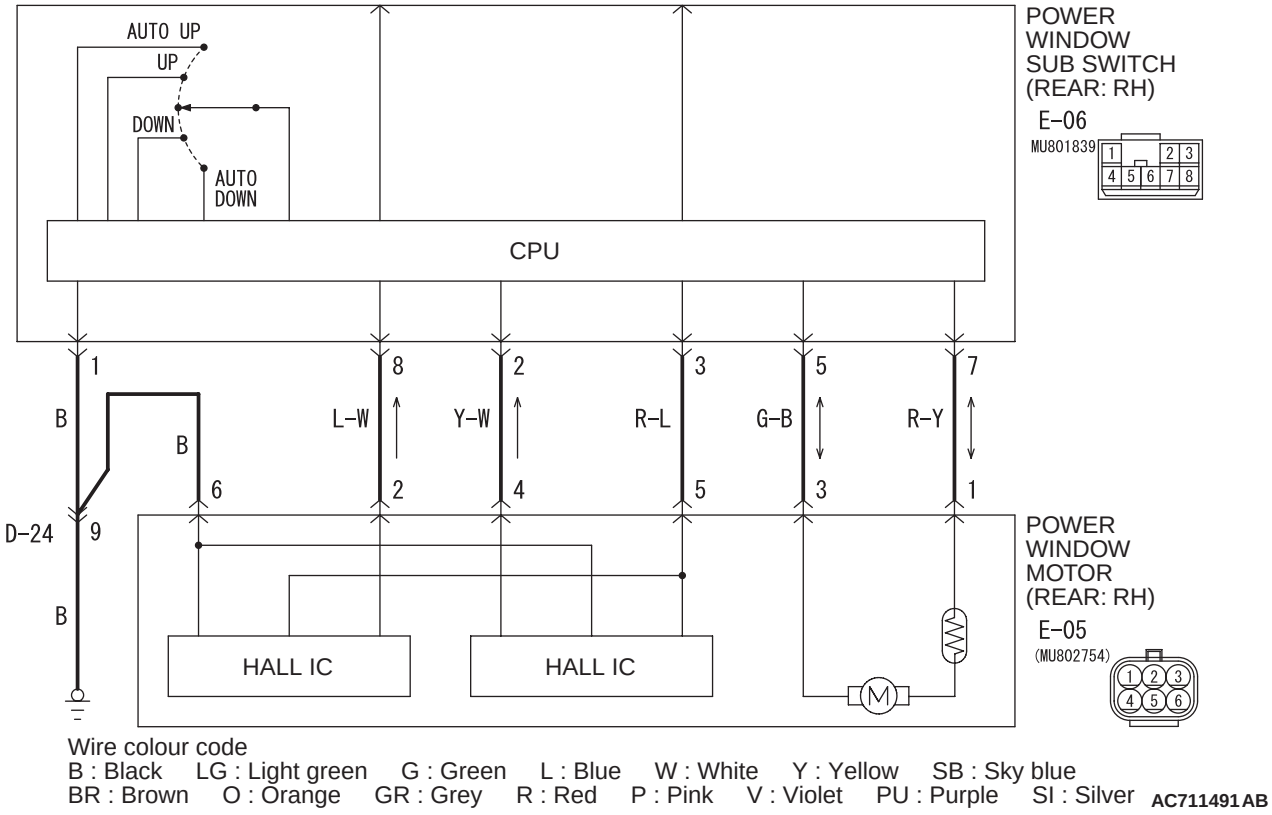
STEP 3. Check whether the diagnosis code is reset.
(1) Replace the rear power window motor (RH).
(2) Check that diagnosis code is not reset.

Q: Is diagnosis code set?
YES : Replace the rear power window sub switch (RH).
NO : The procedure is complete.

Code No.4002 P/W (RR) SW pulse 2 disconnection <Double cab>

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Power Window (Rear: RH) Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

AC711491AB

COMMENTS ON TROUBLE SYMPTOM

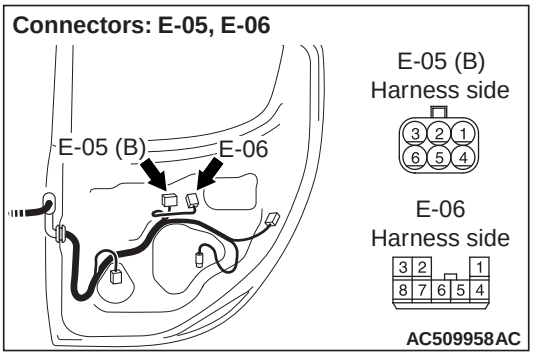
If the pulse 2 signal from the power window motor (rear: RH) cannot be received, power window sub switch (rear: RH) sets the diagnosis code No. 4002.

PROBABLE CAUSES

- Malfunction of the rear power window motor (rear: RH)
- Malfunction of the rear power window sub switch (rear: RH)
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. Connector check: E-06 rear power window sub switch (RH) connector and E-05 rear power window motor (RH) connector



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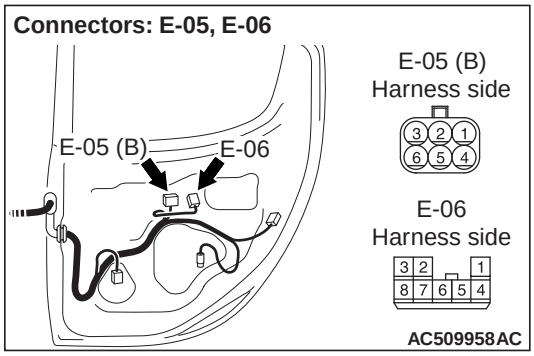
Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the connector.

STEP 2. Check the wiring harness between E-06 rear power window sub switch (RH) connector terminal Nos.2, 3 and E-05 rear power window motor (RH) connector terminal Nos.4, 5.



- Check the input and output lines for open or short circuit.

Q: Is the check result normal?

YES : Go to Step 3.
NO : Repair the wiring harness.

STEP 3. Check whether the diagnosis code is reset.

(1) Replace the rear power window motor (RH).
(2) Check that diagnosis code is not reset.

Q: Is diagnosis code set?

YES : Replace the rear power window sub switch (RH).
NO : The procedure is complete.

Code No.4003: P/W (RR) Above window position

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

COMMENTS ON TROUBLE SYMPTOM

If the rear-right door window glass exceeds the fully closed position, power window main switch sets the diagnosis code No. 4003. And, if the rear door window glass (rear: RH) is removed or installed with the power is supplied to the power window sub switch (rear: RH) sets this diagnosis code.

PROBABLE CAUSES

- Malfunction of the rear power window motor <right side>
- Malfunction of the rear power window sub switch (rear: RH)

DIAGNOSIS PROCEDURE

STEP 1. Confirm the rear power window <right side> learning function.

(1) Check that the rear power window sub switch (RH) has learned the fully closed position of the window (Refer to P.42-172).
(2) On completion, check that diagnosis code No.4003 is not reset.

Q: Is the check result normal?

YES : The procedure is complete.
NO : Go to Step 2.

STEP 2. Check whether the diagnosis code is reset.

(1) Replace the rear power window motor <right side>.
(2) Check that diagnosis code is not reset.

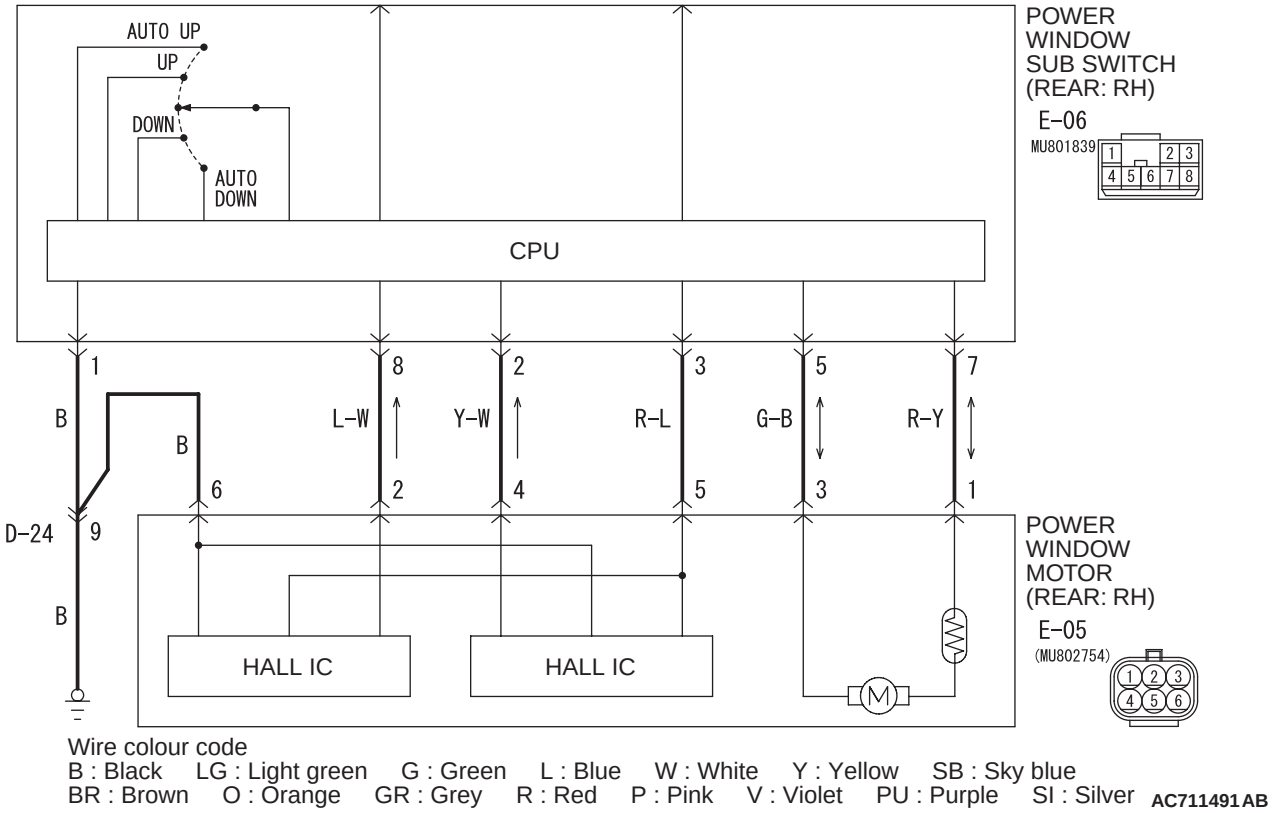
Q: Is diagnosis code set?

YES : Replace the rear power window sub switch (RH).
NO : The procedure is complete.

Code No.4004: P/W (RR) Sensor fail (earth) <Double cab>

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Power Window (Rear: RH) Circuit



COMMENTS ON TROUBLE SYMPTOM

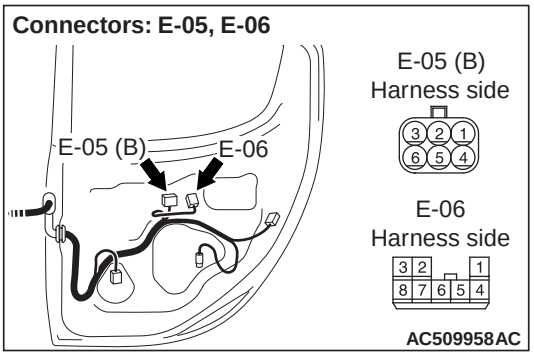
If the earth fault of the power window motor (rear: RH) sensor power supply is detected, power window sub switch (rear: RH) sets the diagnosis code No. 4004.

PROBABLE CAUSES

- Malfunction of the rear power window motor (rear: RH)
- Malfunction of the rear power window sub switch (rear: RH)
- Damaged harness wires and connectors

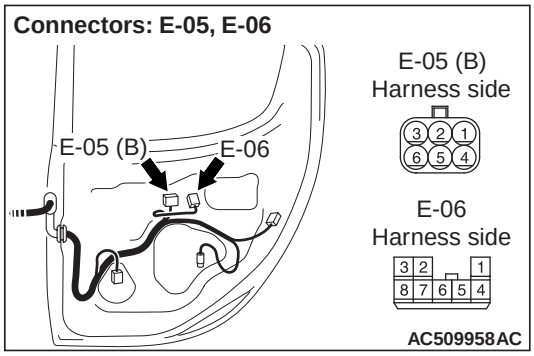
DIAGNOSIS PROCEDURE

STEP 1. Connector check: E-06 rear power window sub switch (RH) connector and E-05 rear power window motor (RH) connector



Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the connector.

STEP 2. Check the wiring harness between E-06 rear power window sub switch (RH) connector terminal No. 3 and E-05 rear power window motor (RH) connector terminal No. 5.



- Check the power supply line for open or short circuit.

Q: Is the check result normal?

YES : Go to Step 3.
NO : Repair the wiring harness.

STEP 3. Check whether the diagnosis code is reset.

(1) Replace the rear power window motor (RH).
(2) Check that diagnosis code is not reset.

Q: Is diagnosis code set?

YES : Replace the rear power window sub switch (RH).
NO : The procedure is complete.

Code No.4005: P/W (RR) 3 Times jam-protection <Double cab>

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

COMMENTS ON TROUBLE SYMPTOM

If the anti-trap function is activated consecutively three times or more, power window sub switch (rear: RH) sets the diagnosis code No. 4005.

PROBABLE CAUSES

- Malfunction of the rear power window motor (rear: RH)
- Malfunction of the rear power window sub switch (rear: RH)

DIAGNOSIS PROCEDURE

STEP 1. Confirm the rear power window <right side> learning function.

(1) Check that the rear power window sub switch (RH) has learned the fully closed position of the window (Refer to P.42-172).
(2) On completion, check that diagnosis code No.4005 is not reset.

Q: Is the check result normal?

YES : The procedure is complete.
NO : Go to Step 2.

STEP 2. Check whether the diagnosis code is reset.

(1) Replace the rear power window motor (RH).
(2) Check that diagnosis code is not reset.

Q: Is diagnosis code set?

YES : Replace the rear power window sub switch (RH).
NO : The procedure is complete.

Code No.4008: P/W (RR) Parameter read fail
Code No.4009: P/W (RR) Position read fail

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

COMMENTS ON TROUBLE SYMPTOM

- If the power window sub switch (rear: RH) information cannot be read, power window sub switch (rear: RH) sets the diagnosis code No. 4008.
- If the rear-right door window glass position cannot be read, power window sub switch (rear: RH) sets the diagnosis code No. 4009.

PROBABLE CAUSES

- Malfunction of the rear power window sub switch (rear: RH)

DIAGNOSIS PROCEDURE

Check whether the diagnosis code is reset.

Check that the diagnosis code is not reset.

Q: Is diagnosis code set?

YES : Replace the rear power window sub switch (RH).

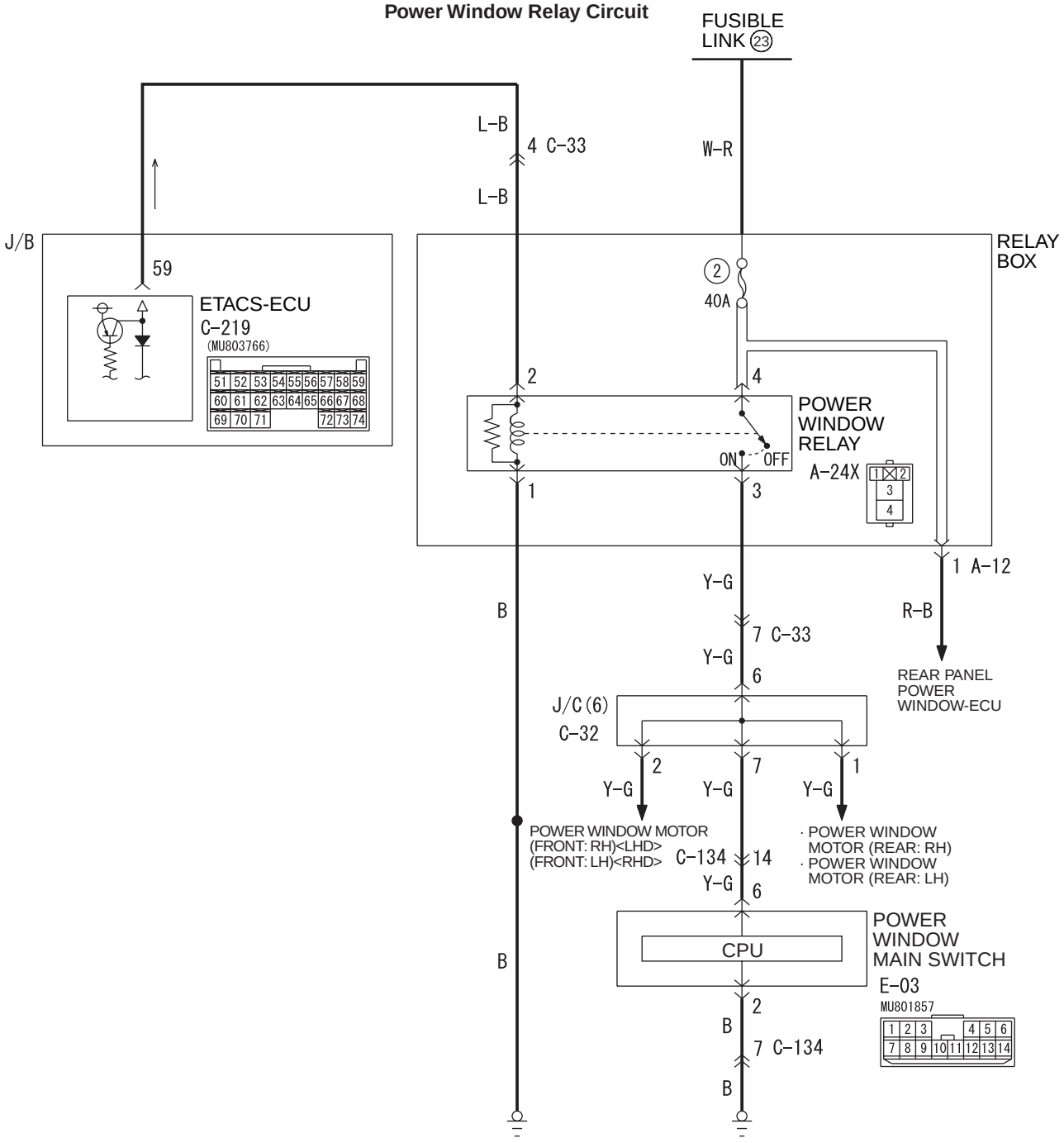
NO : The procedure is complete.

SYMPTOM PROCEDURES <POWER WINDOWS>

Inspection Procedure B-1: Power Windows do not Work at All.

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Power Window Relay Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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COMMENTS ON TROUBLE SYMPTOM

If the power windows do not work at all, the power window relay, the power window main switch or the ETACS-ECU may be defective.

PROBABLE CAUSES

- Malfunction of the power window relay
- Malfunction of the power window main switch
- Malfunction of the ETACS-ECU
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code.

When the ignition switch is turned to the "ON" position, check that the ETACS-ECU does not set the diagnosis code.

Q: Is the diagnosis code set?

YES : Refer to P.42-64.

NO : Go to Step 2.

STEP 2. M.U.T.-III data list

Check the input signal from the ignition switch (IG1).

- Ignition switch: ON

Item No.	Item name	Normal condition
30	Ignition switch (IG1)	ON

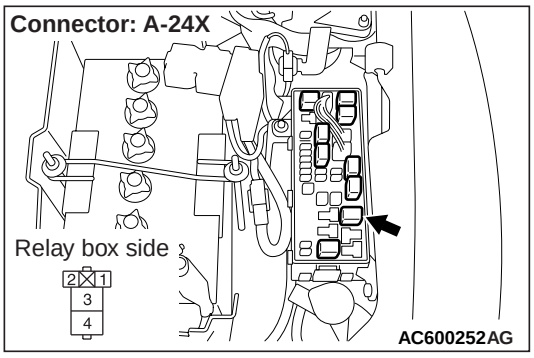
OK: Normal condition is displayed.

Q: Is the check result normal?

YES : Go to Step 3.

NO : Refer to GROUP 54A, Inspection Procedure C-3 "The ignition switch (IG1) signal is not received ."

STEP 3. Connector check: A-24X power window relay connector



Q: Is the check result normal?

YES : Go to Step 4.

NO : Repair the connector.

STEP 4. Check the power window relay.

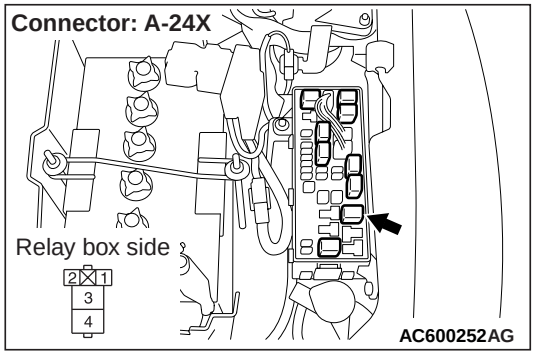
Refer to P.42-171.

Q: Is the check result normal?

YES : Go to Step 5.

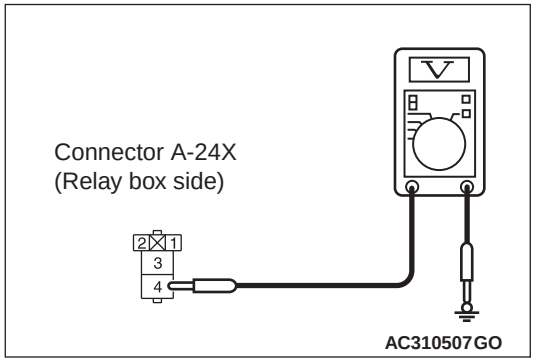
NO : Replace the power window relay.

STEP 5. Voltage measurement at the A-24X power window relay connector.



(1) Disconnect the relay, and measure at the relay box side.

(2) Turn the ignition switch to the ON position.



(3) Check the voltage between the A-24X power window relay connector terminal No.4 and body earth.

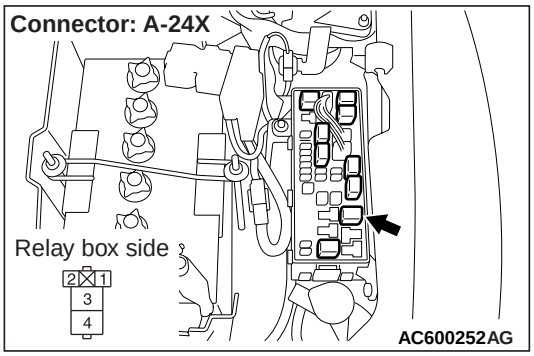
OK: System voltage

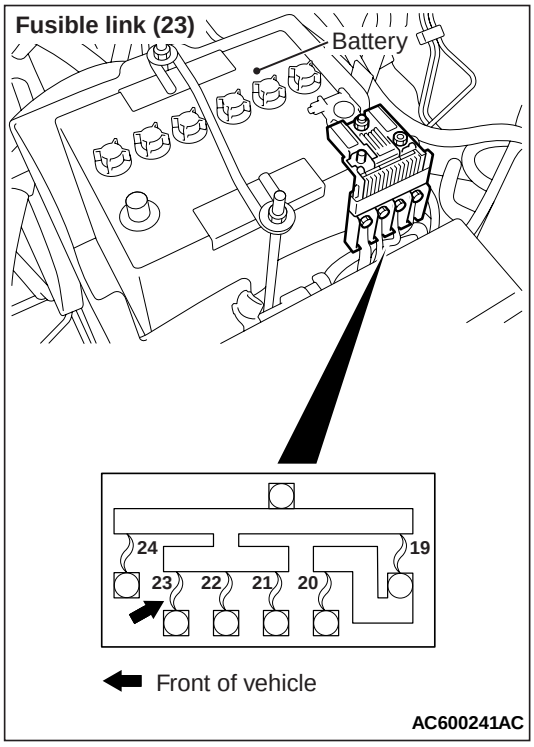
Q: Is the check result normal?

YES : Go to Step 7.

NO : Go to Step 6.

STEP 6. Check the wiring harness between A-24X power window relay connector terminal No.4 and fusible link (23).



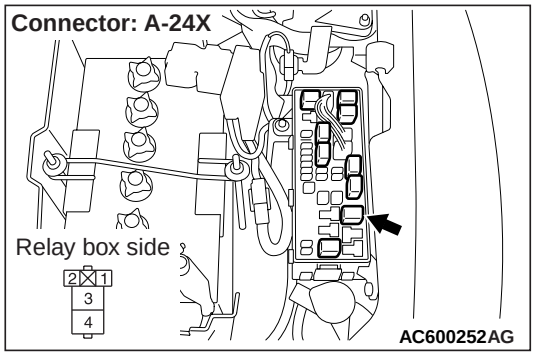


- Check the power supply line for open circuit.

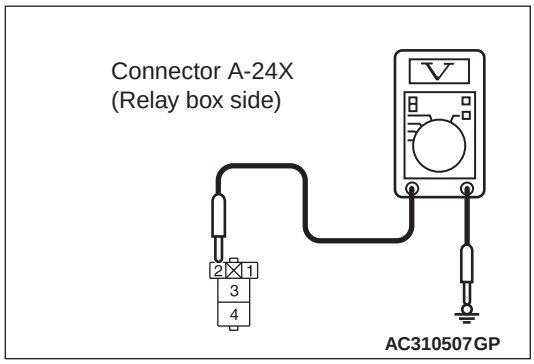
Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness.

STEP 7. Voltage measurement at the A-24X power window relay connector.



(1) Disconnect the relay, and measure at the relay box side.
(2) Turn the ignition switch to the ON position.

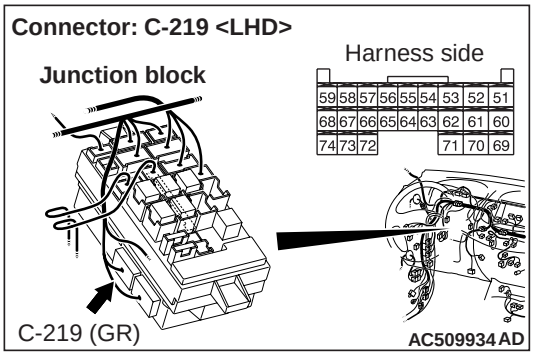


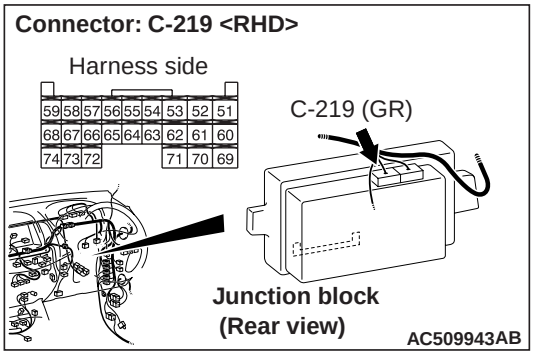
(3) Check the voltage between the A-24X power window relay connector terminal No.2 and body earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 10.
NO : Go to Step 8.

STEP 8. Connector check: C-219 ETACS-ECU connector

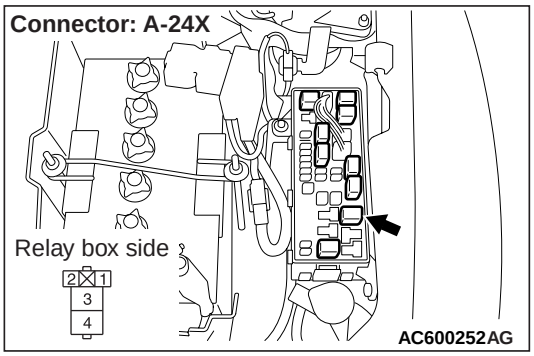


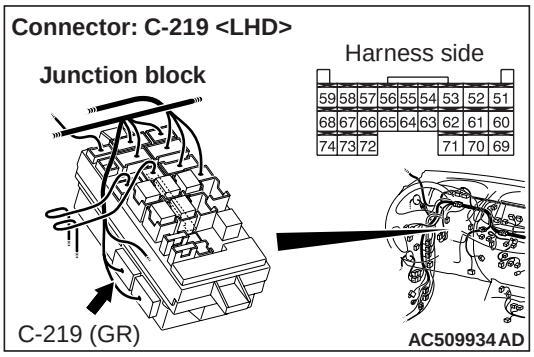


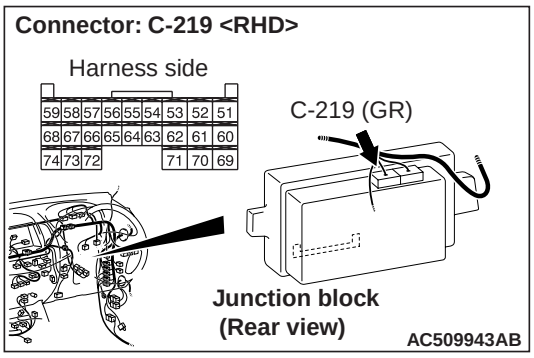
Q: Is the check result normal?

YES : Go to Step 9.
NO : Repair the connector.

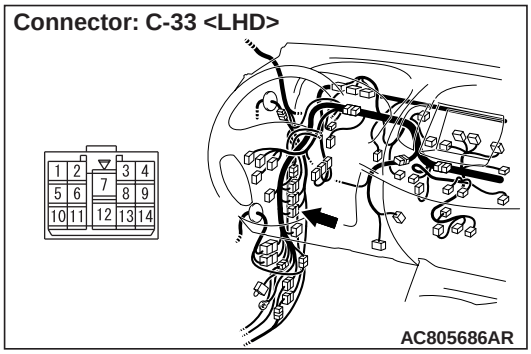
STEP 9. Check the wiring harness between C-219 ETACS-ECU connector terminal No.59 and A-24X power window relay connector terminal No.2.

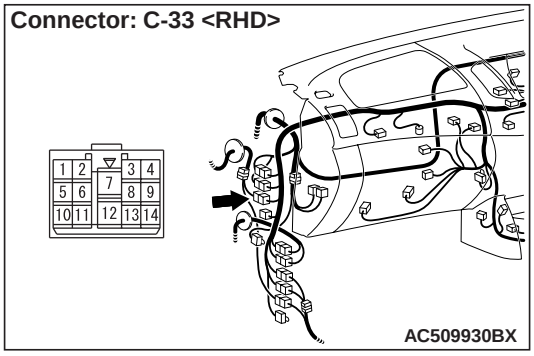






NOTE:





Prior to the wiring harness inspection, check intermediate connector C-33, and repair if necessary.

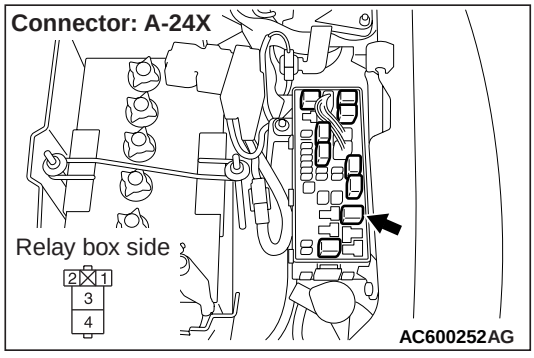
- Check the power supply line for open and short circuit.

Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

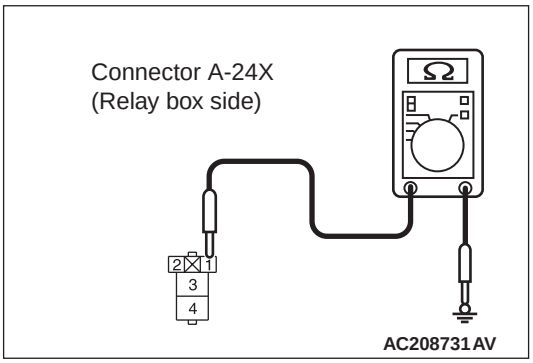
NO : Repair the wiring harness.

STEP 10. Resistance measurement at the A-24X power window relay connector.



(1) Disconnect the relay, and measure at the relay

box side.

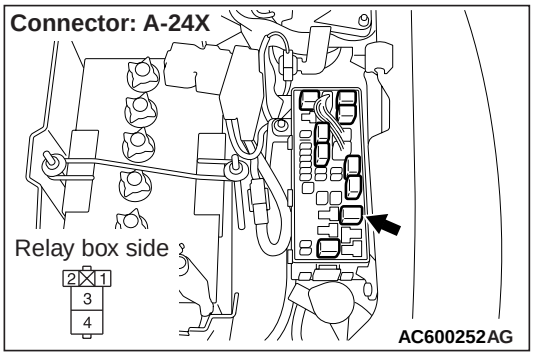


(2) Check the resistance between A-24X power window relay connector terminal No.1 and body earth

OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?
YES : Go to Step 12.
NO : Go to Step 11.

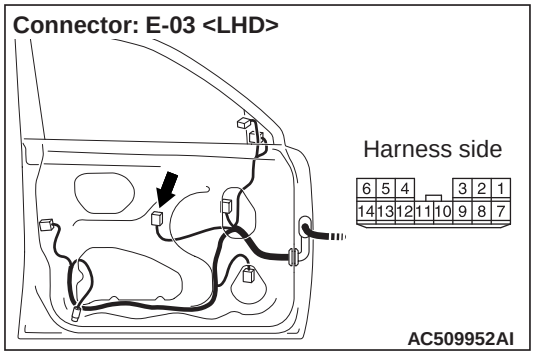
STEP 11. Check the wiring harness between A-24X power window relay connector terminal No.1 and body earth.

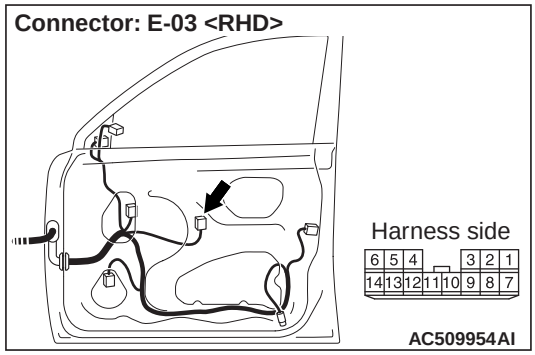


- Check the earth wires for open circuit.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness.

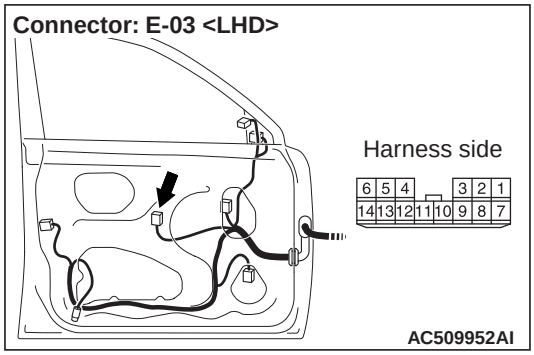
STEP 12. Connector check: E-03 power window main switch connector

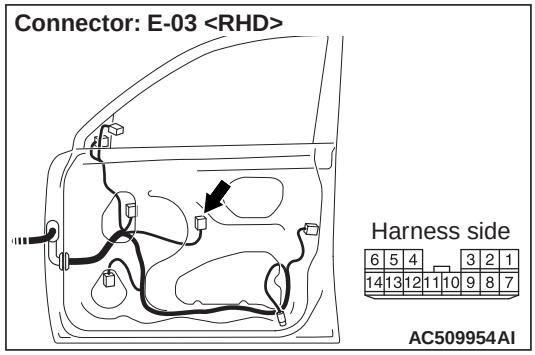




Q: Is the check result normal?
YES : Go to Step 13.
NO : Repair the connector.

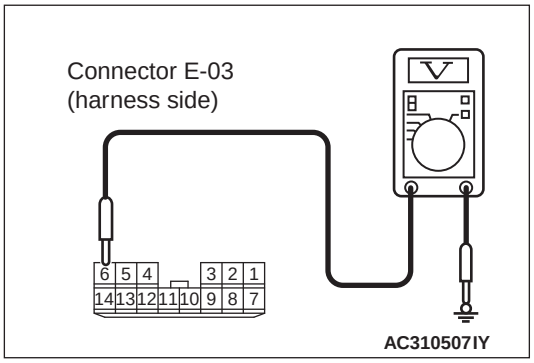
STEP 13. Voltage measurement at the E-03 power window main switch connector.





(1) Disconnect the connector, and measure at the wiring harness side.

(2) Turn the ignition switch to the ON position.

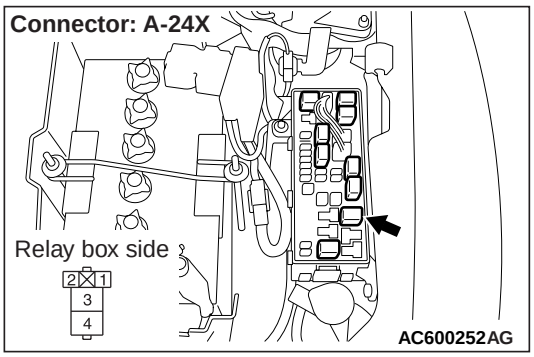


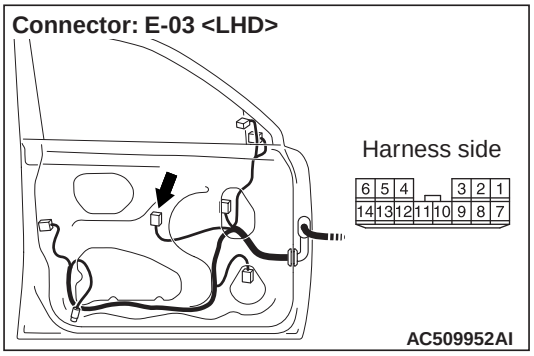
(3) Check the voltage between the E-03 power window relay connector terminal No.6 and body earth.

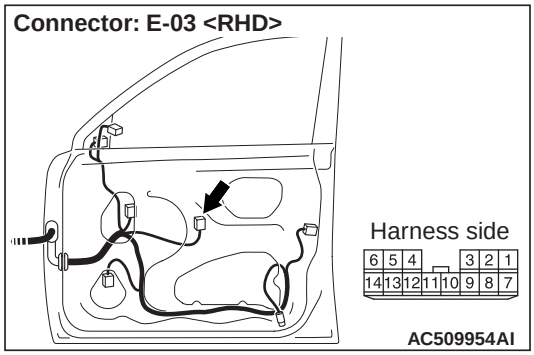
OK: System voltage

Q: Is the check result normal?
YES : Go to Step 15.
NO : Go to Step 14.

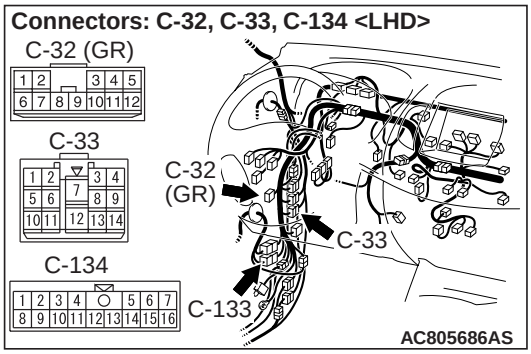
STEP 14. Check the wiring harness between A-24X power window relay connector terminal No.3 and E-03 power window main switch connector terminal No. 6.

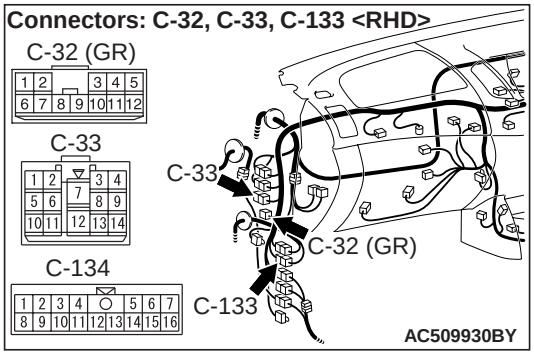






NOTE:





Prior to the wiring harness inspection, check intermediate connector C-33, C-134 and joint connector C-32, and repair if necessary.

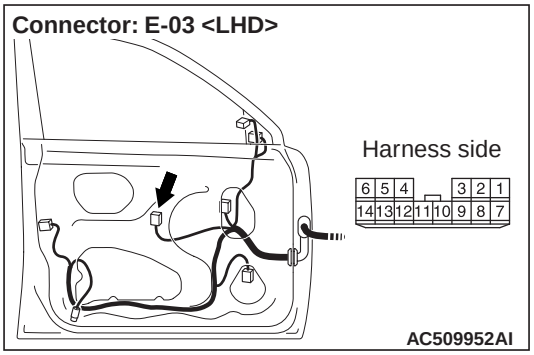
- Check the power supply line for open circuit.

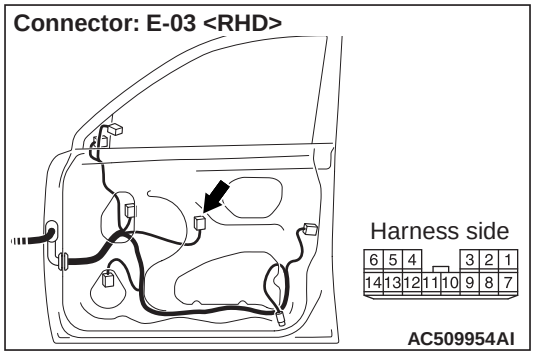
Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

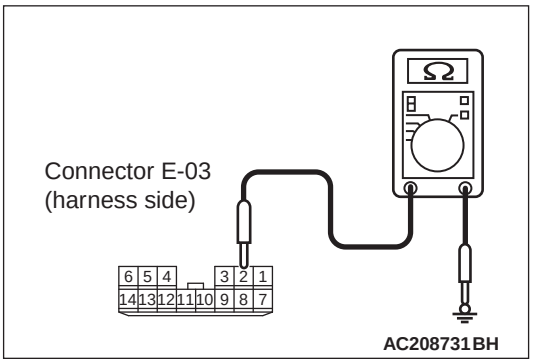
NO : Repair the harness wire.

STEP 15. Resistance measurement at the E-03 power window main switch connector.





(1) Disconnect the connector, and measure at the wiring harness side.

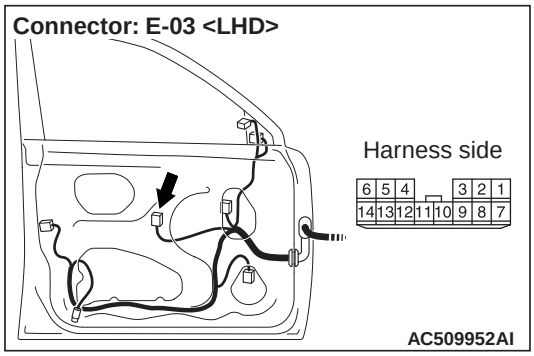


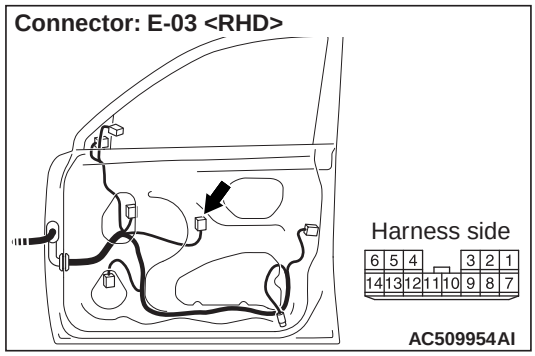
(2) Check the resistance between E-03 power window main switch connector terminal No.2 and body earth.

OK: Continuity exists (2 Ω or less)

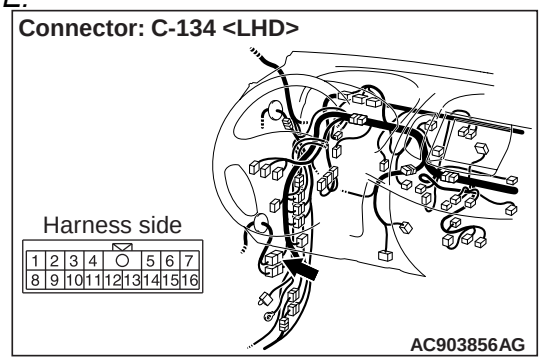
Q: Is the check result normal?
YES : Go to Step 17.
NO : Go to Step 16.

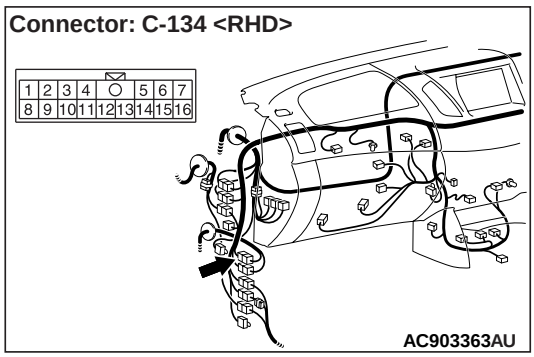
STEP 16. Check the wiring harness between E-03 power window main switch connector terminal No.2 and body earth.





NOTE:





Prior to the wiring harness inspection, check intermediate connector C-134, and repair if necessary.

- Check the earth wires for open circuit.

Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/inspection Service Points − How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness.

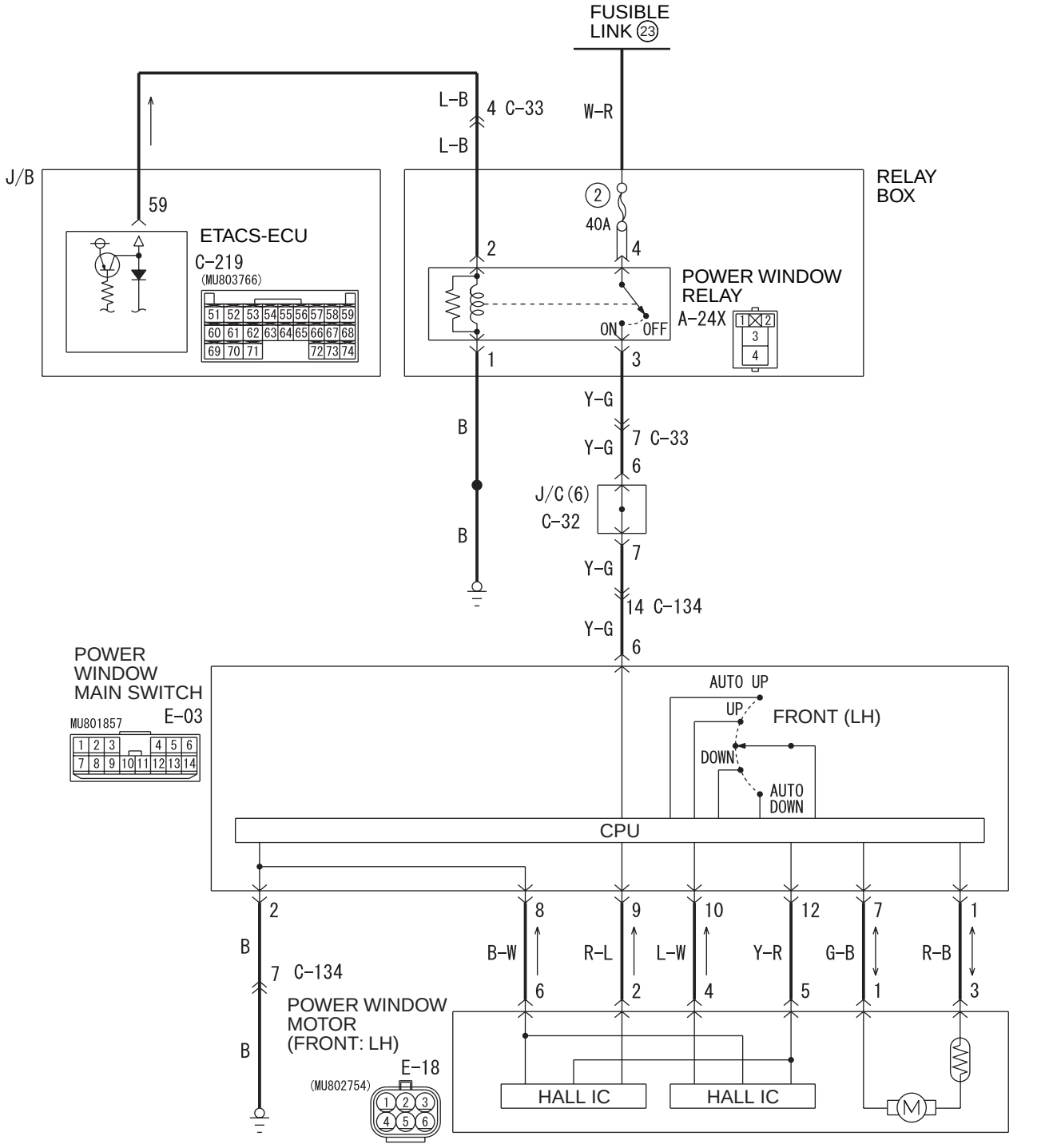
STEP 17. Retest the system.
(1) Replace the power window main switch.
(2) Check that the all the power windows works.

Q: Is the check result normal?
YES : The procedure is complete.
NO : Replace the ETACS-ECU and register the ID codes (Refer to GROUP 54A, How to Register Encrypted Code).

Inspection Procedure B-2: Driver's Power Window does not Work by means of the Power Window Main Switch. <LH drive vehicles>

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Power Window (LH) Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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COMMENTS ON TROUBLE SYMPTOM
If the driver's door power window does not work by means of the power window main switch, the power window main switch or the driver's door power window motor may be defective.

PROBABLE CAUSES
- Malfunction of the power window main switch
- Malfunction of the power window motor (front:LH)
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

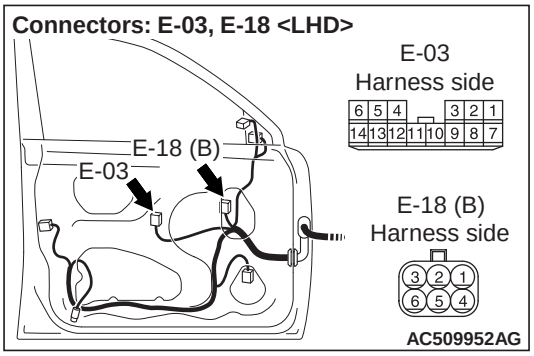
STEP 1. M.U.T.-III diagnosis code.
When the ignition switch is turned to the "ON" position, check that the ETACS-ECU does not set the diagnosis code.

Q: Is the diagnosis code set?
YES : Refer to P.42-64.
NO : Go to Step 2.

STEP 2. Check the power window main switch.
Check that all of the front passenger's power window and the rear power windows <Double cab> can operate by means of the power window main switch.

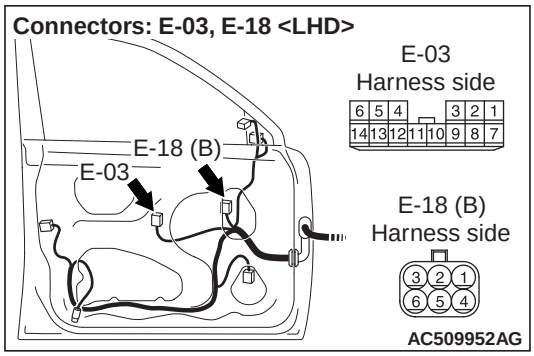
Q: Is the check result normal?
YES : Go to Step 3.
NO : Refer to P.42-186.

STEP 3. Connector check: Connector check: E-03 power window main switch connector and E-18 power window motor (front: LH) connector



Q: Is the check result normal?
YES : Go to Step 4.
NO : Repair the connector.

STEP 4. Check the wiring harness between E-03 power window main switch connector terminal Nos. 1, 7 and E-18 power window motor (front: LH) connector terminal Nos. 3, 1.



- Check the input and output lines for open and short circuit.

Q: Is the check result normal?
YES : Go to Step 5.
NO : Repair the wiring harness.

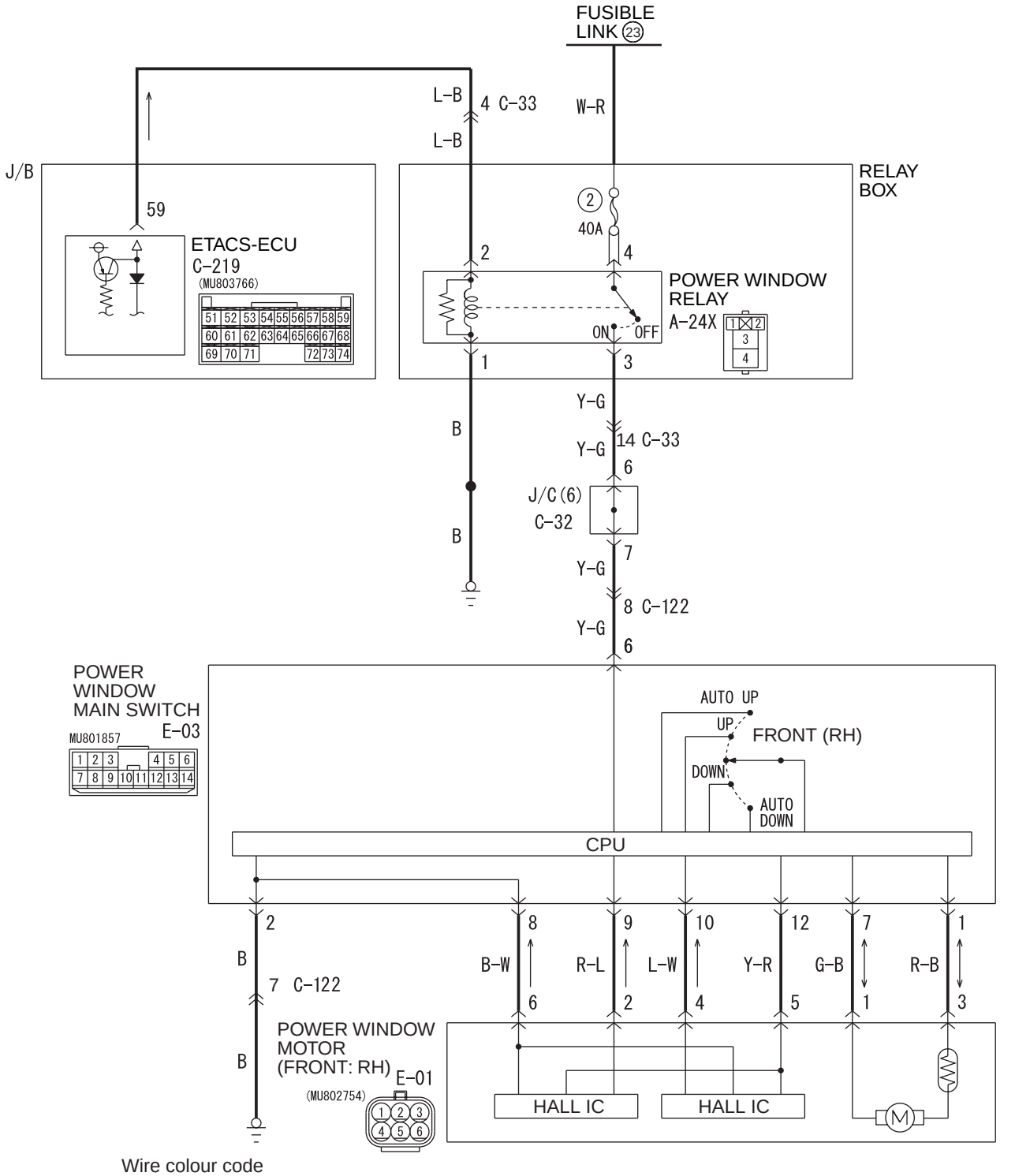
STEP 5. Retest the system.
(1) Replace the power window main switch.
(2) Check that the driver's power window works by means of the power window main switch.

Q: Is the check result normal?
YES : The procedure is complete.
NO : Replace the power window motor (front: LH).

Inspection Procedure B-3: Driver's Power Window does not Work by means of the Power Window Main Switch. <RH drive vehicles>

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Power Window (RH) Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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COMMENTS ON TROUBLE SYMPTOM

If the driver's door power window does not work by means of the power window main switch, the power window main switch or the driver's door power window motor may be defective.

PROBABLE CAUSES

- Malfunction of the power window main switch
- Malfunction of the power window motor (front: RH)
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

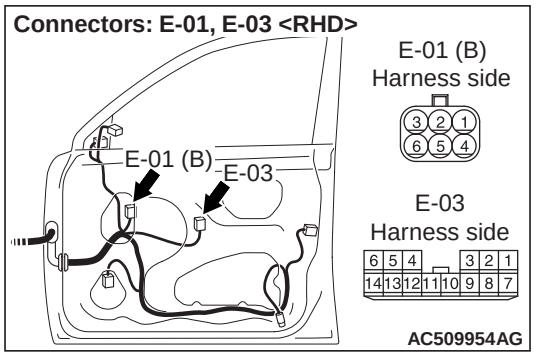
STEP 1. M.U.T.-III diagnosis code.
When the ignition switch is turned to the "ON" position, check that the ETACS-ECU does not set the diagnosis code.

Q: Is the diagnosis code set?
YES : Refer to P.42-64.
NO : Go to Step 2.

STEP 2. Check the power window main switch.
Check that all of the front passenger's power window and the rear power windows <Double cab> can operate by means of the power window main switch.

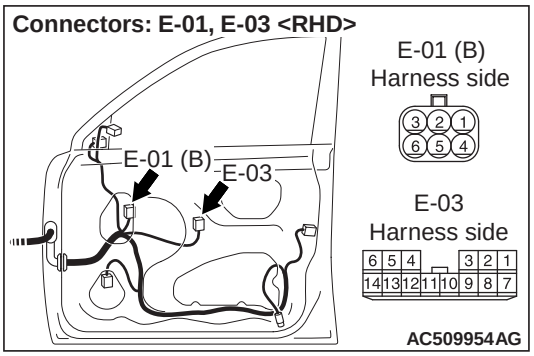
Q: Is the check result normal?
YES : Go to Step 3.
NO : Refer to P.42-186.

STEP 3. Connector check: Connector check: E-03 power window main switch connector and E-01 power window motor (front: RH) connector



Q: Is the check result normal?
YES : Go to Step 4.
NO : Repair the connector.

STEP 4. Check the wiring harness from E-03 power window main switch connector terminal Nos. 1, 7 and E-01 power window motor (front: RH) connector terminal Nos. 3, 1.



- Check the input and output lines for open and short circuit.

Q: Is the check result normal?
YES : Go to Step 5.
NO : Repair the wiring harness.

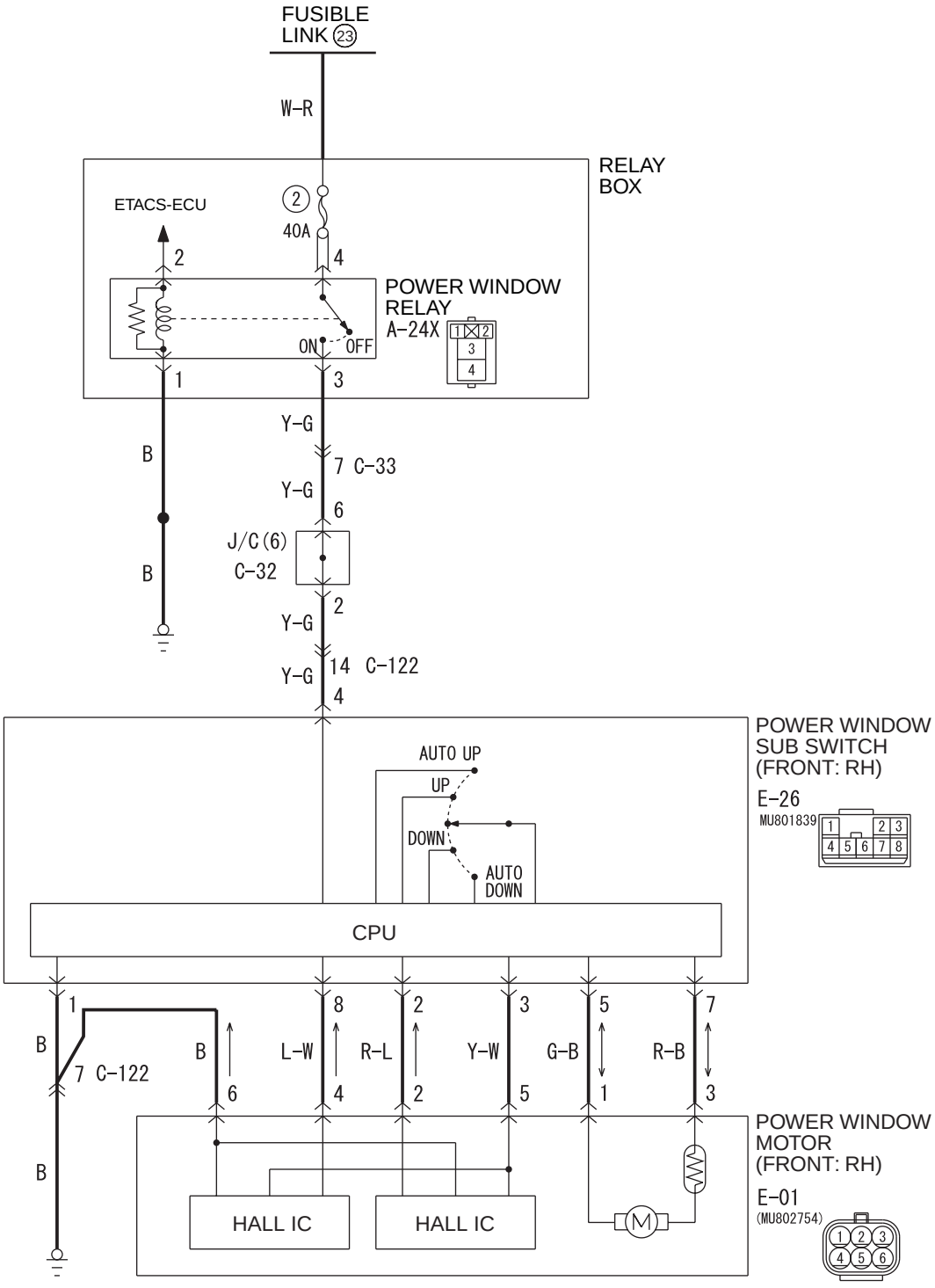
STEP 5. Retest the system.
(1) Replace the power window main switch.
(2) Check that the driver's power window works by means of the power window main switch.

Q: Is the check result normal?
YES : The procedure is complete.
NO : Replace the power window motor (front: RH).

Inspection Procedure B-4: Relevant Power Window(s) do not Work by means of the Front Passenger's Power Window Sub Switch and Rear Power Window Sub Switches. <LH drive vehicles>

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

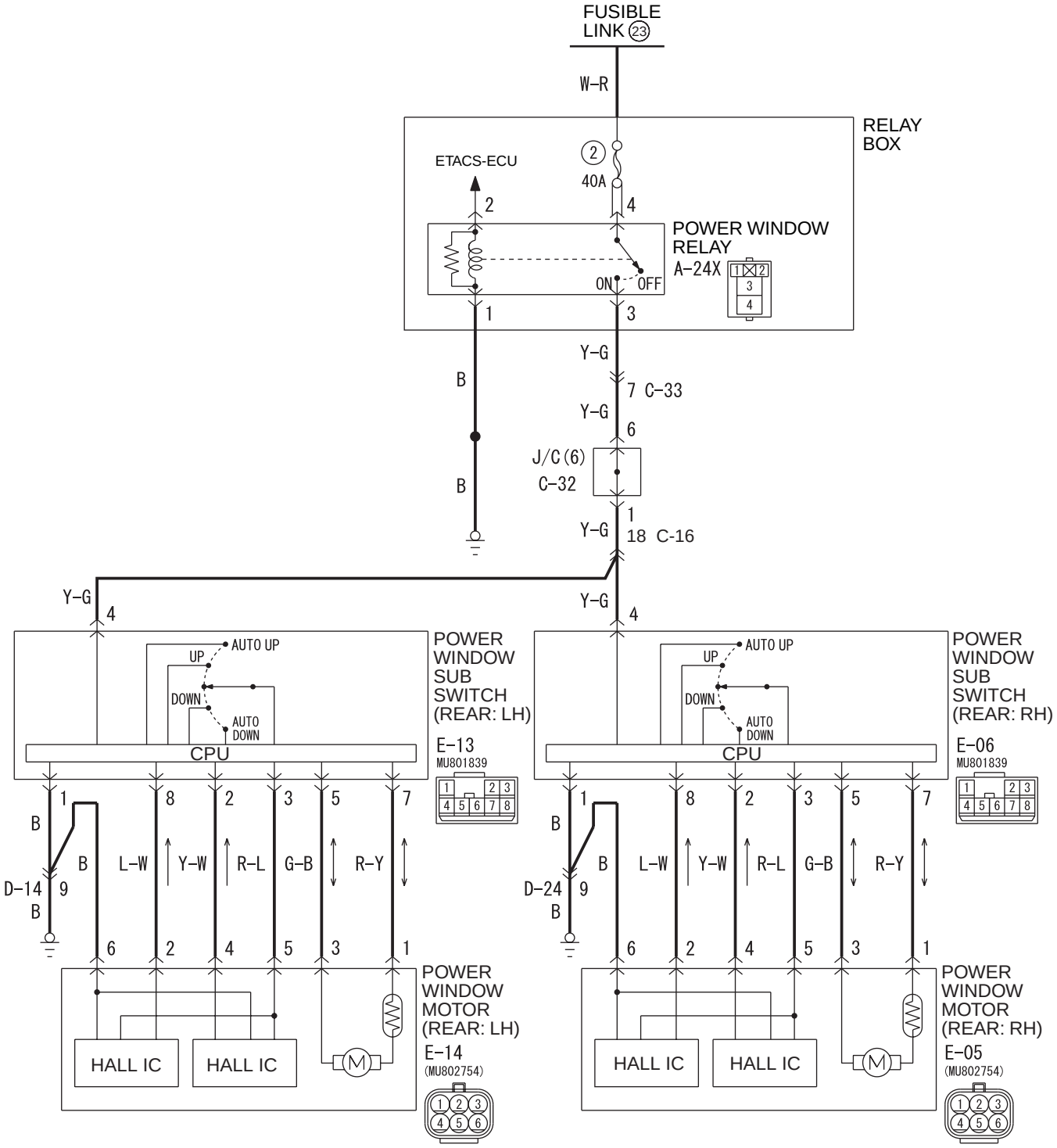
Power Window Sub Switch Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

AC900873AB

Power Window Sub Switch Circuit <Double Cab>



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

AC903704AB

COMMENTS ON TROUBLE SYMPTOM

If the front passenger's or rear power window <Double cab> does not work by means of the respective power window sub switch, the power window sub switch or the power window motor may be defective.

PROBABLE CAUSES

- Malfunction of the power window sub switch (front: RH), power window sub switch (rear: RH) or power window sub switch (rear: LH)

- Malfunction of the power window motor (front: RH), power window motor (rear: RH) or power window motor (rear: LH)
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. Check the power window main switch.
Check that the power window lock switch is turned off.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Turn off the power window lock switch.

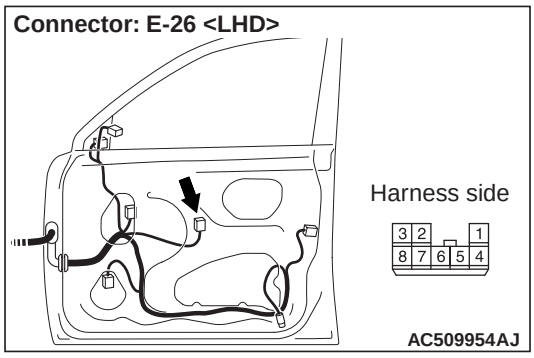
STEP 2. M.U.T.-III diagnosis code.
When the ignition switch is turned to the "ON" position, check that the ETACS-ECU does not set the diagnosis code.

Q: Is the diagnosis code set?
YES : Refer to P.42-64.
NO : Go to Step 3.

STEP 3. Determine a trouble spot.

Q: Which power window does not work?
Front passenger's door : Go to Step 4.
Rear right door <Double cab> : Go to Step 12.
Rear left door <Double cab> : Go to Step 20.

STEP 4. Connector check: E-26 power window sub switch (front: RH) connector

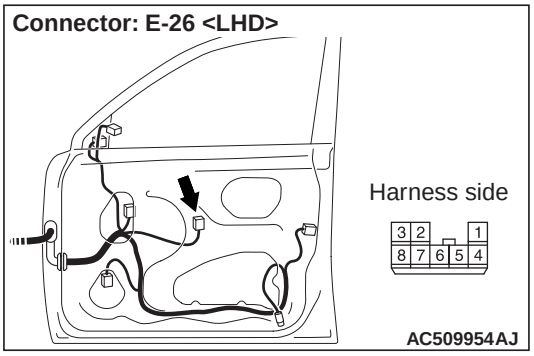


Q: Is the check result normal?
YES : Go to Step 5.
NO : Repair the connector.

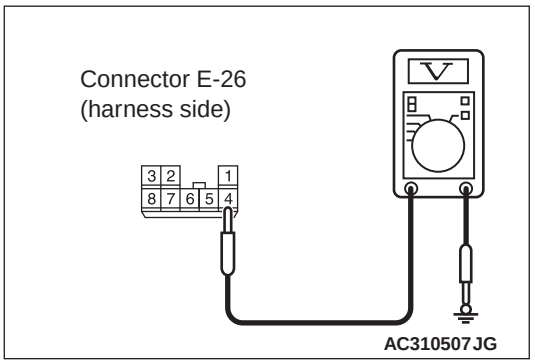
STEP 5. Check the power window sub switch (front: RH)
Check that the power window sub switch (front: RH) works normally. Refer to P.42-186.

Q: Is the check result normal?
YES : Go to Step 6.
NO : Replace the power window sub switch (front: RH).

STEP 6. Voltage measurement at the E-26 power window sub switch (front: RH) connector.



(1) Disconnect the connector, and measure at the wiring harness side.
(2) Turn the ignition switch to the ON position.

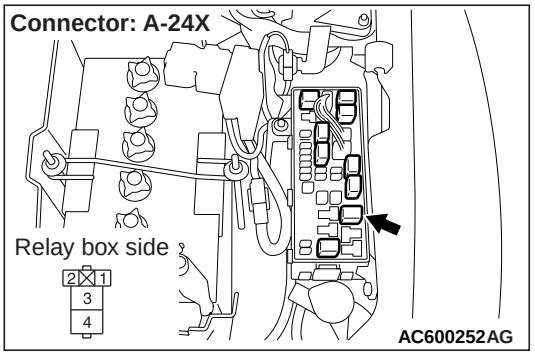


(3) Check the voltage between the E-26 power window sub switch (front: RH) connector terminal No.4 and body earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 9.
NO : Go to Step 7.

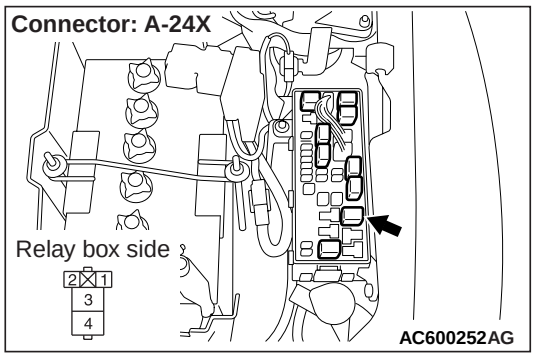
STEP 7. Connector check: A-24X power window relay connector

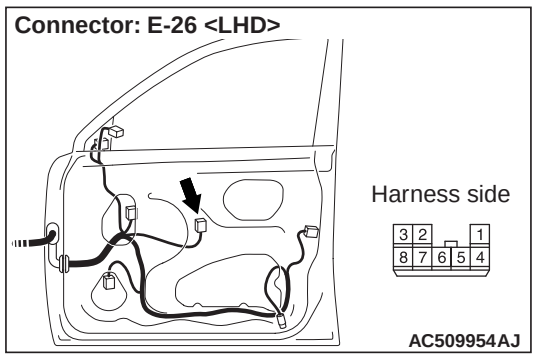


Q: Is the check result normal?

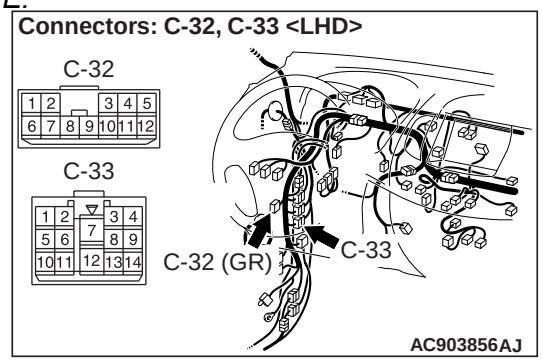
YES : Go to Step 8.
NO : Repair the connector.

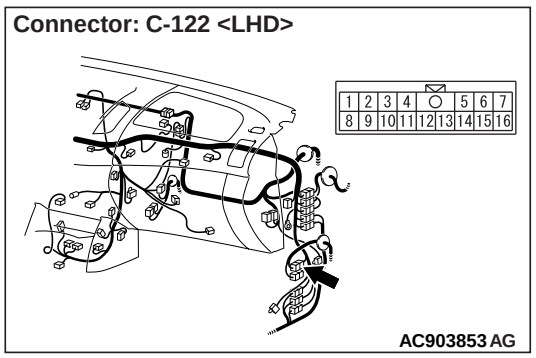
STEP 8. Check the wiring harness between E-26 power window sub switch (front: RH) connector terminal No.4 and A-24X power window relay connector terminal No.3.





NOTE:





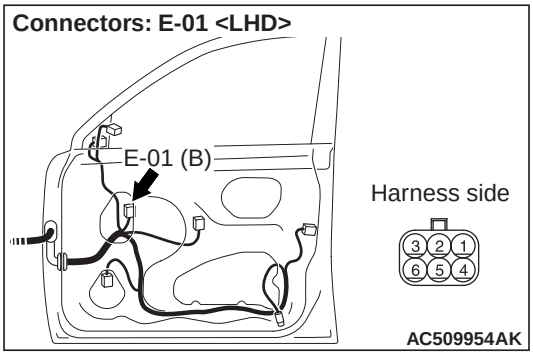
Prior to the wiring harness inspection, check intermediate connectors C-33, C-122 and joint connector C-32, and repair if necessary.

- Check the power supply line for open circuit.

Q: Is the check result normal?

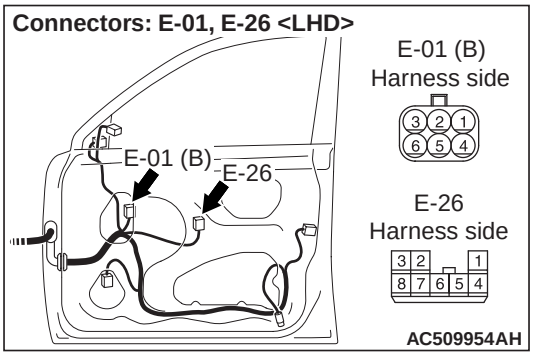
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/inspection Service Points − How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness.

STEP 9. Connector check: E-01 power window motor (front: RH) connector



Q: Is the check result normal?
YES : Go to Step 10.
NO : Repair the connector.

STEP 10. Check the wiring harness between E-01 power window motor (front: RH) connector terminal Nos. 1, 3 and E-26 power window sub switch (front: RH) connector terminal Nos. 5, 7.



- Check the input and output lines for open and short circuit.

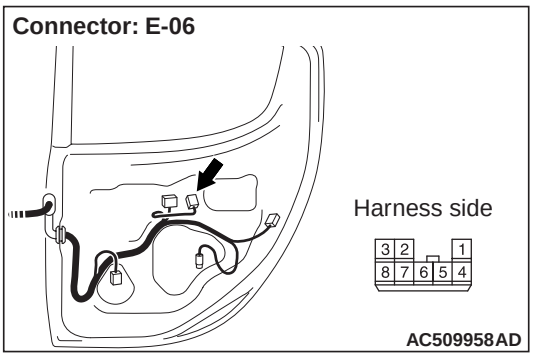
Q: Is the check result normal?
YES : Go to Step 11.
NO : Repair the wiring harness.

STEP 11. Retest the system.

(1) Replace the power window sub switch (front: RH).
(2) Check that the front passenger's door power window can be operated by the power window sub switch (front: RH).

Q: Is the check result normal?
YES : The procedure is complete.
NO : Replace the power window motor (front: RH).

STEP 12. Connector check: E-06 power window sub switch (rear: RH) connector



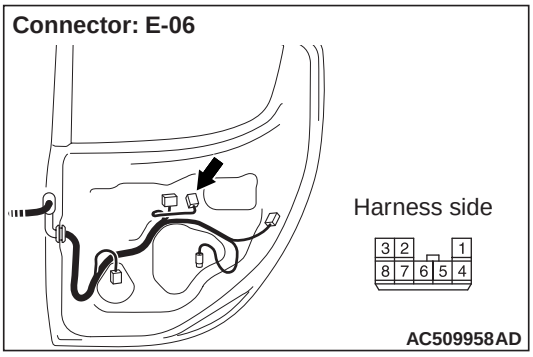
Q: Is the check result normal?
YES : Go to Step 13.
NO : Repair the connector.

STEP 13. Check the power window sub switch (rear: RH)

Check that the power window sub switch (rear: RH) works normally. Refer to P.42-186.

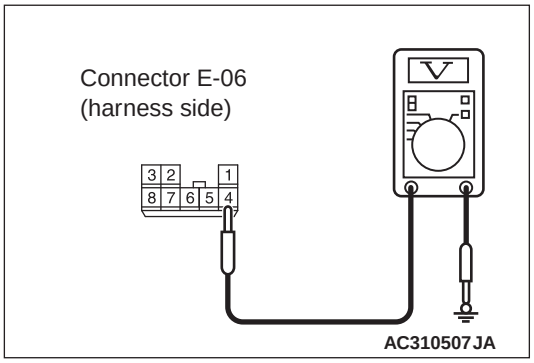
Q: Is the check result normal?
YES : Go to Step 14.
NO : Replace the power window sub switch (rear: RH).

STEP 14. Voltage measurement at the E-06 power window sub switch (rear: RH) connector.



(1) Disconnect the connector, and measure at the wiring harness side.

(2) Turn the ignition switch to the ON position.

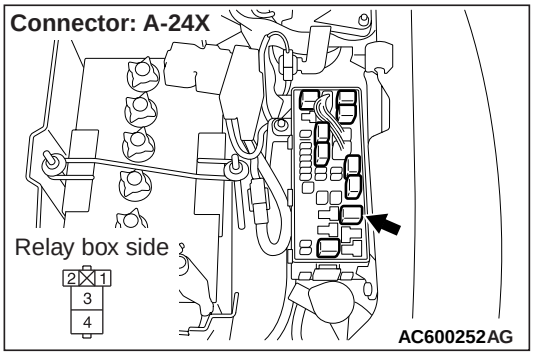


(3) Check the voltage between the E-06 power window sub switch (rear: RH) connector terminal No.4 and body earth.

OK: System voltage

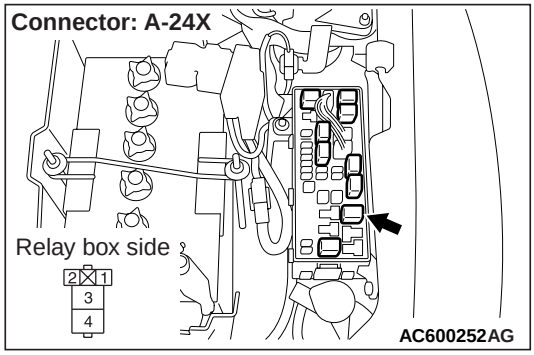
Q: Is the check result normal?
YES : Go to Step 17.
NO : Go to Step 15.

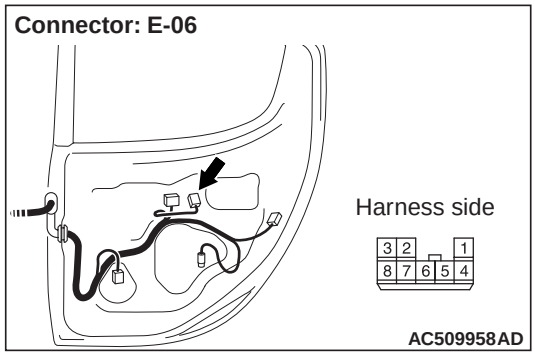
STEP 15. Connector check: A-24X power window relay connector



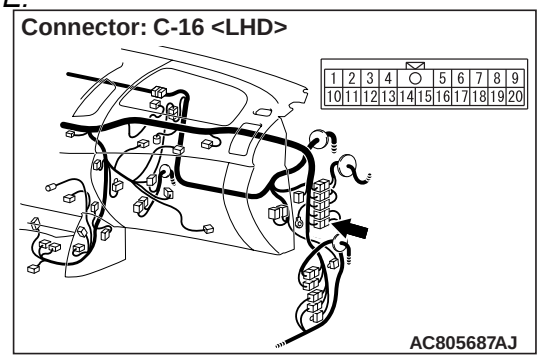
Q: Is the check result normal?
YES : Go to Step 16.
NO : Repair the connector.

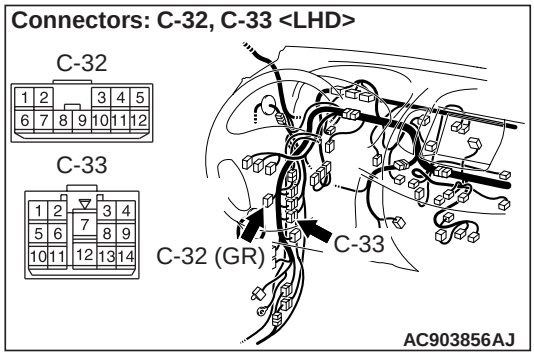
STEP 16. Check the wiring harness between E-06 power window sub switch (rear: RH) connector terminal No.4 and A-24X power window relay connector terminal No.3.





NOTE:





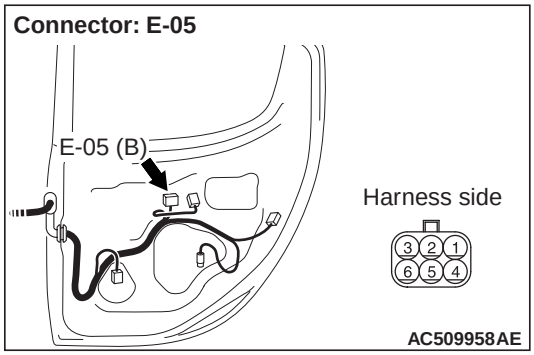
Prior to the wiring harness inspection, check intermediate connectors C-16, C-33 and joint connector C-32, and repair if necessary.

- Check the power supply line for open circuit.

Q: Is the check result normal?

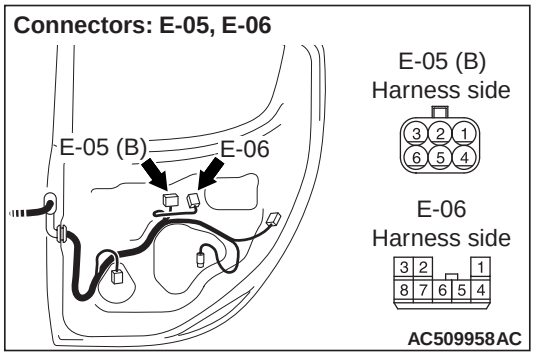
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/inspection Service Points − How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness.

STEP 17. Connector check: E-05 power window motor (rear: RH) connector



Q: Is the check result normal?
YES : Go to Step 18.
NO : Repair the connector.

STEP 18. Check the wiring harness between E-05 power window motor (rear: RH) connector terminal Nos. 1, 3 and E-06 power window sub switch (rear: RH) connector terminal Nos. 7, 5.



- Check the input and output lines for open and short circuit.

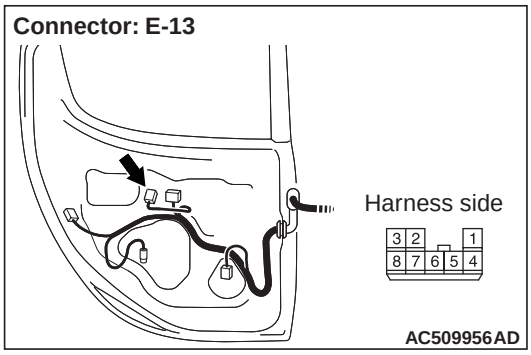
Q: Is the check result normal?
YES : Go to Step 19.
NO : Repair the wiring harness.

STEP 19. Retest the system.

(1) Replace the power window sub switch (rear: RH).
(2) Check that the rear door power window can be operated by the power window sub switch (rear: RH).

Q: Is the check result normal?
YES : The procedure is complete.
NO : Replace the power window motor (rear: RH).

STEP 20. Connector check: E-13 power window sub switch (rear: LH) connector



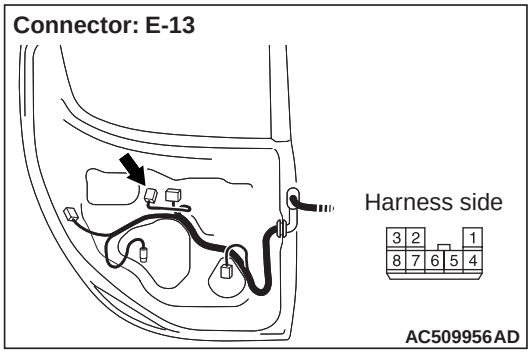
Q: Is the check result normal?
YES : Go to Step 21.
NO : Repair the connector.

STEP 21. Check the power window sub switch (rear: LH)

Check that the power window sub switch (rear: LH) works normally. Refer to P.42-186.

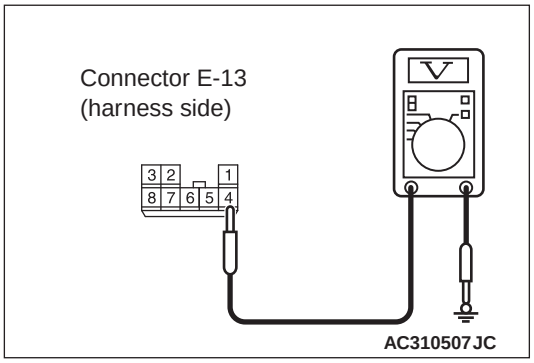
Q: Is the check result normal?
YES : Go to Step 22.
NO : Replace the power window sub switch (rear: LH).

STEP 22. Voltage measurement at the E-13 power window sub switch (rear: LH) connector.



(1) Disconnect the connector, and measure at the wiring harness side.

(2) Turn the ignition switch to the ON position.

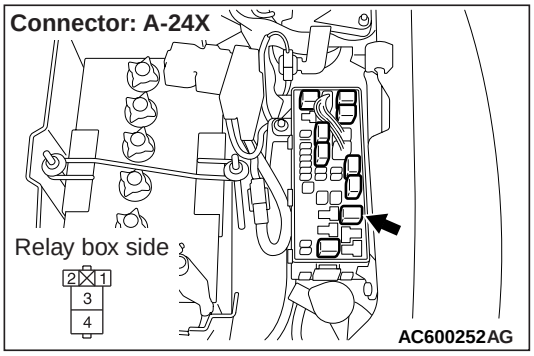


(3) Check the voltage between the E-13 power window sub switch (rear: LH) connector terminal No.4 and body earth.

OK: System voltage

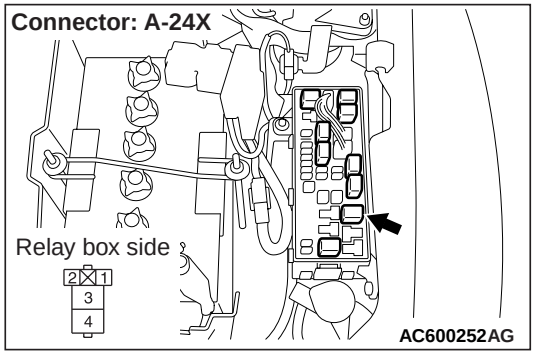
Q: Is the check result normal?
YES : Go to Step 25.
NO : Go to Step 23.

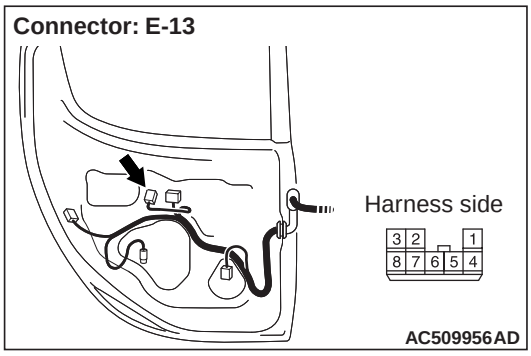
STEP 23. Connector check: A-24X power window relay connector



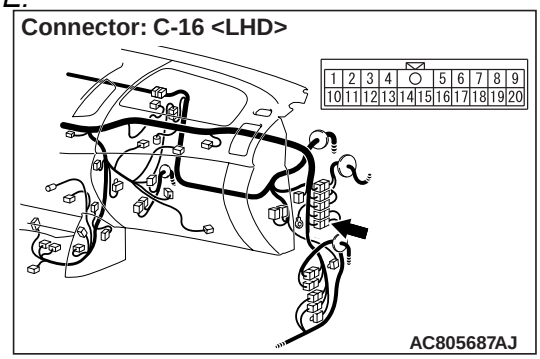
Q: Is the check result normal?
YES : Go to Step 24.
NO : Repair the connector.

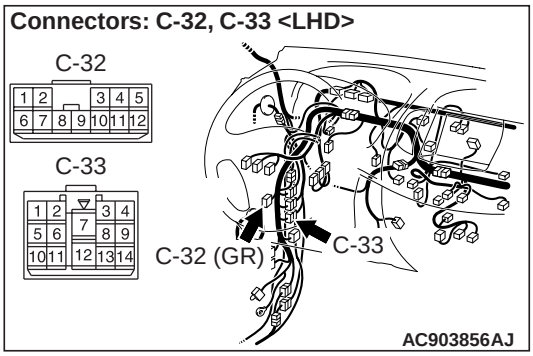
STEP 24. Check the wiring harness between E-13 power window sub switch (rear: LH) connector terminal No.4 and A-24X power window relay connector terminal No.3.





NOTE:





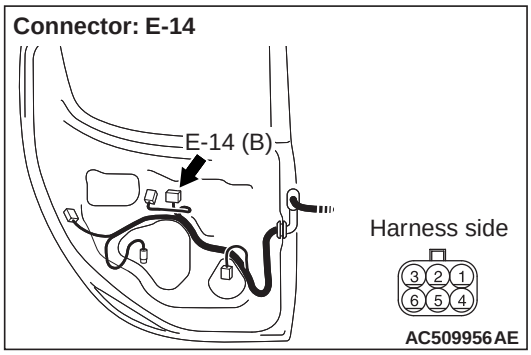
Prior to the wiring harness inspection, check intermediate connectors C-16, C-33 and joint connector C-32, and repair if necessary.

- Check the power supply line for open circuit.

Q: Is the check result normal?

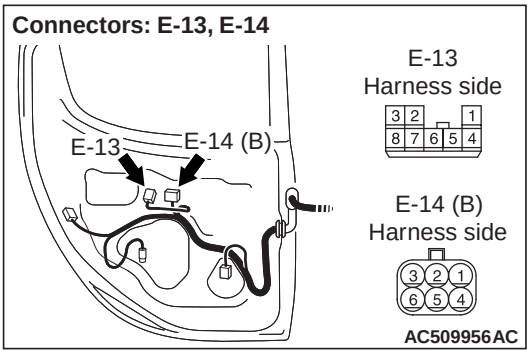
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/inspection Service Points − How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness.

STEP 25. Connector check: E-14 power window motor (rear: LH) connector



Q: Is the check result normal?
YES : Go to Step 26.
NO : Repair the connector.

STEP 26. Check the wiring harness between E-14 power window motor (rear: RH) connector terminal Nos. 1, 3 and E-13 power window sub switch (rear: LH) connector terminal Nos. 7, 5.



- Check the input and output lines for open and short circuit.

Q: Is the check result normal?
YES : Go to Step 27.
NO : Repair the wiring harness.

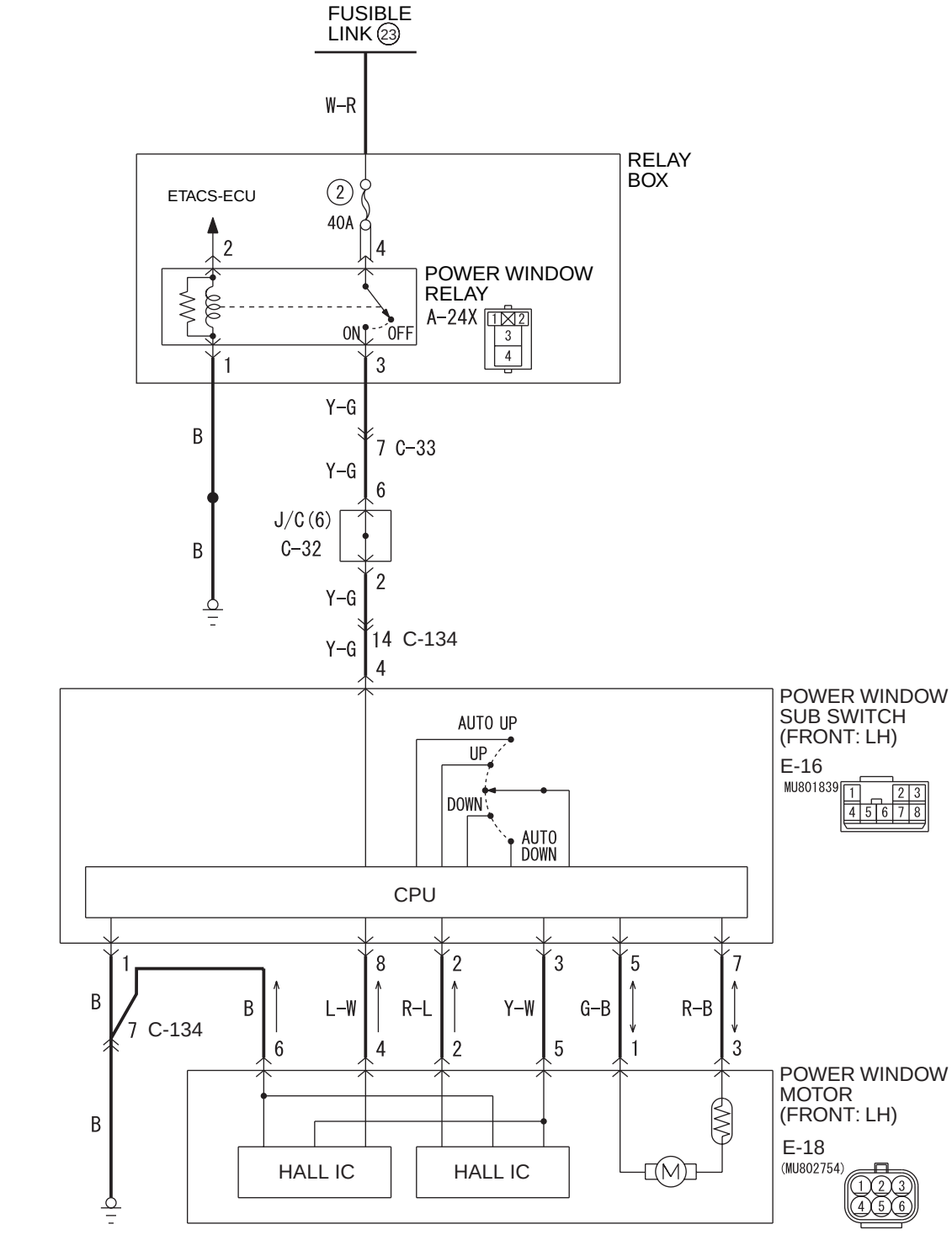
STEP 27. Retest the system.
(1) Replace the power window sub switch (rear: LH).
(2) Check that the rear door power window can be operated by the power window sub switch (rear: LH).

Q: Is the check result normal?
YES : The procedure is complete.
NO : Replace the power window motor (rear: LH).

Inspection Procedure B-5: Relevant Power Window(s) do not Work by means of the Front Passenger's Power Window Sub Switch and Rear Power Window Sub Switches. <RH drive vehicles>

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Power Window Sub Switch Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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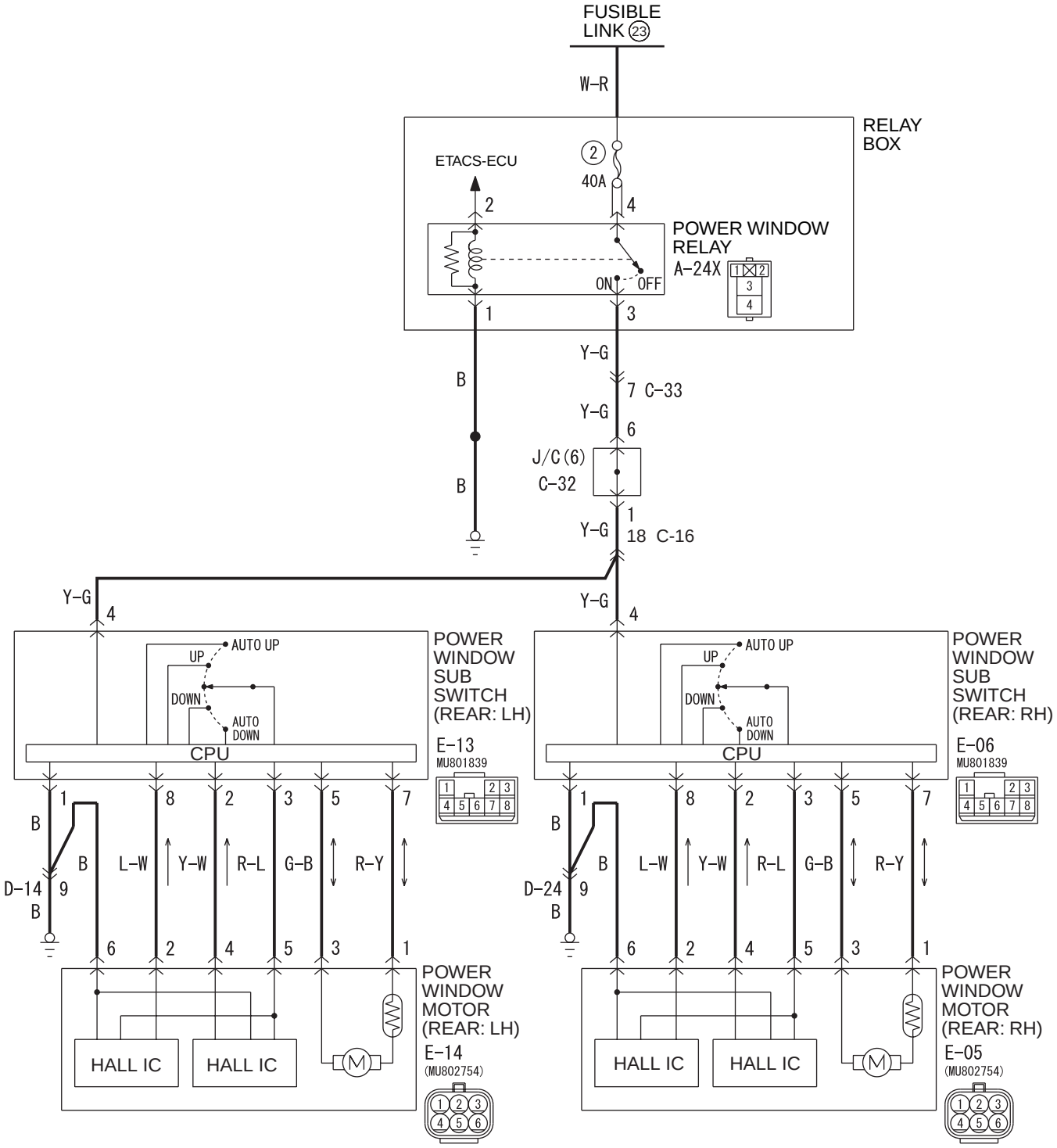
Power Window Sub Switch Circuit <Double Cab>



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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COMMENTS ON TROUBLE SYMPTOM

If the front passenger's or rear power window <Double cab> does not work by means of the respective power window sub switch, the power window sub switch or the power window motor may be defective.

PROBABLE CAUSES

- Malfunction of the power window sub switch (front: LH), power window sub switch (rear: RH) or power window sub switch (rear: LH)

- Malfunction of the power window motor (front: LH), power window motor (rear: RH) or power window motor (rear: LH)
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. Check the power window main switch.
Check that the power window lock switch is turned off.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Turn off the power window lock switch.

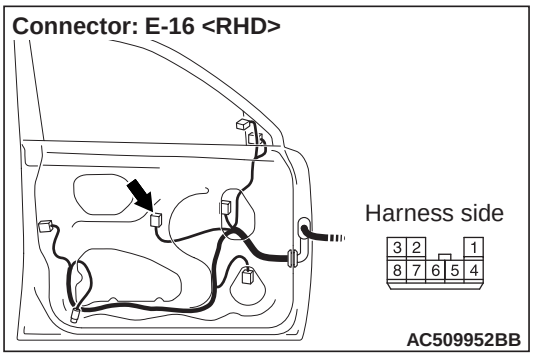
STEP 2. M.U.T.-III diagnosis code.
When the ignition switch is turned to the "ON" position, check that the ETACS-ECU does not set the diagnosis code.

Q: Is the diagnosis code set?
YES : Refer to P.42-64.
NO : Go to Step 3.

STEP 3. Determine a trouble spot.

Q: Which power window does not work?
Front passenger's door : Go to Step 4.
Rear right door <Double cab> : Go to Step 12.
Rear left door <Double cab> : Go to Step 20.

STEP 4. Connector check: E-16 power window sub switch (front: LH) connector

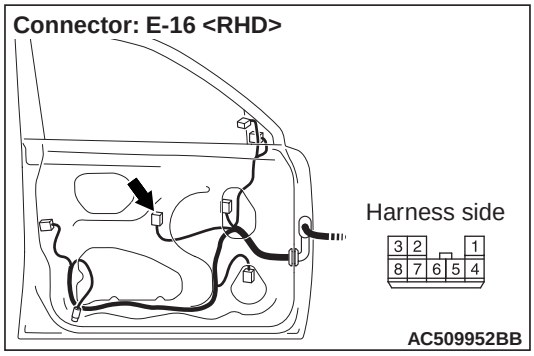


Q: Is the check result normal?
YES : Go to Step 5.
NO : Repair the connector.

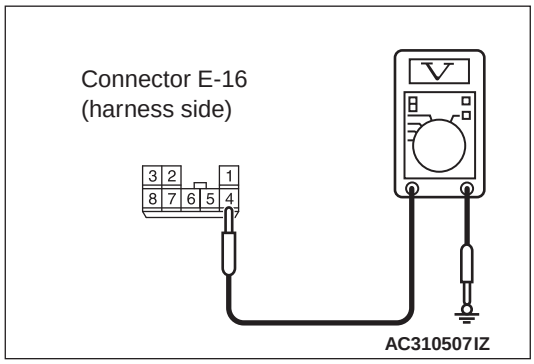
STEP 5. Check the power window sub switch (front: LH)
Check that the power window sub switch (front: LH) works normally. Refer to P.42-186.

Q: Is the check result normal?
YES : Go to Step 6.
NO : Replace the power window sub switch (front: LH).

STEP 6. Voltage measurement at the E-16 power window sub switch (front: LH) connector.



(1) Disconnect the connector, and measure at the wiring harness side.
(2) Turn the ignition switch to the ON position.

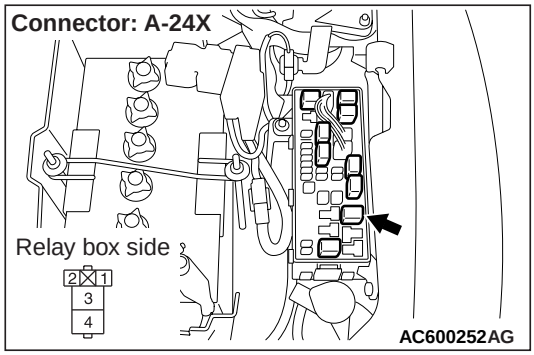


(3) Check the voltage between the E-16 power window sub switch (front: LH) connector terminal No.4 and body earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 9.
NO : Go to Step 7.

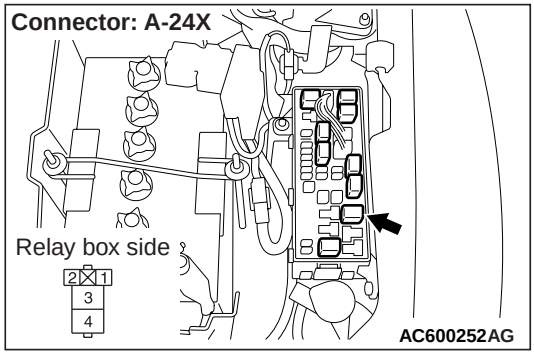
STEP 7. Connector check: A-24X power window relay connector

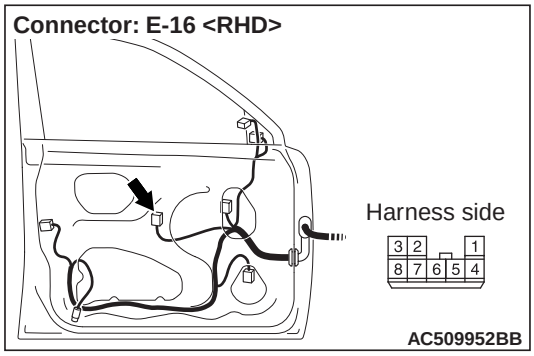


Q: Is the check result normal?

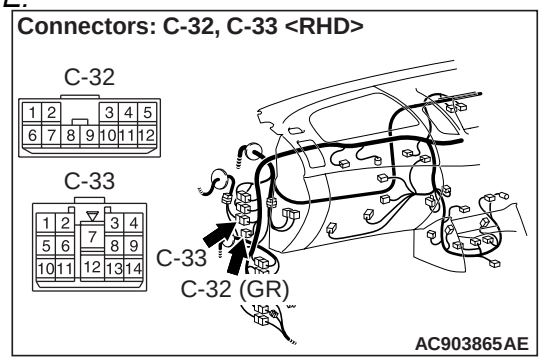
YES : Go to Step 8.
NO : Repair the connector.

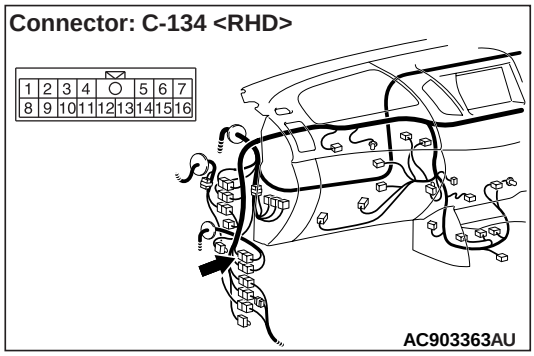
STEP 8. Check the wiring harness between E-16 power window sub switch (front: LH) connector terminal No.4 and A-24X power window relay connector terminal No.3.





NOTE:





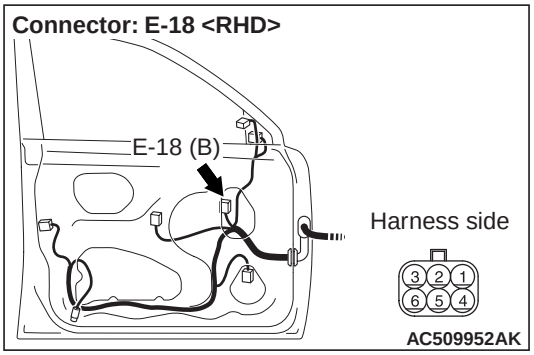
Prior to the wiring harness inspection, check intermediate connectors C-33, C-134 and joint connector C-32, and repair if necessary.

- Check the power supply line for open circuit.

Q: Is the check result normal?

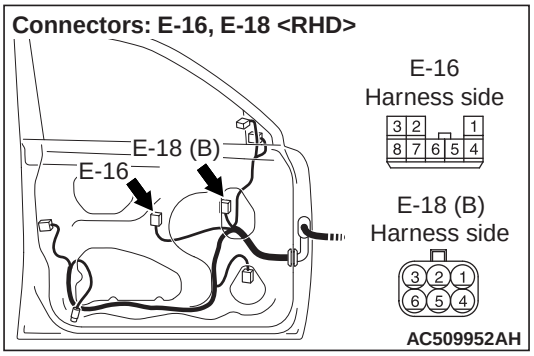
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness.

STEP 9. Connector check: E-18 power window motor (front: LH) connector



Q: Is the check result normal?
YES : Go to Step 10.
NO : Repair the connector.

STEP 10. Check the wiring harness between E-18 power window motor (front: LH) connector terminal Nos. 1, 3 and E-16 power window sub switch (front: LH) connector terminal Nos. 5, 7.



- Check the input and output lines for open and short circuit.

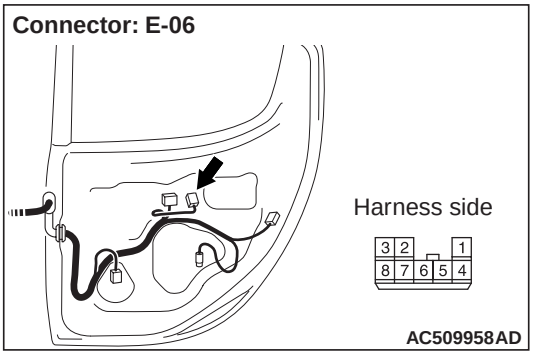
Q: Is the check result normal?
YES : Go to Step 11.
NO : Repair the wiring harness.

STEP 11. Retest the system.

(1) Replace the power window sub switch (front: LH).
(2) Check that the front passenger's door power window can be operated by the power window sub switch (front: LH).

Q: Is the check result normal?
YES : The procedure is complete.
NO : Replace the power window motor (front: LH).

STEP 12. Connector check: E-06 power window sub switch (rear: RH) connector



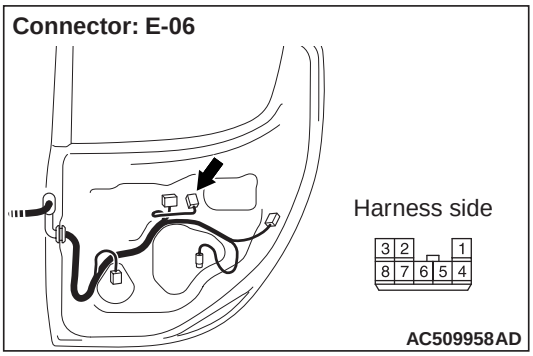
Q: Is the check result normal?
YES : Go to Step 13.
NO : Repair the connector.

STEP 13. Check the power window sub switch (rear: RH)

Check that the power window sub switch (rear: RH) works normally. Refer to P.42-186.

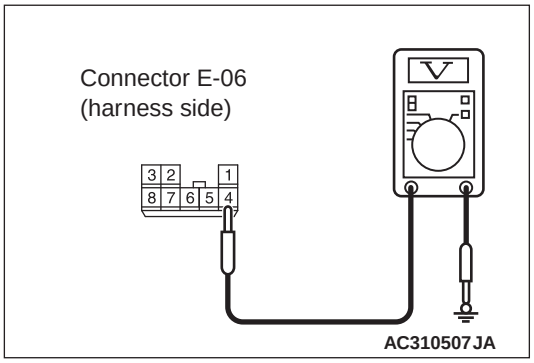
Q: Is the check result normal?
YES : Go to Step 14.
NO : Replace the power window sub switch (rear: RH).

STEP 14. Voltage measurement at the E-06 power window sub switch (rear: RH) connector.



(1) Disconnect the connector, and measure at the wiring harness side.

(2) Turn the ignition switch to the ON position.

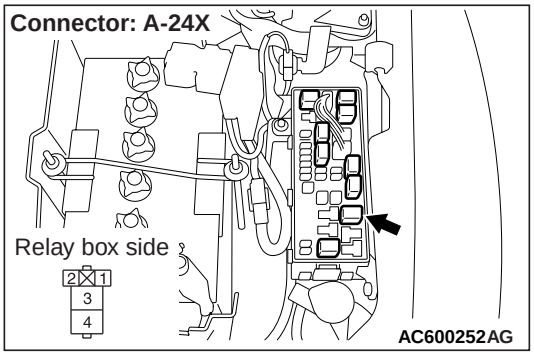


(3) Check the voltage between the E-06 power window sub switch (rear: RH) connector terminal No.4 and body earth.

OK: System voltage

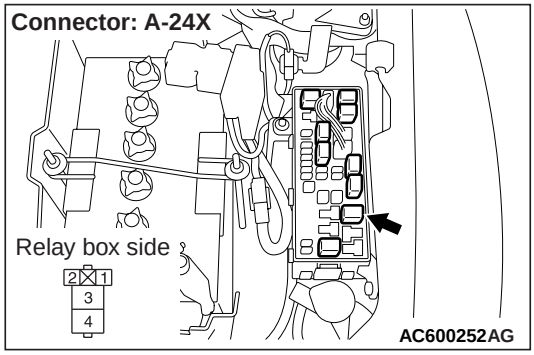
Q: Is the check result normal?
YES : Go to Step 17.
NO : Go to Step 15.

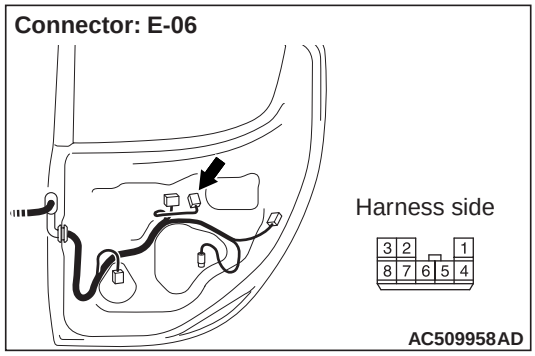
STEP 15. Connector check: A-24X power window relay connector



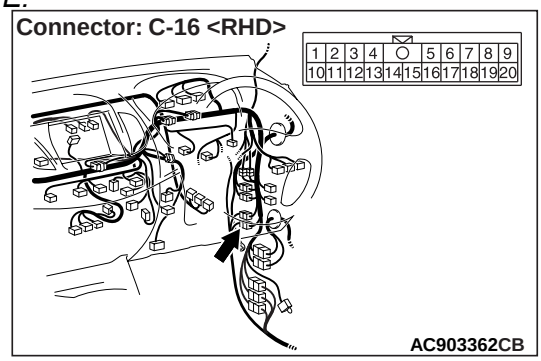
Q: Is the check result normal?
YES : Go to Step 16.
NO : Repair the connector.

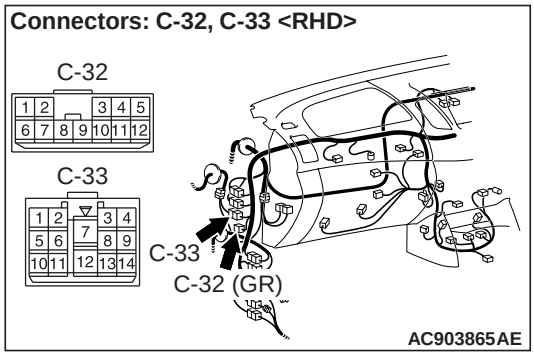
STEP 16. Check the wiring harness between E-06 power window sub switch (rear: RH) connector terminal No.4 and A-24X power window relay connector terminal No.3.





NOTE:





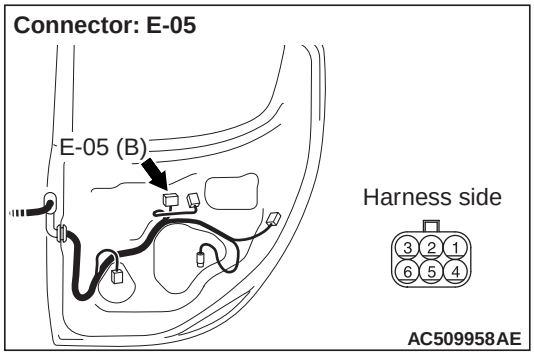
Prior to the wiring harness inspection, check intermediate connectors C-16, C-33 and joint connector C-32, and repair if necessary.

- Check the power supply line for open circuit.

Q: Is the check result normal?

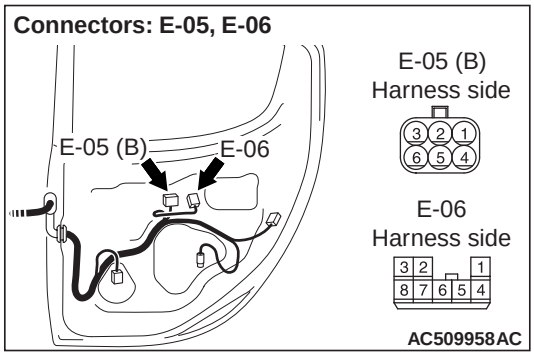
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/inspection Service Points − How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness.

STEP 17. Connector check: E-05 power window motor (rear: RH) connector



Q: Is the check result normal?
YES : Go to Step 18.
NO : Repair the connector.

STEP 18. Check the wiring harness between E-05 power window motor (rear: RH) connector terminal Nos. 1, 3 and E-06 power window sub switch (rear: RH) connector terminal Nos. 7, 5.



- Check the input and output lines for open and short circuit.

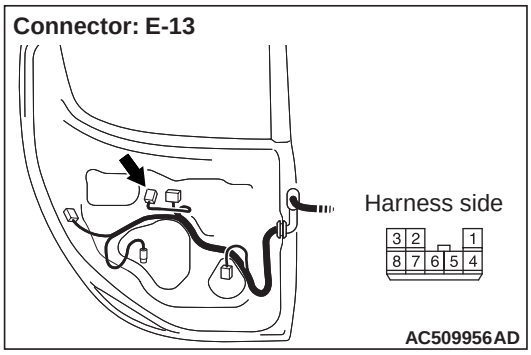
Q: Is the check result normal?
YES : Go to Step 19.
NO : Repair the wiring harness.

STEP 19. Retest the system.

(1) Replace the power window sub switch (rear: RH).
(2) Check that the rear door power window can be operated by the power window sub switch (rear: RH).

Q: Is the check result normal?
YES : The procedure is complete.
NO : Replace the power window motor (rear: RH).

STEP 20. Connector check: E-13 power window sub switch (rear: LH) connector



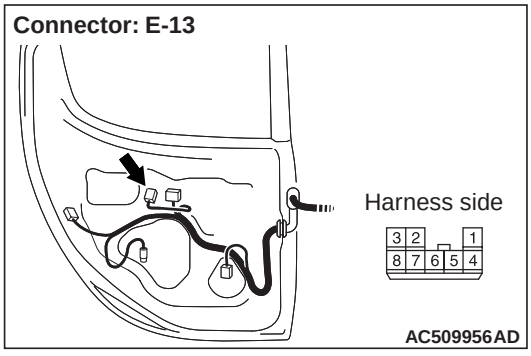
Q: Is the check result normal?
YES : Go to Step 21.
NO : Repair the connector.

STEP 21. Check the power window sub switch (rear: LH)

Check that the power window sub switch (rear: LH) works normally. Refer to P.42-186.

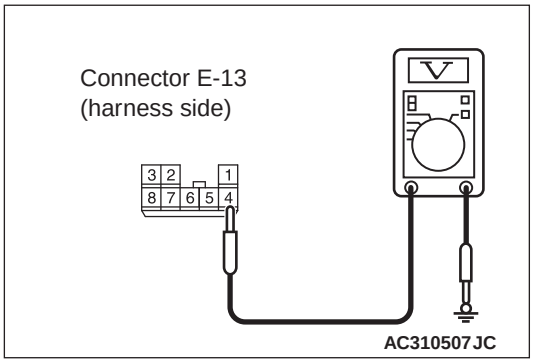
Q: Is the check result normal?
YES : Go to Step 22.
NO : Replace the power window sub switch (rear: LH).

STEP 22. Voltage measurement at the E-13 power window sub switch (rear: LH) connector.



(1) Disconnect the connector, and measure at the wiring harness side.

(2) Turn the ignition switch to the ON position.

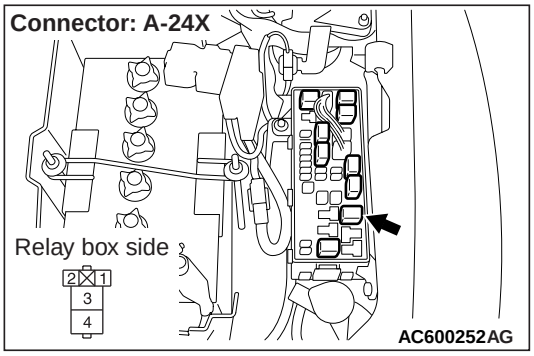


(3) Check the voltage between the E-13 power window sub switch (rear: LH) connector terminal No.4 and body earth.

OK: System voltage

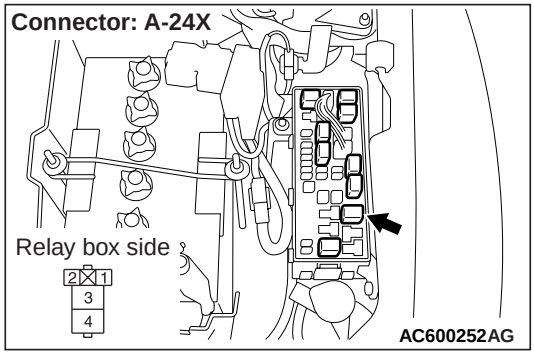
Q: Is the check result normal?
YES : Go to Step 25.
NO : Go to Step 23.

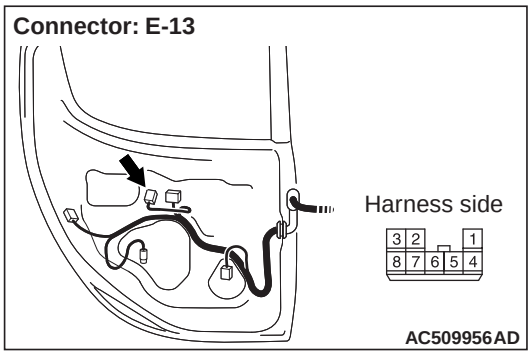
STEP 23. Connector check: A-24X power window relay connector



Q: Is the check result normal?
YES : Go to Step 24.
NO : Repair the connector.

STEP 24. Check the wiring harness between E-13 power window sub switch (rear: LH) connector terminal No.4 and A-24X power window relay connector terminal No.3.





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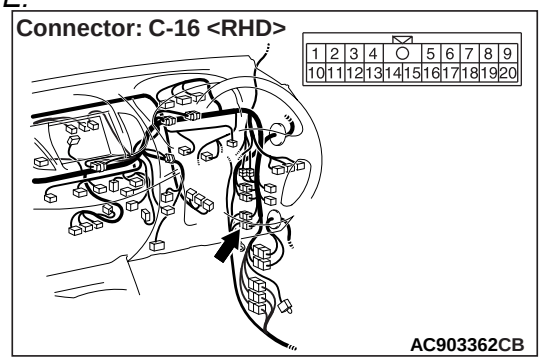
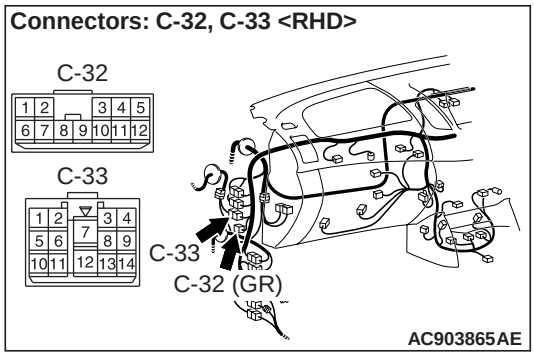




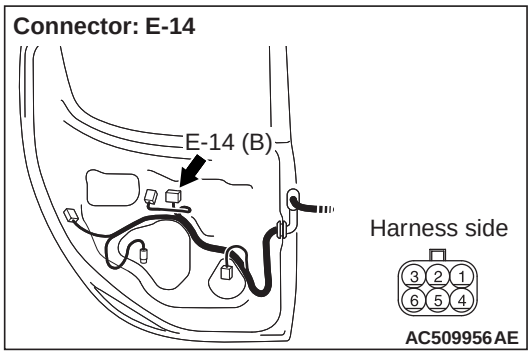
Prior to the wiring harness inspection, check intermediate connectors C-16, C-33 and joint connector C-32, and repair if necessary.

- Check the power supply line for open circuit.

Q: Is the check result normal?

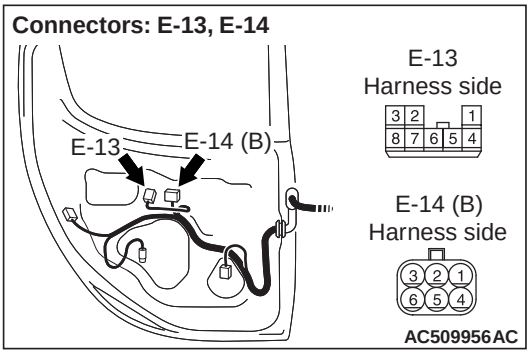
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness.

STEP 25. Connector check: E-14 power window motor (rear: LH) connector



Q: Is the check result normal?
YES : Go to Step 26.
NO : Repair the connector.

STEP 26. Check the wiring harness between E-14 power window motor (rear: LH) connector terminal Nos. 1, 3 and E-13 power window sub switch (rear: LH) connector terminal Nos. 7, 5.



- Check the input and output lines for open and short circuit.

Q: Is the check result normal?
YES : Go to Step 27.
NO : Repair the wiring harness.

STEP 27. Retest the system.
(1) Replace the power window sub switch (rear: LH).
(2) Check that the rear door power window can be operated by the power window sub switch (rear: LH).

Q: Is the check result normal?
YES : The procedure is complete.
NO : Replace the power window motor (rear: LH).

Inspection Procedure B-6: Front Passenger's and /or Rear Power Window do not Work by means of the Power Window Main Switch.

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

COMMENTS ON TROUBLE SYMPTOM
If the passenger's and/or rear power window <Double cab> does not work by means of the power window main switch, the power window main switch or the respective power window sub switch(es) may be defective.

PROBABLE CAUSES
- Malfunction of the power window main switch
- Malfunction of the power window sub switch (front: RH), power window sub switch (rear: RH) or power window sub switch (rear: LH)
- Malfunction of the ETACS-ECU
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. Check the power window main switch.
Check that the driver's power window works by means of the power window main switch.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Refer to P.42-65.

STEP 2. Check the power window sub switch.
Check that each power window works by means of the respective power window sub switch when the power window lock switch is turned off.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Refer to P.42-65.

STEP 3. Check the power supply circuit.
When the ignition switch is turned to the LOCK (OFF) position, check if the hazard warning lamps illuminate.

Q: Is the check result normal?
YES : Go to Step 4.
NO : Refer to GROUP 54A, Inspection Procedure A-1 "Check the battery power supply circuit to the ETACS-ECU" .

STEP 4. M.U.T.-III diagnosis code.
When the ignition switch is turned to the "ON" position, check that the ETACS-ECU does not set the diagnosis code.

Q: Is the diagnosis code set?
YES : GROUP 54B, Diagnosis Code Chart (Refer to).
NO : Go to Step 5.

STEP 5. Retest the system.
Check that the front passenger's and/or rear power window operate with the power window main switch.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Replace the power window main switch.

Inspection procedure B-7: Power Window Timer Function does not Work Normally.

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

COMMENTS ON TROUBLE SYMPTOM
If the power window timer function does not work, the input circuit from the ignition switch (IG1) or the driver's door switch, the communication lines between the ETACS-ECU and the power window main switch, the power window main switch or the ETACS-ECU may be defective.

PROBABLE CAUSES
- Malfunction of ETACS-ECU
- Malfunction of the power window main switch
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. Check the power window main switch.
Check that all of the front passenger's and rear door <Double cab> power windows can operate by means of the power window main switch.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Refer to P.42-65."

STEP 2. Check the power supply circuit.
When the ignition switch is turned to the LOCK (OFF) position, check if the hazard warning lamps illuminate.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Refer to GROUP 54A, Inspection Procedure A-1 "Check The Battery Power Supply Circuit to The ETACS-ECU ."

STEP 3. M.U.T.-III data list
Check the input signals below, which are related to the power window timer function.
- Ignition switch: OFF
- Drive's door: Open

Item No.	Item name	Normal condition
19	Driver's door switch	ON
30	Ignition switch (IG1)	OFF

OK: Normal conditions are displayed for all the items.

Q: Is the check result normal?
YES (All the signals are received normally.) : Go to Step 4.
NO (The driver's door switch signal is not received.) : Refer to GROUP 54A, Inspection Procedure C-5 "One of the switch signals is not received ."
NO (The ignition switch (IG1) signal is not received.) : Refer to GROUP 54A, Inspection Procedure C-3 "The ignition switch (IG1) signal is not received ."

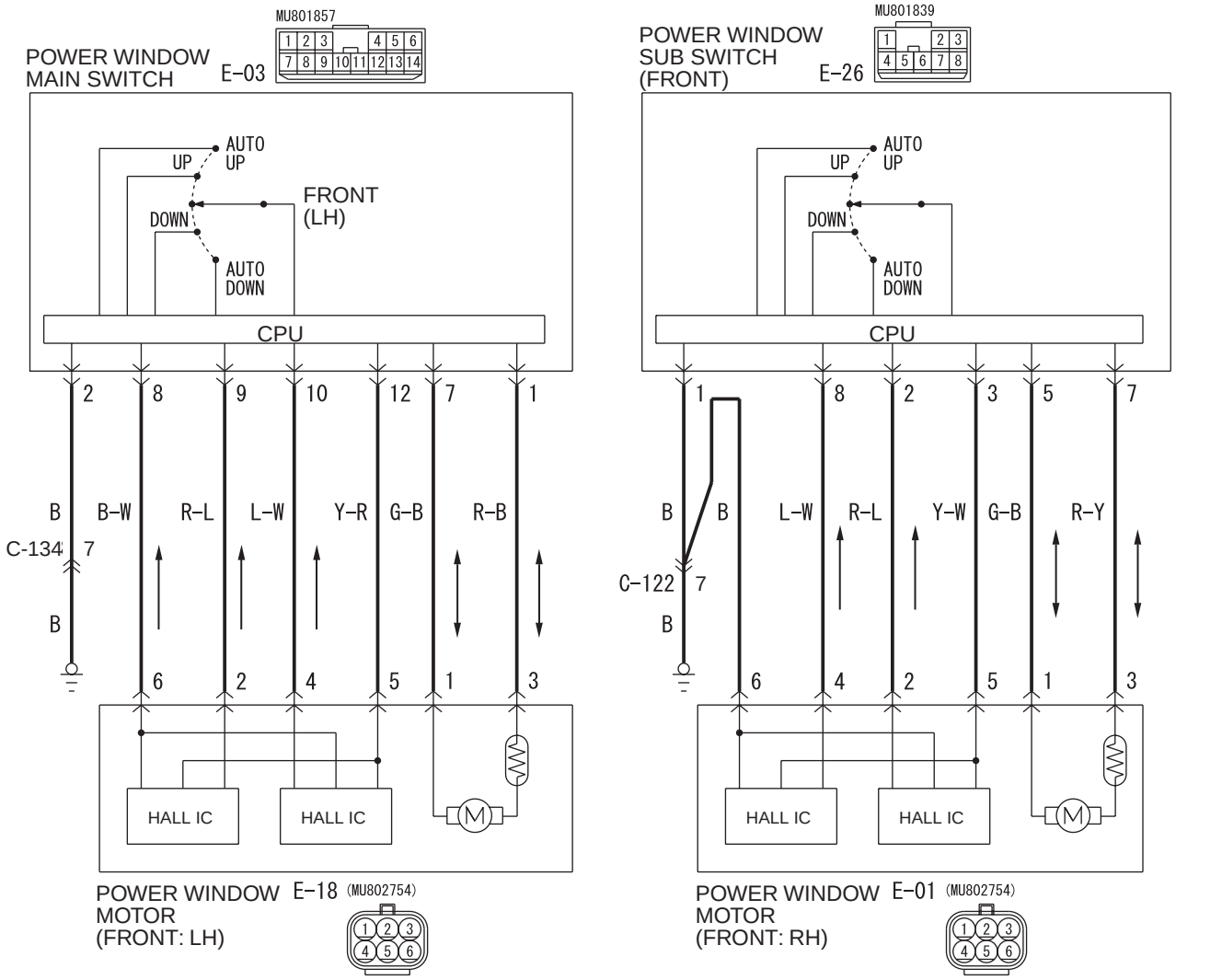
STEP 4. Retest the system.
Check that the power window timer function works normally.

Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Replace the power window main switch.

Inspection Procedure B-8: Power window anti-trap function does not work normally. <LH drive vehicles>

Power Window (front) Circuit <LH drive vehicles>



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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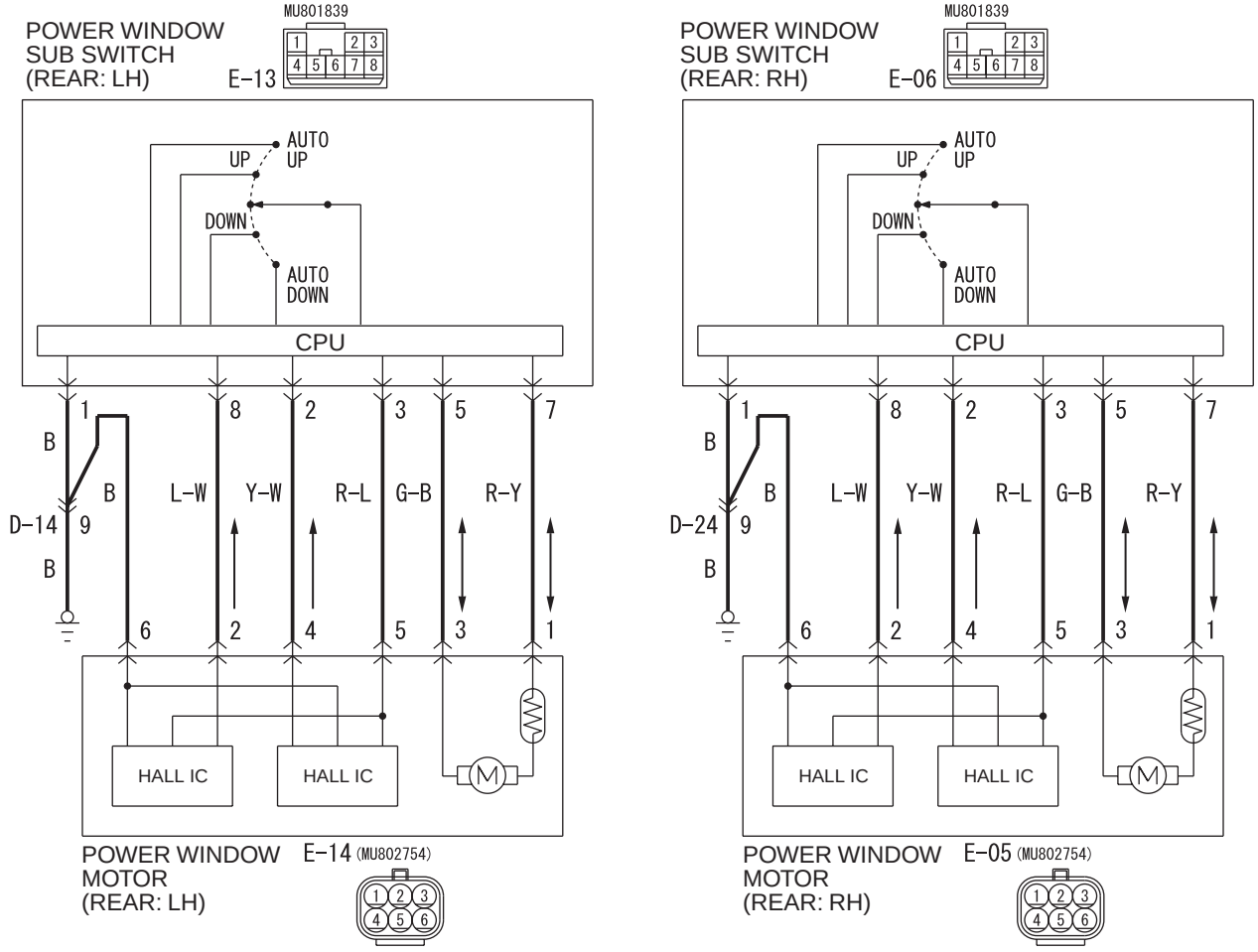
Power Window (rear) Circuit <Vehicles with rear power window>



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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COMMENTS ON TROUBLE SYMPTOM

The revolution detection sensor, which is incorporated in the power window motor, may be defective.

PROBABLE CAUSE

- Malfunction of the power window motor

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code.

When the ignition switch is turned to the "ON" position, check that the ETACS-ECU does not set the diagnosis code.

Q: Is the diagnosis code set?

YES : Refer to P.42-64.

NO : Go to Step 2.

STEP 2. Check the power window operating current.

Check that the power window operating current is normal (Refer to P.42-171).

Q: Is the check result normal?

YES : Adjust the door window glass (Refer to P.42-169), and then go to Step 3.

NO : Replace the defective power window motor which operating current are abnormal.

STEP 3. Confirm the power window learning function.

Check that the power window switch has learned the fully closed position of the windows (Refer to P.42-172).

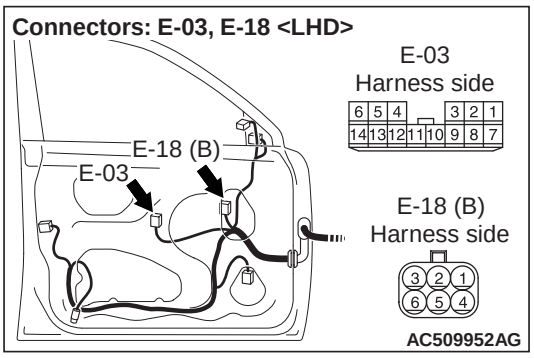
Q: Is the check result normal?

YES : Go to Step 4.
NO : Make the power window switch learn the fully closed position of the windows (Refer to P.42-172).

STEP 4. Determine a trouble spot.

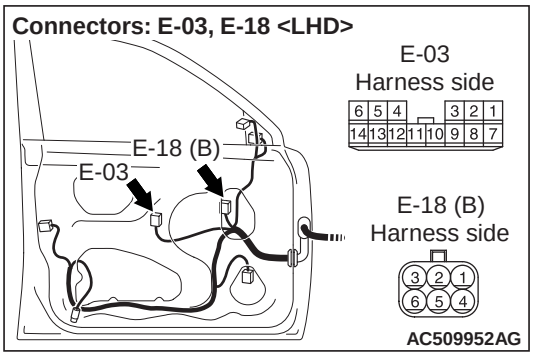
Q: Which door does the power window anti-trap function fail on?
Driver's door : Go to Step 5.
Front passenger's door : Go to Step 8.
Rear right door <Double cab> : Go to Step 14.
Rear left door <Double cab> : Go to Step 20.

STEP 5. Connector check: E-03 power window main switch connector and E-18 power window motor (front: LH) connector



Q: Is the check result normal?
YES : Go to Step 6.
NO : Repair the defective connector.

STEP 6. Check the wiring harness between E-03 power window main switch connector terminal Nos. 8, 9, 10, 12 and E-18 power window motor (front: LH) connector terminal Nos. 6, 2, 4, 5.



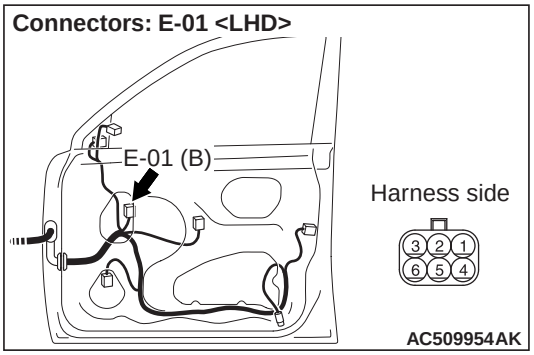
- Check the input and output lines to the revolution detection sensor for open and short circuit.

Q: Is the check result normal?
YES : Go to Step 7.
NO : Repair the wiring harness.

STEP 7. Retest the system.
(1) Replace the power window main switch.
(2) Check that the driver's power window anti-trap function works.

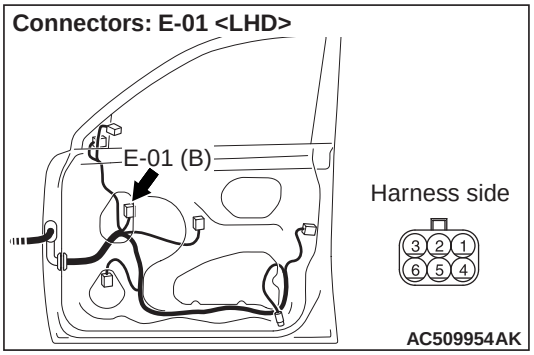
Q: Is the check result normal?
YES : The procedure is complete.
NO : Replace the power window motor (front: LH).

STEP 8. Connector check: E-01 power window motor (front: RH) connector

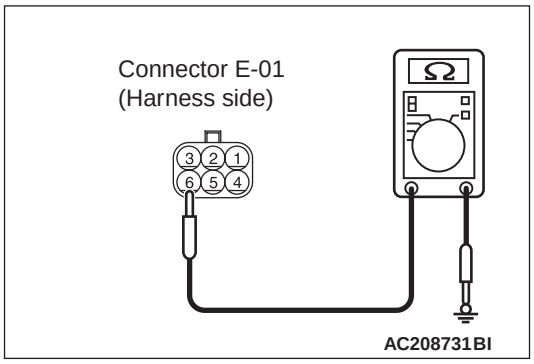


Q: Is the check result normal?
YES : Go to Step 9.
NO : Repair the defective connector.

STEP 9. Resistance measurement at the E-01 power window motor (front: RH) connector.



(1) Disconnect the connector, and measure at the wiring harness side.



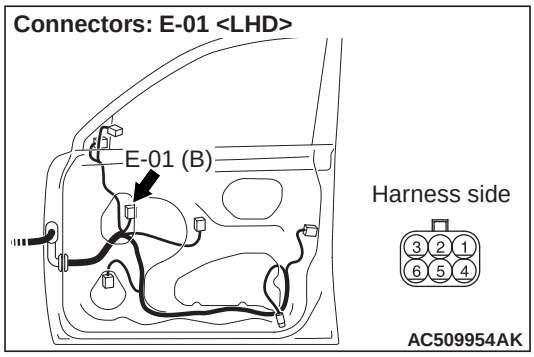
(2) Check the resistance between E-01 power

window motor (front RH) connector terminal No.6 and body earth.

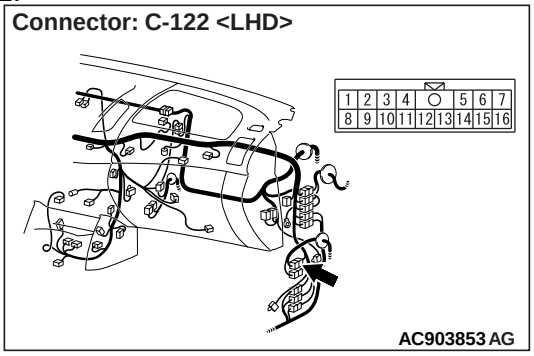
OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?
YES : Go to Step 11.
NO : Go to Step 10.

STEP 10. Check the wiring harness between E-01 power window motor (front: RH) connector terminal No.6 and body earth.



NOTE:

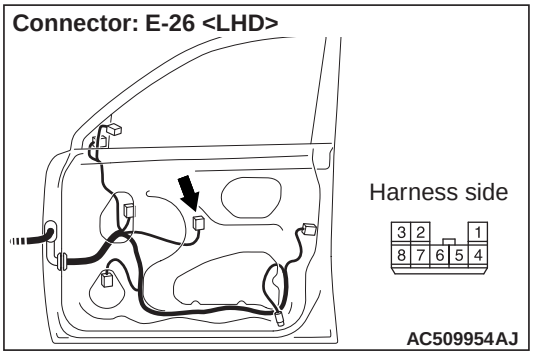


Prior to the wiring harness inspection, check intermediate connector C-122 and repair if necessary.

- Check the input and output lines to the revolution detection sensor for open or short circuit.

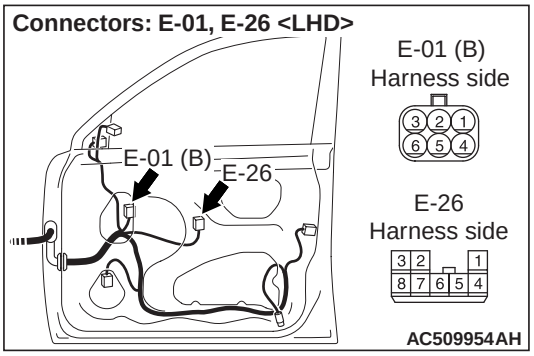
Q: Is the check result normal?
YES : Go to Step 13.
NO : Repair the wiring harness.

STEP 11. Connector check: E-26 power window sub switch (front) connector



Q: Is the check result normal?
YES : Go to Step 12.
NO : Repair the defective connector.

STEP 12. Check the wiring harness between E-26 power window sub switch (front) connector terminal Nos. 2, 3, 8 and E-01 power window motor (front: RH) connector terminal Nos. 2, 5, 4.



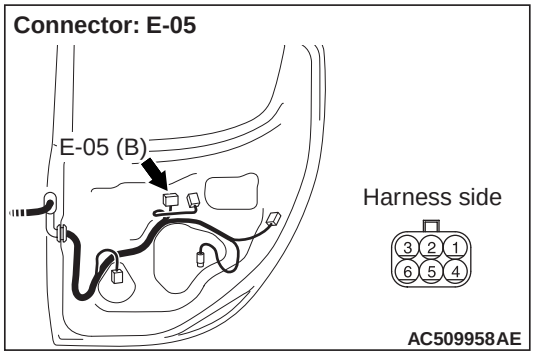
- Check the input and output lines to the revolution detection sensor for open and short circuit.

Q: Is the check result normal?
YES : Go to Step 13.
NO : Repair the wiring harness.

STEP 13. Retest the system.
(1) Replace the power window sub switch (front).
(2) Check that the front passenger's power window anti-trap function works.

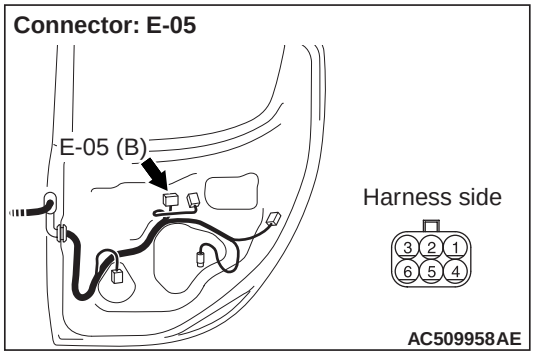
Q: Is the check result normal?
YES : The procedure is complete.
NO : Replace the power window motor (front: RH).

STEP 14. Connector check: E-05 power window motor (rear: RH) connector

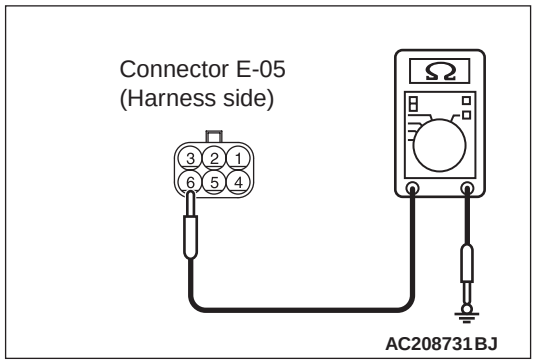


Q: Is the check result normal?
YES : Go to Step 15.
NO : Repair the defective connector.

STEP 15. Resistance measurement at the E-05 power window motor (rear: RH) connector.



(1) Disconnect the connector, and measure at the wiring harness side.

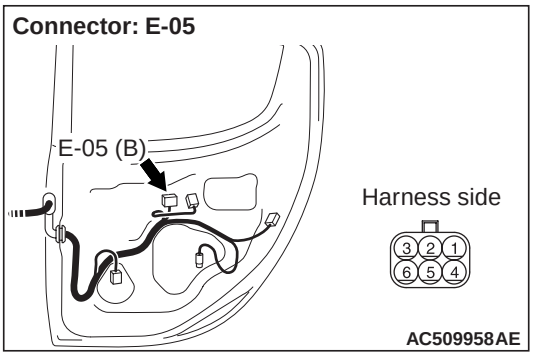


(2) Check the resistance between E-05 power window motor (rear: RH) connector terminal No.6 and body earth

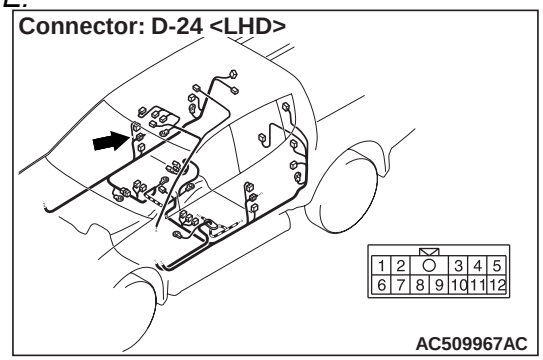
OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?
YES : Go to Step 17.
NO : Go to Step 16.

STEP 16. Check the wiring harness between E-05 power window motor (rear: RH) connector terminal No.6 and body earth.



NOTE:

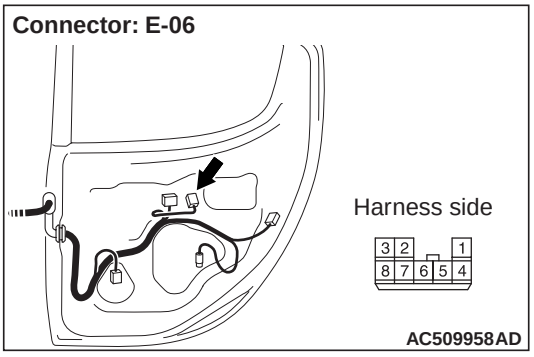


Prior to the wiring harness inspection, check intermediate connector D-24, and repair if necessary.

- Check the input and output lines to the revolution detection sensor for open or short circuit.

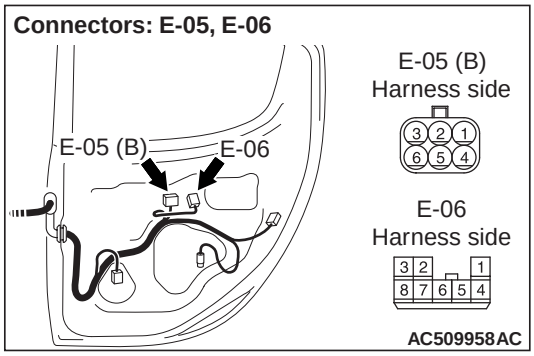
Q: Is the check result normal?
YES : Go to Step 19.
NO : Repair the wiring harness.

STEP 17. Connector check: E-06 power window sub switch (rear: RH) connector



Q: Is the check result normal?
YES : Go to Step 18.
NO : Repair the defective connector.

STEP 18. Check the wiring harness between E-06 power window sub switch (rear: RH) connector terminal Nos. 2, 3, 8 and E-05 power window motor (rear: RH) connector terminal Nos. 4, 5, 2.



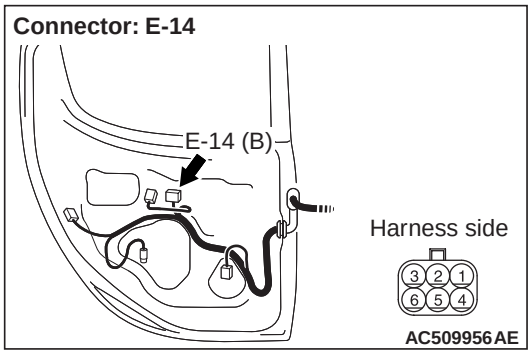
- Check the input and output lines to the revolution detection sensor for open and short circuit.

Q: Is the check result normal?
YES : Go to Step 19.
NO : Repair the wiring harness.

STEP 19. Retest the system.
(1) Replace the power window sub switch (rear: RH).
(2) Check that the rear right power window anti-trap function works.

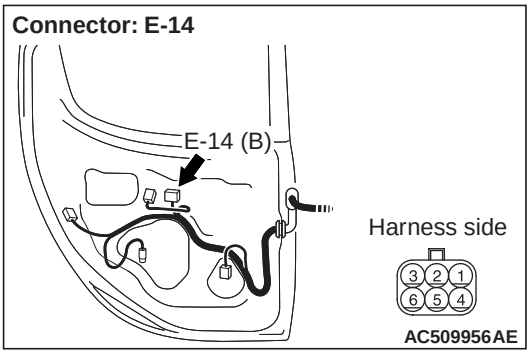
Q: Is the check result normal?
YES : The procedure is complete.
NO : Replace the power window motor (rear: RH).

STEP 20. Connector check: E-14 power window motor (rear: LH) connector

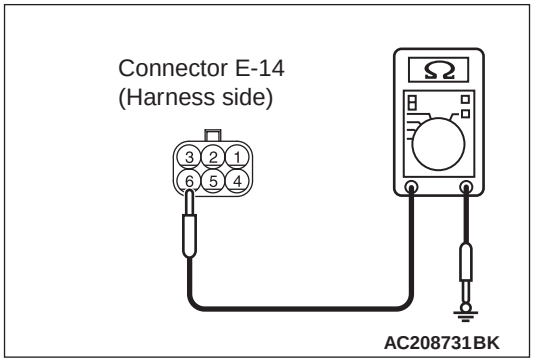


Q: Is the check result normal?
YES : Go to Step 21.
NO : Repair the defective connector.

STEP 21. Resistance measurement at the E-14 power window motor (rear: LH) connector.



(1) Disconnect the connector, and measure at the wiring harness side.

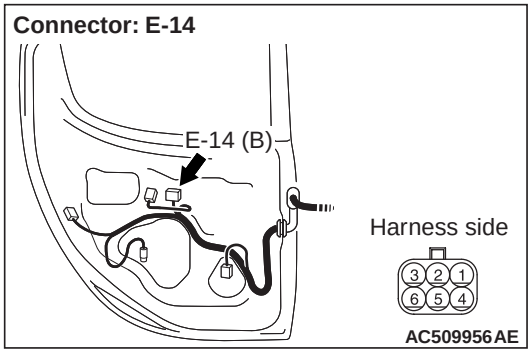


(2) Check the resistance between E-14 power window motor (rear: LH) connector terminal No.6 and body earth

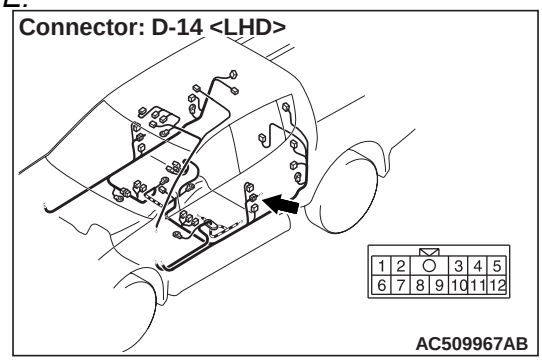
OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?
YES : Go to Step 23.
NO : Go to Step 22.

STEP 22. Check the wiring harness between E-14 power window motor (rear: LH) connector terminal No.6 and body earth.



NOTE:

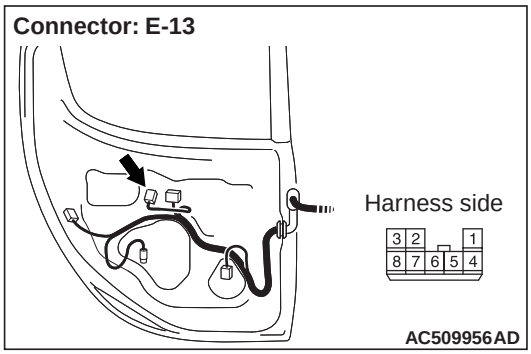


Prior to the wiring harness inspection, check intermediate connector D-14, and repair if necessary.

- Check the input and output lines to the revolution detection sensor for open and short circuit.

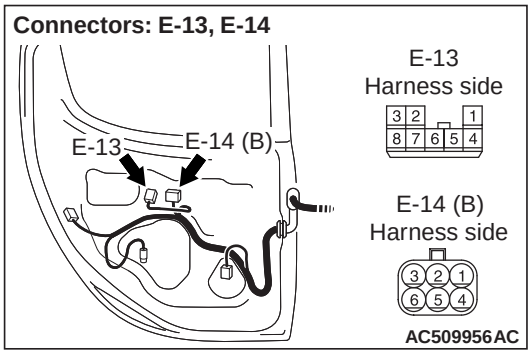
Q: Is the check result normal?
YES : Go to Step 25.
NO : Repair the wiring harness.

STEP 23. Connector check: E-13 power window sub switch (rear: LH) connector



Q: Is the check result normal?
YES : Go to Step 24.
NO : Repair the defective connector.

STEP 24. Check the wiring harness between E-13 power window sub switch (rear: LH) connector terminal Nos. 2, 3, 8 and E-14 power window motor (rear: LH) connector terminal Nos. 4, 5, 2.



- Check the input and output lines to the revolution detection sensor for open and short circuit.

Q: Is the check result normal?
YES : Go to Step 25.
NO : Repair the wiring harness.

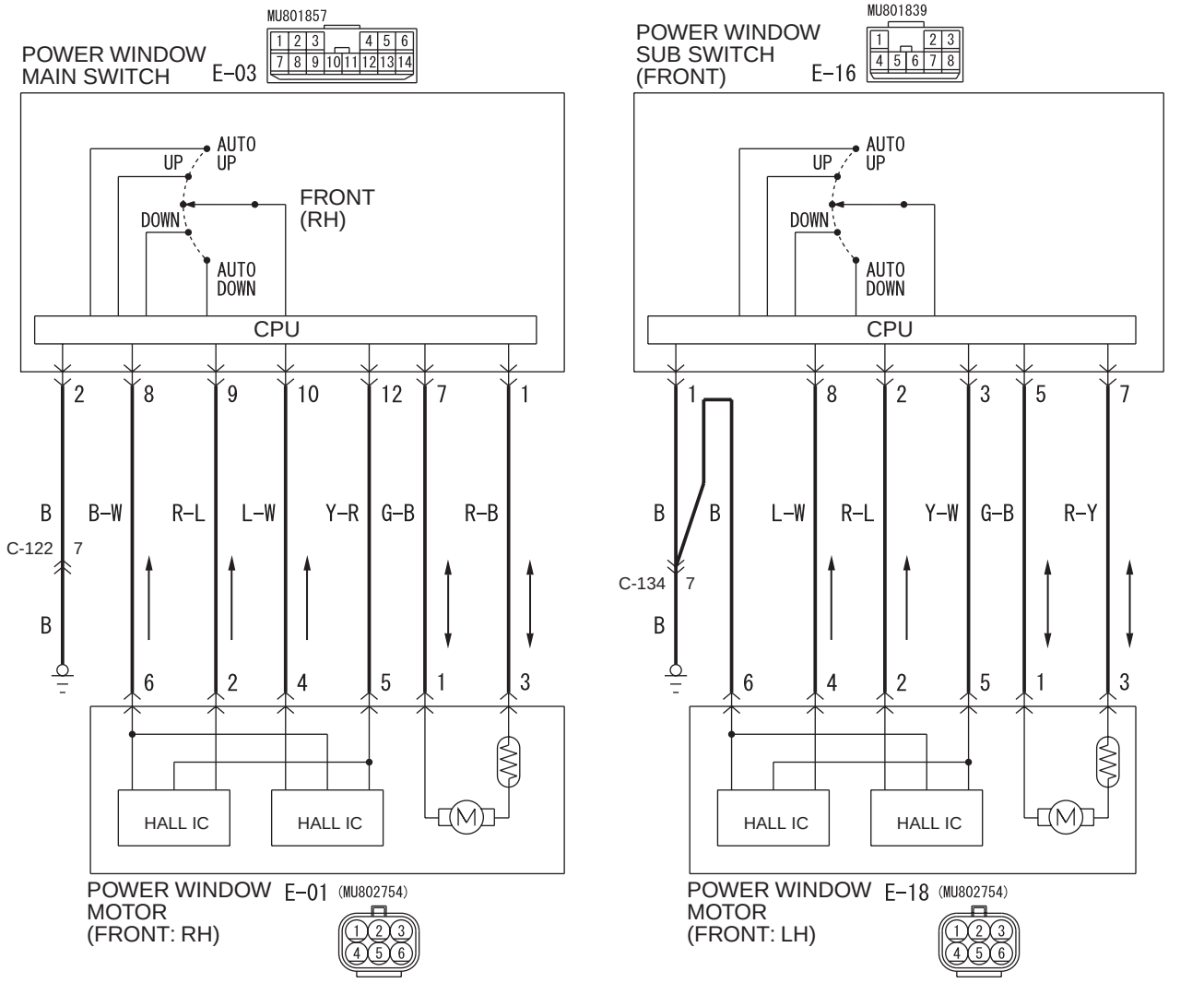
STEP 25. Retest the system.

(1) Replace the power window sub switch (rear: LH).
(2) Check that the rear left power window anti-trap function works.

Q: Is the check result normal?
YES : The procedure is complete.
NO : Replace the power window motor (rear: LH).

Inspection Procedure B-9: Power window anti-trap function does not work normally. <RH drive vehicles>

Power Window (front) Circuit <RH drive vehicles>



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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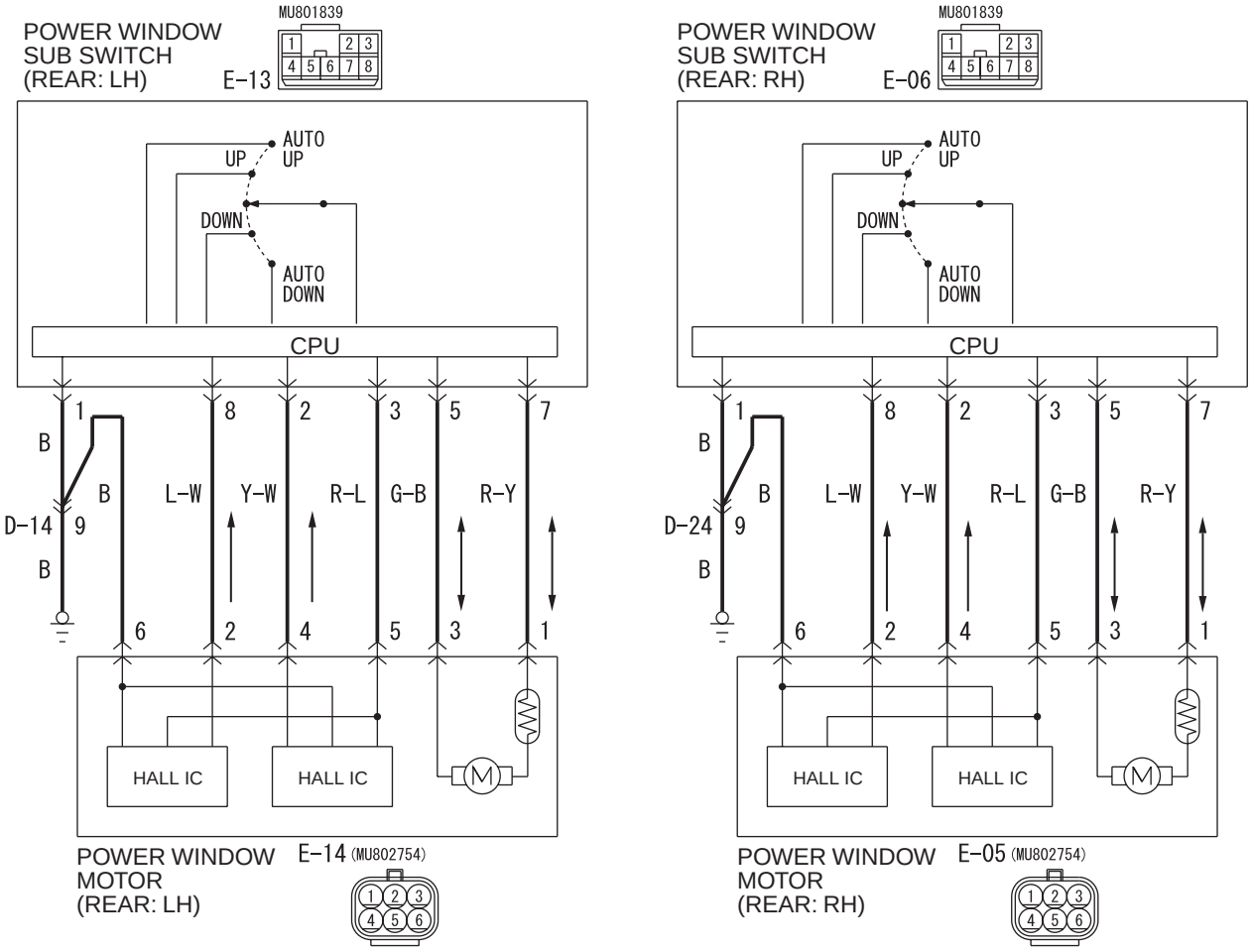
Power Window (rear) Circuit <Vehicles with rear power window>



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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COMMENTS ON TROUBLE SYMPTOM

The revolution detection sensor, which is incorporated in the power window motor, may be defective.

PROBABLE CAUSE

- Malfunction of the power window motor

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code.

When the ignition switch is turned to the "ON" position, check that the ETACS-ECU does not set the diagnosis code.

Q: Is the diagnosis code set?

YES : Refer to P.42-64.

NO : Go to Step 2.

STEP 2. Check the power window operating current.

Check that the power window operating current is normal (Refer to P.42-171).

Q: Is the check result normal?

YES : Adjust the door window glass (Refer to P.42-169), and then go to Step 3.

NO : Replace the defective power window motor which operating current are abnormal.

STEP 3. Confirm the power window learning function.

Check that the power window switch has learned the fully closed position of the windows (Refer to P.42-186).

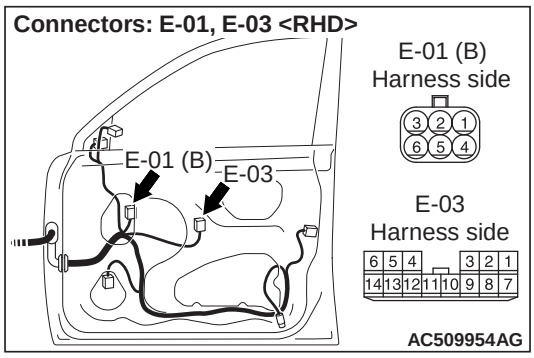
Q: Is the check result normal?

YES : Go to Step 4.
NO : Make the power window switch learn the fully closed position of the windows (Refer to P.42-186).

STEP 4. Determine a trouble spot.

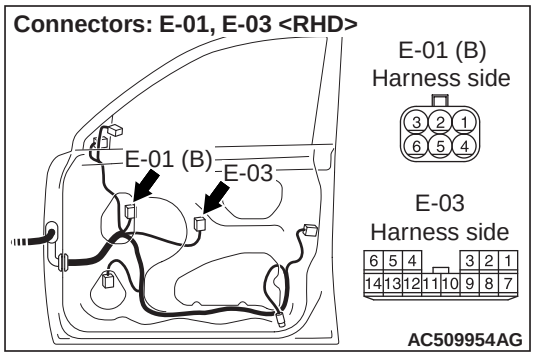
Q: Which door does the power window anti-trap function fail on?
Driver's door : Go to Step 5.
Front passenger's door : Go to Step 8.
Rear right door <Double cab> : Go to Step 14.
Rear left door <Double cab> : Go to Step 20.

STEP 5. Connector check: E-03 power window main switch connector and E-01 power window motor (front: RH) connector



Q: Is the check result normal?
YES : Go to Step 6.
NO : Repair the defective connector.

STEP 6. Check the wiring harness between E-03 power window main switch connector terminal Nos. 8, 9, 10, 12 and E-01 power window motor (front: RH) connector terminal Nos. 6, 2, 4, 5.



- Check the input and output lines to the revolution detection sensor for open and short circuit.

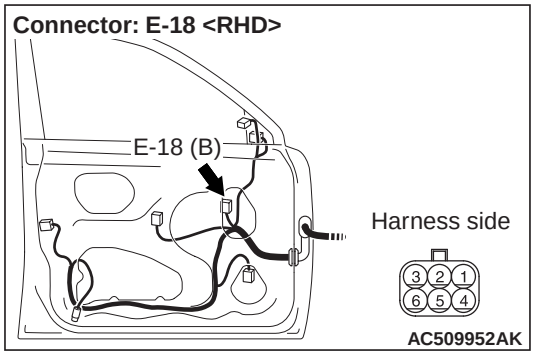
Q: Is the check result normal?
YES : Go to Step 7.
NO : Repair the wiring harness.

STEP 7. Retest the system.

(1) Replace the power window main switch.
(2) Check that the driver's power window anti-trap function works normally.

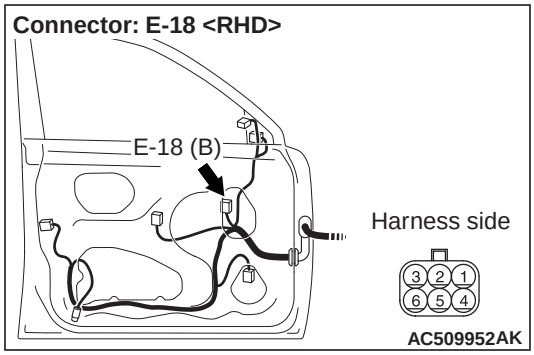
Q: Is the check result normal?
YES : The procedure is complete.
NO : Replace the power window motor (front: LH).

STEP 8. Connector check: E-18 power window motor (front: LH) connector

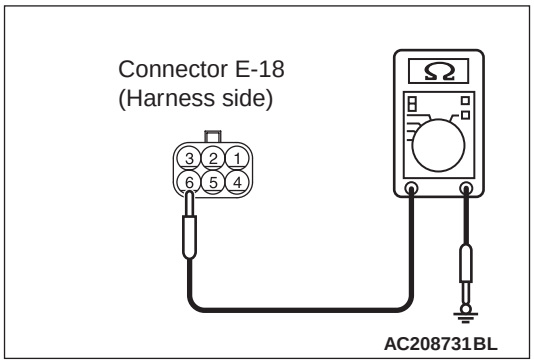


Q: Is the check result normal?
YES : Go to Step 9.
NO : Repair the defective connector.

STEP 9. Resistance measurement at the E-18 power window motor (front: LH) connector.



(1) Disconnect the connector, and measure at the wiring harness side.



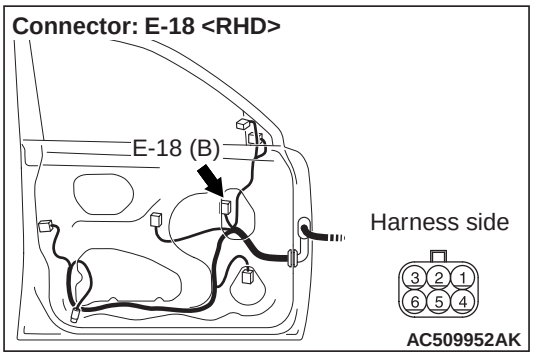
(2) Check the resistance between E-18 power

window motor (front: LH) connector terminal No.6 and body earth

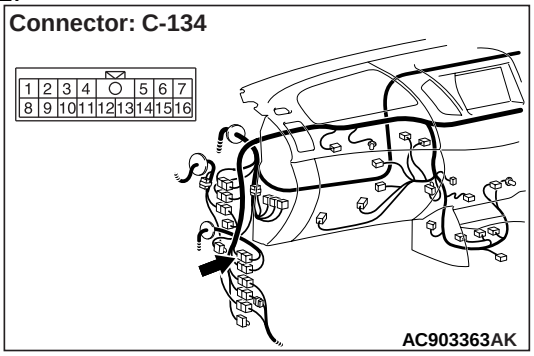
OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?
YES : Go to Step 11.
NO : Go to Step 10.

STEP 10. Check the wiring harness between E-18 power window motor (front: LH) connector terminal No.6 and body earth.



NOTE:

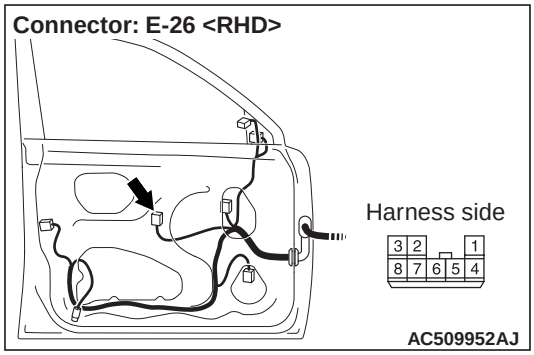


Prior to the wiring harness inspection, check intermediate connector C-134 and repair if necessary.

- Check the input and output lines to the revolution detection sensor for open and short circuit.

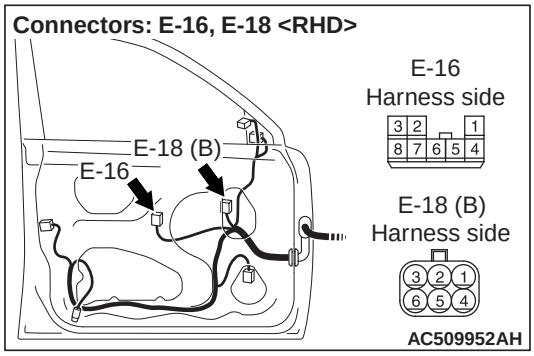
Q: Is the check result normal?
YES : Go to Step 13.
NO : Repair the wiring harness.

STEP 11. Connector check: E-16 power window sub switch (front) connector.



Q: Is the check result normal?
YES : Go to Step 12.
NO : Repair the defective connector.

STEP 12. Check the wiring harness between E-16 power window sub switch (front) connector terminal Nos. 2, 3, 8 and E-18 power window motor (front: LH) connector terminal Nos. 2, 5, 4.



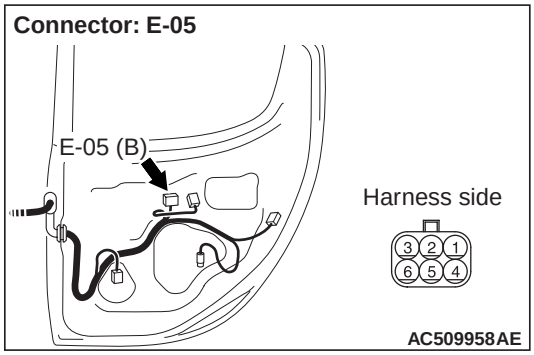
- Check the input and output lines to the revolution detection sensor for open and short circuit.

Q: Is the check result normal?
YES : Go to Step 13.
NO : Repair the wiring harness.

STEP 13. Retest the system.
(1) Replace the power window sub switch (front).
(2) Check that the front passenger's power window anti-trap function works normally.

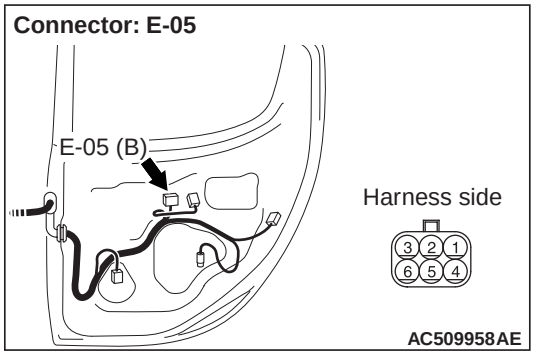
Q: Is the check result normal?
YES : The procedure is complete.
NO : Replace the power window motor (front: LH).

STEP 14. Connector check: E-05 power window motor (rear: RH) connector

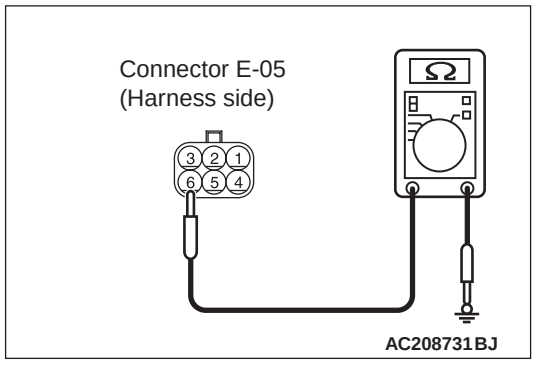


Q: Is the check result normal?
YES : Go to Step 15.
NO : Repair the defective connector.

STEP 15. Resistance measurement at the E-05 power window motor (rear: RH) connector.



(1) Disconnect the connector, and measure at the wiring harness side.

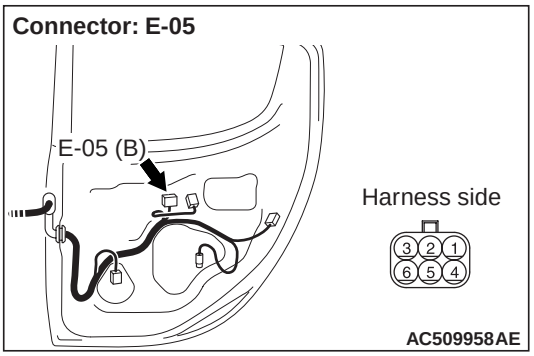


(2) Check the resistance between E-05 power window motor (rear: RH) connector terminal No.6 and body earth

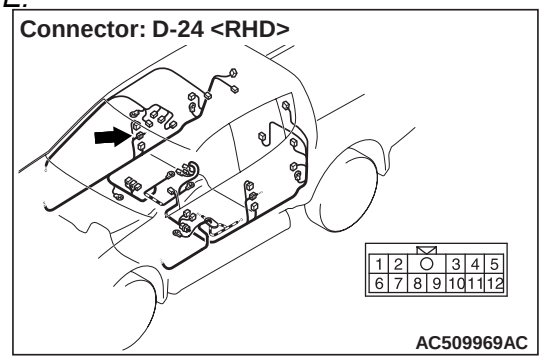
OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?
YES : Go to Step 17.
NO : Go to Step 16.

STEP 16. Check the wiring harness between E-05 power window motor (rear: RH) connector terminal No.6 and body earth.



NOTE:

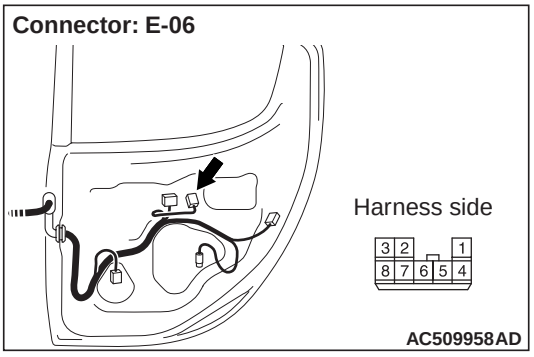


Prior to the wiring harness inspection, check intermediate connector D-24, and repair if necessary.

- Check the input and output lines to the revolution detection sensor for open and short circuit.

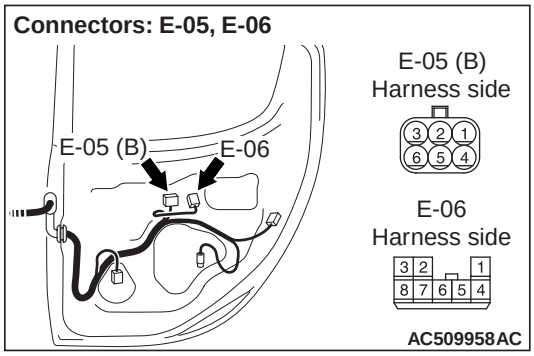
Q: Is the check result normal?
YES : Go to Step 19.
NO : Repair the wiring harness.

STEP 17. Connector check: E-06 power window sub switch (rear: RH) connector



Q: Is the check result normal?
YES : Go to Step 18.
NO : Repair the defective connector.

STEP 18. Check the wiring harness between E-06 power window sub switch (rear: RH) connector terminal Nos. 2, 3, 8 and E-05 power window motor (rear: RH) connector terminal Nos. 4, 5, 2.



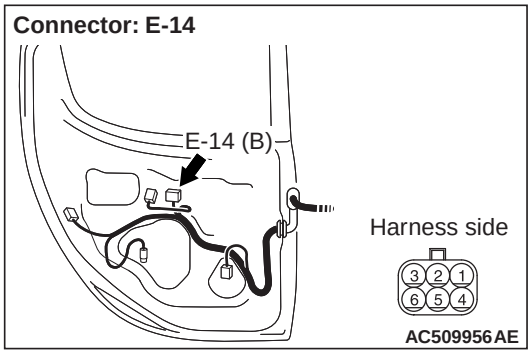
- Check the input and output lines to the revolution detection sensor for open and short circuit.

Q: Is the check result normal?
YES : Go to Step 19.
NO : Repair the wiring harness.

STEP 19. Retest the system.
(1) Replace the power window sub switch (rear: RH).
(2) Check that the rear right power window anti-trap function works normally.

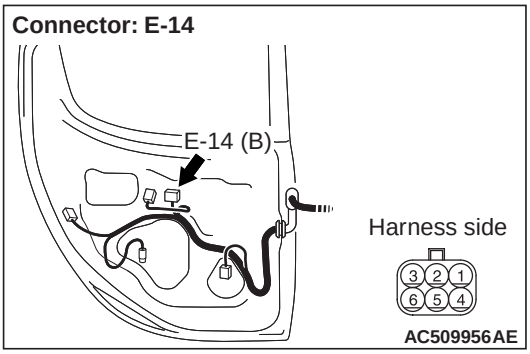
Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Replace the power window motor (rear: RH).

STEP 20. Connector check: E-14 power window motor (rear: LH) connector

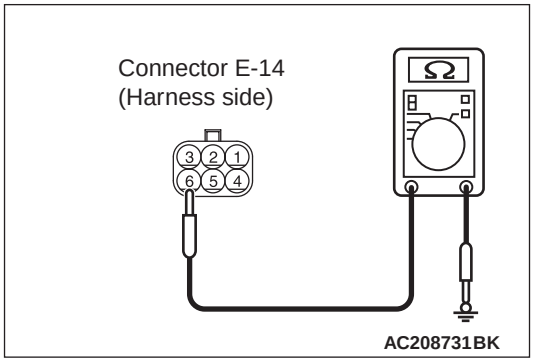


Q: Is the check result normal?
YES : Go to Step 21.
NO : Repair the defective connector.

STEP 21. Resistance measurement at the E-14 power window motor (rear: LH) connector.



(1) Disconnect the connector, and measure at the wiring harness side.

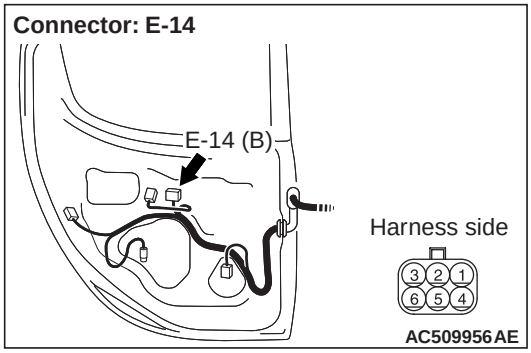


(2) Check the resistance between E-14 power window motor (rear: LH) connector terminal No.6 and body earth

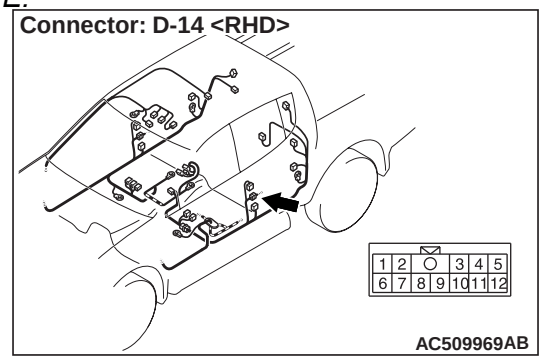
OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?
YES : Go to Step 23.
NO : Go to Step 22.

STEP 22. Check the wiring harness between E-14 power window motor (rear: LH) connector terminal No.6 and body earth.



NOTE:

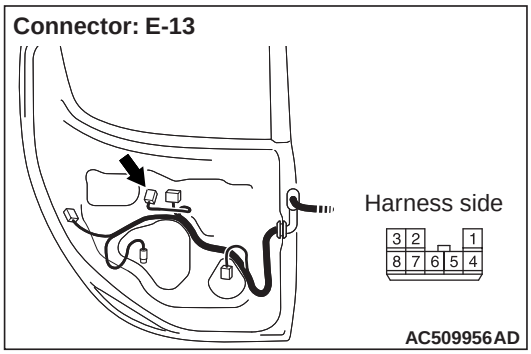


Prior to the wiring harness inspection, check intermediate connector D-14, and repair if necessary.

- Check the input and output lines to the revolution detection sensor for open and short circuit.

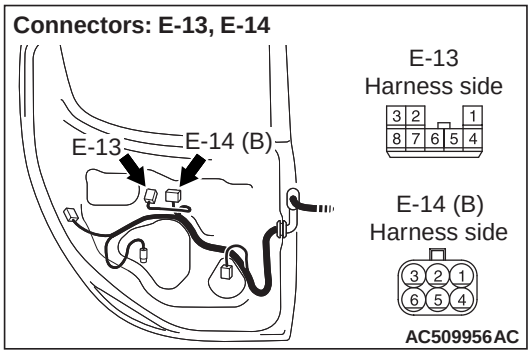
Q: Is the check result normal?
YES : Go to Step 25.
NO : Repair the wiring harness.

STEP 23. Connector check: E-13 power window sub switch (rear: LH) connector



Q: Is the check result normal?
YES : Go to Step 24.
NO : Repair the defective connector.

STEP 24. Check the wiring harness between E-13 power window sub switch (rear: LH) connector terminal Nos. 2, 3, 8 and E-14 power window motor (rear: LH) connector terminal Nos. 4, 5, 2.



- Check the input and output lines to the revolution detection sensor for open and short circuit.

Q: Is the check result normal?
YES : Go to Step 25.
NO : Repair the wiring harness.

STEP 25. Retest the system.
(1) Replace the power window sub switch (rear: LH).
(2) Check that the rear left power window anti-trap function works normally.

Q: Is the check result normal?
YES : The procedure is complete.
NO : Replace the power window motor (rear: LH).

Inspection Procedure B-10: The Window Glass Lowers Automatically while it is Rising.

COMMENTS ON TROUBLE SYMPTOM
If the sliding resistance is too great when the window is being raised or the window glass encounters an object, the window glass will lower by approximately 150 mm.

PROBABLE CAUSES

- Improper adjusted door window glass
- Incorrectly installed or warped glass slider
- Malfunction of the power window motor
- Malfunction of the window regulator

DIAGNOSIS PROCEDURE

STEP 1. Check the power window operating current.

Check that the power window operating current is normal (Refer to P.42-171).

Q: Is the check result normal?

YES : Go to Step 2.

NO : Replace the defective power window motor assembly which operating current are abnormal.

STEP 2. Check that the door window glasses are installed correctly.

Check that the door window glasses are installed correctly (Refer to P.42-169).

Q: Is the check result normal?

YES : Go to Step 3.

NO : Adjust the door window glass (Refer to P.42-169).

STEP 3. Retest the system.

Check that the power window does not lower automatically while it is being raised.

Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

NO : Replace the power window motor assembly of the defective window.

ON-VEHICLE SERVICE

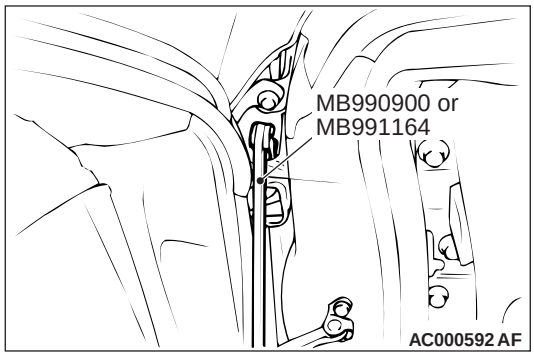
DOOR FIT ADJUSTMENT

M1423000900316

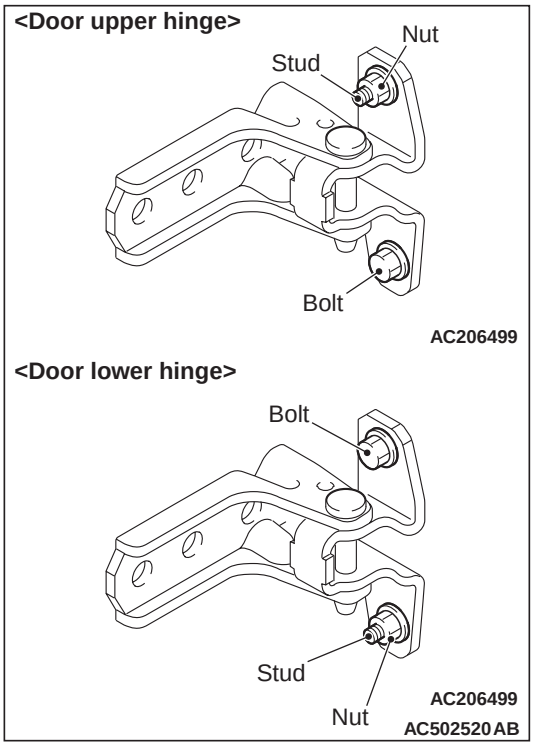
⚠ CAUTION

- **Attach protection tapes to the fender and door edges where the hinge is installed.**
- **Do not rotate special tool door hinge adjusting wrench MB991163 with a torque of over 98 N·m.**

1. When the clearance between the front door and the body is uneven:
   (1) Apply protective tapes to the fender and front door edge around the hinge mounting area.
   (2) Remove the front pillar pad <Except for single cab> (Refer to P.42-8).



   (3) Use the special tool door hinge adjusting wrench (MB990834 or MB991163) to loosen the body-side door hinge mounting bolts.
   (4) Move the front door to adjust until the clearance around the front door is even.
2. When the clearance between the rear door and the body is uneven <Double cab>:
   (1) Remove the centre pillar trim lower (Refer to GROUP 52A, Interior trim).
   (2) Apply protective tapes to the body and rear door edge around the hinge mounting area.
   (3) Loosen the body-side door hinge mounting nuts and bolts.
   (4) Move the rear door to adjust until the clearance around the rear door is even.
3. When the door is not flush with the vehicle body surface:

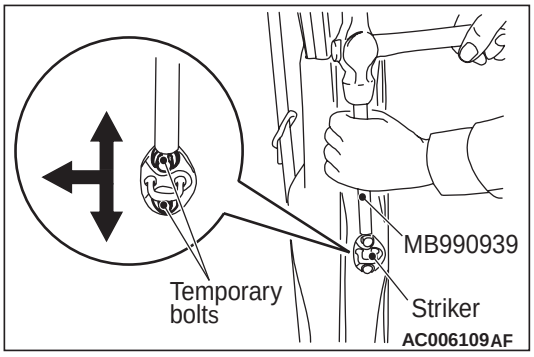


(1) Loosen the door-side hinge mounting bolts and nuts.

(2) Move the door to adjust until the door is flush with the vehicle body.

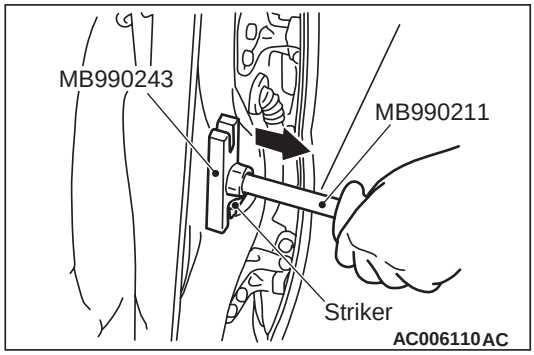
NOTE: If the levelling of the door is difficult, replace the door-side hinge mounting bolts, studs and nuts with a bolt (MU001031) and carry out the levelling. The tightening torque for the bolt (MU001031) is 25 ± 7 N·m.

4. When the door is stiff to lock and unlock:



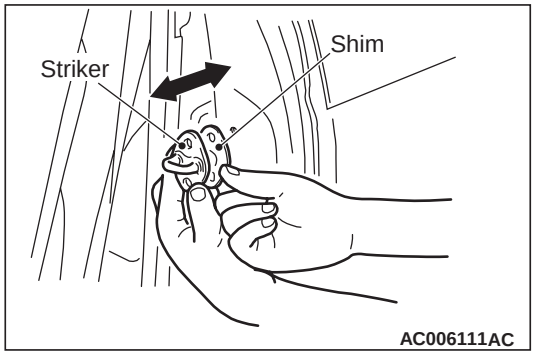
(1) Adjustment by using the striker (toward the inside of the vehicle and vertical direction)

Install an temporary bolts instead of the striker mounting bolt, and use special tool remover bar (MB990939) and a hammer to tap the bolts to the desired direction.



(2) Adjustment by using the striker (toward the outside of the vehicle)

Use special tools, sliding hammer (MB990211) and body puller (MB990243) to pull the striker toward the outside of the vehicle.



(3) Adjustment by using shims (forward and rearward)

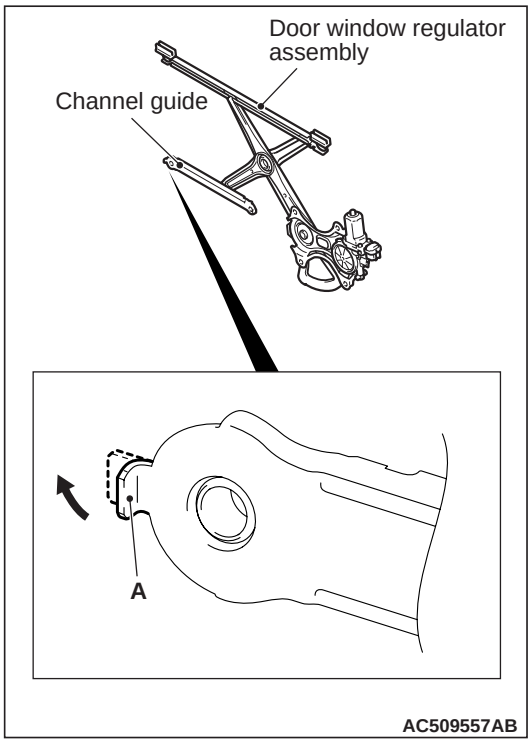
Increase or decrease the number of shims so that the striker engages with the door latch properly.

FRONT DOOR WINDOW GLASS ADJUSTMENT

M1423001000598

Check that the door glass operates smoothly and moves along the door glass runchannel when the door window glass is fully raised and fully lowered. If there is a problem, adjust by the following procedures:

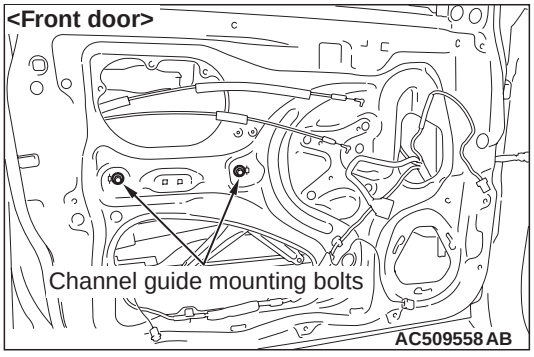
1. Remove the door trim assembly (Refer to GROUP 52A, Door trim <Single cab and Club cab>, <Double cab>).
2. Remove the waterproof film (Refer to P.42-196 <Single cab>, P.42-198 <Club cab>, P.42-200 <Double cab>).
3. Remove the door window regulator assembly (Refer to P.42-179 <Single cab>, P.42-181 <Club cab>, P.42-183 <Double cab>).



4. Stretch the both bends ("A" shown in the figure) of channel guide on the door window regulator assembly.

   NOTE: The bend "A" shown in the figure is used for positioning the door window regulator assembly. However, stretching the A section enables the adjustment of door window glass. In addition, keep the part "A" stretched.

5. Install the door window regulator assembly (Refer to P.42-179 <Single cab>, P.42-181 <Club cab>, P.42-183 <Double cab>).



6. Raise the door window glass and loosen the channel guide mounting bolts to adjust the window glass slants appropriately.

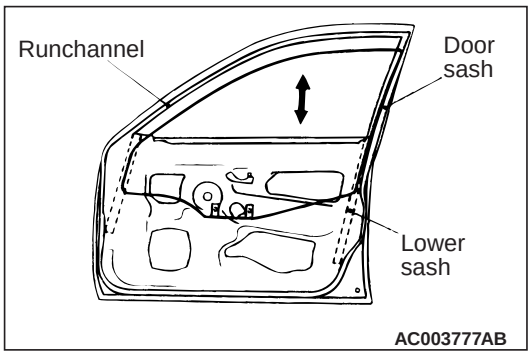
GLASS SLIDING MECHANISM CHECK AND ADJUSTMENT

M1429000900336

If the window glass automatically starts moving downwards at the wrong time while it is being raised, carry out the following adjustment or replacement procedures:

1. Remove the door trim assembly. (Refer to GROUP 52A, Door trim <Single cab and Club cab>, <Double cab>).
2. Remove the waterproof film. (Refer to P.42-196 <Single cab>, P.42-198 <Club cab>, P.42-200 <Double cab>).
3. Remove the window regulator assembly from the door window glass, and then raise and lower the door window glass by hand to check the operation force.

   NOTE: Insert a cushion or similar object to prevent damage to the glass if it should happen to fall down.



4. If the door window glass does not move up and down smoothly, check or repair the following points:
   - Check the installation condition of the runchannel.
   - Repair any twisting in the door sash.
   - Check the installation condition of the lower sash.
5. If repair or adjustment is not possible, replace the door assembly with new one.

POWER WINDOW TIMER FUNCTION CHECK

M1429004300392

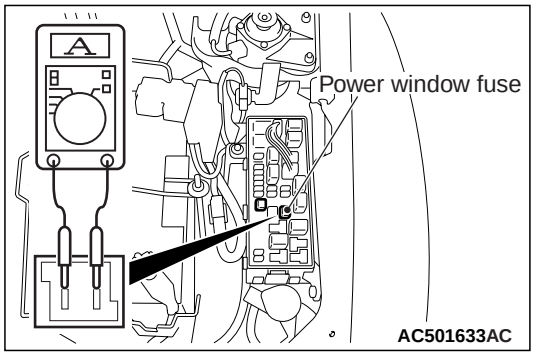
Check that the power window timer works as described below. If it does not work, carry out troubleshooting (Refer to P.42-65).

- Close the doors and turn the ignition switch to the LOCK (OFF) position. Check that the power window operates for 30 seconds.

- The timer activates by closing the doors and turning the ignition switch to the LOCK (OFF) position. Check if the power window operates within 30 seconds after the driver's door is opened while the timer is being activated. The timer period will be extended if the driver's door is opened, but the timer will be cancelled if the driver's door is closed while the timer is being activated.

POWER WINDOW OPERATING CURRENT CHECK

M1429001100797

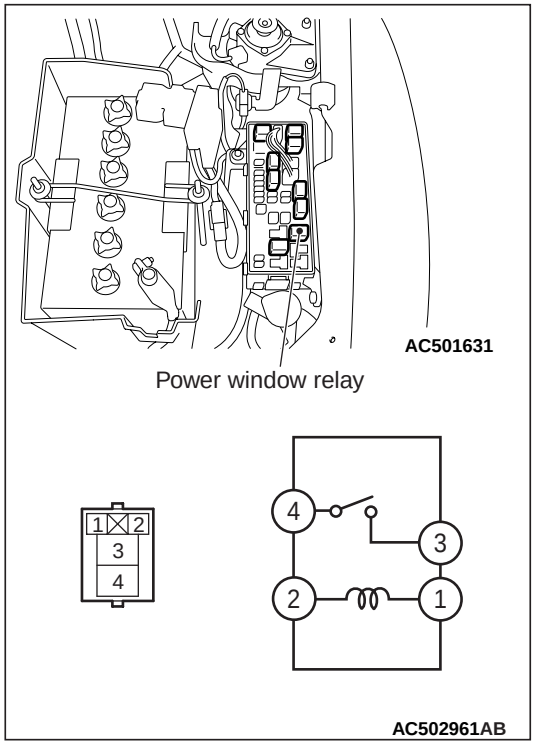


1. Remove the power window fuse and connect an ammeter as shown in the illustration.
2. When the power window switch is operated to the “UP” position, a large amount of current flows at the time when the window starts to close and when it is fully closed, so measure the operation current in the interval between these two points.

   Standard value: 5 ± 1A (Power supply voltage 14.5 ± 0.5V, 25°C)
3. If the operation current is outside the standard value, refer to P.42-170.

POWER WINDOW RELAY CHECK

M1429001800439



Battery voltage	Tester connection	Specified condition
Not applied	3 – 4	Open circuit
• Connect terminal No.2 and the positive battery terminal. • Connect terminal No.1 and the negative battery terminal.	3 – 4	Continuity exists (2 Ω or less)

POWER WINDOW CHECK

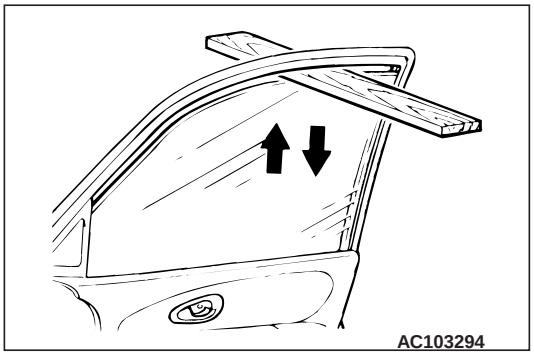
M1429004400559

Check the power window system as described below: If it does not work, carry out troubleshooting. Refer to P.42-65.

- Operate the power window switch of each seat to check that it works normally.
- Turn on the power window lock switch of the driver’s side power window main switch. Operate the front and rear passenger's power window sub switches to check that they do not work.
- Turn on the power window lock switch of the driver’s side power window main switch. Operate the power window main switch to check that each power window operates normally.

POWER WINDOW SAFETY MECHANISM CHECK

M1429013700149



1. Place an approximately 10 mm thick wood board as shown. Then, close the door window glass by one-shot up action of the power window switch.
2. Check that the window glass lowers by about 150 mm when it clamps the board. This is called anti-trap function (safety mechanism). If this does not happen, carry out troubleshooting (Refer to P.42-65).

   NOTE: If the anti-trap function (safety mechanism) is activated consecutively 3 times or more, carry out the learning procedures of the power window fully closed position (Refer to P.42-172.)

POWER WINDOW INITIALIZED ADJUSTMENT

M1429004600047

HOW TO MAKE THE POWER WINDOW SWITCH LEARN THE FULLY CLOSED POSITION OF THE POWER WINDOW

HOW TO MAKE THE POWER WINDOW SWITCH LEARN THE FULLY CLOSED POSITION WHEN THE POWER WINDOW SWITCH IS REMOVED, OR THE POWER WINDOW REGULATOR ASSEMBLY IS REMOVED OR REPLACED

1. If the anti-trap function (safety mechanism) is activated consecutively 3 times or more, the fully closed position that the power window switch has learned will be erased (initialised).
2. Operate the power window switch and fully open the door window glass.

⚠ CAUTION

The anti-trap function does not work until the power window switch completes learning the fully closed position (It is because the anti-trap function is reset).

3. Operate the power window switch and fully close the door window glass. The power window activates for 0.7 seconds and stops automatically when the power window switch is pressed once. Repeat this operation until the door window glass fully closes and release the switch once. Then, hold the power window switch to the fully closed side again for one second so that the power window switch completes learning the fully closed position.

   NOTE: If the power window switch is operated to open the door window glass while the switch is learning, learning will be cancelled. If this happens, return to step 2.

HOW TO MAKE THE POWER WINDOW SWITCH LEARN THE FULLY CLOSED POSITION WHEN THE POWER WINDOW SWITCH IS REPLACED WITH A NEW ONE

⚠ CAUTION

The anti-trap function does not work until the power window switch completes learning the fully closed position (It is because the anti-trap function is reset).

Operate the power window switch to fully close the door window glass by one-shot up action so that the power window switch will complete learning (no initialisation is required).

CENTRAL DOOR LOCKING SYSTEM INSPECTION

M1427001100467

Check the system as described below: If the system does not work, carry out troubleshooting. Refer to P.42-64.

- Check that the central door locking system works by operating the driver's door key cylinder and the inside lock knob.

NOTE: When the inside lock knob is operated with the driver's door opened, the driver's door is not locked.

- Check whether the driver's door is opened when the driver's door inside handle is pulled with all the doors locked. Also check whether all the doors are unlocked simultaneously.

CHECK OF KEY LOCK PREVENTION FUNCTION

M1427003300229

Check that the driver's door is not locked when the driver's door inside lock knob is operated with the driver's door opened. If it is locked, replace the door latch assembly. Refer to P.42-187 <Single cab>, P.42-189 <Club cab>, P.42-191 <Double cab>.

SHIFT "P" INTERLINK DOOR UNLOCK FUNCTION CHECK

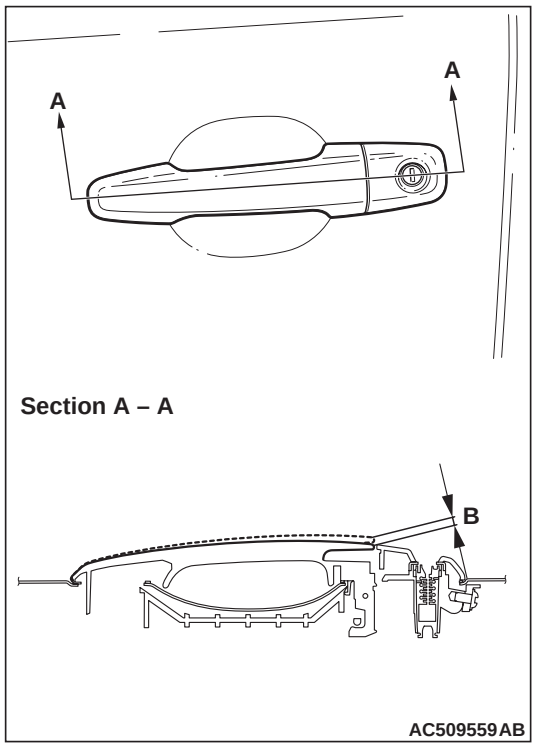
M1427003400129

When the selector lever is moved to the P (parking) position with the ignition switch on, all the doors will be unlocked.
Carry out troubleshooting if the doors are not unlocked. Refer to P.42-64.

NOTE: The adjustment function allows you to change the selector "P" position-linked door unlocking's setting from "Inhibit (initial setting)" or "Operation". Prior to the check, confirm which setting is activated.

DOOR OUTSIDE HANDLE PLAY CHECK

M1423001600697



1. Check that the door outside handle play is within the standard value range.

   Standard value (B):

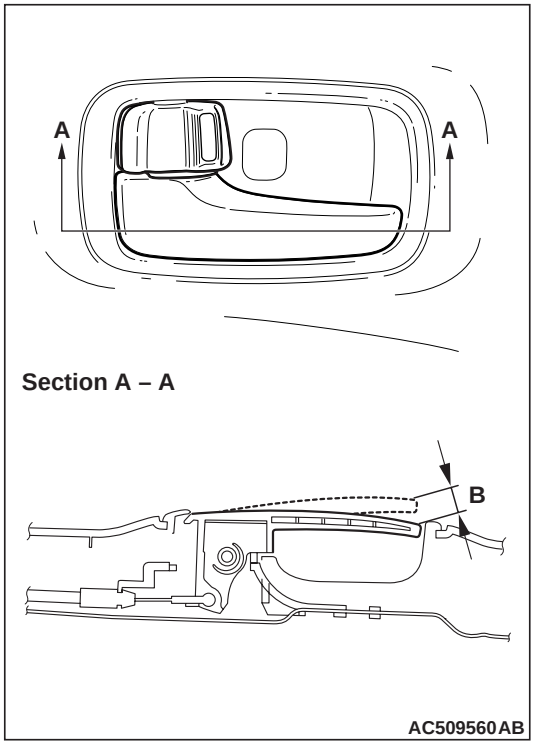
   Front door: 0.1 – 5.9 mm (target value: 2.5 mm)
   Rear door: 0.0 – 4.8 mm (target value: 2.1 mm)

2. Check the door outside handle and door latch assembly, and replace them if they are out of the standard value.

DOOR INSIDE HANDLE PLAY ADJUSTMENT

M1423001500786

DOOR INSIDE HANDLE KNOB PLAY CHECK



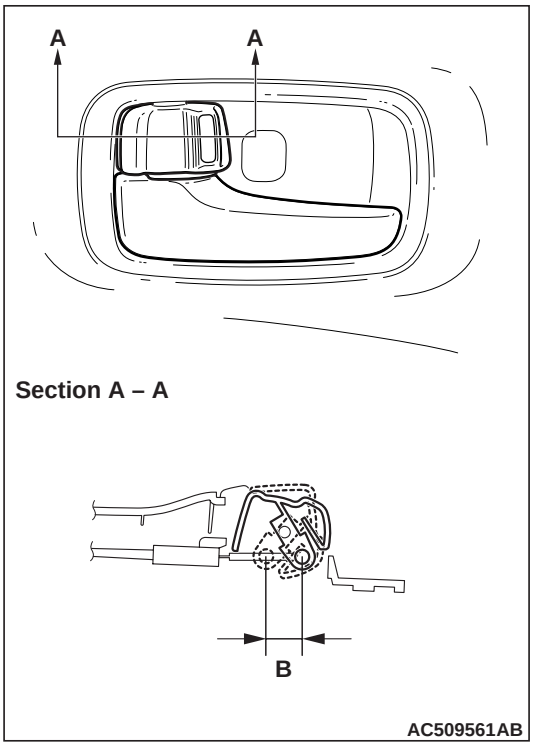
1. Check that the door inside handle play is within the standard value range.

   Standard value (B): 5.2 – 19.6 mm (target value: 10.9 mm)

2. If it is outside the standard value range, check the door inside handle and door latch assembly and replace them if necessary.

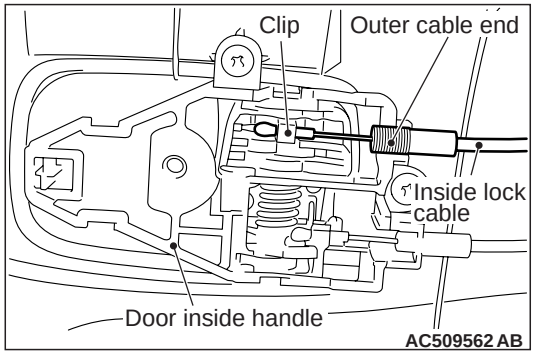
DOOR INSIDE HANDLE LOCK KNOB STROKE CHECK

1. Remove the door trim assembly. Refer to GROUP 52A, Door Trim <Single cab and Club cab>, <Double cab>.



2. Check that the stroke of the door inside handle lock knob is within the standard value range.

   Standard value (B):
   Front door: 14.5 – 16 mm (target value: 15 mm)
   Rear door: 14.5 – 15.5 mm



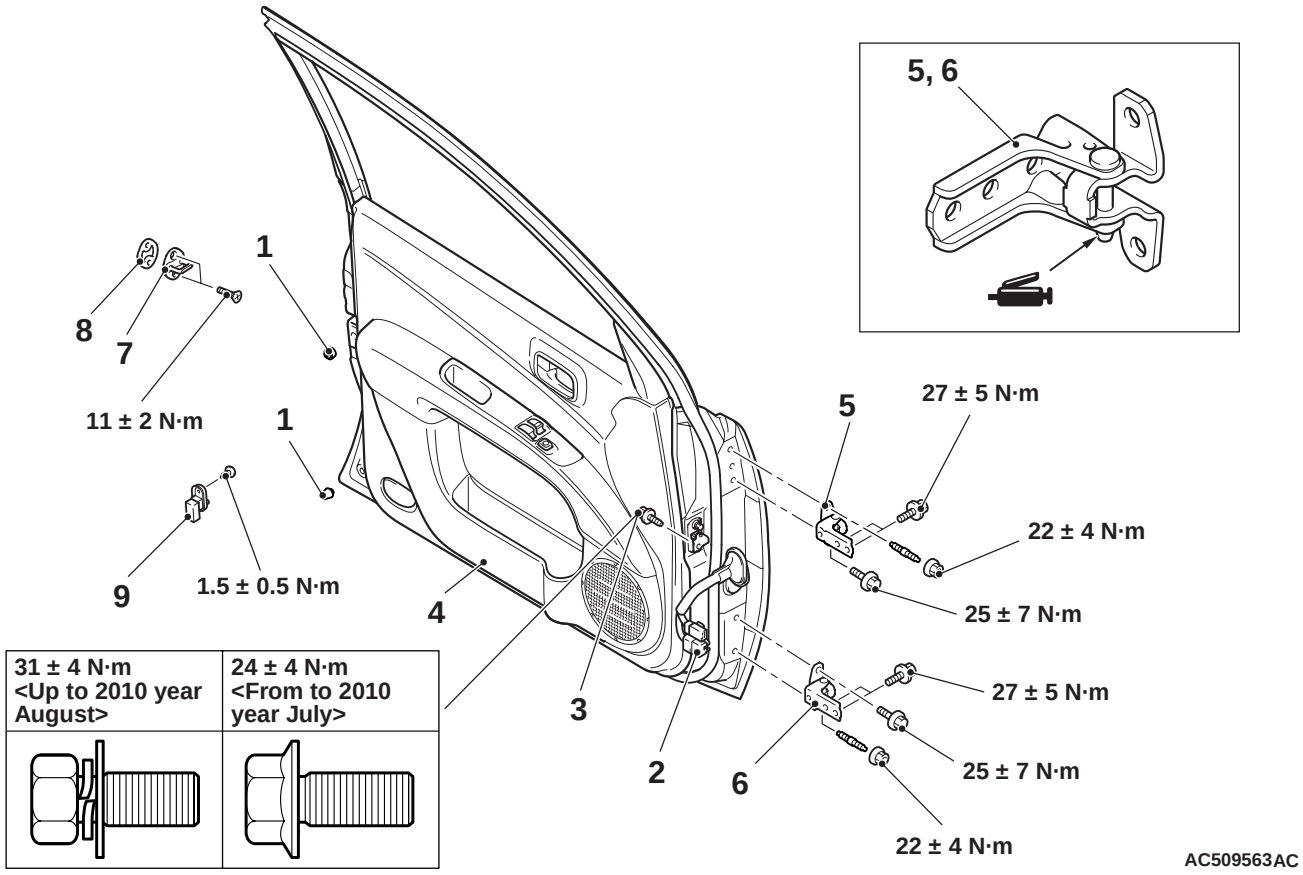
3. If it is outside the standard value range, adjust the stroke of the inside handle lock knob by using the outer cable end, which connects the inside handle lock knob to the inside lock cable.

DOOR ASSEMBLY

REMOVAL AND INSTALLATION <SINGLE CAB>

M1423002200573

Post-installation Operation
- Door Fit Adjustment (Refer to P.42-168).



Damper removal
1. Damper

Door assembly removal steps
- Front Scuff Plate and Cowl Side Trim (Refer to GROUP 52A, Interior Trim .)

2. Wiring harness connector connection
3. Door check connecting bolt
4. Door assembly
5. Door upper hinge
6. Door lower hinge

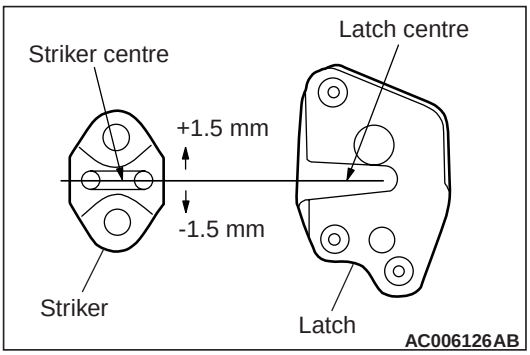
Striker removal steps

>>A<< 7. Striker
8. Striker shim

Door switch removal
9. Door switch

INSTALLATION SERVICE POINT

>>A<< STRIKER INSTALLATION

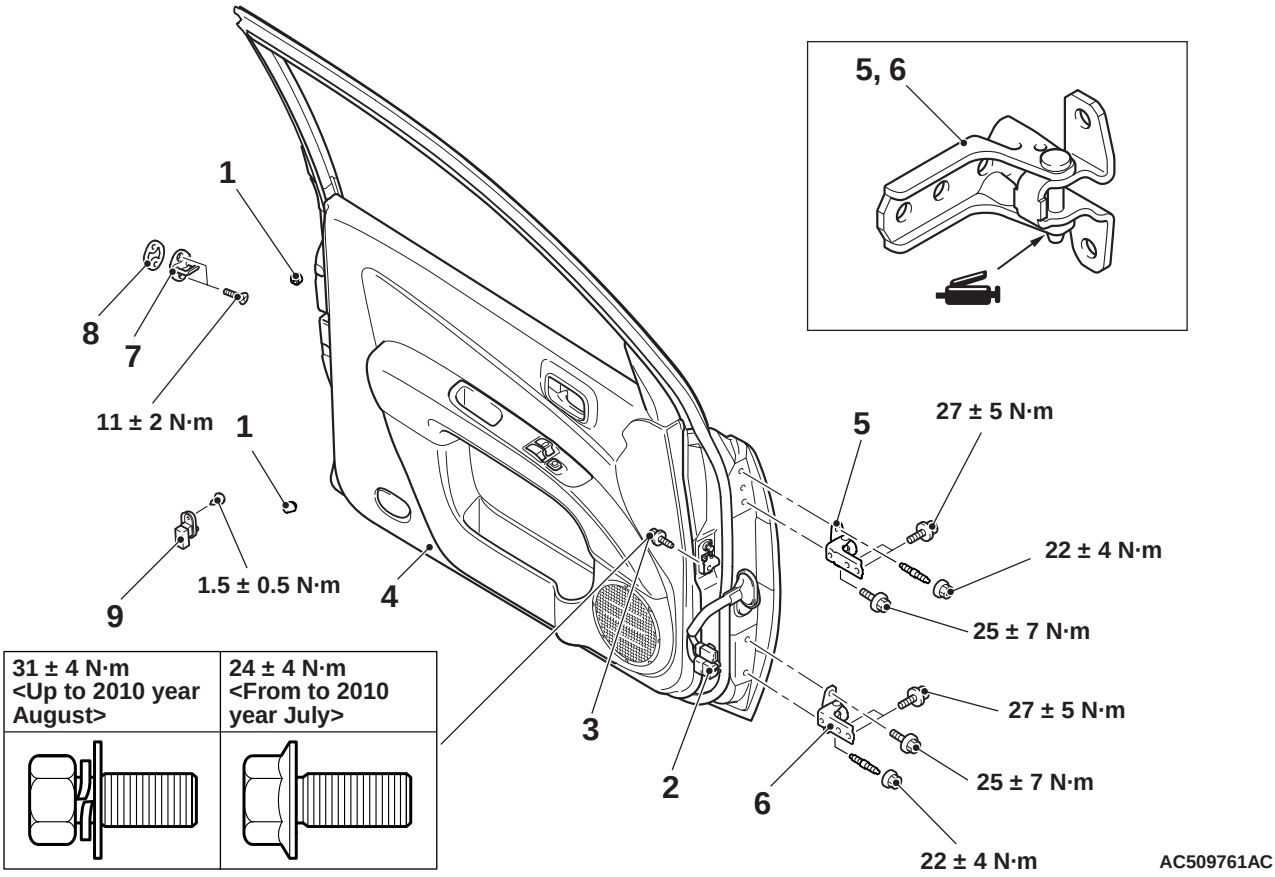


Align the centre of the striker and latch within ±1.5 mm, and install.

REMOVAL AND INSTALLATION <CLUB CAB>

M1423002200584

Post-installation Operation
- Door Fit Adjustment (Refer to P.42-168).



AC509761AC

Damper removal
1. Damper

Door assembly removal steps
- Front Scuff Plate and Cowl Side Trim (Refer to GROUP 52A, Interior Trim .)
2. Wiring harness connector connection
3. Door check connecting bolt
4. Door assembly
5. Door upper hinge
6. Door lower hinge

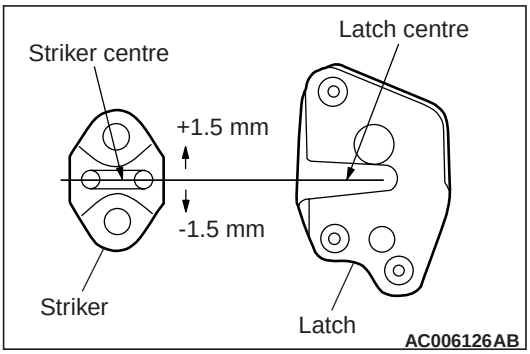
Striker removal steps

>>A<< 7. Striker
8. Striker shim

Door switch removal
9. Door switch

INSTALLATION SERVICE POINT

>>A<< STRIKER INSTALLATION



AC006126AB

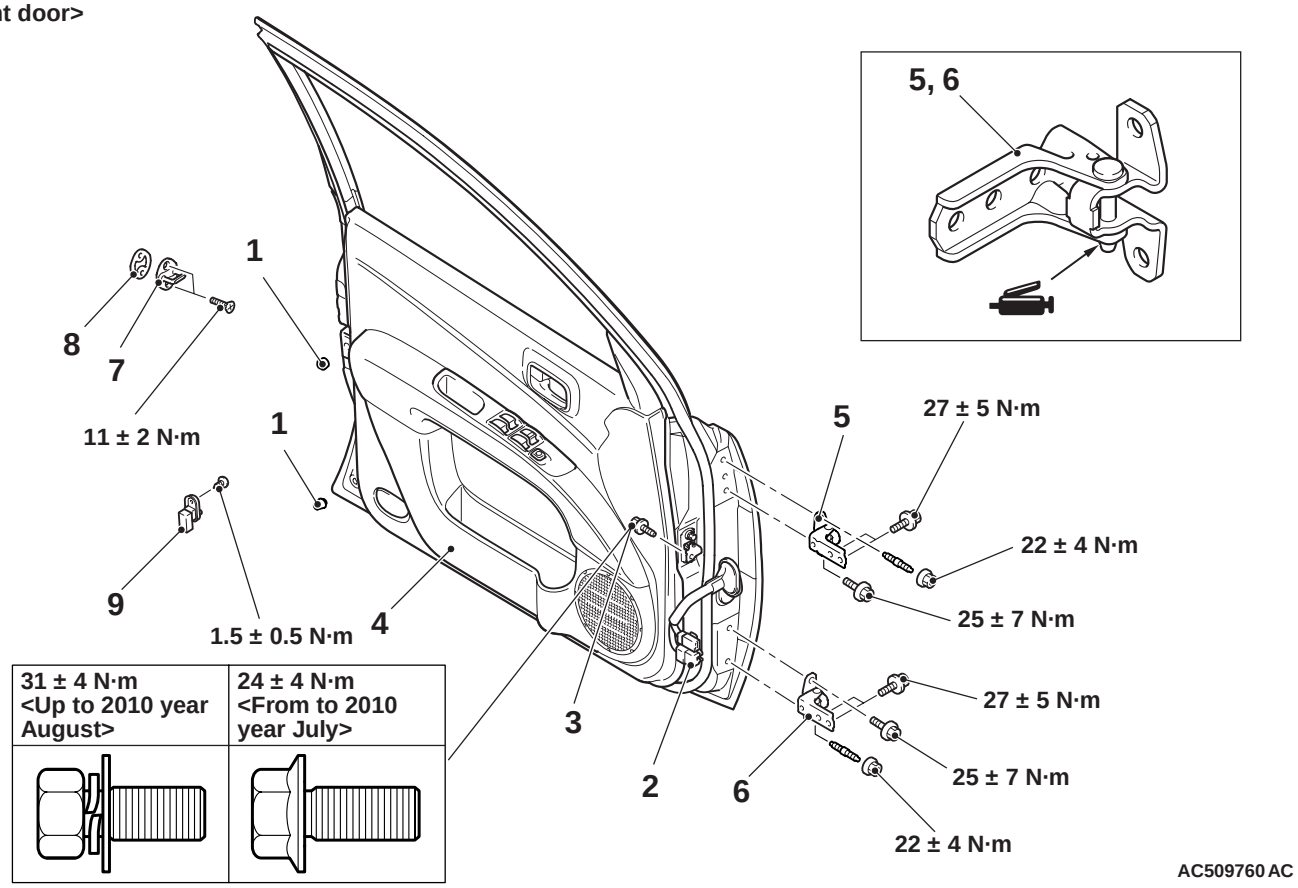
Align the centre of the striker and latch within ±1.5 mm, and install.

REMOVAL AND INSTALLATION <DOUBLE CAB>

M1423002200595

Post-installation Operation
- Door Fit Adjustment (Refer to P.42-168).

<Front door>



AC509760 AC

Damper removal
1. Damper

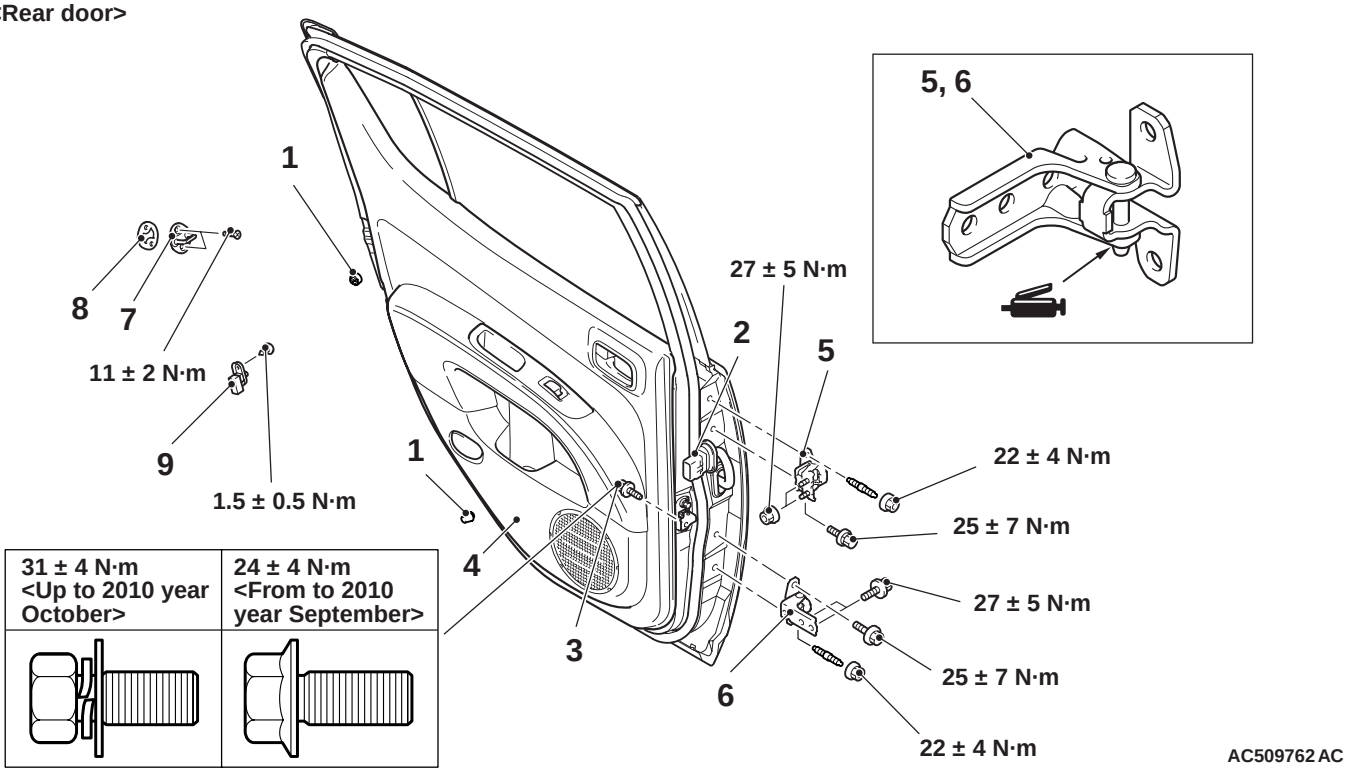
Door assembly removal steps
- Front Scuff Plate and Cowl Side Trim (Refer to GROUP 52A, Interior Trim .)
2. Wiring harness connector connection
3. Door check connecting bolt
4. Door assembly

Door assembly removal steps
5. Door upper hinge
6. Door lower hinge

Striker removal steps
>>A<< 7. Striker
8. Striker shim

Door switch removal
9. Door switch

<Rear door>



Damper removal

1. Damper

Door assembly removal steps

2. Wiring harness connector connection
3. Door check connecting bolt
4. Door assembly
   - Centre pillar trim lower (Refer to GROUP 52A, Interior Trim .)
5. Door upper hinge
6. Door lower hinge

Striker removal steps

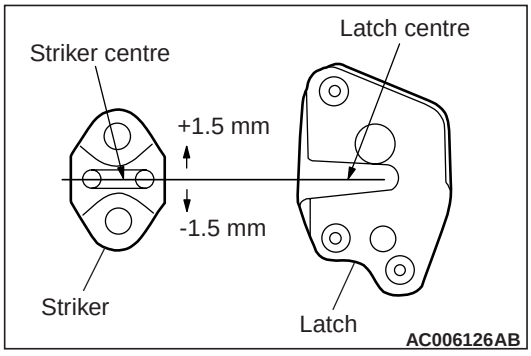
>>A<< 7. Striker
8. Striker shim

Door switch removal

9. Door switch

INSTALLATION SERVICE POINT

>>A<< STRIKER INSTALLATION

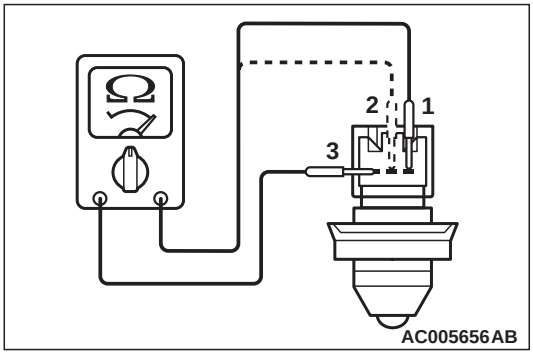


Align the centre of the striker and latch within ±1.5 mm, and install.

INSPECTION

M1423006000559

DOOR SWITCH CHECK



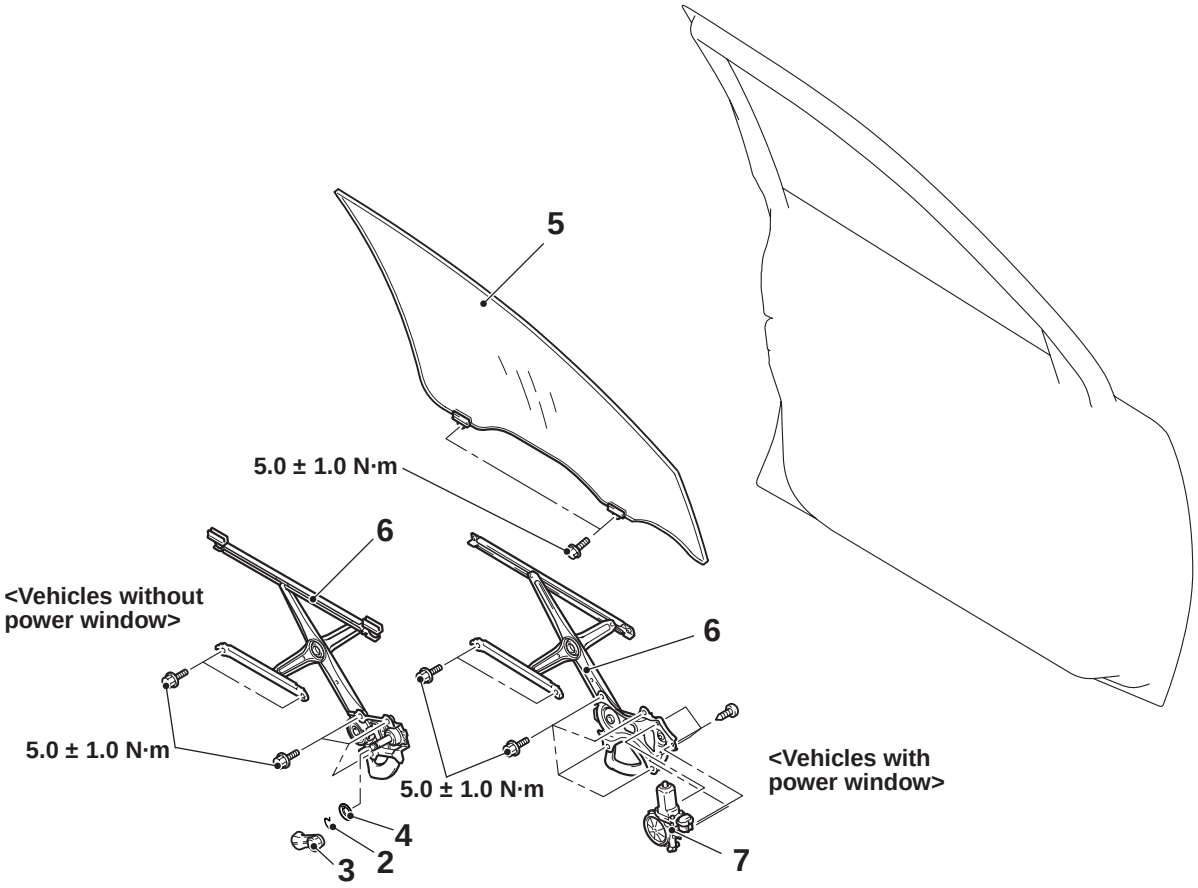
Switch position	Tester connection	Specified condition
Released (ON)	1 – 3, 2 – 3	Continuity exists (2 Ω or less)
Depressed (OFF)		Open circuit

DOOR GLASS AND REGULATOR

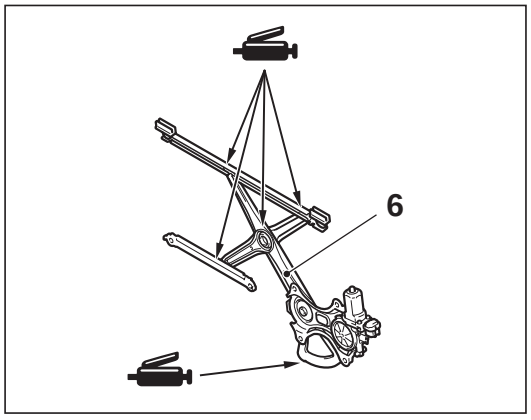
REMOVAL AND INSTALLATION <SINGLE CAB>

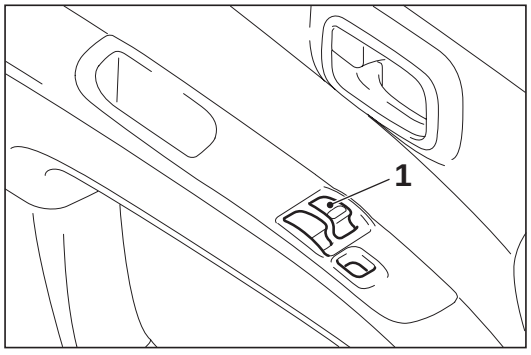
M1429001301501

Post-installation Operation
- Door Window Glass Adjustment (Refer to P.42-169).



AC509763AE





AC509768AB

Power window switch <Vehicles with power window> removal

1. Power window main switch (driver's side), power window sub switch (passenger's side) (Refer to GROUP 52A, Door Trim .)

<<A>> >>**B**<<

Regulator handle <Vehicles with manual window> removal steps

2. Clip
3. Regulator handle
4. Escutcheon

Door window glass assembly removal steps

- Beltline moulding, beltline weatherstrip inner (Refer to P.42-196.)
- Waterproof film (Refer to P.42-196.)

5. Door window glass assembly

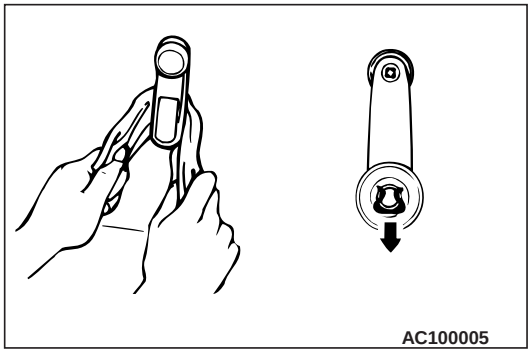
Door window regulator assembly removal steps

>>A<<
- Post-installation operation check
- Rear lower sash (Refer to P.42-196.)

<<B>>
6. Door window regulator assembly
7. Power window motor <Vehicles with power window>

REMOVAL SERVICE POINTS

<<A>> CLIP REMOVAL

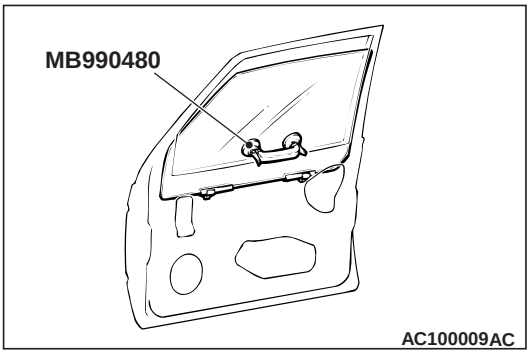


Use a cloth to remove the clip as shown in the illustration.

<<B>> DOOR WINDOW REGULATOR ASSEMBLY REMOVAL

1. Remove the door window glass installation bolts.

⚠ CAUTION



If tinting film is adhered to the door window glass, attach the special tool window glass holder (MB990480) to the outside of the glass to prevent the film from peeling off.

2. Lift the door window glass, and attach the special tool window glass holder (MB990480) to the glass as shown to prevent the glass from falling.
3. Remove the door window regulator assembly.

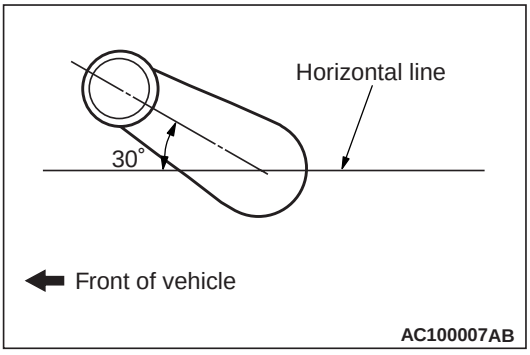
INSTALLATION SERVICE POINTS

>>A<< POST-INSTALLATION OPERATION CHECK

When the following procedures are carried out, make the power window switch learn the fully closed position of the power window (Refer to P.42-172).

- Power window regulator removal or replacement
- Power window switch removal or replacement

>>B<< ESCUTCHEON/REGULATOR HANDLE/ CLIP INSTALLATION

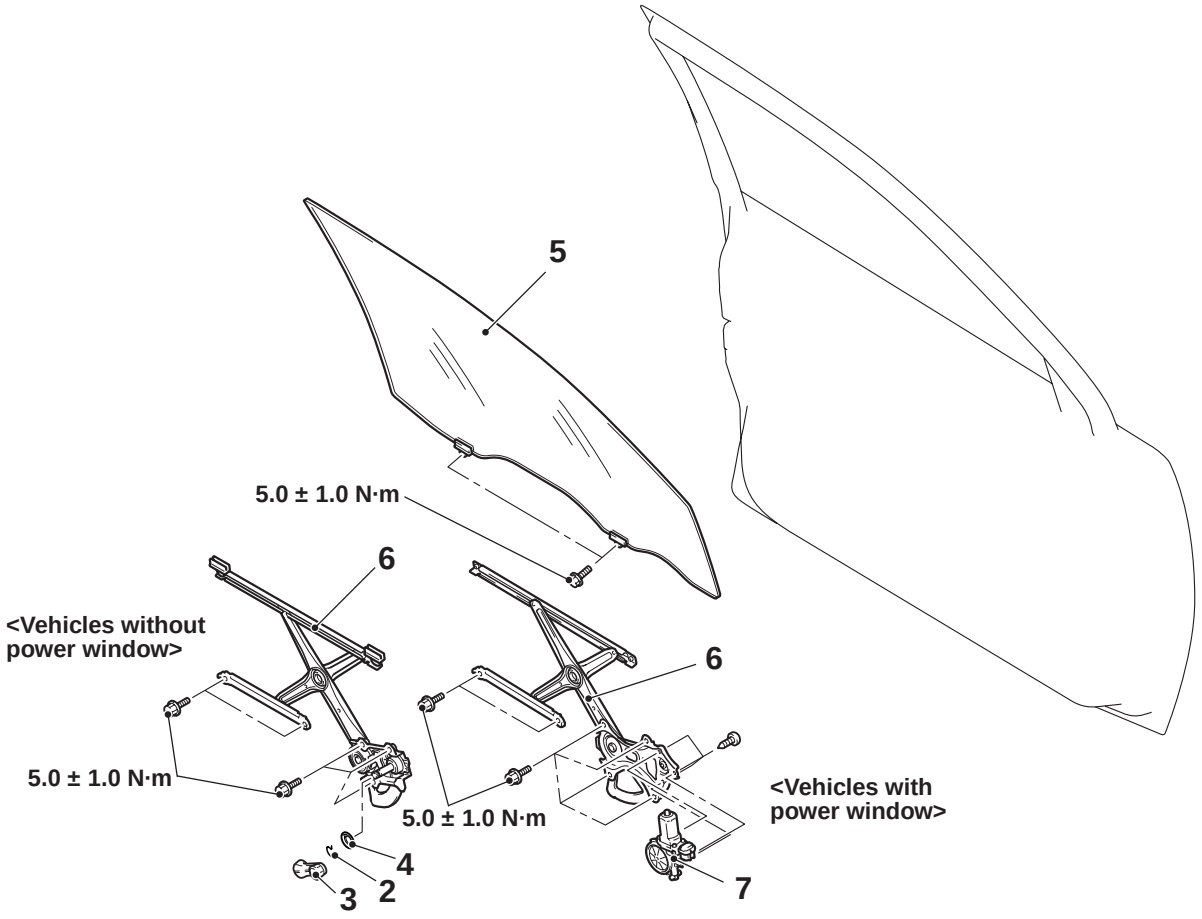


1. Install the escutcheon and regulator handle to the clip.
2. Close the door window glass fully, and then install the regulator handle as shown in the illustration.

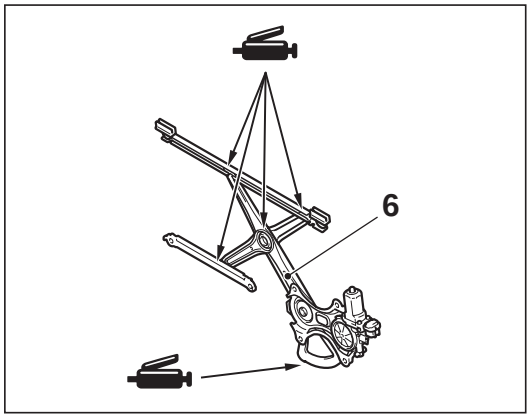
REMOVAL AND INSTALLATION <CLUB CAB>

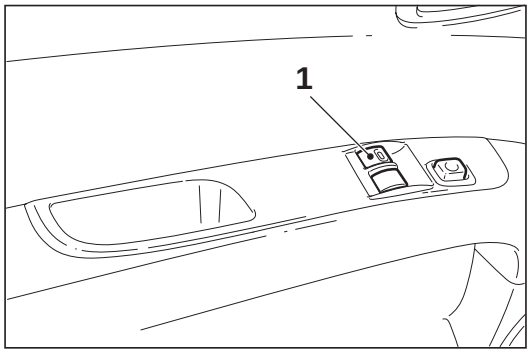
M1429001301512

Post-installation Operation
- Door Window Glass Adjustment (Refer to P.42-169).



AC509765AC





AC509766 AB

Power window switch <Vehicles with power window> removal

1. Power window main switch (driver's side), power window sub switch (passenger's side) (Refer to GROUP 52A, Door Trim .)

<<A>> **>>B<<**

Regulator handle <Vehicles with manual window> removal steps

2. Clip
3. Regulator handle
4. Escutcheon

Door window glass assembly removal steps

- Beltline moulding, beltline weatherstrip inner (Refer to P.42-198.)
- Waterproof film (Refer to P.42-198.)

5. Door window glass assembly

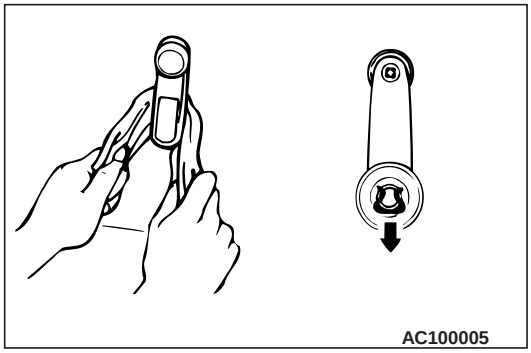
Door window regulator assembly removal steps

>>A<<
- Post-installation operation check
- Rear lower sash (Refer to P.42-198.)

<<B>>
6. Door window regulator assembly
7. Power window motor <Vehicles with power window>

REMOVAL SERVICE POINTS

<<A>> CLIP REMOVAL

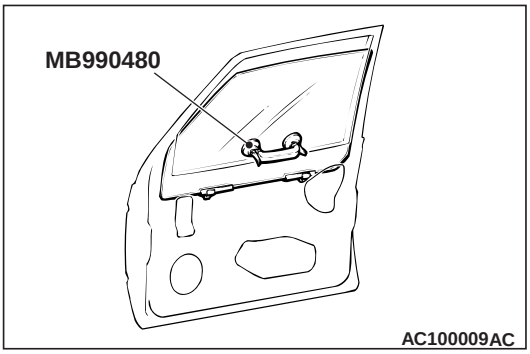


Use a cloth to remove the clip as shown in the illustration.

<<B>> DOOR WINDOW REGULATOR ASSEMBLY REMOVAL

1. Remove the door window glass installation bolts.

⚠ CAUTION



If tinting film is adhered to the door window glass, attach the special tool window glass holder (MB990480) to the outside of the glass to prevent the film from peeling off.

2. Lift the door window glass, and attach the special tool window glass holder (MB990480) to the glass as shown to prevent the glass from falling.
3. Remove the door window regulator assembly.

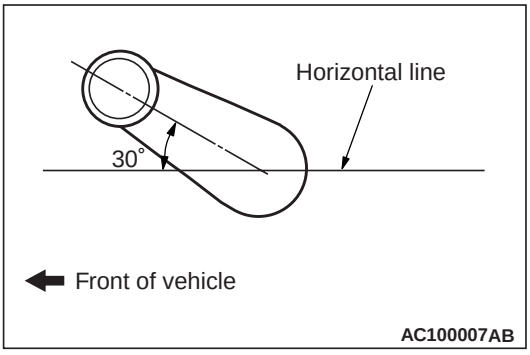
INSTALLATION SERVICE POINTS

>>A<< POST-INSTALLATION OPERATION CHECK

When the following procedures are carried out, make the power window switch learn the fully closed position of the power window (Refer to P.42-172).

- Power window regulator removal or replacement
- Power window switch removal or replacement

>>B<< ESCUTCHEON/REGULATOR HANDLE/ CLIP INSTALLATION



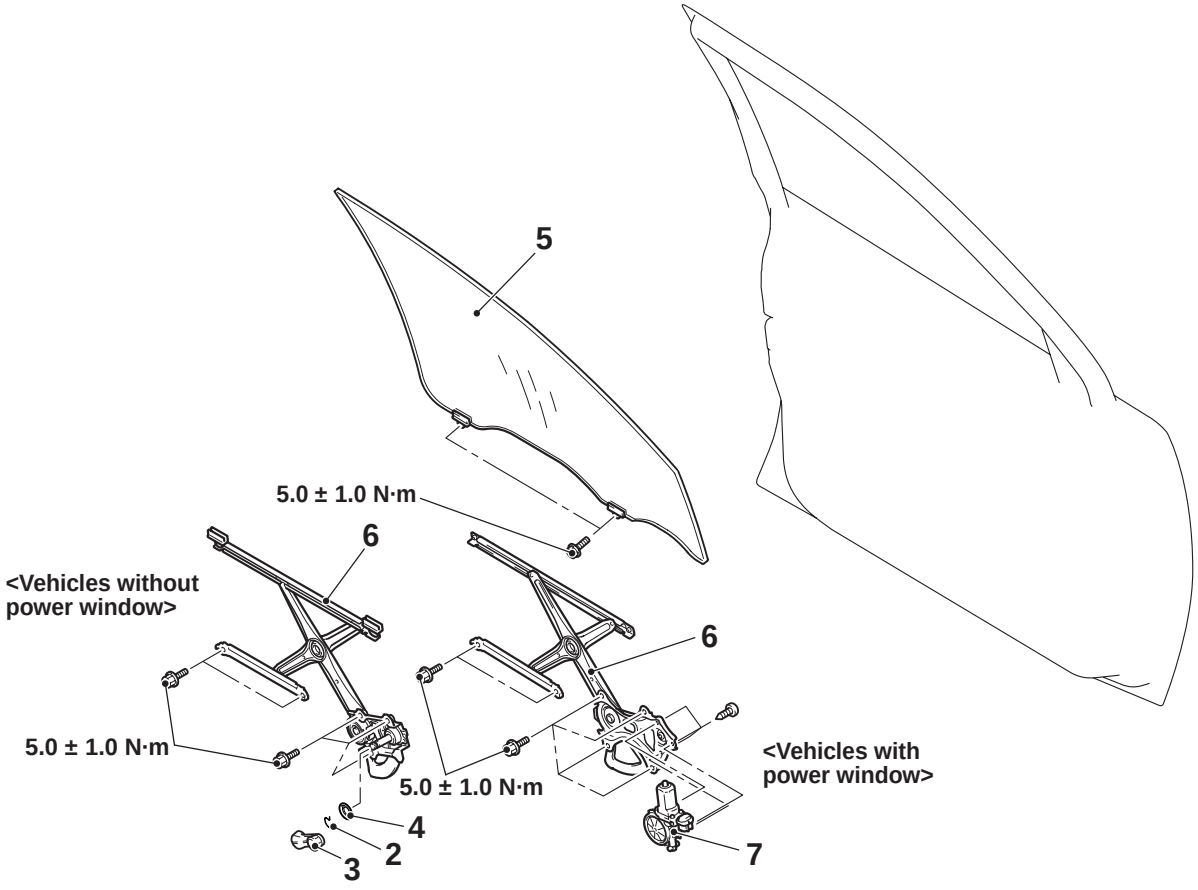
1. Install the escutcheon and regulator handle to the clip.
2. Close the door window glass fully, and then install the regulator handle as shown in the illustration.

REMOVAL AND INSTALLATION <DOUBLE CAB>

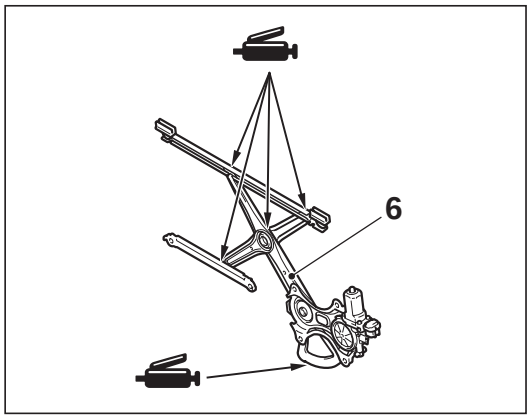
M1429001301523

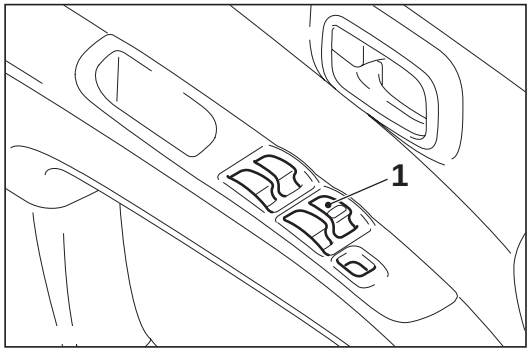
Post-installation Operation
- Door Window Glass Adjustment (Refer to P.42-169).

<Front door>



AC509764AD





AC509767AB

Power window switch <Vehicles with power window> removal

1. Power window main switch (driver's side), power window sub switch (passenger's side) (Refer to GROUP 52A, Door Trim).

<<A>> **>>B<<**

Regulator handle <Vehicles with manual window> removal steps

2. Clip
3. Regulator handle
4. Escutcheon

Door window glass assembly removal steps

- Waterproof film (Refer to P.42-196).
- Beltline moulding, beltline weatherstrip inner (Refer to P.42-200).

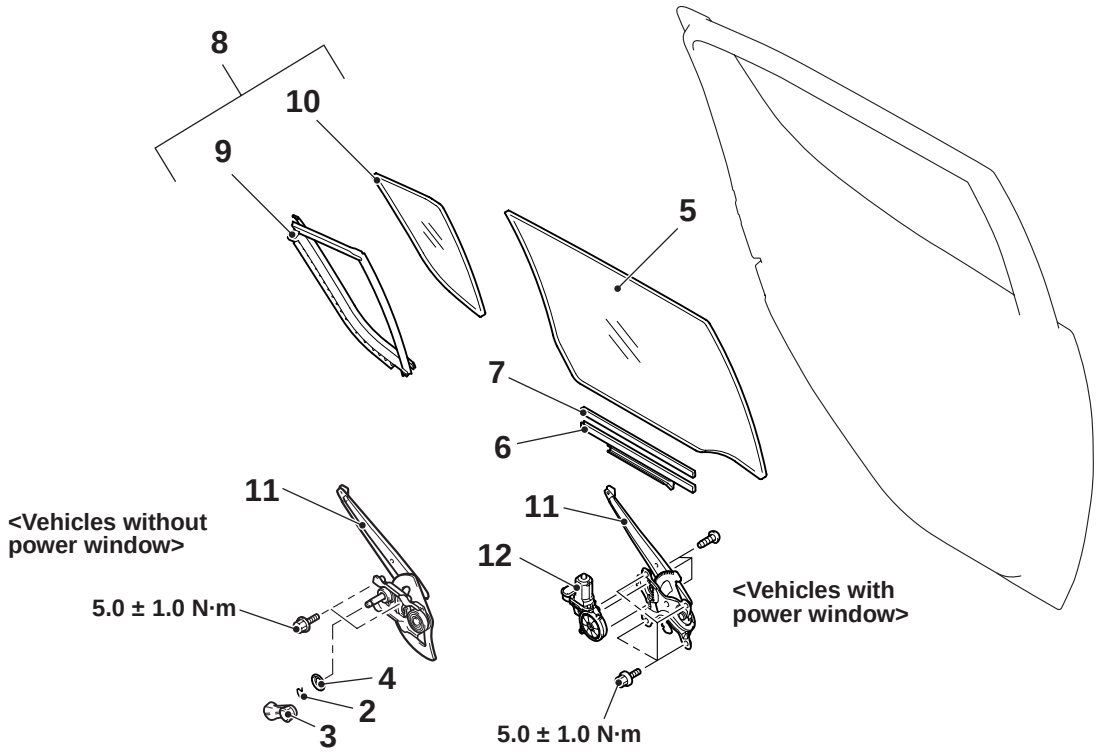
5. Door window glass assembly

Door window regulator assembly removal steps

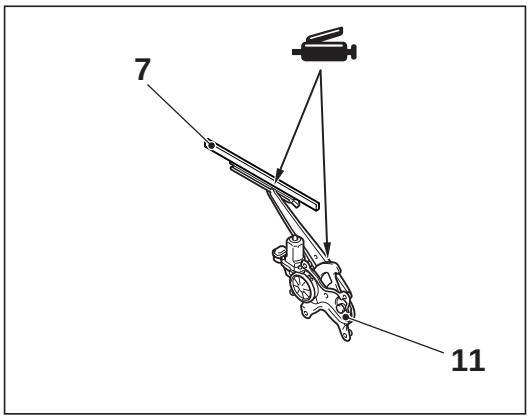
>>A<<
- Post-installation operation check
- Waterproof film (Refer to P.42-200).

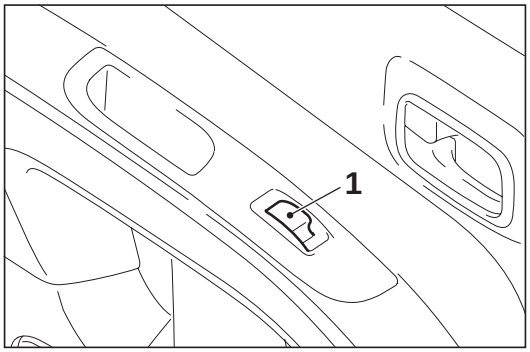
<<B>>
6. Door window regulator assembly
7. Power window motor <Vehicles with power window>

<Rear door>



AC509769AD





AC509770AB

Power window sub switch <Vehicles with power window> removal

1. Power window sub switch (Refer to GROUP 52A, Door Trim .)

Regulator handle <Vehicles with manual window> removal steps

<<A>> >>B<< 2. Clip
>>B<< 3. Regulator handle
>>B<< 4. Escutcheon

Door window glass assembly and stationary window glass removal steps

- Beltline moulding, beltline weatherstrip inner (Refer to P.42-200.)
- Waterproof film (Refer to P.42-200.)

5. Door window glass assembly
6. Door window glass holder
7. Door window glass pad
- Centre sash (Refer to P.42-200.)

8. stationary window glass assembly
9. stationary window weatherstrip
10. stationary window glass

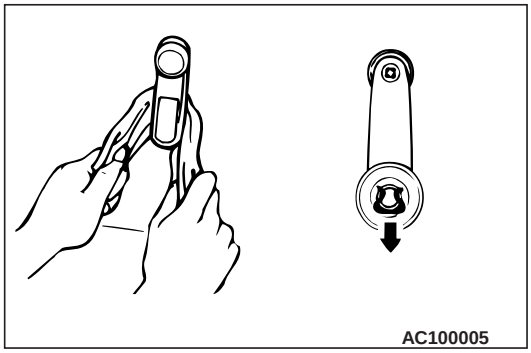
Door window regulator assembly removal steps

>>A<< • Post-installation operation check
- Waterproof film (Refer to P.42-200.)

<<B>> 11. Door window regulator assembly
12. Power window motor <Vehicles with power window>

REMOVAL SERVICE POINTS

<<A>> CLIP REMOVAL

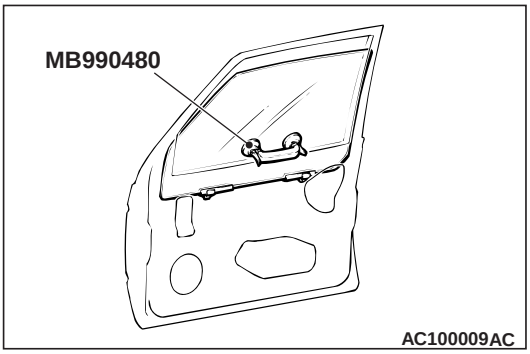


Use a cloth to remove the clip as shown in the illustration.

<<B>> DOOR WINDOW REGULATOR ASSEMBLY REMOVAL

1. Remove the door window glass assembly installation bolts.

⚠ CAUTION



If tinting film is adhered to the door window glass, attach the special tool window glass holder (MB990480) to the outside of the glass to prevent the film from peeling off.

2. Lift the door window glass, and attach the special tool window glass holder (MB990480) to the glass as shown to prevent the glass from falling.
3. Remove the door window regulator assembly.

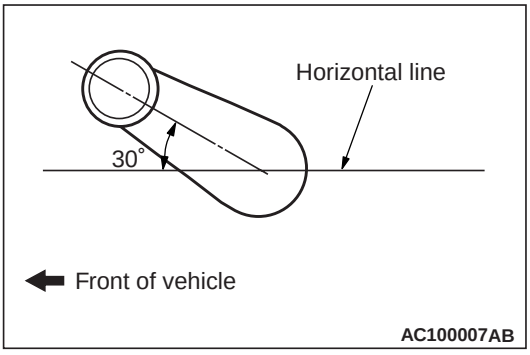
INSTALLATION SERVICE POINTS

>>A<< POST-INSTALLATION OPERATION CHECK

When the following procedures are carried out, make the power window switch learn the fully closed position of the power window (Refer to P.42-172).

- Power window regulator removal or replacement
- Power window switch removal or replacement

>>B<< ESCUTCHEON/REGULATOR HANDLE/ CLIP INSTALLATION



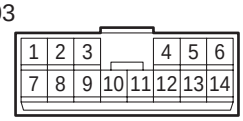
1. Install the escutcheon and regulator handle to the clip.
2. Close the door window glass fully, and then install the regulator handle as shown in the illustration.

INSPECTION

M1429001401241

POWER WINDOW MAIN SWITCH TERMINAL CHECK

E-03

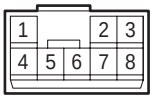


AC312988AC

Terminal No.	Check item	Check condition	Normal condition
1	Output to power window motor	–	–
2	Earth	Always	1 V or less
3	–	–	–
4	LIN communication line (ETACS-ECU)	Always	0 to 12 V (pulse signal)
5	–	–	–
6	Power supply	Ignition switch: ON	System voltage
7	Output to power window motor	–	–
8	Input from power window motor (pulse sensor earth)	–	0.5 V or less
9	Input from power window motor (pulse sensor signal)	When the power windows are operating	0 to 5 V (pulse signal)
10	Input from power window motor (pulse sensor signal)	When the power windows are operating	0 to 5 V (pulse signal)
11	–	–	–
12	Input from power window motor (power supply to pulse sensor)	When the power windows are operating	5 V
13, 14	–	–	–

POWER WINDOW SUB SWITCH TERMINAL CHECK

E-16: Front power window sub switch,
E-13: Rear power window sub switch (LH),
E-06: Rear power window sub switch (RH)



AC312990AC

Terminal No.	Check item	Check condition	Normal condition
1	Earth	Always	1 V or less
2	Input from power window motor (pulse sensor signal)	When the power windows are operating	0 to 5 V (pulse signal)
3	Input from power window motor (power supply to pulse sensor)	When the power windows are operating	5 V

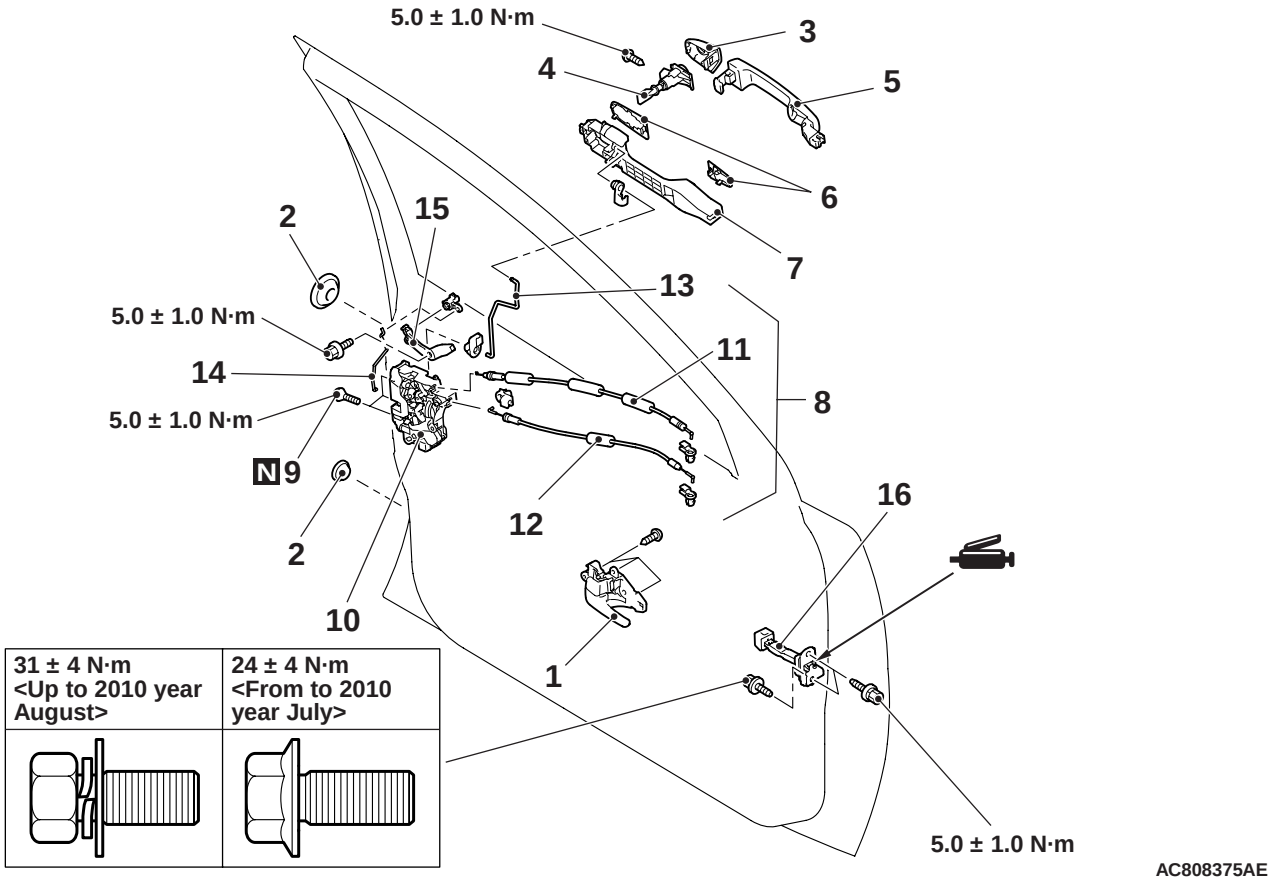
Terminal No.	Check item	Check condition	Normal condition
4	Power supply	Ignition switch: ON	System voltage
5	Output to power window motor	–	–
6	LIN communication line (ETACS-ECU)	Always	0 to 12 V (pulse signal)
7	Output to power window motor	–	–
8	Input from power window motor (pulse sensor signal)	When the power windows are operating	0 to 5 V (pulse signal)

DOOR HANDLE AND LATCH

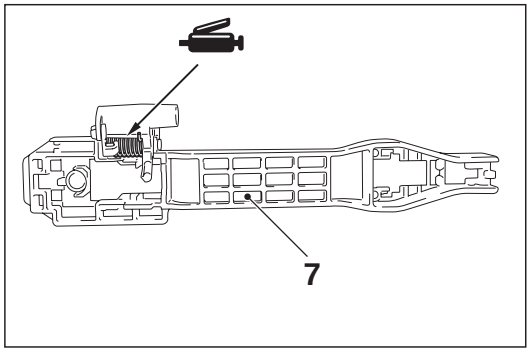
REMOVAL AND INSTALLATION <SINGLE CAB>

M1423004601622

Pre-removal Operation	Post-installation Operation
• Door Trim Assembly Removal (Refer to GROUP 52A, Door Trim).	• Door Inside Handle Play Check (Refer to P.42-173). • Door Outside Handle Play Check (Refer to P.42-173). • Door Trim Assembly Installation (Refer to GROUP 52A, Door Trim).



AC808375AE



Door inside handle removal

>>B<< 1. Door inside handle (built-in front door trim) (Refer to GROUP 52A - Door Trim .)

Door lock key cylinder and door outside handle removal steps

- Waterproof film and rear lower sash (Refer to P.42-196.)

2. Plug
3. Door outside handle cover
4. Door lock key cylinder <some models for front passenger's side>
5. Door outside handle
6. Door outside handle gasket
7. Door outside handle base

Door latch assembly removal steps

- Waterproof film and rear lower sash (Refer to P.42-196.)

8. Door latch and cable assembly
9. Screw
10. Door latch assembly
11. Door inside lock cable
12. Door inside handle cable
13. Door outside handle rod
14. Door outside lock rod
15. Door panel bracket

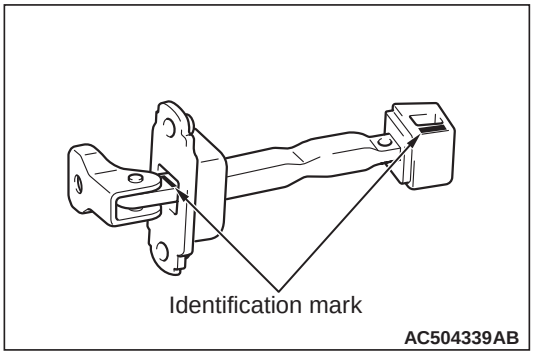
Door check removal steps

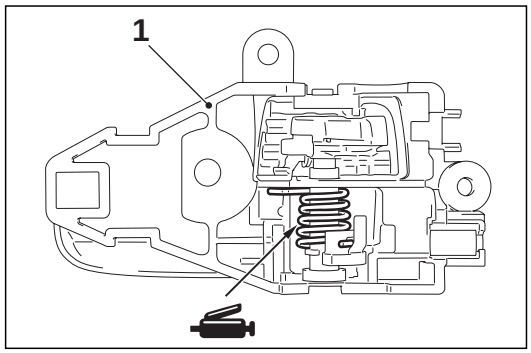
- Waterproof film (Refer to P.42-196.)

>>A<< 16. Door check

INSTALLATION SERVICE POINTS

>>A<< DOOR CHECK INSTALLATION <From to 2010 year July>

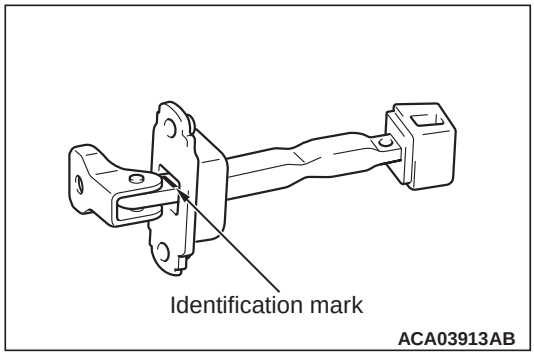




Install the door check with the following identification marks facing upward.

Application locations	Identification mark
Left side	57L
Right side	57R

>>A<< DOOR CHECK INSTALLATION <Up to 2010 year August>



When installing the door check to the front left door, make sure that its identification mark faces up. When installing the door check to the front right door, make sure that its identification mark faces down.

Application locations	Identification mark
Left side	FR
Right side	FR

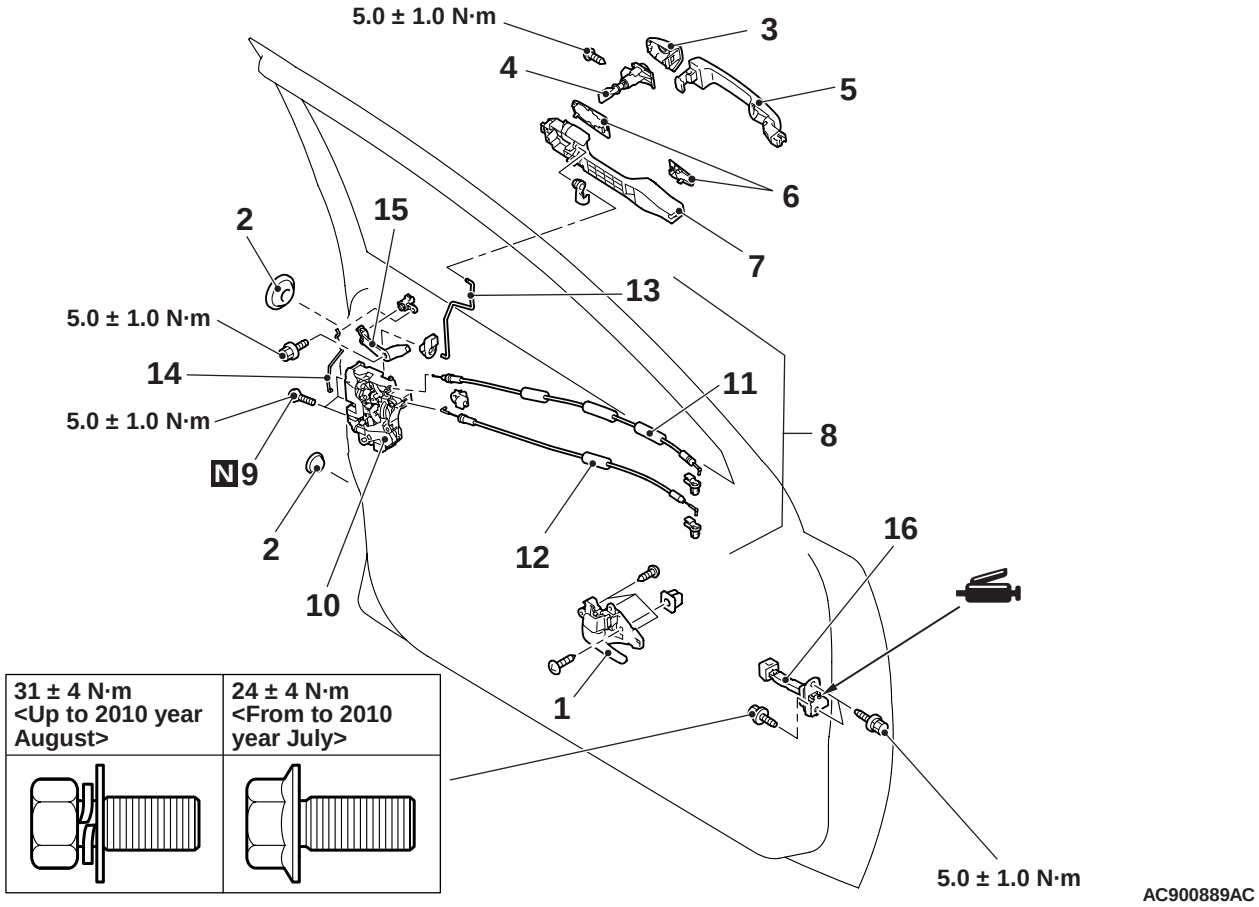
>>B<< DOOR INSIDE HANDLE INSTALLATION

When connecting the inside cable to the door inside handle, ensure that the door latch and the inside handle are unlocked.

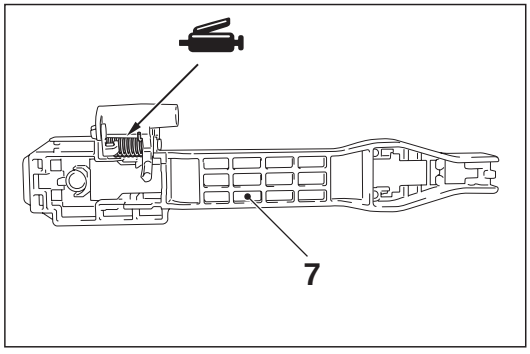
REMOVAL AND INSTALLATION <CLUB CAB>

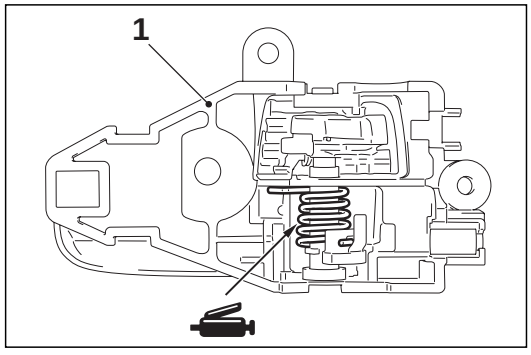
M1423004601633

Pre-removal Operation	Post-installation Operation
• Door Trim Assembly Removal (Refer to GROUP 52A, Door Trim).	• Door Inside Handle Play Check (Refer to P.42-173). • Door Outside Handle Play Check (Refer to P.42-173). • Door Trim Assembly Installation (Refer to GROUP 52A, Door Trim).



AC900889AC





AC509773AB

Door inside handle removal

>>B<< 1. Door inside handle

Door lock key cylinder and door outside handle removal steps

- Waterproof film and rear lower sash (Refer to P.42-198.)

2. Plug
3. Door outside handle cover
4. Door lock key cylinder

Door lock key cylinder and door outside handle removal steps

5. Door outside handle
6. Door outside handle gasket
7. Door outside handle base

Door latch assembly removal steps
- Waterproof film and rear lower sash (Refer to P.42-198.)

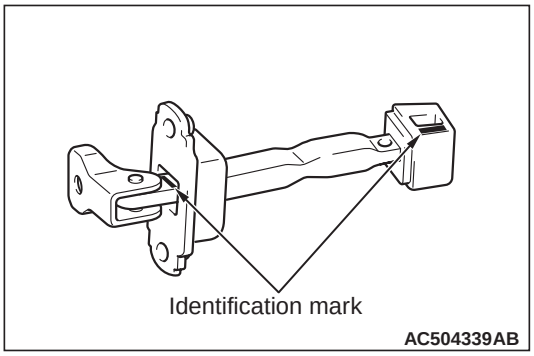
8. Door latch and cable assembly
9. Screw
10. Door latch assembly
11. Door inside lock cable
12. Door inside handle cable
13. Door outside handle rod
14. Door outside lock rod
15. Door panel bracket

Door check removal steps
- Waterproof film (Refer to P.42-198.)

>>A<< 16. Door check

INSTALLATION SERVICE POINTS

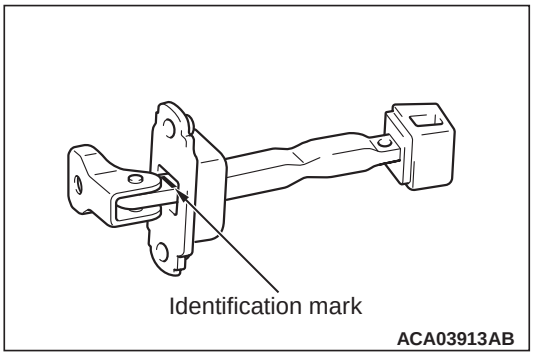
>>A<< DOOR CHECK INSTALLATION <From to 2010 year July>



Install the door check with the following identification marks facing upward.

Application locations	Identification mark
Left side	57L
Right side	57R

>>A<< DOOR CHECK INSTALLATION <Up to 2010 year August>



When installing the door check to the front left door, make sure that its identification mark faces up. When installing the door check to the front right door, make sure that its identification mark faces down.

Application locations	Identification mark
Left side	FR
Right side	FR

>>B<< DOOR INSIDE HANDLE INSTALLATION

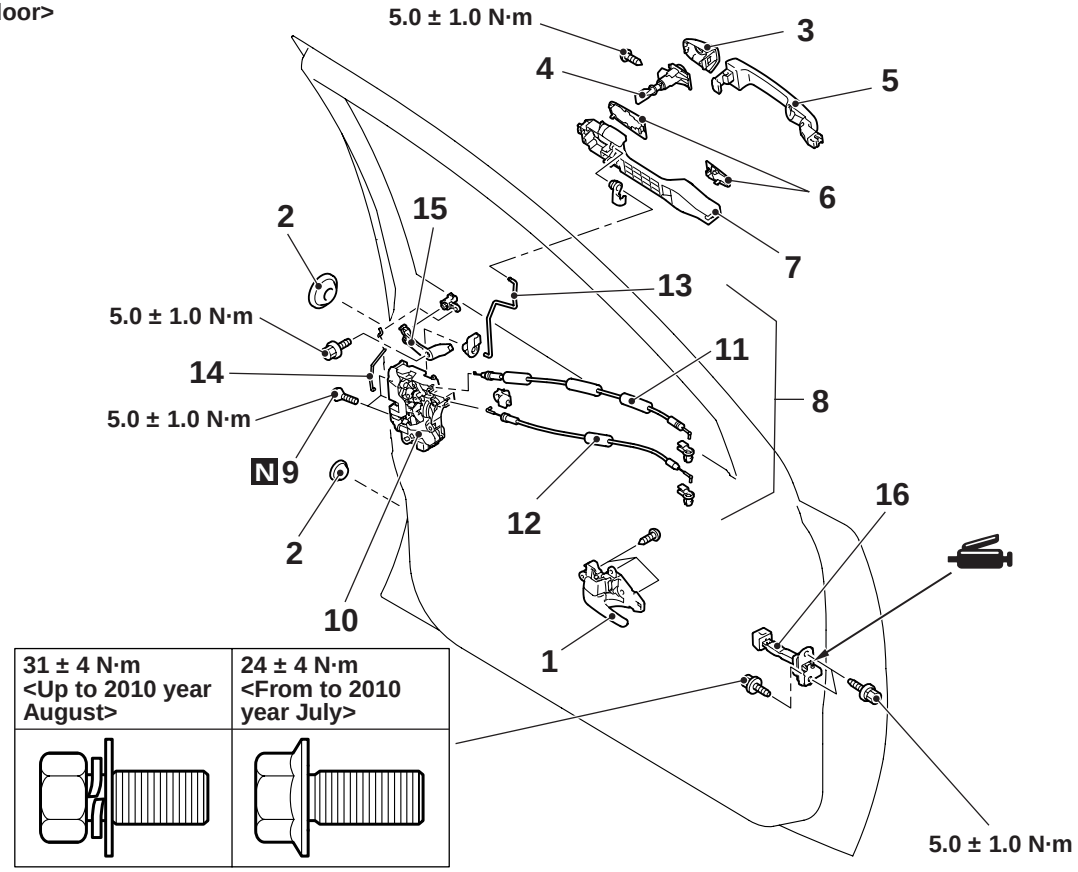
When connecting the inside cable to the door inside handle, ensure that the door latch and the inside handle are unlocked.

REMOVAL AND INSTALLATION <DOUBLE CAB>

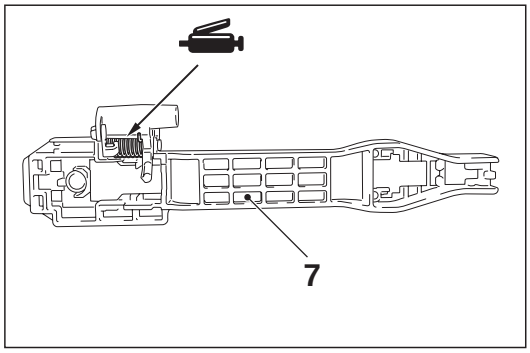
M1423004601644

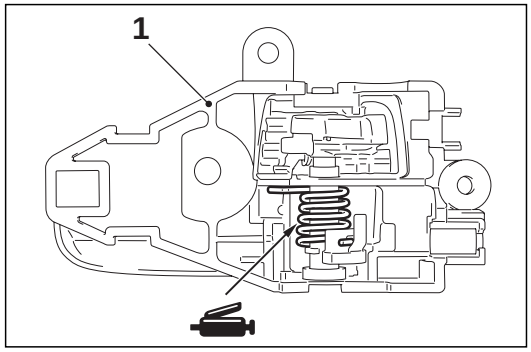
Pre-removal Operation	Post-installation Operation
• Door Trim Assembly Removal (Refer to GROUP 52A, Door Trim).	• Door Inside Handle Play Check (Refer to P.42-173). • Door Outside Handle Play Check (Refer to P.42-173). • Door Trim Assembly Installation (Refer to GROUP 52A, Door Trim).

<Front door>



AC808375AD





AC509773AB

Door inside handle removal

>>B<< 1. Door inside handle (built-in front door trim) (Refer to GROUP 52A - Door Trim .)

Door lock key cylinder and door outside handle removal steps

- Waterproof film and rear lower sash (Refer to P.42-200.)

2. Plug
3. Door outside handle cover

Door lock key cylinder and door outside handle removal steps

4. Door lock key cylinder <some models for front passenger's side>
5. Door outside handle
6. Door outside handle gasket
7. Door outside handle base

Door latch assembly removal steps

- Waterproof film and rear lower sash (Refer to P.42-200.)

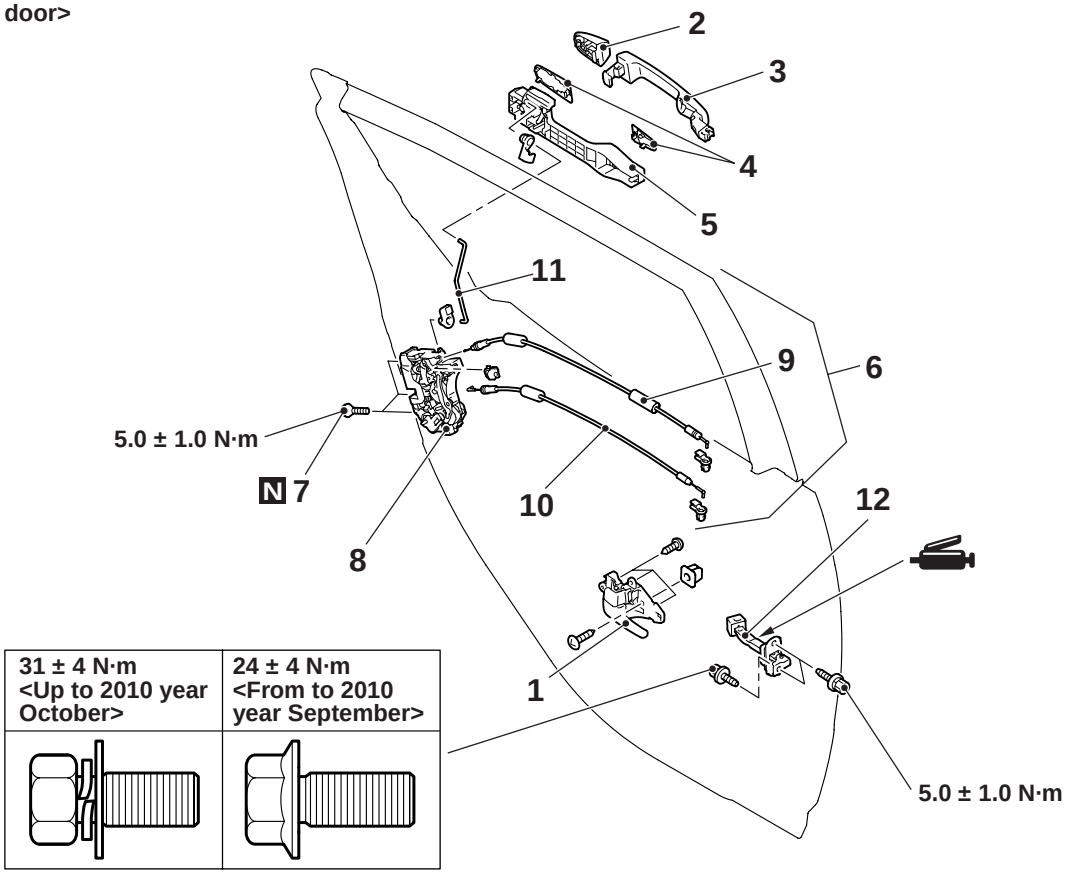
8. Door latch and cable assembly
9. Screw
10. Door latch assembly
11. Door inside lock cable
12. Door inside handle cable
13. Door outside handle rod
14. Door outside lock rod
15. Door panel bracket

Door check removal steps

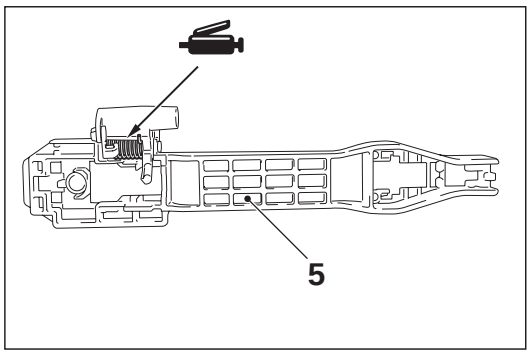
- Waterproof film (Refer to P.42-200.)

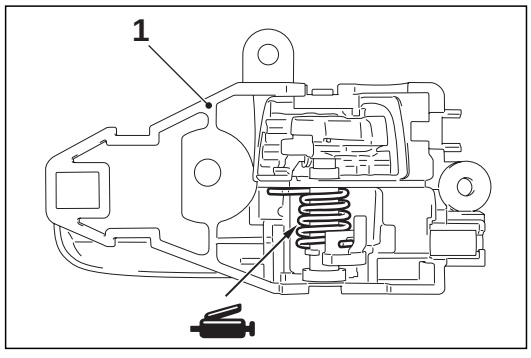
>>A<< 16. Door check

<Rear door>



AC509778AG





AC509773AB

Door inside handle removal

>>B<< 1. Door inside handle (built-in rear door trim) (Refer to GROUP 52A - Door Trim .)

Door outside handle removal steps

- Waterproof film (Refer to P.42-200.)

2. Door outside handle cover
3. Door outside handle
4. Door outside handle gasket
5. Door outside handle base

Door latch assembly removal steps

- Waterproof film (Refer to P.42-200.)

6. Door latch and cable assembly
7. Screw
8. Door latch assembly
9. Door inside lock cable
10. Door inside handle cable
11. Door outside handle rod

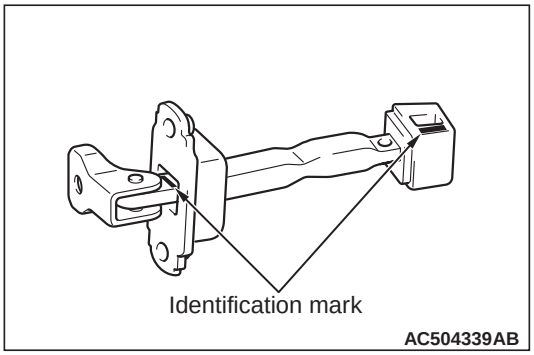
Door check removal steps

- Waterproof film (Refer to P.42-200.)

>>A<< 12. Door check

INSTALLATION SERVICE POINTS

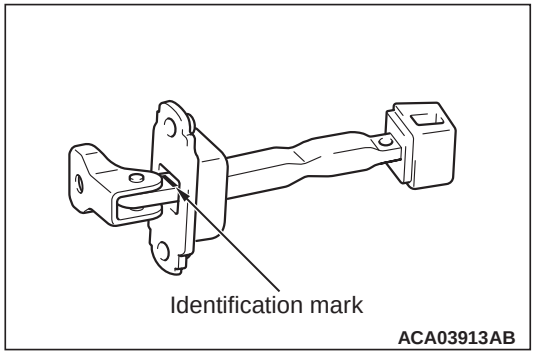
>>A<< DOOR CHECK INSTALLATION <Front door: From to 2010 year July, Rear door: From to 2010 year September>



Install the door check with the following identification marks facing upward.

Application locations		Identification mark
Front door	Left side	57L
	Right side	57R
Rear door	Left side	56L
	Right side	56R

>>A<< DOOR CHECK INSTALLATION <Front door: Up to 2010 year August, Rear door: Up to 2010 year October>



When installing the door check to the front left door, make sure that its identification mark faces up. When installing the door check to the front right door, make sure that its identification mark faces down.

Application locations		Identification mark
Front door	Left side	FR
	Right side	FR
Rear door	Left side	RR
	Right side	RR

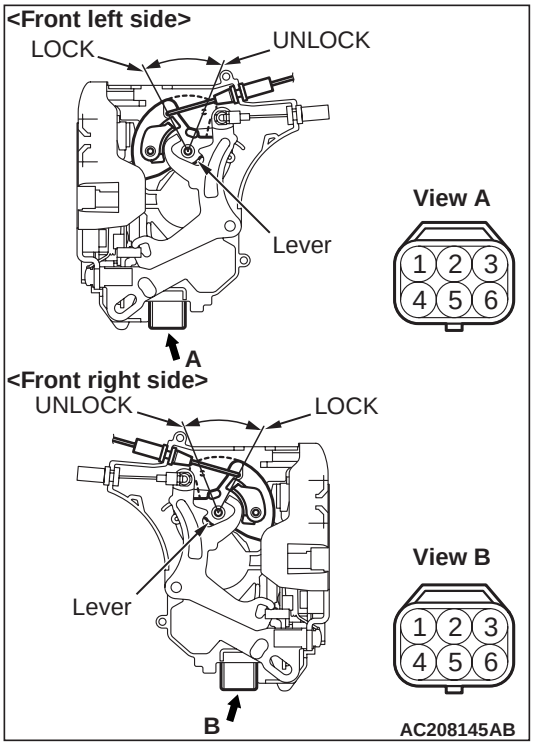
>>B<< DOOR INSIDE HANDLE INSTALLATION

When connecting the inside cable to the door inside handle, ensure that the door latch and the inside handle are unlocked.

INSPECTION

M1423004700842

FRONT DOOR LOCK ACTUATOR CHECK



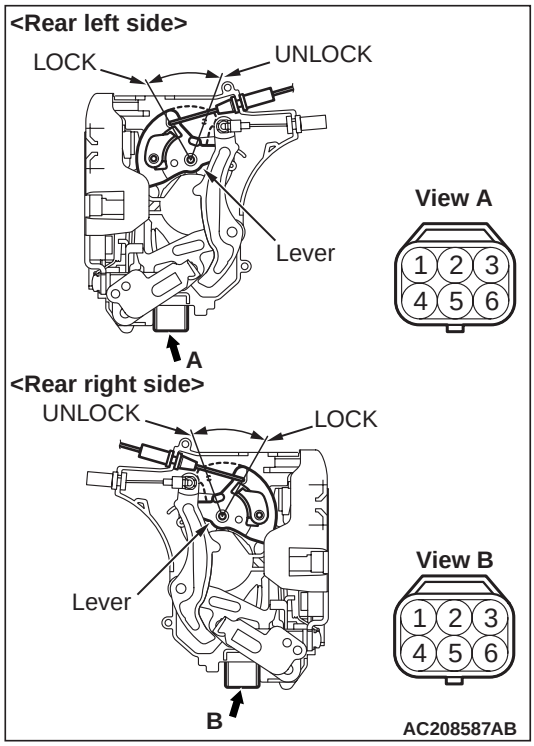
ACTUATOR OPERATION CHECK

Lever position	Battery connection	Lever operation
At the "LOCK" position	• Connect terminal No.4 and the negative battery terminal. • Connect terminal No.6 and the positive battery terminal.	The lever moves from the "LOCK" position to the "UNLOCK" position.
At the "UNLOCK" position	• Connect terminal No.6 and the negative battery terminal. • Connect terminal No.4 and the positive battery terminal.	The lever moves from the "UNLOCK" position to the "LOCK" position.

ACTUATOR SWITCH CHECK <DRIVER'S SIDE>

Lever position	Tester connection	Specified condition
At the "LOCK" position	2 – 3	Continuity exists (2 Ω or less)
At the "UNLOCK" position	1 – 3	

REAR DOOR LOCK ACTUATOR CHECK



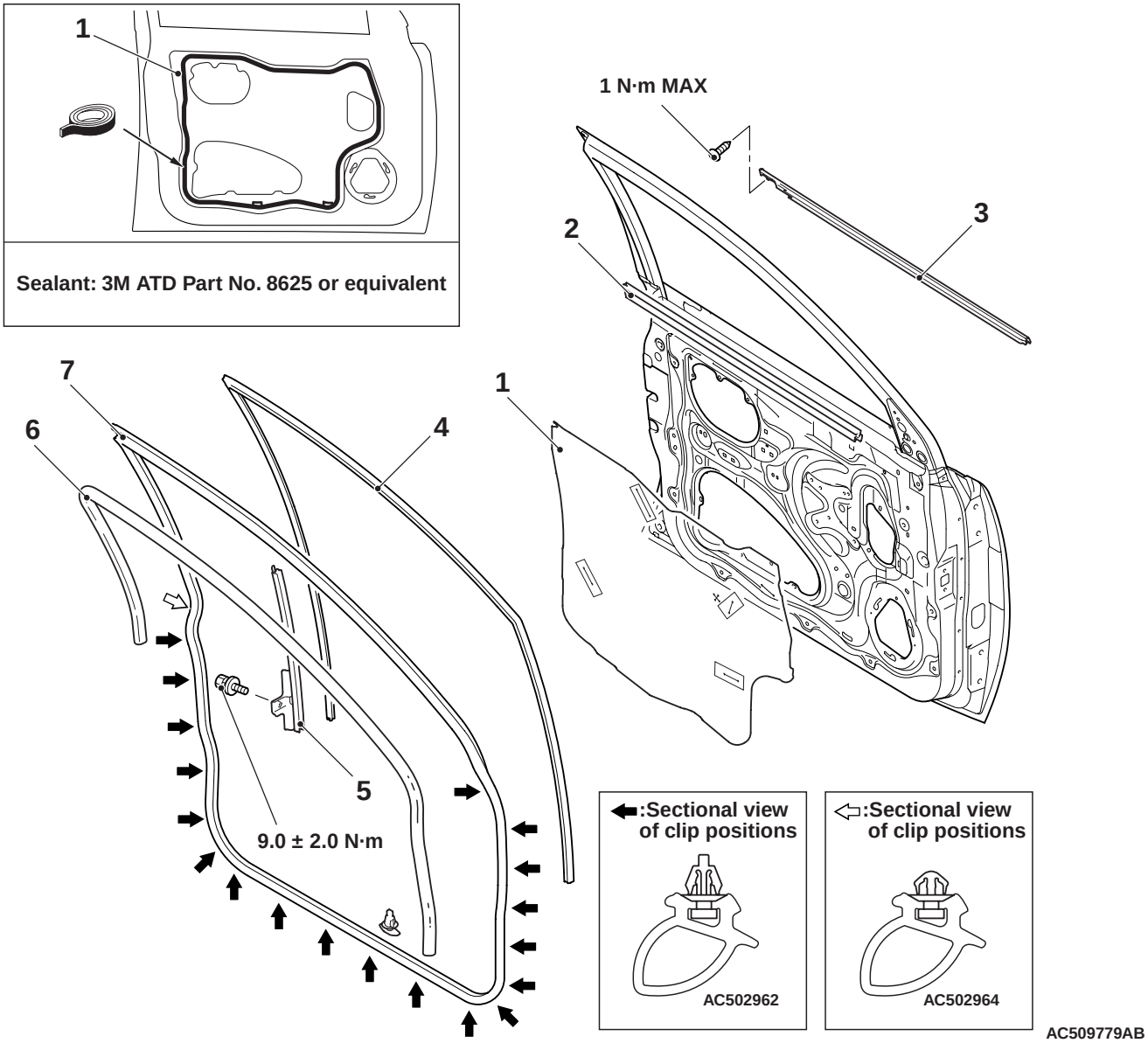
ACTUATOR OPERATION CHECK

Lever position	Battery connection	Lever operation
At the "LOCK" position	• Connect terminal No.4 and the negative battery terminal. • Connect terminal No.6 and the positive battery terminal.	The lever moves from the "LOCK" position to the "UNLOCK" position.
At the "UNLOCK" position	• Connect terminal No.6 and the negative battery terminal. • Connect terminal No.4 and the positive battery terminal.	The lever moves from the "UNLOCK" position to the "LOCK" position.

WINDOW GLASS RUNCHANNEL AND DOOR OPENING WEATHERSTRIP

REMOVAL AND INSTALLATION <SINGLE CAB>

M1423003101453



Door window glass runchannel removal steps

- Pull handle bracket (Refer to GROUP 52A, Door Trim .)

>>B<< 1. Waterproof film
2. Door beltline weatherstrip inner
3. Door beltline moulding
4. Door window glass runchannel

Door beltline weatherstrip inner removal steps

- Door trim assembly (Refer to GROUP 52A, Door Trim .)

2. Door beltline weatherstrip inner

Door beltline moulding removal steps

- Door trim assembly (Refer to GROUP 52A, Door Trim .)

3. Door beltline moulding

Rear lower sash removal steps

- Pull handle bracket (Refer to GROUP 52A, Door Trim .)

>>B<< 1. Waterproof film
>>A<< 5. Rear lower sash

Door opening weatherstrip inner removal steps

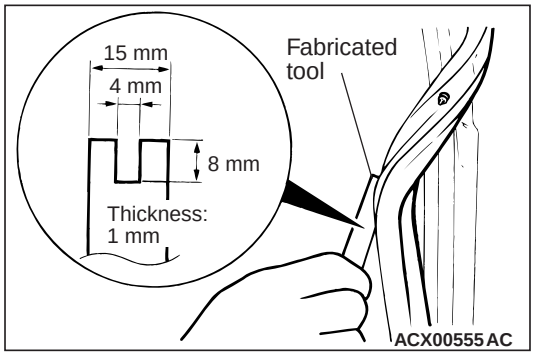
- Cowl side trim, front scuff plate and rear pillar trim (Refer to GROUP 52A, Interior Trim .)

6. Door opening weatherstrip inner
Door opening weatherstrip outer removal

<<**A**>> 7. Door opening weatherstrip outer

REMOVAL SERVICE POINT

<<A>> DOOR OPENING WEATHERSTRIP OUTER REMOVAL



Make a fabricated tool as shown in the illustration to remove the door opening weatherstrip outer.

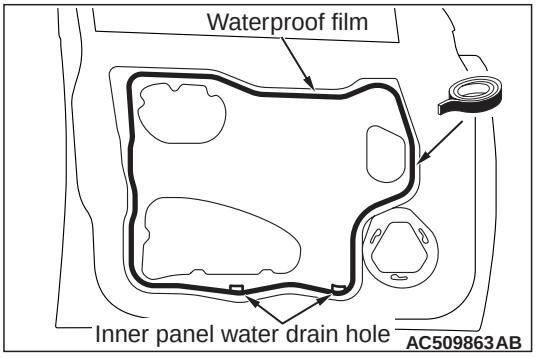
INSTALLATION SERVICE POINTS

>>A<< REAR LOWER SASH INSTALLATION

Engage the rear lower sash with the window sash (door) securely.

>>B<< WATERPROOF FILM INSTALLATION

⚠ CAUTION



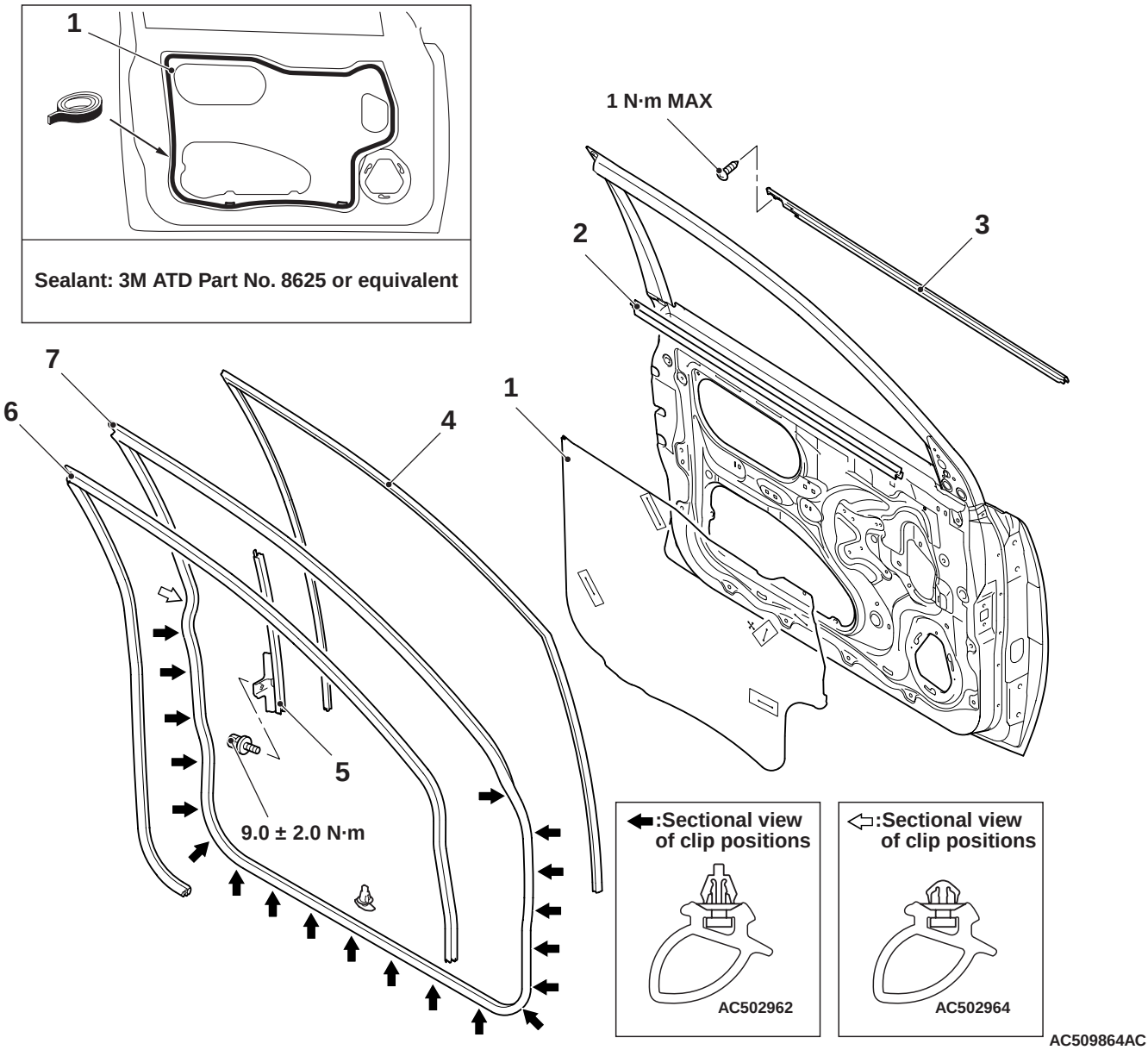
When sticking the waterproof film, ensure that the sealant is applied under the inner panel water drain hole.

Apply the specified sealant to the waterproof film as shown and stick the film.

Specified sealant: 3M ATD Part No.8625 or equivalent

REMOVAL AND INSTALLATION <CLUB CAB>

M1423003101464



Door window glass runchannel removal steps

- Pull handle bracket (Refer to GROUP 52A, Door Trim .)

>>**B**<< 1. Waterproof film
2. Door beltline weatherstrip inner
3. Door beltline moulding
4. Door window glass runchannel

Door beltline weatherstrip inner removal steps

- Door trim assembly (Refer to GROUP 52A, Door Trim .)

2. Door beltline weatherstrip inner

Door beltline moulding removal steps

- Door trim assembly (Refer to GROUP 52A, Door Trim .)

3. Door beltline moulding

Rear lower sash removal steps

- Pull handle bracket (Refer to GROUP 52A, Door Trim .)

>>**B**<< 1. Waterproof film
>>**A**<< 5. Rear lower sash

Door opening weatherstrip inner removal steps

- Cowl side trim, front scuff plate and quarter upper trim (Refer to GROUP 52A, Interior Trim .)

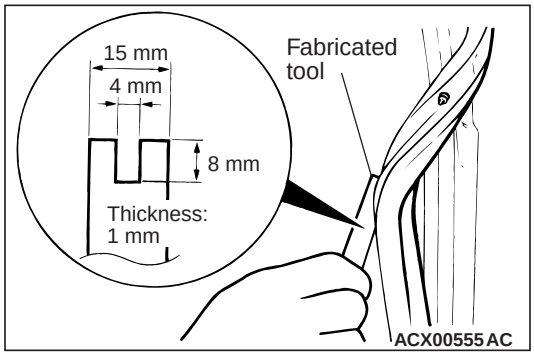
6. Door opening weatherstrip inner

Door opening weatherstrip outer removal

<<A>> 7. Door opening weatherstrip outer

REMOVAL SERVICE POINT

<<A>> DOOR OPENING WEATHERSTRIP OUTER REMOVAL



Make a fabricated tool as shown in the illustration to remove the door opening weatherstrip outer.

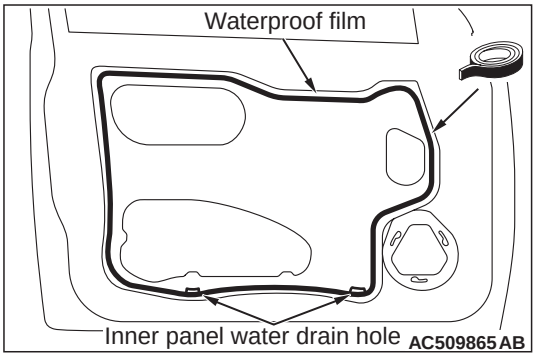
INSTALLATION SERVICE POINTS

>>A<< REAR LOWER SASH INSTALLATION

Engage the rear lower sash with the window sash (door) securely.

>>B<< WATERPROOF FILM INSTALLATION

⚠ CAUTION



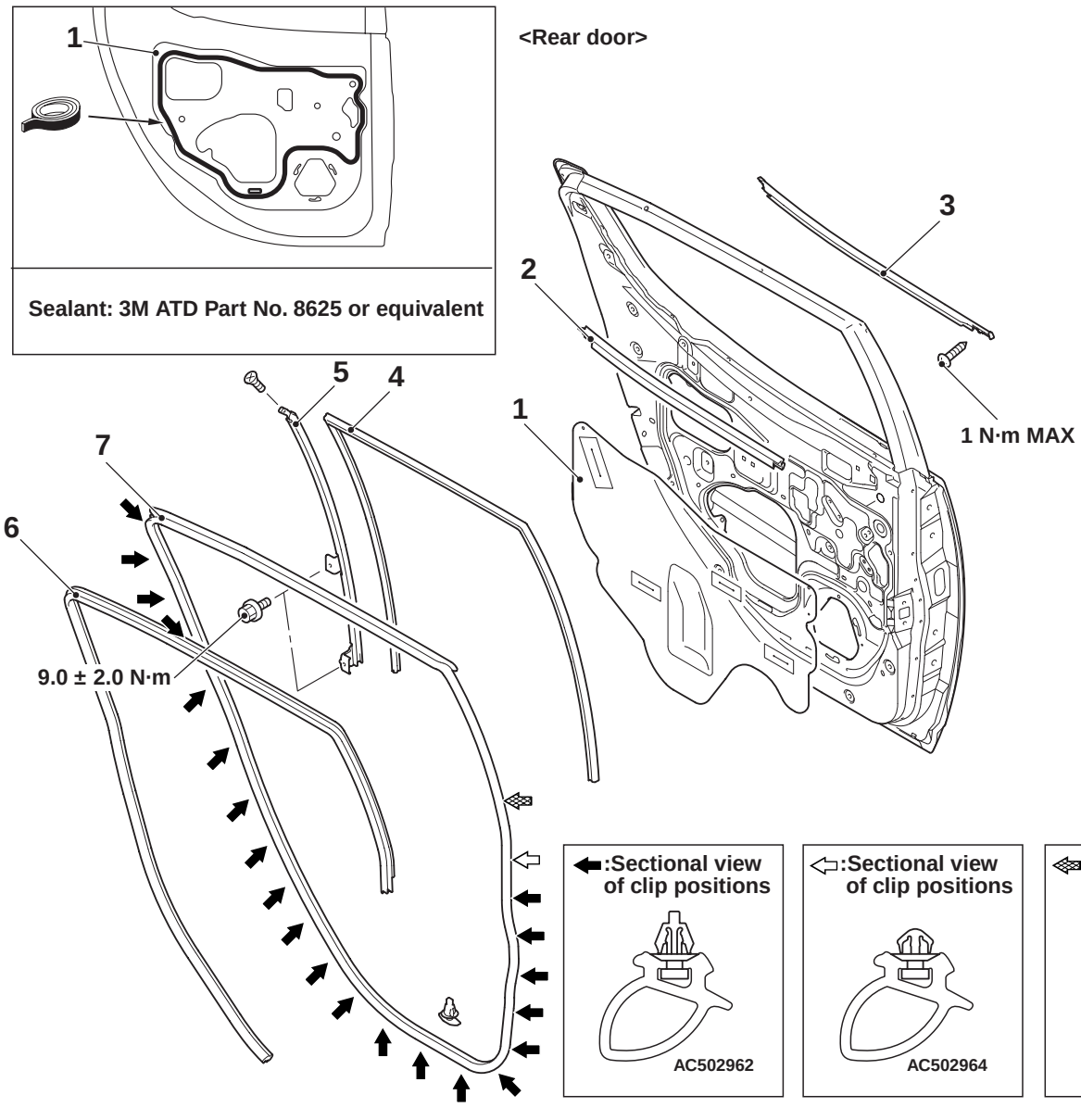
When sticking the waterproof film, ensure that the sealant is applied under the inner panel water drain hole.

Apply the specified sealant to the waterproof film as shown and stick the film.

Specified sealant: 3M ATD Part No.8625 or equivalent

REMOVAL AND INSTALLATION <DOUBLE CAB>

M1423003101806



AC509867AE

Door window glass runchannel removal steps
- Pull handle bracket (Refer to GROUP 52A, Door Trim .)

>>B<< 1. Waterproof film
2. Door beltline weatherstrip inner
3. Door beltline moulding
4. Door window glass runchannel

Door beltline weatherstrip inner removal steps
- Door trim assembly (Refer to GROUP 52A, Door Trim .)

2. Door beltline weatherstrip inner

Door beltline moulding removal steps
- Door trim assembly (Refer to GROUP 52A, Door Trim .)

3. Door beltline moulding

Rear lower sash removal steps
- Pull handle bracket (Refer to GROUP 52A, Door Trim .)

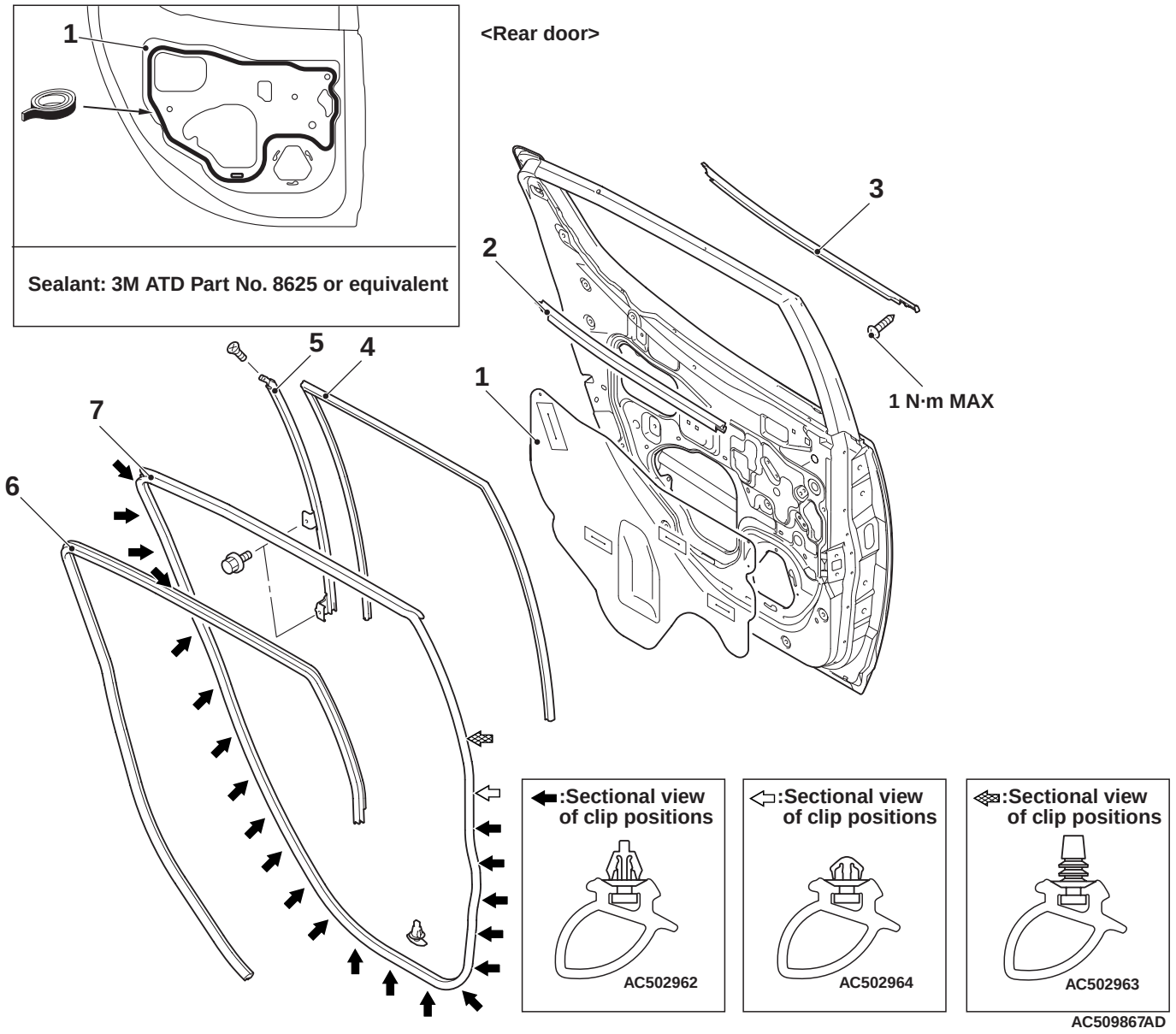
>>B<< 1. Waterproof film
>>A<< 5. Rear lower sash

Door opening weatherstrip inner removal steps
- Cowl side trim and centre pillar upper trim (Refer to GROUP 52A, Interior Trim .)

6. Door opening weatherstrip inner

Door opening weatherstrip outer removal

<<B>> 7. Door opening weatherstrip outer



Door window glass runchannel and centre sash removal steps

- Pull handle bracket (Refer to GROUP 52A, Door Trim .)

>>B<< 1. Waterproof film
2. Door beltline weatherstrip inner
3. Door beltline moulding

- Door window regulator assembly (Refer to P.42-183.)

4. Door window glass runchannel

<<A>> 5. Centre sash

Door beltline weatherstrip inner removal steps

- Door trim assembly (Refer to GROUP 52A, Door Trim .)

2. Door beltline weatherstrip inner

Door beltline moulding removal steps

- Door trim assembly (Refer to GROUP 52A, Door Trim .)

3. Door beltline moulding

Door opening weatherstrip inner removal steps

- Rear scuff plate, centre pillar upper trim and rear pillar upper trim (Refer to GROUP 52A, Interior Trim .)

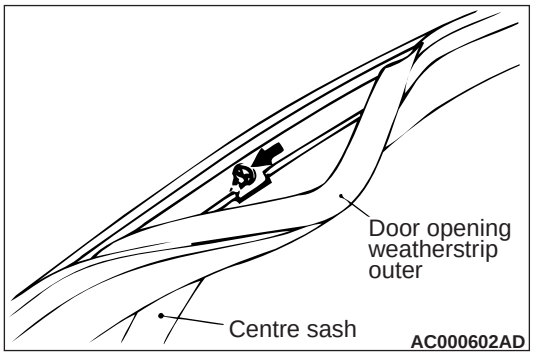
6. Door opening weatherstrip inner

Door opening weatherstrip outer removal

<<B>> 7. Door opening weatherstrip outer

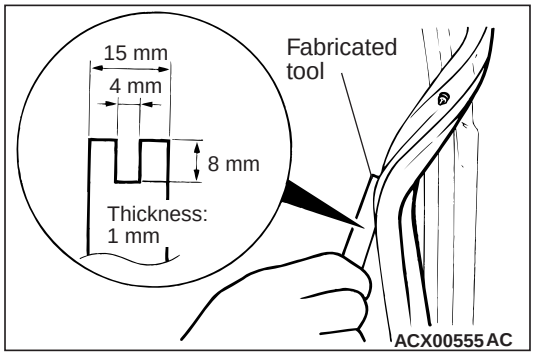
REMOVAL SERVICE POINTS

<<A>> CENTRE SASH REMOVAL



1. Remove the door opening weatherstrip outer from the centre sash only.
2. Remove the centre sash mounting screws, and then remove the centre sash from the door panel.

<<B>> DOOR OPENING WEATHERSTRIP OUTER REMOVAL



Make a fabricated tool as shown in the illustration to remove the door opening weatherstrip outer.

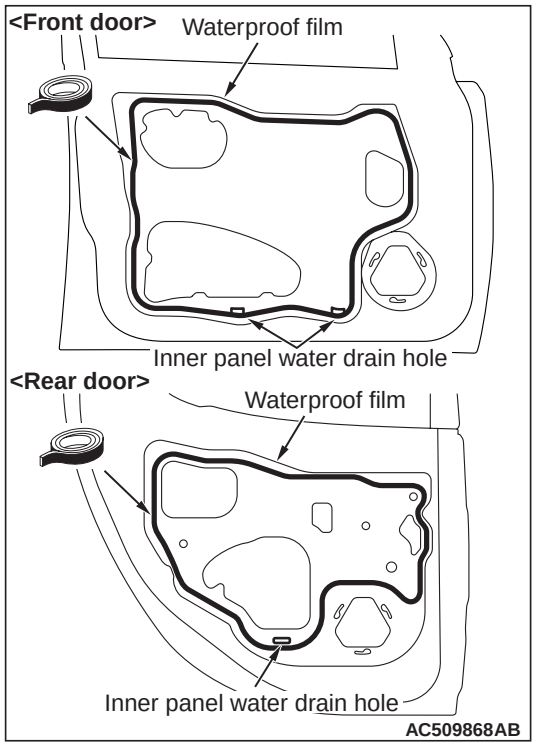
INSTALLATION SERVICE POINTS

>>A<< REAR LOWER SASH INSTALLATION

Engage the rear lower sash with the window sash (door) securely.

>>B<< WATERPROOF FILM INSTALLATION

⚠ CAUTION



When sticking the waterproof film, ensure that the sealant is applied under the inner panel water drain hole.

Apply the specified sealant to the waterproof film as shown and stick the film.

Specified sealant: 3M ATD Part No.8625 or equivalent

KEYLESS ENTRY SYSTEM

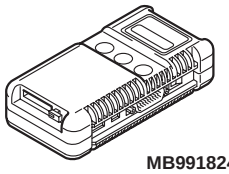
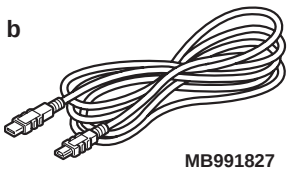
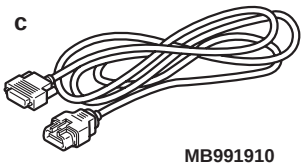
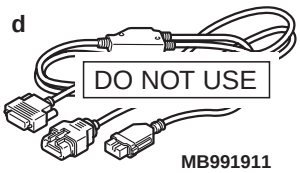
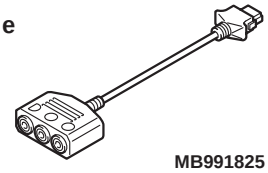
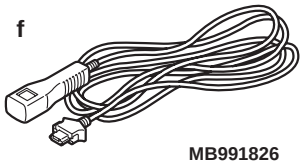
SERVICE SPECIFICATIONS

M1428000300201

Item	Standard value
Voltage of transmitter battery V	2.5 – 3.2

SPECIAL TOOL

M1428000600859

Tool	Number	Name	Use
a  MB991824 b  MB991827 c  MB991910 d  MB991911 e  MB991825 f  MB991826 MB991955	MB991955 a. MB991824 b. MB991827 c. MB991910 d. MB991911 e. MB991825 f. MB991826	M.U.T.-III sub-assembly a. Vehicle Communication Interface (V.C.I.) b. M.U.T.-III USB cable c. M.U.T.-III main harness A (Vehicles with CAN communication system) d. M.U.T.-III main harness B (Vehicles without CAN communication system) e. M.U.T.-III measure adapter f. M.U.T.-III trigger harness	⚠ CAUTION **For vehicles with CAN communication, use M.U.T.-III main harness A to send simulated vehicle speed. If you connect M.U.T.-III main harness B instead, the CAN communication does not function correctly.** Communication line check (service data and diagnosis codes)

TROUBLESHOOTING

DIAGNOSIS TROUBLESHOOTING FLOW

M1428001500093

Refer to GROUP 00, Contents of Troubleshooting .

TROUBLE SYMPTOM CHART

M1428001800113

Symptom	Inspection procedure number	Reference page
Keyless entry system does not work at all.	A-1	P.42-204
Keyless entry hazard lamp answerback function or the room lamp answerback function does not work normally.	A-2	P.42-206
Encrypted code cannot be registered.	A-3	P.42-207
The timer lock function does not work after the doors have been unlocked by the keyless entry system.	A-4	P.42-208

INPUT SIGNAL CHART

M1428004800059

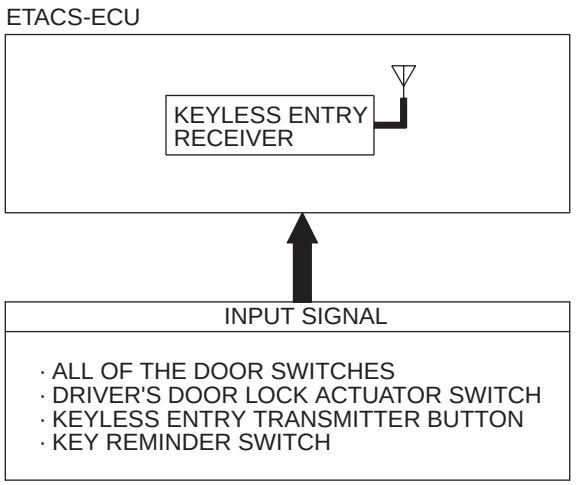
Symptom	Inspection procedure number	Reference page
Each button signal of the keyless entry transmitter is not received.	B-1	P.42-209
The key reminder switch signal is not received.	B-2	P.42-210

SYMPTOM PROCEDURES

Inspection Procedure A-1: Keyless Entry System does not Work at all.

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Keyless Entry System Function Circuit



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COMMENTS ON TROUBLE SYMPTOM
If the keyless entry system does not work normally, the input signal circuits to the components below or the ETACS-ECU may be defective.

- Key reminder switch
- All of the door switches

- Transmitter
- Driver's door lock actuator

PROBABLE CAUSES

- Malfunction of the key reminder switch
- Malfunction of the door switches
- Malfunction of the transmitter
- Malfunction of the driver's door lock actuator
- Malfunction of the ETACS-ECU
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. Check the operation of the central door locking system.

Check that the central door locking system works normally.

Q: Is the check result normal?

YES : Go to Step 2.

NO : Refer to P.42-64.

STEP 2. Check the power supply circuit.

When the ignition switch is turned to the LOCK (OFF) position, check if the hazard warning lamp illuminate.

Q: Is the check result normal?

YES : Go to Step 3.

NO : Refer to GROUP 54A, Inspection Procedure A-1 "Check the battery power supply circuit to the ETACS-ECU ."

STEP 3. M.U.T.-III data list

Check the input signals from the drive's door switch, the passenger's switch and the rear door switch <Double cab>.

- Drive's door: Close
- Passenger's door: Close
- Rear door <Double cab>: Close

Item No.	Item name	Normal condition
19	Driver's door switch	OFF
48	Passenger's door switch	OFF
49	Rear door switch	OFF

OK: Normal conditions are displayed for all the items.

Q: Are the check result normal?

YES : Go to Step 4.

NO (The door switches signal are not received.) : Refer to GROUP 54A, Inspection Procedure C-5 "One of the switch signals is not received ."

STEP 4. Pulse check

Check the input signals below which are related to the encrypted code of the keyless entry transmitter.

System switch	Check condition
Transmitter button	When the button is turned from off to on
Key reminder switch	When the inserted ignition key is pulled out

OK: The M.U.T.-III sounds or the voltmeter needle fluctuates.

Q: Are the check result normal?

YES : Go to Step 5.

NO (The keyless entry transmitter button signal is not received.) : Refer to P.42-209.

NO (The key reminder switch signal is not received.) : Refer to P.42-210.

STEP 5. Retest the system.

Check that the keyless entry system works normally.

Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

NO : Replace the ETACS-ECU and register the ID codes (Refer to GROUP 54A, How to Register Encrypted Code).

Inspection Procedure A-2: Keyless Entry Hazard Lamp Answerback Function or the Room Lamp Answerback Function does not Work Normally.

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

COMMENTS ON TROUBLE SYMPTOM
If the hazard warning lamp and the room lamp work normally, the ETACS-ECU may be defective. Alternatively, it is possible that the keyless entry hazard lamp answerback function was disabled by the customise function.

PROBABLE CAUSES
- Defective hazard warning lamp
- Malfunction of the room lamp
- Malfunction of the ETACS-ECU
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. Check the operation of the hazard warning lamp.
Check that the hazard warning lamp illuminate normally.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Refer to GROUP 54A, Inspection Procedure 1 "The hazard warning lamp do not illuminate ".

STEP 2. Check the operation of the room lamp.
Check that the room lamp illuminate normally.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Refer to GROUP 54A, Check Chart for Trouble Symptoms .

STEP 3. Check the operation of the keyless entry system.
If the keyless entry system is operated, check that the doors can be locked and unlocked normally.

Q: Is the check result normal?
YES : Go to Step 4.
NO : Refer to P.42-204.

STEP 4. Check the customise function.
Using the customise function, check that the number of flashings of hazard warning lamp is set to any of the followings other than "LOCK: 0/UNLOCK: 0."
- LOCK:1/UNLOCK:2
- LOCK:1/UNLOCK:0
- LOCK:0/UNLOCK:2
- LOCK:2/UNLOCK:0

Q: Is the check result normal?
YES : Go to Step 5.
NO : Enable the keyless entry hazard lamp answerback function by using the customise function (Refer to P.42-244).

STEP 5. Check the power supply circuit.
When the ignition switch is turned to the LOCK (OFF) position, check if the hazard warning lamp illuminate.

Q: Is the check result normal?
YES : Go to Step 6.
NO : Refer to GROUP 54A, Inspection Procedure A-1 "Check The Battery Power Supply Circuit to The ETACS-ECU ."

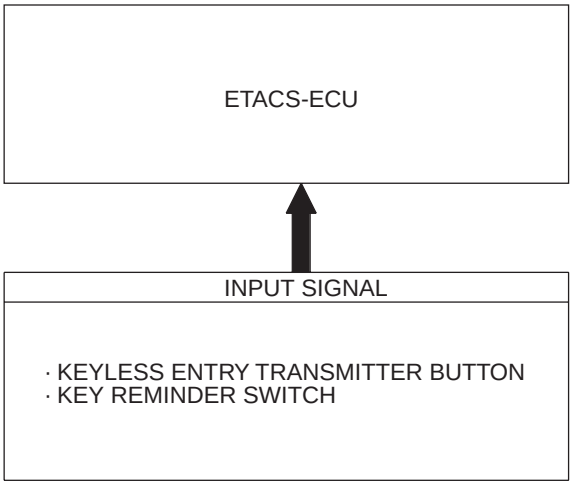
STEP 6. Retest the system.
Check that the keyless entry hazard lamp answerback function or the room lamp answerback function works normally.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Replace the ETACS-ECU and register the ID codes (Refer to GROUP 54A, How to Register Encrypted Code).

Inspection Procedure A-3: Encrypted Code cannot be Registered.

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Encrypted Transmitter Code Register Mode



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COMMENTS ON TROUBLE SYMPTOM
If the encrypted code registration mode is not entered, the key reminder switch or the ETACS-ECU may be defective.
If the registration is not possible although the registration mode is entered, the keyless entry transmitter or the ETACS-ECU may be defective.

POSSIBLE CAUSES
- Malfunction of the keyless entry transmitter
- Malfunction of the key reminder switch
- Malfunction of the ETACS-ECU
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. Check the encrypted code registration mode.
Check that the encrypted code registration mode is entered.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Go to Step 2.

STEP 2. Pulse check
Check the input signals below which are related to the encrypted code of the keyless entry transmitter.

System switch	Check condition
Transmitter button	When the button is turned from off to on
Key reminder switch	When the inserted ignition key is pulled out

OK: The M.U.T.-III sounds or the voltmeter needle fluctuates.

Q: Is the check result normal?
YES : Go to Step 3.
NO (The keyless entry transmitter button signal is not received.) : Refer to P.42-209.
NO (The key reminder switch signal is not received.) : Refer to P.42-210.

STEP 3. Retest the system.
Check that the encrypted code can be registered.

Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Replace the ETACS-ECU and register the ID codes (Refer to GROUP 54A, How to Register Encrypted Code).

Inspection Procedure A-4: The Timer Lock Function does not Work after the Doors have been Unlocked by the Keyless Entry System.

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

COMMENT ON TROUBLE SYMPTOM
If the keyless entry timer lock does not work normally, the input signal circuit(s) to the keyless entry transmitter or the ETACS-ECU may be defective.

PROBABLE CAUSES
- Malfunction of the keyless entry transmitter
- Malfunction of the ETACS-ECU
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. Check the operation of the keyless entry system.
Check that the keyless entry system works normally.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Refer to P.42-204.

STEP 2. Check the customise function.
Using the customise function, check that the timer lock function time is set to any of the followings.
- 30s
- 60s
- 120s
- 180s

Q: Is the check result normal?
YES : Go to Step 3.
NO : Enable the keyless entry timer lock function by using the customise function (Refer to P.42-244).

STEP 3. Retest the system.
Check that the keyless entry timer lock works normally.

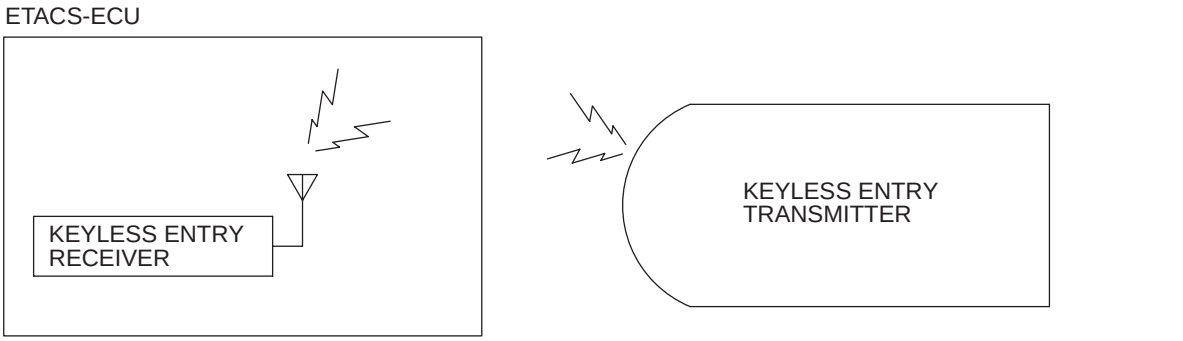
Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Replace the ETACS-ECU and register the ID codes (Refer to GROUP 54A, How to Register Encrypted Code).

INPUT SIGNAL PROCEDURES

Inspection Procedure B-1: Each Button Signal of the Keyless Entry Transmitter is not Received.

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input signal circuit is normal.

Transmitter Input Circuit



COMMENTS ON TROUBLE SYMPTOM
Input signal from the keyless entry transmitter is used to operate the keyless entry system. If the signal is abnormal, the keyless entry system will not work normally.

PROBABLE CAUSES
- Malfunction of the keyless entry transmitter
- Defective battery of the keyless entry transmitter
- Malfunction of the ETACS-ECU

DIAGNOSIS PROCEDURE

STEP 1. Pulse check
Check the input signals below which are related to the encrypted code of the keyless entry transmitter.

System switch	Check condition
Transmitter button	When the button is turned from off to on

OK: The M.U.T.-III sounds or the voltmeter needle fluctuates.

Q: Is the check result normal?
YES : Go to Step 4.
NO : Go to Step 2.

STEP 2. Check the transmitter battery.
Refer to P.42-215.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Replace the keyless entry transmitter battery.

STEP 3. Register the encrypted code, and then retest the system.
(1) Register the keyless entry transmitter again.
(2) Check that each signal is received from the keyless entry transmitter.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Replace the keyless entry transmitter.

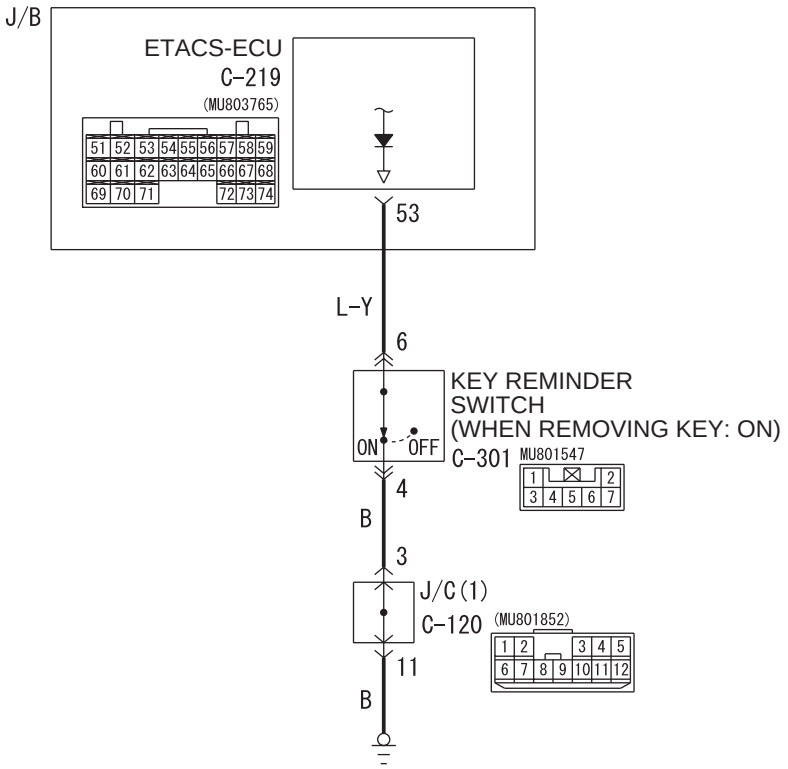
STEP 4. Retest the system.
Check that each signal is received from the keyless entry transmitter.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Replace the ETACS-ECU and register the ID codes (Refer to GROUP 54A, How to Register Encrypted Code).

Inspection Procedure B-2: The Key Reminder Switch Signal is not Received.

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Key Reminder Switch Input Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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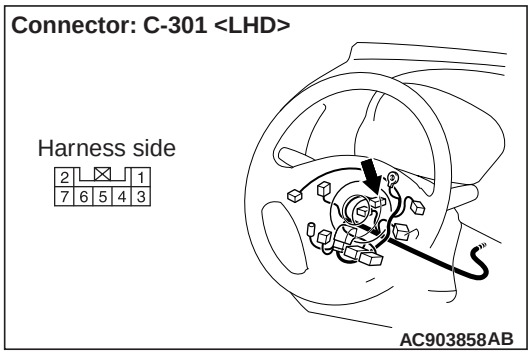
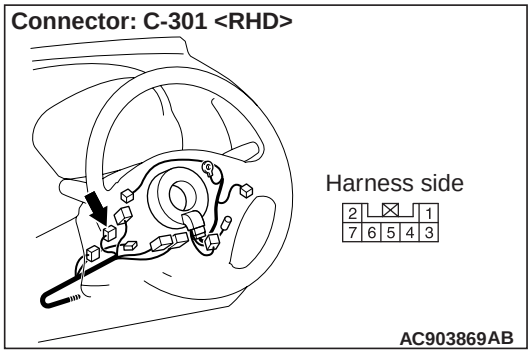
COMMENTS ON TROUBLE SYMPTOM
Input signal from the key reminder switch is used to operate the functions below. If the signal is abnormal, these functions will not work normally.
- Ignition key reminder buzzer
- Keyless entry system
- Ignition key cylinder illumination lamp
- Room lamp

PROBABLE CAUSES
- Malfunction of the key reminder switch
- Malfunction of the ETACS-ECU
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. Connector check: C-301 key reminder switch connector





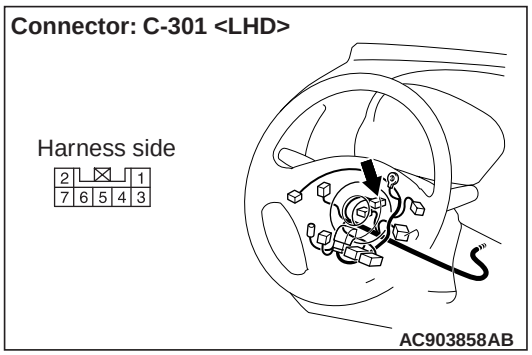
Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the defective connector.

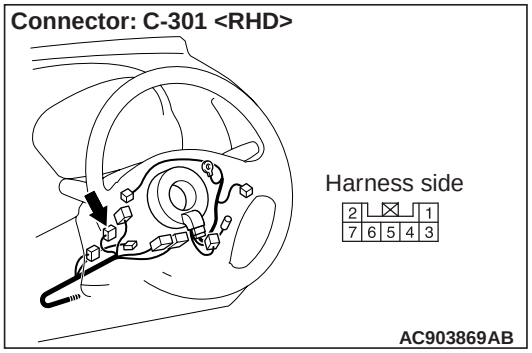
STEP 2. Check the key reminder switch.

Refer to GROUP 54A, Ignition switch .

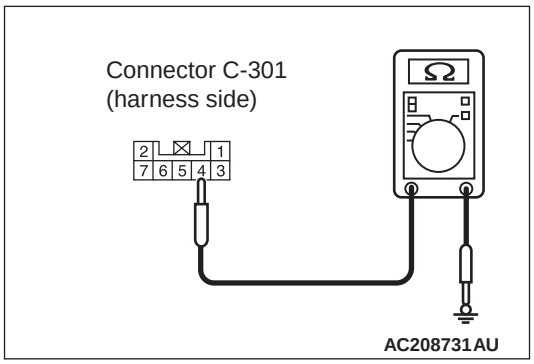
Q: Is the check result normal?
YES : Go to Step 3.
NO : Replace the key reminder switch.

STEP 3. Resistance measurement at the C-301 key reminder switch connector.





(1) Disconnect the connector, and measure at the wiring harness side.

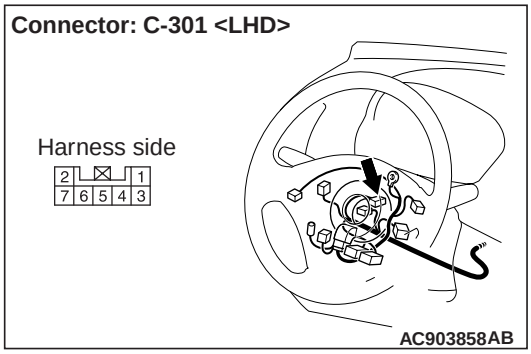


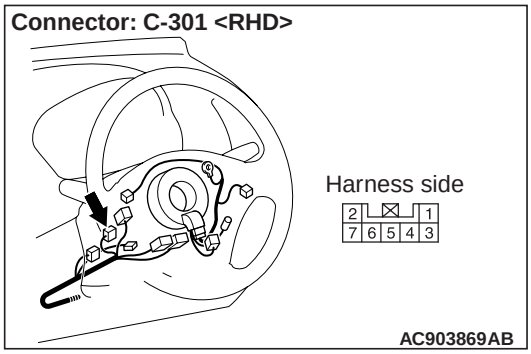
(2) Check the resistance between C-301 key reminder switch connector terminal No.4 and body earth

OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?
YES : Go to Step 5.
NO : Go to Step 4.

STEP 4. Check the wiring harness between C-301 key reminder switch connector terminal No.4 and the body earth.





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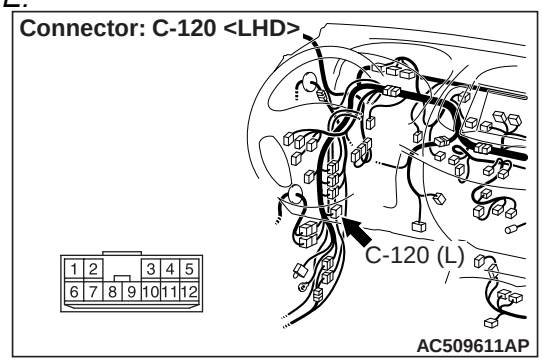
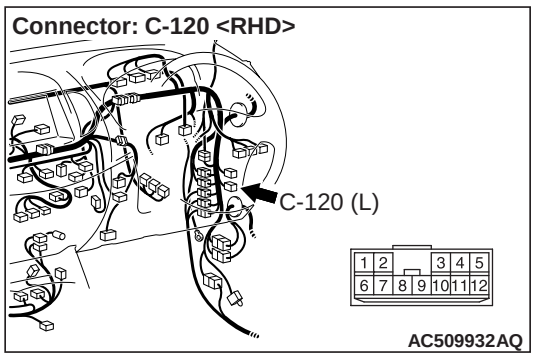




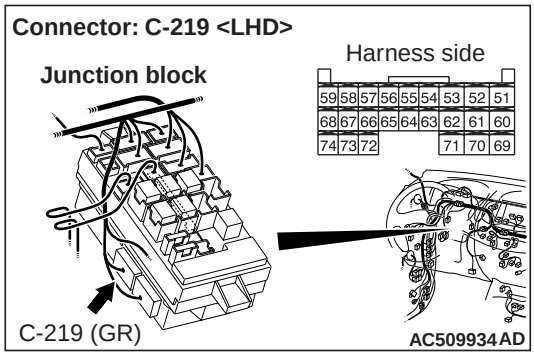
Prior to the wiring harness inspection, check junction block connector C-120, and repair if necessary.

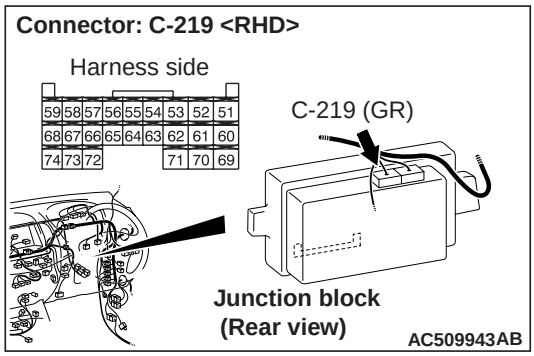
- Check the earth wires for open circuit.

Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness.

STEP 5. Connector check: C-219 ETACS-ECU connector

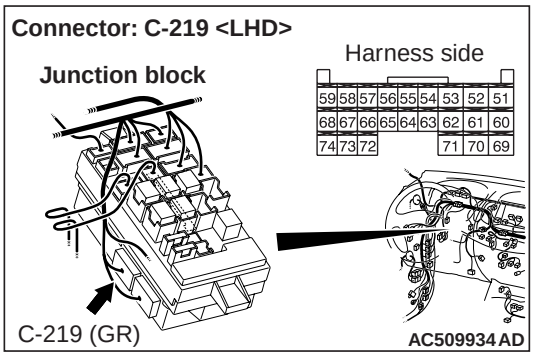


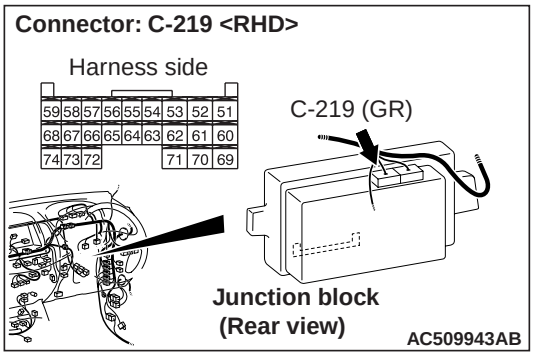


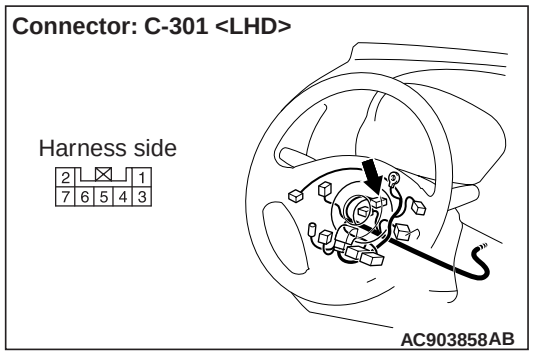
Q: Is the check result normal?

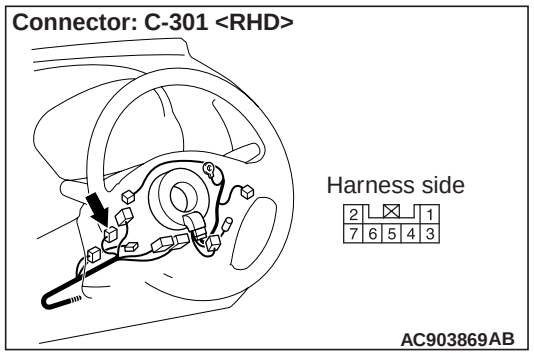
YES : Go to Step 6.
NO : Repair the defective connector.

STEP 6. Check the wiring harness between C-219 ETACS-ECU connector terminal No.53 and C-301 key reminder switch connector terminal No.6.









- Check the input line for open circuit.

Q: Is the check result normal?

YES : Go to Step 7.
NO : Repair the wiring harness.

STEP 7. Retest the system.
Check that the keyless entry system works normally.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Replace the ETACS-ECU and register the ID codes (Refer to GROUP 54A, How to Register Encrypted Code).

ON-VEHICLE SERVICE

KEYLESS ENTRY SYSTEM INSPECTION

M1428001400405

Check the system as described below. If the system does not work, carry out troubleshooting. Refer to P.42-204.

- Operate the transmitter to check that the doors can be locked and unlocked.
- Operate the transmitter to check when the door locking or unlocking operation is performed that the hazard warning lamp [lock: flash once, unlock: flash twice (initial setting)] and room lamp [lock: flash once, unlock: illuminates for 15 seconds (initial setting)] answerback operates. Refer to P.42-244.

NOTE:

- *The customise function allows you to change the answerback setting as follows. Prior to that check, confirm which setting is activated.*
  - *The hazard warning lamp flash once when locked and twice when unlocked (initial setting).*
  - *The hazard warning lamp flash once when locked and do not flash when unlocked.*
  - *The hazard warning lamp do not flash when locked and flash twice when unlocked.*
  - *The hazard warning lamp flash twice when locked and do not flash when unlocked.*
  - *The hazard warning lamp do not flash when both locked and unlocked.*

KEYLESS ENTRY SYSTEM TIMER LOCK FUNCTION INSPECTION

M1428004000365

Attempt to unlock the doors by using the transmitter. If the doors are not locked within 30 seconds, carry out troubleshooting. Note that the doors will not be locked if the ignition key is inserted within the 30-second period, one of the doors is opened, or the keyless entry function is triggered. Refer to P.42-204.

NOTE: The customise function allows you to change the keyless entry system timer lock period from 30 seconds (initial setting) to 60, 120 or 180 seconds. Prior to the check, confirm which setting is activated. Refer to P.42-244.

Post-reassembly operation
- Transmitter operation check

HOW TO REGISTER ENCRYPTED CODE

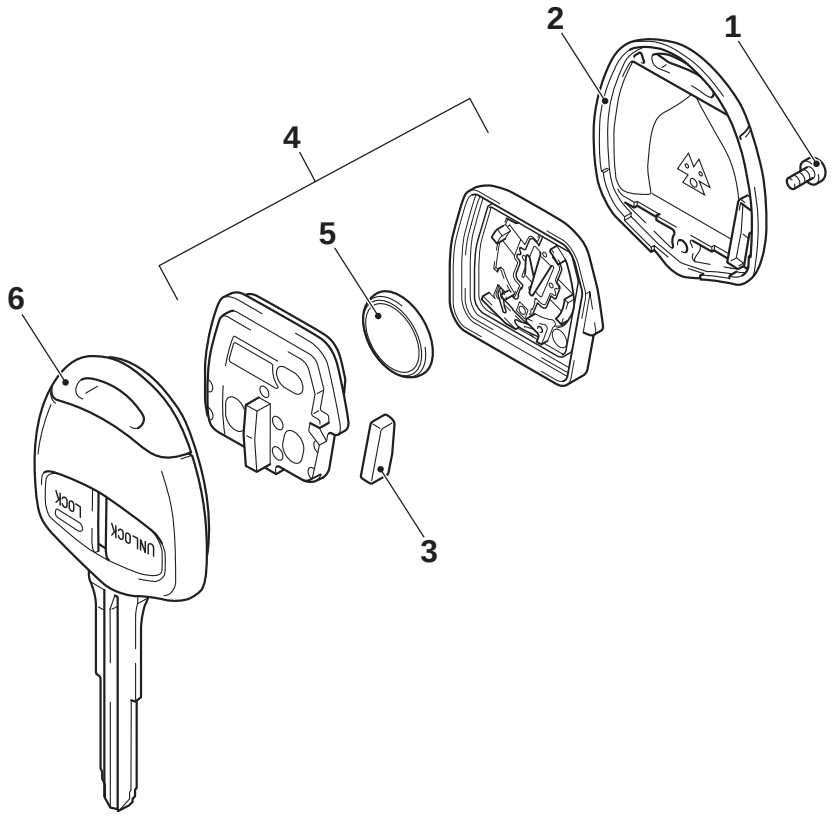
M1428001001206

For the details of key registration procedure, refer to the ID registration procedure manual.

TRANSMITTER

DISASSEMBLY AND REASSEMBLY

M1428002800354



AC310838AF

Disassembly steps

1. Screw
2. Upper cover
3. Transponder <Vehicles with immobiliser>
4. Transmitter assembly
5. Battery
6. Master key

<<A>> >>A<<

DISASSEMBLY SERVICE POINT

<<A>> BATTERY REMOVAL

⚠ CAUTION

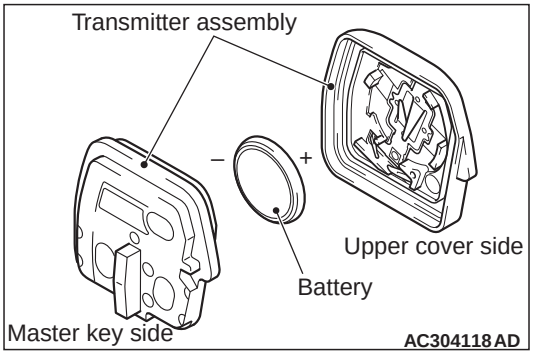
Do not allow water or dust to enter the inside of the transmitter assembly when it is open. Also, do not touch the precision electronic device.

REASSEMBLY SERVICE POINT

>>A<< BATTERY INSTALLATION

⚠ CAUTION

Do not allow water or dust to enter the inside of the transmitter assembly when it is open. Also, do not touch the precision electronic device.



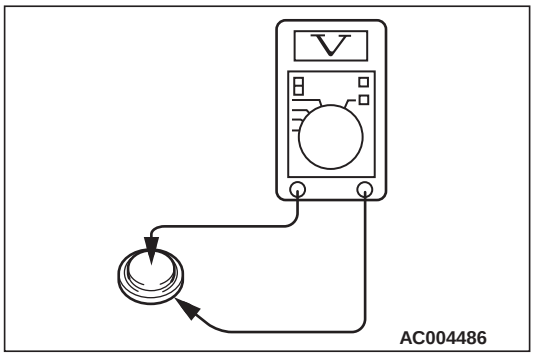
Install a new battery to the transmitter assembly with its (+) side facing towards the upper cover side.

Battery required for replacement: Coin type battery CR1616

INSPECTION

M1428003800238

TRANSMITTER BATTERY CHECK



Measure the voltage of the battery. If the voltage of the battery is not within the standard value, replace the battery.

Standard value: 2.5 – 3.2 V

SUNROOF ASSEMBLY

SERVICE SPECIFICATIONS

M1421000300578

Item	Standard value
Sunroof lid glass operation current A (at 20 °C)	3 or less

LUBRICANT

M1421000400025

Item		Specified lubricant	Quantity
Sunroof assembly	Sunroof drive cable, rotating or sliding portions of functional parts	Molykote G-1023 (Dow Corning CO., LTD.)	As required

TROUBLESHOOTING

DIAGNOSIS TROUBLESHOOTING FLOW

M1426001700187

Refer to GROUP 00, Contents of Troubleshooting .

CHECK CHART FOR TROUBLE SYMPTOMS

M1426002000233

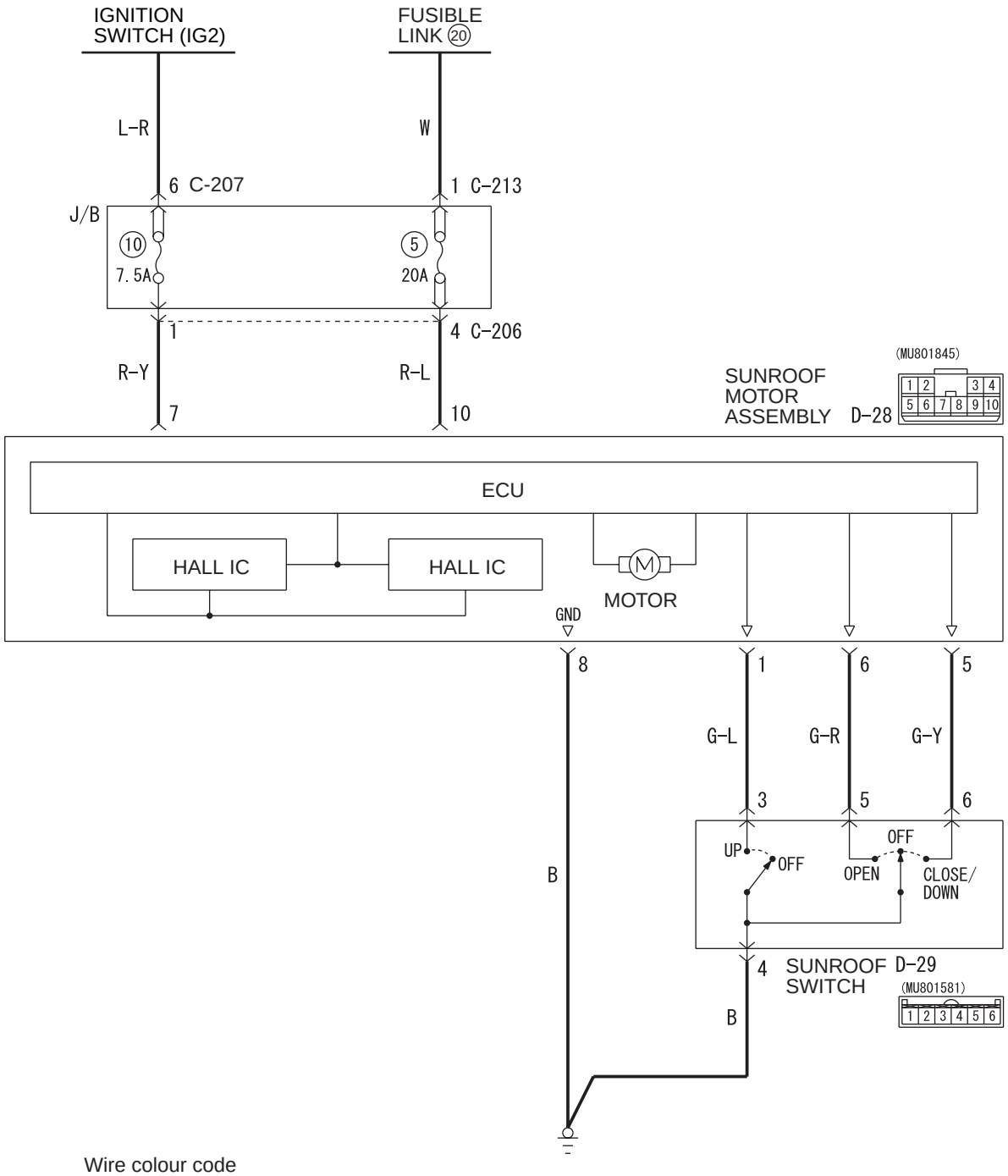
Symptom	Inspection procedure number	Reference page
The sunroof does not work at all.	1	P.42-216
Any of the sunroof switch positions is defective.	2	P.42-224
Sunroof anti-trap function does not work normally.	3	P.42-227

SYMPTOM PROCEDURES

Inspection Procedure 1: The Sunroof does not Work at All.

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Sunroof-ECU Power Supply Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

AC806121AC

COMMENTS ON TROUBLE SYMPTOM

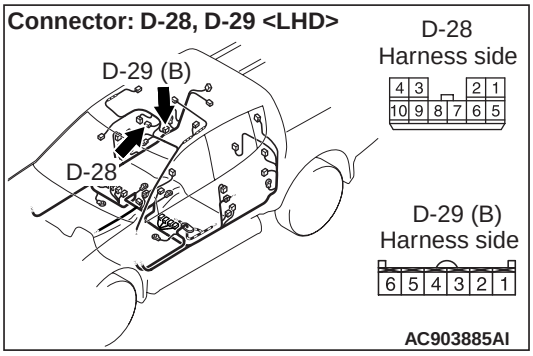
If the sunroof does not work at all, these power supply circuit(s), these earth circuit(s), sunroof switch or the sunroof motor assembly (sunroof-ECU) may be defective.

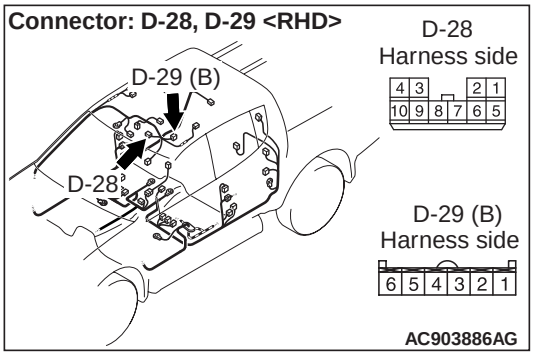
PROBABLE CAUSES

- Malfunction of the sunroof switch
- Malfunction of the sunroof motor assembly (sunroof-ECU)
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. Connector check: D-29 sunroof switch connector





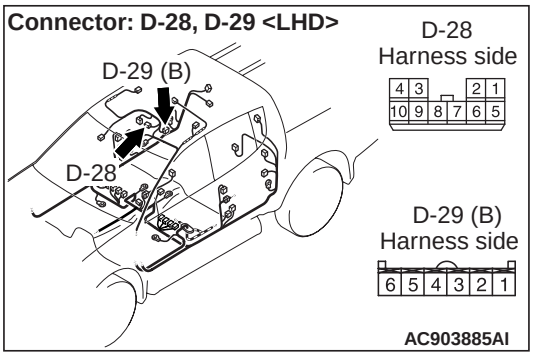
Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the connector.

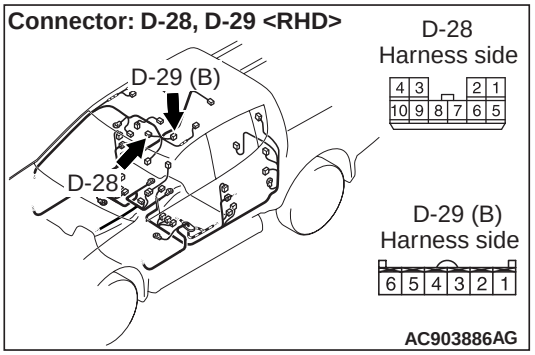
STEP 2. Check the sunroof switch.

Check that the sunroof switch works normally. Refer to P.42-230.

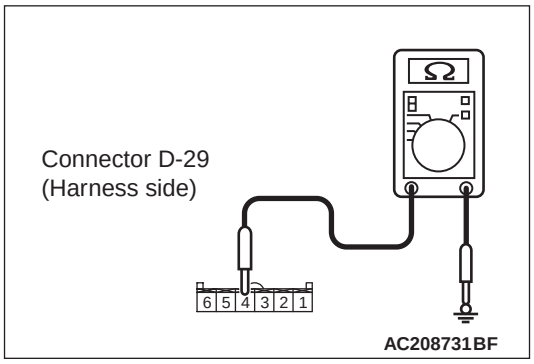
Q: Is the check result normal?
YES : Go to Step 3.
NO : Replace the sunroof switch.

STEP 3. Resistance measurement at the D-29 sunroof switch connector.





(1) Disconnect the connector, and measure at the wiring harness side.

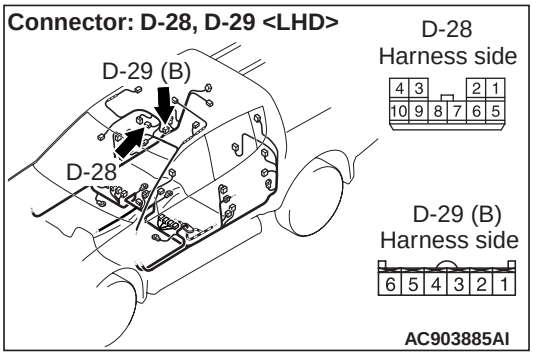


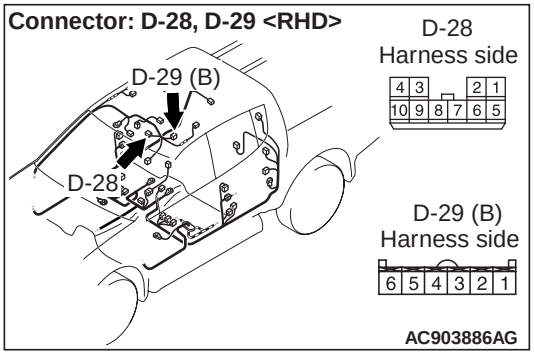
(2) Check the resistance between D-29 sunroof switch connector terminal No.4 and body earth

OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?
YES : Go to Step 5.
NO : Go to Step 4.

STEP 4. Check the wiring harness between D-29 sunroof switch connector terminal No.4 and body earth.





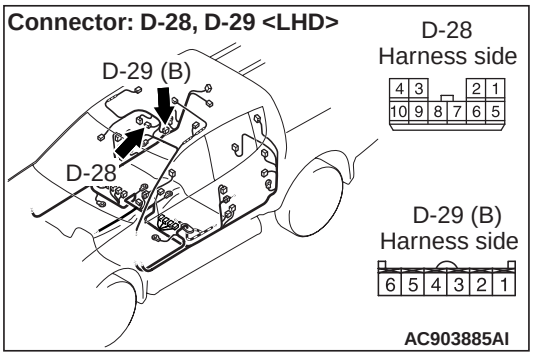
- Check the earth wires for open circuit.

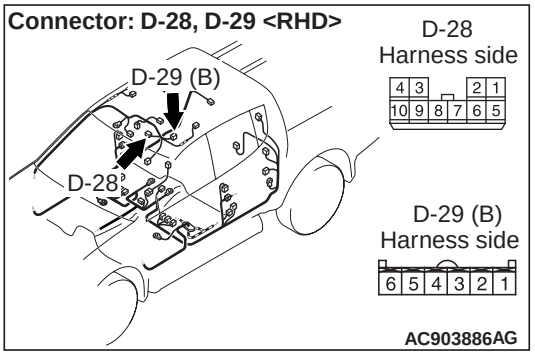
Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

NO : Repair the wiring harness.

STEP 5. Connector check: D-28 sunroof motor assembly connector



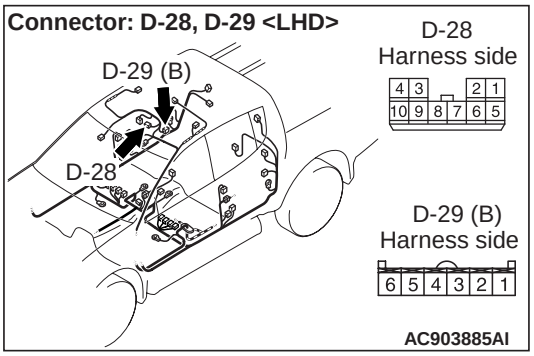


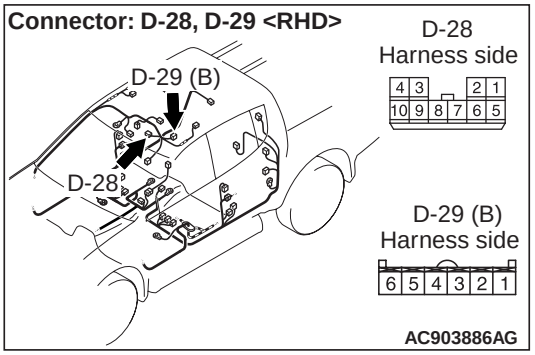
Q: Is the check result normal?

YES : Go to Step 6.

NO : Repair the connector.

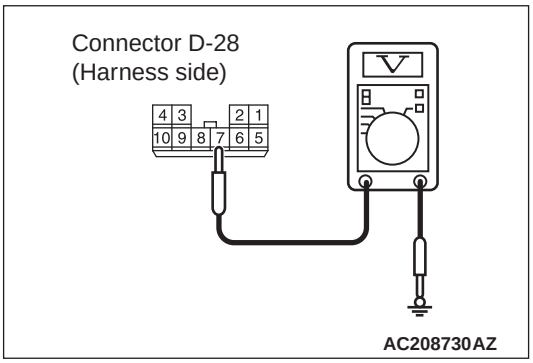
STEP 6. Voltage measurement at the D-28 sunroof motor assembly connector.





(1) Disconnect the sunroof motor assembly connector, and measure at the harness side.

(2) Ignition switch: ON

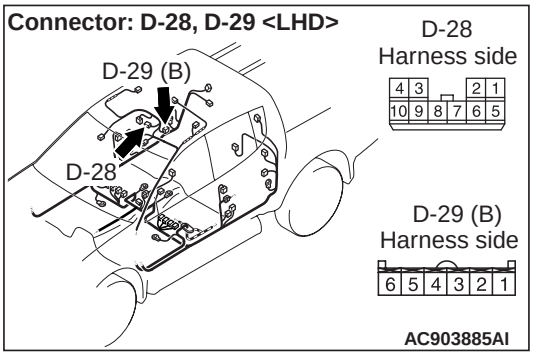


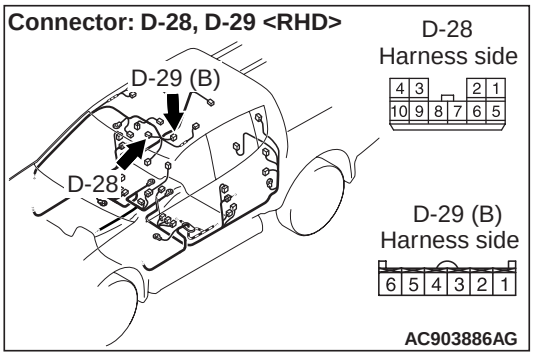
(3) Check the voltage between the D-28 sunroof motor assembly connector terminal No.7 and body earth.

OK: System voltage

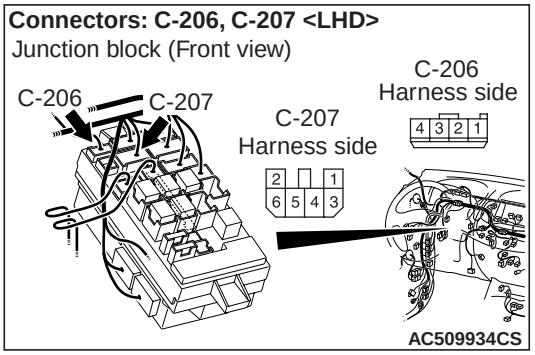
Q: Is the check result normal?
YES : Go to Step 8.
NO : Go to Step 7.

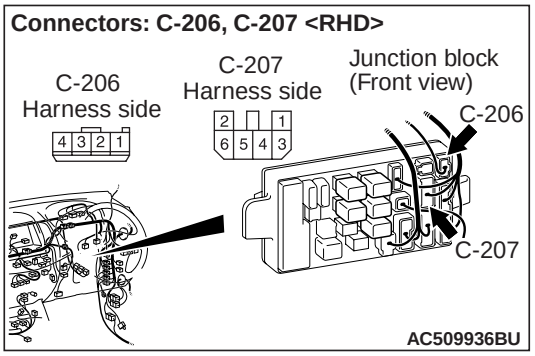
STEP 7. Check the wiring harness between D-28 sunroof motor assembly connector terminal No.7 and the ignition switch (IG2).





NOTE:





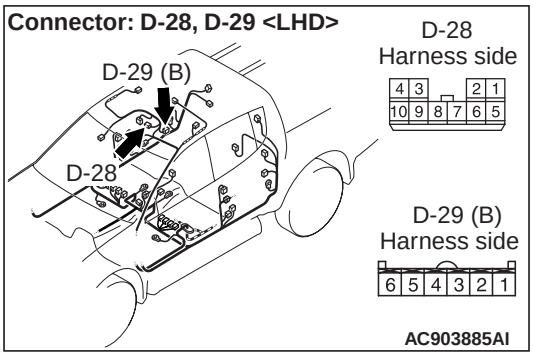
Prior to the wiring harness inspection, check junction block connector C-206 and C-207, and repair if necessary.

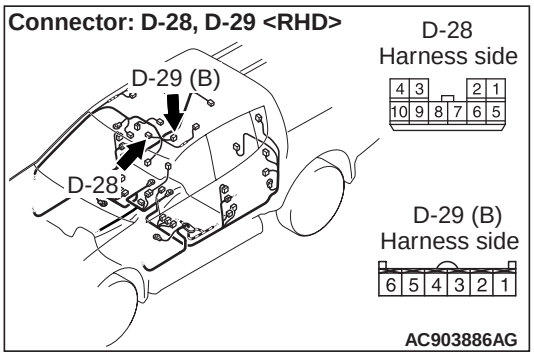
- Check the power supply line for open circuit.

Q: Is the check result normal?

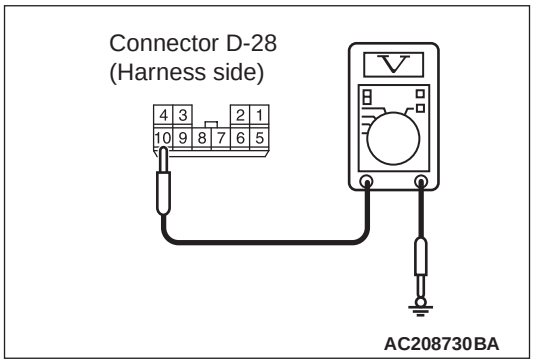
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness.

STEP 8. Voltage measurement at the D-28 sunroof motor assembly connector.





(1) Disconnect the sunroof motor assembly connector, and measure at the harness side.

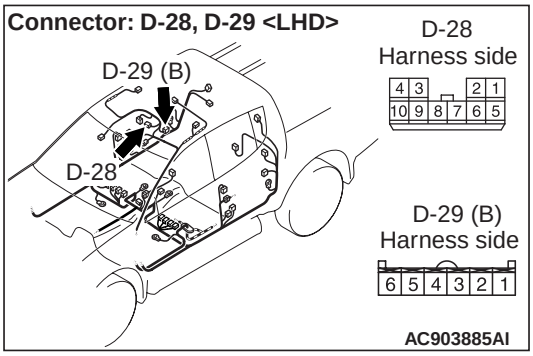


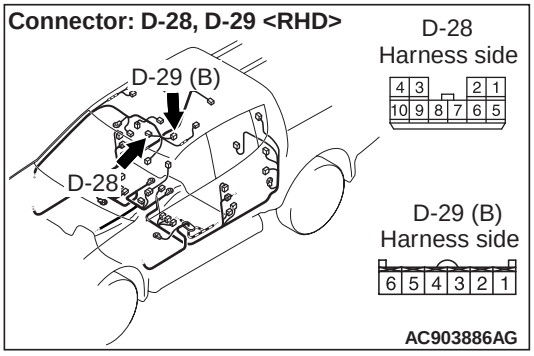
(2) Check the voltage between the D-28 sunroof motor assembly connector terminal No.10 and body earth.

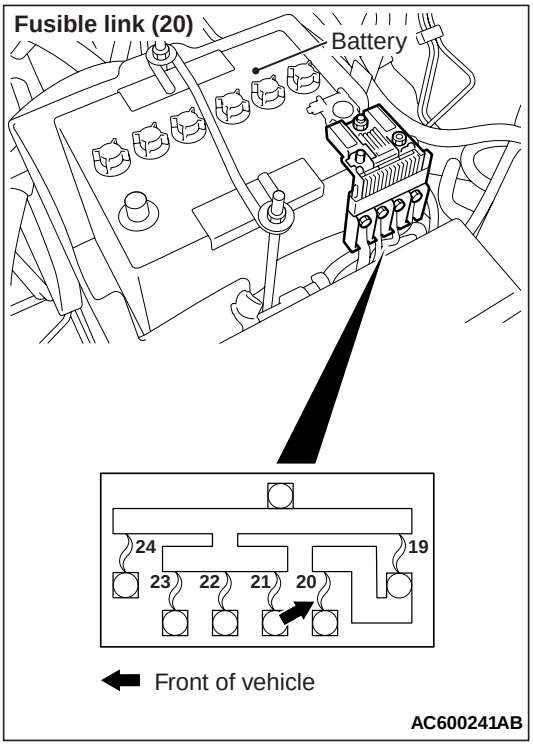
OK: System voltage

Q: Is the check result normal?
YES : Go to Step 10.
NO : Go to Step 9.

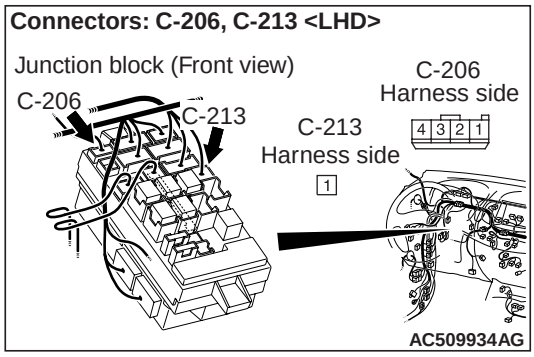
STEP 9. Check the wiring harness between D-28 sunroof motor assembly connector terminal No.10 and the fusible link (20).

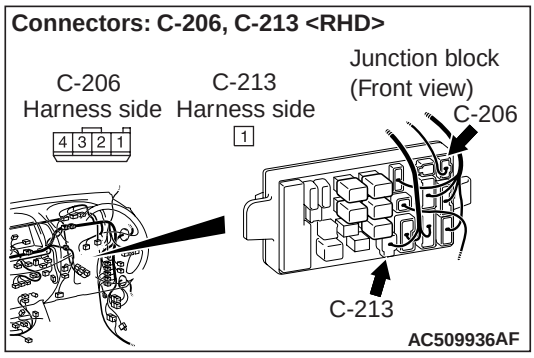






NOTE:





Prior to the wiring harness inspection, check junction block connector C-206 and C-213, and repair if necessary.

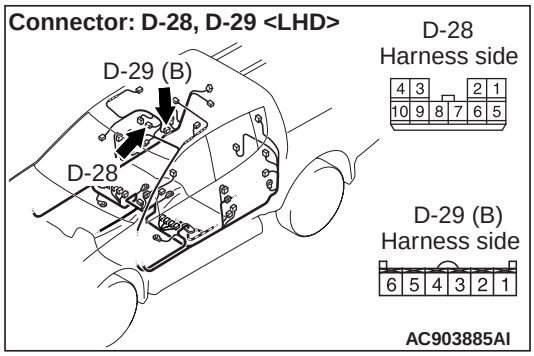
- Check the power supply line for open circuit.

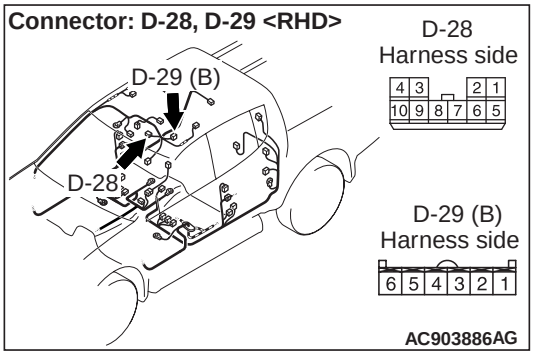
Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

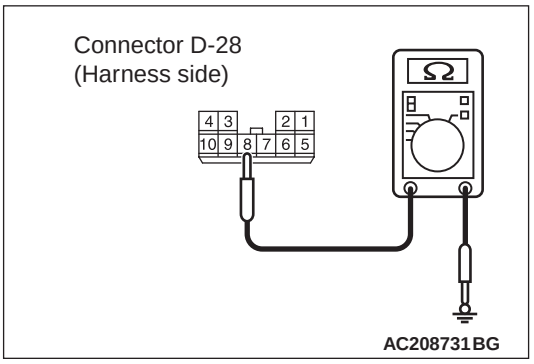
NO : Repair the wiring harness.

STEP 10. Resistance measurement at the D-28 sunroof motor assembly connector.





(1) Disconnect the sunroof motor assembly connector, and measure at the harness side.

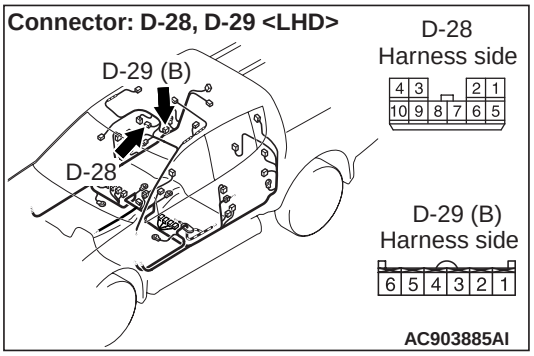


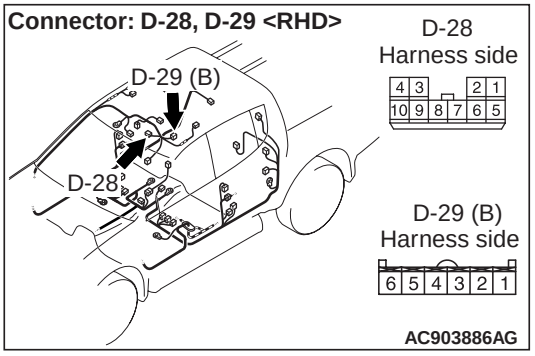
(2) Check the resistance between D-28 sunroof motor assembly connector terminal No.8 and body earth.

OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?
YES : Go to Step 12.
NO : Go to Step 11.

STEP 11. Check the wiring harness between D-28 sunroof motor assembly connector terminal No.8 and body earth.





- Check earth line for open circuit.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness.

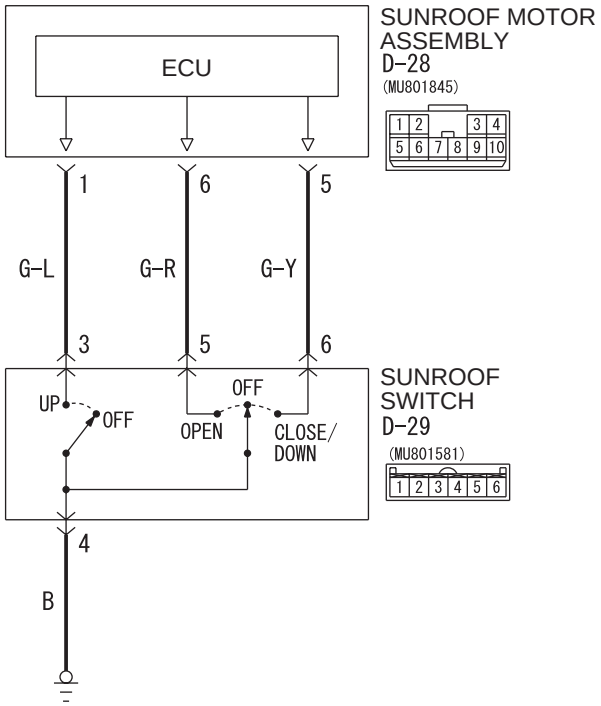
STEP 12. Retest the system.
Check that the sunroof assembly works normally.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Replace the sunroof motor assembly.

Inspection Procedure 2: Any of The Sunroof Switch Positions is Defective.

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Sunroof Switch Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

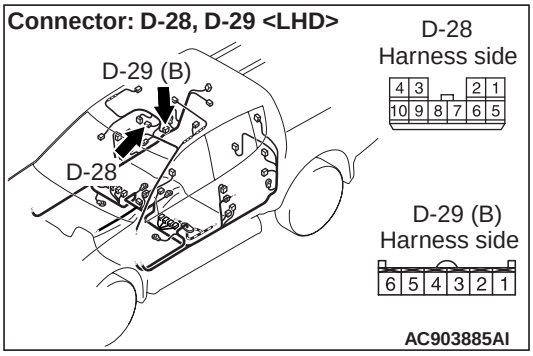
W7C42E005A

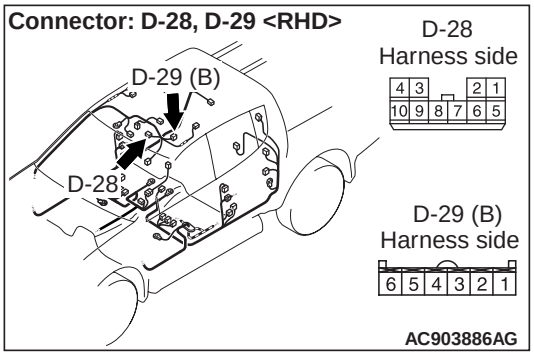
COMMENTS ON TROUBLE SYMPTOM
If any of the sunroof switch positions is defective, the communication line between the sunroof switch and the sunroof motor assembly (sunroof-ECU) may be defective.

PROBABLE CAUSES
- Malfunction of the sunroof switch
- Malfunction of the sunroof motor assembly (sunroof-ECU)
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. Connector check: D-29 sunroof switch connector





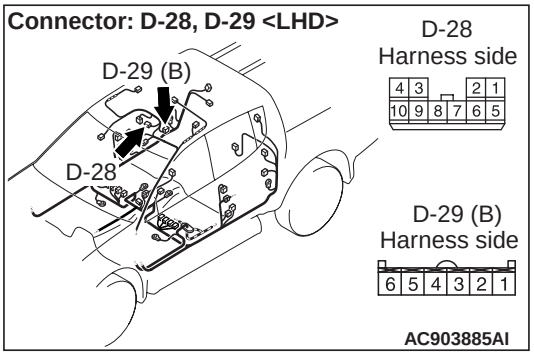
Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the connector.

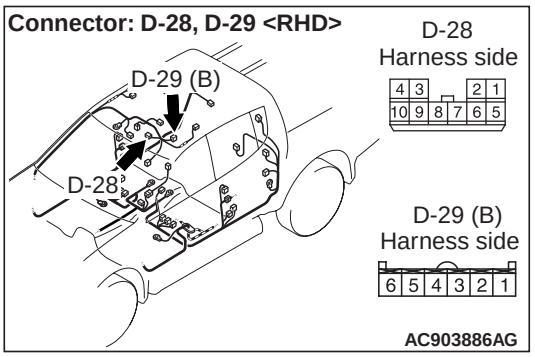
STEP 2. Check the sunroof switch.

Check that the sunroof switch works normally. Refer to P.42-230.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Replace the sunroof switch.

STEP 3. Connector check: D-28 sunroof motor assembly connector



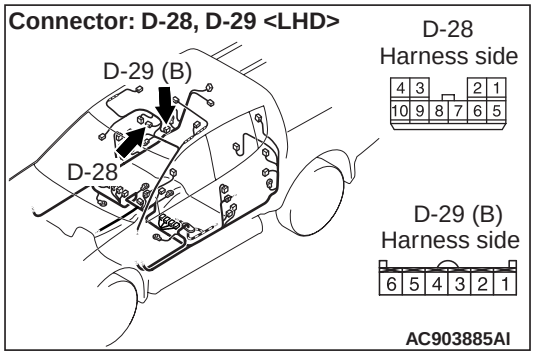


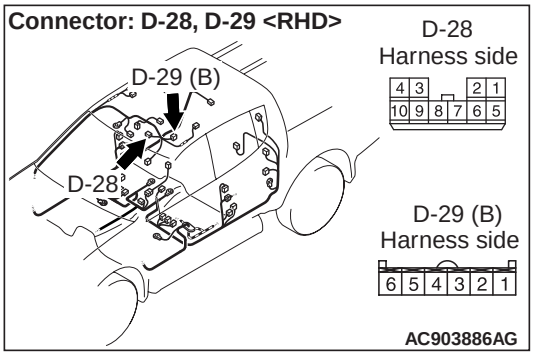
Q: Is the check result normal?
YES : Go to Step 4.
NO : Repair the connector.

STEP 4. Retest the system.

Q: Which switch position is defective?
"TILT UP" : Go to Step 5.
"OPEN" : Go to Step 6.
"CLOSE/DOWN" : Go to Step 7.

STEP 5. Check the wiring harness between D-28 sunroof motor assembly connector terminal No.1 and D-29 sunroof switch connector terminal No.3.

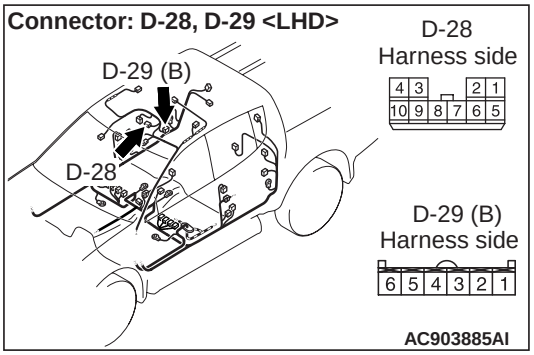


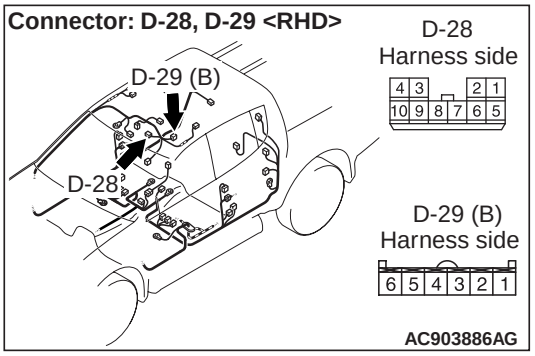


- Check the communication line for open and short circuit.

Q: Is the check result normal?
YES : Replace the sunroof motor assembly.
NO : Repair the wiring harness.

STEP 6. Check the wiring harness between D-28 sunroof motor assembly connector terminal No.6 and D-29 sunroof switch connector terminal No.5.

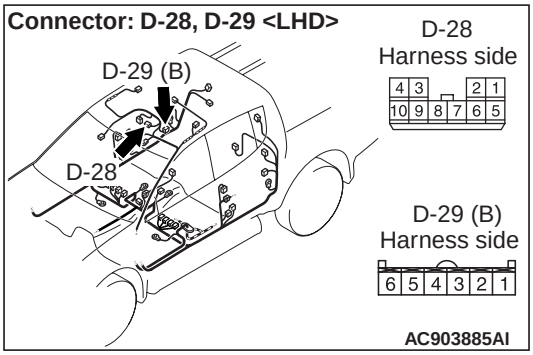


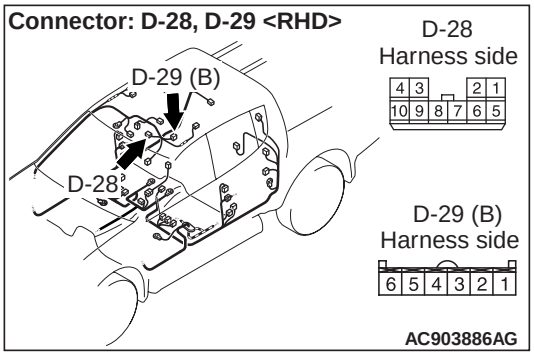


- Check the communication line for open and short circuit.

Q: Is the check result normal?
YES : Replace the sunroof motor assembly.
NO : Repair the wiring harness.

STEP 7. Check the wiring harness between D-28 sunroof motor assembly connector terminal No.5 and D-29 sunroof switch connector terminal No.6.





- Check the communication line for open and short circuit.

Q: Is the check result normal?

YES : Replace the sunroof motor assembly.
NO : Repair the wiring harness.

Inspection Procedure 3: Sunroof Anti-trap Function does not Work Normally.

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

COMMENTS ON TROUBLE SYMPTOM
If the sunroof anti-trap function does not work, the sunroof motor assembly (sunroof-ECU) may be defective.

PROBABLE CAUSE
- Malfunction of the sunroof motor assembly (sunroof-ECU)

DIAGNOSIS PROCEDURE

Retest the system.
Check that the sunroof anti-trap function works normally.

Q: Is the check result normal?

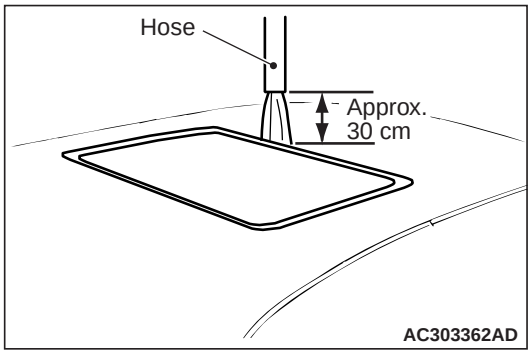
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Replace the sunroof motor assembly.

ON-VEHICLE SERVICE

WATER TEST

M1426000900531

Check if there are any leaks in the sunroof by the following procedures:
1. Fully close the sunroof lid glass.
2. Adjust the water pressure so that water comes out of the hose to a height of approx. 50 cm when the hose is held vertically facing upwards.

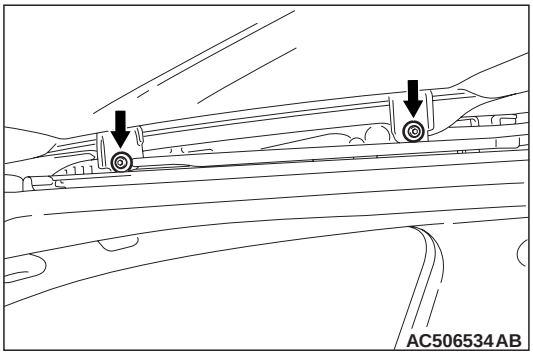


3. Hold the end of the hose approx. 30 cm above the roof and let the water run onto the weatherstrip for 5 minutes or more.
4. Check if any water leaks can be found in the vehicle interior while watering. Even though there are any water leaks around the sunroof lid glass, it can be acceptable as long as water is caught in the drip area.

SUNROOF FIT ADJUSTMENT

M1426001000434

1. Close the sunroof lid glass completely.
2. Open the sun shade completely.



3. Loosen the sunroof lid glass assembly mounting screws as shown in the illustration. Adjust the sunroof lid glass height by moving the glass assembly along the guide oblong hole so that the clearance between the glass and the vehicle body is even.
4. After adjustment, check that the sunroof operates smoothly.

SUNROOF OPERATION CHECK

M1426002600484

Check to see that the sunroof operates by pressing the sunroof switch. Perform troubleshooting if operations malfunction. Refer to P.42-215.

SUNROOF SAFETY FUNCTION CHECK

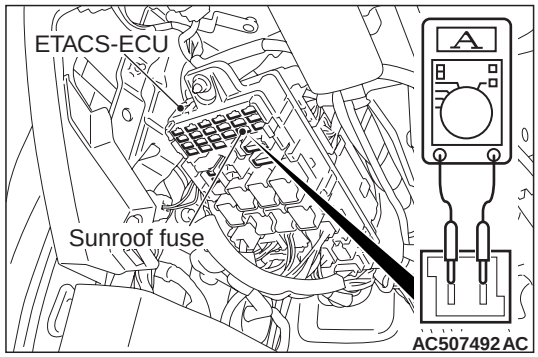
M1426004400312

1. Close the sunroof lid glass by applying an approximately 10 mm thickness wooden board placed at a right angle to the sunroof lid glass.
2. Check that the sunroof motor assembly rotates reversely to open the sunroof lid glass when the sunroof lid glass pinches the wooden board. If there is a problem, carry out troubleshooting. Refer to P.42-215.

   NOTE: When the safety mechanism has been operated 5 or more times continuously, carry out sunroof initialisation. Refer to P.42-228.

SUNROOF LID GLASS OPERATION CURRENT CHECK

M1426003200542



1. Remove the sunroof fuse to check that it is normal, and connect a circuit tester as shown.
2. Turn ON the sunroof switch, then measure the operating current of the intermediary segment except when operation is starting, the sunroof is fully closed, the sunroof is fully opened and the sunroof is tilted fully up.

   Standard value: 3 A or less (at 20 °C)
3. Check the following areas if the operating current of the sunroof lid glass is outside the standard value:
   - Improperly installed sunroof assembly, deformation or any foreign substances
   - Improperly fastened drive cable
   - Tilting of sunroof lid glass

SUNROOF INITIALISATION

M1426004600286

Perform the following initialisation when the anti-trap function has been triggered 5 times or more, or the sunroof motor assembly is removed.

1. Press the close/tilt-down switch to move the sunroof lid glass to the fully-tilted-up position. Each switch operation makes the sunroof lid glass move by approximately 30 mm and stops it automatically. Repeat the operation to move the sunroof lid glass to the fully-tilted-up position.
2. Hold the close/tilt-down switch for 3 seconds.

NOTE: If the close/tilt-down switch is released while the sunroof is moving, the initialisation will be cancelled. If this happens, repeat the procedures from the beginning.

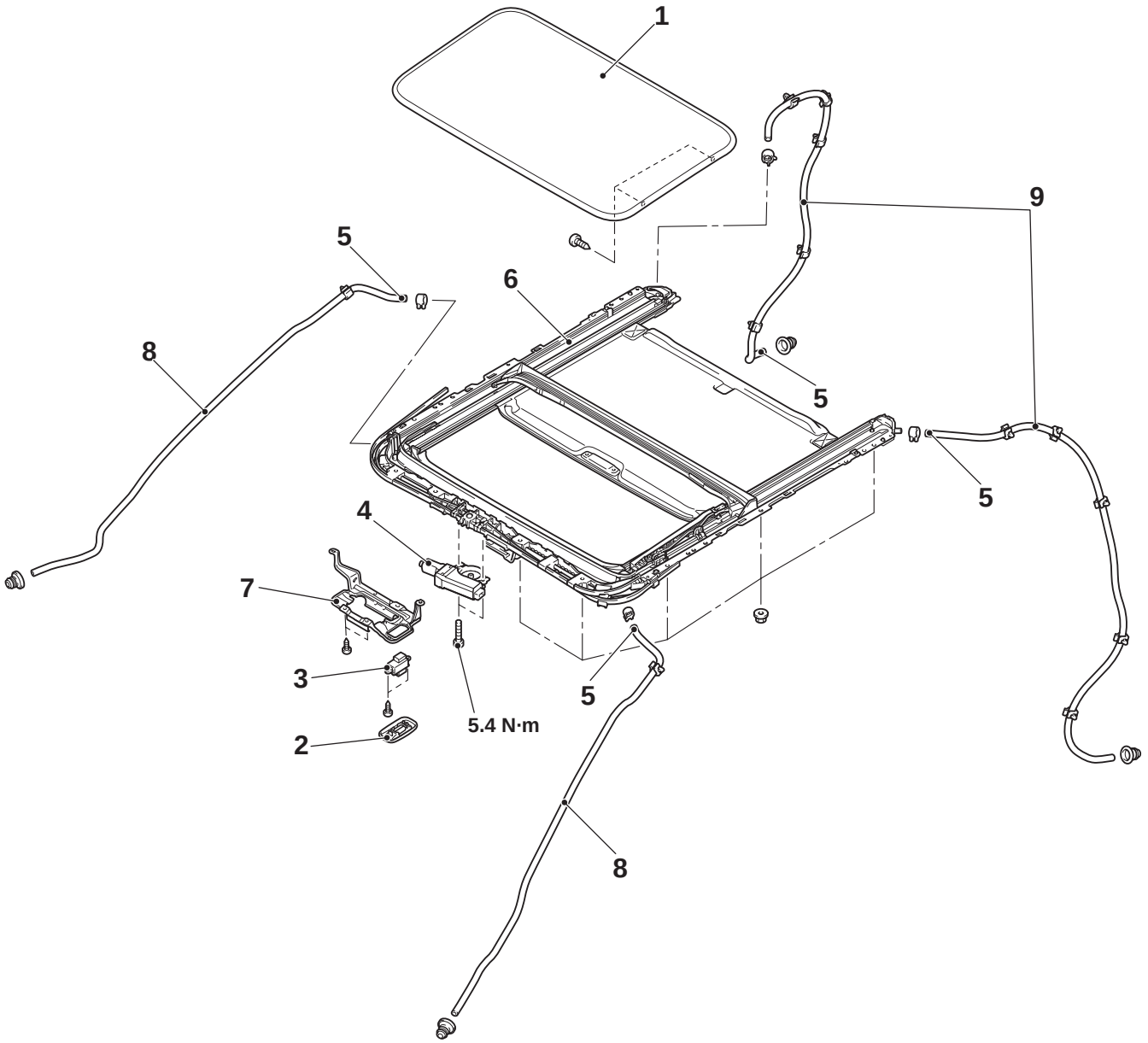
3. Press the open switch to move the sunroof lid glass to the fully-open position.
4. Press the close/tilt-down switch to move the sunroof lid glass to the fully-closed position.

Post-installation Operation <Sunroof lid glass assembly, Sunroof assembly>
- Sunroof Water Test (Refer to P.42-227.)
- Sunroof Fit Adjustment (Refer to P.42-228.)
- Sunroof initialisation (Refer to P.42-228.)

SUNROOF ASSEMBLY

REMOVAL AND INSTALLATION

M1426001201044



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Sunroof lid glass assembly removal
1. Sunroof lid glass assembly

Sunroof switch removal steps
2. Sunroof switch cover
3. Sunroof switch

Sunroof motor assembly removal steps

2. Sunroof switch cover
- Headlining (Refer to GROUP 52A, Headlining .)

4. Sunroof motor assembly

Sunroof assembly removal steps

2. Sunroof switch cover
- Headlining (Refer to GROUP 52A, Headlining .)

5. Drain pipe connection
6. Sunroof assembly
7. Room lamp bracket

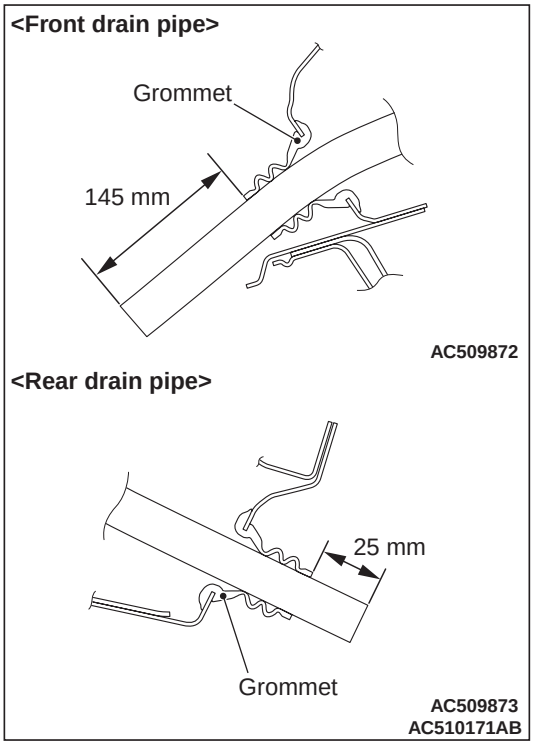
Drain pipe removal steps

2. Sunroof switch cover
- Headlining (Refer to GROUP 52A, Headlining .)

>>A<< 8. Front drain pipe
>>A<< 9. Rear drain pipe

INSTALLATION SERVICE POINT

>>A<< REAR DRAIN PIPE AND FRONT DRAIN PIPE INSTALLATION

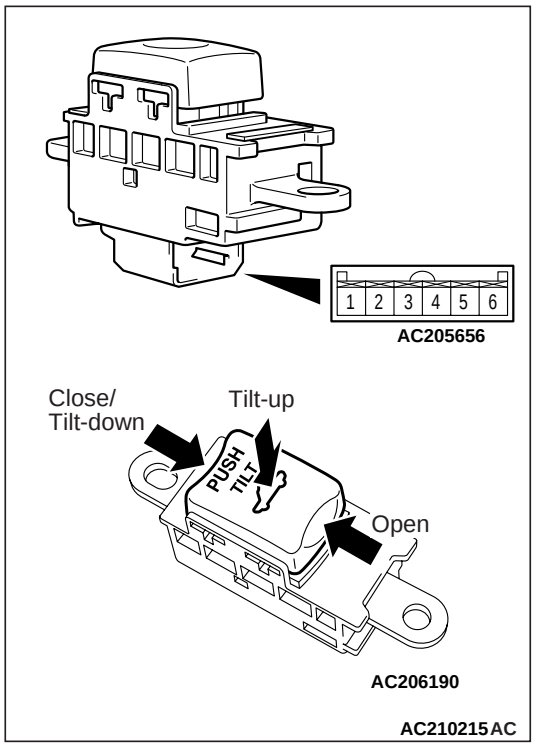


Install the grommet. Adjust the front and rear drain pipe projection as shown.

INSPECTION

M1426004700498

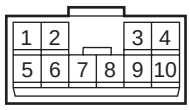
SUNROOF SWITCH CONTINUITY CHECK



Switch position	Tester connection	Specified condition
Open	4 – 5	Continuity exists (2 Ω or less)
OFF	3 – 4, 3 – 5, 3 – 6, 4 – 5, 4 – 6, 5 – 6	Open circuit
Tilt-up	3 – 4	Continuity exists (2 Ω or less)
Close/Tilt-down	4 – 6	Continuity exists (2 Ω or less)

SUNROOF MOTOR ASSEMBLY TERMINAL CHECK

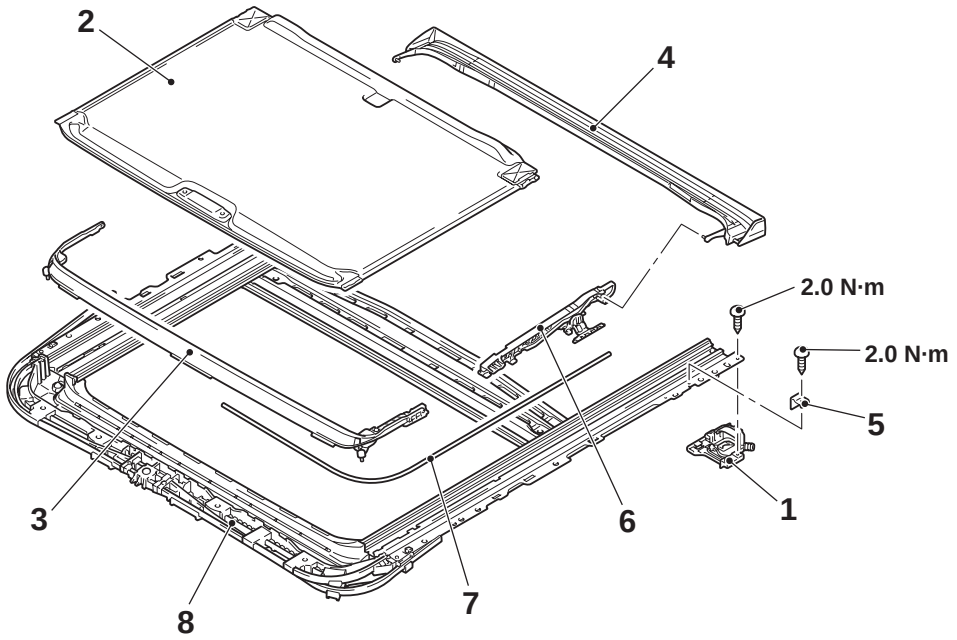
D-28



Terminal No.	Check item	Check condition	Normal condition
1	Input from sunroof switch (Tilt-up)	Sunroof switch: Tilt-up	1 V or less
2	–	–	–
3	–	–	–
4	–	–	–
5	Input from sunroof switch (Close/Tilt-down)	Sunroof switch: Close/Tilt-down	1 V or less
6	Input from sunroof switch (Open)	Sunroof switch: Open	1 V or less
7	Power supply from ignition switch (IG2)	Ignition switch: ON	System voltage
8	Earth	Always	1 V or less
9	–	–	–
10	System voltage (Motor)	Always	System voltage

DISASSEMBLY AND REASSEMBLY

M1426001400506



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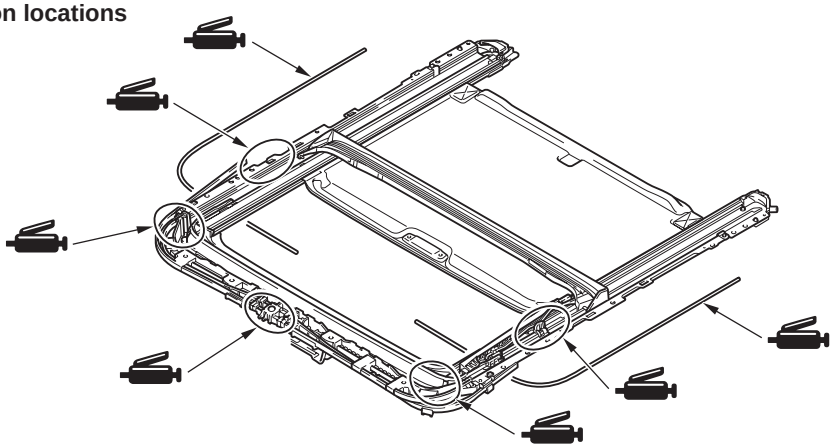
Grease application locations



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Grease: Molykote G-1023 (Dow Corning CO., LTD.) or equivalent

Disassembly steps

1. Sunroof drain bracket
2. Sunroof sunshade
3. Sunroof deflector
4. Sunroof drip rail
5. Sunroof sunshade stopper

<<A>> >>A<< 6. Sunroof lid slide guide

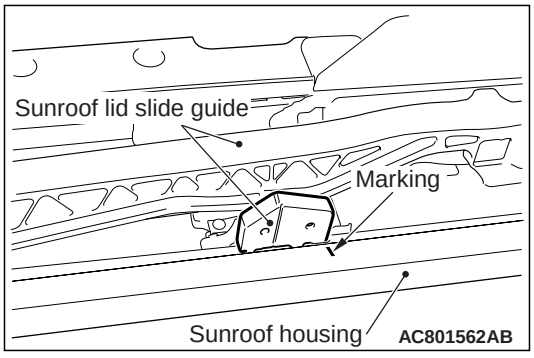
<<B>> 7. Sunroof drove belt

8. Sunroof housing

REMOVAL SERVICE POINTS

<<A>> SUNROOF LID SLIDE GUIDE REMOVAL

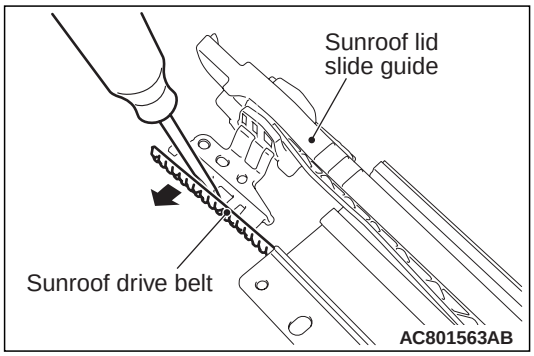
⚠ CAUTION



Before removing the sunroof lid slide guide rearward, make the marking on the sunroof housing as shown in the figure to indicate the sunroof lid glass fully closed position.

<<B>> SUNROOF DRIVE BELT REMOVAL

⚠ CAUTION



Grease is applied to the sunroof drive belt. Prevent dust from adhering to the surface because it may cause abnormal noise or malfunction.
Slide the sunroof lid slide guide rearward, and remove the sunroof drive belt from the guide.

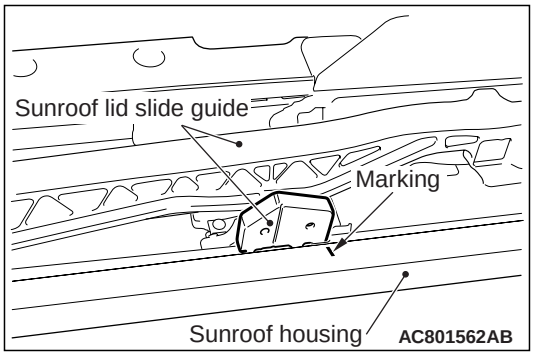
INSTALLATION SERVICE POINT

>>A<< SUNROOF LID SLIDE GUIDE INSTALLATION

1. Install the sunroof lid slide guide and the sunroof drive belt to the sunroof housing.
2. Push in the sunroof lid slide guide and the sunroof drive belt to the front side of the sunroof housing until they stop.

⚠ CAUTION

Position the sunroof lid slide guide properly, or the sunroof may not operate normally.



3. Set the sunroof lid slide guide to the position of the marking on the sunroof housing made at removal step as shown in the figure.

GREASE APPLICATION

Apply the grease to the sunroof drive cable, rotating or sliding portions of functional parts (Refer to the figure entitled "Grease application locations").

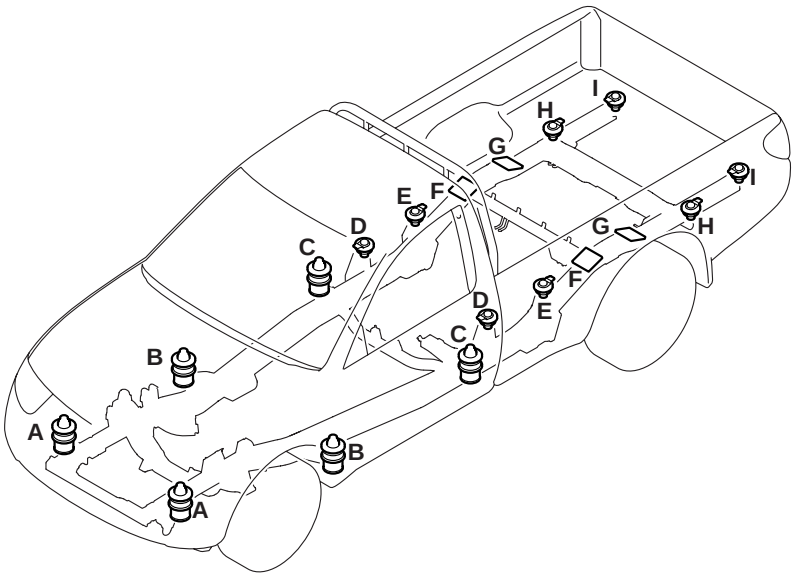
Specified Grease: Molykote G-1023 (Dow Corning CO., LTD.) or equivalent

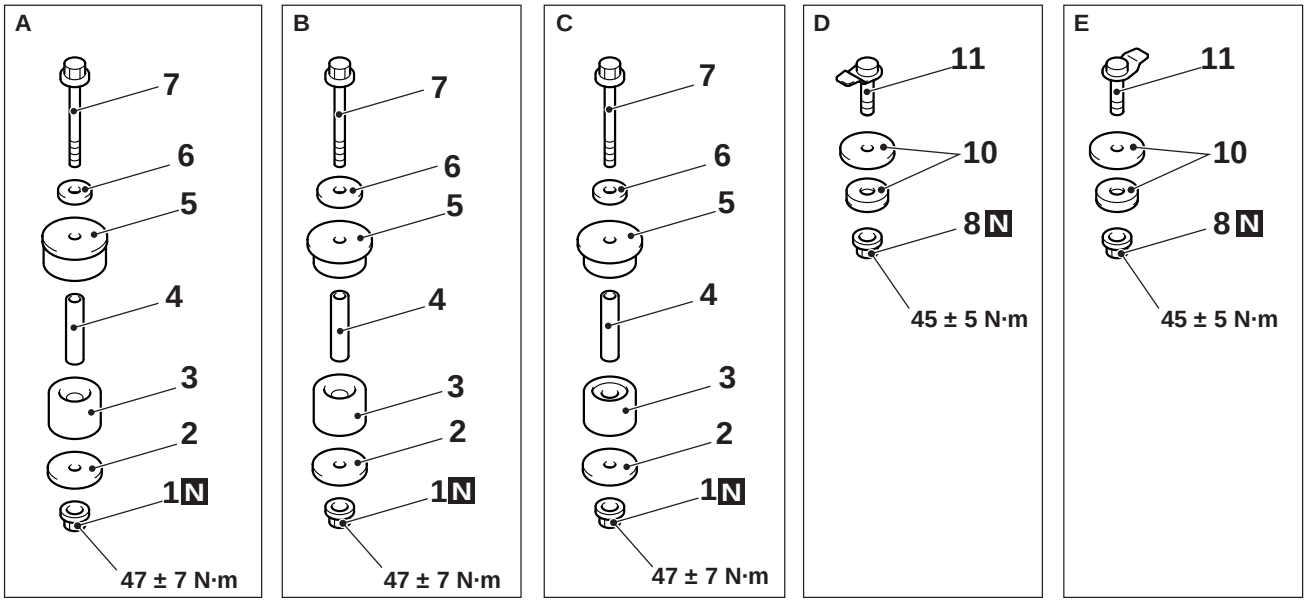
BODY MOUNTING

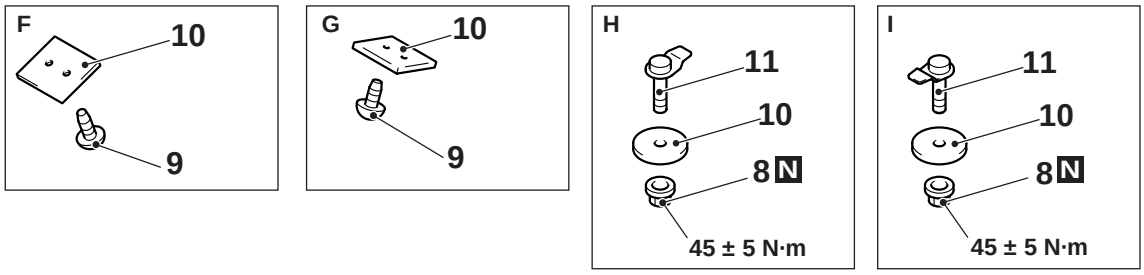
REMOVAL AND INSTALLATION

M1421003700218

<Single cab>







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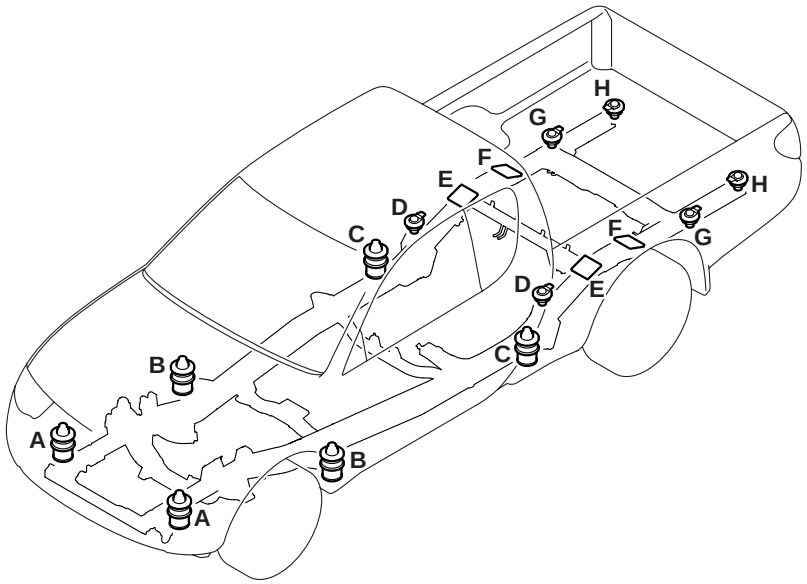
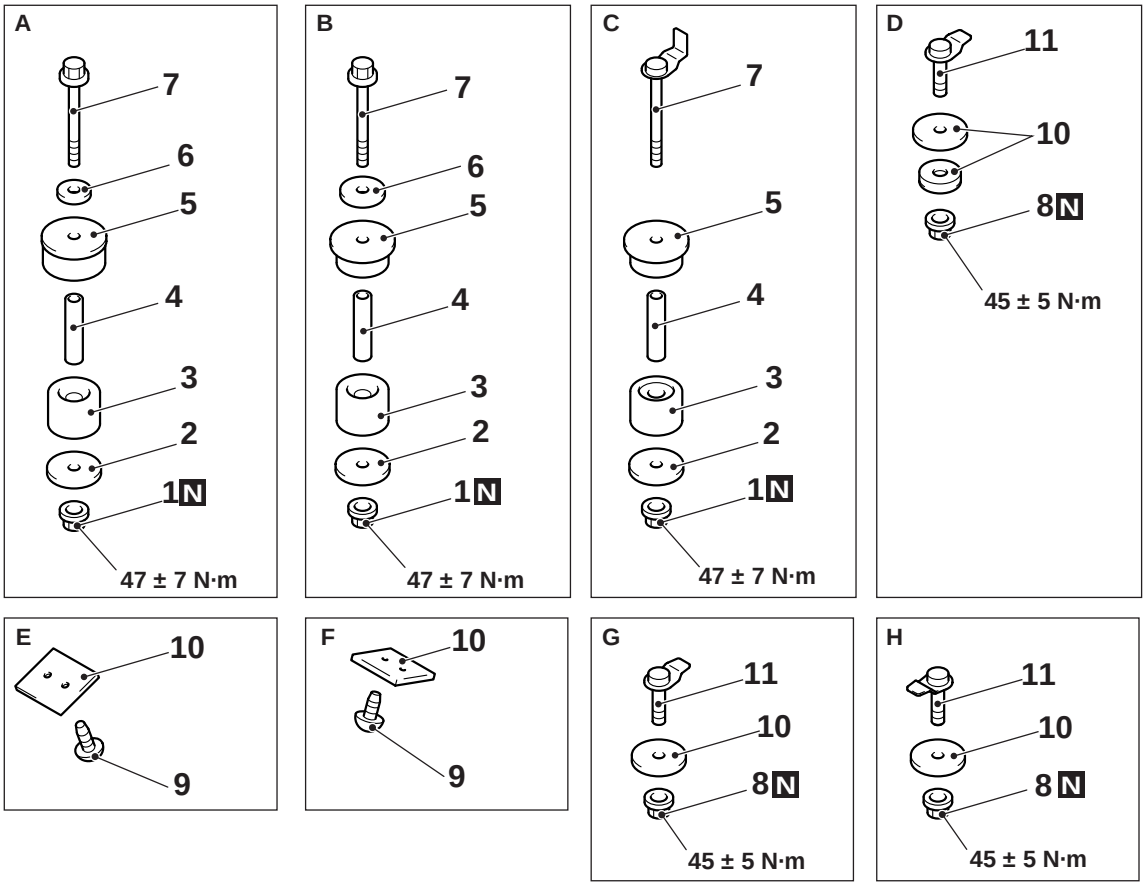
<Club cab>





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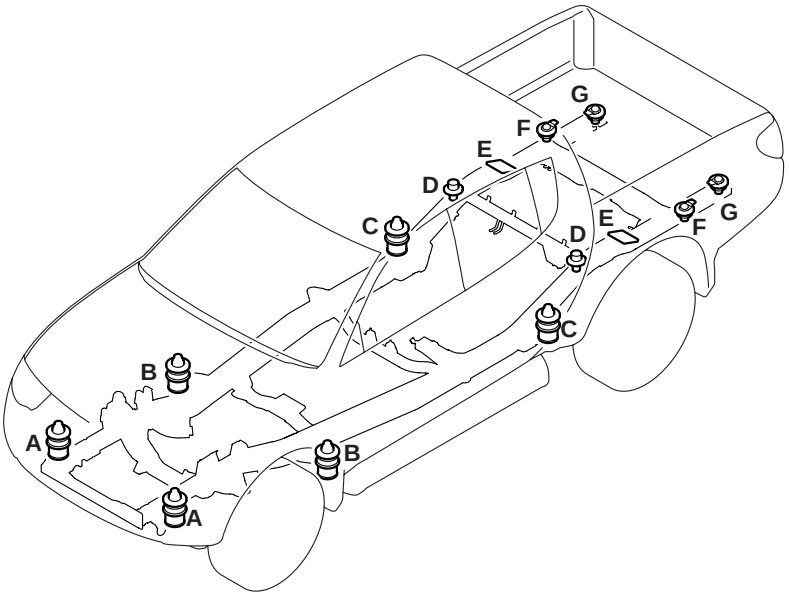
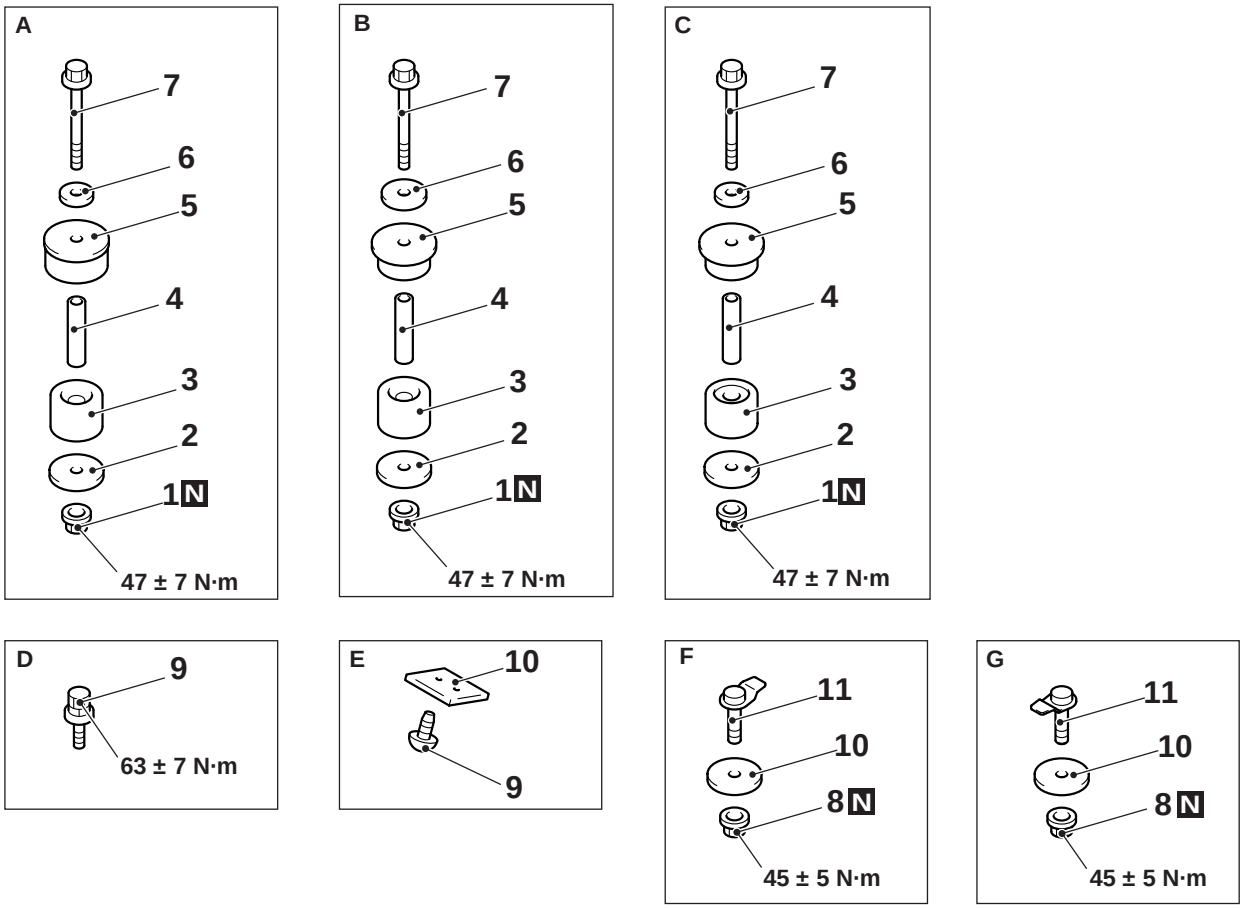
<Double cab>





AC501256AG

Cab body mounting removal steps

1. Cab body mounting nut
2. Cab body mounting washer
3. Cab body mounting cushion
4. Cab body mounting spacer
5. Cab body mounting cushion
6. Cab body mounting washer

<<A>>

Cab body mounting removal steps

7. Cab body mounting bolt

- Cab body

Rear body mounting removal steps

8. Rear body mounting nut
9. Rear body mounting screw or bolt
10. Rear body mounting shim

Rear body mounting removal steps (Continued)

11. Rear body mounting bolt

<<B>>

- Rear body

REMOVAL SERVICE POINTS

<<A>> CAB BODY REMOVAL

1. Remove or disconnect the following parts:
   - Hood
   - Radiator grille
   - Headlamp
   - Front bumper assembly
   - Oil cooler hose <Vehicles with oil cooler>
   - Radiator assembly
   - Air cleaner duct
   - Steering shaft joint
   - Heater hose
   - Power steering reservoir tank
   - Brake booster vacuum hose
   - Accelerator cable
   - Fuel hose
   - Brake pipe
   - A/C piping
   - Clutch release cylinder <Vehicles with manual transmission>
   - Speedometer cable
   - Parking brake cable
   - Shift lever knob <Vehicles with manual transmission>
   - Select lever knob <Vehicles with automatic transmission>
   - Idle up vacuum hose
   - Engine harness
   - A/C harness
   - Frame harness
   - Earth strap
   - Engine earth
   - Door opening weatherstrip inner
   - Floor carpet
   - Cab body mounting bolt

⚠ CAUTION

Before lifting the vehicle, check to be sure that all connections between cab body, frame and engine are separated. Connect sling wires to suitable bar or frame, fitting protection covers as necessary.

2. After removing the cab body mounting bolts and the cab body washers, insert wooden blocks to the cab body. Gently lift the vehicle with a crane.

<<B>> REAR BODY REMOVAL

1. Remove or disconnect the following parts:
   - Fuel filler neck
   - Rear body harness
   - Rear body mounting bolts and screws

⚠ CAUTION

Make sure that the rear body does not hit the cab body while it is being raised.

2. Hook wires onto the rope hocks on the rear body, and use a crane to raise the rear body.

REAR GATE

SERVICE SPECIFICATIONS

M1425000300031

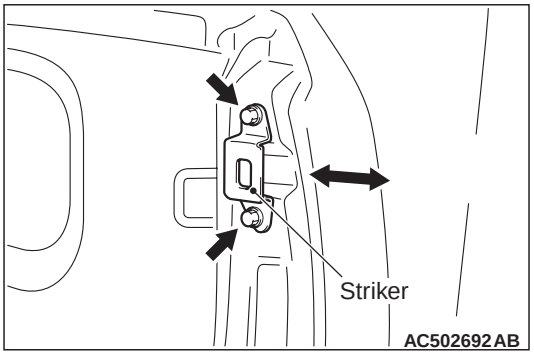
Item		Standard value
Rear gate outside handle play mm	Vehicles without high-mounted stop lamp	0.3 – 1.2 (target value: 0.7)
	Vehicles with high-mounted stop lamp	0.1 – 5.9 (target value: 2.6)

ON-VEHICLE SERVICE

REAR GATE PANEL FIT ADJUSTMENT

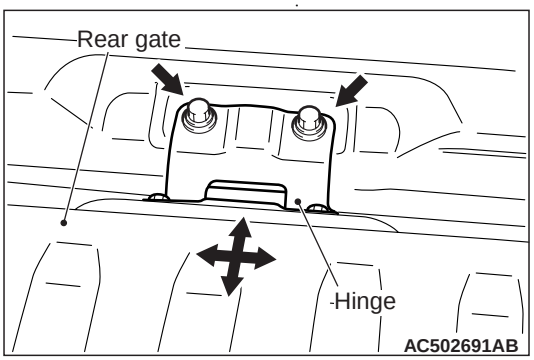
M1425001000033

ALIGNMENT OF REAR GATE LATCH AND STRIKER

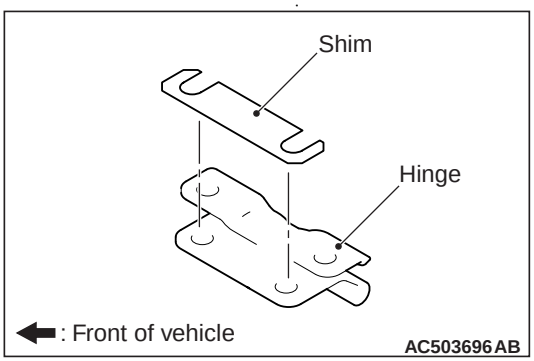


Loosen the striker mounting bolts to adjust the striker.

ADJUSTMENT OF CLEARANCE AROUND REAR GATE



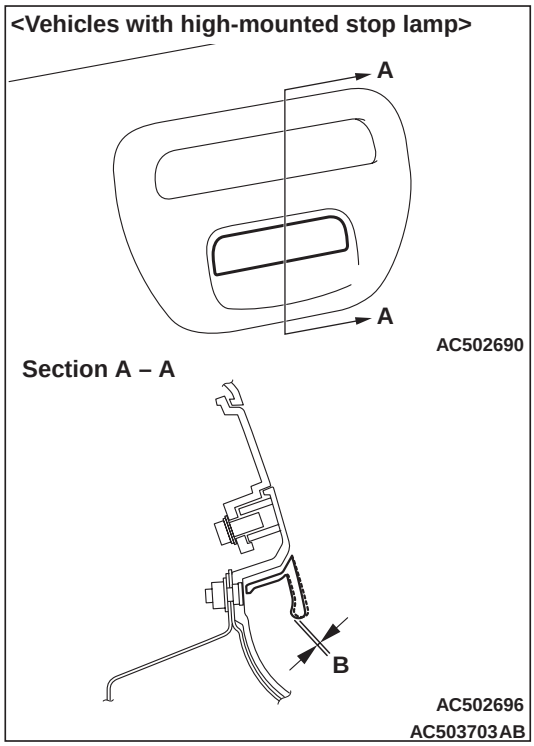
If the clearance between the rear gate and rear body is uneven, loosen the mounting bolts on the body of the rear gate hinge, and then adjust the rear gate assembly.



If the height of the rear gate and rear body is uneven, attach the shims to the rear body and hinge mounting section to adjust the height.

REAR GATE OUTSIDE HANDLE ADJUSTMENT

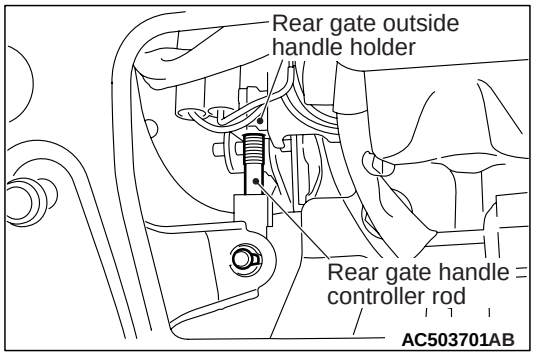
M1425000900033



1. Check that the rear gate outside handle play is within the standard value range.

   Standard value (B):
   Vehicles without high-mounted stop lamp: 0.3 – 1.2 mm (target value: 0.7 mm)
   Vehicles with high-mounted stop lamp: 0.1 – 5.9 mm (target value: 2.6 mm)

2. If it is outside the standard value range, remove the rear gate cover (Refer to P.42-240).



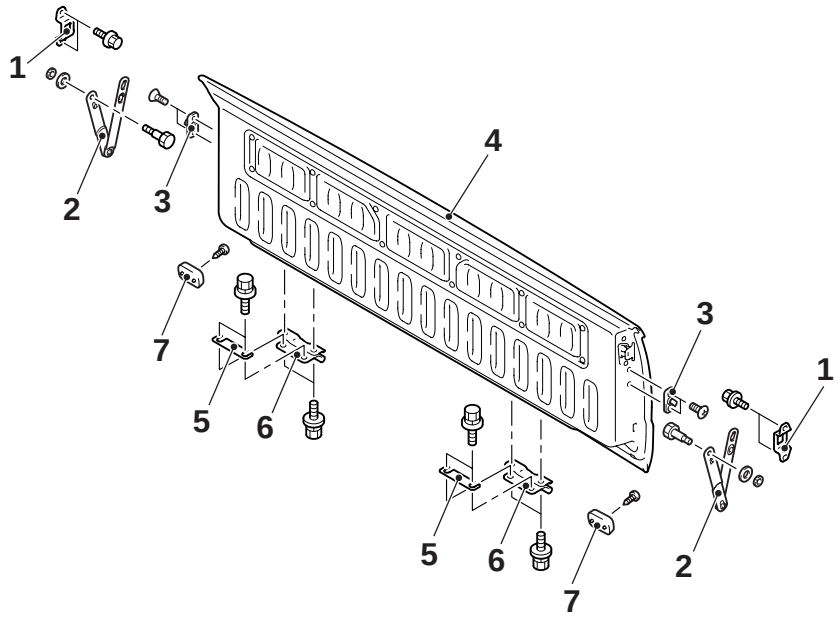
3. Remove the rear gate outside handle holder. Adjust the play by changing the connecting point between the rear gate handle controller rod and the rear gate outside handle.

REAR GATE

REMOVAL AND INSTALLATION

M1425001700032

Post-installation Operation
- Rear Gate Fit Adjustment (Refer to P.42-238).



AC509877AB

Striker removal
1. Striker

Rear gate removal steps
- Wiring harness connector connection

2. Rear body rear gate link
3. Rear gate link hook
4. Rear gate assembly

Hinge removal steps
5. Shim (0 – several pieces)
6. Hinge

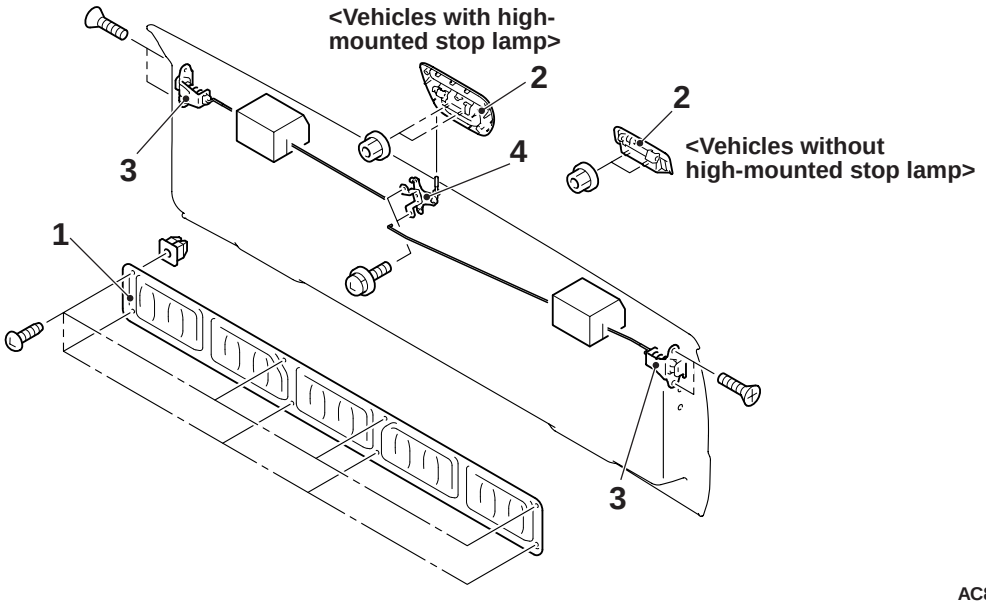
Damper removal
7. Damper

REAR GATE LATCH ASSEMBLY

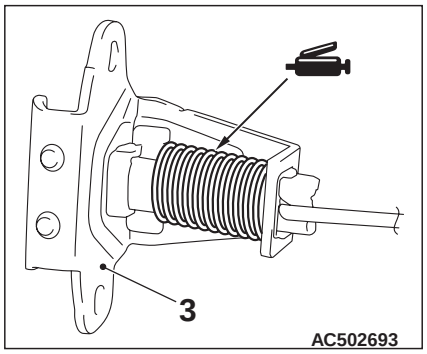
REMOVAL AND INSTALLATION

M1425003400059

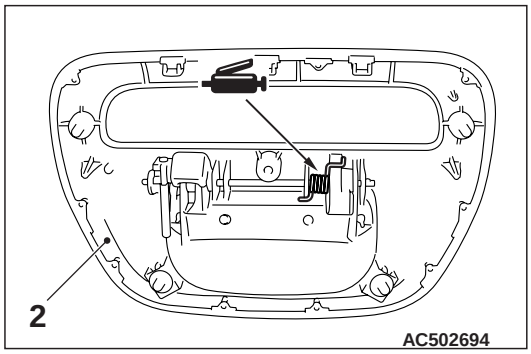
Post-installation Operation
- Rear Gate Fit Adjustment (Refer to P.42-238).
- Rear Gate Outside Handle Adjustment (Refer to P.42-238).



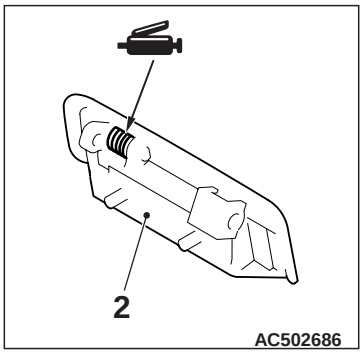
AC805340AB



AC502693



AC502694



AC502686

AC503697AB

Rear gate outside handle removal steps
1. Rear gate cover
2. Rear gate outside handle

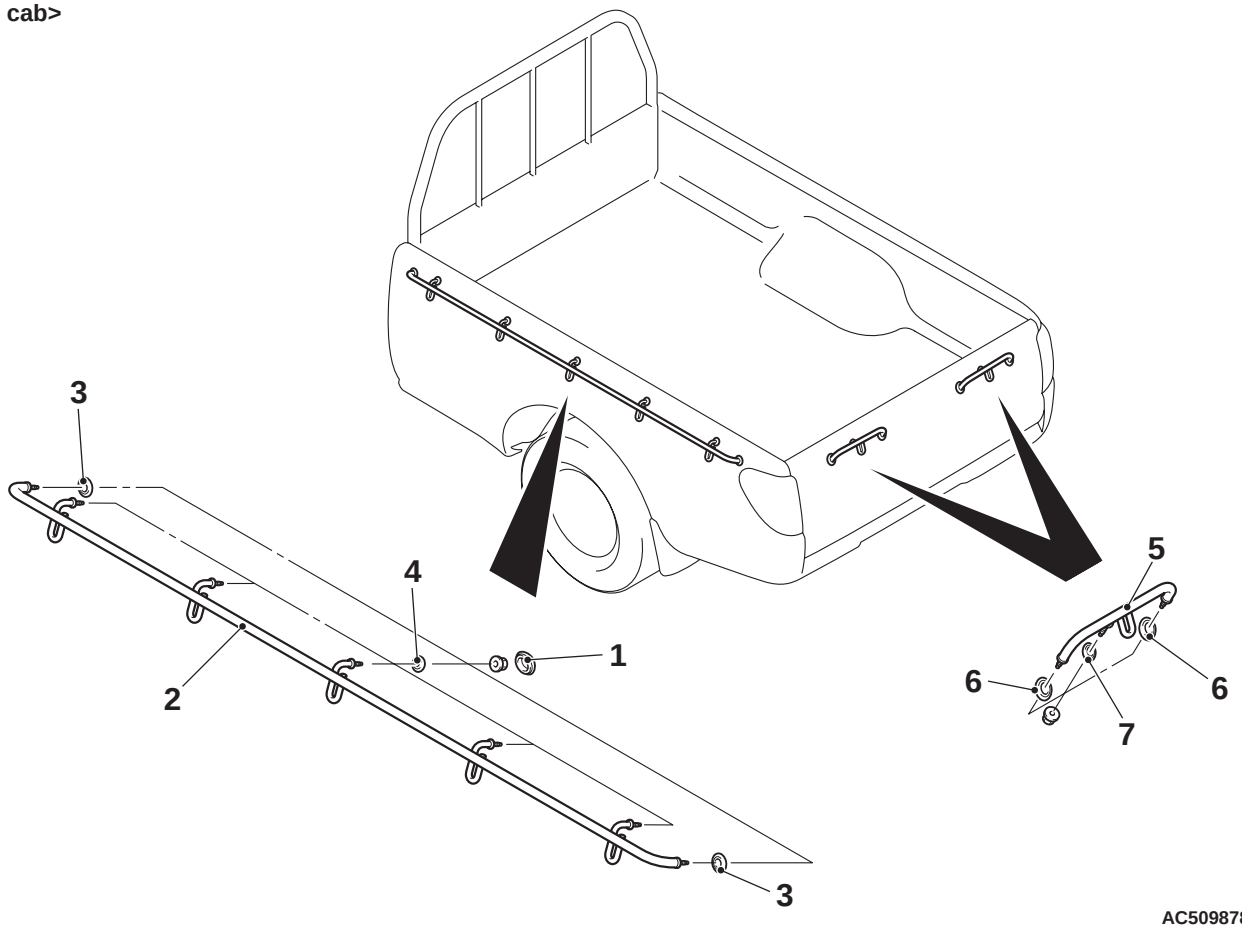
Rear gate latch removal steps
1. Rear gate cover
3. Rear gate latch
4. Rear gate handle controller

REAR BODY ROPE HOOK

REMOVAL AND INSTALLATION

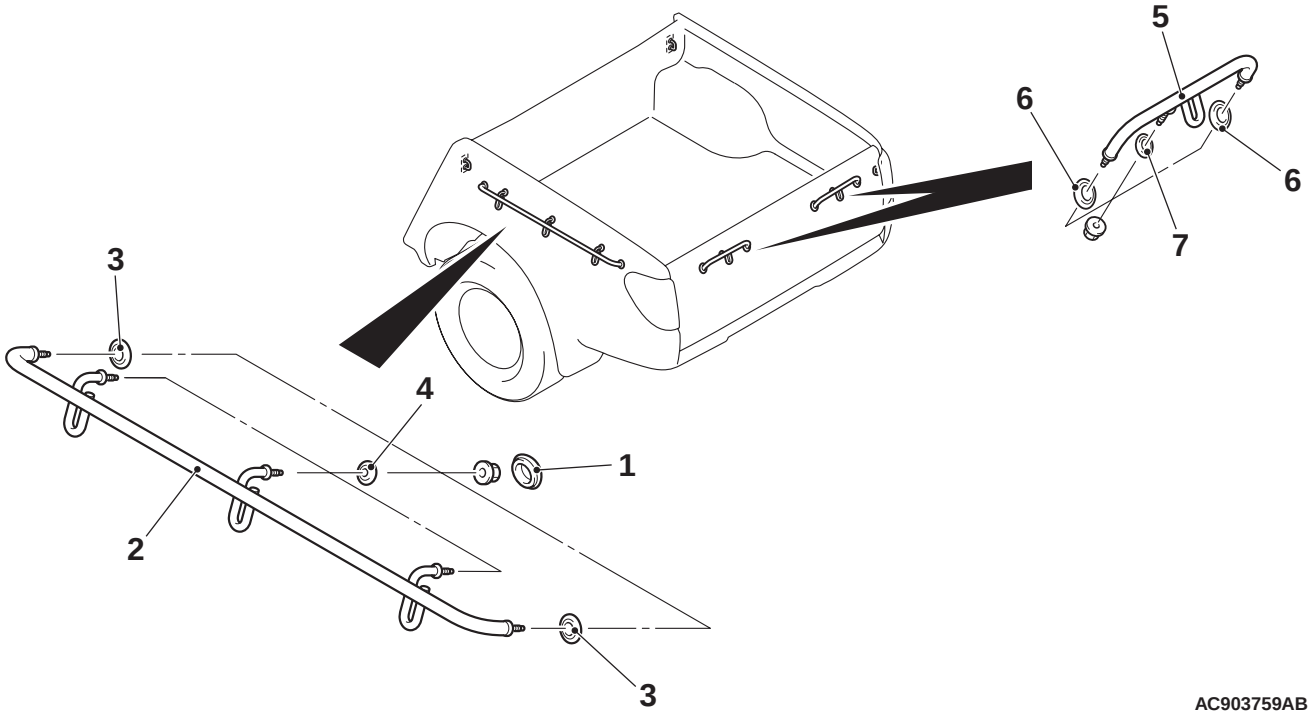
M1425004000087

<Single cab>



AC509878AD

<Double cab>



AC903759AB

Rear body rope hook removal steps

1. Rear body plug
2. Rear body rope hook

>>A<< 3. Rear body grommet A

>>A<< 4. Rear body grommet B

Rear gate rope hook removal steps

- Rear gate cover (Refer to P.42-240.)

5. Rear gate rope hook

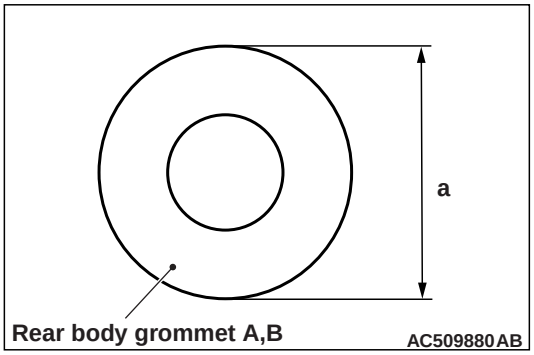
>>B<< 6. Rear body grommet C

>>B<< 7. Rear body grommet D

INSTALLATION SERVICE POINTS

>>A<< REAR BODY GROMMET A AND B INSTALLATION

⚠ CAUTION

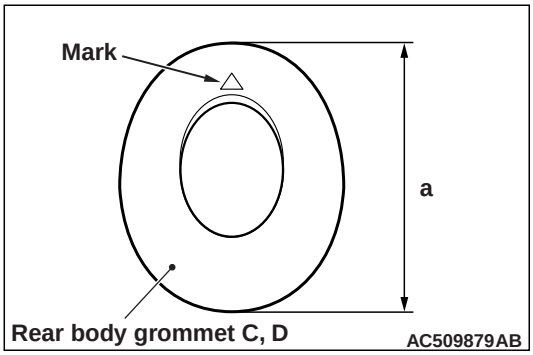


Install the grommets at correct locations in order not to damage them.

Standard value (a): 40 mm <Rear body grommet A>,
33mm <Rear body grommet B>

>>B<< REAR BODY GROMMET C AND D INSTALLATION

⚠ CAUTION



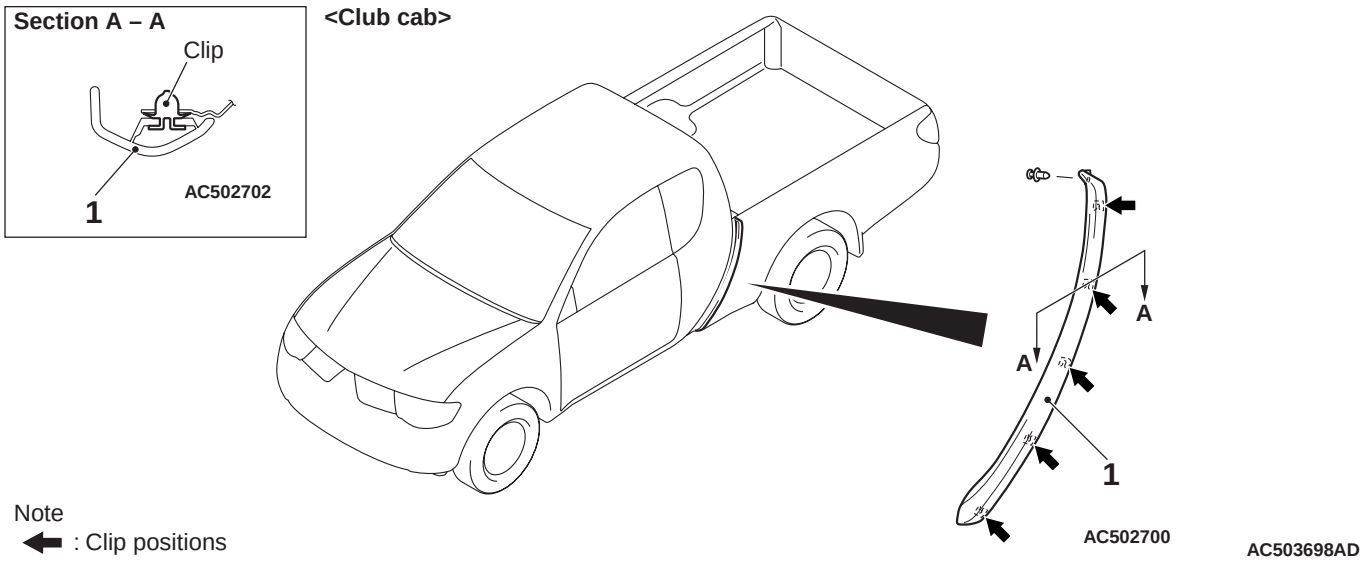
Install the grommets at correct locations in order not to damage them.
Install the grommets so that the mating marks face upward.

Standard value (a): 46.5 mm <Rear body grommet C>,
38.5mm <Rear body grommet D>

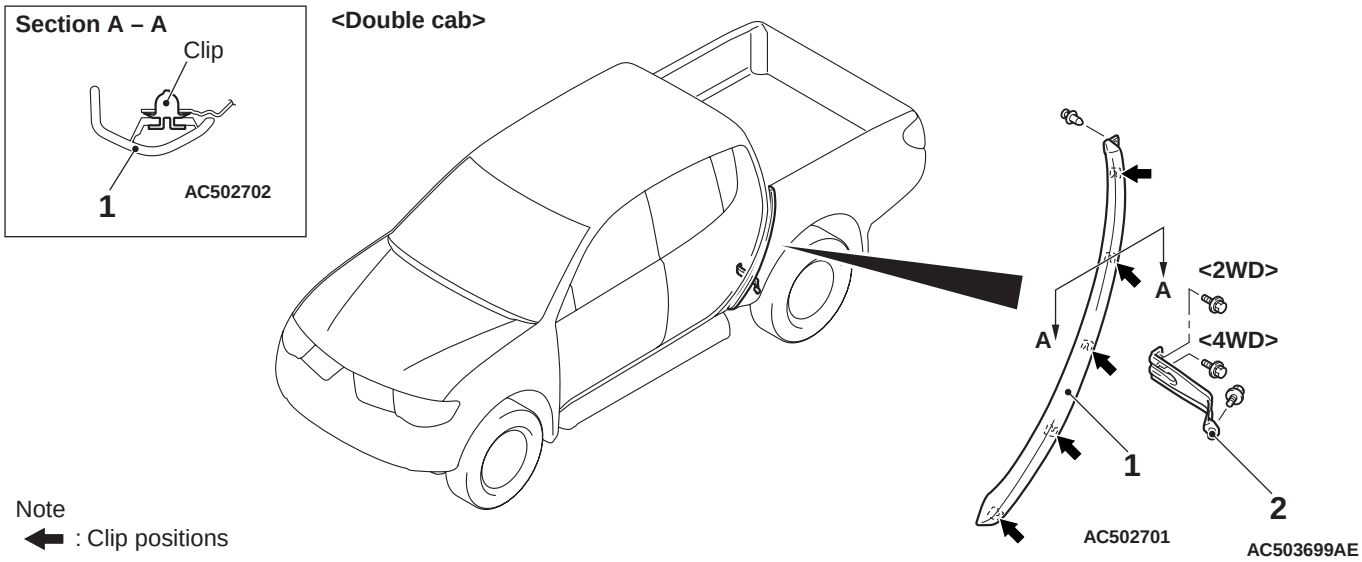
REAR SIDE PANEL

REMOVAL AND INSTALLATION

M1425003700094



Note
: Clip positions



Note
: Clip positions

Removal steps

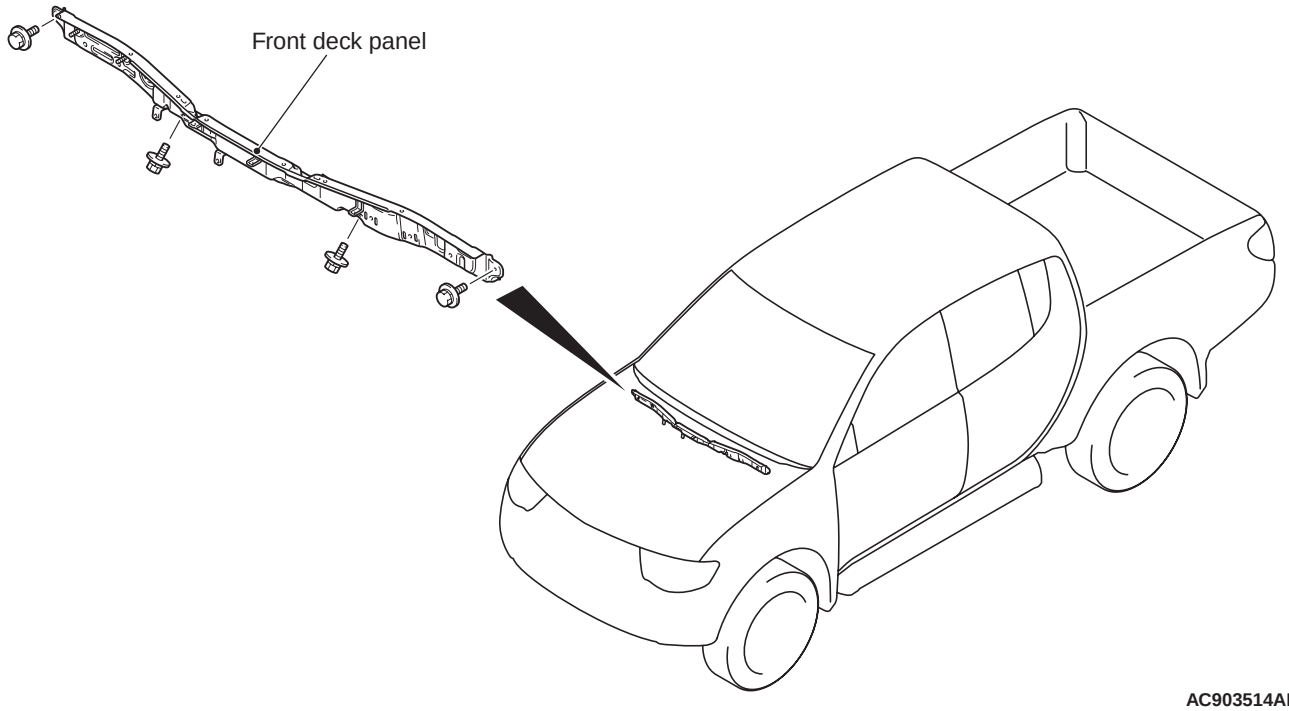
1. Rear side panel
2. Rear wheelhouse stay

LOOSE PANEL

REMOVAL AND INSTALLATION

M1421003101189

Pre-removal and Post-installation Operation
- Front Deck Garnish and Windshield Wiper Link Assembly Removal and Installation (Refer to GROUP 51, Windshield Wiper .)



AC903514AB

CUSTOMISE FUNCTION

M1421009900083

The following functions can be customised using M.U.T.-III.

Function	Item name	Configuration
Hazard lamp blink time of keyless entry hazard lamp answerback function <vehicles with keyless entry system>	Hazard answer-back	• Lock 1 Unlock 2 (initial condition) • Lock 1 Unlock 0 • Lock 0 Unlock 2 • Lock 2 Unlock 0 • Lock 0 Unlock 0
"P" position shift linked door-unlock function <vehicles with automatic transmission with keyless entry system>	Door unlock (Shift "P" position)	• Inhibit (initial condition) • Operation
Keyless entry timer lock time <vehicles with keyless entry system>	Auto-relock time	• 30 sec (initial condition) • 60 sec • 120 sec • 180 sec

GROUP 51

EXTERIOR

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FRONT BUMPER ASSEMBLY

ADHESIVE

M1511000501106

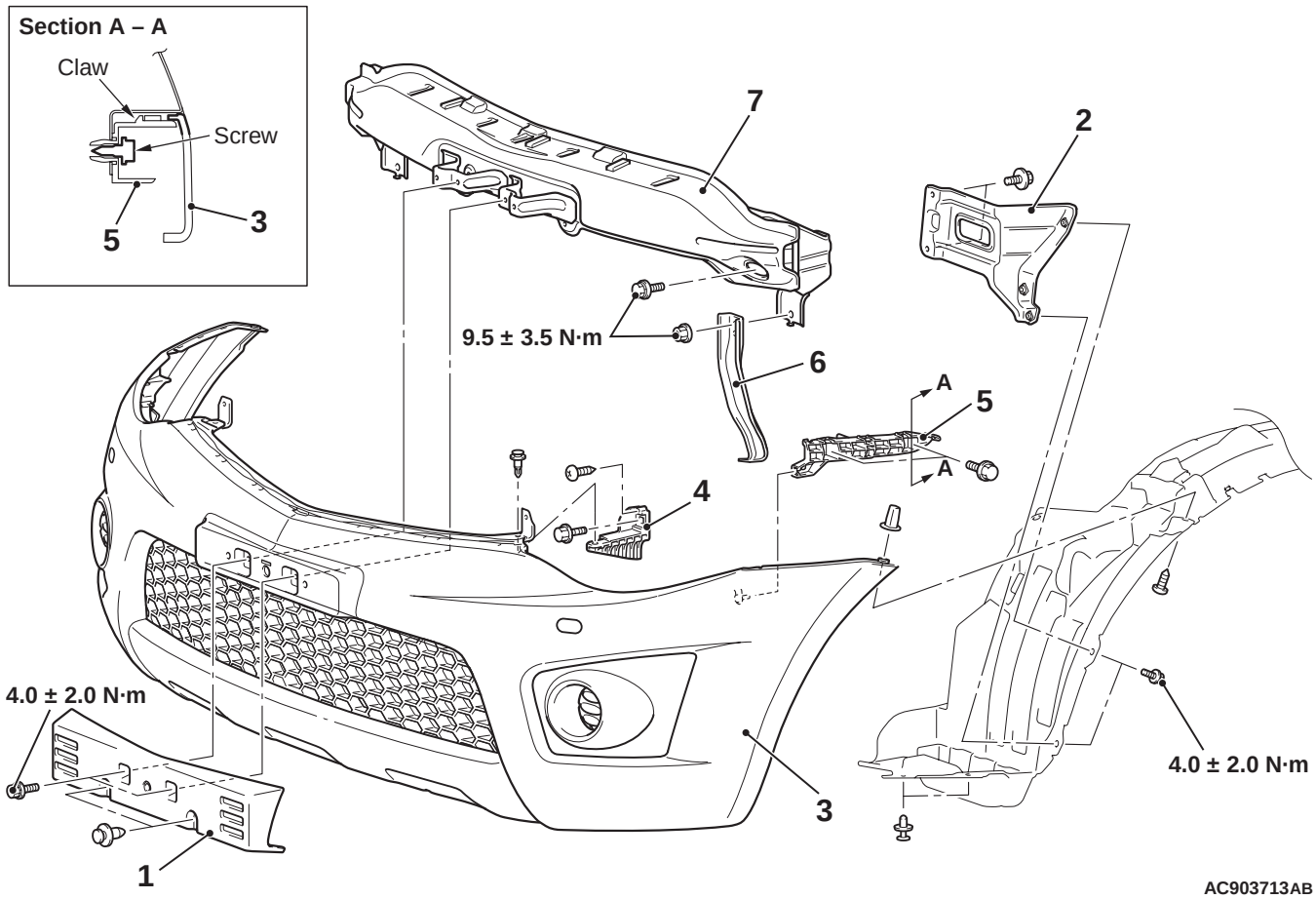
Application	Specified adhesive
Front three-diamond mark	Double-sided tape: Generic products, 1.2 mm thickness

FRONT BUMPER ASSEMBLY

REMOVAL AND INSTALLATION

M1511001402105

<Vehicles for Europe: Single cab>
<Vehicles for Russia>



AC903713AB

Removal steps

- Radiator grille (Refer to P.51-14.)
- Front overfender <Vehicles with wide fender> (Refer to P.51-17.)

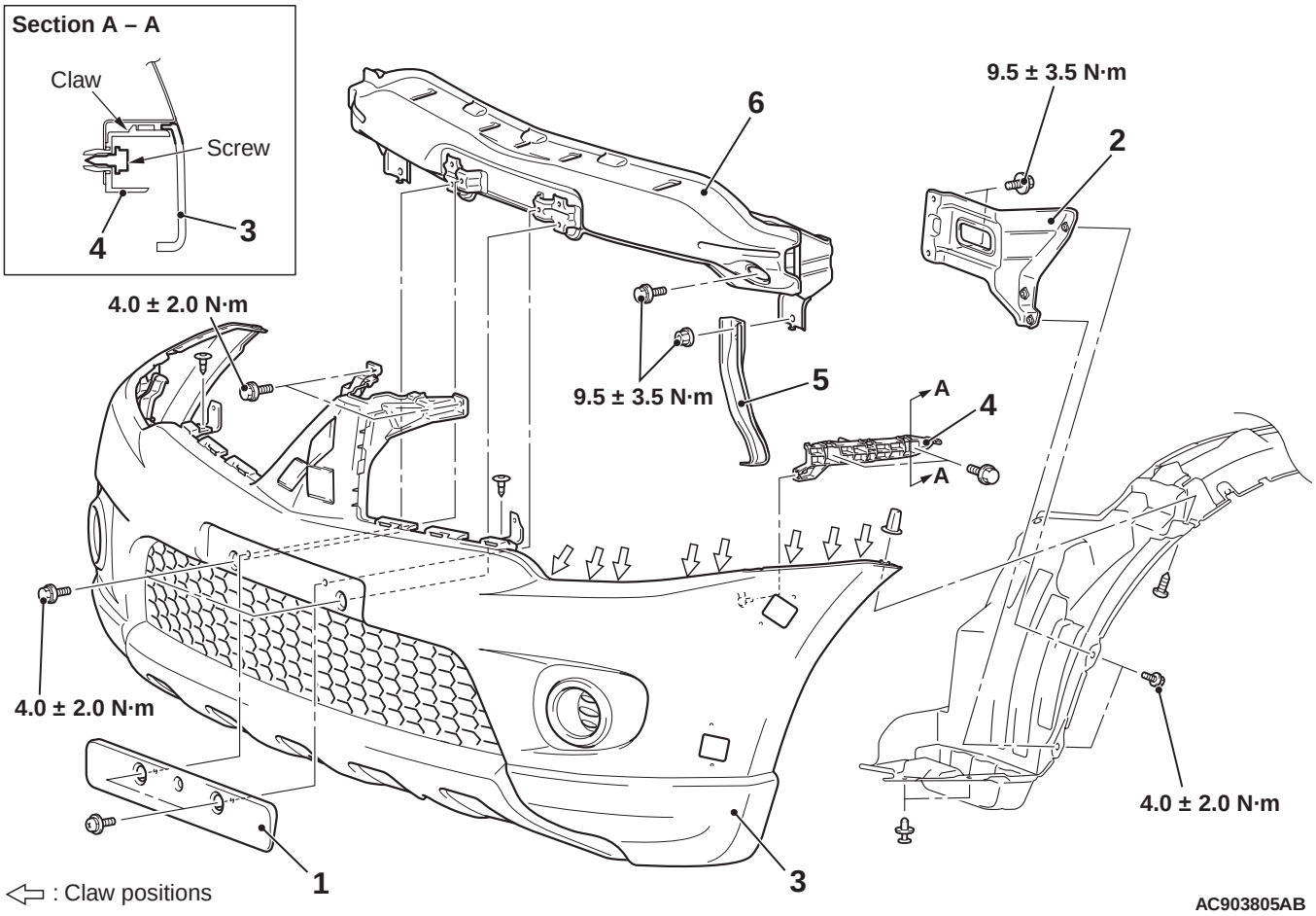
1. Licence plate garnish
   - Windshield washer tank (Refer to P.51-73.)
2. Front bumper side stay

Removal steps (Continued)

- Headlamp assembly (Refer to GROUP 54A, Headlamp .)

3. Front bumper assembly
4. Headlamp support bracket
5. Front bumper support bracket
6. Front bumper stay
7. Front bumper reinforcement

<Vehicles for Europe: Club and double cab>



Removal steps

- Radiator grille (Refer to P.51-14.)
- Front overfender (Refer to P.51-17.)

1. Licence plate garnish
2. Front bumper side stay

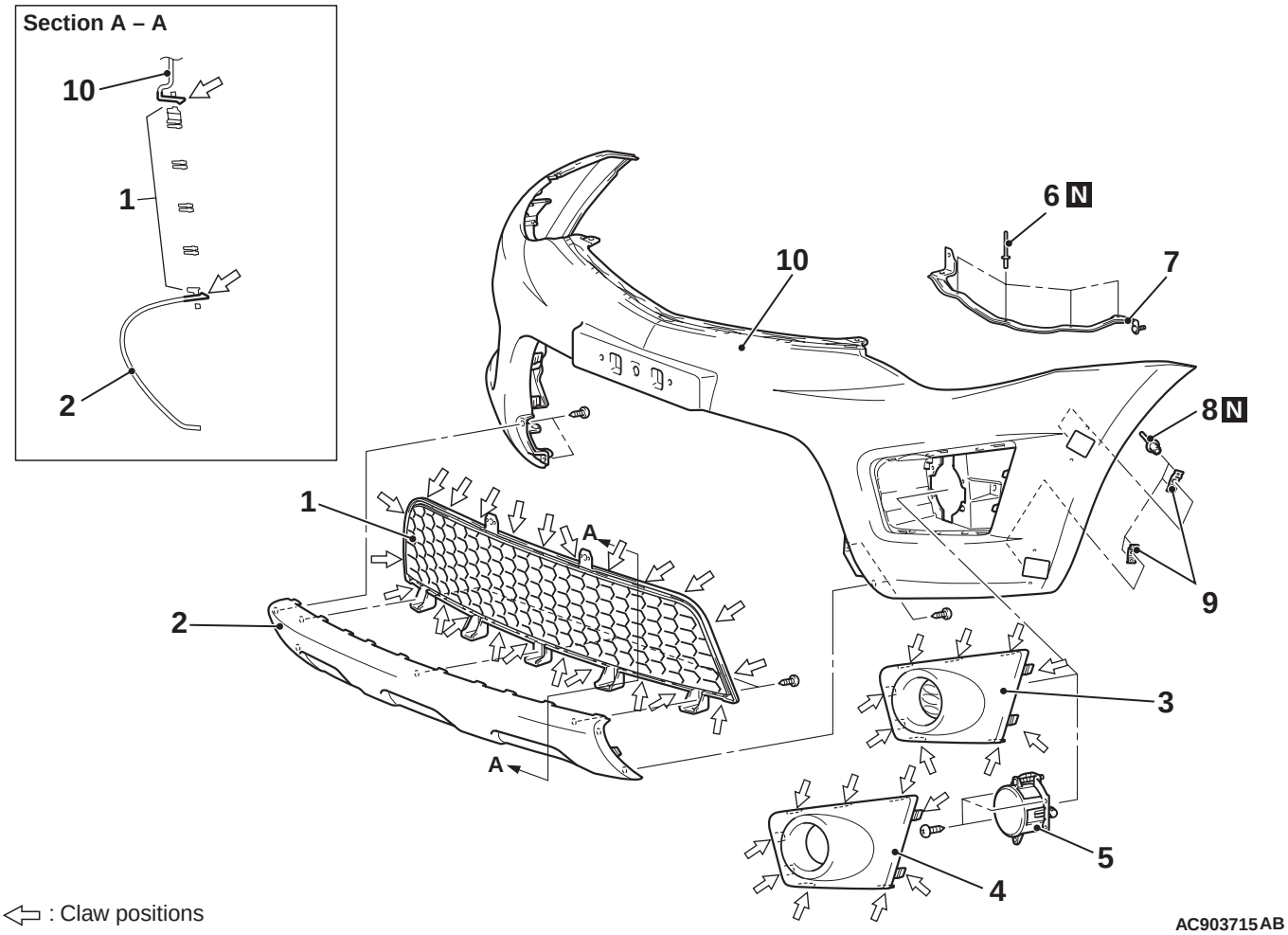
Removal steps (Continued)

- Fog lamp connector connection <vehicles with fog lamp>

3. Front bumper assembly
4. Front bumper support bracket
5. Front bumper stay
6. Front bumper reinforcement

DISASSEMBLY AND REASSEMBLY<VEHICLES FOR EUROPE (SINGLE CAB, DOUBLE CAB (2WD(EXCEPT HIGH RIDER)) AND RUSSIA>

M1511001602596



⇦ : Claw positions

AC903715AB

Disassembly steps

- Headlamp washer <Vehicles with headlamp washer> (Refer to P.51-83.)

1. Front bumper grille
2. Front bumper cover
3. Front fog lamp cover <Vehicles without front fog lamps>
4. Front fog lamp bezel <Vehicles with front fog lamps>
5. Front fog lamp <Vehicles with front fog lamps>

<<A>> >>A<< 6. Rivets A

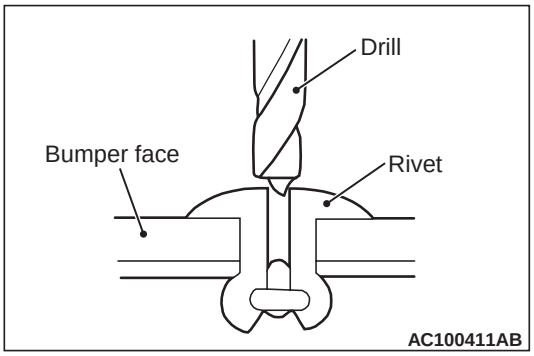
7. Front bumper side reinforcement

<<A>> >>A<< 8. Rivets B <Vehicles with overfender>

9. Overfender extension bracket <Vehicles with overfender>
10. Front bumper face

DISASSEMBLY SERVICE POINT

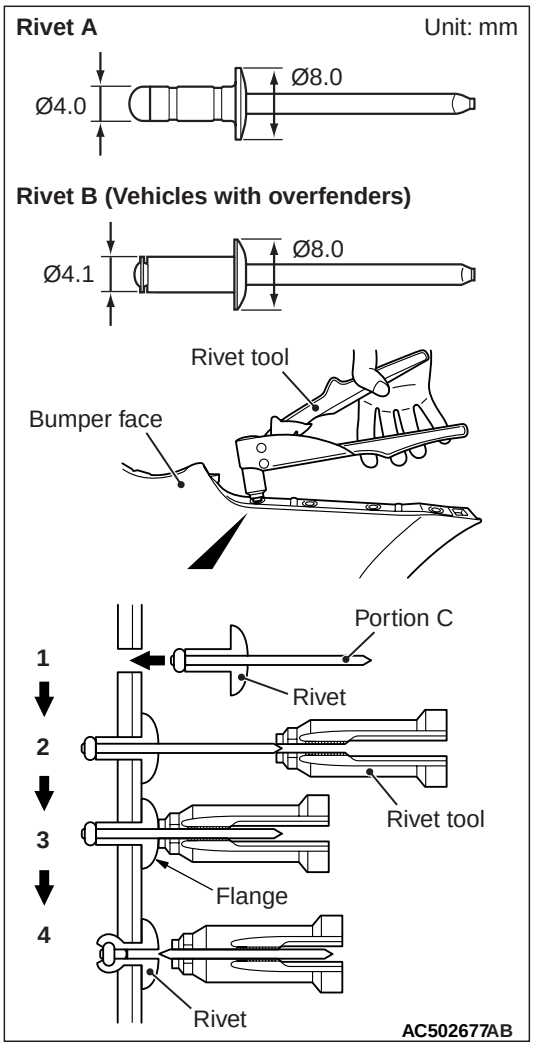
<<A>> RIVETS A/RIVETS B REMOVAL



Use a drill (ϕ 4.0 mm) to make a hole in the rivet A and rivet B to break it, and remove the rivet.

REASSEMBLY SERVICE POINT

>>A<< RIVETS A/RIVETS B INSTALLATION



Use a rivet tool shown in the illustration to connect the parts with rivets by the following procedures.

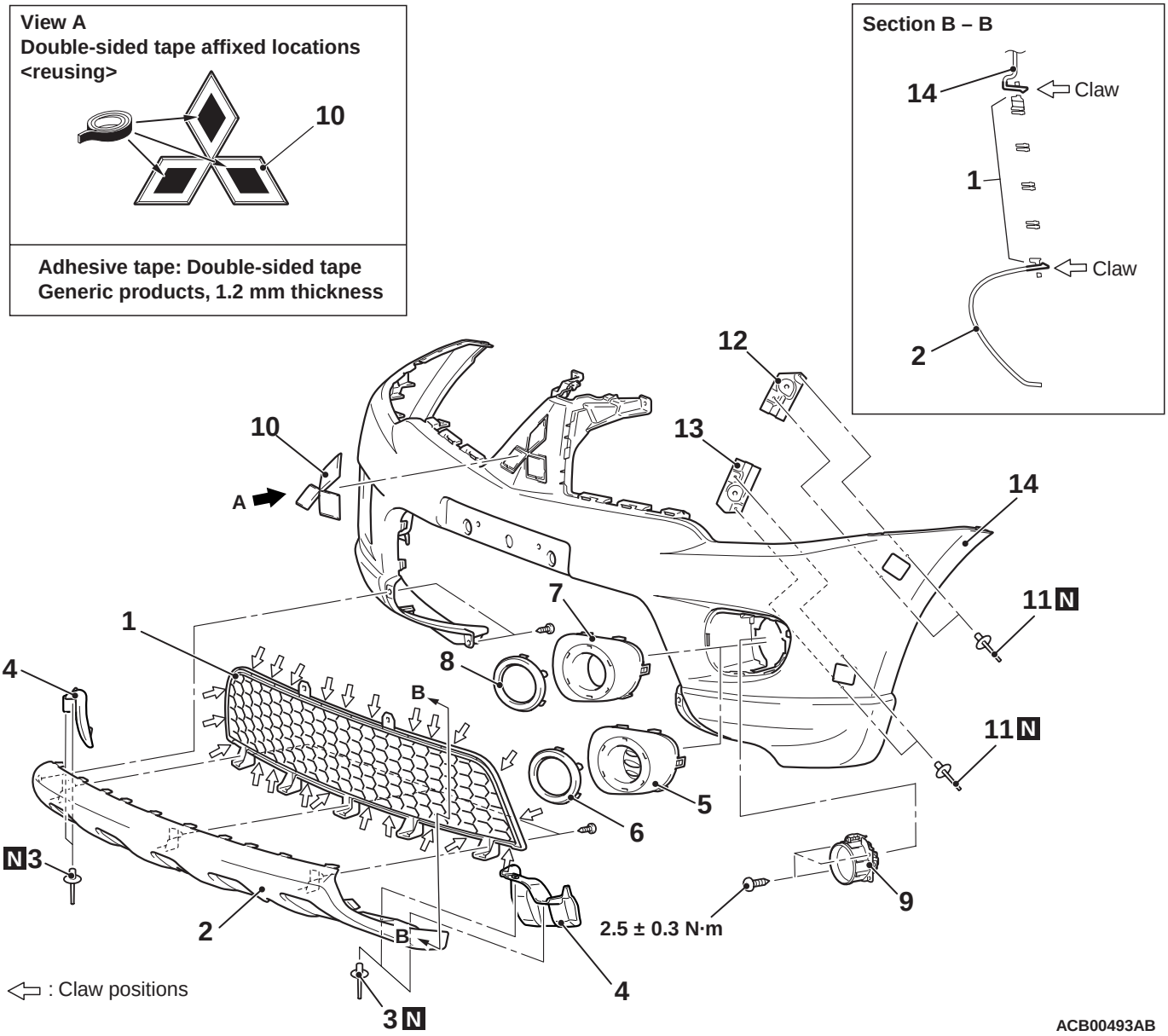
1. Insert rivet A into the front bumper face and front bumper side reinforcement and rivet B into the overfender extension bracket and front bumper face.

NOTE: Do not confuse rivet A and rivet B. Rivet B is a split type and used for vehicles with overfenders only.

2. Place the rivet tool over portion C of rivet.
3. While pushing the flange surface of the rivet onto parts to be fixed with the rivet tool, press the handle of the tool.
4. Thin part of portion C of the rivet will cut off and the rivet is fixed in position.

DISASSEMBLY AND REASSEMBLY <VEHICLES FOR EUROPE (CLUB CAB, DOUBLE CAB(HIGH RIDER, 4WD)) >

M1511001602585



Disassembly steps

1. Front bumper grille
2. Front bumper cover

<<A>> >>A<< 3. Rivets

4. Air dam LH/RH
5. Front fog lamp cover <Vehicles without front fog lamps>
6. Front fog lamp bezel <Vehicles without front fog lamps>
7. Front bumper garnish <Vehicles with front fog lamps>

Disassembly steps (Continued)

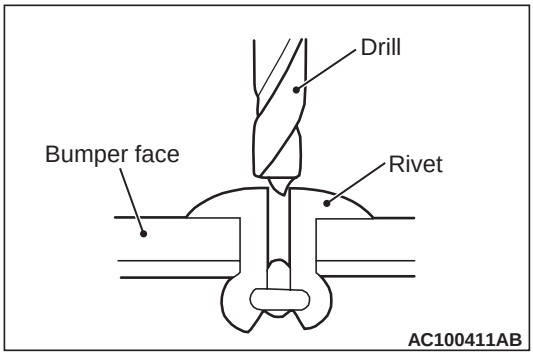
8. Front fog lamp bezel <Vehicles with front fog lamps>
9. Front fog lamp <Vehicles with front fog lamps>
10. Front three-diamond mark

<<A>> >>A<< 11. Rivets

12. Front bumper side bracket upper
13. Front bumper side bracket lower
14. Front bumper face

DISASSEMBLY SERVICE POINT

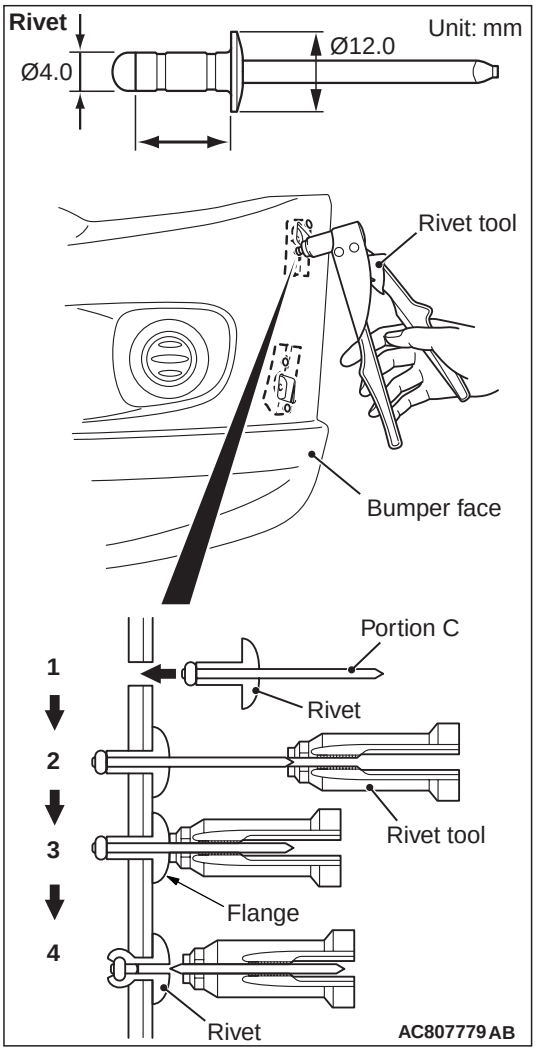
<<A>> RIVETS REMOVAL



Use a drill (ϕ 4.0 mm) to make a hole in the rivet to break it, and remove the rivet.

REASSEMBLY SERVICE POINT

>>A<< RIVETS INSTALLATION



Use a rivet tool shown in the illustration to connect the parts with rivets by the following procedures.

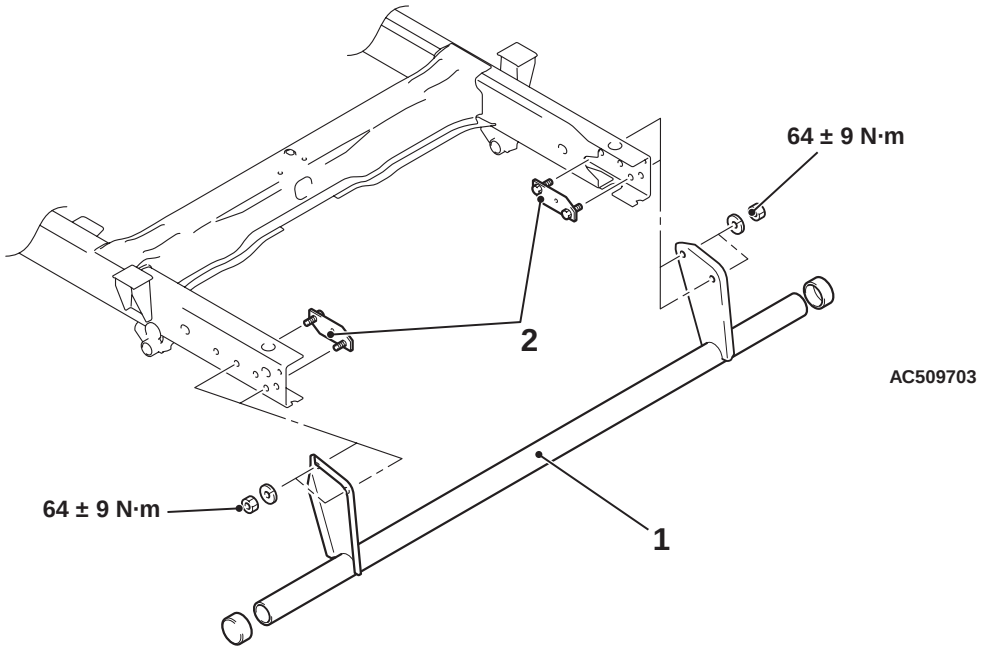
1. Insert rivet into the front bumper side bracket and front bumper face.
2. Place the rivet tool over portion C of rivet.
3. While pushing the flange surface of the rivet onto parts to be fixed with the rivet tool, press the handle of the tool.
4. Thin part of portion C of the rivet will cut off and the rivet is fixed in position.

GUARD BAR

REAR GUARD BAR REMOVAL AND INSTALLATION

M1511010600026

VEHICLES FOR EUROPE AND RUSSIA



AC509703 AD

Removal steps

1. Rear bumper guard
2. Rear bumper plate

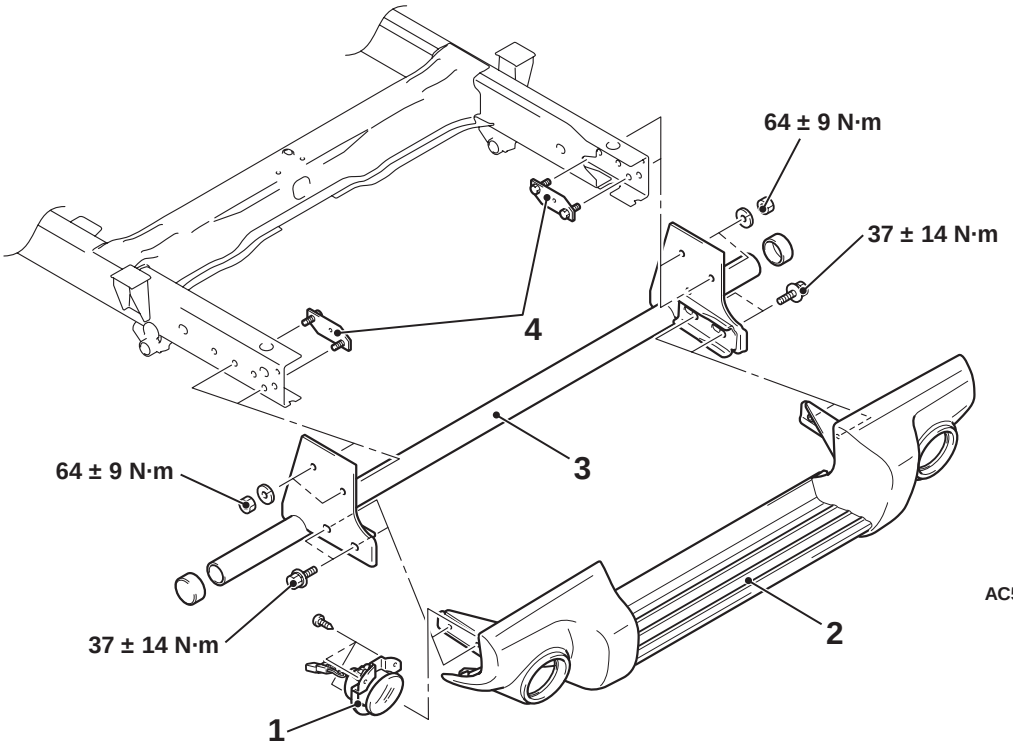
REAR BUMPER ASSEMBLY

REMOVAL AND INSTALLATION

M1511001902649

VEHICLES FOR EUROPE AND RUSSIA(OPTIONAL)

VEHICLES WITHOUT LONG CARGO BED



AC511260 AC

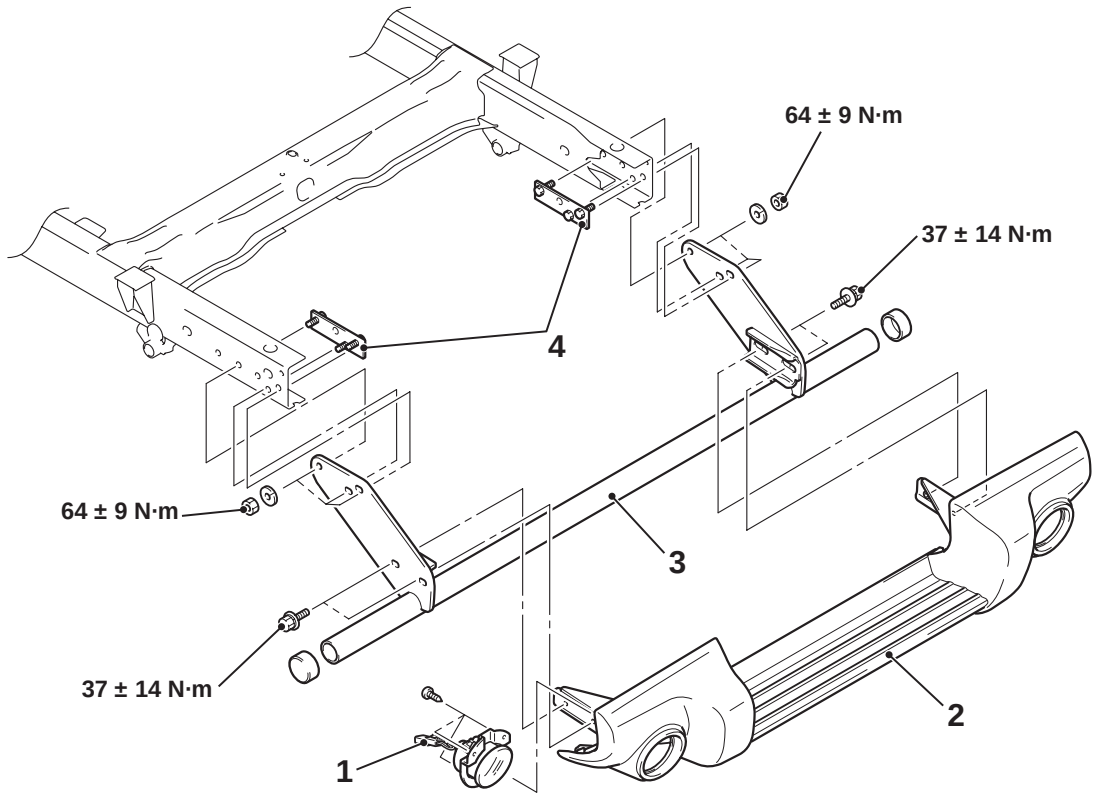
Removal steps

<<**A**>> 1. Rear fog lamp <Vehicles with rear fog lamp>
2. Rear step bumper assembly

Removal steps (Continued)

3. Rear bumper side bracket
4. Rear bumper plate

VEHICLES WITH LONG CARGO BED



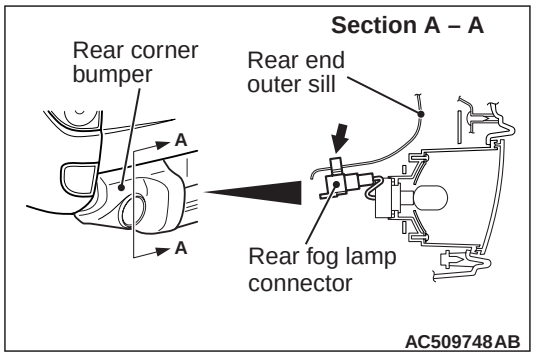
ACA00440AC

Removal steps

<<A>> 1. Rear fog lamp <Vehicles with rear fog lamp>
2. Rear step bumper assembly
3. Rear bumper guard
4. Rear bumper plate

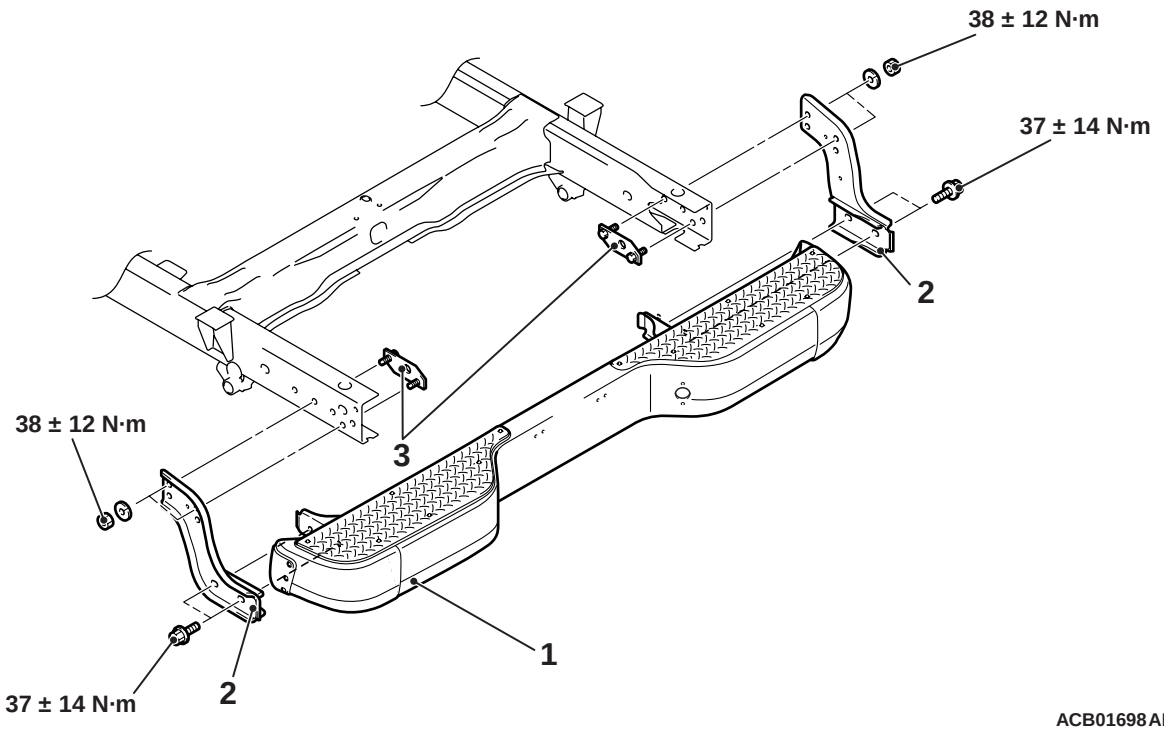
REMOVAL SERVICE POINT

<<A>> REAR FOG LAMP CONNECTOR REMOVAL



Remove the rear fog lamp connector on rear end outer sill before removing the rear corner bumper.

VEHICLES FOR MOROCCO (OPTIONAL)



ACB01698AB

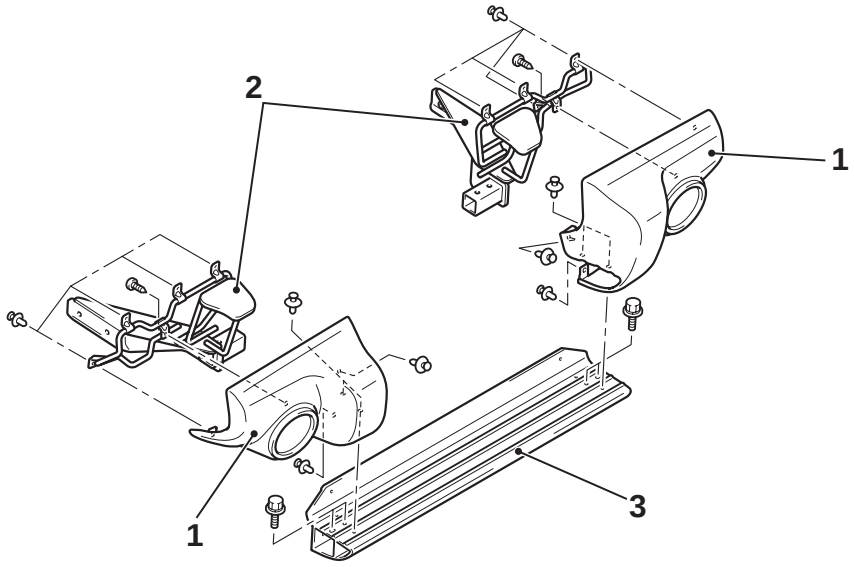
Removal steps

- Licence plate lamp(Refer to .
1. Rear step bumper assembly
2. Rear bumper side bracket
3. Rear bumper plate

DISASSEMBLY AND REASSEMBLY

M1511002101063

VEHICLES FOR EUROPE AND RUSSIA(OPTIONAL)

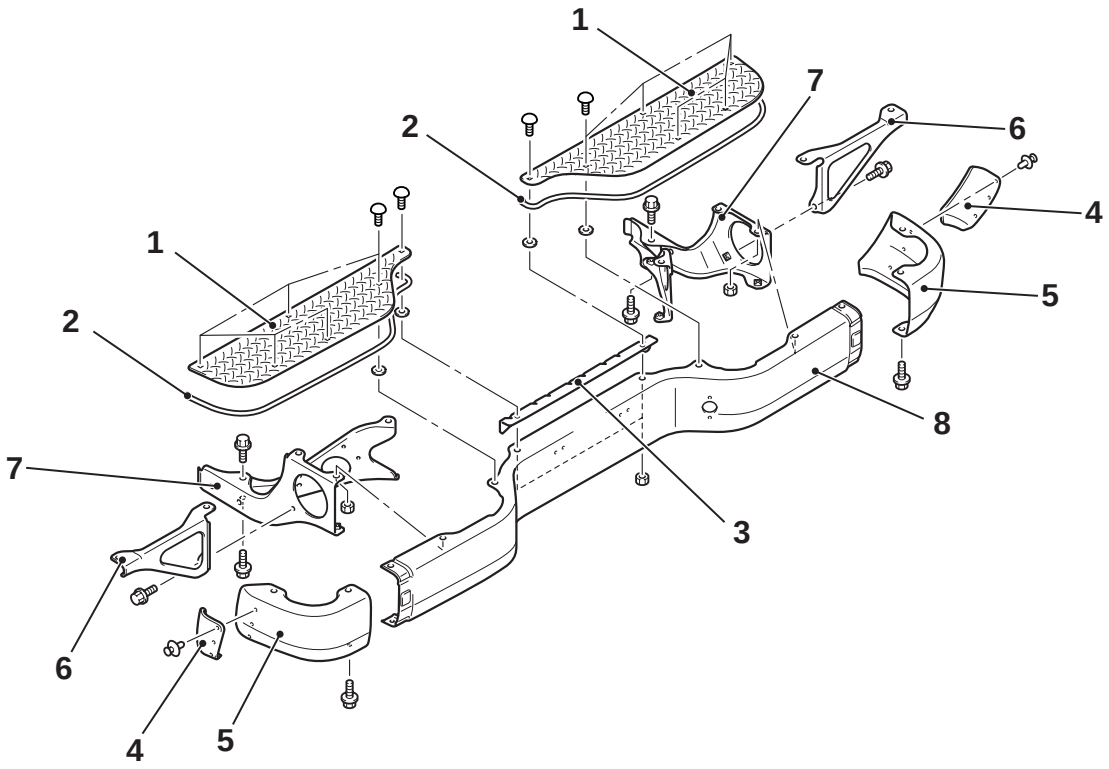


ACB01724AB

Removal steps

1. Rear corner bumper
2. Rear bumper face support reinforcement
3. Rear bumper step plate

VEHICLES FOR MOROCCO (OPTIONAL)



ACB01723AB

Disassembly steps

- Licence plate lamp(Refer to .

1. Rear bumper step plate
2. Rear bumper weatherstrip
3. Rear bumper mud guard

Disassembly steps (Continued)

4. Rear bumper protector
5. Rear side bumper
6. Rear step bumper reinforcement
7. Rear step bumper stay assembly
8. Rear centre bumper

RADIATOR GRILLE

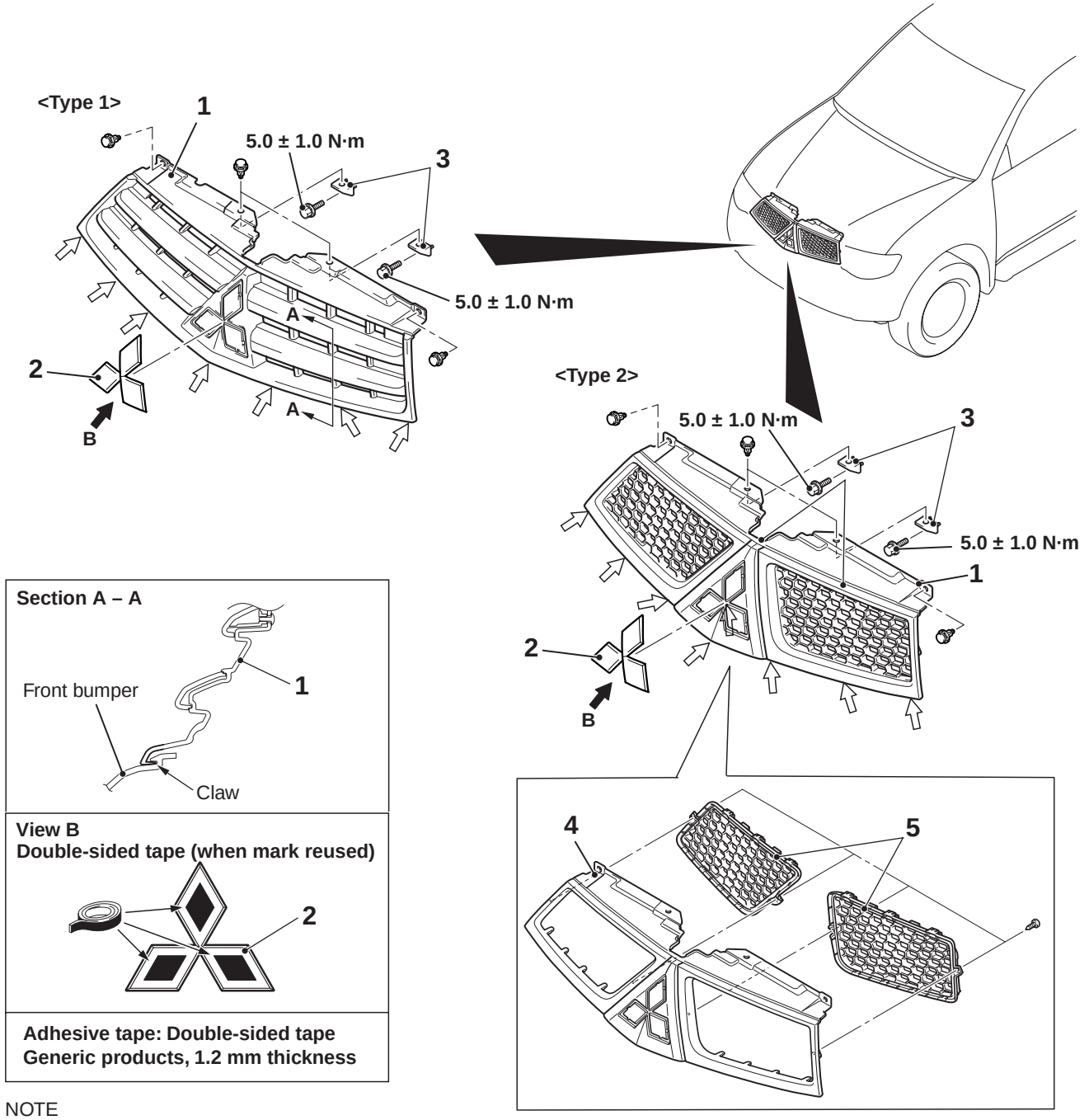
ADHESIVE

M1511000501292

Application	Specified adhesive
Front three-diamond mark	Double-sided tape: Generic products, 1.2 mm thickness

REMOVAL AND INSTALLATION

M1511002901263



NOTE
⇦:Claw positions

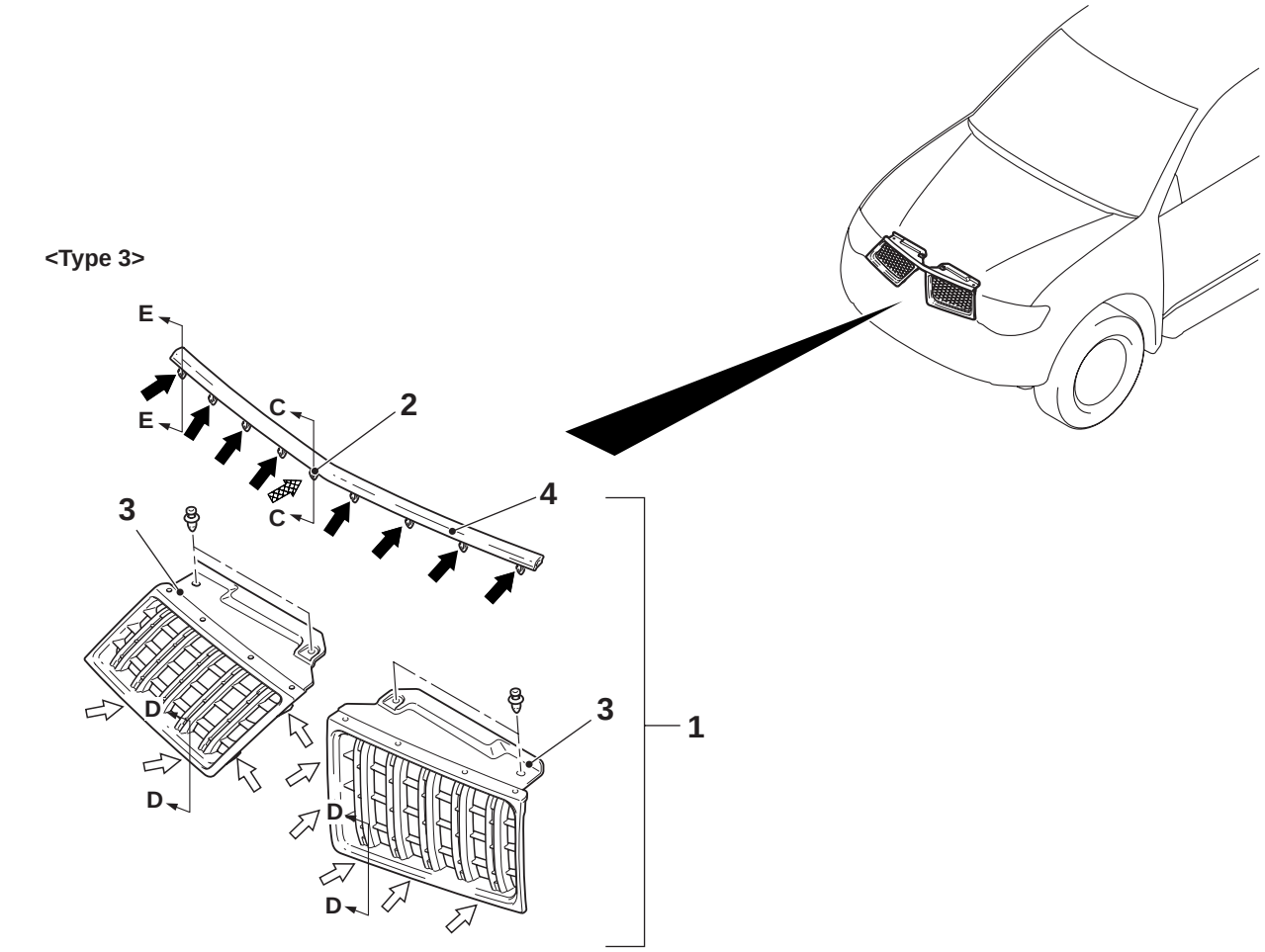
AC808687AD

Removal steps

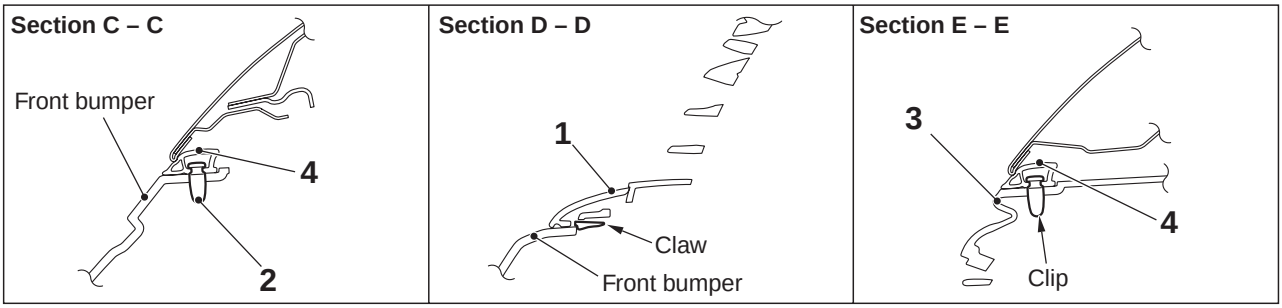
1. Radiator grille
2. Front three-diamond mark
3. Bracket

Removal steps (Continued)

4. Radiator grille outer
5. Radiator grille inner



:Clip position (To front bumper)
:Clip positions (To radiator grille)
:Claw positions (To front bumper)



AC902498AB

Removal steps <Type 3>

1. Radiator grille assembly

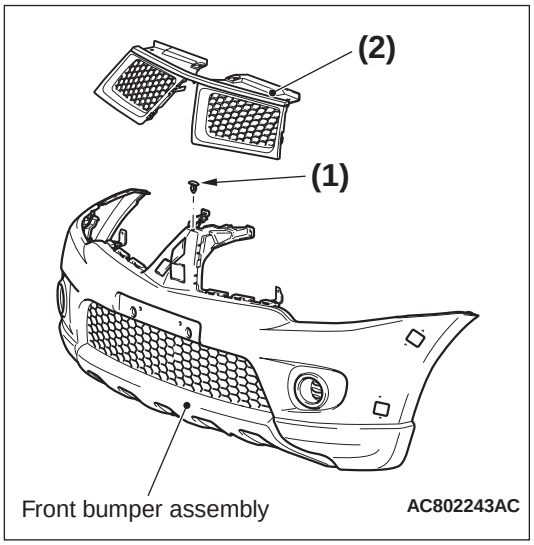
<<**A**>> 2. Radiator grille weatherstrip mounting clip

Removal steps <Type 3>

3. Radiator grille
4. Radiator grille weatherstrip

REMOVAL SERVICE POINT

<<A>> RADIATOR GRILLE WEATHERSTRIP MOUNTING CLIP REMOVAL



1. Disconnect the radiator grille weatherstrip mounting clip (1) (one location) that is connecting the radiator grille assembly (2) to the front bumper assembly.
2. Remove the radiator grille assembly (2) from the front bumper assembly toward a diagonal front upper direction.

OVERFENDER <VEHICLES WITH WIDE FENDER>

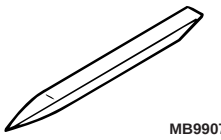
ADHESIVE

M1511000501117

Application	Specified adhesive
Front/ rear overfender	Double-sided tape: Generic products, 4.0 mm width and 0.4 mm thickness

SPECIAL TOOL

M1511000601620

Tool	Number	Name	Use
 MB990784	MB990784	Ornament remover	Removal of overfender

LUBRICANT

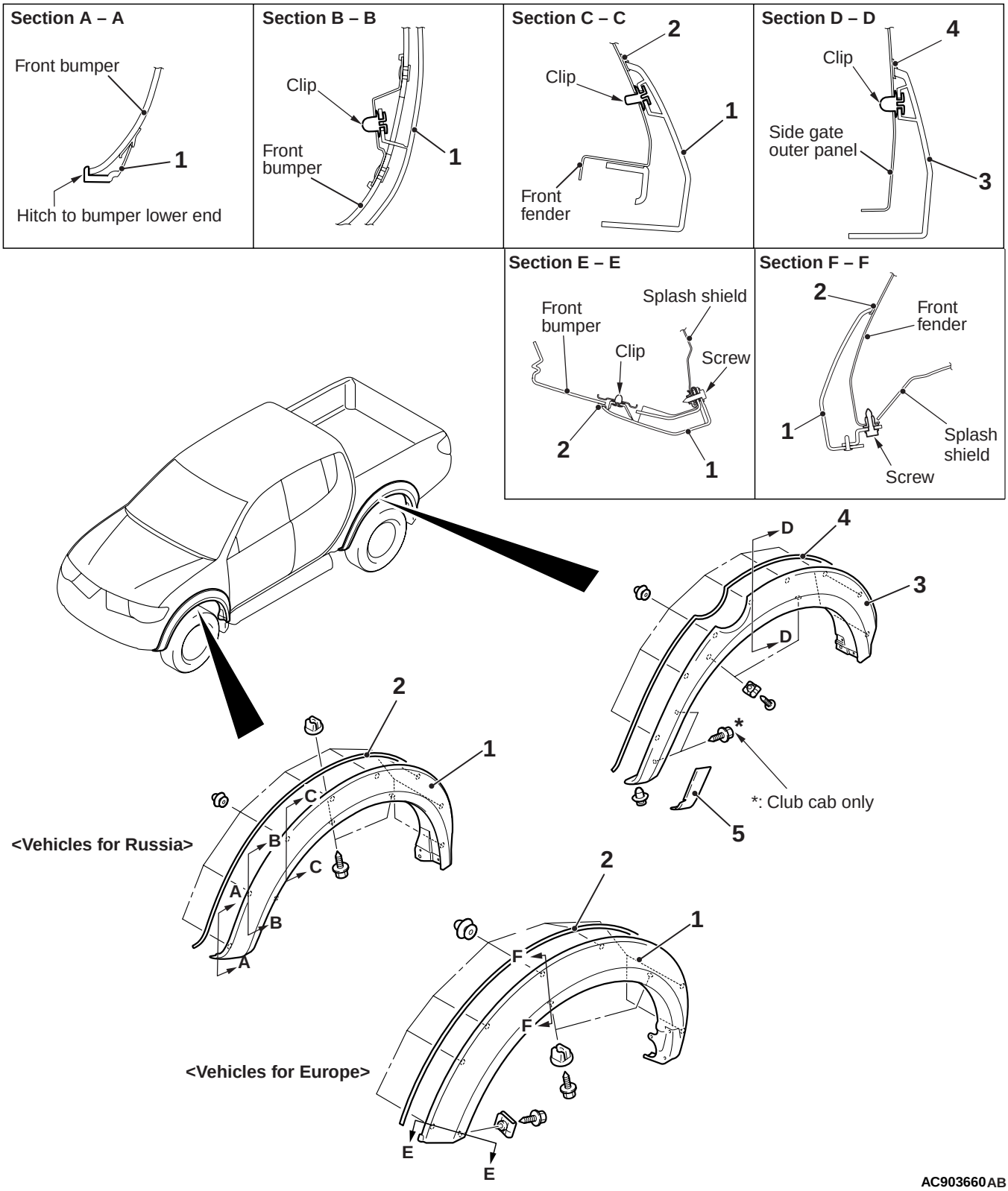
M1511000400140

Item		Specified lubricant	Quantity
Degrease agent	Grease and dirt removal from parts surface	Parts cleaner (MZ100387 or equivalent)	As required

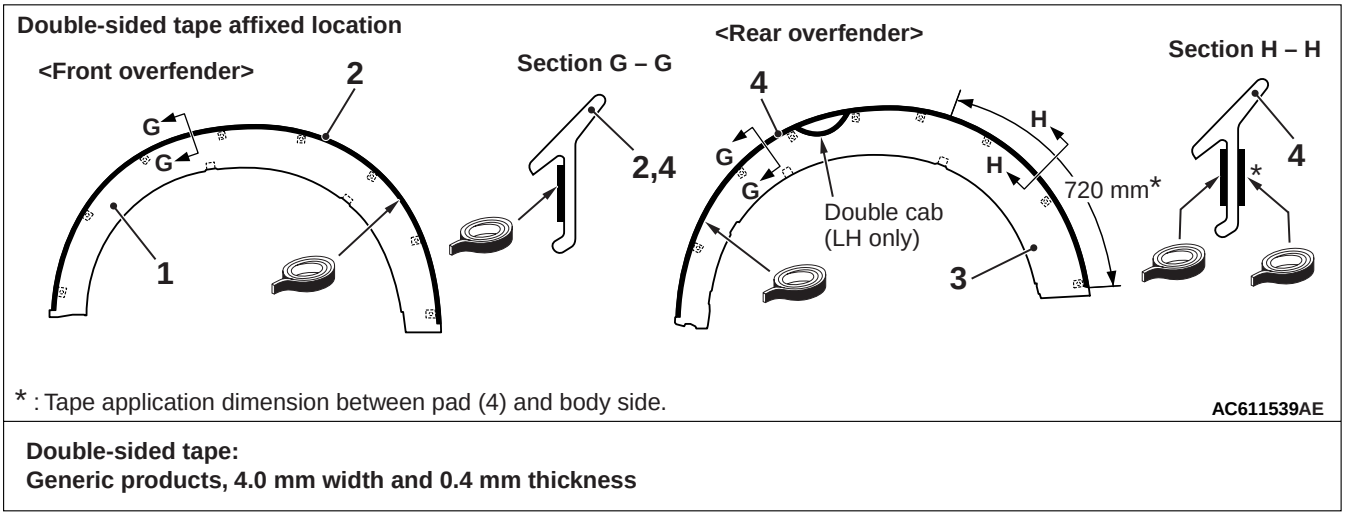
OVERFENDER

REMOVAL AND INSTALLATION

M1511024700543



AC903660 AB



Front overfender removal steps

<<**A**>> 1. Front overfender

>>**A**<< 2. Front overfender pad

Rear overfender removal steps

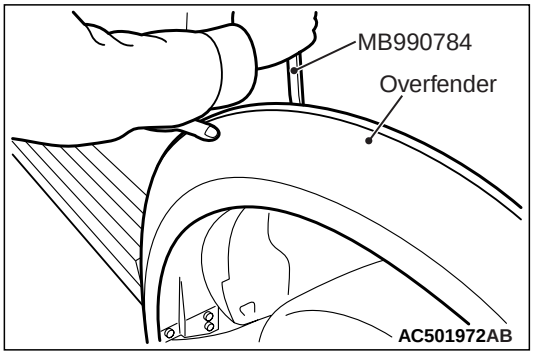
<<**A**>> 3. Rear overfender

>>**A**<< 4. Rear overfender pad

>>**B**<< 5. Protector film <Vehicles without side step>

REMOVAL SERVICE POINT

<<A>> FRONT/REAR OVERFENDER REMOVAL



Use the special tool ornament remover (MB990784) to pry out the overfender.

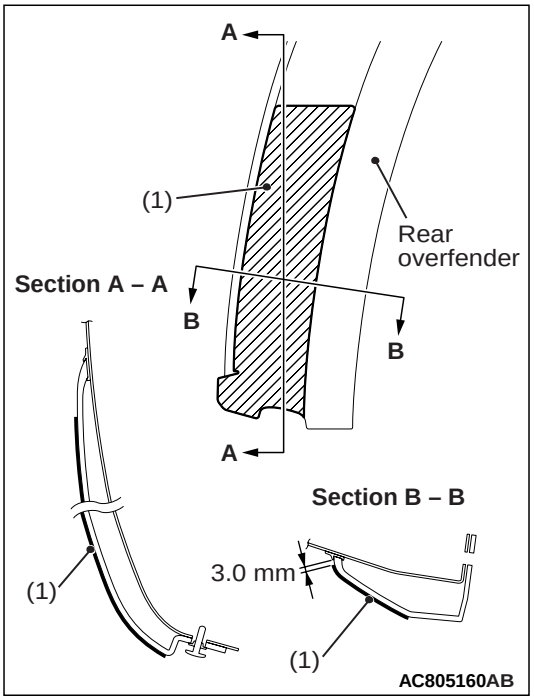
INSTALLATION SERVICE POINT

>>A<< FRONT/REAR OVERFENDER PAD INSTALLATION

1. Wipe the double-sided tape application surface on the front/rear overfender and clean it with a rag moistened with the parts cleaner (MZ100387 or equivalent).
2. Tear off the double-sided tape backing paper of the front/rear overfender pad.
3. Install the pad to the overfender.

   NOTE: If the double-sided tape is difficult to affix in cold temperature, etc., warm the bonding surfaces of the overfender to about 40 − 60°C before affixing the tape.
4. Firmly press in the pad to the overfender.

>>B<< PROTECTOR FILM INSTALLATION <VEHICLES WITHOUT SIDE STEP>



1. Installation position

⚠ CAUTION
- **The ambient temperature should be 20 to 38°C. Ensure that the working area is clean.**
- **If ambient temperature is less than 20°C, heat the protector film and application surface to a temperature of 20 to 30°C.**
- **Be careful that air bubbles are not formed under the protector film.**

2. Installation procedure

(1) Wipe the protector film (1) application surface and clean it with a rag moistened with the parts cleaner (MZ100387 or equivalent).
(2) Remove backing paper from the protector film (1), and apply it to the specified position.

MOULDINGS

ADHESIVE

M1511000501377

Application	Specified adhesive
Clip B for roof drip moulding	Double-sided tape: Generic products, 10 mm width and 30 mm length
Door and rear pillar protect mouldings	Double-sided tape: Generic products

LUBRICANT

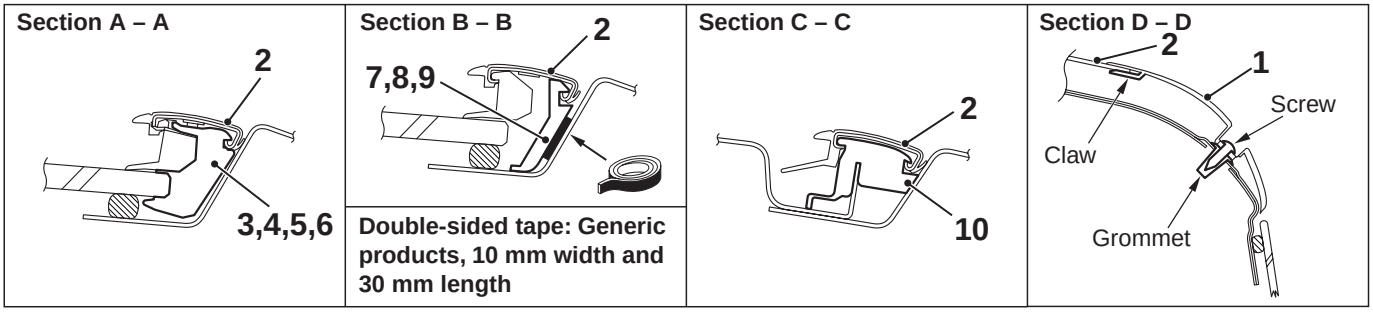
M1511000400140

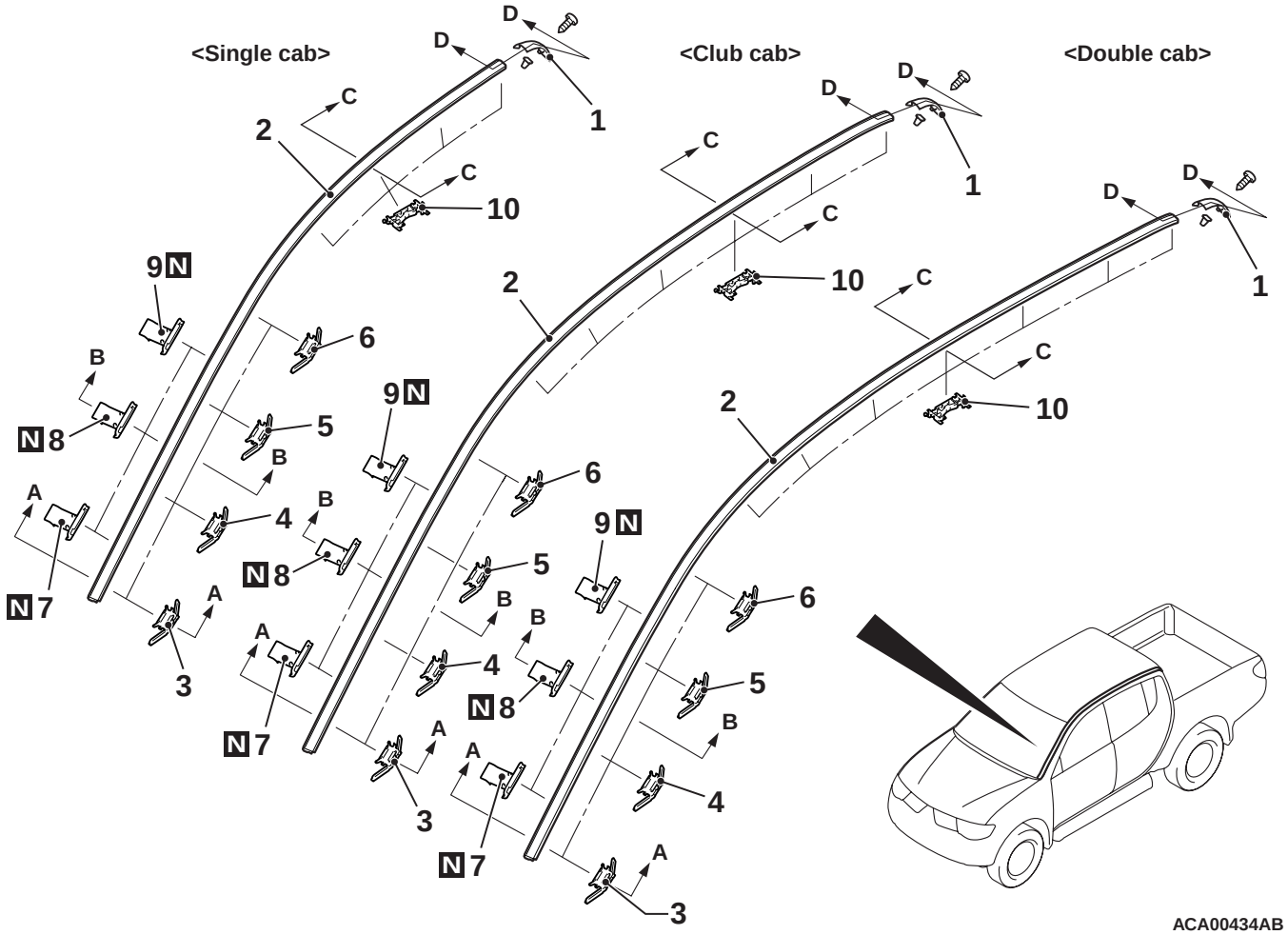
Item		Specified lubricant	Quantity
Degrease agent	Grease and dirt removal from parts surface	Parts cleaner (MZ100387 or equivalent)	As required

MOULDINGS

ROOF DRIP MOULDING REMOVAL AND INSTALLATION

M1511004701771





ACA00434AB

Roof drip moulding removal steps

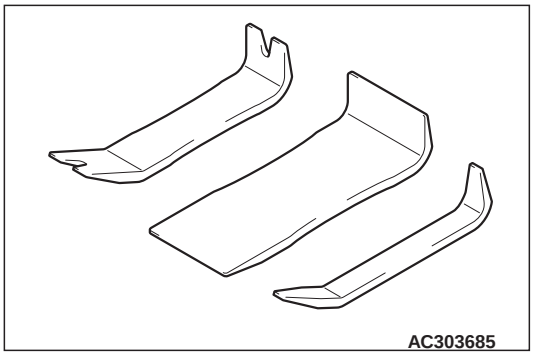
1. Rear end cover
<<**A**>> >>**A**<< 2. Roof drip moulding
3. Clip A (Yellow)
4. Clip A (Green)
5. Clip A (Dark blue)

Roof drip moulding removal steps

6. Clip A (Red)
7. Clip B (Material colour)
8. Clip B (Light grey)
9. Clip B (Yellow)
10. Clip C

REMOVAL SERVICE POINT

<<A>> ROOF DRIP MOULDING REMOVAL



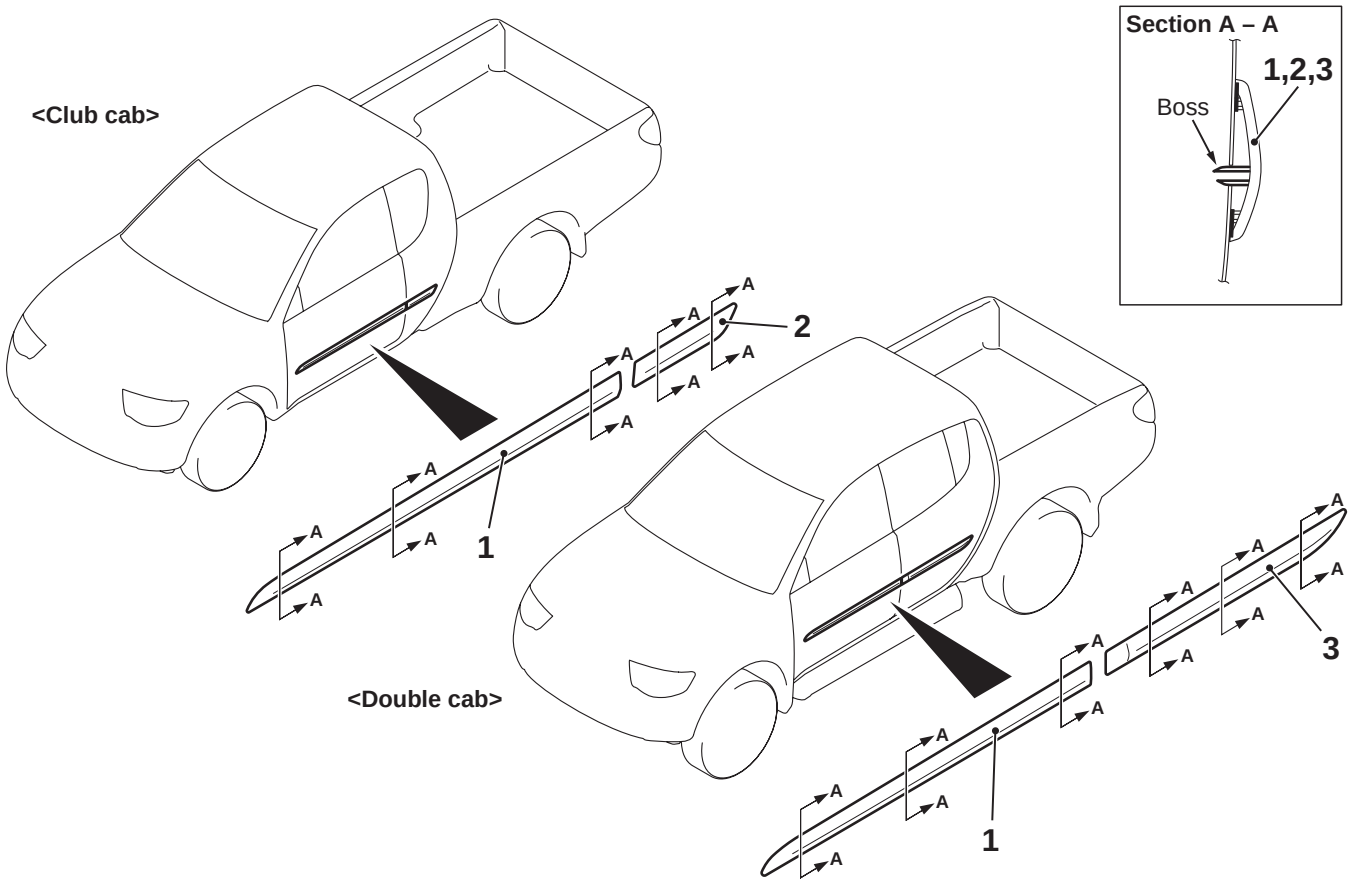
NOTE: Use a commercial ornament remover (resin-made) as shown to pry out the roof drip moulding.

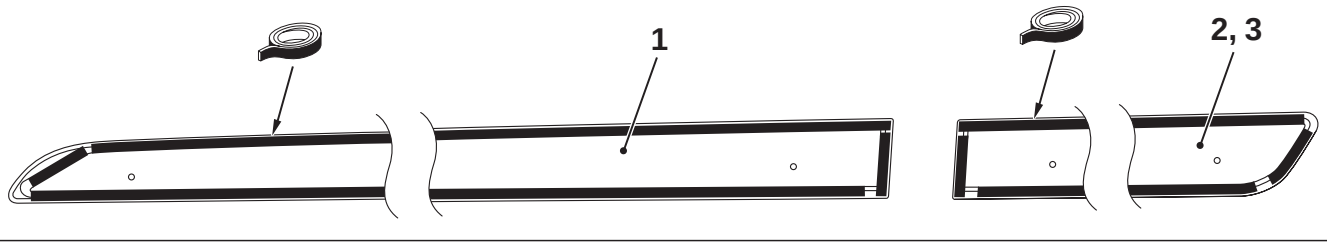
INSTALLATION SERVICE POINT

>>A<< ROOF DRIP MOULDING INSTALLATION

Install the clips to the roof drip moulding before installing the moulding to the vehicle body.

DOOR PROTECT MOULDING REMOVAL AND INSTALLATION



Double-sided tape affixed location	
	
Double-sided tape: Generic products	

AC509721AB

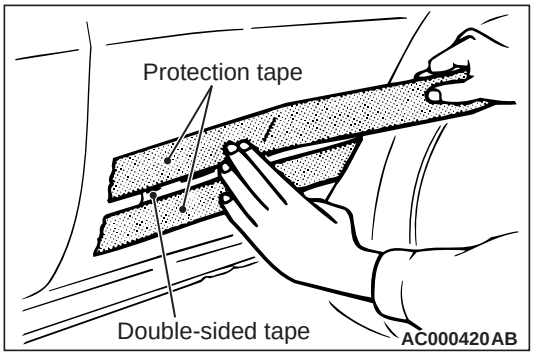
Door protect moulding removal steps

<<**A**>> >>**A**<< 1. Front door protect moulding
<<**A**>> >>**A**<< 2. Rear pillar protect moulding
<<**A**>> >>**A**<< 3. Rear door protect moulding

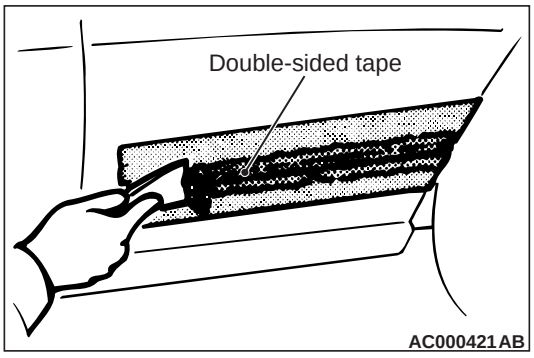
REMOVAL SERVICE POINT

<<A>> DOOR AND REAR PILLAR PROTECT MOULDINGS REMOVAL

Gently lift and remove the moulding. If there is any double-sided tape remaining on the moulding, remove it according to the following instructions.
<Remove double-sided tape remaining on the body surface>

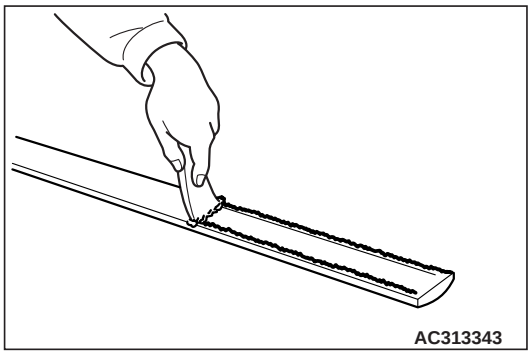


1. Attach protection tape all the way along the edges of the double-sided tape which is still adhering to the body.



2. Use a resin spatula to scrape off the double-sided tape.
3. Peel off the protection tape.
4. Wipe the body surface and clean it with a rag moistened with the parts cleaner (MZ100387 or equivalent).

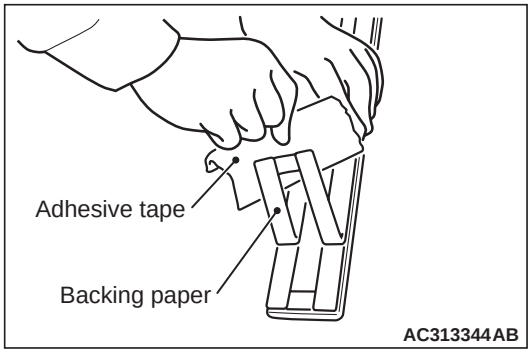
<Remove double-sided tape remaining on the moulding and adhere double-sided tape (when re-using a moulding)>



1. Scrape off the double-sided tape on the moulding with a resin spatula as possible.
2. Wipe the door moulding surface and clean it with a rag moistened with the parts cleaner (MZ100387 or equivalent).
3. Remove only a small portion of the residual adhesive.
4. Adhere the double-sided tape as specified on the moulding.

INSTALLATION SERVICE POINT

>>A<< DOOR AND REAR PILLAR PROTECT MOULDINGS INSTALLATION

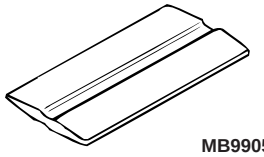


1. Tear off the double-sided tape backing paper.
   NOTE: If attach the adhesive tape to the edge of the backing paper, it will be easy to tear off.
2. Install the clips to the moulding before installing it to the vehicle body.
3. Install the mouldings.
   NOTE: If the double-sided tape is difficult to affix in cold temperature, etc., warm the bonding surfaces of the body and moulding to about 40 – 60 ℃ before affixing the tape.
4. Firmly press in the moulding onto the respective body surface.

DOOR SASH TAPE <VEHICLES WITH WIDE FENDER>

SPECIAL TOOL

M1511000601664

Tool	Number	Name	Use
 MB990528	MB990528	Stripe tape spatula	Installation of door sash tape

LUBRICANT

M1511000400140

Item		Specified lubricant	Quantity
Degrease agent	Grease and dirt removal from parts surface	Parts cleaner (MZ100387 or equivalent)	As required

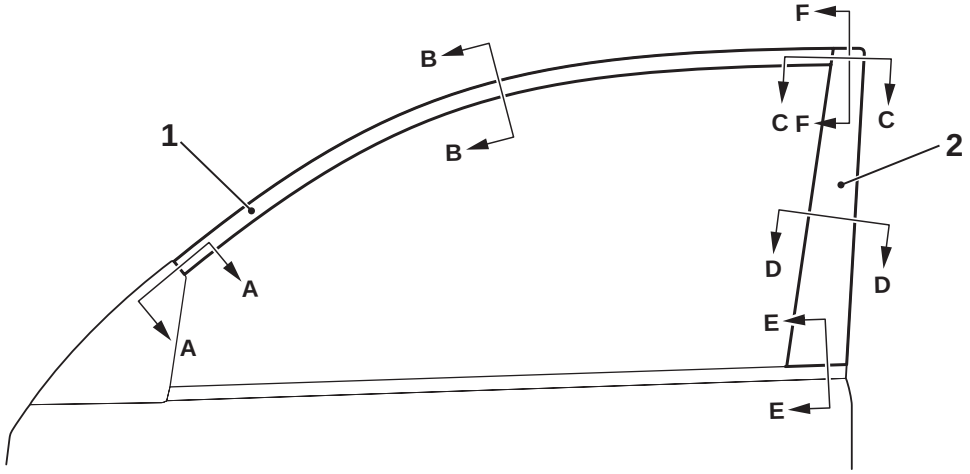
DOOR SASH TAPE

REMOVAL AND INSTALLATION

M1511024101016

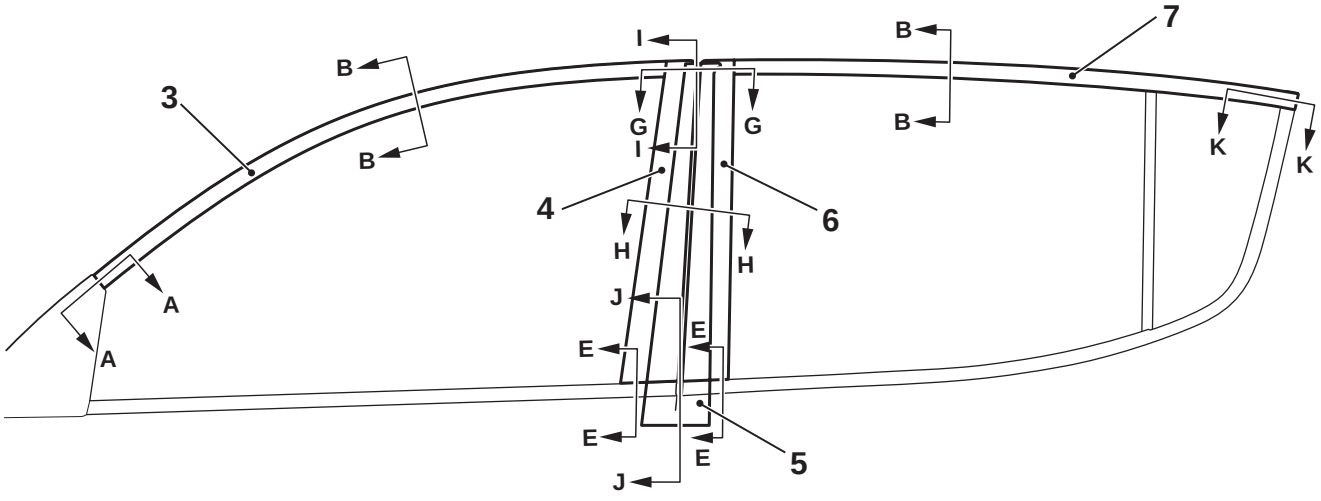
Pre-removal and Post-installation Operation
- Front Door Sash Trim Removal and Installation (Refer to GROUP 52A, Door Trim for Club Cab and for Double Cab)
- Door Opening Weatherstrip Outer Removal and Installation (Refer to GROUP 42, Window Glass Runchannel and Door Opening Weatherstrip .)
- Door Window Glass Runchannel Removal and Installation (Refer to GROUP 42, Window Glass Runchannel and Door Opening Weatherstrip .)
- Door Beltline Moulding Removal and Installation (Refer to GROUP 42, Window Glass Runchannel and Door Opening Weatherstrip .)
- Outside Mirror Removal and Installation (Refer to P.51-106.)

<Club cab>



AC500616AB

<Double cab>



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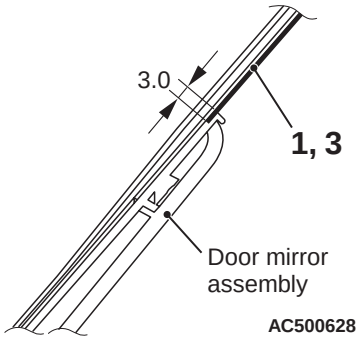
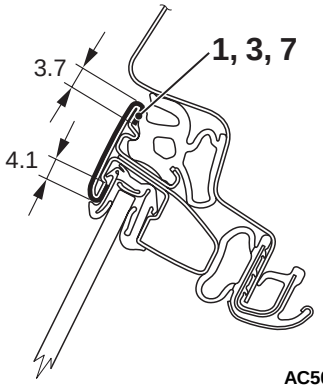
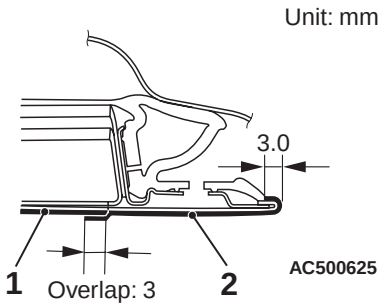
Section A – A



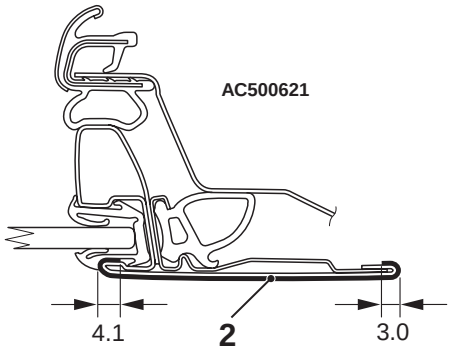
Section B – B



Section C – C



Section D – D



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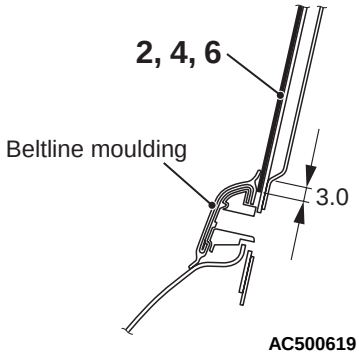

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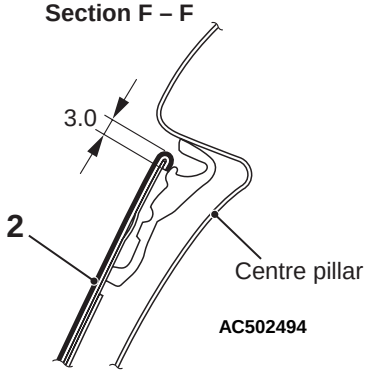
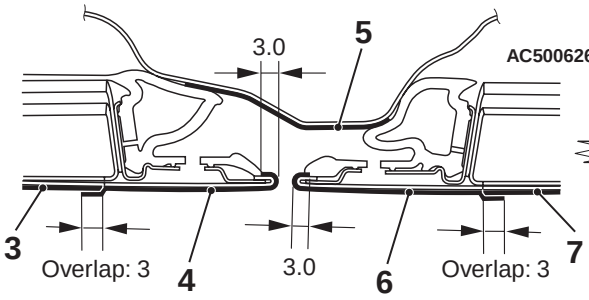
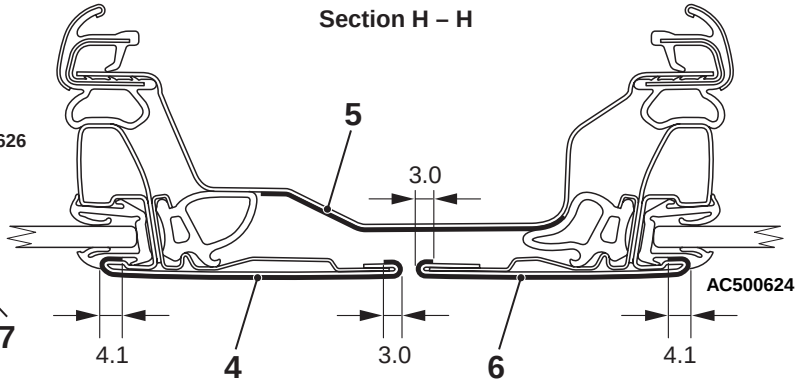


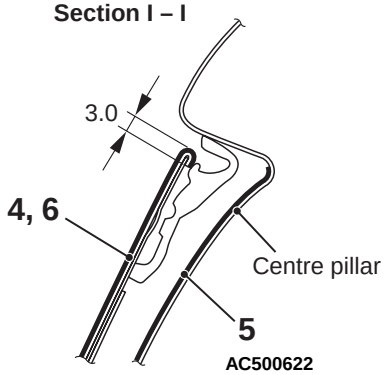
Section G – G



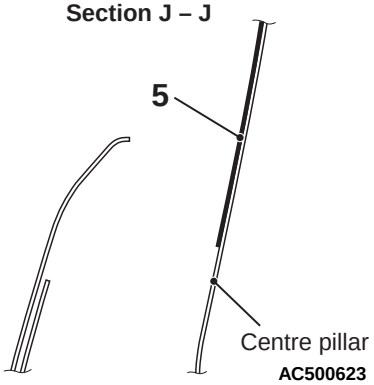
Section H – H



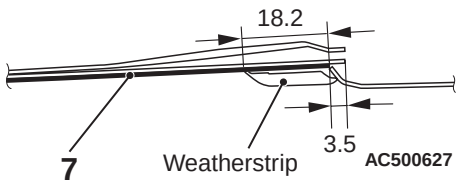
Section I – I



Section J – J



Section K – K



AC502531AB

Removal steps <Club cab>

<<**A**>> >>**A**<< 1. Door sash tape front
<<**A**>> >>**A**<< 2. Door sash tape rear

Removal steps <Double cab>

<<**A**>> >>**A**<< 3. Door sash tape front
<<**A**>> >>**A**<< 4. Door sash tape rear
<<**A**>> >>**A**<< 5. Centre pillar tape

Removal steps <Double cab>

<<**A**>> >>**A**<< 6. Rear door sash tape front
<<**A**>> >>**A**<< 7. Rear door sash tape rear

REMOVAL SERVICE POINT

<<A>> DOOR SASH TAPES/CENTRE PILLAR TAPE REMOVAL

⚠ **CAUTION**

Pay attention to keep from getting burned by hot door panel or tapes.

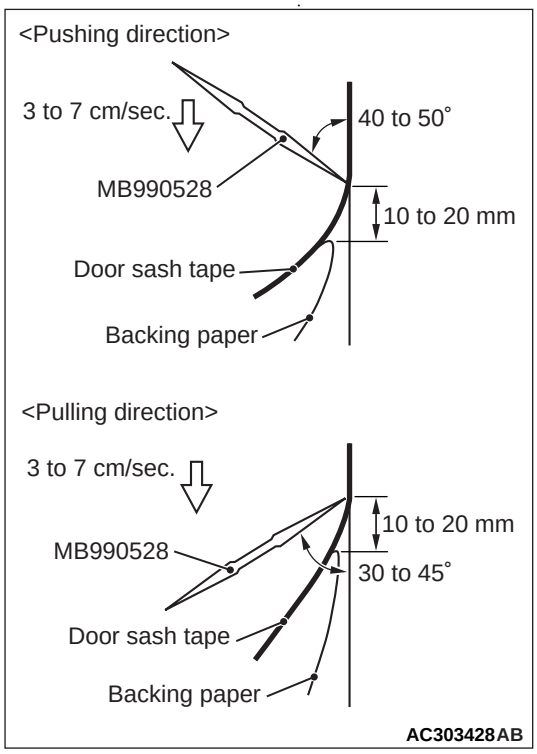
1. Use a hair drier to warm the tape.
2. Peel the tip of the tape with your finger, and then peel off the tape parallel to the application surface.

INSTALLATION SERVICE POINT

>>A<< DOOR SASH TAPES/CENTRE PILLAR TAPE INSTALLATION

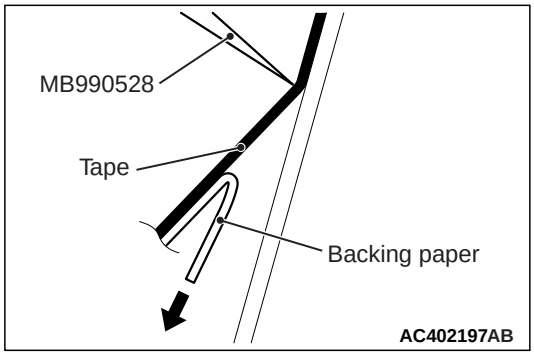
⚠ CAUTION

- **The ambient temperature should be 20 - 30°C. Ensure that the working area is clean. Tape application should be done at ambient temperature of 25°C.**
- **If ambient temperature is less than 15°C, heat the tape and application surface to a temperature of 20 - 30°C. If ambient temperature is 35°C or higher, cool down.**
- **The adhesive property of the tape is deteriorated at low temperature, so tape may come adrift easily. Meanwhile, it gets softened at hot temperature.**
- **When beginning to apply the tape, pay particular attention. If the end of the tape cannot be applied to the specified position with an accuracy of less than 1 mm, it may cause the poor appearance or adhesion.**

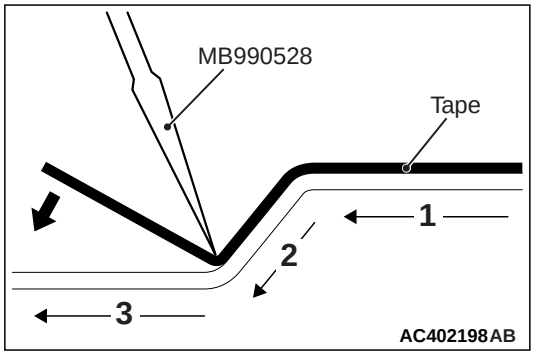


Use the special tool stripe tape spatula (MB990528) to apply the tape with a steady pace and pressure. If you do not apply the tape with a steady pace or pressure, or abort the application, a shallow groove (lateral groove called as "Shock line") may be present on the tape surface. Meanwhile, if you apply it too quickly, air bubbles may be formed under the tape.

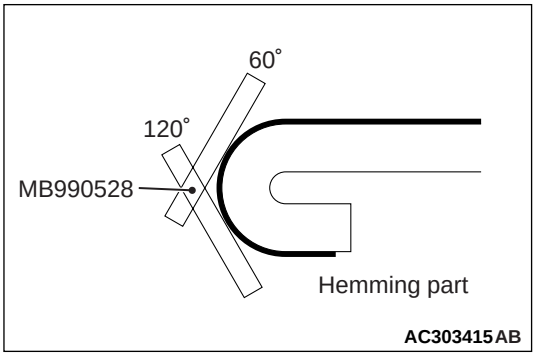
1. Wrap a soft cloth (synthetic fibre) around the tip of the special tool(MB990528).
2. Use the parts cleaner (MZ100387 or equivalent) to degrease the tape application surface.
3. Wipe away dirt from the tape.
4. Apply the door sash and centre pillar tapes according to the procedures below.



(1) Peel off the backing paper of the tape.
(2) Apply the tape and press it by using the special tool.



(3) Press the tape at the stepped part of the panel in the following procedure.
   1. Apply the tape onto the top plain part.
   2. Next, apply onto the stepped part.
   3. Finally, apply onto the bottom plain part.

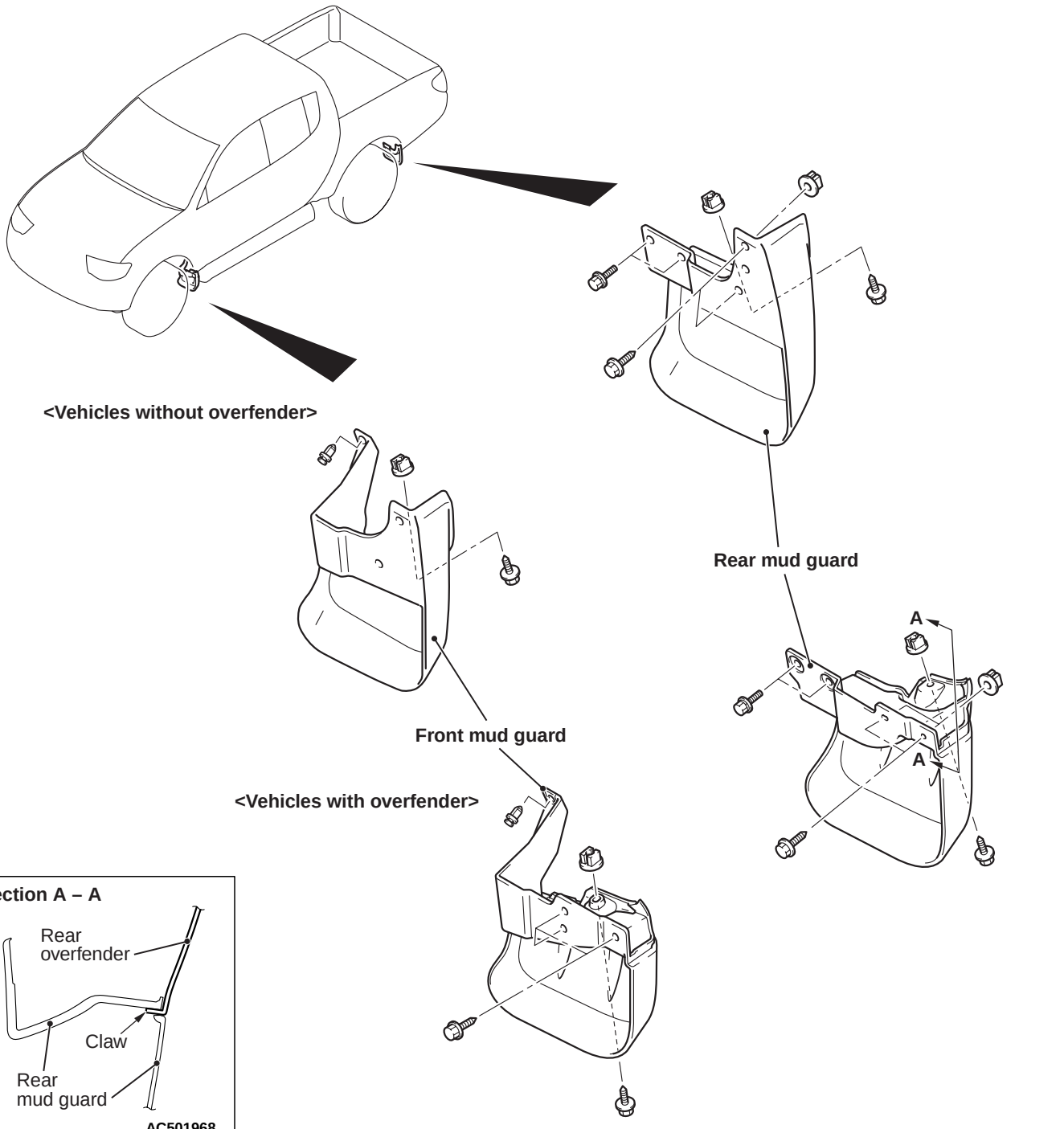


(4) Press the tape at the panel folded areas (hemming part) at 3 steps (60°, 120° and holding), while rolling it toward the vehicle inside.

MUD GUARD

REMOVAL AND INSTALLATION

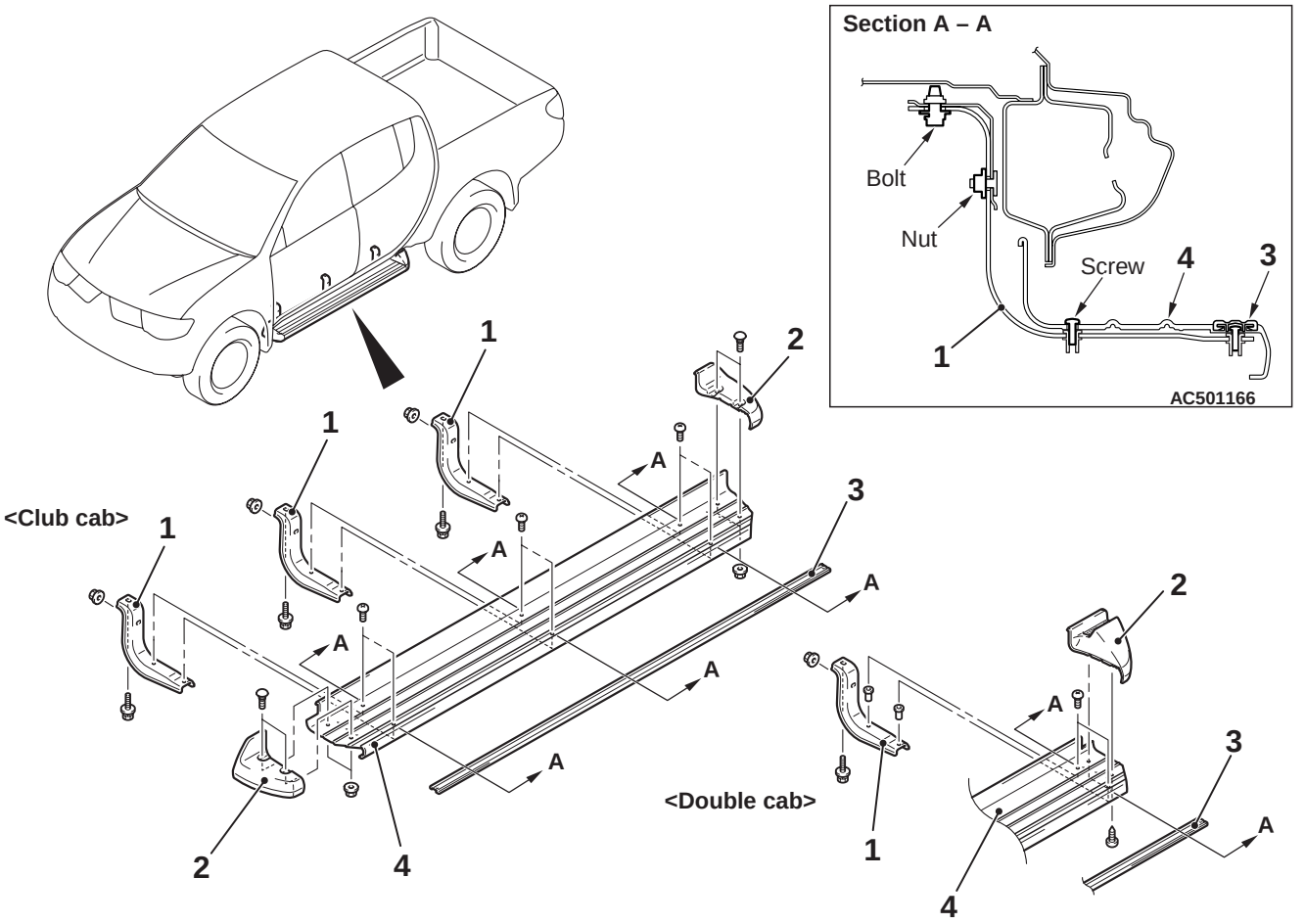
M1511011200430



SIDE STEP

REMOVAL AND INSTALLATION

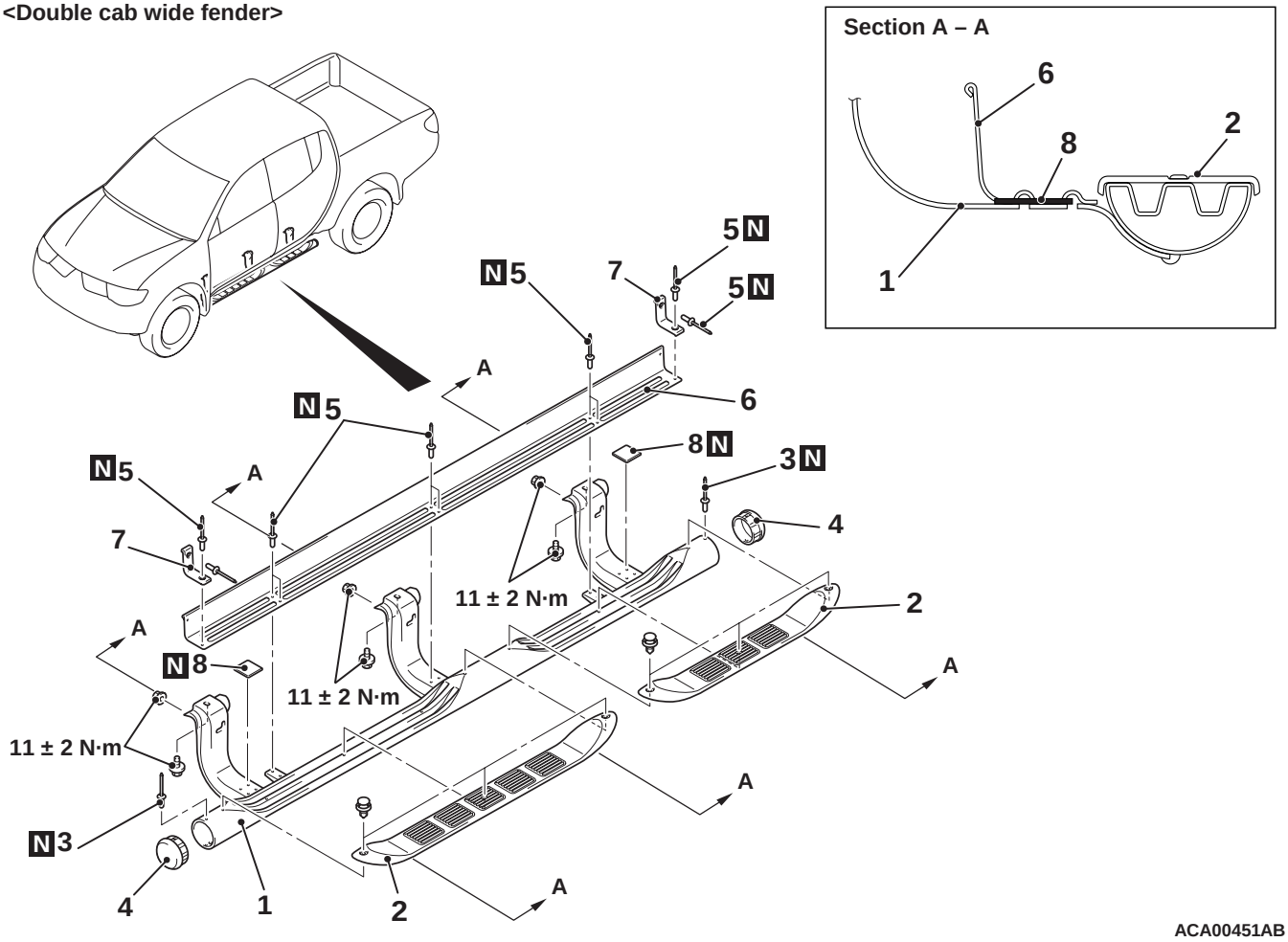
M1511011500378



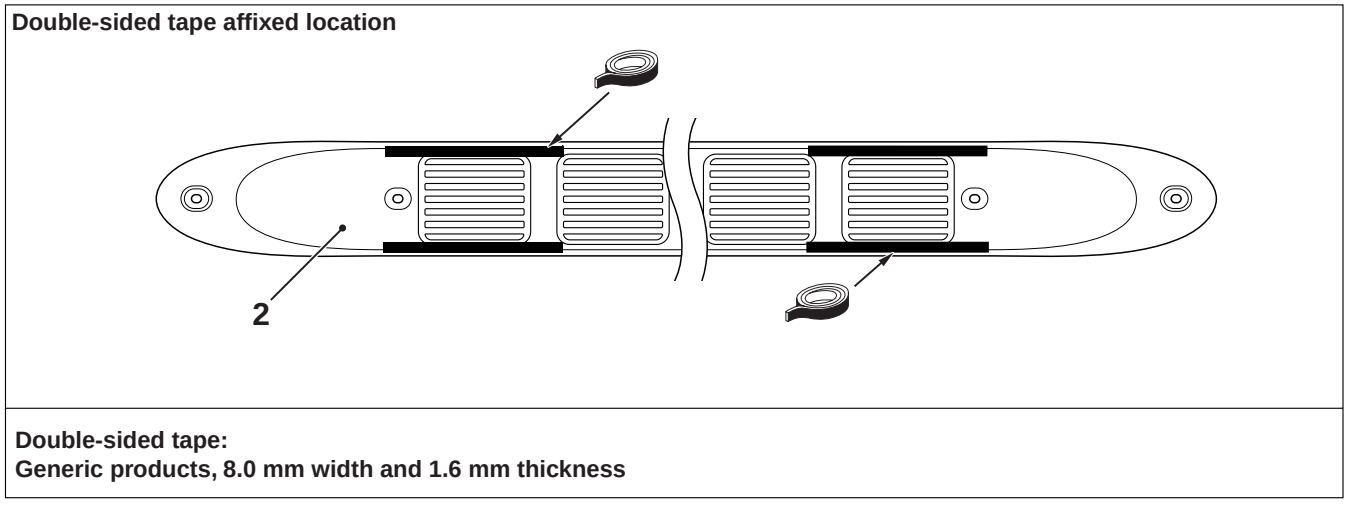
Removal steps
1. Step stay
2. Side step garnish

Removal steps (Continued)
3. Side step cover
4. Side step plate

<Double cab wide fender>



ACA00451AB



Double-sided tape:
Generic products, 8.0 mm width and 1.6 mm thickness

AC808295 AB

Removal steps

1. Side step pipe
2. Side step cover A

<<A>> >>A<< 3. Rivets A

4. Side step cap

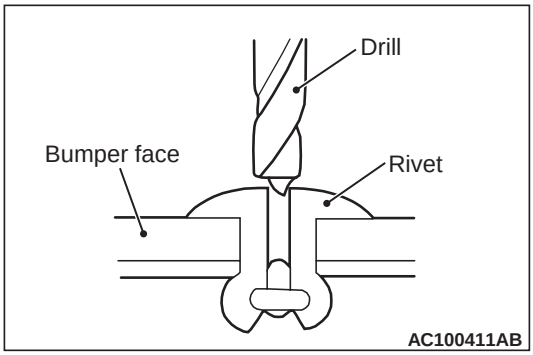
Removal steps (Continued)

<<A>> >>A<< 5. Rivets B

6. Side step plate
7. Side step cover B
8. Pad

DISASSEMBLY SERVICE POINT

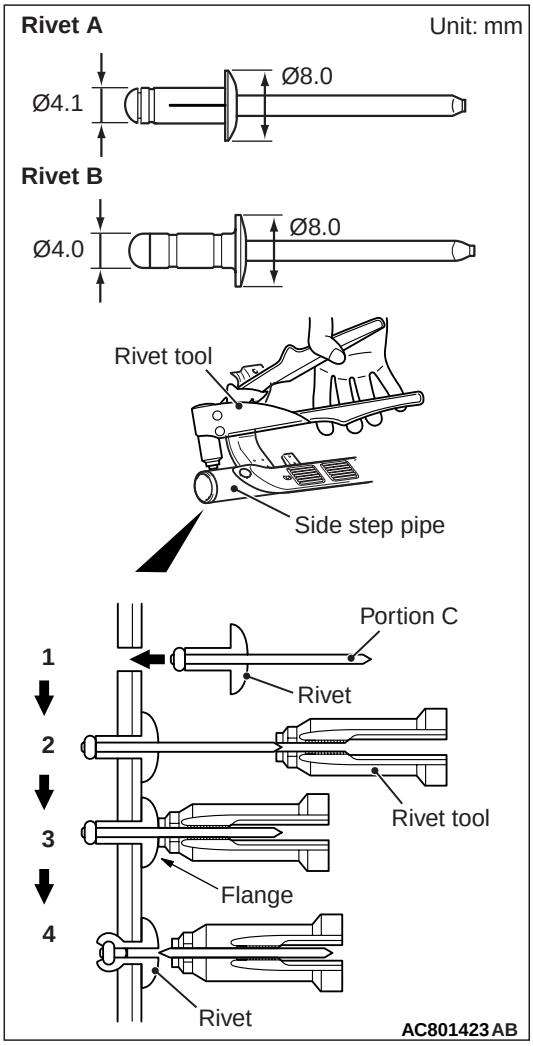
<<A>> RIVETS A/RIVETS B REMOVAL



Use a drill (ϕ 4.0 mm) to make a hole in the rivet A and rivet B to break it, and remove the rivet.

REASSEMBLY SERVICE POINT

>>A<< RIVETS A/RIVETS B INSTALLATION



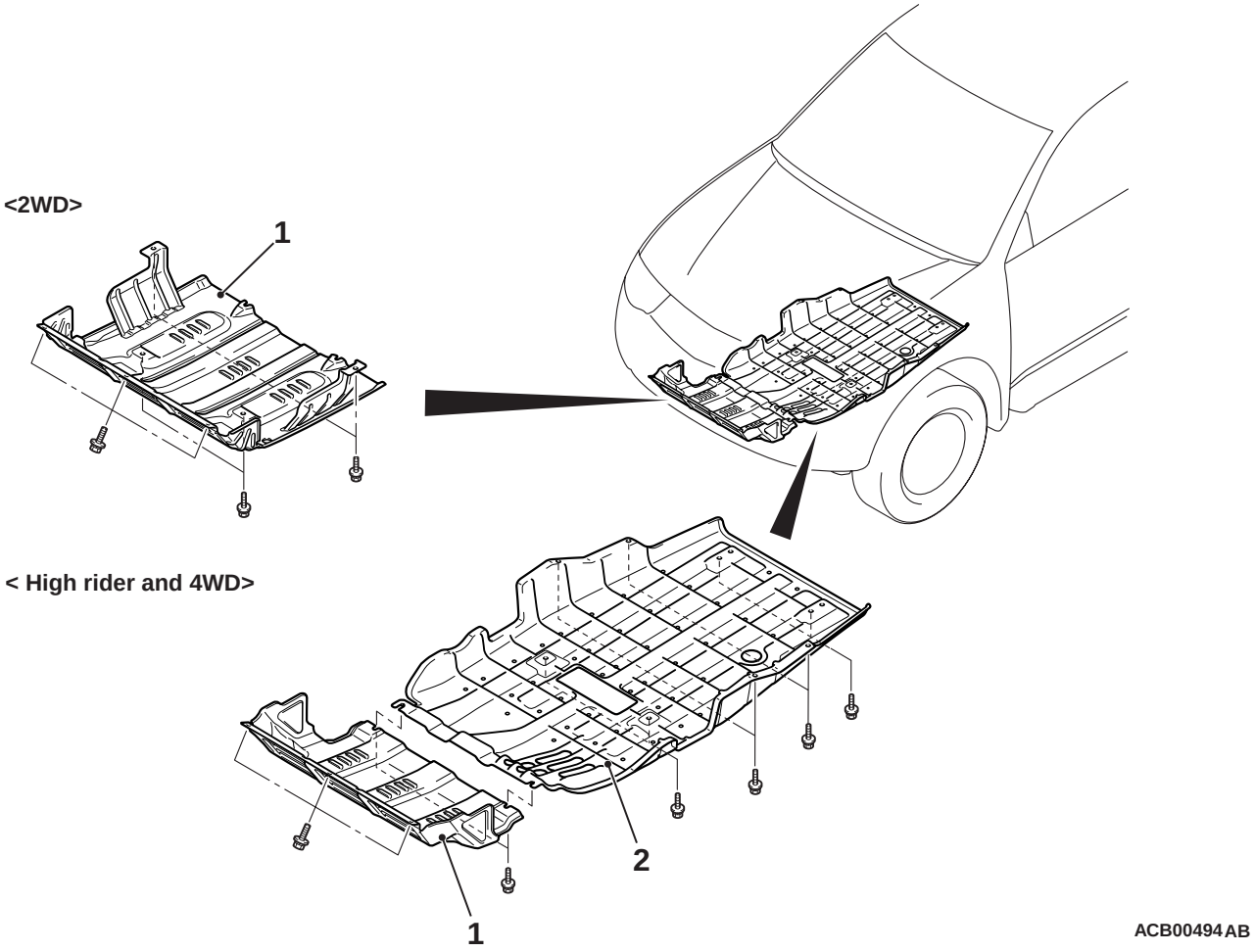
Use a rivet tool shown in the illustration to connect the parts with rivets by the following procedures.

1. Insert rivet A into the side step pipe and side step cap and rivet B into the side step pipe and side step plate.
2. Place the rivet tool over portion C of rivet.
3. While pushing the flange surface of the rivet onto parts to be fixed with the rivet tool, press the handle of the tool.
4. Thin part of portion C of the rivet will cut off and the rivet is fixed in position.

UNDER COVER

REMOVAL AND INSTALLATION

M1511019601231



Removal steps

1. Under skid plate
2. Engine room under cover front

WINDSHIELD WIPER AND WASHER

SERVICE SPECIFICATION

M1511000300778

Item	Standard value (reference)
Stop position of the windshield wiper arm/blade assembly (Distance between the edge of the wiper blade and the end of the deck garnish) mm	Driver's side: (31 ± 5) Passenger's side: (33 ± 5)

LUBRICANT

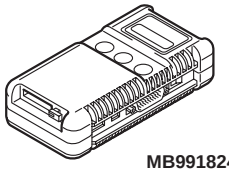
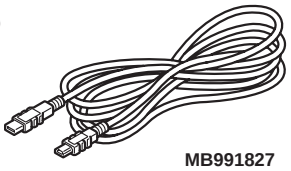
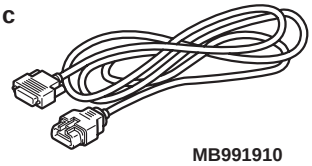
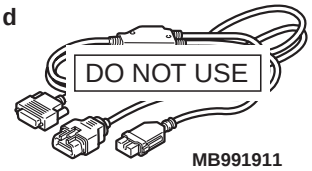
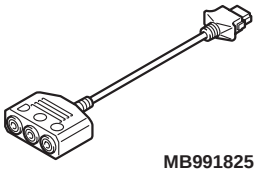
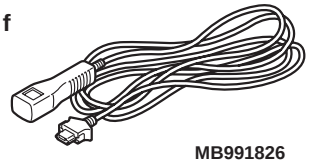
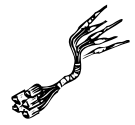
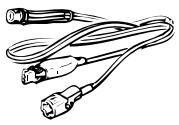
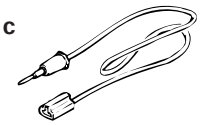
M1511000400043

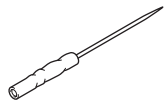
Item		Specified lubricant	Quantity
Wiper motor link rod	Contact joint between link rod and wiper motor link plate	Multipurpose grease SAE J310, NLGI No.2 or equivalent	As required

SPECIAL TOOLS

M1511000602764

Tool	Number	Name	Use
MB992326	MB992326	Adjustment tool, washer nozzle	Injection angle adjustment of the washer nozzle

Tool	Number	Name	Use
a  MB991824 b  MB991827 c  MB991910 d  MB991911 e  MB991825 f  MB991826 MB991955	MB991955 a: MB991824 b: MB991827 c: MB991910 d: MB991911 e: MB991825 f: MB991826	M.U.T.-III sub-assembly a: Vehicle Communication Interface (V.C.I.) b: M.U.T.-III USB cable c: M.U.T.-III main harness A (Vehicles with CAN communication system) d: M.U.T.-III main harness B (Vehicles without CAN communication system) e: M.U.T.-III measure adapter f: M.U.T.-III trigger harness	⚠ CAUTION **For vehicles with CAN communication, use M.U.T.-III main harness A to send simulated vehicle speed. If you connect M.U.T.-III main harness B instead, the CAN communication does not function correctly.** Checking windshield wiper intermittent time Lighting control sensor (rain sensor) adaptation
a  b  c  d DO NOT USE MB991223	MB991223 a: MB991219 b: MB991220 c: MB991221 d: MB991222	Harness set a: Check harness b: LED harness c: LED harness adapter d: Probe	Continuity check and voltage measurement at harness wire or connector a: For checking connector pin contact pressure b: For checking power supply circuit c: For checking power supply circuit d: For connecting a locally sourced tester

Tool	Number	Name	Use
 MB992006	MB992006	Extra fine probe	Continuity check and voltage measurement at harness wire or connector

TROUBLESHOOTING

DIAGNOSIS TROUBLESHOOTING FLOW

M1511014600404

Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – Contents of Trouble-shooting .

TROUBLE SYMPTOM CHART

M1511015001851

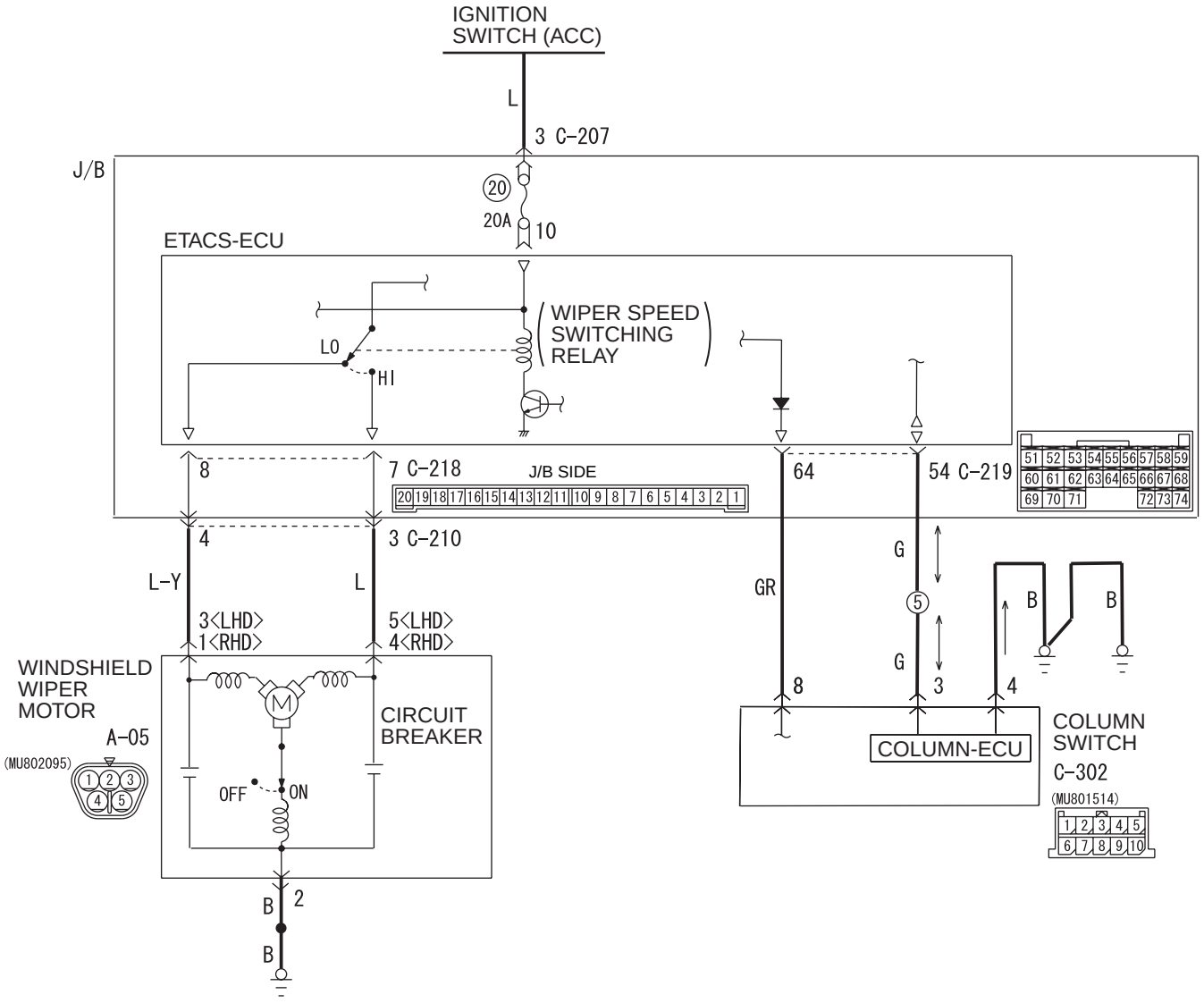
Symptom	Inspection procedure	Reference page
The windshield wipers do not work at all.	1	P.51-36
The windshield wipers do not work normally.	2	P.51-41
The windshield wipers do not stop at the specified park position.	3	P.51-48
The intermittent wiper interval cannot be adjusted by operating the windshield intermittent wiper volume control.	4	P.51-53
The intermittent wiper interval is not changed according to the vehicle speed.	5	P.51-54
The rain sensitive AUTO wiper function does not work at all <Vehicles with lighting control sensor>.	6	P.51-62
The rain sensitive AUTO wiper function works even though there is no rainfall <Vehicles with lighting control sensor>..	7	P.51-62
Sometimes the rain sensitive wiper function works even though there is no rainfall <Vehicles with lighting control sensor>.	8	P.51-62
The windshield washer does not work normally.	9	P.51-62

NOTE: Even when the ETACS-ECU has failed, the windshield wiper can work at low speed as fail-safe mode.

Inspection Procedure 1: The windshield wipers do not work at all.

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Windshield Wiper Power Supply Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

AC903741AB

COMMENTS ON TROUBLE SYMPTOM
The windshield wiper motor, the column switch or the ETACS-ECU may be defective.

PROBABLE CAUSES
- Malfunction of the windshield wiper motor
- Malfunction of the column switch
- Malfunction of the ETACS-ECU
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code.
When the ignition switch is turned to the "LOCK" (OFF) position, check that the ETACS-ECU does not set the diagnosis code.

Q: Is the diagnosis code set?
YES : Refer to GROUP 54A, ETACS Diagnosis Code Chart .
NO : Go to Step 2.

STEP 2. Check the power supply circuit.
When the ignition switch is turned to the LOCK (OFF) position, check if the hazard warning lamps illuminate.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Refer to GROUP 54A,ETACS Inspection Procedure A-1 "Check The Battery Power Supply Circuit to The ETACS-ECU ."

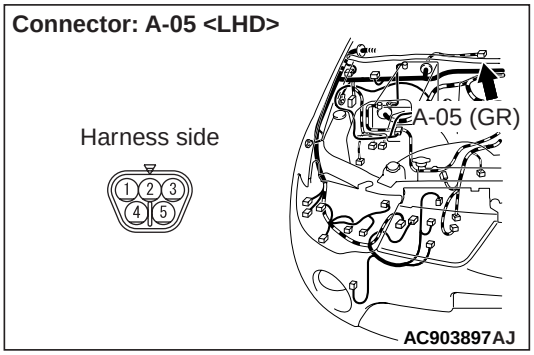
STEP 3. M.U.T.-III data list
Check the input signals below which are related to the windshield wiper.
- Turn the ignition switch to the "ACC" position.

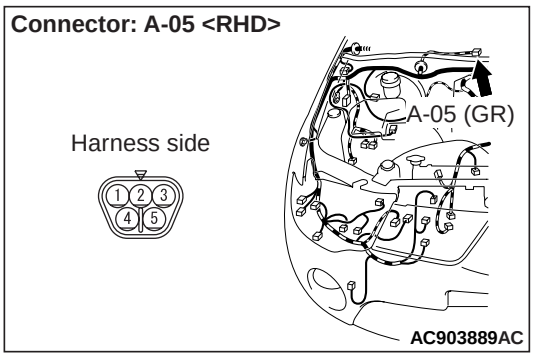
Item No.	Item name	Normal condition
29	Ignition switch(ACC)	ON

OK: Normal condition is displayed.

Q: Is the check result normal?
YES : Go to Step 4.
NO : Refer to GROUP 54A, ETACS Inspection Procedure C-2 "The Ignition Switch (ACC) signal is not received ."

STEP 4. Connector check: A-05 windshield wiper motor connector



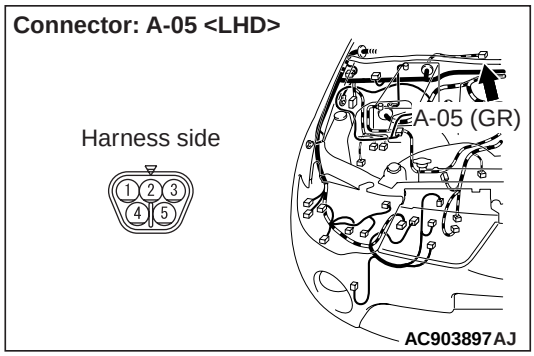


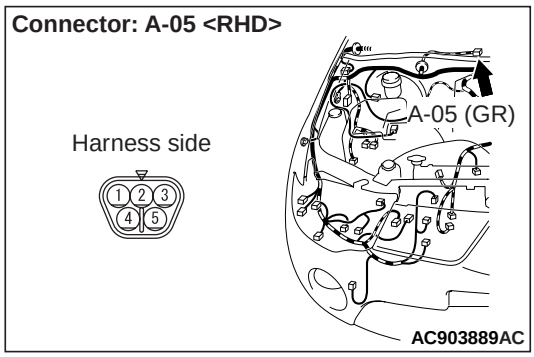
Q: Is the check result normal?
YES : Go to Step 5.
NO : Repair the connector.

STEP 5. Check the windshield wiper motor assembly.
Refer to P.51-71.

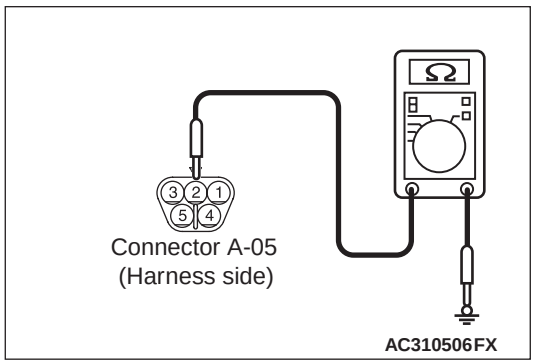
Q: Is the check result normal?
YES : Go to Step 6.
NO : Replace the windshield wiper motor assembly.

STEP 6. Resistance measurement at the A-05 windshield wiper motor connector.





(1) Disconnect the connector, and measure at the wiring harness side.

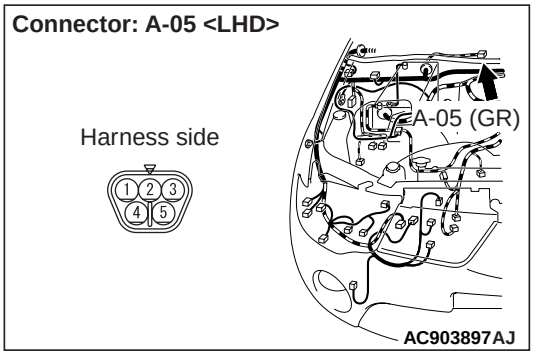


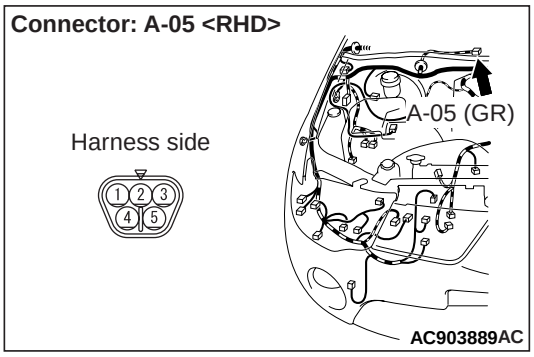
(2) Continuity between A-05 windshield wiper motor connector terminal No.2 and body earth

OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?
YES : Go to Step 8.
NO : Go to Step 7.

STEP 7. Check the wiring harness between A-05 windshield wiper motor connector terminal No.2 and body earth.





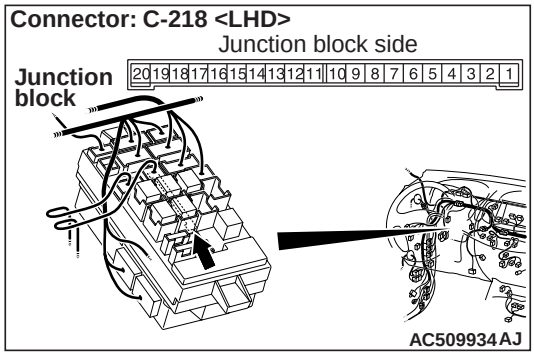
- Check the earth wires for open circuit.

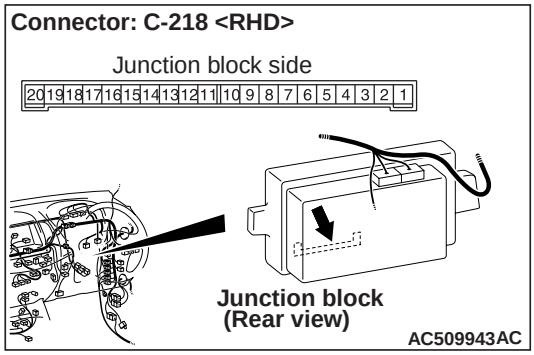
Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

NO : Repair the wiring harness and go to Step 8.

STEP 8. Connector check: C-218 ETACS-ECU connector



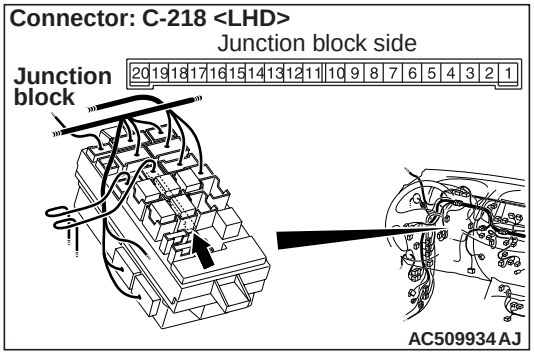


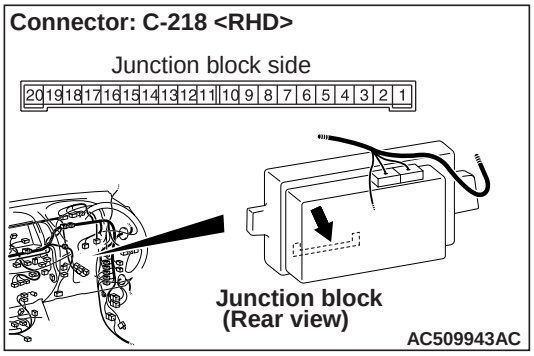
Q: Is the check result normal?

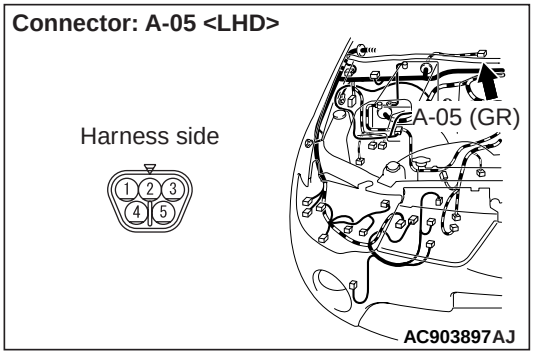
YES : Go to Step 9.

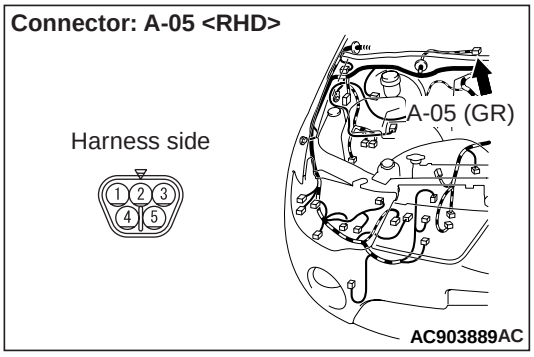
NO : Repair the defective connector.

STEP 9. Check the wiring harness between C-218 ETACS-ECU connector terminal Nos. 8,7 and A-05 windshield wiper motor connector terminal Nos. 3,5 <LHD> or 1,4 <RHD>.









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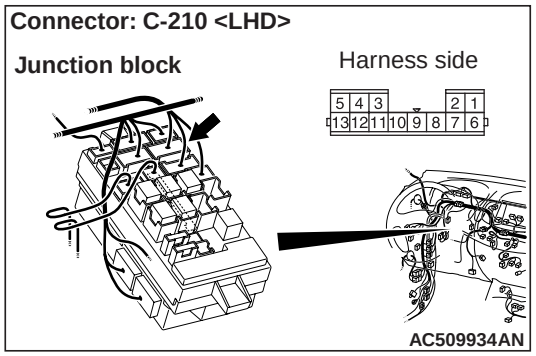
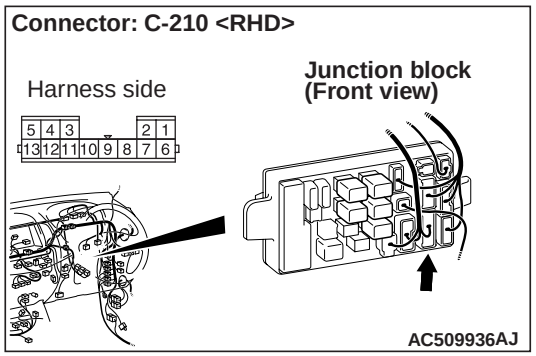


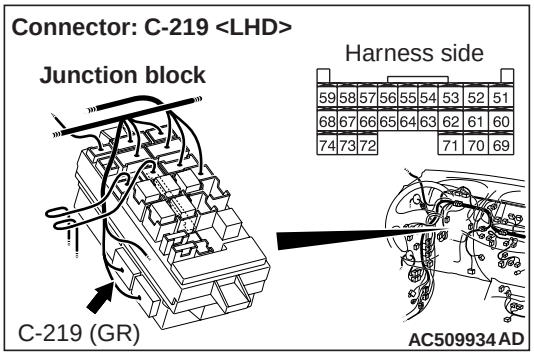


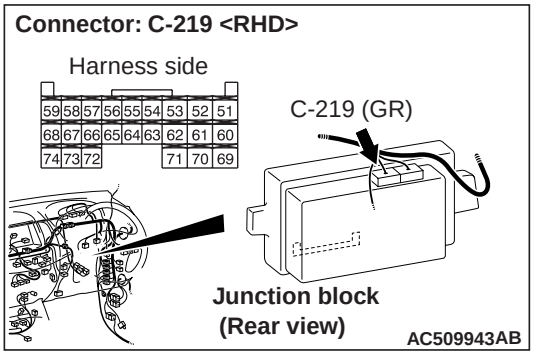
Prior to the wiring harness inspection, check the junction block connector C-210 and repair if necessary.

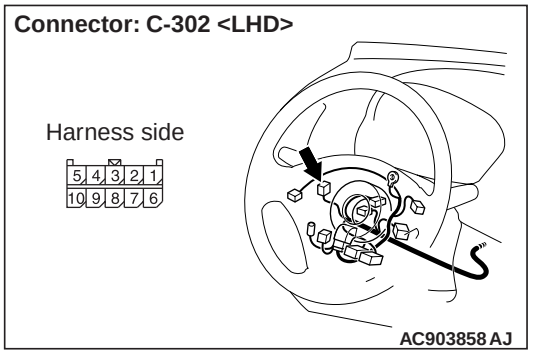
- Check the output lines for open circuit.

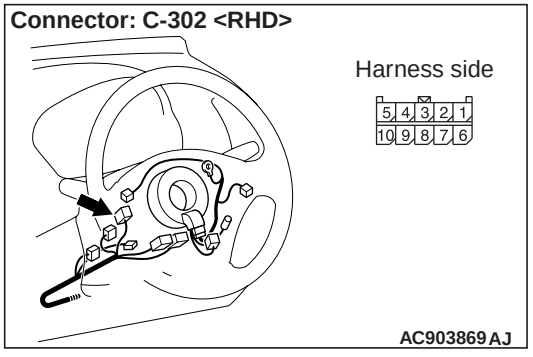
Q: Is the check result normal?
YES : Go to Step 10.
NO : Repair the wiring harness.

STEP 10. Connector check: C-219 ETACS-ECU connector, C-302 column switch connector



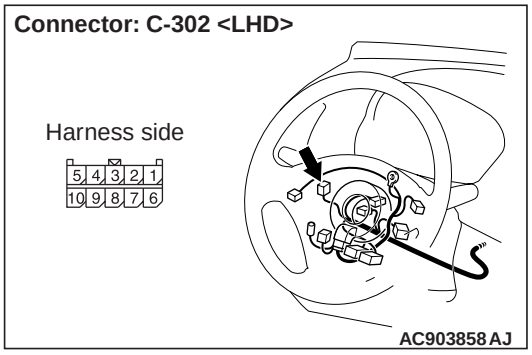


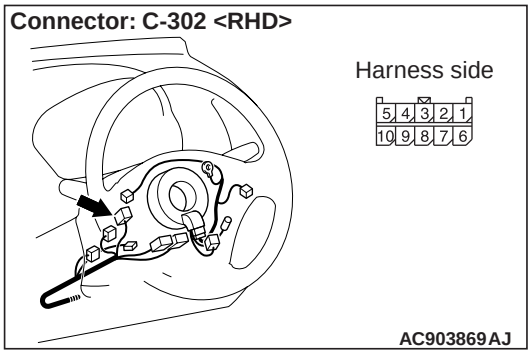


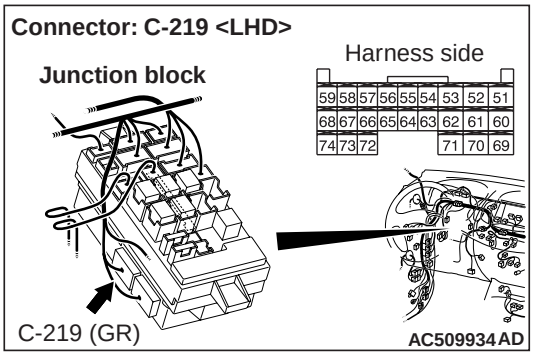


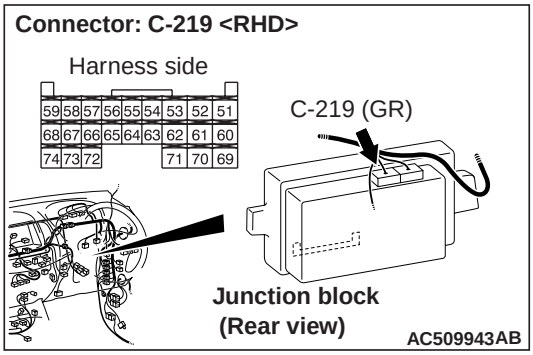
Q: Is the check result normal?
YES : Go to Step 11.
NO : Repair the connector.

STEP 11. Check the wiring harness between C-302 column switch connector terminal No.8 and C-219 ETACS-ECU connector terminal No.64.









- Check the wiper backup circuit.

Q: Is the check result normal?
YES : Go to Step 12.
NO : Repair the wiring harness.

STEP 12. Retest the system.
The windshield wiper should now work normally at all.

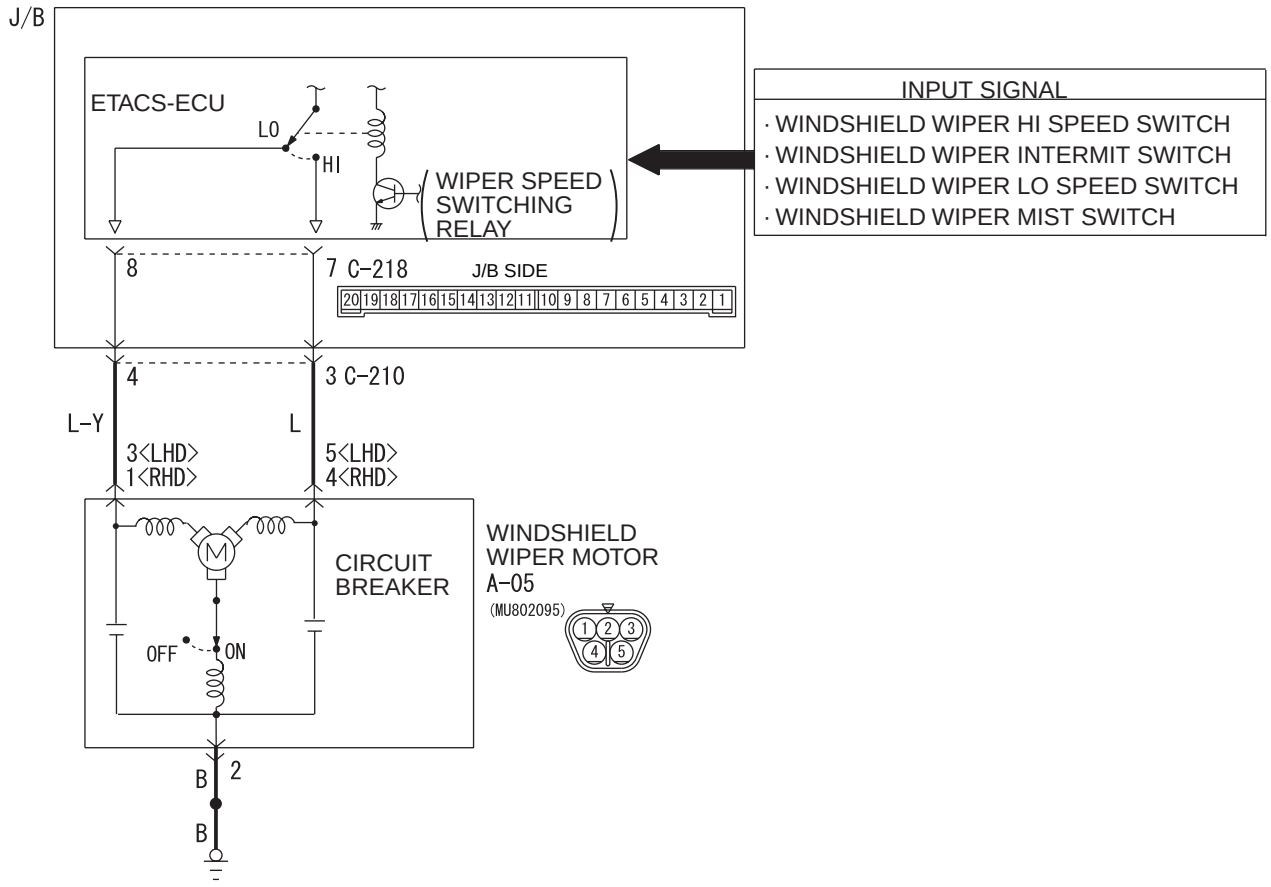
Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Replace the ETACS-ECU and register the ID codes.

Inspection Procedure 2: The Windshield Wipers do not Work Normally.

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Windshield Wiper Motor Drive Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

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COMMENTS ON TROUBLE SYMPTOM
The windshield wiper motor, the column switch or the ETACS-ECU may be defective.

PROBABLE CAUSES
- Malfunction of the windshield wiper motor
- Malfunction of the column switch
- Malfunction of the ETACS-ECU
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code.
When the ignition switch is turned to the "LOCK" (OFF) position, check that the ETACS-ECU does not set the diagnosis code.

Q: Is the diagnosis code set?
YES : Refer to GROUP 54A, Diagnosis Code Chart .
NO : Go to Step 2.

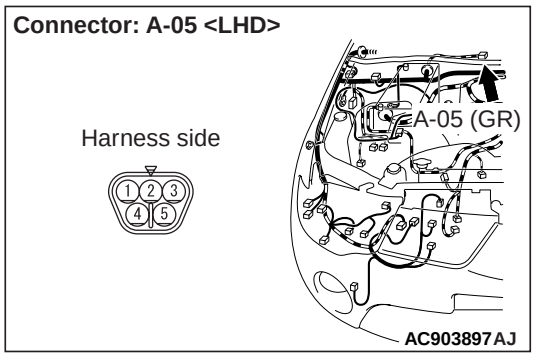
STEP 2. M.U.T.-III data list
Check the input signals below which are related to the windshield wiper.
(1) Turn the ignition switch to the "ON" position.
(2) Operate the windshield wiper switch.

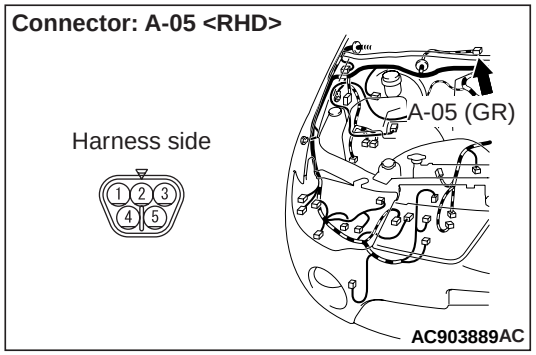
Item No.	Item name	Normal condition
65	Front wiper output	Turns ON when each switch is operated.
66	Front wiper HI output	

OK: Normal conditions are displayed for all the functions of the switch.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Refer to GROUP 54A, Inspection Procedure C-1 "The column switch (lighting and wiper switch) signal is not received ."

STEP 3. Connector check: A-05 windshield wiper motor connector





Q: Is the check result normal?
YES : Go to Step 4.
NO : Repair the defective connector.

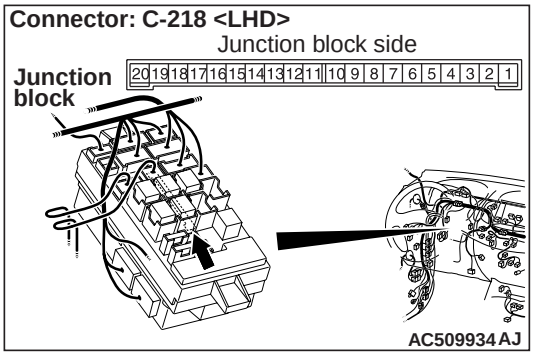
STEP 4. Check the windshield wiper motor assembly.
Refer to P.51-71.

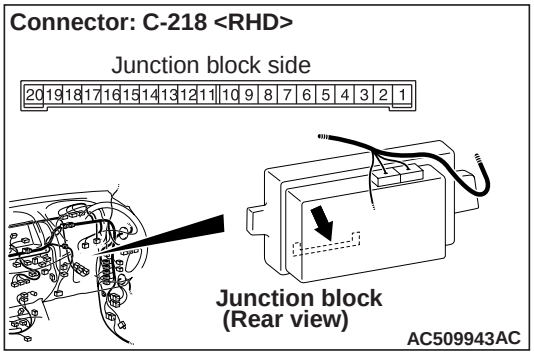
Q: Is the check result normal?
YES : Go to Step 5.
NO : Replace the windshield wiper motor assembly.

STEP 5. Retest the system.
Check that the windshield wipers work normally by moving the switch to HI or MIST position.

Q: Is the check result normal?
YES : Go to Step 6.
NO : Go to Step 10.

STEP 6. Connector check: C-218 ETACS-ECU connector

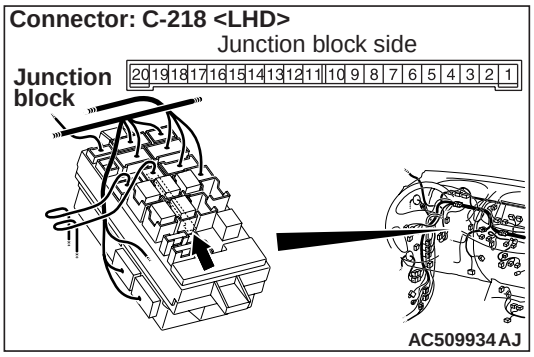


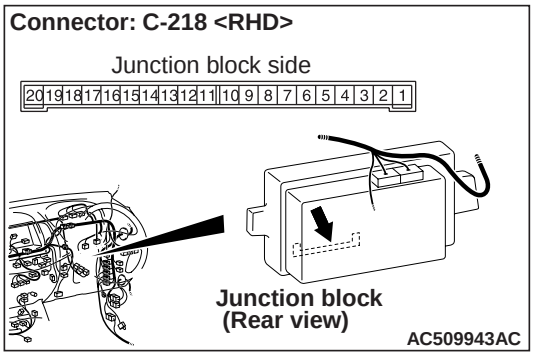


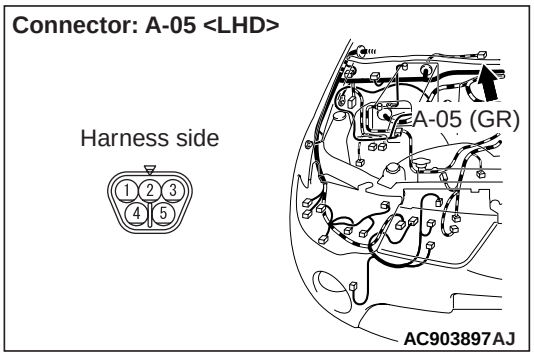
Q: Is the check result normal?

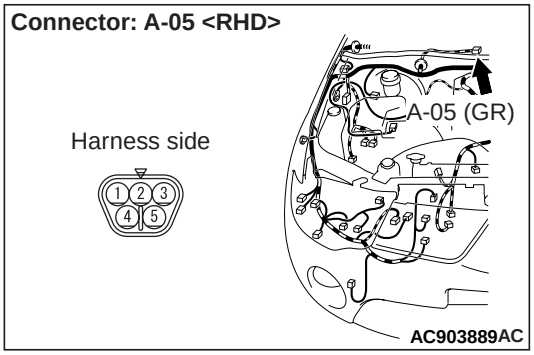
YES <LH drive vehicles> : Go to Step 7.
YES <RH drive vehicles> : Go to Step 8.
NO : Repair the defective connector.

STEP 7. Check the wiring harness between C-218 ETACS-ECU connector terminal No.8 and A-05 windshield wiper motor connector terminal No.3.









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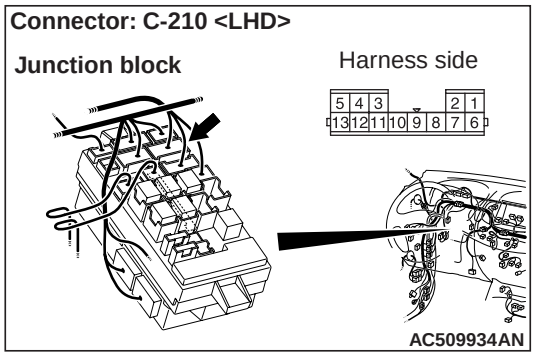
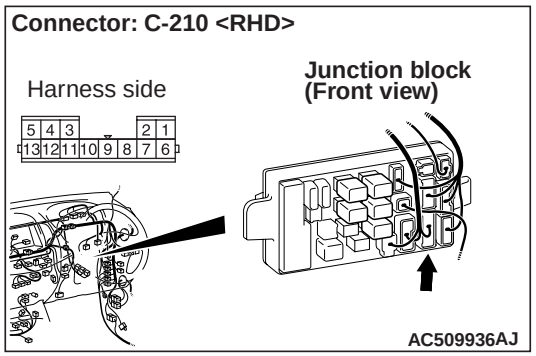


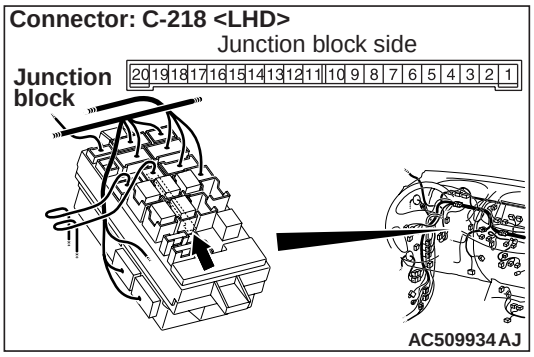


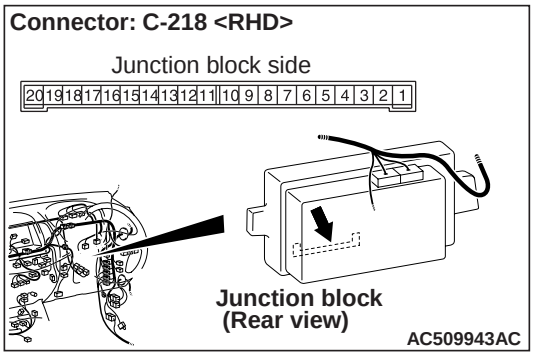
Prior to the wiring harness inspection, check the junction block connector C-210 and repair if necessary.

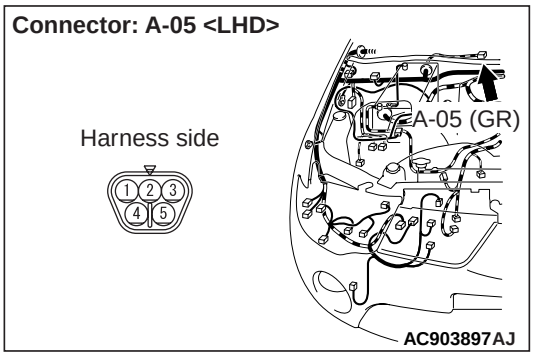
- Check the output lines for open circuit.

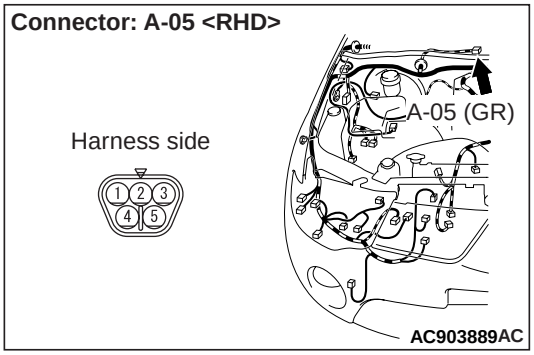
Q: Is the check result normal?
YES : Go to Step 9.
NO : Repair the wiring harness.

STEP 8. Check the wiring harness between C-218 ETACS-ECU connector terminal No.8 and A-05 windshield wiper motor connector terminal No.1.









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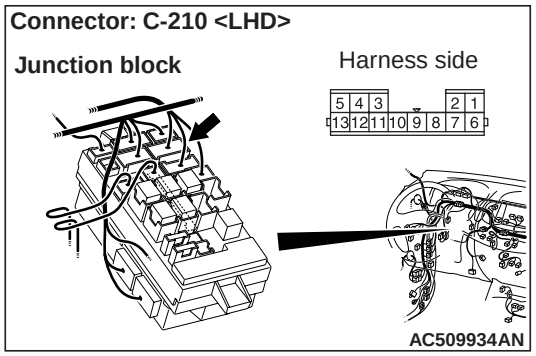
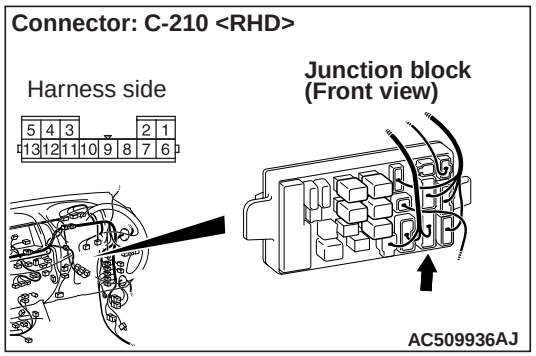




Prior to the wiring harness inspection, check the junction block connector C-210 and repair if necessary.

- Check the output lines for open circuit.

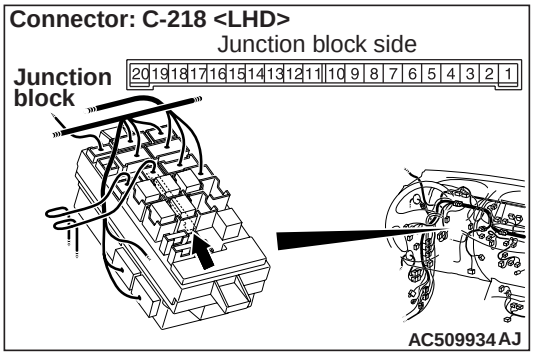
Q: Is the check result normal?
YES : Go to Step 9.
NO : Repair the wiring harness.

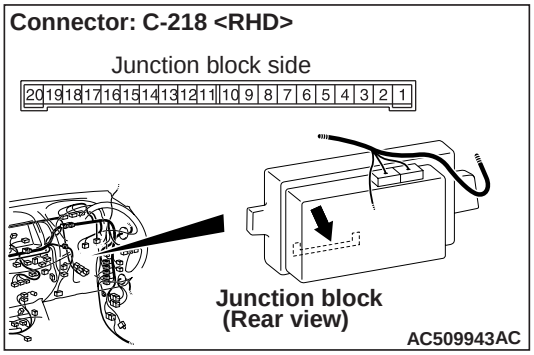
STEP 9. Retest the system.

Check that the windshield wipers work normally by moving the switch to each position.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Replace the windshield wiper motor.

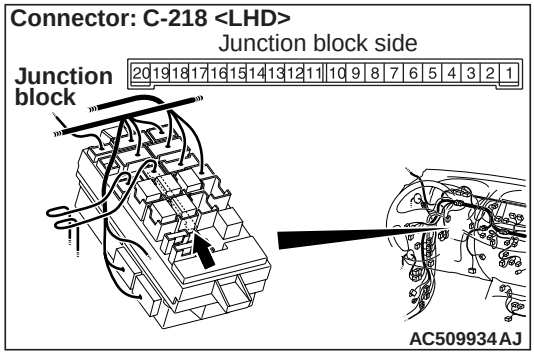
STEP 10. Connector check: C-218 ETACS-ECU connector

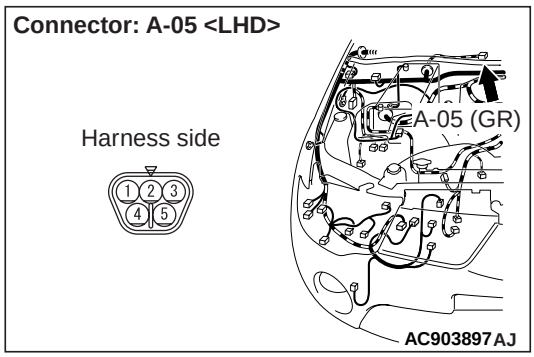




Q: Is the check result normal?
YES <LH drive vehicles> : Go to Step 11.
YES <RH drive vehicles> : Go to Step 12.
NO : Repair the defective connector.

STEP 11. Check the wiring harness between C-218 ETACS-ECU connector terminal No.7 and A-05 windshield wiper motor connector terminal No.5.





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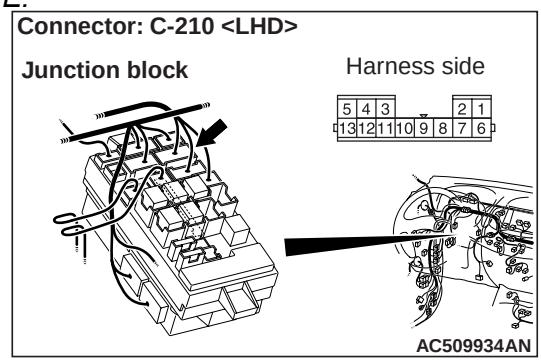
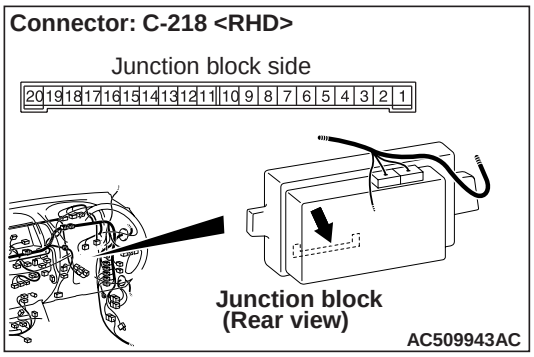


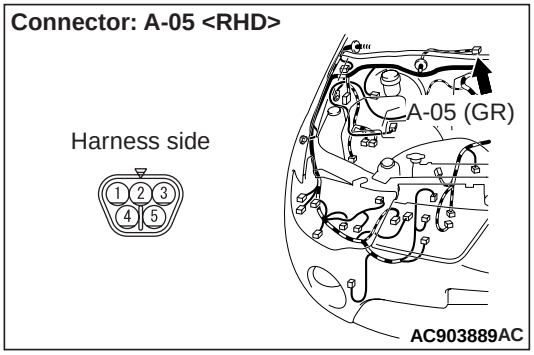
Prior to the wiring harness inspection, check the junction block connector C-210 and repair if necessary.

- Check the output lines for open circuit.

Q: Is the check result normal?
YES : Go to Step 13.
NO : Repair the wiring harness.

STEP 12. Check the wiring harness between C-218 ETACS-ECU connector terminal No.7 and A-05 windshield wiper motor connector terminal No.4.





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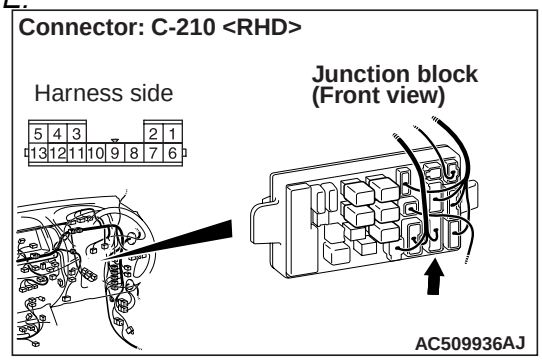


Prior to the wiring harness inspection, check the junction block connector C-210 and repair if necessary.

- Check the output lines for open circuit.

Q: Is the check result normal?

YES : Go to Step 13.
NO : Repair the wiring harness.

STEP 13. Retest the system.

Check that the windshield wipers work normally by moving the switch to each position.

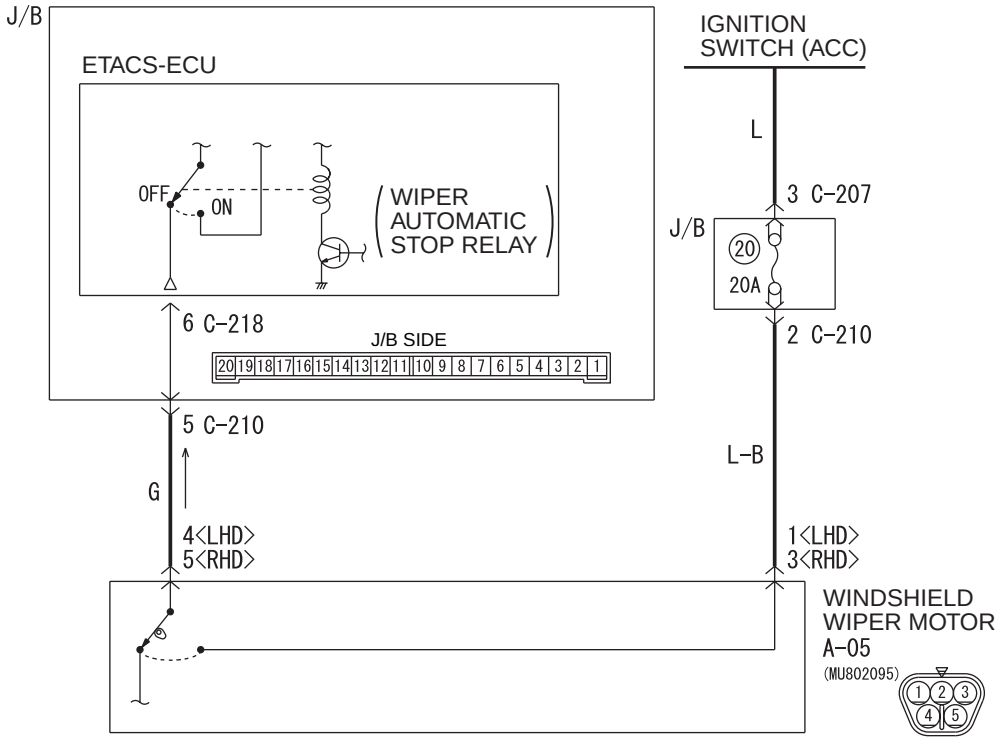
Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Replace the windshield wiper motor.

Inspection Procedure 3: The Windshield Wipers do not Stop at The Specified Park Position

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Windshield Wiper Automatic Stop Relay Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

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COMMENTS ON TROUBLE SYMPTOM
The windshield wiper motor or the ETACS-ECU may be defective.

PROBABLE CAUSES
- Malfunction of the windshield wiper motor
- Malfunction of the ETACS-ECU
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

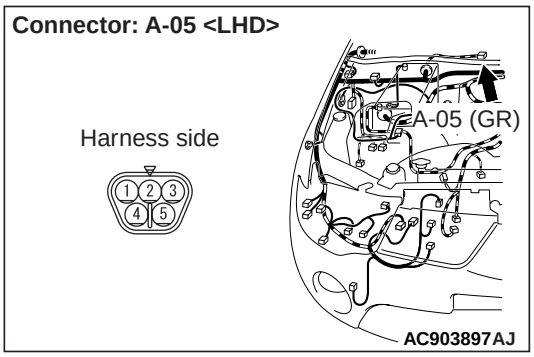
STEP 1. M.U.T.-III data list
Check if the ETACS-ECU receives the windshield wiper auto-stop signal.
- Activate the windshield wipers.

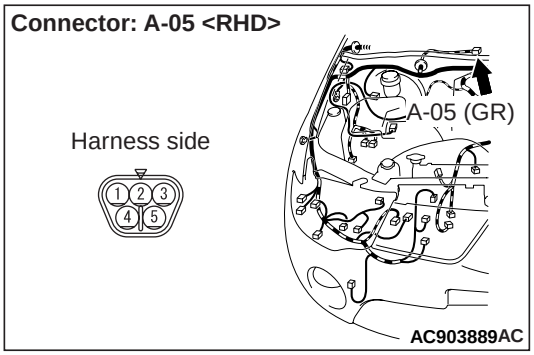
Item No.	Item name	Normal condition
25	Front wiper auto stop switch	Turns ON when the wipers are activated from the stopped state.

OK: Normal condition is displayed.

Q: Is the check result normal?
YES : Go to Step 12.
NO : Go to Step 2.

STEP 2. Connector check: A-05 windshield wiper motor connector



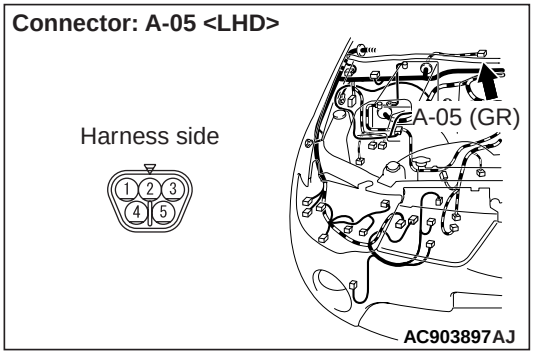


Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the connector.

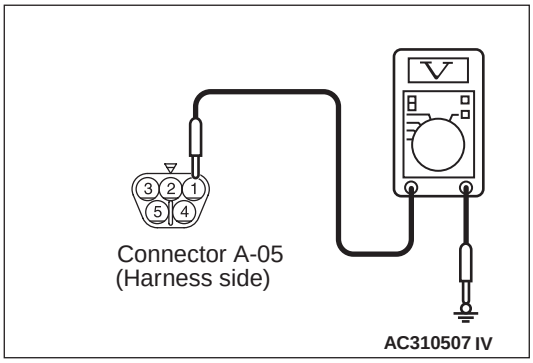
STEP 3. Check the windshield wiper motor assembly.
Refer to P.51-71.

Q: Is the check result normal?
YES <LH drive vehicles> : Go to Step 4.
YES <RH drive vehicles> : Go to Step 8.
NO : Replace the windshield wiper motor assembly.

STEP 4. Voltage measurement at the A-05 windshield wiper motor connector.



(1) Disconnect the connector, and measure at the wiring harness side.
(2) Ignition switch: ACC

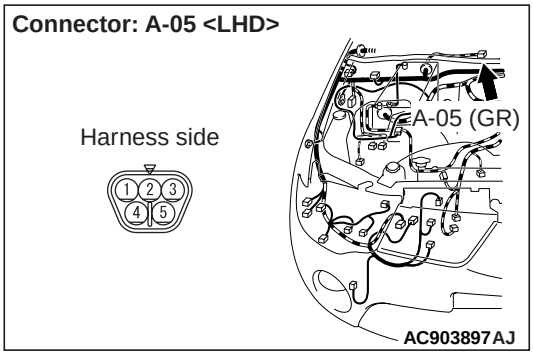


(3) Check the voltage between the A-05 windshield wiper motor connector terminal No.1 and body earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 6.
NO : Go to Step 5.

STEP 5. Check the wiring harness between A-05 windshield wiper motor connector terminal No.1 and ignition switch (ACC).



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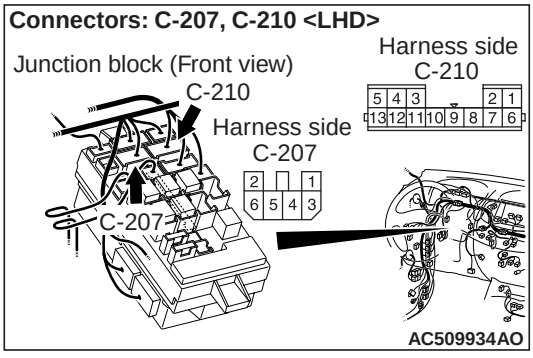


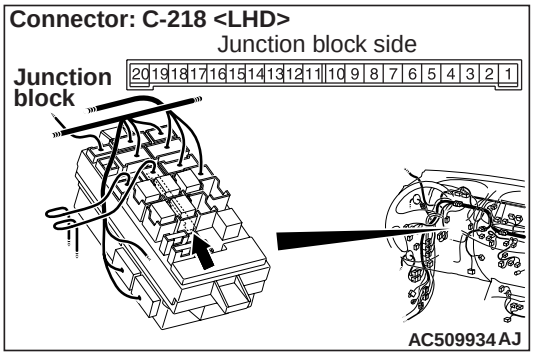
Prior to the wiring harness inspection, check the junction block connectors C-207, C-210, and repair if necessary.

- Check the power supply line to ignition switch (ACC) for open circuit.

Q: Is the check result normal?

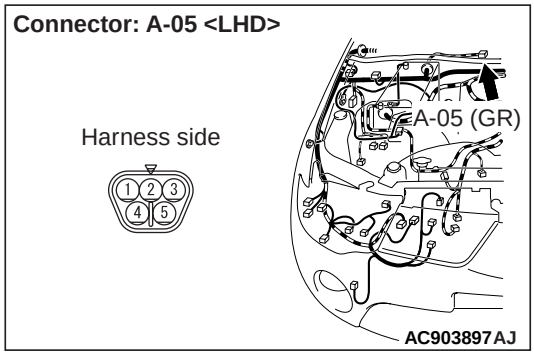
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/inspection Service Points − How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness.

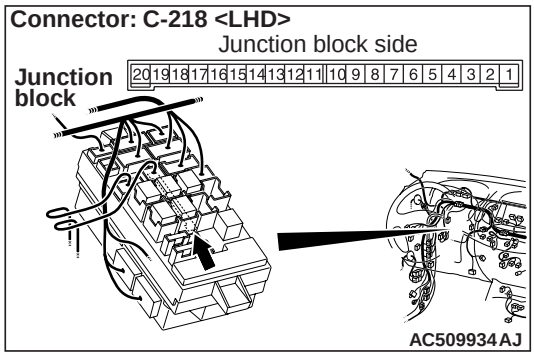
STEP 6. Connector check: C-218 ETACS-ECU connector



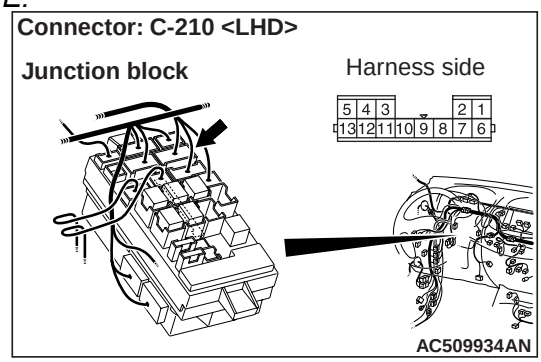
Q: Is the check result normal?
YES : Go to Step 7.
NO : Repair the connector.

STEP 7. Check the wiring harness between A-05 windshield wiper motor connector terminal No.4 and C-218 ETACS-ECU connector terminal No.6.





NOTE:

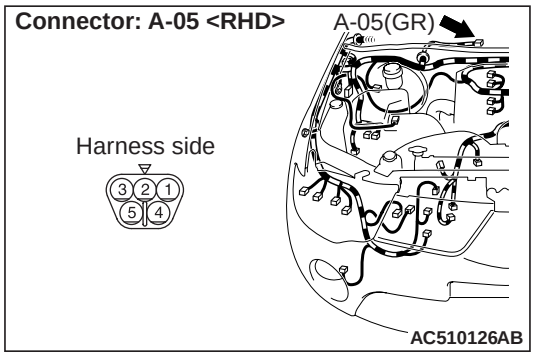


Prior to the wiring harness inspection, check the junction block connector C-210, and repair if necessary.

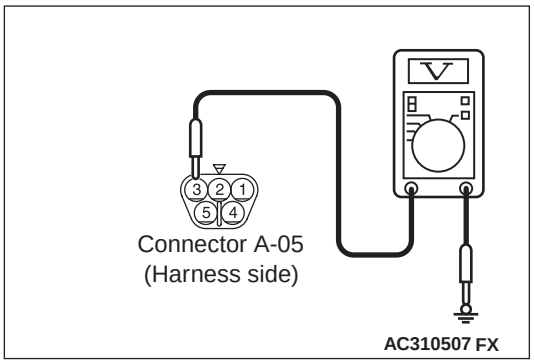
- Check the input signal lines.

Q: Is the check result normal?
YES : Go to Step 12.
NO : Repair the wiring harness.

STEP 8. Voltage measurement at the A-05 windshield wiper motor connector.



(1) Disconnect the connector, and measure at the wiring harness side.
(2) Ignition switch: ACC

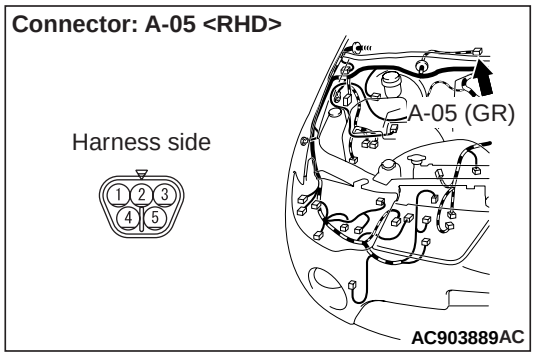


(3) Check the voltage between the A-05 windshield wiper motor connector terminal No.3 and body earth.

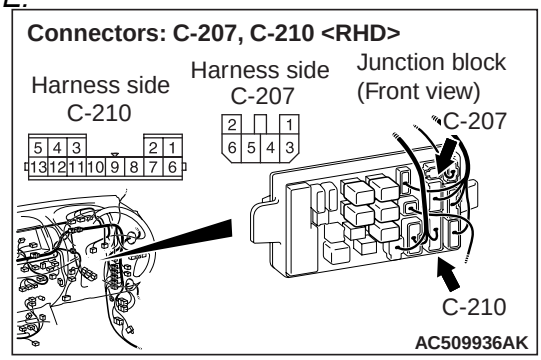
OK: System voltage

Q: Is the check result normal?
YES : Go to Step 10.
NO : Go to Step 9.

STEP 9. Check the wiring harness between A-05 windshield wiper motor connector terminal No.3 and ignition switch (ACC).



NOTE:

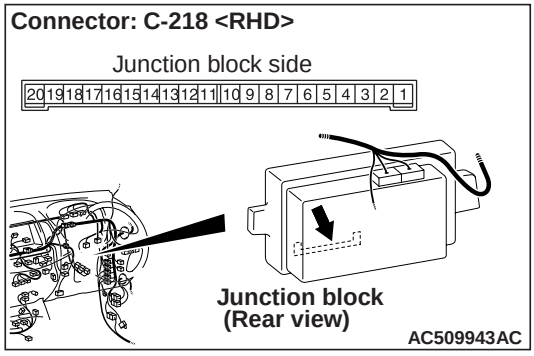


Prior to the wiring harness inspection, check the junction block connectors C-207, C-210, and repair if necessary.

- Check the power supply line to ignition switch (ACC) for open circuit.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness.

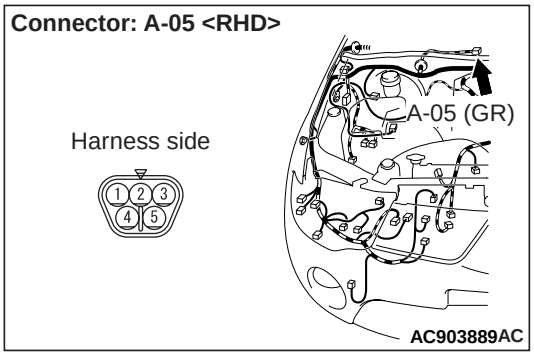
STEP 10. Connector check: C-218 ETACS-ECU connector

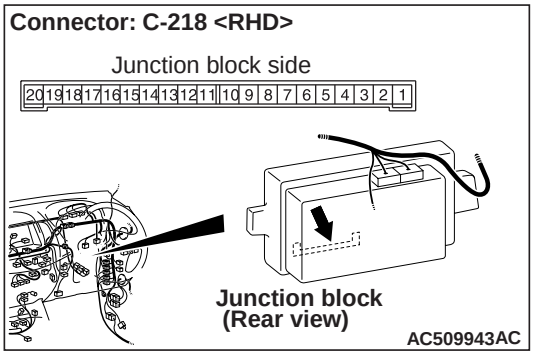


Q: Is the check result normal?

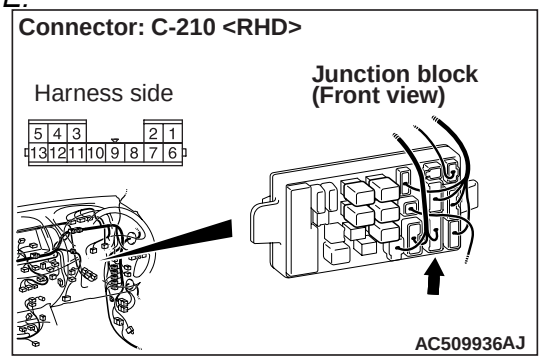
YES : Go to Step 11.
NO : Repair the connector.

STEP 11. Check the wiring harness between A-05 windshield wiper motor connector terminal No.5 and C-218 ETACS-ECU connector terminal No.6.





NOTE:



Prior to the wiring harness inspection, check the junction block connector C-210, and repair if necessary.

- Check the input signal lines.

Q: Is the check result normal?

YES : Go to Step 12.
NO : Repair the wiring harness.

STEP 12. Retest the system.

Check that the windshield wipers stop at the specified park position.

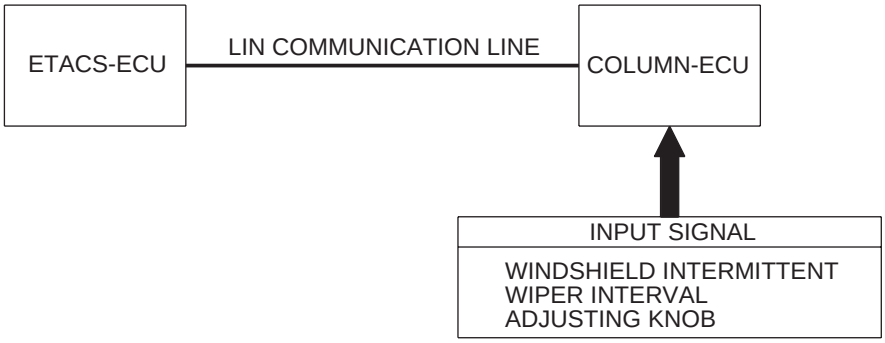
Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Replace the ETACS-ECU and register the ID codes.

Inspection Procedure 4: The Intermittent Wiper Interval cannot be Adjusted by Operating The Windshield Intermittent Wiper Volume Control.

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Windshield Intermittent Wiper Control Circuit



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COMMENTS ON TROUBLE SYMPTOM
The column switch or the ETACS-ECU may be defective. Alternatively, there are cases where the windshield intermittent wiper volume is disabled for changing the windshield intermittent wiper interval by using the adjustment function.

PROBABLE CAUSES
- Malfunction of the column switch
- Malfunction of the ETACS-ECU
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code.
When the ignition switch is turned to the "LOCK" (OFF) position, check that the ETACS-ECU does not set the diagnosis code.

Q: Is the diagnosis code set?
YES : Refer to GROUP 54A, Diagnosis Code Chart .
NO : Go to Step 2.

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/inspection Service Points − How to Cope with Intermittent

STEP 2. M.U.T.-III data list
Check the input signals below which are related to the windshield intermittent wiper function.

Item No.	Item name	Normal condition
86	Intermittent wiper interval	Operation duration is influenced by the intermittent wiper interval adjusting knob position.

OK: Normal condition is displayed.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Refer to GROUP 54A Inspection Procedure C-1 "The Column Switch (lighting and wiper switch) signal is not received ."

STEP 3. Retest the system.
Check that the windshield intermittent wiper interval can be adjusted by operating the windshield intermittent wiper volume control.

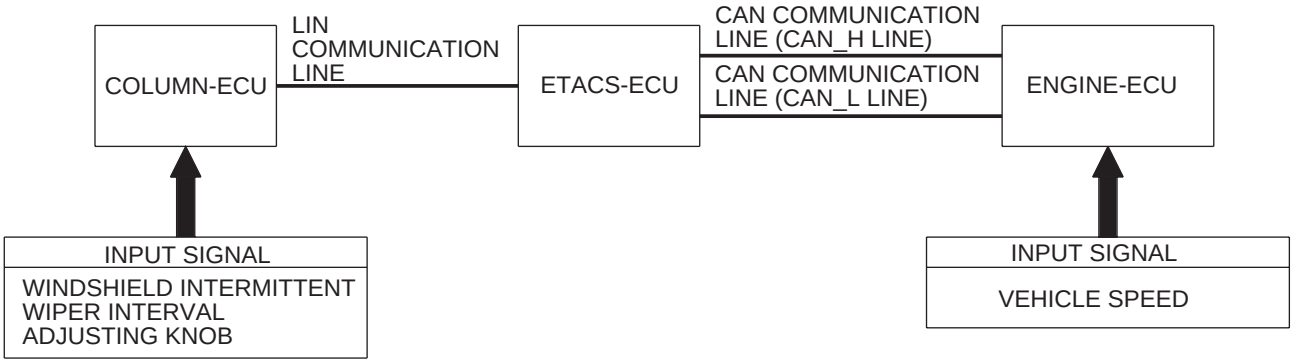
OK: The intermittent wiper interval is changed as the intermittent wiper volume is rotated.

Q: Is the check result normal?
Malfunction).
NO : Replace the ETACS-ECU and register the ID codes.

Inspection Procedure 5: The Intermittent Wiper Interval is not Changed According to The Vehicle Speed.

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Windshield Intermittent Wiper Control Circuit



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COMMENTS ON TROUBLE SYMPTOM
The ETACS-ECU calculates the intermittent wiper interval according to the vehicle speed signal which is sent by the engine-ECU.
If the intermittent wiper interval does not depend on the vehicle speed, the input circuit of the vehicle speed signal or the ETACS-ECU may be defective. Alternatively, there are cases where the intermittent wiper interval does not depend on the vehicle speed because of the setting by the adjustment function.

PROBABLE CAUSES
- The CAN bus line is defective.
- Malfunction of the ETACS-ECU
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. Retest the system.
Check that the windshield intermittent wiper interval can be adjusted by operating the windshield intermittent wiper volume control.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Refer to Inspection Procedure 4 " The intermittent wiper interval cannot be adjusted by operating the windshield intermittent wiper volume control P.51-53."

STEP 2. Check of the adjustment details for the vehicle speed-sensing wiper function
Check that the vehicle speed-dependent wiper function is set to "Operation" using the customisation function of M.U.T-III.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Using the customisation function of M.U.T-III, set the speed-dependent wiper function to "Operation."

STEP 3. M.U.T.-III CAN bus diagnostics
Use the M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 4.
NO : Repair the CAN bus line (Refer to GROUP 54C, Troubleshooting).

STEP 4. Check the diagnosis code of the engine-ECU.
Check if the diagnosis code is set in either of the engine-ECU.

Q: Is the diagnosis code set?
YES : Diagnose the engine-ECU (Refer to GROUP 13A, Troubleshooting).
NO : Go to Step 5.

STEP 5. M.U.T.-III diagnosis code.

When the ignition switch is turned to the "LOCK" (OFF) position, check that the ETACS-ECU does not set the diagnosis code.

Q: Is the diagnosis code set?

YES : Refer to GROUP 54A, Diagnosis Code Chart .

NO : Go to Step 6.

STEP 6. Retest the system.

Check that the intermittent wiper interval depends on the vehicle speed.

Q: Is the check result normal?

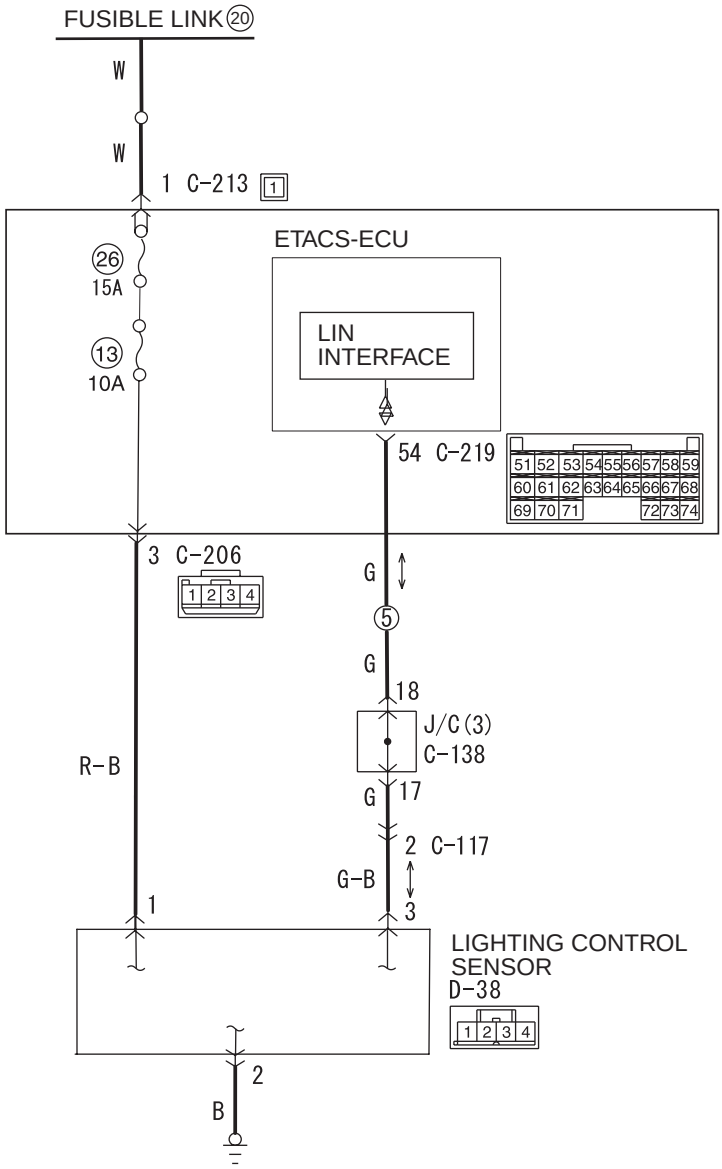
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

NO : Replace the ETACS-ECU and register the ID codes.

Inspection Procedure 6: The rain sensitive AUTO wiper function does not work at all <Vehicles with lighting control sensor>.

⚠ CAUTION
Whenever ECU is replaced, ensure that the input and output signal circuits are normal.

Raindrops Sensing Wiper Function Control Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

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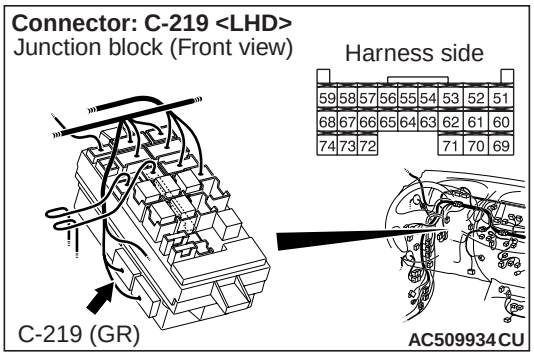
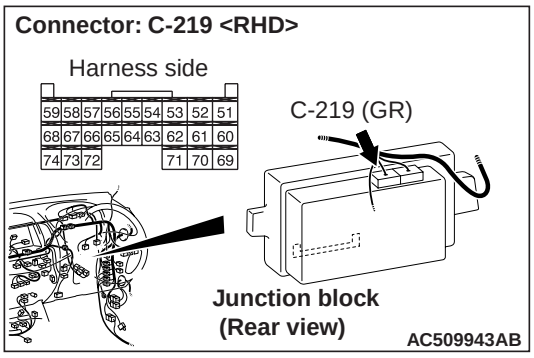
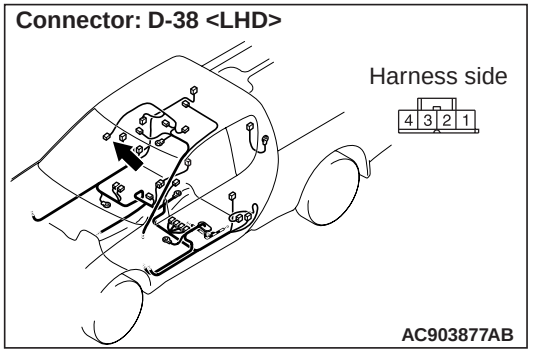
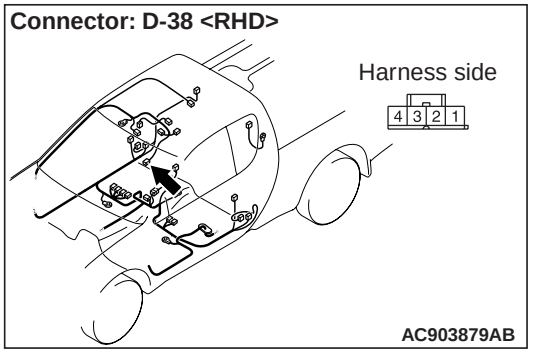








OPERATION

The raindrops sensitive wiper function automatically adjusts the wiping speed of windscreen wiper by detecting the rainfall through lighting control sensor when the ignition switch is in the ON position and the column switch is in the AUTO position.

COMMENTS ON TROUBLE SYMPTOM

The windshield wiper motor, the column switch, the lighting control sensor, the harness connector, or the ETACS-ECU may be defective.

PROBABLE CAUSES

- Defective column switch (column-ECU)
- Malfunction of the lighting control sensor
- Defective windshield wiper motor
- Malfunction of ETACS-ECU
- Damaged wiring harness and connectors

DIAGNOSIS PROCEDURE

STEP 1. Lighting control sensor installation surface check

Visually check the presence of scratches or air bubbles (diameter of 5 mm or more) on the windshield to which the lighting control sensor is installed.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Replace the windshield (Refer to GROUP 42 – Windshield Removal and Installation).

STEP 2. Windshield wiper operation check

Check that the windshield wipers work normally.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Refer to trouble symptom chart P.51-93.

STEP 3. M.U.T.-III diagnosis code

Check if an ETACS-related diagnosis code is set.

Q: Is the diagnosis code set?
YES : Diagnose the ETACS-ECU. Refer to GROUP 54A – ETACS .
NO : Go to Step 4.

STEP 4. M.U.T.-III diagnosis code

Check if a lighting control sensor-related diagnosis code is set.

Q: Is the diagnosis code set?
YES : Diagnose the lighting control sensor. (Refer to GROUP 54A – Diagnosis Code Chart .)
NO : Go to Step 5.

STEP 5. Connector check: D-38 Lighting control sensor connector

Q: Is the check result normal?
YES : Go to Step 6.
NO : Repair the damaged connector.

STEP 6. Resistance measurement at the D-38 lighting control sensor connector

(1) Disconnect the connector, and measure the resistance at the wiring harness.
(2) Measure the resistance between D-38 lighting control sensor connector terminal No.2 and body earth.

OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?
YES : Go to Step 8.
NO : Go to Step 7.

STEP 7. Check the wiring harness between D-38 lighting control sensor connector terminal No.2 and body earth.

- Check the earth wires for open circuit.

Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points - How to Cope with Intermittent Malfunction .)
NO : Repair the wiring harness.

STEP 8. Voltage measurement at the D-38 lighting control sensor connector

(1) Disconnect the connector, and measure the voltage at the wiring harness side.
(2) Measure the voltage between D-38 lighting control sensor connector terminal No.1 and body earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 10.
NO : Go to Step 9.

STEP 9. Check the wiring harness between D-38 lighting control sensor connector terminal No.1 and fusible link (20).

NOTE: Prior to the wiring harness inspection, check the ETACS-ECU connectors C-213, C-206 and repair if necessary.

- Check the power supply line for open circuit.

Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points - How to Cope with Intermittent Malfunction .)
NO : Repair the wiring harness.

STEP 10. Connector check: C-219 ETACS-ECU connector

Q: Is the check result normal?
YES : Go to Step 11.
NO : Repair the damaged connector.

STEP 11. Measure the voltage at the C-219 ETACS-ECU connector.

(1) Disconnect the connector, and measure the voltage at the wiring harness side.
(2) Measure the voltage between C-219 ETACS-ECU connector terminal No. 1 and body earth.

OK: System voltage

Q: Is the check result normal?
YES : Replace the Lighting control sensor.
NO : Go to Step 12.

STEP 12. Check the wiring harness between C-219 ETACS-ECU connector terminal No.54 and D-38 lighting control sensor connector terminal No.3.

NOTE: Prior to the wiring harness inspection, check the intermediate connector C-117, C-138 and repair if necessary.

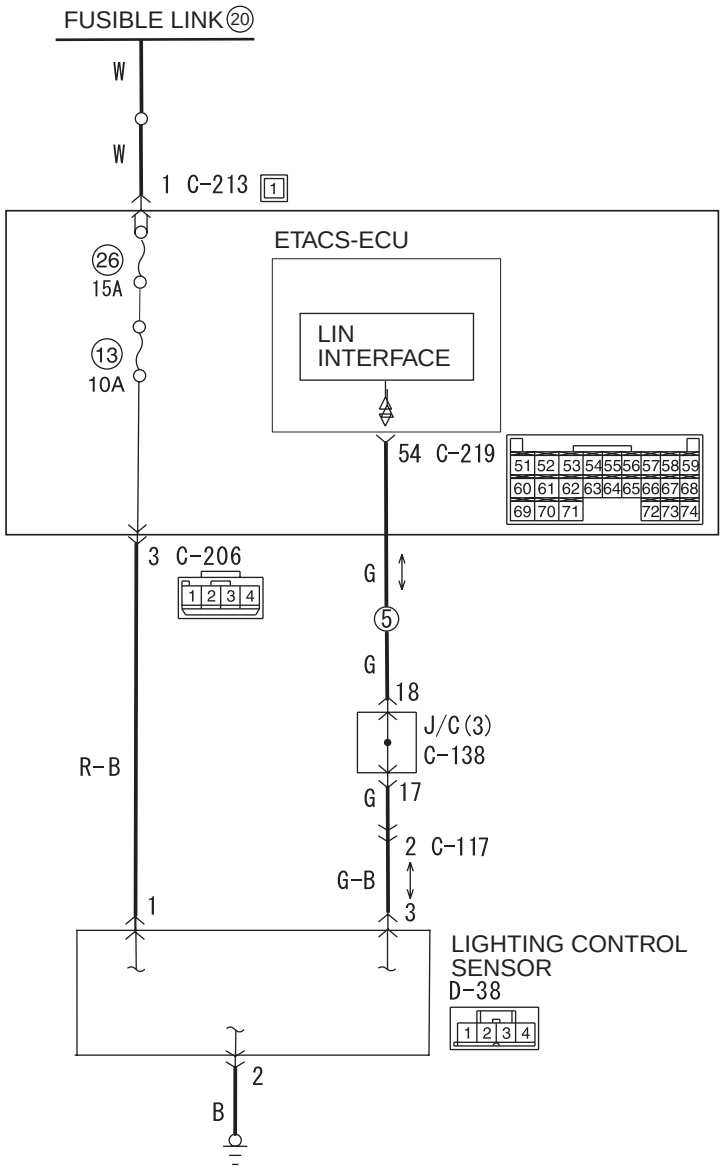
- Check the input and output lines for open or short circuit.

Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points - How to Cope with Intermittent Malfunction .)
NO : Repair the wiring harness.

INSPECTION PROCEDURE 7: The rain sensitive AUTO wiper function works even though there is no rainfall <Vehicles with lighting control sensor>.

⚠ CAUTION
Whenever ECU is replaced, ensure that the input and output signal circuits are normal.

Raindrops Sensing Wiper Function Control Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

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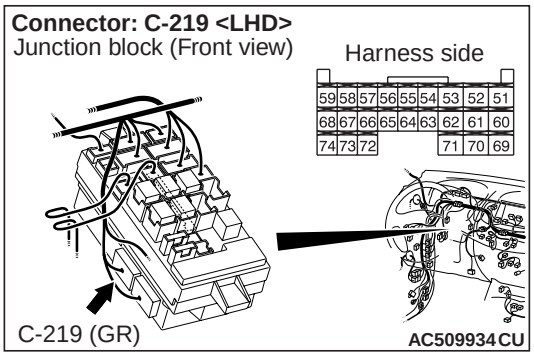
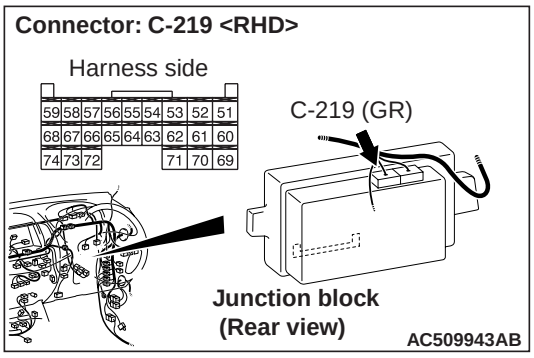
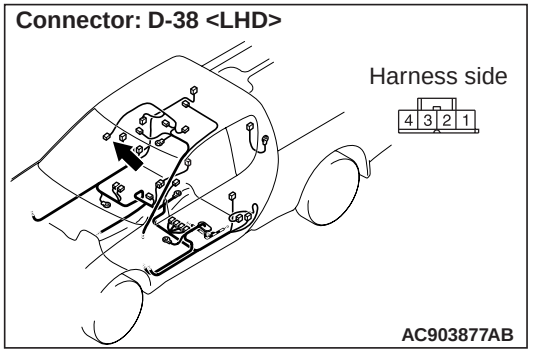
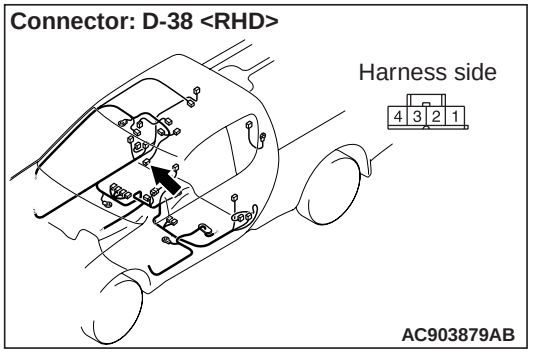








COMMENTS ON TROUBLE SYMPTOM

The lighting control sensor, the harness connector, or the ETACS-ECU may be defective.

PROBABLE CAUSES

- Malfunction of the lighting control sensor
- Malfunction of ETACS-ECU
- Damaged wiring harness and connectors

DIAGNOSIS PROCEDURE

STEP 1. Lighting control sensor installation surface check

Visually check the presence of scratches or air bubbles (diameter of 5 mm or more) on the windshield to which the lighting control sensor is installed.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Replace the windshield (Refer to GROUP 42 – Windshield Removal and Installation).

STEP 2. Windshield wiper operation check

Check that the windshield wipers work normally.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Refer to trouble symptom chart P.51-93.

STEP 3. M.U.T.-III diagnosis code

Check if an ETACS-related diagnosis code is set.

Q: Is the diagnosis code set?
YES : Diagnose the ETACS-ECU. Refer to GROUP 54A – ETACS .
NO : Go to Step 4.

STEP 4. M.U.T.-III diagnosis code

Check if a lighting control sensor-related diagnosis code is set.

Q: Is the diagnosis code set?
YES : Diagnose the lighting control sensor. (Refer to GROUP 54A – Diagnosis Code Chart .)
NO : Go to Step 5.

STEP 5. Connector check: C-219 ETACS-ECU connector

Q: Is the check result normal?
YES : Go to Step 6.
NO : Repair the damaged connector.

STEP 6. Measure the voltage at the C-219 ETACS-ECU connector.

(1) Disconnect the connector, and measure the voltage at the wiring harness side.
(2) Measure the voltage between C-219 ETACS-ECU connector terminal No. 1 and body earth.

OK: System voltage

Q: Is the check result normal?
YES : Replace the Lighting control sensor.
NO : Go to Step 7.

STEP 7. Check the wiring harness between C-219 ETACS-ECU connector terminal No.54 and D-38 lighting control sensor connector terminal No.3.

NOTE: Prior to the wiring harness inspection, check the intermediate connector C-117, C-138 and repair if necessary.

- Check the input and output lines for open or short circuit.

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/ Inspection Service Points - How to Cope with Intermittent Malfunction .)
NO : Repair the wiring harness.

INSPECTION PROCEDURE 8: Sometimes the rain sensitive AUTO wiper function works even though there is no rainfall <Vehicles with lighting control sensor>.

⚠ CAUTION
Whenever ECU is replaced, ensure that the input and output signal circuits are normal.

COMMENTS ON TROUBLE SYMPTOM
The lighting control sensor may be defective or a failure in the lighting control sensor (rain sensor) adaptation is suspected.

PROBABLE CAUSES
- Malfunction of the lighting control sensor
- Lighting control sensor (rain sensor) adaptation failure

DIAGNOSTIC PROCEDURE

STEP 1. Lighting control sensor installation surface check
Visually check the presence of scratches or air bubbles (diameter of 5 mm or more) on the windshield to which the lighting control sensor is installed.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Replace the windshield (Refer to GROUP 42 – Windshield Removal and Installation).

STEP 2. Windshield wiper operation check
Check that the windshield wipers work normally.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Refer to trouble symptom chart P.51-93.

STEP 3. M.U.T.-III diagnosis code
Check if an ETACS-related diagnosis code is set.

Q: Is the diagnosis code set?
YES : Diagnose the ETACS-ECU. Refer to GROUP 54A – ETACS .
NO : Go to Step 4.

STEP 4. M.U.T.-III diagnosis code
Check if a lighting control sensor diagnosis code is set.

Q: Is the diagnosis code set?
YES : Diagnose the lighting control sensor. (Refer to GROUP 54A – Diagnosis Code Chart).
NO : Go to Step 5.

STEP 5. Lighting control sensor (rain sensor) installation surface check
Check that the lighting control sensor (rain sensor) is installed to the windshield glass correctly.

Q: Is the check result normal?
YES : Go to Step 6 after completion of the lighting control sensor (rain sensor) adaptation (P.51-75).
NO : Install the lighting control sensor (rain sensor) to the windshield glass correctly (Refer to GROUP 54A – Lighting control sensor removal and Installation).

STEP 6. Retest the system.
Check the lighting control sensor (rain sensor) after completion of the lighting control sensor (rain sensor) adaptation
(1) Windshield glass surface should be dry.
(2) Pour the windshield glass surface where the lighting control sensor is installed.

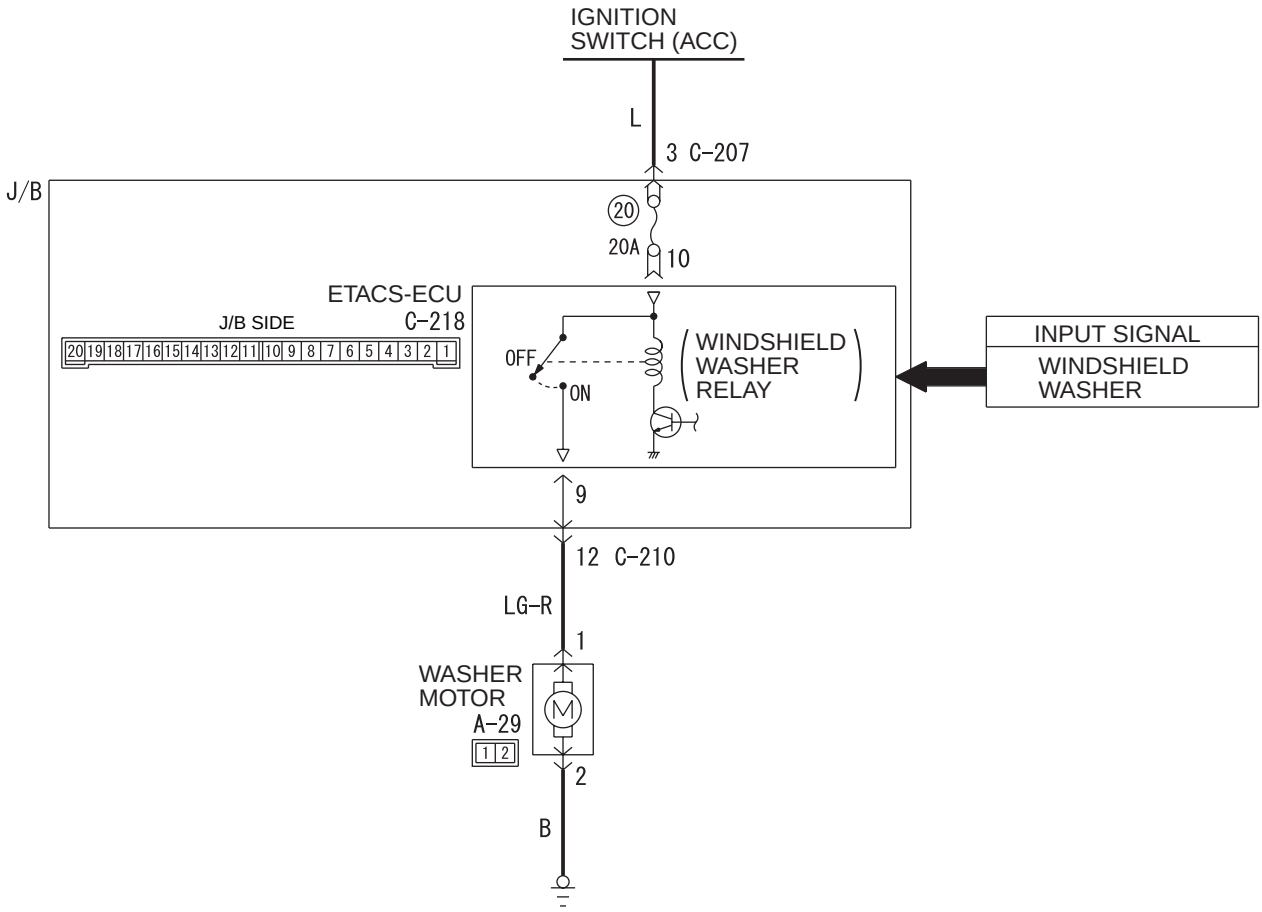
Q: Does the windshield wiper operate?

Operate once or more : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points - How to Cope with Intermittent Malfunction).
Does not operate : Troubleshoot the rain-sensitive wiper function (Refer to Inspection procedure 7 P.51-56).

Inspection Procedure 9: The Windshield Washer does not Work Normally.

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Windshield Washer Motor Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

W7C51E003A

COMMENTS ON TROUBLE SYMPTOM
The washer motor, the column switch or the ETACS-ECU may be defective.

PROBABLE CAUSES
- Malfunction of the washer motor
- Malfunction of the column switch
- Malfunction of the ETACS-ECU
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. Check the operation of the windshield wipers.

Check that the windshield wipers work normally.

Q: Is the check result normal?

YES : Go to Step 2.

NO : Refer to Inspection Procedure 1 "The windshield wipers does not work at all P.51-36."

STEP 2. M.U.T.-III diagnosis code.

When the ignition switch is turned to the "LOCK" (OFF) position, check that the ETACS-ECU does not set the diagnosis code.

Q: Is the diagnosis code set?

YES : Refer to GROUP 54A, Diagnosis Code Chart .

NO : Go to Step 3.

STEP 3. M.U.T.-III data list

Check the input signals below which are related to the windshield washer.

- Turn the windshield washer switch to the "ON" position.

Item No.	Item name	Normal condition
67	Front washer output	ON

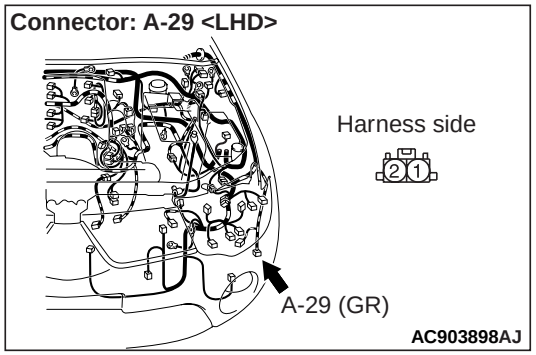
OK: Normal condition is displayed.

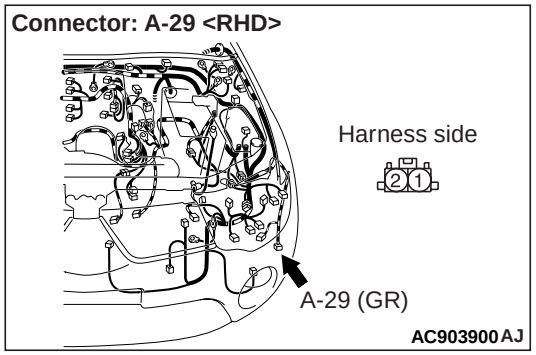
Q: Is the check result normal?

YES : Go to Step 4.

NO : Refer to GROUP 54A, Inspection Procedure C-1 "The Column Switch (lighting and wiper switch) signal is not received ."

STEP 4. Connector check: A-29 washer motor connector





Q: Is the check result normal?

YES : Go to Step 5.

NO : Repair the connector.

STEP 5. Check the washer motor assembly.

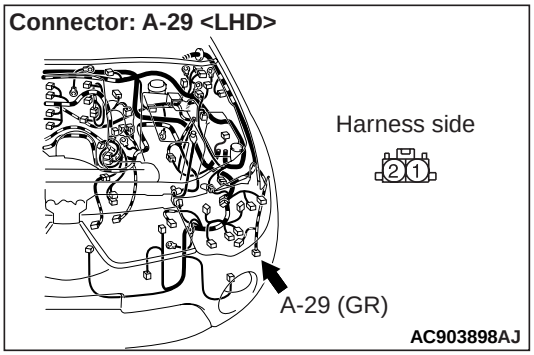
Refer to P.51-74.

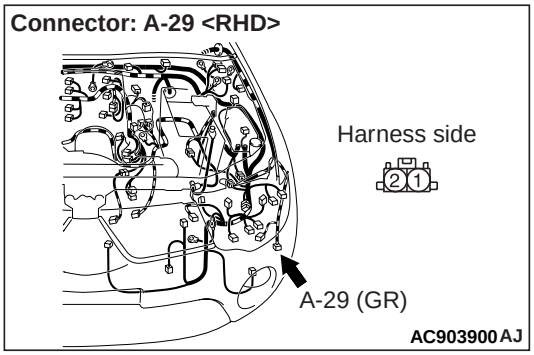
Q: Is the check result normal?

YES : Go to Step 6.

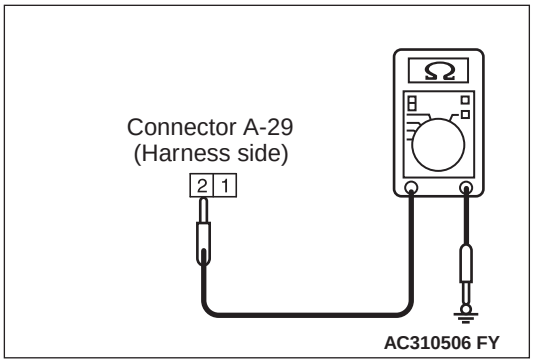
NO : Replace the washer motor.

STEP 6. Resistance measurement at the A-29 washer motor connector.





(1) Disconnect the connector, and measure at the wiring harness side.

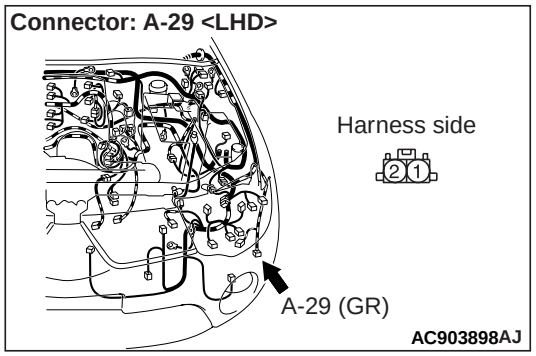


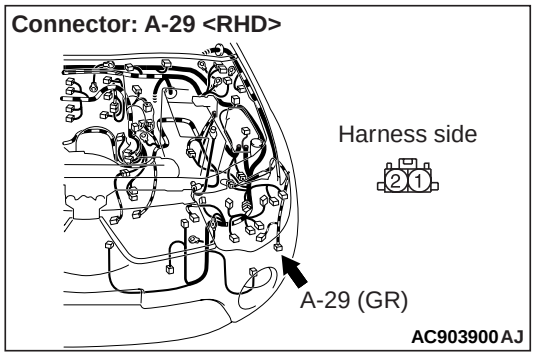
(2) Resistance between A-29 washer motor connector terminal No.2 and body earth

OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?
YES : Go to Step 8.
NO : Go to Step 7.

STEP 7. Check the wiring harness between A-29 washer motor connector terminal No.2 and the body earth.

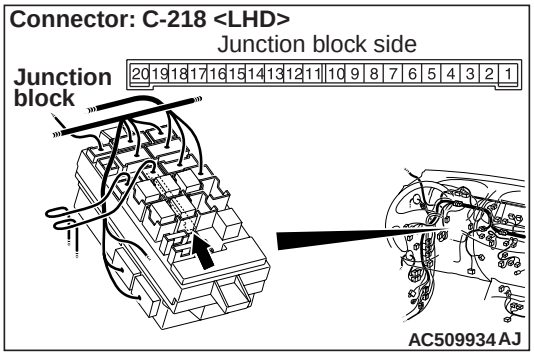


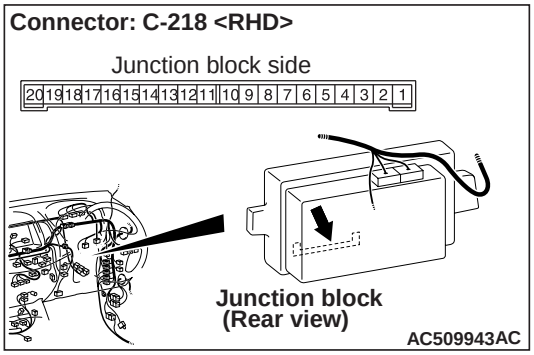


- Check the earth wires for open circuit.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness.

STEP 8. Connector check: C-218 ETACS-ECU connector

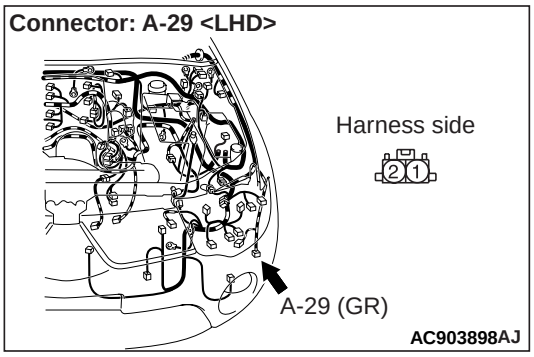


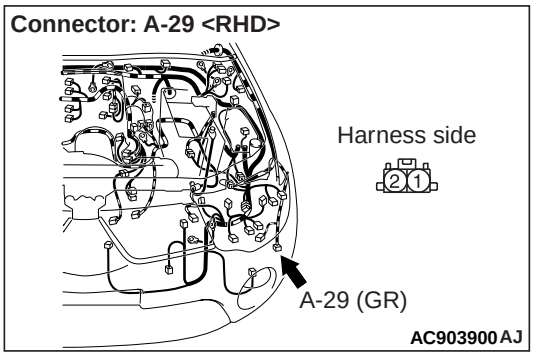


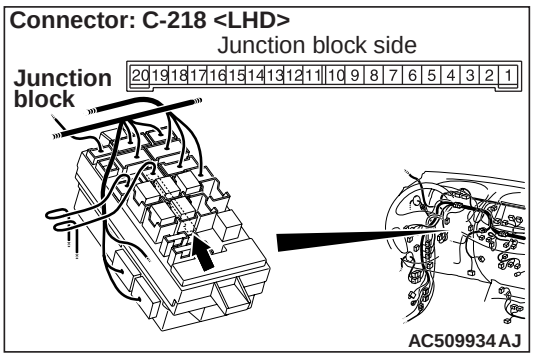
Q: Is the check result normal?

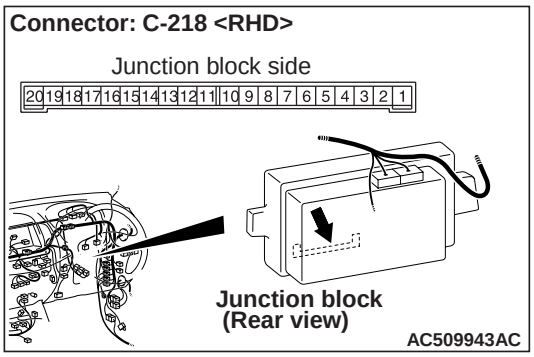
YES : Go to Step 9.
NO : Repair the connector.

STEP 9. Check the wiring harness from A-29 washer motor connector terminal No.1 to C-218 ETACS-ECU connector terminal No.9.

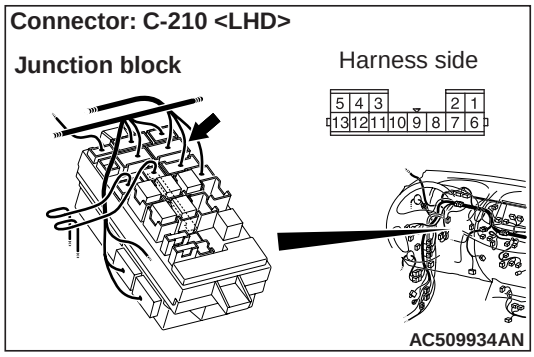


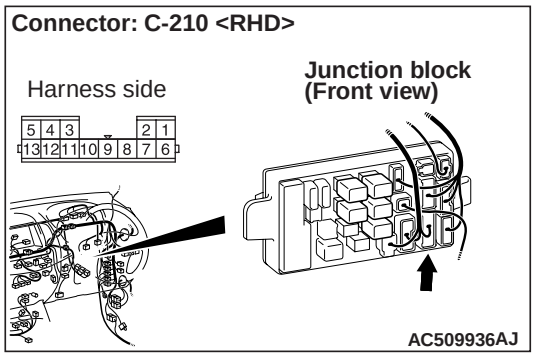






NOTE:





Prior to the wiring harness inspection, check the junction block connector C-210 and repair if necessary.

- Check the earth wires for open circuit.

Q: Is the check result normal?
YES : Go to Step 10.
NO : Repair the wiring harness.

STEP 10. Retest the system.
The windshield washer should now work normally.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Replace the ETACS-ECU and register the ID codes.

DATA LIST REFERENCE TABLE

M1511015100060

LIN (LIGHTING CONTROL SENSOR)

Item No.	M.U.T.-III display	Check condition	Normal condition
7005	RLS Rain sensor ON/OFF	When the wiper switch is AUTO position	ON
		When a switch (except the wiper switch) is AUTO position	OFF
7006	RLS Rain sensor sensitivity	Changes from 1 to 5 according to the wiper volume.	1, 2, 3, 4, 5
7008	RLS Wiper auto stop SW	When the windshield wiper is in operation	Park
		Other than above	Outside park
7013	RLS Wiper control output	When the operation is not requested from lighting control sensor (rain sensor).	OFF
		When the LO operation is requested from lighting control sensor (rain sensor)	LO
		When the HI operation is requested from lighting control sensor (rain sensor)	HI
7020	RLS RS measurement value(RS1)	When the lighting control sensor (rain sensor) detects raindrops	The sensor 1 detects raindrops and the value changes.
7021	RLS RS measurement value(RS2)	When the lighting control sensor (rain sensor) detects raindrops	The sensor 2 detects raindrops and the value changes.
7022	RLS RS adaptation value(RS1)	When initialising after the adaptation (sensor 1)	The amount of output when initialising (sensor 1)
7023	RLS RS adaptation value(RS2)	When initialising after the adaptation (sensor 2)	The amount of output when initialising (sensor 2)
7024	RLS RS adaptation gain level	When initialising after the adaptation	The calibrated value of initialising

ON-VEHICLE SERVICE

WINDSHIELD INTERMITTENT WIPER INSPECTION

M1511023600071

1. Check that the intermittent wiper interval is changed as the windshield intermittent wiper volume is operated.
2. Turn the windshield intermittent wiper switch to the intermittent operation position. Use the M.U.T.-III to set a simulated vehicle speed with the wiper volume held. The intermittent wiper interval should be changed as the simulated vehicle speed is changed.
3. If either of above is defective, carry out the troubleshooting. (Refer to P.51-53)

LIGHTING CONTROL SENSOR (RAIN SENSOR) INSPECTION

M1511028400083

Turn the ignition switch to the "ON" position when the windshield glass is dry, and turn the wiper switch to the "AUTO" position. Apply water to the upper part of the windshield glass where the lighting control sensor is installed. Confirm that the windshield wiper operates at this time. If not, perform troubleshooting (Refer to P.51-93).

CUSTOMISATION FUNCTION

M1511027401577

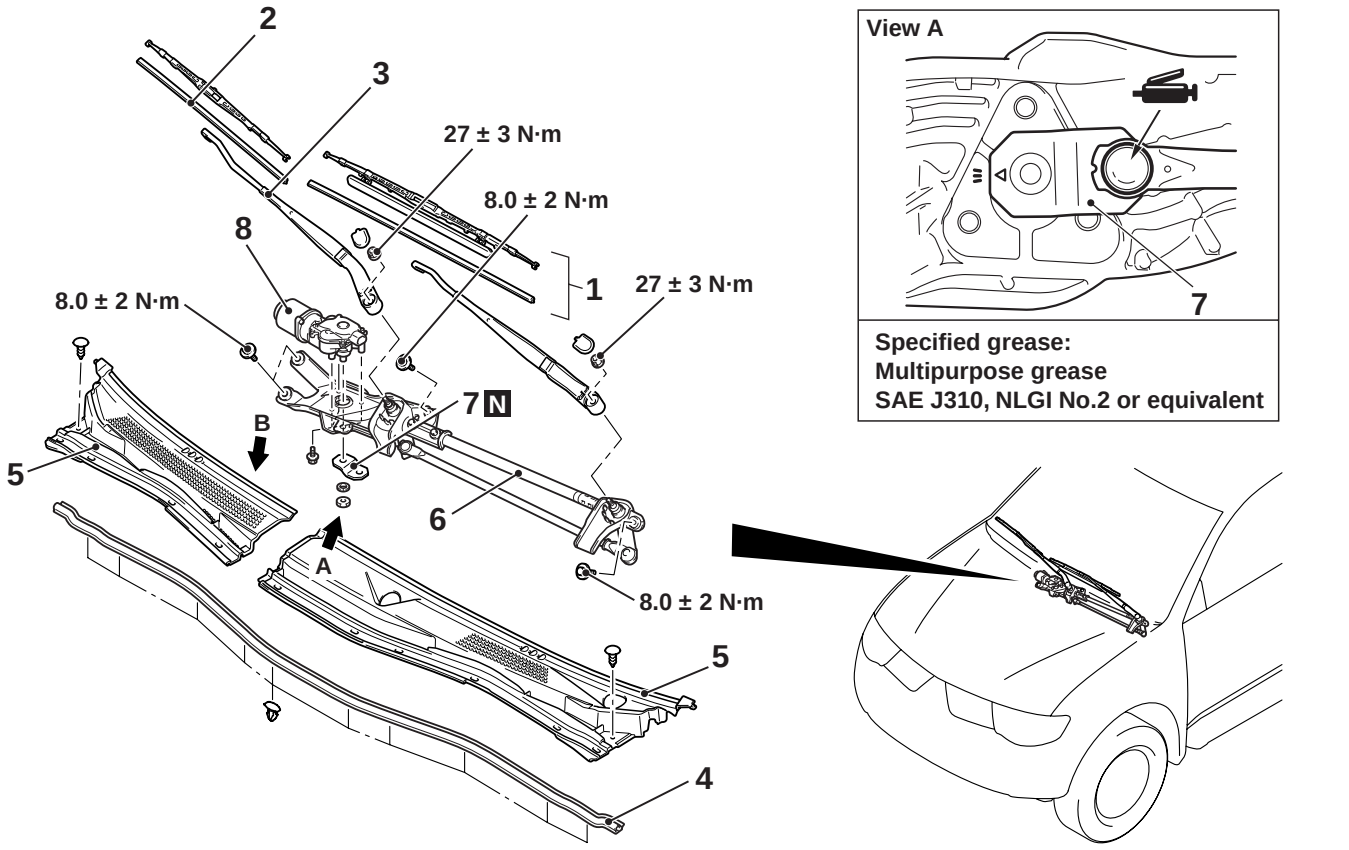
The following functions can be customised using M.U.T.-III.

Function	Item name	Configuration
Windshield wiper intermittent control (vehicle speed sensing intermittent time adjustable type)	Vehicle speed-dependent wiper	• Inhibit • Operation (initial condition)
Wiper linked with washer function	Wiper synchronized washer	• Inhibit • Operation (initial condition)

WINDSHIELD WIPER

REMOVAL AND INSTALLATION

M1511007900522



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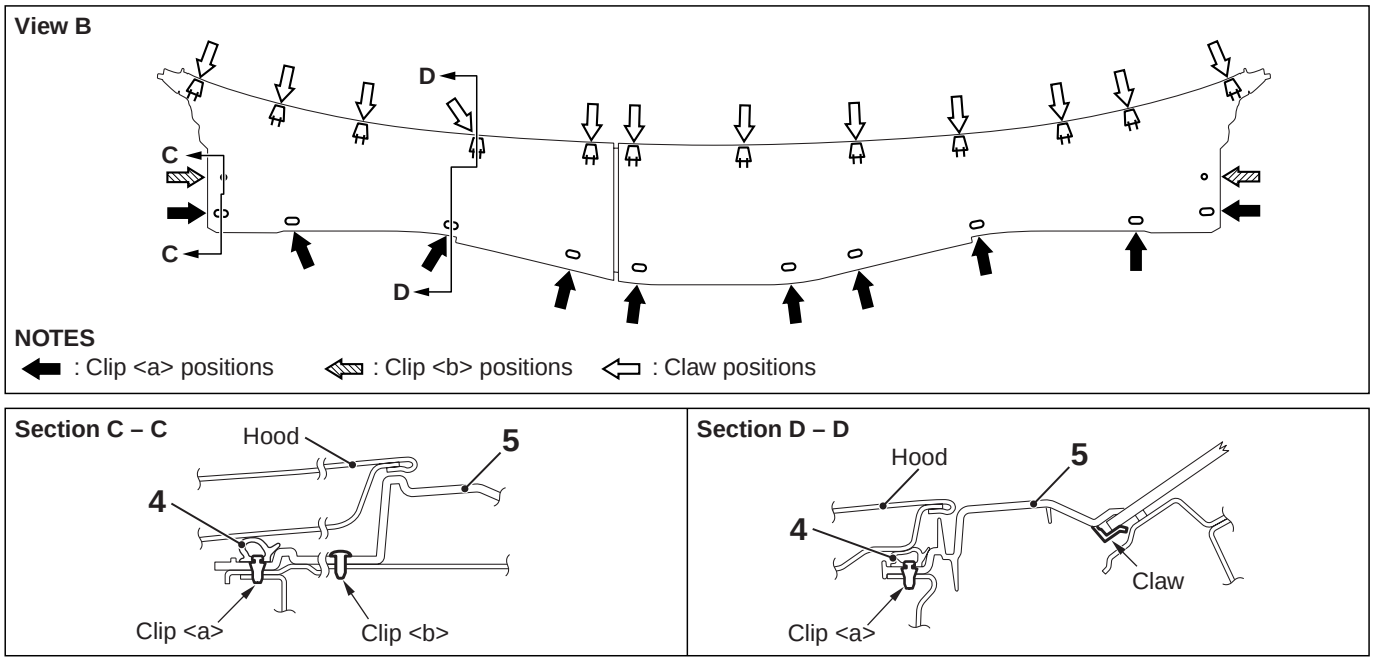

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Wiper blade removal steps

1. Wiper blade assembly
>>C<< 2. Wiper blade

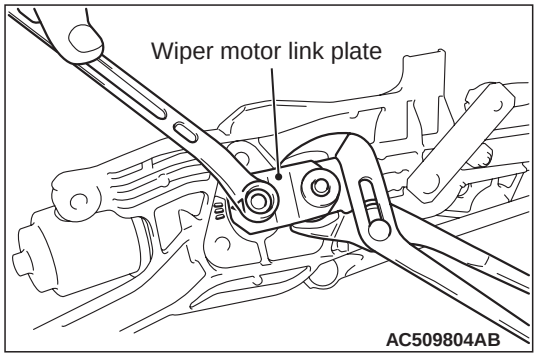
Windshield wiper motor and link assembly removal steps

>>B<< 3. Wiper arm
4. Hood weather strip
5. Front deck garnish
<<A>> >>A<< 6. Windshield wiper link
<<A>> >>A<< 7. Wiper motor link plate
<<A>> >>A<< 8. Windshield wiper motor

NOTE: For removal and installation of the wiper and washer switch, refer to GROUP 54A, Column switch .

REMOVAL SERVICE POINT

<<A>> WINDSHIELD WIPER LINK/WIPER MOTOR LINK PLATE/WINDSHIELD WIPER MOTOR REMOVAL



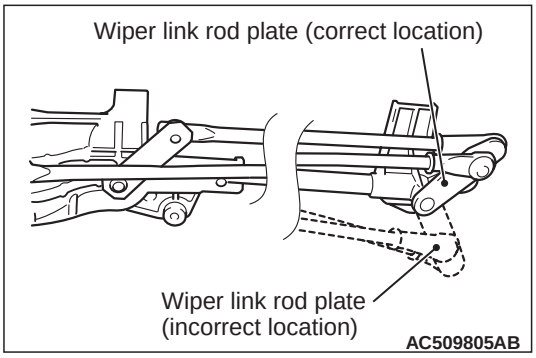
1. To disconnect the wiper motor link plate from the wiper motor shaft, use an appropriate tool to counter-hold the plate to prevent it from turning.
2. Remove the wiper motor from the windshield wiper link.

INSTALLATION SERVICE POINT

>>A<< WINDSHIELD WIPER LINK/WIPER MOTOR LINK PLATE/WINDSHIELD WIPER MOTOR INSTALLATION

1. Confirm that the wiper motor has set to automatic stop position (refer to P.51-71).

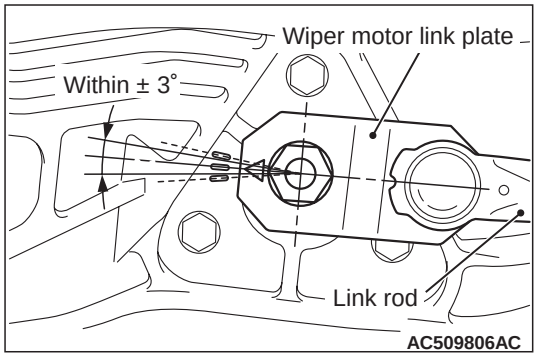
⚠ CAUTION



Wiper link rod plate at left end should be located as shown in the illustration (dotted line shows incorrect location).

2. Assemble the wiper motor to windshield wiper link.

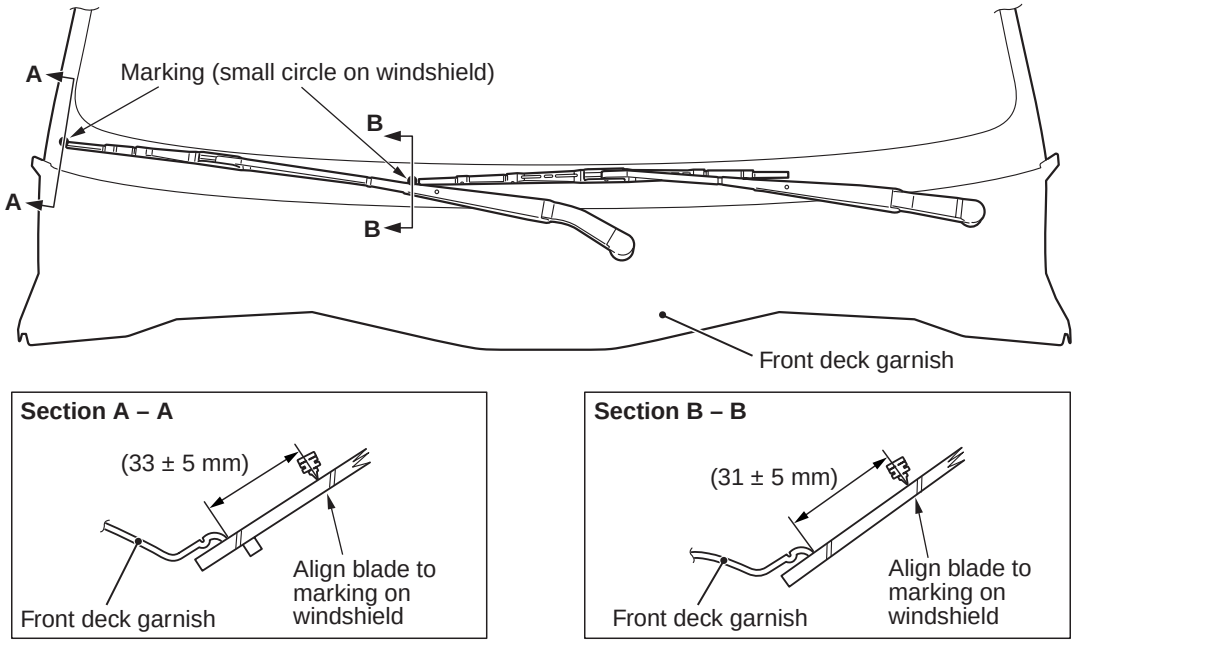
⚠ CAUTION



Always replace the wiper motor link plate with new one.

3. Set the wiper motor link plate onto the wiper motor shaft; aligning the plate to the windshield wiper link as shown in the illustration.
4. Tighten the attaching nut of wiper motor link plate and wiper motor shaft. Use an appropriate tool to counter-hold the plate to prevent it from turning.
5. Apply grease to the inside of link rod joint (as required) and connect the link rod to wiper motor link plate.

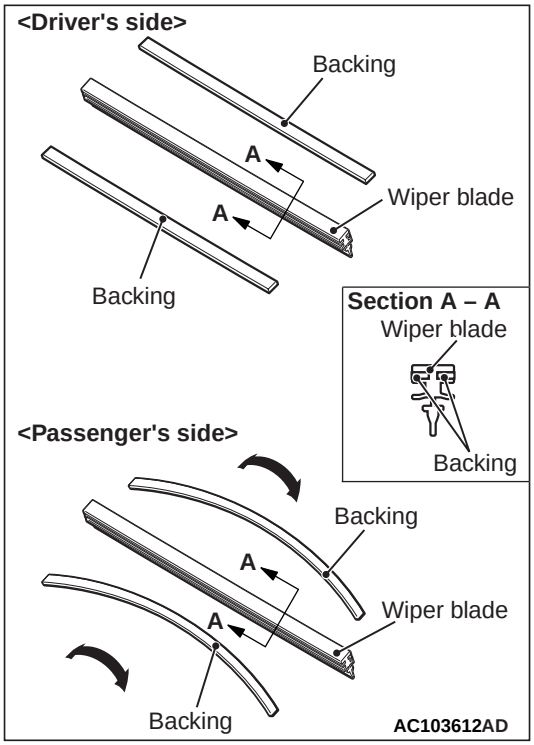
>>B<< WIPER ARM INSTALLATION



Install the wiper arms and blades at the specified positions shown above.

>>C<< WIPER BLADE INSTALLATION

⚠ CAUTION



For good windshield wiper wiping performance, use a driver's side windshield wiper without curve in the backings of the wiper blade. The windshield wiper on the passenger's side should be a wiper blade with curved backings.

INSPECTION

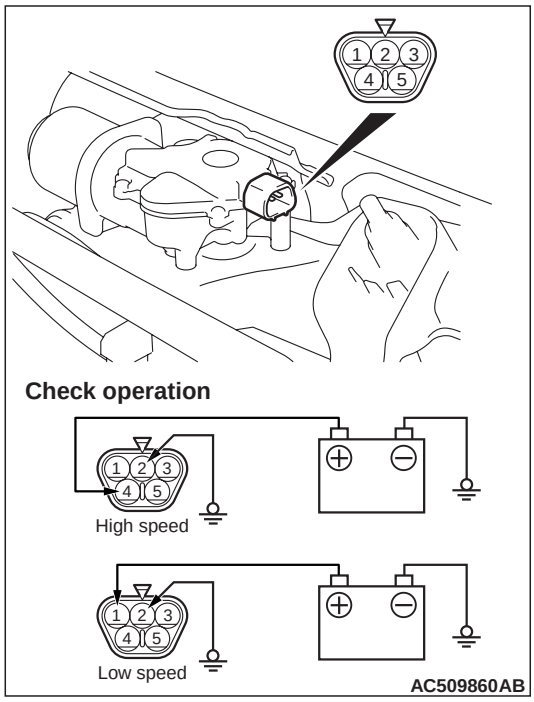
M1511008000500

WINDSHIELD WIPER MOTOR CHECK

Inspect the windshield wiper motor by removing the harness connector with the motor attached to the vehicle.

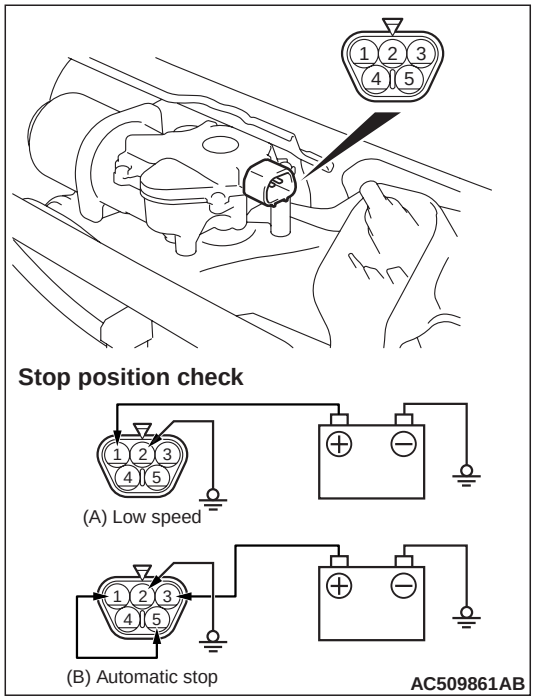
3. As shown in the illustration (B), connect the

WIPER MOTOR AT LOW OR HIGH SPEED OPERATION



Connect the battery to the wiper motor to inspect the operation of motor rotation at low or high speed.

WIPER MOTOR AT STOP POSITION OPERATION

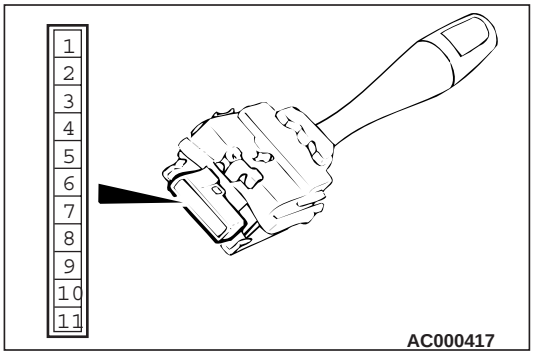


1. Connect the battery to the wiper motor as shown in the illustration (A).
2. Run the wiper motor at low speed, then disconnect the battery in the middle of the motor rotation and check to see that the motor stops.

terminals of the wiper motor connector.

4. Check to see that the wiper motor runs at low speed and then stops at the automatic stop position.

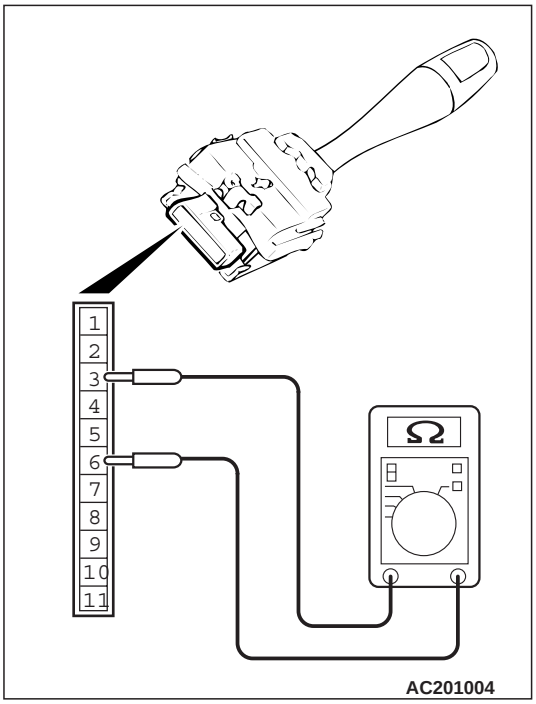
WINDSHIELD WIPER AND WINDSHIELD WASHER SWITCH CHECK



Check continuity between the switch terminals.

Switch position	Tester connection	Specified condition
OFF	6 – 11, 6 – 10, 6 – 9, 6 – 8, 6 – 7	Open circuit
Windshield mist wiper switch	6 – 11	Continuity exists (2 Ω or less)
Windshield intermittent wiper switch	6 – 10	
Windshield low-speed wiper switch	6 – 9	
Windshield high-speed wiper switch	6 – 8	
Windshield washer switch	6 – 7	

WINDSHIELD INTERMITTENT WIPER VOLUME CHECK

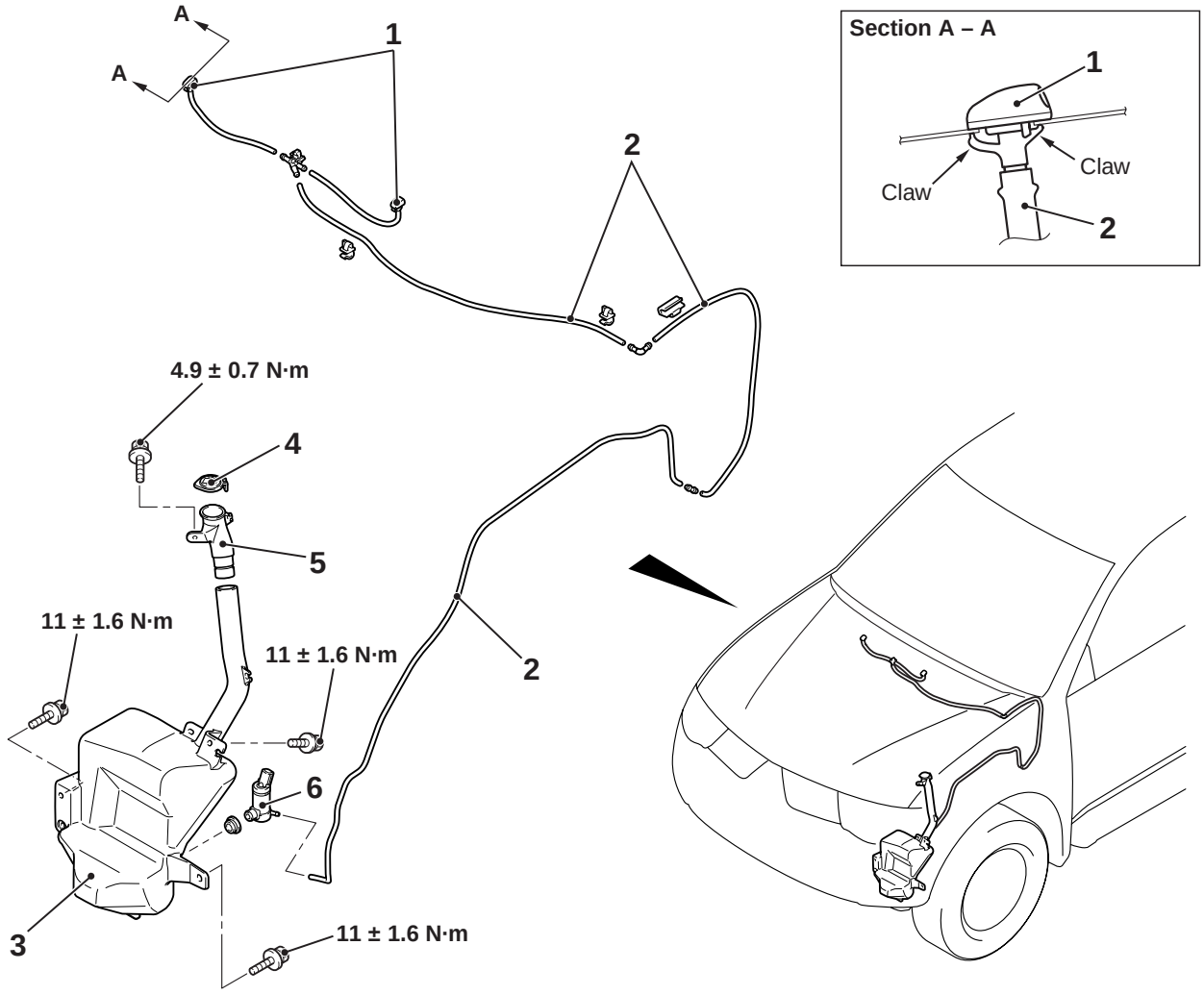


Check that the resistance varies between 0 and 1 kΩ when the windshield intermittent volume is turned from FAST to SLOW by after measuring resistance between connector terminals 3 and 6 at the column switch.

WINDSHIELD WASHER

REMOVAL AND INSTALLATION

M1511008200838



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Windshield washer nozzle removal steps

- Connection of windshield washer hose

1. Windshield washer nozzle

Washer hose removal steps

- Splash shield (LH) (Refer to GROUP 42, Fender .)
- Connection of windshield washer nozzle/washer tank

2. Windshield washer hose

Washer tank removal steps

- Splash shield (LH) (Refer to GROUP 42, Fender .)
- Connection of windshield washer hose

Washer tank removal steps

3. Windshield washer tank
4. Washer tank filler cap
5. Washer tank filler hose
6. Windshield washer motor

Washer motor removal steps

- Splash shield (LH) (Refer to GROUP 42, Fender .)
- Connection of windshield washer hose

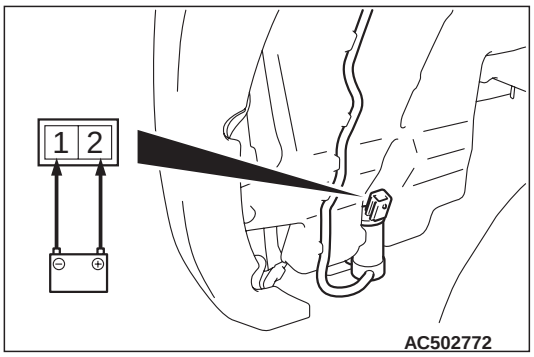
6. Windshield washer motor

NOTE: For removal and installation of the wiper and washer switch, refer to GROUP 54A, Column switch .

INSPECTION

M1511008300813

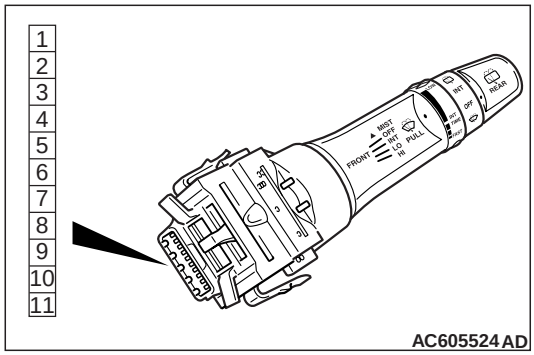
WINDSHIELD WASHER MOTOR CHECK



1. Remove the washer tank assembly with the washer hose connected. Then fill the washer tank with water.
2. Check to see that the water is vigorously sprayed when connecting the terminals as shown in the illustration.

WINDSHIELD WASHER SWITCH CHECK

<LH DRIVE VEHICLES>



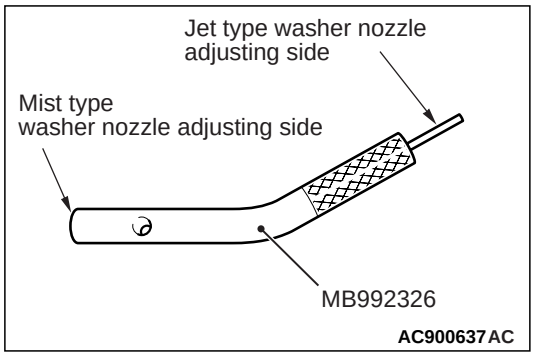
Switch position	Tester connection	Specified condition
OFF	6 – 7	Open circuit
Windshield washer switch ON	6 – 7	Continuity exists (2 Ω or less)

<RH DRIVE VEHICLES>

Check the windshield washer switch from the ETACS diagnosis codes for proper operation (Refer to GROUP 54A, ETACS).

WINDSHIELD WASHER FLUID EJECTION CHECK

NOTE: Be sure to use the special tool, washer nozzle adjustment tool (MB992326) to adjust the splashing points of the nozzle.

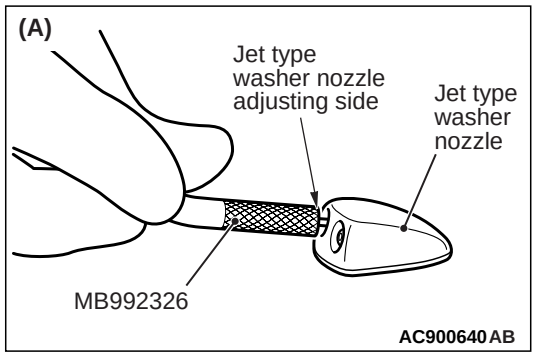


ADJUSTMENT OF THE JET TYPE WASHER NOZZLE INJECTION POSITION

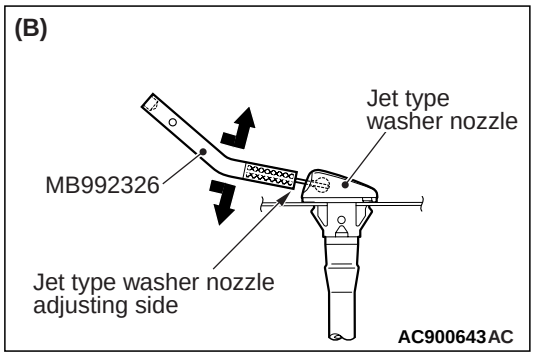
⚠ CAUTION

Adjust the splashing position within the specified adjustment range, otherwise the windshield glass cannot be washed properly.

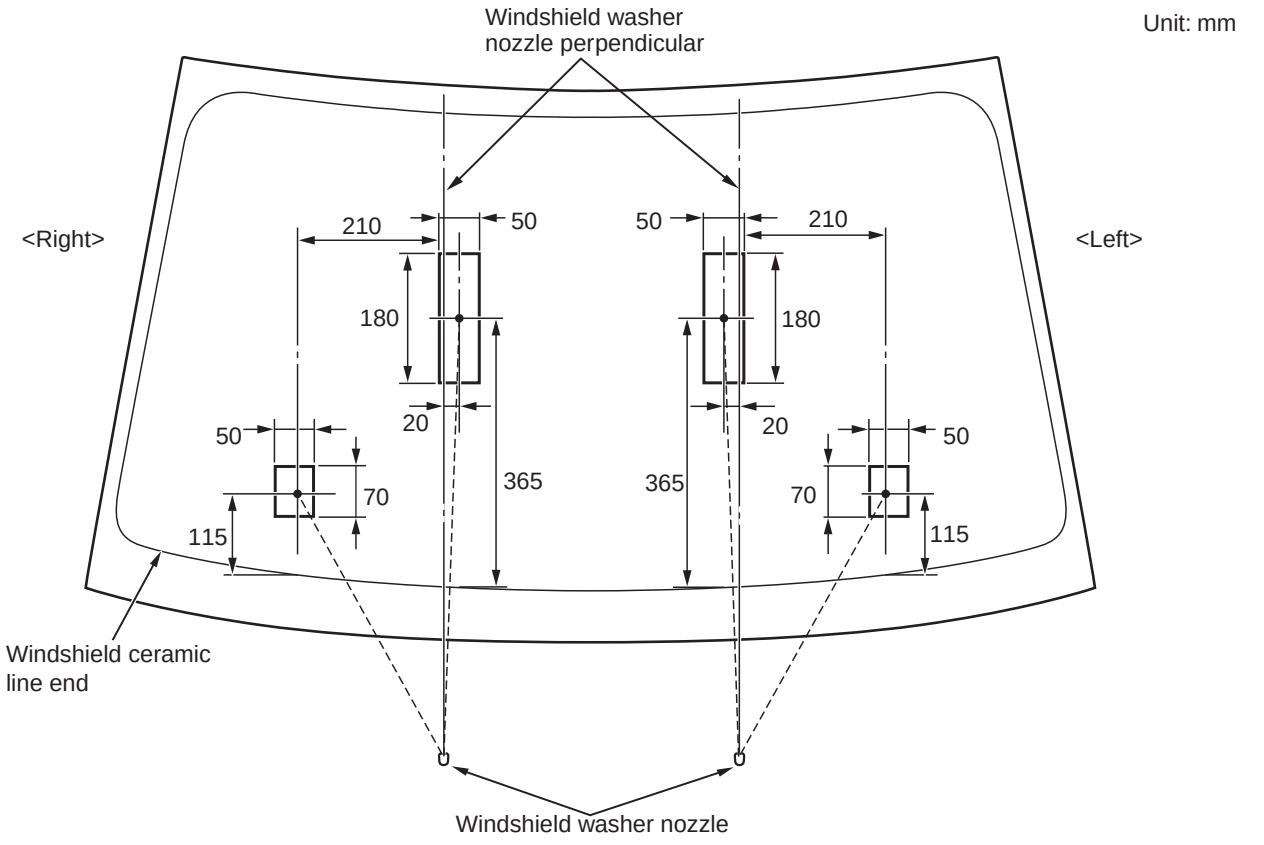
1. Use the special tool, washer nozzle adjustment tool (MB992326) to adjust the splashing points of the nozzle.



2. Insert the jet type washer nozzle adjusting side of the special tool (MB992326) into the injection part of the washer nozzle as shown in figure (A).



3. Move the special tool (MB992326) up and down to adjust the angle of the washer nozzle as shown in figure (B).



LIGHTING CONTROL SENSOR

LIGHTING CONTROL SENSOR REMOVAL AND INSTALLATION

M1511028300064

For removal and installation, refer to GROUP 54A, Lighting control sensor .

Lighting control sensor (rain sensor) adaptation

M1511028600106

⚠ CAUTION

- **Before performing the adaptation, check if the lighting control sensor (rain sensor)-related diagnosis code is set in the lighting control sensor (rain sensor).**
- **Turn the wiper switch to the OFF position.**

1. Clean the windshield in fine weather.

2. Wipe the surface of the windshield thoroughly, and check that the surface is dry.
3. Turn the ignition switch to the ON position.
4. Turn the ignition switch to the LOCK (OFF) position.

⚠ CAUTION

Before connecting or disconnecting M.U.T.-III, always turn the ignition switch to the LOCK (OFF) position.

5. Connect the M.U.T.-III to the diagnosis connector.
6. Turn the ignition switch to the ON position.
7. Wipe the windshield surface of the lighting control sensor section thoroughly, and check that the surface is dry.
8. Select "LIN" on the "System Select" screen, and press the "OK" button.
9. Select "Rain light sensor" on the "System Select" screen, and press the "OK" button.
10. Select "Special Function" on the "Rain light sensor" screen.
11. Select "Rain Sensor Adaptation" on the "Special Function" screen.
12. Press the "OK" button, and execute the "Rain Sensor Adaptation."
13. Press the "OK" button after the execution screen is displayed.
14. Press the "OK" button after "Completed" is displayed.

HEADLAMP WASHER

TROUBLESHOOTING

DIAGNOSIS TROUBLESHOOTING FLOW

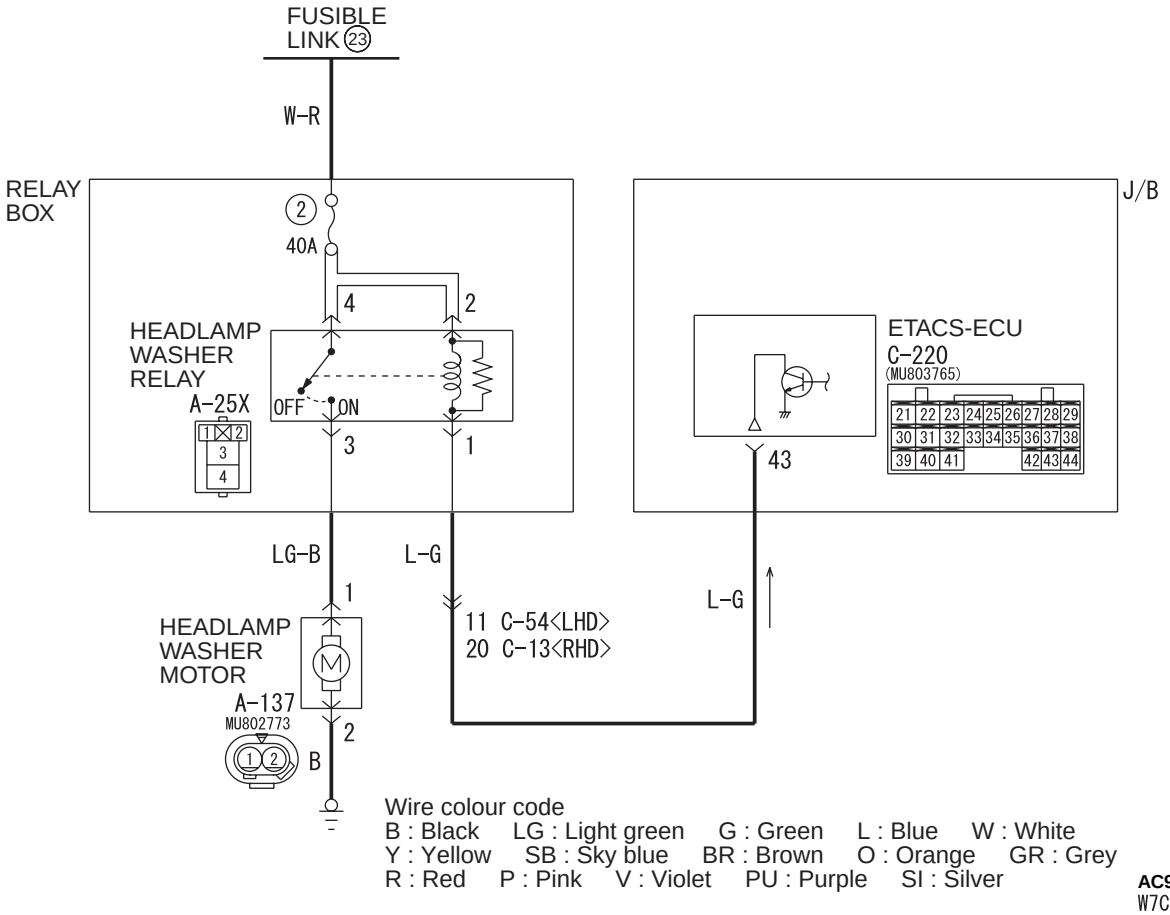
M1511014600396

Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – Contents of Trouble-shooting .

Inspection Procedure: The headlamp washer does not work.

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Headlamp Washer Motor Circuit



COMMENTS ON TROUBLE SYMPTOM
The headlamp washer motor, the headlamp washer relay, the column switch or the ETACS-ECU may be defective.

POSSIBLE CAUSES
- Malfunction of the headlamp washer motor
- Malfunction of the headlamp washer relay
- Malfunction of the column switch
- Malfunction of the ETACS-ECU
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code.
When the ignition switch is turned to the LOCK (OFF) position, check that the ETACS-ECU does not set the diagnosis code.

Q: Is the diagnosis code set?
YES : Refer to GROUP 54A, Diagnosis Code Chart .
NO : Go to Step 2.

STEP 2. M.U.T.-III data list

Check the input signals below which are related to the headlamp washer.

- Ignition switch: ON
- Headlamp washer switch: ON

Item No.	Item name	Normal condition
30	Ignition switch (IG1)	ON
64	Head lamp washer output	ON

OK: Normal conditions are displayed for all the items.

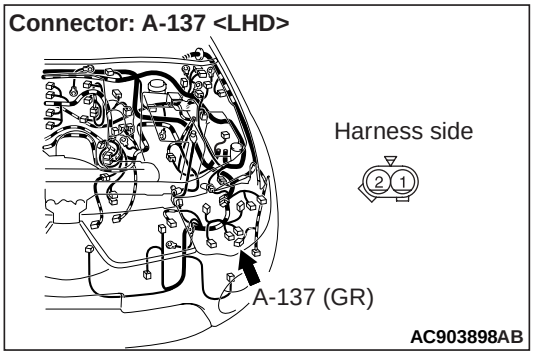
Q: Is the check result normal?

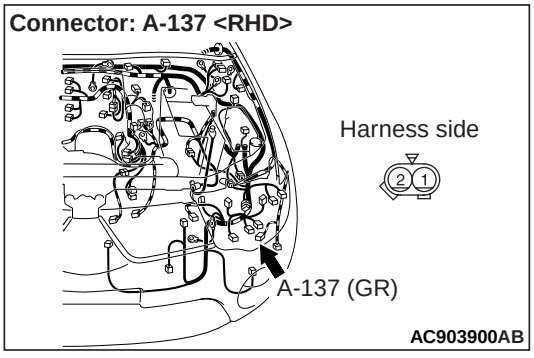
All the signals are received normally. : Go to Step 3.

The ignition switch (IG1) signal is not received. : Refer to GROUP 54A, Inspection Procedure C-3 "The ignition switch (IG1) signal is not received ."

The headlamp washer switch signal is not received. : Refer to GROUP 54A Inspection Procedure C-1 "The column switch (lighting and wiper switch) signal is not received ."

STEP 3. Connector check: A-137 headlamp washer motor connector





Q: Is the check result normal?

YES : Go to Step4.

NO : Repair the connector.

STEP 4. Check the headlamp washer motor assembly.

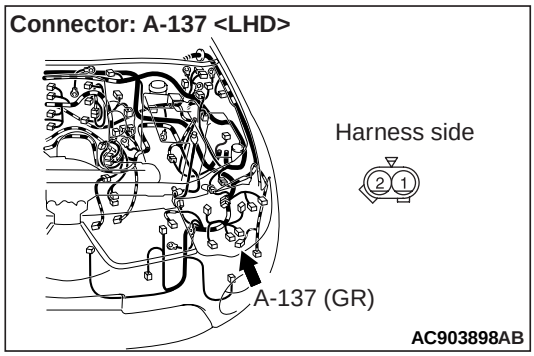
Refer to P.51-85.

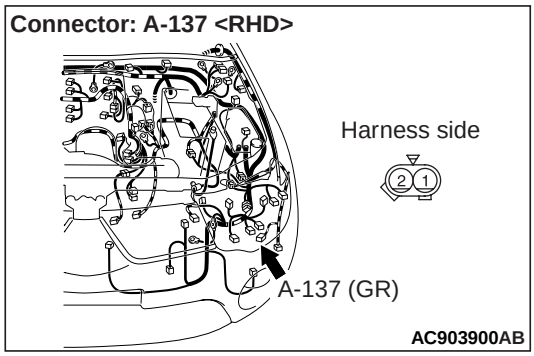
Q: Is the check result normal?

YES : Go to Step 5.

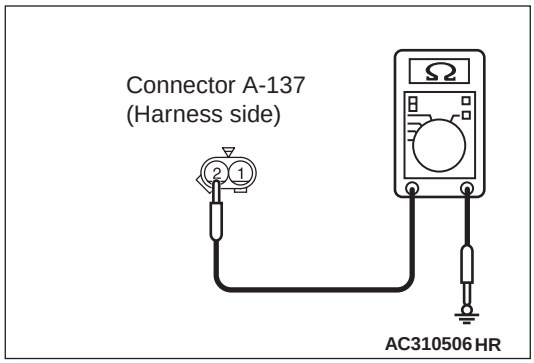
NO : Replace the headlamp washer motor.

STEP 5. Resistance measurement at the A-137 headlamp washer motor connector.





(1) Disconnect the connector, and measure at the wiring harness side.



(2) Continuity between A-137 headlamp washer motor connector terminal No.2 and body earth

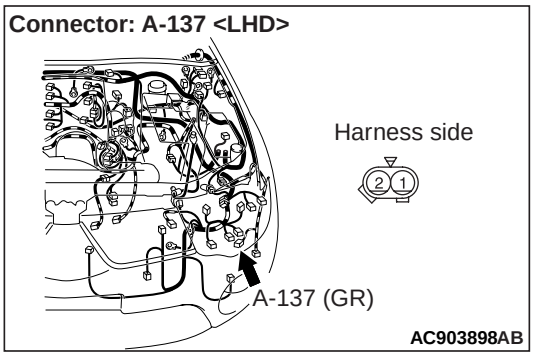
OK: Continuity exists (2 Ω or less)

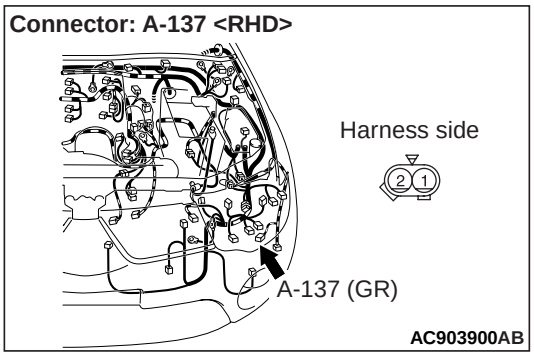
Q: Is the check result normal?

YES : Go to Step 7.

NO : Go to Step 6.

STEP 6. Check the wiring harness between A-137 headlamp washer motor connector terminal No.2 and body earth.





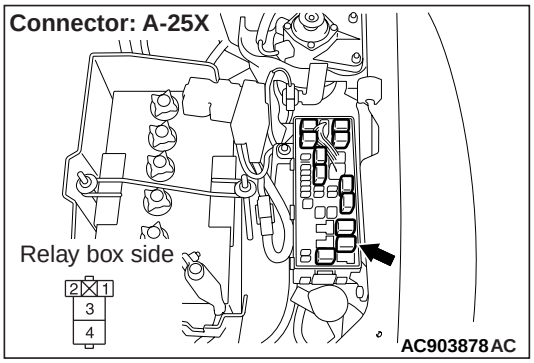
- Check the earth wires for open circuit.

Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

NO : Repair the wiring harness.

STEP 7. Connector check: A-25X headlamp washer relay connector



Q: Is the check result normal?

YES : Go to Step 8.

NO : Repair the connector.

STEP 8. Check the headlamp washer relay.

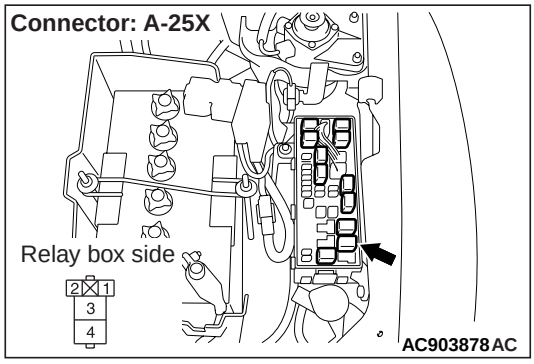
Refer to P.51-85.

Q: Is the check result normal?

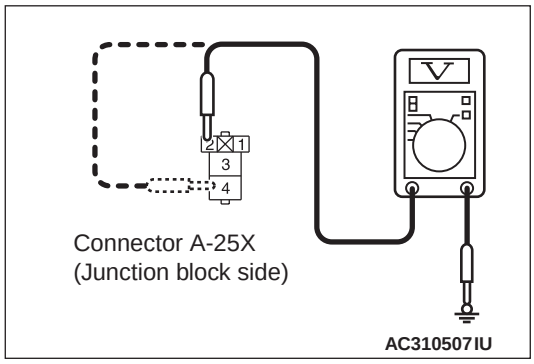
YES : Go to Step 9.

NO : Replace the headlamp washer relay.

STEP 9. Voltage measurement at the A-25X headlamp washer relay connector.



(1) Remove the headlamp washer relay, and measure at the junction block side.



(2) Check the voltage between the A-25X headlamp washer relay connector terminal No.2, 4 and body earth.

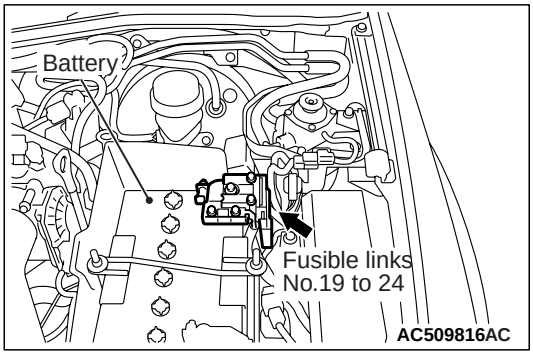
OK: System voltage

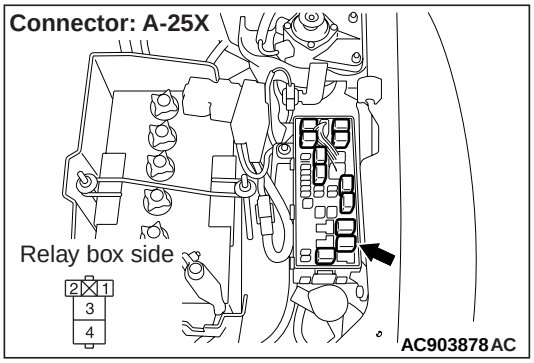
Q: Is the check result normal?

YES : Go to Step 11.

NO : Go to Step 10.

STEP 10. Check the wiring harness between A-25X headlamp washer relay connector terminal Nos.2, 4 and the fusible link (23).



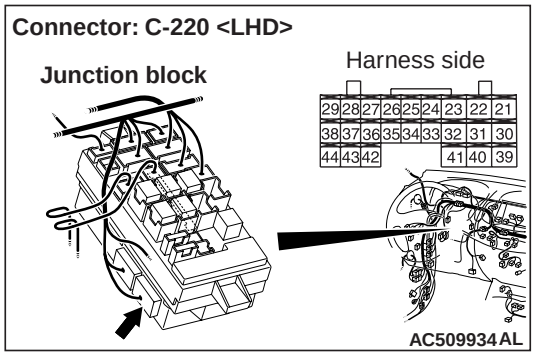


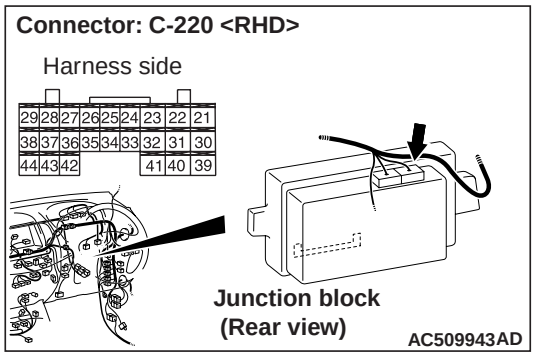
- Check the power supply line from the fusible link (23) for open circuit.

Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness.

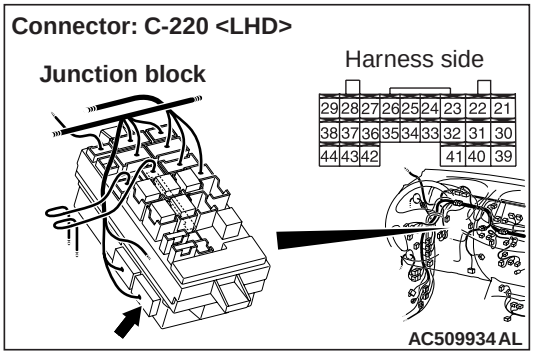
STEP 11. Connector check: C-220 ETACS-ECU connector

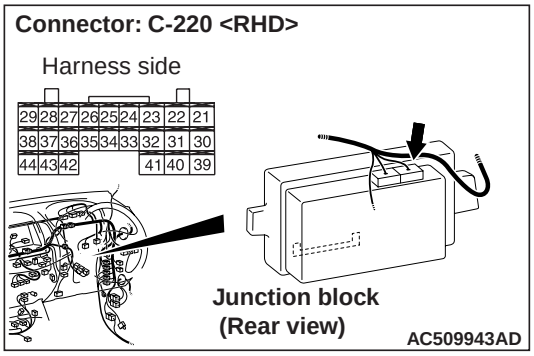


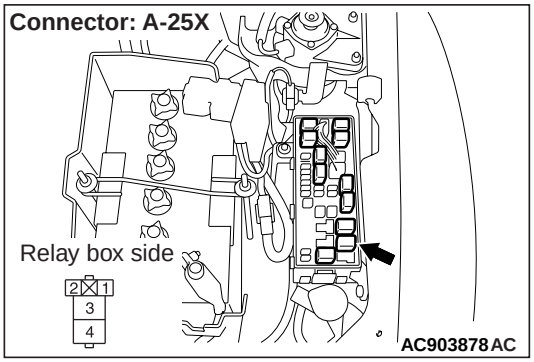


Q: Is the check result normal?
YES : Go to Step 12.
NO : Repair the connector.

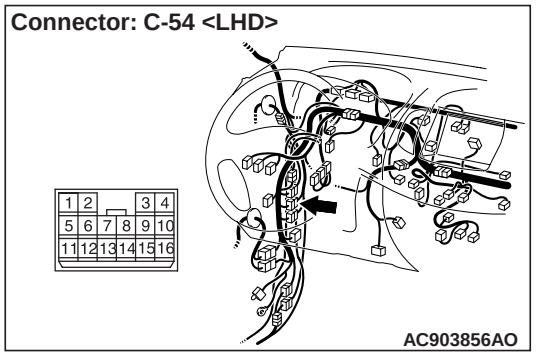
STEP 12. Check the wiring harness between C-220 ETACS-ECU connector terminal No.43 and A-25X headlamp washer relay connector terminal No.1.

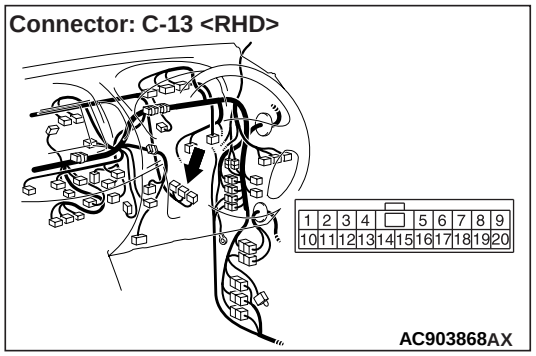






NOTE:





Prior to the wiring harness inspection, check the intermediate connector C-54 <LHD> or C-13 <RHD>, and repair if necessary.

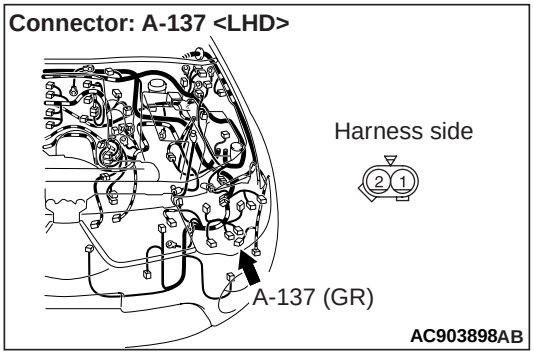
- Check the output line for open circuit.

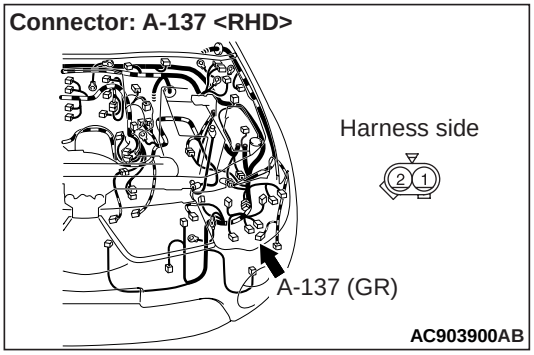
Q: Is the check result normal?

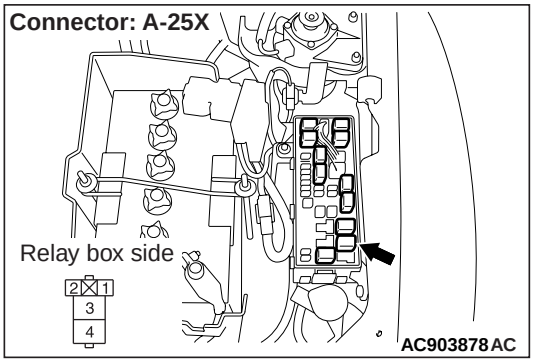
YES : Go to Step 13.

NO : Repair the wiring harness.

STEP 13. Check the wiring harness between A-137 headlamp washer motor connector terminal No.1 and A-25X headlamp washer relay connector terminal No.4.







- Check the output line to headlamp washer motor for open circuit.

Q: Is the check result normal?

YES : Go to Step 14.
NO : Repair the wiring harness.

STEP 14. Retest the system.

The headlamp washer should now work normally.

Q: Is the check result normal?

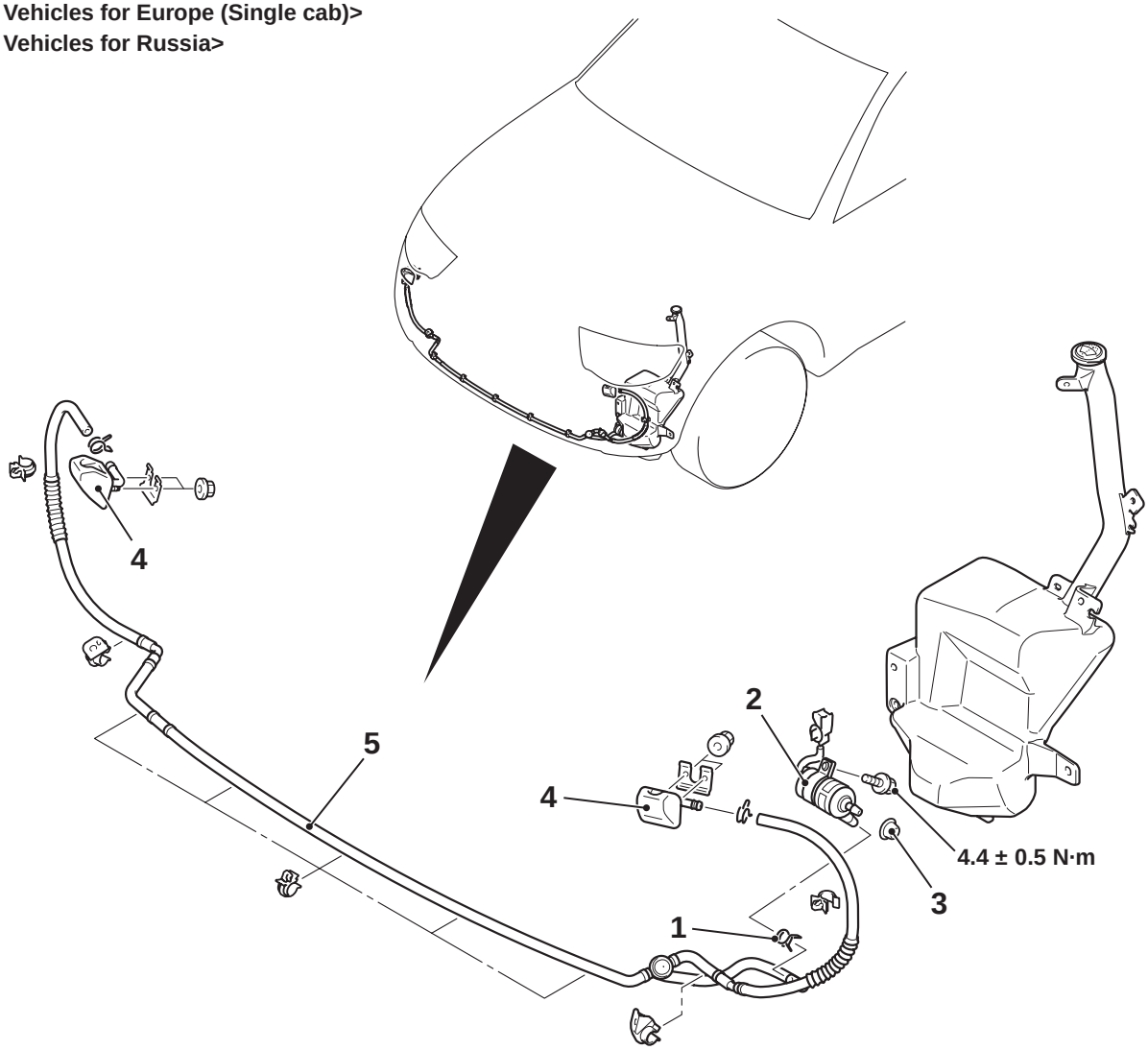
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Replace the ETACS-ECU and register the ID codes.

HEADLAMP WASHER

REMOVAL AND INSTALLATION

M1511009700386

<Type1: Vehicles for Europe (Single cab)>
<Type1: Vehicles for Russia>



AC510124AC

Removal steps

- Splash shield (LH) (Refer to GROUP 42, Splash shield .)
- Washer fluid draining

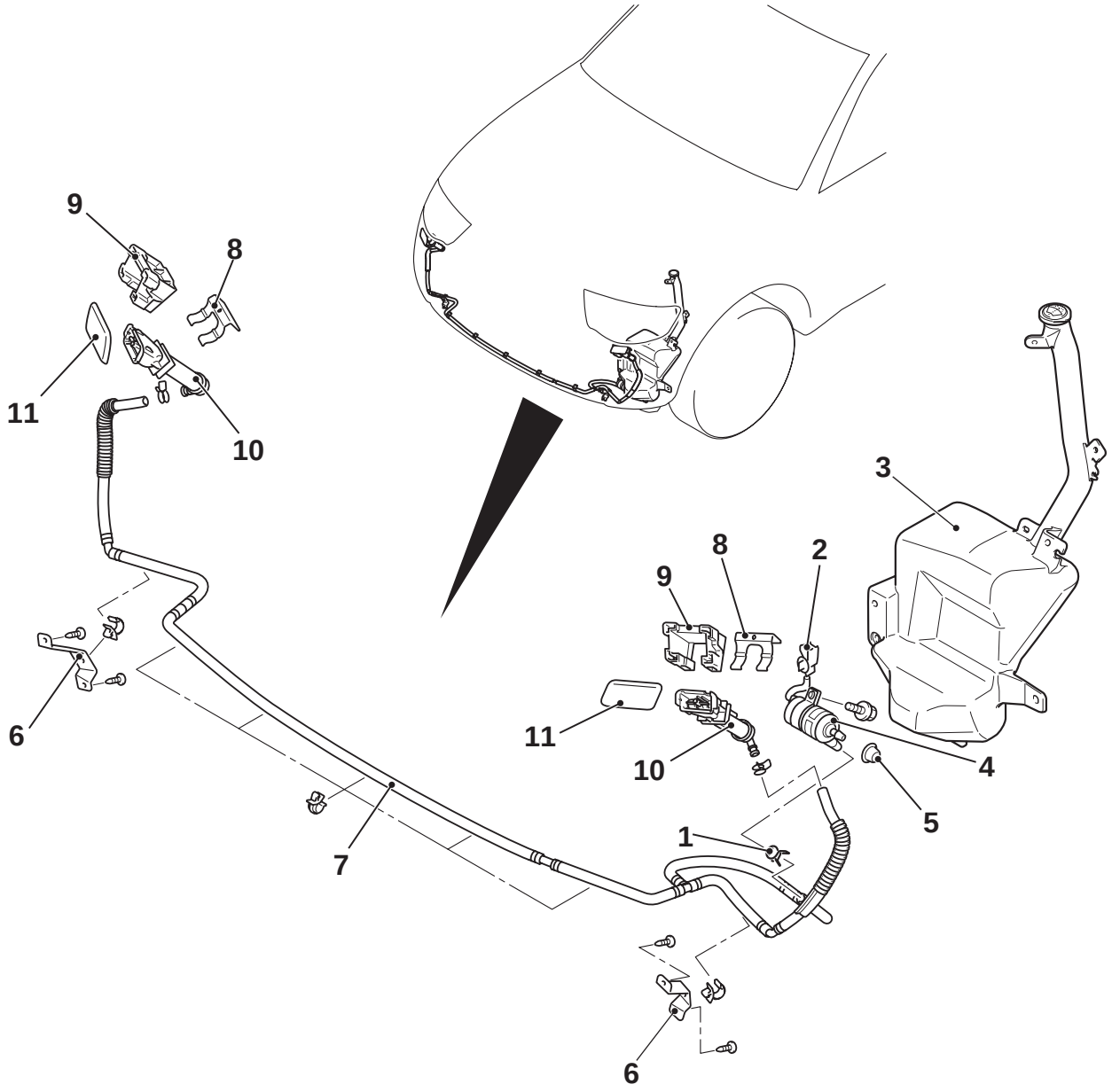
1. Headlamp washer hose connection
- Headlamp washer motor connector connection

Removal steps (Continued)

2. Headlamp washer motor
3. Packing
- Front bumper (Refer to P.51-3 .)

4. Headlamp washer nozzle
5. Headlamp washer hose assembly

<Type2: Vehicles for Europe (Club and double cab)>



AC807299 AD

Removal steps

- Front bumper (Refer to P.51-3)
- Washer fluid draining

1. Headlamp washer hose connection (headlamp washer motor side)
2. Headlamp washer motor connector connection
3 Windshield washer tank (Refer to P.51-73)
4. Headlamp washer motor

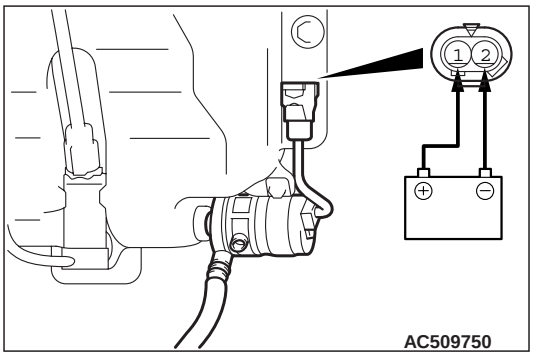
Removal steps (Continued)

5. Packing
6. Headlamp washer hose bracket
7. Headlamp washer hose
8. Headlamp washer clamp
9. Headlamp washer collar
10. Headlamp washer actuator assembly
11. Headlamp washer cover

INSPECTION

M1511019103135

HEADLAMP WASHER MOTOR CHECK

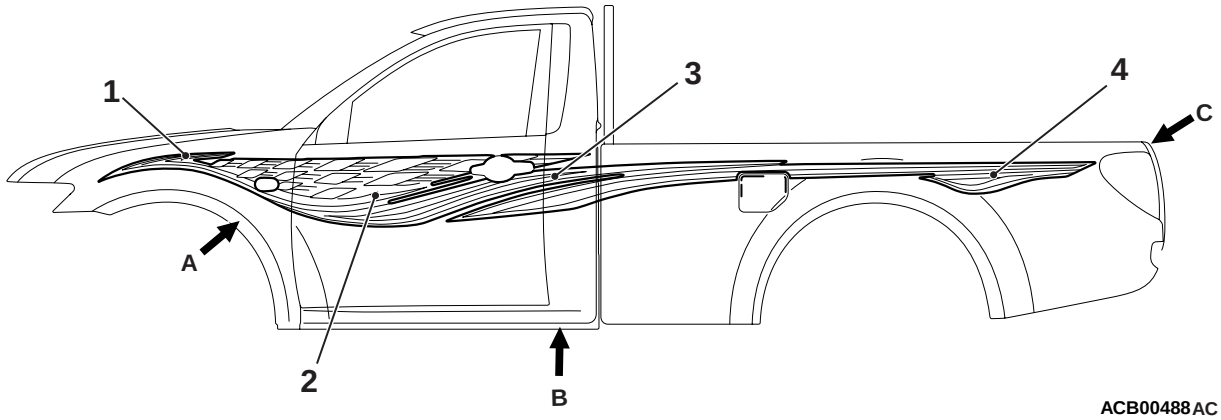


1. Remove the headlamp washer motor connector.
2. Check to see that the water is vigorously sprayed when connecting the positive battery terminal to terminal number 1 and terminal number 2 to the negative battery terminal.

STRIPE TAPE <VEHICLES FOR MOROCCO>

REMOVAL AND INSTALLATION

M1511012100168



Removal steps

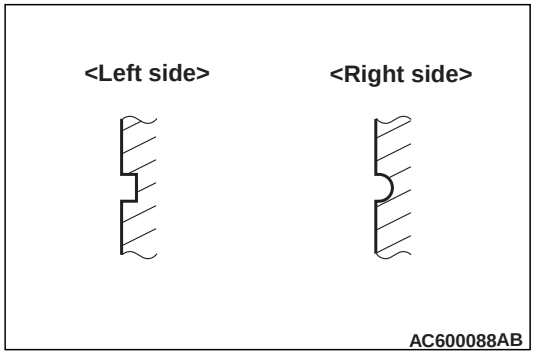
>>**A**<< 1. Front fender tape
>>**A**<< 2. Front door tape
>>**A**<< 3. Rear pillar tape
>>**A**<< 4. Side gate tape
>>**A**<< 5. Rear door tape
>>**A**<< 6. Rear pillar tape
>>**A**<< 7. Side gate tape

INSTALLATION SERVICE POINT

>>A<< STRIPE TAPES INSTALLATION

1. Clean the tapes installation surfaces on the body with the parts cleaner (MZ100387 or equivalent).

⚠ CAUTION

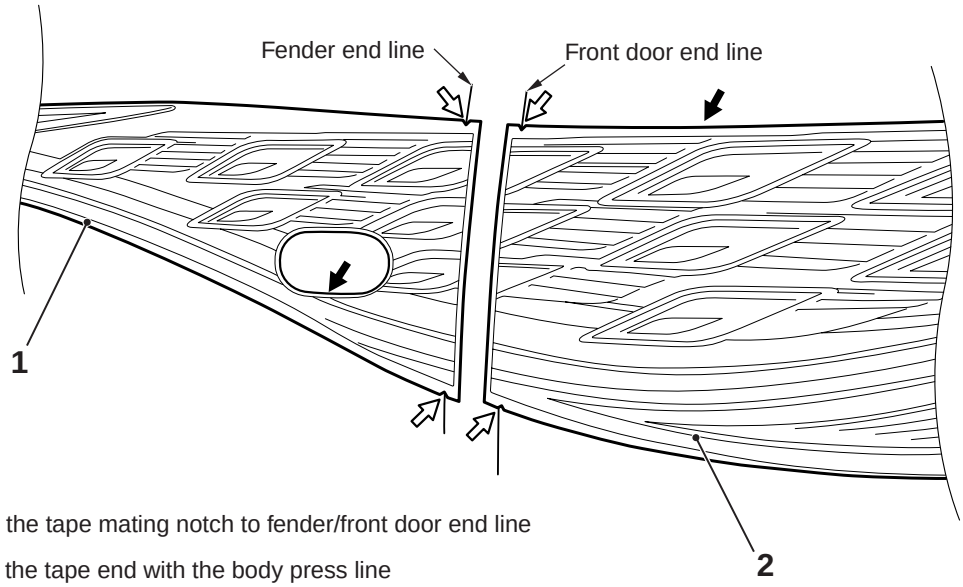


Stripe tapes have different notches for identifying the left or right side as shown besides tape mating notches.

- **When attaching the tapes, the surrounding temperature should be 20 - 38°C and air should completely free from dust.**
- **If the surrounding temperature is lower then 20°C, the tapes and the places on the body where the tapes are to be attached should be heated to 20 - 30°C.**

2. Peel off the backing paper from the reverse side of the tapes, and then attach them to the vehicle body so that they fit properly in position.

View A
1. Front fender tape
2. Front door tape



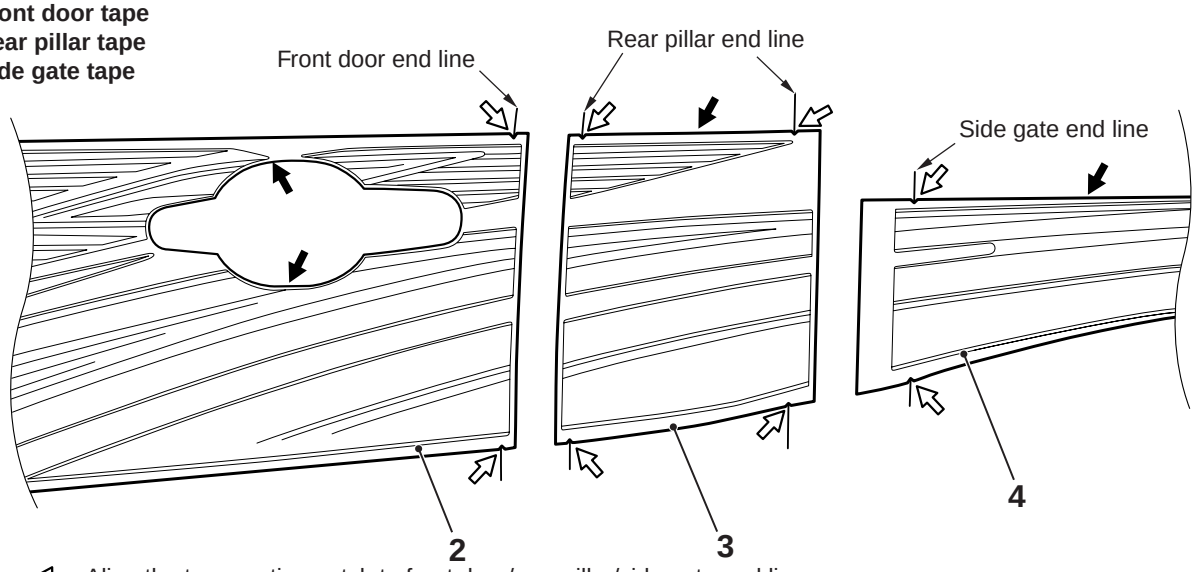
⇦ : Align the tape mating notch to fender/front door end line

⬅ : Align the tape end with the body press line

ACB00410AB

View B

2. Front door tape
3. Rear pillar tape
4. Side gate tape



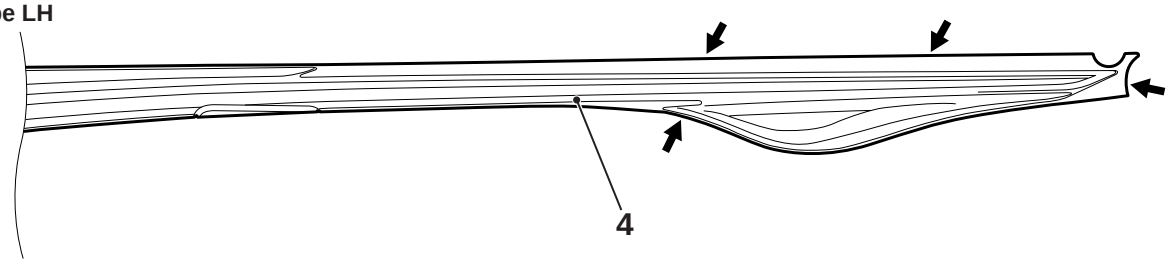
⇦: Align the tape mating notch to front door/rear pillar/side gate end line

⬅: Align the tape end with the body press line

ACB00411AC

View C

4. Side gate tape LH

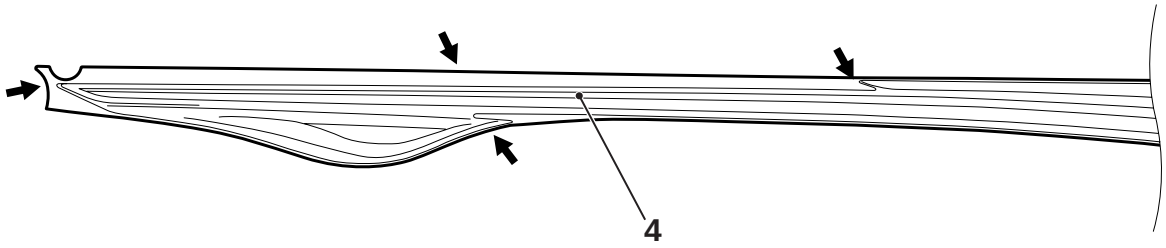


⬅: Align the tape end with the body press line

ACB00412AB

View C

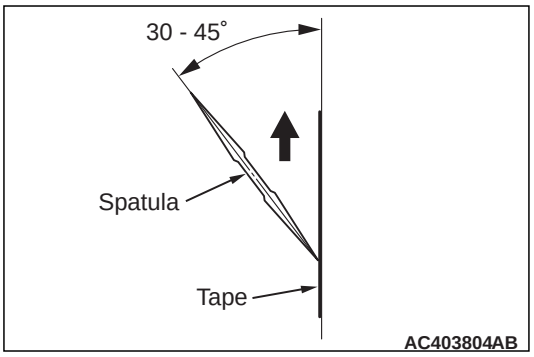
4. Side gate tape RH



⬅: Align the tape end with the body press line

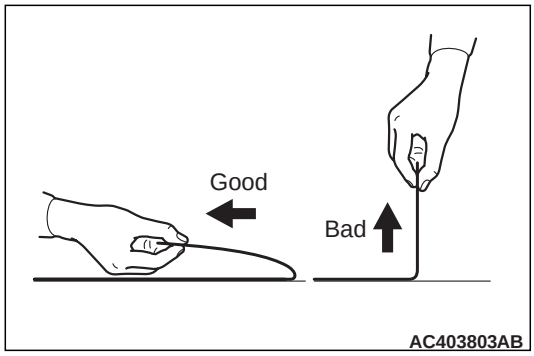
ACB00413AB

⚠ CAUTION



- **If the special tool (spatula) slides to the side, there will be slack at the end of the tape, causing wrinkles, and the tape may deviate from the correct application position.**
- **If the tape is not applied properly, it may come off later.**

3. Attach the tapes so that no air bubbles get trapped under the surface. For adhesive-type tapes, use the special tool Stripe Tape Spatula (MB990528) to press down them evenly, starting from the centre and working toward the top and bottom, so that no air bubbles get trapped underneath.



4. For adhesive-type tapes, hold one edge of the application tape (surface protective layer) and slowly peel it off horizontally. If there are any air bubbles in the tape after application, use a sewing needle to make small holes in the bubbles, and use the corners of the special tool to press the air out.

MARK

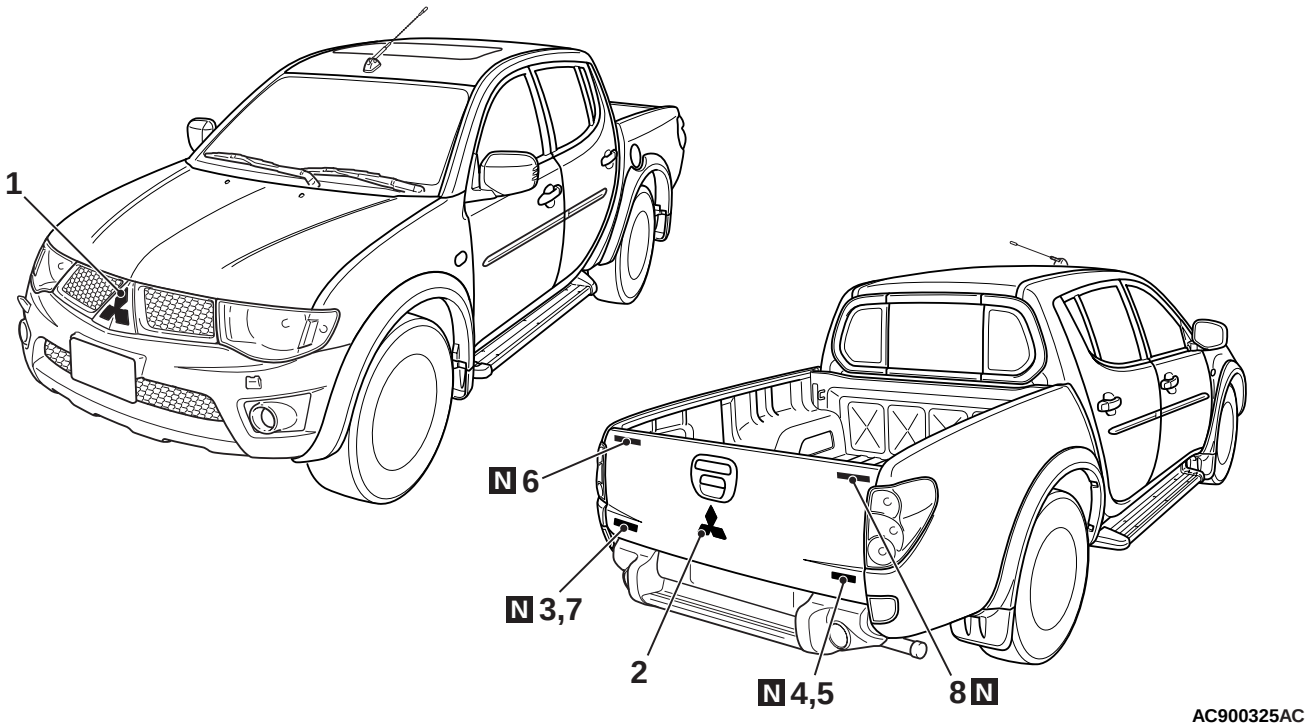
LUBRICANT

M1511000400140

Item		Specified lubricant	Quantity
Degrease agent	Grease and dirt removal from parts surface	Parts cleaner (MZ100387 or equivalent)	As required

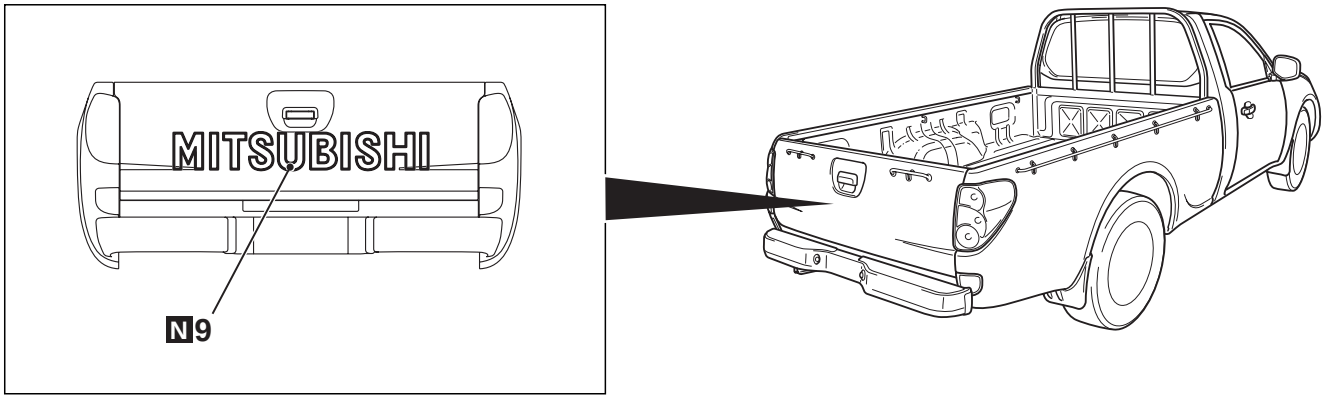
REMOVAL AND INSTALLATION

M1511011803840



AC900325AC

<Vehicles for MOROCCO optional>



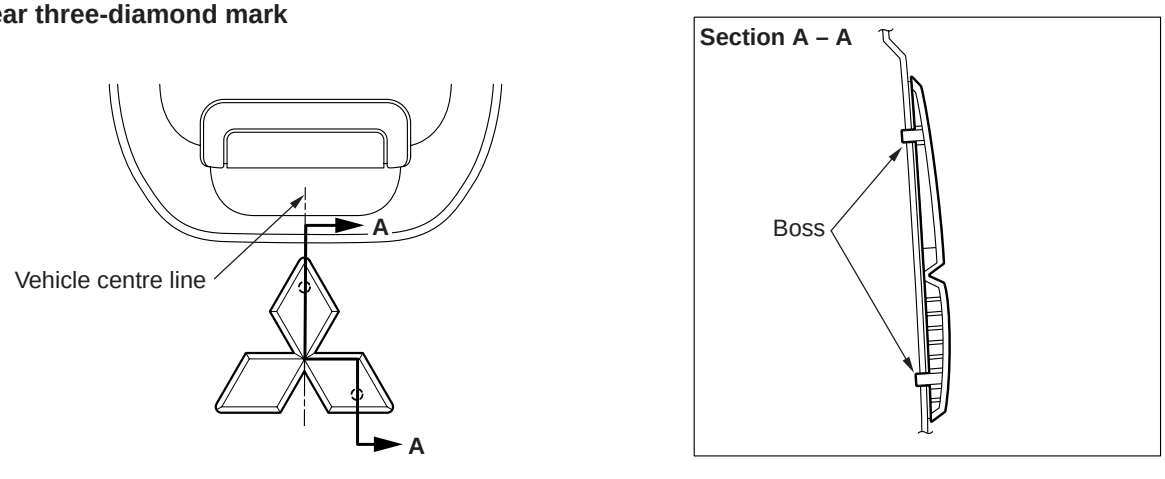
ACB00514AB

1. Front three-diamond mark (Refer to P.51-14 <Single cab>, P.51-5 <Club and Double cab>.)
>>A<< 2. Rear three-diamond mark (Refer to P.51-14.)
>>A<< 3. MITSUBISHI mark
>>A<< 4. L200 mark
>>A<< 5. DI-D and COMMON RAIL mark <Optional>
>>A<< 6. L200 and Sportero mark <Optional>
>>A<< 7. L200 and Sportero mark <Optional>
>>A<< 8. DI-D and COMMON RAIL mark <Optional>
>>A<< 9. MITSUBISHI decal <Vehicles for MOROCCO Optional>

INSTALLATION SERVICE POINT

>>A<< MARK INSTALLATION

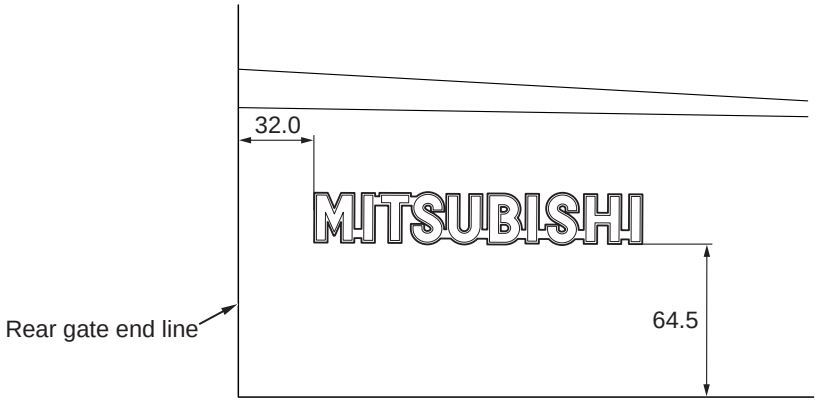
2. Rear three-diamond mark



AC500398AB

3. MITSUBISHI mark

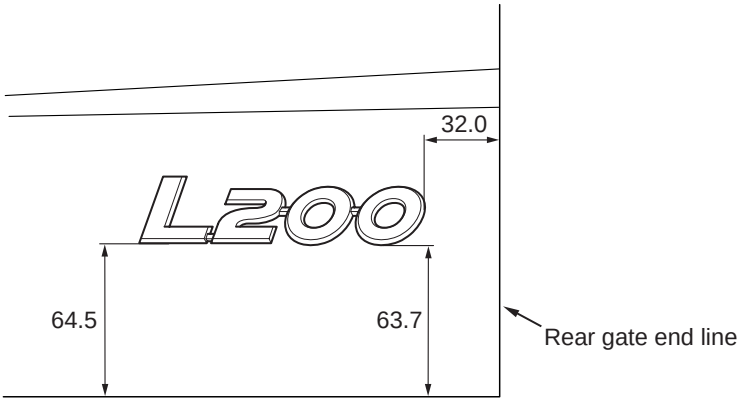
Unit: mm



AC805985AB

4. L200 mark

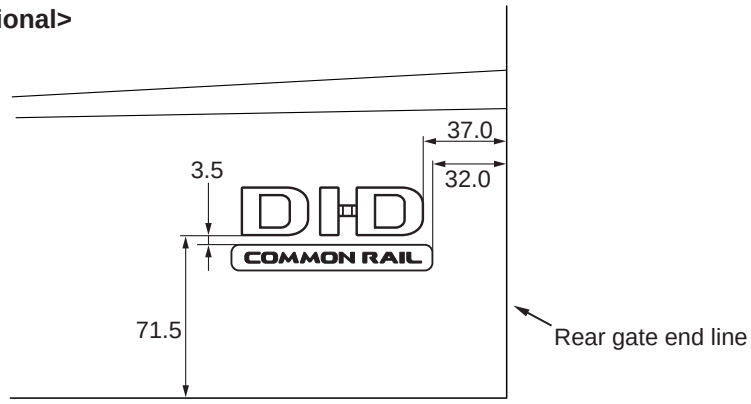
Unit: mm



AC805984AB

5. DI-D and COMMON RAIL mark <Optional>

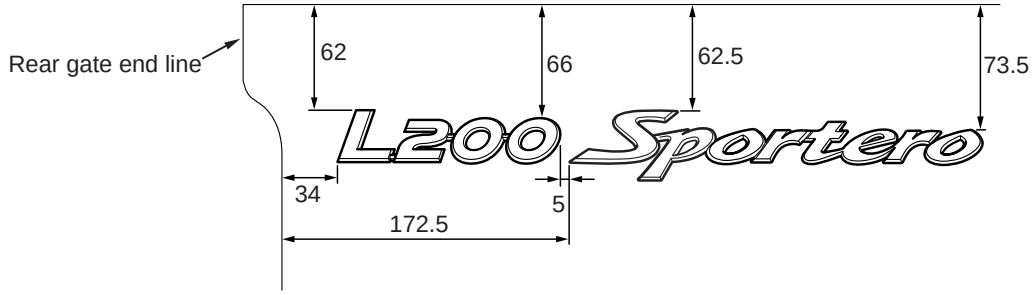
Unit: mm



AC903810 AB

6. L200 and Sportero mark <Optional>

Unit: mm

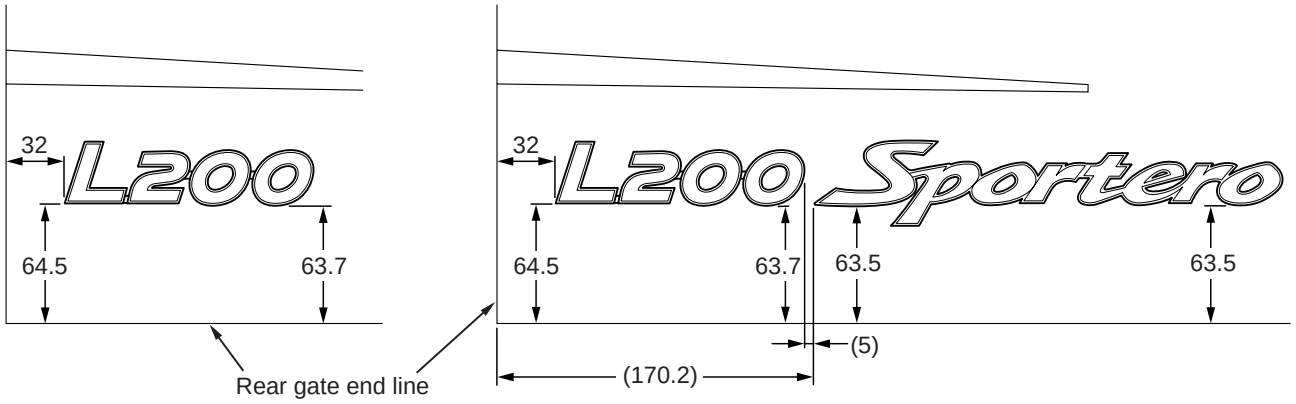


AC805987AB

7. L200 mark <Optional>

7. L200 SPORTERO mark <Optional>

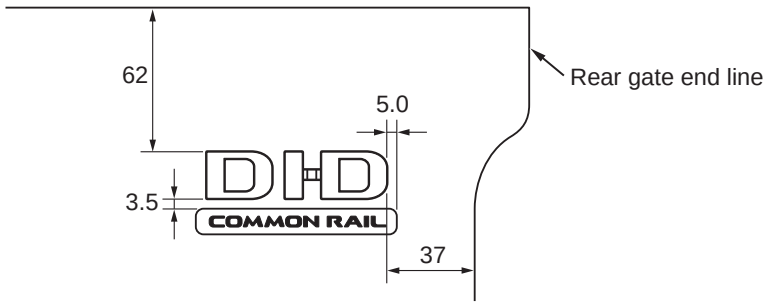
Unit: mm



AC809151AC

8. DI-D and COMMON RAIL mark <Optional>

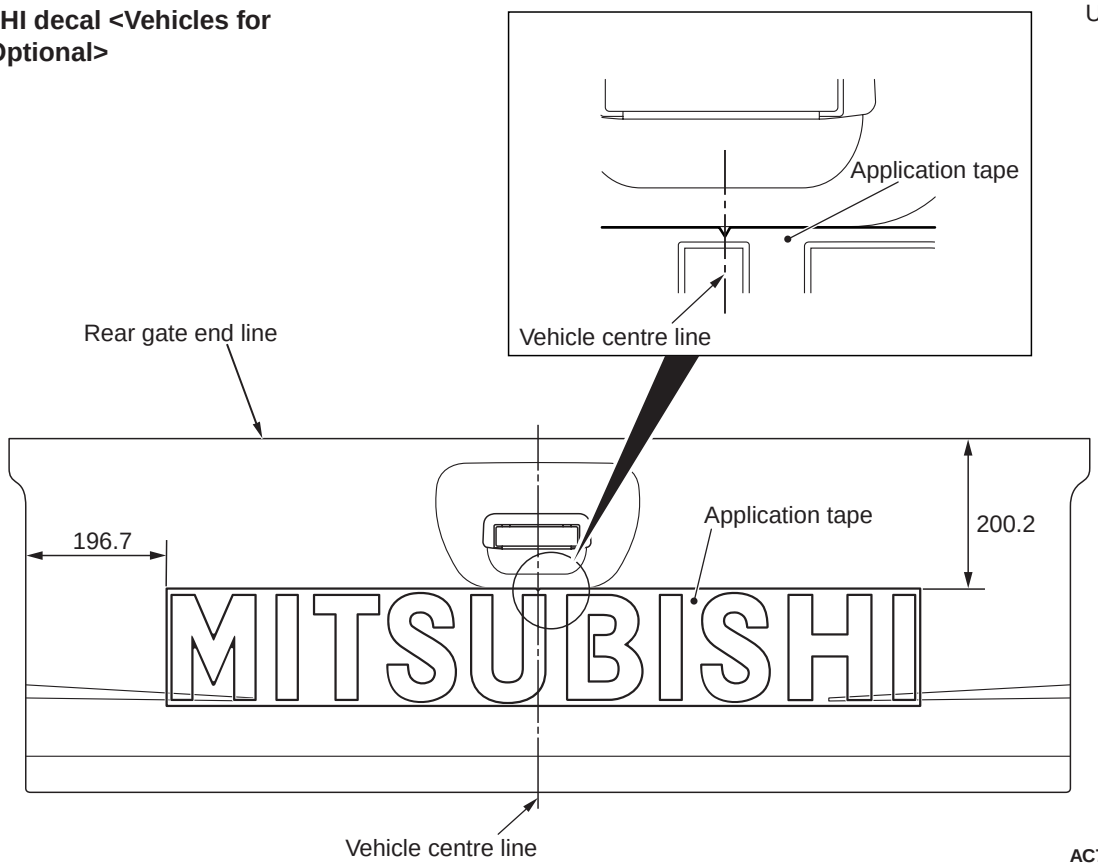
Unit: mm



AC903808AB

9. MITSUBISHI decal <Vehicles for MOROCCO Optional>

Unit: mm



AC711983 AC

1. Clean the mark installation surfaces on the body with the parts cleaner (MZ100387 or equivalent).

⚠ CAUTION
When attaching the marks, the ambient temperature should be 20 – 38°C and the air should be completely free of dust. If the ambient temperature is lower than 20°C, the marks and the places on the vehicle body where the marks are to be attached should be heated to 20 – 30°C.

2. Peel off the protection sheet on the back of the mark to paste it on the installation position.

OUTSIDE MIRROR

SERVICE SPECIFICATION

M1511000300789

Item	Standard value
Heated door mirror line resistance Ω	7.2 ± 1.4 at 25°C

TROUBLESHOOTING

DIAGNOSIS TROUBLESHOOTING FLOW

M1511014600385

Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – Contents of Troubleshooting .

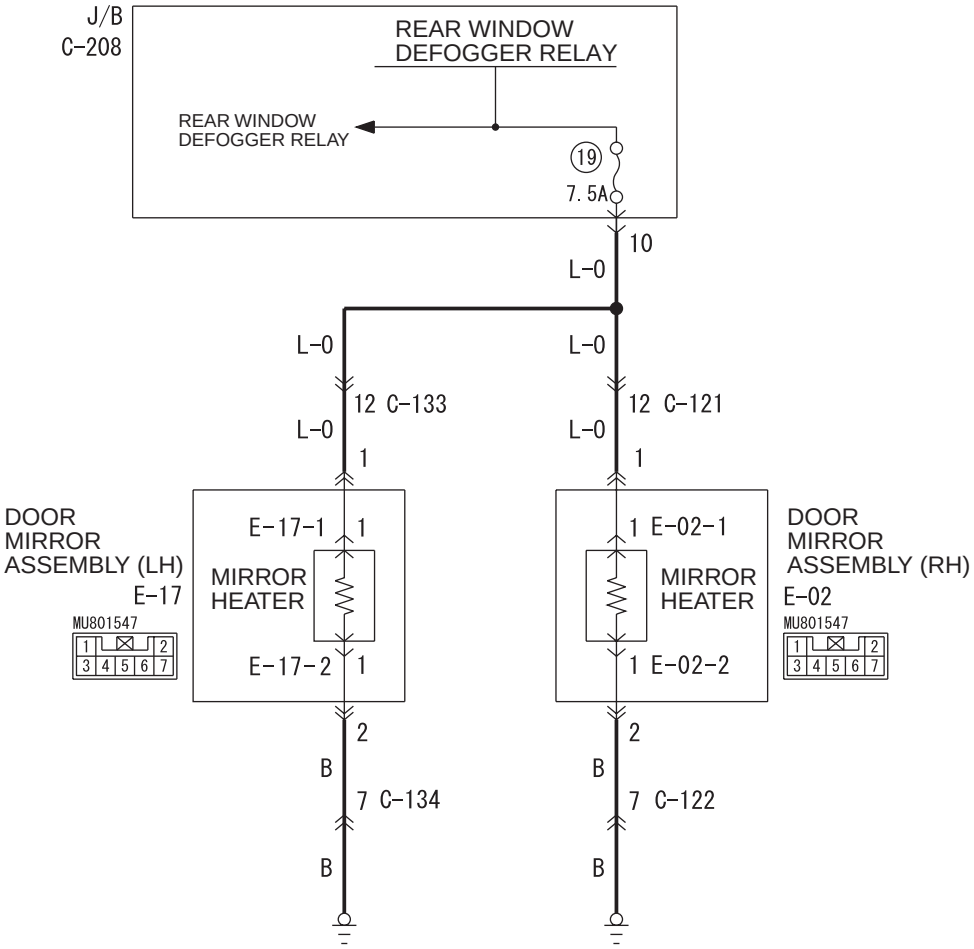
TROUBLE SYMPTOM CHART

M1511015000472

Symptom	Inspection procedure	Reference page
All heated door mirrors do not operate	1	P.51-93
The right or left heated door mirror does not operate	2	P.51-98

Inspection Procedure 1: All Heated Door Mirrors do not Operate

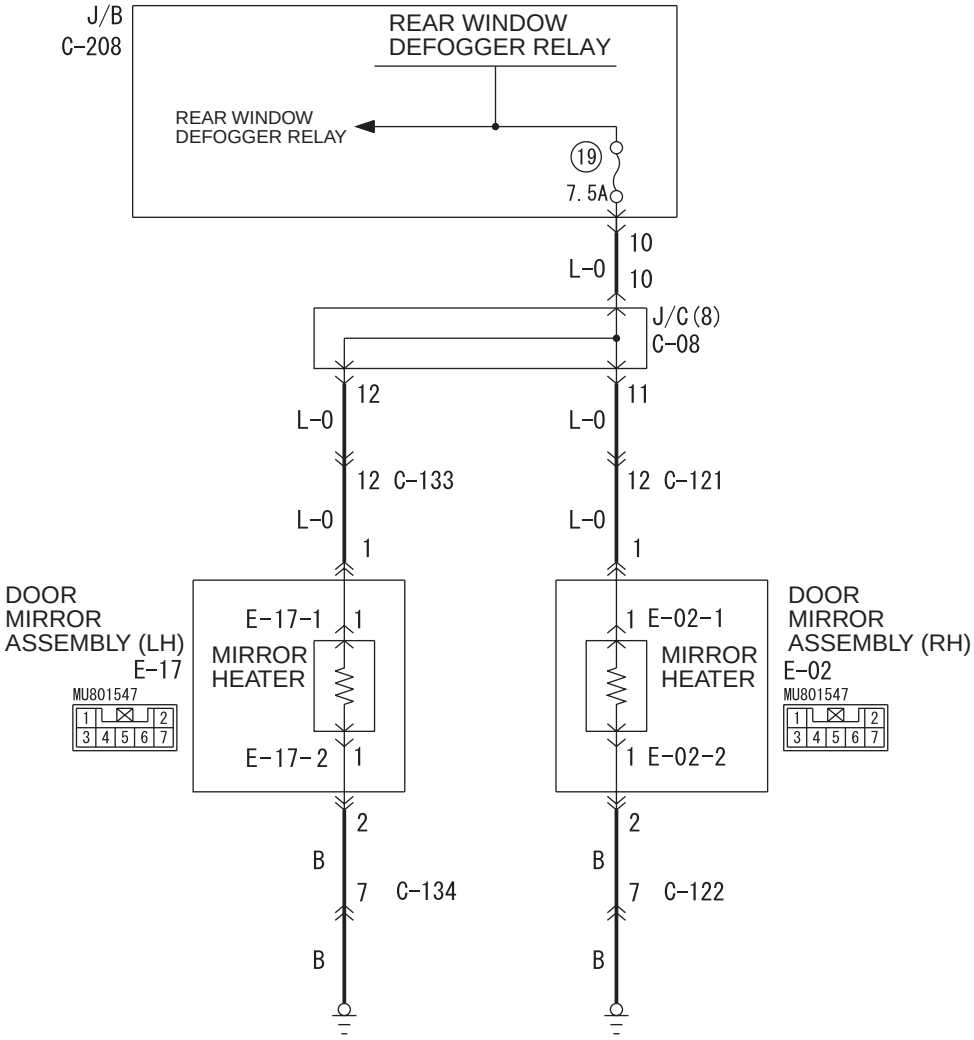
Heated Door Mirror <LHD> Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

AC903734AB
W7C51E005A

Heated Door Mirror <RHD> Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

AC903735AB
W7C51E006A

COMMENTS ON TROUBLE SYMPTOM

The heated door mirrors should work for approximately 20 minutes when the rear defogger switch is turned on. If the mirror heater does not work for the specified period, the defogger relay circuit (heated door mirror power supply circuit) may be defective.

POSSIBLE CAUSES

- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. Check the rear window defogger.

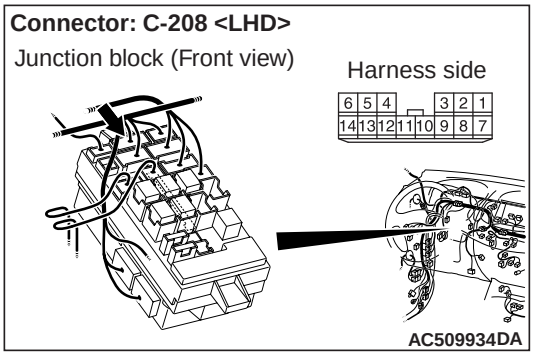
The rear defogger system should work normally (Refer to GROUP 54A, Printed Heater Lines Check).

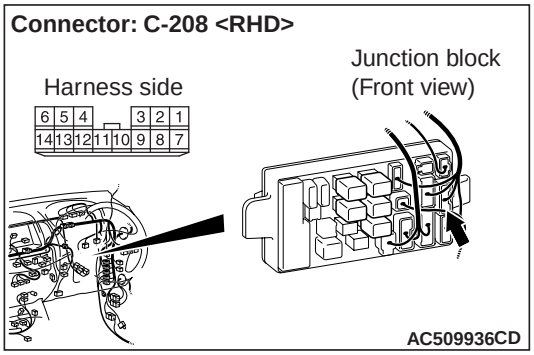
Q: Is the check result normal?

YES : Go to Step 2.

NO : Diagnose the rear window defogger (Refer to GROUP 55B, Troubleshooting).

STEP 2. Connector check: C-208 junction block connector.

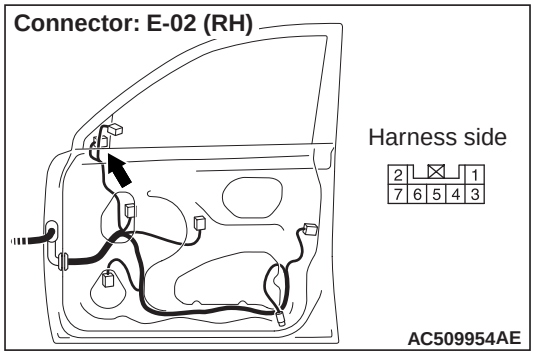


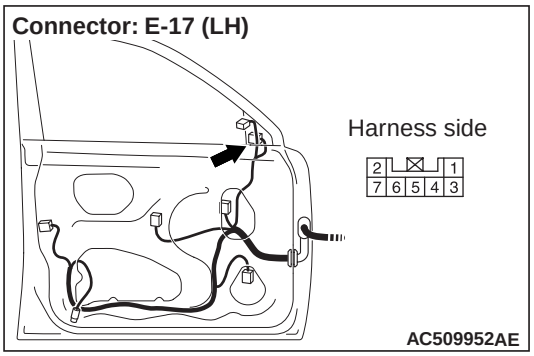


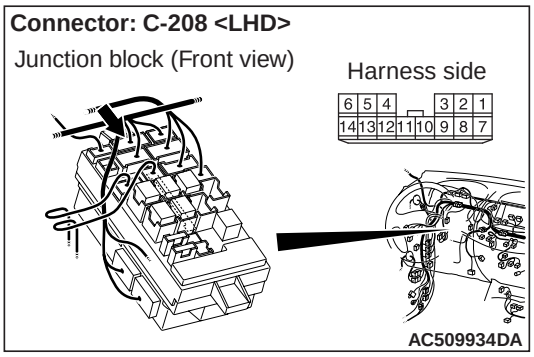
Q: Is the check result normal?

YES <LH drive vehicles> : Go to Step 3.
YES <RH drive vehicles> : Go to Step 4.
NO : Repair the defective connector.

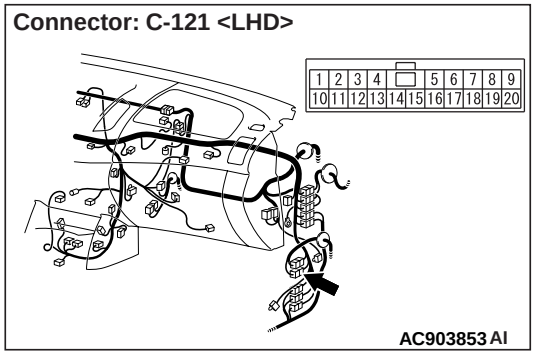
STEP 3. Check the wiring harness between E-02 door mirror assembly (RH) connector terminal No.1, E-17 door mirror assembly (LH) connector terminal No.1 and C-208 junction block connector terminal No.10.

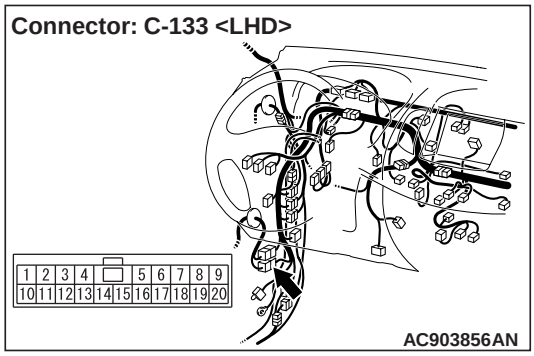






NOTE:





Prior to the wiring harness inspection, check intermediate connector C-121, C-133, and repair if necessary.

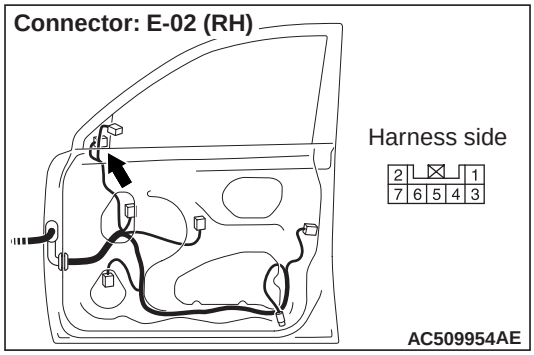
- Check the power supply line for open circuit.

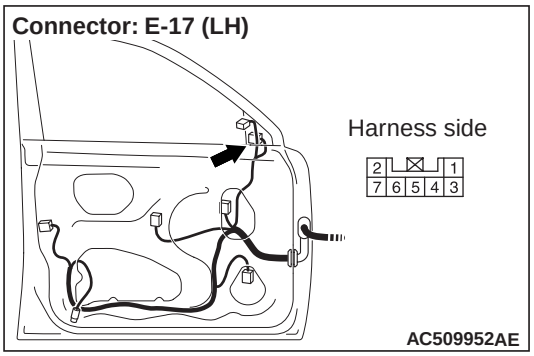
Q: Is the check result normal?

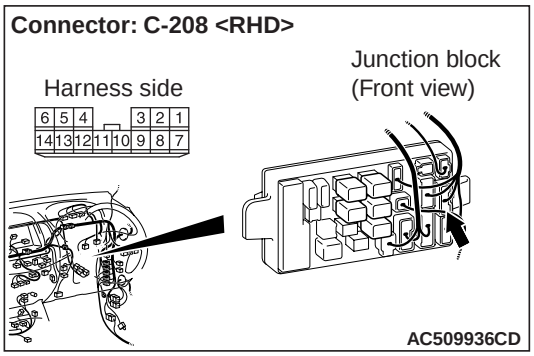
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction).

NO : Repair the wiring harness.

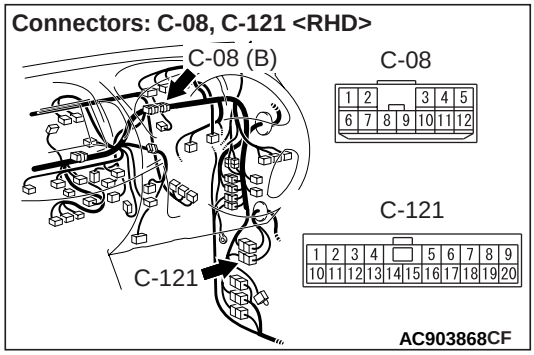
STEP 4. Check the wiring harness between E-02 door mirror assembly (RH) connector terminal No.1, E-17 door mirror assembly (LH) connector terminal No.1 and C-208 junction block connector terminal No.10.

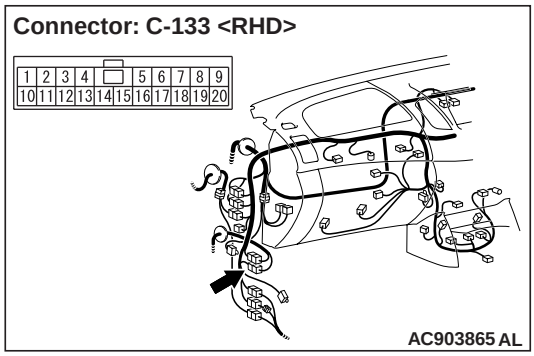






NOTE:





Prior to the wiring harness inspection, check joint connector C-08 <RH drive vehicles>, intermediate connector C-121 and C-133, and repair if necessary.

- Check the power supply line for open circuit.

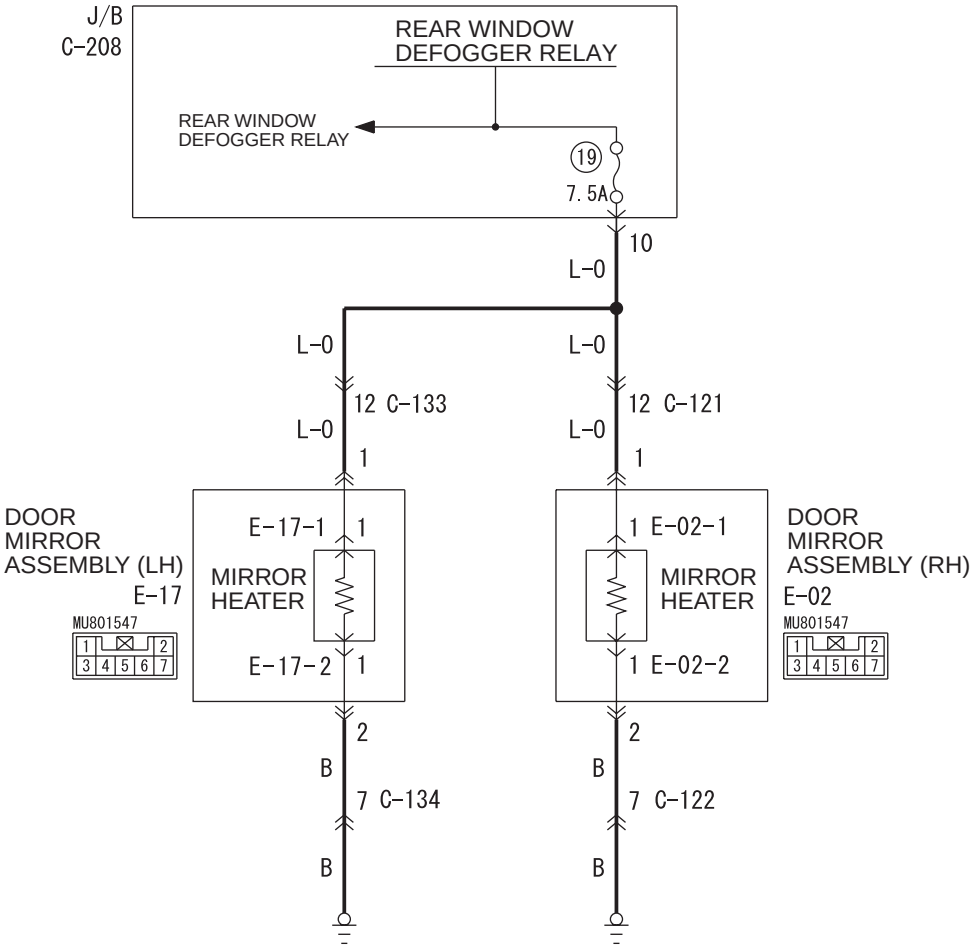
Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction).

NO : Repair the wiring harness.

INSPECTION PROCEDURE 2: Right or Left Heated Door Mirror does not Operate

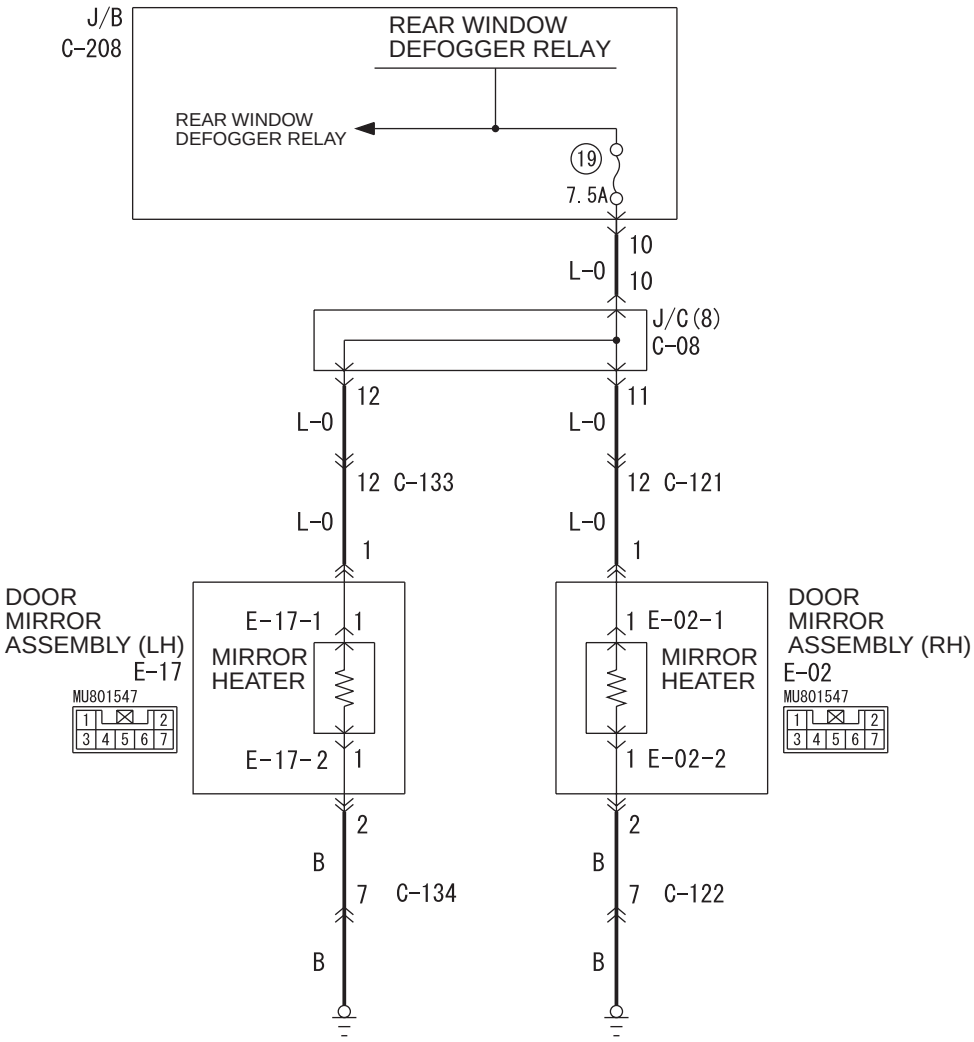
Heated Door Mirror <LHD> Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

AC903734AB
W7C51E005A

Heated Door Mirror <RHD> Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

AC903735AB
W7C51E006A

COMMENTS ON TROUBLE SYMPTOM
If either of the heated door mirrors does not work, the door mirror assembly may be defective.

POSSIBLE CAUSES
- Malfunction of the door mirror assembly
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. Verify the operation of each heated door mirror.

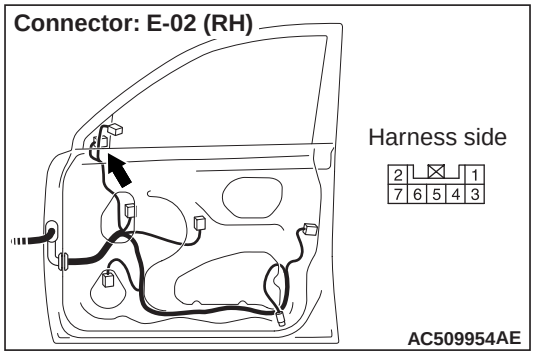
Q: Which door mirror does not heat?

Door mirror (RH) : Go to Step 2.
Door mirror (LH) : Go to Step 9.

STEP 2. Check the door mirror assembly (RH).
Check that the heater element of the door mirror assembly (RH) is in good condition (Refer to the heated door mirror check P.51-108).

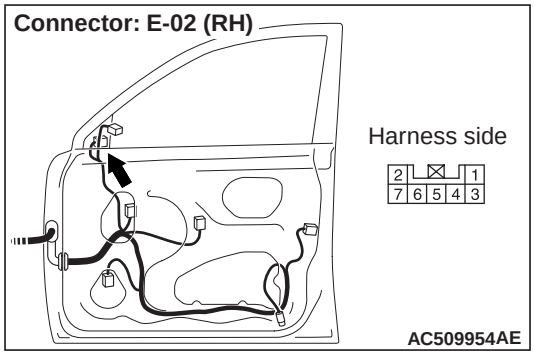
Q: Is the check result normal?
YES : Go to Step 3.
NO : Replace the mirror glass of the door mirror assembly (RH).

STEP 3. Connector check: E-02 door mirror assembly (RH) connector.

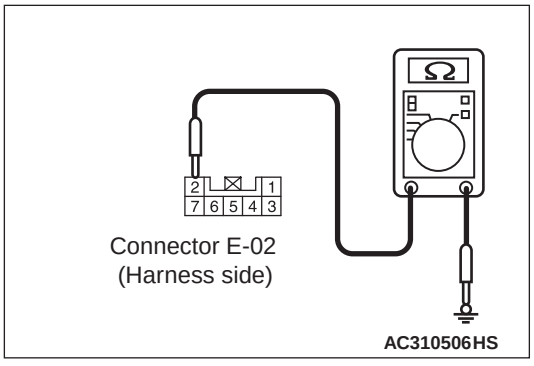


Q: Is the check result normal?
YES : Go to Step 4.
NO : Repair the defective connector.

STEP 4. Resistance measurement at the E-02 door mirror assembly (RH) connector.



(1) Disconnect the connector, and measure at the wiring harness side.

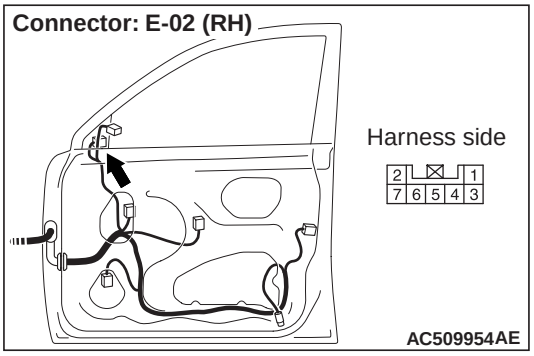


(2) Resistance between E-02 door mirror assembly connector terminal No.2 and body earth.

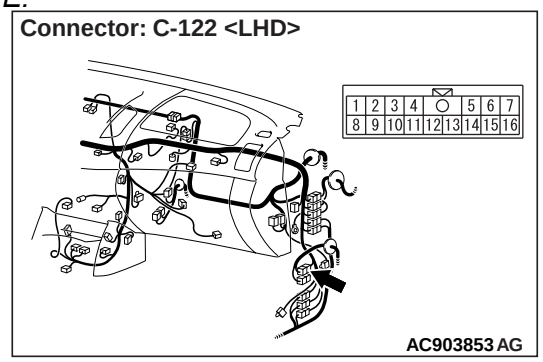
OK: Continuity exists (2 Ω or less)

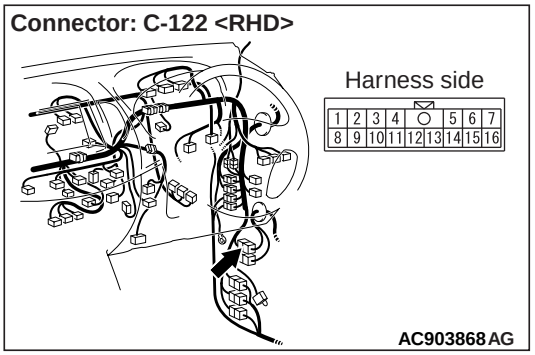
Q: Is the check result normal?
YES : Go to Step 6.
NO : Go to Step 5.

STEP 5. Check the wiring harness between E-02 door mirror assembly (RH) connector terminal No.2 and body earth.



NOTE:



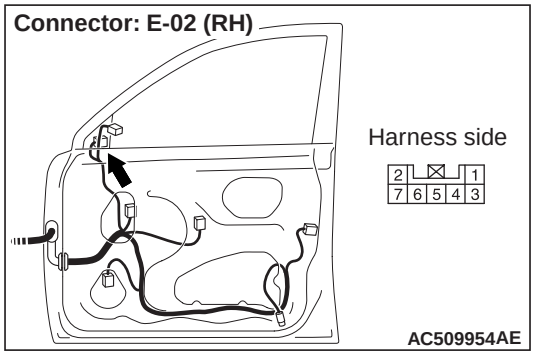


Prior to the wiring harness inspection, check intermediate connector C-122, and repair if necessary.

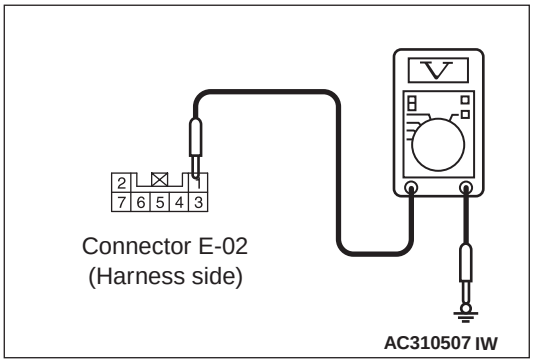
- Check the earth wires for open circuit.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness.

STEP 6. Voltage measurement at the E-02 door mirror assembly (RH) connector.



(1) Turn the ignition switch to the ON position.
(2) Rear window defogger switch: ON
(3) Disconnect the connector, and measure at the wiring harness side.



(4) Voltage between E-02 door mirror assembly connector terminal No.1 and body earth.

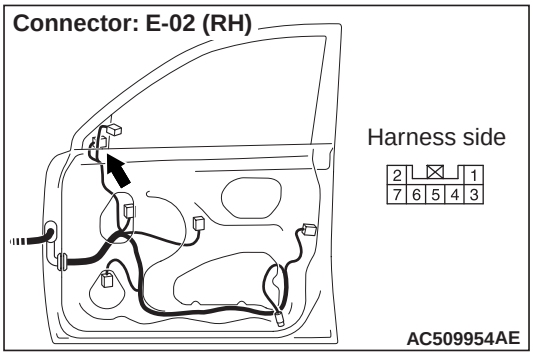
OK: System voltage

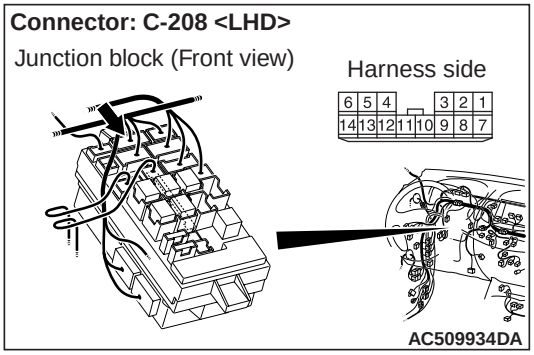
Q: Is the check result normal?

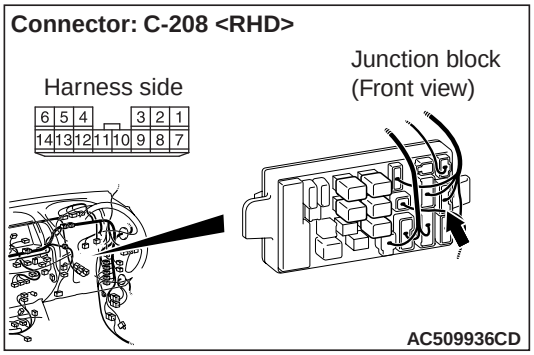
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction).

NO : Go to Step 7.

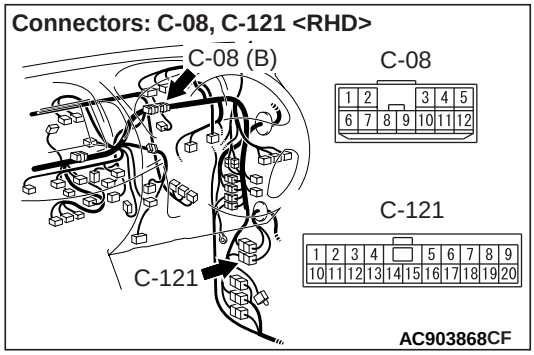
STEP 7. Check the wiring harness between E-02 door mirror assembly (RH) connector terminal No.1 and C-208 junction block connector terminal No.10.

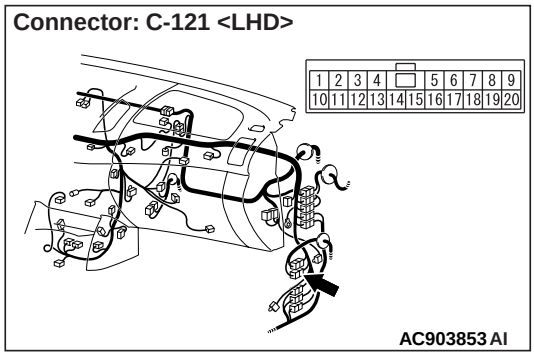






NOTE:





Prior to the wiring harness inspection, check joint connector C-08 <RH drive vehicles>, intermediate connector C-121, and repair if necessary.

- Check the power supply line for open circuit.

Q: Is the check result normal?
YES : Go to Step 8.
NO : Repair the wiring harness.

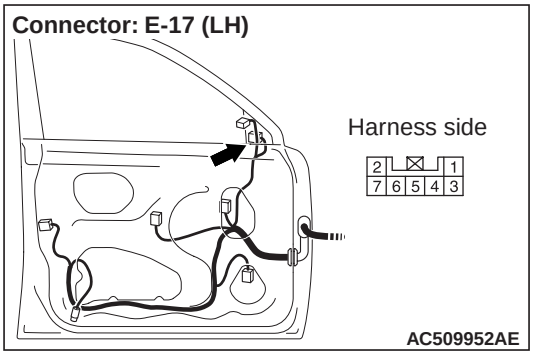
STEP 8. Retest the system.
Check that the heater element of the door mirror (RH) functions normally.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Replace the door mirror assembly (RH).

STEP 9. Check the heater element of the door mirror (LH)
Check the heater element of the door mirror (LH) (Refer to P.51-108).

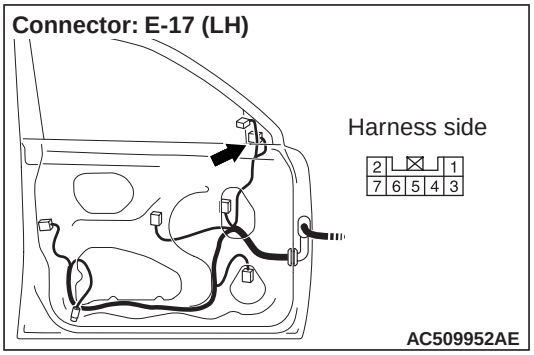
Q: Is the check result normal?
YES : Go to Step 10.
NO : Replace the mirror glass of the door mirror assembly (LH).

STEP 10. Connector check: E-17 door mirror assembly (LH) connector.

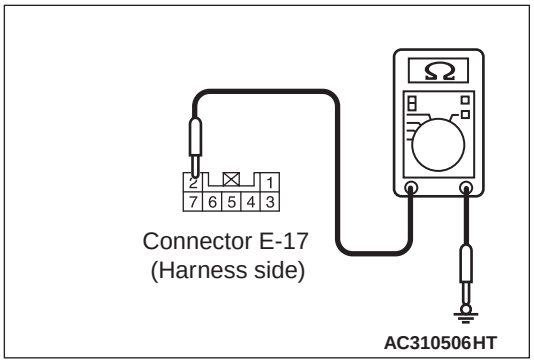


Q: Is the check result normal?
YES : Go to Step 11.
NO : Repair the defective connector.

STEP 11. Resistance measurement at the E-17 door mirror assembly (LH) connector.



(1) Disconnect the connector, and measure at the wiring harness side.

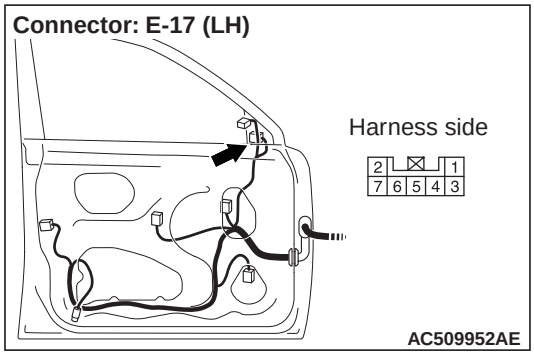


(2) Resistance between E-17 door mirror assembly connector terminal No.2 and body earth.

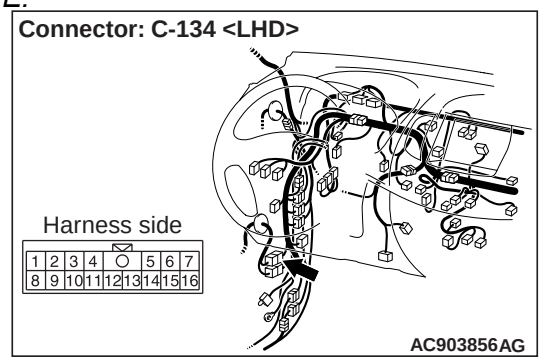
OK: Continuity exists (2 Ω or less)

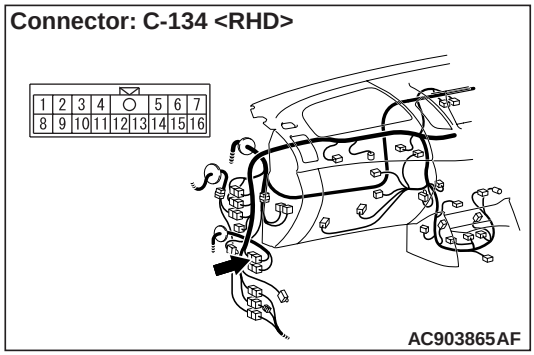
Q: Is the check result normal?
YES : Go to Step 13.
NO : Go to Step 12.

STEP 12. Check the wiring harness between E-17 door mirror assembly (LH) connector terminal No.2 and body earth.



NOTE:



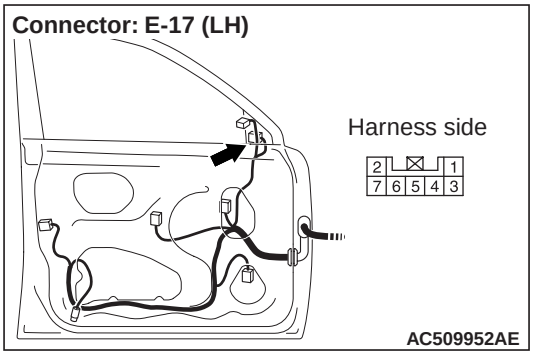


Prior to the wiring harness inspection, check intermediate connector C-134 and repair if necessary.

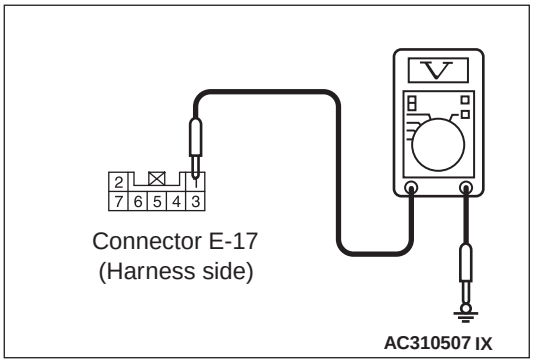
- Check the earth wires for open circuit.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness.

STEP 13. Voltage measurement at the E-17 door mirror assembly (LH) connector.



(1) Turn the ignition switch to the ON position.
(2) Rear window defogger switch: ON
(3) Disconnect the connector, and measure at the wiring harness side.



(4) Voltage between E-17 door mirror assembly connector terminal No.1 and body earth

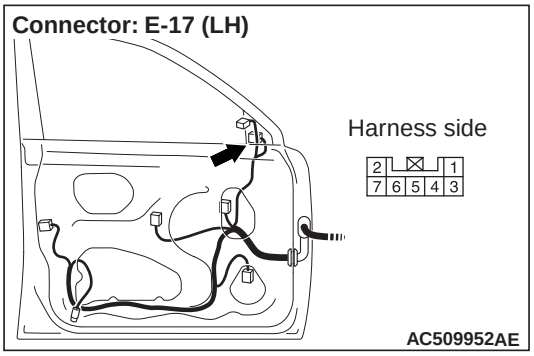
OK: System voltage

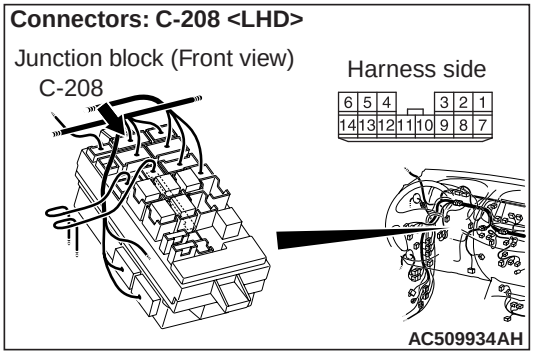
Q: Is the check result normal?

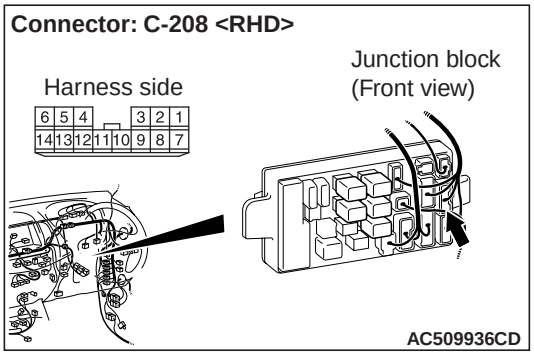
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction).

NO : Go to Step 14.

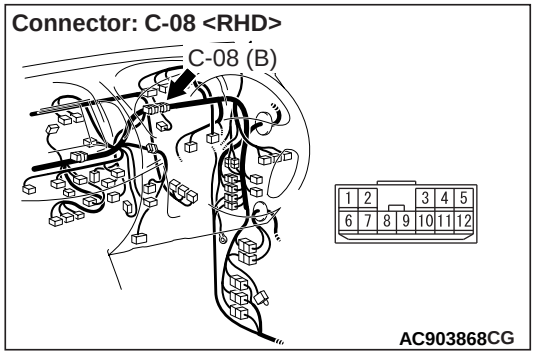
STEP 14. Check the wiring harness between E-17 door mirror assembly (LH) connector terminal No.1 and C-208 junction block connector terminal No.10.

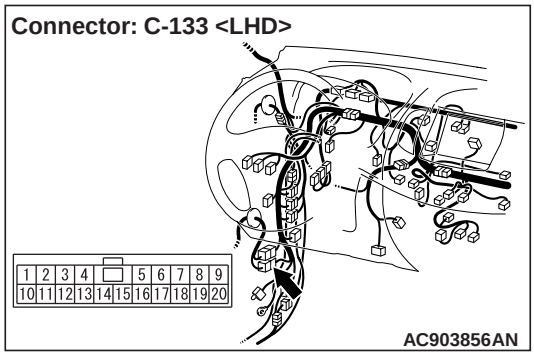


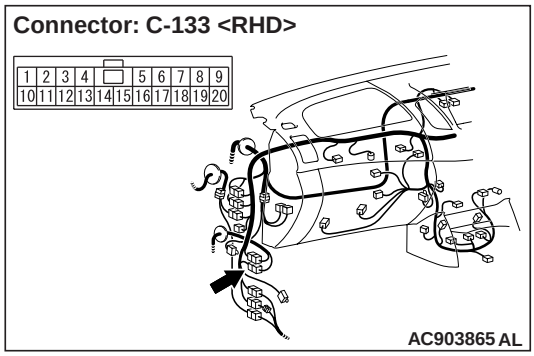




NOTE:







Prior to the wiring harness inspection, check joint connector C-08 <RH drive vehicles>, intermediate connector C-133 and repair if necessary.

- Check the power supply line for open circuit.

Q: Is the check result normal?
YES : Go to Step 15.
NO : Repair the wiring harness.

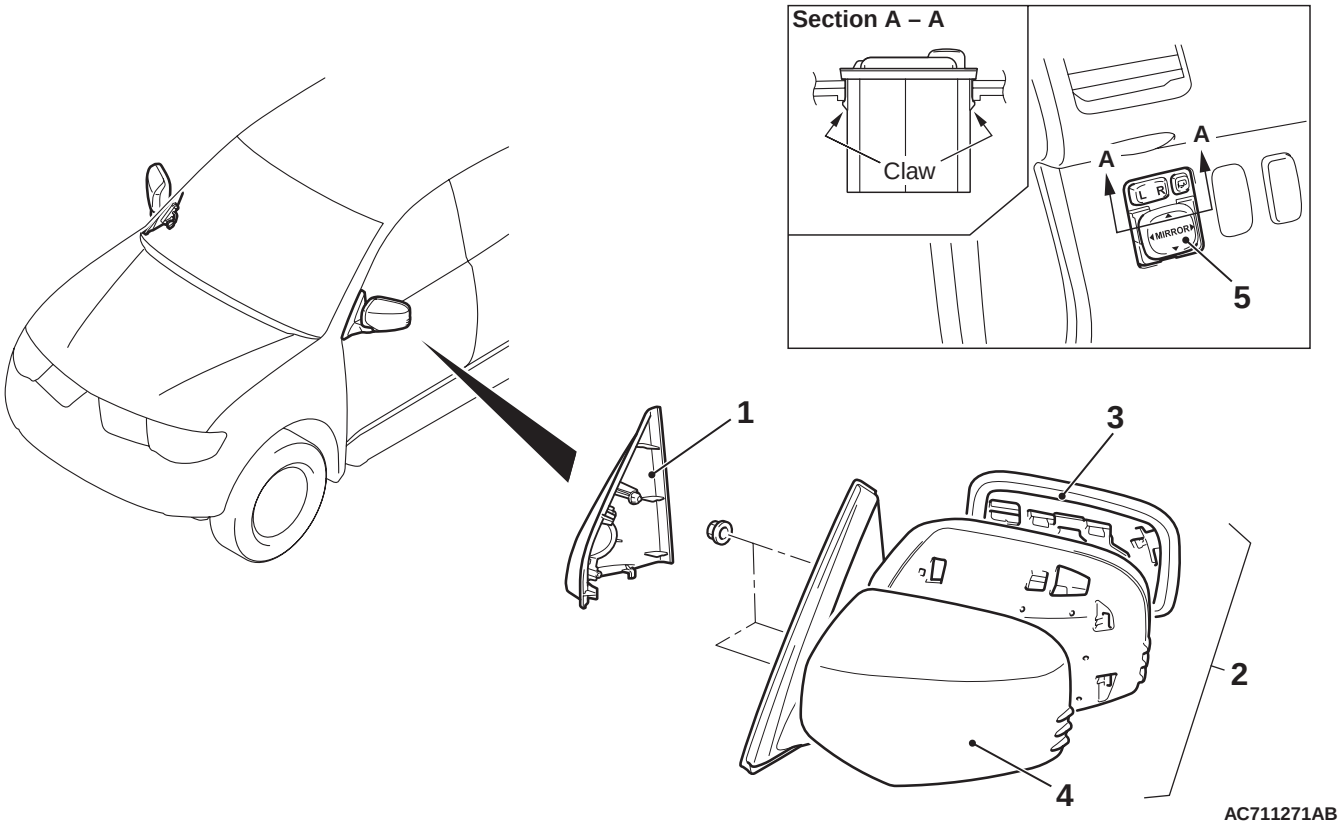
STEP 15. Retest the system.
Check that the heater element works normally.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Replace the door mirror assembly (LH).

OUTSIDE MIRROR

REMOVAL AND INSTALLATION

M1511006400955



AC711271AB

Door mirror assembly removal steps

1. Front door sash trim
   - Door mirror connector connection

>>A<< 2. Door mirror assembly

Mirror removal

<<A>> 3. Mirror

Door mirror outer cover removal steps

<<A>> 3. Mirror

<<B>> 4. Door mirror outer cover

Remote controlled mirror switch removal steps

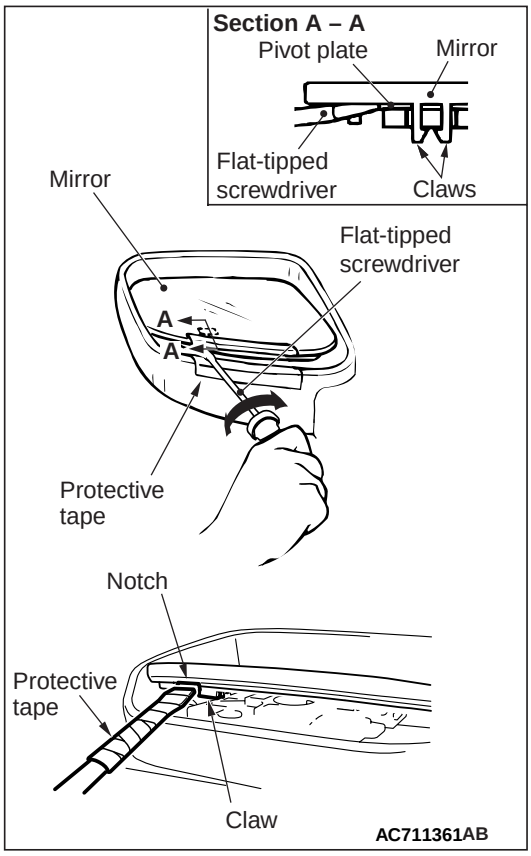
- Lower panel assembly (Refer to GROUP 52A, Instrument panel .)

5. Remote controlled mirror switch

REMOVAL SERVICE POINTS

<<A>> MIRROR REMOVAL

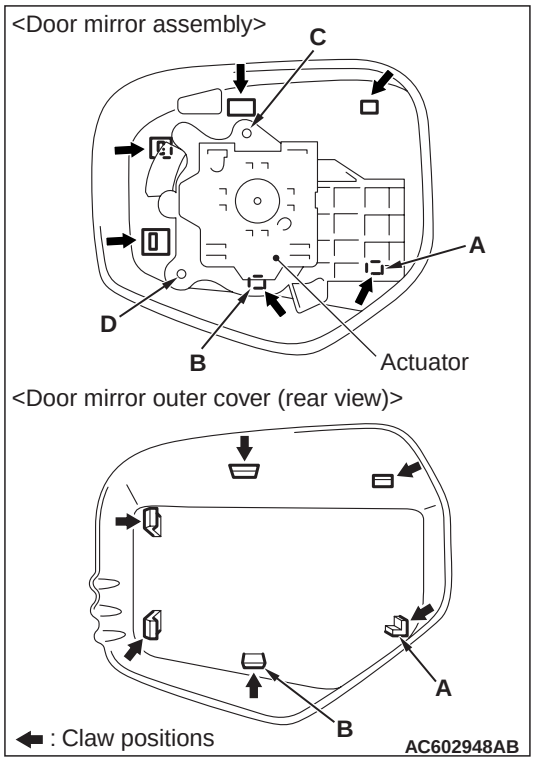
⚠ CAUTION



The claw of the mirror is prone to breakage when working in cold temperatures. Always warm up the mirror claw and claw periphery to 20°C or higher before handling.

Slant the mirror upward with your hands. Then insert a flat-tipped screwdriver wrapped with protective tape between the pivot plate and mirror through the cut-out from behind the mirror. Now pry off the mirror claw and remove the mirror as shown.

<<B>> DOOR MIRROR OUTER COVER REMOVAL



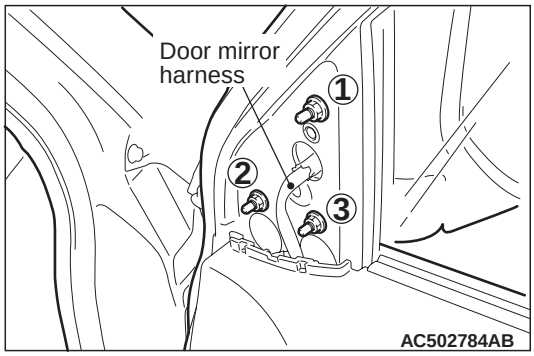
1. Remove the mirror.
2. Release the claws of door mirror outer cover from the door mirror assembly as shown in the illustration.

NOTE: Because the claws A and B are not accessible, disengage the points C and D of the door mirror actuator and release the claws.

3. Remove the cover from the door mirror assembly.

INSTALLATION SERVICE POINT

>>A<< DOOR MIRROR BODY ASSEMBLY INSTALLATION



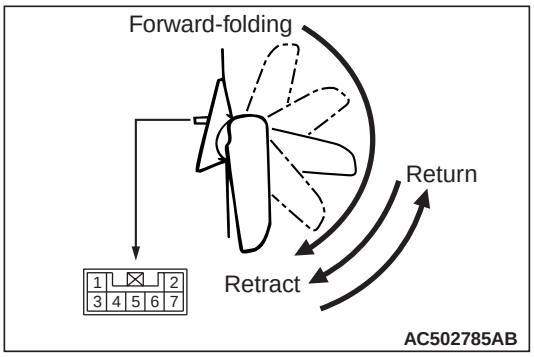
Install the door mirror body assembly with the nuts in the numerical order as shown in the illustration.

INSPECTION

M1511006500703

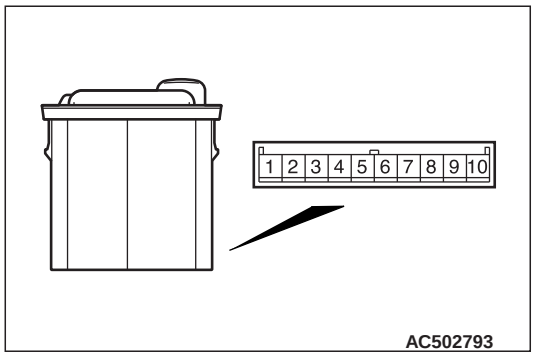
DOOR MIRROR ASSEMBLY OPERATION CHECK

Remove the front door sash trim, and then connect the battery to the door mirror body assembly connector to check that the door mirror operates.



Battery connection	Direction operation
• Connect terminal 5 to the negative battery terminal. • Connect terminal 7 to the positive battery terminal.	Up
• Connect terminal 5 to the positive battery terminal. • Connect terminal 7 to the negative battery terminal.	Down
• Connect terminal 6 to the negative battery terminal. • Connect terminal 5 to the positive battery terminal.	Right
• Connect terminal 6 to the positive battery terminal. • Connect terminal 5 to the negative battery terminal.	Left
• Connect terminal 4 to the positive battery terminal. • Connect terminal 3 to the negative battery terminal.	Retract
• Connect terminal 4 to the negative battery terminal. • Connect terminal 3 to the positive battery terminal.	Return

DOOR MIRROR CONTROL SWITCH CONTINUITY CHECK

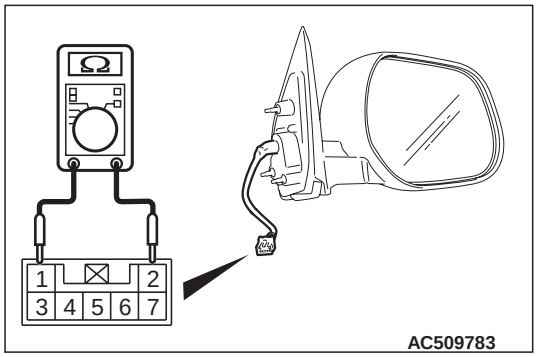


Switch position		Tester connection	Specified condition
OFF		3 – 1, 3 – 2, 3 – 5, 3 – 6, 3 – 7, 3 – 8, 3 – 9, 4 – 1, 4 – 2, 4 – 5, 4 – 6, 4 – 7, 4 – 8, 4 – 9	Open circuit
Left side	OFF	3 – 5, 3 – 6, 3 – 7, 4 – 5, 4 – 6, 4 – 7	Open circuit
	Up	3 – 7, 4 – 5	Continuity exists (2 Ω or less)
	Down	3 – 5, 4 – 7	
	Right	3 – 5, 4 – 6	
	Left	3 – 6, 4 – 5	
Right side	OFF	3 – 5, 3 – 8, 3 – 9, 4 – 5, 4 – 8, 4 – 9	Open circuit
	Up	3 – 8, 4 – 5	Continuity exists (2 Ω or less)
	Down	3 – 5, 4 – 8	
	Right	3 – 5, 4 – 9	
	Left	3 – 9, 4 – 5	
Retract and return		1 – 4, 2 – 4	Continuity exists (2 Ω or less)

HEATED DOOR MIRROR CHECK

⚠ CAUTION

When relocating the car between locations with extremely different temperatures (warm and cold), leave the car in the location for a while to adapt to the temperature prior to checking it.



Check that the resistance value between the connector terminals is at the standard value.

Standard value: 7.2 ± 1.4 Ω at 25°C

GROUP 52

INTERIOR AND SUPPLEMENTAL RESTRAINT SYSTEM(SRS)

CONTENTS

INTERIOR 52A

SUPPLEMENTAL RESTRAINT SYSTEM (SRS) 52B

GROUP 52A

INTERIOR

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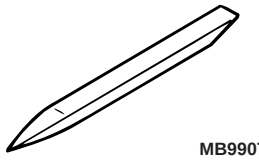
REAR SEAT BELT <CLUB CAB, DOUBLE CAB> 52A-34

REAR SEAT BELT REMOVAL AND INSTALLATION 52A-34

SPECIAL TOOL

M1521000600479

Tool	Tool number	Name	Use
 MB990784	MB990784	Ornament remover	Removal of switch, trim, etc.

INSTRUMENT PANEL ASSEMBLY

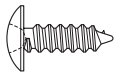
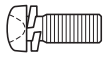
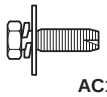
REMOVAL AND INSTALLATION

M1521001702691

⚠ WARNING

For removal and installation of the passenger's (front) air bag module, always observe the service procedures described in GROUP 52B, Driver's, Front Passenger's Air Bag Module(s) and Clock Spring (Refer to).

The following bolts and screws are used for installing the instrument panel. Bolts and screws are indicated as marks shown in the illustration in the sections of "Removal and Installation" and "Disassembly and Reassembly."

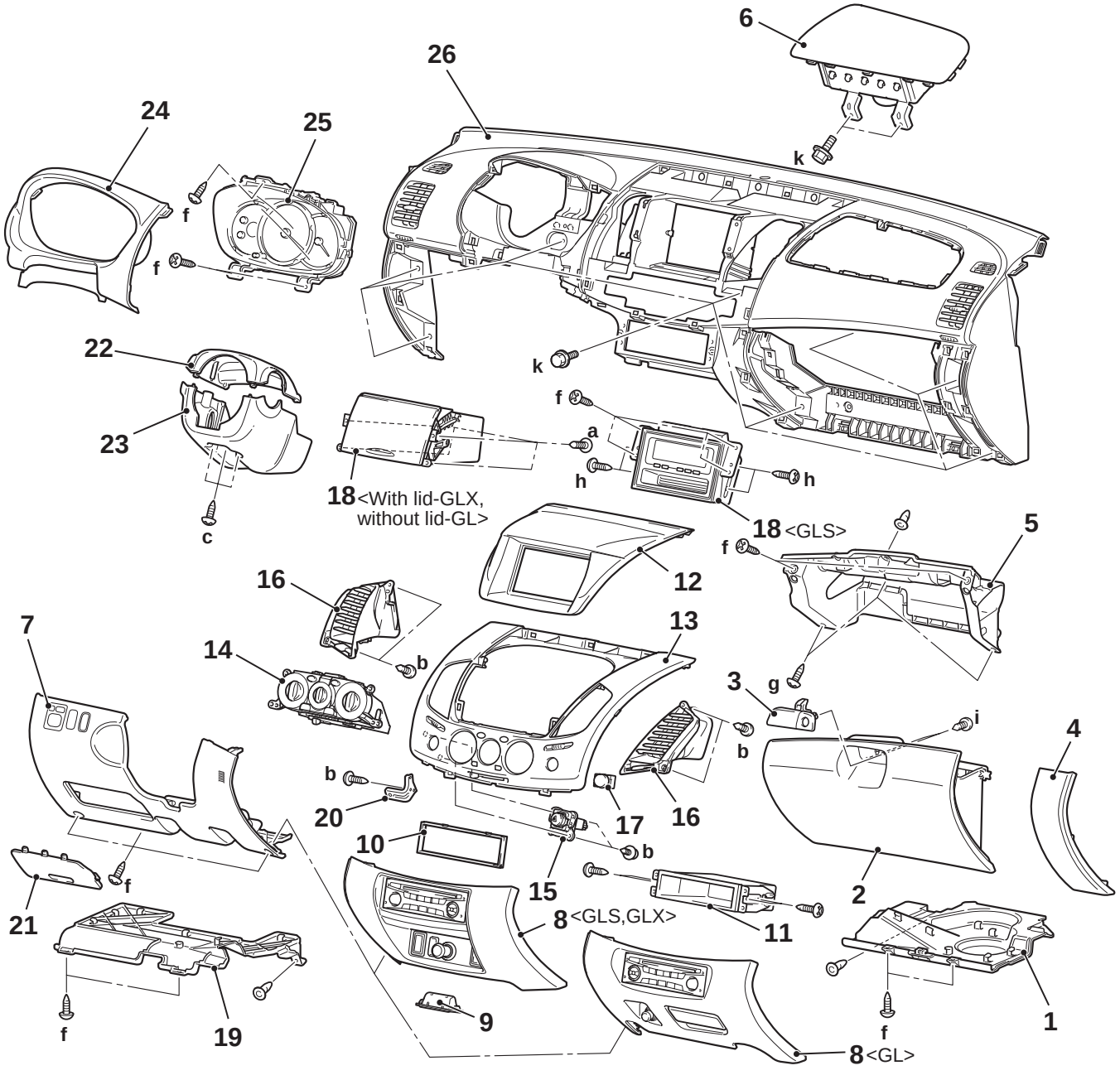
Name	Symbol	Size (D × L) mm	Colour	Shape
Tapping screw	a	4 × 12	–	AC104436
	b	5 × 12	–	
	c	5 × 16	–	
	d	5 × 10	–	 AC104450
	e	5 × 12	–	
	f	5 × 16	–	
	g		Green	
Machine flange screw	h	5 × 8	–	AC104322
Washer assembly screw	i	4 × 12	–	 AC104422
	j	5 × 12	–	
Washer assembly bolt	k	6 × 16	–	 AC104417

⚠ CAUTION

- **Refer to GROUP 52B, Service Precautions (Refer to) and Driver's, Front Passenger's Air bag Module(s) and Clock Spring (Refer to) before removing the passenger's (front) air bag module.**
- **Do not subject the SRS-ECU to any shocks when removing or installing the instrument panel.**

Pre-removal and Post-installation Operation

- Removal and Installation of Front Pillar Trim (Refer to P.52A-11<Single Cab>, P.52A-13<Club Cab > or P.52A-15<Double Cab>).
- Removal and Installation of Hood Lock Release Handle (Refer to GROUP 42, Hood).
- Removal and Installation of Fuel filler lid lock release handle (Refer to GROUP 42, Fuel filler lid <Single Cab>, <Club Cab > or <Double Cab>).



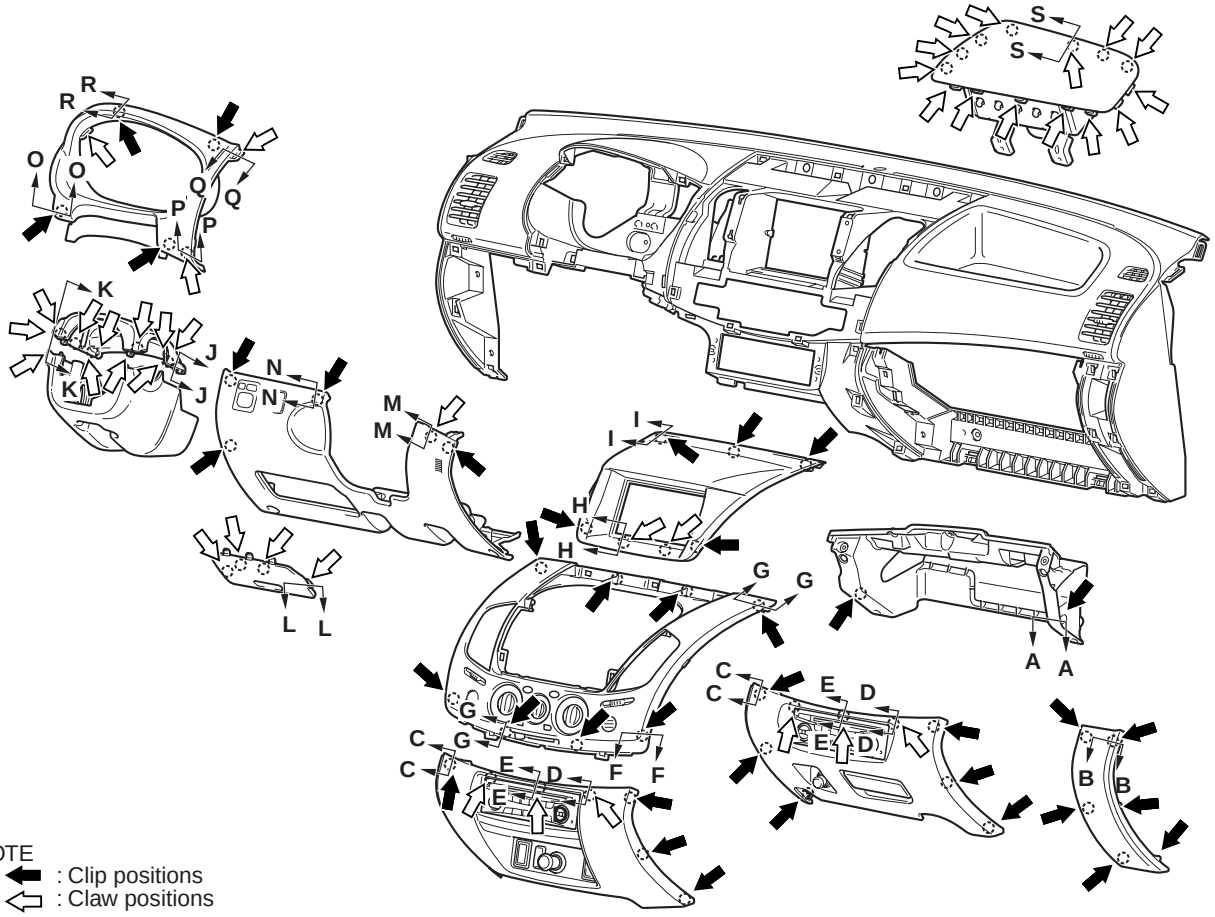
Removal steps

1. Passenger's side under cover <Except vehicles Single cab>
2. Glove box
3. Glove box lock assembly
4. Instrument panel side cover
- Passenger's (front) air bag module (squib) connector
5. Glove box cover
6. Passenger's (front) air bag module assembly <GLS-Limited> (Refer to GROUP 52B, Driver's, Front Passenger's Air bag Module(s) and Clock Spring).
- Cigarette lighter connector
- Cigarette lighter illumination lamp connector
7. Lower panel assembly
8. Centre lower panel assembly
9. Down light garnish<GLS,GLX>
10 Spacer
11. Accessory box <Vehicles without audio>
12. Centre upper box hood <GL, GLX> or RV meter hood <GLS-Limited> or MDS <GLS-Limited>
13. Centre upper panel assembly
14. Heater control panel assembly (Refer to GROUP 55A, Heater Control Assembly and A/C switch <Single Cab>, <Club Cab , Double Cab>).

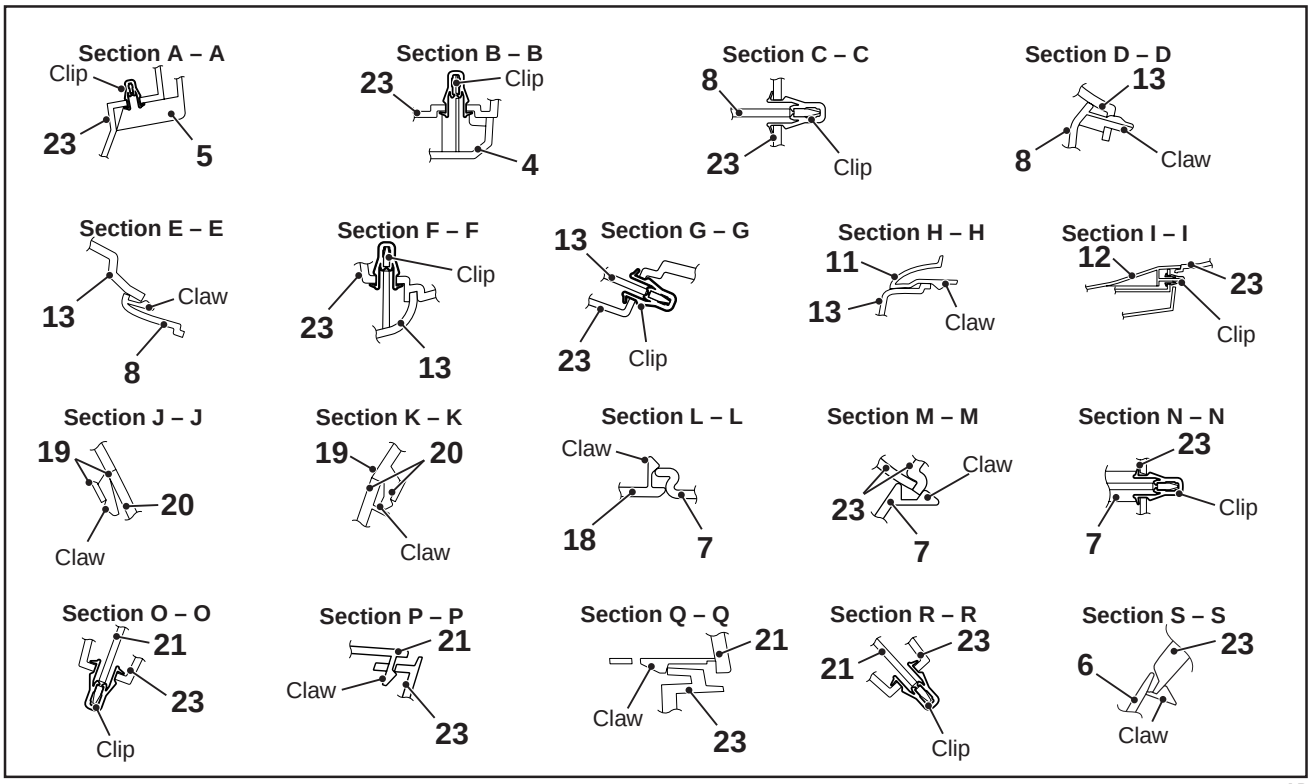
Removal steps (Continued)

15. Hazard warning lamp switch (Refer to GROUP 54A, Hazard Warning Lamp Switch).
16. Centre air outlet
17 Passenger's air bag cut off switch
18. Centre upper box <GL, GLX> or RV meter <GLS-Limited> or MDS <GLS-Limited (option)>
19. Driver's side under cover <Except vehicles Single cab>
21. Driver's side under cover bracket <Except vehicles Single cab>
22. Fuse lid
- Key reminder switch connector
- Column-ECU connector
- Clock spring connector
- Ignition switch connector
23. Steering column upper cover
23. Steering column lower cover
24. Meter bezel assembly
25. Combination meter assembly
- Glove box lamp connector
- Front pillar trim (Refer to P.52A-11<Single Cab>, P.52A-13<Club Cab > or P.52A-15<Double Cab>.
- Steering column shaft (Refer to GROUP 37, Steering Column Shaft assembly).
26. Instrument panel assembly

CLIP AND CLAW POSITIONS



NOTE
(1) ⬅ : Clip positions
(2) ⇦ : Claw positions

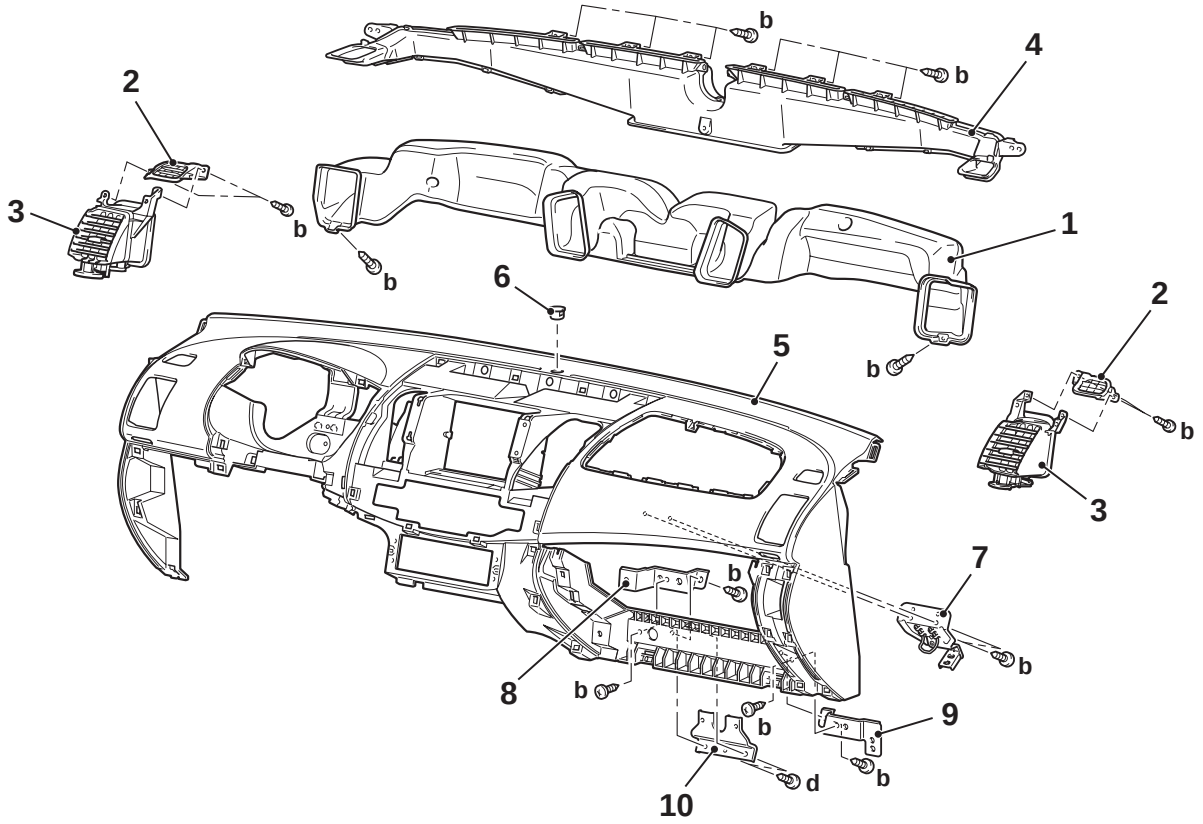


AC809365AD

NOTE: Each number in the illustration indicates a part number.

DISASSEMBLY AND REASSEMBLY

M1521001900688



AC508317AB

Disassembly steps

1. Ventilator air distribution duct
2. Side defroster grille
3. Instrument panel side air outlet
4. Defroster garnish
5. Instrument panel

Disassembly steps (Continued)

6. Plug
7. Glove box striker
8. Bracket B
9. Bracket A
10. Heater bracket

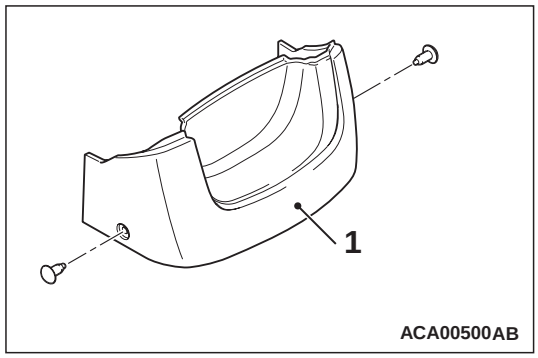
FLOOR CONSOLE ASSEMBLY

FRONT FLOOR CONSOLE ASSEMBLY front floor console assembly) >

REMOVAL AND INSTALLATION

M1521005200818

<Centre reinforce cover (Vehicles without

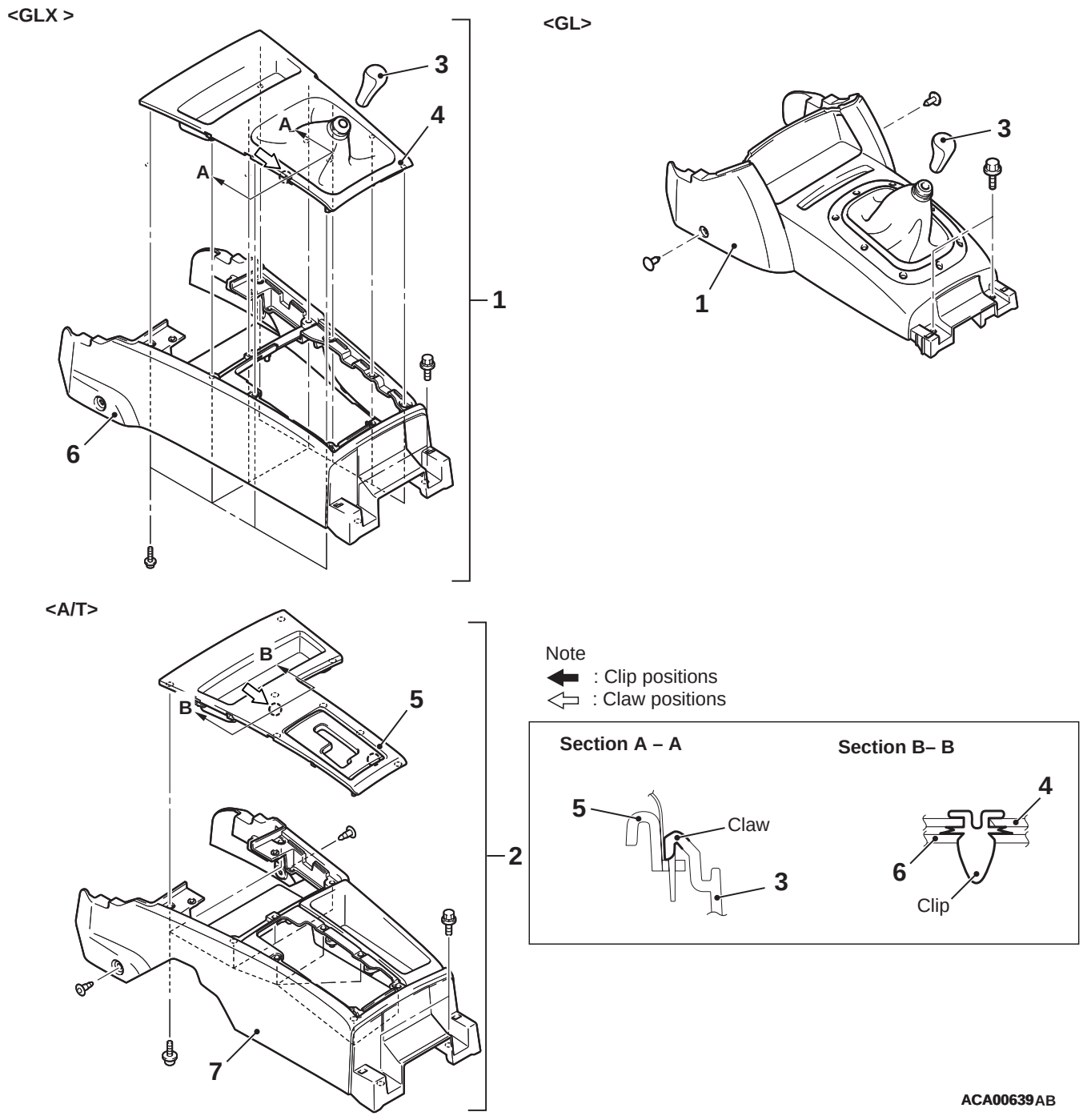


ACA00500AB

Centre reinforce cover removal

1. Centre reinforce cover

<Front floor console assembly (2WD)>



Front floor console assembly removal steps

1. Front floor console assembly <M/T>

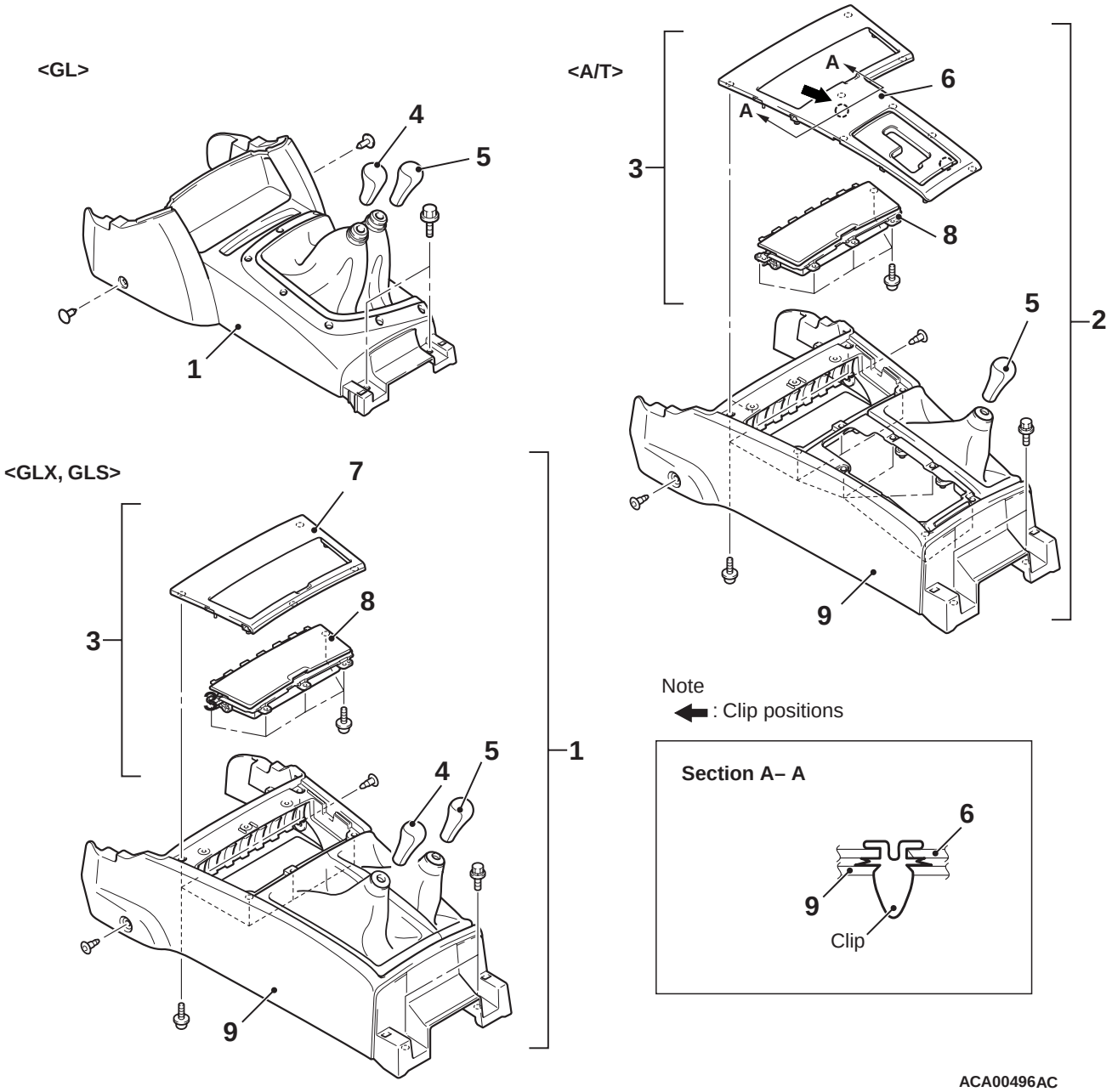
<<**A**>>

2. Front floor console assembly <A/T>
3. Shift knob
4. Gearshift lever panel <M/T>

Front floor console assembly removal steps (Continued)

5. Gearshift lever panel <A/T>
6. Front floor console <M/T>
7. Front floor console <A/T>

<Front floor console assembly (4WD)>



Front floor console assembly removal steps

1. Front floor console assembly <M/T>

<<**A**>>

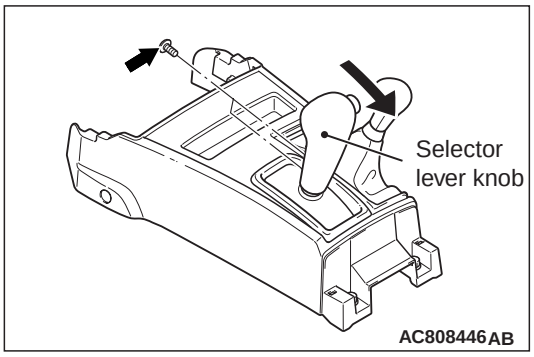
2. Front floor console assembly <A/T>
3. Gearshift lever panel assembly
4. Shift knob <M/T>
5. Transfer shift lever knob

Front floor console assembly removal steps (Continued)

6. Gearshift lever panel <A/T>
7. Gearshift lever panel <M/T>
8. Floor console tray
9. Front floor console

REMOVAL SERVICE POINT

<<A>> FRONT FLOOR CONSOLE ASSEMBLY REMOVAL <A/T>



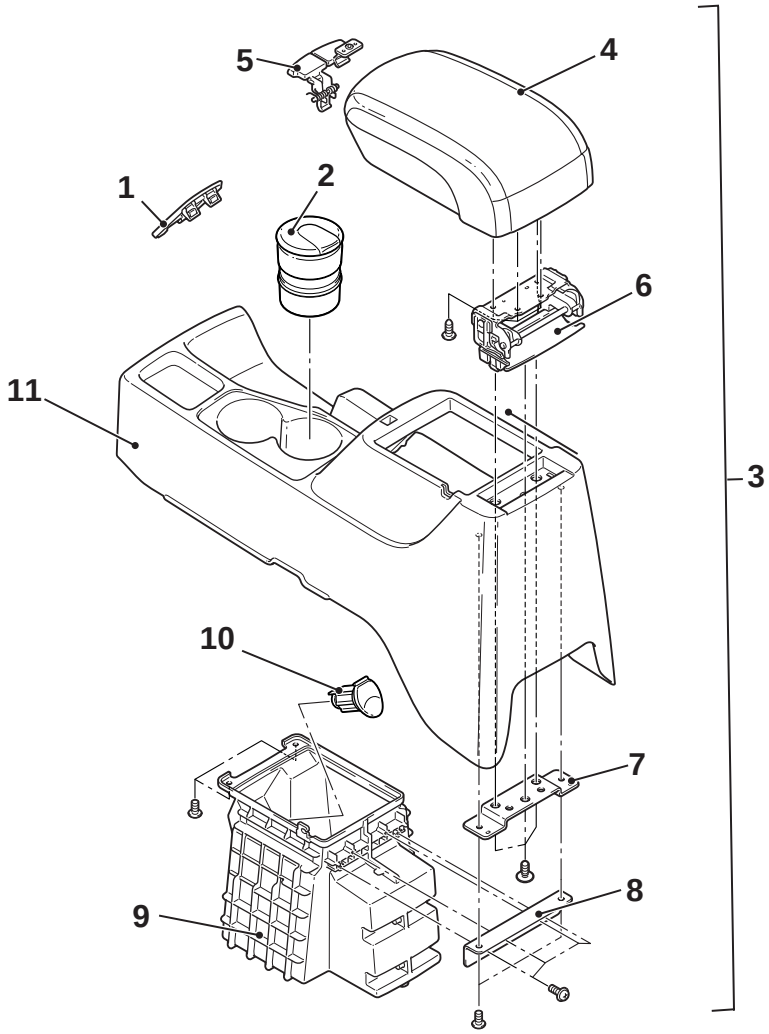
Loosen the screw of the selector lever knob, and turn the knob 90 degrees.

REAR FLOOR CONSOLE ASSEMBLY

REMOVAL AND INSTALLATION

M1521005700619

<Rear floor console assembly (GLS,GLX)>



Removal steps

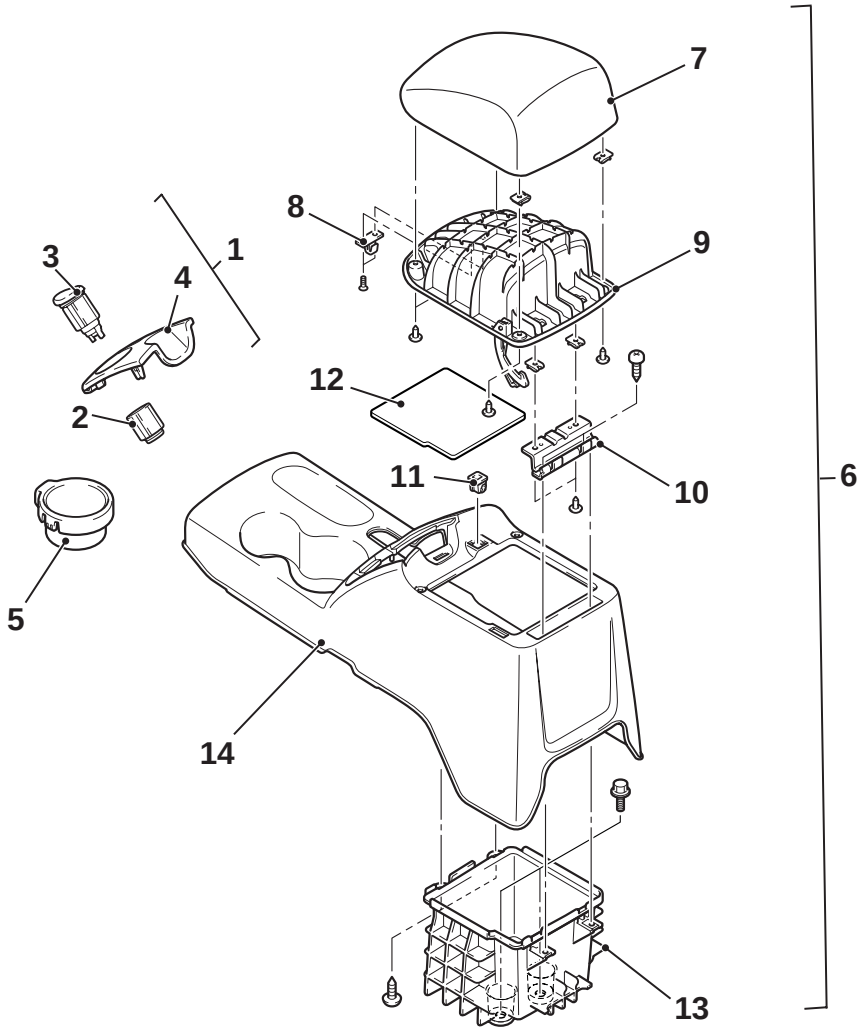
1. Service panel
2. Cup holder
3. Rear floor console assembly
4. Floor console armrest assembly
5. Armrest assembly hinge
6. Striker

Removal steps (Continued)

7. Floor console bracket upper
8. Floor console bracket lower
9. Rear console box
10. Accessory socket

11 Rear floor console

<Rear floor console assembly (GL)>



ACA00225 AB

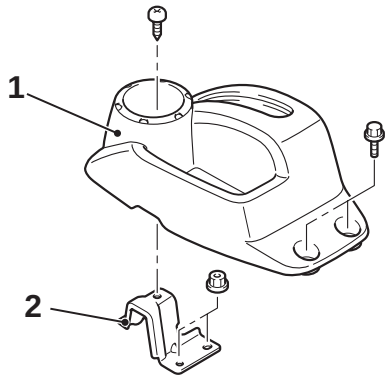
Removal steps

1. Rear floor console cover assembly
2. Accessory socket case
3. Accessory socket
4. Rear floor console cover
5. Console cup holder
6. Rear floor console assembly
7. Lid outer

Removal steps (Continued)

8. Striker
9. Lid inner
10. Lid hinge
11. Rear floor console lock
12. Rear floor console mat
13. Box with lid
14. Rear floor console

<Rear floor console parking brake lever cover (Vehicles without rear floor console assembly)>



AC611602AB

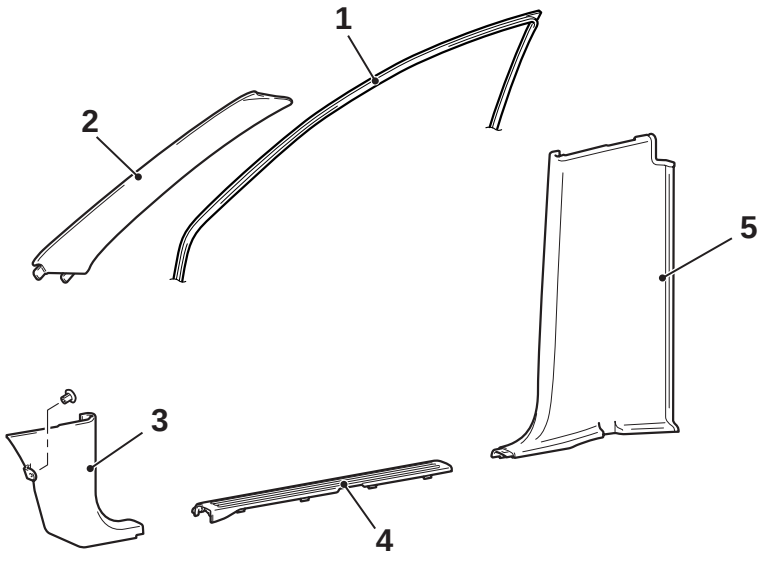
Removal steps
1. Rear floor console parking brake lever cover
2. Rear floor console parking brake bracket

TRIMS

INTERIOR TRIM

REMOVAL AND INSTALLATION <SINGLE CAB>

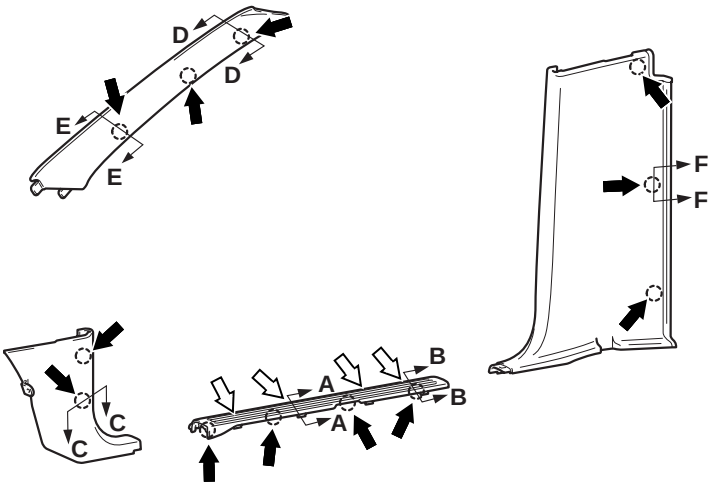
M1521001101812



AC505616AB

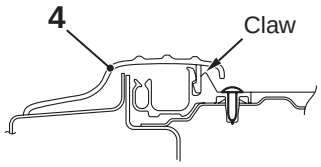
1. Door opening trim
2. Front pillar trim
3. Cowl side trim
4. Front scuff plate
5. Rear pillar lower trim

CLIP AND CLAW POSITIONS

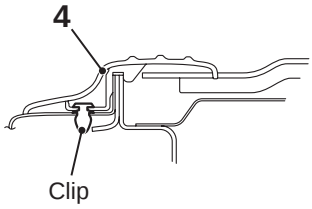


NOTE
(1) ⬅ : Clip positions
(2) ⇦ : Claw positions

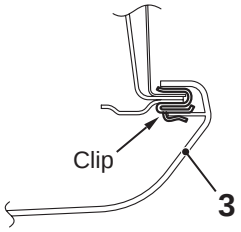
Section A – A



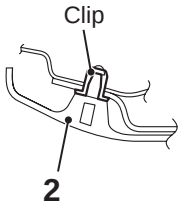
Section B – B



Section C – C



Section D – D



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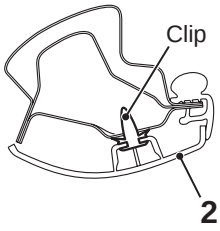

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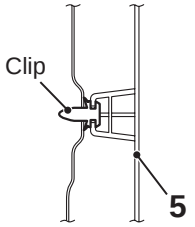
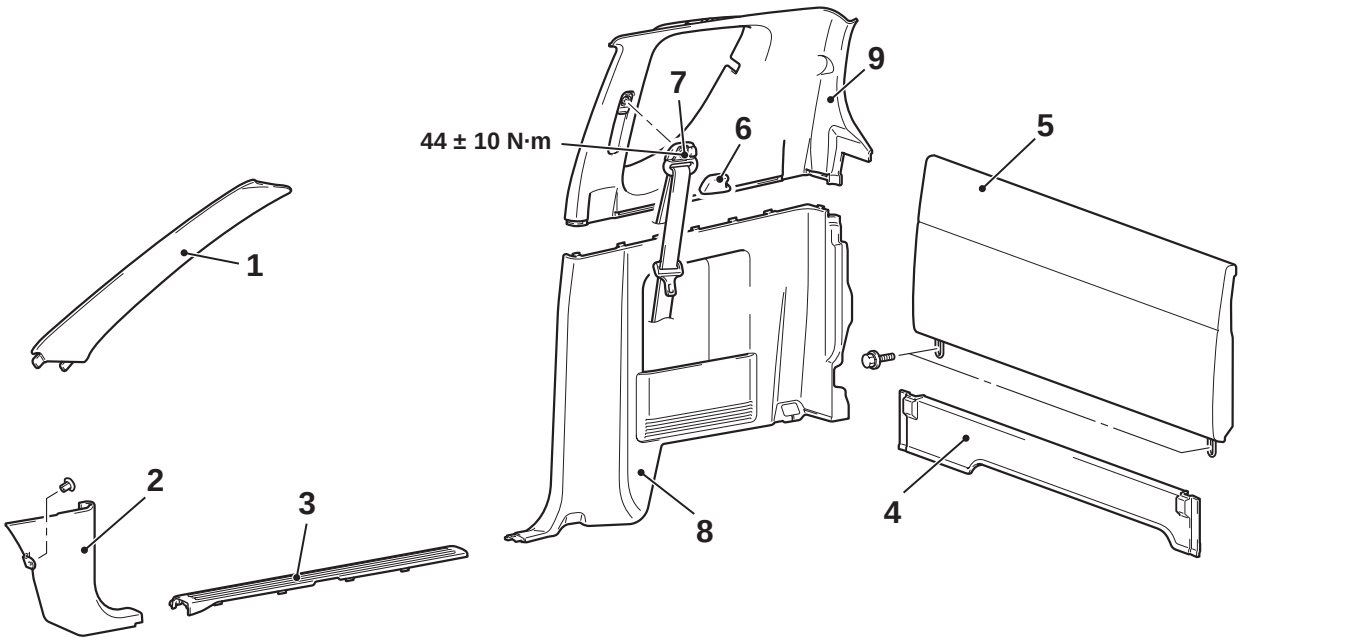


AC505620AG

REMOVAL AND INSTALLATION <CLUB CAB>

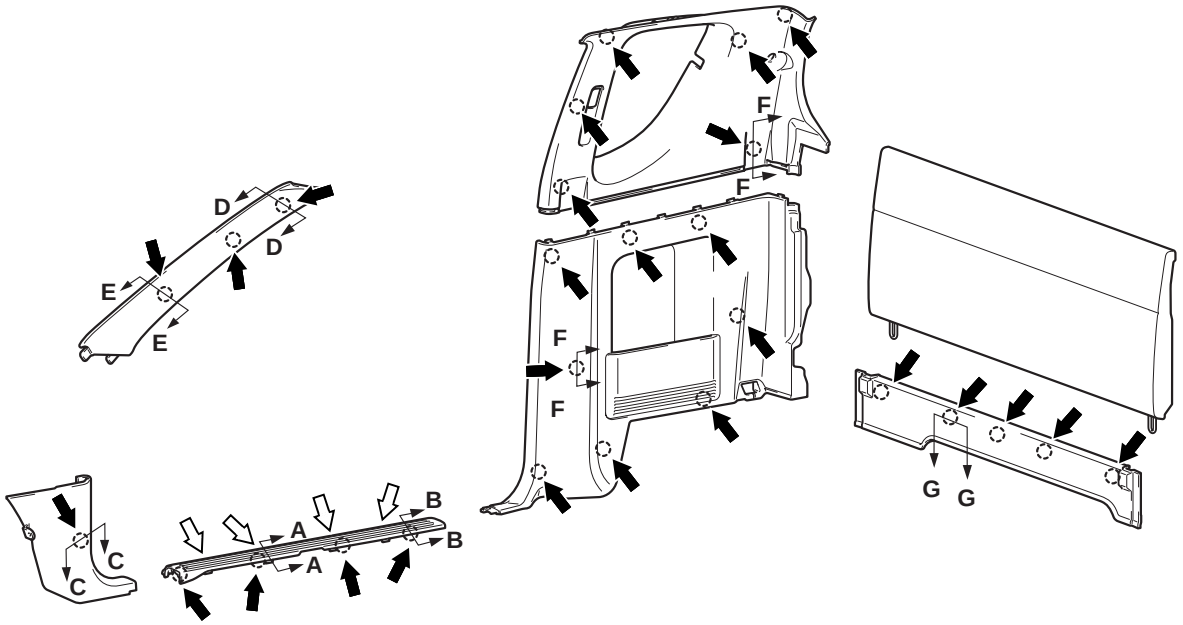
M1521001102127



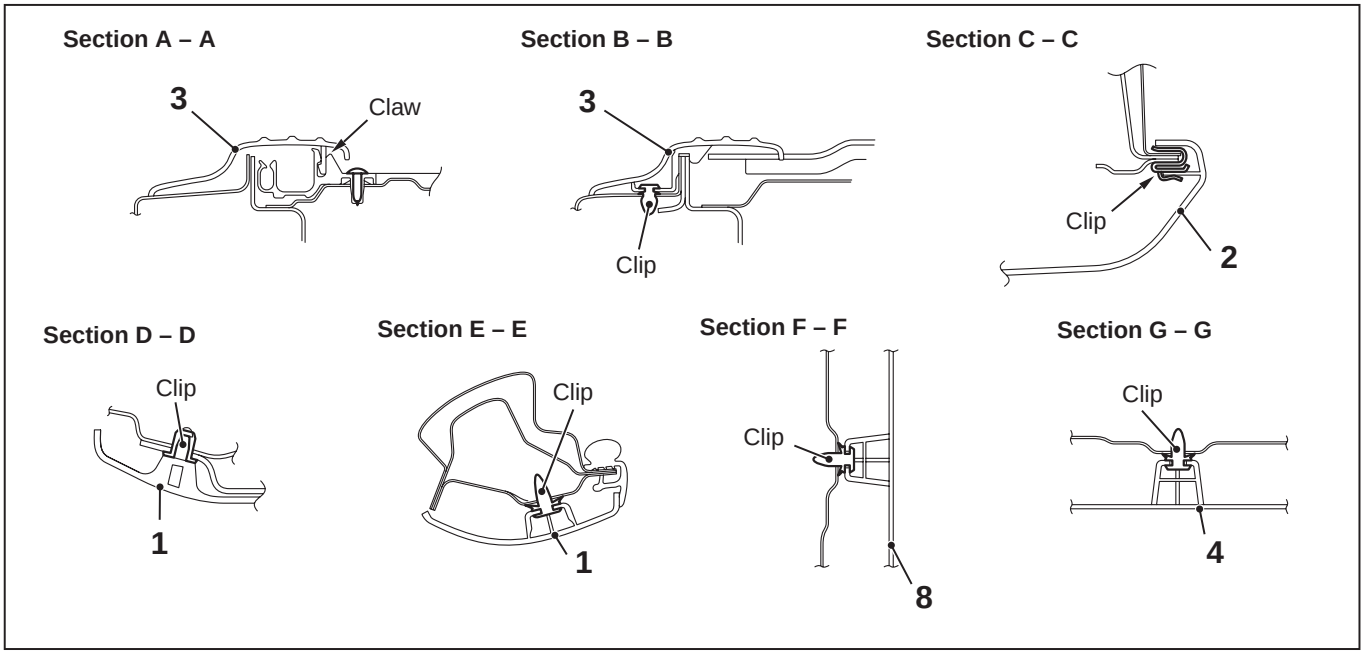
AC407282 AC

1. Front pillar trim
2. Cowl side trim
3. Front scuff plate
4. Cab rear end lower trim
5. Cab rear end trim
6. Sash guide cover
7. Front seat belt bolt
8. Quarter lower trim
9. Quarter upper trim

CLIP AND CLAW POSITIONS



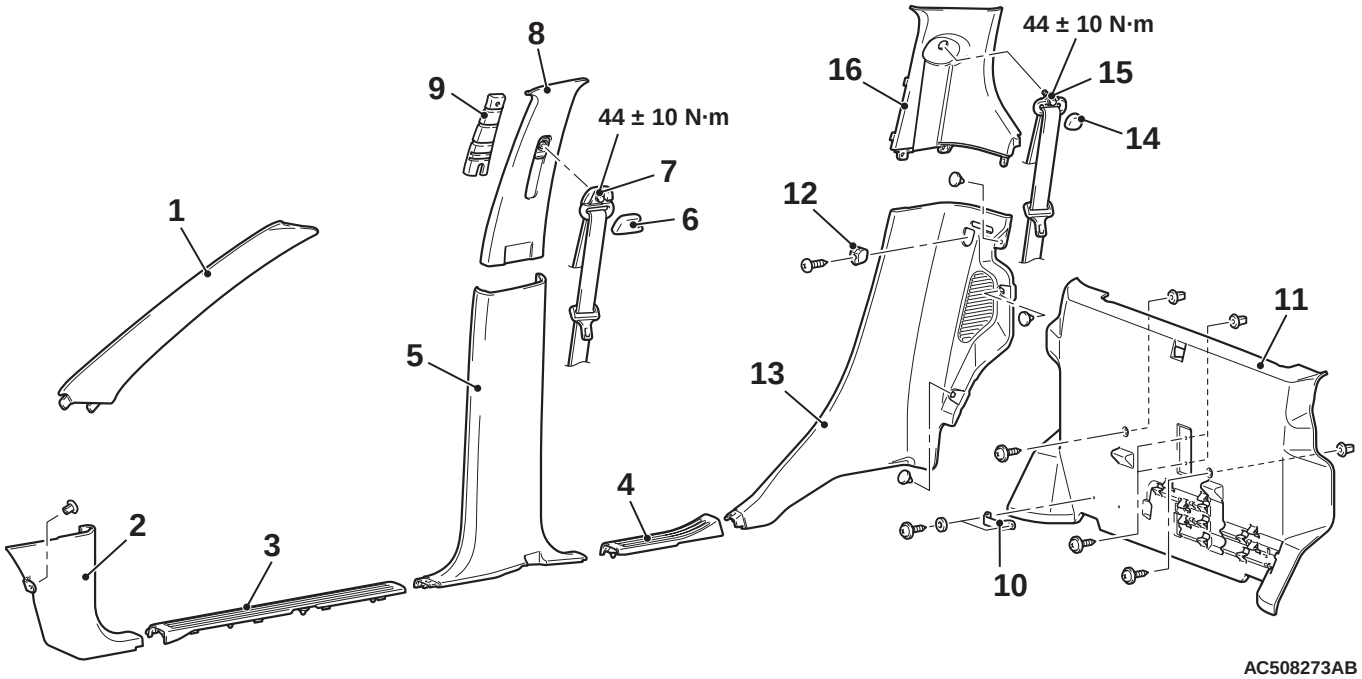
NOTE
(1) ⬅ : Clip positions
(2) ⇦ : Claw positions



AC407285AD

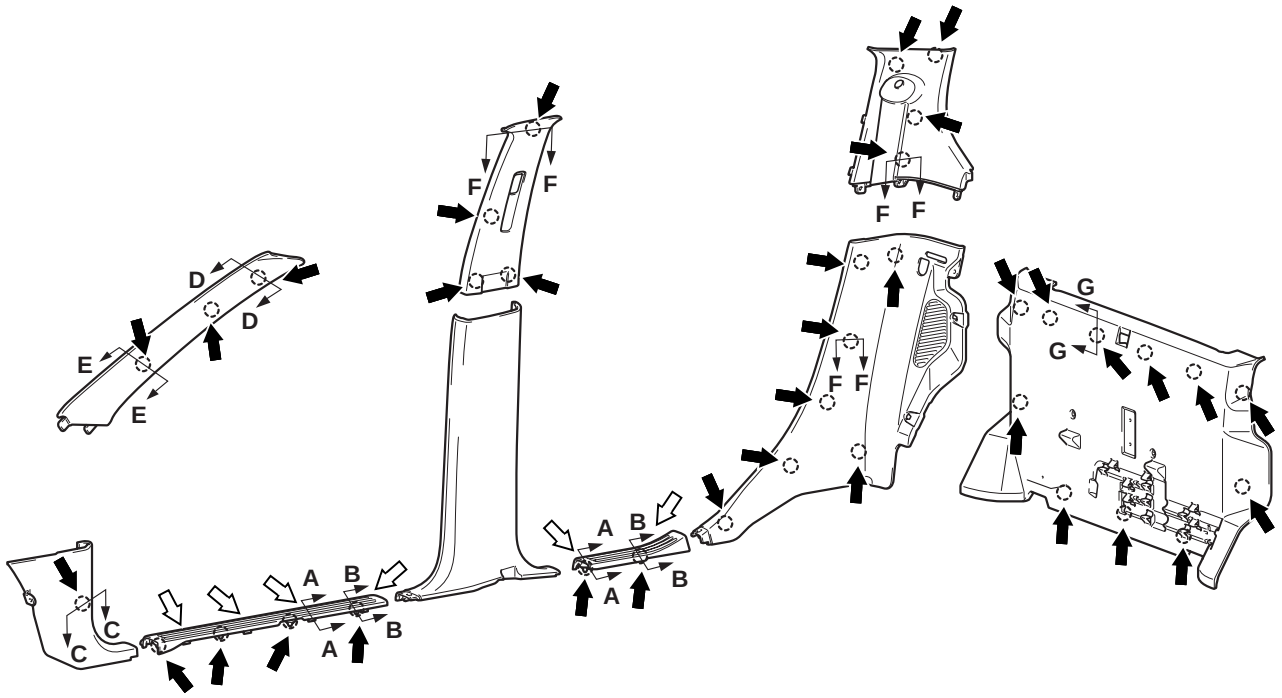
REMOVAL AND INSTALLATION <DOUBLE CAB>

M1521001102008



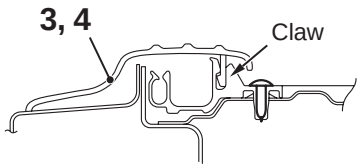
1. Front pillar trim
2. Cowl side trim
3. Front scuff plate
4. Rear scuff plate
5. Centre pillar lower trim
6. Front sash guide cover
7. Front seat belt bolt
8. Centre pillar upper trim
9. Centre pillar upper trim energy absorber
10. Tool band
11. Cab rear end lower trim <Vehicles with rear panel power window>
12. Rear seatback damper
13. Rear pillar lower trim
14. Rear sash guide cover
15. Rear seat belt bolt
16. Rear pillar upper trim

CLIP AND CLAW POSITIONS

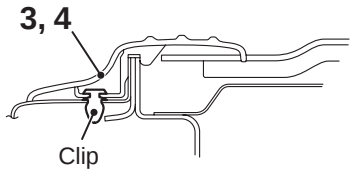


NOTE
(1) ◀ : Clip positions
(2) ◁ : Claw positions

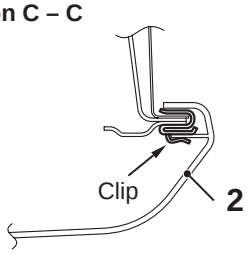
Section A – A



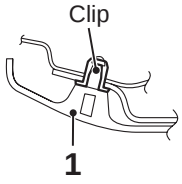
Section B – B



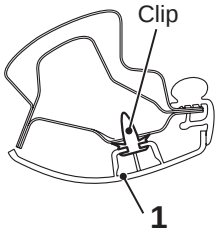
Section C – C



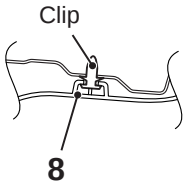
Section D – D



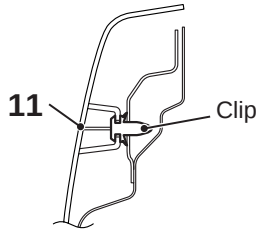
Section E – E



Section F – F



Section G – G



AC407284AG

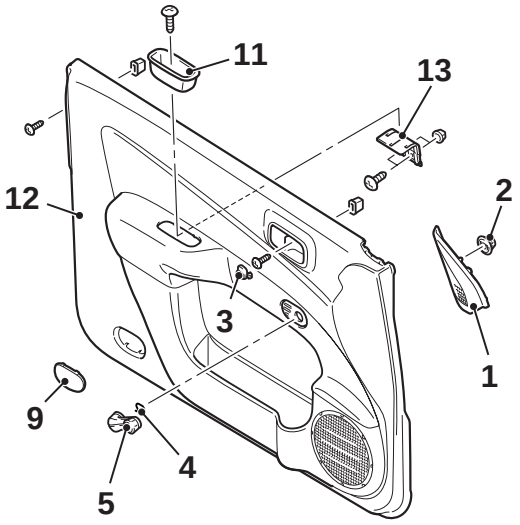
DOOR TRIM

REMOVAL AND INSTALLATION

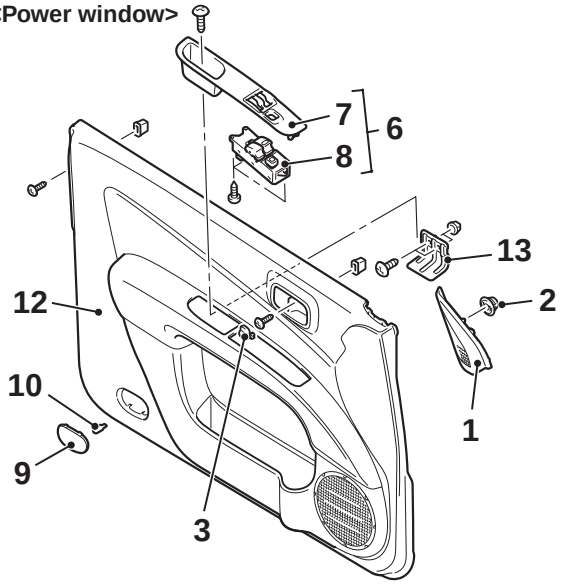
M1521006401302

<FRONT DOOR TRIM>

<Manual window>



<Power window>



AC509431AB

Removal steps

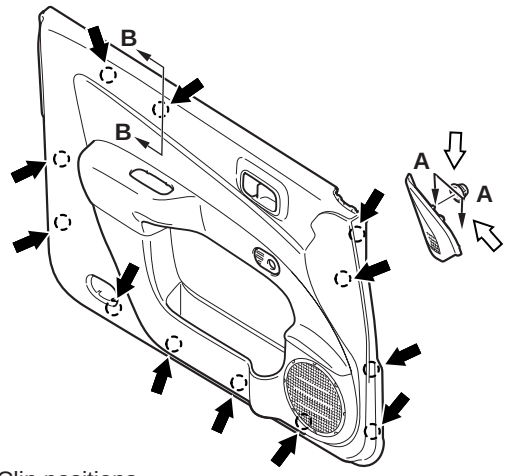
1. Front door sash trim
2. Front door sash trim clip
3. <<**A**>> Front door trim screw cap
4. <<**B**>> Regulator handle clip <Manual window >
5. Regulator handle <Manual window>
6. Front door power window switch assembly <Power window>
7. Front door power window switch panel <Power window>

Removal steps (Continued)

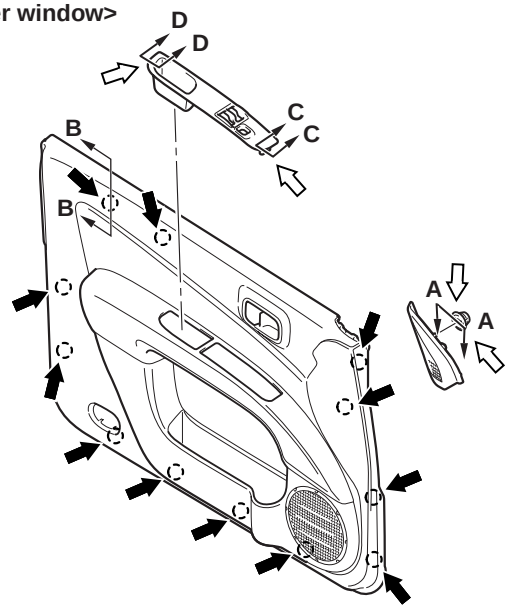
8. Front door power window switch <Power window>
9. Front door support panel <Manual window> or front door courtesy lamp lens <Power window>
10. Front door courtesy lamp bulb
11. Front door trim box <Manual window>
12. Front door trim
13. Pull handle bracket

CLIP AND CLAW POSITIONS

<Manual window>

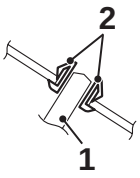


<Power window>

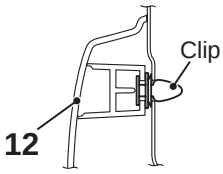


NOTE
(1) ⬅ : Clip positions
(2) ⇦ : Claw positions

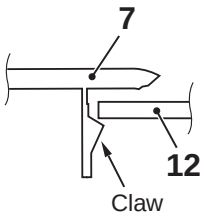
Section A – A



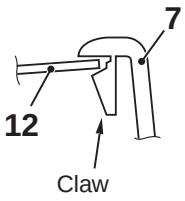
Section B – B



Section C – C



Section D – D

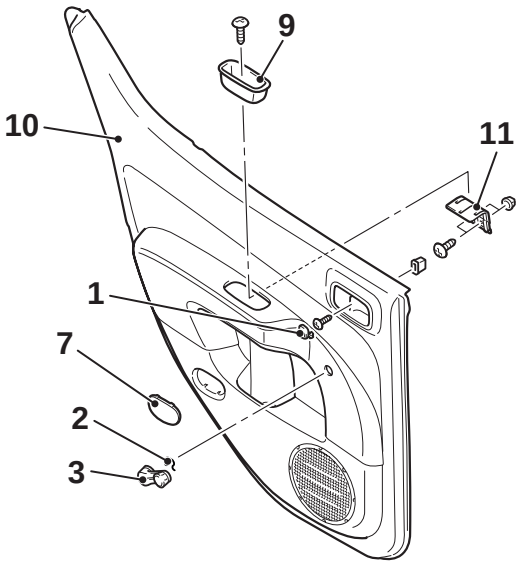


AC509424AD

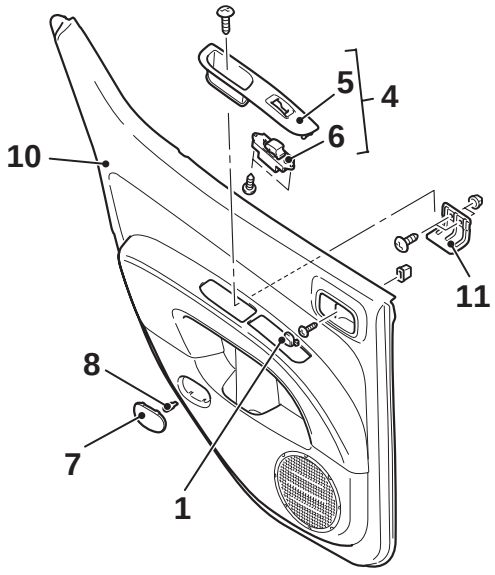
NOTE: Each number in the illustration indicates a part number.

<REAR DOOR TRIM-DOUBLE CAB>

<Manual window>



<Power window>



AC508266AB

Removal steps

<<**A**>>

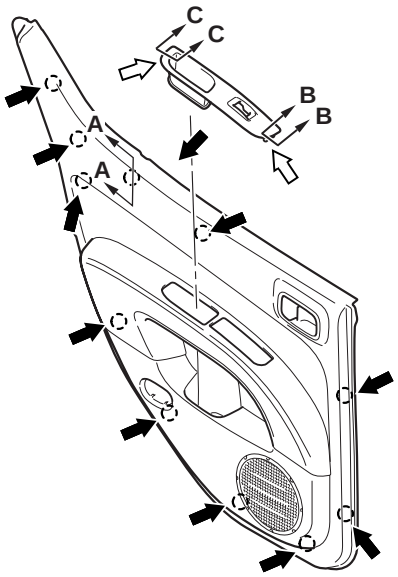
1. Rear door trim screw cap
2. Regulator handle clip <Manual window>
3. Regulator handle <Manual window>
4. Rear door power window switch assembly <Power window>
5. Rear door power window switch panel <Power window>
6. Rear door power window switch <Power window>
7. Rear door courtesy lamp lens <Vehicles with door lamp> or rear door courtesy lamp bulb <Vehicles without door lamp>

Removal steps (Continued)

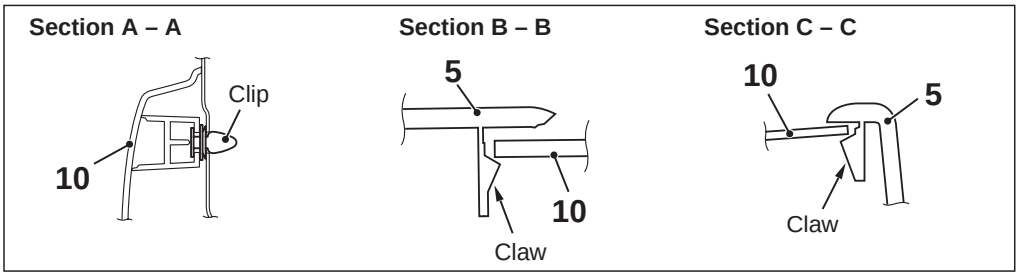
8. Rear door courtesy lamp bulb <Vehicles with door lamp>
9. Rear door trim box <Manual window>
10. Rear door trim
11. Rear door pull handle bracket

NOTE: Manual window removal and installation steps for the front and rear are the same as for the front of the club cab.

CLIP AND CLAW POSITIONS



NOTE
(1) ⬅ : Clip positions
(2) ⇦ : Claw positions

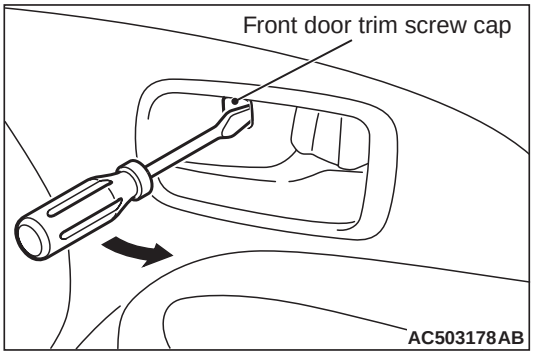


AC509423AB

NOTE: Each number in the illustration indicates a part number.

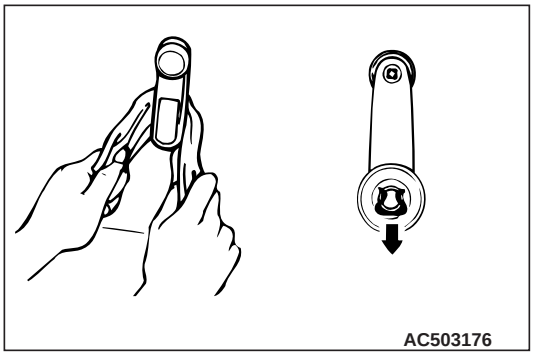
REMOVAL SERVICE POINTS

<<A>> FRONT/REAR DOOR TRIM SCREW CAP REMOVAL



Insert a flat-tipped screwdriver into the rear end of the front door trim screw cap, and prize out the cap to the direction shown. Then remove the tapping screw.

<<B>> REGULATOR HANDLE CLIP REMOVAL



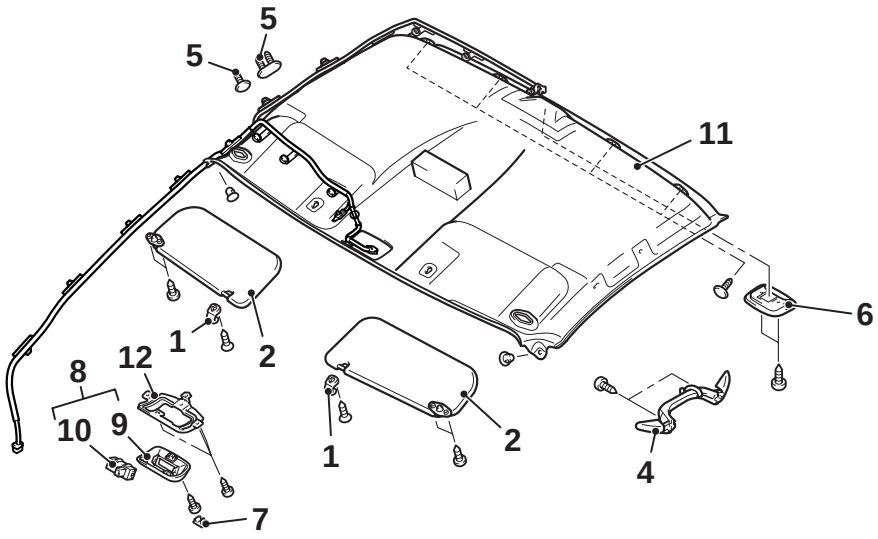
Use cloth to remove the regulator handle clip as shown in the illustration.

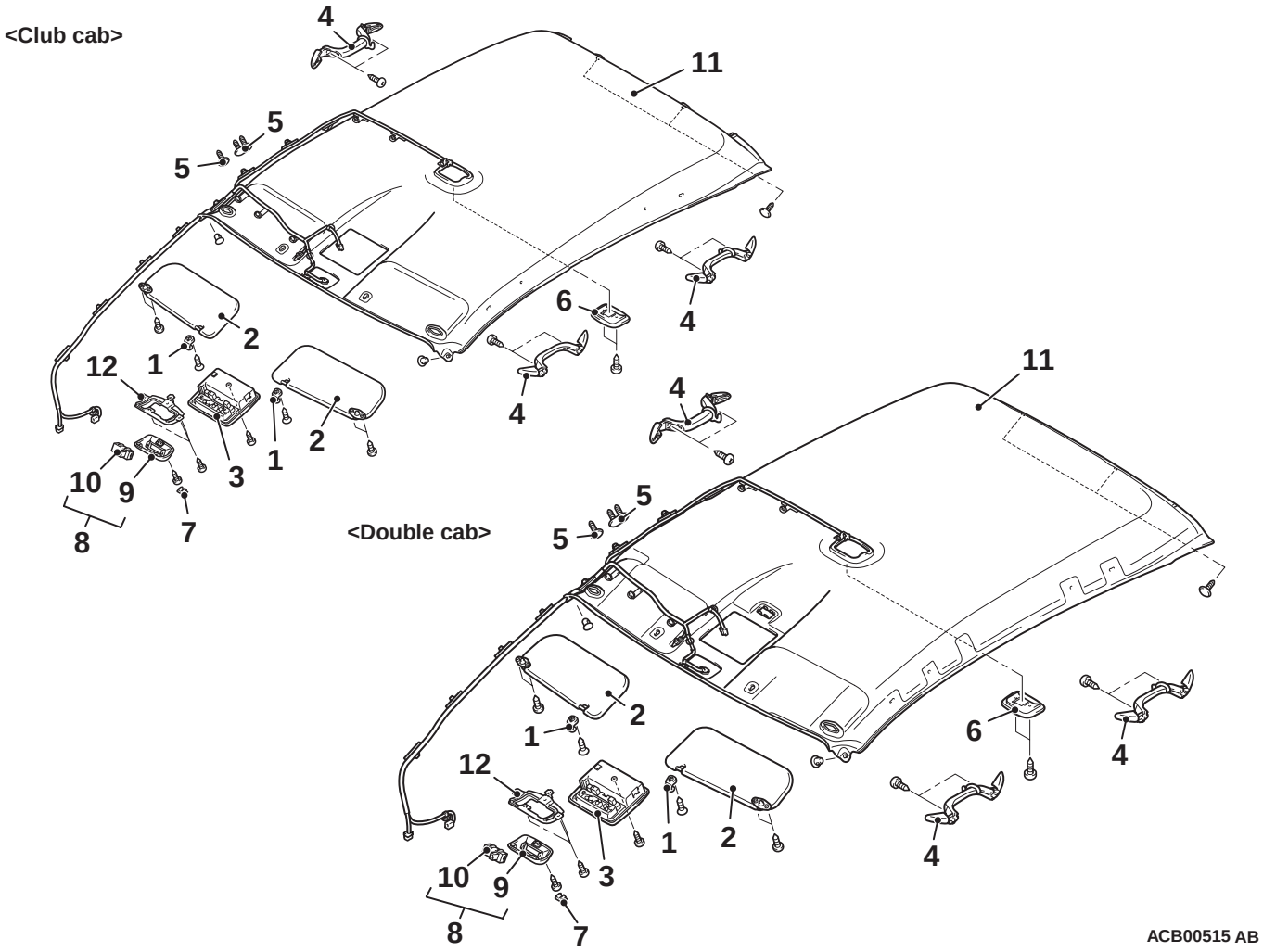
HEADLINING

REMOVAL AND INSTALLATION

M1521001402009

<Single cab>





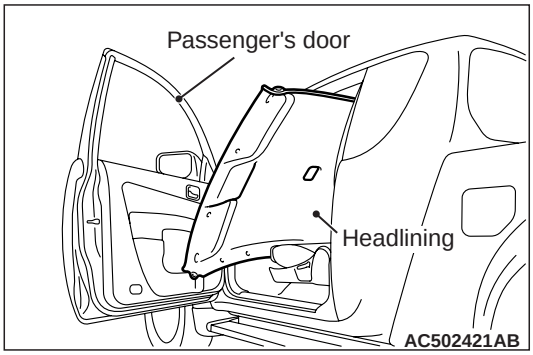
Removal steps

1. Sunvisor holder
2. Sunvisor
3. Front room lamp assembly <Except Single cab>
4. Assist grip
5. Assist grip clip
6. Rear room lamp
7. Clock hole cover <Except GLS-Limited>
8. Clock assembly <Except GLS-Limited>
9. Clock Garnish <Except GLS-Limited>
10. Digital clock <Except GLS-Limited>
- Microphone unit <Vehicles with microphone unit> (Refer to GROUP 54A –Microphone unit removal and installation .)
- Front seat passenger's side assembly <Double cab> (Refer to P.52A-22)

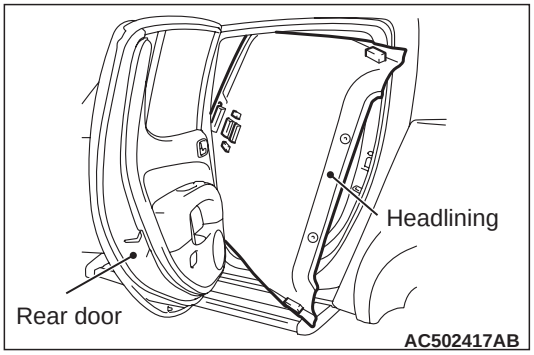
<<A>>
11. Headlining
12. Clock cover bracket <Except GLS-Limited>

REMOVAL SERVICE POINT

<<A>> HEADLINING REMOVAL



To remove the headlining from the vehicle, slide the front seat forward all the way, recline the seat-back to the back completely, and remove the headlining from passenger seat as shown in the figure. <Single cab and Club cab>

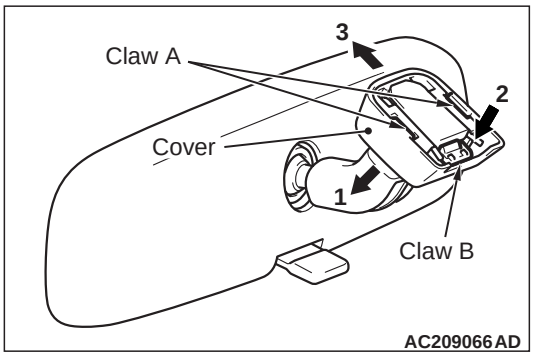


To remove the headlining from the vehicle, remove from the rear door (LH) as shown in the figure. <Double cab>

INSIDE REAR VIEW MIRROR

M1521002600431

REMOVAL SERVICE POINT



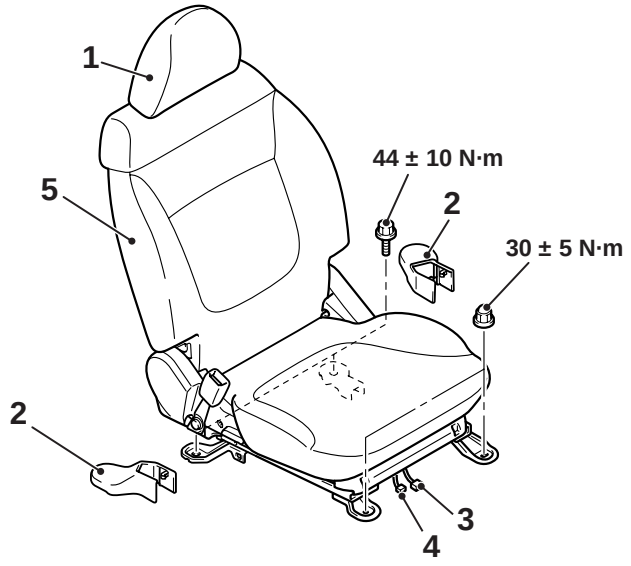
1. Disengage the claw A and lower the cover toward arrow 1 direction.
2. Push the claw B toward arrow 2 direction to unlock, and pull out the mirror toward arrow 3 direction.

FRONT SEAT ASSEMBLY

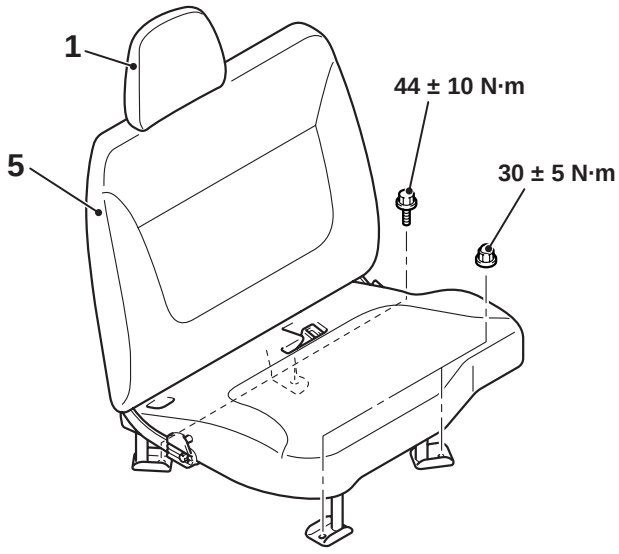
REMOVAL AND INSTALLATION

M1522001302061

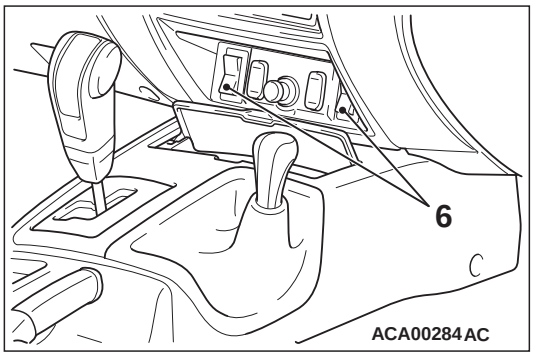
<Separate seat>



<Bench seat>



AC511525AB



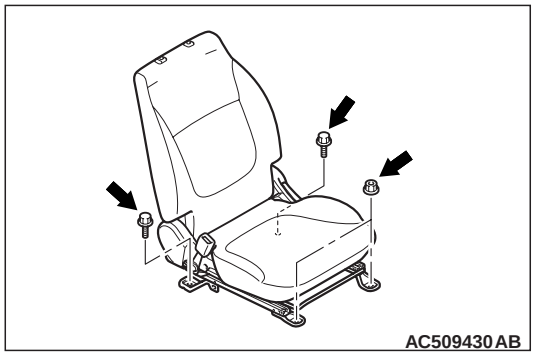
1. Headrestraint
   Removal steps
2. Rear anchor cover
3. Power seat harness connecter <Vehicles with power seat>
4. Seat belt switch connector <Vehicles for GCC>

>>**A**<< 5. Front seat assembly
   Heated seat switch removal step

6. Heated seat switch <Vehicles for Russia>

INSTALLATION SERVICE POINT

>>A<< FRONT SEAT ASSEMBLY INSTALLATION



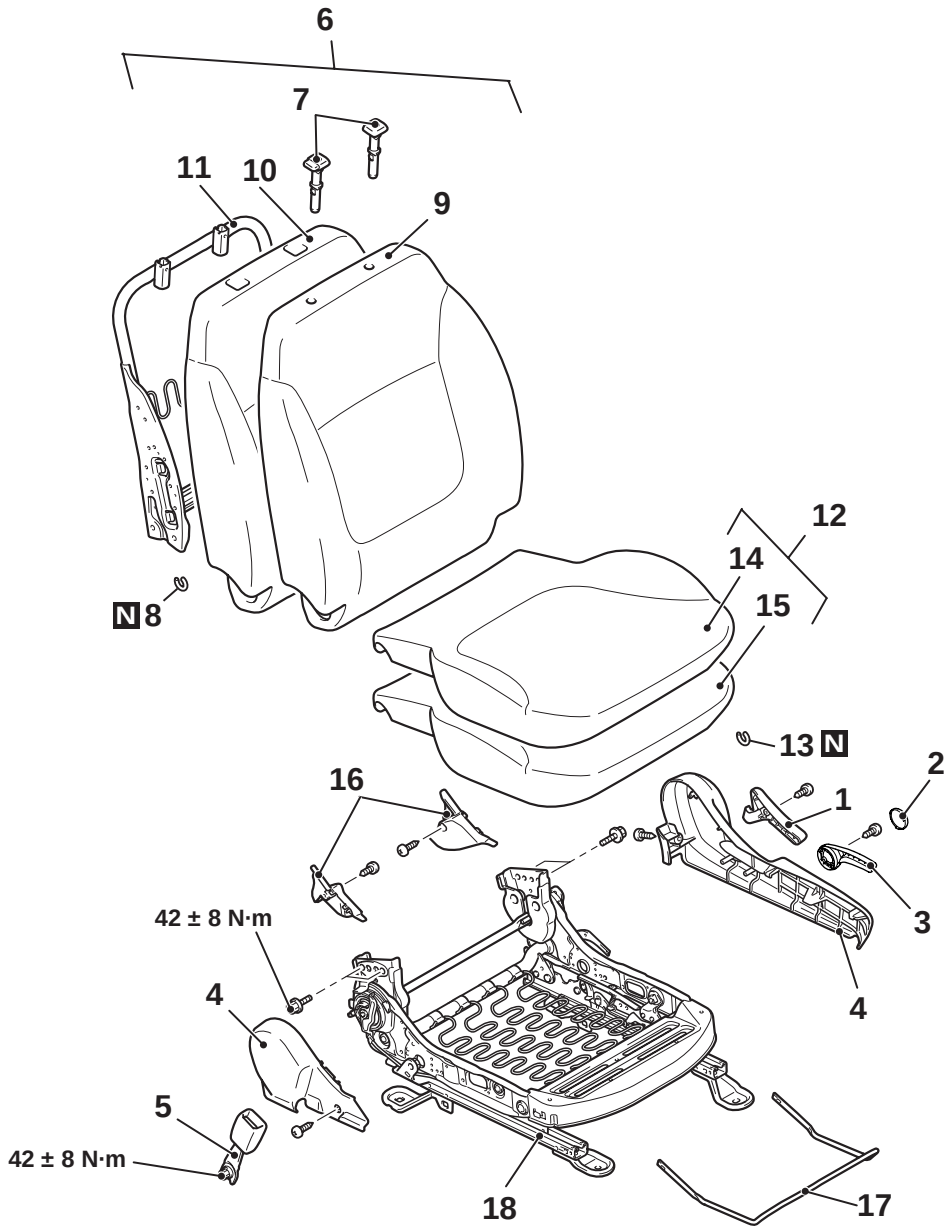
1. Confirm that the seat slide is locked. Then temporarily tighten all the nuts and bolts with no load applied to the front seat cushion.
2. Tighten all the nuts and bolts to the specified torque.

Tightening torque:
Bolt: 44 ± 10 N·m
Nut: 30 ± 5 N·m

DISASSEMBLY AND REASSEMBLY

M1522001502065

<MANUAL SEAT>



AC509458AC

Disassembly steps

1. Front seat reclining adjuster lever cover
2. Height adjuster lever cap <Except Single cab>
3. Height adjuster lever <Except Single cab>
4. Front seat side shield cover
5. Inner seat belt
6. Front seatback assembly

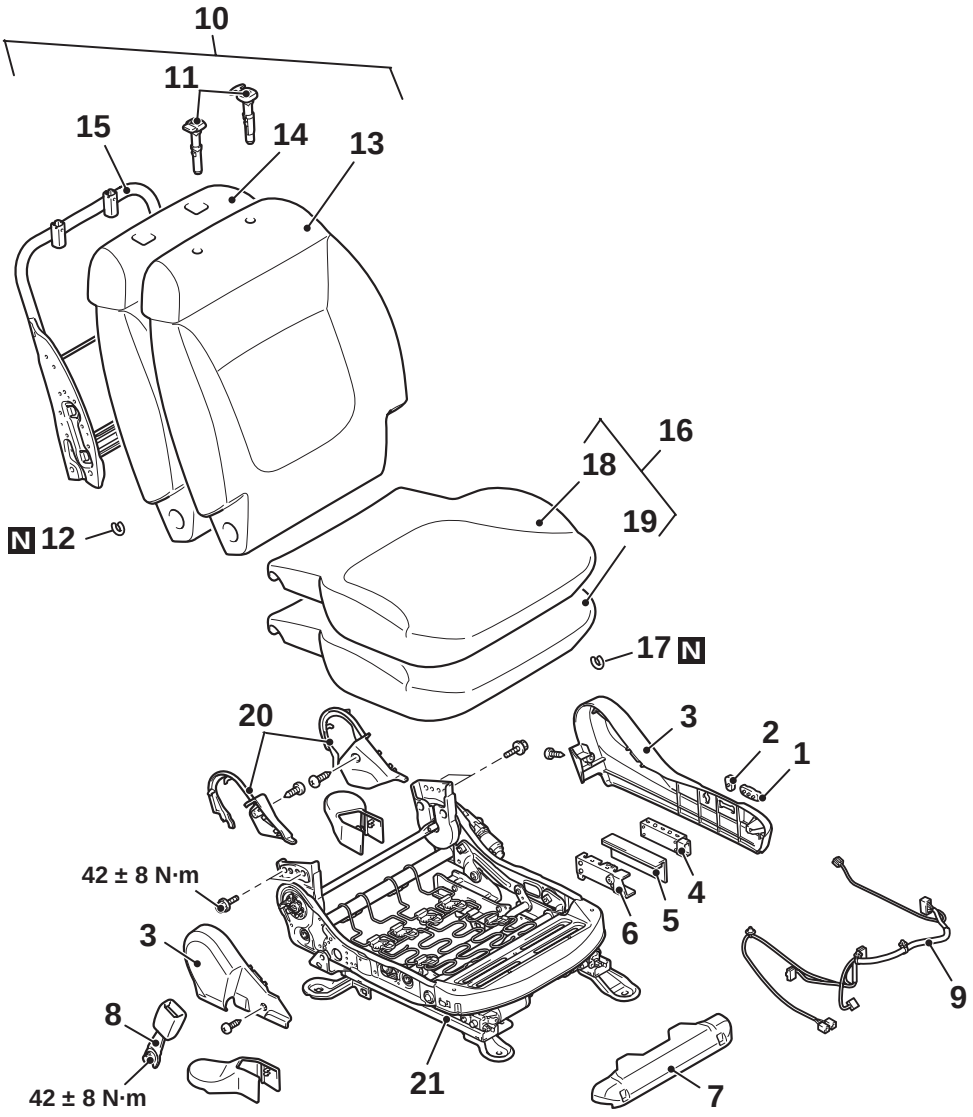
<<A>>

7. Headrestraint guide
8. Hog ling
9. Front seatback cover

Disassembly steps (Continued)

10. Front seatback pad
11. Front seatback frame
12. Front seat cushion assembly
13. Hog ling
14. Front seat cushion cover
15. Front seat cushion pad
16. Front seat side shield inner cover
17. Slide adjuster lever
18. Seat slide adjuster

<POWER SEAT>



AC509459AC

Disassembly steps

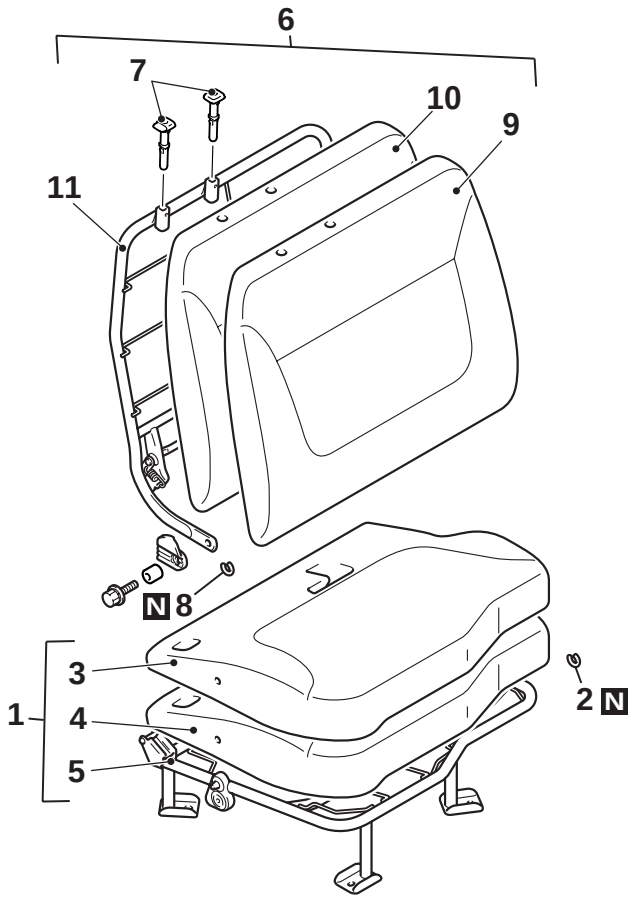
1. Front seat slide adjuster knob
2. Front seat reclining adjuster knob
3. Front seat side shield cover
4. Front power seat switch
5. Power seat switch bracket A
6. Power seat switch bracket B
7. Front seat motor cover
8. Inner seat belt
9. Front power seat harness
10. Front seatback assembly

<<A>> 11. Headrestraint guide

Disassembly steps (Continued)

12. Hog ling
13. Front seatback cover
14. Front seatback pad
15. Front seatback Frame
16. Front seat cushion assembly
17. Hog ling
18. Front seat cushion cover
19. Front seat cushion pad
20. Front seat side shield inner cover
21. Seat slide adjuster

<BENCH SEAT>



AC509460AC

Disassembly steps

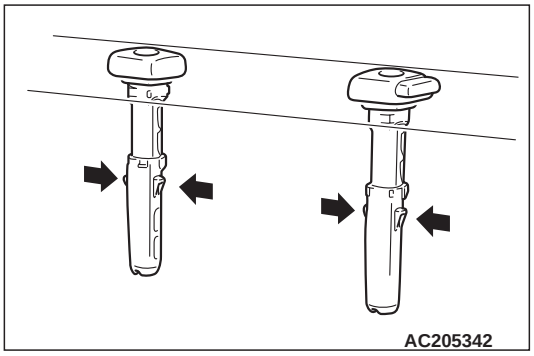
1. Front seat cushion assembly
2. Hog ling
3. Front seat cushion cover
4. Front seat cushion pad
5. Inner seat cushion frame
6. Front seatback assembly

<<A>>

7. Headrestraint guide
8. Front seatback cover
9. Hog ling
10. Front seatback pad
11. Front seatback frame

DISASSEMBLY SERVICE POINT

<<A>> HEADRESTRAINT GUIDE REMOVAL



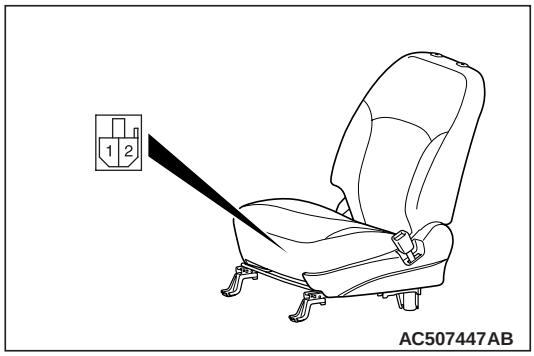
AC205342

Remove the headrest guides while pushing the on both sides inward.

INSPECTION

M1522001400608

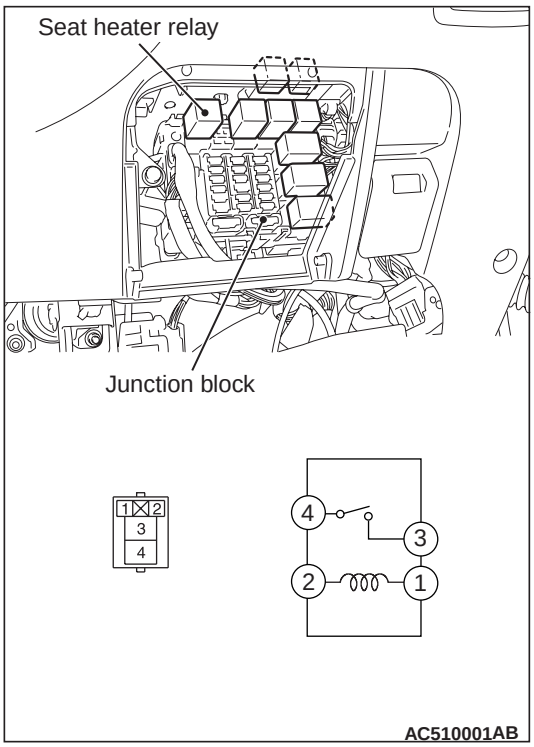
POWER SEAT SWITCH CONTINUITY CHECK



AC507447AB

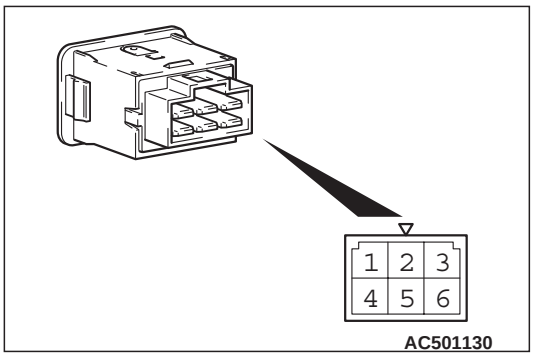
Connect the (+) terminal of the battery to the power seat connector terminal No.2 and the (–) terminal to terminal No.1, and check that the power seat works normally.

HEATED SEAT RELAY CONTINUITY CHECK



Battery voltage	Tester connection	Specified condition
Not applied	3 – 4	Open circuit
• Connect terminal 2 to the positive battery terminal • Connect terminal 1 to the negative battery terminal		Continuity (Less than 2 Ω)

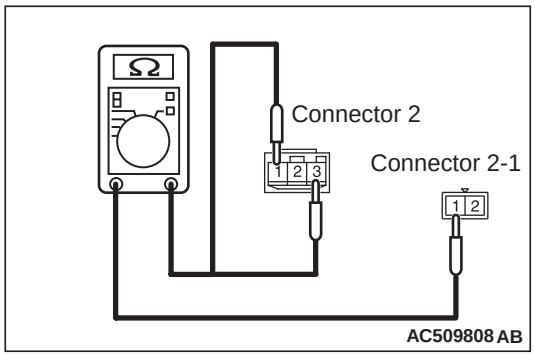
HEATED SEAT SWITCH CONTINUITY CHECK



Inspect the heated seat switch for continuity.

Switch position	Tester connection	Specified condition	Note
HI	1 – 2	Continuity (Less than 2 Ω)	
	2(+) – 6(–)		Indicator
	3 – 4		Illumination
OFF	3 – 4		Illumination
LOW	2 – 5		
	2(+) – 6(–)		Indicator
	3 – 4		Illumination

SEAT CUSHION HEATER CHECK

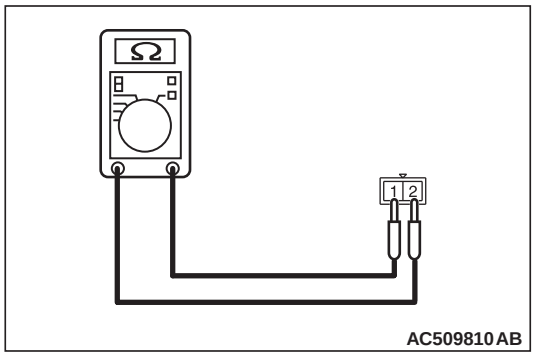


Measure the resistance between the terminals.

Standard value (At room temperature 20 °C):

Connector, terminal No.	Specified condition
Connector 2, terminal 3 – Connector 2 – 1, terminal 1	3.79 – 4.53 Ω
Connector 2, terminal 1 – Connector 2 – 1, terminal 1	3.98 – 4.76 Ω
Connector 2, terminal 3 – Connector 2, terminal 1	0.22 – 0.26 Ω

SEATBACK HEATER CHECK



Measure the resistance between the terminals.

Standard value (At room temperature 20 °C):

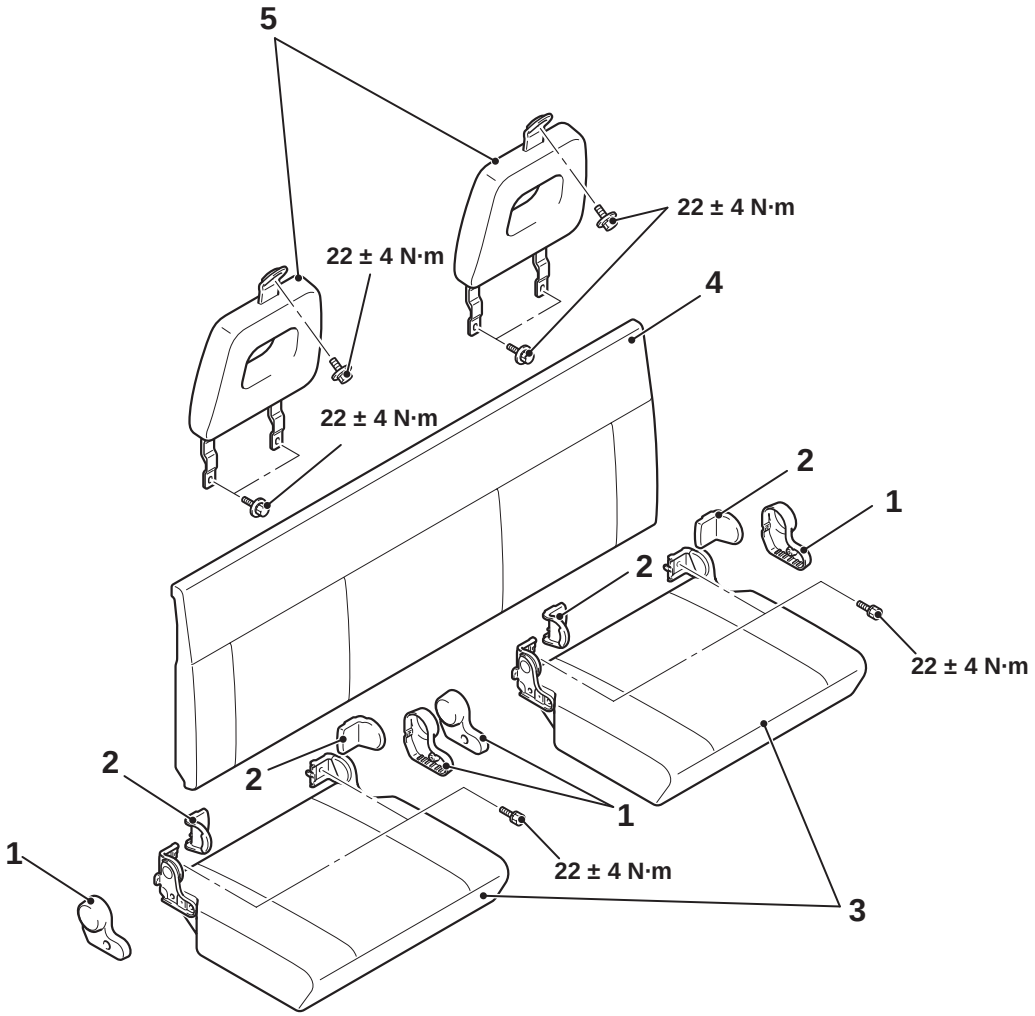
Tester connection	Specified condition
1 – 2	5.01 – 6.00 Ω

REAR SEAT ASSEMBLY <CLUB CAB, DOUBLE CAB>

REMOVAL AND INSTALLATION

M1522001801007

<CLUB CAB>



ACA01331 AC

Removal steps

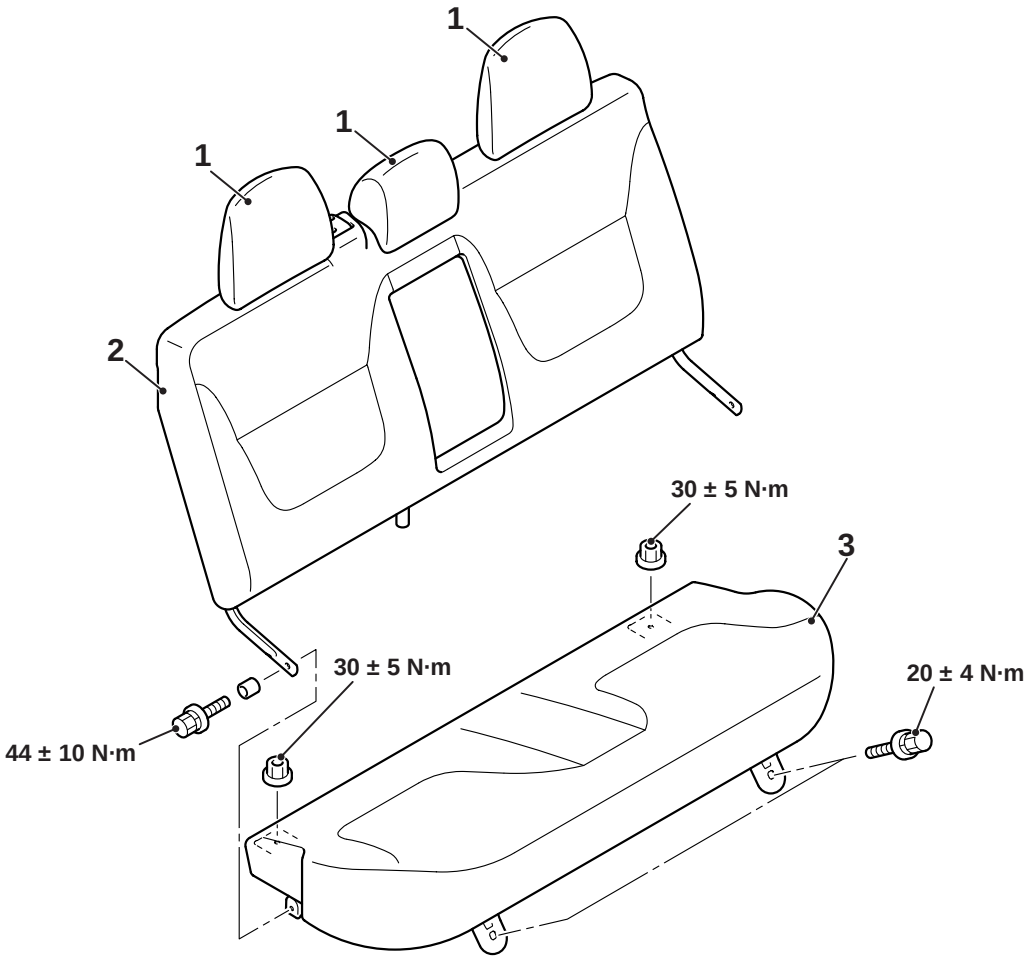
1. Rear seat hinge cover outer
2. Rear seat hinge cover inner
3. Rear seat cushion assembly

Removal steps (Continued)

4. Rear seatback assembly

>>A<< 5. Headrestraint

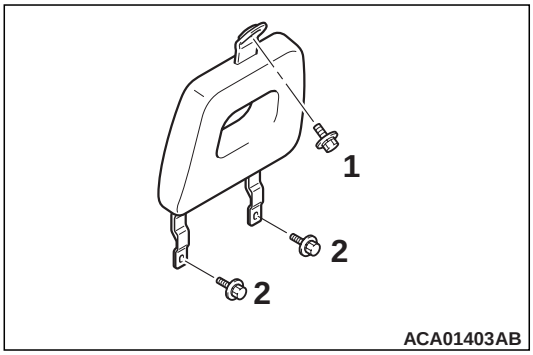
<DOUBLE CAB>



AC509494AB

1. Headrestraint
   Removal steps
2. Rear seat back assembly
3. Rear seat cushion assembly

INSTALLATION SERVICE POINT



ACA01403AB

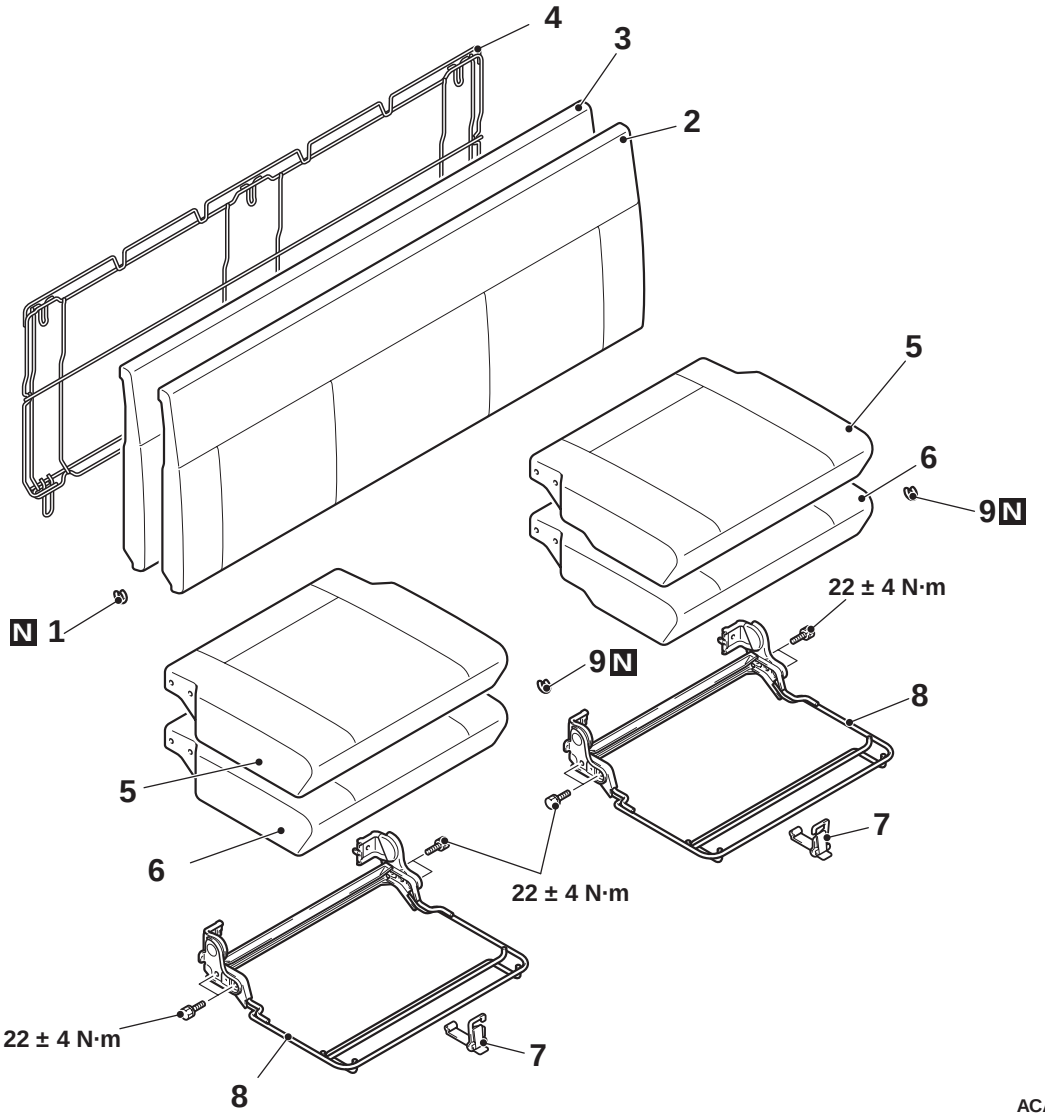
>>A<< HEADRESTRAINT INSTALLATION (CLUB CAB)

Tighten the bolts in the order shown in the figure.

DISASSEMBLY AND REASSEMBLY

M1522002001134

<CLUB CAB>



ACA01424AC

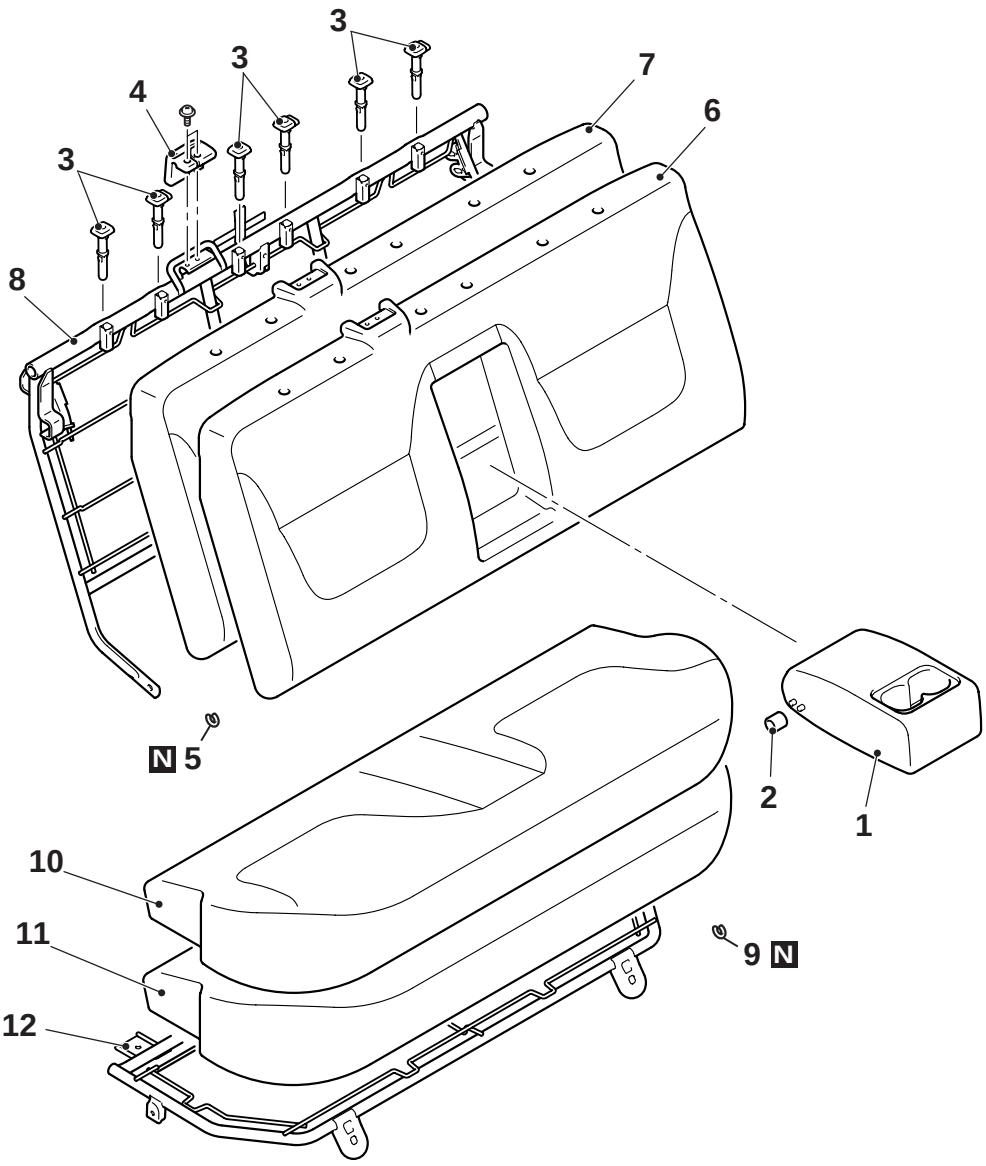
Disassembly steps

1. Hog ling
2. Rear seat back cover
3. Rear seat back pad
4. Rear seat back frame
5. Rear seat cushion cover

Disassembly steps (Continued)

6 Rear seat cushion pad
7 Strap
8. Rear seat cushion frame
9. Hog ling

<DOUBLE CAB>



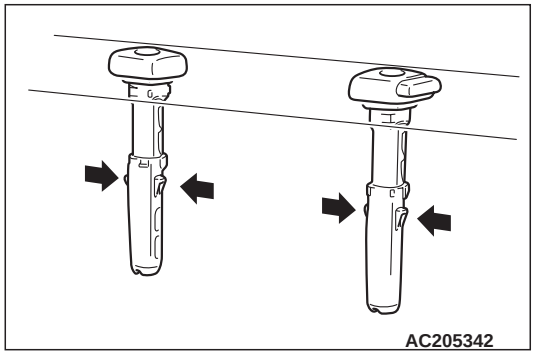
AC509496AD

Disassembly steps

1. Rear seat armrest
2. Rear seat bushing
<<A>> 3. Headrestraint guide
4. Rear seat belt garnish
5. Hog ling
6. Rear seat back cover
7. Rear seat back pad
8. Rear seat back frame
9. hog ling
10. Rear seat cushion cover
11. Rear seat cushion pad
12. Rear seat cushion frame

DISASSEMBLY SERVICE POINT

<<A>> HEADRESTRAINT GUIDE REMOVAL



Remove the headrest guides while pushing the on both sides inward.

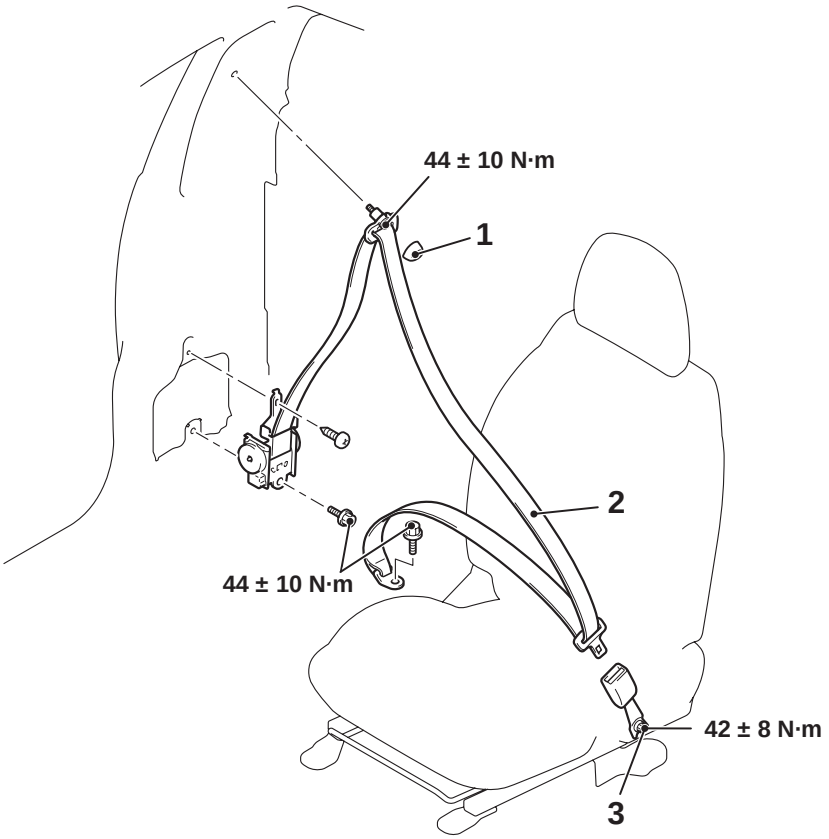
FRONT SEAT BELT

REMOVAL AND INSTALLATION <SINGLE CAB>

M1523001300701

⚠ CAUTION

SRS: Before removing and installing the seat belts with pre-tensioner, refer to GROUP 52B, Seat Belt with Pre-tensioner .



AC503184 AB

Removal steps

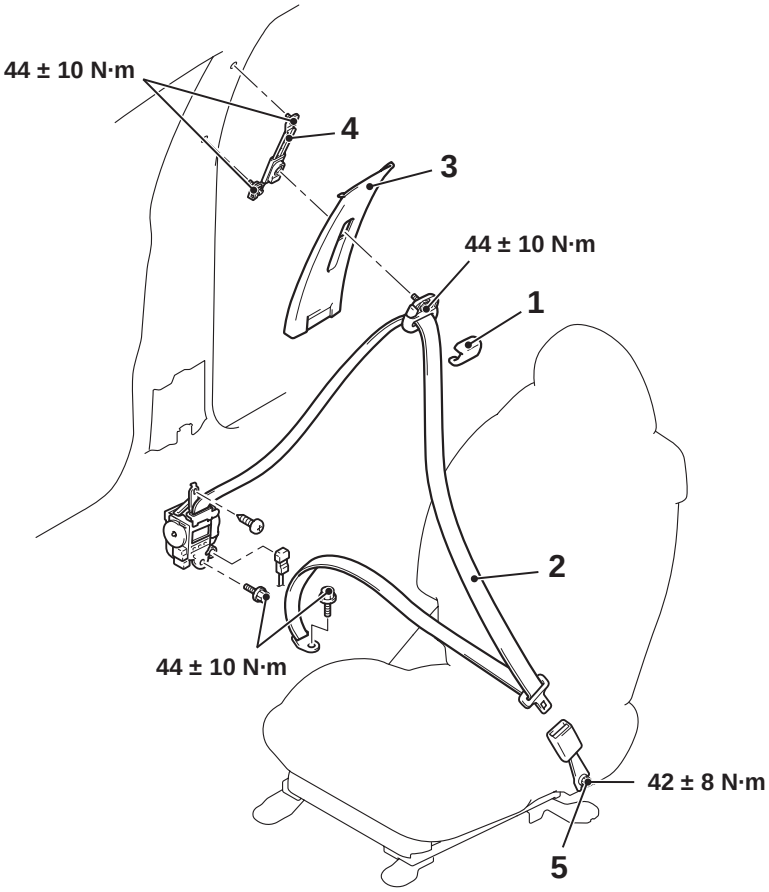
1. Sash guide cover
2. Outer seat belt (Refer to GROUP 52B, Seat belt with Pre-tensioner).
3. Inner seat belt

REMOVAL AND INSTALLATION <CLUB CAB AND DOUBLE CAB>

M1523001301481

⚠ CAUTION

SRS: Before removing and installing the seat belts with pre-tensioner, refer to GROUP 52B, Seat Belt with Pre-tensioner .



AC407291AB

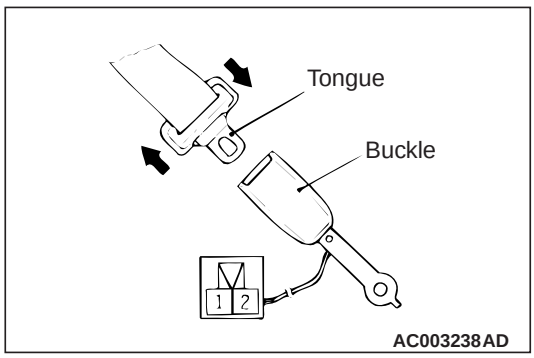
Removal steps

1. Sash guide cover
- Quarter lower trim <Club cab>, Centre pillar lower trim <Double cab> (Refer to P.52A-13<Club cab>, P.52A-15<Double cab>).
2. Outer seat belt (Refer to GROUP 52B, Seat belt with Pre-tensioner).
3. Quarter upper trim <Club cab>, centre pillar upper trim <Double cab> (Refer to P.52A-13<Club cab>, P.52A-15<Double cab>).
4. Adjustable seat belt anchor
5. Inner seat belt

INSPECTION

M1523004400291

SEAT BELT BUCKLE SWITCH CONTINUITY CHECK



AC003238AD

If there is no continuity, replace the seat belt.

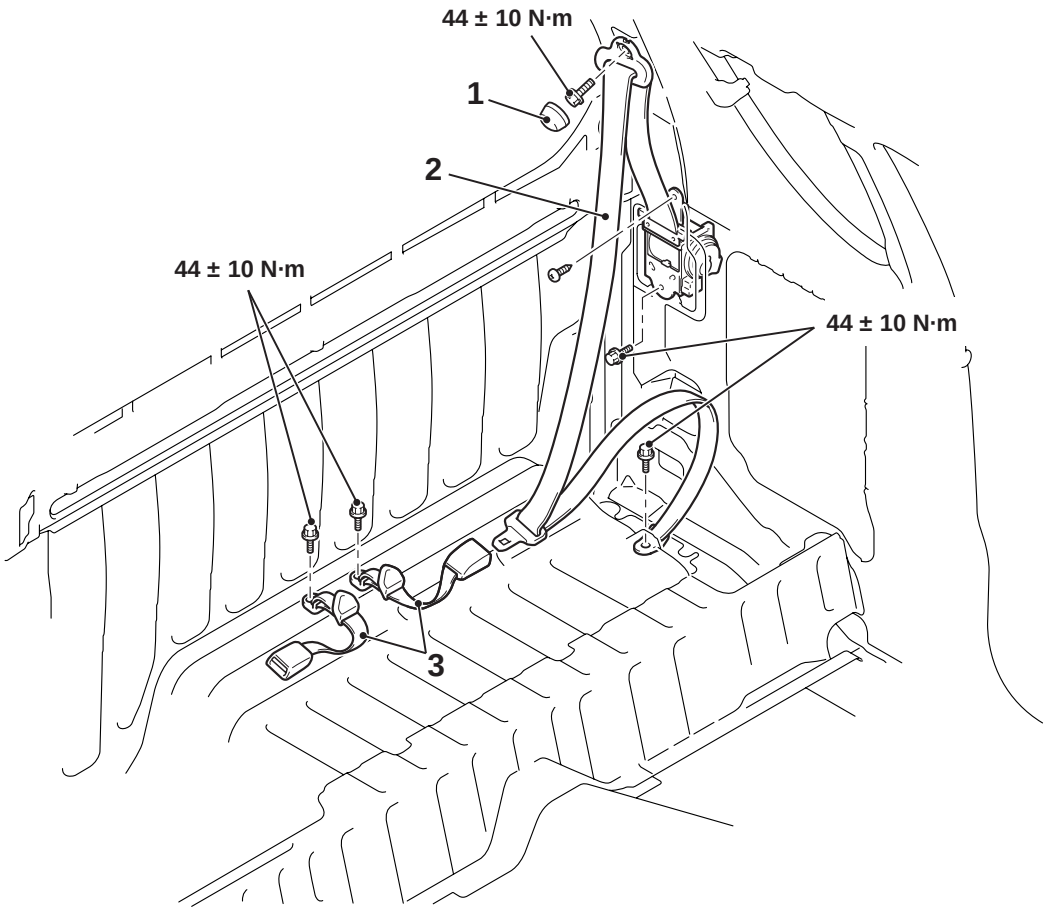
Item	Tester connection	Specified condition
Fastened seat belt	1 – 2	Open circuit
Unfastened seat belt	1 – 2	Continuity (Less than 2 Ω)

REAR SEAT BELT <CLUB CAB, DOUBLE CAB>

REMOVAL AND INSTALLATION

M1523001601181

<CLUB CAB>



AC509487AB

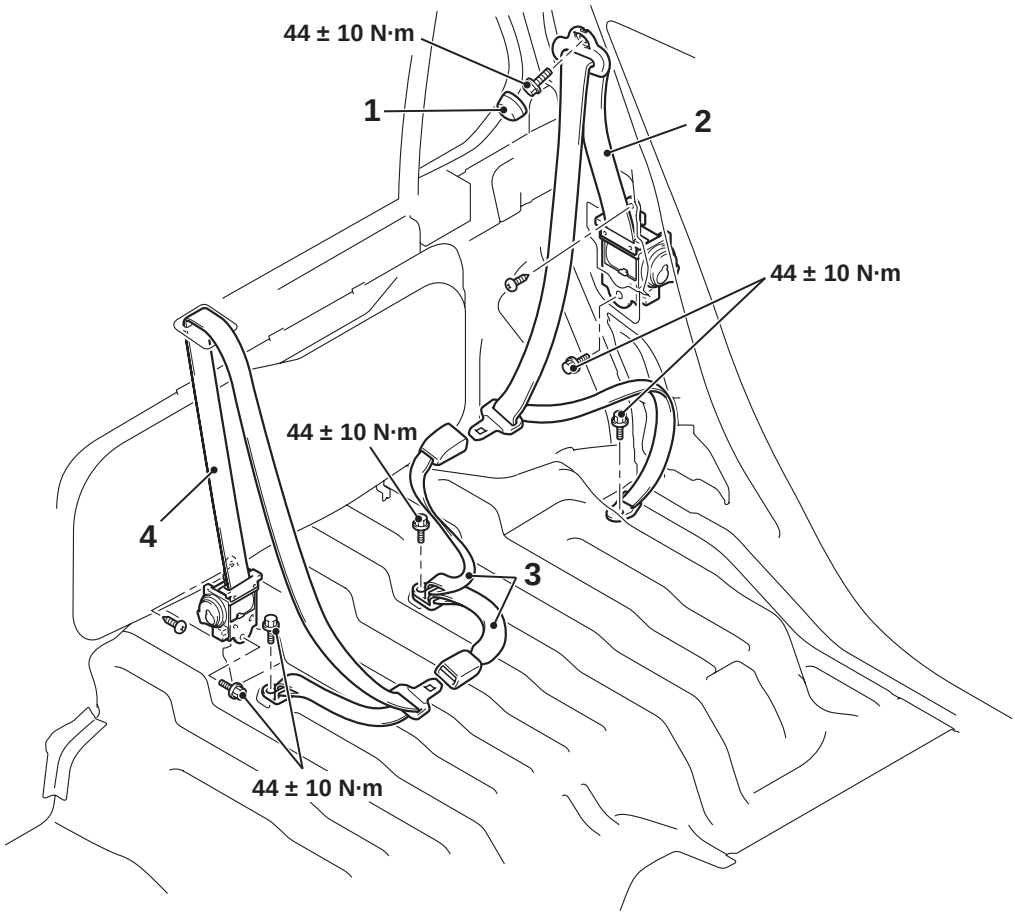
Removal steps

- Rear seat assembly (Refer to P.52A-30).
- Quarter lower trim (Refer to P.52A-13).

Removal steps (Continued)

1. Sash guide cover
2. Outer seat belt
3. Inner seat belt

<DOUBLE CAB>



AC509488AB

Removal steps

- Rear seat assembly (Refer to P.52A-30).
- Rear pillar lower trim (Refer to P.52A-15).

Removal steps (Continued)

1. Sash guide cover
2. Outer seat belt
3. Inner seat belt
4. Centre seat belt

GROUP 52B

SUPPLEMENTAL RESTRAINT SYSTEM (SRS)

CONTENTS

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TEST EQUIPMENTS 52B-11

TROUBLESHOOTING 52B-12

- DIAGNOSIS TROUBLESHOOTING FLOW 52B-12
- DIAGNOSIS FUNCTION. 52B-12
- SRS WARNING LAMP CHECK 52B-12
- PASSENGER'S AIR BAG OFF INDICATOR LAMP CHECK 52B-12
- DIAGNOSIS CODE CHART 52B-12
- DIAGNOSIS CODE PROCEDURES <VEHICLES WITHOUT SIDE-AIRBAG AND CURTAIN AIR BAG> 52B-21
- DTC B1400 DRIVER'S AIR BAG SQUIB SHORT-CIRCUITED. 52B-21
- DTC B1401 DRIVER'S AIR BAG SQUIB OPEN-CIRCUITED. 52B-25
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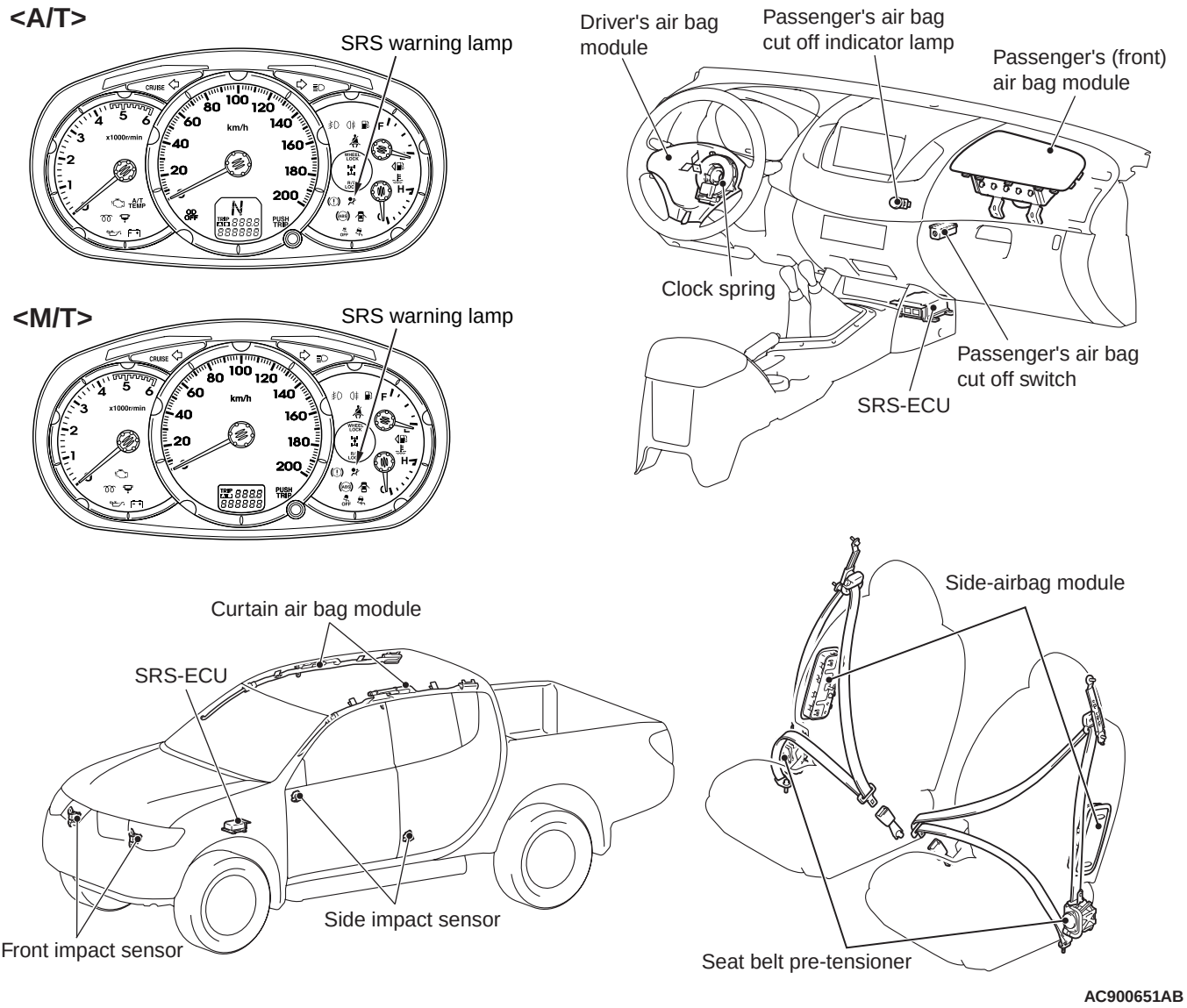
GENERAL INFORMATION

M1524000102145

The driver’s and passenger’s air bag and seat belt with pre-tensioner is designed to supplement the driver's and front passenger's seat belts to help reduce the risk or severity of injury to the driver and front passenger by activating and deploying both front air bags in certain frontal collisions. The side-air bag and the curtain air bag are activated when an impact exceeds the threshold upon a side collision, and inflates to protect the heads of the occupants in the front and rear seats.

The Supplemental Restraint System (SRS) consists of air bag modules, SRS air bag control unit (SRS-ECU), front impact sensors, side impact sensor, SRS warning lamp, clock spring, passenger’s air bag cut off switch, passenger’s air bag cut off indicator lamp and seat belt with pre-tensioner. Front air bags are located in the centre of the steering wheel and above the glove box. Side-airbags are located inside the front seatback assemblies. The curtain air bag module is installed in the roof side sections (from the driver's and the passenger's front pillars to the rear pillars). Each air bag is made up of a folded air bag and an inflator unit. The SRS-ECU is mounted on the front of the floor console and has a front air bag safing G-sensor, front air bag analogue G-sensor. The front impact sensor is installed out side of the headlamp support panel. The side impact sensor is installed in the lower parts of the centre pillars. The warning lamp on the instrument panel indicates the operational status of the SRS. The clock spring is installed in the steering column. The passenger’s air bag cut off switch is located above inside the glove box. The passenger’s air bag cut off indicator lamp is located above the centre upper panel. The seat belt pre-tensioner is built into the driver's and passenger's front seat belt retractor.

Only authorized service personnel should do work on or around the SRS components. Those service personnel should read this manual carefully before starting any such work.



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SERVICE PRECAUTIONS

M1524000301867

⚠ DANGER

In order to avoid injury to yourself or others from accidental deployment of the air bag during servicing, read and carefully follow all the precautions and procedures described in this manual.

⚠ CAUTION

Do not use any electrical test equipment on or near SRS components, except those specified on P.52B-11.

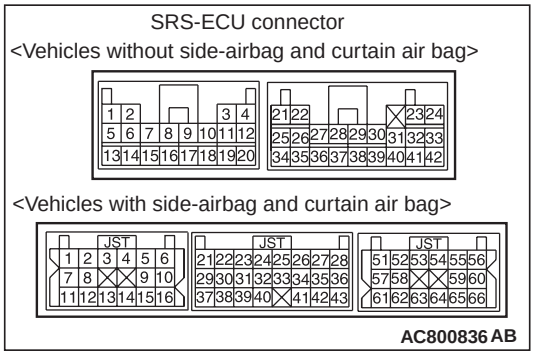
⚠ CAUTION

Never attempt to repair the following components:

1. **SRS-ECU**
2. **Front impact sensor**
3. **Clock spring**
4. **Driver's and passenger's (front) air bag modules**
5. **Seat belt with pre-tensioner**
6. **Side impact sensor**
7. **Front seatback assembly incorporating side-airbag module**
8. **Curtain air bag module**

NOTE: If any of these components are diagnosed as faulty, they should only be replaced, in accordance with the INDIVIDUAL COMPONENTS SERVICE procedures in this manual, starting at page P.52B-261.

⚠ CAUTION



Do not attempt to repair the wiring harness connectors of the SRS. If a defective wiring harness is found, repair or replace it by referring to the table below.

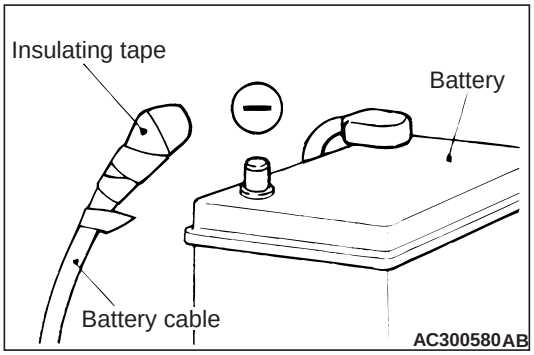
<Vehicle without side-airbag and curtain air bag>

SRS-ECU terminal No.	Destination of harness	Remedy
1, 2	Instrument panel wiring harness → Front wiring harness → Front impact sensor (RH)	Correct or replace each wiring harness.
3, 4	Instrument panel wiring harness → Front wiring harness → Front impact sensor (LH)	Correct or replace each wiring harness.
8	Instrument panel wiring harness → SRS warning lamp	Correct or replace the Instrument panel wiring harness.
9, 10	Instrument panel wiring harness → Passenger's air bag cut off switch → Passenger's (front) air bag module	Correct or replace the instrument panel wiring harness.
11, 12	Instrument panel wiring harness → Clock spring → Driver's air bag module	Correct or replace instrument panel wiring harness. Replace the clock spring.
13	Instrument panel wiring harness → Junction block (fuse No.21)	Correct or replace the instrument panel wiring harness.
16	Instrument panel wiring harness → Junction block (fuse No.15)	Correct or replace the instrument panel wiring harness.
18	Instrument panel wiring harness → Earth	Correct or replace the instrument panel wiring harness.
20	Instrument panel wiring harness → Diagnosis connector	Correct or replace the instrument panel wiring harness.
27, 28	Instrument panel wiring harness → Floor wiring harness → Seat belt pretensioner (passenger’s side)	Correct or replace each wiring harness.
29, 30	Instrument panel wiring harness → Floor wiring harness → Seat belt pretensioner (driver’s side)	Correct or replace each wiring harness.

<Vehicle with side-airbag and curtain air bag>

SRS-ECU terminal No.	Destination of harness	Remedy
1, 2	Floor wiring harness → Instrument panel wiring harness → roof wiring harness → curtain air bag module (LH)	Correct or replace each wiring harness.
3, 4	Floor wiring harness → side-airbag module (LH)	Correct or replace the floor wiring harness.
5, 6	Floor wiring harness → Seat belt pre-tensioner (passenger's side)	
15, 16	Floor wiring harness → side impact sensor (LH)	
21, 22	Instrument panel wiring harness → Passenger's air bag cut off switch → Passenger's (front) air bag module	Correct or replace the instrument panel wiring harness.
27, 28	Instrument panel wiring harness → Clock spring → Driver's air bag module	Correct or replace instrument panel wiring harness. Replace the clock spring.
29, 30	Instrument panel wiring harness → Front wiring harness → Front impact sensor (LH)	Correct or replace each wiring harness.
35, 36	Instrument panel wiring harness → Front wiring harness → Front impact sensor (RH)	
37	Instrument panel wiring harness → Junction block (fuse No.15)	Correct or replace the instrument panel wiring harness.
38	Instrument panel wiring harness → Diagnosis connector	
39	Instrument panel wiring harness → SRS warning lamp	
41	Instrument panel wiring harness → Earth	
43	Instrument panel wiring harness → Junction block (fuse No.21)	
51, 52	Floor wiring harness → Seat belt pre-tensioner (driver's side)	Correct or replace the floor wiring harness.
53, 54	Floor wiring harness → side-airbag module (RH)	
55, 56	Floor wiring harness → Instrument panel wiring harness → roof wiring harness → curtain air bag module (RH)	Correct or replace each wiring harness.
61, 62	Floor wiring harness → side impact sensor (RH)	Correct or replace the floor wiring harness.

⚠ DANGER



After disconnecting the battery cable, wait 60 seconds or more before proceeding with the following work. In addition, insulate the negative battery terminal with a tape. The condenser inside the SRS-ECU is designed to retain enough voltage to deploy the air bag

for a short time even after the battery has been disconnected, so serious injury may result from unintended air bag deployment if work is done on the SRS system immediately after the battery cables are disconnected.

⚠ CAUTION

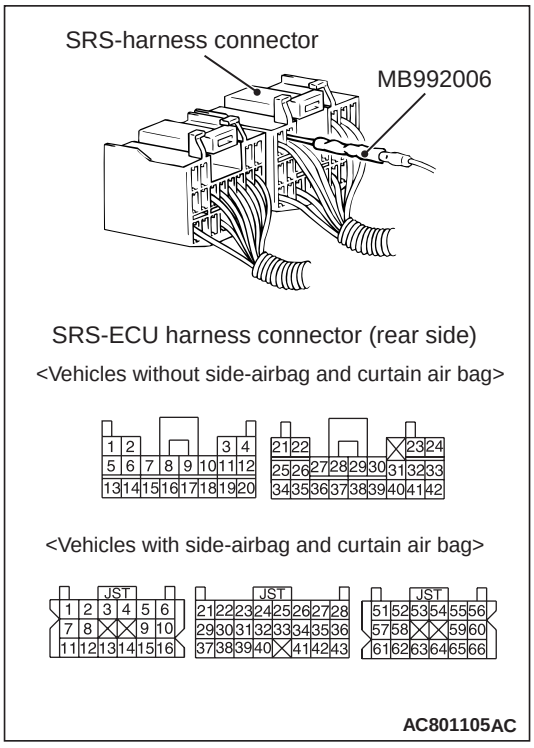
The SRS components and seat belt with pre-tensioner should not be subjected to heat, so remove the SRS-ECU, driver's and passenger's (front) air bag modules, clock spring, front impact sensor, curtain air bag module, seat belt with pre-tensioner before drying or baking the vehicle after painting.

- **SRS-ECU, air bag modules, clock spring and impact sensors: 93° C or more**
- **Seat belt with pre-tensioner: 90°C or more**

⚠ CAUTION

Whenever you finish servicing the SRS, always erase the diagnosis code and check warning lamp operation to make sure that the system functions properly.

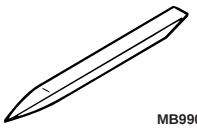
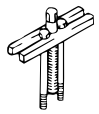
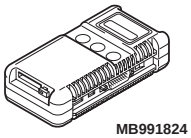
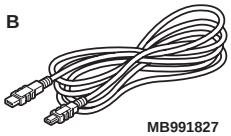
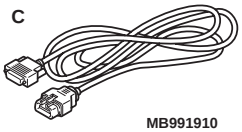
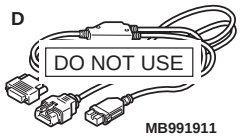
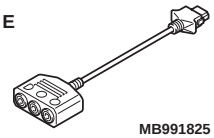
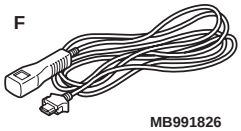
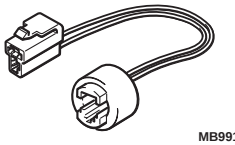
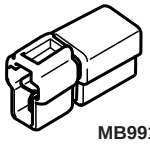
⚠ CAUTION

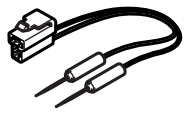
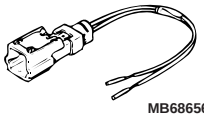
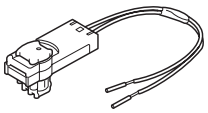
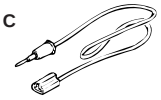


If checks are carried out by using the SRS-ECU harness connector, observe the following procedures: Insert the special tool extra fine probe (MB992006) into connector from harness side (rear side), and connect the tester to this probe. If any tool than special tool is used, damage to the harness and other components will result. Never insert the probe directly to the terminals from the front of the connector. The terminals are plated to increase their conductivity, so that if they are touched directly by the probe, the plating may break, which will cause drops in reliability.

SPECIAL TOOLS

M1524000701683

Tool	No.	Name	Use
 MB990784	MB990784	Ornament remover	Removal of cover.
 MB990803	MB990803	Steering wheel puller	Steering wheel disconnection
A  MB991824 B  MB991827 C  MB991910 D  MB991911 E  MB991825 F  MB991826 MB991955	MB991955 A: MB991824 B: MB991827 C: MB991910 D: MB991911 E: MB991825 F: MB991826	M.U.T.-III sub-assembly A: Vehicle communication interface (V. C. I.) B: M.U.T.-III USB cable C: M.U.T.-III main harness A (Vehicles with CAN communication system) D: M.U.T.-III main harness B (Vehicles without CAN communication system) E: M.U.T.-III measure adapter F: M.U.T.-III trigger harness	⚠ CAUTION **For vehicles with CAN communication, use M.U.T.-III main harness A to send simulated vehicle speed. If you connect M.U.T.-III main harness B instead, the CAN communication does not function correctly.** Checking diagnosis code
 MB991884	MB991884	Resistor harness (For pre-tensioner)	Seat belt pre-tensioner and curtain air bag circuit check
 MB991865	MB991865	Dummy resistor	SRS air bag and seat belt pre-tensioner circuit check

Tool	No.	Name	Use
 MB991866	MB991866	Resistor harness	Driver's and passenger's (front) air bag and side-airbag circuit check
 MB686560	MB686560	SRS air bag adapter harness	• Deployment of passenger's (front) air bag module inside the vehicle • Deployment of passenger's (front) air bag module outside the vehicle
 MB991885	MB991885	Pre-tensioner adapter harness	• Deployment of curtain air bag module or seat belt pre-tensioner inside the vehicle • Deployment of curtain air bag module or seat belt pre-tensioner outside the vehicle
A B C  D MB991223AZ	MB991223 A: MB991219 B: MB991220 C: MB991221 D: MB991222	Harness set A: Check harness B: LED harness C: LED harness adapter D: Probe	Continuity check and voltage measurement at harness wire or connector A: For checking connector pin contact pressure B: For checking power supply circuit C: For checking power supply circuit D: For connecting a locally sourced tester
MB992006	MB992006	Extra fine probe	Continuity check and voltage measurement at harness wire or connector

TEST EQUIPMENTS

M1524000800568

Tool	Name	Use
AC300683	Digital multi-meter	Checking SRS electrical circuitry (Use multi-meter for which the maximum test current is 2 mA or less at minimum range of resistance measurement)

TROUBLESHOOTING

DIAGNOSIS TROUBLESHOOTING FLOW

M1524003100728

Refer to GROUP 00, Contents of Troubleshooting .

DIAGNOSIS FUNCTION

M1524003200554

DIAGNOSIS CODES CHECK

⚠ CAUTION

Turn off the ignition switch before connecting or disconnecting the M.U.T.-III.

Connect the M.U.T.-III to the diagnosis connector (16-pin) under the instrument under cover, then check diagnosis codes (Refer to GROUP 00, Diagnosis Function).

ERASING DIAGNOSIS CODE

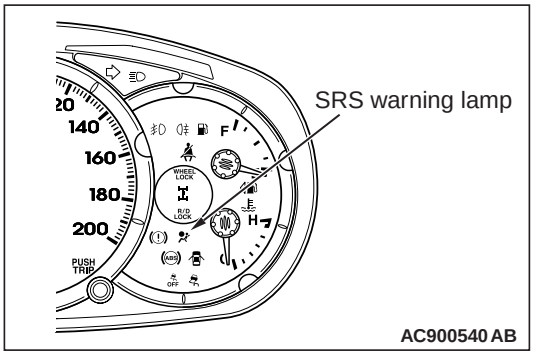
⚠ CAUTION

Turn off the ignition switch before connecting or disconnecting the M.U.T.-III.

Connect the M.U.T.-III to the diagnosis connector and erase the diagnosis code (Refer to GROUP 00, Diagnosis Function).

SRS WARNING LAMP CHECK

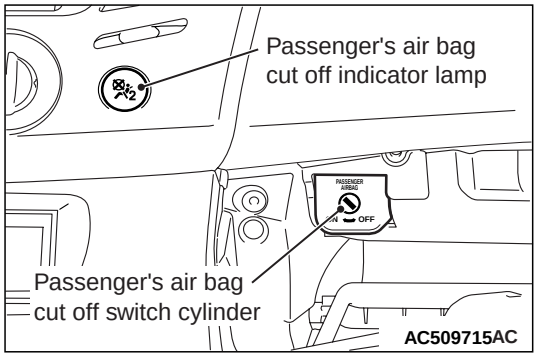
M1524004301104



1. Check that the SRS warning lamp comes on when the ignition switch is turned ON.
2. Check that the SRS warning lamp illuminates for about 7 seconds and then goes out.
3. If this is not the cause, check the diagnosis codes.

PASSENGER'S AIR BAG CUT OFF INDICATOR LAMP CHECK

M1524026300217



1. Check that the passenger’s air bag cut off indicator lamp illuminates when the ignition key is inserted in the passenger's air bag cut off switch cylinder and turned it to the "OFF" position.
2. If not, refer toP.52B-288.

CHECK CHART FOR DIAGNOSIS CODES

M1524003302278

Inspect according to the inspection chart that is appropriate for the diagnosis code.

Code No.	Diagnosis item	Reference Page
B1400*2	Driver's air bag module (squib) system (short-circuited between terminals of the squib circuit)	P.52B-21 <vehicles without side-airbag and curtain air bag>, P.52B-93 <vehicles with side-airbag and curtain air bag>
B1401*2	Driver's air bag module (squib) system (open-circuited in the squib circuit)	P.52B-25 <vehicles without side-airbag and curtain air bag>, P.52B-97 <vehicles with side-airbag and curtain air bag>
B1402*2	Driver's air bag module (squib) system (short-circuited to the earth)	P.52B-28 <vehicles without side-airbag and curtain air bag>, P.52B-100 <vehicles with side-airbag and curtain air bag>
B1403*2	Driver's air bag module (squib) system (short-circuited to the power supply)	P.52B-31 <vehicles without side-airbag and curtain air bag>, P.52B-103 <vehicles with side-airbag and curtain air bag>
B1404*3	Driver's air bag module (squib ignition drive circuit) system detected short circuit	P.52B-34 <vehicles without side-airbag and curtain air bag>, P.52B-106 <vehicles with side-airbag and curtain air bag>
B1405*3	Driver's air bag module (squib ignition drive circuit) system detected open circuit	P.52B-34 <vehicles without side-airbag and curtain air bag>, P.52B-106 <vehicles with side-airbag and curtain air bag>
B1410*2	Passenger's (front) air bag module (squib) system (short-circuited between terminals of the squib circuit)	P.52B-36 <vehicles without side-airbag and curtain air bag>, P.52B-109 <vehicles with side-airbag and curtain air bag>
B1411*2	Passenger's (front) air bag module (squib) system (open-circuited in the squib circuit)	P.52B-40 <vehicles without side-airbag and curtain air bag>, P.52B-113 <vehicles with side-airbag and curtain air bag>

Code No.	Diagnosis item	Reference Page
B1412*2	Passenger's (front) air bag module (squib) system (short-circuited to the earth)	P.52B-43 <vehicles without side-airbag and curtain air bag>, P.52B-116 <vehicles with side-airbag and curtain air bag>
B1413*2	Passenger's (front) air bag module (squib) system (short-circuited to the power supply)	P.52B-46 <vehicles without side-airbag and curtain air bag>, P.52B-119 <vehicles with side-airbag and curtain air bag>
B1414*3	Passenger's (front) air bag module (squib ignition drive circuit) system detected short circuit	P.52B-34 <vehicles without side-airbag and curtain air bag>, P.52B-106 <vehicles with side-airbag and curtain air bag>
B1415*3	Passenger's (front) air bag module (squib ignition drive circuit) system detected open circuit	P.52B-34 <vehicles without side-airbag and curtain air bag>, P.52B-106 <vehicles with side-airbag and curtain air bag>
B1420*2	Side-airbag module (RH) (squib) system (short-circuit between terminals of the squib circuit)	P.52B-122
B1421*2	Side-airbag module (RH) (squib) system (open-circuited in the squib circuit)	P.52B-130
B1422*2	Side-airbag module (RH) (squib) system (short-circuited to the earth)	P.52B-134
B1423*2	Side-airbag module (RH) (squib) system (short-circuited to the power supply)	P.52B-139
B1424*3	Side-airbag module (RH) (squib ignition drive circuit) system detected short circuit	P.52B-34
B1425*3	Side-airbag module (RH) (squib ignition drive circuit) system detected open circuit	P.52B-106
B1426*3	G-sensor of side impact sensor (RH) failure	P.52B-143
B1427*2	Side impact sensor (RH) voltage error	P.52B-144
B1428*2	Side impact sensor (RH) communication error	P.52B-146
B1429*2	Side impact sensor (RH) communication impossible	P.52B-146
B1430*2	Side-airbag module (LH) (squib) system (short-circuit between terminals of the squib circuit)	P.52B-149
B1431*2	Side-airbag module (LH) (squib) system (open-circuited in the squib circuit)	P.52B-157
B1432*2	Side-airbag module (LH) (squib) system (short-circuited to the earth)	P.52B-162

Code No.	Diagnosis item	Reference Page
B1433*2	Side-airbag module (LH) (squib) system (short-circuited to the power supply)	P.52B-167
B1434*3	Side-airbag module (LH) (squib ignition drive circuit) system detected short circuit	P.52B-34
B1435*3	Side-airbag module (LH) (squib ignition drive circuit) system detected open circuit	P.52B-106
B1436*3	G-sensor of side impact sensor (LH) failure	P.52B-143
B1437*2	Side impact sensor (LH) voltage error	P.52B-171
B1438*2	Side impact sensor (LH) communication error	P.52B-173
B1439*2	Side impact sensor (LH) communication impossible	P.52B-173
B1440*2	Curtain air bag module (RH) (squib) system (short-circuited between terminals of the squib circuit)	P.52B-176
B1441*2	Curtain air bag module (RH) (squib) system (open-circuited in the squib circuit)	P.52B-182
B1442*2	Curtain air bag module (RH) (squib) system (short-circuited to the earth)	P.52B-186
B1443*2	Curtain air bag module (RH) (squib) system (short-circuited to the power supply)	P.52B-189
B1444*3	Curtain air bag module (RH) (squib ignition drive circuit) system detected open circuit	P.52B-34
B1445*3	Curtain air bag module (RH) (squib ignition drive circuit) system (short-circuit between terminals of the squib circuit)	P.52B-106
B1450*2	Curtain air bag module (LH) (squib) system (short-circuited between terminals of the squib circuit)	P.52B-192
B1451*2	Curtain air bag module (LH) (squib) system (open-circuited in the squib circuit)	P.52B-198
B1452*2	Curtain air bag module (LH) (squib) system (short-circuited to the earth)	P.52B-202
B1453*2	Curtain air bag module (LH) (squib) system (short-circuited to the power supply)	P.52B-205
B1454*3	Curtain air bag module (LH) (squib ignition drive circuit) system detected short circuit	P.52B-106
B1455*3	Curtain air bag module (LH) (passenger's side) (squib ignition drive circuit) system detected open circuit	P.52B-106
B1466*3	Analogue G-sensor system in the SRS-ECU (front air bag)	P.52B-34 <vehicles without side-airbag and curtain air bag>, P.52B-106 <vehicles with side-airbag and curtain air bag>

Code No.	Diagnosis item	Reference Page
B1467*3	Safing G-sensor open circuit (front air bag)	P.52B-34 <vehicles without side-airbag and curtain air bag>, P.52B-106 <vehicles with side-airbag and curtain air bag>
B1468*3	Safing G-sensor short circuit (front air bag)	P.52B-34 <vehicles without side-airbag and curtain air bag>, P.52B-106 <vehicles with side-airbag and curtain air bag>
B1469*3	Analogue G-sensor system in the SRS-ECU (side air bag)	P.52B-106
B1476*1	Power supply voltage (IG1 (A) voltage) drops abnormally.	P.52B-49 <vehicles without side-airbag and curtain air bag>, P.52B-208 <vehicles with side-airbag and curtain air bag>
B1477*1	Power supply voltage (IG1 (B) voltage) drops abnormally.	P.52B-52 <vehicles without side-airbag and curtain air bag>, P.52B-211 <vehicles with side-airbag and curtain air bag>
B1478*3	SRS-ECU capacitor circuit voltage too high	P.52B-34 <vehicles without side-airbag and curtain air bag>, P.52B-106 <vehicles with side-airbag and curtain air bag>
B1479*3	SRS-ECU capacitor circuit voltage too low	P.52B-34 <vehicles without side-airbag and curtain air bag>, P.52B-106 <vehicles with side-airbag and curtain air bag>
B1496*3	SRS-ECU non-volatile memory (EEPROM)	P.52B-34 <vehicles without side-airbag and curtain air bag>, P.52B-106 <vehicles with side-airbag and curtain air bag>

Code No.	Diagnosis item		Reference Page
B1497*3	SRS-ECU application specific integrated circuit (for frontal activation)		P.52B-34 <vehicles without side-airbag and curtain air bag>, P.52B-106 <vehicles with side-airbag and curtain air bag>
B1498*3	SRS-ECU ROM or RAM		P.52B-34 <vehicles without side-airbag and curtain air bag>, P.52B-106 <vehicles with side-airbag and curtain air bag>
B1499*3	Collision decision		P.52B-34 <vehicles without side-airbag and curtain air bag>, P.52B-106 <vehicles with side-airbag and curtain air bag>
B1509*1	Incorrect installation of SRS-ECU		P.52B-55 <vehicles without side-airbag and curtain air bag>, P.52B-214 <vehicles with side-airbag and curtain air bag>
B1519*2	SRS-ECU connector lock out of order		P.52B-55 <vehicles without side-airbag and curtain air bag>, P.52B-214 <vehicles with side-airbag and curtain air bag>
B1550*3	SRS warning lamp drive circuit malfunction		P.52B-34 <vehicles without side-airbag and curtain air bag>, P.52B-106 <vehicles with side-airbag and curtain air bag>
B1551*2	SRS warning lamp circuit malfunction	Lamp does not illuminate	P.52B-57 <vehicles without side-airbag and curtain air bag>, P.52B-216 <vehicles with side-airbag and curtain air bag>
		Lamp does not switch off	P.52B-62 <vehicles without side-airbag and curtain air bag>, P.52B-221 <vehicles with side-airbag and curtain air bag>

Code No.	Diagnosis item		Reference Page
B1557*3	SRS-ECU application specific integrated circuit		P.52B-34 <vehicles without side-airbag and curtain air bag>, P.52B-106 <vehicles with side-airbag and curtain air bag>
B1595*2	Front impact sensor (RH) system	Short circuit in the sensor	P.52B-64 <vehicles without side-airbag and curtain air bag>, P.52B-223 <vehicles with side-airbag and curtain air bag>
B1596*2		Open circuit in the sensor	P.52B-64 <vehicles without side-airbag and curtain air bag>, P.52B-223 <vehicles with side-airbag and curtain air bag>
B1597*2		Short circuit in the earth	P.52B-64 <vehicles without side-airbag and curtain air bag>, P.52B-223 <vehicles with side-airbag and curtain air bag>
B1598*2		Short circuit in the power supply	P.52B-64 <vehicles without side-airbag and curtain air bag>, P.52B-223 <vehicles with side-airbag and curtain air bag>

Code No.	Diagnosis item		Reference Page
B1599*2	Front impact sensor (LH) system	Short circuit in the sensor	P.52B-64 <vehicles without side-airbag and curtain air bag>, P.52B-223 <vehicles with side-airbag and curtain air bag>
B1600*2		Open circuit in the sensor	P.52B-64 <vehicles without side-airbag and curtain air bag>, P.52B-223 <vehicles with side-airbag and curtain air bag>
B1601*2		Short circuit in the earth	P.52B-64 <vehicles without side-airbag and curtain air bag>, P.52B-223 <vehicles with side-airbag and curtain air bag>
B1602*2		Short circuit in the power supply	P.52B-64 <vehicles without side-airbag and curtain air bag>, P.52B-223 <vehicles with side-airbag and curtain air bag>
B1603*2	Seat belt pre-tensioner (driver's side) (squib) system (short-circuited between terminals of the squib circuit)		P.52B-67 <vehicles without side-airbag and curtain air bag>, P.52B-226 <vehicles with side-airbag and curtain air bag>
B1604*2	Seat belt pre-tensioner (driver's side) (squib) system (open-circuited in the squib circuit)		P.52B-71 <vehicles without side-airbag and curtain air bag>, P.52B-230 <vehicles with side-airbag and curtain air bag>
B1605*2	Seat belt pre-tensioner (driver's side) (squib) system (short-circuited to the earth)		P.52B-74 <vehicles without side-airbag and curtain air bag>, P.52B-233 <vehicles with side-airbag and curtain air bag>
B1606*2	Seat belt pre-tensioner (driver's side) (squib) system (short-circuited to the power supply)		P.52B-77 <vehicles without side-airbag and curtain air bag>, P.52B-236 <vehicles with side-airbag and curtain air bag>

Code No.	Diagnosis item	Reference Page
B1607*3	Seat belt pre-tensioner (driver's side) (squib ignition drive circuit) system detected short circuit	P.52B-34 <vehicles without side-airbag and curtain air bag>, P.52B-106 <vehicles with side-airbag and curtain air bag>
B1608*3	Seat belt pre-tensioner (driver's side) (squib ignition drive circuit) system detected open circuit	P.52B-34 <vehicles without side-airbag and curtain air bag>, P.52B-106 <vehicles with side-airbag and curtain air bag>
B1609*2	Seat belt pre-tensioner (passenger's side) (squib) system (short-circuit between terminals of the squib circuit)	P.52B-80 <vehicles without side-airbag and curtain air bag>, P.52B-239 <vehicles with side-airbag and curtain air bag>
B1610*2	Seat belt pre-tensioner (passenger's side) (squib) system (open-circuited in the squib circuit)	P.52B-84 <vehicles without side-airbag and curtain air bag>, P.52B-243 <vehicles with side-airbag and curtain air bag>
B1611*2	Seat belt pre-tensioner (passenger's side) (squib) system (short-circuited to the earth)	P.52B-87 <vehicles without side-airbag and curtain air bag>, P.52B-246 <vehicles with side-airbag and curtain air bag>
B1612*2	Seat belt pre-tensioner (passenger's side) (squib) system (short-circuited to the power supply)	P.52B-90 <vehicles without side-airbag and curtain air bag>, P.52B-249 <vehicles with side-airbag and curtain air bag>
B1613*3	Seat belt pre-tensioner (passenger's side) (squib ignition drive circuit) system detected short circuit	P.52B-34 <vehicles without side-airbag and curtain air bag>, P.52B-106 <vehicles with side-airbag and curtain air bag>
B1614*3	Seat belt pre-tensioner (passenger's side) (squib ignition drive circuit) system detected open circuit	P.52B-34 <vehicles without side-airbag and curtain air bag>, P.52B-106 <vehicles with side-airbag and curtain air bag>

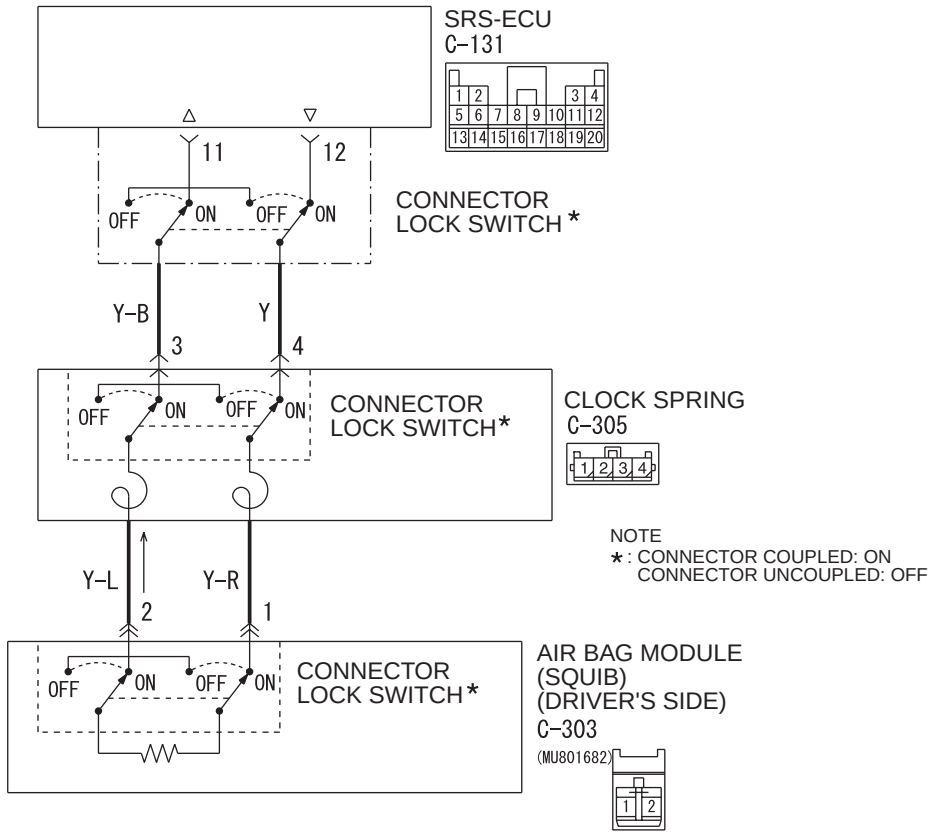
NOTE:

- *[*1]: This diagnosis code will remain in memory and the SRS warning lamp will be switched off when the system returns to normal condition.*
- *[*2]: This diagnosis code will remain in memory and the SRS warning lamp will be switched on even if the system returns to normal condition.*
- *[*3]: This diagnosis code cannot be erased by "Erase diagnosis codes" function.*

DIAGNOSIS CODE PROCEDURES <VEHICLES WITHOUT SIDE-AIRBAG AND CURTAIN AIR BAG>

Code No.B1400: Driver's air bag module (squib) system (short-circuited between terminals of the squib circuit)

Driver's Air Bag Module (Squib) Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

AC806117AB

OPERATION

- The SRS-ECU judges how severe a collision is by detecting signals from the front impact sensors and the front air bag analogue G-sensor. If the impact is over a predetermined level, the SRS-ECU sends an ignition signal. At this time, if the front air bag safing G-sensor is on, the SRS air bag will inflate.
- The ignition signal is input to the air bag module via the clock spring to inflate the air bag.

DIAGNOSIS CODE SET CONDITIONS
This diagnosis code is set if one driver's air bag squib wire shorted to the other.

PROBABLE CAUSES
- Improper engaged connector or defective short spring*
- Short circuit in the clock spring
- Short circuit between the driver's air bag module (squib) circuit terminals
- Damaged connector(s)
- Malfunction of the SRS-ECU

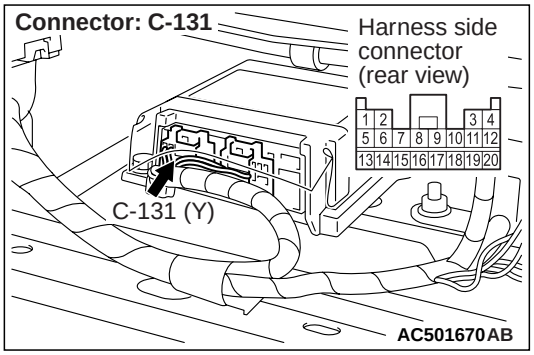
*NOTE: *: The squib circuit connectors integrate a "short" spring (which prevents the air bag from deploying unintentionally due to static electricity by shorting the positive wire to the earth wire in the squib circuit when the connectors are disconnected). Therefore, if connector C-131, C-303 or C-305 is damaged or improperly engaged, the short spring may not be released when the connector is connected.*

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code.

Q: Is diagnosis code B1519 set?
YES : Go to Step 2.
NO : Go to Step 3.

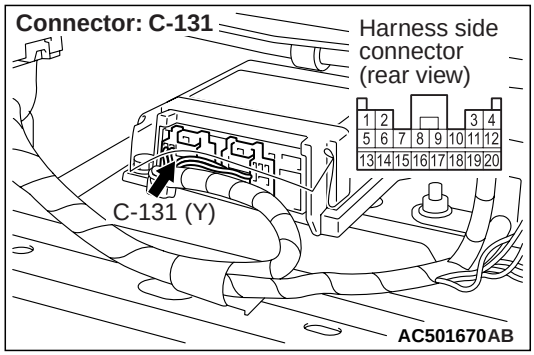
STEP 2. Connector lock check: SRS-ECU connector C-131. (M.U.T.-III diagnosis code)
(1) Disconnect the negative battery terminal.

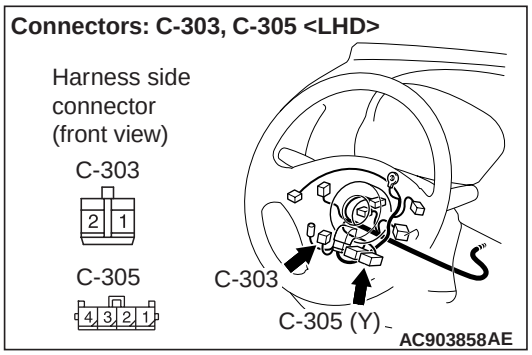


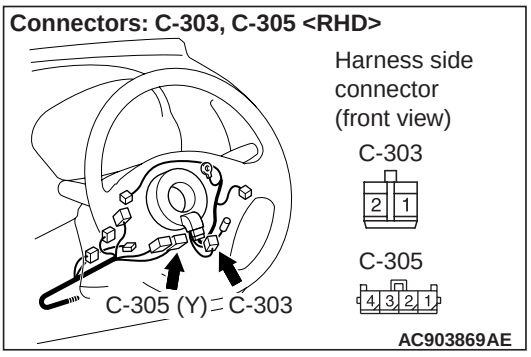
(2) Disconnect connectors C-131 and then reconnect it.
(3) Connect the negative battery terminal.
(4) Erase the diagnosis code memory, and check the diagnosis code.

Q: Is diagnosis code B1400 set?
YES : Go to Step 3.
NO : The procedure is complete. It is assumed that diagnosis code B1400 set as connector C-131 was engaged improperly.

STEP 3. Connector lock check: SRS-ECU connector C-131, clock spring connector C-305 and driver's air bag module connector C-303. (M.U.T.-III diagnosis code)
(1) Disconnect the negative battery terminal.





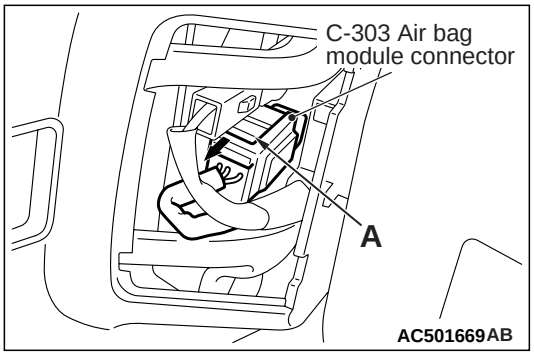


(2) Disconnect connectors C-131, C-305 and C-303, and then reconnect them.
(3) Connect the negative battery terminal.
(4) Erase the diagnosis code memory, and check the diagnosis code.

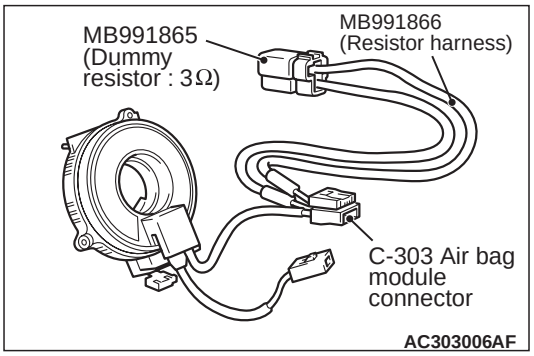
Q: Is diagnosis code B1400 set?
YES : Go to Step 4.
NO : The procedure is complete. It is assumed that diagnosis code B1400 set as connector C-131, C-305 or C-303 was engaged improperly.

STEP 4. Check the diagnosis code by connecting a dummy resistor. (M.U.T.-III diagnosis code)

(1) Disconnect the negative battery terminal.



(2) By sliding the A section (in the figure) of air bag module connector C-303 in the arrow direction, disconnect the connector.



(3) Connect special tool dummy resistor (MB991865) to special tool resistor harness (MB991866).

⚠ CAUTION

Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(4) Insert special tool (MB991866) into clock spring side air bag module connector C-303 by backprobing.
(5) Connect the negative battery terminal.
(6) Erase the diagnosis code memory, and check the diagnosis code.

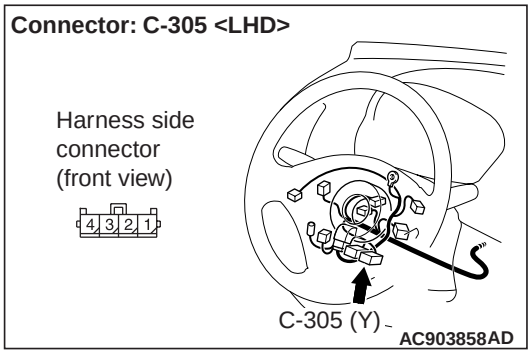
Q: Is diagnosis code B1400 set?

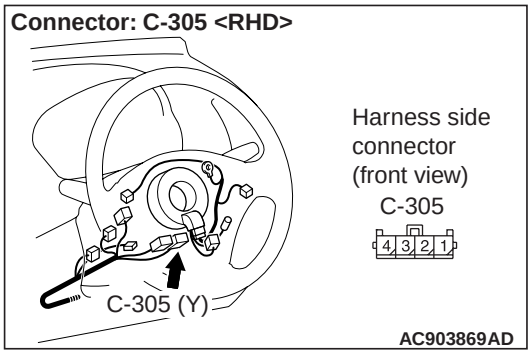
YES : Go to Step 5.

NO : Replace the driver's air bag module (Refer to P.52B-268).

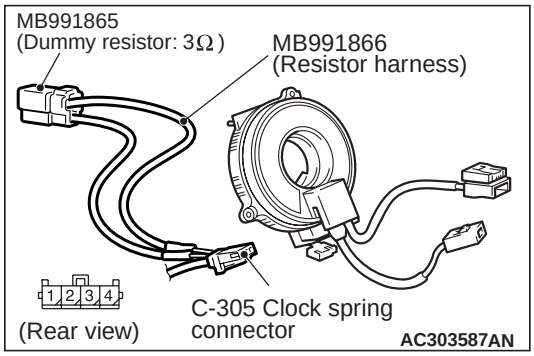
STEP 5. Check the diagnosis code by connecting a dummy resistor. (M.U.T.-III diagnosis code)

(1) Disconnect the negative battery terminal.





(2) Disconnect the clock spring connector C-305.



(3) Connect special tool dummy resistor (MB991865) to special tool resistor harness (MB991866).

⚠ CAUTION

Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(4) Insert special tool (MB991866) into clock spring harness side connector C-305 (terminal No.3 and 4) by backprobing.
(5) Connect the negative battery terminal.
(6) Erase the diagnosis code memory, and check the diagnosis code.

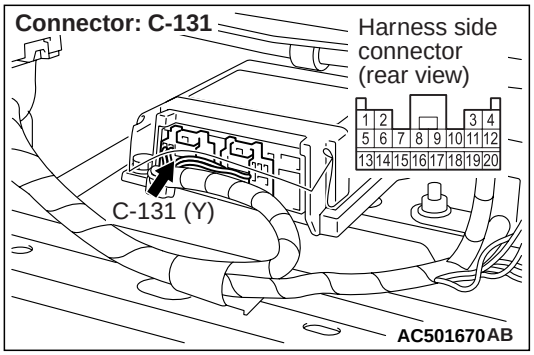
Q: Is diagnosis code B1400 set?

YES : Go to Step 6.

NO : Replace the clock spring (Refer to P.52B-268).

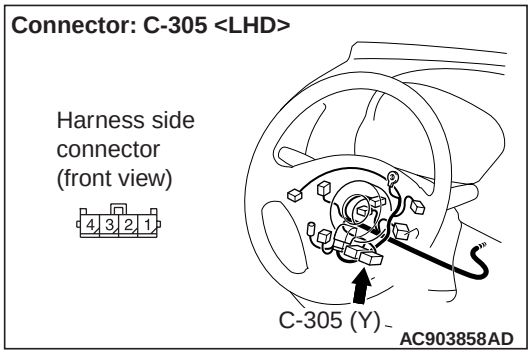
STEP 6. Resistance measurement at the SRS-ECU connector C-131.

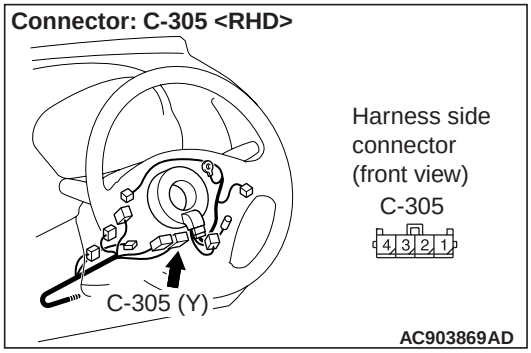
(1) Disconnect the negative battery terminal.



(2) Disconnect SRS-ECU connector C-131.

⚠ *DANGER*

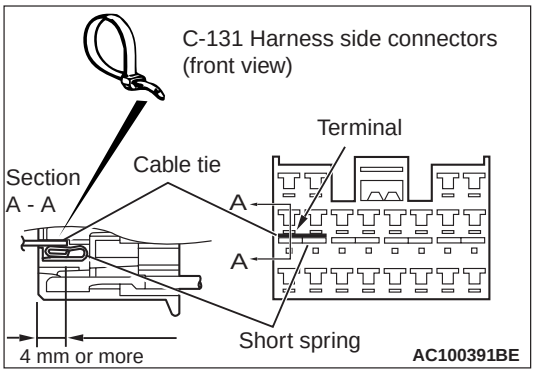




To prevents the air bag from deploying unintentionally, disconnect the clock spring connector C-305 to short the squib circuit.

(3) Disconnect the clock spring connector C-305.

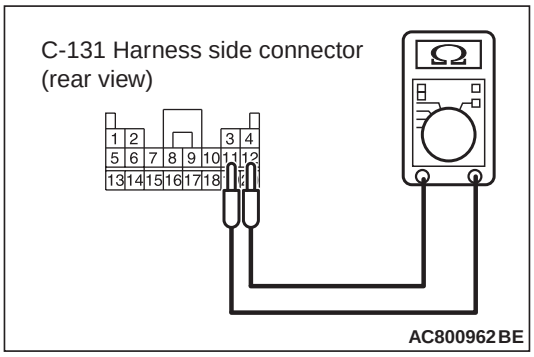
⚠ CAUTION



Insert an insulator such as a cable tie to a depth of 4 mm or more, otherwise the short spring will not be released.

(4) Insert a cable tie [3 mm wide, 0.5 mm thick] between terminals 11, 12 and the short spring to release the short spring.

⚠ CAUTION



Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(5) Resistance measurement between C-131 harness side connector terminals 11 and 12.

OK: Open circuit

Q: Is the check result normal?

YES : Go to Step 7.

NO : Repair the harness wires between SRS-ECU connector C-131 (terminal No.11 and 12) and clock spring connector C-305 (terminal No.3 and 4).

STEP 7. Check whether the diagnosis code is reset.

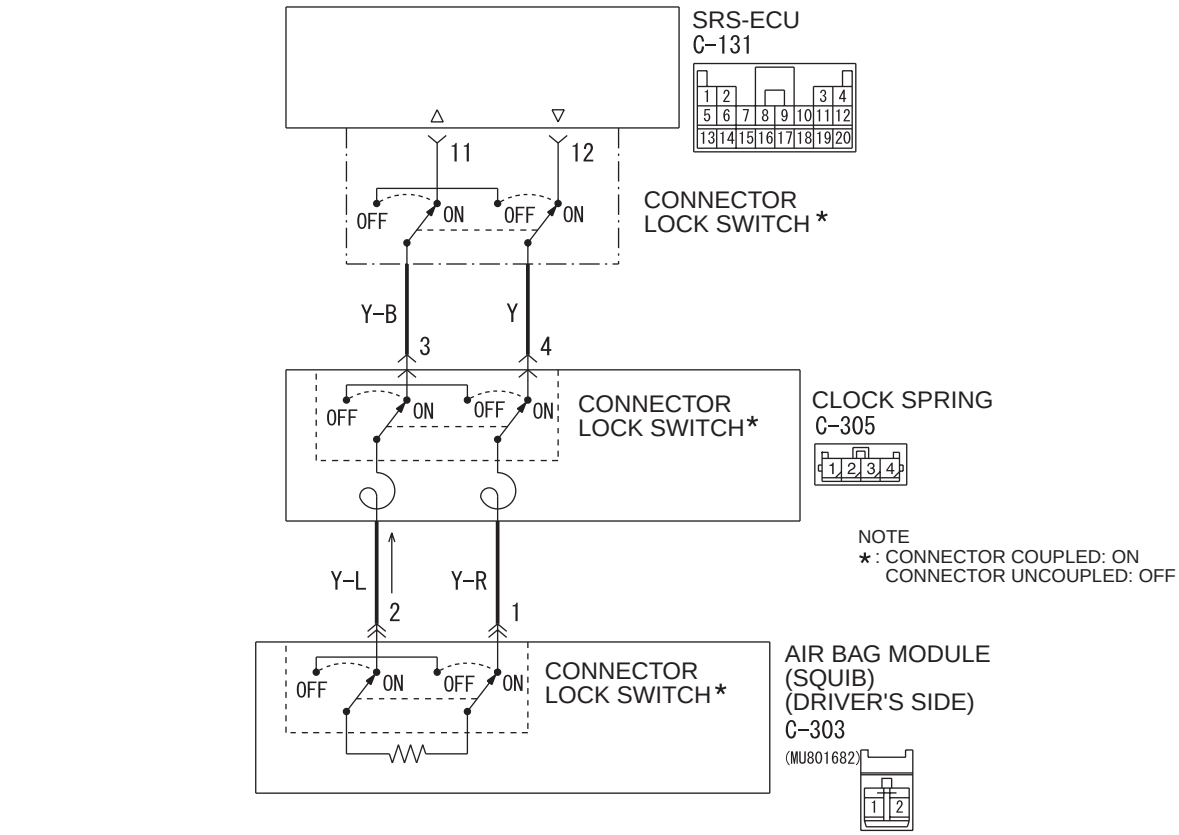
Q: Is diagnosis code B1400 set?

YES : Replace the SRS-ECU (Refer to P.52B-266).

NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1401: Driver's air bag module (squib) system (open-circuited in the squib circuit)

Driver's Air Bag Module (Squib) Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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OPERATION

- The SRS-ECU judges how severe a collision is by detecting signals from the front impact sensors and the front air bag analogue G-sensor. If the impact is over a predetermined level, the SRS-ECU sends an ignition signal. At this time, if the front air bag safing G-sensor is on, the SRS air bag will inflate.
- The ignition signal is input to the air bag module via the clock spring to inflate the air bag.

DIAGNOSIS CODE SET CONDITIONS

This diagnosis code is set if driver's air bag squib wire(s) are open-circuited.

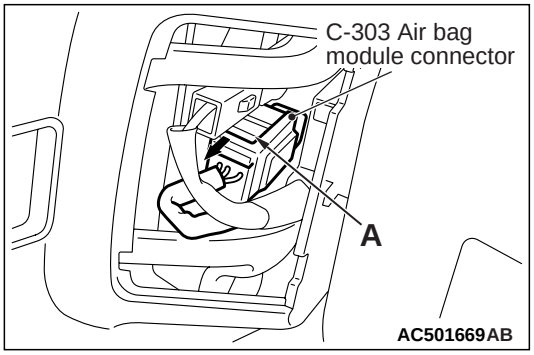
PROBABLE CAUSES

- Open circuit in the clock spring
- Open circuit due to improper neutral position of the clock spring
- Open circuit in the driver's air bag module (squib) circuit
- Disengaged driver's air bag module (squib) connector
- Improper connector contact
- Malfunction of the SRS-ECU

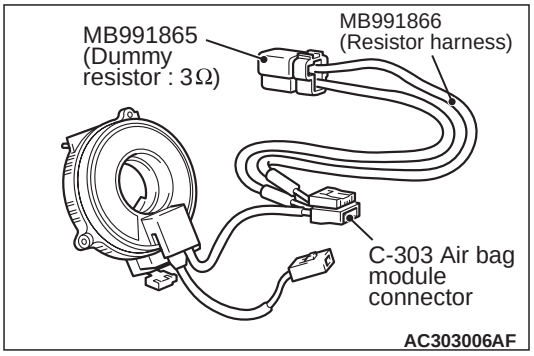
DIAGNOSIS PROCEDURE

STEP 1. Check the diagnosis code by connecting a dummy resistor. (M.U.T.-III diagnosis code)

(1) Disconnect the negative battery terminal.



(2) By sliding the A section (in the figure) of air bag module connector C-303 in the arrow direction, disconnect the connector.



(3) Connect special tool dummy resistor (MB991865) to special tool resistor harness (MB991866).

⚠ CAUTION

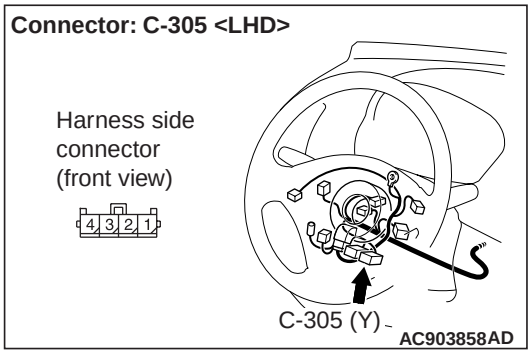
Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

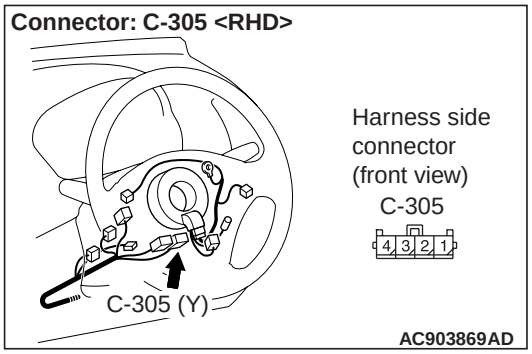
(4) Insert special tool (MB991866) into clock spring side air bag module connector C-303 by backprobing.
(5) Connect the negative battery terminal.
(6) Erase the diagnosis code memory, and check the diagnosis code.

Q: Is diagnosis code B1401 set?
YES : Go to Step 2.
NO : Replace the driver's air bag module (Refer to P.52B-268).

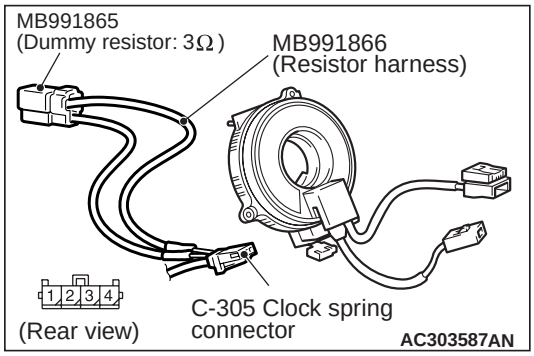
STEP 2. Check the clock spring. (M.U.T.-III diagnosis code)

(1) Disconnect the negative battery terminal.





(2) Disconnect the clock spring connector C-305.



(3) Connect special tool dummy resistor (MB991865) to special tool resistor harness (MB991866).

⚠ CAUTION

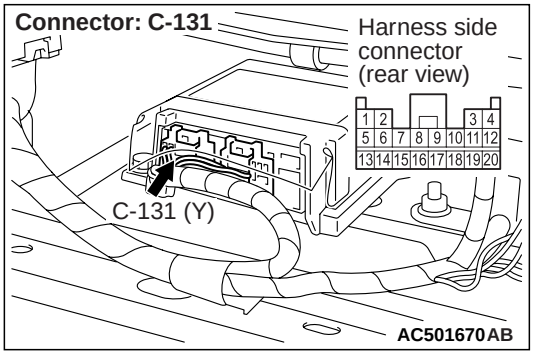
Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(4) Insert special tool (MB991866) into clock spring harness side connector C-305 (terminal No.3 and 4) by backprobing.
(5) Connect the negative battery terminal.
(6) Erase the diagnosis code memory, and check the diagnosis code.

Q: Is diagnosis code B1401 set?
YES : Go to Step 3.
NO : Replace the clock spring (Refer to P.52B-268).

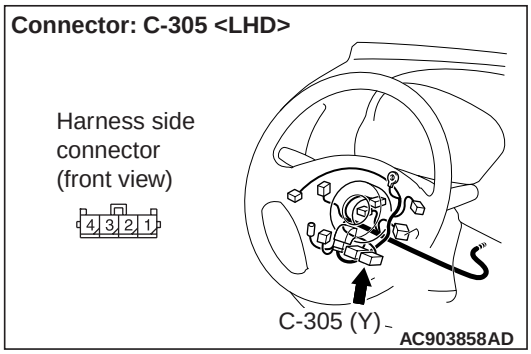
STEP 3. Resistance measurement between the SRS-ECU connector C-131 (terminal No.11 and 12) and the clock spring connector C-305 (terminal No.3 and 4)

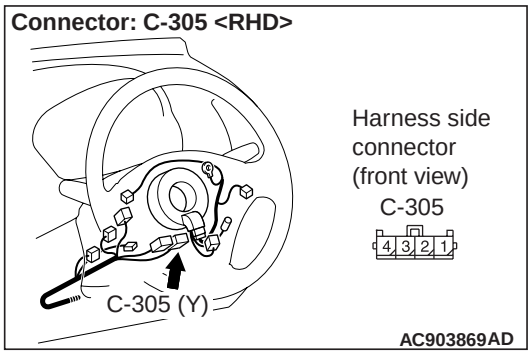
(1) Disconnect the negative battery terminal.



(2) Disconnect SRS-ECU connector C-131.

⚠ ***DANGER***

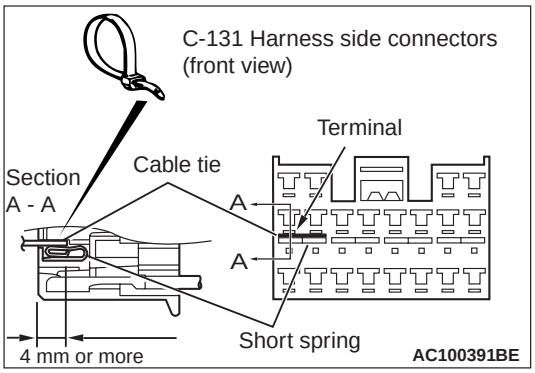




To prevents the air bag from deploying unintentionally, disconnect the clock spring connector C-305 to short the squib circuit.

(3) Disconnect the clock spring connector C-305.

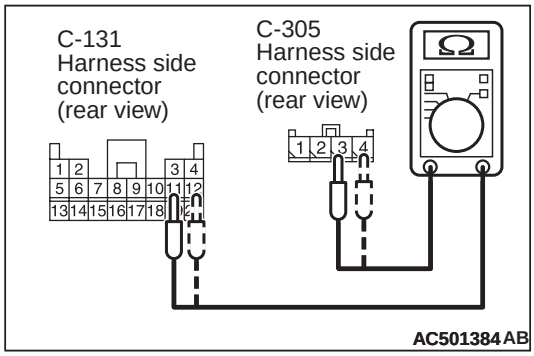
⚠ **CAUTION**



Insert an insulator such as a cable tie to a depth of 4 mm or more, otherwise the short spring will not be released.

(4) Insert a cable tie [3 mm wide, 0.5 mm thick] between terminals 11, 12 and the short spring to release the short spring.

⚠ **CAUTION**



Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(5) Resistance measurement between the following terminals.
- SRS-ECU connector C-131 terminal No.11 and the clock spring connector C-305 terminal No.3
- SRS-ECU connector C-131 terminal No.12 and the clock spring connector C-305 terminal No.4

OK: Continuity (Less than 2 Ω)

Q: Are the check results normal?

YES : Go to Step 4.

NO : Repair the harness wires between SRS-ECU connector C-131 (terminal No.11 and 12) and clock spring connector C-305 (terminal No.3 and 4).

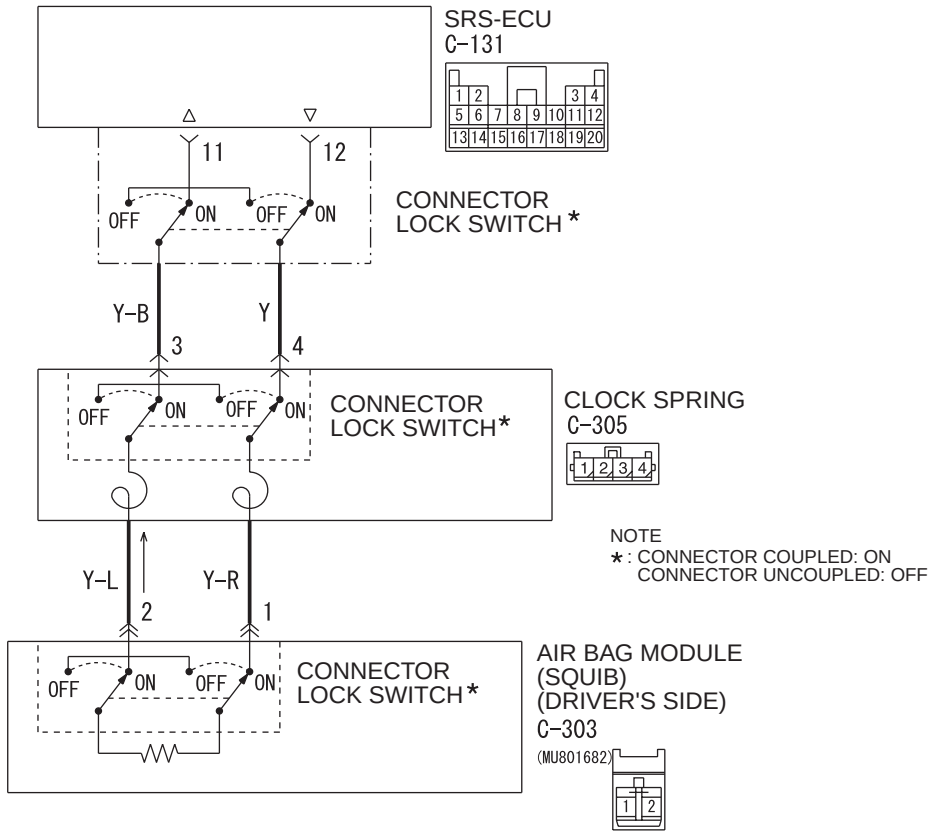
STEP 4. Check whether the diagnosis code is reset.

Q: Is diagnosis code B1401 set?

YES : Replace the SRS-ECU (Refer to P.52B-266).
NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1402: Driver's air bag module (squib) system (short-circuited to the earth)

Driver's Air Bag Module (Squib) Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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OPERATION

- The SRS-ECU judges how severe a collision is by detecting signals from the front impact sensors and the front air bag analogue G-sensor. If the impact is over a predetermined level, the SRS-ECU sends an ignition signal. At this time, if the front air bag safing G-sensor is on, the SRS air bag will inflate.
- The ignition signal is input to the air bag module via the clock spring to inflate the air bag.

DIAGNOSIS CODE SET CONDITIONS

This diagnosis code is set if the driver's air bag squib wire(s) are short-circuited to the earth.

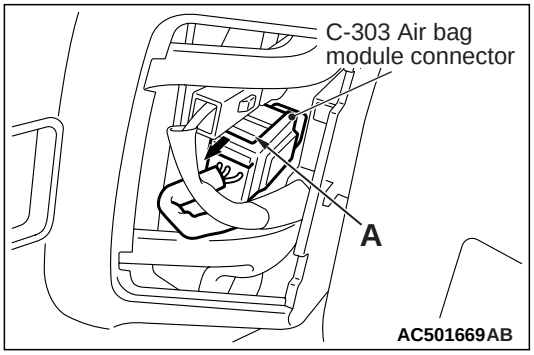
PROBABLE CAUSES

- Malfunction of the clock spring
- Damaged harness wires and connectors
- Short to the earth in the driver's air bag module (squib) harness
- Malfunction of the SRS-ECU

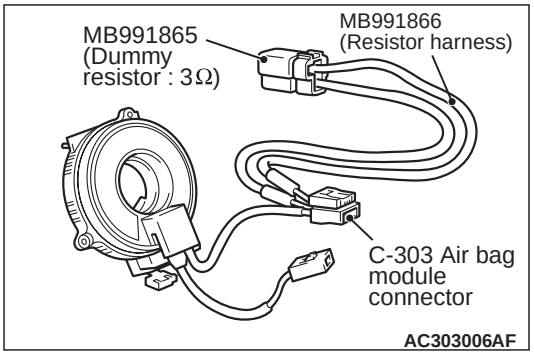
DIAGNOSIS PROCEDURE

STEP 1. Check the diagnosis code by connecting a dummy resistor. (M.U.T.-III diagnosis code)

(1) Disconnect the negative battery terminal.



(2) By sliding the A section (in the figure) of air bag module connector C-303 in arrow direction, disconnect the connector.



(3) Connect special tool dummy resistor (MB991865) to special tool resistor harness (MB991866).

⚠ CAUTION

Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(4) Insert special tool (MB991866) into clock spring side air bag module connector C-303 by backprobing.
(5) Connect the negative battery terminal.
(6) Erase the diagnosis code memory, and check the diagnosis code.

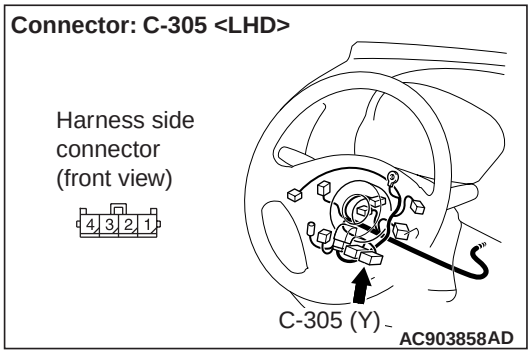
Q: Is diagnosis code B1402 set?

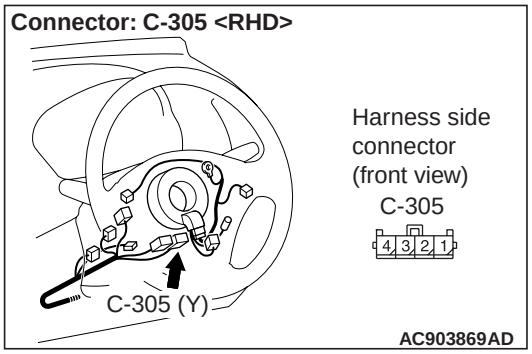
YES : Go to Step 2.

NO : Replace the driver's air bag module (Refer to P.52B-268).

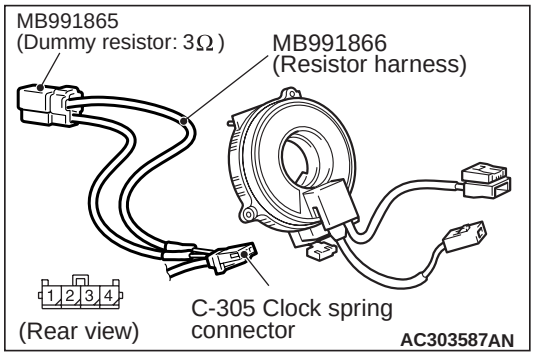
STEP 2. Check the diagnosis code by connecting a dummy resistor. (M.U.T.-III diagnosis code)

(1) Disconnect the negative battery terminal.





(2) Disconnect the clock spring connector C-305.



(3) Connect special tool dummy resistor (MB991865) to special tool resistor harness (MB991866).

⚠ CAUTION

Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(4) Insert special tool (MB991866) into clock spring harness side connector C-305 (terminal No.3 and 4) by backprobing.
(5) Connect the negative battery terminal.
(6) Erase the diagnosis code memory, and check the diagnosis code.

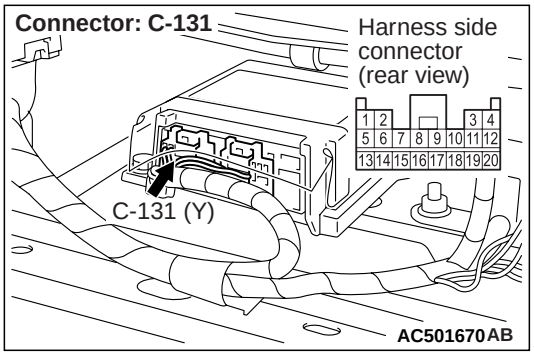
Q: Is diagnosis code B1402 set?

YES : Go to Step 3.

NO : Replace the clock spring (Refer to P.52B-268).

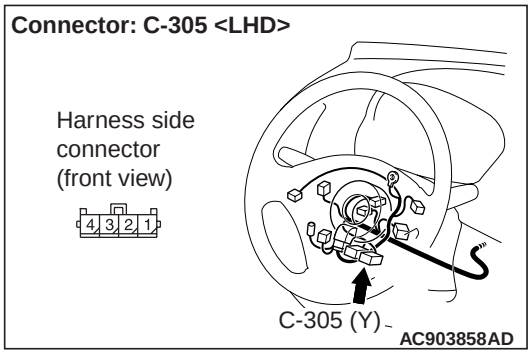
STEP 3. Resistance measurement at the SRS-ECU connector C-131.

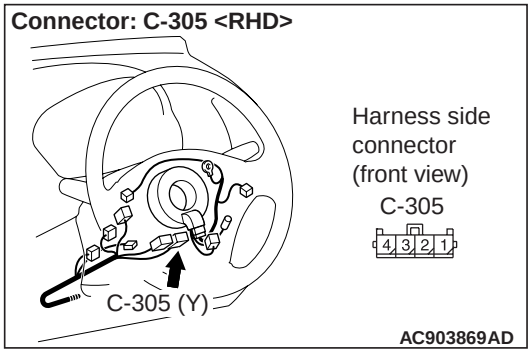
(1) Disconnect the negative battery terminal.



(2) Disconnect SRS-ECU connector C-131.

⚠ ***DANGER***

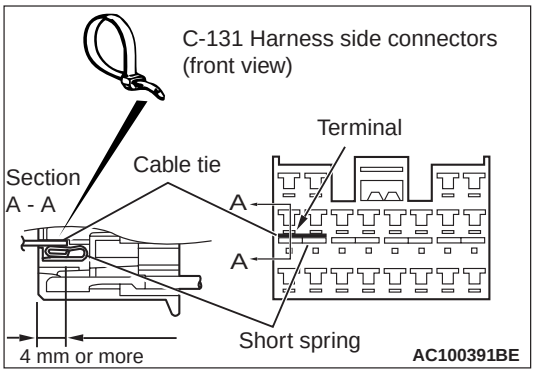




To prevents the air bag from deploying unintentionally, disconnect the clock spring connector C-305 to short the squib circuit.

(3) Disconnect the clock spring connector C-305.

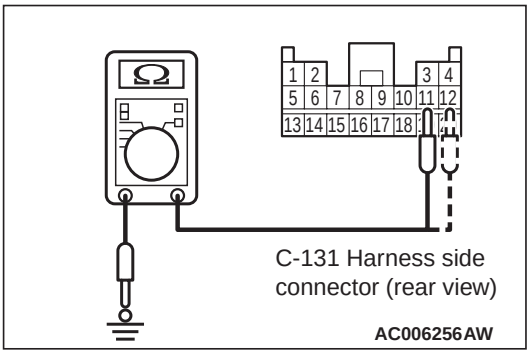
⚠ **CAUTION**



Insert an insulator such as a cable tie to a depth of 4 mm or more, otherwise the short spring will not be released.

(4) Insert a cable tie [3 mm wide, 0.5 mm thick] between terminals 11, 12 and the short spring to release the short spring.

⚠ **CAUTION**



Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(5) Check for continuity between C-131 harness side connector terminals 11, 12 and body earth.

OK: Open circuit

Q: Is the check result normal?

YES : Go to Step 4.

NO : Repair the harness wires between SRS-ECU connector C-131 (terminal No.11 and 12) and clock spring connector C-305 (terminal No.3 and 4).

STEP 4. Check whether the diagnosis code is reset.

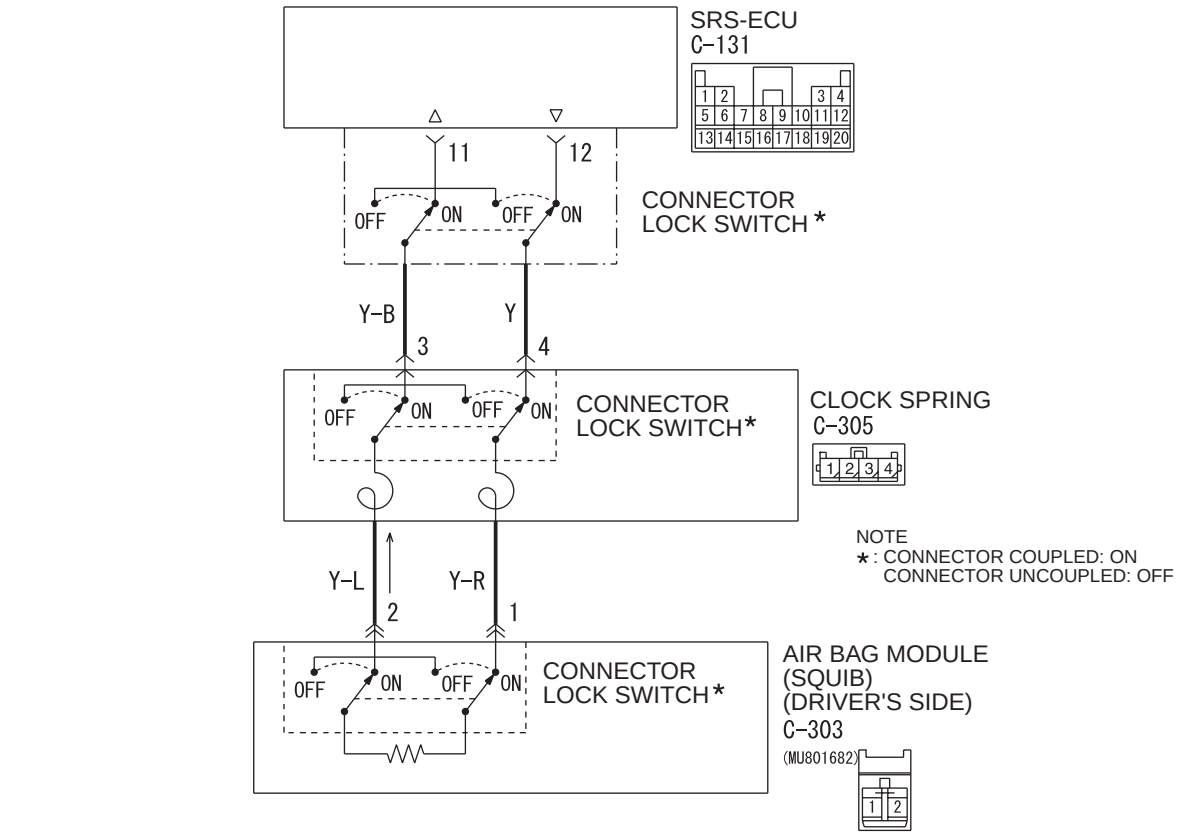
Q: Is diagnosis code B1402 set?

YES : Replace the SRS-ECU (Refer to P.52B-266).

NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1403: Driver's air bag module (squib) system (short-circuited to the power supply)

Driver's Air Bag Module (Squib) Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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OPERATION

- The SRS-ECU judges how severe a collision is by detecting signals from the front impact sensors and the front air bag analogue G-sensor. If the impact is over a predetermined level, the SRS-ECU sends an ignition signal. At this time, if the front air bag safing G-sensor is on, the SRS air bag will inflate.
- The ignition signal is input to the air bag module via the clock spring to inflate the air bag.

DIAGNOSIS CODE SET CONDITIONS

This diagnosis code is set if the driver's air bag squib wire(s) are short-circuited to the power supply.

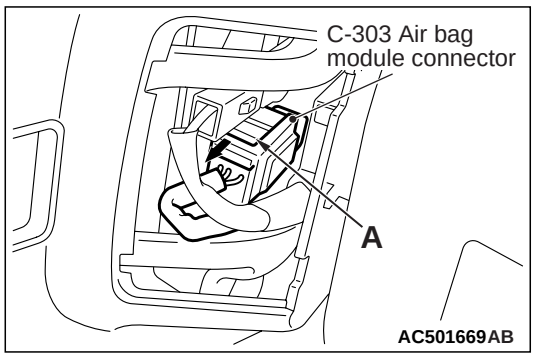
PROBABLE CAUSES

- Malfunction of the clock spring
- Damaged harness wires and connectors
- Short to the power supply in the driver's air bag module (squib) harness
- Malfunction of the SRS-ECU

DIAGNOSIS PROCEDURE

STEP 1. Check the diagnosis code by connecting a dummy resistor. (M.U.T.-III diagnosis code)

(1) Disconnect the negative battery terminal.



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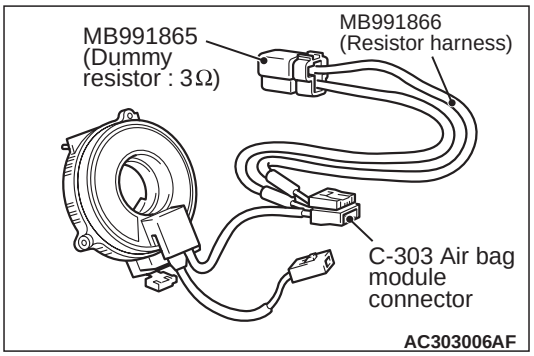
(2) By sliding the A section (in the figure) of air bag module connector C-303 in arrow direction,

disconnect the connector.



(3) Connect special tool dummy resistor (MB991865) to special tool resistor harness (MB991866).

⚠ CAUTION

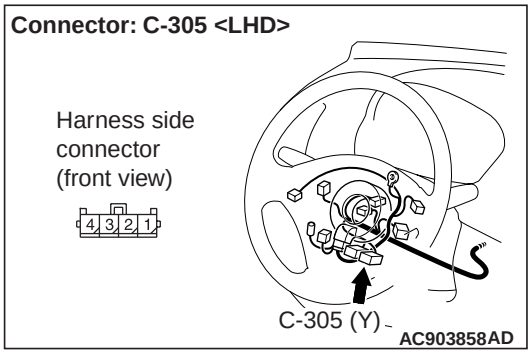
Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

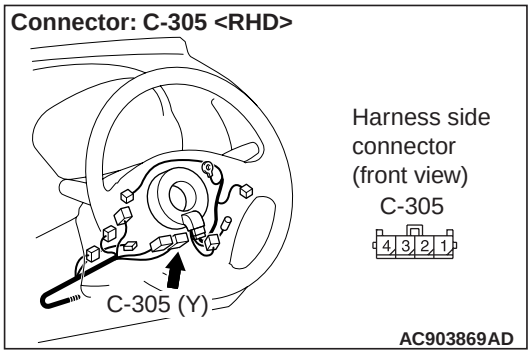
(4) Insert special tool (MB991866) into clock spring side air bag module connector C-303 by backprobing.
(5) Connect the negative battery terminal.
(6) Erase the diagnosis code memory, and check the diagnosis code.

Q: Is diagnosis code B1403 out put?
YES : Go to Step 2.
NO : Replace the driver's air bag module (Refer to P.52B-268).

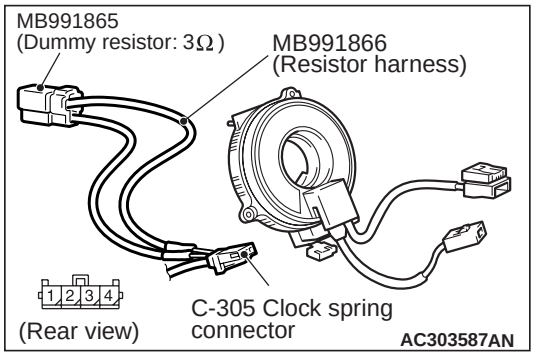
STEP 2. Check the diagnosis code by connecting a dummy resistor. (M.U.T.-III diagnosis code)

(1) Disconnect the negative battery terminal.





(2) Disconnect the clock spring connector C-305.



(3) Connect special tool dummy resistor (MB991865) to special tool resistor harness (MB991866).

⚠ CAUTION

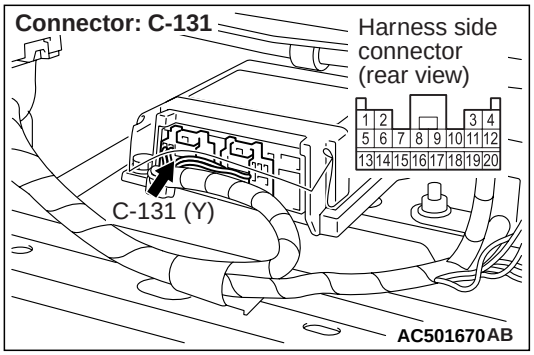
Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(4) Insert special tool (MB991866) into clock spring harness side connector C-305 (terminal No.3 and 4) by backprobing.
(5) Connect the negative battery terminal.
(6) Erase the diagnosis code memory, and check the diagnosis code.

Q: Is diagnosis code B1403 set?
YES : Go to Step 3.
NO : Replace the clock spring (Refer to P.52B-268).

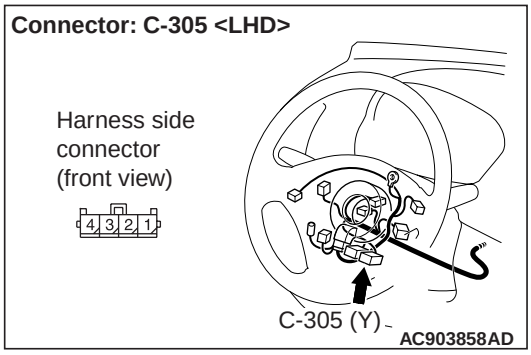
STEP 3. Voltage measurement at the SRS-ECU connector C-131.

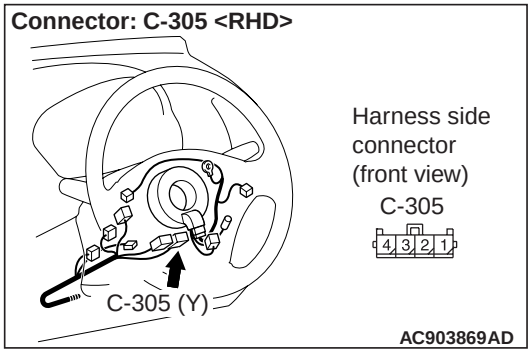
(1) Disconnect the negative battery terminal.



(2) Disconnect SRS-ECU connector C-131.

⚠ ***DANGER***

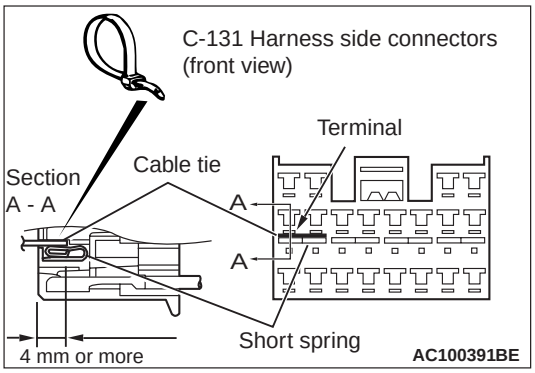




To prevents the air bag from deploying unintentionally, disconnect the clock spring connector C-305 to short the squib circuit.

(3) Disconnect the clock spring connector C-305.

⚠ **CAUTION**



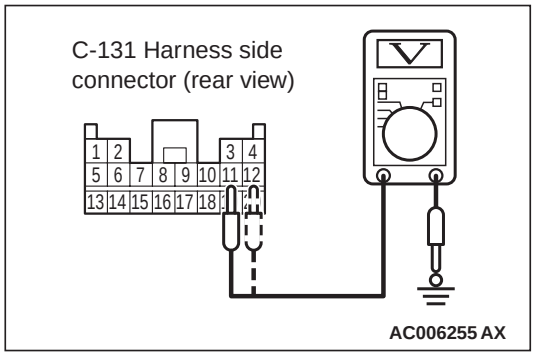
Insert an insulator such as a cable tie to a depth of 4 mm or more, otherwise the short spring will not be released.

(4) Insert a cable tie [3 mm wide, 0.5 mm thick] between terminals 11, 12 and the short spring to release the short spring.

(5) Connect the negative battery terminal.

(6) Turn the ignition switch to the "ON" position.

⚠ **CAUTION**



Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(7) Voltage measurement between C-131 harness side connector terminals 11, 12 and body earth.

OK: 1 V or less

Q: Is the check result normal?

YES : Go to Step 4.

NO : Repair the harness wires between SRS-ECU connector C-131 (terminal No.11 and 12) and clock spring connector C-305 (terminal No.3 and 4).

STEP 4. Check whether the diagnosis code is reset.

Q: Is diagnosis code B1403 set?

YES : Replace the SRS-ECU (Refer to P.52B-266).
NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1404: Driver's air bag module (squib ignition drive circuit) system detected short circuit
Code No.B1405: Driver's air bag module (squib ignition drive circuit) system detected open circuit
Code No.B1414: Passenger's (front) air bag module (squib ignition drive circuit) system detected short circuit
Code No.B1415: Passenger's (front) air bag module (squib ignition drive circuit) system detected open circuit
Code No.B1466: Analogue G-sensor system in the SRS-ECU
Code No.B1467: Safing G-sensor open circuit
Code No.B1468: Safing G-sensor short circuit
Code No.B1478: SRS-ECU capacitor circuit voltage too high
Code No.B1479: SRS-ECU capacitor circuit voltage too low
Code No.B1496: SRS-ECU non-volatile memory (EEPROM)
Code No.B1497: SRS-ECU application specific integrated circuit (for frontal activation)
Code No.B1498: SRS-ECU ROM or RAM
Code No.B1499: Collision decision
Code No.B1550: SRS warning lamp drive circuit malfunction
Code No.B1557: SRS-ECU application specific integrated circuit
Code No.B1607: Seat belt pre-tensioner (driver's side) (squib ignition drive circuit) system detected short circuit
Code No.B1608: Seat belt pre-tensioner (driver's side) (squib ignition drive circuit) system detected open circuit
Code No.B1613: Seat belt pre-tensioner (passenger's side) (squib ignition drive circuit) system detected short circuit
Code No.B1614: Seat belt pre-tensioner (passenger's side) (squib ignition drive circuit) system detected open circuit

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DIAGNOSIS CODE SET CONDITIONS
These diagnosis code are set when a fault is detected in the SRS-ECU. The most likely causes for this code to be set are shown in the table below:

Code No.	Part/Circuit integral to SRS-ECU	Trouble causes
B1404	Driver's air bag module (squib ignition drive circuit)	• Short circuit in the squib ignition drive circuit
B1405		• Open circuit in the squib ignition drive circuit
B1414	Passenger's (front) air bag module (squib ignition drive circuit)	• Short circuit in the squib ignition drive circuit
B1415		• Open circuit in the squib ignition drive circuit
B1466	Analogue G-sensor	• When the analogue G-sensor is not operating • When the characteristics of the analogue G-sensor are abnormal • When the output from the analogue G-sensor is abnormal

Code No.	Part/Circuit integral to SRS-ECU	Trouble causes
B1467	Safing G-sensor (front air bag)	• Open circuit in the safing G-sensor
B1468		• Short circuit in the safing G-sensor
B1478	Capacitor	• Voltage at the capacitor terminal is higher than the specified value for five seconds or more
B1479		• Voltage at the capacitor terminal is lower than the specified value for five seconds or more (This is not detected if diagnosis code B1476 or B1477 indicating battery positive voltage drop has been set).
B1496	Non-volatile memory (EEPROM)	• When the non-volatile memory (EEPROM) is abnormal
B1497	Application specific integrated circuit (for frontal activation)	• When the application specific integrated circuit (frontal activation) is abnormal
B1498	ROM or RAM	• When the ROM or RAM is abnormal
B1499	Collision decision	• If this code is set before the air bags have deployed, an internal failure may have occurred in the SRS-ECU.
B1550	SRS warning lamp drive circuit	• Failure in SRS warning lamp drive circuit
B1557	Application specific integrated circuit	• When the application specific integrated circuit is abnormal
B1607	Seat belt pre-tensioner (driver's side) (squib ignition drive circuit)	• Short circuit in the squib ignition drive circuit
B1608		• Open circuit in the squib ignition drive circuit
B1613	Seat belt pre-tensioner (passenger's side) (squib ignition drive circuit)	• Short circuit in the squib ignition drive circuit
B1614		• Open circuit in the squib ignition drive circuit

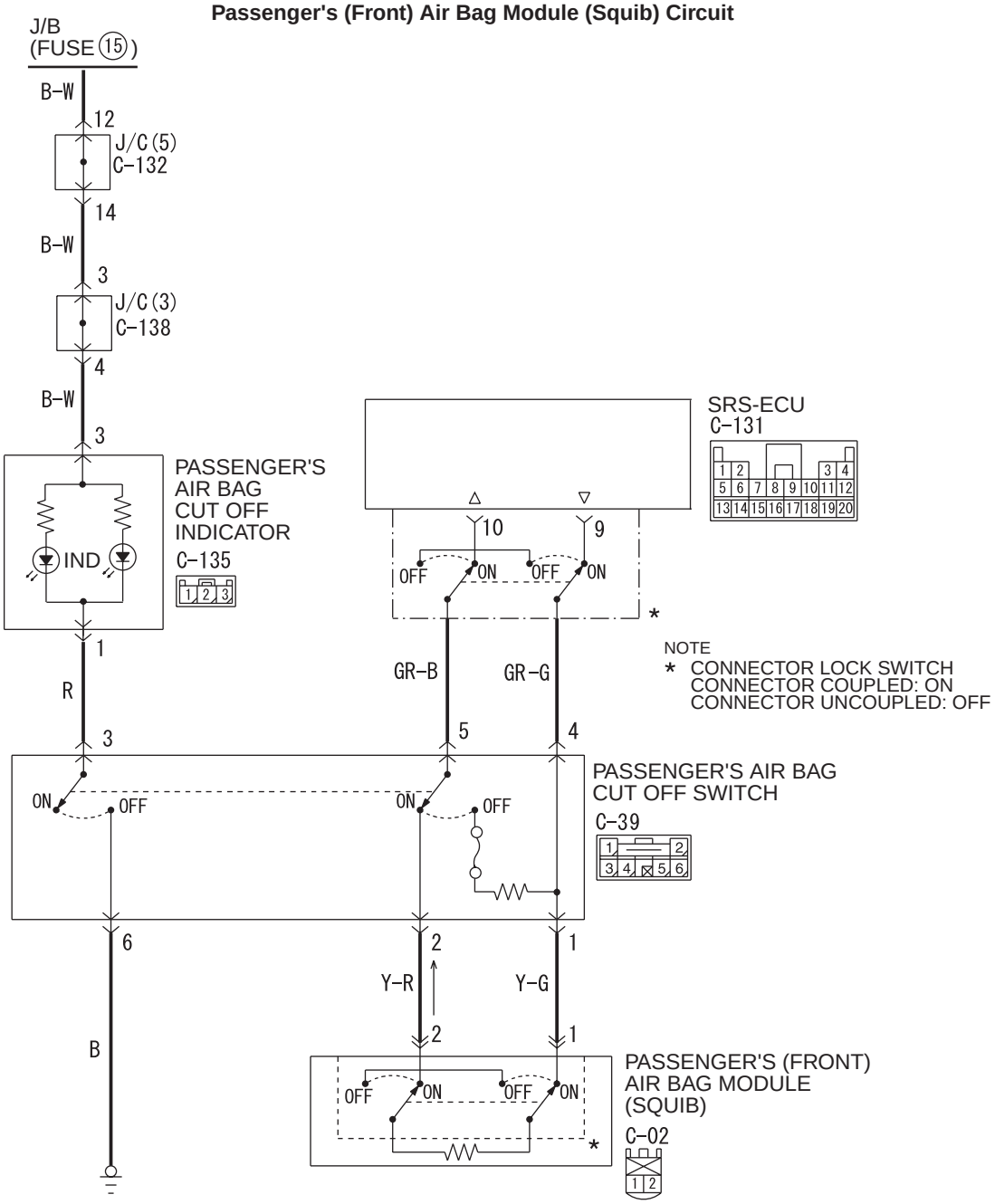
PROBABLE CAUSE
Malfunction of the SRS-ECU

DIAGNOSIS PROCEDURE

Replace the SRS-ECU (Refer to P.52B-266).

Code No.B1410: Passenger's (front) air bag module (squib) system (short-circuited between terminals of the squib circuit)

Passenger's (Front) Air Bag Module (Squib) Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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OPERATION

- The SRS-ECU judges how severe a collision is by detecting signals from the front impact sensors and the front air bag analogue G-sensor. If the impact is over a predetermined level, the SRS-ECU sends an ignition signal. At this time, if the front air bag safing G-sensor is on, the SRS air bag will inflate.
- The ignition signal is input to the air bag module to inflate the air bag.

DIAGNOSIS CODE SET CONDITIONS

This diagnosis code is set if one passenger's (front) air bag squib wire shorted to the other.

PROBABLE CAUSES

- Improper engaged connector or defective short spring*
- Short circuit between the passenger's (front) air bag module (squib) circuit terminals
- Damaged connector(s)
- Malfunction of the passenger's air bag cut off switch
- Malfunction of the SRS-ECU

*NOTE: *: The squib circuit connectors integrate a "short" spring (which prevents the air bag from deploying unintentionally due to static electricity by shorting the positive wire to the earth wire in the squib circuit when the connectors are disconnected).Therefore, if connector C-02 or C-131 is damaged or improperly engaged, the short spring may not be released when the connector is connected.*

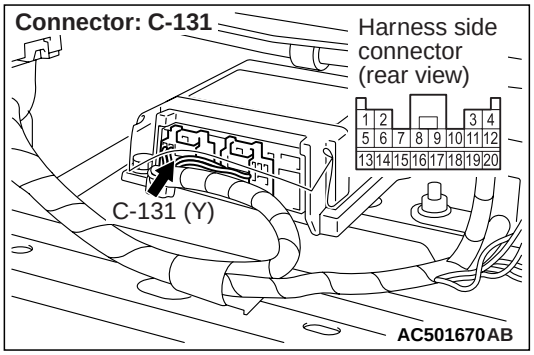
DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code.

Q: Is diagnosis code B1519 set?
YES : Go to Step 2.
NO : Go to Step 3.

STEP 2. Connector lock check: SRS-ECU connector C-131. (M.U.T.-III diagnosis code)

(1) Disconnect the negative battery terminal.

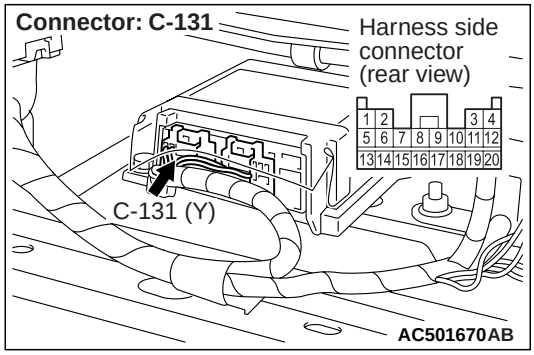


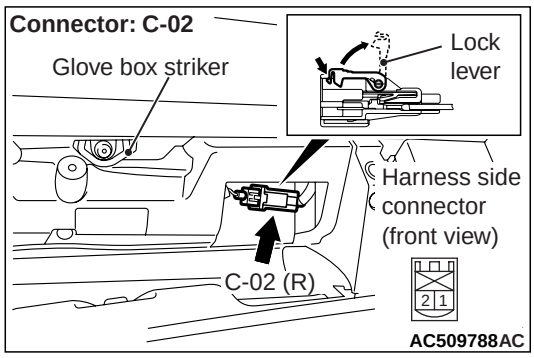
(2) Disconnect the connectors C-131 and then reconnect them.
(3) Connect the negative battery terminal.
(4) Erase the diagnosis code memory, and check the diagnosis code.

Q: Is diagnosis code B1410 set?
YES : Go to Step 3.
NO : The procedure is complete. It is assumed that diagnosis code B1410 set as connector C-131 was engaged improperly.

STEP 3. Connector lock check: SRS-ECU connector C-131 and passenger's (front) air bag module connector C-02. (M.U.T.-III diagnosis code)

(1) Disconnect the negative battery terminal.





(2) Disconnect connectors C-02 and C-131, and then reconnect them. For connector C-02, pull up the harness side lock lever with a nail and disconnect the connector lock.
(3) Connect the negative battery terminal.
(4) Erase the diagnosis code memory, and check the diagnosis code.

Q: Is diagnosis code B1410 set?
YES : Go to Step 4.
NO : The procedure is complete. It is assumed that diagnosis code B1410 set as connector C-02 or C-131 was engaged improperly.

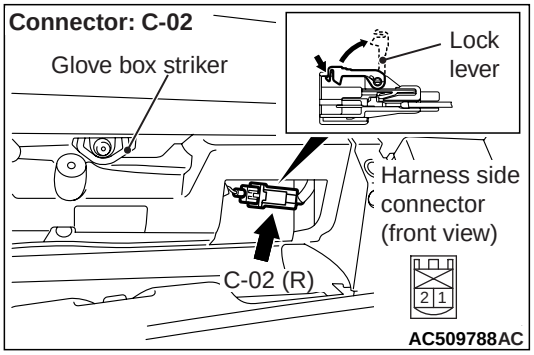
STEP 4. Check the passenger's air bag cut off switch.

Check the passenger's air bag cut off switch (Refer to P.52B-288).

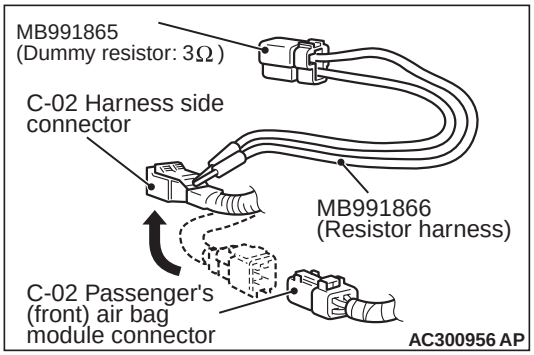
Q: Is the check result normal?
YES : Go to Step 5.
NO : Replace passenger's air bag cut off switch (Refer to P.52B-287).

STEP 5. Check the diagnosis code by connecting a dummy resistor. (M.U.T.-III diagnosis code)

(1) Disconnect the negative battery terminal.



(2) Disconnect passenger's (front) air bag module connector C-02. Pull up the harness side lock lever with a nail and disconnect the connector lock.



(3) Connect special tool dummy resistor (MB991865) to special tool resistor harness (MB991866).

⚠ CAUTION

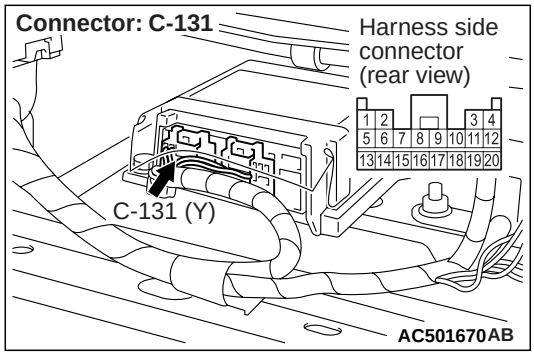
Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(4) Insert special tool (MB991866) into the harness side connector C-02 by backprobing.
(5) Check that the passenger's air bag cut off switch is "ON" position.
(6) Connect the negative battery terminal.
(7) Erase the diagnosis code memory, and check the diagnosis code.

Q: Is diagnosis code B1410 set?
YES : Go to Step 6.
NO : Replace the passenger's (front) air bag module (Refer to P.52B-268).

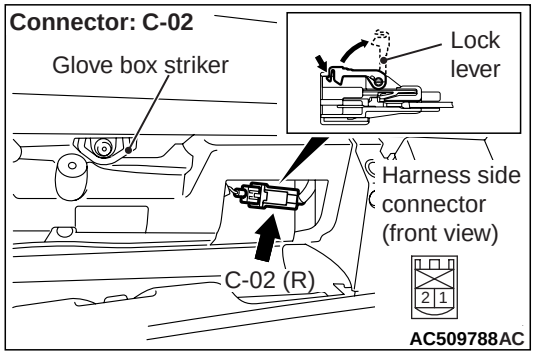
STEP 6. Resistance measurement at SRS-ECU connector C-131.

(1) Disconnect the negative battery terminal.



(2) Disconnect SRS-ECU connector C-131.

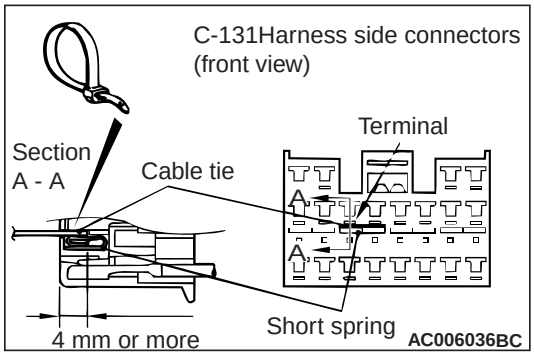
⚠ DANGER



To prevents the air bag from deploying unintentionally, disconnect the passenger's (front) air bag module connector C-02 to short the squib circuit.

(3) Disconnect passenger's (front) air bag module connector C-02. Pull up the harness side lock lever with a nail and disconnect the connector lock.

⚠ CAUTION

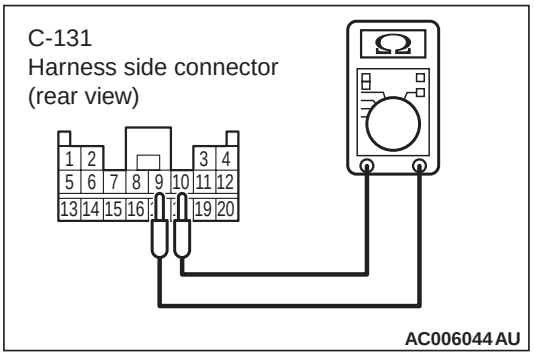


Insert an insulator such as a cable tie to a depth of 4 mm or more, otherwise the short spring will not be released.

(4) Insert a cable tie [3 mm wide, 0.5 mm thick] between terminals 9, 10 and the short spring to release the short spring.
(5) Check that the passenger's air bag cut off switch

is "ON" position.

⚠ CAUTION



Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(6) Resistance measurement between C-131 harness side connector terminals 9 and 10.

OK: Open circuit

Q: Is the check result normal?

YES : Go to Step 7.

NO : Repair the harness wires between SRS-ECU connector C-131 (terminal No.9 and 10) and passenger's (front) air bag module connector C-02 (terminal No.1 and 2).

STEP 7. Check whether the diagnosis code is reset.

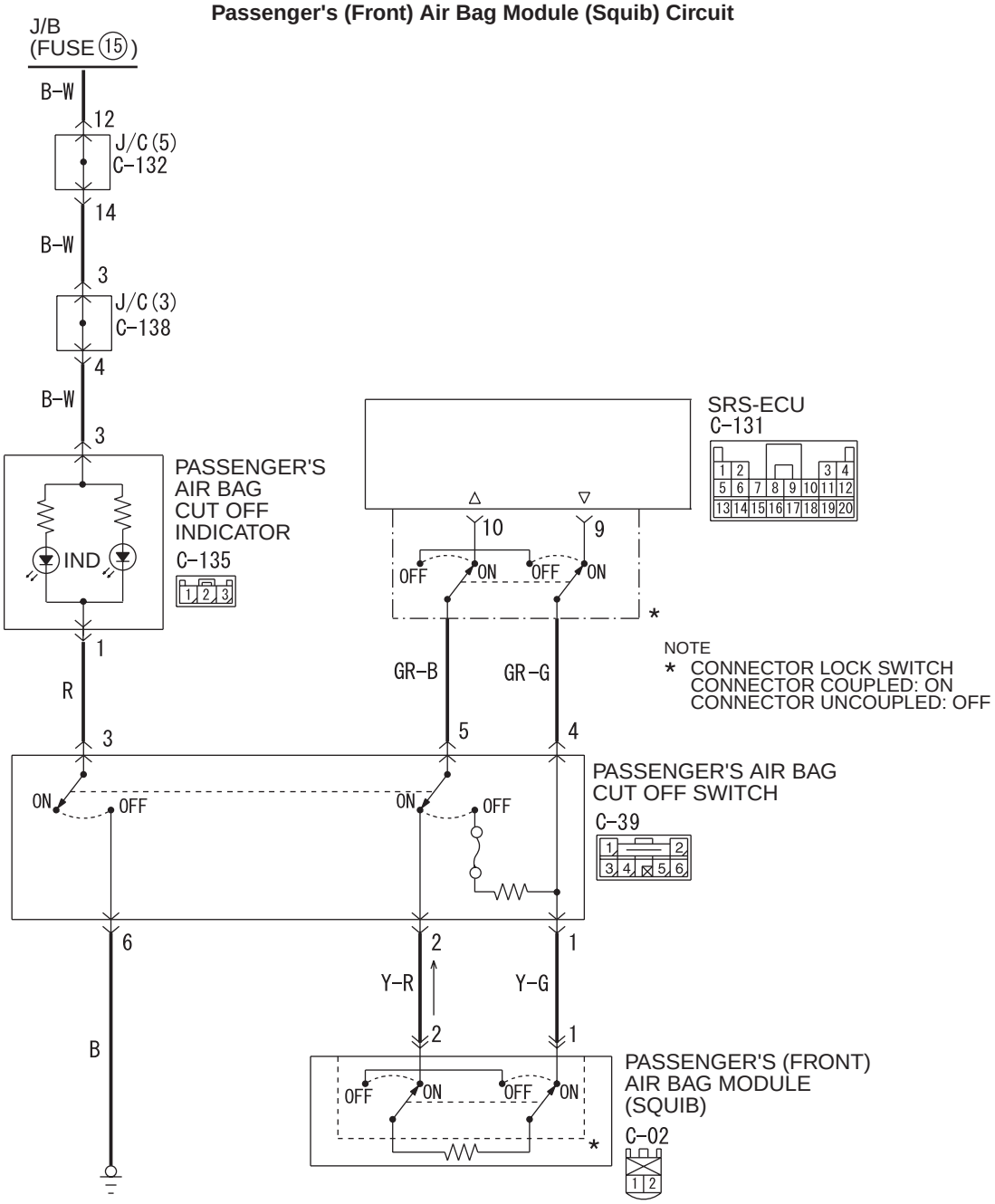
Q: Is diagnosis code B1410 set?

YES : Replace the SRS-ECU (Refer to P.52B-266).

NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1411: Passenger's (front) air bag module (squib) system (open-circuited in the squib circuit)

Passenger's (Front) Air Bag Module (Squib) Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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OPERATION

- The SRS-ECU judges how severe a collision is by detecting signals from the front impact sensors and the front air bag analogue G-sensor. If the impact is over a predetermined level, the SRS-ECU sends an ignition signal. At this time, if the front air bag safing G-sensor is on, the SRS air bag will inflate.
- The ignition signal is input to the air bag module to inflate the air bag.

DIAGNOSIS CODE SET CONDITIONS

This diagnosis code is set if passenger's (front) air bag squib wire(s) are open-circuited.

PROBABLE CAUSES

- Open circuit in the passenger's (front) air bag module (squib) circuit
- Improper connector contact
- Malfunction of the passenger's air bag cut off switch
- Malfunction of the SRS-ECU

DIAGNOSIS PROCEDURE

STEP 1. Check the passenger's air bag cut off switch.

Check the passenger's air bag cut off switch (Refer to P.52B-288).

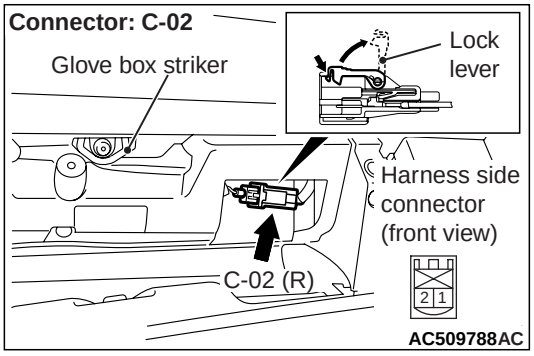
Q: Is the check result normal?

YES : Go to Step 2 .

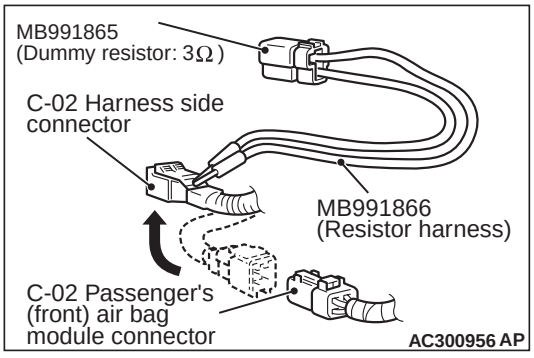
NO : Replace passenger's air bag cut off switch (Refer to P.52B-287).

STEP 2. Check the diagnosis code by connecting a dummy resistor. (M.U.T.-III diagnosis code)

(1) Disconnect the negative battery terminal.



(2) Disconnect passenger's (front) air bag module connector C-02. Pull up the harness side lock lever with a nail and disconnect the connector lock.



(3) Connect special tool dummy resistor (MB991865) to special tool resistor harness (MB991866).

⚠ CAUTION

Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(4) Insert special tool (MB991866) into the harness side connector C-02 by backprobing.

(5) Check that the passenger's air bag cut off switch is "ON" position.

(6) Connect the negative battery terminal.

(7) Erase the diagnosis code memory, and check the diagnosis code.

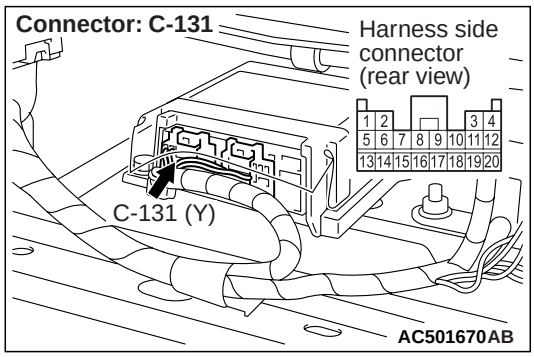
Q: Is diagnosis code B1411 set?

YES : Go to Step 3 .

NO : Replace the passenger's (front) air bag module (Refer to P.52B-268).

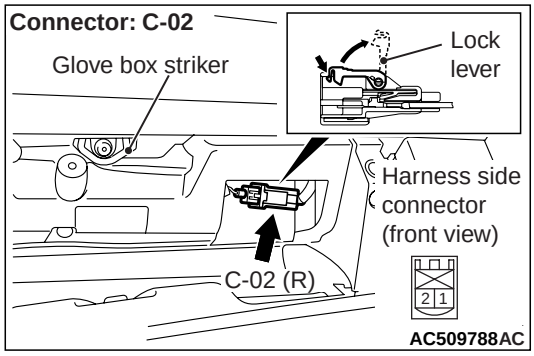
STEP 3. Resistance measurement between SRS-ECU connector C-131 (terminal No.9 and 10) and the passenger's (front) air bag module connector C-02 (terminal No.1 and 2).

(1) Disconnect the negative battery terminal.



(2) Disconnect SRS-ECU connector C-131.

⚠ *DANGER*

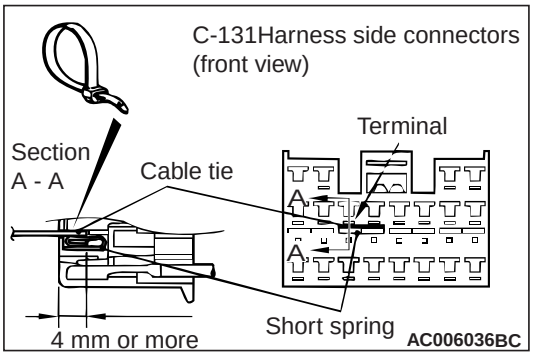


To prevents the air bag from deploying unintentionally, disconnect the passenger's (front) air bag module connector C-02 to short the squib circuit.

(3) Disconnect passenger's (front) air bag module connector C-02. Pull up the harness side lock lever with a nail and disconnect the connector

lock.

⚠ CAUTION

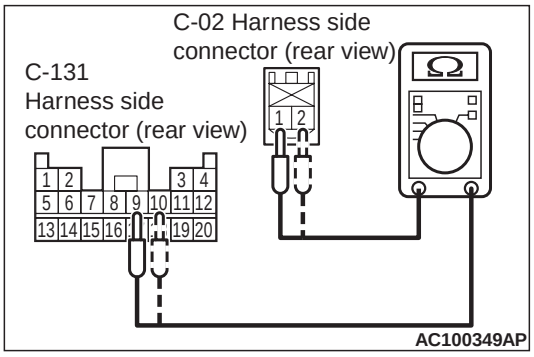


Insert an insulator such as a cable tie to a depth of 4 mm or more, otherwise the short spring will not be released.

(4) Insert a cable tie [3 mm wide, 0.5 mm thick] between terminals 9, 10 and the short spring to release the short spring.

(5) Check that the passenger's air bag cut off switch is "ON" position.

⚠ CAUTION



Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(6) Resistance measurement between the following terminals.

- SRS-ECU connector C-131 terminal No.9 and the passenger's (front) air bag module connector C-02 terminal No.1
- SRS-ECU connector C-131 terminal No.10 and the passenger's (front) air bag module connector C-02 terminal No.2

OK: Continuity (Less than 2 Ω)

Q: Are the check results normal?

YES : Go to Step 4 .

NO : Repair the harness wires between SRS-ECU connector C-131 (terminal No.9 and 10) and passenger's (front) air bag module connector C-02 (terminal No.1 and 2).

STEP 4. Check whether the diagnosis code is reset.

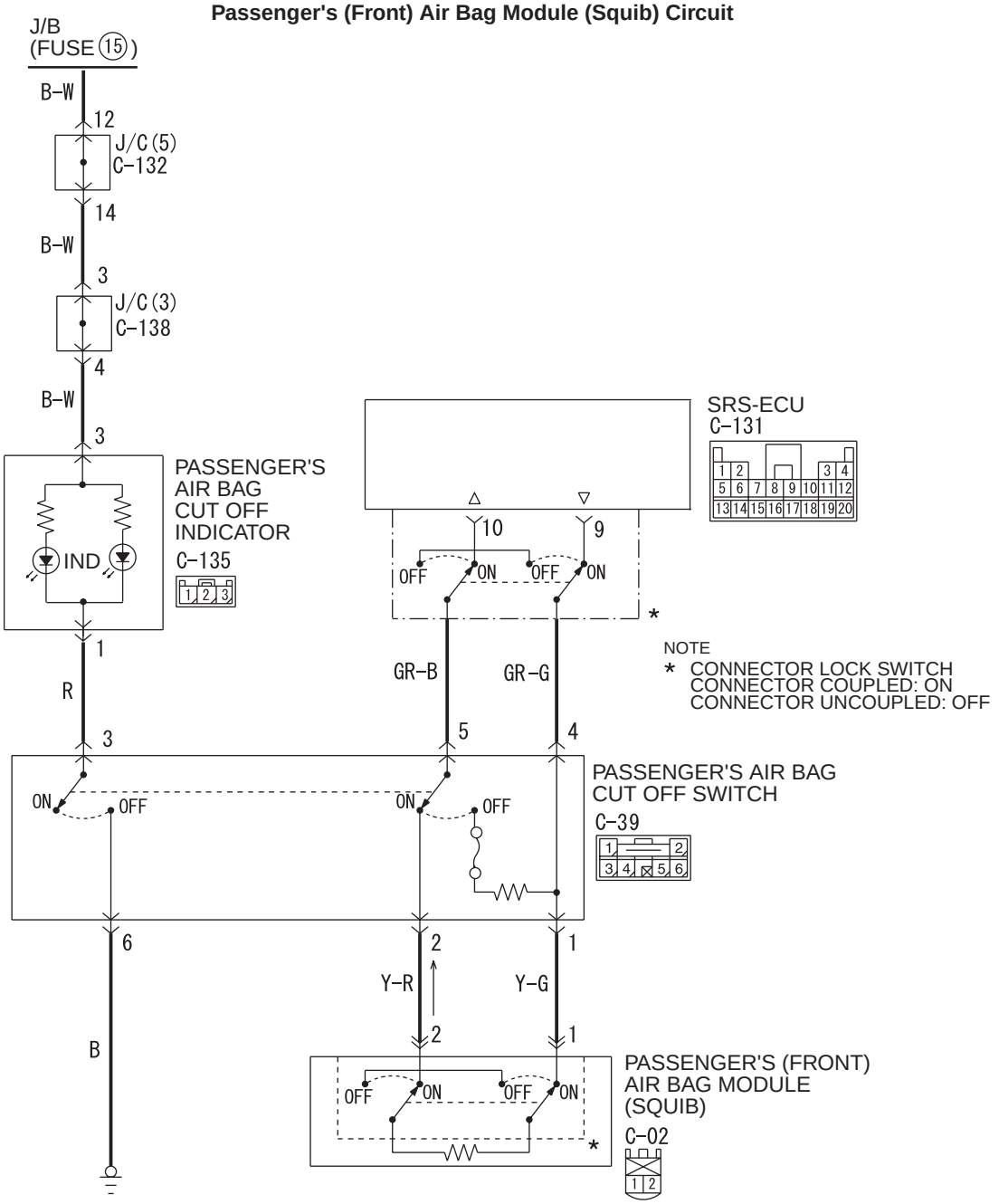
Q: Is diagnosis code B1411 set?

YES : Replace the SRS-ECU (Refer to P.52B-266).

NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1412: Passenger's (front) air bag module (squib) system (short-circuited to the earth)

Passenger's (Front) Air Bag Module (Squib) Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

AC805767AC

OPERATION

- The SRS-ECU judges how severe a collision is by detecting signals from the front impact sensors and the front air bag analogue G-sensor. If the impact is over a predetermined level, the SRS-ECU sends an ignition signal. At this time, if the front air bag safing G-sensor is on, the SRS air bag will inflate.
- The ignition signal is input to the air bag module to inflate the air bag.

DIAGNOSIS CODE SET CONDITIONS

This diagnosis code is set if the passenger's (front) air bag squib wire(s) are short-circuited to the earth.

PROBABLE CAUSES

- Damaged harness wires and connectors

- Short to the earth in the passenger's (front) air bag module (squib) harness
- Malfunction of the passenger's air bag cut off switch
- Malfunction of the SRS-ECU

DIAGNOSIS PROCEDURE

STEP 1. Check the passenger's air bag cut off switch.

Check the passenger's air bag cut off switch (Refer to P.52B-288).

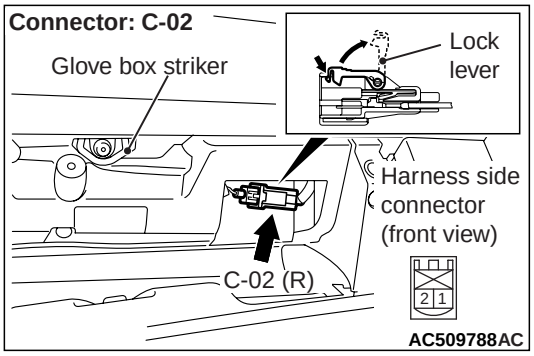
Q: Is the check result normal?

YES : Go to Step 2.

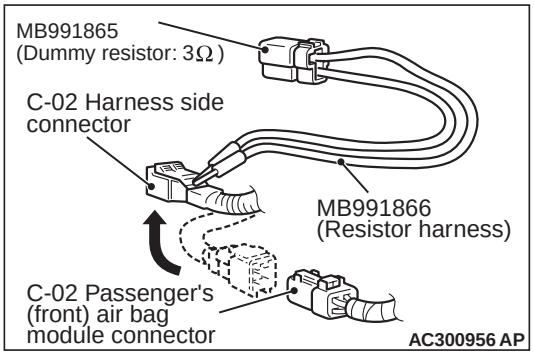
NO : Replace passenger's air bag cut off switch (Refer to P.52B-287).

STEP 2. Check the diagnosis code by connecting a dummy resistor. (M.U.T.-III diagnosis code)

(1) Disconnect the negative battery terminal.



(2) Disconnect passenger's (front) air bag module connector C-02. Pull up the harness side lock lever with a nail and disconnect the connector lock.



(3) Connect special tool dummy resistor (MB991865) to special tool resistor harness (MB991866).

⚠ CAUTION

Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(4) Insert special tool (MB991866) into the harness side connector C-02 by backprobing.

(5) Check that the passenger's air bag cut off switch is "ON" position.

(6) Connect the negative battery terminal.

(7) Erase the diagnosis code memory, and check the diagnosis code.

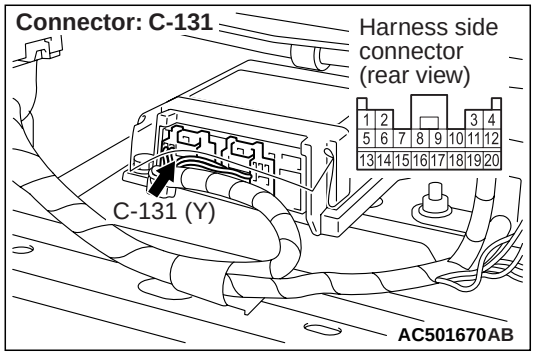
Q: Is diagnosis code B1412 set?

YES : Go to Step 3.

NO : Replace the passenger's (front) air bag module (Refer to P.52B-268).

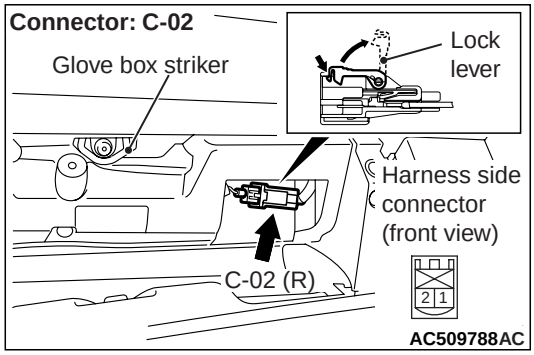
STEP 3. Resistance measurement at the SRS-ECU connector C-131.

(1) Disconnect the negative battery terminal.



(2) Disconnect SRS-ECU connector C-131.

⚠ DANGER

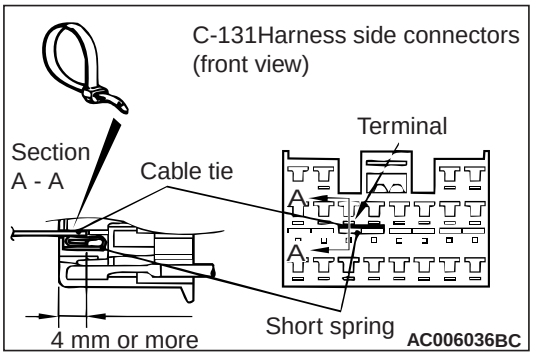


To prevents the air bag from deploying unintentionally, disconnect the passenger's (front) air bag module connector C-02 to short the squib circuit.

(3) Disconnect passenger's (front) air bag module connector C-02. Pull up the harness side lock lever with a nail and disconnect the connector

lock.

⚠ CAUTION

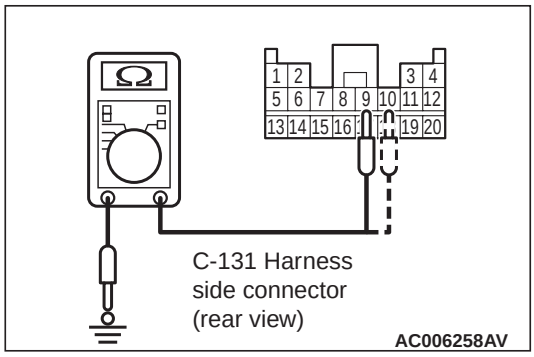


Insert an insulator such as a cable tie to a depth of 4 mm or more, otherwise the short spring will not be released.

(4) Insert a cable tie [3 mm wide, 0.5 mm thick] between terminals 9, 10 and the short spring to release the short spring.

(5) Check that the passenger's air bag cut off switch is "ON" position.

⚠ CAUTION



Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(6) Resistance measurement between C-131 harness side connector terminals 9, 10 and body earth.

OK: Open circuit

Q: Is the check result normal?

YES : Go to Step 4.

NO : Repair the harness wires between SRS-ECU connector C-131 (terminal No.9 and 10) and passenger's (front) air bag module connector C-02 (terminal No.1 and 2).

STEP 4. Check whether the diagnosis code is reset.

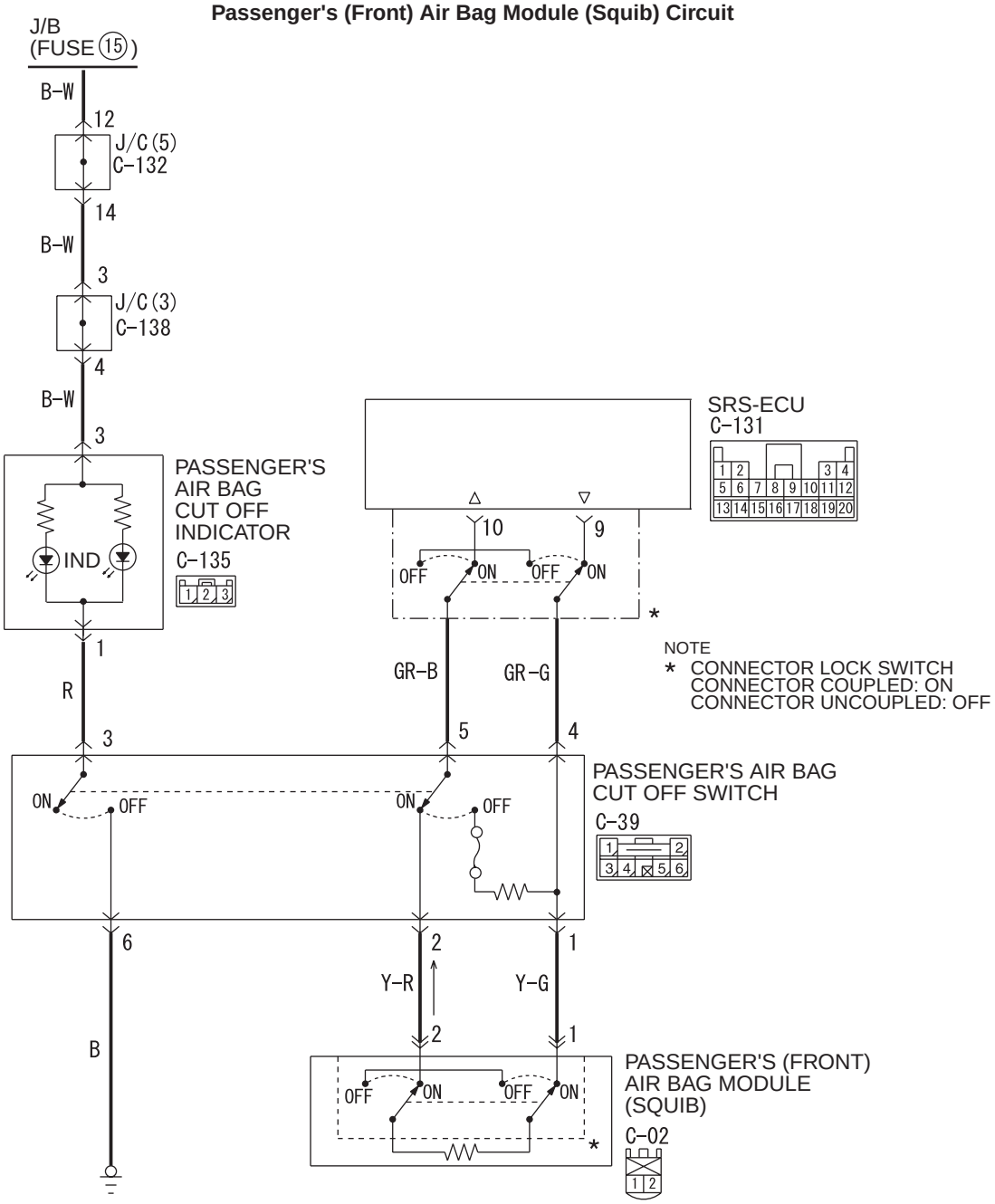
Q: Is diagnosis code B1412 set?

YES : Replace the SRS-ECU (Refer to P.52B-266).

NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1413: Passenger's (front) air bag module (squib) system (short-circuited to the power supply)

Passenger's (Front) Air Bag Module (Squib) Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

AC805767AC

OPERATION

- The SRS-ECU judges how severe a collision is by detecting signals from the front impact sensors and the front air bag analogue G-sensor. If the impact is over a predetermined level, the SRS-ECU sends an ignition signal. At this time, if the front air bag safing G-sensor is on, the SRS air bag will inflate.
- The ignition signal is input to the air bag module to inflate the air bag.

DIAGNOSIS CODE SET CONDITIONS

This diagnosis code is set if the passenger's (front) air bag squib wire(s) are short-circuited to the power supply.

PROBABLE CAUSES

- Damaged harness wires and connectors
- Short to the power supply in the passenger's (front) air bag module (squib) harness
- Malfunction of the passenger's air bag cut off switch
- Malfunction of the SRS-ECU

DIAGNOSIS PROCEDURE

STEP 1. Check the passenger's air bag cut off switch.

Check the passenger's air bag cut off switch (Refer to P.52B-288).

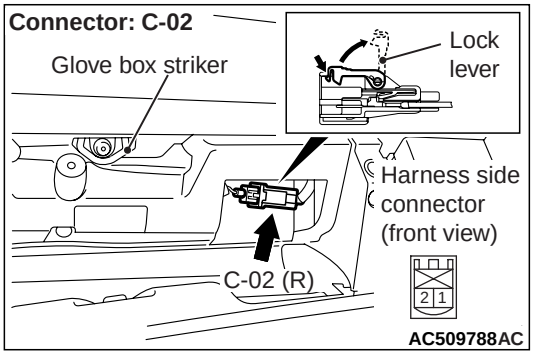
Q: Is the check result normal?

YES : Go to Step 2.

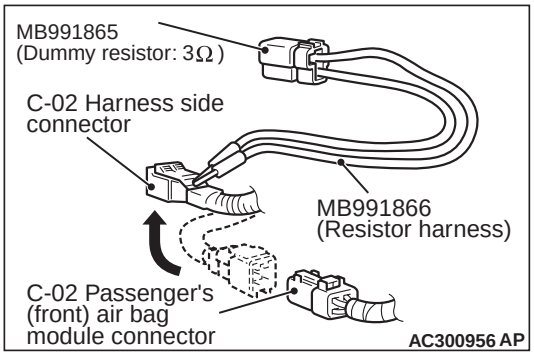
NO : Replace passenger's air bag cut off switch (Refer to P.52B-287).

STEP2. Check the diagnosis code by connecting a dummy resistor. (M.U.T.-III diagnosis code)

(1) Disconnect the negative battery terminal.



(2) Disconnect passenger's (front) air bag module connector C-02. Pull up the harness side lock lever with a nail and disconnect the connector lock.



(3) Connect special tool dummy resistor (MB991865) to special tool resistor harness (MB991866).

⚠ CAUTION

Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(4) Insert special tool (MB991866) into the harness side connector C-02 by backprobing.

(5) Check that the passenger's air bag cut off switch is "ON" position.

(6) Connect the negative battery terminal.

(7) Erase the diagnosis code memory, and check the diagnosis code.

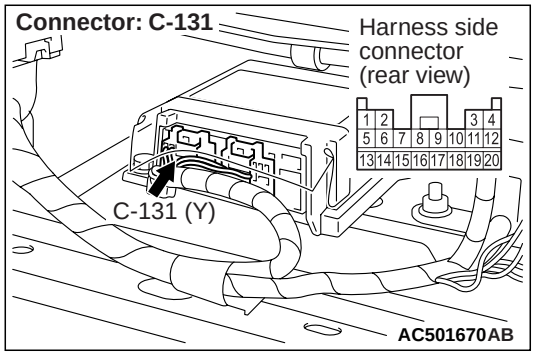
Q: Is diagnosis code B1413 set?

YES : Go to Step 3.

NO : Replace the passenger's (front) air bag module (Refer to P.52B-268).

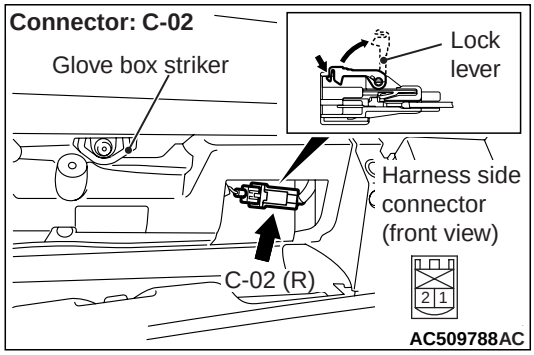
STEP 3. Voltage measurement at the SRS-ECU connector C-131.

(1) Disconnect the negative battery terminal.



(2) Disconnect SRS-ECU connector C-131.

⚠ DANGER

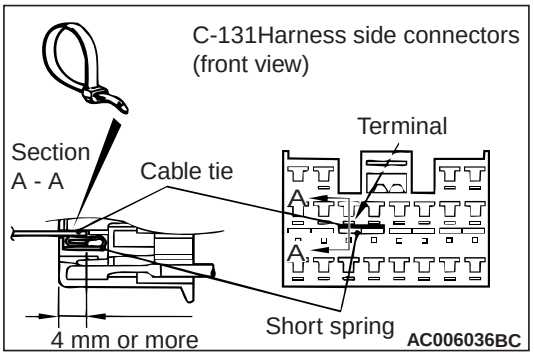


To prevents the air bag from deploying unintentionally, disconnect the passenger's (front) air bag module connector C-02 to short the squib circuit.

(3) Disconnect passenger's (front) air bag module connector C-02. Pull up the harness side lock lever with a nail and disconnect the connector

lock.

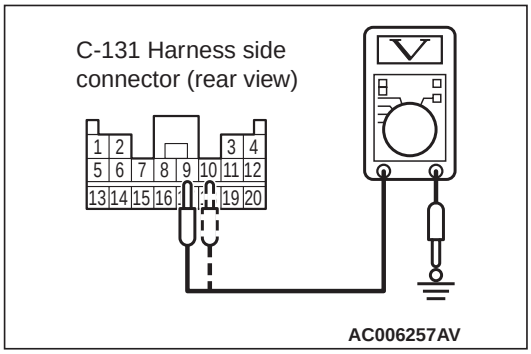
⚠ CAUTION



Insert an insulator such as a cable tie to a depth of 4 mm or more, otherwise the short spring will not be released.

(4) Insert a cable tie [3 mm wide, 0.5 mm thick] between terminals 9, 10 and the short spring to release the short spring.
(5) Check that the passenger's air bag cut off switch is "ON" position.
(6) Connect the negative battery terminal.
(7) Turn the ignition switch to the "ON" position.

⚠ CAUTION



Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(8) Voltage measurement between C-131 harness side connector terminals 9, 10 and body earth.

OK: 1 V or less

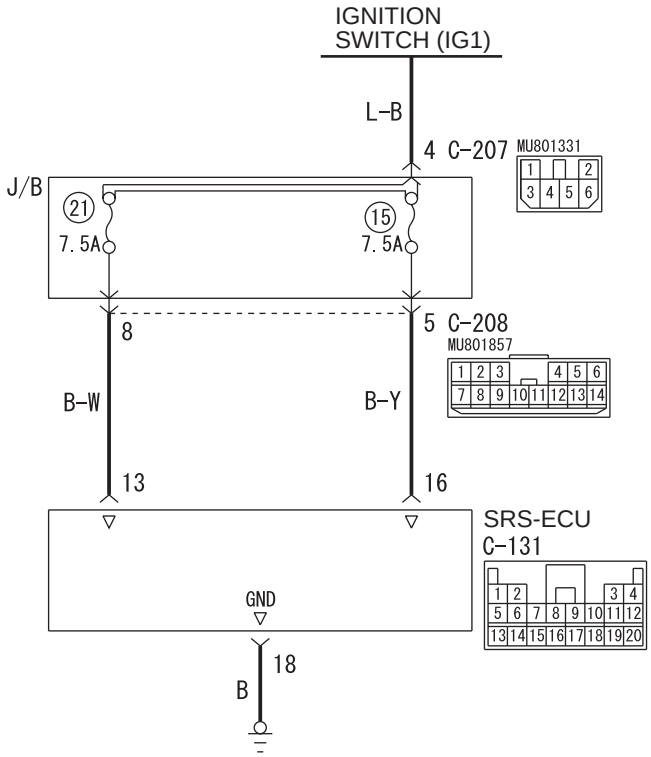
Q: Is the check result normal?
YES : Go to Step 4.
NO : Repair the harness wires between SRS-ECU connector C-131 (terminal No.9 and 10) and passenger's (front) air bag module connector C-02 (terminal No.1 and 2).

STEP 4. Check whether the diagnosis code is reset.

Q: Is diagnosis code B1413 set?
YES : Replace the SRS-ECU (Refer to P.52B-266).
NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1476: Power supply voltage (IG1 (A) voltage) drops abnormally.

IG1 Power Supply Circuit System



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

W7C52E001A

OPERATION

- The SRS-ECU is powered from the ignition switch (IG1).
- The SRS-ECU power is supplied from two circuits. Even if one circuit is shut off, the air bag can inflate.

DIAGNOSIS CODE SET CONDITIONS

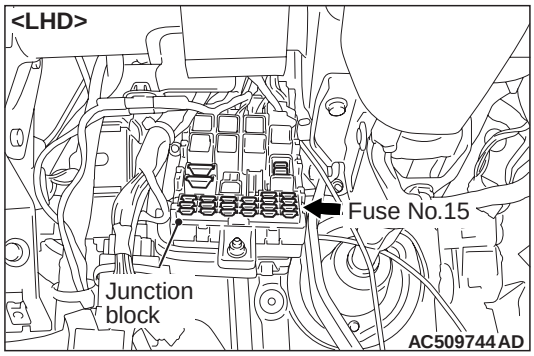
This diagnosis code is set if the voltage between the IG1 terminals (fuse No.15 circuit) and earth is lower than a predetermined value for a continuous period of 5 seconds or more.

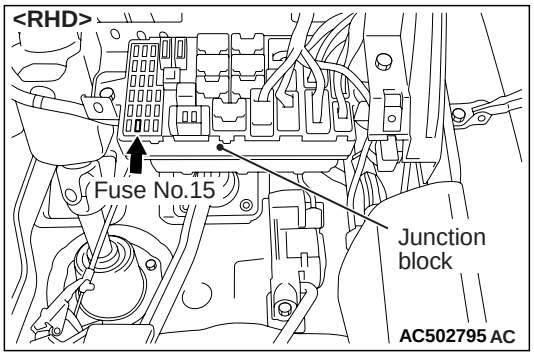
PROBABLE CAUSES

- Damaged wiring harnesses or connectors
- Malfunction of the SRS-ECU

DIAGNOSIS PROCEDURE

STEP 1. Check junction block fuse number 15.

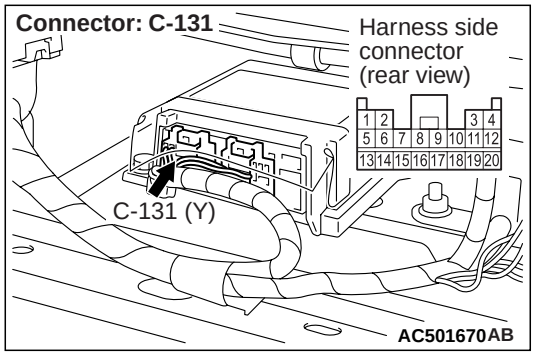




Q: Is the fuse burned out?
YES : Go to Step 4.
NO : Go to Step 2.

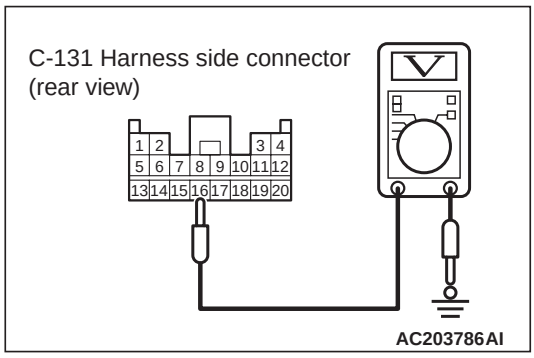
STEP 2. Voltage measurement at the SRS-ECU connector C-131.

(1) Disconnect the negative battery terminal.



(2) Disconnect SRS-ECU connector C-131.
(3) Connect the negative battery terminal.
(4) Turn the ignition switch to the "ON" position.

⚠ CAUTION



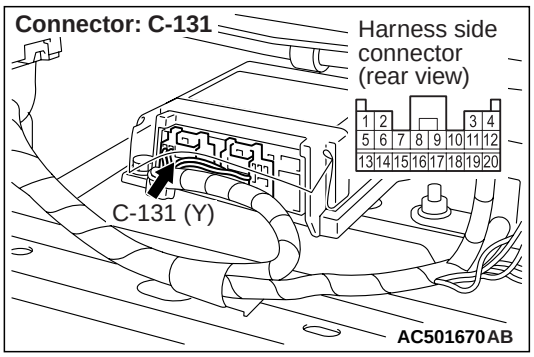
Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

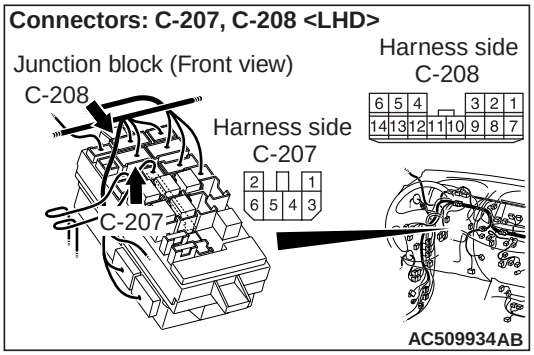
(5) Voltage measurement between C-131 harness side connector terminal 16 and body earth.

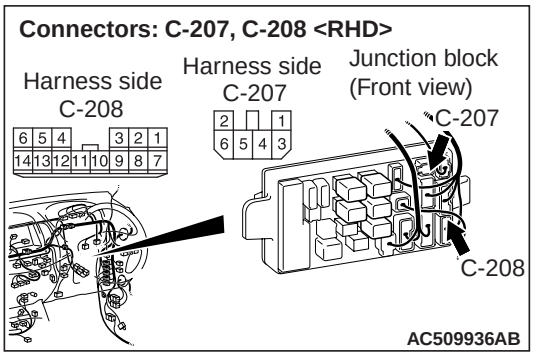
OK: 9 V or more.

Q: Is the check result normal?
YES : Go to Step 6.
NO : Go to Step 3.

STEP 3. Connector check: SRS-ECU connector C-131, junction block connector C-207 and C-208.







Q: Is the check result normal?

YES : Check the harness wires for open or short circuit between SRS-ECU connector C-131 (terminal No.16) and ignition switch, and repair if necessary.

NO : Replace it.

STEP 4. Check a burned-out fuse.

(1) Replace the fuse.

(2) Turn the ignition switch to the "ON" position, wait for at least one minute and then turn the ignition switch to the "LOCK" (OFF) position.

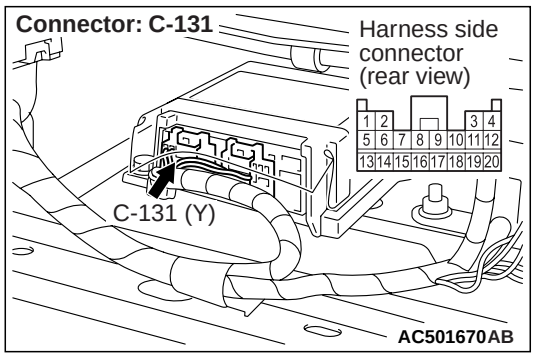
(3) Check the fuse.

Q: Is the fuse in good condition?

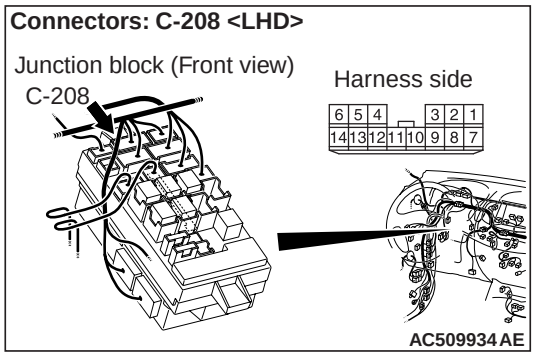
YES : This diagnosis is complete.

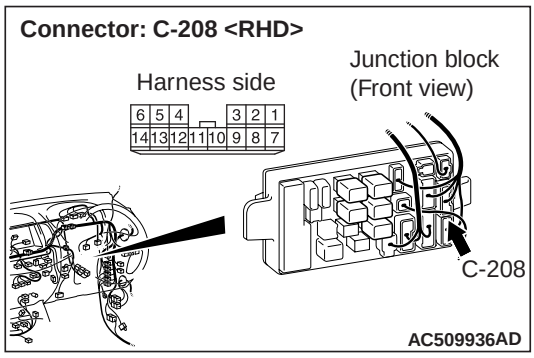
NO : Go to Step 5.

STEP 5. Resistance measurement at the junction block connector C-208.



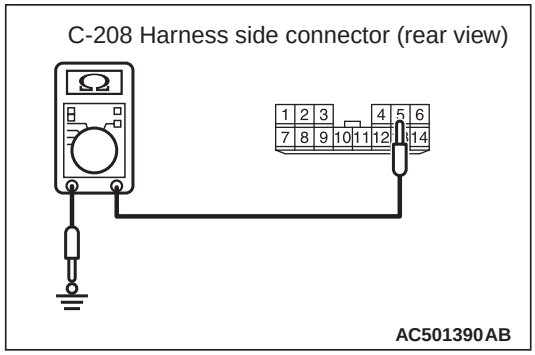
(1) Disconnect SRS-ECU connector C-131.





(2) Disconnect junction block connector C-208, and measure at the wiring harness side.

⚠ CAUTION



Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(3) Resistance measurement between terminal 5

and body earth.

OK: Open circuit

Q: Is the check result normal?

YES : Check the other circuit which flows through fuse number 15.

NO : Repair the wiring harness between junction block connector C-208 (terminal No.5) and SRS-ECU connector C-131 (terminal No.16), and replace the fuse.

STEP 6. Check whether the diagnosis code is reset.

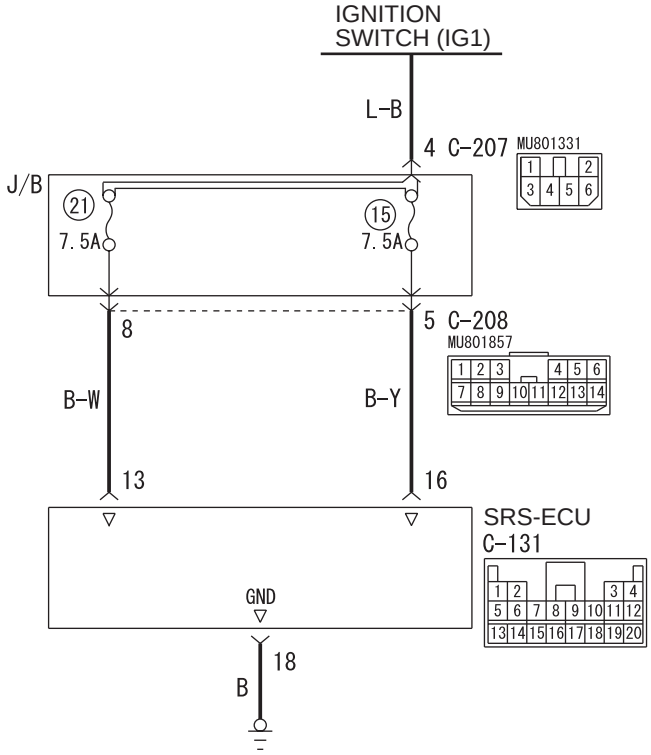
Q: Is diagnosis code B1476 set?

YES : Replace the SRS-ECU (Refer to P.52B-266).

NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1477: Power supply voltage (IG1 (B) voltage) drops abnormally.

IG1 Power Supply Circuit System



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

W7C52E001A

OPERATION

- The SRS-ECU is powered from the ignition switch (ACC).
- The SRS-ECU power is supplied from two circuits. Even if one circuit is shut off, the air bag can inflate.

DIAGNOSIS CODE SET CONDITIONS

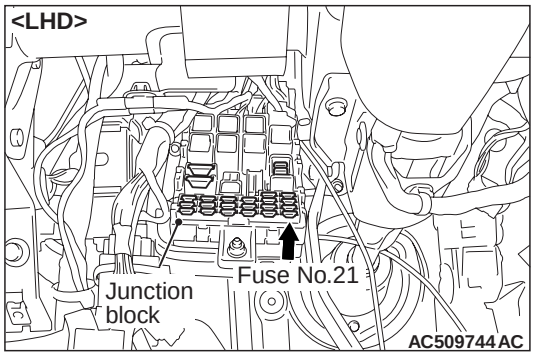
This diagnosis code is set if the voltage between the IG1 terminals (fuse No.21 circuit) and earth is lower than a predetermined value for a continuous period of 5 seconds or more.

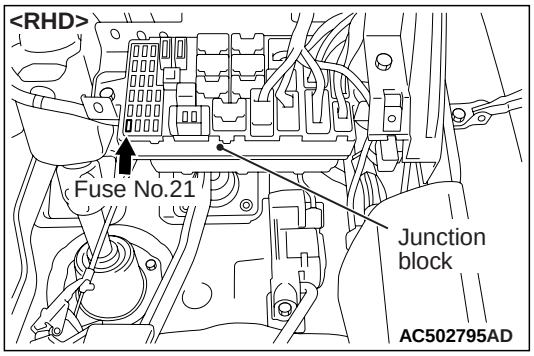
PROBABLE CAUSES

- Damaged wiring harnesses or connectors
- Malfunction of the SRS-ECU

DIAGNOSIS PROCEDURE

STEP 1. Check junction block fuse number 21.

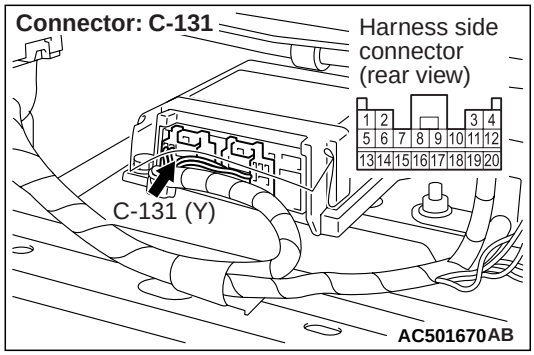




Q: Is the fuse burned out?
YES : Go to Step 4.
NO : Go to Step 2.

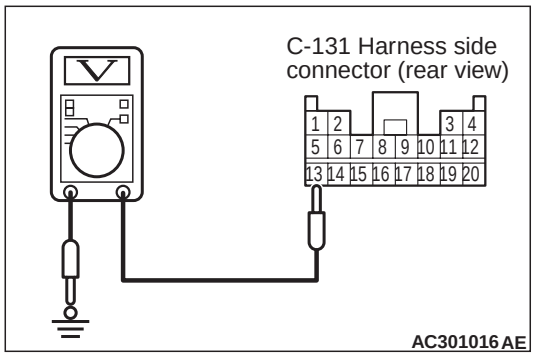
STEP 2. Voltage measurement at SRS-ECU connector C-131.

(1) Disconnect the negative battery terminal.



(2) Disconnect SRS-ECU connector C-131.
(3) Connect the negative battery terminal.
(4) Turn the ignition switch to the "ON" position.

⚠ CAUTION



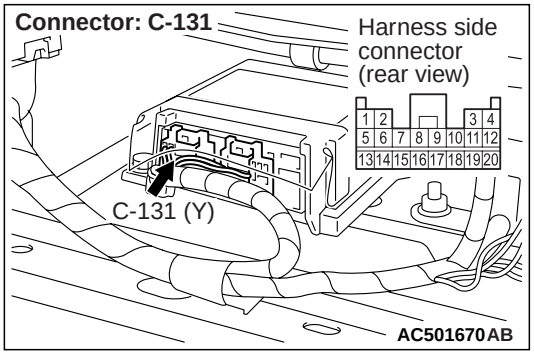
Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

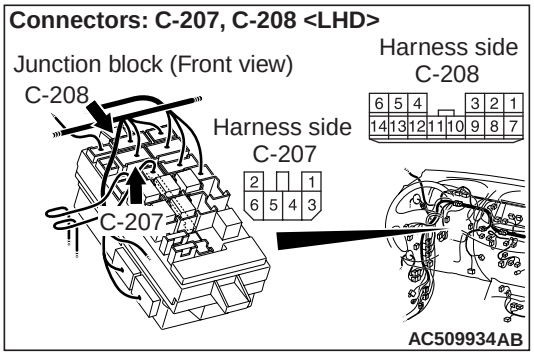
(5) Voltage measurement between C-131 harness side connector terminal 13 and body earth.

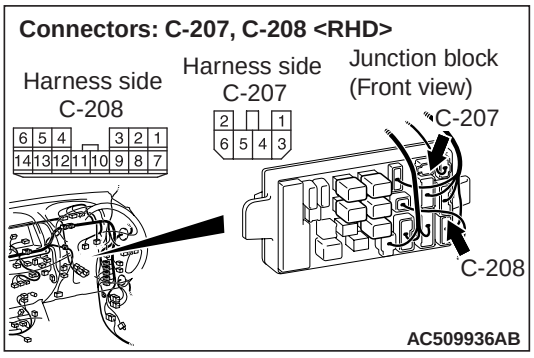
OK: 9 V or more

Q: Is the check result normal?
YES : Go to Step 6.
NO : Go to Step 3.

STEP 3. Connector check: SRS-ECU connector C-131, junction block connector C-207 and C-208.







Q: Is the check result normal?

YES : Check the harness wires for open or short circuit between SRS-ECU connector C-131 (terminal No.13) and ignition switch, and repair if necessary.

NO : Replace it.

STEP 4. Check a burned-out fuse.

(1) Replace the fuse.

(2) Turn the ignition switch to the "ON" position, wait for at least one minute and then turn the ignition switch to the "LOCK" (OFF) position.

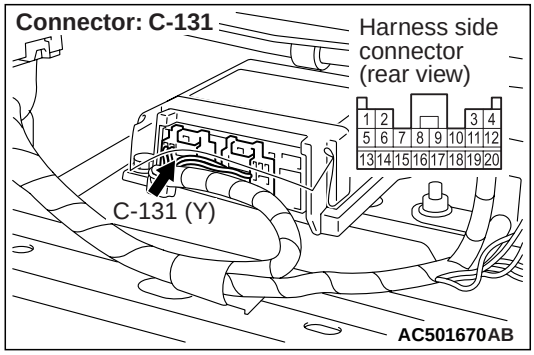
(3) Check the fuse.

Q: Is the fuse in good condition?

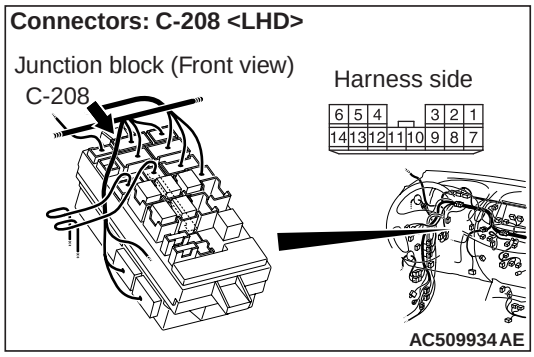
YES : This diagnosis is complete.

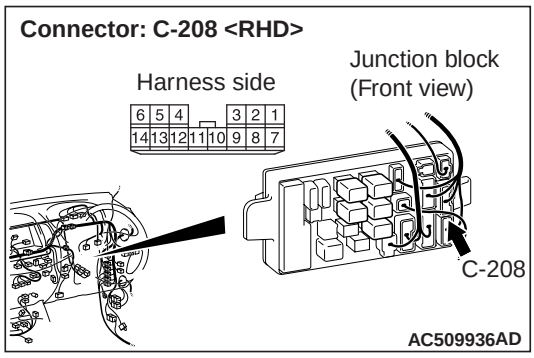
NO : Go to Step 5.

STEP 5. Resistance measurement at the junction block connector C-208



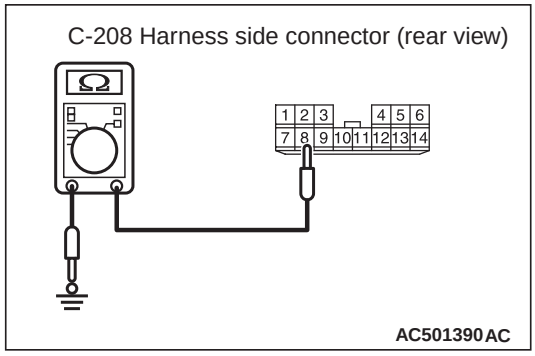
(1) Disconnect SRS-ECU connector C-131.





(2) Disconnect junction block connector C-208, and measure at the wiring harness side.

⚠ CAUTION



Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(3) Resistance measurement between terminal 8

and body earth.

OK: Open circuit

Q: Is the check result normal?

YES : Check the other circuit, which flows through fuse number 21.

NO : Repair the wiring harness between junction block connector C-208 (terminal No.8) and SRS-ECU connector C-131 (terminal No.13), and replace the fuse.

STEP 6. Check whether the diagnosis code is reset.

Q: Is diagnosis code B1477 set?

YES : Replace the SRS-ECU (Refer to P.52B-266).

NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1509: Incorrect installation of SRS-ECU

DIAGNOSIS CODE SET CONDITIONS

This code is set when the vehicle specification does not meet the ECU specification.

PROBABLE CAUSES

Malfunction of the SRS-ECU

DIAGNOSIS PROCEDURE

Replace the SRS-ECU (Refer to P.52B-266).

Code No.B1519: SRS-ECU connector lock out of order

DIAGNOSIS CODE SET CONDITIONS

This diagnosis code is set if a poor connection at the SRS-ECU is detected.

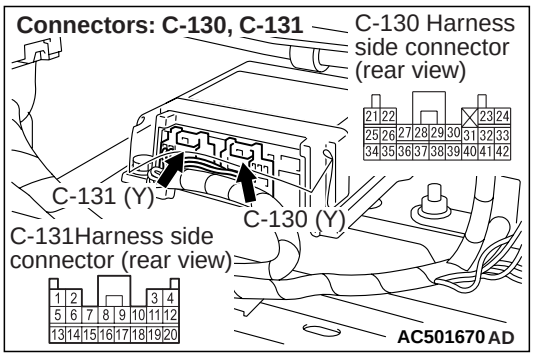
PROBABLE CAUSES

- Damaged connectors
- Malfunction of the SRS-ECU

DIAGNOSIS PROCEDURE

STEP 1. Connector lock check: SRS-ECU connectors C-130 and C-131. (M.U.T.-III diagnosis code)

(1) Disconnect the negative battery terminal.



(2) Disconnect SRS-ECU connectors C-130, C-131 and then reconnect them.

(3) Connect the negative battery terminal.

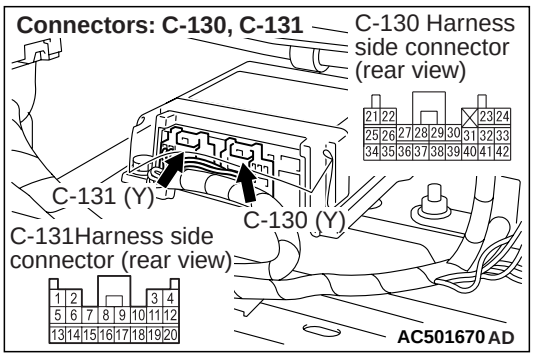
(4) Erase diagnosis code memory, and then check the diagnosis code.

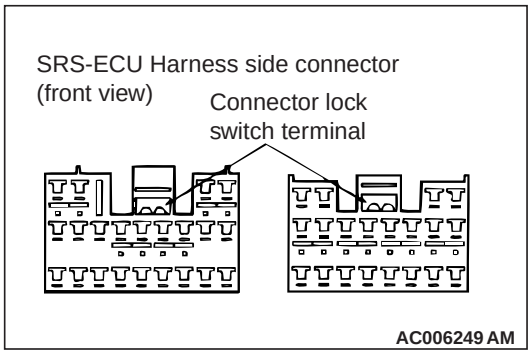
Q: Is diagnosis code B1519 set?

YES : Go to Step 2.

NO : The procedure is complete. It is assumed that diagnosis code B1519 set as connectors C-130 and C-131 were engaged improperly.

STEP 2. Connector lock check: SRS-ECU connectors C-130 and C-131.





(1) Disconnect SRS-ECU connectors C-130 and C-131.
(2) Check the connector lock switch terminal inside the harness side connector for improper contact or deformation.

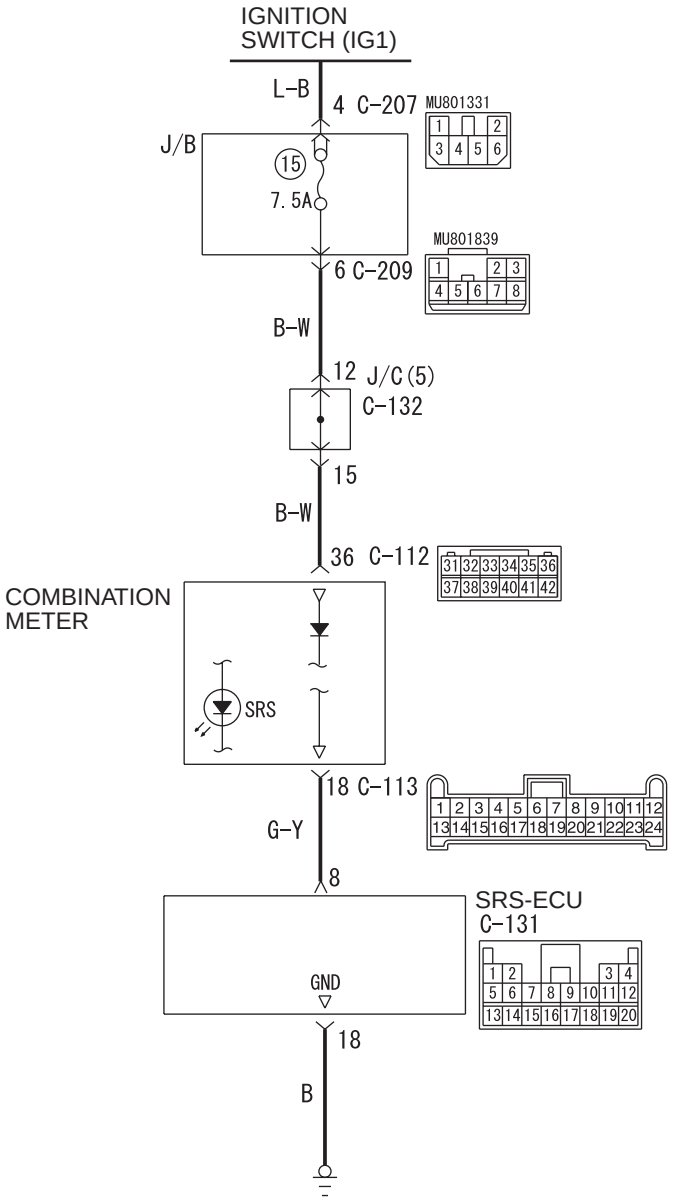
Q: Are the SRS-ECU connectors C-130 and C-131 in good condition?
YES : Go to Step 3.
NO : Replace the SRS-ECU connector C-130 and C-131.

STEP 3. Check whether the diagnosis code is reset.

Q: Is diagnosis code B1519 set?
YES : Replace the SRS-ECU (Refer to P.52B-266).
NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No. B1551: SRS warning lamp circuit malfunction (Lamp does not Illuminate).

SRS Warning Lamp Drive Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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OPERATION

- Power for the SRS warning lamp is supplied from the ignition switch (IG1) circuit.
- The SRS warning lamp illuminates when the ignition switch is turned to the "ON" position and goes out after approximately 7 seconds if there is not a malfunction in the SRS system.

DIAGNOSIS CODE SET CONDITIONS

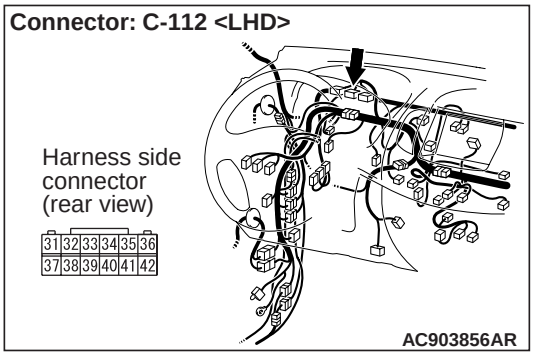
This diagnosis code will be set if the SRS warning lamp driving circuit is short to earth.

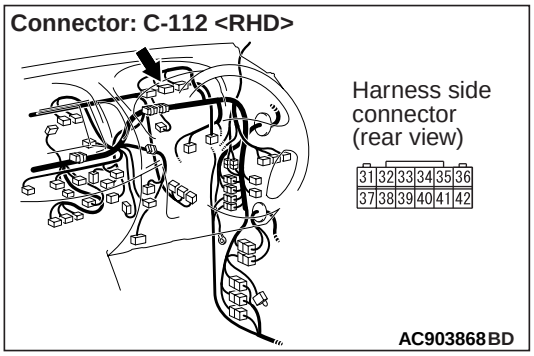
PROBABLE CAUSES

- Damaged wiring harnesses of connectors
- Malfunction of the SRS-ECU
- Malfunction of the combination meter

DIAGNOSIS PROCEDURE

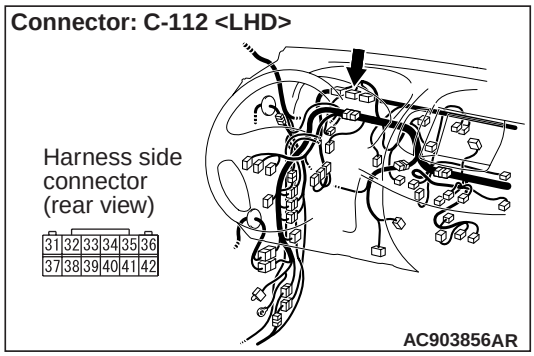
STEP 1. Check the combination meter connector C-112.

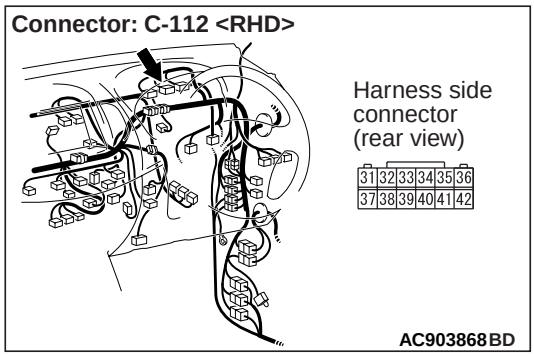




Q: Is the connector correctly engaged?
YES : Go to Step 2.
NO : Engage the connector correctly. Then go to Step 7.

STEP 2. Voltage measurement at combination meter connector C-112.



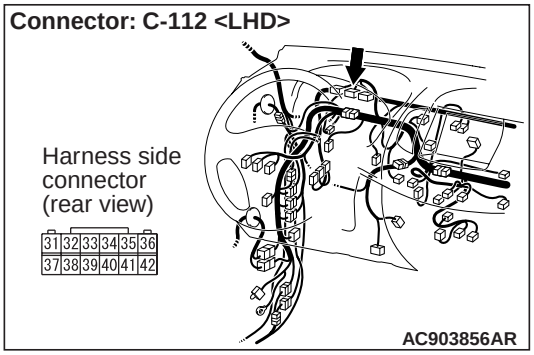


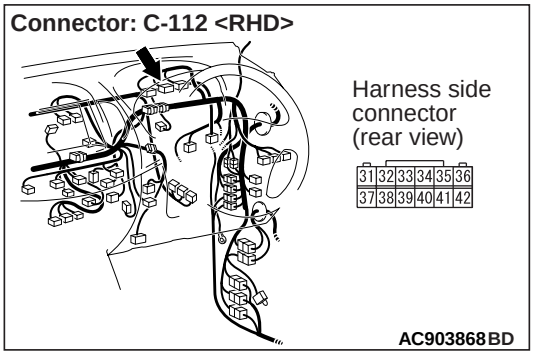
(1) Disconnect the combination meter connector C-112.
(2) Connect the negative battery terminal.
(3) Turn the ignition switch to the "ON" position.
(4) Measure the voltage between C-112 harness side connector terminal 36 and body earth.

OK: System voltage

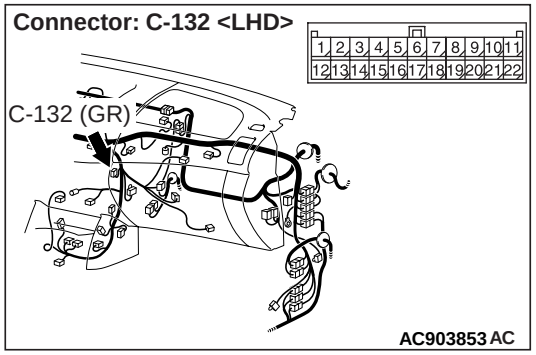
Q: Is the check result normal?
YES : Go to Step 4.
NO : Go to Step 3.

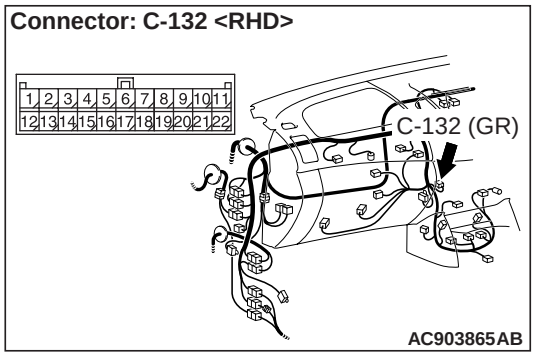
STEP 3. Check the harness for open circuit between ignition switch and combination meter connector C-112 (terminal No.36).

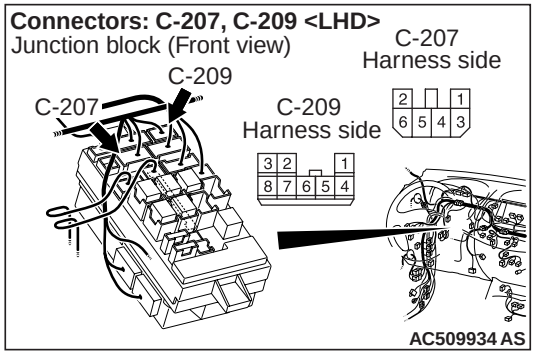


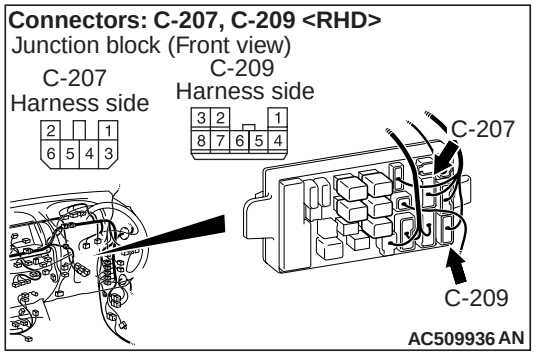


NOTE:









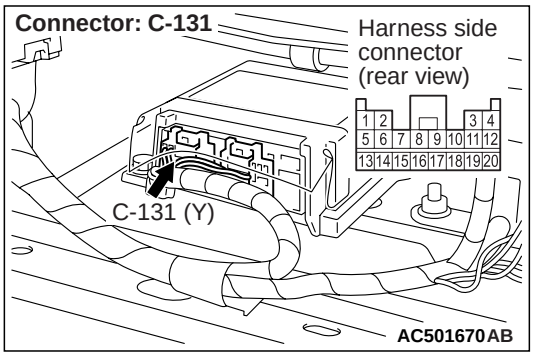
Prior to the wiring harness inspection, check junction block connector C-132, C-207 and C-209, and repair if necessary.

Q: Is the check result normal?

YES : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

NO : Repair the harness wires between ignition switch and the combination meter connector C-112 (terminal No.36). Then go to Step 7.

STEP 4. Check SRS-ECU connector C-131.

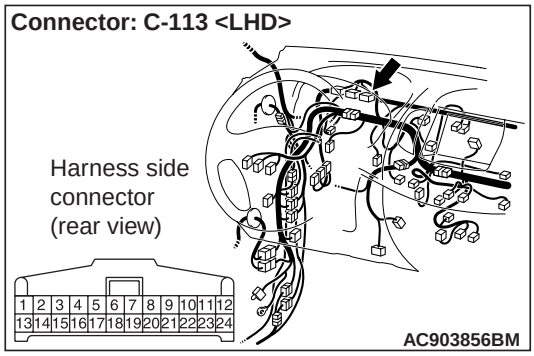


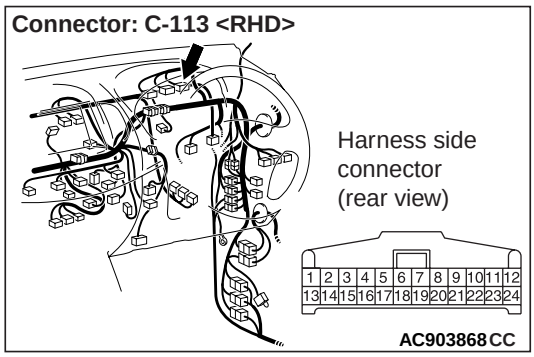
Q: Is the connector correctly engaged?

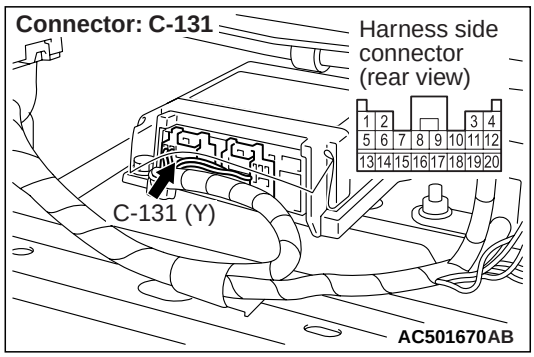
YES : Go to Step 5.

NO : Engage the connector correctly. Then go to Step 7.

STEP 5. Check the harness for short circuit between the combination meter connector C-113 (terminal No.18) and SRS-ECU connector C-131 (terminal No.8).







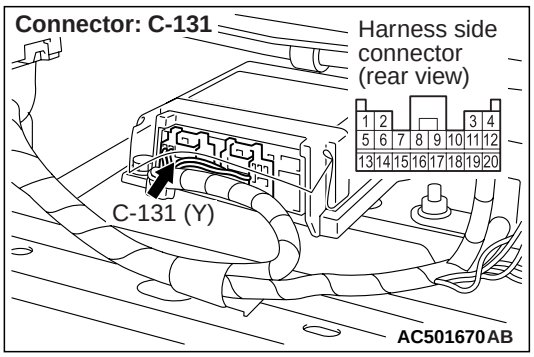
Q: Is the check result normal?

YES : Go to Step 6.

NO : Repair the harness wires between the combination meter connector C-113 (terminal No.18) and SRS-ECU connector C-131 (terminal No.8). Then go to Step 7.

STEP 6. Check the SRS warning lamp.

(1) Disconnect the negative battery terminal.



(2) Disconnected the SRS-ECU connector C-131.
(3) Connect the negative battery terminal.
(4) Turn the ignition switch to the "ON" position.

Q: Does the SRS warning lamp illuminate?

YES : Go to Step 7.
NO : Replace the combination meter (Refer to GROUP 54A, Combination Meter Assembly). Go to Step 7.

STEP 7. Check whether the diagnosis code is reset.

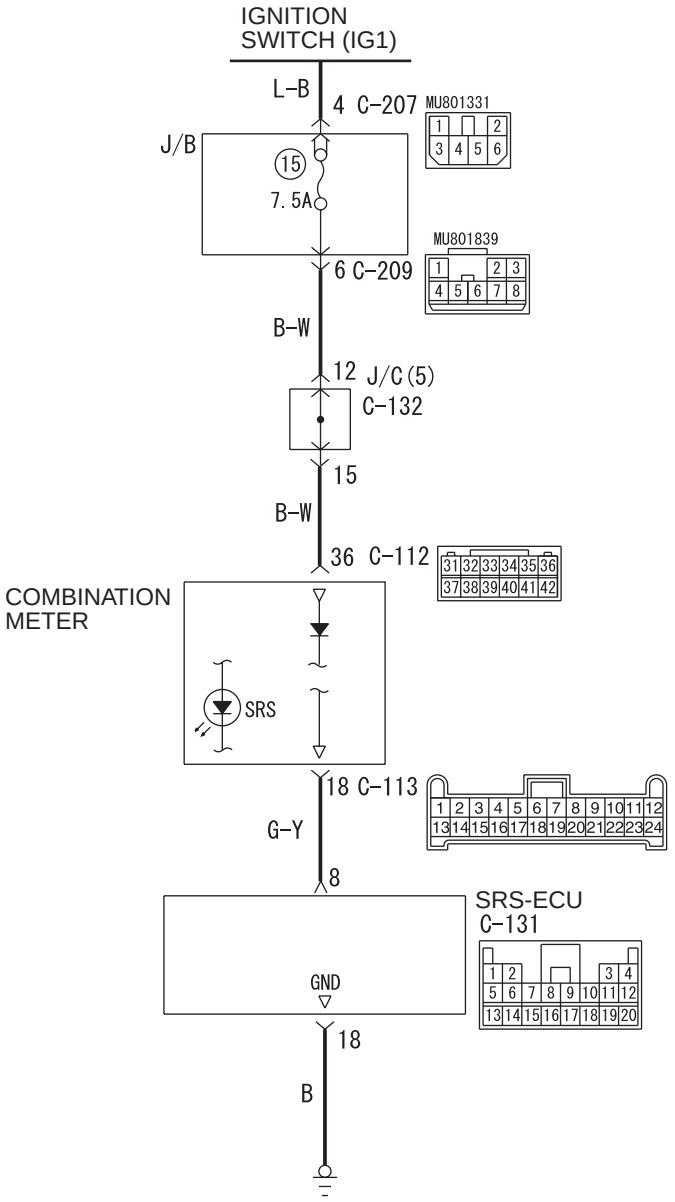
Check again if the diagnosis code is set.
(1) Erase the diagnosis code.
(2) Ignition: "LOCK" (OFF) position to "ON"
(3) On completion, check that the diagnosis code is not reset.

Q: Is the diagnosis code set?

YES : Replace the SRS-ECU (Refer to P.52B-266).
NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1551: SRS warning lamp circuit malfunction (Lamp does not Switch Off).

SRS Warning Lamp Drive Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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OPERATION

- Power for the SRS warning lamp is supplied from the ignition switch (IG1) circuit.
- The SRS warning lamp illuminates when the ignition switch is turned to the "ON" position and goes out after approximately 7 seconds if there is not a malfunction in the SRS system.

DIAGNOSIS CODE SET CONDITIONS

- This diagnosis code will be set if an open circuit has occurred in the wiring harness between the combination meter and the SRS-ECU.

TROUBLESHOOTING HINTS

- Damaged wiring harnesses of connectors
- Malfunction of the SRS-ECU
- Malfunction of the combination meter

DIAGNOSIS PROCEDURE

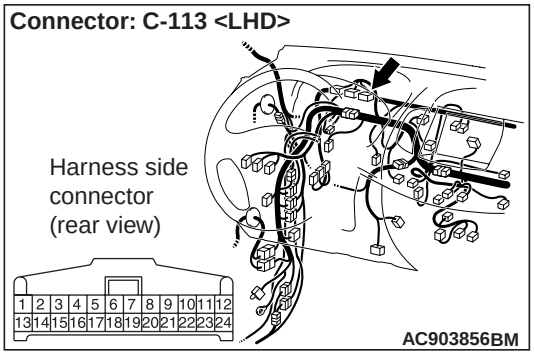
STEP 1. M.U.T.-III diagnosis code.

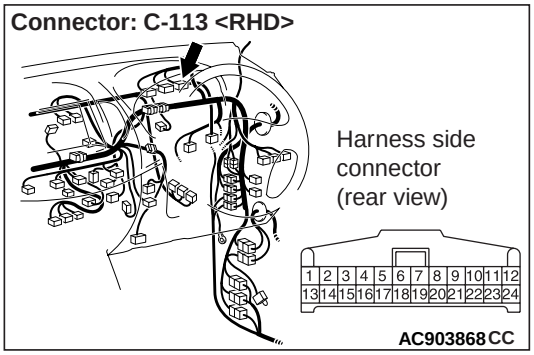
Q: Is the diagnosis code set?

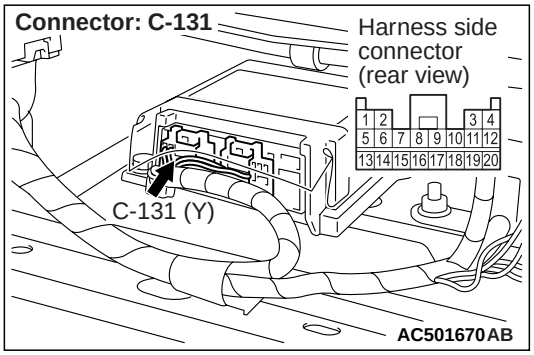
YES : Perform the troubleshooting to the set diagnosis code. (Refer to P.52B-12).

NO : Go to Step 2.

STEP 2. Check the harness between SRS-ECU connector C-131 (terminal No.8) and the combination meter connector C-113 (terminal No.18).







- Check the SRS warning lamp output lines for open circuit.

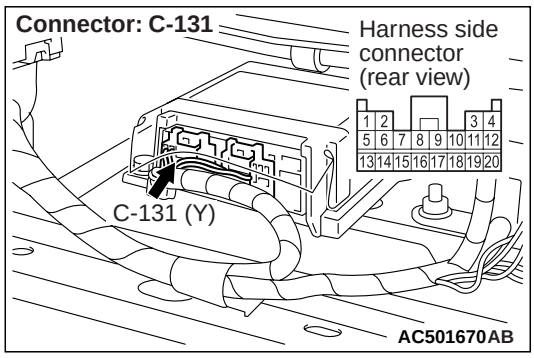
Q: Is the check result normal?

YES : Go to Step 3.

NO : Repair the harness wires. Then go to Step 4.

STEP 3. Check the SRS warning lamp.

(1) Disconnect the negative battery terminal.



(2) Disconnected the SRS-ECU connector C-131.

(3) Connect the negative battery terminal.

(4) Turn the ignition switch to the "ON" position.

⚠ CAUTION

Do not insert a test probe into the terminal from its front side directly, as the connector contact pressure may be weakened.

(5) Check that SRS warning lamp turn "ON" when SRS-ECU connector C-131 is disconnected. Check that the same warning lamp turn "OFF" when the terminal No.8 of the above connector is earthed.

Q: Is the check result normal?

YES : Go to Step 4

NO : Replace the combination meter (Refer to GROUP 54A, Combination Meter Assembly).

STEP 4. Check whether the diagnosis code is reset.

Check again if the diagnosis code is set.

(1) Erase the diagnosis code.

(2) Ignition: "LOCK" (OFF) position to "ON"

(3) On completion, check that the diagnosis code is not reset.

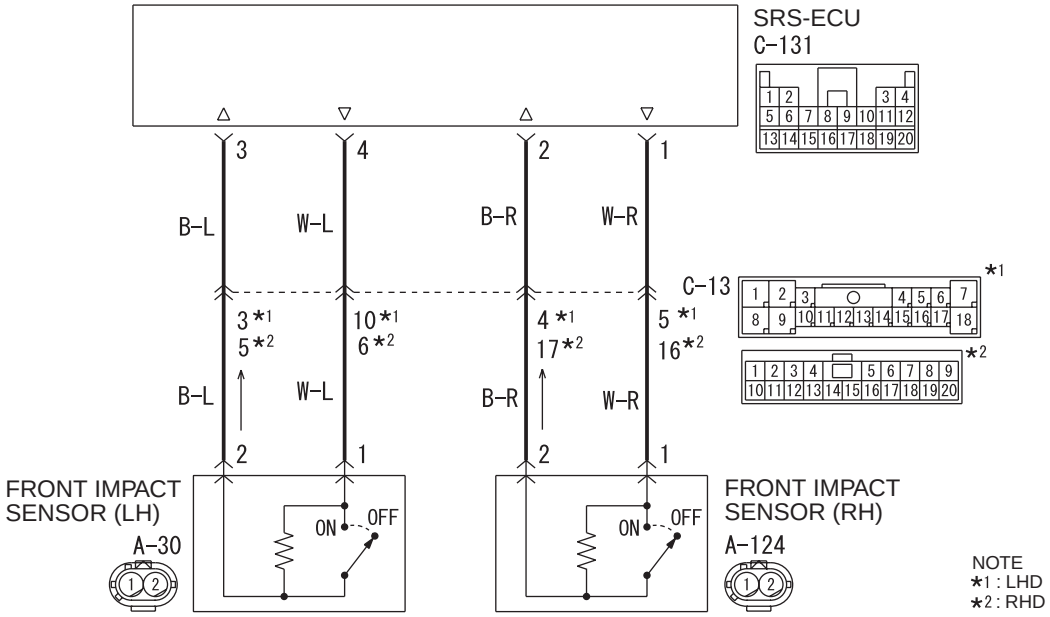
Q: Is the diagnosis code set?

YES : Replace the SRS-ECU (Refer to P.52B-266).

NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1595: Front impact sensor RH system (short circuit in the sensor)
Code No.B1596: Front impact sensor RH system (open circuit in the sensor)
Code No.B1597: Front impact sensor RH (short circuited in the earth)
Code No.B1598: Front impact sensor RH (short circuited in the power supply)
Code No.B1599: Front impact sensor LH system (short circuit in the sensor)
Code No.B1600: Front impact sensor LH (open circuit in the sensor)
Code No.B1601: Front impact sensor LH (short circuited in the earth)
Code No.B1602: Front impact sensor LH (short circuited in the power supply)

Front Impact Sensor Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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OPERATION

- When the left and right front impact sensors detect a collision, the switches inside the sensors turn ON.
- SRS-ECU judges how severe a collision is by detecting signals from the front impact sensors and the front air bag analogue G-sensor. If the impact is over a predetermined level, the SRS-ECU sends an ignition signal. At this time, if the front air bag safing G-sensor is on, the SRS air bag will inflate.

DIAGNOSIS CODE SET CONDITIONS

These diagnosis codes are set if these are abnormal resistance between the input terminals of the front impact sensors.
The most likely causes for these codes to be set are shown in the table below:

Code No.	Trouble causes
B1595	Right front impact sensor or its wiring shorted
B1596	Right front impact sensor or wiring open circuit
B1597	Short to body earth in the right front impact sensor harness
B1598	Short to the power supply in the right front impact sensor harness
B1599	Left front impact sensor or its wiring shorted

Code No.	Trouble causes
B1600	Left front impact sensor or wiring open circuit
B1601	Short to body earth in the left front impact sensor harness
B1602	Short to the power supply in the left front impact sensor harness

PROBABLE CAUSES

- Damaged harness wires and connectors
- Front impact sensor failed
- Malfunction of the SRS-ECU

DIAGNOSIS PROCEDURE

STEP 1. Check the front impact sensor.

Refer to P.52B-264.

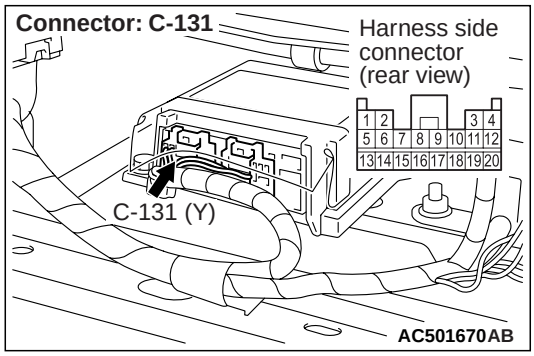
Q: Is the check result normal?

YES : Go to Step 2.

NO : Check the harness wires for open or short circuit between intermediate connector and front impact sensor, and repair if necessary. Then replace the front impact sensor (Refer to P.52B-263).

STEP 2. Resistance measurement at the SRS-ECU connector C-131.

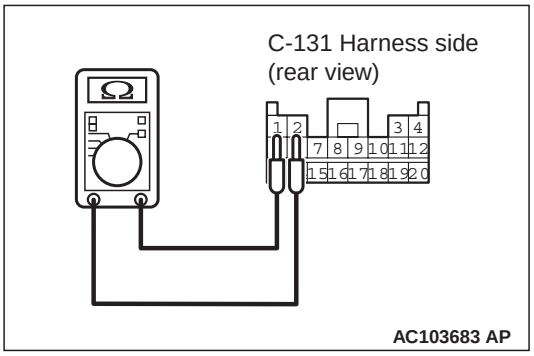
(1) Disconnect the negative battery terminal.

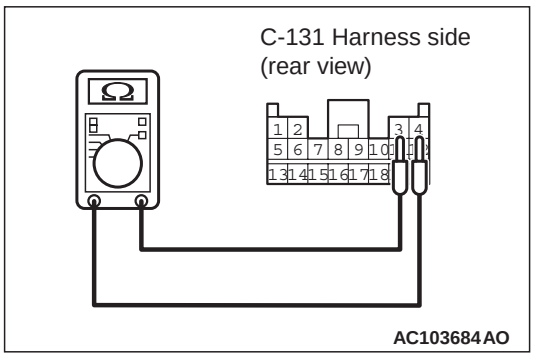


(2) Disconnect SRS-ECU connector C-131.

⚠ CAUTION

Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.



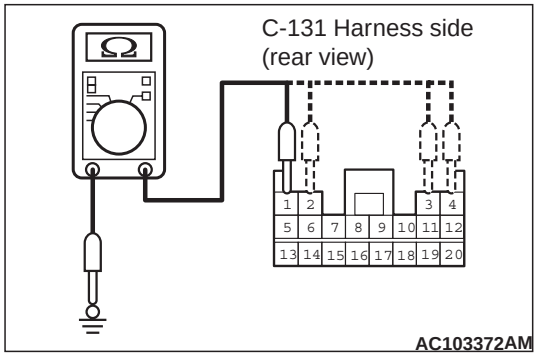


(3) Take the measurements below at harness side

connector C-131.

- Resistance between terminals 1 and 2 as well as 3 and 4.

  OK: 820 ± 82 Ω



- Continuity between terminals 1, 2, 3, 4 and body earth

  OK: Open circuit

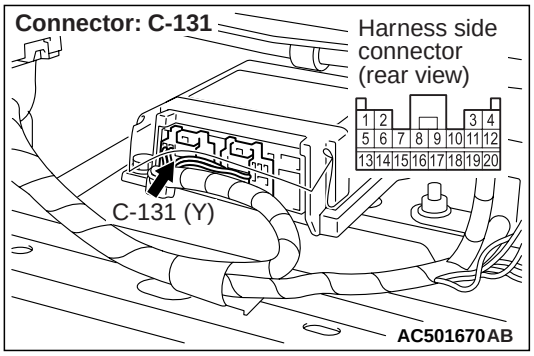
Q: Is the check result normal?

YES : Go to Step 3.

NO : Repair the harness wire between the front impact sensor (RH) connector A-124 (terminals 1 and 2) and SRS-ECU connector C-131 (terminals 1 and 2) as well as between front impact sensor (LH) connector A-30 (terminals 1 and 2) and SRS-ECU connector C-131 (terminals 4 and 3).

STEP 3. Voltage measurement at the SRS-ECU connector C-131.

(1) Disconnect the negative battery terminal.



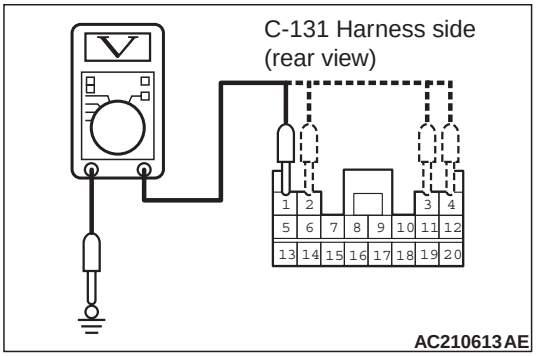
(2) Disconnect SRS-ECU connector C-131.

(3) Connect the negative battery terminal.

(4) Turn the ignition switch to the "ON" position.

⚠ CAUTION

Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.



(5) Take the measurements below at harness-side connector C-131.

- Voltage between terminals 1, 2, 3, 4 and body earth

  OK: 1 V or less

Q: Is the check result normal?

YES : Go to Step 4.

NO : Repair the harness wire between the front impact sensor (RH) connector A-124 (terminals 1 and 2) and SRS-ECU connector C-131 (terminals 1 and 2) as well as between front impact sensor (LH) connector A-30 (terminals 1 and 2) and SRS-ECU connector C-131 (terminals 4 and 3).

STEP 4. Check whether the diagnosis code is reset.

Check again if the diagnosis code is set.

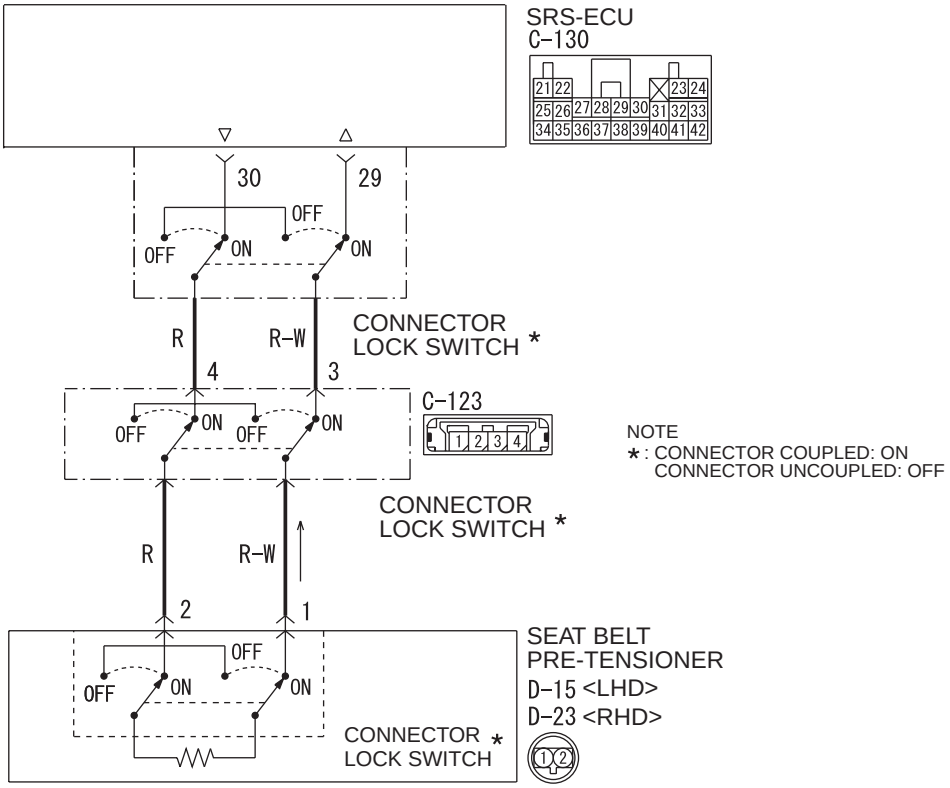
Q: Is diagnosis code B1595, B1596, B1597, B1598, B1599, B1600, B1601 or B1602 set?

YES : Replace the SRS-ECU (Refer to P.52B-266).

NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1603: Seat belt pre-tensioner (driver's side) (squib) system (short-circuited between terminals of the squib circuit)

Seat Belt Pre-tensioner (Driver's Side) (Squib)



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

AC805782 AE

OPERATION
The SRS-ECU judges how severe a collision is by detecting signals from the front impact sensors and the front air bag analogue G-sensor. If the impact is over a predetermined level, the SRS-ECU sends an ignition signal. At this time, if the front air bag safing G-sensor is on, the seat belt pre-tensioner will deploy.

DIAGNOSIS CODE SET CONDITIONS
This diagnosis code is set if one seat belt pre-tensioner (driver's side) squib wire shorted to the other.

PROBABLE CAUSES
- Improper engaged connector or defective short spring*
- Short circuit between the seat belt pre-tensioner (driver's side) (squib) circuit terminals
- Damaged connector(s)
- Malfunction of the SRS-ECU

*NOTE: *: The squib circuit connectors integrate a "short" spring (which prevents the air bag from deploying unintentionally due to static electricity by shorting the positive wire to the earth wire in the squib circuit when the connectors are disconnected). Therefore, if connector C-123, C-130, D-15 <LHD> or D-23 <RHD> is damaged or improperly engaged, the short spring may not be released when the connector is connected.*

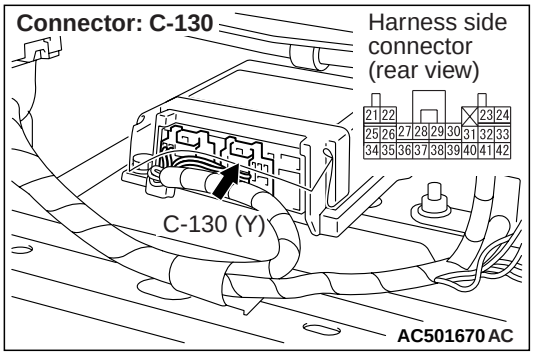
DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code.

Q: Is diagnosis code B1519 set?
YES : Go to Step 2.
NO : Go to Step 3.

STEP 2. Connector lock check: SRS-ECU connector C-130. (M.U.T.-III diagnosis code)

(1) Disconnect the negative battery terminal.



(2) Disconnect the connectors C-130 and then reconnect it.

(3) Connect the negative battery terminal.

(4) Erase the diagnosis code memory, and check the diagnosis code.

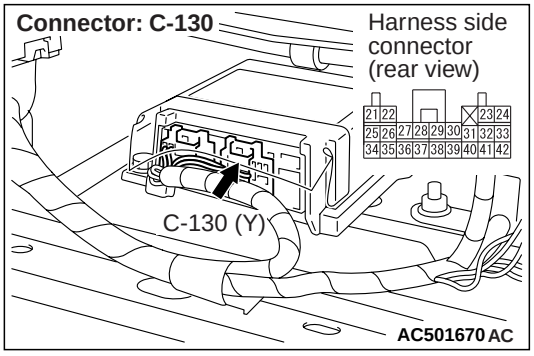
Q: Is diagnosis code B1603 set?

YES : Go to Step 3.

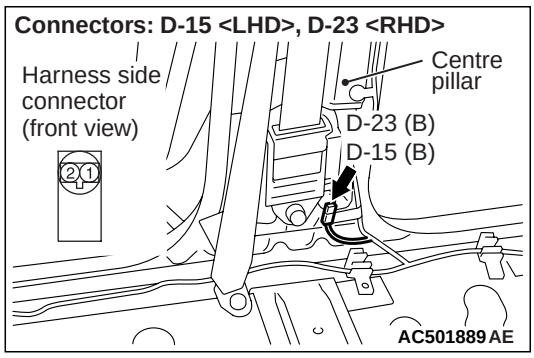
NO : The procedure is complete. It is assumed that diagnosis code B1603 set as connector C-130 was engaged improperly.

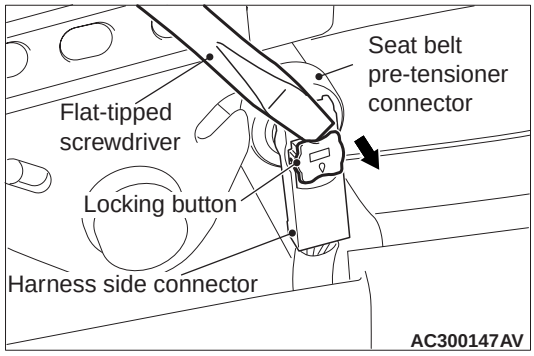
STEP 3. Connector lock check: Intermediate connector C-123, SRS-ECU connector C-130 and seat belt pre-tensioner (driver's side) connector D-15 <LHD> or D-23 <RHD>. (M.U.T.-III diagnosis code)

(1) Disconnect the negative battery terminal.



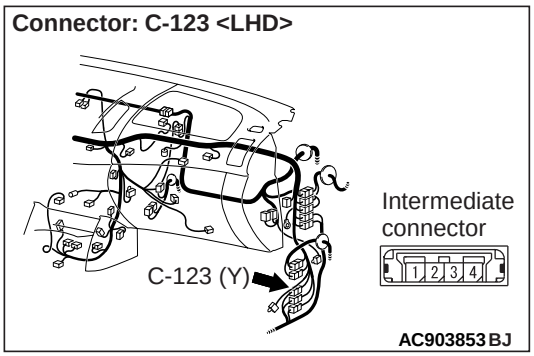
(2) Disconnect the connectors C-130 and then reconnect them.

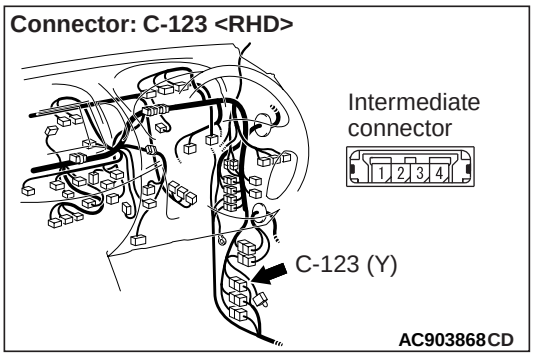


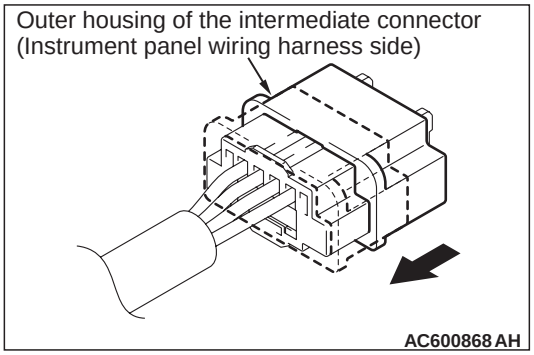


(3) Disconnect connector D-15 <LHD> or D-23 <RHD> and then reconnect them. Use a flat-tipped screwdriver to pull out the locking button at

the harness side connector.



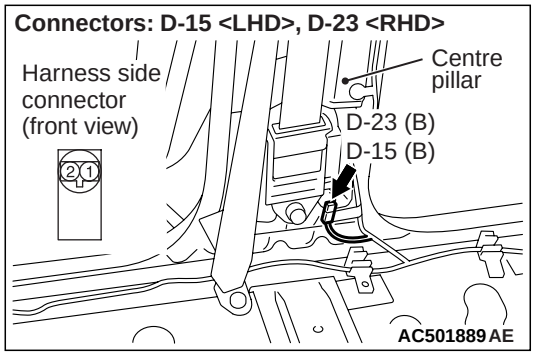


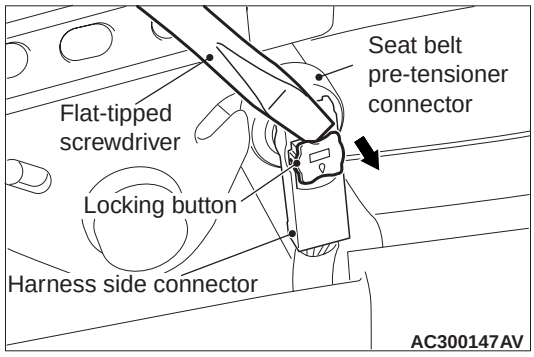


(4) Disconnect connectors C-123, and then reconnect it. Slide the outer hosing of intermediate connector (instrument panel wiring harness side) C-123 in the arrow direction shown.
(5) Connect the negative battery terminal.
(6) Erase the diagnosis code memory, and check the diagnosis code.

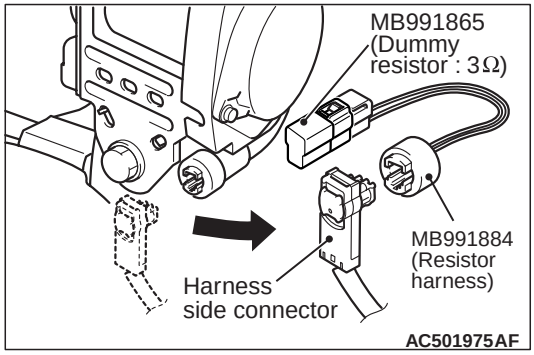
Q: Is diagnosis code B1603 set?
YES : Go to Step 4.
NO : The procedure is complete. It is assumed that diagnosis code B1603 set as connector C-123, C-130 or D-15 <LHD> or D-23 <RHD> was engaged improperly.

STEP 4. Check the diagnosis code by connecting a dummy resistor. (M.U.T.-III diagnosis code)
(1) Disconnect the negative battery terminal.





(2) Disconnect seat belt pre-tensioner (driver's side) connector D-15 <LHD> or D-23 <RHD>. Use a flat-tipped screwdriver to pull out the locking button at the harness side connector, and then disconnect the connector.

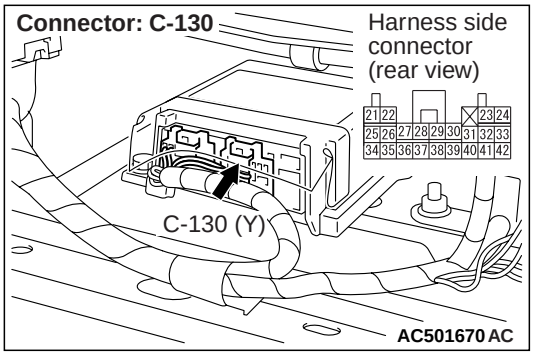


(3) Connect special tool dummy resistor (MB991865) to special tool resistor harness (MB991884).
(4) Connect special tool (MB991884) to the D-15 <LHD> or D-23 <RHD> harness side connector.
(5) Connect the negative battery terminal.
(6) Erase diagnosis code memory, and then check the diagnosis code.

Q: Is diagnosis code B1603 set?
YES : Go to Step 5.
NO : Replace the seat belt with pre-tensioner (driver's side) (Refer to P.52B-284).

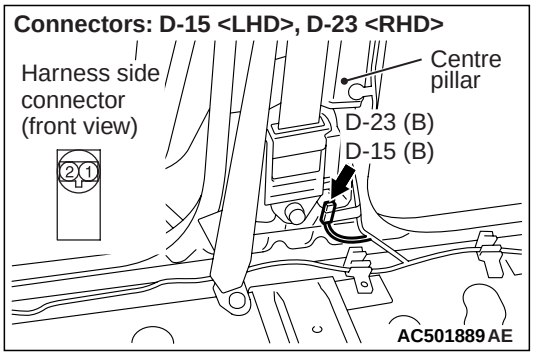
STEP 5. Resistance measurement at the SRS-ECU connector C-130.

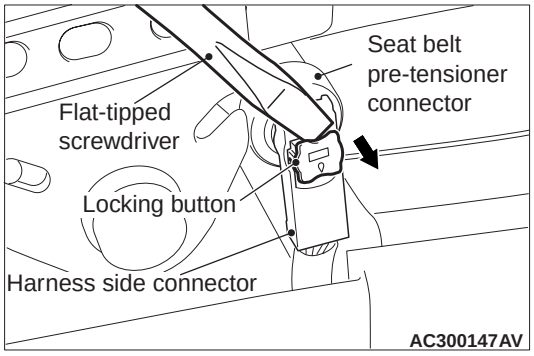
(1) Disconnect the negative battery terminal.



(2) Disconnect SRS-ECU connector C-130.

⚠ *DANGER*

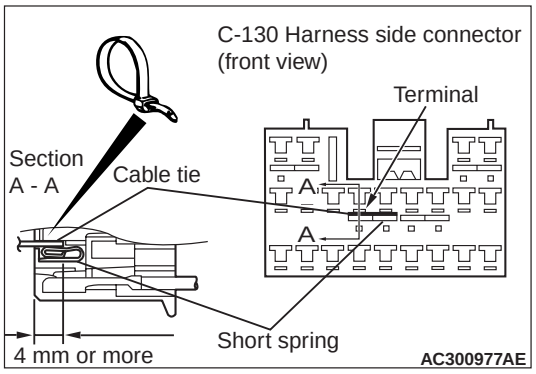




To prevents the seat belt pre-tensioner from operating unintentionally, disconnect the seat belt pre-tensioner (driver's side) connector D-15 <LHD> or D-23 <RHD> to short the squib circuit.

(3) Disconnect seat belt pre-tensioner (driver's side) connector D-15 <LHD> or D-23 <RHD>. Use a flat-tipped screwdriver to pull out the locking button at the harness side connector, and then disconnect the connector.

⚠ CAUTION

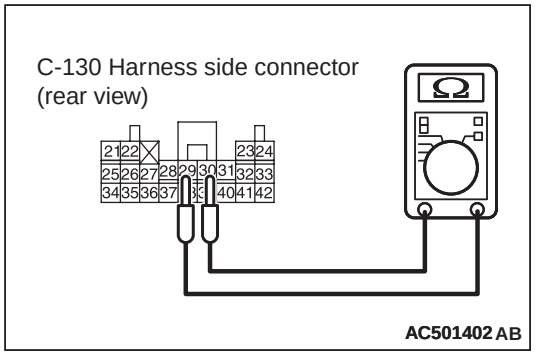


Insert an insulator such as a cable tie to a depth of 4mm or more, otherwise the short spring will not be released.

(4) Insert a cable tie [3 mm wide, 0.5 mm thick] between terminals 29, 30 and the short spring to release the short spring.

⚠ CAUTION

Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.



(5) Resistance measurement between C-130 harness side connector terminals 29 and 30

OK: Open circuit

Q: Is the check result normal?

YES : Go to Step 6.

NO : Repair the harness wires between SRS-ECU connector C-130 (terminal No.29 and 30) and the seat belt pre-tensioner (driver's side) connector D-15 <LHD> or D-23 <RHD> (terminal No.1 and 2)

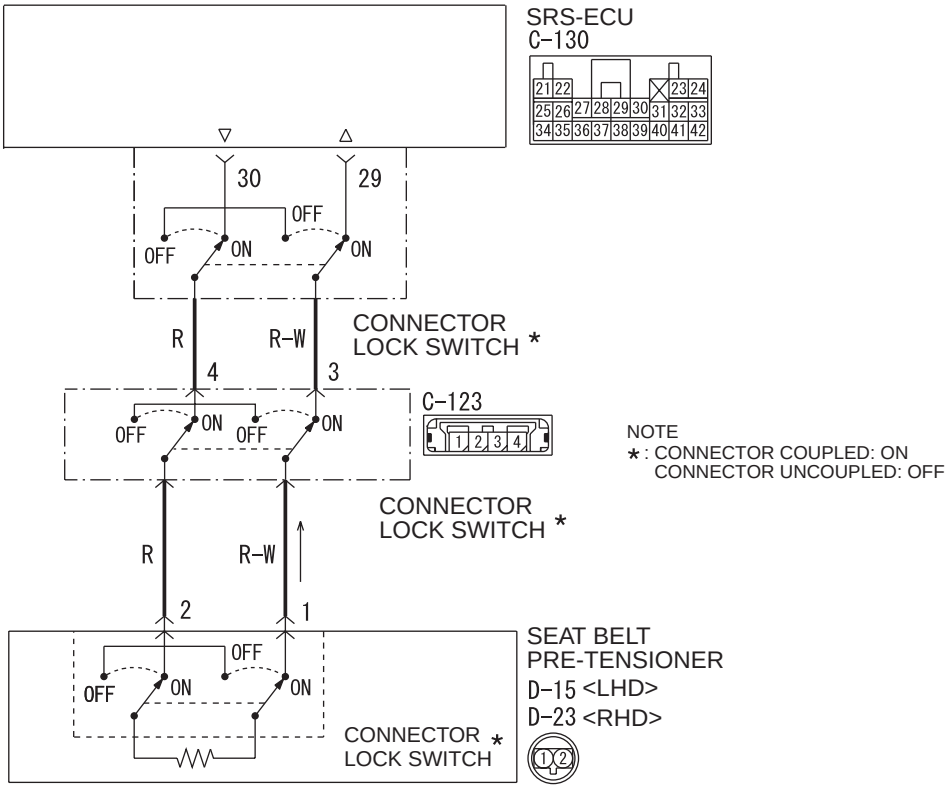
STEP 6. Check whether the diagnosis code is reset.

Q: Is diagnosis code B1603 set?

YES : Replace the SRS-ECU (Refer to P.52B-266).
NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1604: Seat belt pre-tensioner (driver's side) (squib) system (open-circuited in the squib circuit)

Seat Belt Pre-tensioner (Driver's Side) (Squib)



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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OPERATION
The SRS-ECU judges how severe a collision is by detecting signals from the front impact sensors and the front air bag analogue G-sensor. If the impact is over a predetermined level, the SRS-ECU sends an ignition signal. At this time, if the front air bag safing G-sensor is on, the seat belt pre-tensioner will deploy.

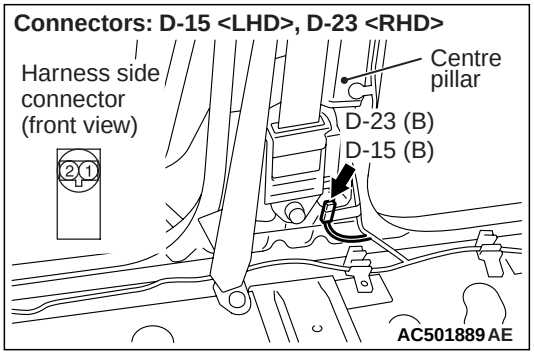
DIAGNOSIS CODE SET CONDITIONS
This diagnosis code is set if seat belt pre-tensioner (driver's side) squib wire(s) are open-circuited.

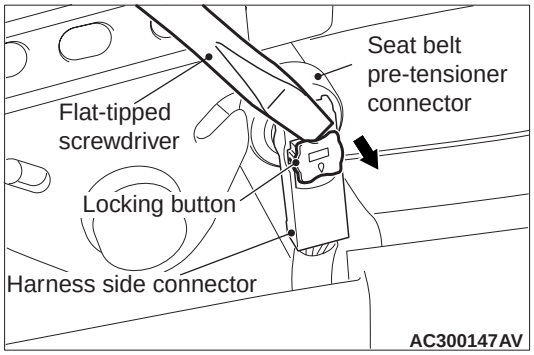
PROBABLE CAUSES
- Improper connector contact
- Open circuit in the seat belt pre-tensioner (driver's side) (squib) circuit
- Malfunction of the SRS-ECU

DIAGNOSIS PROCEDURE

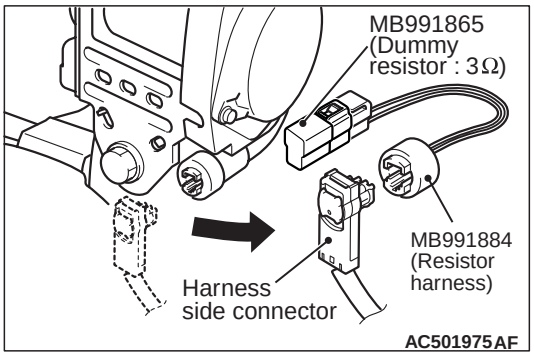
STEP 1. Check the diagnosis code by connecting a dummy resistor. (M.U.T.-III diagnosis code)

(1) Disconnect the negative battery terminal.





(2) Disconnect seat belt pre-tensioner (driver's side) connector D-15 <LHD> or D-23 <RHD>. Use a flat-tipped screwdriver to pull out the locking button at the harness side connector, and then disconnect the connector.



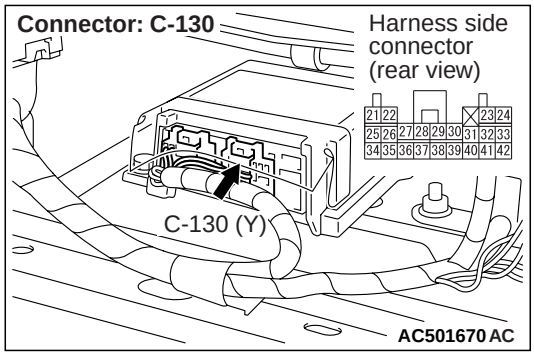
(3) Connect special tool dummy resistor (MB991865) to special tool resistor harness (MB991884).
(4) Connect special tool (MB991884) to the D-15 <LHD> or D-23 <RHD> harness side connector.
(5) Connect the negative battery terminal.
(6) Erase diagnosis code memory, and then check the diagnosis code.

Q: Is diagnosis code B1604 set?

YES : Go to Step 2.
NO : Replace the seat belt with pre-tensioner (driver's side) (Refer to P.52B-284).

STEP 2. Resistance measurement between SRS-ECU connector C-130 (terminal No.29 and 30) and the seat belt pre-tensioner (driver's side) connector D-15 <LHD> or D-23 <RHD> (terminal No.2 and 1).

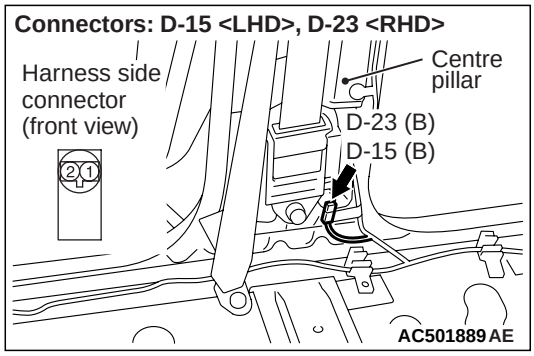
(1) Disconnect the negative battery terminal.

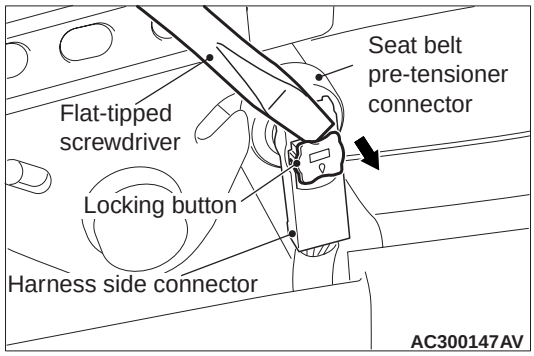


(2) Disconnect SRS-ECU connector C-130.

⚠ DANGER

To prevents the seat belt pre-tensioner from operating unintentionally, disconnect the seat belt pre-tensioner (driver's side) connector D-15 <LHD> or D-23 <RHD> to short the squib circuit.

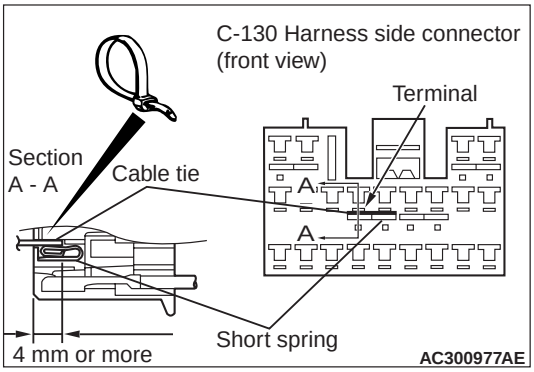




(3) Disconnect seat belt pre-tensioner (driver's side) connector D-15 <LHD> or D-23 <RHD>. Use a flat-tipped screwdriver to pull out the locking button at the harness side connector, and then

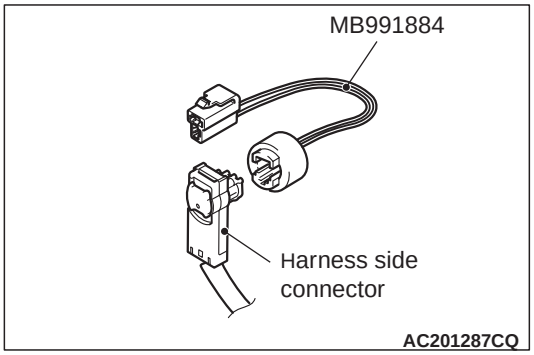
disconnect the connector.

⚠ CAUTION

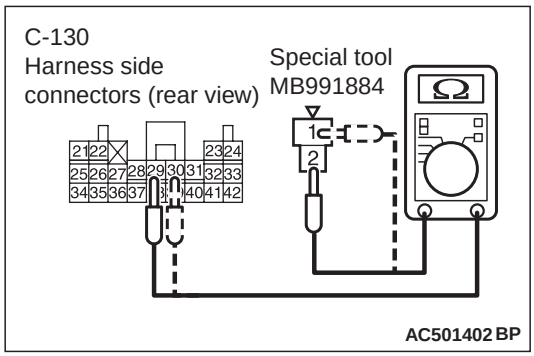


Insert an insulator such as a cable tie to a depth of 4mm or more, otherwise the short spring will not be released.

(4) Insert a cable tie [3 mm wide, 0.5 mm thick] between terminals 29, 30 and the short spring to release the short spring.



(5) Connect D-15 <LHD> or D-23 <RHD> harness side connector to special tool resistor harness (MB991884).



⚠ CAUTION

Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(6) Resistance measurement between the following terminals.
- SRS-ECU connector C-130 terminal No.29 and special tool terminal No.2
- SRS-ECU connector C-130 terminal No.30 and special tool terminal No.1

OK: Continuity (Less than 2 Ω)

Q: Are the check results normal?

YES : Go to Step 3.

NO : Repair the harness wires between SRS-ECU connector C-130 (terminal No.29 and 30) and the seat belt pre-tensioner (driver's side) connector D-15 <LHD> or D-23 <RHD> (terminal No.1 and 2)

STEP 3. Check whether the diagnosis code is reset.

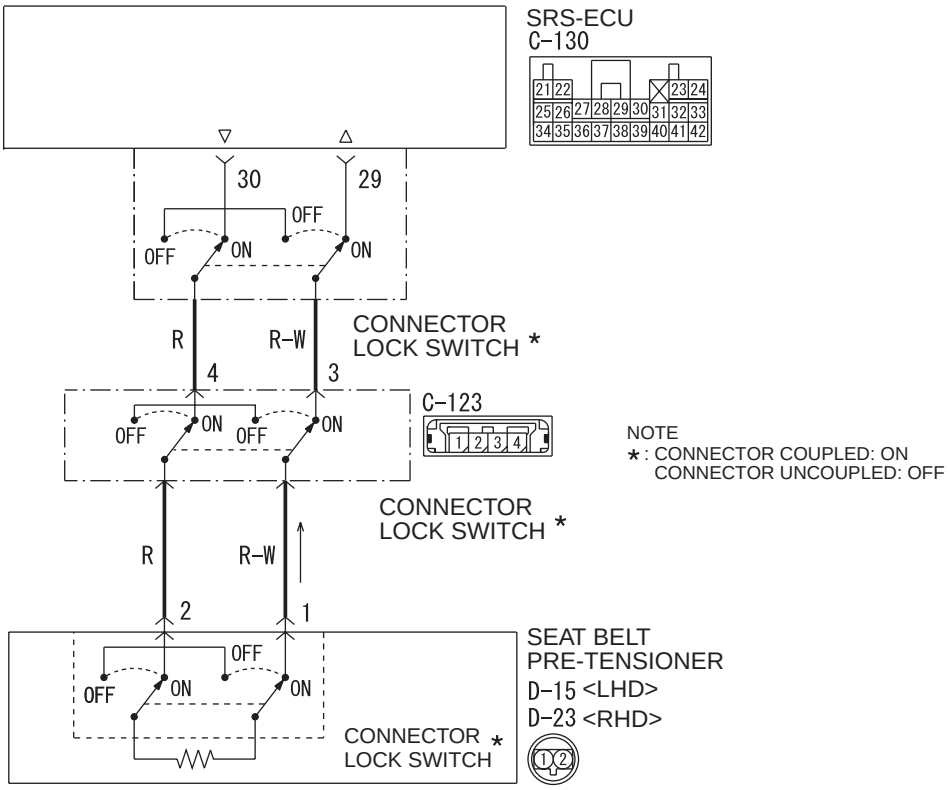
Q: Is diagnosis code No.B1604 set?

YES : Replace the SRS-ECU (Refer to P.52B-266).

NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1605: Seat belt pre-tensioner (driver's side) (squib) system (short-circuited to the earth)

Seat Belt Pre-tensioner (Driver's Side) (Squib)



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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OPERATION

The SRS-ECU judges how severe a collision is by detecting signals from the front impact sensors and the front air bag analogue G-sensor. If the impact is over a predetermined level, the SRS-ECU sends an ignition signal. At this time, if the front air bag safing G-sensor is on, the seat belt pre-tensioner will deploy.

DIAGNOSIS CODE SET CONDITIONS

This diagnosis code is set if the seat belt pre-tensioner (driver's side) wire(s) are short-circuited to the earth.

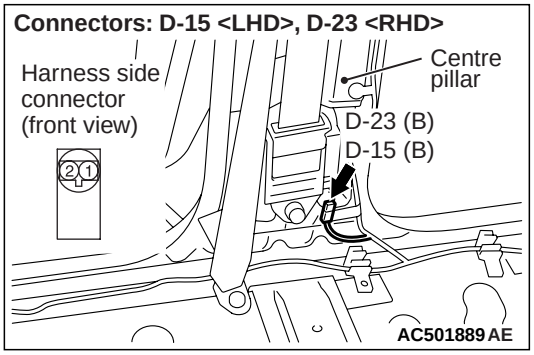
PROBABLE CAUSES

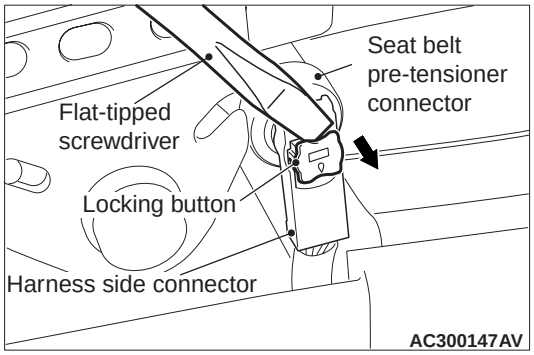
- Damaged wiring harnesses or connectors
- Short to the earth in the seat belt pre-tensioner (driver's side) (squib) harness
- Malfunction of the SRS-ECU

DIAGNOSIS PROCEDURE

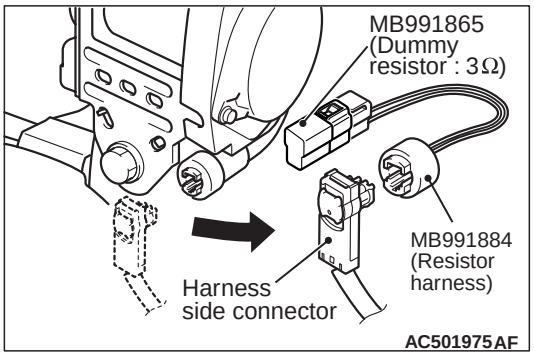
STEP 1. Check the diagnosis code by connecting a dummy resistor. (M.U.T.-III diagnosis code)

(1) Disconnect the negative battery terminal.





(2) Disconnect seat belt pre-tensioner (driver's side) connector D-15 <LHD> or D-23 <RHD>. Use a flat-tipped screwdriver to pull out the locking button at the harness side connector, and then disconnect the connector.



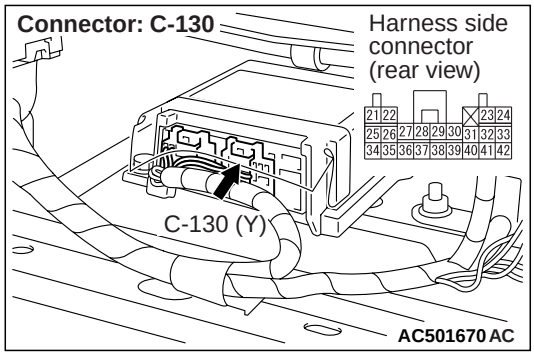
(3) Connect special tool dummy resistor (MB991865) to special tool resistor harness (MB991884).
(4) Connect special tool (MB991884) to the D-15 <LHD> or D-23 <RHD> harness side connector.
(5) Connect the negative battery terminal.
(6) Erase diagnosis code memory, and check the diagnosis code.

Q: Is diagnosis code B1605 set?

YES : Go to Step 2.
NO : Replace the seat belt with pre-tensioner (driver's side) (Refer to P.52B-284).

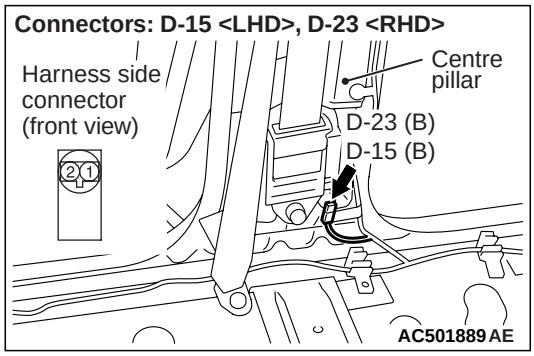
STEP 2. Resistance measurement at the SRS-ECU connector C-130.

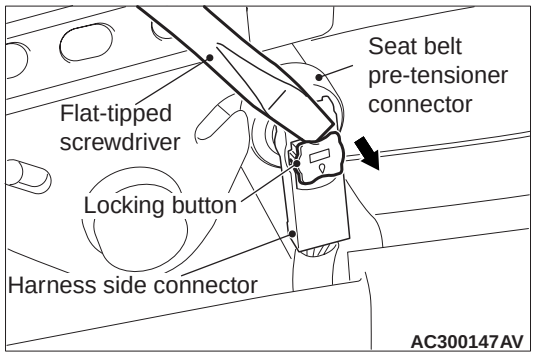
(1) Disconnect the negative battery terminal.



(2) Disconnect SRS-ECU connector C-130.

⚠ DANGER



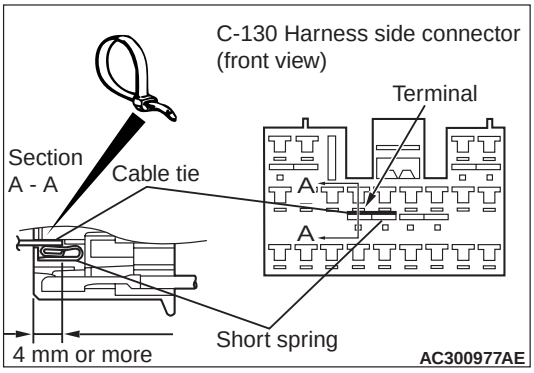


To prevents the seat belt pre-tensioner from operating unintentionally, disconnect the seat belt pre-tensioner (driver's side) connector D-15 <LHD> or D-23 <RHD> to short the squib circuit.

(3) Disconnect seat belt pre-tensioner (driver's side) connector D-15 <LHD> or D-23 <RHD>. Use a flat-tipped screwdriver to pull out the locking button at the harness side connector, and then

disconnect the connector.

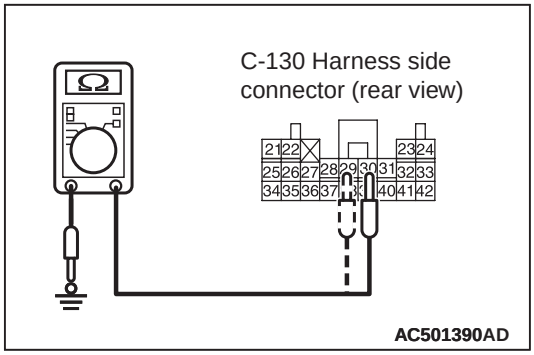
⚠ CAUTION



Insert an insulator such as a cable tie to a depth of 4mm or more, otherwise the short spring will not be released.

(4) Insert a cable tie [3 mm wide, 0.5 mm thick] between terminals 29, 30 and the short spring to release the short spring.

⚠ CAUTION



Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(5) Resistance measurement between C-130 harness side connector terminals 29, 30 and body earth.

OK: Open circuit

Q: Is the check result normal?

YES : Go to Step 3.

NO : Repair the harness wire between SRS-ECU connector C-130 (terminal No.29 and 30) and the seat belt pre-tensioner (driver's side) connector D-15 <LHD> or D-23 <RHD> (terminal No.1 and 2)

STEP 3. Check whether the diagnosis code is reset.

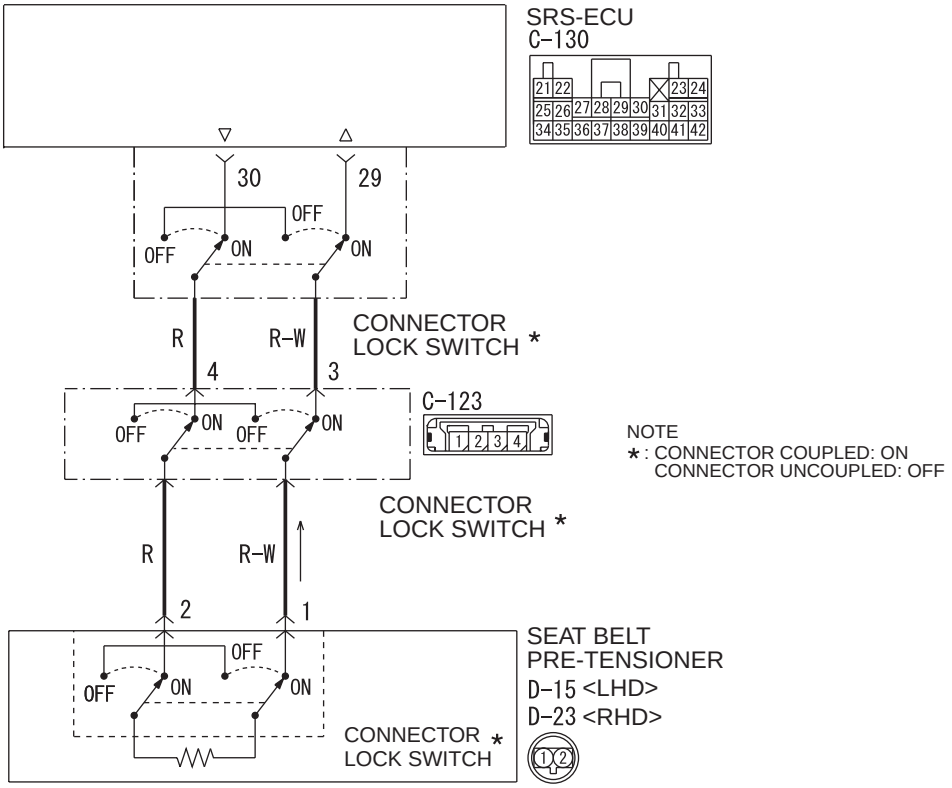
Q: Is diagnosis code B1605 set?

YES : Replace the SRS-ECU (Refer to P.52B-266).

NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1606: Seat belt pre-tensioner (driver's side) (squib) system (short-circuited to the power supply)

Seat Belt Pre-tensioner (Driver's Side) (Squib)



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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OPERATION

The SRS-ECU judges how severe a collision is by detecting signals from the front impact sensors and the front air bag analogue G-sensor. If the impact is over a predetermined level, the SRS-ECU sends an ignition signal. At this time, if the front air bag safing G-sensor is on, the seat belt pre-tensioner will deploy.

DIAGNOSIS CODE SET CONDITIONS

This diagnosis code is set if the seat belt pre-tensioner (driver's side) wire(s) are short-circuited to the power supply.

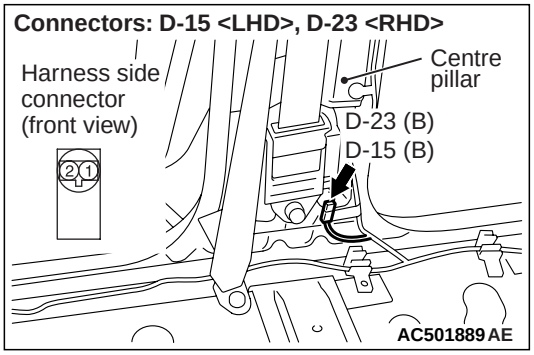
PROBABLE CAUSES

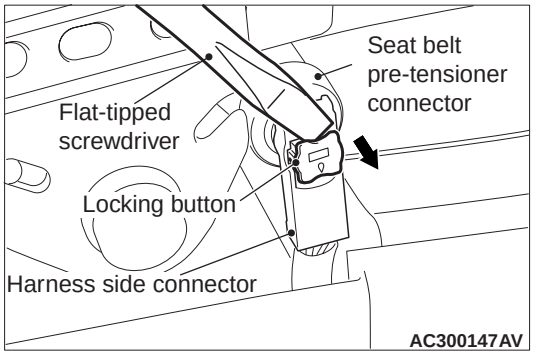
- Damaged wiring harnesses or connectors
- Short to the power supply in the seat belt pre-tensioner (driver's side) (squib) harness
- Malfunction of the SRS-ECU

DIAGNOSIS PROCEDURE

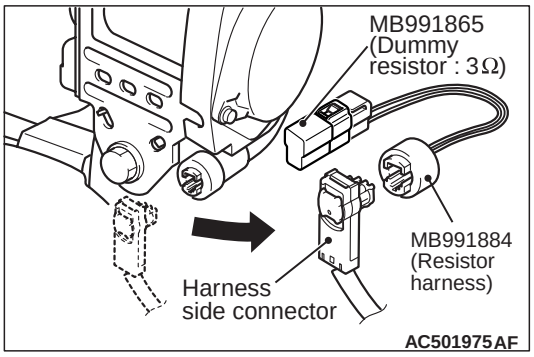
STEP 1. Check the diagnosis code by connecting a dummy resistor. (M.U.T.-III diagnosis code)

(1) Disconnect the negative battery terminal.





(2) Disconnect seat belt pre-tensioner (driver's side) connector D-15 <LHD> or D-23 <RHD>. Use a flat-tipped screwdriver to pull out the locking button at the harness side connector, and then disconnect the connector.



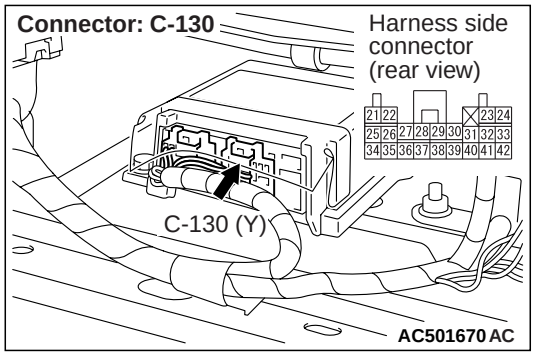
(3) Connect special tool dummy resistor (MB991865) to special tool resistor harness (MB991884).
(4) Connect special tool (MB991884) to the D-15 <LHD> or D-23 <RHD> harness side connector.
(5) Connect the negative battery terminal.
(6) Erase diagnosis code memory, and check the diagnosis code.

Q: Is diagnosis code B1606 set?

YES : Go to Step 2.
NO : Replace the seat belt with pre-tensioner (driver's side) (Refer to P.52B-284).

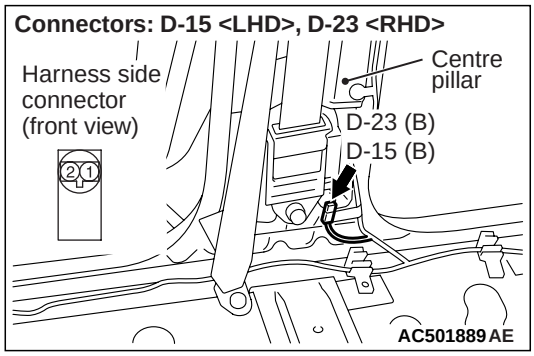
STEP 2. Voltage measurement at the SRS-ECU connector C-130.

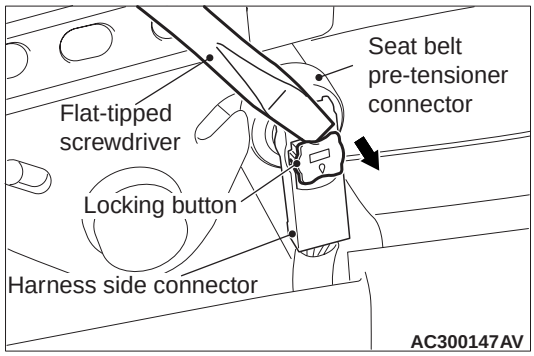
(1) Disconnect the negative battery terminal.



(2) Disconnect SRS-ECU connector C-130.

⚠ DANGER



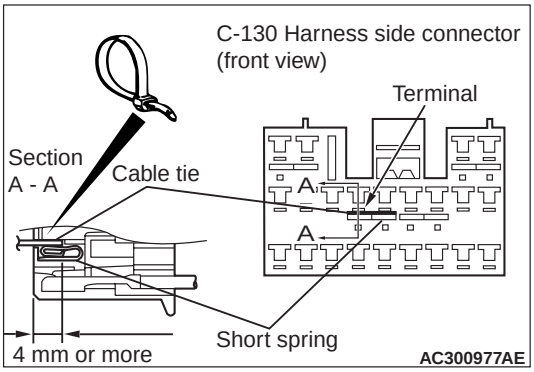


To prevents the seat belt pre-tensioner from operating unintentionally, disconnect the seat belt pre-tensioner (driver's side) connector D-15 <LHD> or D-23 <RHD> to short the squib circuit.

(3) Disconnect seat belt pre-tensioner (driver's side) connector D-15 <LHD> or D-23 <RHD>. Use a flat-tipped screwdriver to pull out the locking button at the harness side connector, and then

disconnect the connector.

⚠ CAUTION



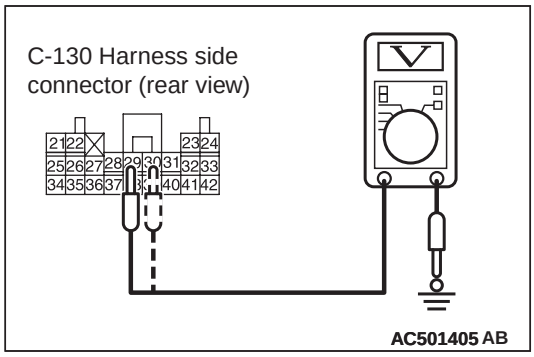
Insert an insulator such as a cable tie to a depth of 4mm or more, otherwise the short spring will not be released.

(4) Insert a cable tie [3 mm wide, 0.5 mm thick] between terminals 29, 30 and the short spring to release the short spring.

(5) Connect the negative battery terminal.

(6) Turn the ignition switch to the "ON" position.

⚠ CAUTION



Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(7) Voltage measurement between C-130 harness side connector terminals 29, 30 and body earth.

OK: 1 V or less

Q: Is the measured voltage within the specified range?

YES : Go to Step 3 .

NO : Repair the harness wire between SRS-ECU connector C-130 (terminal No.29 and 30) and the seat belt pre-tensioner (driver's side) connector D-15 <LHD> or D-23 <RHD> (terminal No.1 and 2)

STEP 3. Check whether the diagnosis code is reset.

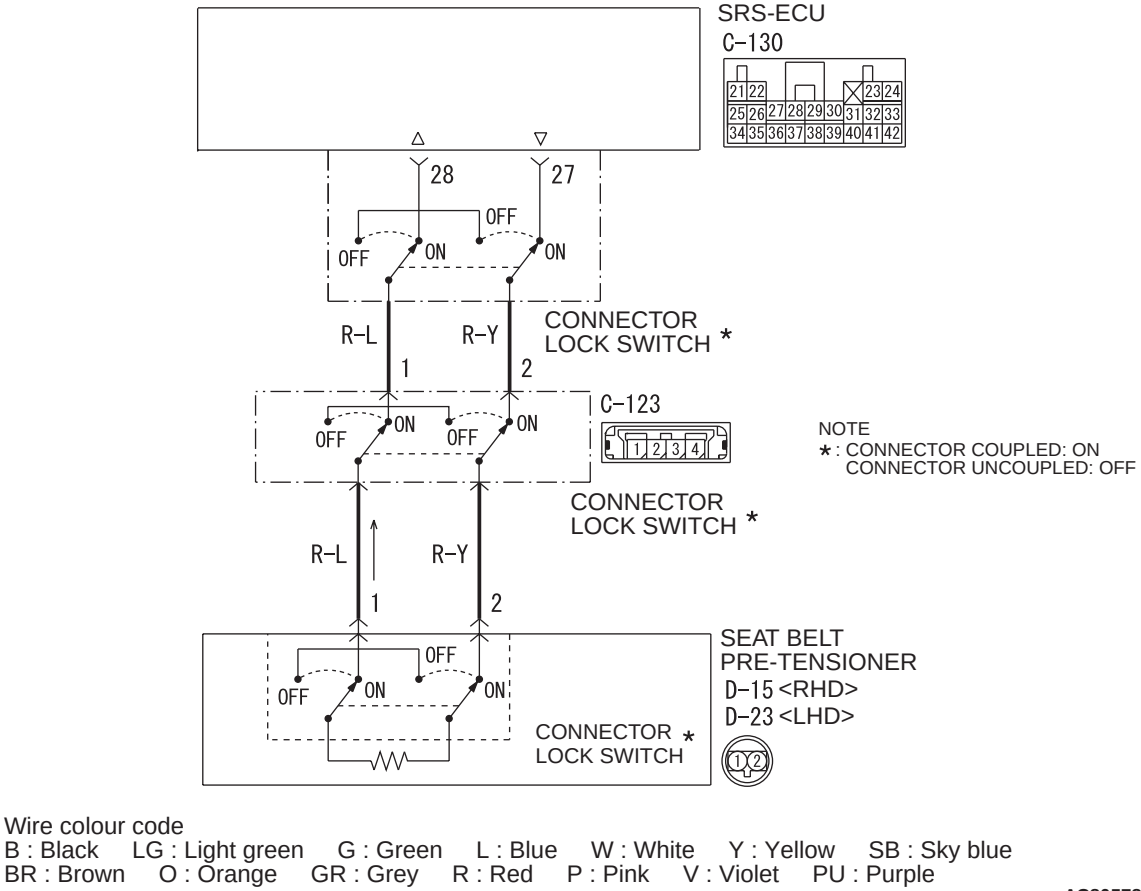
Q: Is diagnosis code B1606 set?

YES : Replace the SRS-ECU (Refer to P.52B-266).

NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1609: Seat belt pre-tensioner (passenger's side) (squib) system (short-circuit between terminals of the squib circuit)

Seat Belt Pre-tensioner (Passenger's Side) (Squib)



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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OPERATION

The SRS-ECU judges how severe a collision is by detecting signals from the front impact sensors and the front air bag analogue G-sensor. If the impact is over a predetermined level, the SRS-ECU sends an ignition signal. At this time, if the front air bag safing G-sensor is on, the seat belt pre-tensioner will deploy.

DIAGNOSIS CODE SET CONDITIONS

This diagnosis code is set if one seat belt pre-tensioner (passenger's side) squib wire shorted to the other.

PROBABLE CAUSES

- Improper engaged connector or defective short spring*
- Short circuit between the seat belt pre-tensioner (passenger's side) (squib) circuit terminals
- Damaged connector(s)
- Malfunction of the SRS-ECU

*NOTE: *: The squib circuit connectors integrate a "short" spring (which prevents the air bag from deploying unintentionally due to static electricity by shorting the positive wire to the earth wire in the squib circuit when the connectors are disconnected). Therefore, if connector C-123, C-130 or D-23 <LHD> or D-15 <RHD> is damaged or improperly engaged, the short spring may not be released when the connector is connected.*

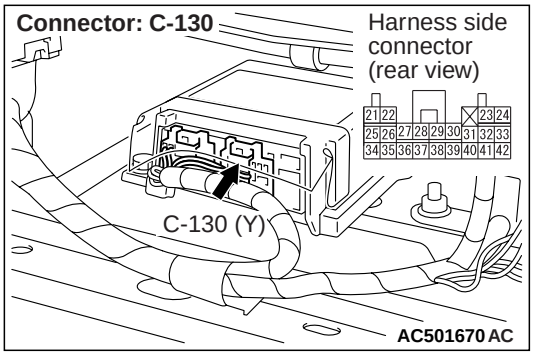
DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code.

Q: Is diagnosis code B1519 set?
YES : Go to Step 2.
NO : Go to Step 3.

STEP 2. Connector lock check: SRS-ECU connector C-130. (M.U.T.-III diagnosis code)

(1) Disconnect the negative battery terminal.

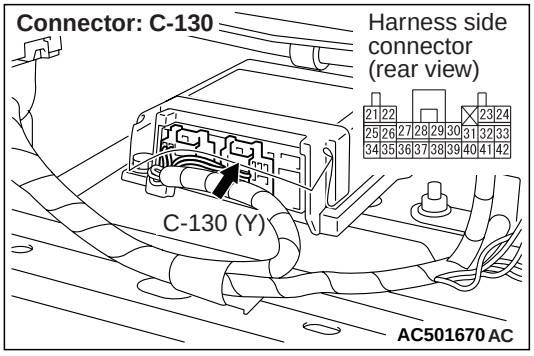


(2) Disconnect the connectors C-130 and then reconnect them.
(3) Connect the negative battery terminal.
(4) Erase the diagnosis code memory, and check the diagnosis code.

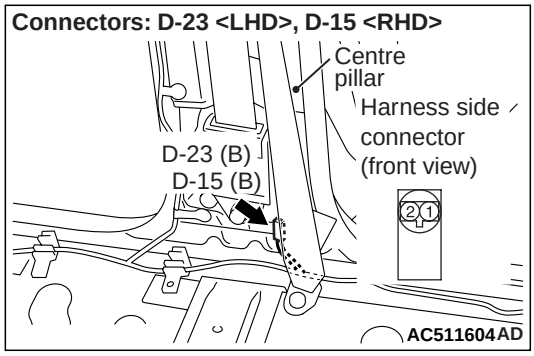
Q: Is diagnosis code B1609 set?
YES : Go to Step 3.
NO : The procedure is complete. It is assumed that diagnosis code B1609 set as connector C-130 was engaged improperly.

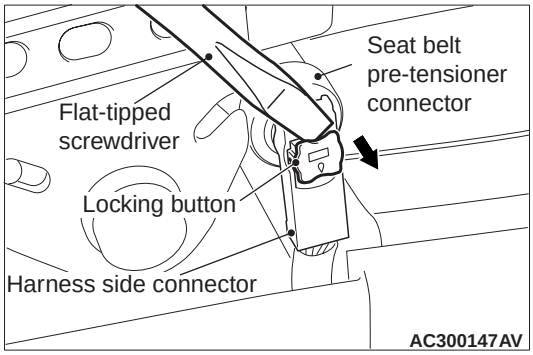
STEP 3. Connector lock check: Intermediate connector C-123, SRS-ECU connector C-130 and seat belt pre-tensioner (passenger's side) connector D-23 <LHD> or D-15 <RHD>. (M.U.T.-III diagnosis code)

(1) Disconnect the negative battery terminal.



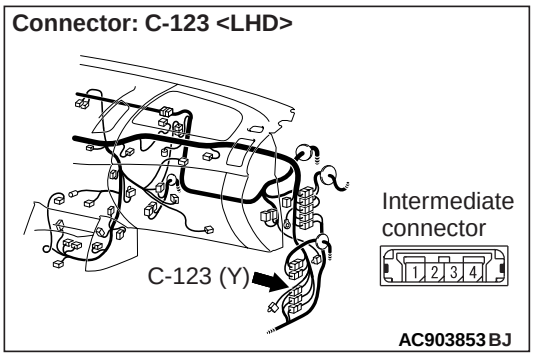
(2) Disconnect the connectors C-130 and then reconnect them.

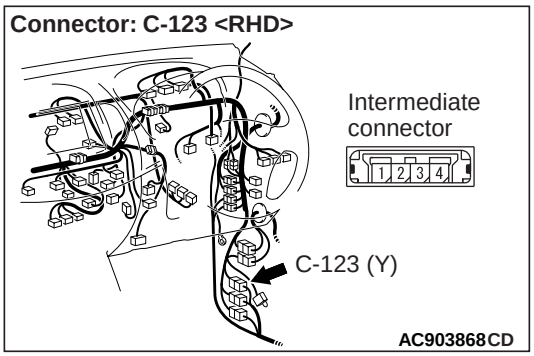


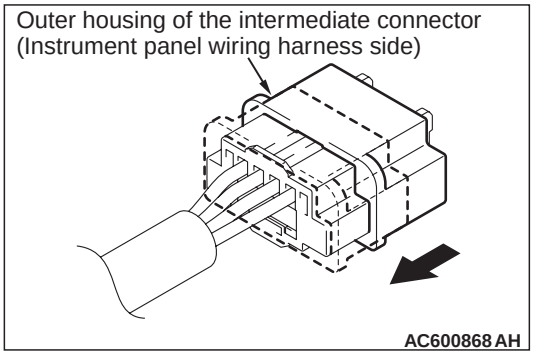


(3) Disconnect connector D-23 <LHD> or D-15 <RHD> and then reconnect them. Use a flat-tipped screwdriver to pull out the locking button at

the harness side connector.





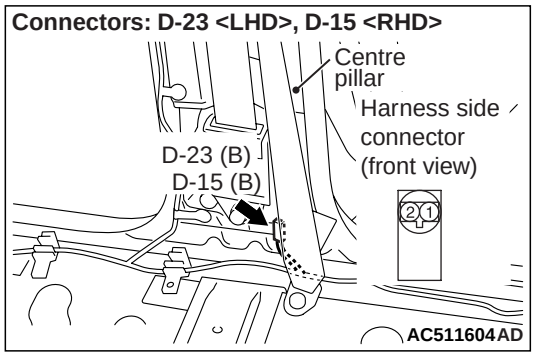


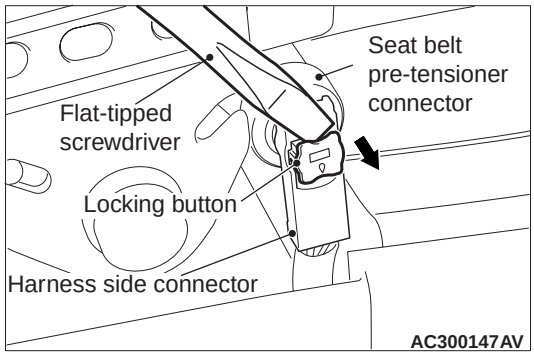
(4) Disconnect connectors C-123, and then reconnect it. Slide the outer hosing of intermediate connector (instrument panel wiring harness side) C-123 in the arrow direction shown.
(5) Connect the negative battery terminal.
(6) Erase the diagnosis code memory, and check the diagnosis code.

Q: Is diagnosis code B1609 set?
YES : Go to Step 4.
NO : The procedure is complete. It is assumed that diagnosis code B1609 set as connector C-123, C-130 or D-23 <LHD> or D-15 <RHD> was engaged improperly.

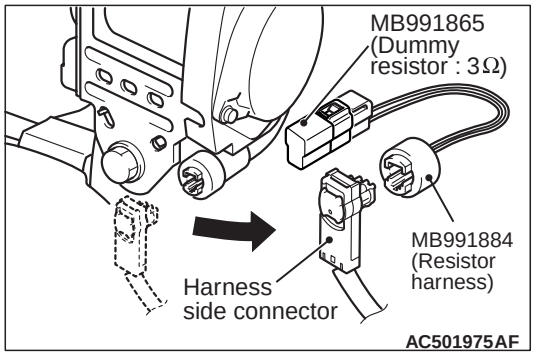
STEP 4. Check the diagnosis code by connecting a dummy resistor. (M.U.T.-III diagnosis code)

(1) Disconnect the negative battery terminal.





(2) Disconnect seat belt pre-tensioner (passenger's side) connector D-23 <LHD> or D-15 <RHD>. Use a flat-tipped screwdriver to pull out the locking button at the harness side connector, and then disconnect the connector.

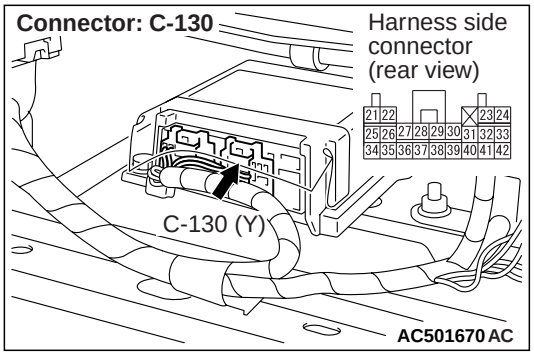


(3) Connect special tool dummy resistor (MB991865) to special tool resistor harness (MB991884).
(4) Connect special tool (MB991884) to the D-23 <LHD> or D-15 <RHD> harness side connector.
(5) Connect the negative battery terminal.
(6) Erase diagnosis code memory, and then check the diagnosis code.

Q: Is diagnosis code B1609 set?
YES : Go to Step 5.
NO : Replace the seat belt with pre-tensioner (passenger's side) (Refer to P.52B-284).

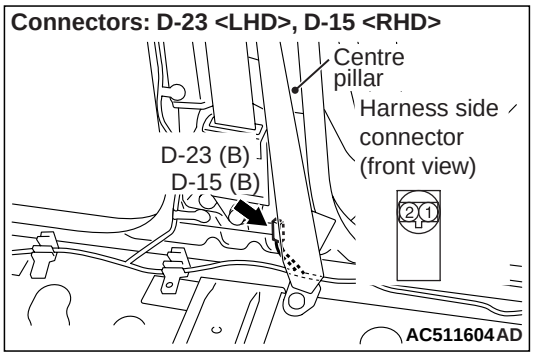
STEP 5. Resistance measurement at the SRS-ECU connector C-130.

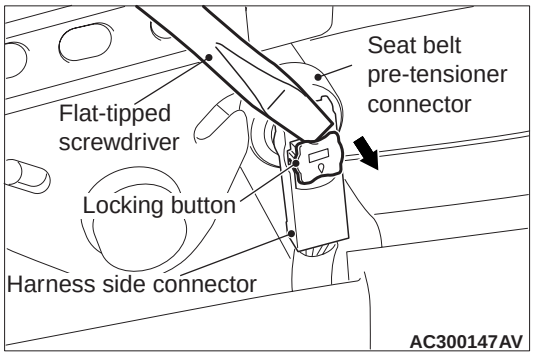
(1) Disconnect the negative battery terminal.



(2) Disconnect SRS-ECU connector C-130.

⚠ *DANGER*

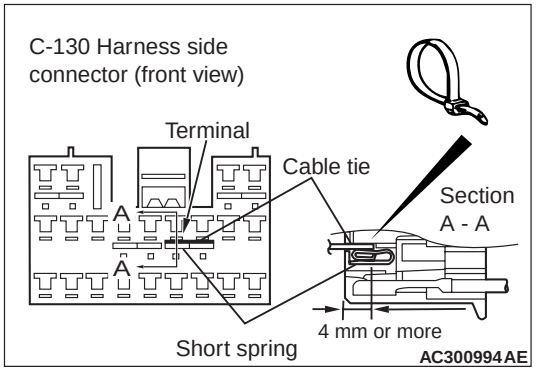




To prevents the seat belt pre-tensioner from deploying unintentionally, disconnect the seat belt pre-tensioner (passenger's side) connector D-23 <LHD> or D-15 <RHD> to short the squib circuit.

(3) Disconnect seat belt pre-tensioner (passenger's side) connector D-23 <LHD> or D-15 <RHD>. Use a flat-tipped screwdriver to pull out the locking button at the harness side connector, and then disconnect the connector.

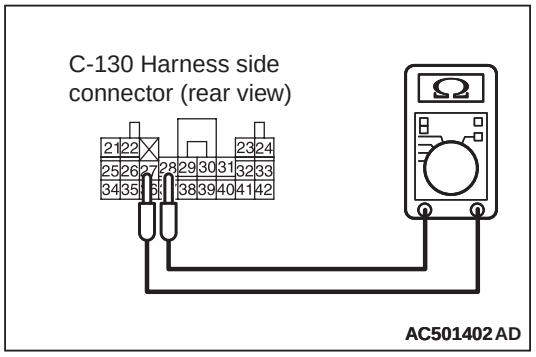
⚠ CAUTION



Insert an insulator such as a cable tie to a depth of 4 mm or more, otherwise the short spring will not be released.

(4) Insert a cable tie [3 mm wide, 0.5 mm thick] between terminals 27, 28 and the short spring to release the short spring.

⚠ CAUTION



Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(5) Resistance measurement between C-130 harness side connector terminals 27 and 28.

OK: Open circuit.

Q: Is the check result normal?

YES : Go to Step 6 .

NO : Repair the harness wires between SRS-ECU connector C-130 (terminal No.27 and 28) and the seat belt pre-tensioner (passenger's side) connector D-23 <LHD> or D-15 <RHD> (terminal No.2 and 1)

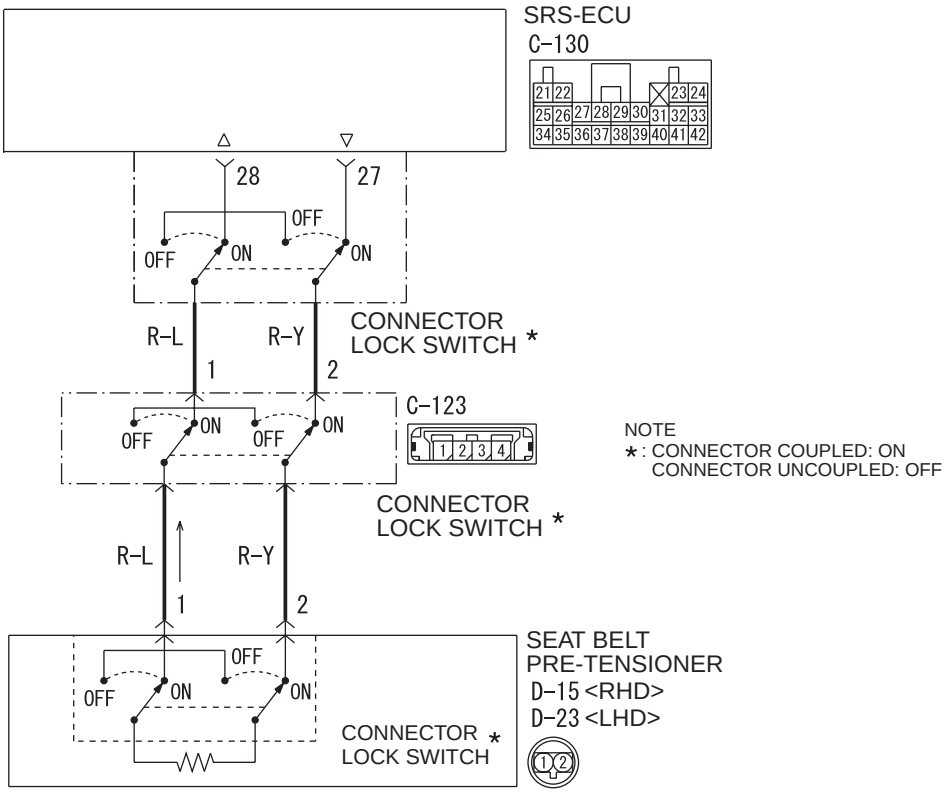
STEP 6. Check whether the diagnosis code is reset.

Q: Is diagnosis code B1609 set?

YES : Replace the SRS-ECU (Refer to P.52B-266).
NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1610: Seat belt pre-tensioner (passenger's side) (squib) system (open-circuited in the squib circuit)

Seat Belt Pre-tensioner (Passenger's Side) (Squib)



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

AC805785AE

OPERATION
The SRS-ECU judges how severe a collision is by detecting signals from the front impact sensors and the front air bag analogue G-sensor. If the impact is over a predetermined level, the SRS-ECU sends an ignition signal. At this time, if the front air bag safing G-sensor is on, the seat belt pre-tensioner will deploy.

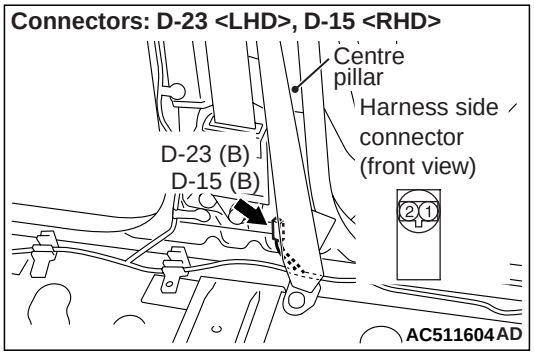
DIAGNOSIS CODE SET CONDITIONS
This diagnosis code is set if the seat belt pre-tensioner (passenger's side) squib wire(s) are open-circuited.

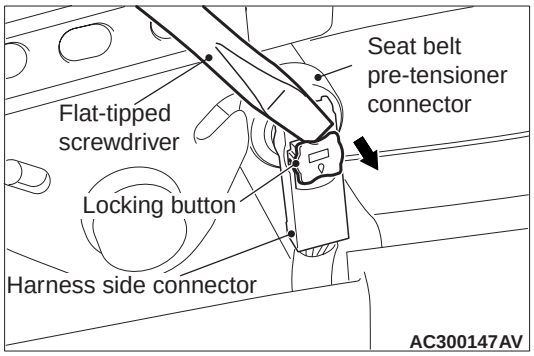
PROBABLE CAUSES
- Open circuit in the seat belt pre-tensioner (passenger's side) (squib) circuit
- Improper connector contact
- Malfunction of the SRS-ECU

DIAGNOSIS PROCEDURE

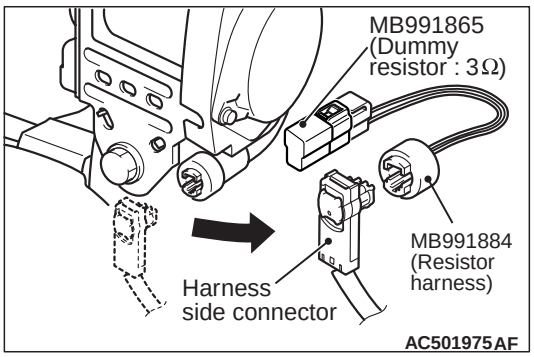
STEP 1. Check the diagnosis code by connecting a dummy resistor. (M.U.T.-III diagnosis code)

(1) Disconnect the negative battery terminal.





(2) Disconnect seat belt pre-tensioner (passenger's side) connector D-23 <LHD> or D-15 <RHD>. Use a flat-tipped screwdriver to pull out the locking button at the harness side connector, and then disconnect the connector.



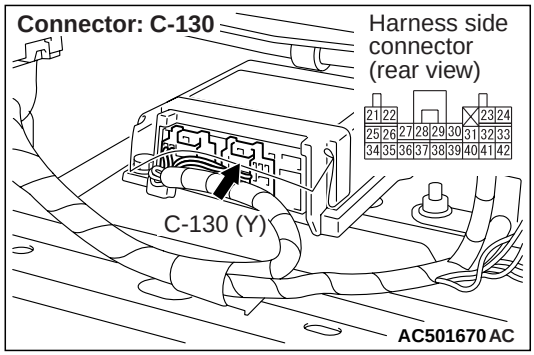
(3) Connect special tool dummy resistor (MB991865) to special tool resistor harness (MB991884).
(4) Connect special tool (MB991884) to the D-23 <LHD> or D-15 <RHD> harness side connector.
(5) Connect the negative battery terminal.
(6) Erase diagnosis code memory, and then check the diagnosis code.

Q: Is diagnosis code B1610 set?

YES : Go to Step 2.
NO : Replace the seat belt with pre-tensioner (passenger's side) (Refer to P.52B-284).

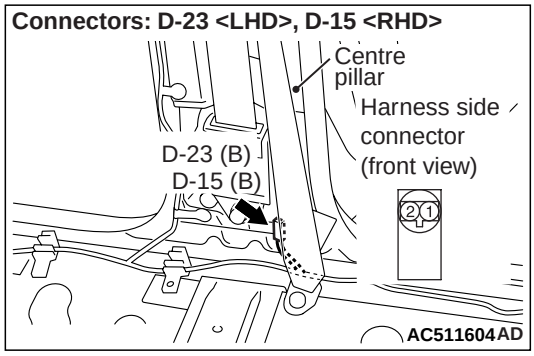
STEP 2. Resistance measurement between SRS-ECU connector C-130 (terminal No.27 and 28) and the seat belt pre-tensioner (passenger's side) connector D-23 <LHD> or D-15 <RHD> (terminal No.2 and 1)

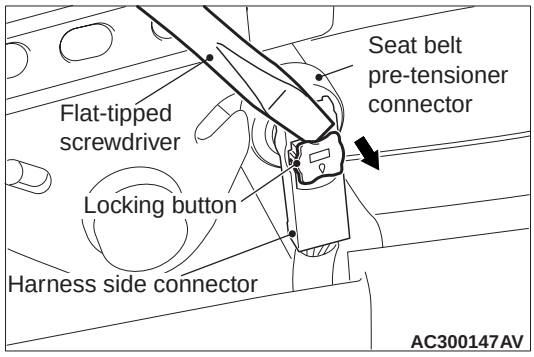
(1) Disconnect the negative battery terminal.



(2) Disconnect SRS-ECU connector C-130.

⚠ DANGER



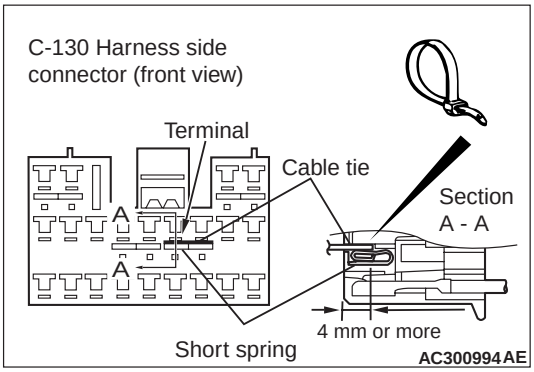


To prevents the seat belt pre-tensioner from deploying unintentionally, disconnect the seat belt pre-tensioner (passenger's side) connector D-23 <LHD> or D-15 <RHD> to short the squib circuit.

(3) Disconnect seat belt pre-tensioner (passenger's side) connector D-23 <LHD> or D-15 <RHD>. Use a flat-tipped screwdriver to pull out the

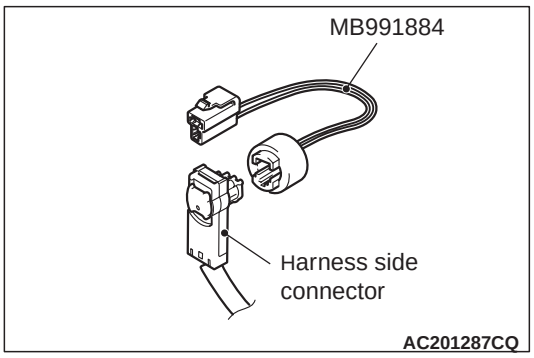
locking button at the harness side connector, and then disconnect the connector.

⚠ CAUTION



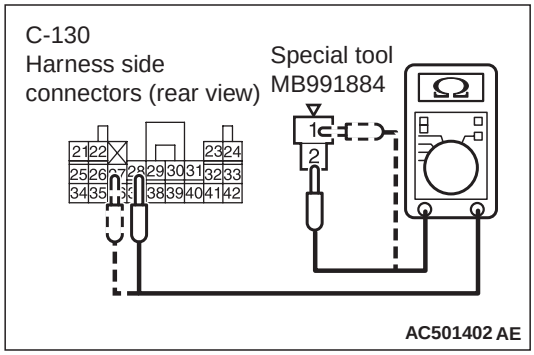
Insert an insulator such as a cable tie to a depth of 4 mm or more, otherwise the short spring will not be released.

(4) Insert a cable tie [3 mm wide, 0.5 mm thick] between terminals 27, 28 and the short spring to release the short spring.



(5) Connect D-23 <LHD> or D-15 <RHD> harness side connector to special tool resistor harness (MB991884).

⚠ CAUTION



Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(6) Resistance measurement between the following terminals.
- SRS-ECU connector C-130 terminal No.27 and the special tool terminal No.1
- SRS-ECU connector C-130 terminal No.28 and the special tool terminal No.2

OK: Continuity (Less than 2 Ω)

Q: Are the check results normal?

YES : Go to Step 3 .

NO : Repair the harness wires between SRS-ECU connector C-130 (terminal No.27 and 28) and the seat belt pre-tensioner (passenger's side) connector D-23 <LHD> or D-15 <RHD> (terminal No.2 and 1)

STEP 3. Check whether the diagnosis code is reset.

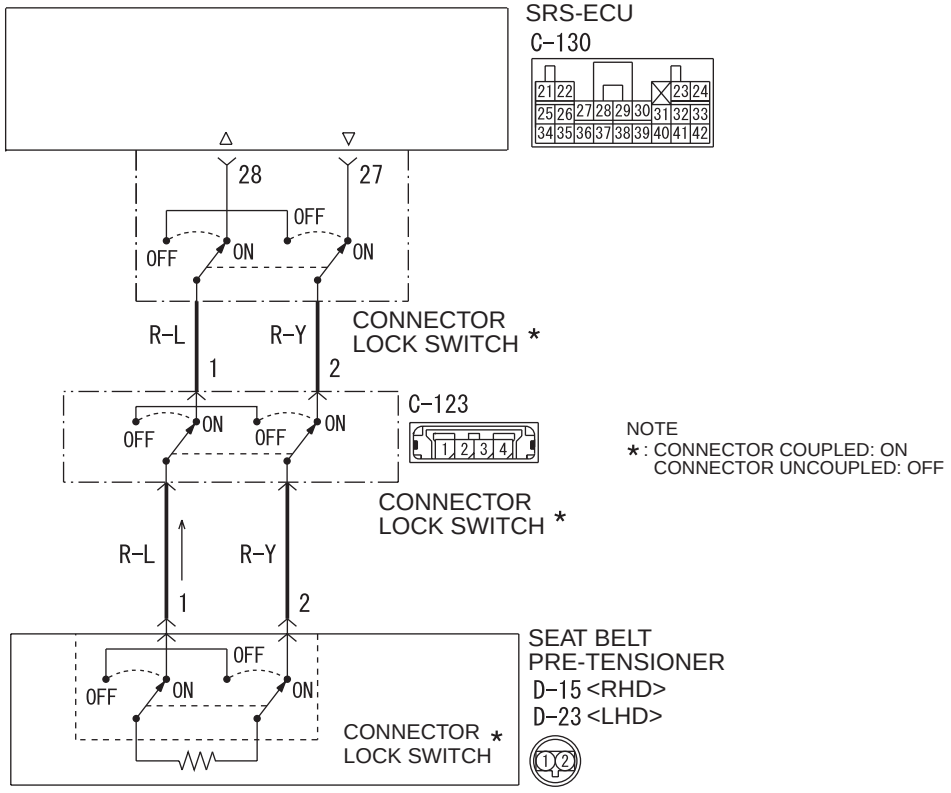
Q: Is diagnosis code B1610 set?

YES : Replace the SRS-ECU (Refer to P.52B-266).

NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1611: Seat belt pre-tensioner (passenger's side) (squib) system (short-circuited to the earth)

Seat Belt Pre-tensioner (Passenger's Side) (Squib)



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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OPERATION

The SRS-ECU judges how severe a collision is by detecting signals from the front impact sensors and the front air bag analogue G-sensor. If the impact is over a predetermined level, the SRS-ECU sends an ignition signal. At this time, if the front air bag safing G-sensor is on, the seat belt pre-tensioner will deploy.

DIAGNOSIS CODE SET CONDITIONS

This diagnosis code is set if seat belt pre-tensioner (passenger's side) wire(s) are short-circuited to the earth.

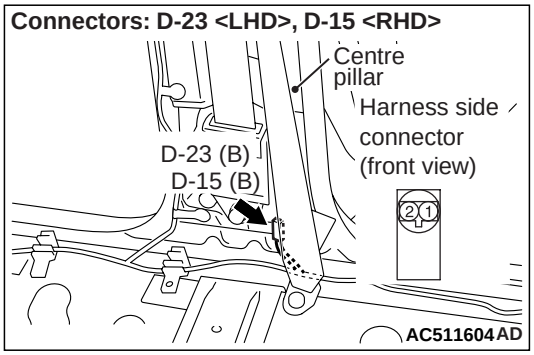
PROBABLE CAUSES

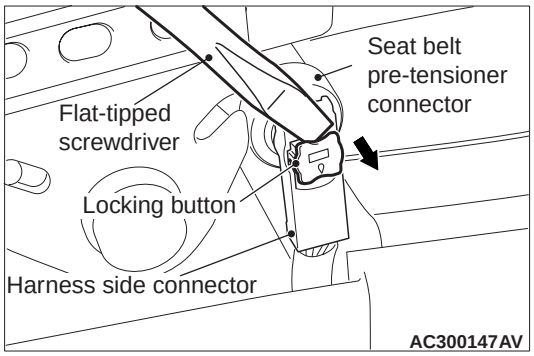
- Damaged wiring harnesses or connectors
- Short to the earth in the seat belt pre-tensioner (passenger's side) (squib) harness
- Malfunction of the SRS-ECU

DIAGNOSIS PROCEDURE

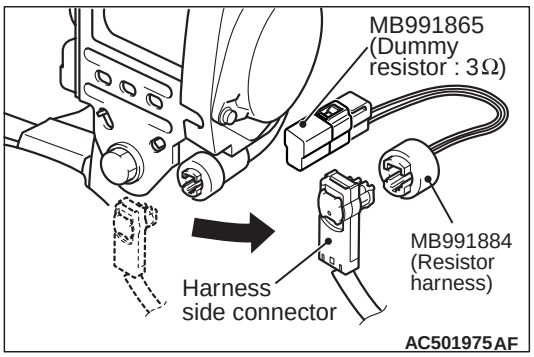
STEP 1. Check the diagnosis code by connecting a dummy resistor. (M.U.T.-III diagnosis code)

(1) Disconnect the negative battery terminal.





(2) Disconnect seat belt pre-tensioner (passenger's side) connector D-23 <LHD> or D-15 <RHD>. Use a flat-tipped screwdriver to pull out the locking button at the harness side connector, and then disconnect the connector.



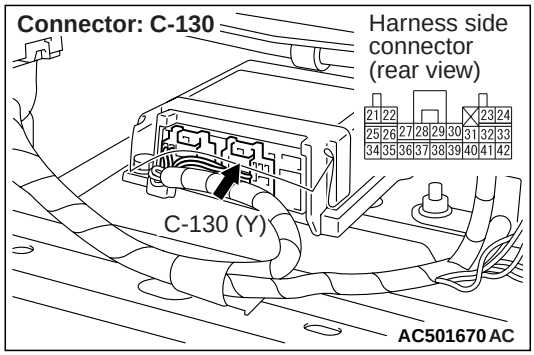
(3) Connect special tool dummy resistor (MB991865) to special tool resistor harness (MB991884).
(4) Connect special tool (MB991884) to the D-23 <LHD> or D-15 <RHD> harness side connector.
(5) Connect the negative battery terminal.
(6) Erase diagnosis code memory, and then check the diagnosis code.

Q: Is diagnosis code B1611 set?

YES : Go to Step 2.
NO : Replace the seat belt with pre-tensioner (passenger's side) (Refer to P.52B-284).

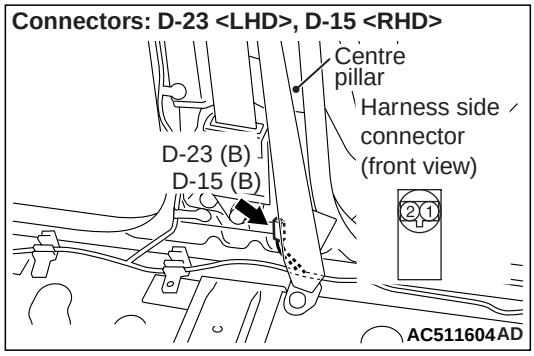
STEP 2. Resistance measurement at the SRS-ECU connector C-130

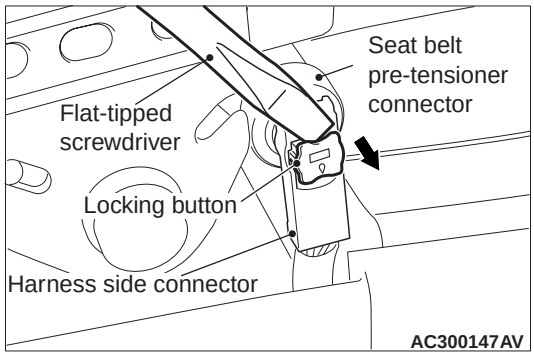
(1) Disconnect the negative battery terminal.



(2) Disconnect SRS-ECU connector C-130.

⚠ DANGER



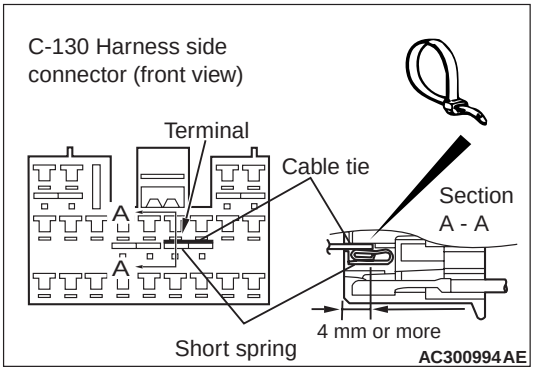


To prevents the seat belt pre-tensioner from deploying unintentionally, disconnect the seat belt pre-tensioner (passenger's side) connector D-23 <LHD> or D-15 <RHD> to short the squib circuit.

(3) Disconnect seat belt pre-tensioner (passenger's side) connector D-23 <LHD> or D-15 <RHD>. Use a flat-tipped screwdriver to pull out the locking button at the harness side connector, and

then disconnect the connector.

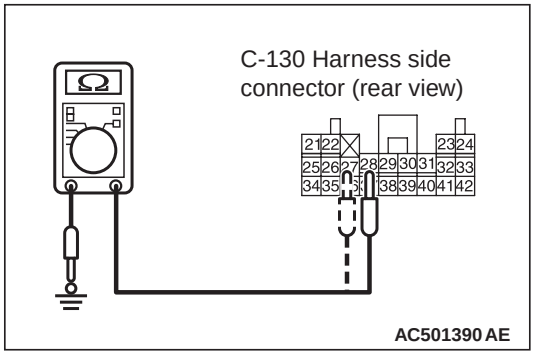
⚠ CAUTION



Insert an insulator such as a cable tie to a depth of 4 mm or more, otherwise the short spring will not be released.

(4) Insert a cable tie [3 mm wide, 0.5 mm thick] between terminals 27, 28 and the short spring to release the short spring.

⚠ CAUTION



Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(5) Resistance measurement between C-130 harness side connector terminals 27, 28 and body earth.

OK: Open circuit

Q: Is the check result normal?

YES : Go to Step 3 .

NO : Repair the harness wires between SRS-ECU connector C-130 (terminal No.27 and 28) and the seat belt pre-tensioner (passenger's side) connector D-23 <LHD> or D-15 <RHD> (terminal No.2 and 1)

STEP 3. Check whether the diagnosis code is reset.

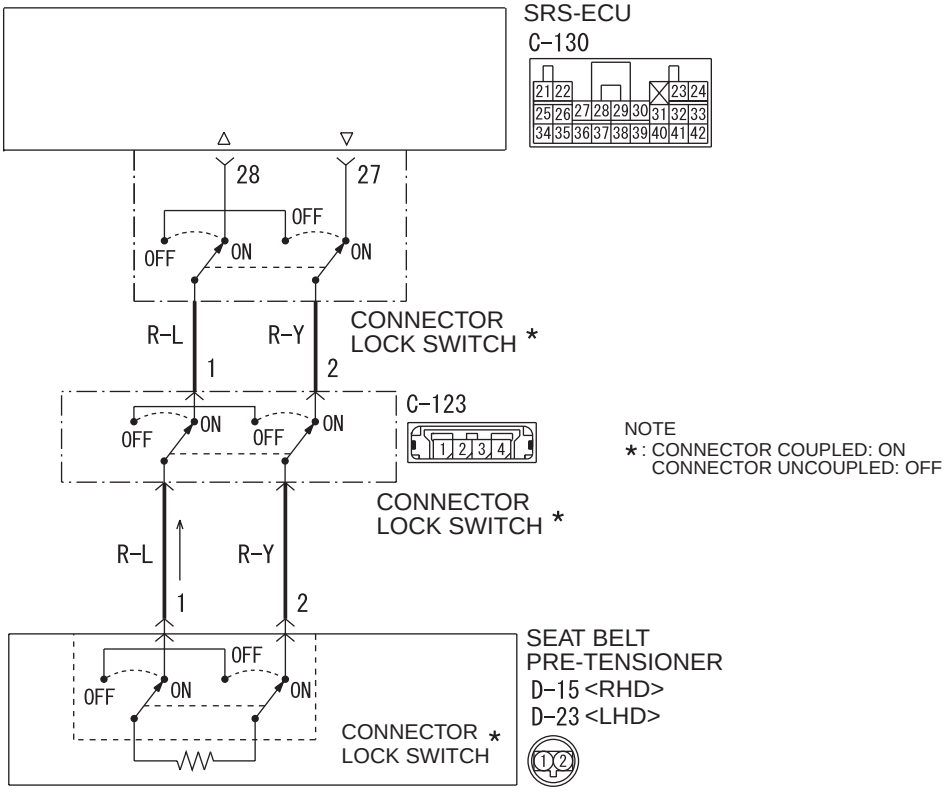
Q: Is diagnosis code B1611 set?

YES : Replace the SRS-ECU (Refer to P.52B-266).

NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1612: Seat belt pre-tensioner (passenger's side) (squib) system (short-circuited to the power supply)

Seat Belt Pre-tensioner (Passenger's Side) (Squib)



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

AC805785AE

OPERATION

The SRS-ECU judges how severe a collision is by detecting signals from the front impact sensors and the front air bag analogue G-sensor. If the impact is over a predetermined level, the SRS-ECU sends an ignition signal. At this time, if the front air bag safing G-sensor is on, the seat belt pre-tensioner will deploy.

DIAGNOSIS CODE SET CONDITIONS

This diagnosis code is set if seat belt pre-tensioner (passenger's side) wire(s) are short-circuited to the power supply.

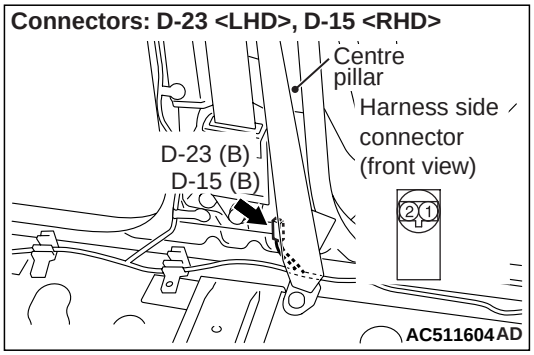
PROBABLE CAUSES

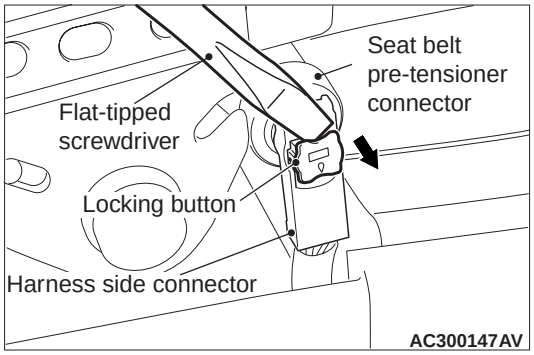
- Damaged wiring harnesses or connectors
- Short to the power supply in the seat belt pre-tensioner (passenger's side) (squib) harness
- Malfunction of the SRS-ECU

DIAGNOSIS PROCEDURE

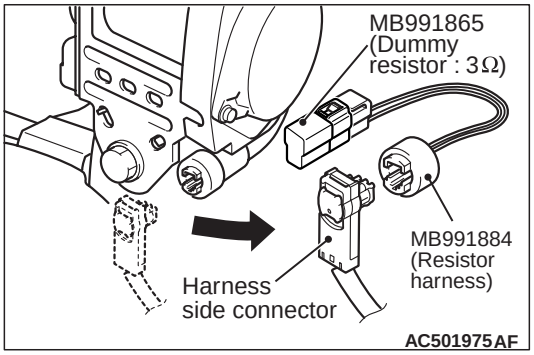
STEP 1. Check the diagnosis code by connecting a dummy resistor. (M.U.T.-III diagnosis code)

(1) Disconnect the negative battery terminal.





(2) Disconnect seat belt pre-tensioner (passenger's side) connector D-23 <LHD> or D-15 <RHD>. Use a flat-tipped screwdriver to pull out the locking button at the harness side connector, and then disconnect the connector.



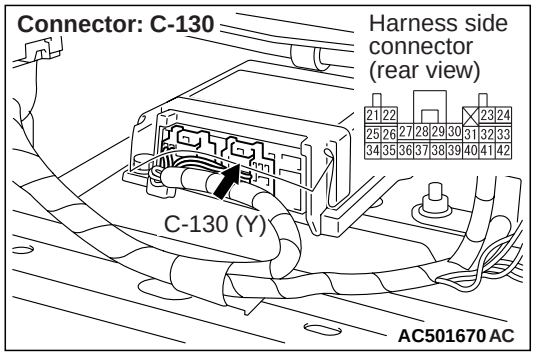
(3) Connect special tool dummy resistor (MB991865) to special tool resistor harness (MB991884).
(4) Connect special tool (MB991884) to the D-23 <LHD> or D-15 <RHD> harness side connector.
(5) Connect the negative battery terminal.
(6) Erase diagnosis code memory, and then check the diagnosis code.

Q: Is diagnosis code B1612 set?

YES : Go to Step 2.
NO : Replace the seat belt with pre-tensioner (passenger's side) (Refer to P.52B-284).

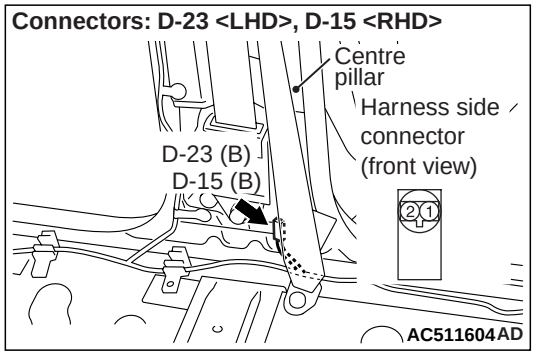
STEP 2. Voltage measurement at the SRS-ECU connector C-130.

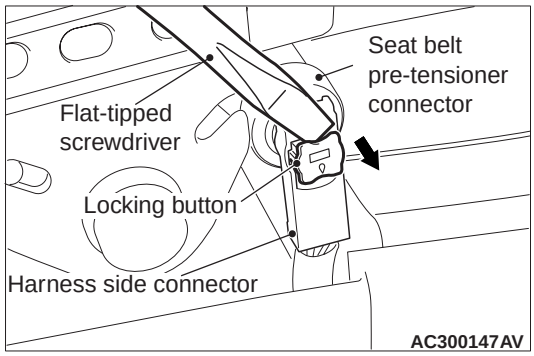
(1) Disconnect the negative battery terminal.



(2) Disconnect SRS-ECU connector C-130.

⚠ DANGER



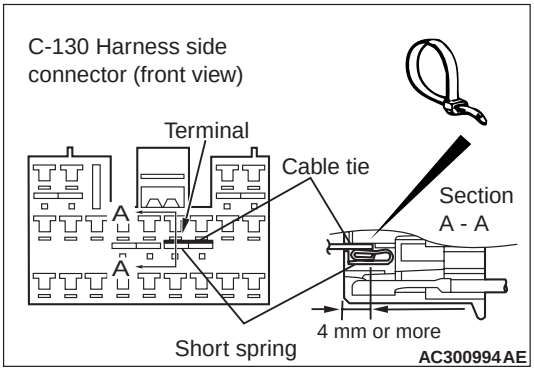


To prevents the seat belt pre-tensioner from deploying unintentionally, disconnect the seat belt pre-tensioner (passenger's side) connector D-23 <LHD> or D-15 <RHD> to short the squib circuit.

(3) Disconnect seat belt pre-tensioner (passenger's side) connector D-23 <LHD> or D-15 <RHD>. Use a flat-tipped screwdriver to pull out the locking button at the harness side connector, and

then disconnect the connector.

⚠ CAUTION



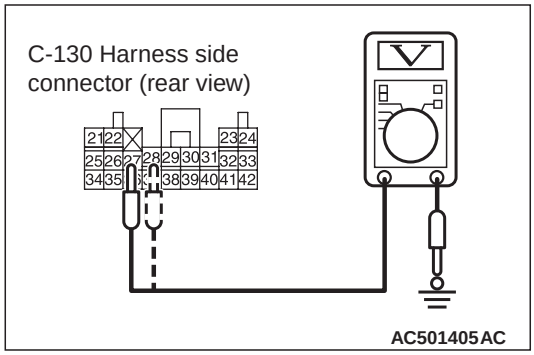
Insert an insulator such as a cable tie to a depth of 4 mm or more, otherwise the short spring will not be released.

(4) Insert a cable tie [3 mm wide, 0.5 mm thick] between terminals 27, 28 and the short spring to release the short spring.

(5) Connect the negative battery terminal.

(6) Turn the ignition switch to the "ON" position,

⚠ CAUTION



Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(7) Voltage measurement between C-130 harness side connector terminals 27, 28 and body earth.

OK: 1 V or less

Q: Is the check result normal?

YES : Go to Step 3.

NO : Repair the harness wires between SRS-ECU connector C-130 (terminal No.27 and 28) and the seat belt pre-tensioner (passenger's side) connector D-23 <LHD> or D-15 <RHD> (terminal No.2 and 1)

STEP 3. Check whether the diagnosis code is reset.

Q: Is diagnosis code B1612 set?

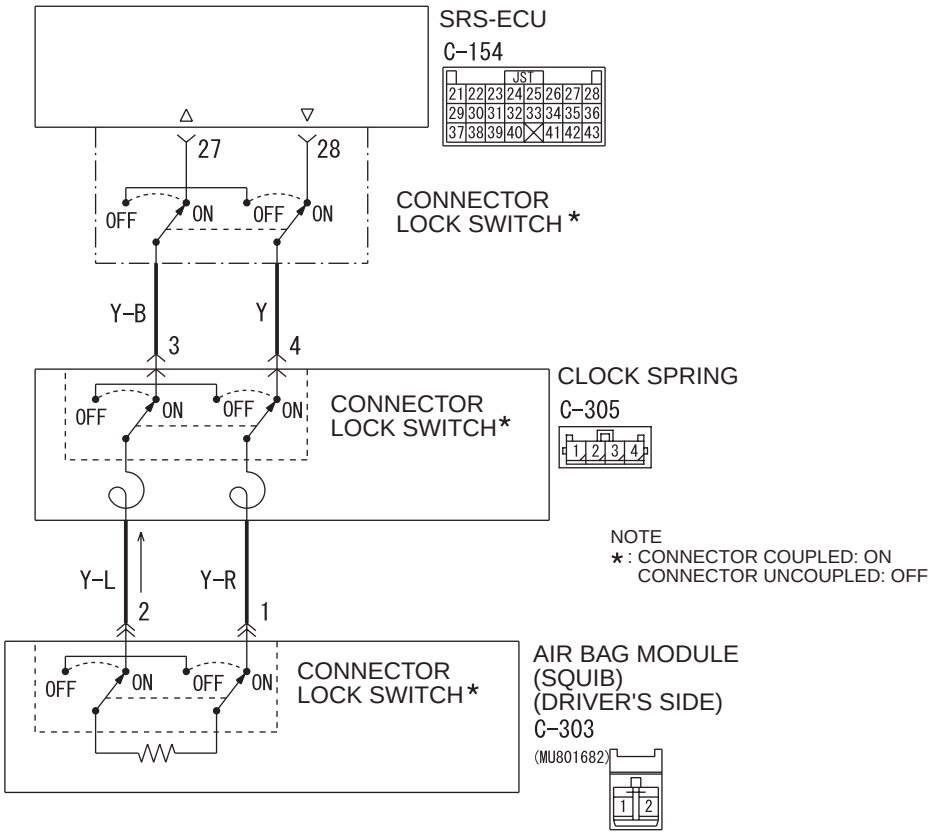
YES : Replace the SRS-ECU (Refer to P.52B-266).

NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

DIAGNOSIS CODE PROCEDURES <VEHICLES WITH SIDE-AIRBAG AND CURTAIN AIR BAG>

Code No.B1400: Driver's air bag module (squib) system (short-circuited between terminals of the squib circuit)

Driver's Air Bag Module (Squib) Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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OPERATION

- The SRS-ECU judges how severe a collision is by detecting signals from the front impact sensors and the front air bag analogue G-sensor. If the impact is over a predetermined level, the SRS-ECU sends an ignition signal. At this time, if the front air bag safing G-sensor is on, the SRS air bag will inflate.
- The ignition signal is input to the air bag module via the clock spring to inflate the air bag.

DIAGNOSIS CODE SET CONDITIONS

This diagnosis code is set if one driver's air bag squib wire shorted to the other.

PROBABLE CAUSES

- Improper engaged connector or defective short spring*
- Short circuit in the clock spring
- Short circuit between the driver's air bag module (squib) circuit terminals
- Damaged connector(s)
- Malfunction of the SRS-ECU

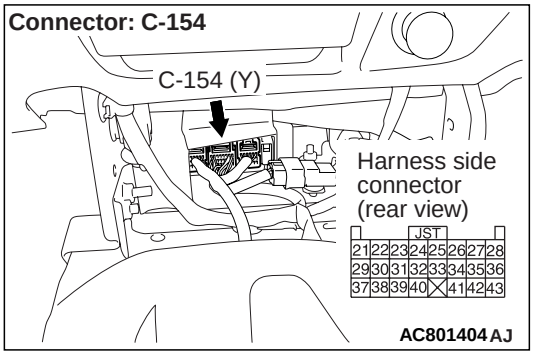
*NOTE: *: The squib circuit connectors integrate a "short" spring (which prevents the air bag from deploying unintentionally due to static electricity by shorting the positive wire to the earth wire in the squib circuit when the connectors are disconnected). Therefore, if connector C-154, C-303 or C-305 is damaged or improperly engaged, the short spring may not be released when the connector is connected.*

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code.

Q: Is diagnosis code B1519 set?
YES : Go to Step 2.
NO : Go to Step 3.

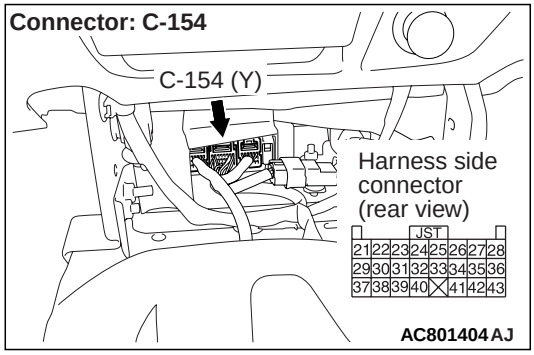
STEP 2. Connector lock check: SRS-ECU connector C-154. (M.U.T.-III diagnosis code)
(1) Disconnect the negative battery terminal.

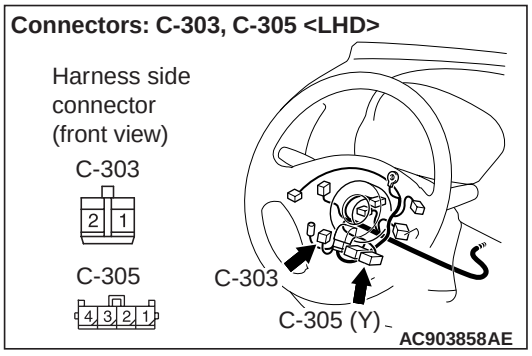


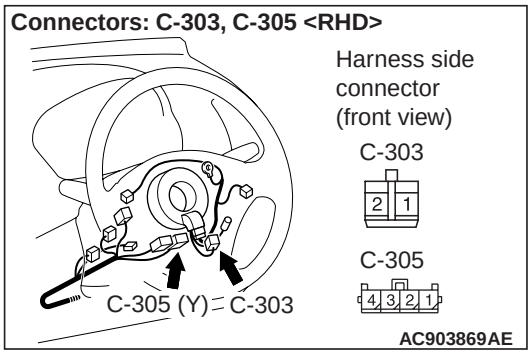
(2) Disconnect connectors C-154 and then reconnect them.
(3) Connect the negative battery terminal.
(4) Erase the diagnosis code memory, and check the diagnosis code.

Q: Is diagnosis code B1400 set?
YES : Go to Step 3.
NO : The procedure is complete. It is assumed that diagnosis code B1400 set as connector C-154 was engaged improperly.

STEP 3. Connector lock check: SRS-ECU connector C-154, clock spring connector C-305 and driver's air bag module connector C-303. (M.U.T.-III diagnosis code)
(1) Disconnect the negative battery terminal.





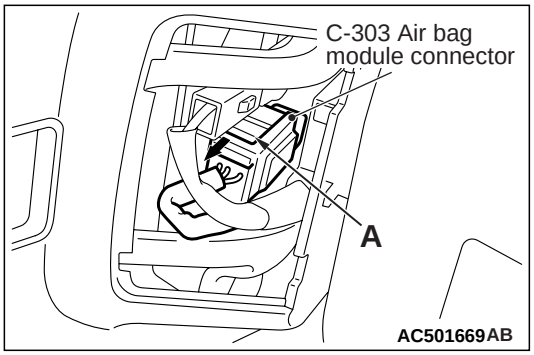


(2) Disconnect connectors C-154, C-305 and C-303, and then reconnect them.
(3) Connect the negative battery terminal.
(4) Erase the diagnosis code memory, and check the diagnosis code.

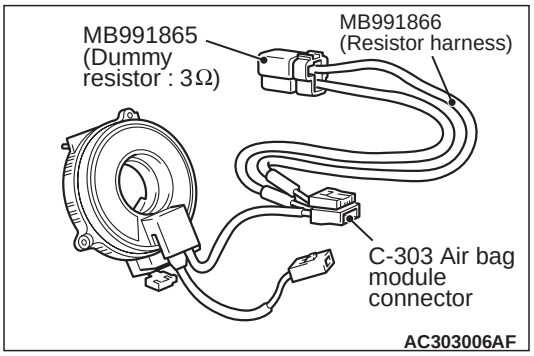
Q: Is diagnosis code B1400 set?
YES : Go to Step 4.
NO : The procedure is complete. It is assumed that diagnosis code B1400 set as connector C-154, C-305 or C-303 was engaged improperly.

STEP 4. Check the diagnosis code by connecting a dummy resistor. (M.U.T.-III diagnosis code)

(1) Disconnect the negative battery terminal.



(2) By sliding the A section (in the figure) of air bag module connector C-303 in the arrow direction, disconnect the connector.



(3) Connect special tool dummy resistor (MB991865) to special tool resistor harness (MB991866).

⚠ CAUTION

Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(4) Insert special tool (MB991866) into clock spring side air bag module connector C-303 by backprobing.
(5) Connect the negative battery terminal.
(6) Erase the diagnosis code memory, and check the diagnosis code.

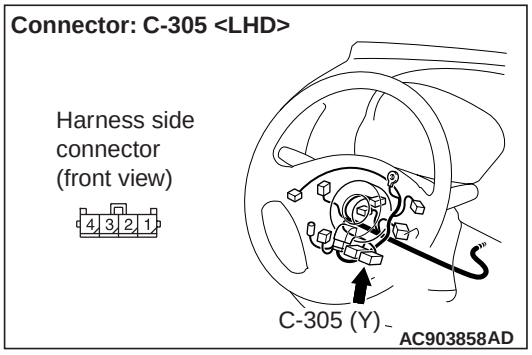
Q: Is diagnosis code B1400 set?

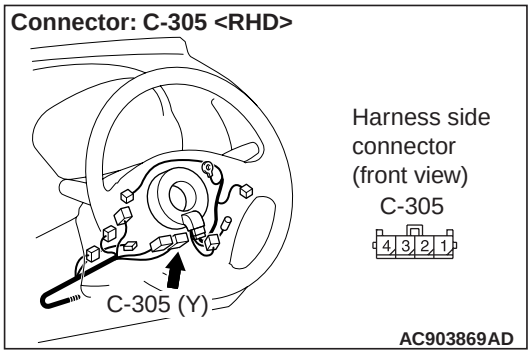
YES : Go to Step 5.

NO : Replace the driver's air bag module (Refer to P.52B-268).

STEP 5. Check the diagnosis code by connecting a dummy resistor. (M.U.T.-III diagnosis code)

(1) Disconnect the negative battery terminal.

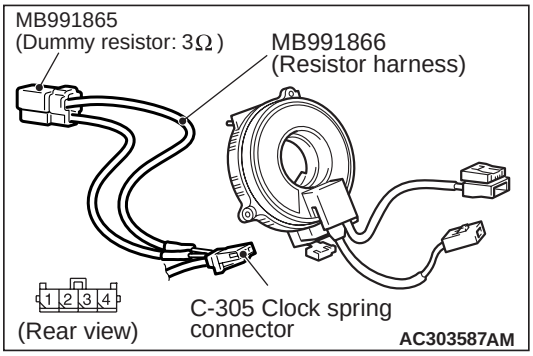




(2) Disconnect the clock spring connector C-305.
(3) Connect special tool dummy resistor (MB991865) to special tool resistor harness (MB991866).

⚠ CAUTION

Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.



(4) Insert special tool (MB991866) into clock spring harness side connector C-305 (terminal No.3 and 4) by backprobing.
(5) Connect the negative battery terminal.
(6) Erase the diagnosis code memory, and check the diagnosis code.

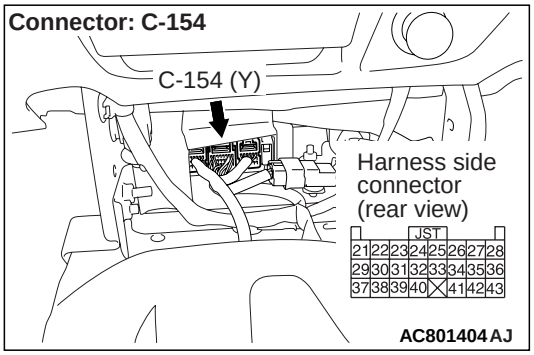
Q: Is diagnosis code B1400 set?

YES : Go to Step 6.

NO : Replace the clock spring (Refer to P.52B-268).

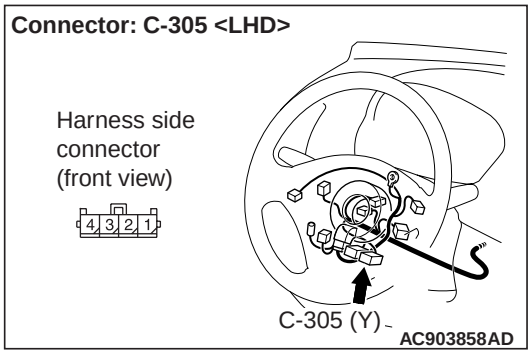
STEP 6. Resistance measurement at the SRS-ECU connector C-154.

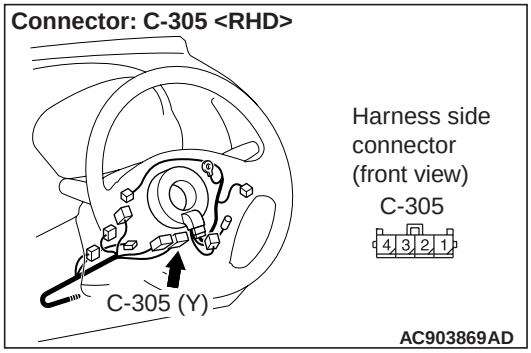
(1) Disconnect the negative battery terminal.



(2) Disconnect SRS-ECU connector C-154.

⚠ ***DANGER***

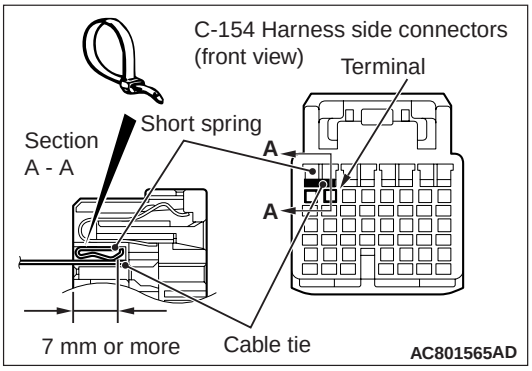




To prevents the air bag from deploying unintentionally, disconnect the clock spring connector C-305 to short the squib circuit.

(3) Disconnect the clock spring connector C-305.

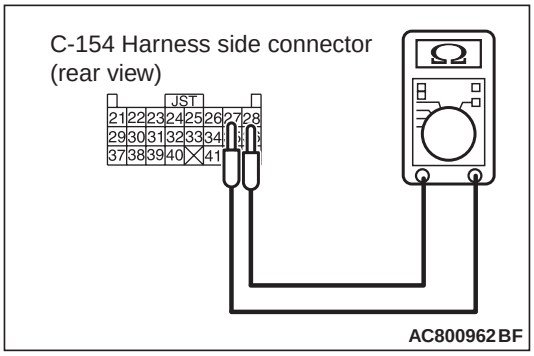
⚠ **CAUTION**



Insert an insulator such as a cable tie to a depth of 7 mm or more, otherwise the short spring will not be released.

(4) Insert a cable tie [3 mm wide, 0.5 mm thick] between terminals 27, 28 and the short spring to release the short spring.

⚠ **CAUTION**



Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(5) Resistance measurement between C-154 harness side connector terminals 27 and 28.

OK: Open circuit

Q: Is the check result normal?

YES : Go to Step 7.

NO : Repair the harness wires between SRS-ECU connector C-154 (terminal No.27 and 28) and clock spring connector C-305 (terminal No.3 and 4).

STEP 7. Check whether the diagnosis code is reset.

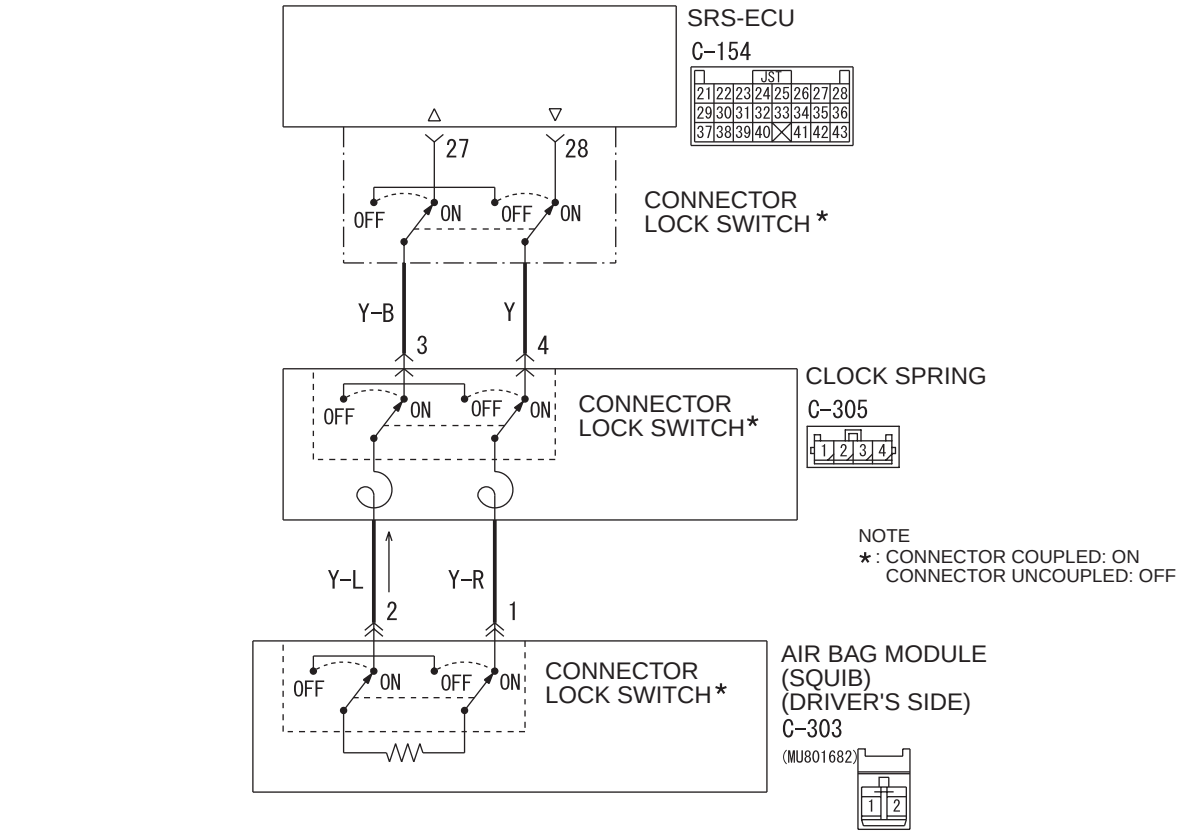
Q: Is diagnosis code B1400 set?

YES : Replace the SRS-ECU (Refer to P.52B-266).

NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1401: Driver's air bag module (squib) system (open-circuited in the squib circuit)

Driver's Air Bag Module (Squib) Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

AC805793 AB

OPERATION

- The SRS-ECU judges how severe a collision is by detecting signals from the front impact sensors and the front air bag analogue G-sensor. If the impact is over a predetermined level, the SRS-ECU sends an ignition signal. At this time, if the front air bag safing G-sensor is on, the SRS air bag will inflate.
- The ignition signal is input to the air bag module via the clock spring to inflate the air bag.

DIAGNOSIS CODE SET CONDITIONS

This diagnosis code is set if driver's air bag squib wire(s) are open-circuited.

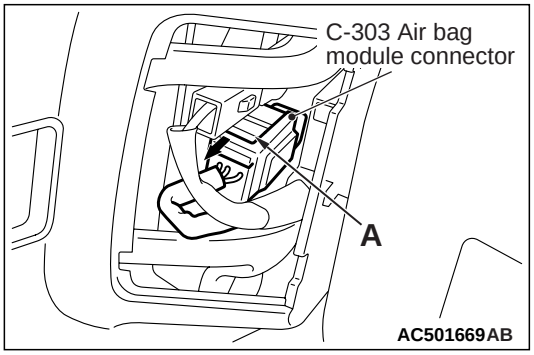
PROBABLE CAUSES

- Open circuit in the clock spring
- Open circuit due to improper neutral position of the clock spring
- Open circuit in the driver's air bag module (squib) circuit
- Disengaged driver's air bag module (squib) connector
- Improper connector contact
- Malfunction of the SRS-ECU

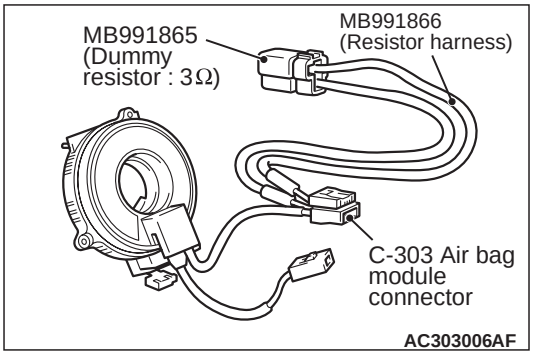
DIAGNOSIS PROCEDURE

STEP 1. Check the diagnosis code by connecting a dummy resistor. (M.U.T.-III diagnosis code)

(1) Disconnect the negative battery terminal.



(2) By sliding the A section (in the figure) of air bag module connector C-303 in the arrow direction, disconnect the connector.



(3) Connect special tool dummy resistor (MB991865) to special tool resistor harness (MB991866).

⚠ CAUTION

Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(4) Insert special tool (MB991866) into clock spring side air bag module connector C-303 by backprobing.
(5) Connect the negative battery terminal.
(6) Erase the diagnosis code memory, and check the diagnosis code.

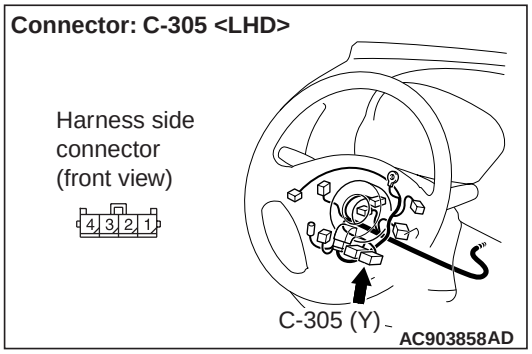
Q: Is diagnosis code B1401 set?

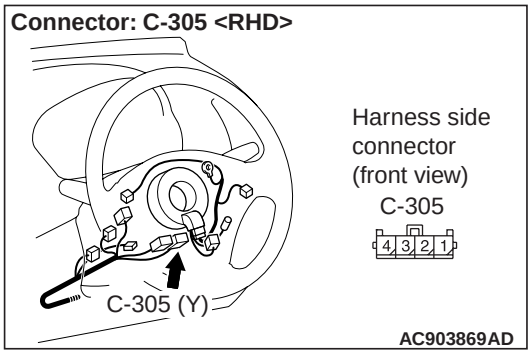
YES : Go to Step 2.

NO : Replace the driver's air bag module (Refer to P.52B-268).

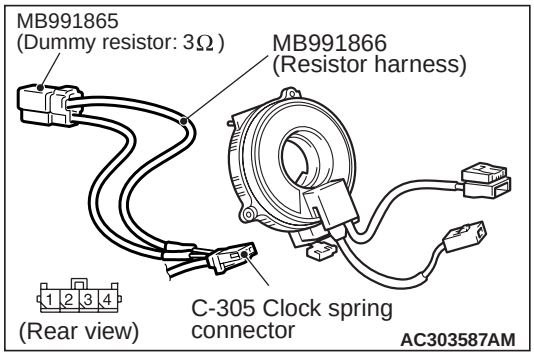
STEP 2. Check the clock spring. (M.U.T.-III diagnosis code)

(1) Disconnect the negative battery terminal.





(2) Disconnect the clock spring connector C-305.



(3) Connect special tool dummy resistor (MB991865) to special tool resistor harness (MB991866).

⚠ CAUTION

Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(4) Insert special tool (MB991866) into clock spring harness side connector C-305 (terminal No.3 and 4) by backprobing.
(5) Connect the negative battery terminal.
(6) Erase the diagnosis code memory, and check the diagnosis code.

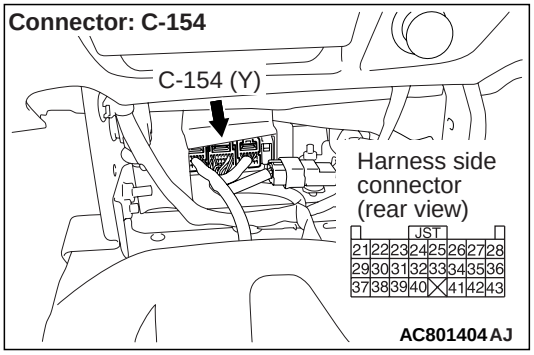
Q: Is diagnosis code B1401 set?

YES : Go to Step 3.

NO : Replace the clock spring (Refer to P.52B-268).

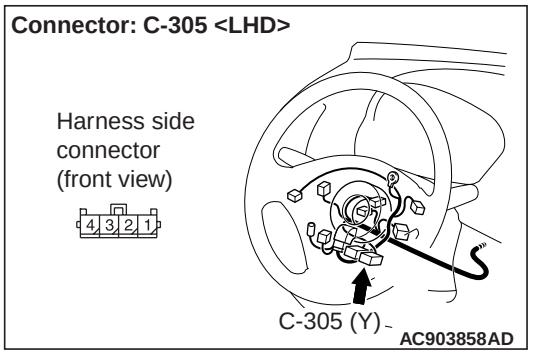
STEP 3. Resistance measurement between the SRS-ECU connector C-154 (terminal No.27 and 28) and the clock spring connector C-305 (terminal No.3 and 4)

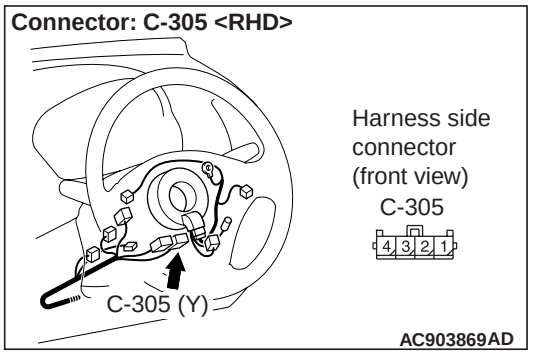
(1) Disconnect the negative battery terminal.



(2) Disconnect SRS-ECU connector C-154.

⚠ ***DANGER***

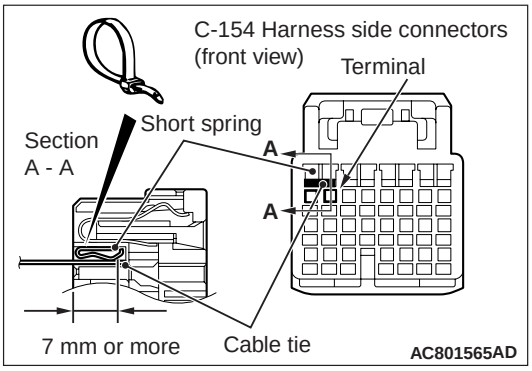




To prevents the air bag from deploying unintentionally, disconnect the clock spring connector C-305 to short the squib circuit.

(3) Disconnect the clock spring connector C-305.

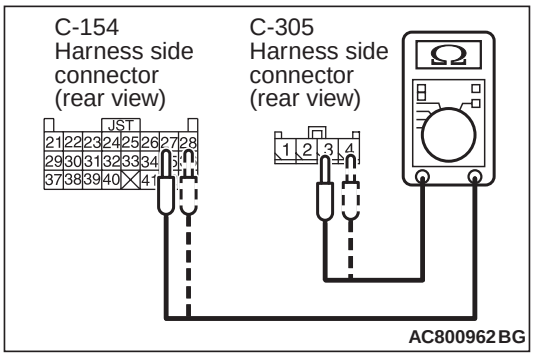
⚠ **CAUTION**



Insert an insulator such as a cable tie to a depth of 7 mm or more, otherwise the short spring will not be released.

(4) Insert a cable tie [3 mm wide, 0.5 mm thick] between terminals 27, 28 and the short spring to release the short spring.

⚠ **CAUTION**



Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(5) Resistance measurement between the following terminals.

- SRS-ECU connector C-154 terminal No.27 and the clock spring connector C-305 terminal No.3
- SRS-ECU connector C-154 terminal No.28 and the clock spring connector C-305 terminal No.4

OK: Continuity (Less than 2 Ω)

Q: Are the check results normal?

YES : Go to Step 4.

NO : Repair the harness wires between SRS-ECU connector C-154 (terminal No.27 and 28) and clock spring connector C-305 (terminal No.3 and 4).

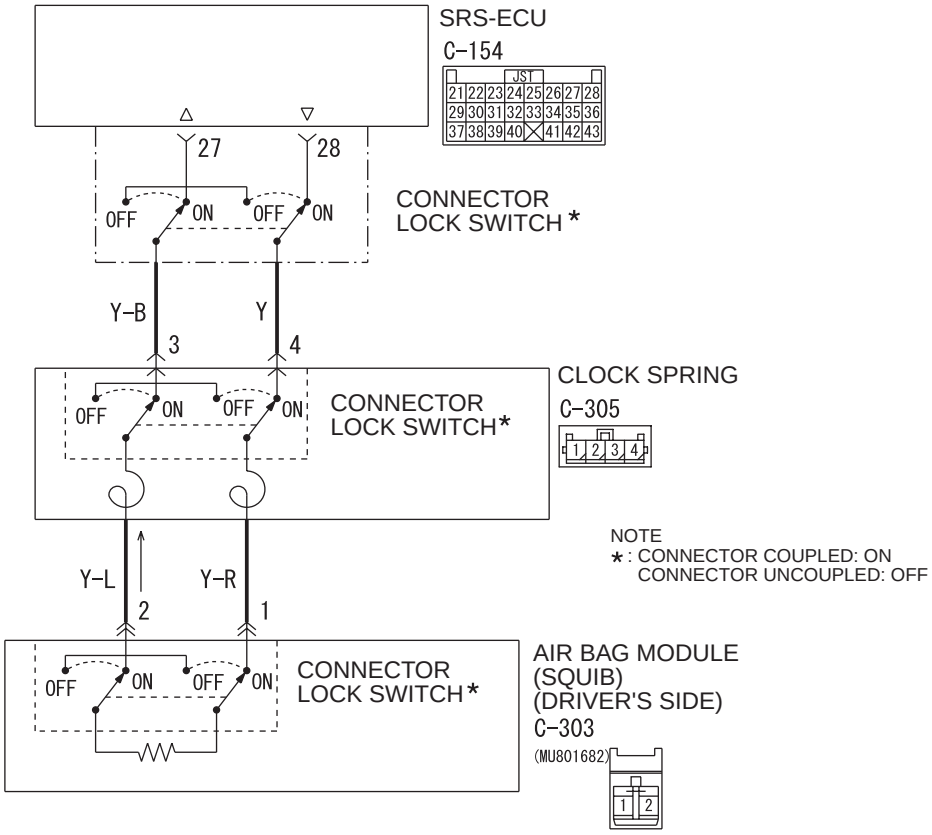
STEP 4. Check whether the diagnosis code is reset.

Q: Is diagnosis code B1401 set?

YES : Replace the SRS-ECU (Refer to P.52B-266).
NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1402: Driver's air bag module (squib) system (short-circuited to the earth)

Driver's Air Bag Module (Squib) Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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OPERATION

- The SRS-ECU judges how severe a collision is by detecting signals from the front impact sensors and the front air bag analogue G-sensor. If the impact is over a predetermined level, the SRS-ECU sends an ignition signal. At this time, if the front air bag safing G-sensor is on, the SRS air bag will inflate.
- The ignition signal is input to the air bag module via the clock spring to inflate the air bag.

DIAGNOSIS CODE SET CONDITIONS

This diagnosis code is set if the driver's air bag squib wire(s) are short-circuited to the earth.

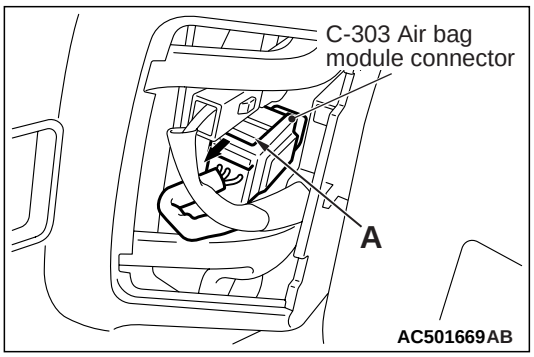
PROBABLE CAUSES

- Malfunction of the clock spring
- Damaged harness wires and connectors
- Short to the earth in the driver's air bag module (squib) harness
- Malfunction of the SRS-ECU

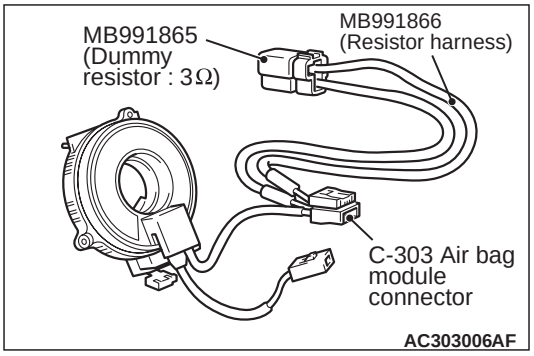
DIAGNOSIS PROCEDURE

STEP 1. Check the diagnosis code by connecting a dummy resistor. (M.U.T.-III diagnosis code)

(1) Disconnect the negative battery terminal.



(2) By sliding the A section (in the figure) of air bag module connector C-303 in arrow direction, disconnect the connector.



(3) Connect special tool dummy resistor (MB991865) to special tool resistor harness (MB991866).

⚠ CAUTION

Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(4) Insert special tool (MB991866) into clock spring side air bag module connector C-303 by backprobing.
(5) Connect the negative battery terminal.
(6) Erase the diagnosis code memory, and check the diagnosis code.

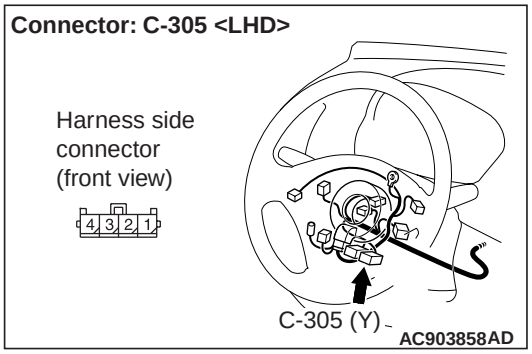
Q: Is diagnosis code B1402 set?

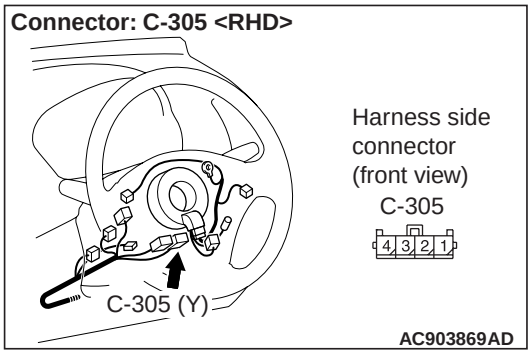
YES : Go to Step 2.

NO : Replace the driver's air bag module (Refer to P.52B-268).

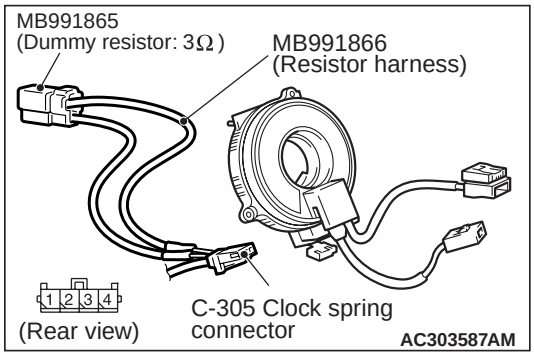
STEP 2. Check the diagnosis code by connecting a dummy resistor. (M.U.T.-III diagnosis code)

(1) Disconnect the negative battery terminal.





(2) Disconnect the clock spring connector C-305.



(3) Connect special tool dummy resistor (MB991865) to special tool resistor harness (MB991866).

⚠ CAUTION

Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(4) Insert special tool (MB991866) into clock spring harness side connector C-305 (terminal No.3 and 4) by backprobing.
(5) Connect the negative battery terminal.
(6) Erase the diagnosis code memory, and check the diagnosis code.

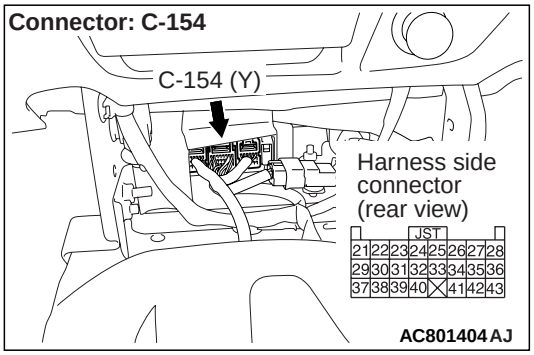
Q: Is diagnosis code B1402 set?

YES : Go to Step 3.

NO : Replace the clock spring (Refer to P.52B-268).

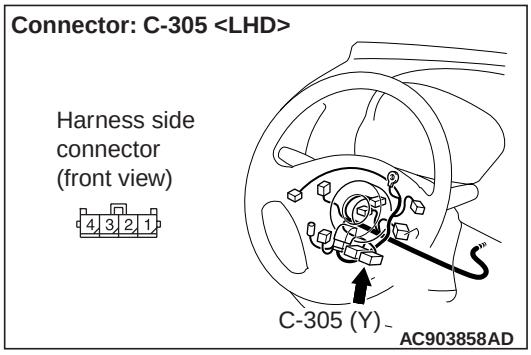
STEP 3. Resistance measurement at the SRS-ECU connector C-154.

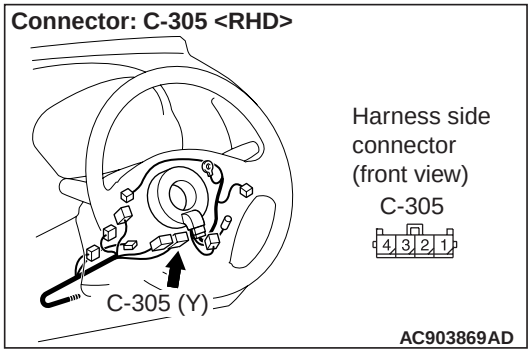
(1) Disconnect the negative battery terminal.



(2) Disconnect SRS-ECU connector C-154.

⚠ ***DANGER***

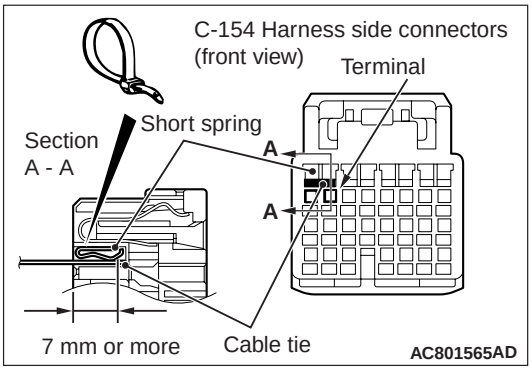




To prevents the air bag from deploying unintentionally, disconnect the clock spring connector C-305 to short the squib circuit.

(3) Disconnect the clock spring connector C-305.

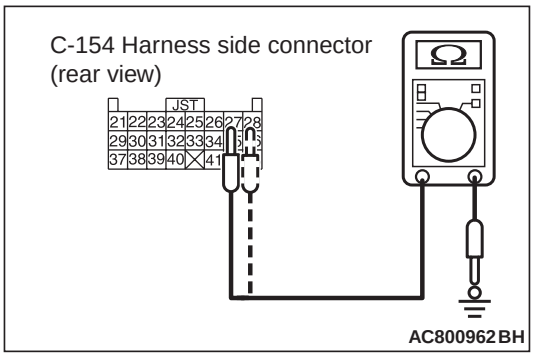
⚠ **CAUTION**



Insert an insulator such as a cable tie to a depth of 7 mm or more, otherwise the short spring will not be released.

(4) Insert a cable tie [3 mm wide, 0.5 mm thick] between terminals 27, 28 and the short spring to release the short spring.

⚠ **CAUTION**



Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(5) Check for continuity between C-154 harness side connector terminals 27, 28 and body earth.

OK: Open circuit

Q: Is the check result normal?

YES : Go to Step 4.

NO : Repair the harness wires between SRS-ECU connector C-154 (terminal No.27 and 28) and clock spring connector C-305 (terminal No.3 and 4).

STEP 4. Check whether the diagnosis code is reset.

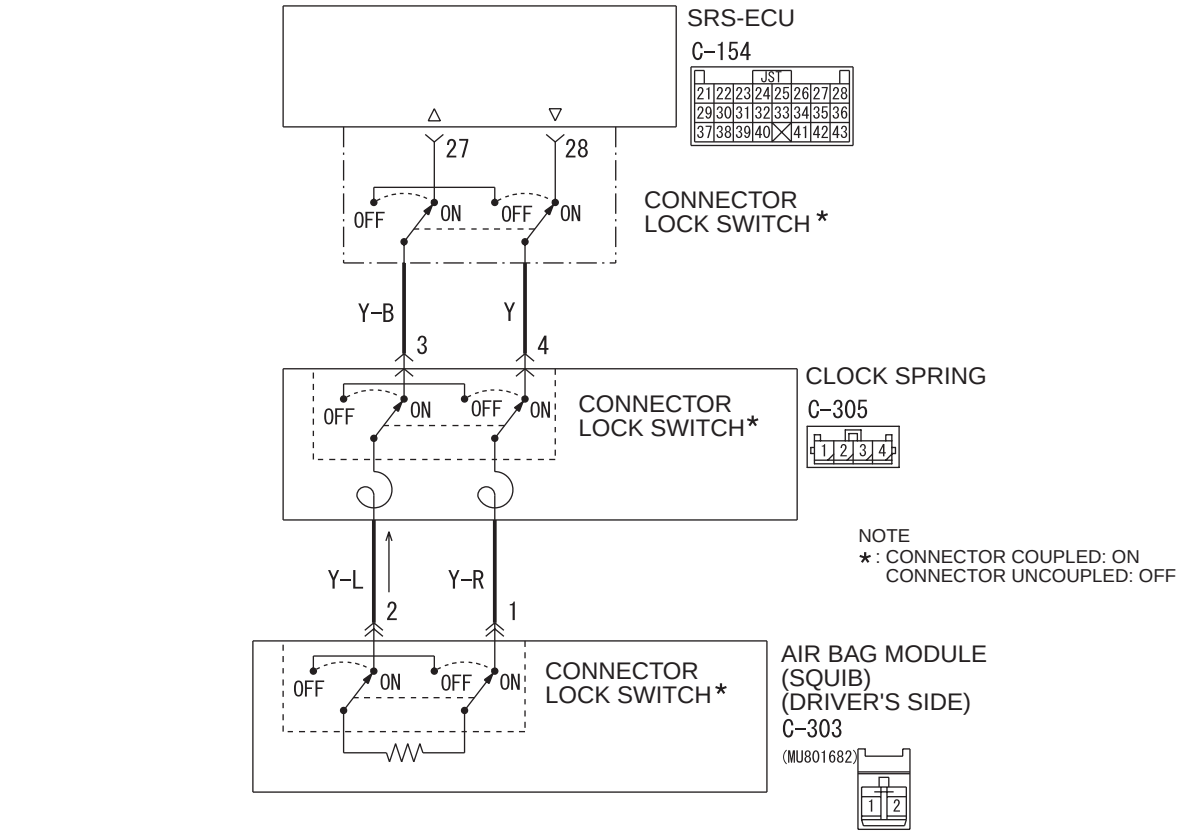
Q: Is diagnosis code B1402 set?

YES : Replace the SRS-ECU (Refer to P.52B-266).

NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1403: Driver's air bag module (squib) system (short-circuited to the power supply)

Driver's Air Bag Module (Squib) Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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OPERATION

- The SRS-ECU judges how severe a collision is by detecting signals from the front impact sensors and the front air bag analogue G-sensor. If the impact is over a predetermined level, the SRS-ECU sends an ignition signal. At this time, if the front air bag safing G-sensor is on, the SRS air bag will inflate.
- The ignition signal is input to the air bag module via the clock spring to inflate the air bag.

DIAGNOSIS CODE SET CONDITIONS

This diagnosis code is set if the driver's air bag squib wire(s) are short-circuited to the power supply.

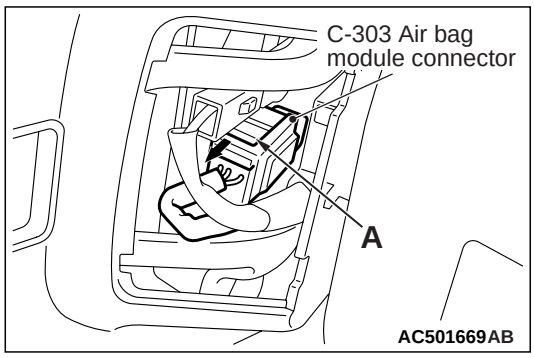
PROBABLE CAUSES

- Malfunction of the clock spring
- Damaged harness wires and connectors
- Short to the power supply in the driver's air bag module (squib) harness
- Malfunction of the SRS-ECU

DIAGNOSIS PROCEDURE

STEP 1. Check the diagnosis code by connecting a dummy resistor. (M.U.T.-III diagnosis code)

(1) Disconnect the negative battery terminal.



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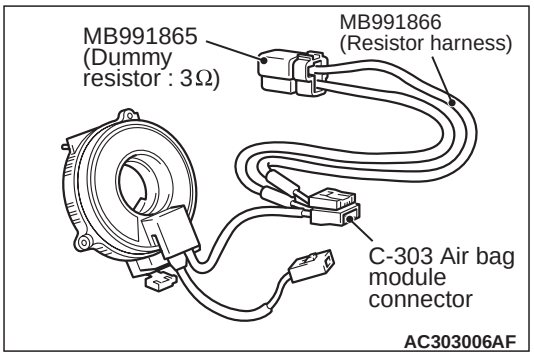
(2) By sliding the A section (in the figure) of air bag module connector C-303 in arrow direction,

disconnect the connector.



(3) Connect special tool dummy resistor (MB991865) to special tool resistor harness (MB991866).

⚠ CAUTION

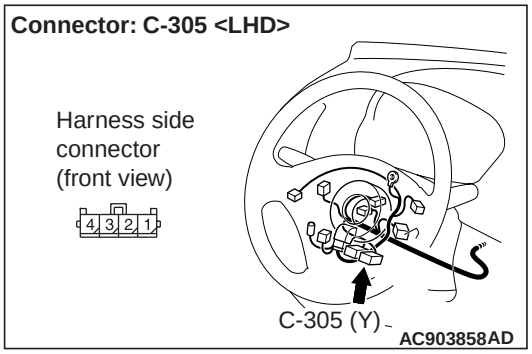
Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

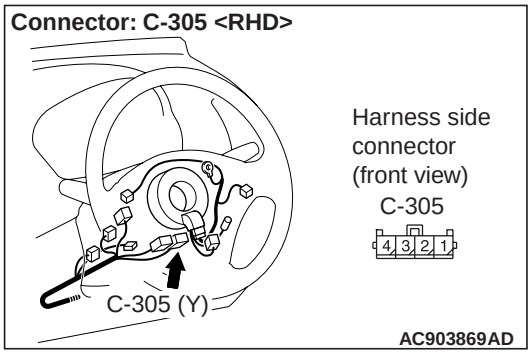
(4) Insert special tool (MB991866) into clock spring side air bag module connector C-303 by backprobing.
(5) Connect the negative battery terminal.
(6) Erase the diagnosis code memory, and check the diagnosis code.

Q: Is diagnosis code B1403 out put?
YES : Go to Step 2.
NO : Replace the driver's air bag module (Refer to P.52B-268).

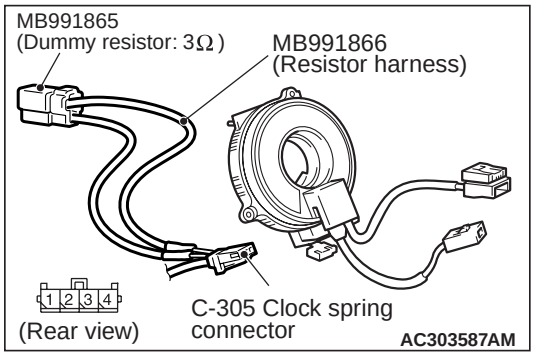
STEP 2. Check the diagnosis code by connecting a dummy resistor. (M.U.T.-III diagnosis code)

(1) Disconnect the negative battery terminal.





(2) Disconnect the clock spring connector C-305.



(3) Connect special tool dummy resistor (MB991865) to special tool resistor harness (MB991866).

⚠ CAUTION

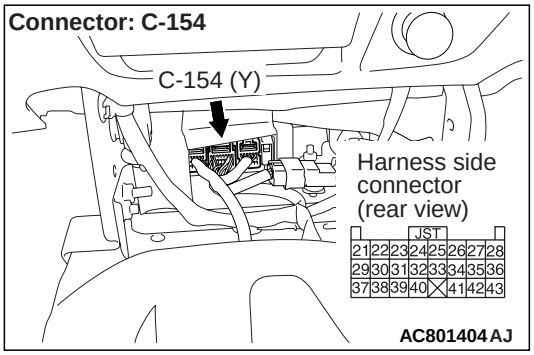
Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(4) Insert special tool (MB991866) into clock spring harness side connector C-305 (terminal No.3 and 4) by backprobing.
(5) Connect the negative battery terminal.
(6) Erase the diagnosis code memory, and check the diagnosis code.

Q: Is diagnosis code B1403 set?
YES : Go to Step 3.
NO : Replace the clock spring (Refer to P.52B-268).

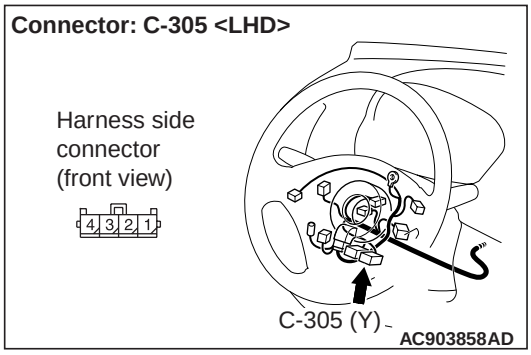
STEP 3. Voltage measurement at the SRS-ECU connector C-154.

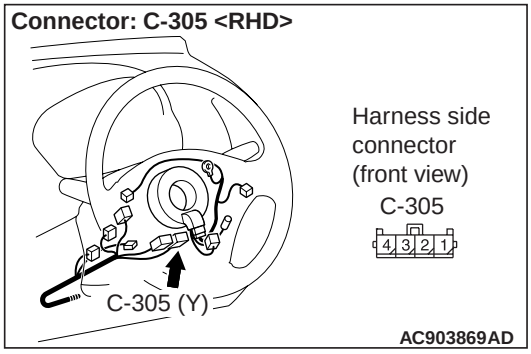
(1) Disconnect the negative battery terminal.



(2) Disconnect SRS-ECU connector C-154.

⚠ ***DANGER***

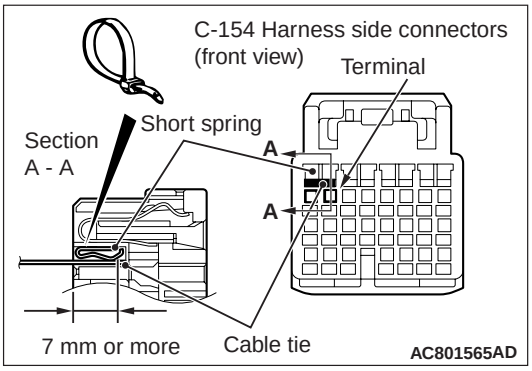




To prevents the air bag from deploying unintentionally, disconnect the clock spring connector C-305 to short the squib circuit.

(3) Disconnect the clock spring connector C-305.

⚠ **CAUTION**



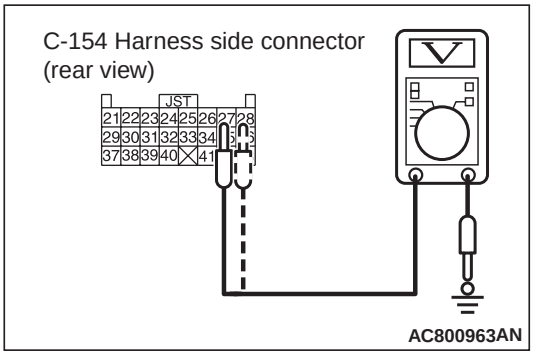
Insert an insulator such as a cable tie to a depth of 7 mm or more, otherwise the short spring will not be released.

(4) Insert a cable tie [3 mm wide, 0.5 mm thick] between terminals 27, 28 and the short spring to release the short spring.

(5) Connect the negative battery terminal.

(6) Turn the ignition switch to the "ON" position.

⚠ **CAUTION**



Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(7) Voltage measurement between C-154 harness side connector terminals 27, 28 and body earth.

OK: 1 V or less

Q: Is the check result normal?

YES : Go to Step 4.

NO : Repair the harness wires between SRS-ECU connector C-154 (terminal No.27 and 28) and clock spring connector C-305 (terminal No.3 and 4).

STEP 4. Check whether the diagnosis code is reset.

Q: Is diagnosis code B1403 set?

YES : Replace the SRS-ECU (Refer to P.52B-266).
NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1404: Driver's air bag module (squib ignition drive circuit) system detected short circuit
Code No.B1405: Driver's air bag module (squib ignition drive circuit) system detected open circuit
Code No.B1414: Passenger's (front) air bag module (squib ignition drive circuit) system detected short circuit
Code No.B1415: Passenger's (front) air bag module (squib ignition drive circuit) system detected open circuit
Code No.B1424: Side-airbag module (RH) (squib ignition drive circuit) system detected short circuit
Code No.B1425: Side-airbag module (RH) (squib ignition drive circuit) system detected open circuit
Code No.B1434: Side-airbag module (LH) (squib ignition drive circuit) system detected short circuit
Code No.B1435: Side-airbag module (LH) (squib ignition drive circuit) system detected open circuit
Code No.B1444: Curtain air bag module (RH) (squib ignition drive circuit) system detected short circuit
Code No.B1445: Curtain air bag module (RH) (squib ignition drive circuit) system detected open circuit
Code No.B1454: Curtain air bag module (LH) (squib ignition drive circuit) system detected short circuit
Code No.B1455: Curtain air bag module (LH) (squib ignition drive circuit) system detected open circuit
Code No.B1466: Analogue G-sensor system in the SRS-ECU (front air bag)
Code No.B1467: Safing G-sensor open circuit (front air bag)
Code No.B1468: Safing G-sensor short circuit (front air bag)
Code No.B1469: Analogue G-sensor system in the SRS-ECU (side air bag)
Code No.B1478: SRS-ECU capacitor circuit voltage too high
Code No.B1479: SRS-ECU capacitor circuit voltage too low
Code No.B1496: SRS-ECU non-volatile memory (EEPROM)
Code No.B1497: SRS-ECU application specific integrated circuit (for frontal activation)
Code No.B1498: SRS-ECU ROM or RAM
Code No.B1499: Collision decision
Code No.B1550: SRS warning lamp drive circuit malfunction
Code No.B1557: SRS-ECU application specific integrated circuit
Code No.B1607: Seat belt pre-tensioner (driver's side) (squib ignition drive circuit) system detected short circuit
Code No.B1608: Seat belt pre-tensioner (driver's side) (squib ignition drive circuit) system detected open circuit
Code No.B1613: Seat belt pre-tensioner (passenger's side) (squib ignition drive circuit) system detected short circuit
Code No.B1614: Seat belt pre-tensioner (passenger's side) (squib ignition drive circuit) system detected open circuit

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DIAGNOSIS CODE SET CONDITIONS
These diagnosis code are set when a fault is detected in the SRS-ECU. The most likely causes for this code to be set are shown in the table below:

Code No.	Part/Circuit integral to SRS-ECU	Trouble causes
B1404	Driver's air bag module (squib ignition drive circuit)	• Short circuit in the squib ignition drive circuit
B1405		• Open circuit in the squib ignition drive circuit
B1414	Passenger's (front) air bag module (squib ignition drive circuit)	• Short circuit in the squib ignition drive circuit
B1415		• Open circuit in the squib ignition drive circuit
B1424	Side-airbag module (RH) (squib ignition drive circuit)	• Short circuit in the squib ignition drive circuit
B1425		• Open circuit in the squib ignition drive circuit
B1434	Side-airbag module (LH) (squib ignition drive circuit)	• Short circuit in the squib ignition drive circuit
B1435		• Open circuit in the squib ignition drive circuit
B1444	Curtain air bag module (RH) (squib ignition drive circuit)	• Short circuit in the squib ignition drive circuit
B1445		• Open circuit in the squib ignition drive circuit
B1454	Curtain air bag module (LH) (squib ignition drive circuit)	• Short circuit in the squib ignition drive circuit
B1455		• Open circuit in the squib ignition drive circuit
B1466	Analogue G-sensor (front air bag)	• When the analogue G-sensor is not operating • When the characteristics of the analogue G-sensor are abnormal • When the output from the analogue G-sensor is abnormal
B1467	Safing G-sensor (front air bag)	• Open circuit in the safing G-sensor
B1468		• Short circuit in the safing G-sensor
B1469	Analogue G-sensor (side air bag)	• When the analogue G-sensor is not operating • When the characteristics of the analogue G-sensor are abnormal • When the output from the analogue G-sensor is abnormal
B1478	Capacitor	• Voltage at the capacitor terminal is higher than the specified value for five seconds or more
B1479		• Voltage at the capacitor terminal is lower than the specified value for five seconds or more (This is not detected if diagnosis code B1476 or B1477 indicating battery positive voltage drop has been set).
B1496	Non-volatile memory (EEPROM)	• When the non-volatile memory (EEPROM) is abnormal
B1497	Application specific integrated circuit (for frontal activation)	• When the application specific integrated circuit (frontal activation) is abnormal
B1498	ROM or RAM	• When the ROM or RAM is abnormal
B1499	Collision decision	• If this code is set before the air bags have deployed, an internal failure may have occurred in the SRS-ECU.
B1550	SRS warning lamp drive circuit	• Failure in SRS warning lamp drive circuit
B1557	Application specific integrated circuit	• When the application specific integrated circuit is abnormal

Code No.	Part/Circuit integral to SRS-ECU	Trouble causes
B1607	Seat belt pre-tensioner (driver's side) (squib ignition drive circuit)	• Short circuit in the squib ignition drive circuit
B1608		• Open circuit in the squib ignition drive circuit
B1613	Seat belt pre-tensioner (passenger's side) (squib ignition drive circuit)	• Short circuit in the squib ignition drive circuit
B1614		• Open circuit in the squib ignition drive circuit

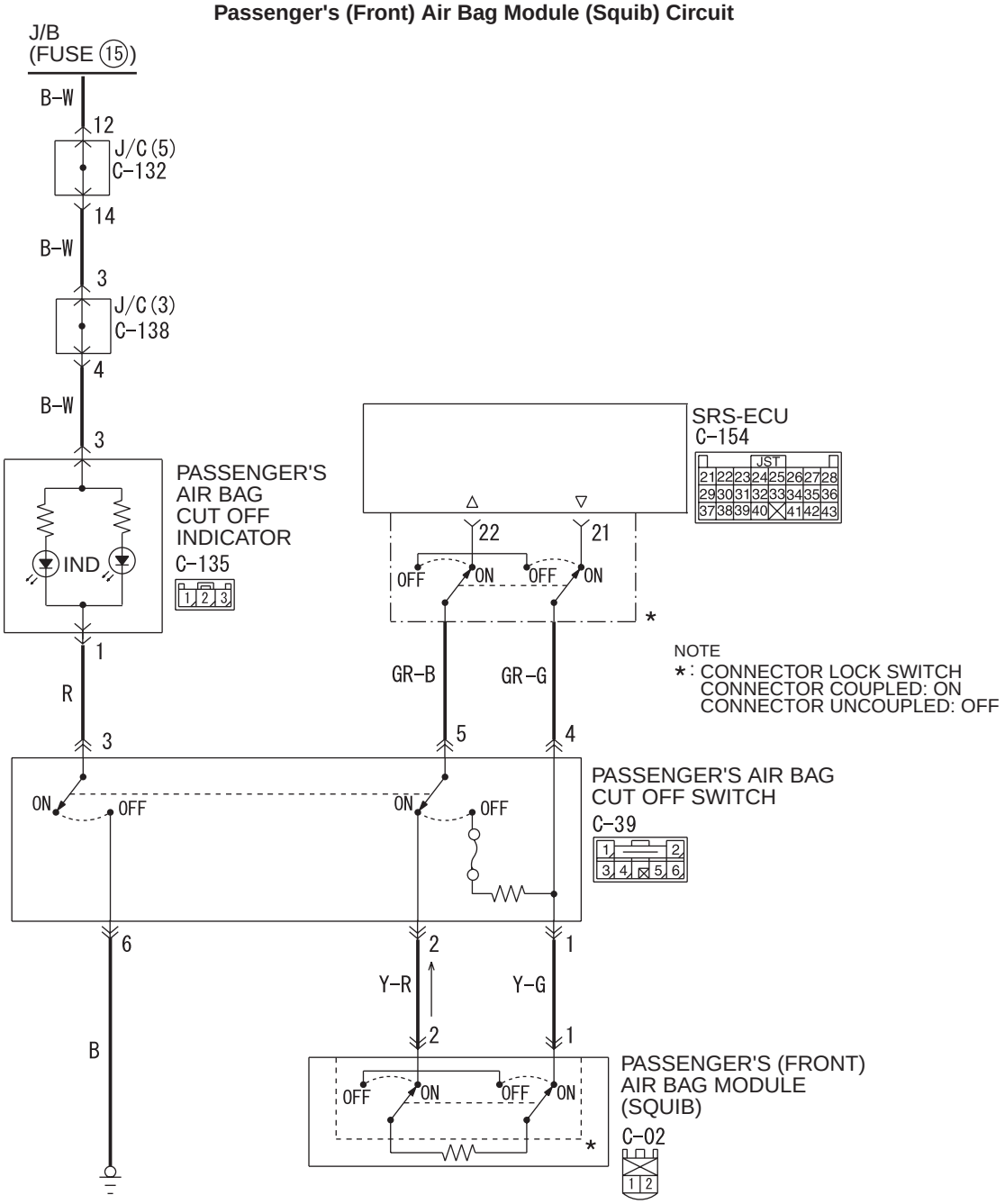
PROBABLE CAUSE
Malfunction of the SRS-ECU

DIAGNOSIS PROCEDURE

Replace the SRS-ECU (Refer to P.52B-266).

Code No.B1410: Passenger's (front) air bag module (squib) system (short-circuited between terminals of the squib circuit)

Passenger's (Front) Air Bag Module (Squib) Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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OPERATION

- The SRS-ECU judges how severe a collision is by detecting signals from the front impact sensors and the front air bag analogue G-sensor. If the impact is over a predetermined level, the SRS-ECU sends an ignition signal. At this time, if the front air bag safing G-sensor is on, the SRS air bag will inflate.
- The ignition signal is input to the air bag module to inflate the air bag.

DIAGNOSIS CODE SET CONDITIONS

This diagnosis code is set if one passenger's (front) air bag squib wire shorted to the other.

PROBABLE CAUSES

- Improper engaged connector or defective short spring*
- Short circuit between the passenger's (front) air bag module (squib) circuit terminals
- Damaged connector(s)
- Malfunction of the passenger's air bag cut off switch
- Malfunction of the SRS-ECU

*NOTE: *: The squib circuit connectors integrate a "short" spring (which prevents the air bag from deploying unintentionally due to static electricity by shorting the positive wire to the earth wire in the squib circuit when the connectors are disconnected).Therefore, if connector C-02 or C-154 is damaged or improperly engaged, the short spring may not be released when the connector is connected.*

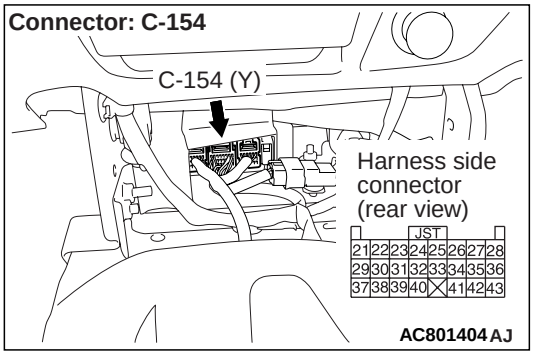
DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code.

Q: Is diagnosis code B1519 set?
YES : Go to Step 2.
NO : Go to Step 3.

STEP 2. Connector lock check: SRS-ECU connector C-154. (M.U.T.-III diagnosis code)

(1) Disconnect the negative battery terminal.

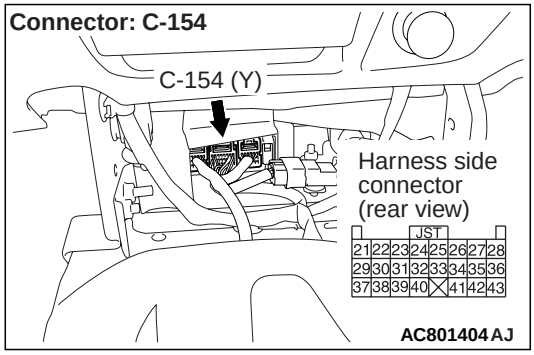


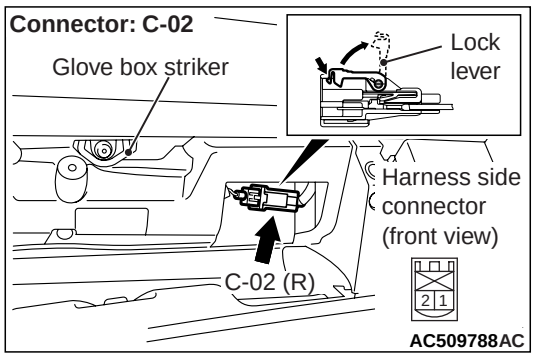
(2) Disconnect the connectors C-154 and then reconnect them.
(3) Connect the negative battery terminal.
(4) Erase the diagnosis code memory, and check the diagnosis code.

Q: Is diagnosis code B1410 set?
YES : Go to Step 3.
NO : The procedure is complete. It is assumed that diagnosis code B1410 set as connector C-154 was engaged improperly.

STEP 3. Connector lock check: SRS-ECU connector C-154 and passenger's (front) air bag module connector C-02. (M.U.T.-III diagnosis code)

(1) Disconnect the negative battery terminal.





(2) Disconnect connectors C-02 and C-154, and then reconnect them. For connector C-02, pull up the harness side lock lever with a nail and disconnect the connector lock.
(3) Connect the negative battery terminal.
(4) Erase the diagnosis code memory, and check the diagnosis code.

Q: Is diagnosis code B1410 set?
YES : Go to Step 4.
NO : The procedure is complete. It is assumed that diagnosis code B1410 set as connector C-02 or C-154 was engaged improperly.

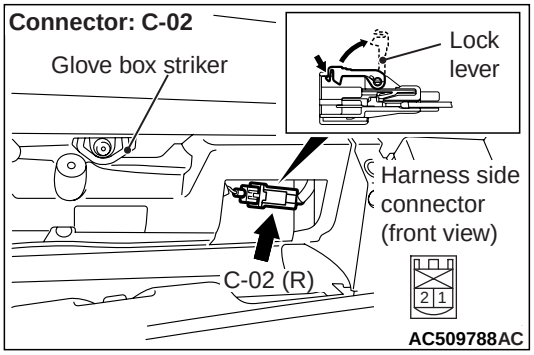
STEP 4. Check the passenger's air bag cut off switch.

Check the passenger's air bag cut off switch (Refer to P.52B-288).

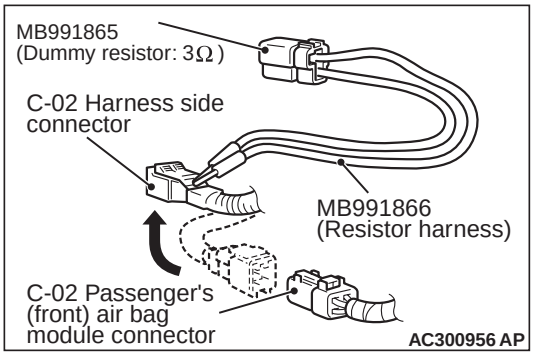
Q: Is the check result normal?
YES : Go to Step 5.
NO : Replace passenger's air bag cut off switch (Refer to P.52B-287).

STEP 5. Check the diagnosis code by connecting a dummy resistor. (M.U.T.-III diagnosis code)

(1) Disconnect the negative battery terminal.



(2) Disconnect passenger's (front) air bag module connector C-02. Pull up the harness side lock lever with a nail and disconnect the connector lock.



(3) Connect special tool dummy resistor (MB991865) to special tool resistor harness (MB991866).

⚠ CAUTION

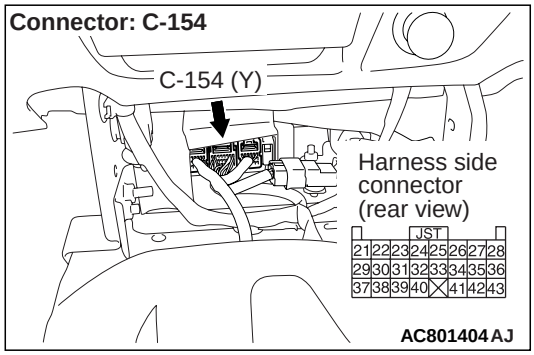
Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(4) Insert special tool (MB991866) into the harness side connector C-02 by backprobing.
(5) Check that the passenger's air bag cut off switch is "ON" position.
(6) Connect the negative battery terminal.
(7) Erase the diagnosis code memory, and check the diagnosis code.

Q: Is diagnosis code B1410 set?
YES : Go to Step 6.
NO : Replace the passenger's (front) air bag module (Refer to P.52B-268).

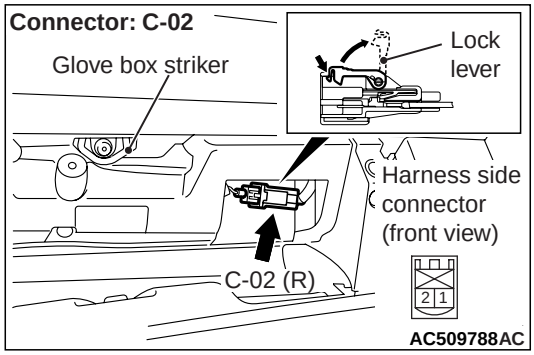
STEP 6. Resistance measurement at SRS-ECU connector C-154.

(1) Disconnect the negative battery terminal.



(2) Disconnect SRS-ECU connector C-154.

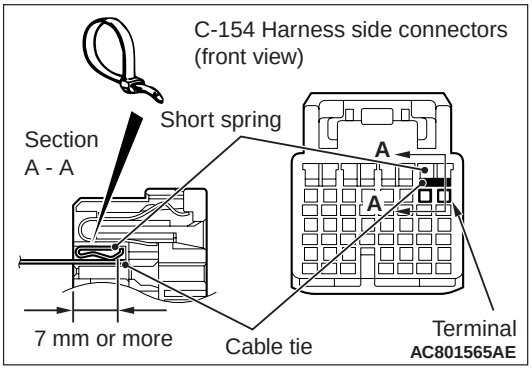
⚠ DANGER



To prevents the air bag from deploying unintentionally, disconnect the passenger's (front) air bag module connector C-02 to short the squib circuit.

(3) Disconnect passenger's (front) air bag module connector C-02. Pull up the harness side lock lever with a nail and disconnect the connector lock.

⚠ CAUTION

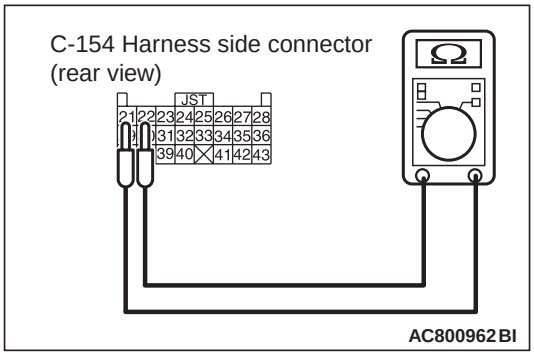


Insert an insulator such as a cable tie to a depth of 7 mm or more, otherwise the short spring will not be released.

(4) Insert a cable tie [3 mm wide, 0.5 mm thick] between terminals 21, 22 and the short spring to release the short spring.

(5) Check that the passenger's air bag cut off switch is "ON" position.

⚠ CAUTION



Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(6) Resistance measurement between C-154 harness side connector terminals 21 and 22.

OK: Open circuit

Q: Is the check result normal?

YES : Go to Step 7.

NO : Repair the harness wires between SRS-ECU connector C-154 (terminal No.21 and 22) and passenger's (front) air bag module connector C-02 (terminal No.1 and 2).

STEP 7. Check whether the diagnosis code is reset.

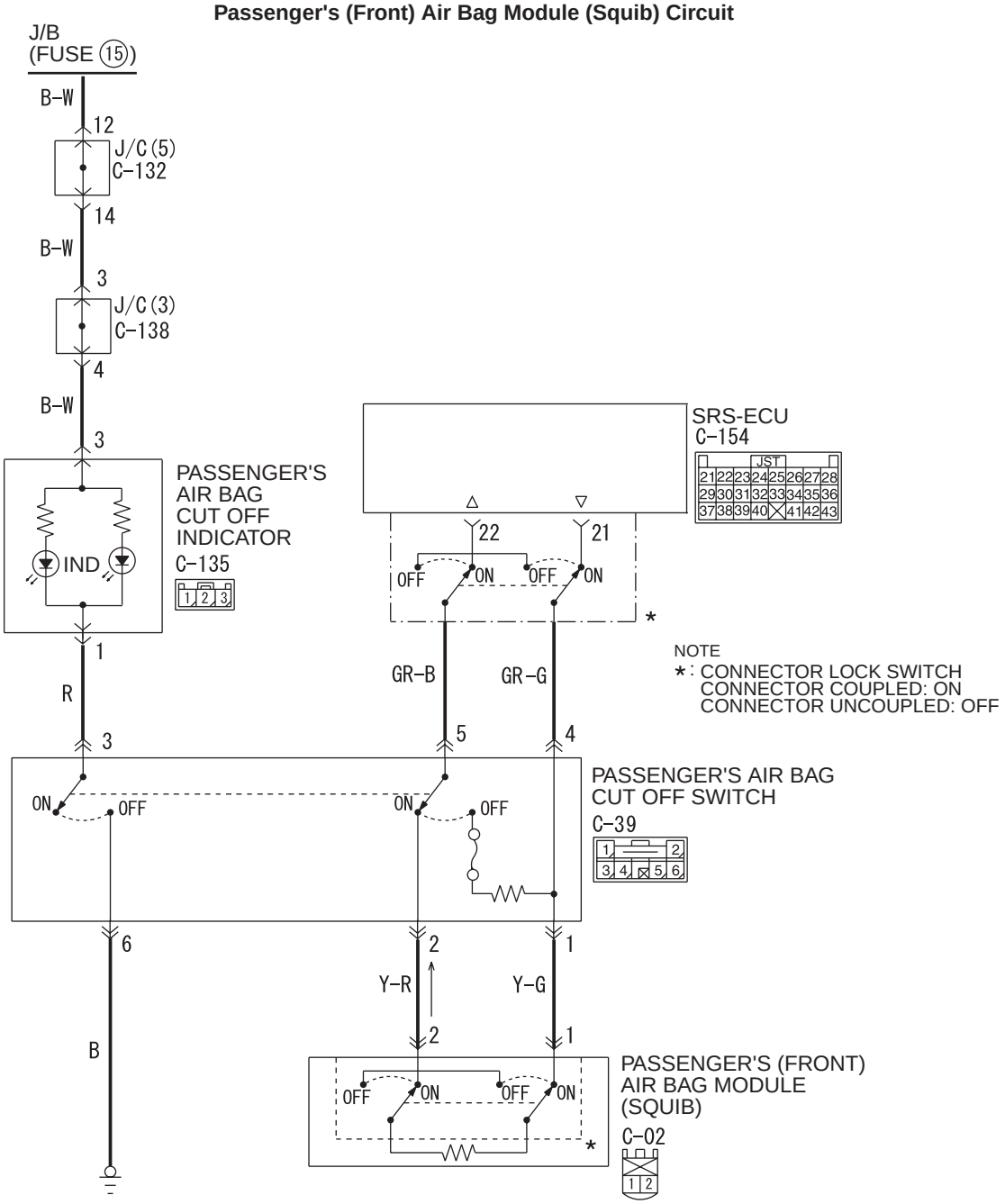
Q: Is diagnosis code B1410 set?

YES : Replace the SRS-ECU (Refer to P.52B-266).

NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1411: Passenger's (front) air bag module (squib) system (open-circuited in the squib circuit)

Passenger's (Front) Air Bag Module (Squib) Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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OPERATION

- The SRS-ECU judges how severe a collision is by detecting signals from the front impact sensors and the front air bag analogue G-sensor. If the impact is over a predetermined level, the SRS-ECU sends an ignition signal. At this time, if the front air bag safing G-sensor is on, the SRS air bag will inflate.
- The ignition signal is input to the air bag module to inflate the air bag.

DIAGNOSIS CODE SET CONDITIONS

This diagnosis code is set if passenger's (front) air bag squib wire(s) are open-circuited.

PROBABLE CAUSES

- Open circuit in the passenger's (front) air bag module (squib) circuit
- Improper connector contact
- Malfunction of the passenger's air bag cut off switch
- Malfunction of the SRS-ECU

DIAGNOSIS PROCEDURE

STEP 1. Check the passenger's air bag cut off switch.

Check the passenger's air bag cut off switch (Refer to P.52B-288).

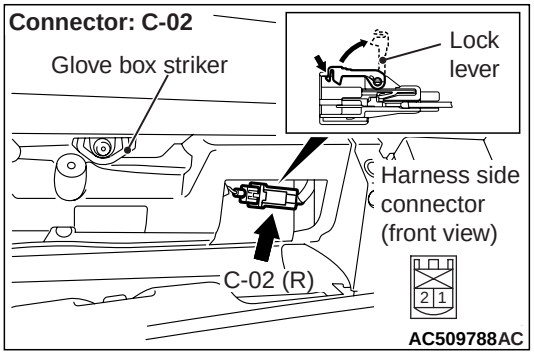
Q: Is the check result normal?

YES : Go to Step 2 .

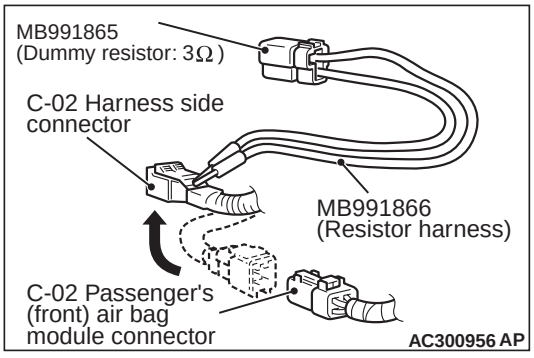
NO : Replace passenger's air bag cut off switch (Refer to P.52B-287).

STEP 2. Check the diagnosis code by connecting a dummy resistor. (M.U.T.-III diagnosis code)

(1) Disconnect the negative battery terminal.



(2) Disconnect passenger's (front) air bag module connector C-02. Pull up the harness side lock lever with a nail and disconnect the connector lock.



(3) Connect special tool dummy resistor (MB991865) to special tool resistor harness (MB991866).

⚠ CAUTION

Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(4) Insert special tool (MB991866) into the harness side connector C-02 by backprobing.

(5) Check that the passenger's air bag cut off switch is "ON" position.

(6) Connect the negative battery terminal.

(7) Erase the diagnosis code memory, and check the diagnosis code.

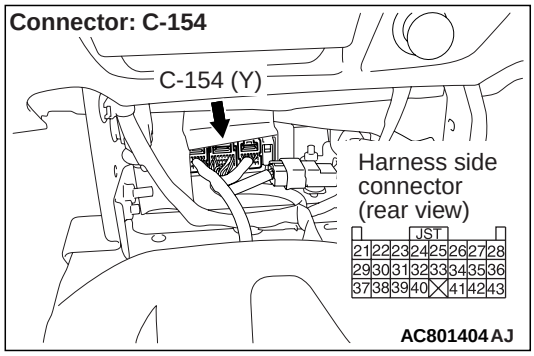
Q: Is diagnosis code B1411 set?

YES : Go to Step 3 .

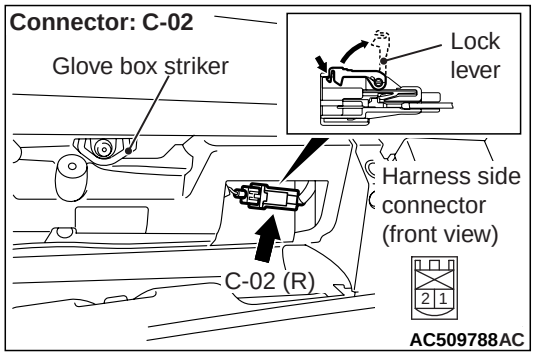
NO : Replace the passenger's (front) air bag module (Refer to P.52B-268).

STEP 3. Resistance measurement between SRS-ECU connector C-154 (terminal No.21 and 22) and the passenger's (front) air bag module connector C-02 (terminal No.1 and 2).

(1) Disconnect the negative battery terminal.



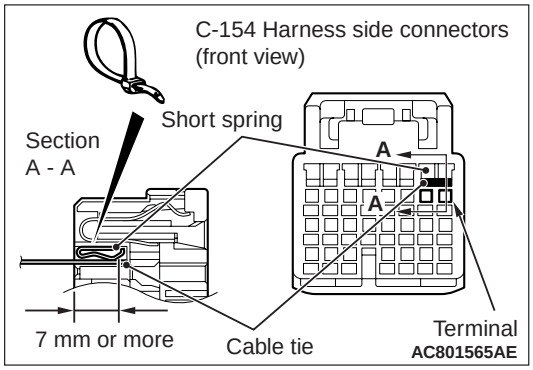
(2) Disconnect SRS-ECU connector C-154.



(3) Disconnect passenger's (front) air bag module connector C-02. Pull up the harness side lock lever with a nail and disconnect the connector

lock.

⚠ CAUTION

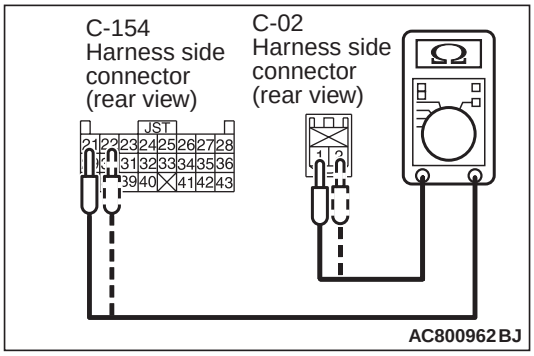


Insert an insulator such as a cable tie to a depth of 7 mm or more, otherwise the short spring will not be released.

(4) Insert a cable tie [3 mm wide, 0.5 mm thick] between terminals 21, 22 and the short spring to release the short spring.

(5) Check that the passenger's air bag cut off switch is "ON" position.

⚠ CAUTION



Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(6) Resistance measurement between the following terminals.

- SRS-ECU connector C-154 terminal No.21 and the passenger's (front) air bag module connector C-02 terminal No.1
- SRS-ECU connector C-154 terminal No.22 and the passenger's (front) air bag module connector C-02 terminal No.2

OK: Continuity (Less than 2 Ω)

Q: Are the check results normal?

YES : Go to Step 4 .

NO : Repair the harness wires between SRS-ECU connector C-154 (terminal No.21 and 22) and passenger's (front) air bag module connector C-02 (terminal No.1 and 2).

STEP 4. Check whether the diagnosis code is reset.

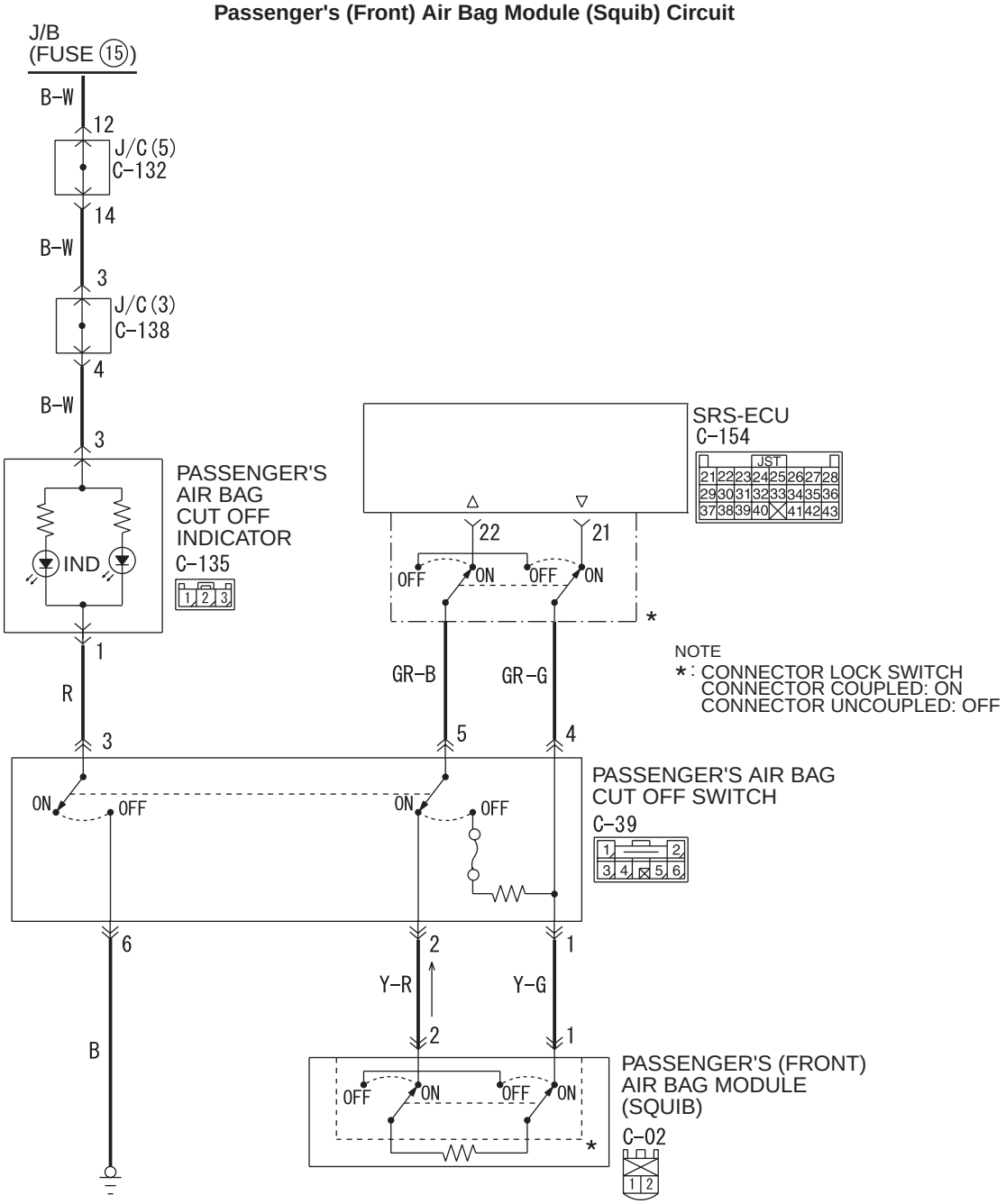
Q: Is diagnosis code B1411 set?

YES : Replace the SRS-ECU (Refer to P.52B-266).

NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1412: Passenger's (front) air bag module (squib) system (short-circuited to the earth)

Passenger's (Front) Air Bag Module (Squib) Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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OPERATION

- The SRS-ECU judges how severe a collision is by detecting signals from the front impact sensors and the front air bag analogue G-sensor. If the impact is over a predetermined level, the SRS-ECU sends an ignition signal. At this time, if the front air bag safing G-sensor is on, the SRS air bag will inflate.
- The ignition signal is input to the air bag module to inflate the air bag.

DIAGNOSIS CODE SET CONDITIONS

This diagnosis code is set if the passenger's (front) air bag squib wire(s) are short-circuited to the earth.

PROBABLE CAUSES

- Damaged harness wires and connectors
- Short to the earth in the passenger's (front) air bag module (squib) harness
- Malfunction of the passenger's air bag cut off switch
- Malfunction of the SRS-ECU

DIAGNOSIS PROCEDURE

STEP 1. Check the passenger's air bag cut off switch.

Check the passenger's air bag cut off switch (Refer to P.52B-288).

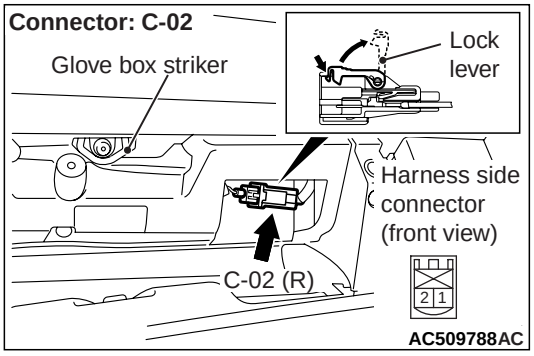
Q: Is the check result normal?

YES : Go to Step 2.

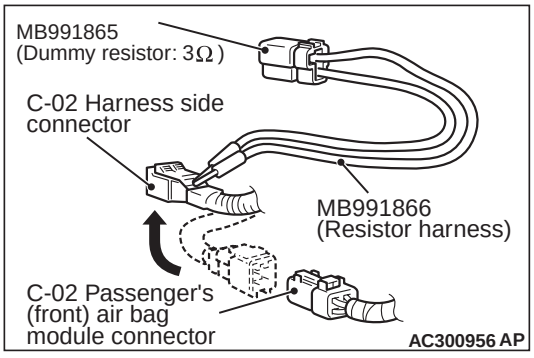
NO : Replace passenger's air bag cut off switch (Refer to P.52B-287).

STEP 2. Check the diagnosis code by connecting a dummy resistor. (M.U.T.-III diagnosis code)

(1) Disconnect the negative battery terminal.



(2) Disconnect passenger's (front) air bag module connector C-02. Pull up the harness side lock lever with a nail and disconnect the connector lock.



(3) Connect special tool dummy resistor (MB991865) to special tool resistor harness (MB991866).

⚠ CAUTION

Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(4) Insert special tool (MB991866) into the harness side connector C-02 by backprobing.

(5) Check that the passenger's air bag cut off switch is "ON" position.

(6) Connect the negative battery terminal.

(7) Erase the diagnosis code memory, and check the diagnosis code.

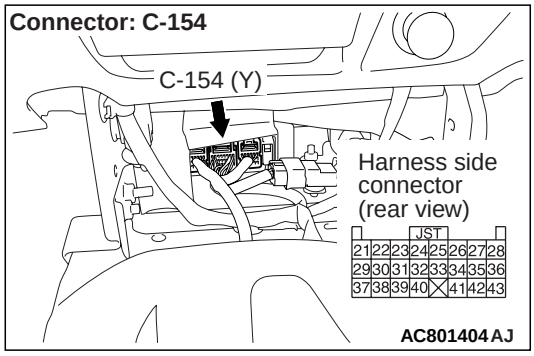
Q: Is diagnosis code B1412 set?

YES : Go to Step 3.

NO : Replace the passenger's (front) air bag module (Refer to P.52B-268).

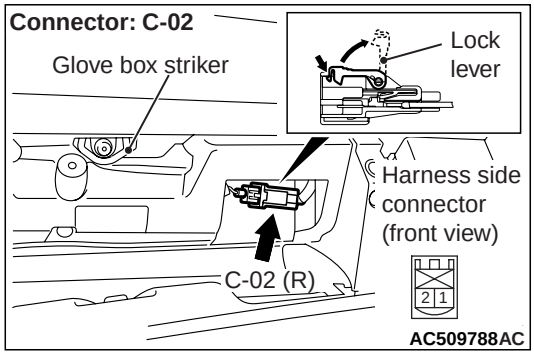
STEP 3. Resistance measurement at the SRS-ECU connector C-154.

(1) Disconnect the negative battery terminal.



(2) Disconnect SRS-ECU connector C-154.

⚠ DANGER

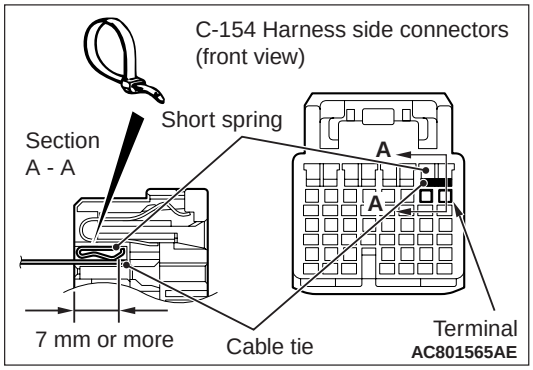


To prevents the air bag from deploying unintentionally, disconnect the passenger's (front) air bag module connector C-02 to short the squib circuit.

(3) Disconnect passenger's (front) air bag module connector C-02. Pull up the harness side lock lever with a nail and disconnect the connector

lock.

⚠ CAUTION

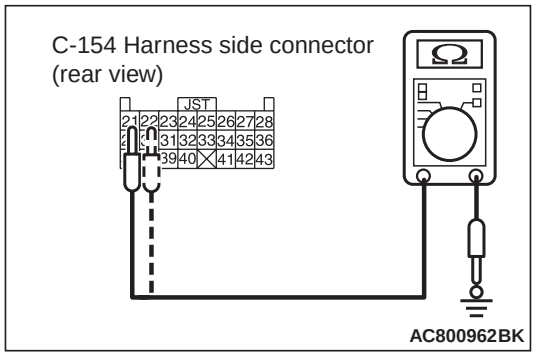


Insert an insulator such as a cable tie to a depth of 7 mm or more, otherwise the short spring will not be released.

(4) Insert a cable tie [3 mm wide, 0.5 mm thick] between terminals 21, 22 and the short spring to release the short spring.

(5) Check that the passenger's air bag cut off switch is "ON" position.

⚠ CAUTION



Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(6) Resistance measurement between C-154 harness side connector terminals 21, 22 and body earth.

OK: Open circuit

Q: Is the check result normal?

YES : Go to Step 4.

NO : Repair the harness wires between SRS-ECU connector C-154 (terminal No.21 and 22) and passenger's (front) air bag module connector C-02 (terminal No.1 and 2).

STEP 4. Check whether the diagnosis code is reset.

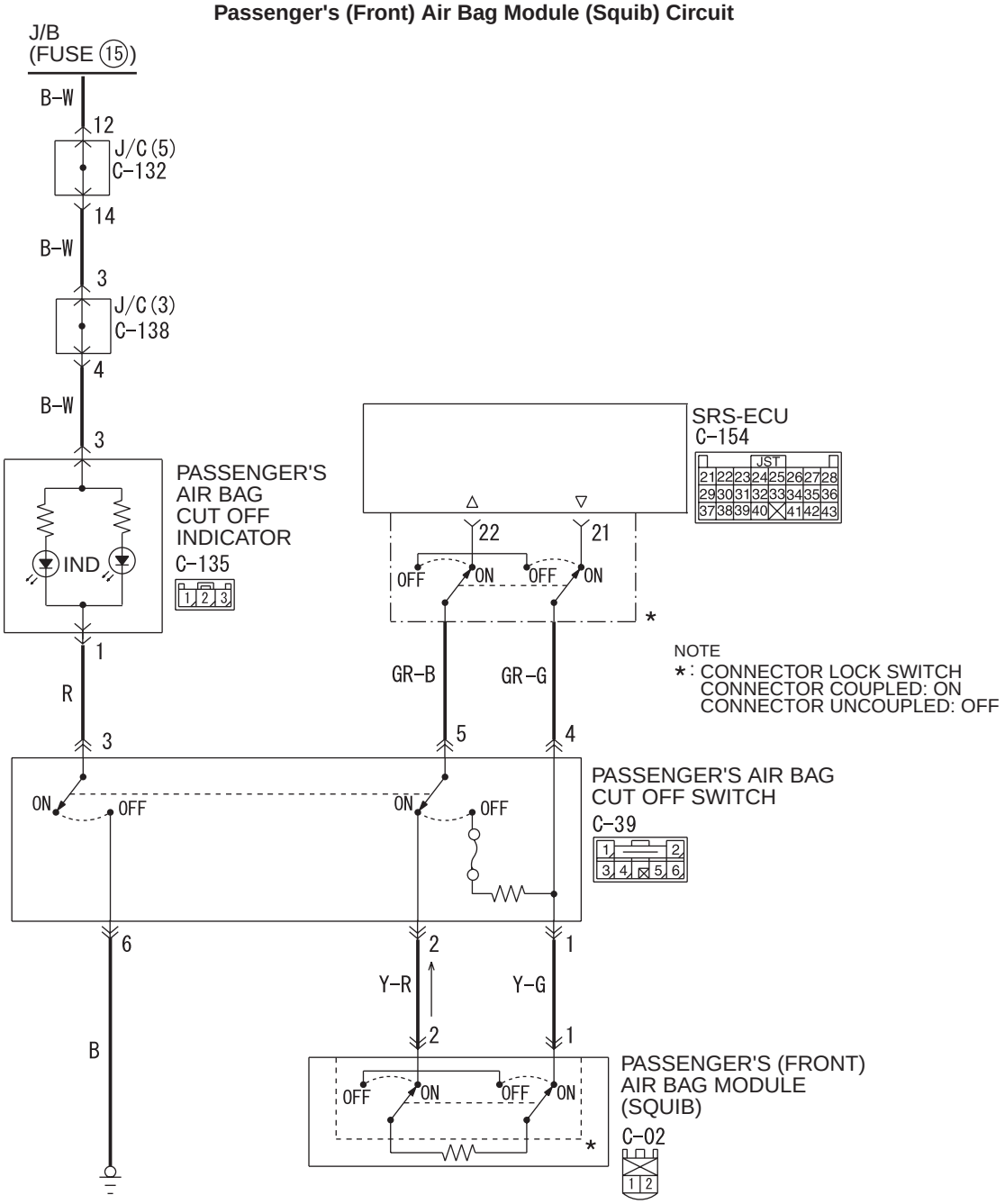
Q: Is diagnosis code B1412 set?

YES : Replace the SRS-ECU (Refer to P.52B-266).

NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1413: Passenger's (front) air bag module (squib) system (short-circuited to the power supply)

Passenger's (Front) Air Bag Module (Squib) Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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OPERATION

- The SRS-ECU judges how severe a collision is by detecting signals from the front impact sensors and the front air bag analogue G-sensor. If the impact is over a predetermined level, the SRS-ECU sends an ignition signal. At this time, if the front air bag safing G-sensor is on, the SRS air bag will inflate.
- The ignition signal is input to the air bag module to inflate the air bag.

DIAGNOSIS CODE SET CONDITIONS
This diagnosis code is set if the passenger's (front) air bag squib wire(s) are short-circuited to the power supply.

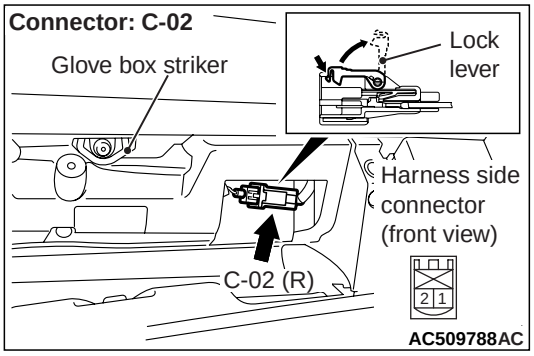
PROBABLE CAUSES
- Damaged harness wires and connectors
- Short to the power supply in the passenger's (front) air bag module (squib) harness
- Malfunction of the passenger's air bag cut off switch
- Malfunction of the SRS-ECU

DIAGNOSIS PROCEDURE

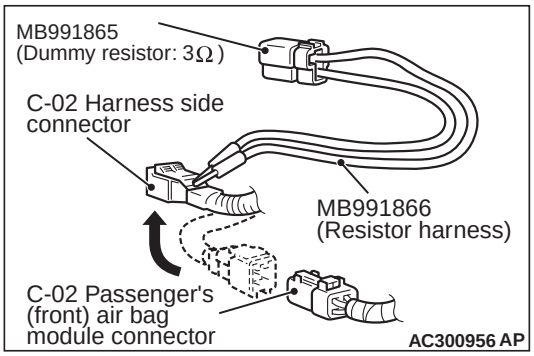
STEP 1. Check the passenger's air bag cut off switch.
Check the passenger's air bag cut off switch (Refer to P.52B-288).

Q: Is the check result normal?
YES : Go to Step 2.
NO : Replace passenger's air bag cut off switch (Refer to P.52B-287).

STEP2. Check the diagnosis code by connecting a dummy resistor. (M.U.T.-III diagnosis code)
(1) Disconnect the negative battery terminal.



(2) Disconnect passenger's (front) air bag module connector C-02. Pull up the harness side lock lever with a nail and disconnect the connector lock.

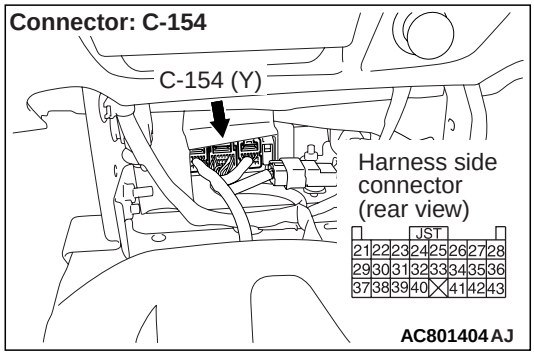


(3) Connect special tool dummy resistor (MB991865) to special tool resistor harness (MB991866).

⚠ CAUTION
Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.
(4) Insert special tool (MB991866) into the harness side connector C-02 by backprobing.
(5) Check that the passenger's air bag cut off switch is "ON" position.
(6) Connect the negative battery terminal.
(7) Erase the diagnosis code memory, and check the diagnosis code.

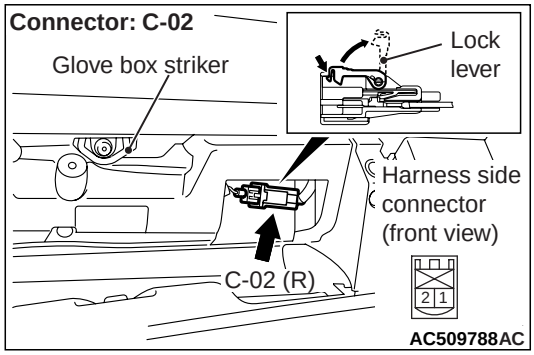
Q: Is diagnosis code B1413 set?
YES : Go to Step 3.
NO : Replace the passenger's (front) air bag module (Refer to P.52B-268).

STEP 3. Voltage measurement at the SRS-ECU connector C-154.
(1) Disconnect the negative battery terminal.



(2) Disconnect SRS-ECU connector C-154.

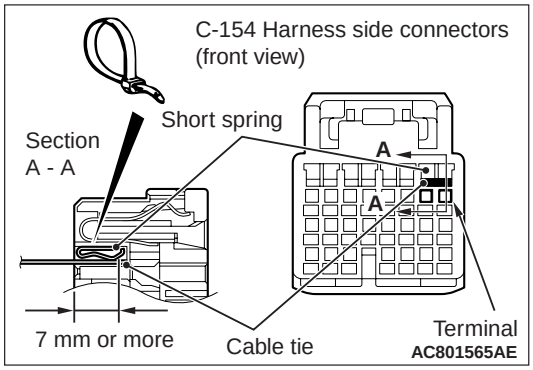
⚠ DANGER



To prevents the air bag from deploying unintentionally, disconnect the passenger's (front) air bag module connector C-02 to short the squib circuit.
(3) Disconnect passenger's (front) air bag module connector C-02. Pull up the harness side lock lever with a nail and disconnect the connector

lock.

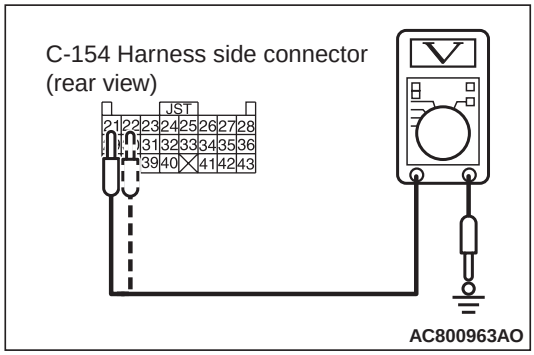
⚠ CAUTION



Insert an insulator such as a cable tie to a depth of 7 mm or more, otherwise the short spring will not be released.

(4) Insert a cable tie [3 mm wide, 0.5 mm thick] between terminals 21, 22 and the short spring to release the short spring.
(5) Connect the negative battery terminal.
(6) Turn the ignition switch to the "ON" position.
(7) Check that the passenger's air bag cut off switch is "ON" position.

⚠ CAUTION



Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(8) Voltage measurement between C-154 harness side connector terminals 21, 22 and body earth.

OK: 1 V or less

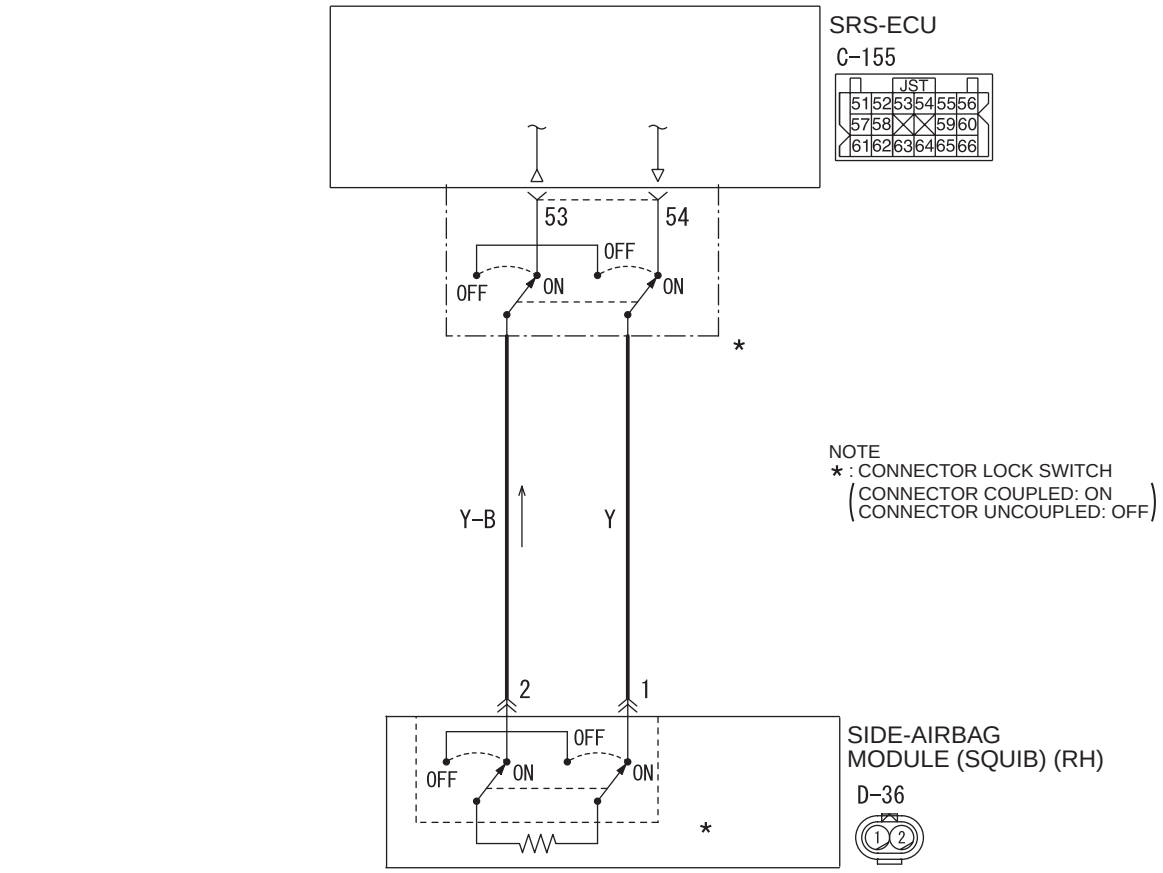
Q: Is the check result normal?
YES : Go to Step 4.
NO : Repair the harness wires between SRS-ECU connector C-154 (terminal No.21 and 22) and passenger's (front) air bag module connector C-02 (terminal No.1 and 2).

STEP 4. Check whether the diagnosis code is reset.

Q: Is diagnosis code B1413 set?
YES : Replace the SRS-ECU (Refer to P.52B-266).
NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1420: Side-airbag module (RH) (squib) system (short-circuited between terminals of the squib circuit)

Side-Airbag Module (RH) (Squib) Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

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OPERATION

- The SRS-ECU judges how severe a collision is by detecting signals from the left and right side impact sensors. If the impact is over a predetermined level, the SRS-ECU sends an ignition signal. At this time, if the side air bag safing G-sensor is on, the SRS side-airbag will inflate.
- The ignition signal is input to the side-airbag module to inflate the side-airbag.

DIAGNOSIS CODE SET CONDITIONS

This diagnosis code is set if one side-airbag (RH) squib wire shorted to the other.

PROBABLE CAUSES

- Improper engaged connector or defective short spring*
- Short circuit between the side-airbag module (RH) (squib) circuit terminals
- Damaged connector(s)
- Malfunction of the SRS-ECU

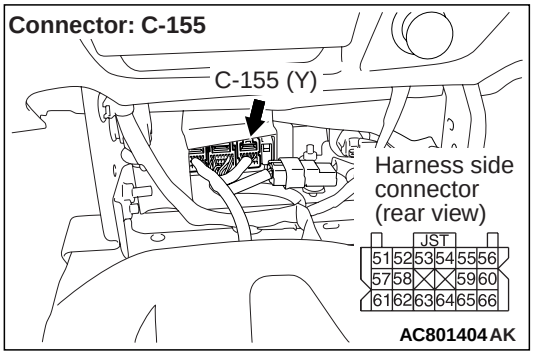
*NOTE: *: The squib circuit connectors integrate a "short" spring (which prevents the air bag from deploying unintentionally due to static electricity by shorting the positive wire to the earth wire in the squib circuit when the connectors are disconnected).Therefore, if connector C-155 or D-36 is damaged or improperly engaged, the short spring may not be released when the connector is connected.*

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code.

Q: Is diagnosis code B1519 set?
YES : Go to Step 2
NO : Go to Step 3

STEP 2. Connector lock check: SRS-ECU connector C-155. (M.U.T.-III diagnosis code)
(1) Disconnect the negative battery terminal.

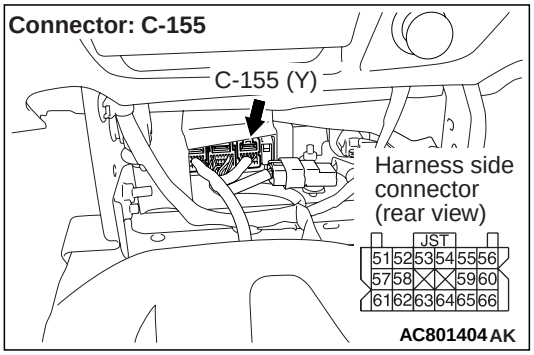


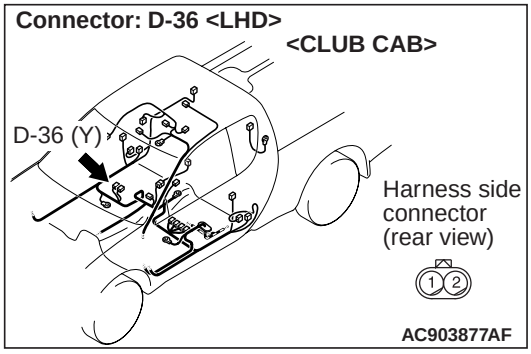
(2) Disconnect the connectors C-155 and then reconnect them.
(3) Connect the negative battery terminal.
(4) Erase the diagnosis code memory, and check the diagnosis code.

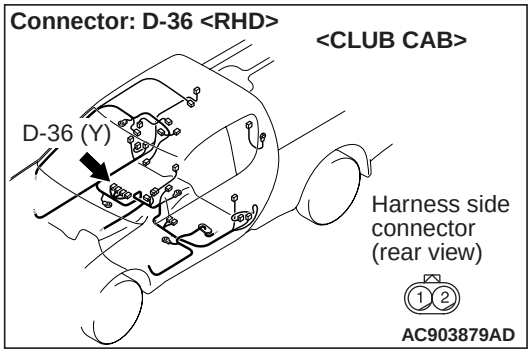
Q: Is diagnosis code B1420 set?
YES : Go to Step 3
NO : The procedure is complete. It is assumed that diagnosis code B1420 set as connector C-155 was engaged improperly.

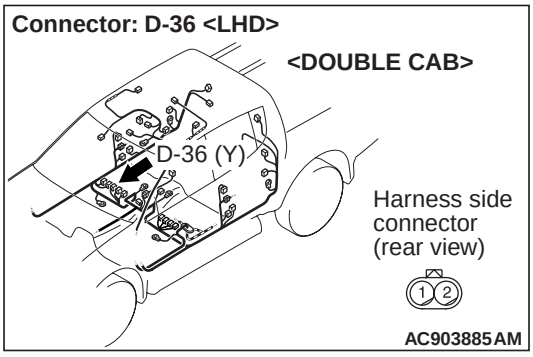
STEP 3. Connector lock check: SRS-ECU connector C-155 and side-airbag module (RH) connector D-36. (M.U.T.-III diagnosis code)

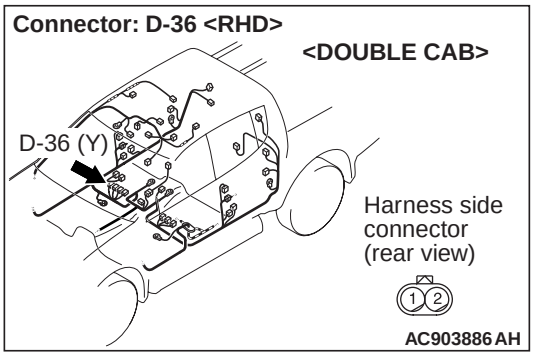
(1) Disconnect the negative battery terminal.

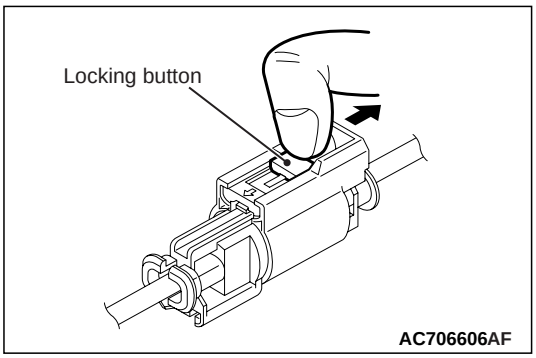










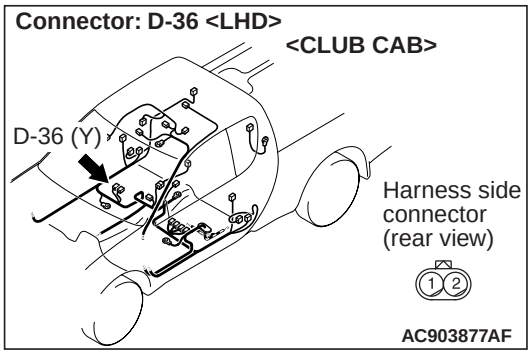


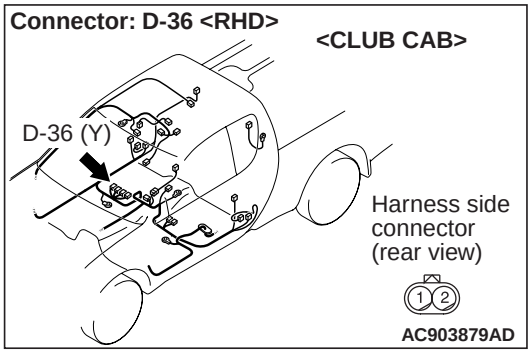
(2) Disconnect connectors C-155 and D-36, and then reconnect them. When disconnecting connector D-36, unlock the connector by sliding the locking button to the direction of the arrow as shown in the figure, and then disconnect the connector.
(3) Connect the negative battery terminal.
(4) Erase the diagnosis code memory, and check the diagnosis code.

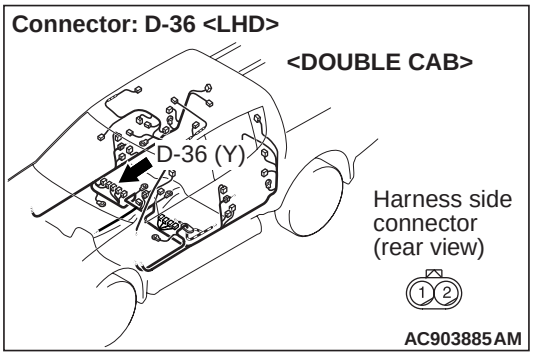
Q: Is diagnosis code B1420 set?
YES : Go to Step 4
NO : The procedure is complete. It is assumed that diagnosis code B1420 set as connector C-155 or D-36 was engaged improperly.

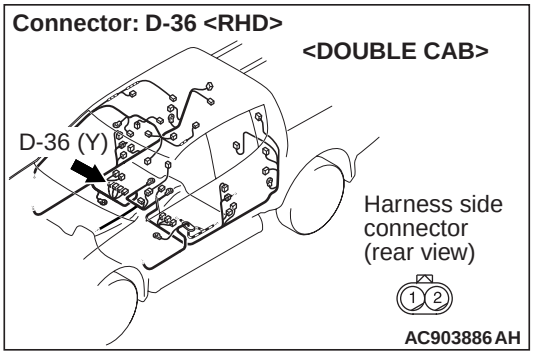
STEP 4. Check the diagnosis code by connecting a dummy resistor. (M.U.T.-III diagnosis code)

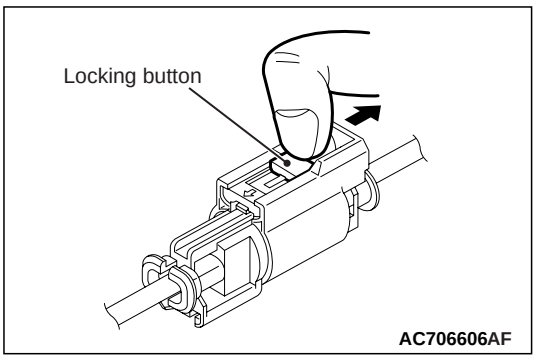
(1) Disconnect the negative battery terminal.





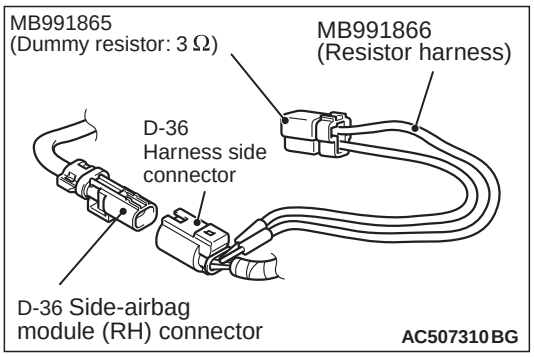






(2) Disconnect side-airbag module (RH) connector

D-36. When disconnecting connector D-36, unlock the connector by sliding the locking button to the direction of the arrow as shown in the figure, and then disconnect the connector.



(3) Connect special tool dummy resistor (MB991865) to special tool resistor harness (MB991866).

⚠ CAUTION

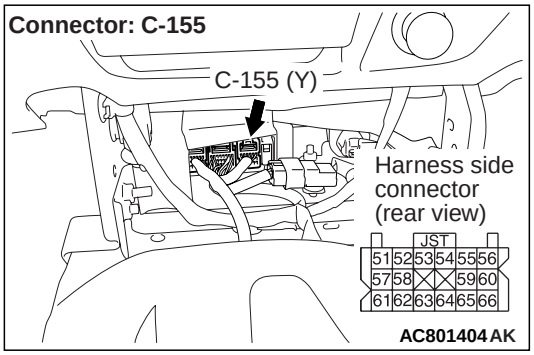
Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(4) Insert special tool (MB991866) into the harness side connector D-36 by backprobing.
(5) Connect the negative battery terminal.
(6) Erase the diagnosis code memory, and check the diagnosis code.

Q: Is diagnosis code B1420 set?
YES : Go to Step 5
NO : Replace the front seatback assembly (RH) (Refer to P.52B-276).

STEP 5. Resistance measurement at SRS-ECU connector C-155.

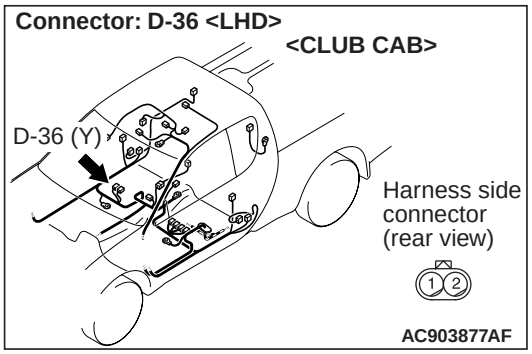
(1) Disconnect the negative battery terminal.

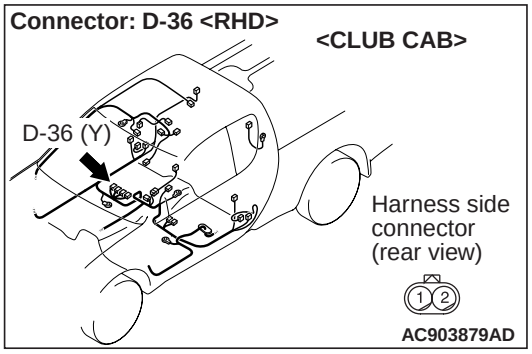


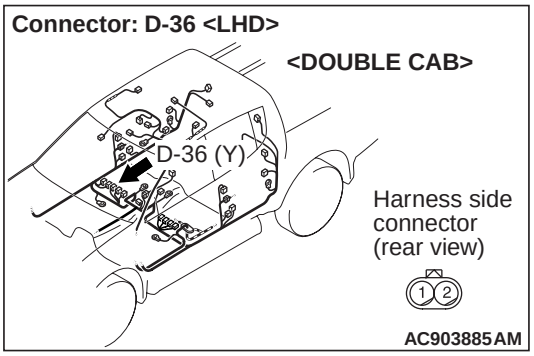
(2) Disconnect SRS-ECU connector C-155.

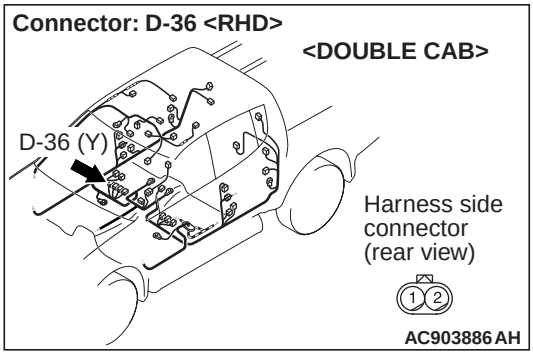
⚠ DANGER

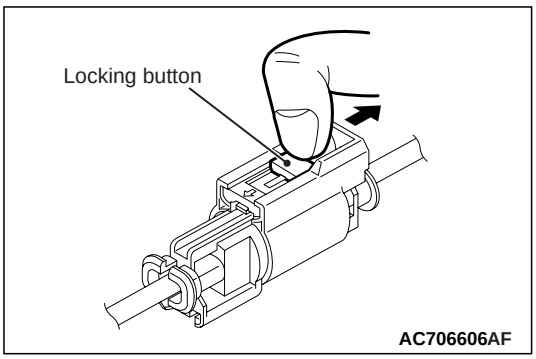
To prevents the air bag from deploying unintentionally, disconnect the side-airbag module (RH) connector D-36 to short the squib circuit.







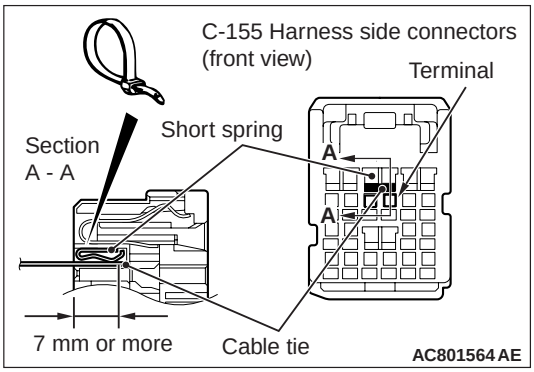




(3) Disconnect side-airbag module (RH) connector

D-36. When disconnecting connector D-36, unlock the connector by sliding the locking button to the direction of the arrow as shown in the figure, and then disconnect the connector.

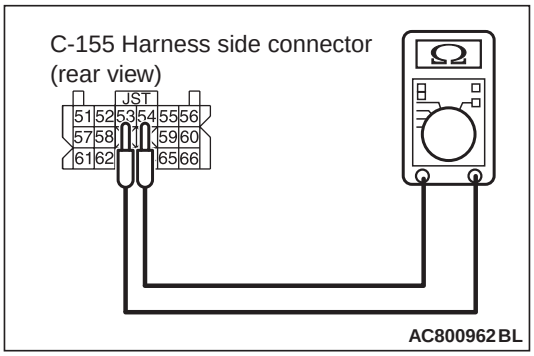
⚠ CAUTION



Insert an insulator such as a cable tie to a depth of 7 mm or more, otherwise the short spring will not be released.

(4) Insert a cable tie [3 mm wide, 0.5 mm thick] between terminals 53, 54 and the short spring to release the short spring.

⚠ CAUTION



Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(5) Resistance measurement between C-155 harness side connector terminals 53 and 54.

OK: Open circuit

Q: Is the check result normal?

YES : Go to Step 6

NO : Repair the harness wires between SRS-ECU connector C-155 (terminal No.53 and 54) and side-airbag module (RH) connector D-36 (terminal No.2 and 1).

STEP 6. Check whether the diagnosis code is reset.

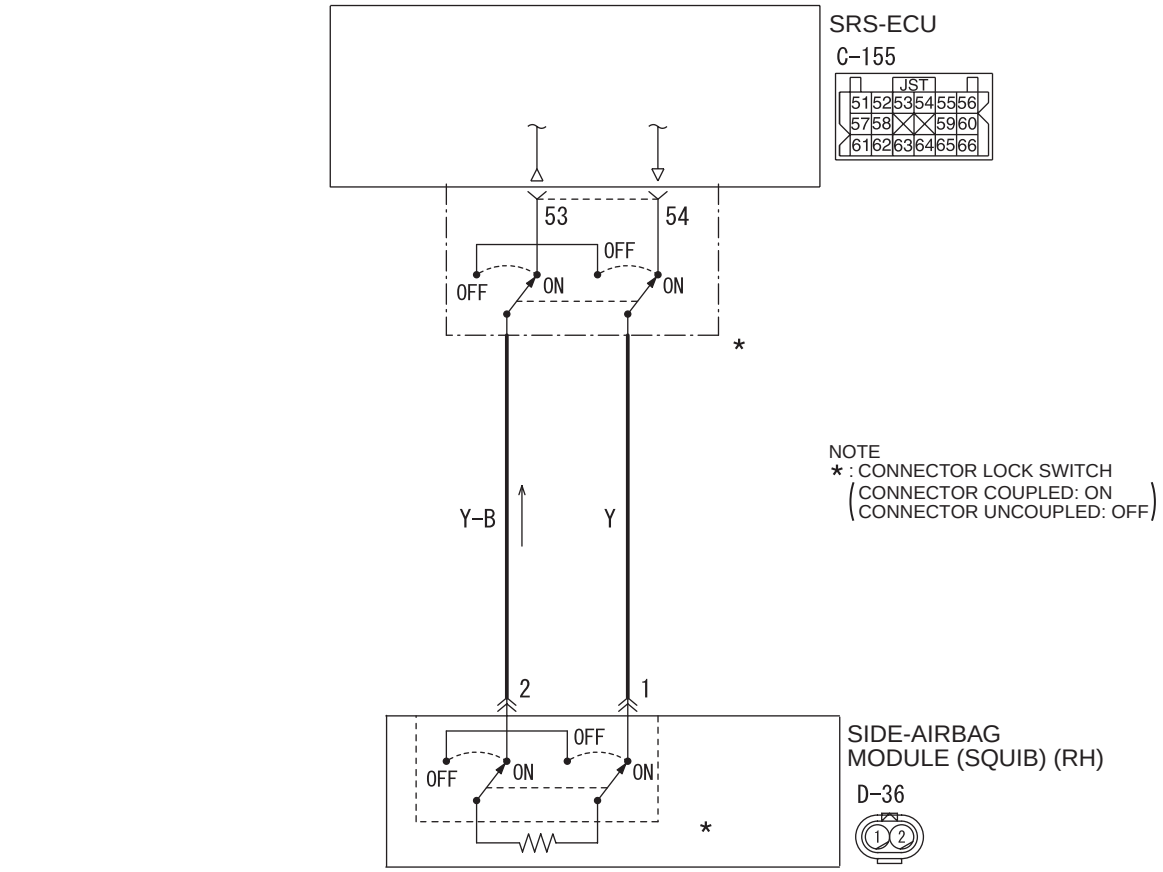
Q: Is diagnosis code B1420 set?

YES : Replace the SRS-ECU (Refer to P.52B-266).

NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1421: Side-airbag module (RH) (squib) system (open-circuited in the squib circuit)

Side-Airbag Module (RH) (Squib) Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

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OPERATION

- The SRS-ECU judges how severe a collision is by detecting signals from the left and right side impact sensors. If the impact is over a predetermined level, the SRS-ECU sends an ignition signal. At this time, if the side air bag safing G-sensor is on, the SRS side-airbag will inflate.
- The ignition signal is input to the side-airbag module to inflate the side-airbag.

DIAGNOSIS CODE SET CONDITIONS

This diagnosis code is set if side-airbag module (RH) squib wire(s) are open-circuited.

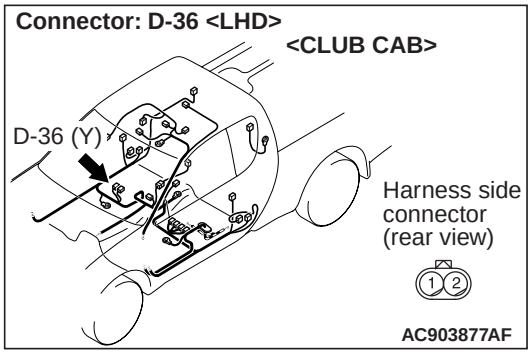
PROBABLE CAUSES

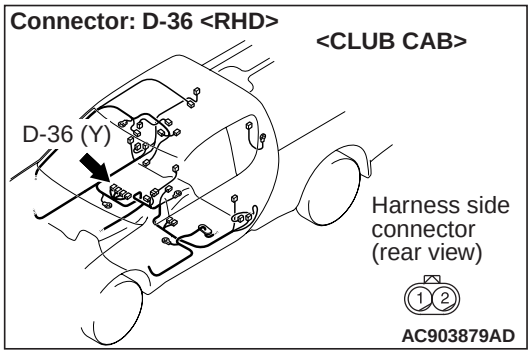
- Open circuit in the side-airbag module (RH) (squib) circuit
- Improper connector contact
- Malfunction of the SRS-ECU

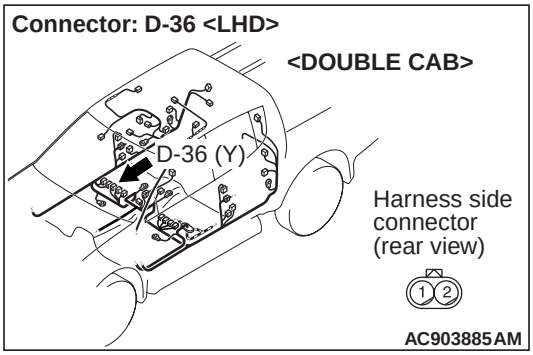
DIAGNOSIS PROCEDURE

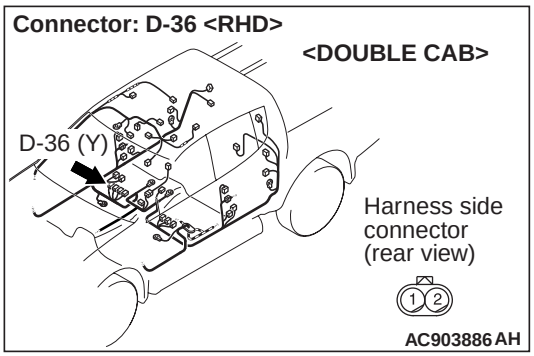
STEP 1. Check the diagnosis code by connecting a dummy resistor. (M.U.T.-III diagnosis code)

(1) Disconnect the negative battery terminal.

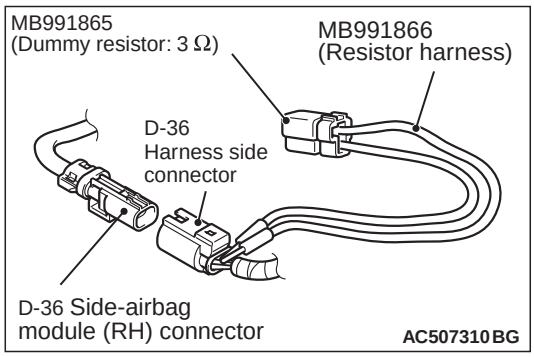








(2) Disconnect side-airbag module (RH) connector D-36. When disconnecting connector D-36, unlock the connector by sliding the locking button to the direction of the arrow as shown in the figure, and then disconnect the connector.



(3) Connect special tool dummy resistor (MB991865) to special tool resistor harness (MB991866).

⚠ CAUTION

Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(4) Insert special tool (MB991866) into the harness side connector D-36 by backprobing.
(5) Connect the negative battery terminal.
(6) Erase the diagnosis code memory, and check the diagnosis code.

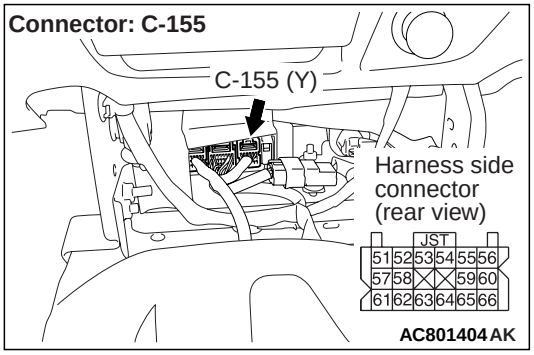
Q: Is diagnosis code B1421 set?

YES : Go to Step 2

NO : Replace the front seatback assembly (RH) (Refer to P.52B-276).

STEP 2. Resistance measurement between SRS-ECU connector C-155 (terminal No.53 and 54) and the side-airbag module (RH) connector D-36 (terminal No.2 and 1).

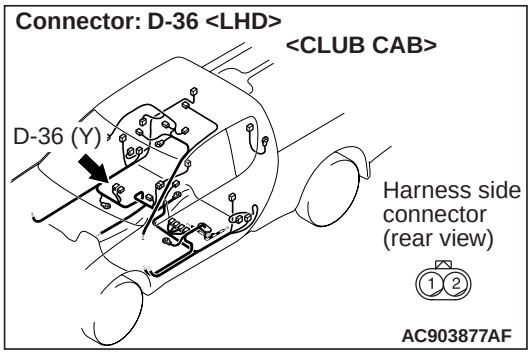
(1) Disconnect the negative battery terminal.

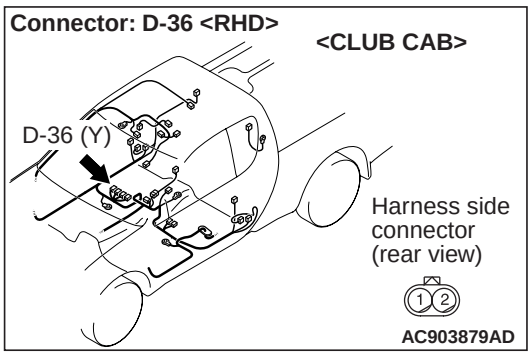


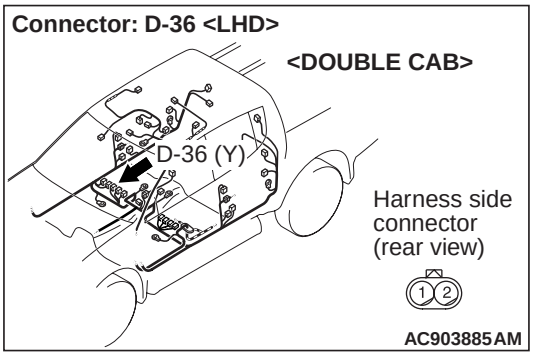
(2) Disconnect SRS-ECU connector C-155.

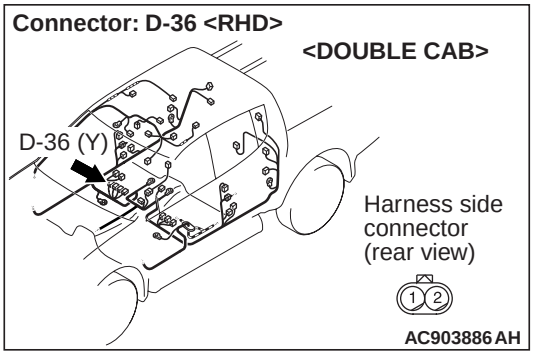
⚠ ***DANGER***

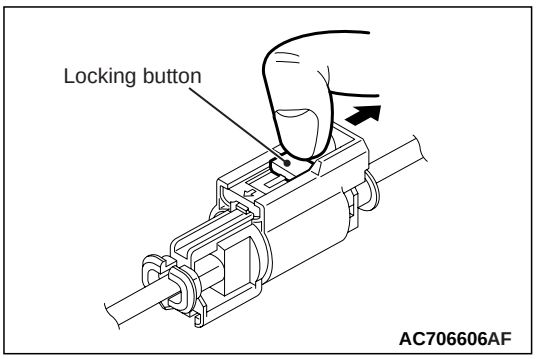
To prevents the air bag from deploying unintentionally, disconnect the side-airbag module (RH) connector D-36 to short the squib circuit.







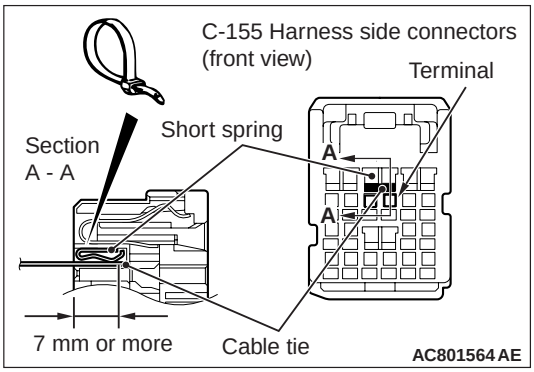




(3) Disconnect side-airbag module (RH) connector

D-36. When disconnecting connector D-36, unlock the connector by sliding the locking button to the direction of the arrow as shown in the figure, and then disconnect the connector.

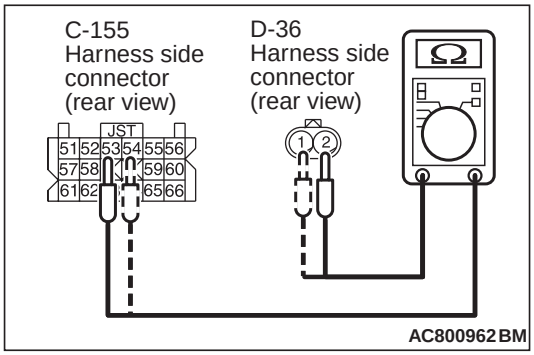
⚠ CAUTION



Insert an insulator such as a cable tie to a depth of 7 mm or more, otherwise the short spring will not be released.

(4) Insert a cable tie [3 mm wide, 0.5 mm thick] between terminals 53, 54 and the short spring to release the short spring.

⚠ CAUTION



Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(5) Resistance measurement between the following terminals.

- SRS-ECU connector C-155 terminal No.53 and the side-airbag module (RH) connector D-36 terminal No.2
- SRS-ECU connector C-155 terminal No.54 and the side-airbag module (RH) connector D-36 terminal No.1

OK: Continuity (Less than 2 Ω)

Q: Are the check results normal?

YES : Go to Step 3

NO : Repair the harness wires between SRS-ECU connector C-155 (terminal No.53 and 54) and side-airbag module (RH) connector D-36 (terminal No.2 and1).

STEP 3. Check whether the diagnosis code is reset.

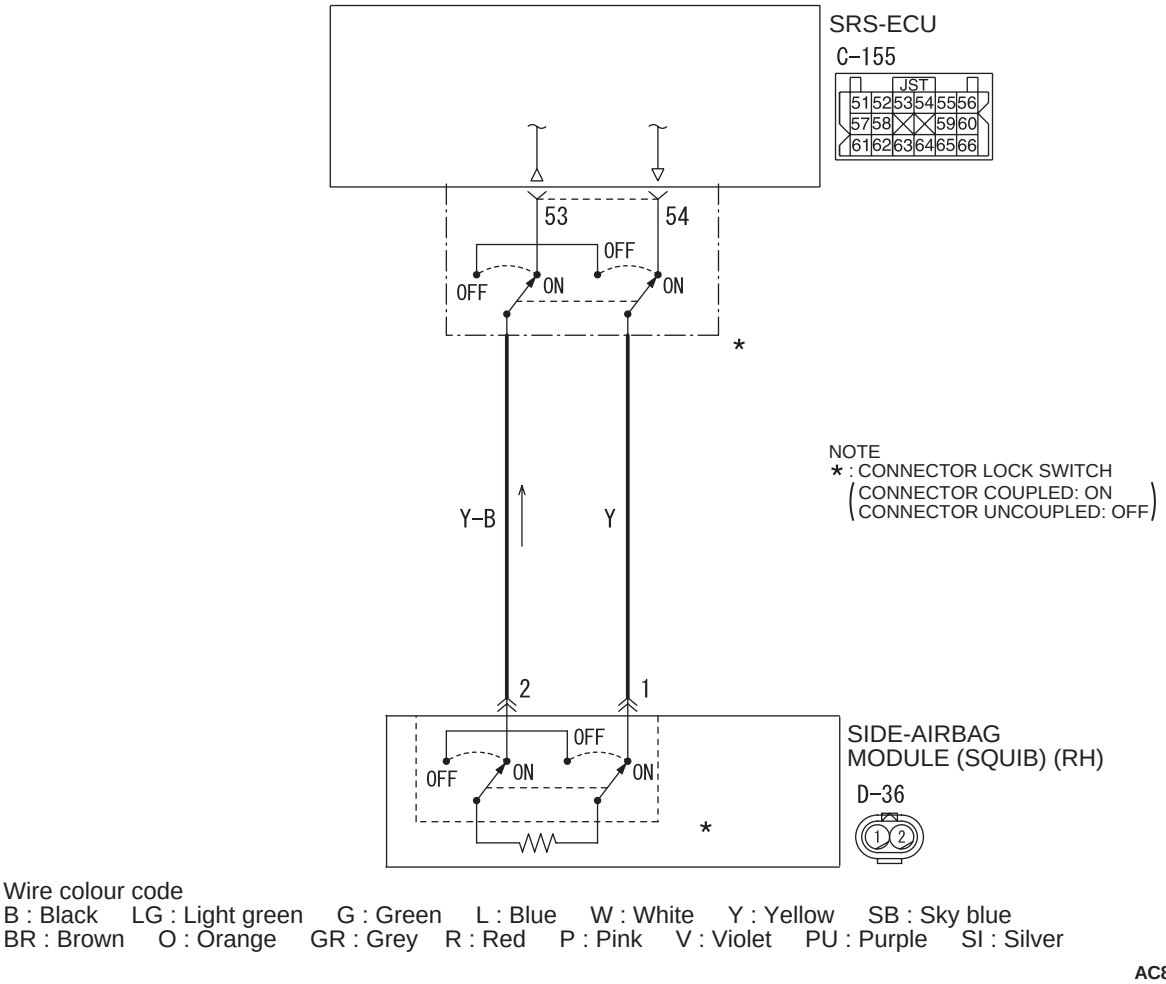
Q: Is diagnosis code B1421 set?

YES : Replace the SRS-ECU (Refer to P.52B-266).

NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1422: Side-airbag module (RH) (squib) system (short-circuited to the earth)

Side-Airbag Module (RH) (Squib) Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

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OPERATION

- The SRS-ECU judges how severe a collision is by detecting signals from the left and right side impact sensors. If the impact is over a predetermined level, the SRS-ECU sends an ignition signal. At this time, if the side air bag safing G-sensor is on, the SRS side-airbag will inflate.
- The ignition signal is input to the side-airbag module to inflate the side-airbag.

DIAGNOSIS CODE SET CONDITIONS

This diagnosis code is set if the side-airbag module (RH) squib wire(s) are short-circuited to the earth.

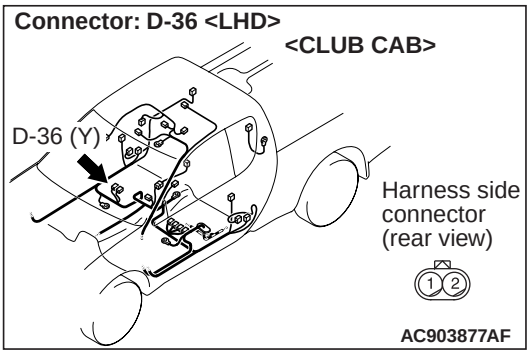
PROBABLE CAUSES

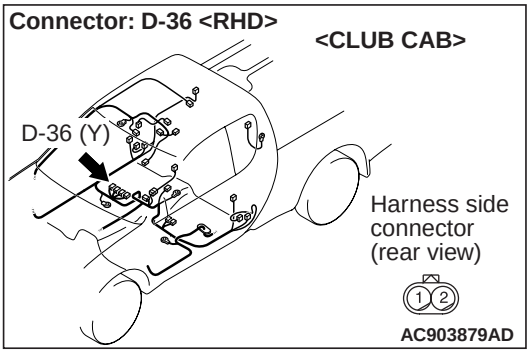
- Damaged harness wires and connectors
- Short to the earth in the side-airbag module (RH) (squib) harness
- Malfunction of the SRS-ECU

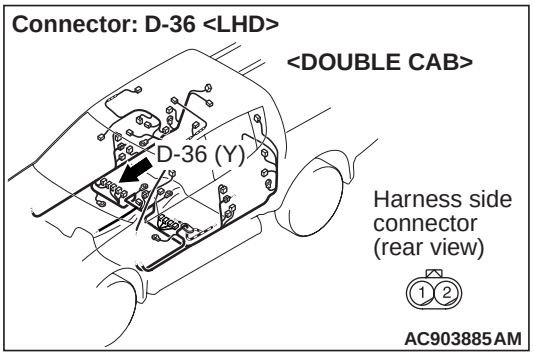
DIAGNOSIS PROCEDURE

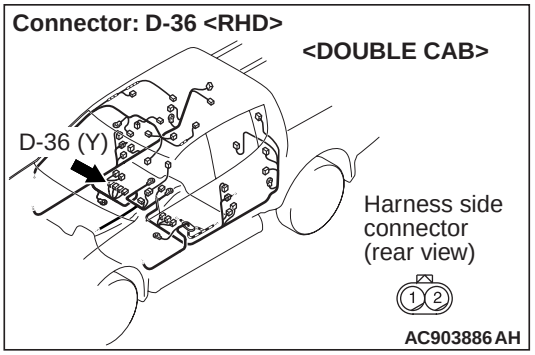
STEP 1. Check the diagnosis code by connecting a dummy resistor. (M.U.T.-III diagnosis code)

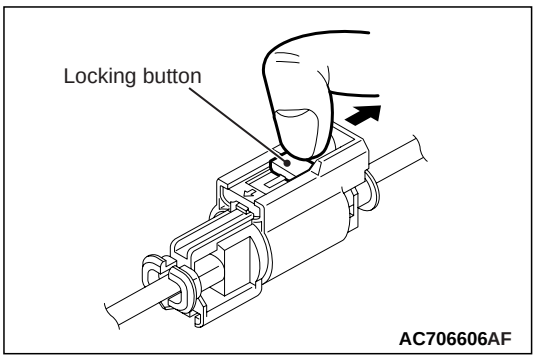
(1) Disconnect the negative battery terminal.





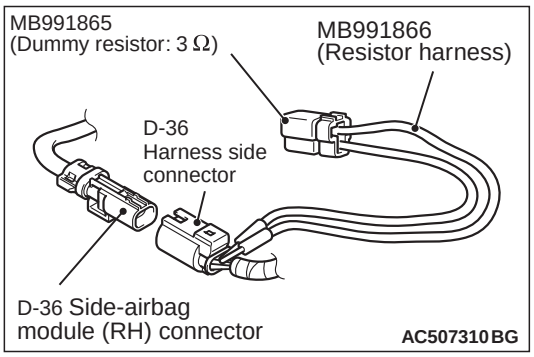






(2) Disconnect side-airbag module (RH) connector

D-36. When disconnecting connector D-36, unlock the connector by sliding the locking button to the direction of the arrow as shown in the figure, and then disconnect the connector.



(3) Connect special tool dummy resistor (MB991865) to special tool resistor harness (MB991866).

⚠ CAUTION

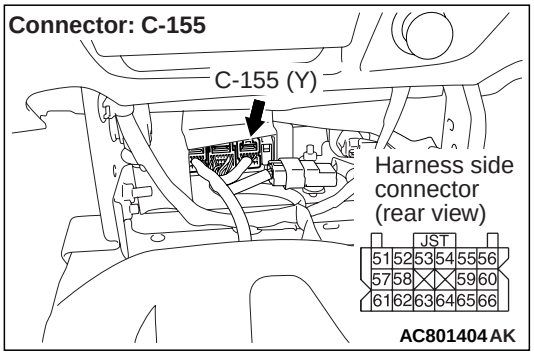
Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(4) Insert special tool (MB991866) into the harness side connector D-36 by backprobing.
(5) Connect the negative battery terminal.
(6) Erase the diagnosis code memory, and check the diagnosis code.

Q: Is diagnosis code B1422 set?
YES : Go to Step 2
NO : Replace the front seatback assembly (RH) (Refer to P.52B-276).

STEP 2. Resistance measurement at the SRS-ECU connector C-155.

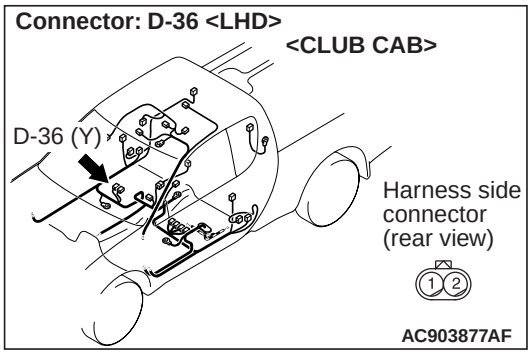
(1) Disconnect the negative battery terminal.

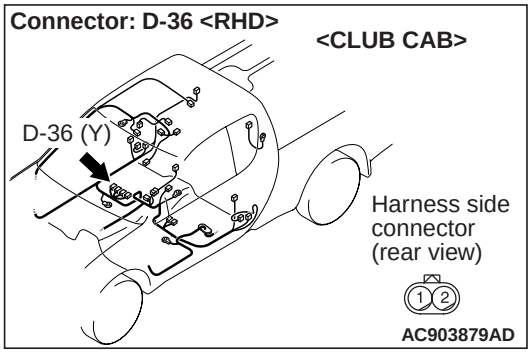


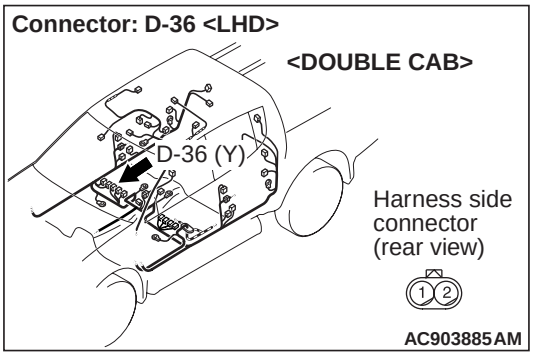
(2) Disconnect SRS-ECU connector C-155.

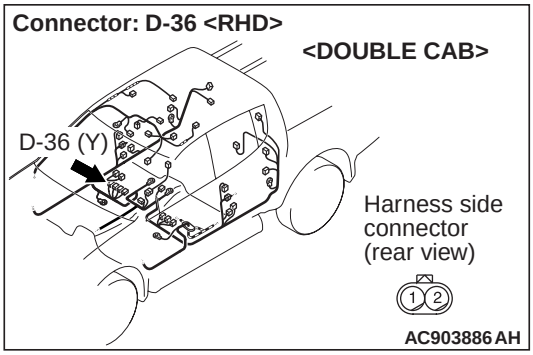
⚠ DANGER

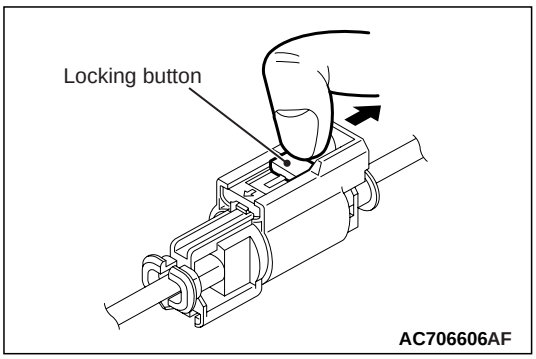
To prevents the air bag from deploying unintentionally, disconnect the side-airbag module (RH) connector D-36 to short the squib circuit.







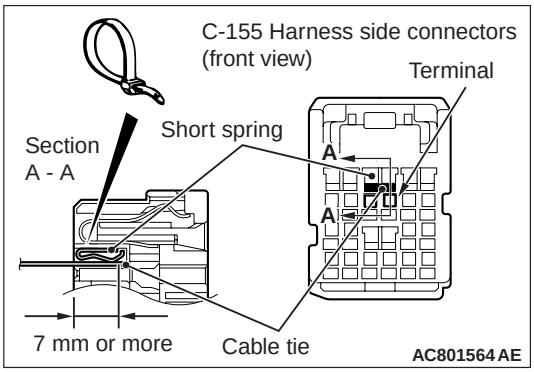




(3) Disconnect side-airbag module (RH) connector

D-36. When disconnecting connector D-36, unlock the connector by sliding the locking button to the direction of the arrow as shown in the figure, and then disconnect the connector.

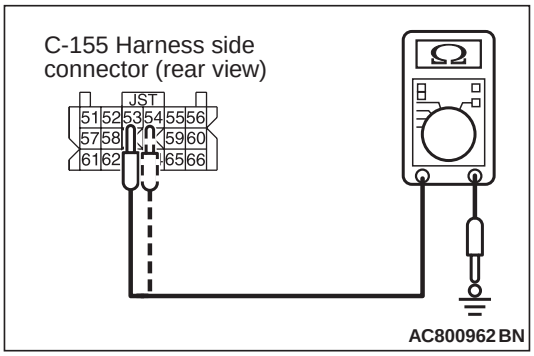
⚠ CAUTION



Insert an insulator such as a cable tie to a depth of 7 mm or more, otherwise the short spring will not be released.

(4) Insert a cable tie [3 mm wide, 0.5 mm thick] between terminals 53, 54 and the short spring to release the short spring.

⚠ CAUTION



Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(5) Resistance measurement between C-155 harness side connector terminals 53, 54 and body earth.

OK: Open circuit

Q: Is the check result normal?

YES : Go to Step 3

NO : Repair the harness wires between SRS-ECU connector C-155 (terminal No.53 and 54) and side-airbag module (RH) connector D-36 (terminal No.2 and 1).

STEP 3. Check whether the diagnosis code is reset.

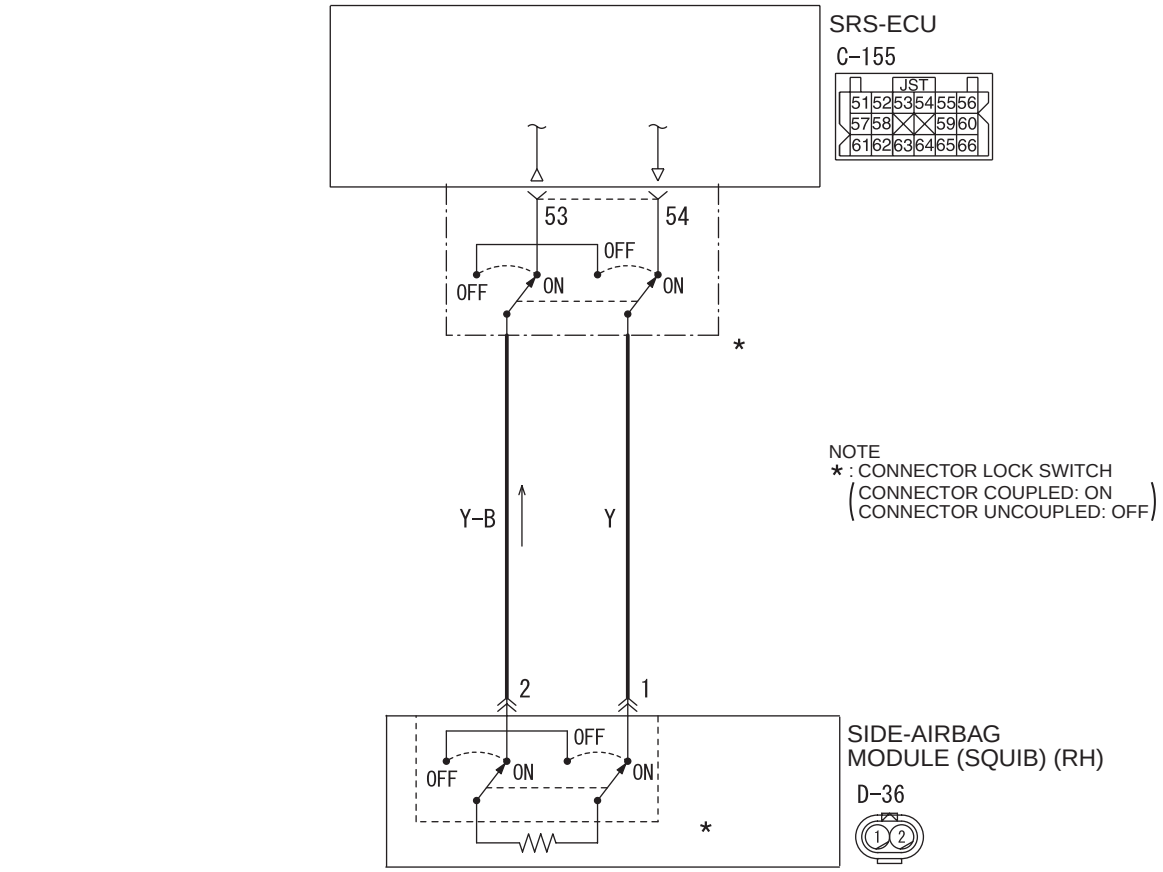
Q: Is diagnosis code B1422 set?

YES : Replace the SRS-ECU (Refer to P.52B-266).

NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1423: Side-airbag module (RH) (squib) system (short-circuited to the power supply)

Side-Airbag Module (RH) (Squib) Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

AC805811AB

OPERATION

- The SRS-ECU judges how severe a collision is by detecting signals from the left and right side impact sensors. If the impact is over a predetermined level, the SRS-ECU sends an ignition signal. At this time, if the side air bag safing G-sensor is on, the SRS side-airbag will inflate.
- The ignition signal is input to the side-airbag module to inflate the side-airbag.

DIAGNOSIS CODE SET CONDITIONS

This diagnosis code is set if the side-airbag (RH) squib wire(s) are short-circuited to the power supply.

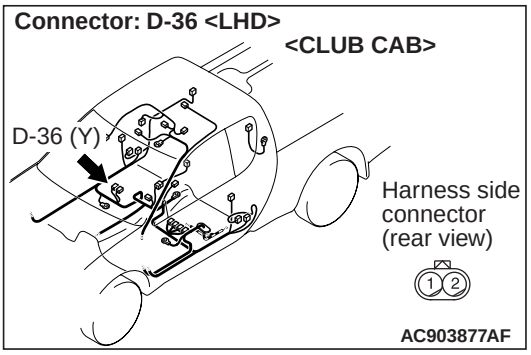
PROBABLE CAUSES

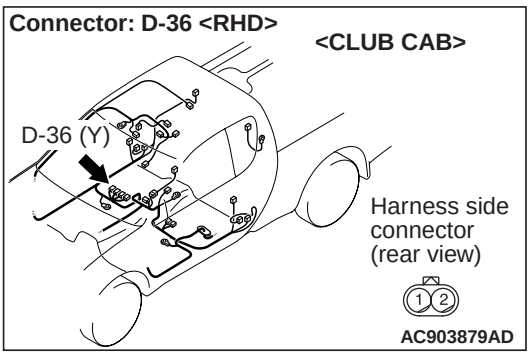
- Damaged harness wires and connectors
- Short to the power supply in the side-airbag module (RH) (squib) harness
- Malfunction of the SRS-ECU

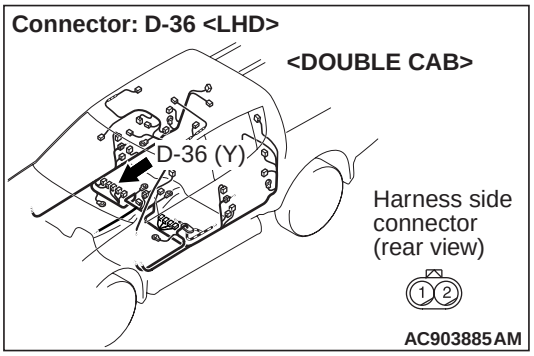
DIAGNOSIS PROCEDURE

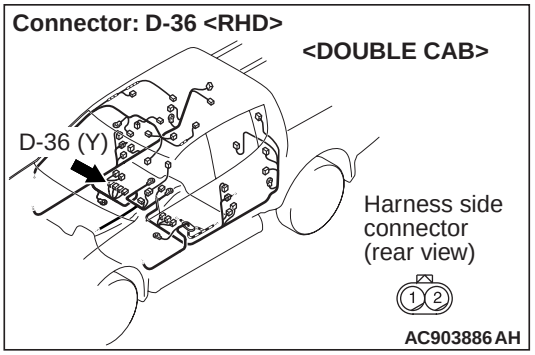
STEP1. Check the diagnosis code by connecting a dummy resistor. (M.U.T.-III diagnosis code)

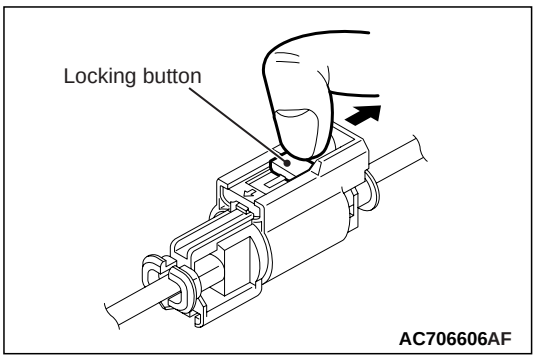
(1) Disconnect the negative battery terminal.





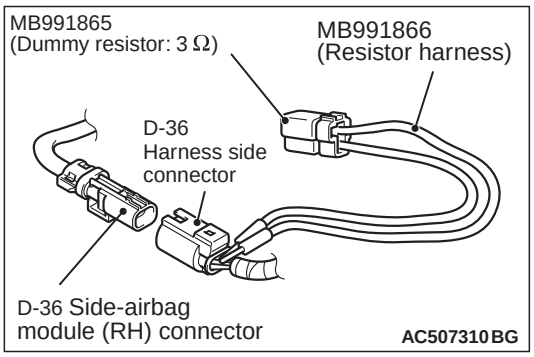






(2) Disconnect side-airbag module (RH) connector

D-36. When disconnecting connector D-36, unlock the connector by sliding the locking button to the direction of the arrow as shown in the figure, and then disconnect the connector.



(3) Connect special tool dummy resistor (MB991865) to special tool resistor harness (MB991866).

⚠ CAUTION

Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(4) Insert special tool (MB991866) into the harness side connector D-36 by backprobing.
(5) Connect the negative battery terminal.
(6) Erase the diagnosis code memory, and check the diagnosis code.

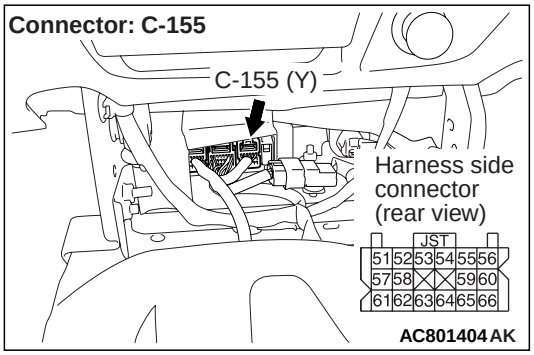
Q: Is diagnosis code B1423 set?

YES : Go to Step 2

NO : Replace the front seatback assembly (RH) (Refer to P.52B-276).

STEP 2. Voltage measurement at the SRS-ECU connector C-155.

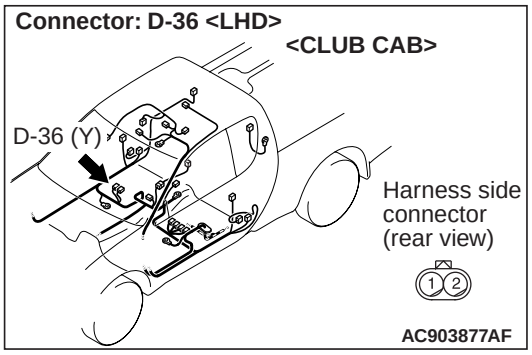
(1) Disconnect the negative battery terminal.

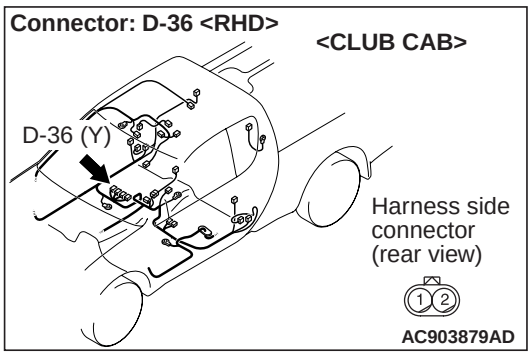


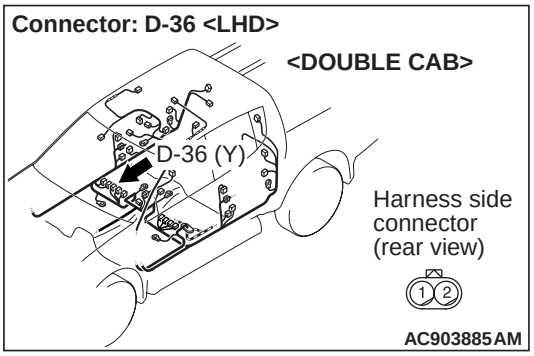
(2) Disconnect SRS-ECU connector C-155.

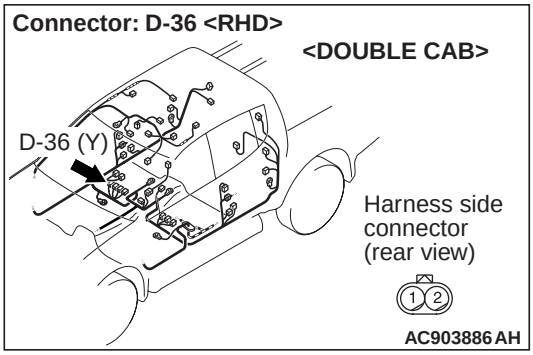
⚠ DANGER

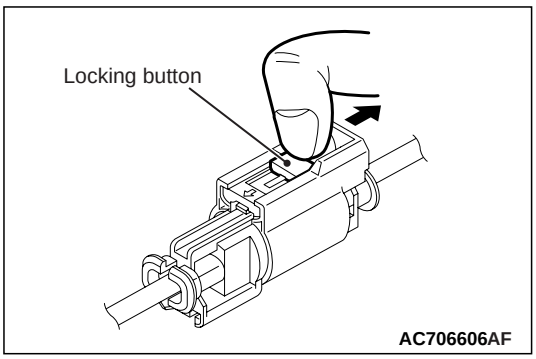
To prevents the air bag from deploying unintentionally, disconnect the side-airbag module (RH) connector D-36 to short the squib circuit.







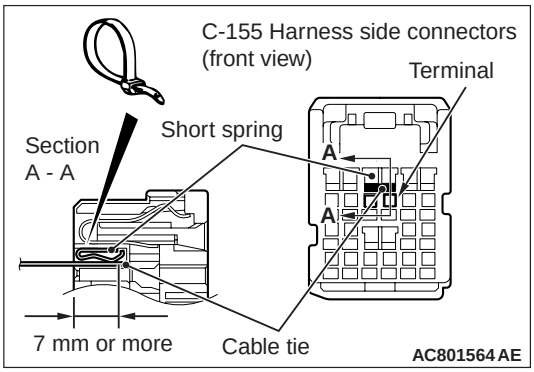




(3) Disconnect side-airbag module (RH) connector

D-36. When disconnecting connector D-36, unlock the connector by sliding the locking button to the direction of the arrow as shown in the figure, and then disconnect the connector.

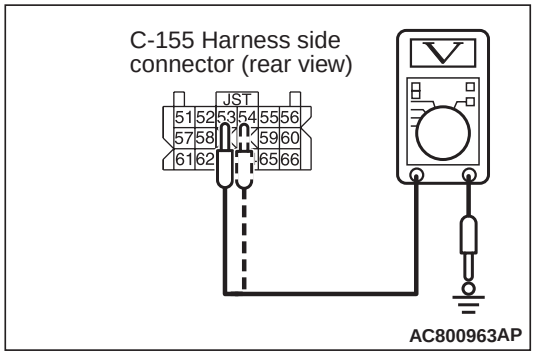
⚠ CAUTION



Insert an insulator such as a cable tie to a depth of 7 mm or more, otherwise the short spring will not be released.

(4) Insert a cable tie [3 mm wide, 0.5 mm thick] between terminals 53, 54 and the short spring to release the short spring.
(5) Connect the negative battery terminal.
(6) Turn the ignition switch to the "ON" position.

⚠ CAUTION



Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(7) Voltage measurement between C-155 harness side connector terminals 53, 54 and body earth.

OK: 1 V or less

Q: Is the check result normal?
YES : Go to Step 3
NO : Repair the harness wires between SRS-ECU connector C-155 (terminal No.53 and 54) and side-airbag (RH) air bag module connector D-36 (terminal No.2 and 1).

STEP 3. Check whether the diagnosis code is reset.

Q: Is diagnosis code B1423 set?
YES : Replace the SRS-ECU (Refer to P.52B-266).
NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1426: G-sensor of side impact sensor (RH) failure
Code No.B1436: G-sensor of side impact sensor (LH) failure

DIAGNOSIS CODE SET CONDITIONS

These diagnosis codes are set if the following conditions are detected from the analogue G-sensor inside the side impact sensor output:

- Analogue G-sensor is not operating.
- Analogue G-sensor characteristics are abnormal.
- Analogue G-sensor output is abnormal.

PROBABLE CAUSES

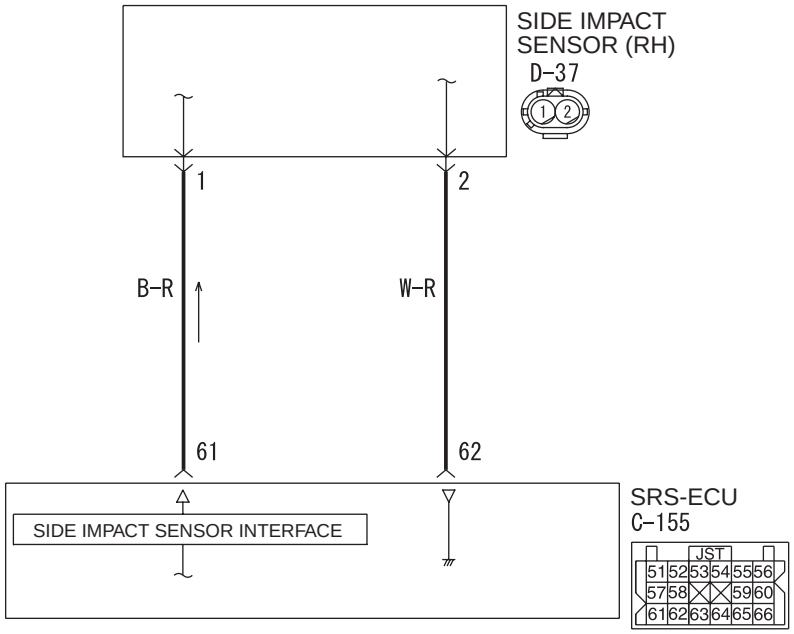
Malfunction of side impact sensor (RH) (for diagnosis code B1426) and side impact sensor (LH) (for diagnosis code B1436)

DIAGNOSIS PROCEDURE

Replace the SRS-ECU and side impact sensor (RH) (for diagnosis code B1426) or replace the SRS-ECU and side impact sensor (LH) (for diagnosis code B1436) (Refer to P.52B-266 <SRS-ECU>, P.52B-282 <Side impact sensor>).

Code No.B1427: Side impact sensor (RH) voltage error

Side Impact Sensor (RH) Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

AC801032 AC

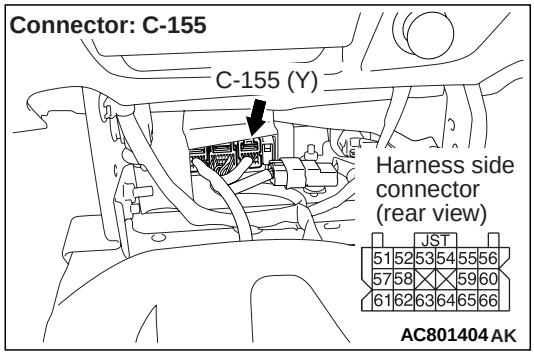
OPERATION
The side impact sensor transmits acceleration data to the SRS-ECU. The SRS-ECU then determines. if the side and/or curtain air bags should be inflated, and then sends an ignition signal. The side impact sensor also diagnoses itself, and sends a diagnosis code to the SRS-ECU if a problem occurs.

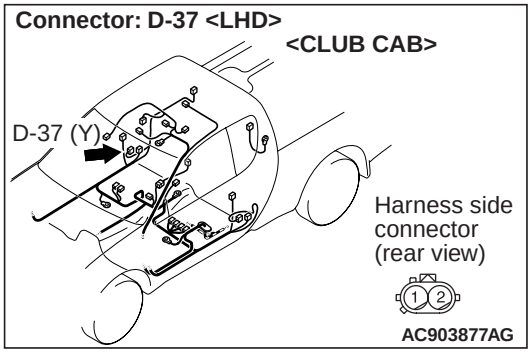
DIAGNOSIS CODE SET CONDITIONS
This diagnosis code will set when the power supply voltage to the side impact sensor (RH) remains less than a predetermined value for one second.

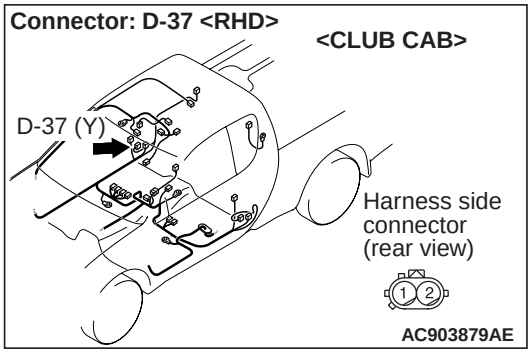
PROBABLE CAUSES
- Damaged wiring harness or connectors
- Malfunction of the side impact sensor (RH)
- Malfunction of the SRS-ECU

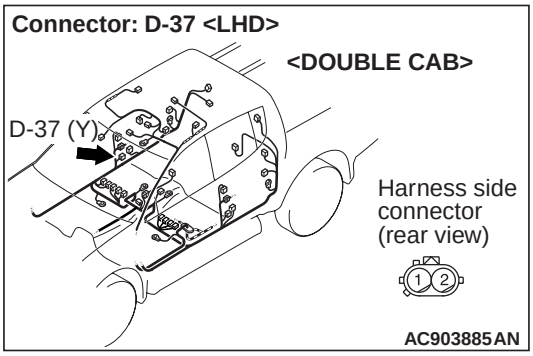
DIAGNOSIS PROCEDURE

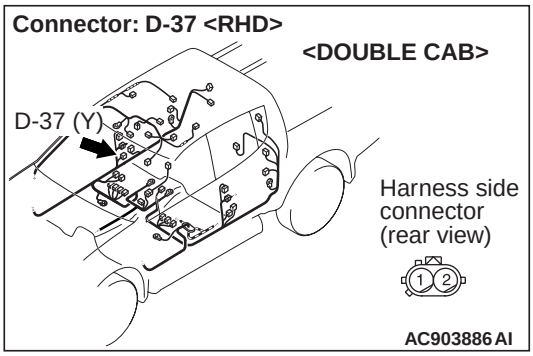
STEP 1. Check the harness wires for open circuit and short circuit between SRS-ECU connector C-155 (terminal No.61 and 62) and side impact sensor (RH) connector D-37 (terminal No.1 and 2).











Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the harness wires between SRS-ECU connector C-155 (terminal No.61 and 62) and side impact sensor (RH) connector D-37 (terminal No.1 and 2).

STEP 2. Check the side impact sensor (RH).

(1) Disconnect the negative battery terminal.
(2) Alternate the side impact sensor (RH) and the side impact sensor (LH), and then install the alternated sensor.
(3) Connect the negative battery terminal.
(4) Erase the diagnosis code from memory, and check the diagnosis code.

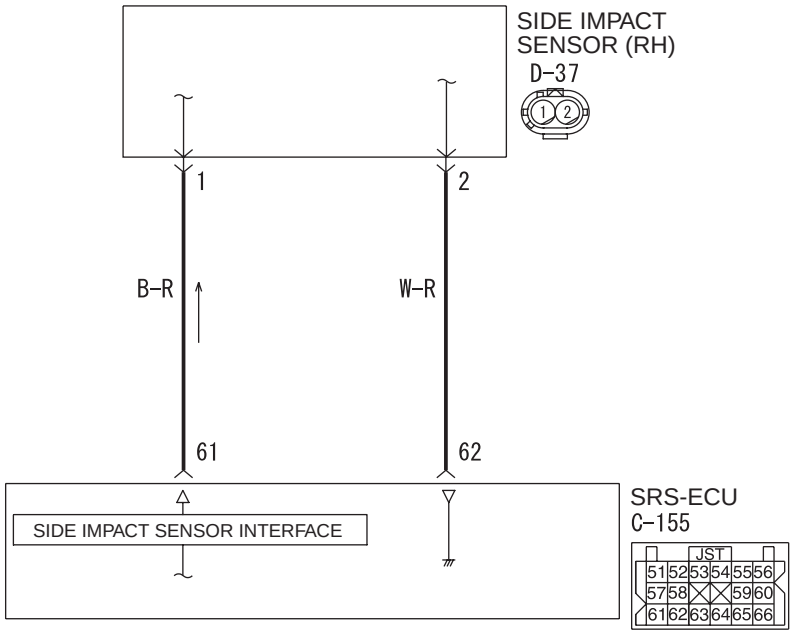
Q: Is diagnosis code B1437 set?
YES : Replace the side impact sensor (RH) with a new one (Refer to P.52B-282).
NO : Go to Step 3.

STEP 3. Check whether the diagnosis code is reset.

Q: Is diagnosis code B1427 set?
YES : Replace the SRS-ECU (Refer to P.52B-266).
NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1428: Side impact sensor (RH) communication error
Code No.B1429: Side impact sensor (RH) communication impossible

Side Impact Sensor (RH) Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

AC801032 AC

OPERATION

The side impact sensor transmits acceleration data to the SRS-ECU. The SRS-ECU then determines. if the side and/or curtain air bags should be inflated, and then sends an ignition signal. The side impact sensor also diagnoses itself, and sends a diagnosis code to the SRS-ECU if a problem occurs.

DIAGNOSIS CODE SET CONDITIONS

These diagnosis codes are set if communication between the side impact sensor (RH) and the SRS-ECU is not possible or faulty.

PROBABLE CAUSES

- Damaged wiring harnesses or connectors
- Malfunction of the side impact sensor (RH)

- Malfunction of the SRS-ECU

DIAGNOSIS PROCEDURE

STEP 1.Check the side impact sensor (RH).

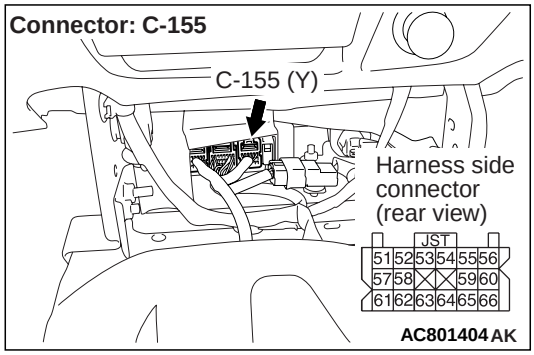
(1) Disconnect the negative battery terminal.
(2) Alternate the side impact sensor (RH) and the side impact sensor (LH), and then install the alternated sensor.
(3) Connect the negative battery terminal.
(4) Erase diagnosis code memory, and check the diagnosis code.

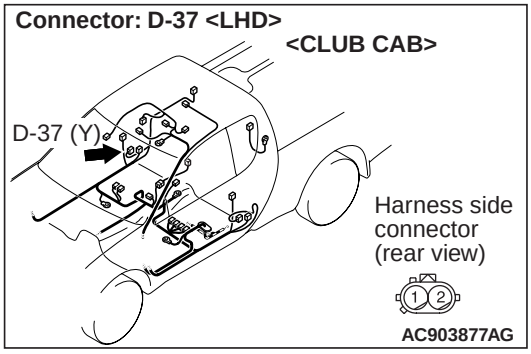
Q: Is diagnosis code B1438 or B1439 set?

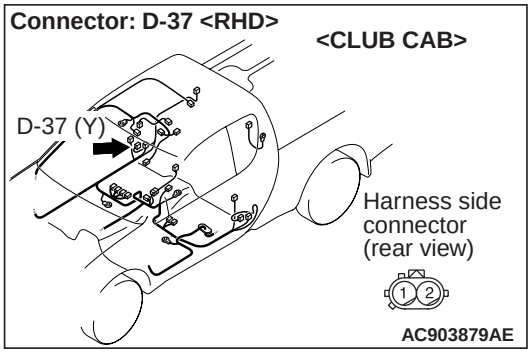
YES : Replace the side impact sensor (RH) with a new one (Refer to P.52B-282). Then go to Step 3.

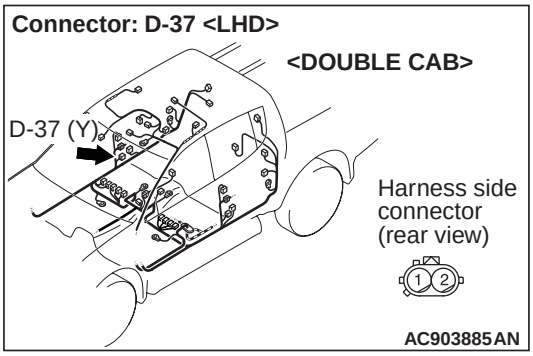
NO : Go to Step 2.

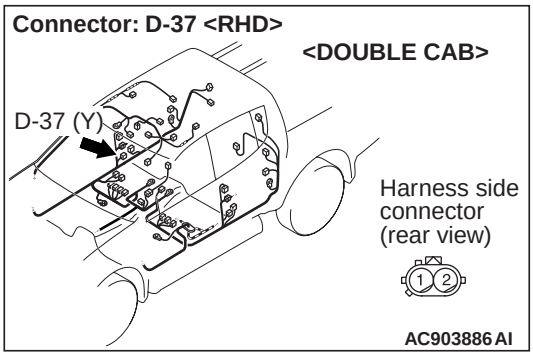
STEP 2. Check the harness wires for open circuit and short circuit between SRS-ECU connector C-155 (terminal No.61 and 62) and side impact sensor (RH) connector D-37 (terminal No.1 and 2).











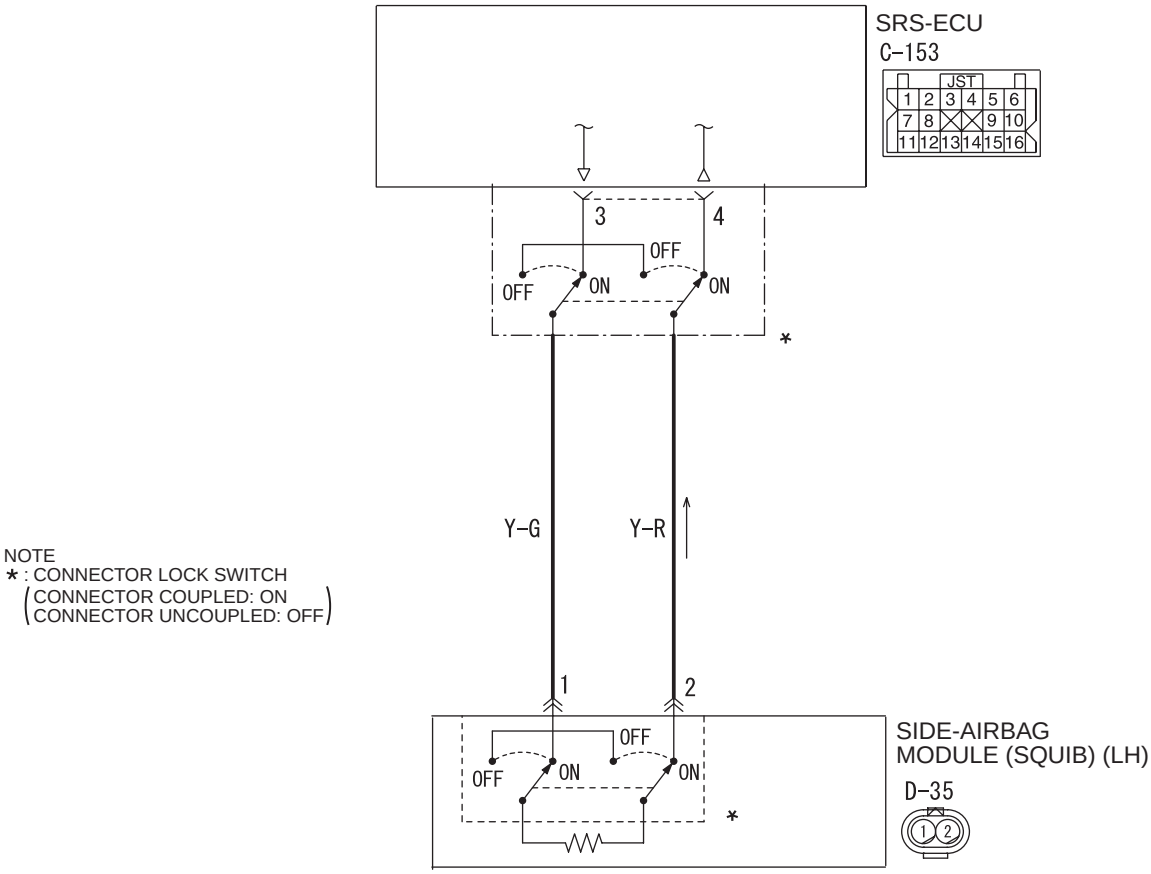
Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the harness wires between SRS-ECU connector C-155 (terminal No.61 and 62) and side impact sensor (RH) connector D-37 (terminal No.1 and 2).

STEP 3. Check whether the diagnosis code is reset.

Q: Is diagnosis code B1428 or B1429 set?
YES : Replace the SRS-ECU (Refer to P.52B-266).
NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1430: Side-airbag module (LH) (squib) system (short-circuited between terminals of the squib circuit)

Side-Airbag Module (LH) (Squib) Circuit



NOTE
* : CONNECTOR LOCK SWITCH
(CONNECTOR COUPLED: ON
CONNECTOR UNCOUPLED: OFF)

Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

AC801027AC

OPERATION

- The SRS-ECU judges how severe a collision is by detecting signals from the left and right side impact sensors. If the impact is over a predetermined level, the SRS-ECU sends an ignition signal. At this time, if the side air bag safing G-sensor is on, the SRS side-airbag will inflate.
- The ignition signal is input to the side-airbag module to inflate the side-airbag.

DIAGNOSIS CODE SET CONDITIONS

This diagnosis code is set if one side-airbag (LH) squib wire shorted to the other.

PROBABLE CAUSES

- Improper engaged connector or defective short spring*
- Short circuit between the side-airbag module (LH) (squib) circuit terminals
- Damaged connector(s)
- Malfunction of the SRS-ECU

*NOTE: *: The squib circuit connectors integrate a "short" spring (which prevents the air bag from deploying unintentionally due to static electricity by shorting the positive wire to the earth wire in the squib circuit when the connectors are disconnected).Therefore, if connector C-153 or D-35 is damaged or improperly engaged, the short spring may not be released when the connector is connected.*

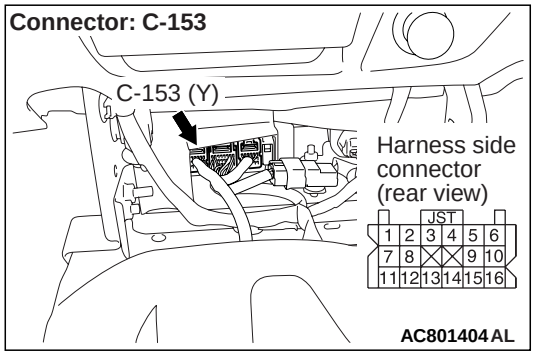
DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code.

Q: Is diagnosis code B1519 set?
YES : Go to Step 2
NO : Go to Step 3

STEP 2. Connector lock check: SRS-ECU connector C-153. (M.U.T.-III diagnosis code)

(1) Disconnect the negative battery terminal.

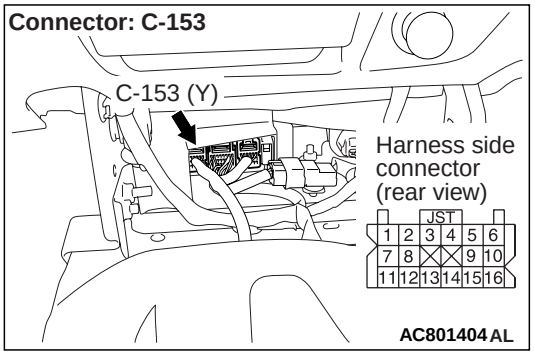


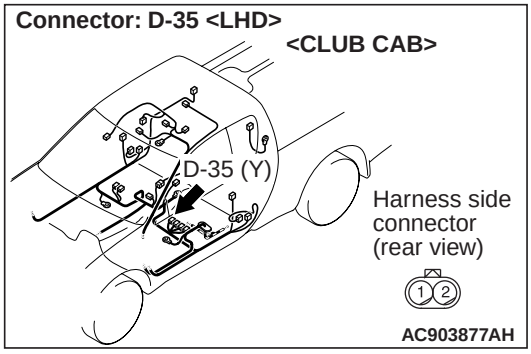
(2) Disconnect the connectors C-153 and then reconnect them.
(3) Connect the negative battery terminal.
(4) Erase the diagnosis code memory, and check the diagnosis code.

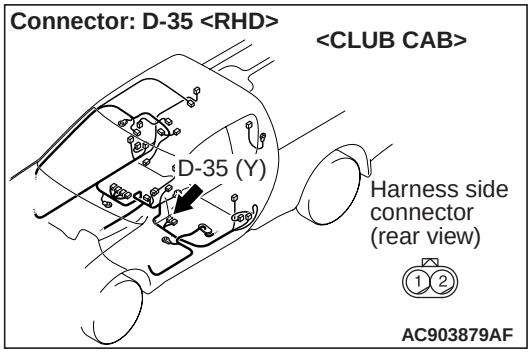
Q: Is diagnosis code B1430 set?
YES : Go to Step 3
NO : The procedure is complete. It is assumed that diagnosis code B1430 set as connector C-153 was engaged improperly.

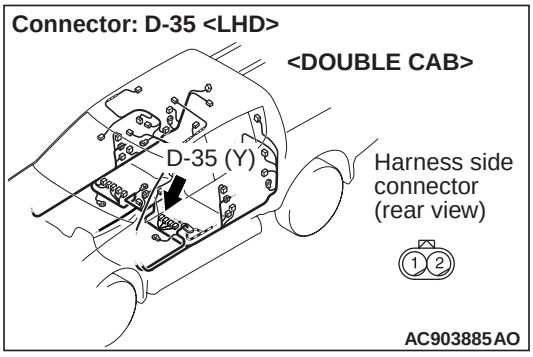
STEP 3. Connector lock check: SRS-ECU connector C-153 and side-airbag module (LH) connector D-35. (M.U.T.-III diagnosis code)

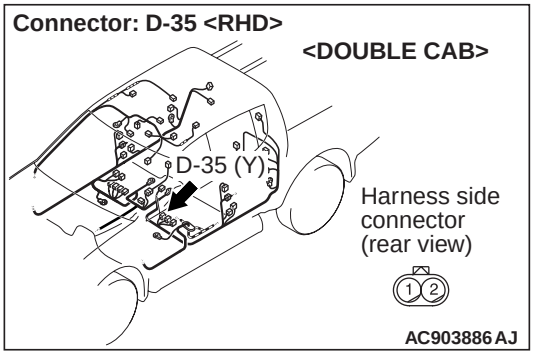
(1) Disconnect the negative battery terminal.

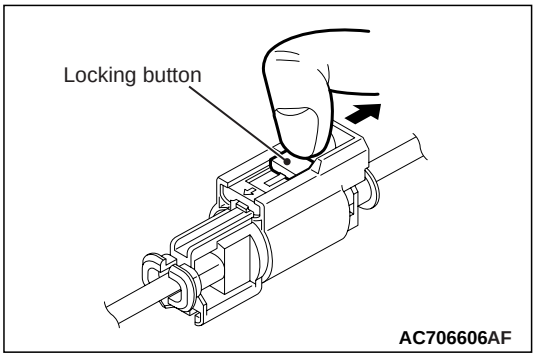










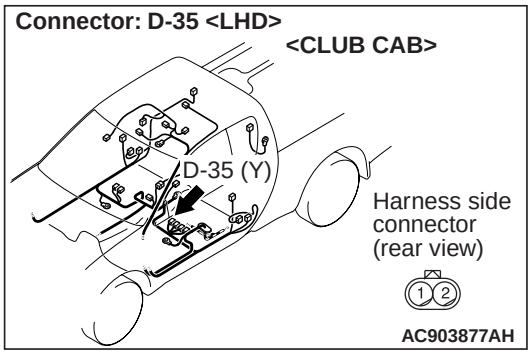


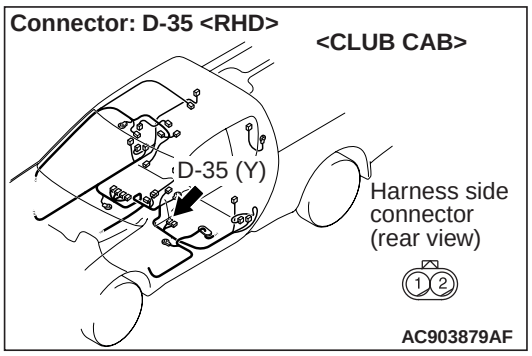
(2) Disconnect connectors C-153 and D-35, and then reconnect them. When disconnecting connector D-35, unlock the connector by sliding the locking button to the direction of the arrow as shown in the figure, and then disconnect the connector.
(3) Connect the negative battery terminal.
(4) Erase the diagnosis code memory, and check the diagnosis code.

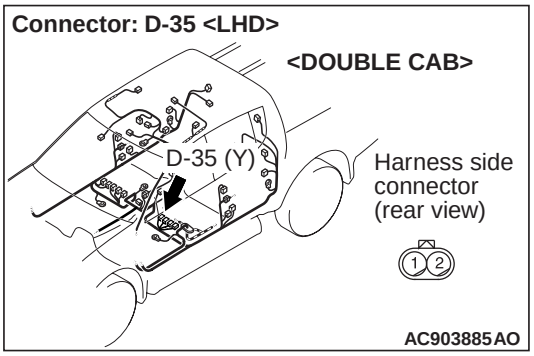
Q: Is diagnosis code B1430 set?
YES : Go to Step 4
NO : The procedure is complete. It is assumed that diagnosis code B1430 set as connector C-153 or D-35 was engaged improperly.

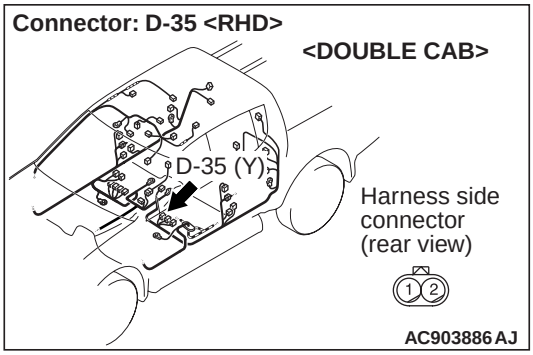
STEP 4. Check the diagnosis code by connecting a dummy resistor. (M.U.T.-III diagnosis code)

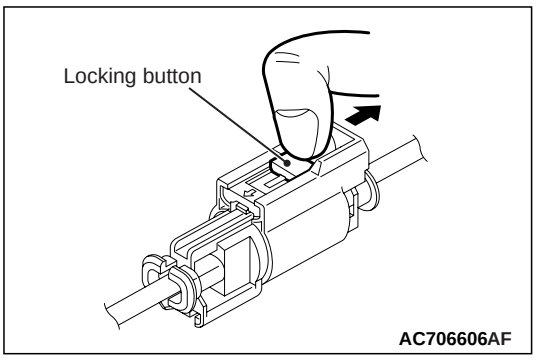
(1) Disconnect the negative battery terminal.





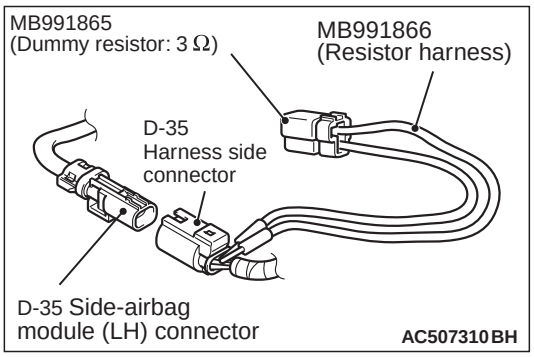






(2) Disconnect side-airbag module (LH) connector

D-35. When disconnecting connector D-35, unlock the connector by sliding the locking button to the direction of the arrow as shown in the figure, and then disconnect the connector.



(3) Connect special tool dummy resistor (MB991865) to special tool resistor harness (MB991866).

⚠ CAUTION

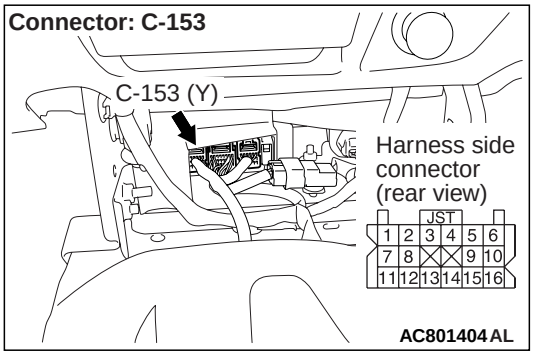
Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(4) Insert special tool (MB991866) into the harness side connector D-35 by backprobing.
(5) Connect the negative battery terminal.
(6) Erase the diagnosis code memory, and check the diagnosis code.

Q: Is diagnosis code B1430 set?
YES : Go to Step 5
NO : Replace the front seatback assembly (LH) (Refer to P.52B-276).

STEP 5. Resistance measurement at SRS-ECU connector C-153.

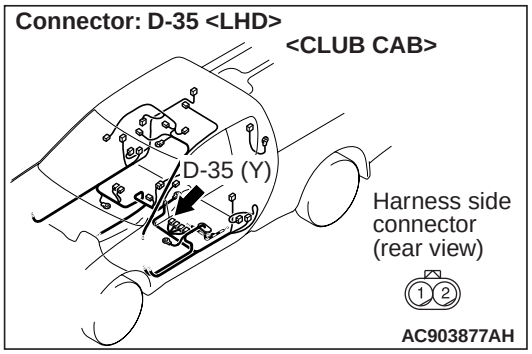
(1) Disconnect the negative battery terminal.

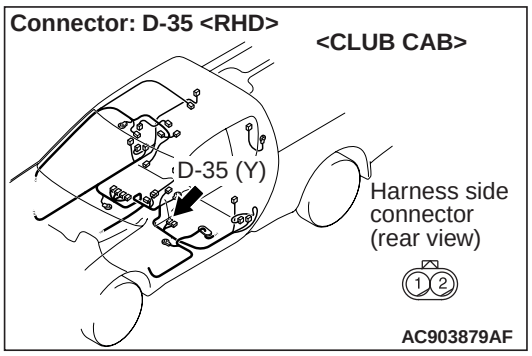


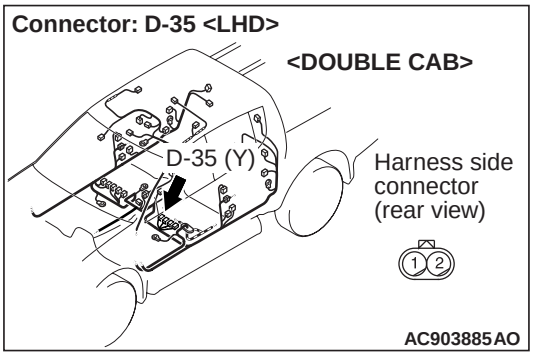
(2) Disconnect SRS-ECU connector C-153.

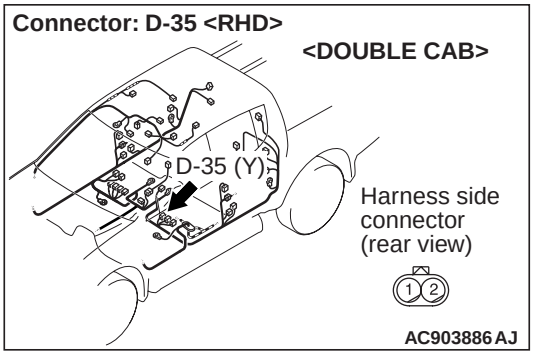
⚠ DANGER

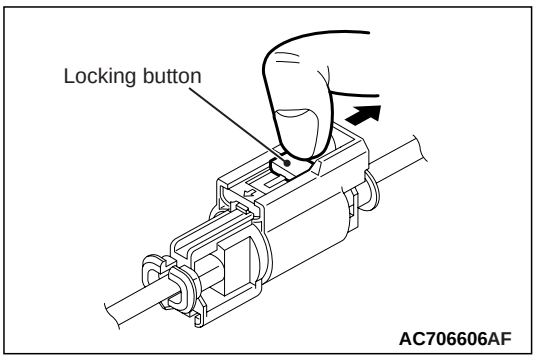
To prevents the air bag from deploying unintentionally, disconnect the side-airbag module (LH) connector D-35 to short the squib circuit.







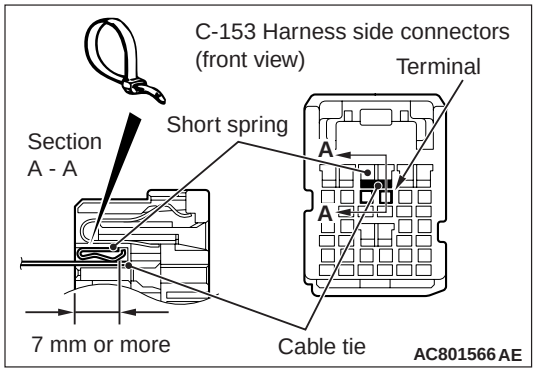




(3) Disconnect side-airbag module (LH) connector

D-35. When disconnecting connector D-35, unlock the connector by sliding the locking button to the direction of the arrow as shown in the figure, and then disconnect the connector.

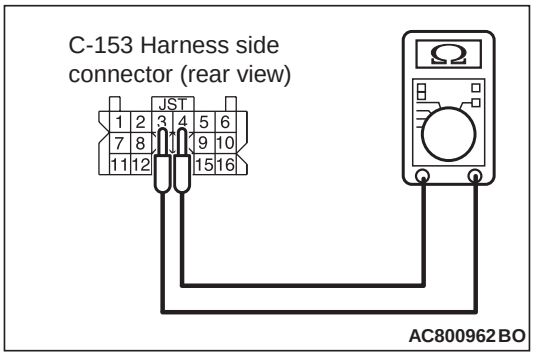
⚠ CAUTION



Insert an insulator such as a cable tie to a depth of 7 mm or more, otherwise the short spring will not be released.

(4) Insert a cable tie [3 mm wide, 0.5 mm thick] between terminals 3, 4 and the short spring to release the short spring.

⚠ CAUTION



Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(5) Resistance measurement between C-153 harness side connector terminals 3 and 4.

OK: Open circuit

Q: Is the check result normal?

YES : Go to Step 6

NO : Repair the harness wires between SRS-ECU connector C-153 (terminal No.3 and 4) and side-airbag module (LH) connector D-35 (terminal No.1 and 2).

STEP 6. Check whether the diagnosis code is reset.

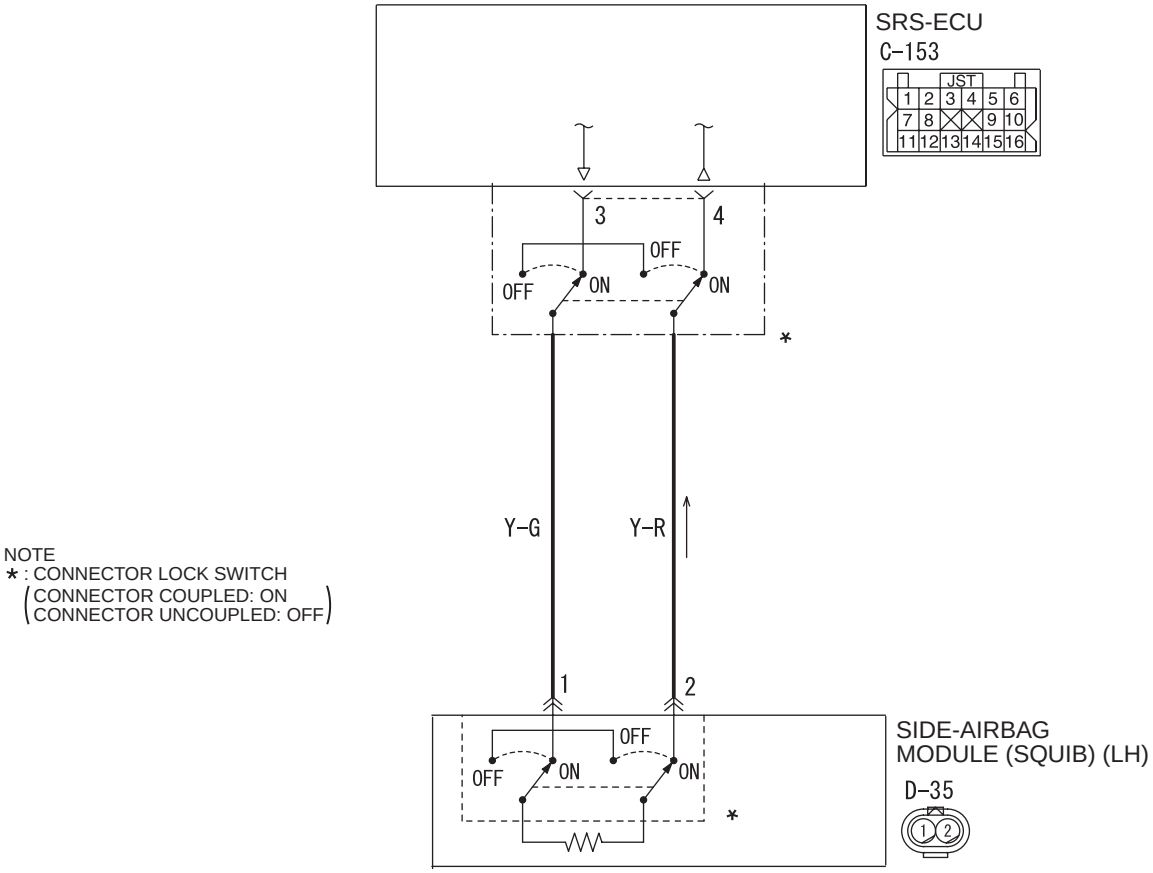
Q: Is diagnosis code B1430 set?

YES : Replace the SRS-ECU (Refer to P.52B-266).

NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1431: Side-airbag module (LH) (squib) system (open-circuited in the squib circuit)

Side-Airbag Module (LH) (Squib) Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

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OPERATION

- The SRS-ECU judges how severe a collision is by detecting signals from the left and right side impact sensors. If the impact is over a predetermined level, the SRS-ECU sends an ignition signal. At this time, if the side air bag safing G-sensor is on, the SRS side-airbag will inflate.
- The ignition signal is input to the side-airbag module to inflate the side-airbag.

DIAGNOSIS CODE SET CONDITIONS

This diagnosis code is set if side-airbag module (LH) squib wire(s) are open-circuited.

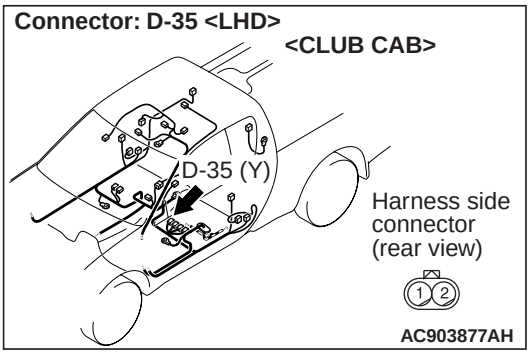
PROBABLE CAUSES

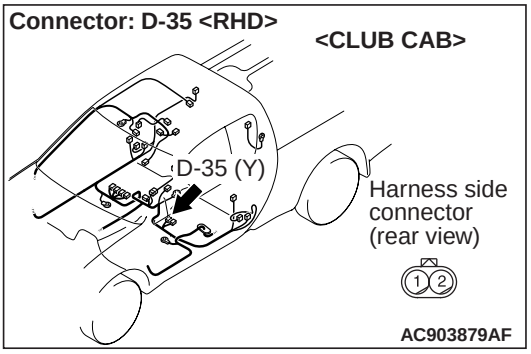
- Open circuit in the side-airbag module (LH) (squib) circuit
- Improper connector contact
- Malfunction of the SRS-ECU

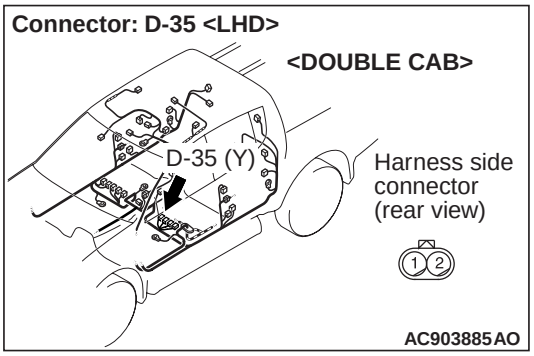
DIAGNOSIS PROCEDURE

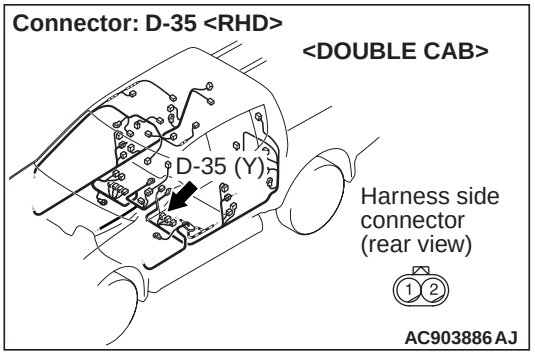
STEP 1. Check the diagnosis code by connecting a dummy resistor. (M.U.T.-III diagnosis code)

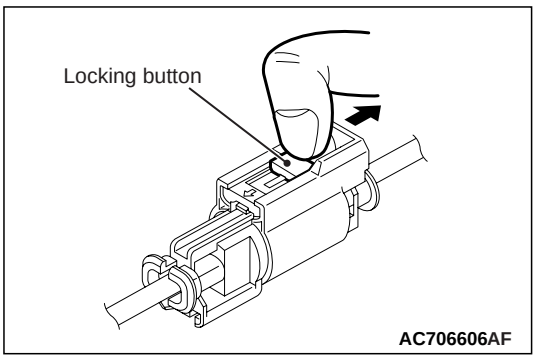
(1) Disconnect the negative battery terminal.





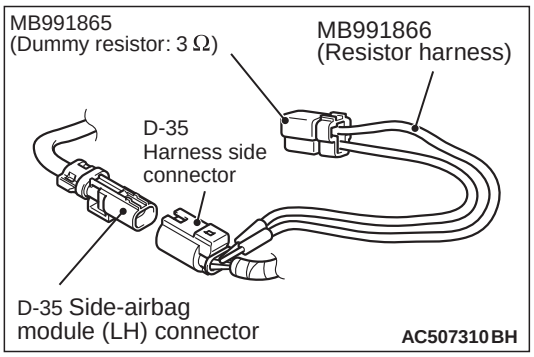






(2) Disconnect side-airbag module (LH) connector

D-35. When disconnecting connector D-35, unlock the connector by sliding the locking button to the direction of the arrow as shown in the figure, and then disconnect the connector.



(3) Connect special tool dummy resistor (MB991865) to special tool resistor harness (MB991866).

⚠ CAUTION

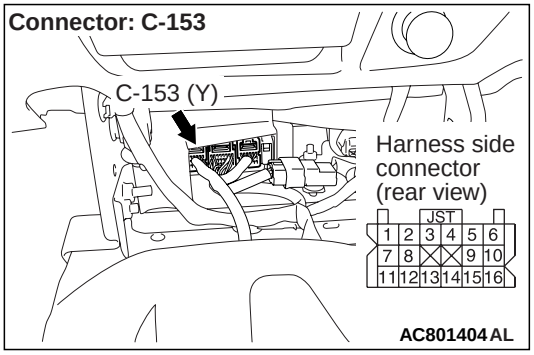
Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(4) Insert special tool (MB991866) into the harness side connector D-35 by backprobing.
(5) Connect the negative battery terminal.
(6) Erase the diagnosis code memory, and check the diagnosis code.

Q: Is diagnosis code B1431 set?
YES : Go to Step 2
NO : Replace the front seatback assembly (LH) (Refer to P.52B-276).

STEP 2. Resistance measurement between SRS-ECU connector C-153 (terminal No.3 and 4) and the side-airbag module (LH) connector D-35 (terminal No.1 and 2).

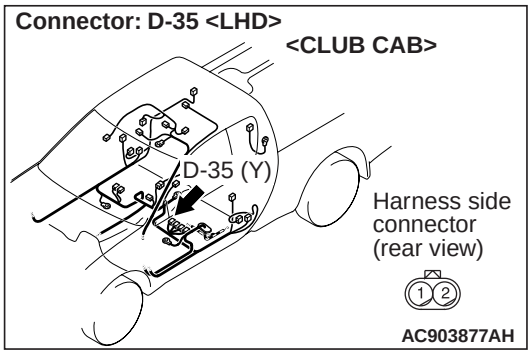
(1) Disconnect the negative battery terminal.

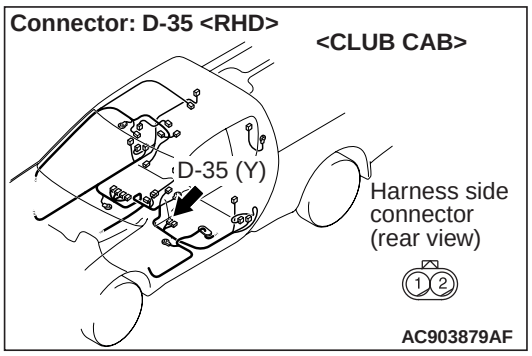


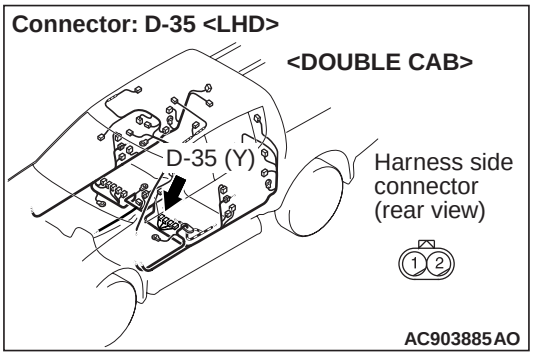
(2) Disconnect SRS-ECU connector C-153.

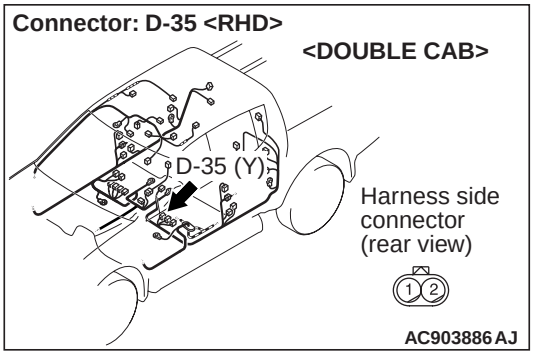
⚠ DANGER

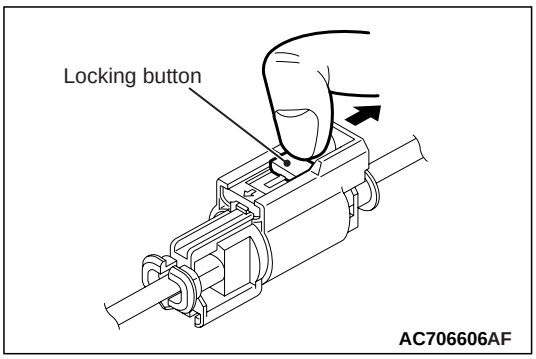
To prevents the air bag from deploying unintentionally, disconnect the side-airbag module (LH) connector D-35 to short the squib circuit.







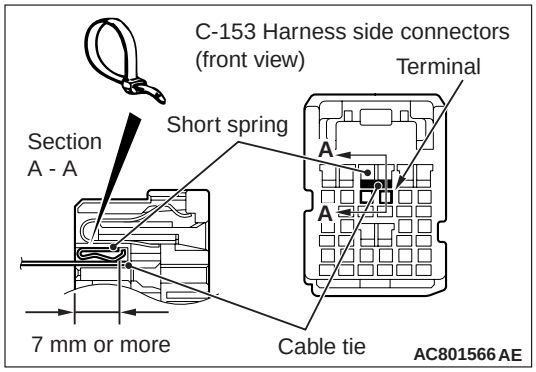




(3) Disconnect side-airbag module (LH) connector

D-35. When disconnecting connector D-35, unlock the connector by sliding the locking button to the direction of the arrow as shown in the figure, and then disconnect the connector.

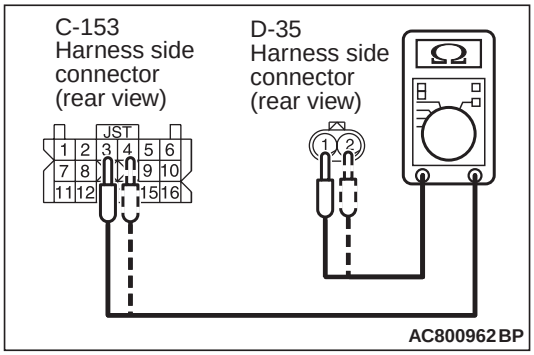
⚠ CAUTION



Insert an insulator such as a cable tie to a depth of 7 mm or more, otherwise the short spring will not be released.

(4) Insert a cable tie [3 mm wide, 0.5 mm thick] between terminals 3, 4 and the short spring to release the short spring.

⚠ CAUTION



Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(5) Resistance measurement between the following terminals.

- SRS-ECU connector C-153 terminal No.3 and the side-airbag module (LH) connector D-35 terminal No.1
- SRS-ECU connector C-153 terminal No.4 and the side-airbag module (LH) connector D-35 terminal No.2

OK: Continuity (Less than 2 Ω)

Q: Are the check results normal?

YES : Go to Step 3

NO : Repair the harness wires between SRS-ECU connector C-153 (terminal No.3 and 4) and side-airbag module (LH) connector D-35 (terminal No.1 and2).

STEP 3. Check whether the diagnosis code is reset.

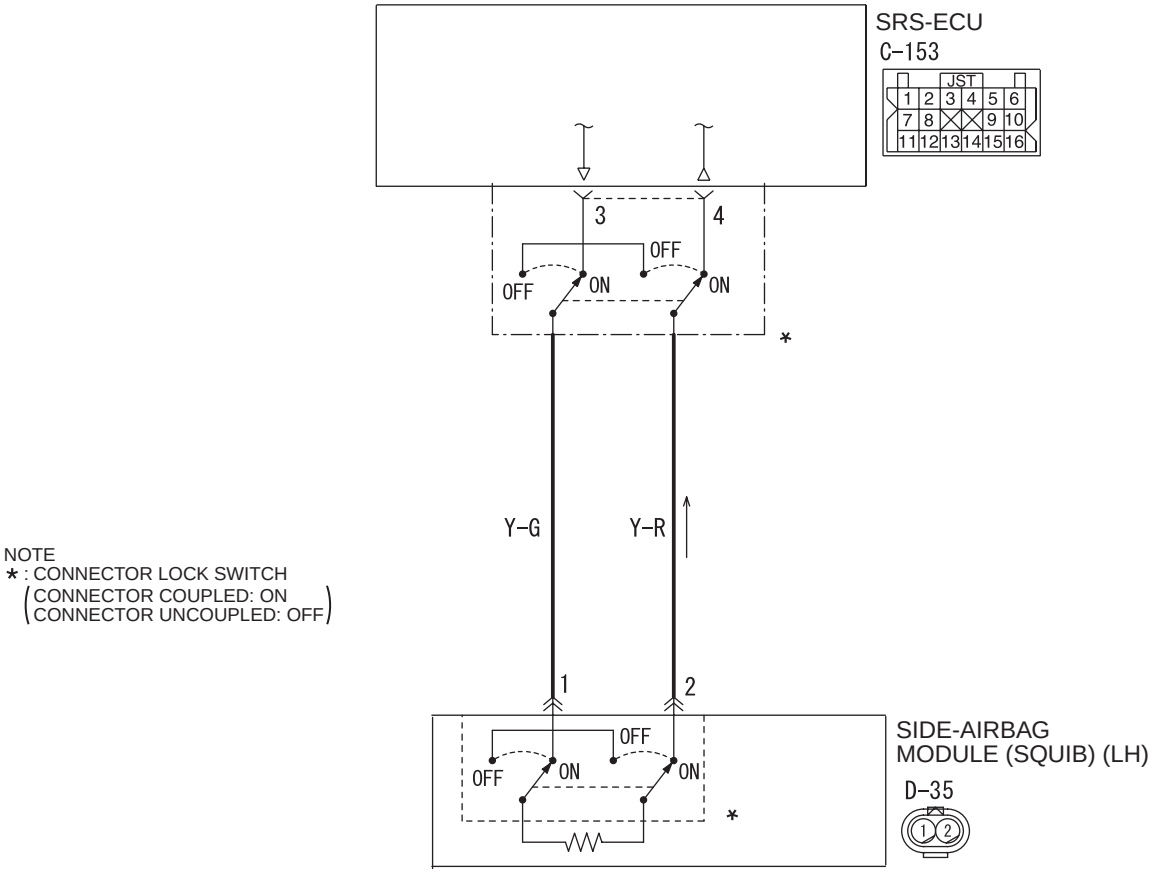
Q: Is diagnosis code B1431 set?

YES : Replace the SRS-ECU (Refer to P.52B-266).

NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1432: Side-airbag module (LH) (squib) system (short-circuited to the earth)

Side-Airbag Module (LH) (Squib) Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

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OPERATION

- The SRS-ECU judges how severe a collision is by detecting signals from the left and right side impact sensors. If the impact is over a predetermined level, the SRS-ECU sends an ignition signal. At this time, if the side air bag safing G-sensor is on, the SRS side-airbag will inflate.
- The ignition signal is input to the side-airbag module to inflate the side-airbag.

DIAGNOSIS CODE SET CONDITIONS

This diagnosis code is set if the side-airbag (LH) squib wire(s) are short-circuited to the earth.

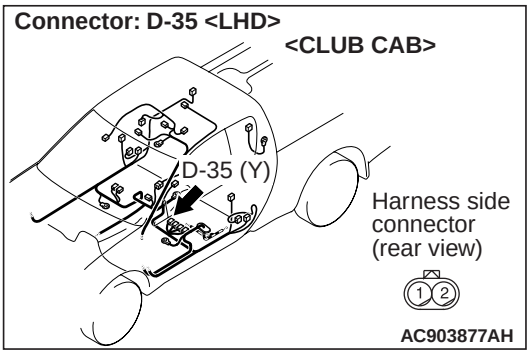
PROBABLE CAUSES

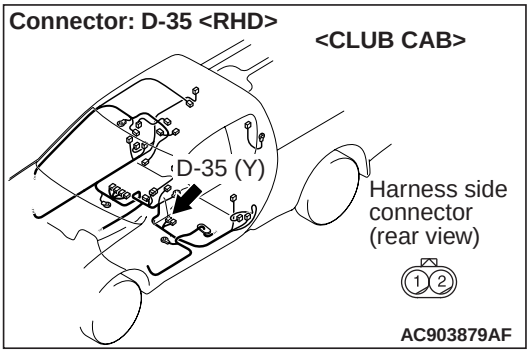
- Damaged harness wires and connectors
- Short to the earth in the side-airbag module (LH) (squib) harness
- Malfunction of the SRS-ECU

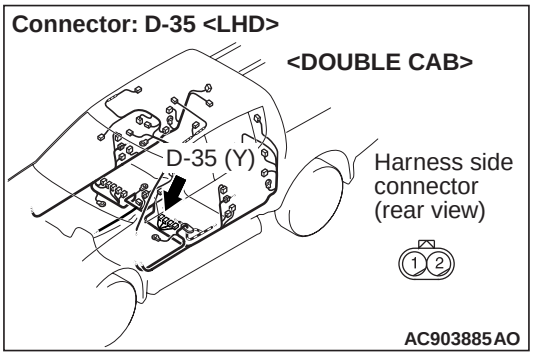
DIAGNOSIS PROCEDURE

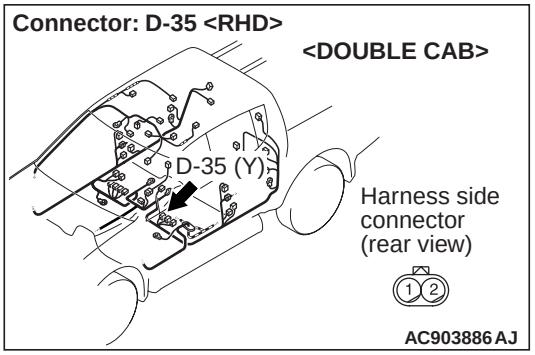
STEP 1. Check the diagnosis code by connecting a dummy resistor. (M.U.T.-III diagnosis code)

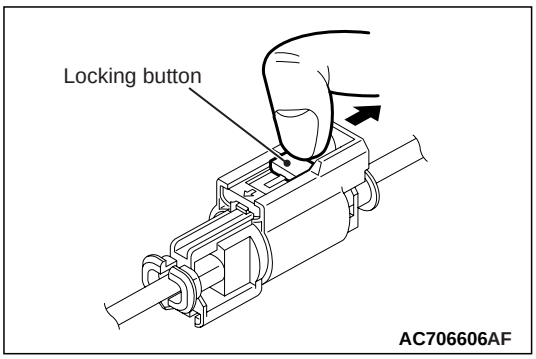
(1) Disconnect the negative battery terminal.





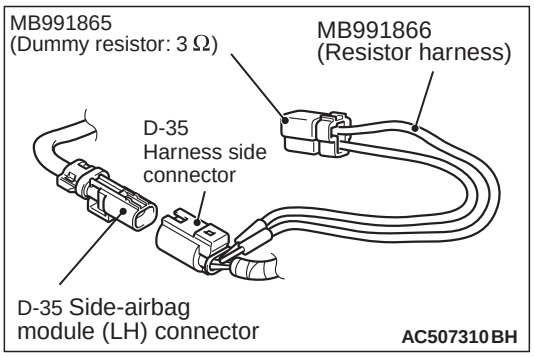






(2) Disconnect side-airbag module (LH) connector

D-35. When disconnecting connector D-35, unlock the connector by sliding the locking button to the direction of the arrow as shown in the figure, and then disconnect the connector.



(3) Connect special tool dummy resistor (MB991865) to special tool resistor harness (MB991866).

⚠ CAUTION

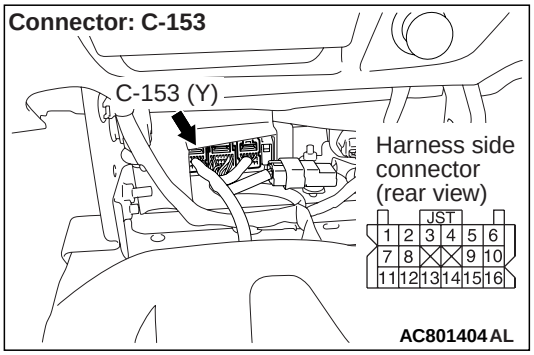
Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(4) Insert special tool (MB991866) into the harness side connector D-35 by backprobing.
(5) Connect the negative battery terminal.
(6) Erase the diagnosis code memory, and check the diagnosis code.

Q: Is diagnosis code B1432 set?
YES : Go to Step 2
NO : Replace the front seatback assembly (LH) (Refer to P.52B-276).

STEP 2. Resistance measurement at the SRS-ECU connector C-153.

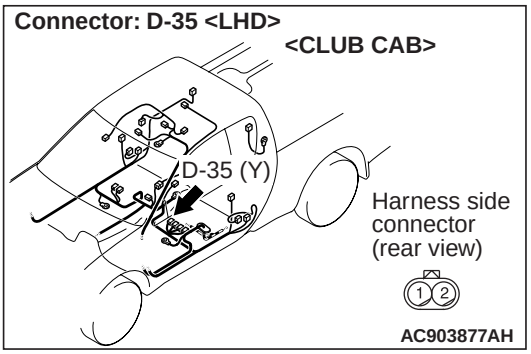
(1) Disconnect the negative battery terminal.

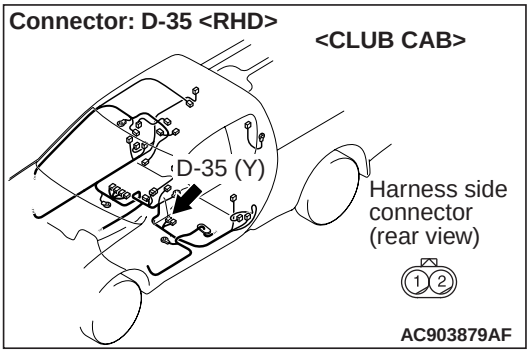


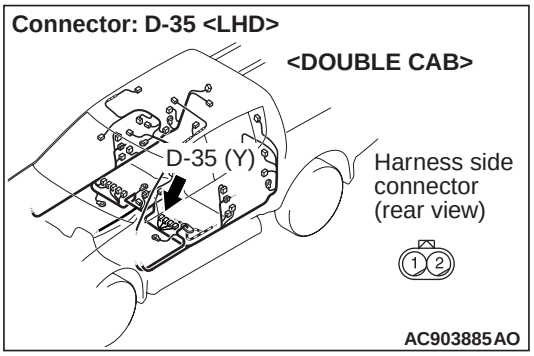
(2) Disconnect SRS-ECU connector C-153.

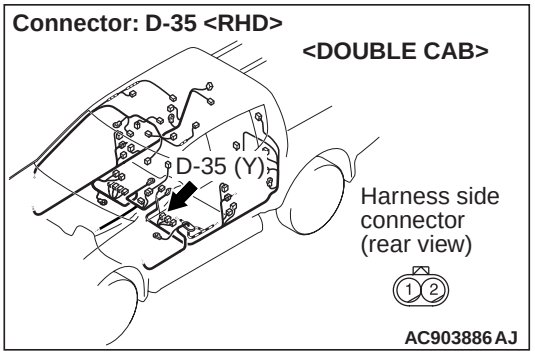
⚠ ***DANGER***

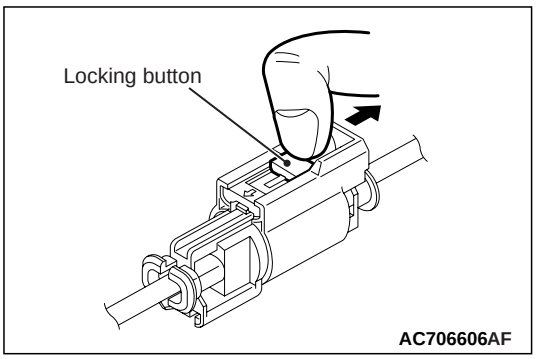
To prevents the air bag from deploying unintentionally, disconnect the side-airbag module (LH) connector D-35 to short the squib circuit.







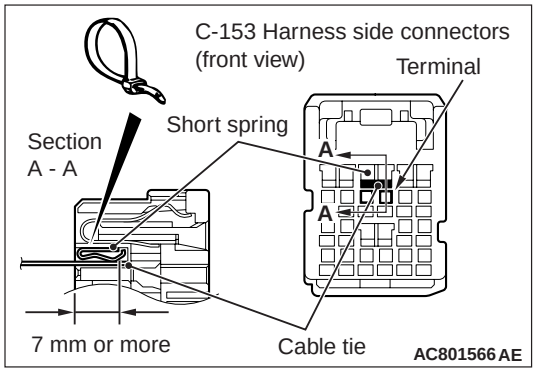




(3) Disconnect side-airbag module (LH) connector

D-35. When disconnecting connector D-35, unlock the connector by sliding the locking button to the direction of the arrow as shown in the figure, and then disconnect the connector.

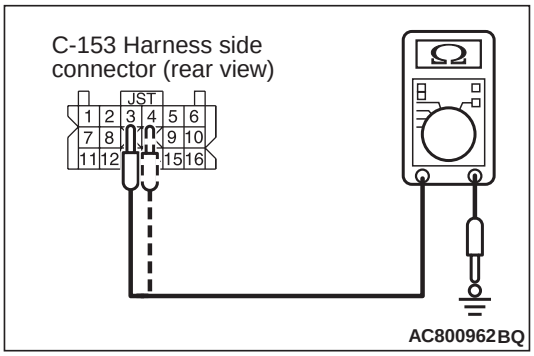
⚠ CAUTION



Insert an insulator such as a cable tie to a depth of 7 mm or more, otherwise the short spring will not be released.

(4) Insert a cable tie [3 mm wide, 0.5 mm thick] between terminals 3, 4 and the short spring to release the short spring.

⚠ CAUTION



Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(5) Resistance measurement between C-153 harness side connector terminals 3, 4 and body earth.

OK: Open circuit

Q: Is the check result normal?

YES : Go to Step 3

NO : Repair the harness wires between SRS-ECU connector C-153 (terminal No.3 and 4) and side-airbag module (LH) connector D-35 (terminal No.1 and 2).

STEP 3. Check whether the diagnosis code is reset.

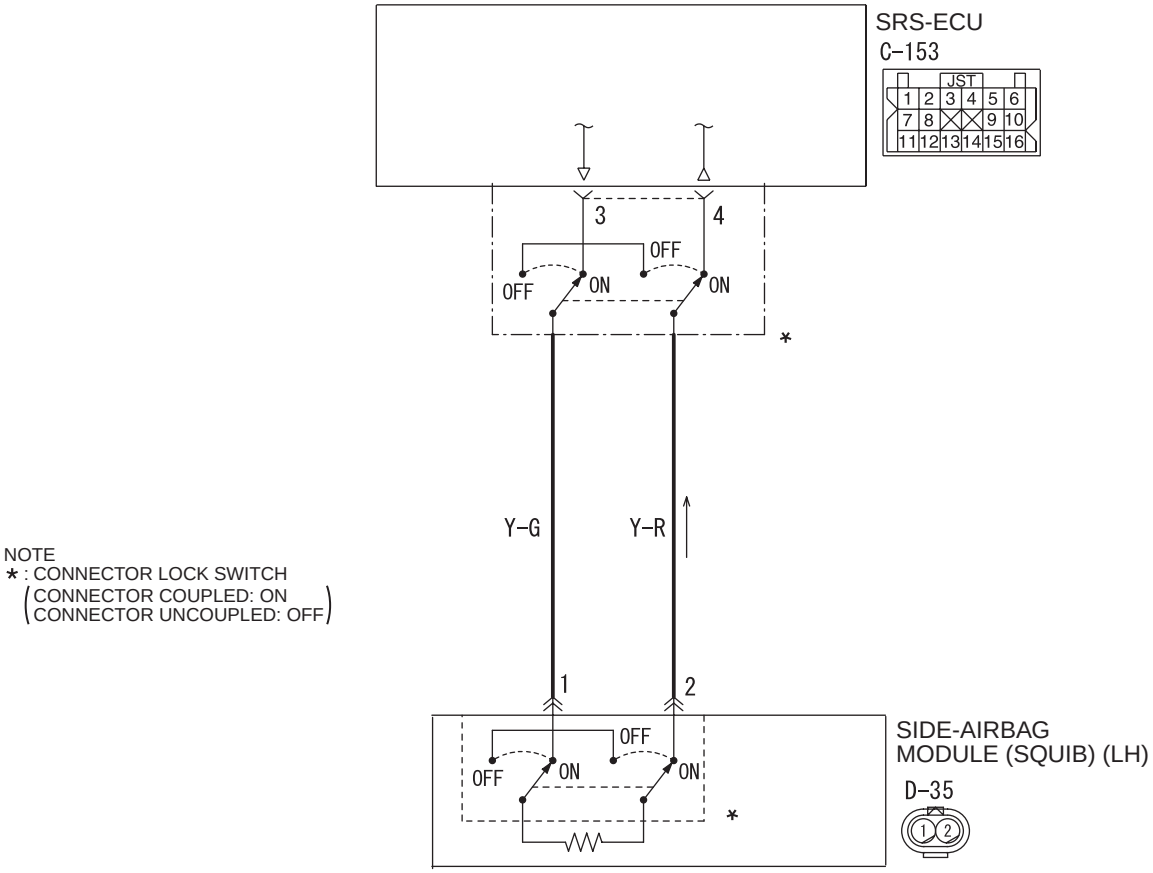
Q: Is diagnosis code B1432 set?

YES : Replace the SRS-ECU (Refer to P.52B-266).

NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1433: Side-airbag module (LH) (squib) system (short-circuited to the power supply)

Side-Airbag Module (LH) (Squib) Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

AC801027AC

OPERATION

- The SRS-ECU judges how severe a collision is by detecting signals from the left and right side impact sensors. If the impact is over a predetermined level, the SRS-ECU sends an ignition signal. At this time, if the side air bag safing G-sensor is on, the SRS side-airbag will inflate.
- The ignition signal is input to the side-airbag module to inflate the side-airbag.

DIAGNOSIS CODE SET CONDITIONS

This diagnosis code is set if the side-airbag (LH) squib wire(s) are short-circuited to the power supply.

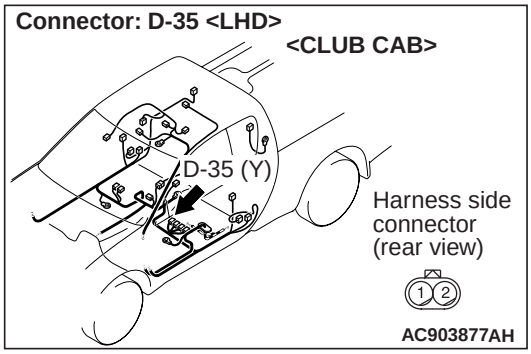
PROBABLE CAUSES

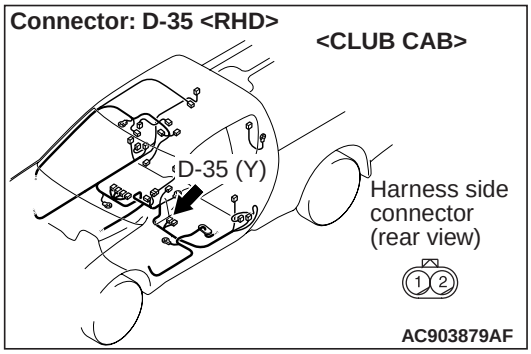
- Damaged harness wires and connectors
- Short to the power supply in the side-airbag module (LH) (squib) harness
- Malfunction of the SRS-ECU

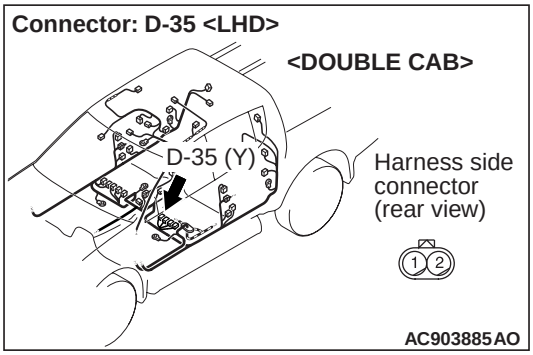
DIAGNOSIS PROCEDURE

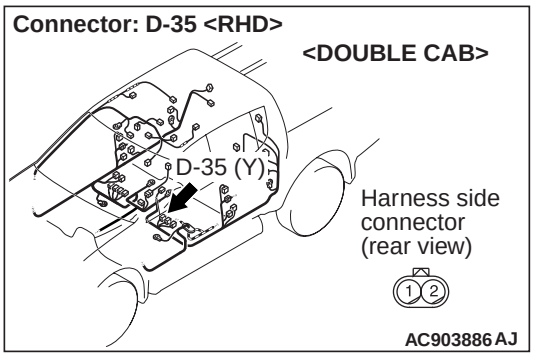
STEP1. Check the diagnosis code by connecting a dummy resistor. (M.U.T.-III diagnosis code)

(1) Disconnect the negative battery terminal.

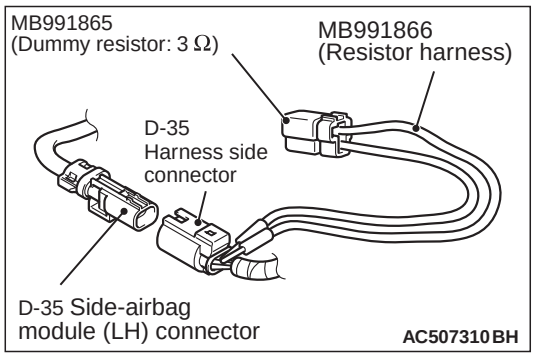








(2) Disconnect side-airbag module (LH) connector D-35. When disconnecting connector D-35, unlock the connector by sliding the locking button to the direction of the arrow as shown in the figure, and then disconnect the connector.



(3) Connect special tool dummy resistor (MB991865) to special tool resistor harness (MB991866).

⚠ CAUTION

Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(4) Insert special tool (MB991866) into the harness side connector D-35 by backprobing.
(5) Connect the negative battery terminal.
(6) Erase the diagnosis code memory, and check the diagnosis code.

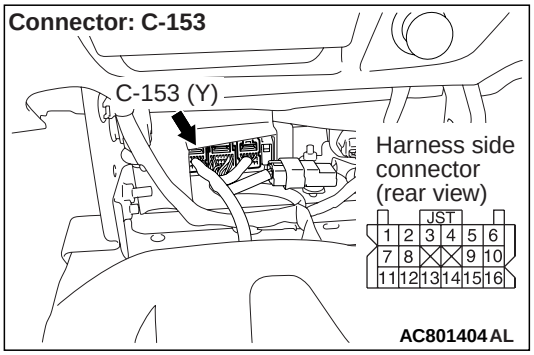
Q: Is diagnosis code B1433 set?

YES : Go to Step 2

NO : Replace the front seatback assembly (LH) (Refer to P.52B-276).

STEP 2. Voltage measurement at the SRS-ECU connector C-153.

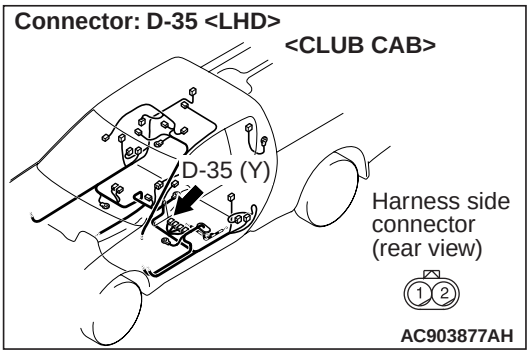
(1) Disconnect the negative battery terminal.

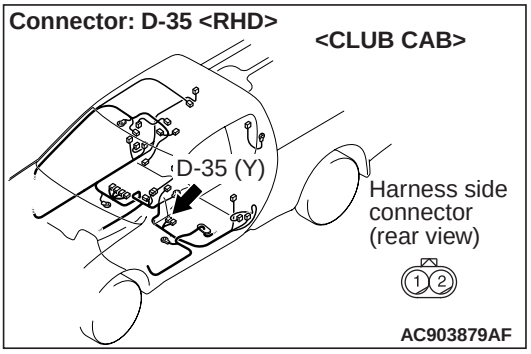


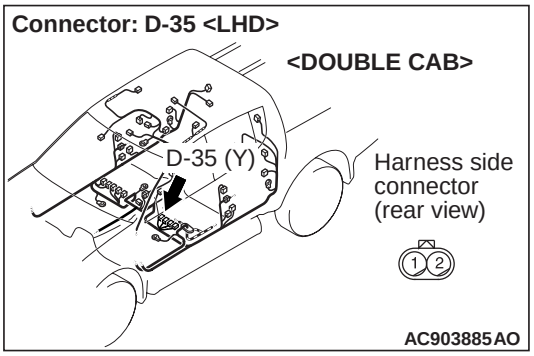
(2) Disconnect SRS-ECU connector C-153.

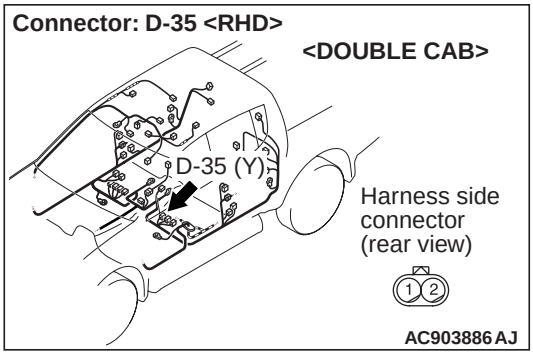
⚠ *DANGER*

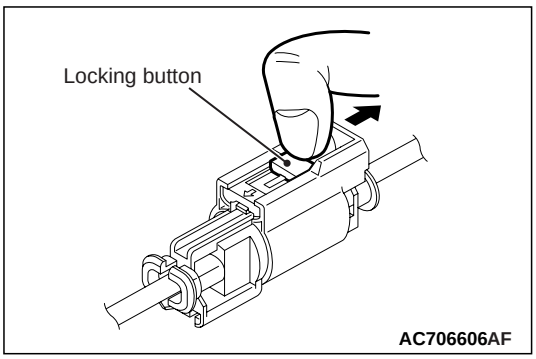
To prevents the air bag from deploying unintentionally, disconnect the side-airbag module (LH) connector D-35 to short the squib circuit.







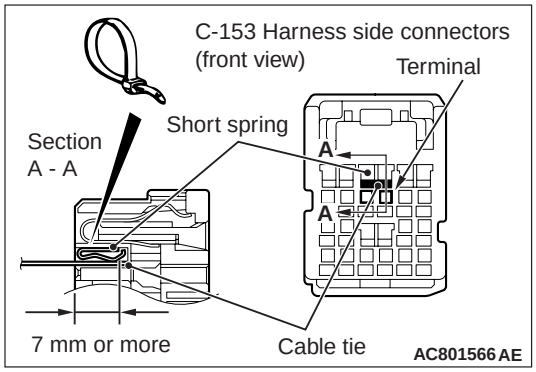




(3) Disconnect side-airbag module (LH) connector

D-35. When disconnecting connector D-35, unlock the connector by sliding the locking button to the direction of the arrow as shown in the figure, and then disconnect the connector.

⚠ CAUTION



Insert an insulator such as a cable tie to a depth of 7 mm or more, otherwise the short spring will not be released.

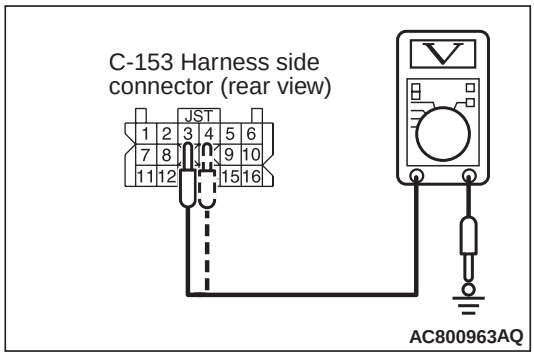
(4) Insert a cable tie [3 mm wide, 0.5 mm thick] between terminals 3, 4 and the short spring to release the short spring.

(5) Connect the negative battery terminal.

(6) Turn the ignition switch to the "ON" position.

⚠ CAUTION

Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.



(7) Voltage measurement between C-153 harness side connector terminals 3, 4 and body earth.

OK: 1 V or less

Q: Is the check result normal?

YES : Go to Step 3

NO : Repair the harness wires between SRS-ECU connector C-153 (terminal No.3 and 4) and side-airbag (LH) air bag module connector D-35 (terminal No.1 and 2).

STEP 3. Check whether the diagnosis code is reset.

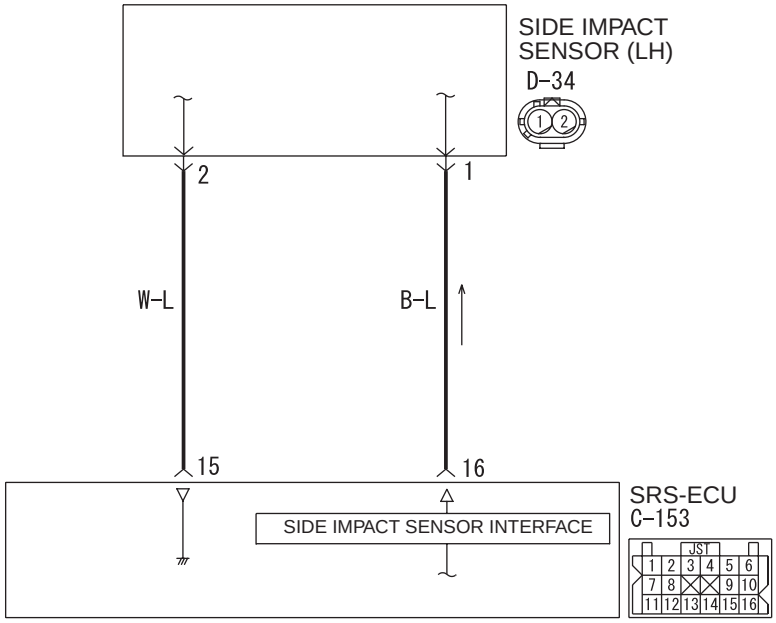
Q: Is diagnosis code B1433 set?

YES : Replace the SRS-ECU (Refer to P.52B-266).

NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1437: Side impact sensor (LH) voltage error

Side Impact Sensor (LH) Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

AC801033 AC

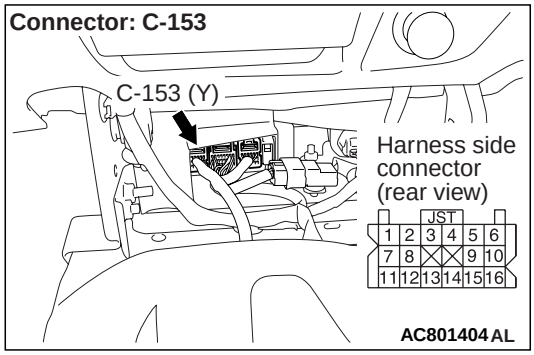
OPERATION
The side impact sensor transmits acceleration data to the SRS-ECU. The SRS-ECU then determines. if the side and/or curtain air bags should be inflated, and then sends an ignition signal. The side impact sensor also diagnoses itself, and sends a diagnosis code to the SRS-ECU if a problem occurs.

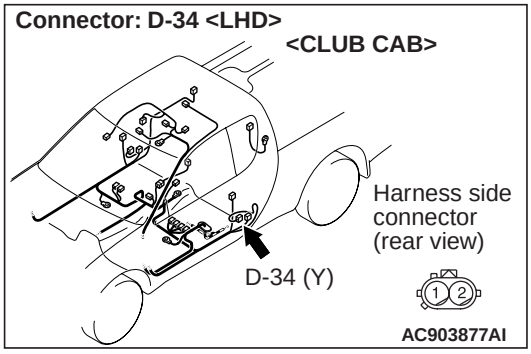
DIAGNOSIS CODE SET CONDITIONS
This diagnosis code will set when the power supply voltage to the side impact sensor (LH) remains less than a predetermined value for one second.

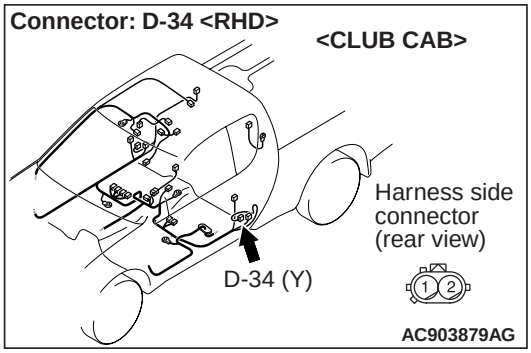
PROBABLE CAUSES
- Damaged wiring harness or connectors
- Malfunction of the side impact sensor (LH)
- Malfunction of the SRS-ECU

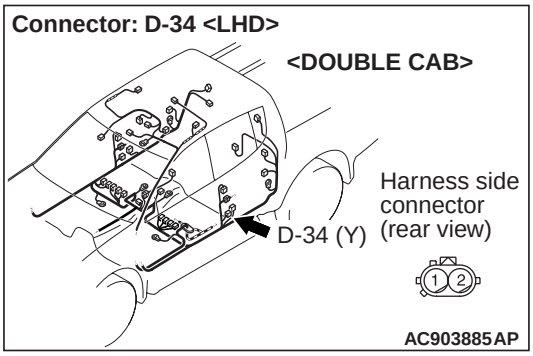
DIAGNOSIS PROCEDURE

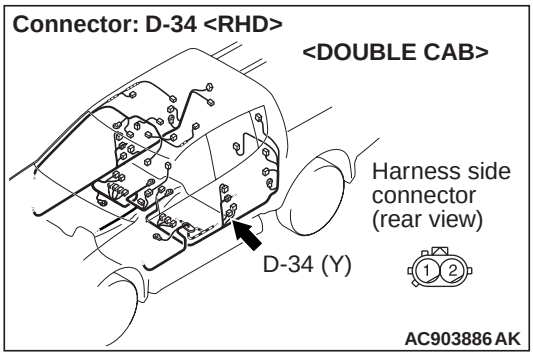
STEP 1. Check the harness wires for open circuit and short circuit between SRS-ECU connector C-153 (terminal No.15 and 16) and side impact sensor (LH) connector D-34 (terminal No.2 and 1).











Q: Is the check result normal
YES : Go to Step 2.
NO : Repair the harness wires between SRS-ECU connector C-153 (terminal No.15 and 16) and side impact sensor (LH) connector D-34 (terminal No.2 and 1).

STEP 2. Check the side impact sensor (LH).

(1) Disconnect the negative battery terminal.
(2) Alternate the side impact sensor (LH) and the side impact sensor (RH), and then install the alternated sensor.
(3) Connect the negative battery terminal.
(4) Erase the diagnosis code from memory, and check the diagnosis code.

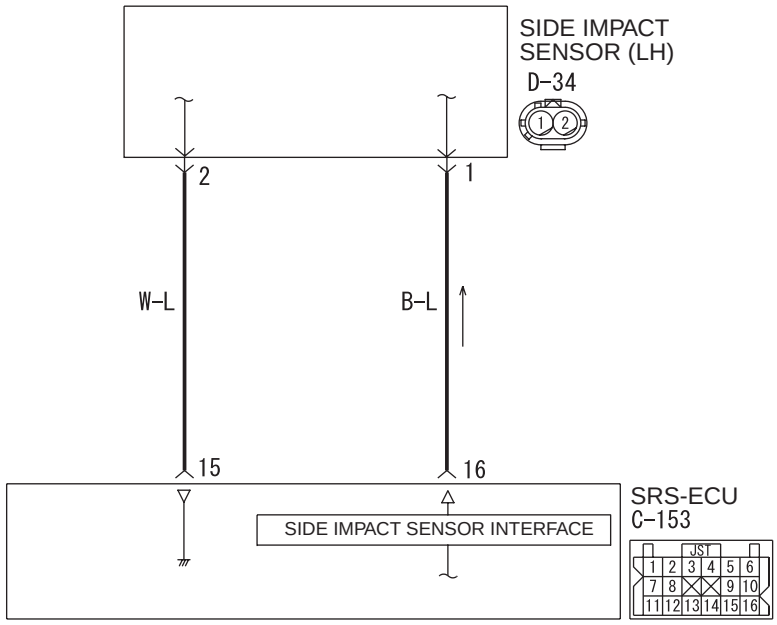
Q: Is diagnosis code B1427 set?
YES : Replace the side impact sensor (LH) with a new one (Refer to P.52B-282).
NO : Go to Step 3.

STEP 3. Check whether the diagnosis code is reset.

Q: Is diagnosis code B1437 set?
YES : Replace the SRS-ECU (Refer to P.52B-266).
NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1438: Side impact sensor (LH) communication error
Code No.B1439: Side impact sensor (LH) communication impossible

Side Impact Sensor (LH) Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

AC801033 AC

OPERATION

The side impact sensor transmits acceleration data to the SRS-ECU. The SRS-ECU then determines. if the side and/or curtain air bags should be inflated, and then sends an ignition signal. The side impact sensor also diagnoses itself, and sends a diagnosis code to the SRS-ECU if a problem occurs.

DIAGNOSIS CODE SET CONDITIONS

These diagnosis codes are set if communication between the side impact sensor (LH) and the SRS-ECU is not possible or faulty.

PROBABLE CAUSES

- Damaged wiring harnesses or connectors
- Malfunction of the side impact sensor (LH)

- Malfunction of the SRS-ECU

DIAGNOSIS PROCEDURE

STEP 1. Check the side impact sensor (LH).

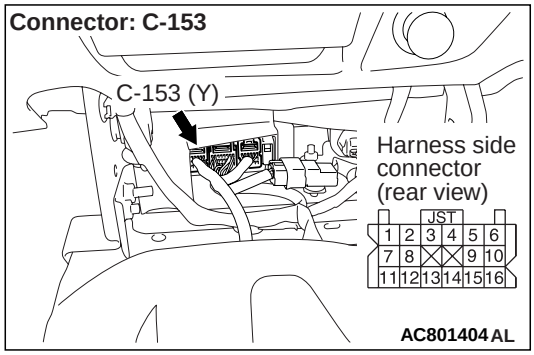
(1) Disconnect the negative battery terminal.
(2) Alternate the side impact sensor (LH) and the side impact sensor (RH), and then install the alternated sensor.
(3) Connect the negative battery terminal.
(4) Erase diagnosis code from memory, and check the diagnosis code.

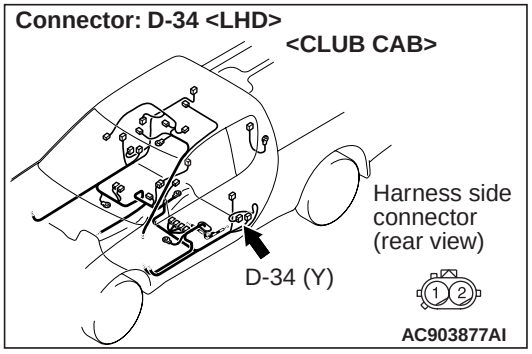
Q: Is diagnosis code B1428 or B1429 set?

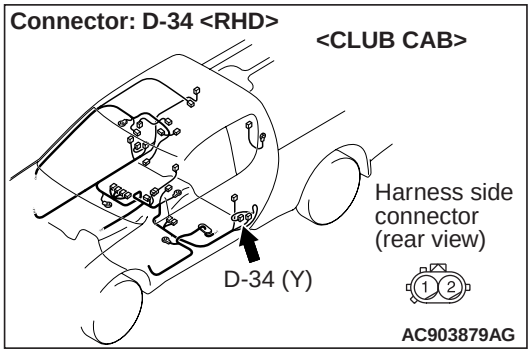
YES : Replace the side impact sensor (LH) with a new one. (Refer to P.52B-282). Go to Step 3.

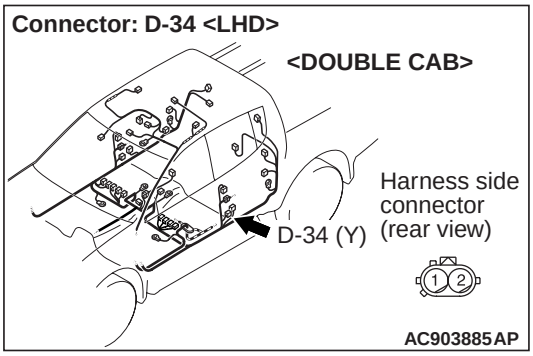
NO : Go to Step 2.

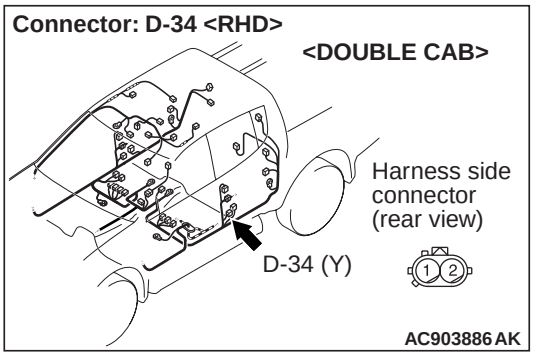
STEP 2. Check the harness wires for open circuit and short circuit between SRS-ECU connector C-153 (terminal No.15 and 16) and side impact sensor (LH) connector D-34 (terminal No.2 and 1).











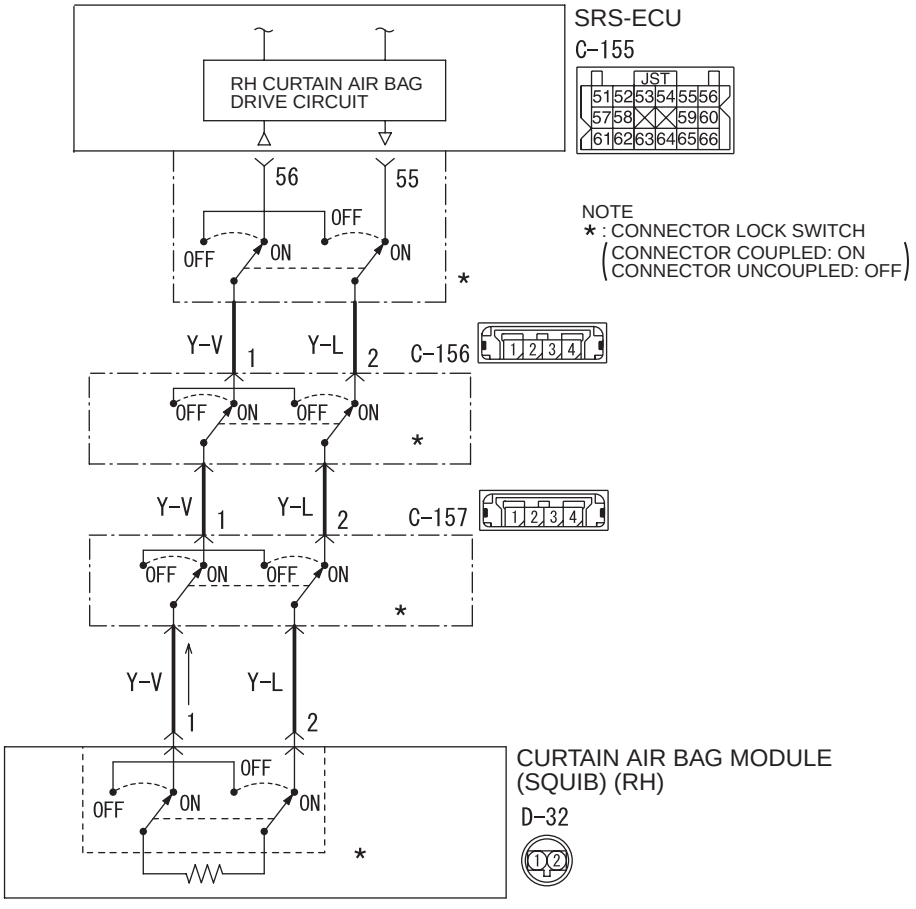
Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the harness wires between SRS-ECU connector C-153 (terminal No.15 and 16) and side impact sensor (LH) connector D-34 (terminal No.2 and 1).

STEP 3. Check whether the diagnosis code is reset.

Q: Is diagnosis code B1438 or B1439 set?
YES : Replace the SRS-ECU (Refer to P.52B-266).
NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1440: Curtain air bag module (RH) (squib) system (short-circuited between terminals of the squib circuit)

Curtain Air Bag Module (Squib) (RH) Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

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OPERATION
The SRS-ECU judges how severe a collision is by detecting signals from the left and right side impact sensors. If the impact is over a predetermined level, the SRS-ECU sends an ignition signal. At this time, if the side-airbag safing G-sensor is on, the curtain air bag module will deploy.

DIAGNOSIS CODE SET CONDITIONS
This diagnosis code is set if one curtain air bag (RH) squib wire shorted to the other.

PROBABLE CAUSES

- Improper engaged connector or defective short spring*
- Short circuit between the curtain air bag module (RH) (squib) circuit terminals
- Damaged connector(s)
- Malfunction of the SRS-ECU

*NOTE: *: The squib circuit connectors integrate a "short" spring (which prevents the air bag from deploying unintentionally due to static electricity by shorting the positive wire to the earth wire in the squib circuit when the connectors are disconnected).Therefore, if connector C-155, C-156, C-157 or D-32 is damaged or improperly engaged, the short spring may not be released when the connector is connected.*

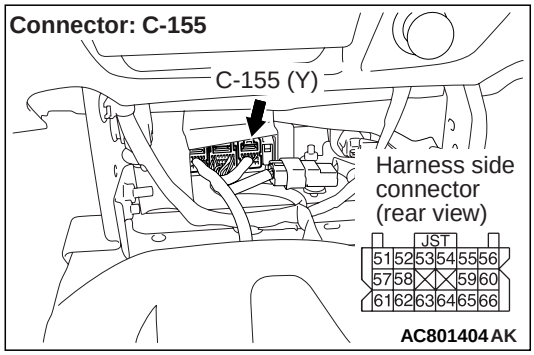
DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code.

Q: Is diagnosis code B1519 set?
YES : Go to Step 2.
NO : Go to Step 3.

STEP 2. Connector lock check: SRS-ECU connector C-155. (M.U.T.-III diagnosis code)

(1) Disconnect the negative battery terminal.

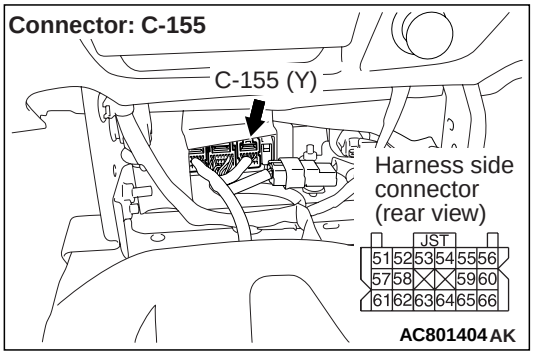


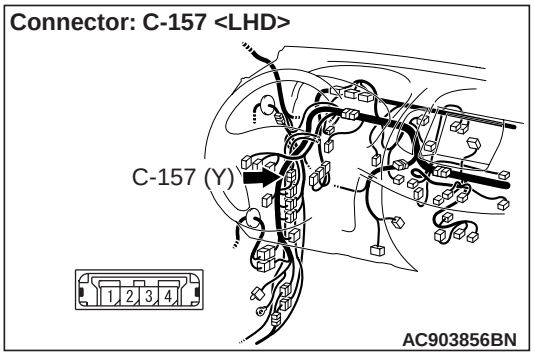
(2) Disconnect the connectors C-155 and then reconnect them.
(3) Connect the negative battery terminal.
(4) Erase the diagnosis code memory, and check the diagnosis code.

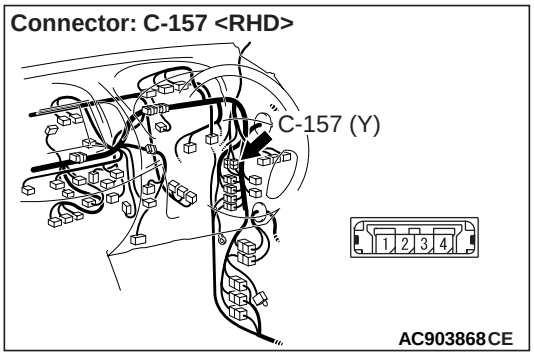
Q: Is diagnosis code B1440 set?
YES : Go to Step 3.
NO : The procedure is complete. It is assumed that diagnosis code B1440 set as connector C-155 was engaged improperly.

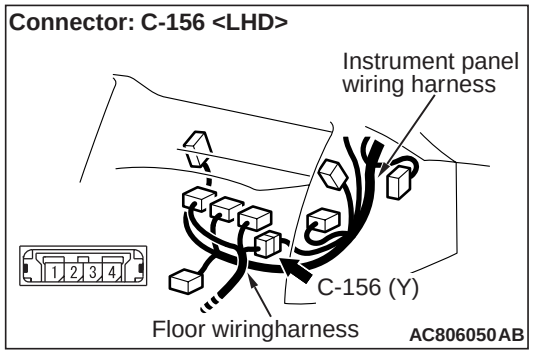
STEP 3. Connector lock check: SRS-ECU connector C-155, intermediate connector C-156, C-157 and curtain air bag module (RH) connector D-32. (M.U.T.-III diagnosis code)

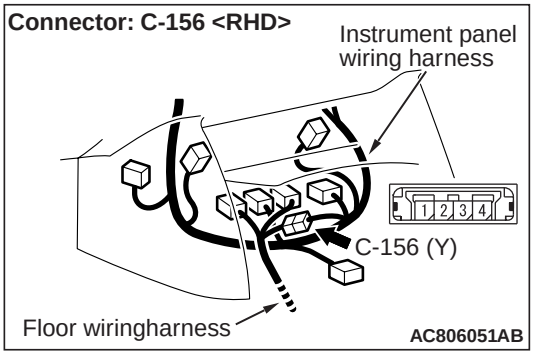
(1) Disconnect the negative battery terminal.

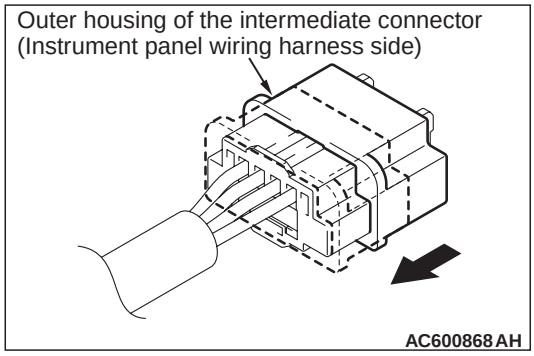




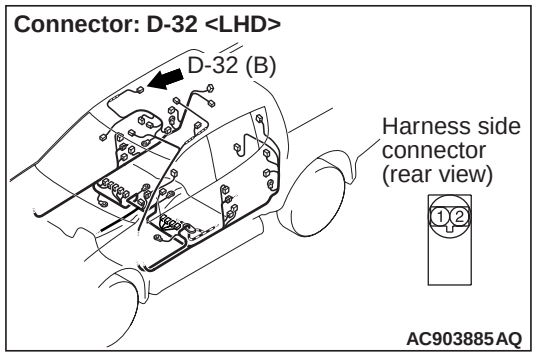


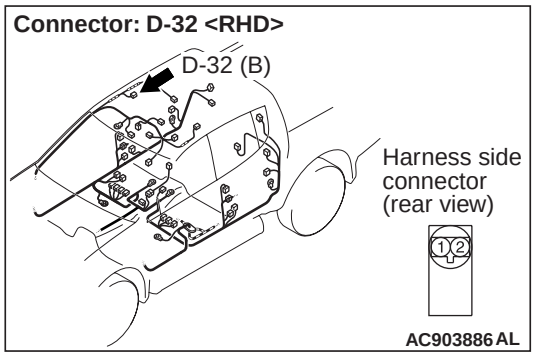


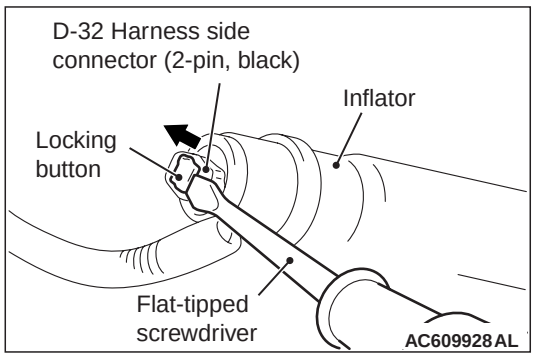




(2) Disconnect connectors C-155, C-156 and C-157 and then reconnect them. Slide the outer hosing of intermediate connector C-156 and C-157 in the arrow direction shown.







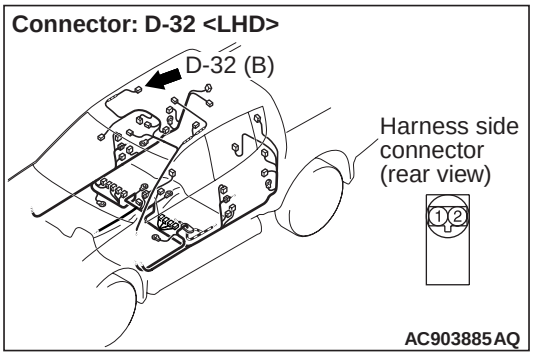
(3) Use the flat-tipped screwdriver to pull out the locking button of D-32 harness side connector to the direction of the arrow. After releasing the lock, disconnect the connector. Then, reconnect the connector.
(4) Connect the negative battery terminal.
(5) Erase the diagnosis code memory, and check the

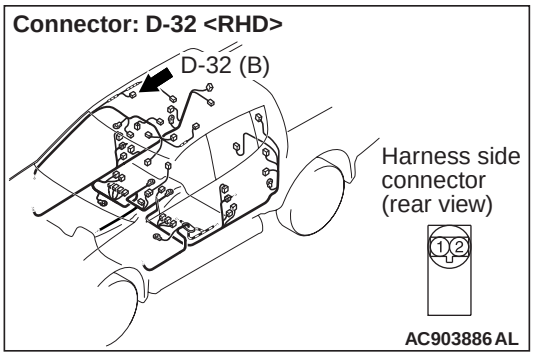
diagnosis code.

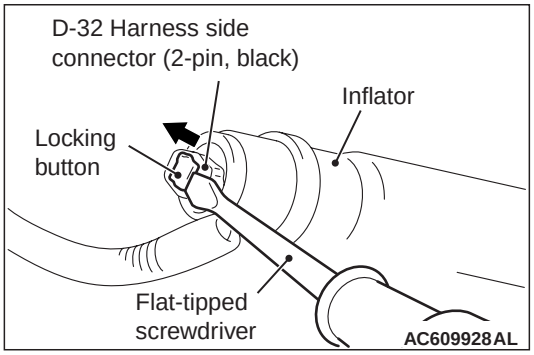
Q: Is diagnosis code B1440 set?
YES : Go to Step 4.
NO : The procedure is complete. It is assumed that diagnosis code B1440 set as connector C-155, C-156, C-157 or D-32 was engaged improperly.

STEP 4. Check the diagnosis code by connecting a dummy resistor. (M.U.T.-III diagnosis code)

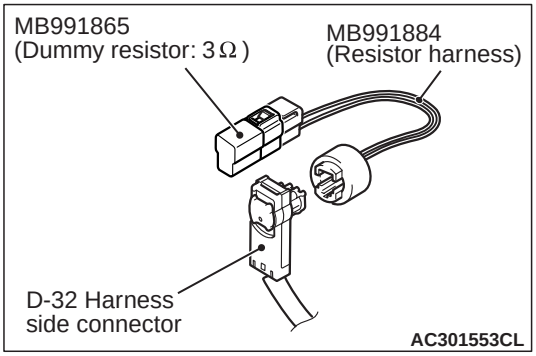
(1) Disconnect the negative battery terminal.







(2) Use the flat-tipped screwdriver to pull out the locking button of D-32 harness side connector to the direction of the arrow. After releasing the lock, disconnect the connector.

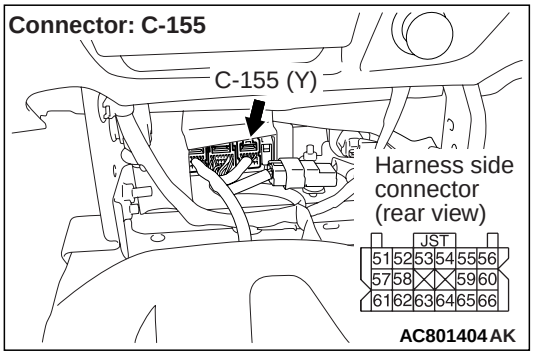


(3) Connect the dummy resistor (Special tool: MB991865) to the resistor harness (Special tool: MB991884).
(4) Connect special tool (MB991884) to the D-32 harness side connector.
(5) Connect the negative battery terminal.
(6) Erase the diagnosis code memory, and check the diagnosis code.

Q: Is diagnosis code B1440 set?
YES : Go to Step 5.
NO : Replace the curtain air bag module (RH) (Refer to P.52B-279).

STEP 5. Resistance measurement at SRS-ECU connector C-155.

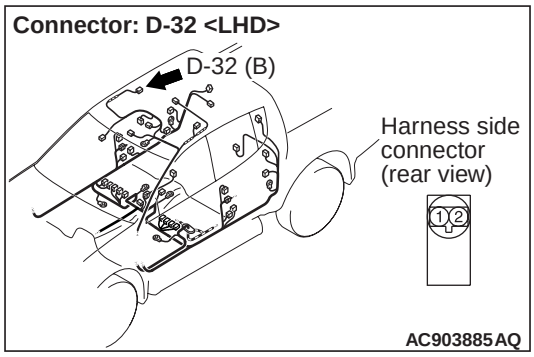
(1) Disconnect the negative battery terminal.

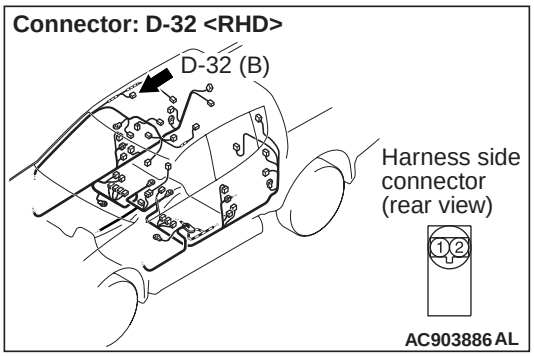


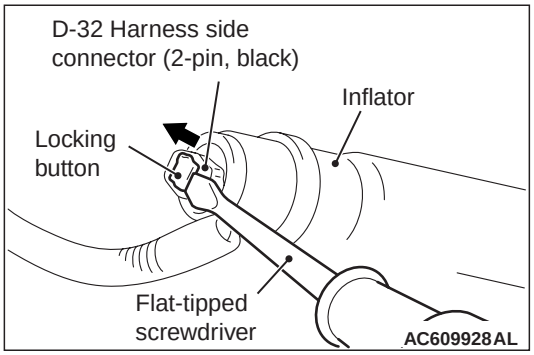
(2) Disconnect SRS-ECU connector C-155.

⚠ ***DANGER***

To prevents the air bag from deploying unintentionally, disconnect the curtain air bag module (RH) connector D-32 to short the squib circuit.

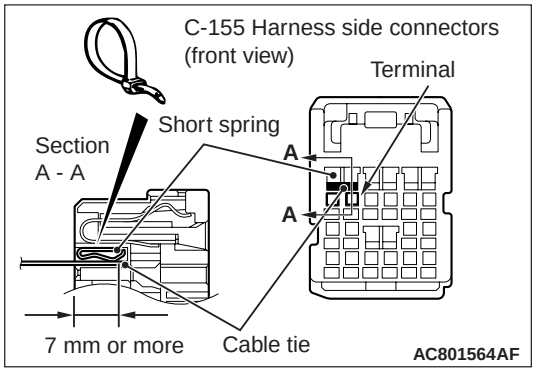






(3) Use the flat-tipped screwdriver to pull out the locking button of D-32 harness side connector to the direction of the arrow. After releasing the lock, disconnect the connector.

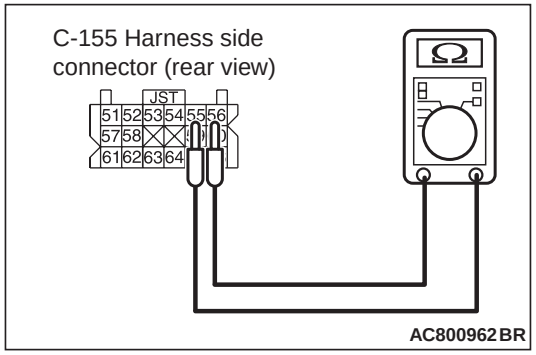
⚠ **CAUTION**



Insert an insulator such as a cable tie to a depth of 7 mm or more, otherwise the short spring will not be released.

(4) Insert a cable tie [3 mm wide, 0.5 mm thick] between terminals 55, 56 and the short spring to release the short spring.

⚠ **CAUTION**



Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(5) Resistance measurement between C-155 harness side connector terminals 55 and 56.

OK: Open circuit

Q: Is the check result normal?

YES : Go to Step 6.

NO : Repair the harness wires between SRS-ECU connector C-155 (terminal No.55 and 56) and curtain air bag module (RH) connector D-32 (terminal No.2 and 1).

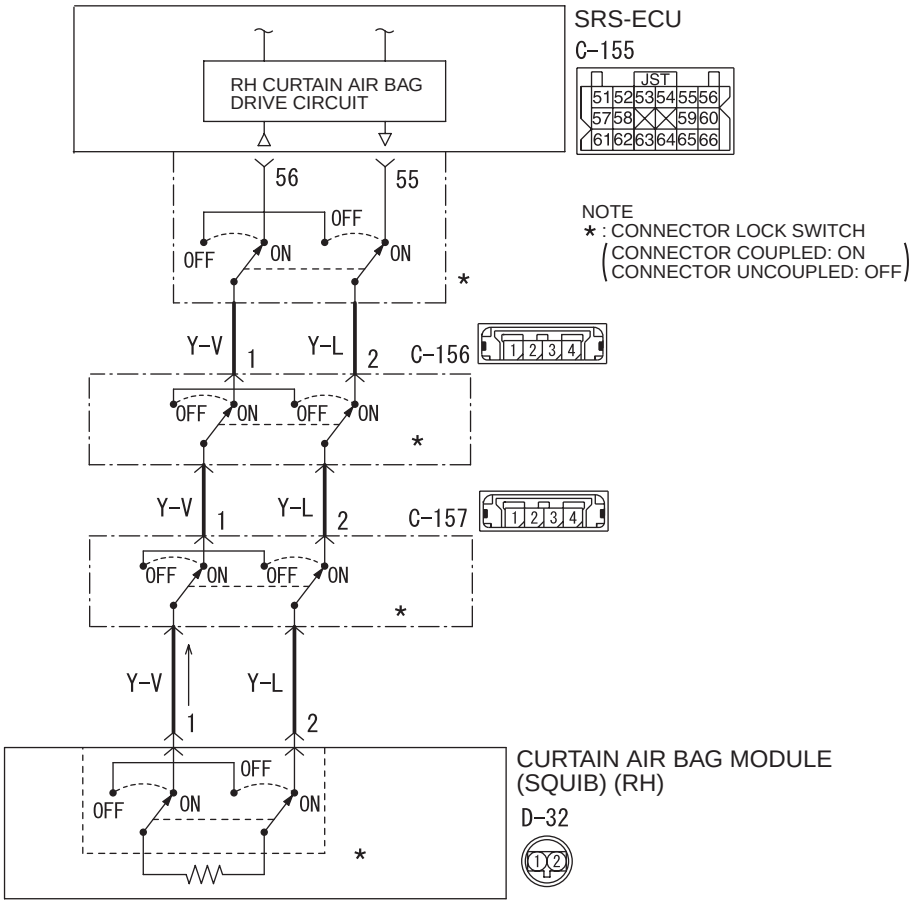
STEP 6. Check whether the diagnosis code is reset.

Q: Is diagnosis code B1440 set?

YES : Replace the SRS-ECU (Refer to P.52B-266).
NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1441: Curtain air bag module (RH) (squib) system (open-circuited in the squib circuit)

Curtain Air Bag Module (Squib) (RH) Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

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OPERATION
The SRS-ECU judges how severe a collision is by detecting signals from the left and right side impact sensors. If the impact is over a predetermined level, the SRS-ECU sends an ignition signal. At this time, if the side-airbag safing G-sensor is on, the curtain air bag module will deploy.

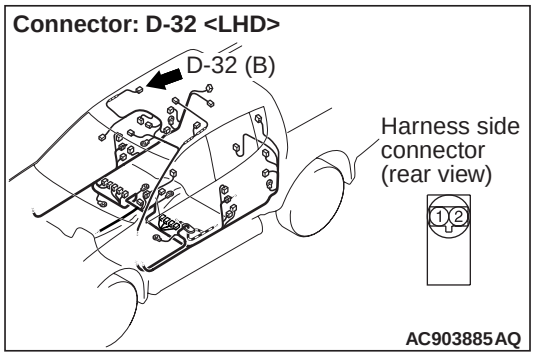
DIAGNOSIS CODE SET CONDITIONS
This diagnosis code is set if curtain air bag (RH) squib wire(s) are open-circuited.

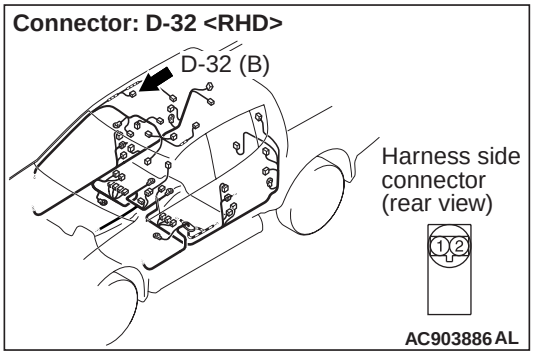
PROBABLE CAUSES
- Open circuit in the curtain air bag module (RH) (squib) circuit
- Improper connector contact
- Malfunction of the SRS-ECU

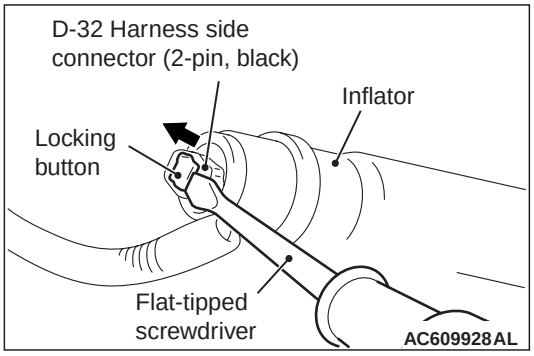
DIAGNOSIS PROCEDURE

STEP 1. Check the diagnosis code by connecting a dummy resistor. (M.U.T.-III diagnosis code)

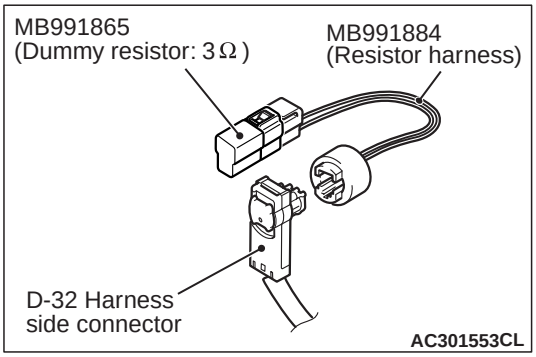
(1) Disconnect the negative battery terminal.







(2) Use the flat-tipped screwdriver to pull out the locking button of D-32 harness side connector to the direction of the arrow. After releasing the lock, disconnect the connector. Then, reconnect the connector.

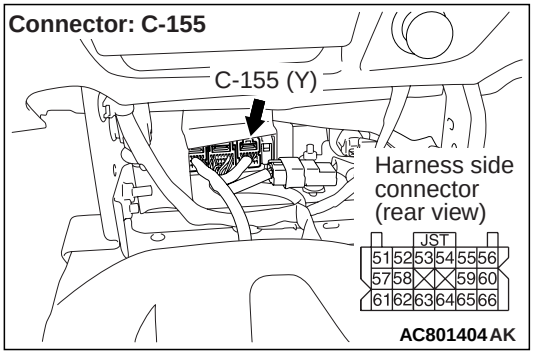


(3) Connect the dummy resistor (Special tool: MB991865) to the resistor harness (Special tool: MB991884).
(4) Connect special tool (MB991884) to the D-32 harness side connector.
(5) Connect the negative battery terminal.
(6) Erase the diagnosis code memory, and check the diagnosis code.

Q: Is diagnosis code B1441 set?
YES : Go to Step 2 .
NO : Replace the curtain air bag module (RH) (Refer to P.52B-279).

STEP 2. Resistance measurement between SRS-ECU connector C-155 (terminal No.55 and 56) and the curtain air bag module (RH) connector D-32 (terminal No.2 and 1).

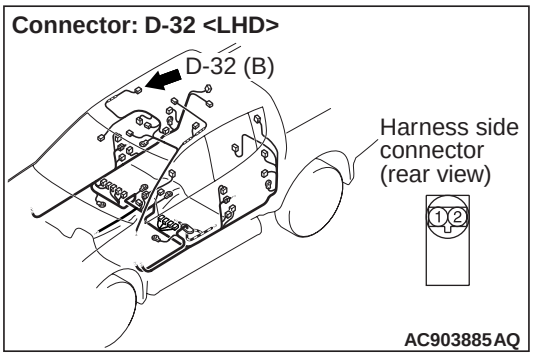
(1) Disconnect the negative battery terminal.

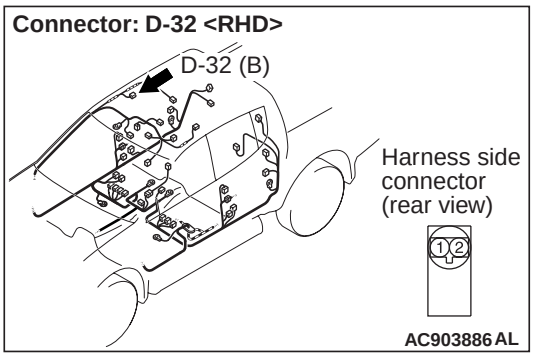


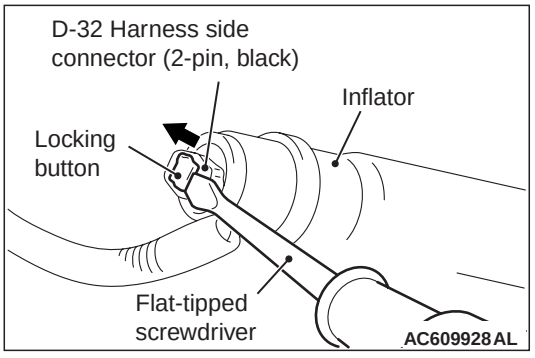
(2) Disconnect SRS-ECU connector C-155.

⚠ *DANGER*

To prevents the air bag from deploying unintentionally, disconnect the curtain air bag module (RH) connector D-32 to short the squib circuit.

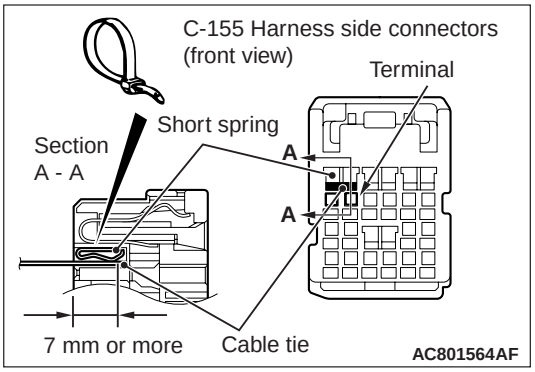






(3) Use the flat-tipped screwdriver to pull out the locking button of D-32 harness side connector to the direction of the arrow. After releasing the lock, disconnect the connector. Then, reconnect the connector.

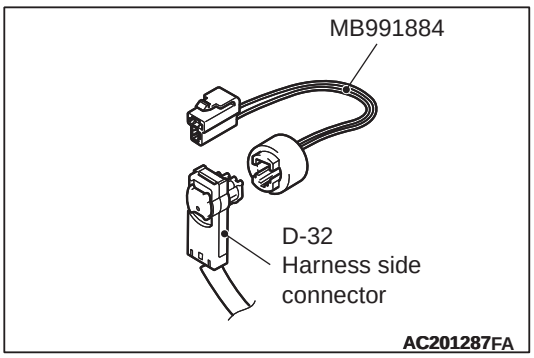
⚠ **CAUTION**



Insert an insulator such as a cable tie to a depth of 7 mm or more, otherwise the short spring will not be released.

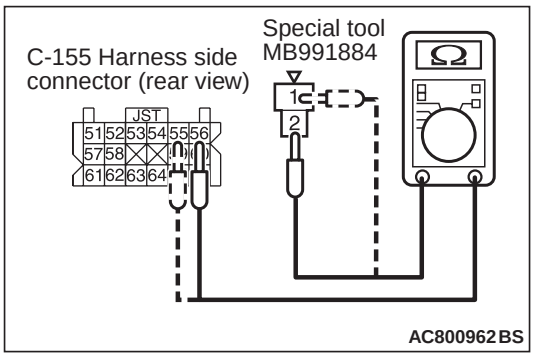
(4) Insert a cable tie [3 mm wide, 0.5 mm thick] between terminals 55, 56 and the short spring to

release the short spring.



(5) Connect D-32 harness side connector to special tool resistor harness (MB991884).

⚠ CAUTION



Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(6) Resistance measurement between the following terminals.

- SRS-ECU connector C-155 terminal No.55 and special tool terminal No.1
- SRS-ECU connector C-155 terminal No.56 and special tool terminal No.2

OK: Continuity (Less than 2 Ω)

Q: Are the check results normal?

YES : Go to Step 3 .

NO : Repair the harness wires between SRS-ECU connector C-155 (terminal No.55 and 56) and curtain air bag module (RH) connector D-32 (terminal No.2 and1).

STEP 3. Check whether the diagnosis code is reset.

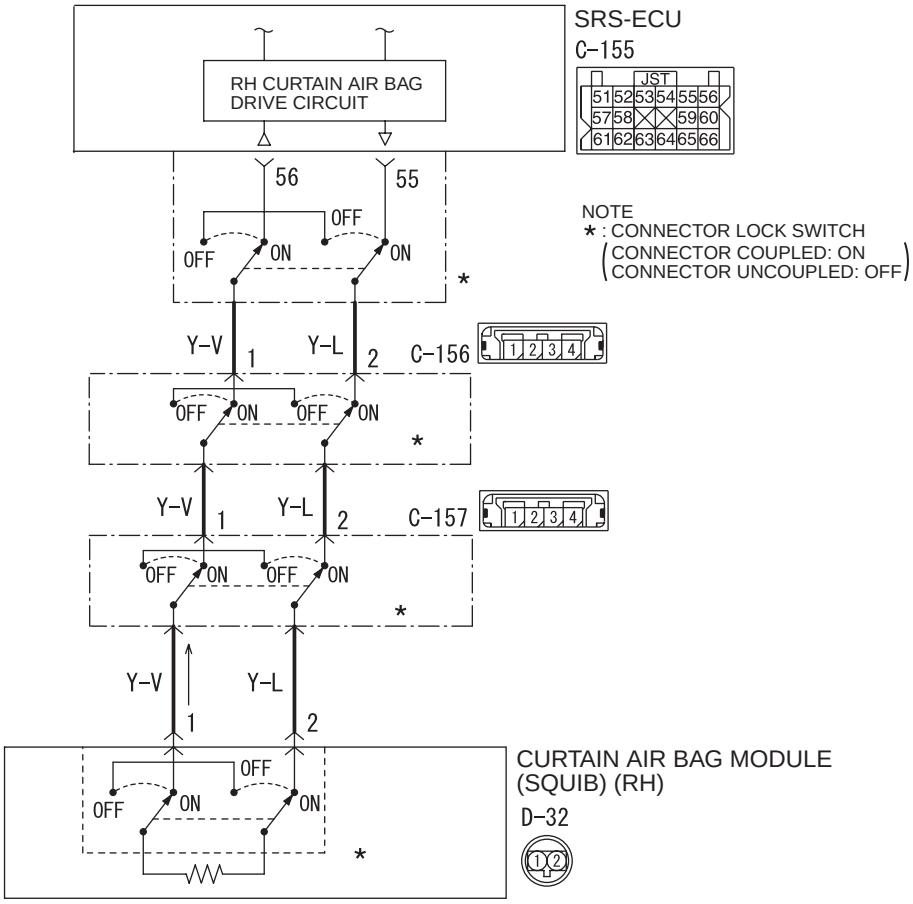
Q: Is diagnosis code B1441 set?

YES : Replace the SRS-ECU (Refer to P.52B-266).

NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1442: Curtain air bag module (RH) (squib) system (short-circuited to the earth)

Curtain Air Bag Module (Squib) (RH) Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

AC805929 AC

OPERATION

The SRS-ECU judges how severe a collision is by detecting signals from the left and right side impact sensors. If the impact is over a predetermined level, the SRS-ECU sends an ignition signal. At this time, if the side-airbag safing G-sensor is on, the curtain air bag module will deploy.

DIAGNOSIS CODE SET CONDITIONS

This diagnosis code is set if the curtain air bag (RH) squib wire(s) are short-circuited to the earth.

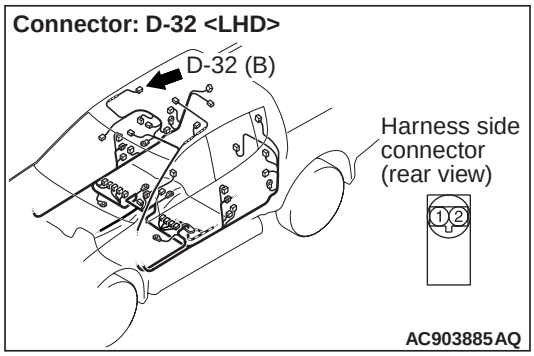
PROBABLE CAUSES

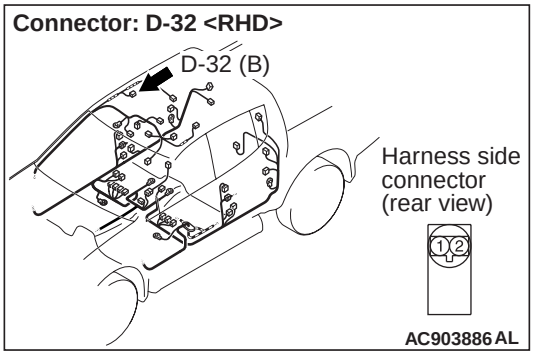
- Damaged harness wires and connectors
- Short to the earth in the curtain air bag module (RH) (squib) harness
- Malfunction of the SRS-ECU

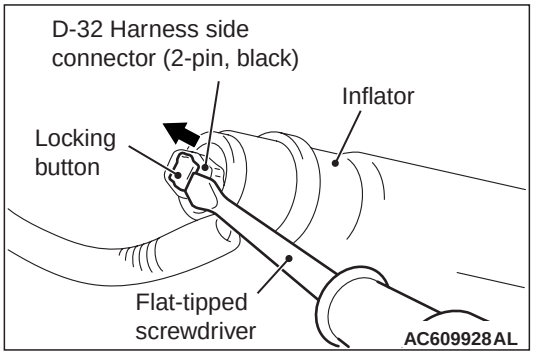
DIAGNOSIS PROCEDURE

STEP 1. Check the diagnosis code by connecting a dummy resistor. (M.U.T.-III diagnosis code)

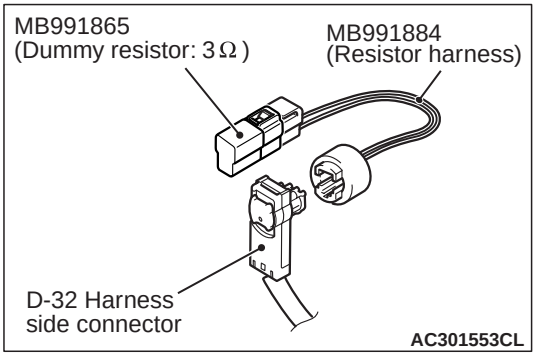
(1) Disconnect the negative battery terminal.







(2) Use the flat-tipped screwdriver to pull out the locking button of D-32 harness side connector to the direction of the arrow. After releasing the lock, disconnect the connector.

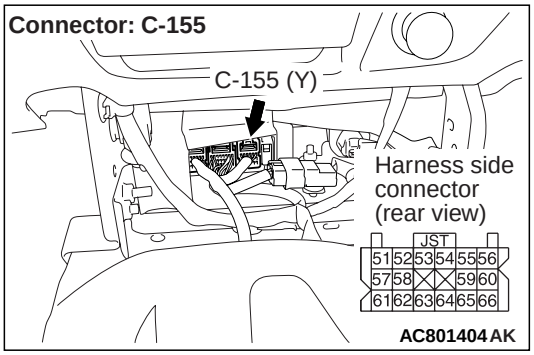


(3) Connect the dummy resistor (Special tool: MB991865) to the resistor harness (Special tool: MB991884).
(4) Connect special tool (MB991884) to the D-32 harness side connector.
(5) Connect the negative battery terminal.
(6) Erase the diagnosis code memory, and check the diagnosis code.

Q: Is diagnosis code B1442 set?
YES : Go to Step 2.
NO : Replace the curtain air bag module (RH) (Refer to P.52B-279).

STEP 2. Resistance measurement at the SRS-ECU connector C-155.

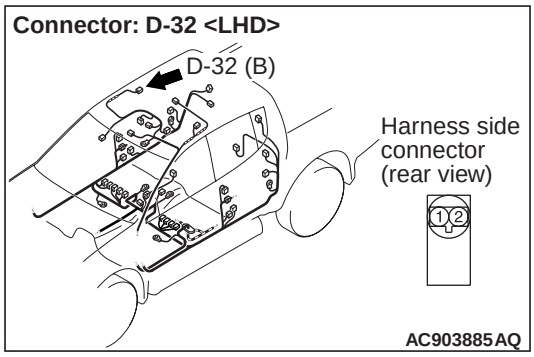
(1) Disconnect the negative battery terminal.

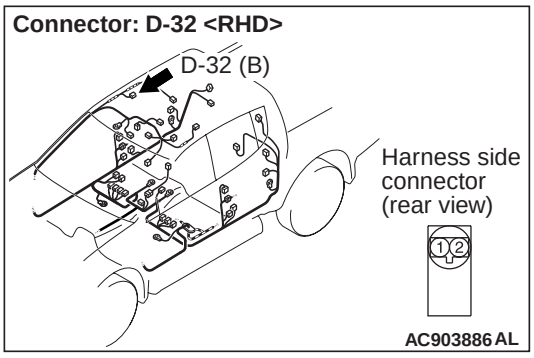


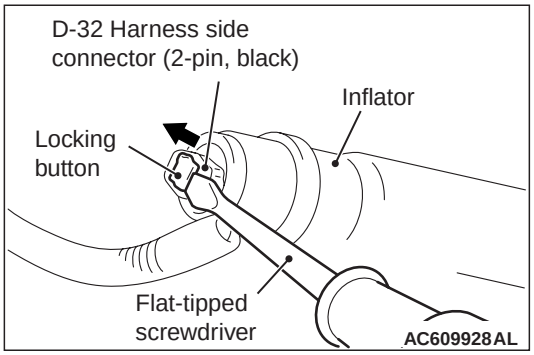
(2) Disconnect SRS-ECU connector C-155.

⚠ ***DANGER***

To prevents the air bag from deploying unintentionally, disconnect the curtain air bag module (RH) connector D-32 to short the squib circuit.

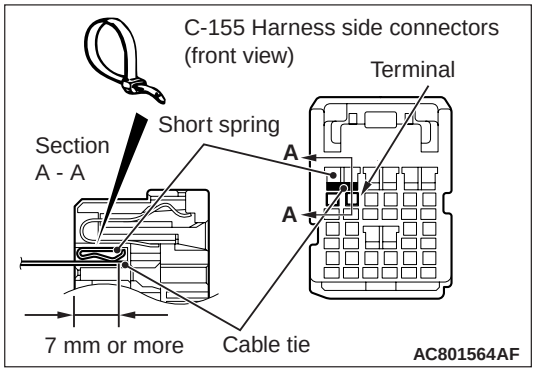






(3) Use the flat-tipped screwdriver to pull out the locking button of D-32 harness side connector to the direction of the arrow. After releasing the lock, disconnect the connector.

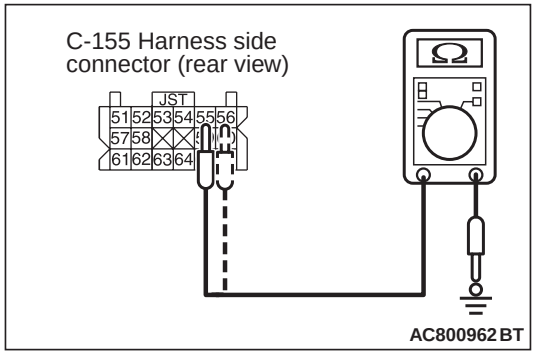
⚠ **CAUTION**



Insert an insulator such as a cable tie to a depth of 7 mm or more, otherwise the short spring will not be released.

(4) Insert a cable tie [3 mm wide, 0.5 mm thick] between terminals 55, 56 and the short spring to release the short spring.

⚠ **CAUTION**



Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(5) Resistance measurement between C-155 harness side connector terminals 55, 56 and body earth.

OK: Open circuit

Q: Is the check result normal?

YES : Go to Step 3.

NO : Repair the harness wires between SRS-ECU connector C-155 (terminal No.55 and 56) and curtain air bag module (RH) connector D-32 (terminal No.2 and 1).

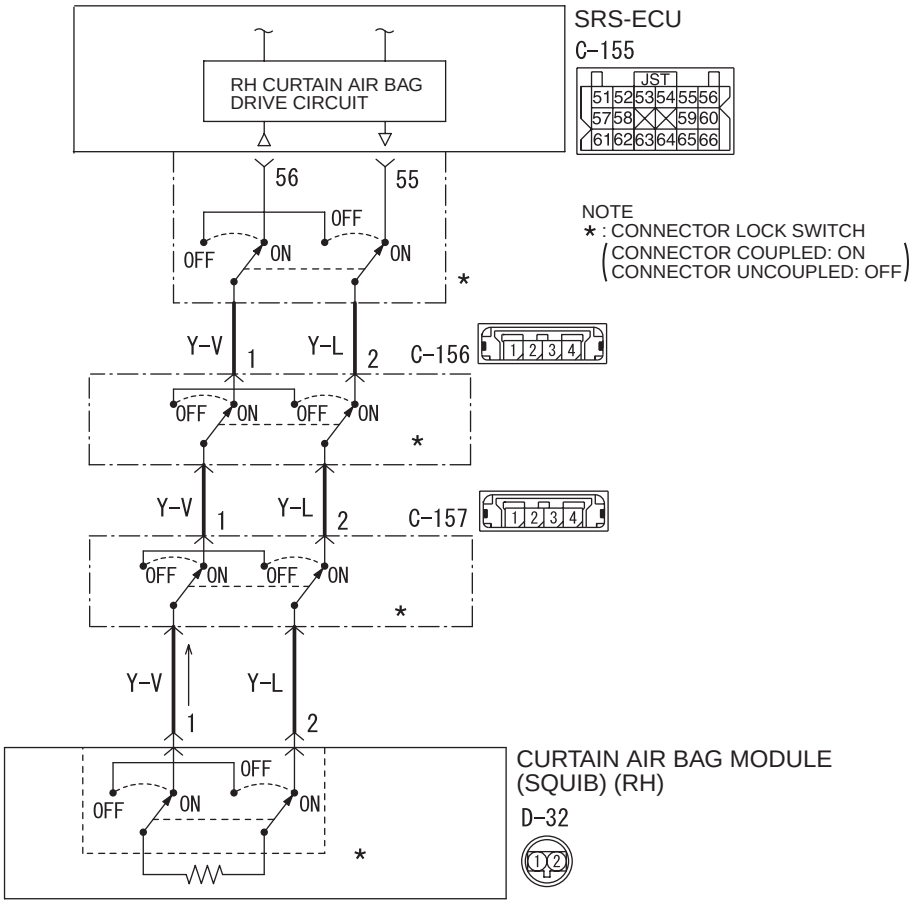
STEP 3. Check whether the diagnosis code is reset.

Q: Is diagnosis code B1442 set?

YES : Replace the SRS-ECU (Refer to P.52B-266).
NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1443: Curtain air bag module (RH) (squib) system (short-circuited to the power supply)

Curtain Air Bag Module (Squib) (RH) Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

AC805929 AC

OPERATION
The SRS-ECU judges how severe a collision is by detecting signals from the left and right side impact sensors. If the impact is over a predetermined level, the SRS-ECU sends an ignition signal. At this time, if the side-airbag safing G-sensor is on, the curtain air bag module will deploy.

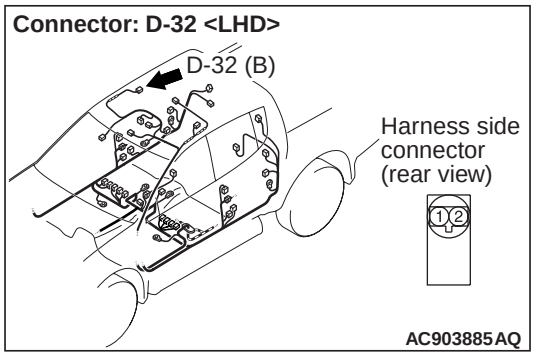
DIAGNOSIS CODE SET CONDITIONS
This diagnosis code is set if the curtain air bag (RH) squib wire(s) are short-circuited to the power supply.

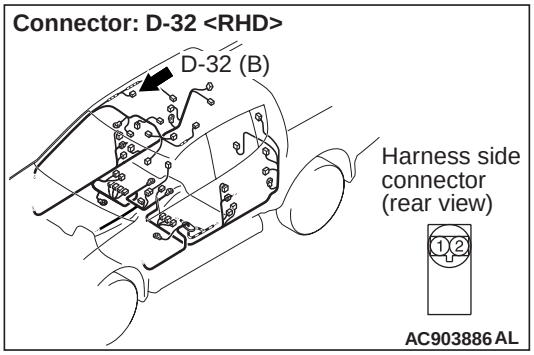
PROBABLE CAUSES
- Damaged harness wires and connectors
- Short to the power supply in the curtain air bag module (RH) (squib) harness
- Malfunction of the SRS-ECU

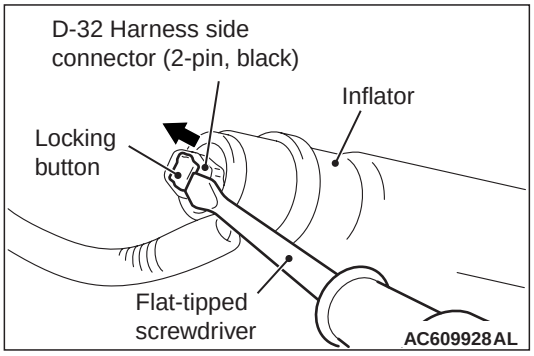
DIAGNOSIS PROCEDURE

STEP1. Check the diagnosis code by connecting a dummy resistor. (M.U.T.-III diagnosis code)

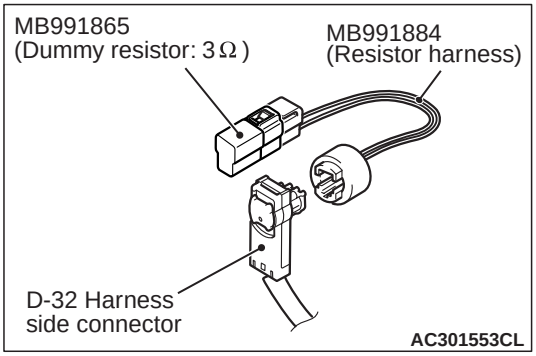
(1) Disconnect the negative battery terminal.







(2) Use the flat-tipped screwdriver to pull out the locking button of D-32 harness side connector to the direction of the arrow. After releasing the lock, disconnect the connector.

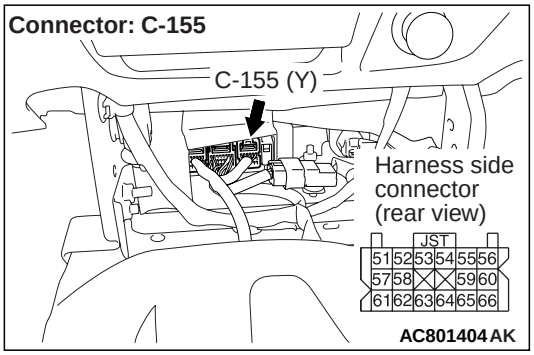


(3) Connect the dummy resistor (Special tool: MB991865) to the resistor harness (Special tool: MB991884).
(4) Connect special tool (MB991884) to the D-32 harness side connector.
(5) Connect the negative battery terminal.
(6) Erase the diagnosis code memory, and check the diagnosis code.

Q: Is diagnosis code B1443 set?
YES : Go to Step 2.
NO : Replace the curtain air bag module (RH) (Refer to P.52B-279).

STEP 2. Voltage measurement at the SRS-ECU connector C-155.

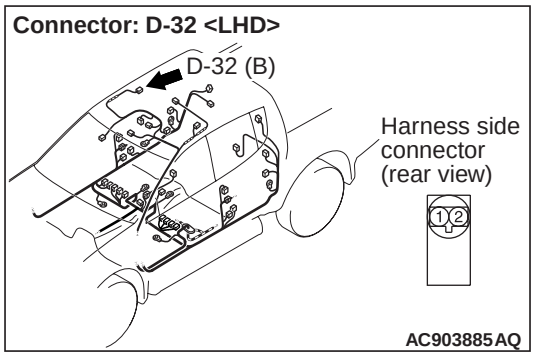
(1) Disconnect the negative battery terminal.

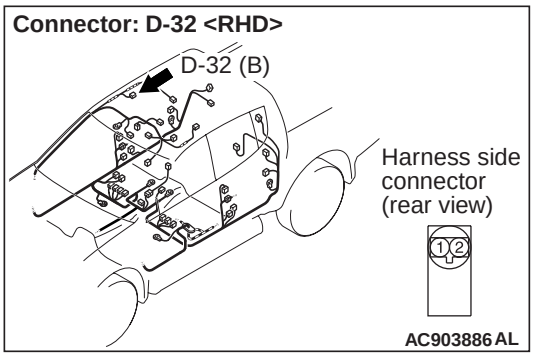


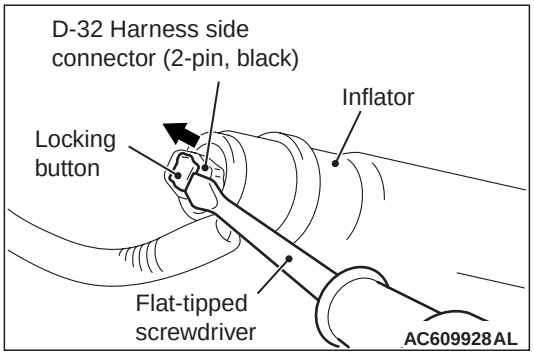
(2) Disconnect SRS-ECU connector C-155.

⚠ ***DANGER***

To prevents the air bag from deploying unintentionally, disconnect the curtain air bag module (RH) connector D-32 to short the squib circuit.

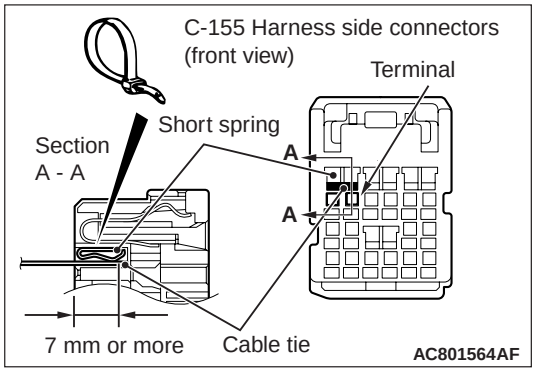






(3) Use the flat-tipped screwdriver to pull out the locking button of D-32 harness side connector to the direction of the arrow. After releasing the lock, disconnect the connector.

⚠ **CAUTION**



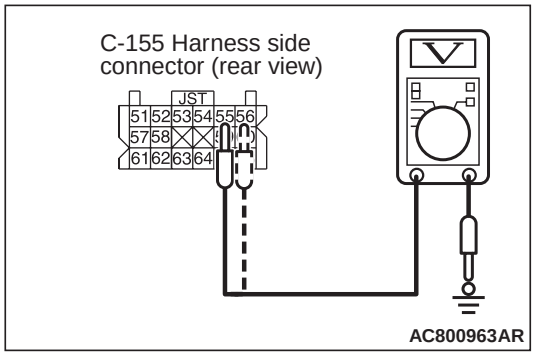
Insert an insulator such as a cable tie to a depth of 7 mm or more, otherwise the short spring will not be released.

(4) Insert a cable tie [3 mm wide, 0.5 mm thick] between terminals 55, 56 and the short spring to release the short spring.

(5) Connect the negative battery terminal.

(6) Turn the ignition switch to the "ON" position.

⚠ **CAUTION**



Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(7) Voltage measurement between C-155 harness side connector terminals 55, 56 and body earth.

OK: 1 V or less

Q: Is the check result normal?

YES : Go to Step 3.

NO : Repair the harness wires between SRS-ECU connector C-155 (terminal No.55 and 56) and side-airbag (RH) air bag module connector D-32 (terminal No.2 and 1).

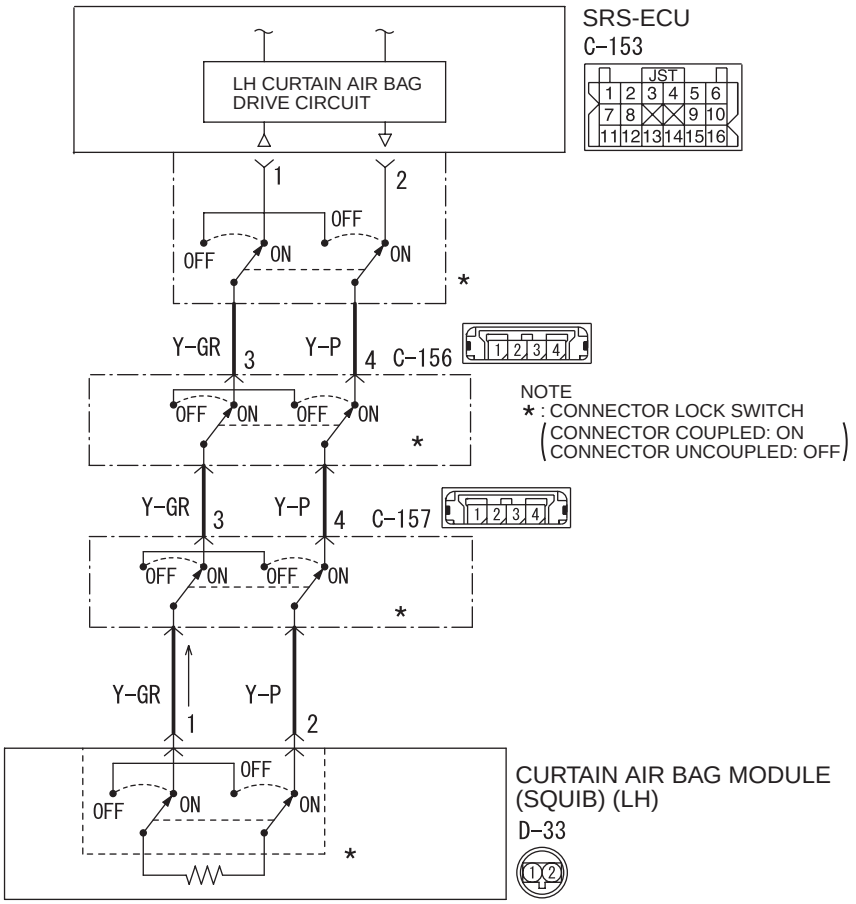
STEP 3. Check whether the diagnosis code is reset.

Q: Is diagnosis code B1443 set?

YES : Replace the SRS-ECU (Refer to P.52B-266).
NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1450: Curtain air bag module (LH) (squib) system (short-circuited between terminals of the squib circuit)

Curtain Air Bag Module (Squib) (LH) Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

AC805930 AD

OPERATION
The SRS-ECU judges how severe a collision is by detecting signals from the left and right side impact sensors. If the impact is over a predetermined level, the SRS-ECU sends an ignition signal. At this time, if the side-airbag safing G-sensor is on, the curtain air bag module will deploy.

DIAGNOSIS CODE SET CONDITIONS
This diagnosis code is set if one curtain air bag (LH) squib wire shorted to the other.

PROBABLE CAUSES
- Improper engaged connector or defective short spring*
- Short circuit between the curtain air bag module (LH) (squib) circuit terminals
- Damaged connector(s)

- Malfunction of the SRS-ECU

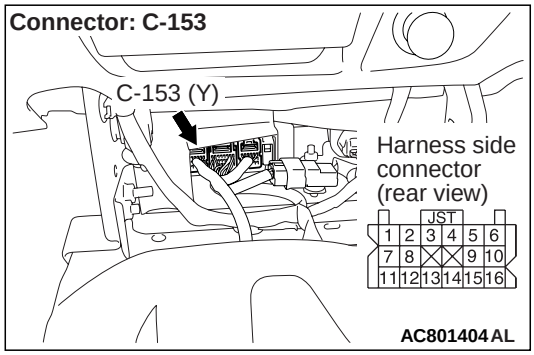
*NOTE: *: The squib circuit connectors integrate a "short" spring (which prevents the air bag from deploying unintentionally due to static electricity by shorting the positive wire to the earth wire in the squib circuit when the connectors are disconnected).Therefore, if connector C-153, C-156 C-157 or D-33 is damaged or improperly engaged, the short spring may not be released when the connector is connected.*

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code.

Q: Is diagnosis code B1519 set?
YES : Go to Step 2.
NO : Go to Step 3.

STEP 2. Connector lock check: SRS-ECU connector C-153. (M.U.T.-III diagnosis code)
(1) Disconnect the negative battery terminal.

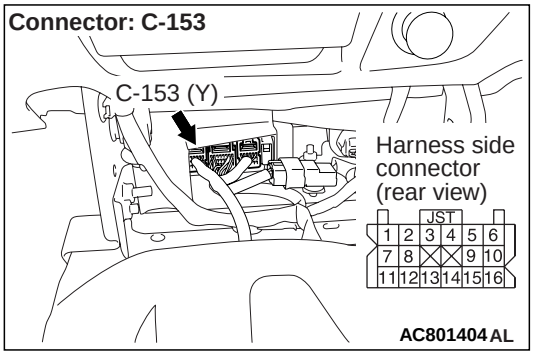


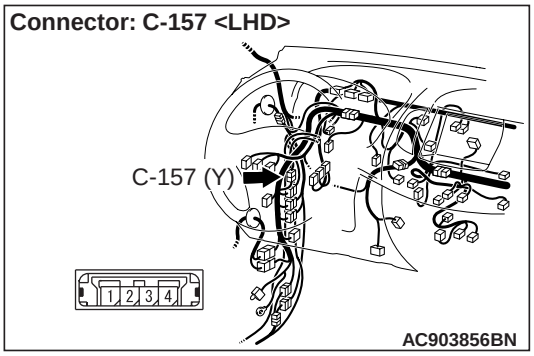
(2) Disconnect the connectors C-153 and then reconnect them.
(3) Connect the negative battery terminal.
(4) Erase the diagnosis code memory, and check the diagnosis code.

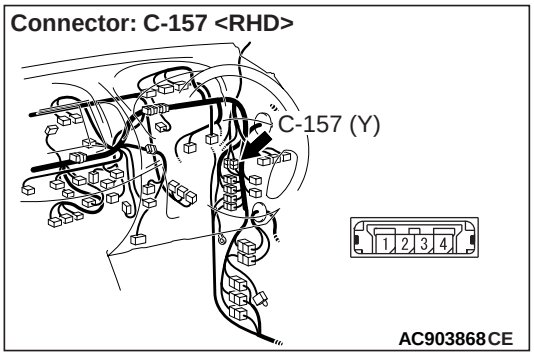
Q: Is diagnosis code B1450 set?
YES : Go to Step 3.
NO : The procedure is complete. It is assumed that diagnosis code B1450 set as connector C-153 was engaged improperly.

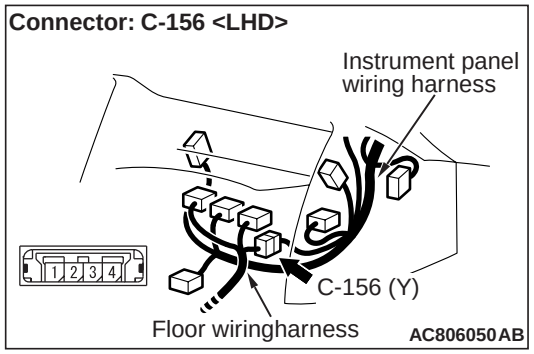
STEP 3. Connector lock check: SRS-ECU connector C-153, intermediate connector C-156, C-157 and curtain air bag module (LH) connector D-33. (M.U.T.-III diagnosis code)

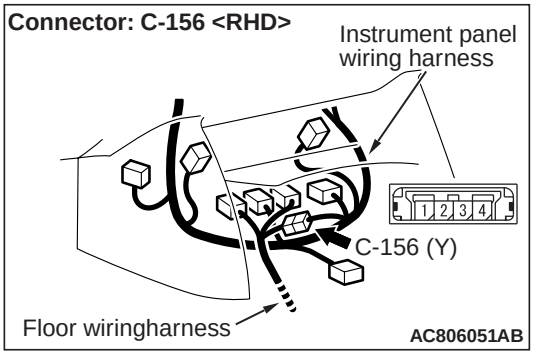
(1) Disconnect the negative battery terminal.

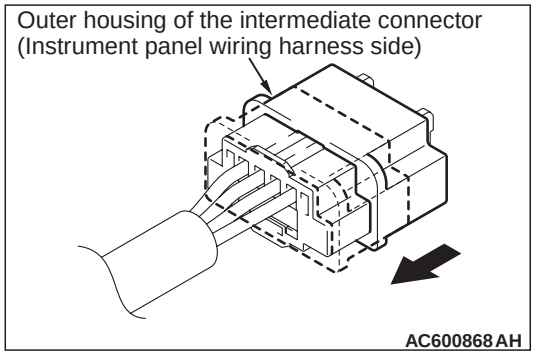




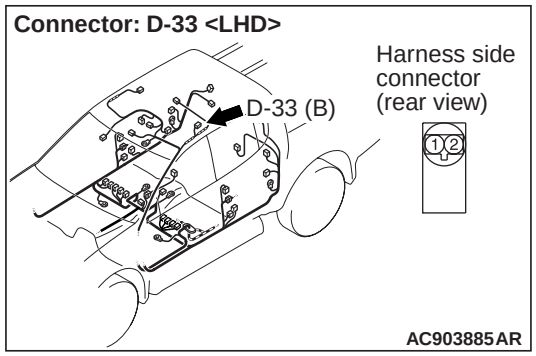


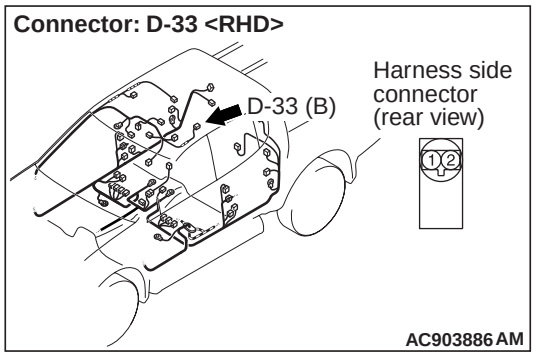


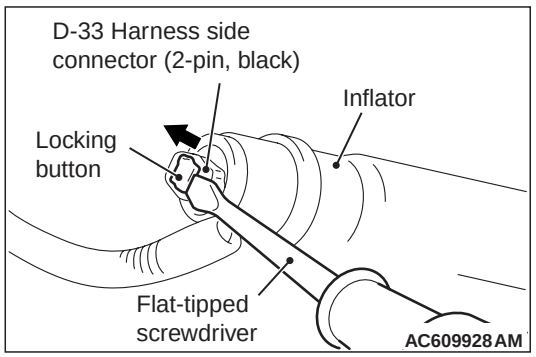




(2) Disconnect connectors C-153, C-156 and C-157 and then reconnect them. Slide the outer hosing of intermediate connector C-156 and C-157 in the arrow direction shown.







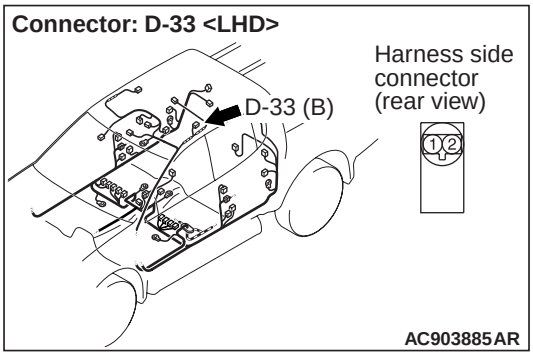
(3) Use the flat-tipped screwdriver to pull out the locking button of D-33 harness side connector to the direction of the arrow. After releasing the lock, disconnect the connector. Then, reconnect the connector.
(4) Connect the negative battery terminal.
(5) Erase the diagnosis code memory, and check the

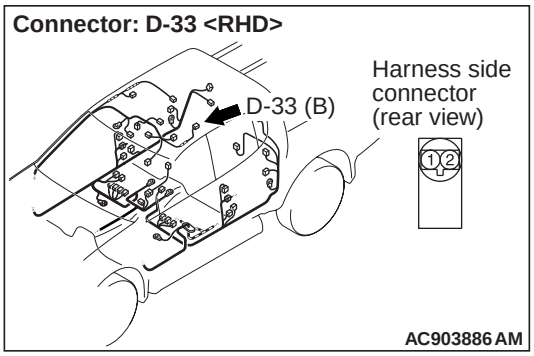
diagnosis code.

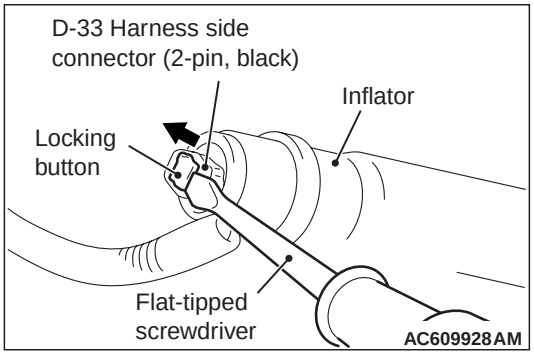
Q: Is diagnosis code B1450 set?
YES : Go to Step 4.
NO : The procedure is complete. It is assumed that diagnosis code B1450 set as connector C-153, C-156, C-157 or D-33 was engaged improperly.

STEP 4. Check the diagnosis code by connecting a dummy resistor. (M.U.T.-III diagnosis code)

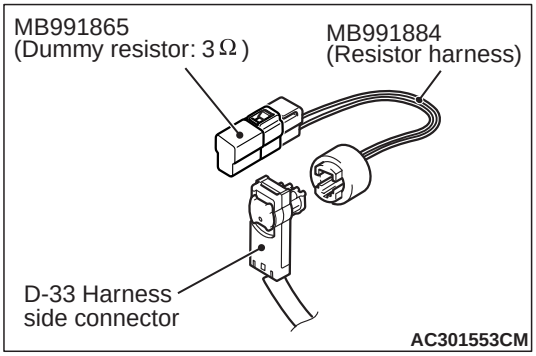
(1) Disconnect the negative battery terminal.







(2) Use the flat-tipped screwdriver to pull out the locking button of D-33 harness side connector to the direction of the arrow. After releasing the lock, disconnect the connector.

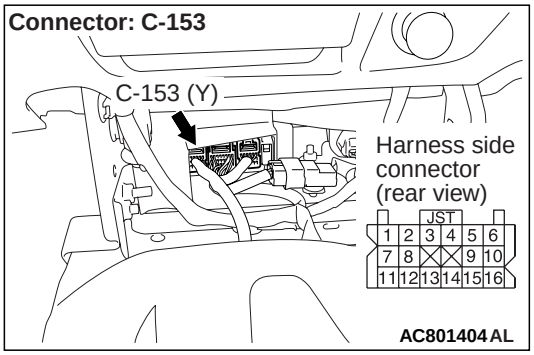


(3) Connect the dummy resistor (Special tool: MB991865) to the resistor harness (Special tool: MB991884).
(4) Connect special tool (MB991884) to the D-33 harness side connector.
(5) Connect the negative battery terminal.
(6) Erase the diagnosis code memory, and check the diagnosis code.

Q: Is diagnosis code B1450 set?
YES : Go to Step 5.
NO : Replace the curtain air bag module (LH) (Refer to P.52B-279).

STEP 5. Resistance measurement at SRS-ECU connector C-153.

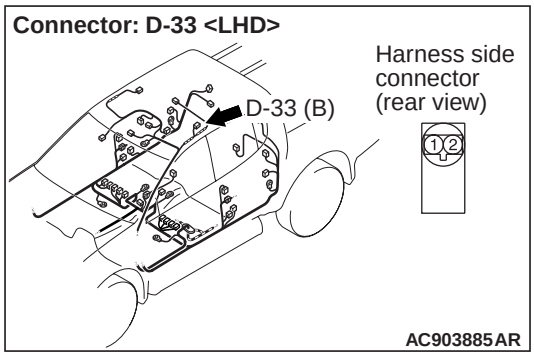
(1) Disconnect the negative battery terminal.

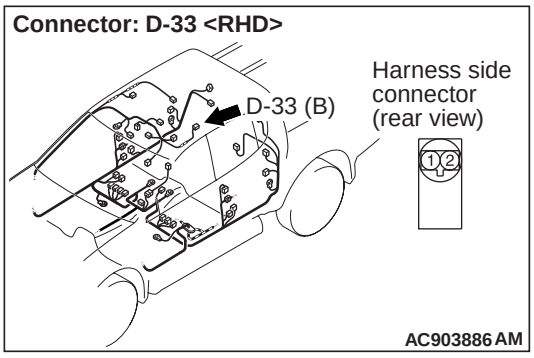


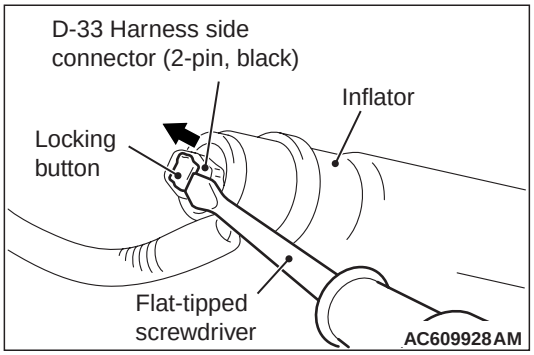
(2) Disconnect SRS-ECU connector C-153.

⚠ ***DANGER***

To prevents the air bag from deploying unintentionally, disconnect the curtain air bag module (LH) connector D-33 to short the squib circuit.

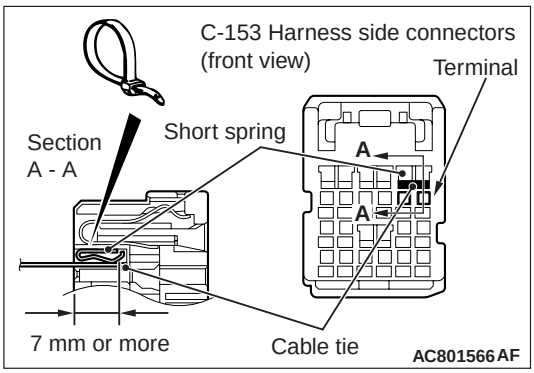






(3) Use the flat-tipped screwdriver to pull out the locking button of D-33 harness side connector to the direction of the arrow. After releasing the lock, disconnect the connector.

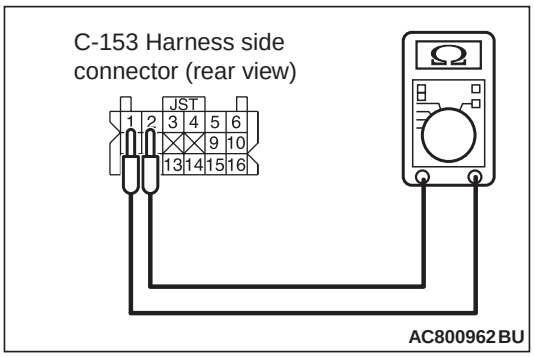
⚠ **CAUTION**



Insert an insulator such as a cable tie to a depth of 7 mm or more, otherwise the short spring will not be released.

(4) Insert a cable tie [3 mm wide, 0.5 mm thick] between terminals 1, 2 and the short spring to release the short spring.

⚠ **CAUTION**



Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(5) Resistance measurement between C-153 harness side connector terminals 1 and 2.

OK: Open circuit

Q: Is the check result normal?

YES : Go to Step 6.

NO : Repair the harness wires between SRS-ECU connector C-153 (terminal No.1 and 2) and curtain air bag module (LH) connector D-33 (terminal No.1 and 2).

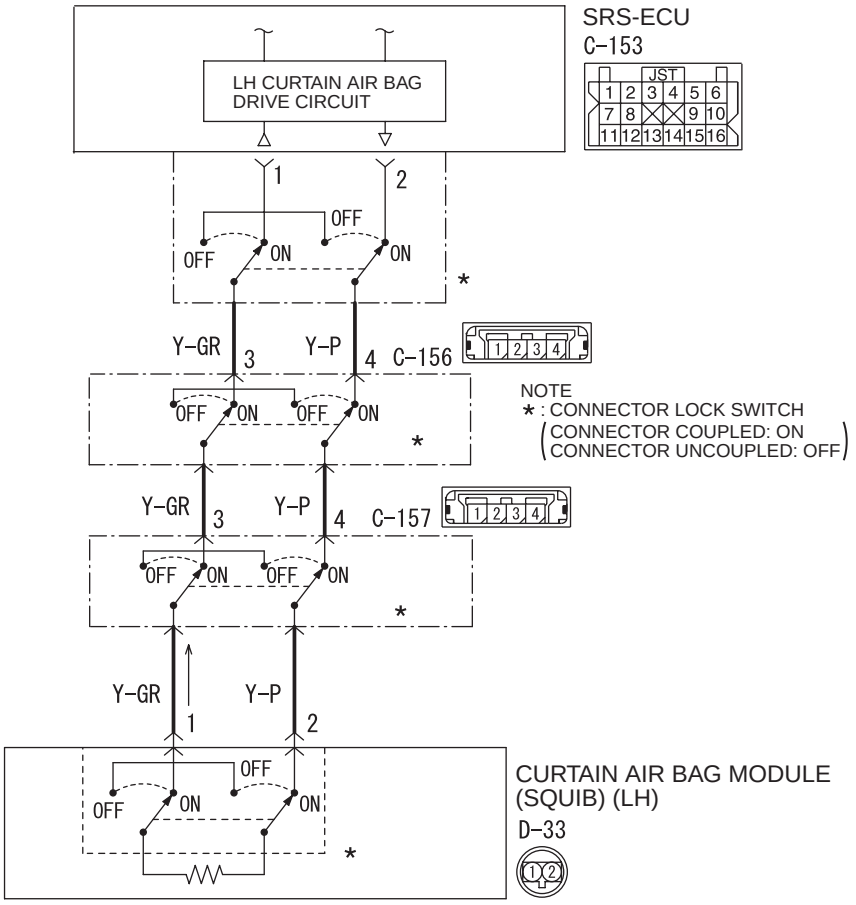
STEP 6. Check whether the diagnosis code is reset.

Q: Is diagnosis code B1450 set?

YES : Replace the SRS-ECU (Refer to P.52B-266).
NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1451: Curtain air bag module (LH) (squib) system (open-circuited in the squib circuit)

Curtain Air Bag Module (Squib) (LH) Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

AC805930 AD

OPERATION
The SRS-ECU judges how severe a collision is by detecting signals from the left and right side impact sensors. If the impact is over a predetermined level, the SRS-ECU sends an ignition signal. At this time, if the side-airbag safing G-sensor is on, the curtain air bag module will deploy.

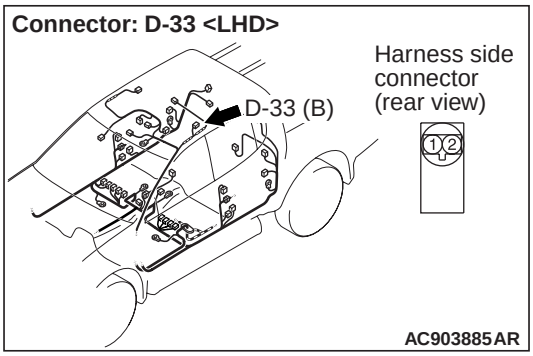
DIAGNOSIS CODE SET CONDITIONS
This diagnosis code is set if curtain air bag (LH) squib wire(s) are open-circuited.

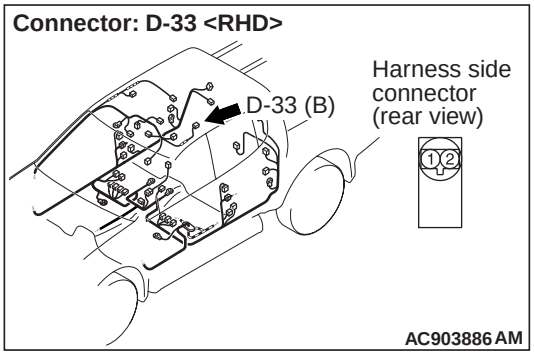
PROBABLE CAUSES
- Open circuit in the curtain air bag module (LH) (squib) circuit
- Improper connector contact
- Malfunction of the SRS-ECU

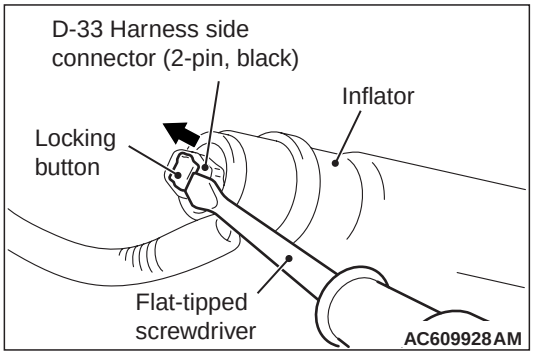
DIAGNOSIS PROCEDURE

STEP 1. Check the diagnosis code by connecting a dummy resistor. (M.U.T.-III diagnosis code)

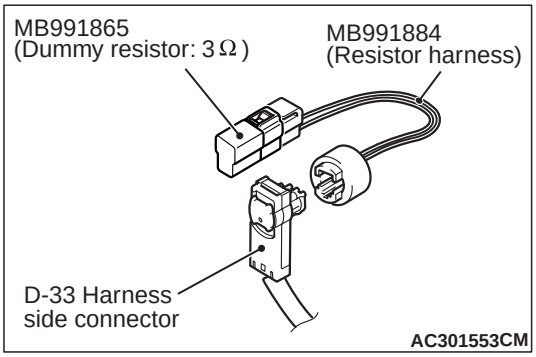
(1) Disconnect the negative battery terminal.







(2) Use the flat-tipped screwdriver to pull out the locking button of D-33 harness side connector to the direction of the arrow. After releasing the lock, disconnect the connector. Then, reconnect the connector.

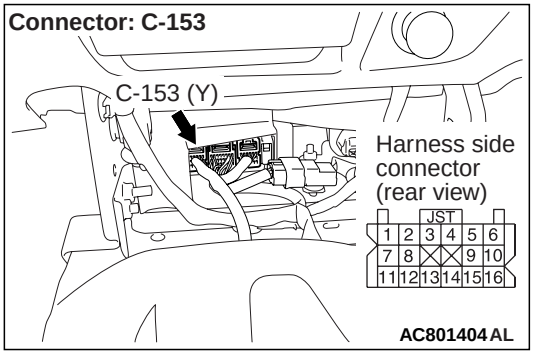


(3) Connect the dummy resistor (Special tool: MB991865) to the resistor harness (Special tool: MB991884).
(4) Connect special tool (MB991884) to the D-33 harness side connector.
(5) Connect the negative battery terminal.
(6) Erase the diagnosis code memory, and check the diagnosis code.

Q: Is diagnosis code B1451 set?
YES : Go to Step 2 .
NO : Replace the curtain air bag module (LH) (Refer to P.52B-279).

STEP 2. Resistance measurement between SRS-ECU connector C-153 (terminal No.1 and 2) and the curtain air bag module (LH) connector D-33 (terminal No.1 and 2).

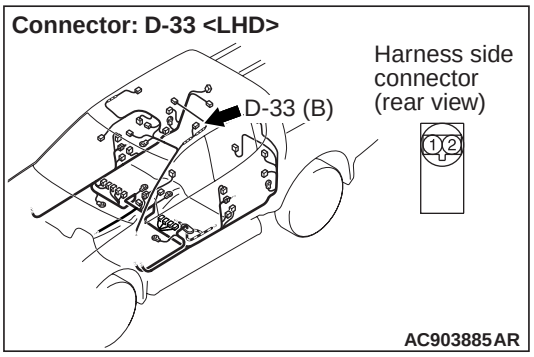
(1) Disconnect the negative battery terminal.

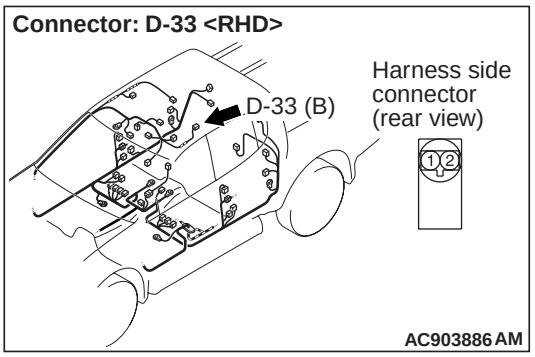


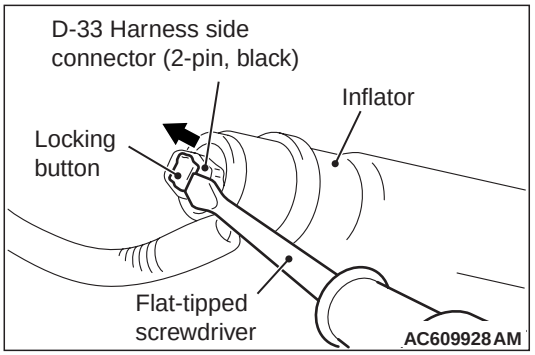
(2) Disconnect SRS-ECU connector C-153.

⚠ ***DANGER***

To prevents the air bag from deploying unintentionally, disconnect the curtain air bag module (LH) connector D-33 to short the squib circuit.

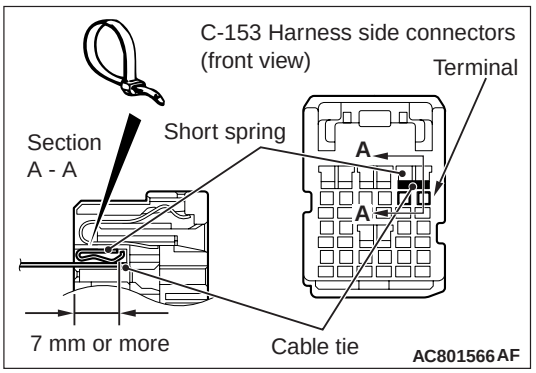






(3) Use the flat-tipped screwdriver to pull out the locking button of D-33 harness side connector to the direction of the arrow. After releasing the lock, disconnect the connector. Then, reconnect the connector.

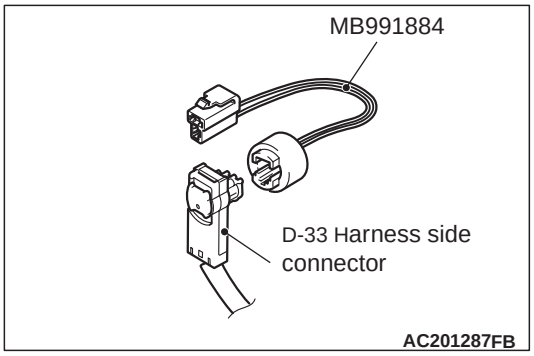
⚠ **CAUTION**



Insert an insulator such as a cable tie to a depth of 7 mm or more, otherwise the short spring will not be released.

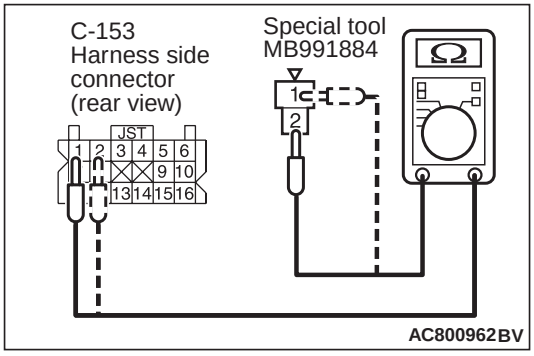
(4) Insert a cable tie [3 mm wide, 0.5 mm thick] between terminals 1, 2 and the short spring to

release the short spring.



(5) Connect D-33 harness side connector to special tool resistor harness (MB991884).

⚠ CAUTION



Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(6) Resistance measurement between the following terminals.

- SRS-ECU connector C-153 terminal No.1 and special tool terminal No.2
- SRS-ECU connector C-153 terminal No.2 and special tool terminal No.1

OK: Continuity (Less than 2 Ω)

Q: Are the check results normal?

YES : Go to Step 3 .

NO : Repair the harness wires between SRS-ECU connector C-153 (terminal No.1 and 2) and curtain air bag module (LH) connector D-33 (terminal No.1 and 2).

STEP 3. Check whether the diagnosis code is reset.

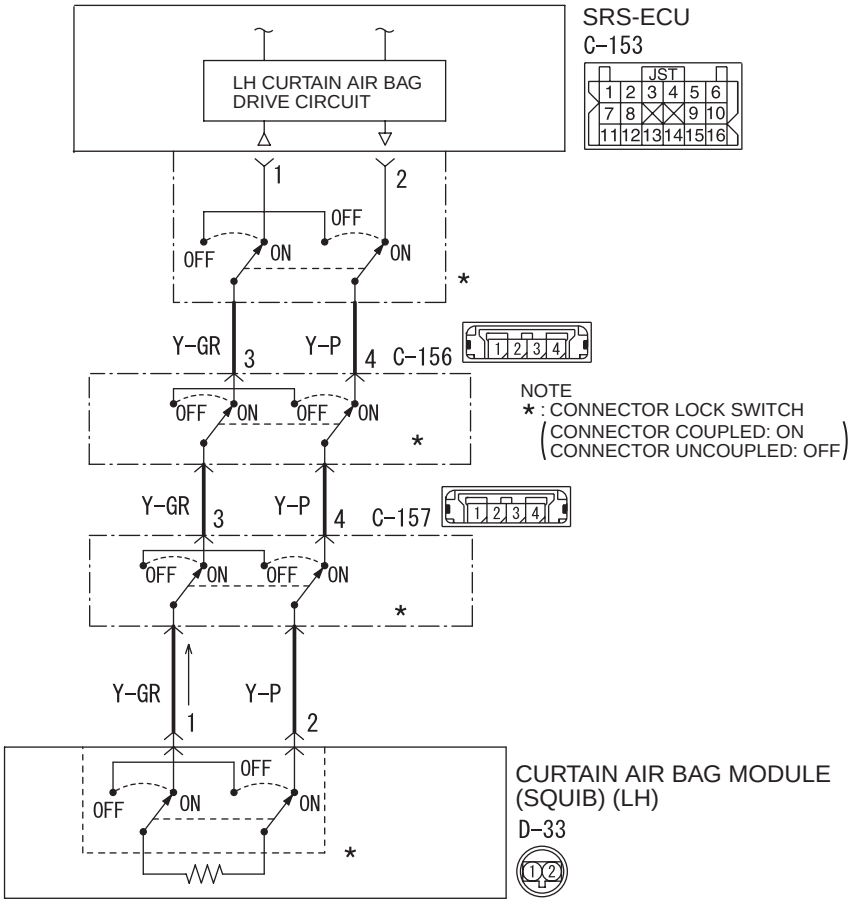
Q: Is diagnosis code B1441 set?

YES : Replace the SRS-ECU (Refer to P.52B-266).

NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1452: Curtain air bag module (LH) (squib) system (short-circuited to the earth)

Curtain Air Bag Module (Squib) (LH) Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

AC805930 AD

OPERATION

The SRS-ECU judges how severe a collision is by detecting signals from the left and right side impact sensors. If the impact is over a predetermined level, the SRS-ECU sends an ignition signal. At this time, if the side-airbag safing G-sensor is on, the curtain air bag module will deploy.

DIAGNOSIS CODE SET CONDITIONS

This diagnosis code is set if the curtain air bag (LH) squib wire(s) are short-circuited to the earth.

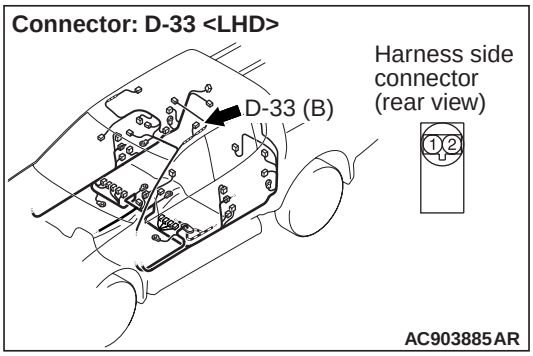
PROBABLE CAUSES

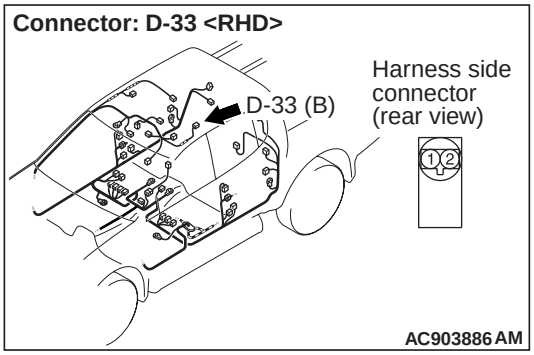
- Damaged harness wires and connectors
- Short to the earth in the curtain air bag module (LH) (squib) harness
- Malfunction of the SRS-ECU

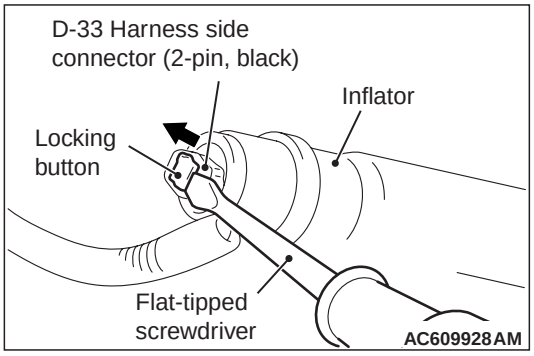
DIAGNOSIS PROCEDURE

STEP 1. Check the diagnosis code by connecting a dummy resistor. (M.U.T.-III diagnosis code)

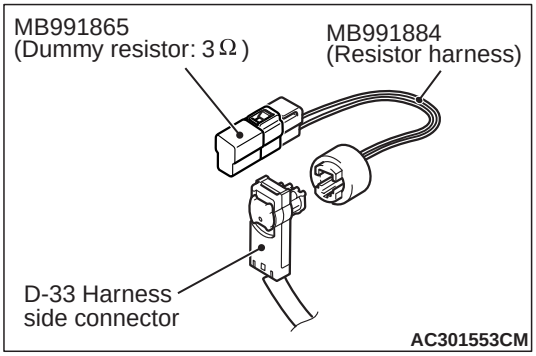
(1) Disconnect the negative battery terminal.







(2) Use the flat-tipped screwdriver to pull out the locking button of D-33 harness side connector to the direction of the arrow. After releasing the lock, disconnect the connector.



(3) Connect the dummy resistor (Special tool: MB991865) to the resistor harness (Special tool: MB991884).
(4) Connect special tool (MB991884) to the D-33 harness side connector.
(5) Connect the negative battery terminal.
(6) Erase the diagnosis code memory, and check the diagnosis code.

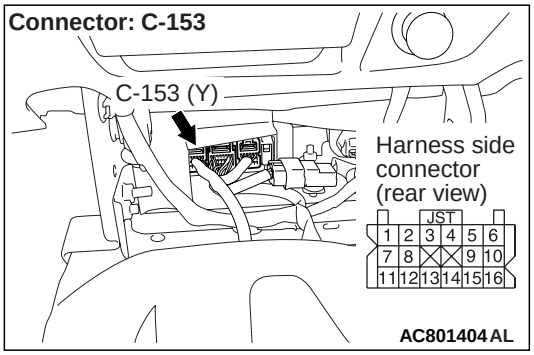
Q: Is diagnosis code B1452 set?

YES : Go to Step 2.

NO : Replace the curtain air bag module (LH) (Refer to P.52B-279).

STEP 2. Resistance measurement at the SRS-ECU connector C-153.

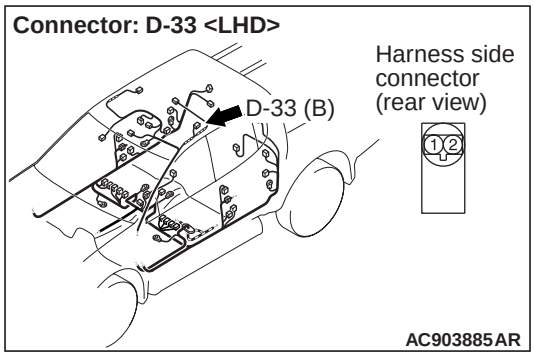
(1) Disconnect the negative battery terminal.

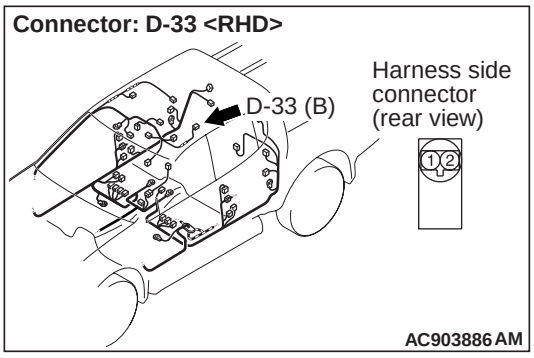


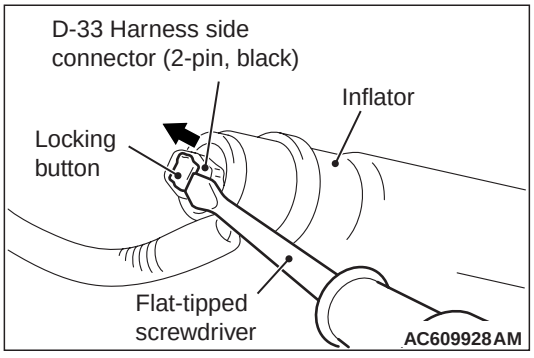
(2) Disconnect SRS-ECU connector C-153.

⚠ ***DANGER***

To prevents the air bag from deploying unintentionally, disconnect the curtain air bag module (LH) connector D-33 to short the squib circuit.

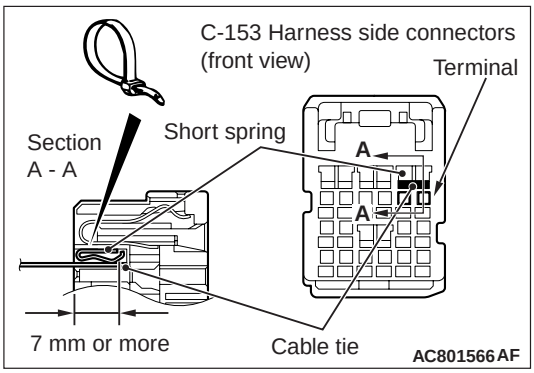






(3) Use the flat-tipped screwdriver to pull out the locking button of D-33 harness side connector to the direction of the arrow. After releasing the lock, disconnect the connector.

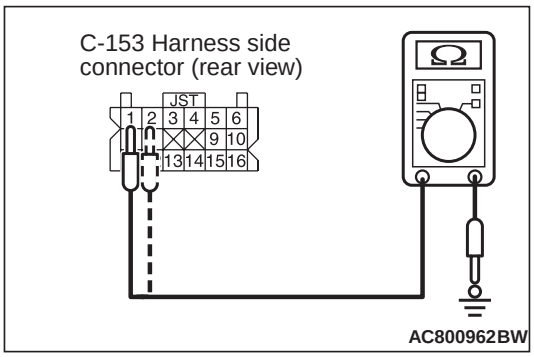
⚠ **CAUTION**



Insert an insulator such as a cable tie to a depth of 7 mm or more, otherwise the short spring will not be released.

(4) Insert a cable tie [3 mm wide, 0.5 mm thick] between terminals 1, 2 and the short spring to release the short spring.

⚠ **CAUTION**



Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(5) Resistance measurement between C-153 harness side connector terminals 1, 2 and body earth.

OK: Open circuit

Q: Is the check result normal?

YES : Go to Step 3.

NO : Repair the harness wires between SRS-ECU connector C-153 (terminal No.1 and 2) and curtain air bag module (LH) connector D-33 (terminal No.1 and 2).

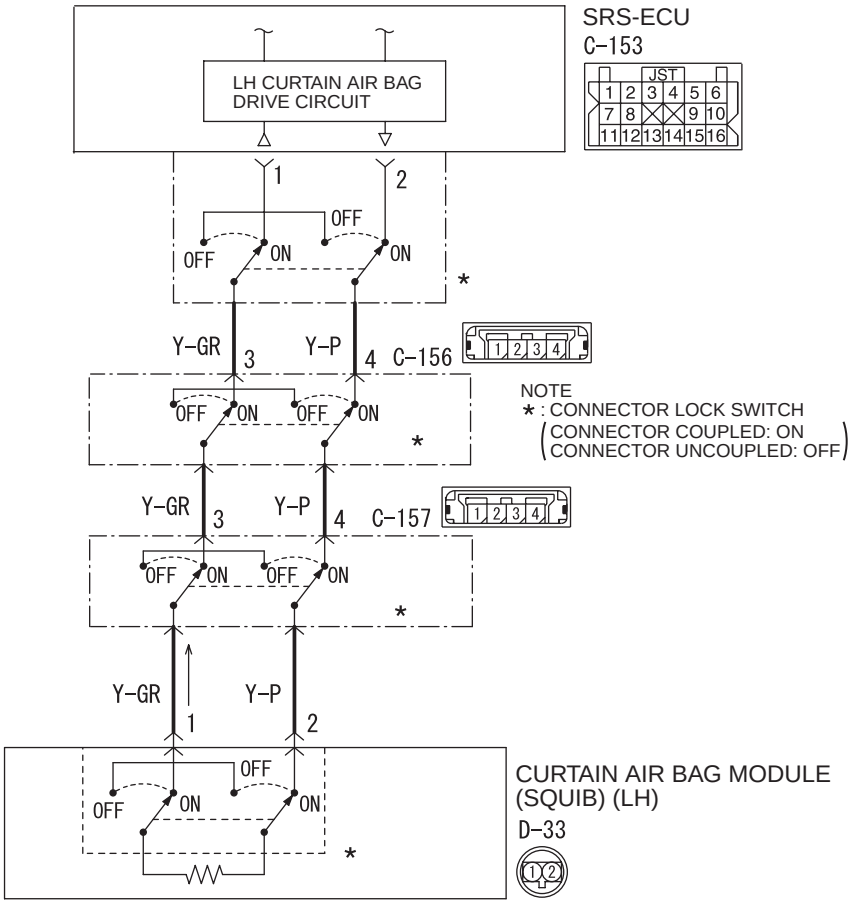
STEP 3. Check whether the diagnosis code is reset.

Q: Is diagnosis code B1452 set?

YES : Replace the SRS-ECU (Refer to P.52B-266).
NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1453: Curtain air bag module (LH) (squib) system (short-circuited to the power supply)

Curtain Air Bag Module (Squib) (LH) Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

AC805930 AD

OPERATION
The SRS-ECU judges how severe a collision is by detecting signals from the left and right side impact sensors. If the impact is over a predetermined level, the SRS-ECU sends an ignition signal. At this time, if the side-airbag safing G-sensor is on, the curtain air bag module will deploy.

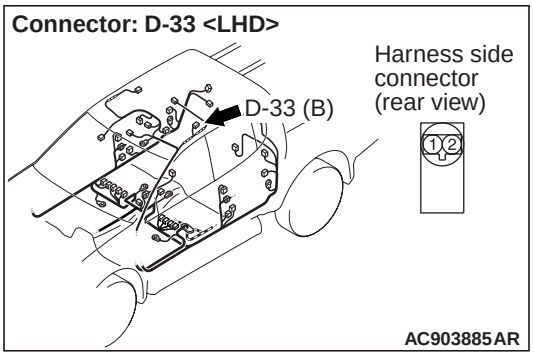
DIAGNOSIS CODE SET CONDITIONS
This diagnosis code is set if the curtain air bag (LH) squib wire(s) are short-circuited to the power supply.

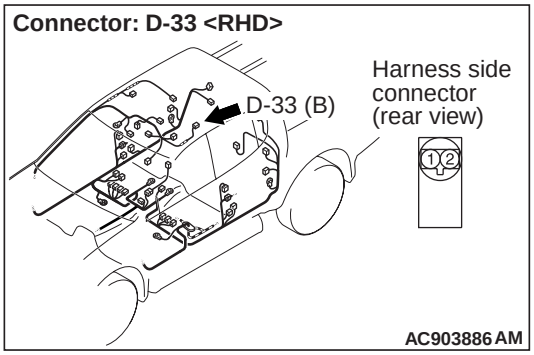
PROBABLE CAUSES
- Damaged harness wires and connectors
- Short to the power supply in the curtain air bag module (LH) (squib) harness
- Malfunction of the SRS-ECU

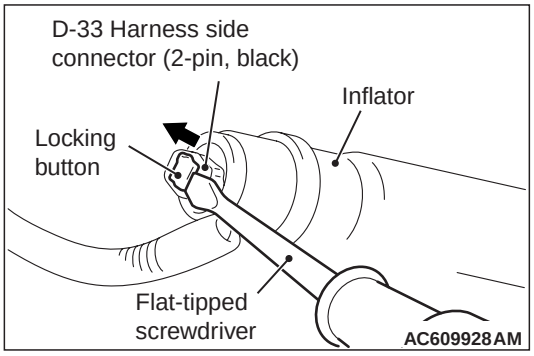
DIAGNOSIS PROCEDURE

STEP1. Check the diagnosis code by connecting a dummy resistor. (M.U.T.-III diagnosis code)

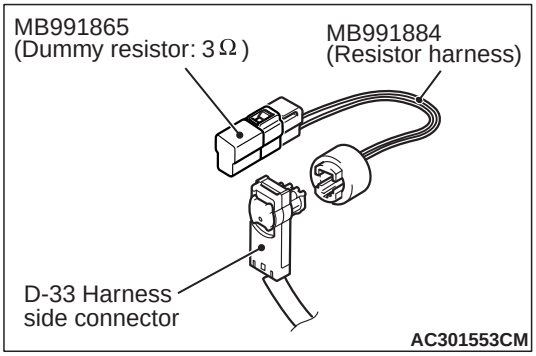
(1) Disconnect the negative battery terminal.







(2) Use the flat-tipped screwdriver to pull out the locking button of D-33 harness side connector to the direction of the arrow. After releasing the lock, disconnect the connector.

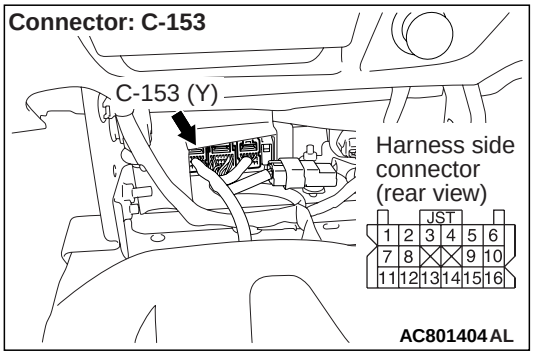


(3) Connect the dummy resistor (Special tool: MB991865) to the resistor harness (Special tool: MB991884).
(4) Connect special tool (MB991884) to the D-33 harness side connector.
(5) Connect the negative battery terminal.
(6) Erase the diagnosis code memory, and check the diagnosis code.

Q: Is diagnosis code B1453 set?
YES : Go to Step 2.
NO : Replace the curtain air bag module (LH) (Refer to P.52B-279).

STEP 2. Voltage measurement at the SRS-ECU connector C-153.

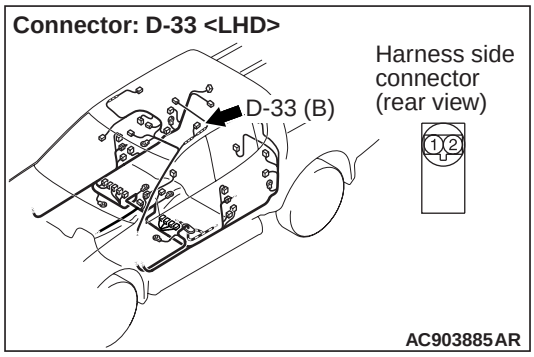
(1) Disconnect the negative battery terminal.

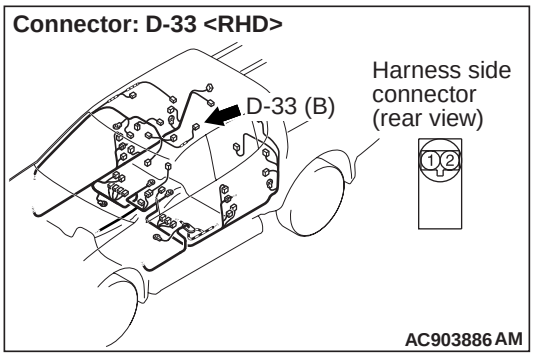


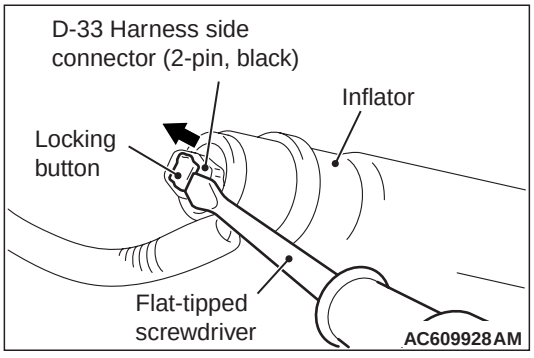
(2) Disconnect SRS-ECU connector C-153.

⚠ ***DANGER***

To prevents the air bag from deploying unintentionally, disconnect the curtain air bag module (LH) connector D-33 to short the squib circuit.

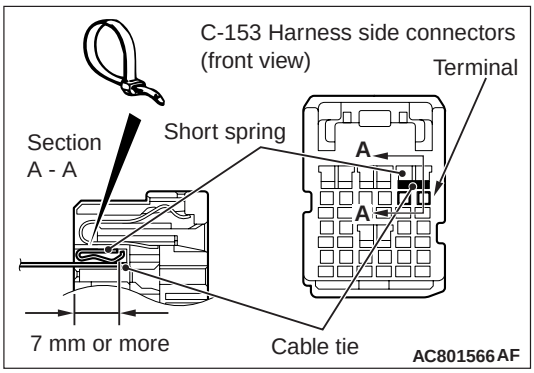






(3) Use the flat-tipped screwdriver to pull out the locking button of D-33 harness side connector to the direction of the arrow. After releasing the lock, disconnect the connector.

⚠ **CAUTION**



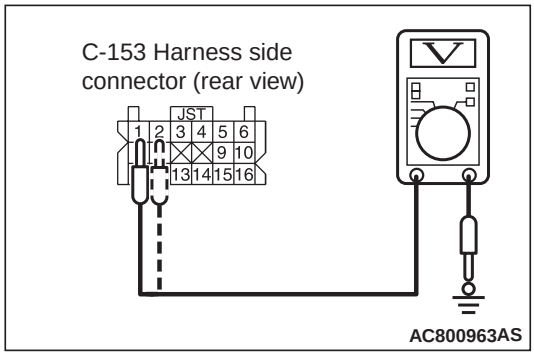
Insert an insulator such as a cable tie to a depth of 7 mm or more, otherwise the short spring will not be released.

(4) Insert a cable tie [3 mm wide, 0.5 mm thick] between terminals 1, 2 and the short spring to release the short spring.

(5) Connect the negative battery terminal.

(6) Turn the ignition switch to the "ON" position.

⚠ **CAUTION**



Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(7) Voltage measurement between C-153 harness side connector terminals 1, 2 and body earth.

OK: 1 V or less

Q: Is the check result normal?

YES : Go to Step 3.

NO : Repair the harness wires between SRS-ECU connector C-153 (terminal No.1 and 2) and curtain air bag module (LH) connector D-33 (terminal No.1 and 2).

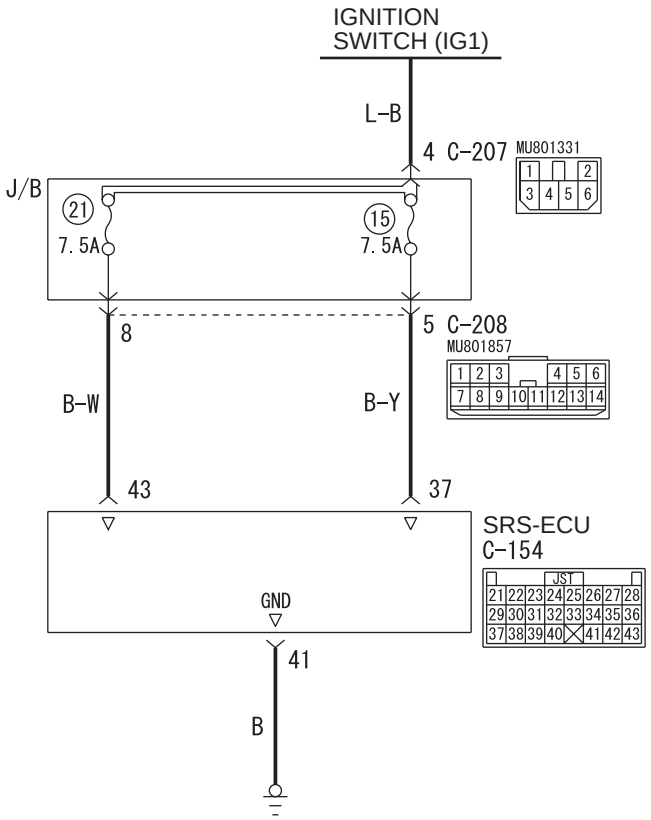
STEP 3. Check whether the diagnosis code is reset.

Q: Is diagnosis code B1453 set?

YES : Replace the SRS-ECU (Refer to P.52B-266).
NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1476: Power supply voltage (IG1 (A) voltage) drops abnormally.

SRS-ECU Power Supply Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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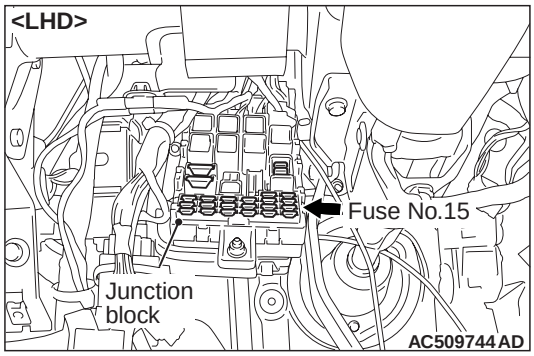
OPERATION
- The SRS-ECU is powered from the ignition switch (IG1).
- The SRS-ECU power is supplied from two circuits. Even if one circuit is shut off, the air bag can inflate.

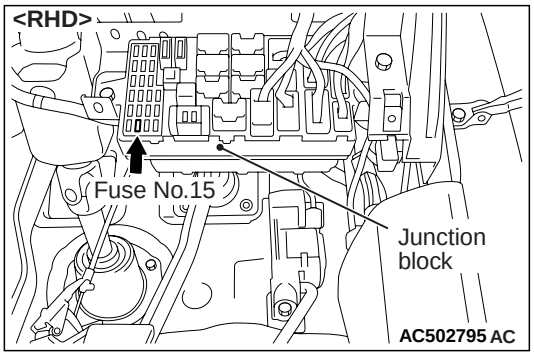
DIAGNOSIS CODE SET CONDITIONS
This diagnosis code is set if the voltage between the IG1 terminals (fuse No.15 circuit) and earth is lower than a predetermined value for a continuous period of 5 seconds or more.

PROBABLE CAUSES
- Damaged wiring harnesses or connectors
- Malfunction of the SRS-ECU

DIAGNOSIS PROCEDURE

STEP 1. Check junction block fuse number 15.

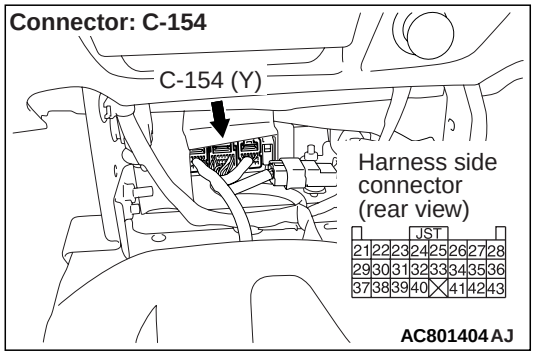




Q: Is the fuse burned out?
YES : Go to Step 4.
NO : Go to Step 2.

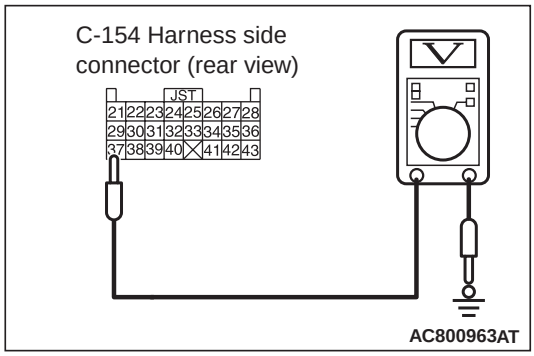
STEP 2. Voltage measurement at the SRS-ECU connector C-154.

(1) Disconnect the negative battery terminal.



(2) Disconnect SRS-ECU connector C-154.
(3) Connect the negative battery terminal.
(4) Turn the ignition switch to the "ON" position.

⚠ CAUTION



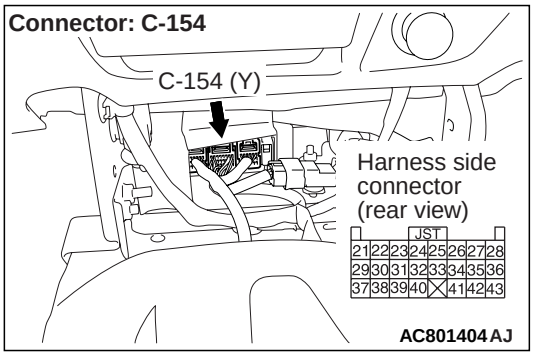
Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

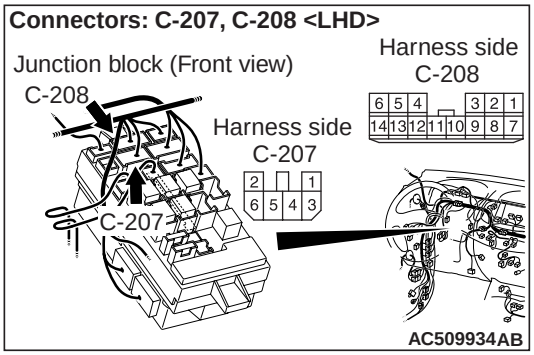
(5) Voltage measurement between C-154 harness side connector terminal 37 and body earth.

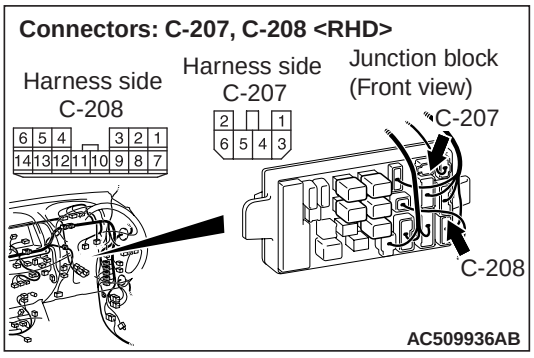
OK: 9 V or more.

Q: Is the check result normal?
YES : Go to Step 6.
NO : Go to Step 3.

STEP 3. Connector check: SRS-ECU connector C-154, junction block connector C-207 and C-208.







Q: Is the check result normal?

YES : Check the harness wires for open or short circuit between SRS-ECU connector C-154 (terminal No.37) and ignition switch, and repair if necessary.

NO : Replace it.

STEP 4. Check a burned-out fuse.

(1) Replace the fuse.

(2) Turn the ignition switch to the "ON" position, wait for at least one minute and then turn the ignition switch to the "LOCK" (OFF) position.

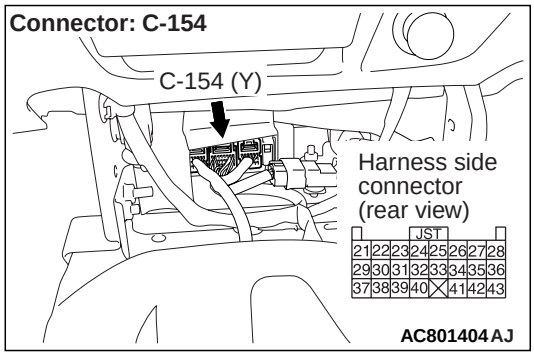
(3) Check the fuse.

Q: Is the fuse in good condition?

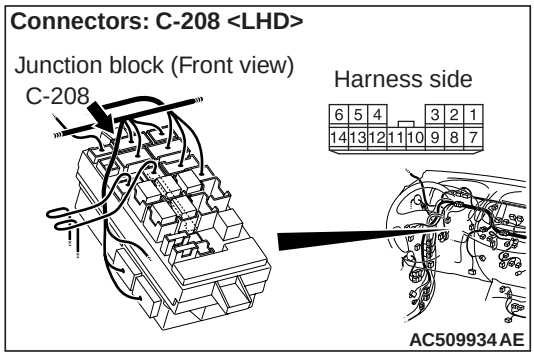
YES : This diagnosis is complete.

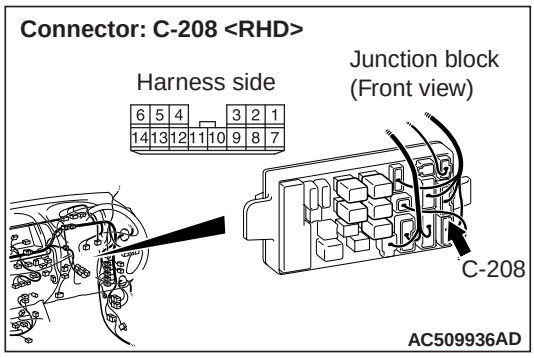
NO : Go to Step 5.

STEP 5. Resistance measurement at the junction block connector C-208.



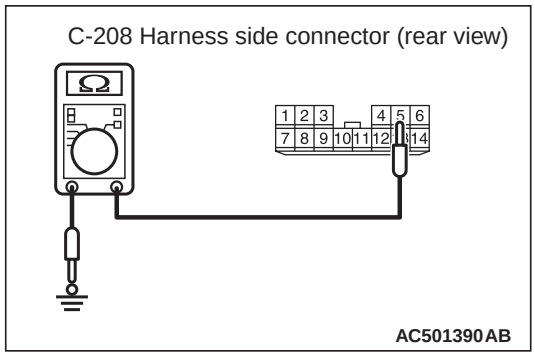
(1) Disconnect SRS-ECU connector C-154.





(2) Disconnect junction block connector C-208, and measure at the wiring harness side.

⚠ CAUTION



Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(3) Resistance measurement between terminal 5

and body earth.

OK: Open circuit

Q: Is the check result normal?

YES : Check the other circuit which flows through fuse number 15.

NO : Repair the wiring harness between junction block connector C-208 (terminal No.5) and SRS-ECU connector C-154 (terminal No.37), and replace the fuse.

STEP 6. Check whether the diagnosis code is reset.

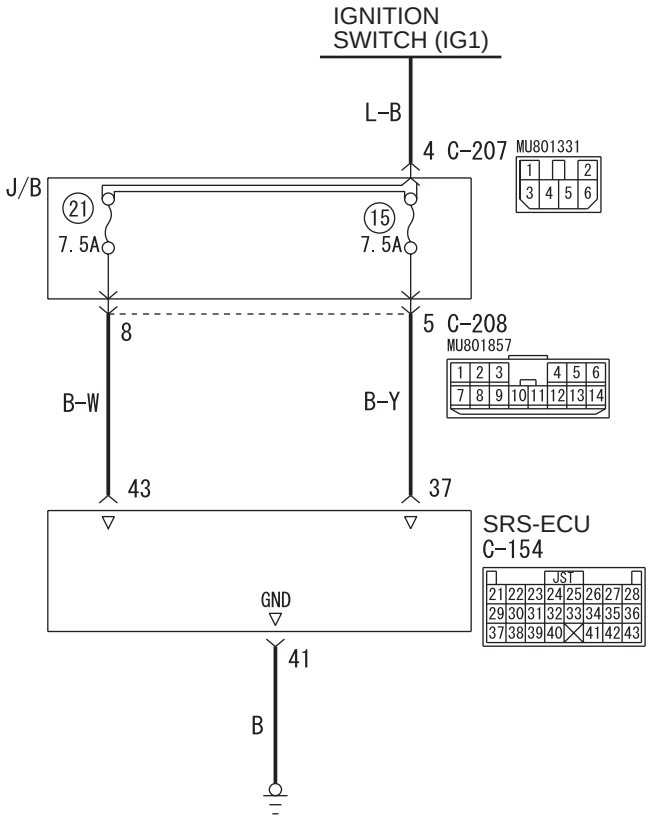
Q: Is diagnosis code B1476 set?

YES : Replace the SRS-ECU (Refer to P.52B-266).

NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1477: Power supply voltage (IG1 (B) voltage) drops abnormally.

SRS-ECU Power Supply Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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OPERATION

- The SRS-ECU is powered from the ignition switch (IG1).
- The SRS-ECU power is supplied from two circuits. Even if one circuit is shut off, the air bag can inflate.

DIAGNOSIS CODE SET CONDITIONS

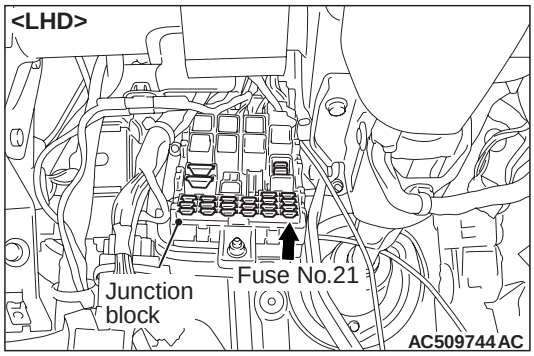
This diagnosis code is set if the voltage between the IG1 terminals (fuse No.21 circuit) and earth is lower than a predetermined value for a continuous period of 5 seconds or more.

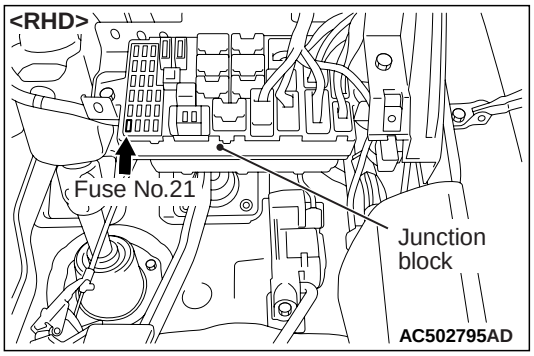
PROBABLE CAUSES

- Damaged wiring harnesses or connectors
- Malfunction of the SRS-ECU

DIAGNOSIS PROCEDURE

STEP 1. Check junction block fuse number 21.

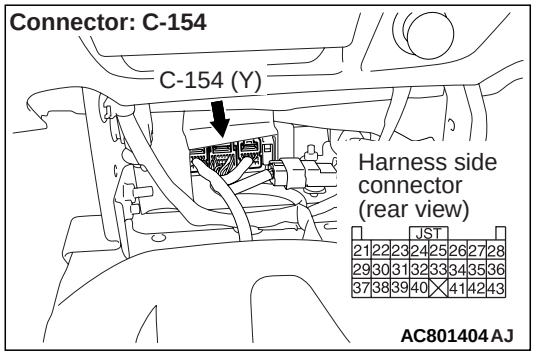




Q: Is the fuse burned out?
YES : Go to Step 4.
NO : Go to Step 2.

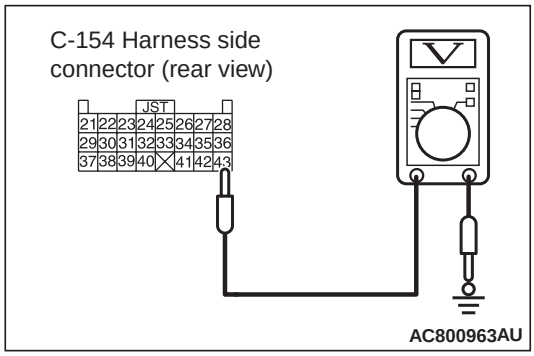
STEP 2. Voltage measurement at SRS-ECU connector C-154.

(1) Disconnect the negative battery terminal.



(2) Disconnect SRS-ECU connector C-154.
(3) Connect the negative battery terminal.
(4) Turn the ignition switch to the "ON" position.

⚠ CAUTION



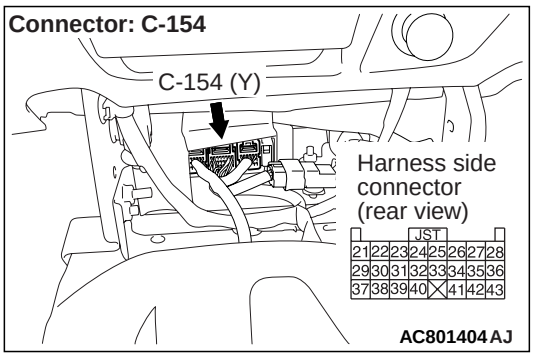
Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

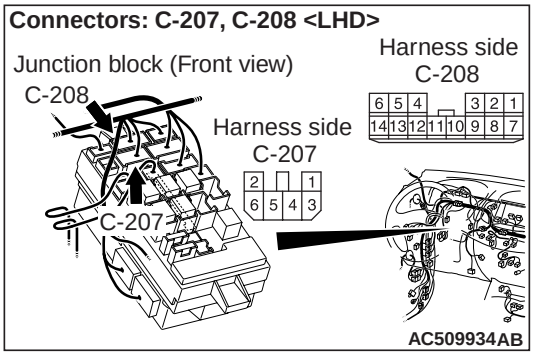
(5) Voltage measurement between C-154 harness side connector terminal 43 and body earth.

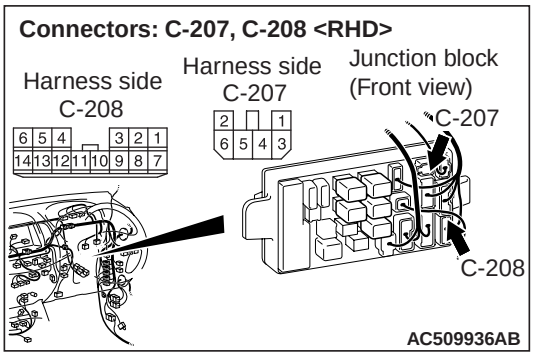
OK: 9 V or more

Q: Is the check result normal?
YES : Go to Step 6.
NO : Go to Step 3.

STEP 3. Connector check: SRS-ECU connector C-154, junction block connector C-207 and C-208.





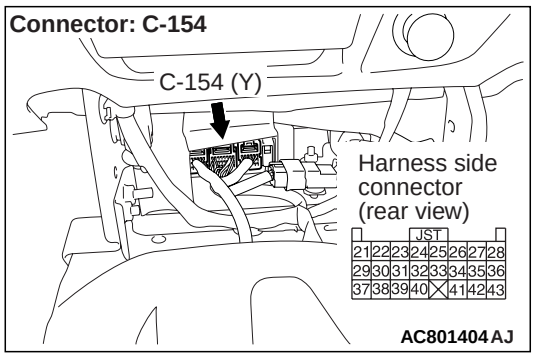


Q: Is the check result normal?
YES : Check the harness wires for open or short circuit between SRS-ECU connector C-154 (terminal No.43) and ignition switch, and repair if necessary.
NO : Replace it.

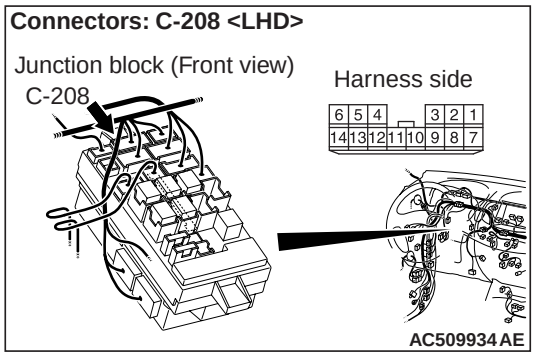
STEP 4. Check a burned-out fuse.
(1) Replace the fuse.
(2) Turn the ignition switch to the "ON" position, wait for at least one minute and then turn the ignition switch to the "LOCK" (OFF) position.
(3) Check the fuse.

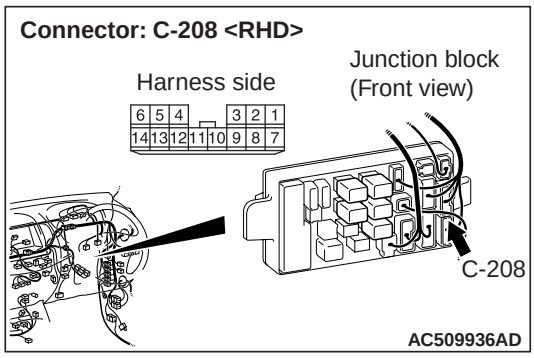
Q: Is the fuse in good condition?
YES : This diagnosis is complete.
NO : Go to Step 5.

STEP 5. Resistance measurement at the junction block connector C-208
(1) Disconnect the negative battery terminal.



(2) Disconnect SRS-ECU connector C-154.

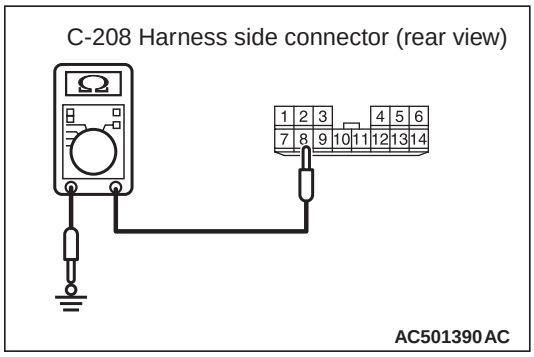




(3) Disconnect junction block connector C-208, and

measure at the wiring harness side.

⚠ CAUTION



Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(4) Resistance measurement between terminal 8 and body earth.

OK: Open circuit

Q: Is the check result normal?

YES : Check the other circuit, which flows through fuse number 21.

NO : Repair the wiring harness between junction block connector C-208 (terminal No.8) and SRS-ECU connector C-154 (terminal No.43), and replace the fuse.

STEP 6. Check whether the diagnosis code is reset.

Q: Is diagnosis code B1477 set?

YES : Replace the SRS-ECU (Refer to P.52B-266).

NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1509: Incorrect installation of SRS-ECU

DIAGNOSIS CODE SET CONDITIONS

This code is set when the vehicle specification does not meet the ECU specification.

PROBABLE CAUSES

Malfunction of the SRS-ECU

DIAGNOSIS PROCEDURE

Replace the SRS-ECU (Refer to P.52B-266).

Code No.B1519: SRS-ECU connector lock out of order

DIAGNOSIS CODE SET CONDITIONS

This diagnosis code is set if a poor connection at the SRS-ECU is detected.

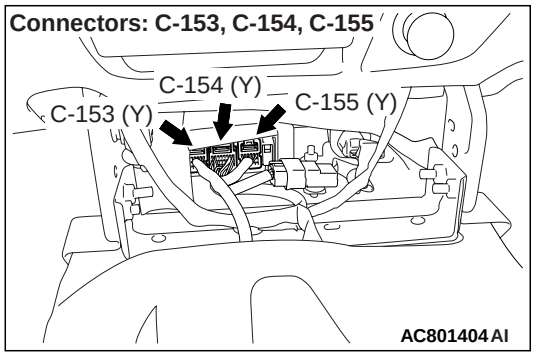
PROBABLE CAUSES

- Damaged connectors
- Malfunction of the SRS-ECU

DIAGNOSIS PROCEDURE

STEP 1. Connector lock check: SRS-ECU connectors C-153, C-154 and C-155. (M.U.T.-III diagnosis code)

(1) Disconnect the negative battery terminal.



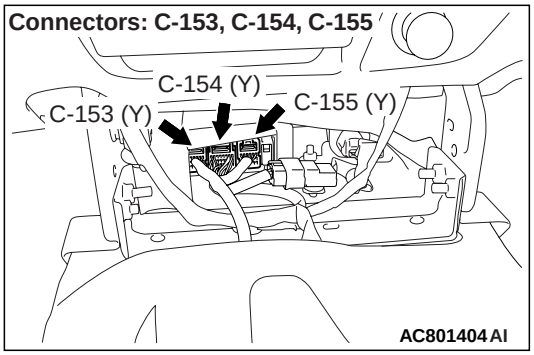
(2) Disconnect SRS-ECU connectors C-153, C-154, C-155 and then reconnect them.

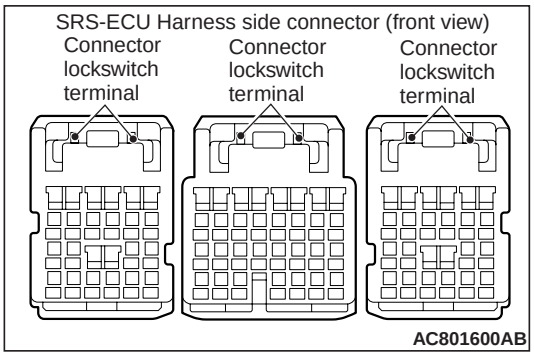
(3) Connect the negative battery terminal.

(4) Erase diagnosis code memory, and then check the diagnosis code.

Q: Is diagnosis code B1519 set?
YES : Go to Step 2.
NO : The procedure is complete. It is assumed that diagnosis code B1519 set as connectors C-153, C-154 and C-155 were engaged improperly.

STEP 2. Connector lock check: SRS-ECU connectors C-153, C-154 and C-155.





(1) Disconnect SRS-ECU connectors C-153, C-154 and C-155.
(2) Check the connector lock switch terminal inside the harness side connector for improper contact or deformation.

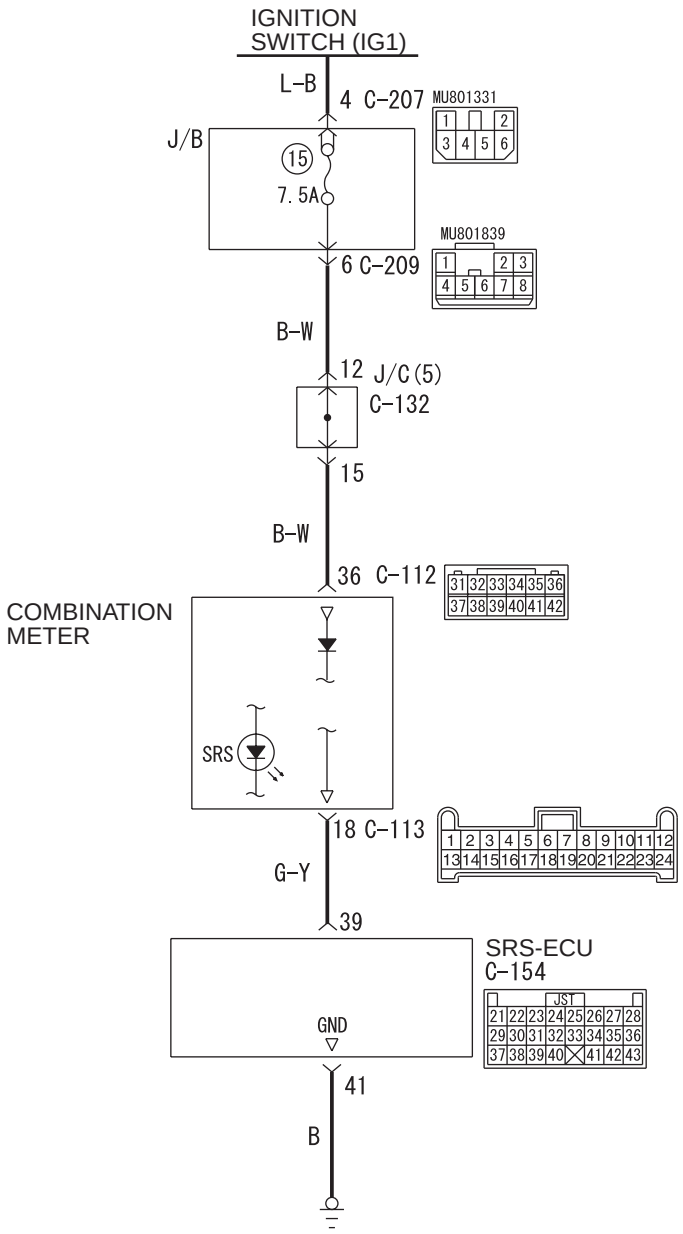
Q: Are the SRS-ECU connectors C-153, C-154 and C-155 in good condition?
YES : Go to Step 3.
NO : Replace the SRS-ECU connector C-153, C-154 and C-155.

STEP 3. Check whether the diagnosis code is reset.

Q: Is diagnosis code B1519 set?
YES : Replace the SRS-ECU (Refer to P.52B-266).
NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No. B1551: SRS warning lamp circuit malfunction (Lamp does not Illuminate).

SRS Warning Lamp Drive Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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OPERATION

- Power for the SRS warning lamp is supplied from the ignition switch (IG1) circuit.
- The SRS warning lamp illuminates when the ignition switch is turned to the "ON" position and goes out after approximately 7 seconds if there is not a malfunction in the SRS system.

DIAGNOSIS CODE SET CONDITIONS

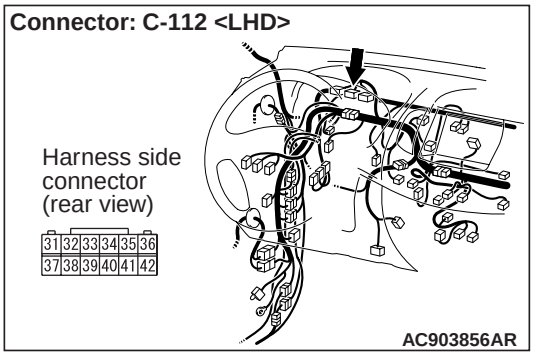
This diagnosis code will be set if the SRS warning lamp driving circuit is short to earth.

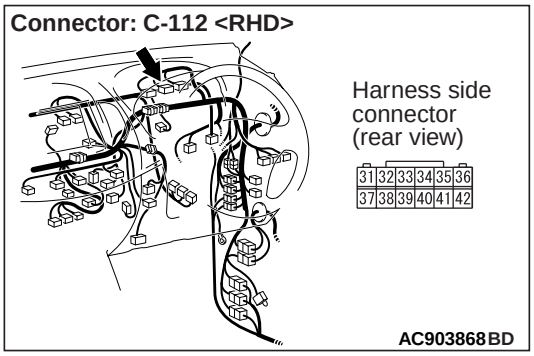
PROBABLE CAUSES

- Damaged wiring harnesses of connectors
- Malfunction of the SRS-ECU
- Malfunction of the combination meter

DIAGNOSIS PROCEDURE

STEP 1. Check the combination meter connector C-112.



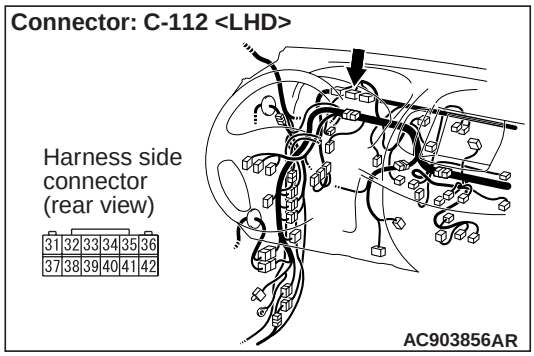


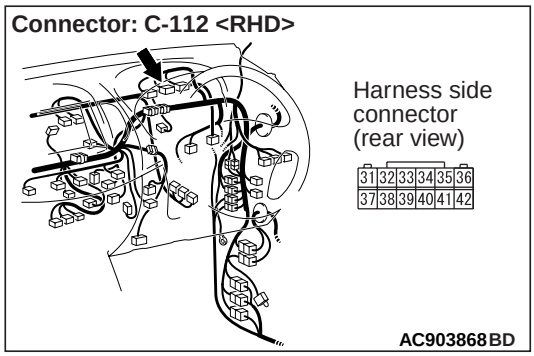
Q: Is the connector correctly engaged?

YES : Go to Step 2.

NO : Engage the connector correctly. Then go to Step 7.

STEP 2. Voltage measurement at combination meter connector C-112.





(1) Disconnect the combination meter connector C-112.
(2) Connect the negative battery terminal.
(3) Turn the ignition switch to the "ON" position.
(4) Measure the voltage between C-112 harness side connector terminal 36 and body earth.

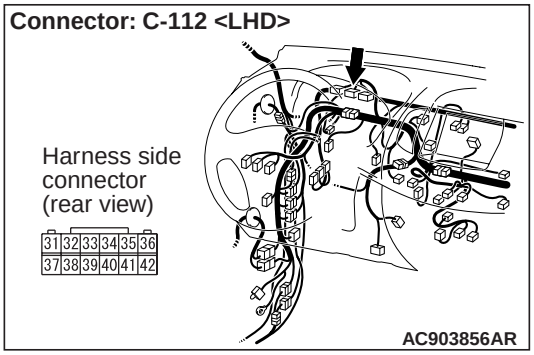
OK: System voltage

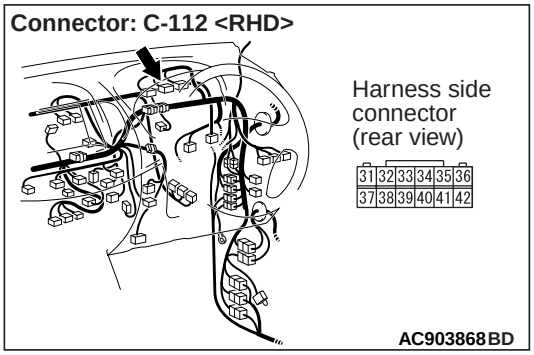
Q: Is the check result normal?

YES : Go to Step 4.

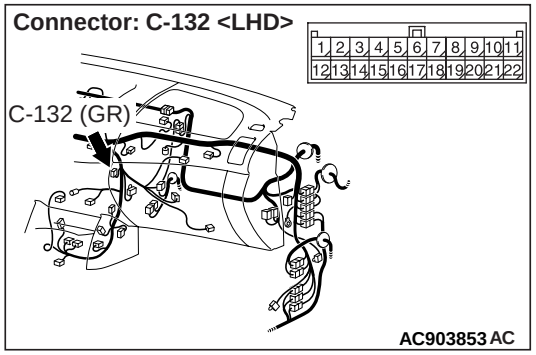
NO : Go to Step 3.

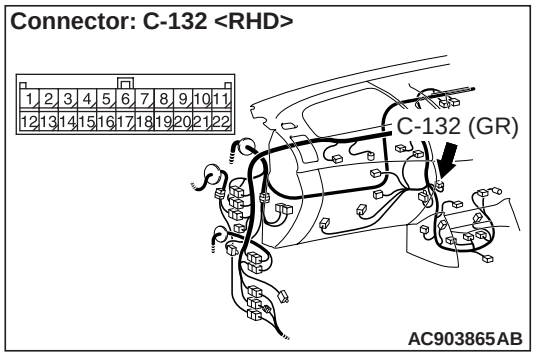
STEP 3. Check the harness for open circuit between ignition switch and combination meter connector C-112 (terminal No.36).

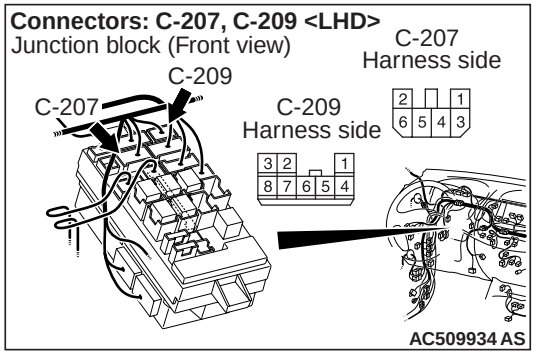


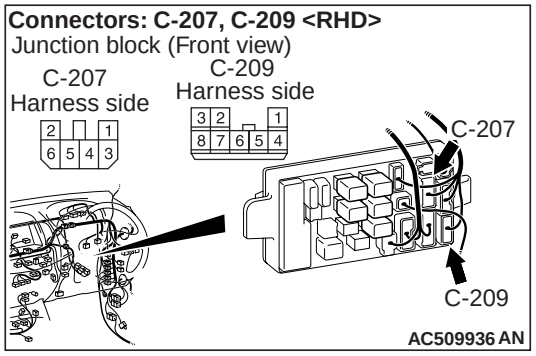


NOTE:









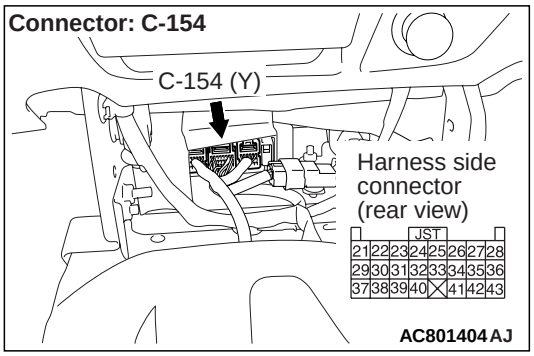
Prior to the wiring harness inspection, check junction block connector C-132, C-207 and C-209, and repair if necessary.

Q: Is the check result normal?

YES : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

NO : Repair the harness wires between ignition switch and the combination meter connector C-112 (terminal No.36). Then go to Step 7.

STEP 4. Check SRS-ECU connector C-154.

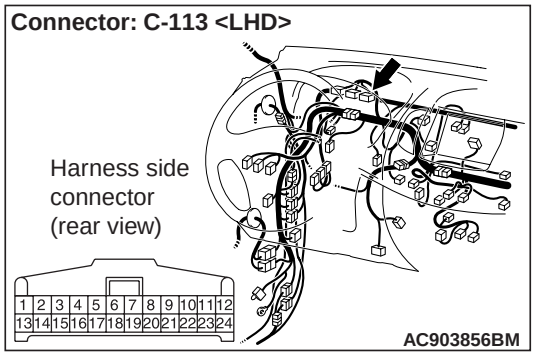


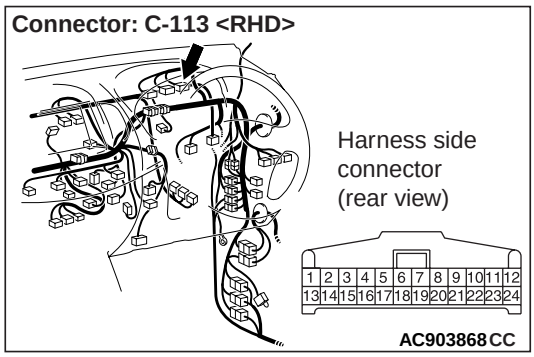
Q: Is the connector correctly engaged?

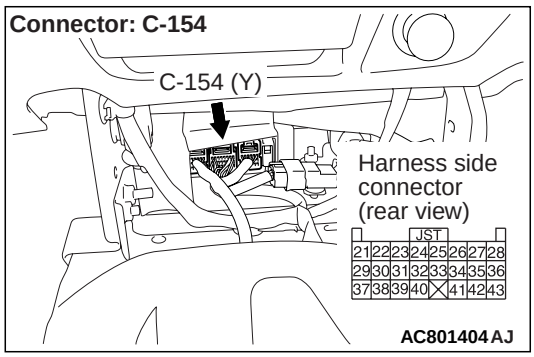
YES : Go to Step 5.

NO : Engage the connector correctly. Then go to Step 7.

STEP 5. Check the harness for short circuit between the combination meter connector C-113 (terminal No.18) and SRS-ECU connector C-154 (terminal No.39).







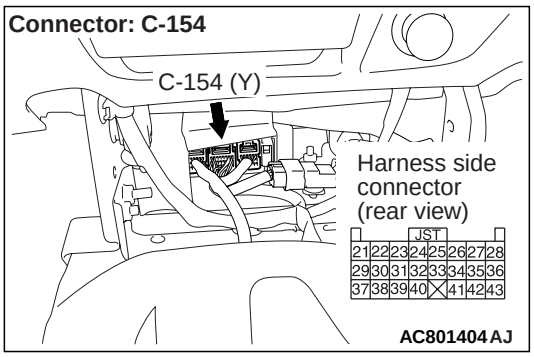
Q: Is the check result normal?

YES : Go to Step 6.

NO : Repair the harness wires between the combination meter connector C-113 (terminal No.18) and SRS-ECU connector C-154 (terminal No.39). Then go to Step 7.

STEP 6. Check the SRS warning lamp.

(1) Disconnect the negative battery terminal.



(2) Disconnected the SRS-ECU connector C-154.
(3) Connect the negative battery terminal.
(4) Turn the ignition switch to the "ON" position.

Q: Does the SRS warning lamp illuminate?

YES : Go to Step 7.
NO : Replace the combination meter (Refer to GROUP 54A, Combination Meter Assembly). Go to Step 7.

STEP 7. Check whether the diagnosis code is reset.

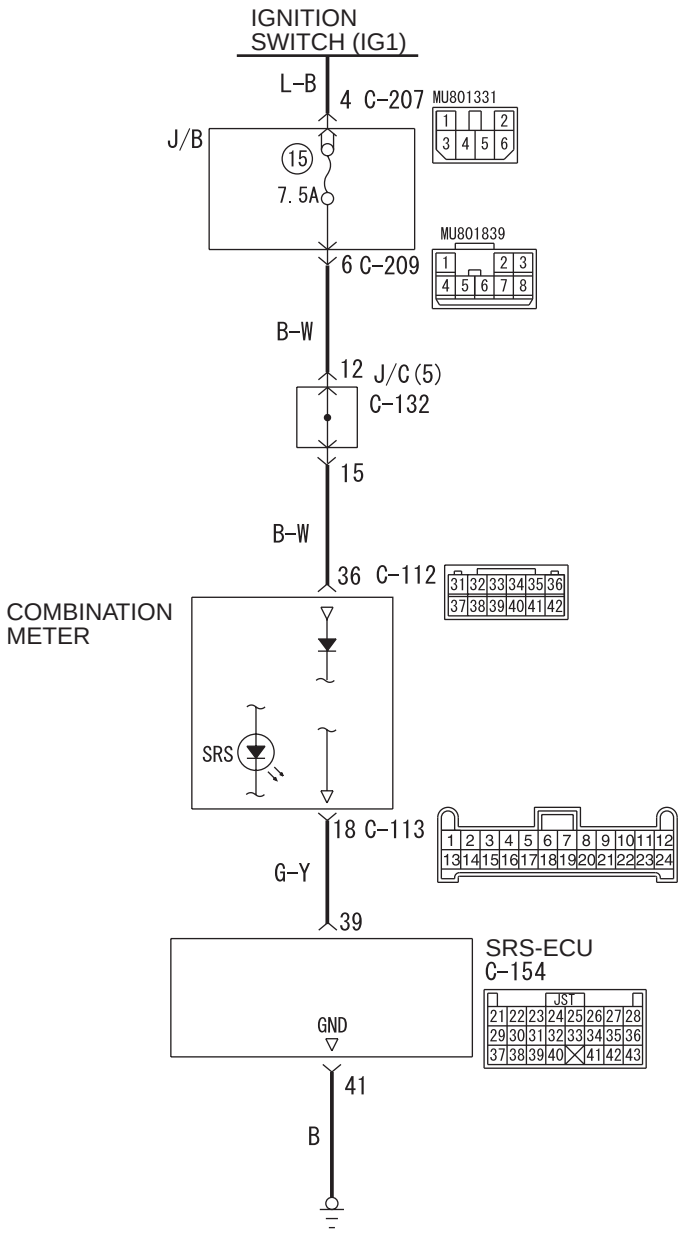
Check again if the diagnosis code is set.
(1) Erase the diagnosis code.
(2) Ignition: "LOCK" (OFF) position to "ON"
(3) On completion, check that the diagnosis code is not reset.

Q: Is the diagnosis code set?

YES : Replace the SRS-ECU (Refer to P.52B-266).
NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1551: SRS warning lamp circuit malfunction (Lamp does not Switch Off).

SRS Warning Lamp Drive Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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OPERATION

- Power for the SRS warning lamp is supplied from the ignition switch (IG1) circuit.
- The SRS warning lamp illuminates when the ignition switch is turned to the "ON" position and goes out after approximately 7 seconds if there is not a malfunction in the SRS system.

DIAGNOSIS CODE SET CONDITIONS

- This diagnosis code will be set if an open circuit has occurred in the wiring harness between the combination meter and the SRS-ECU.

TROUBLESHOOTING HINTS

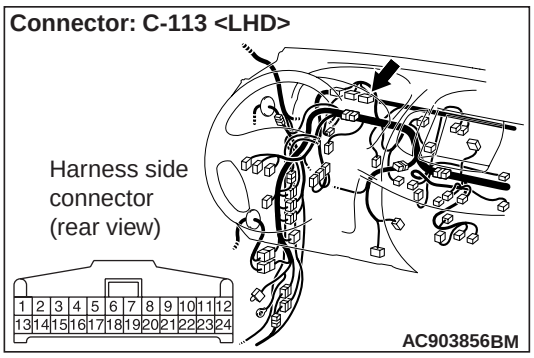
- Damaged wiring harnesses of connectors
- Malfunction of the SRS-ECU
- Malfunction of the combination meter

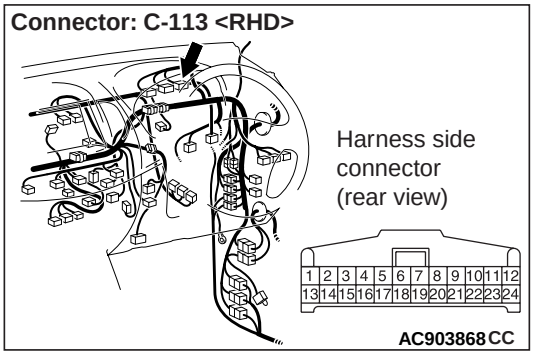
DIAGNOSIS PROCEDURE

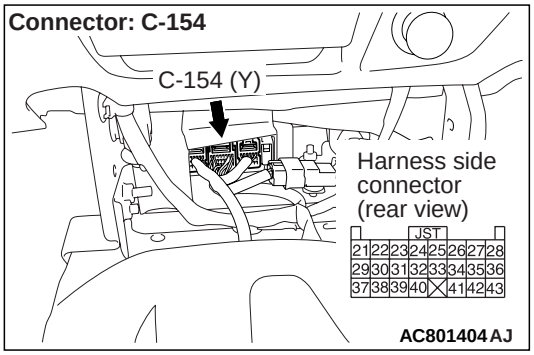
STEP 1. M.U.T.-III diagnosis code.

Q: Is the diagnosis code set?
YES : Perform the troubleshooting to the set diagnosis code. (Refer to P.52B-12).
NO : Go to Step 2.

STEP 2. Check the harness between SRS-ECU connector C-154 (terminal No.39) and the combination meter connector C-113 (terminal No.18).





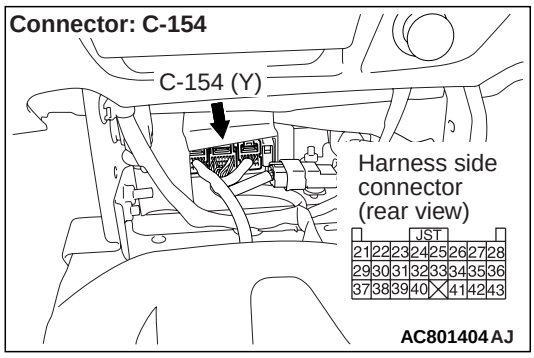


- Check the SRS warning lamp output lines for open circuit.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the harness wires. Then go to Step 4.

STEP 3. Check the SRS warning lamp.

(1) Disconnect the negative battery terminal.



(2) Disconnected the SRS-ECU connector C-154.
(3) Connect the negative battery terminal.
(4) Turn the ignition switch to the "ON" position.

⚠ CAUTION
Do not insert a test probe into the terminal from its front side directly, as the connector contact pressure may be weakened.

(5) Check that SRS warning lamp turn "ON" when SRS-ECU connector C-154 is disconnected. Check that the same warning lamp turn "OFF" when the terminal No.39 of the above connector is earthed.

Q: Is the check result normal?
YES : Go to Step 4
NO : Replace the combination meter (Refer to GROUP 54A, Combination Meter Assembly).

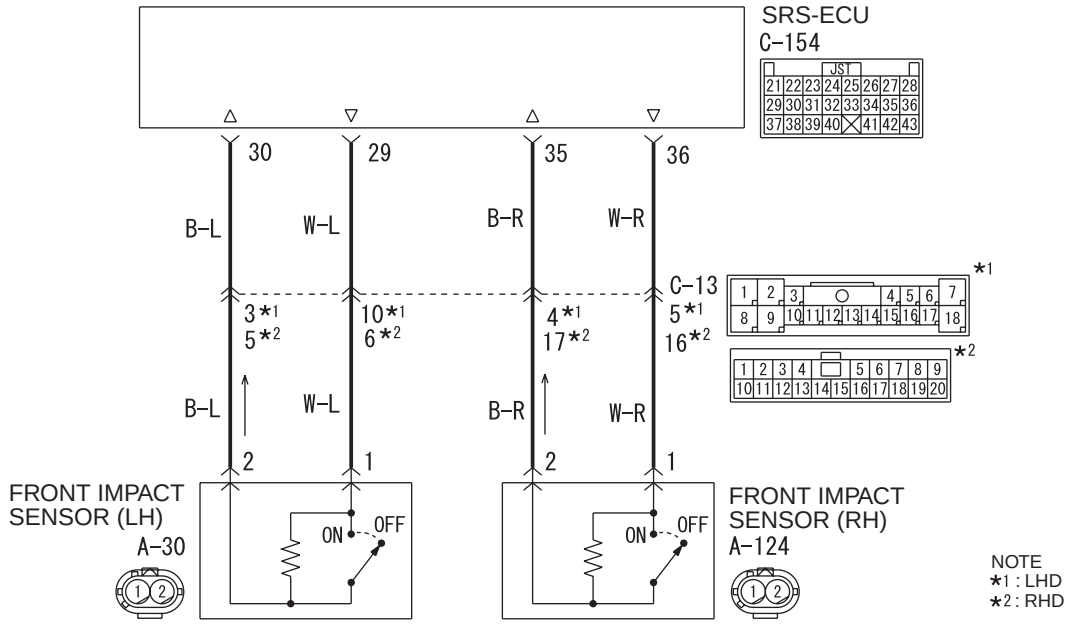
STEP 4. Check whether the diagnosis code is reset.

Check again if the diagnosis code is set.
(1) Erase the diagnosis code.
(2) Ignition: "LOCK" (OFF) position to "ON"
(3) On completion, check that the diagnosis code is not reset.

Q: Is the diagnosis code set?
YES : Replace the SRS-ECU (Refer to P.52B-266).
NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1595: Front impact sensor RH system (short circuit in the sensor)
Code No.B1596: Front impact sensor RH system (open circuit in the sensor)
Code No.B1597: Front impact sensor RH (short circuited in the earth)
Code No.B1598: Front impact sensor RH (short circuited in the power supply)
Code No.B1599: Front impact sensor LH system (short circuit in the sensor)
Code No.B1600: Front impact sensor LH (open circuit in the sensor)
Code No.B1601: Front impact sensor LH (short circuited in the earth)
Code No.B1602: Front impact sensor LH (short circuited in the power supply)

Front Impact Sensor Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

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OPERATION

- When the left and right front impact sensors detect a collision, the switches inside the sensors turn ON.
- SRS-ECU judges how severe a collision is by detecting signals from the front impact sensors and the front air bag analogue G-sensor. If the impact is over a predetermined level, the SRS-ECU sends an ignition signal. At this time, if the front air bag safing G-sensor is on, the SRS air bag will inflate.

DIAGNOSIS CODE SET CONDITIONS

These diagnosis codes are set if these are abnormal resistance between the input terminals of the front impact sensors.
The most likely causes for these codes to be set are shown in the table below:

Code No.	Trouble causes
B1595	Right front impact sensor or its wiring shorted
B1596	Right front impact sensor or wiring open circuit
B1597	Short to body earth in the right front impact sensor harness
B1598	Short to the power supply in the right front impact sensor harness
B1599	Left front impact sensor or its wiring shorted

Code No.	Trouble causes
B1600	Left front impact sensor or wiring open circuit
B1601	Short to body earth in the left front impact sensor harness
B1602	Short to the power supply in the left front impact sensor harness

PROBABLE CAUSES

- Damaged harness wires and connectors
- Front impact sensor failed
- Malfunction of the SRS-ECU

DIAGNOSIS PROCEDURE

STEP 1. Check the front impact sensor.

Refer to P.52B-264.

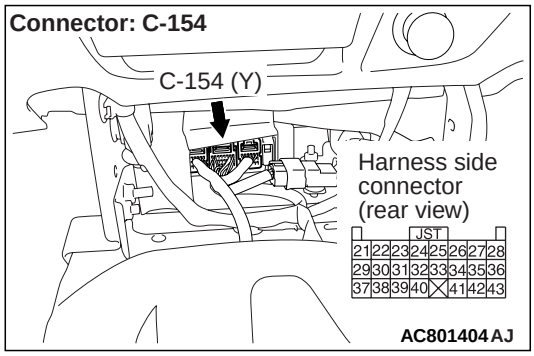
Q: Is the check result normal?

YES : Go to Step 2.

NO : Check the harness wires for open or short circuit between intermediate connector and front impact sensor, and repair if necessary. Then replace the front impact sensor (Refer to P.52B-263).

STEP 2. Resistance measurement at the SRS-ECU connector C-154.

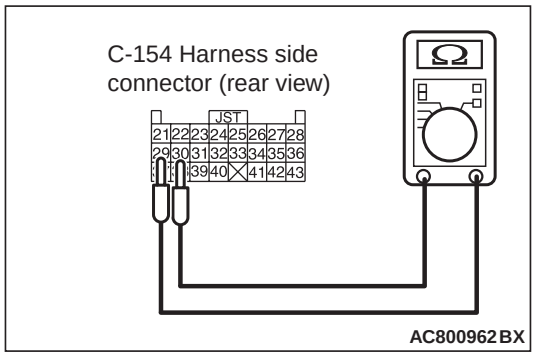
(1) Disconnect the negative battery terminal.

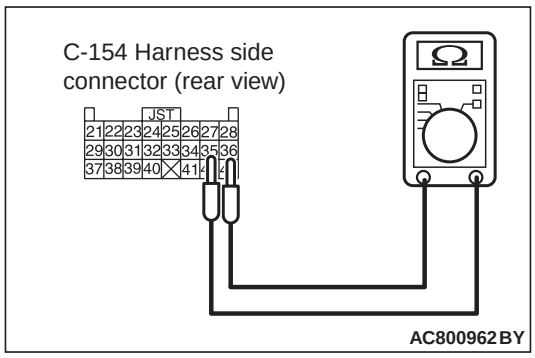


(2) Disconnect SRS-ECU connector C-154.

⚠ CAUTION

Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.



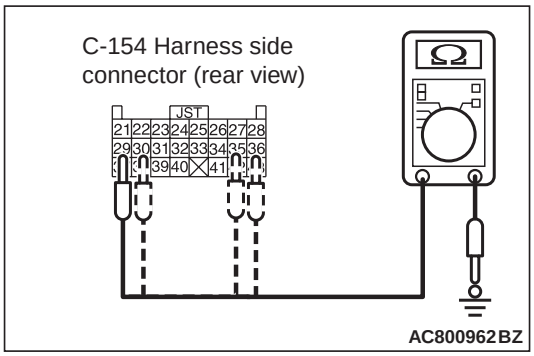


(3) Take the measurements below at harness side

connector C-154.

- Resistance between terminals 29 and 30 as well as 35 and 36.

OK: 820 ± 82 Ω



- Continuity between terminals 29, 30, 35, 36 and body earth

OK: Open circuit

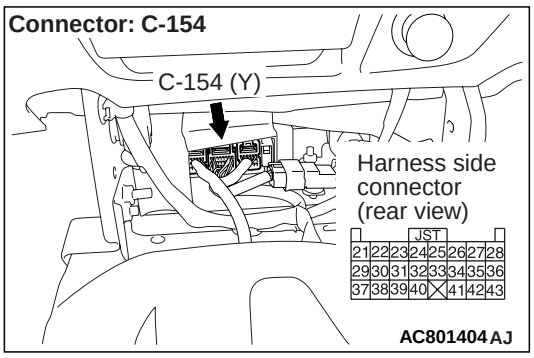
Q: Is the check result normal?

YES : Go to Step 3.

NO : Repair the harness wire between the front impact sensor (RH) connector A-124 (terminals 1 and 2) and SRS-ECU connector C-154 (terminals 36 and 35) as well as between front impact sensor (LH) connector A-30 (terminals 1 and 2) and SRS-ECU connector C-154 (terminals 29 and 30).

STEP 3. Voltage measurement at the SRS-ECU connector C-154.

(1) Disconnect the negative battery terminal.

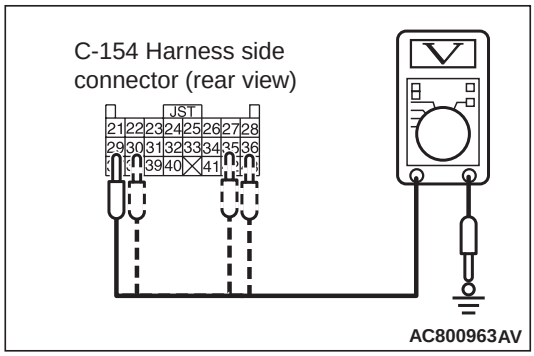


(2) Disconnect SRS-ECU connector C-154.

(3) Connect the negative battery terminal.

(4) Turn the ignition switch to the "ON" position.

⚠ CAUTION



Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(5) Take the measurements below at harness-side connector C-154.

- Voltage between terminals 29, 30, 35, 36 and body earth

OK: 1 V or less

Q: Is the check result normal?

YES : Go to Step 4.

NO : Repair the harness wire between the front impact sensor (RH) connector A-124 (terminals 1 and 2) and SRS-ECU connector C-154 (terminals 36 and 35) as well as between front impact sensor (LH) connector A-30 (terminals 1 and 2) and SRS-ECU connector C-154 (terminals 29 and 30).

STEP 4. Check whether the diagnosis code is reset.

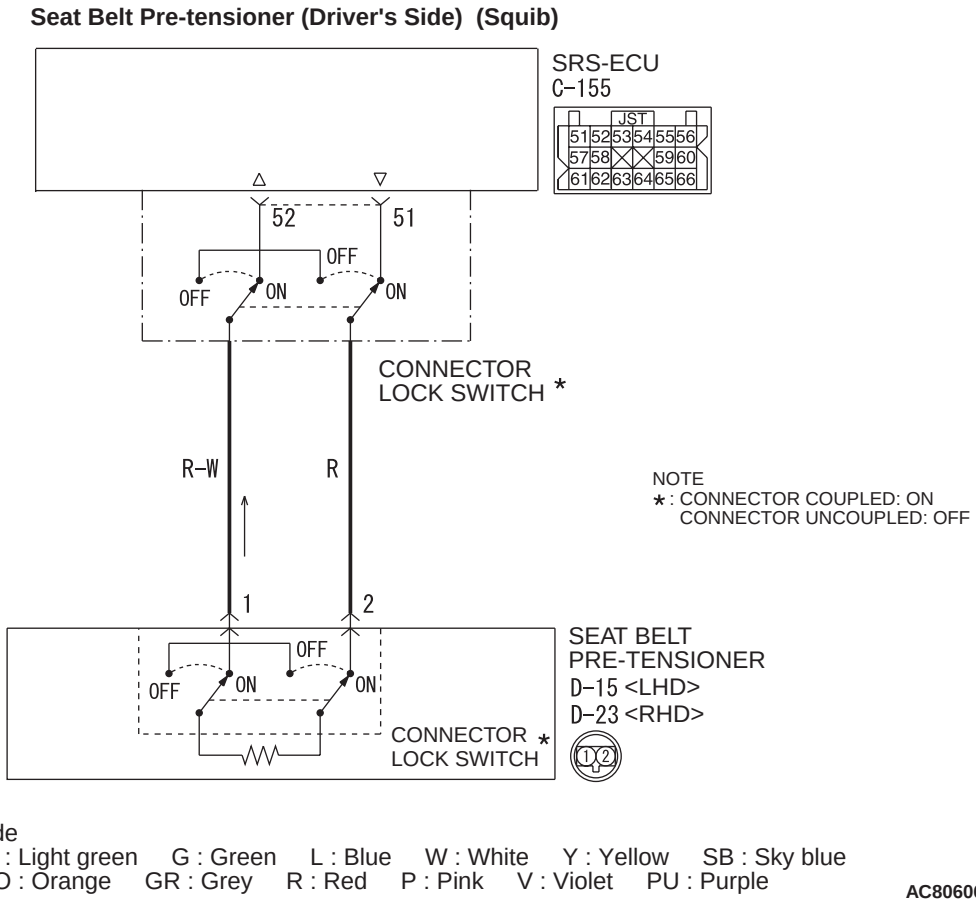
Check again if the diagnosis code is set.

Q: Is diagnosis code B1595, B1596, B1597, B1598, B1599, B1600, B1601 or B1602 set?

YES : Replace the SRS-ECU (Refer to P.52B-266).

NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1603: Seat belt pre-tensioner (driver's side) (squib) system (short-circuited between terminals of the squib circuit)



OPERATION

The SRS-ECU judges how severe a collision is by detecting signals from the front impact sensors and the front air bag analogue G-sensor. If the impact is over a predetermined level, the SRS-ECU sends an ignition signal. At this time, if the front air bag safing G-sensor is on, the seat belt pre-tensioner will deploy.

DIAGNOSIS CODE SET CONDITIONS

This diagnosis code is set if one seat belt pre-tensioner (driver's side) squib wire shorted to the other.

PROBABLE CAUSES

- Improper engaged connector or defective short spring*
- Short circuit between the seat belt pre-tensioner (driver's side) (squib) circuit terminals
- Damaged connector(s)
- Malfunction of the SRS-ECU

*NOTE: *: The squib circuit connectors integrate a "short" spring (which prevents the air bag from deploying unintentionally due to static electricity by shorting the positive wire to the earth wire in the squib circuit when the connectors are disconnected). Therefore, if connector C-155 or D-15 <LHD> or D-23 <RHD> is damaged or improperly engaged, the short spring may not be released when the connector is connected.*

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code.

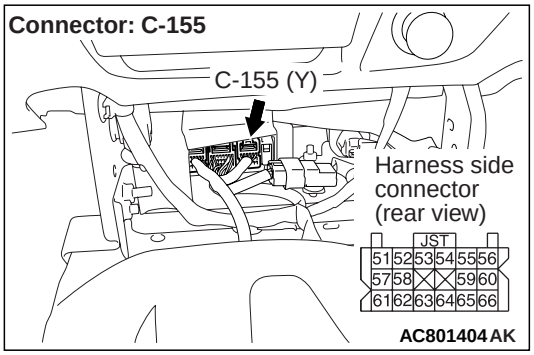
Q: Is diagnosis code B1519 set?

YES : Go to Step 2.

NO : Go to Step 3.

STEP 2. Connector lock check: SRS-ECU connector C-155. (M.U.T.-III diagnosis code)

(1) Disconnect the negative battery terminal.

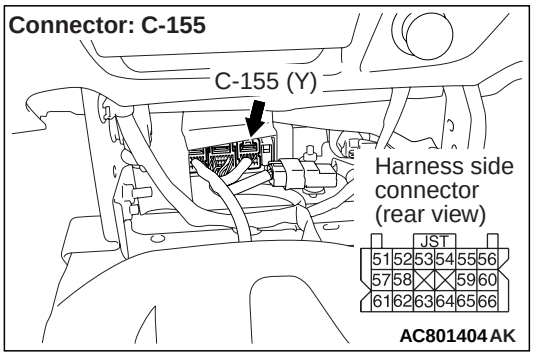


(2) Disconnect the connectors C-155 and then reconnect it.
(3) Connect the negative battery terminal.
(4) Erase the diagnosis code memory, and check the diagnosis code.

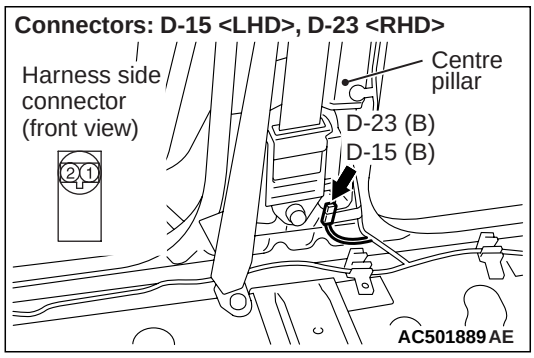
Q: Is diagnosis code B1603 set?
YES : Go to Step 3.
NO : The procedure is complete. It is assumed that diagnosis code B1603 set as connector C-155 was engaged improperly.

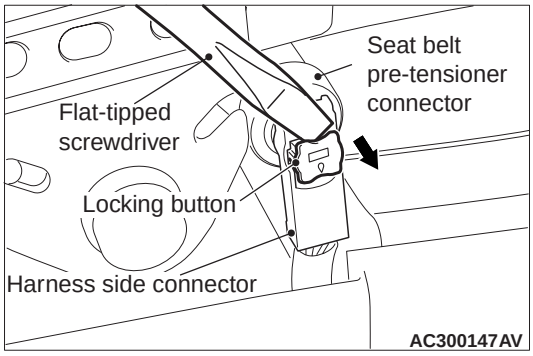
STEP 3. Connector lock check: SRS-ECU connector C-155 and seat belt pre-tensioner (driver's side) connector D-15 <LHD> or D-23 <RHD>. (M.U.T.-III diagnosis code)

(1) Disconnect the negative battery terminal.



(2) Disconnect the connectors C-155 and then reconnect them.



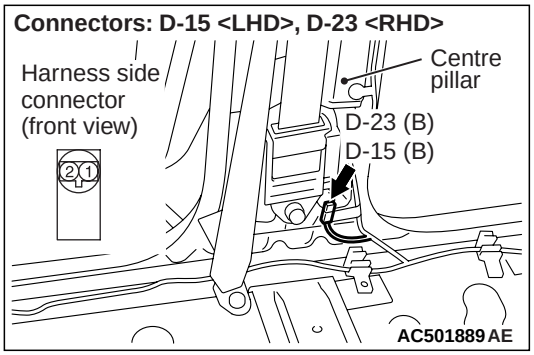


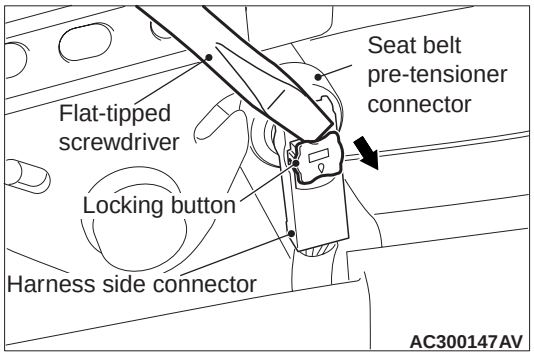
(3) Disconnect connector D-15 <LHD> or D-23 <RHD> and then reconnect them. Use a flat-tipped screwdriver to pull out the locking button at the harness side connector.
(4) Connect the negative battery terminal.
(5) Erase the diagnosis code memory, and check the diagnosis code.

Q: Is diagnosis code B1603 set?
YES : Go to Step 4.
NO : The procedure is complete. It is assumed that diagnosis code B1603 set as connector C-155 or D-15 <LHD> or D-23 <RHD> was engaged improperly.

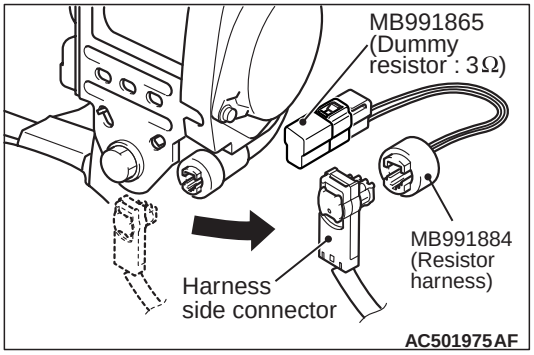
STEP 4. Check the diagnosis code by connecting a dummy resistor. (M.U.T.-III diagnosis code)

(1) Disconnect the negative battery terminal.





(2) Disconnect seat belt pre-tensioner (driver's side) connector D-15 <LHD> or D-23 <RHD>. Use a flat-tipped screwdriver to pull out the locking button at the harness side connector, and then disconnect the connector.



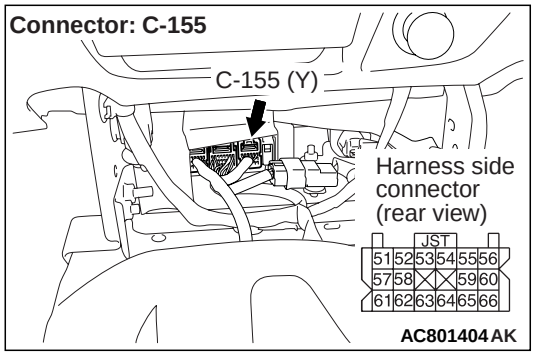
(3) Connect special tool dummy resistor (MB991865) to special tool resistor harness (MB991884).
(4) Connect special tool (MB991884) to the D-15 <LHD> or D-23 <RHD> harness side connector.
(5) Connect the negative battery terminal.
(6) Erase diagnosis code memory, and then check the diagnosis code.

Q: Is diagnosis code B1603 set?

YES : Go to Step 5.
NO : Replace the seat belt with pre-tensioner (driver's side) (Refer to P.52B-284).

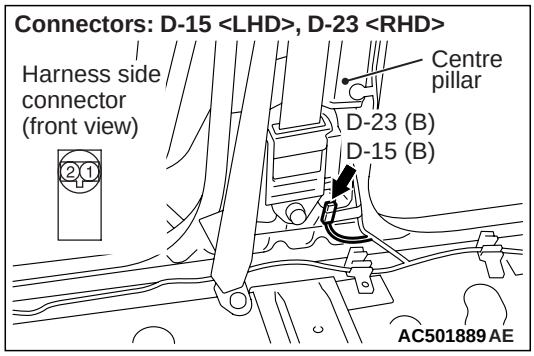
STEP 5. Resistance measurement at the SRS-ECU connector C-155.

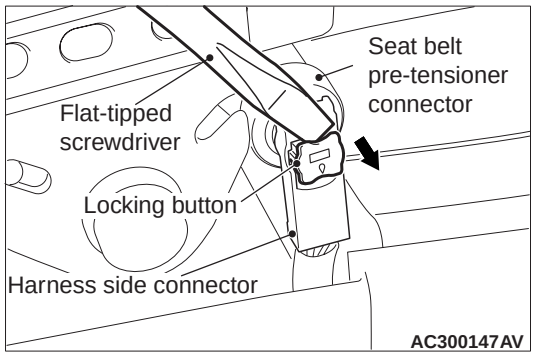
(1) Disconnect the negative battery terminal.



(2) Disconnect SRS-ECU connector C-155.

⚠ DANGER



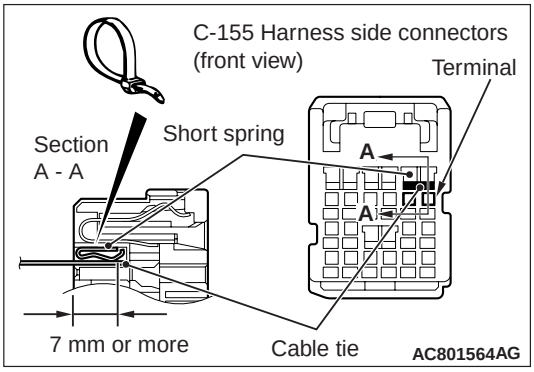


To prevents the seat belt pre-tensioner from operating unintentionally, disconnect the seat belt pre-tensioner (driver's side) connector D-15 <LHD> or D-23 <RHD> to short the squib circuit.

(3) Disconnect seat belt pre-tensioner (driver's side) connector D-15 <LHD> or D-23 <RHD>. Use a flat-tipped screwdriver to pull out the locking button at the harness side connector, and then

disconnect the connector.

⚠ CAUTION

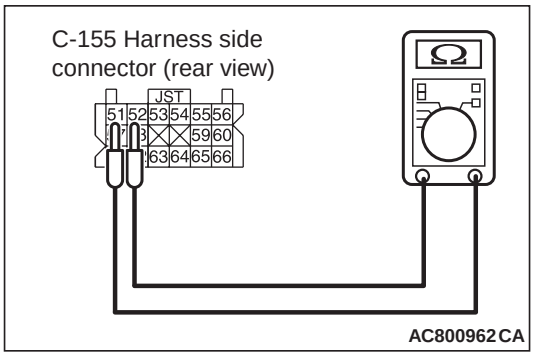


Insert an insulator such as a cable tie to a depth of 7 mm or more, otherwise the short spring will not be released.

(4) Insert a cable tie [3 mm wide, 0.5 mm thick] between terminals 51, 52 and the short spring to release the short spring.

⚠ CAUTION

Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.



(5) Resistance measurement between C-155 harness side connector terminals 51 and 52

OK: Open circuit

Q: Is the check result normal?

YES : Go to Step 6.

NO : Repair the harness wires between SRS-ECU connector C-155 (terminal No.51 and 52) and the seat belt pre-tensioner (driver's side) connector D-15 <LHD> or D-23 <RHD> (terminal No.2 and 1)

STEP 6. Check whether the diagnosis code is reset.

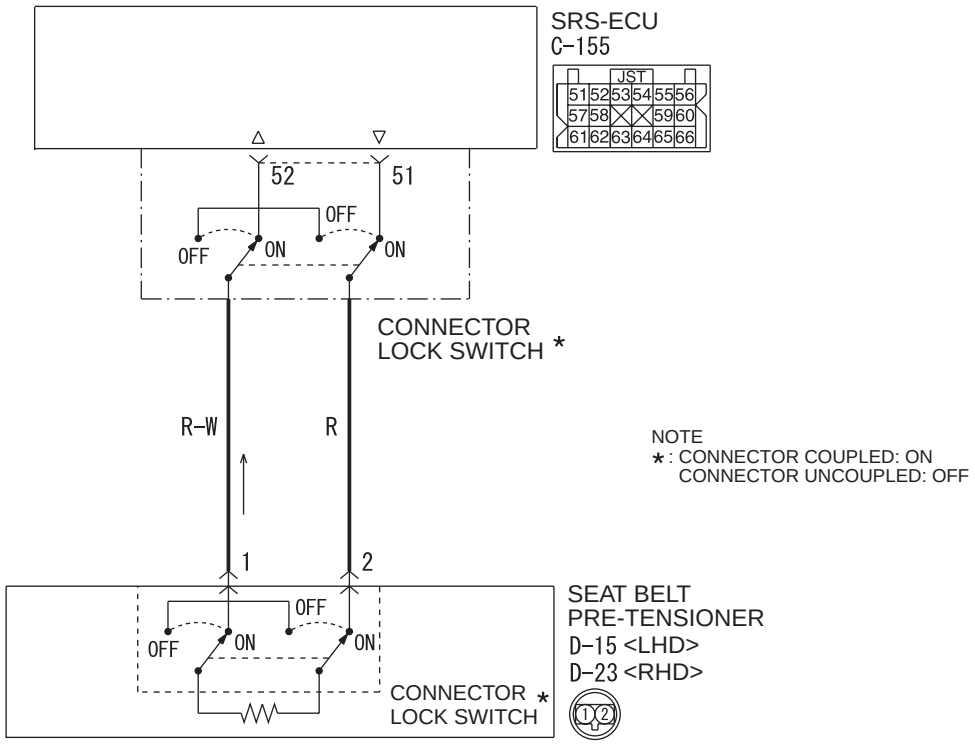
Q: Is diagnosis code B1603 set?

YES : Replace the SRS-ECU (Refer to P.52B-266).

NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1604: Seat belt pre-tensioner (driver's side) (squib) system (open-circuited in the squib circuit)

Seat Belt Pre-tensioner (Driver's Side) (Squib)



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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OPERATION

The SRS-ECU judges how severe a collision is by detecting signals from the front impact sensors and the front air bag analogue G-sensor. If the impact is over a predetermined level, the SRS-ECU sends an ignition signal. At this time, if the front air bag safing G-sensor is on, the seat belt pre-tensioner will deploy.

DIAGNOSIS CODE SET CONDITIONS

This diagnosis code is set if seat belt pre-tensioner (driver's side) squib wire(s) are open-circuited.

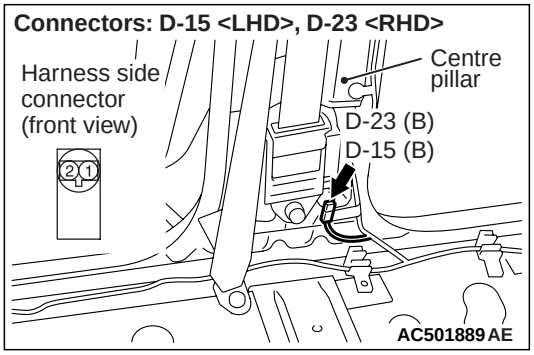
PROBABLE CAUSES

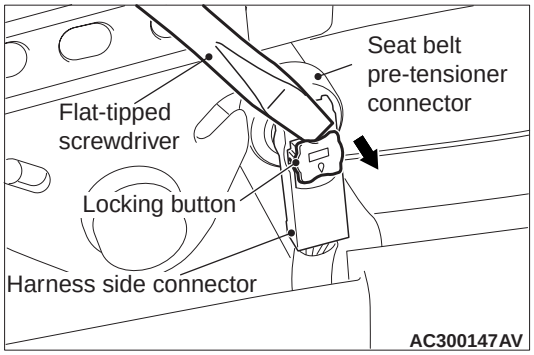
- Improper connector contact
- Open circuit in the seat belt pre-tensioner (driver's side) (squib) circuit
- Malfunction of the SRS-ECU

DIAGNOSIS PROCEDURE

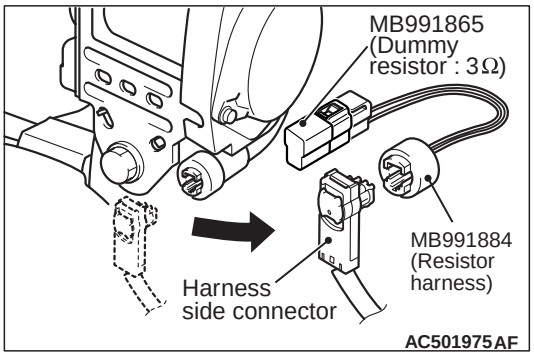
STEP 1. Check the diagnosis code by connecting a dummy resistor. (M.U.T.-III diagnosis code)

(1) Disconnect the negative battery terminal.





(2) Disconnect seat belt pre-tensioner (driver's side) connector D-15 <LHD> or D-23 <RHD>. Use a flat-tipped screwdriver to pull out the locking button at the harness side connector, and then disconnect the connector.



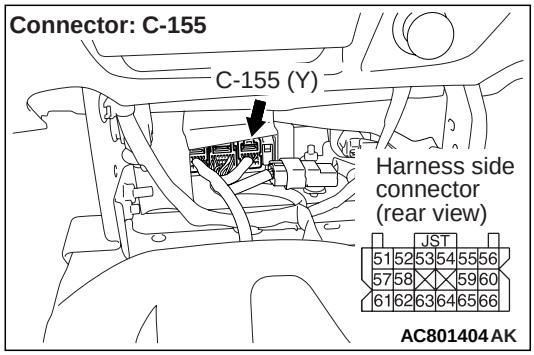
(3) Connect special tool dummy resistor (MB991865) to special tool resistor harness (MB991884).
(4) Connect special tool (MB991884) to the D-15 <LHD> or D-23 <RHD> harness side connector.
(5) Connect the negative battery terminal.
(6) Erase diagnosis code memory, and then check the diagnosis code.

Q: Is diagnosis code B1604 set?

YES : Go to Step 2.
NO : Replace the seat belt with pre-tensioner (driver's side) (Refer to P.52B-284).

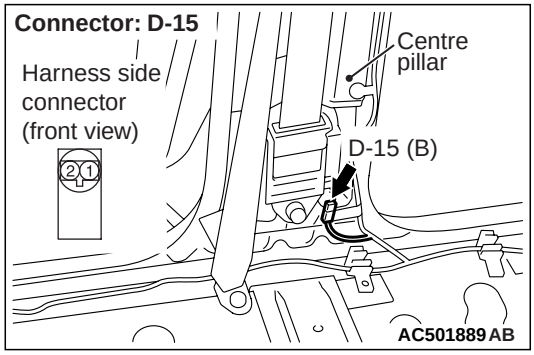
STEP 2. Resistance measurement between SRS-ECU connector C-155 (terminal No.51 and 52) and the seat belt pre-tensioner (driver's side) connector D-15 <LHD> or D-23 <RHD> (terminal No.2 and 1).

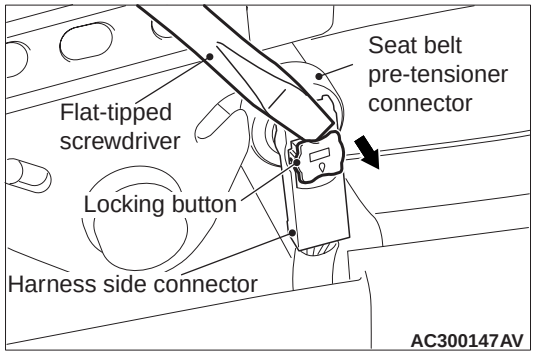
(1) Disconnect the negative battery terminal.



(2) Disconnect SRS-ECU connector C-155.

⚠ *DANGER*



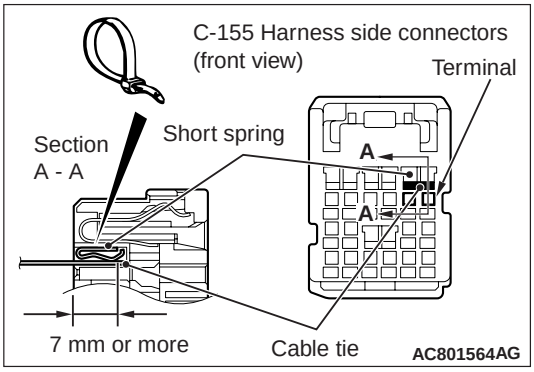


To prevents the seat belt pre-tensioner from operating unintentionally, disconnect the seat belt pre-tensioner (driver's side) connector D-15 <LHD> or D-23 <RHD> to short the squib circuit.

(3) Disconnect seat belt pre-tensioner (driver's side) connector D-15 <LHD> or D-23 <RHD>. Use a flat-tipped screwdriver to pull out the locking button at the harness side connector, and then

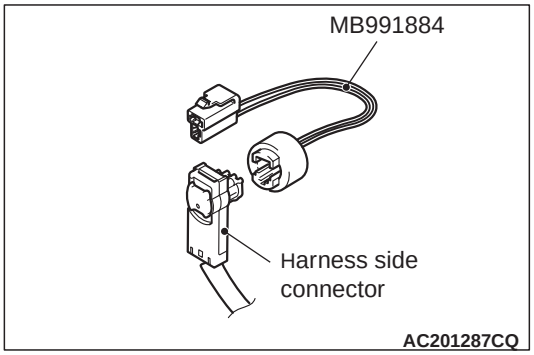
disconnect the connector.

⚠ CAUTION

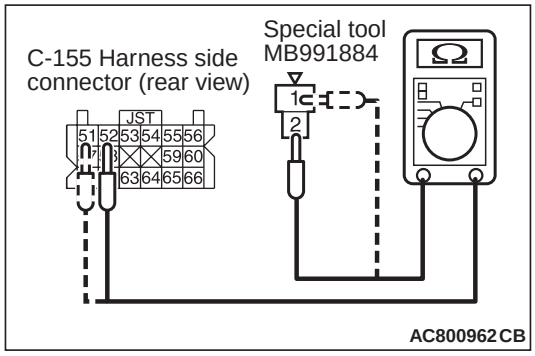


Insert an insulator such as a cable tie to a depth of 4mm or more, otherwise the short spring will not be released.

(4) Insert a cable tie [3 mm wide, 0.5 mm thick] between terminals 51, 52 and the short spring to release the short spring.



(5) Connect D-15 <LHD> or D-23 <RHD> harness side connector to special tool resistor harness (MB991884).



⚠ CAUTION

Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(6) Resistance measurement between the following terminals.
- SRS-ECU connector C-155 terminal No.51 and special tool terminal No.1
- SRS-ECU connector C-155 terminal No.52 and special tool terminal No.2

OK: Continuity (Less than 2 Ω)

Q: Are the check results normal?

YES : Go to Step 3.

NO : Repair the harness wires between SRS-ECU connector C-155 (terminal No.51 and 52) and the seat belt pre-tensioner (driver's side) connector D-15 <LHD> or D-23 <RHD> (terminal No.2 and 1)

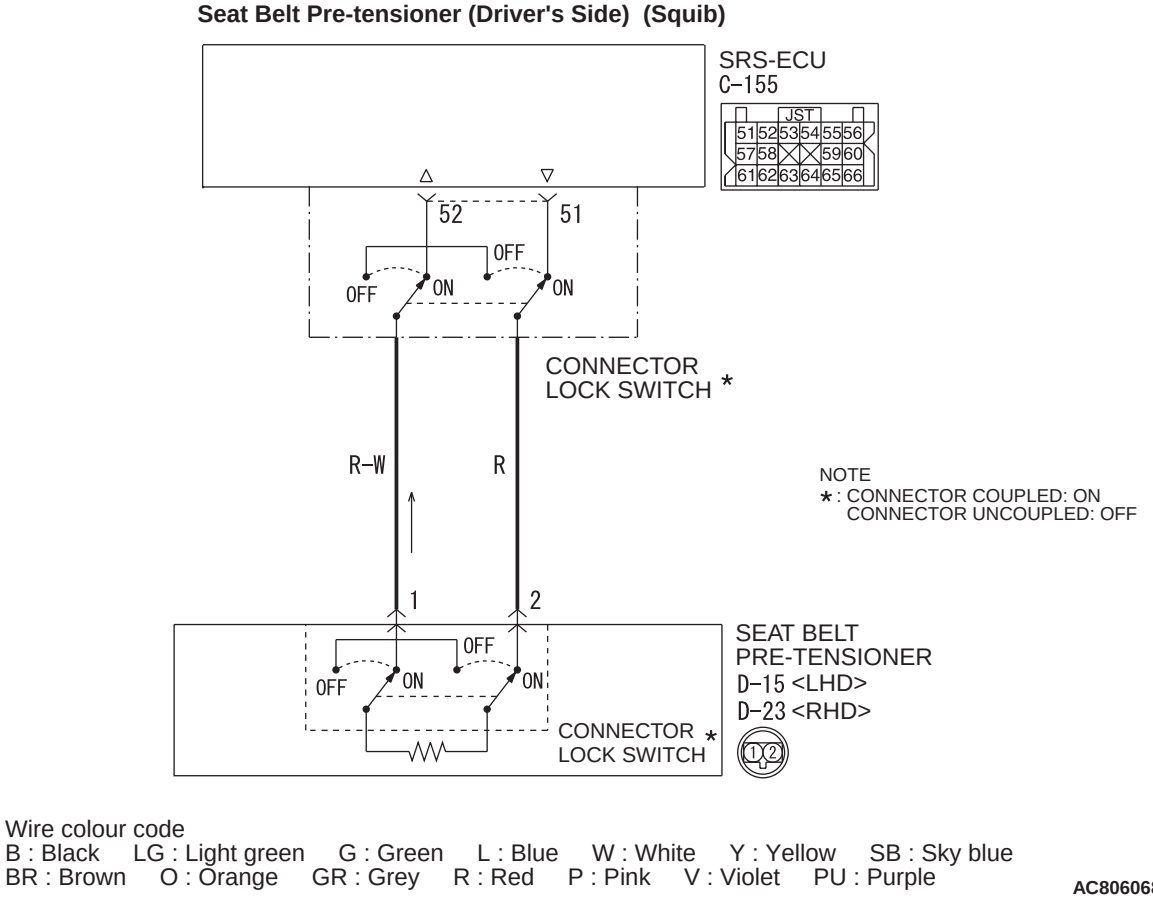
STEP 3. Check whether the diagnosis code is reset.

Q: Is diagnosis code No.B1604 set?

YES : Replace the SRS-ECU (Refer to P.52B-266).

NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1605: Seat belt pre-tensioner (driver's side) (squib) system (short-circuited to the earth)



OPERATION

The SRS-ECU judges how severe a collision is by detecting signals from the front impact sensors and the front air bag analogue G-sensor. If the impact is over a predetermined level, the SRS-ECU sends an ignition signal. At this time, if the front air bag safing G-sensor is on, the seat belt pre-tensioner will deploy.

DIAGNOSIS CODE SET CONDITIONS

This diagnosis code is set if the seat belt pre-tensioner (driver's side) wire(s) are short-circuited to the earth.

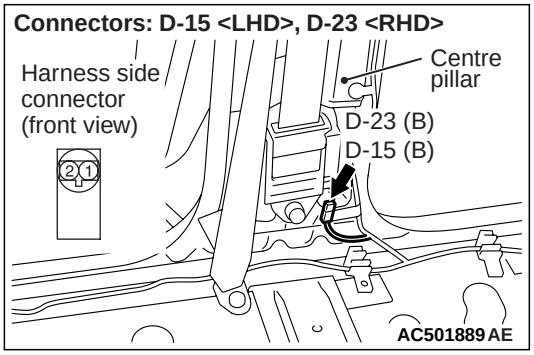
PROBABLE CAUSES

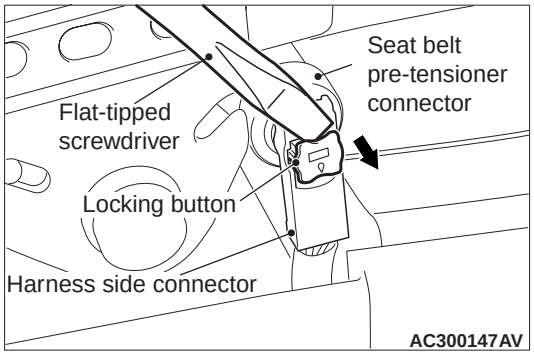
- Damaged wiring harnesses or connectors
- Short to the earth in the seat belt pre-tensioner (driver's side) (squib) harness
- Malfunction of the SRS-ECU

DIAGNOSIS PROCEDURE

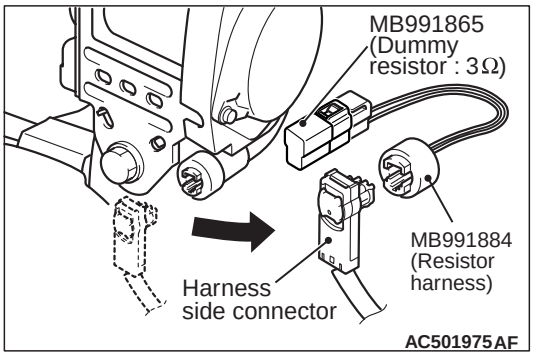
STEP 1. Check the diagnosis code by connecting a dummy resistor. (M.U.T.-III diagnosis code)

(1) Disconnect the negative battery terminal.





(2) Disconnect seat belt pre-tensioner (driver's side) connector D-15 <LHD> or D-23 <RHD>. Use a flat-tipped screwdriver to pull out the locking button at the harness side connector, and then disconnect the connector.



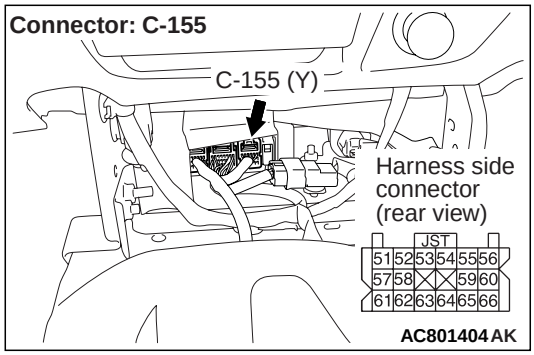
(3) Connect special tool dummy resistor (MB991865) to special tool resistor harness (MB991884).
(4) Connect special tool (MB991884) to the D-15 <LHD> or D-23 <RHD> harness side connector.
(5) Connect the negative battery terminal.
(6) Erase diagnosis code memory, and check the diagnosis code.

Q: Is diagnosis code B1605 set?

YES : Go to Step 2.
NO : Replace the seat belt with pre-tensioner (driver's side) (Refer to P.52B-284).

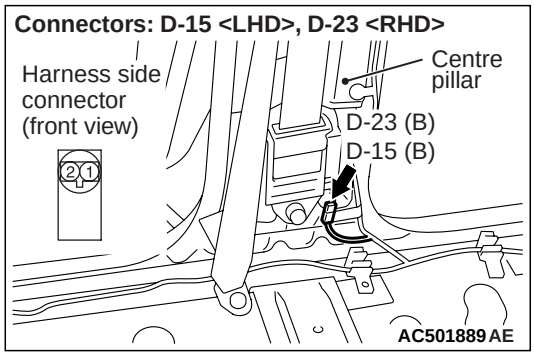
STEP 2. Resistance measurement at the SRS-ECU connector C-155.

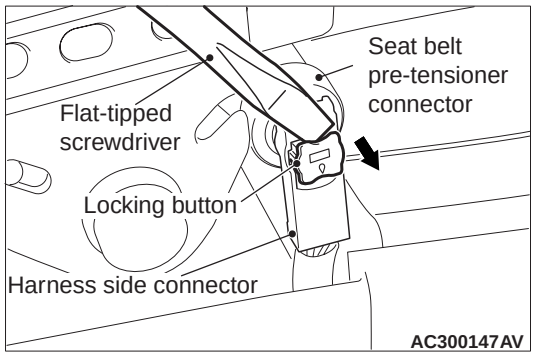
(1) Disconnect the negative battery terminal.



(2) Disconnect SRS-ECU connector C-155.

⚠ ***DANGER***



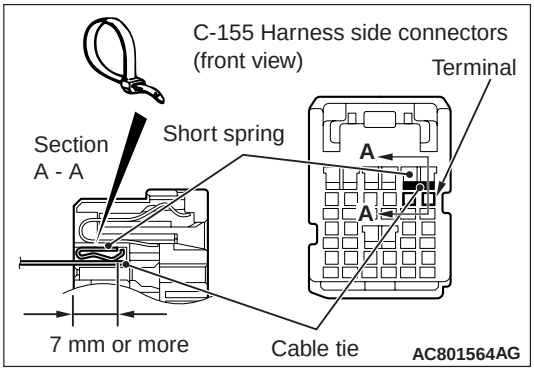


To prevents the seat belt pre-tensioner from operating unintentionally, disconnect the seat belt pre-tensioner (driver's side) connector D-15 <LHD> or D-23 <RHD> to short the squib circuit.

(3) Disconnect seat belt pre-tensioner (driver's side) connector D-15 <LHD> or D-23 <RHD>. Use a flat-tipped screwdriver to pull out the locking button at the harness side connector, and then

disconnect the connector.

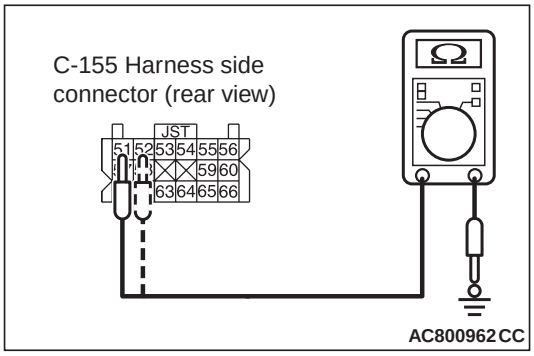
⚠ CAUTION



Insert an insulator such as a cable tie to a depth of 7 mm or more, otherwise the short spring will not be released.

(4) Insert a cable tie [3 mm wide, 0.5 mm thick] between terminals 51, 52 and the short spring to release the short spring.

⚠ CAUTION



Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(5) Resistance measurement between C-155 harness side connector terminals 51, 52 and body earth.

OK: Open circuit

Q: Is the check result normal?

YES : Go to Step 3.

NO : Repair the harness wire between SRS-ECU connector C-155 (terminal No.51 and 52) and the seat belt pre-tensioner (driver's side) connector D-15 <LHD> or D-23 <RHD> (terminal No.2 and 1).

STEP 3. Check whether the diagnosis code is reset.

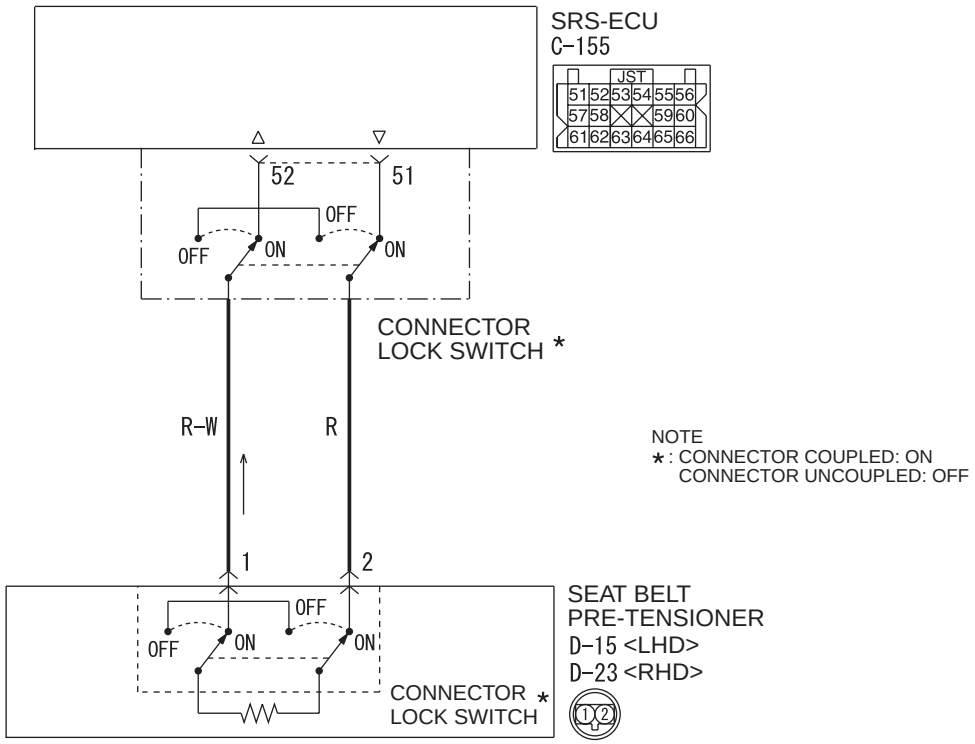
Q: Is diagnosis code B1605 set?

YES : Replace the SRS-ECU (Refer to P.52B-266).

NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1606: Seat belt pre-tensioner (driver's side) (squib) system (short-circuited to the power supply)

Seat Belt Pre-tensioner (Driver's Side) (Squib)



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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OPERATION

The SRS-ECU judges how severe a collision is by detecting signals from the front impact sensors and the front air bag analogue G-sensor. If the impact is over a predetermined level, the SRS-ECU sends an ignition signal. At this time, if the front air bag safing G-sensor is on, the seat belt pre-tensioner will deploy.

DIAGNOSIS CODE SET CONDITIONS

This diagnosis code is set if the seat belt pre-tensioner (driver's side) wire(s) are short-circuited to the power supply.

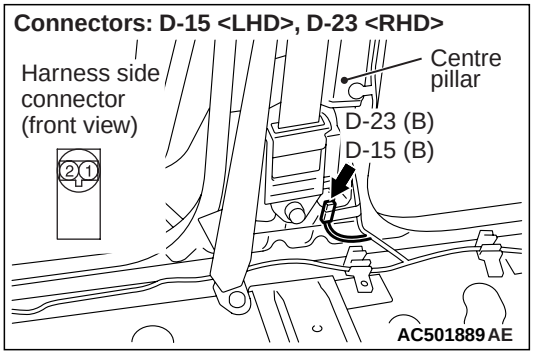
PROBABLE CAUSES

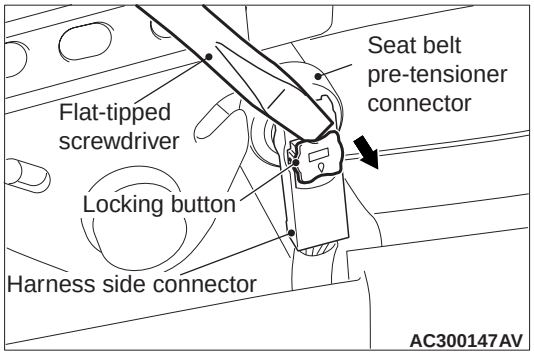
- Damaged wiring harnesses or connectors
- Short to the power supply in the seat belt pre-tensioner (driver's side) (squib) harness
- Malfunction of the SRS-ECU

DIAGNOSIS PROCEDURE

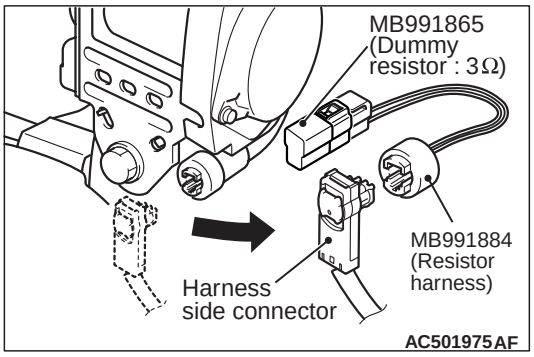
STEP 1. Check the diagnosis code by connecting a dummy resistor. (M.U.T.-III diagnosis code)

(1) Disconnect the negative battery terminal.





(2) Disconnect seat belt pre-tensioner (driver's side) connector D-15 <LHD> or D-23 <RHD>. Use a flat-tipped screwdriver to pull out the locking button at the harness side connector, and then disconnect the connector.



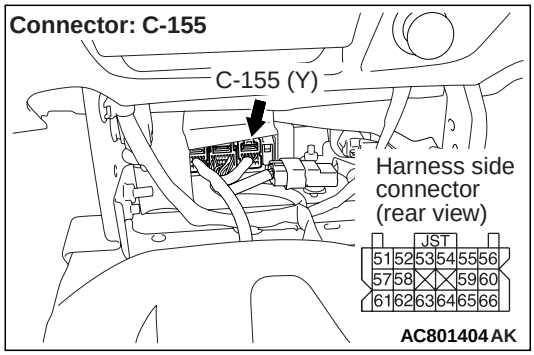
(3) Connect special tool dummy resistor (MB991865) to special tool resistor harness (MB991884).
(4) Connect special tool (MB991884) to the D-15 <LHD> or D-23 <RHD> harness side connector.
(5) Connect the negative battery terminal.
(6) Erase diagnosis code memory, and check the diagnosis code.

Q: Is diagnosis code B1606 set?

YES : Go to Step 2.
NO : Replace the seat belt with pre-tensioner (driver's side) (Refer to P.52B-284).

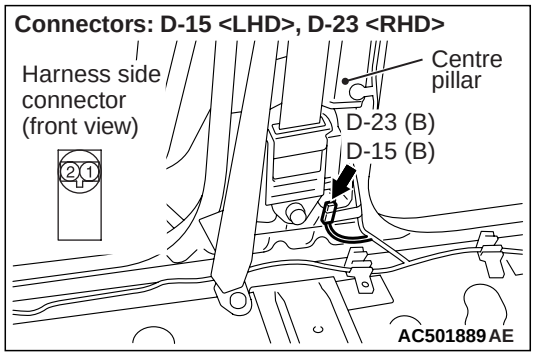
STEP 2. Voltage measurement at the SRS-ECU connector C-155.

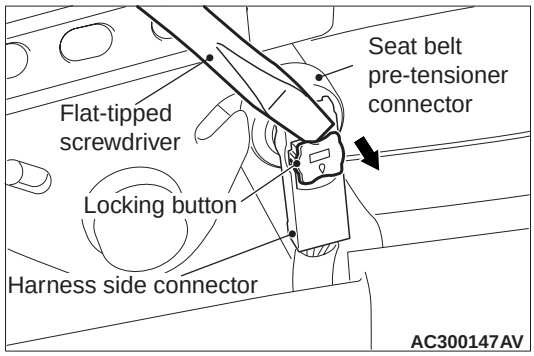
(1) Disconnect the negative battery terminal.



(2) Disconnect SRS-ECU connector C-155.

⚠ DANGER



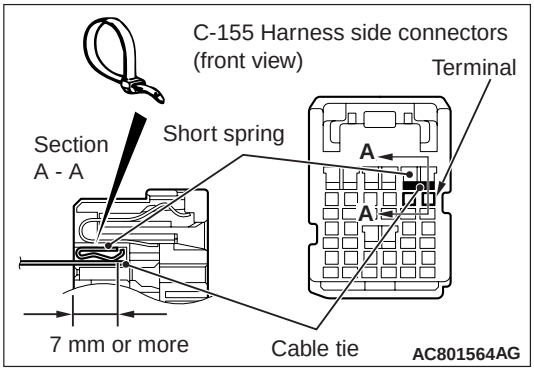


To prevents the seat belt pre-tensioner from operating unintentionally, disconnect the seat belt pre-tensioner (driver's side) connector D-15 <LHD> or D-23 <RHD> to short the squib circuit.

(3) Disconnect seat belt pre-tensioner (driver's side) connector D-15 <LHD> or D-23 <RHD>. Use a flat-tipped screwdriver to pull out the locking button at the harness side connector, and then

disconnect the connector.

⚠ CAUTION



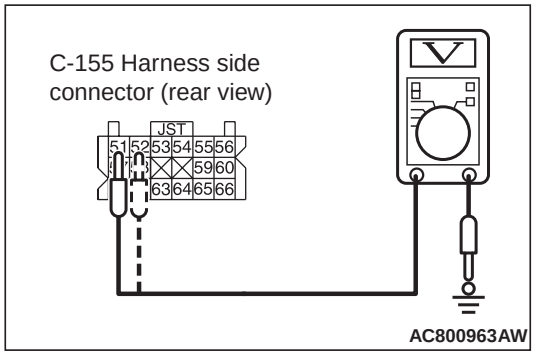
Insert an insulator such as a cable tie to a depth of 7 mm or more, otherwise the short spring will not be released.

(4) Insert a cable tie [3 mm wide, 0.5 mm thick] between terminals 51, 52 and the short spring to release the short spring.

(5) Connect the negative battery terminal.

(6) Turn the ignition switch to the "ON" position.

⚠ CAUTION



Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(7) Voltage measurement between C-155 harness side connector terminals 51, 52 and body earth.

OK: 1 V or less

Q: Is the measured voltage within the specified range?

YES : Go to Step 3 .

NO : Repair the harness wire between SRS-ECU connector C-155 (terminal No.51 and 52) and the seat belt pre-tensioner (driver's side) connector D-15 <LHD> or D-23 <RHD> (terminal No.2 and 1).

STEP 3. Check whether the diagnosis code is reset.

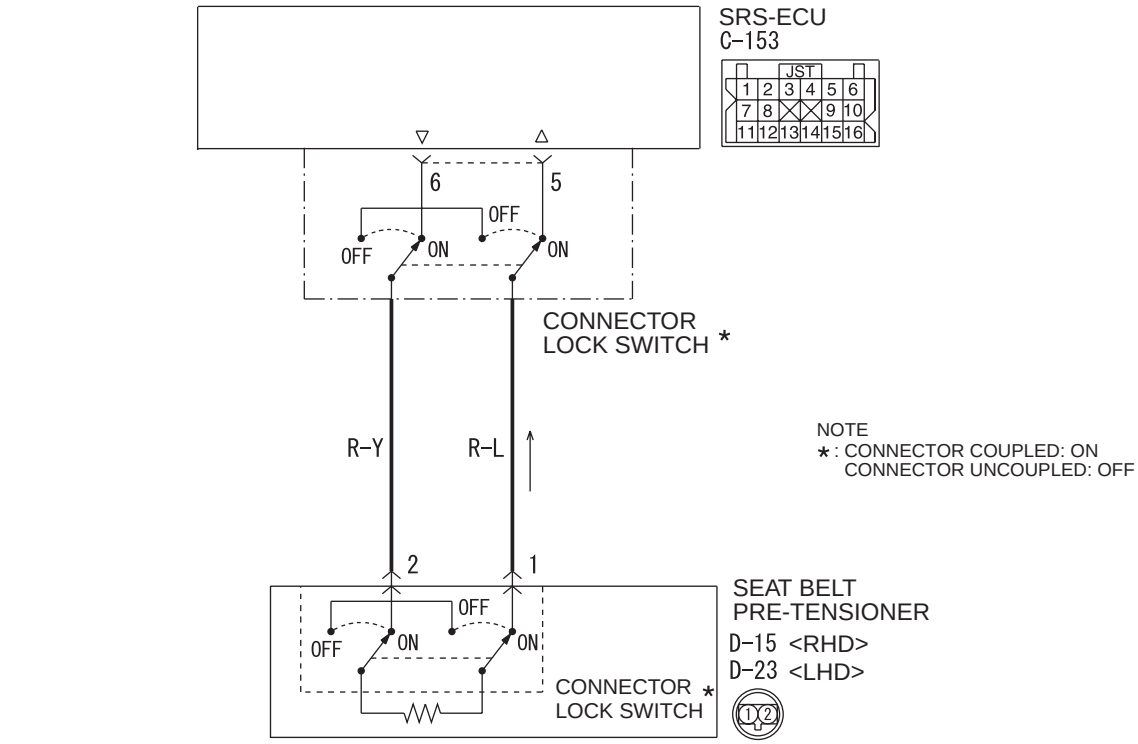
Q: Is diagnosis code B1606 set?

YES : Replace the SRS-ECU (Refer to P.52B-266).

NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1609: Seat belt pre-tensioner (passenger's side) (squib) system (short-circuit between terminals of the squib circuit)

Seat Belt Pre-tensioner (Passenger's Side) (Squib)



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

AC806069 AB

OPERATION

The SRS-ECU judges how severe a collision is by detecting signals from the front impact sensors and the front air bag analogue G-sensor. If the impact is over a predetermined level, the SRS-ECU sends an ignition signal. At this time, if the front air bag safing G-sensor is on, the seat belt pre-tensioner will deploy.

DIAGNOSIS CODE SET CONDITIONS

This diagnosis code is set if one seat belt pre-tensioner (passenger's side) squib wire shorted to the other.

PROBABLE CAUSES

- Improper engaged connector or defective short spring*
- Short circuit between the seat belt pre-tensioner (passenger's side) (squib) circuit terminals
- Damaged connector(s)
- Malfunction of the SRS-ECU

*NOTE: *: The squib circuit connectors integrate a "short" spring (which prevents the air bag from deploying unintentionally due to static electricity by shorting the positive wire to the earth wire in the squib circuit when the connectors are disconnected). Therefore, if connector C-153 or D-23 <LHD>, D-15 <RHD> is damaged or improperly engaged, the short spring may not be released when the connector is connected.*

DIAGNOSIS PROCEDURE

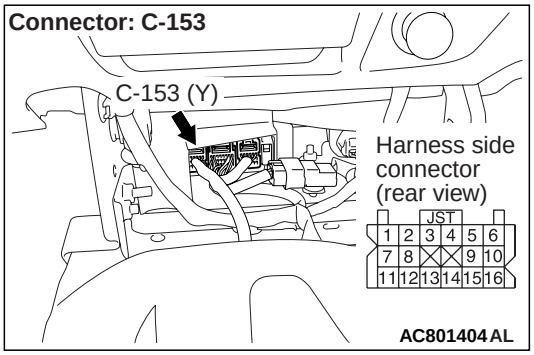
STEP 1. M.U.T.-III diagnosis code.

Q: Is diagnosis code B1519 set?

YES : Go to Step 2.
NO : Go to Step 3.

STEP 2. Connector lock check: SRS-ECU connector C-153. (M.U.T.-III diagnosis code)

(1) Disconnect the negative battery terminal.

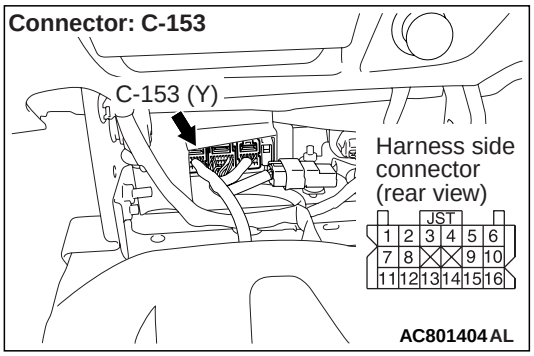


(2) Disconnect the connectors C-153 and then reconnect it.
(3) Connect the negative battery terminal.
(4) Erase the diagnosis code memory, and check the diagnosis code.

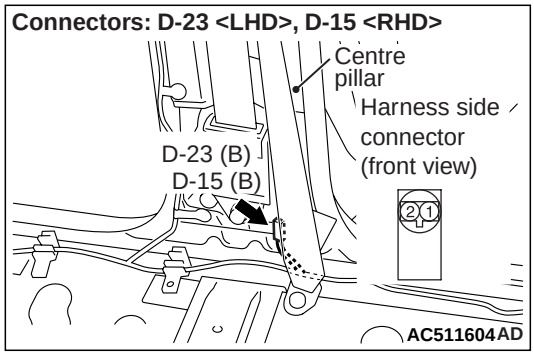
Q: Is diagnosis code B1609 set?
YES : Go to Step 3.
NO : The procedure is complete. It is assumed that diagnosis code B1609 set as connector C-153 was engaged improperly.

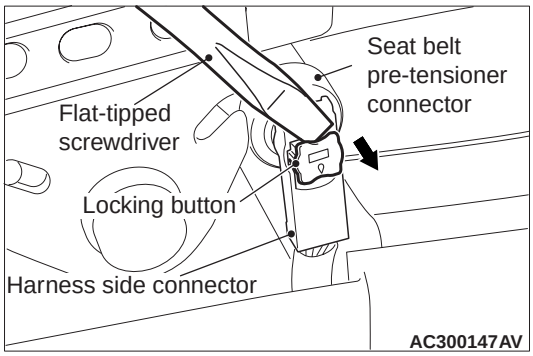
STEP 3. Connector lock check: SRS-ECU connector C-153 and seat belt pre-tensioner (passenger's side) connector D-23 <LHD>, D-15 <RHD>. (M.U.T.-III diagnosis code)

(1) Disconnect the negative battery terminal.



(2) Disconnect the connectors C-153 and then reconnect it.



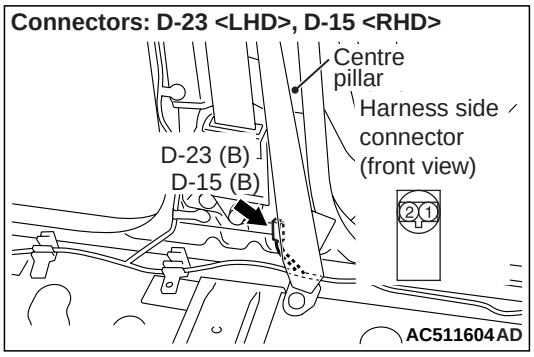


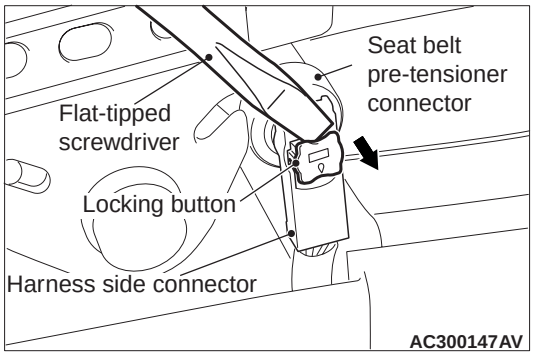
(3) Disconnect connector D-23 <LHD>, D-15 <RHD> and then reconnect them. Use a flat-tipped screwdriver to pull out the locking button at the harness side connector.
(4) Connect the negative battery terminal.
(5) Erase the diagnosis code memory, and check the diagnosis code.

Q: Is diagnosis code B1609 set?
YES : Go to Step 4.
NO : The procedure is complete. It is assumed that diagnosis code B1609 set as connector C-153 or D-23 <LHD>, D-15 <RHD> was engaged improperly.

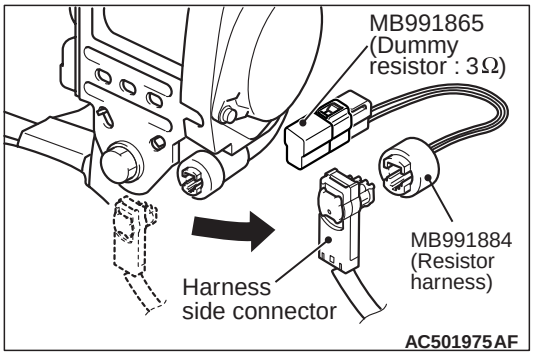
STEP 4. Check the diagnosis code by connecting a dummy resistor. (M.U.T.-III diagnosis code)

(1) Disconnect the negative battery terminal.





(2) Disconnect seat belt pre-tensioner (passenger's side) connector D-23 <LHD>, D-15 <RHD>. Use a flat-tipped screwdriver to pull out the locking button at the harness side connector, and then disconnect the connector.



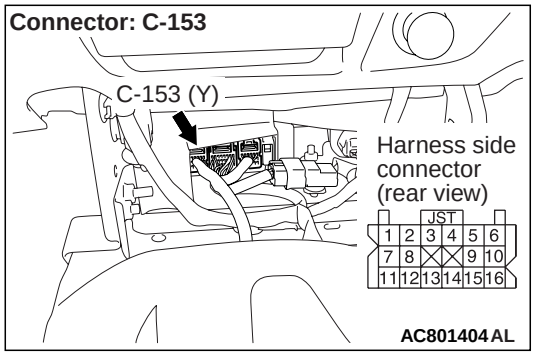
(3) Connect special tool dummy resistor (MB991865) to special tool resistor harness (MB991884).
(4) Connect special tool (MB991884) to the D-23 <LHD>, D-15 <RHD> harness side connector.
(5) Connect the negative battery terminal.
(6) Erase diagnosis code memory, and then check the diagnosis code.

Q: Is diagnosis code B1609 set?

YES : Go to Step 5.
NO : Replace the seat belt with pre-tensioner (passenger's side) (Refer to P.52B-284).

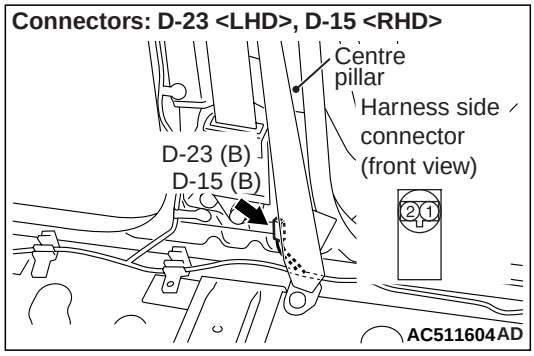
STEP 5. Resistance measurement at the SRS-ECU connector C-153.

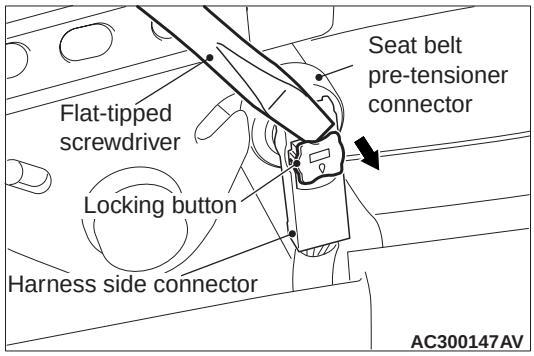
(1) Disconnect the negative battery terminal.



(2) Disconnect SRS-ECU connector C-153.

⚠ DANGER



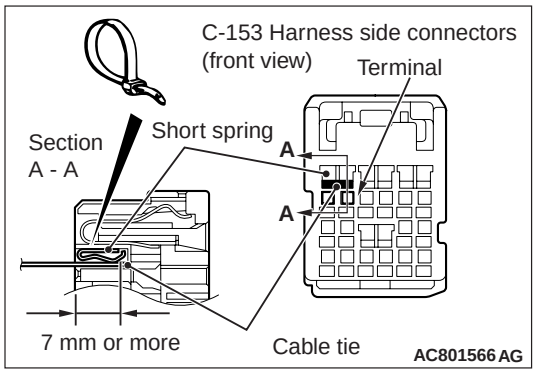


To prevents the seat belt pre-tensioner from deploying unintentionally, disconnect the seat belt pre-tensioner (passenger's side) connector D-23 <LHD>, D-15 <RHD> to short the squib circuit.

(3) Disconnect seat belt pre-tensioner (passenger's side) connector D-23 <LHD>, D-15 <RHD>. Use a flat-tipped screwdriver to pull out the locking button at the harness side connector, and then

disconnect the connector.

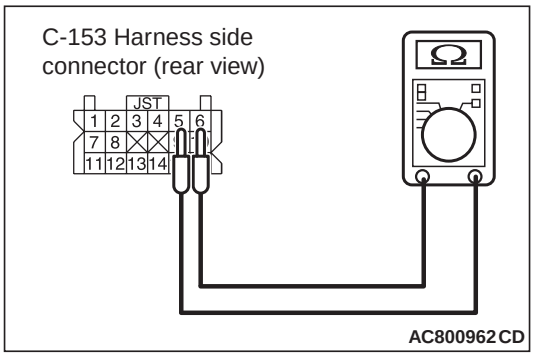
⚠ CAUTION



Insert an insulator such as a cable tie to a depth of 7 mm or more, otherwise the short spring will not be released.

(4) Insert a cable tie [3 mm wide, 0.5 mm thick] between terminals 5, 6 and the short spring to release the short spring.

⚠ CAUTION



Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(5) Resistance measurement between C-153 harness side connector terminals 5 and 6.

OK: Open circuit.

Q: Is the check result normal?

YES : Go to Step 6 .

NO : Repair the harness wires between SRS-ECU connector C-153 (terminal No.5 and 6) and the seat belt pre-tensioner (passenger's side) connector D-23 <LHD>, D-15 <RHD> (terminal No.1 and 2).

STEP 6. Check whether the diagnosis code is reset.

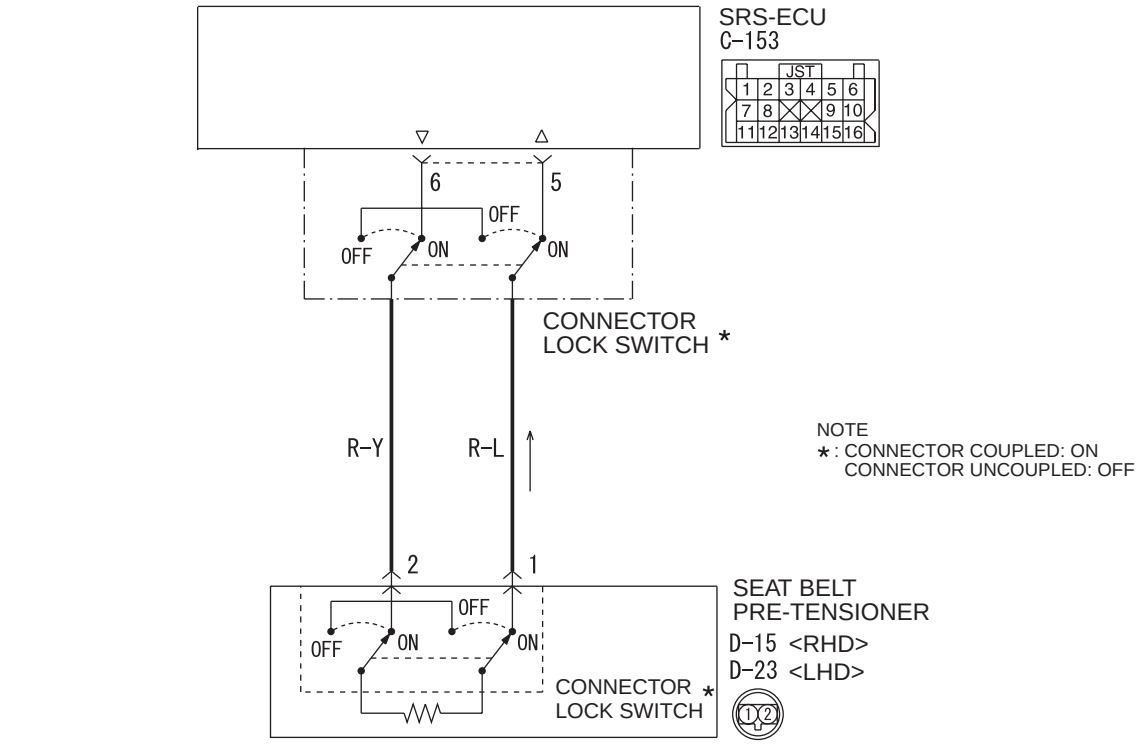
Q: Is diagnosis code B1609 set?

YES : Replace the SRS-ECU (Refer to P.52B-266).

NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1610: Seat belt pre-tensioner (passenger's side) (squib) system (open-circuited in the squib circuit)

Seat Belt Pre-tensioner (Passenger's Side) (Squib)



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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OPERATION

The SRS-ECU judges how severe a collision is by detecting signals from the front impact sensors and the front air bag analogue G-sensor. If the impact is over a predetermined level, the SRS-ECU sends an ignition signal. At this time, if the front air bag safing G-sensor is on, the seat belt pre-tensioner will deploy.

DIAGNOSIS CODE SET CONDITIONS

This diagnosis code is set if the seat belt pre-tensioner (passenger's side) squib wire(s) are open-circuited.

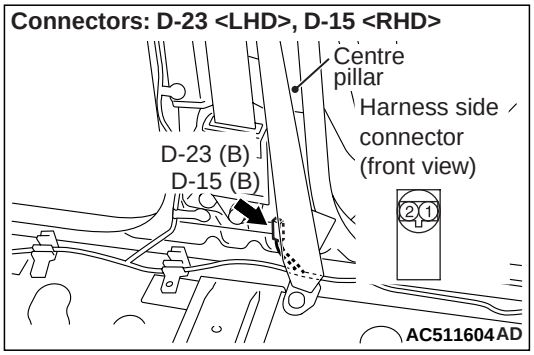
PROBABLE CAUSES

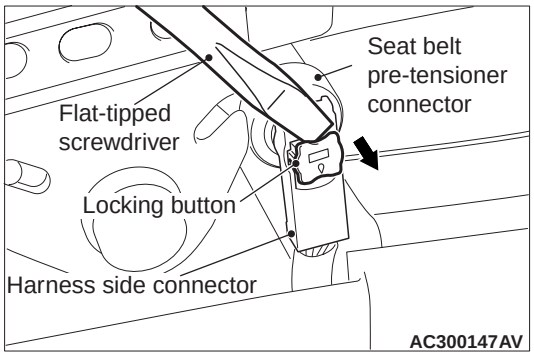
- Open circuit in the seat belt pre-tensioner (passenger's side) (squib) circuit
- Improper connector contact
- Malfunction of the SRS-ECU

DIAGNOSIS PROCEDURE

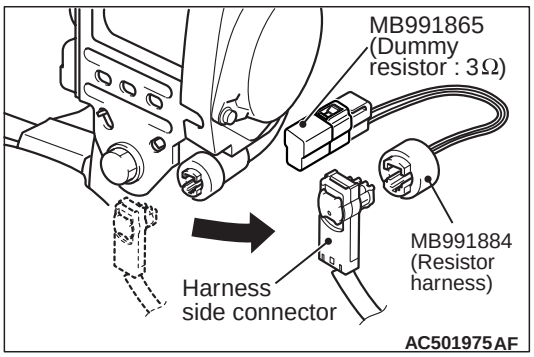
STEP 1. Check the diagnosis code by connecting a dummy resistor. (M.U.T.-III diagnosis code)

(1) Disconnect the negative battery terminal.





(2) Disconnect seat belt pre-tensioner (passenger's side) connector D-23 <LHD>, D-15 <RHD>. Use a flat-tipped screwdriver to pull out the locking button at the harness side connector, and then disconnect the connector.



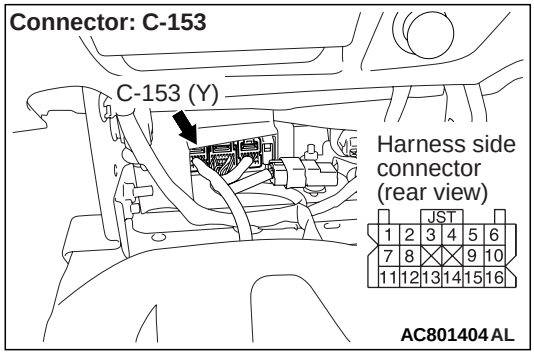
(3) Connect special tool dummy resistor (MB991865) to special tool resistor harness (MB991884).
(4) Connect special tool (MB991884) to the D-23 <LHD>, D-15 <RHD> harness side connector.
(5) Connect the negative battery terminal.
(6) Erase diagnosis code memory, and then check the diagnosis code.

Q: Is diagnosis code B1610 set?

YES : Go to Step 2.
NO : Replace the seat belt with pre-tensioner (passenger's side) (Refer to P.52B-284).

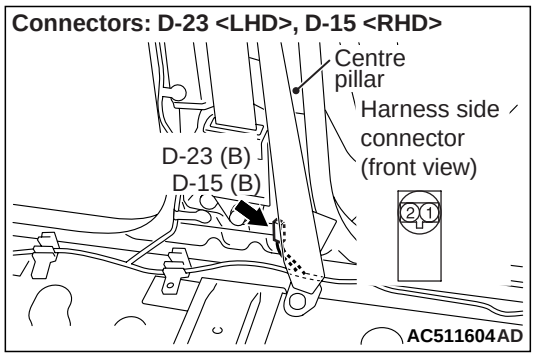
STEP 2. Resistance measurement between SRS-ECU connector C-153 (terminal No.5 and 6) and the seat belt pre-tensioner (passenger's side) connector D-23 (terminal No.1 and 2)

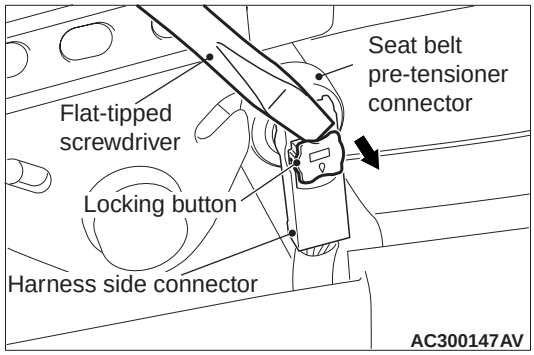
(1) Disconnect the negative battery terminal.



(2) Disconnect SRS-ECU connector C-153.

⚠ DANGER



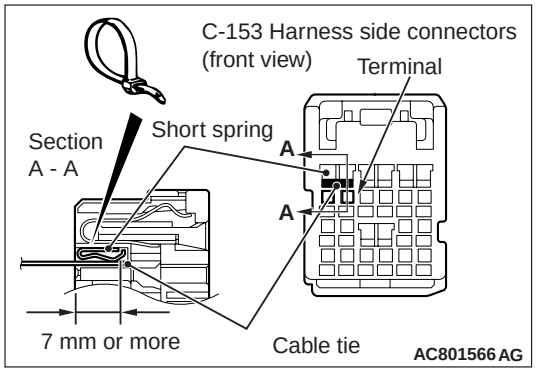


To prevents the seat belt pre-tensioner from deploying unintentionally, disconnect the seat belt pre-tensioner (passenger's side) connector D-23 <LHD>, D-15 <RHD> to short the squib circuit.

(3) Disconnect seat belt pre-tensioner (passenger's side) connector D-23 <LHD>, D-15 <RHD>. Use a flat-tipped screwdriver to pull out the locking button at the harness side connector, and then

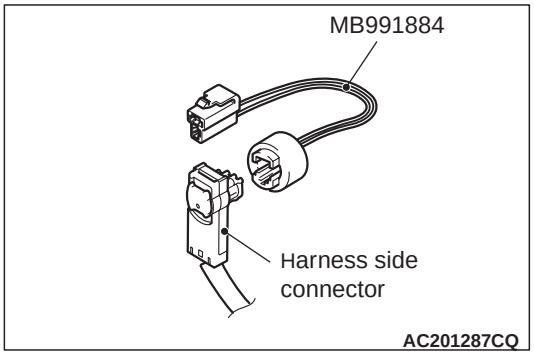
disconnect the connector.

⚠ CAUTION



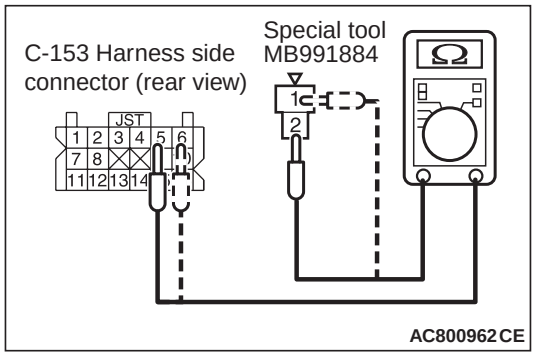
Insert an insulator such as a cable tie to a depth of 7 mm or more, otherwise the short spring will not be released.

(4) Insert a cable tie [3 mm wide, 0.5 mm thick] between terminals 5, 6 and the short spring to release the short spring.



(5) Connect D-23 <LHD>, D-15 <RHD> harness side connector to special tool resistor harness (MB991884).

⚠ CAUTION



Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(6) Resistance measurement between the following terminals.
- SRS-ECU connector C-153 terminal No.5 and the special tool terminal No.2
- SRS-ECU connector C-153 terminal No.6 and the special tool terminal No.1

OK: Continuity (Less than 2 Ω)

Q: Are the check results normal?

YES : Go to Step 3 .

NO : Repair the harness wires between SRS-ECU connector C-153 (terminal No.5 and 6) and the seat belt pre-tensioner (passenger's side) connector D-23 <LHD>, D-15 <RHD> (terminal No.1 and 2).

STEP 3. Check whether the diagnosis code is reset.

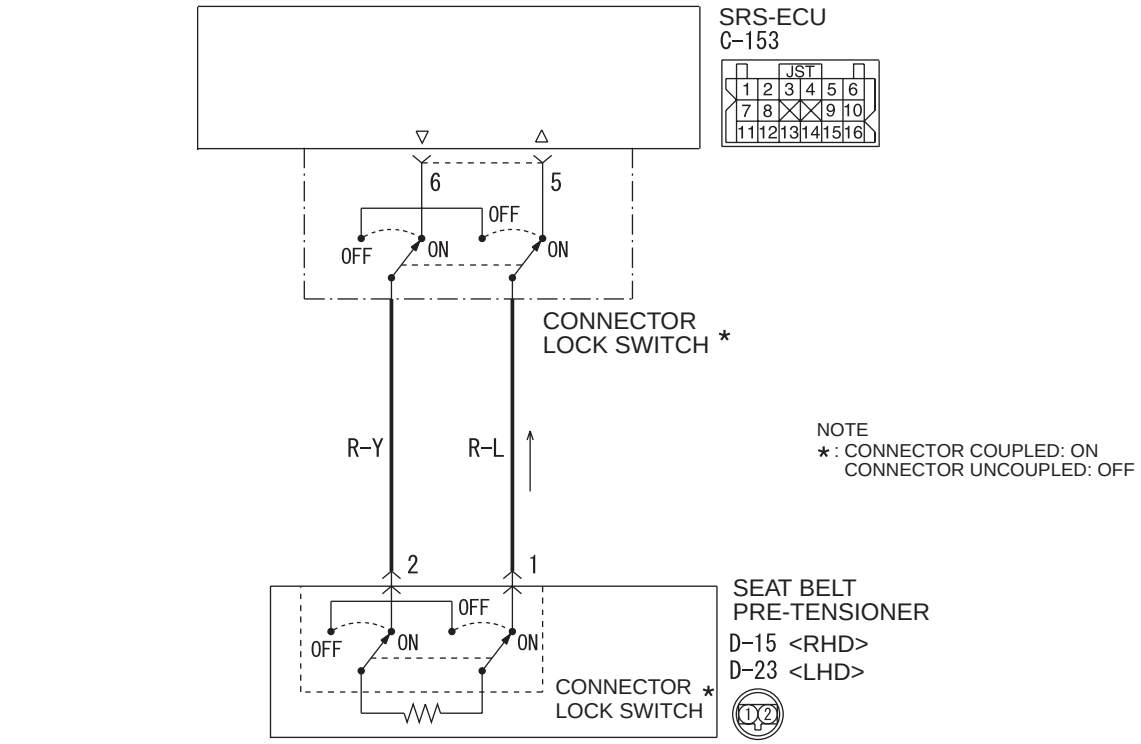
Q: Is diagnosis code B1610 set?

YES : Replace the SRS-ECU (Refer to P.52B-266).

NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1611: Seat belt pre-tensioner (passenger's side) (squib) system (short-circuited to the earth)

Seat Belt Pre-tensioner (Passenger's Side) (Squib)



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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OPERATION

The SRS-ECU judges how severe a collision is by detecting signals from the front impact sensors and the front air bag analogue G-sensor. If the impact is over a predetermined level, the SRS-ECU sends an ignition signal. At this time, if the front air bag safing G-sensor is on, the seat belt pre-tensioner will deploy.

DIAGNOSIS CODE SET CONDITIONS

This diagnosis code is set if seat belt pre-tensioner (passenger's side) wire(s) are short-circuited to the earth.

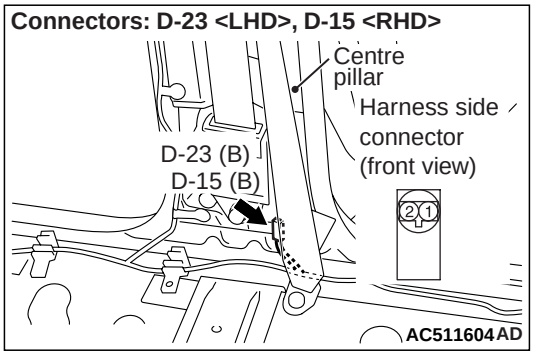
PROBABLE CAUSES

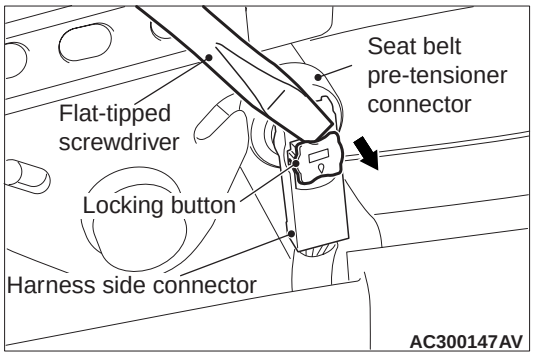
- Damaged wiring harnesses or connectors
- Short to the earth in the seat belt pre-tensioner (passenger's side) (squib) harness
- Malfunction of the SRS-ECU

DIAGNOSIS PROCEDURE

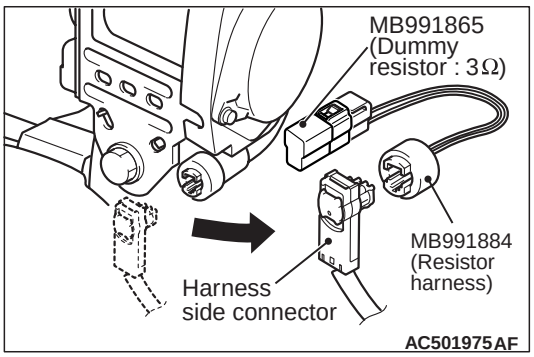
STEP 1. Check the diagnosis code by connecting a dummy resistor. (M.U.T.-III diagnosis code)

(1) Disconnect the negative battery terminal.





(2) Disconnect seat belt pre-tensioner (passenger's side) connector D-23 <LHD>, D-15 <RHD>. Use a flat-tipped screwdriver to pull out the locking button at the harness side connector, and then disconnect the connector.



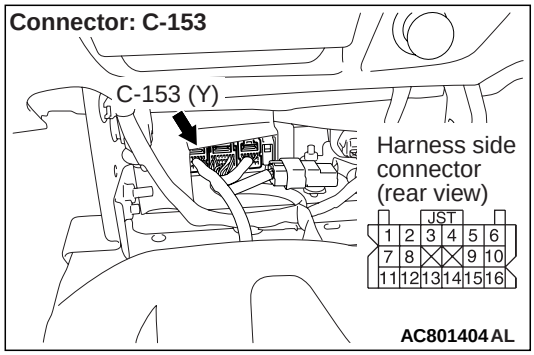
(3) Connect special tool dummy resistor (MB991865) to special tool resistor harness (MB991884).
(4) Connect special tool (MB991884) to the D-23 <LHD>, D-15 <RHD> harness side connector.
(5) Connect the negative battery terminal.
(6) Erase diagnosis code memory, and then check the diagnosis code.

Q: Is diagnosis code B1611 set?

YES : Go to Step 2.
NO : Replace the seat belt with pre-tensioner (passenger's side) (Refer to P.52B-284).

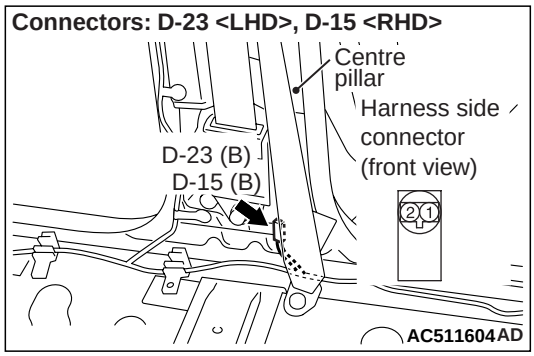
STEP 2. Resistance measurement at the SRS-ECU connector C-153

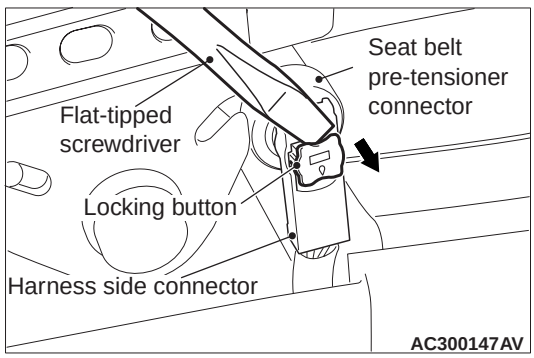
(1) Disconnect the negative battery terminal.



(2) Disconnect SRS-ECU connector C-153.

⚠ DANGER



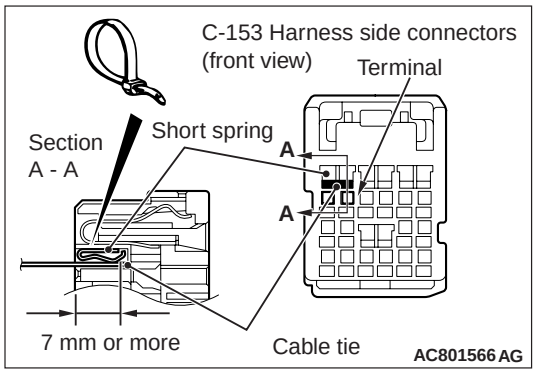


To prevents the seat belt pre-tensioner from deploying unintentionally, disconnect the seat belt pre-tensioner (passenger's side) connector D-23 <LHD>, D-15 <RHD> to short the squib circuit.

(3) Disconnect seat belt pre-tensioner (passenger's side) connector D-23 <LHD>, D-15 <RHD>. Use a flat-tipped screwdriver to pull out the locking button at the harness side connector, and then

disconnect the connector.

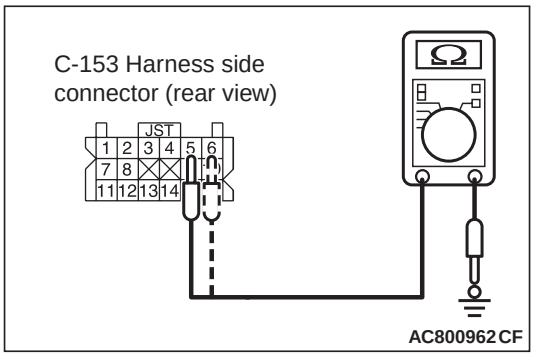
⚠ CAUTION



Insert an insulator such as a cable tie to a depth of 7 mm or more, otherwise the short spring will not be released.

(4) Insert a cable tie [3 mm wide, 0.5 mm thick] between terminals 5, 6 and the short spring to release the short spring.

⚠ CAUTION



Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(5) Resistance measurement between C-153 harness side connector terminals 5, 6 and body earth.

OK: Open circuit

Q: Is the check result normal?

YES : Go to Step 3 .

NO : Repair the harness wires between SRS-ECU connector C-153 (terminal No.5 and 6) and the seat belt pre-tensioner (passenger's side) connector D-23 <LHD>, D-15 <RHD> (terminal No.1 and 2).

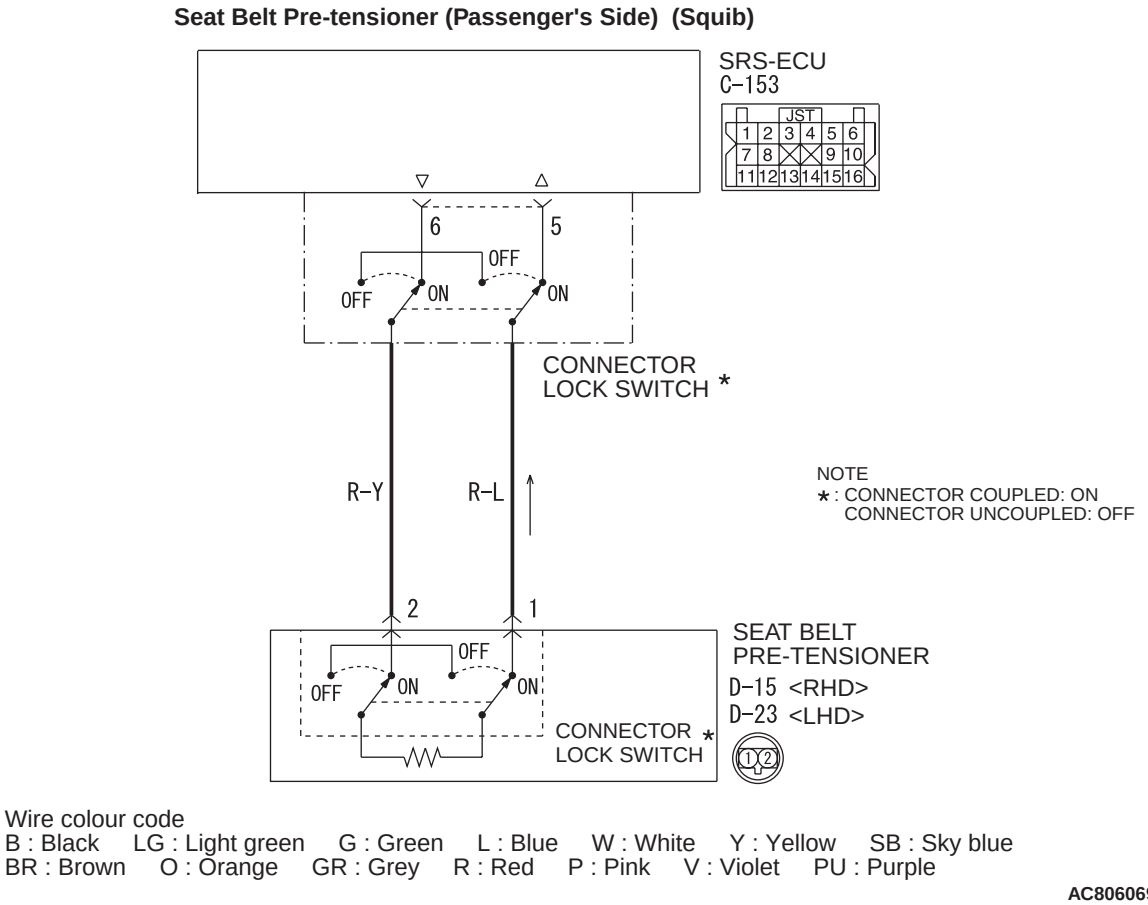
STEP 3. Check whether the diagnosis code is reset.

Q: Is diagnosis code B1611 set?

YES : Replace the SRS-ECU (Refer to P.52B-266).

NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1612: Seat belt pre-tensioner (passenger's side) (squib) system (short-circuited to the power supply)



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

AC806069 AB

OPERATION

The SRS-ECU judges how severe a collision is by detecting signals from the front impact sensors and the front air bag analogue G-sensor. If the impact is over a predetermined level, the SRS-ECU sends an ignition signal. At this time, if the front air bag safing G-sensor is on, the seat belt pre-tensioner will deploy.

DIAGNOSIS CODE SET CONDITIONS

This diagnosis code is set if seat belt pre-tensioner (passenger's side) wire(s) are short-circuited to the power supply.

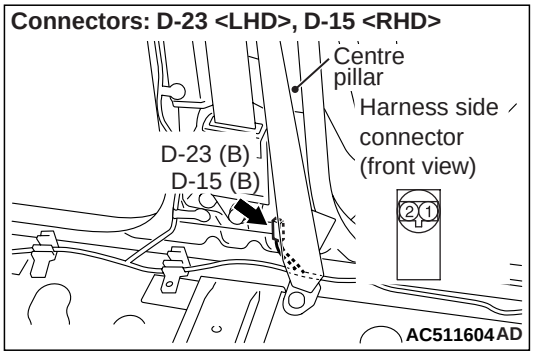
PROBABLE CAUSES

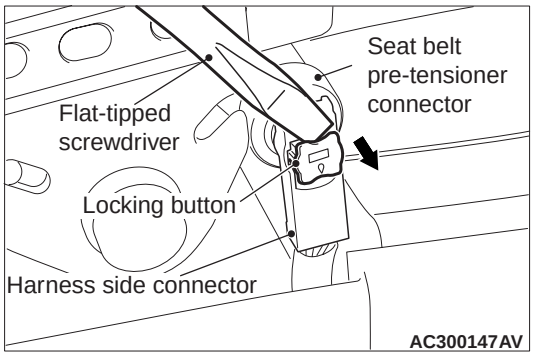
- Damaged wiring harnesses or connectors
- Short to the power supply in the seat belt pre-tensioner (passenger's side) (squib) harness
- Malfunction of the SRS-ECU

DIAGNOSIS PROCEDURE

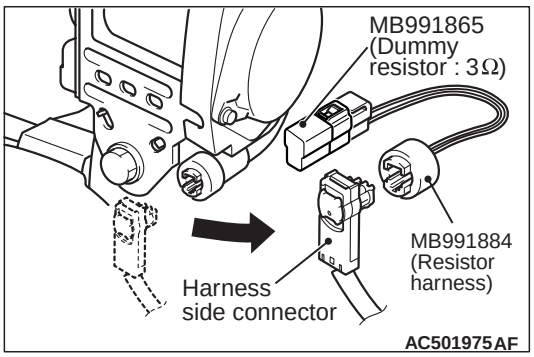
STEP 1. Check the diagnosis code by connecting a dummy resistor. (M.U.T.-III diagnosis code)

(1) Disconnect the negative battery terminal.





(2) Disconnect seat belt pre-tensioner (passenger's side) connector D-23 <LHD>, D-15 <RHD>. Use a flat-tipped screwdriver to pull out the locking button at the harness side connector, and then disconnect the connector.



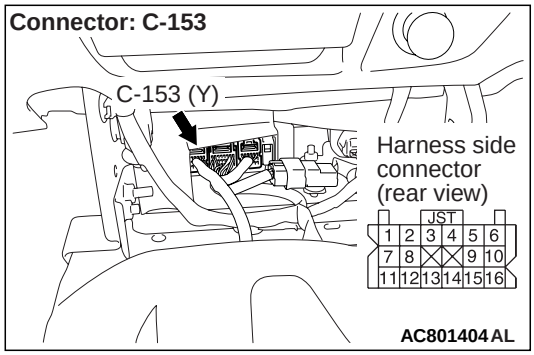
(3) Connect special tool dummy resistor (MB991865) to special tool resistor harness (MB991884).
(4) Connect special tool (MB991884) to the D-23 <LHD>, D-15 <RHD> harness side connector.
(5) Connect the negative battery terminal.
(6) Erase diagnosis code memory, and then check the diagnosis code.

Q: Is diagnosis code B1612 set?

YES : Go to Step 2.
NO : Replace the seat belt with pre-tensioner (passenger's side) (Refer to P.52B-284).

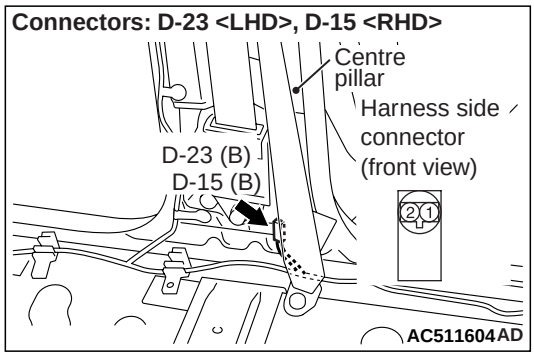
STEP 2. Voltage measurement at the SRS-ECU connector C-153.

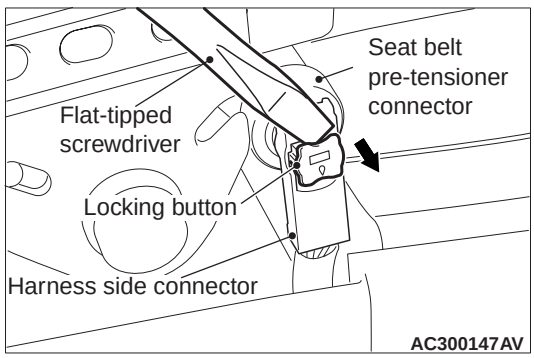
(1) Disconnect the negative battery terminal.



(2) Disconnect SRS-ECU connector C-153.

⚠ DANGER



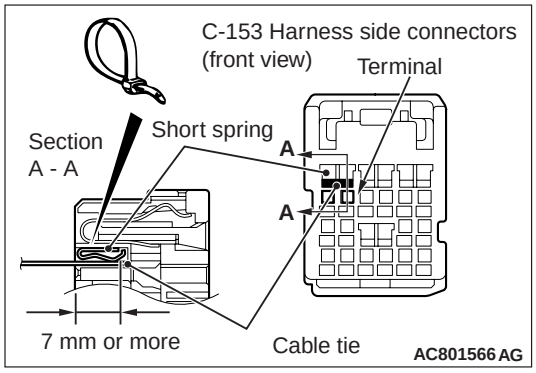


To prevents the seat belt pre-tensioner from deploying unintentionally, disconnect the seat belt pre-tensioner (passenger's side) connector D-23 <LHD>, D-15 <RHD> to short the squib circuit.

(3) Disconnect seat belt pre-tensioner (passenger's side) connector D-23 <LHD>, D-15 <RHD>. Use a flat-tipped screwdriver to pull out the locking button at the harness side connector, and then

disconnect the connector.

⚠ CAUTION



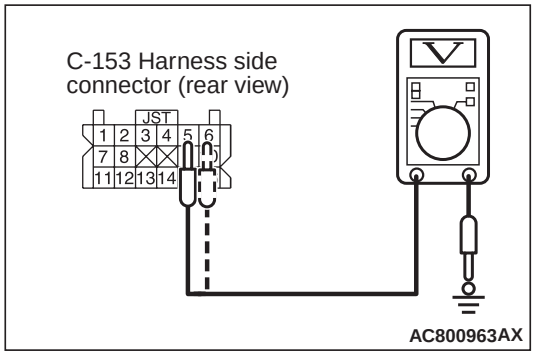
Insert an insulator such as a cable tie to a depth of 7 mm or more, otherwise the short spring will not be released.

(4) Insert a cable tie [3 mm wide, 0.5 mm thick] between terminals 5, 6 and the short spring to release the short spring.

(5) Connect the negative battery terminal.

(6) Turn the ignition switch to the "ON" position,

⚠ CAUTION



Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(7) Voltage measurement between C-153 harness side connector terminals 5, 6 and body earth.

OK: 1 V or less

Q: Is the check result normal?

YES : Go to Step 3.

NO : Repair the harness wires between SRS-ECU connector C-153 (terminal No.5 and 6) and the seat belt pre-tensioner (passenger's side) connector D-23 <LHD>, D-15 <RHD> (terminal No.1 and 2)

STEP 3. Check whether the diagnosis code is reset.

Q: Is diagnosis code B1612 set?

YES : Replace the SRS-ECU (Refer to P.52B-266).

NO : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

CHECK CHART FOR TROUBLE SYMPTOMS

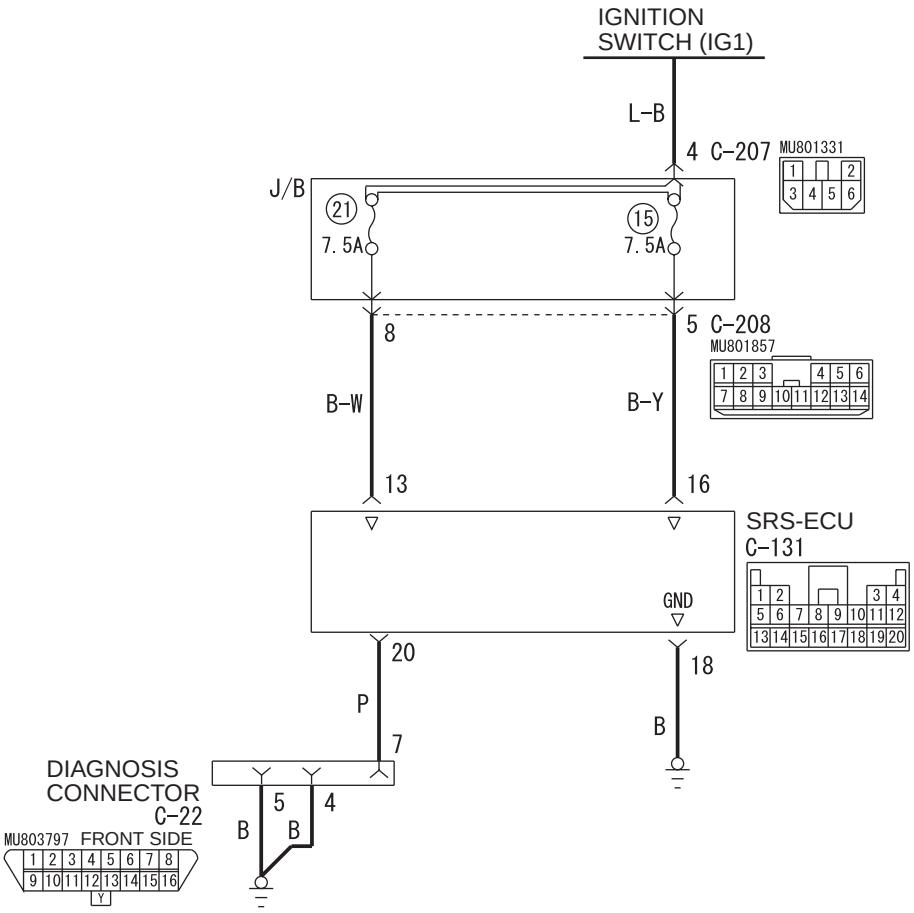
M1524003401409

Trouble	Inspection procedure No.	Reference page
Communication with M.U.T.-III is not possible (Communication with engine control systems is not possible).	–	GROUP 13A, Troubleshooting
Communication with M.U.T.-III is not possible (Communication is not possible with SRS).	1	P.52B-252 <vehicles without side-airbag and curtain air bag>, P.52B-255 <vehicles with side-airbag and curtain air bag>

SYMPTOM PROCEDURES <VEHICLES WITHOUT SIDE-AIRBAG AND CURTAIN AIR BAG>

Inspection Procedure 1: Communication with M.U.T.-III is not possible (Communication is not possible with SRS).

SRS-ECU Power Supply Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

W7C52E006A

OPERATION

- The SRS-ECU is powered from the ignition switch (IG1).
- The SRS-ECU power is supplied from two circuits. Even if one circuit is shut off, the air bag can inflate.
- The SRS system diagnosis can be done by connecting M.U.T.-III to the diagnosis connector.

COMMENTS ON TROUBLE SYMPTOM

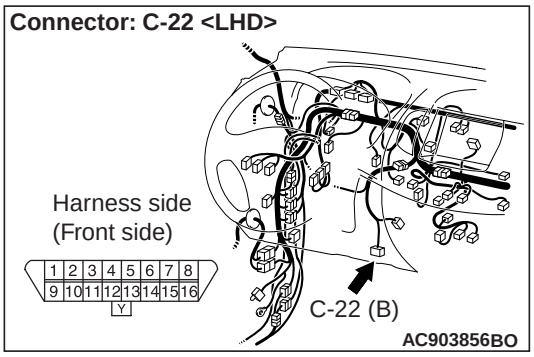
If communication is not possible with the SRS only, the cause is probably an open circuit in the diagnosis output circuit of the SRS or in the power circuit (including earth circuit).

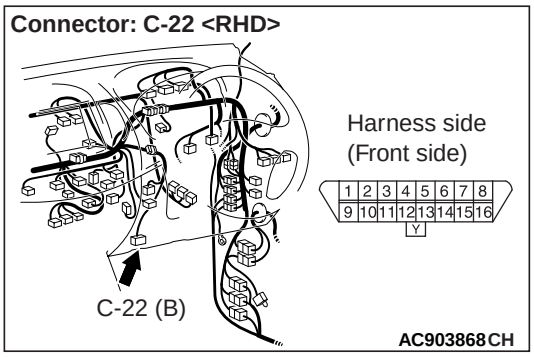
PROBABLE CAUSES

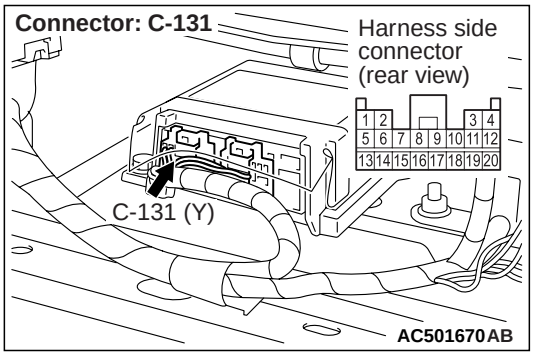
- Damaged wiring harnesses or connectors
- Malfunction of the SRS-ECU

DIAGNOSIS PROCEDURE

STEP 1. Wiring harnesses check between SRS-ECU connector C-131 (terminal No.20) and diagnosis connector C-22 (terminal No.7).





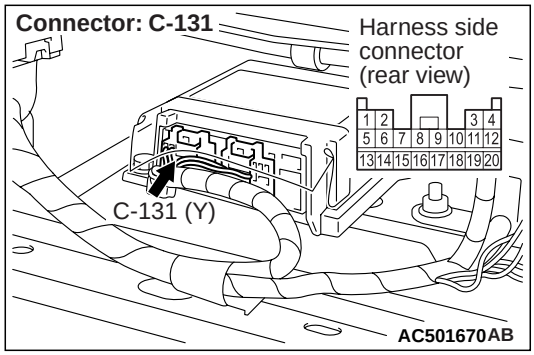


- Check the wiring harness for open circuit.

Q: Is the check results normal?
YES : Go to Step 2.
NO : Repair the wiring harness.

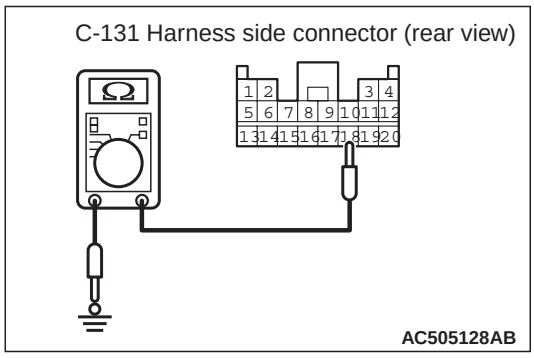
STEP 2. Resistance measurement the earth circuit to the SRS-ECU connector C-131

(1) Disconnect the negative battery terminal.



(2) Disconnect SRS-ECU connector C-131 and measure at the wiring harness side.

⚠ CAUTION



Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

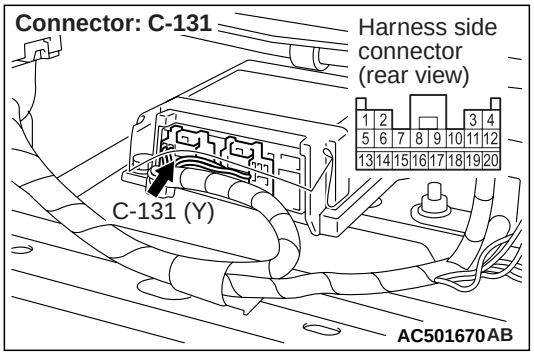
(3) Check for continuity between terminal 18 and body earth.

OK: Continuity (Less than 2 Ω)

Q: Is the check result normal?
YES : Go to Step 3.
NO : Check the harness wire for open circuit between SRS-ECU connector C-131 (terminal No.18) and earth, and repair if necessary.

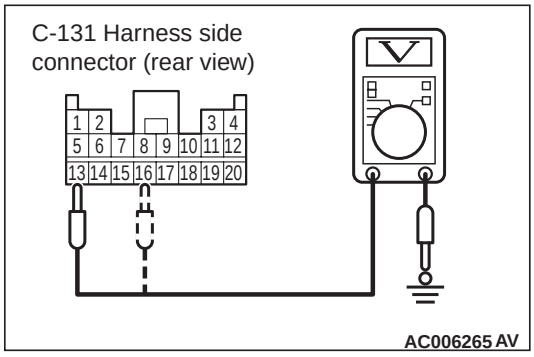
STEP 3. Voltage measurement the power supply circuit to the SRS-ECU connector C-131.

(1) Disconnect the negative battery terminal.



(2) Disconnect SRS-ECU connector C-131 and measure at the wiring harness side.
(3) Connect the negative battery terminal.
(4) Turn the ignition switch to the "ON" position.

⚠ CAUTION



Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(5) Voltage measurement between terminals 13, 16 and body earth.

OK: 9 V or more

Q: Is the check result normal?

YES : Go to Step 4.

NO : Check the harness wires for open or short circuit between SRS-ECU connector C-131 (terminal No.13, 16) and ignition switch, and repair if necessary.

STEP 4. Retest the system.

Q: Does the M.U.T.-III communicate normally with the SRS system?

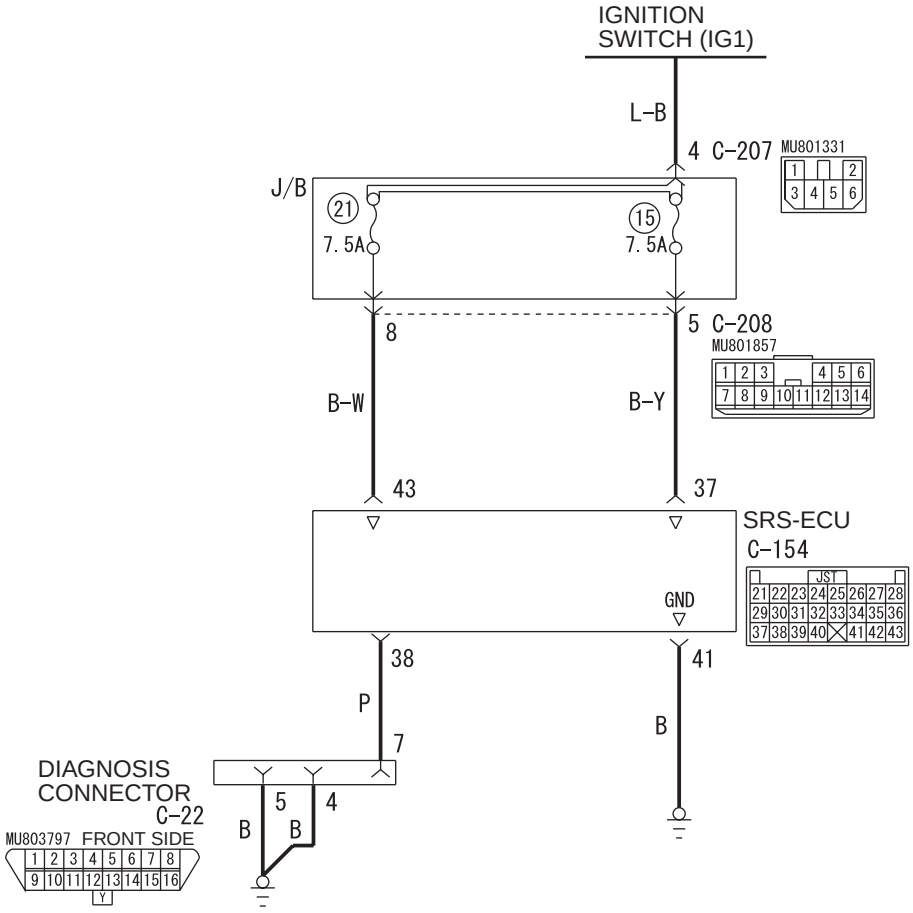
YES : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

NO : Replace the SRS-ECU (Refer to P.52B-266).

SYMPTOM PROCEDURES <VEHICLES WITH SIDE-AIRBAG AND CURTAIN AIR BAG>

Inspection Procedure 1: Communication with M.U.T.-III is not possible (Communication is not possible with SRS).

SRS-ECU Power Supply Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

AC801154 AC

OPERATION

- The SRS-ECU is powered from the ignition switch (IG1).
- The SRS-ECU power is supplied from two circuits. Even if one circuit is shut off, the air bag can inflate.
- The SRS system diagnosis can be done by connecting M.U.T.-III to the diagnosis connector.

COMMENTS ON TROUBLE SYMPTOM

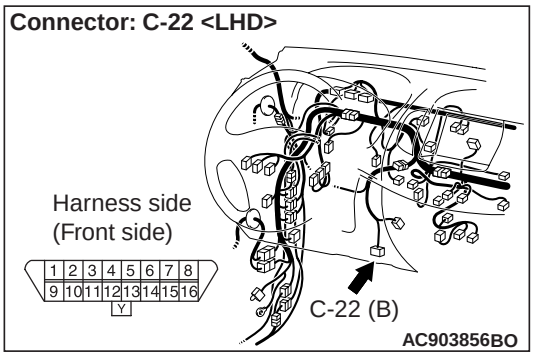
If communication is not possible with the SRS only, the cause is probably an open circuit in the diagnosis output circuit of the SRS or in the power circuit (including earth circuit).

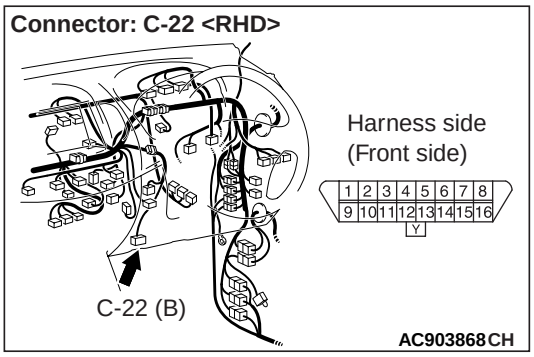
PROBABLE CAUSES

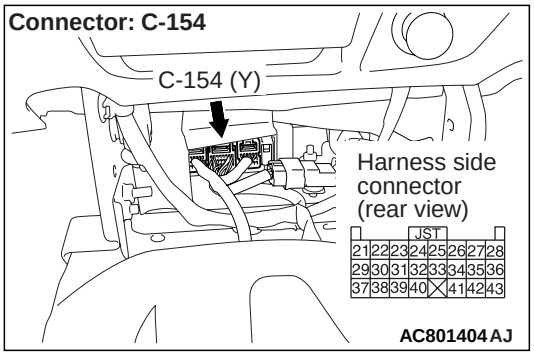
- Damaged wiring harnesses or connectors
- Malfunction of the SRS-ECU

DIAGNOSIS PROCEDURE

STEP 1. Wiring harnesses check between SRS-ECU connector C-154 (terminal No.38) and diagnosis connector C-22 (terminal No.7).





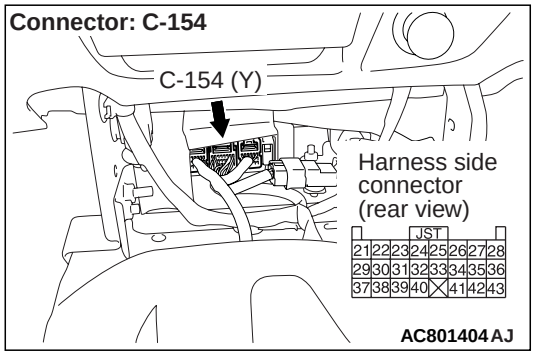


- Check the wiring harness for open circuit.

Q: Is the check results normal?
YES : Go to Step 2.
NO : Repair the wiring harness.

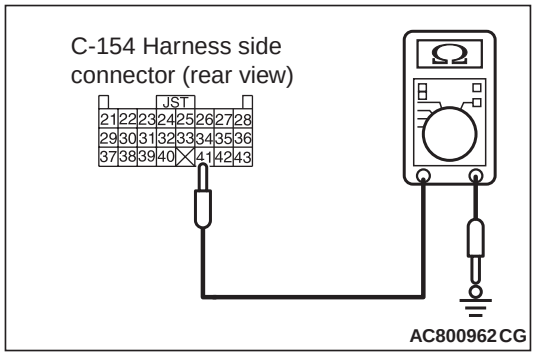
STEP 2. Resistance measurement the earth circuit to the SRS-ECU connector C-154

(1) Disconnect the negative battery terminal.



(2) Disconnect SRS-ECU connector C-154 and measure at the wiring harness side.

⚠ CAUTION



Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

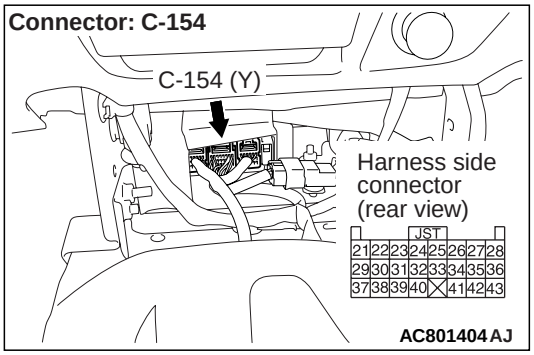
(3) Check for continuity between terminal 41 and body earth.

OK: Continuity (Less than 2 Ω)

Q: Is the check result normal?
YES : Go to Step 3.
NO : Check the harness wire for open circuit between SRS-ECU connector C-154 (terminal No.41) and earth, and repair if necessary.

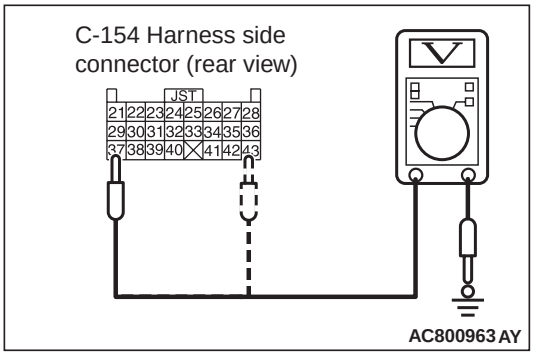
STEP 3. Voltage measurement the power supply circuit to the SRS-ECU connector C-154.

(1) Disconnect the negative battery terminal.



(2) Disconnect SRS-ECU connector C-154 and measure at the wiring harness side.
(3) Connect the negative battery terminal.
(4) Turn the ignition switch to the "ON" position.

⚠ CAUTION



Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

(5) Voltage measurement between terminals 37, 43 and body earth.

OK: 9 V or more

Q: Is the check result normal?
YES : Go to Step 4.
NO : Check the harness wires for open or short circuit between SRS-ECU connector C-158 (terminal No.37, 43) and ignition switch, and repair if necessary.

STEP 4. Retest the system.

Q: Does the M.U.T.-III communicate normally with the SRS system?
YES : An intermittent malfunction is suspected (Refer to GROUP 00, How to Cope with Intermittent Malfunction).
NO : Replace the SRS-ECU (Refer to P.52B-266).

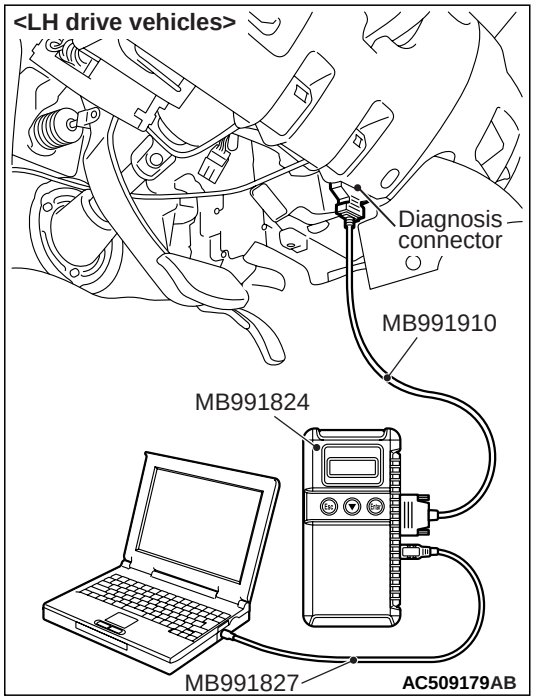
POST-COLLISION DIAGNOSIS

M1524001102353

Whether or not the air bags have deployed, check and service the vehicle after collision as follows:

SRS-ECU MEMORY CHECK

⚠ CAUTION



Refer to that the ignition switch is "LOCK" (OFF) when connecting or disconnecting M.U.T.-III.

1. Connect the M.U.T.-III to the diagnosis connector (Refer to GROUP 00, Diagnosis Function).

Data list

No.	Data list Item	Applicability
01	Failure continuation time 1	Maximum time to be stored: 9,999 minutes (approximately 7 days)
02	Failure continuation time 2	
03	Elimination times	Maximum time to be stored: 250 times

4. Erase the diagnosis codes and after waiting 5 seconds or more read (and write down) all displayed diagnosis codes.
2. Read (and write down) all displayed diagnosis codes (Refer to P.52B-12).

   NOTE: If battery power supply has been shut down by the collision, the M.U.T.-III cannot communicate with the SRS-ECU. Check and, repair if necessary, the instrument panel wiring harness before the next job.
3. Use the M.U.T.-III to read the data list (how long trouble(s) have continued and how often memory have been erased).

REPAIR PROCEDURE

WHEN FRONT AIR BAGS DEPLOY IN A COLLISION.

1. Replace the following parts with new ones.
   - Front impact sensor (Refer to P.52B-263).
   - SRS-ECU (Refer to P.52B-266).
   - Driver's air bag modules (Refer to P.52B-268).
   - Passenger's (front) air bag modules (Refer to P.52B-268).
   - Seat belt with pre-tensioner (Refer to P.52B-284).
2. Check the following parts and replace if there are any malfunctions.
   - Clock spring (Refer to P.52B-268).
   - Steering wheel, steering column and shaft assembly
     (1) Check the wiring harness (built into the steering wheel) and connectors for damage, and terminals for deformation.
     (2) Install the air bag module to check fit or alignment with the steering wheel.
     (3) Check the steering wheel for noise, binds or difficult operation and excessive free play.
     (4) Check the steering column shaft shock absorbing mechanism (Refer to GROUP 37, On-vehicle Service).
   - Instrument panel (Refer to GROUP 52A, Instrument panel assembly).
   - Passenger's air bag cut off switch (Refer to P.52B-287).

3. Check the harness for binding, connectors for damage, poor connections, and terminals for deformation (Refer to P.52B-5).

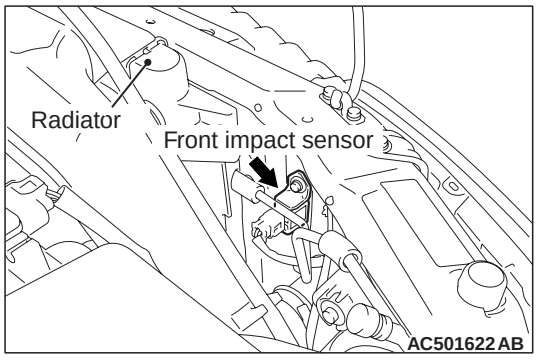
<SIDE AND CURTAIN AIR BAGS ARE DEPLOYED>

1. Replace the following parts with new ones.
   - SRS-ECU (Refer to P.52B-266).
   - Front seatback assembly (Refer to P.52B-276).
   - Curtain air bag module (Refer to P.52B-279).
   - Side impact sensor (Refer to P.52B-282).
   - Headlining (Refer to GROUP 52A, Headlining).
   - Front pillar trim, centre pillar upper trim, rear pillar upper trim (Refer to GROUP 52A – Interior Trim).
   - Seat belt with pre-tensioner (Refer to P.52B-284).
2. Check the wiring harness for binding, the connector for damage, and the terminal for deformation (Refer to P.52B-5).

WHEN AIR BAGS DO NOT DEPLOY IN LOW-SPEED COLLISION.

Check the SRS components. If visible damage such as dents, cracks, or deformation are found on the SRS components, replace them with new ones. Concerning parts removed for inspection, replacement with new parts and cautions in working, refer to P.52B-261

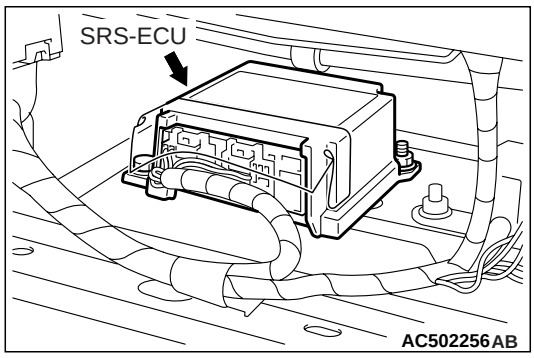
FRONT IMPACT SENSOR



1. Check the head lamp support panel for distortion and rust.
2. Check the front impact sensor for dents, cracks, deformation or rust.
3. Check the front impact sensor wiring harness for binding, check the connector for damage, and check the terminals for deformation.

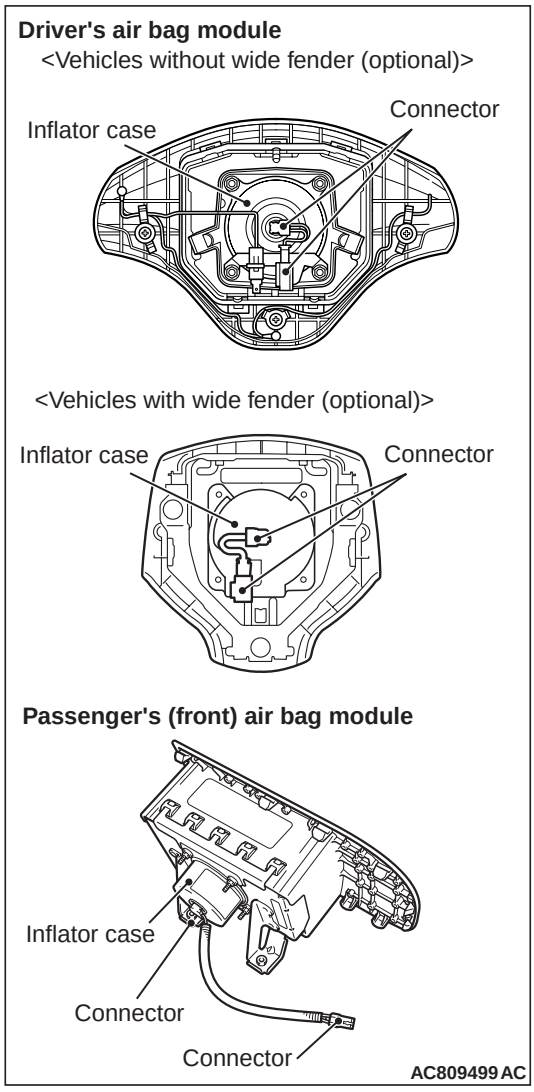
   NOTE: The figures show front impact sensors (RH). The front impact sensors (LH) is symmetrical with the front impact sensors (RH).

SRS-ECU



1. Check the SRS-ECU case for dents, cracks or deformation.
2. Check the connector for damage, and the terminals for deformation.
3. Check the SRS-ECU for installation condition.

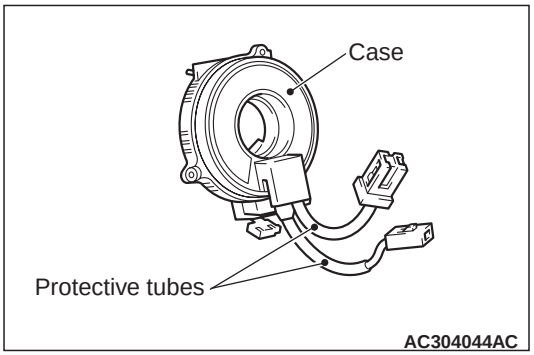
AIR BAG MODULES



1. Check the pad cover for dents, cracks or deformation.

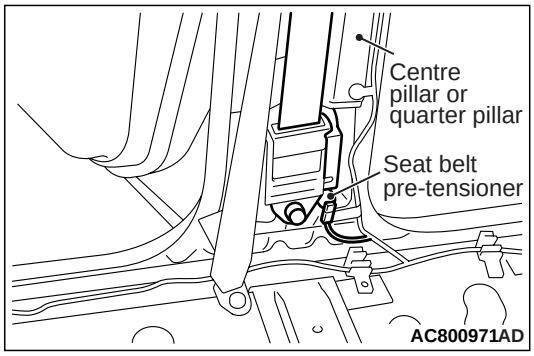
2. Check the connector for damage, terminals deformities, and the harness for binding.
3. Check the air bag inflator case for dents, cracks or deformities.
4. Check the air bag modules for proper installation.

CLOCK SPRING



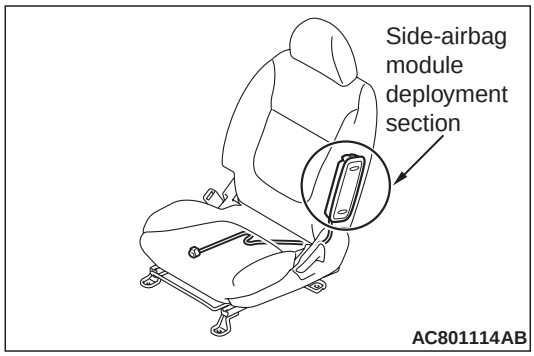
1. Check the clock spring connectors and protective tube for damage, and the terminals for deformation.
2. Visually check the case for damage.

SEAT BELT PRE-TENSIONER



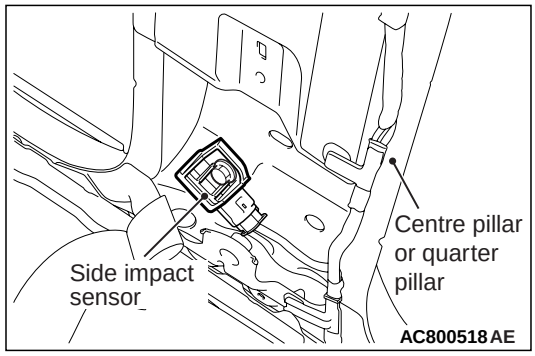
1. Check the seat belt for damage or deformation.
2. Check the seat belt pre-tensioner for cracks or deformation.
3. Check that the unit is installed correctly to the vehicle body.

FRONT SEAT ASSEMBLY (WITH BUILT-IN SIDE-AIRBAG MODULE)



1. Check that the side-airbag module deployment part of the seat is normal.
2. Check the connector for damage, the terminal for deformation and the harness for binding.

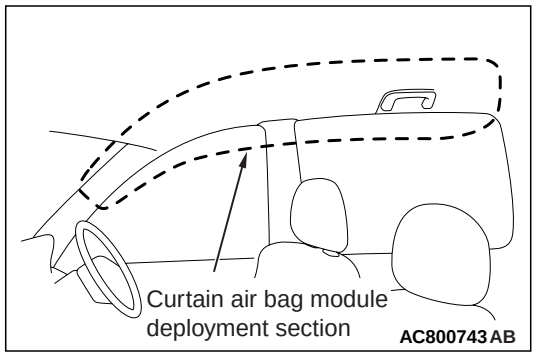
SIDE IMPACT SENSOR



1. Check the centre pillar <Double cab> or quarter pillar <Club cab> for deformation.
2. Check the side impact sensor for dent, crack, deformation or rust.
3. Check the connector for damage, the terminal for deformation and the harness for binding.

NOTE: The illustration shows the side impact sensor (LH). The position of the side impact sensor (RH) is symmetrical to this.

CURTAIN AIR BAG MODULE



1. Check that the curtain air bag deployment part of the headlining is normal.
2. Check the inflator surface for cracks, dents or deformations.
3. Check the connector for damage, the terminal for deformation and the harness for binding.

NOTE: The illustration shows the curtain air bag module (RH). The position of the curtain air bag module (LH) is symmetrical to this.

STEERING WHEEL, STEERING COLUMN AND SHAFT ASSEMBLY

1. Check the wiring harness (built into the steering wheel) and the connectors for damage, and the terminals for deformation.
2. Install the air bag module to check fit or alignment with the steering wheel.
3. Check the steering wheel for noise, binding or difficult operation and excessive free play.
4. Check the steering column shaft shock absorbing mechanism (Refer to GROUP 37, On-vehicle Service).

HARNESS CONNECTOR (INSTRUMENT PANEL WIRING HARNESS AND FLOOR WIRING HARNESS)

Check harnesses for binding, connectors for damage and terminals for deformation (Refer to P.52B-5).

INDIVIDUAL COMPONENT SERVICE

M1524002901069

⚠ ***WARNING***

- ***If heat damage may occur during paint work, remove the SRS-ECU, the air bag modules, the clock spring, impact sensors, passenger's air bag cut off switch and the seat belt with pre-tensioner.***
  - ***SRS-ECU, air bag modules, clock spring, impact sensors and passenger's air bag cut off switch: 93°C or more***
  - ***Seat belt with pre-tensioner: 90°C or more***
- ***If the SRS components are removed for the purpose of check, sheet metal repair, painting, etc., they should be stored in a clean, dry place until they are reinstalled.***

If the SRS components are to be removed or replaced as a result of maintenance, troubleshooting etc., follow the service procedures that follow.

- Front impact sensors; refer to P.52B-263
- SRS-ECU; refer to P.52B-266
- Driver's and passenger's (front) air bag modules and clock spring; refer to P.52B-268
- Side-air bag module; refer to P.52B-276
- Curtain air bag module; refer to P.52B-279
- Side impact sensors; refer to P.52B-282
- Seat belt with pre-tensioner; refer to P.52B-284

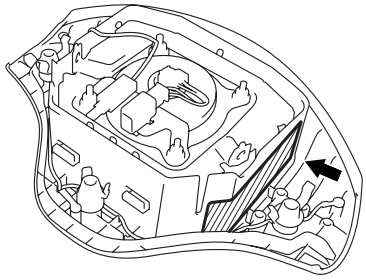
WARNING/CAUTION LABELS

M1524003002039

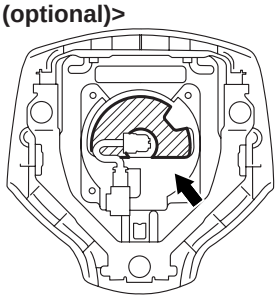
Caution labels on the SRS are attached in the vehicle as shown. Follow label instructions when servicing the SRS. If the label(s) are dirty or damaged, replace with new one(s).

Driver's air bag module

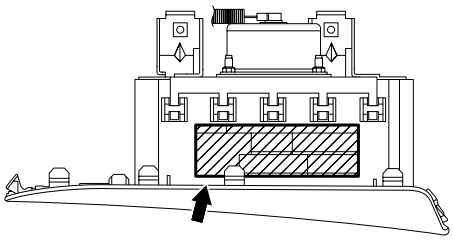
<Vehicles without wide fender (optional)>



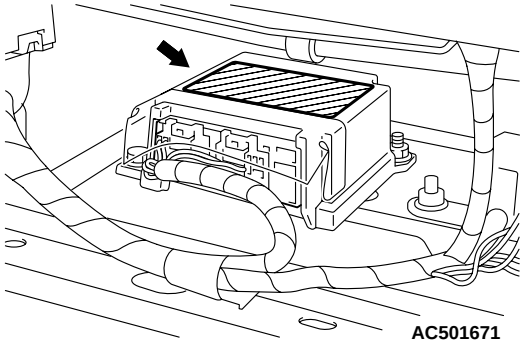
<Vehicles with wide fender (optional)>



Passenger's (front) air bag module

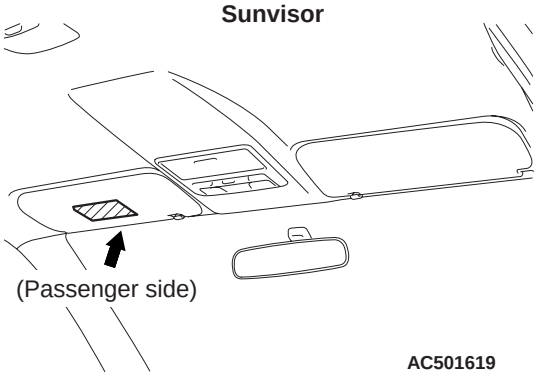


SRS-ECU



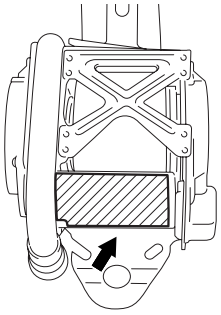
AC501671

Sunvisor



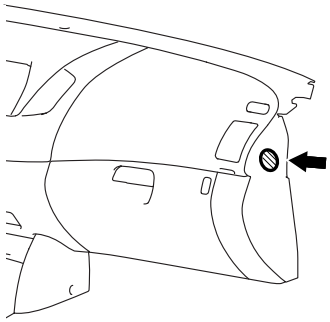
AC501619

Seat belt pre-tensioner (driver's and front passenger's seat)

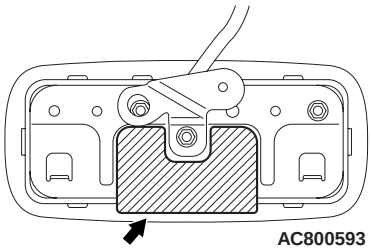


AC501620

Instrument panel

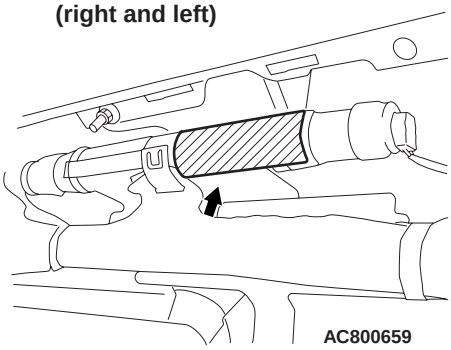


Side-airbag module (right and left)



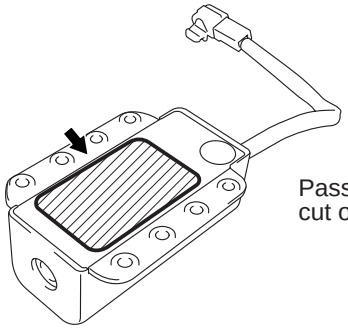
AC800593

Curtain air bag module (right and left)

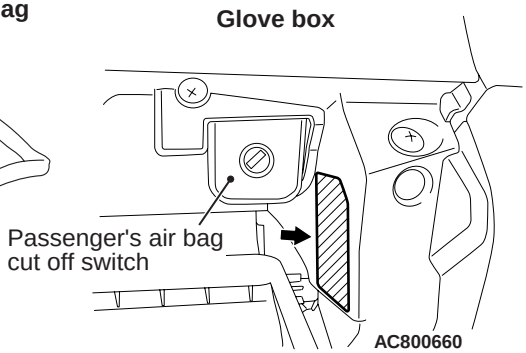


AC800659

Passenger's air bag cut off switch



Glove box



AC800660

AC900542AD

FRONT IMPACT SENSORS

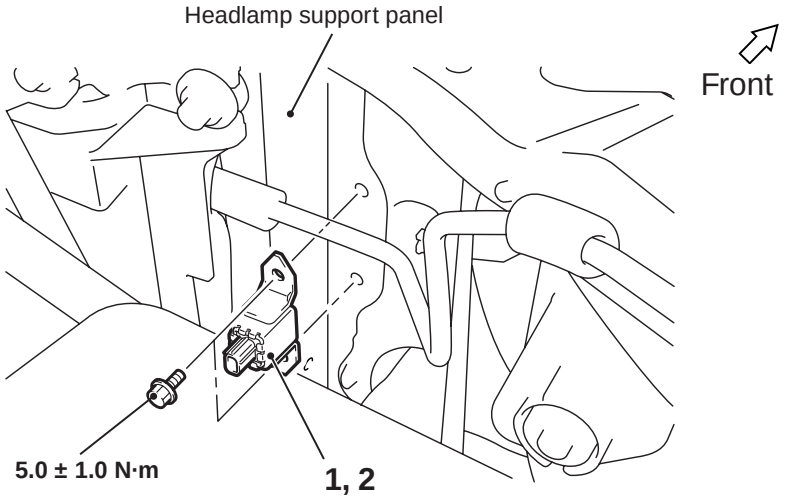
REMOVAL AND INSTALLATION

M1524001501596

⚠ ***WARNING***

- ***Disconnect the negative battery terminal and wait for 60 seconds or more before starting work. Furthermore, the disconnected battery terminal should be covered with tape to insulate it.***
- ***Never attempt to disassemble or repair the front impact sensor. If faulty, replace it.***
- ***Do not drop or subject the front impact sensor to impact or vibration. If denting, cracking, deformation, or rust are discovered in the front impact sensor, replace it with a new front impact sensor. Discard the old one.***
- ***After deployment of an air bag, replace the front impact sensor with a new one.***
- ***Never use an ohmmeter on or near the front impact sensor, and use only the special test equipment described on P.52B-11.***

Pre-removal Operation
- Turn the ignition switch to the "LOCK" (OFF) position.
- Disconnect the Negative Battery Terminal.



AC502126 AC

			Removal step
<<A>>		1.	Front impact sensor (RH)
<<B>>		2.	Front impact sensor (LH)
			Installation steps
	>>A<<	•	Pre-installation inspection
	>>B<<	2.	Front impact sensor (LH)
	>>B<<	1.	Front impact sensor (RH)
		•	Negative battery cable connection
	>>C<<	•	Post-installation inspection

NOTE: The figures show front impact sensor (RH).

REMOVAL SERVICE POINTS

<<A>> FRONT IMPACT SENSOR (RH)

1. An air duct is removed (Refer to GROUP15, Air cleaner).
2. Slide the A/C condenser outlet pipe to remove the front impact sensor (RH).

<<B>> FRONT IMPACT SENSOR (LH)

Disconnect the power steering oil reservoir and remove the front impact sensor (LH).

INSTALLATION SERVICE POINTS

>>A<< PRE-INSTALLATION INSPECTION

When the new front impact sensor, refer to "INSPECTION P.52B-264."

>>B<< FRONT IMPACT SENSOR INSTALLATION

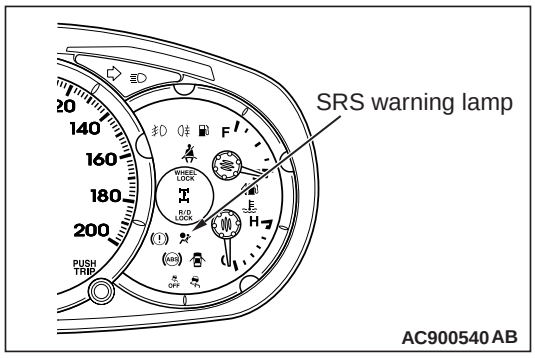
⚠ WARNING

The SRS may not activate properly if a front impact sensor is not installed properly.

1. Securely connect the connector.
2. Install the front impact sensor with the arrow on the label pointing toward the front of the vehicle and with the labelled surface facing outside the vehicle.

>>C<< POST-INSTALLATION INSPECTION

1. Connect the negative battery cable.
2. Turn the ignition switch to "ON" position.



3. Does the "SRS" warning lamp illuminate for approximately seven seconds, and go out?
4. If no, refer to troubleshooting (Refer to P.52B-12).

INSPECTION

M1524001600965

⚠ WARNING

If a dent, crack, deformation or rust is detected, replace with a new sensor.

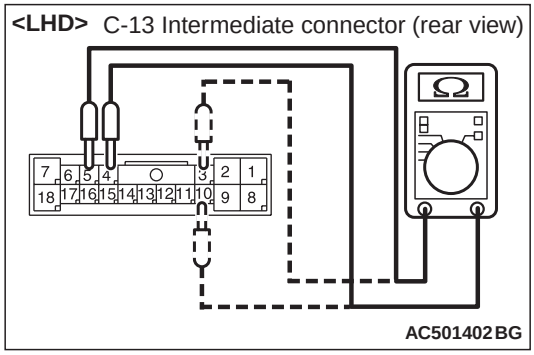
1. Check the front impact sensor for dents, cracks, deformation or rust.
2. Check the connector for damage, and terminals for deformation.
3. Check the headlamp support panel for deformation.

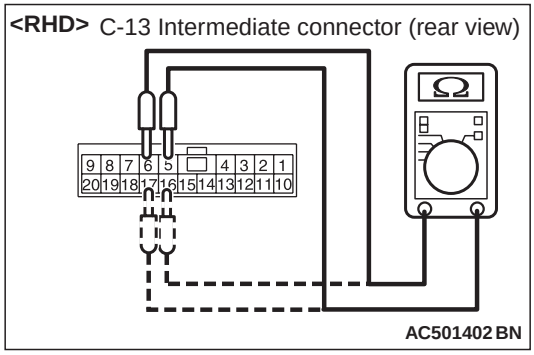
⚠ WARNING

Always replace the sensor with a new one if the resistance shows a short or open circuit.

⚠ CAUTION

Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

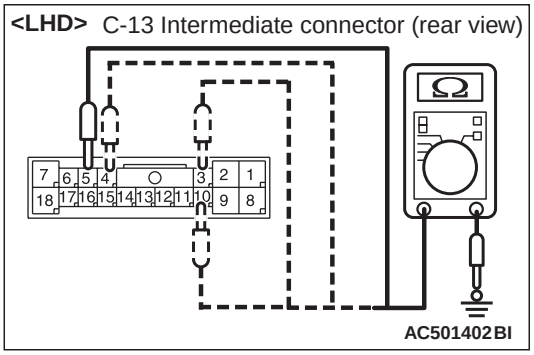


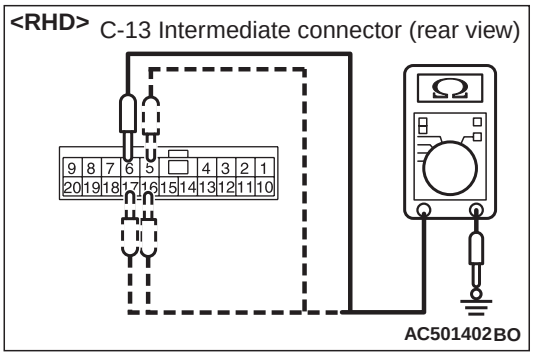


4. Measure the resistance of front impact sensor at the intermediate connector (the front impact sensor is connected).
   (1) Disconnect intermediate connector C-13.
   (2) The resistance between the terminal 3 and 10, or between the terminal 4 and 5 on the backside of intermediate connector (male side) <LHD>
   (3) The resistance between the terminal 5 and 6, or between the terminal 16 and 17 on the backside of intermediate connector (male side) <RHD>

   NOTE: Prior to that check, confirm the wiring harness between the front impact sensor and intermediate connector, and repair if necessary.

   Standard value: 820 ± 82 Ω

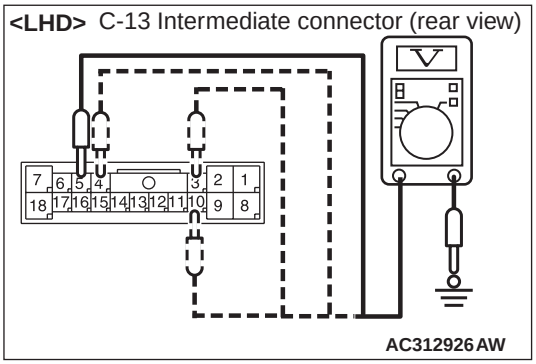


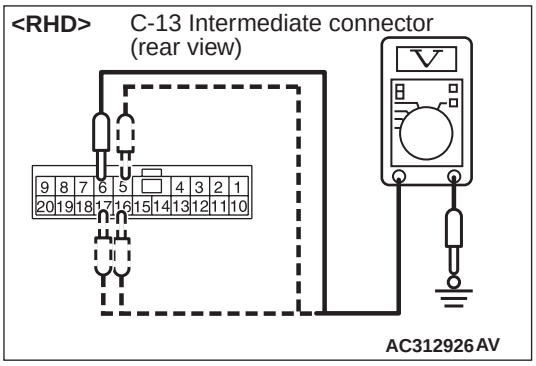


5. Measure the resistance of front impact sensor at the intermediate connector (the front impact sensor is connected).
   (1) Disconnect intermediate connector C-13.
   (2) Continuity between the terminal 3, 4, 5 and 10 on the backside of intermediate connector (male side) and body earth <LHD>
   (3) Continuity between the terminal 5, 6, 16 and 17 on the backside of intermediate connector (male side) and body earth <RHD>

   NOTE: Prior to that check, confirm the wiring harness between the front impact sensor and intermediate connector, and repair if necessary.

   OK: Open circuit





6. Measure the voltage of front impact sensor at the intermediate connector (the front impact sensor is connected).
   (1) Disconnect intermediate connector C-13.
   (2) Connect the negative battery cable.
   (3) Turn the ignition switch to "ON" position.
   (4) Voltage between the terminal 3, 4, 5 and 10 on the backside of intermediate connector (male side) and body earth <LHD>
   (5) Voltage between the terminal 5, 6, 16 and 17 on the backside of intermediate connector (male side) and body earth <RHD>

   NOTE: Prior to that check, confirm the wiring harness between the front impact sensor and intermediate connector, and repair if necessary.

   OK: 1 V or less

7. Check the headlamp support pane for deformation and rust.

SRS CONTROL UNIT (SRS-ECU)

REMOVAL AND INSTALLATION

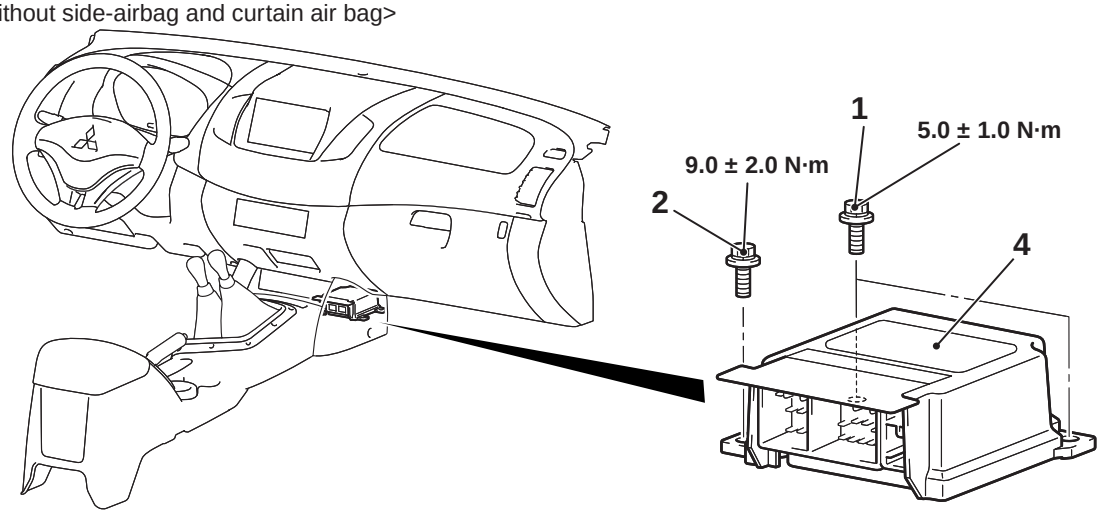
M1524002101591

⚠ ***WARNING***

- ***Disconnect the negative battery terminal and wait for 60 seconds or more before starting work. Furthermore, the disconnected battery terminal should be covered with tape to insulate it.***
- ***Never attempt to disassemble or repair the SRS-ECU. If faulty, replace it.***
- ***Do not drop or subject the SRS-ECU to impact or vibration. If denting, cracking, deformation, or rust are discovered in the SRS-ECU, replace it with a new SRS-ECU. Discard the old one.***
- ***After deployment of an air bag, replace the SRS-ECU with a new one.***
- ***Never use an ohmmeter on or near the SRS-ECU, and use only the special test equipment described on P.52B-11.***

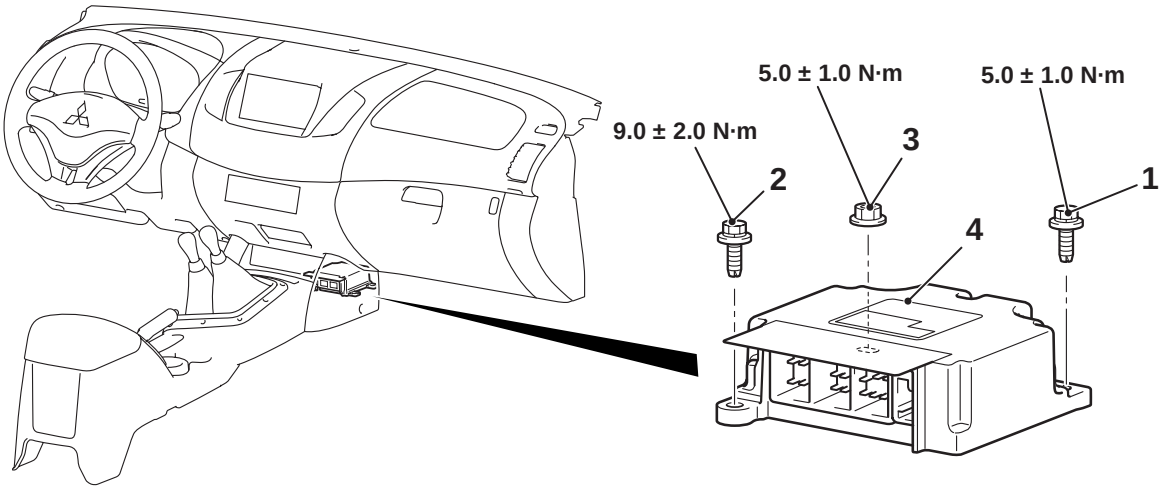
Pre-removal Operation
- Turn the ignition switch to the "LOCK" (OFF) position.
- Disconnect the Negative Battery Terminal.

<Vehicles without side-airbag and curtain air bag>



AC701017AC

<Vehicles with side-airbag and curtain air bag>



AC805944 AB

Removal steps

- Rear floor console (Refer to GROUP 52A, Rear floor console assembly).
- Front floor console (Refer to GROUP 52A, Font floor console assembly).

1. SRS-ECU mounting bolt
2. SRS-ECU mounting bolt (earth bolt)
3. Flange nut
4. SRS-ECU

Installation steps

>>A<< 4. SRS-ECU
3. Flange nut
>>B<< 2. SRS-ECU mounting bolt (earth bolt)
1. SRS-ECU mounting bolt

- Front floor console (Refer to GROUP 52A, Font floor console assembly).
- Rear floor console (Refer to GROUP 52A, Rear floor console assembly).
- Negative battery cable connection

>>C<< • Post-installation inspection

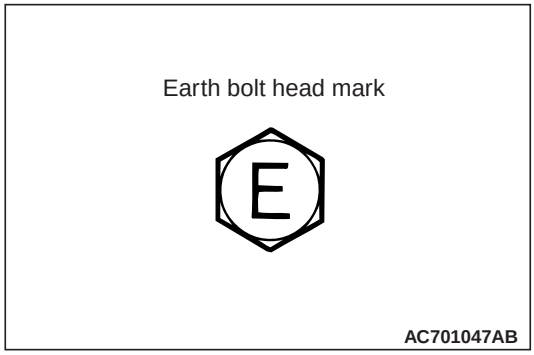
INSTALLATION SERVICE POINTS

>>A<< SRS-ECU INSTALLATION

⚠ ***WARNING***

The SRS may not activate if SRS-ECU is not installed properly.

>>B<< SRS-ECU MOUNTING BOLT (EARTH BOLT) INSTALLATION

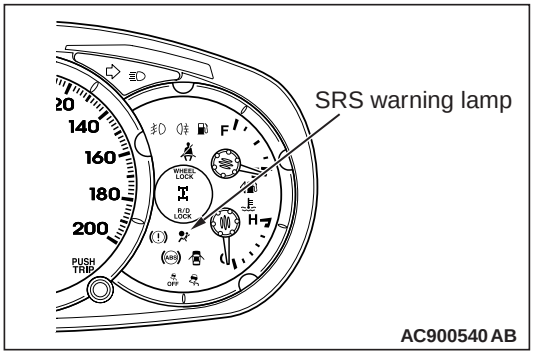


AC701047AB

Check the head mark "E" and install the earth bolt.

>>C<< POST-INSTALLATION INSPECTION

1. Connect the negative battery cable.
2. Turn the ignition switch to "ON" position.



AC900540 AB

3. Does the "SRS" warning lamp illuminate for approximately seven seconds, and go out?
4. If no, refer to troubleshooting (Refer to P.52B-12).

INSPECTION

M1524002200540

⚠ ***WARNING***

If any problems are found, replace the SRS-ECU.

- Check the SRS-ECU and brackets for dents, cracks or deformation.
- Check the SRS-ECU connector for damage, and the terminals for deformation.

NOTE: For the checks other than the items above, refer to "Troubleshooting" (Refer to P.52B-12).

DRIVER'S AND PASSENGER'S (FRONT) AIR BAG MODULE(S) AND CLOCK SPRING

REMOVAL AND INSTALLATION

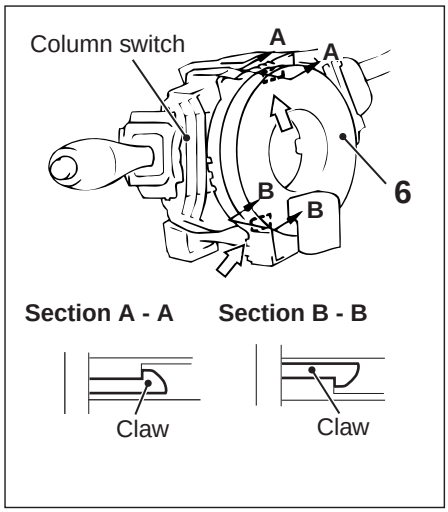
M1524014501132

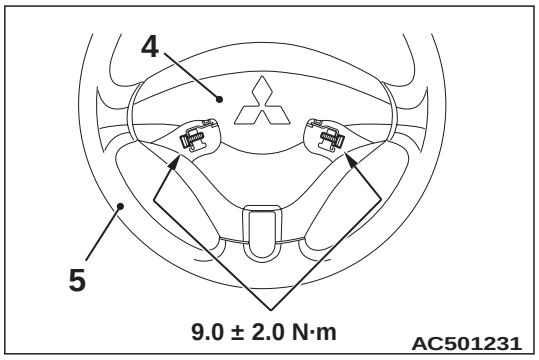
⚠ ***WARNING***

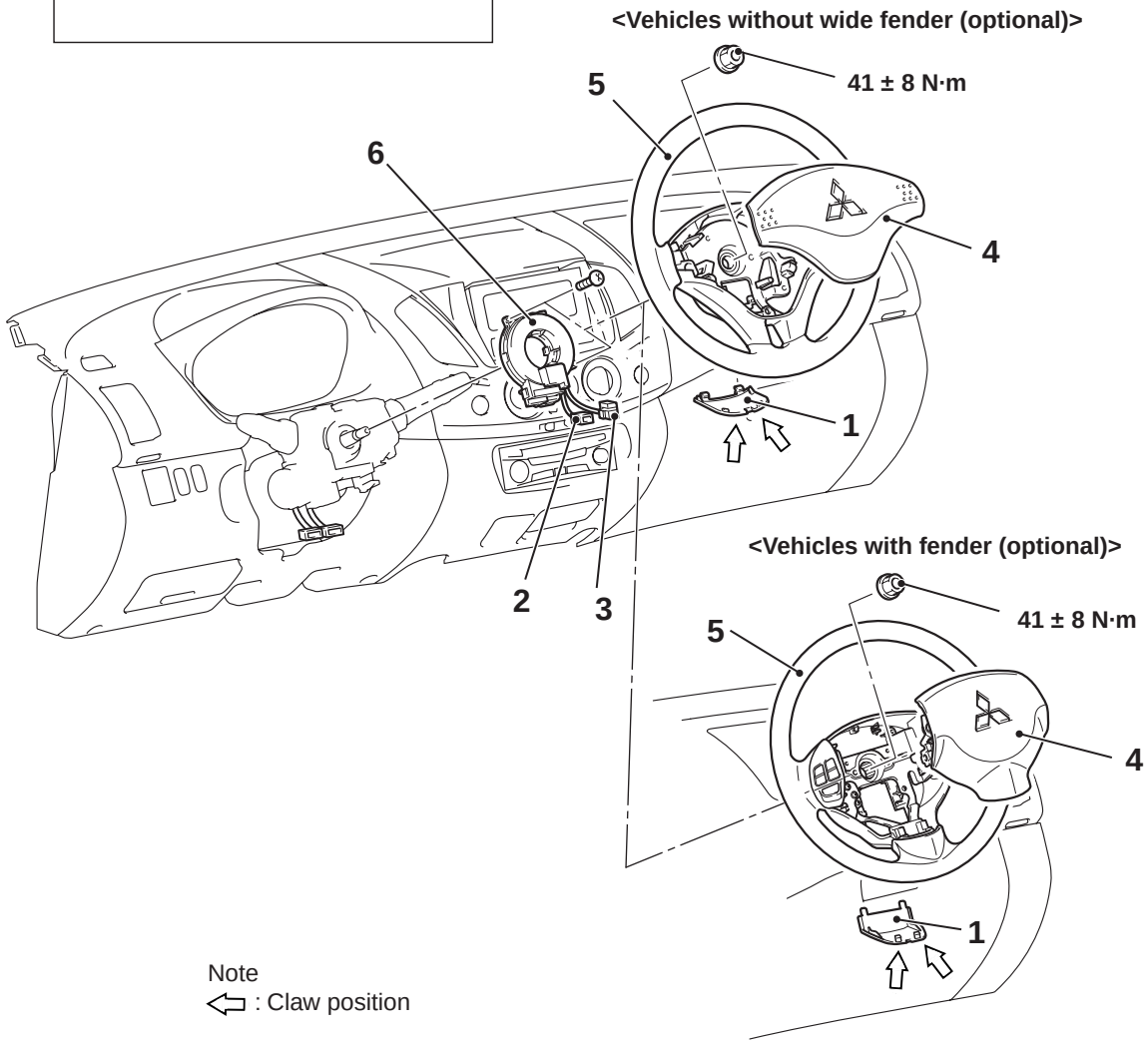
- ***Disconnect the negative battery terminal and wait for 60 seconds or more before starting work. Furthermore, the disconnected battery terminal should be covered with tape to insulate it.***
- ***Never attempt to disassemble or repair the air bag modules or clock spring. If faulty, replace it.***
- ***Do not drop the air bag modules or clock spring or allow contact with water, grease or oil. Replace it if a dent, crack, deformation or rust is detected.***
- ***The removed air bag module should be stored in a clean, dry place with the deployment surface facing up. Do not place anything on top of it.***
- ***Do not expose the air bag modules to temperatures over 93°C.***
- ***After deployment of an air bag, the driver's and passenger's (front) air bag module has been replaced with a new one. Also, check the clock spring, and replace with a new one if there is an abnormality.***
- ***Wear gloves and safety glasses when handling air bags that have already deployed.***
- ***An undeployed air bag module should only be disposed of in accordance with the procedures (Refer to P.52B-289).***

<DRIVER'S AIR BAG MODULE AND CLOCK SPRING>

Pre-removal Operation
- Disconnect the Negative Battery Terminal.







Air bag module removal steps

<<A>> 1. Cover
2. Horn connector connection

<<B>> 3. Driver's air bag module connector connection

<<C>> 4. Driver's air bag module

Clock spring removal steps

<<A>> 1. Cover
2. Horn connector connection
<<B>> 3. Driver's air bag module connector connection
<<C>> 4. Driver's air bag module
<<D>> 5. Steering wheel
- Column cover (Refer to GROUP 37, Steering shaft).

<<E>> 6. Clock spring

Air bag module installation steps

>>A<< - Pre-installation inspection
>>C<< 4. Driver's air bag module
3. Driver's air bag module connector connection
2. Horn connector connection
1. Cover
- Negative battery cable connection

>>D<< - Post-installation inspection

Clock spring installation steps

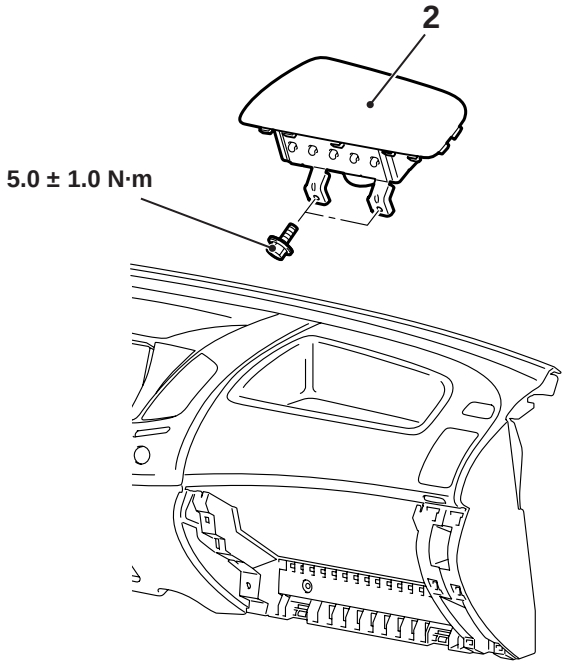
>>A<< - Pre-installation inspection
>>B<< 6. Clock spring
- Column cover (Refer to GROUP 37, Steering shaft).

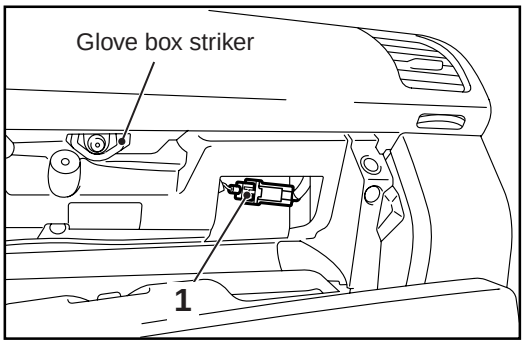
>>C<< 5. Steering wheel
>>C<< 4. Driver's air bag module
3. Driver's air bag module connector connection
2. Horn connector connection
1. Cover
- Negative battery cable connection

>>D<< - Post-installation inspection

<PASSENGER'S (FRONT) AIR BAG MODULE>

Pre-removal Operation
- Turn the ignition switch to the "LOCK" (OFF) position.
- Disconnect the Negative Battery Terminal.





AC801610 AB

Removal steps

<<F>> 1. Passenger's (front) air bag module connector connection
- Glove box cover (Refer to GROUP 52A, Instrument panel assembly).

<<G>> 2. Passenger's (front) air bag module

Installation steps

>>A<<
- Pre-installation inspection

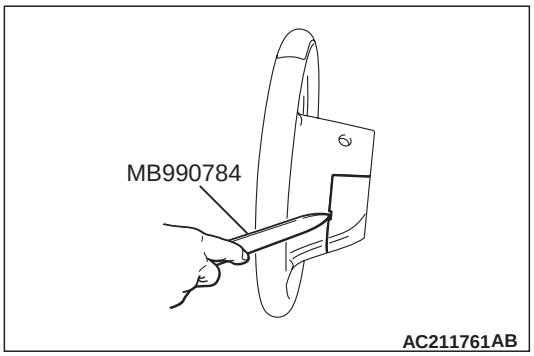
2. Passenger's (front) air bag module
- Glove box cover (Refer to GROUP 52A, Instrument panel assembly).

1. Passenger's (front) air bag module connector connection
- Negative battery cable connection

>>D<<
- Post-installation inspection

REMOVAL SERVICE POINTS

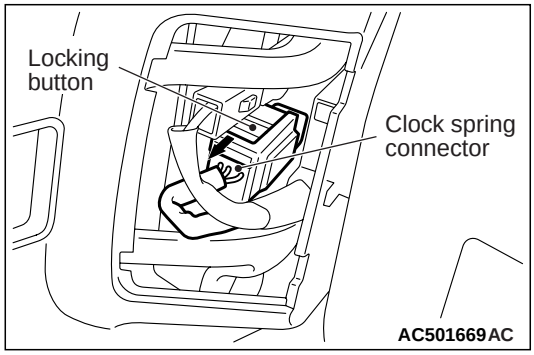
<<A>> COVER REMOVAL



AC211761 AB

Insert the special tool ornament remover (MB990784) as shown in the illustration to remove the cover.

<<B>> DRIVER'S AIR BAG MODULE CONNECTOR DISCONNECTION



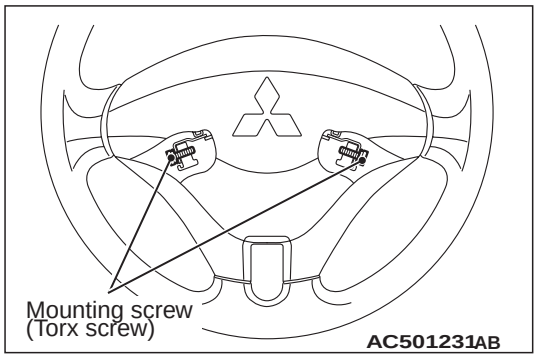
AC501669 AC

Disconnect the clock spring connector while compressing its locking button and sliding it to the direction of an arrow.

<<C>> DRIVER'S AIR BAG MODULE REMOVAL

⚠ ***WARNING***

- ***The air bag module must not be measured with such equipment as an ohmmeter, nor disassembled.***
- ***The removed air bag module should be stored in a clean, dry place with the deployment surface facing up.***

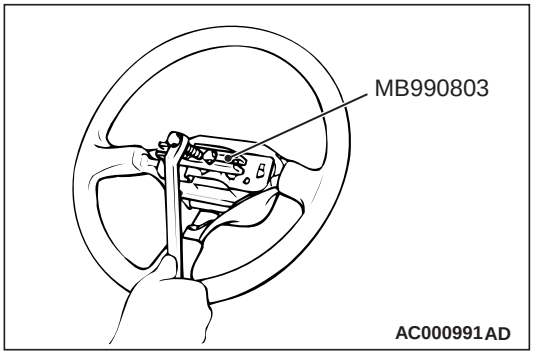


1. Remove the bag module mounting screws (Torx screws) at the sides of the steering wheel.

   NOTE: Do not remove the screws from the holders.

<<D>> STEERING WHEEL REMOVAL

1. Position the steering wheel in the straight-ahead position.



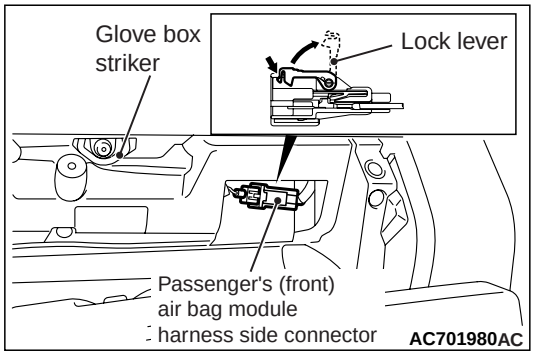
2. Use special tool steering wheel puller (MB990803) to remove the steering wheel.

<<E>> CLOCK SPRING REMOVAL

⚠ ***WARNING***

The removed clock spring should be stored in a clean, dry place.

<<F>> PASSENGER'S (FRONT) AIR BAG MODULE CONNECTOR DISCONNECTION



Pull up the passenger's (front) air bag module harness side lock lever with a mail and disconnect the connector lock.

<<G>> PASSENGER'S (FRONT) AIR BAG MODULE REMOVAL

⚠ ***WARNING***

- ***When the passenger's (front) air bag module is removed, do not damage the engagement of the pawls.***
- ***The removed passenger's (front) air bag module should be stored in a clean, dry place with facing the deployment surface facing up.***

INSTALLATION SERVICE POINTS

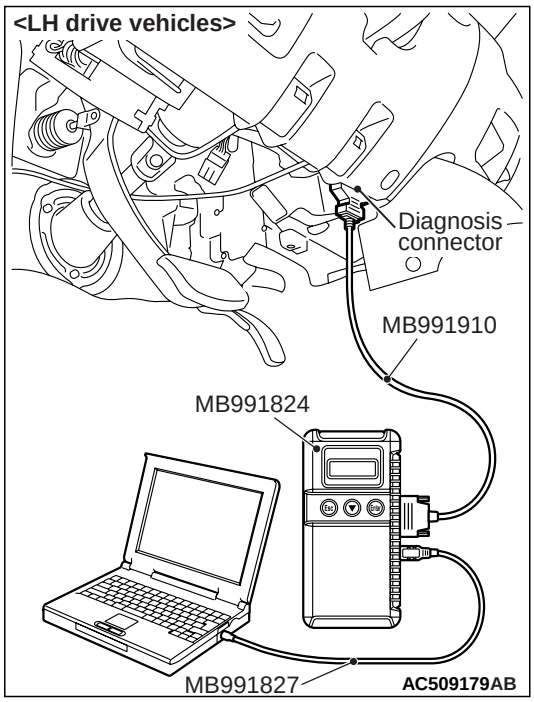
>>A<< PRE-INSTALLATION INSPECTION

⚠ ***WARNING***

Dispose of air bag modules only according to the specified procedure (Refer to P.52B-289).

1. When installing the new air bag modules and clock spring, refer to "INSPECTION" (P.52B-274).
2. Connect the negative battery cable.

⚠ CAUTION



To prevent damage to M.U.T.-III, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting M.U.T.-III.

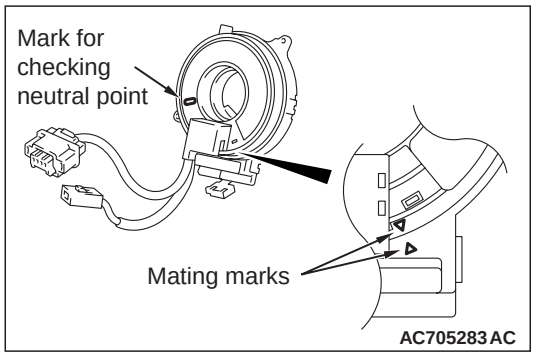
3. Connect M.U.T.-III to the diagnosis connector.
4. Turn the ignition switch to the "ON" position.
5. Check diagnosis codes using M.U.T.-III to ensure that the SRS operates properly.

   At this time, check that no diagnosis code except B1400 and B1410 are set.
6. Turn the ignition switch to the "LOCK" (OFF) position. Disconnect the negative battery cable and tape the terminal to prevent accidental connection and air bags deployment.

>>B<< CLOCK SPRING INSTALLATION

⚠ WARNING

Ensure that the clock spring's mating marks are properly aligned. If not, the steering wheel may not rotate completely during a turn, or the flat cable in the clock spring could be damaged, This would prevent normal SRS operation and possibly cause serious injury to the driver.



Align the mating marks of the clock spring.
<Alignment of mating marks>

1. Turn the clock spring clockwise fully.
2. Turn the clock spring anti-clockwise approximately three and 1/2 turns to align the mating marks.
3. Check that the white or yellow roller can be seen from the window for checking the neutral point when the mating marks are aligned.

   NOTE: If the white or yellow roller cannot be seen or black roller can be seen, the neutral point is not aligned correctly.
4. Turn the front wheels to the straight-ahead position. Then install the clock spring to the column switch.

>>C<< STEERING WHEEL/DRIVER'S AIR BAG MODULE INSTALLATION

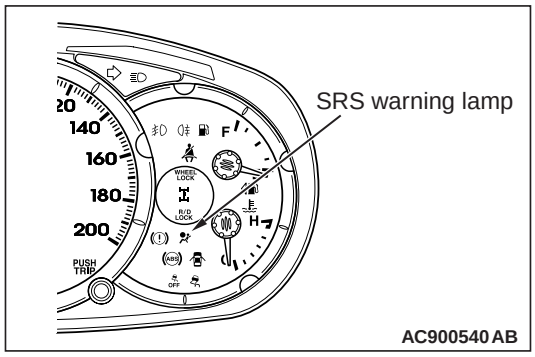
⚠ CAUTION

When installing the steering wheel, and driver's air bag module ensure that the harness of the clock spring does not become caught or tangled.

1. Before installing the steering wheel, and driver's air bag module turn the vehicle's front wheels to the straight-ahead position and align the mating marks of the clock spring.
2. After securing the steering wheel, turn the steering wheel all the way in both directions to confirm that the steering wheel rotation is normal.

>>D<< POST-INSTALLATION INSPECTION

1. Connect the negative battery cable.
2. Turn the ignition switch to “ON” position.



3. Does the "SRS" warning lamp illuminate for approximately seven seconds, and go out?
4. If no, refer to troubleshooting (Refer to P.52B-12).

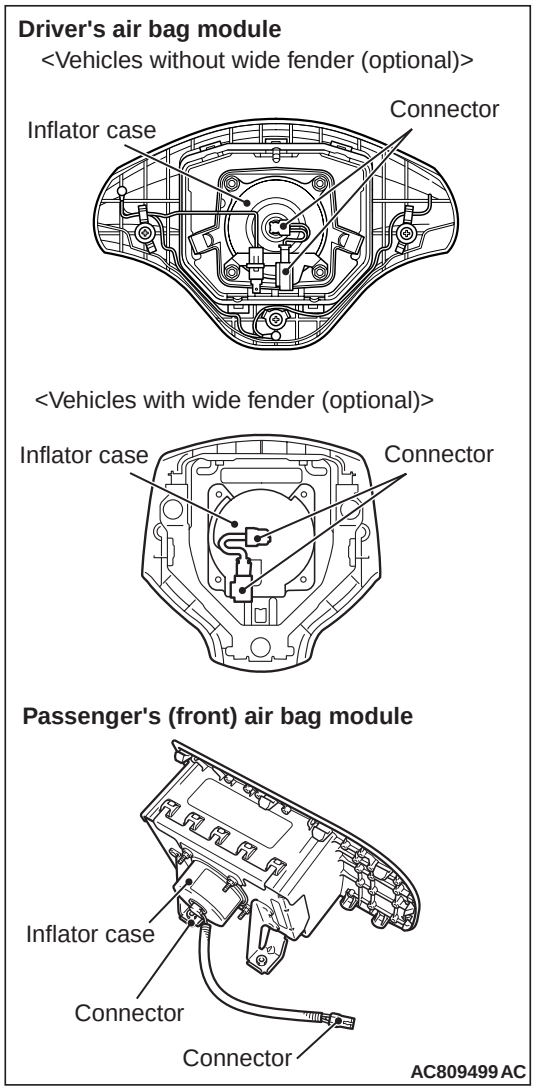
INSPECTION

M1524014600619

AIR BAG MODULE CHECK

⚠ WARNING

- ***If any component damage is found during the following inspection, replace the air bag module(s) with a new one. Dispose of the old one according to the specified procedure (Refer to P.52B-289).***
- ***Never attempt to measure the circuit resistance of the air bag module (squib) even if you are using the specified tester. If the circuit resistance is measured with a tester, accidental air bag module(s) deployment will result in serious personal injury.***

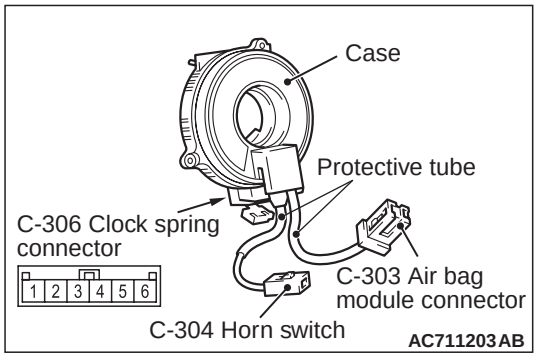


1. Check the pad cover for dents, cracks or deformation.
2. Check the connectors for damage, the terminals for deformation, and the harness for binds.

3. Check the air bag inflator case for dents, cracks or deformation.
4. Install the driver's air bag module to the steering wheel and check fit and alignment with the wheel.
5. Install the passenger's (front) air bag module to the instrument panel and front deck crossmember and check fit and alignment.

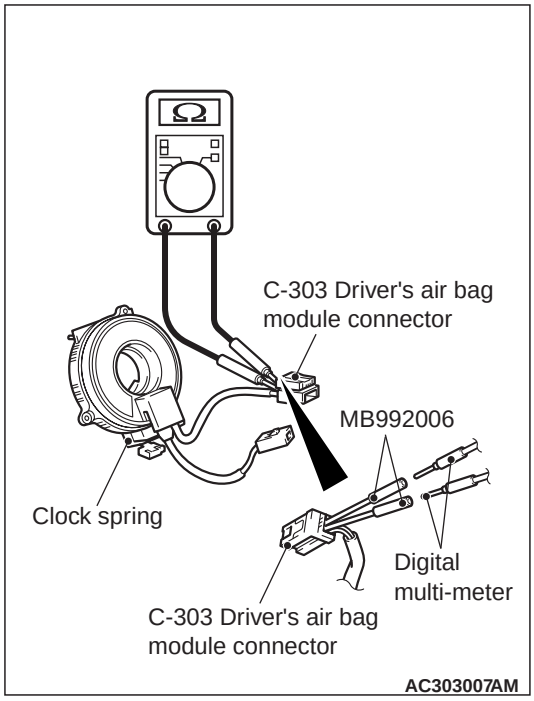
CLOCK SPRING

If any malfunction is found in the following inspections, replace the clock spring with a new one.



1. Check the connectors and protective tubes for damage and the terminal for deformation.
2. Check the case for damage.
3. Check that the continuity exists between the following connector terminals.
4. Check to see that there is continuity between the C-306 clock spring connector terminal 1 and C-304 horn switch.

⚠ CAUTION



Do not directly insert a probe, etc. into the terminal from the front of the connector.

5. Insert the special tool extra fine probe (MB992006) from behind the C-303 driver's air bag module connector.
6. As shown in the Figure, connect the circuit tester to the special tool extra fine probe (MB992006) and check to see that there is a continuity between the terminals.

SIDE-AIRBAG MODULE(S) <VEHICLES WITH SIDE-AIRBAG AND CURTAIN AIR BAG>

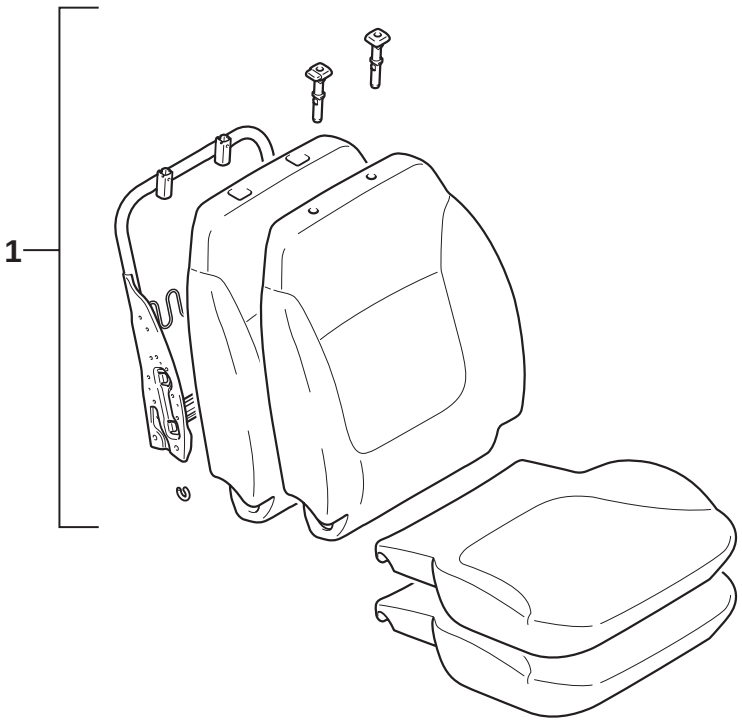
REMOVAL AND INSTALLATION

M1524036500524

⚠ WARNING

- ***Disconnect the negative battery terminal and wait for 60 seconds or more before starting work. Furthermore, the disconnected battery terminal should be covered with tape to insulate it.***
- ***Never attempt to disassemble or repair the side-airbag modules. If faulty, replace it.***
- ***Do not drop the side-airbag modules or allow contact with water, grease or oil. Replace it if a dent, crack, deformation or rust is detected.***
- ***The removed side-airbag module should be stored in a clean, dry place with the deployment surface facing up. Do not place anything on top of it.***
- ***Do not expose the side-airbag modules to temperatures over 93 ℃.***
- ***After deployment of an side-airbag, the side-airbag module has been replaced with a new one.***
- ***Wear gloves and safety glasses when handling side-airbag that have already deployed.***
- ***An undeployed side-airbag module should only be disposed of in accordance with the procedures (Refer to P.52B-289).***

Pre-removal Operation
- Turn the ignition switch to the LOCK (OFF) position.
- Disconnect the negative (–) battery terminal.



AC900870AC

<<A>>

Removal step

1. Front seatback assembly (Refer to GROUP 52A, Front Seat Assembly)

>>A<<

Installation step

- Pre-installation inspection

Installation step (Continued)

1. Front seatback assembly (Refer to GROUP 52A, Front Seat Assembly)

>>B<< • Post-installation inspection

REMOVAL SERVICE POINT

<<A>> SIDE-AIRBAG MODULE ASSEMBLY REMOVAL

⚠ CAUTION

- **Never use an electric tester to diagnose the side-airbag module circuit. Never attempt to disassemble the side-airbag module.**
- **Store the removed side-airbag in a clean and dry place.**
- **When discarding the side-airbag module, discard after deploying the side-airbag as specified in the service procedure (Refer to P.52B-289).**

INSTALLATION SERVICE POINTS

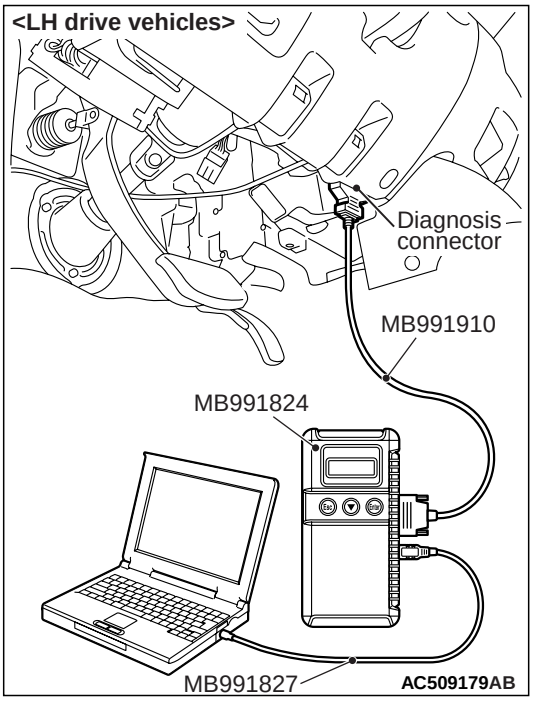
>>A<< PRE-INSTALLATION INSPECTION

1. Before the installation, check the side-airbag module (Refer to P.52B-278).

   NOTE: Even when installing a new side-airbag module assembly, perform an inspection before the installation.

2. Connect the negative (–) battery terminal.

⚠ CAUTION

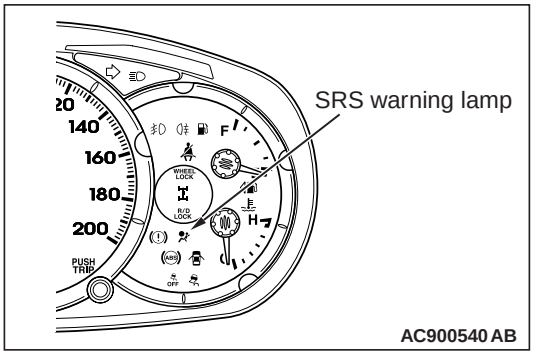


Be sure to turn the ignition key to the LOCK (OFF) position when connecting or disconnecting M.U.T.-III.

3. Connect M.U.T.-III to the diagnosis connector (16 pin).
4. Turn the ignition switch to the ON position.
5. Read the diagnosis code, and check that everything is normal except the air bag module open circuit.
6. Turn the ignition switch to the LOCK (OFF) position.

>>B<< POST-INSTALLATION INSPECTION

1. Connect the negative battery cable.
2. Turn the ignition switch to the "ON" position.

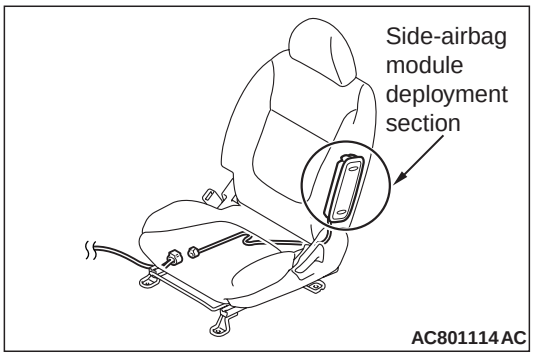


3. Does the "SRS" warning lamp illuminate for approximately seven seconds, and go out?
4. If no, refer to troubleshooting (Refer to P.52B-12).

INSPECTION

M1524036600134

⚠ CAUTION



- **Never measure the side-airbag module (squib) circuit resistance even with the specified tester. Measuring the circuit resistance with a tester causes accidental side-airbag deployment due to current that flows or static, resulting in serious personal injury.**
- **When replacing the parts, discard the old parts after deploying the side-airbag according to the specified procedure (Refer to P.52B-289).**

1. Dent or deformation to side-airbag module deployment part
2. Check the harness and connector for damage and the terminal for deformation.

CURTAIN AIR BAG MODULE(S) <VEHICLES WITH SIDE-AIRBAG AND CURTAIN AIR BAG>

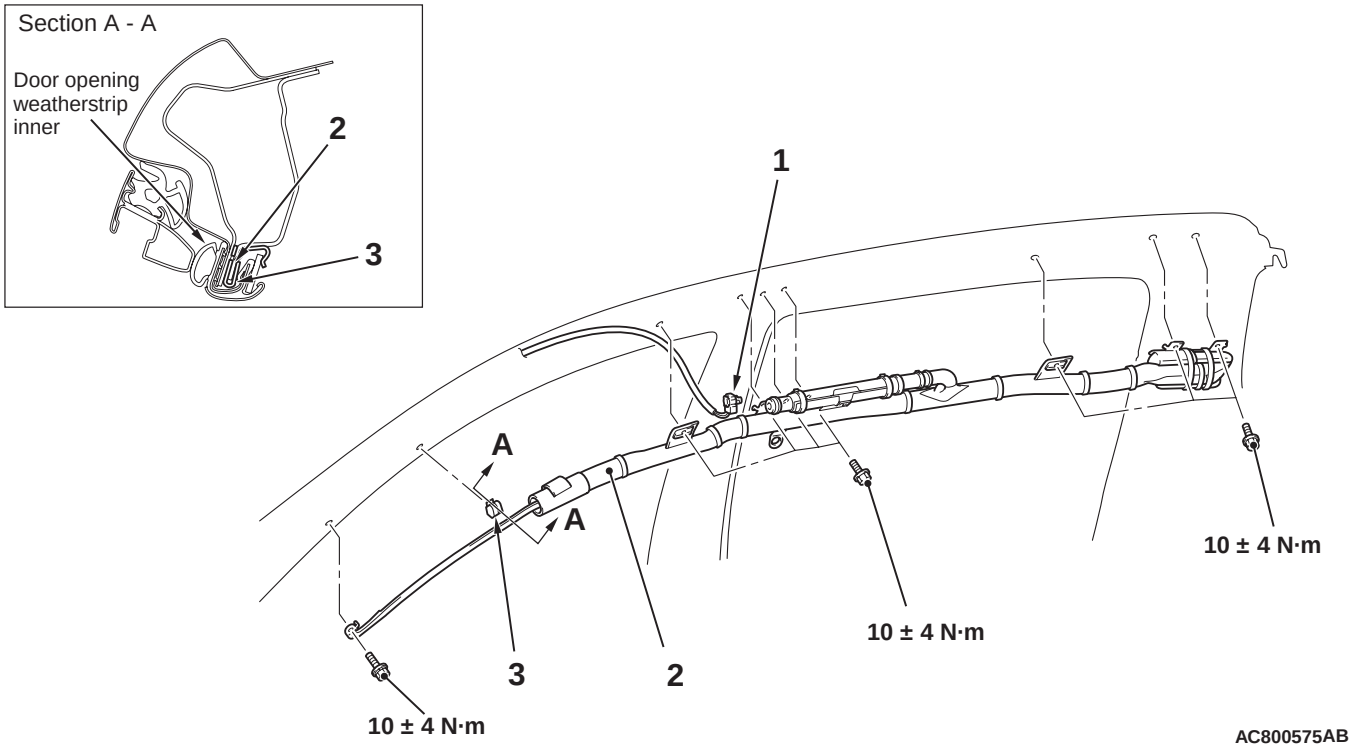
REMOVAL AND INSTALLATION

M1524013500523

⚠ WARNING

- ***Disconnect the negative battery terminal and wait for 60 seconds or more before starting work. Furthermore, the disconnected battery terminal should be covered with tape to insulate it.***
- ***Never attempt to disassemble or repair the air bag modules. If faulty, replace it.***
- ***Do not drop the air bag modules or allow contact with water, grease or oil. Replace it if a dent, crack, deformation or rust is detected.***
- ***The removed air bag module should be stored in a clean, dry place with the deployment surface facing up. Do not place anything on top of it.***
- ***Do not expose the air bag modules to temperatures over 93°C.***
- ***After deployment of an air bag, the air bag module has been replaced with a new one.***
- ***Wear gloves and safety glasses when handling air bags that have already deployed.***
- ***An undeployed air bag module should only be disposed of in accordance with the procedures (Refer to P.52B-289).***

Pre-removal Operation
- Turn the ignition switch to the LOCK (OFF) position.
- Disconnect the negative (–) battery terminal.



Removal steps
- Headlining (Refer to GROUP 52A, Headlining).

<<A>>
1. Curtain air bag module harness side connector

<<B>>
2. Curtain air bag module
3. Headlining bracket

Installation steps

>>A<<
- Pre-installation inspection

3. Headlining bracket

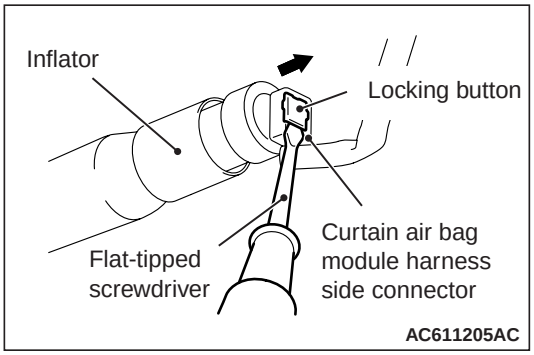
Installation steps (Continued)

>>B<< 2. Curtain air bag module
>>C<< 1. Curtain air bag module harness side connector
- Headlining (Refer to GROUP 52A, Headlining).

>>D<<
- Post-installation inspection

REMOVAL SERVICE POINTS

<<A>> CURTAIN AIR BAG MODULE HARNESS SIDE CONNECTOR REMOVAL



Use the flat-tipped screwdriver to pull out the locking button of curtain air bag harness side connector, and release the lock.

<<B>> CURTAIN AIR BAG MODULE REMOVAL

⚠ CAUTION

- **Never use an electric tester to diagnose the air bag module circuit. Never attempt to disassemble the air bag module.**
- **The removed air bag module should be stored in a clean, dry place.**
- **When discarding the air bag module, discard after deploying the air bag as specified in the service procedure (Refer to P.52B-289).**

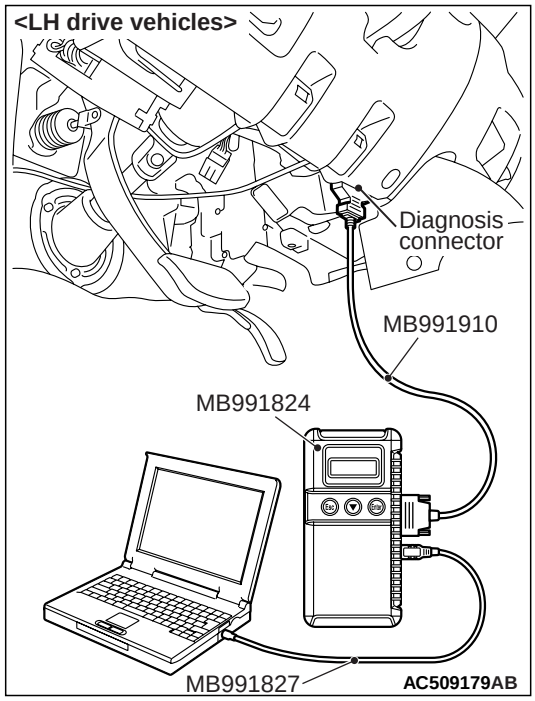
INSTALLATION SERVICE POINTS

>>A<< PRE-INSTALLATION INSPECTION

1. Before the installation, check the air bag module (Refer to P.52B-281).

   NOTE: Even when installing a new air bag module, perform an inspection before the installation.
2. Connect the negative (–) battery terminal.

⚠ CAUTION



Be sure to turn the ignition key to the LOCK (OFF) position when connecting or disconnecting M.U.T.-III.

3. Connect M.U.T.-III to the diagnosis connector (16 pin).
4. Turn the ignition switch to the ON position.
5. Read the diagnosis code, and check that everything is normal except the air bag module open circuit.
6. Turn the ignition switch to the LOCK (OFF) position.

>>B<< CURTAIN AIR BAG MODULE INSTALLATION

⚠ CAUTION

- **Take care not to contort the curtain air bag when installing it.**
- **Do not trap the air bag with the peripheral parts.**
- **Do not trap the strap with the front pillar trim clip or others.**

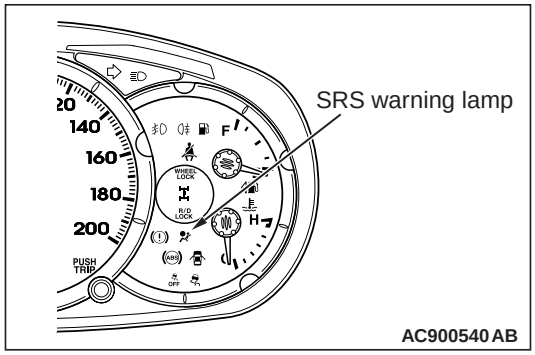
>>C<< CURTAIN AIR BAG MODULE HARNESS SIDE CONNECTOR INSTALLATION

⚠ CAUTION

Connect the connector to the inflator thoroughly.

>>D<< POST-INSTALLATION INSPECTION

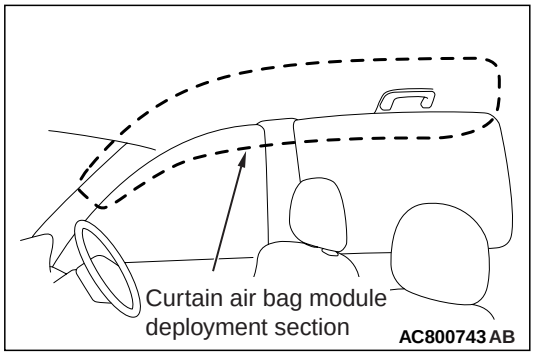
1. Connect the negative battery cable.
2. Turn the ignition switch to “ON” position.



3. Does the "SRS" warning lamp illuminate for approximately seven seconds, and go out?
4. If no, refer to troubleshooting (Refer to P.52B-12).

INSPECTION

M1524013600241



⚠ CAUTION

- **Never measure the curtain air bag module circuit resistance even with the specified tester. Measuring the circuit resistance with a tester causes accidental air bag deployment due to current that flows or static, resulting in serious personal injury.**
- **When replacing the parts, discard the old parts after deploying the air bag according to the specified procedure (Refer to P.52B-289).**
- **There must be no abnormality to the curtain air bag deployment section of headlining.**

1. Crack, dent or deformation to inflator surface
2. Torn air bag
3. Damaged connector, deformation of terminal, and harness binding

SIDE IMPACT SENSOR <VEHICLES WITH SIDE-AIRBAG AND CURTAIN AIR BAG>

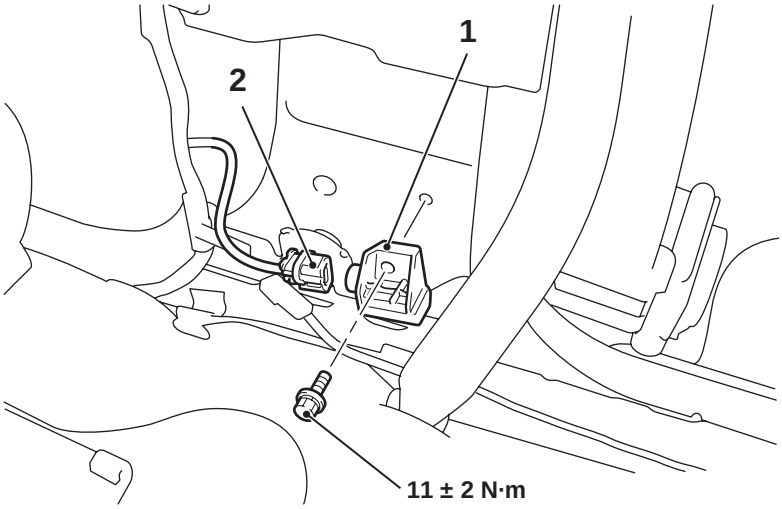
REMOVAL AND INSTALLATION

M1524004601213

⚠ ***WARNING***

- ***Disconnect the negative battery terminal and wait for 60 seconds or more before starting work. Furthermore, the disconnected battery terminal should be covered with tape to insulate it.***
- ***Never attempt to disassemble or repair the side impact sensor. If faulty, replace it.***
- ***Do not drop or subject the side impact sensor to impact or vibration. If denting, cracking, deformation, or rust are discovered in the side impact sensor, replace it with a new side impact sensor. Discard the old one.***
- ***After deployment of an air bag, replace the side impact sensor with a new one.***
- ***Never use an ohmmeter on or near the side impact sensor, and use only the special test equipment described on P.52B-11.***

Pre-removal Operation
- Turn the ignition switch to the "LOCK" (OFF) position.
- Disconnect the Negative (–) Battery Terminal.



AC801140 AB

Removal steps
- Centre pillar lower trim <Double cab> (Refer to GROUP 52A, Trims).
- Quarter lower trim <Club cab> (Refer to GROUP 52A, Trims).
- Seat belt retractor (Refer to P.52B-284).

1. Side impact sensor
<<A>> 2. Side impact sensor harness side connector

Installation steps

>>A<<
- Pre-installation inspection

2. Side impact sensor harness side connector

Installation steps (Continued)

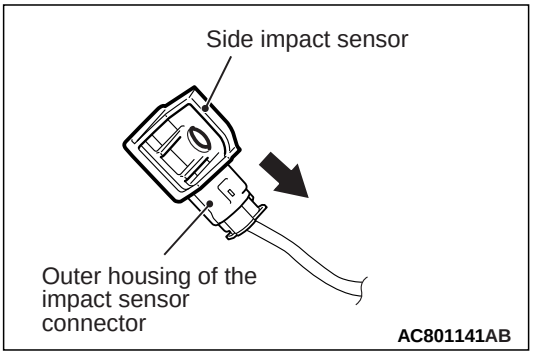
>>B<<
1. Side impact sensor
- Seat belt retractor (Refer to P.52B-284).
- Quarter lower trim <Club cab> (Refer to GROUP 52A, Trims).
- Centre pillar lower trim <Double cab> (Refer to GROUP 52A, Trims).

>>C<<
- Post-installation inspection

NOTE: The figure shows the right side impact sensor.

REMOVAL SERVICE POINT

<<A>> SIDE IMPACT SENSOR HARNESS SIDE CONNECTOR REMOVAL



Slide the outer housing of the side impact sensor harness side connector in the arrow direction shown, and disconnect the connector.

INSTALLATION SERVICE POINTS

>>A<< PRE-INSTALLATION INSPECTION

Even when installing a new side impact sensor, perform an inspection before the installation (Refer to the item on inspection).

>>B<< SIDE IMPACT SENSOR INSTALLATION

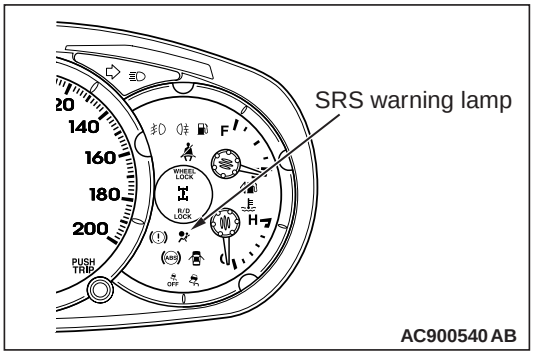
⚠ CAUTION

If the side impact sensor is not securely and correctly installed, the correct operation of side/curtain air bag is prevented.

Connect the connector securely.

>>C<< POST-INSTALLATION INSPECTION

1. Connect the negative battery cable.
2. Turn the ignition switch to the "ON" position.



3. Does the "SRS" warning lamp illuminate for approximately seven seconds, and go out?
4. If no, refer to troubleshooting (Refer to P.52B-12).

INSPECTION

M1524004700734

⚠ CAUTION

If there is a dent, crack, deformation, or others, replace with a new sensor.

1. Dents, cracks, deformation, and rust of side impact sensor
2. Connector damage and terminal deformation
3. Deformation or rust of rear pillar lower trim or centre pillar lower trim

SEAT BELTS WITH PRE-TENSIONER

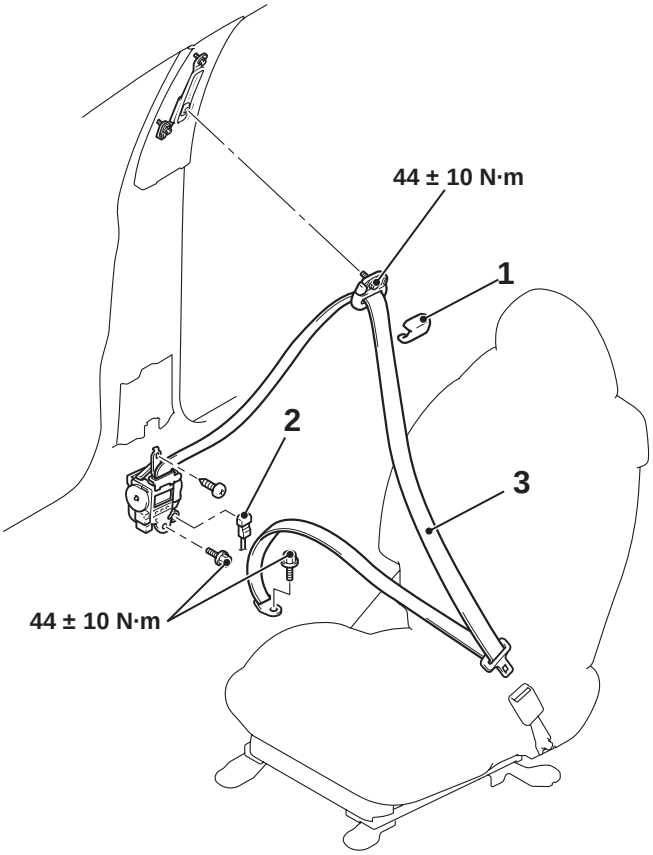
REMOVAL AND INSTALLATION

M1524004101478

⚠ WARNING

- ***Never attempt to disassemble or repair the seat belt pre-tensioner. If faulty, replace it.***
- ***Be extremely careful when handling the seat belt with pre-tensioner. Do not subject it to shocks, drop it, bring it close to strong magnets or allow contact with water, grease or oil. Always replace it with a new part if any dents, cracks or deformation is found.***
- ***Do not place anything on top of the seat belt pre-tensioner.***
- ***Do not expose the seat belt with pre-tensioner to temperatures over 90 ℃.***
- ***After operating the seat belt pre-tensioner, replace the seat belt with pre-tensioner with a new part.***
- ***Gloves and protective goggles should be worn when handling a seat belt with pre-tensioner once it has been used.***
- ***If disposing of a seat belt with pre-tensioner which has not yet been operated, its seat belt pre-tensioner should be operated first before disposal (Refer to P.52B-289).***

Pre-removal Operation
- Turn the ignition switch to the "LOCK" (OFF) position.
- Disconnect the Negative Battery Terminal.



AC500483AC

Removal steps

1. Sash guide cover
   - Rear pillar lower trim, quarter lower trim or centre pillar lower trim (Refer to GROUP 52A, Trims <Single Cab>, <Club Cab>, <Double Cab>).

<<A>> 2. Seat belt pre-tensioner harness side connector connection

3. Seat belt with pre-tensioner

Installation steps

>>A<<
- Pre-installation inspection

3. Seat belt with pre-tensioner

>>B<< 2. Seat belt pre-tensioner harness side connector connection
   - Rear pillar lower trim, quarter lower trim or centre pillar lower trim (Refer to GROUP 52A, Trims <Single Cab>, <Club Cab>, <Double Cab>).

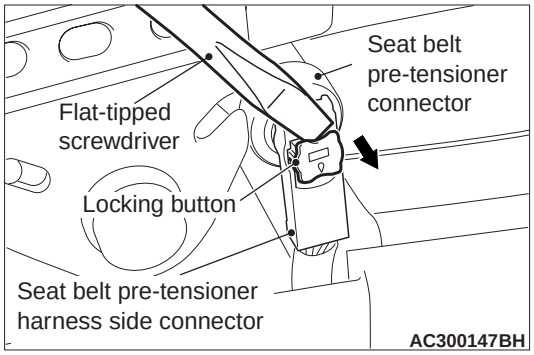
1. Sash guide cover
   - Negative battery cable connection

>>C<<
- Post-installation inspection

NOTE: The figure shows the seat belt with pre-tensioner (RH).

REMOVAL SERVICE POINTS

<<A>> SEAT BELT PRE-TENSIONER HARNESS SIDE CONNECTOR DISCONNECTION



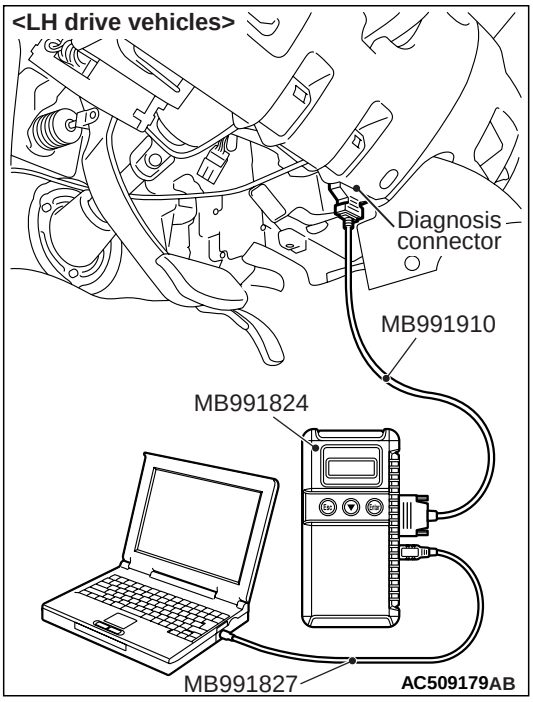
1. Use a flat-tipped screwdriver to pull out forward and unlock the locking button of the seat belt pre-tensioner harness side connector.
2. Disconnect the seat belt pre-tensioner harness side connector.

INSTALLATION SERVICE POINTS

>>A<< PRE-INSTALLATION INSPECTION

1. When installing the new seat belt with pre-tensioner, refer to "INSPECTION"(P.52B-286).
2. Connect the negative battery cable.

⚠ CAUTION



To prevent damage to M.U.T.-III, always turn the ignition, switch to the "LOCK" (OFF) position before connecting or disconnecting M.U.T.-III.

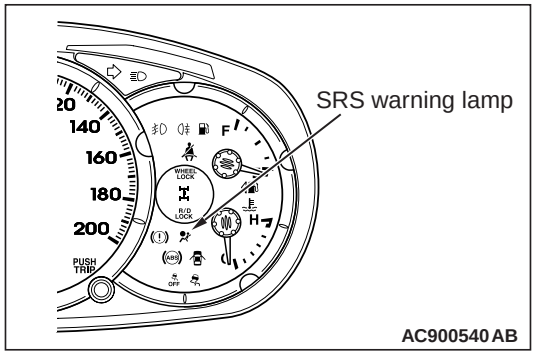
3. Connect M.U.T.-III to the diagnosis connector.
4. Turn the ignition switch to the "ON" position.
5. Check diagnosis codes using M.U.T.-III to ensure that the SRS operates properly. At this time, check that no diagnosis code except B1603 and B1609 are set.
6. Turn the ignition switch to the "LOCK" (OFF) position. Disconnect the negative battery cable and tape the terminal to prevent accidental connection and seat belt pre-tensioner operation.

>>B<< SEAT BELT PRE-TENSIONER HARNESS SIDE CONNECTOR CONNECTION

Connect the seat belt pre-tensioner connector then securely lock the locking button of the seat belt pre-tensioner harness-side connector.

>> C<< POST-INSTALLATION INSPECTION

1. Connect the negative battery cable.
2. Turn the ignition switch to the "ON" position.



3. Does the "SRS" warning lamp illuminate for approximately seven seconds, and go out?
4. If no, refer to troubleshooting (Refer to P.52B-12).

INSPECTION

M1524004200483

⚠ WARNING

- ***If any component damage is found during the following inspection, replace the seat belt with pre-tensioner with a new one. Dispose of the old one according to the specified procedure (Refer to P.52B-289).***
- ***Never attempt to measure the circuit resistance of the seat belt pre-tensioner even if you are using the specified tester. If the circuit resistance is measured with a tester, accidental seat belt pre-tensioner operation will result in serious personal injury.***

1. Check the seat belt pre-tensioner deployment section for dents and deformation.
2. Check the harness and connector for damage and the terminals for deformation.

PASSENGER'S AIR BAG CUT OFF SWITCH

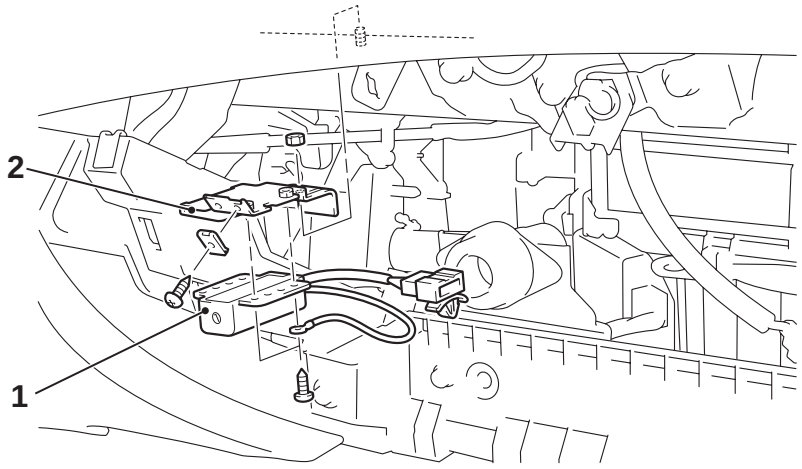
REMOVAL AND INSTALLATION

M1524026700464

⚠ WARNING

- ***Never attempt to disassemble or repair the passenger's air bag cut off switch. If faulty, replace it.***
- ***Do not drop or subject the passenger's air bag cut off switch to impact or vibration. Replace the passenger's air bag cut off switch, if a dent, cracking, deformation, or rust is present.***
- ***After deployment of an air bag, check the passenger's air bag cut off switch and replace a new one if there is an abnormality.***

Pre-removal Operation
- Turn the ignition key to the "LOCK" (OFF) position.
- Disconnect the Negative Battery terminal.



AC509683 AB

Removal steps

<<A>>
- Passenger's air bag module connector connection (Refer to P.52B-268).
- Glove box cover (Refer to GROUP 52A, Instrument panel assembly).

1. Passenger's air bag cut off switch
2. Passenger's air bag cut off switch bracket

Installation steps

>>A<<
- Pre-installation inspection

2. Passenger's air bag cut off switch bracket

>>B<<
1. Passenger's air bag cut off switch
- Glove box cover (Refer to GROUP 52A, Instrument panel assembly).
- Passenger's air bag module connector connection (Refer to P.52B-268).
- Negative battery cable connection

>>C<<
- Post-installation inspection

REMOVAL SERVICE POINT

<<A>> PASSENGER'S (FRONT) AIR BAG MODULE CONNECTOR DISCONNECTION

⚠ DANGER

Remove the passenger's (front) air bag module first to prevent the air bag from deploying unintentionally, because the passenger's air bag cut off switch does not have a connector short circuiting mechanism.

INSTALLATION SERVICE POINTS

>>A<< PRE-INSTALLATION INSPECTION

Check the passenger's air bag cut off switch for dents, breakage and bending and measure the resistance between the terminals, even when installing a new passenger's air bag cut off switch.

>>B<< PASSENGER'S AIR BAG CUT OFF SWITCH INSTALLATION

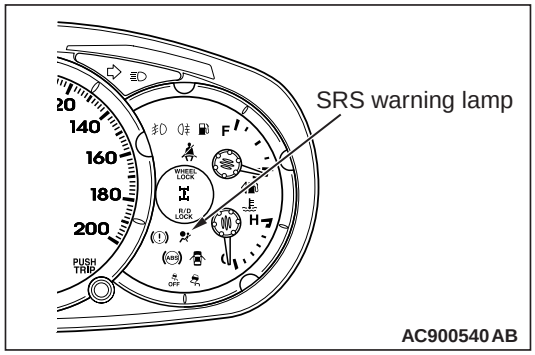
⚠ ***WARNING***

If the passenger's air bag cut off switch is not installed securely and correctly, the passenger's (front) air bag may not operate normally.

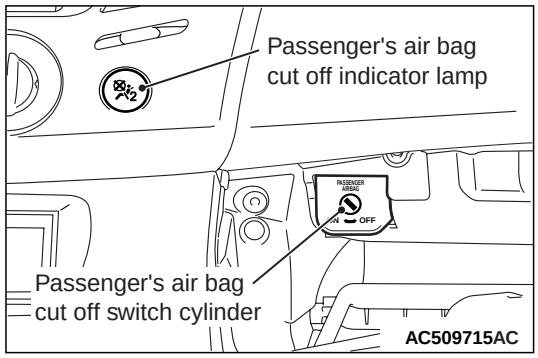
Securely connect the connector.

>>C<< POST-INSTALLATION INSPECTION

1. Reconnect the negative battery cable.
2. Turn the ignition switch to the "ON" position.



3. Does the SRS warning lamp illuminate for about 7 seconds, and go out?
4. If no, refer to troubleshooting (Refer to P.52B-12).



5. When the ignition key is inserted in the passenger's air bag cut off switch cylinder and turned to the "OFF" position, check that the passenger's air bag cut off indicator lamp illuminates.

INSPECTION

PASSENGER'S AIR BAG CUT OFF SWITCH CONTINUITY CHECK

M1524026800375

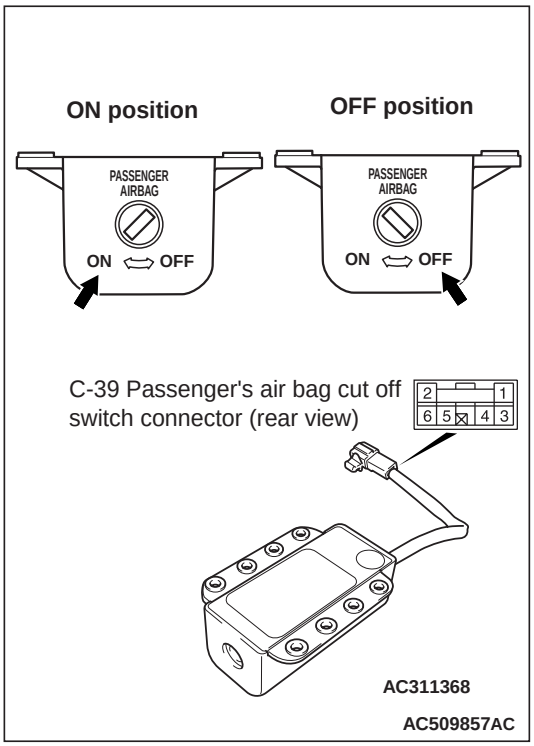
1. Disconnect the negative battery terminal.

⚠ ***DANGER***

To prevents the air bag from deploying unintentionally, disconnect the passenger's (front) air bag module connector C-02 to short the squib circuit.

2. Disconnect the passenger's (front) air bag module connector C-02.
3. Disconnect the passenger's air bag cut off switch connector C-39.

⚠ CAUTION



Do not insert a test probe into the terminal from its front side directly as the connector contact pressure may be weakened.

4. Make a short-circuit in connector terminals 1 and 2, and measure the resistance between connectors.

NOTE: The harness, which is of less resistance (0.1 Ω or less), should be used to earth the terminals 1 and 2.

Switch position	Tester connection	Specified condition
ON position	4 – 5	Less than 0.1 Ω
	3 – 6	Open circuit
OFF position	4 – 5	2.0 ± 0.3 Ω
	3 – 6	Less than 0.2 Ω

AIR BAG MODULE AND SEAT BELT PRE-TENSIONER DISPOSAL PROCEDURES

M1524001201915

Before disposing of an air bag or a vehicle equipped with an air bag, follow the procedures below to deploy the air bag.

UNDEPLOYED AIR BAG MODULE DISPOSAL

⚠ ***WARNING***

- ***If the vehicle is to be scrapped or otherwise disposed of, deploy the air bags and operate the seat belt pre-tensioner inside the vehicle. If the vehicle will continue to be used and only the air bag modules and seat belt pre-tensioner are to be disposed of, deploy the air bags and operate the seat belt pre-tensioner outside the vehicle.***
- ***Since a large amount of smoke is produced when the air bag is deployed and the seat belt pre-tensioner is operated, avoid residential areas whenever possible.***
- ***Since there is loud noise when the air bags are deployed and when the seat belt pre-tensioner are operated, avoid residential areas whenever possible. If anyone is nearby, give warning of the impending noise.***
- ***Suitable ear protection should be worn by personnel performing these procedures or by people in the immediate area.***

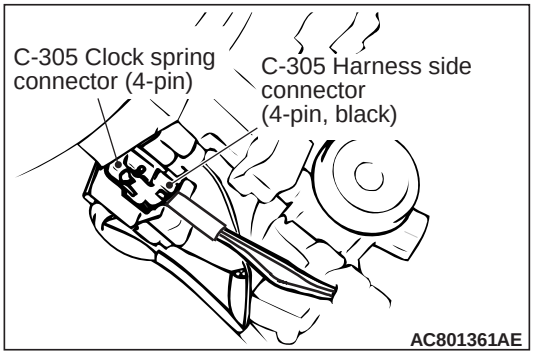
DEPLOYMENT INSIDE THE VEHICLE (WHEN DISPOSING OF A VEHICLE) <DRIVER'S AIR BAG MODULE>

1. Move the vehicle to an isolated spot.

⚠ ***DANGER***

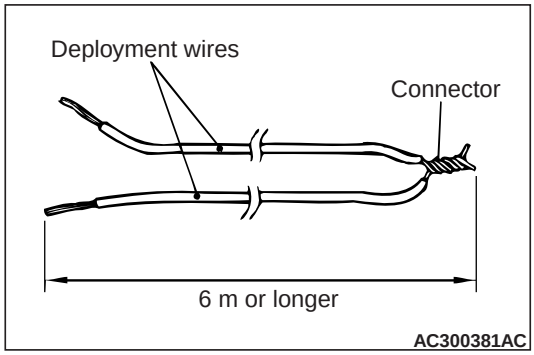
Wait at least 60 seconds after disconnecting the battery cable before doing any further work (Refer to P.52B-5).

2. Disconnect the negative and positive battery cables from the battery terminals, and then remove the battery from the vehicle.
3. Remove the column cover lower (Refer to GROUP 37, Steering shaft).

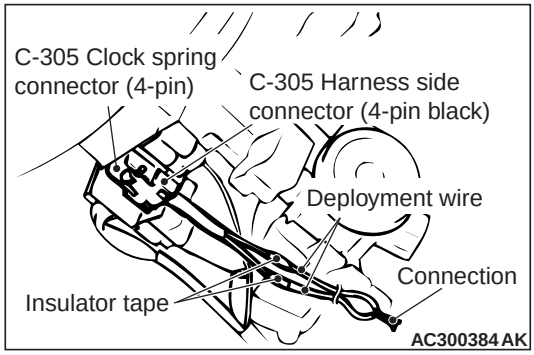


4. Remove the connection between the C-305 clock spring connector (4-pin) and the harness side connector (4-pin black).

   NOTE: Once disconnected from the instrument panel wiring harness, both electrodes of the clock spring connector short automatically. This prevents the driver's air bag from accidental deployment caused by static, etc.



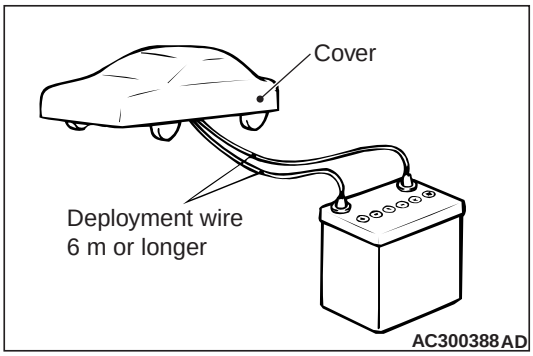
5. Obtain two suitable wires, which are 6 meters or longer, as deployment wires. Then connect the wires at one end to short.
6. Touch the vehicle's body with bare hands to discharge static in you.



7. Cut with a pliers, etc. the instrument panel wiring harness shown in the figure of the instructions, while the C-305 clock spring connector is disconnected.

   NOTE: The disconnection location should be sufficiently away from the C-305 harness side connector with consideration to the expansion harness connection location upon disconnections.
8. Connect the deployment wires on the two instrument panel wiring harnesses disconnected, cover the connection areas with insulator tape and then pull out the deployment wires outside the vehicle.
9. Connect the C-305 harness side connector connected with an expansion harness to the C-305 clock spring connector.

⚠ ***WARNING***



If the glass is scratched, air bag deployment could cause it to crack and fly out of the vehicle, so always put a cover over the vehicle.

10. To suppress the operation sound as much as possible completely close all door windows, close the doors and put the cover on the vehicle.

⚠ ***WARNING***

- ***Before deploying the air bag in this manner, first check to be sure that there is no one in or near the vehicle. Wear safety glasses.***
- ***The inflator will be quite hot immediately following the deployment, so wait at least 30 minutes to allow it to cool before attempting to handle it. Although not poisonous, do not inhale gas from the air bag deployment. See Deployed Air Bag Module and Operated Seat Belt Pre-tensioner Disposal (Refer to) for post-deployment handling instructions.***
- ***If the air bag module fails to deploy, do not go near the module. Contact your distributor.***

11. At a location as far away from the vehicle as possible, disconnect the two connected wires from each other, and connect them to the two terminals of the battery (which has been removed from the vehicle) to deploy the air bag.
12. After deployment, dispose of the air bag module according to the Deployed Air Bag Module and Operated Seat Belt Pre-tensioner Disposal (Refer to).

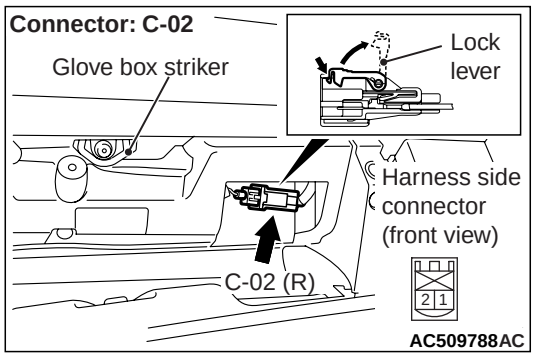
DEPLOYMENT INSIDE THE VEHICLE (WHEN DISPOSING OF A VEHICLE) <PASSENGER'S (FRONT) AIR BAG MODULE>

1. Move the vehicle to an isolated spot.

⚠ ***DANGER***

Wait at least 60 seconds after disconnecting the battery cable before doing any further work (Refer to P.52B-5).

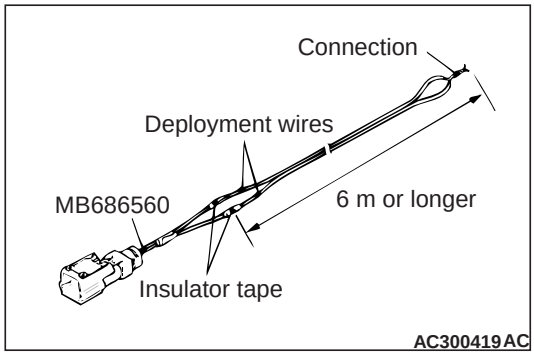
2. Disconnect the negative and positive battery cables from the battery terminals, and then remove the battery from the vehicle.
3. Remove the glove box (Refer to GROUP 52A, Instrument Panel Assembly).



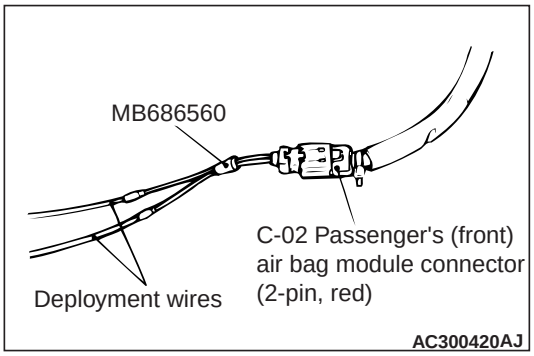
4. Execute the follow steps to disconnect the connection between the C-02 passenger's (front) air bag module connector (2-pin, red) and the harness side connector (2-pin, red).

   NOTE: Once disconnected from the instrument panel wiring harness, both electrodes of the passenger's (front) air bag module short automatically. This prevents the passenger's (front) air bag from accidental deployment caused by static, etc.

   (1) For connector C-02, pull up the harness side lock lever with a nail and disconnect the connector lock.
   (2) Disconnect the C-02 harness side connector.

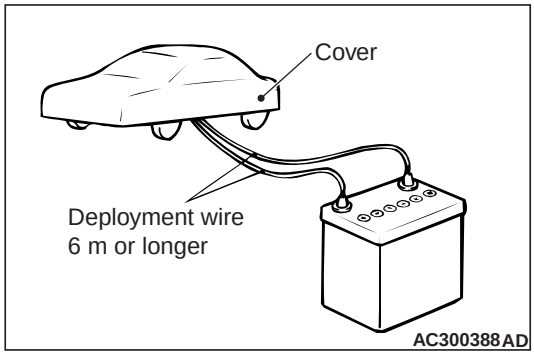


5. Connect deployment wires longer than 6 m to each SRS air bag adapter harness (MB686560) and insulate the connections with insulator tape. Also, connect the deployment wires in the other ends to short, thereby preventing the passenger's (front) air bag from accidental deployment caused by static etc.



6. Connect the C-02 passenger's (front) air bag module connector (2-pin, red) to special tool SRS air bag adapter harness (MB686560) and move the deployment wires out of the vehicle.

⚠ WARNING



If the glass is scratched, air bag deployment could cause it to crack and fly out of the vehicle, so always put a cover over the vehicle.

7. To suppress the operation sound as much as possible completely close all door windows, close the doors and put the cover on the vehicle.

⚠ WARNING

- ***Before deploying the air bag in this manner, first check to be sure that there is no one in or near the vehicle. Wear safety glasses.***
- ***The inflator will be quite hot immediately following the deployment, so wait at least 30 minutes to allow it to cool before attempting to handle it. Although not poisonous, do not inhale gas from the air bag deployment. See Deployed Air Bag Module and Operated Seat Belt Pre-tensioner Disposal (Refer to) for post-deployment handling instructions.***
- ***If the air bag module fails to deploy, do not go near the module. Contact your distributor.***

8. At a location as far away from the vehicle as possible, disconnect the two connected wires from each other, and connect them to the two terminals of the battery (which has been removed from the vehicle) to deploy the air bag.
9. After deployment, dispose of the air bag module according to the Deployed Air Bag Module and Operated Seat Belt Pre-tensioner Disposal (Refer to).

DEPLOYMENT INSIDE THE VEHICLE (WHEN DISPOSING OF A VEHICLE) <SIDE-AIRBAG MODULE>

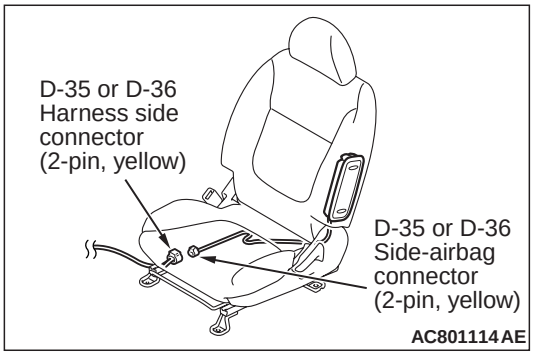
1. Move the vehicle to an isolated spot.

⚠ WARNING

Wait at least 60 seconds after disconnecting the battery cables before doing any further work (Refer to P.52B-5).

2. Disconnect the negative and positive battery cables from the battery terminals, and then remove the battery from the vehicle.

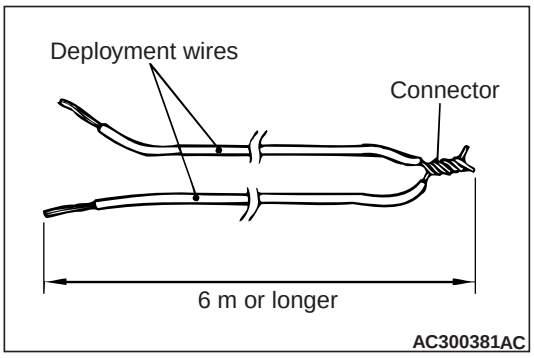
⚠ ***WARNING***



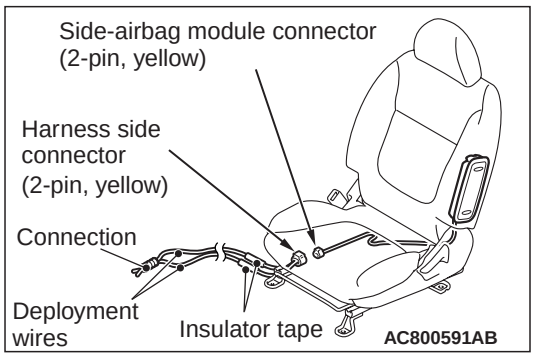
The side-airbag modules for both the driver's side and passenger's side should be deployed.

3. Remove the connection between the D-35 or D-36 side-airbag module connector (2-pin, yellow) and the harness side connector (2-pin, yellow).

   NOTE: Once disconnected from the floor wiring harness, both electrode of the side-airbag module connector short automatically. This prevents the side-airbag from accidental deployment caused by static etc.

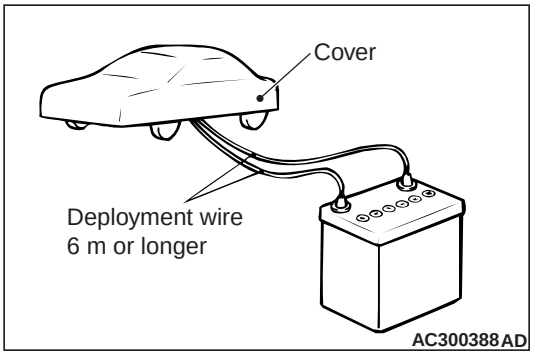


4. Obtain two suitable wires, which are 6 meters or longer, as deployment wires. Then connect the wires at one end to short.
5. Touch the vehicle's body with bare hands to discharge static in you.



6. With the side-airbag module connector disconnected, cut the harness side connector using a nipper or similar tools.
7. Connect the deployment wire to each of two cut wiring harnesses. After covering the connection areas with insulation tape, pull out the deployment wire to outside the vehicle.
8. Connect the harness side connector, to which the deployment wire is connected, to the side-airbag module connector.

⚠ ***WARNING***



If the glass is scratched, air bag deployment could cause it to crack and fly out of the vehicle, so always put a cover over the vehicle.

9. To suppress the operation sound as much as possible completely close all door windows, close the doors and put the vehicle.

⚠ ***WARNING***

- ***Before deploying the air bag in this manner, first check to be sure that there is no one in or near the vehicle. Wear safety glasses.***
- ***The inflator will be quite hot immediately following the deployment, so wait at least 30 minutes to allow it to cool before attempting to handle it. Although not poisonous, do not inhale gas from the air bag deployment. See Deployed Air Bag Module and Operated Seat Belt Pre-tensioner Disposal (Refer to) for post-deployment handling instructions.***
- ***If the air bag module fails to deploy, do not go near the module. Contact your distributor.***

10. At a location as far away from the vehicle as possible, disconnect the two connected wires from each other, and connect them to the two terminals of the battery (which has been removed from the vehicle) to deploy the air bag.

11. After deployment, dispose of the air bag module according to the Deployed Air Bag Module and Operated Seat Belt Pre-tensioner Disposal (Refer to).

DEPLOYMENT INSIDE THE VEHICLE (WHEN DISPOSING OF A VEHICLE) <CURTAIN AIR BAG MODULE>

1. Move the vehicle to an isolated spot.

⚠ WARNING

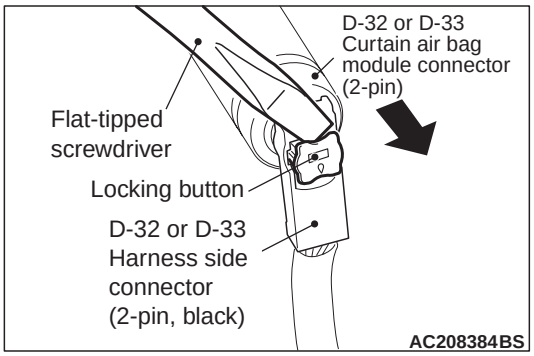
Wait at least 60 seconds after disconnecting the battery cables before doing any further work (Refer to P.52B-5).

2. Disconnect the negative and positive battery cables from the battery terminals, and then remove the battery from the vehicle.

⚠ WARNING

The curtain air bag modules for both the right side and left side should be deployed.

3. Remove the headlining (Refer to GROUP 52A, Headlining).

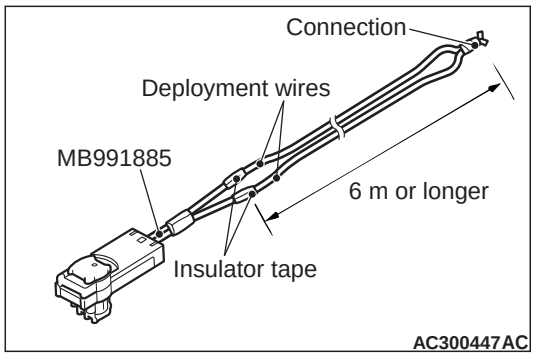


4. Execute the following steps to disconnect the connection between D-32 or D-33 curtain air bag module connector (2-pin) and harness side connector (2-pin, black).

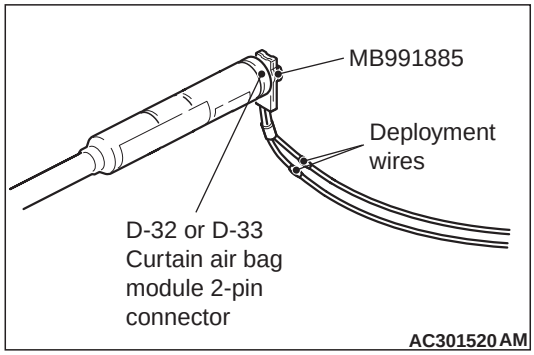
   NOTE: Once disconnected from the roof wiring harness, both electrode of the curtain air bag module connector short automatically. This prevents the curtain air bag from accidental deployment caused by static etc.

   (1) Use a flat-tipped screwdriver to pull out forward and unlock the locking button of the harness-side connector (2-pin, black).

   (2) Disconnect the D-32 or D-33 harness side connector.

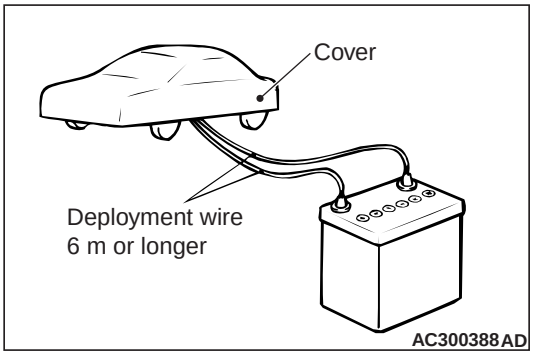


5. Connect deployment wires longer than 6 m to each special tool SRS air bag adapter harness (MB991885) and insulate the connections with insulator tape. Also, connect the deployment wires in the other ends to short, thereby preventing the curtain air bag module from accidental deployment caused by static etc.



6. Connect the D-32 or D-33 curtain air bag module connector (2-pin) to special tool SRS air bag adapter harness (MB991885) and move the deployment harness out of the vehicle.

⚠ WARNING



If the glass is scratched, air bag deployment could cause it to crack and fly out of the vehicle, so always put a cover over the vehicle.

7. To suppress the operation sound as much as possible completely close all door windows, close the doors and put the vehicle.

⚠ ***WARNING***

- ***Before deploying the air bag in this manner, first check to be sure that there is no one in or near the vehicle. Wear safety glasses.***
- ***The inflator will be quite hot immediately following the deployment, so wait at least 30 minutes to allow it to cool before attempting to handle it. Although not poisonous, do not inhale gas from the air bag deployment. See Deployed Air Bag Module and Operated Seat Belt Pre-tensioner Disposal (Refer to) for post-deployment handling instructions.***
- ***If the air bag module fails to deploy, do not go near the module. Contact your distributor.***

8. At a location as far away from the vehicle as possible, disconnect the two connected wires from each other, and connect them to the two terminals of the battery (which has been removed from the vehicle) to deploy the air bag.
9. After deployment, dispose of the curtain air bag module according to the Deployed Air Bag Module and Operated Seat Belt Pre-tensioner Disposal (Refer to).

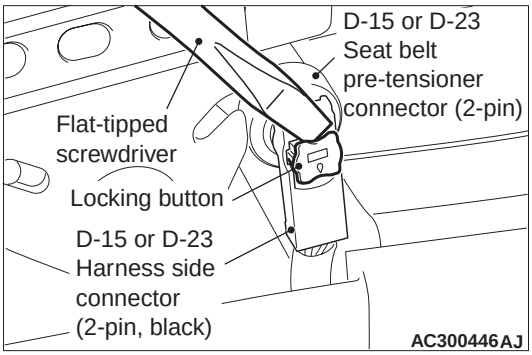
DEPLOYMENT INSIDE THE VEHICLE (WHEN DISPOSING OF A VEHICLE) <SEAT BELT PRE-TENSIONER>

1. Move the vehicle to an isolated spot.

⚠ ***DANGER***

Wait at least 60 seconds after disconnecting the battery cables before doing any further work (Refer to P.52B-5).

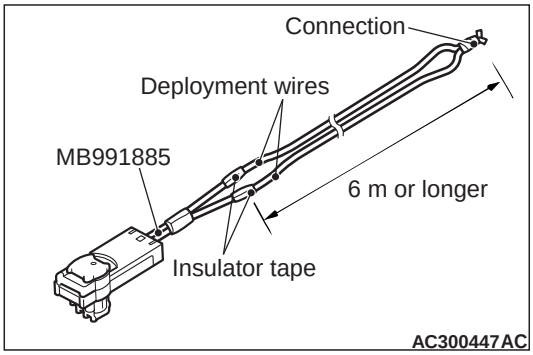
2. Disconnect the negative and positive battery cables from the battery terminals, and then remove the battery from the vehicle.
3. Remove the rear pillar lower trim, quarter lower trim or centre pillar lower trim (Refer to GROUP 52A, Trim <Single Cab>, <Club Cab> <Double Cab>).



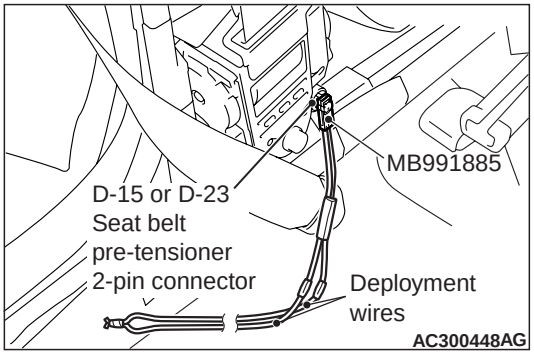
4. Execute the following steps to disconnect the connection between D-15 or D-23 seat belt pre-tensioner connector (2-pin) and harness side connector (2-pin, black).

   NOTE: Once disconnected from the floor wiring harness, both electrode of the seat belt pre-tensioner connector short automatically. This prevents the seat belt pre-tensioner from accidental deployment caused by static etc.

   (1) Use a flat-tipped screwdriver to pull out forward and unlock the locking button of the harness-side connector (2-pin, black).
   (2) Disconnect the D-15 or D-23 harness side connector.



5. Connect deployment wires longer than 6 m to each special tool SRS air bag adapter harness (MB991885) and insulate the connections with insulator tape. Also, connect the deployment wires in the other ends to short, thereby preventing the seat belt pre-tensioner from accidental deployment caused by static etc.



6. Connect the D-15 or D-23 seat belt pre-tensioner connector (2-pin) to special tool SRS air bag adapter harness (MB991885) and move the deployment wires out of the vehicle.
7. Close all the door windows fully to avoid operating sound as much as possible.

⚠ WARNING

- ***Before operating the seat belt pre-tensioner in this manner, first check to be sure that there is no one in or near the vehicle. Wear safety glasses.***
- ***The inflator will be quite hot immediately following the operation, so wait at least 30 minutes to allow it to cool before attempting to handle it. Although no poisonous, do not inhale gas from the seat belt pre-tensioner operation. See Deployed Air Bag and Operated Seat Belt pre-tensioner Disposal (Refer to) for post-operation handling instructions.***
- ***If the seat belt pre-tensioner fails to operate, do not go near the seat belt pre-tensioner. Contact your distributor.***

8. At a location as far away from the vehicle as possible, disconnect the two connected wires from each the, and connect them to the two terminals of the battery (which has been removed from the vehicle) to operating the seat belt pre-tensioner.
9. After operation, dispose of the seat belt pre-tensioner according to the Deployed Air Bag Module operated seat belt pre-tensioner Disposal (Refer to).

DEPLOYMENT OUTSIDE THE VEHICLE <DRIVER'S AIR BAG MODULE>

⚠ WARNING

- ***This should be carried out in a wide, flat area at least 6 m away from obstacles and other people.***
- ***Do not deploy outside if wind is high. Even in a soft wind, ignite to windward of the air bag modules.***

⚠ DANGER

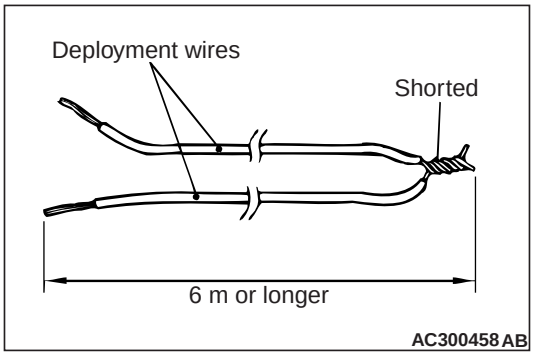
Wait at least 60 seconds after disconnecting the battery cables before doing any further work (Refer to P.52B-5).

1. Disconnect the negative and positive battery cables from the battery terminals, and then remove the battery from the vehicle.

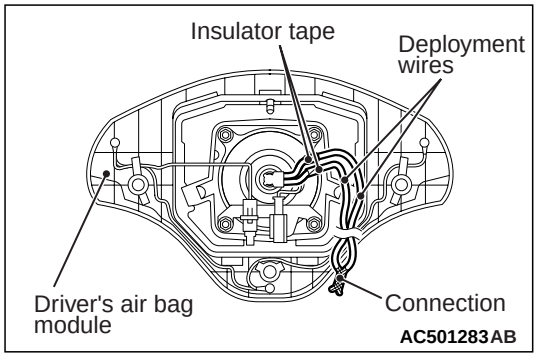
⚠ WARNING

Once disconnected, both electrodes of the driver's air bag module connector short automatically to prevent accidental deployment caused by static etc. Still, in consideration of the accidental deployment, store the air bag module on flat place with deployment surface facing up. Also, do not put anything on it.

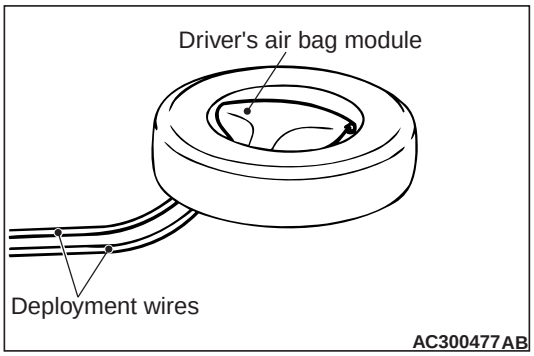
2. Remove the air bag module from the vehicle (Refer to P.52B-268).



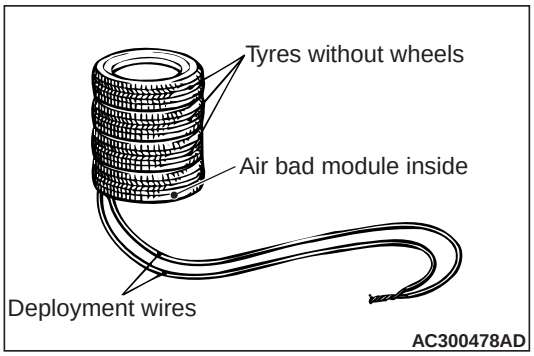
3. Obtain two suitable wires, which are 6 meters or longer, as deployment wires. Then connect the wires at one end to short.
4. Touch the vehicle's body with bare hands to discharge static in you.



5. Using pliers, cut the driver's air bag module connector from the harnesses. Connect the deployment wires to each harness that has been cut and insulate the connections with insulator tape.



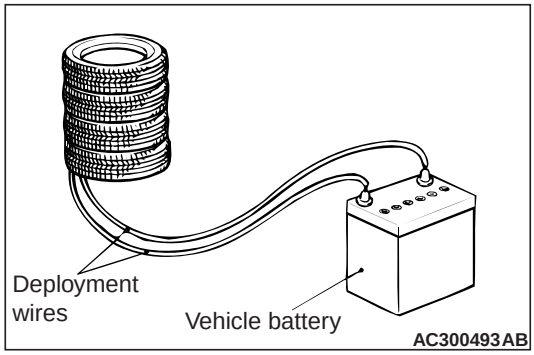
6. Install a nut to the bolt behind the driver's air bag module and tie thick wire there for securing.
7. Route the deployment wires connected to the driver's air bag module beneath an old tyre and wheel assembly. Then, using the wire tied to the bolt, secure the driver's air bag module to the tyre and wheel assembly with the deployment surface facing up.



8. Place three old tyres without wheels on the tyre secured with the driver's air bag module.

⚠ WARNING

- ***Before deployment, check carefully to be sure that no one is nearby.***
- ***The inflator will be quite hot immediately following the deployment, so wait at least 30 minutes to allow it to cool before attempting to handle it. Although not poisonous, do not inhale gas from air bag deployment. See Deployed Air Bag Module and Operated Seat Belt Pre-tensioner Disposal (Refer to) for post-deployment handling instructions.***
- ***If the air bag fails to deploy, do not go near the module. Contact your distributor.***



9. At a location as far away from the driver's air bag module as possible, and from a shielded position, disconnect the two connected wires from each other, and connect them, to the two terminals of the battery (which has been removed from the vehicle) to deploy the air bag.
10. Discard the deployed driver's air bag module as specified in Deployed Air Bag Module and Operated Seat Belt Pre-tensioner Disposal (Refer to).

DEPLOYMENT OUTSIDE THE VEHICLE <PASSENGER'S (FRONT) AIR BAG MODULE >

⚠ WARNING

- ***This should be carried out in a wide, flat area at least 6 m away from obstacles and other people.***
- ***Do not deploy outside if wind is high. Even in a soft wind, ignite to windward of the air bag modules.***

⚠ DANGER

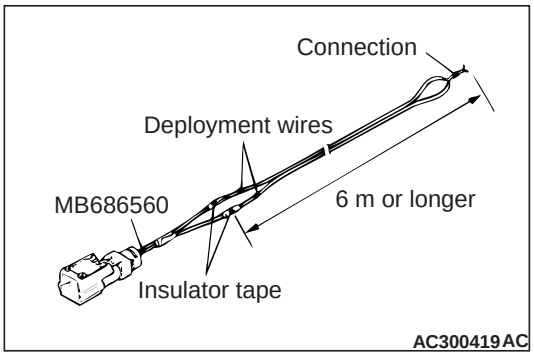
Wait at least 60 seconds after disconnecting the battery cables before doing any further work (Refer to P.52B-5).

1. Disconnect the negative and positive battery cables from the battery terminals, and then remove the battery from the vehicle.

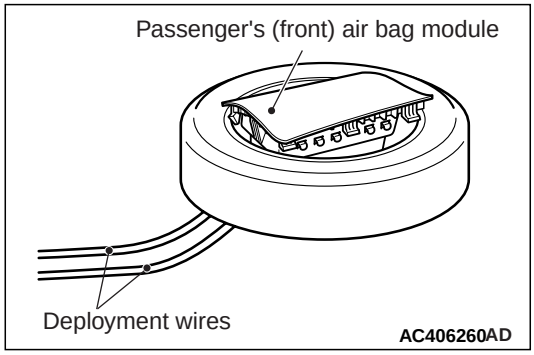
⚠ WARNING

Once disconnected, both electrodes of the front passenger's (front) air bag module connector short automatically to prevent accidental deployment caused by static etc. Still, in consideration of the accidental deployment, store the air bag module on flat place with deployment surface facing up. Also, do not put anything on it.

2. Remove the passenger's (front) air bag module from the vehicle (Refer to P.52B-268).



3. Connect deployment wires longer than 6 m to each SRS air bag adapter harness (MB686560) and insulate the connections with insulator tape. Also, connect the deployment wires in the other ends to short, thereby preventing the passenger's (front) air bag from accidental deployment caused by static etc.

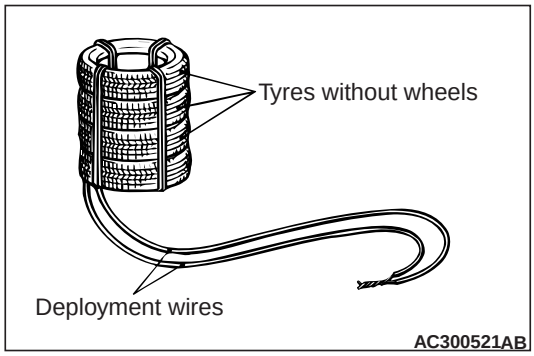


4. Connect the deployment wires to SRS air bag adapter harness (MB686560), pass it beneath the tyre and wheel assembly, and connect it to the passenger's (front) air bag module.

⚠ CAUTION

- **The adapter harness below the wheel should be loose. If it is too tight, the reaction when the air bag deploys could damage the adapter harness.**
- **During deployment, the connector of SRS air bag adapter harness (MB686560) must not be between the tyres.**

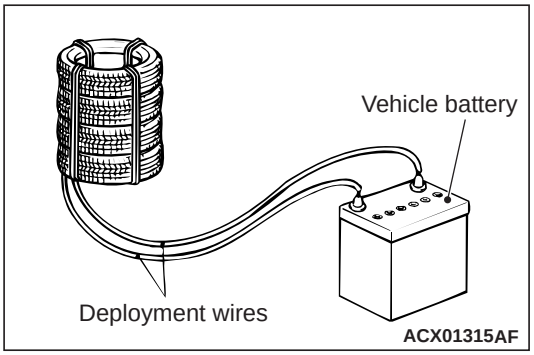
5. Pass the thick wire through the passenger's (front) air bag module mounting hole, and then secure the passenger's (front) air bag module to an old tyre with a wheel in it so that the pad on the module is facing upwards.



6. Place three old tyres without wheels on top of the tyre secured to the passenger's (front) air bag module, and secure all tyres together with ropes (four locations).

⚠ ***WARNING***

- ***Before deployment, check carefully to be sure that no one is nearby.***
- ***The inflator will be quite hot immediately following the deployment, so wait at least 30 minutes to allow it to cool before attempting to handle it. Although not poisonous, do not inhale gas from air bag deployment. See Deployed Air Bag Module and Operated Seat Belt Pre-tensioner Disposal (Refer to) for post-deployment handling instructions.***
- ***If the air bag fails to deploy, do not go near the module. Contact your distributor.***



7. At a location as far away from the passenger's (front) air bag module as possible, and from a shielded position, disconnect the two connected wires from each other, and connect them, to the two terminals of the battery (which has been removed from the vehicle) to deploy the air bag.
8. Discard the deployed passenger's (front) air bag module as specified in Deployed Air Bag Module and Operated Seat Belt Pre-tensioner Disposal (Refer to).

DEPLOYMENT OUTSIDE VEHICLE <SIDE-AIRBAG MODULE>

⚠ ***WARNING***

- ***This should be carried out in a wide, flat area at least 6 m away from obstacles and other people.***
- ***Do not deploy outside if wind is high. Even in a soft wind, ignite to windward of the air bag modules.***

⚠ ***DANGER***

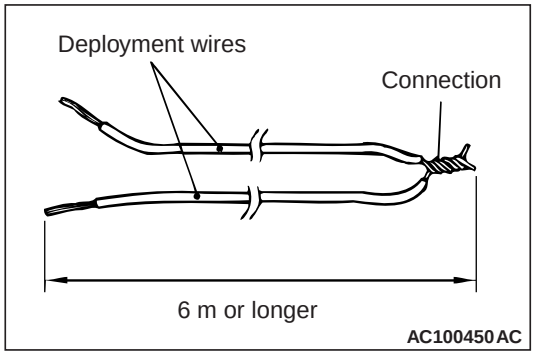
Wait at least 60 seconds after disconnecting the battery cables before doing any further work (Refer to P.52B-5).

1. Disconnect the negative and positive battery cables from the battery terminals, and then remove the battery from the vehicle.

⚠ ***WARNING***

Once disconnected, both electrodes of the side-airbag module connector short automatically to prevent accidental deployment caused by static etc. Still, in consideration of the accidental deployment, store the air bag module on flat place with deployment surface facing up. Also, do not put anything on it.

2. Remove the front seatback assembly with side-airbag module from the vehicle (Refer to 52A, Front Seat Assembly).



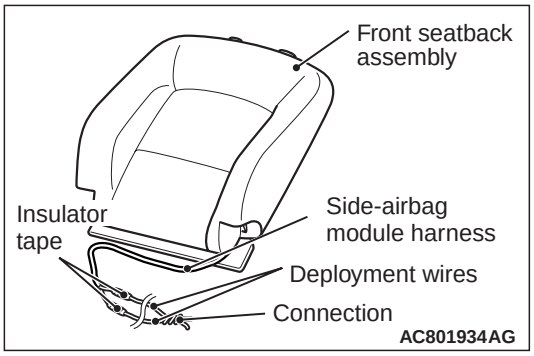
3. Prepare two deployment wires of 6 m or more, and keep the terminal at one end connected to that of the other wire (shorted).

   NOTE: This prevents the air bags from unintentional deployment caused by static.

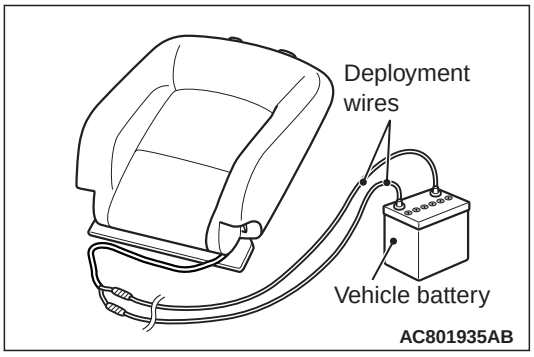
⚠ CAUTION

The following procedures are intended to prevent the unintentional deployment caused by the static. Therefore, make sure to perform the procedures.

4. Touch the vehicle body with bare hands to release the charged static.



5. Install the front seatback assembly with its backside facing the ground.
6. Cut off the side-airbag module connector from the wiring harness with nippers. Individually connect a harness on the two harnesses disconnected, cover the connection areas with insulation tape.



7. Disconnect the shorted part of the deployment wiring harness at a place as far as possible from the front seatback assembly. Then, connect the wires to the removed vehicle battery to perform deployment.

⚠ WARNING

- ***Before deployment, check carefully to be sure that no one is nearby.***
- ***The inflator will be quite hot immediately following the deployment, so wait at least 30 minutes to allow it to cool before attempting to handle it. Although not poisonous, do not inhale gas from air bag deployment. See Deployed Air Bag Module and Operated Seat Belt Pre-tensioner Disposal (Refer to) for post-deployment handling instructions.***
- ***If the air bag fails to deploy, do not go near the module. Contact your distributor.***

8. At a location as far away from the air bag module as possible, and from a shielded position, disconnect the two connected wires from each other, and connect them to the two terminals of the battery (which has been removed from the vehicle) to deploy the air bag.
9. Discard the deployed air bag module as specified in Deployed Air Bag Module and Operated Seat Belt Pre-tensioner Disposal (Refer to).

DEPLOYMENT OUTSIDE VEHICLE <CURTAIN AIR BAG MODULE>

⚠ WARNING

- ***This should be carried out in a wide, flat area at least 6 m away from obstacles and other people.***
- ***Do not deploy outside if wind is high. Even in a soft wind, ignite to windward of the air bag modules.***

⚠ DANGER

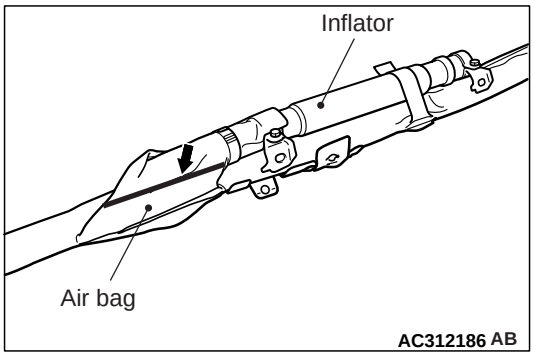
Wait at least 60 seconds after disconnecting the battery cables before doing any further work (Refer to P.52B-5).

1. Disconnect the negative and positive battery cables from the battery terminals, and then remove the battery from the vehicle.

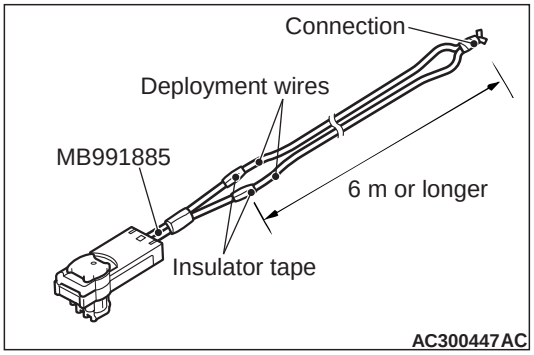
⚠ ***WARNING***

Once disconnected, both electrodes of the curtain air bag module connector short automatically to prevent accidental deployment caused by static etc. Still, in consideration of the accidental deployment, store the air bag module on flat place with deployment surface facing up. Also, do not put anything on it.

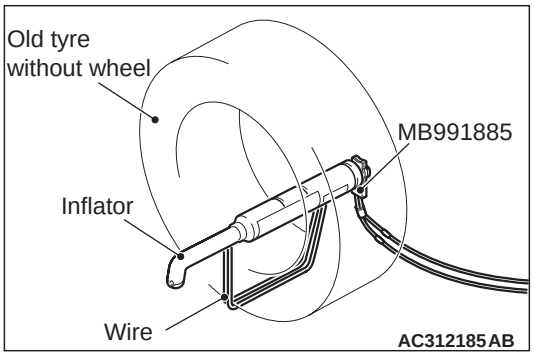
2. Remove the curtain air bag module (Refer to P.52B-279).



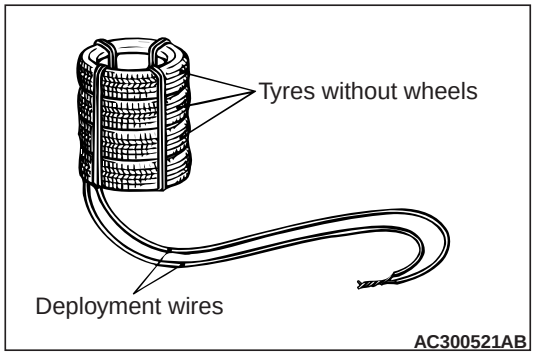
3. Cut the inflator and the air bag with a cutter.



4. Connect deployment wires longer than 6 m to each special tool SRS air bag adapter harness (MB991885) and insulate the connections with insulator tape. Also, connect the deployment wires in the other ends to short, thereby preventing the curtain air bag from accidental deployment caused by static etc.



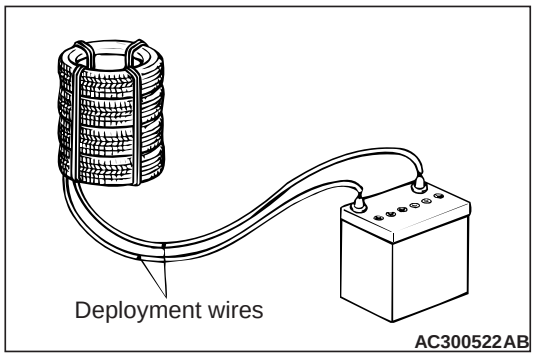
5. Feed a thick wire through the bracket of the inflator, and connect it to an old tyre with a wheel.
6. Connect the SRS air bag adapter harness (MB991885) to the inflator connector.



7. Place three old tyres without wheels on top of the tyre secured to the air bag module, and secure all tyres together with ropes (four locations).

⚠ ***WARNING***

- ***Before deployment, check carefully to be sure that no one is nearby.***
- ***The inflator will be quite hot immediately following the deployment, so wait at least 30 minutes to allow it to cool before attempting to handle it. Although not poisonous, do not inhale gas from air bag deployment. See Deployed Air Bag Module and Operated Seat Belt Pre-tensioner Disposal (Refer to) for post-deployment handling instructions.***
- ***If the air bag fails to deploy, do not go near the module. Contact your distributor.***



8. At a location as far away from the air bag module as possible, and from a shielded position, disconnect the two connected wires from each other, and connect them to the two terminals of the battery (which has been removed from the vehicle) to deploy the air bag.
9. Discard the deployed inflator as specified in Deployed Air Bag Module and Operated Seat Belt Pre-tensioner Disposal (Refer to).

DEPLOYMENT OUTSIDE THE VEHICLE <SEAT BELT PRE-TENSIONER>

⚠ *WARNING*

- ***This should be carried out in a wide, flat area at least 6 m away from obstacles and other people.***
- ***Do not operate outside if wind is high. Even in a soft wind, ignite to windward of the seat belt pre-tensioner.***

⚠ *DANGER*

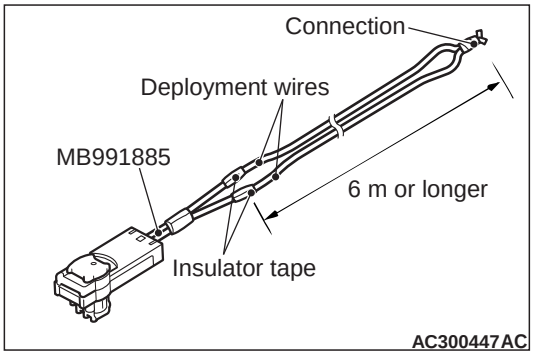
Wait at least 60 seconds after disconnecting the battery cables before doing any further work (Refer to P.52B-5).

1. Disconnect the negative and positive battery cables from the battery terminals, and then remove the battery from the vehicle.

⚠ *WARNING*

Once disconnected, both electrodes of the seat belt pre-tensioner connector short automatically to prevent accidental deployment caused by static etc. Still, in consideration of the accidental deployment, store the seat belt pre-tensioner on flat place with deployment surface facing up. Also, do not put anything on it.

2. Remove the seat belt pre-tensioner from the vehicle (Refer to P.52B-284).

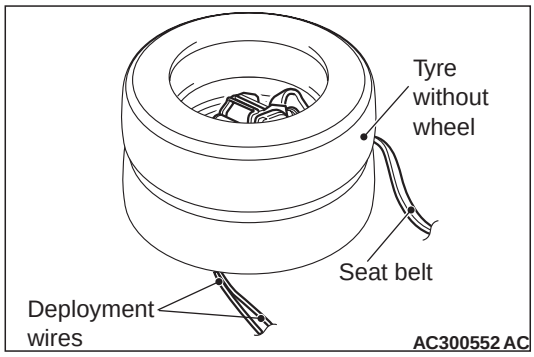


3. Connect deployment wires longer than 6 m to each special tool SRS air bag adapter harness (MB991885) and insulate the connections with insulator tape. Also, connect the deployment wires in the other ends to short, thereby preventing the seat belt pre-tensioner from accidental deployment caused by static etc.
4. Connect the special tool SRS air bag adapter harness (MB991885), which the deployment wires is attached to, to the seat belt pre-tensioner connector.

⚠ CAUTION

The adapter harness below the wheel should be loose. If it is too tight, the reaction when the seat belt pre-tensioner operates could damage the adapter harness.

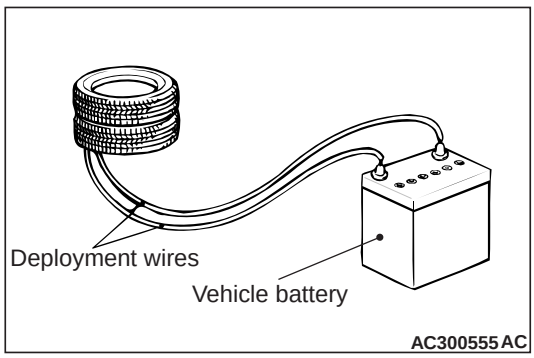
5. Pass the thick wires through the hole on the seat belt pre-tensioner bracket and secure them to the front (raised part) of the wheel on two place.



6. Pull the seat belt out the outside of the tyre, and then place one tyre without a wheel inside on top of the existing tyre.

⚠ *WARNING*

- ***Before operation, check carefully to be sure that no one is nearby.***
- ***The inflator will be quite hot immediately following the operation, so wait at least 30 minutes to allow it to cool before attempting to handle it. Although not poisonous, do not inhale gas from seat belt pre-tensioner operation. See Deployed Air Bag Module and Operated Seat Belt pre-tensioner Disposal (Refer to) for post-operation handling instructions.***
- ***If the seat belt pre-tensioner fails to operate, do not go near the seat belt pre-tensioner. Contact your distributor.***



7. At a location as far away from the seat belt pre-tensioner as possible, and from a shielded position, disconnect the two connected wires from each other, and connect them to the two terminals of the battery (which has been removed from the vehicle) to operated seat belt pre-tensioner.
8. Discard the operated seat belt pre-tensioner as specified in Deployed Air Bag Module and Seat Belt pre-tensioner Disposal (Refer to).

DEPLOYED AIR BAG MODULE AND OPERATED SEAT BELT PRE-TENSIONER DISPOSAL

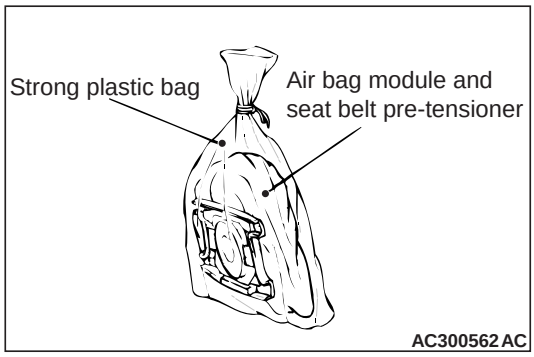
After deployment and operation, the air bag module and seat belt pre-tensioner should be disposed of in the same manner as any other scrap parts, adhering to local laws and/or legislation. Observe the following precautions during air bag or seat belt pre-tensioner disposal:

1. The inflator will be quite hot immediately following deployment, so wait at least 30 minutes to allow it cool before attempting to handle it.
2. Do not put water or oil on the air bag after deployment or on the seat belt pre-tensioner after operation.

⚠ ***WARNING***

If after following these precautions, any material does get into the eyes or on the skin, immediately rinse the affected area with a large amount of clean water. If any irritation develops, seek medical attention.

3. There may be material on the deployed air bag module or the operated seat belt pre-tensioner, that could irritate the eye and/or skin. Wear gloves and safety glasses when handling a deployed air bag module or the operated seat belt pre-tensioner.



4. Tightly seal the air bag module and seat belt pre-tensioner in a strong plastic bag for disposal.
5. Be sure to always wash your hands after completing this operation.

GROUP 54

CHASSIS ELECTRICAL

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BATTERY

GENERAL INFORMATION

M1541000100120

⚠ CAUTION

When reconnecting the battery after the battery line is disconnected, the speedometer needle returns to the zero position. Also, when the gauge functions are lost because of a voltage drop by cranking or others, the same operation is performed as for the voltage return. However, both cases are not failures.

SERVICE SPECIFICATIONS

M1541000300500

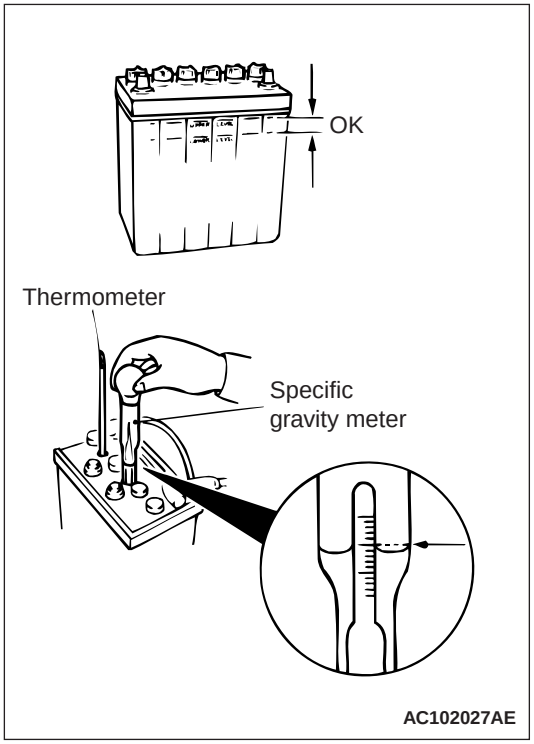
Item	Specification
Specific gravity of the battery fluid	1.220 – 1.290 (20°C)

ON-VEHICLE SERVICE

FLUID LEVEL AND SPECIFIC GRAVITY CHECK

M1541000900289

⚠ CAUTION



- **If the battery is used with the electrolyte level below the LOWER LEVEL indicator, there is the danger that explosions may occur, so add distilled water to the battery until the electrolyte level is between the LOWER LEVEL and UPPER LEVEL indications.**
- **If too much water is added to make the level rise above the UPPER LEVEL indication, the electrolyte may leak out, so adjust so that the electrolyte level is between the LOWER LEVEL and UPPER LEVEL indications.**

1. Check that the battery electrolyte level is between the UPPER LEVEL and LOWER LEVEL indications.
2. Use a specific gravity meter and a thermometer to measure the specific gravity.

   Standard value: 1.220 – 1.290 (electrolyte temperature 20°C)
3. The specific gravity of the battery electrolyte changes according to the temperature, so the specific gravity when the electrolyte is at a temperature of 20°C can be calculated using the following formula. Use the converted value to judge whether the electrolyte is okay or not.

   $D_{20} = (t - 20) \times 0.0007 + Dt$

   D_{20}: Specific gravity converted to a value for electrolyte temperature of 20°C

   t: Electrolyte temperature at the time of measurement

   Dt: Actual specific gravity

CHARGING

M1541001100963

⚠ CAUTION

- **The battery plugs should be removed during charging.**
- **The battery electrolyte level may rise and overflow from the battery during charging.**
- **Explosions may occur if the battery is brought close to naked flames during charging.**
- **Be careful to avoid tasks that might produce sparks or other danger while the battery is charging.**
- **After charging is complete, tighten the battery plugs, pour water over the battery to rinse away any sulphuric acid, and let the battery stand to dry.**
- **Charge the battery in a well-ventilated location.**
- **Do not let the battery electrolyte temperature rise above approximately 45°C (approximately 55°C during rapid charging).**

1. Remove the battery from the vehicle.
2. The normal charging current is a value in amperes which is 1/10th of the battery capacity. If the battery needs to be charged rapidly because of reasons such as time limitations, the maximum charging current for rapid charging is the battery capacity expressed as an ampere value.

Battery type	80D26L	95D31L
Capacity (5-hour rate)	55 Ah	64 Ah
Normal charging current	5.5 A	6.4 A
Rapid charging current	55 A	64 A

3. Determine when charging is finished.

   When the specific gravity of the battery electrolyte is constantly within 1.220 – 1.290 for a continuous period of one hour or more.

BATTERY TEST

M1541001202041

TEST STEPS

⚠ CAUTION

Perform the settings of RV meter when the battery terminal is disconnected. Refer to P.54A-488.

STEP 1. Battery no-load voltage check

(1) Illuminate the headlamp for 15 seconds.
(2) Turn off the headlamp and then leave it for about 2 minutes to stabilise the battery voltage.
(3) Remove the battery cable.
(4) Measure the battery no-load voltage.

OK: 12.4 V or more (Specific gravity 1.240)

Q: Does the measured voltage correspond with this range?
YES : Go to Step 3.
NO : Go to Step 2.

STEP 2. Battery charging

Recharge the battery at 5A (constant-current charging). (Refer to Table 1).

Q: Is the battery no-load voltage normal value (12.4V or more)?
YES : Go to Step 3.
NO : Replace the battery.

STEP 3. Load test check

(1) Connect the battery tester to battery.
(2) Feed a load current through the battery (Refer to Table 1).
(3) Measure the battery voltage after 15 seconds and then eliminate a load current.
(4) Compare the measured voltage to the specified lowest voltage (Refer to Table 2).

Q: Is the measured voltage higher than the lowest voltage?
YES : The battery is normal.
NO : Replace the battery.

(TABLE 1)

Battery type	Charging time when fully discharged [5A constant current charging] (H)	Load current (A)
80D26L	11	290
95D31L	13	310

(TABLE 2)

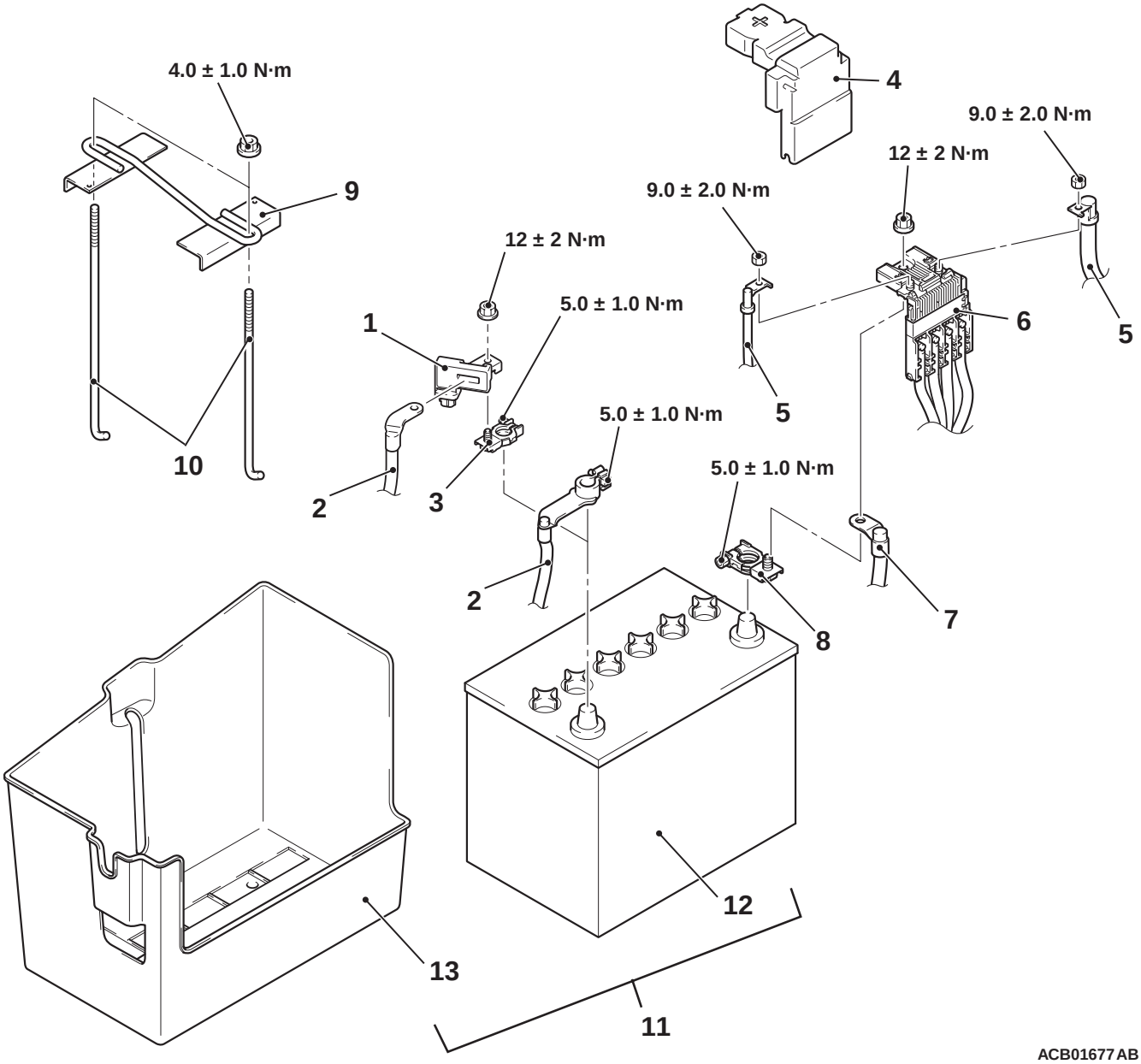
Outside air temperature (°C)	21 or more	16 to 20	10 to 15	4 to 9	-1 to 3	-7 to -2	-12 to -8	-18 to -13
Minimum voltage (V)	9.6	9.5	9.4	9.3	9.1	8.9	8.7	8.5

REMOVAL AND INSTALLATION

M1541001301487

NOTE: When replacing the battery of the vehicles with sub battery, always replace the main and sub battery at the same time. If the batteries are not replaced at the same time, the service lives will be shorter.

MAIN BATTERY



ACB01677AB

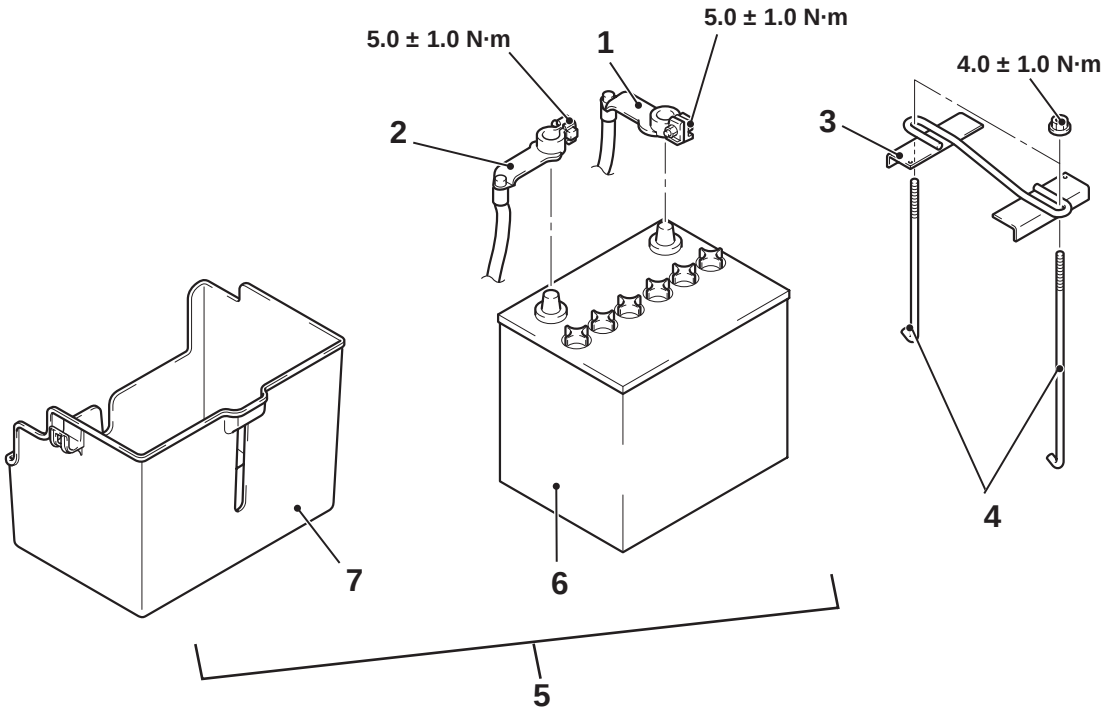
Removal steps

1. Battery current sensor <vehicles with battery current sensor>
2. Connection of the battery harness [negative battery terminal]
3. Battery terminal assembly [negative battery terminal] <vehicles with battery current sensor>
4. Fusible link box cover
5. Connection of the harness

Removal steps (Continued)

6. Connection of the fusible link box assembly
7. Connection of the harness
8. Battery terminal assembly
9. Battery holder
10. Battery L-bolt
11. Battery and battery box
12. Battery
13. Battery box

SUB BATTERY



AC801117 AC

Removal steps

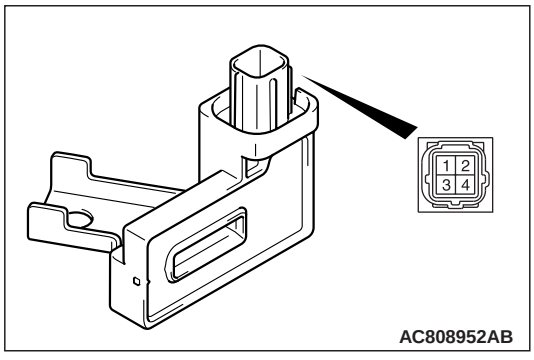
1. Battery (negative) terminal connection harness
2. Battery (positive) terminal connection harness
3. Battery holder
4. Battery L-bolt
5. Battery and battery box
6. Battery
7. Battery box

INSPECTION

BATTERY CURRENT SENSOR CHECK

M1541002100234

CURRENT SENSOR RESISTANCE VALUE

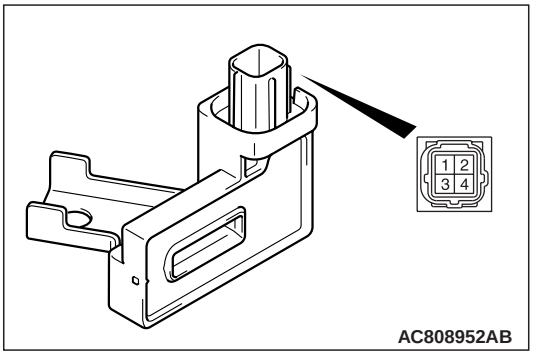


Use the circuit tester to measure the resistance value between battery current sensor connector terminals.

Standard value:

Terminal No. (positive terminal – negative terminal)	Resistance (kΩ)
1 – 3	3 – 10
1 – 4	Less than 0.5
3 – 4	3 – 10

TEMPERATURE SENSOR RESISTANCE VALUE



Using the circuit tester, measure the resistance value between the battery current sensor connector terminal No. 2 and No. 3.

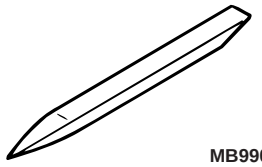
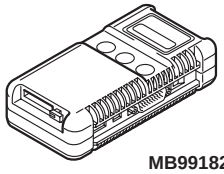
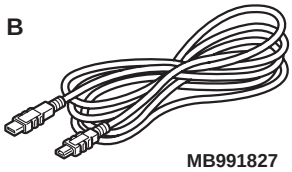
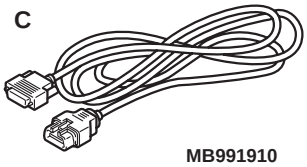
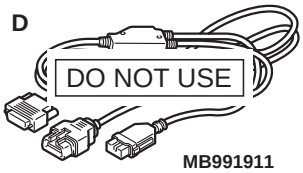
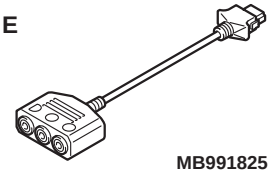
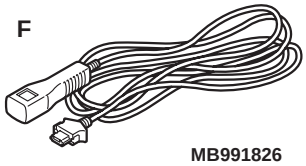
Standard value:

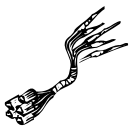
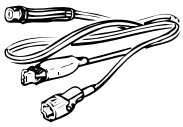
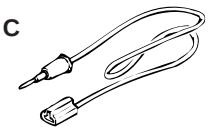
Temperature (°C)	Resistance (kΩ)
0	4.5 – 7.2
25	1.6 – 2.5
40	0.96 – 1.40

IGNITION SWITCH

SPECIAL TOOLS

M1541200600033

Tool	Number	Name	Use
 MB990784	MB990784	Ornament remover	Lower panel and Steering column cover removal
A  MB991824 B  MB991827 C  MB991910 D  MB991911 E  MB991825 F  MB991826 MB991955	MB991955 A: MB991824 B: MB991827 C: MB991910 D: MB991911 E: MB991825 F: MB991826	M.U.T.-III sub-assembly A: Vehicle Communication Interface (V.C.I.) B: M.U.T.-III USB cable C: M.U.T.-III main harness A (Vehicles with CAN communication system) D: M.U.T.-III main harness B (Vehicles without CAN communication system) E: M.U.T.-III measure adapter F: M.U.T.-III trigger harness	⚠ CAUTION **For vehicles with CAN communication, use M.U.T.-III main harness A to send simulated vehicle speed. If you connect M.U.T.-III main harness B instead, the CAN communication does not function correctly.** Checking ETACS-ECU (service data and diagnosis codes)

Tool	Number	Name	Use
A  B  C  D MB991223AZ	MB991223 A: MB991219 B: MB991220 C: MB991221 D: MB991222	Harness set A: Check harness B: LED harness C: LED harness adapter D: Probe	Continuity check and voltage measurement at harness wire or connector A: For checking connector pin contact pressure B: For checking power supply circuit C: For checking power supply circuit D: For connecting a locally sourced tester

TROUBLESHOOTING

DIAGNOSIS TROUBLESHOOTING FLOW

M1541201400021

Refer to GROUP 00 – Contents of Troubleshooting .

CHECK CHART FOR TROUBLE SYMPTOMS

M1541201100279

⚠ CAUTION

- **During diagnosis, a diagnosis code associated with other system may be set when the ignition switch is turned on with connector(s) disconnected. On completion, confirm all systems for diagnosis code(s). If diagnosis code(s) are set, erase them all.**
- **When the battery cable is disconnected or the combination meter is removed, the fuel gauge learned value will be erased. To let the display unit re-learn it, enter the vehicle speed (by driving the vehicle or entering simulated vehicle speed) and then stop the vehicle.**

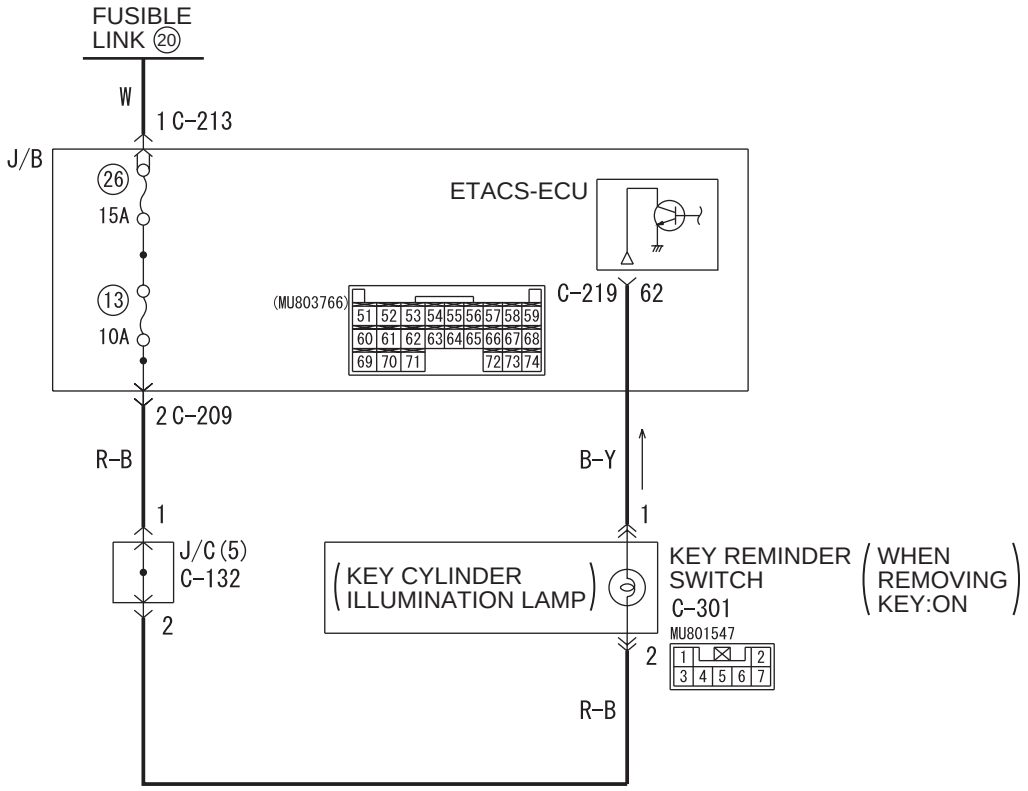
Trouble symptom	Inspection procedure number	Reference page
The ignition key cylinder illumination lamp does not illuminate normally. <Except single cab>	1	P.54A-17
Malfunction of the ignition switch power supply system	2	P.54A-22

SYMPTOM PROCEDURES

Inspection Procedure 1: The ignition key cylinder illumination lamp does not illuminate normally. <Except single cab>

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Ignition Key Cylinder Illumination Lamp Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver WAC54E064A

COMMENTS ON TROUBLE SYMPTOM
The ETACS-ECU operates this function in accordance with the input signals below.
- Ignition switch (IG1)
- Key reminder switch
- Door switch (front: RH)

If this function does not work normally, these input signal circuit(s), the ignition key cylinder illumination lamp or the ETACS-ECU may be defective.

PROBABLE CAUSES
- Malfunction of the key reminder switch
- Malfunction of the door switch (front: RH)
- Malfunction of the ignition key cylinder illumination lamp bulb
- Malfunction of the ETACS-ECU
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. Check the operation of the front room lamp and rear room lamp.
Check that the front room lamp and rear room lamp illuminate and extinguish normally.

Q: Is the check result normal?

YES <Vehicles without key reminder switch> : Go to Step 2.
YES <Vehicles with key reminder switch> : Go to Step 3.
NO : Refer to inspection procedure 1 "The interior lamps (front room ramp, rear room lamp and ignition key cylinder illumination lamp) does not illuminate or extinguish normally P.54A-181."

STEP 2. M.U.T.-III data list
Check the input signals below, which are related to the ignition key cylinder illumination lamp.
- When the closed driver's door is opened.

Item No.	Item name	Normal condition
19	Drive's door switch	ON

OK: Normal condition is displayed.

Q: Is the check result normal?
YES : Go to Step 4.
NO : Refer to inspection procedure C-5 "One of the door switch signals is not received P.54A-540."

STEP 3. M.U.T.-III data list
Check the input signals below, which are related to the ignition key cylinder illumination lamp.
- Turn the ignition switch to the "LOCK" (OFF) position. (key inserted)

Item No.	Item name	Normal condition
28	Steering lock switch	OFF

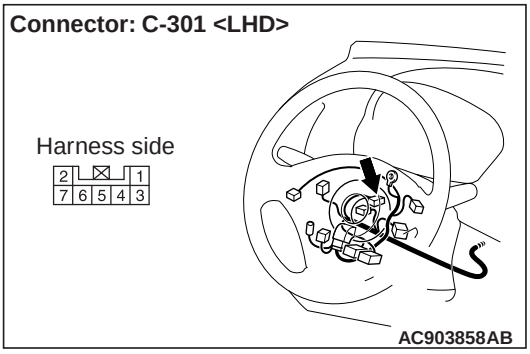
OK: Normal condition is displayed.

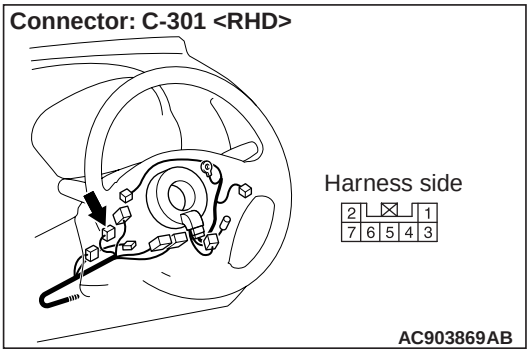
Q: Is the check result normal?
YES : Go to Step 5.
NO : Replace the ETACS-ECU.

STEP 4. Check the key reminder switch.
Check that the key reminder switch works normally. Refer to P.54A-26.

Q: Is the check result normal?
YES : Go to Step 5.
NO : Replace the steering lock cylinder assembly.

STEP 5. Connector check: C-301 key reminder switch connector



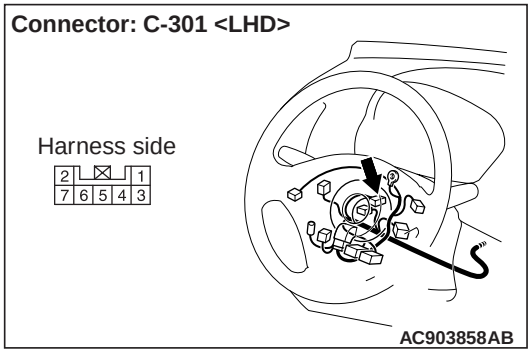


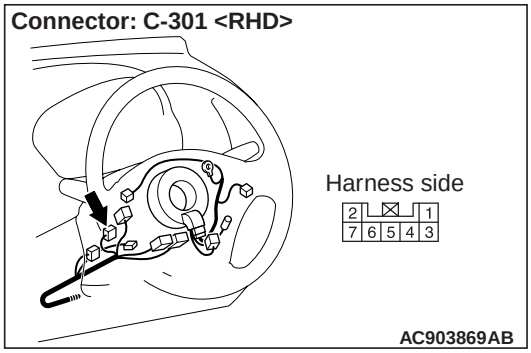
Q: Is the check result normal?
YES : Go to Step 6.
NO : Repair the defective connector.

STEP 6. Check the bulb of the ignition key cylinder illumination lamp.
Check the bulb of the ignition key cylinder illumination lamp.

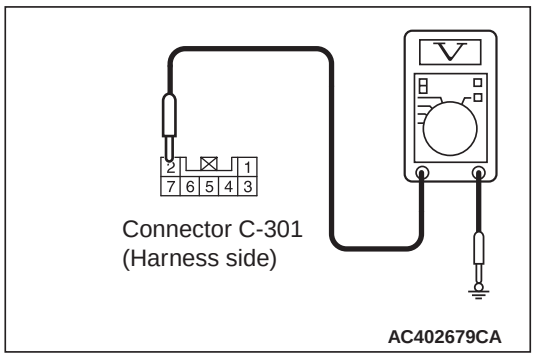
Q: Is the check result normal?
YES : Go to Step 7.
NO : Replace the steering lock cylinder assembly.

STEP 7. Voltage measurement at C-301 key reminder switch connector





(1) Disconnect the connector, and measure at the wiring harness side.

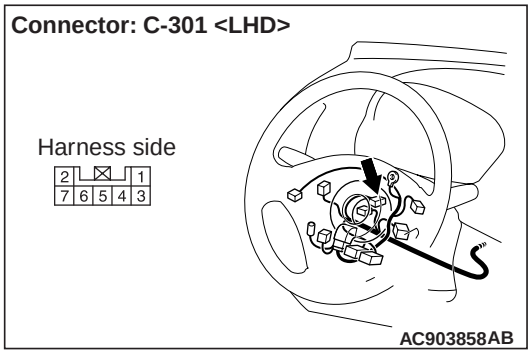


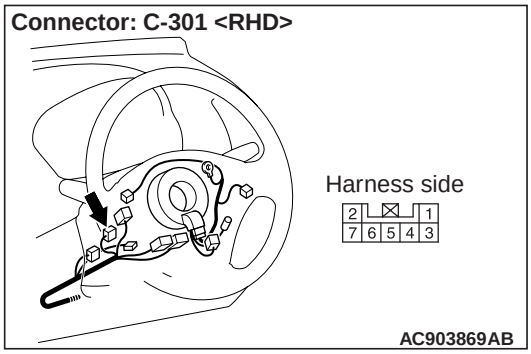
(2) Voltage between C-301 power window main switch connector terminal No.2 and body earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 9.
NO : Go to Step 8.

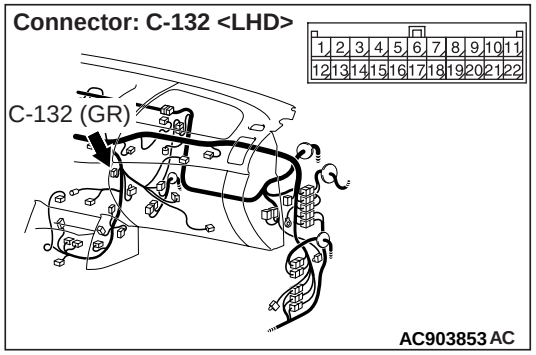
STEP 8. Check the wiring harness from C-301 key reminder switch connector terminal No.2 to fusible link (20).

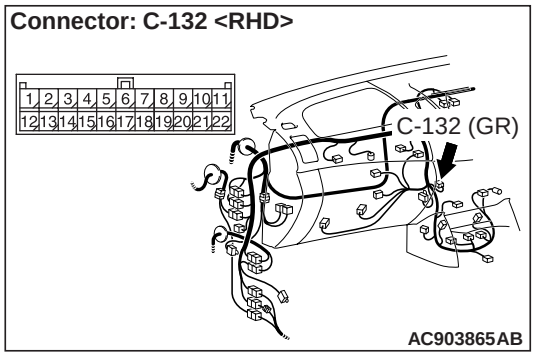


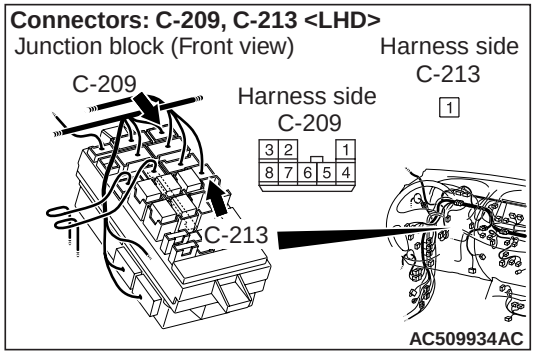


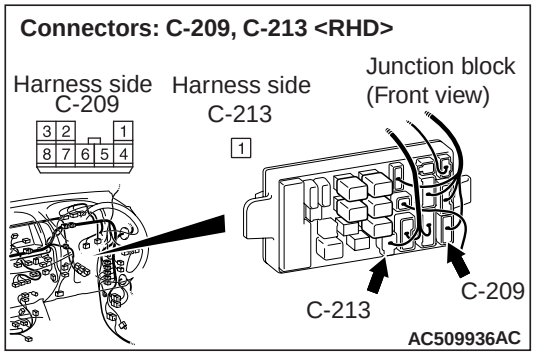
Check the power supply line for open circuit.

NOTE:









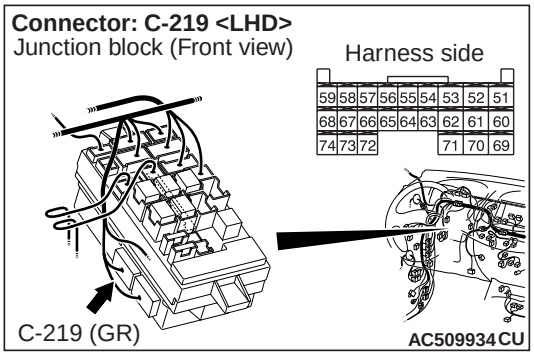
Prior to the wiring harness inspection, check joint connectors C-132, and junction block connector C-209 and C-213, and repair if necessary.

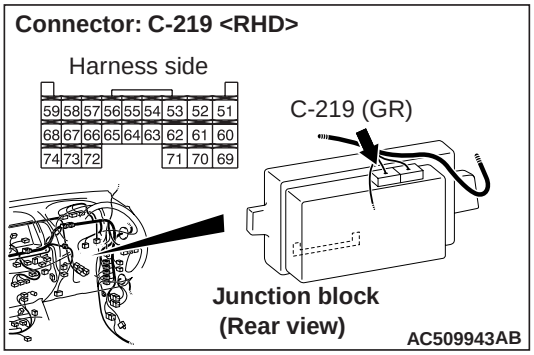
Q: Is the check result normal?

YES : Go to Step 11.

NO : Repair the wiring harness.

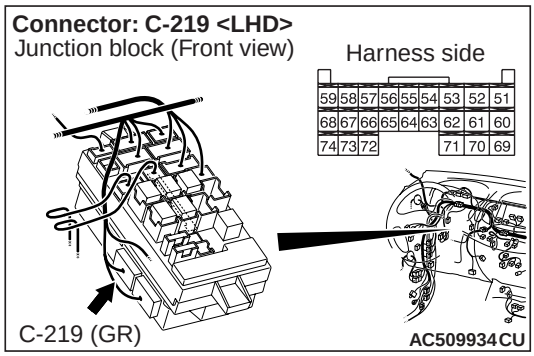
STEP 9. Connector check: C-219 ETACS-ECU connector

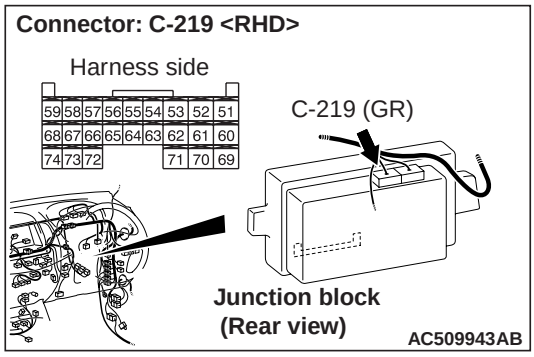


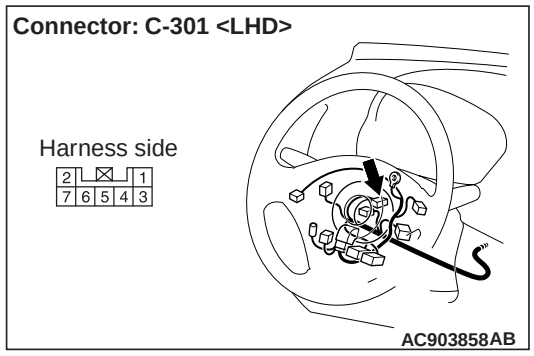


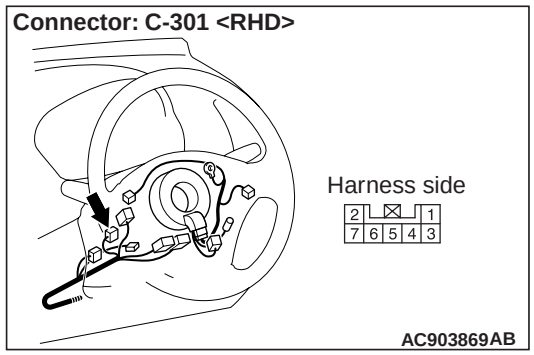
Q: Is the check result normal?
YES : Go to Step 10.
NO : Repair the defective connector.

STEP 10. Check the wiring harness from C-219 ETACS-ECU connector terminal No.62 to C-301 key reminder switch connector terminal No.1.









Check the input line for open circuit or short circuit.

Q: Is the check result normal?
YES : Go to Step 11.
NO : Repair the wiring harness.

STEP 11. Retest the system.
Check that the ignition key cylinder illumination lamp illuminates or extinguishes normally.

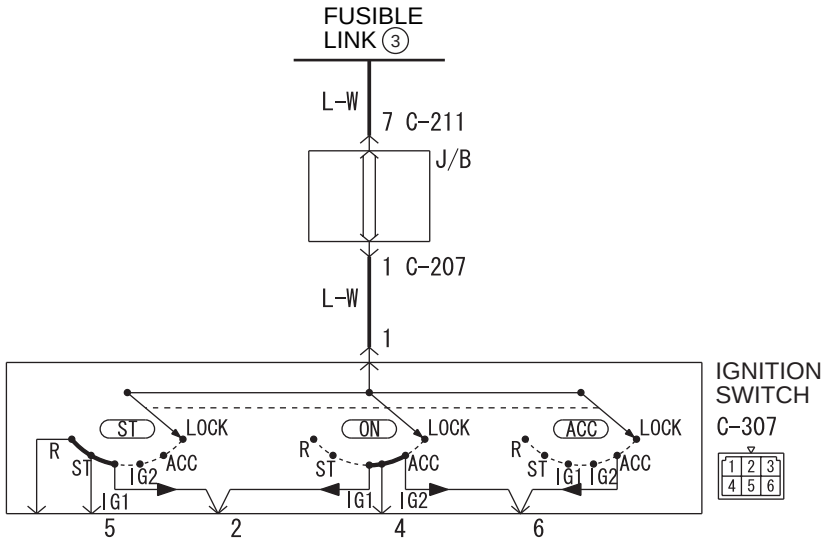
Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction).
NO : Replace the ETACS-ECU and register the ID codes (Refer to P.54A-39).

Inspection Procedure 2: Malfunction of the ignition switch power supply system

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Ignition Switch Power Source Circuit



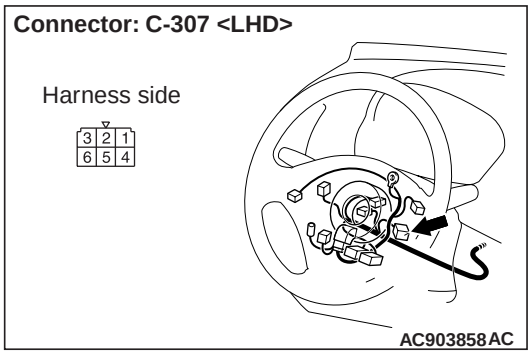
Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver WAC54E065A

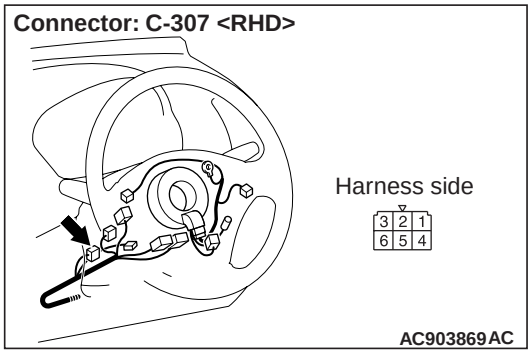
COMMENTS ON TROUBLE SYMPTOM
When the power supply system of ignition switch has a problem, none of the equipment and system connected to the ignition switch works even if the ignition switch is operated.

POSSIBLE CAUSES
- Malfunction of the ignition switch
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

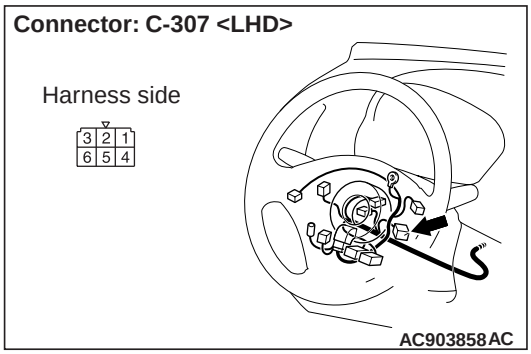
STEP 1. Connector check: C-307 ignition switch connector

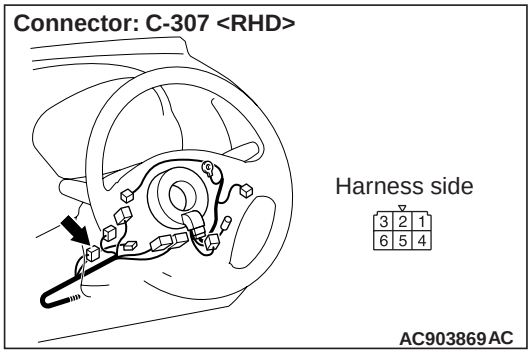




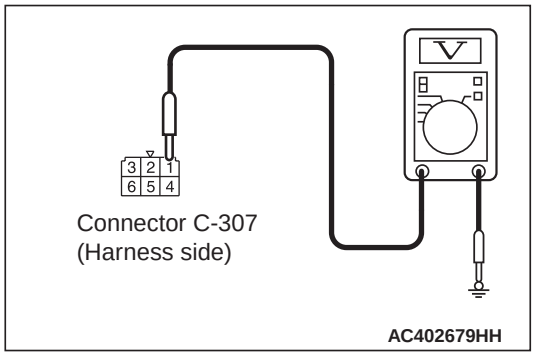
Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the defective connector.

STEP 2. Voltage measurement at ignition switch connector C-307 in order to check the battery circuit of power supply system to the ignition switch.





(1) Disconnect the ignition connector C-307 and measure the voltage at ignition switch connector C-307 harness side.

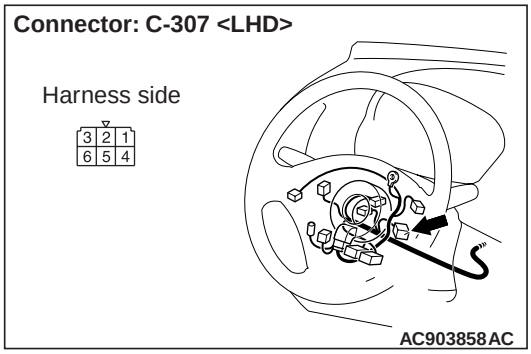


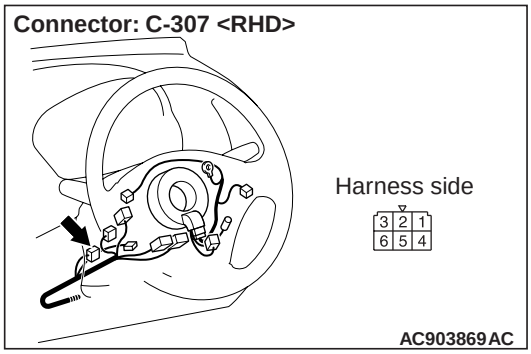
(2) Measure the voltage between terminal 1 and earth.

OK: System voltage

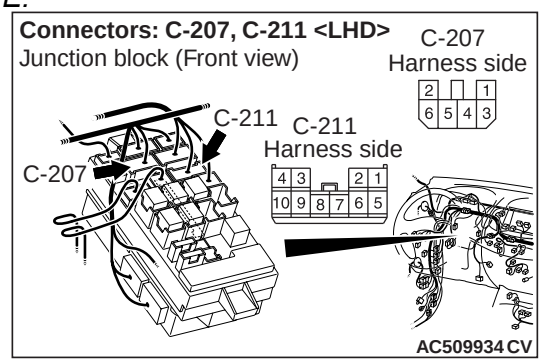
Q: Is the check result normal?
YES : Go to Step 4.
NO : Go to Step 3.

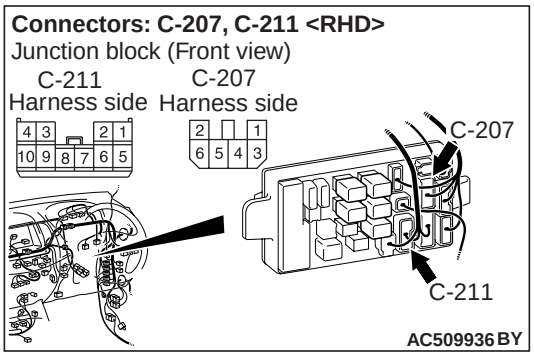
STEP 3. Check the wiring harness from ignition switch connector C-307 (terminal No.1) to fusible link (3).





NOTE:





Prior to the wiring harness inspection, check junction block connector C-207 and C-211, and repair if necessary.

- Check the battery power supply line for open circuit.

Q: Is the check result normal?

YES : Go to Step 5.
NO : Repair the wiring harness.

STEP 4. Check the ignition switch.

Refer to P.54A-26.

Q: Is the ignition switch in good condition?

YES : Go to Step 5.
NO : Replace the ignition switch.

STEP 5. Retest the system.

Q: Do the device and the system work normally when the ignition switch is operated?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction).
NO : Return to Step 1.

REMOVAL AND INSTALLATION

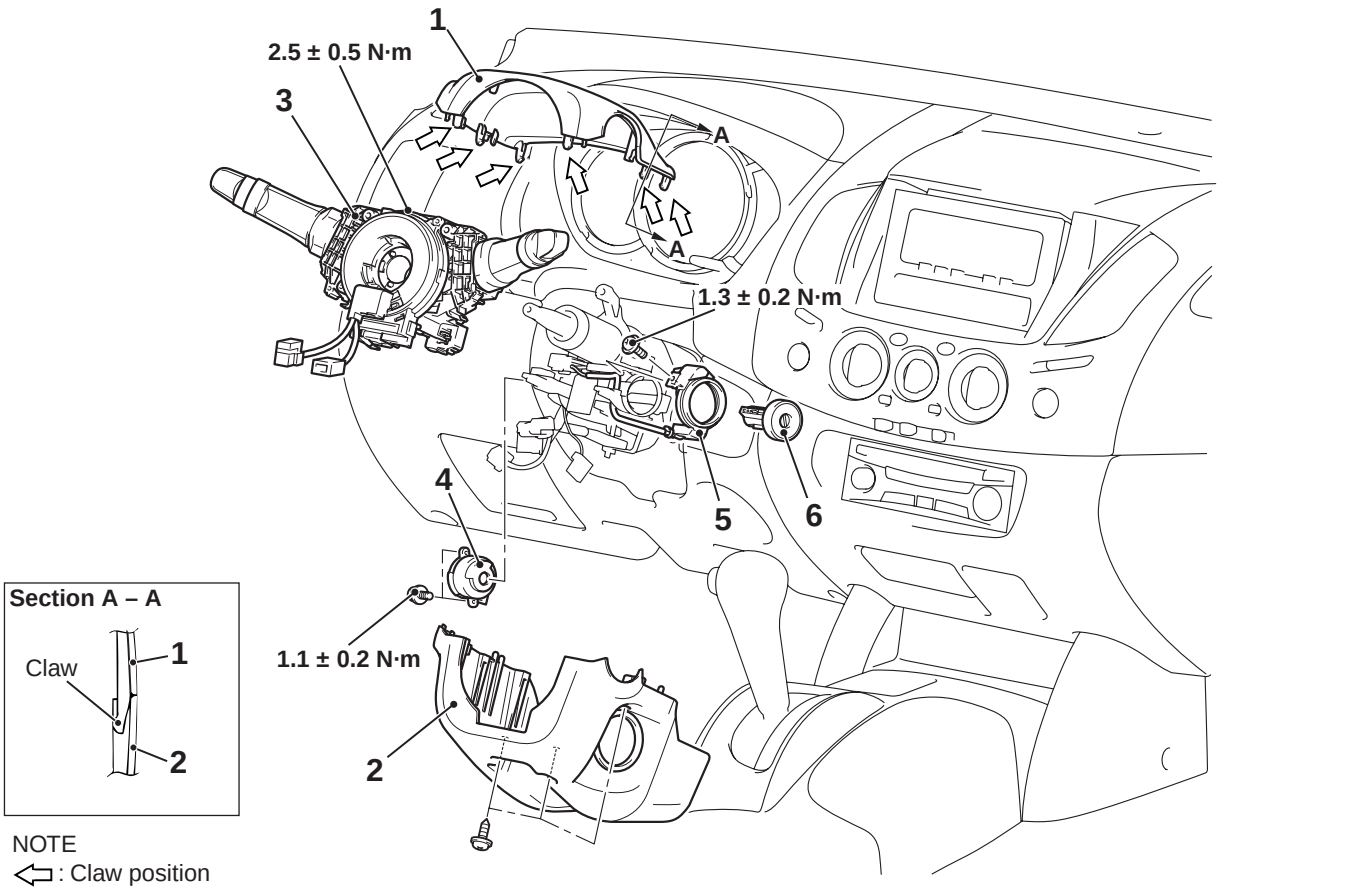
M1541200300849

⚠ *WARNING*

- ***Before removal of the air bag module, refer to GROUP 52B, Service Precautions () and Driver's, Front Passenger's Air Bag Module(s) and Clock Spring ().***
- ***When removing and installing the steering wheel, do not let it bump against the air bag module.***

⚠ CAUTION

When the steering lock cylinder is replaced, refer to the ID Code Registration Judgement Table P.54A-39 and register the each ID code.



AC805697 AB

Removal steps

- Lower panel (Refer to GROUP 52A, Instrument panel assembly .)

1. Steering column upper cover (Refer to GROUP 52A, Instrument Panel Assembly).
2. Steering column lower cover (Refer to GROUP 52A, Instrument Panel Assembly).

<<A>>
<<B>>

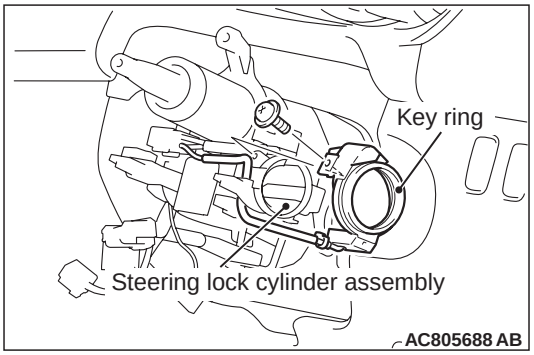
Removal steps (Continued)

- Steering wheel (Refer to GROUP 37, Steering wheel .)

3. Column switch assembly
4. Ignition switch
5. Key ring
6. Steering lock cylinder

REMOVAL SERVICE POINTS

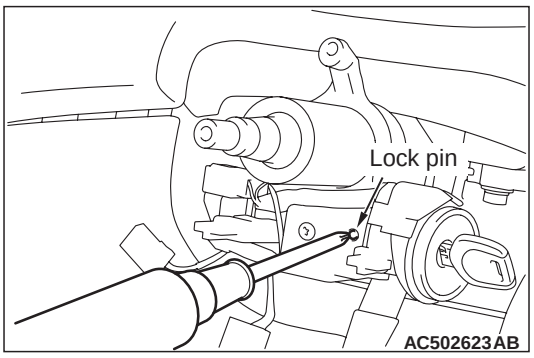
<<A>> KEY RING REMOVAL



Remove the key ring from the steering lock cylinder assembly because the key ring cannot be removed from the vehicle with immobilizer system.

<<B>> STEERING LOCK CYLINDER REMOVAL

1. Insert the key in the steering lock cylinder and turn it to the "ACC" position.

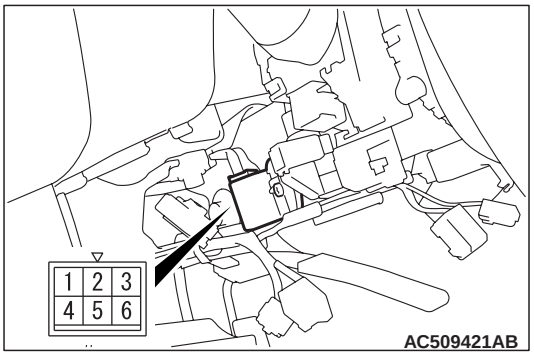


2. Using a small Phillips head screwdriver, pull the steering lock cylinder toward you.

INSPECTION

IGNITION SWITCH CONTINUITY CHECK

M1541200400039

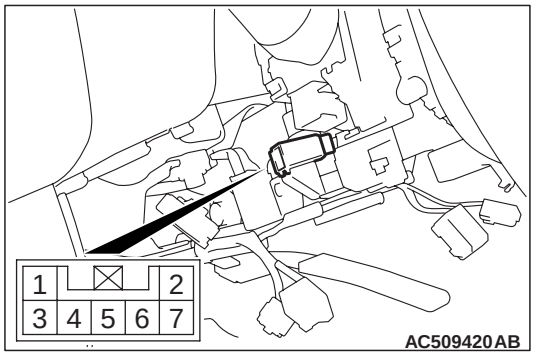


Disconnect ignition switch connector without removing the ignition switch. Then check the continuity.

Switch position	Tester connection	Specified condition
"LOCK" (OFF)	1 – 2, 1 – 4, 1 – 5, 1 – 6	Open circuit
"ACC"	1 – 6	Continuity exists (2 Ω or less)
"ON"	1 – 2, 1 – 4, 1 – 6, 2 – 4, 2 – 6, 4 – 6	
"START"	1 – 2, 1 – 5, 2 – 5	

KEY REMINDER SWITCH CONTINUITY CHECK <VEHICLES WITH KEYLESS ENTRY SYSTEM>

M1541200500252



Disconnect key reminder switch connector without removing the ignition switch and key reminder switch. Then check the continuity.

Status of ignition key	Tester connection	Specified condition
Removed	4 – 6	Continuity exists (2 Ω or less)
Inserted	4 – 6	Open circuit

IMMOBILIZER SYSTEM

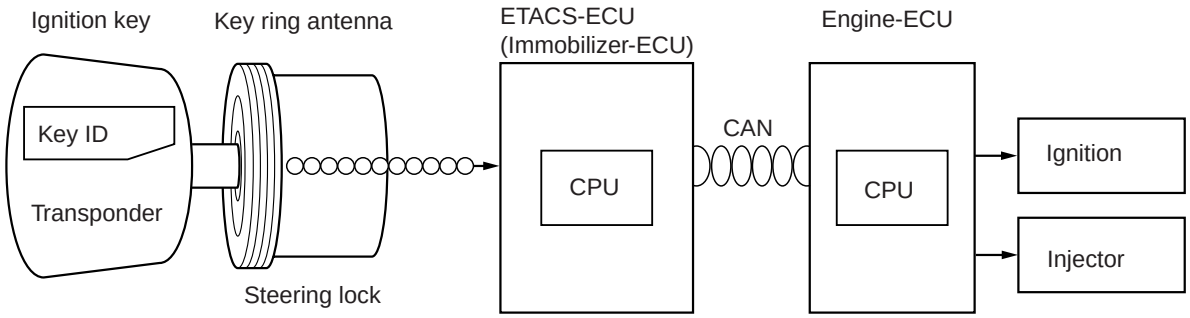
GENERAL INFORMATION

M1541107100076

The engine immobilizer system prevents the engine from starting and immobilizes the vehicle if a key other than the key registered for that vehicle is used in an attempt to start the engine after forced entry. The engine immobilizer system consists of the ignition key, key ring antenna, ETACS-ECU (immobilizer-ECU) and the engine-ECU. It works in the following way and has these functions.

1. With the ignition key turned ON, the transponder (a small transmitter) integrated in the ignition key transmits its own key ID to the key ring antenna via radio wave.
2. According to the sent key ID, the ETACS-ECU (immobilizer-ECU) controls the engine-ECU only when the sent key ID agrees with the pre-registered one.
3. The system is designed to be maintenance-free because the power source for the transponder is supplied by the ETACS-ECU (immobilizer-ECU). Two ignition keys are provided, and up to eight keys can be registered to one vehicle as needed. More than one trillion of key ID combinations can be registered, and parts of them are irregularly changed whenever the ignition key is turned ON. This feature prevents code copying, resulting in higher security of the system.

CONSTRUCTION DIAGRAM



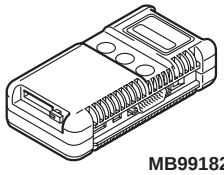
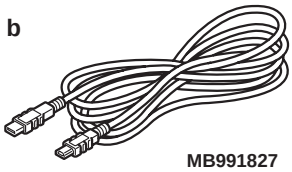
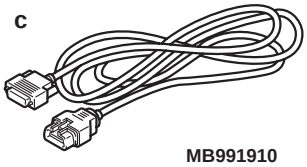
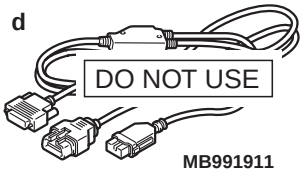
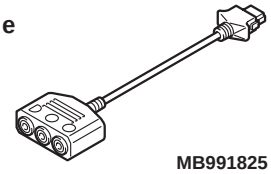
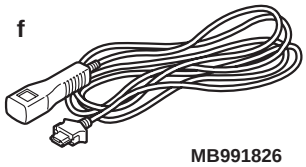
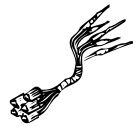
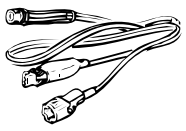
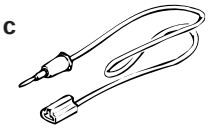
AC406526AQ

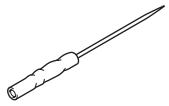
MAIN COMPONENTS

Component name	Outline of function
Transponder	Is power-supplied by the key ring antenna. When the transponder receives random number data, the transponder processes random number data and the key ID. Then it transmits the process result to the ETACS-ECU (immobilizer-ECU).
Key ring antenna	The ETACS-ECU (immobilizer-ECU) supplies power via an antenna on a steering lock by transmission of electromagnetic waves to a transponder built into a key, using magnetic coupling
ETACS-ECU (immobilizer-ECU)	• Supplies electrical power to the transponder integrated in the ignition key, and transmits random number data. • Verifies the key ID which is sent from the transponder. If the code is correct, it sends an engine mobilization signal to the engine-ECU.
Engine-ECU	Starts the engine, and then continues the engine running if an engine mobilization signal is confirmed. If an engine immobilization signal is confirmed, the ECU cancels the engine control and stops the engine.

SPECIAL TOOLS

M1541106600090

Tool	Number	Name	Use
a  MB991824 b  MB991827 c  MB991910 d  MB991911 e  MB991825 f  MB991826 MB991955	MB991955 a. MB991824 b. MB991827 c. MB991910 d. MB991911 e. MB991825 f. MB991826	M.U.T.-III sub-assembly a. Vehicle Communication Interface (V.C.I.) b. M.U.T.-III USB cable c. M.U.T.-III main harness A (Vehicles with CAN communication system) d. M.U.T.-III main harness B (Vehicles without CAN communication system) e. M.U.T.-III measure adapter f. M.U.T.-III trigger harness	⚠ CAUTION **For vehicles with CAN communication, use M.U.T.-III main harness A to send simulated vehicle speed. If you connect M.U.T.-III main harness B instead, the CAN communication does not function correctly.** Diagnosis code check
a  b  c  d MB991223	MB991223 a. MB991219 b. MB991220 c. MB991221 d. MB991222	Harness set a. Check harness b. LED harness c. LED harness adapter d. Probe	Continuity check and voltage measurement at harness wire or connector a. For checking connector pin contact pressure b. For checking power supply circuit c. For checking power supply circuit d. For connecting a locally sourced tester

Tool	Number	Name	Use
 MB992006	MB992006	Extra fine probe	Continuity check and voltage measurement at harness wire or connector

TROUBLESHOOTING

DIAGNOSIS TROUBLESHOOTING FLOW

M1541106700020

Refer to GROUP 00 – Contents of Troubleshooting .

DIAGNOSTIC FUNCTION

M1541100500170

HOW TO READ DIAGNOSIS CODE

Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points .

HOW TO ERASE DIAGNOSIS CODE

Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points .

CHECK OF FREEZE FRAME DATA

The freeze frame data can be checked by using M.U.T.-III. (Refer to GROUP 00 – How to Use Troubleshooting and Inspection Service Points – Diagnosis Function .

When detecting fault and storing the diagnosis code, the ECU connected to CAN bus line obtains the data before the determination of the diagnosis code and the data when the diagnosis code is determined, and then stores the ECU status of that time. By analysing each data from M.U.T.-III, the troubleshooting can be performed more efficiently. The displayed items are as the table below.

Display item list

Item No.	Item name	Data item	Unit
2	Ignition cycle	Number of times the ignition switch is turned "ON" or "LOCK (OFF)" after the past failure transition.	Number of counts is displayed.
3	Elapsed time	Total elapsed time after a diagnosis code is generated	min
4	Accumulated minute	Cumulative time for current malfunction of diagnosis code	min

CHART CLASSIFIED BY DIAGNOSIS CODES

M1541100400173

⚠ CAUTION

During diagnosis, a diagnosis code associated with other system may be set when the ignition switch is turned on with connector(s) disconnected. On completion, confirm all systems for diagnosis code(s). If diagnosis code(s) are set, erase them all.

Code No.	Diagnosis contents	Reference page
B1702	Reception error of key ID	P.54A-31
B1703	Key ID inconsistent	P.54A-32
B1722	Transponder antenna failure	P.54A-32
B1731	Communication error with the engine-ECU	P.54A-35

Code No.	Diagnosis contents	Reference page
B1761	Chassis No. not recorded	P.54A-36
B1766	Transponder registered for other vehicle	P.54A-36
U1073	Bus off	Refer to ETACS P.54A-501.

DIAGNOSIS CODE PROCEDURES

Code No.B1702: Reception error of key ID

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

OPERATION
The key reminder switch (ignition key ring antenna) supplies the ignition key with power, and the ignition key sends the key ID to the ETACS-ECU. ETACS-ECU receives the key ID with the key ring antenna, and judges if the ignition key is the registered one.

TROUBLE JUDGMENT
- Diagnosis code No.B1702 is stored when there are other ignition keys or anything that interferes with the communication (things that generate radio waves such as magnets and an air-cleaning device that has a power plug) near the ignition key that is going to start the engine.
- If the key ID is not sent to the ETACS-ECU even when the ignition switch is turned to the ON position, diagnosis code No.B1702 is stored.

NOTE: Diagnosis code No.B1702 is always set along with MPI system diagnosis code No.P0513.

PROBABLE CAUSES
- Interference of the key ID
- Malfunction of the key ring antenna (antenna wire)*

*NOTE: *: The code No. B1722 will be set if a trouble occurs in the key ring antenna.*
- Malfunction of ignition key
- Malfunction of ETACS-ECU

DIAGNOSIS PROCEDURE

STEP 1. Check the diagnosis code No.B1722 is set.

Q: Is the diagnosis code No.B1722 set?
YES : Refer to P.54A-32.
NO : Go to Step 2

STEP 2. Check the ignition key inserted in the key cylinder for interference.

Q: Are there other ignition keys or anything that interferes with the communication (things that generate radio waves such as magnets and an air-cleaning device that has a power plug) near the ignition key inserted in the key cylinder?
YES : Move away or remove other ignition keys or things that interfere with the communication (things that generate radio waves such as magnets and a air-cleaning device that has a power plug) near the ignition key. Then, go to step 4.
NO : Go to Step 3

STEP 3. Check with the spare key that has already been registered.
Check that the engine starts using the spare key that has already been registered.

Q: Is diagnosis code No.B1702 set?
YES : Replace the ETACS-ECU and register the ID codes again (Refer to P.54A-39). After registering the ID codes, go to Step 4.
NO : Replace the ignition key for which diagnosis code No.B1702 is set, and register the ID codes again (Refer to P.54A-39). After registering the ID codes, go to Step 4.

STEP 4. Check whether the diagnosis code is reset.
(1) Turn the ignition switch to the "LOCK" (OFF) position once, and then turn it to the ON position again.
(2) On completion, check that diagnosis code No.B1702 is not reset.

Q: Is diagnosis code No.B1702 set?

YES : Return to Step 1.
NO : The diagnosis is complete. If another diagnosis code is set, refer to Diagnosis Code Chart P.54A-30.

Code No.B1703: Key ID inconsistent

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

TROUBLE JUDGMENT
When the key ID that is sent from the transponder does not correspond to the key ID registered in the ETACS-ECU, the ETACS-ECU sets diagnosis code No.B1703.

NOTE: Diagnosis code No.B1703 is always set along with MPI system diagnosis code No.P0513.

PROBABLE CAUSES
- Ignition key (key ID) is not registered
- Malfunction of ETACS-ECU

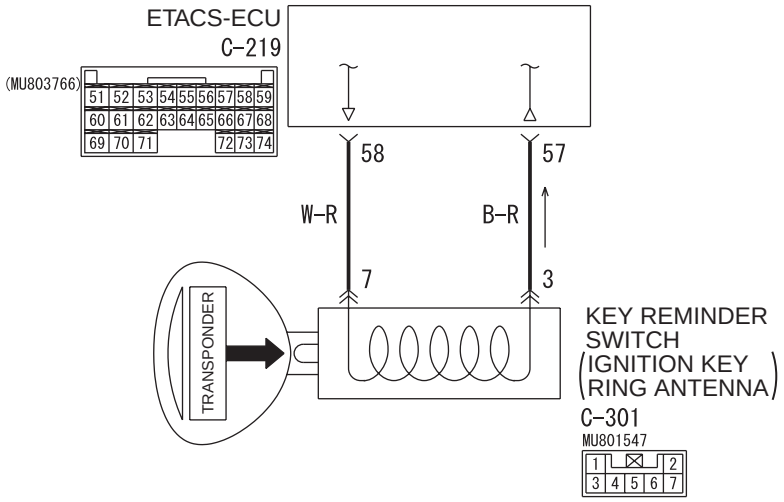
DIAGNOSIS PROCEDURE

Register all the ignition key IDs again, and recheck the diagnosis code.
(1) Register all the ignition keys again (Refer to P.54A-39).
(2) Turn the ignition switch from the "LOCK" (OFF) position to the ON position.
(3) Check that diagnosis code No.B1703 is not reset.

Q: Is diagnosis code No.B1703 set?
YES : Replace the ETACS-ECU and register the ID codes (Refer to P.54A-39). After registering the ID codes, check if the diagnosis code is set.
NO : The diagnosis is complete. If another diagnosis code is set, refer to Diagnosis Code Chart P.54A-30.

Code No. B1722: Transponder antenna failure

Key Reminder Switch (Ignition Key Ring Antenna) and ETACS-ECU Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

WBC54X010A

TROUBLE JUDGEMENT

Diagnosis code No.B1722 is stored when the ETACS-ECU cannot communicate with the ignition key because of defective key ring antenna (antenna wire).

COMMENT ON TROUBLE SYMPTOM

Current trouble

- The wiring harness wire or connectors between the ETACS-ECU and the key ring antenna may have loose, corroded, or damage terminals, or terminals pushed back in the connector, or the key ring antenna (antenna wire) may be defective.

Past trouble

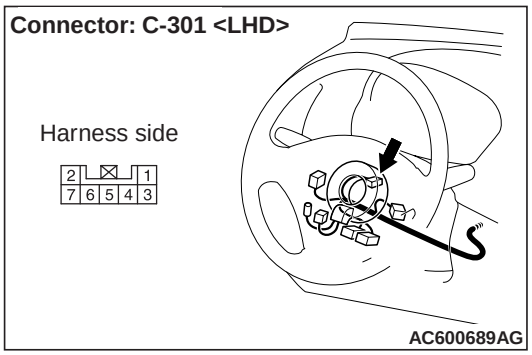
- If diagnosis code No.B1722 is stored as a past trouble, it is possible that there were defective wiring harnesses, defective connectors or defective antennas before.

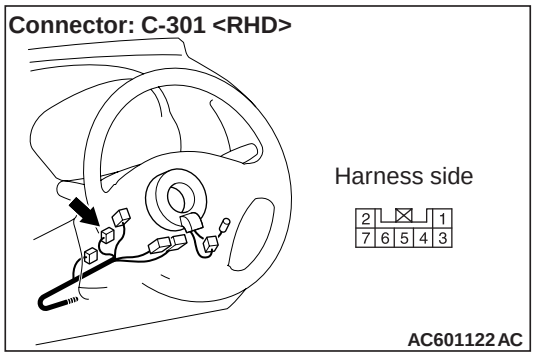
PROBABLE CAUSES

- Damaged harness wires and connectors
- Malfunction of the key ring antenna (antenna wire)
- Malfunction of ETACS-ECU

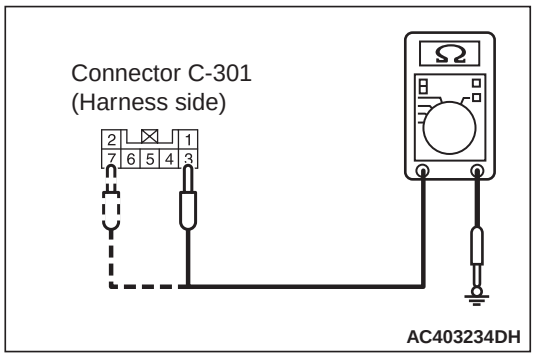
DIAGNOSIS PROCEDURE

STEP 1. Check the key reminder switch (ignition key ring antenna)





(1) Disconnect the key reminder switch (ignition key ring antenna) connector C-301.



(2) Take the measurements below at component-side connector.
There should be continuity between terminals 3, 7 and body earth.

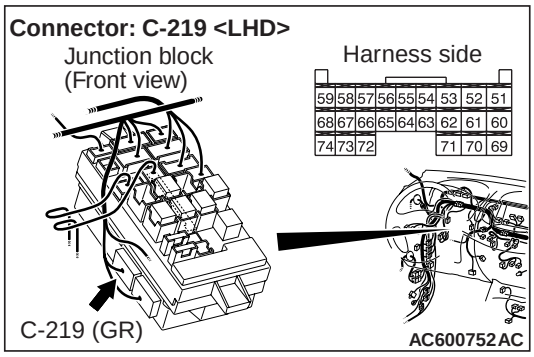
OK: Continuity exists (2 Ω or less)

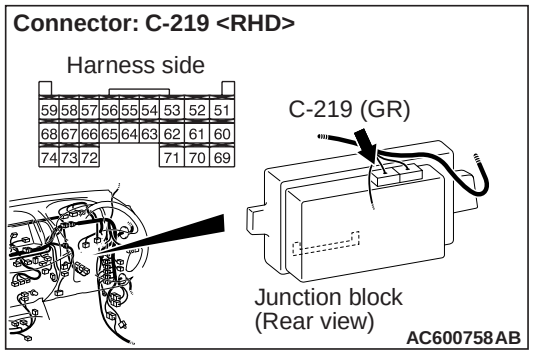
Q: Is the check result satisfactory?

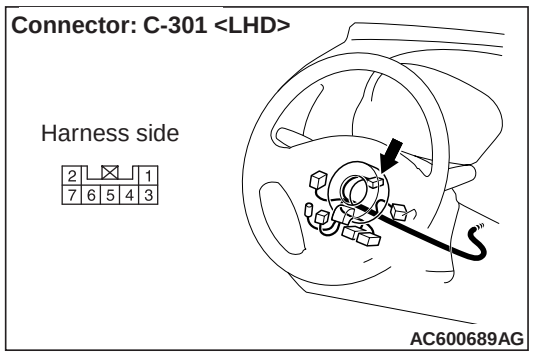
YES : Go to Step 2.

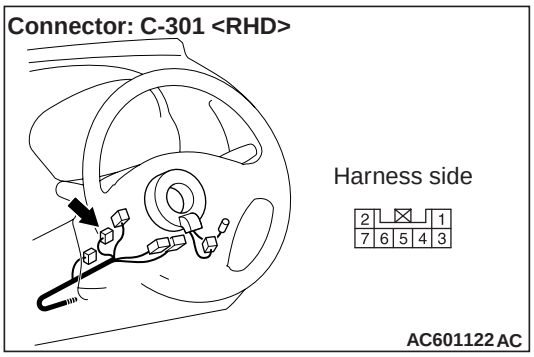
NO : Replace the key reminder switch (ignition key ring antenna), and then go to Step 5 .

STEP 2. Connector check: ETACS-ECU connector C-219 and key reminder switch (ignition key ring antenna) connector C-301.



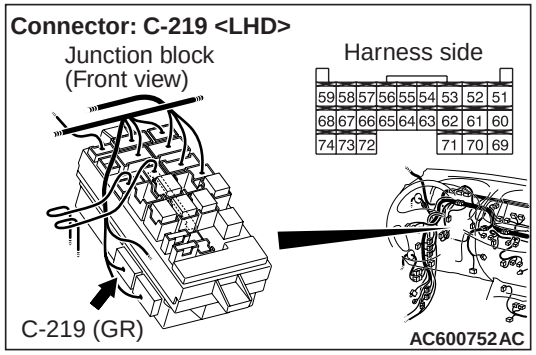


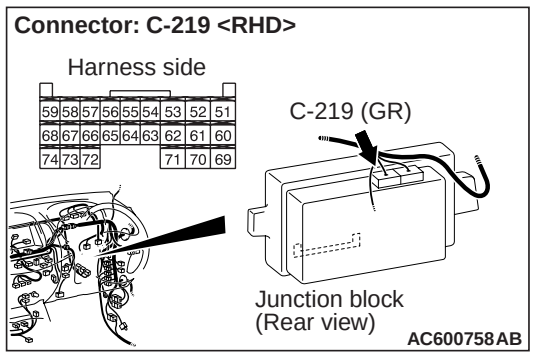


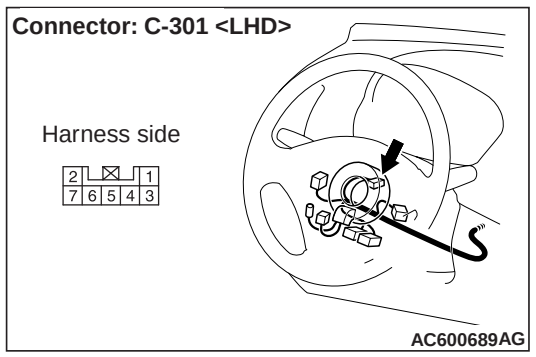


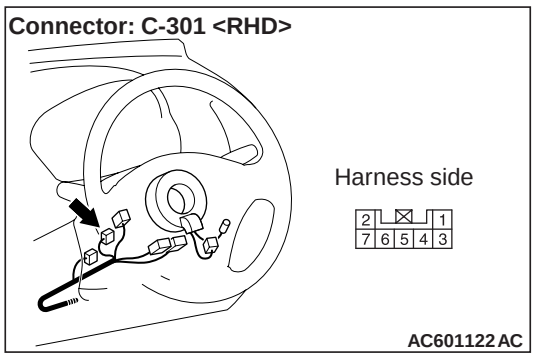
Q: Is the check result satisfactory?
YES : Go to Step 3.
NO : Repair the connector, and then go to Step 4.

STEP 3. Check the wiring harness between ETACS-ECU connector C-219 (terminal 57 and 58) and key reminder switch (ignition key ring antenna) connector C-301 (terminal 3 and 7).









Q: Is the check result normal?
YES : Go to Step 4.
NO : Repair the wiring harness, and then go to Step 4.

STEP 4. Check whether the diagnosis code is reset.

(1) Turn the ignition switch to the "LOCK" (OFF) position once, and then turn it to the ON position again.
(2) Check if diagnosis code No.B1722 is set as a current trouble.

Q: Is diagnosis code No.B1722 set as a current trouble?

YES : Replace the key reminder switch (ignition key ring antenna), and then go to Step 5.
NO : If diagnosis code No.B1722 is set as a past trouble, erase the diagnosis code that is set as a past trouble, and the diagnosis is complete.

STEP 5. Check whether the diagnosis code is reset.

(1) Turn the ignition switch to the "LOCK" (OFF) position once, and then turn it to the ON position again.
(2) Check if diagnosis code No.B1722 is set as a current trouble.

Q: Is diagnosis code No.B1722 set as a current trouble?

YES : Replace the ETACS-ECU and register the ID codes (Refer to P.54A-39). After registering the ID codes, return to Step 1.
NO : If diagnosis code No.B1722 is set as a past trouble, erase the diagnosis code that is set as a past trouble, and the diagnosis is complete.

Code No. B1731: Communication error with the engine-ECU

⚠ CAUTION
If diagnosis code No.B1731 is set in the immobilizer-ECU, diagnose the CAN bus lines.

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

TROUBLE JUDGMENT
If the immobilizer-ECU cannot receive any signals from the engine-ECU, diagnosis code B1731 will be set.

COMMENT ON TROUBLE SYMPTOM
Connector(s) or wiring harness in the CAN bus lines between the immobilizer-ECU and the engine-ECU, the power supply system to the engine-ECU, the engine-ECU itself, or the immobilizer-ECU itself may be defective.

NOTE: Diagnosis code No.B1731 is always set along with MPI system diagnosis code No.U1117.

PROBABLE CAUSES
- Malfunction of engine-ECU
- Malfunction of immobilizer-ECU
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics.
Use the M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?

YES : Go to Step 2.
NO : Repair the CAN bus line (Refer to GROUP 54C – Troubleshooting). Repair the CAN bus line and go to Step 3.

STEP 2. Check whether the diagnosis code is reset.
Check again if the diagnosis code is set.

(1) Turn the ignition switch to the "LOCK" (OFF) position once, and then turn it to the ON position again.
(2) Check that diagnosis code No.B1731 is not set as a current trouble.

Q: Is diagnosis code No.B1731 set?

YES : Replace the immobilizer-ECU and register the ID codes. (Refer to P.54A-39.) After registering the ID codes, go to Step 3.
NO : The diagnosis is complete. If another diagnosis code is set, refer to Diagnosis Code Chart P.54A-30.

STEP 3. Check whether the diagnosis code is reset.
Recheck if the diagnosis code is set.

(1) Turn the ignition switch to the "LOCK" (OFF) position once, and then turn it to the ON position again.
(2) Check that diagnosis code No.B1731 is not set as a current trouble.

Q: Is diagnosis code No.B1731 set?

YES : Replace the engine-ECU and resister the ID code. (Refer to P.54A-39.)
NO : The diagnosis is complete. If another diagnosis code is set, refer to Diagnosis Code Chart P.54A-30.

Code No.B1761: Chassis No. not recorded

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

TROUBLE JUDGMENT
If the chassis No. data is not written when the ETACS-ECU is replaced, the ETACS-ECU sets diagnosis code No.B1761.

PROBABLE CAUSES
- Chassis No. not written
- Damaged harness wires and connectors
- Malfunction of ETACS-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics.
Use the M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the CAN bus line (Refer to GROUP 54C – Troubleshooting). Repair the CAN bus line.

STEP 2. Write the Chassis No.
Write the chassis No. data to the ETACS-ECU [Refer to GROUP 00 – How to perform chassis number (Chassis No.) writing].

Q: Is diagnosis code No.B1761 set?
YES : Replace the ETACS-ECU and register the ID codes (Refer to P.54A-39).
NO : The procedure is complete.

Code No.B1766: Transponder registered for other vehicle

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

TROUBLE JUDGMENT
If the key registered for another vehicle is used to start the engine, the ETACS-ECU sets diagnosis code No.B1766.

PROBABLE CAUSES
- Ignition key (key ID) is another vehicle's key
- Ignition key (key ID) is new key
- Malfunction of ETACS-ECU

DIAGNOSIS PROCEDURE

STEP 1. All ignition keys registration
Check that the all ignition keys are registered.

Q: Is the check result normal?
YES : Go to Step 2
NO : Register the all ignition keys. Refer to P.54A-39.

STEP 2. M.U.T.-III CAN bus diagnostics.
Use the M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 3
NO : Repair the CAN bus line (Refer to GROUP 54C – Troubleshooting). Repair the CAN bus line.

STEP 3. Check with another key that has already been registered.
Turn the ignition switch to the ON position using another key that has already been registered.

Q: Is the diagnosis code set?

YES : Replace the all ignition keys or by the service key set, and register the ID codes (Refer to P.54A-39). After registering the ID codes, go to Step 4.
NO : Replace the ignition key that the diagnosis code is set, and register the ID codes again (Refer to P.54A-39). After registering the ID codes, go to Step 4.

STEP 4. Check whether the diagnosis code is reset.
Check again if the diagnosis code is set.
(1) Turn the ignition switch to the "LOCK" (OFF) position once, and then turn it to the ON position again.
(2) Check that diagnosis code No.B1766 is not set.

Q: Is diagnosis code No.B1766 set?
YES : Replace the ETACS-ECU and register the ID codes (Refer to P.54A-39).
NO : The procedure is complete.

TROUBLE SYMPTOM CHART

M1541100300176

⚠ CAUTION
During diagnosis, a diagnosis code associated with other system may be set when the ignition switch is turned on with connector(s) disconnected. On completion, confirm all systems for diagnosis code(s). If diagnosis code(s) are set, erase them all.

Trouble symptom	Inspection procedure No.	Reference page
The ignition key cannot be registered with the M.U.T.-III.	1	P.54A-37
The engine does not start (Cranking occurs but initial combustion does not).	2	P.54A-38

SYMPTOM PROCEDURES

Inspection Procedure 1: The ignition key cannot be registered with the M.U.T.-III.

COMMENTS ON TROUBLE SYMPTOM
If only some ignition keys cannot be registered, the ignition key itself may be defective. If no ignition key can be registered, the key assembly may have already been registered for another vehicle, or the ETACS-ECU may be defective.

PROBABLE CAUSES
- Malfunction of ignition key
- Damaged harness wires and connectors
- Malfunction of ETACS-ECU
- Malfunction of engine-ECU
- Transponder registered for other vehicle

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics.
Use the M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the CAN bus line (Refer to GROUP 54C – Troubleshooting). Repair the CAN bus line.

STEP 2. Check the ignition key inserted in the key cylinder for interference.

Q: Are there other ignition keys or anything that interferes with the communication (things that generate radio waves such as magnets and an air-cleaning device that has a power plug) near the ignition key inserted in the key cylinder?
YES : Move away or remove other ignition keys or things that interfere with the communication (things that generate radio waves such as magnets and a air-cleaning device that has a power plug) near the ignition key. Then, go to step 3.
NO : Go to Step 4.

STEP 3. Retest the system.
Check that the ignition key can be registered.

Q: Is the check result normal?
YES : The procedure is complete.
NO : Go to Step 4.

STEP 4. Check which ignition key cannot be registered.

Q: Are there only some ignition keys that cannot be registered?
Only some keys : Replace the key that cannot be registered and register the ID codes (Refer to P.54A-39). After registering the ID codes, go to Step 6.
All keys : Go to Step 5.

STEP 5. Retest the system.
Check the M.U.T.-III screen when the key was not able to be registered.

Q: Which error message did the M.U.T.-III display?
Defective key : Carry out the troubleshooting for diagnosis code B1722 Transponder Antenna Failure (Refer to P.54A-32). Then, go to Step 6.
ECU internal error : Replace the ETACS-ECU and register the ID codes (Refer to P.54A-39). After registering the ID codes, go to Step 6.

STEP 6. Retest the system.
Check that the ignition key can be registered.

Q: Is the check result normal?
YES : The procedure is complete.
NO : Replace the ETACS-ECU and register the ID codes (Refer to P.54A-39).

Inspection Procedure 2: The engine does not start (cranking occurs but initial combustion does not).

COMMENTS ON TROUBLE SYMPTOM
If the fuel injection does not work, the ETACS- ECU and the diesel system may be defective. It is no problem with the malfunction above when the engine is started with unregistered ignition key.

PROBABLE CAUSES
- Malfunction of diesel system
- Malfunction of ETACS-ECU
- Damaged harness wires and connectors
- Malfunction of ignition key
- Chassis No. not written

DIAGNOSIS PROCEDURE

STEP 1. Battery voltage check
Measure the battery voltage when cranking.

OK: 8 V or more

Q: Is the check result normal?
YES : Go to Step 2.
NO : Check the battery (Refer to P.54A-9).

STEP 2. M.U.T.-III CAN bus diagnostics
Use the M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the CAN bus line (Refer to GROUP 54C – Troubleshooting).

STEP 3. M.U.T.-III other system diagnosis code
Check whether the diesel system-related diagnosis code is set.

Q: Is the diagnosis code set?
YES : Refer to GROUP 13A, Troubleshooting .
NO : Go to Step 4.

STEP 4. M.U.T.-III diagnosis code
Check whether the engine immobilizer system-related diagnosis code is set.

Q: Is the diagnosis code set?
YES : Refer to P.54A-30.
NO : Go to Step 5.

STEP 5. Check that the engine starts.

Q: Does the engine start?
YES : The procedure is complete.
NO : Refer to GROUP 13A, Troubleshooting . Replace the ETACS-ECU and register the ID codes when the cause of the failure cannot be tracked down by performing the troubleshooting in GROUP 54A (Refer to P.54A-39).

DATA LIST REFERENCE TABLE

M1541104000092

Item No.	Inspection item	Inspection requirement	Normal condition
1	Memorized transponder keys	–	Number of registered ignition keys

CHECK ETACS-ECU (IMMOBILIZER-ECU) ON-VEHICLE SERVICE

M1541104100163

TERMINAL VOLTAGE CHECK TABLE

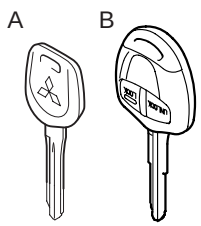
Refer to P.54A-553.

HOW TO REGISTER ENCRYPTED CODE

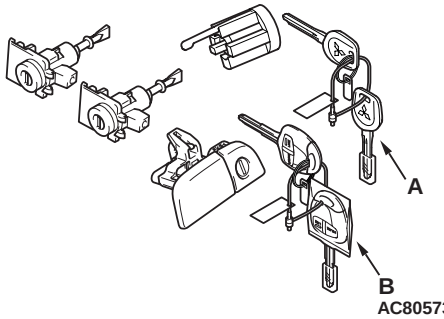
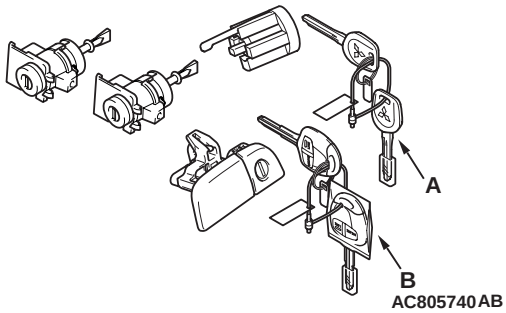
M1541104300510

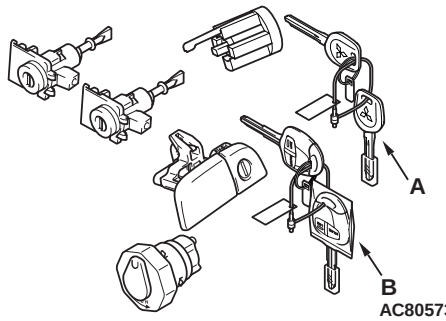
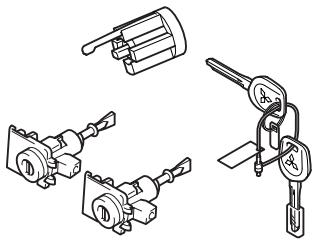
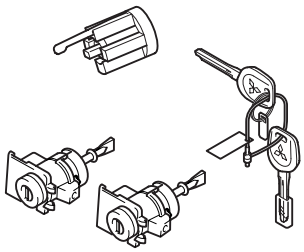
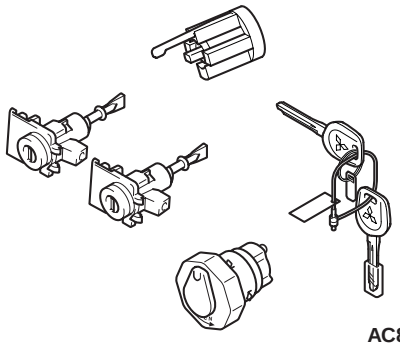
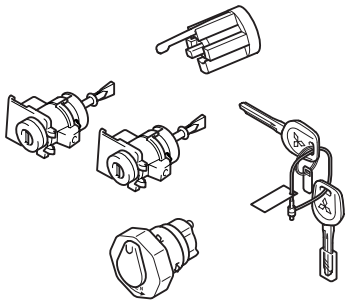
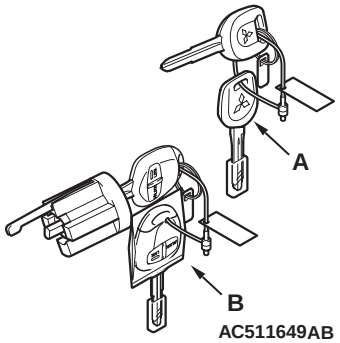
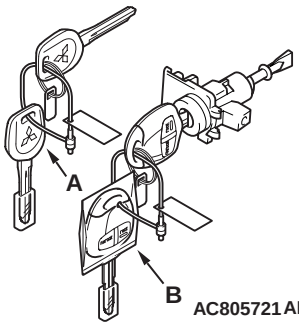
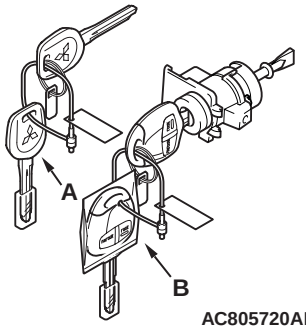
For details of the key registration procedure, refer to the ID registration manual.

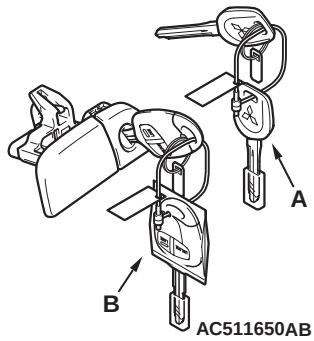
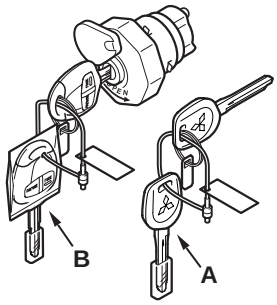
KEY SUPPLY UNIT

Ignition key <single unit> (A: without transmitter, B: with transmitter)
 AC503862AB

KEY SUPPLY UNIT LIST FOR OTHER THAN INDIVIDUAL KEY

Full service key set (A: without transmitter, B: with transmitter) <LHD (Except single cab) >	Full service key set (A: without transmitter, B: with transmitter) <RHD (Except single cab) >
 AC805739AB	 AC805740AB

Full service key set (A: without transmitter, B: with transmitter) <LHD (Double cab-M/T-Europe-rear body less optional)>	**Full service key set <LHD (Single cab, Double cab-low price optional) >**
 AC805738AB	 AC805742
Full service key set <RHD (Single cab) >	**Full service key set <LHD (Single cab-rear body less optional)>**
 AC805744	 AC805741
Full service key set <RHD (Single cab-rear body less optional)>	**Steering lock service key set (A: without transmitter, B: with transmitter)**
 AC805743	 AC511649AB
Door service key set (A: without transmitter, B: with transmitter)	**Door service key set (A: without transmitter, B: with transmitter) <Dead lock>**
 AC805721AB	 AC805720AB

Glove box service key set (A: without transmitter, B: with transmitter)	Filler cap service key set (A: without transmitter, B: with transmitter) <Vehicles without rear body>
 AC511650AB	 AC511655AB

REMOVAL AND INSTALLATION

M1541106900198

⚠ CAUTION

When the ETACS-ECU is replaced, refer to the ID Code Registration Judgment Table P.54A-39 and register the each ID code.

COMBINATION METER

SERVICE SPECIFICATIONS

M1540200200742

Item		Standard value	Limit
Speedometer indicating tolerance km/h <Speedometer to display km/h only>	20	20.0 – 24.0	–
	40	40.0 – 44.0	–
	80	80.5 – 85.5	–
	120	121.5 – 127.5	–
	160	162.5 – 169.5	–
Speedometer indicating tolerance km/h (mph) <Speedometer to display MPH and km/h>	20 (10)	20.0 – 24.0 (10.0 – 12.5)	–
	40 (25)	40.0 – 44.0 (25.0 – 27.5)	–
	80 (50)	80.5 – 85.5 (50.3 – 53.5)	–
	120 (75)	121.5 – 127.5 (76.0 – 80.0)	–
	160 (100)	162.5 – 169.5 (101.5 – 106.0)	–
The speedometer needle fluctuation km/h (Vehicle speed is 35 km/h or more)		–	± 3

Item		Standard value	Limit
Tachometer indicating tolerance r/min The value in parentheses is a reference value.	700	700 ± 100	–
	(2,000)	(2,000 ± 100)	–
	3,000	3,000 ± 150	–
	(4,000)	(4,000 ± 200)	–
	5,000	5,000 ± 250	–
Fuel gauge unit resistance Ω	Stopper position "F"	13.0 ± 1	–
	Stopper position "E"	120.0 ± 1	–
Fuel gauge unit float height mm	Stopper position "F"	35.0 ± 3	–
	Stopper position "E"	254.7 ± 3	–
Engine coolant temperature gauge unit resistance Ω The value in parentheses is a reference value.	50°C	239	–
	(83°C)	(70.2)	–
	(105°C)	(34.9)	–
	122°C	21.5	–

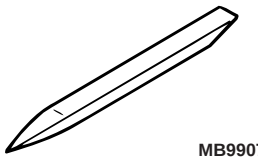
SEALANT

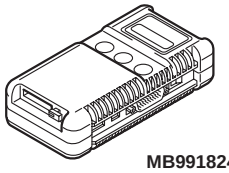
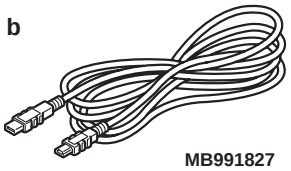
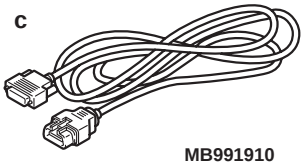
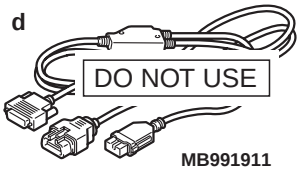
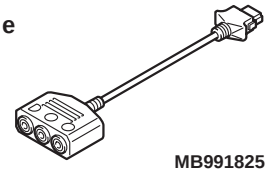
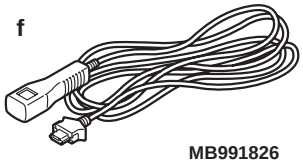
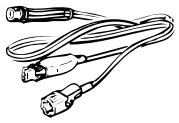
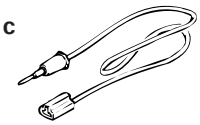
M1540207800013

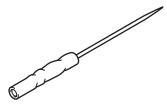
Item	Specified sealant	Remark
Engine coolant temperature gauge unit	3M ATD Part No.8660 or equivalent	Semi-drying sealant

SPECIAL TOOLS

M1540200300028

Tool	Number	Name	Use
 MB990784	MB990784	Ornament remover	Combination meter bezel removal

Tool	Number	Name	Use
a  MB991824 b  MB991827 c  MB991910 d  DO NOT USE MB991911 e  MB991825 f  MB991826 MB991955	MB991955 a. MB991824 b. MB991827 c. MB991910 d. MB991911 e. MB991825 f. MB991826	M.U.T.-III sub-assembly a. Vehicle Communication Interface (V.C.I.) b. M.U.T.-III USB cable c. M.U.T.-III main harness A (Vehicles with CAN communication system) d. M.U.T.-III main harness B (Vehicles without CAN communication system) e. M.U.T.-III measure adapter f. M.U.T.-III trigger harness	⚠ CAUTION **For vehicles with CAN communication, use M.U.T.-III main harness A to send simulated vehicle speed. If you connect M.U.T.-III main harness B instead, the CAN communication does not function correctly.** Check for other system diagnosis code and other system data list
a b  c  d DO NOT USE MB991223	MB991223 a. MB991219 b. MB991220 c. MB991221 d. MB991222	Harness set a. Check harness b. LED harness c. LED harness adapter d. Probe	Continuity check and voltage measurement at harness wire or connector a. For checking connector pin contact pressure b. For checking power supply circuit c. For checking power supply circuit d. For connecting a locally sourced tester

Tool	Number	Name	Use
 MB992006	MB992006	Extra fine probe	Continuity check and voltage measurement at harness wire or connector

TROUBLESHOOTING

DIAGNOSIS TROUBLESHOOTING FLOW

M1540203800022

Refer to GROUP 00 – Contents of Troubleshooting .

TROUBLE SYMPTOM CHART

M1540200800034

⚠ CAUTION

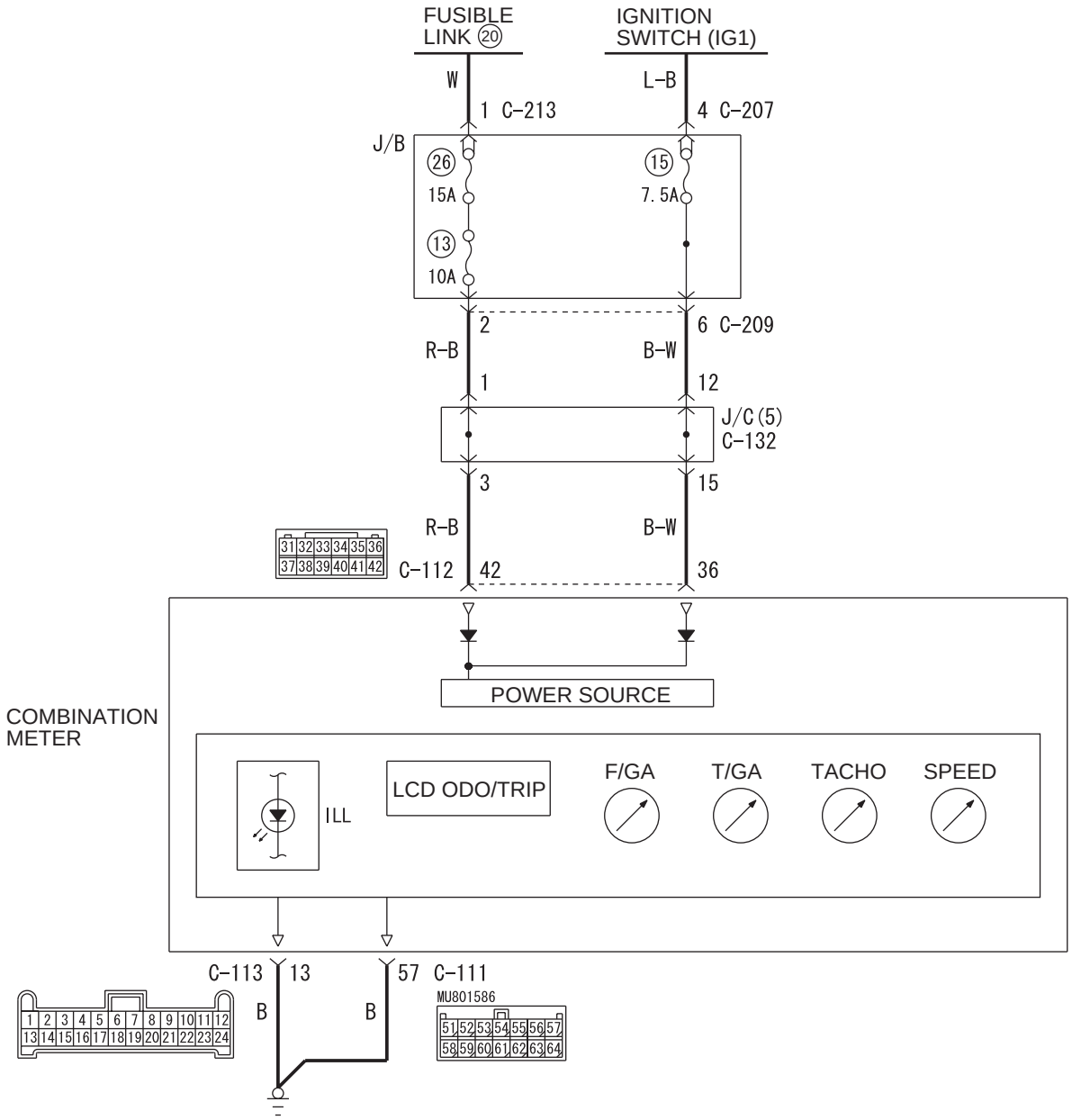
During diagnosis, a diagnosis code associated with other system may be set when the ignition switch is turned on with connector(s) disconnected. On completion, confirm all systems for diagnosis code(s). If diagnosis code(s) are set, erase them all.

Trouble symptom	Inspection procedure number	Reference page
Power supply circuit system check.	1	P.54A-47
Odometer and trip meter is not displayed.	2	
No needle meters work.	3	
If the ignition switch is turned to the ON position, the indicator and warning lamps do not illuminate.	4	
Speedometer does not work (other meters work).	5	P.54A-53
Tachometer does not work (other meters work).	6	P.54A-55
Fuel gauge does not work (other meters work).	7	P.54A-58
Engine coolant temperature gauge does not work (other meters work).	8	P.54A-61
The high-beam indicator does not illuminate.	9	P.54A-64
The front fog lamps indicator does not illuminate.	10	P.54A-67
The rear fog lamps indicator does not illuminate.	11	P.54A-70
The turn-signal lamp indicator does not illuminate.	12	P.54A-75
The door-ajar warning lamp does not illuminate.	13	P.54A-79
The seat belt warning lamp does not illuminate or flash.	14	P.54A-82

SYMPTOM PROCEDURES

Inspection Procedure 1: Power supply circuit system check.
Inspection Procedure 2: Odometer and trip meter is not displayed.
inspection procedure 3: No needle meters work.
Inspection Procedure 4: If the ignition switch is turned to the ON position, the indicator and warning lamps do not illuminate.

Combination Meter Power Source Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

WAC54E068A

COMMENTS ON TROUBLE SYMPTOM

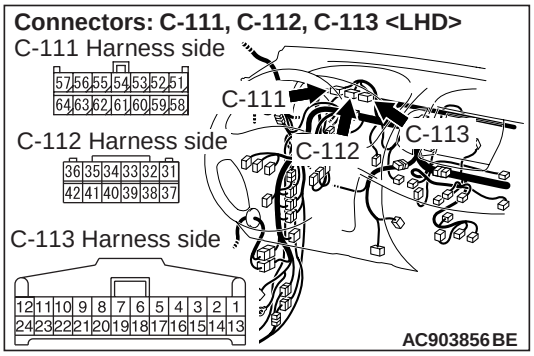
If the odometer and trip meter is not displayed or no needle meters work, power supply to the combination meter, or the combination meter itself may be defective.

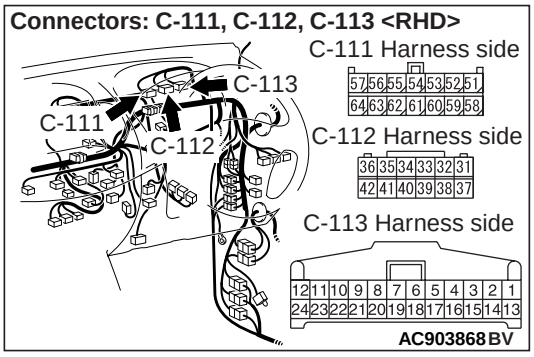
PROBABLE CAUSES

- Damaged harness wires and connectors
- Malfunction of the combination meter

DIAGNOSIS PROCEDURE

STEP 1. Connector check: Combination meter connector C-111, C-112 and C-113.



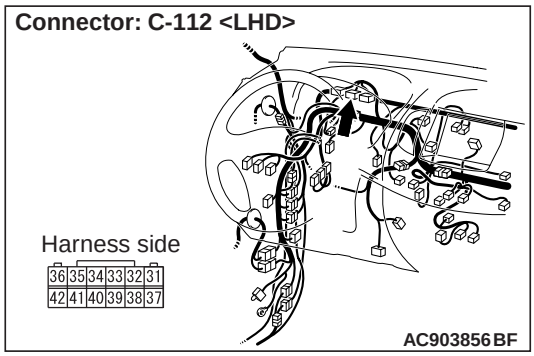


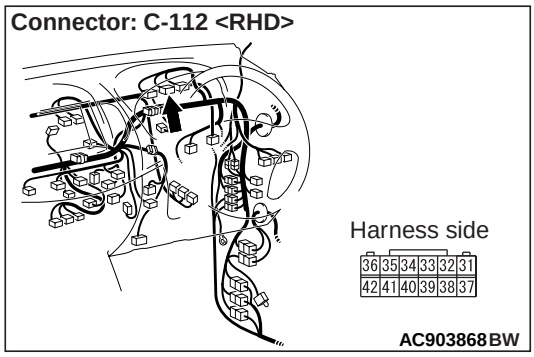
Q: Is the check result normal?

YES : Go to Step 2.

NO : Repair the defective connector.

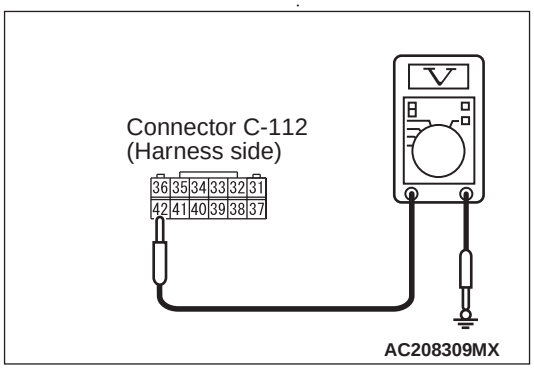
STEP 2. Voltage measurement at combination meter connector C-112.





Disconnect the connector, and measure at the wiring harness side.

- Ignition switch: "LOCK" (OFF) position.



Voltage between combination meter connector C-112 terminal No.42 and body earth.

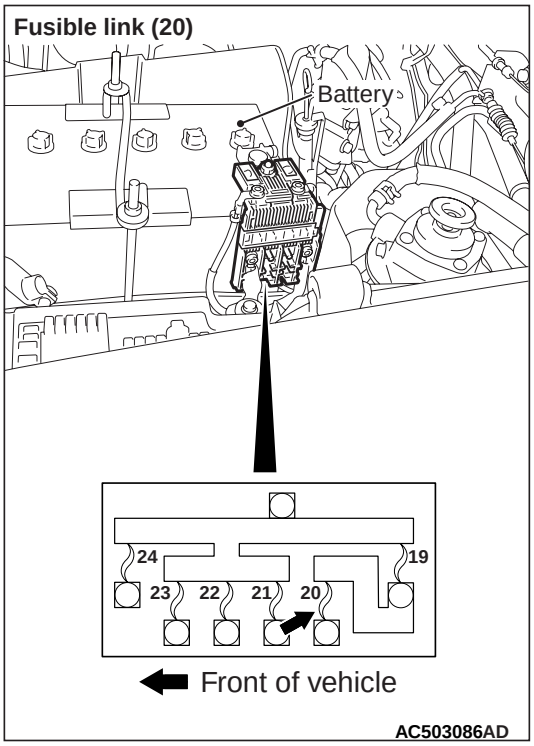
OK: System voltage

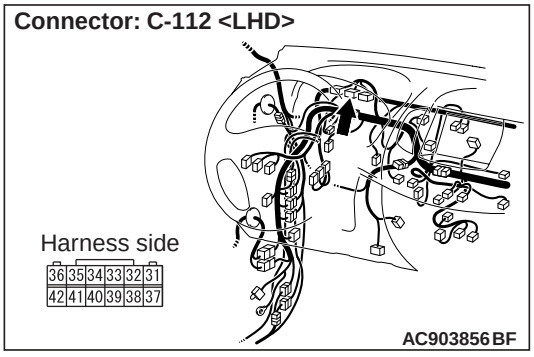
Q: Is the check result normal?

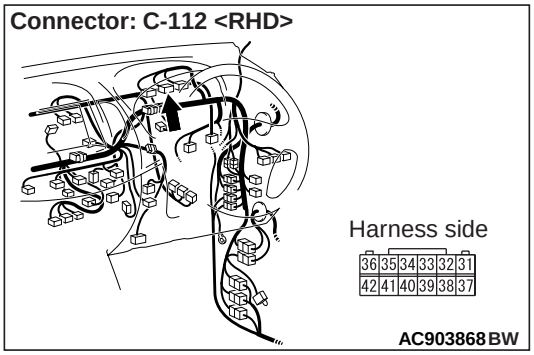
YES : Go to Step 4.

NO : Go to Step 3.

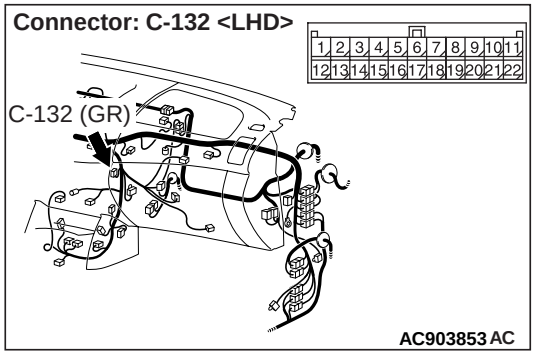
STEP 3. Check the harness wire between the battery (fusible link No.20) and combination meter connector C-112 (terminal No.42).
Check the power supply line for open circuit and short circuit.

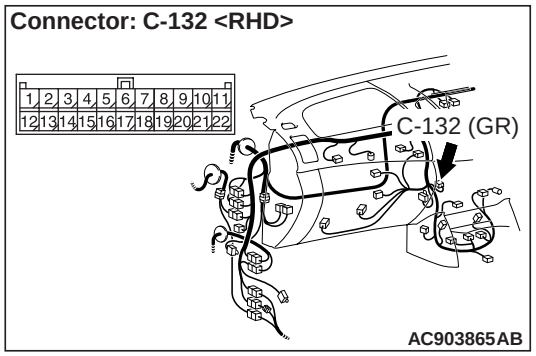


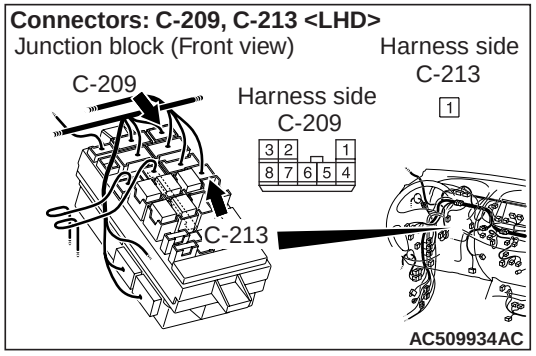


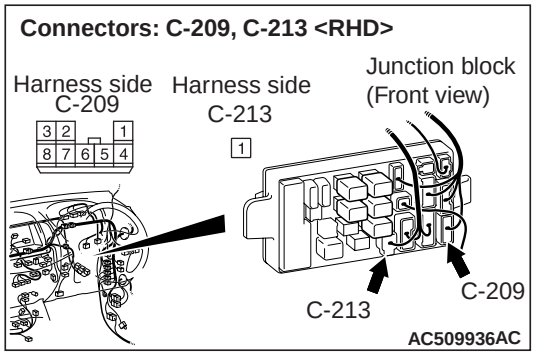


NOTE:





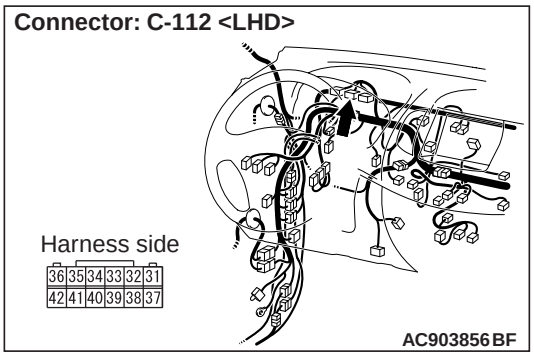


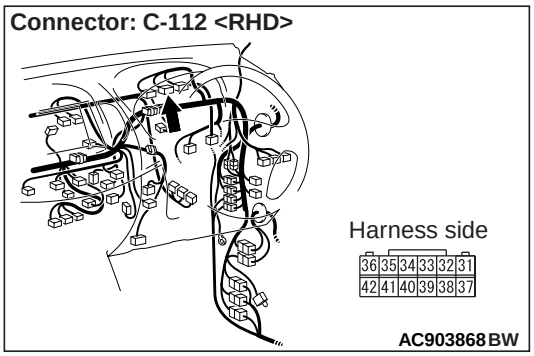


Prior to the wiring harness inspection, check joint connector C-132 and junction block connectors C-209 and C-213, and repair if necessary.

Q: Is the wiring harness between the battery (fusible link No.20) and combination meter connector C-112 (terminal No.42) in good condition?
YES : Retest the system.
NO : Repair the wiring harness.

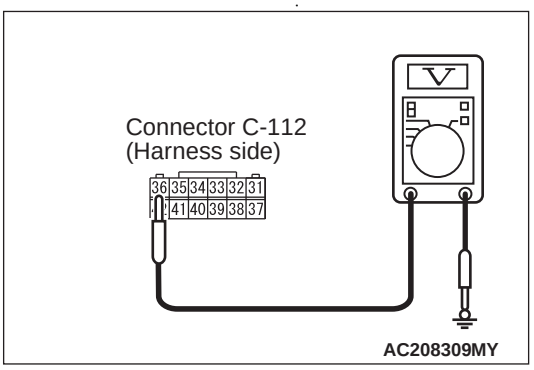
STEP 4. Voltage measurement at combination meter connector C-112.





Disconnect the connector, and measure at the wiring harness side.

- Ignition switch: ON position.



Voltage between combination meter connector C-112 terminal No.36 and body earth.

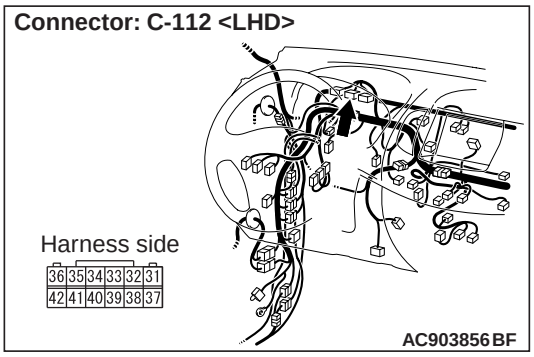
OK: System voltage

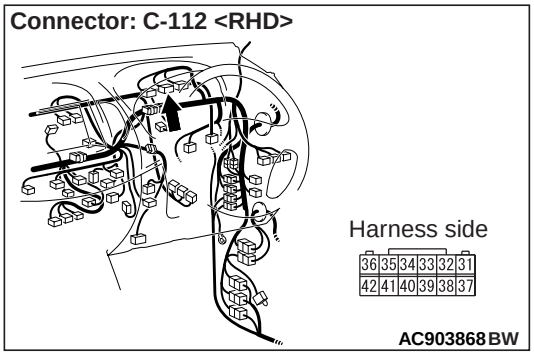
Q: Is the check result normal?

YES : Go to Step 6
NO : Go to Step 5

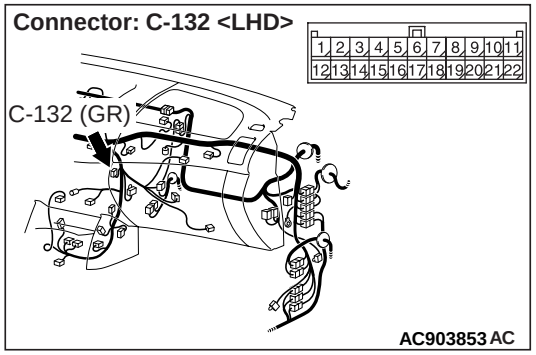
STEP 5. Check the harness wire between the ignition switch (IG1) and combination meter connector C-112 (terminal No.36).

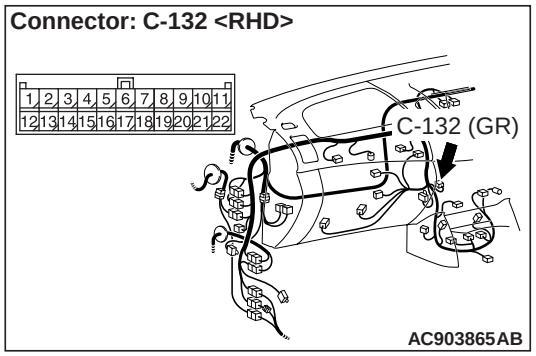
Check the power supply line for open circuit and short circuit.

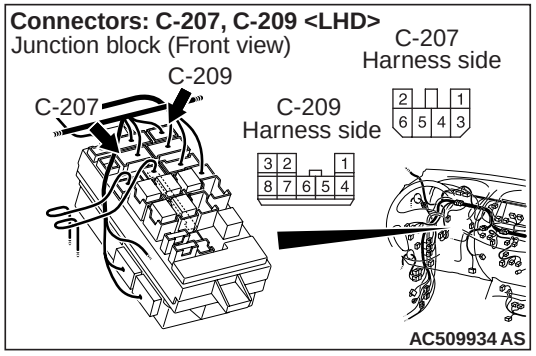


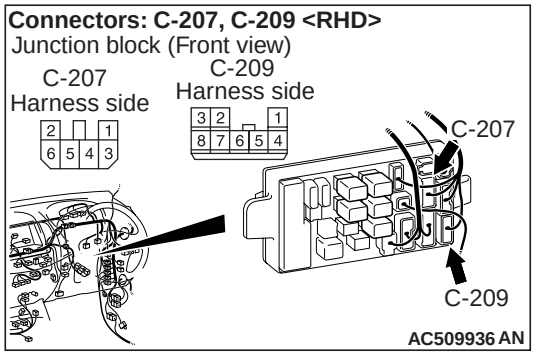


NOTE:





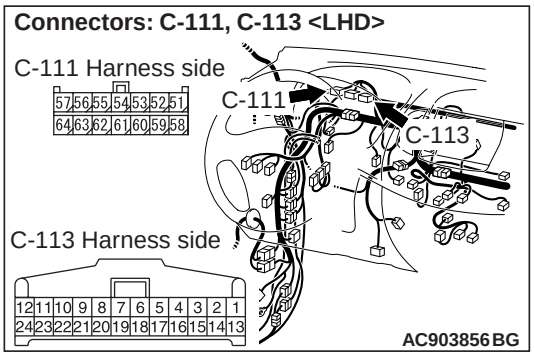


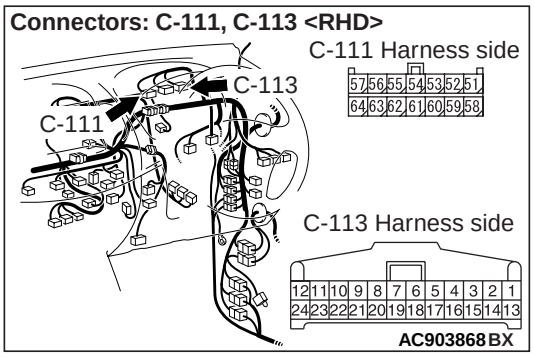


Prior to the wiring harness inspection, check joint connector C-132 and junction block connectors C-207 and C-209, and repair if necessary.

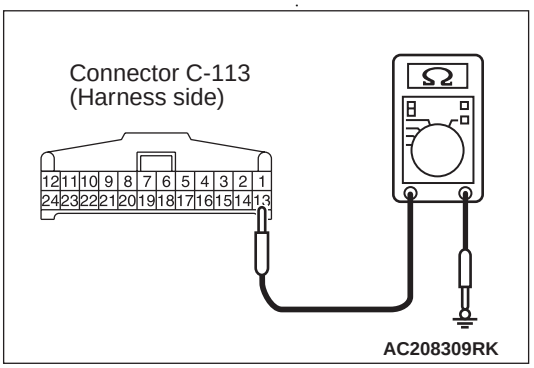
Q: Is the wiring harness between the ignition switch (IG1) and combination meter connector C-112 (terminal No.36) in good condition?
YES : Retest the system.
NO : Repair the wiring harness.

STEP 6. Resistance measurement at combination meter connector C-111 and C-113.



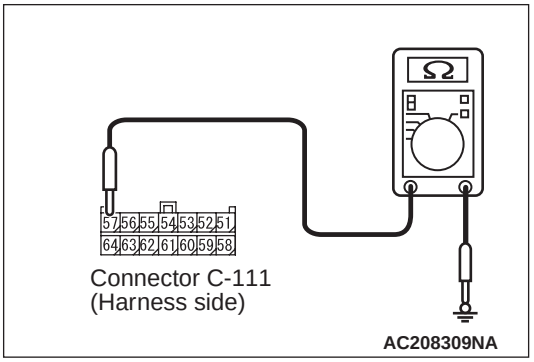


- Disconnect the connector, and measure at the wiring harness side.



Resistance between combination meter connector C-113 terminal No.13 and body earth.

OK: Continuity exists (2 Ω or less)

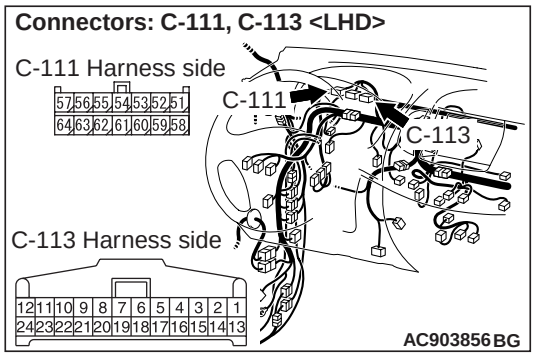


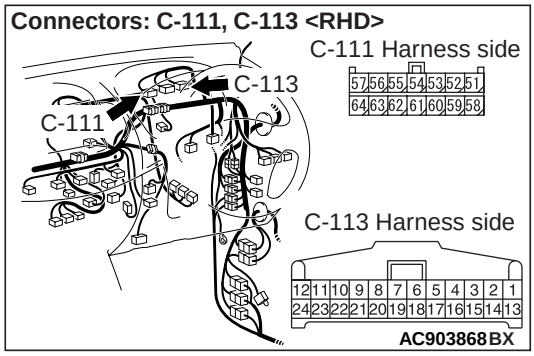
Resistance between combination meter connector C-111 terminal No.57 and body earth.

OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?
YES : Go to Step 8
NO : Go to Step 7

STEP 7. Check the harness between combination meter connector C-111 (terminal No.57), C-113 (terminal No.13) and body earth.





Check the earth wires for open circuit.

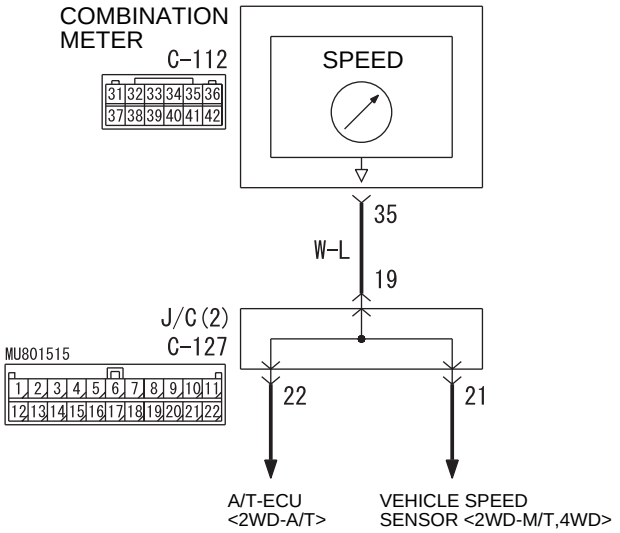
Q: Is the wiring harness between the combination meter connector C-111 (terminal No.57), C-113 (terminal No.13) and body earth in good condition?
YES : Retest the system.
NO : Repair the wiring harness.

STEP 8. Retest the system.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction).
NO : Replace the combination meter.

Inspection Procedure 5: Speedometer does not work (Other meters work).

Speedometer Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver WAC54E090A

COMMENTS ON TROUBLE SYMPTOM

If only the speedometer does not operate, the combination meter, the wiring harness or its connector may be defective.

PROBABLE CAUSES

- Damaged harness wires and connectors
- Malfunction of combination meter

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III other system diagnosis code.

Check whether the DIESEL system-related diagnosis code is set.

Q: Is the diagnosis code set?

YES : Diagnose DIESEL system. (Refer to GROUP 13A, Troubleshooting .) After diagnosing the DIESEL system, go to Step 5.

NO : Go to Step 2.

STEP 2. M.U.T.-III other system data list

Check the vehicle speed signal data list of DIESEL system.

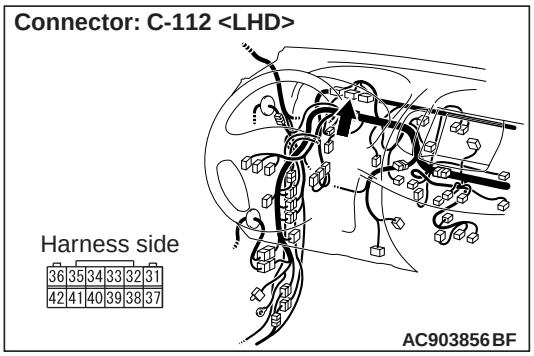
Item No.4: Vehicle speed sensor (Refer to GROUP 13A, Data list reference table .)

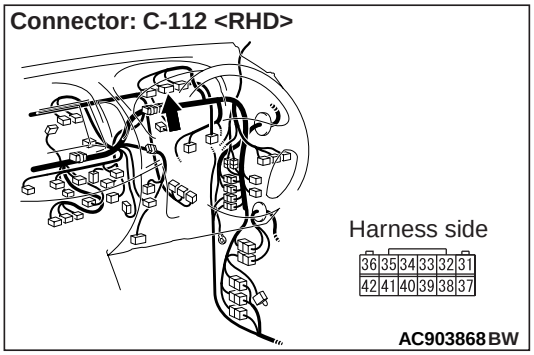
Q: Is the check result satisfactory?

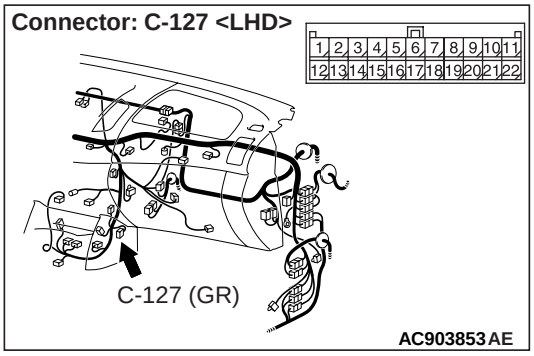
YES : Go to Step 3.

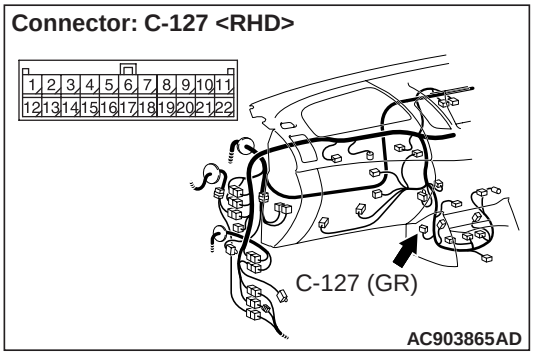
NO : Diagnose DIESEL system. (Refer to GROUP 13A, Troubleshooting .) After diagnosing the DIESEL system.

STEP 3. Connector check: Joint connector C-127 and combination meter connector C-112.



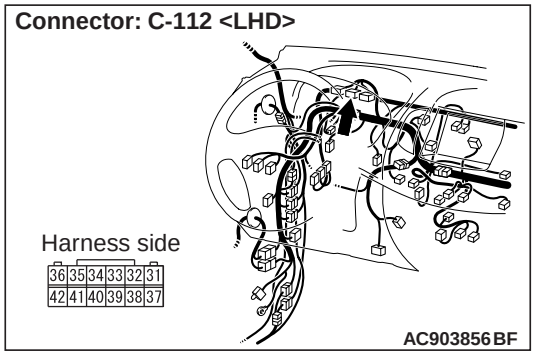


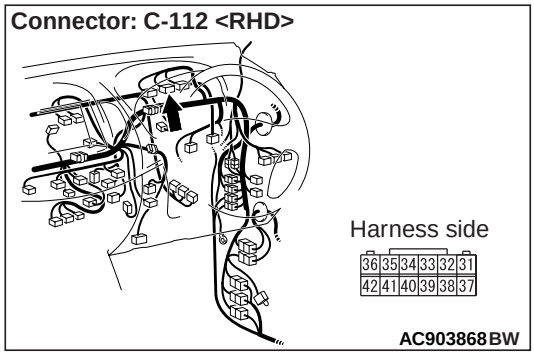


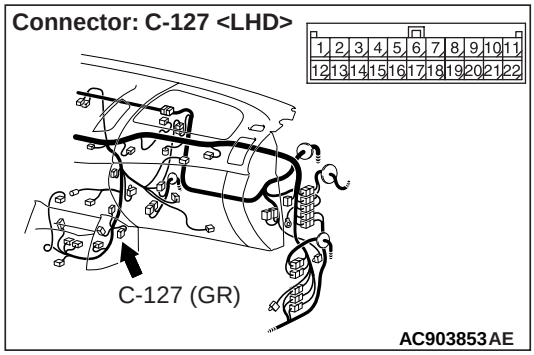


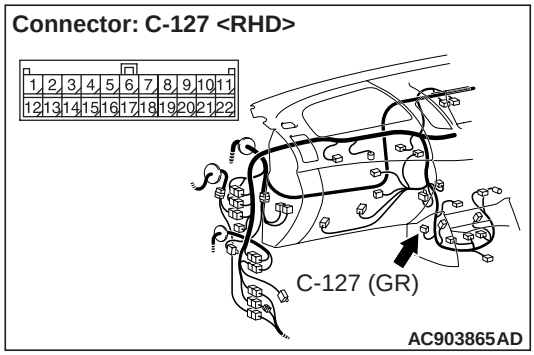
Q: Is joint connector C-127 and combination meter connector C-112 in good condition?
YES : Go to Step 4.
NO : Repair or replace the damage component(s).

STEP 4. Check the wiring harness between joint connector C-127 (terminal 19) and combination meter connector C-112 (terminal 35).
Check the input lines for open circuit and short circuit.









Q: Is the wiring harness between joint connector C-127 (terminal 19) and combination meter connector C-112 (terminal 35) in good condition?
YES : Go to Step 5.
NO : Repair or replace the damage component(s).

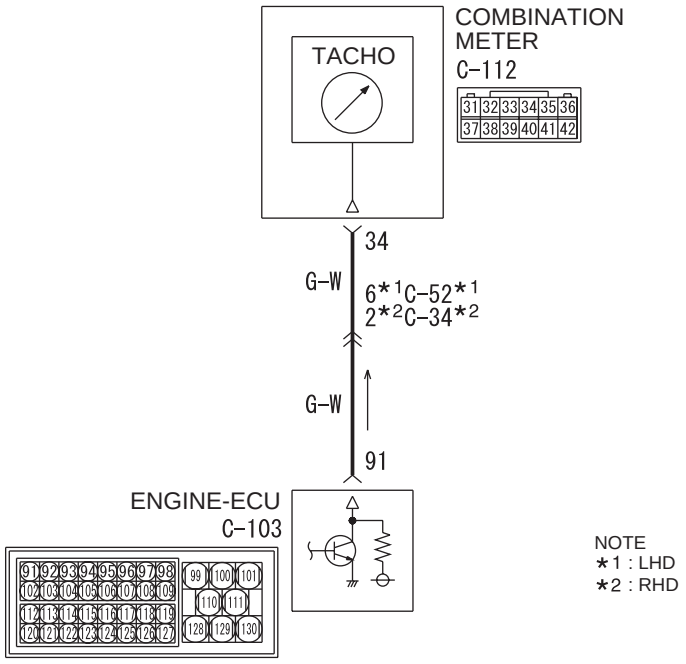
STEP 5. Retest the system.

Q: Is the speedometer normal?

YES : The procedure is complete. (If no malfunctions are found in all steps, an intermittent malfunction is suspected. Refer to GROUP 00 / How to Cope with Intermittent Malfunction).
NO : Replace the combination meter assembly.

Inspection Procedure 6: Tachometer does not work (Other meters work).

Tachometer Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver WAC54E069A

COMMENTS ON TROUBLE SYMPTOM

If only the tachometer does not operate, the engine-ECU system may not be sending ignition signal, or the combination meter, the wiring harness or its connector may be defective.

PROBABLE CAUSES

- Malfunction of combination meter
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

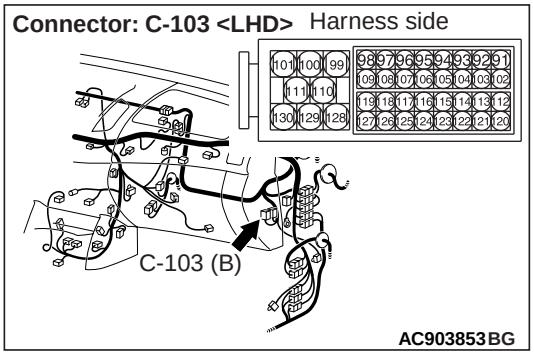
STEP 1. M.U.T.-III other system diagnosis code

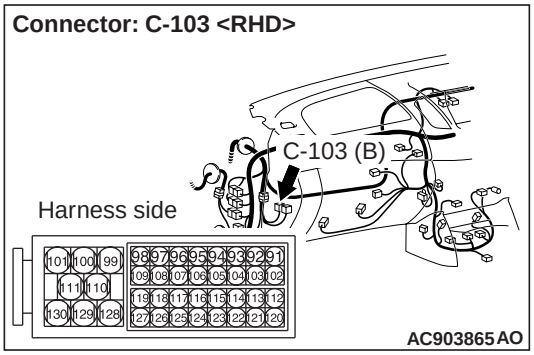
Check whether the DIESEL system-related diagnosis code is set.

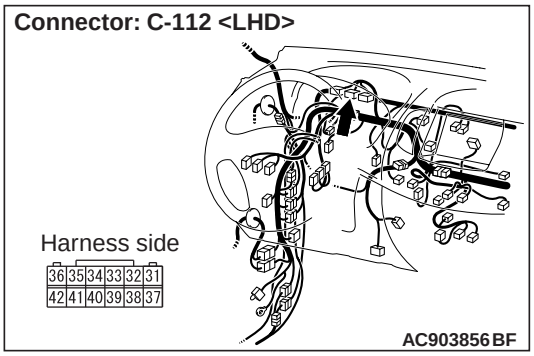
Q: Is the diagnosis code set?

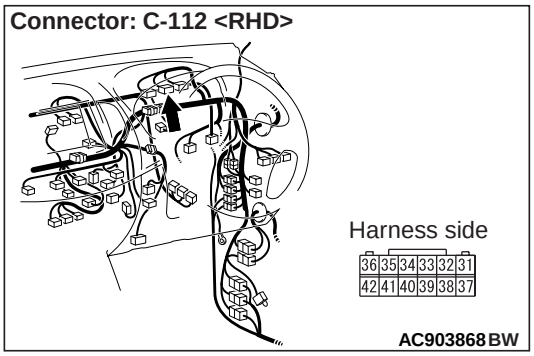
YES : Diagnose DIESEL system. (Refer to GROUP 13A, Troubleshooting .) After diagnosing the DIESEL system, go to Step 4.
NO : Go to Step 2.

STEP 2. Connector check: Combination meter connector C-112 and engine-ECU connector C-103.









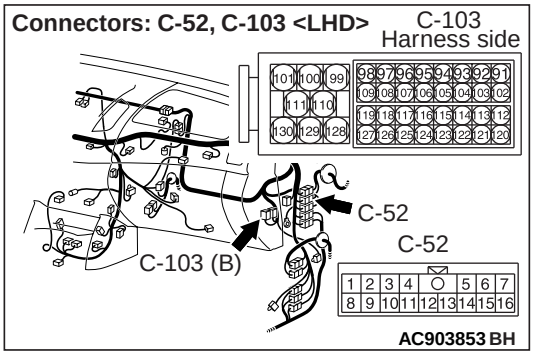
Q: Is combination meter connector C-112 and engine-ECU connector C-103 in good condition?

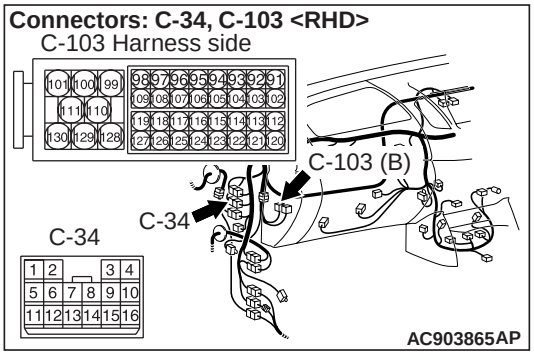
YES : Go to Step 3.
NO : Repair or replace the damage component(s).

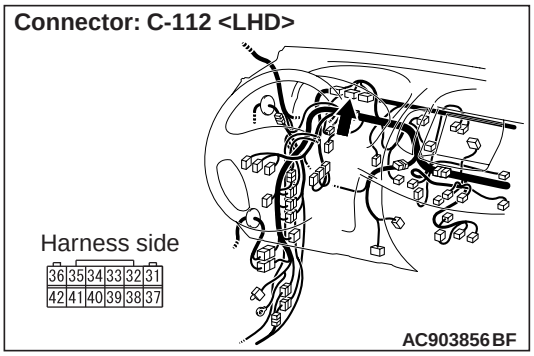
STEP 3. Retest the system.

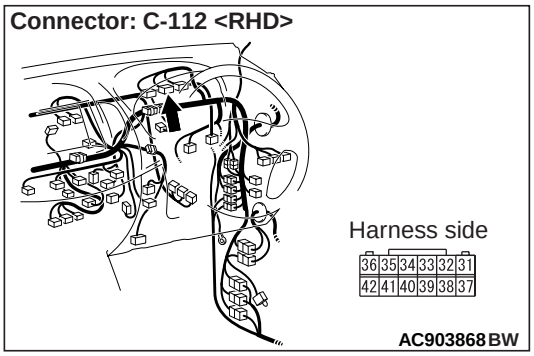
Q: Is the tachometer normal?
YES : Intermittent Malfunction. Refer to GROUP 00 / How to Cope with Intermittent Malfunction).
NO : Go to Step 4.

STEP 4. Check the wiring harness between combination meter connector C-112 (terminal 34) and engine-ECU connector C-103 (terminal 91).









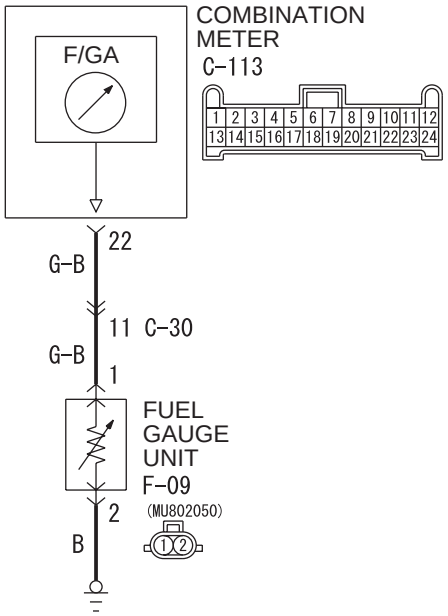
Check the input lines for open circuit and short circuit.

NOTE: Prior to the wiring harness inspection, check intermediate connector C-52 <LHD> or C-34 <RHD>, and repair if necessary.

Q: Is the wiring harness between combination meter connector C-112 (terminal 34) and engine-ECU connector C-103 (terminal 91) in good condition?
YES : Replace the combination meter assembly.
NO : Repair or replace the damage component(s).

Inspection Procedure 7: Fuel gauge does not work (Other meters work).

Fuel Gauge Unit Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver WAC54E070A

COMMENTS ON TROUBLE SYMPTOM

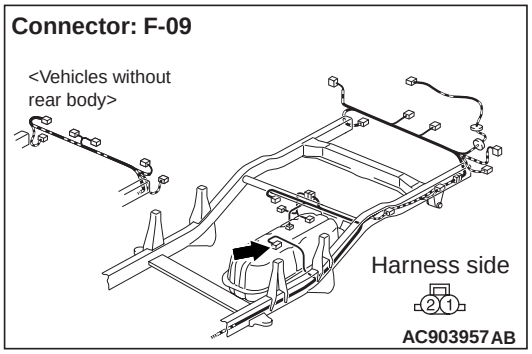
If only the fuel gauge does not operate, the fuel gauge unit, the combination meter, wiring harness or connector(s) may be defective.

PROBABLE CAUSES

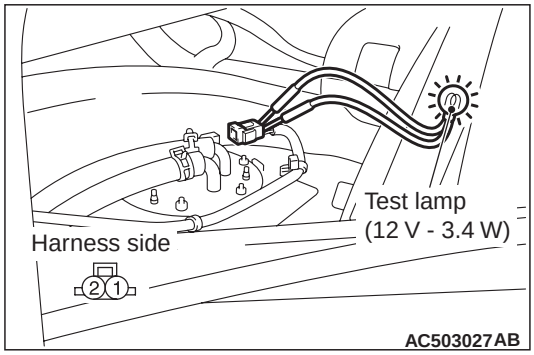
- Damaged harness wires and connectors
- Malfunction of the fuel gauge unit
- Malfunction of combination meter

DIAGNOSIS PROCEDURE

STEP 1. Check the fuel gauge circuit.



(1) Disconnect F-09 fuel gauge unit connector.



(2) Connect a test lamp (12 V – 3.4 W) via special

tool test harness (MB991219) between the wiring harness connector terminals 1 and 2.

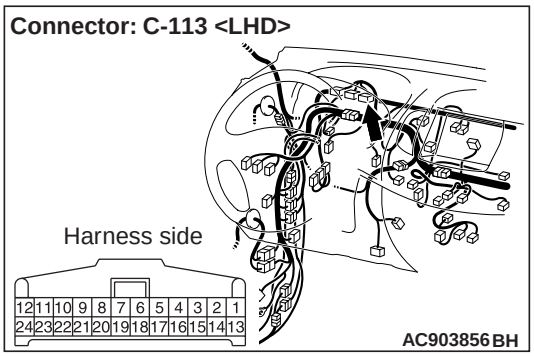
(3) Turn the ignition switch to the "ON" position.

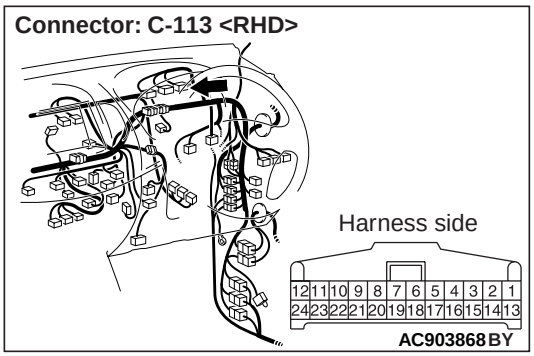
Q: Does the test lamp illuminate?

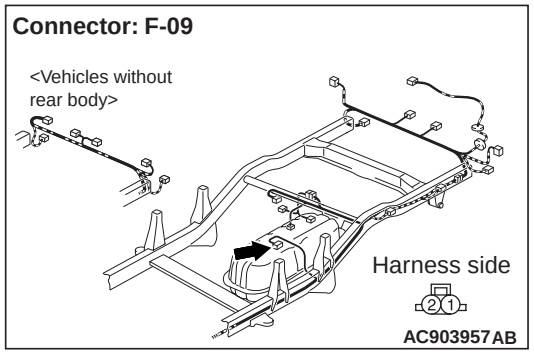
YES : Go to Step 7.

NO : Go to Step 2.

STEP 2. Connector check: Combination meter connector C-113 and fuel gauge unit connector F-09.







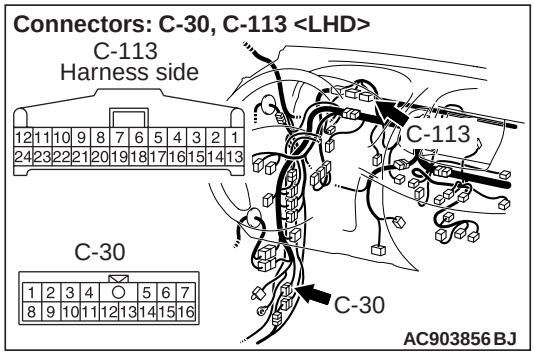
Q: Is combination meter connector C-113 and fuel gauge unit connector F-09 in good condition?

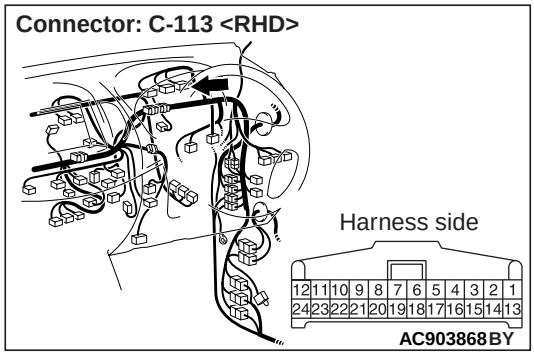
YES : Go to Step 3.

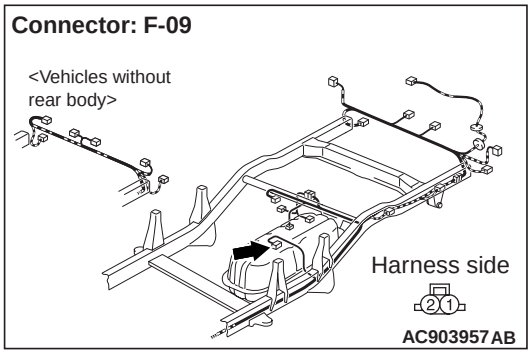
NO : Repair or replace the damaged component(s).

STEP 3. Check the wiring harness between combination meter connector C-113 (terminal 22) and fuel gauge unit connector F-09 (terminal 1).

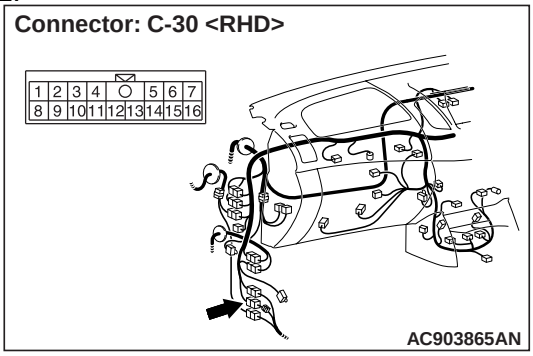
Check the input lines for open circuit and short circuit.







NOTE:



Prior to the wiring harness inspection, check intermediate connector C-30 and repair if necessary.

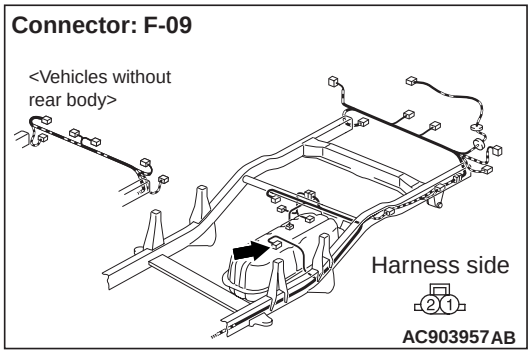
Q: Is the wiring harness between combination meter connector C-113 (terminal 22) and fuel gauge unit connector F-09 (terminal 1) in good condition?

YES : Go to Step 4.
NO : Repair or replace the damaged component(s). Then go to Step 4.

STEP 4. Retest the system.

Q: Is the fuel gauge normal?
YES : The procedure is complete. (If no malfunctions are found in all steps, an intermittent malfunction is suspected. Refer to GROUP 00 / How to Cope with Intermittent Malfunction).
NO : Go to Step 5.

STEP 5. Check the wiring harness between fuel gauge unit connector F-09 (terminal 2) and earth.
Check the earth wires for open circuit.



Q: Is the wiring harness between fuel gauge unit connector F-09 (terminal 2) and earth in good condition?
YES : Go to Step 6.
NO : Repair or replace the damaged component(s).

STEP 6. Retest the system.

Q: Is the fuel gauge normal?
YES : The procedure is complete. (If no malfunctions are found in all steps, an intermittent malfunction is suspected. Refer to GROUP 00 / How to Cope with Intermittent Malfunction).
NO : Carry out the troubleshooting again.

STEP 7. Check the fuel gauge unit.
Refer to P.54A-88.

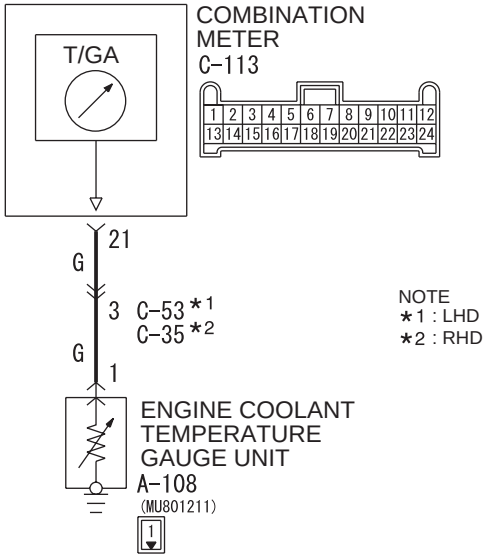
Q: Is the fuel gauge normal?
YES : Go to Step 8.
NO : Replace the fuel gauge unit.

STEP 8. Retest the system.

Q: Is the fuel gauge normal?
YES : The procedure is complete. (If no malfunctions are found in all steps, an intermittent malfunction is suspected. Refer to GROUP 00 / How to Cope with Intermittent Malfunction).
NO : Replace combination meter.

Inspection Procedure 8: Engine coolant temperature gauge does not work (Other meters work).

Engine Coolant Temperature Gauge Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver WAC54E071A

COMMENTS ON TROUBLE SYMPTOM

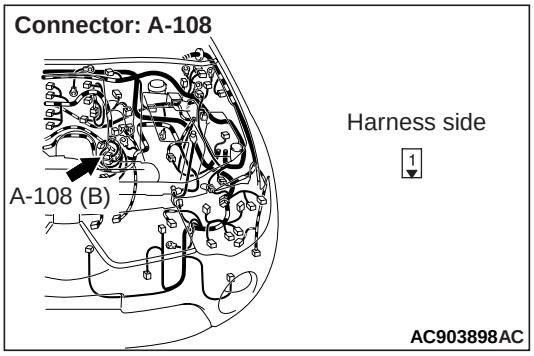
If only the engine coolant temperature gauge does not operate, the engine ECU system, the combination meter, the wiring harness or its connector may be defective.

PROBABLE CAUSES

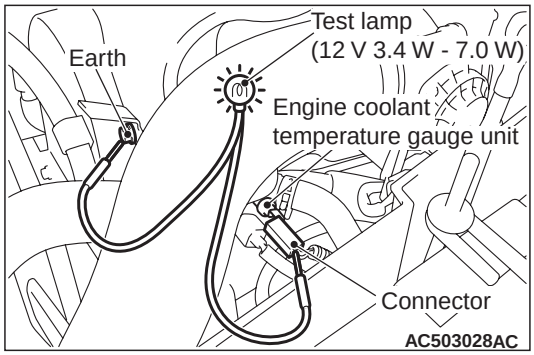
- Damaged harness wires and connectors
- Malfunction of the engine coolant temperature gauge unit
- Malfunction of combination meter

DIAGNOSIS PROCEDURE

STEP 1. Check the engine coolant temperature gauge circuit.



(1) Disconnect the A-108 engine coolant temperature gauge unit connector.



(2) Connect a test lamp (12 V – 3.4 W to 12 V – 7.0 W) to the wiring harness side connector.

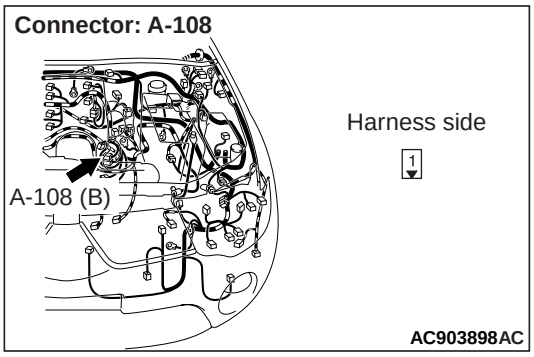
(3) Ignition switch: ON

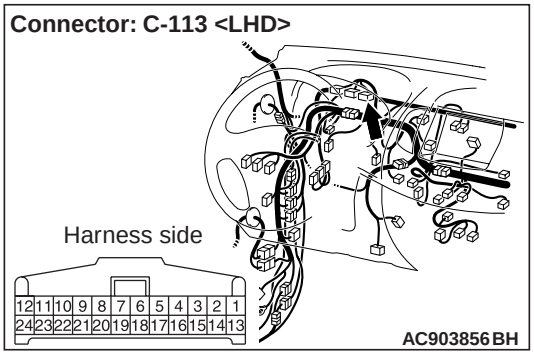
Q: Does the test lamp illuminate?

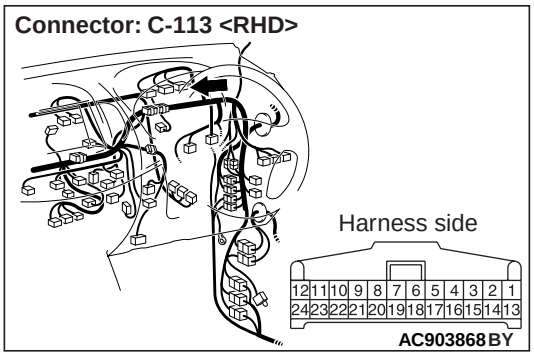
YES : Go to Step 5.

NO : Go to Step 2.

STEP 2. Connector check: Combination meter connector C-113 and engine coolant temperature gauge unit connector A-108.







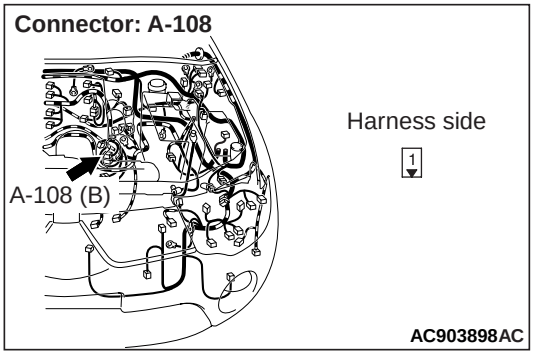
Q: Is combination meter connector C-113 and engine coolant temperature gauge unit connector A-108 in good condition?

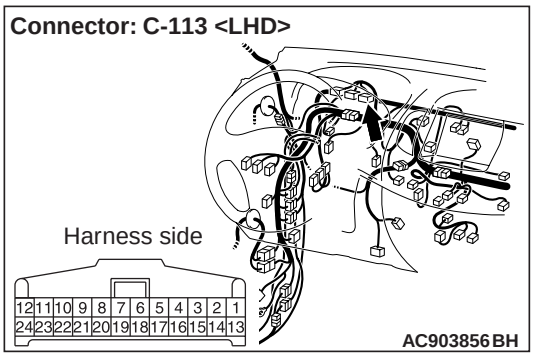
YES : Go to Step 3.
NO : Repair or replace the damage component(s).

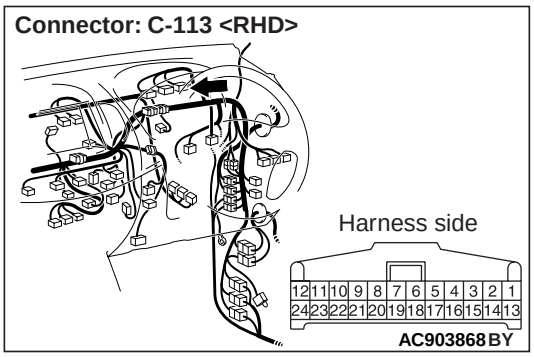
STEP 3. Retest the system.

Q: Is the engine coolant temperature gauge normal?
YES : The procedure is complete. (If no malfunctions are found in all steps, an intermittent malfunction is suspected. Refer to GROUP 00 / How to Cope with Intermittent Malfunction).
NO : Go to Step 4.

STEP 4. Check the wiring harness between combination meter connector C-113 (terminal 21) and engine coolant temperature gauge unit connector A-108 (terminal 1).

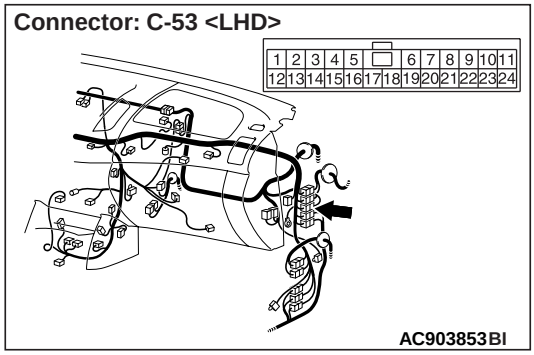


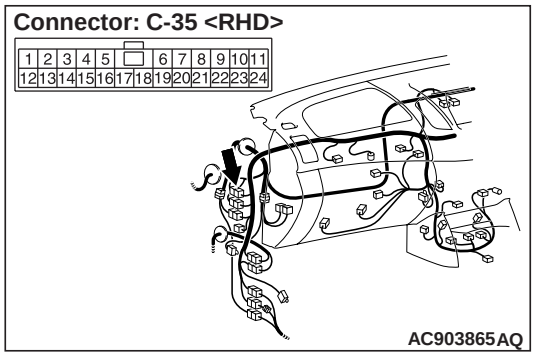




Check the input lines for open circuit and short circuit.

NOTE:





Prior to the wiring harness inspection, check intermediate connector C-53 <LHD> or C-35 <RHD>, and repair if necessary.

Q: Is the wiring harness between combination meter connector C-113 (terminal 21) and engine coolant temperature gauge unit connector A-108 (terminal 1) in good condition?
YES : Go to Step 6.
NO : Repair or replace the damage component(s).

STEP 5. Check the engine coolant temperature gauge unit.
Refer to P.54A-89.

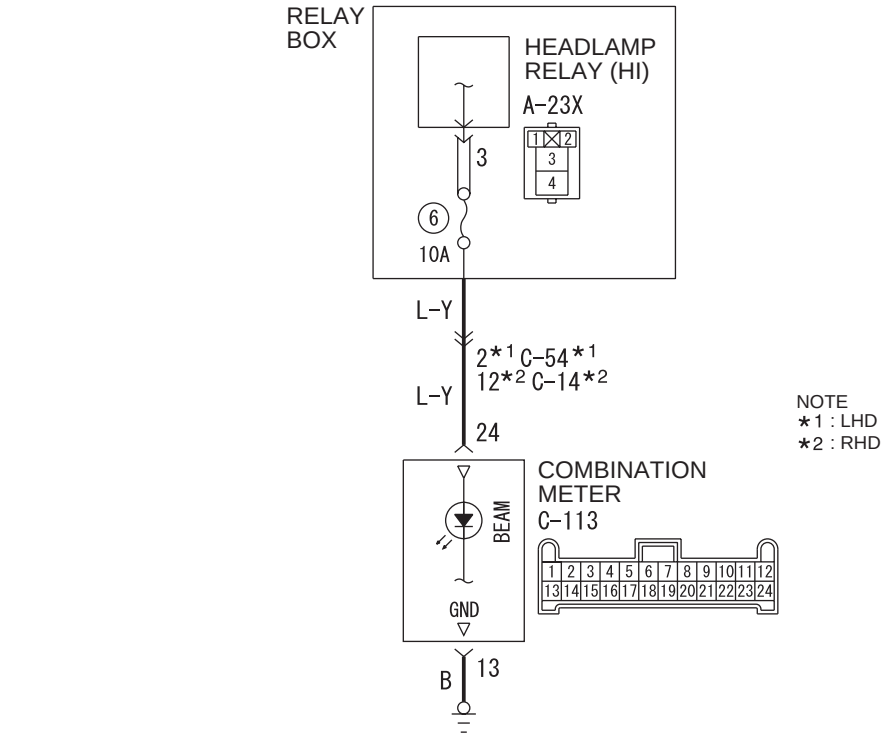
Q: Is the engine coolant temperature gauge unit normal?
YES : Go to Step 6.
NO : Replace the engine coolant temperature gauge unit.

STEP 6. Retest the system

Q: Is the engine coolant temperature gauge normal?
YES : The procedure is complete. (If no malfunctions are found in all steps, an intermittent malfunction is suspected. Refer to GROUP 00 / How to Cope with Intermittent Malfunction).
NO : Replace the combination meter.

Inspection Procedure 9: The high-beam indicator does not illuminate.

High-Beam Indicator Lamp Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver WAC54E072A

COMMENTS ON TROUBLE SYMPTOM

If the high-beam indicator does not illuminate, the wiring harness connector(s) or the combination meter may be defective.

PROBABLE CAUSES

- Malfunction of the combination meter
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. Check of headlamps (high-beam)

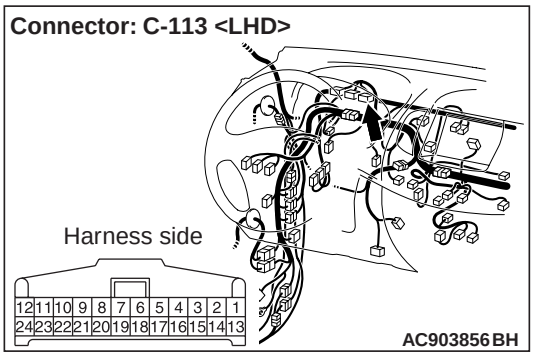
Check that the headlamp (high beam) illuminates normally.

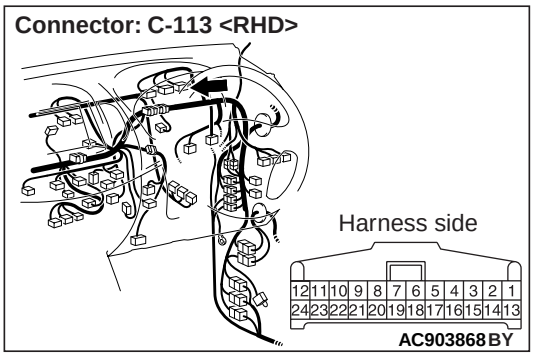
Q: Is the check result normal?

YES : Go to Step 2.

NO : Repair the headlamp first.Refer to trouble symptom chart P.54A-109.

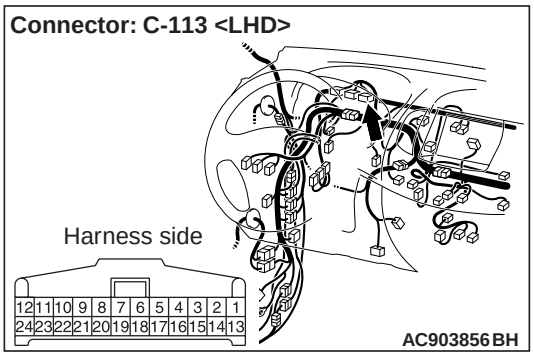
STEP 2. Connector check: C-113 combination meter connector

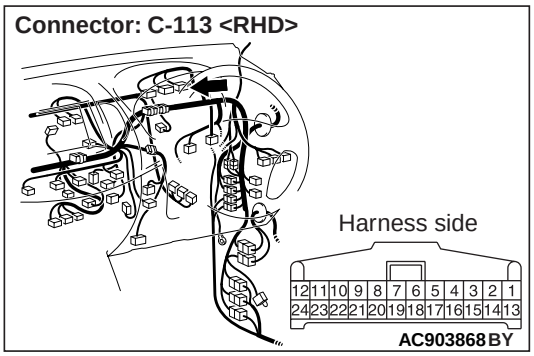




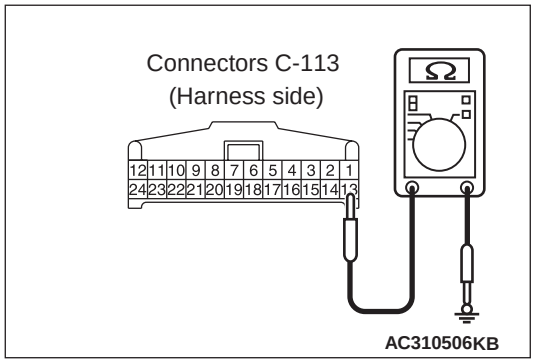
Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the defective connector.

STEP 3. Resistance measurement at the C-113 combination meter connector.





(1) Disconnect the connector, and measure at the wiring harness side.

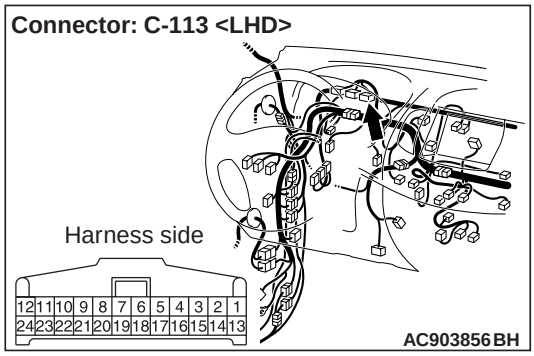


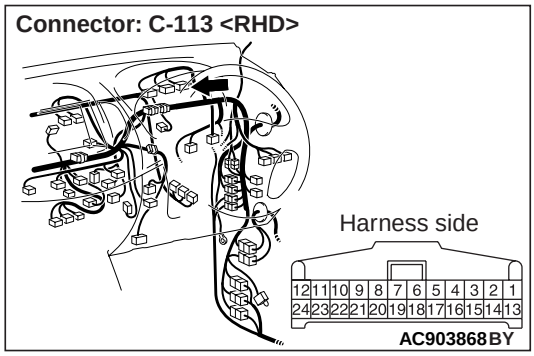
(2) Check the resistance between the C-113 combination meter connector terminal No.13 and body earth.

OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?
YES : Go to Step 5.
NO : Go to Step 4.

STEP 4. Check the wiring harness from C-113 combination meter connector terminal No.13 to body earth.

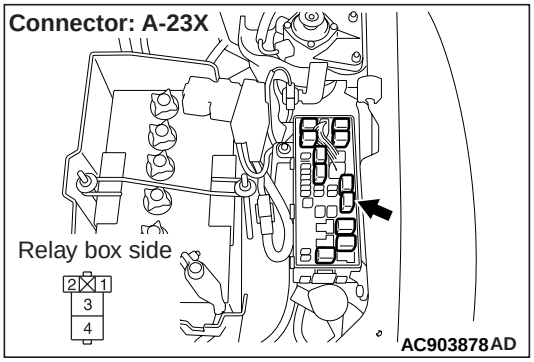




- Check the earth wires for open circuit.

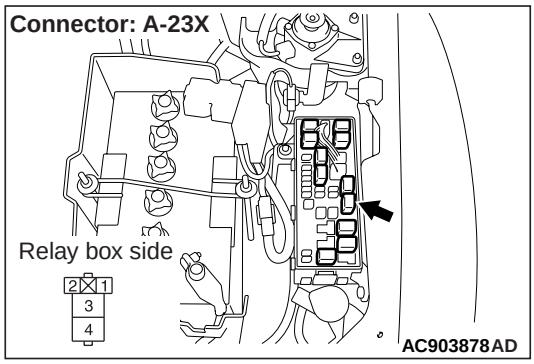
Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness.

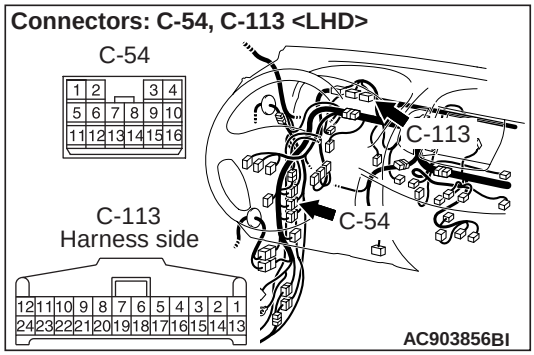
STEP 5. Connector check: A-23X headlamp relay (HI) connector

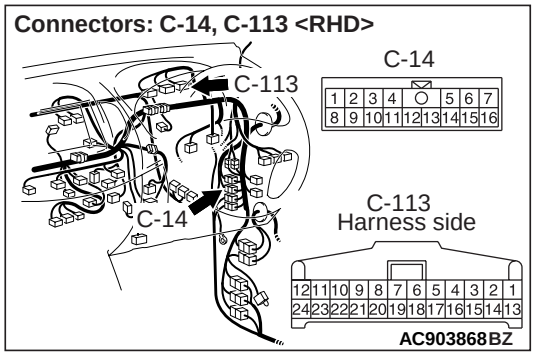


Q: Is the check result normal?
YES : Go to Step 6.
NO : Repair the defective connector.

STEP 6. Check the wiring harness from C-113 combination meter connector terminal No.24 to A-23X headlamp relay (HI) connector terminal No.3.







NOTE: Prior to the wiring harness inspection, check intermediate connector C-54 <LHD> or C-14 <RHD>, and repair if necessary.

- Check the output lines for open circuit.

Q: Is the check result normal?
YES : Go to Step 7.
NO : Repair the wiring harness.

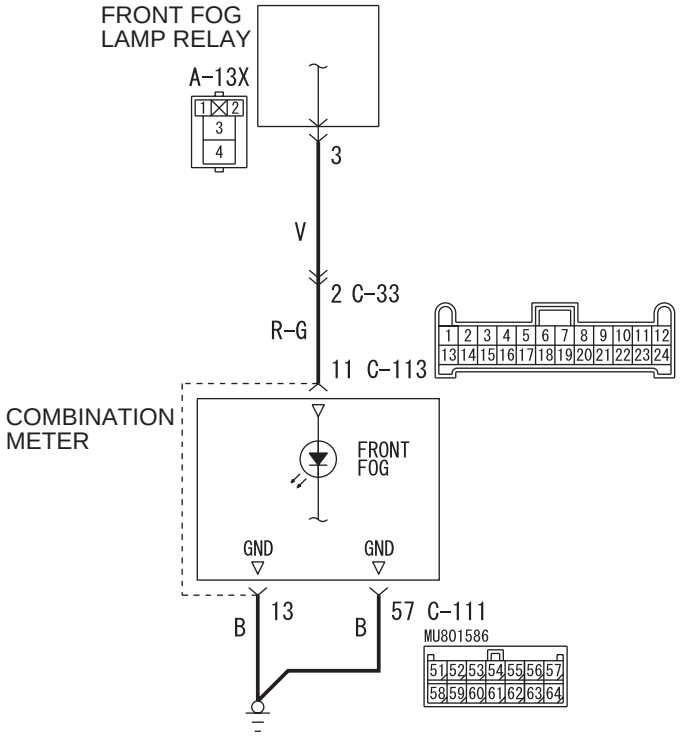
STEP 7. Retest the system.
Check that the headlamp indicator illuminates normally.

Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Replace the combination meter.

Inspection Procedure 10: The front fog lamp indicator does not illuminate.

Front Fog Lamp Indicator Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver WAC54E073A

COMMENTS ON TROUBLE SYMPTOM
If the front fog indicator does not illuminate, the wiring harness connector(s) or the combination meter may be defective.

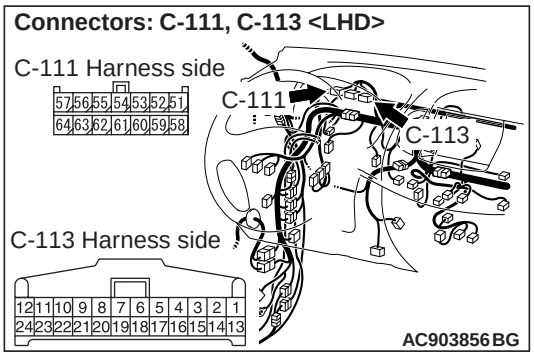
PROBABLE CAUSES
- Malfunction of the combination meter
- Damaged harness wires and connectors

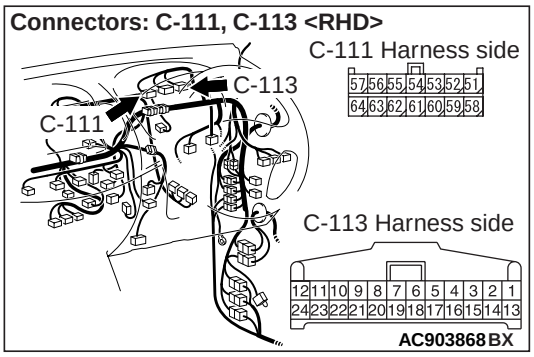
DIAGNOSIS PROCEDURE

STEP 1. Check of front fog lamp
Check that the front fog lamp illuminates normally.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the headlamp first.Refer to trouble symptom chart P.54A-152.

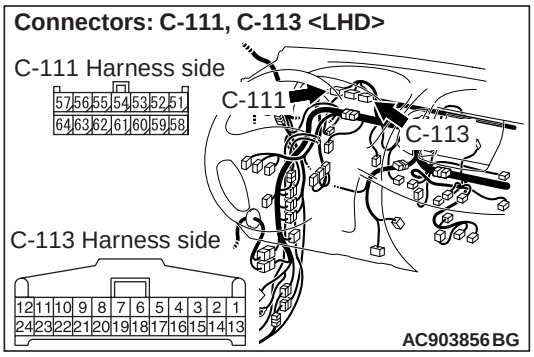
STEP 2. Connector check: C-111 and C-113 combination meter connector

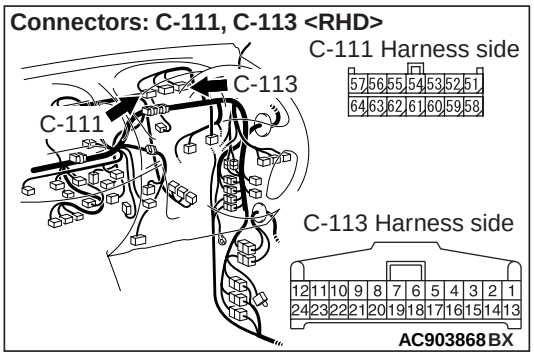




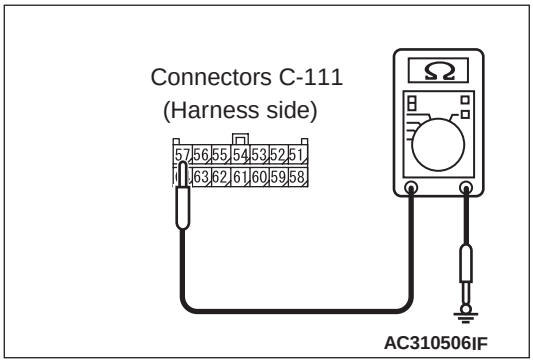
Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the defective connector.

STEP 3. Resistance measurement at the C-111 and C-113 combination meter connector.



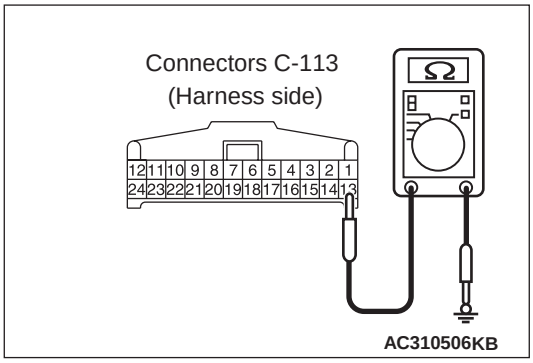


(1) Disconnect the connector, and measure at the wiring harness side.



(2) Resistance between C-111 combination meter connector terminal No.57 and body earth

OK: Continuity exists (2 Ω or less)

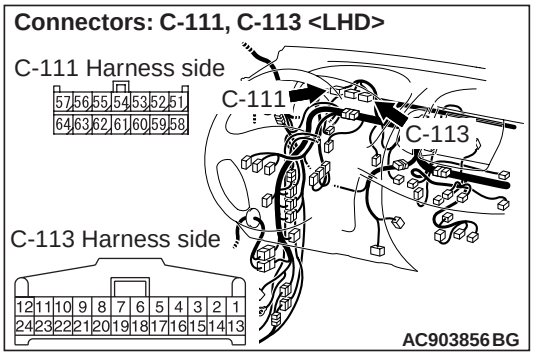


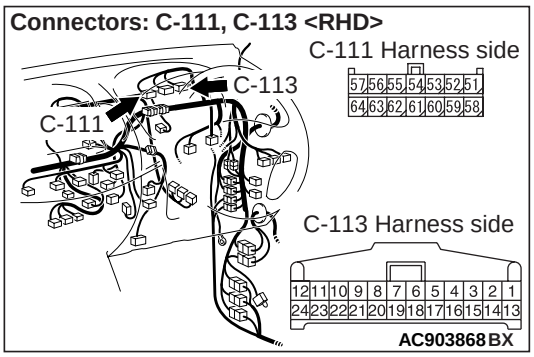
(3) Check the resistance between the C-113 combination meter connector terminal No.13 and body earth.

OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?
YES : Go to Step 5.
NO : Go to Step 4.

STEP 4. Check the wiring harness from C-111 combination meter connector terminal No.57 or C-113 combination meter connector terminal No.13 to body earth.

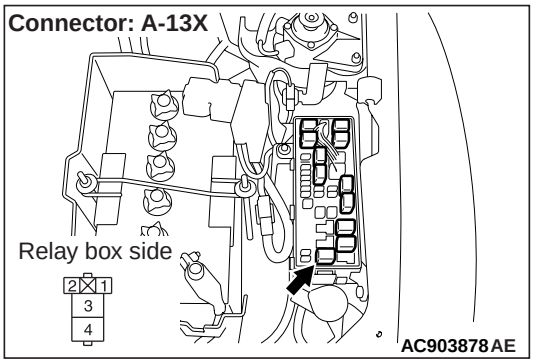




- Check the earth wires for open circuit.

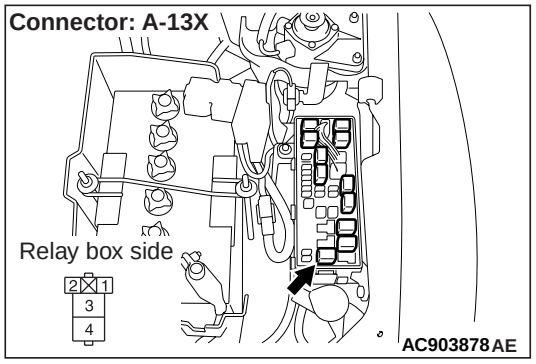
Q: Is the check result normal?
YES : Go to Step 7.
NO : Repair the wiring harness.

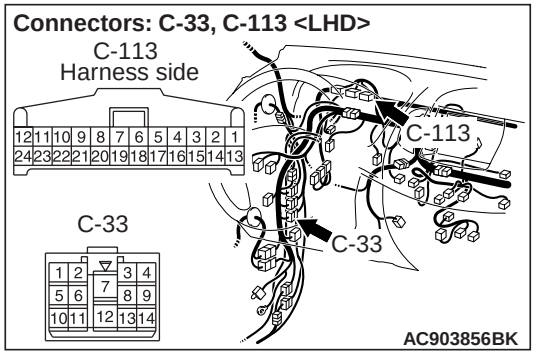
STEP 5. Connector check: Connector check: A-13X front fog lamp relay connector

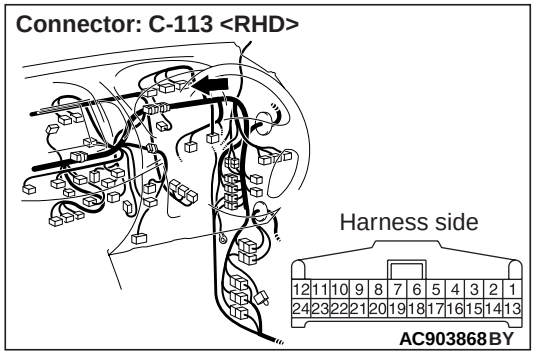


Q: Is the check result normal?
YES : Go to Step 6.
NO : Repair the defective connector.

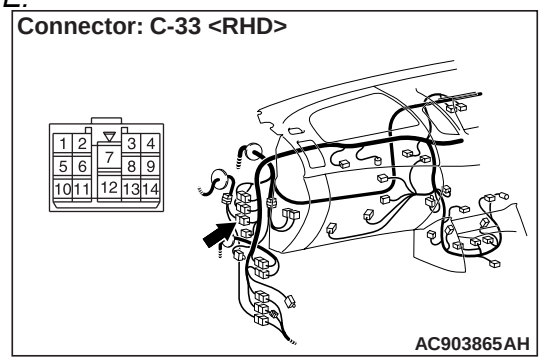
STEP 6. Check the wiring harness from C-113 combination meter connector No.11 to A-13X front fog lamp relay connector terminal No.3.







NOTE:



Prior to the wiring harness inspection, check intermediate connector C-33, and repair if necessary.

- Check the power supply line for open circuit.

Q: Is the check result normal?
YES : Go to Step 7.
NO : Repair the wiring harness.

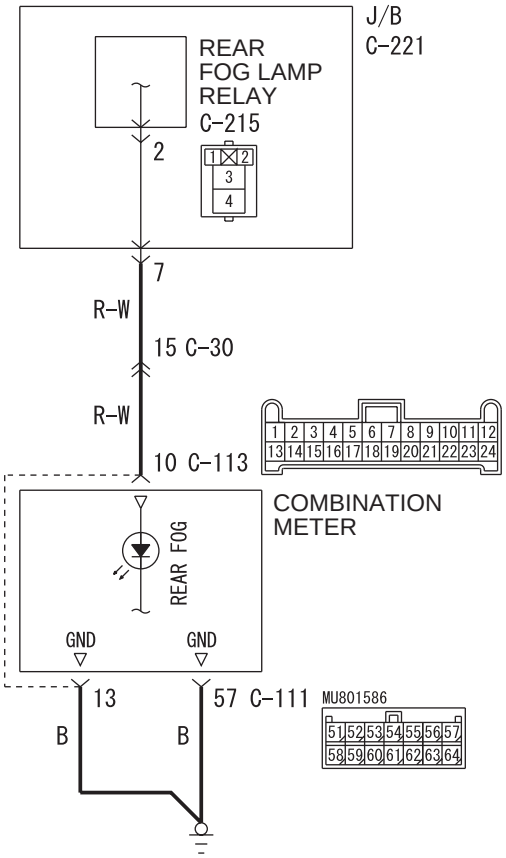
STEP 7. Retest the system.
Check that the front fog lamp indicator illuminate normally.

Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Replace the combination meter.

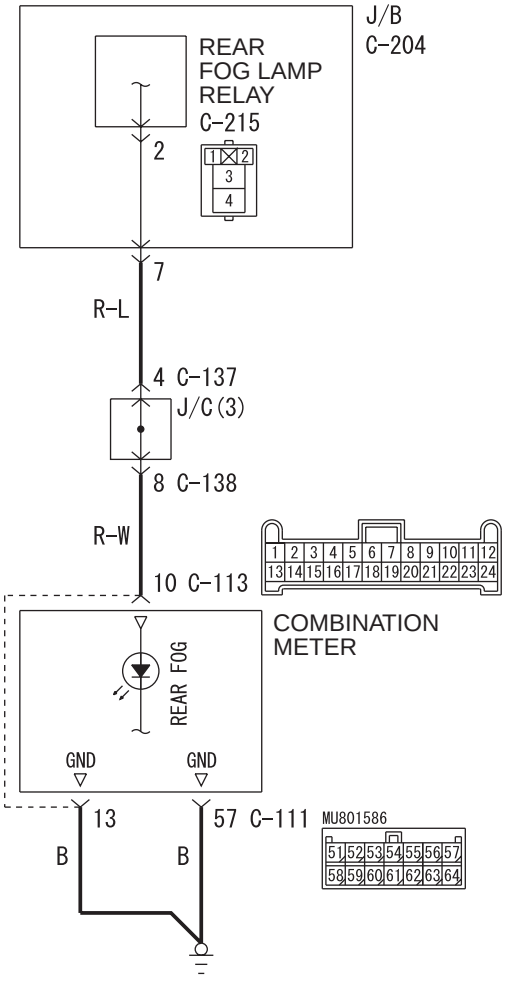
Inspection Procedure 11: The rear fog lamp indicator does not illuminate.

Rear Fog Lamp Indicator Circuit <LHD>



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver WAC54E074A

Rear Fog Lamp Indicator Circuit <RHD>



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver WAC54E075A

COMMENTS ON TROUBLE SYMPTOM

If the rear fog indicator does not illuminate, the wiring harness connector(s) or the combination meter may be defective.

PROBABLE CAUSES

- Malfunction of the combination meter
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. Check of rear fog lamp

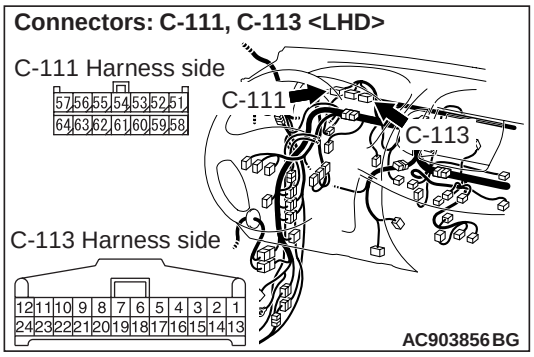
Check that the rear fog lamp illuminates normally.

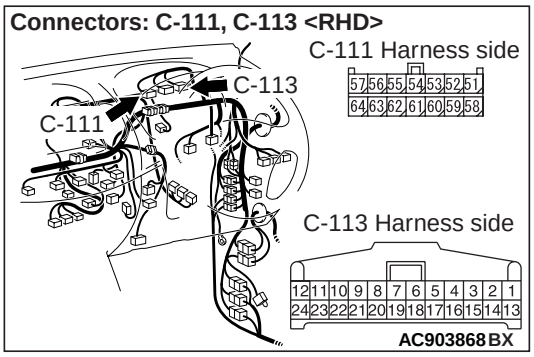
Q: Is the check result normal?

YES : Go to Step 2.

NO : Repair the rear fog lamp first. Refer to trouble symptom chart P.54A-152.

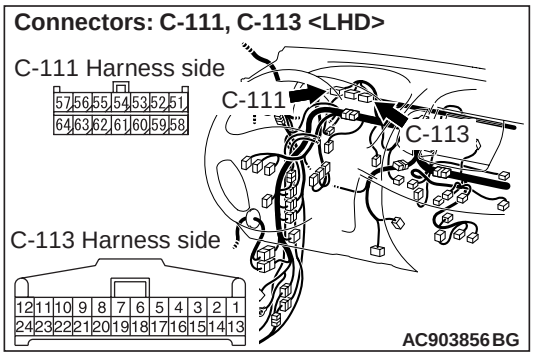
STEP 2. Connector check: C-111 and C-113 combination meter connector

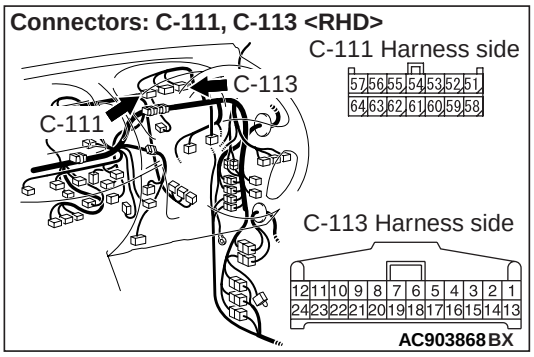




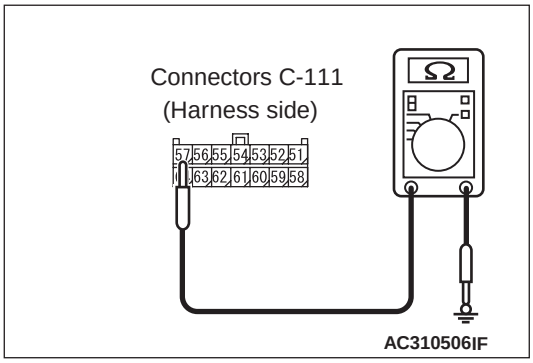
Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the defective connector.

STEP 3. Resistance measurement at the C-111 and C-113 combination meter connector.



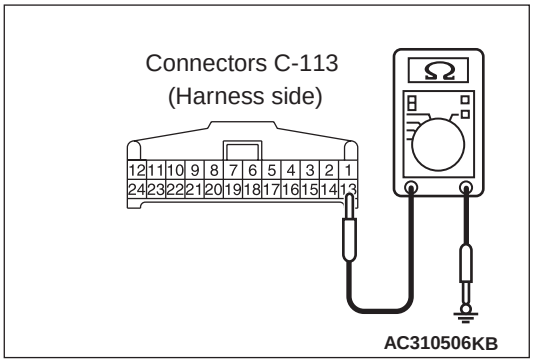


(1) Disconnect the connector, and measure at the wiring harness side.



(2) Resistance between C-111 combination meter connector terminal No.57 and body earth

OK: Continuity exists (2 Ω or less)

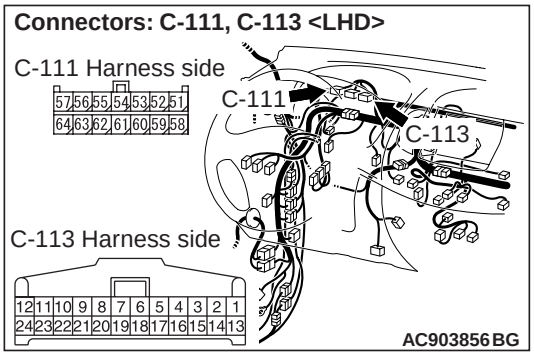


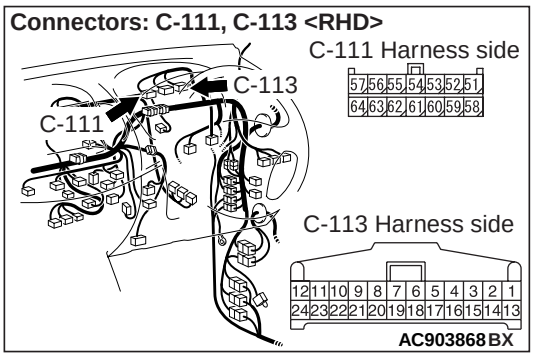
(3) Check the resistance between the C-113 combination meter connector terminal No.13 and body earth.

OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?
YES : Go to Step 5.
NO : Go to Step 4.

STEP 4. Check the wiring harness from C-111 combination meter connector terminal No.57 or C-113 combination meter connector terminal No.13 to body earth.





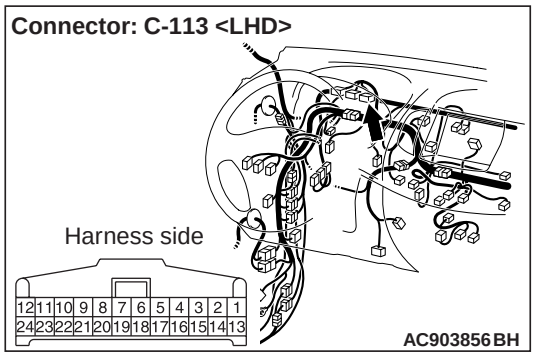
- Check the earth wires for open circuit.

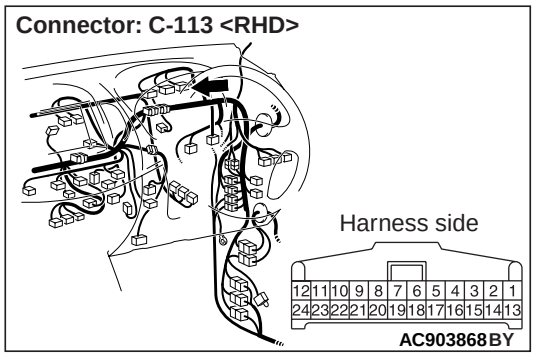
Q: Is the check result normal?

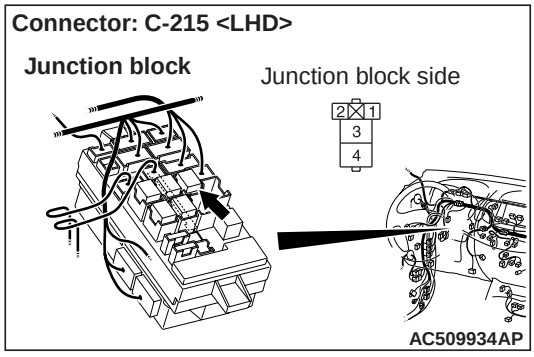
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

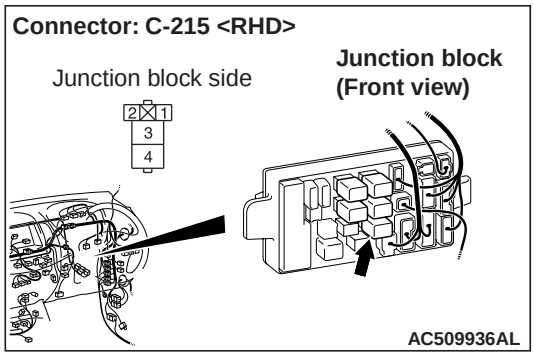
NO : Repair the wiring harness.

STEP 5. Connector check: C-215 rear fog lamp relay connector and C-113 combination meter







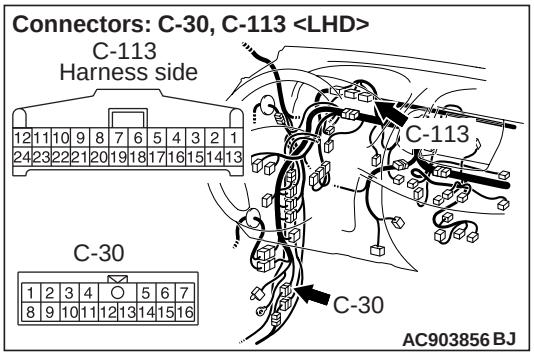


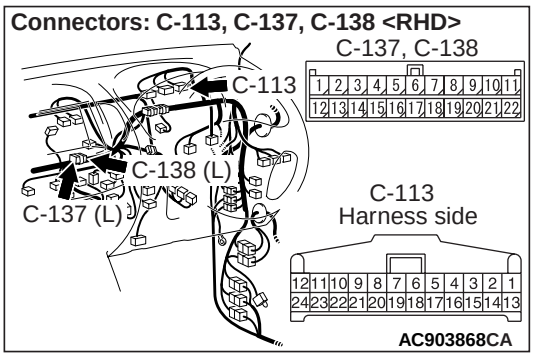
Q: Is the check result normal?

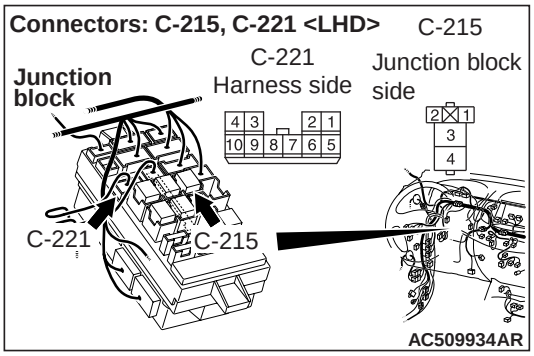
YES : Go to Step 6.

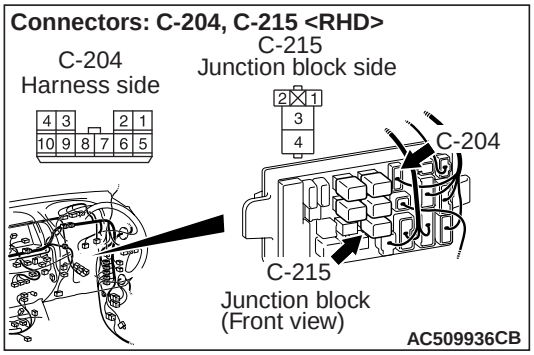
NO : Repair the defective connector.

STEP 6. Check the wiring harness from C-113 combination meter connector terminal No.10 to C-215 rear fog lamp relay connector terminal No.2.









NOTE: Prior to the wiring harness inspection, check junction block connector C-221 and intermediate connector C-30, and repair if necessary. <LHD>

NOTE: Prior to the wiring harness inspection, check junction block connector C-204, joint connectors C-137 and C-138, and repair if necessary. <RHD>

- Check the output lines for open circuit.

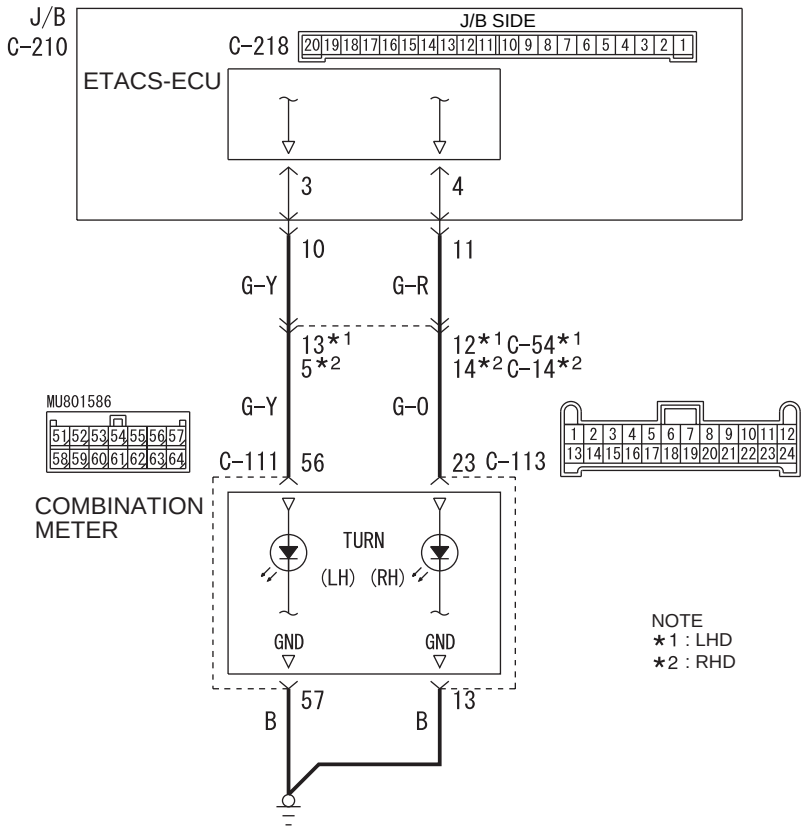
Q: Is the check result normal?
YES : Go to Step 7.
NO : Repair the wiring harness.

STEP 7. Retest the system.
Check that the rear fog lamp indicator illuminates normally.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Replace the combination meter.

Inspection Procedure 12: The turn-signal lamp indicator does not illuminate.

Turn-Signal Lamp Indicator Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver WAC54E076A

COMMENTS ON TROUBLE SYMPTOM

If the turn-signal lamp indicator does not illuminate, the wiring harness connector(s) or the combination meter may be defective.

PROBABLE CAUSES

- Malfunction of the combination meter
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. Check the turn-signal lamps.

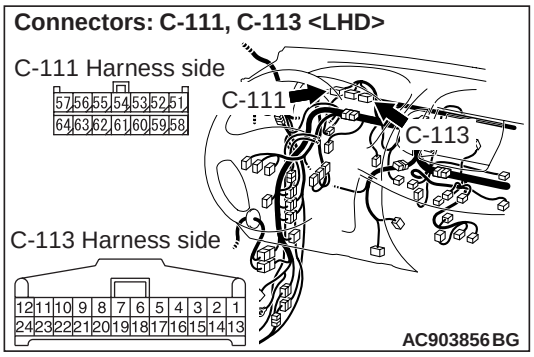
When the turn-signal lamp switch is operated, check that the turn-signal lamps illuminate/go off normally.

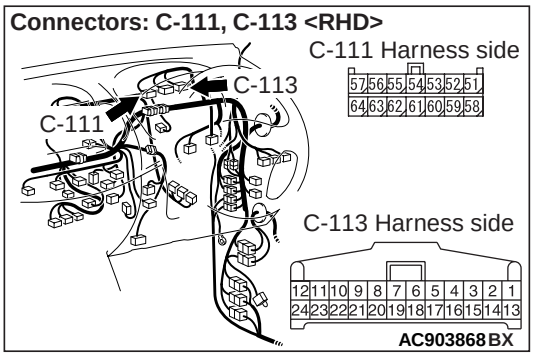
Q: Are the turn-signal lamps in good condition?

YES : Go to Step 2.

NO : First, repair the turn-signal lamps. Refer to trouble symptom chart P.54A-109.

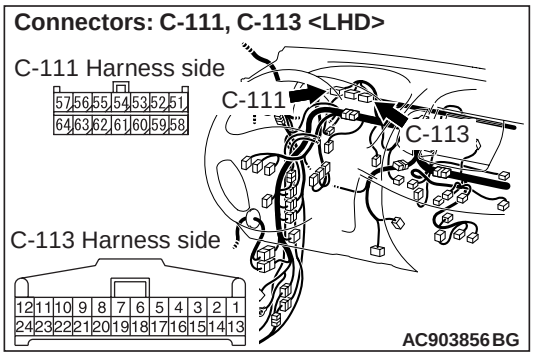
STEP 2. Connector check: C-111 and C-113 combination meter connector

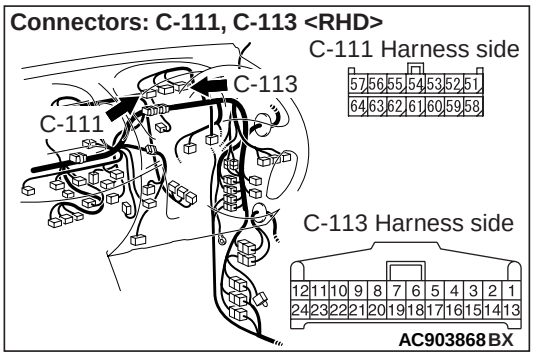




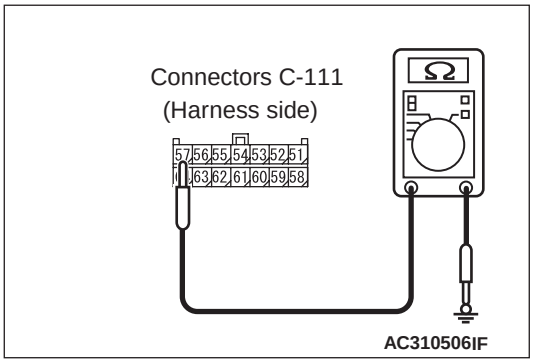
Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the defective connector.

STEP 3. Resistance measurement at the C-111 and C-113 combination meter connector.



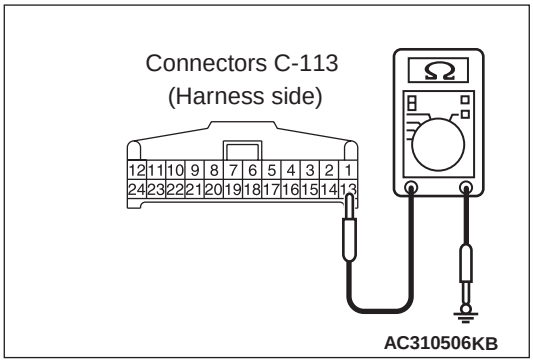


(1) Disconnect the connector, and measure at the wiring harness side.



(2) Resistance between C-111 combination meter connector terminal No.57 and body earth

OK: Continuity exists (2 Ω or less)

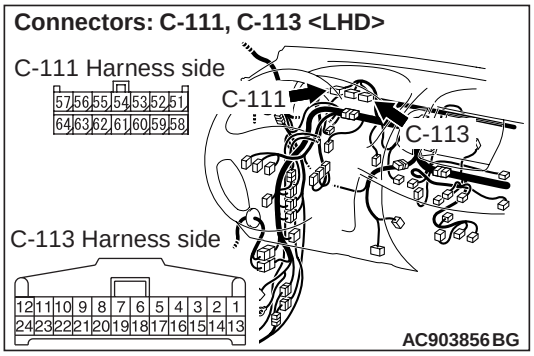


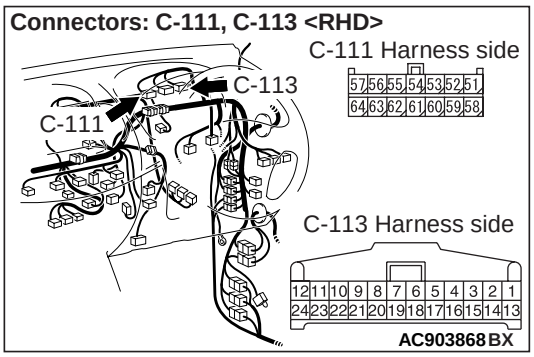
(3) Check the resistance between the C-113 combination meter connector terminal No.13 and body earth.

OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?
YES : Go to Step 5.
NO : Go to Step 4.

STEP 4. Check the wiring harness fromC-111 combination meter conector terminal No.57 or C-113 combination meter connector terminal No.13 to body earth.





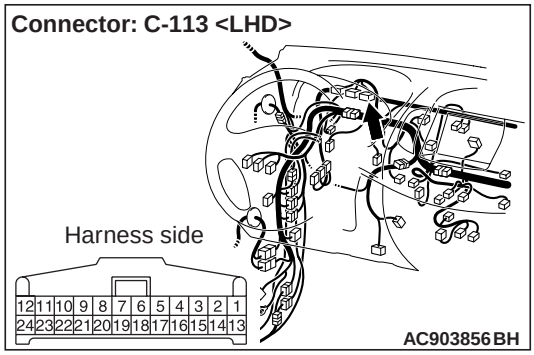
- Check the earth wires for open circuit.

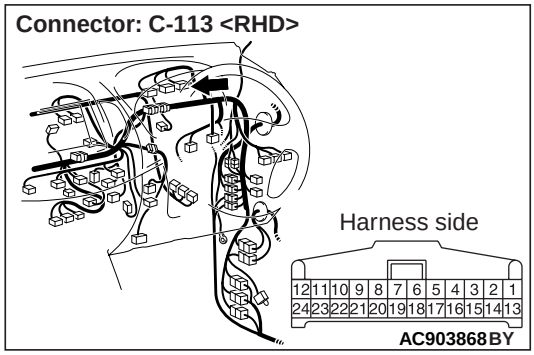
Q: Is the check result normal?

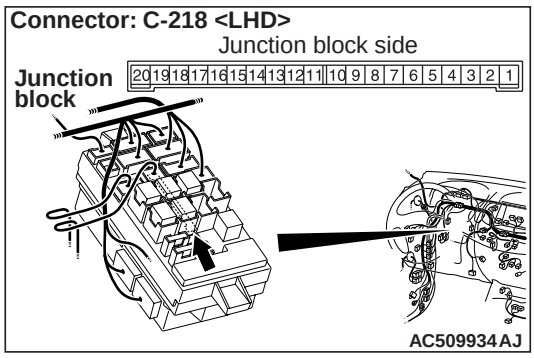
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

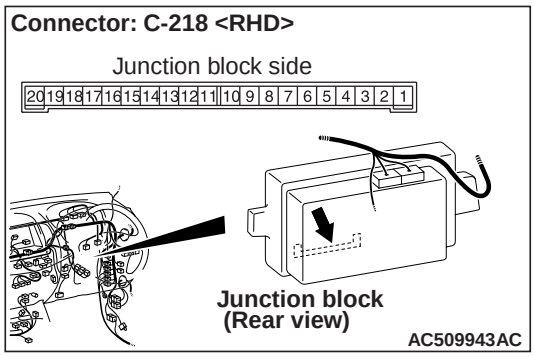
NO : Repair the wiring harness.

STEP 5. Connector check: C-113 combination meter connector and C-218 ETACS-ECU connector







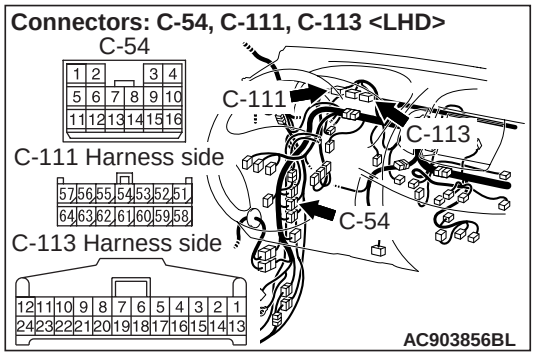


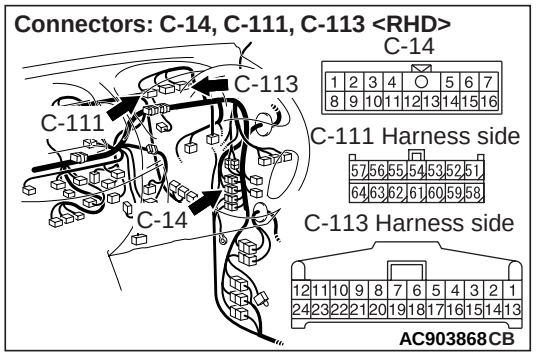
Q: Is the check result normal?

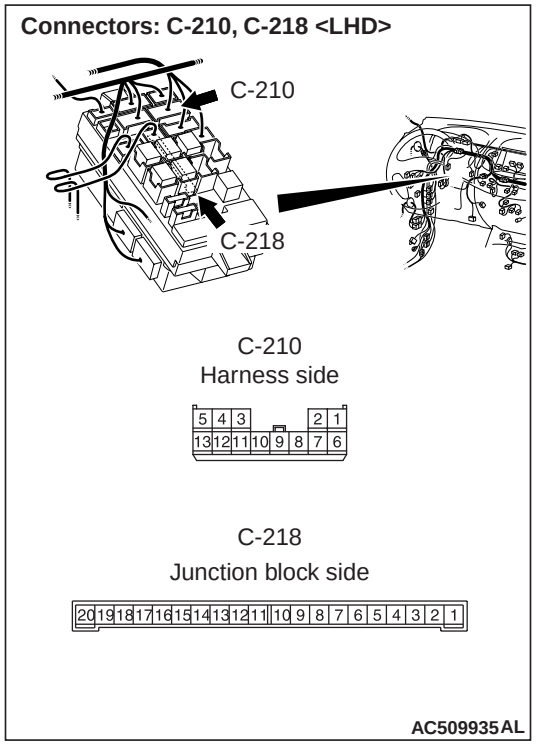
YES : Go to Step 6.

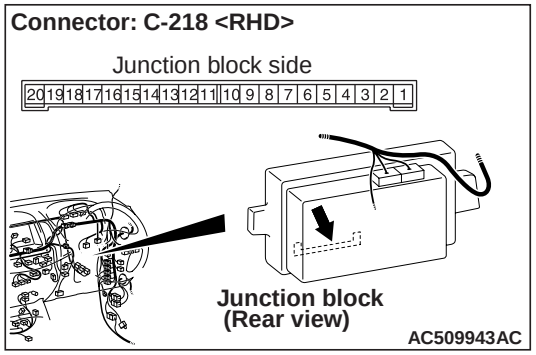
NO : Repair the defective connector.

STEP 6. Check the wiring harness from C-111 combination meter (turn: LH) connector terminal No.56 or C-113 combination meter (turn: RH) connector terminal No.23 to C-218 ETACS-ECU connector terminal No.3 or No.4.

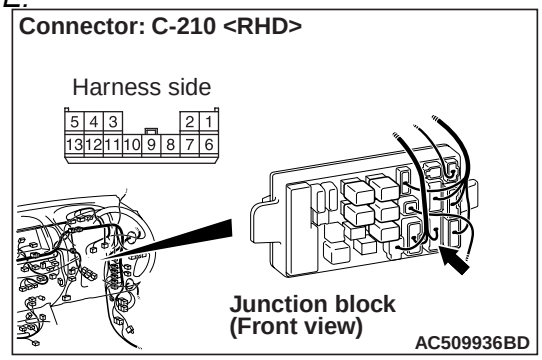








NOTE:



Prior to the wiring harness inspection, check junction block connector C-210 and intermediate connector C-54 <LHD> or C-14 <RHD>, and repair if necessary.

- Check the output lines for open circuit.

Q: Is the check result normal?

YES : Go to Step 7.
NO : Repair the wiring harness.

STEP 7. Retest the system.

Check that the turn-signal lamp indicator illuminates normally.

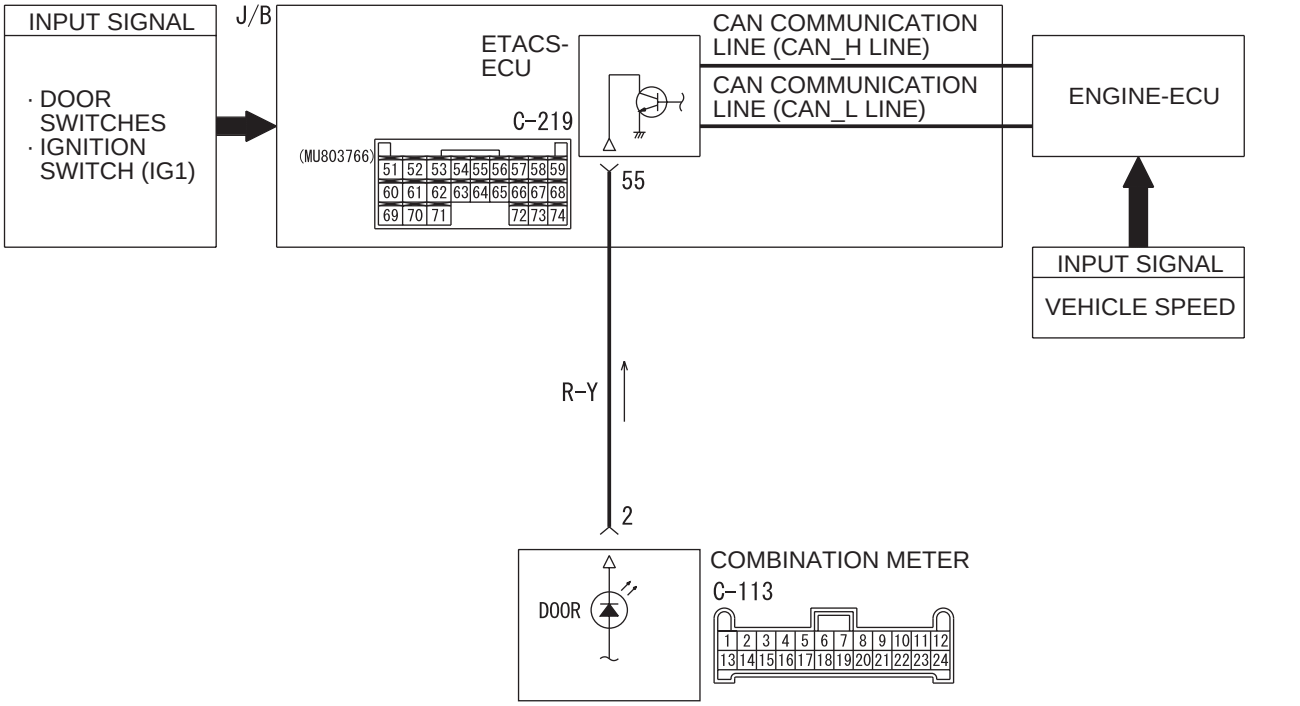
Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Replace the combination meter.

Inspection procedure 13: The door-ajar warning lamp does not illuminate.

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Door-Ajar Warning Lamp Function



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver WAC54E018A

COMMENTS ON TROUBLE SYMPTOM

The ETACS-ECU operates this function in accordance with the input signals below.

- Ignition switch (IG1)

- Driver's door switch
- Passenger's door switch
- Rear door switch
- Vehicle speed signal

If this function does not work normally, these input signal circuit(s) or the ETACS-ECU may be defective.

PROBABLE CAUSES

- Malfunction of the front door switch (RH)
- Malfunction of the front door switch (LH)
- Malfunction of the rear door switch (RH)
- Malfunction of the rear door switch (LH)
- Malfunction of the tailgate switch
- Malfunction of the ETACS-ECU
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics

Use the M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?

YES : Go to Step 2.

NO : Repair the CAN bus line (Refer to GROUP 54C – Troubleshooting). On completion, go to Step 5.

STEP 2. Check the diagnosis code of the engine-ECU.

Check if the diagnosis code is set in either of the engine-ECU.

Q: Is the diagnosis code set?

YES : Diagnose the engine-ECU (Refer to GROUP 13A – Troubleshooting . On completion, go to Step 4.

NO : Go to Step 3.

STEP 3. M.U.T.-III data list

Check the input signals below, which are related to the door-ajar warning lamp function.

- Turn the ignition switch to the "LOCK" (OFF) position.
- Open any door (including tailgate).

Item No.	Item name	Normal condition
19	Drive's door switch	Any of them becomes ON.
48	Passenger's door switch	
49	Rear door switch	
30	Ignition switch(IG1)	OFF

OK: Normal conditions are displayed for all the items.

Q: Is the check result normal?

YES <All the signals are received normally.> : Go to Step 4.

NO <The driver's door switch signal is not received.> : Refer to inspection procedure C-5 "One of the door switch signals is not received P.54A-540."

NO <The passenger's door switch signal is not received.> : Refer to inspection procedure C-5 "One of the door switch signals is not received P.54A-540."

NO <The rear door switch signal is not received.> : Refer to inspection procedure C-5 "One of the door switch signals is not received P.54A-540."

NO <The ignition switch (IG1) signal is not received.> : Refer to inspection procedure C-3 "The ignition switch (IG1) signal is not received P.54A-533."

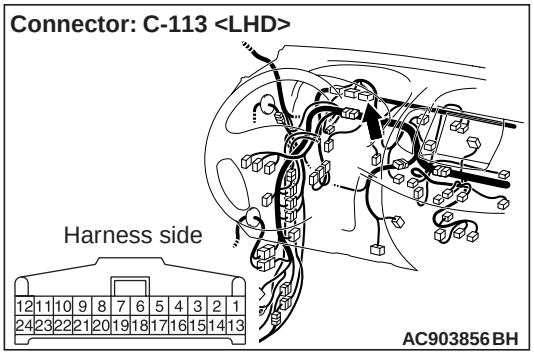
STEP 4. Check the combination meter

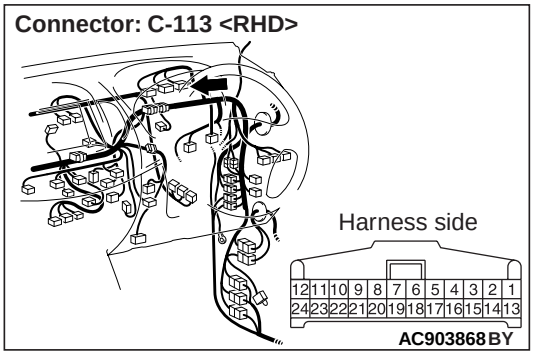
Q: Does the combination meter work?

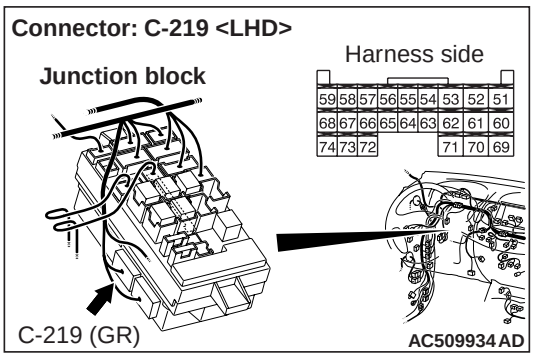
YES : Go to Step 5.

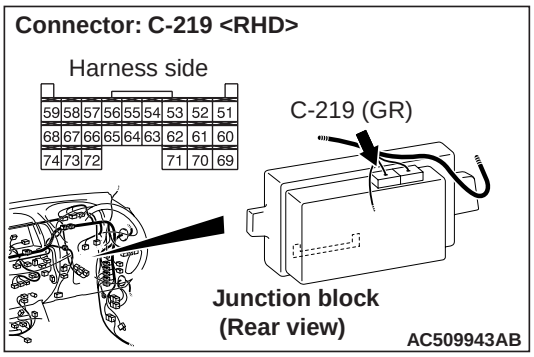
NO : Refer to symptom procedure 1 "Power Supply Circuit System Check P.54A-47."

STEP 5. Connector check: C-113 combination meter connector and C-219 ETACS-ECU connector



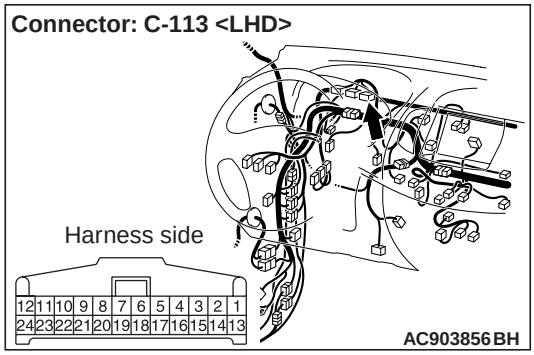


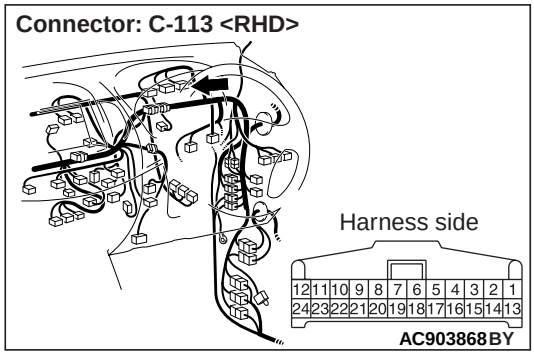


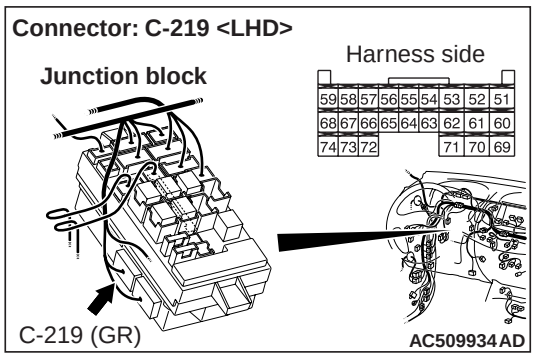


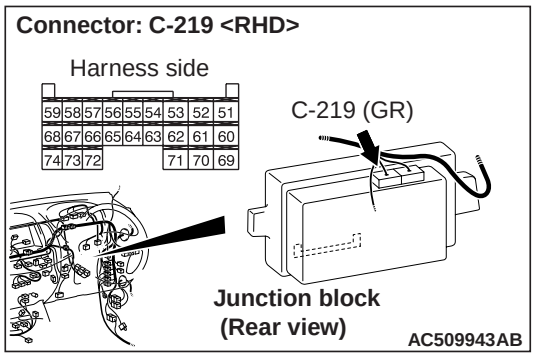
Q: Is the check result normal?
YES : Go to Step 6.
NO : Repair the defective connector.

STEP 6. Check the wiring harness from C-113 combination meter connector terminal No.2 to C-219 ETACS-ECU connector terminal No.55.









- Check the output lines for open circuit.

Q: Is the check result normal?
YES : Go to Step 7.
NO : Repair the wiring harness.

STEP 7. Retest the system.
The door-ajar warning lamp function should work normally.

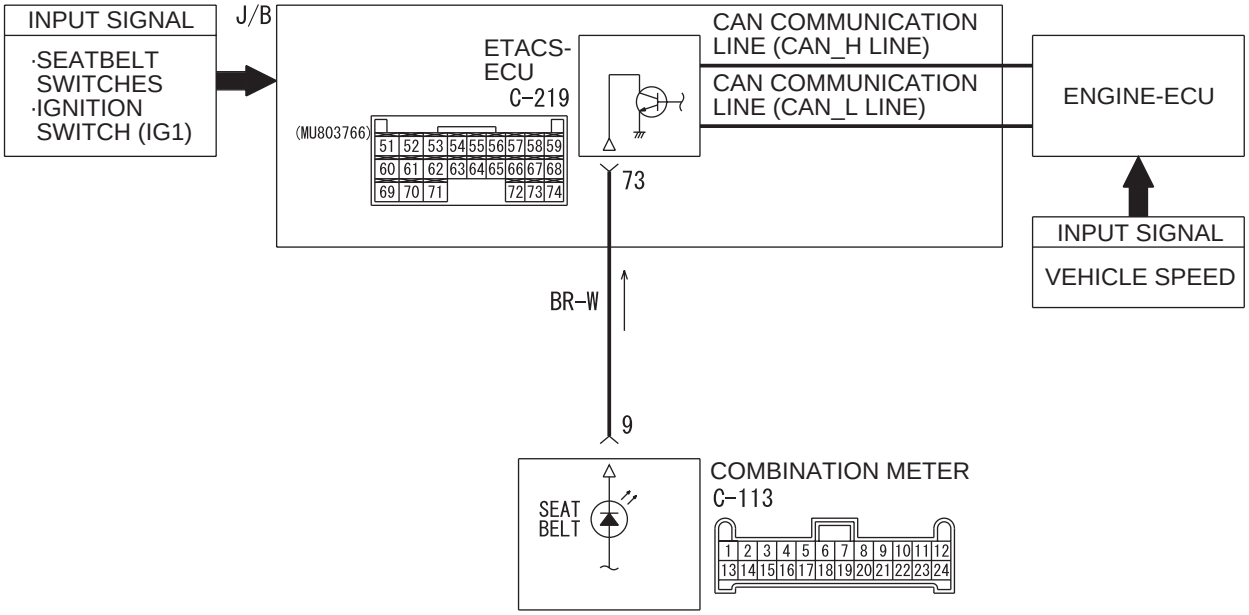
Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Replace the ETACS-ECU and register the ID codes (Refer to P.54A-39).

Inspection procedure 14: The seat belt warning lamp does not illuminate or flash.

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Seat Belt Warning Lamp Function



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver WAC54E019A

COMMENTS ON TROUBLE SYMPTOM
The ETACS-ECU operates this function in accordance with the input signals below.
- Ignition switch (IG1)
- Driver's seat belt switch
- Passenger's seat belt switch
- Vehicle speed signal

If this function does not work normally, these input signal circuit(s) or the ETACS-ECU may be defective.

PROBABLE CAUSES
- Malfunction of the seat belt switch (RH)
- Malfunction of the seat belt switch (LH)
- Malfunction of the ETACS-ECU
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics
Use the M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the CAN bus line (Refer to GROUP 54C – Troubleshooting). On completion, go to Step 5.

STEP 2. Check the diagnosis code of the engine-ECU.

Check if the diagnosis code is set in either of the engine-ECU.

Q: Is the diagnosis code set?

YES : Diagnose the engine-ECU (Refer to GROUP 13A – Troubleshooting . On completion, go to Step 4.

NO : Go to Step 3.

STEP 3. M.U.T.-III data list

Check the input signals below, which are related to the seat belt warning lamp function.

- Turn the ignition switch to the "ON" position.
- Remove the each inserted seatbelt.

Item No.	Item name	Normal condition
30	Ignition switch(IG1)	ON
50	Driver's seatbelt(Buckle SW)	Being turned ON from OFF
51	Passenger seatbelt(Buckle SW)	

OK: Normal conditions are displayed for all the items.

Q: Is the check result normal?

YES <All the signals are received normally.> : Go to Step 4.

NO <The seat belt switch signal is not received.> : Refer to inspection procedure C-6 "The seat belt switch signal is not received P.54A-544 <L.H. drive vehicles> or P.54A-544 <R.H. drive vehicles>."

NO <The ignition switch (IG1) signal is not received.> : Refer to inspection procedure C-3 "The ignition switch (IG1) signal is not received P.54A-533."

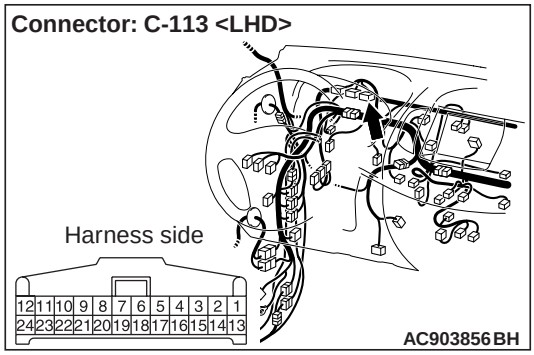
STEP 4. Check the combination meter

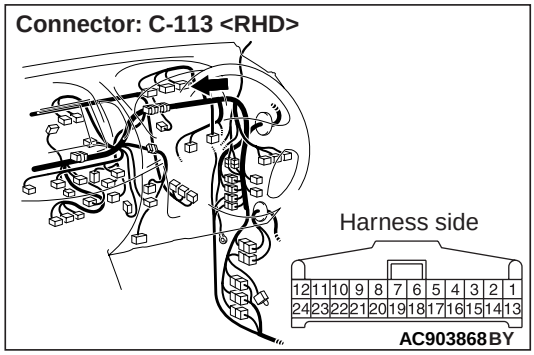
Q: Does the combination meter work?

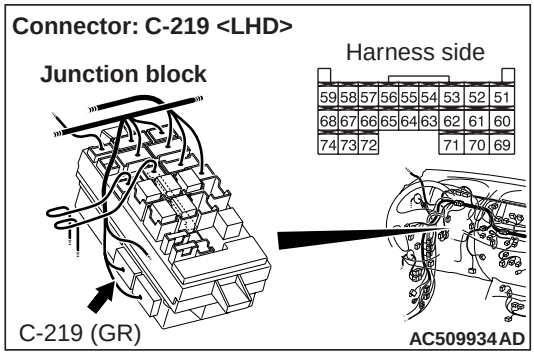
YES : Go to Step 5.

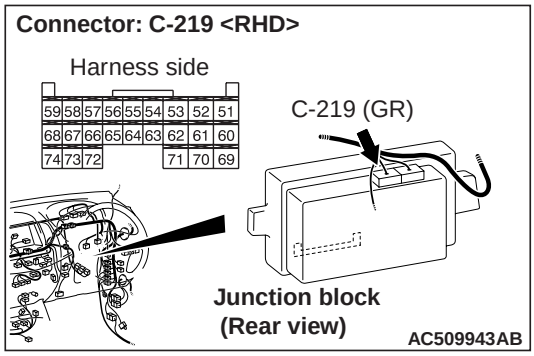
NO : Refer to symptom procedure 1 "Power supply circuit system check P.54A-47."

STEP 5. Connector check: C-113 combination meter connector and C-219 ETACS-ECU connector







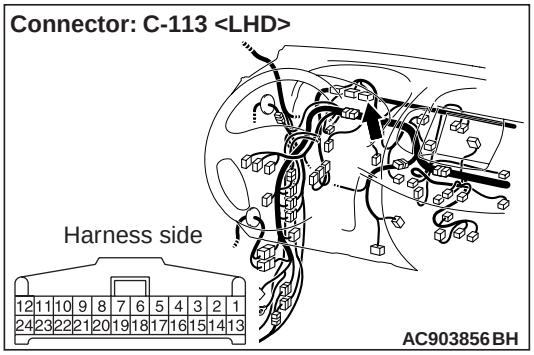


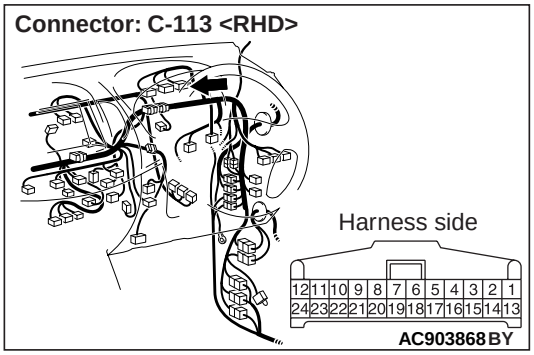
Q: Is the check result normal?

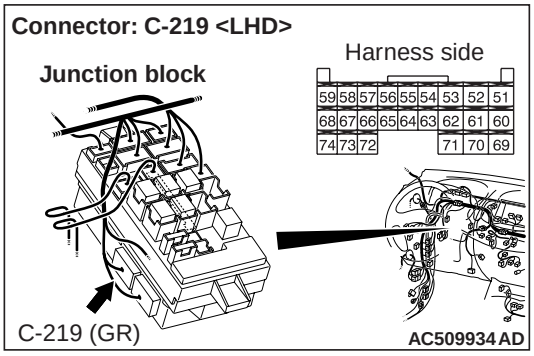
YES : Go to Step 6.

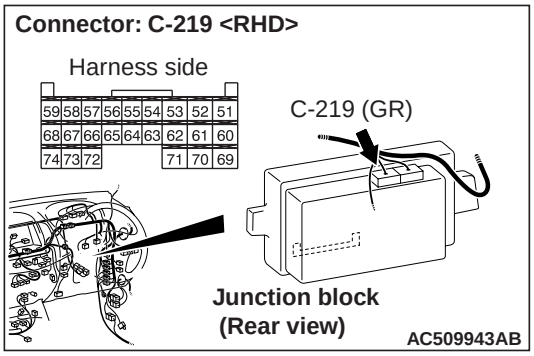
NO : Repair the defective connector.

STEP 6. Check the wiring harness from C-113 combination meter connector terminal No.9 to C-219 ETACS-ECU connector terminal No.73.









- Check the output lines for open circuit.

Q: Is the check result normal?

YES : Go to Step 7.
NO : Repair the wiring harness.

STEP 7. Retest the system.

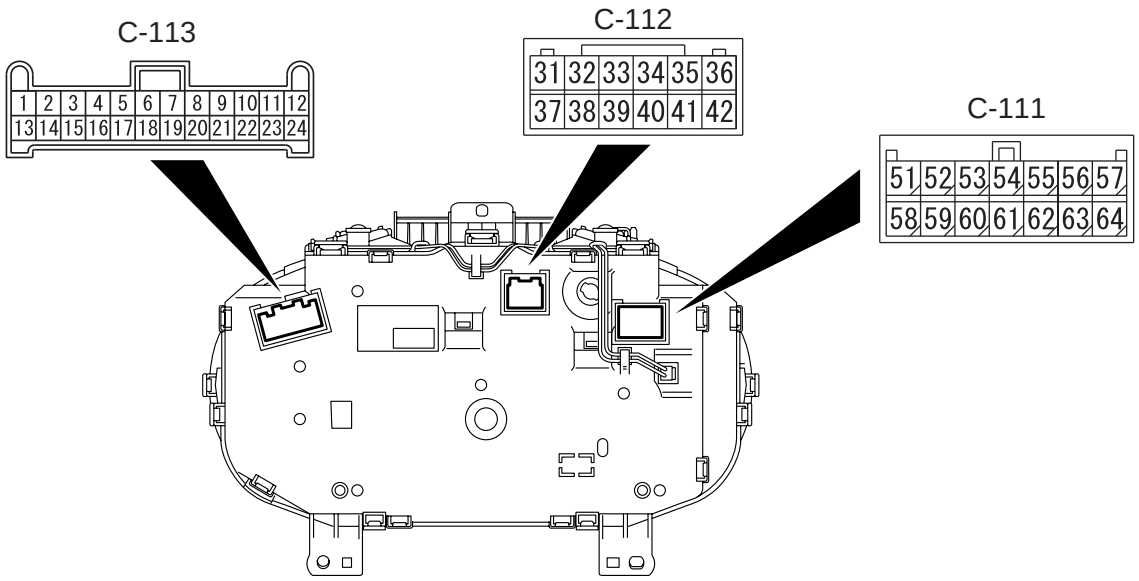
The door-ajar warning lamp function should work normally.

Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Replace the ETACS-ECU and register the ID codes (Refer to P.54A-39).

CHECK AT ECU TERMINALS

M1540201200488



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Connector: C-111

Terminal No.	Check item	Check condition	Normal condition
51	Glow indicator lamp	Ignition switch: ON and glow indicator lamp: OFF	System voltage
52	Charge warning lamp	Ignition switch: ON and before alternator generation and charge warning lamp: OFF	System voltage
53 – 55	–	–	–
56	Input of turn-signal lamp LH switch	Ignition switch: ON and turn-signal lamp (LH) switch: ON and turn-signal lamp: ON (turn: ON)	System voltage
57	Earth	Always	1 V or less
58	–	–	–
59	Over drive off indicator	Ignition switch: ON and over drive off switch: ON and over drive off indicator: ON	System voltage
60	A/T fluid temperature warning lamp	Ignition switch: ON and A/T fluid temperature warning lamp: OFF	System voltage
61	Oil pressure switch	Ignition switch: ON and before starting the engine and oil pressure warning lamp: OFF	System voltage
62	–	–	–
63	Check engine warning lamp	Ignition switch: ON and check engine warning lamp: OFF	System voltage
64	Water separator indicator lamp	Ignition switch: ON and water level switch: ON and water separator indicator lamp: ON	1 V or less

Connector: C-112

Terminal No.	Check items	Check conditions	Normal conditions
31	Shift indicator – L	Ignition switch: ON and shift lever is in L position	System voltage
32	TCL OFF indicator lamp	Ignition switch: ON and TCL OFF indicator lamp: ON	System voltage
33	ASC warning lamp	Ignition switch: ON and ASC warning lamp: ON	System voltage
34	Tachometer (engine speed)	Engine: Started	Pulse signal
35	Speedometer (vehicle speed)	Running	Pulse signal
36	Power supply from ignition switch (IG1)	Ignition switch: ON	System voltage
37	Shift indicator – 2	Ignition switch: ON and shift lever is in 2 position	System voltage
38	Shift indicator – D	Ignition switch: ON and shift lever is in D position	System voltage
39	Shift indicator – N	Ignition switch: ON and shift lever is in N position	System voltage
40	Shift indicator – R	Ignition switch: ON and shift lever is in R position	System voltage
41	Shift indicator – P	Ignition switch: ON and shift lever is in P position	System voltage
42	Battery power supply	Always	System voltage

Connector: C-113

Terminal No.	Check items	Check conditions	Normal conditions
1	–	–	–
2	Door ajar warning lamp	Ignition switch: ON and door is open and door ajar warning lamp: ON	1 V or less
3 – 7	–	–	–
8	4WD indicator lamp	Ignition switch: ON and 4WD indicator lamp: OFF	System voltage
9	Seat belt warning lamp	Ignition switch: ON and seat belt switch: ON	System voltage
10, 11	–	–	–
12	Input of parking brake switch and brake fluid level switch	• Ignition switch: ON and parking brake switch: ON • Ignition switch: ON and brake fluid level switch: ON • Ignition switch: ON and vacuum switch: ON • Brake warning lamp: ON	1 V or less
13	Earth	Always	1 V or less
14	–	–	–

Terminal No.	Check items	Check conditions	Normal conditions
15	Illumination (earth)	Always	1 V or less
16	Illumination (power supply)	Illumination switch: ON and lighting switch: ON	System voltage
17	Brake warning lamp	Ignition switch: ON and brake warning lamp: ON	System voltage
18	SRS air bag warning lamp	Ignition switch: ON and SRS air bag warning lamp: ON	System voltage
19	ABS warning lamp	Ignition switch: ON and ABS warning lamp: ON	System voltage
20, 21	–	–	–
22	Input of fuel gauge	Fuel: FULL	Approximately 2 V
		Fuel: EMPTY	Approximately 8 V
23	Input of turn-signal lamp RH switch	Ignition switch: ON and turn-signal lamp (RH) switch: ON and turn-signal lamp: ON (turn: ON)	System voltage
24	Input of high beam switch	Ignition switch: ON and high beam switch: ON and high beam indicator: ON (beam: ON)	System voltage

ON-VEHICLE SERVICE

CHECK THE SPEEDOMETER

M1540201400608

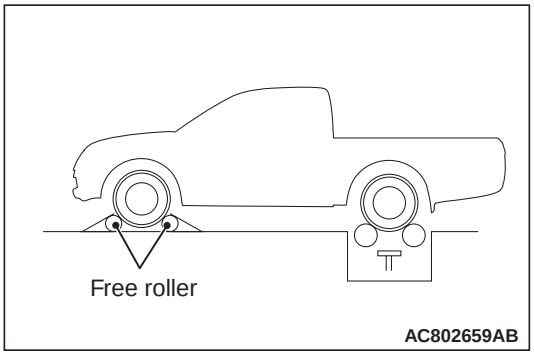
⚠ CAUTION

Since the diagnosis code may be stored in the ABS-ECU or ASTC-ECU when checking the speedometer with speedometer tester, erase the diagnosis code.

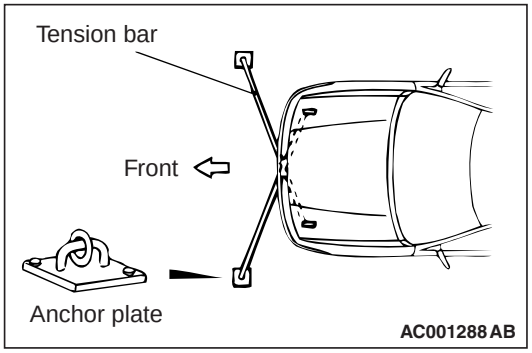
⚠ CAUTION

Do not accelerate or decelerate suddenly during servicing work.

1. Check that the current tyre inflation pressures meet the inflation pressure label (Refer to GROUP 31 – On-vehicle Service).
2. Move <4WD> transfer shift lever to "4H" position.



3. Set the vehicle on the speedometer tester and set the front wheels on the free roller.
4. For prevention of front wheel lateral runout, install chain or wire (the other end of which is tightly fixed on front towing hooks) on the vehicle.



5. For prevention of rear wheel lateral runout and of vehicle from starting out, install extension fittings on rear towing hooks, and install both ends in the anchor plate.
6. Check that the speedometer indicating range is within the standard value and the needle fluctuation is within the limit.

   Standard value <Speedometer to display km/h only>:

Speed km/h	Speedometer indicating tolerance km/h
20	20.0 – 24.0
40	40.0 – 44.0
80	80.5 – 85.5
120	121.5 – 127.5
160	162.5 – 169.5

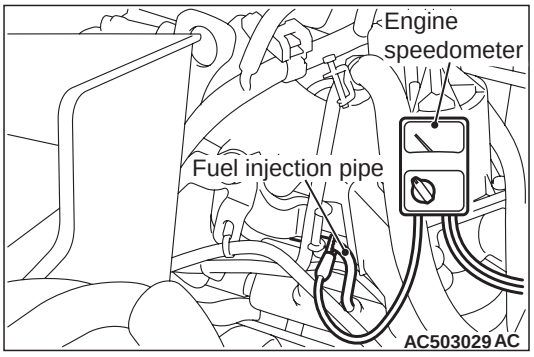
Standard value <Speedometer to display MPH and km/h>:

Speed km/h (mph)	Speedometer indicating tolerance km/h (mph)
20 (10)	20.0 – 24.0 (10.0 – 12.5)
40 (25)	40.0 – 44.0 (25.0 – 27.5)
80 (50)	80.5 – 85.5 (50.3 – 53.5)
120 (75)	121.5 – 127.5 (76.0 – 80.0)
160 (100)	162.5 – 169.5 (101.5 – 106.0)

Limit: Needle fluctuation (Vehicle speed is 35 km/h or more) ± 3 km/h

TACHOMETER CHECK

M1540201500036



1. Connect the engine speedometer to the fuel injection pipe.
2. Compare the readings of the engine speedometer and the tachometer at every engine speed, and check if the variation are within the standard value.

Standard value:

Engine speed r/min	Tachometer indicating tolerance r/min
700	700 ± 100
(2,000)	(2,000 ± 100)
3,000	3,000 ± 150
(4,000)	(4,000 ± 200)
5,000	5,000 ± 250

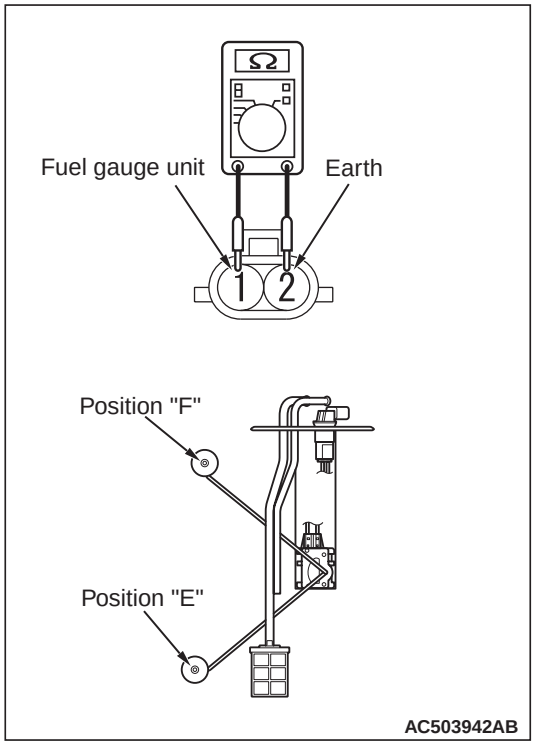
NOTE: The value in parentheses is a reference value.

FUEL GAUGE UNIT CHECK

M1540201600657

NOMINAL RESISTANCE OF THE FUEL GAUGE UNIT

1. Remove the fuel gauge unit (Refer to GROUP 13B, Fuel Tank).



2. When float of the fuel gauge unit is in stopper positions "F" and "E", ensure that resistance between the fuel gauge unit terminal and earth terminal is within the standard value.

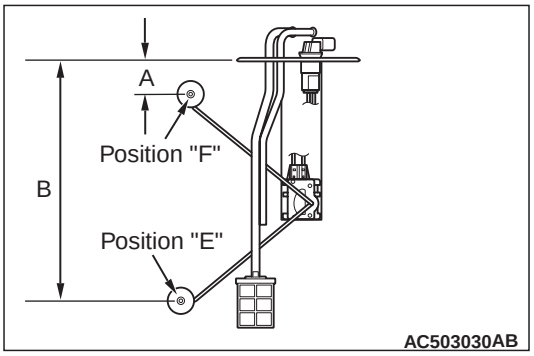
Standard value:

Float position	Gauge resistance Ω
Stopper position "F"	13.0 ± 1
Stopper position "E"	120.0 ± 1

3. When the float is moved slowly between stopper positions "F" and "E", ensure that the resistance is smoothly changing.

FUEL GAUGE UNIT FLOAT HEIGHT

1. Remove the fuel gauge unit (Refer to GROUP 13B, Fuel Tank).



2. When float is moved to contact the float arm on the stopper, ensure that stopper positions "F" and "E" are within the standard value.

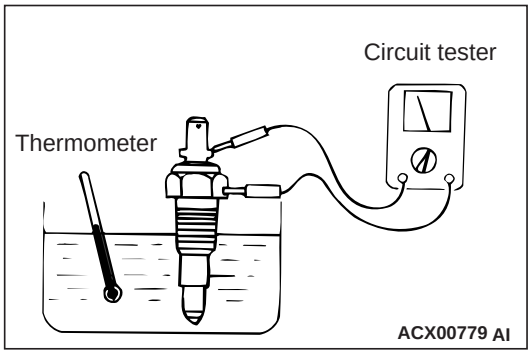
   Standard value:

Float position	Float height mm
Stopper position "F"	35.0 ± 3
Stopper position "E"	254.7 ± 3

ENGINE COOLANT TEMPERATURE GAUGE UNIT CHECK

M1540207200022

1. Bleed the engine coolant.(Refer to GROUP 14 – On-vehicle Service .)
2. Remove the engine coolant temperature gauge unit.

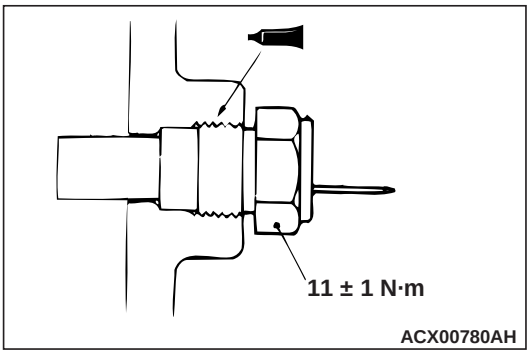


3. Immerse the unit in 50°C water to measure the resistance.

   Standard value: 239 Ω

   Reference value

Temperature (°C)	Resistance Ω
83	70.2
105	34.9
122	21.5



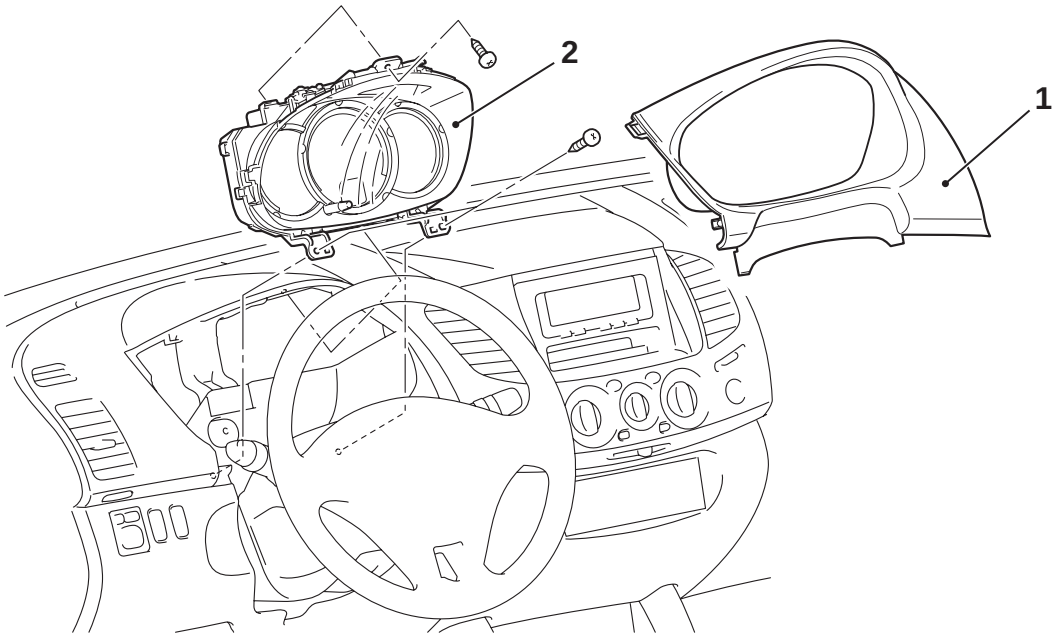
4. After inspection, apply specified sealant at threads of water temperature gauge unit, and tighten to the specified torque.

   Semi-drying sealant: 3M ATD Part No.8660 or equivalent

5. Add engine coolant.(Refer to GROUP 14 – On-vehicle Service .)

REMOVAL AND INSTALLATION

M1540201700030



AC805299AB

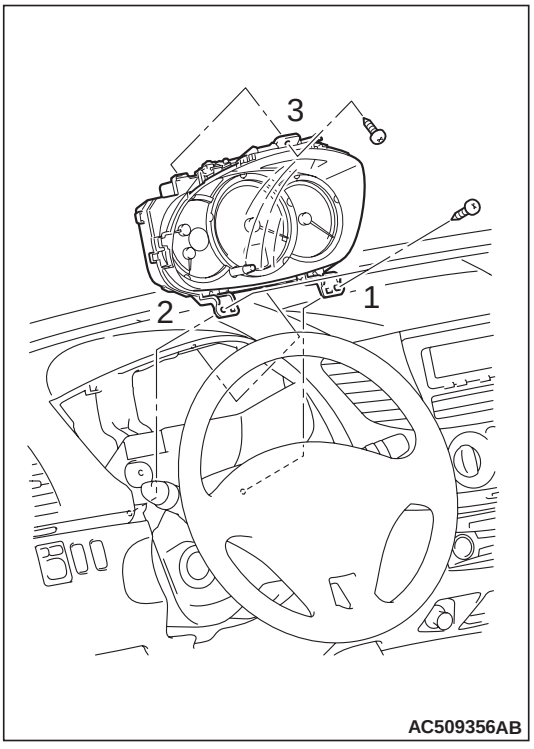
Removal steps

1. Combination meter bezel (Refer to GROUP 52A, Instrument Panel Assembly).

>>A<< 2. Combination meter assembly

INSTALLATION SERVICE POINT

>>A<< COMBINATION METER INSTALLATION



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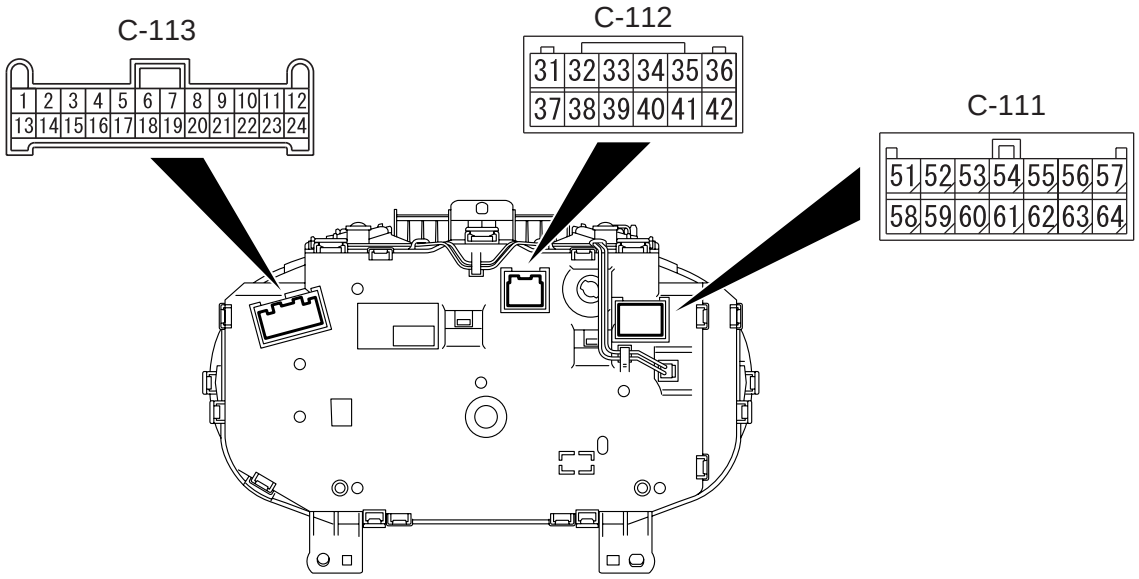
Fixing order of screws from 1 to 3.

INSPECTION

INSPECTION

M1540207600116

CHECK OF COMBINATION METER INTERNAL RESISTANCE



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Measure the resistance between terminals using an ohmmeter.

Terminal No. to measure resistance	Terminal name	Standard value
42 – 13	Battery power source and earth	1 MΩ or more
42 – 57	Battery power source and earth	1 MΩ or more
36 – 13	IG power source and earth	1 MΩ or more
36 – 57	IG power source and earth	1 MΩ or more
42 – 22	Battery power source and fuel gauge	1 MΩ or more
36 – 22	IG power source and fuel gauge	1 MΩ or more
22 – 13	Fuel gauge and earth	–
22 – 57	Fuel gauge and earth	–
42 – 21	Battery power source and engine coolant temperature gauge	1 MΩ or more
36 – 21	IG power source and engine coolant temperature gauge	1 MΩ or more
21 – 13	Engine coolant temperature gauge and earth	–
21 – 57	Engine coolant temperature gauge and earth	–

HEADLAMP

SERVICE SPECIFICATIONS

M1540100200411

Item			Standard value	Limit
Headlamp aiming	Low beam (halogen headlamp)	Vertical direction	36 mm (0.69°) below horizontal line (H)	Between 21 mm (0.4°) to 51 mm (0.98°) downward from the horizontal line (H)
		Horizontal direction	Elbow point intersects the vertical line (V)	± 26 mm (± 0.5°) from the vertical line (V)
Headlamp luminous intensity measurement cd (When a screen is set 25 m ahead of the vehicle)			–	30,000 cd or more

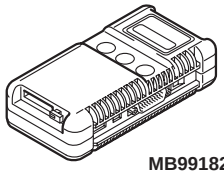
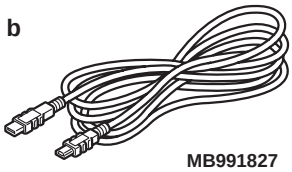
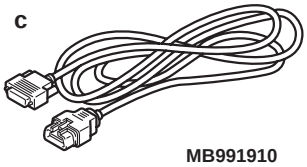
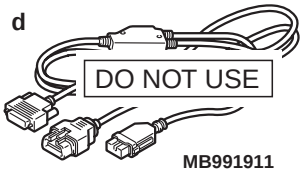
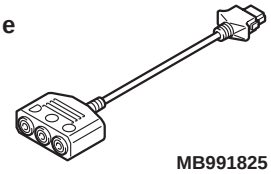
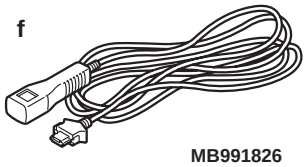
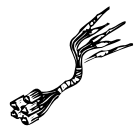
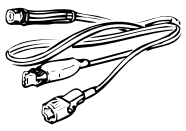
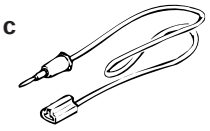
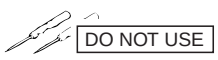
PRECAUTIONS ON HOW TO USE THE HEADLAMP ASSEMBLY

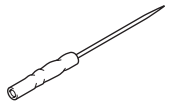
Be careful with the following items as resin lenses are used in the headlamp assembly.

- Don't illuminate the headlamp for three minutes or more when the headlamp is covered with scratch protector.
- Don't tape the outer lens.
- Don't scratch the outer lens surface with a sharp edged special tool.
- Use the specified genuine bulb.

SPECIAL TOOLS

M1540104400031

Tool	Number	Name	Use
a  MB991824 b  MB991827 c  MB991910 d  MB991911 e  MB991825 f  MB991826 MB991955	MB991955 a. MB991824 b. MB991827 c. MB991910 d. MB991911 e. MB991825 f. MB991826	M.U.T.-III sub-assembly a. Vehicle Communication Interface (V.C.I.) b. M.U.T.-III USB cable c. M.U.T.-III main harness A (Vehicles with CAN communication system) d. M.U.T.-III main harness B (Vehicles without CAN communication system) e. M.U.T.-III measure adapter f. M.U.T.-III trigger harness	⚠ CAUTION **For vehicles with CAN communication, use M.U.T.-III main harness A to send simulated vehicle speed. If you connect M.U.T.-III main harness B instead, the CAN communication does not function correctly.** Diagnosis code, service data and actuator test check.
a  b  c  d  MB991223	MB991223 a. MB991219 b. MB991220 c. MB991221 d. MB991222	Harness set a. Check harness b. LED harness c. LED harness adapter d. Probe	Continuity check and voltage measurement at harness wire or connector a. For checking connector pin contact pressure b. For checking power supply circuit c. For checking power supply circuit d. For connecting a locally sourced tester

Tool	Number	Name	Use
 MB992006	MB992006	Extra fine probe	Continuity check and voltage measurement at harness wire or connector

TROUBLESHOOTING

DIAGNOSIS TROUBLESHOOTING FLOW

M1540104200037

Refer to GROUP 00 – Contents of troubleshooting .

DIAGNOSTIC FUNCTION

M1540104300045

HOW TO READ DIAGNOSIS CODE

Use the M.U.T.-III to read diagnosis code (Refer to GROUP 00 – Diagnosis Function).

⚠ CAUTION

On troubleshooting, if the ignition switch is turned ON while disconnecting connector(s), diagnosis code(s) associated with other system may be set. On completion, confirm all systems for diagnosis code(s). If diagnosis code(s) are set, erase them all.

HOW TO ERASE DIAGNOSIS CODE

Use the M.U.T.-III to erasing diagnosis code (Refer to GROUP 00 – Diagnosis Function).

DIAGNOSIS CODE CHART

M1540101400496

ETACS-ECU

Code No.	Diagnostic item		Reference page
B1707	Flasher timer	Detection of turn-signal lamp (open circuit)	P.54A-96

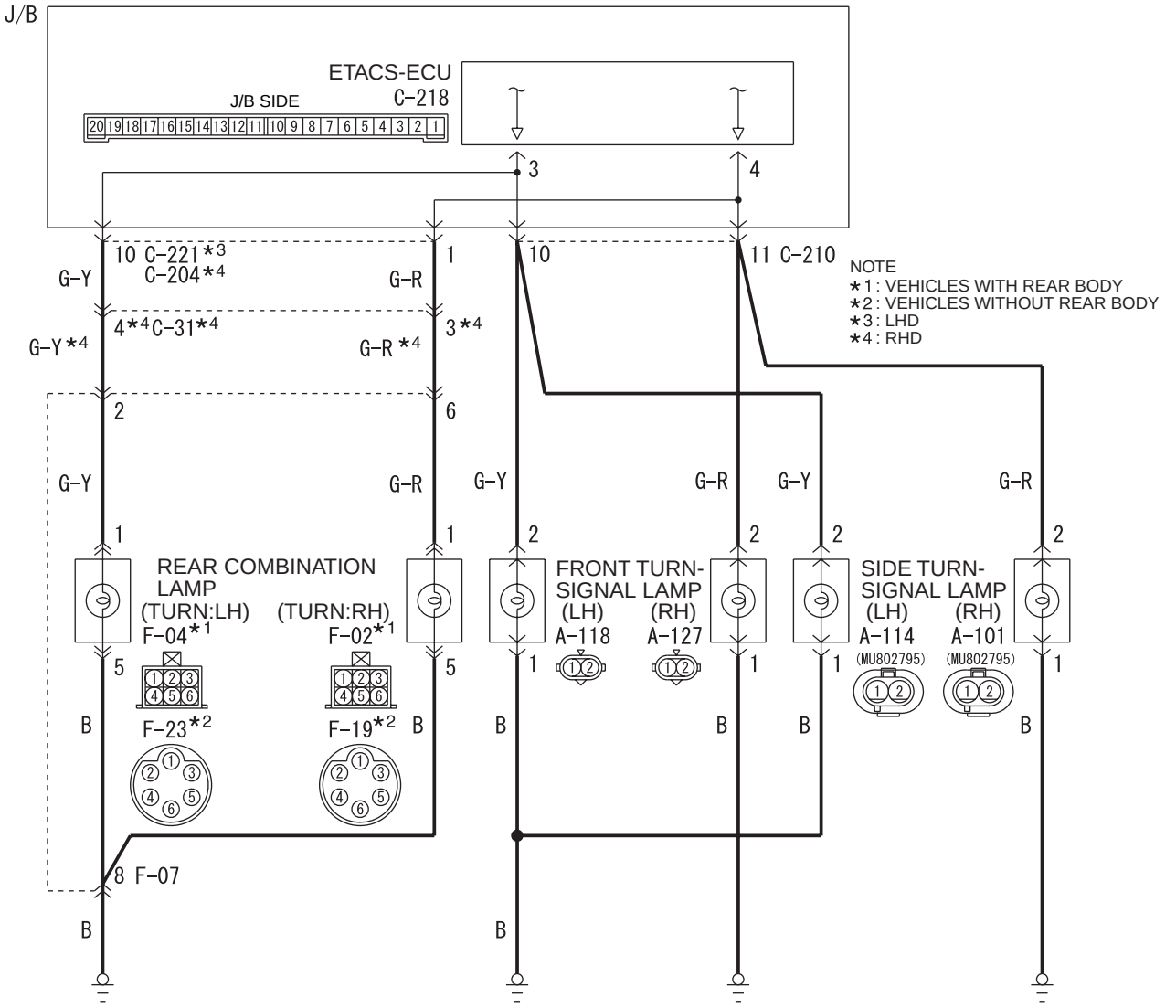
LIN

Code No.	Diagnostic item	Reference page
L0432	RLS RS adaptation error	P.54A-108
L0434	RLS rain sensor error	P.54A-108
L0436	RLS light sensor error	

DIAGNOSIS CODE PROCEDURES

Code No.B1707: Detection of turn-signal lamp (open circuit)

Turn-Signal Lamp Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

WAC54E077A

COMMENTS ON TROUBLE SYMPTOM

When the turn-signal lamp bulb is blown, or connector(s) or wiring harness between the ETACS-ECU, the turn-signal lamp which does not illuminate and body earth is defective, the ETACS-ECU set diagnosis code No.B1707.

PROBABLE CAUSES

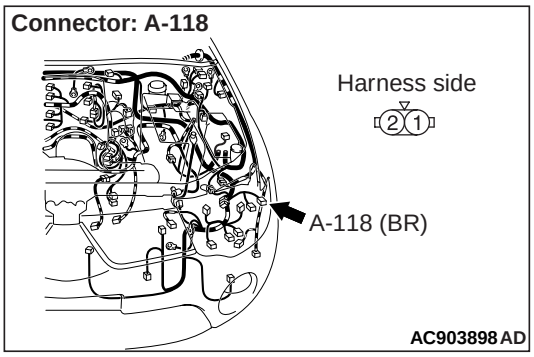
- Malfunction of the turn-signal lamp bulb
- Malfunction of the ETACS-ECU
- Damaged harness wires and connectors

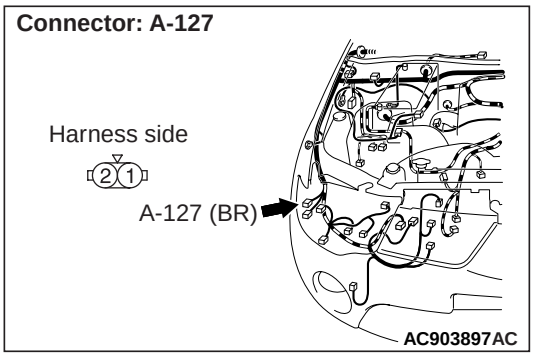
DIAGNOSIS PROCEDURE

STEP 1. Confirm which turn-signal lamp is defective.

Q: Which turn-signal lamp fails to illuminate correctly?
Front turn-signal lamp : Go to Step 2.
Side turn-signal lamp : Go to Step 9.
Rear turn-signal lamp : Go to Step 16.

STEP 2. Connector check: A-118 front turn-signal lamp (LH) connector or A-127 front turn-signal lamp (RH) connector.





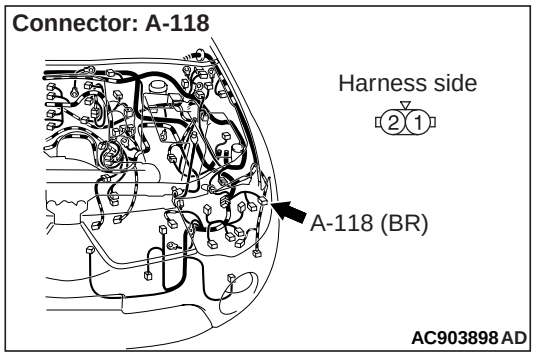
Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the defective connector. Go to Step 23.

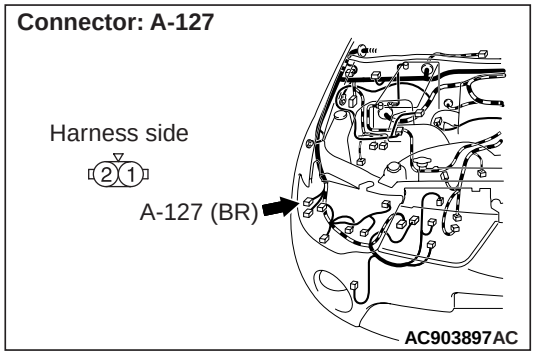
STEP 3. Check the bulb(s) of the front turn-signal lamps.

Check the bulb(s) of the defective lamp.

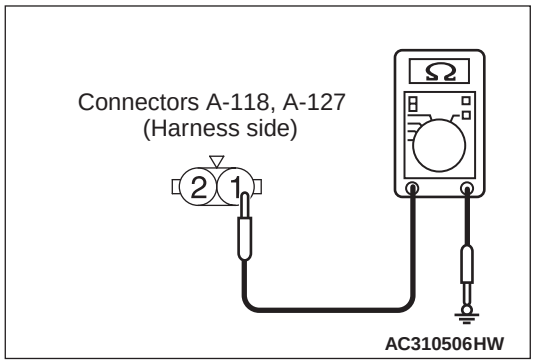
Q: Is the check result normal?
YES : Go to Step 4.
NO : Replace the bulb(s) of the defective lamp. Go to Step 23.

STEP 4. Resistance measurement at the A-118 front turn-signal lamp (LH) connector or A-127 front turn-signal lamp (RH) connector.





(1) Disconnect the connector, and measure at the wiring harness side.

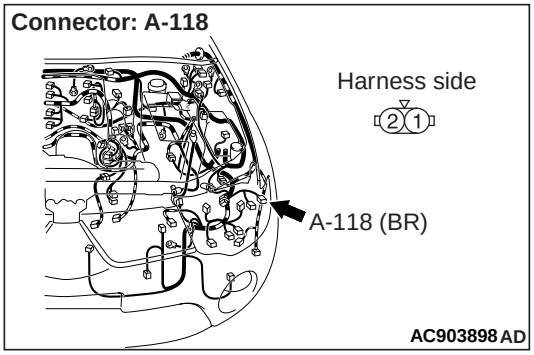


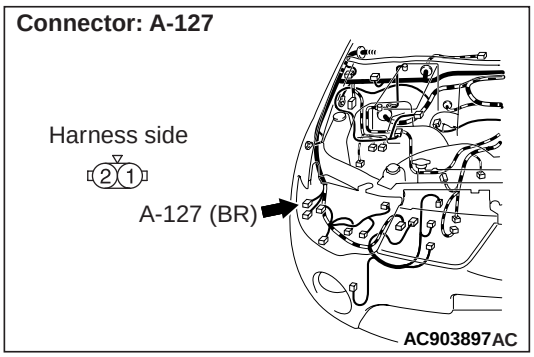
(2) Resistance measurement between the defective lamp connector terminal and body earth.
- Resistance between A-118 front turn-signal lamp (LH) connector terminal No.1 and body earth
- Resistance between A-127 front turn-signal lamp (RH) connector terminal No.1 and body earth

OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?
YES : Go to Step 6.
NO : Go to Step 5.

STEP 5. Check the wiring harness from A-118 front turn-signal lamp (LH) connector terminal No.1 or A-127 front turn-signal lamp (RH) connector terminal No.1 to body earth.





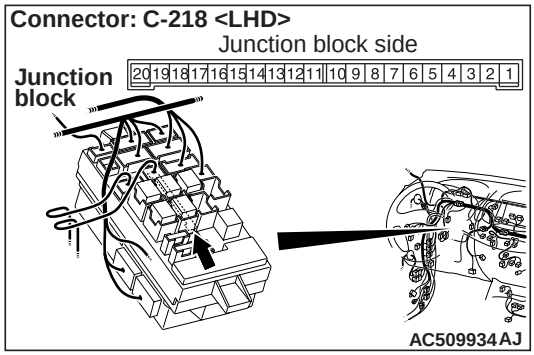
- Check the earth wires for open circuit.

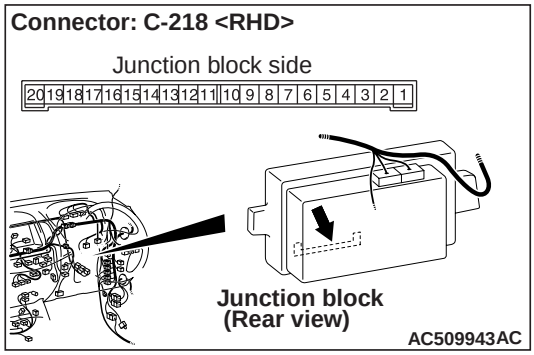
Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction). Go to Step 23.

NO : Repair the wiring harness. Go to Step 23.

STEP 6. Connector check: C-218 ETACS-ECU connector



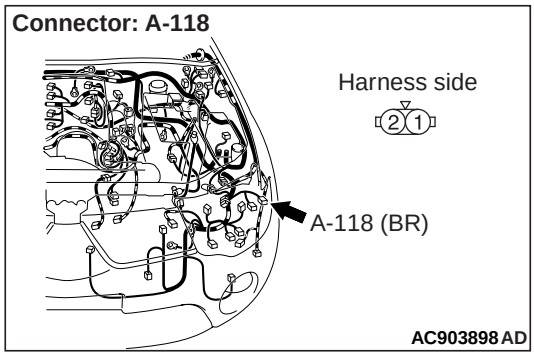


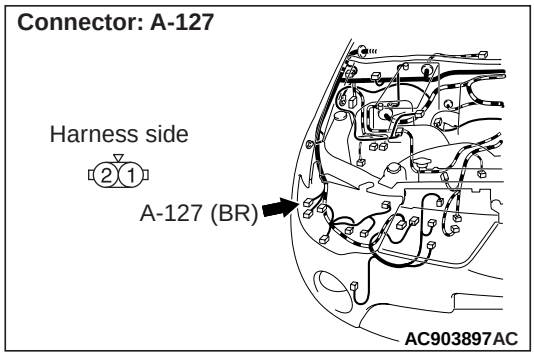
Q: Is the check result normal?

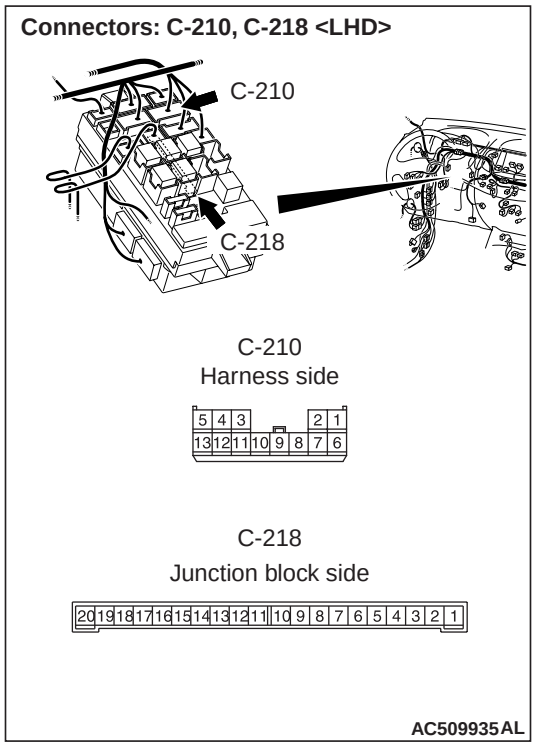
YES : Go to Step 7.

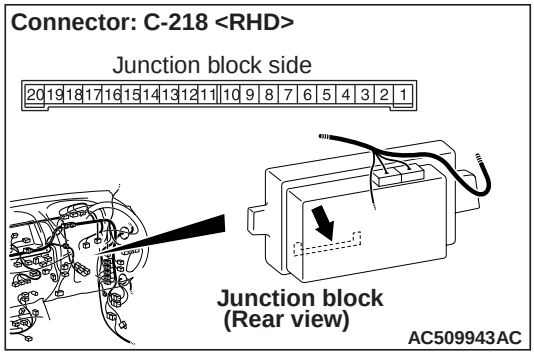
NO : Repair the defective connector. Go to Step 23.

STEP 7. Check the wiring harness from the A-118 front turn-signal lamp (LH) connector terminal No.2 or A-127 front turn-signal lamp (RH) connector terminal No.2 to C-218 ETACS-ECU connector terminal No.3 or No.4.









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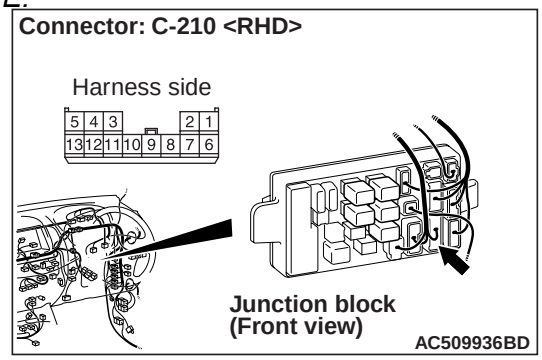


Prior to the wiring harness inspection, check junction block connector C-210, and repair if necessary.

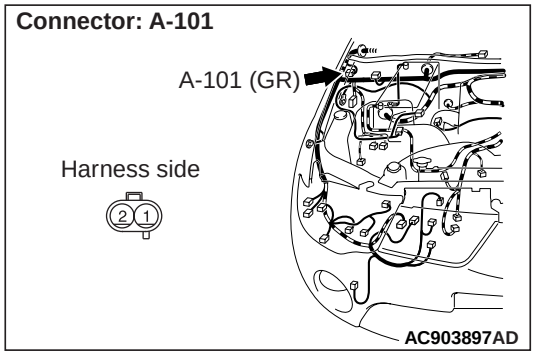
- Check the output lines for open circuit.

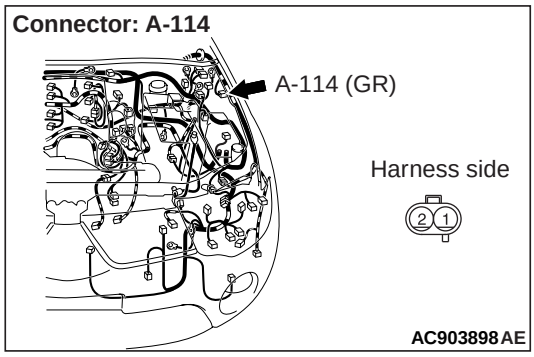
Q: Is the check result normal?
YES : Go to Step 8.
NO : Repair the wiring harness. Go to Step 23.

STEP 8. Retest the system.
Check that the front turn-signal lamps illuminate normally.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction). Go to Step 23.
NO : Replace the front turn-signal lamp. Go to Step 23.

STEP 9. Connector check: A-114 side turn-signal lamp (LH) connector or A-101 side turn-signal lamp (RH) connector.



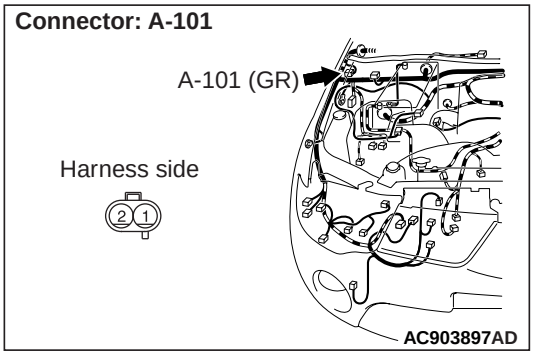


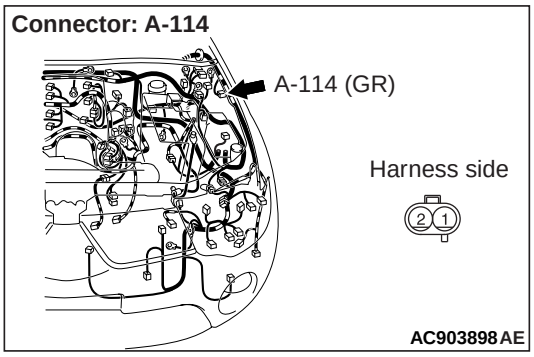
Q: Is the check result normal?
YES : Go to Step 10.
NO : Repair the defective connector. Go to Step 23.

STEP 10. Check the bulb(s) of side turn-signal lamps.
Check the bulb(s) of the defective lamp.

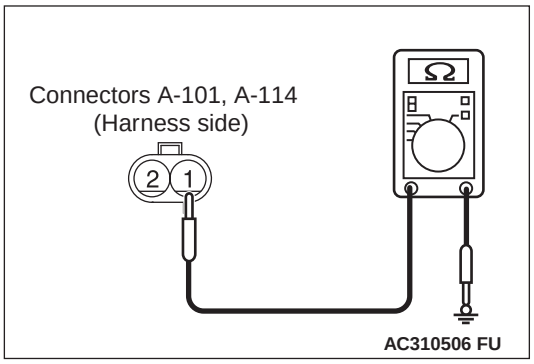
Q: Is the check result normal?
YES : Go to Step 11.
NO : Replace the bulb(s) of the defective lamp. Go to Step 23.

STEP 11. Resistance measurement at the A-114 side turn-signal lamp (LH) connector or A-101 side turn-signal lamp (RH) connector.





(1) Disconnect the connector, and measure at the wiring harness side.

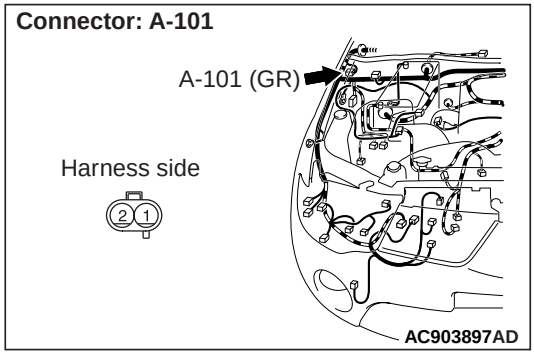


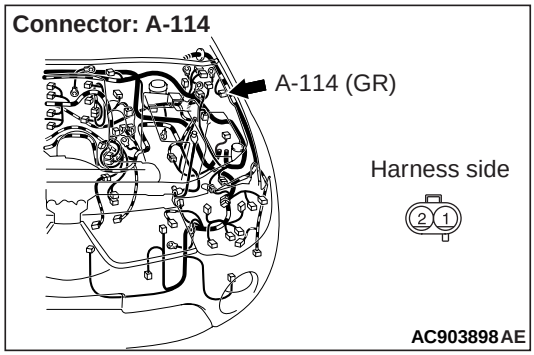
(2) Resistance measurement between the defective lamp connector terminal and body earth.
- Resistance between A-114 side turn-signal lamp (LH) connector terminal No.1 and body earth
- Resistance between A-101 side turn-signal lamp (RH) connector terminal No.1 and body earth

OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?
YES : Go to Step 13.
NO : Go to Step 12.

STEP 12. Check the wiring harness from A-114 side turn-signal lamp (LH) connector terminal No.1 or A-101 side turn-signal lamp (RH) connector terminal No.1 and body earth.

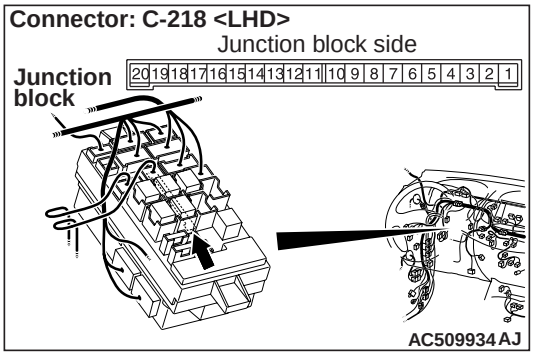


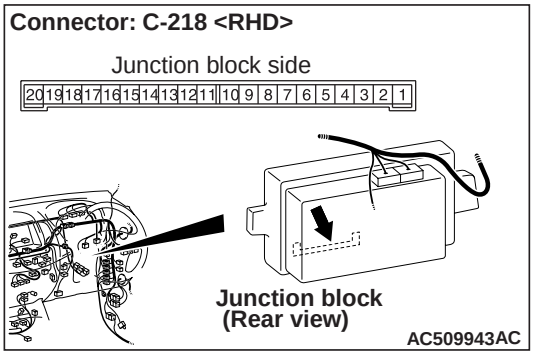


- Check the earth wires for open circuit.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness. Go to Step 23.

STEP 13. Connector check: C-218 ETACS-ECU connector

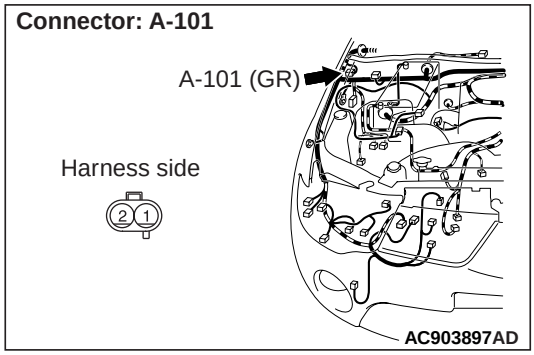


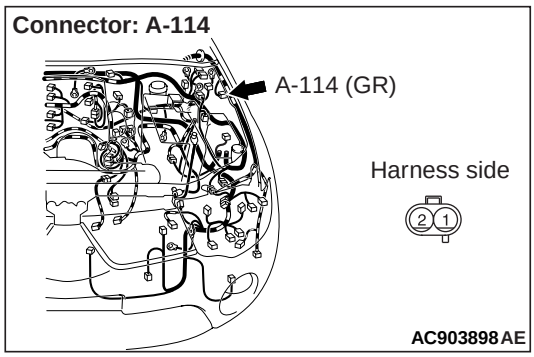


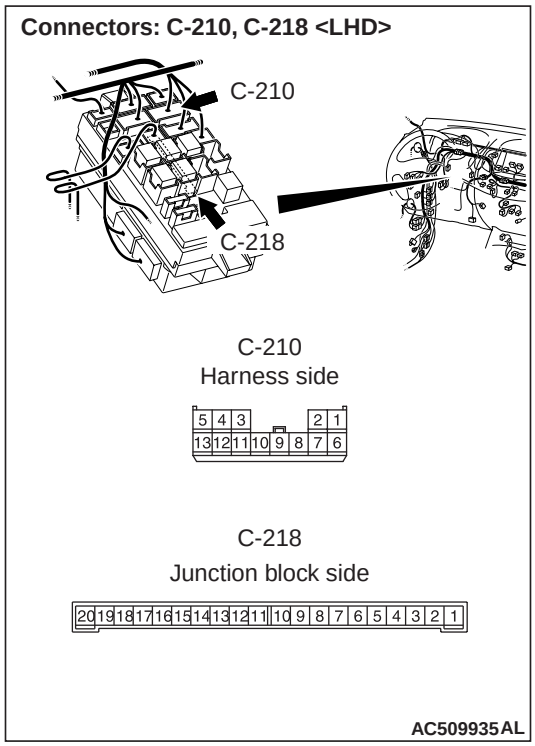
Q: Is the check result normal?

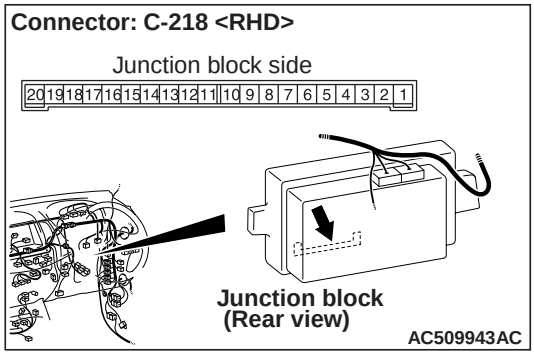
YES : Go to Step 14.
NO : Repair the defective connector. Go to Step 23.

STEP 14. Check the wiring harness from the A-114 side turn-signal lamp (LH) connector terminal No.2 or A-101 side turn-signal lamp (RH) connector terminal No.2 to C-218 ETACS-ECU connector terminal No.3 or No.4.

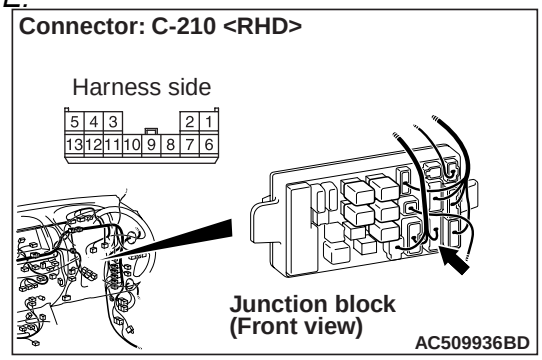








NOTE:



Prior to the wiring harness inspection, check junction block connector C-210, and repair if necessary.

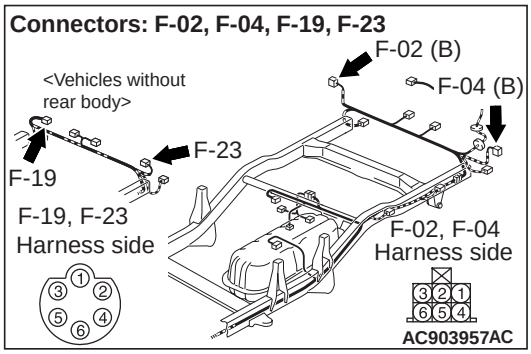
- Check the output lines for open circuit.

Q: Is the check result normal?
YES : Go to Step 15.
NO : Repair the wiring harness. Go to Step 23.

STEP 15. Retest the system.
Check that the side turn-signal lamps illuminate normally.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction). Go to Step 23.
NO : Replace the side turn-signal lamp. Go to Step 23.

STEP 16. Connector check: F-04 <vehicles with rear body> or F-23 <vehicles without rear body> rear combination lamp (turn: LH) or F-02 <vehicles with rear body> or F-19 <vehicles without rear body> rear combination lamp (turn: RH).

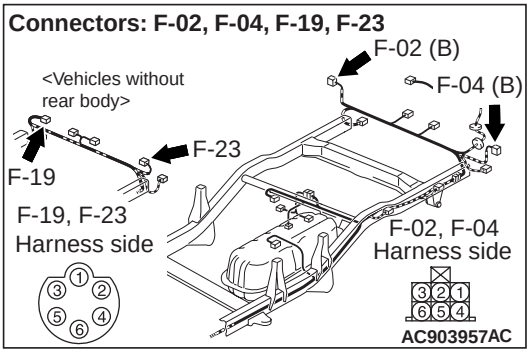


Q: Is the check result normal?
YES : Go to Step 17.
NO : Repair the defective connector. Go to Step 23.

STEP 17. Check the bulb(s) of rear turn-signal lamps.
Check the bulb(s) of the defective lamp.

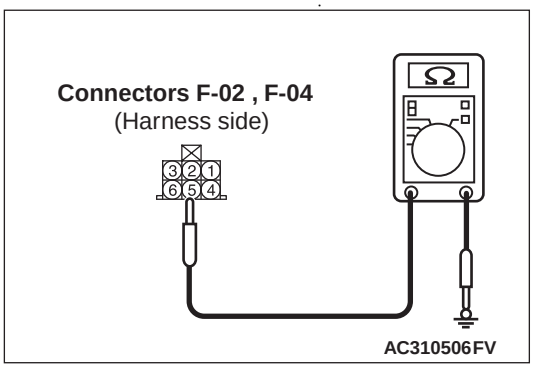
Q: Is the check result normal?
YES : Go to Step 18.
NO : Replace the bulb(s) of the defective lamp. Go to Step 23.

STEP 18. Resistance measurement at the F-04 <vehicles with rear body> or F-23 <vehicles without rear body> rear combination lamp (turn: LH) or F-02 <vehicles with rear body> or F-19 <vehicles without rear body> rear combination lamp (turn: RH) connector.

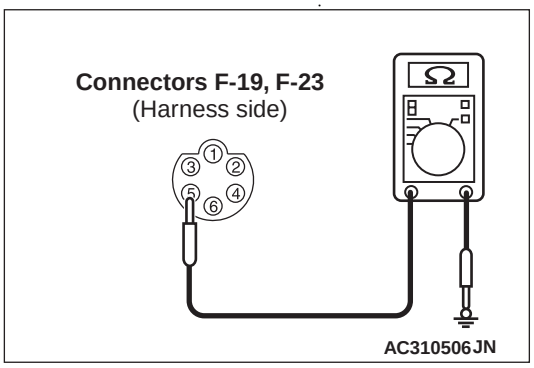


(1) Disconnect the connector, and measure at the wiring harness side.
(2) Resistance measurement between the defective

lamp connector terminal and body earth.



Resistance between F-04 rear combination lamp (turn: LH) or F-02 rear combination lamp (turn: RH) connector terminal No.5 and body earth <vehicles with rear body>



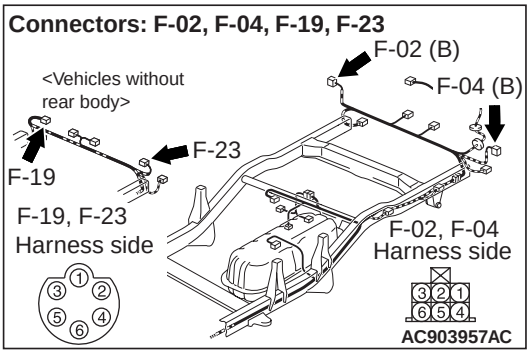
Resistance between F-23 rear combination lamp (turn: LH) or F-19 rear combination lamp (turn: RH) connector terminal No.5 and body earth <vehicles without rear body>

OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?

YES : Go to Step 20.
NO : Go to Step 19.

STEP 19. Check the wiring harness from F-04 <vehicles with rear body> or F-23 <vehicles without rear body> rear combination lamp (turn: LH) or F-02 <vehicles with rear body> or F-19 <vehicles without rear body> rear combination lamp (turn: RH) connector terminal No.5 to body earth.



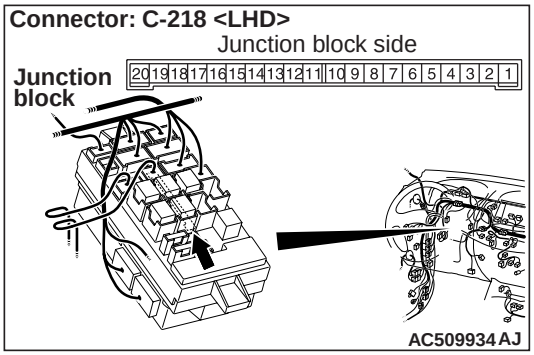
NOTE: Prior to the wiring harness inspection, check intermediate connector F-07, and repair if necessary.

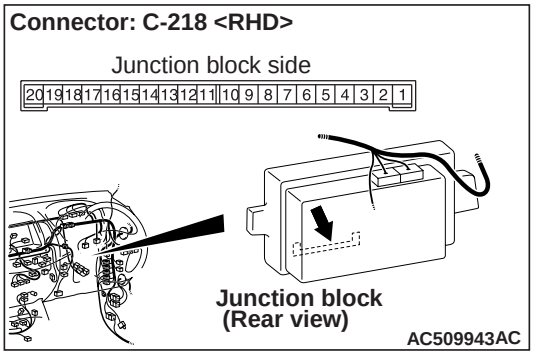
- Check the earth wires for open circuit.

Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction). Go to Step 23.
NO : Repair the wiring harness. Go to Step 23.

STEP 20. Connector check: C-218 ETACS-ECU connector

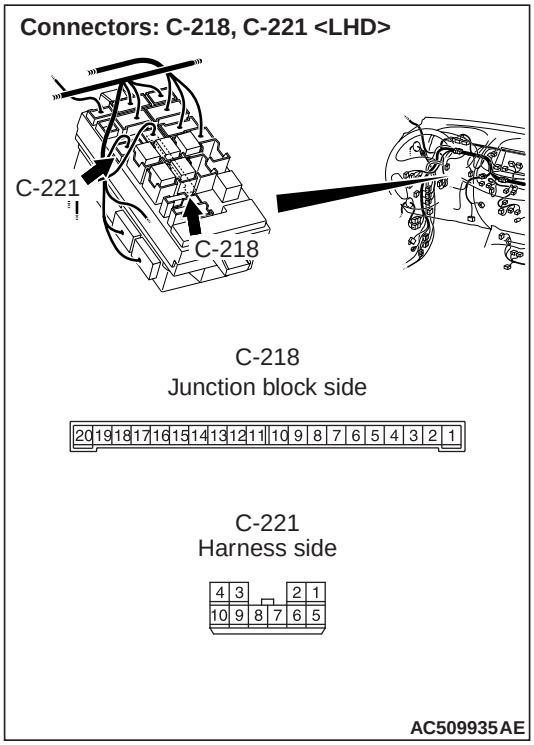


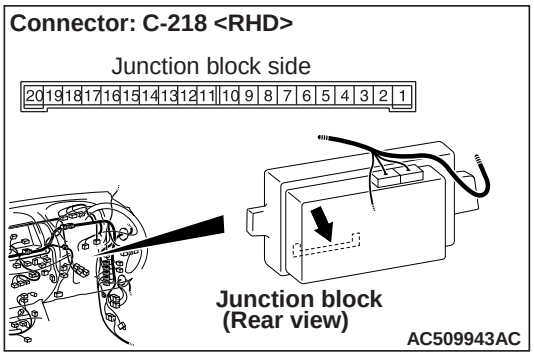


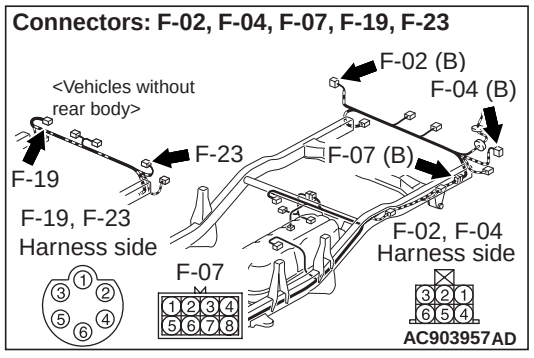
Q: Is the check result normal?

YES : Go to Step 21.
NO : Repair the defective connector. Go to Step 23.

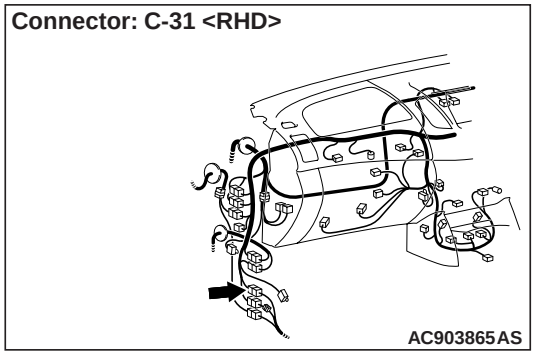
STEP 21. Check the wiring harness from the F-04 <vehicles with rear body> or F-23 <vehicles without rear body> rear combination lamp (turn: LH) or F-02 <vehicles with rear body> or F-19 <vehicles without rear body> rear combination lamp (turn: RH) connector terminal No.1 to C-218 ETACS-ECU connector terminal No.3 or No.4.

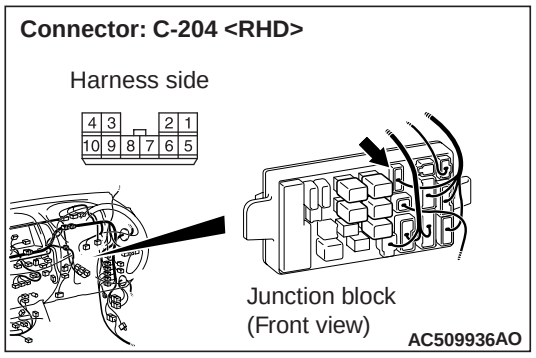






NOTE:





Prior to the wiring harness inspection, check intermediate connector F-07 and C-31 <RHD>, junction block connector C-221 <LHD> or C-204 <RHD>, and repair if necessary.

- Check the output lines for open circuit.

Q: Is the check result normal?
YES : Go to Step 22.
NO : Repair the wiring harness. Go to Step 23.

STEP 22. Retest the system.
Check that the rear turn-signal lamps illuminate normally.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction). Go to Step 23.
NO : Replace the rear combination lamp. Go to Step 23.

STEP 23. Check whether the diagnosis code is reset.
Check if diagnosis code No.B1707 is set to the ETACS-ECU.

Q: Is the diagnosis code set?
YES : Replace the ETACS-ECU and register the ID codes (Refer to P.54A-39).
NO : The procedure is complete.

Code No.L0432 RLS RS adaptation error

DIAGNOSTIC FUNCTION
When the lighting control sensor is installed with the wrong procedure, code No. L0432 is stored by LIN.

COMMENTS ON TROUBLE SYMPTOM
The lighting control sensor may have been installed with the wrong procedure.
- Incorrect installation procedure: Connect the connector before mounting the lighting control sensor onto the optical coupler of the windshield.
- Correct installation procedure: Mount the lighting control sensor onto the optical coupler of the windshield. Wipe the windshield surface thoroughly, and check that the surface is dry. Then, connect the connector.

PROBABLE CAUSES
- Lighting control sensor improperly installed
- Lighting control sensor (rain sensor) abnormal operation

DIAGNOSIS PROCEDURE

STEP 1. Check whether the diagnosis code is reset.
Disconnect the connector from the lighting control sensor, and connect the connector to the lighting control sensor again. Then, check again if the diagnosis code is set to LIN.
(1) Disconnect the connector of lighting control sensor, and connect it again.
NOTE: When connecting the connector, follow the correct installation procedure.
(2) Turn the ignition switch from "LOCK" (OFF) position to "ON" position.
(3) Check if diagnosis code is set.

Q: Is the diagnosis code set?
YES : Go to Step 2.
NO : The lighting control sensor is installed with the wrong procedure.

STEP 2. Lighting control sensor installation surface check
Visually check the presence of scratches or air bubbles (diameter of 5 mm or more) on the windshield to which the lighting control sensor is installed. In addition, visually check that the optical coupler is not broken and that the lighting control sensor can be installed.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Replace the windshield (Refer to GROUP 42 – Windshield).

STEP 3. Check whether the diagnosis code is reset.
Check again if the diagnosis code is set to LIN.
(1) Wipe the windshield surface of the lighting control sensor section thoroughly, and check that the surface is dry. Then, perform the lighting control sensor (rain sensor) adaptation. <Refer to GROUP 51 – Lighting Control Sensor (Rain Sensor) Adaptation >.
(2) Turn the ignition switch from "LOCK" (OFF) position to "ON" position.
(3) Check if diagnosis code is set.

Q: Is the diagnosis code set?
YES : Replace the lighting control sensor.
NO : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

Code No.L0434 RLS rain sensor error
Code No.L0436 RLS light sensor error

DIAGNOSTIC FUNCTION
If a trouble occurs in the lighting control sensor, code Nos. L0434 and L0436 are stored to LIN.

PROBABLE CAUSE
Malfunction of the lighting control sensor

DIAGNOSIS PROCEDURE

Check whether the diagnosis code is reset.
Check again if the diagnosis code is set to LIN.
(1) Erase the diagnosis code.
(2) Turn the ignition switch from "LOCK" (OFF) position to "ON" position.

(3) Check if diagnosis code is set.

Q: Is the diagnosis code set?

YES : Replace the lighting control sensor.

NO : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

TROUBLE SYMPTOM CHART

M1540102100799

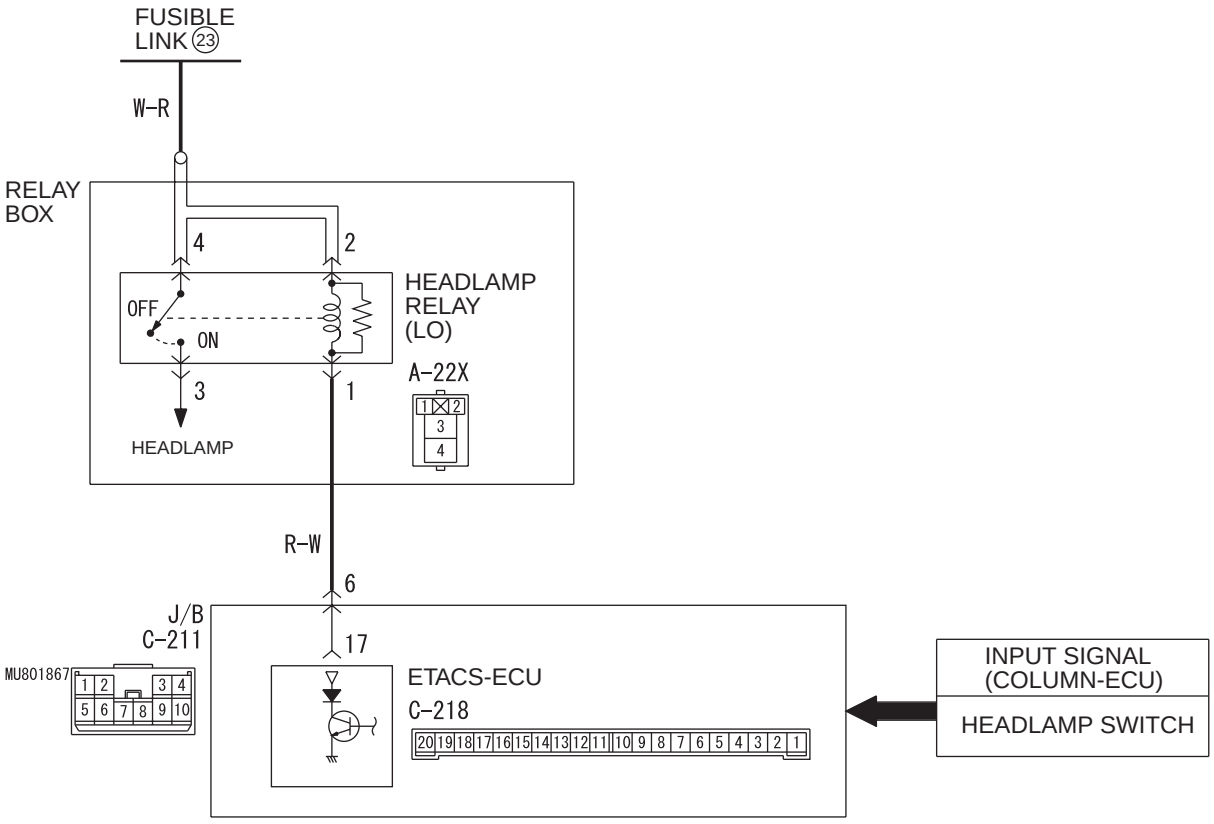
Symptom		Inspection procedure number	Reference page
Headlamp and tail lamp	None of the low-beam headlamps illuminate.	1	P.54A-110
	None of the high-beam headlamps illuminate.	2	P.54A-114
	The high-beam and low-beam headlamps do not illuminate when the passing switch is operated.	3	P.54A-118
	One of position lamps or licence plate lamps does not illuminate.	4	P.54A-119
	One of the Headlamps does not Illuminate. <2-bulb type>	5	P.54A-125
	One of the Headlamps does not Illuminate. <4-bulb type>		P.54A-130
	The headlamp automatic-shutdown function does not work normally.	6	P.54A-134
	Daytime running lamp function does not work normally.	7	P.54A-135
	The auto lamp function does not work normally.	10	P.54A-136
Flasher timer	None of the turn-signal lamps illuminate.	8	P.54A-137
	The comfort flasher does not work normally.	9	P.54A-138

SYMPTOM PROCEDURES

Inspection Procedure 1: None of the low-beam headlamps illuminate.

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Headlamp Relay (Low-Beam) Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

W7C54X027A

COMMENTS ON TROUBLE SYMPTOM
If none of the low-beam headlamps illuminate, the headlamp switch input circuit, the headlamp relay (LO) or the ETACS-ECU may be defective.

PROBABLE CAUSES
- Malfunction of the headlamp relay (LO)
- Malfunction of the column switch
- Malfunction of the ETACS-ECU
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code.
When the ignition switch is turned to the "LOCK" (OFF) position, check that the ETACS-ECU does not set the diagnosis code.

Q: Is the diagnosis code set?
YES : Refer to diagnosis code chart P.54A-494.
NO : Go to Step 2.

STEP 2. M.U.T.-III data list

Check the input signal from the headlamp (low-beam) switch.

- Turn the headlamp (low-beam) switch to the ON position.

Item No.	Item name	Normal condition
60	Headlamp output	ON

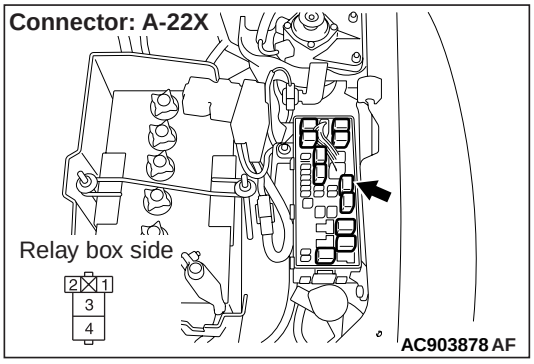
OK: Normal condition is displayed.

Q: Is the check result normal?

YES : Go to Step 3.

NO : Refer to inspection procedure C-1 "The column switch (lighting and wiper switch) signal is not received P.54A-523."

STEP 3. Connector check: A-22X headlamp relay (LO) connector



Q: Is the check result normal?

YES : Go to Step 4.

NO : Repair the defective connector.

STEP 4. Check the headlamp relay (LO).

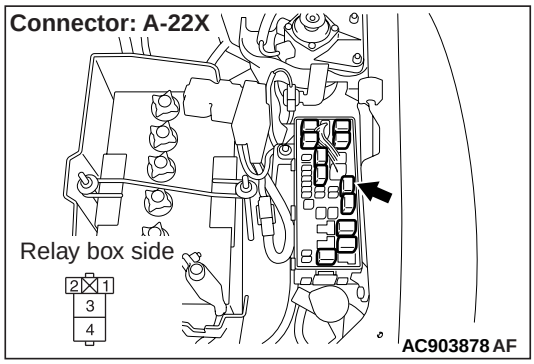
Refer to P.54A-148.

Q: Is the check result normal?

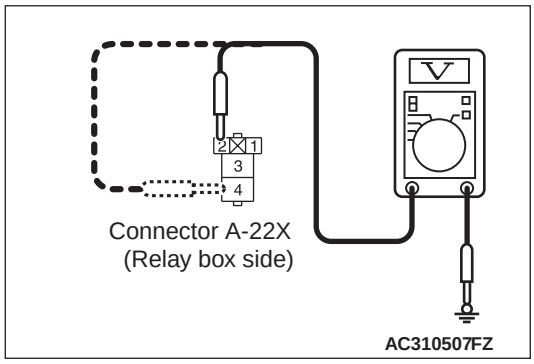
YES : Go to Step 5.

NO : Replace the headlamp relay (LO).

STEP 5. Voltage measurement at A-22X headlamp relay (LO) connector.



(1) Remove the headlamp relay (LO), and measure at the relay box side.



(2) Voltage between A-22X headlamp relay (LO) connector terminal Nos.2, 4 and body earth

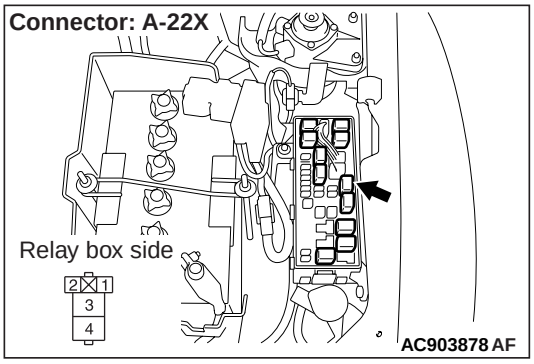
OK: System voltage

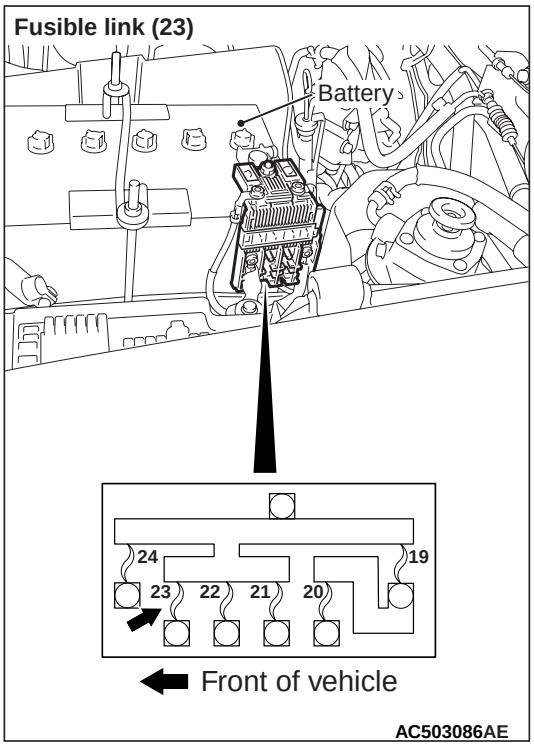
Q: Is the check result normal?

YES : Go to Step 7.

NO : Go to Step 6.

STEP 6. Check the wiring harness between A-22X headlamp relay (LO) connector terminal Nos.2, 4 and the fusible link (23).



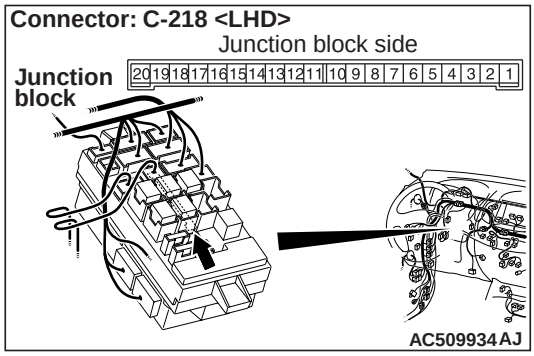


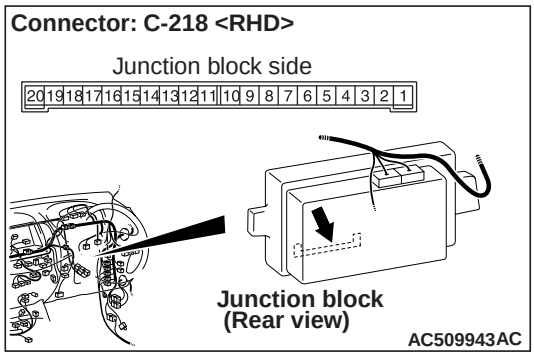
- Check the power supply line from the fusible link (23) for open circuit and short circuit.

Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness.

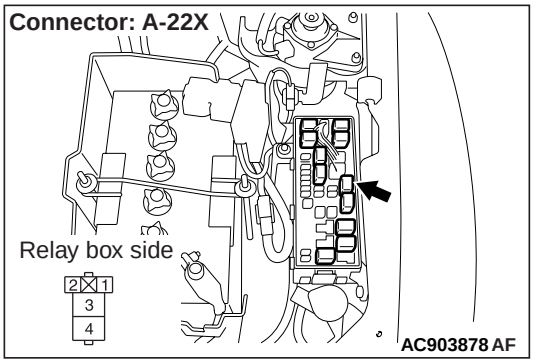
STEP 7. Connector check: C-218 ETACS-ECU connector

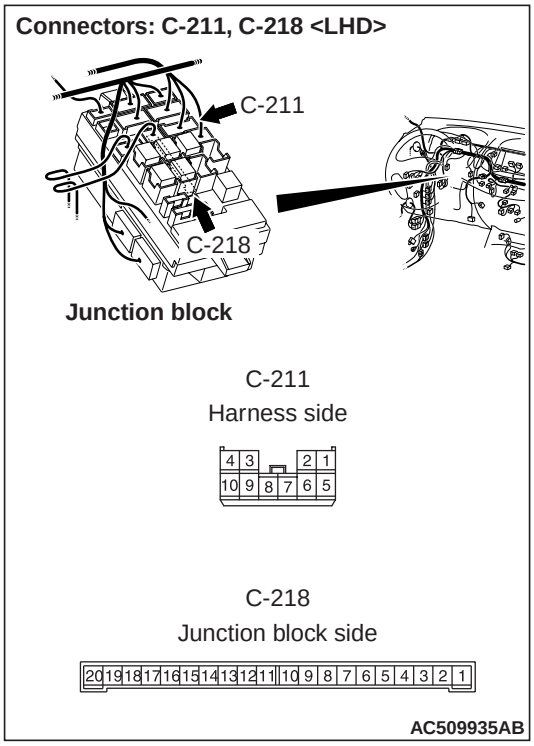


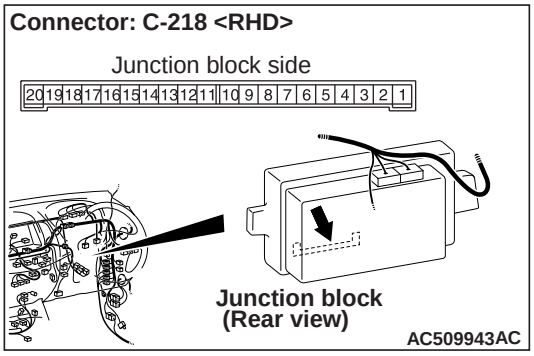


Q: Is the check result normal?
YES : Go to Step 8.
NO : Repair the defective connector.

STEP 8. Check the wiring harness from A-22X headlamp relay (LO) connector terminal No.1 to C-218 ETACS-ECU connector terminal No.17.







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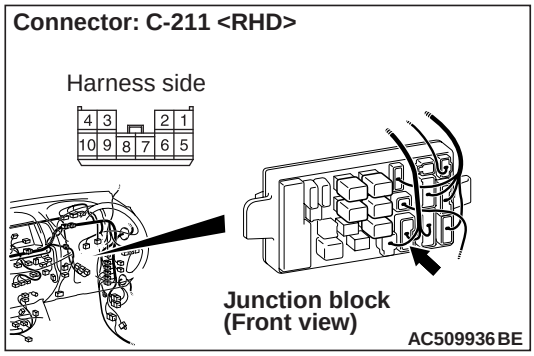


Prior to the wiring harness inspection, check the junction block connector C-211 and repair if necessary.

- Check the earth wires for open circuit.

Q: Is the check result normal?
YES : Go to Step 9.
NO : Repair the wiring harness.

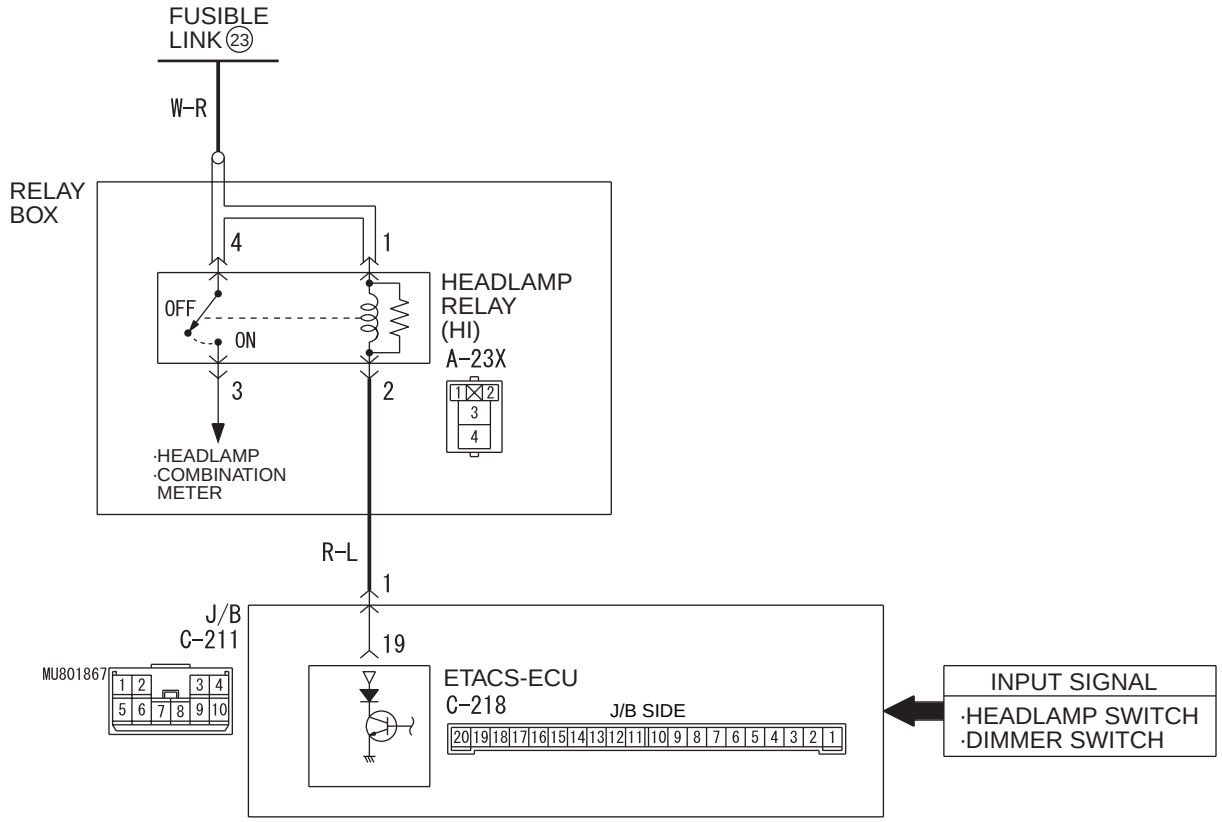
STEP 9. Retest the system.
Check that the low-beam headlamps illuminate normally.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Replace the ETACS-ECU and register the ID codes (Refer to P.54A-39).

Inspection Procedure 2: None of the high-beam headlamps illuminate.

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Headlamp Relay (High-Beam) Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver W9C54E025A

COMMENTS ON TROUBLE SYMPTOM
If none of the high-beam headlamps illuminate, the headlamp switch input circuit, the headlamp relay (HI) or the ETACS-ECU may be defective.

PROBABLE CAUSES
- Malfunction of the headlamp relay (HI)
- Malfunction of the column switch
- Malfunction of the ETACS-ECU
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code.
When the ignition switch is turned to the "LOCK" (OFF) position, check that the ETACS-ECU does not set the diagnosis code.

Q: Is the diagnosis code set?
YES : Refer to diagnosis code chart P.54A-494.
NO : Go to Step 2.

STEP 2. M.U.T.-III data list
Check the input signal from the dimmer switch.
- Operate the dimmer switch.

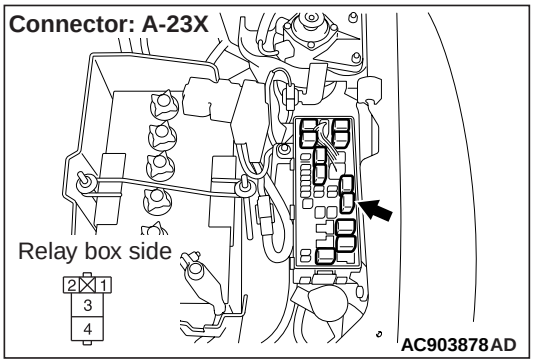
Item No.	Item name	Normal condition
61	Headlamp HI output	ON

OK: Normal condition is displayed.

Q: Is the check result normal?

YES : Go to Step 3.
NO : Refer to inspection procedure C-1 "The column switch (lighting and wiper switch) signal is not received P.54A-523."

STEP 3. Connector check: A-23X headlamp relay (HI) connector



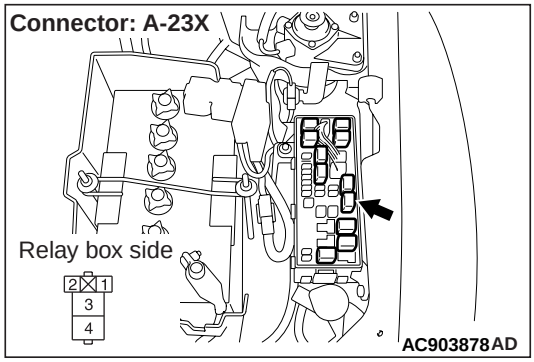
Q: Is the check result normal?
YES : Go to Step 4.
NO : Repair the defective connector.

STEP 4. Check the headlamp relay (HI).

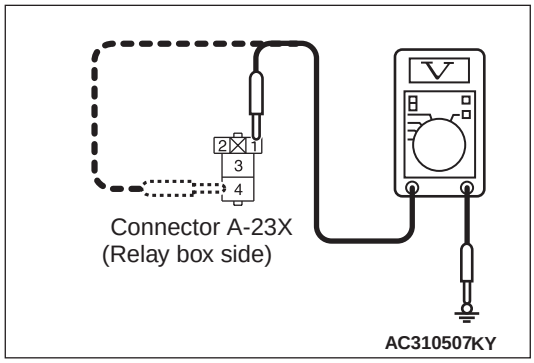
Refer to P.54A-148.

Q: Is the check result normal?
YES : Go to Step 5.
NO : Replace the headlamp relay (HI).

STEP 5. Voltage measurement at A-23X headlamp relay (HI) connector.



(1) Remove the headlamp relay (HI), and measure at the relay box side.

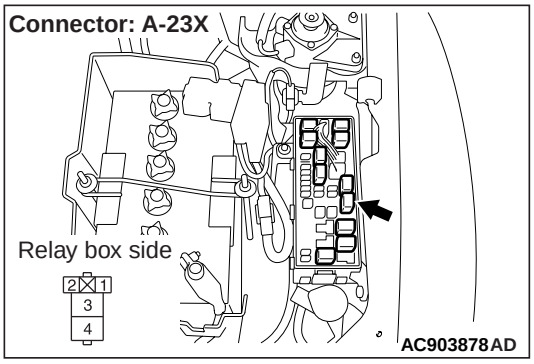


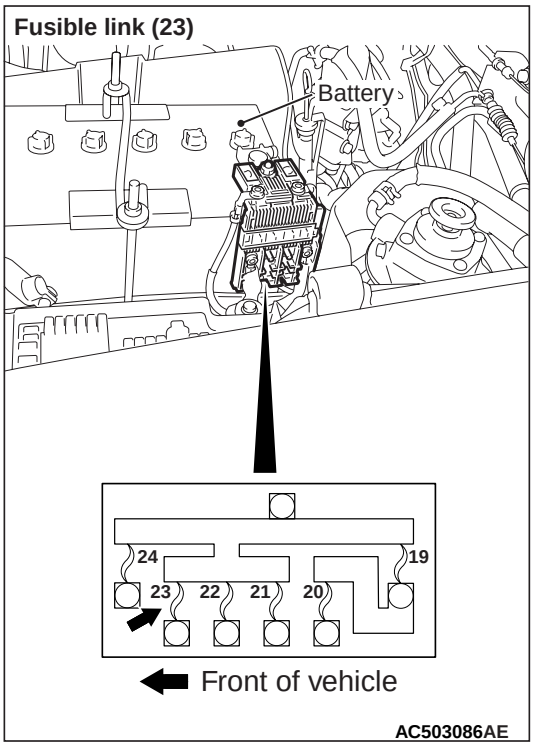
(2) Voltage between A-23X headlamp relay (HI) connector terminal Nos.1, 4 and body earth

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 7.
NO : Go to Step 6.

STEP 6. Check the wiring harness between A-23X headlamp relay (HI) connector terminal Nos.1, 4 and the fusible link (23).



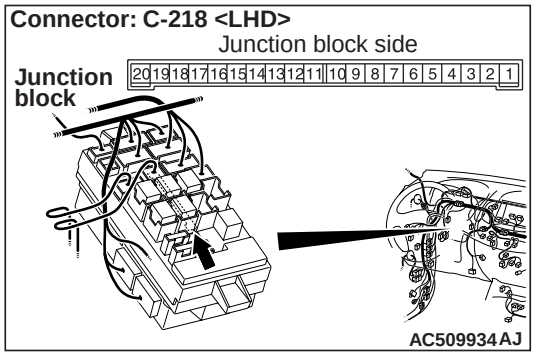


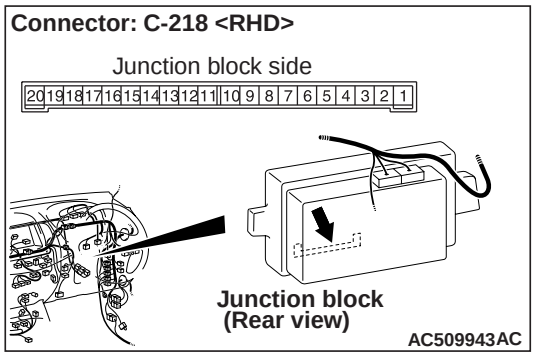
- Check the power supply line from the fusible link (23) for open circuit and short circuit.

Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness.

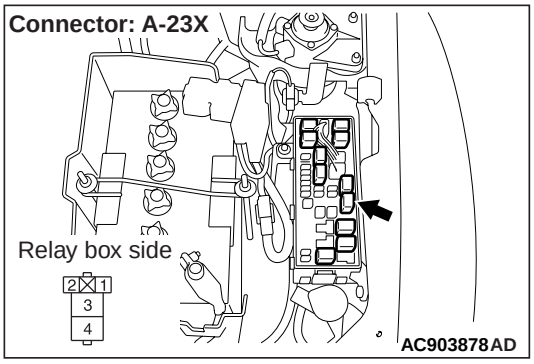
STEP 7. Connector check: C-218 ETACS-ECU connector

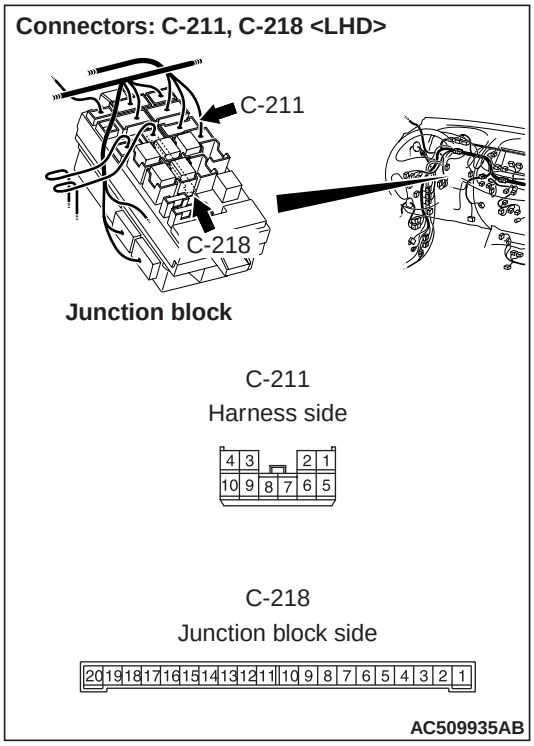


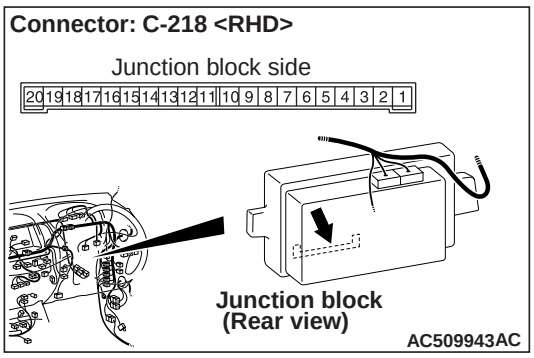


Q: Is the check result normal?
YES : Go to Step 8.
NO : Repair the defective connector.

STEP 8. Check the wiring harness from A-23X headlamp relay (HI) connector terminal No.2 to C-218 ETACS-ECU connector terminal No.19.







NOTE: Prior to the wiring harness inspection, check the junction block connector C-211 and repair if necessary.

- Check the earth wires for open circuit.

Q: Is the check result normal?

YES : Go to Step 9.
NO : Repair the wiring harness.

STEP 9. Retest the system.

Check that the high-beam headlamps illuminate normally.

Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Replace the ETACS-ECU and register the ID codes (Refer to P.54A-39).

Inspection Procedure 3: The high-beam and low-beam headlamps do not illuminate when the passing switch is operated.

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

COMMENTS ON TROUBLE SYMPTOM
If the low-beam and high-beam headlamps are normal, the passing switch input signal circuit or the ETACS-ECU may be defective.

PROBABLE CAUSES
- Malfunction of the column switch
- Malfunction of the ETACS-ECU
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code.
When the ignition switch is turned to the "LOCK" (OFF) position, check that the ETACS-ECU does not set the diagnosis code.

Q: Is the diagnosis code set?
YES : Refer to diagnosis code chart P.54A-494.
NO : Go to Step 2.

STEP 2. Check that the headlamps operate.
Check that the low-beam and high-beam headlamps work normally.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the headlamps. Refer to trouble symptom chart P.54A-109.

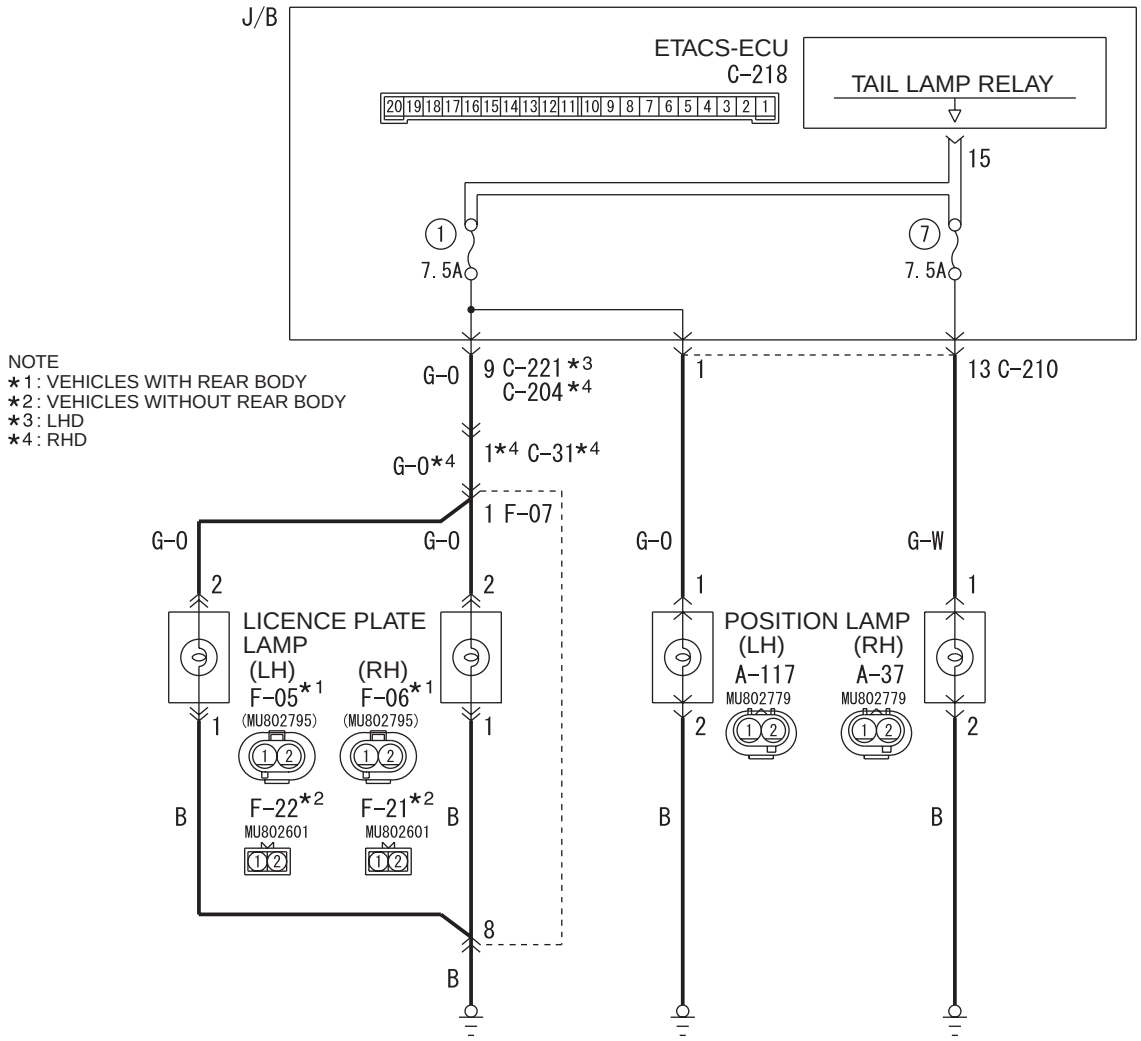
STEP 3. Retest the system.
When the passing switch is turned on, check if the headlamps illuminate normally.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Replace the column switch.

Inspection Procedure 4: One of position lamps or licence plate lamps does not illuminate.

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Position Lamps and Licence Plate Lamps Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

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COMMENTS ON TROUBLE SYMPTOM

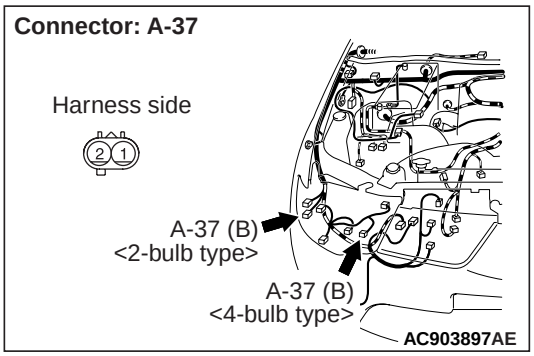
If the position lamps or the licence plate lamps do not illuminate, the wiring harness connector(s), the bulb or the fuse may be defective or burned out.

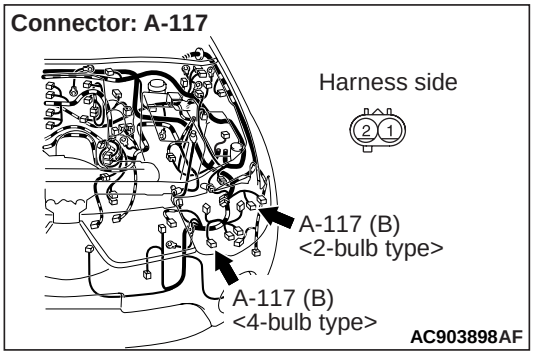
PROBABLE CAUSES

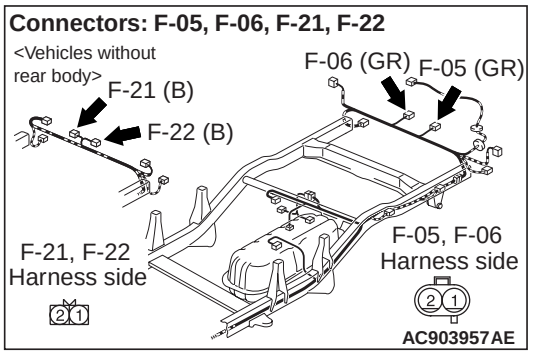
- Burned-out bulb
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. Connector check: A-117 position lamp (LH) connector or A-37 position lamp (RH) connector, F-05 <vehicles with rear body> or F-22 <vehicles without rear body> licence plate lamp (LH) connector or F-06 <vehicles with rear body> or F-21 <vehicles without rear body> licence plate lamp (RH) connector





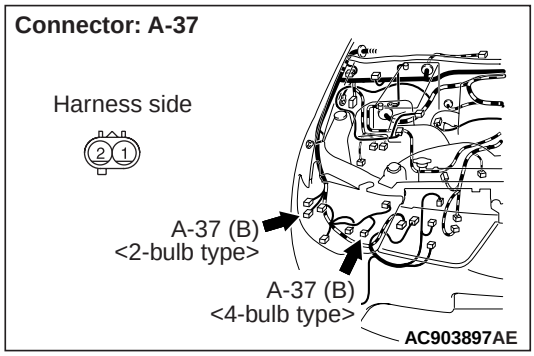


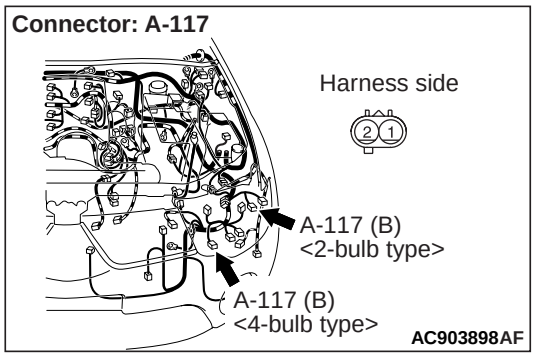
Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the defective connector.

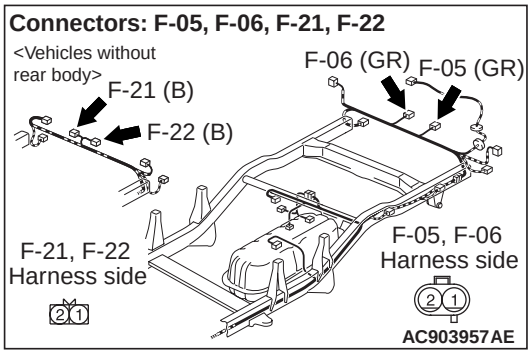
STEP 2. Check the bulbs of the position lamps or the licence plate lamps.
Check the bulb of the lamp which does not illuminate.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Replace the bulb of the lamp which does not illuminate.

STEP 3. Resistance measurement at the A-117 position lamp (LH) connector or A-37 position lamp (RH) connector, the F-05 <vehicles with rear body> or F-22 <vehicles without rear body> licence plate lamp (LH) connector or F-06 <vehicles with rear body> or F-21 <vehicles without rear body> licence plate lamp (RH) connector.

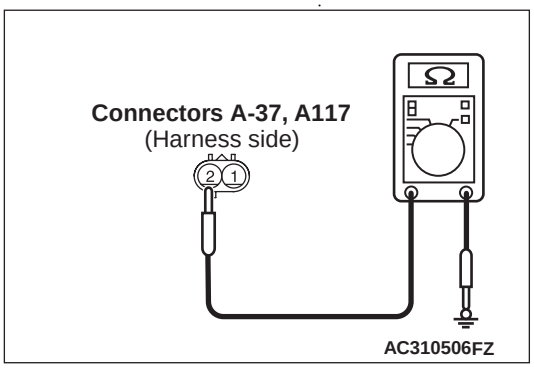




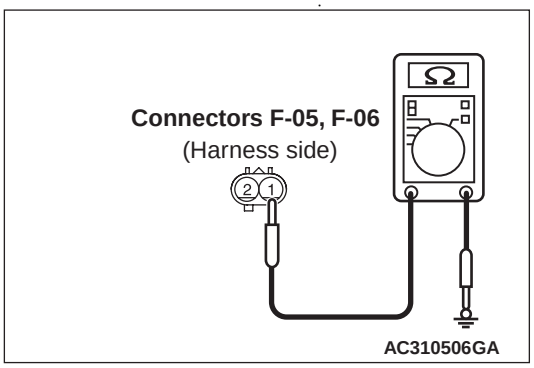


(1) Disconnect the connector, and measure at the wiring harness side.
(2) Check the resistance between the lamp

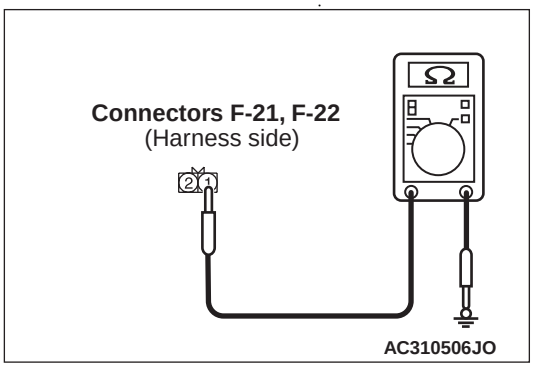
connector and body earth.



Resistance between A-117 position lamp (LH) or A-37 position lamp (RH) connector terminal No.2 and body earth



Resistance between F-05 licence plate lamp (LH) or F-06 licence plate lamp (RH) connector terminal No.1 and body earth <vehicles with rear body>



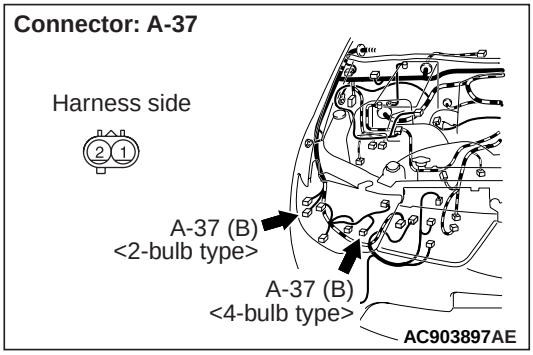
Resistance between F-22 licence plate lamp (LH) or F-21 licence plate lamp (RH) connector terminal No.1 and body earth <vehicles without rear body>

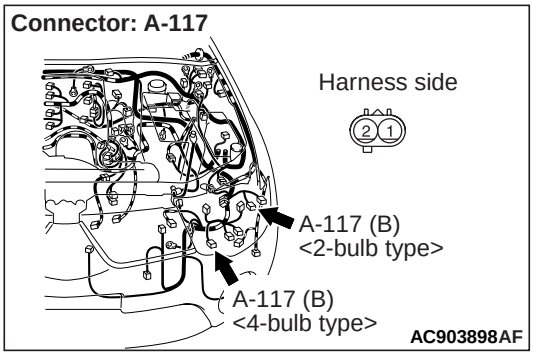
OK: Continuity exists (2 Ω or less)

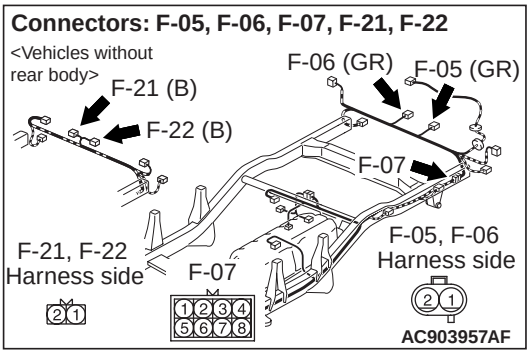
Q: Is the check result normal?

YES : Go to Step 5.
NO : Go to Step 4.

STEP 4. Check the wiring harness from A-117 position lamp (LH) connector terminal No.2 or A-37 position lamp (RH) connector terminal No.2, F-05 licence plate lamp (LH) connector terminal No.1 or F-06 licence plate lamp (RH) connector terminal No.1 to body earth.







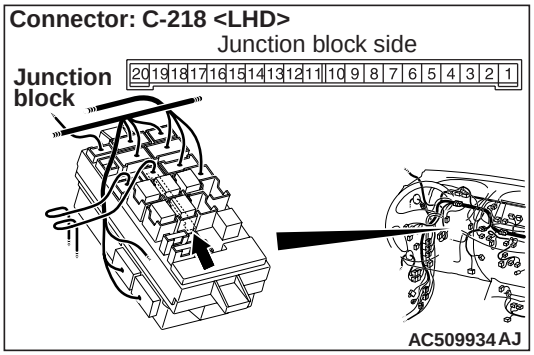
NOTE: Prior to the wiring harness inspection, check intermediate connector F-07 <licence plate lamp>, and repair if necessary.

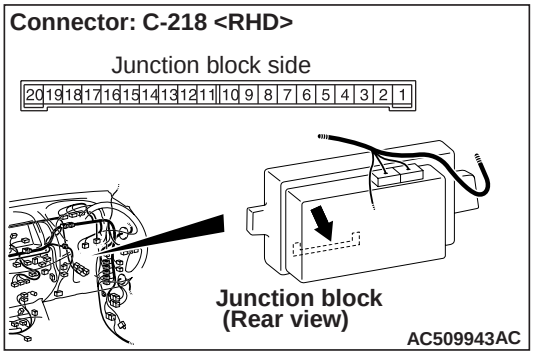
- Check the earth wires for open circuit.

Q: Is the check result normal?

YES : Go to Step 5.
NO : Repair the wiring harness.

STEP 5. Connector check: C-218 ETACS-ECU connector

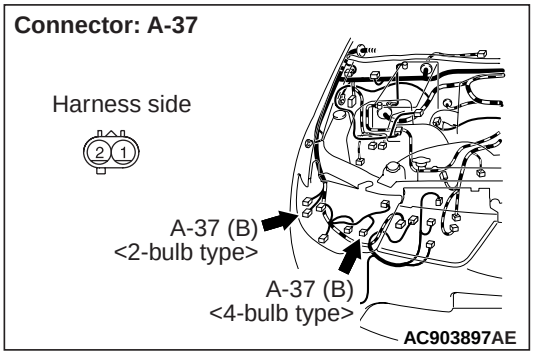


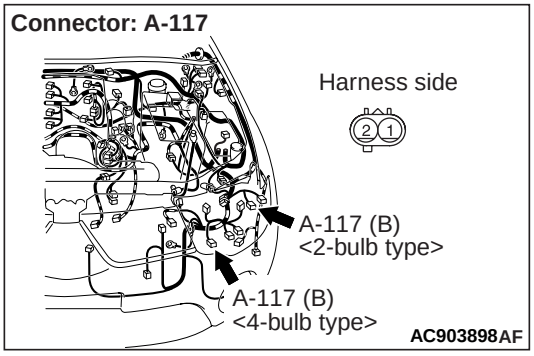


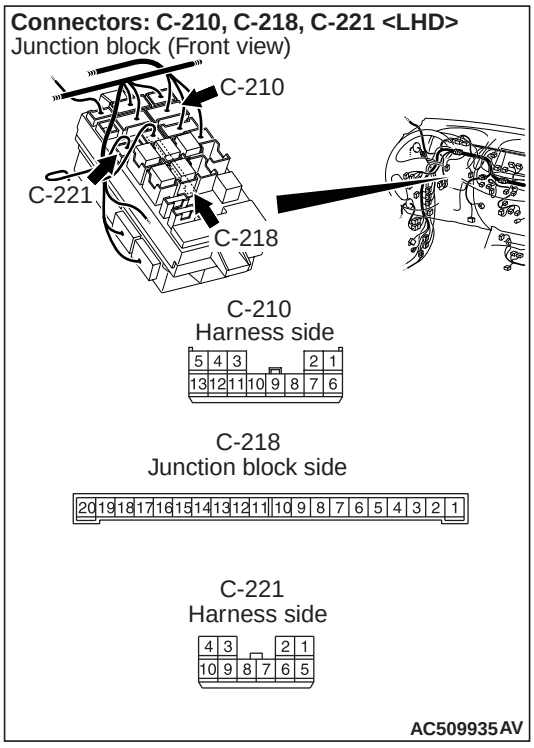
Q: Is the check result normal?

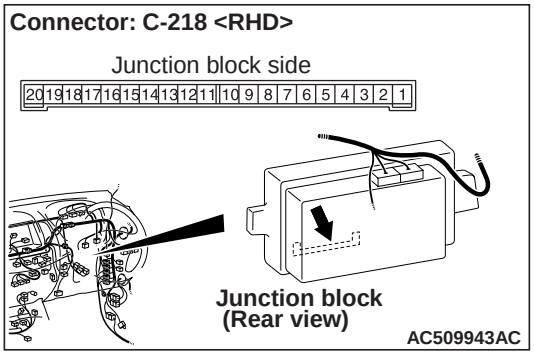
YES : Go to Step 6.
NO : Repair the defective connector.

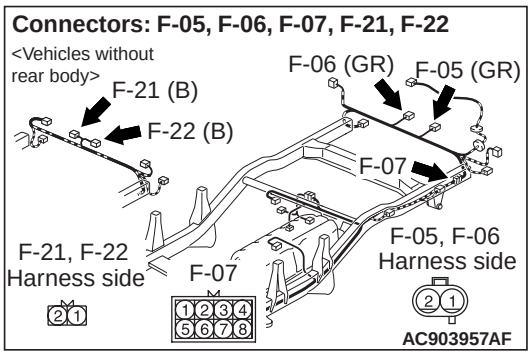
STEP 6. Check the wiring harness from A-117 position lamp (LH) connector terminal No.1 or A-37 position lamp (RH) connector terminal No.1, F-05 <vehicles with rear body> or F-22 <vehicles without rear body> licence plate lamp (LH) connector terminal No.2 or F-06 <vehicles with rear body> or F-21 <vehicles without rear body> licence plate lamp (RH) connector terminal No.2 to C-218 ETACS-ECU connector terminal No.15.



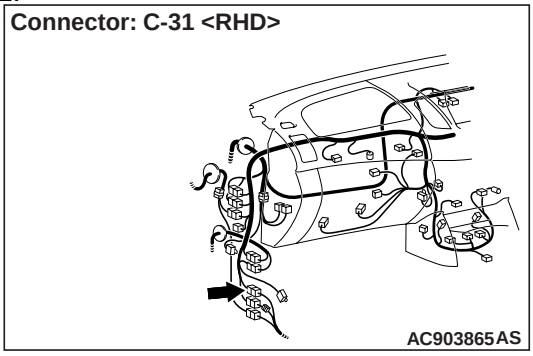


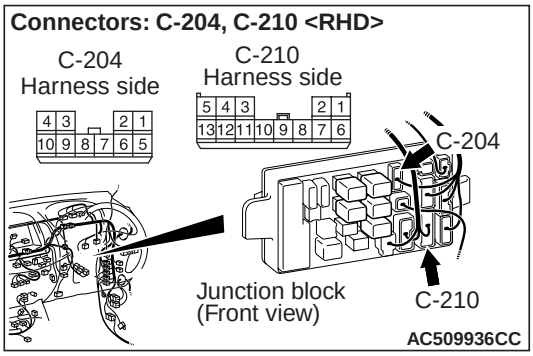






NOTE:





Prior to the wiring harness inspection, check junction block connectors C-210 <position lamp>, C-221 <licence plate lamp-LHD>, C-204 <licence plate lamp-RHD> and intermediate connectors F-07 <licence plate lamp>, C-31 <licence plate lamp-RHD>, and repair if necessary.

- Check the output lines for open circuit.

Q: Is the check result normal?
YES : Go to Step 7.
NO : Repair the wiring harness.

STEP 7. Retest the system.

Check that the position lamps and the licence plate lamps illuminate normally.

Q: Is the check result normal?

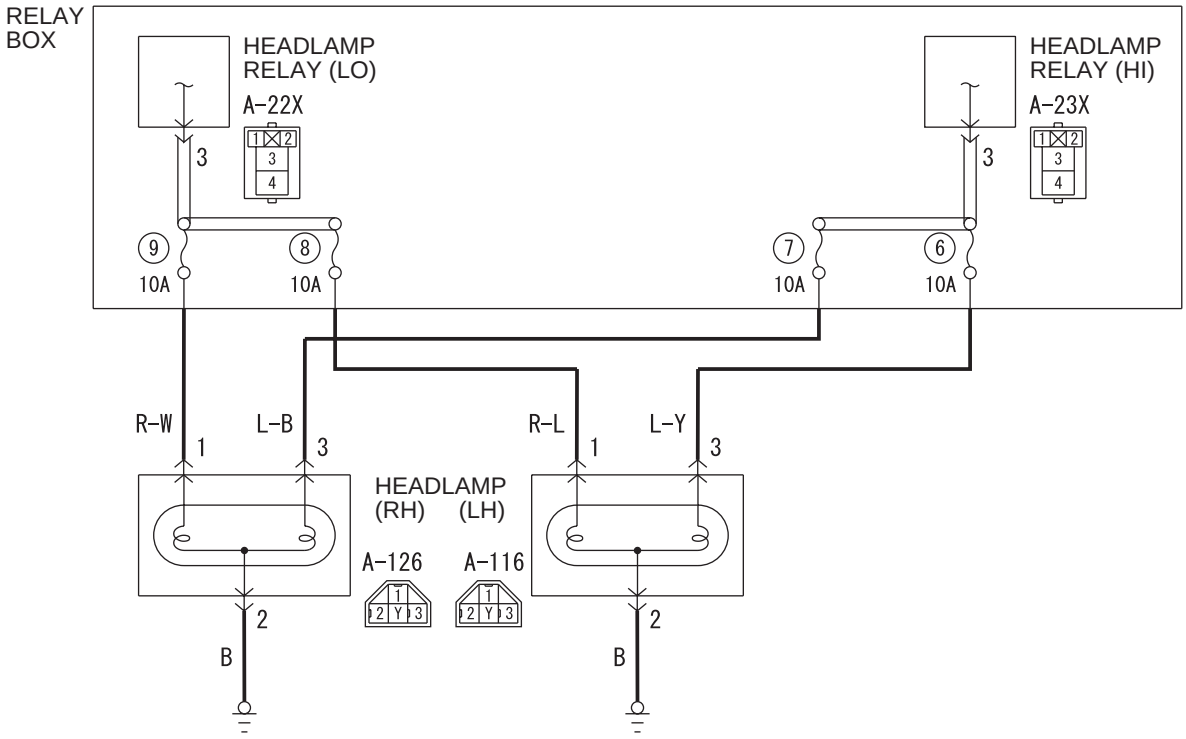
The lamps illuminate normally at both high and low beams. : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

When the position lamps do not illuminate :
Replace the position lamp socket.

When the licence plate lamps do not illuminate :
Replace the licence plate lamp socket.

Inspection Procedure 5: One of the headlamps does not illuminate. <2-bulb type>

Headlamps Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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COMMENTS ON TROUBLE SYMPTOM

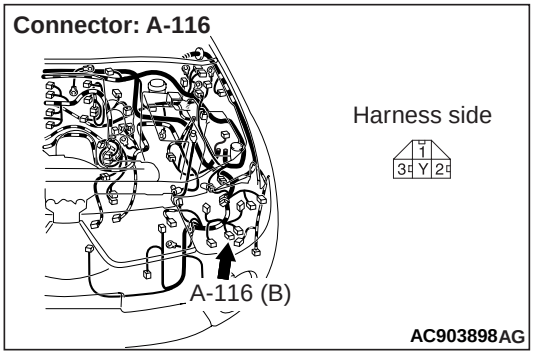
When one of the headlamps does not illuminate, the wiring harness connector(s), the bulb or the fuse may be defective or burned out.

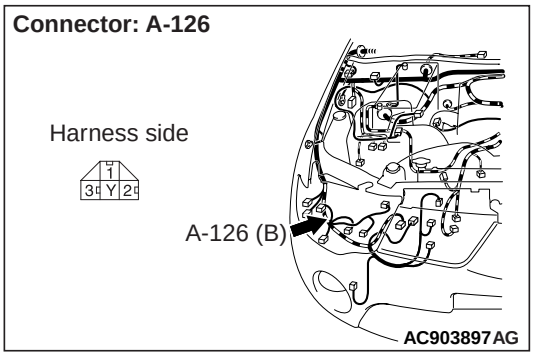
PROBABLE CAUSES

- Malfunction of the headlamp bulbs
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

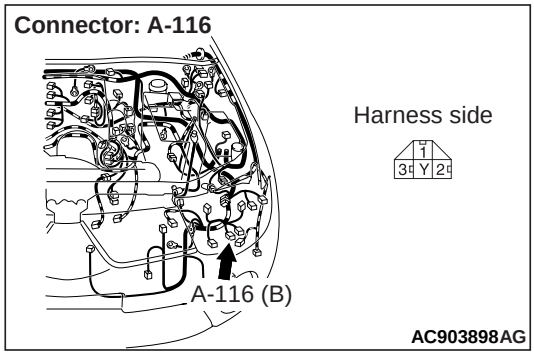
STEP 1. Connector check: A-116 headlamp (LH) connector or A-126 headlamp (RH) connector

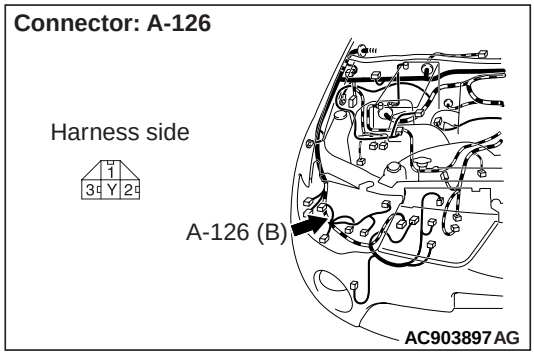




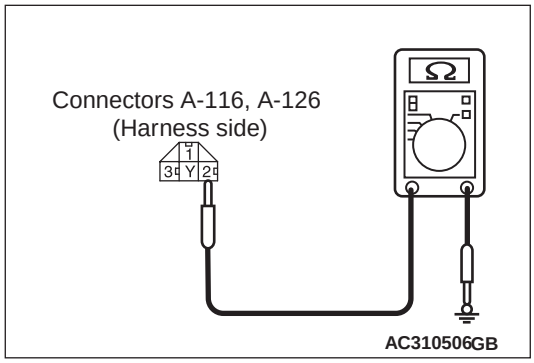
Q: Is the check result normal?
YES <Either of LH side and RH side does not illuminate> : Go to Step 2.
YES <Low-beam of LH side or RH side does not illuminate> : Go to Step 5.
YES <High-beam of LH side or RH side does not illuminate> : Go to Step 9.
NO <The connectors are not in good condition> : Repair the defective connector.

STEP 2. Resistance measurement at the A-116 headlamp (LH) connector or the A-126 headlamp (RH) connector.





(1) Disconnect the connector, and measure at the wiring harness side.
(2) Check the resistance between the lamp connector and body earth.

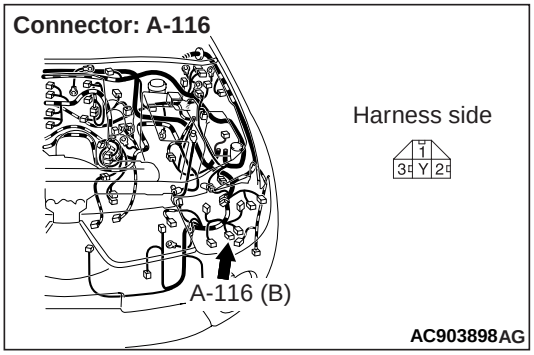


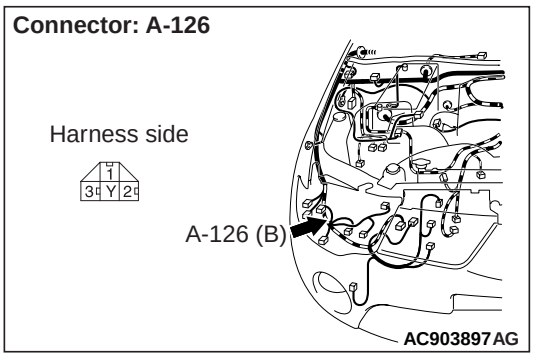
- Resistance between A-116 headlamp (LH) connector terminal No.2 and body earth
- Resistance between A-126 headlamp (RH) connector terminal No.2 and body earth

OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?
YES : Go to Step 4.
NO : Go to Step 3.

STEP 3. Check the wiring harness from A-116 headlamp (LH) connector terminal No.2 or A-126 headlamp (RH) connector terminal No.2 to body earth.





- Check the earth wires for open circuit.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness.

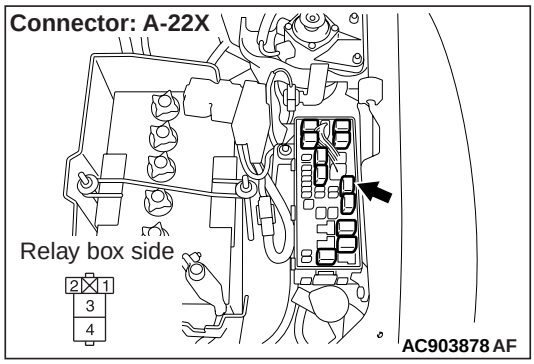
STEP 4. Retest the system.
(1) Replace the socket of the defective headlamp.
(2) Check that the headlamps illuminate normally.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Replace the headlamp.

STEP 5. Check the bulb(s) of the headlamps.
Check the bulb(s) of the defective lamp.

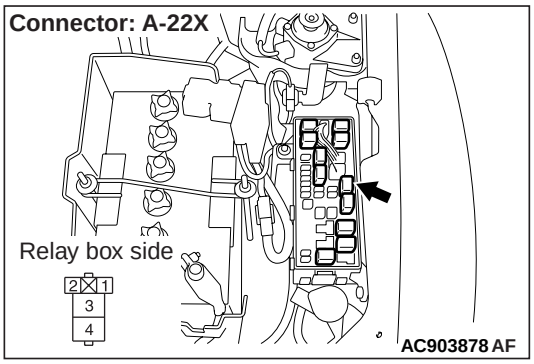
Q: Is the check result normal?
YES : Go to Step 6.
NO : Replace the bulb(s) of the defective lamp.

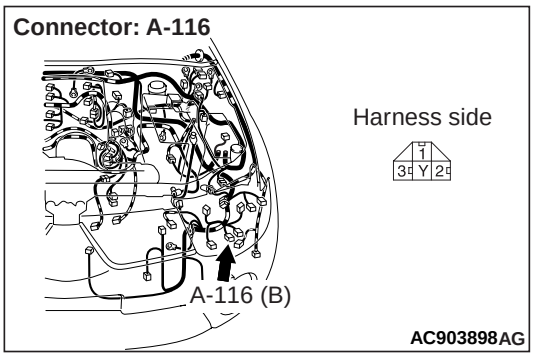
STEP 6. Connector check: A-22X headlamp relay (LO) connector

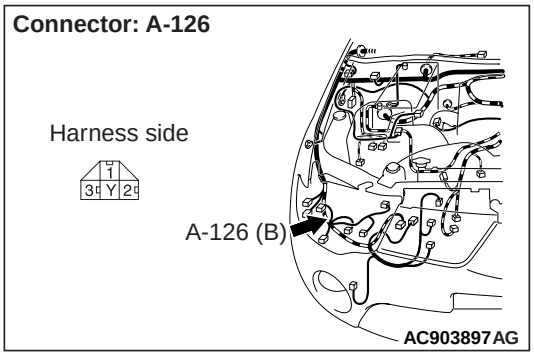


Q: Is the check result normal?
YES : Go to Step 7.
NO : Repair the defective connector.

STEP 7. Check the wiring harness from A-116 headlamp (LH) connector terminal No.1 or A-126 headlamp (RH) connector terminal No.1 to A-22X headlamp relay (LO) connector terminal No.3.







- Check the output lines for open circuit.

Q: Is the check result normal?

YES : Go to Step 8.
NO : Repair the wiring harness.

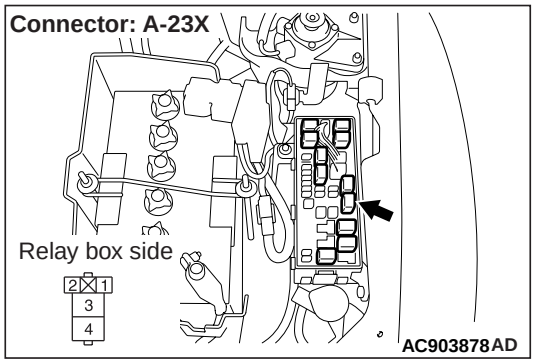
STEP 8. Retest the system.
(1) Replace the socket of the defective headlamp.
(2) Check that the headlamps illuminate normally.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Replace the headlamp.

STEP 9. Check the bulb(s) of the headlamps.
Check the bulb(s) of the defective lamp.

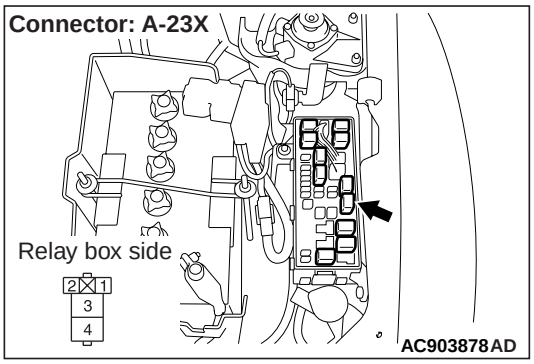
Q: Is the check result normal?
YES : Go to Step 10.
NO : Replace the bulb(s) of the defective lamp.

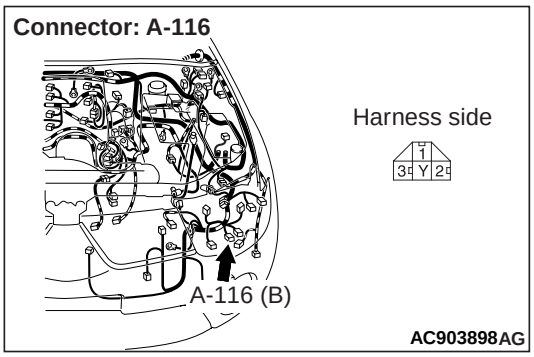
STEP 10. Connector check: A-23X headlamp relay (HI) connector

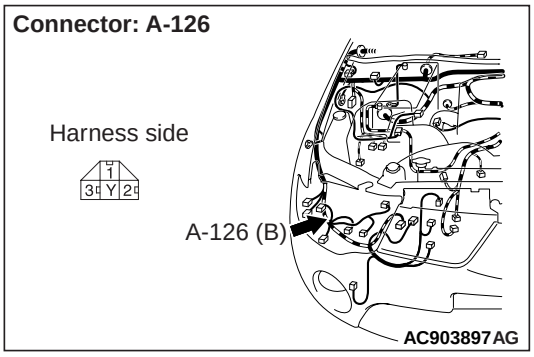


Q: Is the check result normal?
YES : Go to Step 11.
NO : Repair the defective connector.

STEP 11. Check the wiring harness from A-116 headlamp (LH) connector terminal No.3 or A-126 headlamp (RH) connector terminal No.3 to A-23X headlamp relay (HI) connector terminal No.3.







- Check the output lines for open circuit.

Q: Is the check result normal?

YES : Go to Step 12.
NO : Repair the wiring harness.

STEP 12. Retest the system.

(1) Replace the socket of the defective headlamp.
(2) Check that the headlamps illuminate normally.

Q: Is the check result normal?

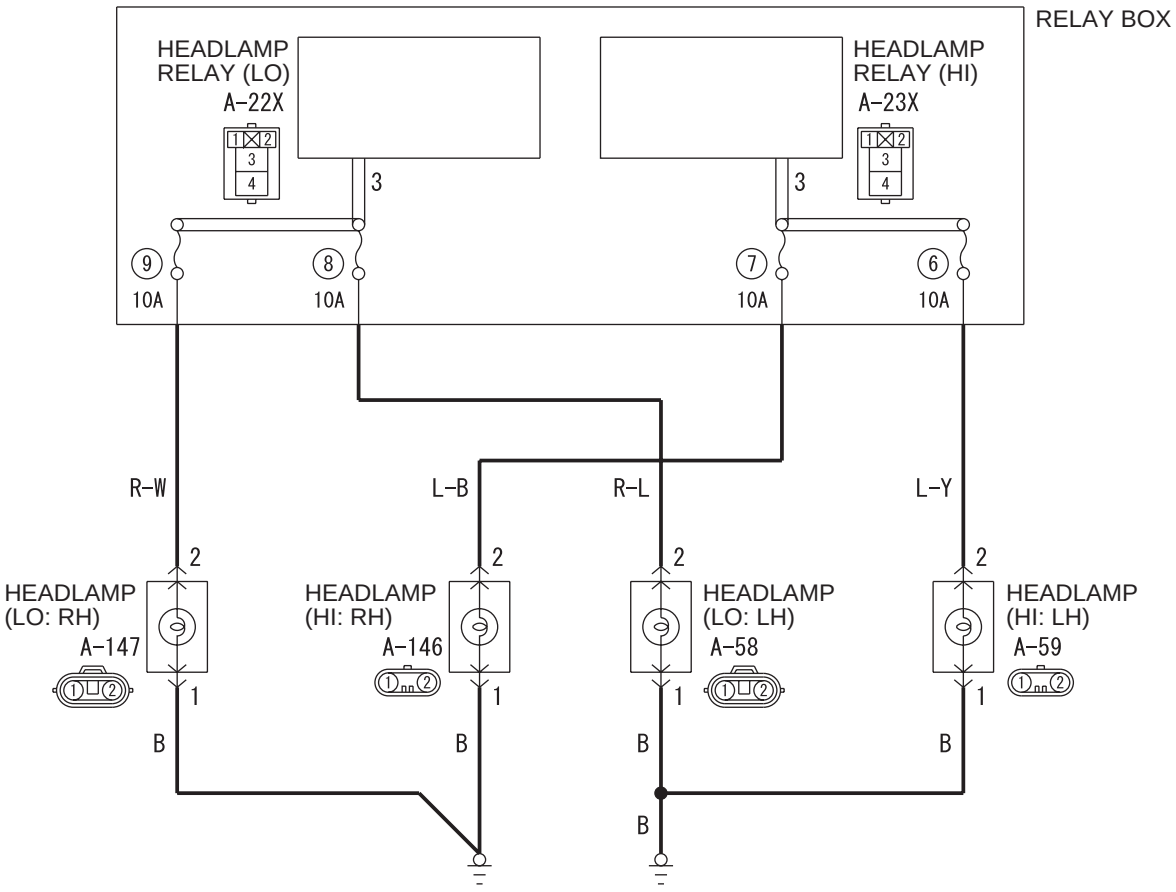
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Replace the headlamp.

Inspection Procedure 5: One of the headlamps does not illuminate. <4-bulb type>

⚠ CAUTION

Whenever the ECU is replaced, ensure that the power supply circuit, the earth circuit and the communication circuit are normal.

Headlamps Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

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COMMENTS ON TROUBLE SYMPTOM

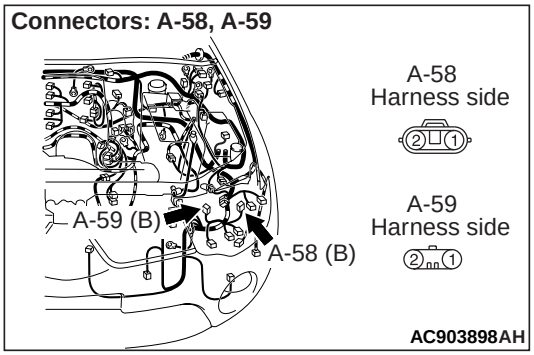
When one of the headlamps does not illuminate, the wiring harness, connector(s), or the bulb may have a problem, or the fuse may be burned out.

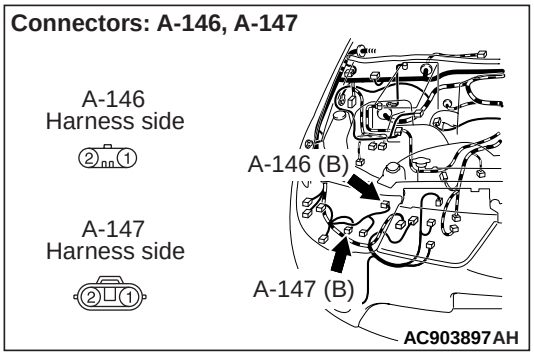
PROBABLE CAUSES

- Malfunction of the headlamp bulbs
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. Connector check: A-58 <headlamp (LO: LH)>, A-147 <headlamp (LO: RH)>, A-59 (HI: LH), A-146 (HI: RH) headlamp connector



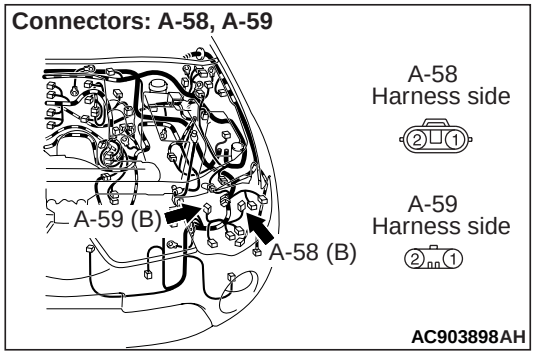


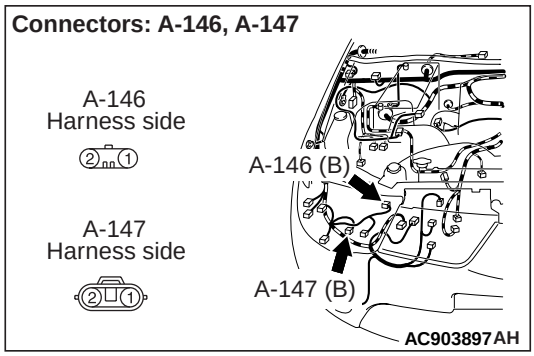
Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the defective connector.

STEP 2. Bulb check
Check the bulb(s) of headlamp that does not illuminate.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Replace the bulb(s) of the lamp that does not illuminate.

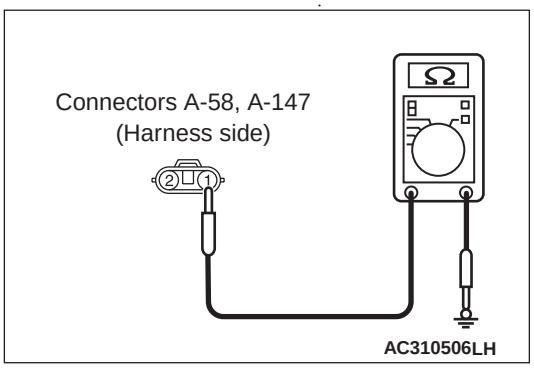
STEP 3. Resistance measurement at the A-58 <headlamp (LO: LH)>, A-147 <headlamp (LO: RH)>, A-59 (HI: LH), A-146 (HI: RH) headlamp connector





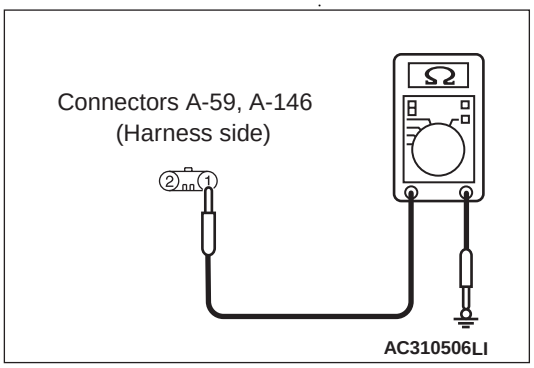
(1) Disconnect the connector, and measure at the wiring harness side.
(2) Measure the resistance between the connector of lamp which does not illuminate and the body

earth.



Measure the resistance between the A-58 headlamp (LO: LH) connector terminal No. 1 and the body earth.

- Measure the resistance between the A-147 headlamp (LO: RH) connector terminal No. 1 and the body earth.



Measure the resistance between the A-59 headlamp (HI: LH) connector terminal No. 1 and the body earth.

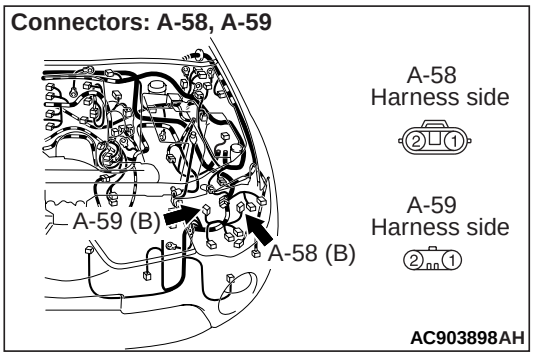
- Measure the resistance between the A-146 headlamp (HI: RH) connector terminal No. 1 and the body earth.

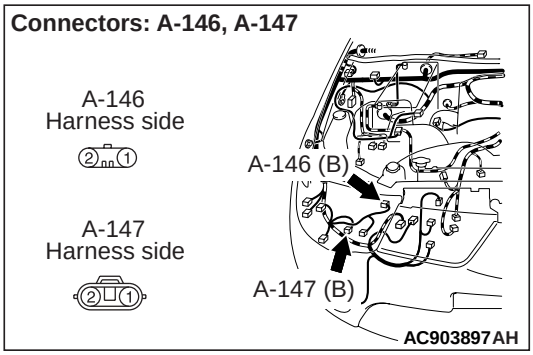
OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?

YES : Go to Step 5.
NO : Go to Step 4.

STEP 4. Check the wiring harness from A-58 <headlamp (LO: LH)>, A-147 <headlamp (LO: RH)>, A-59 (HI: LH), A-146 (HI: RH) headlamp connector (terminal No.1) to body earth



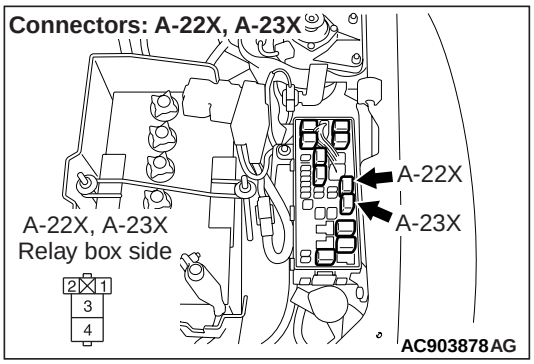


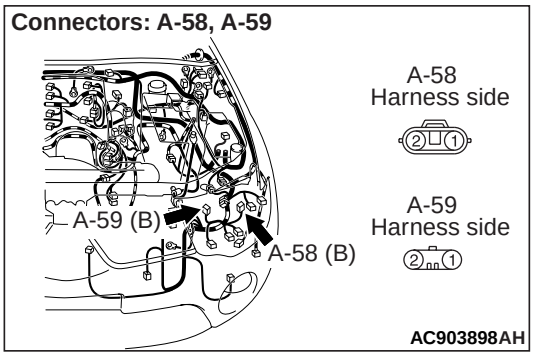
- Check the earth wires for open circuit.

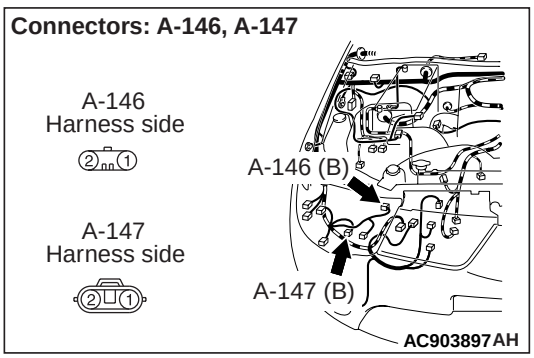
Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness.

STEP 5. Check the wiring harness from A-58 <headlamp (LO: LH)>, A-147 <headlamp (LO: RH)>, A-59 (HI: LH), A-146 (HI: RH) headlamp connector (terminal No.2) to A-22X headlamp relay (LO) or A-23X headlamp relay (HI) connector (terminal No.3)







- Check the power supply line for open circuit and short circuit.

Q: Is the check result normal?

YES : Go to Step 6.
NO : Repair the wiring harness.

STEP 6. Retest the system

Check that the headlamps illuminate normally.

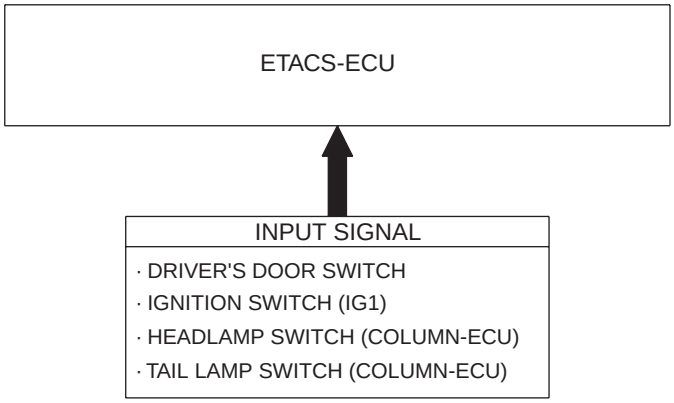
Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Replace the headlamp socket.

Inspection Procedure 6: The headlamp automatic-shutdown function does not work normally.

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Headlamp Automatic Shutdown Function



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COMMENTS ON TROUBLE SYMPTOM
The ETACS-ECU operates this function in accordance with the input signals below.
- Ignition switch (IG1)
- Driver's door switch
- Tail lamp switch
- Headlamp switch

If this function does not work normally, these input signal circuit(s) or the ETACS-ECU may be defective.

PROBABLE CAUSES
- Malfunction of the driver's door switch
- Malfunction of the column switch
- Malfunction of the ETACS-ECU
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. Check of adjustment details for the headlamp automatic-shutdown
Check that the headlamp automatic-shutdown function is set to "B-spec" using the customise function of M.U.T-III.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Using the customise function of M.U.T-III, set the headlamp automatic-shutdown function to "B-spec."

STEP 2. M.U.T.-III diagnosis code.
When the ignition switch is turned to the "LOCK" (OFF) position, check that the ETACS-ECU does not set the diagnosis code.

Q: Is the diagnosis code set?
YES : Refer to diagnosis code chart P.54A-494.
NO : Go to Step 3.

STEP 3. M.U.T.-III data list
Check the input signals below, which are related to the headlamp automatic-shutdown function.
- Turn the ignition switch to the "LOCK" (OFF) position.
- Open the drive's door.
- Turn the headlamp switch to the ON position.

Item No.	Item name	Normal condition
19	Drive's door switch	ON
30	Ignition switch(IG1)	OFF
60	Headlamp output	ON

OK: Normal conditions are displayed for all the items

Q: Are the check result normal?

YES <All the signals are received normally.> : Go to Step 4.
NO <The driver's door switch signal is not received.> : Refer to inspection procedure C-5 "One of the door switch signals is not received P.54A-540."
NO <The ignition switch (IG1) signal is not received.> : Refer to inspection procedure C-3 "The ignition switch (IG1) signal is not received P.54A-533."
NO <The headlamp switch signal is not received.> : Refer to inspection procedure C-1 "The column switch (lighting and wiper switch) signal is not received P.54A-523."

STEP 4. Retest the system.
Check that the headlamp automatic-shutdown function works normally.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Replace the ETACS-ECU and register the ID codes (Refer to P.54A-39).

Inspection Procedure 7: Daytime running lamp function does not work normally.

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

COMMENTS ON TROUBLE SYMPTOM
If the daytime running lamp function is not operating normally the ETACS-ECU power circuit may be defective or the ETACS-ECU may be defective.

PROBABLE CAUSES
- Malfunction of the ETACS-ECU
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. Check that the headlamps operate.
Do the low-beam headlamps illuminate when the lighting switch is turned to the HEAD position?

Q: Is the check result normal?
YES : Go to Step 2.
NO : First, repair the headlamps. Refer to Inspection Procedure 1 "None of the low-beam headlamps illuminate P.54A-110."

STEP 2. M.U.T.-III diagnosis code.
When the ignition switch is turned to the "LOCK" (OFF) position, check that the ETACS-ECU does not set the diagnosis code.

Q: Is the diagnosis code set?
YES : Refer to diagnosis code chart P.54A-494.
NO : Go to Step 3.

STEP 3. M.U.T.-III data list
Check the input signals below, which are related to the daytime running lamp function.
- Turn the ignition switch to the "ON" position.

Item No.	Item name	Normal condition
30	Ignition switch(IG1)	ON

OK: Normal condition is displayed.

Q: Is the check result normal?
YES : Go to Step 4.
NO : Refer to inspection procedure C-3 "The ignition switch (IG1) signal is not received P.54A-533."

STEP 4. Retest the system.
Check that the daytime running lamp function works normally.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Replace the ETACS-ECU and register the ID codes (Refer to P.54A-39).

Inspection Procedure 10: The auto lamp function does not work normally.

⚠ CAUTION
Whenever the ECU is replaced, ensure that the power supply circuit, the earth circuit and the communication circuit are normal.

OPERATION
The ETACS-ECU operates this function in accordance with the input signals from lighting control sensor and column switch (auto lamp switch).

COMMENTS ON TROUBLE SYMPTOM
If the auto lamp function does not work normally, the above input signal circuit(s) or the ETACS-ECU may have a problem.

PROBABLE CAUSES
- Malfunction of the lighting control sensor
- Malfunction of the column switch
- Malfunction of the ETACS-ECU
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics
Use the M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the CAN bus line (Refer to GROUP 54C – Troubleshooting).

STEP 2. M.U.T.-III diagnosis code
Check if diagnosis code is set to the LIN.

Q: Is the diagnosis code set?
YES : Refer to diagnosis code chart P.54A-95.
NO : Go to Step 3.

STEP 3. M.U.T.-III other system diagnosis code
Check if diagnosis code is set to the ETACS-ECU.

Q: Is the diagnosis code set?
YES : Troubleshoot the ETACS-ECU (Refer to P.54A-494).
NO : Go to Step 4.

STEP 4. Check that the headlamps operate.
Check that the headlamps (low-beam) illuminate normally.

Q: Is the check result normal?
YES : Go to Step 5.
NO : Refer to Inspection Procedure 1 "None of the low-beam headlamps illuminate." P.54A-110.

STEP 5. Lighting control sensor check
Check the lighting control sensor. Refer to P.54A-149.

Q: Is the check result normal?
YES : Go to Step 6.
NO : Replace the lighting control sensor.

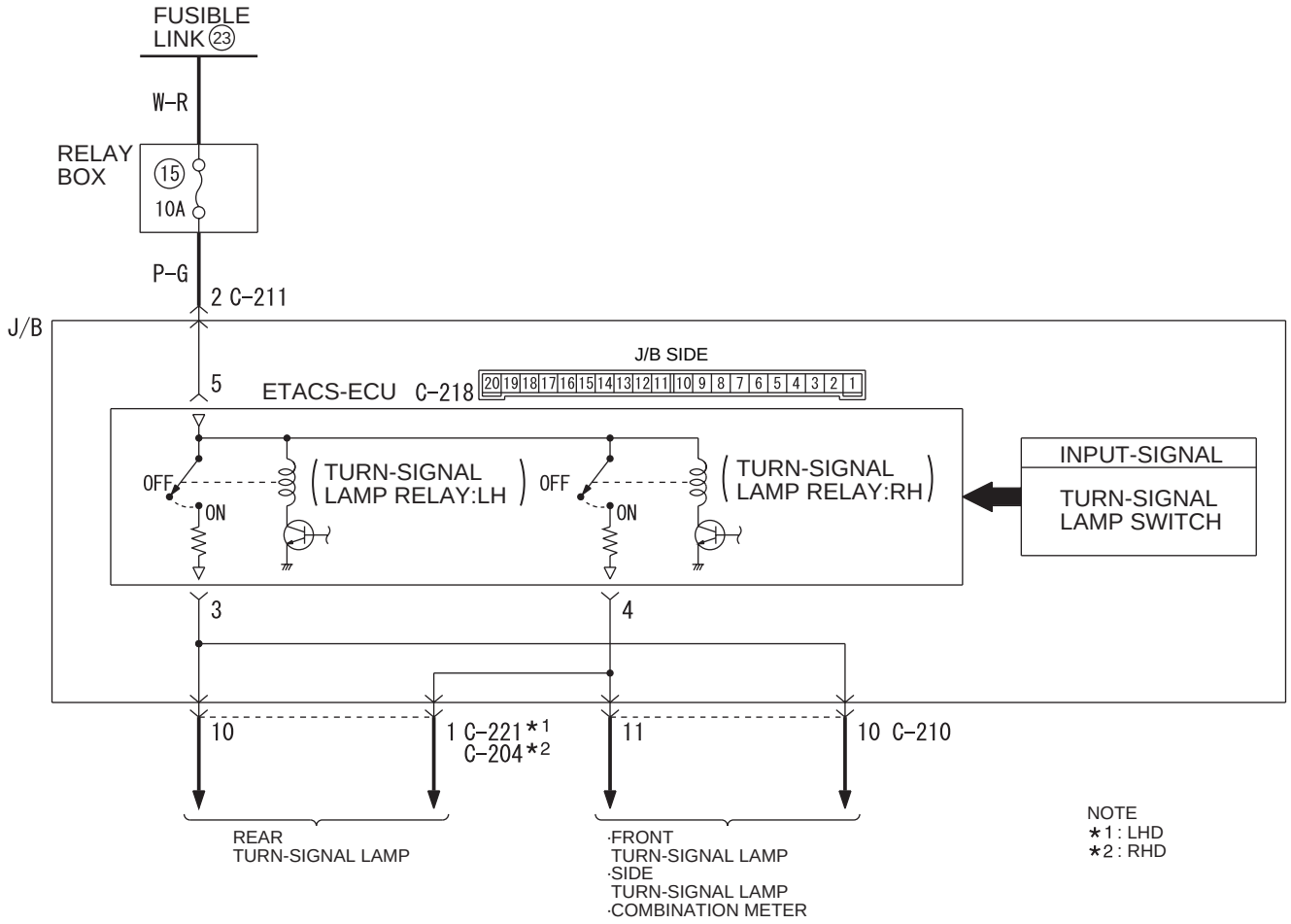
STEP 6. Retest the system
Check that the auto lamp function works normally.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Replace the ETACS-ECU and register the ID codes (Refer to P.54A-39).

Inspection Procedure 8: None of the turn-signal lamps illuminate.

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Turn-Signal Lamp Power Source Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

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COMMENTS ON TROUBLE SYMPTOM

If none of the turn-signal lamps does not illuminate, the ignition switch (IG1), the turn-signal lamp switch input circuit or the ETACS-ECU may be defective. Using a customisation function, the turn-signal lamps can be operated even when the ignition switch is in the ACC position.

PROBABLE CAUSES

- Malfunction of the column switch
- Malfunction of the ETACS-ECU
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code.

When the ignition switch is turned to the "LOCK" (OFF) position, check that the ETACS-ECU does not set the diagnosis code.

Q: Is the diagnosis code set?
YES : Refer to diagnosis code chart P.54A-494.
NO : Go to Step 2.

STEP 2. M.U.T.-III data list

Check the input signal from the ignition switch (IG1) and turn-signal lamp switch.

- Turn the ignition switch to the "LOCK" (OFF) position.

Item No.	Item name	Normal condition
30	Ignition switch(IG1)	OFF

- Turn the turn-signal lamp switch (LH) to the ON position.

Item No.	Item name	Normal condition
62	Turn-signal lamp (LH) output	ON
63	Turn-signal lamp (RH) output	OFF

- Turn the turn-signal lamp switch (RH) to the ON position.

Item No.	Item name	Normal condition
62	Turn-signal lamp (LH) output	OFF
63	Turn-signal lamp (RH) output	ON

OK: Normal conditions are displayed for all the items.

Q: Is the check result normal?

YES <All the signals are received normally.> : Go to Step 3.

NO <The ignition switch (IG1) signal is not received.> : Refer to inspection procedure C-3 "The ignition switch (IG1) signal is not received P.54A-533."

NO <The turn-signal lamp switch signal is not received.> : Refer to inspection procedure C-1 "The column switch (lighting and wiper switch) signal is not received P.54A-523."

STEP 3. Retest the system.

Check that the turn-signal lamps illuminate normally.

Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

NO : Replace the ETACS-ECU and register the ID codes (Refer to P.54A-39).

Inspection Procedure 9: The comfort flasher does not work normally.

⚠ CAUTION

Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

COMMENTS ON TROUBLE SYMPTOM

If the comfort flasher does not work normally, the column switch or the ETACS-ECU may be defective.

PROBABLE CAUSES

- Malfunction of the column switch
- Malfunction of the ETACS-ECU

DIAGNOSIS PROCEDURE

STEP 1. Check of adjustment details for the comfort flasher

Check that the comfort flasher is set to "Operation" using the customise function of M.U.T-III.

Q: Is the check result normal?

YES : Go to Step 2.

NO : Using the customise function of M.U.T-III, set the comfort flasher to "Operation."

STEP 2. M.U.T.-III diagnosis code.

When the ignition switch is turned to the "LOCK" (OFF) position, check that the ETACS-ECU does not set the diagnosis code.

Q: Is the diagnosis code set?

YES : Refer to diagnosis code chart P.54A-494.

NO : Go to Step 3.

STEP 3. Check that the turn-signal lamps operate.

Check that the turn-signal lamps illuminate normally.

Q: Is the check result normal?

YES : Go to Step 4.

NO : Refer to inspection procedure 8 "None of the turn-signal lamps illuminate P.54A-137."

STEP 4. Replace the ECU.

(1) Replace the ETACS-ECU and register the ID codes (Refer to P.54A-39).

(2) Check that the comfort flasher works normally.

Q: Is the check result normal?

YES : The procedure is complete.

NO : Replace the column switch.

DATA LIST REFERENCE TABLE

M1540103800359

LIN <LIGHTING CONTROL SENSOR (LAMP SENSOR)>

Item No.	M.U.T.-III display	Condition	Normal condition
7001	RLS IG1	When the ignition switch is turned to the LOCK or ACC position.	OFF
		When the ignition switch is turned to the ON or START position.	ON
7002	RLS Lamp sensor sensitivity	When the customise value of the lighting control sensor sensitivity is set to level 1 (quick).	Level 1 bright
		When the customise value of the lighting control sensor sensitivity is set to level 2 (slightly quick).	Level 2 bright
		When the customise value of the lighting control sensor sensitivity is set to level 3 (normal).	Level 3
		When the customise value of the lighting control sensor sensitivity is set to level 4 (slightly slow).	Level 4 dark
		When the customise value of the lighting control sensor sensitivity is set to level 5 (slow).	Level 5 dark
7004	RLS Radio ACC	When the ignition switch is turned to the LOCK or START position.	OFF
		When the ignition switch is turned to the ACC or ON position.	ON
7007	RLS Vehicle speed	Perform a test run of the vehicle.	The values displayed on the speedometer and M.U.T.-III are almost the same.
7009	RLS Low beam "ON" request	When the area around the lighting control sensor is bright.	OFF
		When the area around the lighting control sensor is dark.	ON
7010	RLS Judgement illuminance output	When the area around the lighting control sensor has become bright from dark	The value displayed on the M.U.T.-III becomes large.
		When the area around the lighting control sensor has become dark from bright.	The value displayed on the M.U.T.-III becomes small.

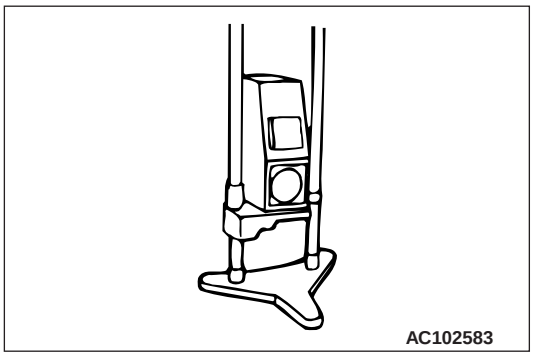
Item No.	M.U.T.-III display	Condition	Normal condition
7011	RLS Tail lamp "ON" request	When the area around the lighting control sensor is bright.	OFF
		When the area around the lighting control sensor is dark.	ON
7012	RLS Tunnel detect output	When the area around the lighting control sensor is bright.	OFF
		When the area around the lighting control sensor is dark.	ON
7014	RLS Specification	–	EU
7015	RLS ECU Diagnostic version	–	–
7016	RLS ECU Hardware version	–	–
7017	RLS ECU Software version	–	–
7018	RLS ECU Part number	–	8634A048
7019	RLS ECU Serial number	–	–

ON-VEHICLE SERVICE

HEADLAMP AIMING

M1540100500542

<USING A BEAM SETTING EQUIPMENT>

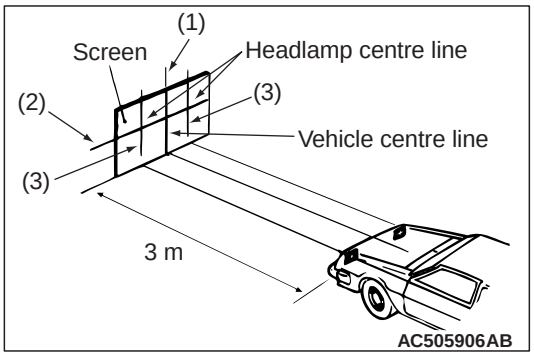


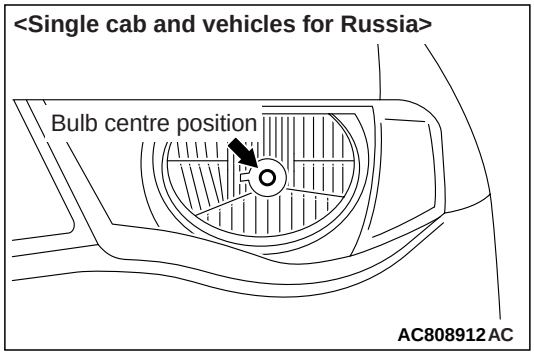
1. The headlamps should be aimed with the proper beam setting equipment, and in accordance with the equipment manufacture’s instructions.
2. Alternately turn the adjusting screw to adjust the headlamp aiming.

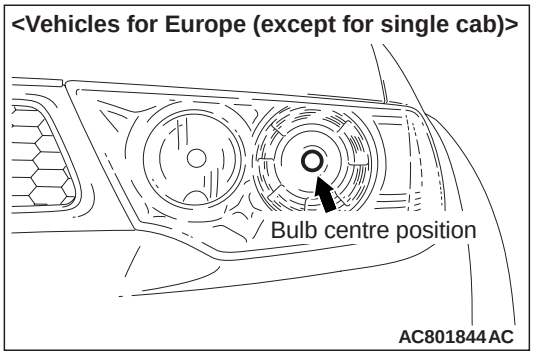
<USING A SCREEN>

PRE-AIMING INSTRACTION

1. Inspect for badly rusted or faulty headlamp assemblies.
2. These conditions must be corrected before a satisfactory adjustment can be made.
3. Inspect tyre inflation, and adjust if it is necessary.
4. If the fuel tank is not filled up, put weight in the luggage compartment to make up for the fuel shortage so that the weight will become 90% of full-state weight or heavier. (0.8 kg per litter)
5. There should be no other load in the vehicle other than driver or substituted weight of approximately 75 kg placed in driver's position.
6. Put the headlamp levelling switch in "0" position.
7. Thoroughly clean the headlamp lenses.







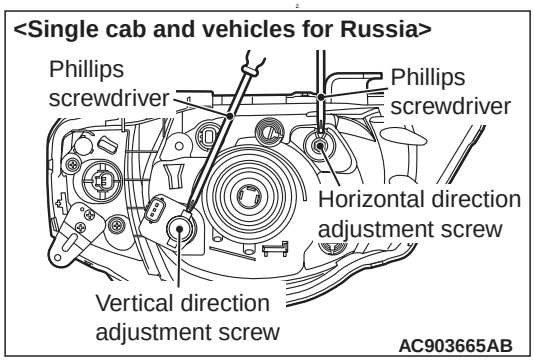
8. Place the vehicle on a level floor, perpendicular to a flat screen 3 m away from the bulb centre-marks on the headlamp lens.
9. Rock vehicle sideways to allow vehicle to assume its normal position.
10. Bounce the front suspension through three oscillations by applying the body weight to hood or bumper.
11. Run the engine at a speed of 2,000 r/min to charge the battery.
12. Four lines of adhesive tape (or equivalent markings) are required on screen or wall:
    (1) Position a vertical tape or mark so that it is aligned with the vehicle centre line.
    (2) Measure the distance from the bulb centre position to the floor. Transfer the measurement to the screen. Horizontal tape or mark on the screen is for reference of vertical adjustment.
    (3) Measure the distance from the centre line of the vehicle to the centre of each headlamp. Transfer the measurement to the screen. Vertical tape or mark on the screen with reference to the centre line of each headlamp bulb.

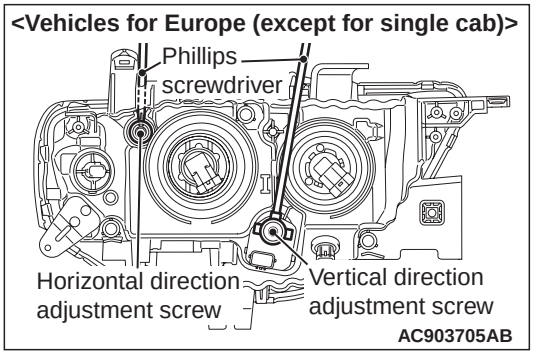
HEADLAMP ADJUSTMENT

⚠ CAUTION

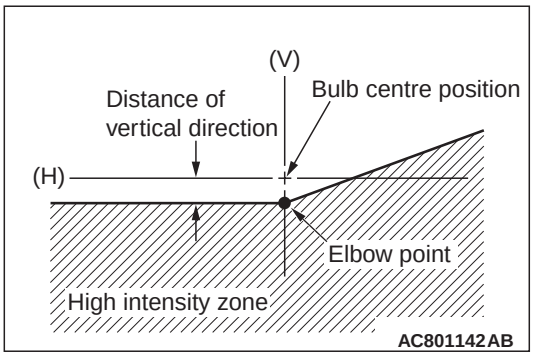
- **Do not cover a headlamp for more than three minutes to prevent the plastic headlamp lens deformation.**
- **Be sure to adjust the aiming adjustment screw in the tightening direction.**

1. The low-beam headlamp should project on the screen upper edge of the beam (cut-off).





If not the case, turn the adjusting screws to achieve the specified low-beam cut-off location on the aiming screen.



Standard value:

Vertical direction; 36 mm (0.69°) below horizontal line (H)
Horizontal direction; Elbow point intersects the vertical line (V)

Limit:
Vertical direction; Between 21 mm (0.4°) to 51 mm (0.98°) downward from the horizontal line (H)
Horizontal direction; ± 26 mm (± 0.5°) from the vertical line (V)

NOTE: The illustration shows LH drive vehicles. For RH drive vehicles, it is symmetrical.

LUMINOUS INTENSITY MEASUREMENT

M1540100600259

Using a photometer, and following its manufacture's instruction manual, measure the headlamp intensity and check to be sure that the limit value is satisfied.

Limit: 30,000 cd or more (When a screen is set 25m ahead of the vehicle)

NOTE:

1. *When measuring the intensity, maintain an engine speed of 2,000 r/min, with the battery in the charging condition.*
2. *There may be special local regulations pertaining to headlamp intensity, be sure to make any adjustments necessary to satisfy such regulations.*
3. *Check that the headlamp intensity of the high-beam satisfies the limit value.*
4. *If an illuminometer is used to make the measurements, convert its values to photometer values by using the following formula.*

   $I = Er^2$:
   I=intensity (cd)
   E=illumination (lux)
   r=distance (m) from headlamps to illuminometer

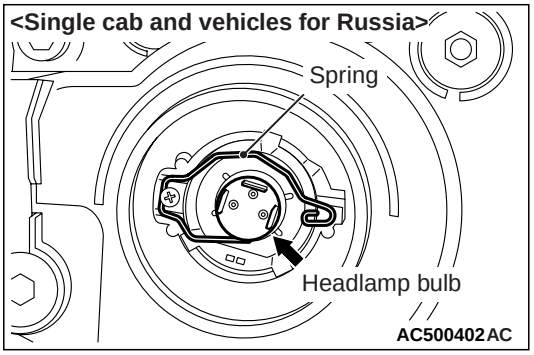
REPLACEMENT OF REPLACEABLE BULB

M1540100700472

HEADLAMP BULB REPLACEMENT <SINGLE CAB AND VEHICLES FOR RUSSIA>

⚠ CAUTION
Don't touch the bulb surface with bare hands or dirty gloves. If the bulb surface (glass part) gets dirty, clean it with alcohol or thinner immediately and dry well, and then install it.

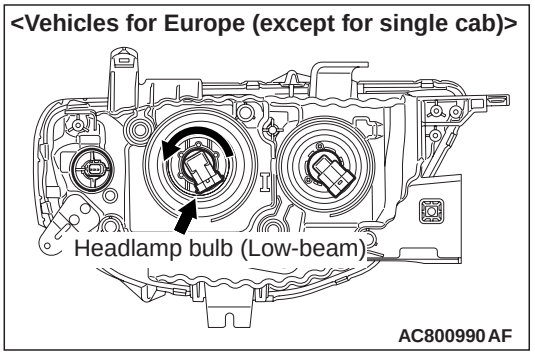
1. Disconnect the battery.
2. Disconnect the connector.



3. Remove the socket cover.
4. Remove bulb mounting spring to pull out bulb.
5. After bulb is replaced, properly reconnect connector.

HEADLAMP BULB (LOW-BEAM) REPLACEMENT <VEHICLES FOR EUROPE (EXCEPT FOR SINGLE CAB)>

⚠ CAUTION
Don't touch the bulb surface with bare hands or dirty gloves. If the bulb surface (glass part) gets dirty, clean it with alcohol or thinner immediately and dry well, and then install it.



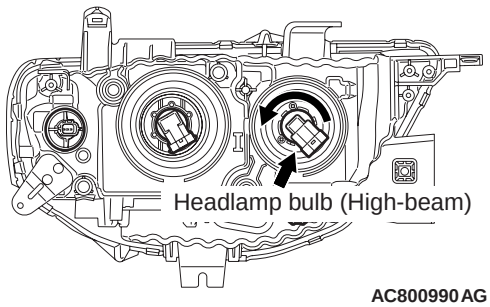
Disconnect the connector, and twist the headlamp bulb (low-beam) to remove.

HEADLAMP BULB (HIGH-BEAM) REPLACEMENT <VEHICLES FOR EUROPE (EXCEPT FOR SINGLE CAB)>

⚠ CAUTION

Do not touch the bulb surface with bare hands or dirty gloves. If the bulb surface (glass part) gets dirty, immediately clean it with alcohol or thinner. After drying completely, install the bulb.

<Vehicles for Europe (except for single cab)>

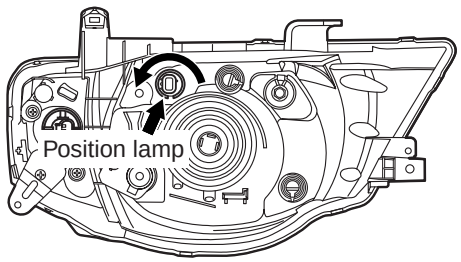


AC800990AG

Disconnect the connector, and twist the headlamp bulb (high-beam) to remove.

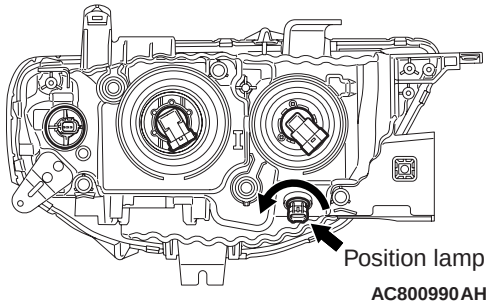
POSITION LAMP BULB REPLACEMENT

<Single cab and vehicles for Russia>



AC900629AD

<Vehicles for Europe (except for single cab)>

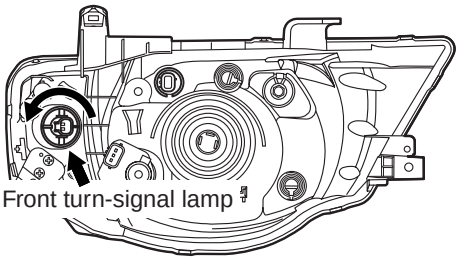


AC800990AH

Disconnect the connector, and twist the position lamp socket to remove it.

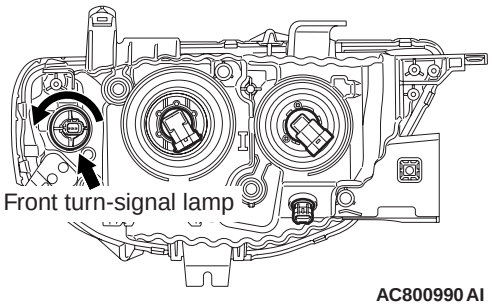
FRONT TURN-SIGNAL LAMP BULB REPLACEMENT

<Single cab and vehicles for Russia>



AC900629AE

<Vehicles for Europe (except for single cab)>



AC800990AI

Disconnect the connector, and twist the front turn-signal lamp socket to remove it.

HEADLAMP AUTOMATIC-SHUTDOWN FUNCTION CHECK

M1540100800026

Confirm that the headlamp turns off when the ignition switch is ON and the driver's door is opened and when the ignition key is pulled out with the lighting switch at ON (HEAD) position and the driver's door is opened. If not, carry out the troubleshooting. (Refer to P.54A-109.)

HEADLAMP AUTO LAMP FUNCTION CHECK

M1540100900261

Verify that the headlamps will illuminate when placing a hand over the light receiver of the lighting control sensor under direct sunlight with the ignition switch in the "ON" position and the lighting switch in the "AUTO" position. If there is a malfunction, perform the troubleshooting (Refer to P.54A-109).

NOTE: When covering the lighting control sensor receiver, be careful not to touch the windshield surface (where the lighting control sensor receiver is mounted). (The lighting control sensor receiver has limited resistance to oil.)

CUSTOMISATION FUNCTION

M1540103701087

The following functions can be customised using M.U.T.-III.

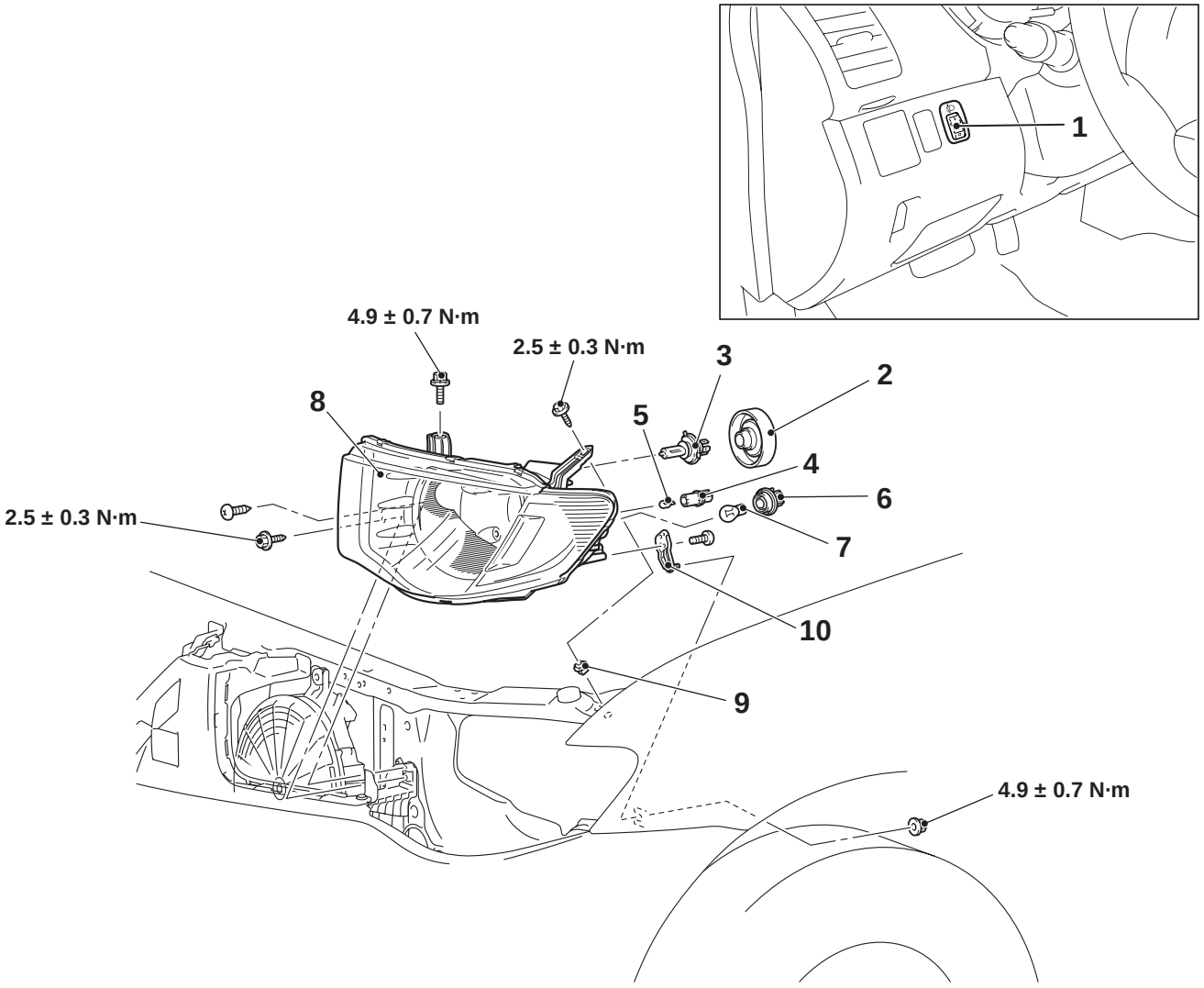
Function	Item name	Configuration
Turn-signal lamp operation sound function	Turn-signal lamp buzzer	• Operation: Standard tone (Initial setting) • Operation (type A): Differs from standard tone
Comfort flashing function	Comfort flashing function	• Inhibit (initial condition) • Operation
Headlamp automatic-shutdown function	Headlamp automatic-shutdown	• Not operation • B-spec (initial condition)
Hazard lamp blink time of keyless entry hazard lamp answerback function <vehicles with keyless entry system>	Hazard answer-back	• Lock 1 Unlock 2 (initial condition) • Lock 1 Unlock 0 • Lock 0 Unlock 2 • Lock 2 Unlock 0 • Lock 0 Unlock 0
Auto lamp function sensor sensitivity (illumination intensity) <vehicles with auto lamp>	Sensitivity for auto lamp(RLS)	• Level 1 bright • Level 2 bright • Level 3 (Initial setting) • Level 4 dark • Level 5 dark

HEADLAMP REMOVAL AND INSTALLATION

M1540101000733

<SINGLE CAB AND VEHICLES FOR RUSSIA>

Post-installation operation
Check the beam direction of the headlamp (Refer to Headlamp Aiming P.54A-140).



AC809114AB

Headlamp levelling switch removal steps
- Lower panel assembly (Refer to GROUP 52A, Instrument Panel Assembly).

1. Headlamp levelling switch

Headlamp removal steps
2. Headlamp bulb socket cover
3. Headlamp bulb
4. Position lamp bulb socket
5. Position lamp bulb

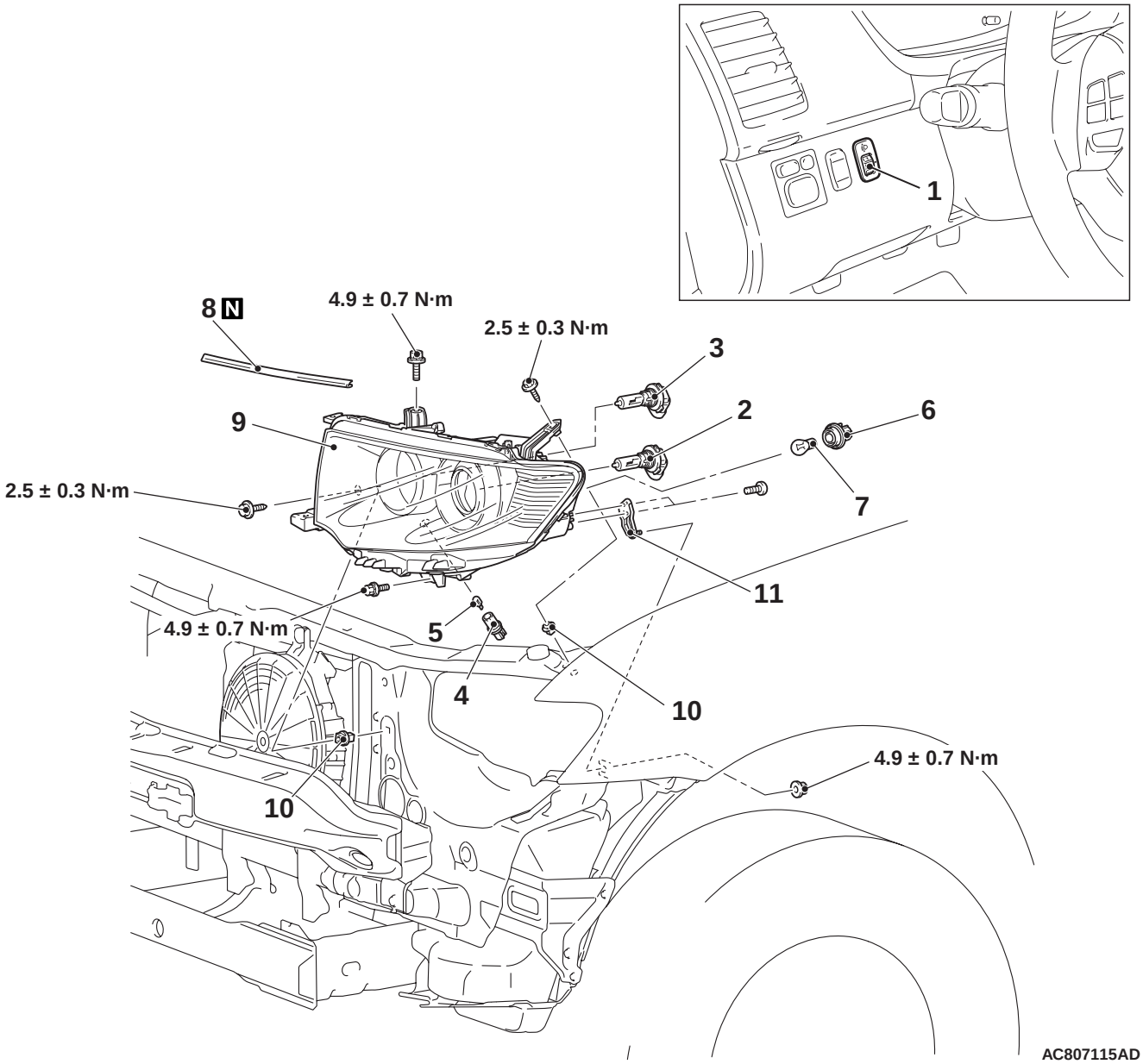
Headlamp removal steps
6. Front turn-signal lamp bulb socket
7. Front turn-signal lamp bulb

Headlamp body removal step
- Radiator grille (Refer to GROUP 51, Radiator grille .)
- Front splash shield (Front bumper side) (Refer to GROUP 42, Splash shield).

8. Headlamp body
9. Grommet
10. Headlamp bracket

<VEHICLES FOR EUROPE (EXCEPT FOR SINGLE CAB)>

Post-installation operation
Check the beam direction of the headlamp (Refer to Headlamp Aiming P.54A-140).



Headlamp levelling switch removal steps
- Lower panel assembly (Refer to GROUP 52A, Instrument Panel Assembly).

1. Headlamp levelling switch

Headlamp removal steps

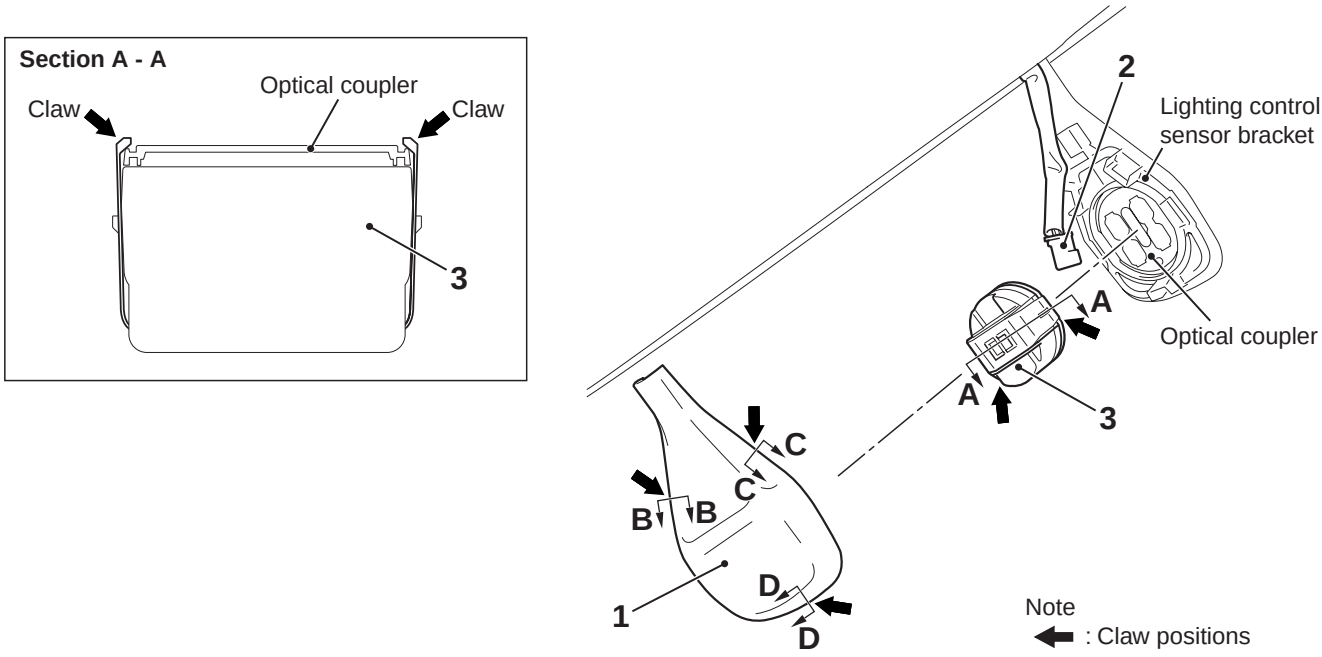
2. Headlamp bulb (low-beam)
3. Headlamp bulb (high-beam)
4. Position lamp bulb socket
5. Position lamp bulb
6. Front turn-signal lamp bulb socket
7. Front turn-signal lamp bulb
8. Headlamp seal

Headlamp body removal step
- Front bumper assembly (Refer to GROUP 51, Front bumper assembly).

9. Headlamp body
10. Grommet
11. Headlamp bracket

LIGHTING CONTROL SENSOR REMOVAL AND INSTALLATION

M1540108500267



AC807278AB

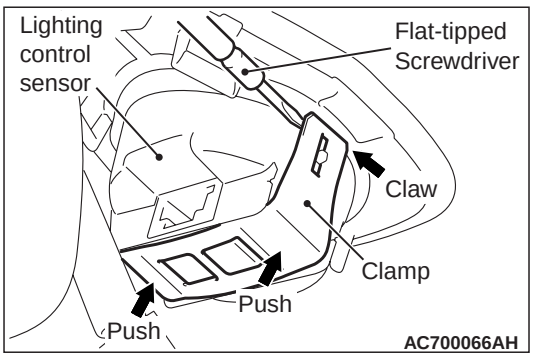
Removal Steps

1. Lighting control sensor cover
2. Connector

<<**A**>> >>**A**<< 3. Lighting control sensor

REMOVAL SERVICE POINT

<<A>> LIGHTING CONTROL SENSOR REMOVAL



While pushing the clamp to the windshield side, pry up the clamp to disengage the right and left claws using the flat-tipped screwdriver, and then remove the lighting control sensor.

INSTALLATION SERVICE POINT

>>A<< LIGHTING CONTROL SENSOR INSTALLATION

⚠ CAUTION

After executing the lighting control sensor (rain sensor) adaptation, do not touch the lighting control sensor (or do not move it from the fixed position).

- Mount the lighting control sensor onto the optical coupler, and then connect the connector.

- When reusing the lighting control sensor or when the lighting control sensor is pushed to check the installation condition, install the connector and the lighting control sensor cover and wipe the windshield thoroughly. When the windshield is dry, execute the lighting control sensor (rain sensor) adaptation. <Refer to GROUP 51 – Lighting Control Sensor (Rain Sensor) Adaptation >.

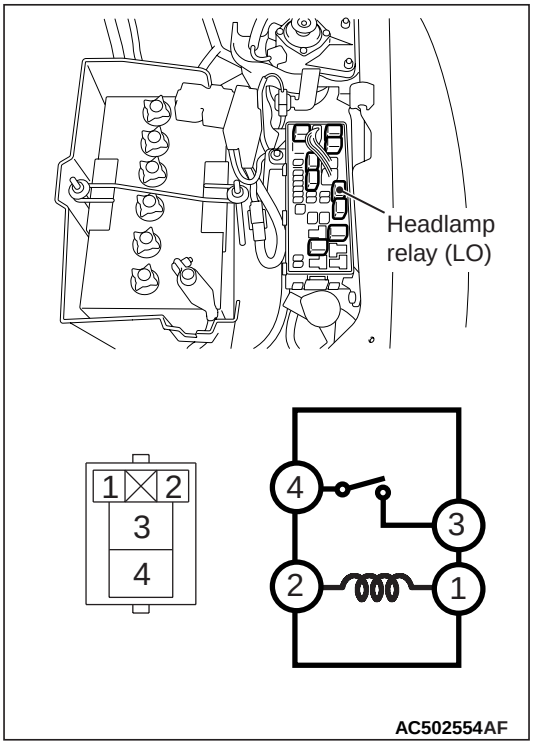
NOTE: Be careful not to touch the lighting control sensor receiver. (The lighting control sensor receiver has limited resistance to oil.)

INSPECTION

HEADLAMP RELAY CHECK

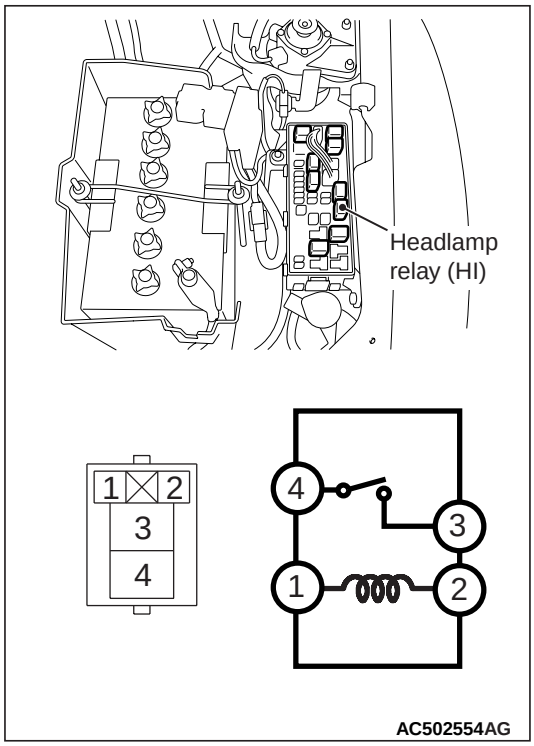
M1540104000282

HEADLAMP RELAY (LO) CHECK



Battery voltage	Tester connection	Specified condition
Not supplied	3 – 4	Open circuit
• Connect terminal 1 to the negative battery terminal • Connect terminal 2 to the positive battery terminal	3 – 4	Continuity exists (2 Ω or less)

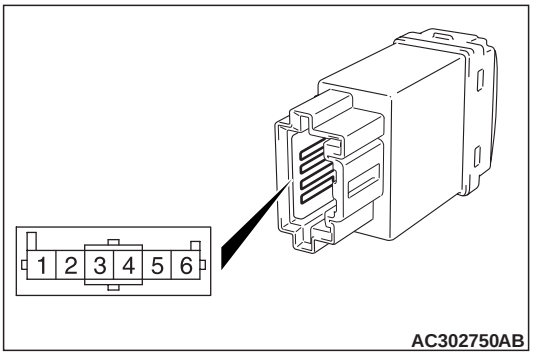
HEADLAMP RELAY (HI) CHECK



Battery voltage	Tester connection	Specified condition
Not supplied	3 – 4	Open circuit
• Connect terminal 2 to the negative battery terminal • Connect terminal 1 to the positive battery terminal	3 – 4	Continuity exists (2 Ω or less)

HEADLAMP LEVELLING SWITCH CHECK

M1540101300035



Tester connection	Switch position	Resistance value Ω
4 – 6	0	750
	1	1, 050
	2	1, 410
	3	1, 710
	4	2, 010
5 – 6	0, 1, 2, 3, 4	2, 830

LIGHTING CONTROL SENSOR (LAMP SENSOR) CHECK

M1540109000210

Use M.U.T.-III to check the LIN data list as follows.

1. Under the direct sunlight, turn the ignition switch to the ON position, and turn the lighting switch to the auto lamp position.
2. When the lighting control sensor receiver is covered to be darkened, it is judged normal if the items of No. 7009: RLS Low beam "ON" request and 7011: RLS Taillamp "ON" request change from OFF to ON.

NOTE:

- *When covering the lighting control sensor receiver, be careful not to touch the windshield surface (where the lighting control sensor receiver is mounted). (The lighting control sensor receiver has limited resistance to oil.)*
- *Before checking the data list by using M.U.T.-III, wipe the windshield thoroughly and visually check if there are foreign materials on the windshield to which the lighting control sensor is installed.*

FRONT FOG LAMP

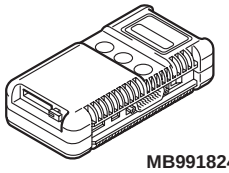
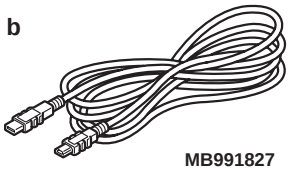
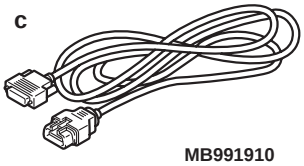
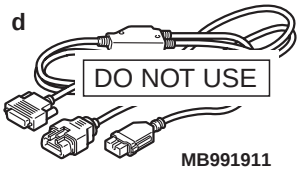
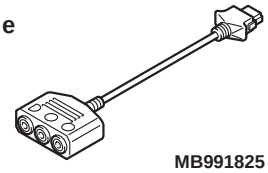
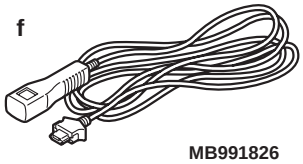
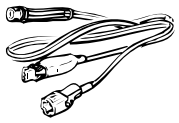
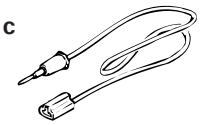
SERVICE SPECIFICATION

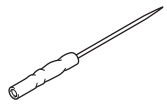
M1540400900024

Item		Standard value
Front fog lamp aiming	Vertical direction	60 mm (1.15°) below horizontal (H)

SPECIAL TOOLS

M1540401800020

Tool	Number	Name	Use
a  MB991824 b  MB991827 c  MB991910 d  MB991911 e  MB991825 f  MB991826 MB991955	MB991955 a. MB991824 b. MB991827 c. MB991910 d. MB991911 e. MB991825 f. MB991826	M.U.T.-III sub-assembly a. Vehicle Communication Interface (V.C.I.) b. M.U.T.-III USB cable c. M.U.T.-III main harness A (Vehicles with CAN communication system) d. M.U.T.-III main harness B (Vehicles without CAN communication system) e. M.U.T.-III measure adapter f. M.U.T.-III trigger harness	⚠ CAUTION **For vehicles with CAN communication, use M.U.T.-III main harness A to send simulated vehicle speed. If you connect M.U.T.-III main harness B instead, the CAN communication does not function correctly.** Checking ETACS-ECU (service data and diagnosis codes)
a b  c  d MB991223	MB991223 a. MB991219 b. MB991220 c. MB991221 d. MB991222	Harness set a. Check harness b. LED harness c. LED harness adapter d. Probe	Continuity check and voltage measurement at harness wire or connector a. For checking connector pin contact pressure b. For checking power supply circuit c. For checking power supply circuit d. For connecting a locally sourced tester

Tool	Number	Name	Use
 MB992006	MB992006	Extra fine probe	Continuity check and voltage measurement at harness wire or connector

TROUBLESHOOTING

TROUBLE SYMPTOM CHART

M1540401000314

DIAGNOSIS TROUBLESHOOTING FLOW

M1540401700023

Refer to GROUP 00 – Contents of Troubleshooting .

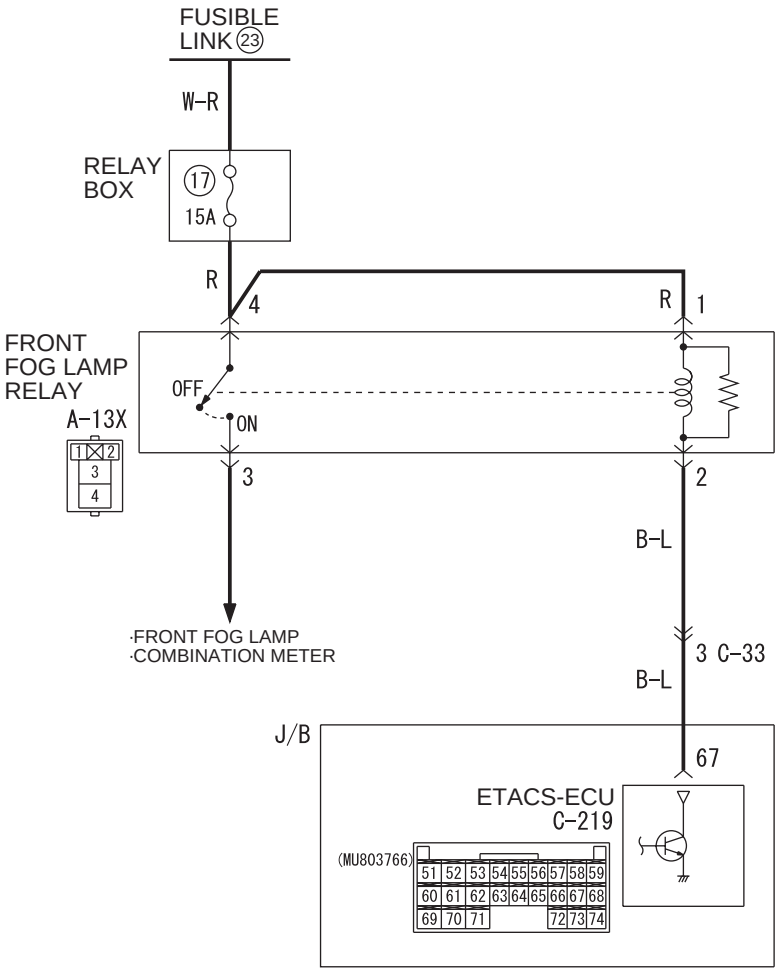
Symptom		Inspection procedure number	Reference page
Front fog lamp	The front fog lamps do not illuminate normally	1	P.54A-153
	One of the front fog lamps does not illuminate normally.	2	P.54A-157

SYMPTOM PROCEDURES

Inspection Procedure 1: The front fog lamps do not illuminate normally.

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Front Fog Lamp Relay Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver WAC54E081A

COMMENTS ON TROUBLE SYMPTOM

If none of the front fog lamps illuminate, the input signal circuit(s) below or the ETACS-ECU may be defective.

- Tail lamp switch
- Headlamp switch
- Front fog lamp switch

PROBABLE CAUSES

- Malfunction of the column switch
- Malfunction of the front fog lamp relay
- Malfunction of the ETACS-ECU
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. Check that the tail/stop lamps and headlamps operate.

Check that the tail/stop lamps and headlamps illuminate normally.

Q: Is the check result normal?

YES : Go to Step 2.

NO : Repair the tail/stop lamp(s) and headlamp(s). Refer to trouble symptom chart P.54A-109.

STEP 2. M.U.T.-III diagnosis code.

When the ignition switch is turned to the "LOCK" (OFF) position, check that the ETACS-ECU does not set the diagnosis code.

Q: Is the diagnosis code set?

YES : Refer to diagnosis code chart P.54A-494.

NO : Go to Step 3.

STEP 3. M.U.T.-III data list

Check the input signals below, which are related to the front fog lamp.

- Turn the ignition switch to the "LOCK" (OFF) position.
- Turn the tail lamp switch to the ON position.
- Turn the front fog lamp switch to the ON position.

Item No.	Item name	Normal condition
30	Ignition switch(IG1)	OFF
70	Front fog lamp	ON

OK: Normal conditions are displayed for all the items

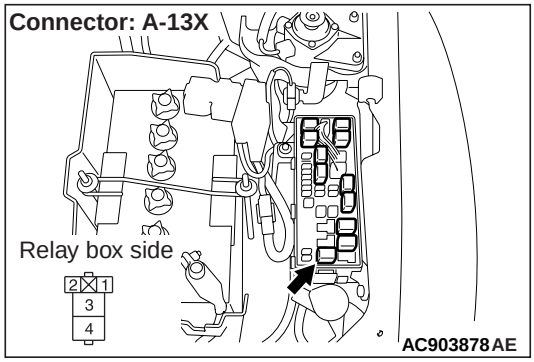
Q: Are the check result normal?

YES <All the signals are received normally.> : Go to Step 4.

NO <The ignition switch (IG1) signal is not received.> : Refer to inspection procedure C-3 "The ignition switch (IG1) signal is not received P.54A-533."

NO <The front fog lamp switch signal is not received.> : Refer to inspection procedure C-1 "The column switch (lighting and wiper switch) signal is not received P.54A-523."

STEP 4. Connector check: A-13X front fog lamp relay connector



Q: Is the check result normal?

YES : Go to Step 5.

NO : Repair the defective connector.

STEP 5. Check the front fog lamp relay.

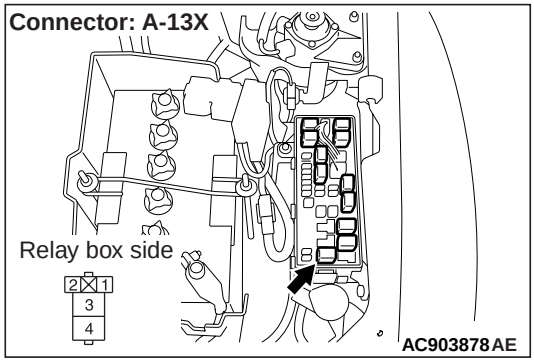
Refer to P.54A-163.

Q: Is the check result normal?

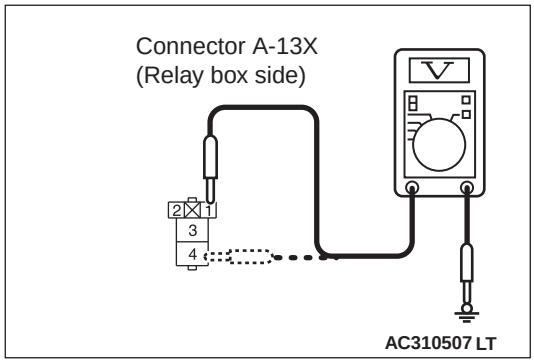
YES : Go to Step 6.

NO : Replace the front fog lamp relay.

STEP 6. Voltage measurement at the A-13X front fog lamp relay connector.



(1) Remove the front fog lamp relay, and measure at the relay box side.



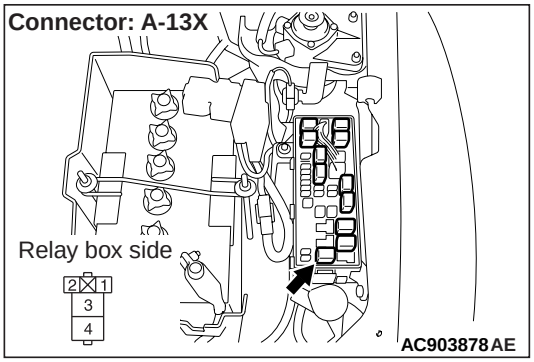
(2) Check the voltage between the front fog lamp

relay connector and body earth.
- Voltage between A-13X front fog lamp relay connector terminal No.1 and body earth
- Voltage between A-13X front fog lamp relay connector terminal No.4 and body earth

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 8.
NO : Go to Step 7.

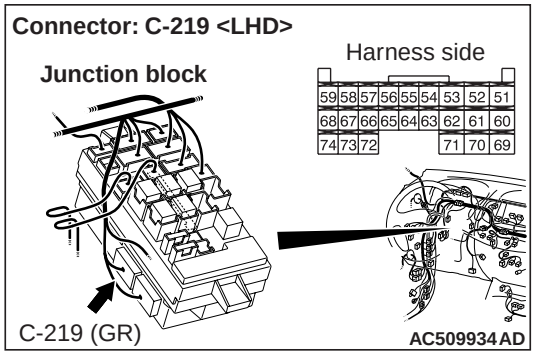
STEP 7. Check the wiring harness between A-13X front fog lamp relay connector terminals Nos.1, 4 and the fusible link (23).

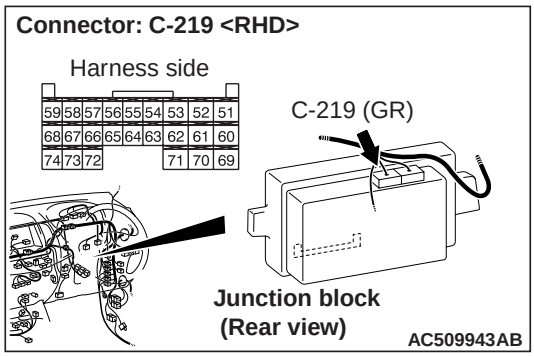


- Check the power supply line for open circuit and short circuit.

Q: Is the check result normal?
YES : Go to Step 10.
NO : Repair the wiring harness.

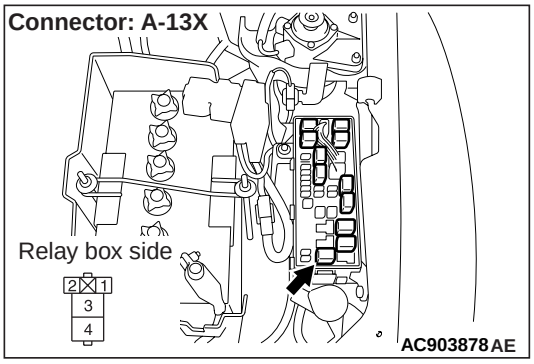
STEP 8. Connector check: C-219 ETACS-ECU connector

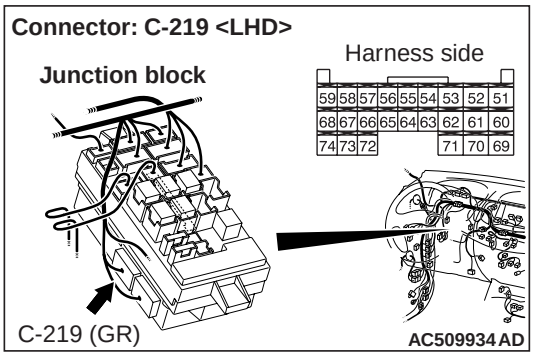


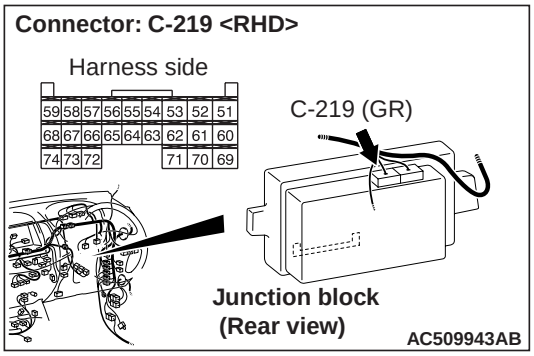


Q: Is the check result normal?
YES : Go to Step 9.
NO : Repair the defective connector.

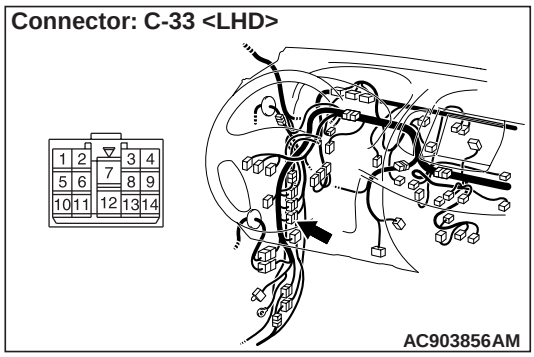
STEP 9. Check the wiring harness between A-13X front fog lamp relay connector terminal No.2 and C-219 ETACS-ECU connector terminal No.67.

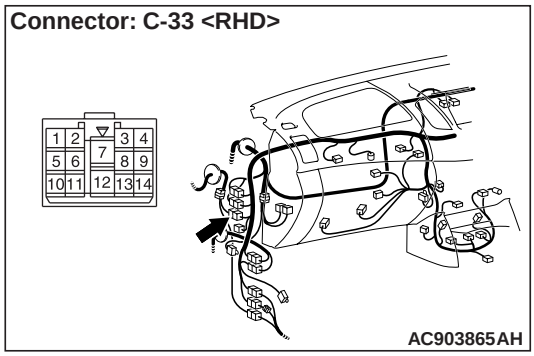






NOTE:





Prior to the wiring harness inspection, check intermediate connector C-33, and repair if necessary.

- Check the output lines for open circuit.

Q: Is the check result normal?

YES : Go to Step 10.

NO : Repair the wiring harness.

STEP 10. Retest the system

Check that the front fog lamps illuminate normally.

Q: Is the check result normal?

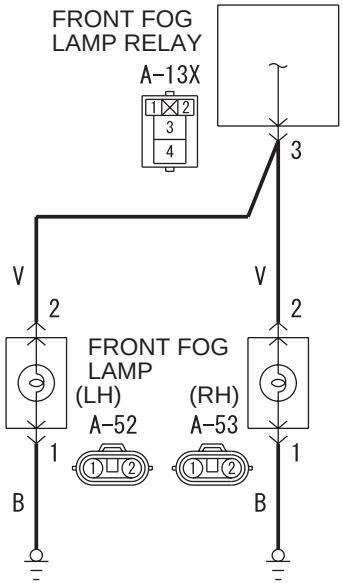
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

NO : Replace the ETACS-ECU and register the ID codes (Refer to P.54A-39).

Inspection Procedure 2: One of the front fog lamps does not illuminate normally.

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Front Fog Lamps Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

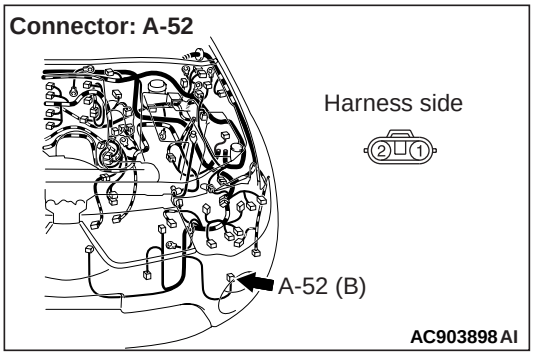
WAC54E082A

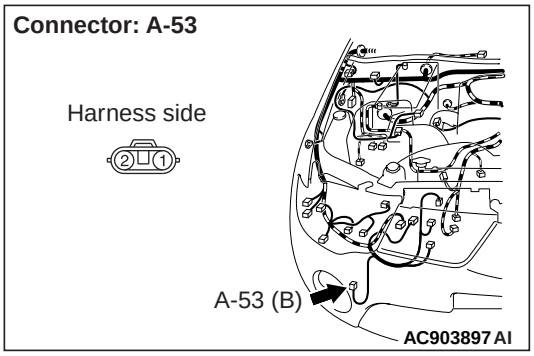
COMMENTS ON TROUBLE SYMPTOM
If one of the front fog lamps do not illuminate, the wiring harness connector(s), the bulb or the fuse may be defective or burned out.

PROBABLE CAUSES
- Burned-out front fog lamp bulb
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. Connector check: A-52 front fog lamp (LH) connector or A-53 front fog lamp (RH) connector



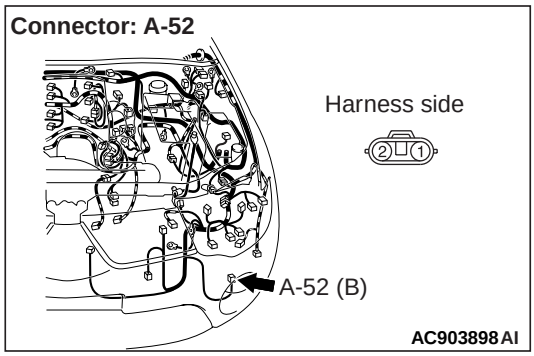


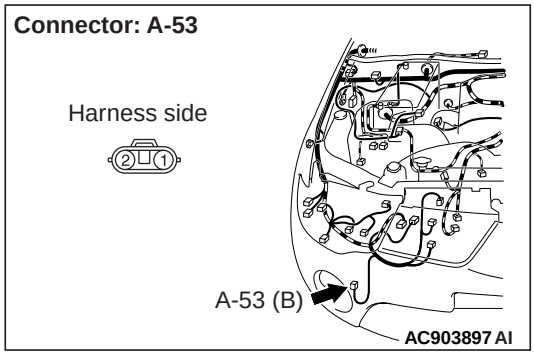
Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the defective connector.

STEP 2. Check the bulbs of the front fog lamps lamp.
Check the bulb(s) of the defective lamp.

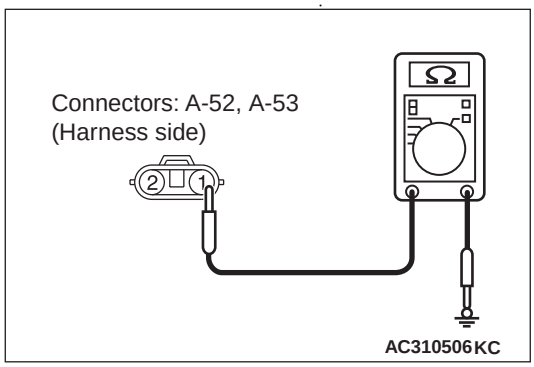
Q: Is the check result normal?
YES : Go to Step 3.
NO : Replace the bulb(s) of the defective lamp.

STEP 3. Resistance measurement at the A-52 front fog lamp (LH) connector or A-53 front fog lamp (RH) connector.





(1) Disconnect the connector, and measure at the wiring harness side.
(2) Check the resistance between the lamp connector and body earth.

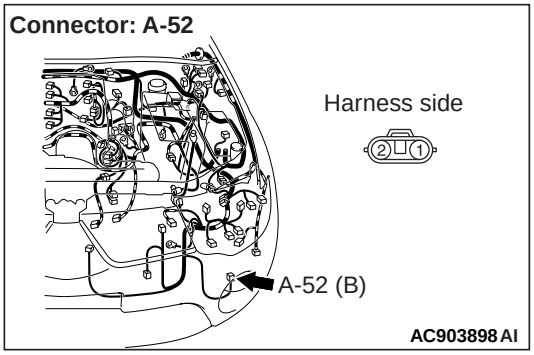


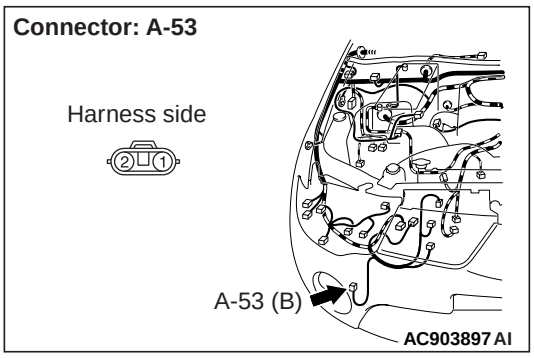
Resistance between A-52 front fog lamp (LH) connector terminal No.1 and body earth
- Resistance between A-53 front fog lamp (RH) connector terminal No.1 and body earth

OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?
YES : Go to Step 5.
NO : Go to Step 4.

STEP 4. Check the wiring harness from A-52 front fog lamp (LH) connector terminal or A-53 front fog lamp (RH) connector terminal No.1 to body earth.

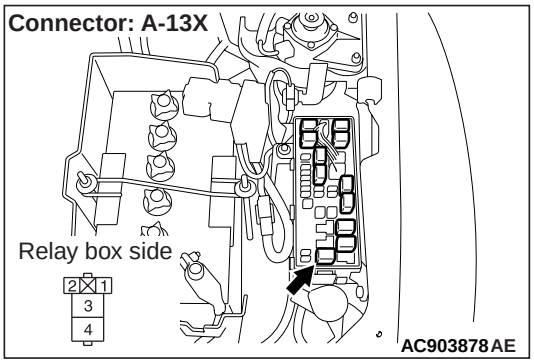




- Check the earth wires for open circuit.

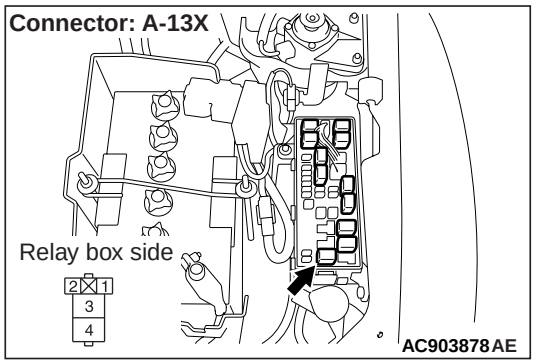
Q: Is the check result normal?
YES : Go to Step 7.
NO : Repair the wiring harness.

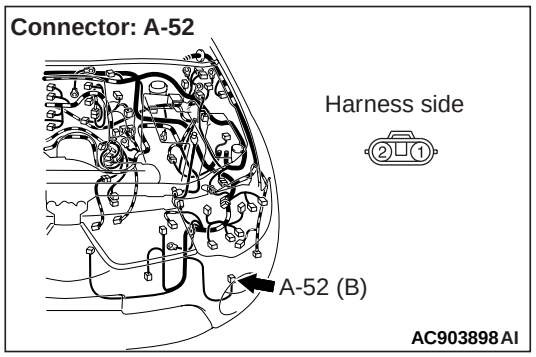
STEP 5. Connector check: Connector check: A-13X front fog lamp relay connector

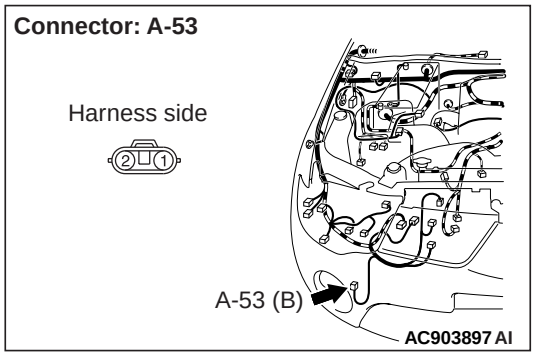


Q: Is the check result normal?
YES : Go to Step 6.
NO : Repair the defective connector.

STEP 6. Check the wiring harness from A-52 front fog lamp (LH) connector or A-53 front fog lamp (RH) connector terminal No.2 to A-13X front fog lamp relay connector terminal No.3.







- Check the power supply line for open circuit.

Q: Is the check result normal?
YES : Go to Step 7.
NO : Repair the wiring harness.

STEP 7. Retest the system.
Check that the front fog lamps illuminate normally.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Replace the front fog lamp(s).

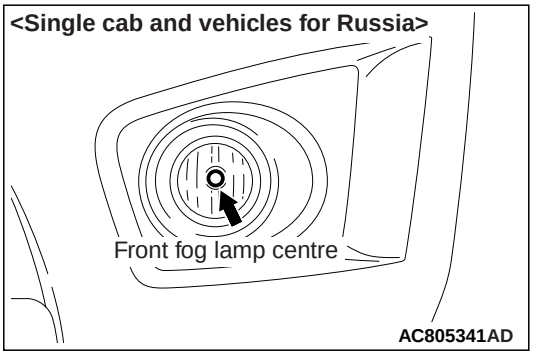
ON-VEHICLE SERVICE

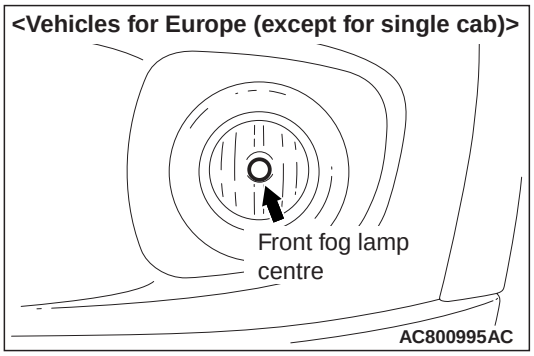
FRONT FOG LAMP AIMING

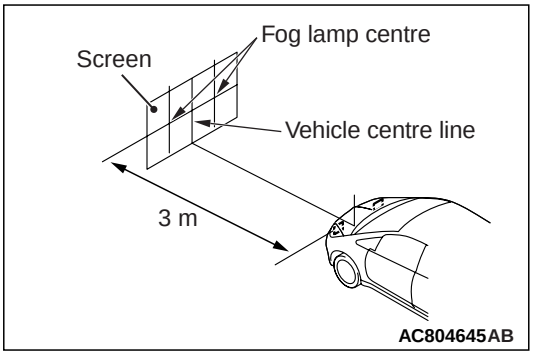
M1540400300680

⚠ CAUTION

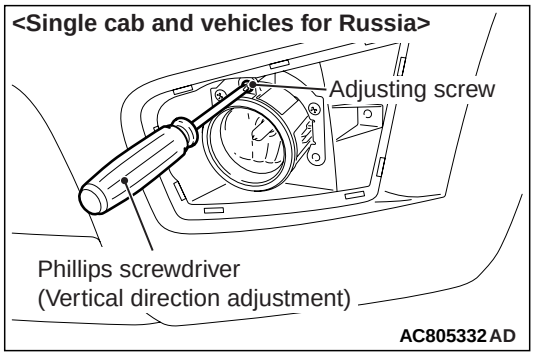
When marking the aiming adjustment, be sure to mask those lamps which are not being adjusted.

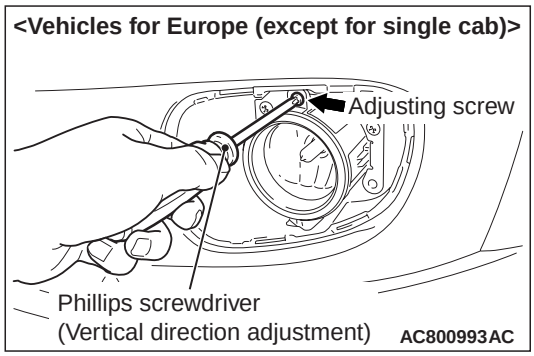




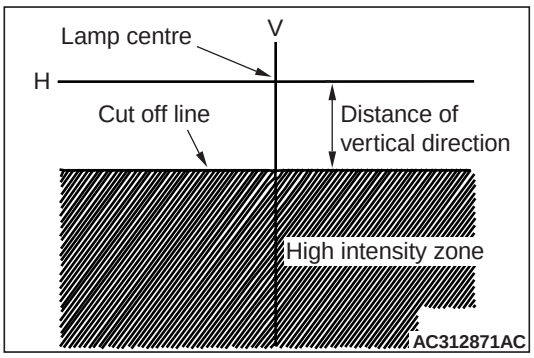


1. Measure the centre of the front fog lamps, as shown in the illustration.
2. Set the distance between the screen and the centre of the front fog lamps as shown in the illustration.
3. Inflate the tyres to the specified pressures and there should be no other load in the vehicles other than driver or substituted weight of approximately 75 kg placed in the driver's position.
4. With the engine running at 2,000 r/min, aim the front fog lamp.
5. Remove the fog lamp bezel. (Refer to P.54A-161.)





6. Insert a Phillips screwdriver into the service hole and place it on the adjusting screw.



7. Adjust the cut off line (boundary between light and dark) position to the standard value with the adjusting screw.

   Standard value:
   (Vertical direction) 60 mm (1.15°) below horizontal (H)

NOTE: The horizontal direction is non-adjustable. If the deviation of the light beam axis exceeds the standard value, check to be sure that the mounting location or some other point is not defective.

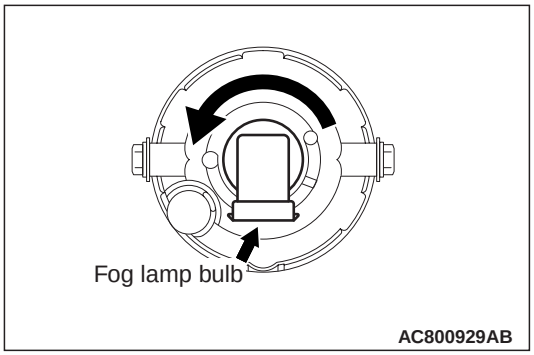
REPLACEMENT OF REPLACEABLE BULB

M1540400400557

⚠ CAUTION

Don't touch the bulb surface with bare hands or dirty gloves. If the bulb surface (glass part) gets dirty, clean it with alcohol or thinner immediately and dry well, and then install it.

1. Remove the fog lamp bezel and the fog lamp assembly. (Refer to P.54A-161.)



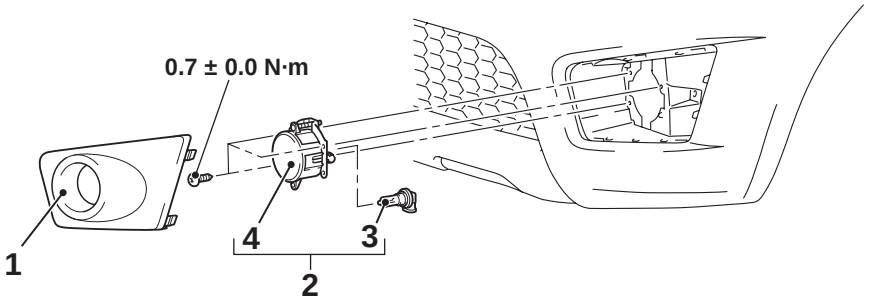
2. Disconnect the connector and withdraw the bulb.
3. After replacing the bulb, securely connect the connector, and install the fog lamp assembly and the fog lamp bezel.

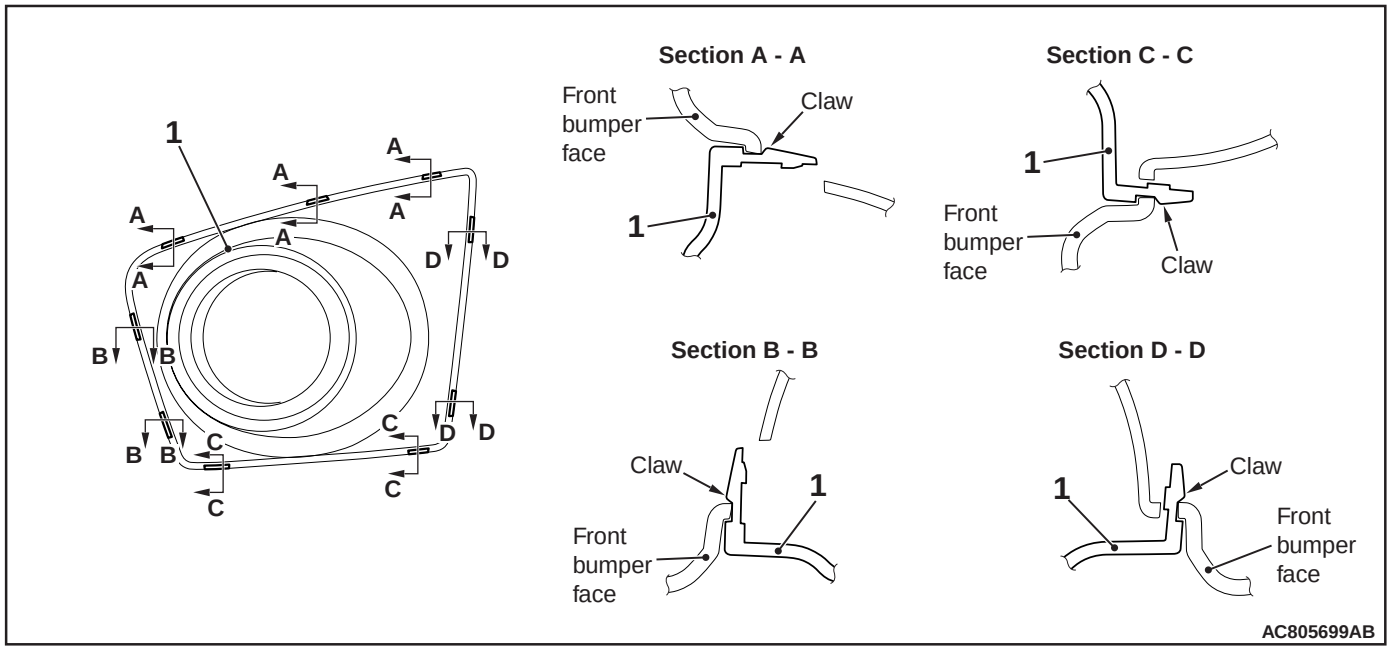
REMOVAL AND INSTALLATION

M1540400500372

<SINGLE CAB AND VEHICLES FOR RUSSIA>

Post-installation operation
Check the beam direction of the front fog lamp (Refer to Front Fog Lamp Aiming P.54A-160).





Removal steps

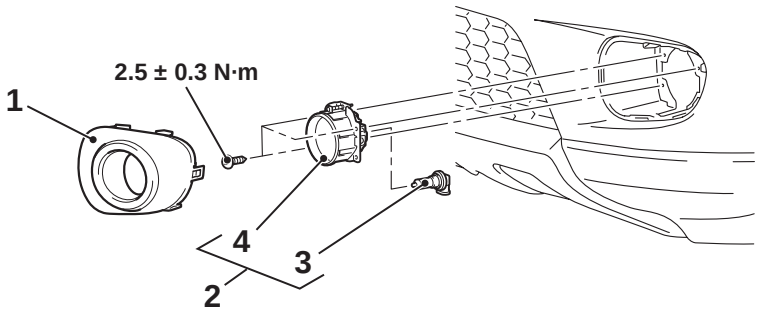
1. Fog lamp bezel
2. Fog lamp assembly

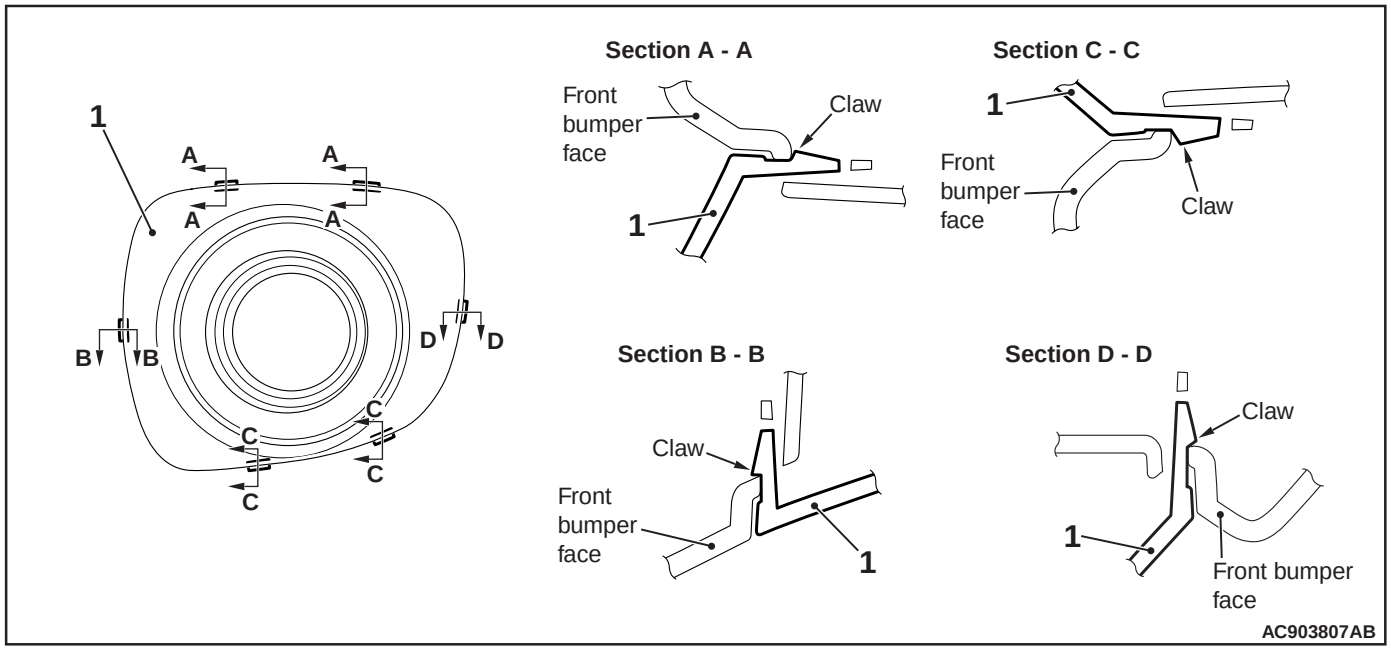
Removal steps (Continued)

3. Bulb
4. Fog lamp

<VEHICLES FOR EUROPE (EXCEPT FOR SINGLE CAB)>

Post-installation operation
Check the beam direction of the front fog lamp (Refer to Front Fog Lamp Aiming P.54A-160).





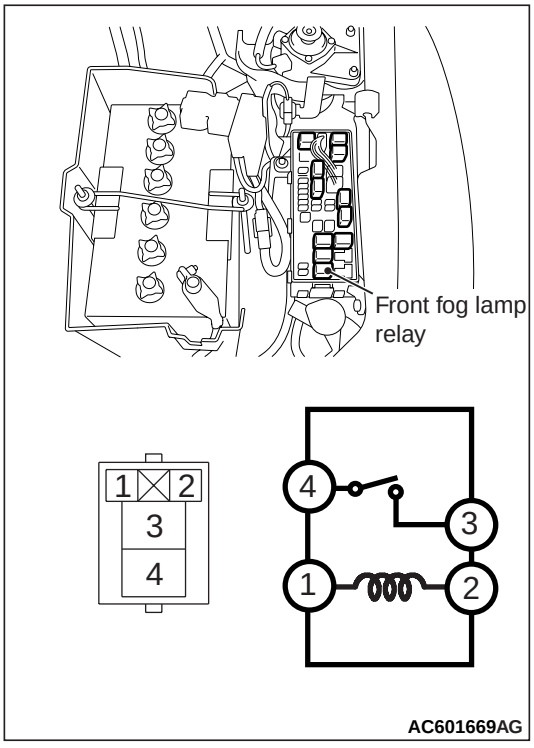
Removal steps

1. Fog lamp bezel
2. Fog lamp assembly
3. Bulb
4. Fog lamp

INSPECTION

FRONT FOG LAMP RELAY CONTINUITY CHECK

M1540400700149

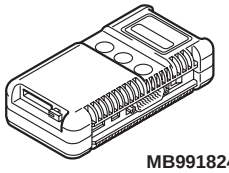
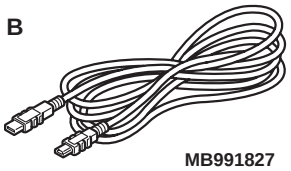
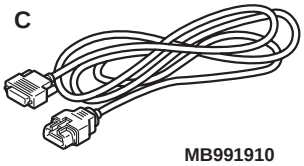
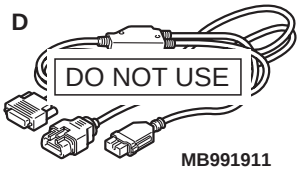
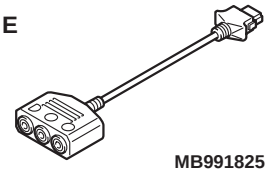
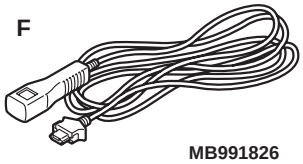
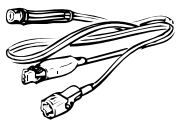
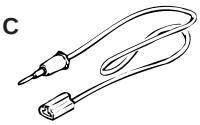
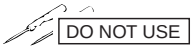


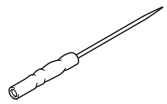
Battery voltage	Tester connection	Specified condition
Not supplied	3 – 4	Open circuit
• Connect terminal 1 to the positive battery terminal • Connect terminal 2 to the negative battery terminal	3 – 4	Continuity exists (2 Ω or less)

REAR FOG LAMP

SPECIAL TOOLS

M1542601200017

Tool	Number	Name	Use
A  MB991824 B  MB991827 C  MB991910 D  MB991911 E  MB991825 F  MB991826 MB991955	MB991955 A: MB991824 B: MB991827 C: MB991910 D: MB991911 E: MB991825 F: MB991826	M.U.T.-III sub-assembly A: Vehicle Communication Interface (V.C.I.) B: M.U.T.-III USB cable C: M.U.T.-III main harness A (Vehicles with CAN communication system) D: M.U.T.-III main harness B (Vehicles without CAN communication system) E: M.U.T.-III measure adapter F: M.U.T.-III trigger harness	⚠ CAUTION **For vehicles with CAN communication, use M.U.T.-III main harness A to send simulated vehicle speed. If you connect M.U.T.-III main harness B instead, the CAN communication does not function correctly.** Checking ETACS-ECU (service data and diagnosis codes)
A B  C  D  MB991223AZ	MB991223 A: MB991219 B: MB991220 C: MB991221 D: MB991222	Harness set A: Check harness B: LED harness C: LED harness adapter D: Probe	Continuity check and voltage measurement at harness wire or connector A: For checking connector pin contact pressure B: For checking power supply circuit C: For checking power supply circuit D: For connecting a locally sourced tester

Tool	Number	Name	Use
 MB992006	MB992006	Extra fine probe	Continuity check and voltage measurement at harness wire or connector

TROUBLESHOOTING

TROUBLE SYMPTOM CHART

M1542600700053

DIAGNOSIS TROUBLESHOOTING FLOW

M1542601100010

Refer to GROUP 00 – Contents of Troubleshooting .

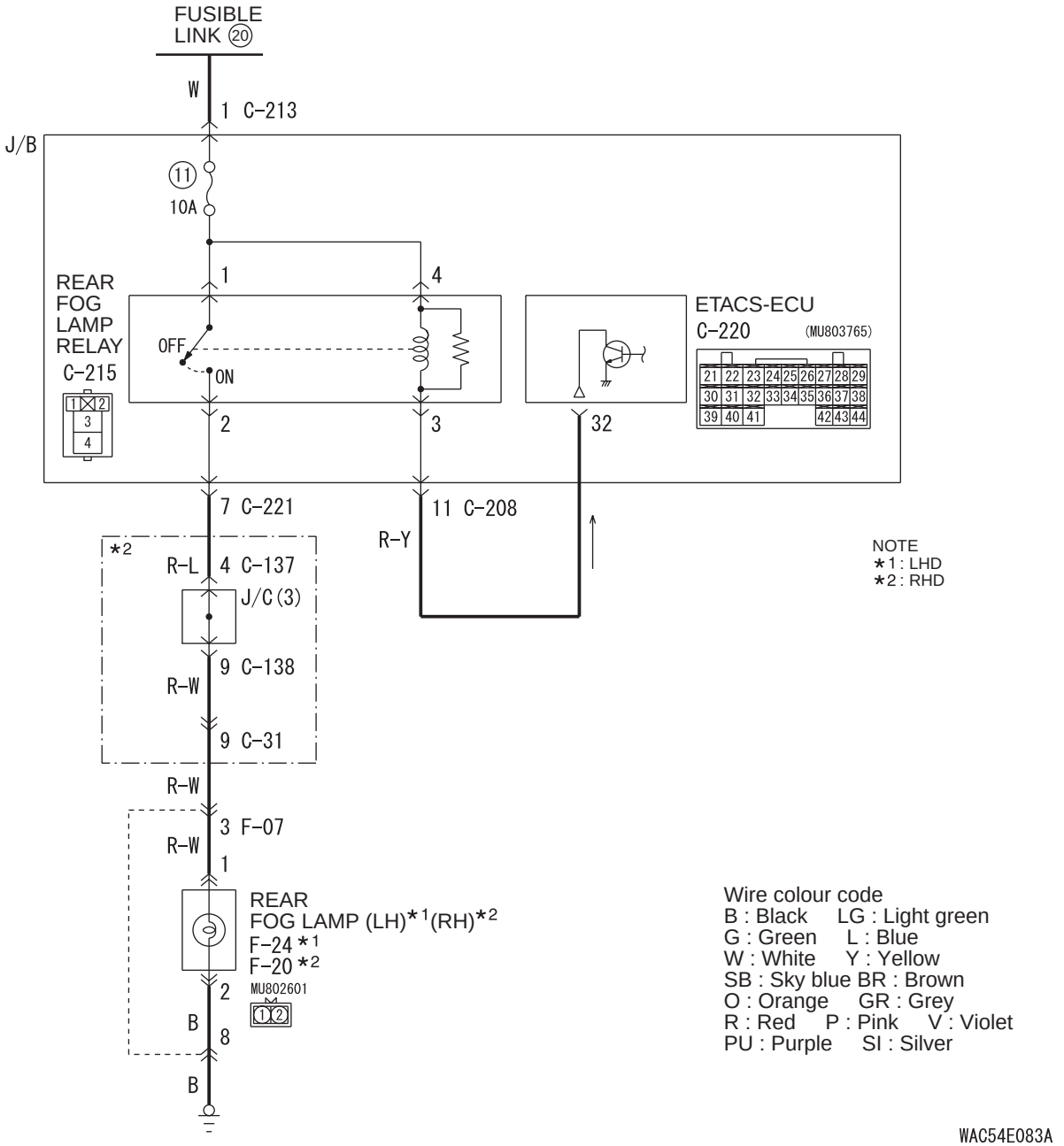
Symptom		Inspection procedure number	Reference page
Rear fog lamp	The rear fog lamp do not illuminate normally.	1	P.54A-167

SYMPTOM PROCEDURES

Inspection Procedure 1: The rear fog lamp do not illuminate normally.

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Rear Fog Lamp Circuit



COMMENTS ON TROUBLE SYMPTOM
If the rear fog lamp do not illuminate, the wiring harness connector(s), the bulb or the fuse may be defective. Otherwise the input signal circuit(s) below or the ETACS-ECU may be defective.

- Tail lamp switch
- Headlamp switch
- Rear fog lamp switch

PROBABLE CAUSES

- Malfunction of the column switch
- Malfunction of the rear fog lamp relay
- Burned-out rear fog lamp bulb
- Malfunction of the ETACS-ECU
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. Check that the rear fog lamp indicator operate.

Check that the rear fog lamp indicator illuminates.

Q: Does the rear fog lamp indicator illuminate?

YES : Go to Step 12.

NO : Go to Step 2.

STEP 2. Check that the tail/stop lamps and headlamps operate.

Check that the tail/stop lamps and headlamps illuminate normally.

Q: Is the check result normal?

YES : Go to Step 3.

NO : Repair the tail/stop lamp(s) and headlamp(s). Refer to trouble symptom chart P.54A-109.

STEP 3. M.U.T.-III diagnosis code.

When the ignition switch is turned to the "LOCK" (OFF) position, check that the ETACS-ECU does not set the diagnosis code.

Q: Is the diagnosis code set?

YES : Refer to diagnosis code chart P.54A-494.

NO : Go to Step 4.

STEP 4. M.U.T.-III data list

Check the input signals below, which are related to the rear fog lamp.

- Turn the ignition switch to the "LOCK" (OFF) position.
- Turn the tail lamp switch to the ON position.
- Turn the rear fog lamp switch to the ON position.

Item No.	Item name	Normal condition
30	Ignition switch(IG1)	OFF
71	Rear fog lamp	ON

OK: Normal conditions are displayed for all the items

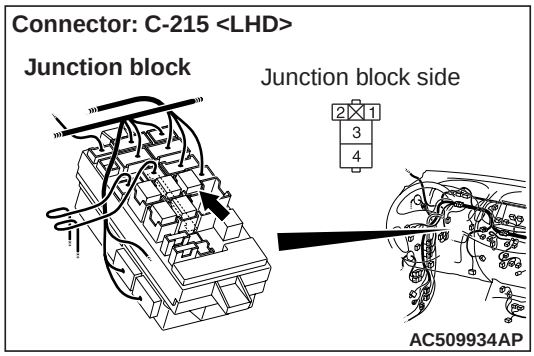
Q: Are the check result normal?

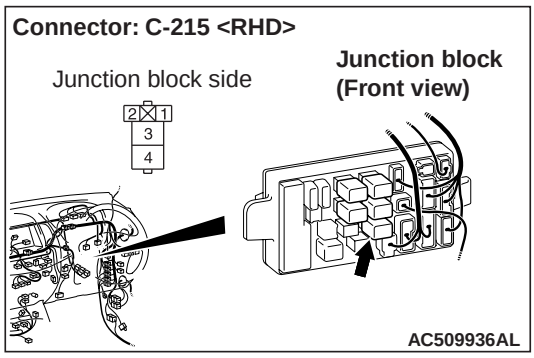
YES <All the signals are received normally.> : Go to Step 5.

NO <The ignition switch (IG1) signal is not received.> : Refer to inspection procedure C-3 "The ignition switch (IG1) signal is not received P.54A-533."

NO <The rear fog lamp switch signal is not received.> : Refer to inspection procedure C-1 "The column switch (lighting and wiper switch) signal is not received P.54A-523."

STEP 5. Connector check: C-215 rear fog lamp relay connector





Q: Is the check result normal?

YES : Go to Step 6.

NO : Repair the defective connector.

STEP 6. Check the rear fog lamp relay.

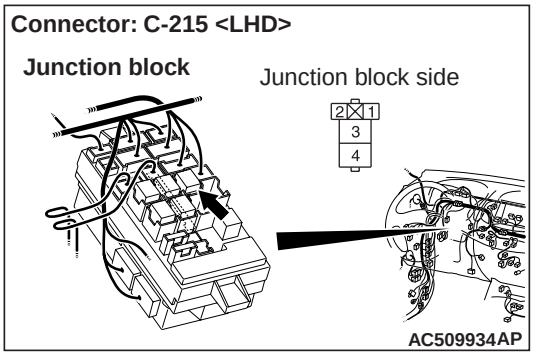
Refer to P.54A-176.

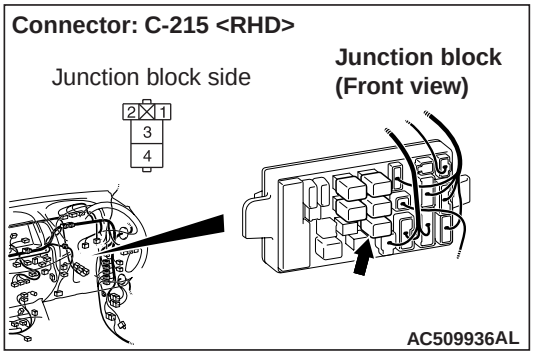
Q: Is the check result normal?

YES : Go to Step 7.

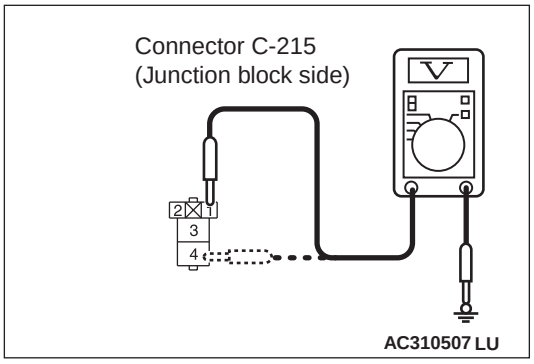
NO : Replace the rear fog lamp relay.

STEP 7. Voltage measurement at the C-215 rear fog lamp relay connector.





(1) Remove the rear fog lamp relay, and measure at the junction block side.

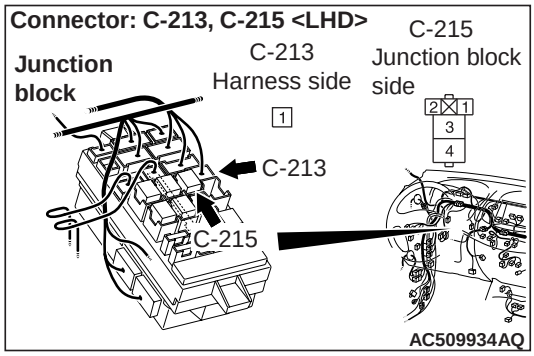


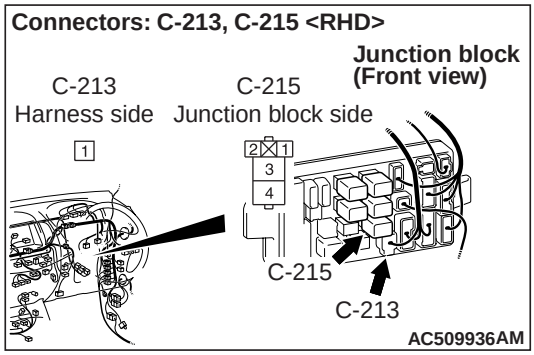
(2) Check the voltage between the rear fog lamp relay connector and body earth.
- Voltage between C-215 rear fog lamp relay connector terminal No.1 and body earth
- Voltage between C-215 rear fog lamp relay connector terminal No.4 and body earth

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 9.
NO : Go to Step 8.

STEP 8. Check the wiring harness between C-215 rear fog lamp relay connector terminals Nos.1, 4 and the fusible link (20).

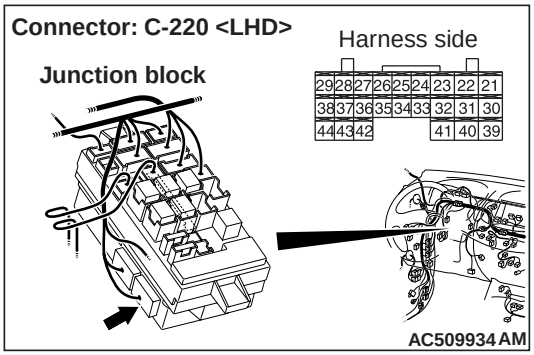


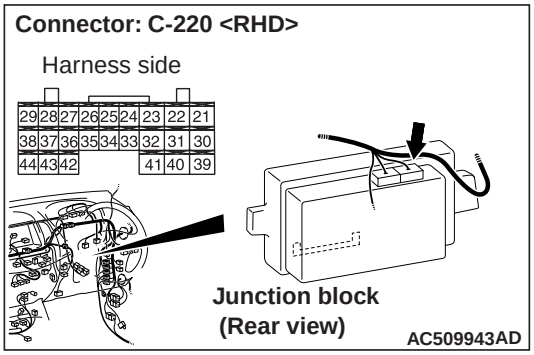


NOTE: Prior to the wiring harness inspection, check junction block connector C-213, and repair if necessary.
- Check the power supply line for open circuit and short circuit.

Q: Is the check result normal?
YES : Go to Step 11.
NO : Repair the wiring harness.

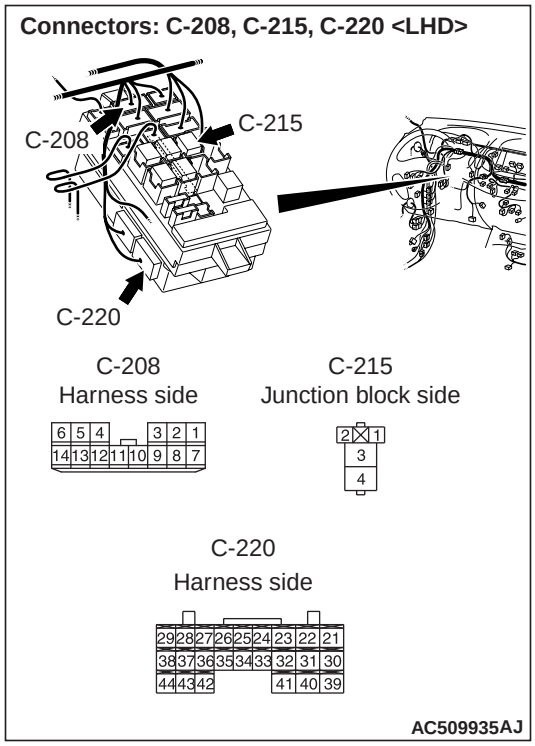
STEP 9. Connector check: C-220 ETACS-ECU connector

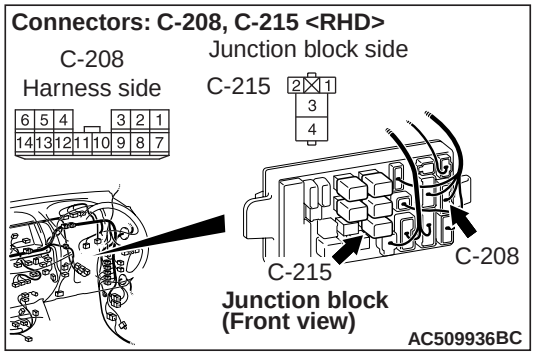


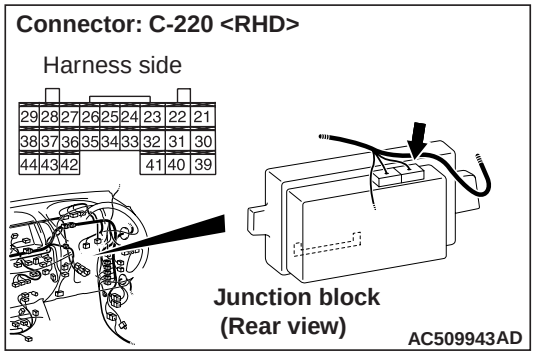


Q: Is the check result normal?
YES : Go to Step 10.
NO : Repair the defective connector.

STEP 10. Check the wiring harness between C-215 rear fog lamp relay connector terminal No.3 and C-220 ETACS-ECU connector terminal No.32.







NOTE: Prior to the wiring harness inspection, check junction block connector C-208, and repair if necessary.

- Check the output lines for open circuit.

Q: Is the check result normal?
YES : Go to Step 11.
NO : Repair the wiring harness.

STEP 11. Retest the system

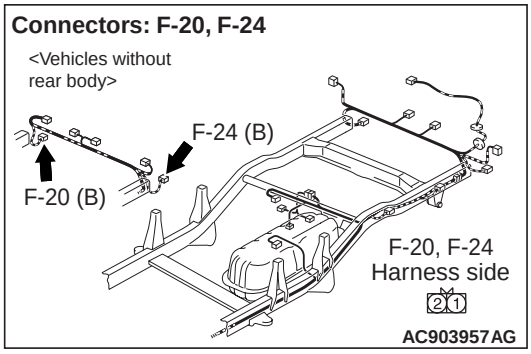
Check that the rear fog lamp illuminate normally.

Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

NO : Replace the ETACS-ECU and register the ID codes (Refer to P.54A-39).

STEP 12. Connector check: F-24 <LHD> or F-20 <RHD> rear fog lamp connector



Q: Is the check result normal?

YES : Go to Step 13.

NO : Repair the defective connector.

STEP 13. Check the bulbs of the rear fog lamps lamp.

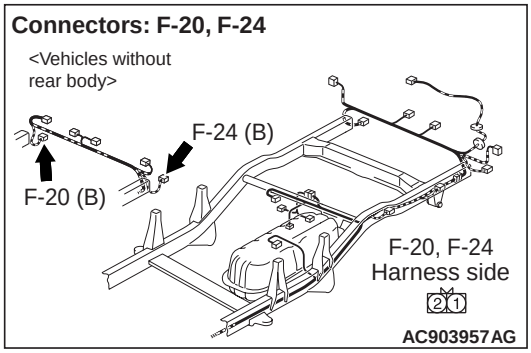
Check the bulb(s) of the defective lamp.

Q: Is the check result normal?

YES : Go to Step 14.

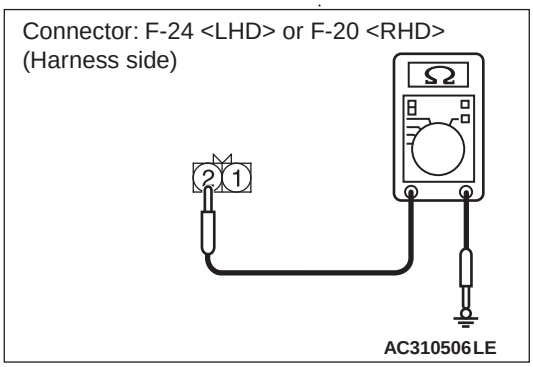
NO : Replace the bulb(s) of the defective lamp.

STEP 14. Resistance measurement at the F-24 <LHD> or F-20 <RHD> rear fog lamp connector.



(1) Disconnect the connector, and measure at the wiring harness side.

(2) Check the resistance between the lamp connector and body earth.



Resistance between F-24 <LHD> or F-20 <RHD> rear fog lamp connector terminal No.2 and body earth

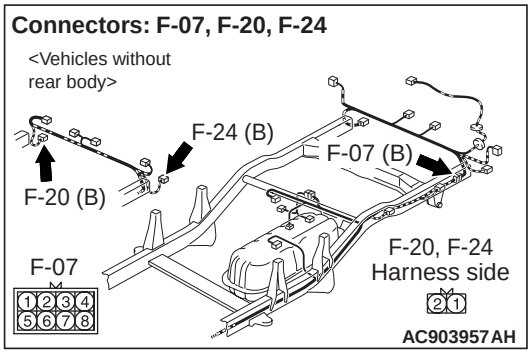
OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?

YES : Go to Step 16.

NO : Go to Step 15.

STEP 15. Check the wiring harness from F-24 <LHD> or F-20 <RHD> rear fog lamp connector terminal No.2 to body earth.



NOTE: Prior to the wiring harness inspection, check intermediate connector F-07, and repair if necessary.

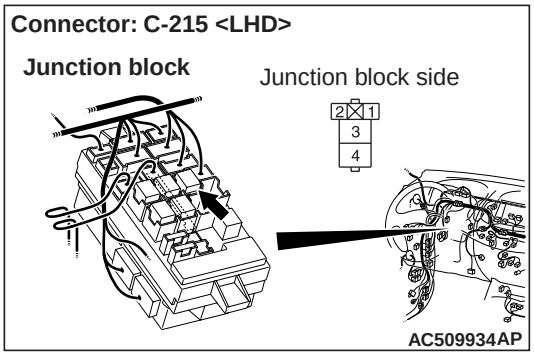
- Check the earth wires for open circuit.

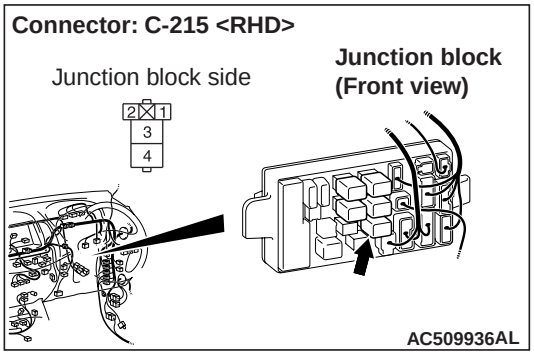
Q: Is the check result normal?

YES : Go to Step 18.

NO : Repair the wiring harness.

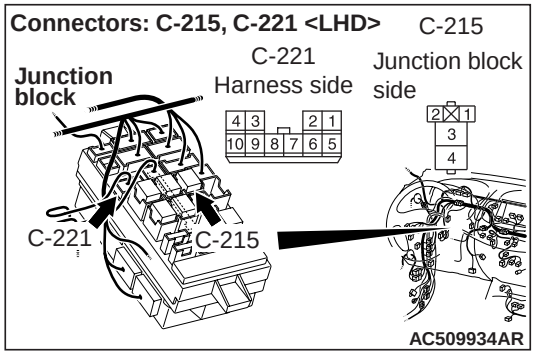
STEP 16. Connector check: Connector check: C-215 rear fog lamp relay connector

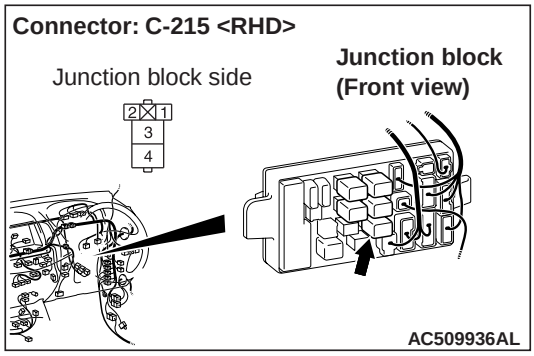


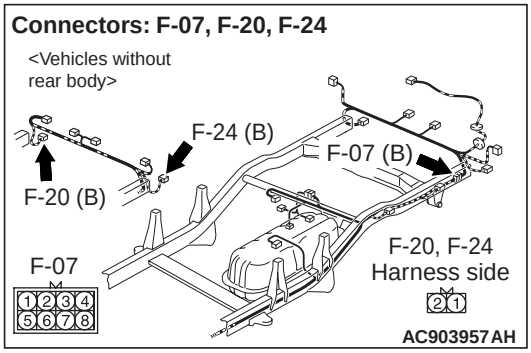


Q: Is the check result normal?
YES : Go to Step 17.
NO : Repair the defective connector.

STEP 17. Check the wiring harness from F-24 <LHD> or F-20 <RHD> rear fog lamp connector terminal No.1 to C-215 rear fog lamp relay connector terminal No.2.



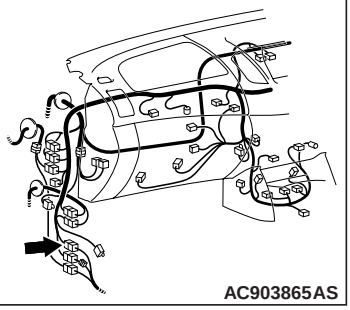




NOTE: Prior to the wiring harness inspection, check intermediate connector F-07 and junction block connector C-221, and repair if necessary. <LHD>

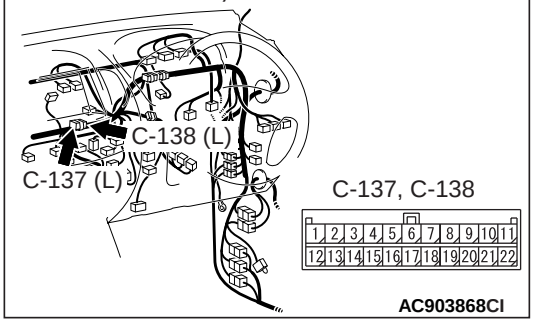
NOTE:

Connector: C-31 <RHD>



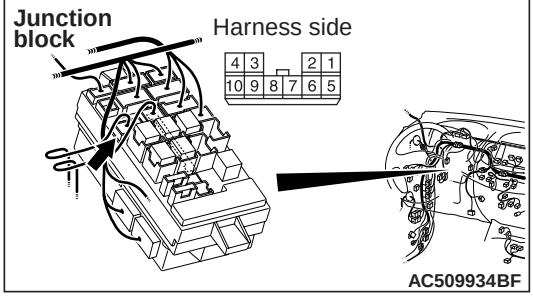
AC903865AS

Connectors: C-137, C-138 <RHD>



AC903868CI

Connector: C-221 <LHD>



AC509934BF

Prior to the wiring harness inspection, check intermediate connectors F-07 and C-31, junction block connector C-221 and joint connectors C-137 and C-138, and repair if necessary. <RHD>

- Check the power supply line for open circuit.

Q: Is the check result normal?

YES : Go to Step 18.
NO : Repair the wiring harness.

STEP 18. Retest the system.

Check that the rear fog lamp illuminate normally.

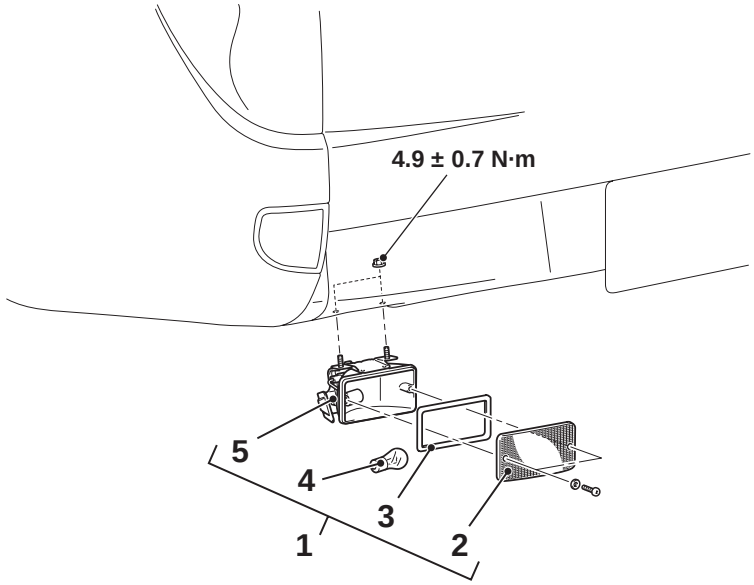
Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Replace the rear fog lamp.

REMOVAL AND INSTALLATION

M1542600300226

<VEHICLES WITHOUT REAR STEP BUMPER>

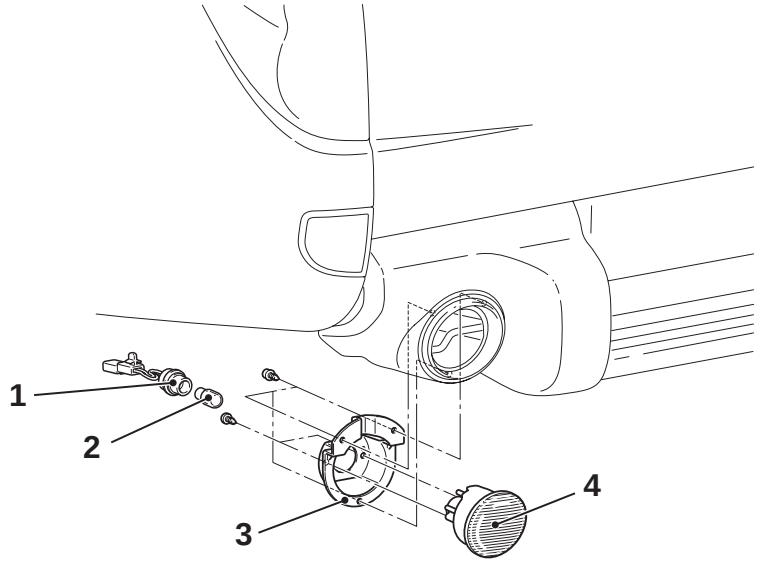


AC509099AB

Removal steps
1. Rear fog lamp assembly
2. Rear fog lamp lens
3. Rear fog lamp lens gasket

Removal steps (Continued)
4. Bulb
5. Rear fog lamp body assembly

<VEHICLES WITH REAR STEP BUMPER>

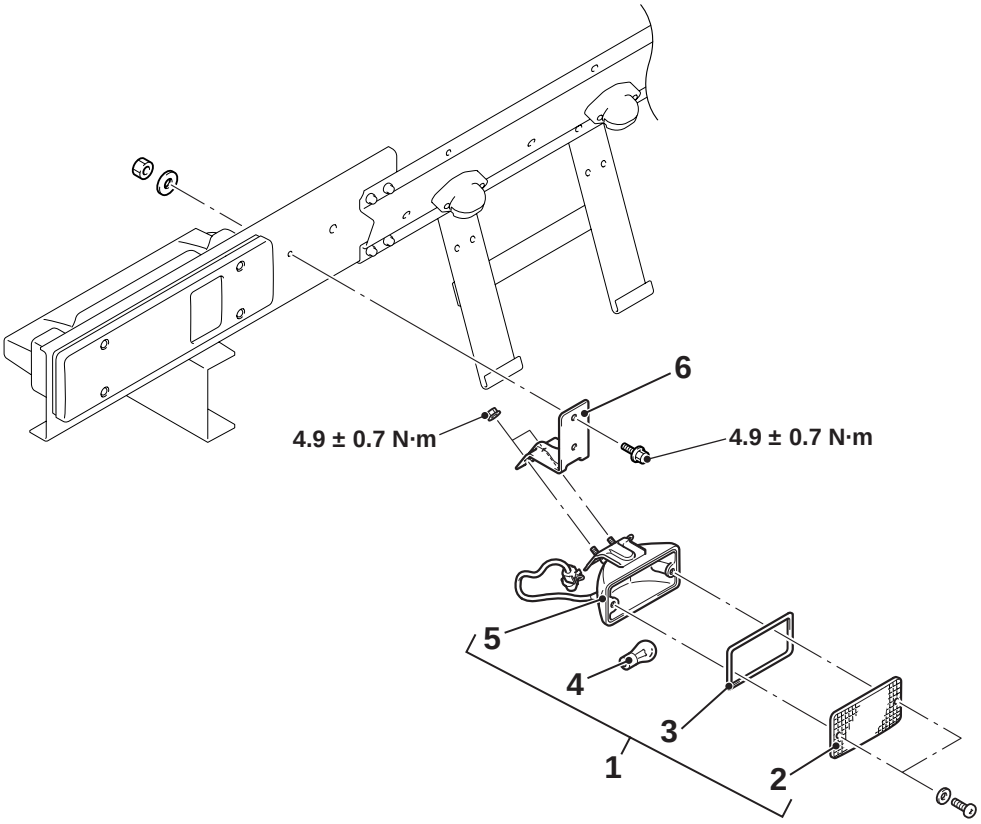


AC509124AB

Removal steps
1. Rear fog lamp socket
2. Bulb

Removal steps (Continued)
3. Rear fog lamp bracket
4. Rear fog lamp body assembly

<VEHICLES WITHOUT REAR BODY>



AC903706 AB

Removal steps

1. Rear fog lamp assembly
2. Rear fog lamp lens
3. Rear fog lamp lens gasket

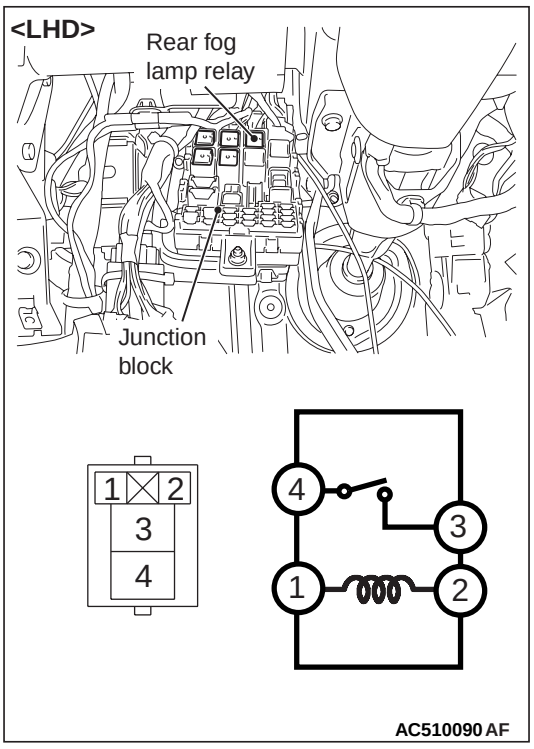
Removal steps (Continued)

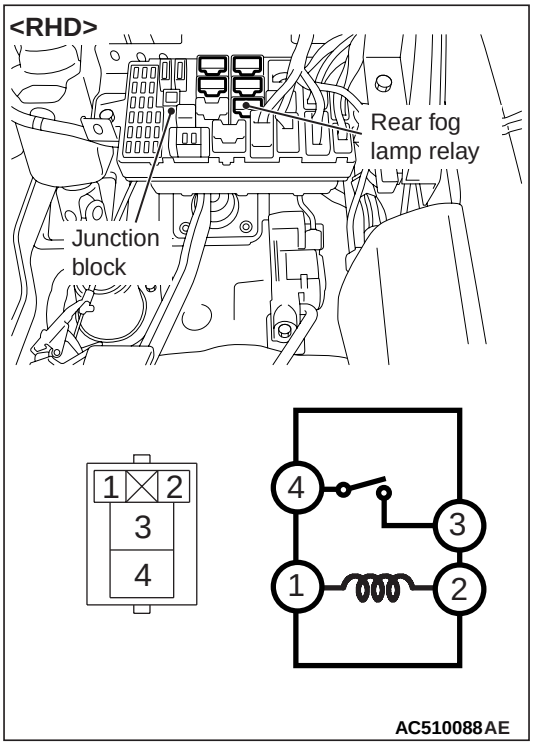
4. Bulb
5. Rear fog lamp body assembly
6. Rear fog lamp bracket

INSPECTION

REAR FOG LAMP RELAY CONTINUITY CHECK

M1542600500101



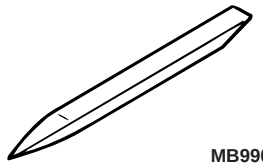


Battery voltage	Tester connection	Specified condition
Not supplied	3 – 4	Open circuit
• Connect terminal 1 to the positive battery terminal • Connect terminal 2 to the negative battery terminal	3 – 4	Continuity exists (2 Ω or less)

SIDE TURN-SIGNAL LAMP

SPECIAL TOOL

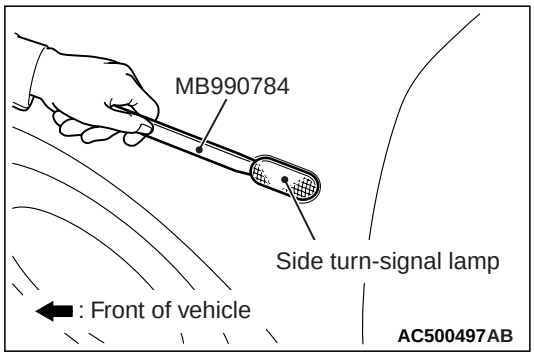
M1541800300012

Tool	Number	Name	Use
	MB990784	Ornament remover	Removal of side turn-signal lamp

REMOVAL AND INSTALLATION

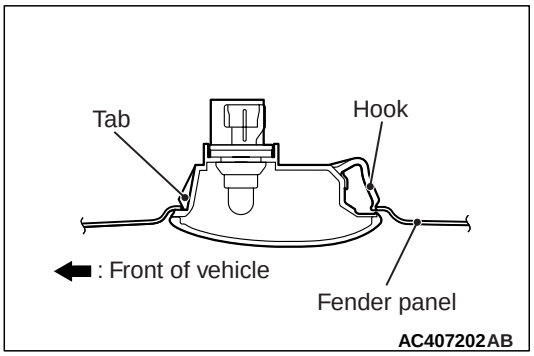
M1541800200026

REMOVAL SERVICE POINT



Use the special tool ornament remover (MB990784) to pry out the tab from the fender, and remove the side turn-signal lamp.

INSTALLATION SERVICE POINT

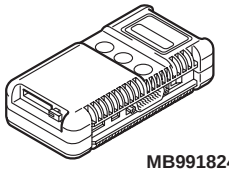
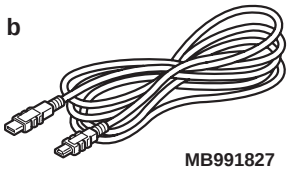
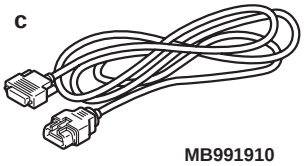
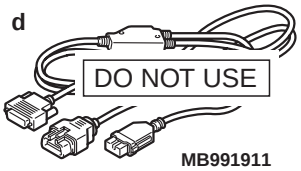
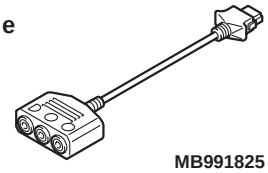
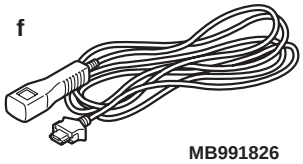
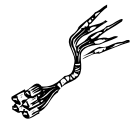
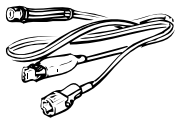
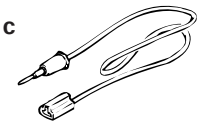


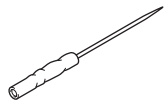
Insert pawls into fender panel and install side turn-signal lamp.

INTERIOR LAMP

SPECIAL TOOLS

M1541301600022

Tool	Number	Name	Use
a  MB991824 b  MB991827 c  MB991910 d  MB991911 e  MB991825 f  MB991826 MB991955	MB991955 a. MB991824 b. MB991827 c. MB991910 d. MB991911 e. MB991825 f. MB991826	M.U.T.-III sub-assembly a. Vehicle Communication Interface (V.C.I.) b. M.U.T.-III USB cable c. M.U.T.-III main harness A (Vehicles with CAN communication system) d. M.U.T.-III main harness B (Vehicles without CAN communication system) e. M.U.T.-III measure adapter f. M.U.T.-III trigger harness	⚠ CAUTION **For vehicles with CAN communication, use M.U.T.-III main harness A to send simulated vehicle speed. If you connect M.U.T.-III main harness B instead, the CAN communication does not function correctly.** Check for CAN bus line
a  b  c  d MB991223	MB991223 a. MB991219 b. MB991220 c. MB991221 d. MB991222	Harness set a. Check harness b. LED harness c. LED harness adapter d. Probe	Continuity check and voltage measurement at harness wire or connector a. For checking connector pin contact pressure b. For checking power supply circuit c. For checking power supply circuit d. For connecting a locally sourced tester

Tool	Number	Name	Use
 MB992006	MB992006	Extra fine probe	Continuity check and voltage measurement at harness wire or connector

TROUBLESHOOTING

DIAGNOSIS TROUBLESHOOTING FLOW

M1541301500025

Refer to GROUP 00 – Contents of troubleshooting .

CHECK CHART FOR TROUBLE SYMPTOMS

M1541300200344

⚠ CAUTION

- **During diagnosis, a diagnosis code associated with other system may be set when the ignition switch is turned on with connector(s) disconnected. On completion, confirm all systems for diagnosis code(s). If diagnosis code(s) are set, erase them all.**
- **When the battery cable is disconnected or the combination meter is removed, the fuel gauge learned value will be erased. To let the display unit re-learn it, enter the vehicle speed (by driving the vehicle or entering simulated vehicle speed) and then stop the vehicle.**

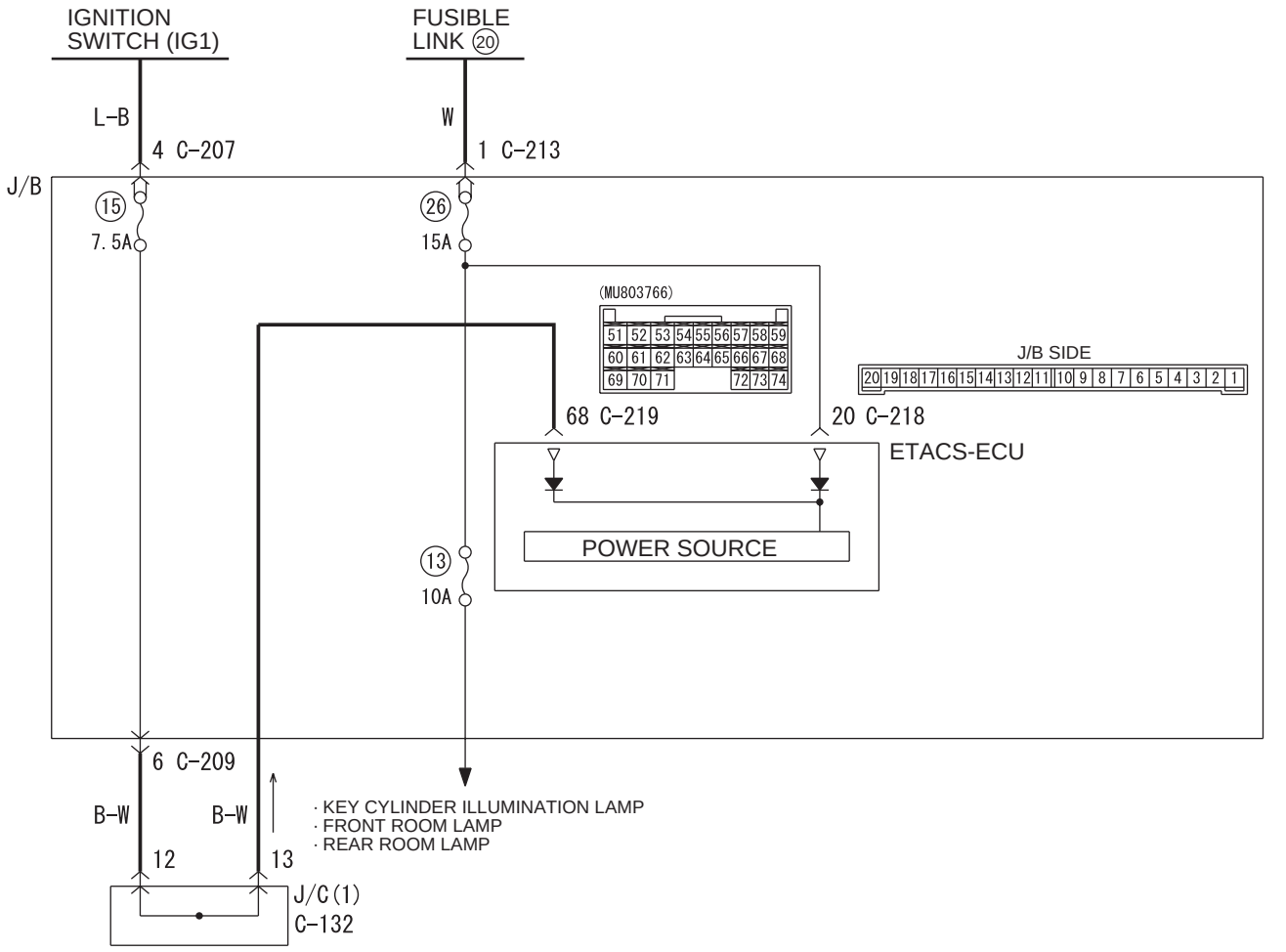
Trouble symptom	Inspection procedure number	Reference page
The interior lamps (front room lamp, rear room lamp and ignition key cylinder illumination lamp) does not illuminate or extinguish normally.	1	P.54A-181
The front room lamp does not illuminate normally.	2	P.54A-183
The rear room lamp does not illuminate normally. <vehicles without sunroof>	3	P.54A-187

SYMPTOM PROCEDURES

Inspection Procedure 1: The interior lamps (front room lamp, rear room lamp and ignition key cylinder illumination lamp) does not illuminate or extinguish normally.

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Interior Lamp Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver WAC54E085A

COMMENTS ON TROUBLE SYMPTOM
The ETACS-ECU operates the interior lamps (room lamp, rear room lamp) in accordance with the input signals below.

- Ignition switch (IG1)
- Driver's door lock actuator
- Driver's door switch
- Passenger's door switch
- Rear door switch

If this function does not work normally, these input signal circuit(s) or the ETACS-ECU may be defective.

PROBABLE CAUSES

- Malfunction of the door lock actuator (RH)

- Malfunction of the door switches
- Malfunction of the ETACS-ECU
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code

When the ignition switch is turned to the "LOCK" (OFF) position, check that the ETACS-ECU does not set the diagnosis code.

Q: Is the diagnosis code set?

YES : Refer to diagnosis code chart P.54A-494.

NO : Go to Step 2.

STEP 2. M.U.T.-III data list

Check the input signals below, which are related to the interior lamps (front room lamp, rear room lamp and ignition key cylinder illumination lamp).

- Turn the ignition switch to the "OFF" position. (key inserted)
- Open the all of doors.
- When the driver's door is unlocked

Item No.	Item name	Normal condition
19	Driver's Door switch	ON
20	Driver's door unlock switch	ON
21	Driver's door lock switch	OFF
30	Ignition switch (IG1)	OFF
48	Passenger's Door switch	ON
49	Rear door switch	ON

OK: Normal conditions are displayed for all the items.

Q: Is the check result normal?

YES <All the signals are received normally.> : Go to Step 4.

NO <The door lock actuator (RH) signal is not received.> : Go to Step 3.

NO <The ignition switch (IG1) signal is not received.> : Refer to inspection procedure C-3 "The ignition switch (IG1) signal is not received P.54A-533."

NO <The door switches signals are not received.> : Refer to inspection procedure C-5 "One of the door switch signals is not received P.54A-540."

STEP 3. Check the door lock actuator (RH).

Check that the front door lock actuator (RH) works normally. Refer to GROUP 42 – Door .

Q: Is the check result normal?

YES : Go to Step 4.

NO : Replace the door lock actuator (RH).

STEP 4. Retest the system.

Check that the interior lamps (front room lamp, rear room lamp and ignition key cylinder illumination lamp) illuminate normally.

Q: Is the check result normal?

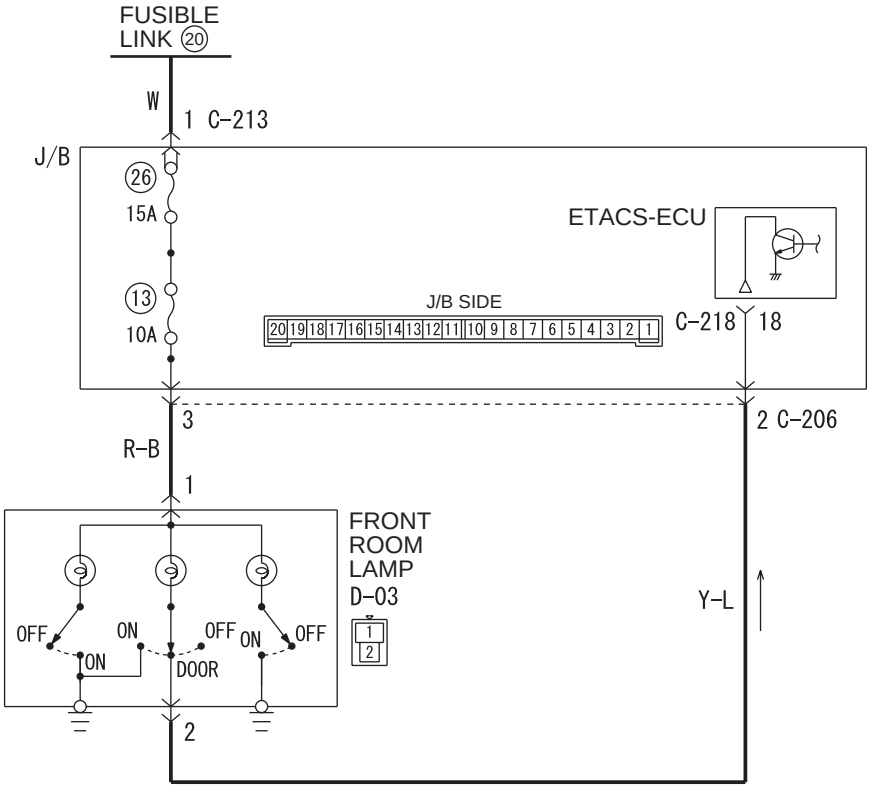
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction).

NO : Replace the ETACS-ECU and register the ID codes (Refer to P.54A-39).

Inspection Procedure 2: The front room lamp does not illuminate normally.

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Front Room Lamp Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver WAC54E086A

COMMENTS ON TROUBLE SYMPTOM
If the front room lamp do not illuminate, the wiring harness connector(s), the bulb or the fuse may be defective or burned out.

PROBABLE CAUSES
- Malfunction of the front room lamp
- Malfunction of the front room lamp bulbs
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

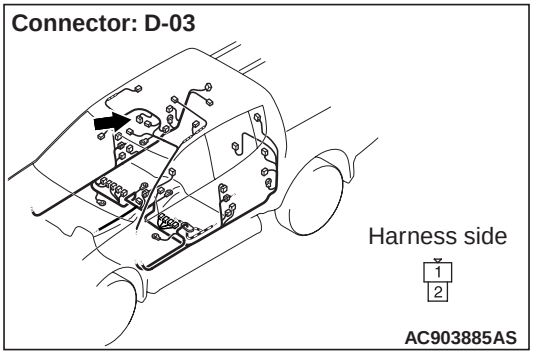
STEP 1. Check that the rear room lamp and ignition key cylinder illumination lamp illuminates.
Check that the rear room lamp and ignition key cylinder illumination lamp illuminates normally.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Refer to Inspection Procedure 1 "The interior lamps (front room ramp, rear room lamp and ignition key cylinder illumination lamp) does not illuminate or extinguish normally P.54A-181."

STEP 2. Retest the system.

Q: At which switch positions (DOOR or ON), the front room lamp does not illuminate?
The lamp does not illuminate at both the ON and DOOR positions. : Go to Step 3.
The lamp does not illuminate at the door position. : Go to Step 7.
The lamp does not illuminate at the ON position. : Replace the front room lamp.

STEP 3. Connector check: D-03 front room lamp connector



Q: Is the check result normal?
YES : Go to Step 4.
NO : Repair the defective connector.

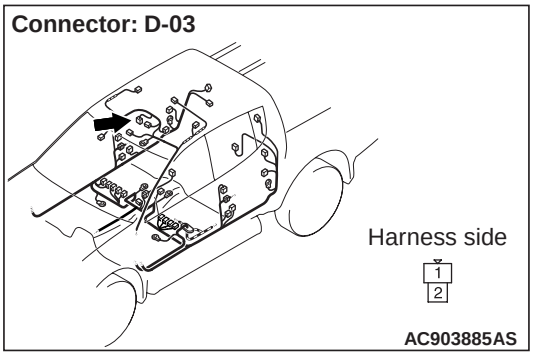
STEP 4. Check the bulb.
Check whether the front room lamp bulb is normal.

Q: Is the check result normal?
YES : Go to Step 5.
NO : Replace the bulb(s) of the defective lamp.

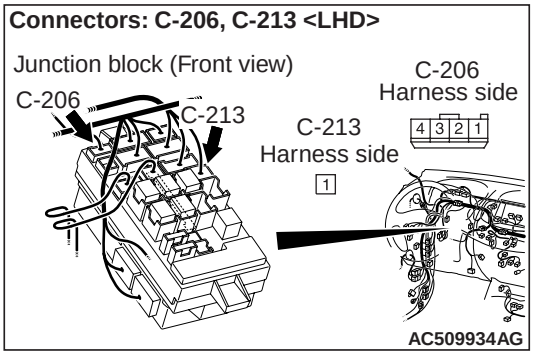
STEP 5. Check the front room lamp.
Check whether the front room lamp is normal.

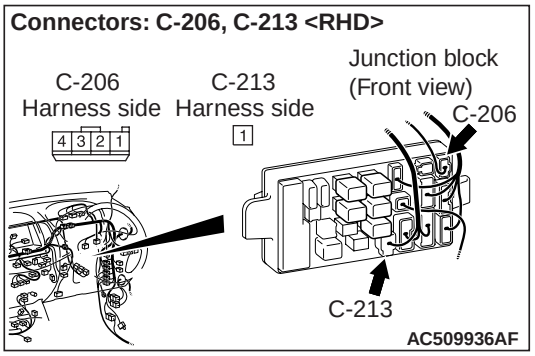
Q: Is the check result normal?
YES : Go to Step 6.
NO : Replace the front room lamp.

STEP 6. Check the wiring harness from D-03 front room lamp connector terminal No.1 to fusible link (20).



NOTE:

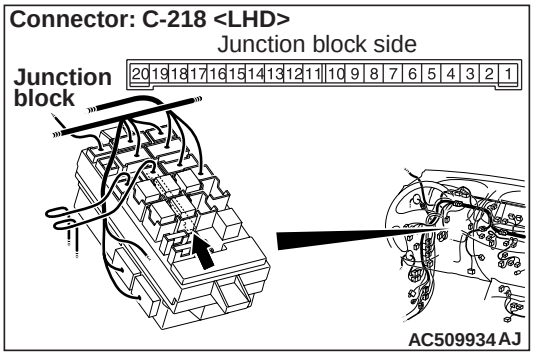


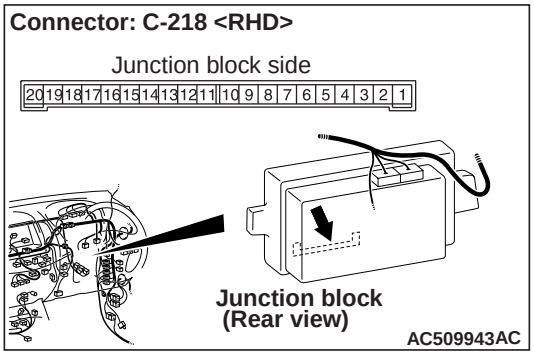


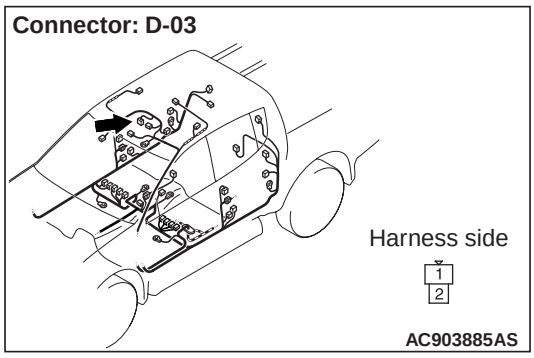
Prior to the wiring harness inspection, check junction block connectors C-206 and C-213 repair if necessary.
Check the power supply line for open circuit and short circuit.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness.

STEP 7. Connector check: C-218 ETACS-ECU connector and D-03 front room lamp connector



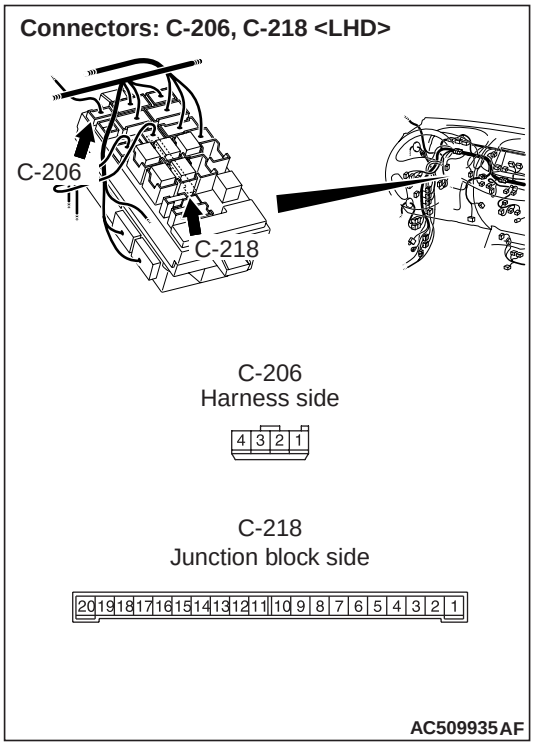


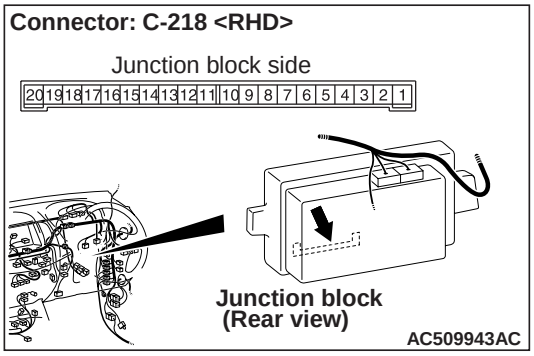


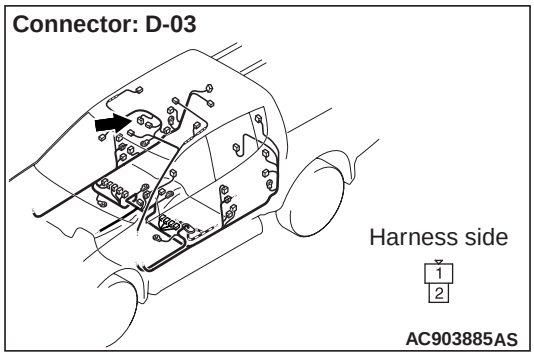
Q: Is the check result normal?

YES : Go to Step 8.
NO : Repair the defective connector.

STEP 8. Check the wiring harness from C-218 ETACS-ECU connector terminal No.18 to D-03 front room lamp connector terminal No.2







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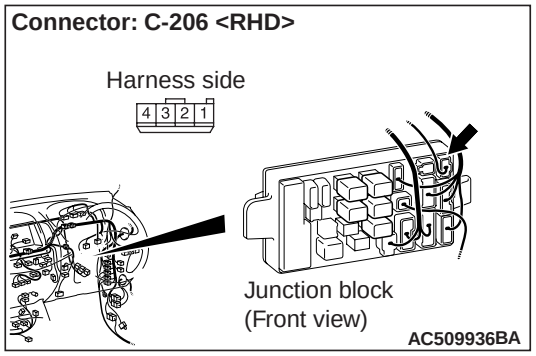


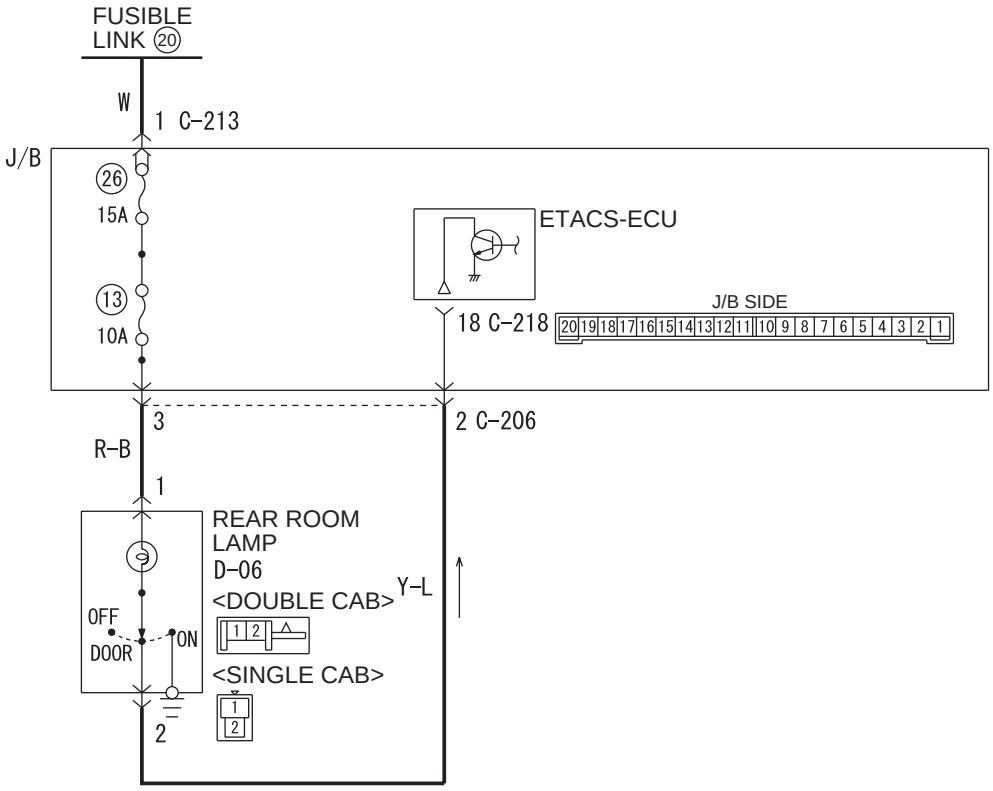
Prior to the wiring harness inspection, check junction block connector C-206 repair if necessary.
Check the input and output lines for open circuit.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness.

Inspection Procedure 3: The rear room lamp does not illuminate normally. <vehicles without sunroof>

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Rear Room Lamp Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

WAC54E087A

COMMENTS ON TROUBLE SYMPTOM
If the rear room lamp do not illuminate, the wiring harness connector(s), the bulb or the fuse may be defective or burned out.

PROBABLE CAUSES
- Malfunction of the rear room lamp
- Malfunction of the rear room lamp bulbs
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. Check if the front room lamp and ignition key cylinder illumination lamp illuminates.
Check whether the front room lamp and ignition key cylinder illumination lamp illuminates normally.

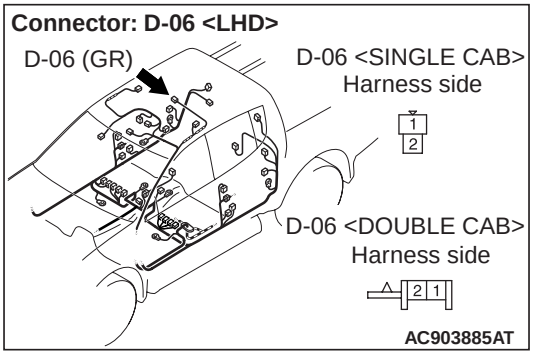
Q: Is the check result normal?
YES : Go to Step 2.
NO : Refer to Inspection Procedure 1 "The interior lamps (front room ramp, rear room lamp and ignition key cylinder illumination lamp) does not illuminate or extinguish normally P.54A-181."

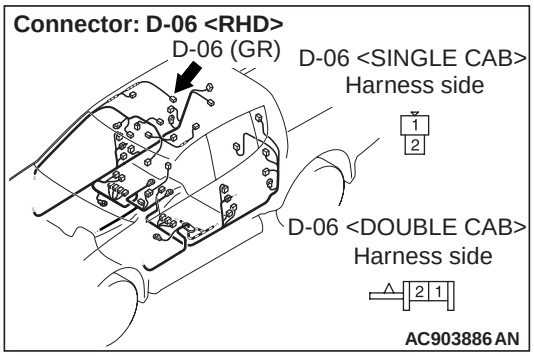
STEP 2. Retest the system.

Q: At which switch positions (DOOR or ON), the rear room lamp does not illuminate?

The lamp does not illuminate at both the ON and DOOR positions. : Go to Step 3.
The lamp does not illuminate at the door position. : Go to Step 7.
The lamp does not illuminate at the ON position. : Replace the rear room lamp.

STEP 3. Connector check: D-06 rear room lamp connector





Q: Is the check result normal?
YES : Go to Step 4.
NO : Repair the defective connector.

STEP 4. Check the bulb.

Check that the rear room lamp bulb is not blown.

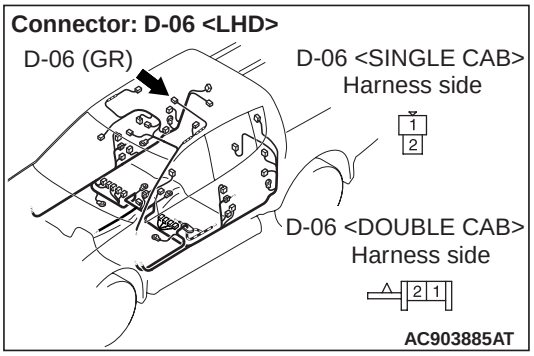
Q: Is the check result normal?
YES : Go to Step 5.
NO : Replace the rear room lamp bulb.

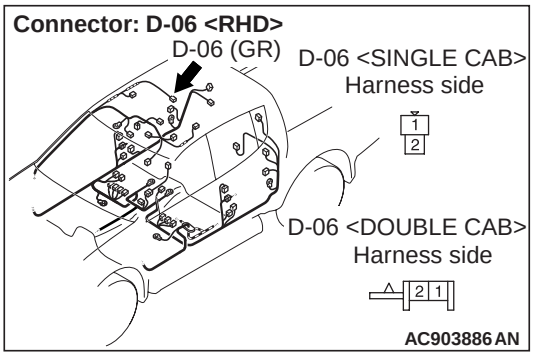
STEP 5. Check the rear room lamp.

Check whether the rear room lamp illuminates normally.

Q: Is the check result normal?
YES : Go to Step 6.
NO : Replace the rear room lamp.

STEP 6. Check the wiring harness from D-06 rear room lamp connector terminal No.1 to fusible link (20).





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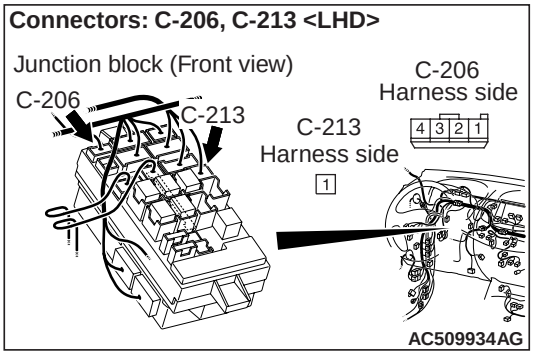
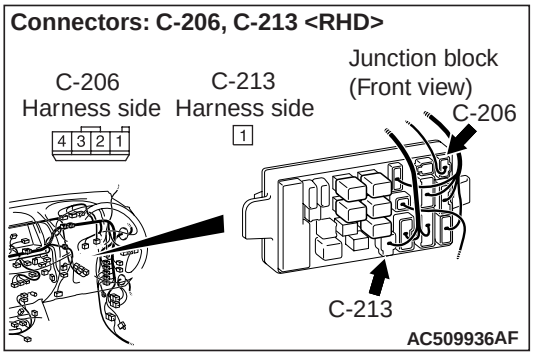


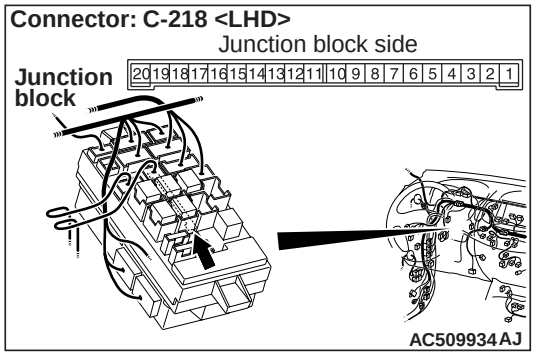


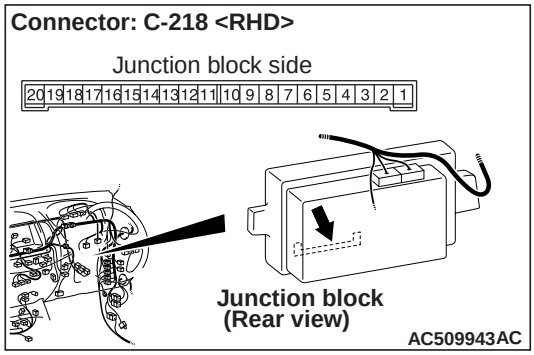
Prior to the wiring harness inspection, check junction block connectors C-206 and C-213, and repair if necessary.
Check the power supply line for open circuit and short circuit.

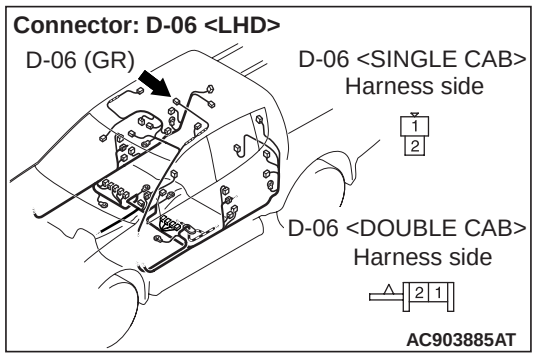
Q: Is the check result normal?

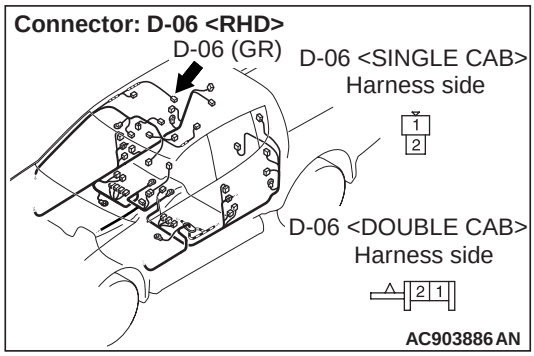
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness.

STEP 7. Connector check: C-218 ETACS-ECU connector and D-06 rear room lamp connector



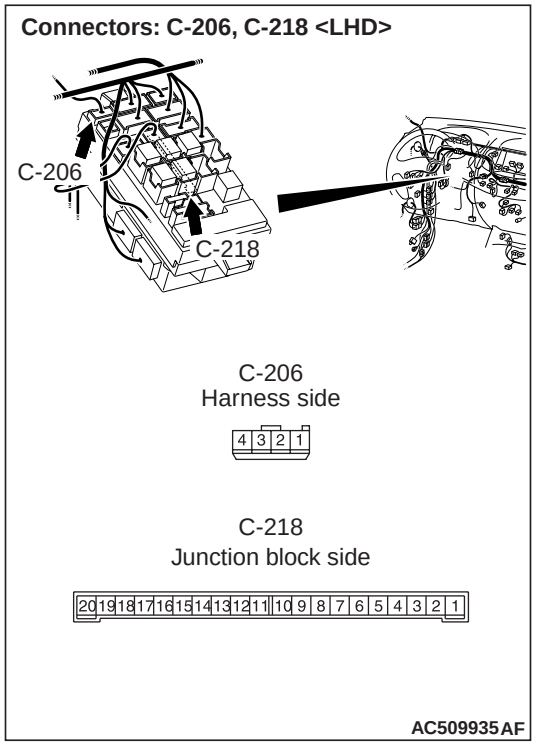


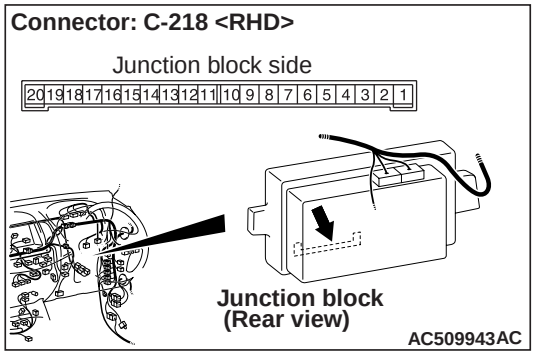


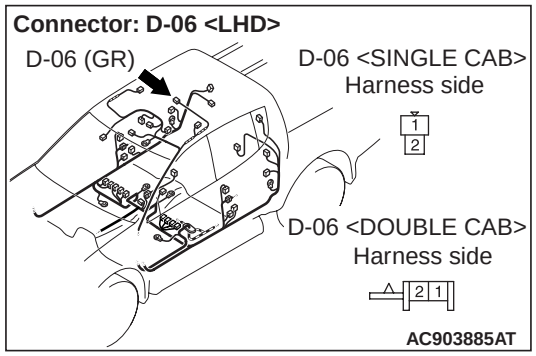


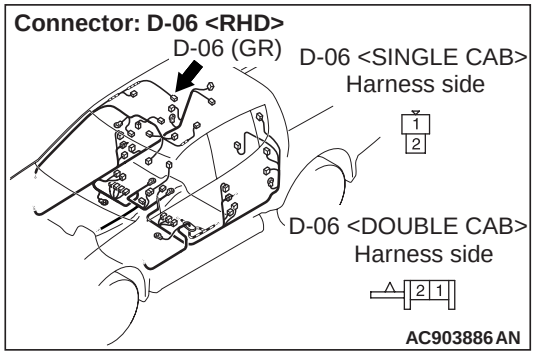
Q: Is the check result normal?
YES : Go to Step 8.
NO : Repair the defective connector.

STEP 8. Check the wiring harness from C-218 ETACS-ECU connector terminal No.18 to D-06 rear room lamp connector terminal No.2









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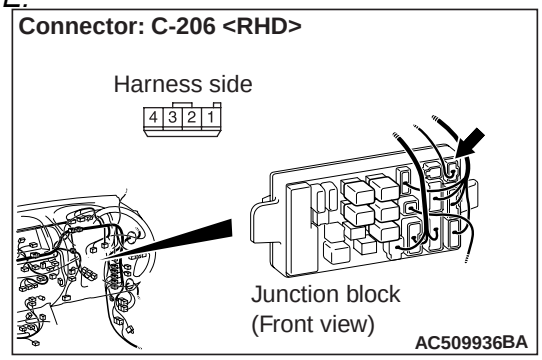


Prior to the wiring harness inspection, check junction block connector C-206, and repair if necessary.
Check the input and output lines for open circuit.

Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness.

ON-VEHICLE SERVICE

CUSTOMISATION FUNCTION

M1541301200035

The following functions can be customised using M.U.T.-III.

Function	Item name	Configuration
Room lamp delay-off time	Room lamp delay timer with door	• 0 s • 7.5 s (initial condition <vehicles without central door locking system>) • 15 s (initial condition <vehicles with central door locking system>) • 30 s • 60 s • 120 s • 180 s

REMOVAL AND INSTALLATION

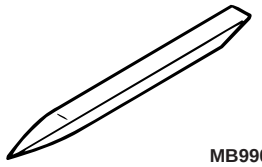
M1541301000031

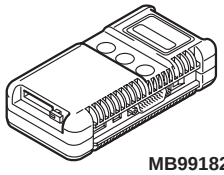
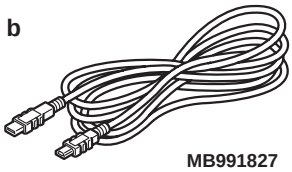
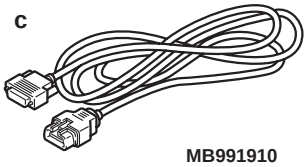
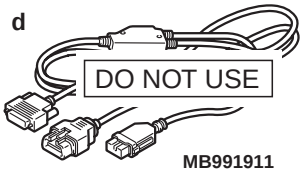
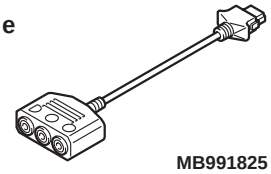
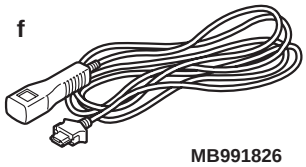
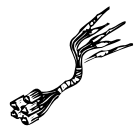
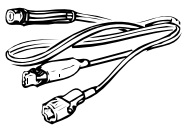
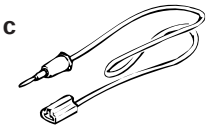
For the front room lamp assembly and the rear room lamp refer to GROUP 52A, Headlining – Removal and installation .

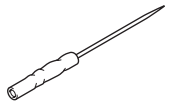
REAR COMBINATION LAMP

SPECIAL TOOLS

M1541400100021

Tool	Number	Name	Use
 MB990784	MB990784	Ornament remover	Removal of rear combination lamp assembly

Tool	Number	Name	Use
a  MB991824 b  MB991827 c  MB991910 d  MB991911 e  MB991825 f  MB991826 MB991955	MB991955 a. MB991824 b. MB991827 c. MB991910 d. MB991911 e. MB991825 f. MB991826	M.U.T.-III sub-assembly a. Vehicle Communication Interface (V.C.I.) b. M.U.T.-III USB cable c. M.U.T.-III main harness A (Vehicles with CAN communication system) d. M.U.T.-III main harness B (Vehicles without CAN communication system) e. M.U.T.-III measure adapter f. M.U.T.-III trigger harness	⚠ CAUTION **For vehicles with CAN communication, use M.U.T.-III main harness A to send simulated vehicle speed. If you connect M.U.T.-III main harness B instead, the CAN communication does not function correctly.** Diagnosis code, service data and actuator test check.
a  b  c  d MB991223	MB991223 a. MB991219 b. MB991220 c. MB991221 d. MB991222	Harness set a. Check harness b. LED harness c. LED harness adapter d. Probe	Continuity check and voltage measurement at harness wire or connector a. For checking connector pin contact pressure b. For checking power supply circuit c. For checking power supply circuit d. For connecting a locally sourced tester

Tool	Number	Name	Use
 MB992006	MB992006	Extra fine probe	Continuity check and voltage measurement at harness wire or connector

TROUBLESHOOTING

TROUBLE SYMPTOM CHART

M1541401000436

DIAGNOSIS TROUBLESHOOTING FLOW

M1541402500025

Refer to GROUP 00 – Contents of troubleshooting .

Symptom		Inspection procedure number	Reference page
Tail lamp	None of the tail lamps, position lamps and licence plate lamps illuminate.	1	P.54A-195
	One of tail lamps does not illuminate.	2	P.54A-200

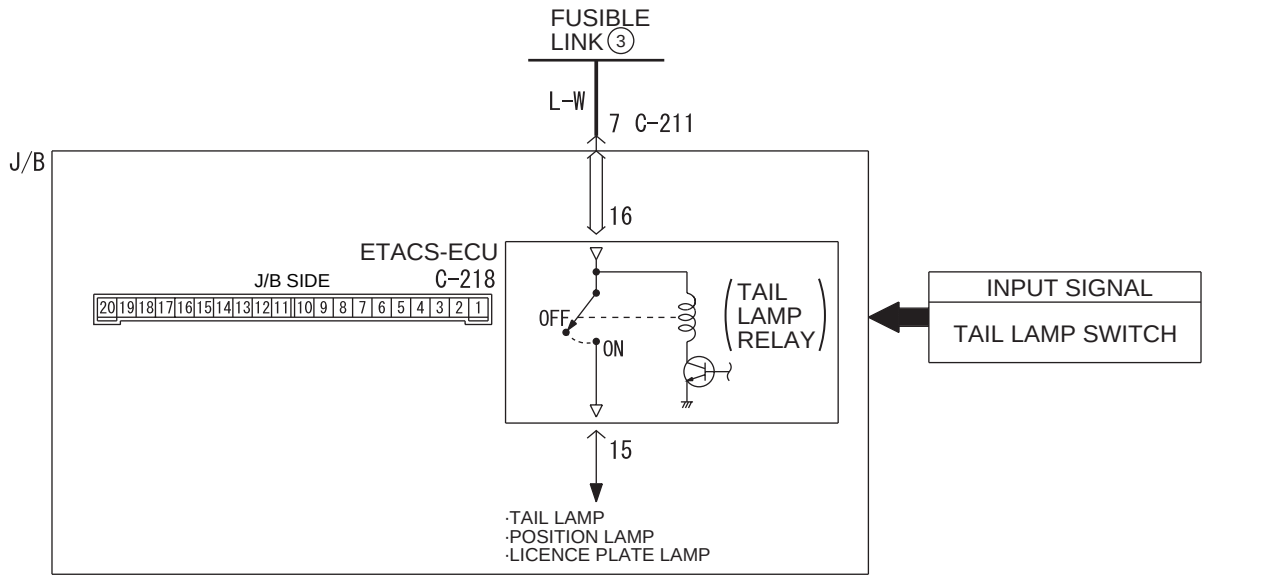
SYMPTOM PROCEDURES

Inspection Procedure 1: None of the tail lamps, position lamps and licence plate lamps illuminate.

⚠ CAUTION

Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Tail Lamp Relay Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

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COMMENTS ON TROUBLE SYMPTOM

If none of the tail lamps, position lamps and licence plate lamps illuminate, the tail lamp switch input circuit or the ETACS-ECU may be defective. Alternately, there may be the case that the adjustment function has set the tail lamps not be illuminated when the ignition switch is at the "LOCK" (OFF) position.

PROBABLE CAUSES

- Malfunction of the column switch
- Malfunction of the ETACS-ECU
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code.

When the ignition switch is turned to the "LOCK" (OFF) position, check that the ETACS-ECU does not set the diagnosis code.

Q: Is the diagnosis code set?

YES : Refer to diagnosis code chart P.54A-494.

NO : Go to Step 2.

STEP 2. M.U.T.-III data list

Check the input signal from the tail lamp switch.

- Turn the tail lamp switch to the ON position.

Item No.	Item name	Normal condition
59	Tail lamp output	ON

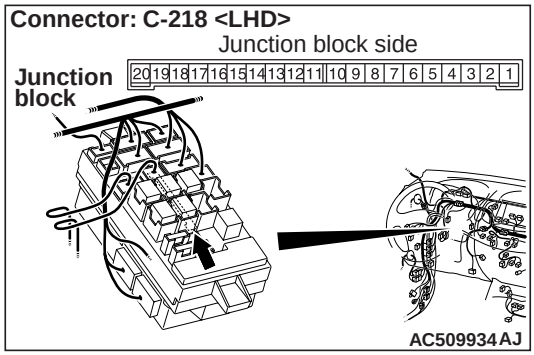
OK: Normal condition is displayed.

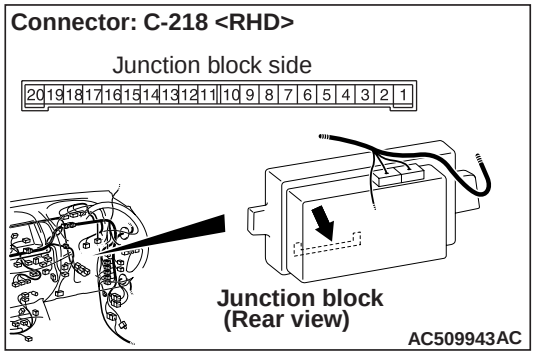
Q: Is the check result normal?

YES : Go to Step 3.

NO : Refer to inspection procedure C-1 "The column switch (lighting and wiper switch) signal is not received P.54A-523."

STEP 3. Connector check: C-218 ETACS-ECU connector



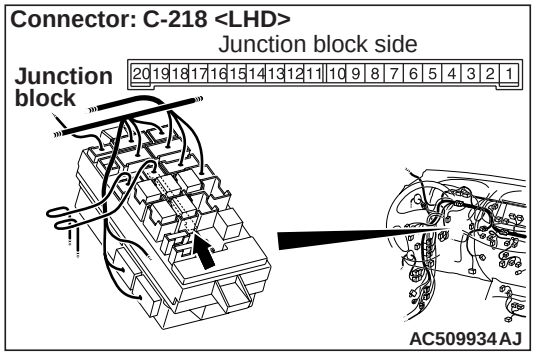


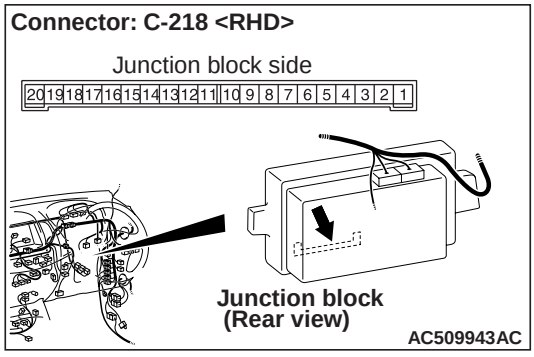
Q: Is the check result normal?

YES : Go to Step 4.

NO : Repair the defective connector.

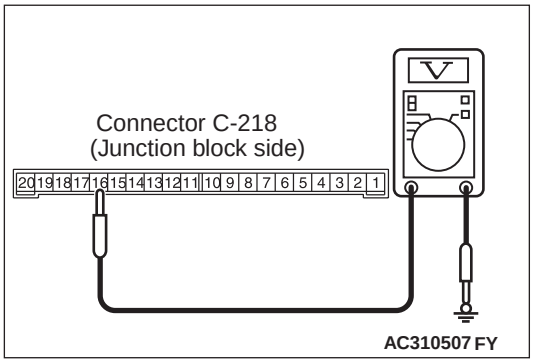
STEP 4. Voltage measurement at C-218 ETACS-ECU connector.





(1) Remove the ETACS-ECU, and measure at the

junction box side.

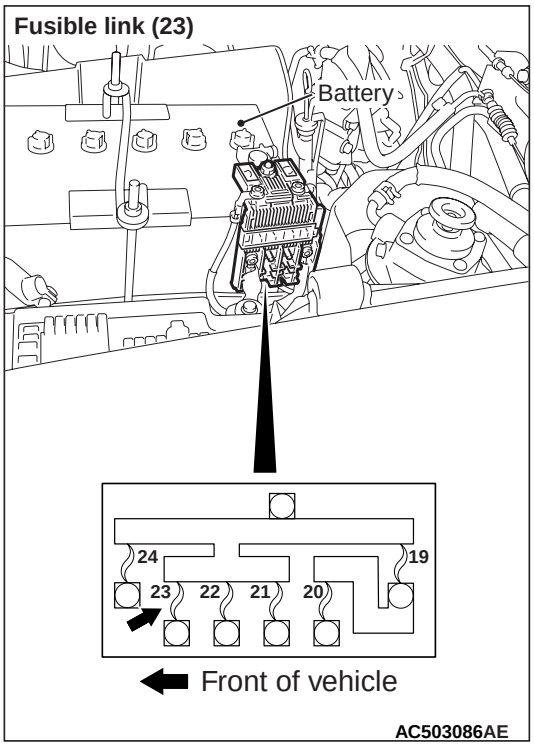


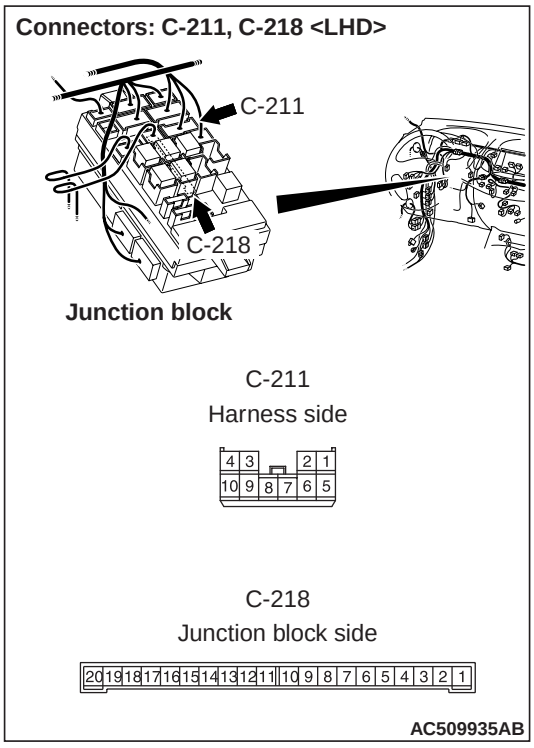
(2) Voltage between C-218 ETACS-ECU connector terminal No.16 and body earth

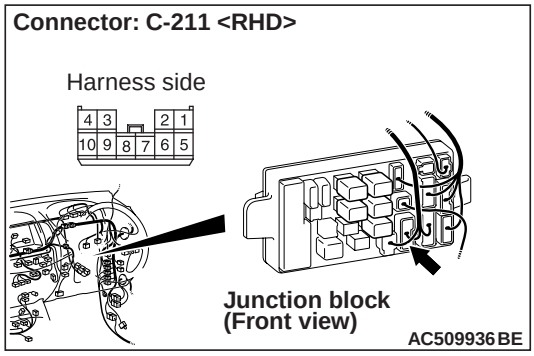
OK: System voltage

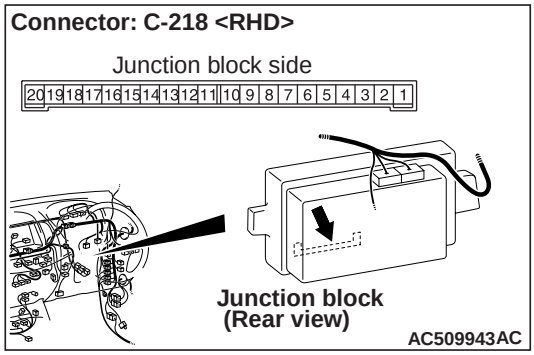
Q: Is the check result normal?
YES : Go to Step 6.
NO : Go to Step 5.

STEP 5. Check the wiring harness between C-218 ETACS-ECU connector terminal No.16 and the fusible link (3).









NOTE: Prior to the wiring harness inspection, check the junction block connector C-211, and repair if necessary.

- Check the power supply line from the fusible link (23) for open circuit and short.

Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

NO : Repair the wiring harness.

STEP 6. Retest the system.

Check that the tail lamps illuminate normally.

Q: Is the check result normal?

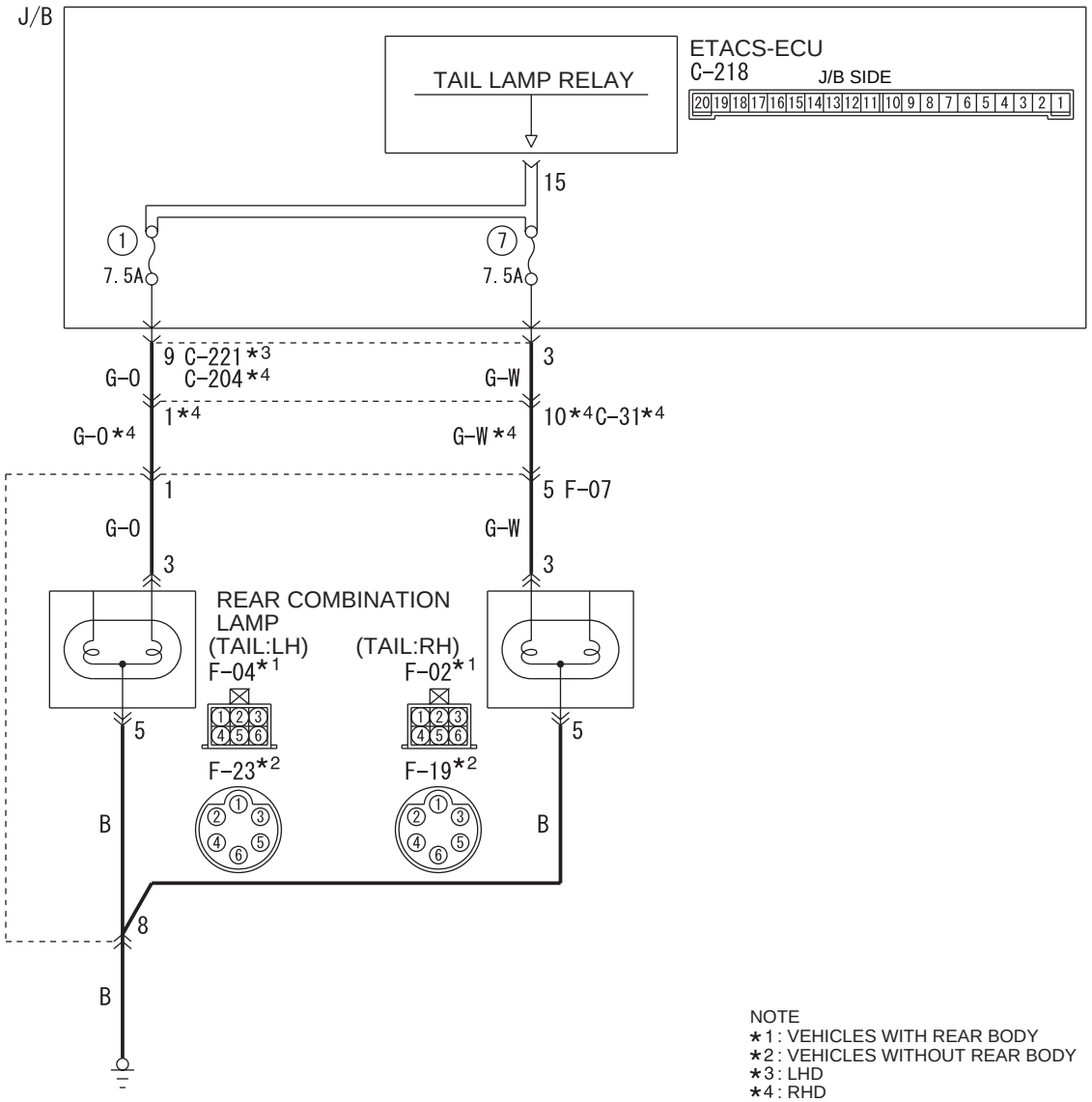
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

NO : Replace the ETACS-ECU and register the ID codes (Refer to P.54A-39).

Inspection Procedure 2: One of tail lamps does not illuminate.

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Tail Lamps Circuit



NOTE
*1: VEHICLES WITH REAR BODY
*2: VEHICLES WITHOUT REAR BODY
*3: LHD
*4: RHD

Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

WAC54E089A

COMMENTS ON TROUBLE SYMPTOM

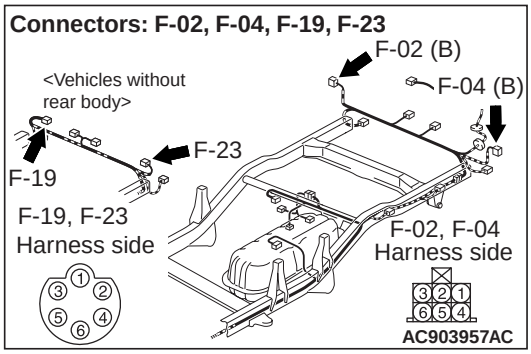
If one of the tail lamps does not illuminate, the wiring harness connector(s), the bulb or the fuse may be defective or burned out.

PROBABLE CAUSES

- Burned-out bulb
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. Connector check: F-04 <vehicles with rear body> or F-23 <vehicles without rear body> rear combination lamp (tail: LH) connector or F-02 <vehicles with rear body> or F-19 <vehicles without rear body> rear combination lamp (tail: RH) connector

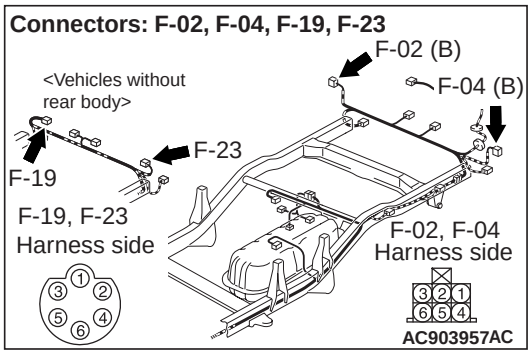


Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the defective connector.

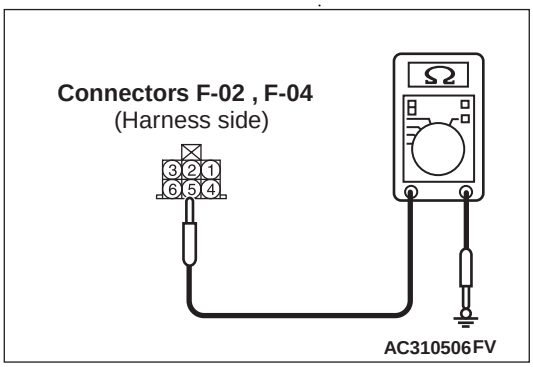
STEP 2. Check the bulbs of the tail lamps.
Check the bulb of the lamp which does not illuminate.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Replace the bulb of the lamp which does not illuminate.

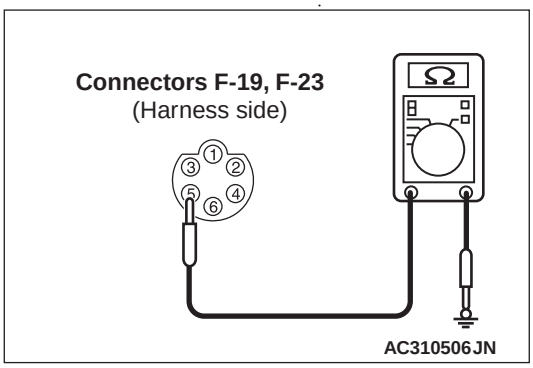
STEP 3. Resistance measurement at the F-04 <vehicles with rear body> or F-23 <vehicles without rear body> rear combination lamp (tail: LH) connector or F-02 <vehicles with rear body> or F-19 <vehicles without rear body> rear combination lamp (tail: RH) connector.



(1) Disconnect the connector, and measure at the wiring harness side.
(2) Check the resistance between the lamp connector and body earth.



Resistance between F-04 rear combination lamp (tail: LH) or F-02 rear combination lamp (tail: RH) connector terminal No.5 and body earth <vehicles with rear body>

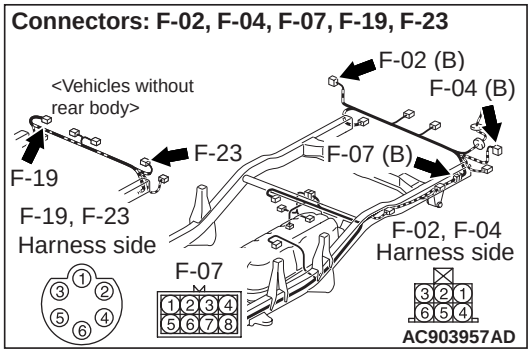


Resistance between F-23 rear combination lamp (tail: LH) or F-19 rear combination lamp (tail: RH) connector terminal No.5 and body earth <vehicles without rear body>

OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?
YES : Go to Step 5.
NO : Go to Step 4.

STEP 4. Check the wiring harness from F-04 <vehicles with rear body> or F-23 <vehicles without rear body> rear combination lamp (tail: LH) connector or F-02 <vehicles with rear body> or F-19 <vehicles without rear body> rear combination lamp (tail: RH) connector terminal No.5 to body earth.



NOTE: Prior to the wiring harness inspection, check intermediate connector F-07, and repair if necessary.

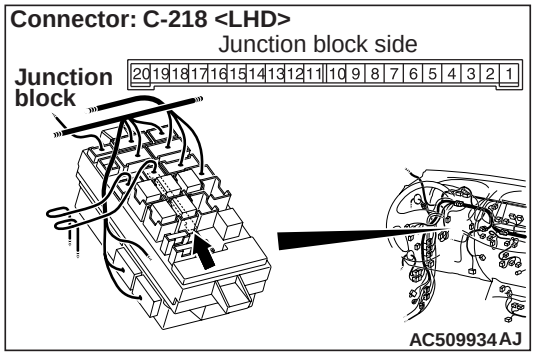
- Check the earth wires for open circuit.

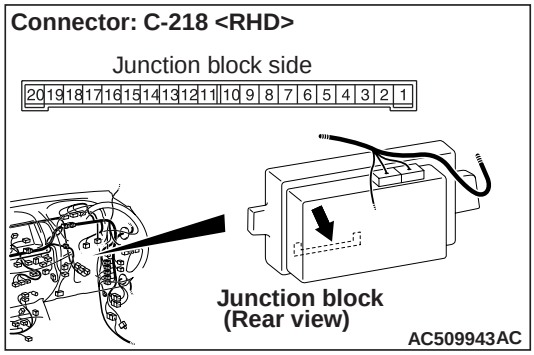
Q: Is the check result normal?

YES : Go to Step 5.

NO : Repair the wiring harness.

STEP 5. Connector check: C-218 ETACS-ECU connector



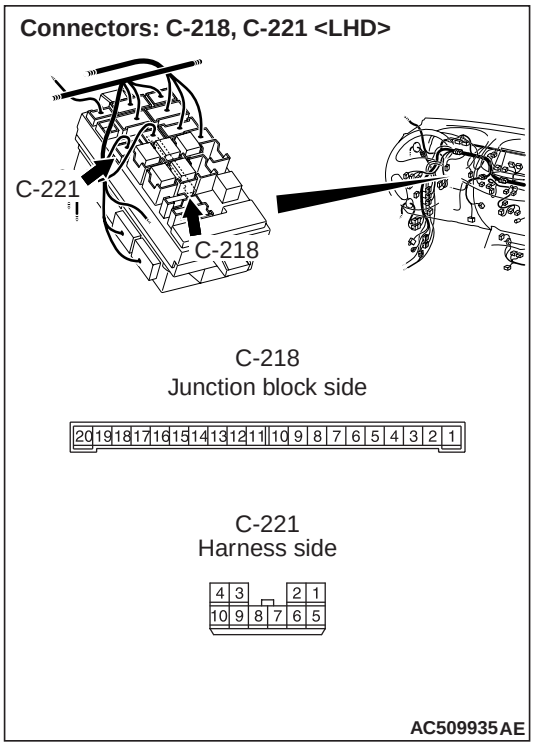


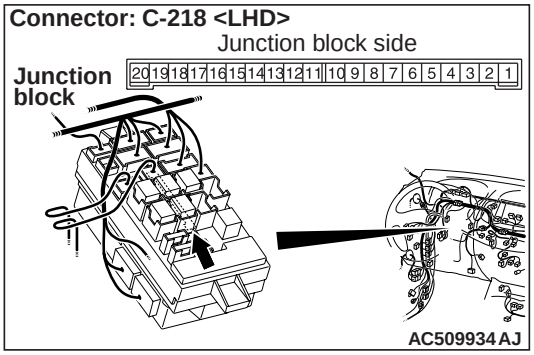
Q: Is the check result normal?

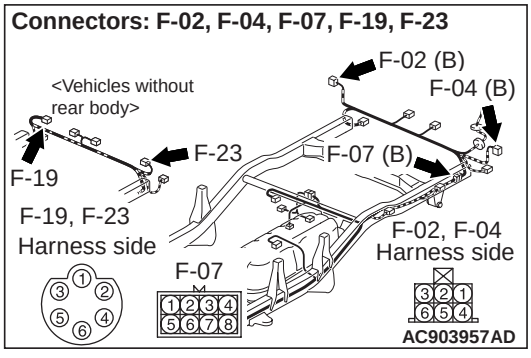
YES : Go to Step 6.

NO : Repair the defective connector.

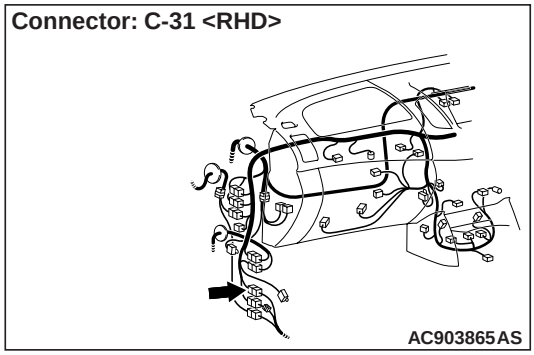
STEP 6. Check the wiring harness from F-04 <vehicles with rear body> or F-23 <vehicles without rear body> rear combination lamp (tail: LH) connector or F-02 <vehicles with rear body> or F-19 <vehicles without rear body> rear combination lamp (tail: RH) connector terminal No.3 to C-218 ETACS-ECU connector terminal No.15.

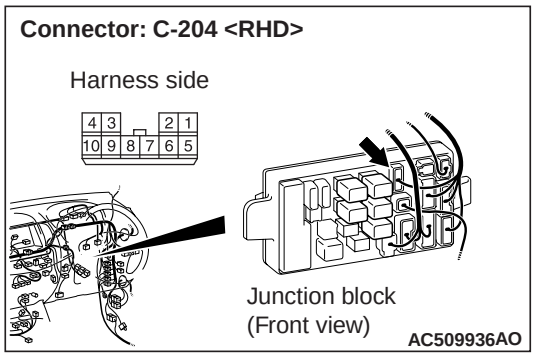






NOTE:





Prior to the wiring harness inspection, check junction block connector C-221 <LHD> or C-204 <RHD> and intermediate connector F-07 and C-31 <RHD>, and repair if necessary.

- Check the output lines for open circuit.

Q: Is the check result normal?
YES : Go to Step 7.
NO : Repair the wiring harness.

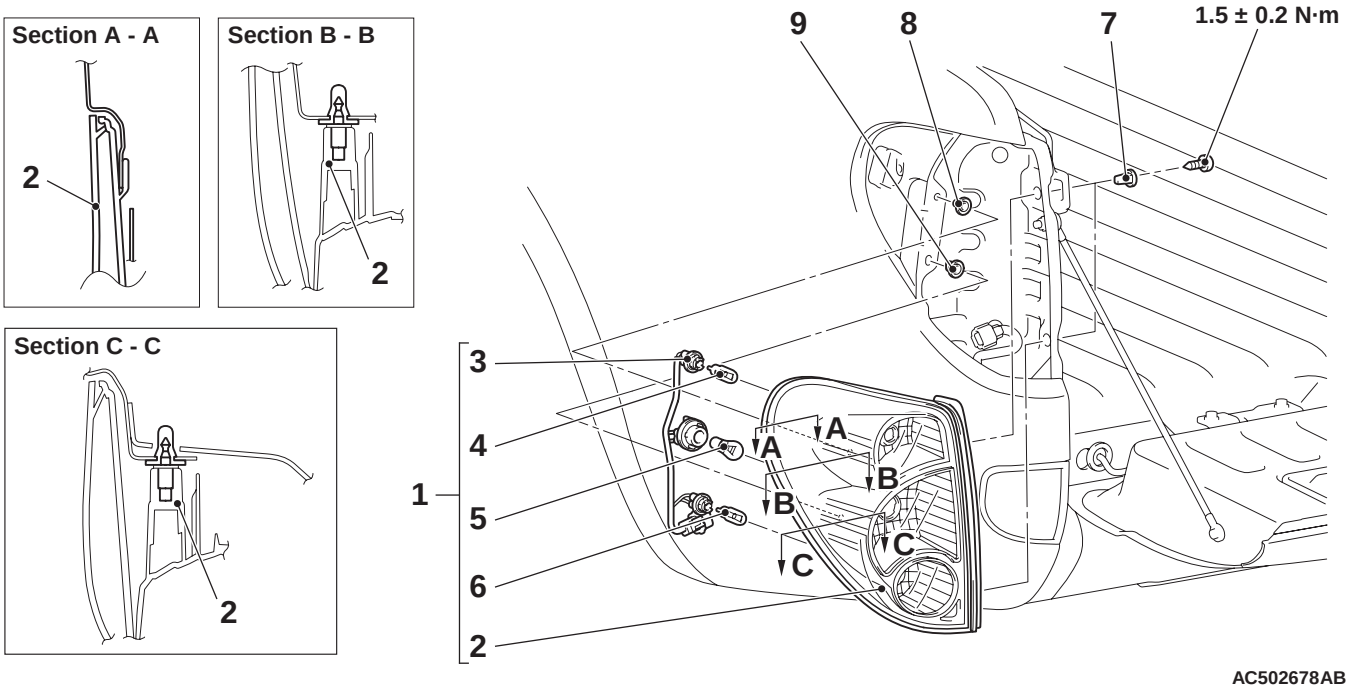
STEP 7. Retest the system.
Check that the tail/stop lamps illuminate normally.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Replace the tail lamp socket.

REMOVAL AND INSTALLATION

M1541402200400

<VEHICLES WITH REAR BODY>



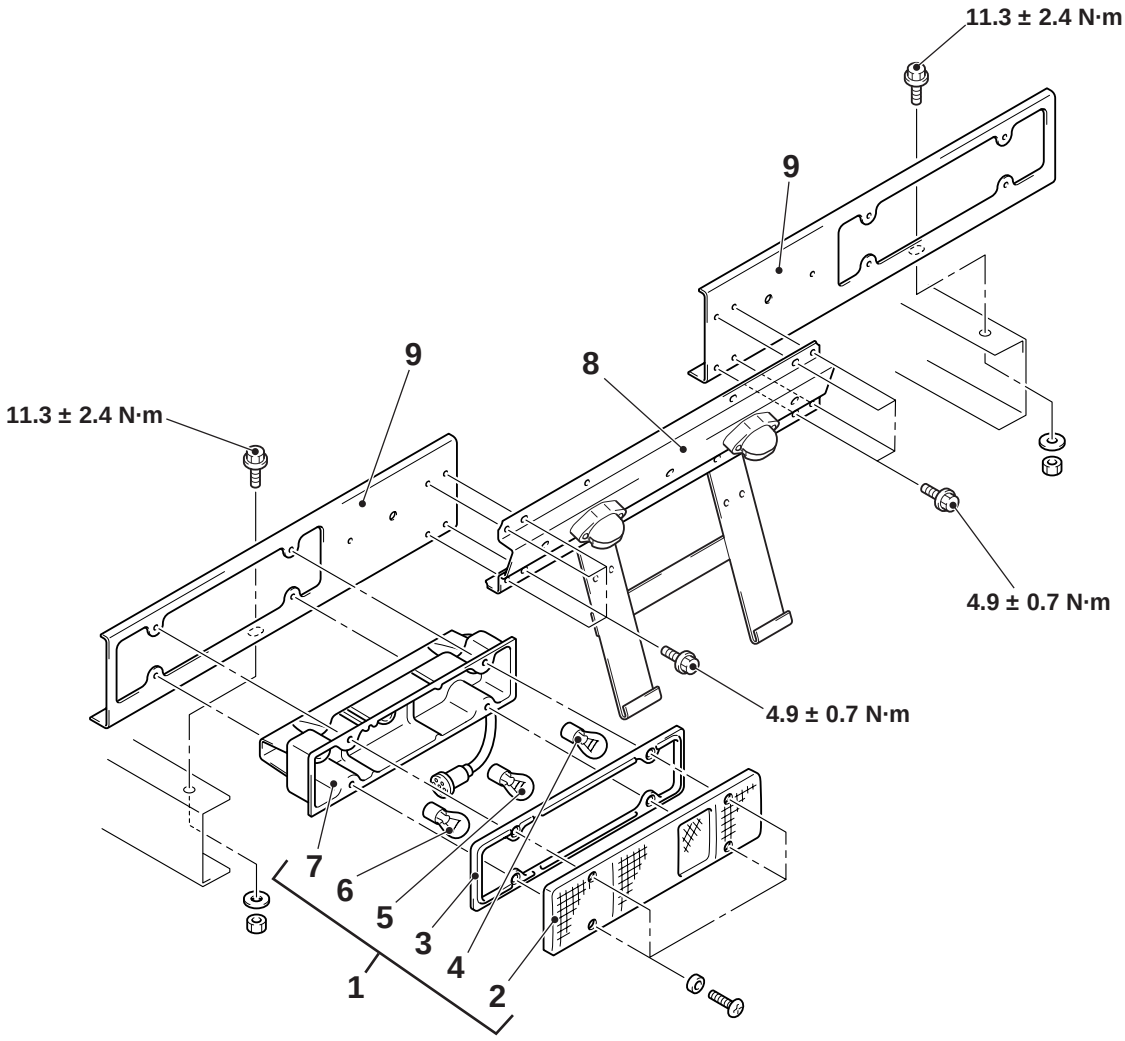
Removal steps

1. Rear combination lamp assembly
2. Rear combination lamp unit
3. Socket
4. Turn-signal lamp bulb
5. Tail lamp and stop lamp bulb

Removal steps (Continued)

6. Back-up lamp bulb
7. Grommet
8. Grommet
9. Grommet

<VEHICLES WITHOUT REAR BODY>



AC903483AB

Removal steps

1. Rear combination lamp assembly
2. Rear combination lamp lens
3. Rear combination lamp gasket
4. Back-up lamp bulb
5. Tail lamp and stop lamp bulb
6. Turn-signal lamp bulb

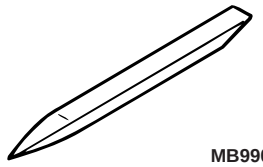
Removal steps (Continued)

7. Rear combination lamp body
8. Licence plate lamp bracket assembly
9. Rear combination lamp bracket assembly

REFLECTOR

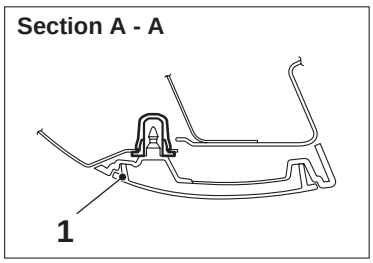
SPECIAL TOOL

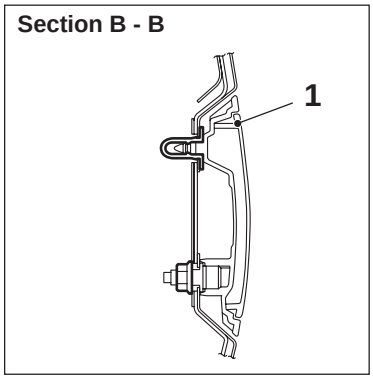
M1542500200017

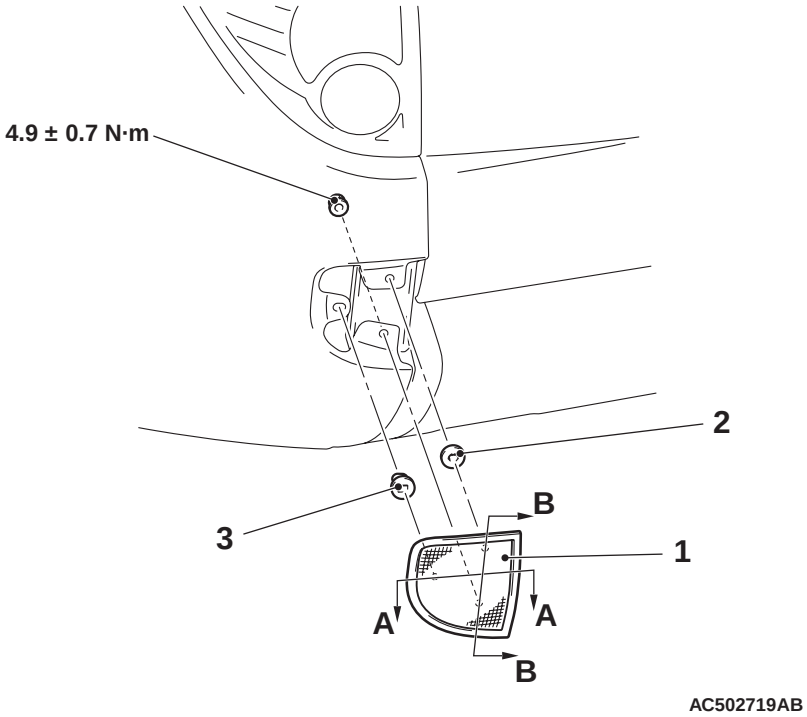
Tool	Number	Name	Use
 MB990784	MB990784	Ornament remover	Removal of reflector

REMOVAL AND INSTALLATION

M1542500300014







AC502719AB

Removal steps

1. Reflector

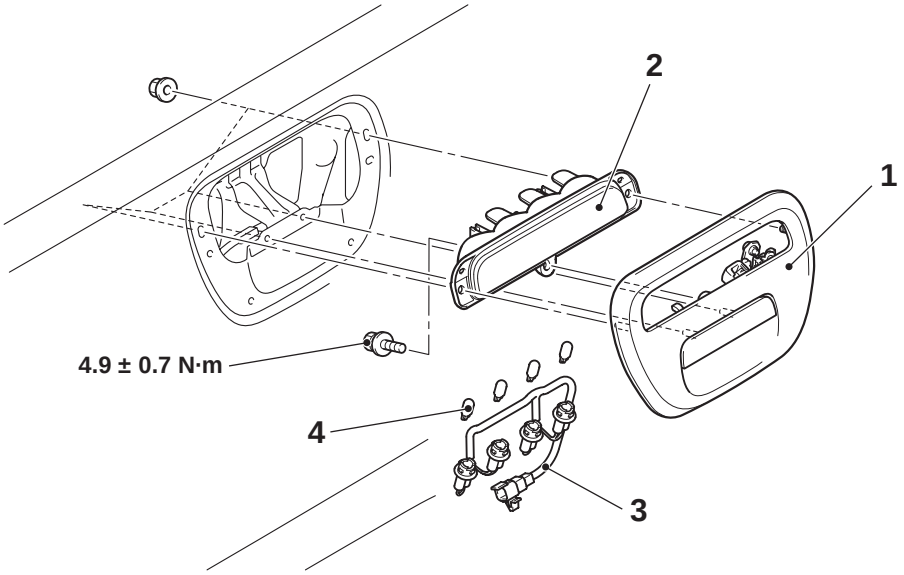
Removal steps (Continued)

2. Grommet
3. Grommet

HIGH-MOUNTED STOP LAMP

REMOVAL AND INSTALLATION

M1541700200030



AC502777AB

High-mounted stop lamp removal steps

- Rear gate cover (Refer to GROUP 42, Rear gate .)

1. Rear gate outside handle

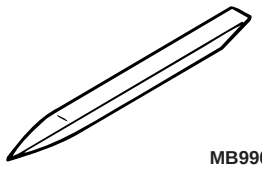
High-mounted stop lamp removal steps (Continued)

2. High-mounted stop lamp
3. Socket
4. Bulb

LICENCE PLATE LAMP

SPECIAL TOOL

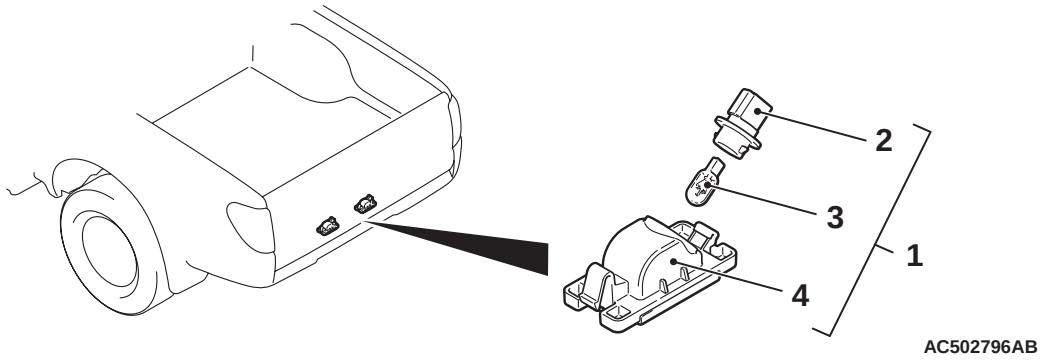
M1541900300019

Tool	Number	Name	Use
 MB990784	MB990784	Ornament remover	Removal of licence plate lamp assembly

REMOVAL AND INSTALLATION

M1541900200465

<VEHICLES WITH REAR BODY>

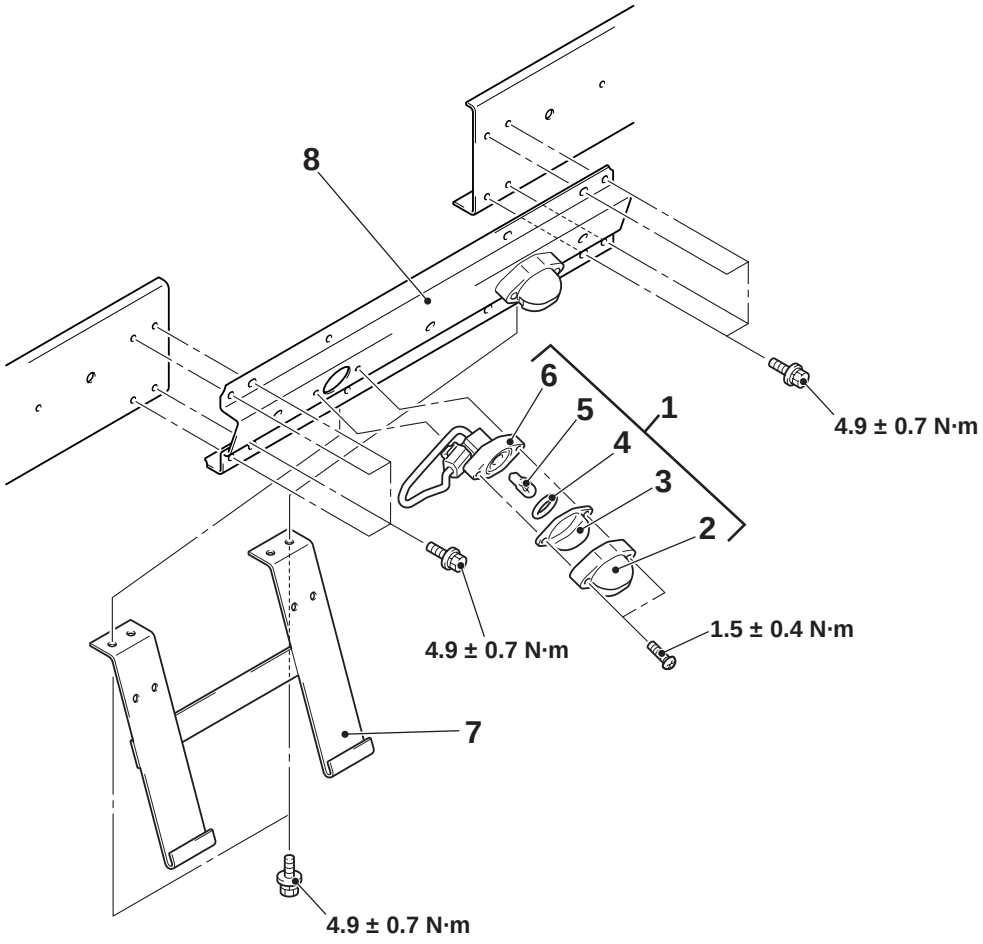


AC502796AB

Removal steps

<<**A**>>
1. Licence plate lamp assembly
2. Socket
3. Bulb
4. Licence plate lamp unit

<VEHICLES WITHOUT REAR BODY>



AC903484AB

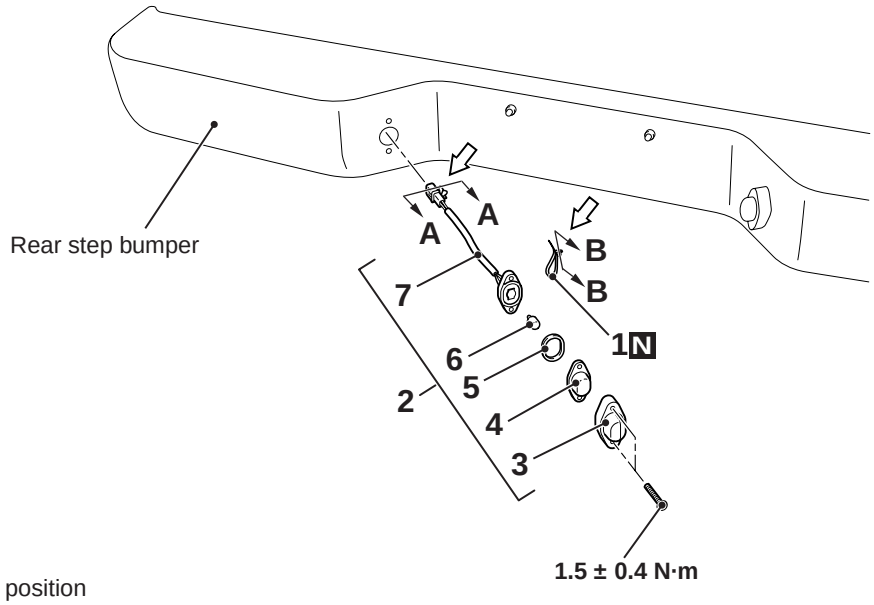
Removal steps
1. Licence plate lamp assembly
2. Cover
3. Lens

Removal steps (Continued)
4. Gasket
5. Bulb
6. Licence plate lamp base

Removal steps (Continued)

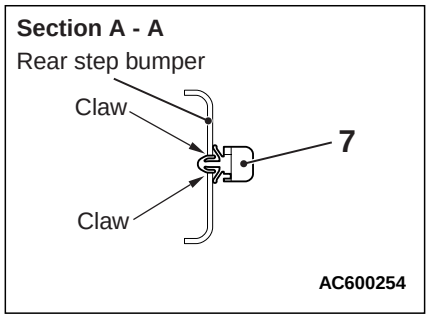
7. Dummy bracket
8. Licence plate lamp bracket assembly

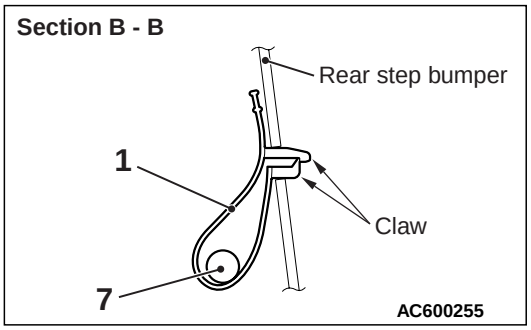
<VEHICLES FOR MOROCCO (OPTIONAL)>



AC600253

NOTE
⇦ : Claw position





ACB01679AB

Removal steps

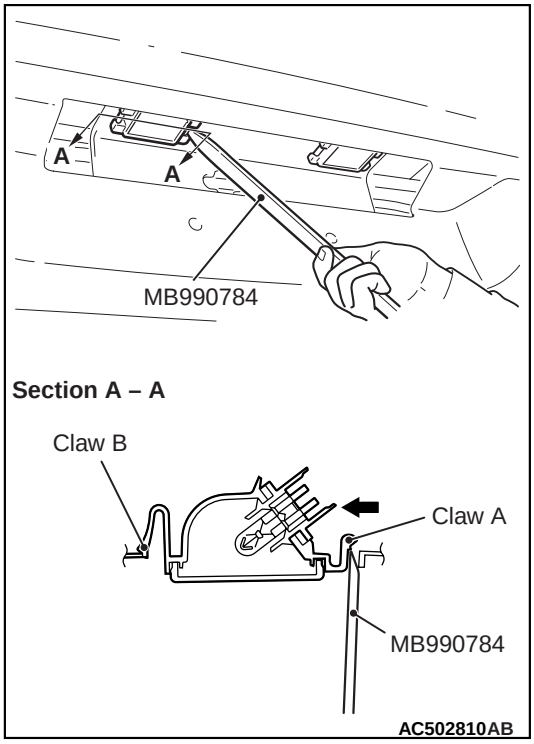
1. Harness band
2. Licence plate lamp assembly
3. Cover
4. Lens

Removal steps (Continued)

5. Gasket
6. Bulb
7. Licence plate lamp base

REMOVAL SERVICE POINT

<<A>> LICENCE PLATE LAMP ASSEMBLY REMOVAL

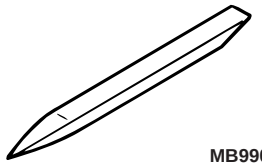


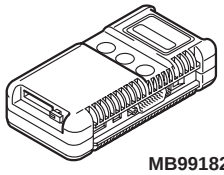
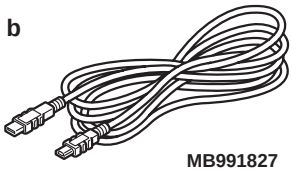
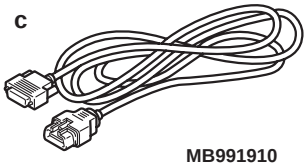
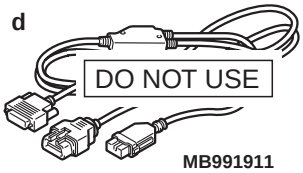
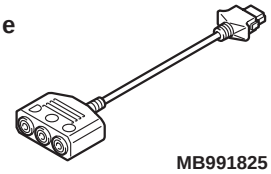
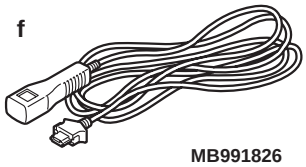
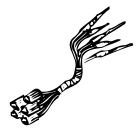
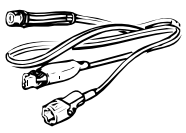
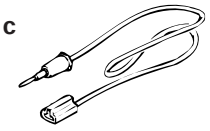
Use special tool ornament remover (MB990784) to press the licence plate assembly to the direction shown (inside the vehicle), and shorten the claw B and disengage the claw A. Then remove the licence plate lamp assembly.

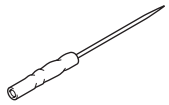
HAZARD WARNING LAMP SWITCH

SPECIAL TOOLS

M1541500100039

Tool	Number	Name	Use
 MB990784	MB990784	Ornament remover	Removal of centre upper panel assembly

Tool	Number	Name	Use
a  MB991824 b  MB991827 c  MB991910 d  MB991911 e  MB991825 f  MB991826 MB991955	MB991955 a. MB991824 b. MB991827 c. MB991910 d. MB991911 e. MB991825 f. MB991826	M.U.T.-III sub-assembly a. Vehicle Communication Interface (V.C.I.) b. M.U.T.-III USB cable c. M.U.T.-III main harness A (Vehicles with CAN communication system) d. M.U.T.-III main harness B (Vehicles without CAN communication system) e. M.U.T.-III measure adapter f. M.U.T.-III trigger harness	⚠ CAUTION **For vehicles with CAN communication, use M.U.T.-III main harness A to send simulated vehicle speed. If you connect M.U.T.-III main harness B instead, the CAN communication does not function correctly.** Checking ETACS-ECU (service data and diagnosis codes)
a  b  c  d MB991223	MB991223 a. MB991219 b. MB991220 c. MB991221 d. MB991222	Harness set a. Check harness b. LED harness c. LED harness adapter d. Probe	Continuity check and voltage measurement at harness wire or connector a. For checking connector pin contact pressure b. For checking power supply circuit c. For checking power supply circuit d. For connecting a locally sourced tester

Tool	Number	Name	Use
 MB992006	MB992006	Extra fine probe	Continuity check and voltage measurement at harness wire or connector

TROUBLESHOOTING

TROUBLE SYMPTOM CHART

M1541500700031

DIAGNOSIS TROUBLESHOOTING FLOW

M1541501400022

Refer to GROUP 00 – Contents of troubleshooting .

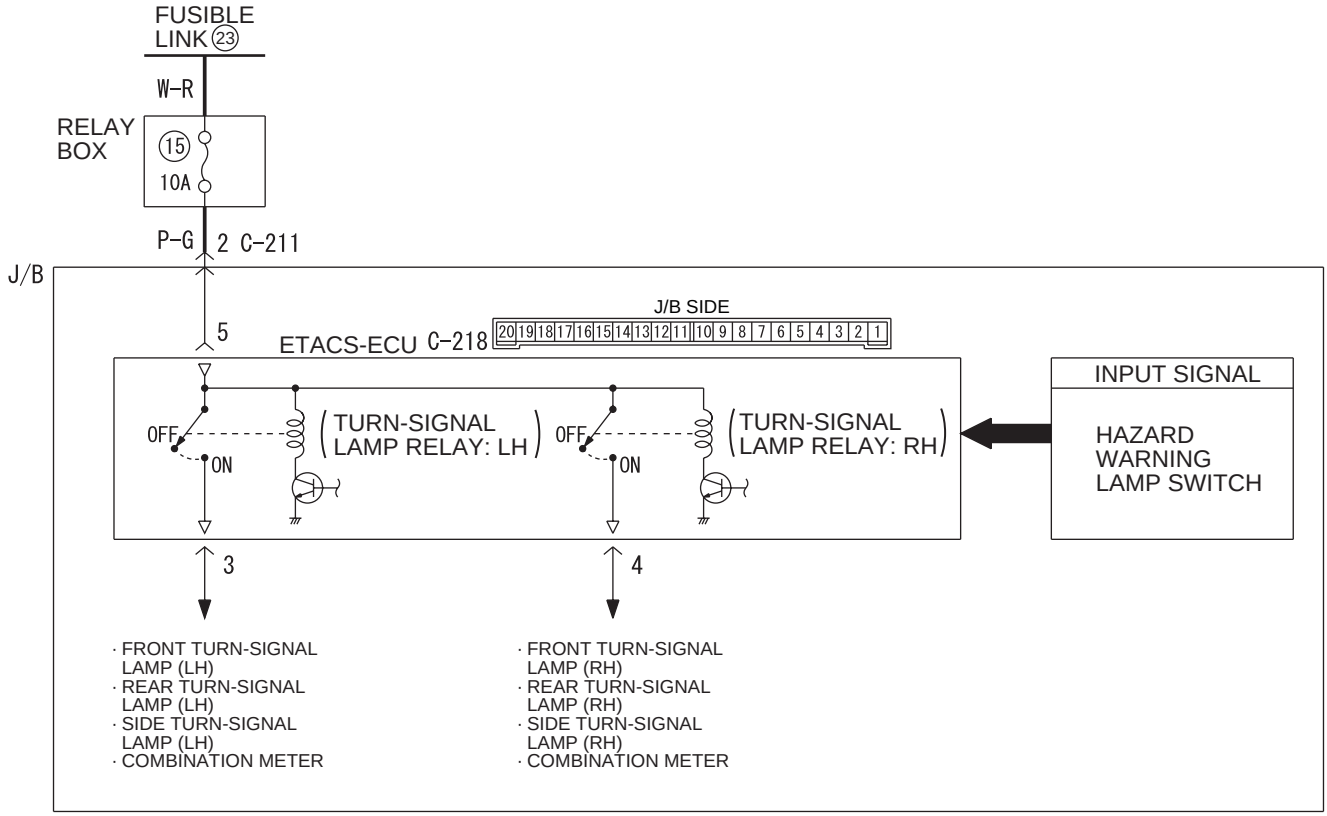
Symptom		Inspection procedure number	Reference page
Flasher timer	The hazard warning lamps do not illuminate.	1	P.54A-215

SYMPTOM PROCEDURES

Inspection Procedure 1: The hazard warning lamps do not illuminate.

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Hazard Warning Lamp Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

W7C54E035A

COMMENTS ON TROUBLE SYMPTOM
If the hazard warning lamps do not illuminate, the hazard warning lamp input signal circuit or the ETACS-ECU may be defective.

PROBABLE CAUSES
- Malfunction of the hazard warning lamp switch
- Malfunction of the ETACS-ECU
- Damaged harness wires and connectors

STEP 2. M.U.T.-III diagnosis code.
When the electric motor switch is turned to the "LOCK" (OFF) position, check that the ETACS-ECU does not set the diagnosis code.

Q: Is the diagnosis code set?

DIAGNOSIS PROCEDURE

STEP 1. Check that the turn-signal lamps operate.
Check that the turn-signal lamps illuminate normally.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Refer to inspection procedure 11 "None of the turn-signal lamps illuminate P.54A-137."

YES : Refer to diagnosis code chart P.54A-494.
NO : Go to Step 3.

STEP 3. Check the power supply circuit.
When the electric motor switch is at the "LOCK" (OFF) position, check that the functions below work normally.
- Lamp reminder function
- Central door locking system

Q: Is the check result normal?
YES : Go to Step 4.
NO : Refer to inspection procedure A-1 "Check the battery power supply circuit to the ETACS-ECU P.54A-512."

STEP 4. M.U.T.-III data list
Check the input signal from the hazard warning lamp switch.
- Operate the hazard warning lamp switch.

Item No.	Item name	Normal condition
26	Hazard warning lamp switch	OFF to ON (only when switch is operated)

OK: Normal condition is displayed.

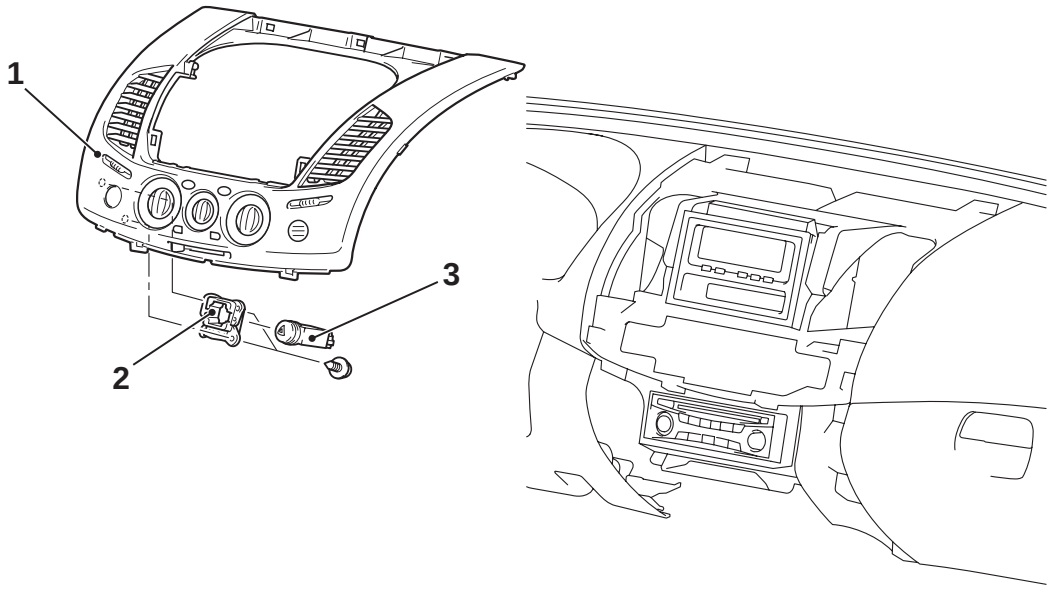
Q: Is the check result normal?
YES : Go to Step 5.
NO : Refer to inspection procedure 8 "The hazard warning lamp switch signal is not received P.54A-536."

STEP 5. Retest the system.
Check that the hazard warning lamps illuminate.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Replace the ETACS-ECU and register the ID codes (Refer to P.54A-39).

REMOVAL AND INSTALLATION

M1541501000035



AC509437AB

Removal steps

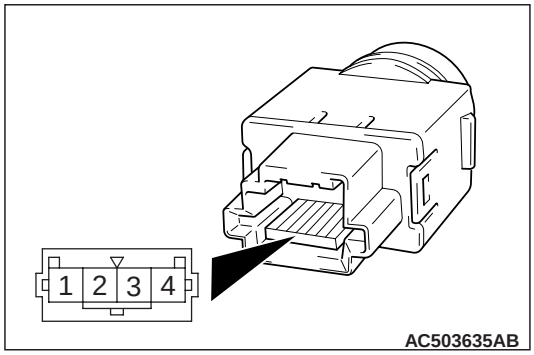
- Centre upper box hood or RV meter hood, lower panel assembly and centre lower panel assembly (Refer to GROUP 52A, Instrument Panel Assembly).

1. Centre upper panel assembly (Refer to GROUP 52A, Instrument Panel Assembly).
2. Instrument panel switch holder
3. Hazard warning lamp switch

INSPECTION

HAZARD WARNING LAMP SWITCH CHECK

M1541501100032

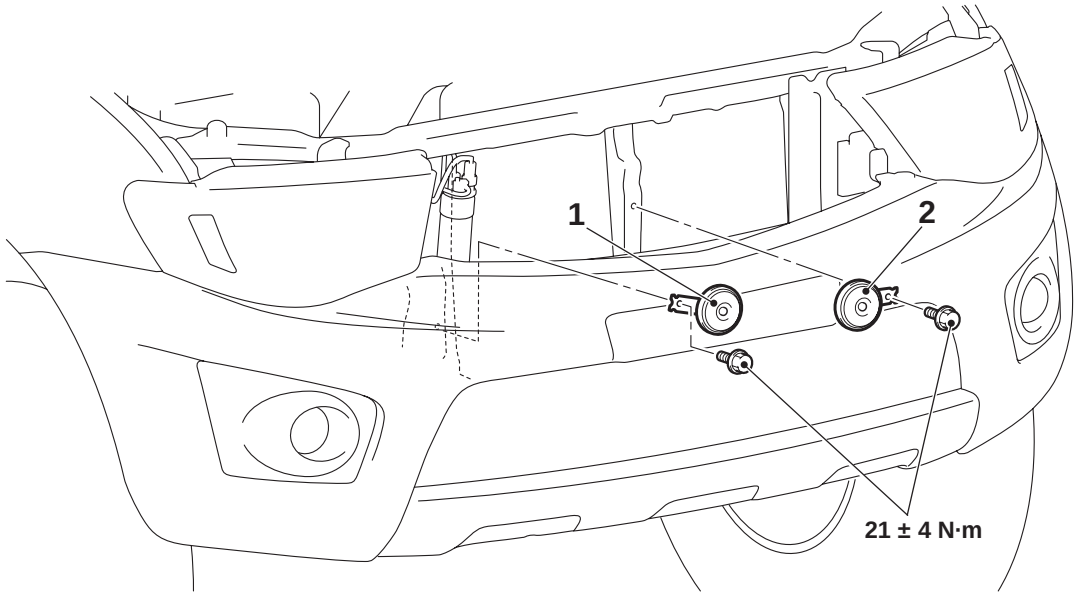


Switch position	Tester connection	Specified condition
Released	1 – 2	Open circuit
Pressed	1 – 2	Continuity (Less than 2 ohms)

HORN

REMOVAL AND INSTALLATION

M1542100200871



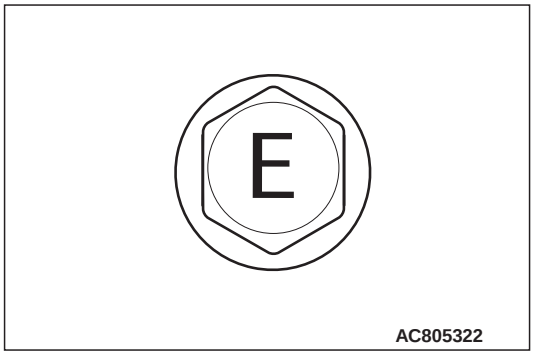
Removal Steps

- Radiator grille (Refer to GROUP 51, Radiator grille .)

>>**A**<< 1. Horn <LO>
>>**A**<< 2. Horn <HI>

INSTALLATION SERVICE POINT

>>A<< HORN (LO)/HORN (HI) INSTALLATION

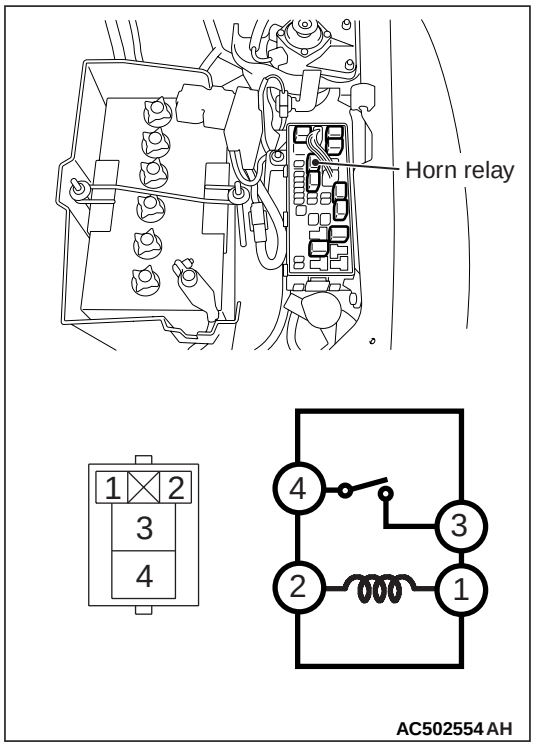


Use the earth bolts as the mounting bolts for horn (LO) and horn (HI). The earth bolts have "E" mark on the bolt heads.

INSPECTION

HORN RELAY CONTINUITY CHECK

M1542100400552



Battery voltage	Tester connection	Specified condition
Not applied	3 – 4	Open circuit
• Connect terminal 2 to the positive battery terminal • Connect terminal 1 to the negative battery terminal		Continuity (2 Ω or less)

ACCESSORY SOCKET

REMOVAL AND INSTALLATION

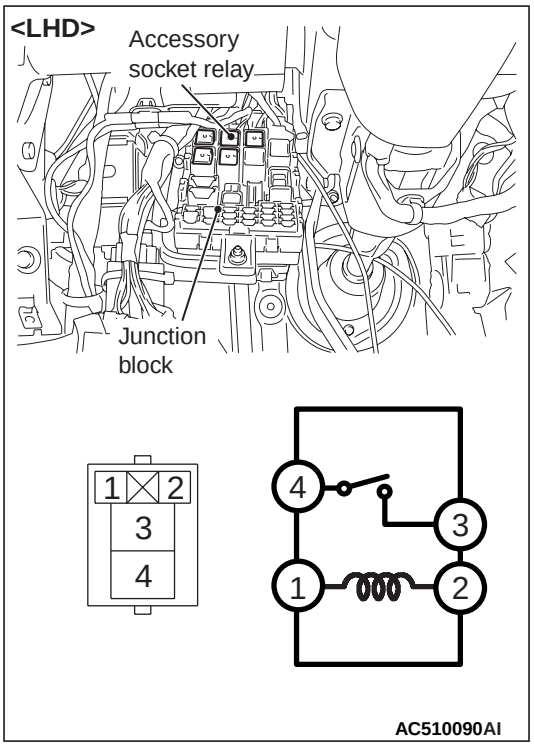
M1542300200499

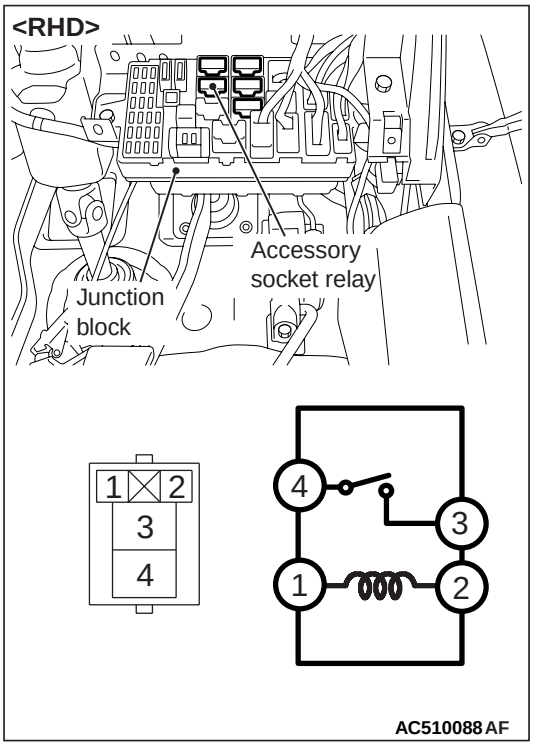
Refer to GROUP 52A, Rear floor console assembly .

INSPECTION

ACCESSORY SOCKET RELAY CHECK

M1542300300098





Battery voltage	Tester connection	Specified condition
Not supplied	3 – 4	Open circuit
• Connect terminal 2 to the positive battery terminal • Connect terminal 1 to the negative battery terminal	3 – 4	Continuity (2 Ω or less)

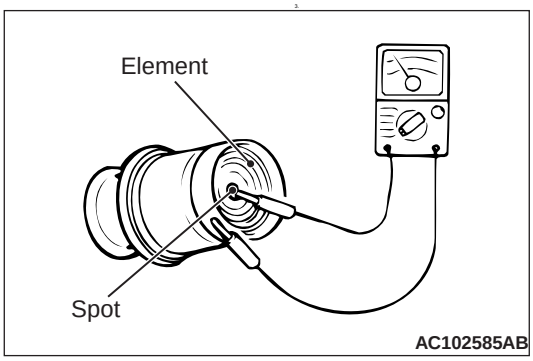
CIGARETTE LIGHTER

INSPECTION

CIGARETTE LIGHTER CHECK

M1542200300068

1. Remove the plug and check the spot for wear.
2. Check that there are no tobacco stains or foreign particles on the element.

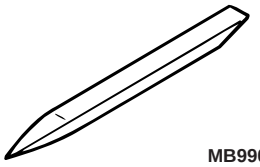


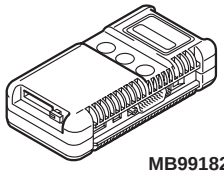
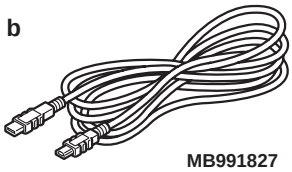
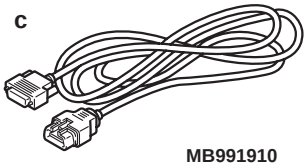
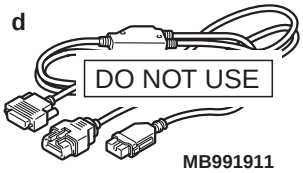
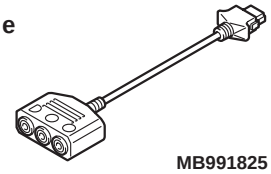
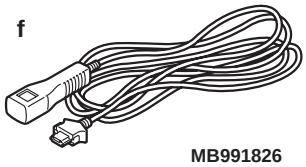
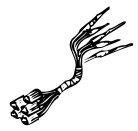
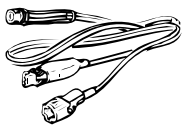
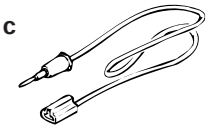
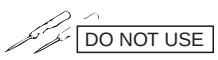
Using an ohmmeter, check that the element resistance value is 1.7 Ω

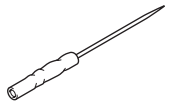
COLUMN SWITCH

SPECIAL TOOLS

M1543100200045

Tool	Number	Name	Use
 MB990784	MB990784	Ornament remover	Removal of column cover

Tool	Number	Name	Use
a  MB991824 b  MB991827 c  MB991910 d  MB991911 e  MB991825 f  MB991826 MB991955	MB991955 a. MB991824 b. MB991827 c. MB991910 d. MB991911 e. MB991825 f. MB991826	M.U.T.-III sub-assembly a. Vehicle Communication Interface (V.C.I.) b. M.U.T.-III USB cable c. M.U.T.-III main harness A (Vehicles with CAN communication system) d. M.U.T.-III main harness B (Vehicles without CAN communication system) e. M.U.T.-III measure adapter f. M.U.T.-III trigger harness	⚠ CAUTION **For vehicles with CAN communication, use M.U.T.-III main harness A to send simulated vehicle speed. If you connect M.U.T.-III main harness B instead, the CAN communication does not function correctly.** Checking ETACS-ECU (service data and diagnosis codes)
a  b  c  d  MB991223	MB991223 a. MB991219 b. MB991220 c. MB991221 d. MB991222	Harness set a. Check harness b. LED harness c. LED harness adapter d. Probe	Continuity check and voltage measurement at harness wire or connector a. For checking connector pin contact pressure b. For checking power supply circuit c. For checking power supply circuit d. For connecting a locally sourced tester

Tool	Number	Name	Use
 MB992006	MB992006	Extra fine probe	Continuity check and voltage measurement at harness wire or connector

TROUBLESHOOTING

DIAGNOSIS TROUBLESHOOTING FLOW

M1543101200037

Refer to GROUP 00 – Contents of Troubleshooting .

DIAGNOSTIC FUNCTION

M1543101300023

HOW TO READ DIAGNOSIS CODE

Use the M.U.T.-III to read diagnosis code (Refer to GROUP 00 – Diagnosis Function).

HOW TO ERASE DIAGNOSIS CODE

Use the M.U.T.-III to erasing diagnosis code (Refer to GROUP 00 – Diagnosis Function).

DIAGNOSIS CODE CHART

M1543100300031

Code No.	Diagnostic item	Reference page
B1763	Column switch abnormality (lighting switch)	P.54A-224
B1764	Column switch abnormality (wiper/washer switch)	

DIAGNOSIS CODE PROCEDURES

Code No.B1763: Column switch abnormality (Lighting switch)
Code No.B1764: Column switch abnormality (Wiper/washer switch)

COMMENTS ON TROUBLE SYMPTOM

- If the ETACS-ECU receives the lighting switch fail signal, the ETACS-ECU stores the diagnosis code No. B1763.
- If the ETACS-ECU receives the wiper/washer switch fail signal, the ETACS-ECU stores the diagnosis code No. B1764.

PROBABLE CAUSES

- Malfunction of the column switch (lighting switch or wiper/washer switch)
- Malfunction of the ETACS-ECU

DIAGNOSIS PROCEDURE

STEP 1. Check whether the diagnosis code is reset.

Check again if the diagnosis code is set to the ETACS-ECU.
(1) Erase the diagnosis code.
(2) Turn the ignition switch from "LOCK" (OFF) position to "ON" position.
(3) On completion, check that the diagnosis code No. B1763 or No. B1764 is reset.

Q: Is the diagnosis code reset?
The diagnosis code is not set. : A poor connection, open circuit or other intermittent malfunction is present in the LIN bus lines between the column switch and the ETACS-ECU (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions).
Diagnosis code No. B1763 is set. : Go to Step 3.
Diagnosis code No. B1764 is set. : Go to Step 2.

STEP 2. Check whether the diagnosis code is reset.

Check again if the diagnosis code is set to the ETACS-ECU.
(1) Replace the windshield wiper and washer switch.
(2) Erase the diagnosis code.
(3) Turn the ignition switch from "LOCK" (OFF) position to "ON" position.
(4) On completion, check that the diagnosis code No. B1764 is reset.

Q: Is the diagnosis code reset?
YES : Go to Step 3.
NO : The procedure is complete.

STEP 3. Check whether the diagnosis code is reset.
Check again if the diagnosis code is set to the ETACS-ECU.
(1) Replace the lighting switch (with built-in column-ECU).
(2) Erase the diagnosis code.
(3) Turn the ignition switch from "LOCK" (OFF) position to "ON" position.
(4) On completion, check that the diagnosis code is reset.

Q: Is the diagnosis code reset?
YES : Return to Step 4.
NO : The procedure is complete.

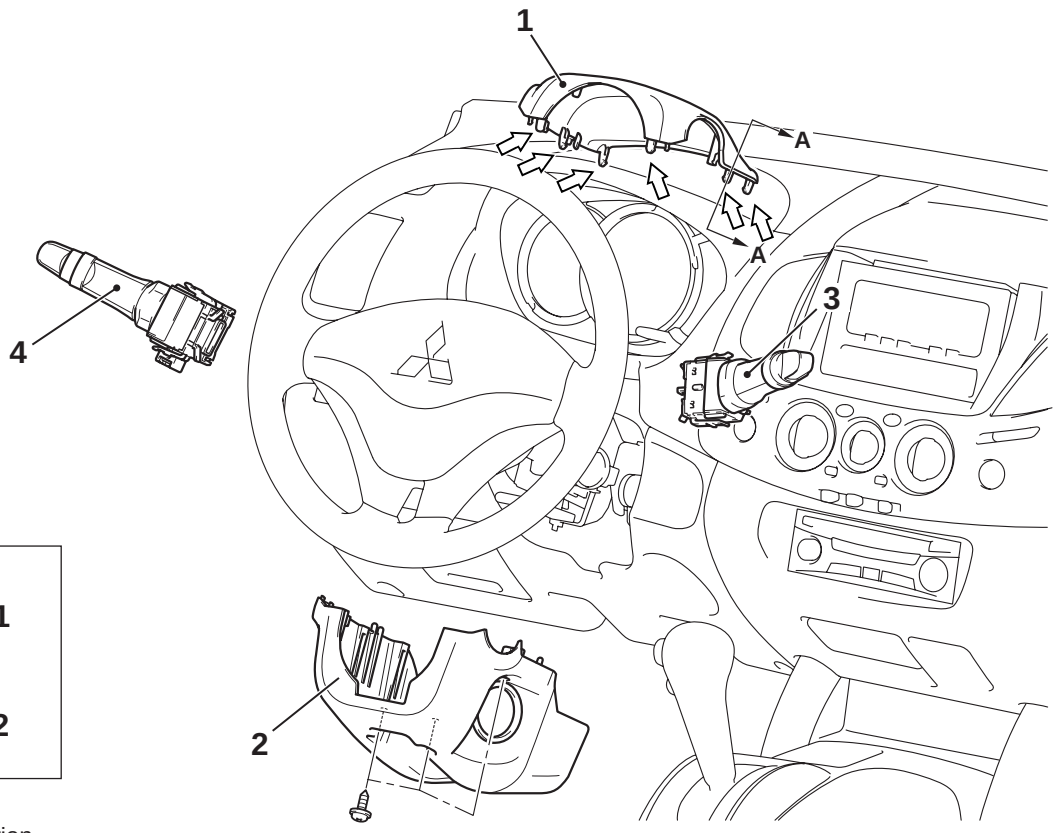
STEP 4. Check whether the diagnosis code is reset.
Check if diagnosis code is reset to the ETACS-ECU.

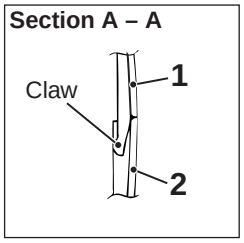
Q: Is the diagnosis code reset?
YES : Replace the ETACS-ECU and register the ID codes (Refer to P.54A-39).
NO : The procedure is complete.

REMOVAL AND INSTALLATION

M1543100700459

LIGHTING SWITCH AND WIPER/WASHER SWITCH





NOTE
⇦ : Claw position

AC509692AB

Removal steps
1. Steering column upper cover (Refer to GROUP 52A, Instrument Panel Assembly).
2. Steering column lower cover (Refer to GROUP 52A, Instrument Panel Assembly).

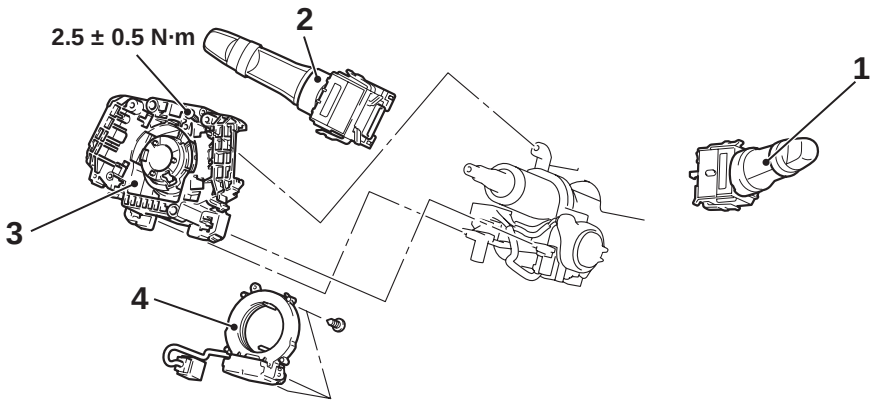
Removal steps (Continued)
3. Windshield wiper and washer switch
4. Lighting switch (with built-in column-ECU)

COLUMN SWITCH BODY

⚠ CAUTION

- **To remove the driver airbag module, refer to GROUP 52B – Service Precautions and Driver/Front Passenger's Air Bag Module and Clock Spring .**
- **After the installation, perform a calibration for the ASC-ECU to learn the steering wheel sensor neutral point. (Refer to GROUP 35C, On-vehicle Service – Steering Wheel Sensor Calibration). <Vehicles with ASTC>**

Pre-removal operation	Post-installation operation
• Check of steering wheel straight-ahead position • Removal of steering wheel assembly (Refer to GROUP 52B – Air Bag Module(s) and Clock Spring .) • Removal of steering column lower cover, steering column upper cover (Refer to GROUP 52A – Instrument Panel Assembly .) • Removal of Clock spring (Refer to GROUP 52B - Driver's Front Passenger's Air Bag Module and Clock Spring).	• Installation of Clock spring (Refer to GROUP 52B - Driver's Front Passenger's Air Bag Module and Clock Spring). • Installation of steering column lower cover, steering column upper cover (Refer to GROUP 52A – Instrument Panel Assembly .) • Installation of steering wheel assembly (Refer to GROUP 52B – Air Bag Module(s) and Clock Spring .) • Check of steering wheel straight-ahead position



AC808093AC

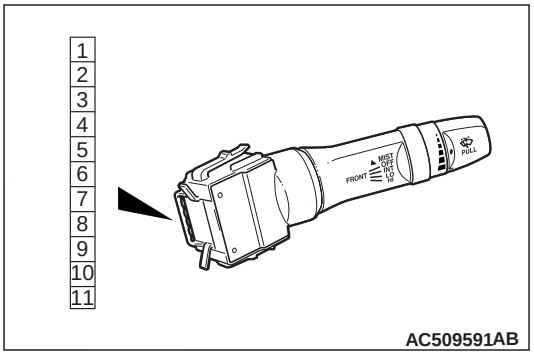
Removal Steps

1. Windshield wiper and washer switch
2. Lighting switch (with built-in column-ECU)
3. Column switch body
4. Steering wheel sensor (Refer to GROUP 35C - Steering wheel sensor). <Vehicles with ASTC>

INSPECTION

WINDSHIELD WIPER AND WASHER SWITCH CONTINUITY CHECK

M1543101500027



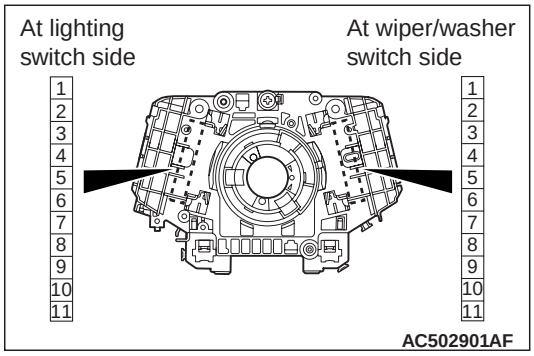
AC509591AB

Switch position		Tester connection	Specified condition
OFF		–	Open circuit
Windshield intermittent wiper interval adjusting knob		6 – 3	Operating the adjusting knob changes the resistance.
Windshield washer switch		6 – 7	Continuity exists (2 Ω or less)
Windshield wiper switch	Hi	6 – 8	Continuity exists (2 Ω or less)
	Lo	6 – 9	Continuity exists (2 Ω or less)
	Int	6 – 10	Continuity exists (2 Ω or less)
	Mist	6 – 11	Continuity exists (2 Ω or less)

COLUMN SWITCH (SWITCH BODY) CONTINUITY CHECK

M1543101000033

1. Remove the lighting switch, wiper and washer switch.
2. Check that there is continuity of each same terminal number (from Nos. 2 to 11) between each connectors of column switch body left in the steering column.

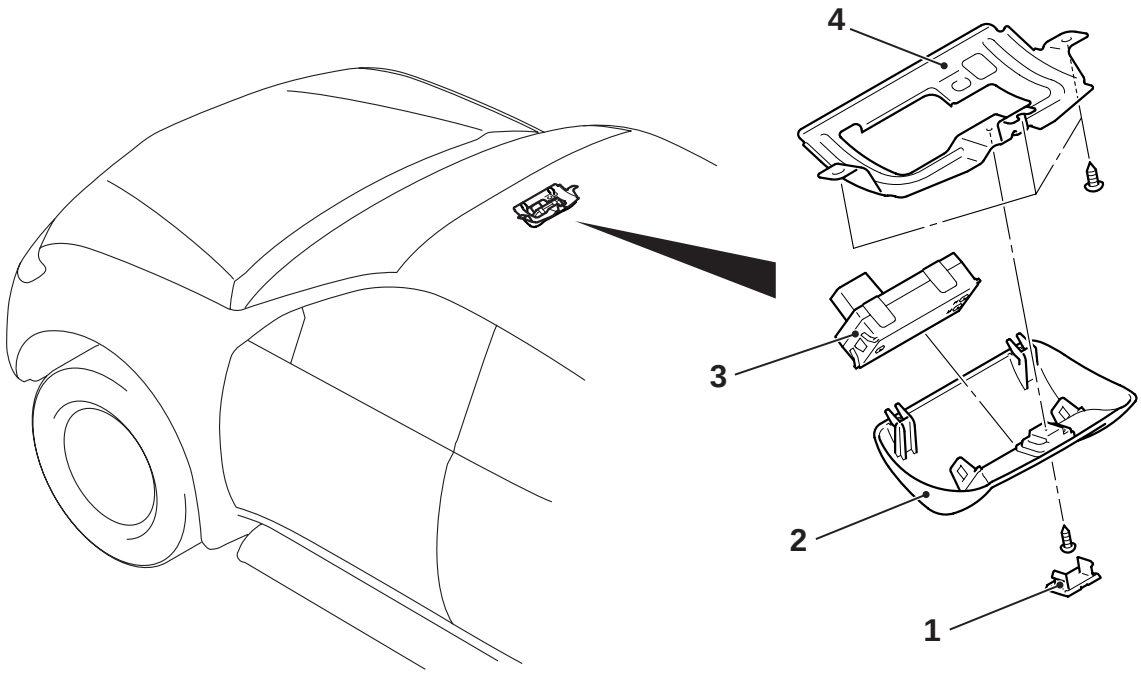


Column switch body	Tester connection	Specified condition
• Lighting switch side connector • Wiper and washer switch side connector	2 – 2 3 – 3 4 – 4 5 – 5 6 – 6 7 – 7 8 – 8 9 – 9 10 – 10 11 – 11	Continuity exists (2 Ω or less)

CLOCK

REMOVAL AND INSTALLATION

M1542700300029



AC502936AB

Removal steps
1. Clock garnish
2. Clock hole cover
3. Digital clock

Removal steps (Continued)
- Headlining (Refer to GROUP 52A, Headlining).

4. Clock bracket

RADIO AND CD PLAYER

GENERAL

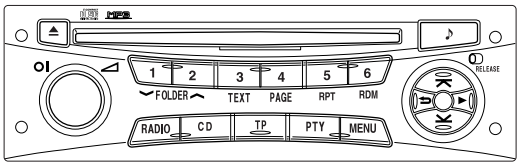
M1544000101520

Two types of 1 DIN size radio and CD player have been established.

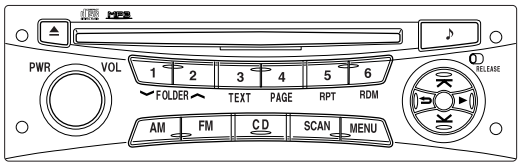
Item	Type 1	Type 2
Radio	AM/FM electronic tuning radio	Lw/MW/FM electronic tuning radio
Compatible with RDS function	–	Equipped
Player	CD player (Compatible with MP3)	CD player (Compatible with MP3)
Power amplifier with radio	35W × 4	35W × 4

CONSTRUCTION DIAGRAM

<Type 1>

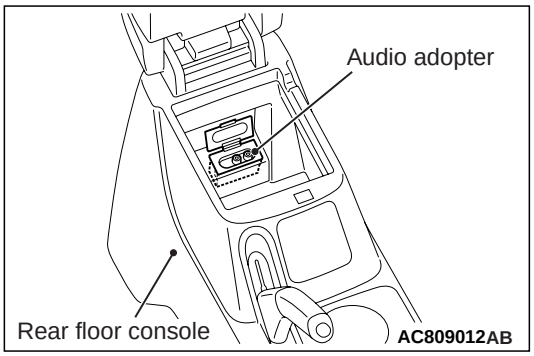


<Type 2>



ACB01704AB

EXTERNAL CONNECTION JACK (AUDIO ADAPTER)

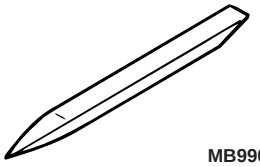


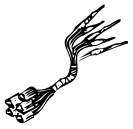
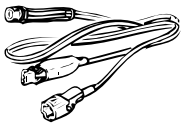
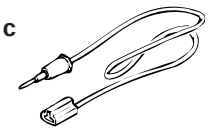
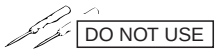
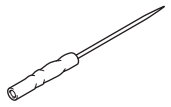
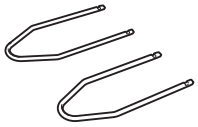
AC809012AB

The external connection jack (audio adapter) has been installed on rear floor console. Therefore, portable music player and so on can be connected.
<Option: vehicles with radio and CD player>

SPECIAL TOOLS

M1542000602782

Tool	Number	Name	Application
 MB990784	MB990784	Ornament remover	Removal of selector panel, instrument centre panel

Tool	Number	Name	Application
a  b  c  d  MB991223	MB991223 a. MB991219 b. MB991220 c. MB991221 d. MB991222	Harness set a. Check harness b. LED harness c. LED harness adapter d. Probe	Continuity check and voltage measurement at harness wire or connector a. For checking connector pin contact pressure b. For checking power supply circuit c. For checking power supply circuit d. For connecting a locally sourced tester
 MB992006	MB992006	Extra fine probe	Continuity check and voltage measurement at harness wire or connector
 MB992279	MB992279	Audio remover and installer	Removal and install of radio and CD player

TROUBLESHOOTING

INTRODUCTION TO AUDIO SYSTEM DIAGNOSIS

M1544018900346

The diagnosis for symptoms such as noise being emitted, no sound being played, or sound coming only out of one speaker (or set of speakers) is provided.

AUDIO ERROR CODES

If the radio and CD player, the iPod or the USB memory device which is connected to the USB box detects any malfunction in itself or the inserted CD, the error codes below will be shown on the RV meter.

RADIO AND CD PLAYER-RELATED ERROR CODE

Error code	Cause	Cause of trouble and its solution
NO DISC	NO disc inserted	Insert disc.
ERROR 001	Focus error	If there is any problem on the CD, this error code will be shown. If no error message appears when another disc is inserted, the disc is defective. Check the items below, and take a necessary action. • Contamination, scratch, or deformation • Formation of moisture or grease Insert the disc again, and check that no error appears.
ERROR 002	Abnormal disc	

Error code	Cause	Cause of trouble and its solution
ERROR 003	Mechanical error	This error codes will be shown if there is any internal mechanical or electrical problem in the radio and CD player. Replace the radio and CD player, and check that no error codes are shown.
ERROR 004	• Power supply error • Communication error • Other errors	Internal malfunction of the radio and CD player Replace the radio and CD player.
ERROR HOT	Protection against high temperature	If the internal temperature is extremely high, this error code will be shown. Turn off the radio and CD player and wait until they cool down. Wait for a while, and then turn on the unit again. Check that the same error does not appear.

iPod-RELATED ERROR CODE

Error code	Cause	Cause of trouble and its solution
NO SONG	No playable music file is found.	No playable music file is stored in the iPod. Store music files to the iPod.
VERSION ERROR	iPod cannot be recognized	iPod itself or software is not supported. Use the supported iPod.
USB BUS POWER	Overcurrent abnormality	There is a communication error with the USB box or hands free ECU. Carry out the troubleshooting of "The USB memory device data cannot be replayed". (Refer to P.54A-435 <USB box> or P.54A-414 <hands free ECU>.)
USB LSI ERROR	USB box or hands free ECU internal error	This error code will be shown when there is a problem in the USB box or hands free ECU. Replace the USB box or hands free ECU.
CONNECT RETRY	iPod cannot be authenticated.	iPod is not authenticated. Reconnect. If the error code is not erased after that, the USB box or hands free ECU communication may have a problem. Carry out the troubleshooting of "The USB adapter data cannot be replayed". (Refer to P.54A-435 <USB box> or P.54A-414 <hands free ECU>.)

USB MEMORY DEVICE-RELATED ERROR CODE

Error code	Cause	Cause of trouble and its solution
NO SONG	No playable music file is found.	No playable music file is stored in the USB memory device. Store music files to the USB memory device.
USB FILE ERROR	Playback of unplayable file (copyright protected file, etc.) is attempted.	Displayed when the playback of unplayable file such as a copyright protected file is attempted. The error code is displayed approximately for 3 seconds, and then a next playable file is played automatically.
UNSUPPORTED FORMAT	Unsupported format	The USB memory device is not supported by the USB box or hands free ECU. Use the supported USB memory device.

Error code	Cause	Cause of trouble and its solution
USB BUS POWER	Overcurrent abnormality	There is a communication error with the USB box or hands free ECU. Carry out the troubleshooting of "The USB memory device data cannot be replayed". (Refer to P.54A-435 <USB box> or P.54A-414 <hands free ECU>.)
USB LSI ERROR	USB box or hands free ECU internal error	This error code will be shown when there is a problem in the USB box or hands free ECU. Replace the USB box or hands free ECU.
CONNECT RETRY	USB memory device cannot be authenticated.	USB memory device is not authenticated. Reconnect. If the error code is not erased after that, the USB box or hands free ECU communication may have a problem. Carry out the troubleshooting of "The USB adapter data cannot be replayed". (Refer to P.54A-435 <USB box> or P.54A-414 <hands free ECU>.)

TROUBLESHOOTING

M1544000700240

Use these steps to plan your diagnostic strategy. Follow through with each step to ensure that you have exhausted all possible methods of finding an audio system fault.

1. Gather information from the customer.
2. Verify that the condition described by the customer exists.
3. Find the malfunction by following the Symptom Chart.
4. Verify that the malfunction is eliminated.

STANDARD FLOW OF DIAGNOSIS TROUBLESHOOTING

Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points, Inspection Service Points for a Blown Fuse .

TROUBLE SYMPTOM CHART

M1544004902673

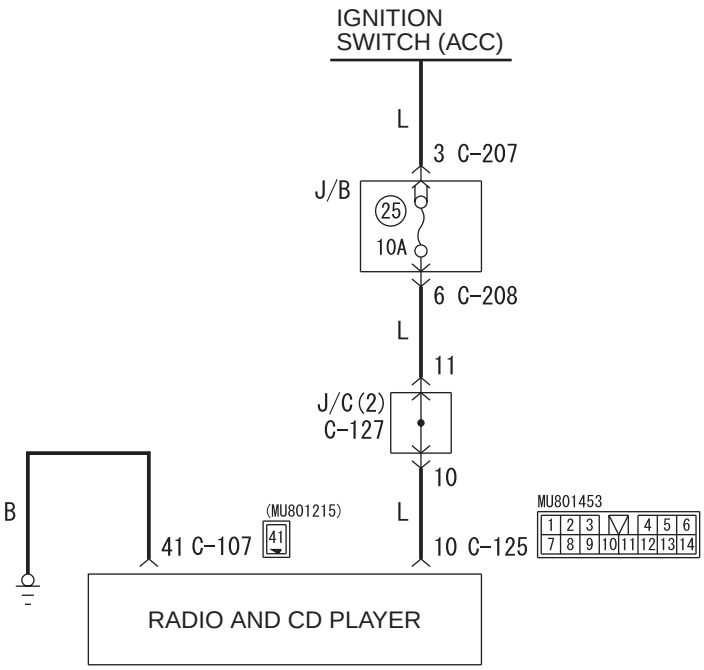
Symptom		Inspection Procedure No.	Reference Page
Power of radio and CD player does not turn ON when the ignition switch is in the "ACC" position or "ON" position.		1	P.54A-234
No sound is heard. <Vehicles without audio amplifier>		2	P.54A-239
No sound is heard. <Vehicles with audio amplifier>			P.54A-245
No sound is heard from one of the speaker. <Vehicles without audio amplifier>		3	P.54A-256
No sound is heard from one of the speaker. <Vehicles with audio amplifier>			P.54A-265
The sound of external input are not played.		4	P.54A-276
Noise	Noise appears at certain places when travelling.	5	P.54A-279
	Mixed with noise, only at night.	6	P.54A-279
	Broadcasts can be heard but both AM and FM have a lot of Noise.	7	P.54A-280
	Broadcasts can be heard but Both LW/MW/FM have a lot of noise.		P.54A-280
	There is noise when starting the engine.	8	P.54A-282
	Some noise appears when there is vibration or shocks during travelling.	9	P.54A-284
	Ever-present noise.	10	P.54A-285

Symptom		Inspection Procedure No.	Reference Page
Radio	There is noise but no reception for both AM and FM or no sound from AM, or No sound from FM.	11	P.54A-285
	There is Noise but No Reception for LW/MW/FM or No Sound from LW/MW/FM.		P.54A-285
	Poor reception.	12	P.54A-286
	Distortion on LW/MW/FM.	13	P.54A-287
	Using the auto select function, too few automatic stations are selected.	14	P.54A-287
	Preset stations are erased.	15	P.54A-289
CD player	CD can not be inserted.	16	P.54A-292
	No sound (CD only).	17	P.54A-292
	CD sound skips.	18	P.54A-293
	Sound quality is poor.	19	P.54A-293
	CD cannot be ejected.	20	P.54A-293

SYMPTOM PROCEDURES

Inspection Procedure 1: Power of radio and CD player does not turn ON when the ignition switch is in the "ACC" position or "ON" position.

Radio and CD Player Power Source Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver W9C54E002A

COMMENTS ON TROUBLE SYMPTOM

The cause is probably a faulty radio and CD player power supply circuit system.

PROBABLE CAUSES

- Damaged wiring harness or connector.
- Malfunction of radio and CD player.

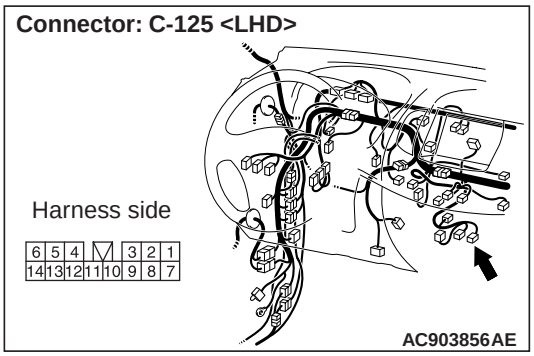
DIAGNOSIS PROCEDURE

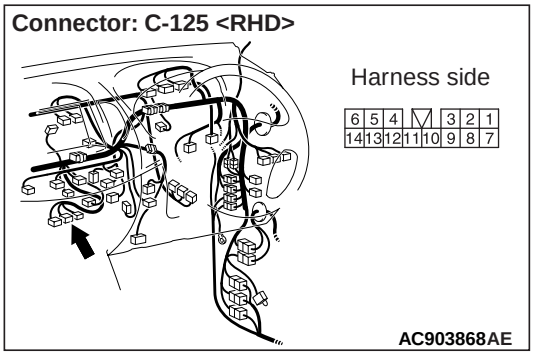
STEP 1. Check to see that the power turns ON when the power switch is turned ON.

(1) Turn the ignition switch to "ACC" position.
(2) Turn ON the radio and CD player power switch.

Q: Is it possible to put the radio and CD player power in the "ON" position?
YES : Go to Step 2.
NO : Go to Step 8.

STEP 2. Connector check: radio and CD player connector C-125.



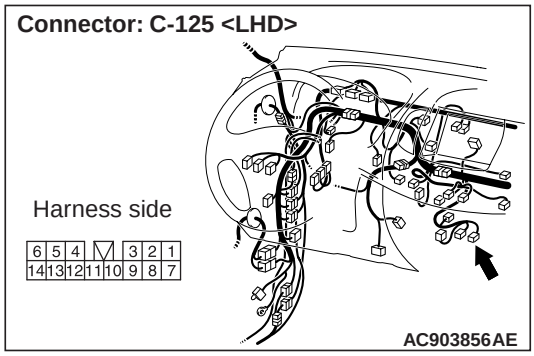


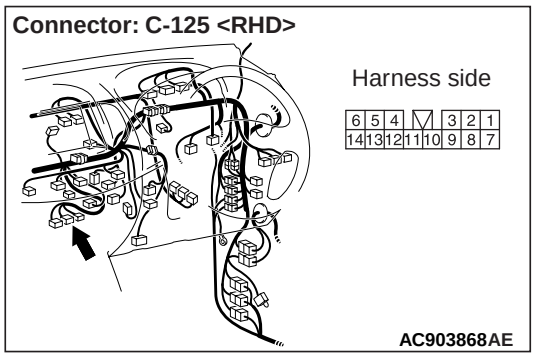
Q: Is radio and CD player connector C-125 in good condition?

YES : Go to Step 3.

NO : Repair or replace the component(s). If the power switch is turned on, the radio and CD player should operate normally.

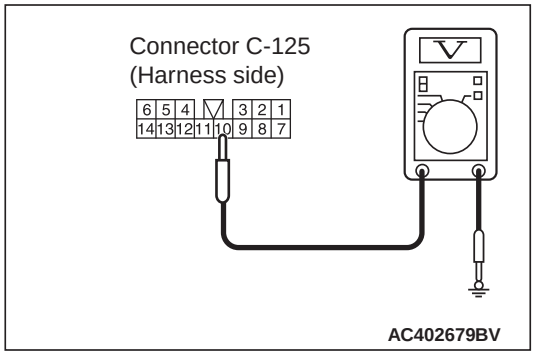
STEP 3. Voltage measurement at radio and CD player connector C-125 in order to check the battery circuit of power supply system to the radio and CD player (ignition switch ACC).





(1) Disconnect radio and CD player connector C-125, and measure at the wiring harness side.

(2) Turn the ignition switch to "ACC" position.



(3) Measure the voltage between terminal 10 and earth.

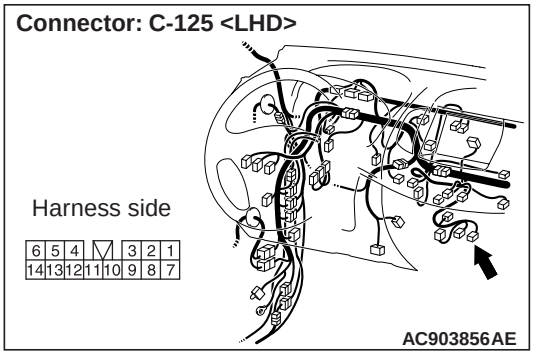
OK: System voltage

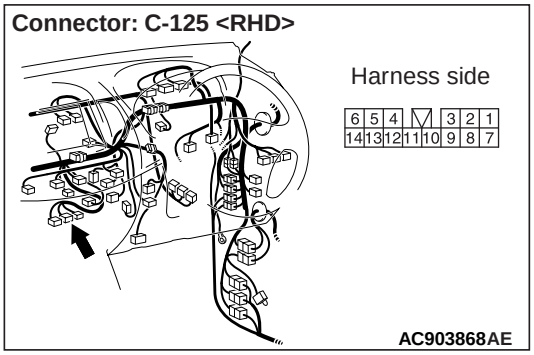
Q: Is the check result normal?

YES : Go to Step 5.

NO : Go to Step 4.

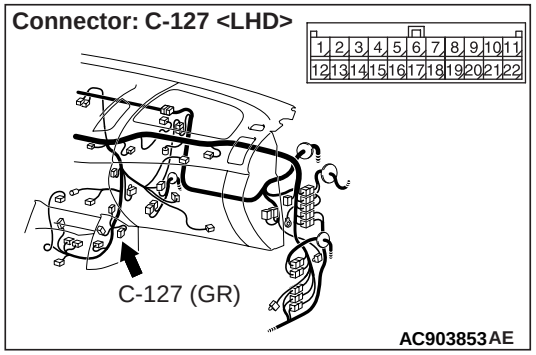
STEP 4. Check the wiring harness between radio and CD player connector C-125 (terminal 10) and ignition switch (ACC).

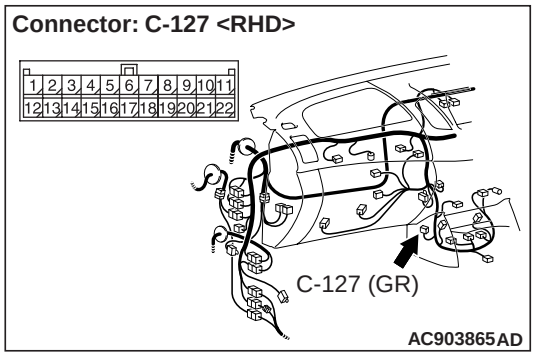


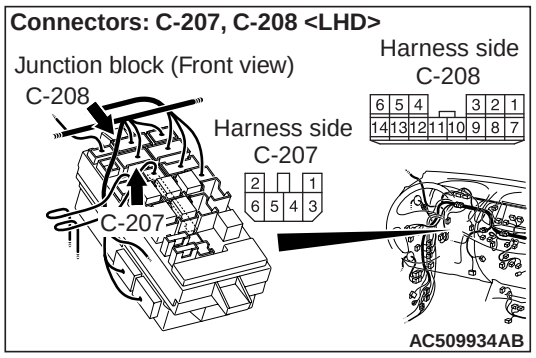


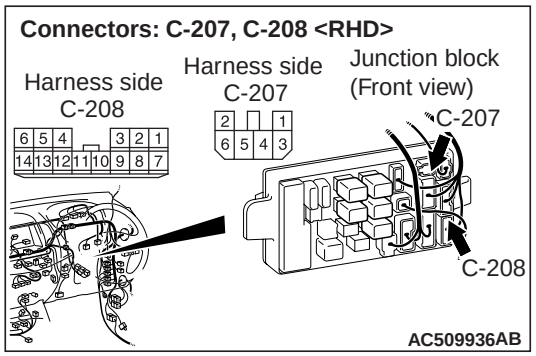
- Check the power supply line for open circuit and short circuit.

NOTE:





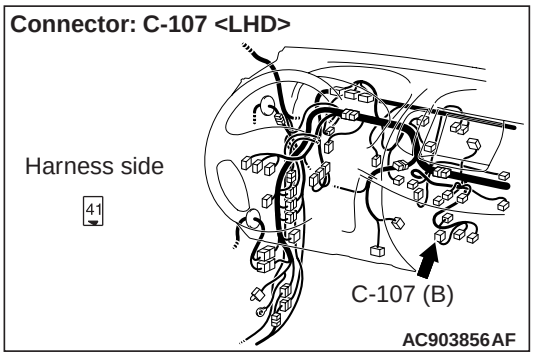


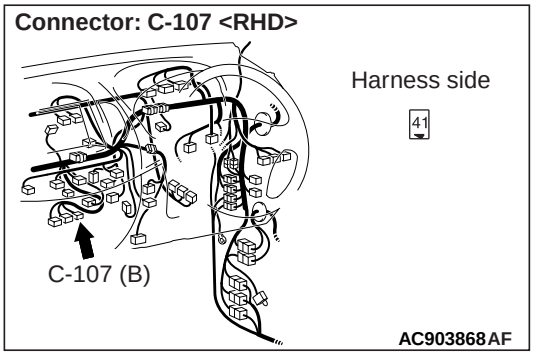


Prior to the wiring harness inspection, check joint connector C-127 and junction block connectors C-207, C-208, and repair if necessary.

Q: Are the wiring harnesses between radio and CD player connector C-125 (terminal 10) and ignition switch (ACC) in good condition?
YES : Refer to ignition switch (P.54A-22).
NO : Repair or replace the damage component(s). If the power switch is turned on, the radio and CD player should operate normally.

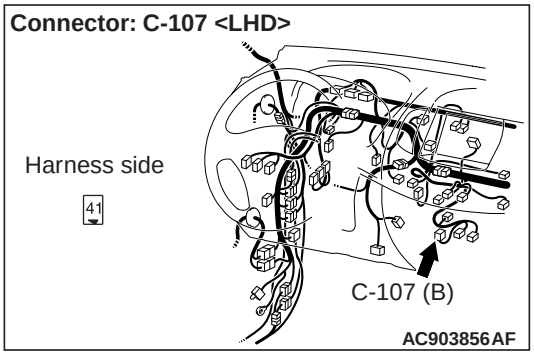
STEP 5. Connector check: C-107 radio and CD player connector

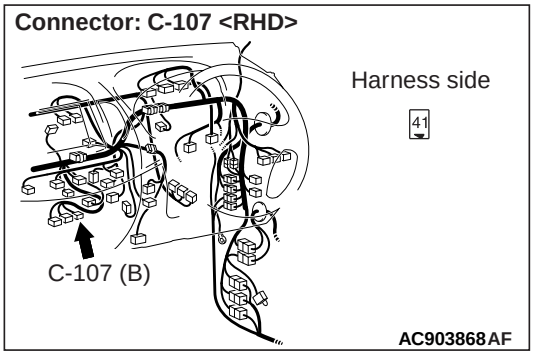




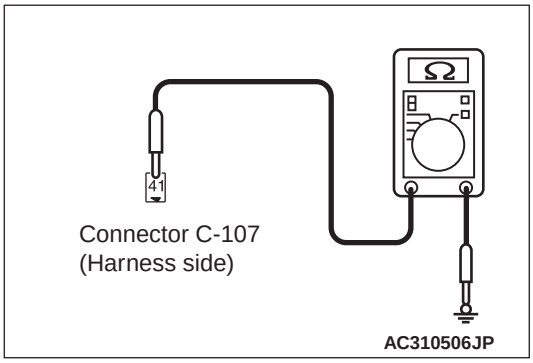
Q: Is the check result normal?
YES : Go to Step 6.
NO : Repair the defective connector.

STEP 6. Resistance measurement at C-107 radio and CD player connector





(1) Disconnect the connector, and measure at the wiring harness side.

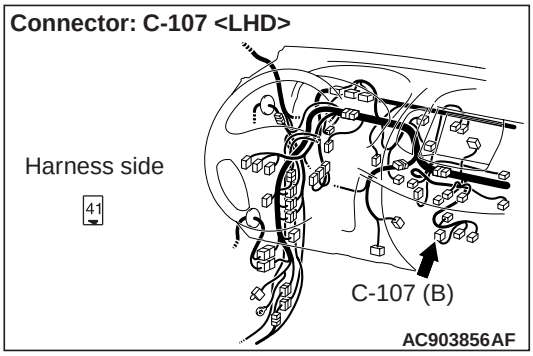


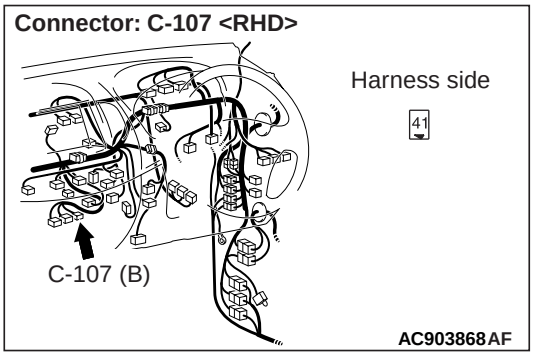
(2) Check the continuity between C-107 radio and CD player connector terminal No.41 and the body earth.

OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?
YES : Go to Step 8.
NO : Go to Step 7.

STEP 7. Check the harness wire between C-107 radio and CD player terminal No.41 and the body earth





- Check the earth wires for open circuit.

Q: Is the check result normal?
YES : Go to Step 8.
NO : Repair the wiring harness.

STEP 8. Replace the radio and CD player temporarily, and check the trouble symptom.
Replace the radio and CD player temporarily, and check that the sound is output from the speaker.

Q: Is the check result normal?

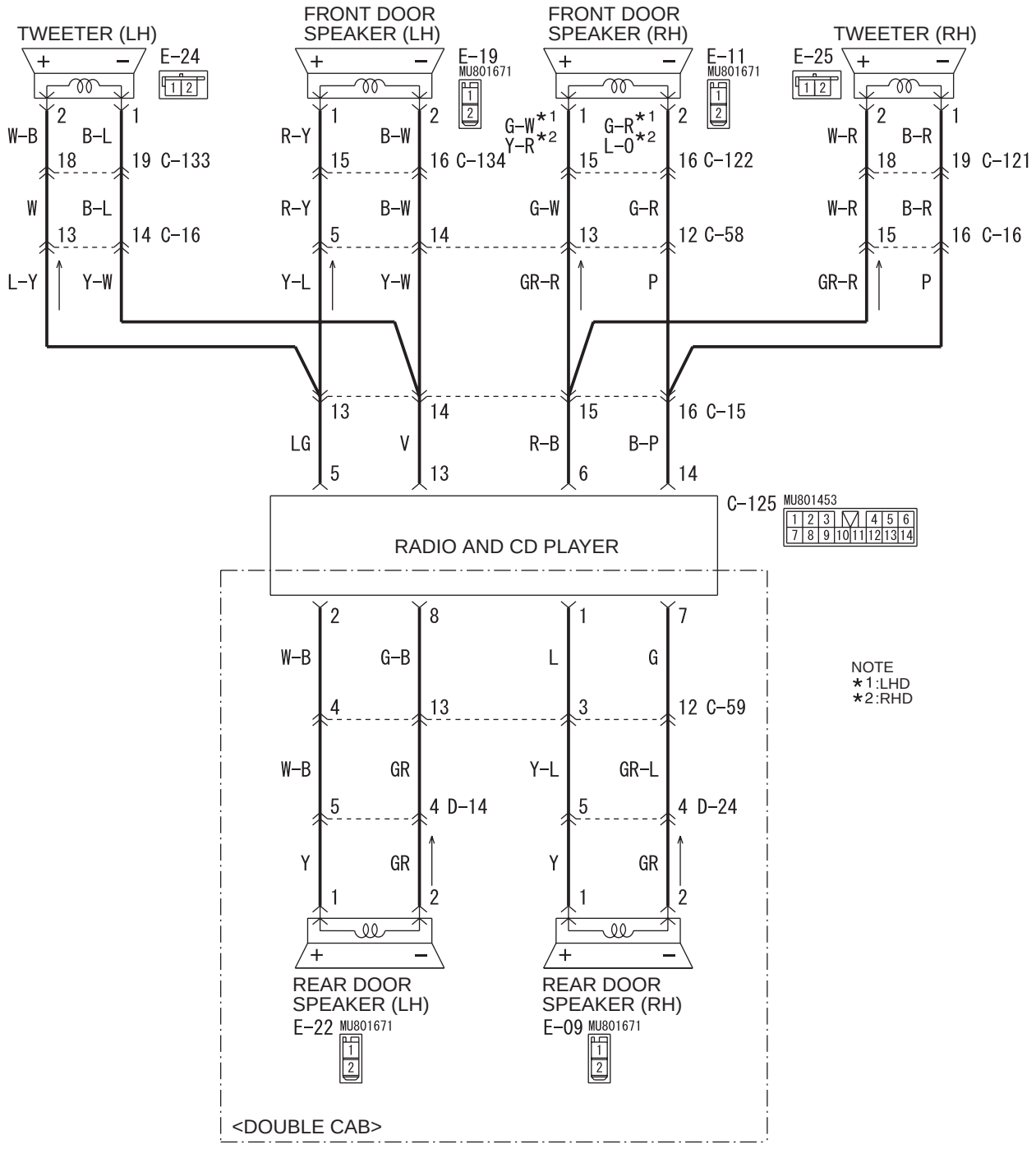
YES : Replace the radio and CD player.
NO : Perform the diagnosis again. Go to Step 1.

Inspection Procedure 2: No sound is heard. <Vehicles without audio amplifier>

⚠ CAUTION

Before replacing the radio and CD player, ensure that the power supply circuit, the earth circuit and the communication circuit are normal.

Speaker System Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

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COMMENTS ON TROUBLE SYMPTOM

If the audio sound is not output, the radio and CD player may have a problem. In addition, if any of the speakers is short-circuited, the protection circuit inside the radio and CD player disables all the speakers to sound. Therefore, if all the speakers do not output sound, the speaker circuit may be shorted or the speaker may be defective.

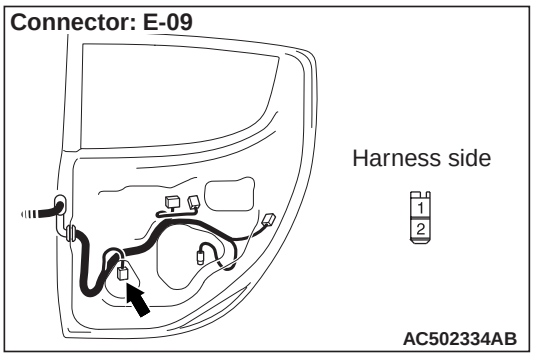
PROBABLE CAUSES

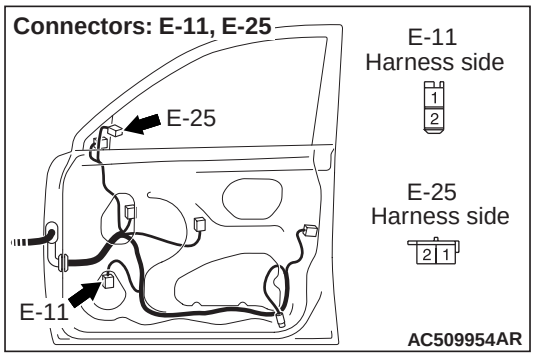
- Malfunctions of radio and CD player
- Malfunction of speaker or tweeter
- Damaged harness wires and connectors

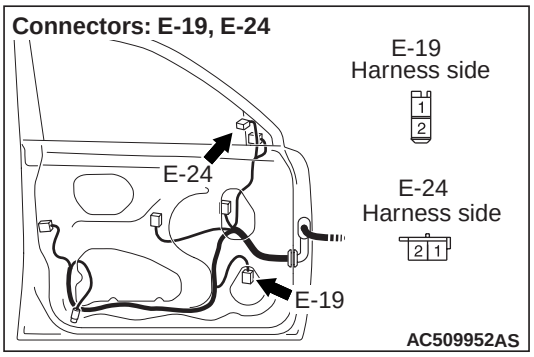
DIAGNOSIS PROCEDURE

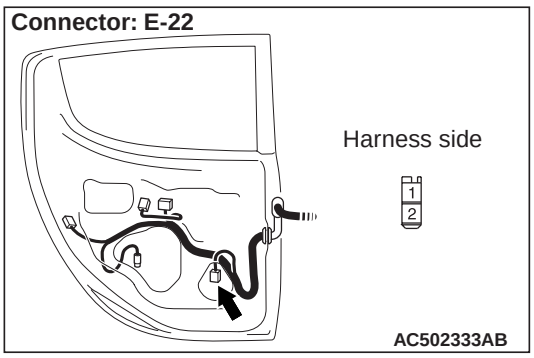
STEP 1. Check the following connectors.

Check the following connectors:







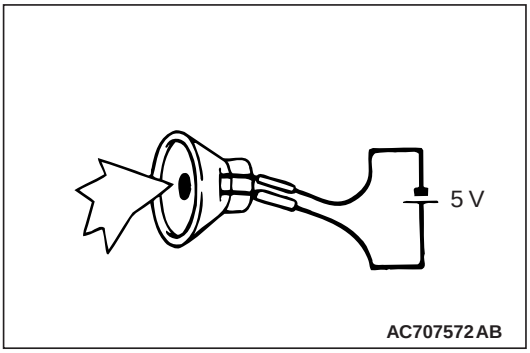


- E-19 front door speaker (LH) connector
- E-11 front door speaker (RH) connector
- E-24 tweeter (LH) connector
- E-25 tweeter (RH) connector
- E-22 rear door speaker (LH) connector <double cab>
- E-09 rear door speaker (RH) connector <double cab>

Q: Are all the connectors in good condition?
YES : Go to Step 2.
NO : Repair the defective connector.

STEP 2. Check the speaker or tweeter.

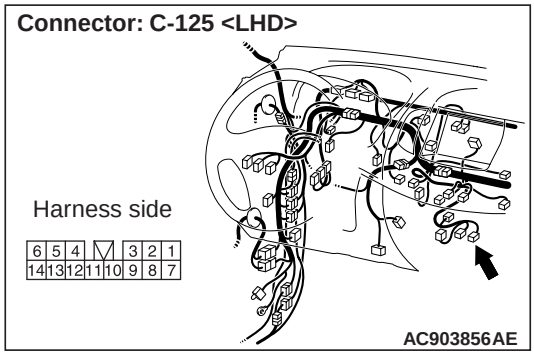
(1) Remove the speaker or tweeter. Refer to P.54A-445.

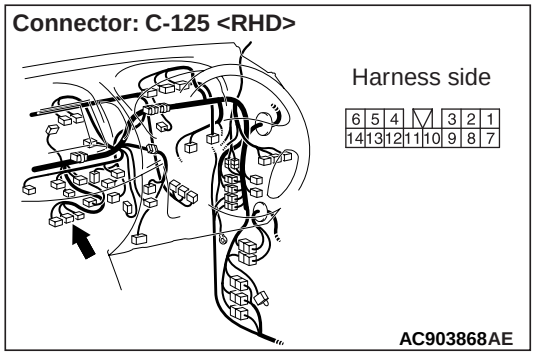


(2) Check that the speaker or tweeter outputs the noise when the voltage of 5 V is applied to the speaker or tweeter connector terminal.

Q: Do the speaker or tweeter output the noise?
YES : Go to Step 3.
NO : Replace the speaker or tweeter.

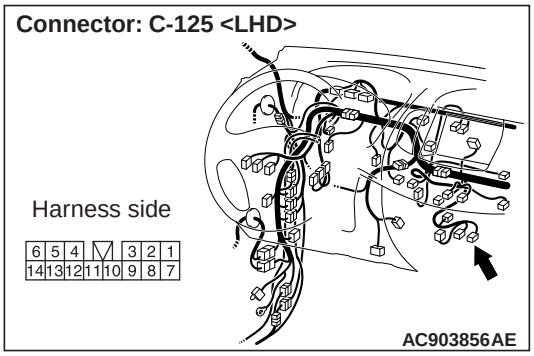
STEP 3. Connector check: C-125 radio and CD player connector

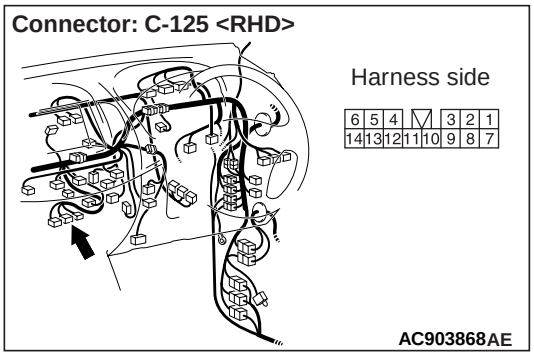


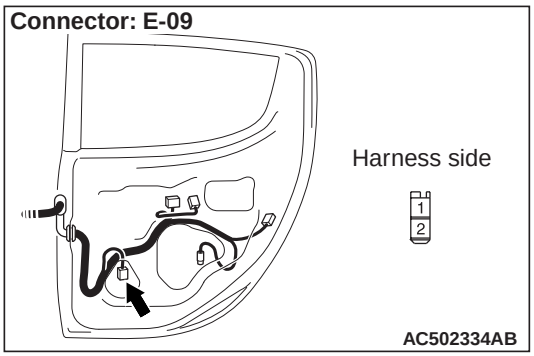


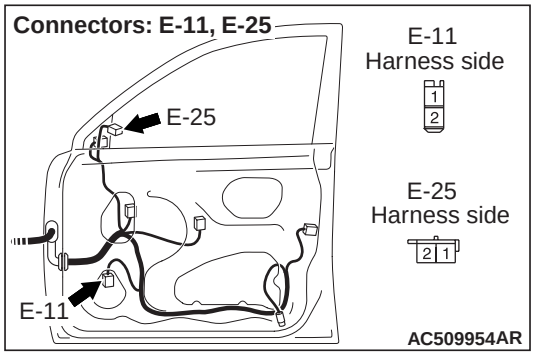
Q: Is the check result normal?
YES : Go to Step 4.
NO : Repair the defective connector.

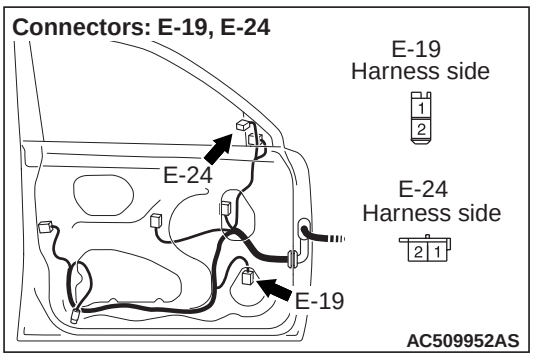
STEP 4. Check the wiring harness between the speaker or tweeter connector terminal and the radio and CD player connector terminal.
Check the communication lines for short circuit.

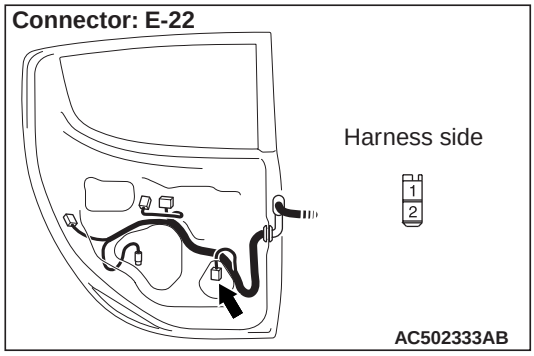












- <Front door speaker (LH), tweeter (LH)> Check the wiring harness between E-19 front door speaker (LH) connector terminal No.1, 2 or E-24 tweeter (LH) connector terminal No.2, 1 and C-125 radio and CD player connector terminal No.5, 13.

NOTE: Prior to the wiring harness inspection, check intermediate connectors C-15, C-16, C-58, C-133 and C-134, and repair if necessary.

- <Front door speaker (RH), tweeter (RH)> Check the wiring harness between E-11 front door speaker (RH) connector terminal No.1, 2 or E-25 tweeter (RH) connector terminal No.2, 1 and C-125 radio and CD player connector terminal No.6, 14.

NOTE: Prior to the wiring harness inspection, check intermediate connectors C-15, C-16, C-58, C-121 and C-122, and repair if necessary.

- <Rear door speaker (LH)> Check the wiring harness between E-22 rear door speaker (LH) connector terminal No.1, 2 and C-125 radio and CD player connector terminal No.2, 8.

NOTE: Prior to the wiring harness inspection, check intermediate connectors C-59 and D-14, and repair if necessary.

- <Rear door speaker (RH)> Check the wiring harness between E-09 rear door speaker (RH) connector terminal No.1, 2 and C-125 radio and CD player connector terminal No.1, 7.

NOTE: Prior to the wiring harness inspection, check intermediate connectors C-59 and D-24, and repair if necessary.

Q: Is the check result normal?
YES : Go to Step 5.
NO : Repair the wiring harness.

STEP 5. Retest the system
Check if the sound is output from all the speakers.

Q: Is the check result normal?

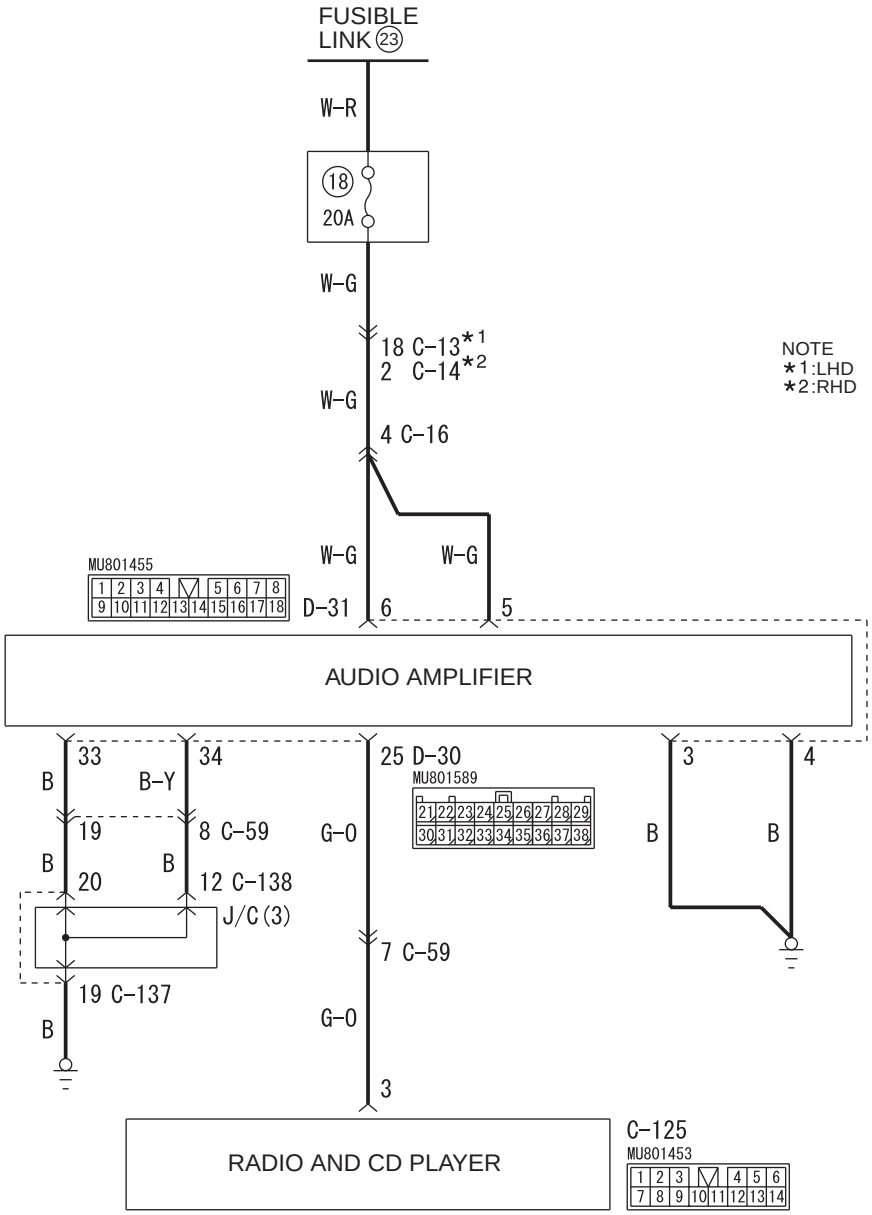
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

NO : Replace the radio and CD player.

Inspection Procedure 2: No sound is heard. <Vehicles with audio amplifier>

⚠ CAUTION
Before replacing the radio and CD player or audio amplifier, ensure that the power supply circuit, the earth circuit and the communication circuit are normal.

Audio System Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

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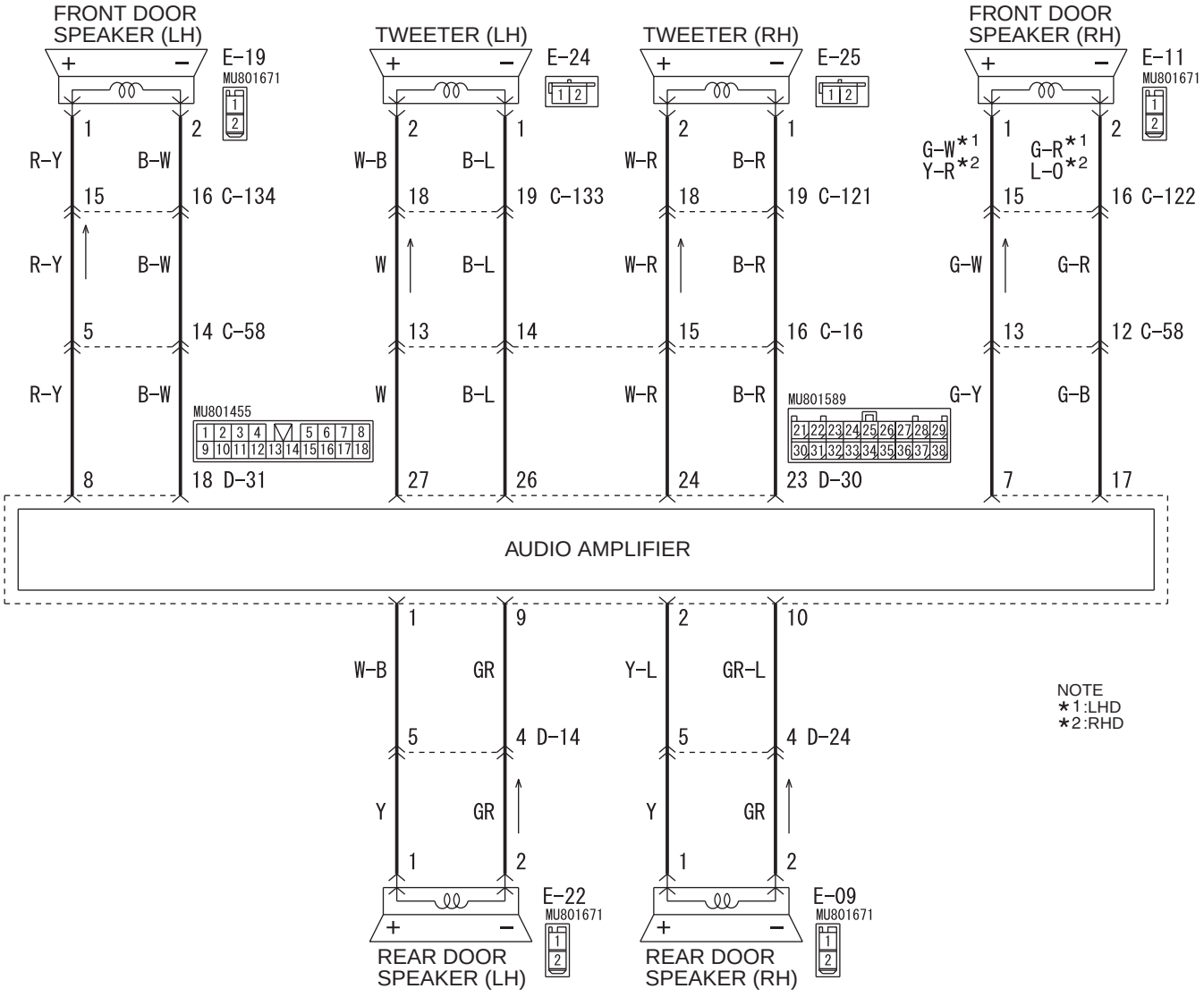
Speaker System Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

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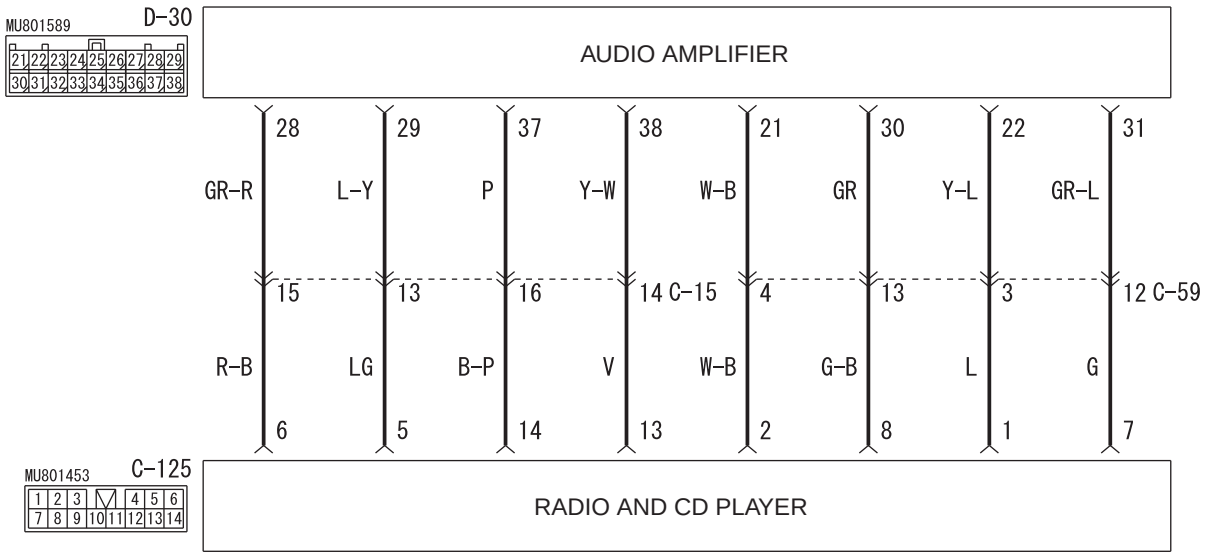
Audio Amplifier System Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

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COMMENTS ON TROUBLE SYMPTOM

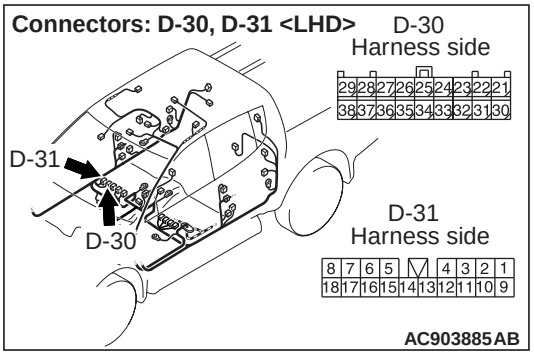
If the audio sound is not output, the radio and CD player, audio amplifier, or power supply circuit of audio amplifier may have a problem. In addition, if any of the speakers is short-circuited, the protection circuit inside the radio and CD player disables all the speakers to sound. Therefore, if all the speakers do not output sound, the speaker circuit may be shorted or the speaker may be defective.

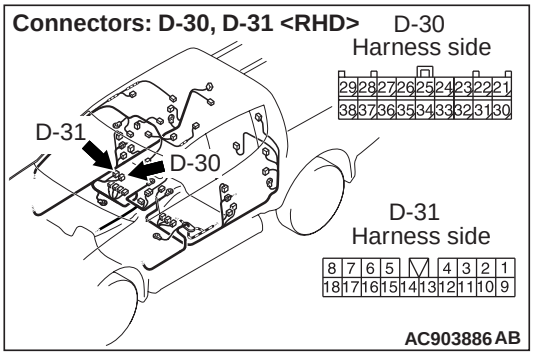
PROBABLE CAUSES

- Malfunction of radio and CD player
- Malfunction of audio amplifier
- Malfunction of speaker or tweeter
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. Connector check: D-30, D-31 audio amplifier connector



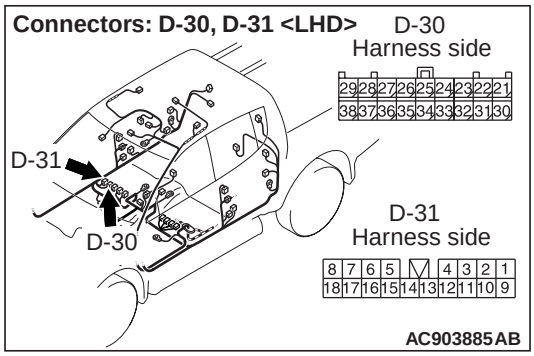


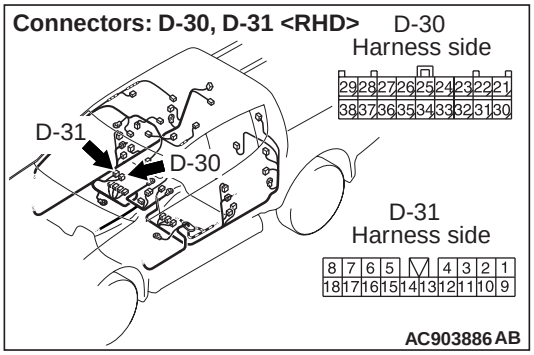
Q: Is the check result normal?

YES : Go to Step 2.

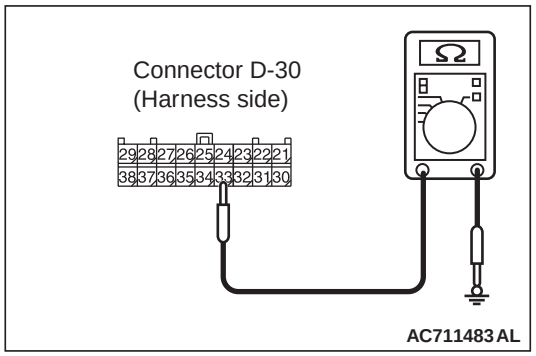
NO : Repair the defective connector.

STEP 2. Resistance measurement at D-30, D-31 audio amplifier connector



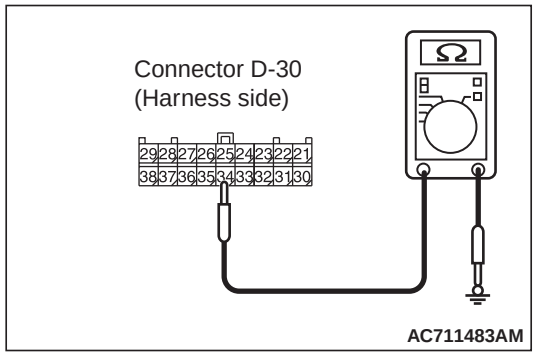


(1) Disconnect the connector, and measure at the wiring harness side.



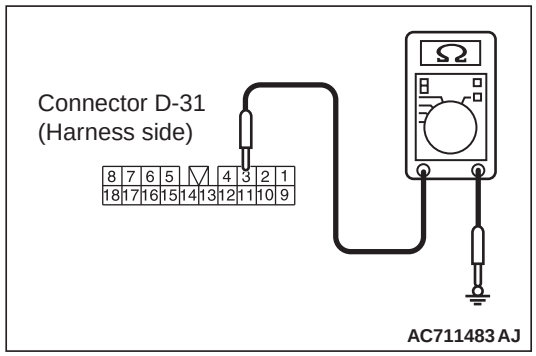
(2) Measure the resistance between D-30 audio amplifier connector terminal No.33 and the body earth.

OK: Continuity exists (2 Ω or less)



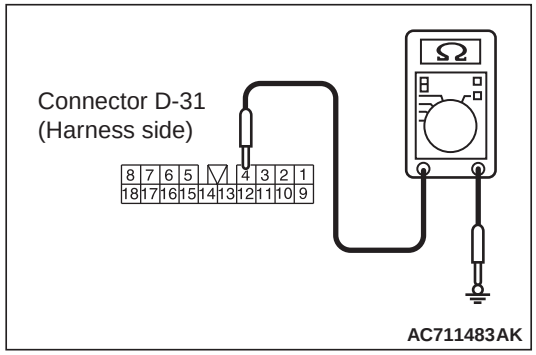
(3) Measure the resistance between D-30 audio amplifier connector terminal No.34 and the body earth.

OK: Continuity exists (2 Ω or less)



(4) Measure the resistance between D-31 audio amplifier connector terminal No.3 and the body earth.

OK: Continuity exists (2 Ω or less)

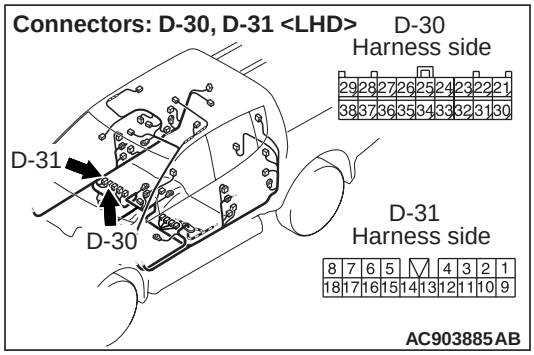


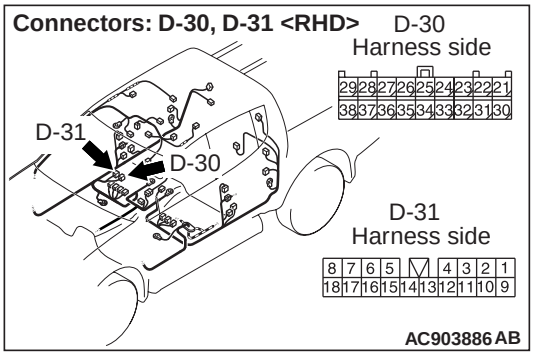
(5) Measure the resistance between D-31 audio amplifier connector terminal No.4 and the body earth.

OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?
YES : Go to Step 4.
NO : Go to Step 3.

STEP 3. Check the wiring harness between the D-30 audio amplifier connector terminal No.33, 34 or D-31 audio amplifier connector terminal No.3, 4 and the body earth



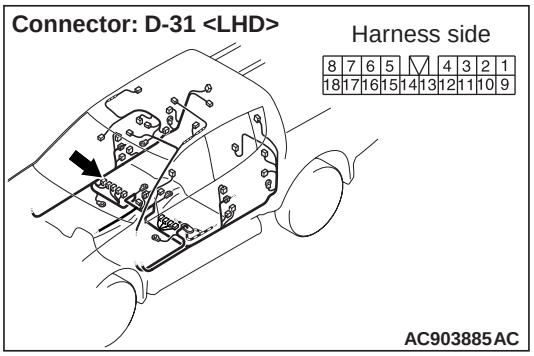


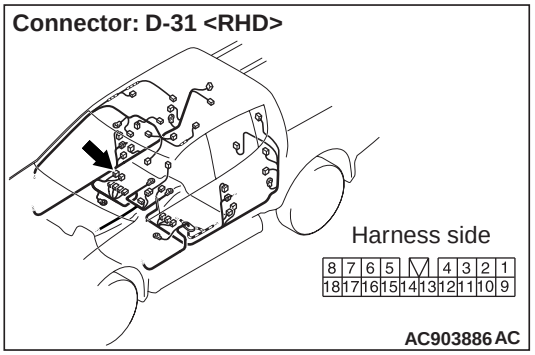
- Check the earth wires for open circuit.

NOTE: Prior to the wiring harness inspection, check intermediate connector C-59, joint connectors C-137 and C-138, and repair if necessary.

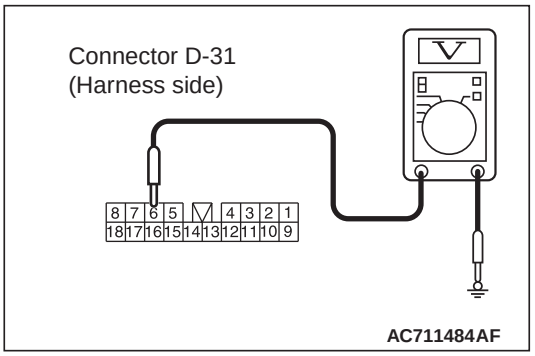
Q: Is the check result normal?
YES : Go to Step 4.
NO : Repair the wiring harness.

STEP 4. Voltage measurement at D-31 audio amplifier connector



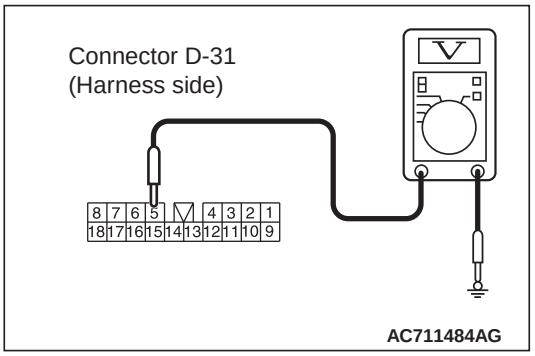


(1) Disconnect the connector, and measure at the wiring harness side.



(2) Voltage between D-31 audio amplifier connector terminal No.5 and the body earth

OK: System voltage



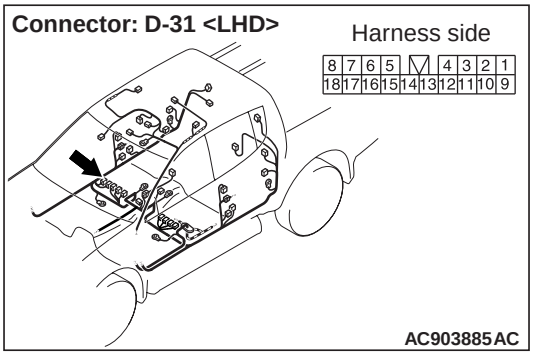
(3) Voltage between D-31 audio amplifier connector

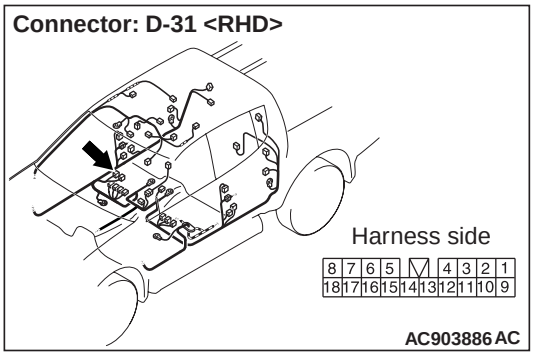
terminal No.6 and the body earth

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 6.
NO : Go to Step 5.

STEP 5. Check the wiring harness between D-31 audio amplifier connector terminal No.5, 6 and fusible link No.23.



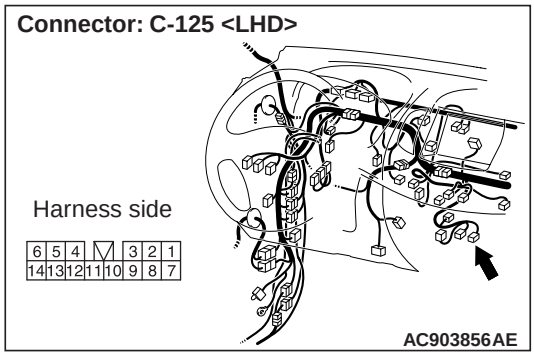


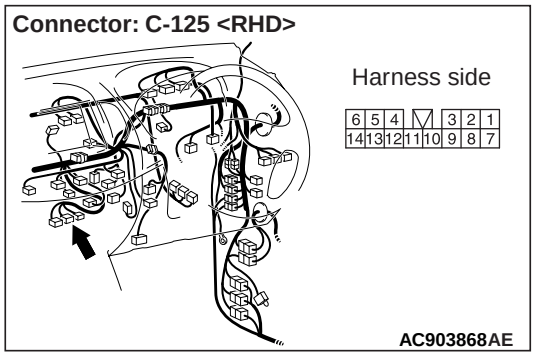
- Check the power supply lines for open circuit and short circuit.

NOTE: Prior to the wiring harness inspection, check intermediate connectors C-16, C-13 <LHD> and C-14 <RHD>, and repair if necessary.

Q: Is the check result normal?
YES : Go to Step 6.
NO : Repair the wiring harness.

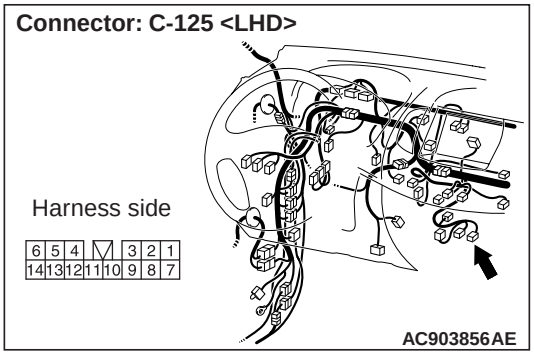
STEP 6. Connector check: C-125 radio and CD player connector

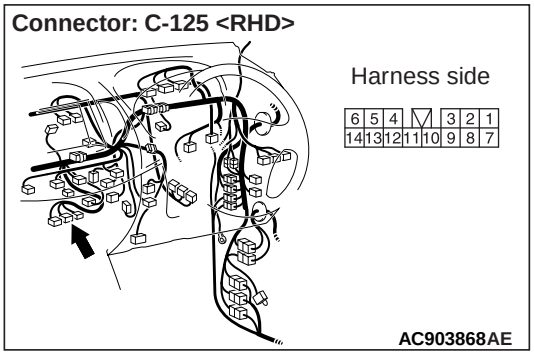


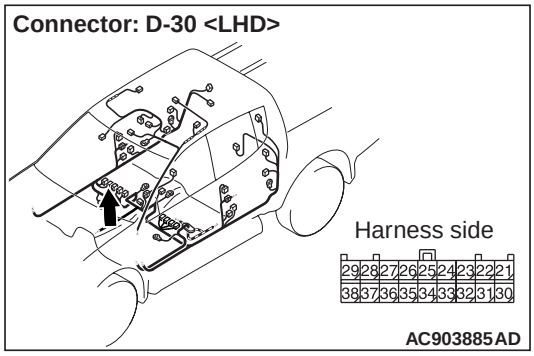


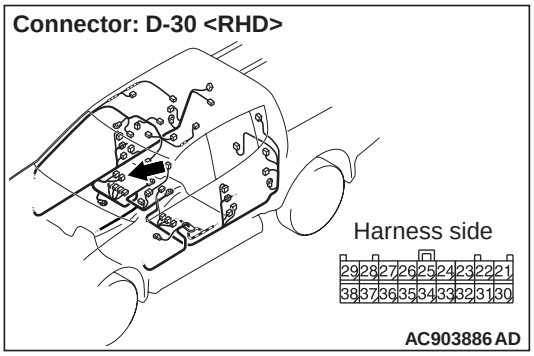
Q: Is the check result normal?
YES : Go to Step 7.
NO : Repair the defective connector.

STEP 7. Check the wiring harness between C-125 radio and CD player connector terminal No.3 and D-30 audio amplifier connector No.25.







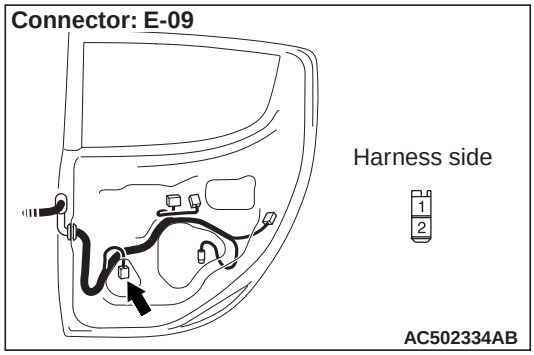


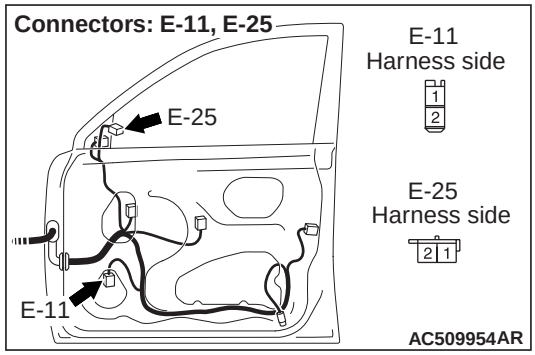
- Check the communication line for open circuit and short circuit.

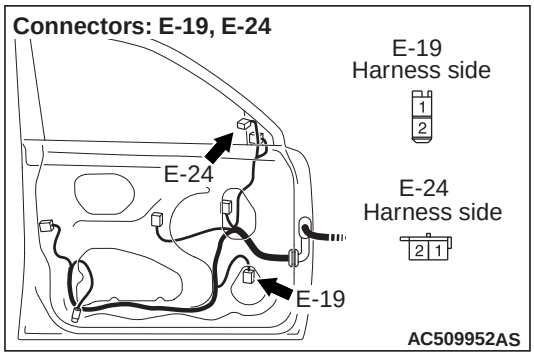
NOTE: Prior to the wiring harness inspection, check intermediate connector C-59, and repair if necessary.

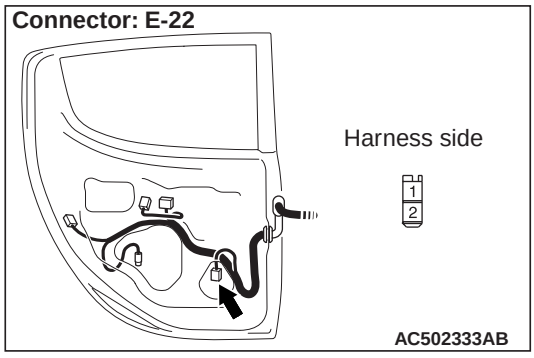
Q: Is the check result normal?
YES : Go to Step 8.
NO : Repair the wiring harness.

STEP 8. Check the following connectors.
Check the following connectors:







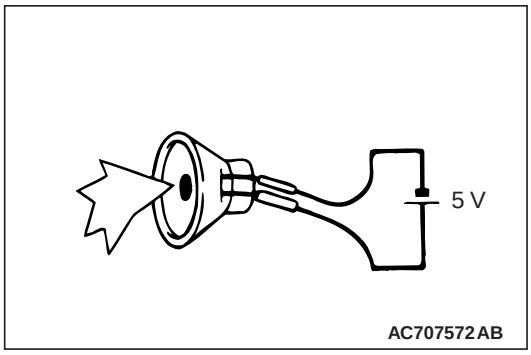


- E-19 front door speaker (LH) connector
- E-11 front door speaker (RH) connector
- E-22 rear door speaker (LH) connector
- E-09 rear door speaker (RH) connector
- E-24 tweeter (LH) connector
- E-25 tweeter (RH) connector

Q: Are all the connectors in good condition?
YES : Go to Step 9.
NO : Repair the defective connector.

STEP 9. Check the speaker or tweeter.

(1) Remove the speaker or tweeter. Refer to P.54A-445.



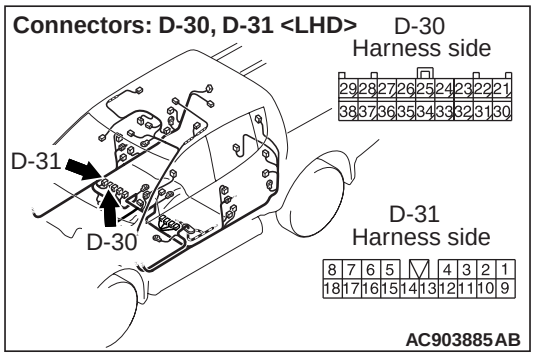
(2) Check that the speaker or tweeter outputs the noise when the voltage of 5 V is applied to the speaker or tweeter connector terminal.

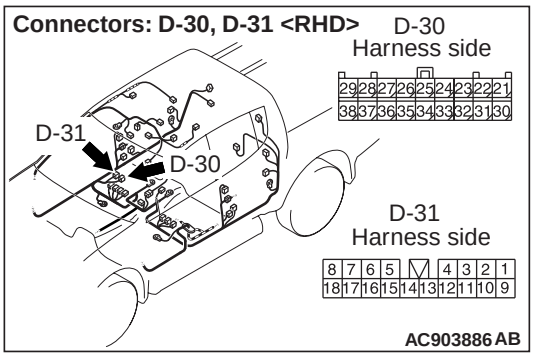
Q: Do the speaker or tweeter output the noise?

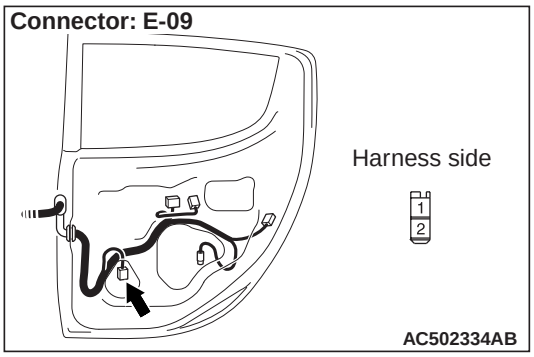
YES : Go to Step 10.

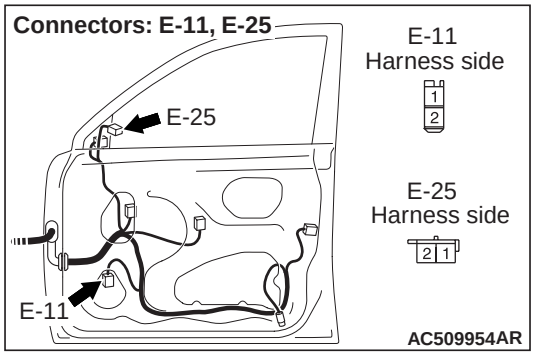
NO : Replace the speaker or tweeter.

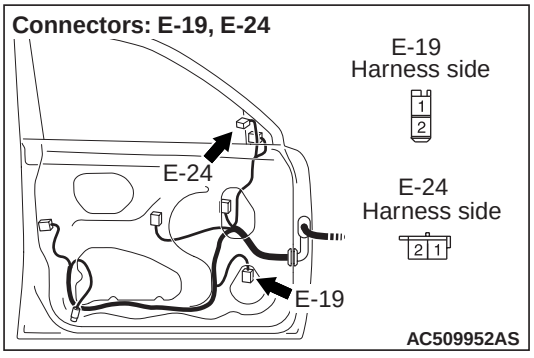
STEP 10. Check the wiring harness between the speaker or tweeter connector terminal and the audio amplifier connector terminal.
Check the communication lines for short circuit.

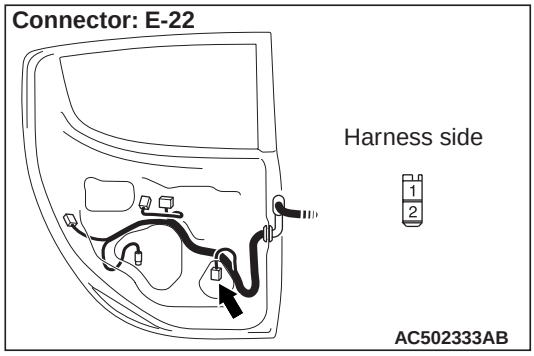












- <Front door speaker (LH)> Check the wiring harness between E-19 front door speaker (LH) connector terminal No.1, 2 and D-31 audio amplifier connector terminal No.8, 18.

NOTE: Prior to the wiring harness inspection, check intermediate connectors C-58 and C-134, and repair if necessary.

- <Front door speaker (RH)> Check the wiring harness between E-11 front door speaker (RH) connector terminal No.1, 2 and D-31 audio amplifier connector terminal No.7, 17.

NOTE: Prior to the wiring harness inspection, check intermediate connectors C-58 and C-122, and repair if necessary.

- <Rear door speaker (LH)> Check the wiring harness between E-22 rear door speaker (LH) connector terminal No.1, 2 and D-31 audio amplifier connector terminal No.1, 9.

NOTE: Prior to the wiring harness inspection, check intermediate connector D-14, and repair if necessary.

- <Rear door speaker (RH)> Check the wiring harness between E-09 rear door speaker (RH) connector terminal No.1, 2 and D-31 audio amplifier connector terminal No.2, 10.

NOTE: Prior to the wiring harness inspection, check intermediate connector D-24, and repair if necessary.

- <Tweeter (LH)> Check the wiring harness between E-24 tweeter (LH) connector terminal No.1, 2 and D-30 audio amplifier connector terminal No.26, 27.

NOTE: Prior to the wiring harness inspection, check intermediate connectors C-16 and C-133, and repair if necessary.

- <Tweeter (RH)> Check the wiring harness between E-25 tweeter (RH) connector terminal No.1, 2 and D-30 audio amplifier connector terminal No.23, 24.

NOTE: Prior to the wiring harness inspection, check intermediate connectors C-16 and C-121, and repair if necessary.

Q: Is the check result normal?
YES : Go to Step 11.
NO : Repair the wiring harness.

STEP 11. Check the wiring harness between C-125 radio and CD player connector terminal No.1, 2, 5, 6, 7, 8, 13, 14 and D-30 audio amplifier connector No.22, 21, 29, 28, 31, 30, 38, 37.

- Check the communication lines for short circuit.

NOTE: Prior to the wiring harness inspection, check intermediate connectors C-15 and C-59, and repair if necessary.

Q: Is the check result normal?
YES : Go to Step 12.
NO : Repair the wiring harness.

STEP 12. Retest the system

Check if the sound is output from all the speakers.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Go to Step 13.

STEP 13. Replace the audio amplifier temporarily, and check the trouble symptom.

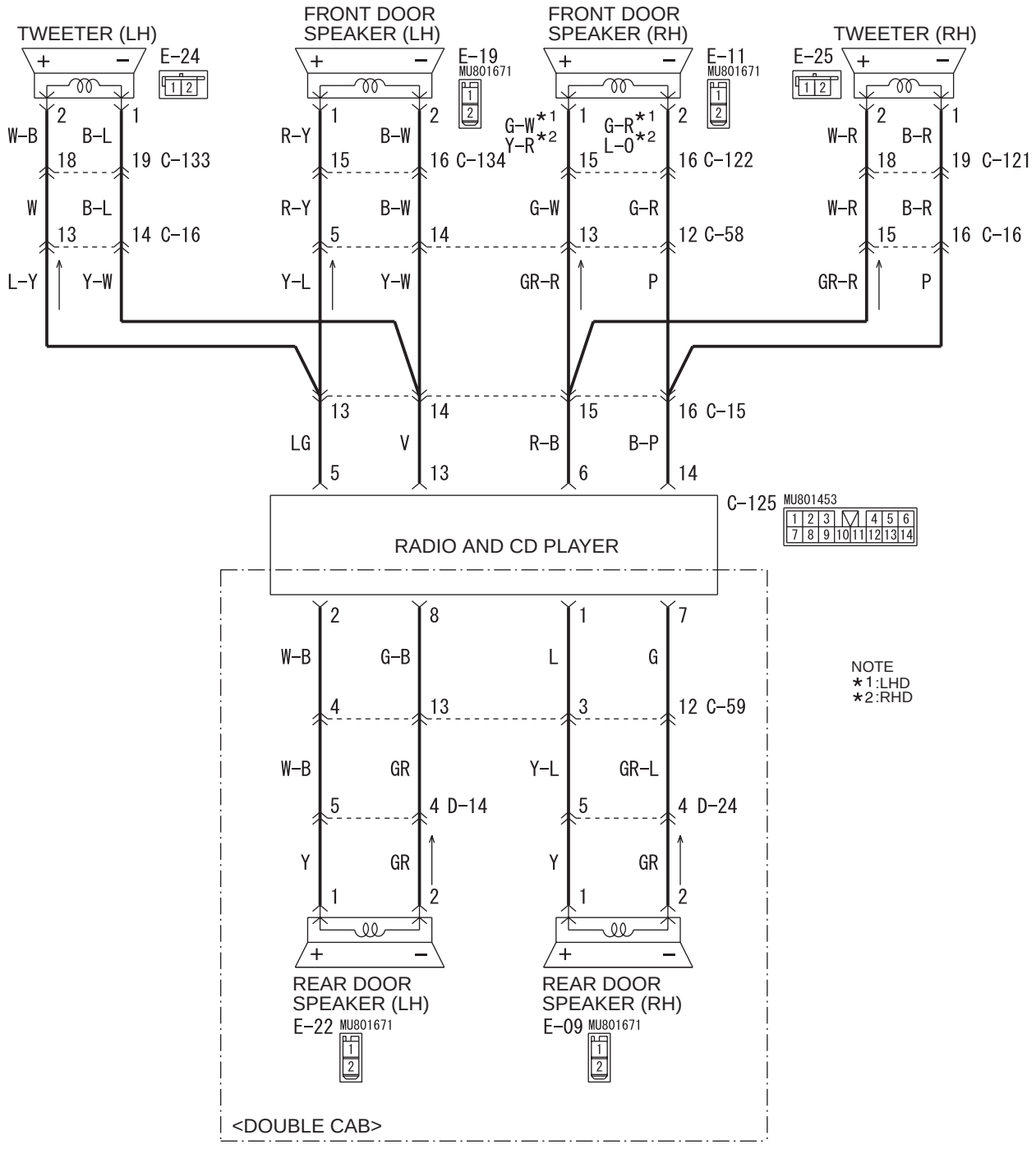
Replace the audio amplifier temporarily, and check that the sound is output from all the speakers.

Q: Is the check result normal?
YES : Replace the audio amplifier.
NO : Replace the radio and CD player.

Inspection Procedure 3: No sound is heard from one of the speaker. <Vehicles without audio amplifier>

⚠ CAUTION
Whenever the radio and CD player is replaced, ensure that the input signal circuit is normal.

Speaker System Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

WAC54E092A

COMMENTS ON TROUBLE SYMPTOM

The cause is probably a faulty speaker circuit system.

PROBABLE CAUSES

- Malfunction of speaker.
- Malfunction of tweeter.
- Damaged wiring harness or connector.
- Malfunction of radio and CD player.

DIAGNOSIS PROCEDURE

STEP 1. Checking with audio speaker test

Perform the audio speaker test, and check which speaker does not output the sound. Refer to P.54A-294.

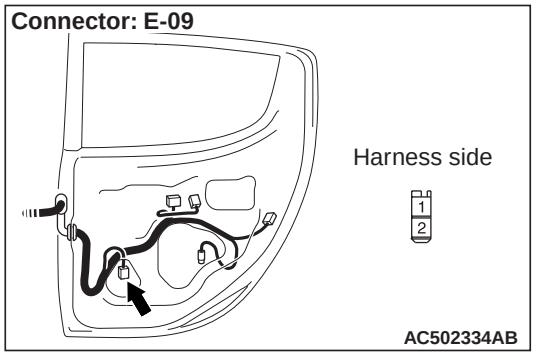
NOTE: In the following procedure, check the speaker or tweeter that is abnormal.

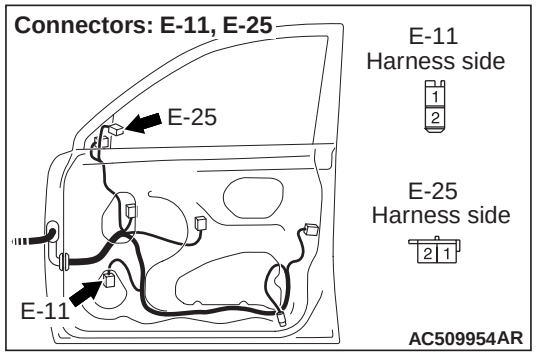
Q: Is the check result normal?

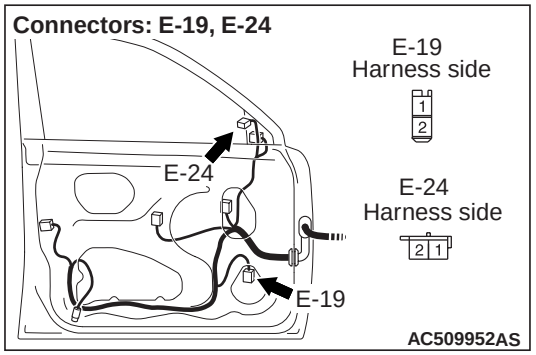
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction).

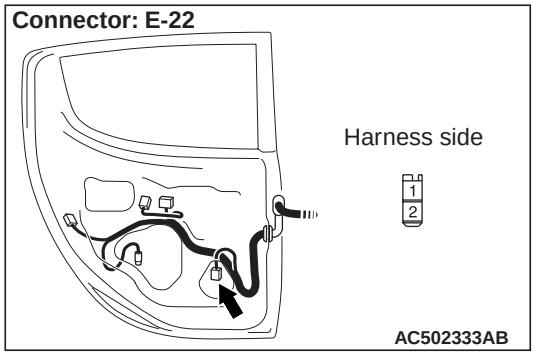
NO : Go to Step 2.

STEP 2. Connector check: E-19 <front-LH>, E-11 <front-RH>, E-22 <rear-LH> or E-09 <rear-RH> door speaker connector, E-24 <LH>, E-25 <RH> tweeter connector









Q: Is the check result normal?

YES : Go to Step 3.

NO : Repair the defective connector.

STEP 3. Check the speaker or tweeter.

(1) Remove the speaker or tweeter. Refer to P.54A-

445.

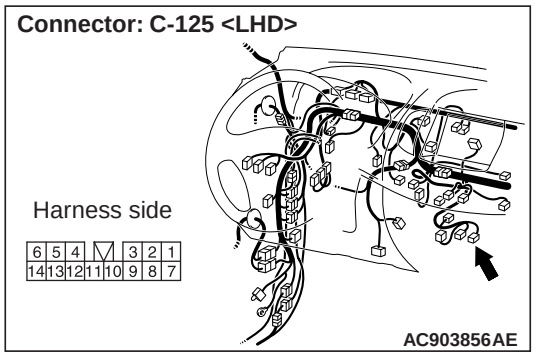
(2) Check that the speaker or tweeter outputs the noise when the voltage of 5 V is applied to the speaker or tweeter connector terminal.

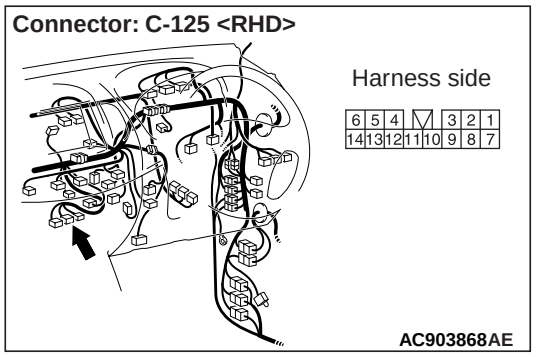
Q: Is the check result normal?

YES : Go to Step 4.

NO : Replace the speaker or tweeter.

STEP 4. Connector check: C-125 radio and CD player connector.





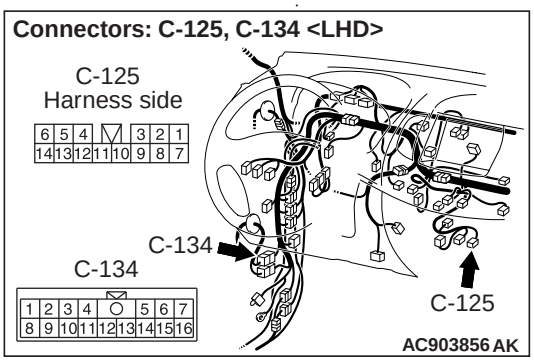
Q: Is the check result normal?

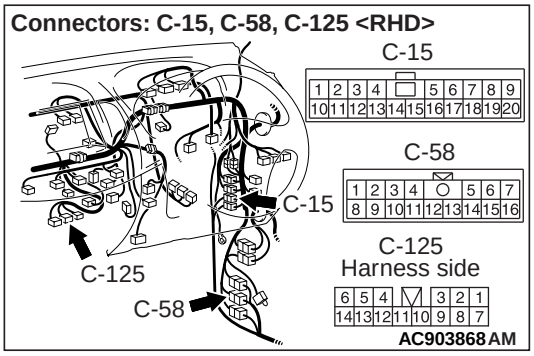
YES : Go to Step 5.

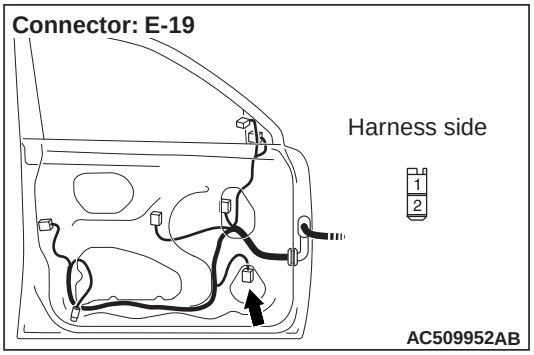
NO : Repair the defective connector.

STEP 5. Check the wire harness between the speaker or tweeter connector terminal and the radio and CD player connector terminal.

Check the communication lines for open circuit and short circuit.

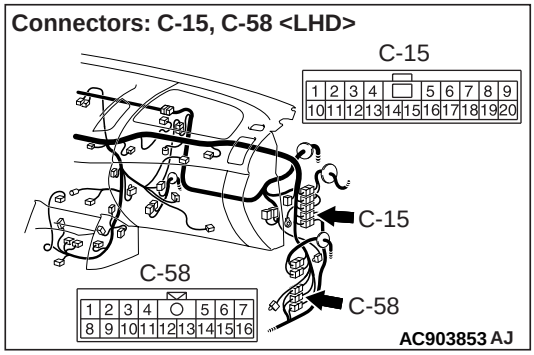


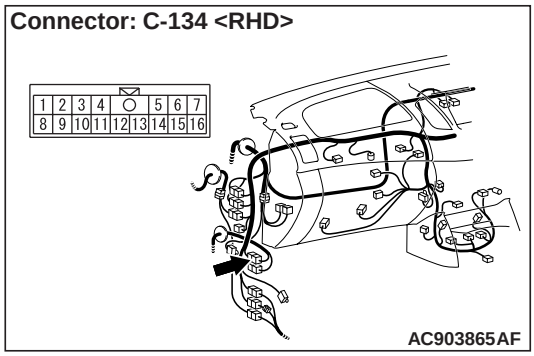




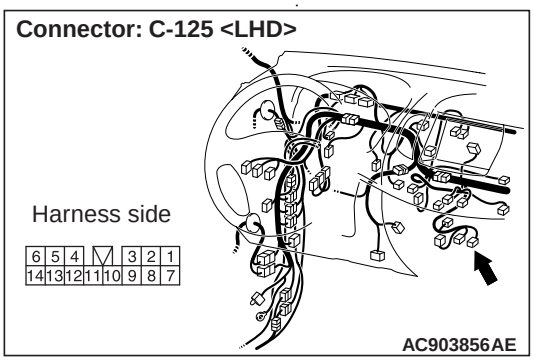
<Front door speaker (LH)> Check the wire harness between E-19 front door speaker (LH) connector terminal No.1, 2 and C-125 radio and CD player connector terminal No.5, 13.

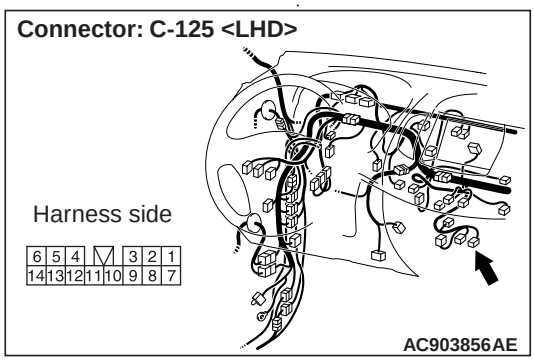
NOTE:

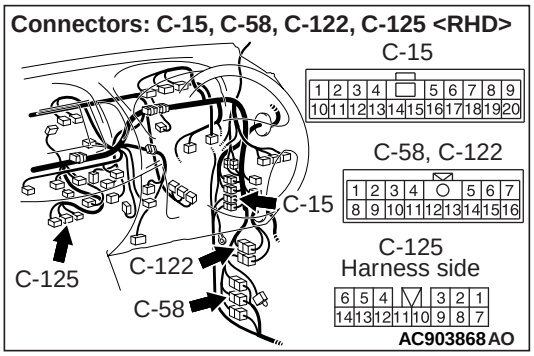


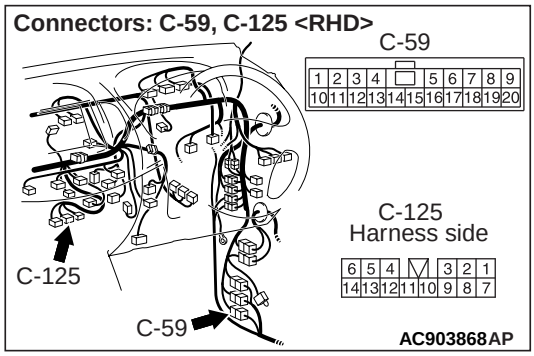


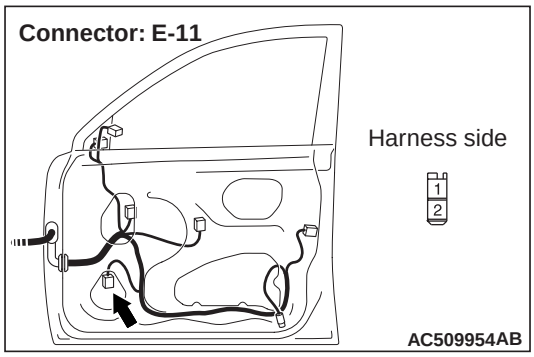
Prior to the wiring harness inspection, check intermediate connectors C-134, C-58 and C-15, and repair if necessary.

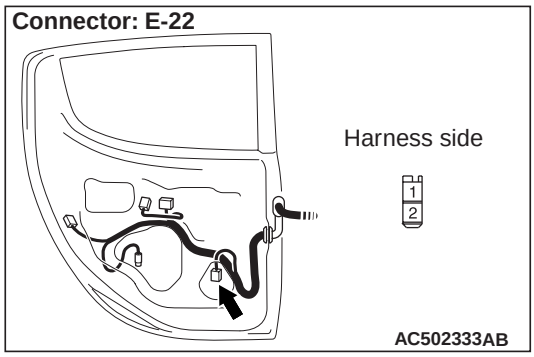






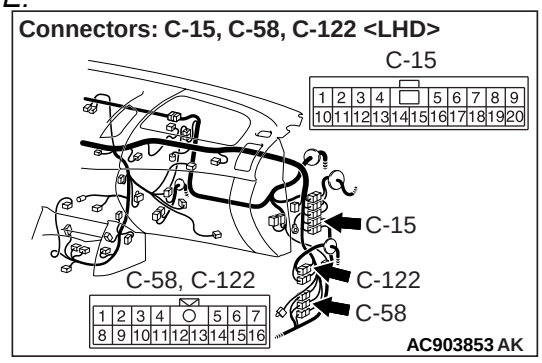






<Front door speaker (RH)> Check the wire harness between E-11 front door speaker (RH) connector terminal No.1, 2 and C-125 radio and CD player connector terminal No.6, 14.

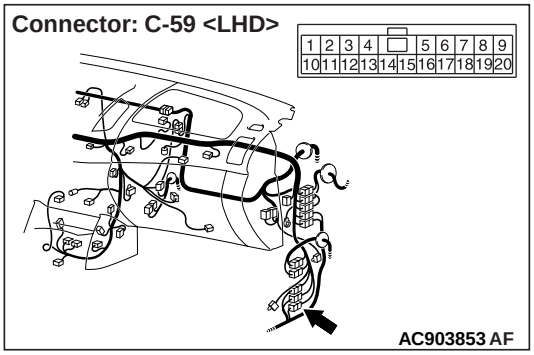
NOTE:

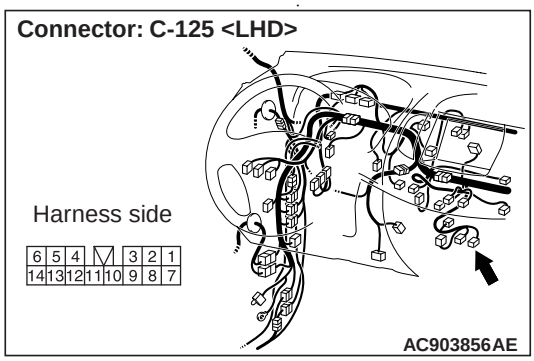


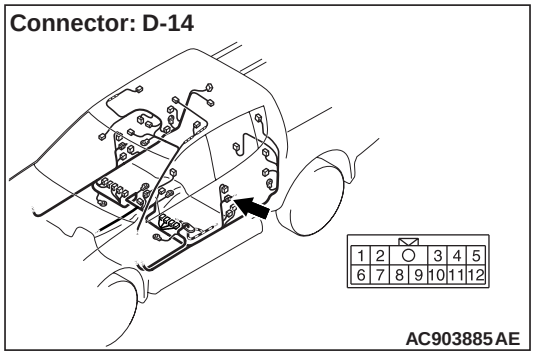
Prior to the wiring harness inspection, check intermediate connectors C-122, C-58 and C-15, and repair if necessary.

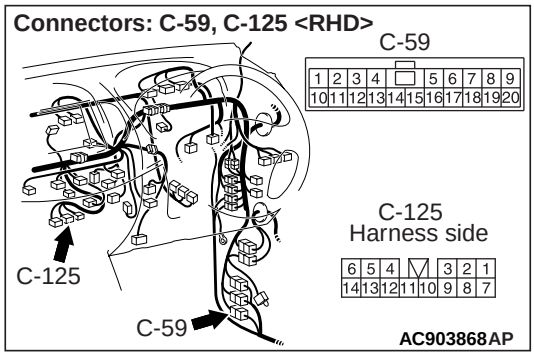
<Rear door speaker (LH)> Check the wire harness between E-22 rear door speaker (LH) connector terminal No.1, 2 and C-125 radio and CD player connector terminal No.2, 8.

NOTE:

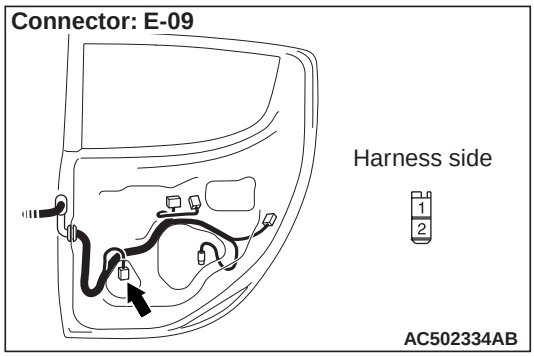






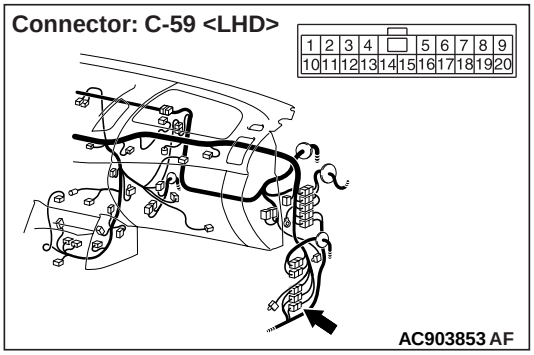


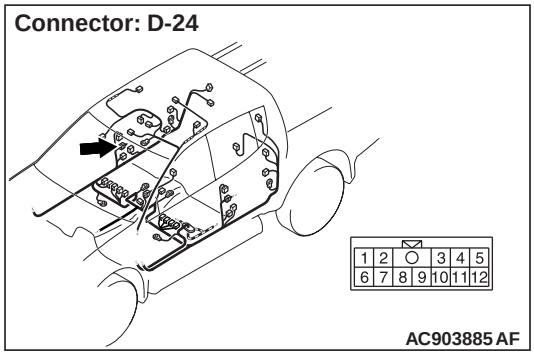
Prior to the wiring harness inspection, check intermediate connectors D-14 and C-59, and repair if necessary.



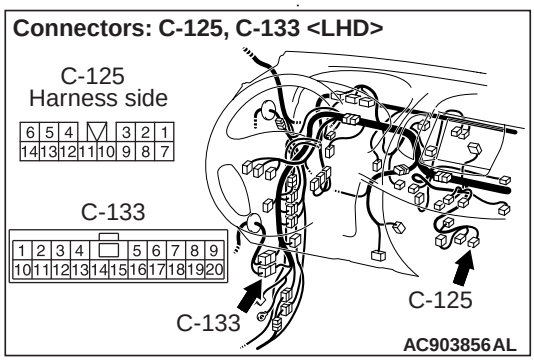
<Rear door speaker (RH)> Check the wire harness between E-09 rear door speaker (RH) connector terminal No.1, 2 and C-125 radio and CD player connector terminal No.1, 7.

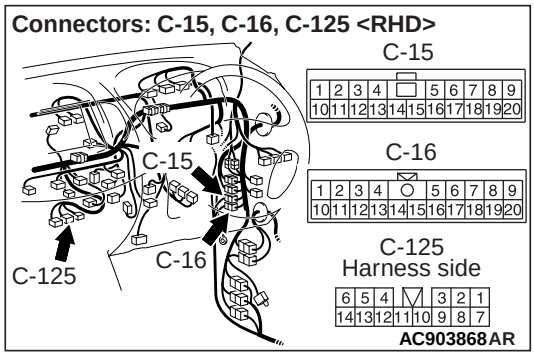
NOTE:

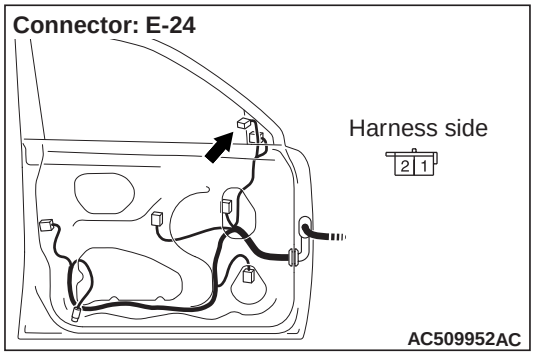




Prior to the wiring harness inspection, check intermediate connectors D-24 and C-59, and repair if necessary.

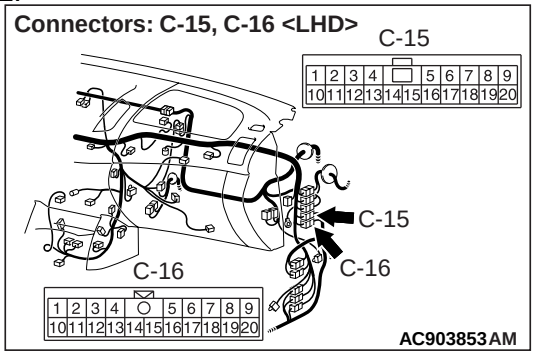




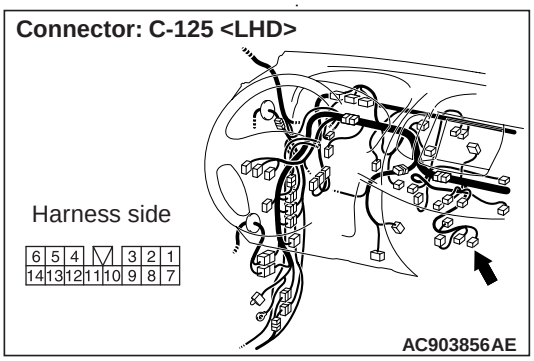


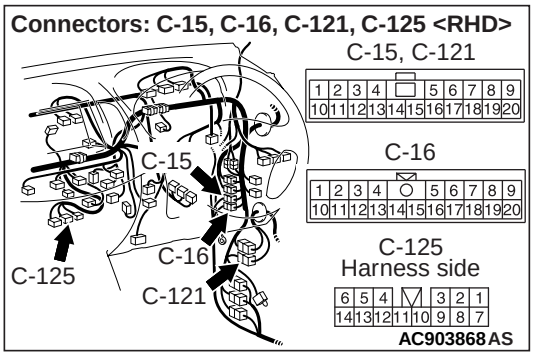
<Tweeter (LH)> Check the wire harness between E-24 tweeter (LH) connector terminal No.1, 2 and C-125 radio and CD player connector terminal No.13, 5.

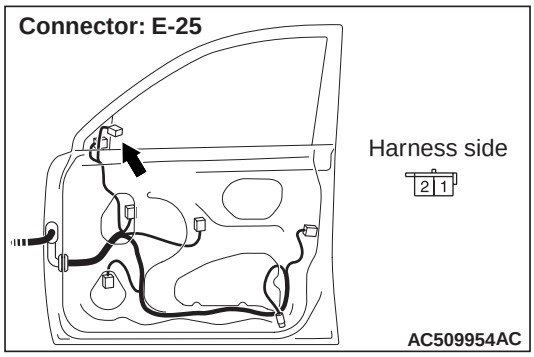
NOTE:



Prior to the wiring harness inspection, check intermediate connector C-133, C-16 and C-15, and repair if necessary.

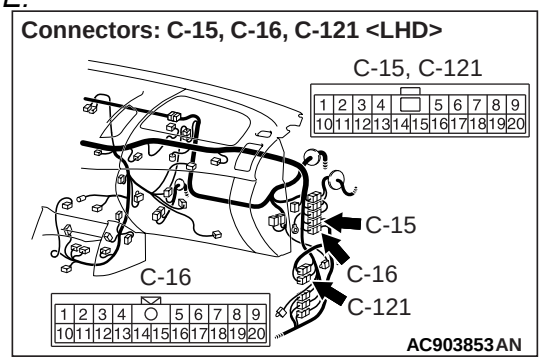






<Tweeter (RH)> Check the wire harness between E-25 tweeter (RH) connector terminal No.2, 1 and C-125 radio and CD player connector terminal No.6, 14.

NOTE:



Prior to the wiring harness inspection, check intermediate connector C-121, C-16 and C-15, and repair if necessary.

Q: Is the check result normal?
YES : Go to Step 6.
NO : Repair the wiring harness.

STEP 6. Retest the system
Then check that the audio sound is output.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Go to Step 7.

STEP 7. Replace the radio and CD player temporarily, and check the trouble symptom.
Replace the radio and CD player temporarily, and check that the sound is output from the speaker.

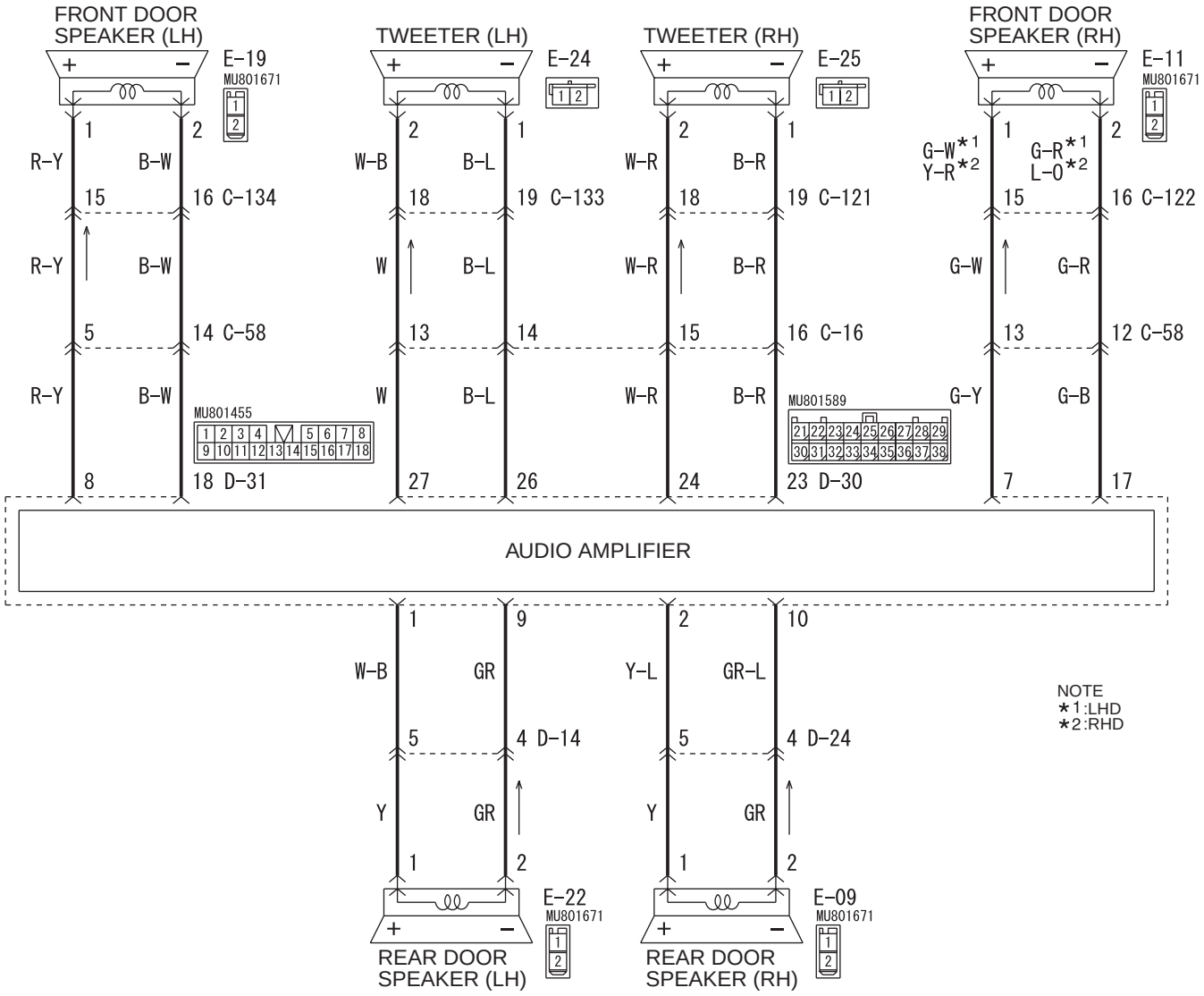
Q: Is the check result normal?
YES : Replace the radio and CD player.
NO : Retest the diagnosis. Go to Step 1.

Inspection Procedure 3: No sound is heard from one of the speakers. <Vehicles with audio amplifier>

⚠ CAUTION

Before replacing the radio and CD player or audio amplifier, ensure that the power supply circuit, the earth circuit and the communication circuit are normal.

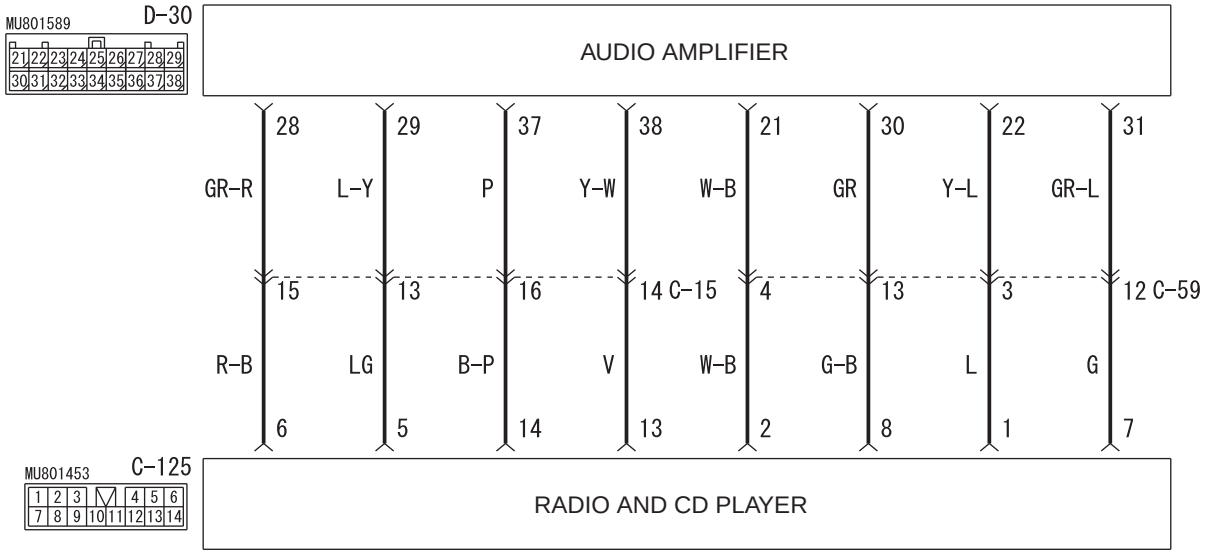
Speaker System Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

WAC54E093A

Audio Amplifier System Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

WAC54E094A

COMMENTS ON TROUBLE SYMPTOM

If the sound is not heard from one of the speakers, the speaker, radio and CD player, audio amplifier, communication line from the radio and CD player to the audio amplifier, or communication line from the audio amplifier to the speaker may have a problem.

PROBABLE CAUSES

- Malfunction of speaker
- Malfunctions of radio and CD player
- Malfunction of audio amplifier
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. Checking with speaker test

Perform the speaker test, and check which speaker does not output the sound. (Refer to P.54A-294.)

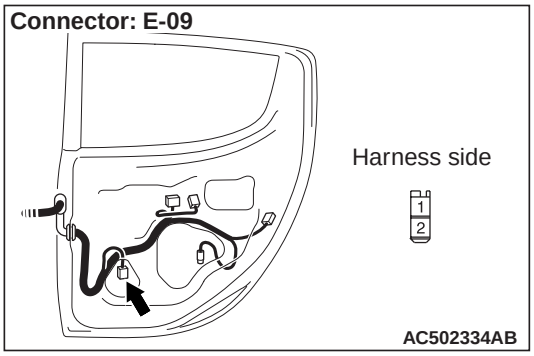
NOTE: In the following procedure, check the speaker, tweeter or subwoofer that is abnormal.

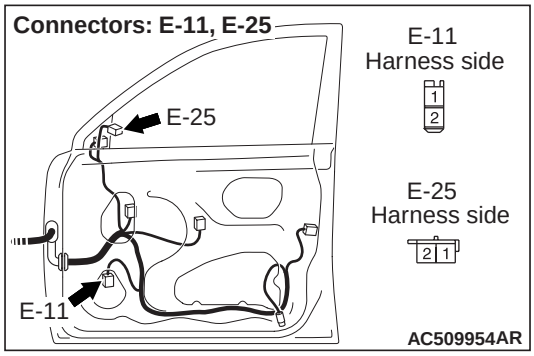
Q: Is the check result normal?

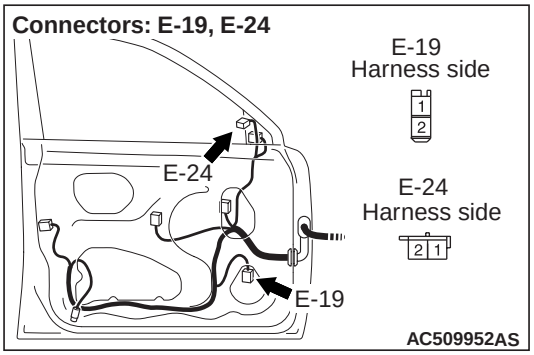
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

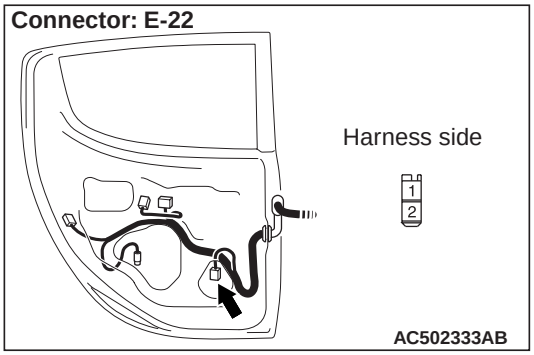
NO : Go to Step 2.

STEP 2. Connector check: E-19 <front-LH>, E-11 <front-RH> door speaker connector, E-22 <LH> or E-09 <RH> rear door speaker connector, E-24 <LH>, E-25 <RH> tweeter connector









Q: Is the check result normal?

YES : Go to Step 3.
NO : Repair the defective connector.

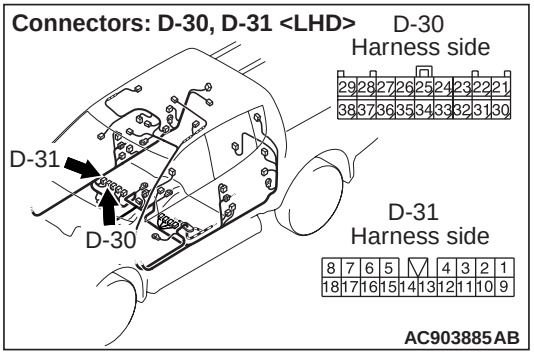
STEP 3. Check the speaker or tweeter.

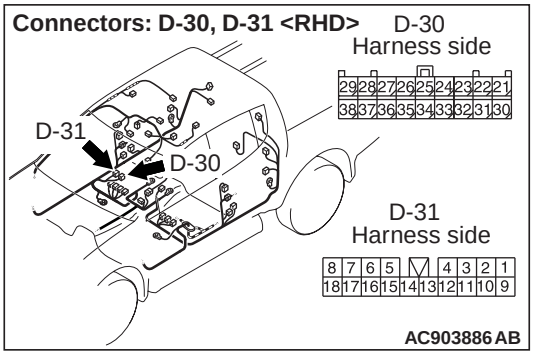
(1) Remove the speaker or tweeter. Refer to P.54A-445.
(2) Check that the speaker or tweeter outputs the noise when the voltage of 5 V is applied to the speaker or tweeter connector terminal.

Q: Do the speaker or tweeter output the noise?

YES : Go to Step 4.
NO : Replace the speaker or tweeter.

STEP 4. Connector check: D-30 <tweeter> or D-31 <front door speaker or rear door speaker> audio amplifier connector .



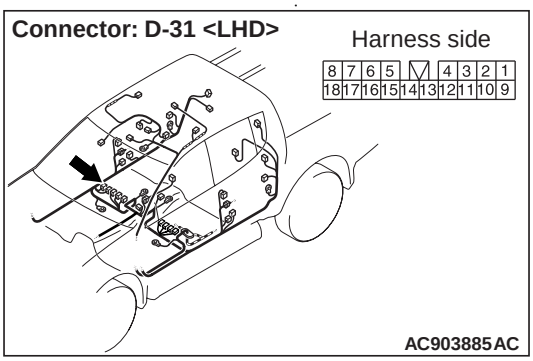


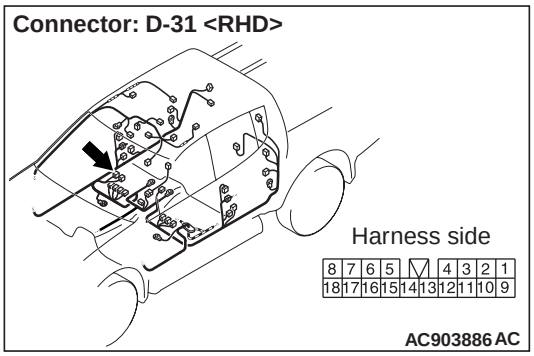
Q: Is the check result normal?

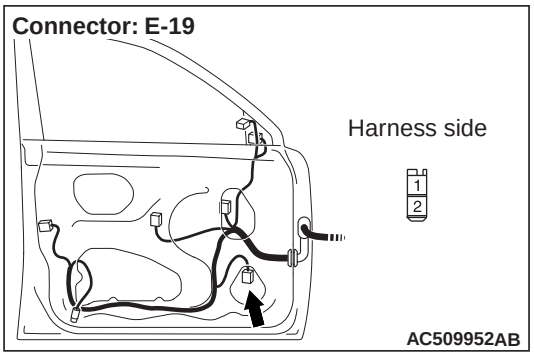
YES : Go to Step 5.
NO : Repair the defective connector.

STEP 5. Check the wire harness between the speaker or tweeter connector terminal and the audio amplifier connector terminal.

Check the communication lines for open circuit and short circuit.

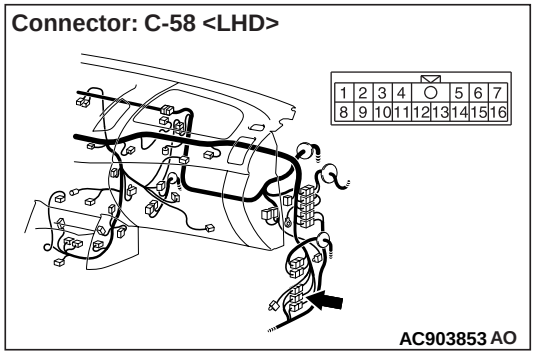


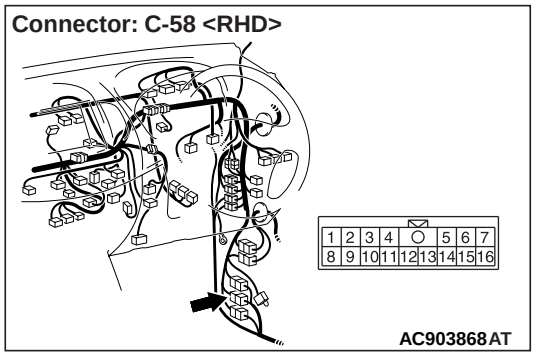


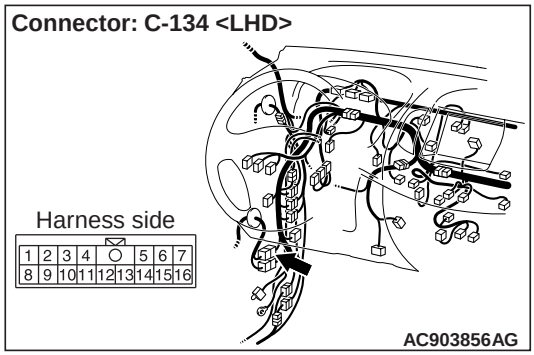


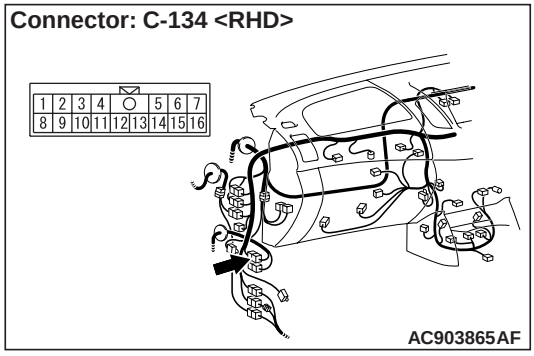
<Front door speaker (LH)> Check the wire harness between E-19 front door speaker (LH) connector terminal No.1, 2 and D-31 audio amplifier connector terminal No.8, 18.

NOTE:

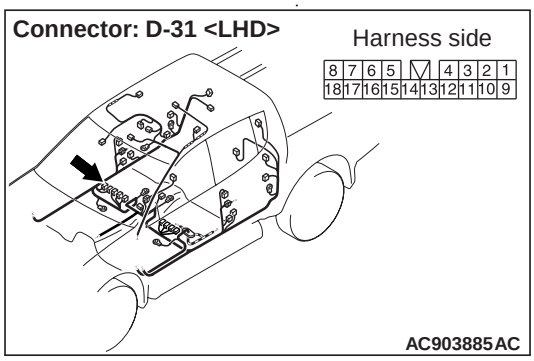


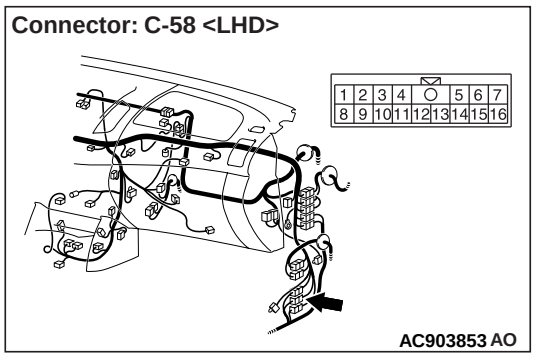


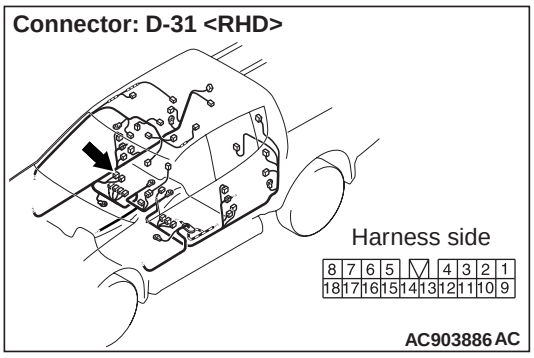


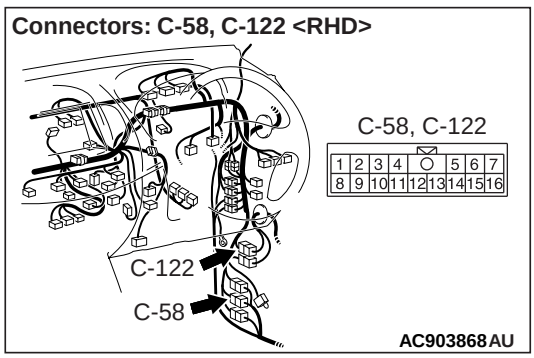


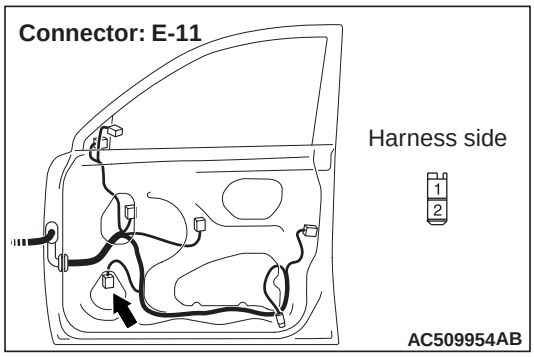
Prior to the wiring harness inspection, check intermediate connectors C-134 and C-58, and repair if necessary.

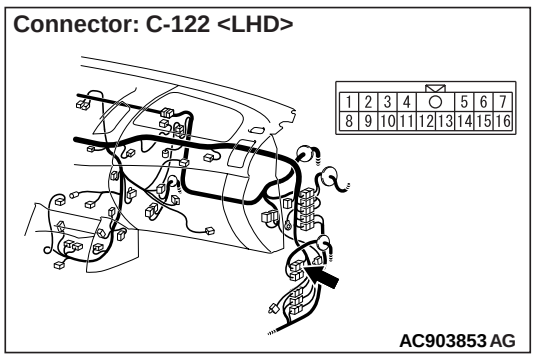








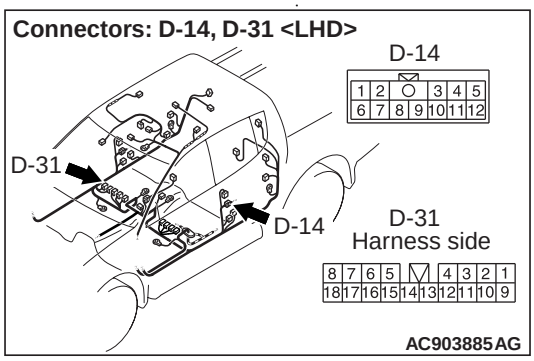


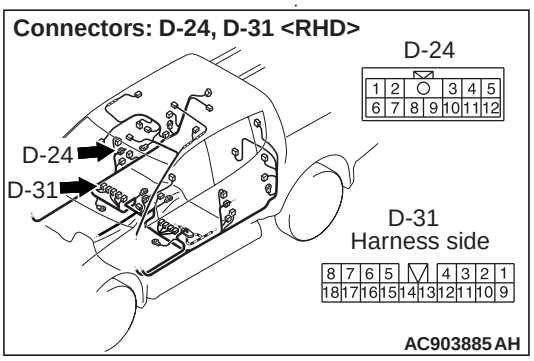


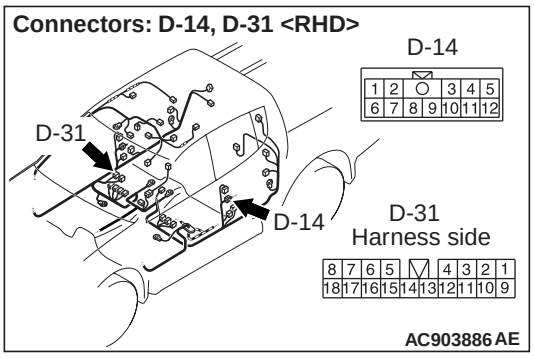
<Front door speaker (RH)> Check the wire harness between E-11 front door speaker (RH) connector terminal No.1, 2 and D-31 audio amplifier connector terminal No.7, 17.

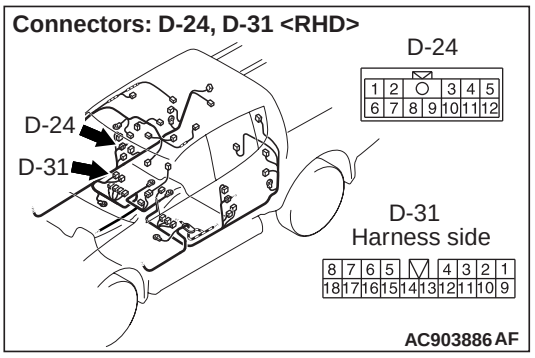
NOTE:

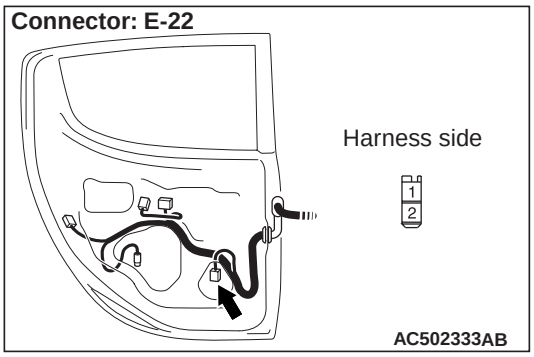
Prior to the wiring harness inspection, check intermediate connectors C-122 and C-58, and repair if necessary.

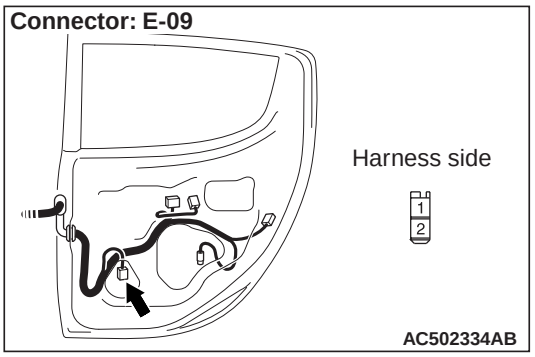










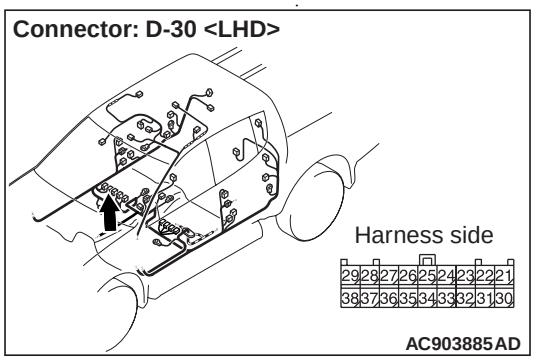


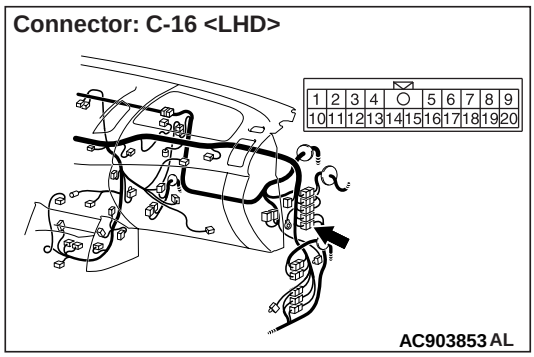
<Rear door speaker (LH)> Check the wire harness between E-22 rear door speaker (LH) connector terminal No.1, 2 and D-31 audio amplifier connector terminal No.1, 9.

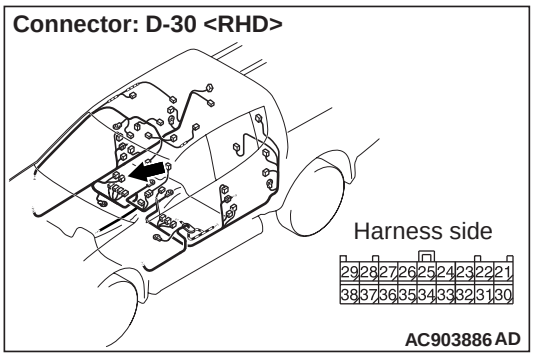
NOTE: Prior to the wiring harness inspection, check intermediate connector D-14, and repair if necessary.

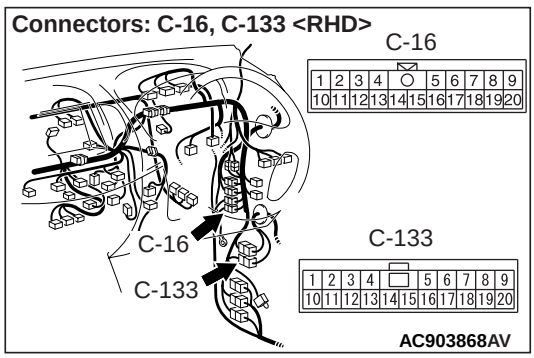
<Rear door speaker (RH)> Check the wire harness between E-09 rear door speaker (RH) connector terminal No.1, 2 and D-31 audio amplifier connector terminal No.2, 10.

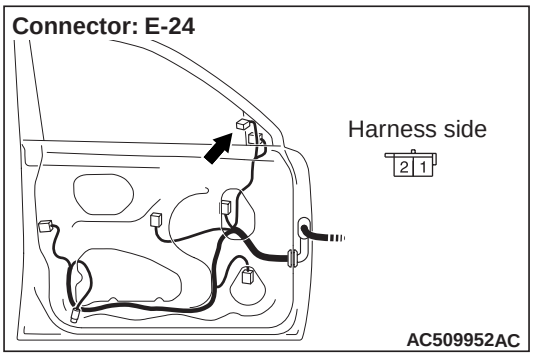
NOTE: Prior to the wiring harness inspection, check intermediate connector D-24, and repair if necessary.

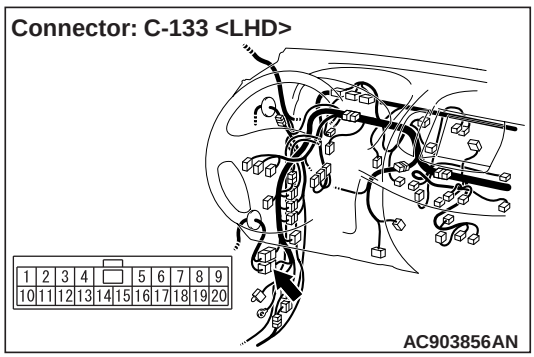








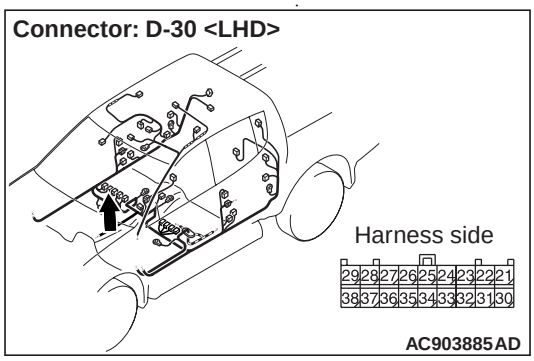


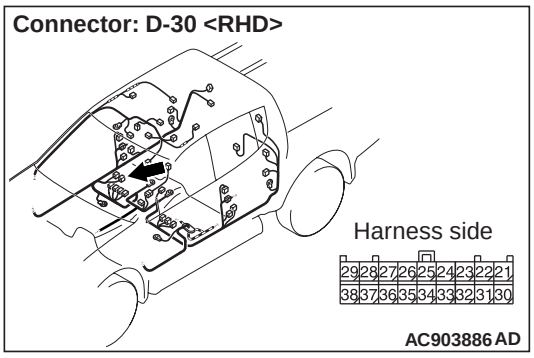


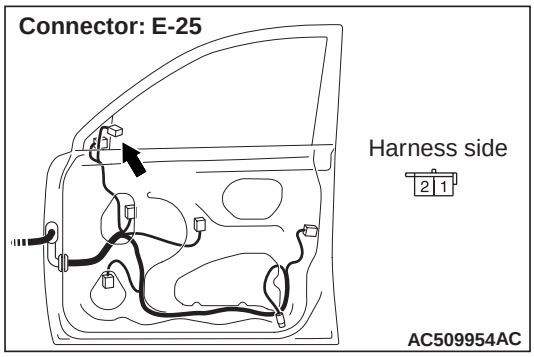
<Tweeter (LH)> Check the wire harness between E-24 tweeter (LH) connector terminal No.2, 1 and D-30 audio amplifier connector terminal No.27, 26.

NOTE:

Prior to the wiring harness inspection, check intermediate connectors C-133 and C-16, and repair if necessary.

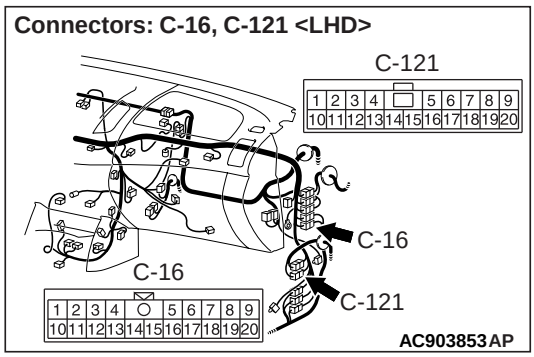


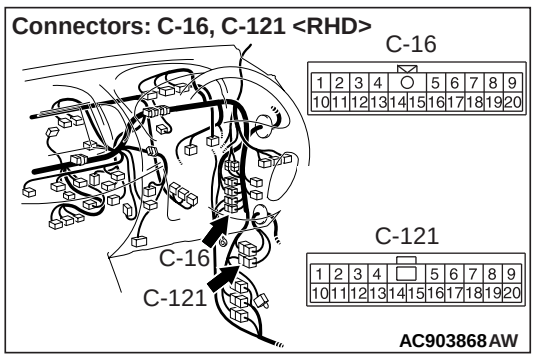




<Tweeter (RH)> Check the wire harness between E-25 tweeter (RH) connector terminal No.2, 1 and D-30 audio amplifier connector terminal No.24, 23.

NOTE:

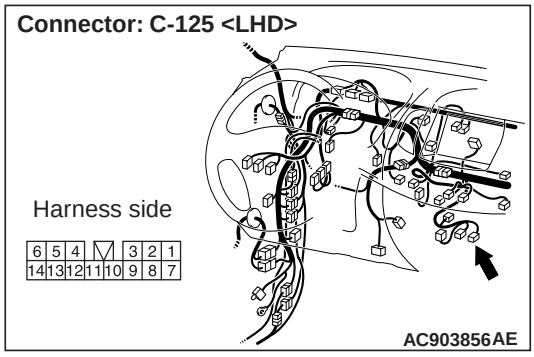


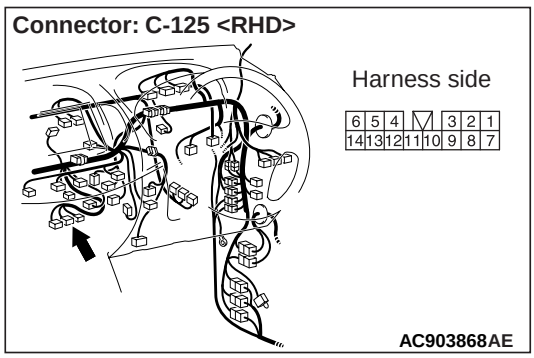


Prior to the wiring harness inspection, check intermediate connectors C-121 and C-16, and repair if necessary.

Q: Is the check result normal?
YES : Go to Step 6.
NO : Repair the wiring harness.

STEP 6. Connector check: C-125 radio and CD player connector

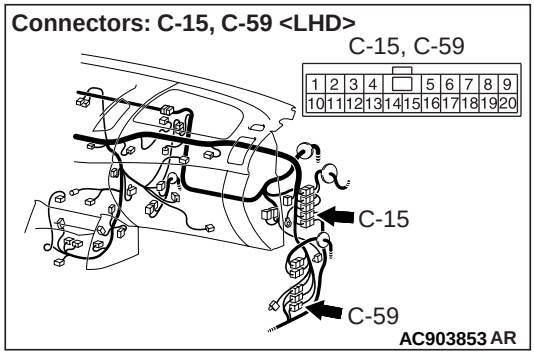


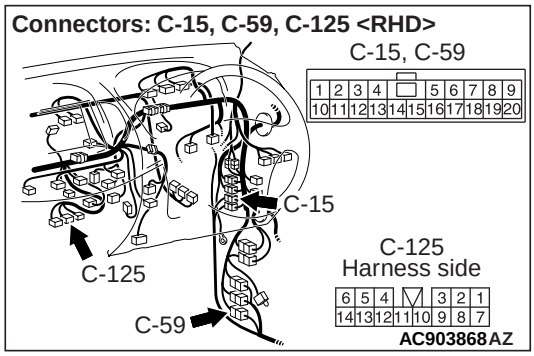


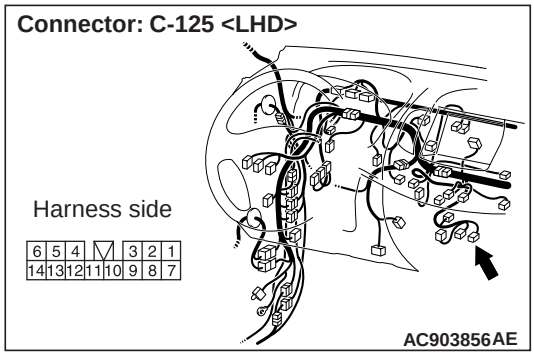
Q: Is the check result normal?

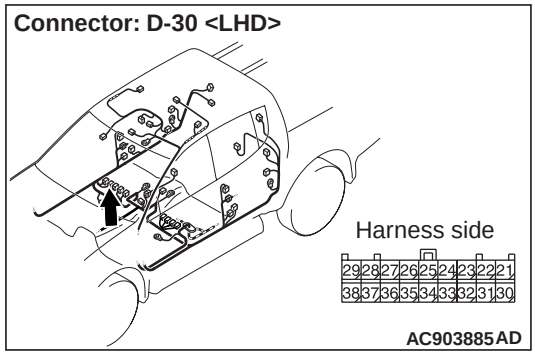
YES <Speakers other than tweeter does not sound.> : Go to Step 7.
YES <Tweeter does not sound.> : Go to Step 8.
NO : Repair the defective connector.

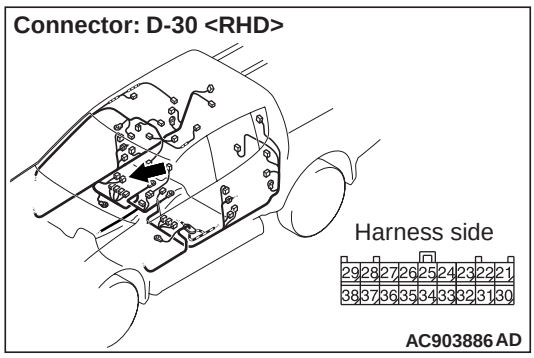
STEP 7. Check the wire harness between the audio amplifier connector terminal and the radio and CD player connector terminal.











Check the communication lines for open circuit and

short circuit.

- <Front door speaker (LH)> Check the wire harness between C-125 radio and CD player connector terminal No.5, 13 and D-30 audio amplifier connector terminal No.29, 38.

NOTE: Prior to the wiring harness inspection, check intermediate connector C-15, and repair if necessary.

- <Front door speaker (RH)> Check the wire harness between C-125 radio and CD player terminal No.6, 14 and D-30 audio amplifier connector terminal No.28, 37.

NOTE: Prior to the wiring harness inspection, check intermediate connector C-15, and repair if necessary.

- <Rear door speaker (LH)> Check the wire harness between C-125 radio and CD player connector terminal No.2, 8 and D-30 audio amplifier connector terminal No.21, 30.

NOTE: Prior to the wiring harness inspection, check intermediate connector C-59, and repair if necessary.

- <Rear door speaker (RH)> Check the wire harness between C-125 radio and CD player connector terminal No.1, 7 and D-30 audio amplifier connector terminal No.22, 31.

NOTE: Prior to the wiring harness inspection, check intermediate connector C-59, and repair if necessary.

Q: Is the check result normal?
YES : Go to Step 8.
NO : Repair the wiring harness.

STEP 8. Retest the system
Check that the sound is output from the speaker.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Go to Step 9.

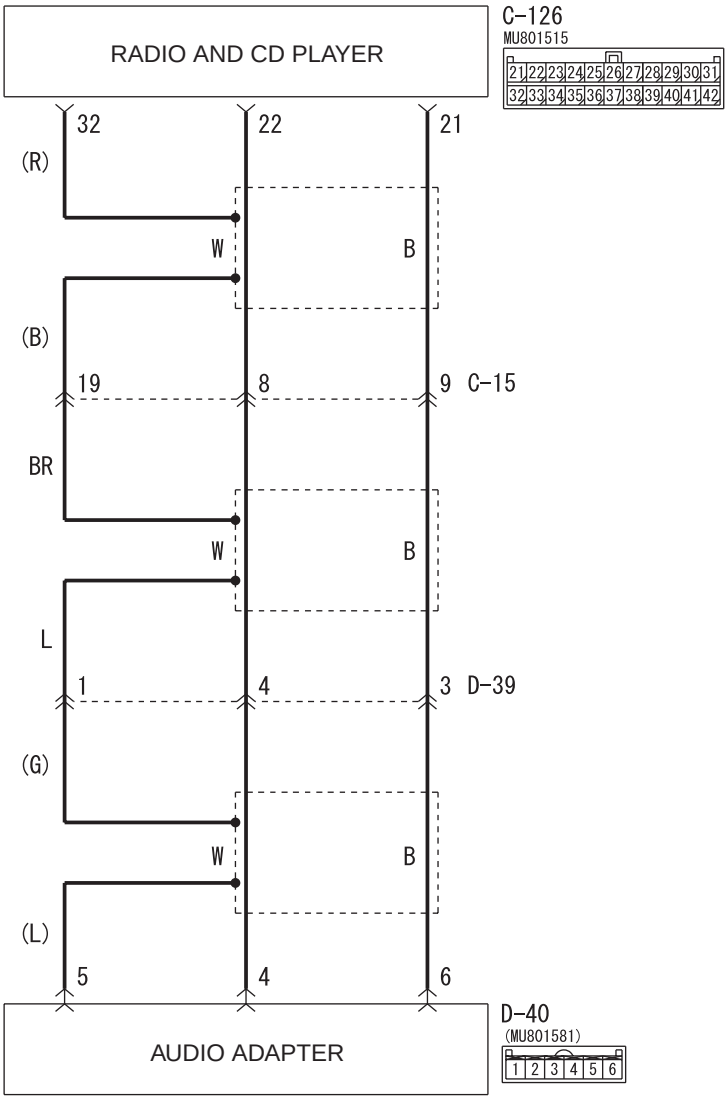
STEP 9. Replace the audio amplifier temporarily, and check the trouble symptom.
Replace the audio amplifier temporarily, and check that the sound is output from the speaker.

Q: Is the check result normal?
YES : Replace the audio amplifier.
NO : Replace the radio and CD player.

Inspection Procedure 4: The sound of external input are not played.

⚠ CAUTION
Before replacing the radio and CD player, ensure that the power supply circuit, the earth circuit and the communication circuit are normal.

Audio Adapter Communication Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

WDC54E000A

COMMENTS ON TROUBLE SYMPTOM

If the external input sound is not output, the radio and CD player, the audio communication line from the radio and CD player or audio adapter may have a problem.

PROBABLE CAUSES

- The audio adapter may be defective.
- The radio and CD player may be defective.
- Damaged harness wires and connectors

DIAGNOSIS

STEP 1. Check the radio and CD player operation.

Check if the radio and CD player work normally and the sound is output.

Q: Is the check result normal?

YES : Go to Step 2.

NO : Troubleshoot the radio and CD player (Refer to P.54A-232).

Step 2. Check the external sounds input mode.

Check if the radio and CD player is switched to the external sounds input mode.

Q: Is the check result normal?

YES : Go to Step 3.

NO : Switch to the external sounds input mode.

STEP 3. Check the audio adapter.

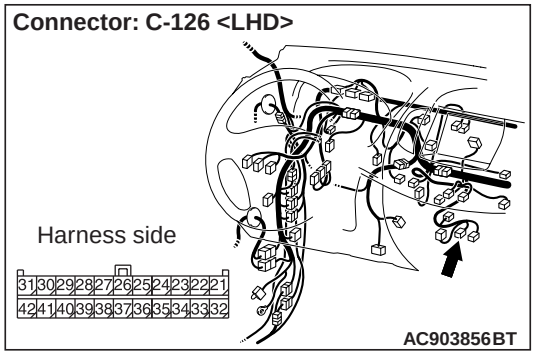
Check if the audio adapter works normally.(Refer to P.54A-296)

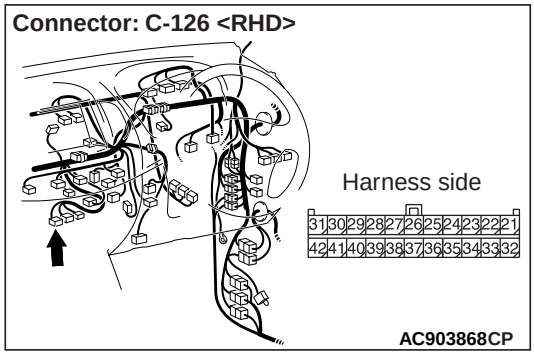
Q: Is the check result normal?

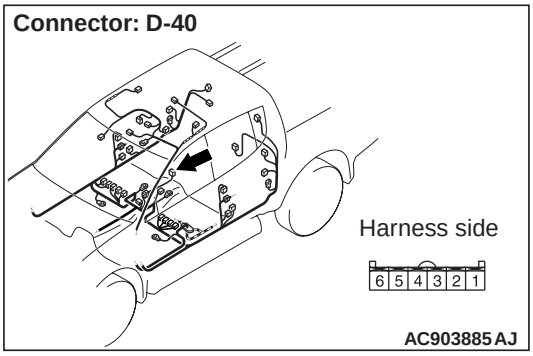
YES : Go to step 4.

NO : Replace the Audio adapter.

STEP 4. Connector check: D-40 audio adapter connector and C-126 radio and CD player connector





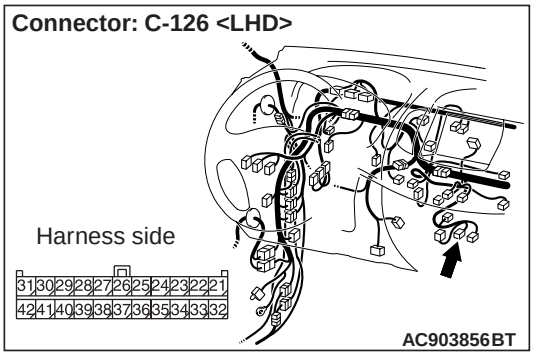


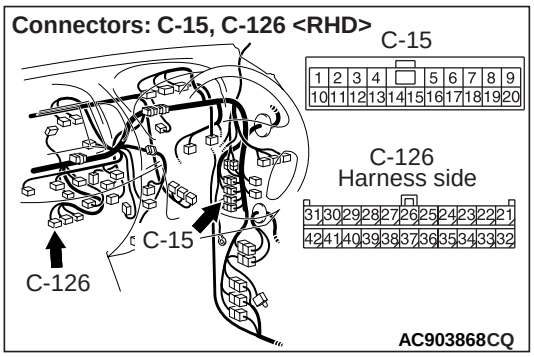
Q: Is the check result normal?

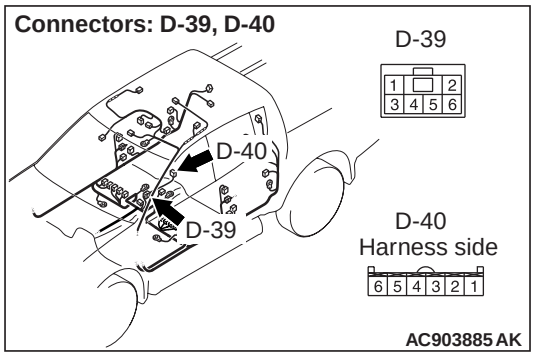
YES : Go to step 5.

NO : Repair the defective connector.

STEP 5. Check the wiring harness between D-40 audio adapter connector terminal No. 4, 5, 6 and C-126 radio and CD player connector terminal No. 22, 32, 21.

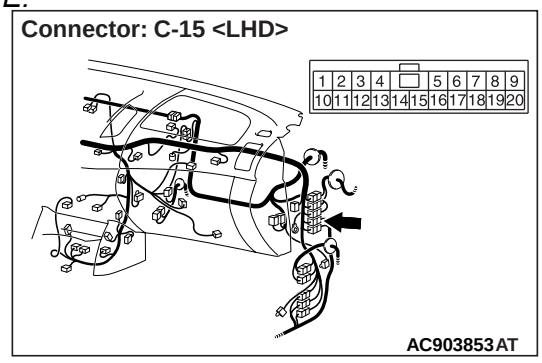






- Check the communication line for open circuit and short circuit.

NOTE:



Prior to the wiring harness inspection, check intermediate connectors C-15 and D-39, and repair if necessary.

Q: Is the check result normal?
YES : Replace the audio adapter, then go to Step 6.
NO : Repair the wiring harness.

STEP 6. Check of the troubles
Check that the external input is normal.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Replace the radio and CD player.

Inspection Procedure 5: Noise appears at certain places when travelling.

DIAGNOSIS PROCEDURE

STEP 1. Check the noise occur when entering or near a particular structure (building, tunnel, mountain, etc).

Q: Does the noise occur when entering or near a particular structure (building, tunnel, mountain, etc.)?
YES : Go to Step 3.
NO : Go to Step 2.

STEP 2. After taking the following measures to prevent the noise, check that no noise appears.
(1) Change to a different station with a stronger wave to boost resistance to interference.
(2) Suppress high tones to reduce noise.

Q: Do the following measures eliminate the noise?
YES : This diagnosis is complete.
NO : Go to Step 4.

STEP 3. Ask the owner about the state of the noise.
Find out the following information from the owner.
- Place where the noise occurs.
- Locality conditions (valley, mountain, etc).
- Name and frequency of stations affected by noise

Q: Which is the noise, vehicle noise or external noise?
Vehicle noise : It may not be possible to prevent noise if the signal is weak. This diagnosis is complete.
External noise : In almost all cases, prevention on the receiver side is impossible. Weak signals especially are susceptible to interference. Go to Step 4.

STEP 4. Check that there is no noise.

Q: Does noise still exist?
YES : If there is more noise than on radios in other vehicles, find out the noise condition and the name and frequency of the receiving stations from the owner, and consult with the radio manufacturer's service centre.
NO : Normal.

Inspection Procedure 6: Mixed with noise, only at night.

The following factors can be considered as possible causes of noise appearing at night.

1. Factors due to signal conditions: Due to the fact that long-distance signals are more easily received at night, even stations that are received without problem during the day may experience interference in a general worsening of reception conditions. The weaker a station is the more susceptible it is to interference, and a change to different station or the appearance of a beating sound* may occur.

   NOTE: Beat sound: Two signals close in frequency interfere with each other, creating a repetitious high-pitched sound. This sound is generated not only by sound signals but electrical waves as well.*
2. Factors due to vehicles noise: Alternator noise may be a cause.

DIAGNOSIS PROCEDURE

STEP 1. Check that the noise still obvious even when the lamps are off.

Q: Is the noise still obvious even when the lamps are off?
YES : Go to Step 2.
NO : Go to Step 3.

Step 2. Check hat the following actions.
Tune to a station with a stronger wave.

Q: Is there more noise than on radio in other vehicles?
YES : Consult the radio manufacturer's service centre.
NO : This diagnosis is complete.

Step 3. Check that the noise fades away when the vehicle harness is moved away from the radio (if the harness is not in the proper position).

Q: Does the noise fade away when the vehicle harness is moved any from the radio (If the harness is not in the proper position)?

YES : Repair the wiring harness.
NO : If there is more noise than other radios, consult the radio manufacturer's service centre.

Inspection Procedure 7: Broadcasts can be heard but both AM and FM have a lot of noise.

DIAGNOSIS PROCEDURE

STEP 1. Check the state of the antenna.

Q: Is the mast antenna assembled?
YES : Go to Step 2.
NO : Assemble the mast antenna. Check to see that the noise is gone.

STEP 2. Check that the noise occur when the engine is stopped or the engine is running.

Q: Does noise occur when the engine is stopped or the engine is running?
When the engine is stopped : Go to Step 3.
When the engine is running : Check the vehicle's noise suppressor (Refer to Inspection Procedure 7 P.54A-282).

STEP 3. Check that the following actions disappear the noise.
(1) Tune to a station with a stronger wave.
(2) Adjust the sound quality to suppress high tones.

Q: Is the noise eliminated?
YES : Consult the radio manufacturer's service centre.
NO : Go to Step 4.

STEP 4. Check that the radio is correctly earthed
The radio is connected to the earth with an assembling screw.

Q: Is the radio correctly earthed?
YES : Go to Step 5.
NO : Assemble the radio and CD player into the vehicle.

STEP 5. Check the connection of the antenna plug and radio and CD player.

Q: Is the antenna plug thoroughly connected to the radio and CD player?
YES : Go to Step 7.
NO : Go to Step 6.

STEP 6. Check that the noise is eliminated when the antenna plug is properly attached.

Q: Is the noise eliminated?
YES : This diagnosis is complete.
NO : Go to Step 7.

STEP 7. Check that the antenna is in good condition and is it properly mounted.

Q: Is the antenna in good condition and is it properly mounted?
YES : Consult the radio manufacturer's service centre.
NO : Repair or replace the antenna.

Inspection Procedure 7: Broadcasts can be heard but both LW/MW/FM have a lot of noise.

DIAGNOSIS PROCEDURE

STEP 1. Check the state of the antenna.

Q: Is the antenna assembled?
YES : Go to Step 2.
NO : Repair or replace the antenna.

STEP 2. Check that the noise occur when the engine is stopped or the engine is running.

Q: Does noise occur when the engine is stopped or the engine is running?

When the engine is stopped : Go to Step 3.
When the engine is running : Check the vehicle's noise suppressor (Refer to Inspection Procedure 8 P.54A-282).

STEP 3. Check that the following actions disappear the noise.
(1) Tune to a station with a stronger wave.
(2) Extend the antenna completely (Pillar antenna).
(3) Adjust the sound quality to suppress high tones.

Q: Is the noise eliminated?
YES : This diagnosis is complete.
NO : Go to Step 4.

STEP 4. Check that the radio is correctly earthed
The radio is connected to the earth with an assembling screw.

Q: Is the radio correctly earthed?
YES : Go to Step 5.
NO : Assemble the radio and CD player into the vehicle.

STEP 5. Check the connection of the antenna plug and radio and CD player.

Q: Is the antenna plug thoroughly connected to the radio and CD player?
YES : Go to Step 7.
NO : Go to Step 6.

STEP 6. Check that the noise is eliminated when the antenna plug is properly attached.

Q: Is the noise eliminated?
YES : This diagnosis is complete.
NO : Go to Step 7.

STEP 7. Check that the antenna is in good condition and is it properly mounted.

Q: Is the antenna in good condition and is it properly mounted?
YES : Consult the radio manufacturer's service centre.
NO : Repair or replace the antenna.

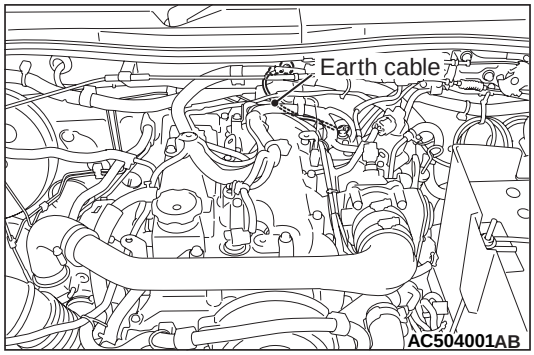
Inspection Procedure 8: There is noise when starting the engine.

DIAGNOSIS PROCEDURE

⚠ CAUTION

- **Connecting a high tension cable to the noise filter may destroy the noise filter and should never be done.**
- **Check that there is no external noise. Since failure to do this may result in an incorrect diagnosis due to the inability to identify the noise source, this operation must be performed.**
- **Noise prevention should be performed by suppressing strong sources of noise step by step.**

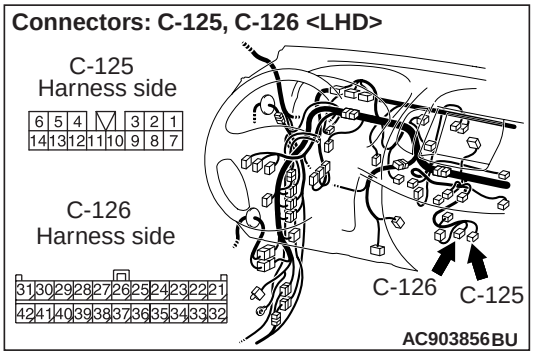
Noise type sounds are in parentheses	Conditions	Cause	Remedy
AM/FM or FM/MW/LW: ignition noise (popping, snapping, cracking, buzzing)	• Increasing the engine speed causes the alternator whine sound to speed up and the volume to decrease • Disappears when the ignition switch turned to "ACC".	• Due to engine noise	• Check or replace the earth cable. • Check or replace the noise capacitor.
Other electrical components	–	Noise may occur as the electrical components become older.	Repair or replace the electrical components.
Static electricity (cracking, crinkling)	• Disappears when the vehicle is completely stopped. • Severe when the clutch is engaged	Occurs when parts or wiring move for some reason and contact metal parts of the body.	Return parts or wiring to their proper position.
Static electricity (cracking, crinkling)	• Various noise are produced depending on the body part of the vehicle.	Due to removal of the front hood, bumpers, exhaust pipe and muffler, suspension, etc.	Earth parts by bonding. Cases where the problem is not eliminated by a signal response to one area are common, due to several body parts being imperfectly earthed.

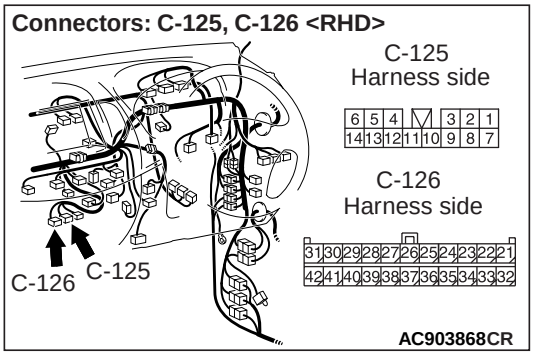

Earth cable
AC504001AB

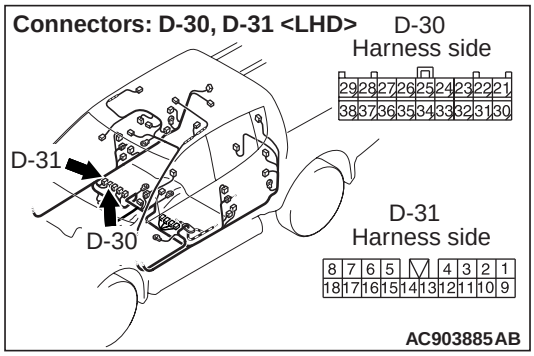
Inspection Procedure 9: Some noise appears when there is vibration or shocks during travelling.

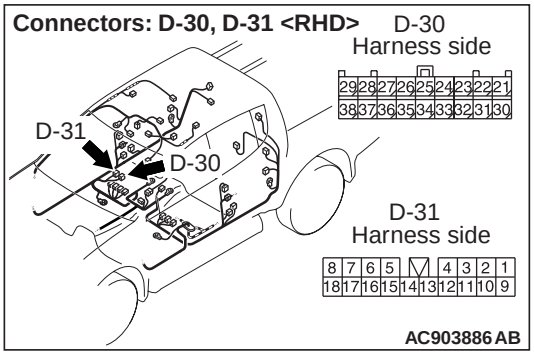
DIAGNOSIS PROCEDURE

STEP 1. Connector check: Radio and CD player connector C-125, C-126 and audio amplifier connector D-30, D-31 <vehicle with audio amplifier>.









Q: Is radio and CD player connector C-125 and audio amplifier connector D-30, D-31 <vehicle with audio amplifier> in good condition?
YES : Go to Step 2.
NO : Repair or replace the connector. Check that there is no noise.

STEP 2. Check that noise appear when the radio switch is turned on while the vehicle is stopped and the radio is tapped while tuned away from a station.

NOTE: Static electricity noise: Body static electric from the shock absorber rubber bushings used to prevent vibration, tires, etc. occurs because of separation from the earth, causing a buzzing noise. Since no measures can be taken to discharge the static electricity of the vehicle body. Check that there is no noise.

Q: Does noise appear when the radio switch is turned on while the vehicle is stopped and the radio is tapped while tuned away from a station?
YES : Go to Step 3.
NO : It may be static electricity noise.

STEP 3. Check that the radio correctly earthed.
The radio is connected to the earth with an assembling screw.

Q: Is the radio correctly earthed?
YES : Go to Step 4.
NO : Tighten the screw securely. Check that there is no noise.

STEP 4. Check by replacing the radio and CD player.

Q: Are operations normal when using another radio and CD player?
YES : Either repair or replace the radio and CD player. Check that there is no noise.
NO : Either repair or replace the antenna assembly. Check that there is no noise.

Inspection Procedure 10: Ever-present noise.

DIAGNOSIS PROCEDURE

Noise is often created by the following factors, and often the radio is OK when it is checked individually.

- Travelling conditions of the vehicle
- Terrain of area travelled through
- Surrounding buildings
- Signal conditions
- Time period

For this reason, if there are still problems with noise even after the measures described in inspection procedure 5 to 9 have been taken, get information on the factors listed above as well as determining whether the problem occurs with AM/FM/WM/LW, the station names, frequencies, etc. and contact the radio manufacturer's service centre.

Inspection Procedure 11: There is noise but no reception for both AM and FM or no sound from AM, or no sound from FM.

DIAGNOSIS PROCEDURE

STEP 1. Check the state of the antenna.

Q: Is the antenna assembled?
YES : Go to Step 2.
NO : Assemble the antenna.

STEP 2. Check to see if inspections are taking place is an area exposed to special electric fields.

Q: Are inspections taking place under special electric field conditions (underground garage, inside a building, etc).?
YES : Go to Step 3.
NO : Go to Step 4.

STEP 3. Relocate and check.

Automatically receive in a good reception area that is not exposed to special electric fields.

Q: Is reception of the strongest radio frequency possible within the area?
YES : There is no action to be taken.
NO : Go to Step 4.

STEP 4. Tune then check.

Q: Did the sensitivity improve after tuning?
YES : There is no action to be taken.
NO : Go to Step 5.

STEP 5. Check the connection of the antenna plug and the radio and CD player.

Q: Is the antenna plug thoroughly connected to the radio and CD player?
YES : Go to Step 6.
NO : Thoroughly connect the antenna plug and the radio and CD player.

STEP 6. Check by replacing the radio and CD player.

Q: Are operations normal when using another radio and tape player or CD player?
YES : Either repair or replace the radio and CD player.
NO : Either repair or replace the antenna assembly.

Inspection Procedure 11: There is noise but no reception for LW/MW/FM or no sound from LW/MW/FM.

DIAGNOSIS PROCEDURE

STEP 1. Check the state of the antenna.

Q: Is the antenna assembled?
YES : Go to Step 2.
NO : Assemble the antenna.

STEP 2. Check to see if inspections are taking place is an area exposed to special electric fields.

Q: Are inspections taking place under special electric field conditions (underground garage, inside a building, etc).?

YES : Go to Step 3.
NO : Go to Step 4.

STEP 3. Relocate and check.
Automatically receive in a good reception area that is not exposed to special electric fields.

Q: Is reception of the strongest radio frequency possible within the area?
YES : There is no action to be taken.
NO : Go to Step 4.

STEP 4. Tune then check.

Q: Did the sensitivity improve after tuning?
YES : There is no action to be taken.
NO : Go to Step 5.

STEP 5. Check the connection of the antenna plug and the radio and CD player.

Q: Is the antenna plug thoroughly connected to the radio and CD player?
YES : Go to Step 6.
NO : Thoroughly connect the antenna plug and the radio and CD player.

STEP 6. Check by replacing the radio and CD player.

Q: Are operations normal when using another radio and CD player?
YES : Either repair or replace the radio and CD player.
NO : Either repair or replace the antenna assembly.

Inspection Procedure 12: Poor reception.

DIAGNOSIS PROCEDURE

STEP 1. Check the state of the antenna.

Q: Is the antenna assembled?
YES : Go to Step 2.
NO : Assemble the antenna. Check that a poor reception is resolved.

STEP 2. Check to see if inspections are taking place is an area exposed to special electric fields.

Q: Are inspections taking place under special electric field conditions (underneath garage, inside a building, etc).?
YES : Go to Step 3.
NO : Go to Step 4.

STEP 3. Relocate and check.
Automatically receive in a good reception area that is not exposed to special electric fields.

Q: Is reception of the strongest radio frequency possible within the area?
YES : Move the vehicle to check the trouble symptom.
NO : Go to Step 4.

STEP 4. Tune then check.

Q: Did the sensitivity improve after tuning?
YES : This diagnosis is complete.
NO : Go to Step 5.

STEP 5. Check with several broadcasting stations.

NOTE: Multipath noise and fading noise: Because the frequency of FM waves is extremely high, it is highly susceptible to effects from geological formations and buildings. These effects disrupt the broadcast signal and obstruct reception in several ways.

Multipath noise
- *This describes the echo that occurs when the broadcast signal is reflected by a large obstruction and enters the receiver with a slight time delay relative to the direct signal (repetitious buzzing).*

Fading noise
- *This is a buzzing noise that occurs when the broadcast beam is disrupted by obstructing objects and the signal strength fluctuates intricately within a narrow range.*

Q: Is the abnormality in reception generated only within a certain range?
YES : Check that a poor reception is resolved.
NO : Go to Step 6.

STEP 6. Check the connection of the antenna plug and the radio and CD player.

Q: Is the antenna plug thoroughly connected to the radio and CD player?

YES : Go to Step 7.
NO : Thoroughly connect the antenna plug and the radio and CD player.

STEP 7. Check by replacing the radio and CD player.

Q: Does the another radio and CD player work normally?

YES : Either repair or replace the radio and CD player.
NO : Either repair or replace the antenna assembly.

Inspection Procedure 13: Distortion on LW/MW/FM.

DIAGNOSIS PROCEDURE

STEP 1. Check the degree in which distortion is generated.

Q: How much distortion is generated?
Occasional distortion : Go to Step 2.
Constant distortion : Go to Step 3.

Step 2. Check by the transmission antenna.

Q: Is there distortion by the transmission antenna?
YES : The input from the antenna is too big.
NO : Go to Step 3.

STEP 3. Check how the speakers are setup.

Q: Are any cords coming in contact with the paper cones of the speakers?

YES : Move the cords so that they do not come in contact with the paper cones of the speaker. Check that a distortion is resolved.
NO : Go to Step 4.

STEP 4. Check the speakers.

1. Remove the speakers.
2. Check to see if there is any ripping of the paper cones or any foreign obstacles in the paper cone.

Q: Are the speakers normal?
YES : Go to Step 5.
NO : Repair or replace the speakers. Check that a distortion is resolved.

STEP 5. Check how the speakers are setup.

Q: Check to see if the speakers are setup in a deformed manner.
YES : Correct the way the speakers are setup so they are securely setup.
NO : Repair or replace the radio and CD player.

Inspection Procedure 14: Using the auto select function, too few automatic stations are selected.

DIAGNOSIS PROCEDURE

STEP 1. Check the state of the antenna.

Q: Is the antenna assembled?
YES : Go to Step 2.
NO : Assemble the antenna. The auto-select function should operate normally.

STEP 2. Check the number of radio stations.

Q: Are there sufficient numbers of radio stations within the area?

YES : Go to Step 3.
NO : Go to Step 4.

STEP 3. Check the distance from the transmission antenna.

Q: Is there a transmission antenna within a range of 2 miles?
YES : Go to Step 5.
NO : Go to Step 4.

STEP 4. The check if there are not that many radio stations and when there is no transmission antenna in the vicinity.

Execute automatic selection and check to see that the strongest radio frequency is receivable within the area.

Q: Is reception of the strongest radio frequency possible within the area?
YES : There is no action to be taken.
NO : Go to Step 5.

STEP 5. Check to see if inspections are taking place is an area exposed to special electric fields.

Q: Are inspections taking place under special electric field conditions (underneath garage, inside a building, etc)?
YES : Go to Step 6.
NO : Go to Step 7.

STEP 6. Relocate and check.

Automatically receive in a good reception area that is not exposed to special electric fields.

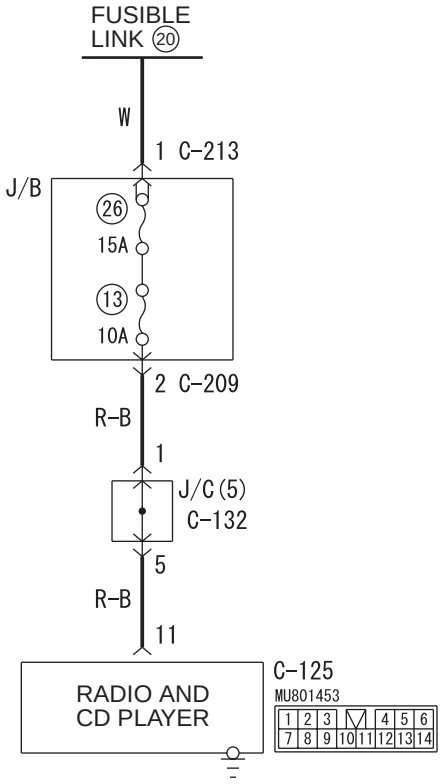
Q: Is reception of the strongest radio frequency possible within the area?
YES : There is no action to be taken.
NO : Go to Step 7.

STEP 7. Check the connection of the antenna plug and the radio and CD player.

Q: Is the antenna plug thoroughly connected to the radio and CD player?
YES : Repair or replace the radio and CD player. The auto-select function should operate normally.
NO : Thoroughly connect the antenna plug and the radio and CD player. The auto-select function should operate normally.

Inspection Procedure 15: Preset station are erased.

Memory Backup Power Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver WAC54E096A

COMMENTS ON TROUBLE SYMPTOM

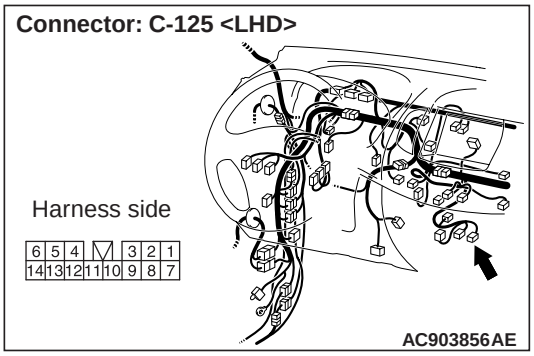
The cause is probably a faulty radio CD player memory backup power supply circuit system.

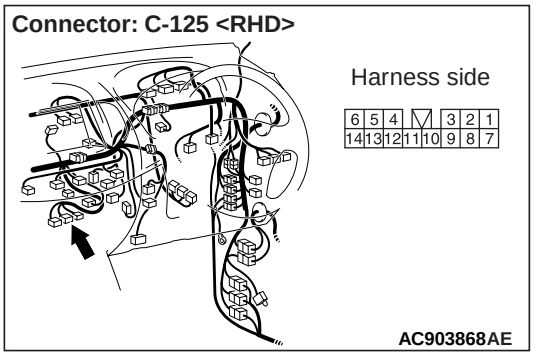
PROBABLE CAUSES

- Damaged wiring harness or connector.
- Malfunction of the radio and CD player.

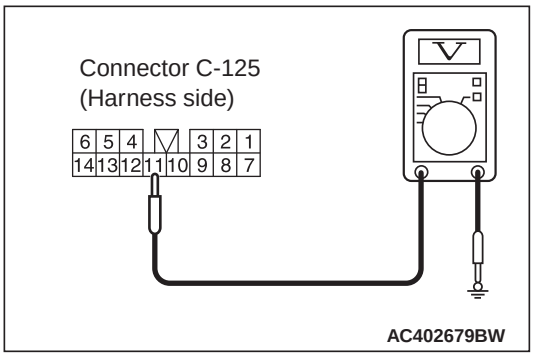
DIAGNOSIS PROCEDURE

STEP 1. Voltage measurement at radio and CD player connector C-125.





(1) Disconnect radio and CD player connector C-125.



(2) Measure the voltage between terminal number 11 and earth.

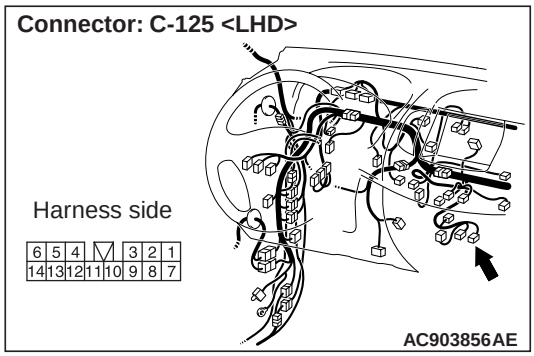
OK: System voltage

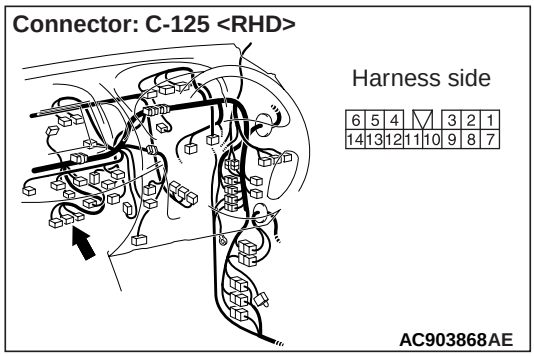
Q: Does the measured voltage correspond with this range?

When YES <radio and CD player does not execute memory save then.> : Either repair or replace the radio and CD player. Check that a memory is retained.

NO : Go to Step 2.

STEP 2. Connector check: Radio and CD player connector C-125.



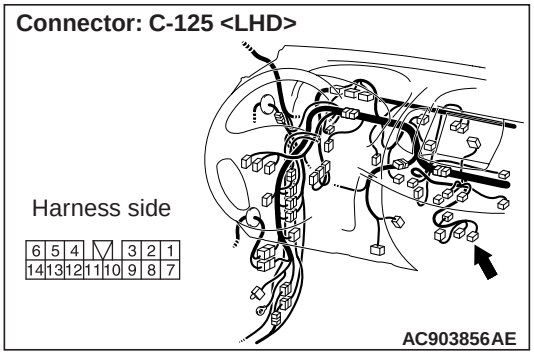


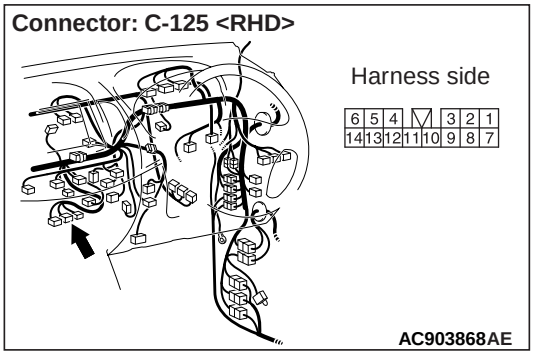
Q: Is radio and CD player connector C-125 in good condition?

YES : Go to Step 3.

NO : Repair or replace the damage component(s). Check that a memory is retained.

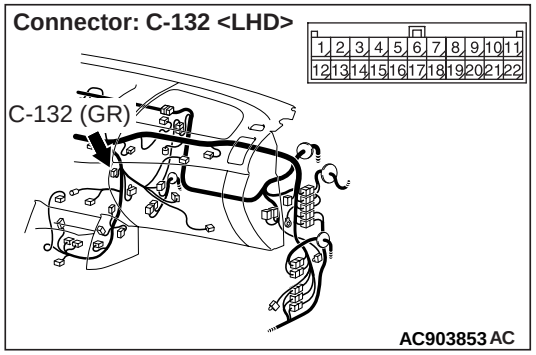
STEP 3. Check the wiring harness between radio and CD player connector C-125 (terminal 11) and fusible link 20 (battery).

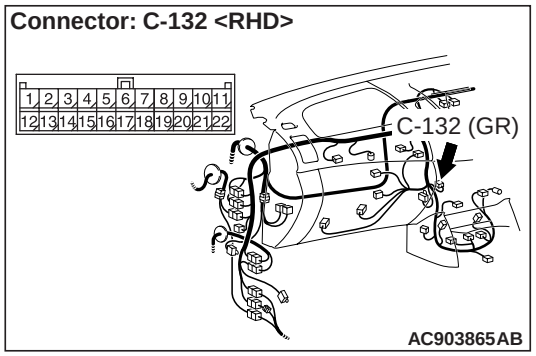


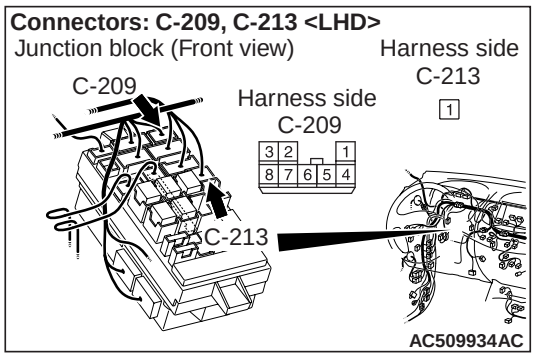


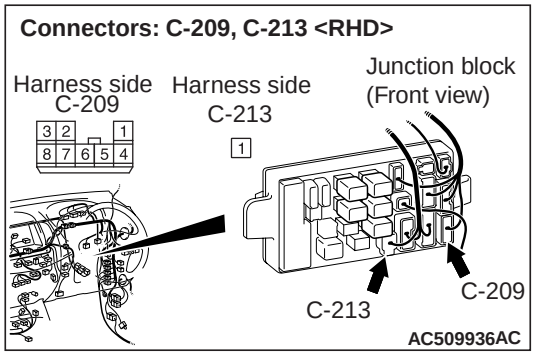
- Check the power supply line for open circuit and short circuit.

NOTE:









Prior to the wiring harness inspection, check junction block connectors C-209, C-213 and joint connector C-132, and repair if necessary.

Q: Are the wiring harness between radio and CD player connector C-125 (terminal 11) and fusible link 20 (battery) in good condition?

YES : Repair or replace the radio and CD player. Check that a memory is retained.

NO : Repair or replace the damage component(s). Check that a memory is retained.

Inspection Procedure 16: CD can not be inserted.

DIAGNOSIS PROCEDURE

STEP 1. Check that a CD has been already loaded.

Q: Has a CD been already loaded?
NO : Go to Step 2.
YES : Take out the CD (If the CD can not be ejected, refer to INSPECTION PROCEDURE 20 P.54A-293). Check that a CD can be inserted.

STEP 2. Check how a CD is inserted.
- Ensure that the ignition switch is at "ACC" or "ON".

NOTE: If you try to load a CD when the ignition switch is at the positions other than "ACC" or "ON", the CD will not be inserted completely and then rejected.

Q: If you try to load the CD, does the CD stops halfway and then rejected?
YES : Refer to INSPECTION PROCEDURE 20 P.54A-293.
NO : Go to Step 3.

STEP 3. Check after the CD is loaded.

NOTE: Even though the CD is loaded, "E" (error) is sometimes displayed with the CD rejected because of vibration/shock or dew on the CD face or optical lens.

Q: Though the CD is inserted completely, is "E" (error) displayed and the CD ejected?
YES : Go to Step 4.
NO : The procedure is complete.

STEP 4. Check the CD.
Check the CD for the conditions below:
- Is the CD loaded with its label facing down?
- Is the recorded face dirty or scratched?
- Is there dew on the recorded face?

Q: Is the CD in good condition?
YES : Go to Step 5.
NO : The original CD is defective. Check that a CD can be inserted.

STEP 5. Check again using a normal CD, which is not dirty or scratched.
- Load another normal CD.
- Check that the CD player recognizes and play the CD.

Q: When you substitute another normal CD, is the CD loaded correctly?
YES : The original CD is defective. Check that a CD can be inserted.
NO : Replace the radio with CD player. The procedure is complete.

Inspection Procedure 17: No sound. (CD only)

DIAGNOSIS PROCEDURE

STEP 1. Check again using a normal CD, which is not dirty or scratched.

Q: When you substitute another normal CD, is the CD played normally?
YES : The original CD is defective. The CD player should sound normally.
NO : Go to Step 2.

STEP 2. Check power supply to the CD player when the ignition switch is at "ACC" or "ACC".

Q: Is the radio and CD player energized when the ignition switch is turned to the "ACC" or "ON" position?
YES : Replace the radio and CD player. The procedure is complete.
NO : Check the memory backup power supply circuit. Refer to Inspection Procedure 1 P.54A-234.

Inspection Procedure 18: CD sound skips.

DIAGNOSIS PROCEDURE

STEP 1. Check the state in which the sound on the CD jumps.

Q: Does the sound jump when the car is parked?
YES : Go to Step 2.
NO : Go to Step 4.

STEP 2. Check the surface of the CD.

Q: Are there any scratches or soiling on the CD?
YES : The CD is defective if there are any scratches. Clean the CD surface if it is dirty. Check that a CD sound skip is resolved.
NO : Go to Step 3.

STEP 3. Check when replacing with a CD that can be played normally without any scratches or soiling.

Q: Does the CD play normally when replaced with a CD that is not scratched or dirty and can play normally?
YES : Defective CD used. Check that a CD sound skip is resolved.
NO : Go to Step 4.

STEP 4. Check by tapping the radio and CD player.

NOTE: Check by using a proper CD which is free from scratches, dirt or any other abnormality.

Q: Does the sound jump when tapping the radio and CD player?
YES : Securely mount the radio and CD player. Check that a CD sound skip is resolved.
NO : Either repair or replace the radio and CD player. (Take the following measures if a servicing shop is closely).
1. Investigate in detail the state when the sound jumps while driving the car.
2. Describe the state to the service shop for consultation.
3. Either repair or replace the radio and CD player according to the instructions of the service shop.

Check that a CD sound skip is resolved.

Inspection Procedure 19: Sound quality is poor.

DIAGNOSIS PROCEDURE

Check to see that the CD can be played normally and that it is free of any scratches or soiling.
Replace with better sound quality CD.

Q: Is the sound quality better replacing the CD with a clean CD without any scratches that can be played?
YES : Defective CD used. The sound quality should return to normal.
NO : Either repair or replace the radio and CD player. The sound quality should return to normal.

Inspection Procedure 20: CD can not be ejected.

DIAGNOSIS PROCEDURE

Check the power of ignition switch "ACC".

Q: Does the radio and CD player power turn ON when the ignition switch is in the "ACC" or "ON" position?
YES : Replace the radio and CD player. Check that a CD can be ejected normally.
NO : Check the power supply circuit. Refer to Inspection Procedure 1 P.54A-234.

ON-VEHICLE SERVICE

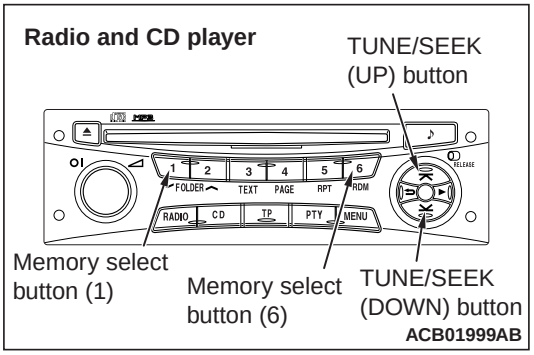
SPEAKER TEST

M1544005400932

RADIO AND CD PLAYER SPEAKER TEST

Enter the speaker test mode according to the following steps:

1. Turn the Ignition switch to the "ACC" or "ON" position and switch off the radio and CD player.



2. Press the following buttons in that order within sixty seconds from step (1).
   (1) Memory select "1" button
   (2) "TUNE/SEEK (DOWN)" button
   (3) "TUNE/SEEK (UP)" button
   (4) Memory select "6" button
3. Check that the speaker, which is displayed on the RV meter, sounds (If the [CH6] button is pressed, the speaker will be changed).

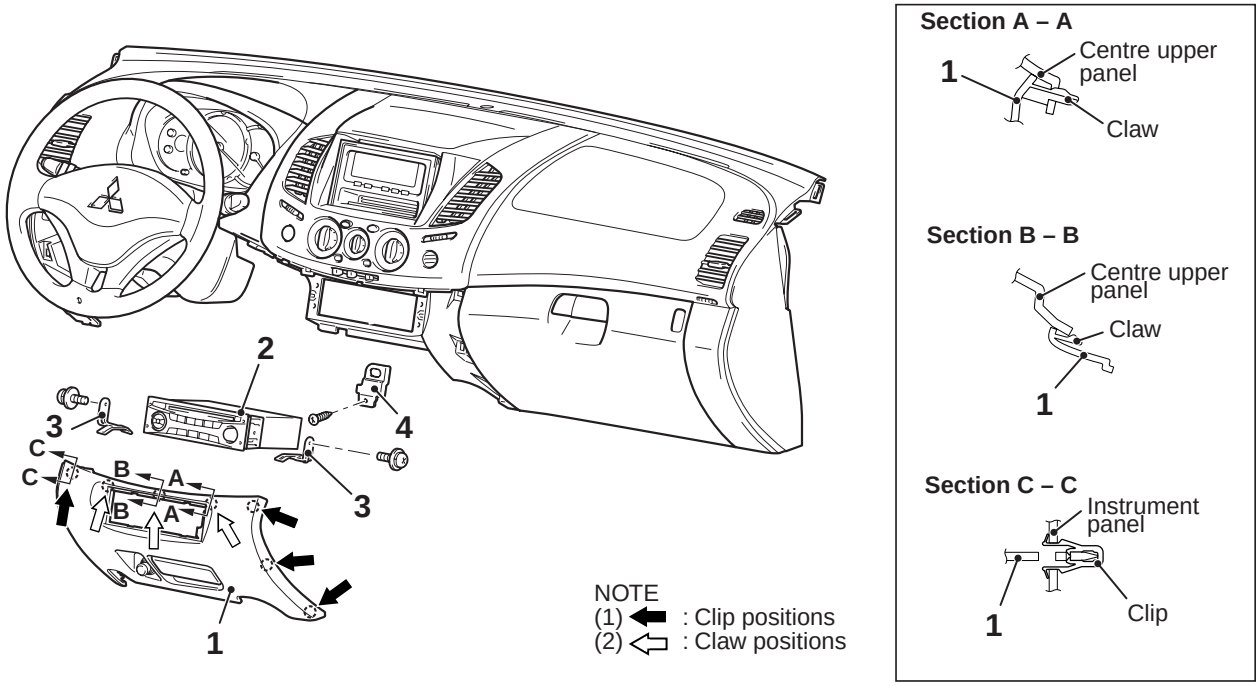
Display	Sound speaker
FL	Front door speaker (LH) and front tweeter (LH)
FR	Front door speaker (RH) and front tweeter (RH)
RL	Rear door speaker (LH)
RR	Rear door speaker (RH)

4. If a button other than the [CH6] button is pressed, or the ignition switch is turned to "LOCK" (OFF) position, you will exit from the speaker connection check mode.

REMOVAL AND INSTALLATION

M1544011300417

<NOT USING SPECIAL TOOL>

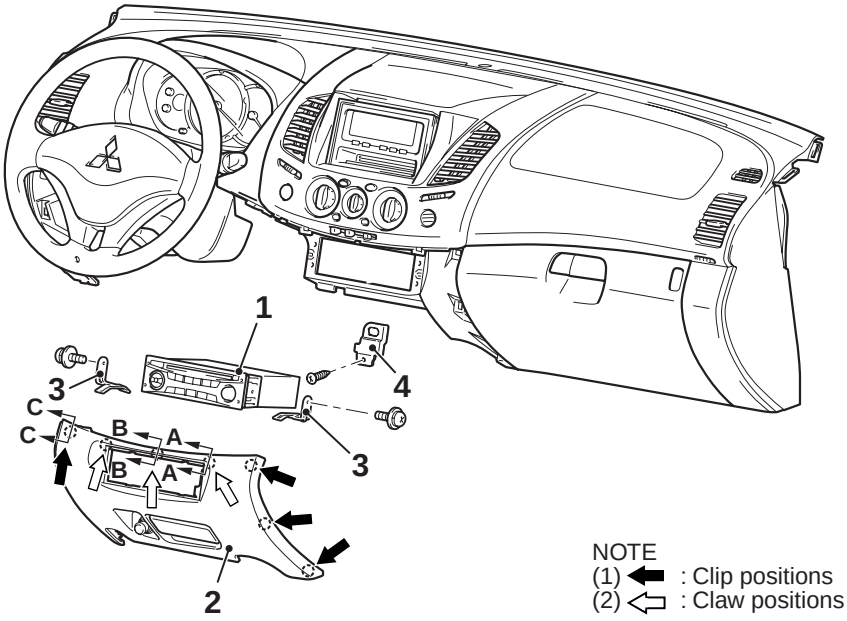


Removal steps
- Lower panel assembly (Refer to GROUP 52A, Instrument Panel Assembly).

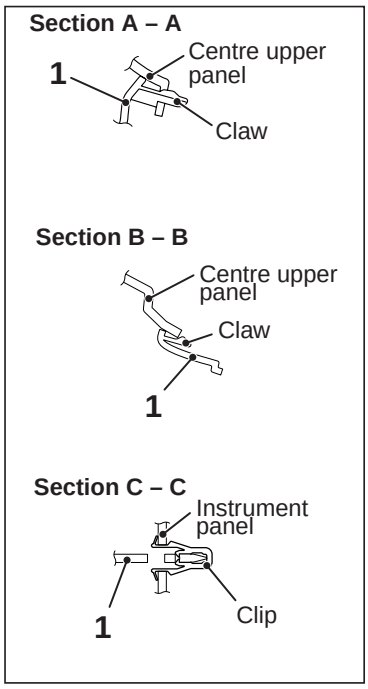
1. Centre lower panel
2. Radio and CD player

Removal steps (Continued)
3. DIN guide
4. DIN bracket

<USING SPECIAL TOOL>



NOTE
(1) ⬅ : Clip positions
(2) ⇦ : Claw positions



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Removal Steps

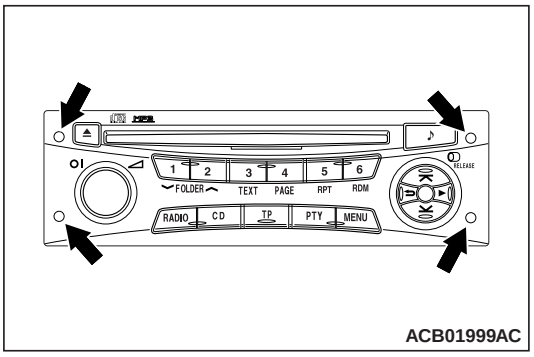
<<**A**>> >>**A**<<
1. Radio and CD player
- Lower panel assembly (Refer to GROUP 52A, Instrument Panel Assembly).

2. Centre lower panel
3. DIN guide
4. DIN bracket

REMOVAL SERVICE POINT

<<A>> RADIO AND CD PLAYER REMOVAL

Using the special tool audio remover and installer (MB992279), the radio and CD player can be removed without removing the lower panel assembly.



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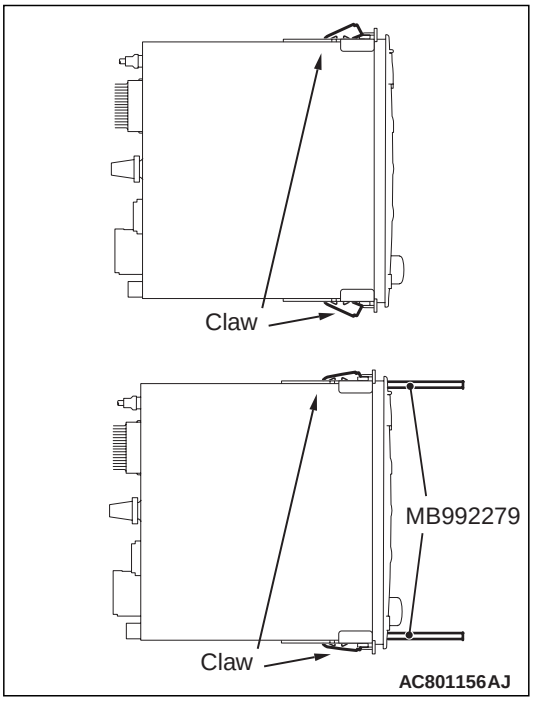
1. Insert the special tool audio remover and installer (MB992279) into the service hole of radio and CD player.



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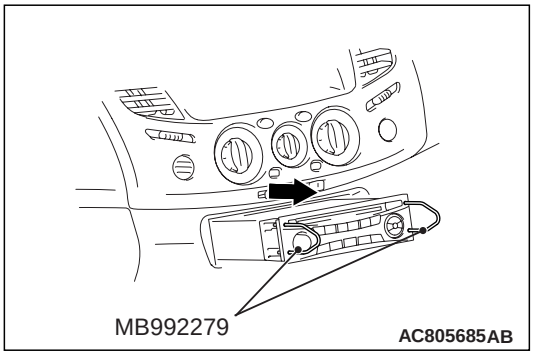
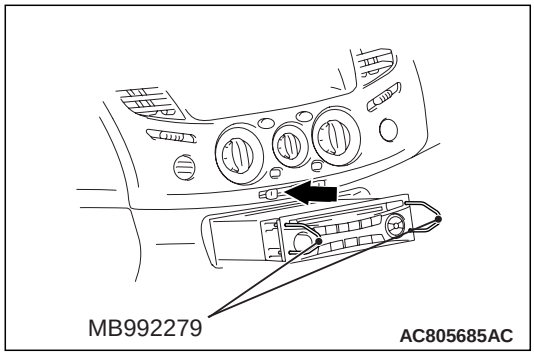
2. Press in the claws of radio and CD player using the special tool audio remover and installer (MB992279).



3. After pulling out the radio and CD player, disconnect the connector connection.

INSTALLATION SERVICE POINT

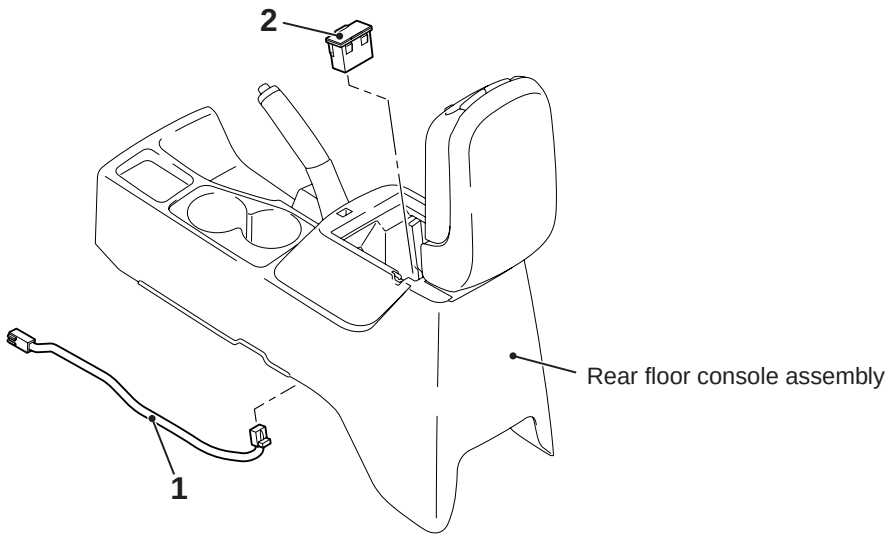
>>A<< RADIO AND CD PLAYER INSTALLATION



Press the radio and CD player using the special tool audio remover and installer (MB992279).

REMOVAL AND INSTALLATION

M1544019400021



Removal Steps

- Rear floor console assembly (Refer to GROUP 52A, floor console assembly).

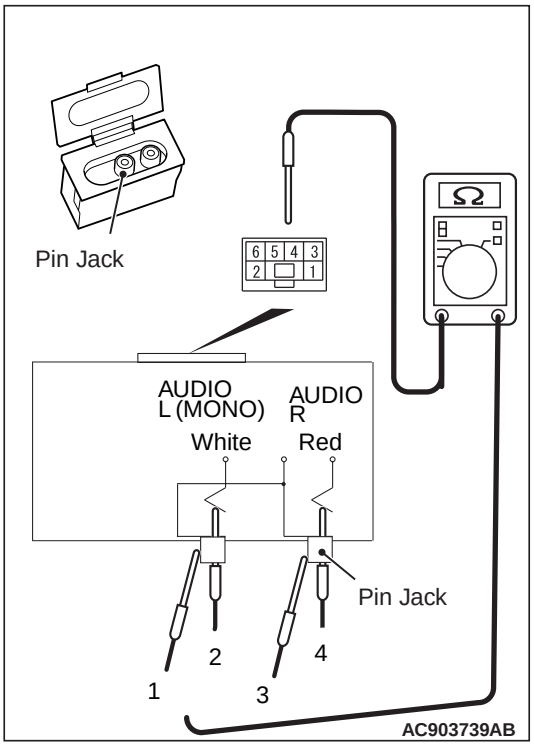
1. Front console harness
2. Audio adapter

INSPECTION

AUDIO ADAPTER INSPECTION

M1544019000197

1. Remove the audio adapter.(Refer to P.54A-296)
2. Check that the continuity exists between the pin jack of audio adapter and terminals.

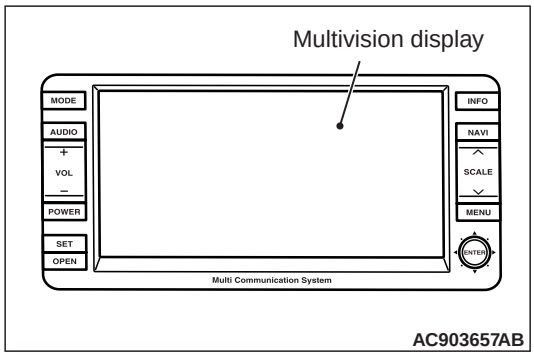


The connection position of pin jack side circuit tester	Terminal number	Measurement value
1	5	Continuity exists (2 Ω or less)
2	4	
3	5	
4	6	

MITSUBISHI MULTI COMMUNICATION SYSTEM (MMCS)

GENERAL INFORMATION

M1544000101111

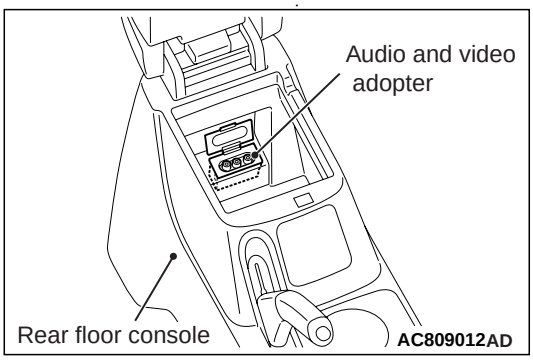


Mitsubishi multi-communication system (multivision display) with built-in hard disk drive (40 gigabyte) has been installed. Also, a 7-inch liquid crystal display of wide 2 DIN size has been adopted.

- The NAVTEQ map data (large volume map data for Europe) has been stored. <Except vehicle for RUSSIA>
- The Mitsubishi multi-communication system with NAVTEQ map data (large volume map data for RUSSIA) and the Mitsubishi multi-communication system without NAVTEQ map data are available. <Vehicle for RUSSIA>
- The 7-inch wide liquid crystal monitor has been adopted. The operation switch for operability has been equipped.
- Most sophisticated LSI* has been used as one for car navigation system.

*NOTE: *:LSI stands for Large Scale Integration, and is a large-scale integrated circuit (IC) containing between 1,000 and 100,000 circuit elements.*

- It is compatible with nine languages (English, Germany, French, Spanish, Italian, Portuguese, Dutch, Swedish and Danish). <Except vehicle for RUSSIA>
- The multivision display for Russia corresponds to Russian only.<Vehicle for RUSSIA>
- Compatible with RDS function.

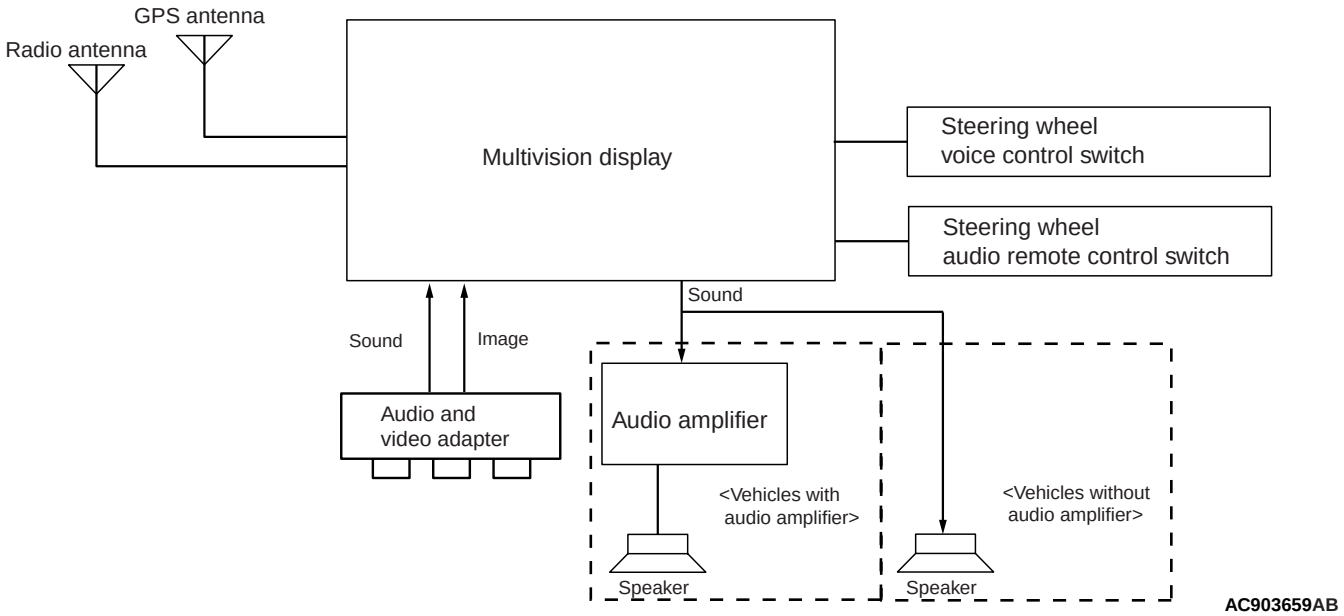


In order to connect video equipment such as video computer and video player, the external connection jacks (audio and video adapter) has been installed to the rear floor console.

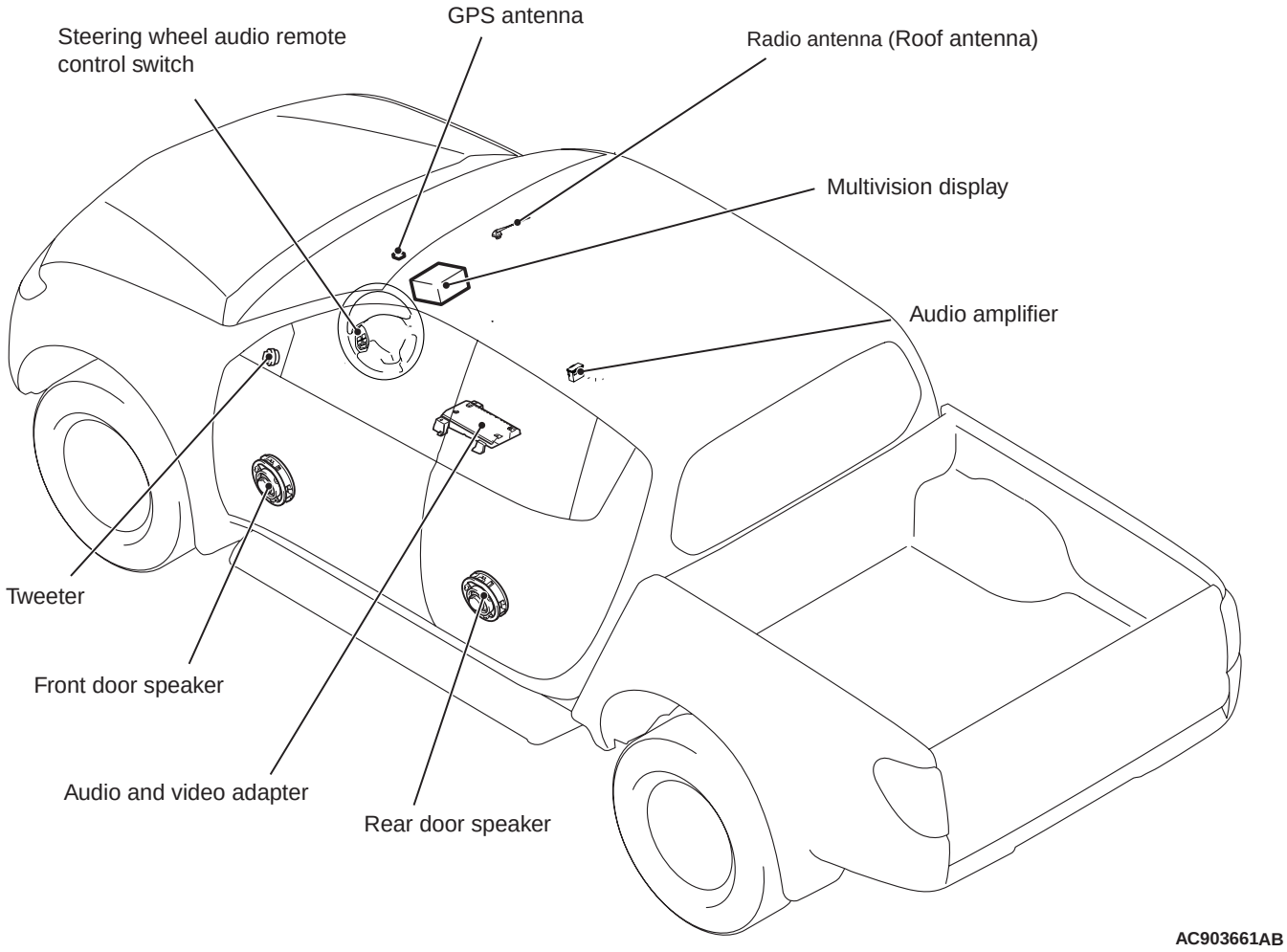
- An exclusive tuner for TMC is incorporated.
- Control by steering wheel audio remote control switch

Screen (function)	Contents
Navigation screen	Displays navigation functions such as road map, search, guidance and information retrieval.
Screen of current vehicle location	Information on vehicle's current position (such as latitude, longitude, altitude and GPS reception status)
CD/DVD	Plays the CD or DVD inserted to the drive (Designed for MP3/WMA file)
Music server screen	Plays music recorded in the hard disk drive and records a music CD. (The title whose information is acquired from CDDB can be displayed.)
Sound control	Adjusts the high/middle/low tone and balance. Function to set Equalizer type, sound field, and others when adopting the ROCKFORD™ ACOUSTIC DESIGN PREMIUM SOUND SYSTEM
Radio screen	Displays available broadcast stations and channels. FM(RDS)/MW/LW
AUX	Plays the image and sound input through the audio and video adapter. (Image cannot be seen during driving because of the driving restriction.)

SYSTEM BLOCK DIAGRAM

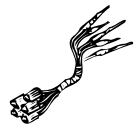
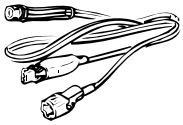
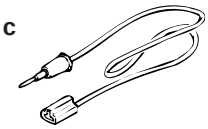
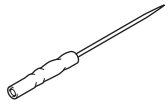


CONSTRUCTION DIAGRAM



SPECIAL TOOLS

M1540200300233

Tool	Number	Name	Use
a  b  c  d MB991223	MB991223 a: MB991219 b: MB991220 c: MB991221 d: MB991222	Harness set a: Test harness b: LED harness c: LED harness adapter d: Probe	Making voltage and resistance measurements during troubleshooting a: Connect pin contact pressure inspection b: Power circuit inspection c: Power circuit inspection d: Commercial tester connection
 MB992006	MB992006	Extra fine probe	Continuity check and voltage measurement at harness wire or connector

TROUBLESHOOTING

STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING

M1544004800669

Refer to GROUP 00 – Contents of troubleshooting .

PRECAUTIONS ON SERVICING MMCS

M1546003000150

PRIOR TO DISCONNECTING THE VEHICLE BATTERY

The MMCS stores a lot of information which your customer registers in its memory. All of this information will be cleared when the battery terminals are disconnected. Therefore, the preset channels must be stored before the vehicle battery is disconnected. Vehicle's current position and destinations must be stored if the vehicle battery remains disconnected for long periods.

DIAGNOSIS TIPS CONCERNING THE ENTIRE SYSTEM

1. If at least two system functions are defective at the same time, it is possible that communication between the system components is abnormal. Check the system using the communication and wire connection check in the service mode.
2. If an error is displayed, check that relevant wiring harness connectors are engaged correctly. If a failure is found, repair the connectors and check the trouble symptom again.
3. If the wiring harness connectors are engaged correctly, check the wiring harness. If the wiring harness is in good condition, replace relevant component(s). Now the error code and the service mode data must be stored.

NOTE: If a system communication related failure is suspected, diagnose the system.

DIAGNOSIS TIPS CONCERNING THE NAVIGATION FUNCTION

1. The precision of the GPS positioning is limited due to its operation principles. So, some of customer reports do not mean that the system is defective.

Prior to troubleshooting, interrogate your customer about how the navigation system is used and where he/she drives. If you determine that the system is OK, explain to your customer about how the system works and how the customer should operate it.

2. If the system is not OK, diagnose the system according to the trouble symptom chart.

ERROR MESSAGE

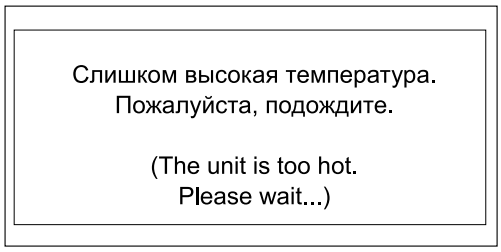
M1546023500254

When the multivision display detects its own unintentional operation or malfunction in the loaded disc, it displays the following error messages.

ERROR MESSAGE SAMPLE

<English>

<Russian>

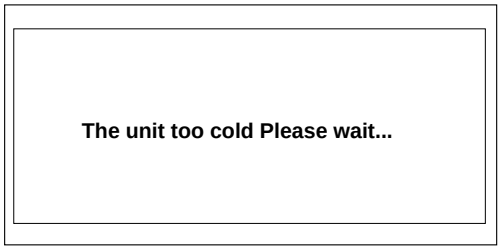


AC804184AB

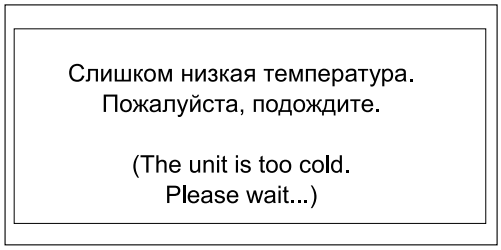
Error contents	Cause	Action
Malfunction of multivision display by high temperature	The inside temperature of the multivision display is 75°C or more.	Wait until the temperature drops to the operable temperature. After the temperature drops, the error message display is terminated, and then returns to the screen before the error message display.

ERROR MESSAGE SAMPLE

<English>



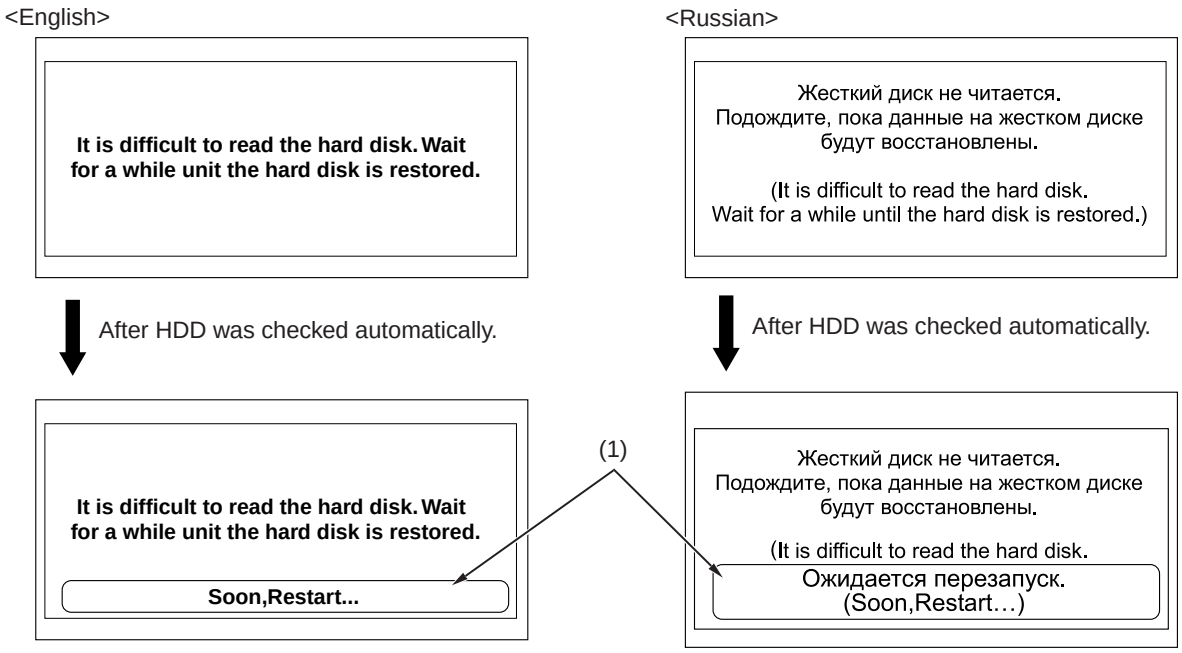
<Russian>



AC804184AC

Error contents	Cause	Action
Malfunction of multivision display by low temperature	The inside temperature of the multivision display is −20°C or less.	Wait until the temperature rises to the operable temperature by working the air conditioner. After the temperature rises, the error message display is terminated, and the screen returns to the status before displaying the error message.

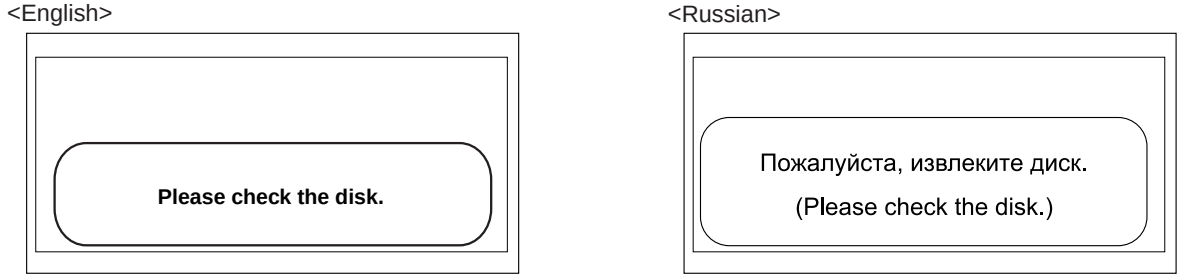
ERROR MESSAGE SAMPLE



AC804210AC

Error contents	Cause	Action
Malfunction of HDD by vibration	Severe vibration is applied to the multivision display, and the reading of the HDD data is prohibited.	When the multivision display confirms the HDD data reading availability, it restarts automatically. Check if the multivision display is securely installed to the vehicle body.
HDD Partition Error	System malfunction occurs to the HDD inside the multivision display.	The multivision display checks HDD automatically. (1) is displayed after the completion of the check. Select (1) to restart the multivision display. If it does not restart, turn the ignition switch to the OFF position to turn off the power supply, and then turn the ignition switch to the ON position to restart. After the restart, check that the OK is displayed for the HDD Drive in the "Network/Connect Line Check" of the MMCS service mode. If not, replace the multivision display.

ERROR MESSAGE SAMPLE

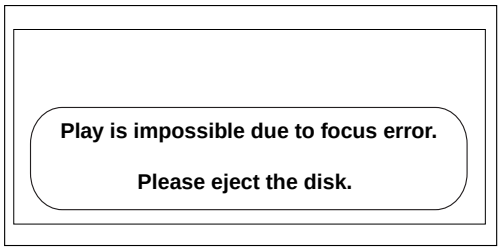


AC804184AK

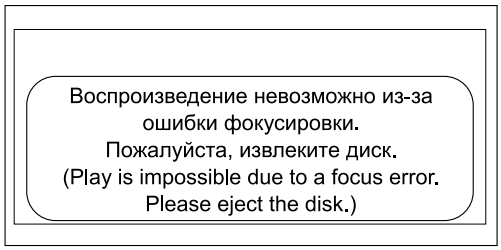
Error contents	Cause	Action
Disc type error	The specification of the disc used has a problem.	The disc used may have a problem. Check the disc for scratches or dirt. Also, perform the Inspection procedure 8 "CD/DVD cannot be Played" of the troubleshooting. (Refer to P.54A-371.)

ERROR MESSAGE SAMPLE

<English>



<Russian>

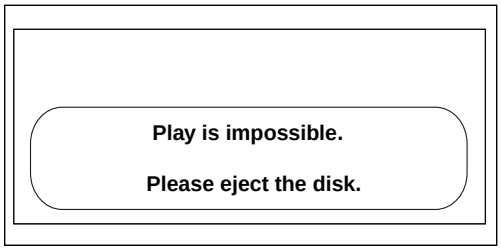


AC804184AG

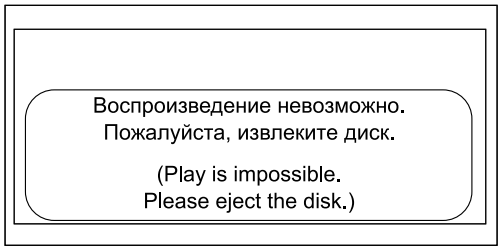
Error contents	Cause	Action
Focus error	The disc used has scratches and dirt, and the data cannot be read.	The disc used may have a problem. Check the disc for scratches or dirt. Also, perform the Inspection procedure 8 "CD/DVD cannot be Played" of the troubleshooting. (Refer to P.54A-371.)

ERROR MESSAGE SAMPLE

<English>



<Russian>

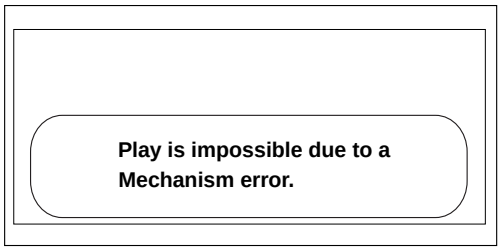


AC804184AE

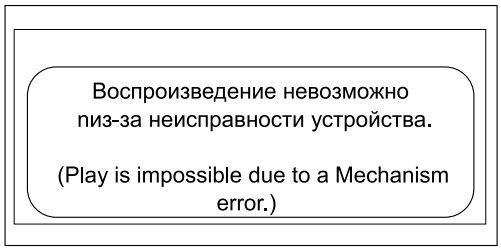
Error contents	Cause	Action
Disc error	The data of the disc used has a malfunction, and the data cannot be read.	The disc used may have a problem. Check the disc for scratches or dirt. Also, perform the Inspection procedure 8 "CD/DVD cannot be Played" of the troubleshooting. (Refer to P.54A-371.)
Seek error		
Servo startup error		
TOC read error		
DVD-Video Disc info error (Disc information cannot be read.)		

ERROR MESSAGE SAMPLE

<English>



<Russian>

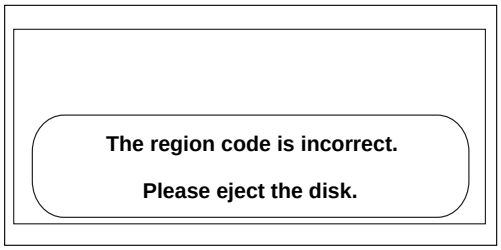


AC804184AJ

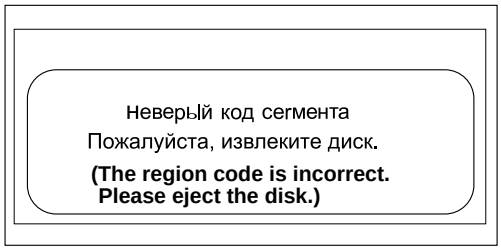
Error contents	Cause	Action
Power-on error	The DVD drive inside the multivision display has a malfunction.	Perform the Inspection procedure 8 "CD/DVD cannot be Played" of the troubleshooting. (Refer to P.54A-371.)
Pickup operation error		
Mecha stack error		
Loading/eject error		

ERROR MESSAGE SAMPLE

<English>



<Russian>

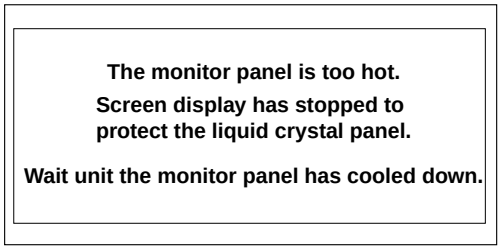


AC804184AI

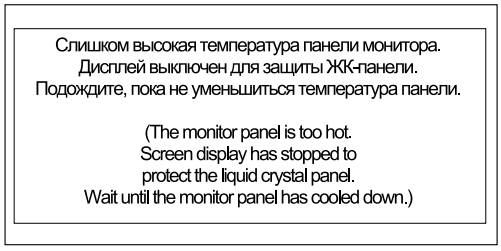
Error contents	Cause	Action
DVD-Video region code error	The region code of the DVD does not match the specification of the multivision display.	Replace with the DVD that matches the specification of the multivision display.

ERROR MESSAGE SAMPLE

<English>



<Russian>



AC804184AH

Error contents	Cause	Action
Monitor high temperature error	The inside temperature of the monitor is 95°C or more for 60 seconds or more.	The monitor turns OFF 5 seconds after the error message appears. Wait until the temperature of the monitor drops. The temperature drops, and then the multivision display returns automatically.

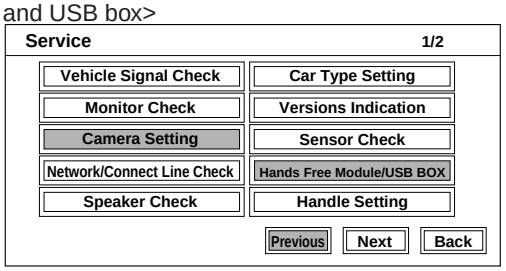
SERVICE MODE

M1546016600992

HOW TO INITIATE THE SERVICE MODE

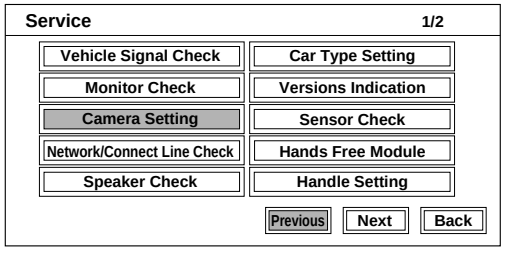
1. With the navigation system active, press and hold both the "NAVI" and "SET" buttons for 3.5 seconds.

<Vehicles without hands free ECU and USB box>



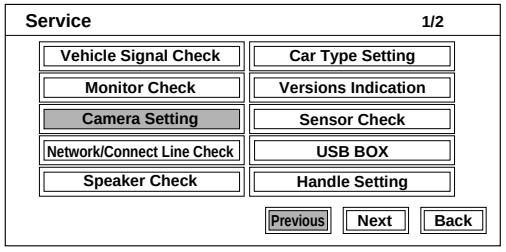
ACB01771AB

<Vehicles with hands free ECU>

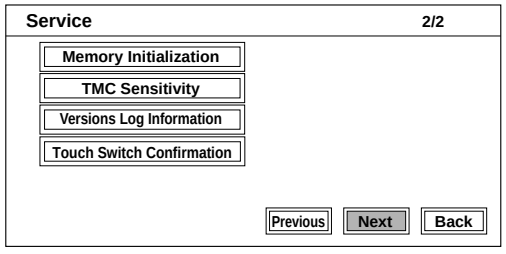


ACB01772AB

<Vehicles with USB box>



ACB01773AB



ACB00873

2. The service mode will be initiated. Then "Service" screen will be displayed.

HOW TO TERMINATE THE SERVICE MODE

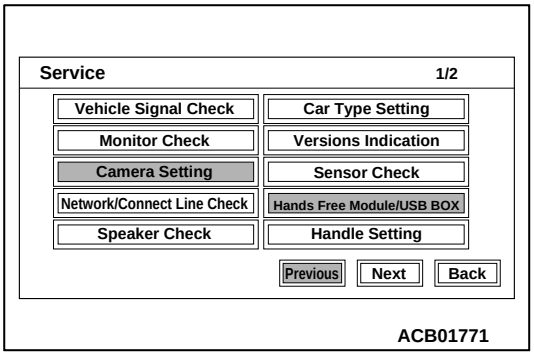
If the operations below are done, the service mode will be terminated.

- If "Back" button is selected on "Service" screen, the service mode will terminate and then return to the previous screen.
- If "NAVI" button is pressed with the service mode active, the service mode will terminate and change to the navigation screen.

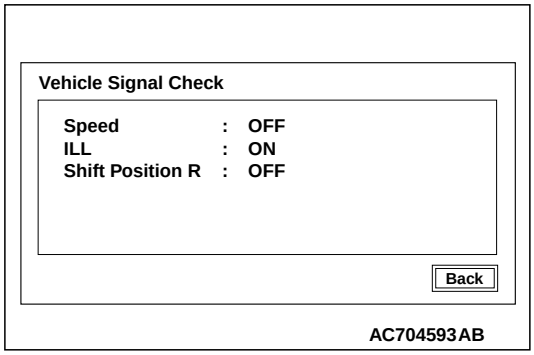
NOTE: If "NAVI" button is pressed, the following functions of the service mode will terminate.

- *Vehicle Signal Check*
- *Monitor Check*
- *Network/Connect Line Check*
- *Speaker Check*
- *Car Type Setting*
- *Versions Indication*
- *Sensor Check*
- *Hands Free Module <Vehicles with hands free ECU>*
- *USB BOX <Vehicles with USB box>*
- *Handle Setting*
- *Memory Initialization*
- *TMC Sensitivity*
- *Versions Log Information*
- *Touch Switch Confirmation*

VEHICLE SIGNAL CHECK

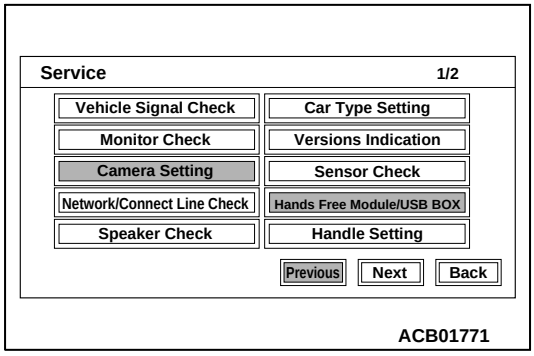


1. Select "Vehicle Signal Check" on "Service" screen.

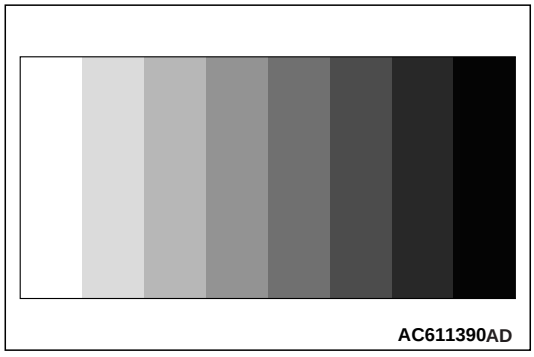


2. The check results will be displayed for the items below.
   - "Speed": "ON" when the vehicle speed is 6 km/h or more, and "OFF" when the vehicle speed is 4 km/h or less.
   - "ILL": "ON" when the headlamps are on, and "OFF" when they are off.
   - "Shift Position R": "ON" when the selector lever is at R position, and "OFF" when it is at the other position.

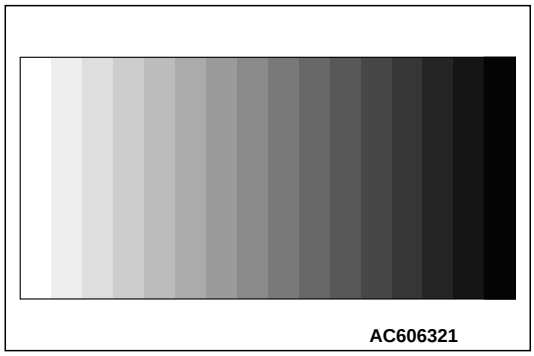
MONITOR CHECK



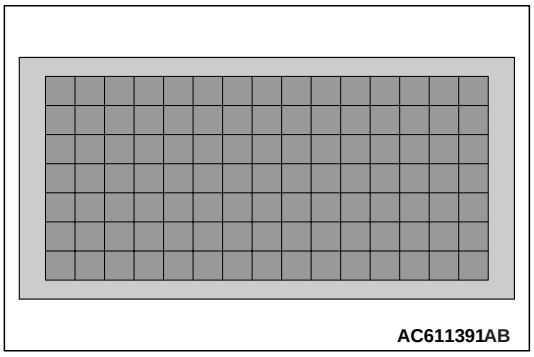
1. Select "Monitor Check" on "Service" screen.



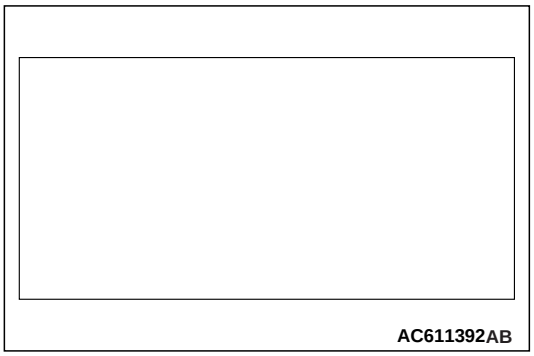
2. Eight colour bars will be displayed.



3. When "Enter" is pressed on the navigation unit joystick while the eight colour bars are shown, grey scale will be displayed with a 16-step gradation.


AC611391AB

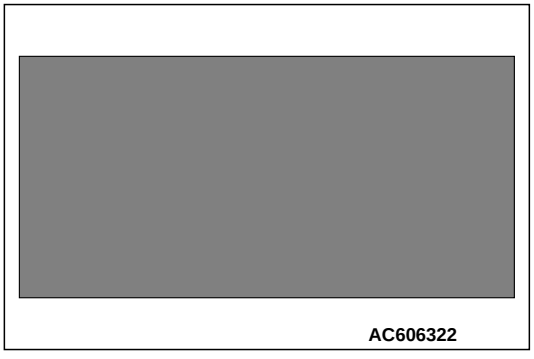
4. When "Enter" is pressed while the grey scale is shown with a 16-step gradation, a crosshatch pattern will be displayed (Each cell should be square).


AC611392AB

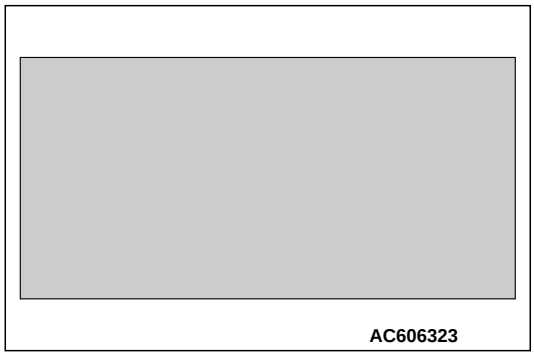
5. When "Enter" is pressed on the navigation unit joystick while the crosshatch pattern is shown, the screen will turn white.

AC611393AB

6. When "Enter" is pressed on the navigation unit joystick while the screen is white, it will turn black.


AC606322

7. When "Enter" is pressed on the navigation unit joystick while the screen is black, the screen will turn red.

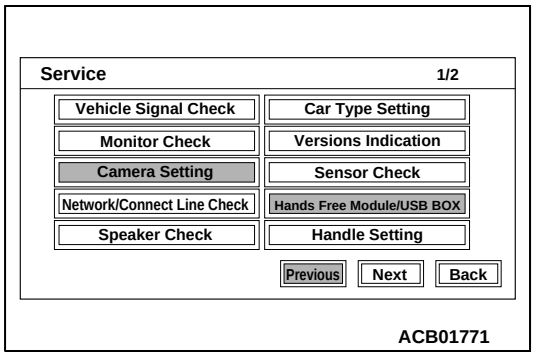

AC606323

8. When "Enter" is pressed on the navigation unit joystick while the screen is red, it will turn green.

AC606324

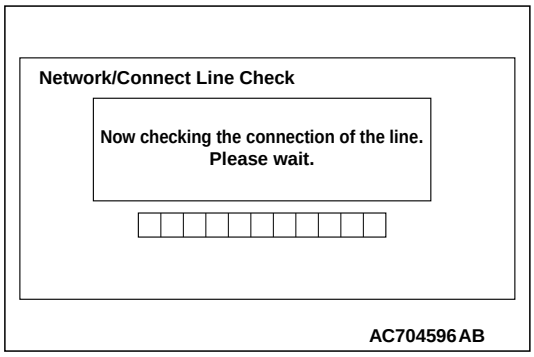
9. When "Enter" is pressed on the navigation unit joystick while the screen is green, it will turn blue.
10. When "Enter" is pressed on the navigation unit joystick while the screen is green, it will return to the "Service" screen.

NETWORK AND CONNECT LINE CHECK

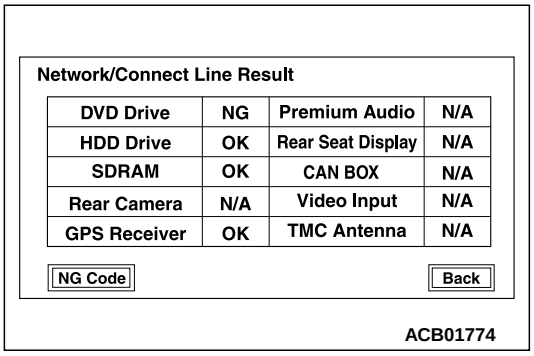


ACB01771

1. Select "Network/Connect Line Check" on "Service" screen.

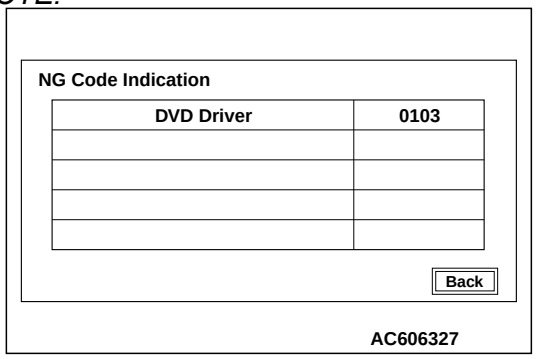


2. A network and connect line check will be initiated. The "Network/Connect Line Check" screen will display how the check is in progress.



3. When the network and connect line check is finished, the screen will change to "Network/ Connect Line Result" to show the check results.

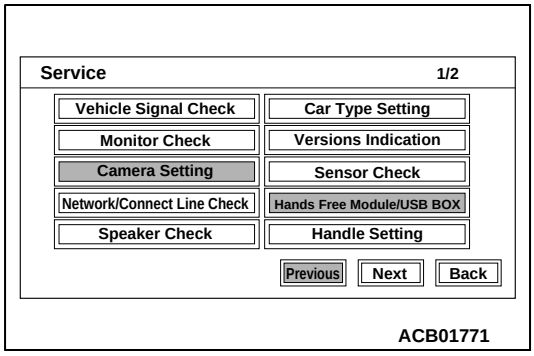
NOTE:



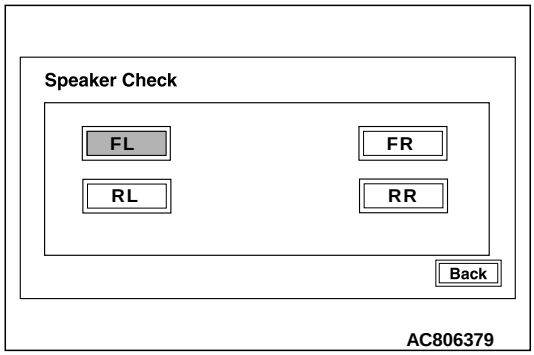
If there is "NG" or "N/A" as the check results, select "NG Code" on the "Network/Connect Line Result" screen. Then "NG code Indication" screen will show the NG code.

4. If "Back" is selected on "Network/Connect Line Result", the screen will return to "Service" screen.

SPEAKER CHECK



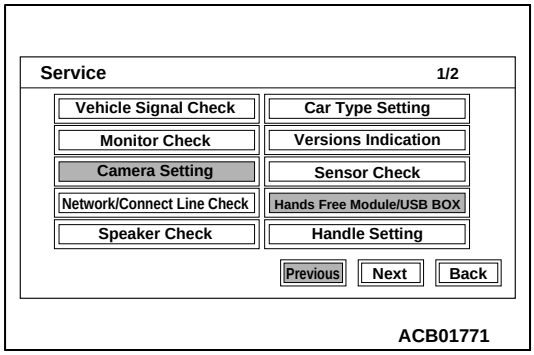
1. Select "Speaker Check" on "Service" screen.



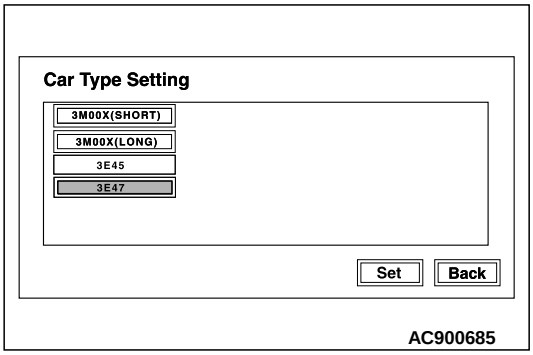
2. Select a speaker to be checked, and play test tone through the speaker.

Display	Sound speaker
FL	Front door speaker (LH) and tweeter (LH)
FR	Front door speaker (RH) and tweeter(RH)
RL	Rear door speaker (LH)
RR	Rear door speaker (RH)

CAR TYPE SETTING



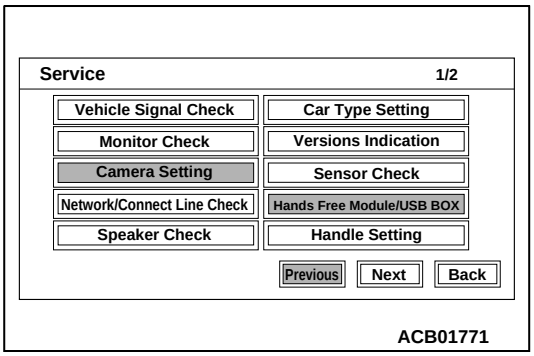
1. Select "Car Type Setting" on "Service" screen.



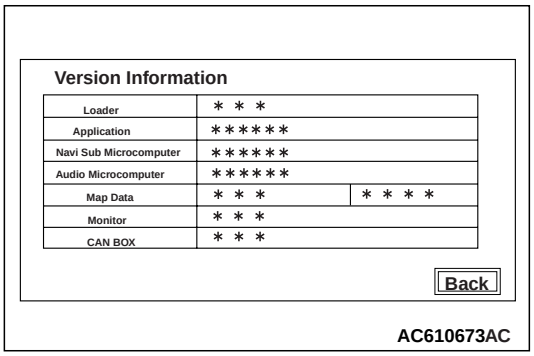
2. Check that it is set to "3E47". If not, select "3E47", and then choose "Set".

VERSIONS INDICATION

Displays versions indication (Loader, Application, Audio Microcomputer, Navi Sub Microcomputer, Map Data, Monitor).



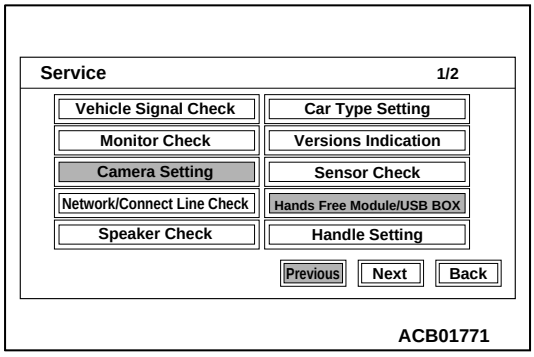
1. Select "Versions Indication" on "Service" screen.



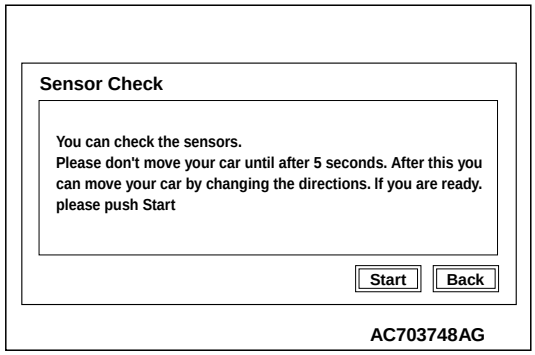
2. Versions indication is displayed.

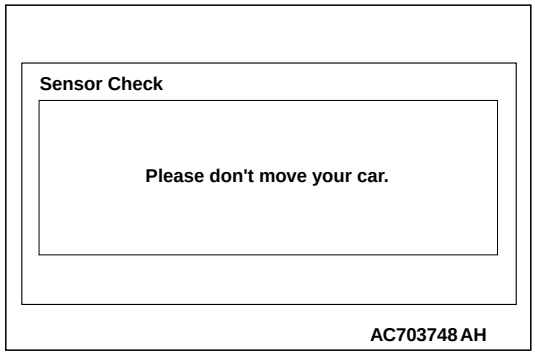
SENSOR CHECK

The speed sensor and gyro sensor will be checked, depending on the vehicle conditions such as driving condition, stationary condition and travel direction change.

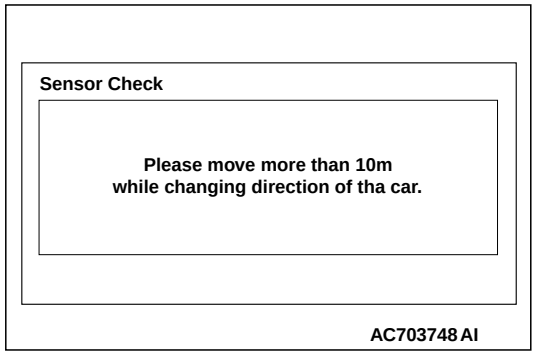


1. Select "Sensor Check" on "Service" screen.

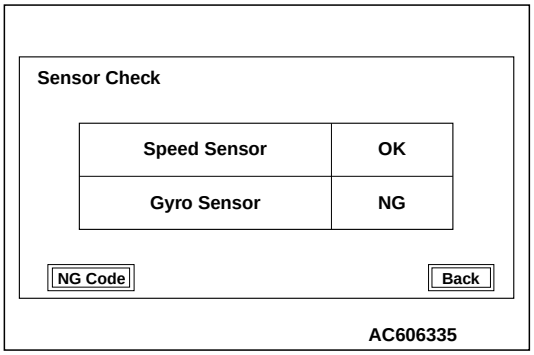




2. The sensor check with the vehicle stationary will be executed in accordance with the screen.

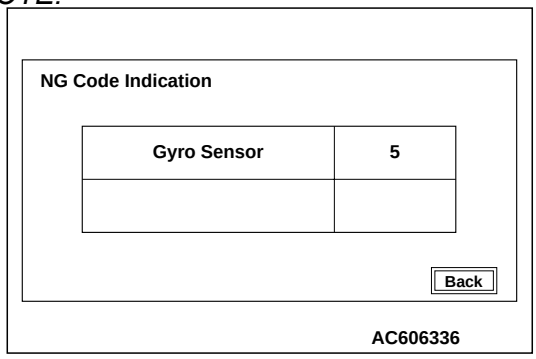


3. The sensor check with the vehicle in motion will be executed in accordance with the screen.



4. When the sensor checks are complete, the screen will display the check results.

NOTE:

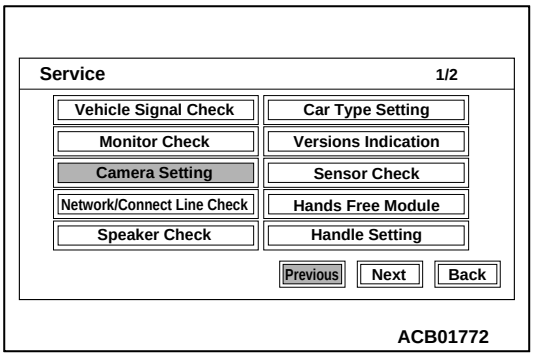


If there is "NG" or "N/A" as the check results, select "NG Code" on the "Sensor Check" screen. Then "NG code Indication" screen will show the NG code.

NG CODE REFERENCE TABLE FOR SENSOR CHECK

Sensor classification	NG Code No.	Error items
Gyro sensor	1	Offset error while the vehicle is stationary (lower limit error)
	2	Offset error while the vehicle is stationary (upper limit error)
	5	Output error during driving
Speed sensor	6	Output error while the vehicle is stationary

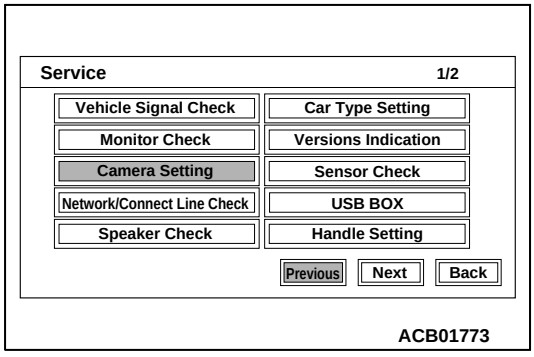
HANDS FREE MODULE <VEHICLES WITH HANDS FREE ECU>



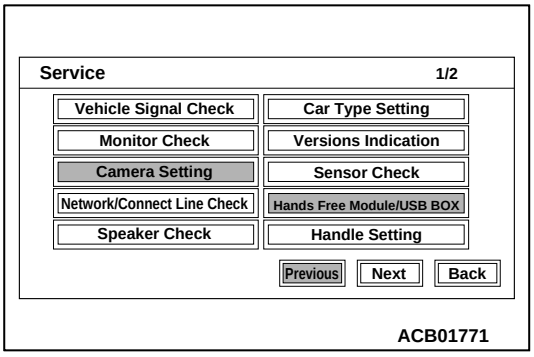
1. Select "Hands Free Module" on "Service" screen.
   NOTE: For item "Hands Free Module", refer to Hands Free ECU – Diagnosis Mode P.54A-406.)

HANDLE SETTING

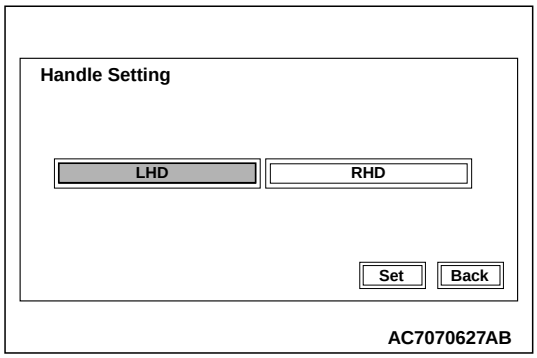
USB BOX <VEHICLES WITH HANDS USB BOX>



1. Select "USB BOX" on "Service" screen.
   NOTE: For item "USB BOX", refer to USB box – Diagnosis Mode P.54A-434.)



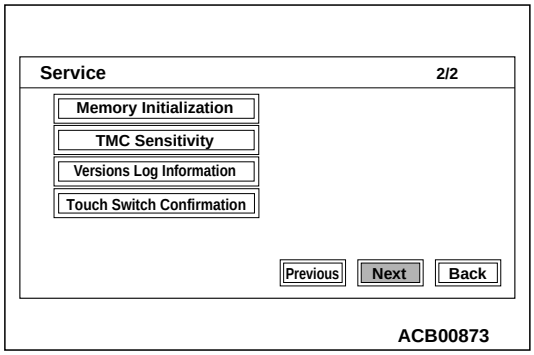
1. Select "Handle Setting" on "Service" screen.



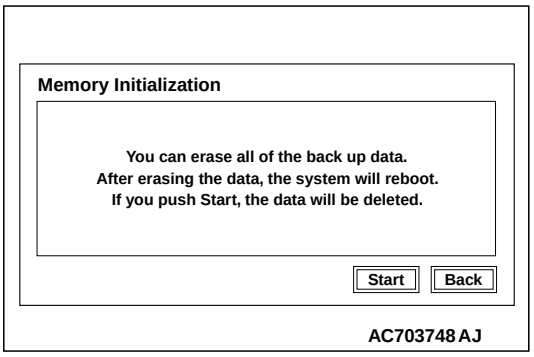
2. Select the currently-set handle to display.
3. To change the handle setting, select the handle to be changed to, and then select "Set."

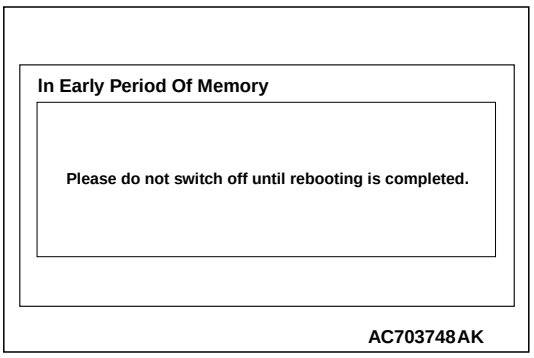
   NOTE: Even when the handle is selected, the selected handle will not be set if "Back" is selected.

MEMORY INITIALIZATION



1. Select "Memory Initialization" on "Service" screen.

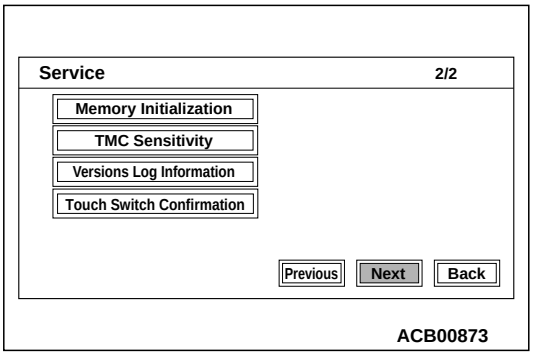




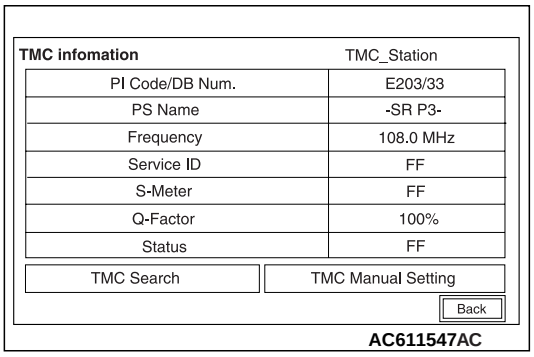
2. If you select "Start" on "Memory Initialization" screen, the settings such as registered locations and music server will be erased (initialized) from the memory.

   NOTE: If the ignition switch is turned to "LOCK" (OFF) position during the initialization, the initialization will be suspended. If the ignition switch is turned to "ACC" or "ON" position, the initialization will be resumed.
3. After the memory initialization is complete, the navigation system will restart automatically.

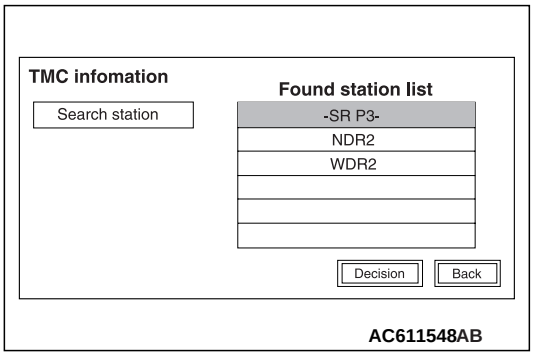
TMC SENSITIVITY



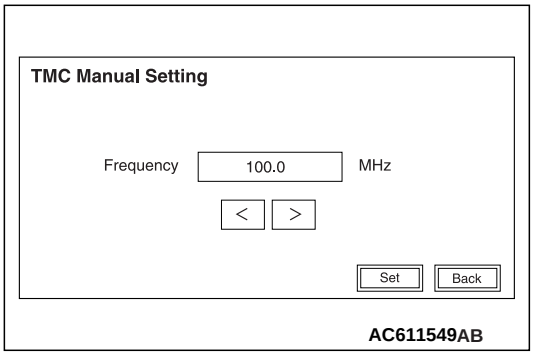
1. Select "TMC sensitivity" on "Service" screen.



2. The information of TMC station is displayed.
   NOTE: When the now-received information is from selected TMC station, "TMC_station" is displayed on the upper right of the screen. "–" is displayed when the information is not received.



3. Select "TMC Search" on the "TMC information" screen to search the TMC station that can be received, and update and display the contents of "Found station list".
4. Select "TMC station" displayed on the "Found station list" and press "decision" switch to update the received TMC station and return to the "TMC information" screen. The information of selected TMC station is displayed on the TMC information screen.

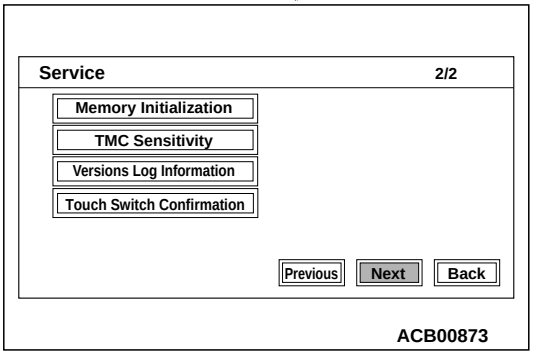


5. Select "TMC Manual Search" on the "TMC information" screen to set the frequency by "<" or ">" switch.
6. Update the received TMC station by "Set" switch and return to the "TMC information" screen. The information of selected TMC station is displayed on the TMC information screen.

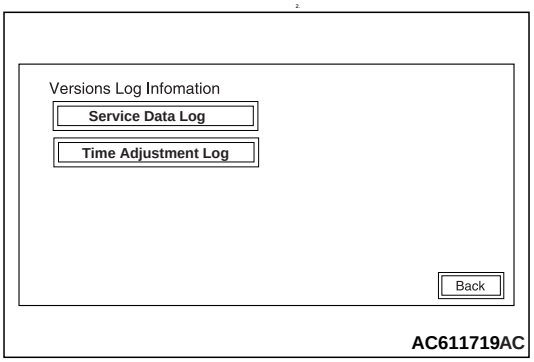
VERSIONS LOG INFORMATION

Displays logs for drive and HDD.

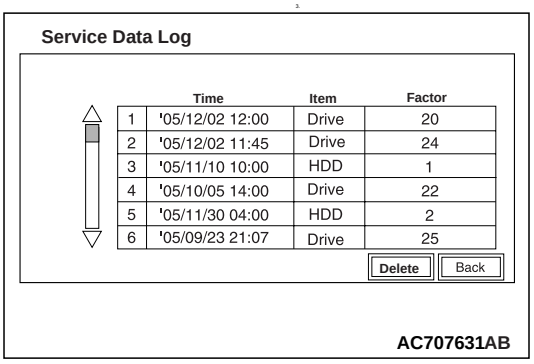
Service Data Log



Select "Versions Log Information" on "Service" screen.



Select "Service Data Log" on the "Versions Log Information" screen.



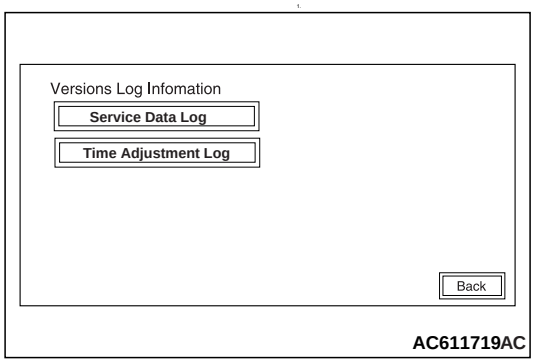
The logs are displayed from the latest one.

4. The log data is erased by pressing "Delete."

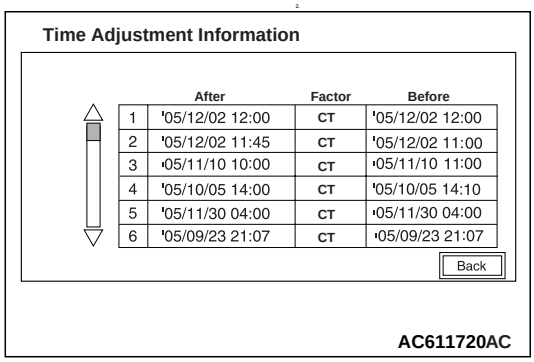
EACH LOG INFORMATION: FACTOR CODE TABLE

Item	Factor number	Produced log
Drive	20	Log concerning focus
	21	Log concerning disc type
	22	Log concerning disc
	25	Log concerning SEEK
	26	Log concerning servo start-up
	27	Log concerning power-On
	28	Log concerning loading / eject operation
	29	Log concerning pick-up operation
	30	Log concerning state of mechanism
	52	Log concerning TOC reading
HDD	1	Log concerning high temperature
	2	Log concerning low temperature
Monitor	1	Log concerning high temperature
AMP	0	Log concerning connection
	15	Log concerning communication

Time Adjustment Log

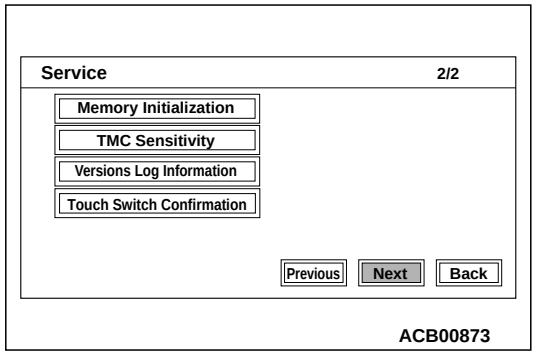


Select "Time Adjustment Log" on the "Versions Log Information" screen.

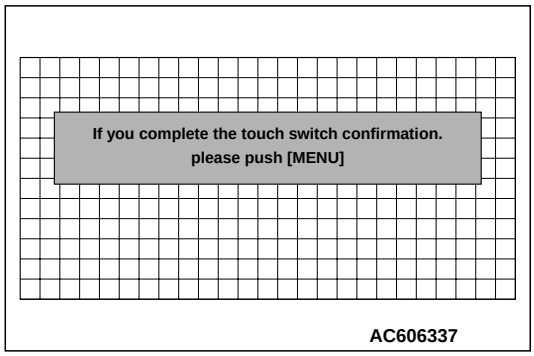


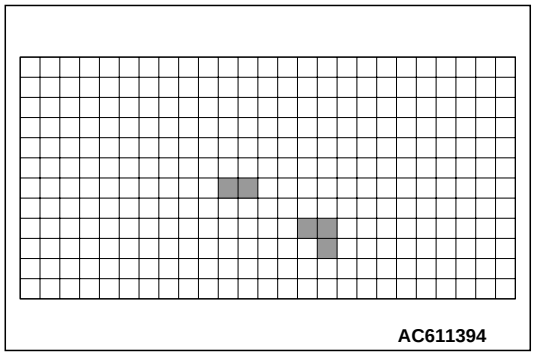
The time adjustment logs are displayed.
As for Factor, the following two types are displayed.
CT: Automatic adjustment
MAN: Manual adjustment

TOUCH SWITCH CONFIRMATION



1. Select "Touch Switch Confirmation" on "Service" screen.





2. If you touch the screen, the colour of the dotted coordinate at the touched area will be changed.

TROUBLE SYMPTOM CHART

M1546001801250

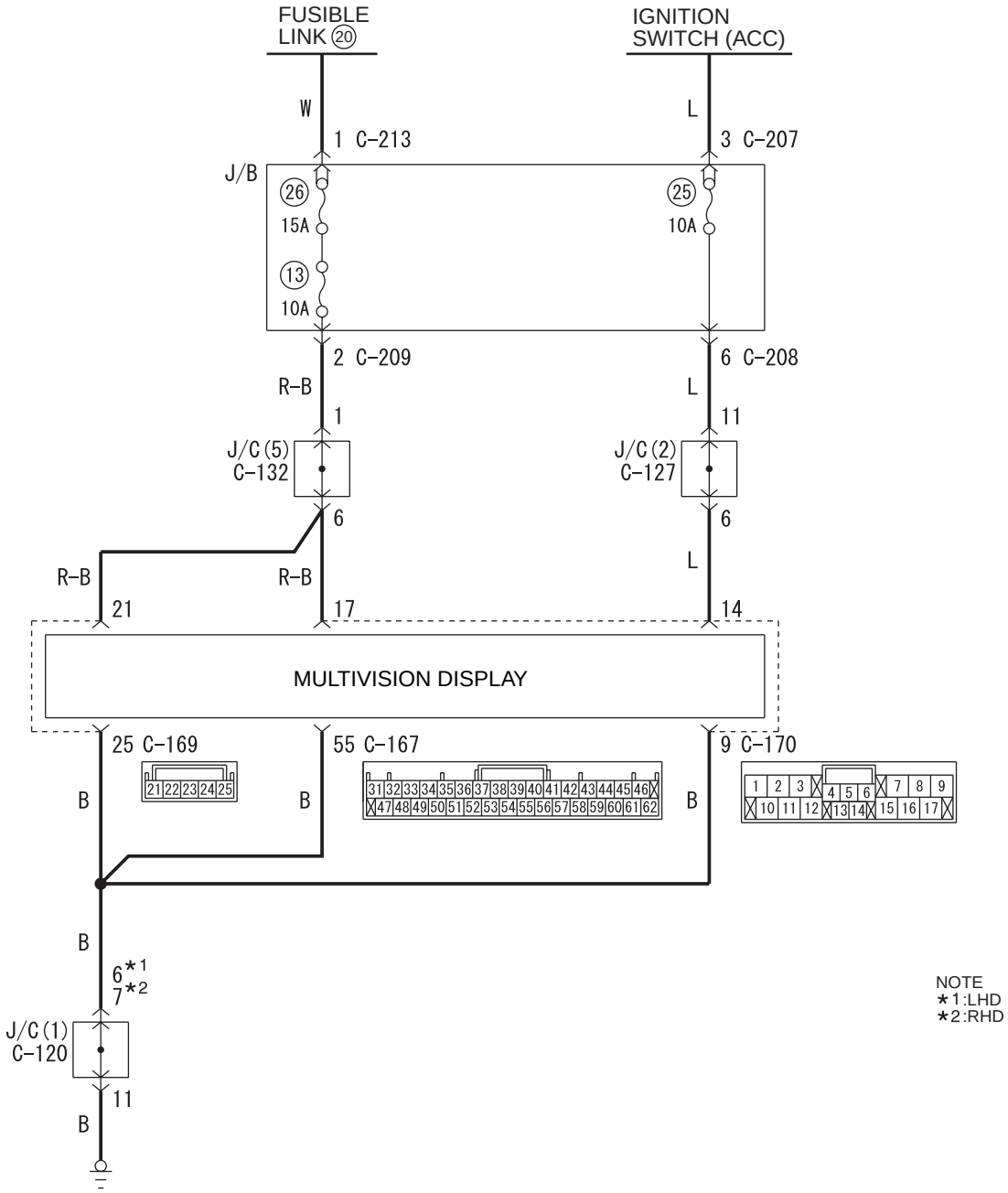
Inspection procedure No.	Trouble symptom		Reference page
1	No navigation screen is displayed.		P.54A-315
2	No sound is heard.	<Vehicles without audio amplifier>	P.54A-327
		<Vehicles with audio amplifier>	P.54A-331
3	No sound is heard from one of the speakers.	<Vehicles without audio amplifier>	P.54A-337
		<Vehicles with audio amplifier>	P.54A-351
4	The navigation system can be operated while the vehicle is driven.		P.54A-361
5	The screen is not normal in the navigation mode. (The own vehicle mark is dislocated.)	<Except vehicles for RUSSIA>	P.54A-363
		<Vehicles for RUSSIA>	P.54A-366
6	The radio broadcasting can not be received.		P.54A-368
7	GPS signal can not be received.	<Except vehicles for RUSSIA>	P.54A-370
		<Vehicles for RUSSIA>	P.54A-370
8	CD/DVD cannot be played.		P.54A-371
9	Image of a DVD is played, but no sound is played.		P.54A-373
10	Sound of a DVD can be played, but no image is played.		P.54A-374
11	The picture and sound of external input are not played.		P.54A-375

SYMPTOM PROCEDURES

Inspection Procedure 1: No navigation screen is displayed.

⚠ CAUTION
Whenever the multivision display is replaced, ensure that the power supply circuit and the earthing circuit are normal. (Check that the voltage is 10 V or more.)

Multivision Display Power Source Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

WAC54E097A

COMMENTS ON TROUBLE SYMPTOM

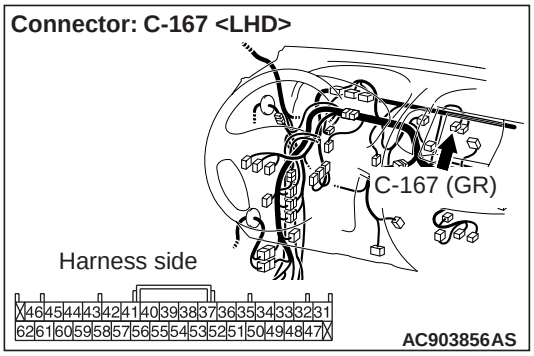
When the ignition switch is turned to the ACC or ON position, if the screen is not displayed at all, the power supply circuit or multivision display may have a problem.

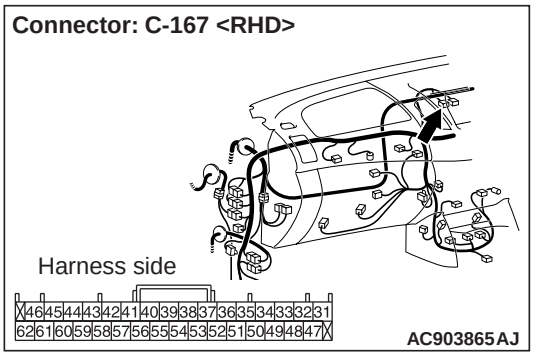
PROBABLE CAUSES

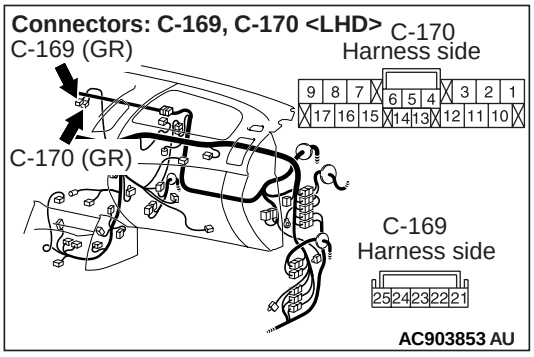
- Malfunction of power supply circuit
- Malfunction of multivision display

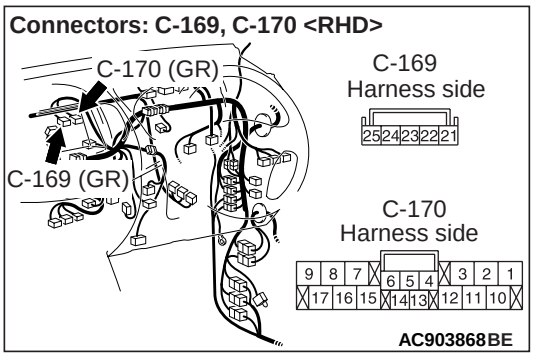
DIAGNOSIS PROCEDURE

STEP 1. Connector check: C-167, C-169, C-170 multivision display connector





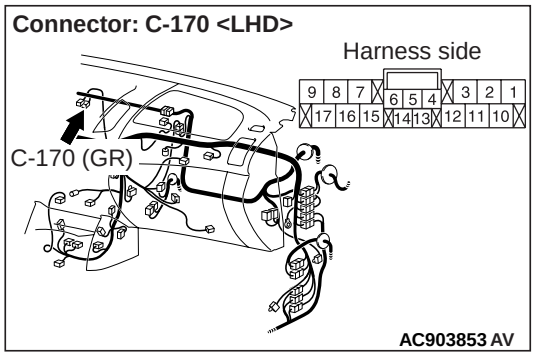


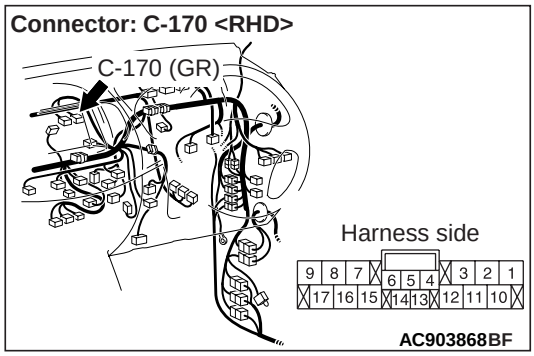


Q: Is the check result normal?

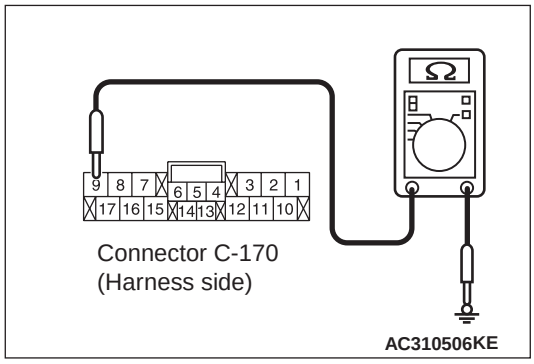
YES : Go to Step 2.
NO : Repair or replace the damaged connector.

STEP 2. Resistance measurement at C-170 multivision display connector.





(1) Disconnect C-170 multivision display connector, and measure the resistance available at the wiring harness side of the connector.



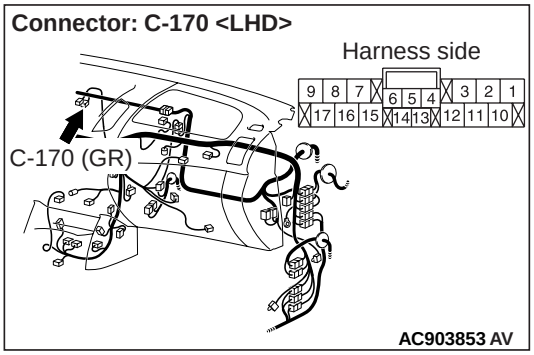
(2) Measure the resistance between C-170 multivision display connector terminal 9 and earth.

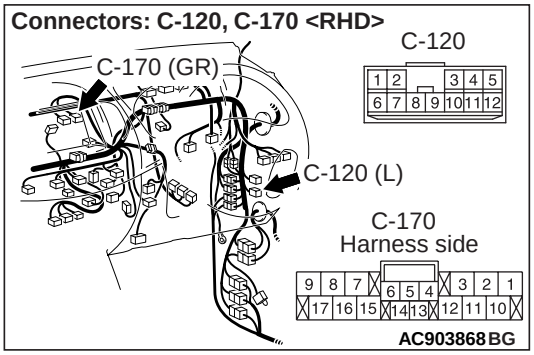
OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?

YES : Go to Step 4.
NO : Go to Step 3.

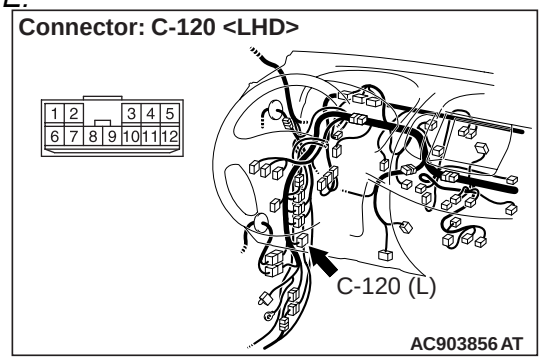
STEP 3. Check the wiring harness between C-170 multivision display connector terminal No.9 and earth.





- Check the earth wires for open circuit.

NOTE:



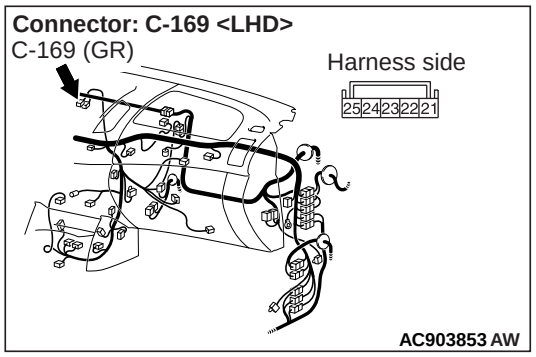
Prior to the wiring harness inspection, joint connector C-120, and repair if necessary.

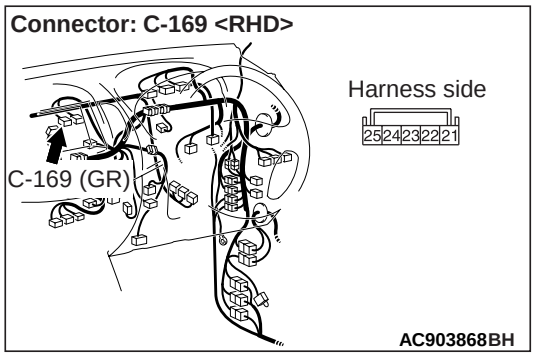
Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/inspection Service Points, How to Cope with Intermittent Malfunction).

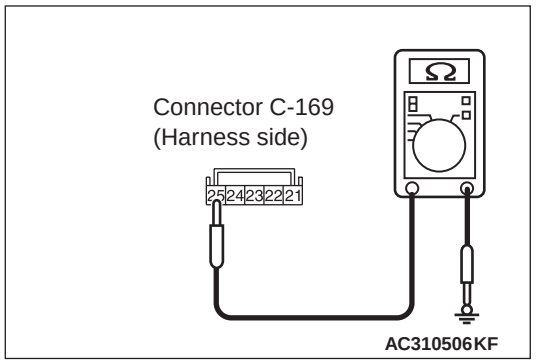
NO : Repair the wiring harness.

STEP 4. Resistance measurement at C-169 multivision display connector.





(1) Disconnect C-169 multivision display connector, and measure the resistance available at the wiring harness side of the connector.



(2) Measure the resistance between C-169 multivision display connector terminal 25 and earth.

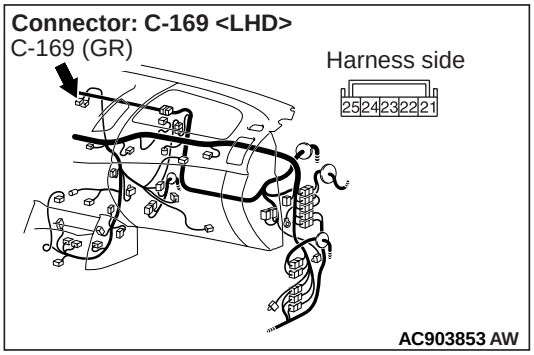
OK: Continuity exists (2 Ω or less)

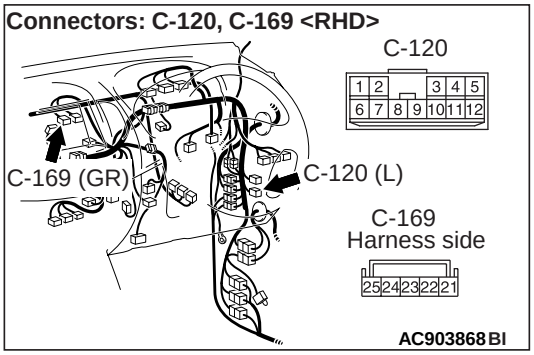
Q: Is the check result normal?

YES : Go to Step 6.

NO : Go to Step 5.

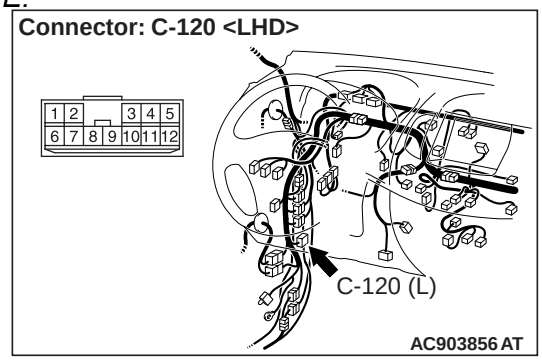
STEP 5. Check the wiring harness between C-169 multivision display connector terminal No.25 and earth.





- Check the earth wires for open circuit.

NOTE:



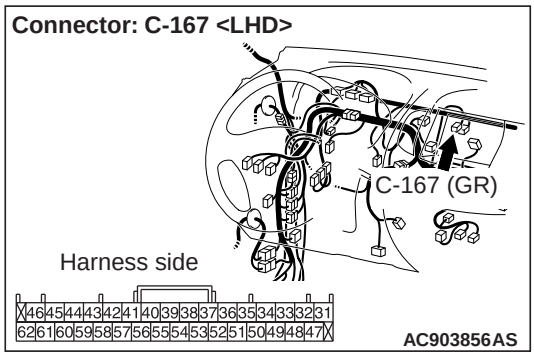
Prior to the wiring harness inspection, joint connector C-120, and repair if necessary.

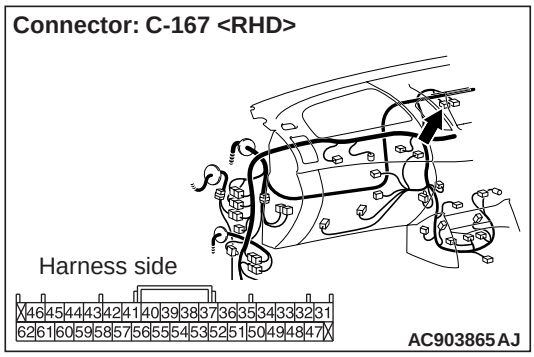
Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/inspection Service Points, How to Cope with Intermittent Malfunction).

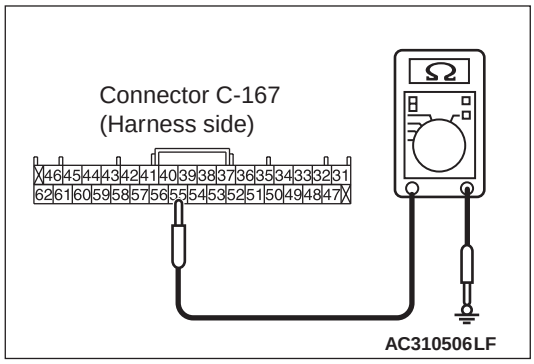
NO : Repair the wiring harness.

STEP 6. Resistance measurement at C-167 multivision display connector.





(1) Disconnect C-167 multivision display connector, and measure the resistance available at the wiring harness side of the connector.



(2) Measure the resistance between C-167 multivision display connector terminal 55 and earth.

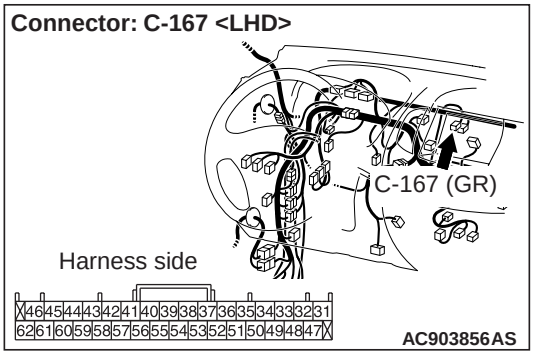
OK: Continuity exists (2 Ω or less)

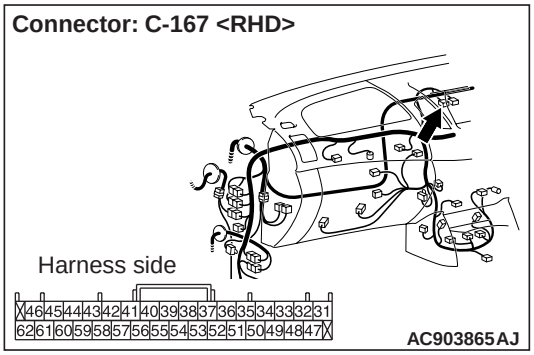
Q: Is the check result normal?

YES : Go to Step 8.

NO : Go to Step 7.

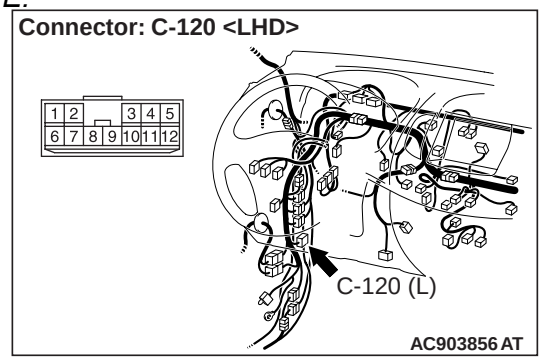
STEP 7. Check the wiring harness between C-167 multivision display connector terminal No.55 and earth.

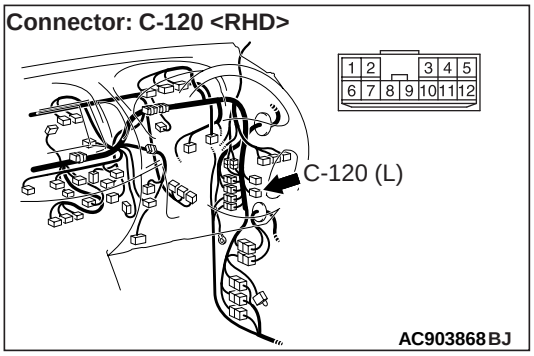




- Check the earth wires for open circuit.

NOTE:



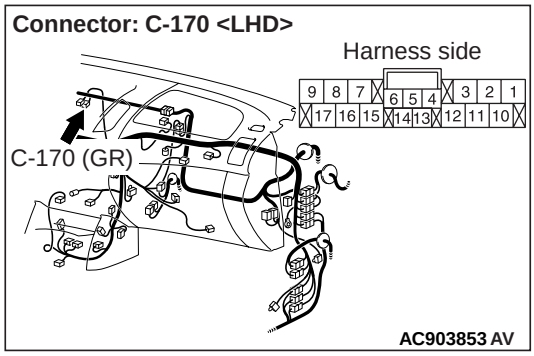


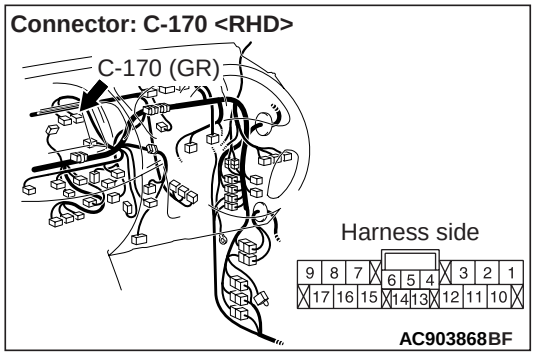
Prior to the wiring harness inspection, joint connector C-120, and repair if necessary.

Q: Is the check result normal?

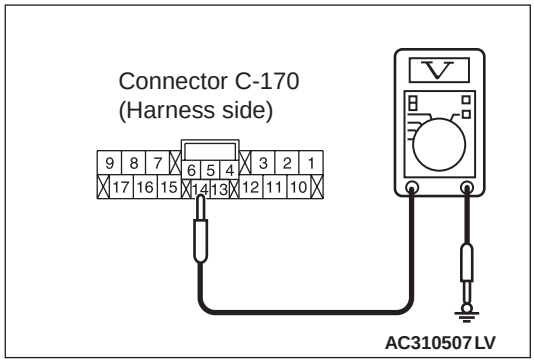
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/inspection Service Points, How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness.

STEP 8. Voltage measurement at C-170 multivision display connector.





(1) Disconnect C-170 multivision display connector, and measure at the wiring harness-side connector.

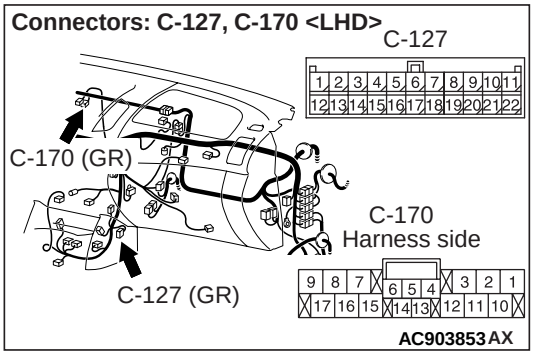


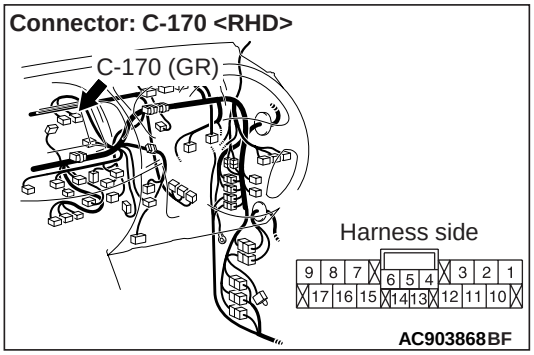
(2) Voltage between C-170 multivision display terminal No.14 and the body earth

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 10.
NO : Go to Step 9.

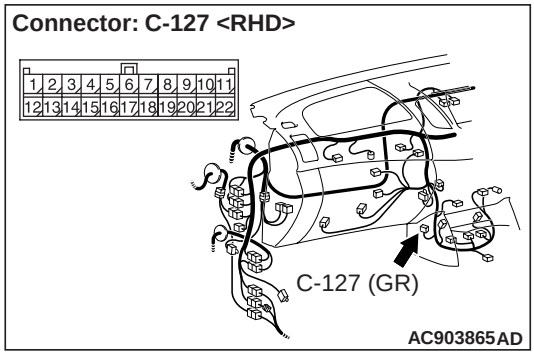
STEP 9. Check the wiring harness between C-170 multivision display connector terminal No.14 and ignition switch (ACC).

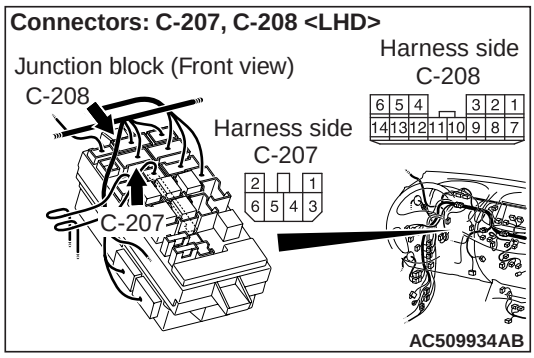


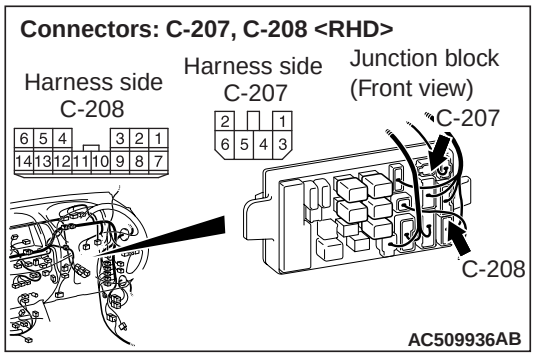


- Check the power supply lines (battery supply) for open circuit and short circuit.

NOTE:



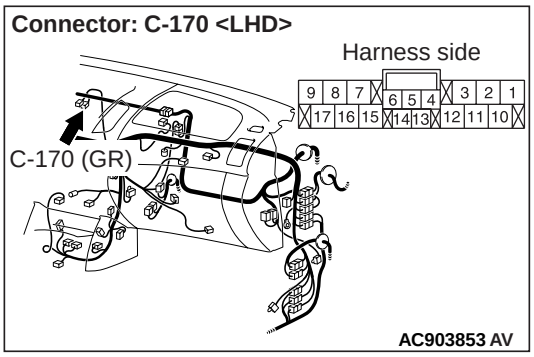


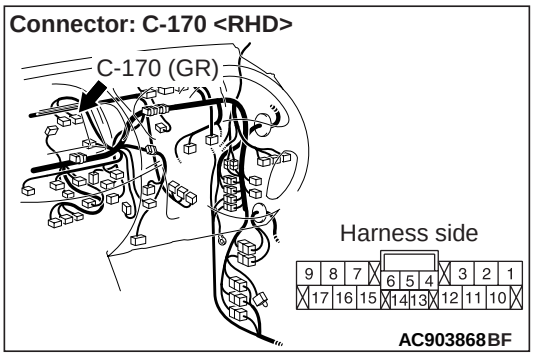


Prior to the wiring harness inspection, check junction block connectors C-207, C-208 and joint connector C-127, and repair if necessary.

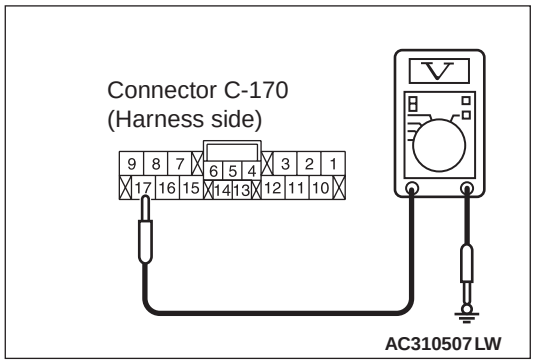
Q: Is the check result normal?
YES : Go to Step 10.
NO : Repair the wiring harness.

STEP 10. Voltage measurement at C-170 multivision display connector.





(1) Disconnect C-170 multivision display connector, and measure at the wiring harness-side connector.

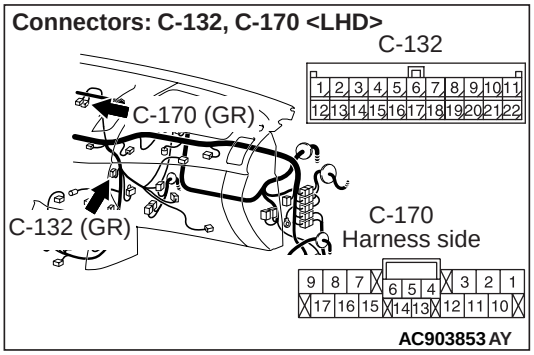


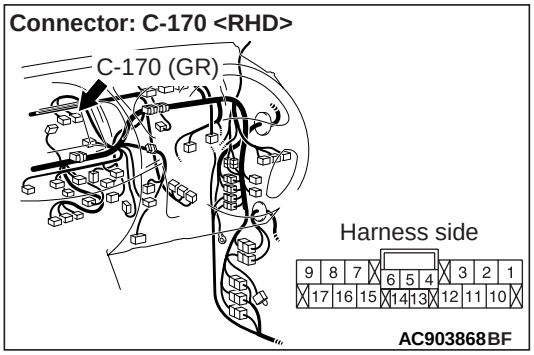
(2) Voltage between C-170 multivision display terminal No.17 and the body earth

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 12.
NO : Go to Step 11.

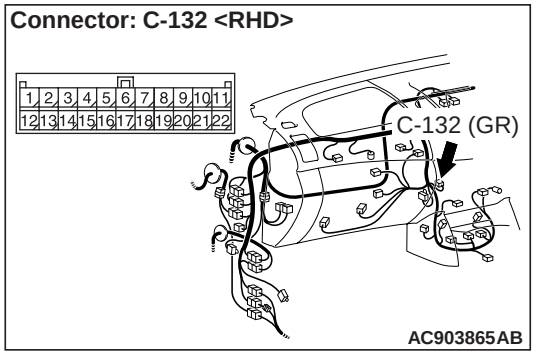
STEP 11. Check the wiring harness between C-170 multivision display connector terminal No.17 and fusible link (20).

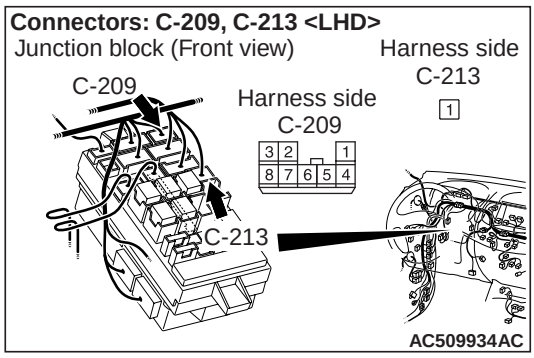


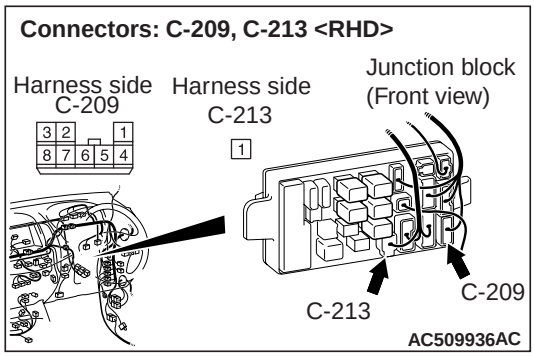


- Check the power supply lines (battery supply) for open circuit and short circuit.

NOTE:







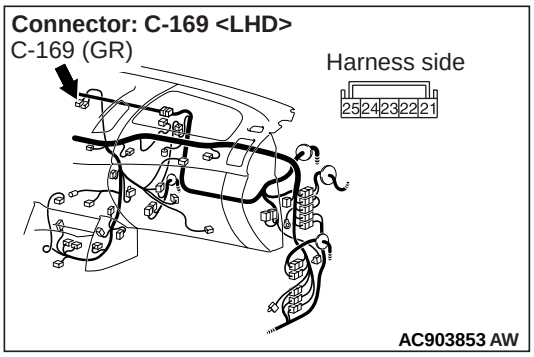
Prior to the wiring harness inspection, check junction block connectors C-213, C-209 and joint connector C-132, and repair if necessary.

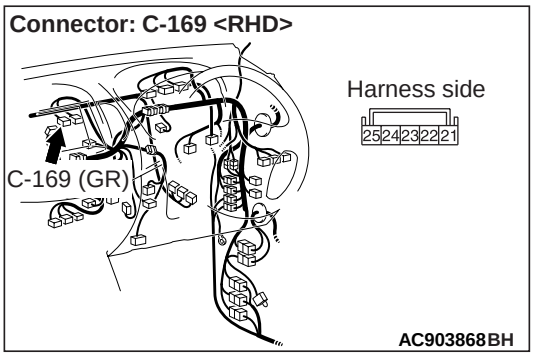
Q: Is the check result normal?

YES : Troubleshoot the ignition switch. Refer to P.54A-22.

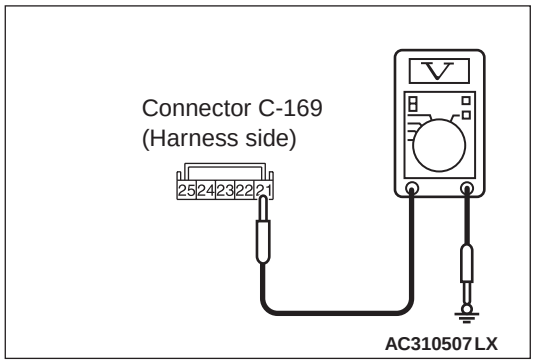
NO : Repair the wiring harness.

STEP 12. Voltage measurement at C-169 multivision display connector.





(1) Disconnect C-169 multivision display connector, and measure at the wiring harness-side connector.

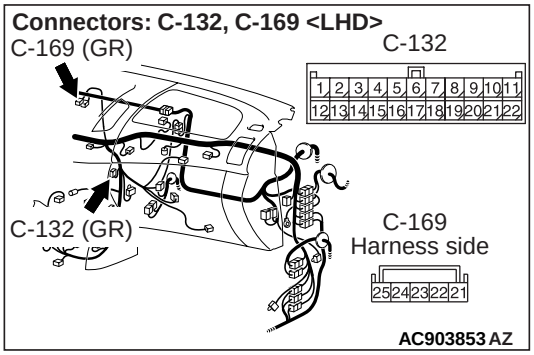


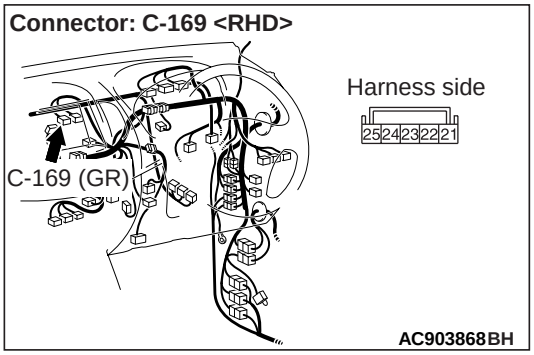
(2) Voltage between C-169 multivision display terminal No.21 and the body earth

OK: System voltage

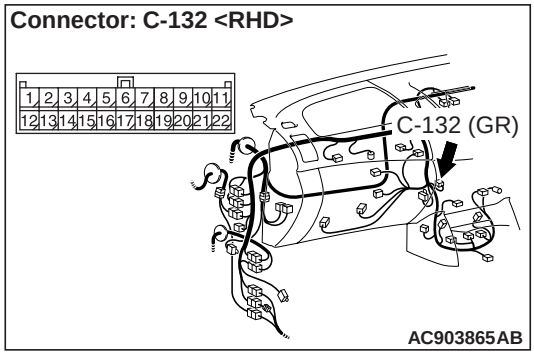
Q: Is the check result normal?
YES : Go to Step 14.
NO : Go to Step 13.

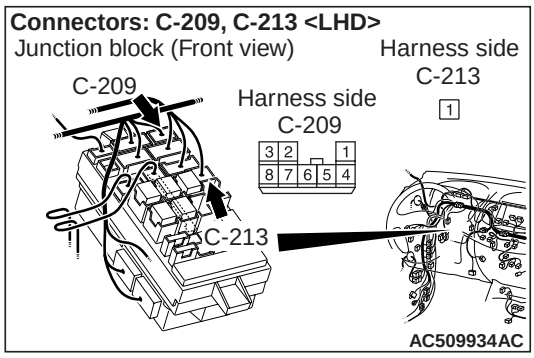
STEP 13. Check the wiring harness between C-169 multivision display connector terminal No.21 and fusible link (20).

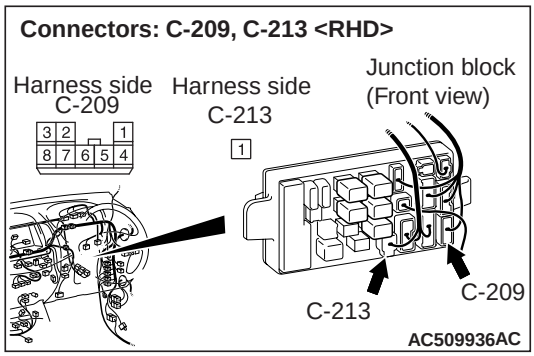




NOTE:







Prior to the wiring harness inspection, check junction block connectors C-213, C-209 and joint connector C-132, and repair if necessary.

- Check the power supply lines (battery supply) for open circuit and short circuit.

Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to use Troubleshooting/inspection Service Points, How to Cope with Intermittent Malfunction).

NO : Repair the wiring harness.

STEP 14. Retest the system

Check if the multivision display power is turned ON.

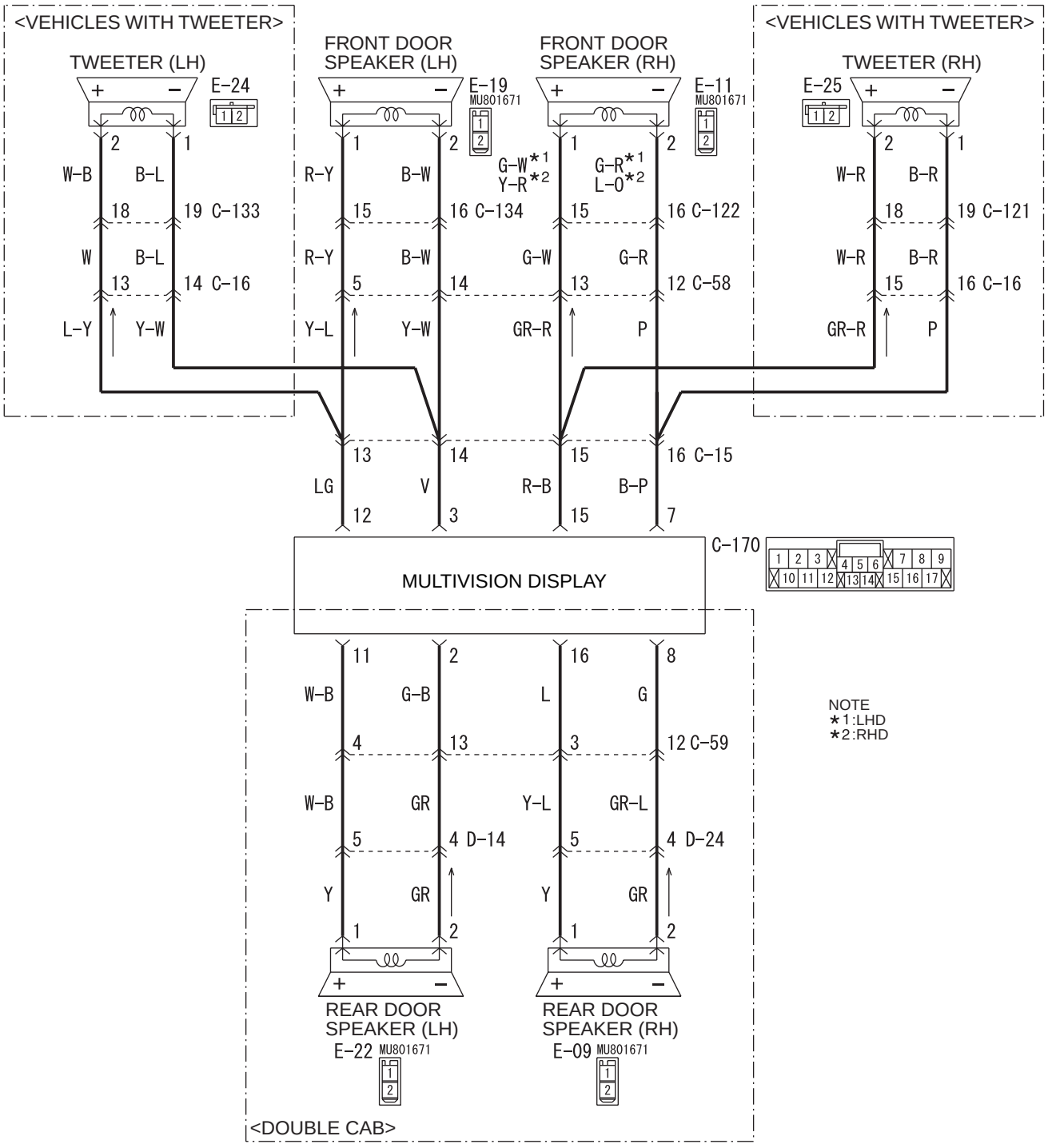
Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Replace the multivision display.

Inspection Procedure 2: No sound is heard. <Vehicles without audio amplifier>

⚠ CAUTION
Whenever the multivision display is replaced, ensure that the power supply circuit and the earthing circuit are normal. (Check that the voltage is 10 V or more.)

Speaker System Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

WAC54E099A

COMMENTS ON TROUBLE SYMPTOM

If the sound is not output, the multivision display may have a problem. In addition, if any of the speakers is short-circuited, the protection circuit inside the multi-vision display disables all the speakers to sound. Therefore, if all the speakers do not output sound, the speaker circuit may be shorted or the speaker may be defective. In some cases, the sound is output depending on sources, thus use the music server, radio, CD/DVD, and others to check if the sound is output.

PROBABLE CAUSES

- Malfunction of multivision display
- Malfunction of speaker
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. Check the multivision display operation.

Q: Check the sources from which the sound is not output.

No sound only from radio : Perform Inspection Procedure 6 "The FM/MW/LM radio broadcasting can not be received." (Refer to P.54A-368.)

No sound only when the CD is played : Perform Inspection Procedure 8 "CD/DVD cannot be played." (Refer to P.54A-371.)

No sound only when the DVD is played : Perform Inspection Procedure 8 "CD/DVD cannot be Played." (Refer to P.54A-371.) Or, perform Inspection Procedure 9 "Image of a DVD is Played, but no Sound is Played." (Refer to P.54A-373.)

No sound only when the music server is used : Go to Step 2.

No sound from any of the sources : Go to Step 2.

STEP 2. Check the service data log for the MMCS service mode.

(1) Display the service data log for the MMCS service mode. (Refer to P.54A-305.)
(2) Check if the service data log for drive and HDD is displayed.

Q: Is the service data log displayed?

YES (The service data log for drive is displayed.) : Perform Inspection Procedure 8 "CD/DVD cannot be Played." (Refer to P.54A-371.) Or, perform Inspection Procedure 9 "Image of a DVD is Played, but no Sound is Played."(Refer to P.54A-373.) Go to Step 3.

YES (The service data log for HDD is displayed.) : Abnormalities relating to high or low temperature may be present. Check if the multivision display can output the sound at the operable temperature. If it cannot output the sound, go to Step 3.

NO : Go to Step 3.

STEP 3. Perform "Network/Connect Line Check" in the MMCS service mode.

(1) Display "Network/Connect Line Check" in the MMCS service mode. (Refer to P.54A-305.)
(2) Check if "DVD Drive OK" is displayed.
(3) Check if "HDD Drive OK" is displayed.

Q: Is the check result normal?

YES : Go to Step 4.
NO : Go to Step 8.

STEP 4. Check the following connectors.

Check the following connectors:

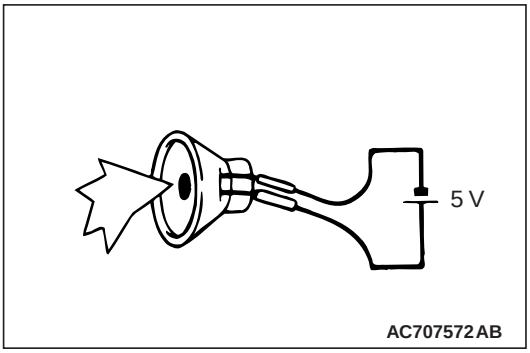
- E-19 front door speaker (LH) connector
- E-11 front door speaker (RH) connector
- E-24 tweeter (LH) connector
- E-25 tweeter (RH) connector
- E-22 rear door speaker (LH) connector <double cab>
- E-09 rear door speaker (RH) connector <double cab>

Q: Are all the connectors in good condition?

YES : Go to Step 5.
NO : Repair the defective connector.

STEP 5. Check the speaker or tweeter.

(1) Remove the speaker or tweeter. Refer to P.54A-445.



(2) Check that the speaker or tweeter outputs the noise when the voltage of 5 V is applied to the speaker or tweeter connector terminal.

Q: Do the speaker or tweeter output the noise?

YES : Go to Step 6.
NO : Replace the speaker or tweeter.

STEP 6. Connector check: C-170 multivision display connector.

Q: Is the check result normal?

YES : Go to Step 7.
NO : Repair the defective connector.

STEP 7. Check the wiring harness between the speaker or tweeter connector terminal and the multivision display connector terminal.

Check the communication lines for short circuit.

- <Front door speaker (LH) or tweeter (LH)> Check the wiring harness between E-19 front door speaker (LH) connector terminal No.1, 2 or E-24 tweeter (LH) connector terminal No.2, 1 and C-170 multivision display connector terminal No.12, 3.

NOTE: Prior to the wiring harness inspection, check intermediate connectors C-16, C-58, C-133 and C-134, and repair if necessary.

- <Front door speaker (RH) or tweeter (RH)> Check the wiring harness between E-11 front door speaker (RH) connector terminal No.1, 2 or E-25 tweeter (RH) connector terminal No.2, 1 and C-170 multivision display connector terminal No.15, 7.

NOTE: Prior to the wiring harness inspection, check intermediate connectors C-16, C-58, C-121 and C-122, and repair if necessary.

- <Rear door speaker (LH)> Check the wiring harness between E-22 rear door speaker (LH) connector terminal No.1, 2 and C-170 multivision display connector terminal No.11, 2.

NOTE: Prior to the wiring harness inspection, check intermediate connectors C-59 and D-14, and repair if necessary.

- <Rear door speaker (RH)> Check the wiring harness between E-09 rear door speaker (RH) connector terminal No.1, 2 and C-170 multivision display connector terminal No.16, 8.

NOTE: Prior to the wiring harness inspection, check intermediate connectors C-59 and D-24, and repair if necessary.

Q: Is the check result normal?
YES : Go to Step 8.
NO : Repair the wiring harness.

STEP 8. Retest the system

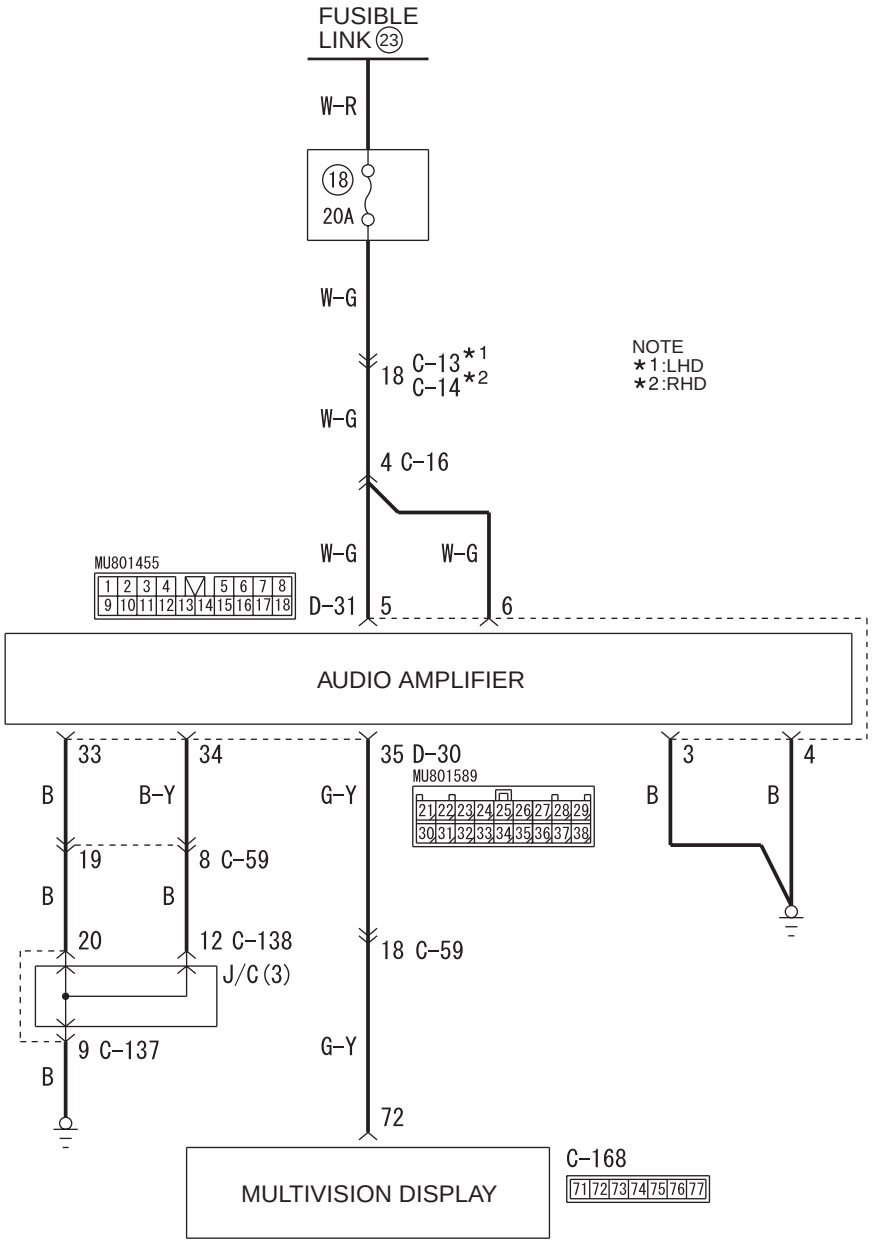
Check if the sound is output from all the speakers.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Replace the multivision display.

Inspection Procedure 2: No sound is heard. <Vehicles with audio amplifier>

⚠ CAUTION
Whenever the multivision display is replaced, ensure that the power supply circuit and the earthing circuit are normal. (Check that the voltage is 10 V or more.)

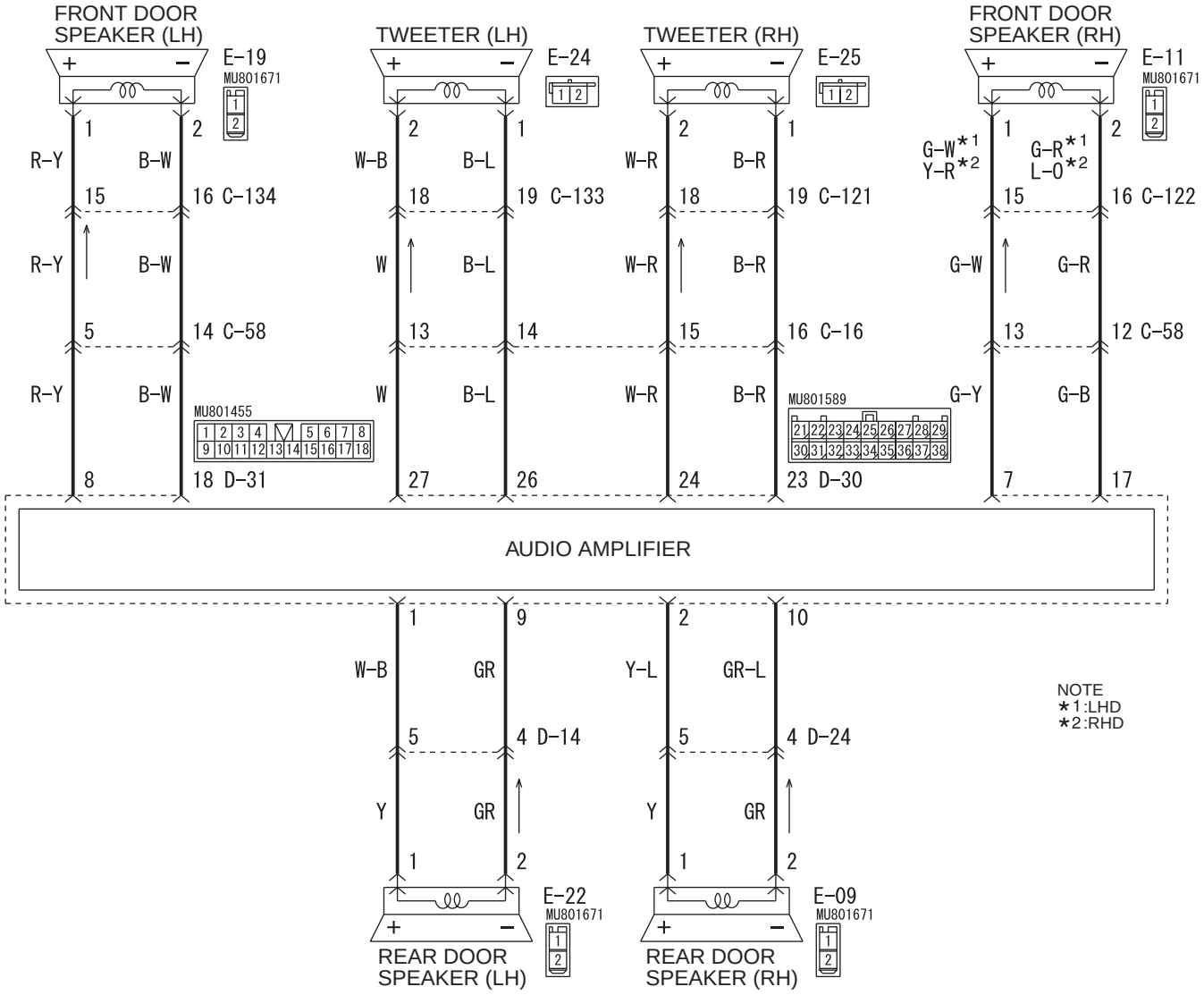
Audio System Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

WAC54E098A

Speaker System Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

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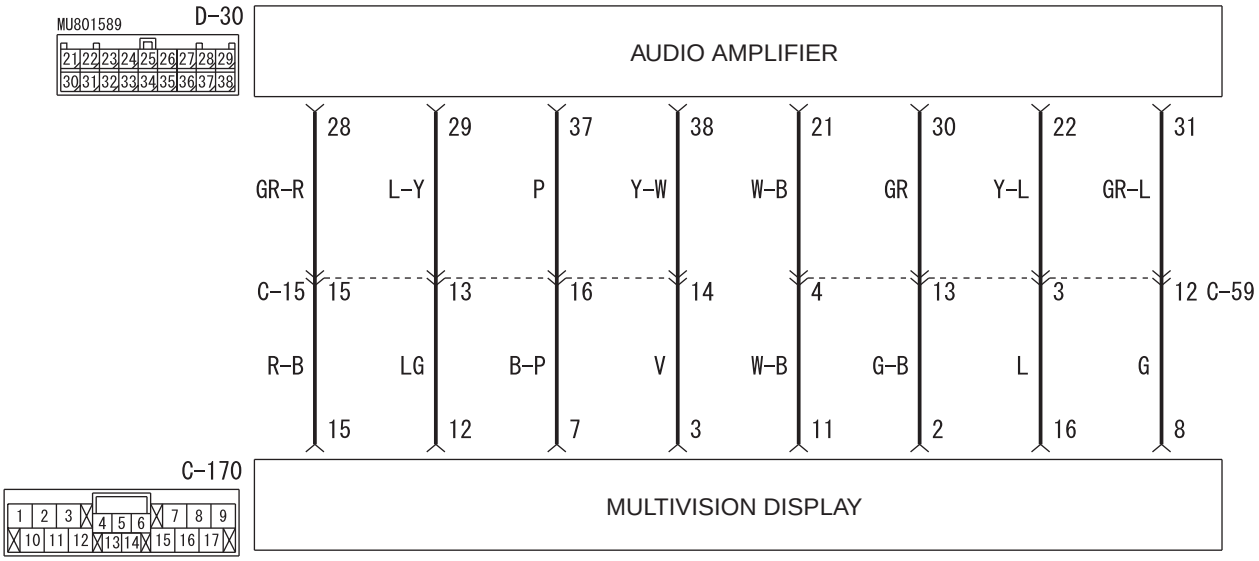
Audio Amplifier System Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

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COMMENTS ON TROUBLE SYMPTOM

If the audio sound is not output, the multivision display, audio amplifier, or power supply circuit of audio amplifier may have a problem. In addition, if any of the speakers is short-circuited, the protection circuit inside the multivision display disables all the speakers to sound. Therefore, if all the speakers do not output sound, the speaker circuit may be shorted or the speaker may be defective. In some cases, the sound is output depending on sources, thus use the music server, radio, CD/DVD, and others to check if the sound is output.

PROBABLE CAUSES

- Malfunctions of multivision display
- Malfunction of audio amplifier
- Malfunction of speaker
- Damaged wiring harness and connectors

DIAGNOSIS PROCEDURE

STEP 1. Check the multivision display operation.

Q: Check the sources from which the sound is not output.

No sound only from radio : Perform Inspection Procedure 6 "The FM/MW/LM radio broadcasting can not be received.." (Refer to P.54A-368.)

No sound only when the CD is played : Perform Inspection Procedure 8 "CD/DVD cannot be played." (Refer to P.54A-371.)

No sound only when the DVD is played : Perform Inspection Procedure 8 "CD/DVD cannot be Played." (Refer to P.54A-371.) Or, perform Inspection Procedure 9 "Image of a DVD is Played, but no Sound is Played." (Refer to P.54A-373.)

No sound only when the music server is used : Go to Step 2.

No sound from any of the sources : Go to Step 2.

STEP 2. Check the service data log for the MMCS service mode.

(1) Display the service data log for the MMCS service mode. (Refer to P.54A-305.)
(2) Check if the service data log for drive and HDD is displayed.

Q: Is the service data log displayed?

YES (The service data log for drive is displayed.) : Perform Inspection Procedure 8 "CD/DVD cannot be Played." (Refer to P.54A-371.) Or, perform Inspection Procedure 9 "Image of a DVD is Played, but no Sound is Played." (Refer to P.54A-373.) Then, go to Step 3.

YES (The service data log for HDD is displayed.) : Abnormalities relating to high or low temperature may be present. Check if the multivision display can output the sound at the operable temperature. If it cannot output the sound, go to Step 3.

NO : Go to Step 3.

STEP 3. Perform "Network/Connect Line Check" in the MMCS service mode.

(1) Display "Network/Connect Line Check" in the MMCS service mode. (Refer to P.54A-305.)
(2) Check if "DVD Drive OK" is displayed.
(3) Check if "HDD Drive OK" is displayed.

Q: Is the check result normal?
YES : Go to Step 4.
NO : Go to Step 15.

STEP 4. Connector check: D-30, D-31 audio amplifier connector

Q: Is the check result normal?
YES : Go to Step 5.
NO : Repair the defective connector.

STEP 5. Resistance measurement at D-30, D-31 audio amplifier connector

(1) Disconnect the connector, and measure at the wiring harness side.
(2) Measure the resistance between D-30 audio amplifier connector terminal No.33 and the body earth.

OK: Continuity exists (2 Ω or less)

(3) Measure the resistance between D-30 audio amplifier connector terminal No.34 and the body earth.

OK: Continuity exists (2 Ω or less)

(4) Measure the resistance between D-31 audio amplifier connector terminal No.3 and the body earth.

OK: Continuity exists (2 Ω or less)

(5) Measure the resistance between D-31 audio amplifier connector terminal No.4 and the body earth.

OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?
YES : Go to Step 7.
NO : Go to Step 6.

STEP 6. Check the wiring harness between the D-30 audio amplifier connector terminal No.33, 34 or D-31 audio amplifier connector terminal No.3, 4 and the body earth

- Check the earth wires for open circuit.

NOTE: Prior to the wiring harness inspection, check intermediate connector C-59, joint connectors C-137 and C-138, and repair if necessary.

Q: Is the check result normal?
YES : Go to Step 7.
NO : Repair the wiring harness.

STEP 7. Voltage measurement at D-31 audio amplifier connector.

(1) Disconnect the connector, and measure at the wiring harness side.
(2) Voltage between D-31 audio amplifier connector terminal No.5 and the body earth

OK: System voltage

(3) Voltage between D-31 audio amplifier connector terminal No.6 and the body earth

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 9.
NO : Go to Step 8.

STEP 8. Check the wiring harness between D-31 audio amplifier connector terminal No.5, 6 and fusible link No.23.

- Check the power supply lines for open circuit and short circuit.

NOTE: Prior to the wiring harness inspection, check intermediate connectors C-16, C-13 <LHD> and C-14 <RHD>, and repair if necessary.

Q: Is the check result normal?
YES : Go to Step 9.
NO : Repair the wiring harness.

STEP 9. Connector check: C-168 multivision display connector

Q: Is the check result normal?
YES : Go to Step 10.
NO : Repair the defective connector.

STEP 10. Check the wiring harness between C-1684 multivision display connector terminal No.72 and D-30 audio amplifier connector terminal No.35

- Check the communication lines for open circuit and short circuit.

NOTE: Prior to the wiring harness inspection, check intermediate connector C-59, and repair if necessary.

Q: Is the check result normal?
YES : Go to Step 11.
NO : Repair the wiring harness.

STEP 11. Check the following connectors

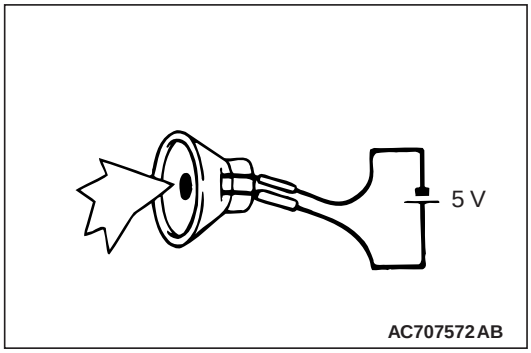
Check the following connectors:

- E-19 front door speaker (LH) connector
- E-11 front door speaker (RH) connector
- E-22 rear door speaker (LH) connector
- E-09 rear door speaker (RH) connector
- E-24 tweeter (LH) connector
- E-25 tweeter (RH) connector

Q: Are all the connectors in good condition?
YES : Go to Step 12.
NO : Repair the defective connector.

STEP 12. Check the speaker or tweeter.

(1) Remove the speaker or tweeter. Refer to P.54A-445.



(2) Check that the speaker or tweeter outputs the noise when the voltage of 5 V is applied to the speaker or tweeter connector terminal.

Q: Do the speaker or tweeter output the noise?
YES : Go to Step 13.
NO : Replace the speaker or tweeter.

STEP 13. Check the wiring harness between the speaker or tweeter connector terminal and the audio amplifier connector terminal.

Check the communication lines for short circuit.

- <Front door speaker (LH)> Check the wiring harness between E-19 front door speaker (LH) connector terminal No.1, 2 and D-31 audio amplifier connector terminal No.8, 18.

NOTE: Prior to the wiring harness inspection, check intermediate connectors C-58 and C-134, and repair if necessary.

- <Front door speaker (RH)> Check the wiring harness between E-11 front door speaker (RH) connector terminal No.1, 2 and D-31 audio amplifier connector terminal No.7, 17.

NOTE: Prior to the wiring harness inspection, check intermediate connectors C-58 and C-122, and repair if necessary.

- <Rear door speaker (LH)> Check the wiring harness between E-22 rear door speaker (LH) connector terminal No.1, 2 and D-31 audio amplifier connector terminal No.1, 9.

NOTE: Prior to the wiring harness inspection, check intermediate connector D-14, and repair if necessary.

- <Rear door speaker (RH)> Check the wiring harness between E-09 rear door speaker (RH) connector terminal No.1, 2 and D-31 audio amplifier connector terminal No.2, 10.

NOTE: Prior to the wiring harness inspection, check intermediate connector D-24, and repair if necessary.

- <Tweeter (LH)> Check the wiring harness between E-24 tweeter (LH) connector terminal No.1, 2 and D-30 audio amplifier connector terminal No.26, 27.

NOTE: Prior to the wiring harness inspection, check intermediate connectors C-16 and C-133, and repair if necessary.

- <Tweeter (RH)> Check the wiring harness between E-25 tweeter (RH) connector terminal No.1, 2 and D-30 audio amplifier connector terminal No.23, 24.

NOTE: Prior to the wiring harness inspection, check intermediate connectors C-16 and C-121, and repair if necessary.

Q: Is the check result normal?
YES : Go to Step 14.
NO : Repair the wiring harness.

STEP 14. Check the wiring harness between C-170 multivision display connector terminal No.2, 3, 7, 8, 11, 12 15, 16 and D-30 audio amplifier connector No.30, 38, 37, 31, 21, 29, 28, 22.

- Check the communication lines for short circuit.

NOTE: Prior to the wiring harness inspection, check intermediate connectors C-15 and C-59, and repair if necessary.

Q: Is the check result normal?
YES : Go to Step 15.
NO : Repair the wiring harness.

STEP 15. Retest the system
Check if the sound is output from all the speakers.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Go to Step 16.

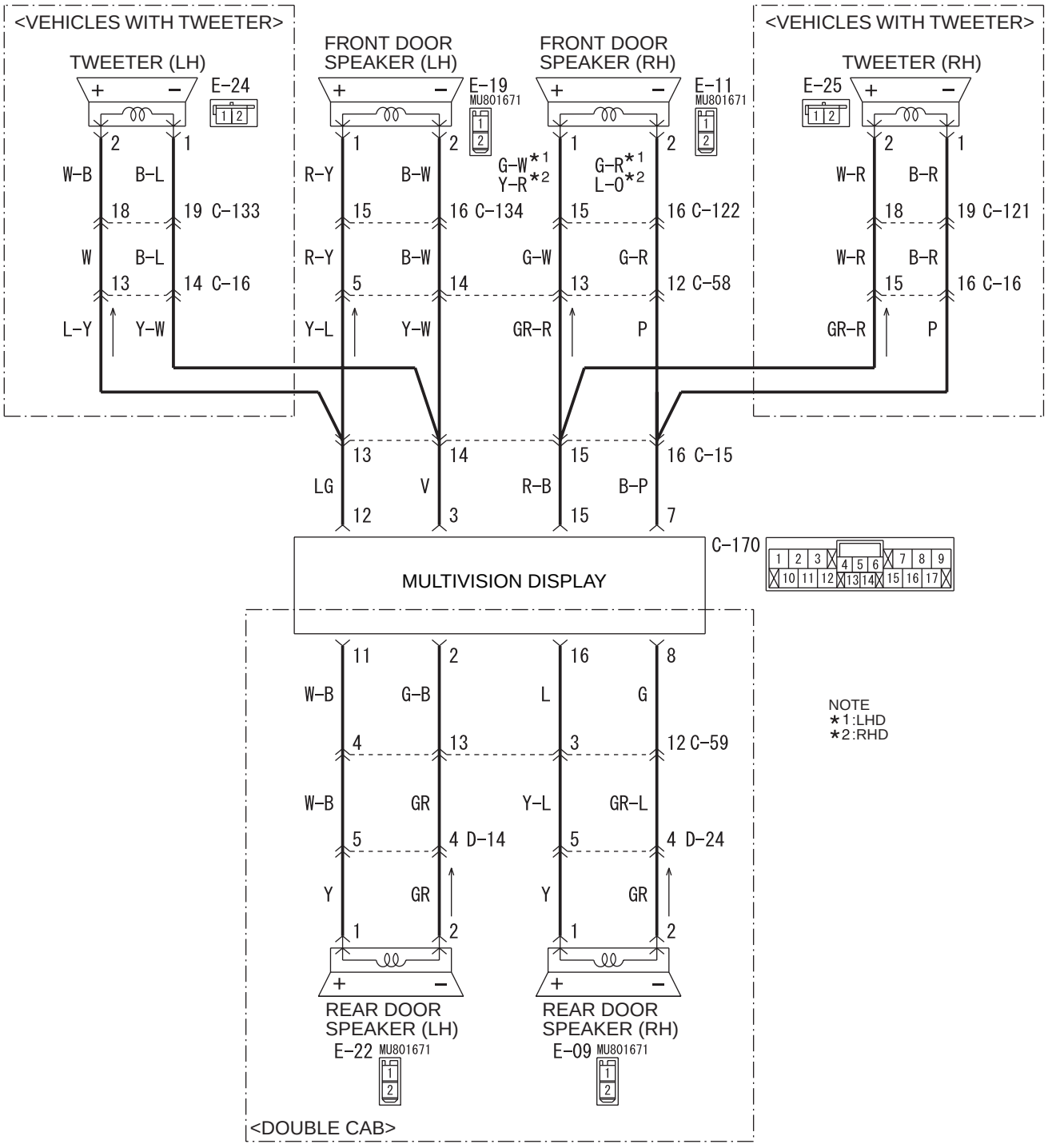
STEP 16. Replace the audio amplifier temporarily, and check the trouble symptom.
Replace the audio amplifier temporarily, and check that the sound is output from all the speakers.

Q: Is the check result normal?
YES : Replace the audio amplifier.
NO : Replace the multivision display.

Inspection Procedure 3: No sound is heard from one of the speakers. <Vehicles without audio amplifier>

⚠ CAUTION
Whenever the multivision display is replaced, ensure that the power supply circuit and the earthing circuit are normal. (Check that the voltage is 10 V or more.)

Speaker System Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

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COMMENTS ON TROUBLE SYMPTOM

If the sound is not heard from one of the speakers, the speaker, multivision display or communication line from the multivision display to the speaker may have a problem.

PROBABLE CAUSES

- Malfunction of speaker
- Malfunction of multivision display
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. Checking with speaker test

Perform the speaker test, and check which speaker does not output the sound. Refer to P.54A-305.

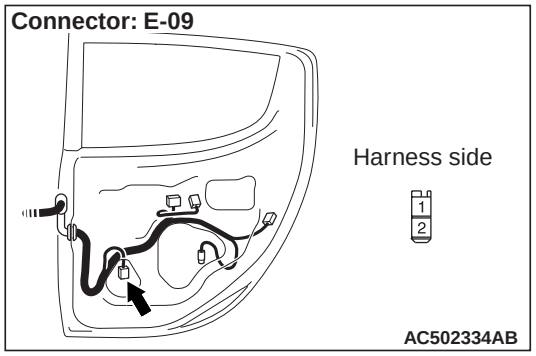
NOTE: In the following procedure, check the speaker or tweeter that is abnormal.

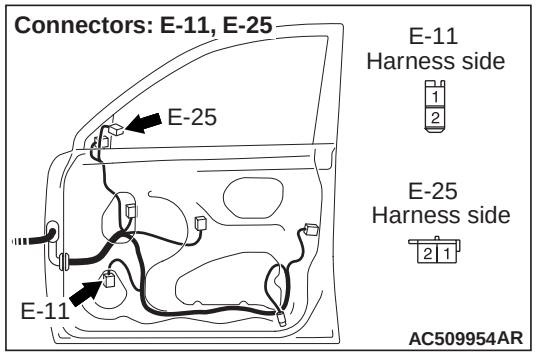
Q: Is the check result normal?

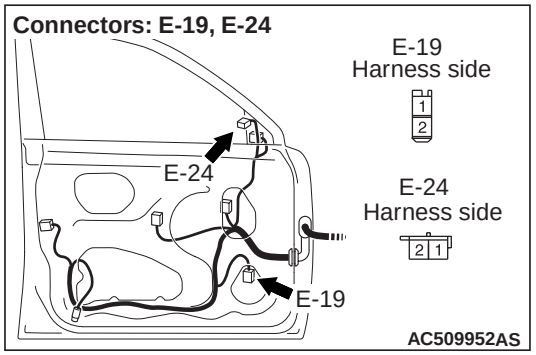
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction).

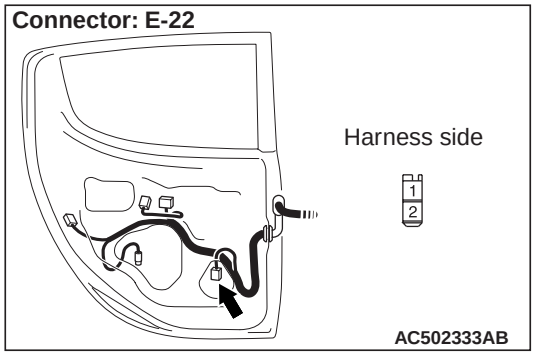
NO (Either a speaker is abnormal) : Go to Step 2.

STEP 2. Connector check: E-19 <front-LH>, E-11 <front-RH>, E-22 <rear-LH>, E-09 <rear-RH>, door speaker connector, E-24 <LH>, E-25 <RH> front tweeter connector









Q: Is the check result normal?

YES : Go to Step 3.

NO : Repair the defective connector.

STEP 3. Check the speaker or tweeter.

(1) Remove the speaker or tweeter. Refer to P.54A-

445.

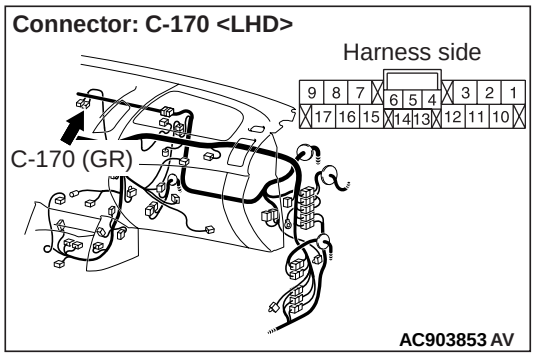
(2) Check that the speaker or tweeter outputs the noise when the voltage of 5 V is applied to the speaker or tweeter connector terminal.

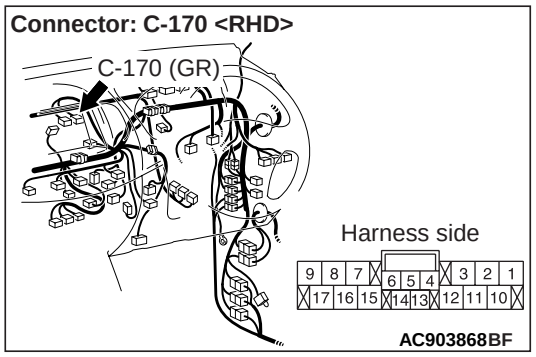
Q: Is the check result normal?

YES : Go to Step 4.

NO : Replace the speaker or tweeter.

STEP 4. Connector check: C-170 multivision display connector.





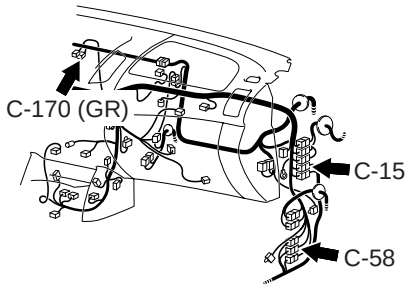
Q: Is the check result normal?

YES : Go to Step 5.

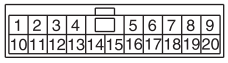
NO : Repair the defective connector.

STEP 5. Check the wire harness between the speaker or tweeter connector terminal and the multivision display connector terminal.
Check the communication lines for open circuit and short circuit.

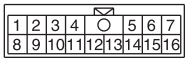
Connectors: C-15, C-58, C-170 <LHD>



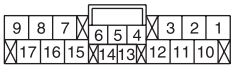
C-15



C-58



C-170
Harness side



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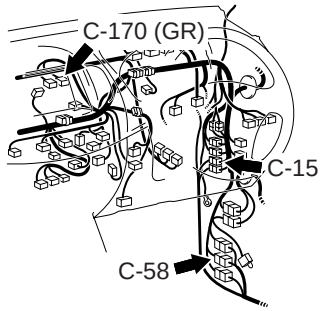
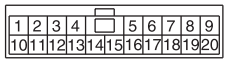
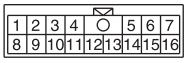
Connectors: C-15, C-58, C-170 <RHD>



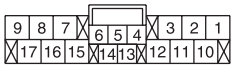
C-15



C-58



C-170
Harness side



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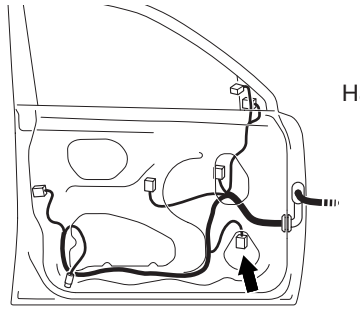
Connector: E-19



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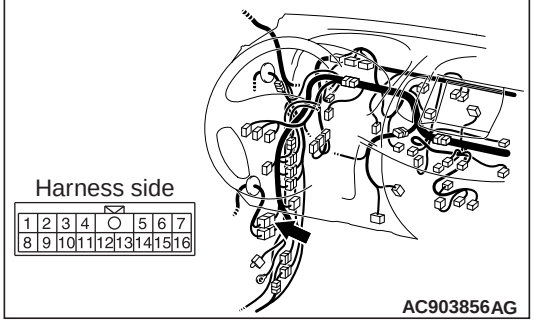
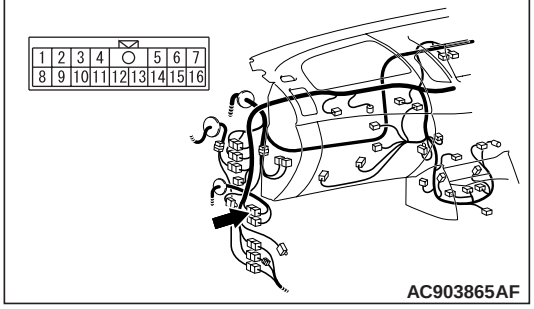
<Front door speaker (LH)> Check the wire harness between E-19 front door speaker (LH) connector terminal No.1, 2 and C-170 multivision display connector terminal No.12, 3.

NOTE:

Connector: C-134 <LHD>

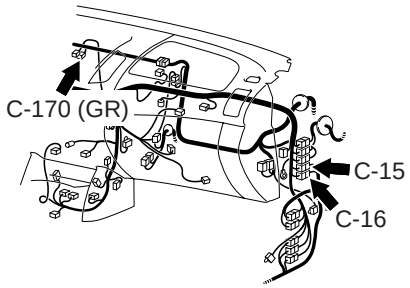


Connector: C-134 <RHD>

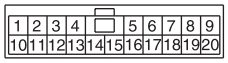


Prior to the wiring harness inspection, check intermediate connectors C-134, C-58 and C-15, and repair if necessary.

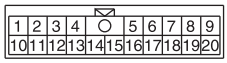
Connectors: C-15, C-16, C-170 <LHD>



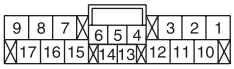
C-15



C-16



C-170
Harness side



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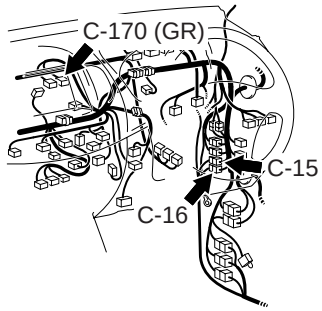
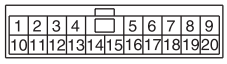
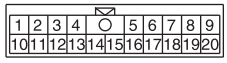
Connectors: C-15, C-16, C-170 <RHD>



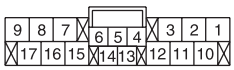
C-15



C-16

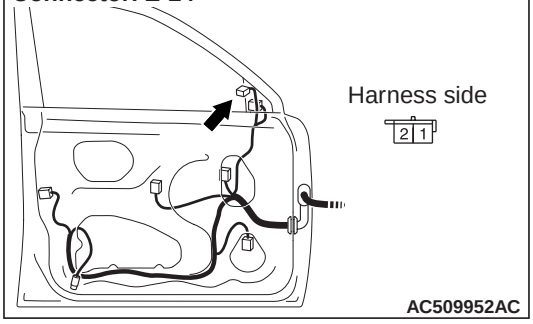


C-170
Harness side



AC903891AD

Connector: E-24

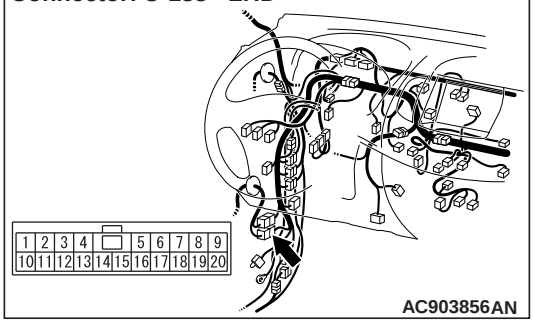


AC509952AC

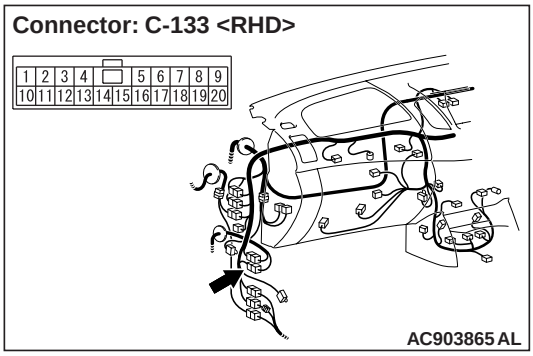
<Tweeter (LH)> Check the wire harness between E-24 tweeter (LH) connector terminal No.2, 1 and C-170 multivision display connector terminal No.12, 3.

NOTE:

Connector: C-133 <LHD>

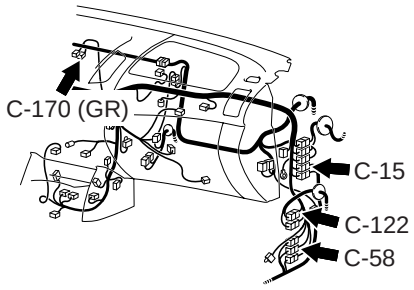


Connector: C-133 <RHD>

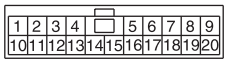


Prior to the wiring harness inspection, check intermediate connectors C-133, C-16 and C-15, and repair if necessary.

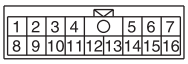
Connectors: C-15, C-58, C-122, C-170 <LHD>



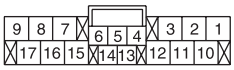
C-15



C-58, C-122

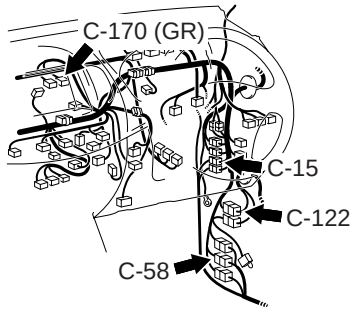


C-170
Harness side

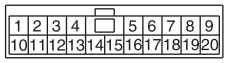


AC903939AD

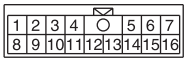
Connectors: C-15, C-58, C-122, C-170 <RHD>



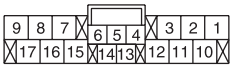
C-15



C-58, C-122

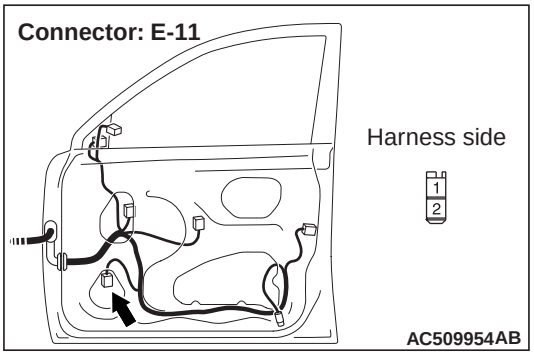


C-170
Harness side



AC903891AE

Connector: E-11

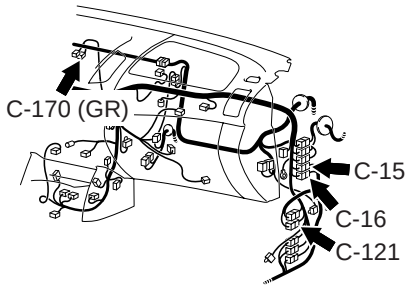


AC509954AB

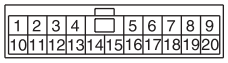
<Front door speaker (RH)> Check the wire harness between E-11 front door speaker (RH) connector terminal No.1, 2 and C-170 multivision display connector terminal No.15, 7.

NOTE: Prior to the wiring harness inspection, check intermediate connectors C-122, C-58 and C-15, and repair if necessary.

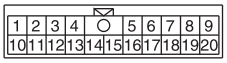
Connectors: C-15, C-16, C-121, C-170 <LHD>



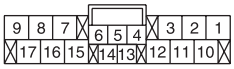
C-15, C-121



C-16

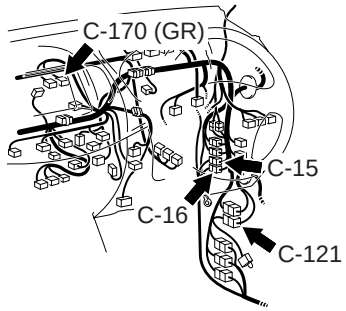


C-170
Harness side

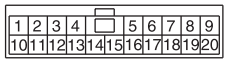


AC903939AE

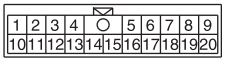
Connectors: C-15, C-16, C-121, C-170 <RHD>



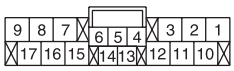
C-15, C-121



C-16

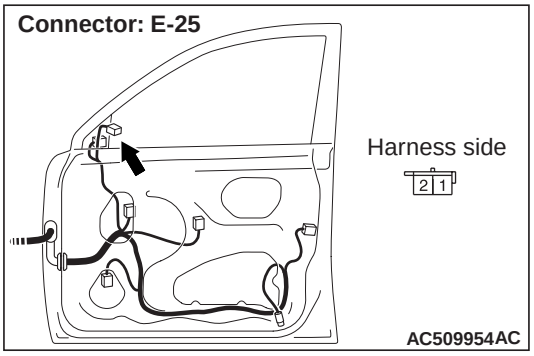


C-170
Harness side



AC903891AF

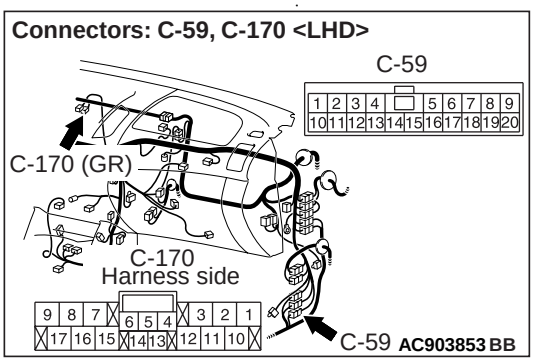
Connector: E-25

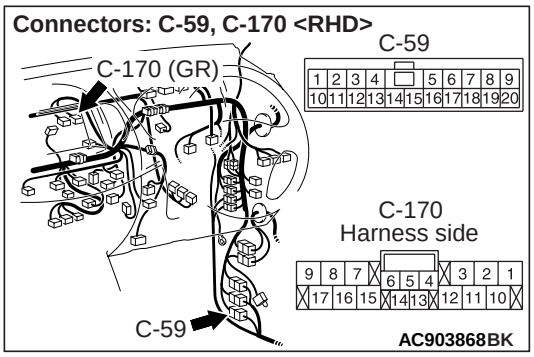


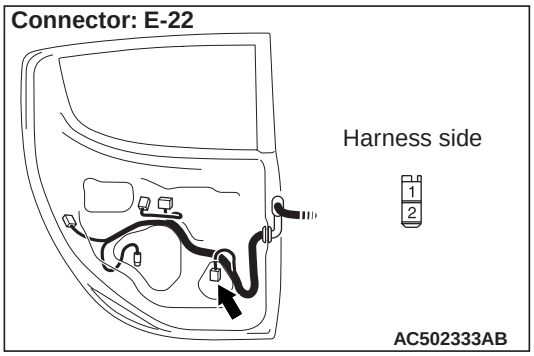
AC509954AC

<Tweeter (RH)> Check the wire harness between E-25 tweeter (RH) connector terminal No.2, 1 and C-170 multivision display connector terminal No.15, 7.

NOTE: Prior to the wiring harness inspection, check intermediate connectors C-121, C-16 and C-15 and repair if necessary.

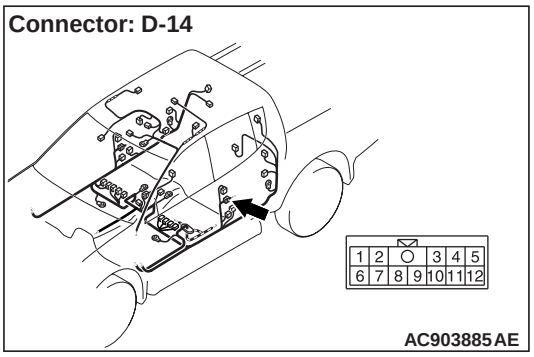




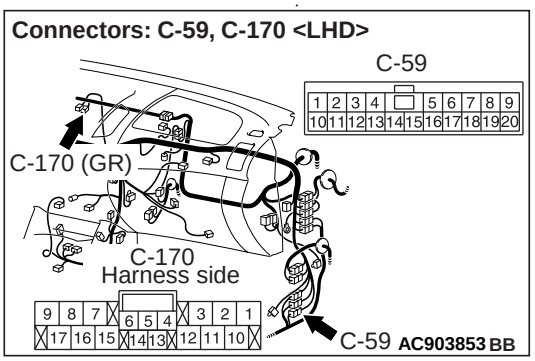


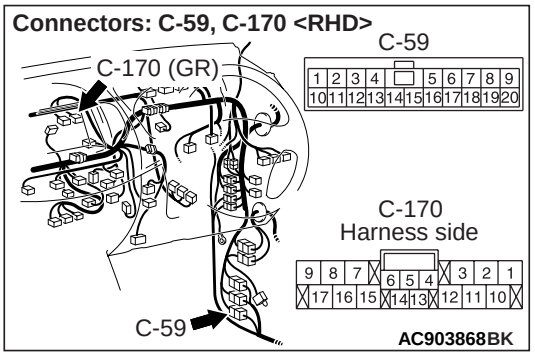
<Rear speaker (LH)> Check the wire harness between E-22 rear door speaker (LH) connector terminal No.1, 2 and C-170 multivision display connector terminal No.11, 12.

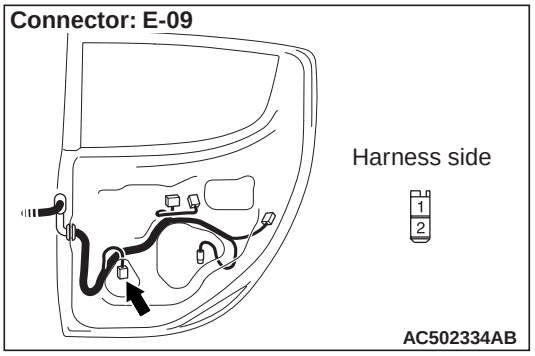
NOTE:



Prior to the wiring harness inspection, check intermediate connectors D-14 and C-59, and repair if necessary.

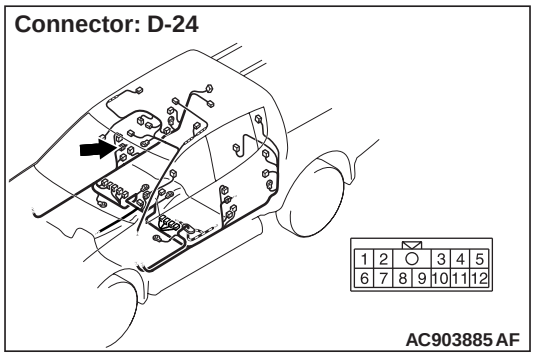






<Rear speaker (RH)> Check the wire harness between E-09 rear door speaker (RH) connector terminal No.1, 2 and C-170 multivision display connector terminal No.16, 8.

NOTE:



Prior to the wiring harness inspection, check intermediate connectors D-24, C-59 and repair if necessary.

Q: Is the check result normal?
YES : Go to Step 6.
NO : Repair the wiring harness.

STEP 6. Retest the system
Check if the sound is output from all the speakers.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Go to Step 7.

STEP 7. Retest the system
Temporarily replace the multivision display, and check if the sound is output from all the speakers.

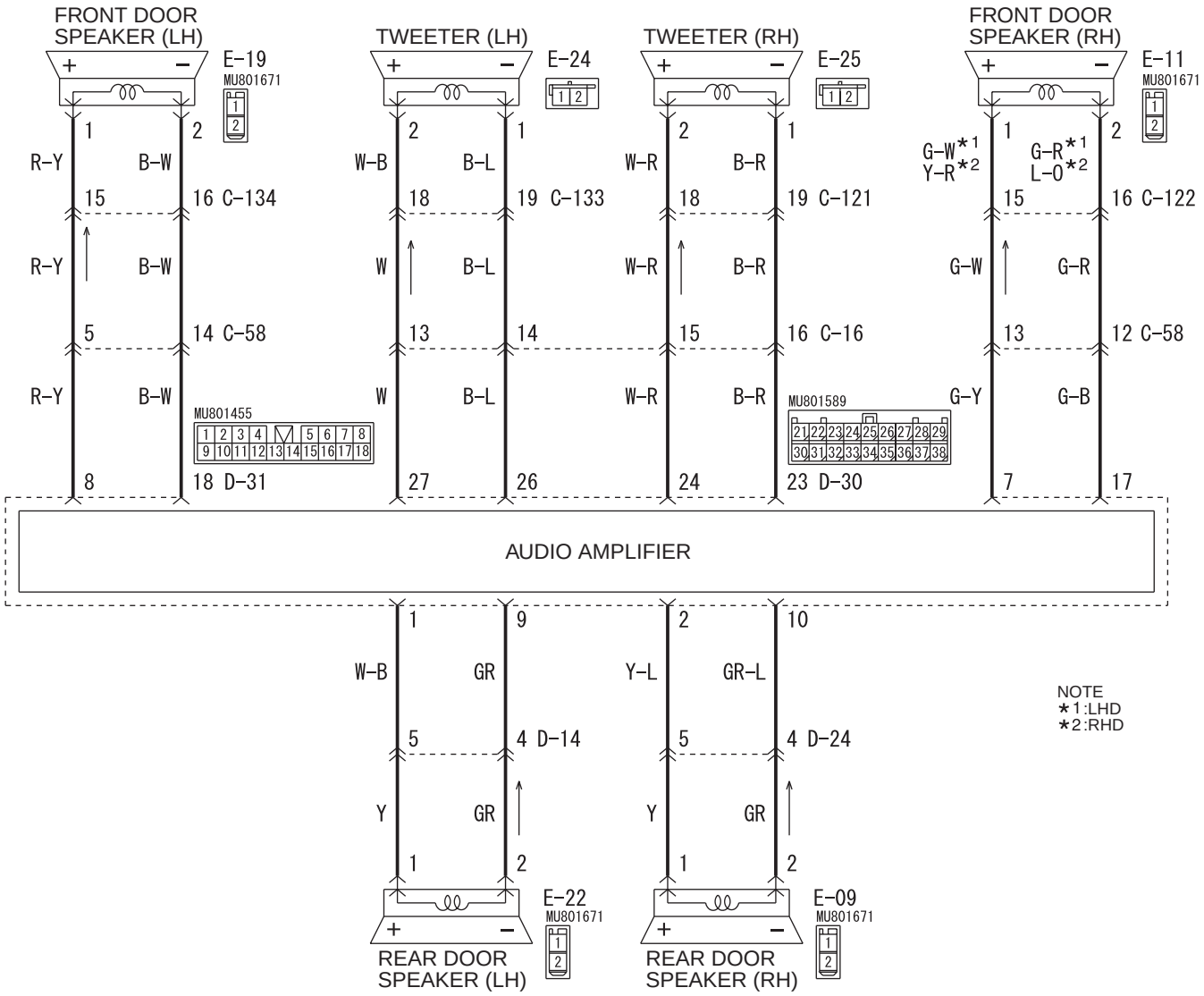
Q: Is the check result normal?
YES : Replace the multivision display.
NO : Replace the speaker which does not output the sound.

Inspection Procedure 3: No sound is heard from one of the speakers. <Vehicles with audio amplifier>

⚠ CAUTION

Before replacing the multivision display or audio amplifier, ensure that the power supply circuit, the earth circuit, and the communication circuit are normal. (Check that the voltage is 10 V or more.)

Speaker System Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

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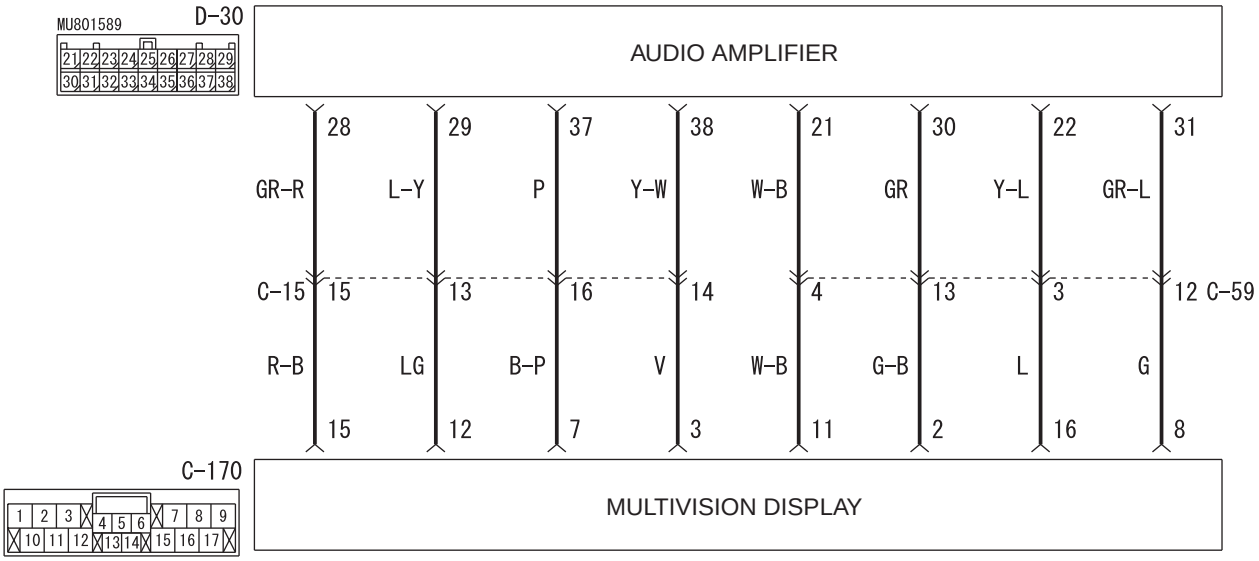
Audio Amplifier System Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

WAC54E100A

COMMENTS ON TROUBLE SYMPTOM

If the sound is not heard from one of the speakers, the speaker, multivision display, audio amplifier, communication line from the multivision display to the audio amplifier, or communication line from the audio amplifier to the speaker may have a problem.

PROBABLE CAUSES

- Malfunction of speaker
- Malfunctions of multivision display
- Malfunction of audio amplifier
- Damaged wiring harness and connectors

DIAGNOSIS PROCEDURE

STEP 1. Checking with speaker test

Perform the speaker test, and check which speaker does not output the sound. Refer to P.54A-305.

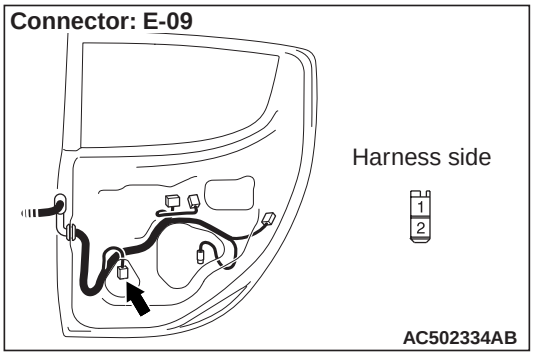
NOTE: In the following procedure, check the speaker or tweeter that is abnormal.

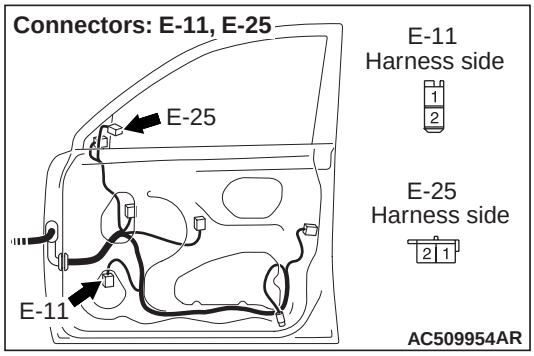
Q: Is the check result normal?

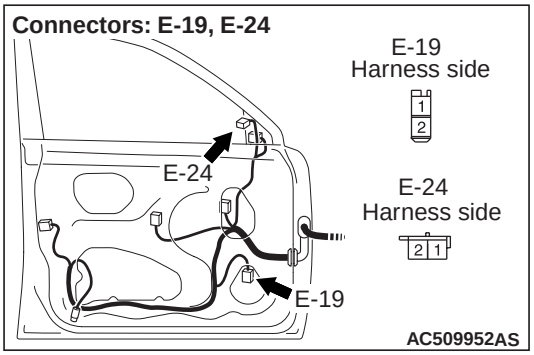
YES (normal for all) : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction).

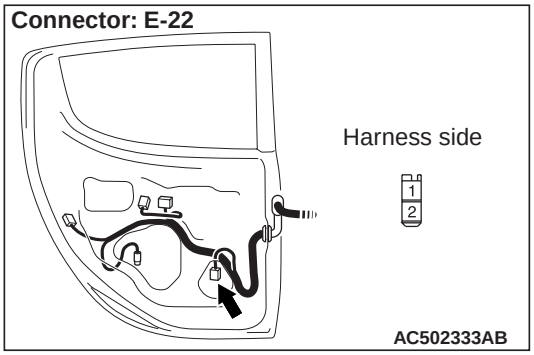
NO (Either a speaker, a tweeter is abnormal) : Go to Step 2.

STEP 2. Connector check: E-19 <LH>, E-11 <RH> front door speaker connector, E-22 <LH> or E-09 <RH> rear door speaker connector, E-24 <LH>, E-25 <RH> tweeter connector









Q: Is the check result normal?

YES : Go to Step 3.
NO : Repair the defective connector.

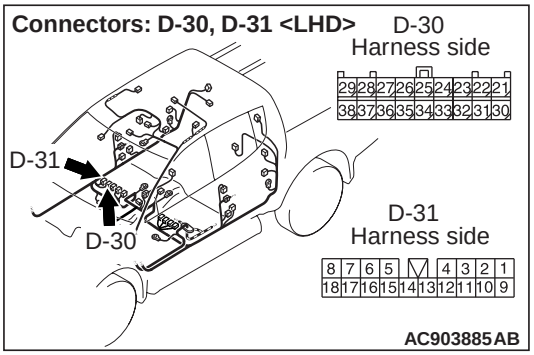
STEP 3. Check the speaker or tweeter.

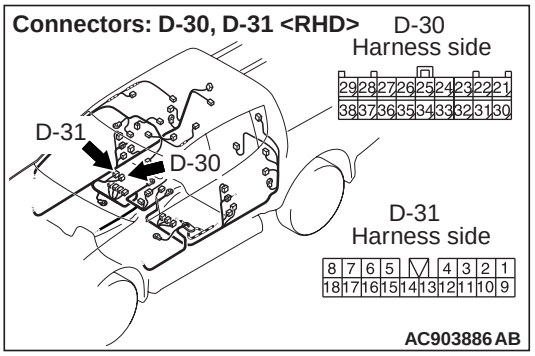
(1) Remove the speaker or tweeter. Refer to P.54A-445.
(2) Check that the speaker or tweeter outputs the noise when the voltage of 5 V is applied to the speaker or tweeter connector terminal. <speaker or tweeter>

Q: Do the speaker or tweeter output the noise?

YES : Go to Step 4.
NO : Replace the speaker or tweeter.

STEP 4. Connector check: D-30 <tweeter> or D-31 <front door speaker or rear door speaker> audio amplifier connector .



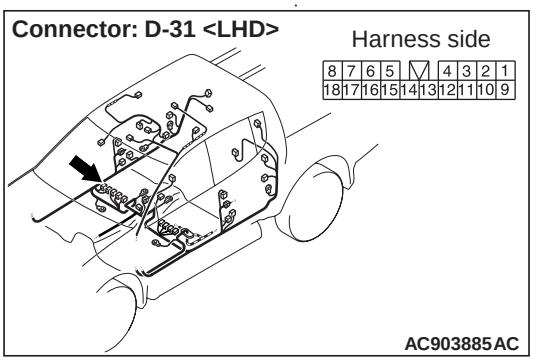


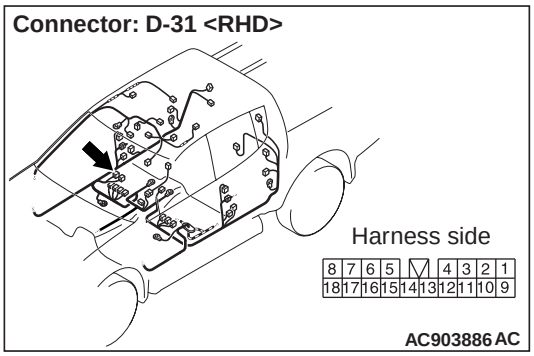
Q: Is the check result normal?

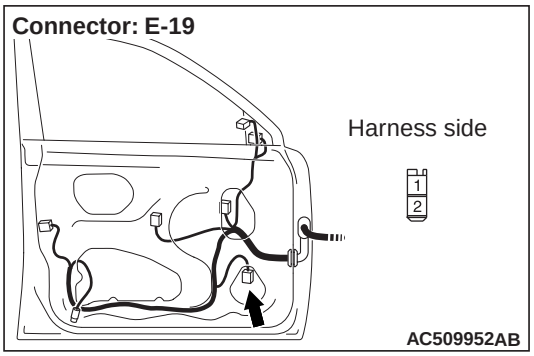
YES : Go to Step 5.
NO : Repair the defective connector.

STEP 5. Check the wiring harness between the speaker or tweeter connector terminal and the audio amplifier connector terminal.

Check the communication lines for open circuit and short circuit.

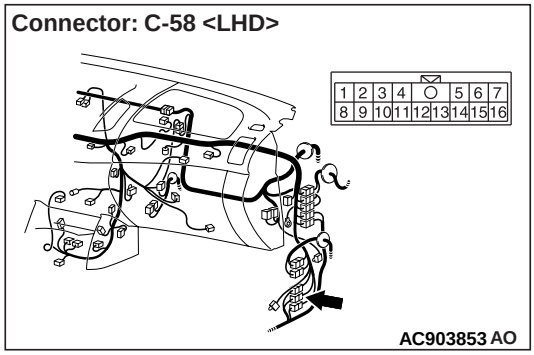


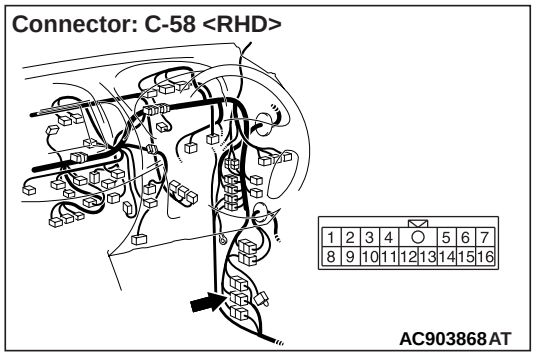


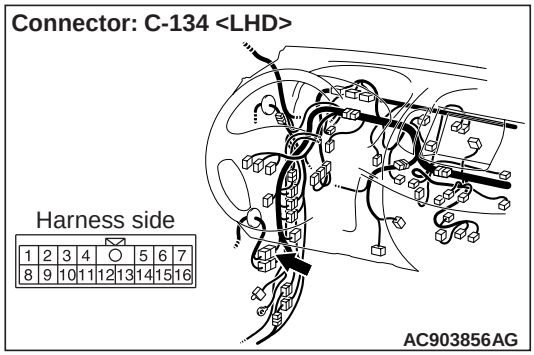


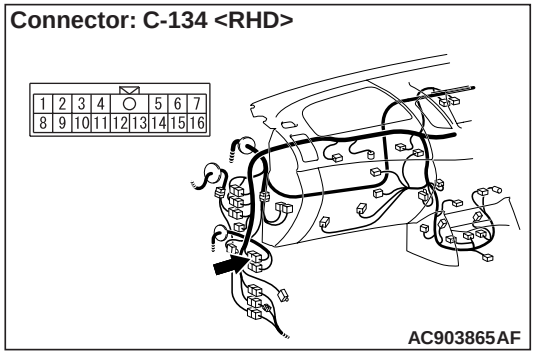
<Front door speaker (LH)> Check the wire harness between E-19 front door speaker (LH) connector terminal No.1, 2 and D-31 audio amplifier connector terminal No.8, 18.

NOTE:

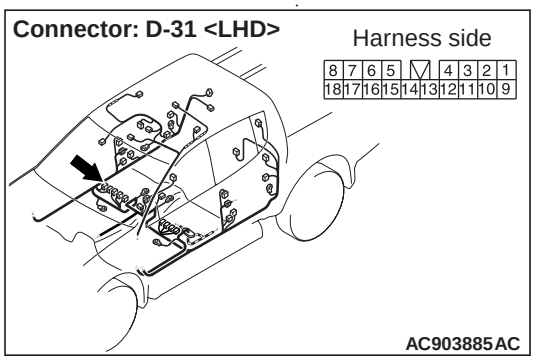


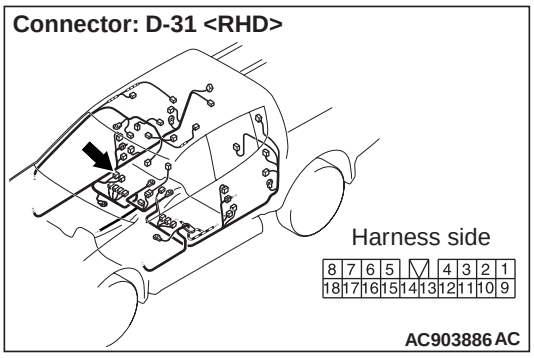


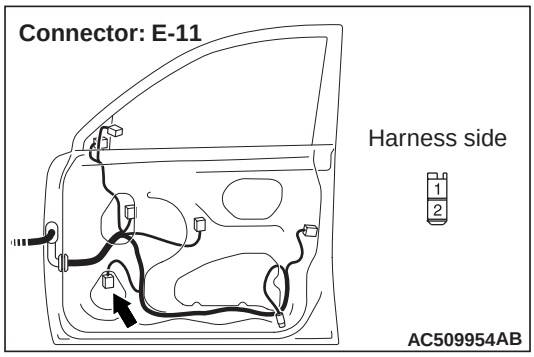




Prior to the wiring harness inspection, check intermediate connectors C-134 and C-58, and repair if necessary.

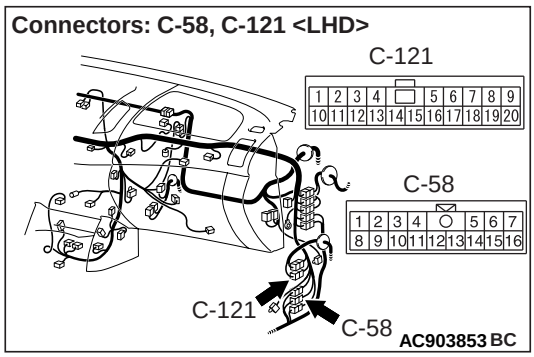


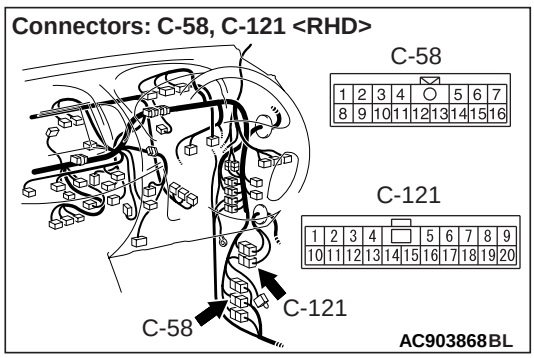




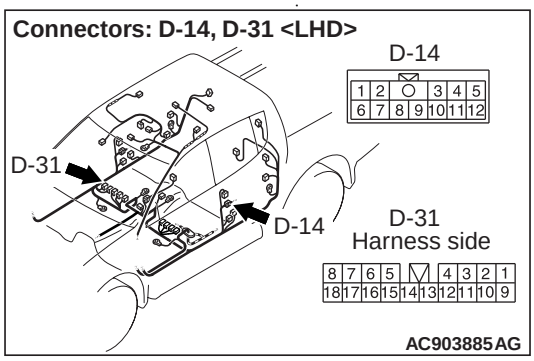
<Front door speaker (RH)> Check the wire harness between E-11 front door speaker (RH) connector terminal No.1, 2 and D-31 audio amplifier connector terminal No.7, 17.

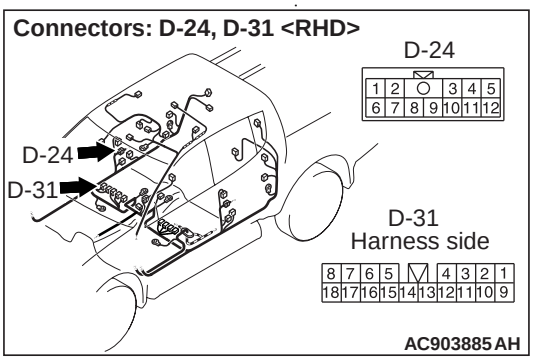
NOTE:

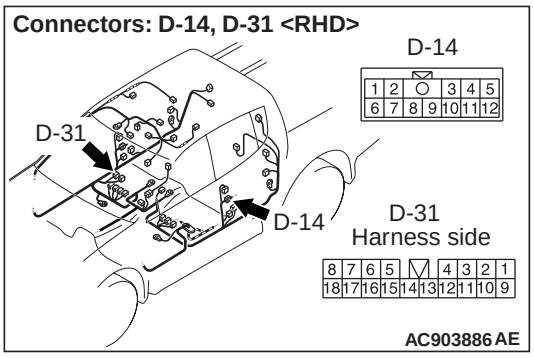


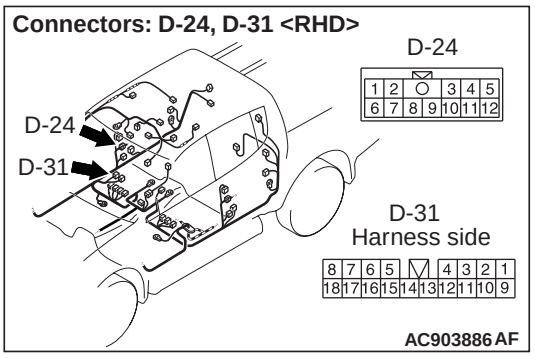


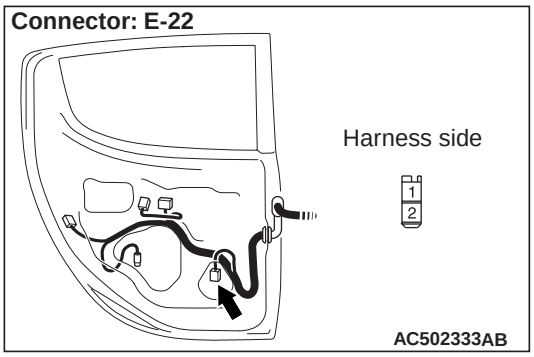
Prior to the wiring harness inspection, check intermediate connectors C-121 and C-58, and repair if necessary.

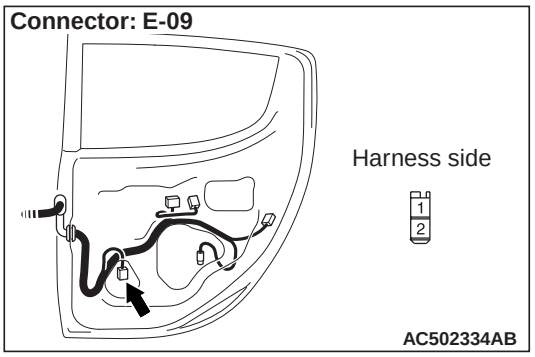










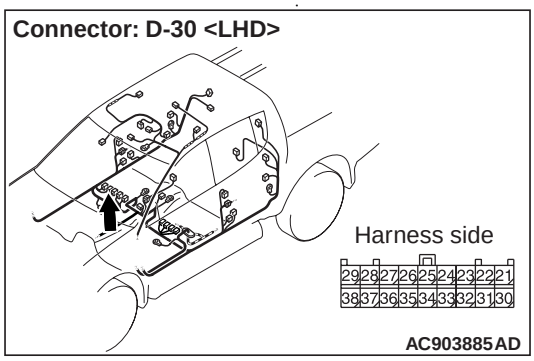


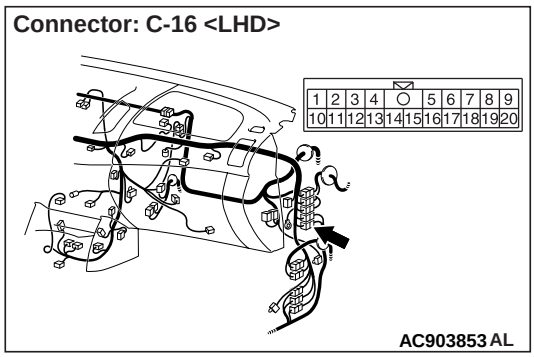
<Rear door speaker (LH)> Check the wire harness between E-22 rear door speaker (LH) connector terminal No.1, 2 and D-31 audio amplifier connector terminal No.1, 9.

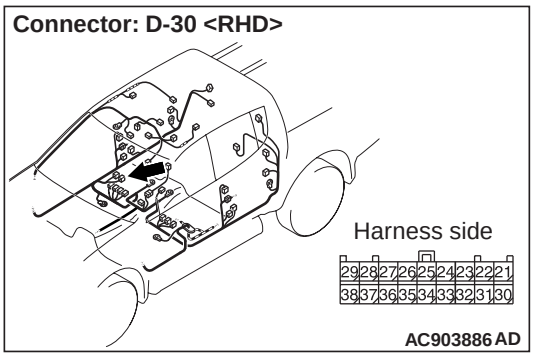
NOTE: Prior to the wiring harness inspection, check intermediate connector D-14, and repair if necessary.

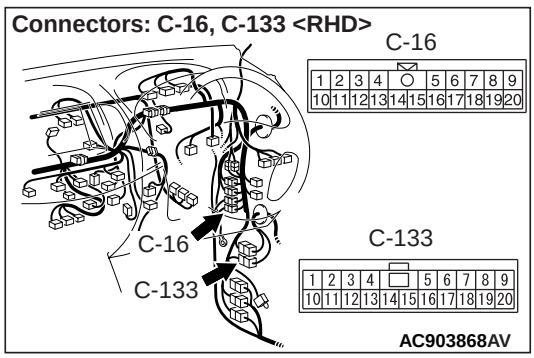
<Rear door speaker (RH)> Check the wire harness between E-09 rear door speaker (RH) connector terminal No.1, 2 and D-31 audio amplifier connector terminal No.2, 10.

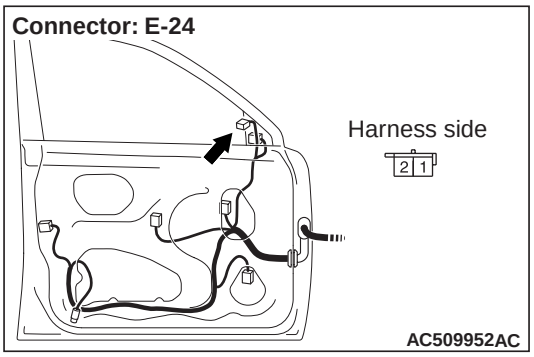
NOTE: Prior to the wiring harness inspection, check intermediate connector D-24, and repair if necessary.

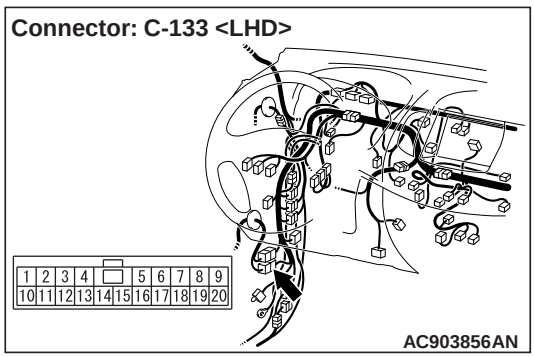








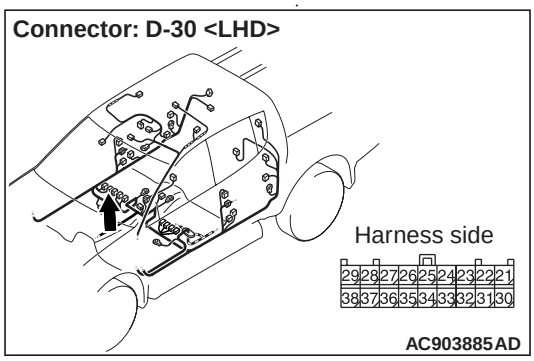


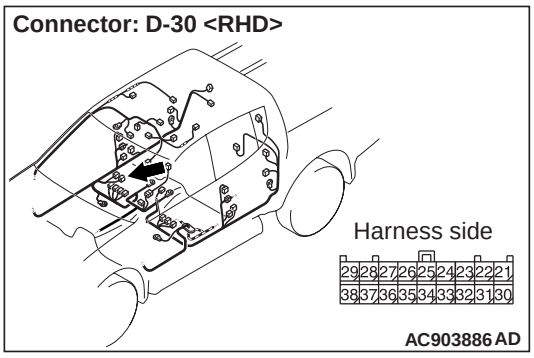


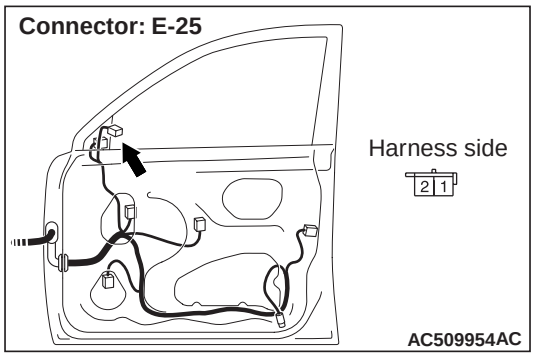
<Tweeter (LH)> Check the wire harness between E-24 tweeter (LH) connector terminal No.1, 2 and D-30 audio amplifier connector terminal No.26, 27.

NOTE:

Prior to the wiring harness inspection, check intermediate connectors C-133 and C-16, and repair if necessary.

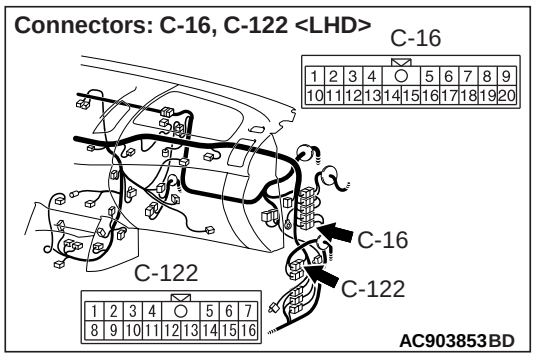


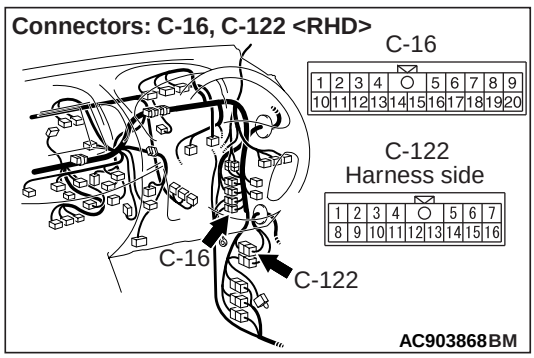




<Tweeter (RH)> Check the wire harness between E-25 tweeter (RH) connector terminal No.1, 2 and D-30 audio amplifier connector terminal No.23, 24.

NOTE:

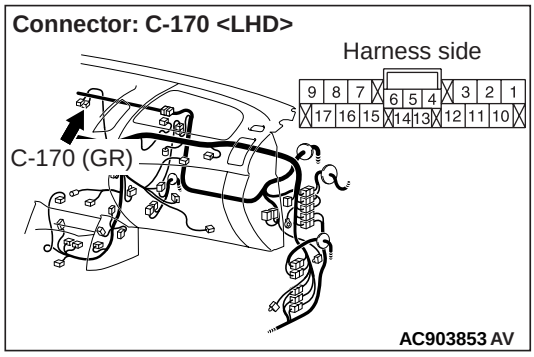


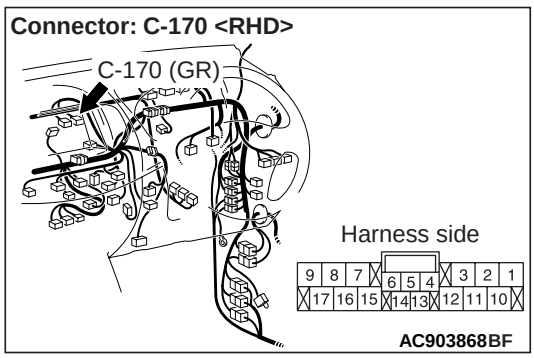


Prior to the wiring harness inspection, check intermediate connectors C-122 and C-16, and repair if necessary.

Q: Is the check result normal?
YES : Go to Step 6.
NO : Repair the wiring harness.

STEP 6. Connector check: C-170 multivision display connector

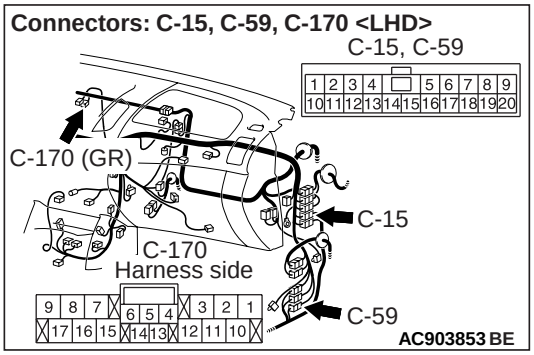


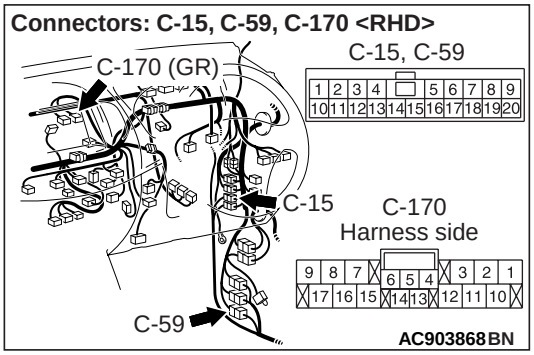


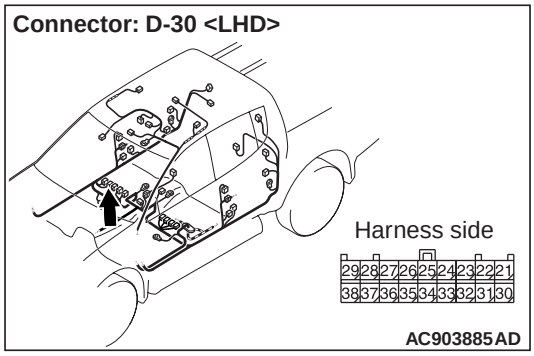
Q: Is the check result normal?

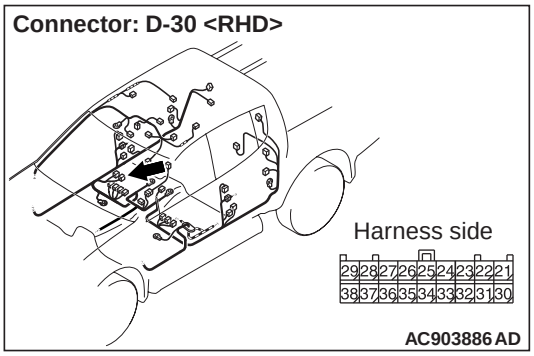
YES <Speakers other than tweeter does not sound.> : Go to Step 7.
YES <Tweeter does not sound.> : Go to Step 8.
NO : Repair the defective connector.

STEP 7. Check the wiring harness between the audio amplifier connector terminal and the multivision display connector terminal.









Check the communication lines for open circuit and short circuit.

- <Front door speaker (LH)> Check the wire harness between C-170 multivision display connector terminal No.12, 3 and D-30 audio amplifier connector terminal No.29, 38.

NOTE: Prior to the wiring harness inspection, check intermediate connector C-15, and repair if necessary.

- <Front door speaker (RH)> Check the wire harness between C-170 multivision display connector terminal No.15, 7 and D-30 audio amplifier connector terminal No.28, 37.

NOTE: Prior to the wiring harness inspection, check intermediate connector C-15, and repair if necessary.

- <Rear door speaker (LH)> Check the wire harness between C-170 multivision display connector terminal No.11, 2 and D-30 audio amplifier connector terminal No.21, 30.

NOTE: Prior to the wiring harness inspection, check intermediate connector C-59, and repair if necessary.

- <Rear door speaker (RH)> Check the wire harness between C-170 multivision display connector terminal No.16, 8 and D-30 audio amplifier connector terminal No.22, 31.

NOTE: Prior to the wiring harness inspection, check intermediate connector C-59, and repair if necessary.

Q: Is the check result normal?
YES : Go to Step 8.
NO : Repair the wiring harness.

STEP 8. Retest the system
Check if the sound is output from all the speakers.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Go to Step 9.

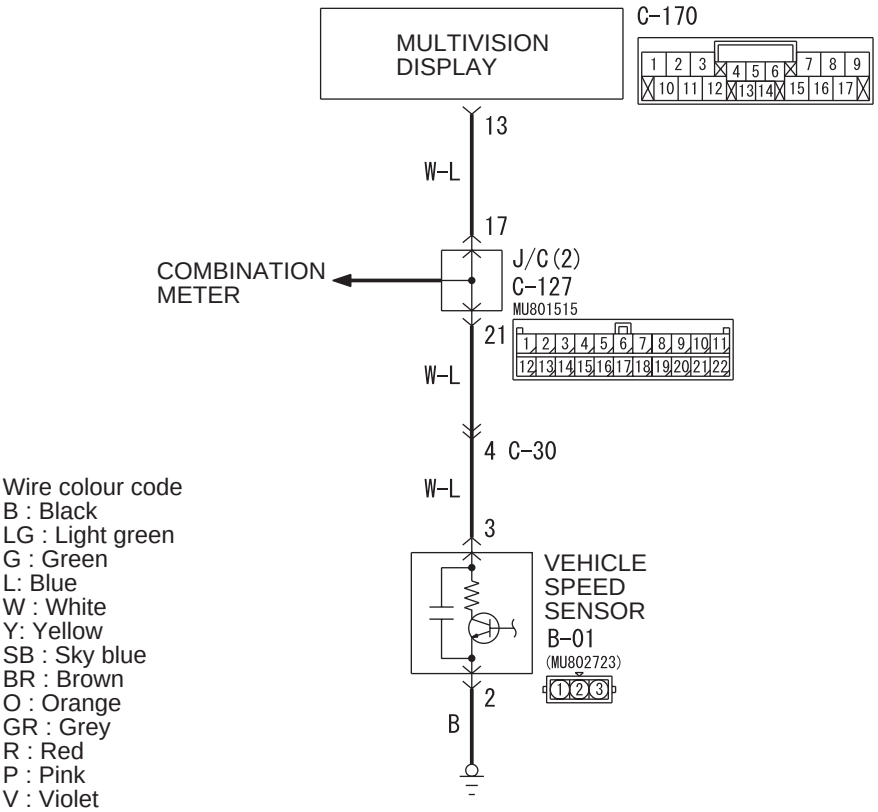
STEP 9. Retest the system
Temporarily replace the multivision display, and check if the sound is output from all the speakers.

Q: Is the check result normal?
YES : Replace the multivision display.
NO : Replace the audio amplifier.

Inspection Procedure 4: The navigation system can be operated while the vehicle is driven.

⚠ CAUTION
Before replacing the multivision display, ensure that the power supply circuit, the earth circuit, and the communication circuit are normal. (Check that the voltage is 10 V or more.)

Multivision Display



WAC54E038A

COMMENTS ON TROUBLE SYMPTOM
There is a failure in the wiring harness between the vehicles speed sensor and the multivision display, the respective connector(s), the vehicles speed sensor or the multivision display.

PROBABLE CAUSES
- Malfunctions of vehicles speed sensor
- Malfunctions of multivision display
- Damaged wiring harness and connectors

DIAGNOSIS PROCEDURE

STEP 1. Perform "Vehicle Signal Check" in the MMCS service mode.
Perform "Vehicle Signal Check" in the MMCS service mode to check whether vehicle speed signal is normal. (Refer to P.54A-305.)

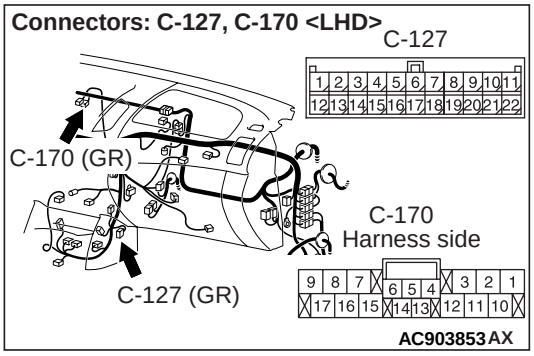
Q: Is the vehicle speed signal transmitted normally?
YES : Replace the multivision display.
NO : Go to Step 2.

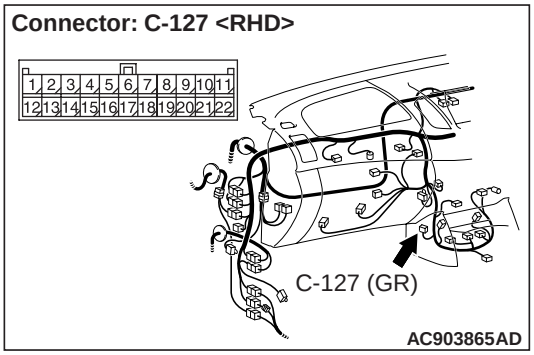
STEP 2. Check the speedometer.
Check whether the speedometer works normally.(Refer to P.54A-87.)

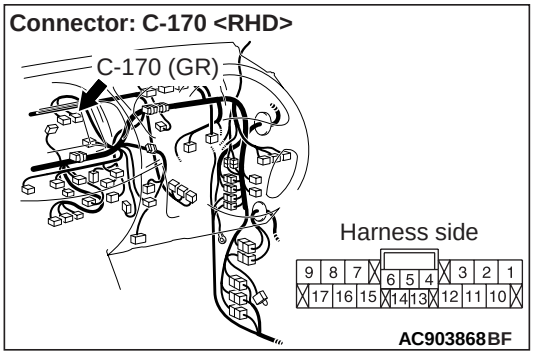
Q: Does the speedometer work normally?

YES : Go to Step 3.
NO : Diagnose the combination meter. (Refer to Combination meter – Troubleshooting P.54A-46.)

STEP 3. Connector check: C-127 joint connector, C-170 multivision display connector

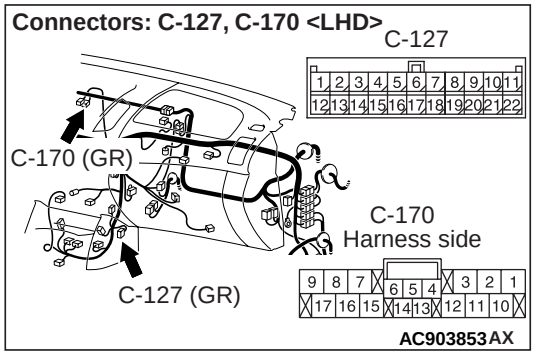


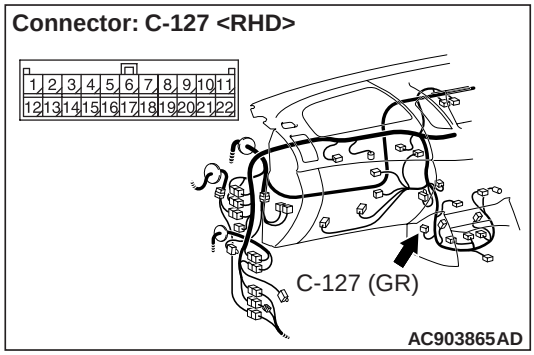


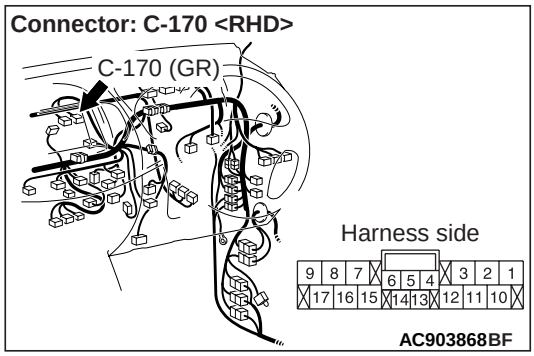


Q: Is the check result normal?
YES : Go to Step 4.
NO : Repair the defective connector.

STEP 4. Check the wiring harness between C-127 joint connector terminal No.17 and C-170 multivision display connector terminal No.13.







- Check the communication line for open circuit and short circuit.

Q: Is the check result normal?
YES : Go to Step 5.
NO : Repair the wiring harness.

STEP 5. Substitute a known good multivision display, and check the trouble symptom.

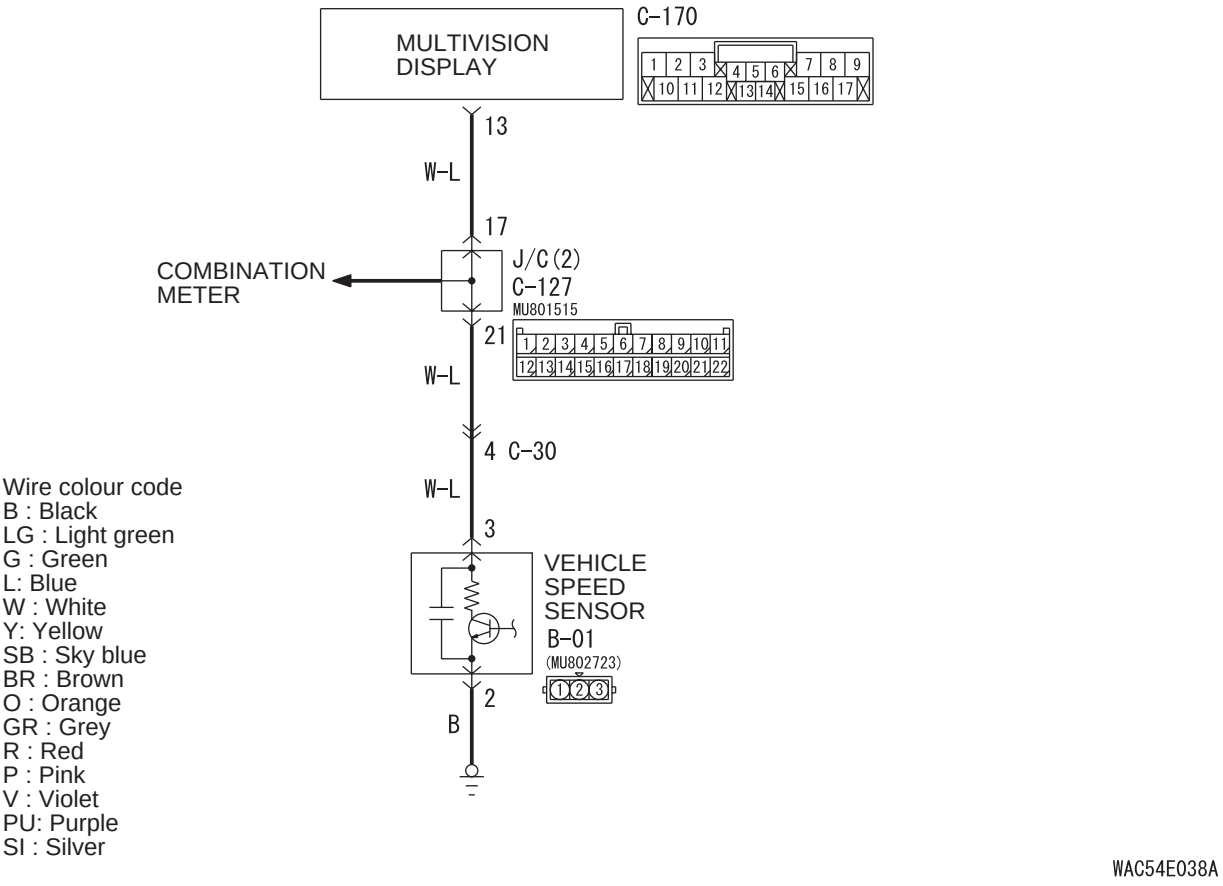
Check that no menus are active during driving.

Q: Is the check result normal?
YES : Replace the multivision display.
NO : Replace the combination meter.

Inspection Procedure 5: The screen is not normal in the navigation mode. (The own vehicle mark is dislocated.) <Except vehicle for RUSSIA>

⚠ CAUTION
Before replacing the multivision display, ensure that the power supply circuit, the earth circuit, and the communication circuit are normal. (Check that the voltage is 10 V or more.)

Multivision Display



WAC54E038A

COMMENTS ON TROUBLE SYMPTOM
There is a failure in the wiring harness between the combination meter and the multivision display, the GPS antenna, the respective connector(s), the vehicle speed sensor or the multivision display.

PROBABLE CAUSES
- Malfunctions of GPS antenna
- Malfunctions of multivision display
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. Confirmation in MMCS service mode
Check the items below in the MMCS service mode. (Refer to P.54A-305.)
- Perform "Network/Connect Line Check" in the MMCS service mode to check that the communication and wire connection with the GPS are in good condition.
- Perform "Vehicle Signal Check", and then check the status of the vehicle speed signal.
- Perform "Sensor Check", and then check the status of the vehicle speed sensor and the gyro sensor.

Q: Is the check result normal?

YES (OK for all) : Go to Step 6.
NO (GPS is not OK) : Go to Step 2.
NO (The vehicle speed sensor is not OK, or vehicle speed pulse does not increase after starting from a standstill) : Go to Step 3.
NO (Gyro sensor is not OK) : Go to Step 6.

STEP 2. GPS reception check

(1) Start the multivision display.
(2) Press the [INFO] button.
(3) Select [Vehicle Position].
(4) Check if the GPS signals are received.

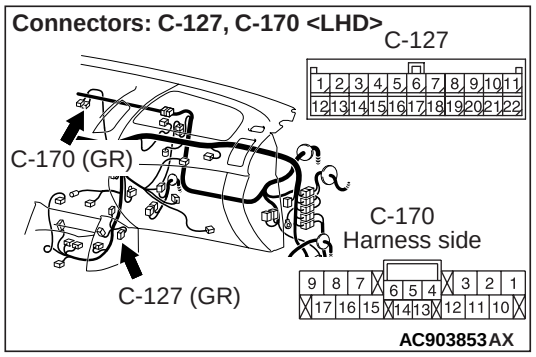
Q: Is the check result normal?
YES : Go to Step 6.
NO : Perform Inspection Procedure "GPS signal cannot be received" (Refer to P.54A-370.), and then go to Step 6.

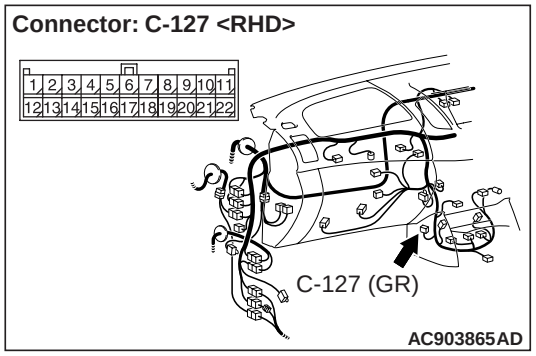
STEP 3. Check the speedometer.

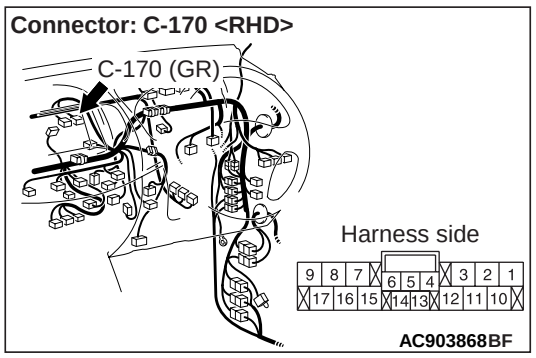
Check whether the speedometer works normally. (Refer to P.54A-87.)

Q: Is the check result normal?
YES : Go to Step 4.
NO : Diagnose the combination meter. (Refer to Combination meter – Troubleshooting P.54A-46.)

STEP 4. Connector check: C-127 joint connector, C-170 multivision display connector

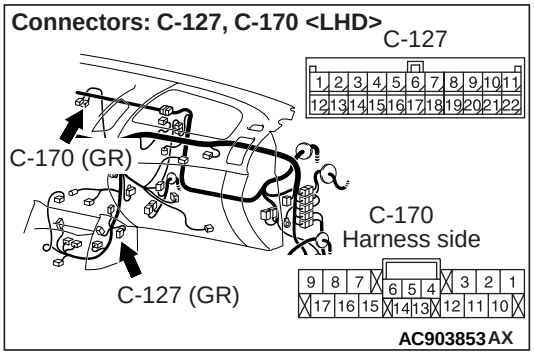


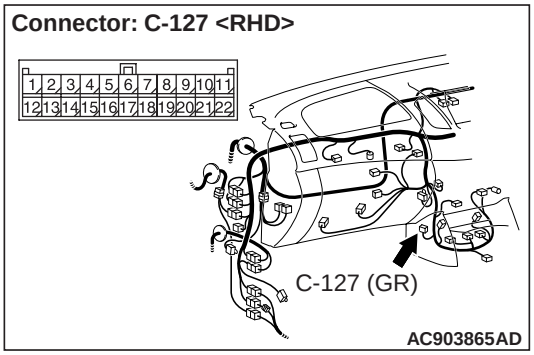


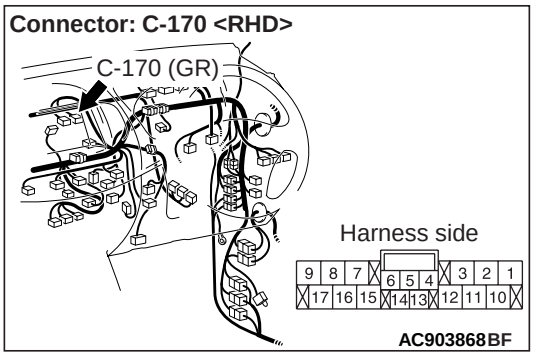


Q: Is the check result normal?
YES : Go to Step 5.
NO : Repair the defective connector.

STEP 5. Check the harness wire between D-127 joint connector terminal No.17 and C-170 multivision display connector terminal No.13.







- Check the communication lines for open circuit and short circuit.

Q: Is the check result normal?

YES : Go to Step 6.
NO : Repair the wiring harness.

STEP 6. Check of the troubles

Drive the vehicle for some time with the GPS signals being received, and check if the own vehicle mark is dislocated.

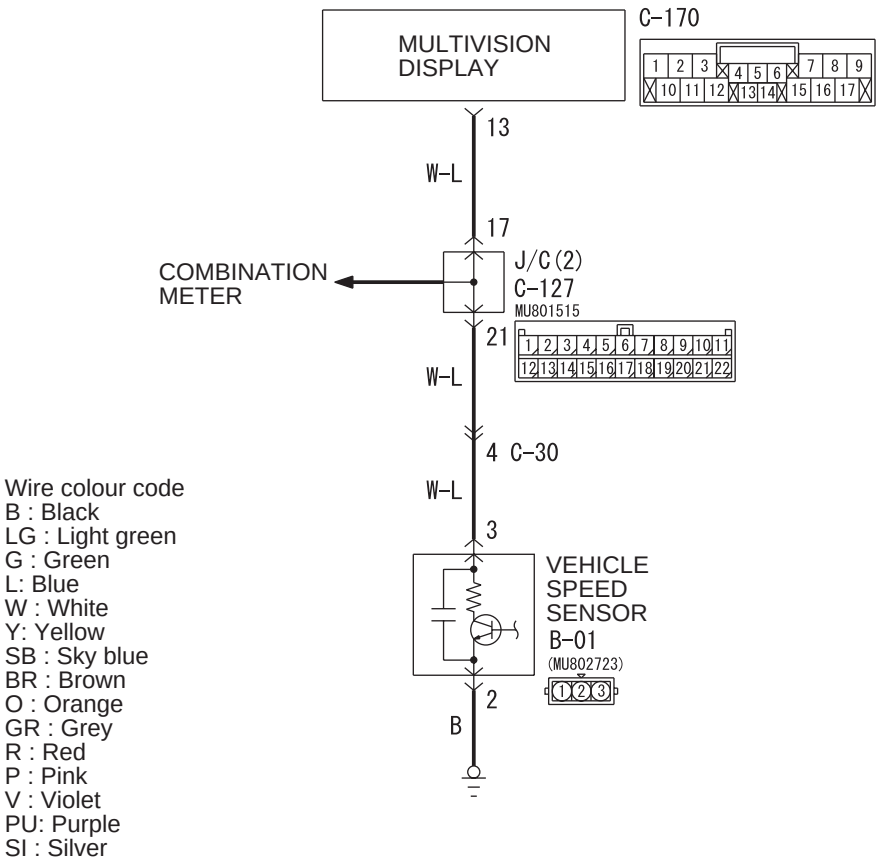
Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Replace the multivision display.

Inspection Procedure 5: The screen is not normal in the navigation mode. (The own vehicle mark is dislocated.) <Vehicles for RUSSIA>

⚠ CAUTION
Before replacing the multivision display, ensure that the power supply circuit, the earth circuit, and the communication circuit are normal. (Check that the voltage is 10 V or more.)

Multivision Display



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COMMENTS ON TROUBLE SYMPTOM
If the own vehicle mark is dislocated, there is a failure in the wiring harness between the vehicles speed sensor and the multivision display, the GPS antenna, the respective connector(s), the vehicles speed sensor or the multivision display.

NOTE: If the vehicle speed signal has a problem, the speedometer of combination meter will be affected. Confirm if the speedometer of combination meter works normally at the abnormal state to customers.

PROBABLE CAUSES
- Malfunctions of GPS antenna
- Malfunctions of vehicles speed sensor
- Malfunctions of multivision display
- Damaged wiring harness and connectors

DIAGNOSIS PROCEDURE

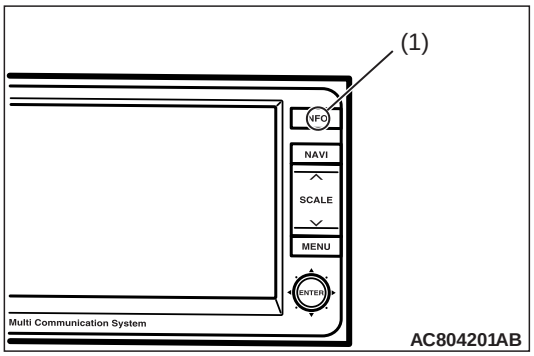
STEP 1. Confirmation in MMCS service mode
Check the items below in the MMCS service mode. (Refer to P.54A-305.)
- Perform "Network/Connect Line Check" in the MMCS service mode to check that the communication and wire connection with the GPS are in good condition.
- Perform "Vehicle Signal Check", and then check the status of the vehicle speed signal.
- Perform "Sensor Check", and then check the status of the vehicle speed sensor and the gyro sensor.

Q: Is the check result normal?

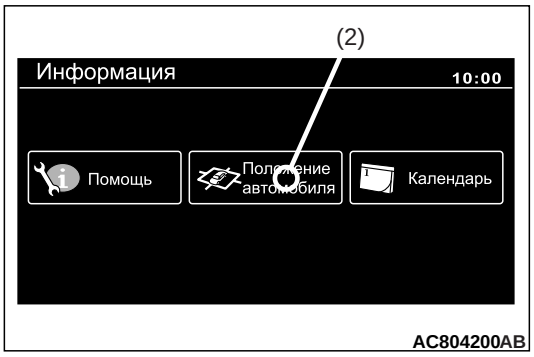
YES (OK for all) : Go to Step 6.
NO (GPS is not OK) : Go to Step 2.
NO (The vehicles speed sensor is not OK, or vehicle speed pulse does not increase after starting from a standstill) : Go to Step 3.
NO (Gyro sensor is not OK) : Go to Step 6.

STEP 2. GPS reception check

(1) Start the multivision display.



(2) Press the (1).



(3) Select (2).

(4) Check if the GPS signals are received.

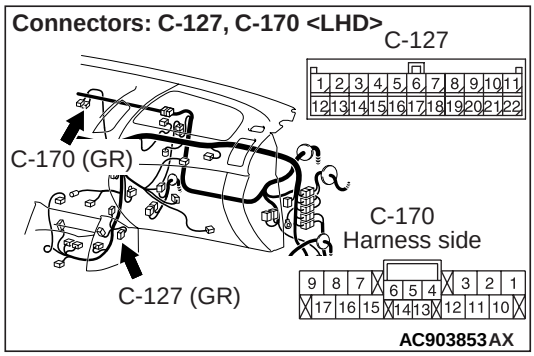
Q: Is the check result normal?
YES : Go to Step 6.
NO : Perform Inspection Procedure 7 "GPS signal cannot be received" (Refer to P.54A-370.), and then go to Step 6.

STEP 3. Check the speedometer.

Check whether the speedometer works normally. (Refer to P.54A-87.)

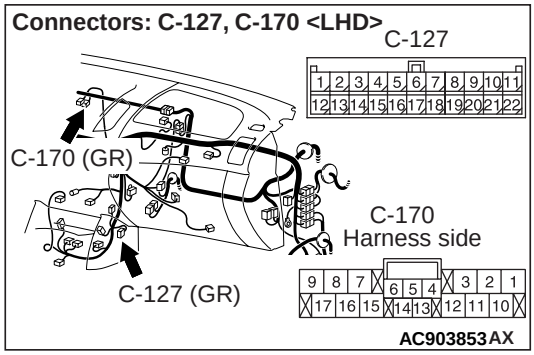
Q: Is the check result normal?
YES : Go to Step 4.
NO : Diagnose the combination meter. (Refer to Combination meter – Troubleshooting P.54A-46.)

STEP 4. Connector check: C-127 joint connector, C-170 multivision display connector



Q: Is the check result normal?
YES : Go to Step 5.
NO : Repair the defective connector.

STEP 5. Check the wiring harness between C-127 joint connector terminal No.17 and C-170 multivision display connector terminal No.13.



- Check the communication line for open circuit and short circuit.

Q: Is the check result normal?
YES : Go to Step 6.
NO : Repair the wiring harness.

STEP 6. Check of the troubles

Drive the vehicle for some time with the GPS signals being received, and check if the own vehicle mark is dislocated.

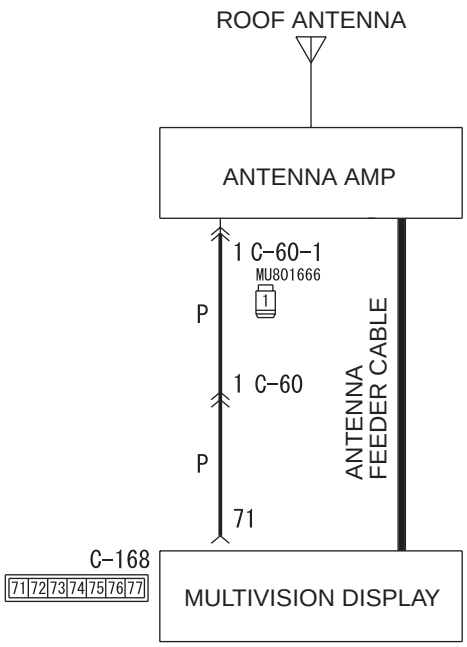
Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Replace the multivision display.

Inspection Procedure 6: The radio broadcasting can not be received.

⚠ CAUTION
Whenever the multivision display is replaced, ensure that the power supply circuit and the earthing circuit are normal. (Check that the voltage is 10 V or more.)

Antenna Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

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COMMENTS ON TROUBLE SYMPTOM
In case of FM/MW/LM radio broadcasting cannot be received., antenna rod, antenna base, antenna fender or multivision display may have a problem.

NOTE: The radio wave may not be received if the vehicle is placed in the area which is exposed to a special electric field. Thus, check that the radio broadcasting can be received using the radio of another vehicle before carrying out diagnosis.

PROBABLE CAUSES
- Malfunctions of antenna rod
- Malfunctions of antenna base
- Malfunctions of antenna feeder
- Malfunctions of multivision display
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. Check the state of the antenna rod and antenna base.

Q: Is the antenna assembled?

YES : Go to Step 2.
NO : Assemble antenna rod and antenna base.

STEP 2. Check to see if inspections are taking place is an area exposed to special electric fields.

Q: Is the reception area exposed to special electric fields?
YES : Go to Step 3.
NO : Go to Step 4.

STEP 3. Move the vehicle and check the radio.
Move the vehicle to a good reception area that is not exposed to special electric fields.

Q: Is the check result normal?
YES : Diagnosis complete.
NO : Go to Step 4.

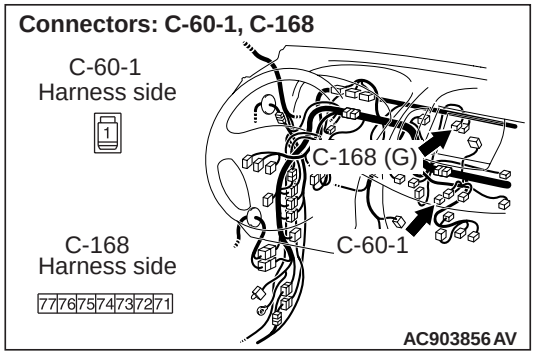
STEP 4. Check if there is any damage to the antenna rod, antenna base and antenna fender.

Q: Is the check result normal?
YES : Go to Step 5.
NO : Replace the antenna rod, antenna base and antenna fender.

STEP 5. Check the connection of the antenna fender's plug and multivision display.

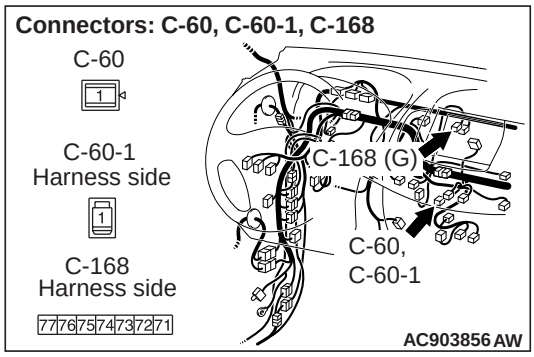
Q: Is the antenna fender's plug thoroughly connected to the multivision display?
YES : Go to Step 6.
NO : Thoroughly connect the antenna fender's plug and the multivision display.

STEP 6. Connector check: C-168 multivision display connector, C-60-1 antenna amp (antenna base) connector



Q: Is the check result normal?
YES : Go to Step 7.
NO : Repair or replace the damaged connector.

STEP 7. Check the antenna feeder between C-168 multivision display connector terminal No.71 and C-60-1 antenna amp (antenna base) connector terminal No.1.



- Check the communication line for open circuit and short circuit.

NOTE: Prior to the wiring harness inspection, intermediate connector C-60, and repair if necessary.

Q: Is the check result normal?
YES : Go to Step 8.
NO : Repair the antenna feeder.

STEP 8. Substitute a known good multivision display, and check the trouble symptom.

Q: Is the check result normal?
YES : Replace the multivision display.
NO : Either repair or replace the antenna rod and antenna base.

Inspection Procedure 7: GPS signal cannot be received. <Except vehicles for RUSSIA>

⚠ CAUTION
Whenever the multivision display is replaced, ensure that the power supply circuit and the earthing circuit are normal. (Check that the voltage is 10 V or more.)

COMMENTS ON TROUBLE SYMPTOM
The GPS antenna or the multivision display may be defective.

PROBABLE CAUSES
- Malfunctions of GPS antenna
- Malfunctions of multivision display

DIAGNOSIS PROCEDURE

STEP 1. Confirmation in MMCS service mode
Perform "Network/Connect Line Check" in the MMCS service mode to check that the communication and wire connection with the GPS antenna are OK. (Refer to P.54A-305.)

Q: Is the check result normal?
YES : Go to Step 2.
NO : Go to Step 4.

STEP 2. Check for the vehicle's current position.
Check that the vehicle is parked on a well-ventilated place.

Q: Is the vehicle parked on a well-ventilated place?
YES : Go to Step 3.
NO : Move the vehicle to a well-ventilated area.

STEP 3. Confirming GPS signal reception
(1) Start the multivision display.
(2) Press the [INFO] button.
(3) Select [Vehicle Position].
(4) Wait for 5 minutes, and then check whether GPS signal can be received.

Q: Can GPS signal be received?
YES : The diagnosis is complete. (There is no failure)
NO : Go to Step 4.

STEP 4. Substitute a known good multivision display, and check the trouble symptom.
(1) Temporarily replace the multivision display.
(2) Start the multivision display.
(3) Press the [INFO] button.
(4) Select [Vehicle Position].
(5) Check if the GPS signals are being received after 5 minutes have elapsed.

Q: Is the check result normal?
YES : Replace the multivision display.
NO : Replace the GPS antenna.

Inspection Procedure 7: GPS signal can not be received. <Vehicles for RUSSIA>

⚠ CAUTION
Whenever the multivision display is replaced, ensure that the power supply circuit and the earthing circuit are normal. (Check that the voltage is 10 V or more.)

COMMENTS ON TROUBLE SYMPTOM
The GPS antenna or the multivision display may be defective.

PROBABLE CAUSES
- Malfunctions of GPS antenna
- Malfunctions of multivision display

DIAGNOSIS PROCEDURE

STEP 1. Confirmation in MMCS service mode
Perform "Network/Connect Line Check" in the MMCS service mode to check that the communication and wire connection with the GPS antenna are OK. (Refer to P.54A-305.)

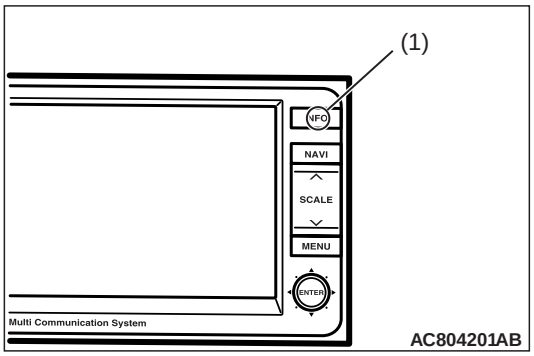
Q: Is the check result normal?
YES : Go to Step 2.
NO : Go to Step 4.

STEP 2. Check for the vehicle's current position.
Check that the vehicle is parked on a well-ventilated place.

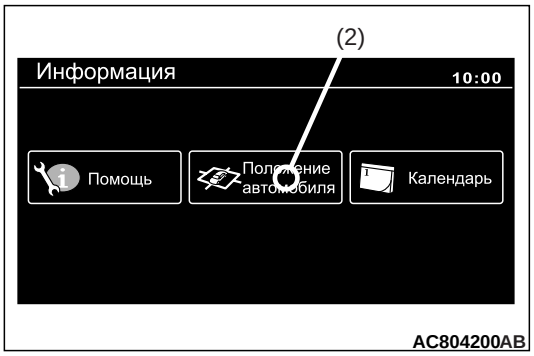
Q: Is the vehicle parked on a well-ventilated place?
YES : Go to Step 3.
NO : Move the vehicle to a well-ventilated area.

STEP 3. Confirming GPS signal reception

(1) Start the multivision display.



(2) Press the (1).



(3) Select (2).

(4) Wait for 5 minutes, and then check whether GPS signal can be received.

Q: Can GPS signal be received?

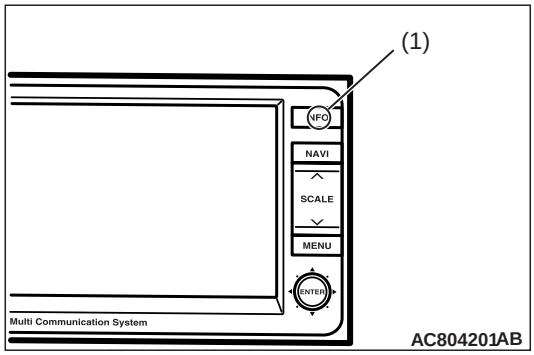
YES : The diagnosis is complete. (There is no failure)

NO : Go to Step 4.

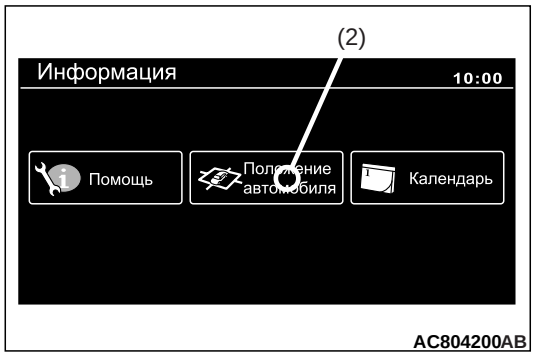
STEP 4. Substitute a known good multivision display, and check the trouble symptom.

(1) Temporarily replace the multivision display.

(2) Start the multivision display.



(3) Press the (1).



(4) Select (2).

(5) Wait for 5 minutes, and then check whether GPS signal can be received.

Q: Is the check result normal?

YES : Replace the multivision display.

NO : Replace the GPS antenna.

Inspection Procedure 8: CD/DVD cannot be played.

⚠ CAUTION

Whenever the multivision display is replaced, ensure that the power supply circuit and the earthing circuit are normal. (Check that the voltage is 10 V or more.)

COMMENTS ON TROUBLE SYMPTOM

The CD/DVD or the multivision display may be defective.

PROBABLE CAUSES

- Defective CD/DVD

- Malfunctions of multivision display

DIAGNOSIS PROCEDURE

STEP 1. Check if the error message is displayed on the monitor.
(Refer to P.54A-301.)

Q: Is the error message displayed on the monitor?
YES : Refer to error massage (refer to P.54A-301), take necessary steps. If the CD or DVD is still not be played, go to Step 2.
NO : Go to Step 2.

STEP 2. Check the CD/DVD insertion surface.
Check that the CD/DVD is inserted with the correct surface facing up.

Q: Is the check result normal?
YES : Go to step 3.
NO : Check the disc insertion surface, and reinsert the disc. (In case of a single-sided disc, insert it with its label facing upward.)

STEP 3. Check the CD/DVD.
- Check that the DVD has the correct region code.
- Check if the CD corresponds with the multivision display.

Q: Is the check result normal?
YES : Go to step 4.
NO : Use a DVD with a correct region code. Or, use a CD corresponds with the multivision display.

STEP 4. Check the CD/DVD.
Check that the CD/DVD is free of dirt or scratch.

Q: Is the check result normal?
YES : Go to step 5.
NO : Clean the disc, use a disc without scratches and burrs, or remove the burrs from the disc, and then reinsert the disc.

STEP 5. Temporarily replace the CD /DVD with another CD or DVD, and check the trouble symptom.
Check that the new CD/DVD is played normally when it is inserted.

Q: Is the check result normal?
YES : Replace the used CD/DVD.
NO : Go to step 6.

STEP 6. Check the service data log for the MMCS service mode.
(1) Display the service data log for the MMCS service mode. (Refer to P.54A-305.)
(2) Check if the service data log for drive and HDD is displayed.

Q: Is the service data log displayed?
YES (The service data log for drive is displayed.) : Check for foreign materials or condensation. Repair if there is an abnormality, and then go to Step 7.
YES (The service data log for HDD is displayed.) : Abnormalities relating to high or low temperature may be present. Check that the multivision display can play the disc at the operable temperature. If it cannot be played normally, go to Step 7.
NO : Go to step 7.

STEP 7. Perform "Network/Connect Line Check" in the MMCS service mode.
(1) Display "Network/Connect Line Check" in the MMCS service mode. (Refer to P.54A-305.)
(2) Check if "DVD Drive OK" is displayed.
(3) Check if "HDD Drive OK" is displayed.

Q: Is the check result normal?
YES : Go to step 8.
NO : Replace the multivision display.

STEP 8. Check of the troubles
Check that the new CD/DVD is played normally when it is inserted.

Q: Is the check result normal?
YES : The diagnosis is complete.
NO : Go to step 9.

STEP 9. Temporarily replace the multivision display, and check the trouble symptom.
After temporary replacement of the multivision display, check that the new CD/DVD is played normally when it is inserted.

Q: Is the check result normal?
YES : Replace the multivision display.
NO : Replace the CD/DVD.

Inspection Procedure 9: Image of a DVD is played, but no sound is played.

⚠ CAUTION
Whenever the multivision display is replaced, ensure that the power supply circuit and the earthing circuit are normal. (Check that the voltage is 10 V or more.)

COMMENTS ON TROUBLE SYMPTOM
The DVD or the multivision display may be defective.

PROBABLE CAUSES
- Defective DVD
- Malfunctions of multivision display

DIAGNOSIS PROCEDURE

STEP 1. Check if the error message is displayed on the monitor.
(Refer to P.54A-301.)

Q: Is the error message displayed on the monitor?
YES : Refer to error massage (refer to P.54A-301), take necessary steps. If the DVD sound is still not output, go to Step 2.
NO : Go to Step 2.

STEP 2. Check whether other sounds are emitted.
Check whether sound other than DVD is emitted.
(1) Check if the sound is output when the music server is used.
(2) Check if the sound is output when the radio is used.
(3) Check if the sound is output when the CD is used.

Q: Is sound other than DVD emitted?
YES : Go to Step 3.
NO : Troubleshoot the MMCS. (Refer to P.54A-314.)

STEP 3. Check a DVD to be inserted.
Check if the sound is recorded in the DVD, using other DVD players.

Q: Is sound data recorded in the DVD?
YES : Go to Step 4.
NO : Use a DVD containing sound data.

STEP 4. Check the DVD.
Check that the DVD is free of dirt or scratch.

Q: Is the check result normal?
YES : Go to step 5.
NO : Clean the disc, use a disc without scratches and burrs, or remove the burrs from the disc, and then reinsert the disc.

STEP 5. Temporarily replace the DVD with another DVD, and check the trouble symptom.
Check if the DVD is played normally when it is inserted.

Q: Is the check result normal?
YES : Replace the used DVD.
NO : Go to step 6.

STEP 6. Check the service data log for the MMCS service mode.
(1) Display the service data log for the MMCS service mode. (Refer to P.54A-305.)
(2) Check if the service data log for drive and HDD is displayed.

Q: Is the service data log displayed?
YES (The service data log for drive is displayed.) : Check for foreign materials or condensation. Repair if there is an abnormality, and then go to Step 7.
YES (The service data log for HDD is displayed.) : Abnormalities relating to high or low temperature may be present. Check that the multivision display can play the disc at the operable temperature. If it cannot be played normally, go to Step 7.
NO : Go to step 7.

STEP 7. Perform "Network/Connect Line Check" in the MMCS service mode.
(1) Display "Network/Connect Line Check" in the MMCS service mode. (Refer to P.54A-305.)
(2) Check if "DVD Drive OK" is displayed.
(3) Check if "HDD Drive OK" is displayed.

Q: Is the check result normal?
YES : Go to step 8.
NO : Replace the multivision display.

STEP 8. Check of playing method
Check whether the disc was played normally and not with special playback (fast rewind, fast forward, slow, pause). Also, check whether the mute mode was selected. After that, check if the DVD is played normally when it is inserted.

Q: Is the check result normal?

YES : This diagnosis is complete.
NO : Go to step 9.

STEP 9. Temporarily replace the multivision display, and check the trouble symptom.
After temporary replacement of the multivision display, check that the new DVD is played normally when it is inserted.

Q: Is the check result normal?
YES : Replace the multivision display.
NO : Replace the DVD.

Inspection Procedure 10: Sound of a DVD can be played, but no image is played.

⚠ CAUTION
Whenever the multivision display is replaced, ensure that the power supply circuit and the earthing circuit are normal. (Check that the voltage is 10 V or more.)

COMMENTS ON TROUBLE SYMPTOM
The DVD or the multivision display may be defective.

PROBABLE CAUSES
- Defective DVD
- Malfunctions of multivision display

DIAGNOSIS PROCEDURE

STEP 1. Check if the error message is displayed on the monitor.
(Refer to P.54A-301.)

Q: Is the error message displayed on the monitor?
YES : Refer to error massage (refer to P.54A-301), take necessary steps. If the CD or DVD is still not be played, go to Step 2.
NO : Go to Step 2.

STEP 2. Check the DVD.
Check that the DVD is free of dirt or scratch.

Q: Is the check result normal?
YES : Go to step 3.
NO : Clean the disc, use a disc without scratches and burrs, or remove the burrs from the disc, and then reinsert the disc.

STEP 3. Temporarily replace the DVD with another DVD, and check the trouble symptom.
Check if another DVD is played normally when it is inserted.

Q: Is the check result normal?
YES : Replace the used DVD.
NO : Go to step 4.

STEP 4. Check the service data log for the MMCS service mode.
(1) Display the service data log for the MMCS service mode. (Refer to P.54A-305.)
(2) Check that the service data log for drive is displayed.
(3) Check that the service data log for monitor is displayed.
(4) Check that the service data log for HDD is displayed.

Q: Is the error log displayed?
YES (The service data log for drive is displayed.) : Check for foreign materials or condensation. Repair if there is an abnormality, and then go to Step 5.
YES (The service data log for monitor or HDD is displayed.) : Abnormalities relating to high or low temperature may be present. Check if the DVD image is displayed on the monitor within the temperature range where the navigation and menu screens can be displayed. If the image is not displayed, go to Step 5.
NO : Go to step 5.

STEP 5. Perform "Network/Connect Line Check" in the MMCS service mode.
(1) Display "Network/Connect Line Check" in the MMCS service mode. (Refer to P.54A-305.)
(2) Check if "DVD Drive OK" is displayed.
(3) Check if "HDD Drive OK" is displayed.

Q: Is the check result normal?
YES : Go to step 6.
NO : Replace the multivision display.

STEP 6. Temporarily replace the multivision display, and check the trouble symptom.
After temporary replacement of the multivision display, check if the DVD image is displayed.

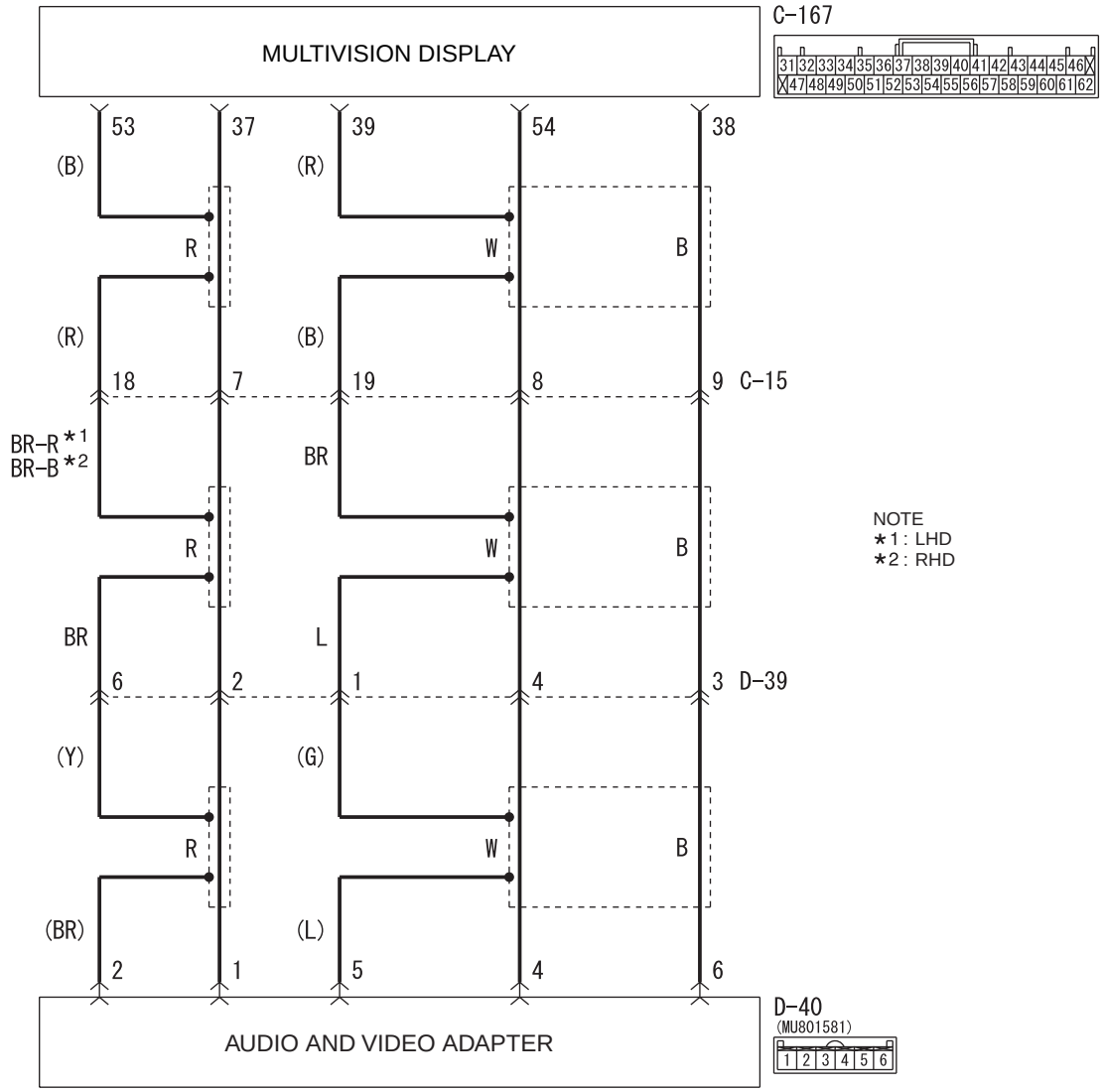
Q: Is the check result normal?

YES : Replace the multivision display.
NO : Replace the DVD.

Inspection Procedure 11: The picture and sound of external input are not played.

⚠ CAUTION
Whenever the multivision display is replaced, ensure that the power supply circuit and the earthing circuit are normal. (Check that the voltage is 10 V or more.)

Audio and Video Adapter Communication Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

WDC54E001A

COMMENTS ON TROUBLE SYMPTOM

The wiring harness between the audio and video adapter and the multivision display, the audio and video adapter or the multivision display may have a problem.

NOTE: The connected equipment side or the connection from the audio and video adapter to the equipment may have a problem. Therefore, check that the operation status and the connecting method of the equipment connected to the multivision display and audio and video adapter before performing the diagnosis.

PROBABLE CAUSES

- The multivision display may be defective
- The audio and video adaptor may be defective
- Damaged harness wires and connectors

DIAGNOSIS

STEP 1. Check of DVD picture

Check that the DVD picture is displayed normally.

Q: Is the check result normal?

YES : Go to Step 2.

NO : Perform the troubleshooting related to the MMCS (Refer to P.54A-314).

STEP 2. Check the audio and video adapter.

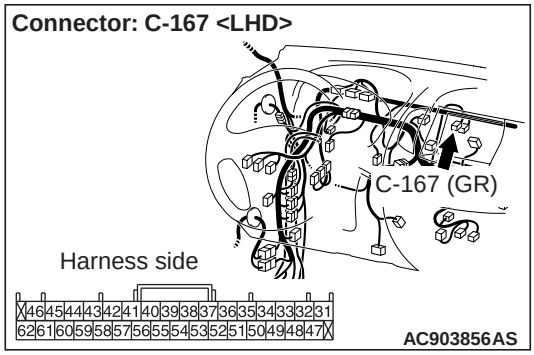
Check the audio and video adapter.(Refer to P.54A-381)

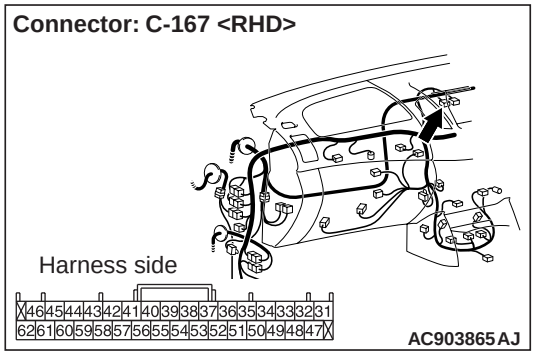
Q: Is the check result normal?

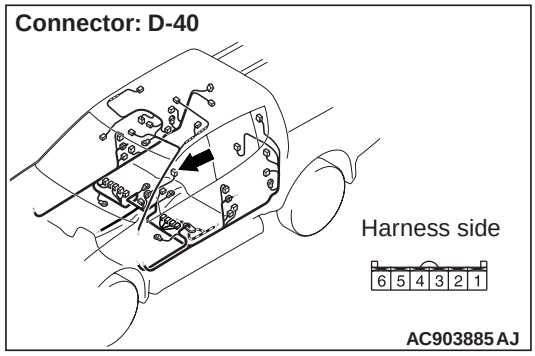
YES : Go to Step 3.

NO : Replace the audio and video adapter.

STEP 3. Connector check: C-167 multivision display connector, D-40 audio and video adaptor connector





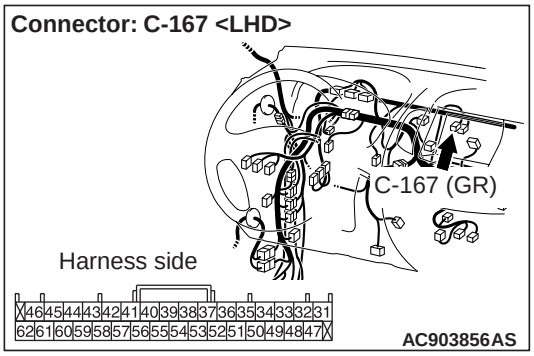


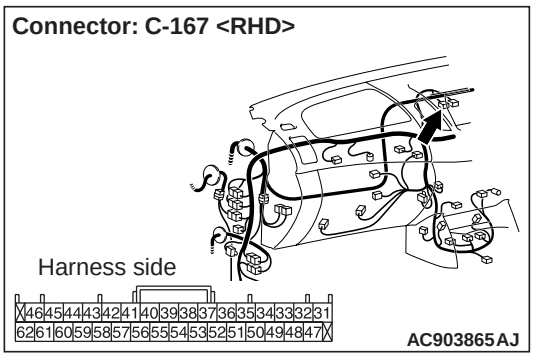
Q: Is the check result normal?

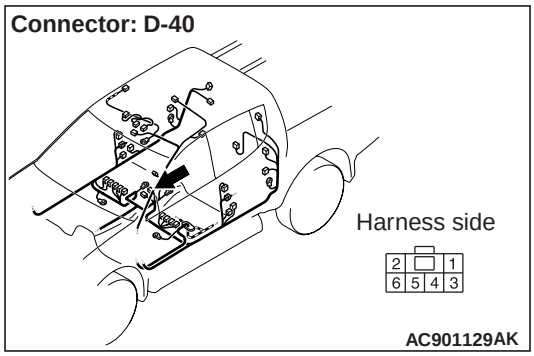
YES : Go to Step 4.

NO : Repair the connector concerned.

STEP 4. Check the wiring harness between C-167 multivision display connector terminal No.37, 38, 39, 53, 54 and D-40 audio and video adaptor connector terminal No. 1, 6, 5, 2, 4.

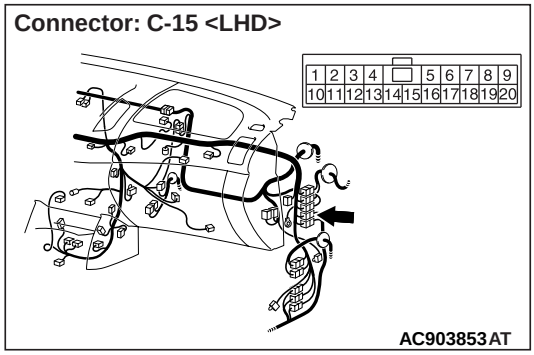


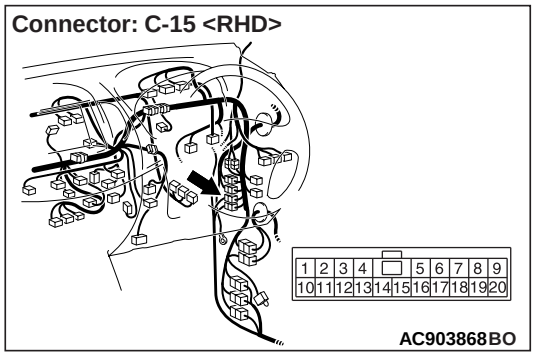




- Check the communication lines for open circuit and short circuit.

NOTE:





Prior to the wiring harness inspection, check intermediate connectors C-15 and D-39, and repair if necessary.

Q: Is the check result normal?
YES : Go to Step 5.
NO : Repair the wiring harness.

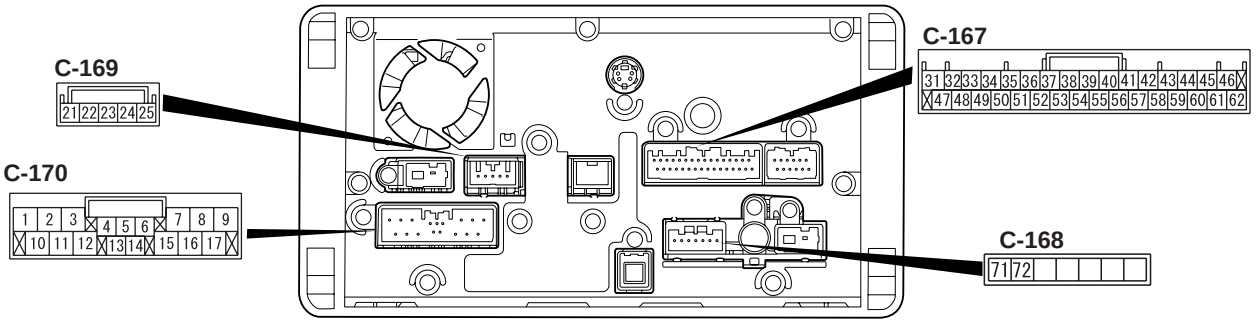
STEP 5. Temporarily replace the multivision display, and check the trouble symptom.
Check that the external input is normal.

Q: Is the check result normal?
YES : Replace the multivision display.
NO : Replace the audio and video adapter.

MAIN UNIT TERMINAL VOLTAGE

M1546003300537

MULTIVISION DISPLAY



C-168

Terminal No.	Signal symbol	Check condition	Terminal voltage
71	ANTENNA POWER ON	Ignition switch: ACC position	System voltage (DC)
72	AMP POWER ON	Ignition switch: ACC position	1 V or less

C-167

Terminal No.	Signal symbol	Check condition	Terminal voltage
37	VIDEO2-IN	When the image is input	1Vp-p (AC)
38	VIDEO2-R	When the sound is input	1.2Vrms (AC)
39	SEIELD (VIDEO2-L/R)	Always	1 V or less
43	AUDIO REMOTE	Ignition switch: ACC position	3.3V (DC)
53	SEIELD (VIDEO2-IN)	Always	Approximately 0 V
54	VIDEO2-L	When the sound is input	1.2Vrms (AC)
55	VIDEO2 DETECT	Always	1 V or less
59	SEIELD (STEERING REMO)	Always	1V or less

C-169

Terminal No.	Signal symbol	Check condition	Terminal voltage
21	BATTERY (+)	Always	System voltage (DC)
24	PS-R	Sift lever <M/T> or selector lever <A/T>: R position Ignition switch: ON position	System voltage (DC)
		Sift lever <M/T> or selector lever <A/T>: Except R position Ignition switch: ON position	1V or less
25	GND	Always	1V or less

C-170

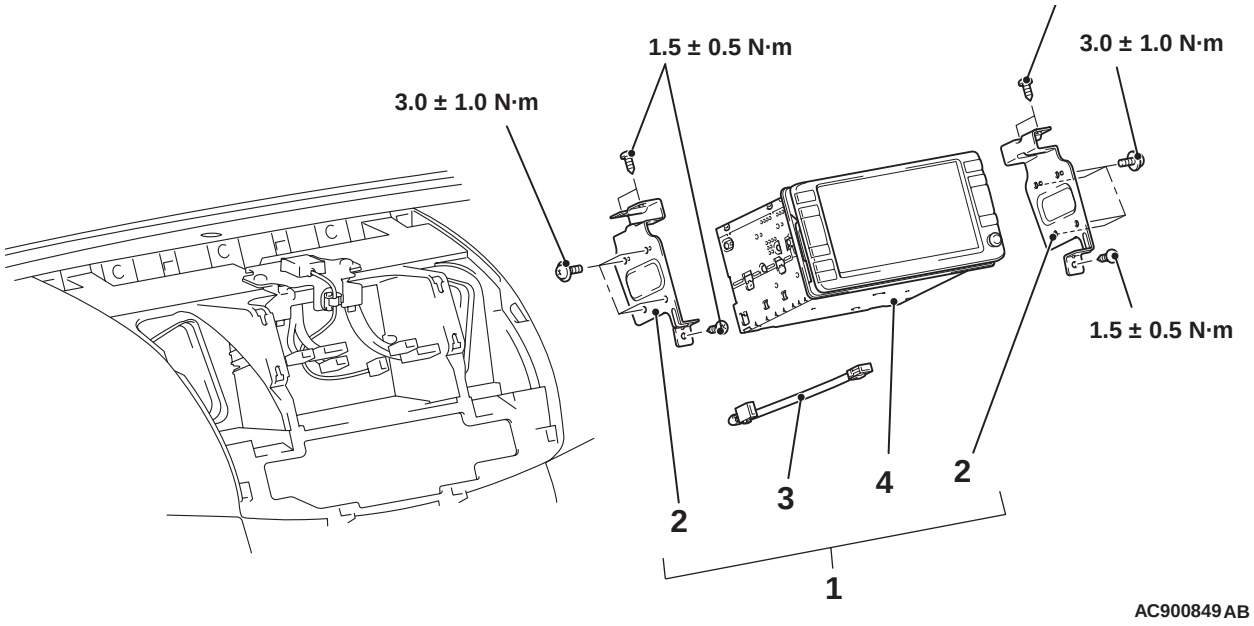
Terminal No.	Signal symbol	Check condition	Terminal voltage
2	SPEAKER RL (–)	When the sound is output	0 - System voltage (AC)
3	SPEAKER FL (–)	When the sound is output	0 - System voltage (AC)
7	SPEAKER FR (–)	When the sound is output	0 - System voltage (AC)
8	SPEAKER RR (–)	When the sound is output	0 - System voltage (AC)
9	MAIN GND	Always	1V or less
10	ILLUMINATION (+)	Tail lamp switch: ON	System voltage (DC)
11	SPEAKER RL (+)	When the sound is output	0 - System voltage (AC)
12	SPEAKER FL (+)	When the sound is output	0 - System voltage (AC)
13	VSS	Ignition switch: ON • Running	0 - System voltage (pulse)
14	ACCESSORY (+)	Ignition switch: ACC position	System voltage (DC)

Terminal No.	Signal symbol	Check condition	Terminal voltage
15	SPEAKER FR (+)	When the sound is output	0 - System voltage (AC)
16	SPEAKER RR (+)	When the sound is output	0 - System voltage (AC)
17	BATTERY (+)	Always	System voltage (DC)

REMOVAL AND INSTALLATION

M1546001000574

MULTIVISION DISPLAY



Removal Steps

- Centre upper panel assembly and meter hood (Refer to GROUP 52A, Instrument Panel Assembly).

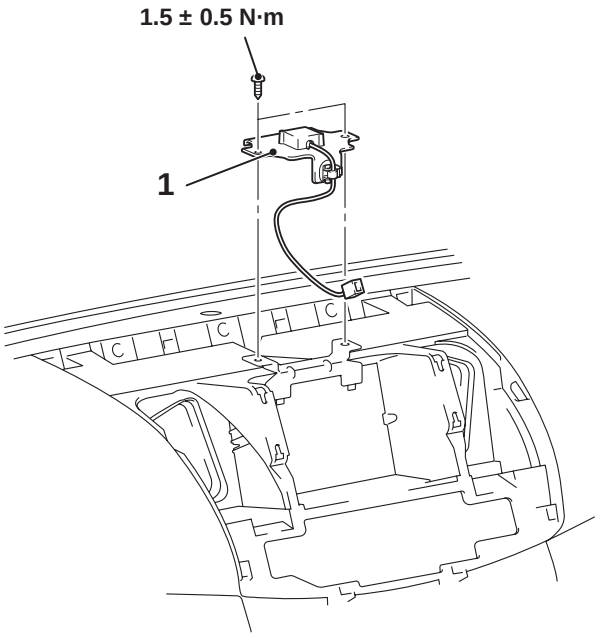
1. Multivision display assembly

Removal Steps (Continued)

2. Bracket (LH/RH)
3. TMC cable

>>**A**<< 4. Multivision display

GPS ANTENNA



AC900595AB

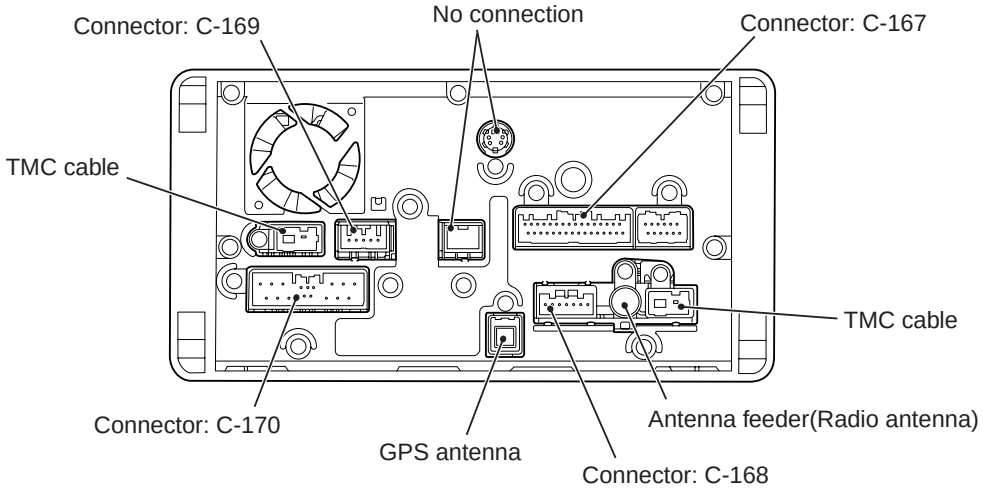
Removal Steps

- Multivision display assembly

1. GPS antenna

INSTALLATION SERVICE POINT

>>A<< MULTIVISION DISPLAY

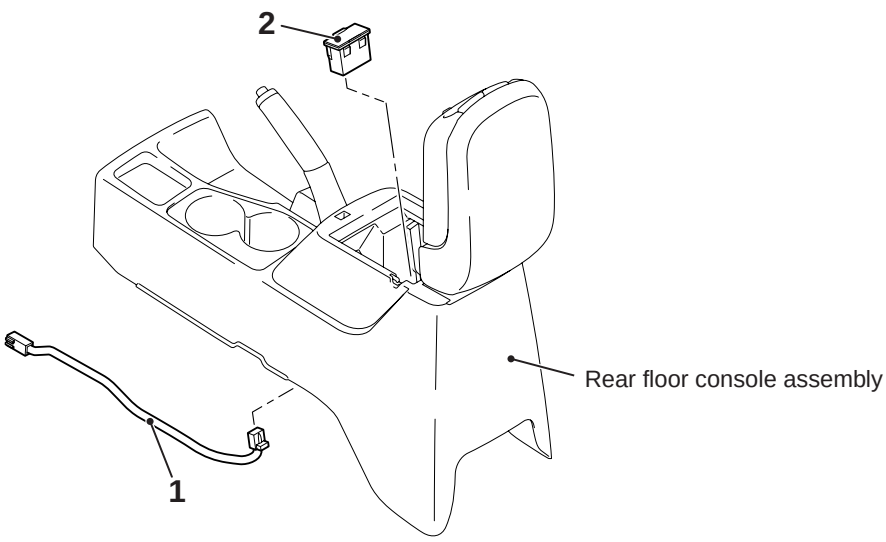


AC802116AH

The connectors, antenna and cables connected to the multivision display are shown in the figure.

REMOVAL AND INSTALLATION

M1546023400086



AC809004AB

Removal Steps

- Rear floor console assembly (Refer to GROUP 52A, floor console assembly).

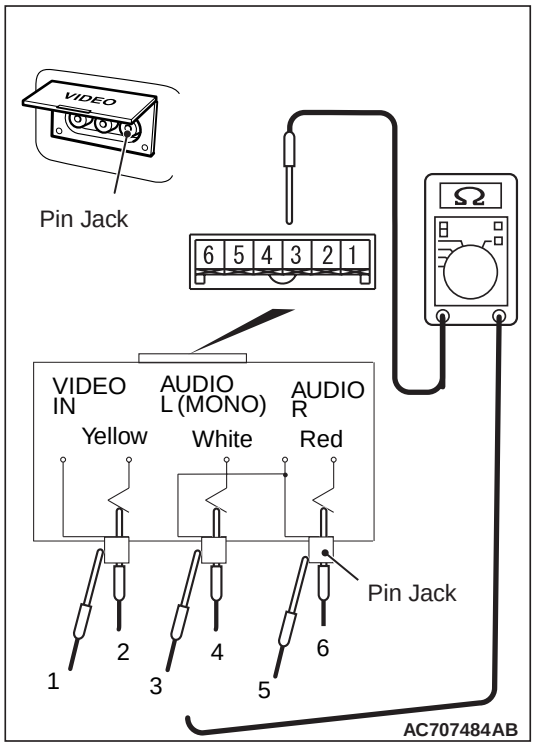
1. Front console harness
2. Video and audio adapter

INSPECTION

AUDIO AND VIDEO ADAPTER INSPECTION

M1546312900141

1. Remove the audio and video adapter.(Refer to P.54A-379.)
2. Check that continuity exists between the terminal and the pin jack of audio and video adapter.



AC707484AB

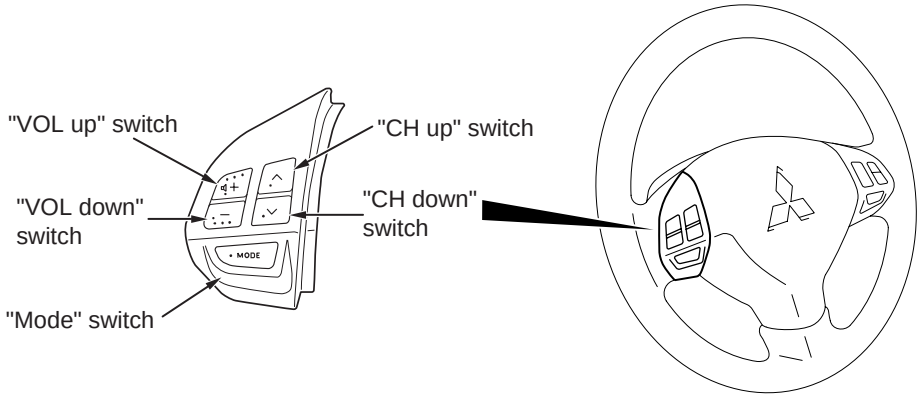
The connection position of pin jack side circuit tester	Terminal number	Measurement value
1	2	Continuity exists (2 Ω or less)
2	1	
3	5	
4	4	
5	5	
6	6	

STEERING WHEEL AUDIO REMOTE CONTROL SWITCH

GENERAL INFORMATION

M1544000101122

On the spoke of steering wheel, the steering wheel audio remote control switch which can operate the radio and CD player or multivision display have been installed.



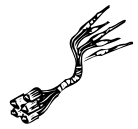
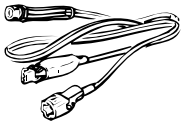
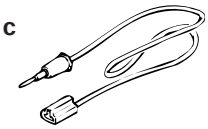
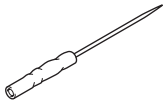
AC800143AB

STEERING WHEEL AUDIO REMOTE CONTROL SWITCH

Using the steering wheel audio remote control switch, the volume adjustment of the radio and CD player or the multivision display, mode changeover, CD track up/down, and others can be performed.

SPECIAL TOOLS

M1544000600652

Tool	Number	Name	Use
a  b  c  d MB991223	MB991223 a. MB991219 b. MB991220 c. MB991221 d. MB991222	Harness set a. Check harness b. LED harness c. LED harness adapter d. Probe	Continuity check and voltage measurement at harness wire or connector a. For checking connector pin contact pressure b. For checking power supply circuit c. For checking power supply circuit d. For connecting a locally sourced tester
 MB992006	MB992006	Extra fine probe	Continuity check and voltage measurement at harness wire or connector

TROUBLESHOOTING

TROUBLE SYMPTOM CHART

M1544004901863

STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING

M1544004800551

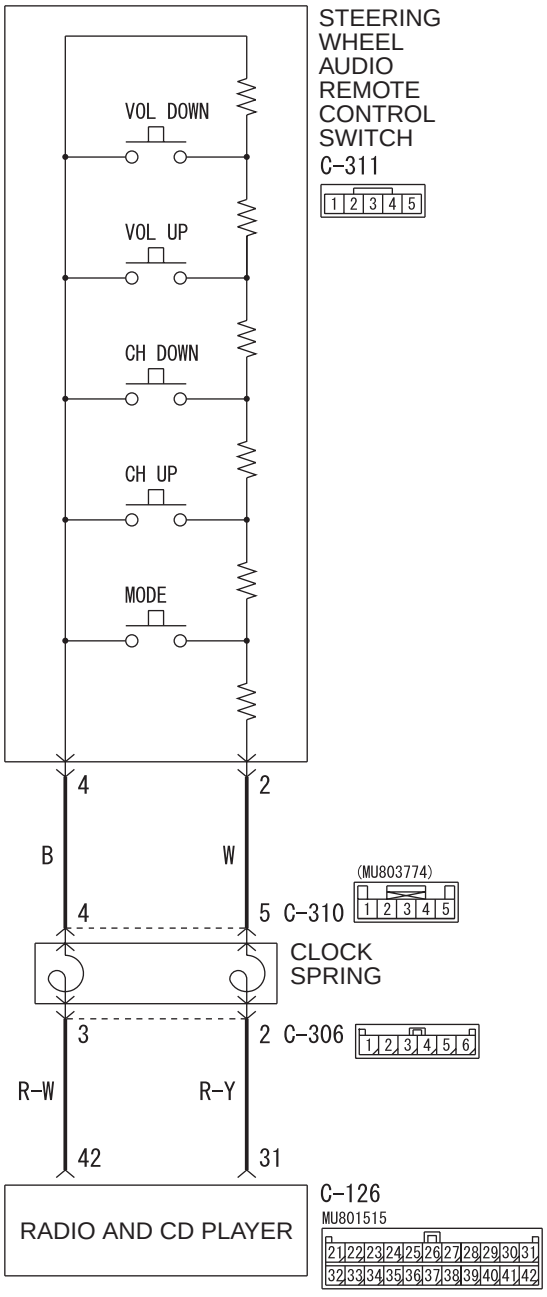
Refer to GROUP 00 – Contents of troubleshooting .

Inspection Procedure No.	Trouble symptom		Reference page
1	Steering wheel audio remote control switch does not function.	<Vehicle with radio and CD player>	P.54A-384
	Steering wheel audio remote control switch does not function.	<Vehicle with MMCS>	P.54A-388
2	Steering wheel audio remote control switch illumination does not come on.		P.54A-392

SYMPTOM PROCEDURES

Inspection Procedure 1: Steering wheel audio remote control switch does not function. <Vehicle with radio and CD player>

Steering Wheel Audio Remote Control Switch Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

WDC54E002A

TECHNICAL DESCRIPTION (COMMENT)

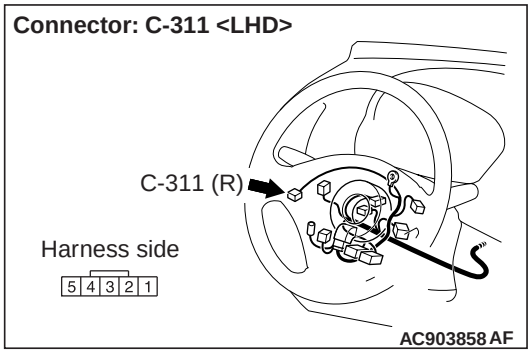
The power supply circuit to the steering wheel audio remote control switch, the steering wheel audio remote control switch, the radio and CD player, or the clock spring may be defective.

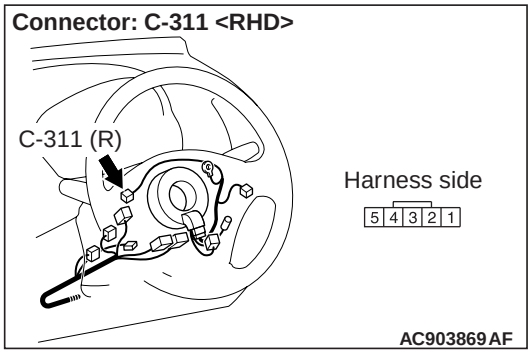
TROUBLESHOOTING HINTS

- Malfunction of steering wheel audio remote control switch
- Malfunctions of radio and CD player
- Malfunction of the clock spring
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. Connector check: C-311 steering wheel audio remote control switch connector





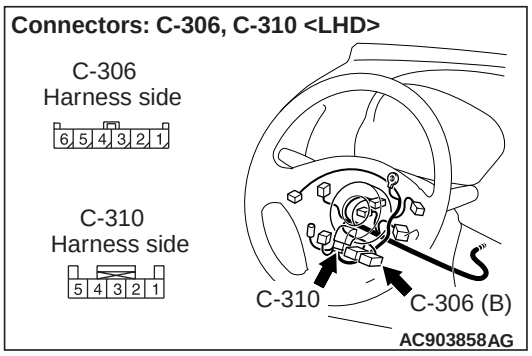
Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the defective connector.

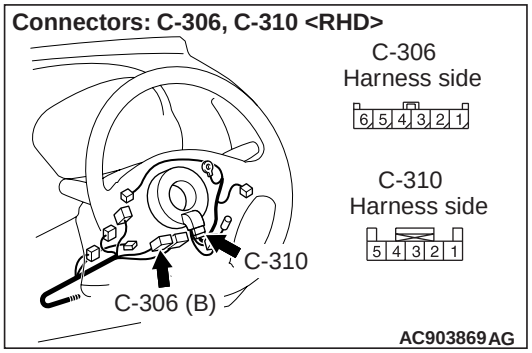
STEP 2. Check the steering wheel audio remote control switch.

Check the continuity of the steering wheel audio remote control switch. (Refer to P.54A-397).

Q: Is the hood switch in good condition?
YES : Go to Step 3.
NO : Replace the steering wheel audio remote control switch.

STEP 3. Connector check: C-310 and C-306 clock spring connector





Q: Is the hood switch in good condition?
YES : Go to Step 4.
NO : Repair the defective connector.

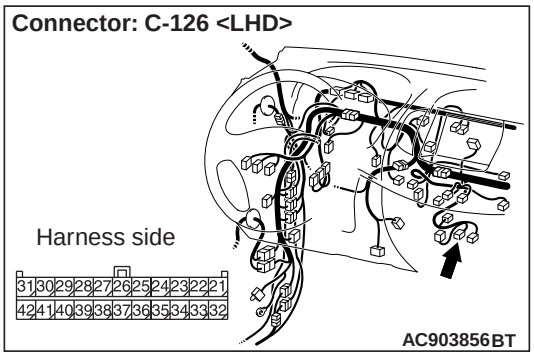
STEP 4. Check the clock spring.

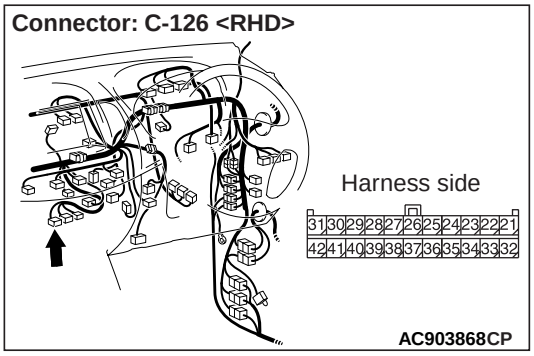
Check whether the clock spring is in good condition (Refer to GROUP 52B – Air bag module and clock spring).

- Check if continuity exists between C-310 clock spring connector terminal No.5 and C-306 clock spring connector terminal No.2.
- Check if continuity exists between C-310 clock spring connector terminal No.4 and C-306 clock spring connector terminal No.3.

Q: Is the check result normal?
YES : Go to Step 5.
NO : Replace the clock spring.

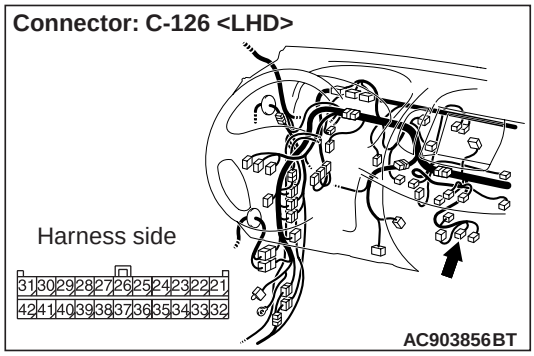
STEP 5. Connector check: C-126 radio and CD player connector

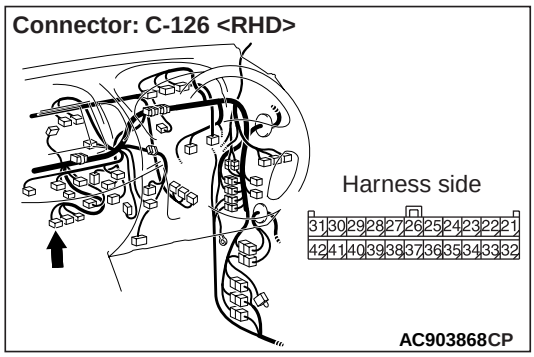


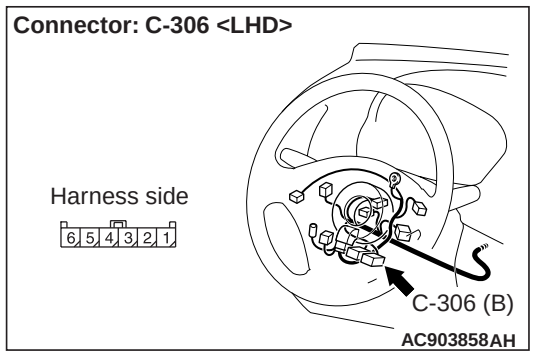


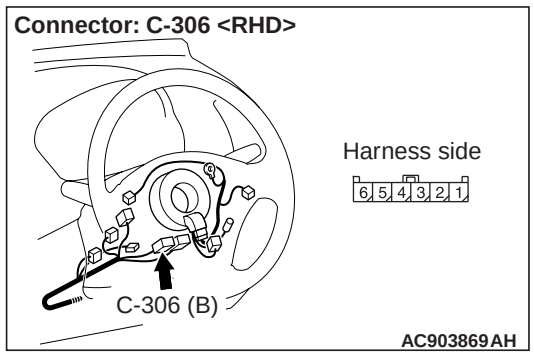
Q: Is the check result normal?
YES : Go to Step 6.
NO : Repair the defective connector.

STEP 6. Check the wiring harness between C-126 radio and CD player connector terminal No.31, 42 and C-306 clock spring connector terminal No.2, 3.





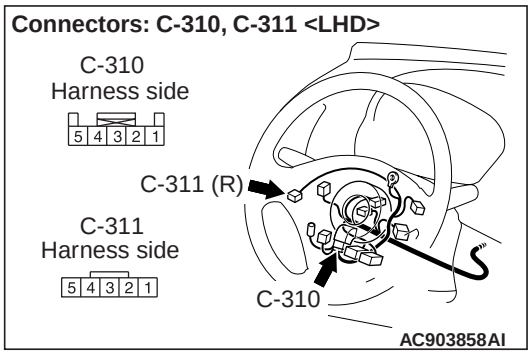


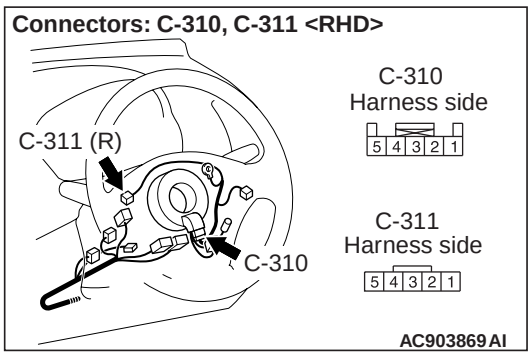


- Check the communication lines for open and short circuit.

Q: Is the check result normal?
YES : Go to Step 7.
NO : Repair the wiring harness.

STEP 7. Check the wiring harness between C-311 steering wheel audio remote control switch connector terminal No.2, 4 and C-310 clock spring connector terminal No.5, 4.





- Check the communication lines for open and short circuit.

Q: Is the check result normal?

YES : Go to Step 8.
NO : Repair the wiring harness.

STEP 8. Retest the system

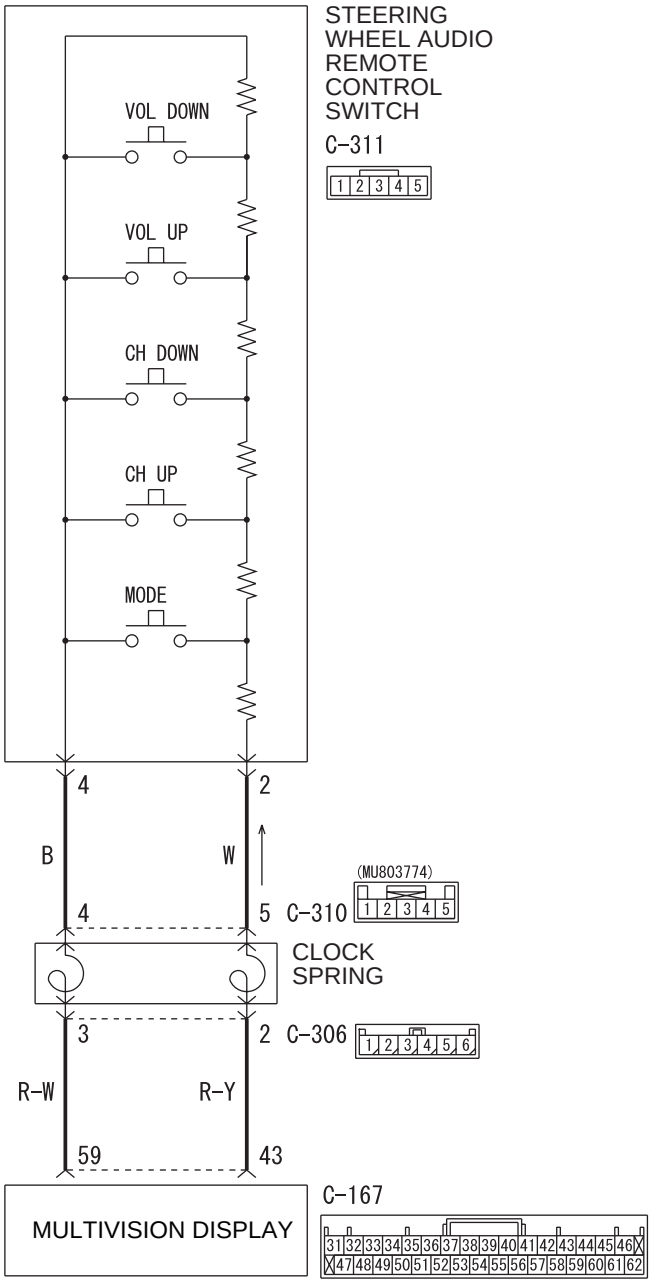
Check whether you can operate the radio and CD player by using the steering wheel audio remote control switch.

Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Replace the radio and CD player.

Inspection Procedure 1: Steering wheel audio remote control switch does not function. <Vehicle with MMCS>

Steering Wheel Audio Remote Control Switch Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

WAC54E042A

TECHNICAL DESCRIPTION (COMMENT)

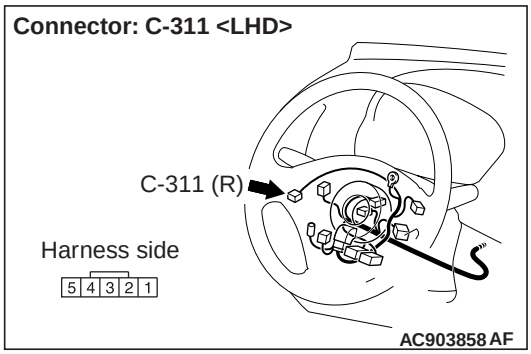
The power supply circuit to the steering wheel audio remote control switch, the steering wheel audio remote control switch, the multivision display, or the clock spring may be defective.

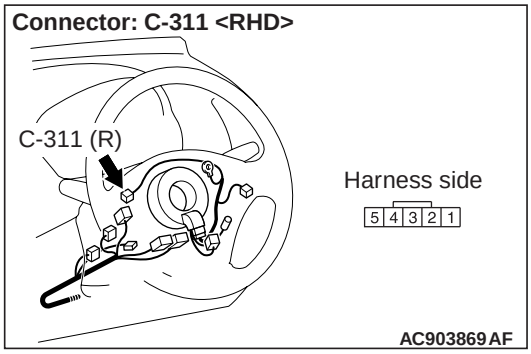
TROUBLESHOOTING HINTS

- Malfunction of steering wheel audio remote control switch
- Malfunctions of multivision display
- Malfunction of the clock spring
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. Connector check: C-311 steering wheel audio remote control switch connector





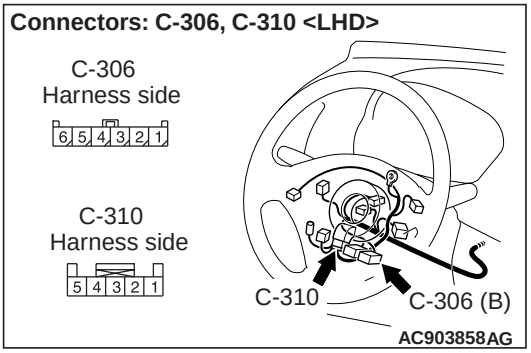
Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the defective connector.

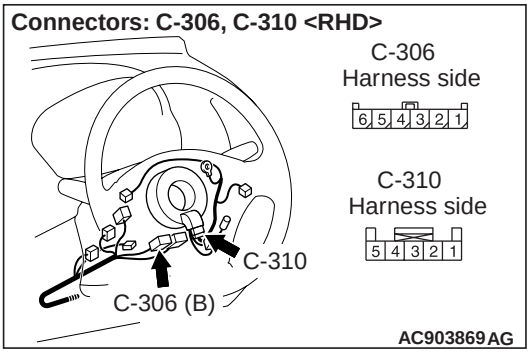
STEP 2. Check the steering wheel audio remote control switch.

Check the continuity of the steering wheel audio remote control switch. (Refer to P.54A-397).

Q: Is the hood switch in good condition?
YES : Go to Step 3.
NO : Replace the steering wheel audio remote control switch.

STEP 3. Connector check: C-310 and C-306 clock spring connector





Q: Is the hood switch in good condition?
YES : Go to Step 4.
NO : Repair the defective connector.

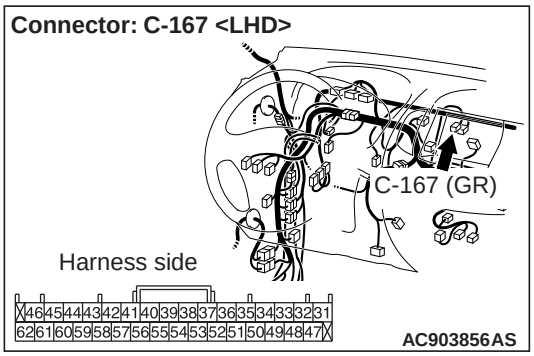
STEP 4. Check the clock spring.

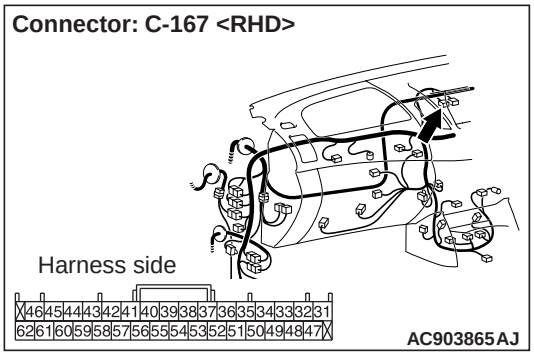
Check whether the clock spring is in good condition (Refer to GROUP 52B – Air bag module and clock spring).

- Check if continuity exists between C-310 clock spring connector terminal No.4 and C-306 clock spring connector terminal No.3.
- Check if continuity exists between C-310 clock spring connector terminal No.5 and C-306 clock spring connector terminal No.2.

Q: Is the check result normal?
YES : Go to Step 5.
NO : Replace the clock spring.

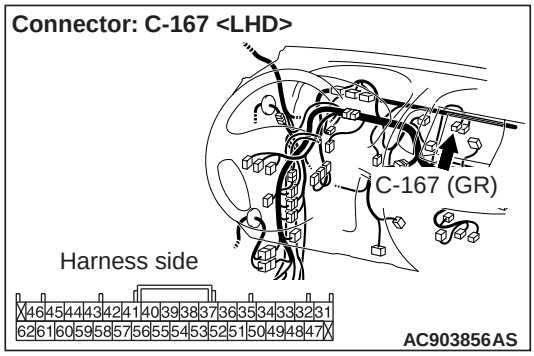
STEP 5. Connector check: C-167 multivision display connector

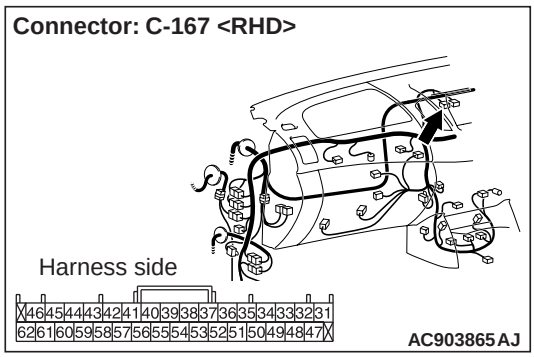


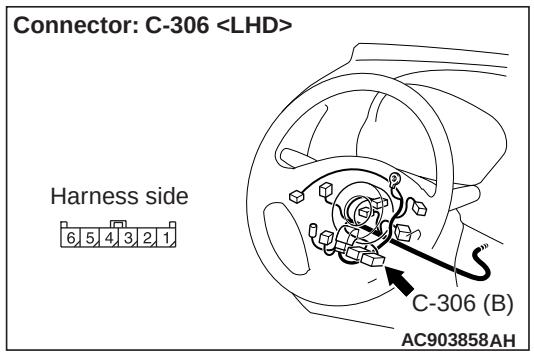


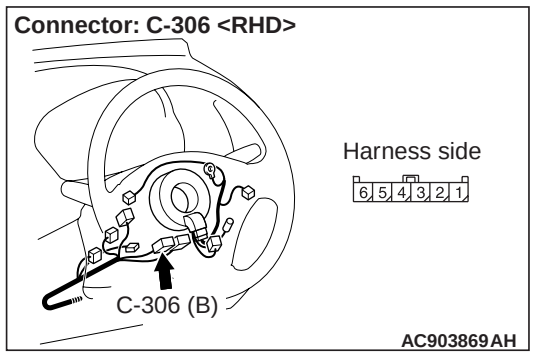
Q: Is the check result normal?
YES : Go to Step 6.
NO : Repair the defective connector.

STEP 6. Check the wiring harness between C-167 multivision display connector terminal No.59, 43 and C-306 clock spring connector terminal No.3, 2.





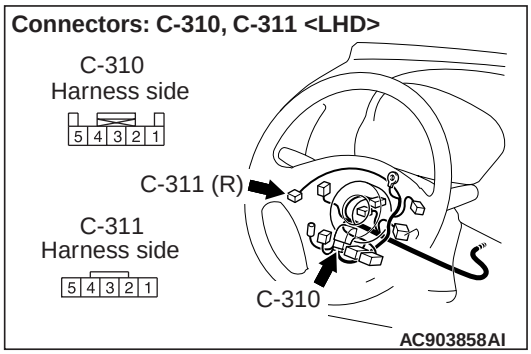


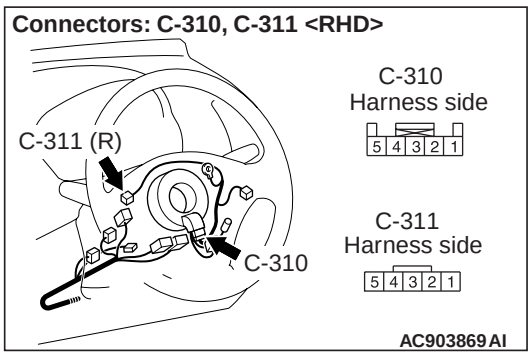


- Check the communication lines for open and short circuit.

Q: Is the check result normal?
YES : Go to Step 7.
NO : Repair the wiring harness.

STEP 7. Check the wiring harness between C-311 steering wheel audio remote control switch connector terminal No.2, 4 and C-310 clock spring connector terminal No.5, 4.





- Check the communication lines for open and short circuit.

Q: Is the check result normal?

YES : Go to Step 8.
NO : Repair the wiring harness.

STEP 8. Retest the system

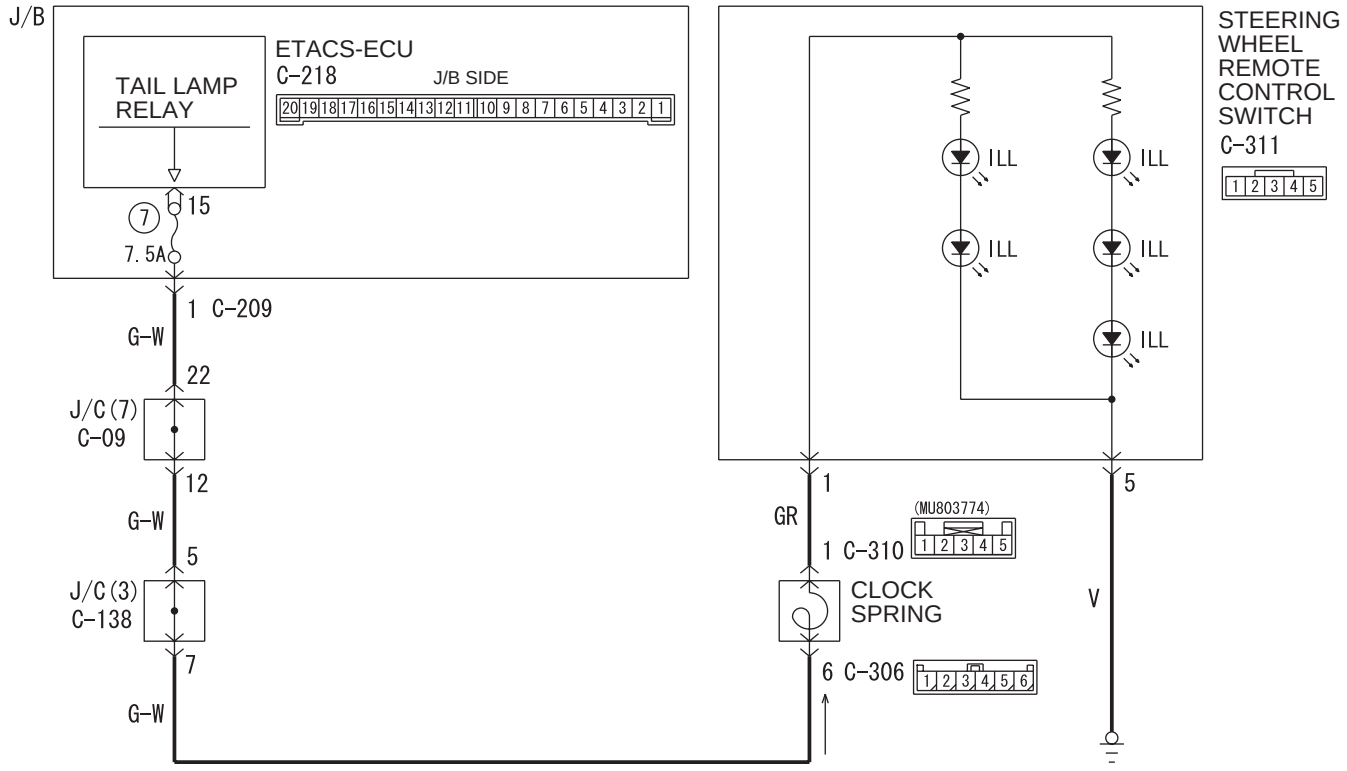
Check whether you can operate the multivision display by using the steering wheel audio remote control switch.

Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Replace the multivision display.

Inspection Procedure 2: Steering wheel audio remote control switch illumination does not come on.

Steering Wheel Audio Remote Control Switch Illumination Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

WAC54E043A

TECHNICAL DESCRIPTION (COMMENT)

The power supply circuit to the steering wheel audio remote control switch, the steering wheel audio remote control switch, the ETACS-ECU, or the clock spring may be defective.

PROBABLE CAUSES

- Malfunction of steering wheel audio remote control switch
- Malfunctions of ETACS-ECU
- Malfunction of the clock spring
- Damaged wiring harness and connectors

DIAGNOSIS PROCEDURE

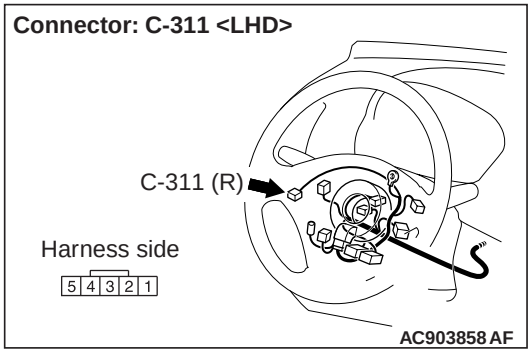
STEP 1. Check if the tail lamp illuminates normally.

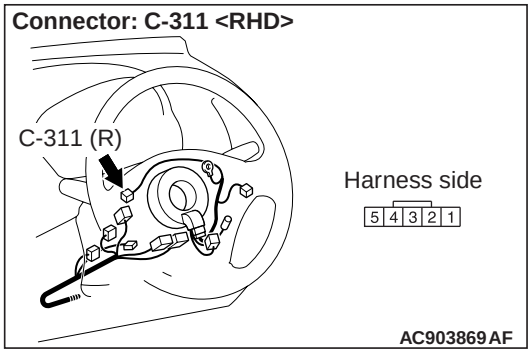
Q: Is the check result normal?

YES : Go to Step 2.

NO : Troubleshoot the headlamp. Refer to P.54A-109.

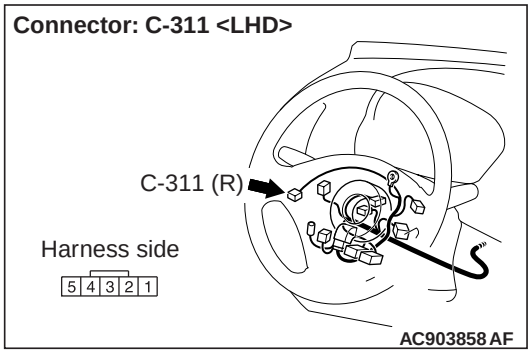
STEP 2. Connector check: C-311 steering wheel audio remote control switch connector

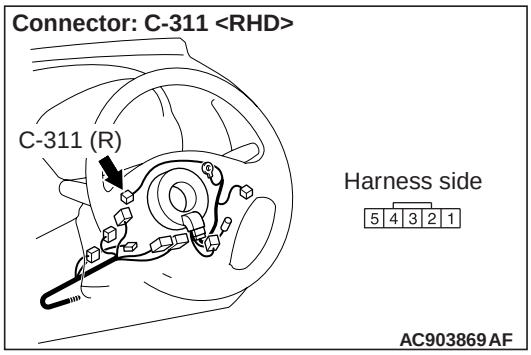




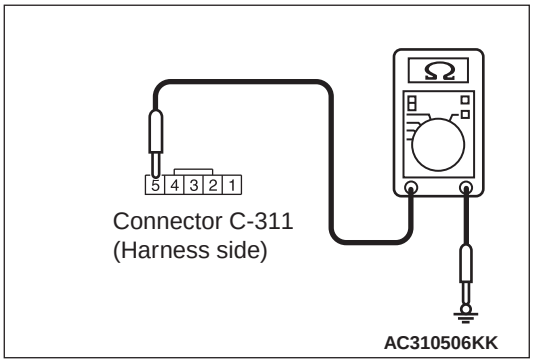
Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the defective connector.

STEP 3. Measure the resistance at C-311 steering wheel audio remote control switch connector.





(1) Disconnect the connector, and measure at the wiring harness side.

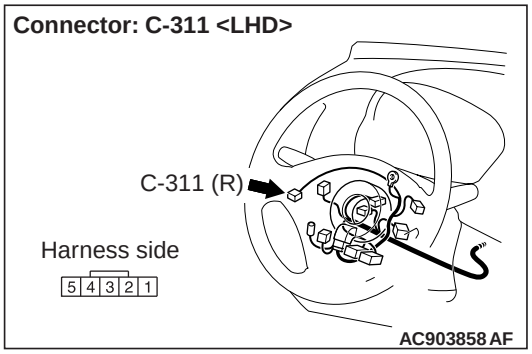


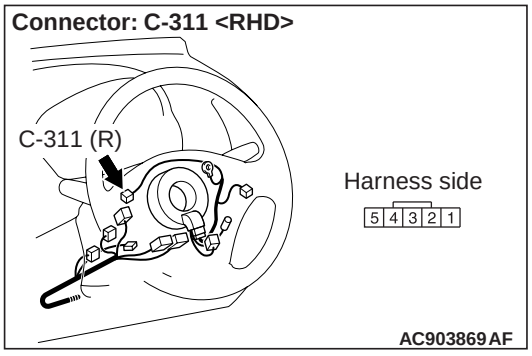
(2) Resistance between terminal No.5 and body earth

OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?
YES : Go to Step 5.
NO : Go to Step 4.

STEP 4. Check the wiring harness between C-311 steering wheel audio remote control switch connector terminal No.5 and body earth.





- Check the earth wires for open circuit.

Q: Is the check result normal?
YES : Go to Step 5.
NO : Repair the wiring harness.

STEP 5. Check the steering wheel audio remote control switch.

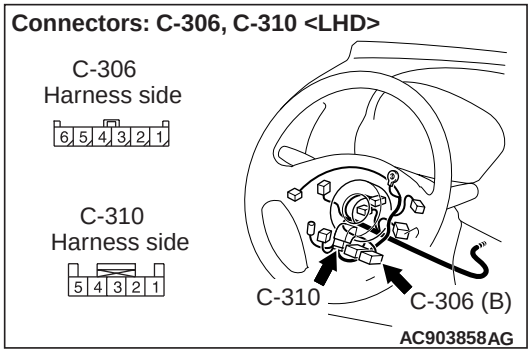
Check if the steering wheel audio remote control switch illuminates. (Refer to P.54A-397).

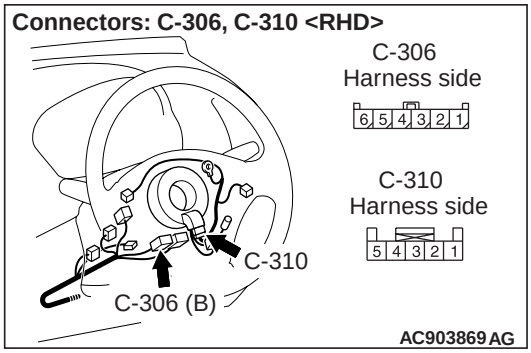
Q: Is the check result normal?

YES : Go to Step 6.

NO : Replace the steering wheel audio remote control switch.

STEP 6. Connector check: C-310 and C-306 clock spring connectors





Q: Is the check result normal?

YES : Go to Step 7.

NO : Repair the defective connector.

STEP 7. Check the clock spring.

Check whether the clock spring is in good condition (Refer to GROUP 52B – Air bag module and clock spring).

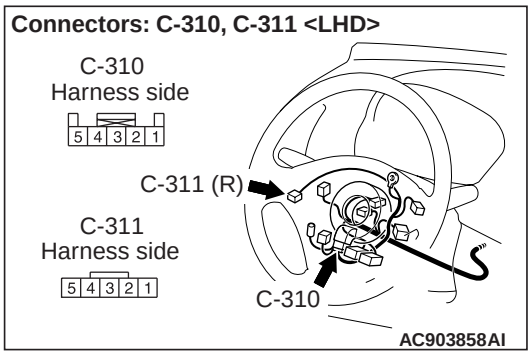
- Check if continuity exists between C-310 clock spring connector terminal No.1 and C-306 clock spring connector terminal No.6.

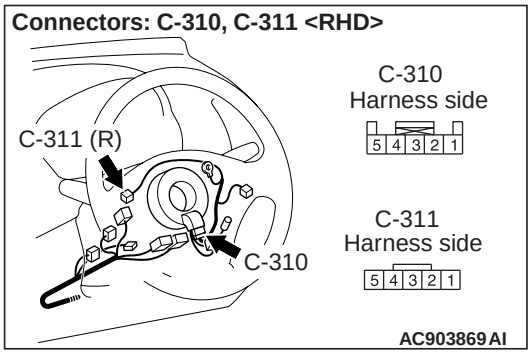
Q: Is the check result normal?

YES : Go to Step 8.

NO : Replace the clock spring.

STEP 8. Check the wiring harness between C-311 steering wheel audio remote control switch connector terminal No.1 and C-310 clock spring connector terminal No.1.





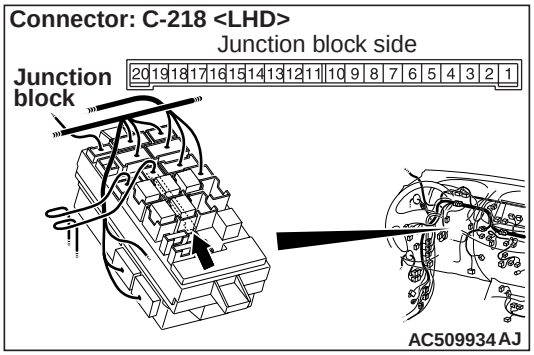
- Check the power supply line for open circuit and short circuit.

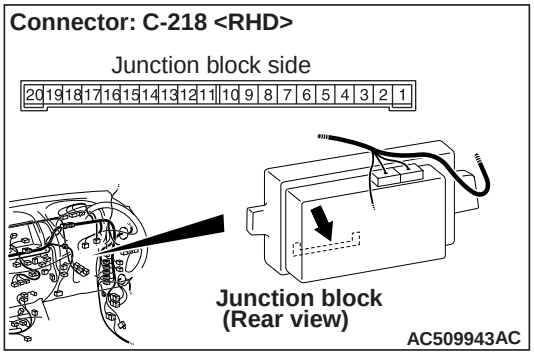
Q: Is the check result normal?

YES : Go to Step 9.

NO : Repair the wiring harness.

STEP 9. Connector check: C-218 ETACS-ECU connector

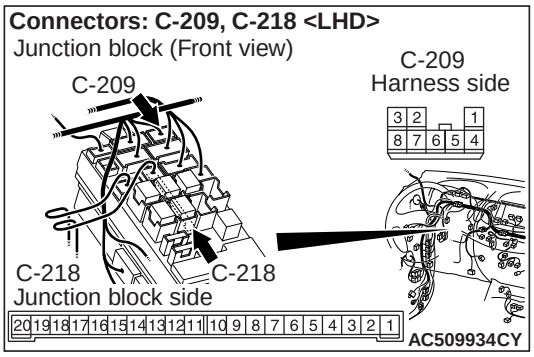


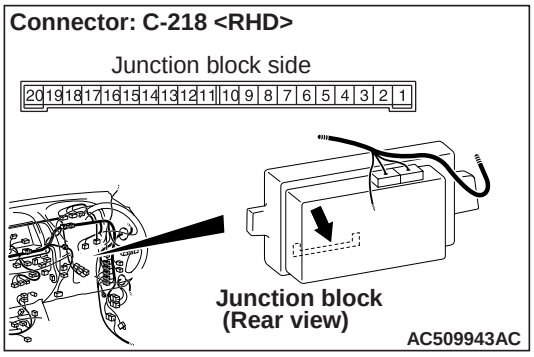


Q: Is the check result normal?

YES : Go to Step 10.
NO : Repair the defective connector.

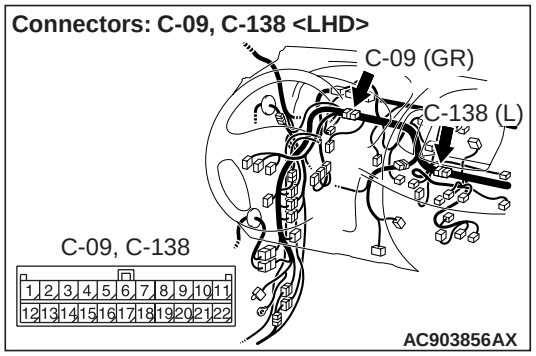
STEP 10. Check the wiring harness between C-218 ETACS-ECU connector terminal No.15 and C-306 clock spring connector terminal No.6.

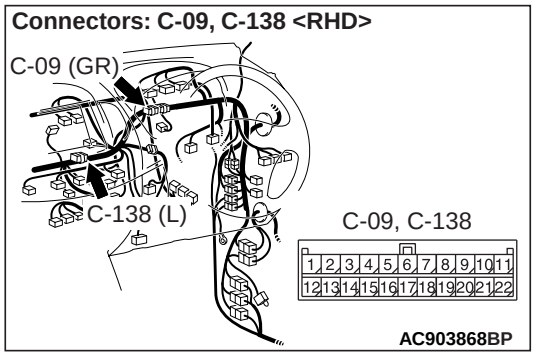


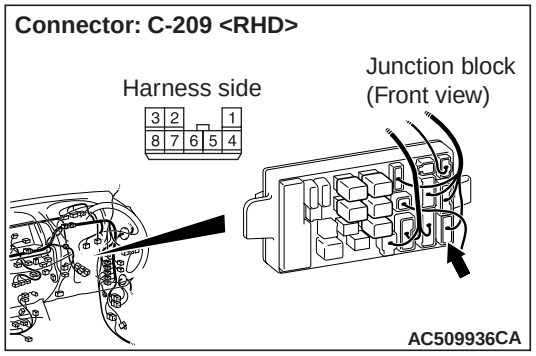


- Check the communication line for open circuit and short circuit.

NOTE:







Prior to the wiring harness inspection, check C-138,C-09 joint connectors and C-209 junction block connector, and repair if necessary.

Q: Is the check result normal?
YES : Go to Step 11.
NO : Repair the wiring harness.

STEP 11. Retest the system
Check whether the illumination of the steering wheel audio remote control switch comes on normally.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Replace the steering wheel audio remote control switch.

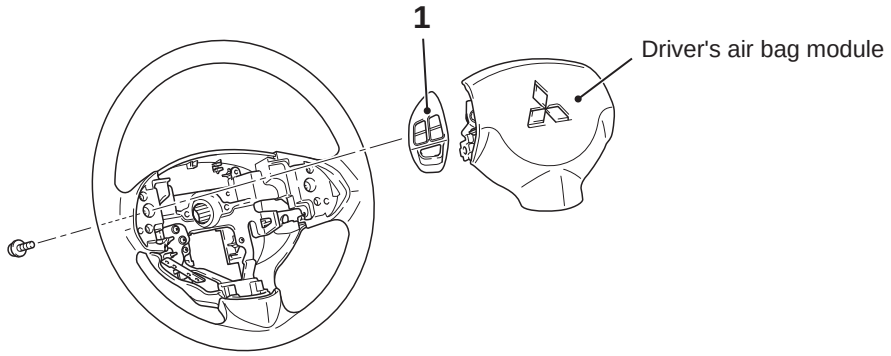
REMOVAL AND INSTALLATION

M1544015600131

⚠ WARNING

- ***Before removing the air bag module, refer to GROUP 52B, Service Precautions and Driver's Front Passenger's Air Bag Module and Clock Spring .***
- ***When removing and installing the steering wheel, do not let it bump against the air bag module.***

Pre-removal operation	Post-installation operation
• Removal of driver's air bag module (Refer to GROUP 52B, Driver's, Front Passenger's Air Bag Module and Clock Spring).	• Installation of driver's air bag module (Refer to GROUP 52B, Driver's, Front Passenger's Air Bag Module and Clock Spring).



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Removal Step

1. Steering wheel audio remote control switch

STEERING WHEEL AUDIO REMOTE CONTROL SWITCH INSPECTION

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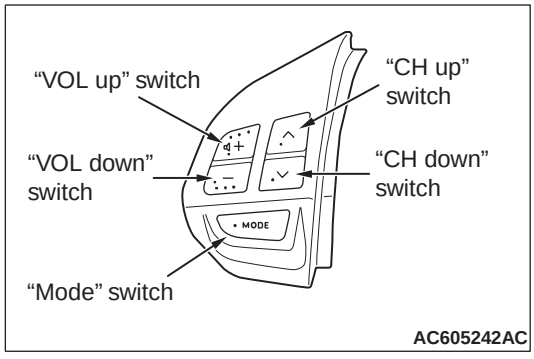
STEERING WHEEL AUDIO REMOTE CONTROL SWITCH CHECK



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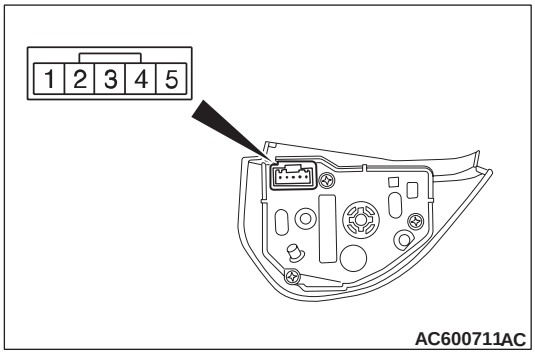

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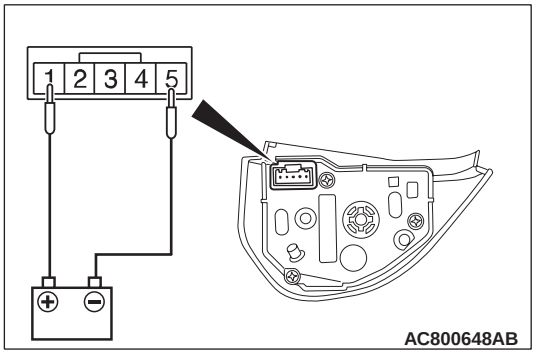
Use an ohmmeter to measure the resistance value between the terminal.

Switch Position	Tester Connection	Measurement Value
No push	2 – 3	Approximately 3.1 kΩ
	2 – 4	Approximately 71 kΩ
"Mode" switch		Approximately 270 Ω
"CH up" switch		Approximately 740 Ω
"CH down" switch		Approximately 1.3 kΩ
"VOL up" switch		Approximately 2.1 kΩ
"VOL down" switch		Approximately 3.1 kΩ

ILLUMINATION CHECK



Apply the battery voltage of steering wheel audio remote control switch connector terminal No. 1 and 5, and check if the steering wheel audio remote control switch illuminates.

NOTE: Make sure that the polarity is correct.

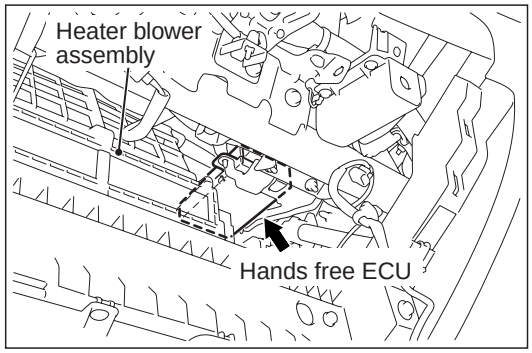
HANDS FREE-ECU

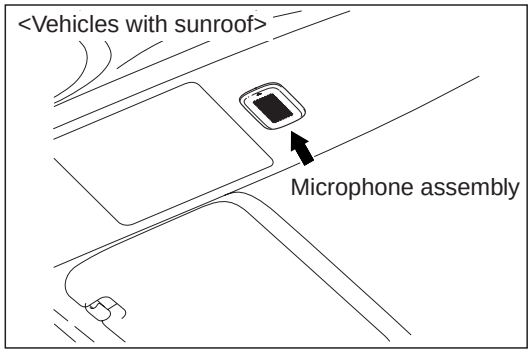
GENERAL INFORMATION

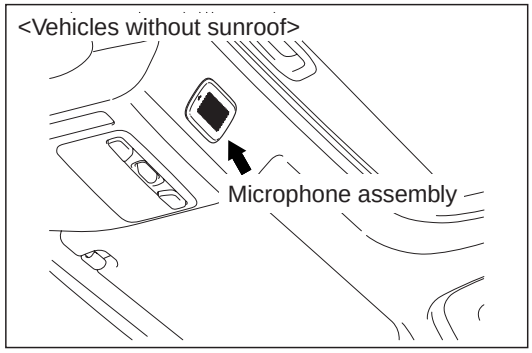
M1544401200376

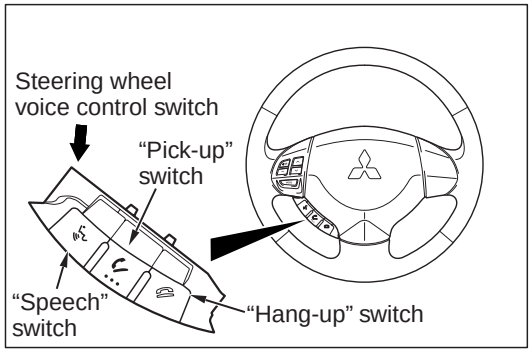
The hands-free interface system enables handsfree talking and playing music by bluetooth® connection with bluetooth® device (mobile phone or music player). In addition, music can be played by connecting the USB-compatible device to the USB connector.

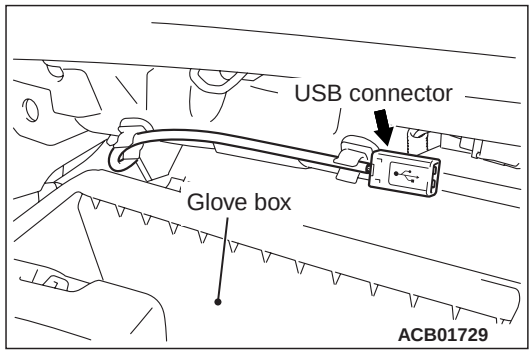
CONSTRUCTION DIAGRAM











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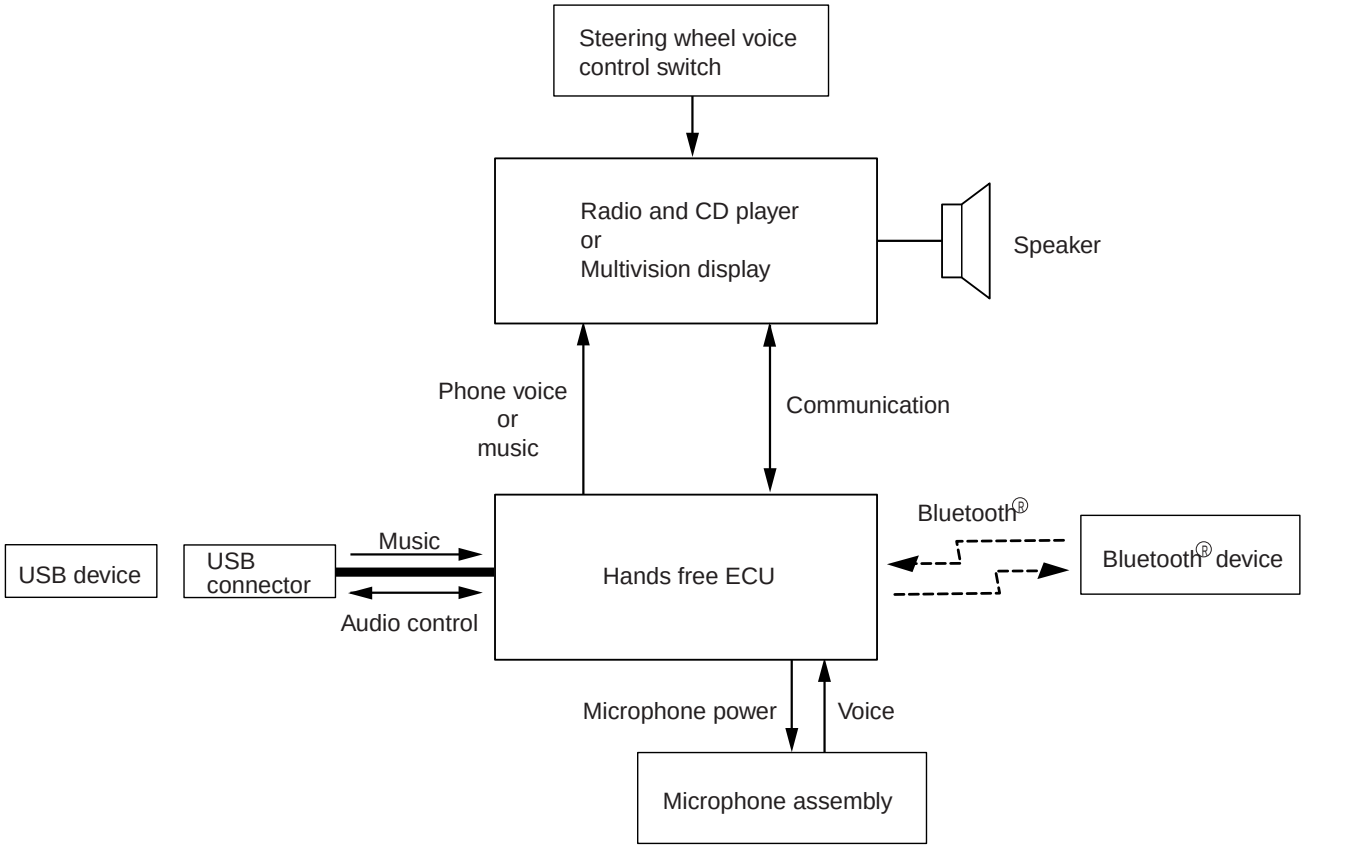
SYSTEM BLOCK DIAGRAM



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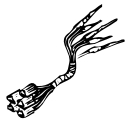
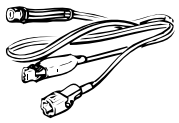
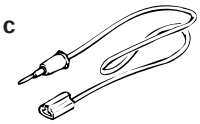
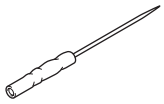
SPECIAL TOOLS

M1544403500210

Tool	Number	Name	Use
a  b  c  d MB991223	MB991223 a. MB991219 b. MB991220 c. MB991221 d. MB991222	Harness set a. Check harness b. LED harness c. LED harness adapter d. Probe	Continuity check and voltage measurement at harness wire or connector a. For checking connector pin contact pressure b. For checking power supply circuit c. For checking power supply circuit d. For connecting a locally sourced tester
 MB992006	MB992006	Extra fine probe	Continuity check and voltage measurement at harness wire or connector

TROUBLESHOOTING

INTRODUCTION TO DIAGNOSIS

M1544404500291

Prior to the troubleshooting, check if the causes below can be the case. If any, take actions according to the solution method.

Pairing of the bluetooth®device (mobile phone or music player) and hands free ECU cannot be made.
The hands free ECU does not recognize the bluetooth®device (mobile phone or music player).

Cause	SOLUTION
The power of the bluetooth®device is off.	With the power of the bluetooth®device turned on, check the trouble symptom again.
In addition to the bluetooth®device to be recognized, two or more bluetooth®device exist in the vehicle.	• With the voice operation, select the device to be connected. • Select the device to be connected on the multivision display.
Power supply abnormality in the hands free ECU, or communication error between the the radio and CD player or multivition display, and hands free ECU.	Turn the electric motor switch to the "ON" position and check if iPod connected to the USB adapter or USB device can be played. If the music cannot be played, the power supply of hands free ECU or the communication between the the radio and CD player or multivition display, and hands free ECU may have a problem. Perform the Inspection procedure 2: The USB memory device data cannot be replayed (Refer to P.54A-414 <vehicles with radio and CD player> or P.54A-415 <vehicles with MMCS>). If the diagnosis mode of hands free ECU can be made an entry, the module status can be checked by the hands free ECU self-check, however, if the power supply of hands free ECU, or the communication with the the radio and CD player or multivition display may have a problem, the module status can not be checked (Refer to P.54A-403 <vehicles with radio and CD player> or P.54A-406 <vehicles with MMCS>).

Calling cannot be made using the hands free cellular phone function.
Bluetooth®The music player cannot be replayed.
The music data received from the USB adapter cannot be replayed.

Cause	SOLUTION
The Bluetooth® connection is not made between the hands free ECU and bluetooth®device.	Connect the bluetooth®device to the hands free ECU via Bluetooth®.
The vehicle is not located in the communication area of the cellular phone.	Check the radio wave condition of the cellular phone shown on the display, or check the radio wave condition shown on the cellular phone itself.
AUDIO communication error between the hands free ECU and the the radio and CD player or multivition display.	Check if the data of music file sent to the hands free ECU can be replayed. If there are no problems, the communication between the hands free ECU and the the radio and CD player or multivition display may have a problem.

The voice recognition operation cannot be performed.
The communication voice cannot be heard by the other party.

Cause	SOLUTION
During the conversation, the microphone unit is set to mute.	During the conversation, press the speech switch and set to mute off by voice recognition. Perform Inspection Procedure 3: When the speech switch is pressed, the voice information is output, but the voice recognition is not performed (Refer to P.54A-417).
The hands free ECU cannot recognize the speech voice because of noise or others.	Minimize the noise by turning off the A/C, closing the window, and stopping the engine, and then clearly speak up near the microphone unit . Or, customize the voice recognition using the speaker enrollment function.
The microphone unit , or the connection has a problem.	The microphone unit may have a problem. Perform Inspection Procedure 3: When the speech switch is pressed, the voice information is output, but the voice recognition is not performed (Refer to P.54A-417). The connection with the microphone unit can be checked by the microphone check result on the diagnosis mode (Refer to P.54A-403 <vehicles with radio and CD player> or P.54A-406 <vehicles with MMCS>).
The speech switch, or the connection has a problem.	If the voice information is not output when the speech switch is operated, the steering wheel voice control switch has a problem. Perform the Inspection Procedure 4: When the speech switch is pressed, the voice information is not output (Refer to P.54A-419).

A call cannot be received when the pick-up switch (Steering wheel voice control switch) is pressed.
The voice information cannot be output from the speaker.

Cause	SOLUTION
The Bluetooth® connection is not made between the hands free ECU and cellular phone.	Connect the cellular phone to the hands free ECU via Bluetooth®.
The pick-up switch (Steering wheel voice control switch), or the connection has a problem.	If the voice information is not output when the speech switch is operated, the steering wheel voice control switch has a problem. Perform the Inspection Procedure 4: When the speech switch is pressed, the voice information is not output (Refer to P.54A-419).

Voice guide "Unable to obtain vehicle speed. Please try again or contact your dealer for service" is sent from the speaker.

Cause	SOLUTION
The hands free ECU cannot receive the vehicle speed signal from the multivision display.	If the vehicle speed signal the hands free ECU receives has a problem, the vehicle speed signal of multivision display, or the hands free ECU may have a problem. Perform the Inspection Procedure 7: Voice guide "Unable to obtain vehicle speed. Please try again or contact your dealer for service" is sent from the speaker (Refer to P.54A-423).

STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING

M1540203800583

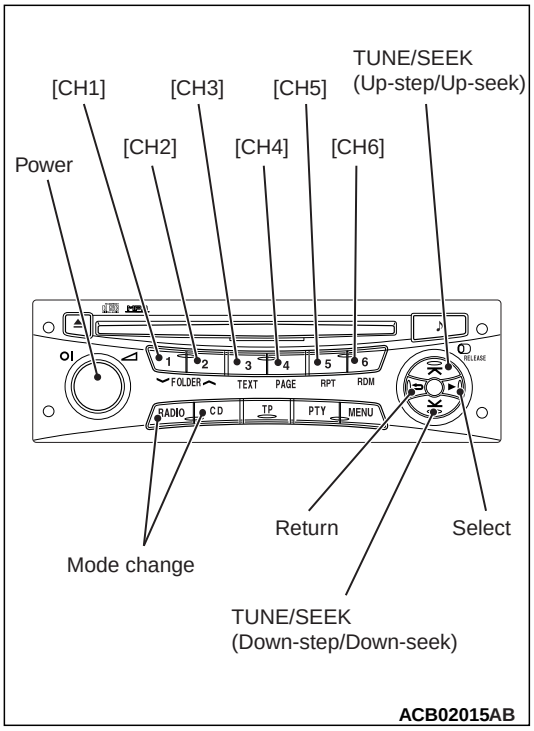
Refer to GROUP 00 – Troubleshooting contents .

DIAGNOSIS MODE <USING RADIO AND CD PLAYER>

M1544404800388

Enter the diagnosis mode according to the following steps:

1. Turn the Ignition switch to the "ACC" or "ON" position and switch off the radio and CD player.



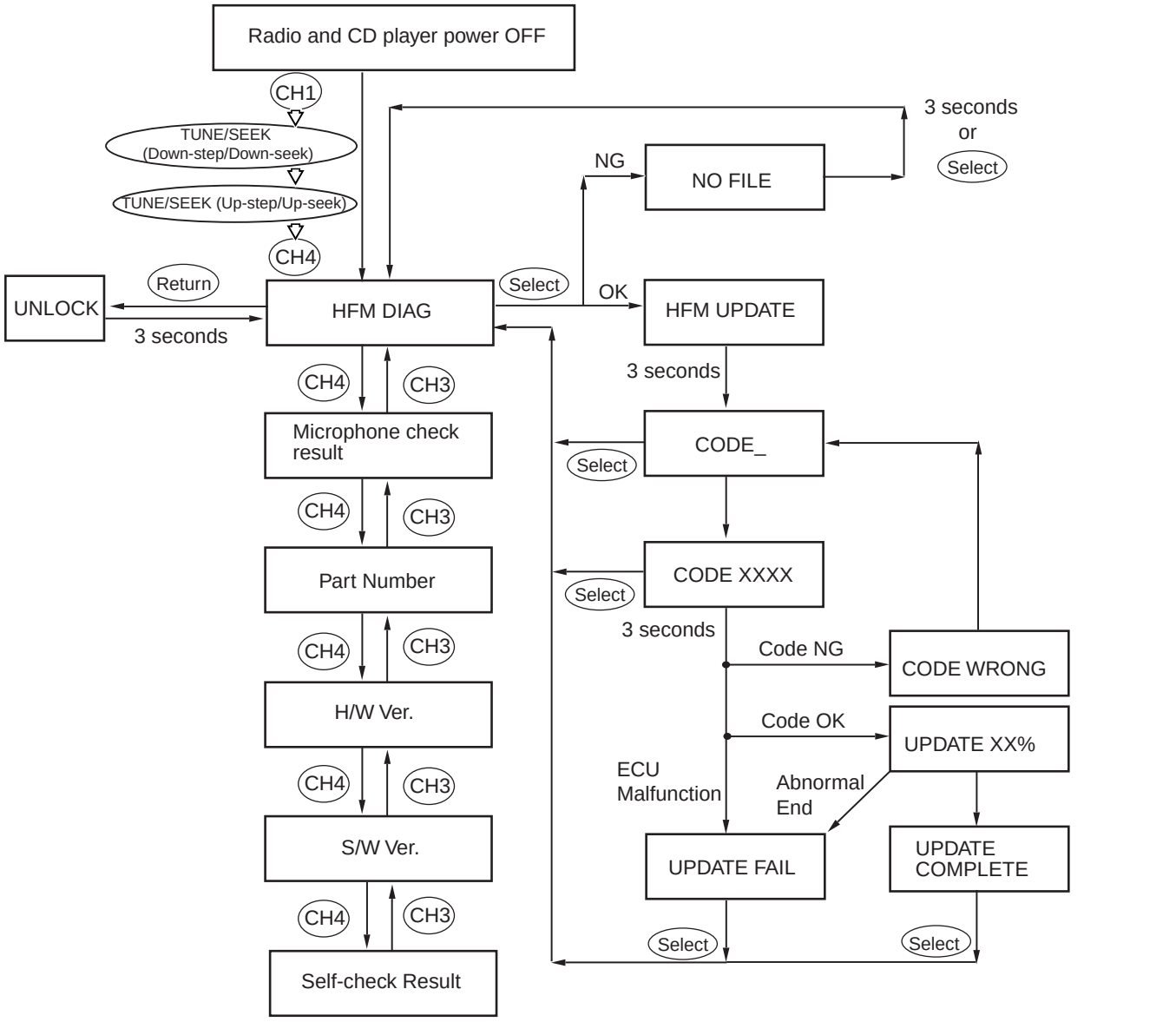
2. Press the following buttons in that order within sixty seconds from step (1).
   (1) [CH1] button.
   (2) TUNE/SEEK (Down-step/Down-seek) button.
   (3) TUNE/SEEK (Up-step/Up-seek) button.
   (4) [CH4] button.

NOTE:

- *When the "Power" button of the radio and CD player is pressed during the diagnosis mode, the diagnosis mode will be cancelled, thus switching off the radio and CD player. However, if the "Power" button is pressed while the hands-free ECU is being updated, the update will not be cancelled.*
- *When the "Mode change" button (FM, AM, CD) is pressed during diagnosis mode except the hands free ECU update, the diagnosis mode will be cancelled and the relevant operation will be carried out.*
- *When an invalid button is pressed during diagnosis mode except the hands free ECU update, the diagnosis mode will be cancelled, thus switching off the radio and CD player.*
- *During the diagnosis mode, voice which is input through the microphone unit is played through a relevant loudspeaker.*

3. "HFM DIAG" is displayed.

DIAGNOSIS MODE OPERATION



Description in the illustrations	Actual display	Item explanation
UNLOCK	Unlock complete	Four-digit password, which has been set by the security function, will be erased.
HFM DIAG	HFM DIAG	Displayed when the diagnosis mode is being entered.
Result of microphone check	MIC short	Displayed when the line between the microphone and the hands free ECU is short-circuited.
	MIC Open	Displayed when the line between the microphone and the hands free ECU is open-circuited.
	MIC OK	Normal status (the line between the microphone and the hands free ECU is not open/short-circuited)
Part number	PN XXXXXXXX	Eight-digit part number is displayed.

Description in the illustrations	Actual display	Item explanation
H/W Ver.	H/W XX	Two-digit hardware version is displayed.
S/W Ver.	S/W XXXXXXX	Seven-digit software version is displayed.
Self-check result	HFM OK	Displayed when the hands free ECU is not defective.
	HFM Error	Displayed when the hands free ECU is suspected to be defective. *NOTE: Turn the ignition switch to the "OFF" position once when "Error" is displayed. Enter the diagnosis mode by turning the ignition switch to the "ON" position again.If the self-check result shows "Error" again, the hands-free ECU is determined to be defective.*
NO FILE	NO file	An USB device stores no data.
HFM UPDATE	HFM Update	Displayed when the hands free ECU enters the update mode. (An USB device stores the file for update.)
CODE_	Code_	Input four-digit code for update.Use the "CH" button when a code is input.
CODE XXXX	Code XXXX	Code XXXX is displayed in number 1 to 6 by pushing each CH1 to CH6 button.
CODE WRONG	Code wrong	The code, which has been input, is wrong.
UPDATING XX%	Updating XX%	Displayed when updating is carried out.
UPDATE COMPLETE	Update complete	The updating mode is complete.
UPDATE FAIL	Update fail	Displayed when the update of the hands-free ECU fails.

DIAGNOSIS MODE <USING MULTIVISION DISPLAY>

M1544404800399

As a diagnosis mode for the hands free ECU, version information of the hands free ECU and diagnostic results of the hands free ECU and the microphone unit can be displayed by the service mode of the multivision display.

HOW TO INITIATE THE SERVICE MODE

Refer to MMCS - Service mode P.54A-305.

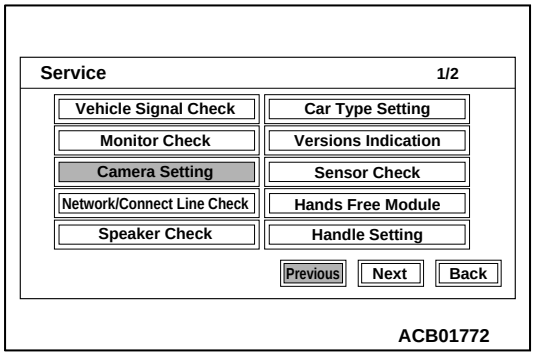
HOW TO TERMINATE THE SERVICE MODE

Refer to MMCS - Service mode P.54A-305.

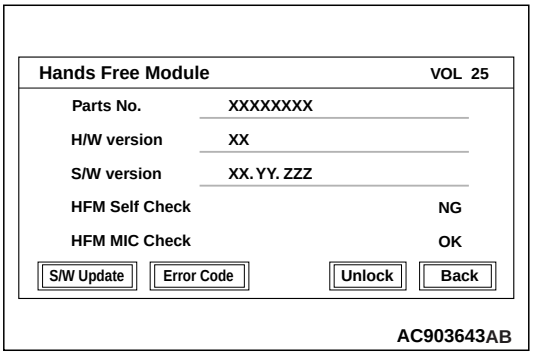
HANDS FREE MODULE

NOTE:

- *While the hands free ECU is in diagnosis mode, connection with the Bluetooth® device is shut down.*
- *While the hands free ECU is in diagnosis mode, the sound input to the microphone unit is output directly through the speaker.*



1. Select "Hands Free Module" on "Service" screen.



2. "Hands Free Module" screen is displayed.

SPECIFICATION OF DISPLAY ITEM

Displayed name	Detail
VOL	The volume of the sound input to the microphone unit and output through the speaker while the hands free ECU is in diagnosis mode. (The sound volume can be changed by operating the multivision display.)
Parts No	The part number of the hands free ECU is displayed in 8 digits.
H/W version	The hardware version information of the hands free ECU is displayed in 2 digits.
S/W version	The software version information of the hands free ECU is displayed in 7 digits.
HFM Self Check	The hands free ECU state is displayed. • "OK": Normal (There is no abnormality in the hands free ECU.) • "NG": Abnormal (The hands free ECU may have a problem.) *NOTE: If "NG" is displayed, turn the electric motor switch to the "OFF" position once. Then, turn the electric motor switch to the "ON" position, and enter into the diagnosis mode. When the HFM Self Check display is NG again, the hands free ECU is determined to be defective.*
HFM MIC Check	Displays the communication condition of the hands free ECU and the microphone unit. • "OK": Normal (There is no short circuit or open circuit in the line between the microphone unit and the hands free ECU.) • "NG (Short)": This message is displayed when the line between the microphone unit and the hands free ECU is shorted. • "NG (Open)": (This message is displayed when there is an open circuit in the line between the microphone unit and the hands free ECU.)

DISPLAY BUTTON AND FUNCTION

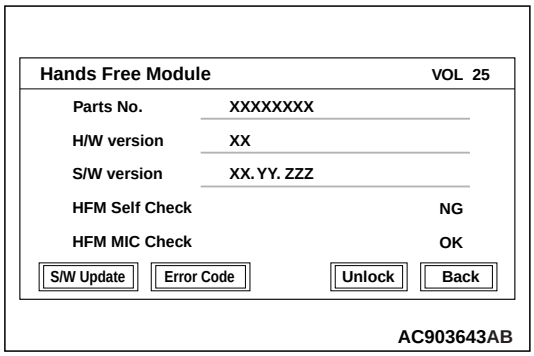
Display button	Detail
S/W Update	Execution button for software update of the hands free ECU (Displayed only when the update is possible.)
Error Code	Error Code screen is displayed. (This button is displayed in gray when "HFM Self Check" is "OK.")
Unlock	Forcibly unlocks the 4-digit passcode that was set by the security function. (When the module is not locked by passcode, the "Unlock" button is displayed in gray.)
Back	Returns to "Service" screen.

SOFTWARE UPDATE (S/W Update)

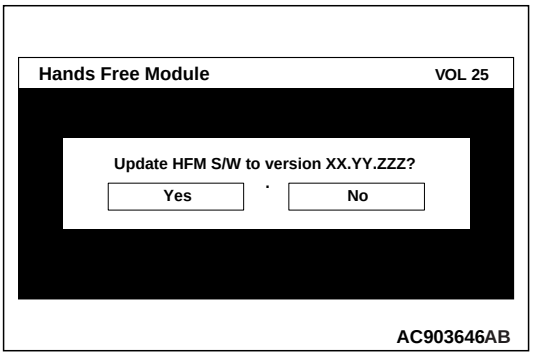
The software of the hands free ECU can be updated.

NOTE:

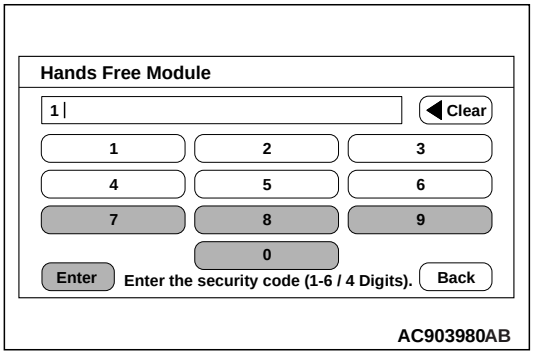
- *"S/W Update" is displayed when an USB that contains files to update the hands free ECU is connected.*
- *When the software update cannot continue because of improper removal of the USB during the update or of an incorrect update code, the display returns to the "Hands Free Module" screen. At this time, warning is not displayed.*



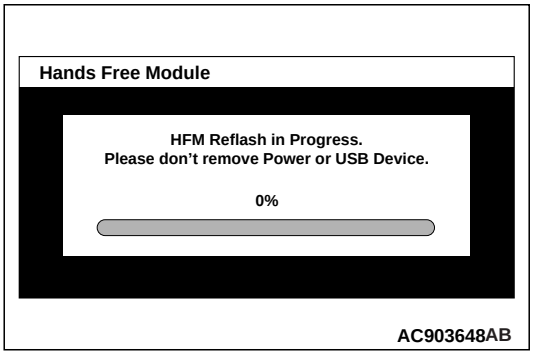
1. Press "S/W Update."



2. Select "Yes." (When "No" is selected, the display returns to the "Hands Free Module" screen.)



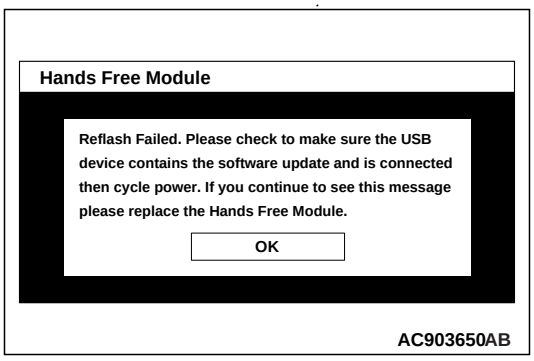
3. Input the 4-digit code for update. ("Enter" is displayed in gray until the 4-digit code is input.)



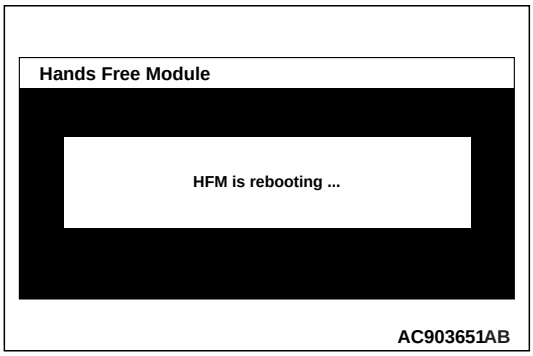
4. Update starts if the 4-digit code is normal.

   NOTE:

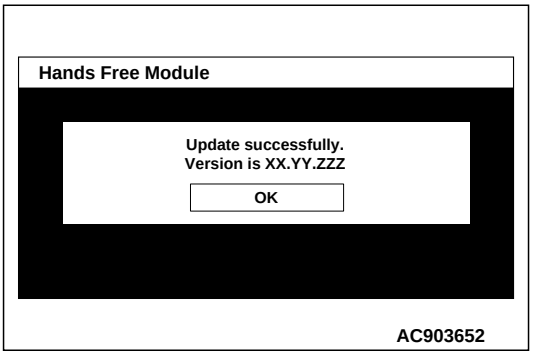
   - *When the input code is normal, the speaker will not output the sound input to the microphone unit until the display returns to the "Hands Free Module" screen.*



   When the data rewriting operation is failed, the error screen is displayed.



5. The "Reboot" screen is displayed when the update is completed successfully.

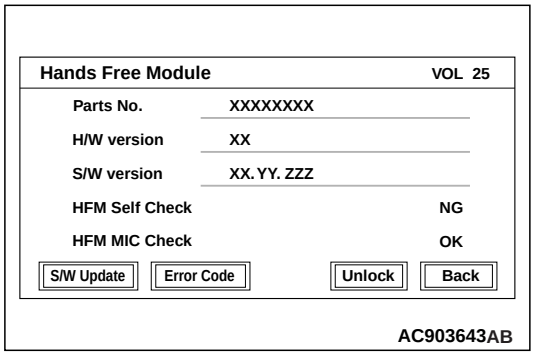


6. After the hands free ECU is rebooted, the "Update successfully." screen is displayed. When "OK" is selected, the display returns to the "Hands Free Module" screen.

ERROR CODE

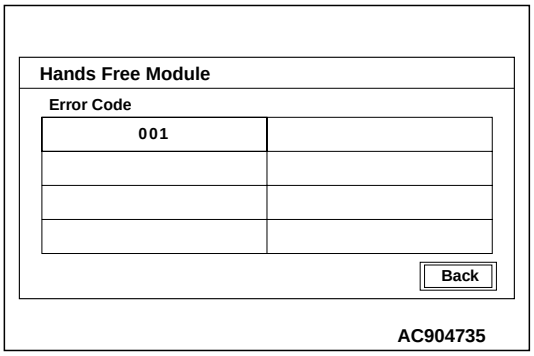
The error code is displayed to show the internal state of the module.

NOTE: This code shows the internal state of the hands free ECU. Do not determine that the module is defective even when an error code is displayed. Be sure to diagnose the module before replacing it.



1. Press "Error Code."

   NOTE: "Error Code" is displayed when the "HFM Self Check" is "NG."

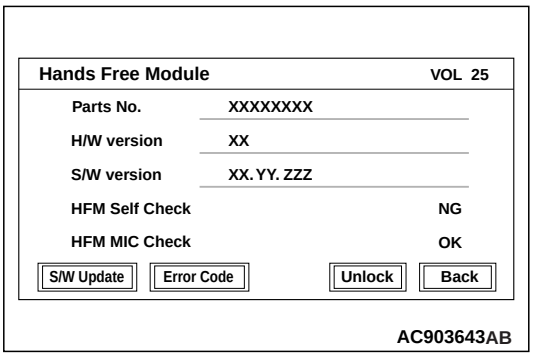


2. When "Back" is selected, the display returns to the "Hands Free Module" screen.

UNLOCK

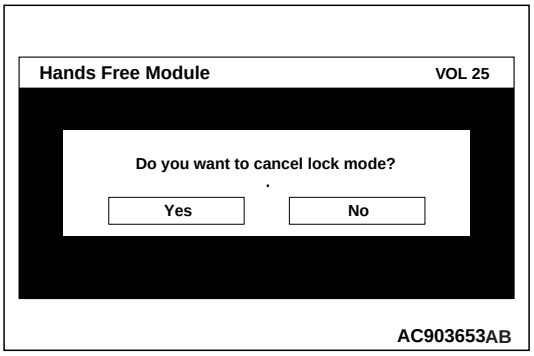
Forcibly unlocks the 4-digit passcode that was set by the security function.

NOTE: When the module is not locked by passcode, the "Unlock" button is displayed in gray.



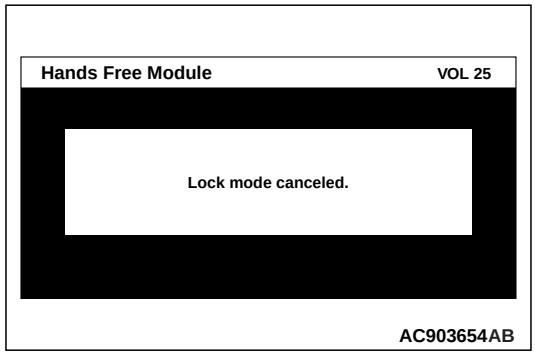
1. Press "Unlock."

   NOTE: "Error Code" is displayed when the "HFM Self Check" is "NG."



2. When "Yes" is selected, "Lock mode canceled" will be displayed and the passcode lock will be unlocked.

   NOTE: When "No" is selected, the display returns to the "Hands Free Module" screen.



3. The display returns to the "Hands Free Module" screen after 4 seconds.

TROUBLE SYMPTOM CHART

M1546001801807

NOTE: Some Bluetooth® devices may not be compatible with the hands free ECU

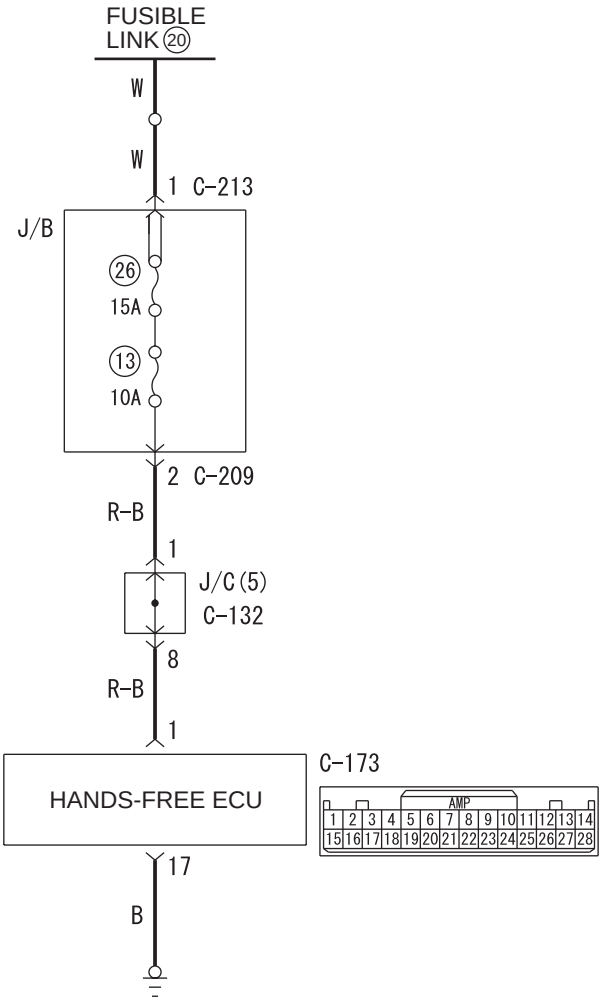
Inspection Procedure No.	Trouble symptom	Reference page
1	Check the hands free ECU power supply circuit.	P.54A-411
2	The USB memory device data cannot be replayed. <Vehicles with radio and CD player>	P.54A-414
	The USB memory device data cannot be replayed. <Vehicles with MMCS>	P.54A-415
3	When the speech switch is pressed, the voice information is output, but the voice recognition is not performed.	P.54A-417
4	When the speech switch is pressed, the voice information is not output.	P.54A-419
5	DIAGNOSIS MODE cannot be made an entry.	P.54A-421
6	Steering wheel voice control switch illumination does not come on.	P.54A-422
7	Voice guide "Unable to obtain vehicle speed. Please try again or contact your dealer for service" is sent from the speaker.	P.54A-423

SYMPTOM PROCEDURES

Inspection Procedure 1: Check the hands free ECU power supply circuit.

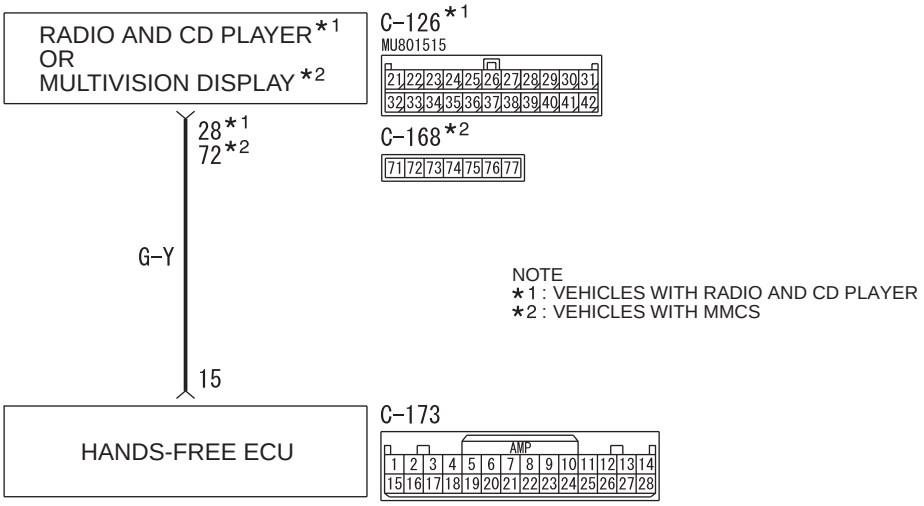
⚠ CAUTION
Before replacing the ECU, ensure that the power supply circuit, the earth circuit and the communication circuit are normal.

Hands-Free ECU Power Source Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver WDC54E003A

Hands-Free ECU Communication Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver WDC54E004A

CIRCUIT OPERATION

- The power supply to the hands free ECU is provided by the fusible link (20).
- The ACC signal is received from C-126 radio and CD player connector terminal No.28. <Vehicles with radio and CD player>
- The ACC signal is received from C-168 multivision display connector terminal No.72. <Vehicles with MMCS>

PROBABLE CAUSES

- Damaged harness wires and connectors
- Malfunction of the hands free ECU
- Malfunction of the radio and CD player <Vehicles with radio and CD player>
- Malfunction of the MMCS <Vehicles with MMCS>

DIAGNOSIS PROCEDURE

STEP 1. Connector check: C-173 hands free ECU connector

Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the defective connector.

STEP 2. Resistance measurement at C-173 hands free ECU connector.

(1) Disconnect the connector, and measure at the wiring harness side.
(2) Check the continuity between terminal 17 and earth.

OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?
YES : Go to Step 4.
NO : Go to Step 3.

STEP 3. Check the wiring harness between C-173 hands free ECU connector terminal No.17 and body earth.

- Check the body earth wires for open circuit.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness.

STEP 4. Voltage measurement at C-173 hands free ECU connector.

(1) Disconnect the connector, and measure at the wiring harness side.
(2) Measure the voltage between terminal No.1 and body earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 6.
NO : Go to Step 5.

STEP 5. Check the wiring harness between C-173 hands free ECU connector terminal No.1 and fusible link (20).

- Check the power supply line for open circuit and short circuit.

NOTE: Prior to the wiring harness inspection, check junction block connectors C-209, C-213 and joint connector C-132, and repair if necessary.

Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

NO : Repair the wiring harness.

STEP 6. Voltage measurement at C-173 hands free ECU connector.

(1) Disconnect the connector, and measure at the wiring harness side.
(2) Turn the ignition switch to "ACC" position.
(3) Measure the voltage between terminal No.15 and body earth.

OK: System voltage

Q: Is the check result normal?

YES : Replace the hands free ECU.

NO : Go to Step 7.

STEP 7. Connector check: C-126 radio and CD player connector <vehicles with radio and CD player> or C-168 multivision display connector <vehicles with MMCS>

Q: Is the check result normal?

YES : Go to Step 8.

NO : Repair the defective connector.

STEP 8. Check the harness wire between C-126 radio and CD player connector terminal No.28 <vehicles with radio and CD player> or C-168 multivision display connector terminal No.72 <vehicles with MMCS> and C-173 hands free ECU connector terminal No.15.

- Check the signal line for open circuit and short circuit.

Q: Is the check result normal?

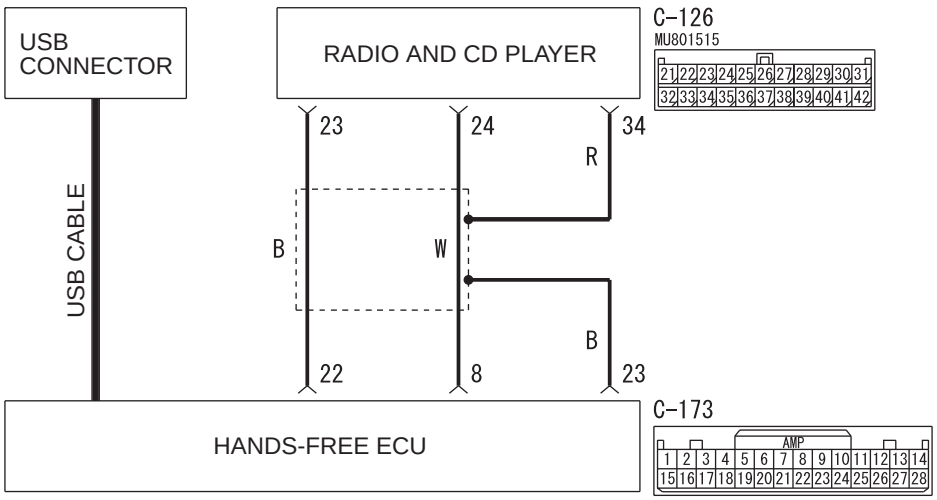
YES : Replace the radio and CD player <vehicles with radio and CD player> or multivision display <vehicles with MMCS>.

NO : Repair the wiring harness.

Inspection Procedure 2: The USB memory device data cannot be replayed. <Vehicles with radio and CD player>

⚠ CAUTION
Before replacing the hands free ECU, ensure that the power supply circuit, the earth circuit and the communication circuit are normal.

Hands-Free ECU Communication Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver WDC54E005A

COMMENTS ON TROUBLE SYMPTOM
If the sound replay is impossible with the USB mode, USB cable, hands free ECU, or radio and CD player may be defective, or a communication error between the radio and CD player and the hands free ECU may have occurred.

NOTE: Before troubleshooting, check that the music file (the customer tried to replay) can be replayed.

PROBABLE CAUSES
- The radio and CD player may be defective.
- The hands free ECU may be defective.
- The USB cable may be defective.
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. Check the radio and CD player operation.
Check if the radio and CD player work normally and the sound is output.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Troubleshoot the radio and CD player. Refer to P.54A-232.

STEP 2. Check the diagnosis mode
Check if the hands free ECU can be switched to the diagnosis mode. (Refer to P.54A-403.)

Q: Is the check result normal?
YES : Go to Step 3.
NO : Perform Inspection Procedure 5 "DIAGNOSIS MODE cannot be made an entry." (Refer to P.54A-421.)

STEP 3. Check the USB cable.
Check that the USB cable is connected to the hands free ECU normally. Or check the USB cable for damage such as bend.

Q: Is the check result normal?
YES : Go to Step 4.
NO : Replace or repair the USB cable.

STEP 4. Connector check: C-173 hands free ECU connector, C-126 radio and CD player connector

Q: Is the check result normal?
YES : Go to Step 5.
NO : Repair the defective connector.

STEP 5. Check the wiring harness between C-173 hands free ECU connector terminal No.8, 22, 23 and C-126 radio and CD player connector terminal No. 24, 23, 34.
- Check the signal lines for open circuit and short circuit.

Q: Is the check result normal?
YES : Go to Step 6.
NO : Repair the wiring harness.

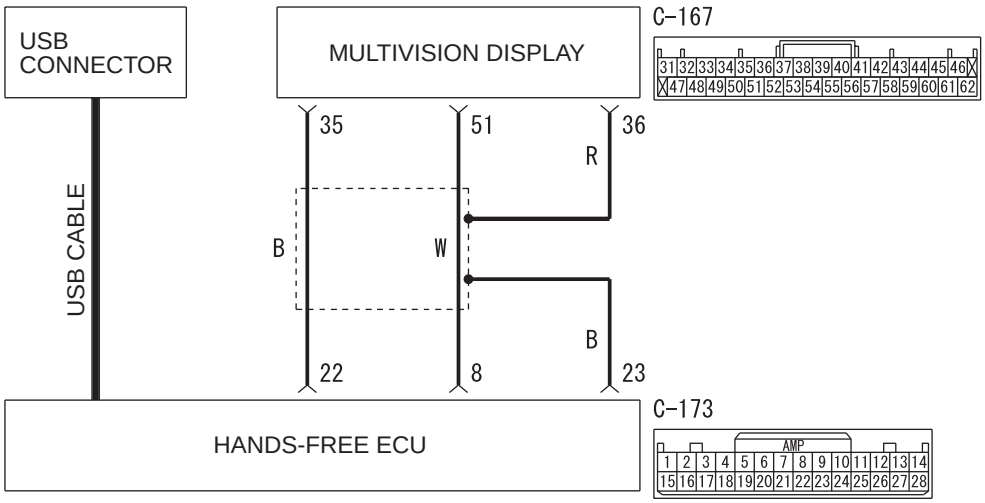
STEP 6. Replace the hands free ECU temporarily, and check the trouble symptom.
Replace the hands free ECU temporarily, and check that the sound is output from the speaker.

Q: Is the check result normal?
YES : Replace the hands free ECU.
NO : Replace the radio and CD player.

Inspection Procedure 2: The USB memory device data cannot be replayed. <Vehicles with MMCS>

⚠ CAUTION
Before replacing the hands free ECU, ensure that the power supply circuit, the earth circuit and the communication circuit are normal.

Hands-Free ECU Communication Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver WDC54E006A

COMMENTS ON TROUBLE SYMPTOM
If the sound replay is impossible with the USB/i Pod mode, the USB adapter, USB cable, hands free ECU, or multivision display may be defective, or a communication error between the multivision display and hands free ECU may have occurred.

NOTE: Before troubleshooting, check that the music file (the customer tried to replay) can be replayed.

PROBABLE CAUSES
- The multivision display may be defective.
- The hands free ECU may be defective.
- The USB cable may be defective.
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. Check the multivision display operation.
Check if the multivision display work normally and the sound is output.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Troubleshoot the MMCS (Refer to P.54A-314.).

STEP 2. Check the diagnosis mode
Check if the hands free ECU can be switched to the diagnosis mode. (Refer to P.54A-406.)

Q: Is the check result normal?
YES : Go to Step 3.
NO : Perform Inspection Procedure 5 "DIAGNOSIS MODE cannot be made an entry." (Refer to P.54A-421.)

STEP 3. Check the USB cable.
Check that the USB cable is connected to the hands free ECU normally. Or check the USB cable for damage such as bend.

Q: Is the check result normal?
YES : Go to Step 4.
NO : Replace or repair the USB cable.

STEP 4. Connector check: C-173 hands free ECU connector, C-167 multivision display connector

Q: Is the check result normal?
YES : Go to Step 5.
NO : Repair the defective connector.

STEP 5. Check the wiring harness between C-173 hands free ECU connector terminal No.8, 22, 23 and C-167 multivision display connector terminal No. 51, 35, 36.
- Check the signal lines for open circuit and short circuit.

Q: Is the check result normal?
YES : Go to Step 6.
NO : Repair the wiring harness.

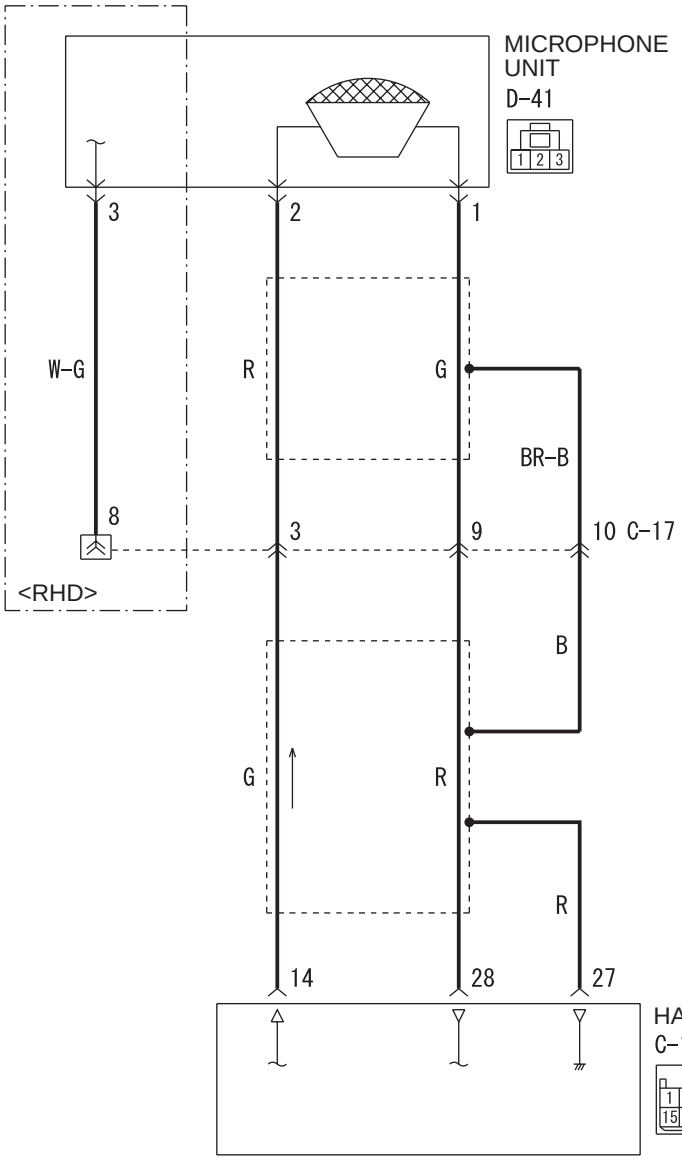
STEP 6. Replace the hands free ECU temporarily, and check the trouble symptom.
Replace the hands free ECU temporarily, and check that the sound is output from the speaker.

Q: Is the check result normal?
YES : Replace the hands free ECU.
NO : Replace the multivision display.

Inspection Procedure 3: When the speech switch is pressed, the voice information is output, but the voice recognition is not performed.

⚠ CAUTION
Before replacing the hands free ECU, ensure that the power supply circuit, the earth circuit and the communication circuit are normal.

Microphone Unit Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver WDC54E007A

COMMENTS ON TROUBLE SYMPTOM
When the speech switch is pushed, if the voice information is output but voice recognition is not executed, the microphone unit, hands free ECU or the communication between the microphone unit and the hands free ECU may have a problem.

PROBABLE CAUSES
- The hands free ECU may be defective.
- The microphone unit may be defective.
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. Check the diagnosis mode

Check if the microphone check result "MIC OK" is displayed on the diagnosis mode of hands free ECU. (Refer to P.54A-403 <Using radio and CD player> or P.54A-406 <Using multivision display>.)

Q: Is the check result normal?
YES : Go to Step 4.
NO : Go to Step 2.

STEP 2. Connector check: D-41 microphone unit connector, C-173 hands free ECU

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the defective connector.

STEP 3. Check the wiring harness between C-173 hands free ECU connector terminal No.14, 28, 27 and D-41 microphone unit connector terminal No.2, 1, 3 <RHD>.

- Check the signal lines for open circuit and short circuit.

NOTE: Prior to the wiring harness inspection, check intermediate connector C-17 and repair if necessary.

Q: Is the check result normal?
YES : Go to Step 4.
NO : Repair the wiring harness.

STEP 4. Replace the microphone unit temporarily, and check the trouble symptom.

Q: Is the check result normal?
YES : Replace the microphone unit.
NO : Go to Step 5.

STEP 5. Replace the hands free ECU temporarily, and check the trouble symptom.

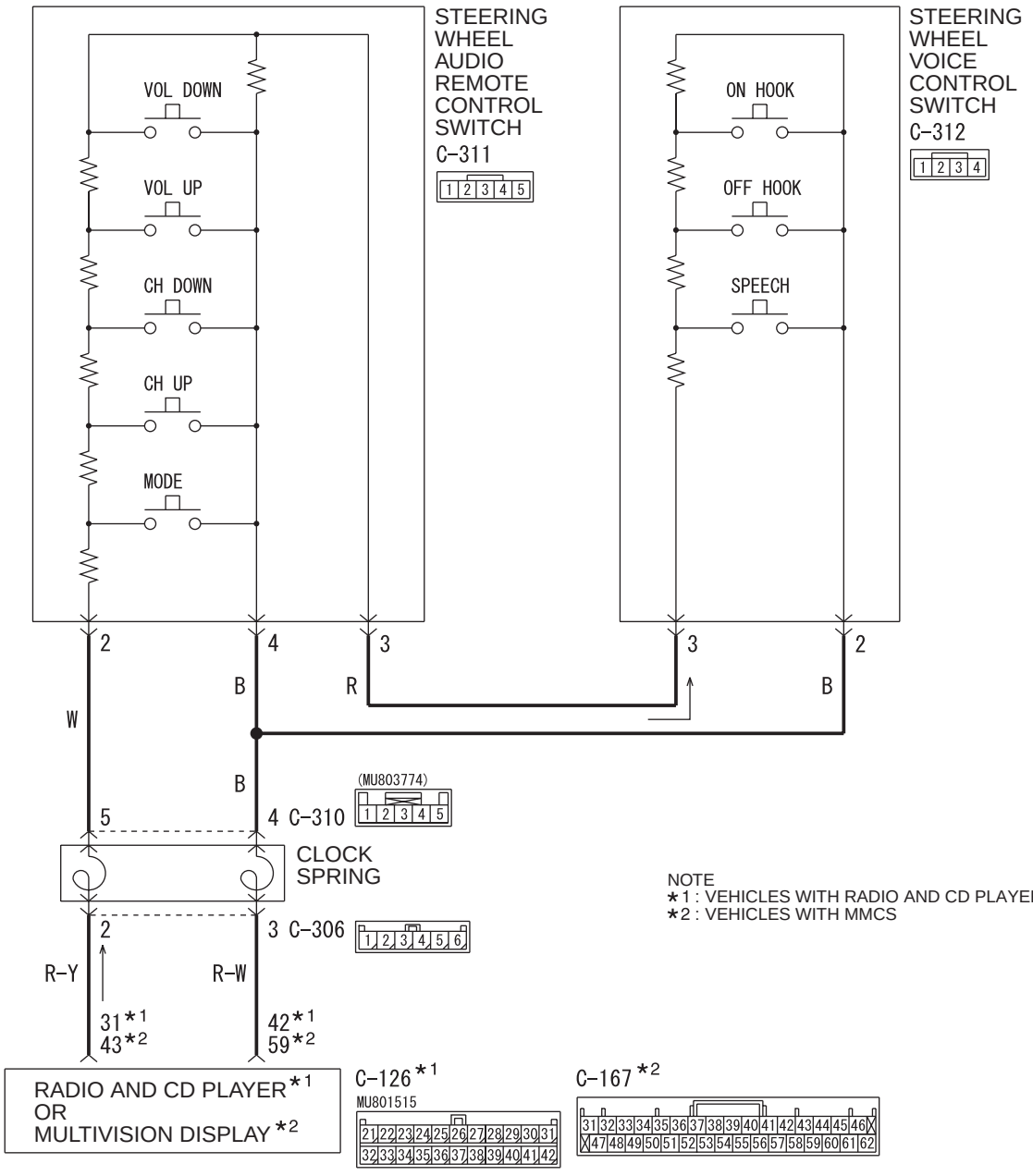
Q: Is the check result normal?
YES : Replace the hands free ECU.
NO : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

Inspection Procedure 4: When the speech switch is pressed, the voice information is not output.

⚠ CAUTION

Before replacing the hands free ECU, ensure that the power supply circuit, the earth circuit and the communication circuit are normal.

Steering Wheel Voice Control Switch Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver WDC54E008A

COMMENTS ON TROUBLE SYMPTOM
If the voice information is not output when the speech switch is pushed, the communication between the radio and CD player <vehicles with radio and CD player> or multivision display <vehicles with MMCS> and the hands free ECU, or the communication between the radio and CD player and the steering wheel voice control switch, the hands free ECU, or the steering wheel voice control switch may have a problem.

PROBABLE CAUSES
- The hands free ECU may be defective.
- The radio and CD player may be defective. <vehicles with radio and CD player>
- The multivision display may be defective. <vehicles with MMCS>
- The steering wheel audio remote control switch may be defective.
- The steering wheel voice control switch may be defective.
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. Check the diagnosis mode
Check if the hands free ECU can be switched to the diagnosis mode. (Refer to P.54A-403 <Using radio and CD player> or P.54A-406 <Using multivision display>.)

Q: Is the check result normal?
YES : Go to Step 2.
NO : Perform Inspection Procedure 5 "DIAGNOSIS MODE cannot be made an entry." (Refer to P.54A-421.)

STEP 2. Operation check of the steering wheel audio remote control switch
Check that the radio and CD player <vehicles with radio and CD player> or multivision display <vehicles with MMCS> can be operated by the steering wheel audio remote control switch.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Troubleshoot the steering wheel audio remote control switch. Refer to P.54A-383.

STEP 3. Check the steering wheel voice control switch.
Check the continuity of the steering wheel voice control switch.

Q: Is the check result normal?
YES : Go to Step 4.
NO : Replace the steering wheel voice control switch.

STEP 4. Check the steering wheel audio remote control switch.
Check the continuity of the steering wheel audio remote control switch. (Refer to steering wheel audio remote control switch inspection.)

Q: Is the check result normal?
YES : Go to Step 5.
NO : Replace the steering wheel audio remote control switch.

STEP 5. Check the harness wire between C-311 steering wheel audio remote control switch connector terminal No. 3 and C-312 steering wheel voice control switch connector terminal No.3.
- Check the communication lines for open circuit and short circuit.

Q: Is the check result normal?
YES : Go to Step 6.
NO : Repair the wiring harness.

STEP 6. Connector check: C-310 clock spring connector.

Q: Is the check result normal?
YES : Go to Step 7.
NO : Repair the defective connector.

STEP 7. Check the harness wire between C-310 clock spring connector terminal No. 4 and C-312 steering wheel voice control switch connector terminal No.2.
- Check the communication lines for open circuit and short circuit.

Q: Is the check result normal?
YES : Go to Step 8.
NO : Repair the wiring harness.

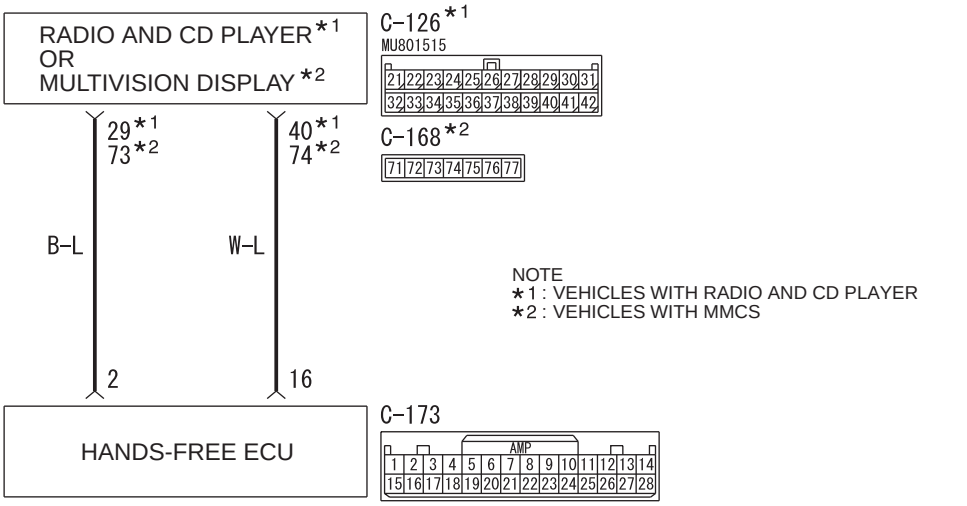
STEP 8. Temporarily replace the steering wheel voice control switch, and check the trouble symptom.

Q: Is the check result normal?
YES : Replace the steering wheel voice control switch.
NO : Replace the radio and CD player <vehicles with radio and CD player> or multivision display <vehicles with MMCS>.

Inspection Procedure 5: DIAGNOSIS MODE cannot be made an entry.

⚠ CAUTION
Before replacing the hands free ECU, ensure that the power supply circuit, the earth circuit and the communication circuit are normal.

Hands-Free ECU Communication Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver WDC54E009A

COMMENTS ON TROUBLE SYMPTOM
If the diagnosis mode cannot be made an entry, the hands free ECU, the communication between the hands free ECU, and the radio and CD player <vehicles with radio and CD player> or multivision display <vehicles with MMCS>, or the power supply system of the hands free ECU may have a problem.

PROBABLE CAUSES
- The hands free ECU may be defective.
- The radio and CD player may be defective. <vehicles with radio and CD player>
- The multivision display may be defective. <vehicles with MMCS>
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. Check the radio and CD player <vehicles with radio and CD player> or multivision display <vehicles with MMCS> operation.
Check if the radio and CD player <vehicles with radio and CD player> or multivision display <vehicles with MMCS> work normally and the sound is output.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Troubleshoot the radio and CD player P.54A-232 <vehicles with radio and CD player> or multivision display P.54A-314 <vehicles with MMCS>.

STEP 2. Connector check: C-173 hands free ECU connector, C-126 radio and CD player connector <vehicles with radio and CD player>, C-168 multivision display connector <vehicles with MMCS>

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the defective connector.

STEP 3. Check the wiring harness between C-173 hands free ECU connector terminal No.2, 16 and C-126 radio and CD player connector terminal No.29, 40 <vehicles with radio and CD player> or C-168 multivision display connector terminal No.73, 74 <vehicles with MMCS>.
- Check the signal lines for open circuit and short circuit.

Q: Is the check result normal?

YES : Go to Step 4.
NO : Repair the wiring harness.

STEP 4. Check if the power supply circuit of hands free ECU have a problem.
Perform the Inspection procedure 1 "Check the hands free ECU power supply circuit." of the trouble-shooting. (Refer to P.54A-411.)

Q: Is the check result normal?

YES : Go to Step 5.
NO : Repair according to the troubleshooting for reference.

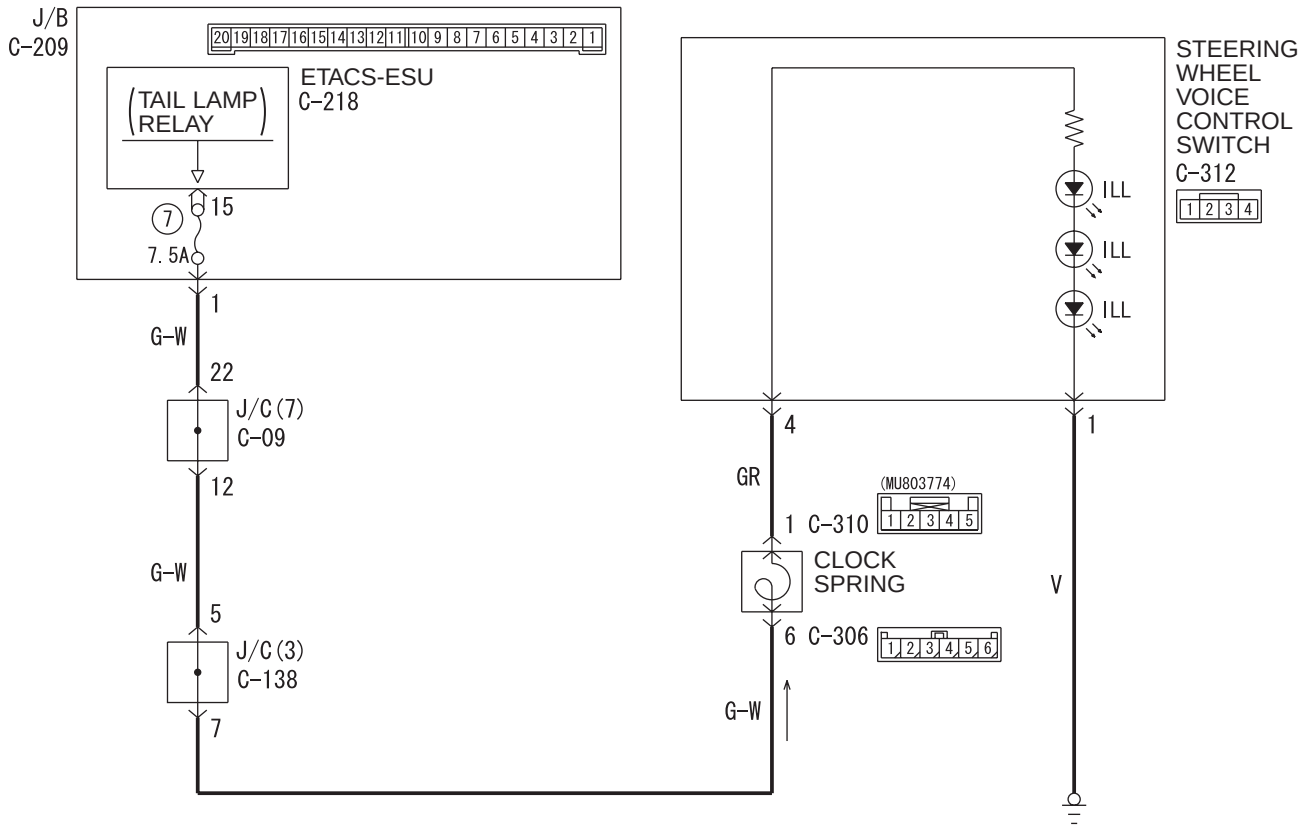
STEP 5. Replace the hands free ECU temporarily, and check the trouble symptom.

Q: Is the check result normal?
YES : Replace the hands free ECU.
NO : Replace the radio and CD player <vehicles with radio and CD player> or multivision display <vehicles with MMCS>.

Inspection Procedure 6: Steering wheel voice control switch illumination does not come on.

⚠ CAUTION
Before replacing the hands free ECU, ensure that the power supply circuit, the earth circuit and the communication circuit are normal.

Steering Wheel Voice Control Switch Illumination Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver WDC54X006A

TECHNICAL DESCRIPTION (COMMENT)
The power supply circuit to the steering wheel voice control switch, the steering wheel voice control switch, or the clock spring may be defective.

PROBABLE CAUSES
- Malfunction of steering wheel voice control switch
- Malfunction of the clock spring
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. Check if the steering wheel audio remote control switch illuminates normally.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Perform the troubleshooting for the illumination of steering wheel audio remote control switch.

STEP 2. Check the steering wheel voice control switch.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Replace the steering wheel voice control switch.

STEP 3. Connector check: C-312 steering wheel voice control switch connector

Q: Is the check result normal?
YES : Go to Step 4.
NO : Repair the defective connector.

STEP 4. Check the wiring harness between C-312 steering wheel voice control switch connector terminal No.1 and body earth.
- Check the earth wire for open circuit.

Q: Is the check result normal?
YES : Go to Step 5.
NO : Repair the wiring harness.

STEP 5. Connector check: C-310 clock spring connector

Q: Is the check result normal?
YES : Go to Step 6.
NO : Repair the defective connector.

STEP 6. Check the clock spring.
Check whether the clock spring is in good condition (Refer to GROUP 52B – Air bag module and clock spring).

Q: Is the check result normal?
YES : Go to Step 7.
NO : Replace the clock spring.

STEP 7. Check the wiring harness between C-312 steering wheel voice control switch connector terminal No.4 and C-310 clock spring connector terminal No.1.
- Check the wiring harness for open circuit and short circuit.

Q: Is the check result normal?
YES : Go to Step 8.
NO : Repair the wiring harness.

STEP 8. Retest the system
Check whether the illumination of the steering wheel voice control switch comes on normally.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Replace the steering wheel voice control switch.

Inspection Procedure 7: Voice guide "Unable to obtain vehicle speed. Please try again or contact your dealer for service" is sent from the speaker.

⚠ CAUTION
Before replacing the hands free ECU, ensure that the power supply circuit, the earth circuit and the communication circuit are normal.

COMMENTS ON TROUBLE SYMPTOM
If the voice guide "Unable to obtain vehicle speed. Please try again or contact your dealer for service" is sent from the speaker, the vehicle speed signal of the hands free ECU has a problem. At this time, the hands free ECU, and the vehicle speed signal of the radio and CD player <vehicles with radio and CD player> or multivision display <vehicles with MMCS> may have a problem.

PROBABLE CAUSES
- The hands free ECU may be defective.
- The radio and CD player may be defective. <vehicles with radio and CD player>

- The multivision display may be defective. <vehicles with MMCS>
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. Check the radio and CD player <vehicles with radio and CD player> or multivision display <vehicles with MMCS> operation.

Check if the speed compensated volume function of the radio and CD player <vehicles with radio and CD player> or multivision display <vehicles with MMCS> works normally during driving.

Q: Is the check result normal?

YES : Go to Step 2.

NO : Troubleshoot the radio and CD player P.54A-152 <vehicles with radio and CD player> or multivision display <vehicles with MMCS>.

STEP 2. Check the diagnosis mode

Check if the hands free ECU can be switched to the diagnosis mode. (Refer to .)

Q: Is the check result normal?

YES : Go to Step 3.

NO : Perform Inspection Procedure 5: "DIAGNOSIS MODE cannot be made an entry." (Refer to P.54A-421.)

STEP 3. Replace the hands free ECU temporarily, and check the trouble symptom.

Q: Is the check result normal?

YES : Replace the hands free ECU.

NO : Replace the radio and CD player <vehicles with radio and CD player> or multivision display <vehicles with MMCS>.

ON-VEHICLE SERVICE

PAIRING A DEVICE OR DELETING A DEVICE <USING STEERING WHEEL VOICE CONTROL SWITCH>

M1544405500391

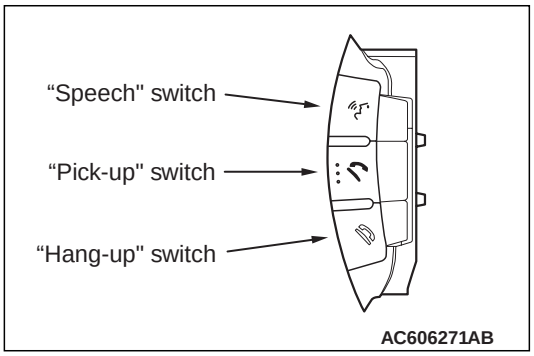
NOTE:

- *Some Bluetooth® devices (cellular phone or music player) may not be compatible with the hands free ECU.*
- *A maximum of seven Bluetooth® devices can be registered.*
- *This system can not be used when a battery of Bluetooth® devices was exhausted.*

PAIRING A DEVICE

Shift the selector lever to P (parking) position <A/T> or shift lever to N (neutral) position <M/T> and pull the parking brake lever.

1. Turn the ignition switch to "ACC" or "ON" position.



2. Press the "Speech" switch.
3. Say "Setup."
4. Say "Pairing options."
5. The voice guide will say "Select one of the following: pair, edit, delete, or list?"
6. Say “Pair.”
7. The voice guide will say "Please say a 4-digit pairing code."
8. Say a 4 digit number. The 4 digit number will be registered as a pairing code for the device.
   - When the confirmation function is on, the system will confirm whether the number said is acceptable. Answer "Yes" to go Step 10. Say "No" to return to pairing code selection.

NOTE:
- *The pairing code entered here is only used for the Bluetooth® connection certification. It is any 4-digit number the user would like to select.*
- *Remember the pairing code as it needs to be keyed into the device later in the pairing process.*
- *Depending on the the connection settings of the Bluetooth® device, this code may have to be entered each time you connect the Bluetooth® device to the hands free ECU. For the default connection settings, refer to the instructions for device.*

9. The voice guide will say “Start pairing procedure on device. See device manual for instructions.” Refer to the owner’s manual for your device and enter into the device the pairing code that was registered in Step 9.
10. When this system finds a Bluetooth® device, the voice guide will say "Please say the name of the device after the beep."
11. After you hear the beep, name the device by saying a name of your preference.

    NOTE: When the confirmation function is on, after repeating the device tag you have said, the voice guide will ask "Is this correct?" Answer "Yes". To change the device tag, answer "No" and then say the device tag again.
12. The voice guide will say "Pairing complete," after which a beep will be played and the pairing process will end.

DELETING A DEVICE

1. Turn the ignition switch to "ACC" or "ON" position.
2. Press the "Speech" switch.
3. Say “Setup.”
4. Say “Pairing options”
5. The voice guide will say “Select one of the following: pair, edit, delete, or list" Say "Delete."
6. Say “Delete.”
7. After the voice guide says "Please say," the numbers of the devices and device tags of corresponding devices will be read out in order, starting with the device that has been most recently connected. After it completes reading all pairs, the voice guide will say "or all."
   Say the number of the device that you want to delete from the system.
   If you want to delete all paired devices from the system, say "All."
8. For confirmation purposes, the voice guide will say "Deleting (device tag) (number). Is this correct?" or "Deleting all devices, Is this correct?"
9. Answer "Yes" to delete the devices.
   Answer "No" the system will return to Step 4.
10. The voice guide will say "Deleted", and then the system will end the device deletion process.
    - If the device deletion process fails for some reason, the voice guide will say "Delete failed." and then the system will cancel deleting the device.

PAIRING A DEVICE OR DELETING A DEVICE <USING MULTIVISION DISPLAY>

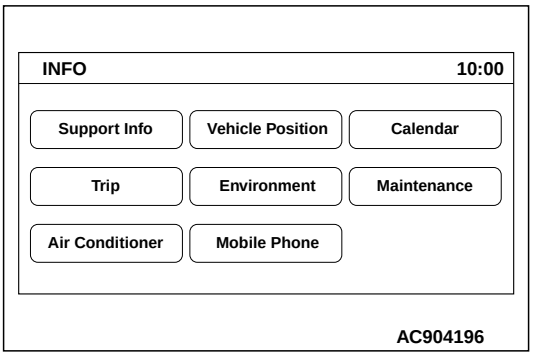
M1544405500409

As for vehicles with MMCS, "pairing" registration of the Bluetooth® device and deletion of paired device from hands free ECU can be done by touch panel operation on the multivision display.

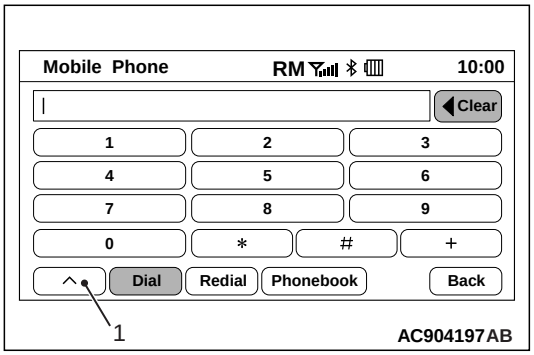
NOTE:
- *Some Bluetooth® devices (cellular phone and music player) may not be compatible with the hands free ECU.*
- *A maximum of seven Bluetooth® devices can be registered.*
- *This system cannot be used when a battery of Bluetooth® devices was exhausted.*

DISPLAY THE PAIRING LIST SCREEN.

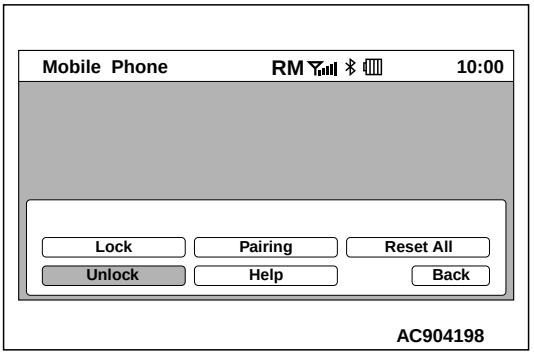
OPERATION ON THE MOBILE PHONE SCREEN



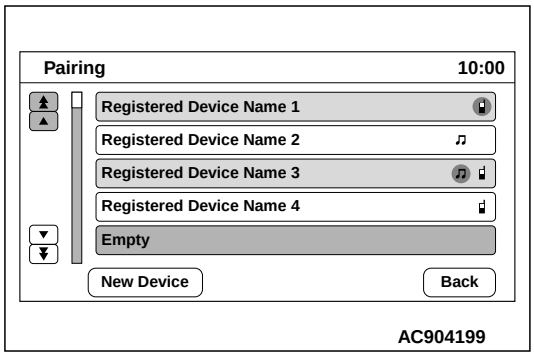
1. Display the INFO screen, and select "Mobile Phone."



2. Select "1" in the illustration on the Mobile Phone screen.

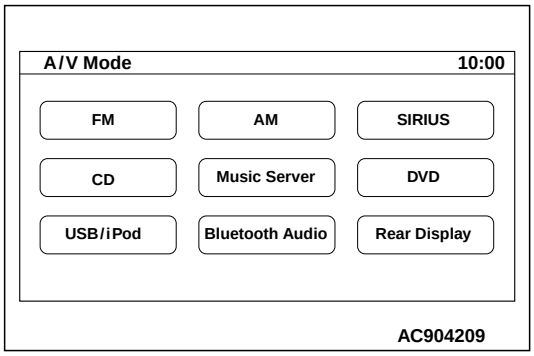


3. Select "Pairing."



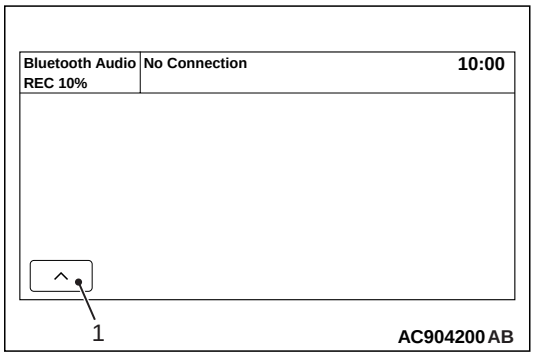
4. The pairing list screen is displayed.

OPERATION ON THE A/V MODE SCREEN

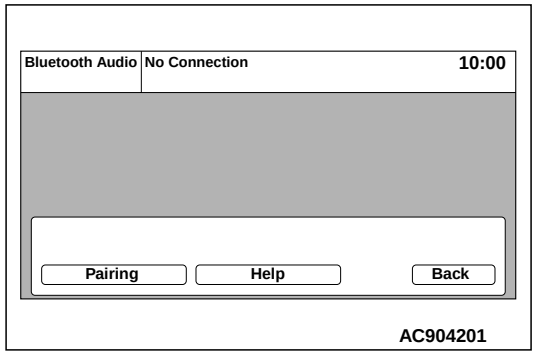


1. Display the A/V mode screen, and select "Bluetooth Audio."

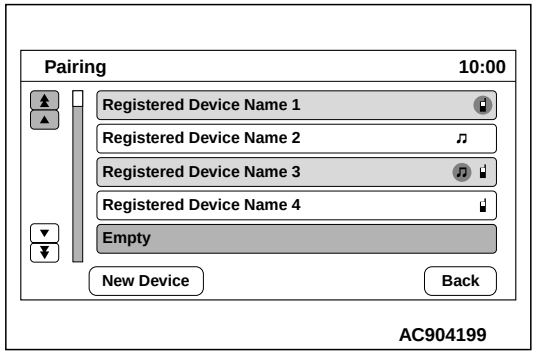
   NOTE: When there are no active connections between the Bluetooth® Audio and the hands free ECU, "There are no active connections." is displayed.



2. Select "1" in the illustration on the Bluetooth Audio screen.



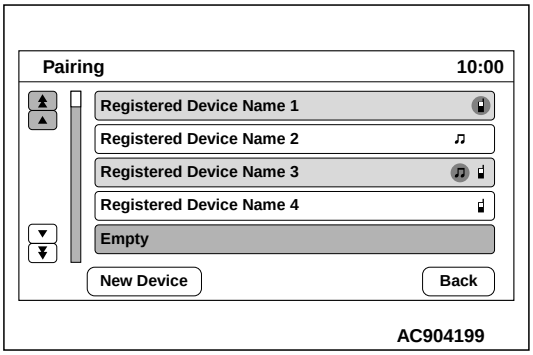
3. Select "Pairing."



4. The pairing list screen is displayed.

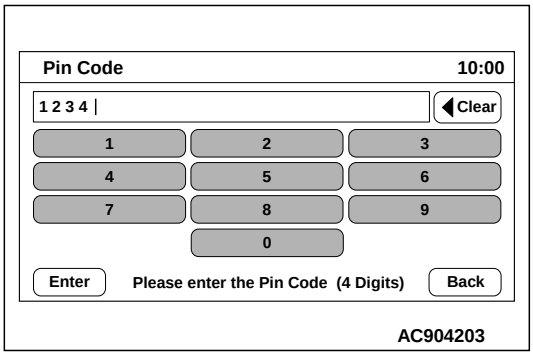
PAIRING OPERATION OF BLUETOOTH® DEVICE

Shift the selector lever to P (parking) or N (neutral) position and pull the parking brake lever.



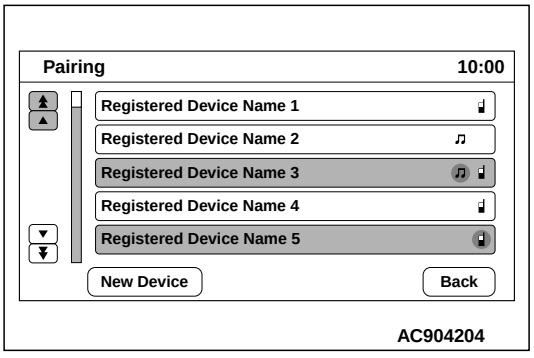
1. Display the pairing list screen, and select "New Device."

   NOTE: When the vehicle is being driven, or when the vehicle is driven during the pairing operation, "This function is disabled while driving." is displayed for 4 seconds, and the display returns to the pairing list screen.



2. Enter the 4-digit code on the Pin code screen, and select "Enter."
3. "Begin Pairing procedure on device. See device's manual for instructions." is displayed on the screen.
4. Refer to the owner's manual for your device and enter into the device the pin code.

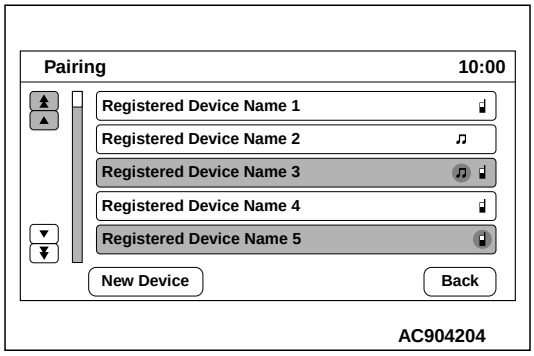
NOTE: When "Cancel" is selected or the pairing is failed, the display returns to the pairing list screen.



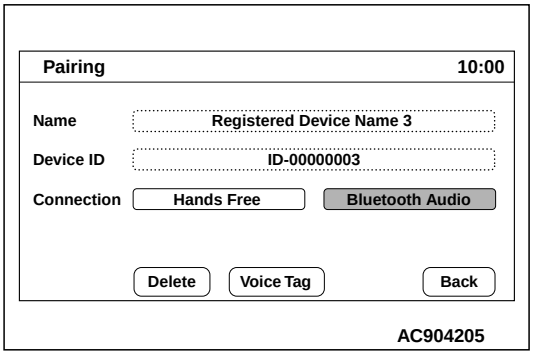
5. When the pairing is completed, the display returns to the pairing list screen.

NOTE: When 7 Bluetooth® devices are already paired to the hands free ECU, "Maximum device paired. Please delete a paired device before pairing a new device." is displayed.

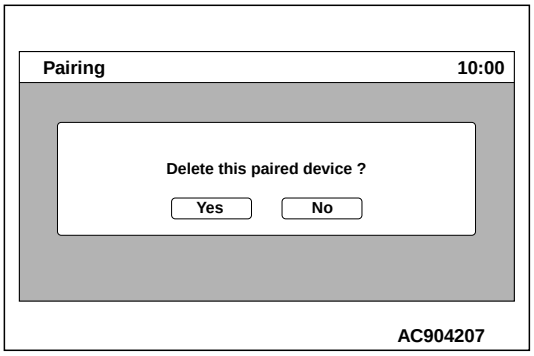
DELETE OPERATION OF BLUETOOTH® DEVICE

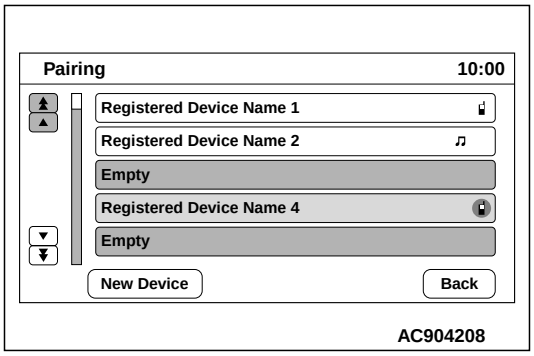


1. Display the pairing list screen, and select the "Bluetooth® device" to be deleted.



2. Select "Delete."





3. When "Yes" is selected, the Bluetooth® device is deleted and the display returns to the pairing list screen.

ERASE THE PASSWORD

M1544403800482

The 4-digit password set by security function can be erased by the diagnosis mode. Perform the "UNLOCK" operation of the diagnosis mode. (Refer to P.54A-406.)

ENGLISH SELECTION USING AUDIO SYSTEM <VEHICLES WITH RADIO AND CD PLAYER (TYPE 2)>

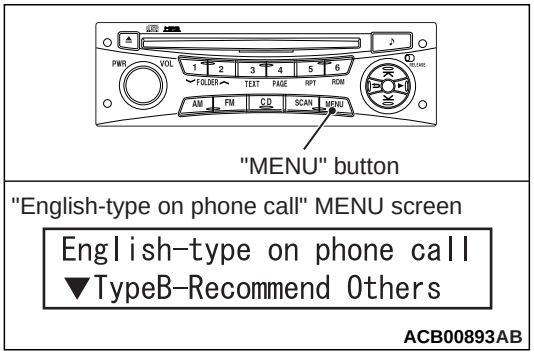
M1544406600023

The language can be switched between Australian English and British English by using the MENU mode of the radio and CD player when the user has selected English as the voice recognition language of the hands free system. The initial setting of the radio and CD player is set to British English. If the language setting of the radio and CD player is changed, the setting will be held until the radio and CD player is reset.

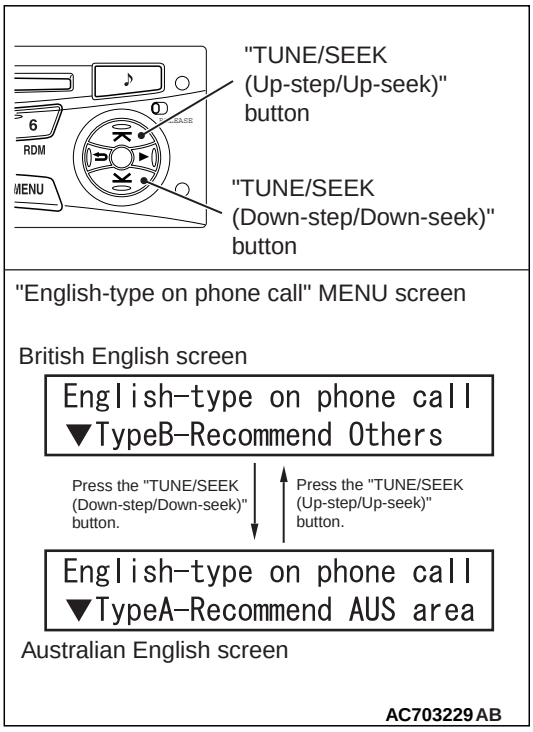
NOTE: When the radio and CD player defaults to the initial setting by replacing the radio and CD player or by removing the battery, set the radio and CD player again.

Procedure for selecting voice recognition language between Australian English and British English

1. Turn the ignition switch to the ACC position.



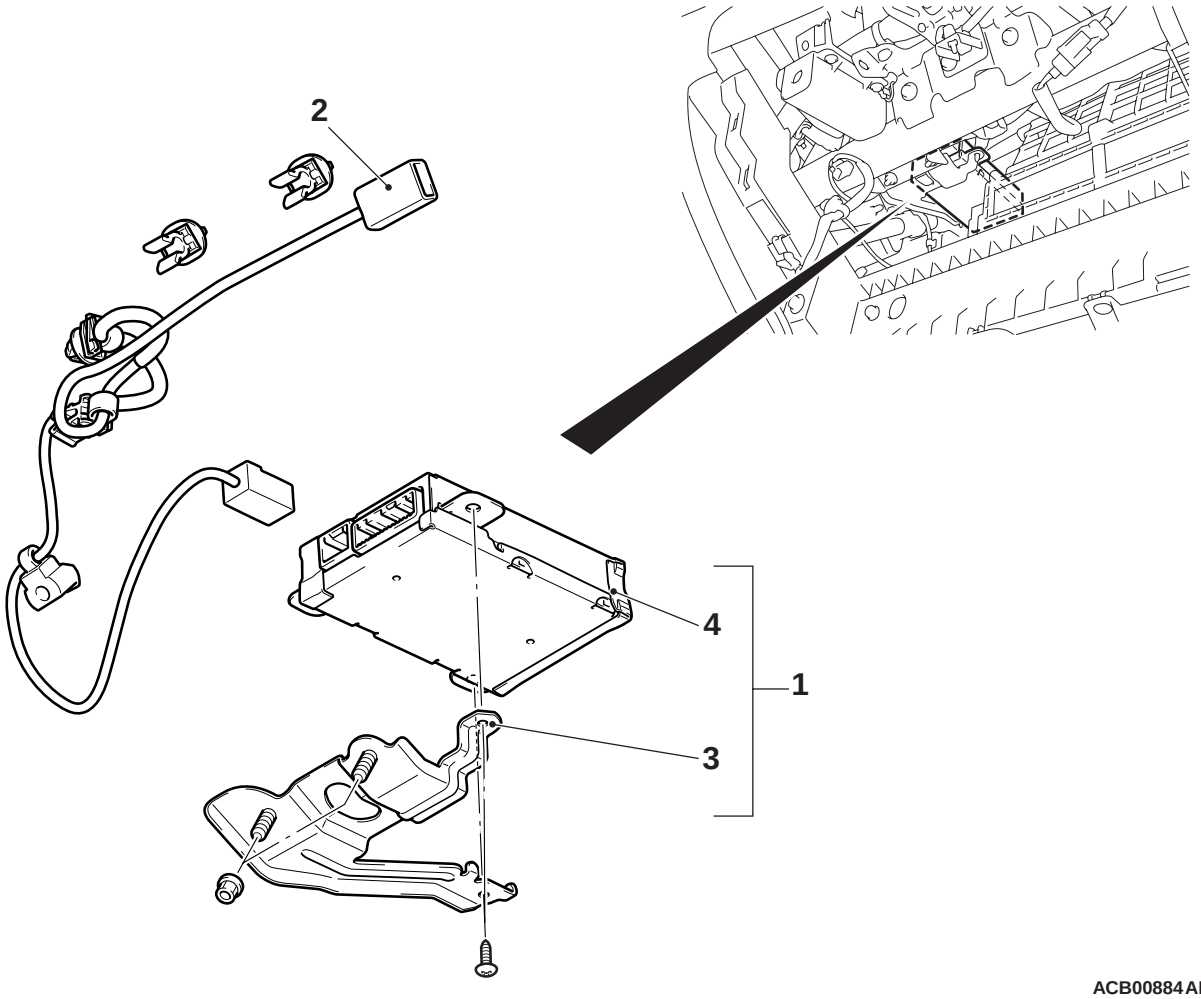
2. Press the "MENU" button of the radio and CD player shortly to switch to the MENU mode.
3. Repeat pressing the "MENU" button of the radio and CD player shortly until the "English-type on phone call" menu is displayed on the MENU mode screen.



4. By pressing the "TUNE/SEEK (Up-step/Up-seek)" button or the "TUNE/SEEK (Down-step/Down-seek)" button of the radio and CD player while the "English-type on phone call" menu is displayed, the display will switch between Australian English and British English.
5. After selecting the language, shortly press the "MENU" button of the radio and CD player to exit the MENU mode.
6. Turn the ignition switch to the "LOCK" (OFF) position, and after approximately 30 seconds, turn it to the ON position again. The language will be switched.

HANDS FREE ECU REMOVAL AND INSTALLATION

M1544405400286



ACB00884AB

Removal steps

- Glove box, glove box cover (Refer to GROUP 52A, Instrument panel assembly)

1. Hands free ECU and bracket

Removal steps (Continued)

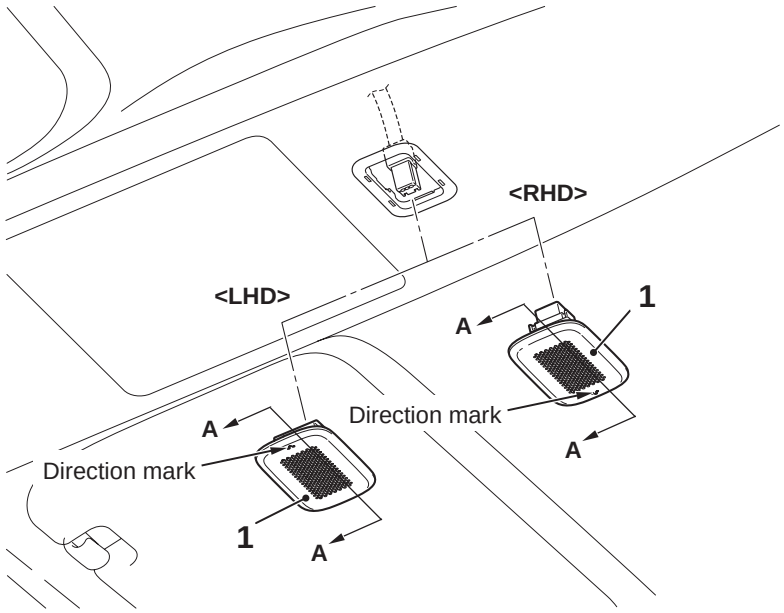
- Harness connector connection

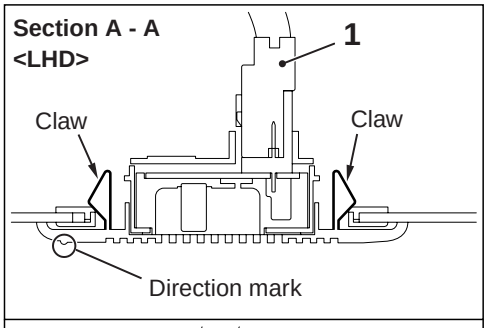
2. USB cable
3. Bracket
4. Hands free ECU

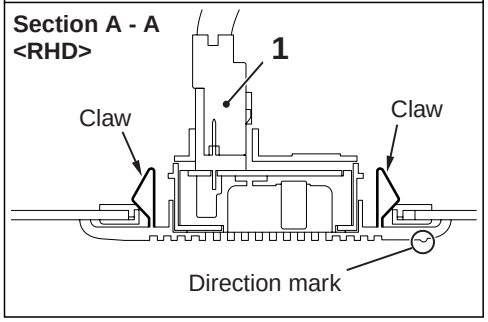
MICROPHONE UNIT REMOVAL AND INSTALLATION

M1546023300294

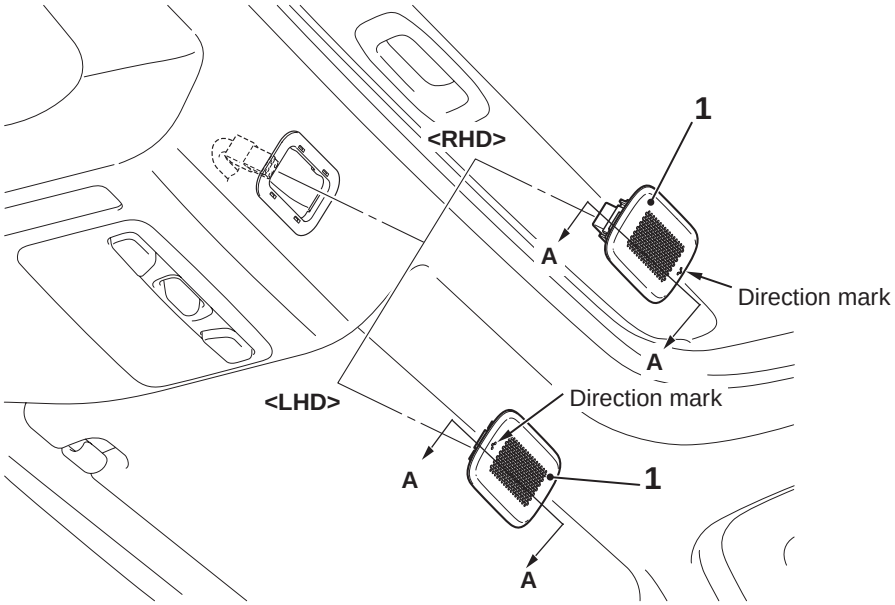
<Vehicles without sunroof>







<Vehicles with sunroof>



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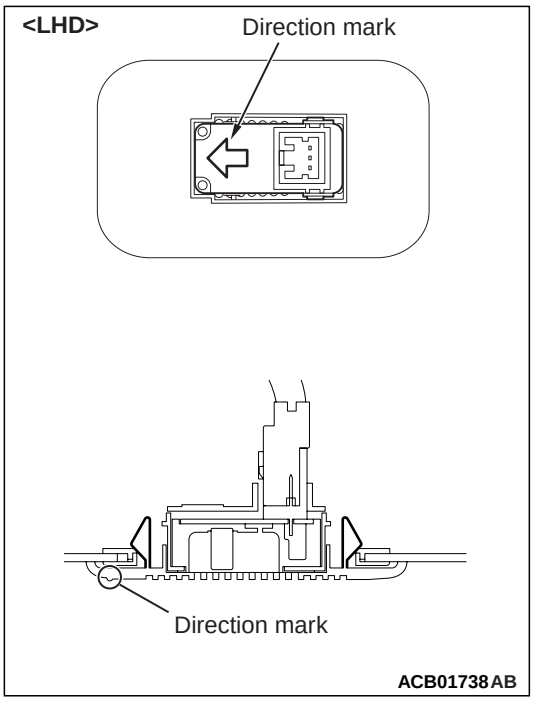
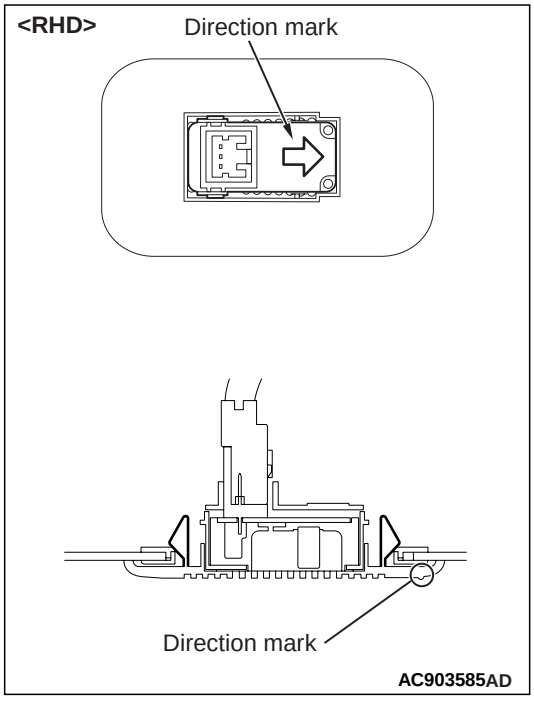
Removal Step

>>**A**<< 1. Microphone unit

INSTALLATION SERVICE POINT

>>A<< MICROPHONE UNIT INSTALLATION

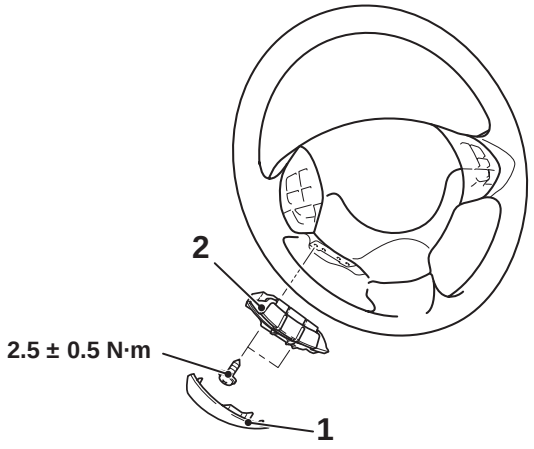




Install the microphone unit so that the arrow and direction mark face toward the driver's seat.

REMOVAL AND INSTALLATION

M1546024200290



AC802108AB

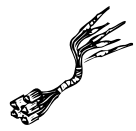
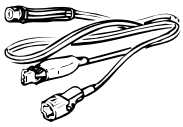
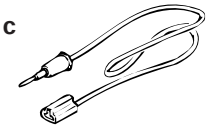
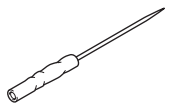
Removal Steps

1. Steering wheel voice control switch cover
2. Steering wheel voice control switch

USB BOX

SPECIAL TOOLS

M1549100300028

Tool	Number	Name	Use
a  b  c  d MB991223	MB991223 a. MB991219 b. MB991220 c. MB991221 d. MB991222	Harness set a. Check harness b. LED harness c. LED harness adapter d. Probe	Continuity check and voltage measurement at harness wire or connector a. For checking connector pin contact pressure b. For checking power supply circuit c. For checking power supply circuit d. For connecting a locally sourced tester
 MB992006	MB992006	Extra fine probe	Continuity check and voltage measurement at harness wire or connector

TROUBLESHOOTING

STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING

M1549100400207

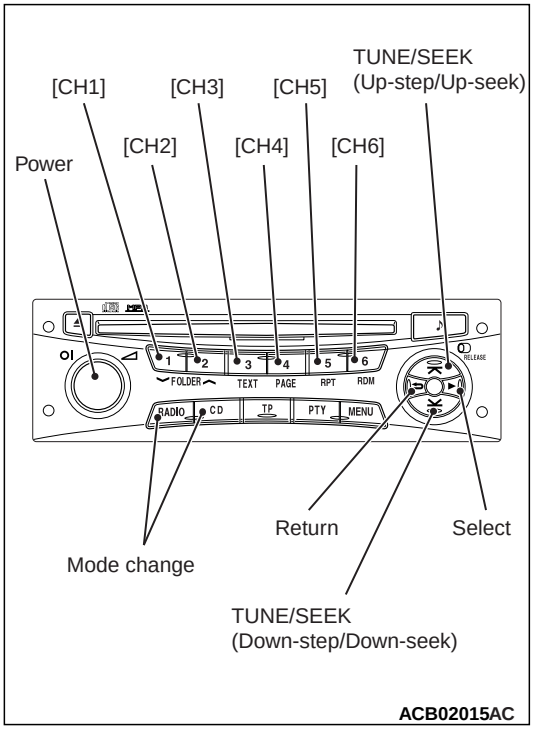
Refer to GROUP 00 – Troubleshooting contents .

DIAGNOSIS MODE <USING RADIO AND CD PLAYER>

M1549101600293

Enter the diagnosis mode according to the following steps:

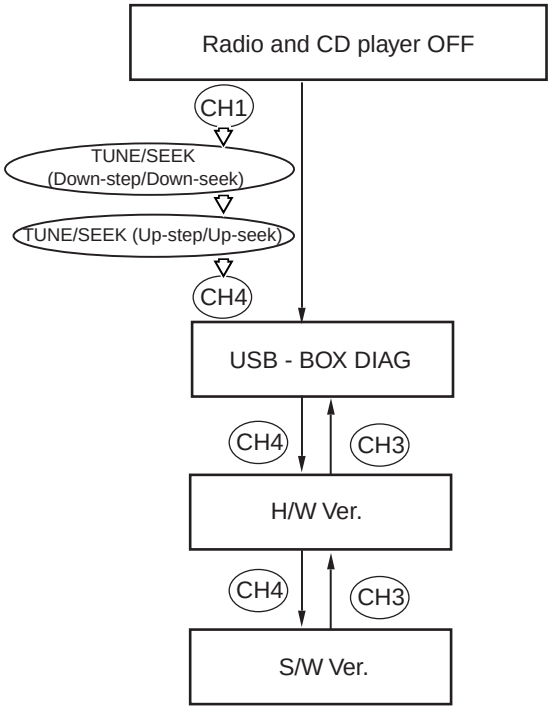
1. Turn the Ignition switch to the "ACC" or "ON" position and switch off the radio and CD player.



2. Press the following buttons in that order within sixty seconds from step (1).
   (1) [CH1] button.
   (2) TUNE/SEEK (Down-step/Down-seek) button.
   (3) TUNE/SEEK (Up-step/Up-seek) button.
   (4) [CH4] button.

NOTE: When the "Power" button of the radio and CD player is pressed during the diagnosis mode, the diagnosis mode will be cancelled, thus switching off the radio and CD player.

3. "USB - BOX DIAG" is displayed.



AC905418AD

Description in the illustrations	Actual display	Condition
USB - BOX DIAG	USB - BOX DIAG	Displayed when the diagnosis mode is being entered.
H/W Ver.	H/W XX	Two-digit hardware version is displayed.
S/W Ver.	S/W XXXXXXX	Seven-digit software version is displayed.

DIAGNOSIS MODE <USING MULTIVISION DISPLAY>

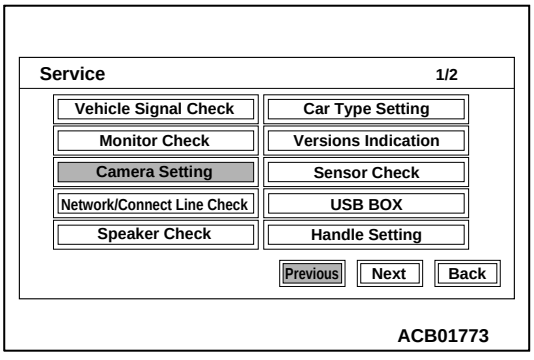
M1549101600301

HOW TO INITIATE THE SERVICE MODE

Refer to MMCS - Service mode P.54A-305.

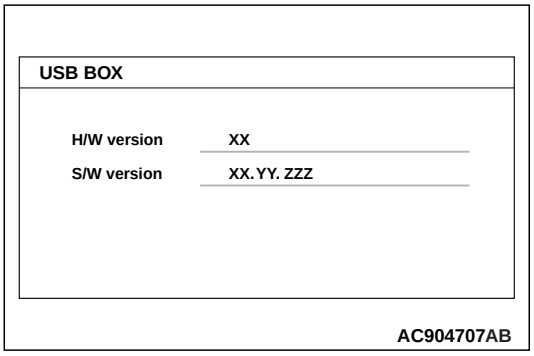
HOW TO TERMINATE THE SERVICE MODE

Refer to MMCS - Service mode P.54A-305.



ACB01773

1. Select "USB BOX" on "Service" screen.



AC904707AB

2. Displays the version information of the USB box.

NOTE:

- *H/W version: The hardware version information of the USB box is displayed in 2 digits.*
- *S/W version: The software version information of the USB box is displayed in 7 digits.*

TROUBLE SYMPTOM CHART

M1549100500248

Trouble symptom		Reference page
The USB memory device data cannot be replayed.	Vehicles with radio and CD player	P.54A-435
	Vehicles with MMCS	P.54A-438

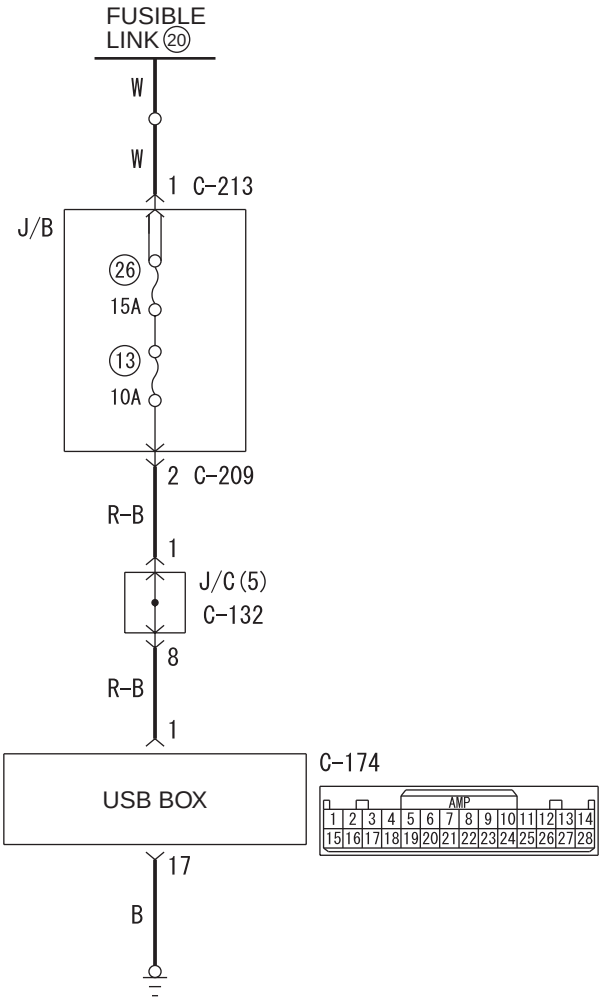
SYMPTOM PROCEDURES

The USB memory device data cannot be replayed. <Vehicles with radio and CD player>

⚠ CAUTION

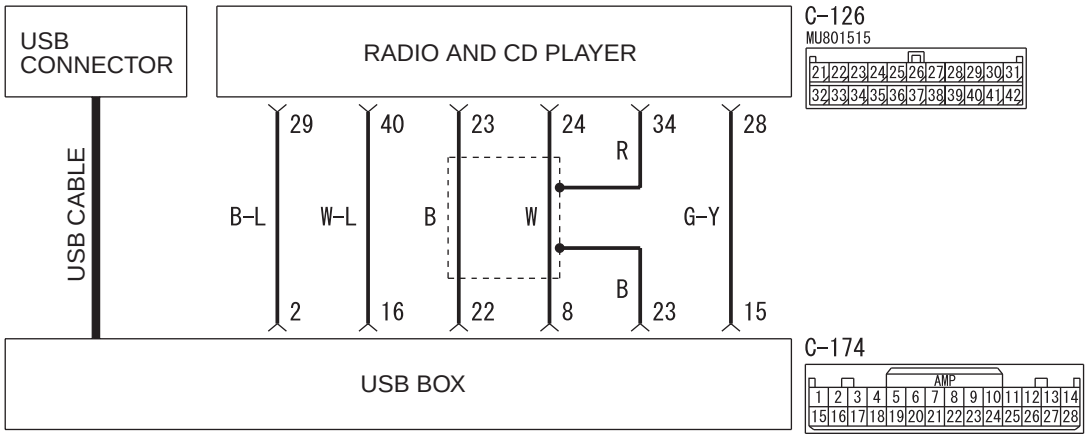
Before replacing the USB box, ensure that the power supply circuit, the earth circuit and the communication circuit are normal.

USB Box Power Source Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver WDC54E010A

USB Box Communication Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver WDC54E011A

COMMENTS ON TROUBLE SYMPTOM

If the sound replay is impossible with the USB mode, USB cable, USB box, or radio and CD player may be defective, or a communication error between the radio and CD player and USB box may have occurred.

NOTE: ""USB LSI ERROR" is displayed on the RV meter when the USB box has an internal error. In this case, the USB box has an internal error.

PROBABLE CAUSES

- The radio and CD player may be defective.
- The USB box may be defective.
- The USB cable may be defective.
- Damaged harness wires and connectors

DIAGNOSIS

STEP 1. Check the radio and CD player operation.

Check if the radio and CD player work normally and the sound is output.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Troubleshoot the radio and CD player P.54A-232.

STEP 2. Check the external sounds input mode.

Check if the audio unit is switched to the "USB mode".

Q: Is the check result normal?
YES : Go to Step 3.
NO : Switch to the external sounds input mode.

STEP 3. Check the RV meter

Check if the RV meter is displayed the "LSI ERROR".

Q: Is the check result normal?
YES : Go to Step 12.
NO : Go to Step 4.

STEP 4. Check the USB cable.

Check that the USB cable is connected to the USB box normally. Or check the USB cable for damage such as bend.

Q: Is the check result normal?
YES : Go to Step 5.
NO : Replace or repair the USB cable.

STEP 5. Connector check: C-174 USB box connector

Q: Is the check result normal?
YES : Go to Step 6.
NO : Repair the defective connector.

STEP 6. Voltage measurement at C-174 USB box connector.

(1) Disconnect the connector, and measure at the wiring harness-side connector.
(2) Voltage between connector terminal No.1 and the body earth

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 8.
NO : Go to Step 7.

STEP 7. Check the wiring harness between C-174 USB box connector terminal No.1 and fusible link 20.

- Check the power supply lines (battery power supply) for open circuit and short circuit.

NOTE: Prior to the wiring harness inspection, check junction block connectors C-209, C-213 and joint connector C-132, and repair if necessary.

Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

NO : Repair the wiring harness.

STEP 8. Resistance measurement at C-174 USB box connector.

(1) Disconnect C-60 USB box connector, and measure the resistance available at the wiring harness side of the connector.

(2) Check the continuity between terminal No.17 and body earth.

OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?

YES : Go to Step 10.

NO : Go to Step 9.

STEP 9. Check the wiring harness between C-174 USB box connector terminal No.17 and body earth.

- Check the earth wires for open circuit.

Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

NO : Repair the wiring harness.

STEP 10. Connector check: C-126 radio and CD player connector

Q: Is the check result normal?

YES : Go to Step 11.

NO : Repair the defective connector.

STEP 11. Check the wiring harness between C-126 radio and CD player connector terminal No. 23, 24, 28, 29, 34, 40 and C-174 USB box connector terminal No. 22, 8, 15, 2, 23, 16.

- Check the communication line for open circuit and short circuit.

Q: Is the check result normal?

YES : Go to Step 12.

NO : Repair the wiring harness.

STEP 12. Replace the USB box temporarily, and check the trouble symptom.

Replace the USB box temporarily, and check that the sound is output from the speaker.

Q: Is the check result normal?

YES : Replace the USB box.

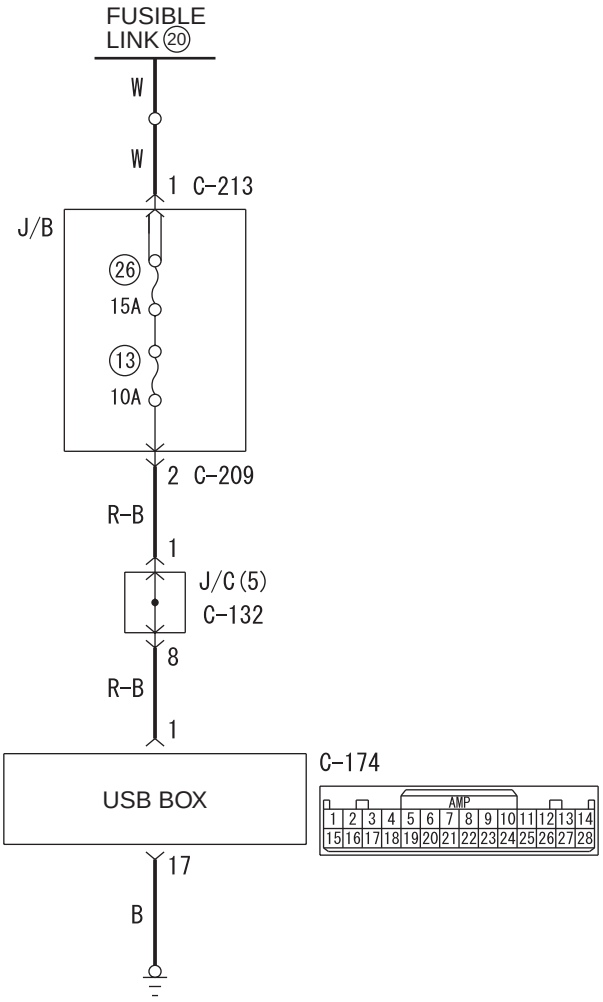
NO : Replace the radio and CD player.

The USB memory device data cannot be replayed. <Vehicles with MMCS>

⚠ CAUTION

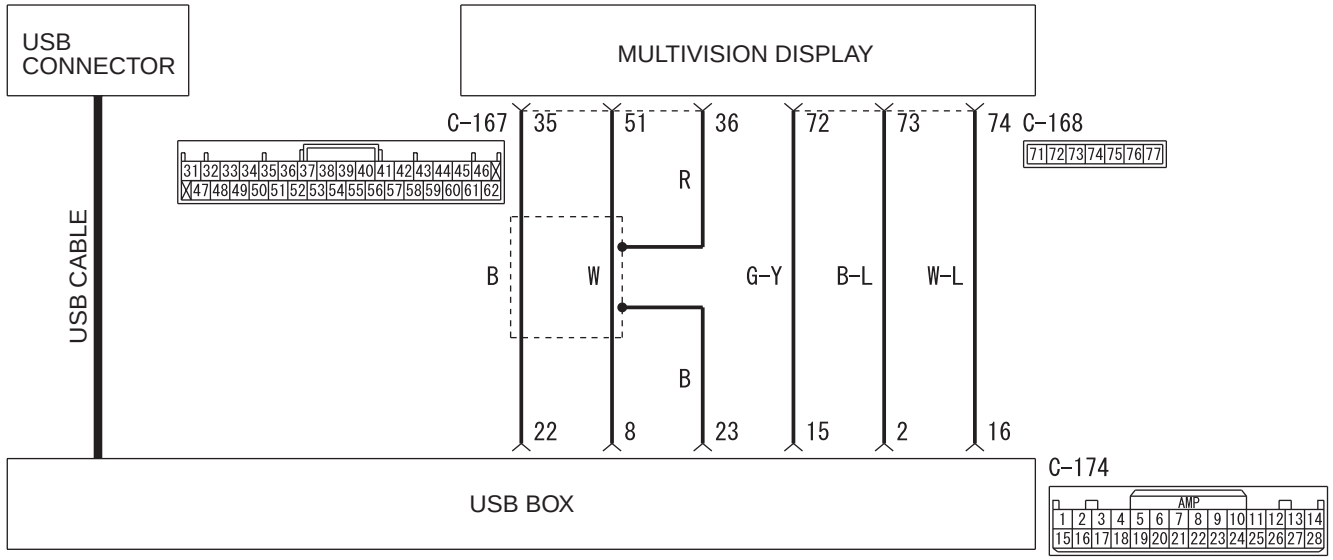
Before replacing the USB box, ensure that the power supply circuit, the earth circuit and the communication circuit are normal.

USB Box Power Source Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver WDC54E010A

USB Box Communication Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver WDC54E012A

COMMENTS ON TROUBLE SYMPTOM
If the sound replay is impossible with the USB/iPod mode, USB cable, USB box, or multivision display may be defective, or a communication error between the multivision display and USB box may have occurred.

PROBABLE CAUSES
- The multivision display may be defective.
- The USB box may be defective.
- The USB cable may be defective.
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. Check the multivision display operation.
Check if the multivision display work normally and the sound is output.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Troubleshoot the MMCS. (Refer to P.54A-314.)

STEP 2. Check the multivision display operation.
Display the A/V Mode screen, and check that the "USB/iPod" item is displayed.

Q: Is the check result normal?
YES : Go to Step 12.
NO : Go to Step 3.

STEP 3. Check the USB cable.
Check that the USB cable is connected to the USB box normally. Or check the USB cable for damage such as bend.

Q: Is the check result normal?
YES : Go to Step 4.
NO : Replace or repair the USB cable.

STEP 4. Connector check: C-174 USB box connector

Q: Is the check result normal?
YES : Go to Step 5.
NO : Repair the defective connector.

STEP 5. Voltage measurement at C-174 USB box connector.
(1) Disconnect the connector, and measure at the wiring harness-side connector.
(2) Voltage between connector terminal No.1 and the body earth

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 7.
NO : Go to Step 6.

STEP 6. Check the wiring harness between C-174 USB box connector terminal No.1 and fusible link 20.

- Check the power supply lines (battery power supply) for open circuit and short circuit.

NOTE: Prior to the wiring harness inspection, check junction block connectors C-209, C-213 and joint connector C-132, and repair if necessary.

Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

NO : Repair the wiring harness.

STEP 7. Resistance measurement at C-174 USB box connector.

(1) Disconnect C-60 USB box connector, and measure the resistance available at the wiring harness side of the connector.

(2) Check the continuity between terminal No.17 and body earth.

OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?

YES : Go to Step 9.

NO : Go to Step 8.

STEP 8. Check the wiring harness between C-174 USB box connector terminal No.17 and body earth.

- Check the earth wires for open circuit.

Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

NO : Repair the wiring harness.

STEP 9. Connector check: C-167, C-168 multivision display connector

Q: Is the check result normal?

YES : Go to Step 10.

NO : Repair the defective connector.

STEP 10. Check the wiring harness between C-167 multivision display connector terminal No. 35, 36, 51 and C-174 USB box connector terminal No. 22, 23, 8.

- Check the communication line for open circuit and short circuit.

Q: Is the check result normal?

YES : Go to Step 11.

NO : Repair the wiring harness.

STEP 11. Check the wiring harness between C-168 multivision display connector terminal No. 72, 73, 74 and C-174 USB box connector terminal No. 15, 2, 16.

- Check the communication line for open circuit and short circuit.

Q: Is the check result normal?

YES : Go to Step 12.

NO : Repair the wiring harness.

STEP 12. Replace the USB box temporarily, and check the trouble symptom.

Replace the USB box temporarily, and check that the sound is output from the speaker.

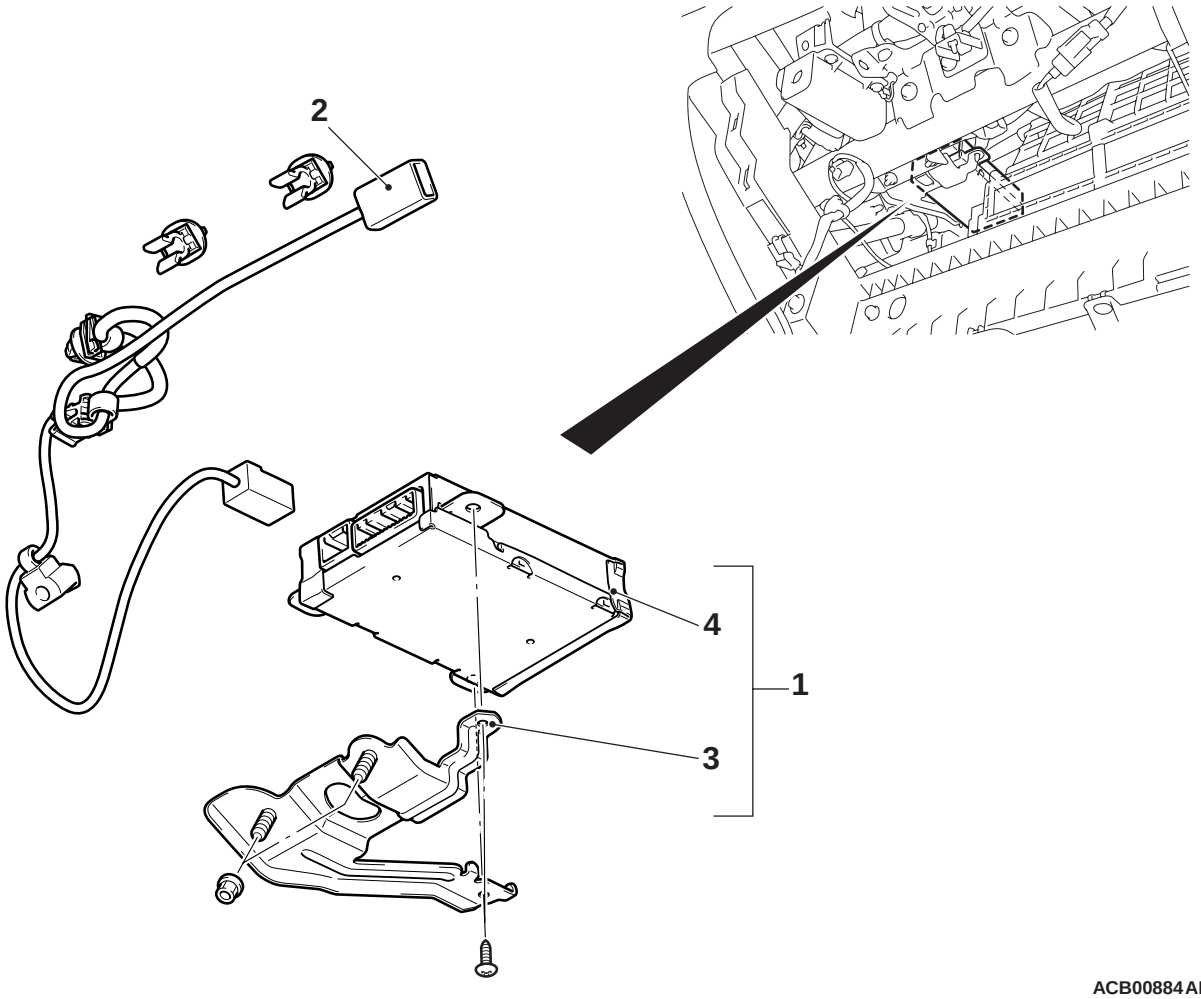
Q: Is the check result normal?

YES : Replace the USB box.

NO : Replace the multivision display.

REMOVAL AND INSTALLATION

M1549100900246



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Removal steps

- Glove box, glove box cover (Refer to GROUP 52A, Instrument panel assembly)

1. USB box and bracket

Removal steps (Continued)

- Harness connector connection

2. USB cable
3. Bracket
4. USB box

SPEAKER

GENERAL INFORMATION

M1544101000133

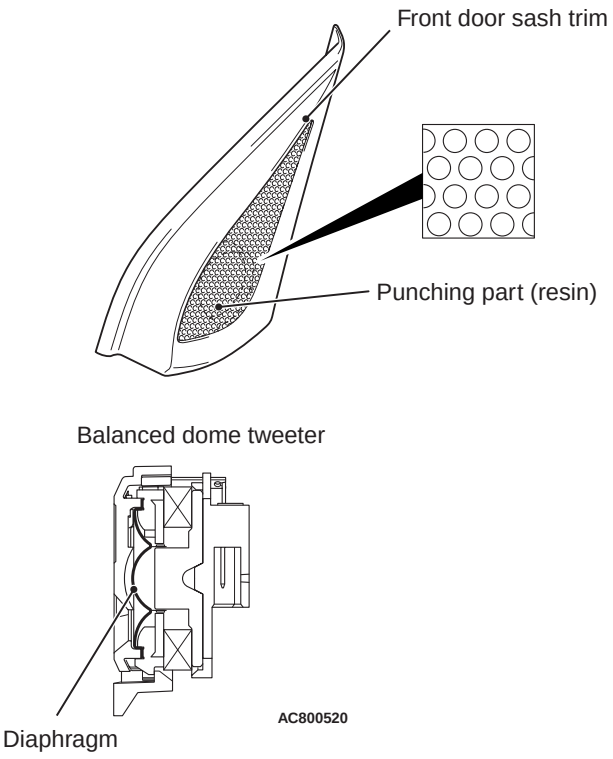
Location	Two speakers	Four speakers or six speakers	Eight speakers (six positions)
Front door	–	Balance dome tweeter – 3.5 cm <Vehicles with wide fender : option>	Aluminium hard dome tweeter – 3.5 cm
	Dual cone full range speaker– 16 cm	Dual cone full range speaker– 16 cm	Metalized hybrid pp (polypropylene) diaphragm speaker – 16 cm
Rear door	–	Dual cone full range speaker– 16 cm	Metalized hybrid PP (polypropylene) diaphragm coaxial 2 way speaker – 16 cm

Specifications

Item	Two speakers		Four speakers or six speakers		Eight speakers (six positions)	
	Allowable input power	Rated input power	Allowable input power	Rated input power	Allowable input power	Rated input power
Tweeter	–	–	25W	3W	50W	25W
Front door speaker	35W	15W	35W	15W	80W	40W
Rear door speaker	–	–	35W	15W	80W	40W

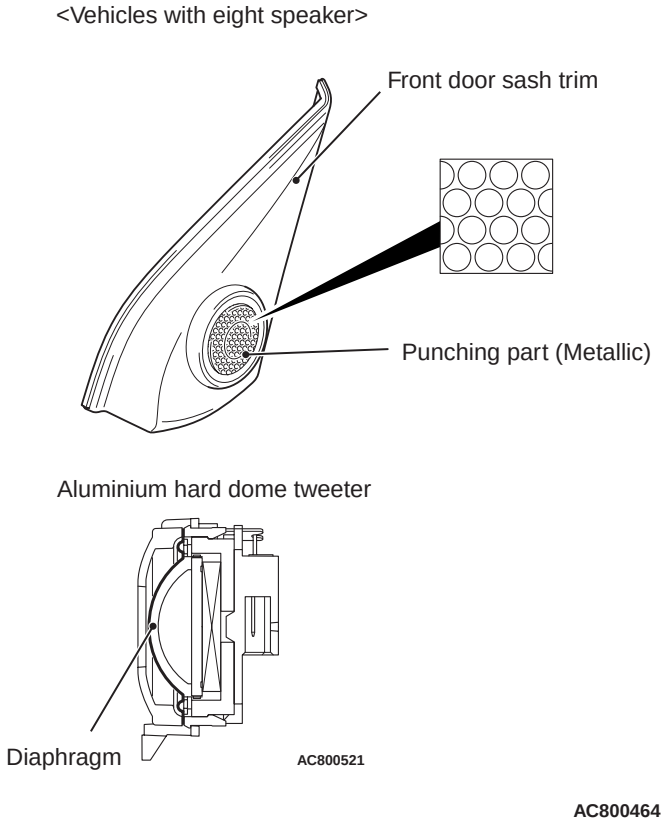
TWEETER

<Vehicles with six speaker>



- The 3.5 cm aluminium hard dome tweeter (ridgeline dome tweeter), established for vehicles with eight speakers, enables playback of at least 50-Hz ultra high frequency by using aluminium diaphragm. Furthermore, by adopting the ridgeline dome (CATS EYE), it can play highly pure and clear treble with less distortion compared with the balance dome tweeter established for vehicles with six speakers.

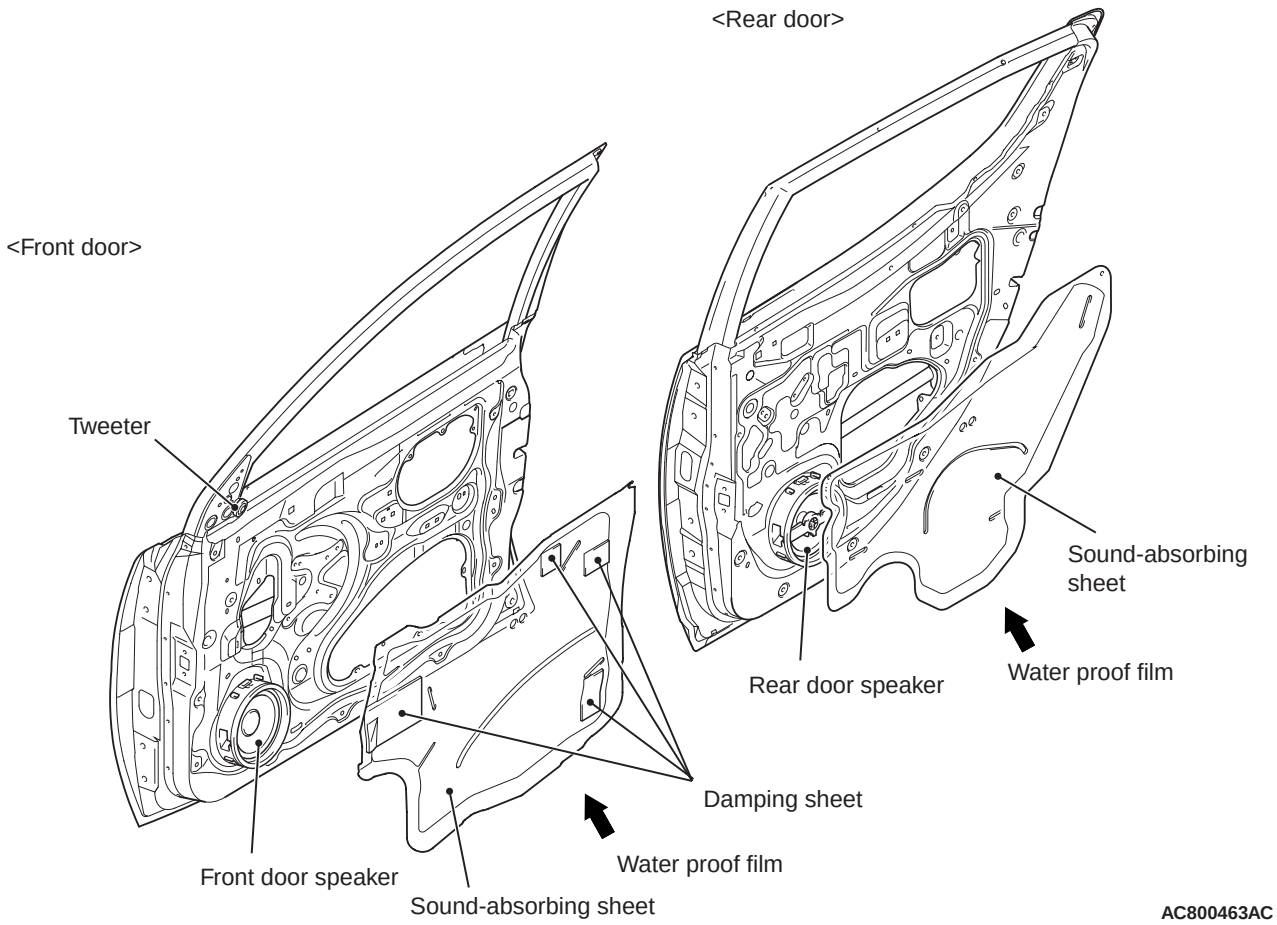
<Vehicles with eight speaker>



AC800464

- Also for vehicles with eight speakers, the punching metal type tweeter cover has been installed.With the punching metal type, the metal is adopted for the punching section to enlarge the punching opening, enabling the playback of cleaner treble.

SPEAKER



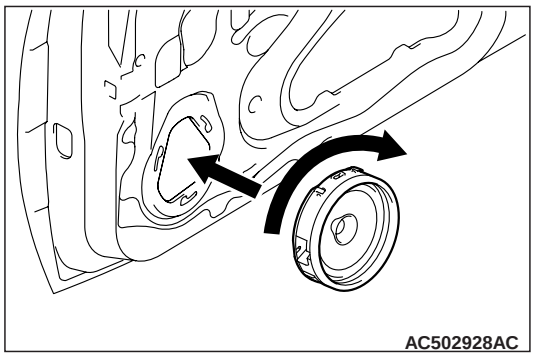
FRONT DOOR SPEAKER

For the diaphragm of 16 cm metalized hybrid PP (polypropylene) diaphragm speaker established for vehicles with eight speakers, the PP (polypropylene) has been adopted. In addition, the vacuum-evaporated metal on PP (polypropylene) surface improves sound propagation speed of paper cone, playing crisper bass sound and life-like sound.

REAR DOOR SPEAKER

The 16 cm metalized hybrid PP (polypropylene) diaphragm coaxial 2 way speaker, established for vehicles with eight speakers, is the 2 way speaker that the balance dome tweeter is combined with the speaker whose diaphragm sound propagation speed is improved by vacuum-evaporated metal on PP (polypropylene) with the same manner as the front door speaker. It can play high quality sound from treble to bass.

For vehicles with eight speakers, in addition to the improvement of speaker performance, the sound-absorbing sheet and damping sheet have been attached to the waterproof film of front door and rear door. This reduces buzz noise from the door and the reflected sound inside the door which comes from the service hole of the door, providing higher quality of sound without distortion.

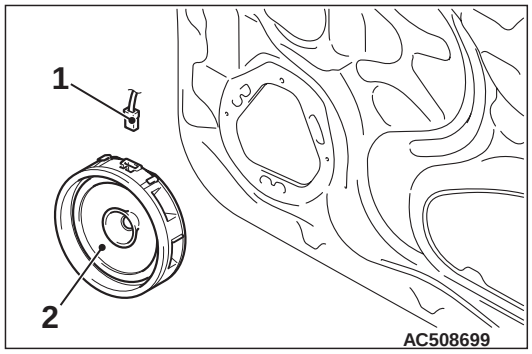


The 16-cm speaker (with 3 tabs, fixed by rotating) which can be installed by one-touch improves serviceability.

REMOVAL AND INSTALLATION

M1544100300034

DOOR SPEAKER

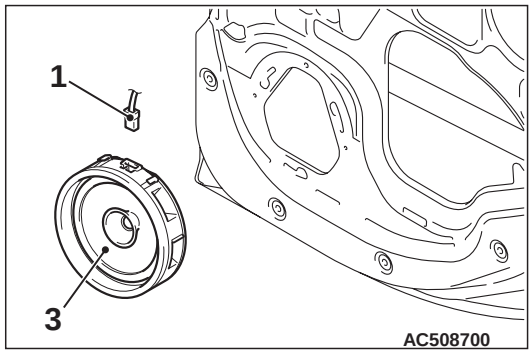


Front door speaker removal steps

- Front door trim (Refer to GROUP 52A, Door Trim .

1. Door Speaker connector connection
2. Front door Speaker

<<A>>



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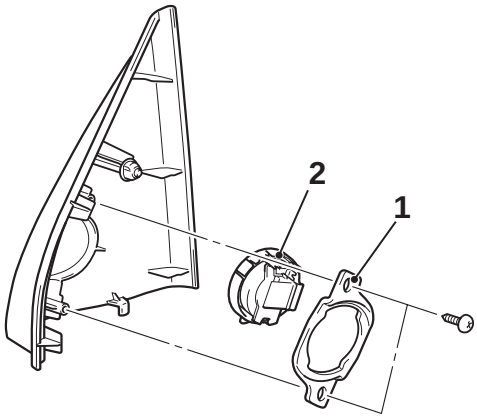
Rear door speaker removal steps

- Rear door trim (Refer to GROUP 52A, Door Trim .

1. Door Speaker connector connection
3. Rear door Speaker

<<A>>

TWEETER



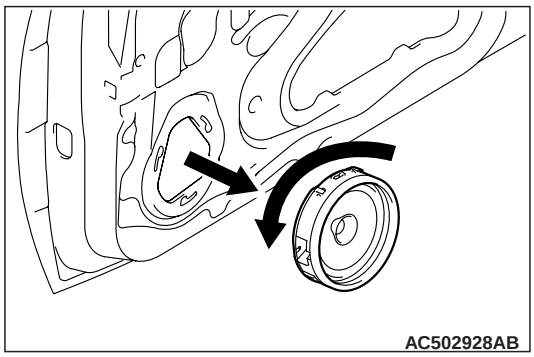
Removal steps

- Front door sash trim (Refer to GROUP 52A, Door Trim .

1. Tweeter bracket
2. Tweeter

REMOVAL SERVICE POINT

<<A>> SPEAKER REMOVAL



1. Disconnect the connector from the speaker.
2. Remove by turning the speaker to the left.

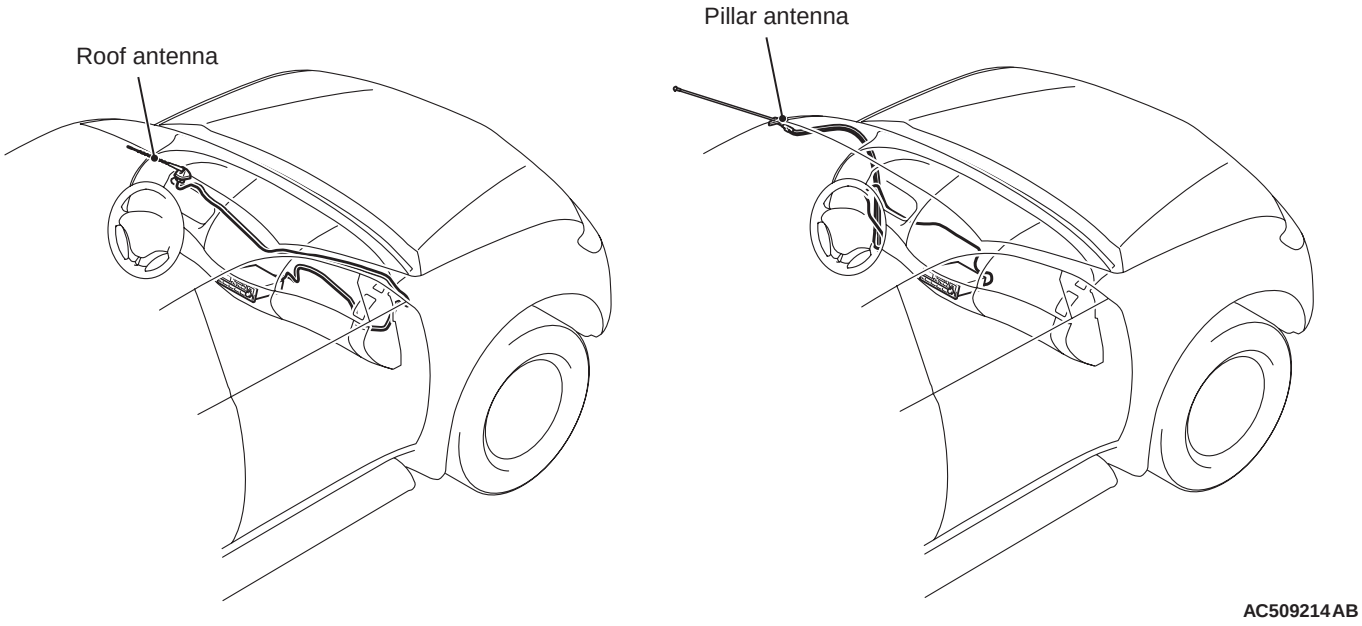
ANTENNA

GENERAL INFORMATION

M1544200500143

There are 2 types of roof antennas; the roof antenna and pillar antenna.

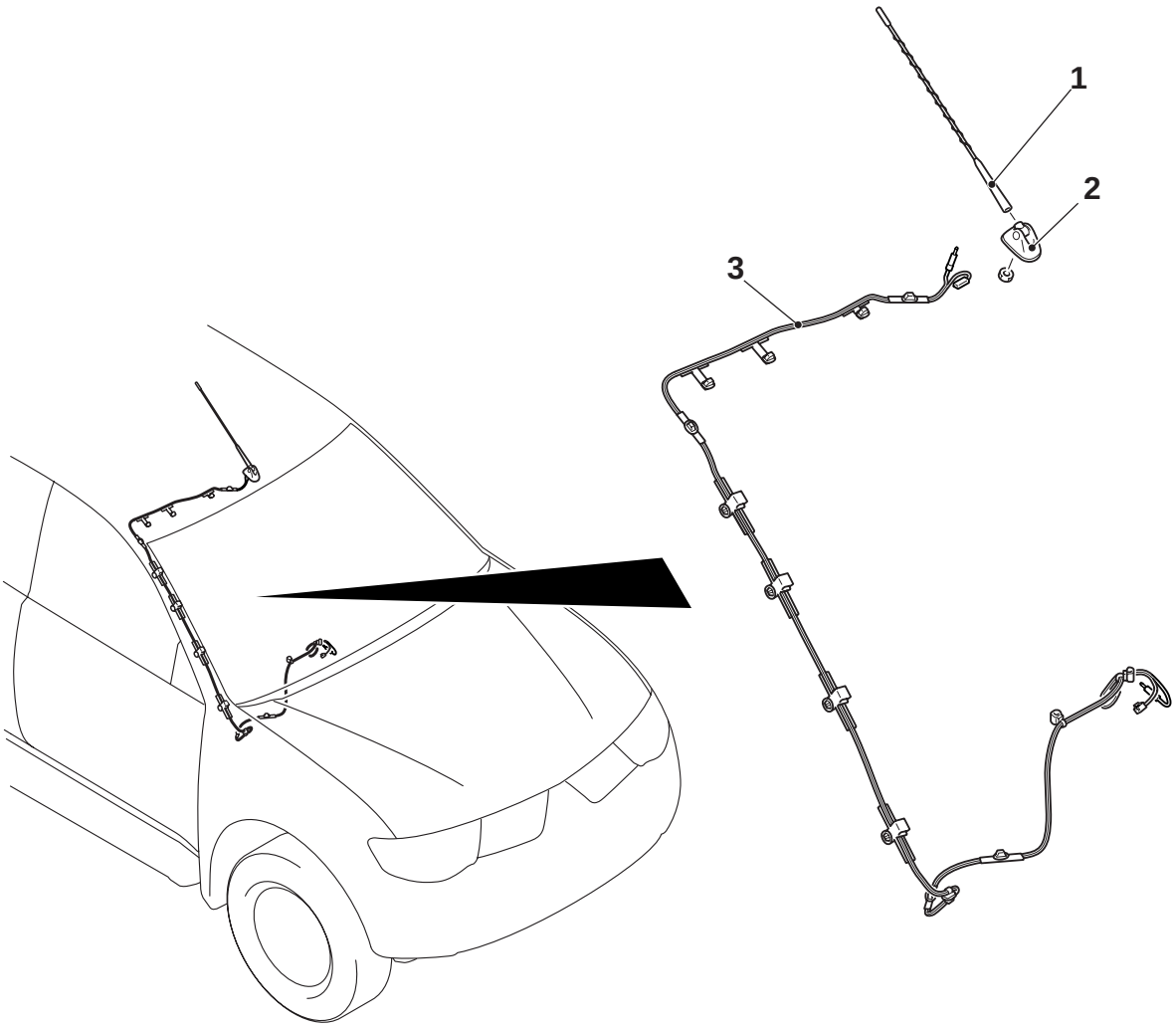
CONSTRUCTION DIAGRAM



REMOVAL AND INSTALLATION

M1544200200885

ROOF ANTENNA



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Removal steps

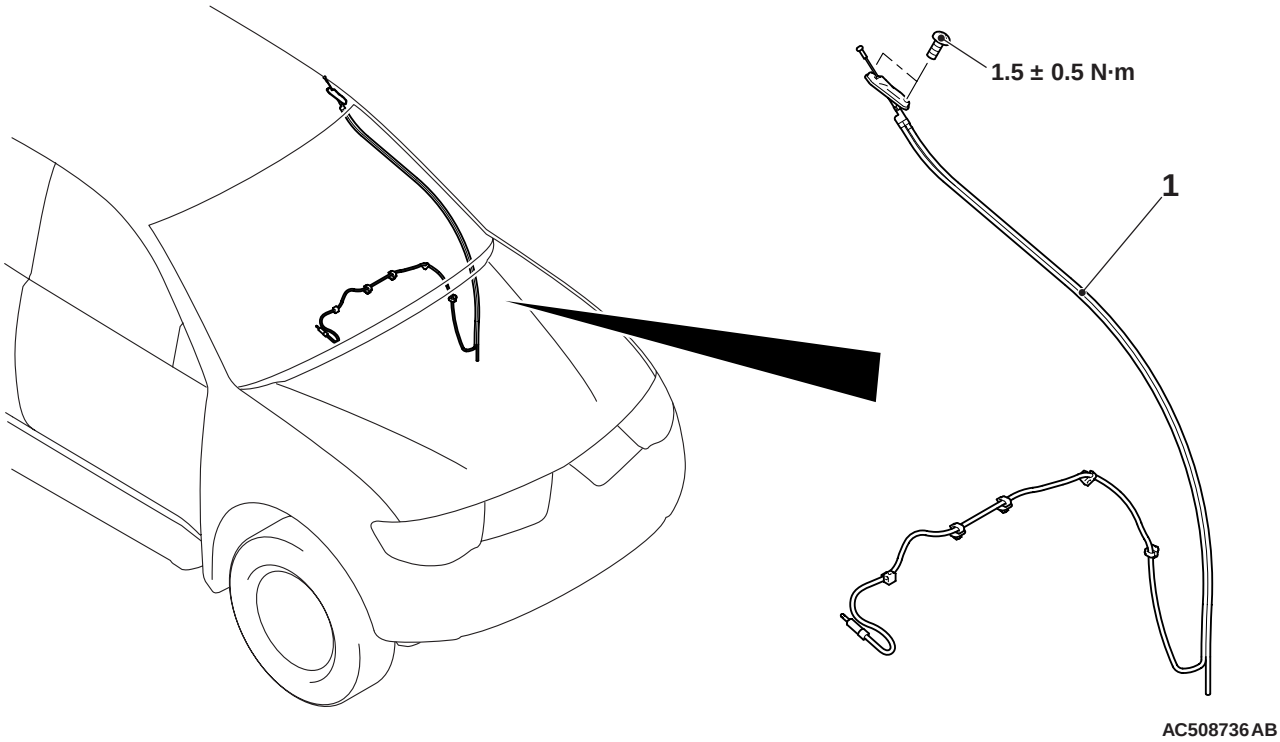
1. Antenna rod
   - Headlining (Refer to GROUP 52A, Headlining).
2. Antenna base
   - RV meter assembly (Refer to P.54A-489). <Vehicles with RV meter>

Removal steps (Continued)

- Multivision display assembly (Refer to P.54A-379). <Vehicles with MMCS>
- Centre upper box (Refer to GROUP 52A – Interior, instrument assembly). <Vehicles without MMCS and RV meter>

3. Antenna feeder cable

PILLAR ANTENNA



Removal steps

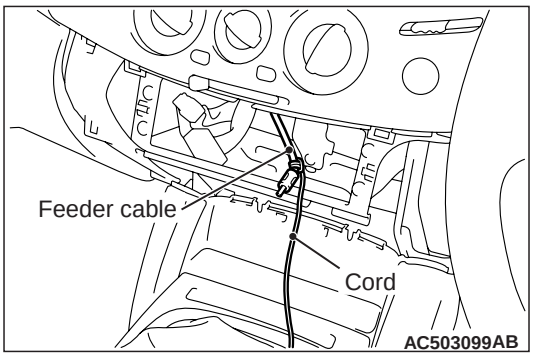
- Centre upper box hood or RV meter hood, lower panel assembly centre upper panel assembly and centre lower panel assembly (Refer to GROUP 52A, Instrument Panel Assembly).
- Radio and CD player (Refer to P.54A-294).
- Cowl side trim (Refer to GROUP 52A, Interior Trim <Single cab>).

<<A>> 1. Antenna assembly

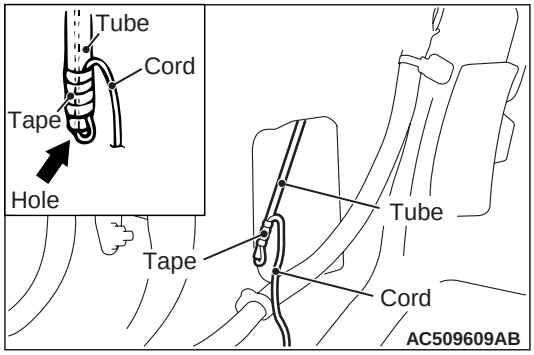
REMOVAL SERVICE POINT

<<A>> ANTENNA ASSEMBLY REMOVAL

Observe the following steps to make the feeder cable of the antenna to be routed easily during reinstallation.



1. Secure a cord to the end of the feeder cable.



2. Pull out the feeder cable slightly until the tube end of the antenna can been seen.

⚠ CAUTION

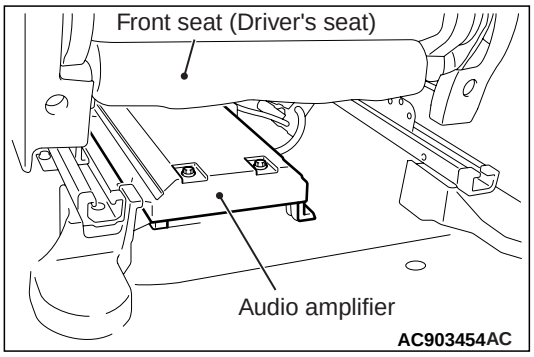
Make sure that the cord is not loosened.

3. Insert a cord into the tube end, and secure the cord with plastic tape as shown.
4. Remove the antenna assembly by pulling it gradually.

AMPLIFIER

GENERAL INFORMATION

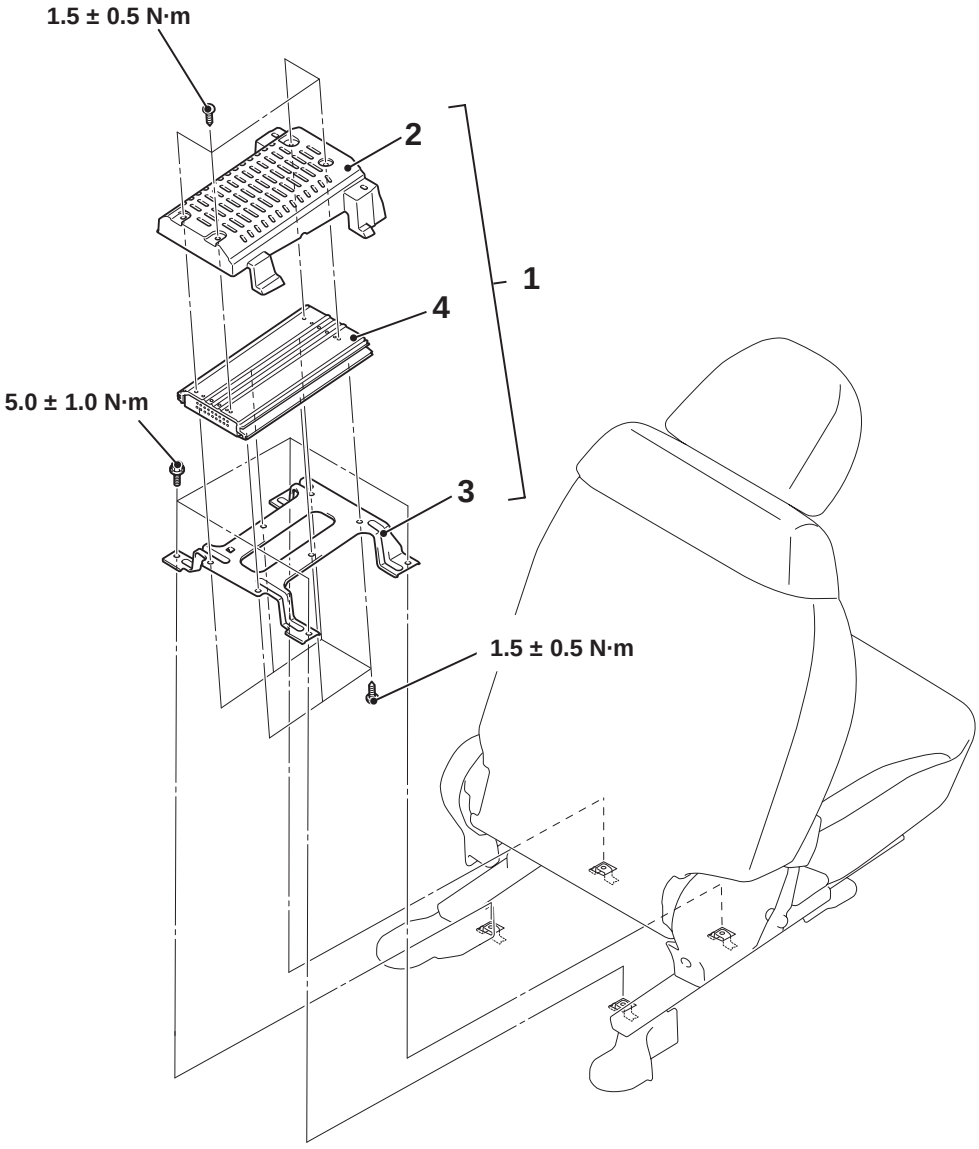
M1544000101133



The 6-channel high power audio amplifier (total output: 420 W) incorporating digital signal processor (DSP) has been established. The audio amplifier is installed under the front seat (Drives's seat).

REMOVAL AND INSTALLATION

M1544004100659



Removal Steps

1. Audio amplifier/amplifier box bracket/audio amplifier cover
2. Audio amplifier cover

Removal Steps (Continued)

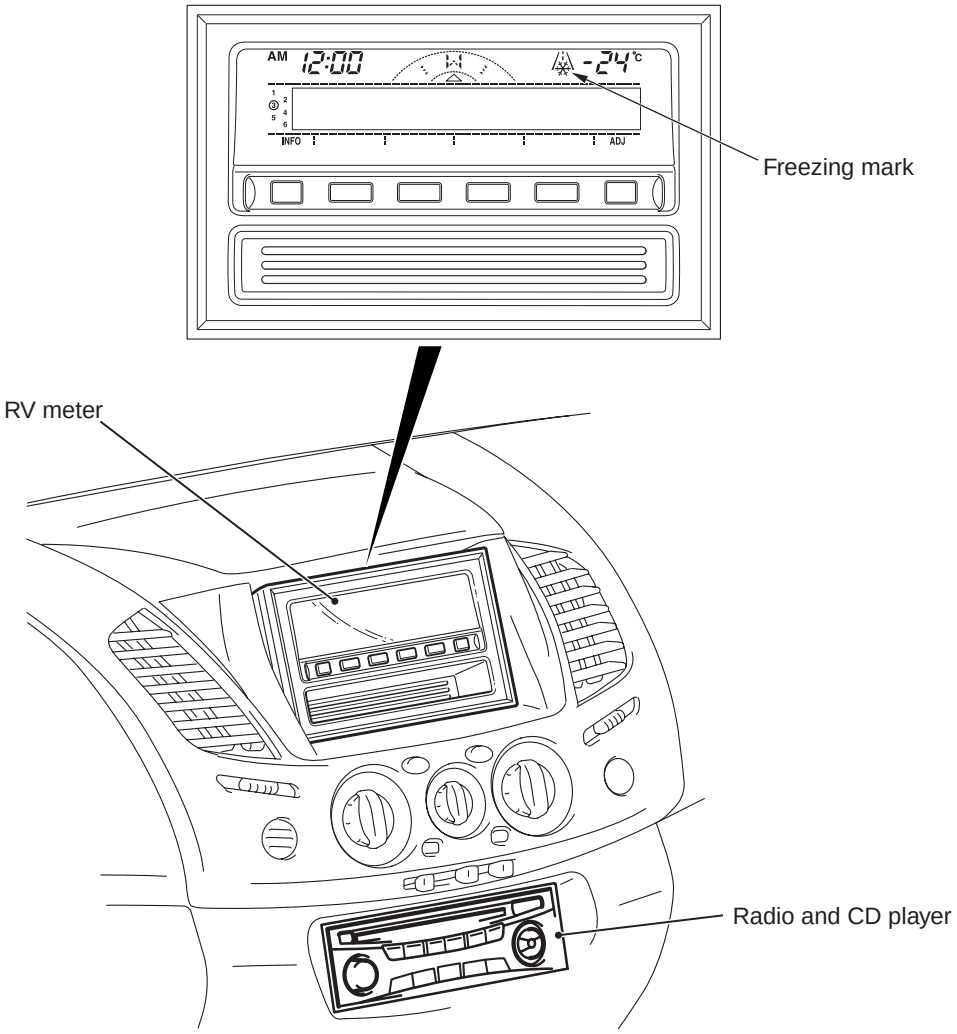
3. Amplifier box bracket
4. Audio amplifier

RV METER

GENERAL INFORMATION

M1546603700043

- The RV meter displays drive information, environmental data, time data, and audio system information.
- The direction indicator of the RV meter displays the eight directions as the result of the calculation based on the earth magnetism detected by the incorporated geomagnetism sensor.
- The atmospheric pressure indicator of the RV meter displays the reading of the incorporated atmospheric pressure sensor. Also the altitude indicator displays the conversion result of the atmospheric pressure sensor reading into altitude.



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Item for display indication			Note
Information	Drive information	Average vehicle speed	• Display can be changed to "km/h" or "mph" as an adjustment function. • Display range is 0 to 240 km/h for "km/h" and 0 to 150 mph for "mph". • Display is updated every 10 seconds when the ignition switch is in the "ON" position. • Average vehicle speed can be displayed either by a bar graph or a line graph.
		Average fuel consumption	• Display can be changed to "km/L", "L/100 km" or "mpg" as an adjustment function. • Display range is 0 to 99.9 km/L for "km/L", 0 to 99.9 L/100 km for "L/100 km", and 0 to 99.9 mpg for "mpg" . • Display is updated every 10 seconds when the ignition switch is in the "ON" position. • Average fuel consumption can be displayed either by a bar graph or a line graph.
		Possible cruising distance	• Display can be changed to "km" or "miles" as an adjustment function. • Display range is 50 to 3000 km for "km" and 30 to 2000 miles for "miles". • Display is updated every 1 km when the possible cruising distance decreases. • The cruising-available distance can be displayed by a line graph.

Item for display indication			Note
Information	Environmental data	Air temperature	• Display can be changed to "°C" or "°F" as an adjustment function. • Ambient temperature display range is −29 to 50 °C. <Vehicles with auto A/C> • Ambient temperature display range is −40 to 50 °C. <Vehicles without auto A/C> • "°F" is calculated from the value of "°C" and the display range is −40 to 122 °F. • Display is updated if the temperature rises 1 °C (1 °F) within 30 seconds or decreases 1 °C (1 °F) within 2.5 seconds. • When the air temperature is 3 °C (37 °F) or lower, the freeze mark appears and the freeze warning *2 operates.
		Direction	Head up type, 8-direction indication (N: North, E: East, W: West, S: South)
		Atmospheric pressure	• Display can be changed to "m" or "ft" as an adjustment function. • Display range is -500 to 4000 m for "m" and -1600 to 12000 ft for "ft". • Display resolution is 100m (300ft). • Display is updated every 5 seconds.
		Altitude	• Display can be changed to "hPa", "mb", "kPa", "kPa" or "inHg" as an adjustment function. • Display range is 614 to 1070 hPa for "hPa", 614 to 1070 mb for "mb", 61.4 to 107.0 kPa for "kPa", and 18.1 to 31.6 inHg for "inHg" . • Display resolution is 2hPa (2mb, 0.2kPa, 0.1inHg). • Display is updated every 5 seconds. • Altitude is calculated based on 1013.25 hPa as 0 m. (25 °C)
Information	Time data	Time	• In 24-hour system, "0:00" to "23:59" • In 12-hour system, "1:00" to "12:59" with AM/PM indication
		Date	Display range is January 1, 2009 − December 31, 2099.
	Audio system information	Radio	When the audio is in the "ON" state, the audio system information screen appears.
		CD player	When the audio is in the "ON" state, the audio system information screen appears.

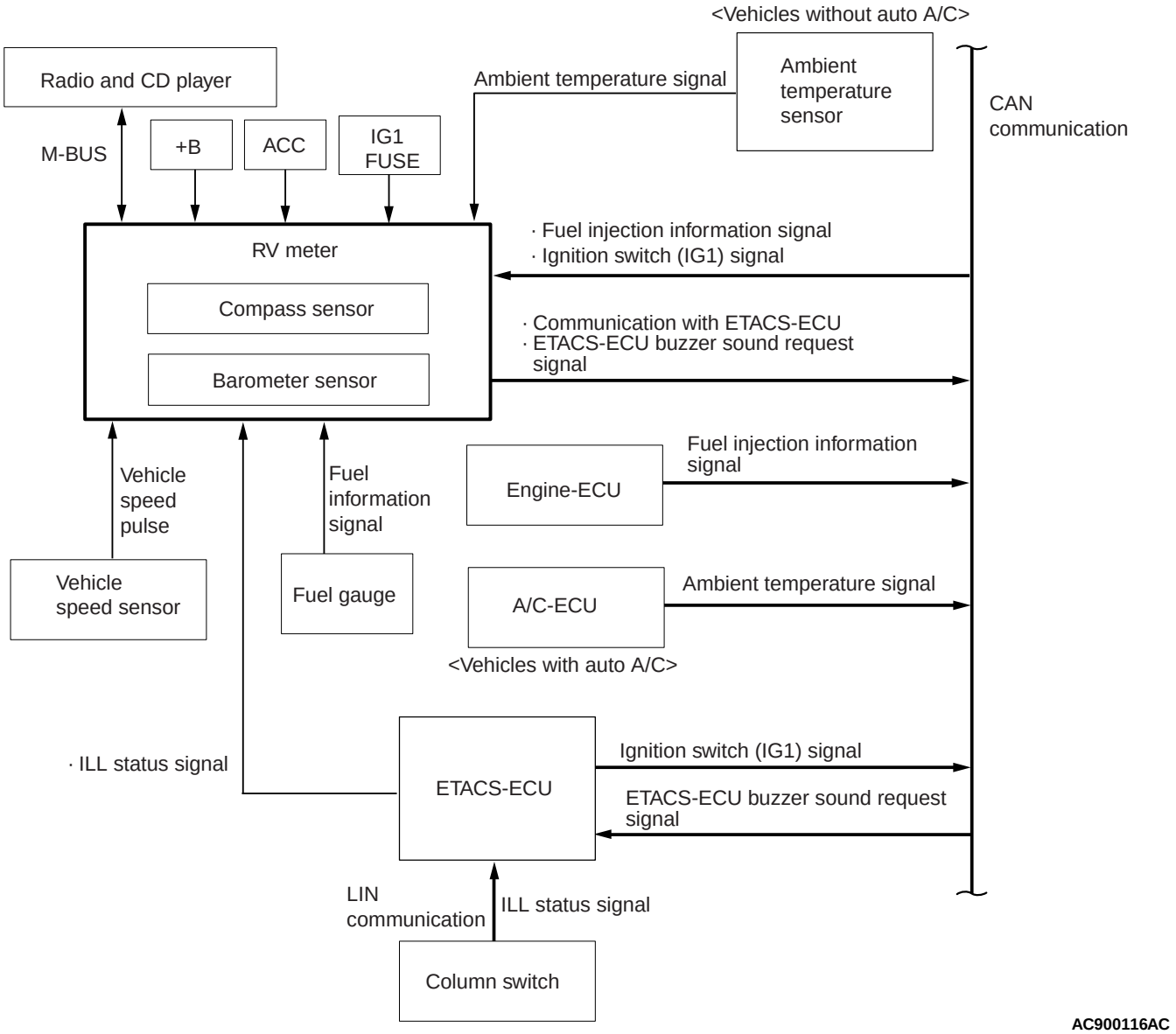
Item for display indication			Note
Settings	User settings	Clock display	–
		Display brightness adjustment	The display brightness in day/night situations is adjusted.
		Direction adjustment	The deviation of earth magnetism from place to place is adjusted.
		Calendar adjustment	The date is adjusted and the display pattern is selected.
		Atmospheric pressure adjustment	The atmospheric pressure is adjusted and the adjusted value is initialised.
		User customise	Units, language *1 (English, Spanish, French, German, Italian, Portuguese), and hour system are set and initialised.
	Audio quality/field settings	FADER, BALANCE, BASS, TREBLE	–

NOTE:

- **1: On the audio screen, only the PTY (Programme type) language can be switched. On the audio screen, the display is in English, except the PTY. (When Portuguese is selected, the PTY language is displayed in English.) And the service mode is displayed in English only.*
- **2: When the conditions descried as below are met, the freeze warning operates.*

Conditions		Display control
When the air temperature is 3 °C or lower, at the ignition switch "ON" position.		The ETACS-ECU buzzer sounds and the freeze mark flashes for 10 seconds.
When the air temperature that is over 3 °C at the ignition switch "ON" position changes to 3 °C or lower.		
After the warnings described as above is operated.	When the air temperature that is 6 °C or higher changes to 3 °C or lower	When the air temperature reaches to 6 °C, the freeze mark disappears, and when the air temperature decreases to 3 °C or lower, the freeze mark flashes for 10 seconds. However, the buzzer does not sound.
	When the air temperature that is over 3 °C but below 6 °C decreases to 3 °C or lower	When the air temperature is over 3 °C but below 6 °C, the freeze mark keeps displaying. If the air temperature decreases to 3 °C or lower again, the buzzer does not sound and the freeze mark does not flash again.

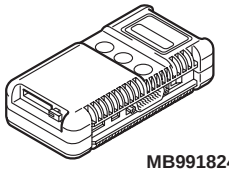
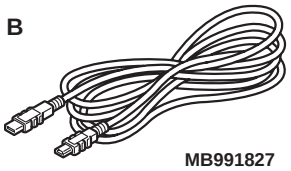
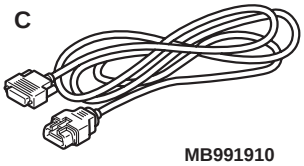
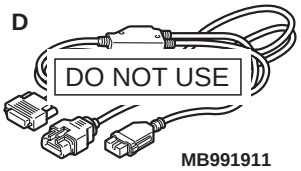
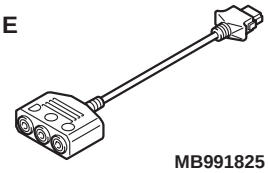
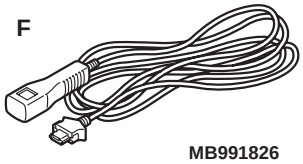
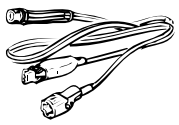
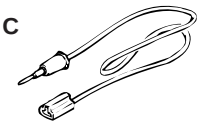
SYSTEM BLOCK DIAGRAM

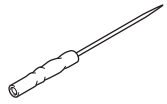


AC900116AC

SPECIAL TOOLS

M1543000602826

Tool	Number	Name	Use
A  MB991824 B  MB991827 C  MB991910 D  MB991911 E  MB991825 F  MB991826 MB991955	MB991955 A: MB991824 B: MB991827 C: MB991910 D: MB991911 E: MB991825 F: MB991826	M.U.T.-III sub-assembly A: Vehicle Communication Interface (V.C.I.) B: M.U.T.-III USB cable C: M.U.T.-III main harness A (Vehicles with CAN communication system) D: M.U.T.-III main harness B (Vehicles without CAN communication system) E: M.U.T.-III adapter harness F: M.U.T.-III trigger harness	⚠ CAUTION **For vehicles with CAN communication, use M.U.T.-III main harness A to send simulated vehicle speed. If you connect M.U.T.-III main harness B instead, the CAN communication does not function correctly.** Check for other system diagnosis code and other system data list
A B  C  D MB991223AZ	MB991223 A: MB991219 B: MB991220 C: MB991221 D: MB991222	Harness set A: Check harness B: LED harness C: LED harness adapter D: Probe	Continuity check and voltage measurement at harness wire or connector A: For checking connector pin contact pressure B: For checking power supply circuit C: For checking power supply circuit D: For connecting a locally sourced tester

Tool	Number	Name	Use
 MB992006	MB992006	Extra fine probe	Continuity check and voltage measurement at harness wire or connector

TROUBLESHOOTING

SERVICE MODE

M1543035600163

In the RV meter service mode, the items of body type setting ("BODY TYPE" screen), destination setting ("DESTINATION" screen), function type reset ("FUNCTION TYPE RESET" screen), and Delete the compass azimuth circle ("PROF CIRCLE DEL" screen) are provided.

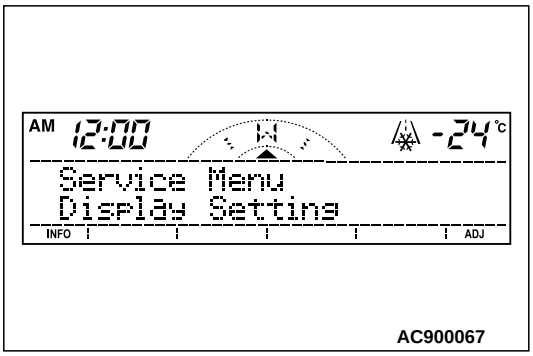
- Body type setting ("BODY TYPE" screen): If the incorrect body type is set, the correct possible cruising distance cannot be displayed.
- Destination setting ("DESTINATION" screen): If the incorrect destination is set, the freezing mark or the initial value of the compass deviation angle correction cannot be displayed correctly.
- Function type reset ("FUNCTION TYPE RESET" screen): If the incorrect model type is set, the drive information and air temperature cannot be displayed correctly.
- Delete the compass azimuth circle ("PROF CIRCLE DEL" screen): When the compass display does not work normally even after performing compass calibration, delete the compass azimuth circle, reset the direction display function itself, and set the compass function again.

HOW TO START AND TERMINATE THE SERVICE MODE

NOTE: If the body type or the destination has not been set when the ignition switch position is changed from the "LOCK" (OFF) position to the "ACC" or "ON" position, the screen of the unset items (in the order of "BODY TYPE" screen, and then "DESTINATION" screen) are displayed. After setting of each item is completed, the display returns to the normal RV meter screen.

HOW TO START THE SERVICE MODE

1. With the ignition switch at the "LOCK" (OFF) position, press the [ADJ] button.
2. With the [ADJ] button being pressed, turn the ignition switch to the "ACC"or "ON" position, and hold that for five seconds or more.



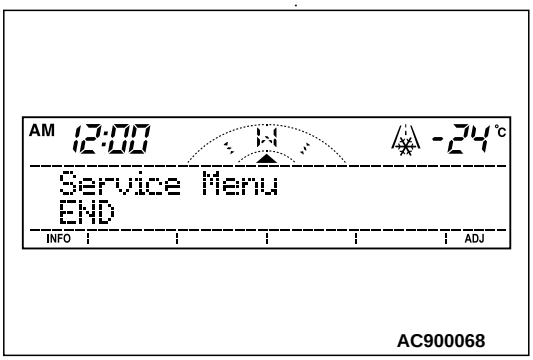
3. The service mode is started, and the "Service Menu" and "Display Setting" screens are displayed.

   NOTE: When the [ADJ] button is pressed on the "Display Setting menu" screen, the display is shifted to the "BODY TYPE" screen. After that, each time the [INFO] button is pressed, the following four setting screens change in turn: "DESTINATION" screen, "FUNCTION TYPE RESET" screen, "PROF CIRCLE DEL" screen, and "BODY TYPE" screen.

HOW TO TERMINATE THE SERVICE MODE

When any of the following operations is performed, the service mode is terminated.

- Turn the ignition switch to the "LOCK" (OFF) position to terminate the service mode forcibly.

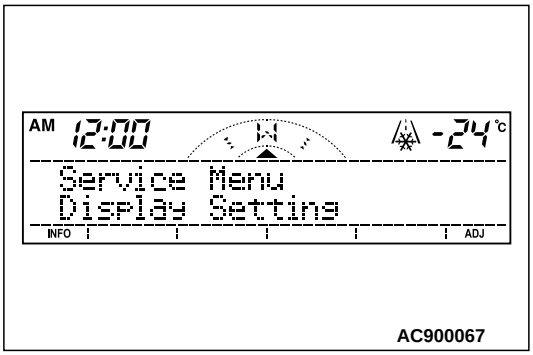


Press the [INFO] button on the "Display Setting Menu" screen to display the "END" screen. On the "END" screen, press the [ADJ] button to terminate the service mode.

NOTE: To return to the "Display Setting Menu" screen from each setting screen, press the [BACK] button.

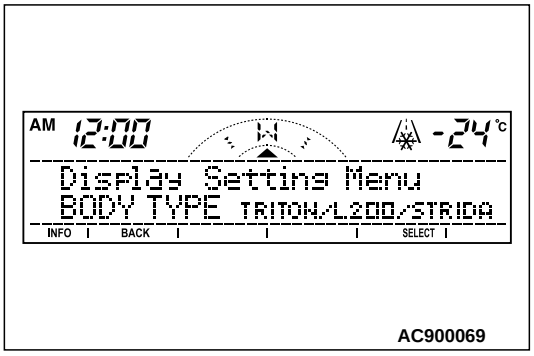
HOW TO SET THE RV METER

HOW TO SET THE BODY TYPE ("BODY TYPE" SCREEN)



AC900067

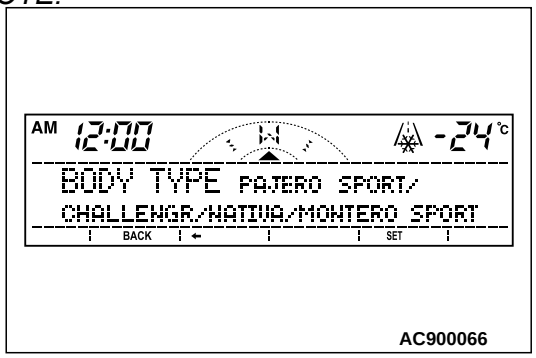
1. Press the [ADJ] button on the "Display Setting menu" screen.



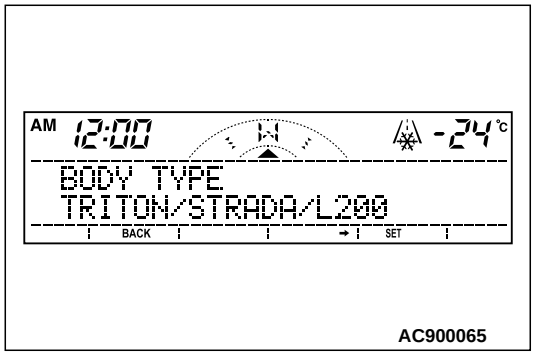
AC900069

2. The "BODY TYPE" screen is displayed, and the body type currently set is indicated.

NOTE:



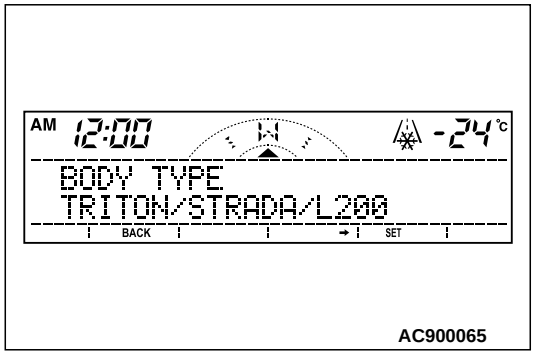
AC900066



AC900065

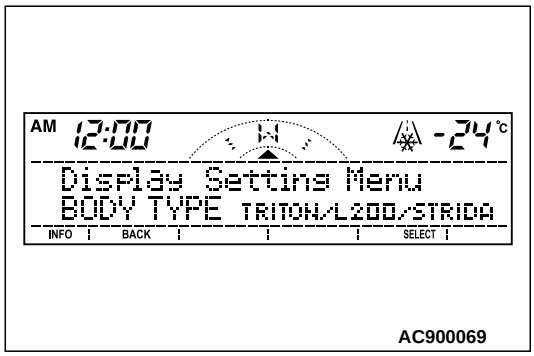
The set body type is indicated as "TRITON/ STRADA/L200" or "PAJERO SPORT/CHAL-LENGER/NATIVA/MONTERO SPORT".

3. To change the body type, press the [SELECT] button.



AC900065

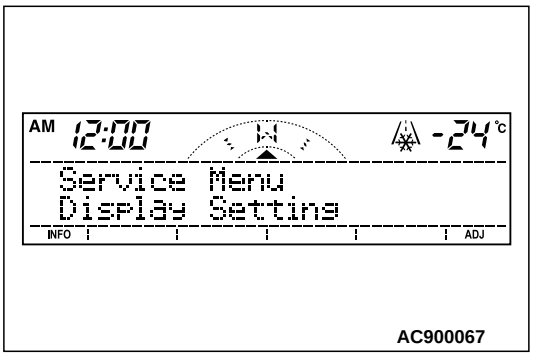
4. [Press [→] or [←] button to display "TRITON/ STRADA/L200".
5. Press [SET] button to make settings.



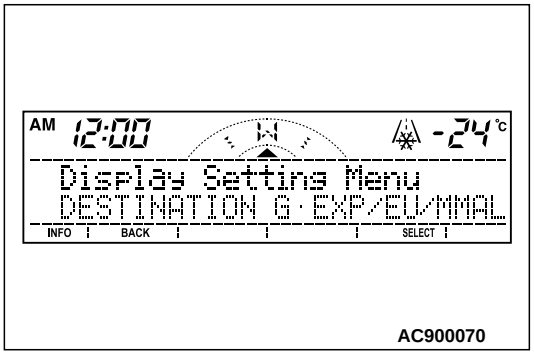
AC900069

6. When the screen returns to the "BODY TYPE" screen, check that the body type is set correctly, and terminate the service mode.

HOW TO SET THE DESTINATION ("DESTINATION" SCREEN)

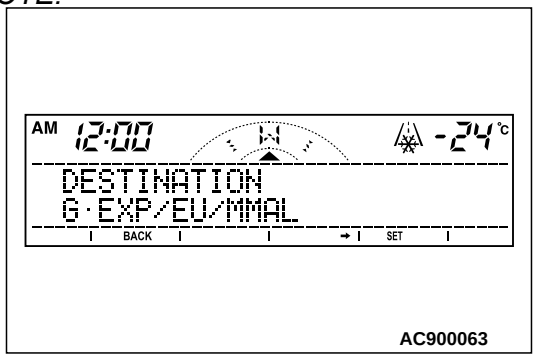


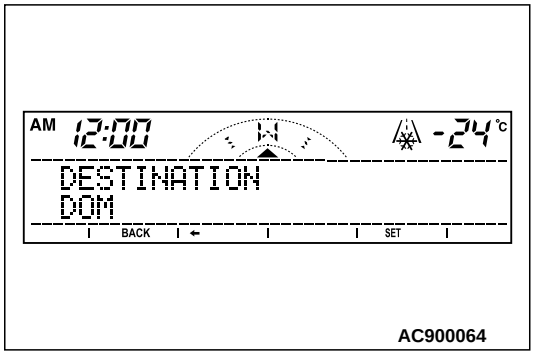
1. Press the [ADJ] button on the "Display Setting menu" screen.
2. Press the [INFO] button on the "BODY TYPE" screen.



3. The "DESTINATION" screen is displayed, and the destination currently set is indicated.

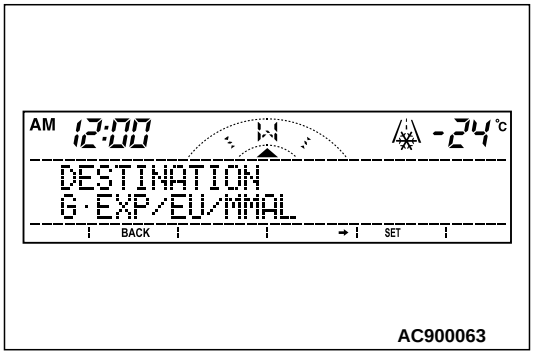
NOTE:



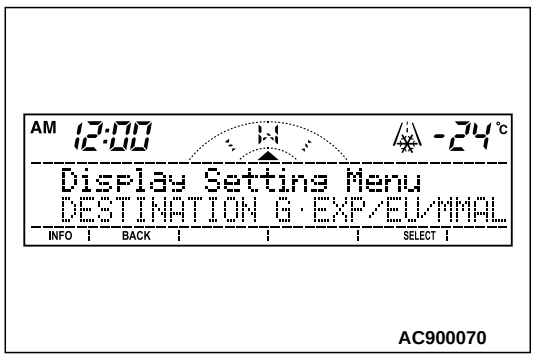


The set destination is indicated as "G·EXP/EU/MMAL" or "DOM".

4. To change the destination, press the [SELECT] button.



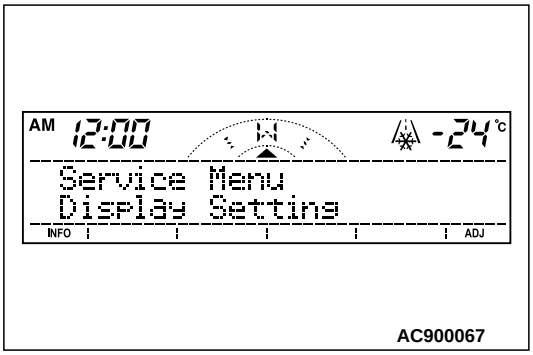
5. [Press [→] or [←] button to display "G·EXP/EU/MMAL".
6. Press [SET] button to make settings.



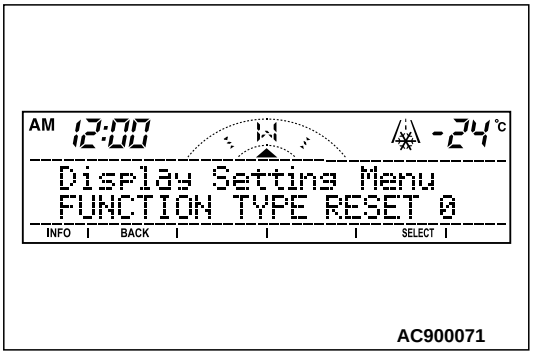
7. When the screen returns to the "DESTINATION" screen, check that the destination is set correctly, and terminate the service mode.

HOW TO RESET THE FUNCTION TYPE ("FUNCTION TYPE RESET" SCREEN)

NOTE: Before resetting the function type reset, check that the power supply systems to the CAN communication line, audio communication line are connected normally in accordance with the vehicle specification. (Because a function type is judged incorrectly if reset is executed with the abnormal connection status.)



1. Press the [ADJ] button on the "Display Setting menu" screen.
2. When the "BODY TYPE" screen is displayed, press the [INFO] button.
3. When the "DESTINATION" screen is displayed, press the [INFO] button.



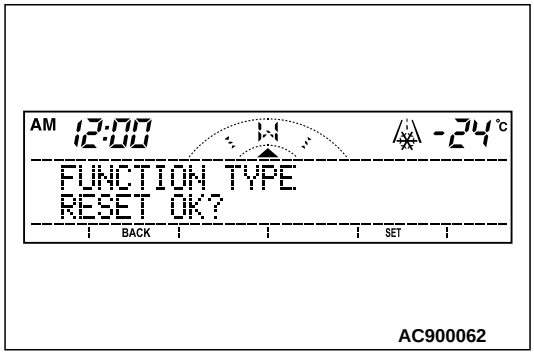
4. The "FUNCTION TYPE RESET" screen is displayed, and the function type currently set is indicated. To reset the function type, press the [SELECT] button.

   NOTE: The function types are indicated by numbers from "1" to "4". ("0" is not set.) They are classified as shown in the table below.

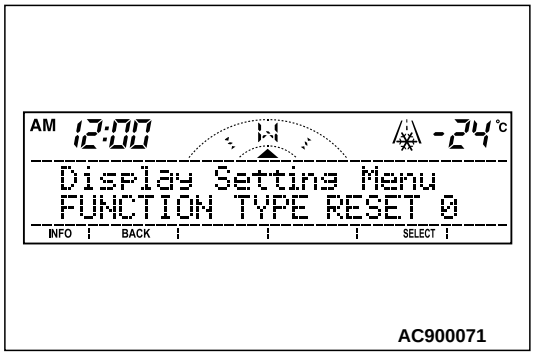
Function type			**TYPE 1 <Vehicles with auto A/C>**	**TYPE 2 <Vehicles with auto A/C>**	**TYPE 3 <Vehicles without auto A/C>**	**TYPE 4 <Vehicles without auto A/C>**
Information display function	Drive information	Average vehicle speed	×	–	×	–
		Average fuel consumption	×	–	×	–
		Possible cruising distance	×	–	×	–
	Environmental data	Ambient temperature	×	×	×	×
		Air pressure	×	×	×	×
		Altitude	×	×	×	×
		Compass	×	×	×	×
	Clock		×	×	×	×
	Calendar		×	×	×	×
	Audio		×	×	×	×
	Display OFF		×	×	×	×
User settings (Clock, calendar, compass, unit, etc.)			×	×	×	×
Opening display (Mitsubishi logotype display)			×	×	×	×
Body type setting (TRITON/STRADA/L200 or PAJERO SPORT/CHALLENGER/NATIVA/MONTERO SPORT)			×	×	×	×

Function type	TYPE 1 <Vehicles with auto A/C>	TYPE 2 <Vehicles with auto A/C>	TYPE 3 <Vehicles without auto A/C>	TYPE 4 <Vehicles without auto A/C>
Destination setting (G·EXP/EU/MMAL or DOM)	×	×	×	×
Service Mode	×	×	×	×
Screen brightness adjustment (Adjusts the display individually)	×	×	×	×
Fail-safe	×	×	×	×

- ×: With function
- –: Without function



5. When "RESET OK?" is indicated, press the [SET] button.



6. When the screen returns to the "FUNCTION TYPE RESET" screen, check that "RESET 0" is indicated, and terminate the service mode.
7. Turn the ignition switch to the "LOCK" (OFF) position.
8. Turn the ignition switch from the LOCK (OFF) position to the ON position.

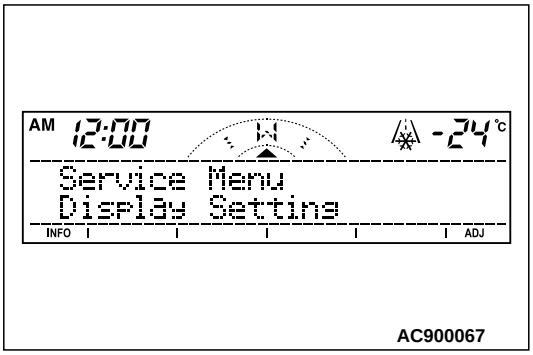
   NOTE: When the ignition switch is turned from "LOCK" to "ON" for the first time after the function type is reset, the centre display automatically judges the status of other ECUs to set the function type.

HOW TO DELETE THE COMPASS AZIMUTH CIRCLE

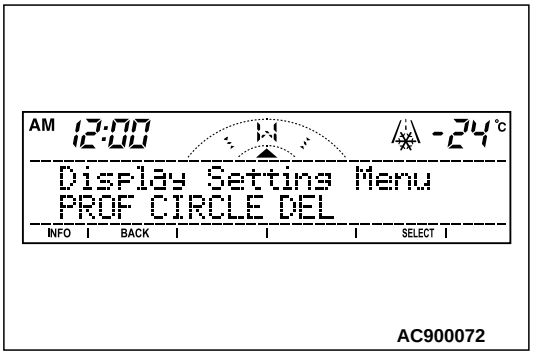
⚠ CAUTION

If the compass azimuth display is not normal, always perform the declination calibration and the compass calibration in the compass setting before deleting the compass azimuth circle. Only if the compass azimuth display is still abnormal and the azimuth display function itself needs to be reset, delete the compass azimuth circle.

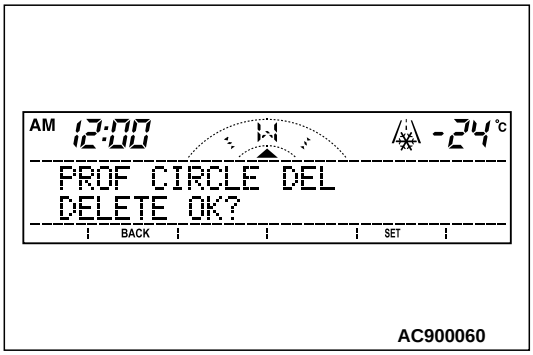
NOTE: Always check the declination calibration and carry out the compass calibration after deleting the compass azimuth circle.



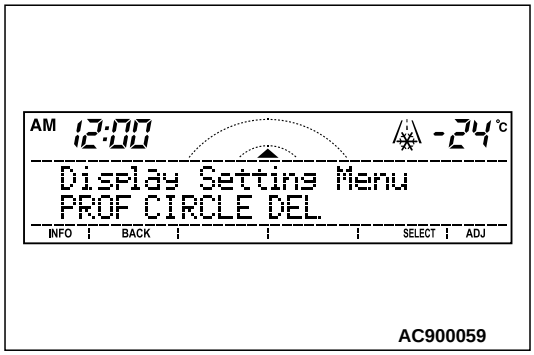
1. Press the [ADJ] button on the "Display Setting menu" screen.
2. When the "BODY TYPE" screen is displayed, press the [INFO] button.
3. When the "DESTINATION" screen is displayed, press the [INFO] button.
4. When the "FUNCTION TYPE RESET" screen is displayed, press the [INFO] button.



5. The "PROF CIRCLE DEL" screen is displayed. To delete the compass azimuth circle data, press the [SELECT] button.



6. When "DELETE OK?" is indicated, press the [SET] button.



7. When the screen returns to the "PROF CIRCLE DEL" screen, terminate the service mode

DIAGNOSIS TROUBLESHOOTING FLOW

M1546600500017

Refer to GROUP 00 – Contents of Troubleshooting .

DIAGNOSTIC FUNCTION

M1543007001156

HOW TO READ DIAGNOSIS CODE

Use the M.U.T.-III to read diagnosis code (Refer to GROUP 00 – Diagnosis Function).

NOTE: Connect the M.U.T.-III to the 16-pin diagnosis connector (black).

HOW TO ERASING DIAGNOSIS CODE

Use the M.U.T.-III to erasing diagnosis code (Refer to GROUP 00 – Diagnosis Function).

NOTE: Connect the M.U.T.-III to the 16-pin diagnosis connector (black).

DIAGNOSIS CODE CHART

M1546600600092

Code No.	Diagnosis item	Reference page
19	ETACS CAN Timeout	P.54A-462
26*	Engine CAN Timeout	P.54A-463
29	No receive fault detect signal	P.54A-464

NOTE: As for the code No. 26, it may be set when a wrong function type is specified.

DIAGNOSIS CODE PROCEDURES

Code No. 19: ETACS CAN Timeout

⚠ CAUTION

- **If diagnosis code No.19 is set in the RV meter, diagnose the CAN main bus line.**
- **Whenever the RV meter is replaced, ensure that the communication circuit is normal.**

NOTE: When the diagnosis codes relating to the CAN communication error are set, make sure of the vehicle equipment. When the vehicle is not equipped with the system the RV meter communicates to, the diagnosis code is always output. This is not abnormal.

TROUBLE JUDGEMENT
If the RV meter cannot communicate with ETACS-ECU when the ignition switch is turned to the ACC position, the diagnosis code No. 19 is set.

COMMENT ON TROUBLE SYMPTOM
The harness or connector between the ETACS-ECU and RV meter may be faulty.

PROBABLE CAUSES
- Malfunction of the RV meter
- Malfunction of the ETACS-ECU
- Damaged harness wires and connectors
- Malfunction of the CAN bus

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics
Use the M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the CAN bus line (Refer to GROUP 54C – Troubleshooting). On completion, go to Step 2.

STEP 2. M.U.T-III other system diagnosis code.
Check whether the ETACS-ECU diagnosis code is set.

Q: Is the diagnosis code set?
YES : Diagnose ETACS-ECU (Refer to ETACS-ECU, Troubleshooting P.54A-462). After diagnosing the ETACS-ECU, go to Step 3.
NO : Go to Step 3.

STEP 3. M.U.T-III other system diagnosis code.
Check if a diagnosis code, which relates to CAN communication-linked systems below, is set.
Engine-ECU
- diagnosis code U1109: ETACS-ECU time out

Q: Is the diagnosis code set?
YES : Go to Step 4.
NO : Go to Step 5.

STEP 4. Check whether the diagnosis code is reset.
Recheck if the diagnosis code is set.
(1) Erase the diagnosis code.
(2) Turn the ignition switch from "LOCK" (OFF) position to "ON" position.
(3) On completion, check that the diagnosis code is not reset.

Q: Is the diagnosis code set?
YES : Replace the ETACS-ECU and register the ID codes (Refer to P.54A-39).
NO : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

STEP 5. Check whether the diagnosis code is reset.
Check again if the diagnosis code is set.
(1) Erase the diagnosis code.
(2) Turn the ignition switch from "LOCK" (OFF) position to "ON" position.
(3) On completion, check that the diagnosis code is not reset.

Q: Is the diagnosis code set?
YES : Replace the RV meter.
NO : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

Code No. 26: Engine CAN Timeout

⚠ CAUTION
- **If diagnosis code No.26 is set in the RV meter, diagnose the CAN main bus line.**
- **Whenever the RV meter is replaced, ensure that the communication circuit is normal.**

NOTE: When the diagnosis codes relating to the CAN communication error are set, make sure of the vehicle equipment. When the vehicle is not equipped with the system the RV meter communicates to, the diagnosis code is always output. This is not abnormal.

TROUBLE JUDGEMENT
If the engine ECU is not communicated from the RV meter, the diagnosis code No. 26 is set.

COMMENT ON TROUBLE SYMPTOM
The harness or connector between the engine-ECU and RV meter may be faulty.

PROBABLE CAUSES
- Malfunction of the RV meter
- Malfunction of the engine-ECU
- Damaged harness wires and connectors
- Malfunction of the CAN bus

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics
Use the M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the CAN bus line (Refer to GROUP 54C – Troubleshooting). On completion, go to Step 2.

STEP 2. M.U.T-III other system diagnosis code.
Check whether the DIESEL system-related diagnosis code is set.

Q: Is the diagnosis code set?
YES : Diagnose DIESEL system. (Refer to GROUP 13A – Troubleshooting .) After diagnosing the DIESEL system, go to Step 3.
NO : Go to Step 3.

STEP 3. M.U.T-III other system diagnosis code.
Check if a diagnosis code, which relates to CAN communication-linked systems below, is set.
ETACS-ECU
- diagnosis code U1100: Engine-ECU time-out

Q: Is the diagnosis code set?
YES : Go to Step 4.
NO : Go to Step 5.

STEP 4. Check whether the diagnosis code is reset.
Check again if the diagnosis code is set.
(1) Erase the diagnosis code.
(2) Turn the ignition switch from "LOCK" (OFF) position to "ON" position.
(3) On completion, check that the diagnosis code is not reset.

Q: Is the diagnosis code set?
YES : Replace the engine-ECU.
NO : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

STEP 5. Check whether the diagnosis code is reset.
Recheck if the diagnosis code is set.
(1) Erase the diagnosis code.
(2) Turn the ignition switch from "LOCK" (OFF) position to "ON" position.
(3) On completion, check that the diagnosis code is not reset.

Q: Is the diagnosis code set?
YES : Replace the RV meter.
NO : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

Code No. 29: No receive fault detect signal

⚠ CAUTION
- **If diagnosis code No.29 is set in the RV meter, diagnose the CAN main bus line.**
- **Whenever the RV meter is replaced, ensure that the communication circuit is normal.**

TROUBLE JUDGEMENT
If ETACS-ECU cannot communicate with the RV meter for 5 seconds when the ignition switch is turned from "LOCK" (OFF) position to "ON" position, the diagnosis code No. 29 is set.

COMMENT ON TROUBLE SYMPTOM
The harness or connector between the ETACS-ECU and RV meter may be faulty.

PROBABLE CAUSES
- Malfunction of the RV meter
- Malfunction of the ETACS-ECU
- Damaged harness wires and connectors
- Malfunction of the CAN bus

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics
Use the M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the CAN bus line (Refer to GROUP 54C – Troubleshooting). On completion, go to Step 2.

STEP 2. M.U.T-III other system diagnosis code.
Check whether the ETACS-ECU diagnosis code is set.

Q: Is the diagnosis code set?
YES : Diagnose ETACS-ECU (Refer to ETACS-ECU, Troubleshooting). After diagnosing the ETACS-ECU, go to Step 3.
NO : Go to Step 3.

STEP 3. Check whether the diagnosis code is reset.
Check again if the diagnosis code is set.
(1) Erase the diagnosis code.
(2) Turn the ignition switch from "LOCK" (OFF) position to "ON" position.
(3) On completion, check that the diagnosis code is not reset.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Replace the RV meter.

SYMPTOM CHART

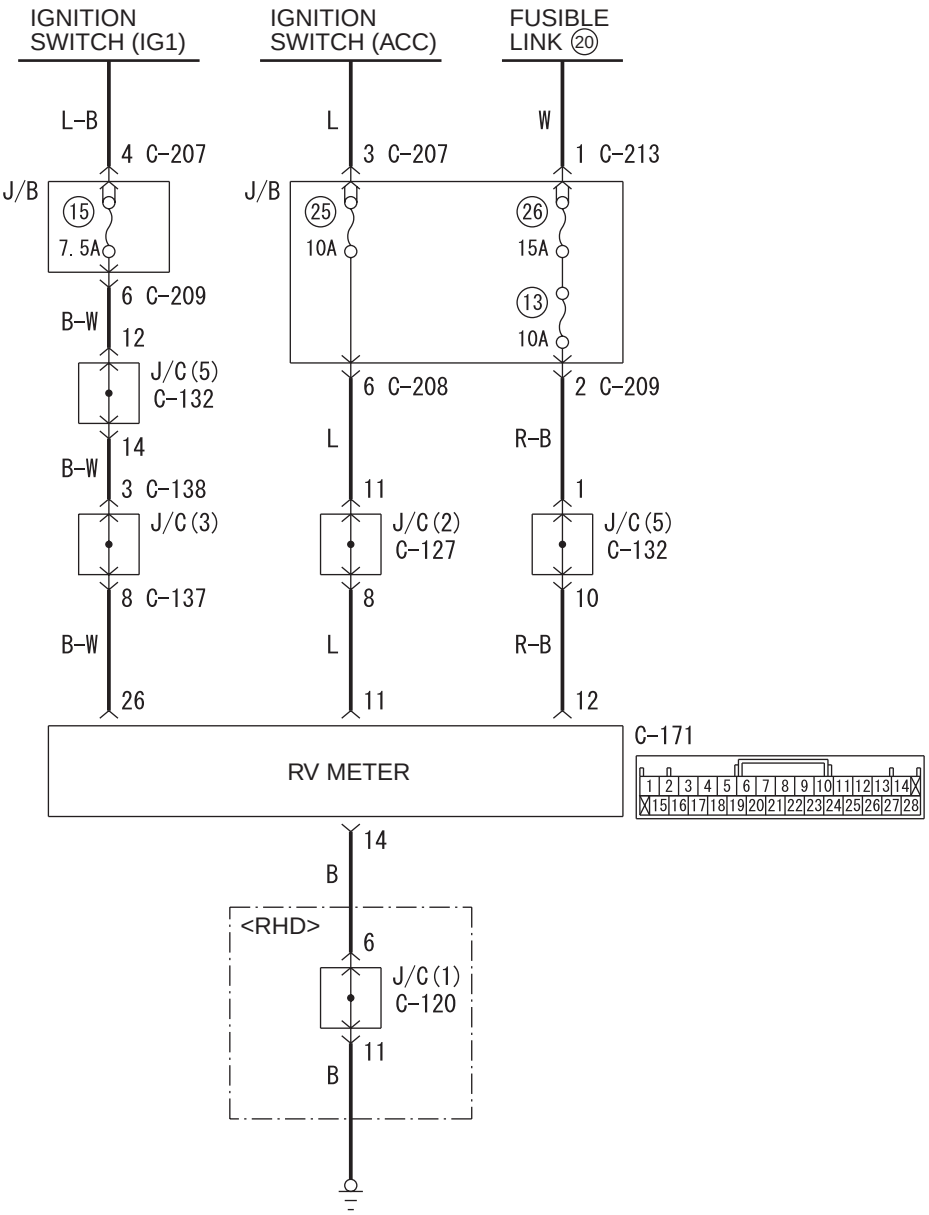
M1543007202829

SYMPTOM		Inspection procedure	Reference page
The RV meter does not show any information.		1	P.54A-466
The drive information is not displayed normally.		2	P.54A-474
The ambient air temperature is not displayed normally.	<Vehicles without auto A/C>	3	P.54A-478
	<Vehicles with auto A/C>		P.54A-481
The freeze mark does not illuminate or flash normally. The freeze warning buzzer does not sound.		4	P.54A-481
The compass does not indicate normally.		5	P.54A-483
The radio and CD player information is not displayed normally.		6	P.54A-484

SYMPTOM PROCEDURES

Inspection Procedure 1: The RV meter does not show any information.

RV Meter Power Source Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

WAC54E103A

CIRCUIT OPERATION

- The RV meter receives the ACC signal from the ignition switch via the harness wire.
- The RV meter receives the IG1 signal from the ETACS-ECU by CAN communication, and at the same time it supplementally receives the signal from the ignition switch via the harness wire.

NOTE: The IG1 signal via the ignition switch is used when the IG1 signal cannot be received by CAN communication.

COMMENTS ON TROUBLE SYMPTOM

The earth circuit, CAN bus line, the battery circuit or the ignition switch (ACC, ON) circuit is suspected to be open or defective.

PROBABLE CAUSES

- Malfunction of the RV meter
- Malfunction of the ETACS-ECU
- Malfunction of the CAN bus line
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics

Use the M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?

YES : Go to Step 2

NO : Repair the CAN bus line (Refer to GROUP 54C – Troubleshooting). On completion, go to Step 2.

STEP 2. Check whether the diagnosis code is set.

Check if the diagnosis code is set.

Q: Is the diagnosis code set?

YES : Go to Step 3

NO : Diagnose RV meter (Refer to RV meter, Troubleshooting P.54A-462).

STEP 3. M.U.T-III other system diagnosis code.

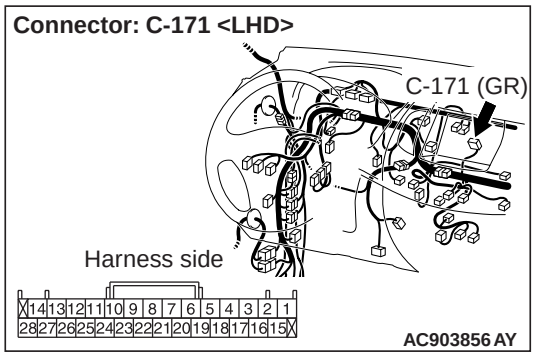
Check whether the ETACS-ECU diagnosis code is set.

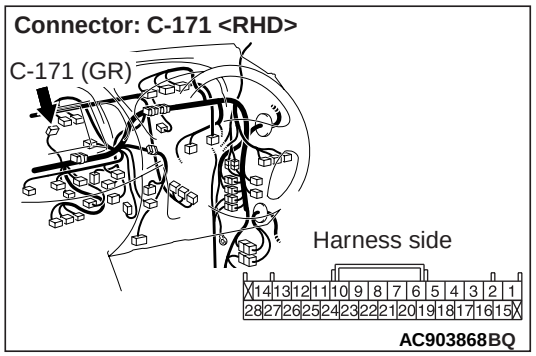
Q: Is the diagnosis code set?

YES : Diagnose ETACS-ECU (Refer to ETACS-ECU, Troubleshooting P.54A-462). After diagnosing the ETACS-ECU, go to Step 4.

NO : Go to Step 4

STEP 4. Check the following connector: C-171 RV meter connector



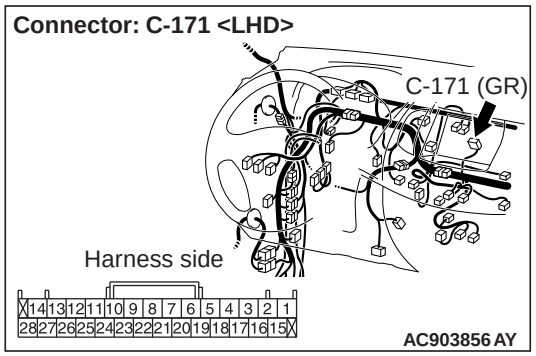


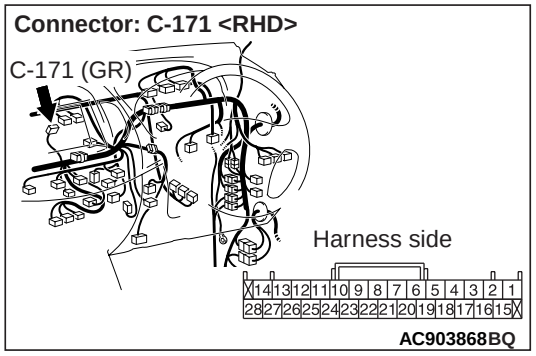
Q: Is the check result normal?

YES : Go to Step 5

NO : Repair the defective connector.

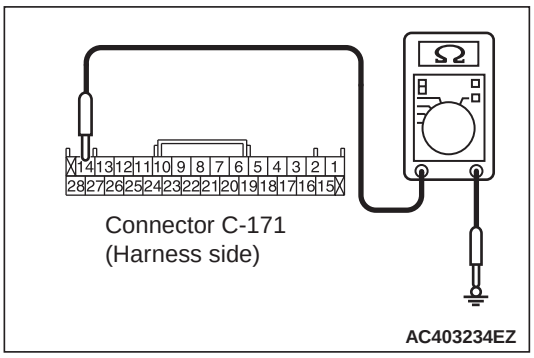
STEP 5. Measure the resistance at C-171 RV meter connector.





(1) Disconnect the connector, and measure at the

wiring harness side.

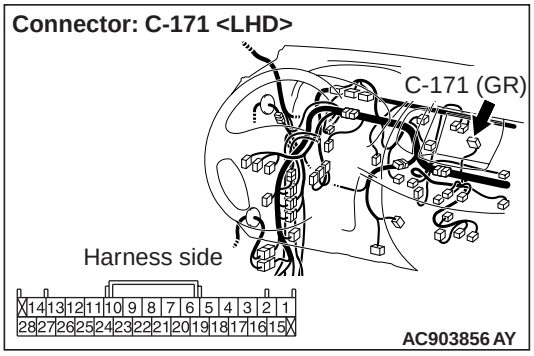


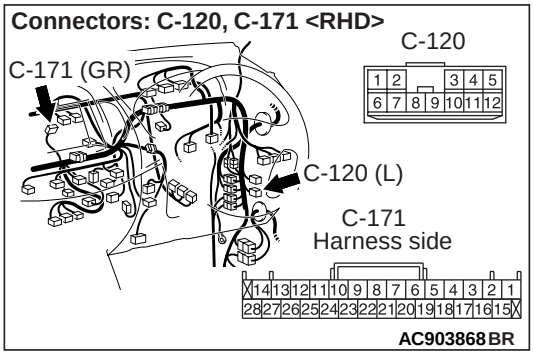
(2) Measure the resistance between C-171 RV meter connector terminal No.14 and body earth

OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?
YES : Go to Step 7
NO : Go to Step 6

STEP 6. Check the harness wire between C-171 RV meter connector terminal No.14 and body earth.



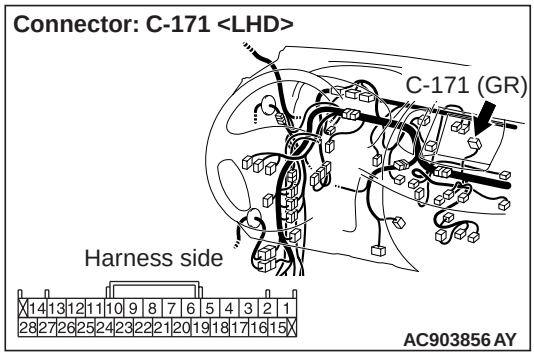


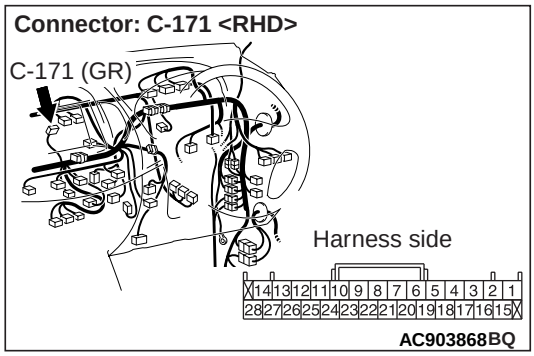
- Check the earth wires for open circuit.

NOTE: Prior to the wiring harness inspection, check joint connector C-120 <RHD>, and repair if necessary.

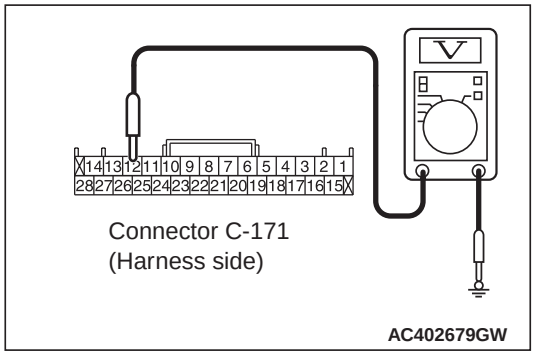
Q: Is the check result normal?
YES : Retest the system.
NO : Repair the wiring harness.

STEP 7. Measure the voltage at C-171 RV meter connector.





(1) Disconnect the connector, and measure at the wiring harness side.
(2) Ignition switch: LOCK (OFF) position

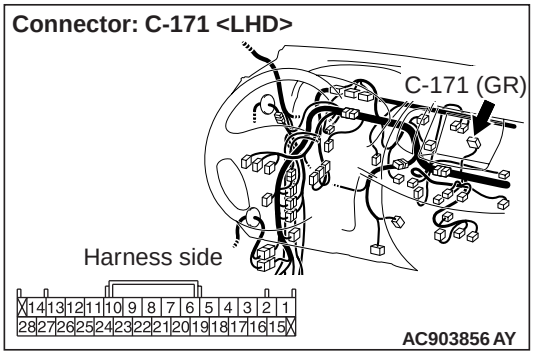


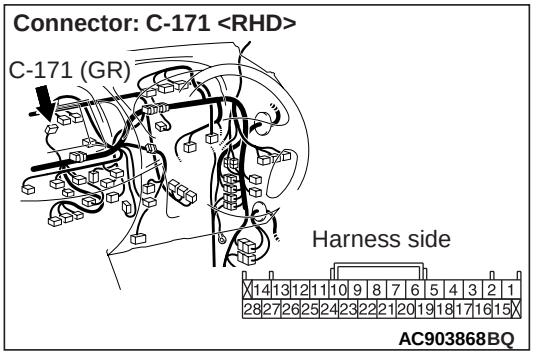
(3) Measure the voltage between C-171 RV meter connector terminal No.12 and body earth

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 9
NO : Go to Step 8

STEP 8. Check the harness wire between battery (fusible link No.20) and C-171 RV meter connector terminal No.12.





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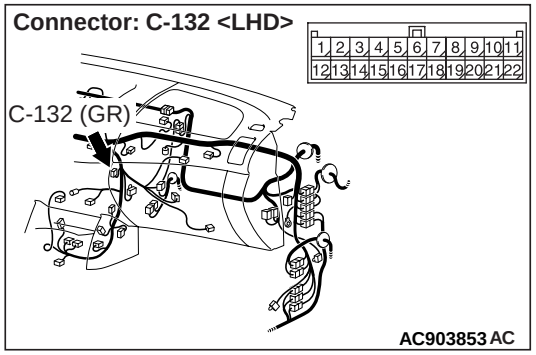
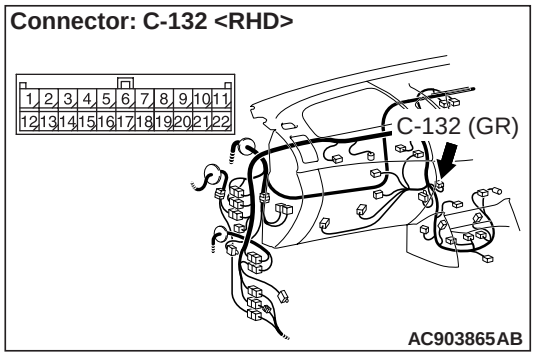
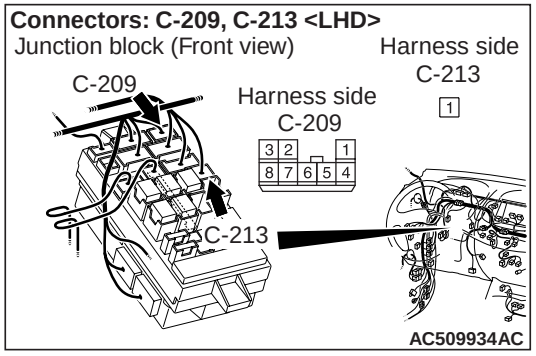
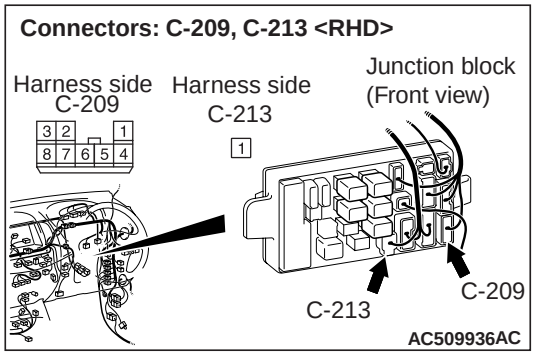






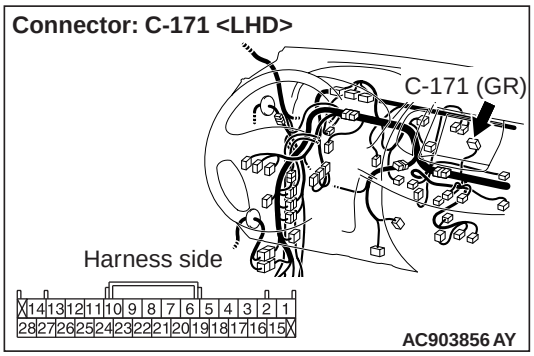


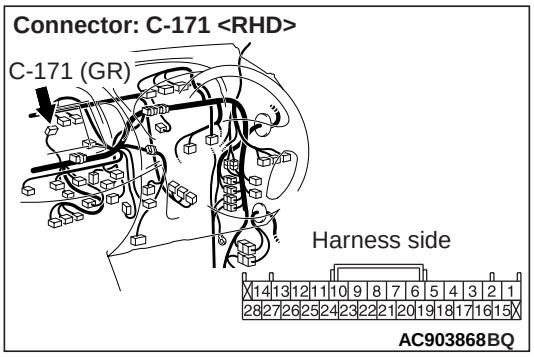
Prior to the wiring harness inspection, check joint connector C-132, junction block connectors C-209 and C-213, and repair if necessary.

- Check the battery power supply open circuit and short circuit.

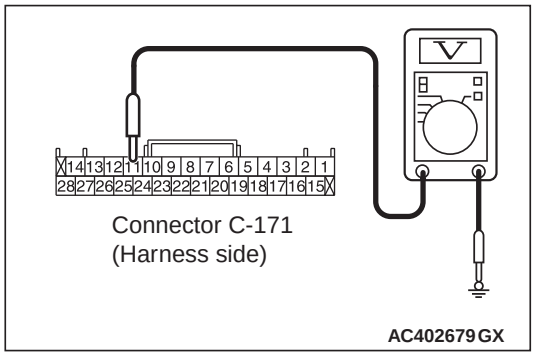
Q: Is the check result normal?
YES : Retest the system.
NO : Repair the wiring harness.

STEP 9. Measure the voltage at C-171 RV meter connector.





(1) Disconnect the connector, and measure at the wiring harness side.
(2) Ignition switch: ACC

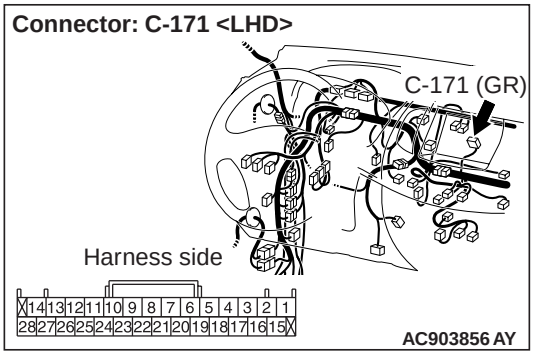


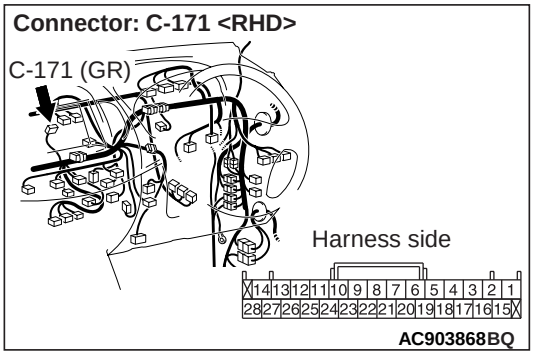
(3) Measure the voltage between C-171 RV meter connector terminal No.11 and body earth

OK: System voltage

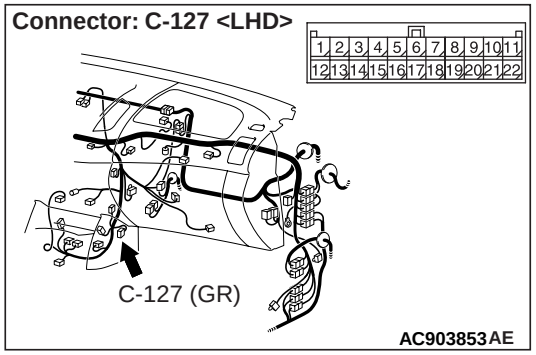
Q: Is the check result normal?
YES : Go to Step 11
NO : Go to Step 10

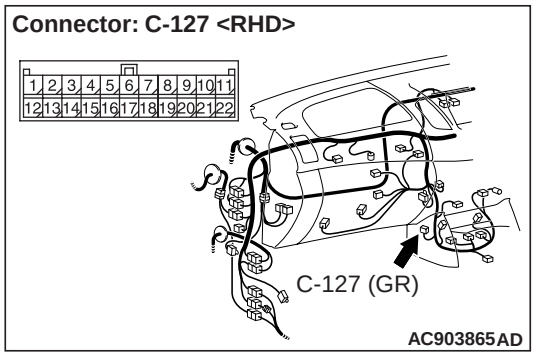
STEP 10. Check the harness wire between ignition switch (ACC) and C-171 RV meter connector terminal No.11.

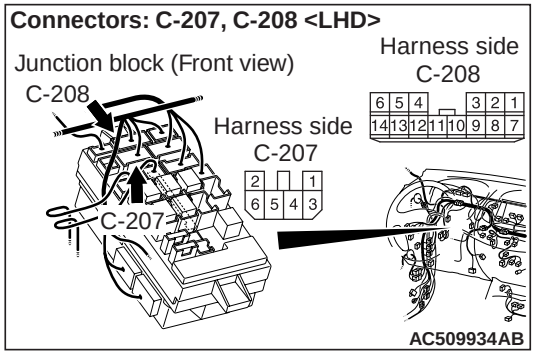


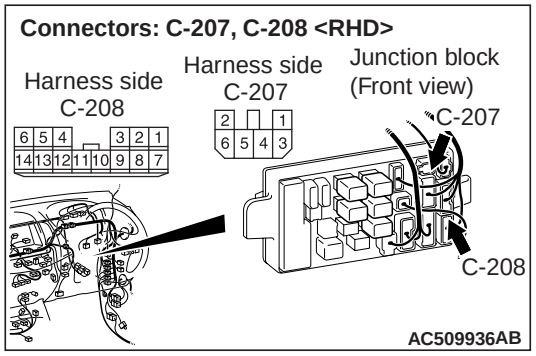


NOTE:







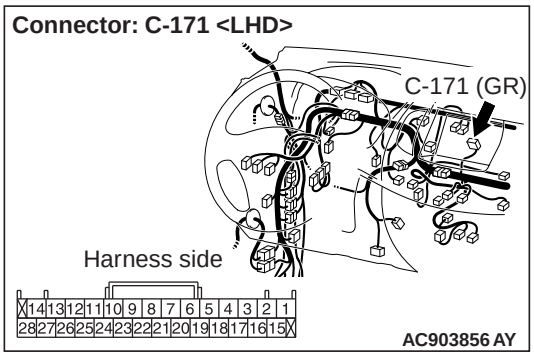


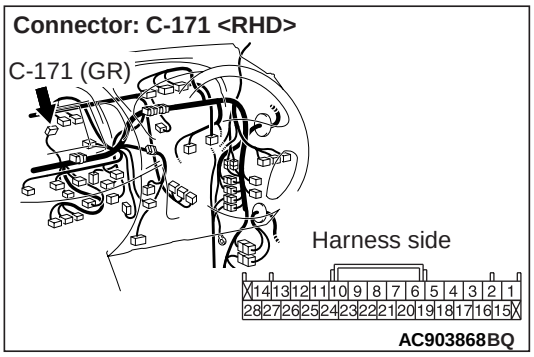
Prior to the wiring harness inspection, check joint connector C-127, junction block connectors C-207 and C-208, and repair if necessary.

- Check the IG (ACC) power supply open circuit and short circuit.

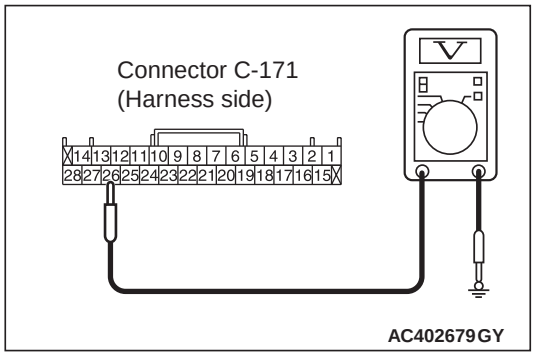
Q: Is the check result normal?
YES : Refer to ignition switch (P.54A-22).
NO : Retest the system.

STEP 11. Measure the voltage at C-171 RV meter connector.





(1) Disconnect the connector, and measure at the wiring harness side.
(2) Ignition switch: ON position

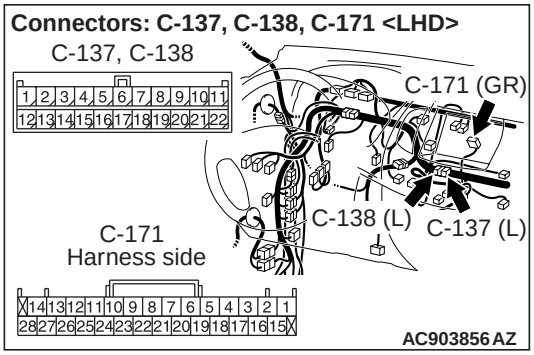


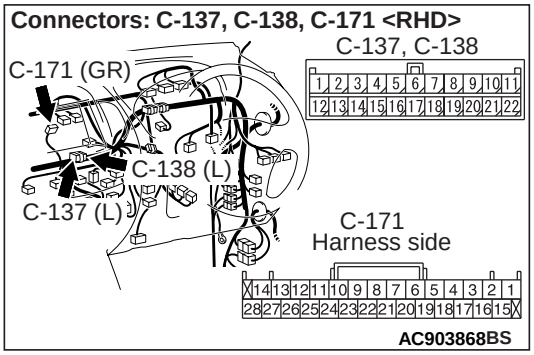
(3) Measure the voltage between C-171 RV meter connector terminal No.26 and body earth

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 13
NO : Go to Step 12

STEP 12. Check the harness wire between ignition switch (IG1) and C-171 RV meter connector terminal No.26.





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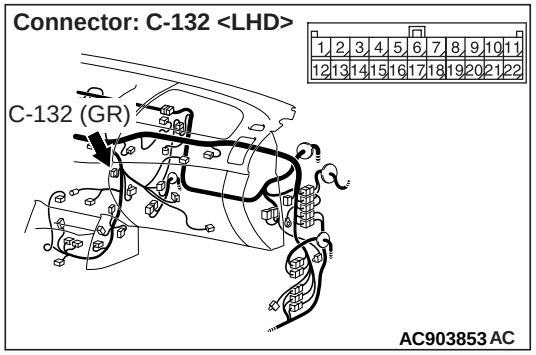
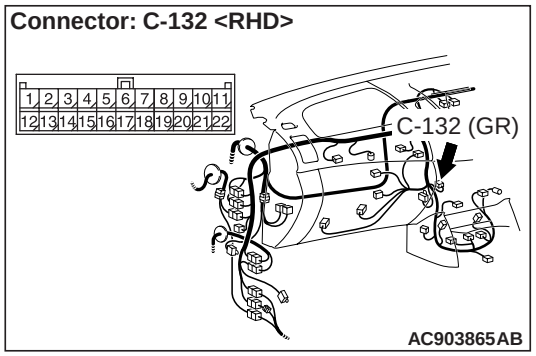
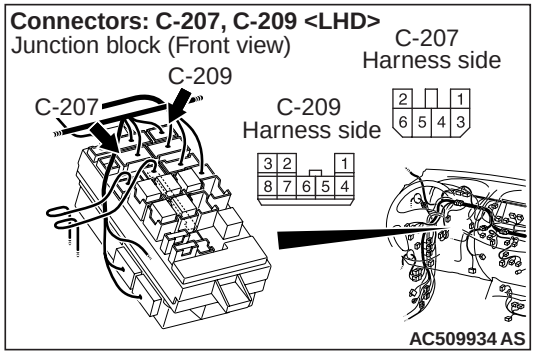
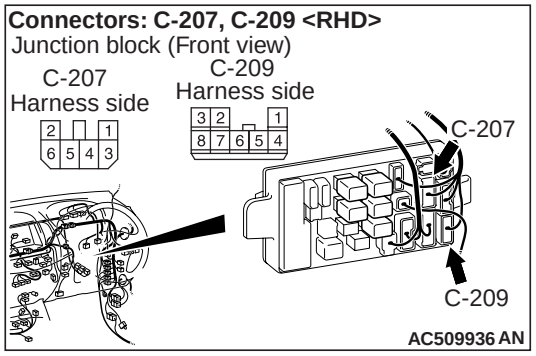








Prior to the wiring harness inspection, check joint connectors C-132, C-138 and C-137, junction block connectors C-207 and C-209, and repair if necessary.

- Check the IG (IG1) power supply open circuit and short circuit.

Q: Is the check result normal?
YES : Refer to ignition switch (P.54A-22).
NO : Retest the system.

STEP 13. Replace the RV meter temporarily and retest the system.

Check that the RV meter shows the drive information when the RV meter is replaced temporarily.

Q: Is the check result normal?

YES : Replace the RV meter.

NO : Go to Step 14

STEP 14. Retest the system.

Check that the RV meter RV meter shows the drive information.

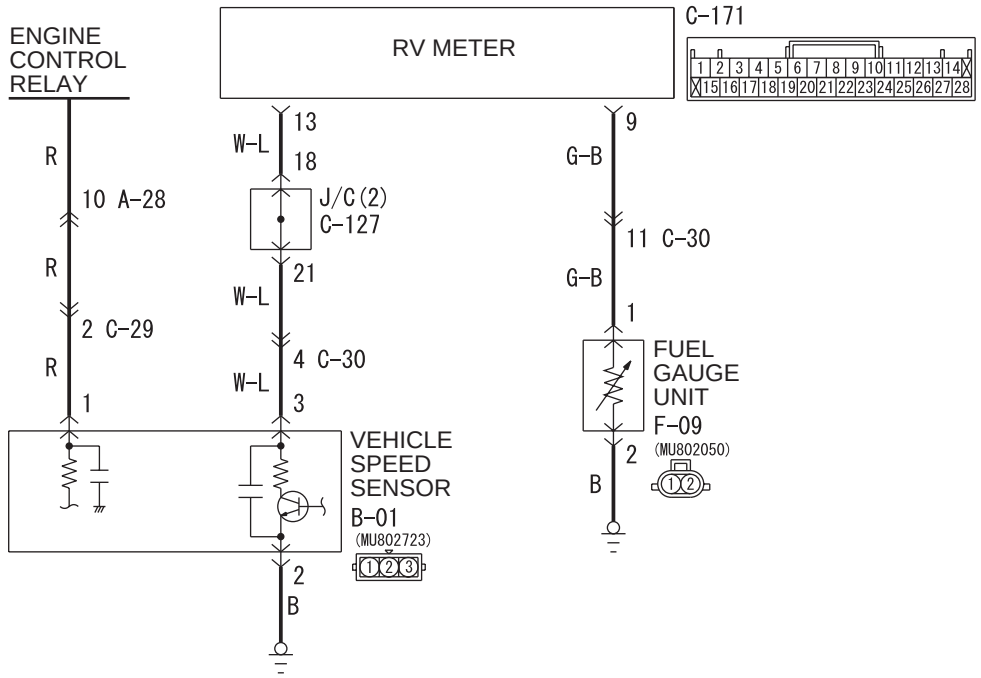
Q: Is the check result normal?

YES : The procedure is complete.

NO : Return to Step 1.

Inspection Procedure 2: The drive information is not displayed normally.

RV Meter Drive Information Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

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CIRCUIT OPERATION

The RV meter calculates, from the calculation value of the following information, the drive information that consists of average fuel consumption, possible cruising distance, and average vehicle speed. If the function type is set as 2 or 4 by mistake, the RV meter does not communicate with the engine-ECU. Also, the RV meter does not display the drive information.

- The vehicle speed signal is calculated from the vehicle speed pulse received from the vehicle speed sensor.
- The remaining fuel amount is calculated from the data received from the fuel gauge unit.
- The fuel injection quantity is calculated from the fuel injection quantity data received from the engine-ECU by CAN communication.

COMMENTS ON TROUBLE SYMPTOM

CAN bus line, harness between RV meter and fuel gauge unit, harness between RV meter and fuel gauge unit, RV meter, engine-ECU, vehicle speed sensor, or fuel gauge unit may be faulty.

PROBABLE CAUSES

- Malfunction of the CAN bus line
- Malfunction of the RV meter
- Malfunction of the Engine- ECU
- Malfunction of the fuel gauge unit

- Malfunction of the vehicle speed sensor
- Incorrect function type setting
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. Check the function type in the service mode.
Check that the function type is set as 1 or 3 in the service mode. (Refer to P.54A-457.)

Q: Is the check result satisfactory?
YES : Go to Step 2
NO : Set the function type again in the service mode, and recheck the trouble symptom.

STEP 2. M.U.T.-III CAN bus diagnostics
Use the M.U.T-III to diagnose the CAN bus lines.

Q: Is the check result satisfactory?
YES : Go to Step 3.
NO : Repair the CAN bus lines (Refer to GROUP 54C, Diagnosis - Can Bus Diagnostics Table). After diagnosing the CAN bus lines, go to Step 3.

STEP 3. M.U.T-III other system diagnosis code.
Check whether the DIESEL system-related diagnosis code is set.

Q: Is the diagnosis code set?
YES : Diagnose DIESEL system. (Refer to GROUP 13A –, Troubleshooting .) After diagnosing the DIESEL system, go to Step 4.
NO : Go to Step 4

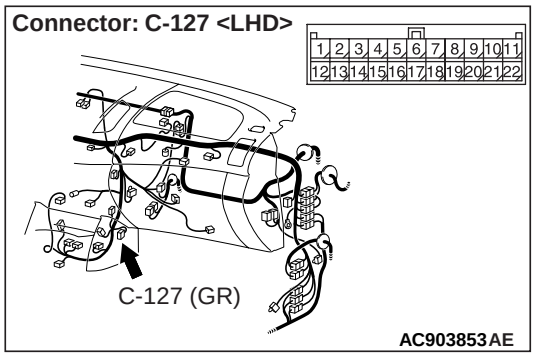
STEP 4. M.U.T.-III diagnosis code.
When the ignition switch is turned to the "LOCK" (OFF) position, check that the RV meter does not set the diagnosis code.

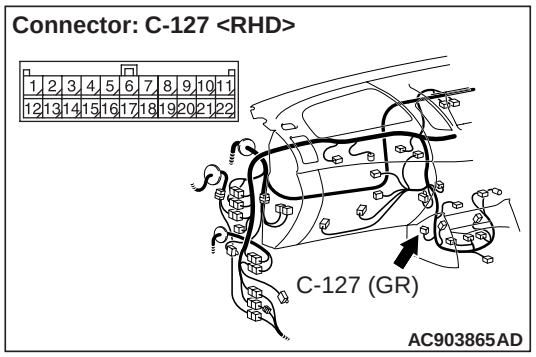
Q: Is the diagnosis code set?
YES : Refer to diagnosis code chart P.54A-462.
NO : Go to Step 5

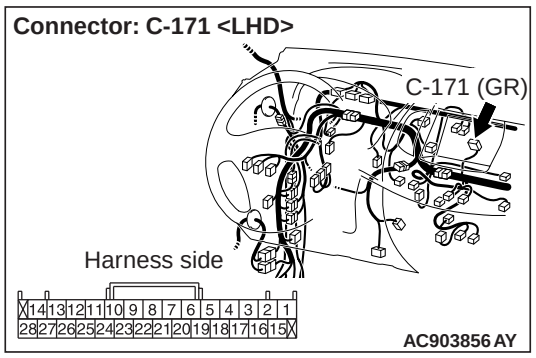
STEP 5. Check the speedometer.
Check whether the speedometer works normally.(Refer to P.54A-87.)

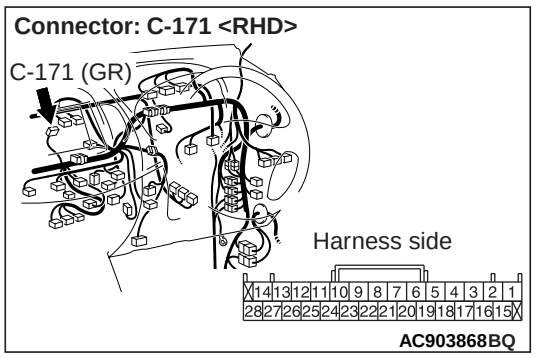
Q: Does the speedometer work normally?
YES : Go to Step 6
NO : Diagnose the combination meter. (Refer to Combination meter – Troubleshooting P.54A-46.)

STEP 6. Connector check: RV meter connector C-171, joint connector C-127



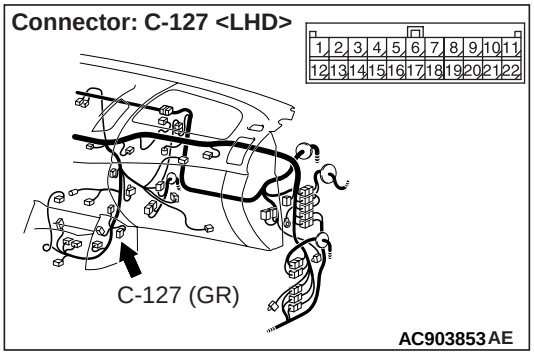


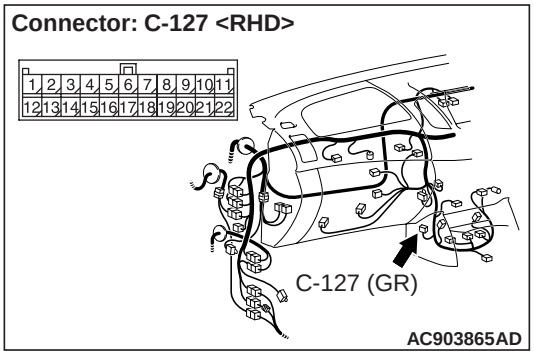


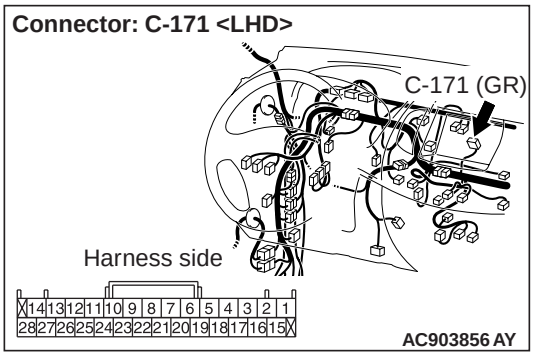


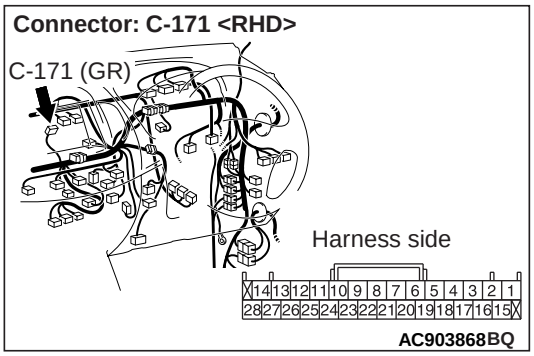
Q: Is the check result normal?
YES : Go to Step 7
NO : Repair the defective connector.

STEP 7. Check the harness wire between C-171 RV meter connector terminal No.13 and C-127 joint connector terminal No.18.





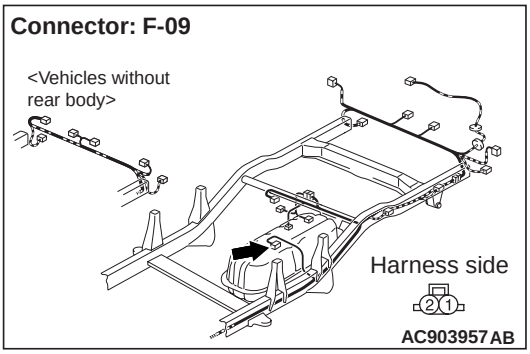




- Check the signal line circuit for open circuit and short circuit.

Q: Is the check result normal?
YES : Go to Step 8
NO : Repair the wiring harness.

STEP 8. Connector check: fuel gauge unit connector F-09

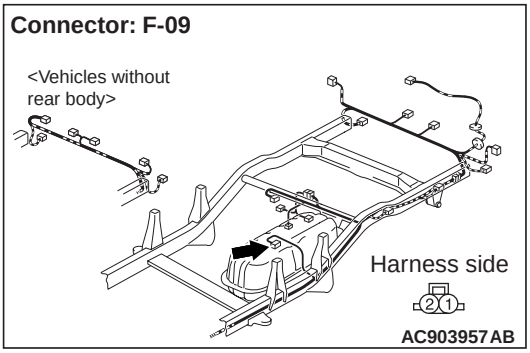


Q: Is the check result normal?
YES : Go to Step 9
NO : Repair the defective connector.

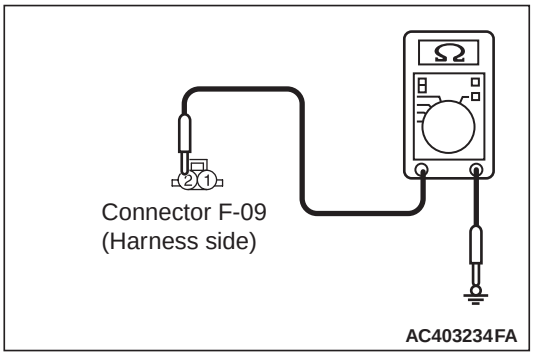
STEP 9. Check the fuel gauge unit.
Check the fuel gauge unit P.54A-88.

Q: Is the check result normal?
YES : Go to Step 10
NO : Replace the fuel gauge unit.

STEP 10. Measure the resistance at F-09 fuel gauge unit connector.



(1) Disconnect the connector, and measure at the wiring harness side.



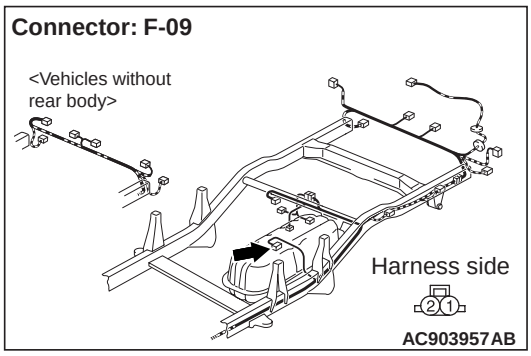
(2) Measure the resistance between F-09 fuel gauge unit connector terminal No.2 and body earth

OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?

YES : Go to Step 12
NO : Go to Step 11

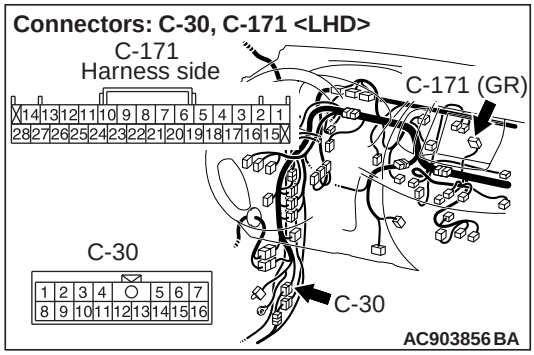
STEP 11. Check the harness wire between F-09 fuel gauge unit connector terminal No.2 and body earth.

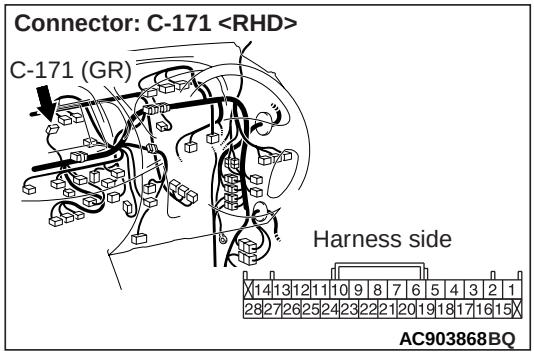


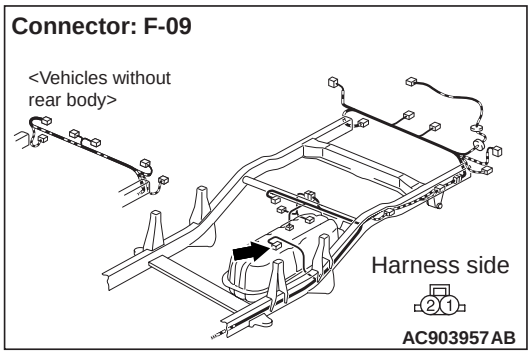
- Check the earth wires for open circuit.

Q: Is the check result normal?
YES : Retest the system.
NO : Repair the wiring harness.

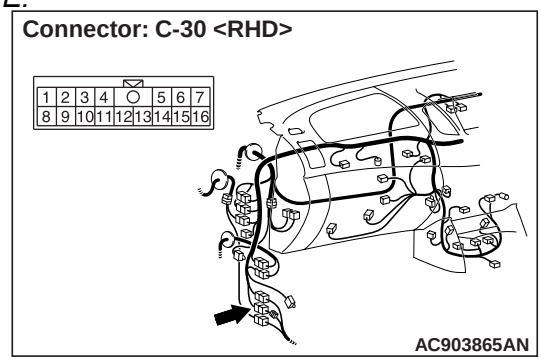
STEP 12. Check the wiring harness between C-171 RV meter connector terminal No.9 and F-09 fuel gauge unit connector terminal No.1.







NOTE:



Prior to the wiring harness inspection, check the intermediate connector C-30, and repair if necessary.

- Check the input line circuit for open circuit and short circuit.

Q: Is the check result normal?
YES : Go to Step 13
NO : Repair the wiring harness.

STEP 13. Recheck for malfunction.

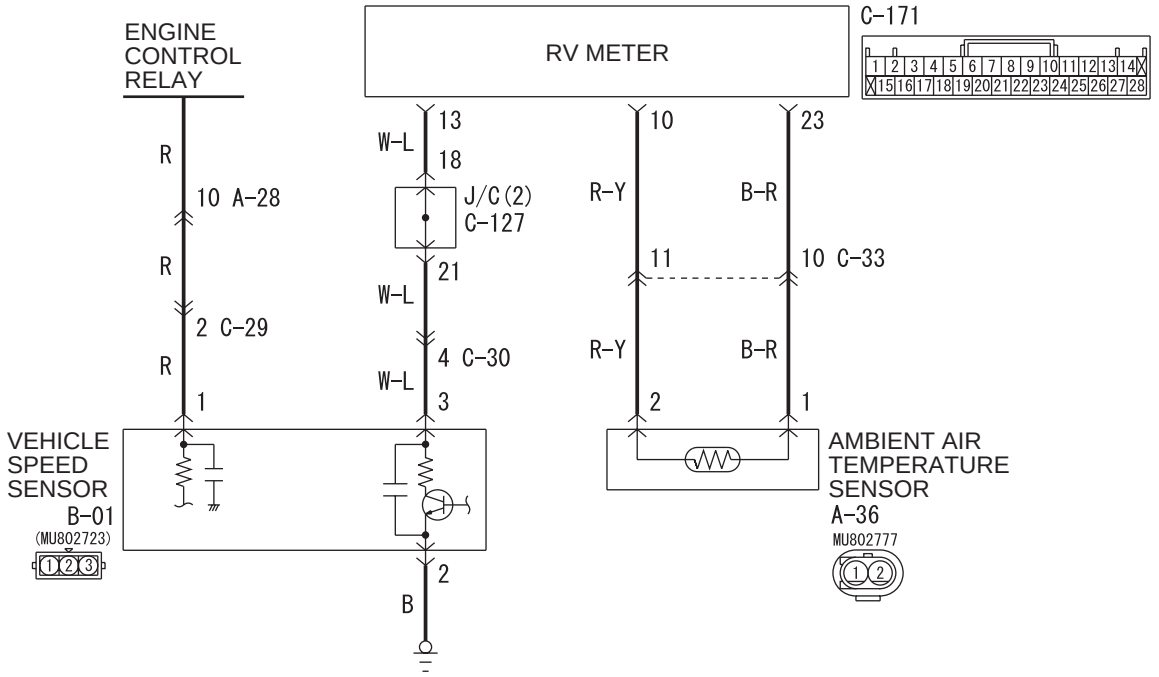
Q: Is a malfunction eliminated?

YES : If no malfunctions are found in all steps, an intermittent malfunction is suspected. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunction .

NO : Replace the RV meter.

Inspection Procedure 3: The ambient air temperature is not displayed normally. <Vehicles without auto A/C>

Ambient Air Temperature Display Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver WAC54E046A

CIRCUIT OPERATION

- For the vehicles without the auto A/C, the RV meter is connected with the ambient air temperature sensor via harness wires. The ambient temperature is calculated with the resistance reading of the ambient air temperature sensor. Also, the ambient temperature displayed on the RV meter is corrected by the vehicle speed pulse signal of the vehicle speed sensor.
- If the function type is set as 1 or 2 by mistake, the RV meter tries to acquire the ambient temperature information from the A/C-ECU by the CAN communication, and the ambient temperature cannot be displayed.

COMMENTS ON TROUBLE SYMPTOM

When other indications are normal, the malfunction of ambient air temperature sensor is considered.

PROBABLE CAUSES

- Malfunction of the ambient air temperature sensor
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. Check the function type in the service mode.

Check that the function type is set as 3 or 4 in the service mode. (Refer to P.54A-457.)

Q: Is the check result satisfactory?

YES : Go to Step 2

NO : Set the function type again in the service mode, and recheck the trouble symptom. (Refer to P.54A-457.)

STEP 2. Check the RV meter.

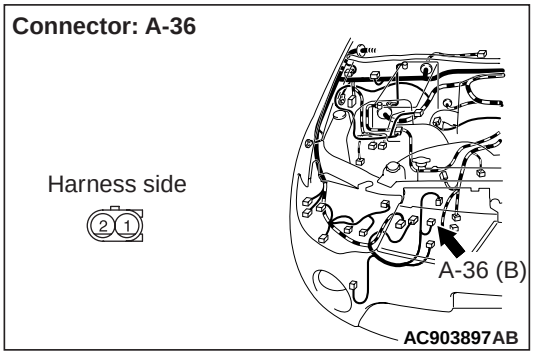
Check that the average vehicle speed and the average fuel consumption are displayed normally, and check that the connection with the vehicle speed sensor is normal.

Q: Is the check result satisfactory?

YES : Go to Step 3

NO : Perform the troubleshooting, Inspection Procedure 2: "The drive information is not displayed normally". (Refer to P.54A-474.)

STEP 3. Check the following connector: A-36 ambient air temperature sensor



Q: Is the check result normal?

YES : Go to Step 4

NO : Repair the defective connector.

STEP 4. Check the ambient air temperature sensor.

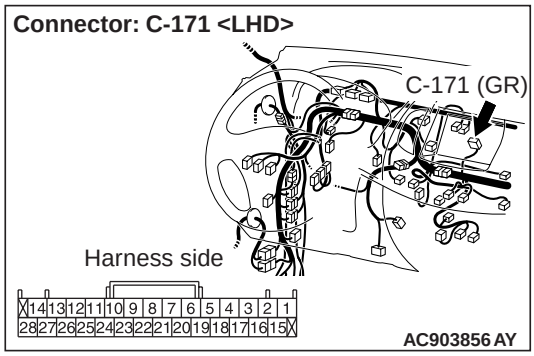
Check the ambient air temperature sensorP.54A-489.

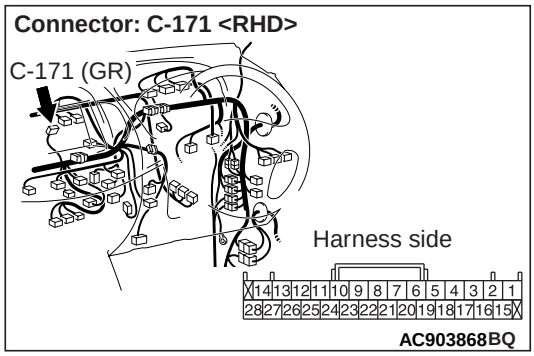
Q: Is the check result normal?

YES : Go to Step 5

NO : Replace the ambient air temperature sensor.

STEP 5. Check the following connector: C-171 RV meter connector



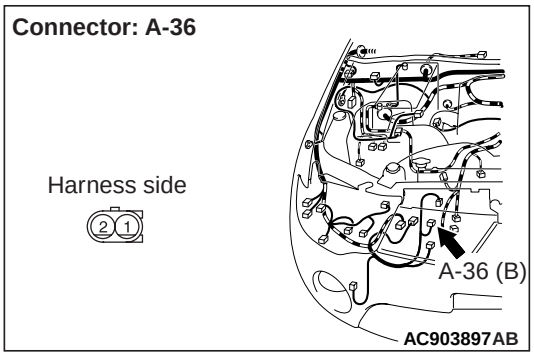


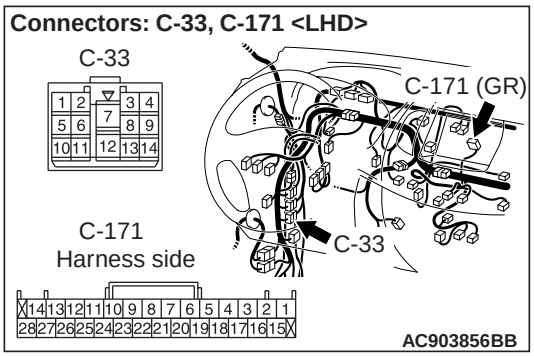
Q: Is the check result normal?

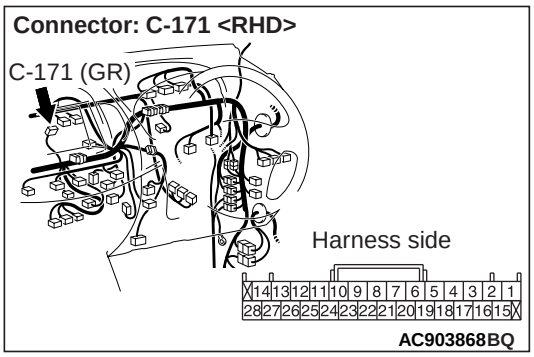
YES : Go to Step 6

NO : Repair the defective connector.

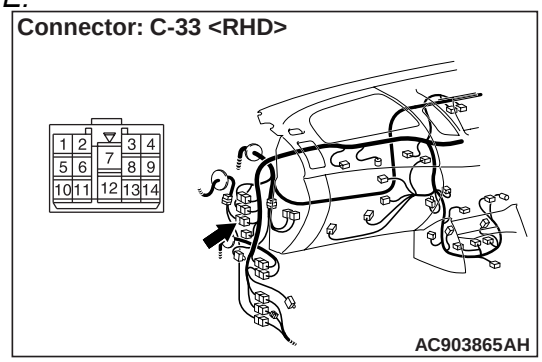
STEP 6. Check the harness wire between C-171 RV meter connector terminals No.10, 23 and A-36 ambient air temperature sensor connector terminals No.2, 1.







NOTE:



Prior to the wiring harness inspection, check intermediate connector C-33, and repair if necessary.

- Check the output lines for open circuit and short circuit.

Q: Is the check result normal?

YES : Go to Step 7
NO : Repair the wiring harness.

STEP 7. Recheck for malfunction.

Q: Is a malfunction eliminated?

YES : If no malfunctions are found in all steps, an intermittent malfunction is suspected. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunction .
NO : Go to Step 8

STEP 8. Replace the ambient air temperature sensor temporarily, and check the trouble symptom.

Q: Is a malfunction eliminated?

YES : Replace the ambient air temperature sensor.
NO : Replace the RV meter.

Inspection Procedure 3: The ambient air temperature is not displayed normally. <Vehicles with auto A/C>

CIRCUIT OPERATION

- For the vehicles with auto A/C, the RV meter receives and displays the ambient temperature information from the A/C-ECU by CAN communication. Also, the ambient temperature displayed on the RV meter is corrected by the vehicle speed of the vehicle speed sensor.
- If the function type is set as 3 or 4 by mistake, the ambient temperature cannot be displayed.

COMMENTS ON TROUBLE SYMPTOM

When other indications are normal, the malfunction of A/C-ECU or CAN bus line is considered.

PROBABLE CAUSES

- Malfunction of the A/C-ECU
- Malfunction of the CAN bus line
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. Check the function type in the service mode.

Check that the function type is set as 1 or 2 in the service mode. (Refer to P.54A-457.)

Q: Is the check result satisfactory?

YES : Go to Step 2

NO : Set the function type again in the service mode, and recheck the trouble symptom. (Refer to P.54A-457.)

STEP 2. Check the RV meter.

Check that the average vehicle speed and the average fuel consumption are displayed normally, and check that the connection with the vehicle speed sensor is normal.

Q: Is the check result satisfactory?

YES : Go to Step 3

NO : Perform the troubleshooting, Inspection Procedure 2: "The drive information is not displayed normally". (Refer to P.54A-474.)

STEP 3. M.U.T.-III CAN bus diagnostics

Use the M.U.T-III to diagnose the CAN bus lines.

Q: Is the check result satisfactory?

YES : Go to Step 4

NO : Repair the CAN bus lines (Refer to GROUP 54C, Diagnosis - Can Bus Diagnostics Table). After diagnosing the CAN bus lines, go to Step 4.

STEP 4. M.U.T-III other system diagnosis code.

Check whether the A/C-ECU diagnosis code is set.

Q: Is the diagnosis code set?

YES : Diagnose A/C-ECU (Refer to GROUP 55B, Troubleshooting), and then go to Step 5.

NO : Go to Step 5

STEP 5. Recheck for malfunction.

Q: Is a malfunction eliminated?

YES : If no malfunctions are found in all steps, an intermittent malfunction is suspected. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunction .

NO : Replace the RV meter.

Inspection Procedure 4: The freeze mark does not illuminate or flash normally. The freeze warning buzzer does not sound.

CIRCUIT OPERATION

If the ambient temperature of RV meter becomes 3°C or lower when the ignition switch is turned ON, the freeze mark flashes for 10 seconds on the RV meter and the ETACS-ECU buzzer sounds at the same time.

NOTE: If the destination setting is wrong, normal operation is not possible because the threshold values of the freeze mark or freeze warning buzzer are different.

freeze warning operate

Conditions		Display control
When the air temperature is 3 °C or lower, at the ignition switch "ON" position.		The ETACS-ECU buzzer (freeze warning buzzer) sounds and the freeze mark flashes for 10 seconds.
When the air temperature that is over 3 °C at the ignition switch "ON" position changes to 3 °C or lower.		
After the warnings described as above is operated.	When the air temperature that is 6 °C or higher changes to 3 °C or lower	When the air temperature reaches to 6 °C, the freeze mark disappears, and when the air temperature decreases to 3 °C or lower again, the freeze mark flashes for 10 seconds. However, the buzzer does not sound.
	When the air temperature that is over 3 °C but below 6 °C decreases to 3 °C or lower	When the air temperature is over 3 °C but below 6 °C, the freeze mark keeps displaying. If the air temperature decreases to 3 °C or lower again, the buzzer does not sound and the freeze mark does not flash again.

COMMENTS ON TROUBLE SYMPTOM
When other indications are normal, the malfunction of RV meter or ETACS-ECU is considered.

PROBABLE CAUSES
- Malfunction of the RV meter
- Malfunction of the ETACS-ECU
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. Check the DESTINATION in the service mode
Check that in the service mode the item "DESTINATION" is set as "G·EXP/EU/MMAL". (Refer to P.54A-457.)

Q: Is the check result satisfactory?
YES : Go to Step 2
NO : Set the "DESTINATION" again in the service mode, and recheck the trouble symptom. (Refer to P.54A-457.)

STEP 2. Check the RV meter.
Check that the ambient air temperature is displayed normally.

Q: Is the check result satisfactory?
YES (The freeze mark does not illuminate or flash normally.) : Go to Step 5
YES (The freeze warning buzzer does not sound.) : Go to Step 3
NO : Perform the troubleshooting, Inspection Procedure 2: "The drive information is not displayed normally". (Refer to P.54A-474.)

STEP 3. M.U.T.-III CAN bus diagnostics
Use the M.U.T-III to diagnose the CAN bus lines.

Q: Is the check result satisfactory?
YES : Go to Step 4
NO : Repair the CAN bus lines (Refer to GROUP 54C, Diagnosis - Can Bus Diagnostics Table). After diagnosing the CAN bus lines, go to Step 4.

STEP 4. M.U.T-III other system diagnosis code.
Check that the ETACS-ECU does not set the diagnosis code.

Q: Is the diagnosis code set?
YES : Diagnose ETACS-ECU (Refer to GROUP 54B, Diagnosis - diagnosis code chart).
NO : Go to Step 5

STEP 5. M.U.T.-III diagnosis code.
When the ignition switch is turned to the "LOCK" (OFF) position, check that the RV meter does not set the diagnosis code.

Q: Is the diagnosis code set?
YES : Refer to diagnosis code chart P.54A-462.
NO : Go to Step 6

STEP 6. Recheck for malfunction.

Q: Is a malfunction eliminated?
YES : If no malfunctions are found in all steps, an intermittent malfunction is suspected. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunction .
NO : Replace the RV meter.

Inspection Procedure 5: The compass does not indicate normally.

COMMENTS ON TROUBLE SYMPTOM

- The compass sensor integrated in the RV meter is abnormal, or it is seemed that the indication is affected by some nearby magnetized matter.
- The RV meter receives the vehicle speed pulse and checks the vehicle status whether it is travelling or being stopped.

NOTE: If the sensor is not normal, the compass is not displayed.

PROBABLE CAUSES

Malfunction of the RV meter

DIAGNOSIS PROCEDURE

STEP 1. Check the RV meter.

Check that the average vehicle speed and the average fuel consumption are displayed normally, and check that the connection with the vehicle speed sensor is normal.

Q: Is the check result satisfactory?

YES : Go to Step 2

NO : Perform the troubleshooting, Inspection Procedure 2: "The drive information is not displayed normally". (Refer to P.54A-465.)

STEP 2.Check of own vehicle position.

Q: Is the geomagnetism stable at the place?

YES : Go to Step 4

NO : Go to Step 3

STEP 3. Move the vehicle to the geomagnetically stable location to re-check the geomagnetism.

Q: Does the compass indicate normal?

YES : There is no action to be taken.

NO : Go to Step 4

STEP 4. Check of compass sensor for magnetisation.

Remove the a magnet or metal existing nearby the compass sensor when the carrier antenna that is mounted on the body by a magnet.

Q: Does the indication return to normal?

YES : There is no action to be taken.

NO : Go to Step 5

STEP 5. Check the declination calibrated value.

In compass setting, check that the initial value of the declination calibrated value is normal. (Refer to RV meter, Compass Setting P.54A-457.)

Q: Is the check result normal?

YES : Go to Step 6

NO : Repair the declination calibrated value, and then go to Step 6.

STEP 6. Carry out the compass calibration and recheck the trouble symptom.

Carry out the compass calibration in the compass setting, and check if the compass display is normal. (Refer to RV meter, Compass Setting P.54A-486.)

Q: Is the check result normal?

YES : The diagnosis is complete.

NO : Go to Step 7

STEP 7. Delete the compass azimuth circle, and recheck the trouble symptom.

Carry out the compass azimuth circle delete in the service mode of the RV meter, and check if the compass display is normal. (Refer to RV meter, Service Mode P.54A-457.)

NOTE: After deleting the compass azimuth circle, carry out the declination calibration of the compass setting and the compass calibration.

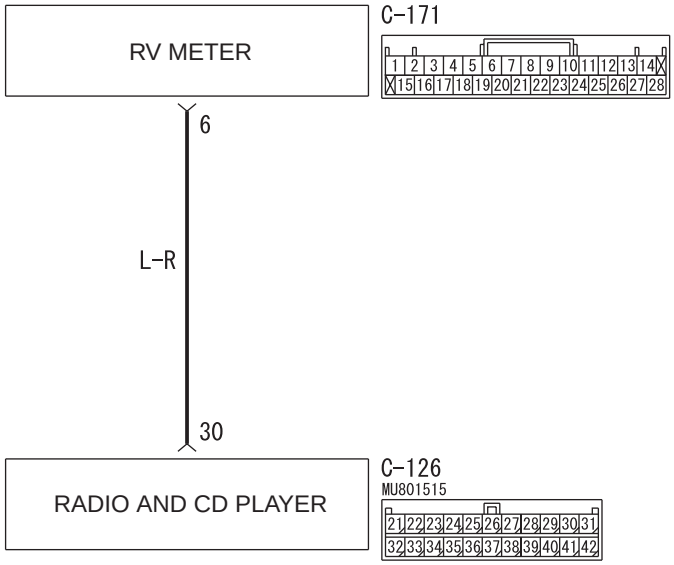
Q: Is the check result normal?

YES : The diagnosis is complete.

NO : Replace the RV meter

Inspection Procedure 6: The radio and CD player information is not displayed normally.

Radio and CD Player Information Line Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

WDC54E013A

COMMENTS ON TROUBLE SYMPTOM

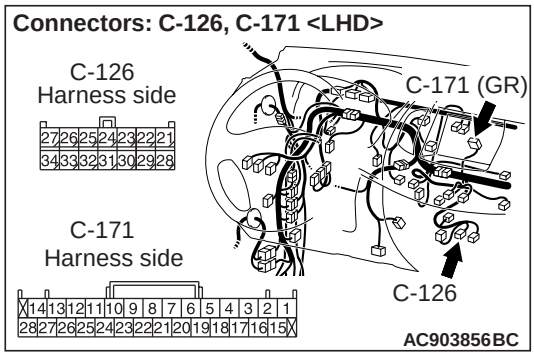
The radio and CD player operation screen will be frozen if the RV meter have received abnormal data from the radio and CD player and via M-bus communication.

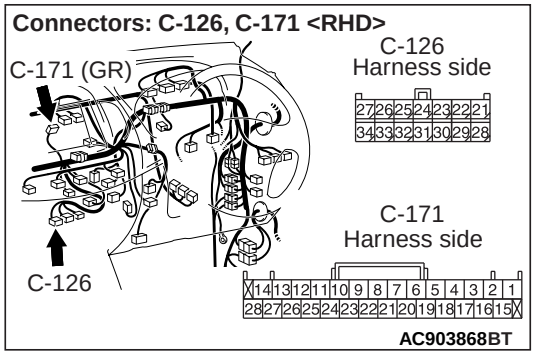
PROBABLE CAUSES

- Malfunction of radio and CD player
- Damaged wiring harness and connectors

DIAGNOSIS PROCEDURE

STEP 1. Connector check: Radio and CD player connector C-126 and RV meter connector C-171.



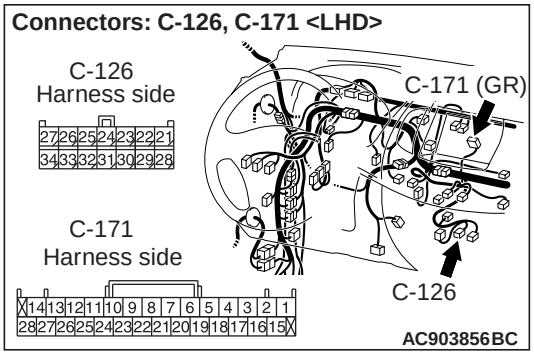


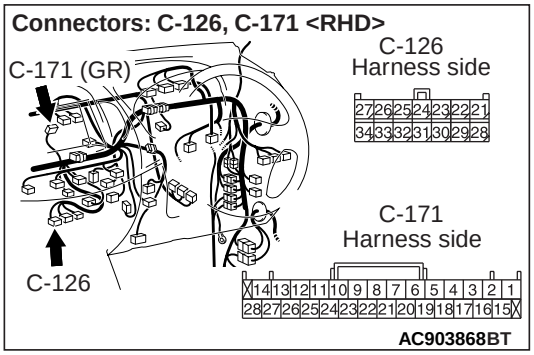
Q: Is the check result normal?

YES : Go to Step 2.

NO : Repair the defective connector.

STEP 2. Check the wiring harness between radio and CD player connector C-126 terminal No. 30 and RV meter connector C-171 terminal No.6.





- Check the communication lines for open circuit and short circuit.

Q: Is the check result normal?

YES : Go to Step 3.
NO : Repair the wiring harness.

STEP 3. Retest the system

Confirm that the radio and CD player operation screen is displayed normally.

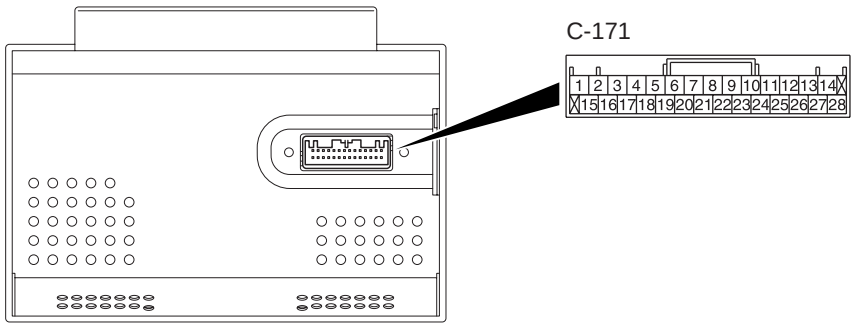
Q: Is the check result normal?

YES : The procedure is complete.
NO : Go to step 1.

CHECK AT ECU TERMINAL

M1543007601471

RV METER



Terminal No.	Signal symbol	Check condition	Terminal voltage (V)
6	M-DATA (Audio) (UART data signal)	Ignition switch: ACC RV meter AUDIO display	0 – 5
7	CAN L	–	–
9	Input of fuel gauge	Fuel: FULL	Approximately 2 V
		Fuel: EMPTY	Approximately 8 V
10	EX-TEMP (ambient temperature sensor signal)	Ignition switch: ACC <Vehicles without A/C-ECU>	5
11	ACC (ACC power supply)	Ignition switch: ACC	System voltage
12	+B	Ignition switch: ON	System voltage

Terminal No.	Signal symbol	Check condition	Terminal voltage (V)
13	VSS (Vehicle speed pulse signal)	Running	Pulse signal
14	GND (earth)	–	–
21	CAN H	–	–
23	GND – TEMP	–	–
25	ILL + (button illumination signal)	Illumination switch: ON and lighting switch: ON	System voltage
26	IG1 (IG1 power supply)	Ignition switch: ON	System voltage

ON-VEHICLE SERVICE

HOW TO SET THE COMPASS

M1543050000072

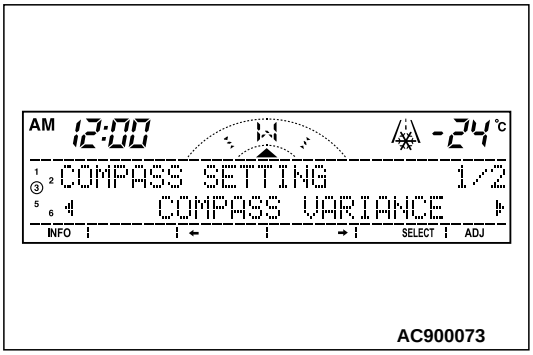
In compass setting, when the compass azimuth display is abnormal, the display can be repaired by performing the following operations.

- Declination calibration: Check that the declination calibrated value is the same as the one for the area that vehicle is in now.
- Compass calibration: Overwrites the compass azimuth circle.

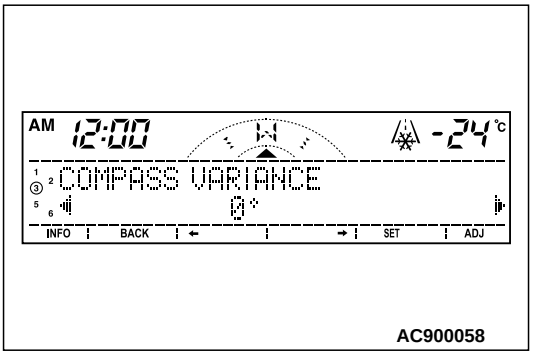
NOTE: If the problem is not solved by performing the operations above, delete the compass azimuth circle by the service mode.

HOW TO SET THE DECLINATION CALIBRATION VALUE

The "COMPASS SETTING" screen is displayed with the user customisation function in the RV meter. (Refer to P.54A-457.)



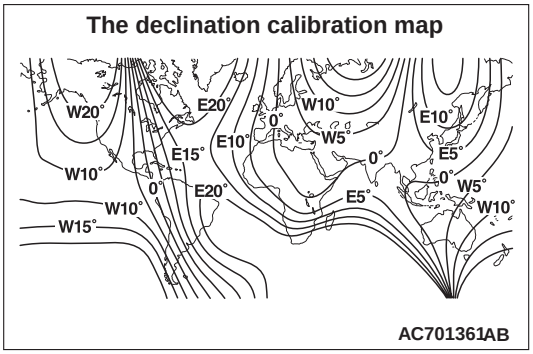
1. When the "COMPASS VARIANCE" screen is displayed, press the [SELECT] button.



2. The declination calibrated value currently set is indicated.

   NOTE: If "11° EAST" is indicated, it means that the calculated value of compass is calibrated from north to east by 11° to be displayed on the centre display.

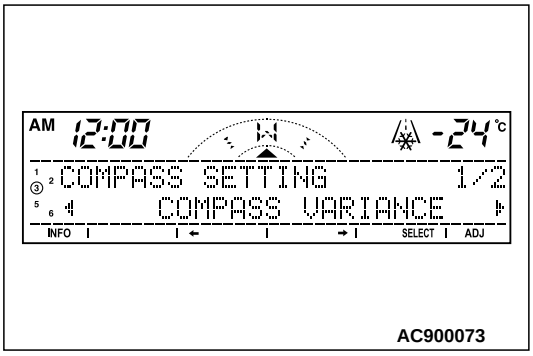
   The initial value of declination calibration is set to 0°.



3. Referring to the value on the declination calibration map, adjust the declination calibrated value by pressing the [←] button and the [→] button, so that the value becomes nearest to the value for the area that the vehicle is in now.

NOTE: The declination calibrated value can be set between 28°WEST and 28°EAST at 1° intervals.

4. After the declination calibrated value is adjusted, press the [SET] button. The screen flashes twice and the value is stored.

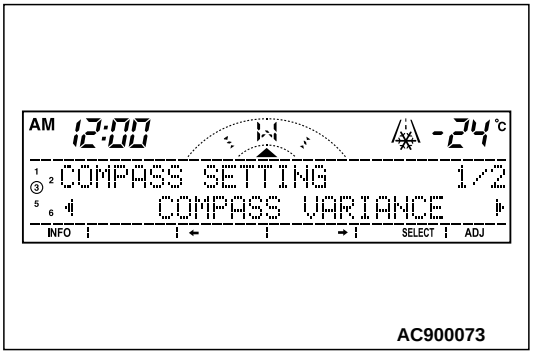


5. Press the [BACK] button to return to the "COMPASS VARIANCE" screen.

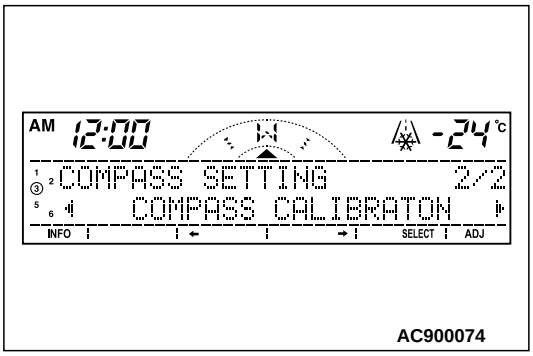
HOW TO SET THE COMPASS CALIBRATION

NOTE: Perform compass calibration in a space where the vehicle can turn around, with the engine running.

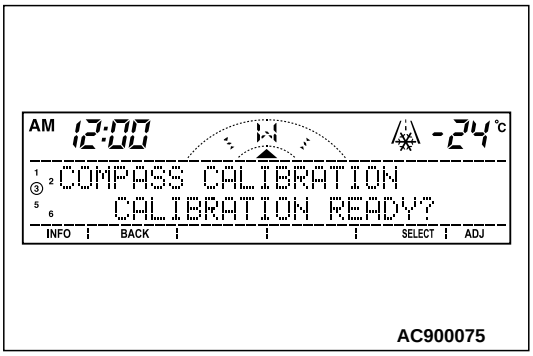
The "COMPASS SETTING" screen is displayed with the user customisation function in the RV meter.



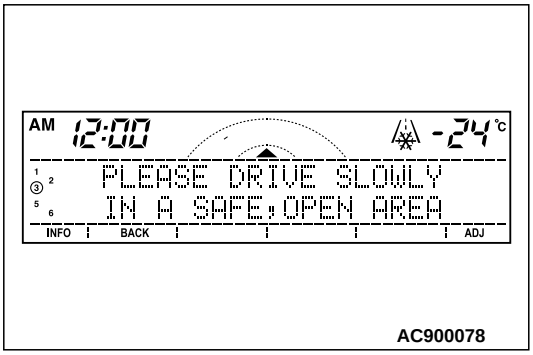
1. When the "COMPASS VARIANCE" screen is displayed, press the [SELECT] button.
2. Press the [←] button or the [→] button.



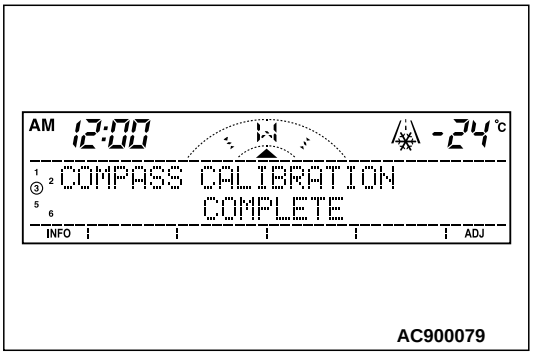
3. When the "COMPASS CALIBRATION" screen is displayed, press the [SELECT] button.



4. When "CALIBRATION READY?" is indicated, press the [SELECT] button.

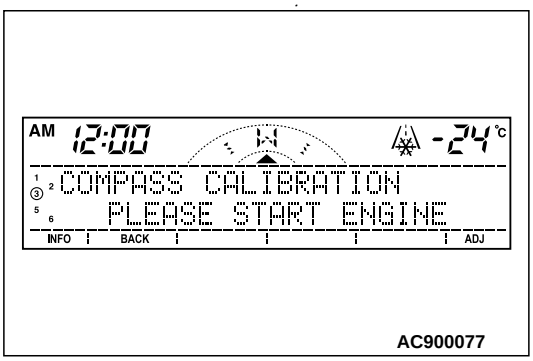


5. When "PLEASE DRIVE SLOWLY IN A SAFE, OPEN AREA" is indicated, turn the vehicle 360° in a safe and open area.



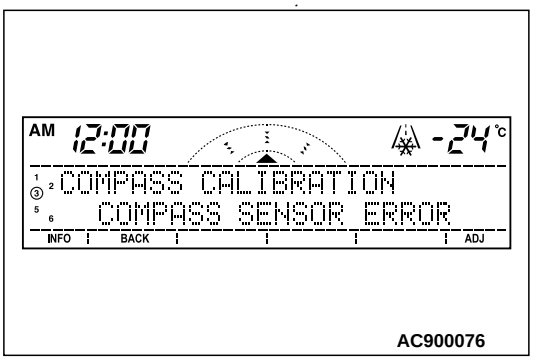
6. "COMPASS CALIBRATION COMPLETE" is indicated with a blip, and the compass calibration is completed. When three seconds have elapsed after completion, the information screen is displayed.

NOTE:



AC900077

When the engine is stopped during compass calibration, "PLEASE START ENGINE" is displayed. Perform compass calibration with the engine running.



AC900076

If the compass sensor is not normal during compass calibration, "COMPASS SENSOR ERROR" is displayed. In this case, perform RV meter troubleshooting "The compass does not indicate normally". (Refer to P.54A-483.)

VEHICLE MAGNETIC COMPENSATION

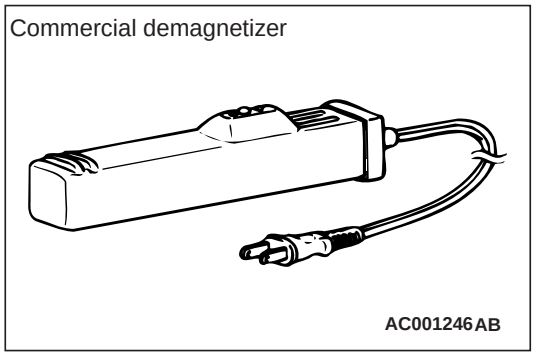
M1543009700288

DEMAGNETIZATION AND CORRECTION METHOD

⚠ CAUTION

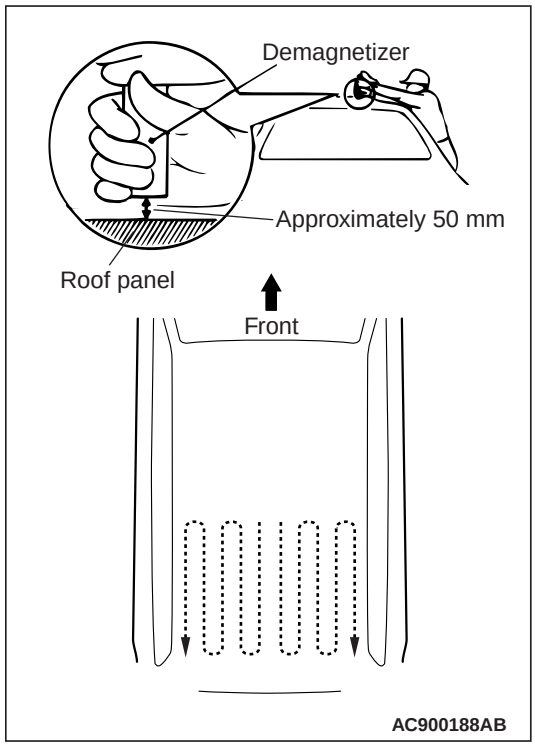
- **If the tip of demagnetizer touches the roof panel, the magnetising condition of body becomes worse to the contrary. Absolutely avoid this.**
- **If the demagnetizer is turned OFF near the body or it is suddenly separated from the body, the magnetising condition of body becomes worse to the contrary. Absolutely avoid these.**

1. Turn the ignition switch to the OFF position.



AC001246AB

2. Demagnetize the body using a commercial demagnetizer.



AC900188AB

3. While keeping the distance between the tip of demagnetizer and the roof panel to approximately 50 mm, move the demagnetizer slowly with a sweeping manner on the rear-half surface of roof panel.
4. Slowly draw the demagnetizer apart from the body. Turn OFF the switch of demagnetizer when it is apart from the body more than 50 mm.
5. After demagnetization of the geomagnetism, perform a compass calibration (Refer to How to Set the Compass P.54A-486).

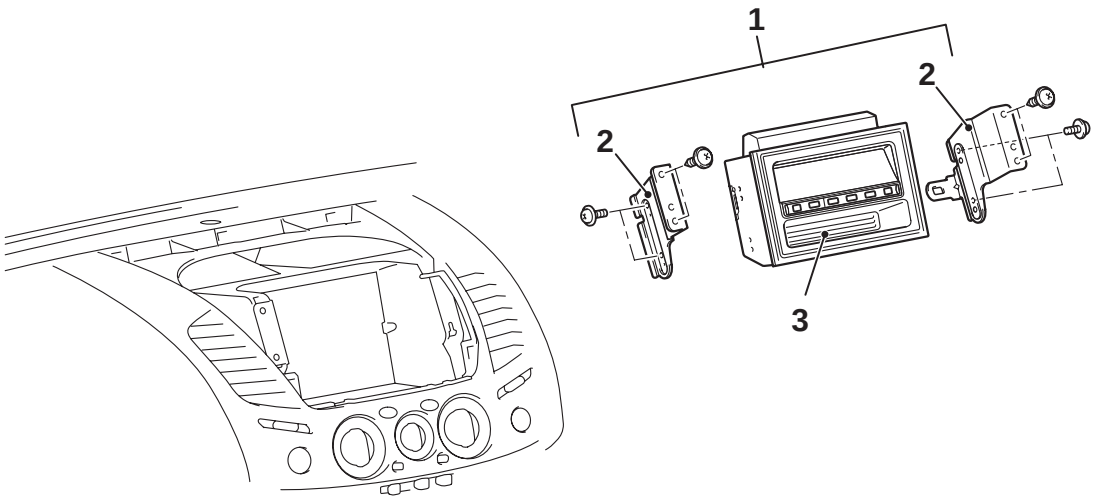
RV METER

REMOVAL AND INSTALLATION

M1543014100077

⚠ CAUTION

- **When the RV meter of another vehicle is replaced, perform "BODY TYPE" and "FUNCTION TYPE RESET" in the service mode. (Refer to P.54A-457.)**
- **After replacement of the RV meter, when the ignition switch is turned to the "ON" position for the first time, "BODY TYPE" and "DESTINATION" of the service mode are displayed automatically. Set each item following the description of the service mode. (Refer to P.54A-457.) Also perform the deviation angle correction. (Refer to P.54A-486.)**



AC900684AB

Removal steps

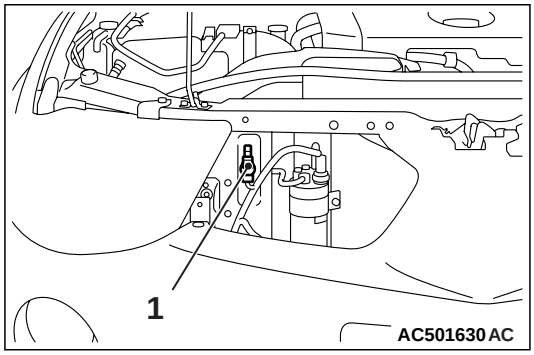
- RV meter hood (Refer to GROUP 52A – Instrument Panel Assembly)

1. RV meter assembly
2. RV meter bracket
3. RV meter

AMBIENT AIR TEMPERATURE SENSOR

REMOVAL AND INSTALLATION

M1543032700042



Removal steps

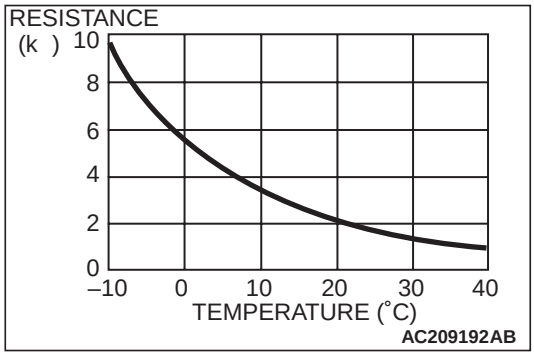
- radiator grille (RH) (GROUP 51, Radiator grille .)

1. Ambient air temperature sensor

INSPECTION

AMBIENT AIR TEMPERATURE SENSOR INSPECTION

M1546602600054



Check to see that the resistance shown in the graph is almost satisfied when measuring the resistance between the sensor terminals under two or more different temperature conditions.

DEFOGGER

TROUBLESHOOTING

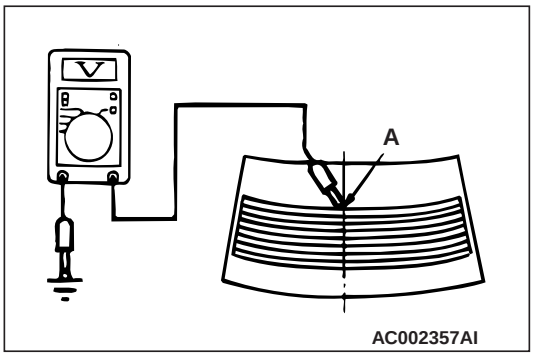
M1540500200033

Refer to GROUP 55A, Troubleshooting .

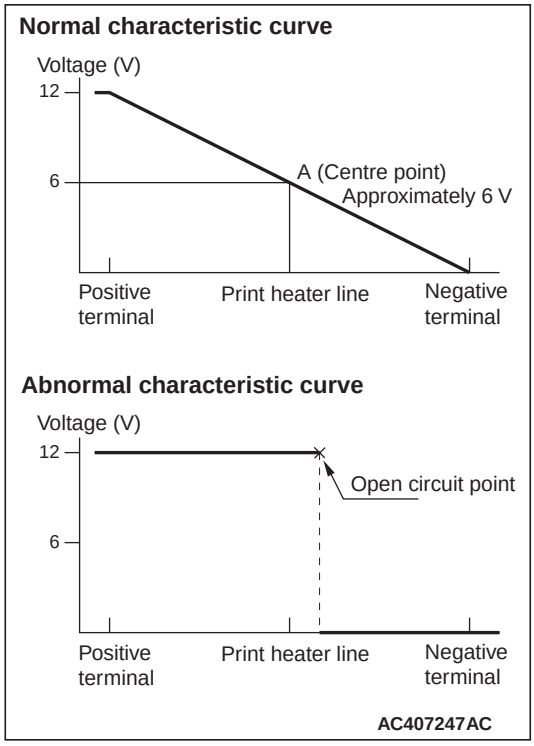
INSPECTION

PRINTED HEATER LINES CHECK

M1540500500368



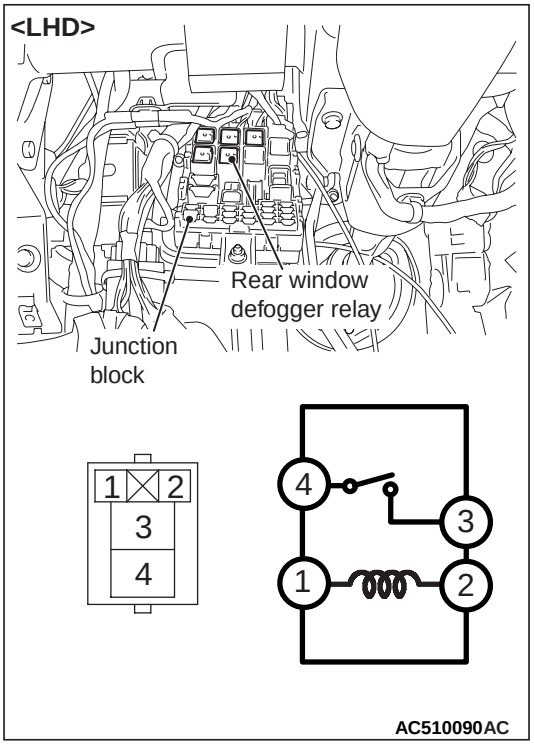
1. Run engine at 2,000 r/min. Check heater element with battery at full.
2. Turn "ON" rear window defogger switch. Measure heater element voltage with circuit tester at rear window glass centre A. Condition is good if it indicates about six volts.

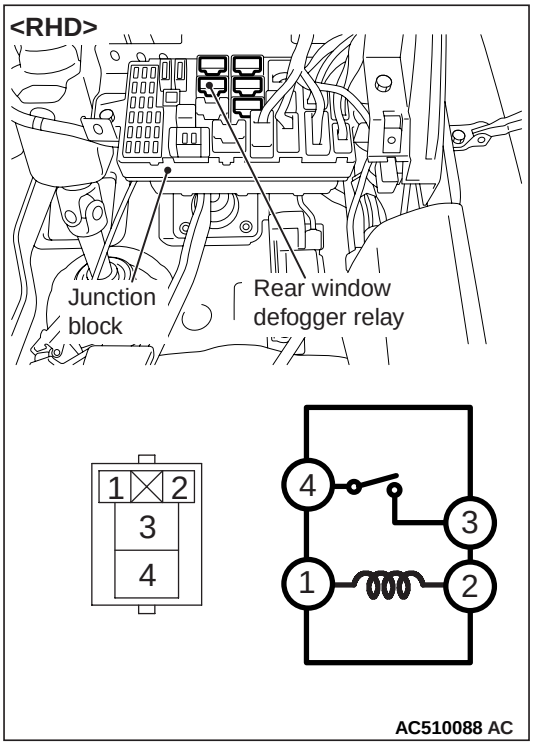


3. If 12 volts is indicated at A, there is a break in the negative terminals from A. Move test bar slowly to negative terminal to detect where voltage changes suddenly (0 volts).
4. If 0 volts is indicated at A, there is a break in the positive terminals from A. Defect where the voltage changes suddenly (12 volts) in the same method described above.
5. If a malfunction such as open circuit occurs, replace the rear window glass <vehicles without rear panel power window> or rear slide window glass <vehicles with rear panel power window>. (Refer to GROUP 42, Rear window glass <rear window glass>, Rear panel power window <rear slide window glass>.)

REAR WINDOW DEFOGGER RELAY CHECK

M1540500600031





Battery voltage	Tester connection	Specified condition
Not supplied	3 – 4	Open circuit
• Connect terminal 1 to the positive battery terminal • Connect terminal 2 to the negative battery terminal	3 – 4	Continuity exists (2 Ω or less)

DEFOGGER SWITCH

REMOVAL AND INSTALLATION

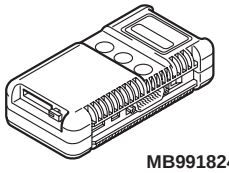
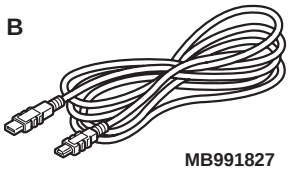
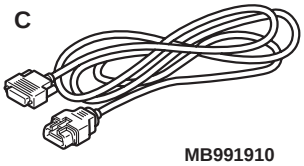
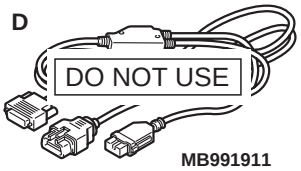
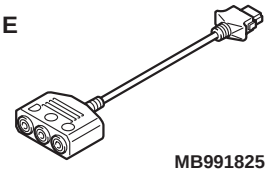
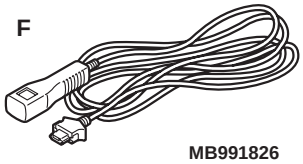
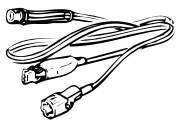
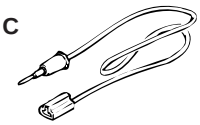
M1540600200030

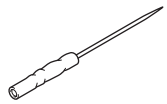
Refer to GROUP 55A, Heater control assembly and A/C switch .

ETACS

SPECIAL TOOLS

M1545000600053

Tool	Number	Name	Use
A  MB991824 B  MB991827 C  MB991910 D  MB991911 E  MB991825 F  MB991826 MB991955	MB991955 A: MB991824 B: MB991827 C: MB991910 D: MB991911 E: MB991825 F: MB991826	M.U.T.-III sub-assembly A: Vehicle Communication Interface (V.C.I.) B: M.U.T.-III USB cable C: M.U.T.-III main harness A (Vehicles with CAN communication system) D: M.U.T.-III main harness B (Vehicles without CAN communication system) E: M.U.T.-III measure adapter F: M.U.T.-III trigger harness	⚠ CAUTION **For vehicles with CAN communication, use M.U.T.-III main harness A to send simulated vehicle speed. If you connect M.U.T.-III main harness B instead, the CAN communication does not function correctly.** Checking ETACS-ECU (service data and diagnosis codes)
A B  C  D MB991223AZ	MB991223 A: MB991219 B: MB991220 C: MB991221 D: MB991222	Harness set A: Check harness B: LED harness C: LED harness adapter D: Probe	Continuity check and voltage measurement at harness wire or connector A: For checking connector pin contact pressure B: For checking power supply circuit C: For checking power supply circuit D: For connecting a locally sourced tester

Tool	Number	Name	Use
 MB992006	MB992006	Extra fine probe	Continuity check and voltage measurement at harness wire or connector

TROUBLESHOOTING

DIAGNOSIS TROUBLESHOOTING FLOW

M1545000900032

Refer to GROUP 00 – Contents of Troubleshooting .

DIAGNOSIS FUNCTION

M1545001000043

HOW TO READ DIAGNOSIS CODE

Use the M.U.T.-III to read diagnosis code (Refer to GROUP 00 – Diagnosis Function).

NOTE: Connect the M.U.T.-III to the 16-pin diagnosis connector (black).

HOW TO ERASING DIAGNOSIS CODE

Use the M.U.T.-III to erasing diagnosis code (Refer to GROUP 00 – Diagnosis Function).

NOTE: Connect the M.U.T.-III to the 16-pin diagnosis connector (black).

CHECK OF FREEZE FRAME DATA

To detect fault and store the diagnosis code, the ETACS-ECU obtains data before the confirmation of the diagnosis code and data when the diagnosis code is confirmed, and then stores the current condition of the ETACS-ECU. By analysing each data from M.U.T.-III, the troubleshooting can be performed more efficiently. Display items of the freeze frame data are as follows.

Display item list

Item No.	Item name	Data item	Unit
2	Ignition cycle	Number of times the ignition switch is turned "ON" or "LOCK (OFF)" after the past failure transition.	Number of counts is displayed.
3	Elapsed time	Total elapsed time after a diagnosis code is generated	min*
4	Accumulated minute	Cumulative time for current malfunction of diagnosis code	min

*NOTE: *: Total elapsed time can be stored up to 65534 minutes. The display of M.U.T.-III is fixed to 65534 minutes after 65534 minutes have elapsed. Or, if the battery is disconnected, the total elapsed time cannot be measured properly. Thus, 65535 minutes (null value) is displayed. Since the value is calculated according to the information from the ETACS-ECU, a proper value may not be displayed when the ETACS-ECU time-out has ocurred.*

DIAGNOSIS CODE CHART

M1545001101065

Code No.	Diagnostic item		Reference page
B1702	Immobilizer system	Reception error of key ID	Refer to immobilizer system P.54A-30.
B1703		Key ID inconsistent	
B1722		Transponder antenna failure	
B1731		Communication error with the engine-ECU	
B1761		Chassis No. not recorded	
B1766		Transponder registered for other vehicle	

Code No.	Diagnostic item		Reference page
B1707*1	Flasher timer	Detection of turn-signal lamp (open circuit)	P.54A-95
B1709	ETACS-ECU internal error (EEPROM abnormality)		P.54A-496
B1760*1	Variant coding unmatched		P.54A-496
B1762*1	Ignition OFF current draw (IOD) fuse disconnected		P.54A-497
B1765*1	ECU power supply fuse disconnected		
B1763	Column switch	Column switch abnormality (lighting switch)	P.54A-224
B1764		Column switch abnormality (wiper switch)	
U1073	CAN communication	Bus off	P.54A-501
U1100		Engine-ECU time-out (related to engine)	P.54A-501
U1101*2		A/T-ECU time-out (related to A/T)	
U1102*2		ABS-ECU or ASTC-ECU Timeout	P.54A-503
U1110*2		A/C-ECU Timeout	P.54A-504
U1111*2		RV Meter time-out	P.54A-506
U1150	Vehicle speed failure information		P.54A-507
U1507	LIN communication	ETACS-ECU LIN communication error	Refer to GROUP 54B – Diagnosis Code Chart .
U1504*2		Lighting control sensor LIN timeout <Vehicles with auto lamp>	
U1500		Column-ECU time-out	
U1508*2		Power window main switch time-out	
U1509*2		Power window sub switch (AS) time-out	
U1510*2		Power window sub switch (RL) time-out	
U1511*2		Power window sub switch (RR) time-out	
U1512*2		Rear panel power window-ECU time-out	
U1530		Column-ECU checksum error	
U1532*2		LIN comm. lighting control sensor <Vehicles with auto lamp>	
U1534*2		Power window main switch checksum error	
U1535*2		Power window sub switch (AS) checksum error	
U1536*4		Power window sub switch (RL) checksum error	
U1537*2		Power window sub switch (RR) checksum error	
U1538*2		Rear panel power window-ECU checksum error	
U1570		No bus activity error for LIN	

NOTE:

- **1: There is no "stored" state for diagnosis code No.B1707, No.B1760, No.B1762, No.B1765.*
- **2: When the diagnosis codes relating to the CAN or LIN communication error are set, make sure of the vehicle equipment. When the vehicle is not equipped with the system the ETACS-ECU communicates to, the diagnosis code is always output. This is not abnormal.*

DIAGNOSIS CODE PROCEDURES

Code No. B1709: ETACS-ECU internal error (EEPROM abnormality)

COMMENTS ON TROUBLE SYMPTOM
If an error is detected more than once during the reading from/writing to the EEPROM of the ETACS-ECU, the ETACS-ECU stores the diagnosis code No. B1709.

PROBABLE CAUSES
- Malfunction of the ETACS-ECU

DIAGNOSIS PROCEDURE

Check whether the diagnosis code is reset.
Check if diagnosis code is set to the ETACS-ECU.

Q: Is the diagnosis code set?
YES : Replace the ETACS-ECU and register the ID codes (Refer to P.54A-39).
NO : The procedure is complete.

Code No. B1760: Variant coding unmatched

COMMENTS ON TROUBLE SYMPTOM
If any abnormality is found in the contents of the variant coding that is registered to the ETACS-ECU, the diagnosis code No. B1760 is stored.

PROBABLE CAUSES
- Malfunction of the ETACS-ECU

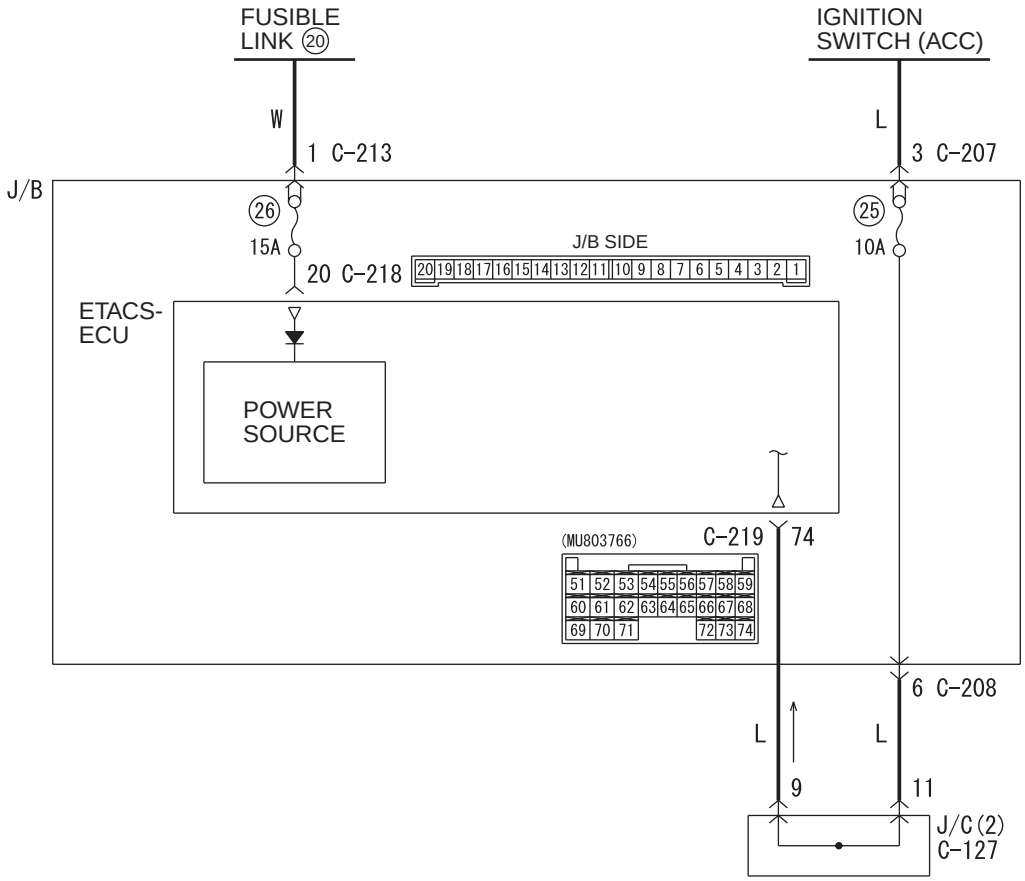
DIAGNOSIS PROCEDURE

Check whether the diagnosis code is reset.
Check again if the diagnosis code is set to the ETACS-ECU.
(1) Erase the diagnosis code.
(2) Turn the ignition switch from "LOCK" (OFF) position to "ON" position.
(3) On completion, check that the diagnosis code is reset.

Q: Is the diagnosis code set?
YES : Replace the ETACS-ECU and register the ID codes (Refer to P.54A-39).
NO : The procedure is complete.

Code No.B1762: Ignition OFF current draw (IOD) fuse disconnected
Code No.B1765: ECU power supply fuse disconnected

Fuse No.25 and No.26 Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

WAC54E105A

COMMENTS ON TROUBLE SYMPTOM

- With the ignition switch "ON" or "START," when the OFF condition (fuse disconnected) of the battery and ignition switch (ACC) is detected, ETACS-ECU stores the diagnosis code No. B1762.
- With the ignition switch "ON" or "START," when the ON condition (fuse disconnected) of the battery and ignition switch (ACC) is detected, ETACS-ECU stores the diagnosis code No. B1765.

PROBABLE CAUSES

- Malfunction of the IOD fuse (No.25)
- Malfunction of the ECU power supply fuse (No.26)
- Malfunction of the ETACS-ECU
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. Check of the fuse

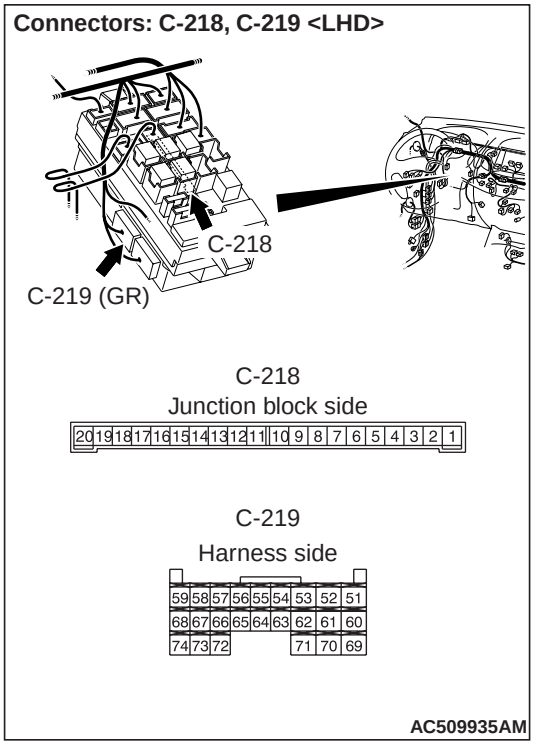
Check the fuse (No. 25 or 26).

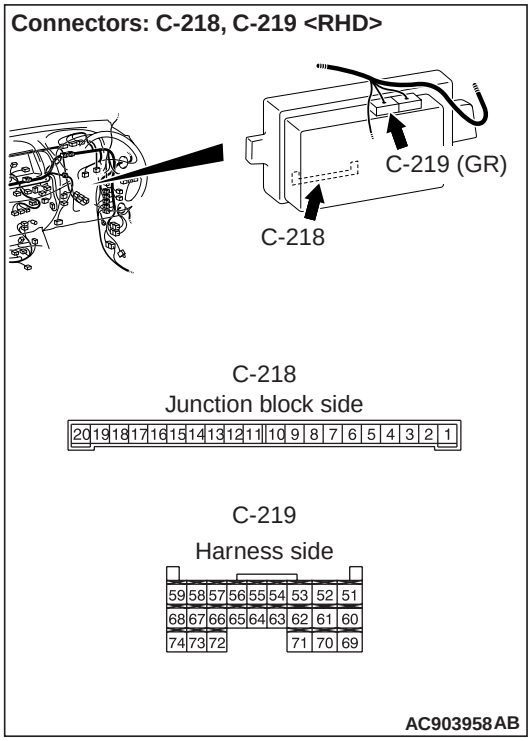
Q: Is the check result normal?

YES : Go to Step 2.

NO : Perform the inspection for a blown fuse (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points – Inspection Service Points for a Blown Fuse). Repair the fuse, and then go to Step 5 .

STEP 2. Connector check: C-218 ETACS-ECU connector, C-219 ETACS-ECU connector

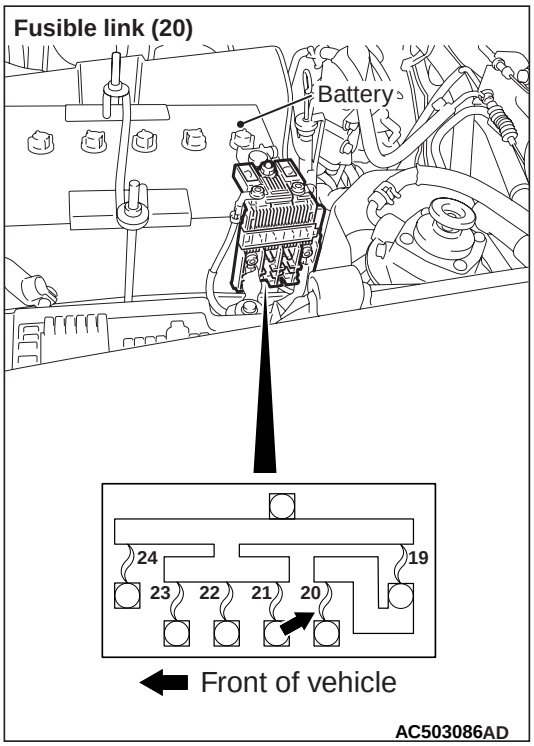


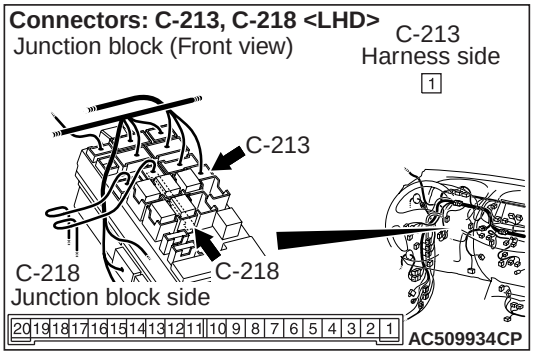


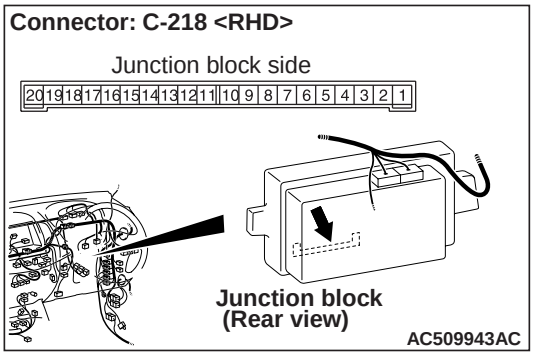
Q: Is the check result normal?

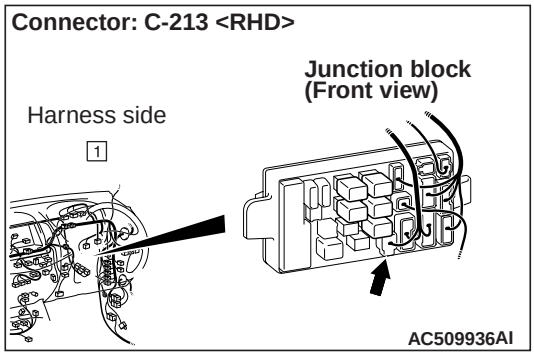
YES : Go to Step 3.
NO : Repair the defective connector. Go to Step 5.

STEP 3. Check the wiring harness between C-218 ETACS-ECU connector terminal No.20 and the fusible link (20).









Prior to the wiring harness inspection, check junction block connector C-213, and repair if necessary.

- Check the power supply line for open circuit.

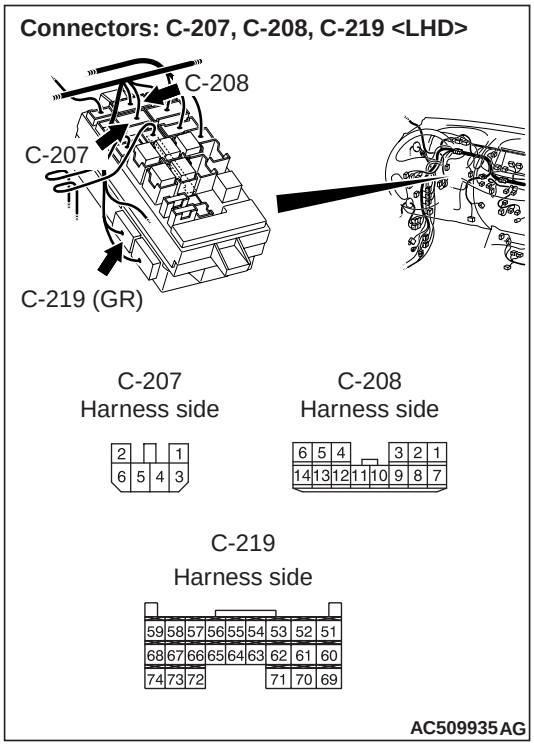
Q: Is the check result normal?

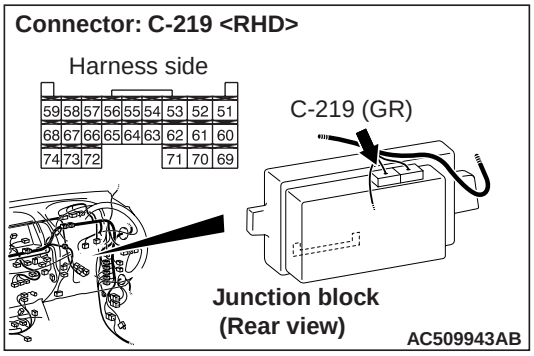
YES : Go to Step 4.

NO : Repair the wiring harness. Go to Step 5.

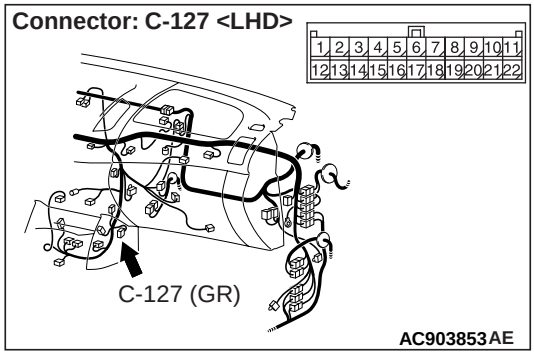
NOTE:

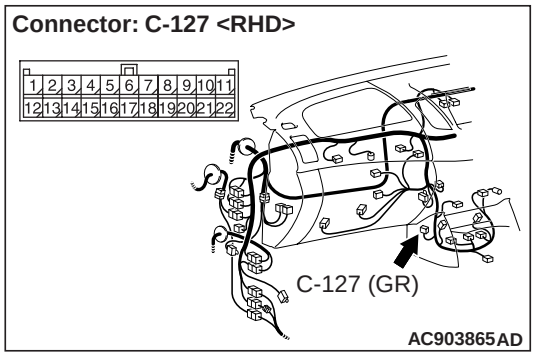
STEP 4. Check the wiring harness between C-219 ETACS-ECU connector terminal No.74 and the ignition switch (ACC).

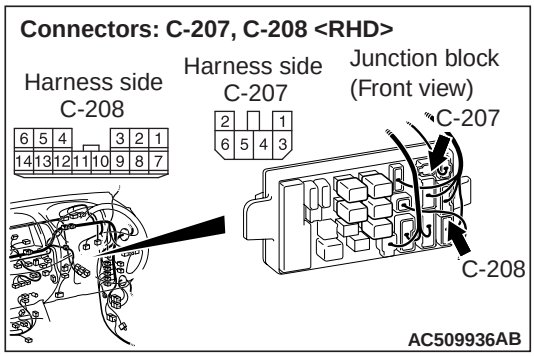




NOTE:







Prior to the wiring harness inspection, check joint connector C-127, junction block connectors C-207 and C-208, and repair if necessary.

- Check the power supply line for open circuit.

Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction). Go to Step 5.

NO : Repair the wiring harness. Go to Step 5.

STEP 5. Check whether the diagnosis code is reset.

Check if diagnosis code No.B1762 or B1765 is set to the ETACS-ECU.

Q: Is the diagnosis code set?

YES : Replace the ETACS-ECU and register the ID codes (Refer to P.54A-39).

NO : The procedure is complete.

Code No.U1073: Bus off

⚠ CAUTION
- **If diagnosis code No.U1073 is set in the ETACS-ECU, diagnose the CAN bus lines.**
- **Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.**

TROUBLE JUDGEMENT
Diagnosis code No.U1073 will be stored when the ETACS-ECU ceases CAN communication (bus off) and then resumes the communication by turning the ignition switch to the "LOCK" (OFF) position.

COMMENT ON TROUBLE SYMPTOM
The wiring harness wire or connectors may have loose, corroded, or damaged terminals, or terminals pushed back in the connector.

PROBABLE CAUSES
Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics
Use the M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the CAN bus line (Refer to GROUP 54C – Troubleshooting). On completion, go to Step 3.

STEP 2. Check whether the diagnosis code is reset.
Check again if the diagnosis code is set to the ETACS-ECU.
(1) Erase the diagnosis code.
(2) Turn the ignition switch from "LOCK" (OFF) position to "ON" position.
(3) On completion, check that the diagnosis code is reset.

Q: Is the diagnosis code set?
YES : Replace the ETACS-ECU and register the ID codes (Refer to P.54A-39), and Then go to Step 3.
NO : If the trouble is solved, it is determined that there is an intermittent malfunction such as poor engaged connector(s) or open circuit (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions).

STEP 3. Check whether the diagnosis code is reset.
Recheck if the diagnosis code is set to the ETACS-ECU.
(1) Erase the diagnosis code.
(2) Turn the ignition switch from "LOCK" (OFF) position to "ON" position.
(3) Check if the diagnosis code is reset.

Q: Is the diagnosis code set?
YES : Return to Step 1.
NO : The procedure is complete.

Code No.U1100: Engine-ECU time-out (Related to Engine)
Code No.U1101: A/T-ECU time-out (Related to A/T)

⚠ CAUTION
- **If diagnosis code No.U1100 or U1101 is set in the ETACS, diagnose the CAN main bus line.**
- **Whenever the ECU is replaced, ensure that the communication circuit is normal.**
- **For M/T-vehicles, diagnosis code No. U1101 does not mean that there is a problem..**

TROUBLE JUDGEMENT

Diagnosis code No.U1100
- The ETACS-ECU receives engine control system-related signals from the engine-ECU through the CAN bus lines. If the ECU cannot receive the engine control system-related signal at all, diagnosis code No.U1100 will be set.

Diagnosis code No.U1101
- The ETACS-ECU receives the transmission control signals from the A/T-ECU <A/T> via CAN bus lines. If the ECU cannot receive the transmission control signal at all, diagnosis code No.U1101 will be set.

COMMENT ON TROUBLE SYMPTOM

The M.U.T.-III shows a diagnosis code status as active.

- Connector(s) or wiring harness in the CAN bus lines between the ETACS-ECU and the engine-ECU or the A/T-ECU <A/T>, the power supply circuits to the engine-ECU or the A/T-ECU <A/T> itself may be defective.

The M.U.T.-III shows a diagnosis code status as stored.

- If diagnosis code No.U1100 or U1101 is set as past trouble, carry out diagnosis with particular emphasis on wiring and connector(s) in the CAN bus lines between the ETACS-ECU and the engine-ECU or the A/T-ECU <A/T>, or power supply to the engine-ECU or the A/T-ECU <A/T>. For diagnosis procedures, refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Treat Past Trouble .

NOTE: For a past trouble, you cannot find it by the M.U.T.-III CAN bus diagnostics even if there is any failure in CAN bus lines. In this case, refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions and check the CAN bus lines. You can narrow down the probable cause of the trouble by referring to the diagnosis code, which is set regarding the CAN communication-linked ECUs (Refer to GROUP 54C – CAN Bus Line Diagnostic Flow).

PROBABLE CAUSES

- Malfunction of the engine-ECU or the A/T-ECU <A/T>
- Malfunction of the CAN bus

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics

Use the M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?

YES : Go to Step 2.

NO : Repair the CAN bus line (Refer to GROUP 54C – Troubleshooting). On completion, go to Step 6.

STEP 2. Check the diagnosis code of the engine-ECU or the A/T-ECU <A/T>.

Check if the diagnosis code is set in either of the engine-ECU or the A/T-ECU <A/T>.

Q: Is the diagnosis code set?

YES : Diagnose the engine-ECU or the A/T-ECU (Refer to GROUP 13A – Troubleshooting <engine-ECU> or GROUP 23A Troubleshooting <A/T-ECU>). On completion, go to Step 6.

NO : Go to Step 3.

STEP 3. M.U.T.-III other system diagnosis code

Check if a diagnosis code, which relates to CAN communication-linked systems below, is set.

- ABS-ECU

U1100: Engine-ECU time-out or U1101: A/T-ECU time-out <A/T>

Q: Is the diagnosis code set?

YES : Go to Step 4.

NO : Go to Step 5.

STEP 4. Check whether the diagnosis code is reset.

Check again if the diagnosis code is set to the ETACS-ECU.

(1) Erase the diagnosis code.
(2) Turn the ignition switch from "LOCK" (OFF) position to "ON" position.
(3) On completion, check that the diagnosis code is reset.

Q: Is the diagnosis code set?

YES : Replace the engine-ECU or the A/T-ECU <A/T>. Then, carry out the CAN bus diagnostics.Then go to Step 6.

NO : A poor connection, open circuit or other intermittent malfunction is present in the CAN bus lines between the engine-ECU or the A/T-ECU <A/T> and the ETACS-ECU (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions).

STEP 5. Check whether the diagnosis code is reset.

Check again if the diagnosis code is set to the ETACS-ECU.

(1) Erase the diagnosis code.
(2) Turn the ignition switch from "LOCK" (OFF) position to "ON" position.
(3) On completion, check that the diagnosis code is reset.

Q: Is the diagnosis code set?

YES : Replace the ETACS-ECU and register the ID codes (Refer to P.54A-39). Then, carry out the CAN bus diagnostics. Then go to Step 6 .
NO : A poor connection, open circuit or other intermittent malfunction is present in the CAN bus lines between the engine-ECU or the A/T-ECU <A/T> and the ETACS-ECU (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions).

STEP 6. Check whether the diagnosis code is reset.
Recheck if the diagnosis code is set to the ETACS-ECU.
(1) Erase the diagnosis code.
(2) Turn the ignition switch from "LOCK" (OFF) position to "ON" position.
(3) On completion, check that the diagnosis code is reset.

Q: Is the diagnosis code set?
YES : Return to Step 1.
NO : The procedure is complete.

Code No.U1102: ABS-ECU or ASTC-ECU timeout

⚠ CAUTION
- **If diagnosis code No.U1102 is set in the ETACS, diagnose the CAN main bus line.**
- **Whenever the ECU is replaced, ensure that the communication circuit is normal.**

TROUBLE JUDGEMENT
The ETACS-ECU receives ABS or ASTC-related signals from the ABS-ECU or ASTC-ECU through the CAN bus lines. If the ECU cannot receive the ABS or ASTC-related signal at all, diagnosis code No.U1102 will be set.

COMMENT ON TROUBLE SYMPTOM

The M.U.T.-III shows a diagnosis code status as active.
- Connector(s) or wiring harness in the CAN bus lines between the ETACS-ECU and the ABS-ECU or ASTC-ECU, the power supply circuits to the ABS-ECU or ASTC-ECU itself may be defective.

The M.U.T.-III shows a diagnosis code status as stored.
- If diagnosis code No.U1102 is set as past trouble, carry out diagnosis with particular emphasis on wiring and connector(s) in the CAN bus lines between the ETACS-ECU and the ABS-ECU or ASTC-ECU, or power supply to the ABS-ECU or ASTC-ECU. For diagnosis procedures, refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Treat Past Trouble .

NOTE: For a past trouble, you cannot find it by the M.U.T.-III CAN bus diagnostics even if there is any failure in CAN bus lines. In this case, refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions and check the CAN bus lines. You can narrow down the probable cause of the trouble by referring to the diagnosis code, which is set regarding the CAN communication-linked ECUs (Refer to GROUP 54C – CAN Bus Line Diagnostic Flow).

PROBABLE CAUSES
- Malfunction of the ABS-ECU or ASTC-ECU
- Malfunction of the CAN bus

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics
Use the M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the CAN bus line (Refer to GROUP 54C – Troubleshooting). On completion, go to Step 6.

STEP 2. Check the diagnosis code of the ABS-ECU or ASTC-ECU.
Check if the diagnosis code is set in either of the ABS-ECU or ASTC-ECU.

Q: Is the diagnosis code set?
YES : Diagnose the ABS-ECU or ASTC-ECU (Refer to GROUP 35B – Troubleshooting <ABS-ECU> or GROUP 35C Troubleshooting <ASTC-ECU>). On completion, go to Step 6.
NO : Go to Step 3.

STEP 3. M.U.T.-III other system diagnosis code
Check if a diagnosis code, which relates to CAN communication-linked systems below, is set.
- Engine-ECU

U1102: ABS-ECU or ASTC-ECU Timeout

Q: Is the diagnosis code set?
YES : Go to Step 4.
NO : Go to Step 5.

STEP 4. Check whether the diagnosis code is reset.
Check again if the diagnosis code is set to the ETACS-ECU.
(1) Erase the diagnosis code.
(2) Turn the ignition switch from "LOCK" (OFF) position to "ON" position.
(3) On completion, check that the diagnosis code is reset.

Q: Is the diagnosis code set?
YES : Replace the ABS-ECU or ASTC-ECU. Then, carry out the CAN bus diagnostics.Then go to Step 6.
NO : A poor connection, open circuit or other intermittent malfunction is present in the CAN bus lines between the ABS-ECU or ASTC-ECU and the ETACS-ECU (Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

STEP 5. Check whether the diagnosis code is reset.
Check again if the diagnosis code is set to the ETACS-ECU.
(1) Erase the diagnosis code.
(2) Turn the ignition switch from "LOCK" (OFF) position to "ON" position.
(3) On completion, check that the diagnosis code is reset.

Q: Is the diagnosis code set?
YES : Replace the ETACS-ECU and register the ID codes (Refer to P.54A-39). Then, carry out the CAN bus diagnostics. Then go to Step 6 .
NO : A poor connection, open circuit or other intermittent malfunction is present in the CAN bus lines between the ABS-ECU or ASTC-ECU and the ETACS-ECU (Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

STEP 6. Check whether the diagnosis code is reset.
Recheck if the diagnosis code is set to the ETACS-ECU.
(1) Erase the diagnosis code.
(2) Turn the ignition switch from "LOCK" (OFF) position to "ON" position.
(3) On completion, check that the diagnosis code is reset.

Q: Is the diagnosis code set?
YES : Return to Step 1.
NO : The procedure is complete.

Code No.U1110: A/C-ECU timeout

⚠ CAUTION
- **If diagnosis code No.U1110 is set in the ETACS-ECU, diagnose the CAN main bus line.**
- **Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.**
- **For vehicles without automatic A/C, diagnosis code No. U1110 does not mean that there is a problem.**

NOTE: When the diagnosis codes relating to the CAN communication error are set, make sure of the vehicle equipment. When the vehicle is not equipped with the system the ETACS-ECU communicates to, the diagnosis code is always output. This is not abnormal.

TROUBLE JUDGEMENT
The ETACS-ECU receives signal from the A/C-ECU. If A/C-related signal cannot be received at all, diagnosis code No.U1110 will be set.

COMMENT ON TROUBLE SYMPTOM

The M.U.T.-III shows a diagnosis code status as active.

- Connector(s) or wiring harness in the CAN bus lines between the A/C-ECU and the ETACS-ECU, the power supply system to the A/C-ECU, the A/C-ECU itself, or the ETACS-ECU may be defective.

The M.U.T.-III shows a diagnosis code status as stored.

- If diagnosis code No.U1110 is stored as a past trouble, carry out diagnosis with particular emphasis on wiring and connector(s) in the CAN bus line between the A/C-ECU and the ETACS-ECU, and the power supply system to the A/C-ECU. For diagnosis procedures, refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Treat Past Trouble .

NOTE: For a past trouble, you cannot find it by the M.U.T.-III CAN bus diagnostics even if there is any failure in CAN bus lines. In this case, refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions and check the CAN bus lines. You can narrow down the probable cause of the trouble by referring to the diagnosis code, which is set regarding the CAN communication-linked ECUs (Refer to GROUP 54C – CAN Bus Line Diagnostic Flow).

PROBABLE CAUSES

- Malfunction of the A/C-ECU
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics

Use the M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?

YES : Go to Step 2.

NO : Repair the CAN bus line (Refer to GROUP 54C – Troubleshooting). On completion, go to Step 5.

STEP 2. Check the diagnosis code of the A/C.

Check that the A/C-ECU sets a diagnosis code.

Q: Is the diagnosis code set?

YES : Diagnose the A/C (Refer to). On completion, go to Step 5.

NO : Go to Step 3.

STEP 3. Check whether the diagnosis code is reset.

Check again if the diagnosis code is set to the ETACS-ECU.

(1) Erase the diagnosis code.
(2) Turn the ignition switch from "LOCK" (OFF) position to "ON" position.
(3) On completion, check that the diagnosis code is reset.

Q: Is the diagnosis code set?

YES : Replace the A/C-ECU. After replacing the A/C-ECU, carry out the CAN bus diagnostics. Then go to Step 4.

NO : A poor connection, open circuit or other intermittent malfunction is present in the CAN bus lines between the A/C-ECU and the ETACS-ECU (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions).

STEP 4. Check whether the diagnosis code is reset.

Check again if the diagnosis code is set to the ETACS-ECU.

(1) Erase the diagnosis code.
(2) Turn the ignition switch from "LOCK" (OFF) position to "ON" position.
(3) On completion, check that the diagnosis code is reset.

Q: Is the diagnosis code set?

YES : Replace the ETACS-ECU and register the ID codes (Refer to P.54A-39). After replacing the ECU, carry out the CAN bus diagnostics. Then go to Step 5.

NO : The procedure is complete.

STEP 5. Check whether the diagnosis code is reset.

Recheck if the diagnosis code is set to the ETACS-ECU.

(1) Erase the diagnosis code.
(2) Turn the ignition switch from "LOCK" (OFF) position to "ON" position.
(3) On completion, check that the diagnosis code is reset.

Q: Is the diagnosis code set?

YES : Return to Step 1.

NO : The procedure is complete.

Code No.U1111: RV Meter time-out

⚠ CAUTION
- **If diagnosis code No.U1111 is set in the ETACS-ECU, diagnose the CAN main bus line.**
- **Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.**
- **For vehicles without RV meter, diagnosis code No. U1111 does not mean that there is a problem.**

TROUBLE JUDGEMENT

The ETACS-ECU receives signal from the RV meter. If RV meter-related signal cannot be received at all, diagnosis code No.U1111 will be set.

COMMENT ON TROUBLE SYMPTOM

The M.U.T.-III shows a diagnosis code status as active.
- Connector(s) or wiring harness in the CAN bus lines between the RV meter and the ETACS-ECU, the power supply system to the RV meter, the RV meter itself, or the ETACS-ECU may be defective.

The M.U.T.-III shows a diagnosis code status as stored.
- If diagnosis code No.U1111 is stored as a past trouble, carry out diagnosis with particular emphasis on wiring and connector(s) in the CAN bus line between the RV meter and the ETACS-ECU, and the power supply system to the RV meter. For diagnosis procedures, refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Treat Past Trouble .

NOTE: For a past trouble, you cannot find it by the M.U.T.-III CAN bus diagnostics even if there is any failure in CAN bus lines. In this case, refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions and check the CAN bus lines. You can narrow down the probable cause of the trouble by referring to the diagnosis code, which is set regarding the CAN communication-linked ECUs (Refer to GROUP 54C – CAN Bus Line Diagnostic Flow).

PROBABLE CAUSES
- Malfunction of the RV meter
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics

Use the M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
- **YES :** Go to Step 2.
- **NO :** Repair the CAN bus line (Refer to GROUP 54C – Troubleshooting). On completion, go to Step 5.

STEP 2. Check the diagnosis code of the RV meter

Check that the RV meter sets a diagnosis code.

Q: Is the diagnosis code set?
- **YES :** Diagnose the RV meter (Refer to P.54A-462). On completion, go to Step 5.
- **NO :** Go to Step 3.

STEP 3. Check whether the diagnosis code is reset.

Check again if the diagnosis code is set to the ETACS-ECU.
(1) Erase the diagnosis code.
(2) Turn the ignition switch from "LOCK" (OFF) position to "ON" position.
(3) On completion, check that the diagnosis code is reset.

Q: Is the diagnosis code set?
- **YES :** Replace the RV meter. After replacing the RV meter, carry out the CAN bus diagnostics. Then go to Step 4.
- **NO :** A poor connection, open circuit or other intermittent malfunction is present in the CAN bus lines between the RV meter and the ETACS-ECU (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions).

STEP 4. Check whether the diagnosis code is reset.

Check again if the diagnosis code is set to the ETACS-ECU.
(1) Erase the diagnosis code.
(2) Turn the ignition switch from "LOCK" (OFF) position to "ON" position.
(3) On completion, check that the diagnosis code is reset.

Q: Is the diagnosis code set?
YES : Replace the ETACS-ECU and register the ID codes (Refer to P.54A-39). After replacing the ECU, carry out the CAN bus diagnostics. Then go to Step 5.
NO : A poor connection, open circuit or other intermittent malfunction is present in the CAN bus lines between the RV meter and the ETACS-ECU (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions).

STEP 5. Check whether the diagnosis code is reset.
Recheck if the diagnosis code is set to the ETACS-ECU.
(1) Erase the diagnosis code.
(2) Turn the ignition switch from "LOCK" (OFF) position to "ON" position.
(3) On completion, check that the diagnosis code is reset.

Q: Is the diagnosis code set?
YES : Return to Step 1.
NO : The procedure is complete.

Code No.U1150: Vehicle speed failure information

COMMENTS ON TROUBLE SYMPTOM
The ETACS-ECU receives the vehicle speed signal from the engine-ECU via the CAN bus line. When the received vehicle speed signal contains the failure information, the diagnosis code No. U1150 is stored.

PROBABLE CAUSES
- Malfunction of the vehicle speed sensor
- Malfunction of the engine-ECU
- Malfunction of the ETACS-ECU
- Malfunction of the CAN bus

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics
Use the M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the CAN bus line (Refer to GROUP 54C – Troubleshooting). On completion, go to Step 3.

STEP 2. Check the diagnosis code of the engine-ECU.
Check that the engine-ECU set a diagnosis code.

Q: Is the diagnosis code set?
YES : Diagnose the engine-ECU. Refer to GROUP 13A – Troubleshooting . On completion, go to Step 3.
NO : Go to Step 3.

STEP 3. Check whether the diagnosis code is reset.
Check again if the diagnosis code is set to the ETACS-ECU.
(1) Erase the diagnosis code.
(2) Turn the ignition switch from "LOCK" (OFF) position to "ON" position.
(3) On completion, check that the diagnosis code is reset.

Q: Is the diagnosis code set?
YES : Replace the ETACS-ECU and register the ID codes (Refer to P.54A-39). After replacing the ECU, carry out the CAN bus diagnostics.
NO : The procedure is complete.

DATA LIST REFERENCE TABLE
M1545001300550
Use the M.U.T.-III to check "Service Data."

NOTE: If a problem is found in the "Service Data" check, refer to the Check Trouble by Using the Input Signal Check (Refer to P.54A-522).

1. The following input signals can be checked by using the M.U.T.-III.

INPUT SIGNALS WHICH CAN BE CHECKED BY SERVICE DATA

Item No.	Item name	Check condition	Normal condition
19	Driver's door switch	Driver's door: Open	ON
		Driver's door: Closed	OFF

Item No.	Item name	Check condition	Normal condition
20	Driver's door unlock switch	When driver's door is unlocked	ON
		Other than above	OFF
21	Driver's door lock switch	When driver's door is locked	ON
		Other than above	OFF
22	Electric folding door mirror SW	Not used	OFF
25	Front wiper auto stop switch	When windshield wipers are in operation	ON
		Other than above	OFF
26	Hazard warning lamp switch	While hazard switch is pressed	ON
		Other than above	OFF
27	Rear wiper auto stop switch	Not used	OFF
28	Steering lock switch	When the ignition key is removed from the ignition key cylinder	ON
		When the ignition key is inserted into the ignition key cylinder	OFF
29	Ignition switch(ACC)	When the ignition switch is turned to the "ACC" or "ON" position.	ON
		Other than above	OFF
30	Ignition switch(IG1)	When the ignition switch is turned to the "ON" or "START" position.	ON
		Other than above	OFF
44	Ignition switch(IG2)	When the ignition switch is turned to the "ON" position.	ON
		Other than above	OFF
45	Shift position "R" input	Not used	OFF
48	Passenger's door switch	Front passenger's door: Open	ON
		Front passenger's door: Closed	OFF
49	Rear door switch	Rear door or tailgate: Open	ON
		Rear door or tailgate: Closed	OFF
50	Driver's seatbelt(Buckle SW)	Driver's seat belt: unfastened	ON
		Driver's seat belt: fastened	OFF
51	Passenger seatbelt(Buckle SW)	Passenger's seat belt: unfastened	ON
		Passenger's seat belt: fastened	OFF
52	Gate opener switch	When the tailgate lock release handle is turned to the "ON" position.	ON
		Other than above	OFF
55	Battery voltage	Always	System voltage
56	Remain of head lamp timer	When headlamp automatic-shutdown function is operating	Displays the time
58	Vehicle speed signal	Perform a run of the vehicle.	Displays the vehicle speed

Item No.	Item name	Check condition	Normal condition
59	Tail lamp output	When the tail lamp illuminates.	ON
		Other than above	OFF
60	Headlamp output	When the headlamp (low-beam) illuminates.	ON
		Other than above	OFF
61	Headlamp HI output	When the headlamp (high-beam) illuminates.	ON
		Other than above	OFF
62	Turn-signal lamp (LH) output	When the turn-signal lamp (LH) illuminates.	ON
		Other than above	OFF
63	Turn-signal lamp (RH) output	When the turn-signal lamp (RH) illuminates.	ON
		Other than above	OFF
64	Headlamp washer output	When the headlamp washer operates.	ON
		Other than above	OFF
65	Front wiper output	When the front wiper operates.	ON
		Other than above	OFF
66	Front wiper HI output	When the windshield wiper (high-speed) operates.	ON
		Other than above	OFF
67	Front washer output	When the windshield washer operates.	ON
		Other than above	OFF
68	Door "LOCK" output	When the door is in the "lock" state.	ON
		Other than above	OFF
69	Door "UNLOCK" output	When the door is in the "unlock" state.	ON
		Other than above	OFF
70	Front fog lamp	When the front fog lamp illuminates.	ON
		Other than above	OFF
71	Rear fog lamp	When the rear fog lamp illuminates.	ON
		Other than above	OFF
72	Room lamp output	When the room lamp illuminates.	ON
		Other than above	OFF
73	Horn	Not used	OFF
74	Buzzer	When the buzzer sounds.	ON
		Other than above	OFF
75	IG key cylinder ILL. output	When the ignition key cylinder illumination lamp illuminates.	ON
		Other than above	OFF

Item No.	Item name	Check condition	Normal condition
76	Illuminations power supply	When the illumination lamp of clock or manual air conditioner illuminates.	ON
		Other than above	OFF
77	Power window relay output	When the ignition switch is turned to the "ON" position.	ON
		Other than above	OFF
78	Door indicator output	When the door indicator illuminates.	ON
		Other than above	OFF
79	Seatbelt indicator output	When the door indicator illuminates.	ON
		Other than above	OFF
80	All of the door switch output	Not used	OFF
81	Shift position "P" output	Not used	OFF
83	Rear washer output	Not used	OFF
84	Rear wiper output	Not used	OFF
86	Intermittent wiper interval	When the intermittent wiper operates.	Displays the time
87	Gate opener output	When the tailgate open actuator operates.	ON
		Other than above	OFF
88	ELC.folding mirror(OPEN)output	Not used	OFF
89	ELC.folding mirror(CLOSE)output	Not used	OFF
90	Security alarm sensor input	Not used	OFF
91	Hood switch	Not used	OFF
101	Driver's key unlock switch	Not used	OFF
102	Security alarm history	Not used	OFF
103	Rear defogger switch	Not used	OFF
104	Auto lamp sensor voltage	When the ignition switch is turned to the "ON" position.	Displays the voltage of the auto-light sensor.
105	Security indicator output	When the security indicator illuminates.	ON
		Other than above	OFF
106	Rear defogger output	Not used	OFF
107	DRL output	Not used	OFF

CHECK CHART FOR TROUBLE SYMPTOMS

M1545001200069

Symptom	Inspection procedure number	Reference page
When the ignition switch is at the "LOCK" (OFF) position, the functions do not work normally.	A-1	P.54A-512
Check the battery power supply circuit to the ETACS-ECU.		

<FUNCTION SYSTEM>

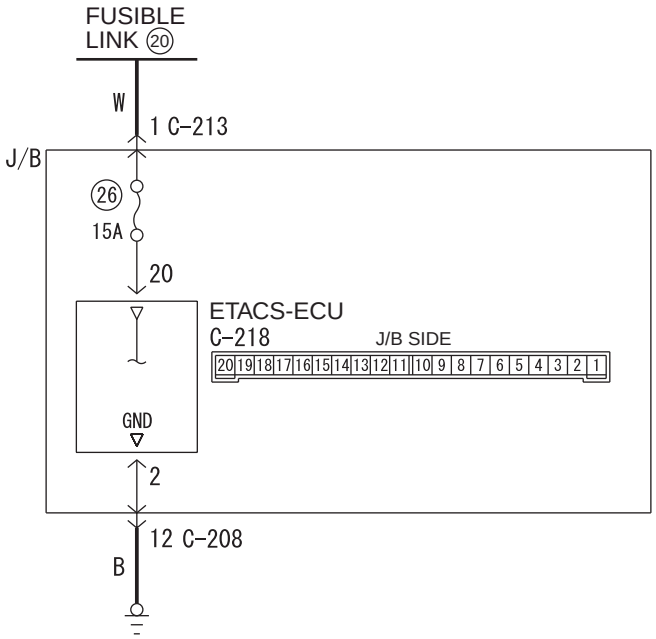
Symptom		Inspection procedure number	Reference page
Buzzer	Lamp reminder buzzer function does not work normally.	B-1	P.54A-517
	Turn-signal lamp operation sound function does not work normally.	B-2	P.54A-518
	Door ajar warning buzzer function does not work normally.	B-3	P.54A-519
	Seat belt warning buzzer function does not work normally.	B-4	P.54A-521

SYMPTOM PROCEDURES

Inspection Procedure A-1: When the ignition switch is at the "LOCK" (OFF) position, the functions do not work normally. Check the battery power supply circuit to the ETACS-ECU.

⚠ CAUTION
Whenever the ECU is replaced, ensure that the power supply circuit and the earthing circuit are normal.

ETACS-ECU Power Source Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

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COMMENTS ON TROUBLE SYMPTOM
If this circuit is defective and the ignition switch is at the "LOCK" (OFF) position, the ETACS-ECU does not work. In this case, the functions below will be suspended.

- Lamp reminder function

- Keyless entry system

However, when the ignition switch is at the ON position, the functions below will work.

- Reading diagnosis code and checking input signal by M.U.T.-III.
- Central door locking
- Headlamp and tail lamp
- Hazard warning lamp
- Room lamps

PROBABLE CAUSES

- Malfunction of the ETACS-ECU
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III data list

Check the power supply voltage of the ETACS-ECU.

- Turn the ignition switch to the "LOCK" (OFF) position

Item No.	Item name	Normal condition
55	Battery voltage(battery)	System voltage

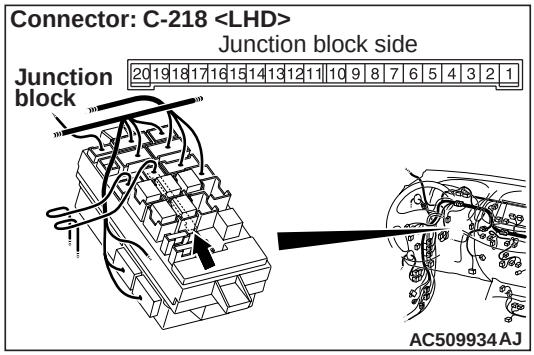
OK: Normal condition is displayed.

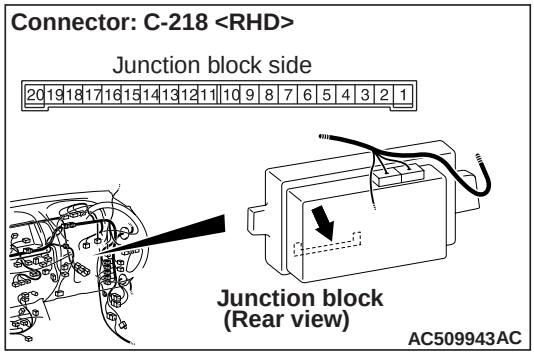
Q: Is the check result normal?

YES : Go to Step 4.

NO : Go to Step 2.

STEP 2. Connector check: C-218 ETACS-ECU connector



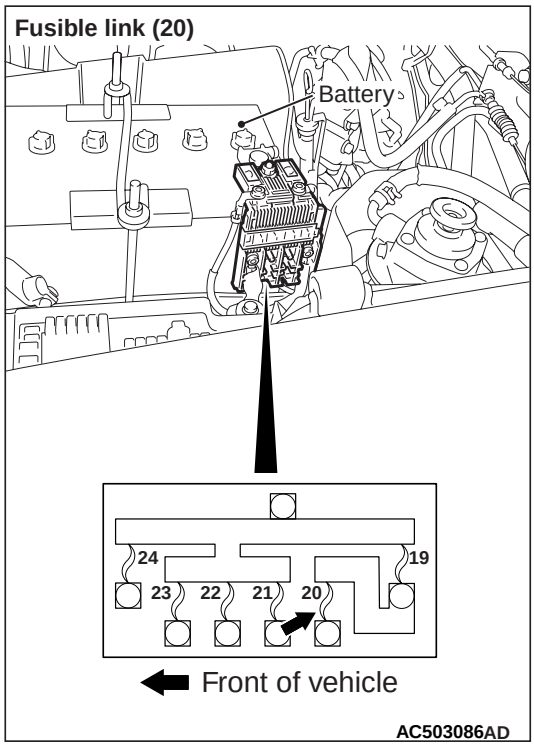


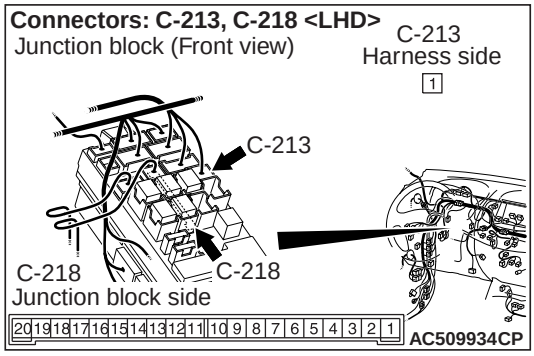
Q: Is the check result normal?

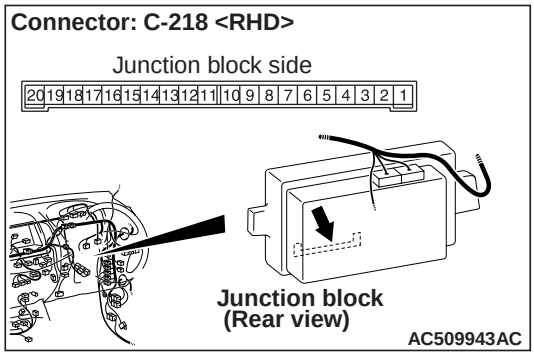
YES : Go to Step 3.

NO : Repair the defective connector.

STEP 3. Check the wiring harness between C-218 ETACS-ECU connector terminal No.20 and fusible link (20).







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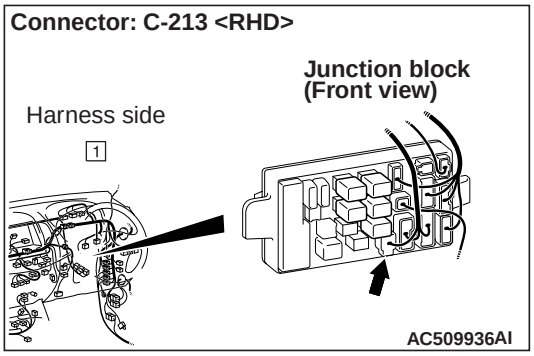


Prior to the wiring harness inspection, check junction block connector C-213, and repair if necessary.

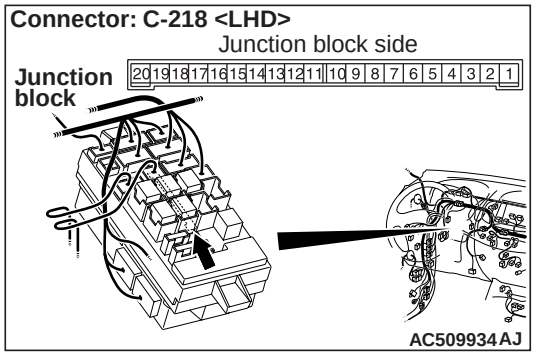
- Check the power supply line for open circuit and short circuit.

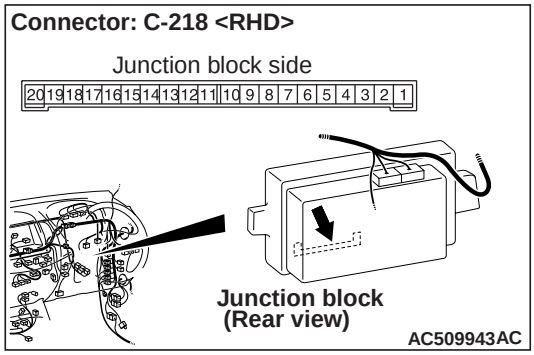
Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

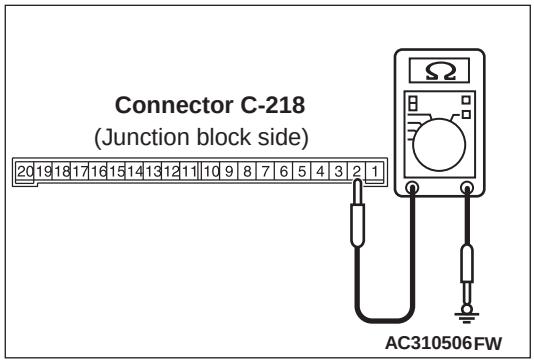
NO : Repair the wiring harness.

STEP 4. Resistance measurement at the C-218 ETACS-ECU connector.





(1) Remove the ETACS-ECU, and measure at the junction block side.



(2) Continuity between C-218 ETACS-ECU connector terminal No.2 and body earth.

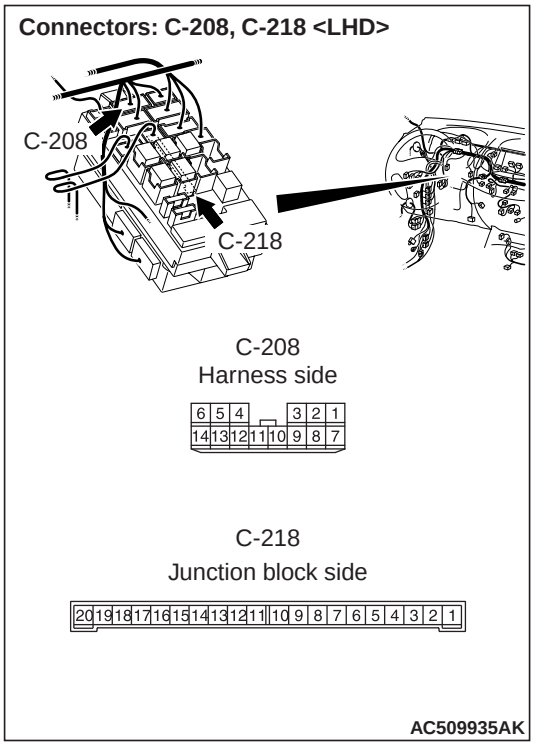
OK: Continuity exists (2 Ω or less)

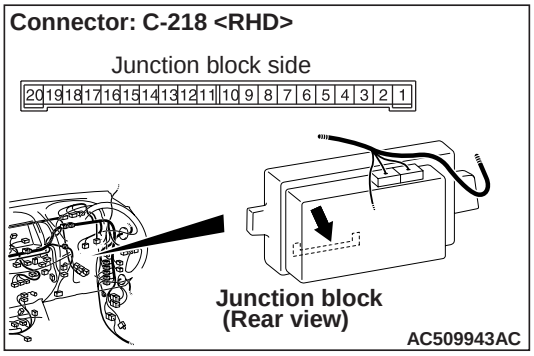
Q: Is the check result normal?

YES : Go to Step 6.

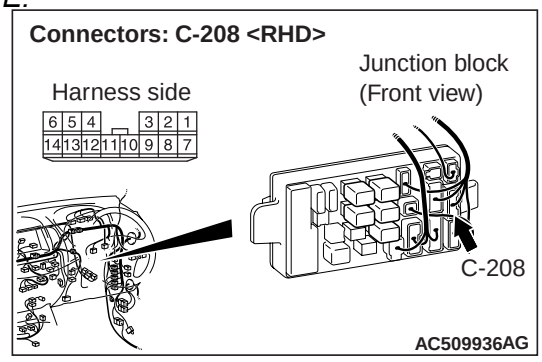
NO : Go to Step 5.

STEP 5. Check the wiring harness between C-218 ETACS-ECU connector terminal No.2 and body earth.





NOTE:



Prior to the wiring harness inspection, check junction block connector C-208, and repair if necessary.

- Check the earth wires for open circuit.

Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

NO : Repair the wiring harness.

STEP 6. Retest the system.

Check that the battery power supply circuit to the ETACS-ECU is normal.

Q: Is the check result normal?

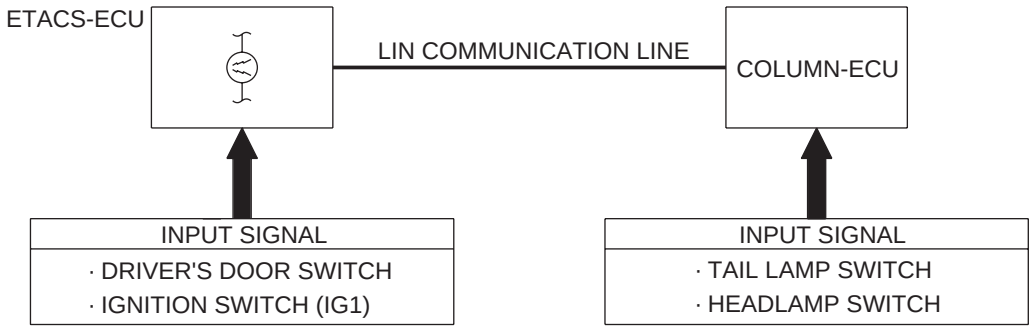
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

NO : Replace the ETACS-ECU and register the ID codes (Refer to P.54A-39).

Inspection procedure B-1: Lamp reminder buzzer function does not work normally.

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Lamp Reminder Buzzer Function



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COMMENTS ON TROUBLE SYMPTOM
The ETACS-ECU operates this function in accordance with the input signals below.
- Ignition switch (IG1)
- Driver's door switch
- Tail lamp switch
- Headlamp switch

If this function does not work normally, these input signal circuit(s) or the ETACS-ECU may be defective.

PROBABLE CAUSES
- Malfunction of the driver's door switch
- Malfunction of the column switch
- Malfunction of the ETACS-ECU
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code.
When the ignition switch is turned to the "LOCK" (OFF) position, check that the ETACS-ECU does not set the diagnosis code.

Q: Is the diagnosis code set?
YES : Refer to diagnosis code chart P.54A-494.
NO : Go to Step 2.

STEP 2. M.U.T.-III data list
Check the input signals below, which are related to the lamp reminder buzzer function.
- Turn the ignition switch to the "LOCK" (OFF) position.
- Open the drive's door.
- Turn the tail lamp or headlamp switch to the ON position.

Item No.	Item name	Normal condition
19	Drive's door switch	ON
30	Ignition switch(IG1)	OFF
60	Headlamp output	Any of items is ON
59	Tail lamp output	

OK: Normal conditions are displayed for all the items.

Q: Is the check result normal?
YES <All the signals are received normally.> : Go to Step 3.
NO <The driver's door switch signal is not received.> : Refer to inspection procedure C-5 "One of the door switch signals is not received P.54A-540."
NO <The ignition switch (IG1) signal is not received.> : Refer to inspection procedure C-3 "The ignition switch (IG1) signal is not received P.54A-533."
NO <The tail lamp or headlamp switch signal is not received.> : Refer to inspection procedure C-1 "The column switch (lighting and wiper switch) signal is not received P.54A-523."

STEP 3. Retest the system.
The lamp reminder buzzer function should work normally.

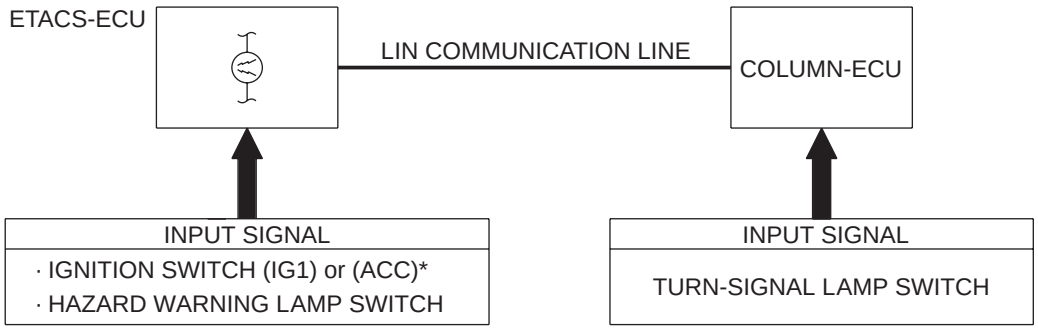
Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Replace the ETACS-ECU and register the ID codes (Refer to P.54A-39).

Inspection procedure B-2: Turn-signal lamp operation sound function does not work normally.

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Turn-Signal Lamp Operation Sound



NOTE:
*: When the turn-signal lamp can be operated with the ignition switch in the ACC position by using customisation function.

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COMMENTS ON TROUBLE SYMPTOM
The ETACS-ECU operates this function in accordance with the input signals below.
- Ignition switch (IG1)
- Turn-signal lamp switch
- Hazard warning lamp switch

If this function does not work normally, these input signal circuit(s) or the ETACS-ECU may be defective.

PROBABLE CAUSES
- Malfunction of the column switch
- Malfunction of the hazard warning lamp switch
- Malfunction of the ETACS-ECU
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code.
Check if diagnosis code is set to the ETACS-ECU.

Q: Is the diagnosis code set?

YES : Refer to diagnosis code chart P.54A-494.
NO : Go to Step 2.

STEP 2. Hazard warning lamps illumination check
When the hazard warning lamp switch is operated, check that the hazard warning lamps flash.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Refer to Inspection Procedure 1 "The hazard warning lamps do not illuminate P.54A-215."

STEP 3. Retest the system.
Check that the turn-signal lamp operation sound function works normally.

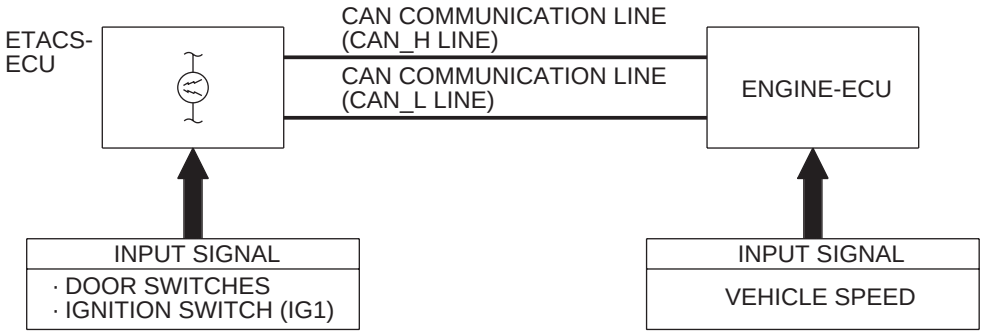
Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Replace the ETACS-ECU and register the ID codes (Refer to P.54A-39).

Inspection procedure B-3: Door ajar warning buzzer function does not work normally.

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Door-Ajar Warning Buzzer Function



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COMMENTS ON TROUBLE SYMPTOM
The ETACS-ECU operates this function in accordance with the input signals below.
- Ignition switch (IG1)
- Driver's door switch
- Passenger's door switch
- Rear door switch
- Vehicle speed signal

If this function does not work normally, these input signal circuit(s) or the ETACS-ECU may be defective.

PROBABLE CAUSES
- Malfunction of the driver's door switch
- Malfunction of the passenger's door switch
- Malfunction of the rear door switch
- Malfunction of the ETACS-ECU
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. Check of adjustment details for the door ajar warning buzzer function
Check that the door ajar warning buzzer is set to either "Operation" or "Constantly" using the customise function of M.U.T-III.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Using the customise function of M.U.T-III, set the door ajar warning buzzer to either "Operation" or "Constantly."

STEP 2. M.U.T.-III CAN bus diagnostics
Use the M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the CAN bus line (Refer to GROUP 54C – Troubleshooting). On completion, go to Step 5.

STEP 3. Check the diagnosis code of the engine-ECU.

Check if the diagnosis code is set in either of the engine-ECU.

Q: Is the diagnosis code set?

YES : Diagnose the engine-ECU (Refer to GROUP 13A – Troubleshooting). On completion, go to Step 5.

NO : Go to Step 4.

STEP 4. M.U.T.-III data list

Check the input signals below, which are related to the door ajar warning buzzer function.

- Turn the ignition switch to the "LOCK" (OFF) position.
- Open any door.

Item No.	Item name	Normal condition
19	Drive's door switch	Any of them becomes ON.
48	Passenger's door switch	
49	Rear door switch	
30	Ignition switch(IG1)	OFF
58	Vehicle speed signal	Displays the input vehicle speed.

OK: Normal conditions are displayed for all the items.

Q: Is the check result normal?

YES <All the signals are received normally.> : Go to Step 5.

NO <The driver's door switch signal is not received.> : Refer to inspection procedure C-5 "One of the door switch signals is not received P.54A-540."

NO <The ignition switch (IG1) signal is not received.> : Refer to inspection procedure C-3 "The ignition switch (IG1) signal is not received P.54A-533."

NO <The vehicle speed signal is not received.> : Go to vehicle speed signal troubleshooting.

STEP 5. Retest the system.

The door ajar warning buzzer function should work normally.

Q: Is the check result normal?

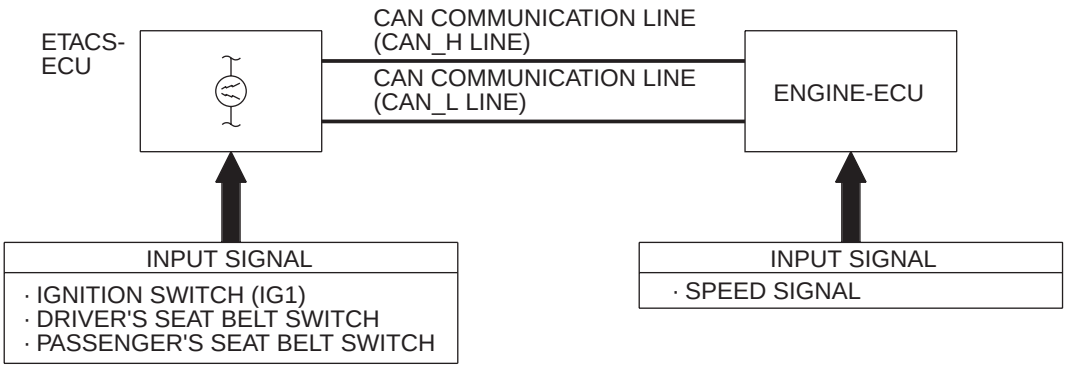
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

NO : Replace the ETACS-ECU and register the ID codes (Refer to P.54A-39).

Inspection Procedure B-4: Seat belt warning buzzer function does not work normally.

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input and output signal circuits are normal.

Seat Belt Warning Buzzer Function



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COMMENTS ON TROUBLE SYMPTOM
The ETACS-ECU operates this function in accordance with the input signals below.
- Ignition switch (IG1)
- Driver's seat belt switch
- Passenger's seat belt switch
- Vehicle speed signal

If this function does not work normally, these input signal circuit(s) or the ETACS-ECU may be defective.

PROBABLE CAUSES
- Malfunction of the ETACS-ECU
- Malfunction of the driver's seat belt switch
- Malfunction of the passenger's seat belt switch
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III CAN bus diagnostics
Use the M.U.T.-III to diagnose the CAN bus lines.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the CAN bus line (Refer to GROUP 54C – Troubleshooting). On completion, go to Step 4.

STEP 2. Check the diagnosis code of the engine-ECU.
Check if the diagnosis code is set in either of the engine-ECU.

Q: Is the diagnosis code set?
YES : Diagnose the engine-ECU (Refer to GROUP 13A – Troubleshooting). On completion, go to Step 4.
NO : Go to Step 3.

STEP 3. M.U.T.-III data list
Check the input signals below, which are related to the seat belt warning buzzer function.
- Turn the ignition switch to the "ON" position.
- Remove the each inserted seatbelt.

Item No.	Item name	Normal condition
30	Ignition switch(IG1)	ON
50	Driver's seatbelt(Buckle SW)	Being turned ON from OFF
51	Passenger seatbelt(Buckle SW)	

OK: Normal conditions are displayed for all the items.

Q: Is the check result normal?

YES <All the signals are received normally.> : Go to Step 4.
NO <The ignition switch (IG1) signal is not received.> : Refer to inspection procedure C-3 "The ignition switch (IG1) signal is not received P.54A-533."
NO <The seat belt switch signal is not received.> : Refer to inspection procedure C-6 "The seat belt switch signal is not received P.54A-544 <L.H. drive vehicles> or P.54A-544 <R.H. drive vehicles>."

STEP 4. Retest the system.
The seat belt warning buzzer function should work normally.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Replace the ETACS-ECU and register the ID codes (Refer to P.54A-39).

CHECK TROUBLE BY USING THE INPUT SIGNAL CHECK

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If a problem is found in the Service Data inspection, observe the table below.

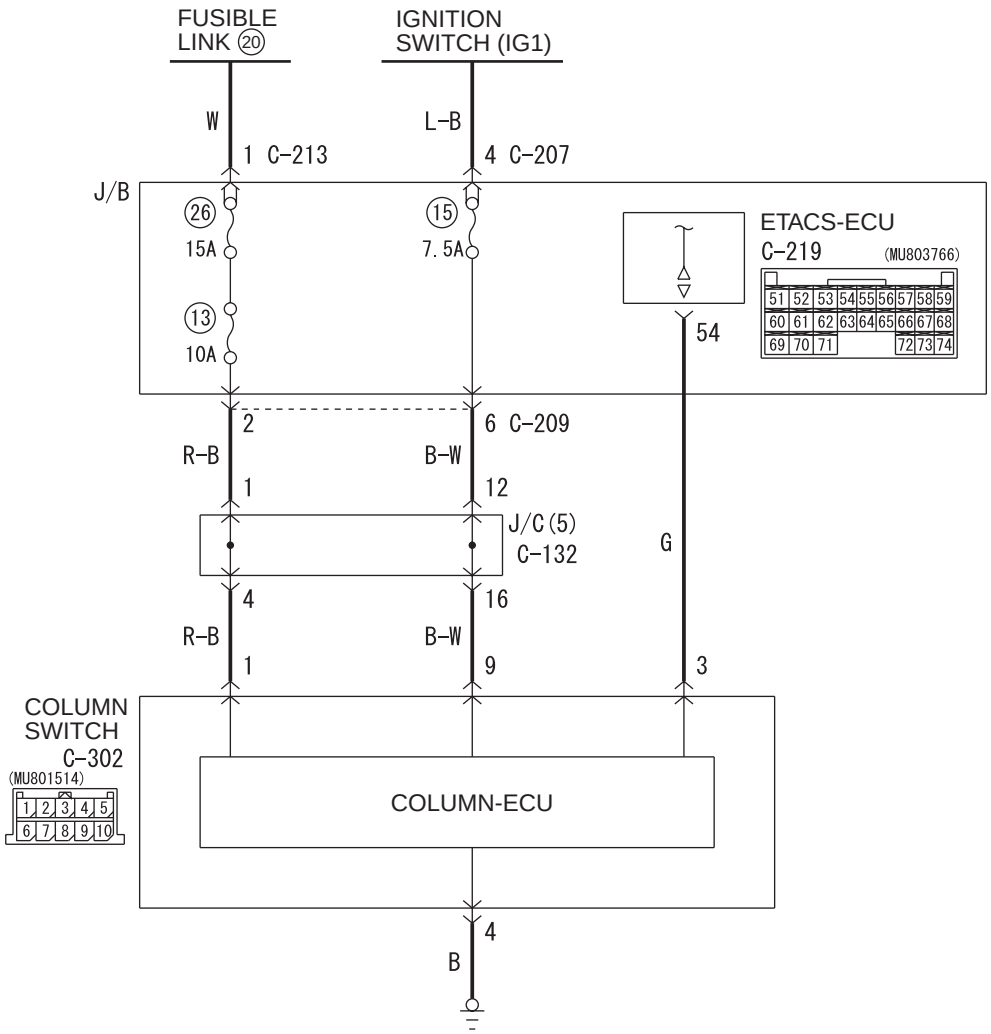
Symptom		Inspection procedure number	Reference page
The column switch (lighting and wiper switch) signal is not received.		C-1	P.54A-523
The ignition switch (ACC) signal is not received.		C-2	P.54A-530
The ignition switch (IG1) signal is not received.		C-3	P.54A-533
The hazard warning lamp switch signal is not received.		C-4	P.54A-536
One of the door switch signals is not received.		C-5	P.54A-540
The seat belt switch signal is not received.	L.H. drive vehicles	C-6	P.54A-544
	R.H. drive vehicles		P.54A-544

INPUT SIGNAL PROCEDURES

Inspection Procedure C-1: The column switch (lighting and wiper switch) signal is not received.

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input signal circuit is normal.

Column Switch Power Source Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

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COMMENTS ON TROUBLE SYMPTOM
Input signal from the column switch is used to operate the functions below. If the signal is abnormal, these functions will not work normally.

- Lamp reminder function
- Turn-signal lamp operation sound function
- Headlamps
- Tail lamps
- Turn-signal lamps
- Front fog lamps
- Rear fog lamps
- Windshield wiper/washer

PROBABLE CAUSES

- Malfunction of the column switch

- Malfunction of the ETACS-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code.

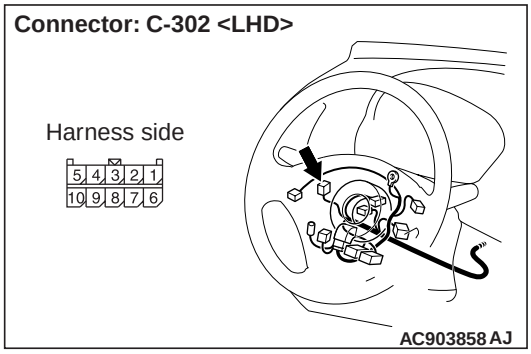
When the ignition switch is turned to the "LOCK" (OFF) position, check that the ETACS-ECU does not set the diagnosis code.

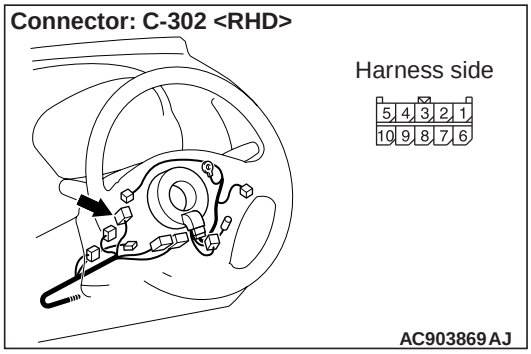
Q: Is the diagnosis code set?

YES : Refer to diagnosis code chart P.54A-494.

NO : Go to Step 2.

STEP 2. Connector check: C-302 column switch connector



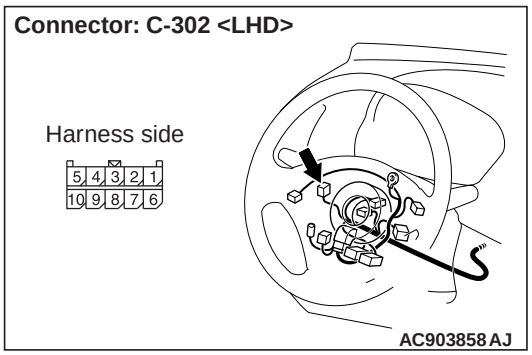


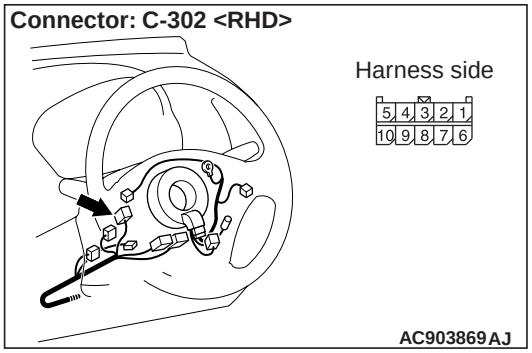
Q: Is the check result normal?

YES : Go to Step 3.

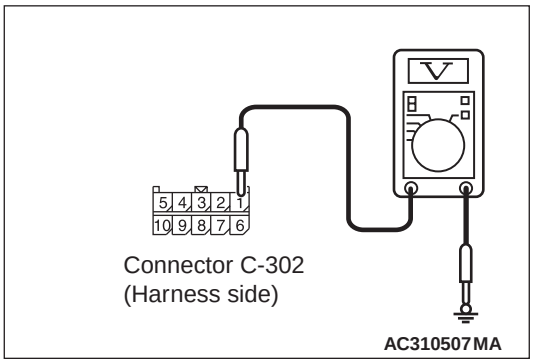
NO : Repair the defective connector.

STEP 3. Resistance measurement at the C-302 column switch connector.





(1) Disconnect the connector, and measure at the wiring harness side.



(2) Check the resistance between C-302 column switch connector terminal No.4 and body earth.

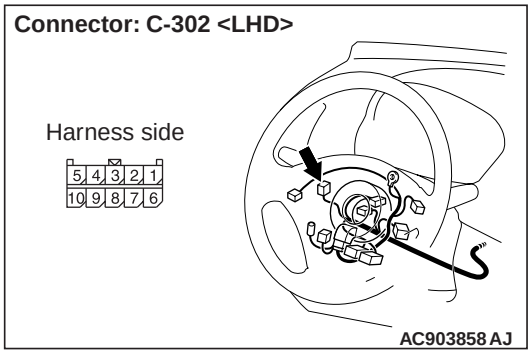
OK: Continuity exists (2 Ω or less)

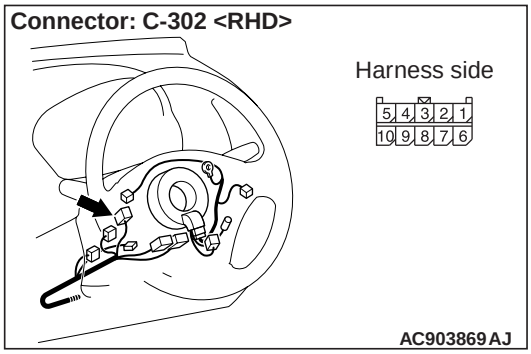
Q: Is the check result normal?

YES : Go to Step 5.

NO : Go to Step 4.

STEP 4. Check the wiring harness from C-302 column switch connector terminal No.4 to body earth.





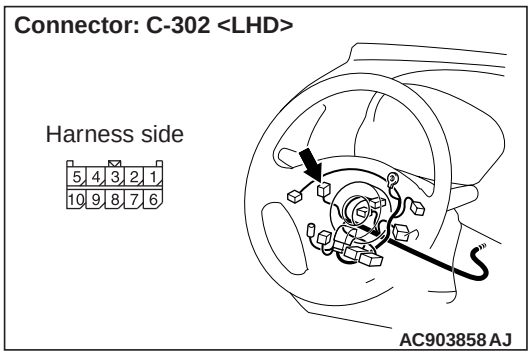
- Check the earth wires for open circuit.

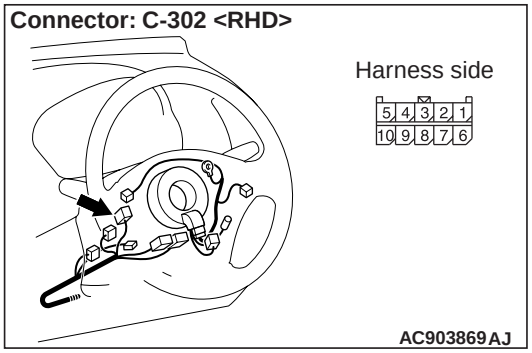
Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

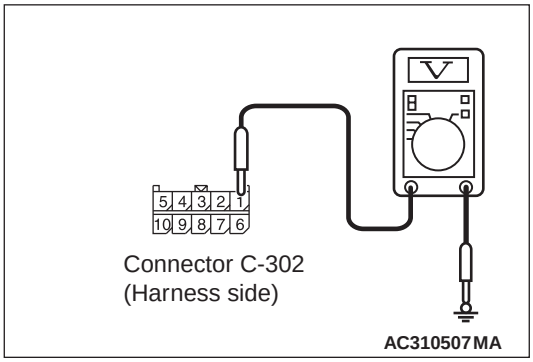
NO : Repair the wiring harness.

STEP 5. Voltage measurement at C-302 column switch connector.





(1) Disconnect the connector, and measure at the wiring harness side.



(2) Voltage between C-302 column switch connector No.1 and body earth.

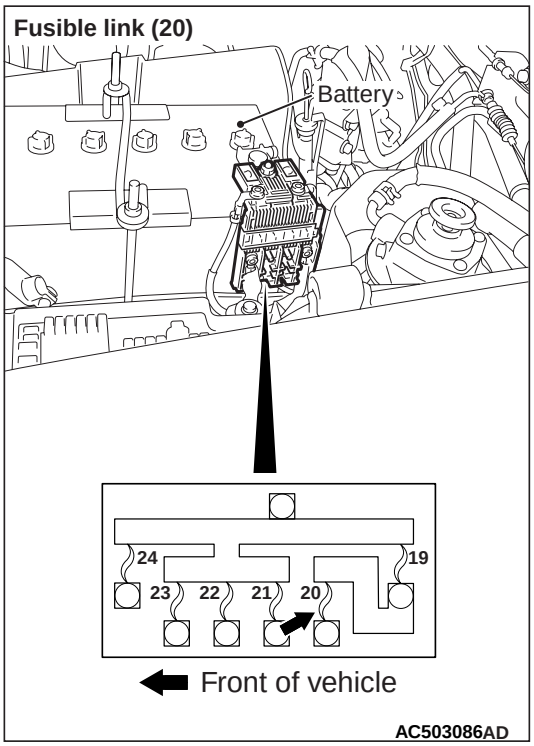
OK: System voltage

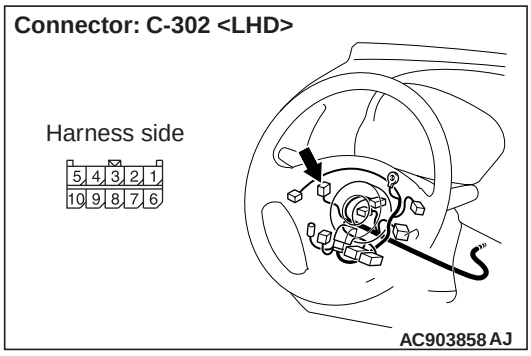
Q: Is the check result normal?

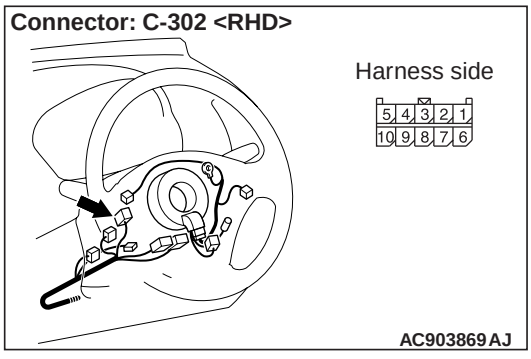
YES : Go to Step 7.

NO : Go to Step 6.

STEP 6. Check the wiring harness between C-302 column switch connector terminal No.1 and fusible link (20).







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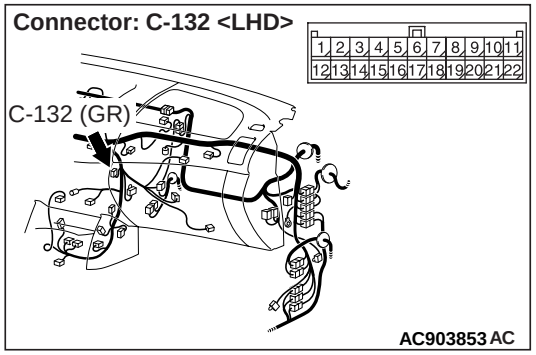
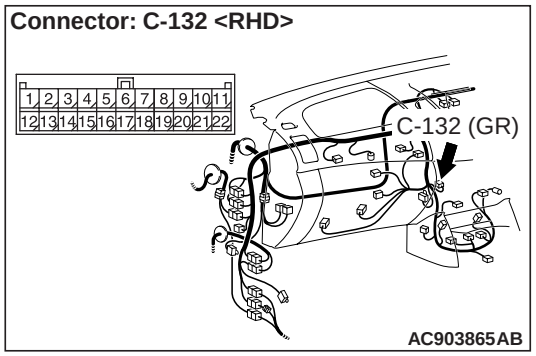
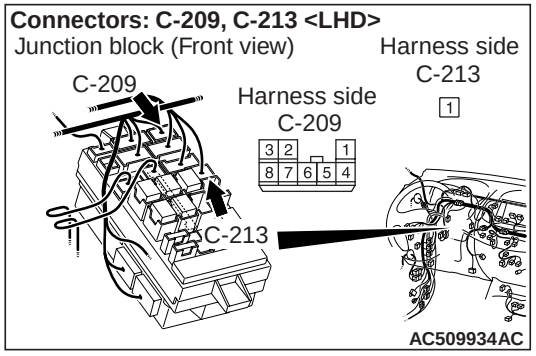
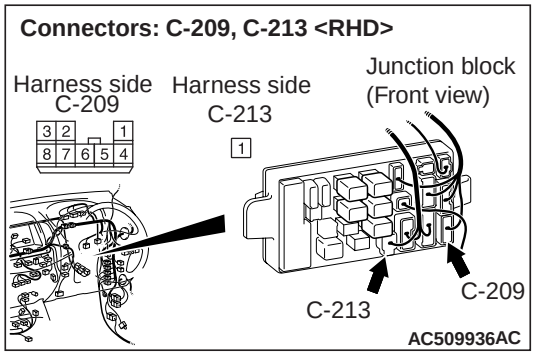








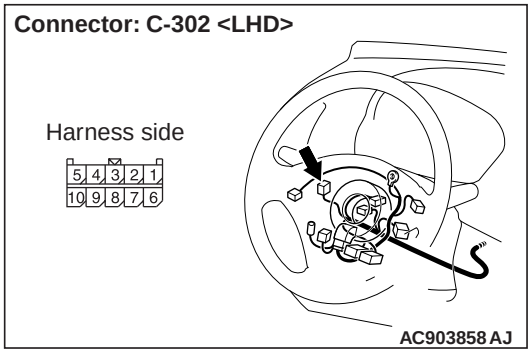
Prior to the wiring harness inspection, check junction block connectors C-209, C-213 and joint connector C-132, and repair if necessary.

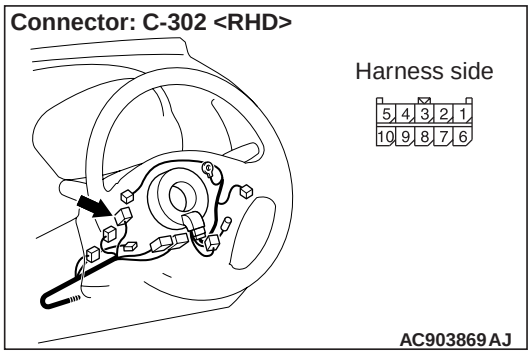
- Check the power supply line for open circuit and short circuit.

Q: Is the check result normal?

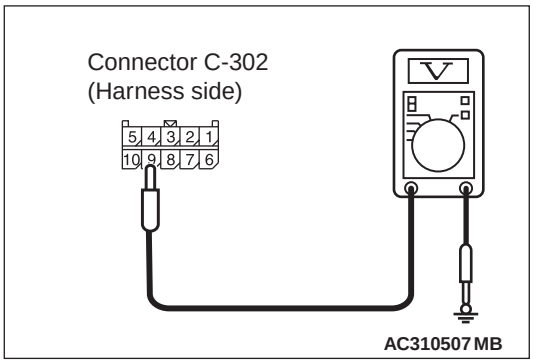
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness.

STEP 7. Voltage measurement at C-302 column switch connector.





(1) Disconnect the connector, and measure at the wiring harness side.
(2) Turn the ignition switch to the "ON" position.

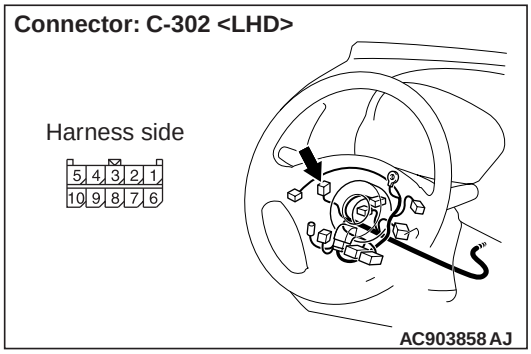


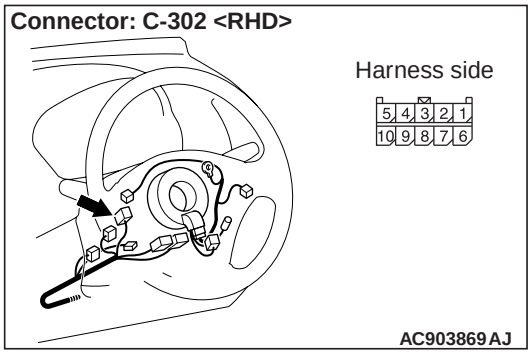
(3) Voltage between C-302 column switch connector No.9 and body earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 9.
NO : Go to Step 8.

STEP 8. Check the wiring harness between C-302 column switch connector terminal No.9 and ignition switch (IG1).





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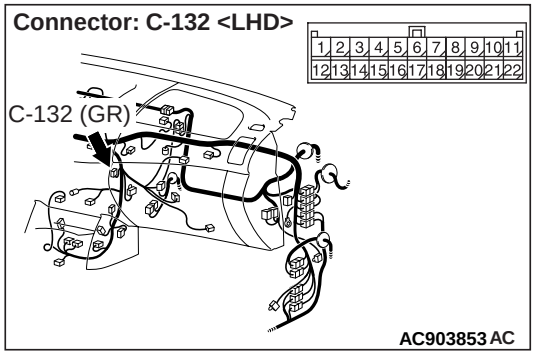
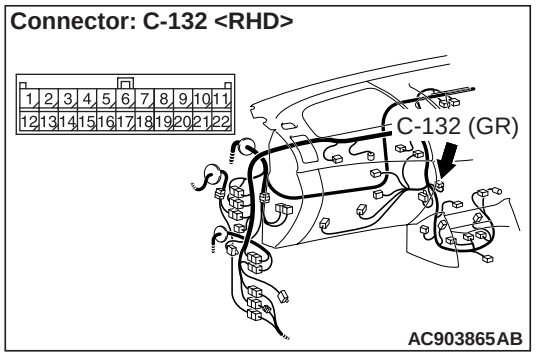
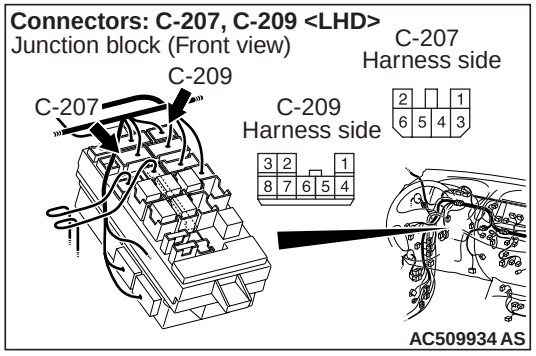
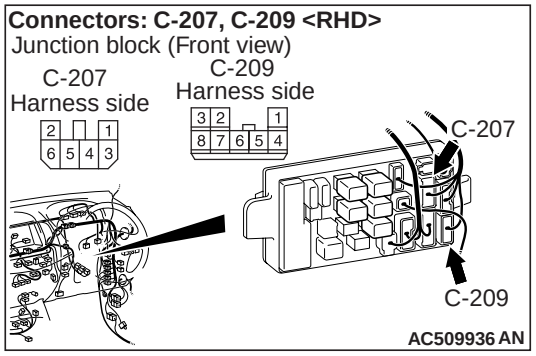








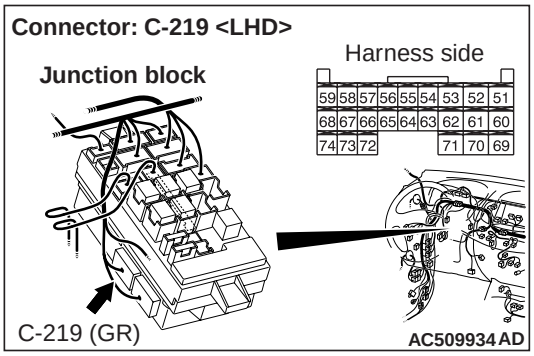
Prior to the wiring harness inspection, check junction block connectors C-207, C-209 and joint connector C-132, and repair if necessary.

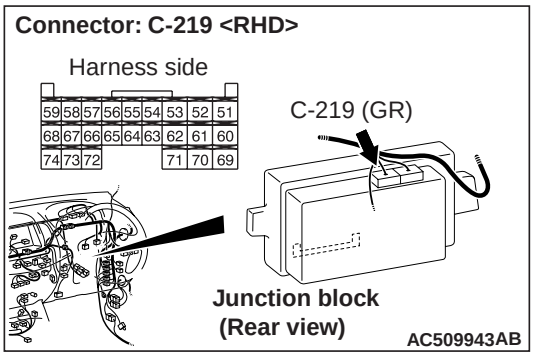
- Check the power supply line for open circuit and short circuit.

Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness.

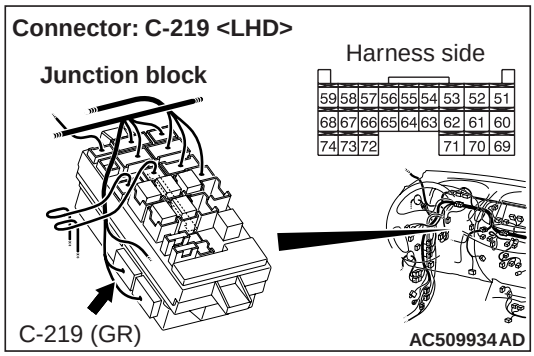
STEP 9. Connector check: C-219 ETACS-ECU connector

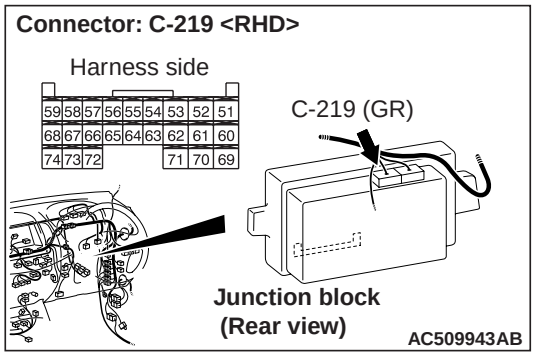


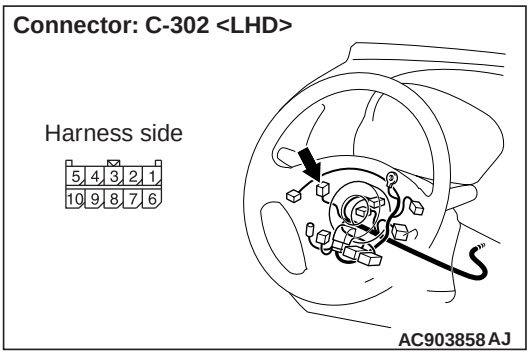


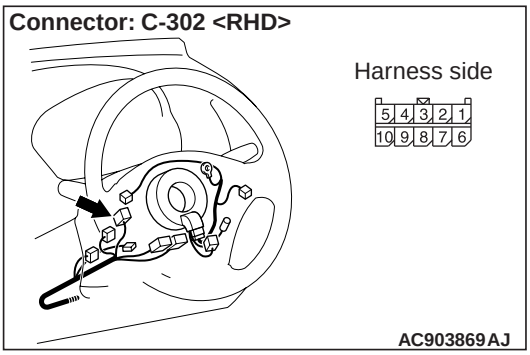
Q: Is the check result normal?
YES : Go to Step 10.
NO : Repair the defective connector.

STEP 10. Check the wiring harness between C-302 column switch connector terminal No.3 and C-219 ETACS-ECU connector terminal No.54.









- Check the communication lines for open circuit.

Q: Is the check result normal?
YES : Go to Step 11.
NO : Repair the wiring harness.

STEP 11. Retest the system
(1) Replace the column switch.

(2) Check that the signals from the column switch are received.

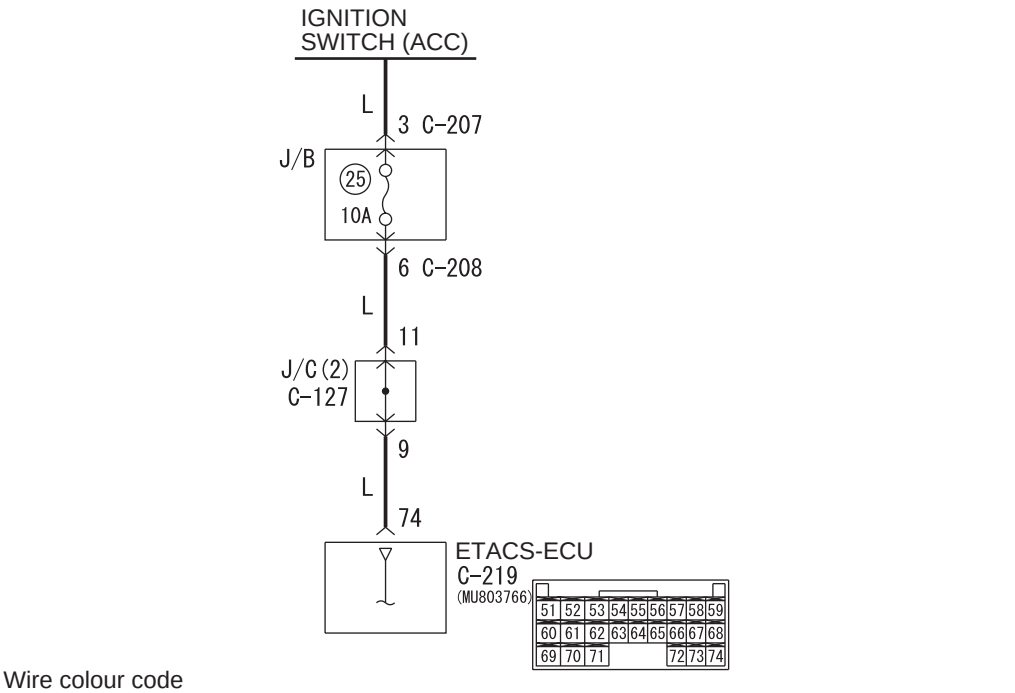
Q: Is the check result normal?

YES : The procedure is complete.
NO : Replace the ETACS-ECU and register the ID codes (Refer to P.54A-39).

Inspection Procedure C-2: The ignition switch (ACC) signal is not received.

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input signal circuit is normal.

Ignition Switch (ACC) Input Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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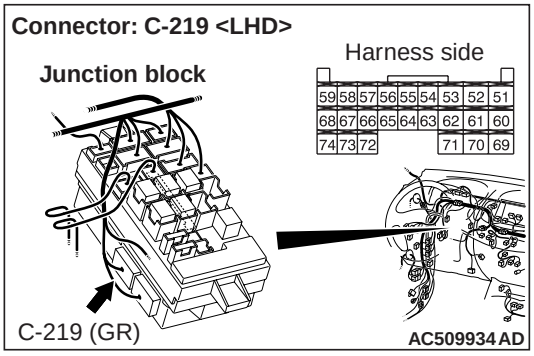
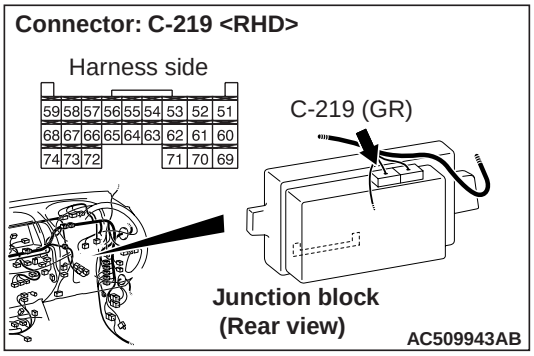
COMMENTS ON TROUBLE SYMPTOM
Input signal from the ignition switch (ACC) is used to operate the windshield wiper and washer. If the signal is abnormal, windshield wiper and washer will not work normally.

PROBABLE CAUSES
- Malfunction of the ETACS-ECU
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

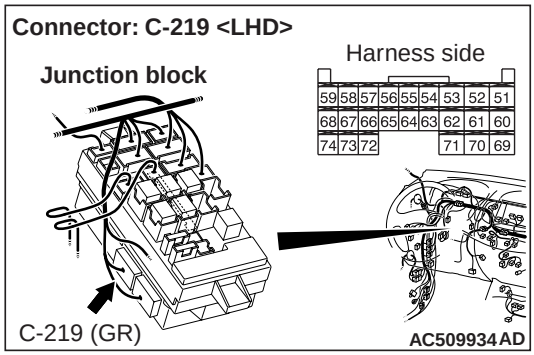
STEP 1. Connector check: C-219 ETACS-ECU connector

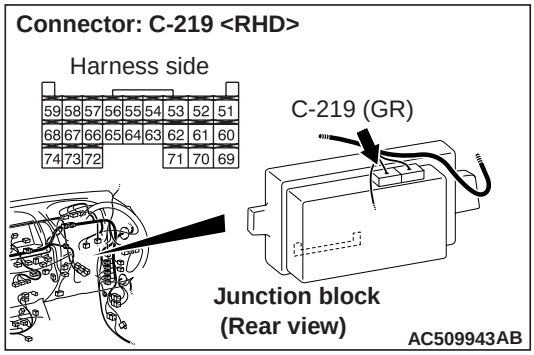




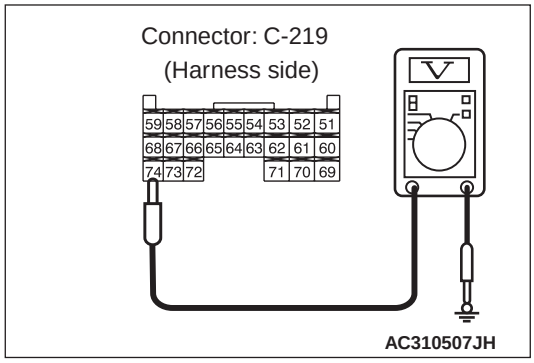
Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the defective connector.

STEP 2. Voltage measurement at the C-219 ETACS-ECU connector.





(1) Disconnect the connector, and measure at the wiring harness side.
(2) Turn the ignition switch to the "ACC" position.

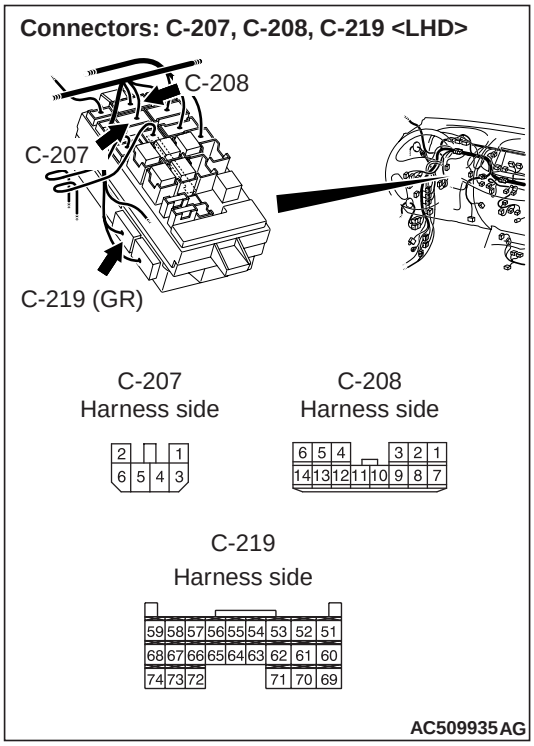


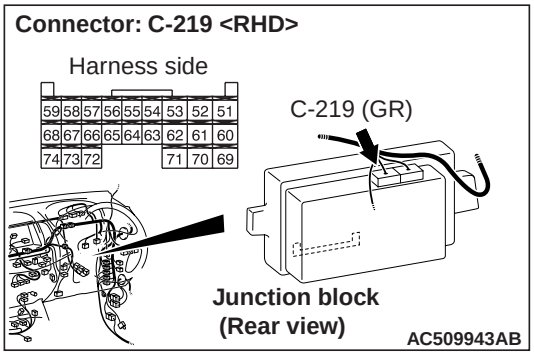
(3) Voltage between C-219 ETACS-ECU connector terminal No.74 and body earth

OK: System voltage

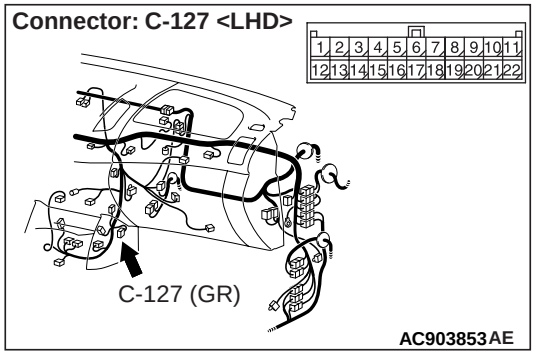
Q: Is the check result normal?
YES : Go to Step 4.
NO : Go to Step 3.

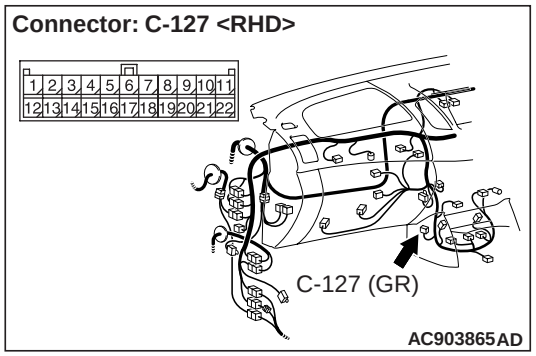
STEP 3. Check the wiring harness between C-219 ETACS-ECU connector terminal No.74 and the ignition switch (ACC).

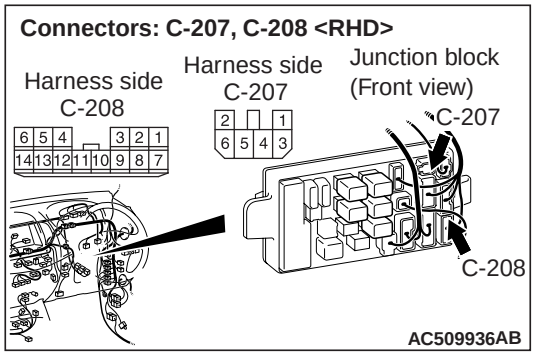




NOTE:







Prior to the wiring harness inspection, check joint connector C-127, junction block connectors C-207 and C-208, and repair if necessary.

- Check the power supply line for open circuit and short circuit.

Q: Is the check result normal?

YES : Refer to Inspection Procedure 2 "Malfunction of the ignition switch power supply system." P.54A-22

NO : Repair the wiring harness.

STEP 4. M.U.T.-III data list

Check the input signals from the ignition switch (ACC).

- Turn the ignition switch to the "ACC" position.

Item No.	Item name	Normal condition
29	Ignition switch(ACC)	ON

OK: Normal condition is displayed.

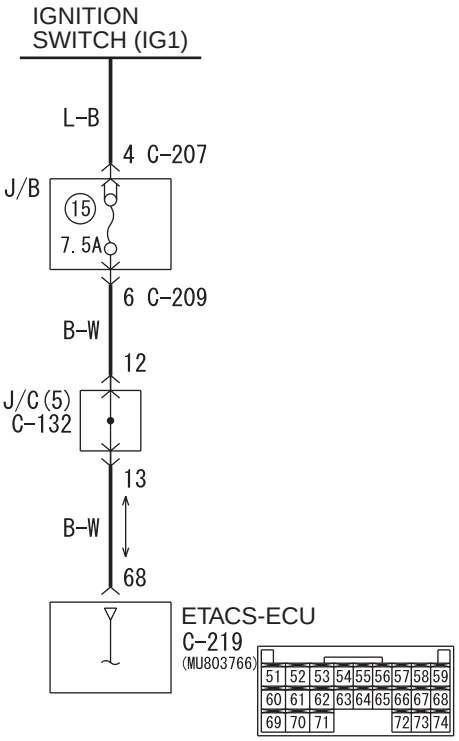
Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Replace the ETACS-ECU and register the ID codes (Refer to P.54A-39).

Inspection Procedure C-3: The ignition switch (IG1) signal is not received.

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input signal circuit is normal.

Ignition Switch (IG1) Input Circuit



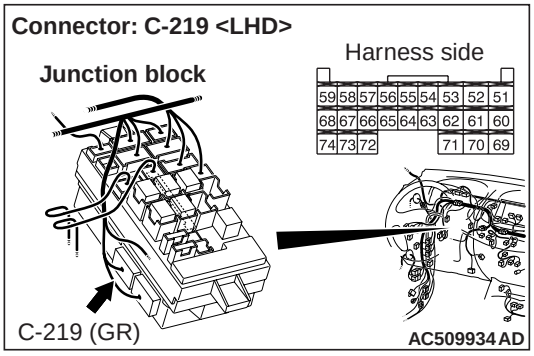
Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver W9C54E035A

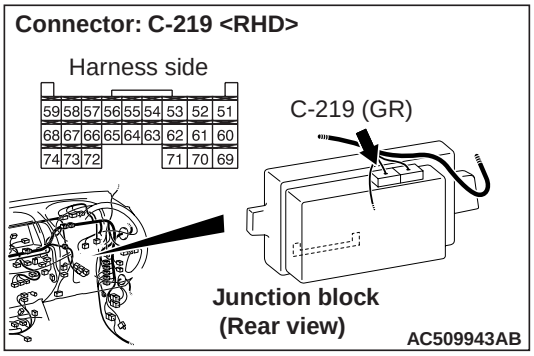
COMMENTS ON TROUBLE SYMPTOM
Input signal from the ignition switch (IG1) is used to operate the functions below. If the signal is abnormal, these functions will not work normally.
- Lamp reminder function
- Turn-signal lamp

PROBABLE CAUSES
- Malfunction of the ETACS-ECU
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

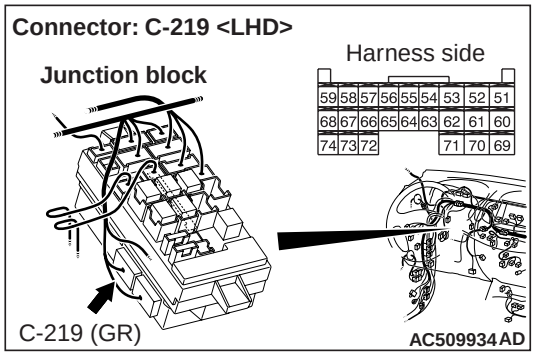
STEP 1. Connector check: C-219 ETACS-ECU connector

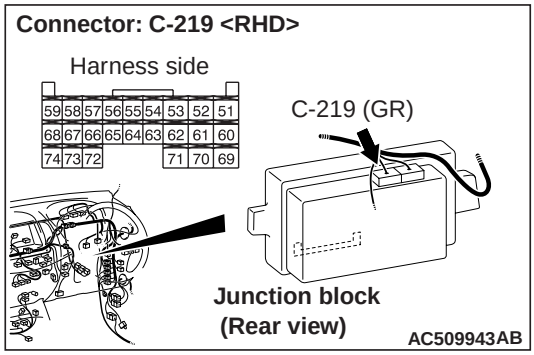




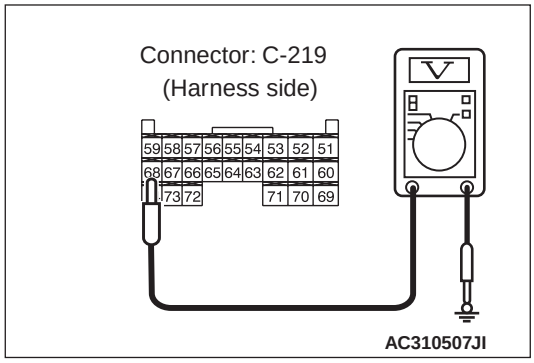
Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the defective connector.

STEP 2. Voltage measurement at the C-219 ETACS-ECU connector.





(1) Disconnect the connector, and measure at the wiring harness side.
(2) Turn the ignition switch to the "ON" position.

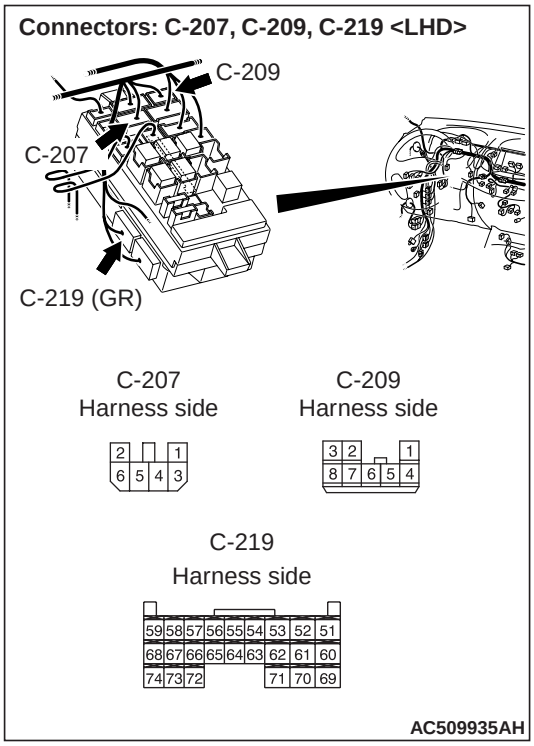


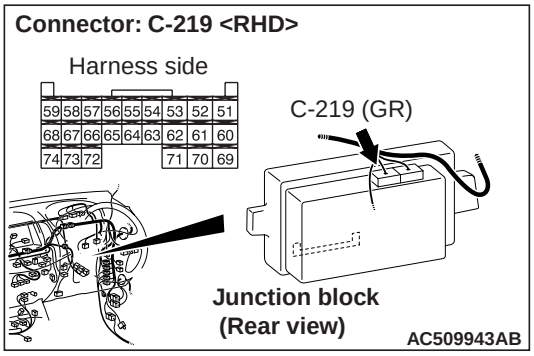
(3) Voltage between C-219 ETACS-ECU connector terminal No.68 and body earth

OK: System voltage

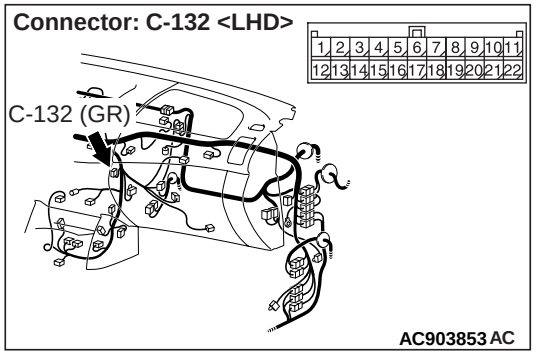
Q: Is the check result normal?
YES : Go to Step 4.
NO : Go to Step 3.

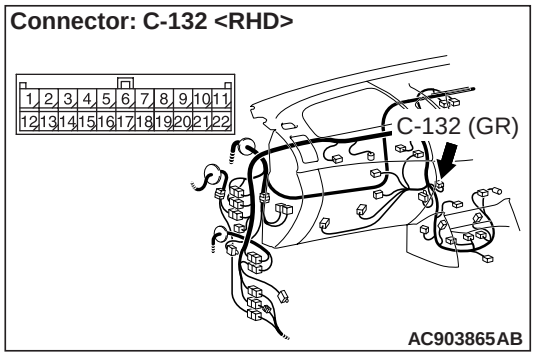
STEP 3. Check the wiring harness between C-219 ETACS-ECU connector terminal No.68 and the ignition switch (IG1).

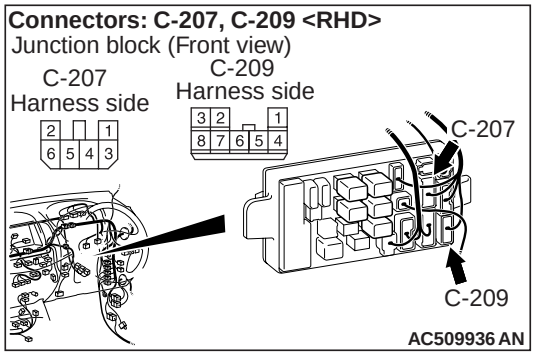




NOTE:







Prior to the wiring harness inspection, check joint connector C-132, junction block connectors C-207 and C-209, and repair if necessary.

- Check the power supply line for open circuit and short circuit.

Q: Is the check result normal?

YES : Refer to Inspection Procedure 2 "Malfunction of the ignition switch power supply system." P.54A-22

NO : Repair the wiring harness.

STEP 4. M.U.T.-III data list

Check the input signal from the ignition switch (IG1).

- Turn the ignition switch to the "ON" position.

Item No.	Item name	Normal condition
30	Ignition switch(IG1)	ON

OK: Normal condition is displayed.

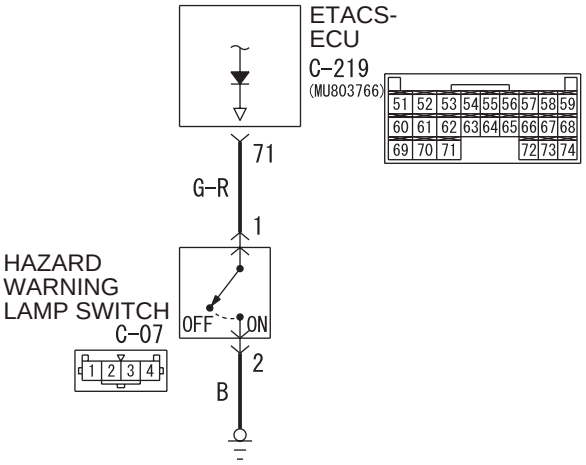
Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Replace the ETACS-ECU and register the ID codes (Refer to P.54A-39).

Inspection Procedure C-4: The hazard warning lamp switch signal is not received.

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input signal circuit is normal.

Hazard Warning Lamp Switch Input Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

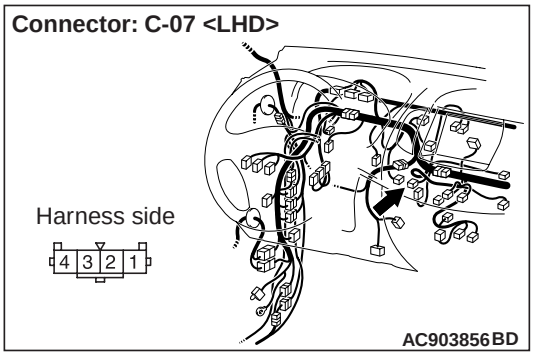
W7C54X035A

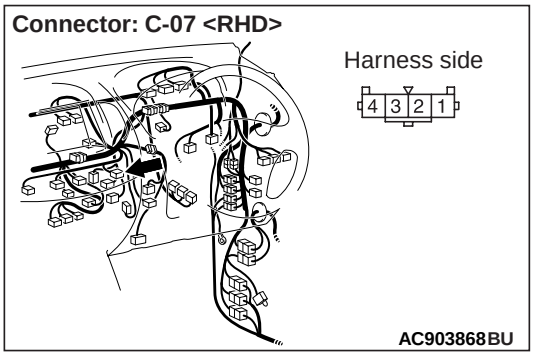
COMMENTS ON TROUBLE SYMPTOM
Input signal from the hazard warning lamp switch is used to operate the functions below. If the signal is abnormal, these functions will not work normally.
- Keyless entry system (encrypted code registration)
- Hazard warning lamp

PROBABLE CAUSES
- Malfunction of the hazard warning lamp switch
- Malfunction of the ETACS-ECU
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. Connector check: C-07 hazard warning lamp switch connector





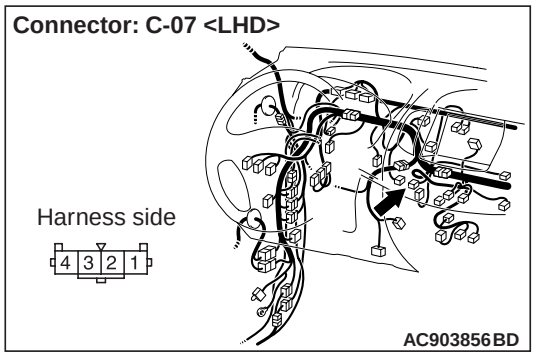
Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the defective connector.

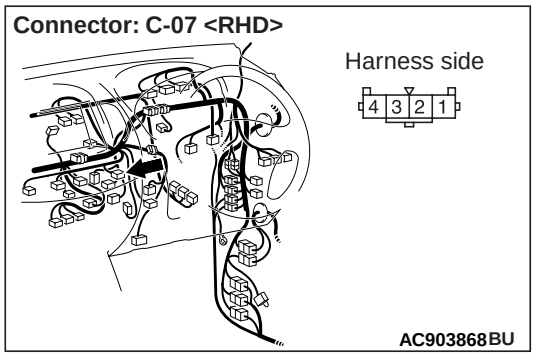
STEP 2. Check the hazard warning lamp switch.

Refer to P.54A-217.

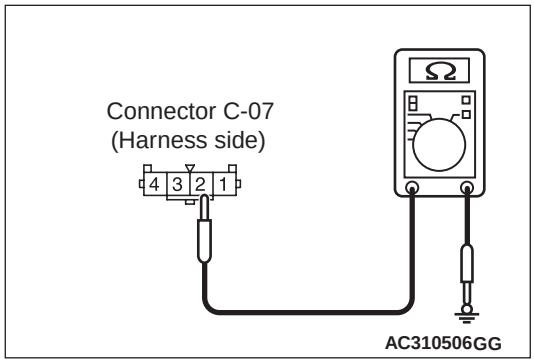
Q: Is the check result normal?
YES : Go to Step 3.
NO : Replace the hazard warning lamp switch.

STEP 3. Resistance measurement at the C-07 hazard warning lamp switch connector.





(1) Disconnect the connector, and measure at the wiring harness side.

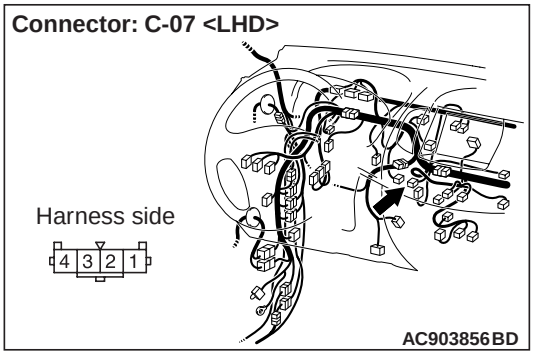


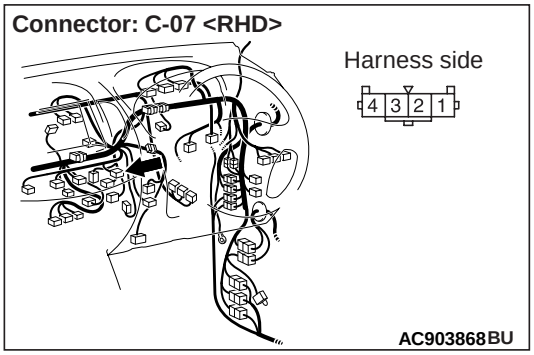
(2) Resistance between C-07 hazard warning lamp switch connector terminal No.2 and body earth

OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?
YES : Go to Step 5.
NO : Go to Step 4.

STEP 4. Check the wiring harness between C-07 hazard warning lamp switch connector terminal No.2 and the body earth.





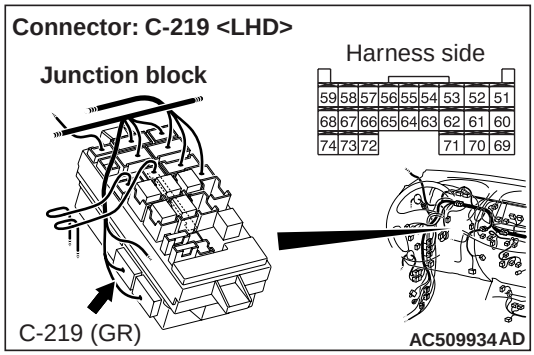
- Check the earth wires for open circuit.

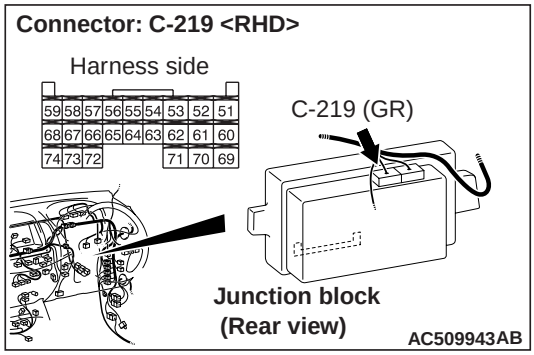
Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

NO : Repair the wiring harness.

STEP 5. Connector check: C-219 ETACS-ECU connector



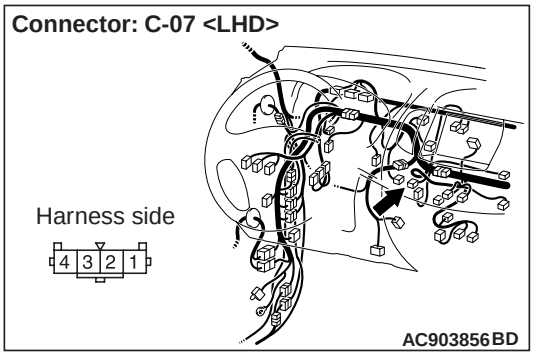


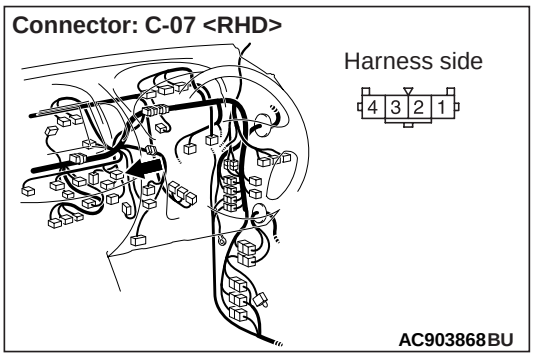
Q: Is the check result normal?

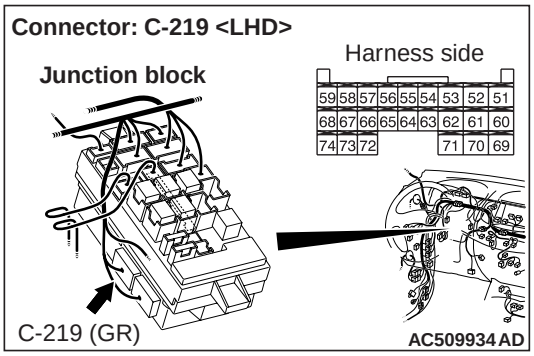
YES : Go to Step 6.

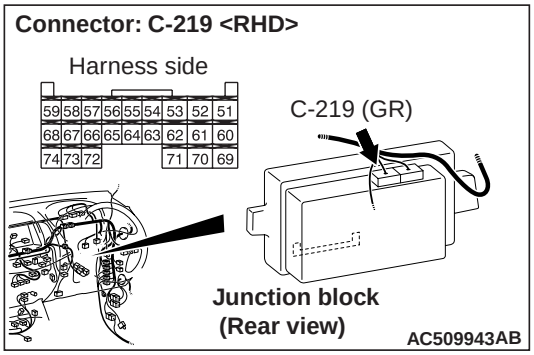
NO : Repair the defective connector.

STEP 6. Check the wiring harness between C-219 ETACS-ECU connector terminal No.71 and C-07 hazard warning lamp switch connector terminal No.1.









- Check the input line for open circuit.

Q: Is the check result normal?

YES : Go to Step 7.
NO : Repair the wiring harness.

STEP 7. M.U.T.-III data list

Check the input signals from the hazard warning lamp switch.

- Operate the hazard warning lamp switch.

Item No.	Item name	Normal condition
26	Hazard warning lamp switch	OFF to ON (only when switch is operated)

OK: Normal condition is displayed.

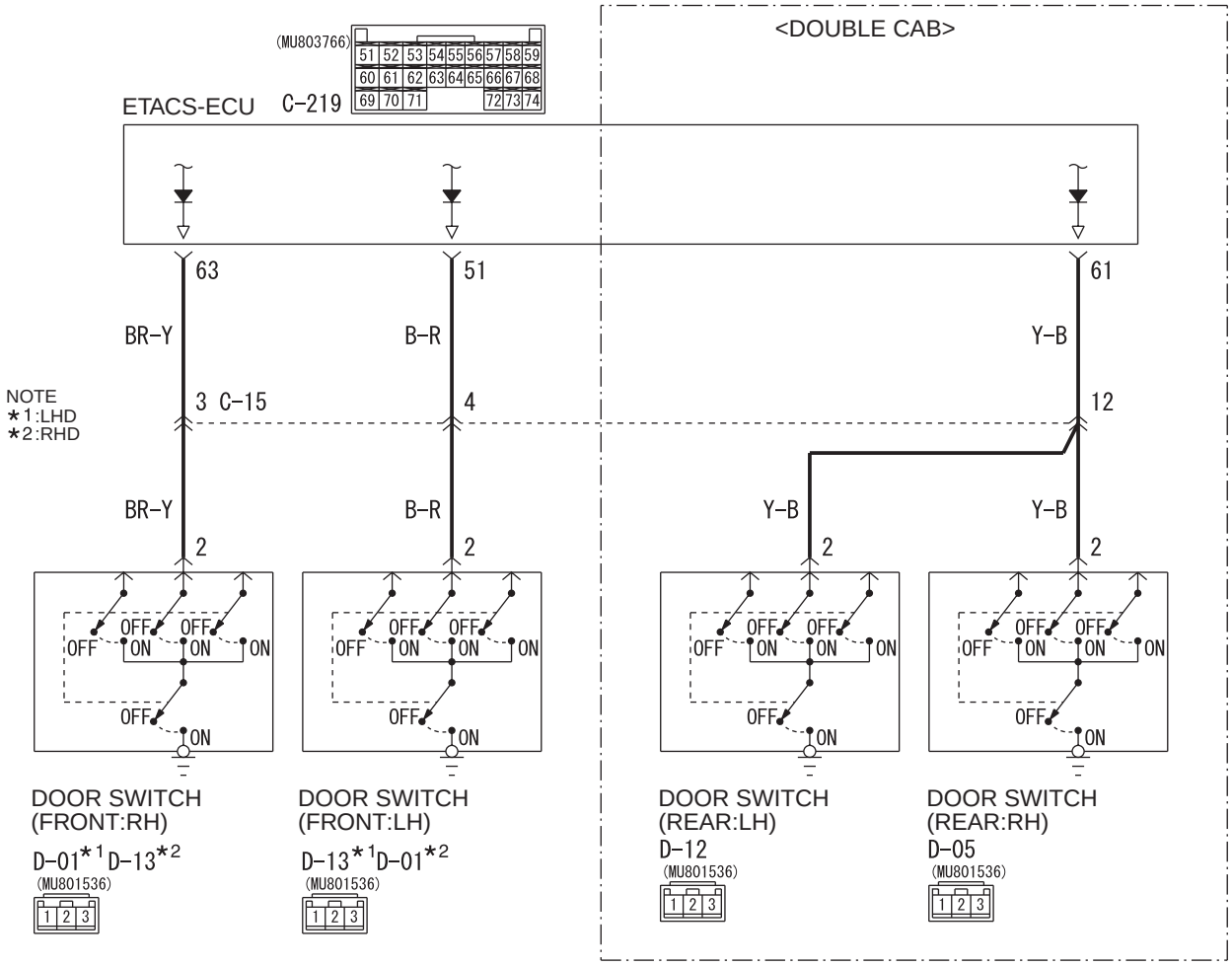
Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Replace the ETACS-ECU and register the ID codes (Refer to P.54A-39).

Inspection procedure C-5: One of the door switch signals is not received.

⚠ CAUTION
Whenever the ECU is replaced, ensure that the input signal circuit is normal.

Door Switches Input Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver WAC54E108A

COMMENTS ON TROUBLE SYMPTOM
Input signals from the door switches are used to operate the functions below. If the signal is abnormal, these functions will not work normally.

- Lamp reminder function
- Door ajar warning buzzer function
- Headlamp automatic-shutdown function
- Room lamps

PROBABLE CAUSES

- Malfunction of the door switch (front: RH)
- Malfunction of the door switch (front: LH)
- Malfunction of the door switch (rear: RH) <Double cab>
- Malfunction of the door switch (rear: LH) <Double cab>
- Malfunction of the ETACS-ECU
- Damaged harness wires and connectors

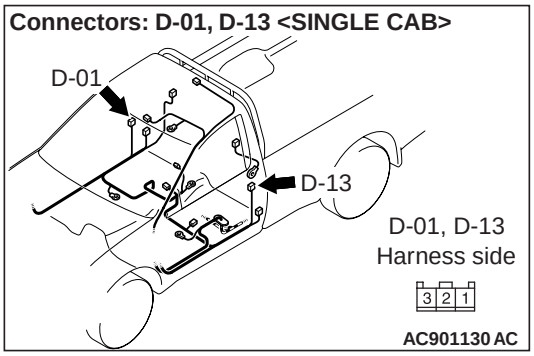
DIAGNOSIS PROCEDURE

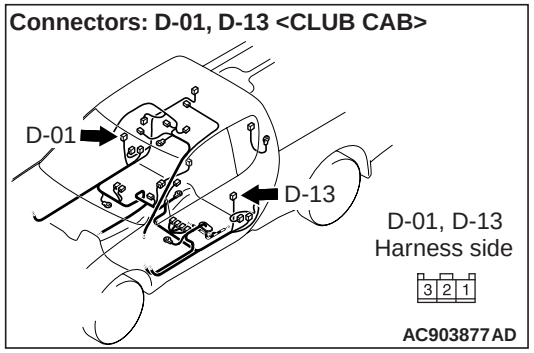
STEP 1. Check the installation condition.
Check the installation state to the body of the door switches that do not receive signals.

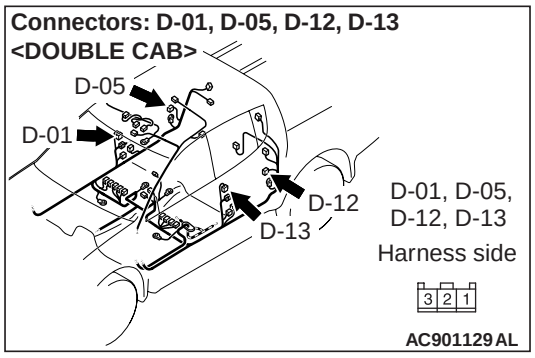
Q: Is the check result normal?

YES : Go to Step 2.
NO : Correct the installation condition.

STEP 2. Connector check: D-01 <LHD> or D-13 <RHD> door switch (front: RH) connector, D-13 <LHD> or D-01 <RHD> door switch (front: LH) connector, D-05 door switch (rear: RH) connector, D-12 door switch (rear: LH) connector







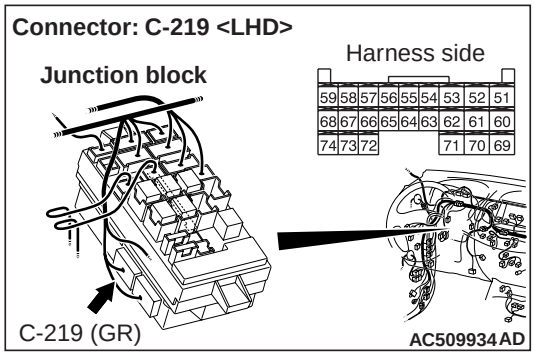
Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the defective connector.

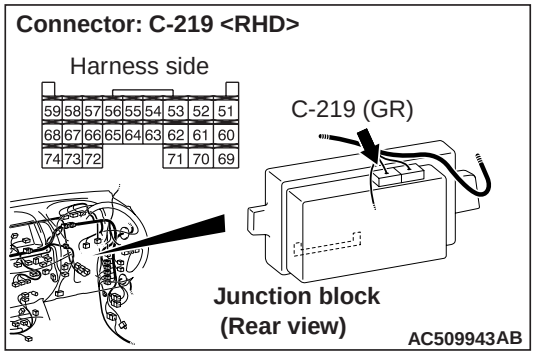
STEP 3. Check of the door switches that do not receive signals.
Refer to GROUP 42 – Door .

Q: Is the check result normal?
YES : Go to Step 4.
NO : Replace the door switch.

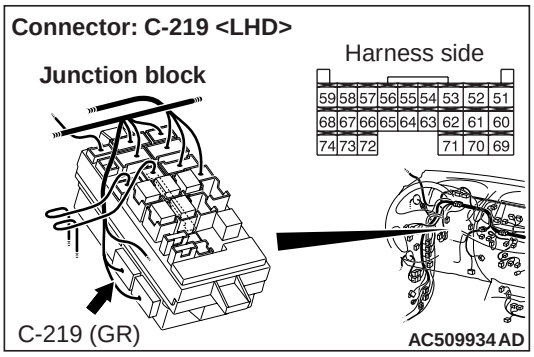
STEP 5. Check the following wiring harness.

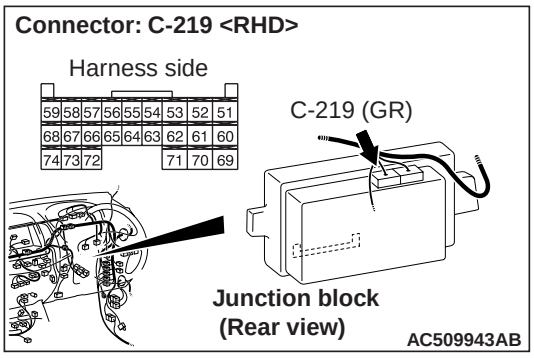
STEP 4. Connector check: C-219 ETACS-ECU connector

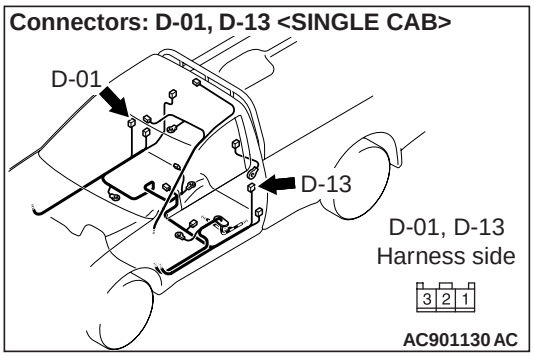


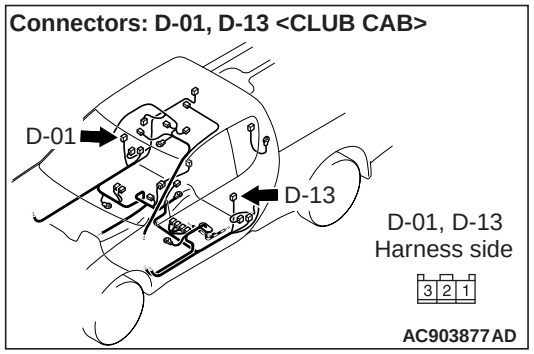


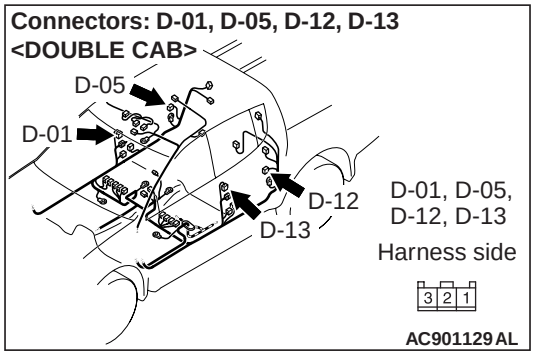
Q: Is the check result normal?
YES : Go to Step 5.
NO : Repair the defective connector.







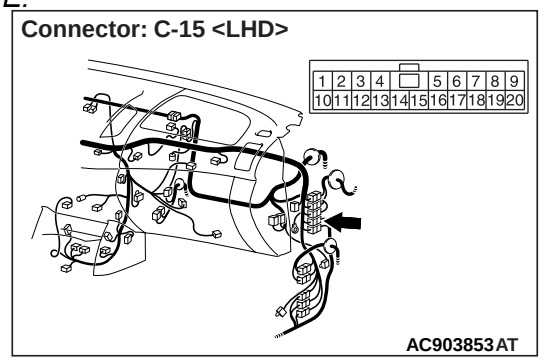


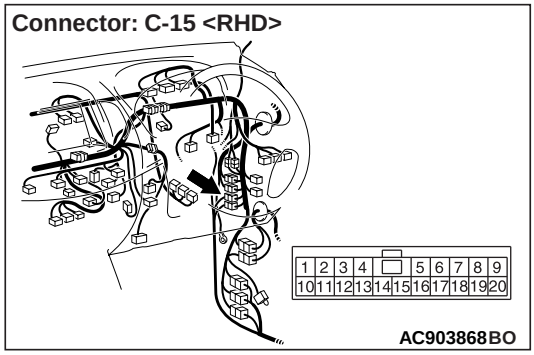


Check the wiring harness for open circuit between the following connectors:

- Wiring harness from C-219 ETACS-ECU connector terminal No.63 to D-01 <LHD> or D-13 < RHD> door switch (front: RH) connector terminal No.2.
- Wiring harness from C-219 ETACS-ECU connector terminal No.51 to D-13 <LHD> or D-01 <RHD> door switch (front: LH) connector terminal No.2.
- Wiring harness from C-219 ETACS-ECU connector terminal No.61 to D-12 door switch (rear: LH) connector terminal No.2.
- Wiring harness from C-219 ETACS-ECU connector terminal No.61 to D-05 door switch (rear: RH)connector terminal No.2.

NOTE:





Prior to the wiring harness inspection, check intermediate connector C-15, and repair if necessary.

- Check the input line for open circuit.

Q: Is the check result normal?
YES : Go to Step 6.
NO : Repair the wiring harness.

STEP 6. M.U.T.-III data list

Check the input signals to the door switch.

- Open any door.

Item No.	Item name	Normal condition
19	Drive's door switch	Any of them becomes ON.
48	Passenger's door switch	
49	Rear door switch	

Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

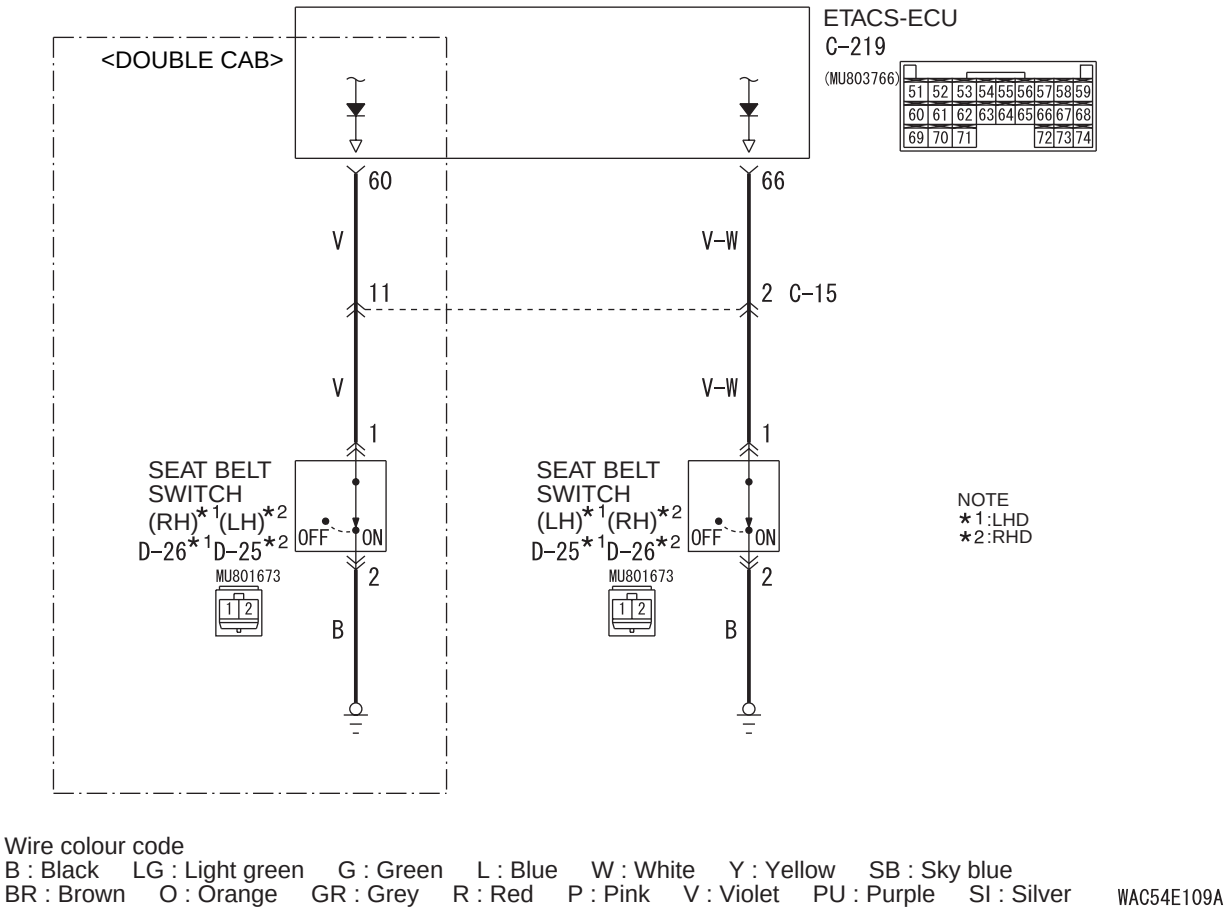
NO : Replace the ETACS-ECU and register the ID codes (Refer to P.54A-39).

Inspection Procedure C-6: The seat belt switch signal is not received.

⚠ CAUTION

Whenever the ECU is replaced, ensure that the input signal circuit is normal.

Seat Belt Switch Input Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

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COMMENTS ON TROUBLE SYMPTOM

Input signal from the seat belt switch is used to operate the functions below. If the signal is abnormal, these functions will not work normally.

- Seat belt warning buzzer function
- Seat belt indicator

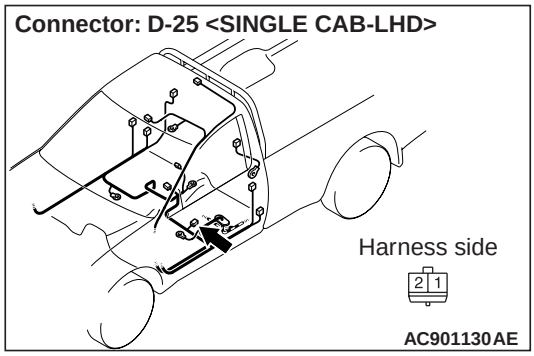
PROBABLE CAUSES

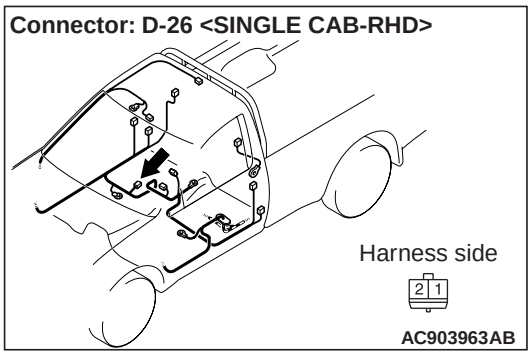
- Malfunction of the seat belt switch (LH)

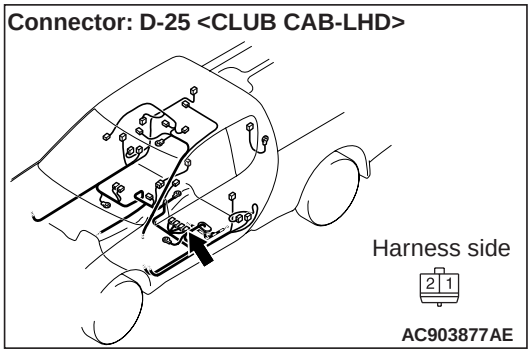
- Malfunction of the seat belt switch (RH)
- Malfunction of the ETACS-ECU
- Damaged harness wires and connectors

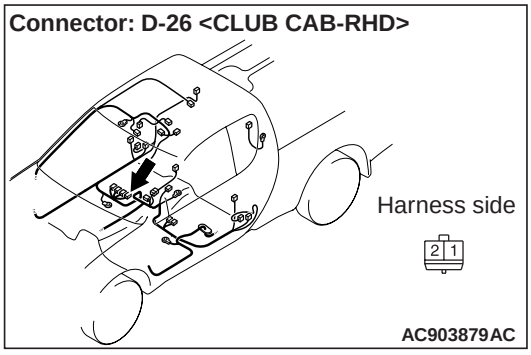
DIAGNOSIS PROCEDURE

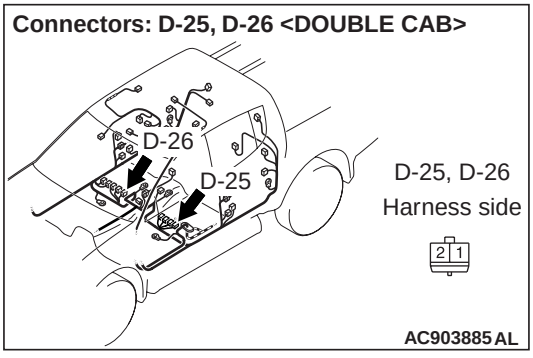
STEP 1. Connector check: D-25 seat belt switch (LH) connector or D-26 seat belt switch (RH) connector









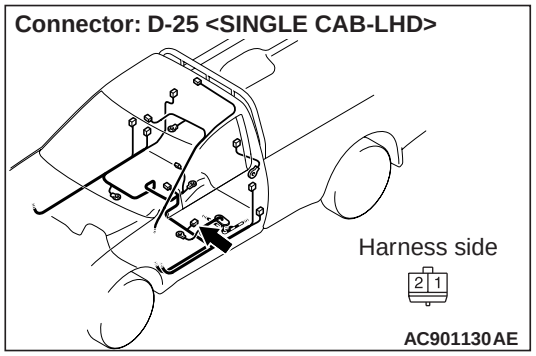


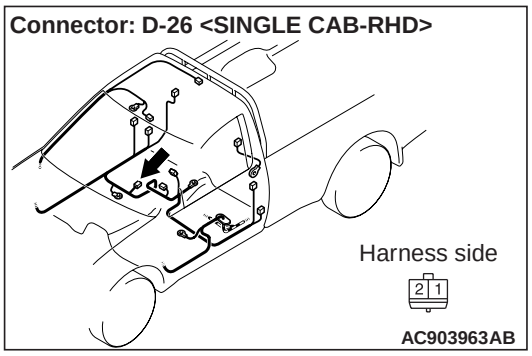
Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the defective connector.

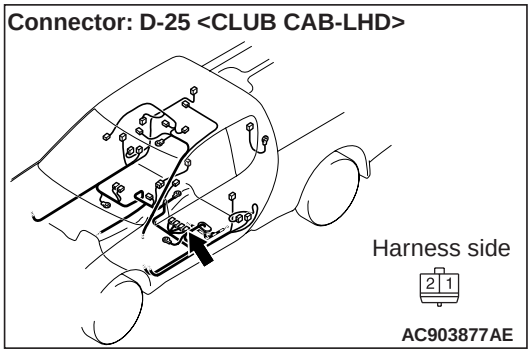
STEP 2. Check the seat belt switch.
Refer to GROUP 52A – Front Seat Belt .

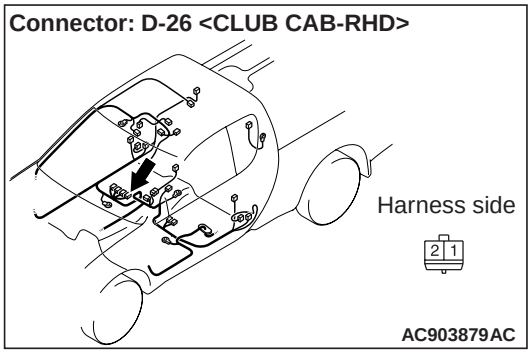
Q: Is the check result normal?
YES : Go to Step 3.
NO : Replace the seat belt switch.

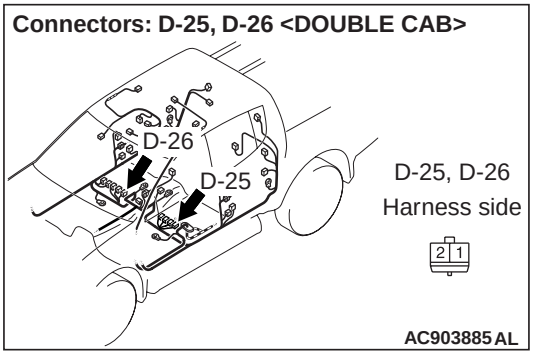
STEP 3. Resistance measurement at the D-25 seat belt switch (LH) connector or D-26 seat belt switch (RH) connector.





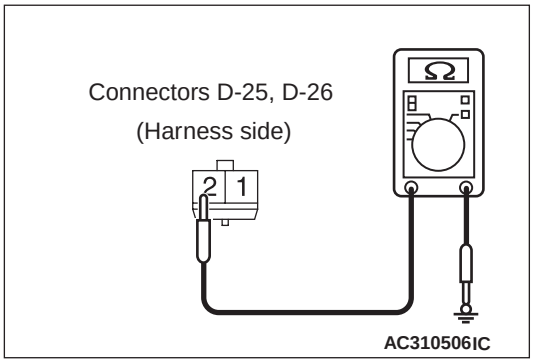






(1) Disconnect the connector, and measure at the

wiring harness side.



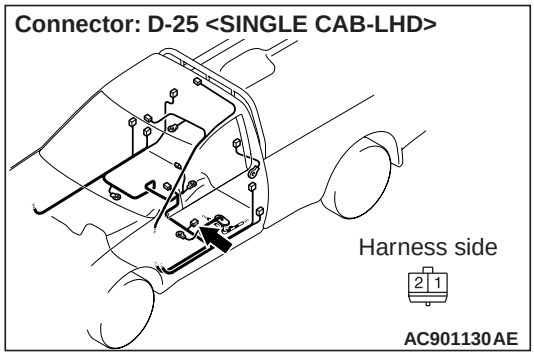
(2) Check the resistance between the seat belt switch connector and body earth.

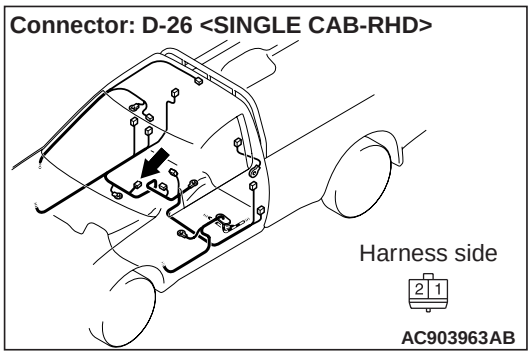
- Resistance between D-25 seat belt switch (LH) connector terminal No.2 and body earth
- Resistance between D-26 seat belt switch (RH) connector terminal No.2 and body earth

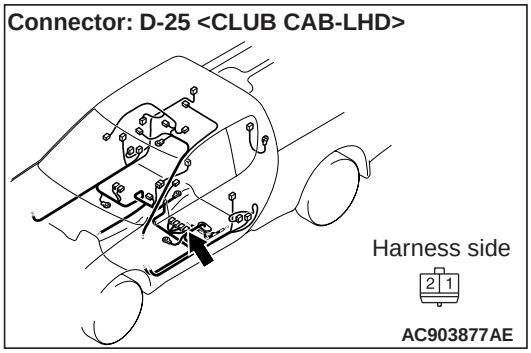
OK: Continuity exists (2 Ω or less)

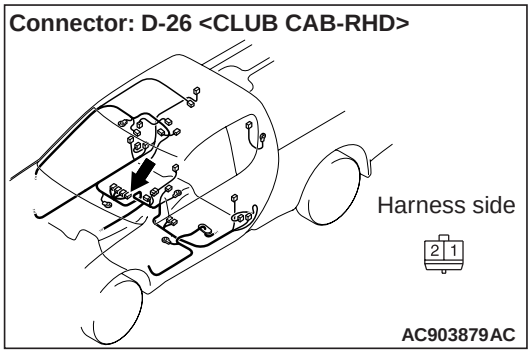
Q: Is the check result normal?
YES : Go to Step 5.
NO : Go to Step 4.

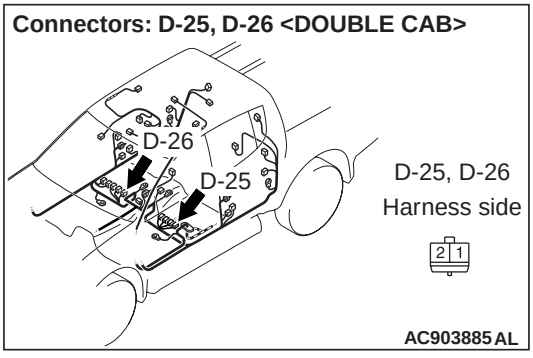
STEP 4. Check the wiring harness between D-25 seat belt switch (LH) connector or D-26 seat belt switch (RH) connector terminal No.2 and the body earth.











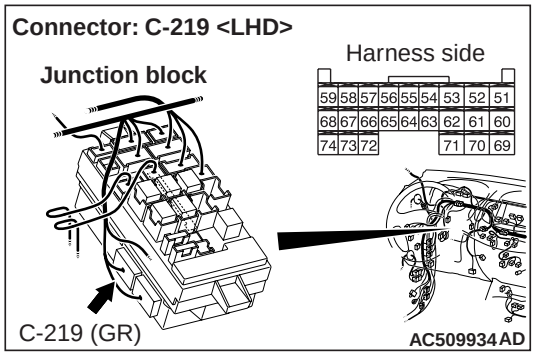
- Check the earth wires for open circuit.

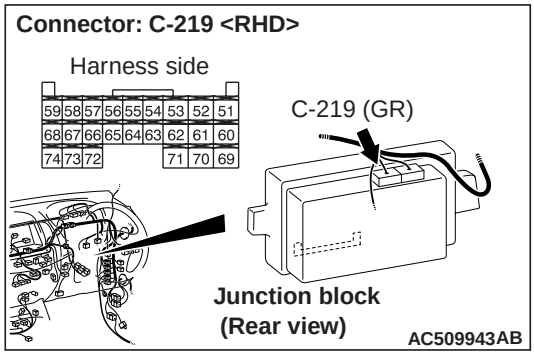
Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

NO : Repair the wiring harness.

STEP 5. Connector check: C-219 ETACS-ECU connector





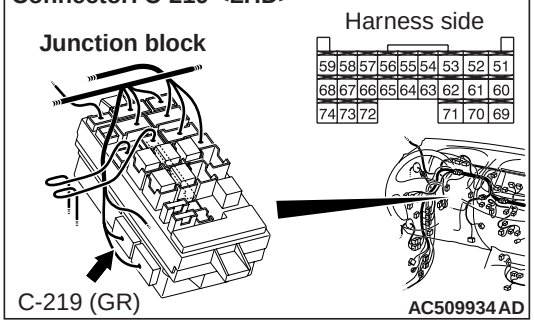
Q: Is the check result normal?

YES : Go to Step 6.

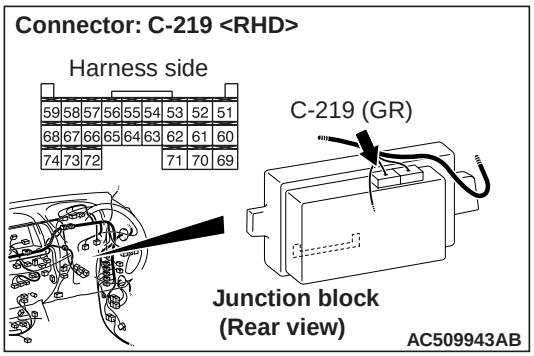
NO : Repair the defective connector.

STEP 6. Check the wiring harness between C-219 ETACS-ECU connector terminal No.60 <seat belt switch (RH-LHD) or (LH-RHD)> or No.66 <seat belt switch (LH-LHD) or (RH-RHD)> and D-26 seat belt switch (RH) connector or D-25 seat belt switch (LH) connector terminal No.1.

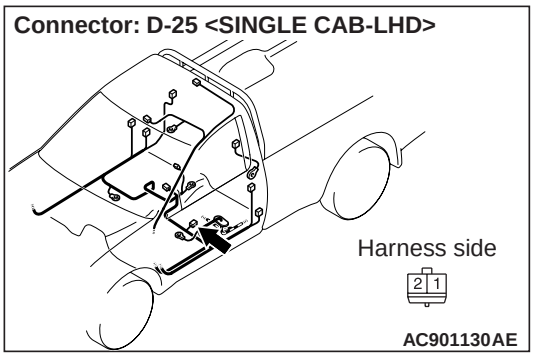
Connector: C-219 <LHD>



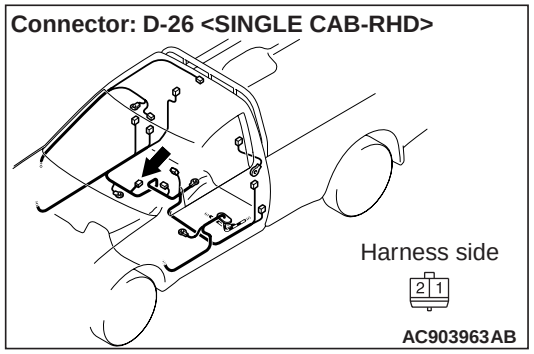
Connector: C-219 <RHD>



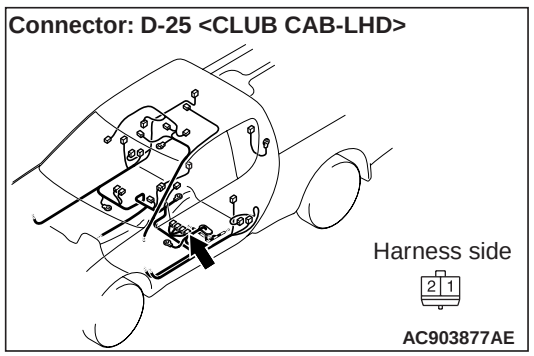
Connector: D-25 <SINGLE CAB-LHD>



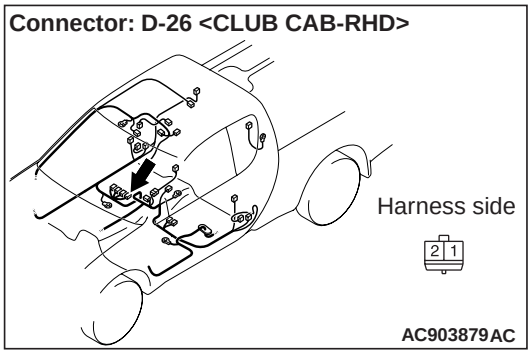
Connector: D-26 <SINGLE CAB-RHD>



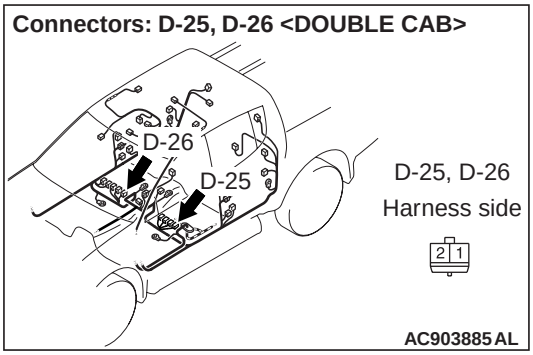
Connector: D-25 <CLUB CAB-LHD>



Connector: D-26 <CLUB CAB-RHD>

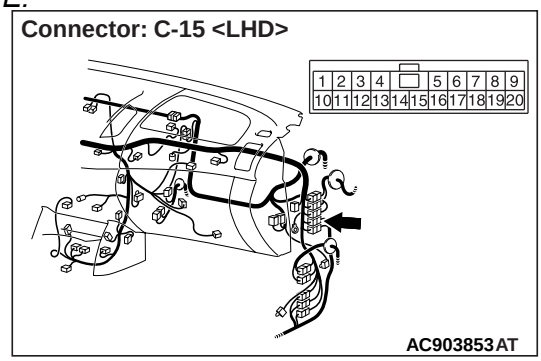


Connectors: D-25, D-26 <DOUBLE CAB>

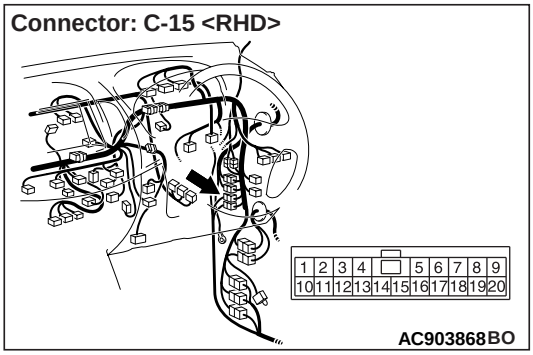


NOTE:

Connector: C-15 <LHD>



Connector: C-15 <RHD>



Prior to the wiring harness inspection, check intermediate connector C-15, and repair if necessary.

- Check the input line for open circuit.

Q: Is the check result normal?

YES : Go to Step 7.

NO : Repair the wiring harness.

STEP 7. M.U.T.-III data list

Check the input signals from the seat belt switch.

- Remove the each inserted seatbelt.

Item No.	Item name	Normal condition
50	Driver's seatbelt(Buckle SW)	Being turned ON from OFF
51	Passenger seatbelt(Buckle SW)	

OK: Normal condition is displayed.

Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction).

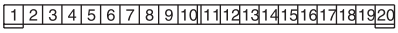
NO : Replace the ETACS-ECU and register the ID codes (Refer to P.54A-39).

CHECK AT ECU TERMINAL

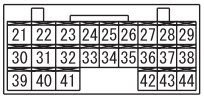
M1545004800491

ETACS-ECU

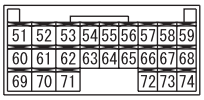
C-218



C-220



C-219



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NOTE: C-218 (terminal numbers 1 to 20) cannot be measured as the ETACS-ECU is mounted on the junction block directly. The values are for reference only.

CONNECTOR: C-218

Terminal No.	Check item	Check condition	Normal condition
1	Power supply to the central door locking system (battery positive voltage)	Always	System voltage
2	Earth (for ECU)	Always	1 V or less
3	Output to left turn-signal lamps	When the left turn-signal lamps are on	System voltage
4	Output to right turn-signal lamps	When the right turn-signal lamps are on	System voltage
5	Power supply to hazard warning lamp (battery positive voltage)	Always	System voltage
6	Input of windshield wiper automatic stop signal	When windshield wipers are operating	System voltage
7	Output to windshield wiper (high-speed operation)	When windshield wipers are operating at high speed	System voltage
8	Output to windshield wiper (low speed operation)	When windshield wipers are operating at low speed	System voltage
9	Output to windshield washer	When windshield washer is operating	System voltage
10	Power supply to windshield wiper/ washer (ignition switch: ACC)	Ignition switch: ACC	System voltage
11 – 14	–	–	–
15	Output to tail lamps	When the tail lamps are on	System voltage
16	Battery power supply (for tail lamps)	Always	System voltage
17	Output to low-beam headlamps	When low-beam headlamps are on	2 V or less

Terminal No.	Check item	Check condition	Normal condition
18	Output to room lamp	When the room lamp is on	Pulse signal
19	Output to high-beam headlamps	When high-beam headlamps are on	2 V or less
20	Battery power supply (for ECU)	Always	System voltage

CONNECTOR: C-220

Terminal No.	Check item	Check condition	Normal condition
21	Output to central door locking (for unlocking the driver's door)	When the door lock actuators unlock the driver's door	System voltage
22	Output to central door locking (for unlocking the doors)	When the door lock actuators unlock the doors	System voltage
23	Output to central door locking (for locking the doors)	When the door lock actuators lock the doors	System voltage
24 – 35	–	–	–
36	Input to front door lock actuator (RH) (lock switch)	Driver's door lock: locked	1 V or less
37 – 40	–	–	–
41	Input to front door lock actuator (unlock switch)	Driver's door lock: Unlocked	1 V or less
42, 43	–	–	–
44	Power supply from ignition switch (IG2)	Ignition switch: ON	System voltage

CONNECTOR: C-219

Terminal No.	Check item	Check condition	Normal condition
51	Input from driver's door switch	Driver's door switch: ON (door open)	1 V or less
52	–	–	–
53	Input to key reminder switch	Key reminder switch: ON (ignition key removed)	1 V or less
54	LIN communication line	Always	0 to 12 V (pulse signal)
55	Output to door ajar indicator	Door ajar indicator is illuminated	System voltage
56	–	–	–
57	Output of key ring antenna signal	Always	1V or less
58	Input of key ring antenna signal	Always	1V or less
59	Output to the power window relay	When the power windows are operative	System voltage
60	Input seat belt switch (RH) <L.H. drive vehicles> or seat belt switch (LH) <R.H. drive vehicles>	When the seat belt is removed.	1 V or less
61	Input from the rear door switches	One of the rear door switches: ON (door open)	1 V or less

Terminal No.	Check item	Check condition	Normal condition
62	Output to key cylinder illumination lamp	When the key cylinder illumination lamp is on	1 V or less
63	Input from the front passenger's door switch	One of the front passenger's door switch: ON (door open)	1 V or less
64	Back-up input from windshield wiper switch	Windshield low-speed wiper switch or windshield high-speed wiper switch: ON	1 V or less
65	–	–	–
66	Input seat belt switch (LH) <L.H. drive vehicles> or seat belt switch (RH) <R.H. drive vehicles>	When the seat belt is removed.	1 V or less
67	–	–	–
68	Power supply from ignition switch (IG1)	Ignition switch: ON or START	System voltage
69	–	–	–
70	Earth (for sensor)	Always	1 V or less
71	Input from hazard warning lamp switch	Hazard warning lamp switch: ON	1 V or less
72	–	–	–
73	Output to seat belt indicator	Seat belt indicator is illuminated	System voltage
74	Power supply from ignition switch (ACC)	Ignition switch: ON or ACC	System voltage

ON-VEHICLE SERVICE

CUSTOMISATION FUNCTION

M1545002501226

The following functions can be customised using M.U.T.-III.

Function	Item name	Configuration
Turn-signal lamp operation sound function	Turn-signal lamp buzzer	• Operation: Standard tone (Initial setting) • Operation (type A): Differs from standard tone
Door-ajar warning buzzer function	Door Ajar Warning custom	• Only indicator: Only door-ajar indicator works. • Operation: Door-ajar indicator and buzzer work. (Works 16 times) (initial condition) • Constantly: Door-ajar indicator and buzzer work. (Without the number limit)
Turn-signal lamp operating conditions	Turn-signal lamp	• ACC or IG1: Operates when the ignition switch is in the "ACC" or "ON" position. • IG1: Operates when the ignition switch is in the "ON" position. (initial condition)
Comfort flashing function	Comfort flashing function	• Inhibit (initial condition) • Operation
Windshield wiper intermittent control (vehicle speed sensing intermittent time adjustable type)	Vehicle speed-dependent wiper	• Inhibit • Operation (initial condition)
Wiper linked with washer function	Wiper synchronized washer	• Inhibit • Operation (initial condition)
Headlamp automatic-shutdown function	Headlamp automatic-shutdown	• Not operation • B-spec (initial condition)
Hazard lamp blink time of keyless entry hazard lamp answerback function <vehicles with keyless entry system>	Hazard answer-back	• Lock 1 Unlock 2 (initial condition) • Lock 1 Unlock 0 • Lock 0 Unlock 2 • Lock 2 Unlock 0 • Lock 0 Unlock 0
Auto lamp function sensor sensitivity (illumination intensity) <vehicles with auto lamp>	Sensitivity for auto lamp(RLS)	• Level 1 bright • Level 2 bright • Level 3 (Initial setting) • Level 4 dark • Level 5 dark

Function	Item name	Configuration
"P" position shift linked door-unlock function <vehicles with automatic transmission with keyless entry system>	Door unlock (Shift "P" position)	• Inhibit (initial condition) • Operation
Keyless entry timer lock time <vehicles with keyless entry system>	Auto-relock time	• 30 sec (initial condition) • 60 sec • 120 sec • 180 sec
Room lamp delay-off time	Interior lamp delay time	• 0 s • 7.5 s (initial condition <vehicles without central door locking system>) • 15 s (initial condition <vehicles with central door locking system>) • 30 s • 60 s • 120 s • 180 s

REMOVAL AND INSTALLATION

M1545004700483

⚠ CAUTION

When the ETACS-ECU is replaced, refer to the ID Code Registration Judgment Table P.54A-39 and register the each ID code.

GROUP 54B

LOCAL INTERCONNECT NETWORK (LIN)

CONTENTS

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DIAGNOSIS CODE PROCEDURES . 54B-6

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- CODE NO. U1504 RAIN LIGHT SENSOR TIMEOUT <Vehicles with auto lamp> 54B-10
- CODE NO.U1507 ETACS-ECU TRANSMISSION ERROR 54B-15
- CODE No.U1508 POWER WINDOW MAIN SWITCH TIME-OUT. 54B-16
- CODE No.U1509 POWER WINDOW SUB SWITCH (AS) TIME-OUT. 54B-21
- CODE No.U1510 POWER WINDOW SUB SWITCH (RL) TIME-OUT. 54B-26
- CODE No.U1511 POWER WINDOW SUB SWITCH (RR) TIME-OUT. 54B-32
- CODE No.U1512 REAR PANEL POWER WINDOW-ECU TIME-OUT. 54B-38
- CODE No.U1530 COLUMN-ECU CHECKSUM ERROR 54B-43
- CODE NO. U1532 RAIN LIGHT SENSOR CHECKSUM ERROR <Vehicles with auto lamp>. 54B-43
- CODE No.U1534 POWER WINDOW MAIN SWITCH CHECKSUM ERROR 54B-43
- CODE No.U1535 POWER WINDOW SUB SWITCH (AS) CHECKSUM ERROR 54B-44
- CODE No.U1536 POWER WINDOW SUB SWITCH (RL) CHECKSUM ERROR 54B-44
- CODE No.U1537 POWER WINDOW SUB SWITCH (RR) CHECKSUM ERROR 54B-44
- CODE No.U1538 REAR PANEL POWER WINDOW-ECU CHECKSUM ERROR 54B-45
- CODE No.U1570 NO BUS ACTIVITY ERROR FOR LIN 54B-46

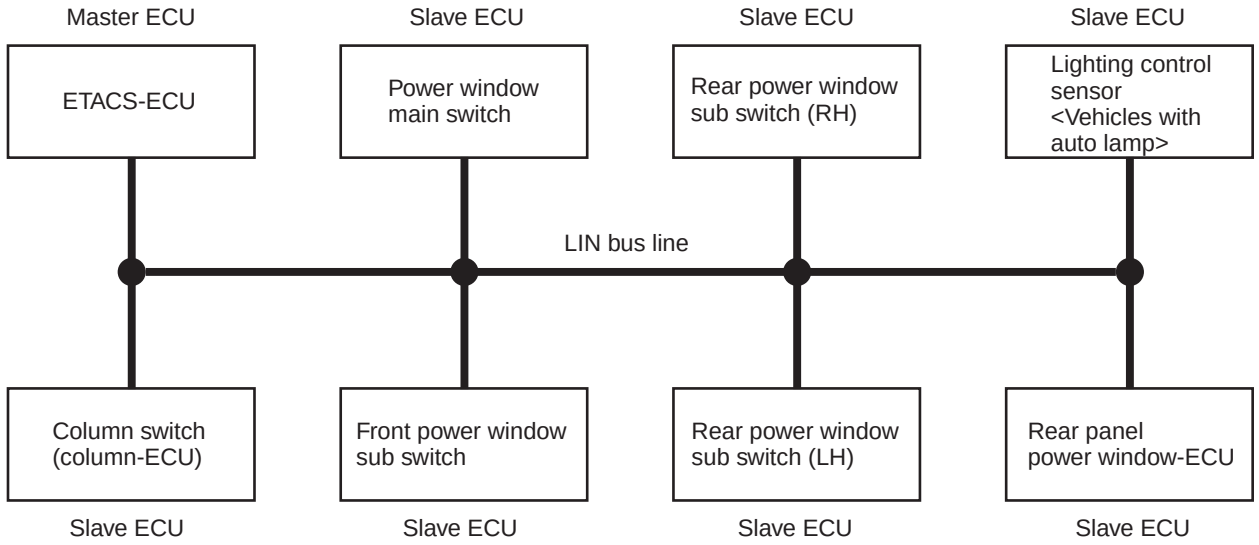
GENERAL INFORMATION

M1545110000491

LIN refers to "Local Interconnect Network" that is the serial multiplex communication protocol* administered by LIN consortium. A communication circuit employing the LIN protocol connects each ECU, and switch and sensor data can be shared among ECUs, which enables more reduction in wiring.

*NOTE: *: The communications protocol has been decided in detail, from software matters such as the necessary transmission rate for communication, the system, data format, and communication timing control method to hardware matters such as the harness type and length and the resistance values.*

STRUCTURE



AC700188AL

Master and slave ECUs are connected to the LIN bus lines. The master ECU is the ETACS*1-ECU, and the slave ECUs are the column switch (column-ECU), each power window, the lighting control sensor*2. The master ECU requests these slave ECUs to communicate each other via communication lines.

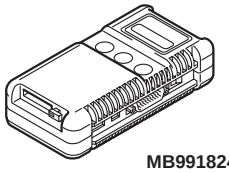
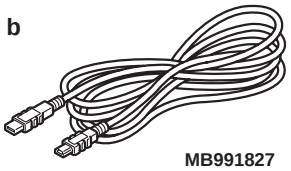
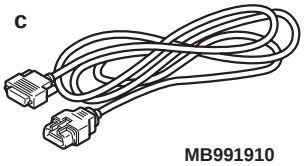
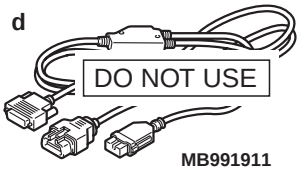
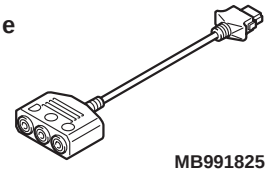
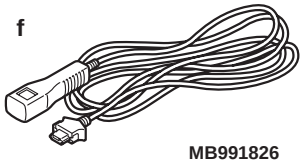
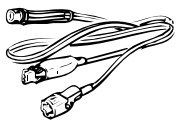
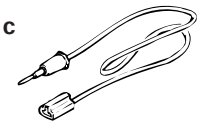
*NOTE: *1: ETACS (Electronic Time and Alarm Control System)*

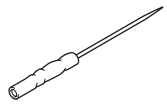
NOTE:

- **1: ETACS (Electronic Time and Alarm Control System)*
- **2: Vehicles with auto lamp.*

SPECIAL TOOLS

M1545100100044

Tool	Number	Name	Use
a  MB991824 b  MB991827 c  MB991910 d  MB991911 e  MB991825 f  MB991826 MB991955	MB991955 a. MB991824 b. MB991827 c. MB991910 d. MB991911 e. MB991825 f. MB991826	M.U.T.-III sub-assembly a. Vehicle Communication Interface (V. C. I.) b. M.U.T.-III USB cable c. M.U.T.-III main harness A (Vehicles with CAN communication system) d. M.U.T.-III main harness B (Vehicles without CAN communication system) e. M.U.T.-III measure adapter f. M.U.T.-III trigger harness	⚠ CAUTION **For vehicles with CAN communication, use M.U.T.-III main harness A to send simulated vehicle speed. If you connect M.U.T.-III main harness B instead, the CAN communication does not function correctly.** LIN communication line check (diagnosis codes)
a b  c  d MB991223	MB991223 a. MB991219 b. MB991220 c. MB991221 d. MB991222	Harness set a. Check harness b. LED harness c. LED harness adapter d. Probe	Continuity check and voltage measurement at harness wire or connector a. For checking connector pin contact pressure b. For checking power supply circuit c. For checking power supply circuit d. For connecting a locally sourced tester

Tool	Number	Name	Use
 MB992006	MB992006	Extra fine probe	Continuity check and voltage measurement at harness wire or connector

DIAGNOSIS CODE CHART

M1545100200795

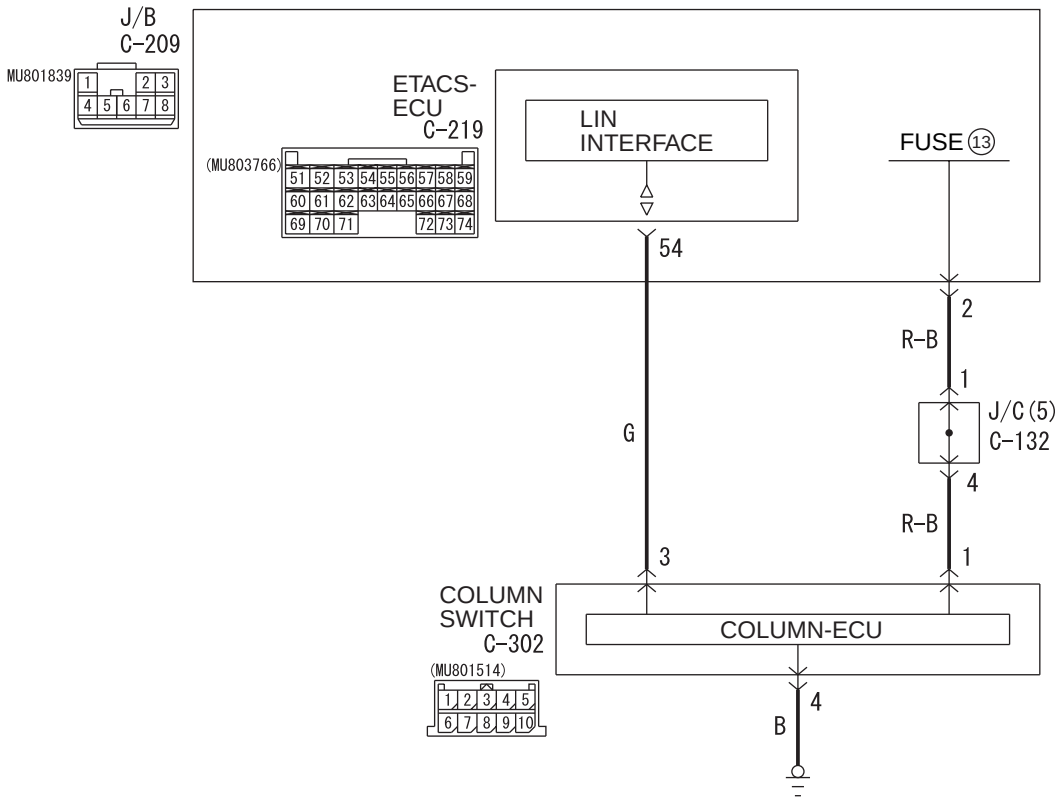
Code No.	Diagnostic item	Reference page
U1500	Column-ECU time-out	P.54B-6
U1504*	Lighting control sensor LIN timeout <Vehicles with auto lamp>	P.54B-10
U1507	ETACS-ECU LIN communication error	P.54B-15
U1508*	Power window main switch time-out	P.54B-16
U1509*	Power window sub switch (AS) time-out	P.54B-21
U1510*	Power window sub switch (RL) time-out	P.54B-26
U1511*	Power window sub switch (RR) time-out	P.54B-32
U1512*	Rear panel power window-ECU time-out	P.54B-38
U1530	Column-ECU checksum error	P.54B-43
U1532*	LIN comm. lighting control sensor <Vehicles with auto lamp>	P.54B-43
U1534*	Power window main switch checksum error	P.54B-43
U1535*	Power window sub switch (AS) checksum error	P.54B-44
U1536*	Power window sub switch (RL) checksum error	P.54B-44
U1537*	Power window sub switch (RR) checksum error	P.54B-44
U1538*	Rear panel power window-ECU checksum error	P.54B-45
U1570	No bus activity error for LIN	P.54B-46

NOTE: When the diagnosis codes relating to the LIN communication error are set, make sure of the vehicle equipment. When the vehicle is not equipped with the system the ETACS-ECU communicates to, the diagnosis code is always set. This is not abnormal.

DIAGNOSIS CODE PROCEDURES

Code No.U1500: Column-ECU time-out

Column Switch LIN Communication Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver WAC54E001A

TROUBLE JUDGEMENT

The ETACS-ECU receives signal from the column-ECU. If signal cannot be received at all, diagnosis code No.U1500 will be set.

COMMENT ON TROUBLE SYMPTOM

The M.U.T.-III shows a diagnosis code status as active.

- Connector(s) or wiring harness in the LIN bus lines between the column-ECU and the ETACS-ECU, the power supply system of the column-ECU, or the column-ECU itself may be defective.

The M.U.T.-III shows a diagnosis code status as stored.

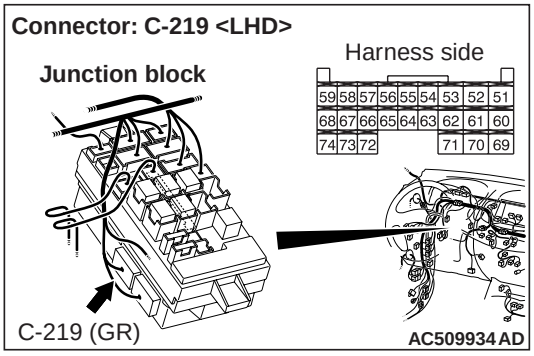
- If diagnosis code No.U1500 is stored as a past trouble, carry out diagnosis with particular emphasis on wiring and connector(s) in the LIN bus line between the column-ECU and the ETACS-ECU, and the power supply system of the column-ECU. For diagnosis procedures, refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Treat Past Trouble .

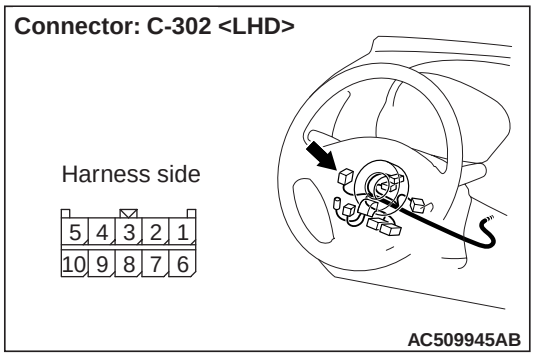
PROBABLE CAUSES

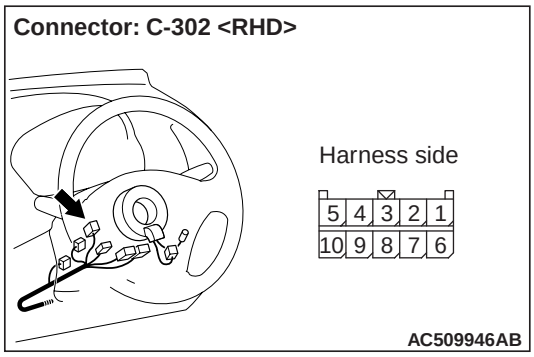
- Malfunction of the lighting switch
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. Connector check: C-219 ETACS-ECU connector, C-302 column switch connector

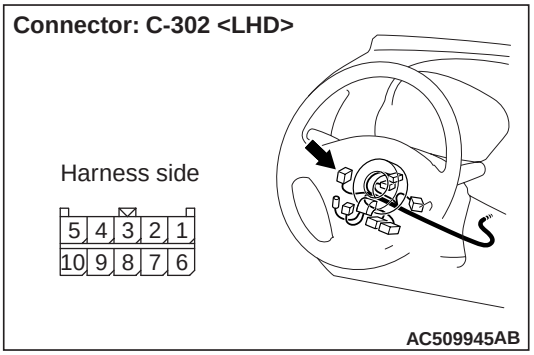


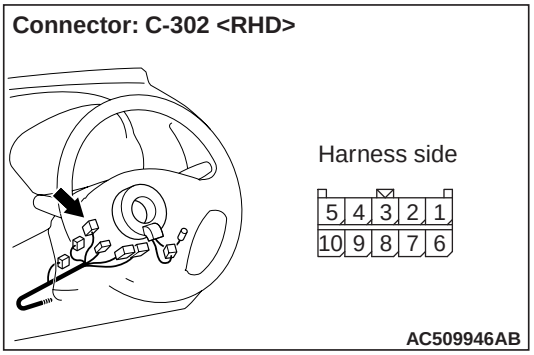




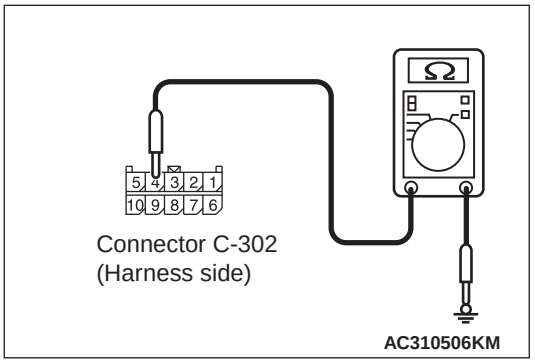
Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the defective connector. Go to Step 7.

STEP 2. Resistance measurement at the C-302 column switch connector





(1) Disconnect the connector, and measure at the wiring harness side.

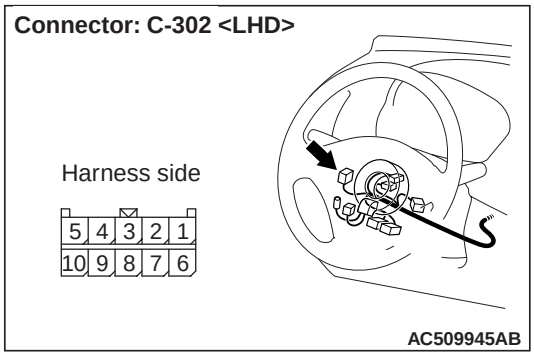


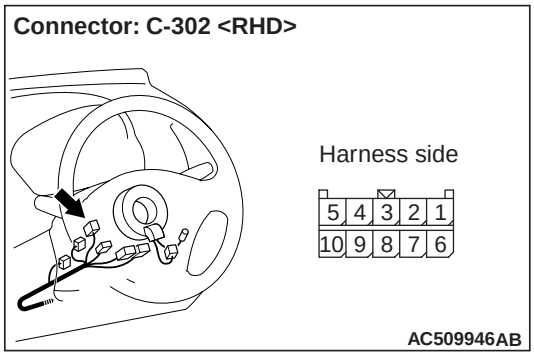
(2) Measure the resistance between the C-302 column switch connector terminal No. 4 and the body earth.

OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?
YES : Go to Step 4.
NO : Go to Step 3.

STEP 3. Check the wiring harness between C-302 column switch connector terminal No. 4 to body earth





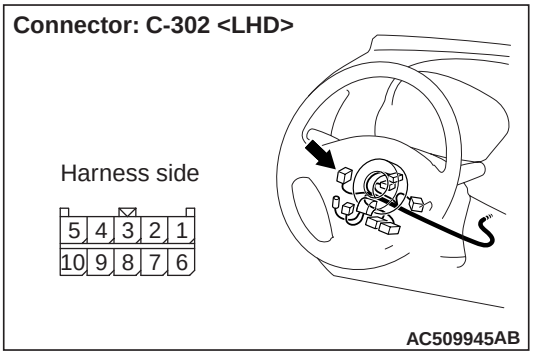
Check the earth wires for open circuit.

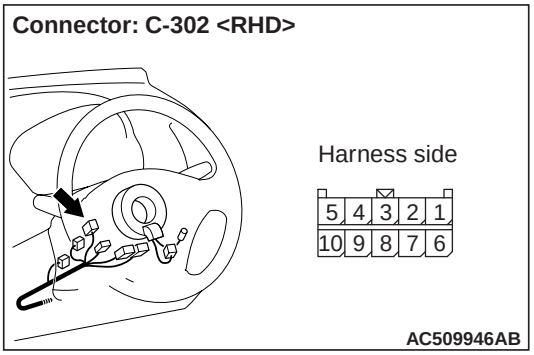
Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

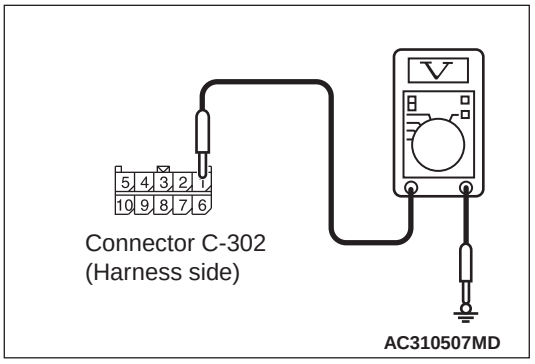
NO : Repair the wiring harness.

STEP 4. Voltage measurement at the C-302 column switch connector.





(1) Disconnect the connector, and measure at the wiring harness side.



(2) Measure the voltage between the C-302 column switch connector terminal No. 1 and the body earth.

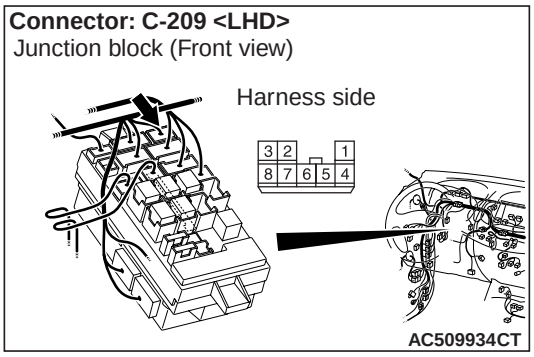
OK: System voltage

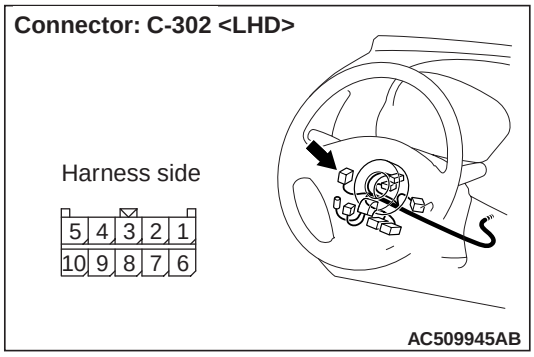
Q: Is the check result normal?

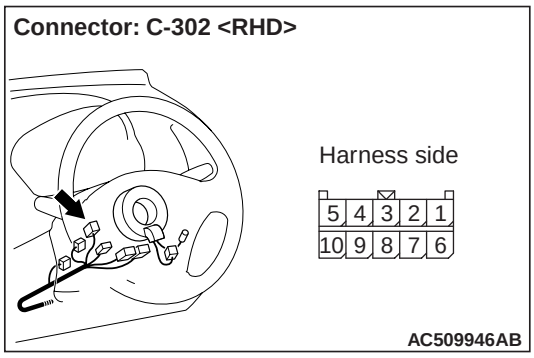
YES : Go to Step 6.

NO : Go to Step 5.

STEP 5. Check the wiring harness between C-302 column switch connector terminal No. 1 and the C-209 junction block connector terminal No. 2

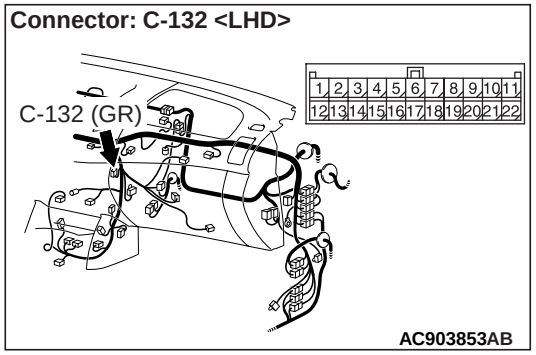


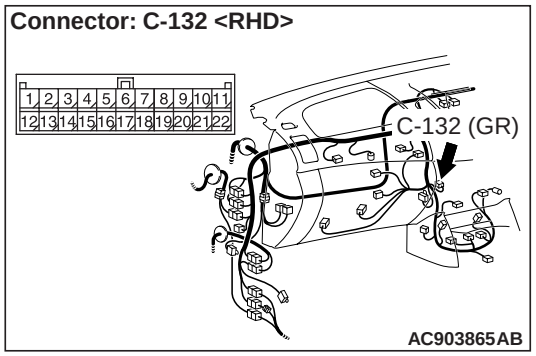




Check the power supply line for open circuit and short circuit.

NOTE:





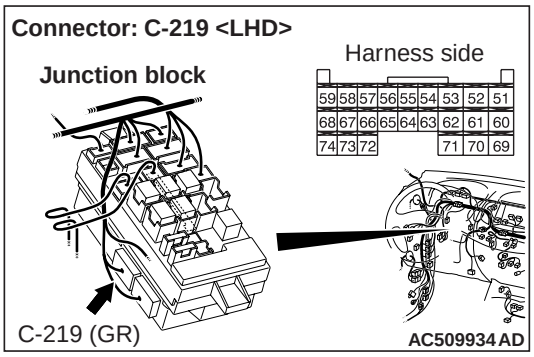
Prior to the wiring harness inspection, check joint connector C-132, and repair if necessary.

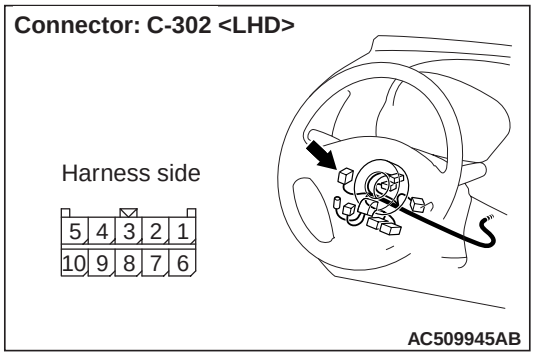
Q: Is the check result normal?

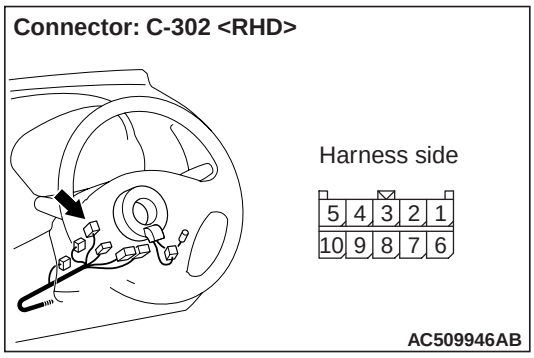
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

NO : Repair the wiring harness.

STEP 6. Check the wiring harness between C-219 ETACS-ECU connector terminal No.54 and C-302 column switch connector terminal No.3.







Check the communication line for open circuit.

Q: Is the check result normal?

YES : Go to Step 7.
NO : Repair the wiring harness. Go to Step 7.

STEP 7. Check whether the diagnosis code is reset.

Check again if the diagnosis code is set to the ETACS-ECU.
(1) Erase the diagnosis code.
(2) Turn the ignition switch from "LOCK" (OFF) position to "ON" position.
(3) On completion, check that the diagnosis code is reset.

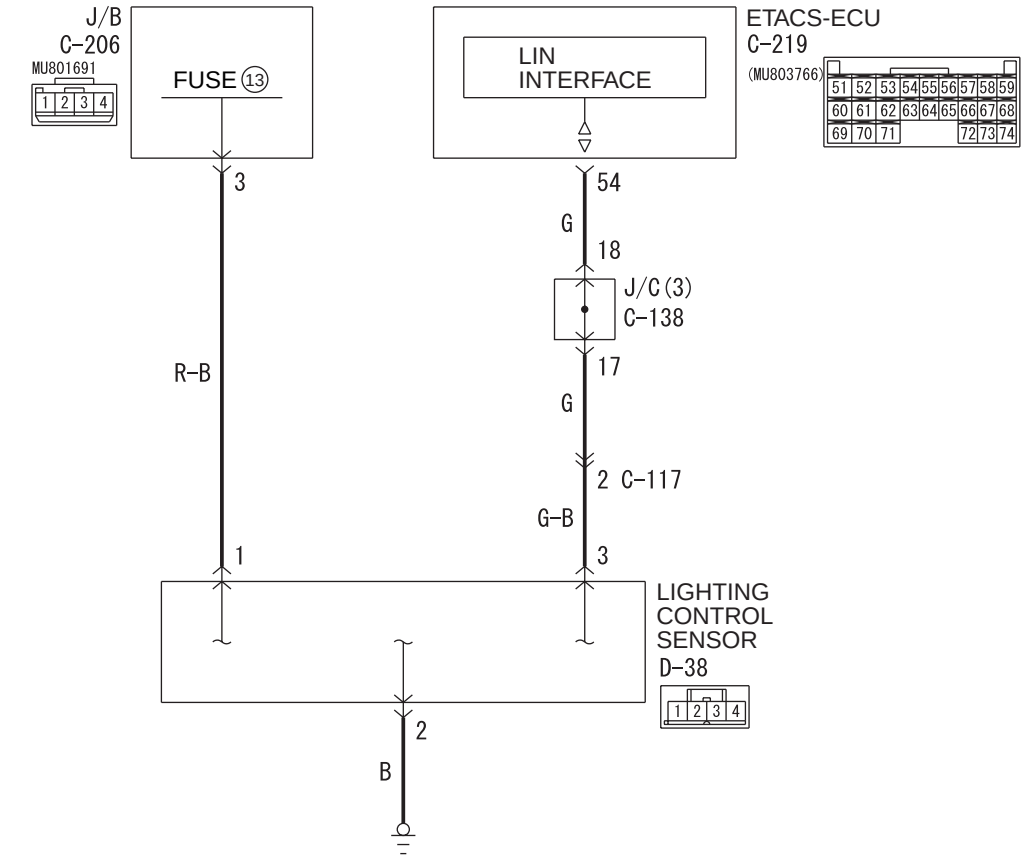
Q: Is the diagnosis code set?

YES : Replace the lighting switch.
NO : A poor connection, open circuit or other intermittent malfunction is present in the LIN bus lines between the column-ECU and the ETACS-ECU (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions).

Code No.U1504: Lighting control sensor LIN timeout <Vehicles with auto lamp>

NOTE: When the diagnosis codes relating to the LIN communication error are set, make sure of the vehicle equipment. When the vehicle is not equipped with the system the ETACS-ECU communicates to, the diagnosis code is always set. This is not abnormal.

Lighting Control Sensor LIN Communication Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver WAC54E062A

TROUBLE JUDGEMENT

The ETACS-ECU receives signal from the lighting control sensor. If signal cannot be received at all, diagnosis code No.U1504 will be set.

COMMENT ON TROUBLE SYMPTOM

The M.U.T.-III shows a diagnosis code status as active.

- Connector(s) or wiring harness in the LIN bus lines between the lighting control sensor and the ETACS-ECU, the power supply system of the lighting control sensor, or the lighting control sensor itself may be defective.

The M.U.T.-III shows a diagnosis code status as stored.

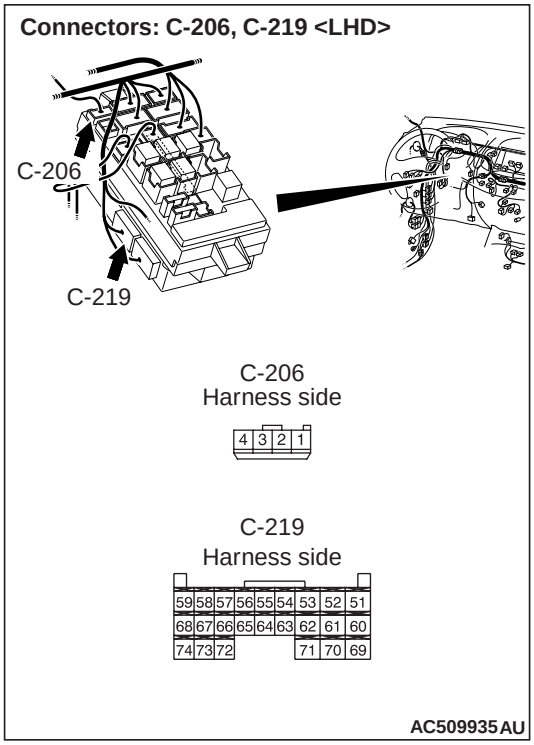
- If diagnosis code No.U1504 is stored as a past trouble, carry out diagnosis with particular emphasis on wiring and connector(s) in the LIN bus line between the lighting control sensor and the ETACS-ECU, and the power supply system of the lighting control sensor. For diagnosis procedures, refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Treat Past Trouble .

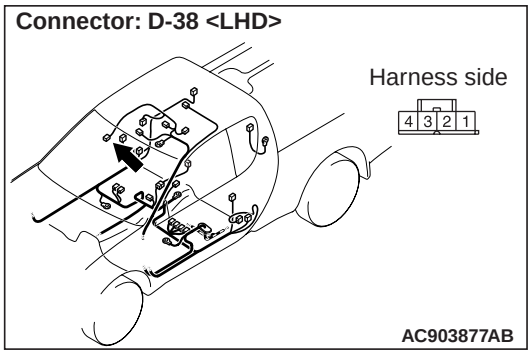
PROBABLE CAUSES

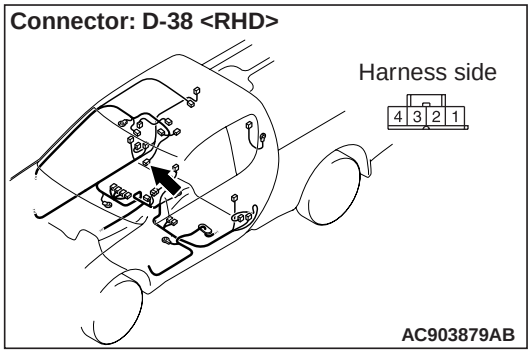
- Malfunction of the lighting control sensor
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. Connector check: C-206 junction block connector, C-219 ETACS-ECU connector, D-38 lighting control sensor connector



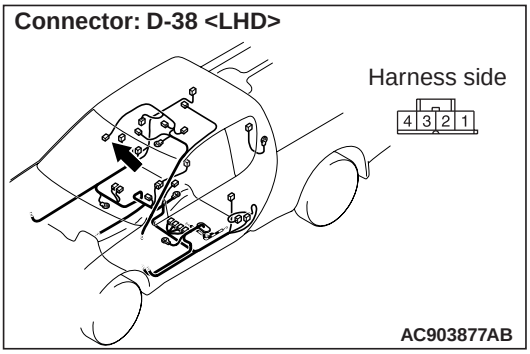


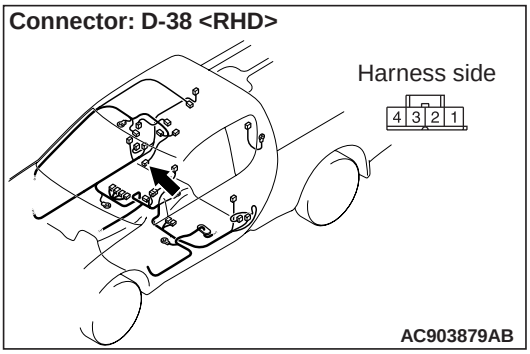


Q: Is the check result normal?

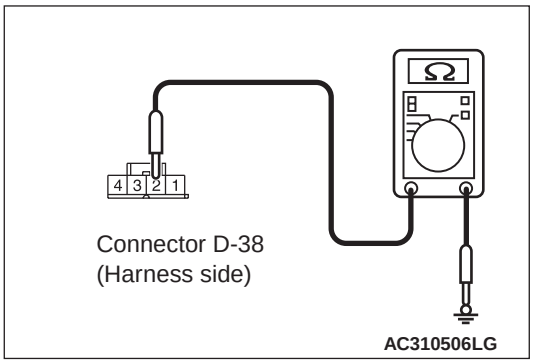
YES : Go to Step 2.
NO : Repair the defective connector. Go to Step 7.

STEP 2. Resistance measurement at the D-38 lighting control sensor connector





(1) Disconnect the connector, and measure at the wiring harness side.



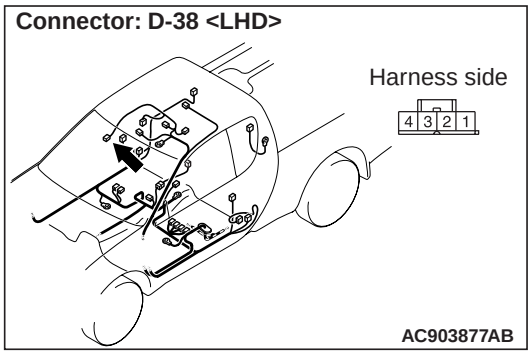
(2) Measure the resistance between the D-38 lighting control sensor connector terminal No. 2 and the body earth.

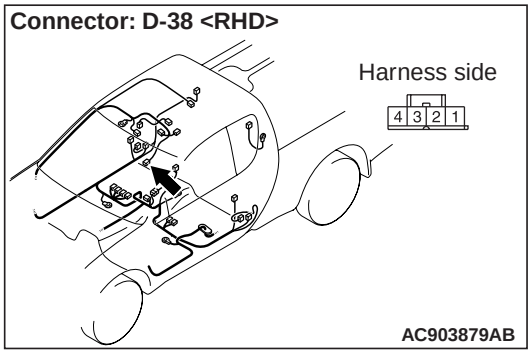
OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?

YES : Go to Step 4.
NO : Go to Step 3.

STEP 3. Check the wiring harness between D-38 lighting control sensor connector terminal No. 2 to body earth





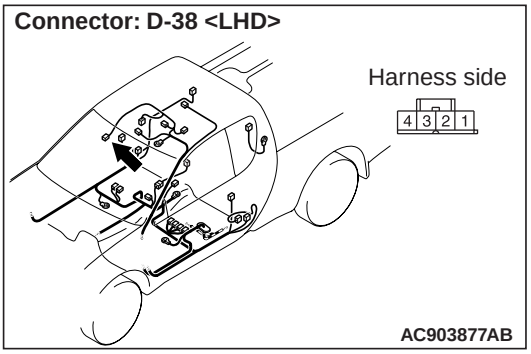
Check the earth wires for open circuit.

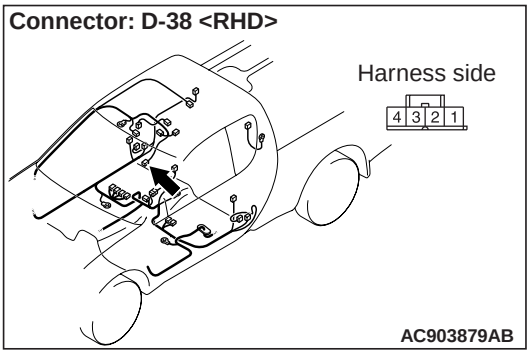
Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

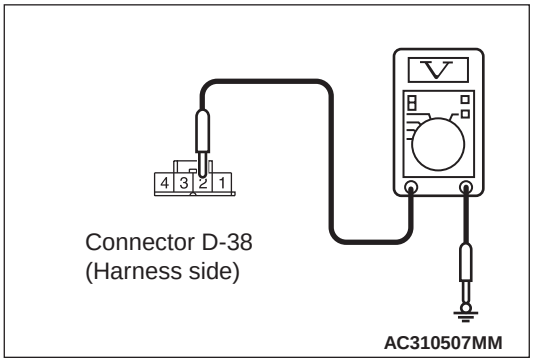
NO : Repair the wiring harness.

STEP 4. Voltage measurement at the D-38 lighting control sensor connector.





(1) Disconnect the connector, and measure at the wiring harness side.



(2) Measure the voltage between the D-38 lighting control sensor connector terminal No. 1 and the body earth.

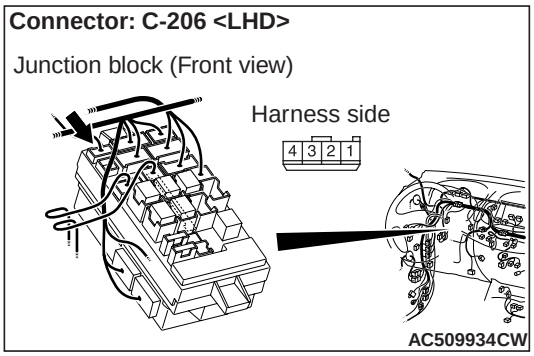
OK: System voltage

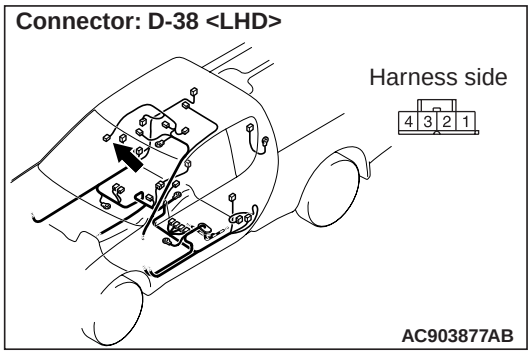
Q: Is the check result normal?

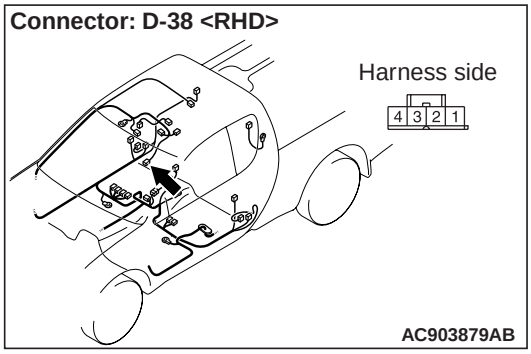
YES : Go to Step 6.

NO : Go to Step 5.

STEP 5. Check the wiring harness between C-206 junction block connector terminal No. 3 and D-38 lighting control sensor connector terminal No. 1







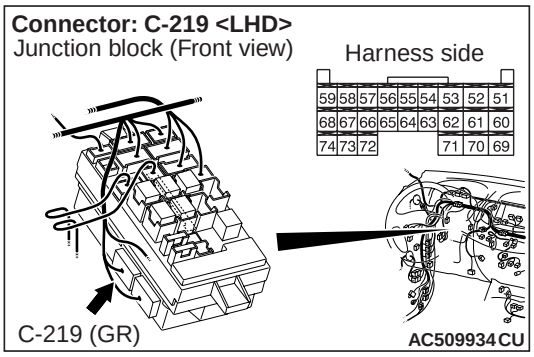
Check the power supply line for open circuit and short circuit.

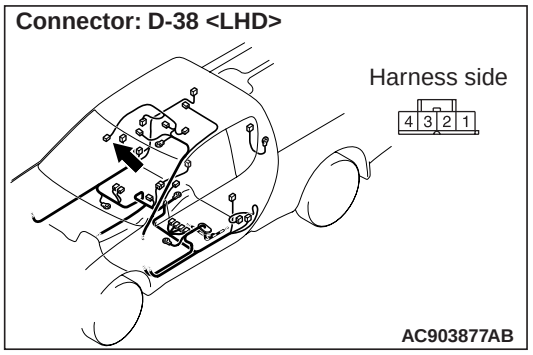
Q: Is the check result normal?

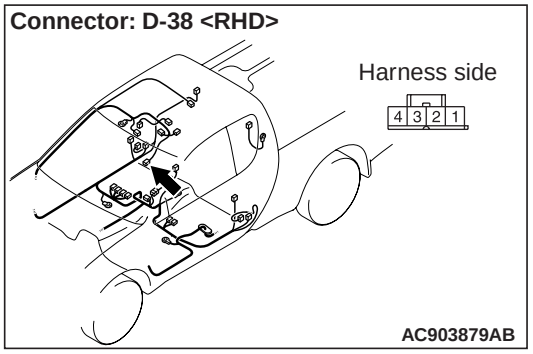
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

NO : Repair the wiring harness.

STEP 6. Check the wiring harness between C-219 ETACS-ECU connector terminal No. 54 and D-38 lighting control sensor connector terminal No. 3.

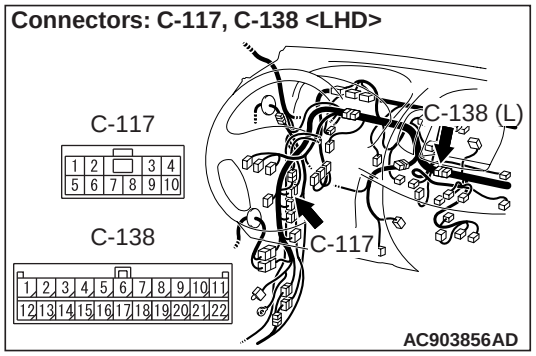


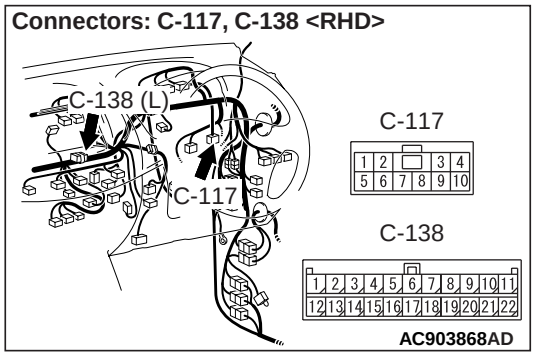




Check the communication lines for open circuit.

NOTE:





Prior to the wiring harness inspection, check joint connector C-138 and intermediate connector C-117, and repair if necessary.

Q: Is the check result normal?
YES : Go to Step 7.
NO : Repair the wiring harness. Go to Step 7.

STEP 7. Check whether the diagnosis code is reset.

Check again if the diagnosis code is set to the ETACS-ECU.
(1) Erase the diagnosis code.
(2) Turn the ignition switch from "LOCK" (OFF) position to "ON" position.
(3) Check if diagnosis code is set.

Q: Is the diagnosis code set?
YES : Replace the lighting control sensor.
NO : A poor connection, open circuit or other intermittent malfunction is present in the LIN bus lines between the lighting control sensor and the ETACS-ECU (Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

Code No.U1507: ETACS-ECU LIN Communication Error

COMMENTS ON TROUBLE SYMPTOM
If any abnormality is found with the ETACS-ECU, the ETACS-ECU stores the diagnosis code No. U1507.

PROBABLE CAUSES
- Malfunction of the ETACS-ECU

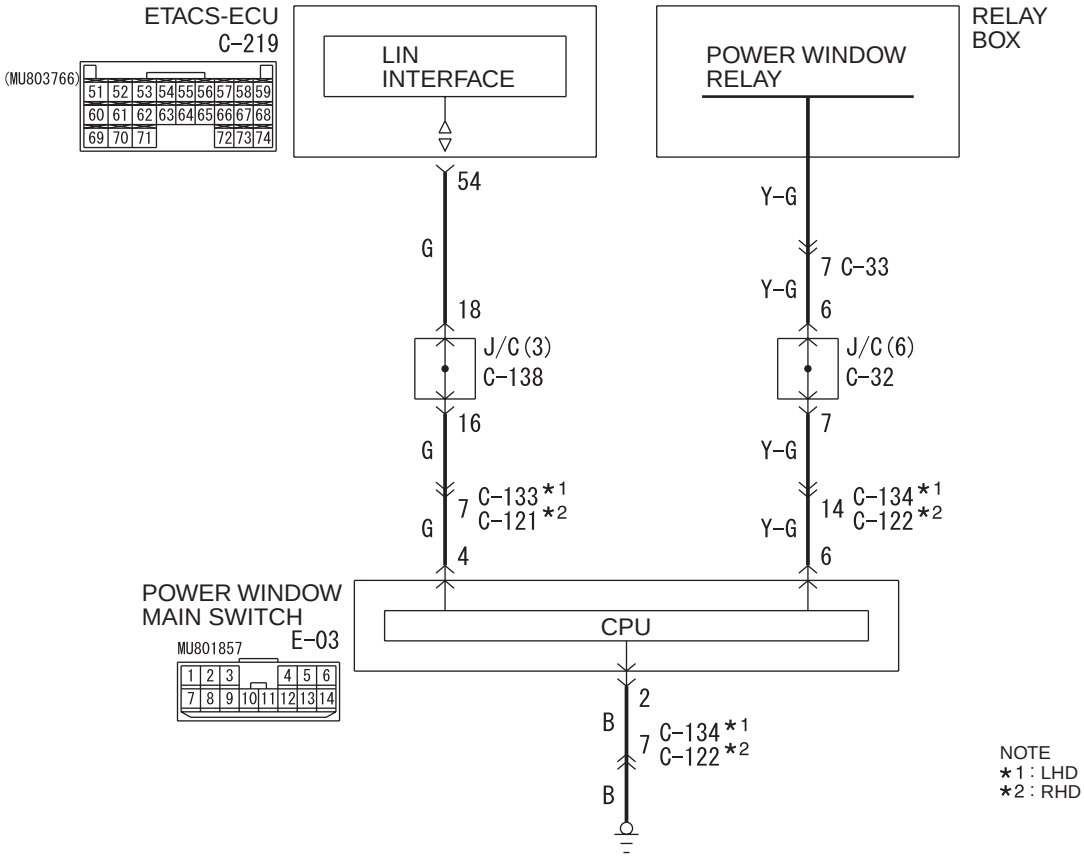
DIAGNOSIS PROCEDURE

Check whether the diagnosis code is reset.
Check again if the diagnosis code is set to the ETACS-ECU.
(1) Erase the diagnosis code.
(2) Turn the ignition switch from "LOCK" (OFF) position to "ON" position.
(3) On completion, check that the diagnosis code is reset.

Q: Is the diagnosis code set?
YES : Replace the ETACS-ECU and register the ID codes (Refer to GROUP 54A, Immobilizer System – On-vehicle service).
NO : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions).

Code No.U1508: Power window main switch time-out

Power Window Main Switch LIN Communication Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver WAC54E060A

TROUBLE JUDGEMENT
The ETACS-ECU receives signal from the power window main switch. If signal cannot be received at all, diagnosis code No.U1508 will be set.

COMMENT ON TROUBLE SYMPTOM

The M.U.T.-III shows a diagnosis code status as active.

- Connector(s) or wiring harness in the LIN bus lines between the power window main switch and the ETACS-ECU, the power supply system of the power window main switch, or the power window main switch itself may be defective.

The M.U.T.-III shows a diagnosis code status as stored.

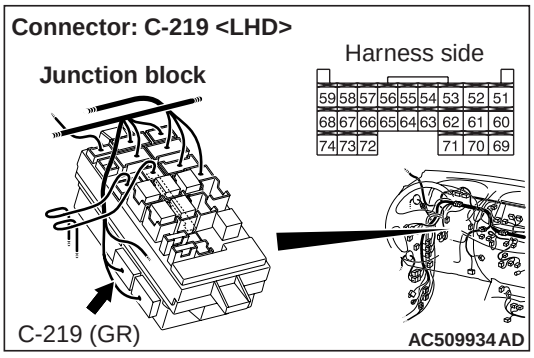
- If diagnosis code No.U1508 is stored as a past trouble, carry out diagnosis with particular emphasis on wiring and connector(s) in the LIN bus line between the power window main switch and the ETACS-ECU, and the power supply system of the power window main switch. For diagnosis procedures, refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Treat Past Trouble .

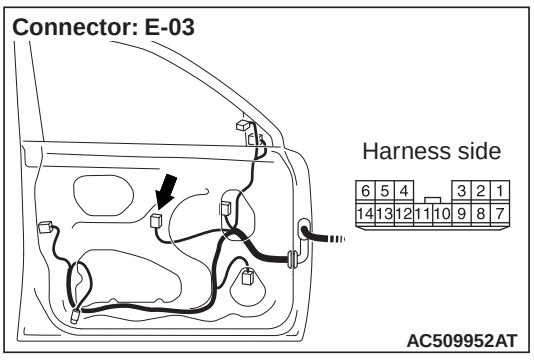
PROBABLE CAUSES

- Malfunction of the power window main switch
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. Connector check: C-219 ETACS-ECU connector, E-03 power window main switch connector

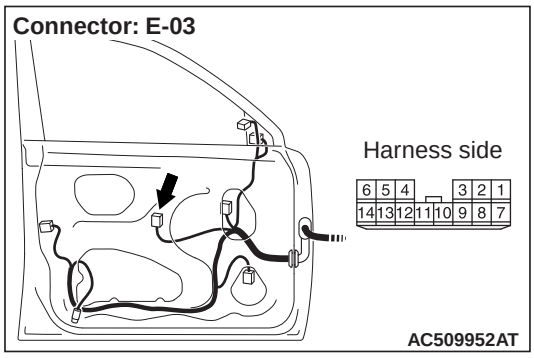




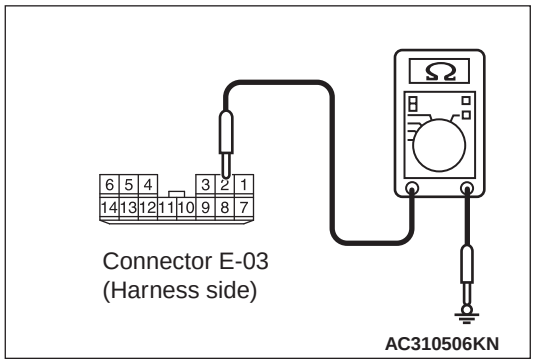
Q: Is the check result normal?

YES : Go to Step 2.
NO : Repair the defective connector.

STEP 2. Resistance measurement at the E-03 power window main switch connector



(1) Disconnect the connector, and measure at the wiring harness side.



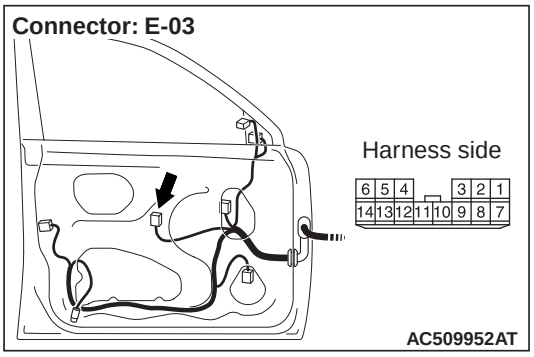
(2) Measure the resistance between the E-03 power window main switch connector terminal No. 2 and the body earth.

OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?

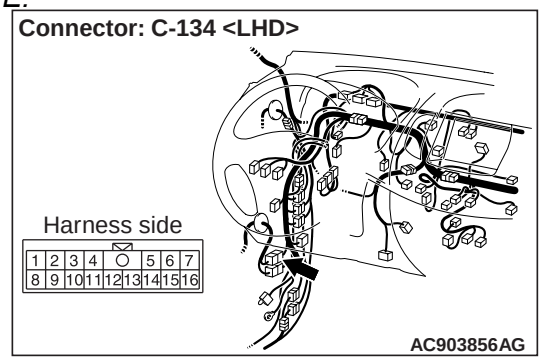
YES : Go to Step 4.
NO : Go to Step 3.

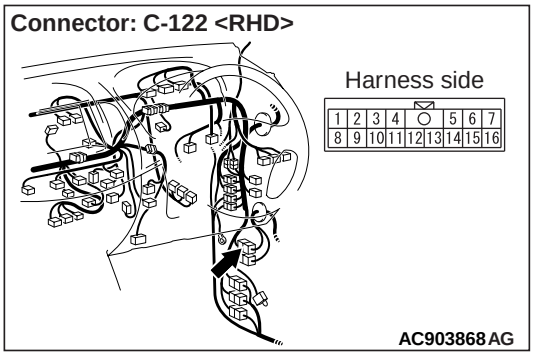
STEP 3. Wiring harness check from E-03 power window main switch connector terminal No. 2 to body earth



Check the earth wires for open circuit.

NOTE:





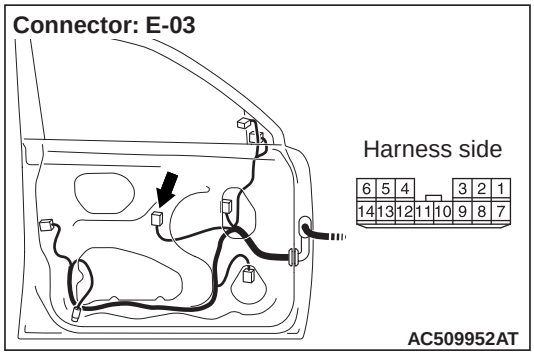
Prior to the wiring harness inspection, check intermediate connector C-134 <LHD> or C-122 <RHD>, and repair if necessary.

Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

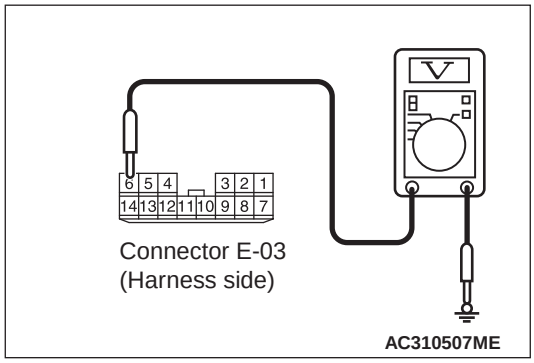
NO : Repair the wiring harness.

STEP 4. Voltage measurement at the E-03 power window main switch connector.



(1) Disconnect the connector, and measure at the wiring harness side.

(2) Ignition switch: ON position



(3) Measure the voltage between the E-03 power window main switch connector terminal No. 6 and the body earth.

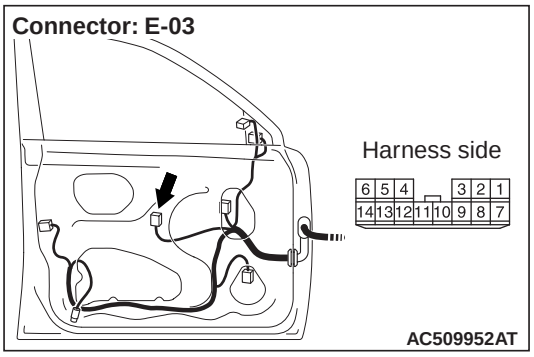
OK: System voltage

Q: Is the check result normal?

YES : Go to Step 6.

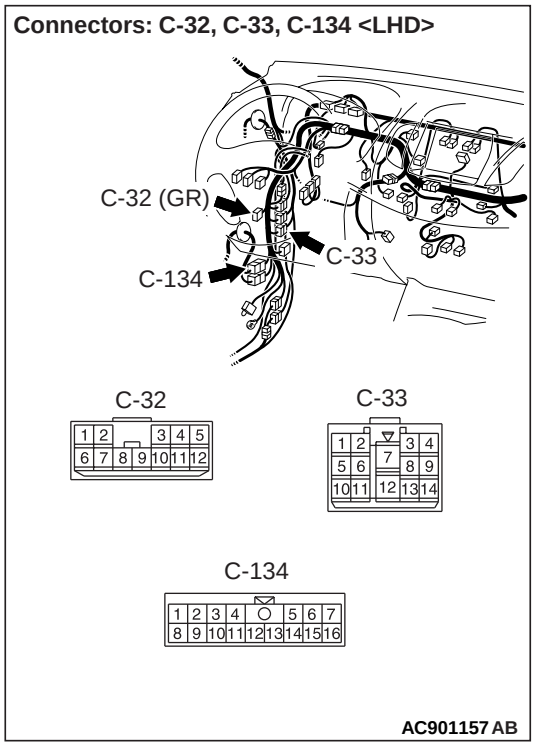
NO : Go to Step 5.

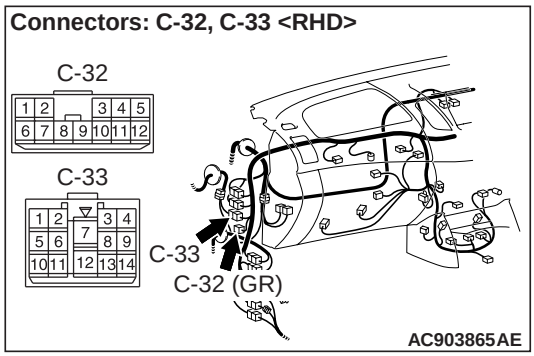
STEP 5. Wiring harness check between the E-03 power window main switch connector terminal No. 6 and the power window relay.

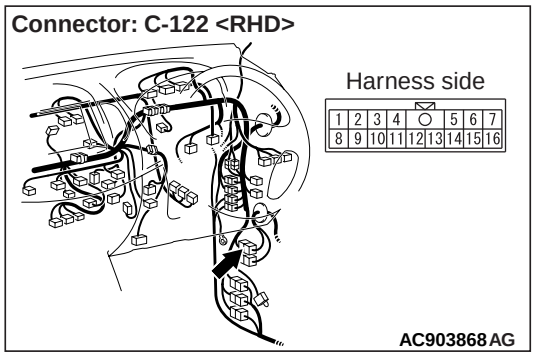


Check the power supply line for open circuit and short circuit.

NOTE:





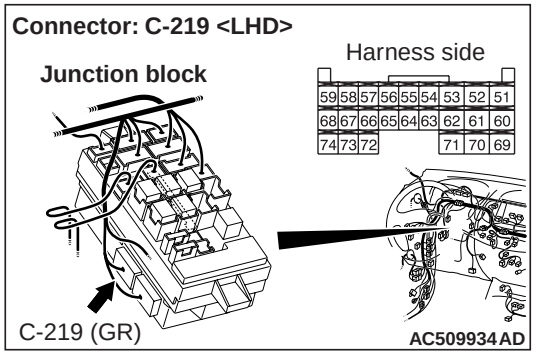


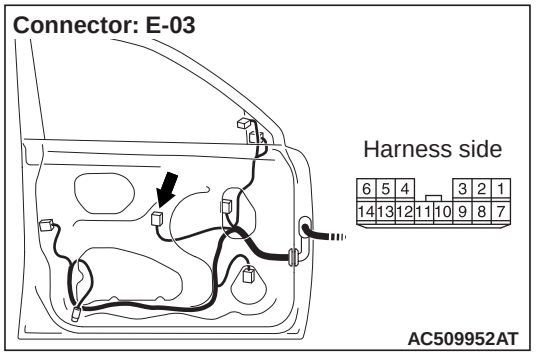
Prior to the wiring harness inspection, check intermediate connectors C-33, C-134 <LHD> or C-122 <RHD> and joint connector C-32, and repair if necessary.

Q: Is the check result normal?

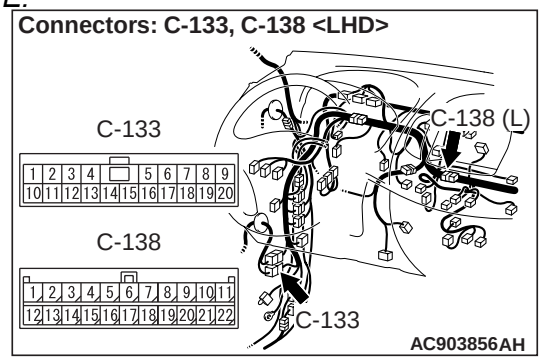
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness.

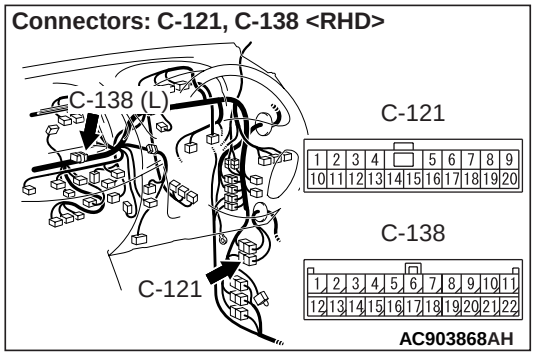
STEP 6. Check the wiring harness between C-219 ETACS-ECU connector terminal No.54 and E-03 power window main switch connector terminal No.4.





NOTE:





Prior to the wiring harness inspection, check joint connector C-138 and intermediate connector C-133 <LHD> or C-121 <RHD>, and repair if necessary.

- Check the communication line for open circuit.

Q: Is the check result normal?

YES : Go to Step 7.
NO : Repair the wiring harness.

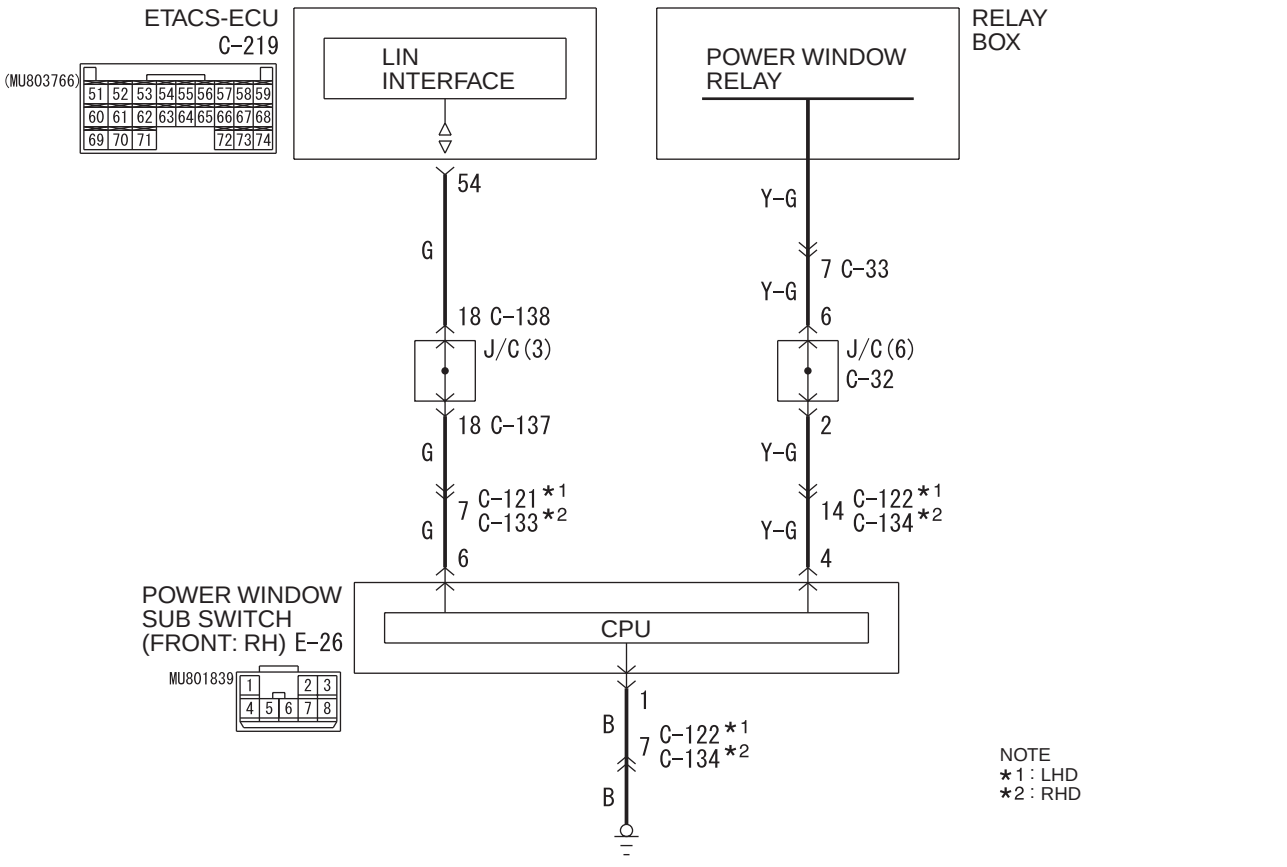
STEP 7. Check whether the diagnosis code is reset.

Check again if the diagnosis code is set to the ETACS-ECU.
(1) Erase the diagnosis code.
(2) Turn the ignition switch from "LOCK" (OFF) position to "ON" position.
(3) On completion, check that the diagnosis code is reset.

Q: Is the diagnosis code set?
YES : Replace the power window main switch.
NO : A poor connection, open circuit or other intermittent malfunction is present in the LIN bus lines between the power window main switch and the ETACS-ECU (Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

Code No.U1509: Power window sub switch (AS) time-out

Front Power Window Sub Switch LIN Communication Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

WAC54E061A

TROUBLE JUDGEMENT

The ETACS-ECU receives signal from the front power window sub switch. If signal cannot be received at all, diagnosis code No.U1509 will be set.

COMMENT ON TROUBLE SYMPTOM

The M.U.T.-III shows a diagnosis code status as active.

- Connector(s) or wiring harness in the LIN bus lines between the front power window sub switch and the ETACS-ECU, the power supply system of the front power window sub switch, or the front power window sub switch itself may be defective.

The M.U.T.-III shows a diagnosis code status as stored.

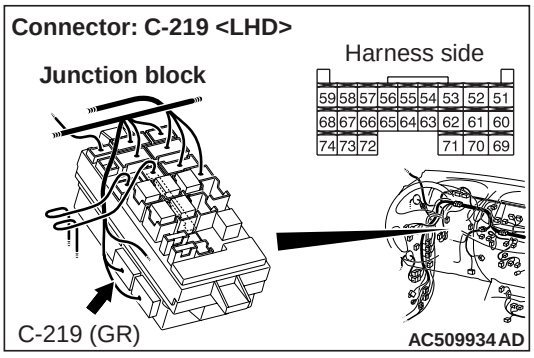
- If diagnosis code No.U1509 is stored as a past trouble, carry out diagnosis with particular emphasis on wiring and connector(s) in the LIN bus line between the front power window sub switch and the ETACS-ECU, and the power supply system of the front power window sub switch. For diagnosis procedures, refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Treat Past Trouble .

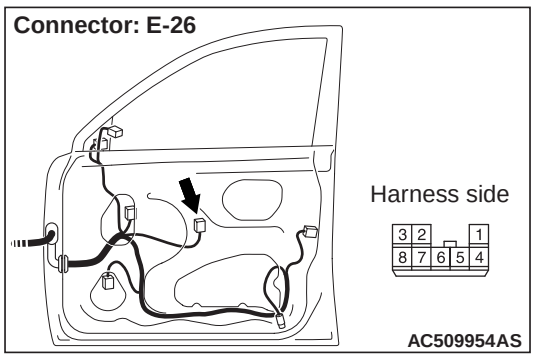
PROBABLE CAUSES

- Malfunction of the front power window sub switch
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. Connector check: C-219 ETACS-ECU connector, E-26 front power window sub switch connector

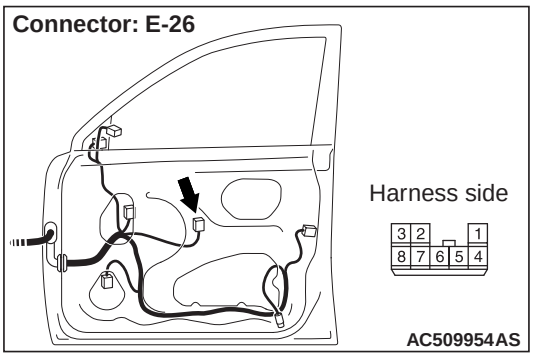




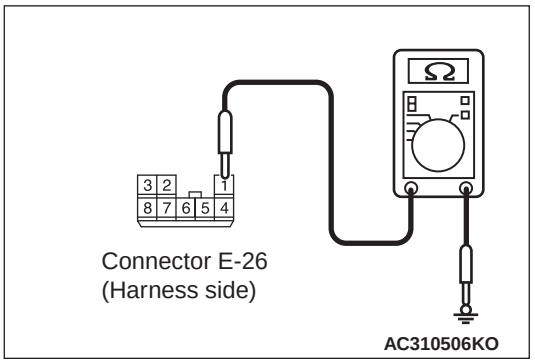
Q: Is the check result normal?

YES : Go to Step 2.
NO : Repair the defective connector.

STEP 2. Resistance measurement at the E-26 front power window sub switch connector



(1) Disconnect the connector, and measure at the wiring harness side.



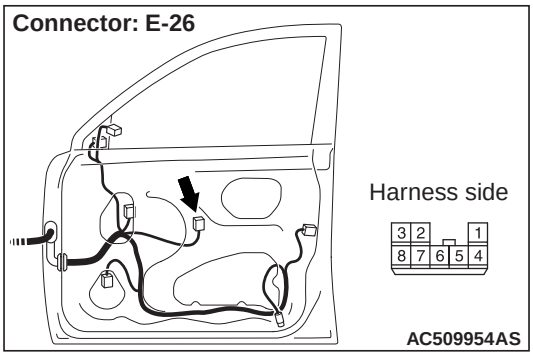
(2) Measure the resistance between the E-26 front power window sub switch connector terminal No. 1 and the body earth.

OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?

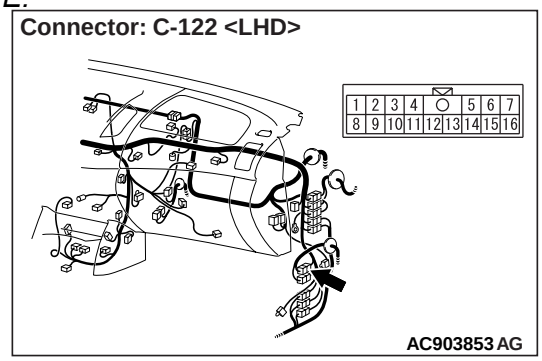
YES : Go to Step 4.
NO : Go to Step 3.

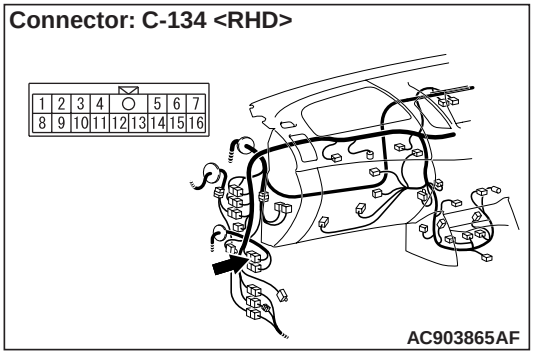
STEP 3. Wiring harness check from E-26 front power window sub switch connector terminal No. 1 to body earth



Check the earth wires for open circuit.

NOTE:





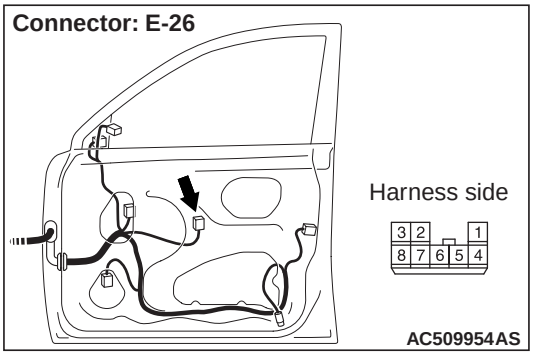
Prior to the wiring harness inspection, check intermediate connector C-122 <LHD> or C-134 <RHD>, and repair if necessary.

Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

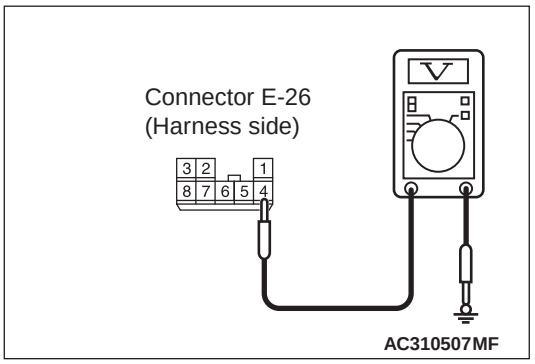
NO : Repair the wiring harness.

STEP 4. Voltage measurement at the E-26 front power window sub switch connector.



(1) Disconnect the connector, and measure at the wiring harness side.

(2) Ignition switch: ON position



(3) Measure the voltage between the E-26 front power window sub switch connector terminal No. 4 and the body earth.

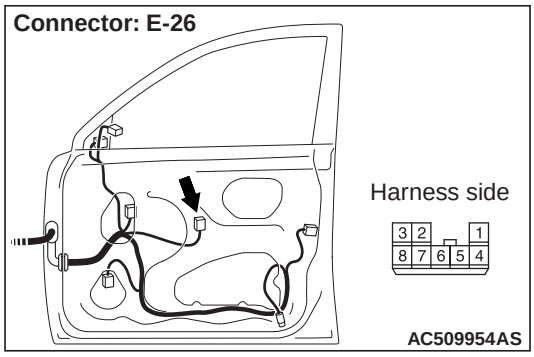
OK: System voltage

Q: Is the check result normal?

YES : Go to Step 6.

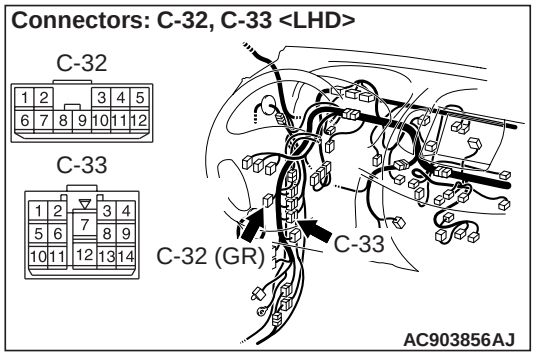
NO : Go to Step 5.

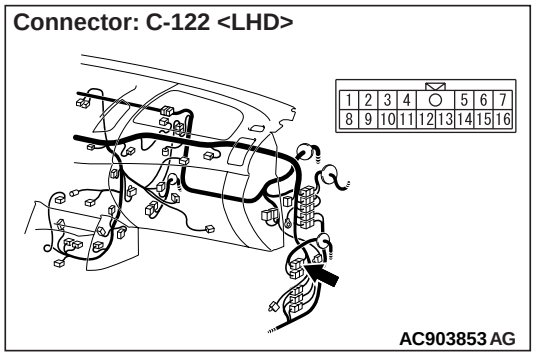
STEP 5. Wiring harness check between the E-26 front power window sub switch connector terminal No. 4 and the power window relay

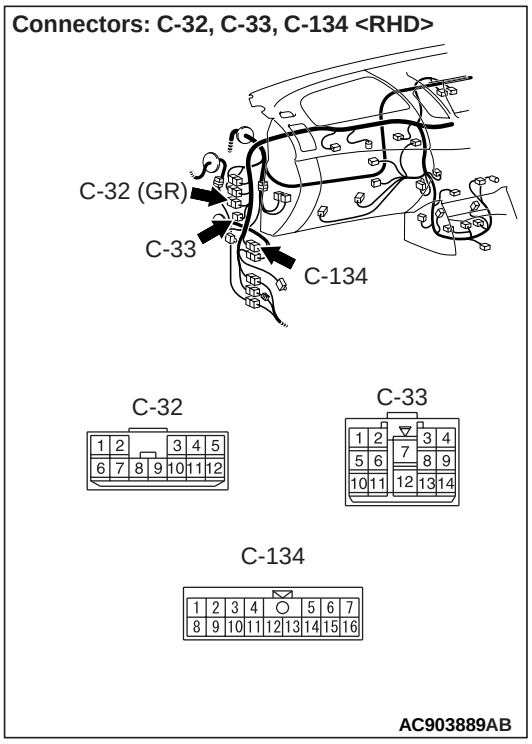


Check the power supply line for open circuit and short circuit.

NOTE:







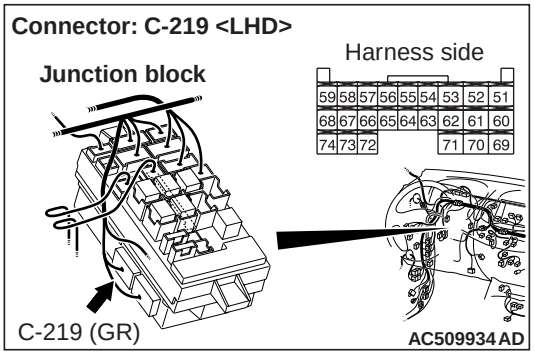
Prior to the wiring harness inspection, check intermediate connectors C-33, C-122 <LHD> or C-134 <RHD> and joint connector C-32, and repair if necessary.

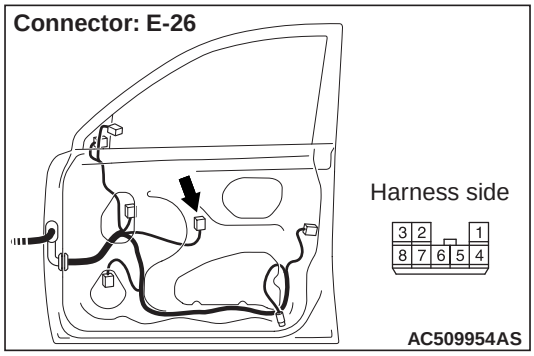
Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

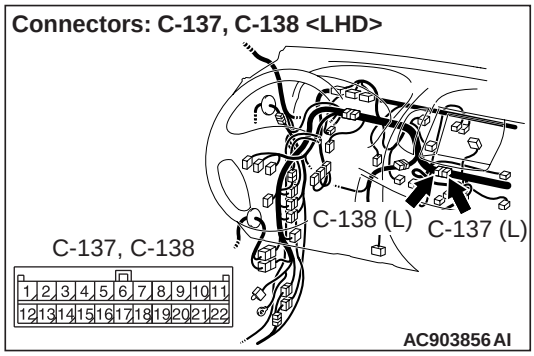
NO : Repair the wiring harness.

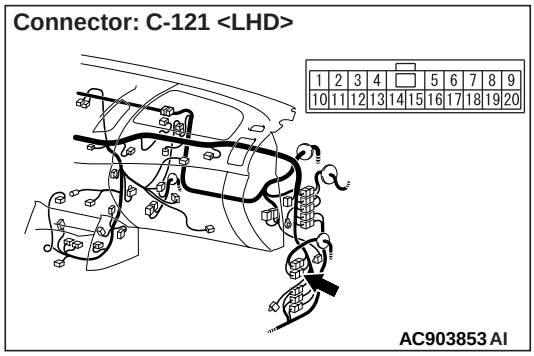
STEP 6. Check the wiring harness between C-219 ETACS-ECU connector terminal No.54 and E-26 front power window sub switch connector terminal No.6.

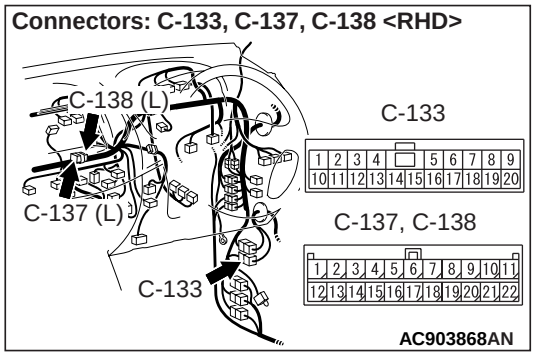




NOTE:







Prior to the wiring harness inspection, check joint connectors C-137, C-138 and intermediate connector C-121 <LHD> or C-133 <RHD>, and repair if necessary.

- Check the communication line for open circuit.

Q: Is the check result normal?

YES : Go to Step 7.

NO : Repair the wiring harness.

STEP 7. Check whether the diagnosis code is reset.

Check again if the diagnosis code is set to the ETACS-ECU.

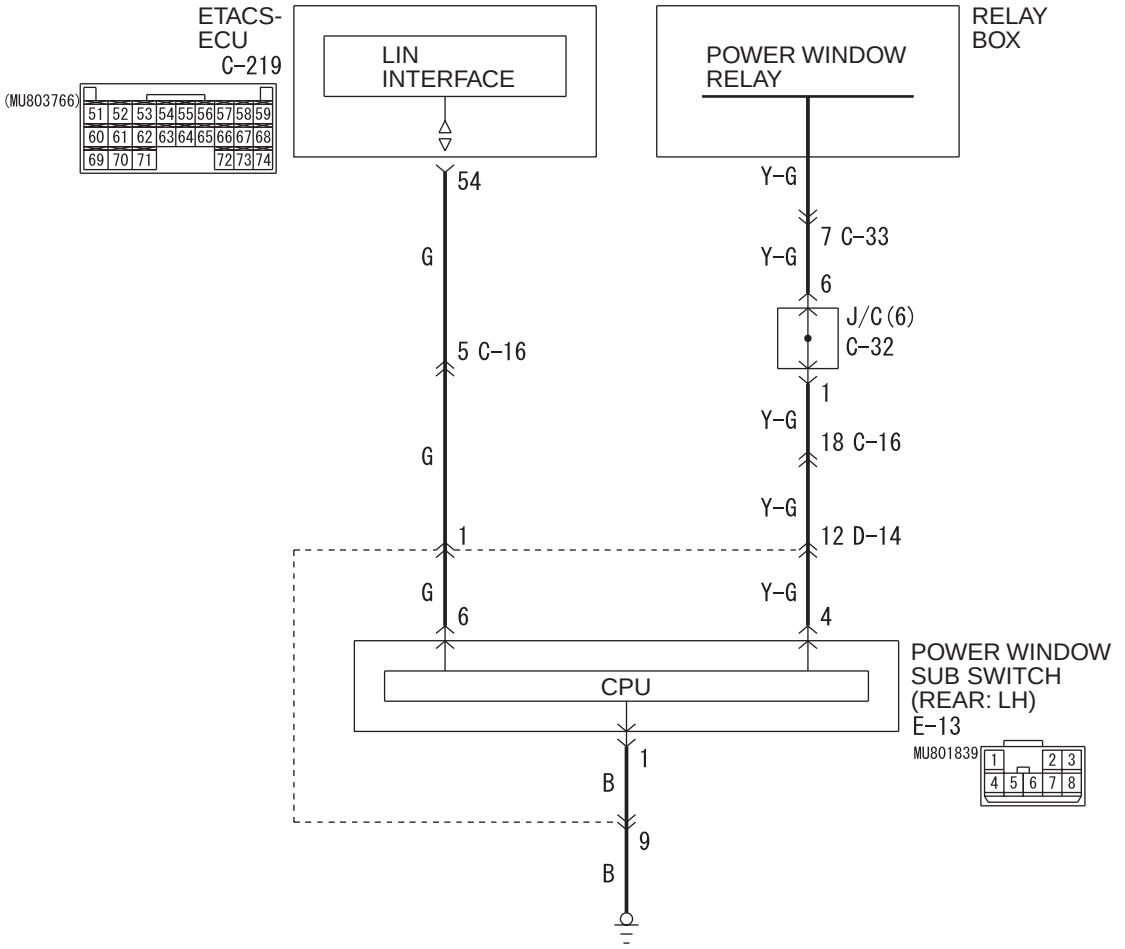
(1) Erase the diagnosis code.
(2) Turn the ignition switch from "LOCK" (OFF) position to "ON" position.
(3) On completion, check that the diagnosis code is reset.

Q: Is the diagnosis code set?

YES : Replace the front power window sub switch.
NO : A poor connection, open circuit or other intermittent malfunction is present in the LIN bus lines between the front power window sub switch and the ETACS-ECU (Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

Code No.U1510: Power window sub switch (RL) time-out

Rear Power Window Sub Switch (LH) LIN Communication Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

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TROUBLE JUDGEMENT
The ETACS-ECU receives signal from the rear power window sub switch (LH). If signal cannot be received at all, diagnosis code No.U1510 will be set.

COMMENT ON TROUBLE SYMPTOM

The M.U.T.-III shows a diagnosis code status as active.

- Connector(s) or wiring harness in the LIN bus lines between the rear power window sub switch (LH) and the ETACS-ECU, the power supply system of the rear power window sub switch (LH), or the rear power window sub switch (LH) itself may be defective.

The M.U.T.-III shows a diagnosis code status as stored.

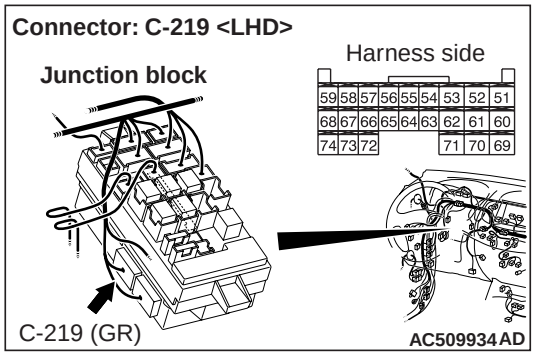
- If diagnosis code No.U1510 is stored as a past trouble, carry out diagnosis with particular emphasis on wiring and connector(s) in the LIN bus line between the rear power window sub switch (LH) and the ETACS-ECU, and the power supply system of the rear power window sub switch (LH). For diagnosis procedures, refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Treat Past Trouble .

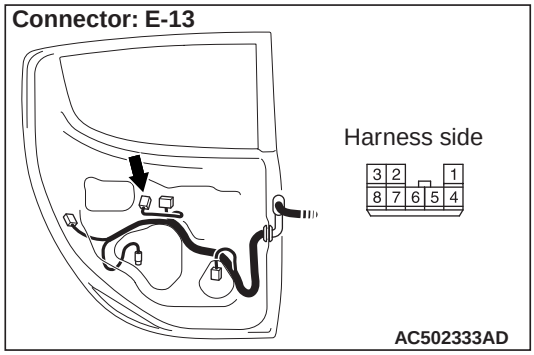
PROBABLE CAUSES

- Malfunction of the rear power window sub switch (LH)
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

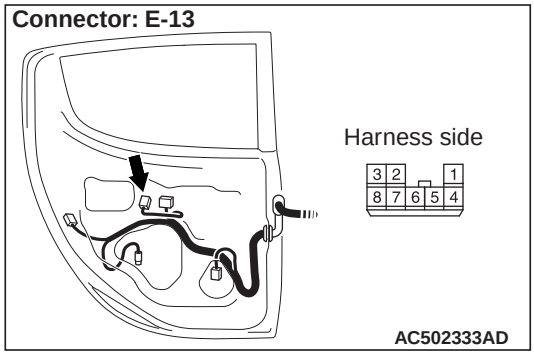
STEP 1. Connector check: C-219 ETACS-ECU connector, E-13 rear power window sub switch (LH) connector





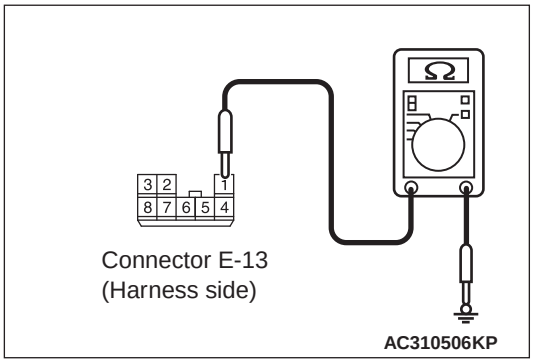
Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the defective connector.

STEP 2. Resistance measurement at the E-13 rear power window sub switch (LH) connector



(1) Disconnect the connector, and measure at the

wiring harness side.

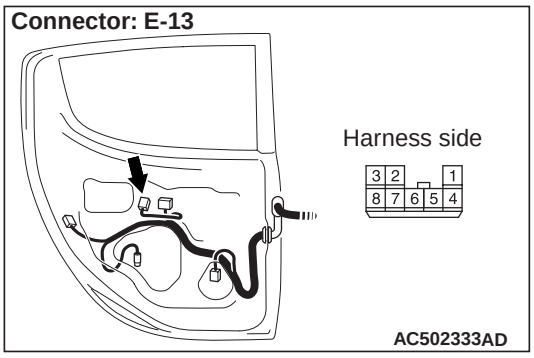


(2) Measure the resistance between the E-13 rear power window sub switch (LH) connector terminal No. 1 and the body earth.

OK: Continuity exists (2 Ω or less)

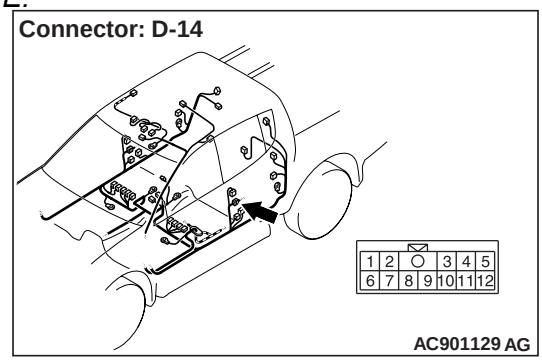
Q: Is the check result normal?
YES : Go to Step 4.
NO : Go to Step 3.

STEP 3. Check the wiring harness between E-13 rear power window sub switch (LH) connector terminal No. 1 to body earth



Check the earth wires for open circuit.

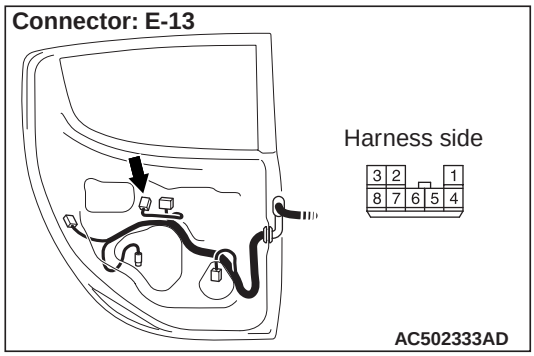
NOTE:



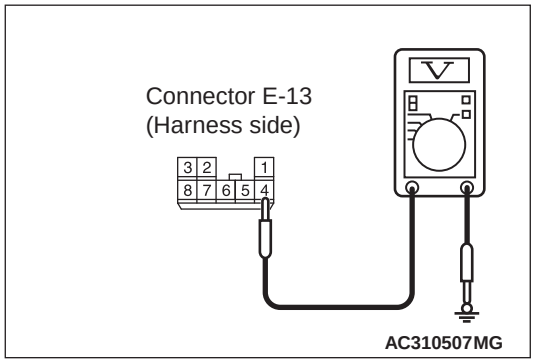
Prior to the wiring harness inspection, check intermediate connector D-14, and repair if necessary.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness.

STEP 4. Voltage measurement at the E-13 rear power window sub switch (LH) connector.



(1) Disconnect the connector, and measure at the wiring harness side.
(2) Ignition switch: ON position

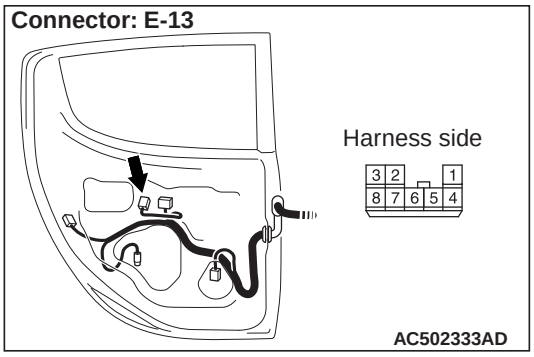


(3) Measure the voltage between the E-13 rear power window sub switch (LH) connector terminal No. 4 and the body earth.

OK: System voltage

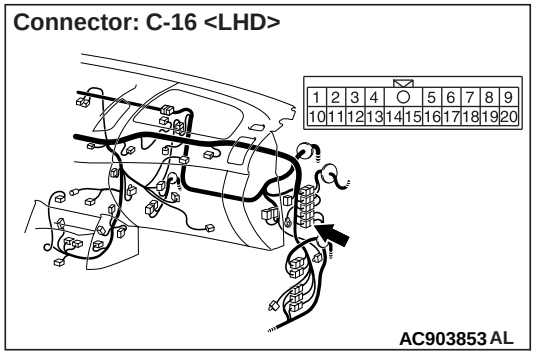
Q: Is the check result normal?
YES : Go to Step 6.
NO : Go to Step 5.

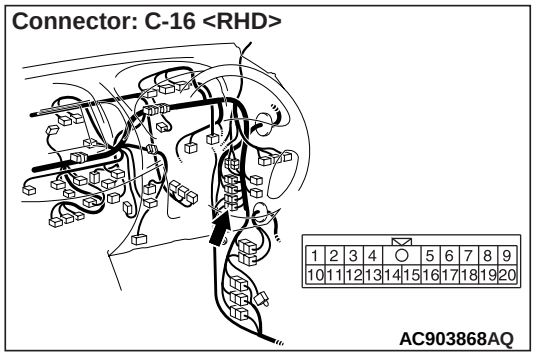
STEP 5. Check the wiring harness between E-13 rear power window sub switch (LH) connector terminal No. 4 and the power window relay

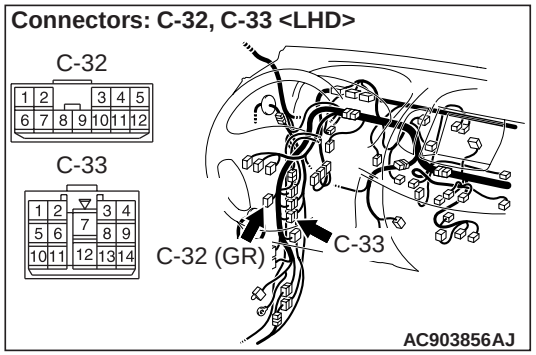


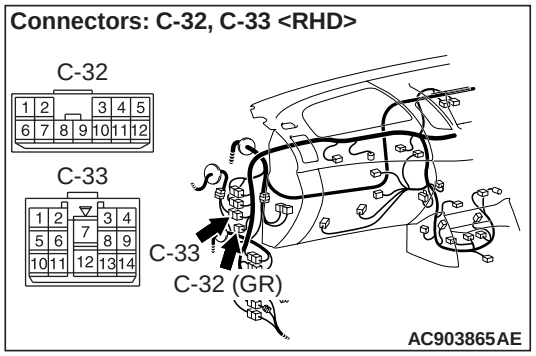
Check the power supply line for open circuit and short circuit.

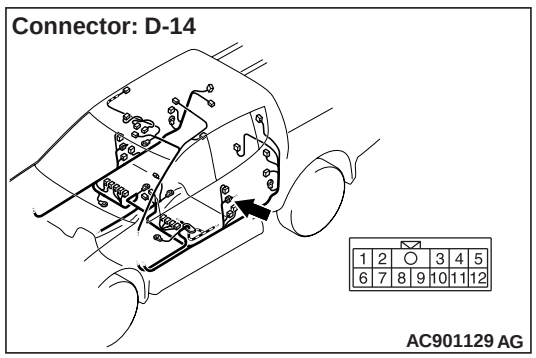
NOTE:











Prior to the wiring harness inspection, check interme-

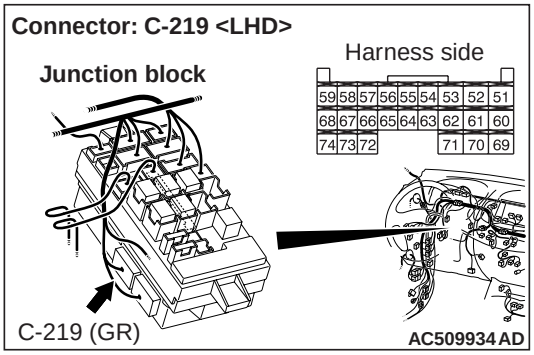
diate connectors C-16, C-33, D-14 and joint connector C-32, and repair if necessary.

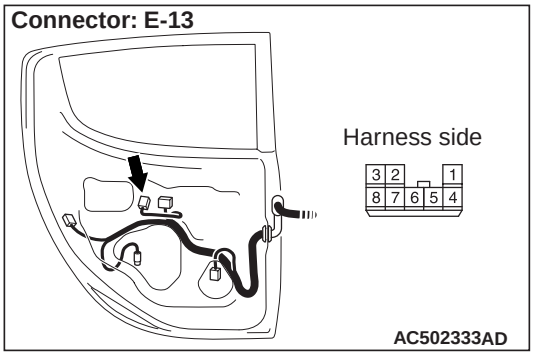
Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

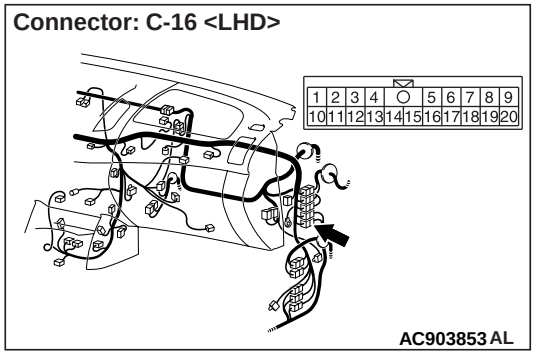
NO : Repair the wiring harness.

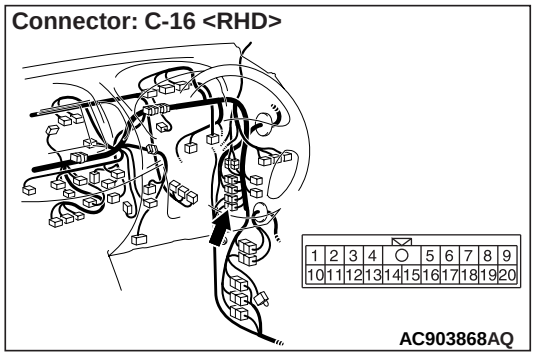
STEP 6. Check the wiring harness between C-219 ETACS-ECU connector terminal No.54 and E-13 rear power window sub switch (LH) connector terminal No.6.

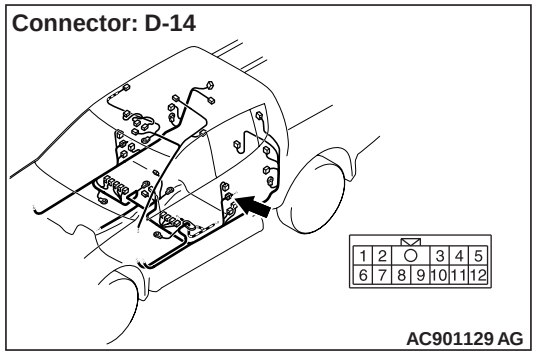




NOTE:







Prior to the wiring harness inspection, check intermediate connectors C-16 and D-14, and repair if necessary.

- Check the communication line for open circuit.

Q: Is the check result normal?
YES : Go to Step 7.
NO : Repair the wiring harness.

STEP 7. Check whether the diagnosis code is reset.

Check again if the diagnosis code is set to the ETACS-ECU.
(1) Erase the diagnosis code.
(2) Turn the ignition switch from "LOCK" (OFF) position to "ON" position.
(3) On completion, check that the diagnosis code is reset.

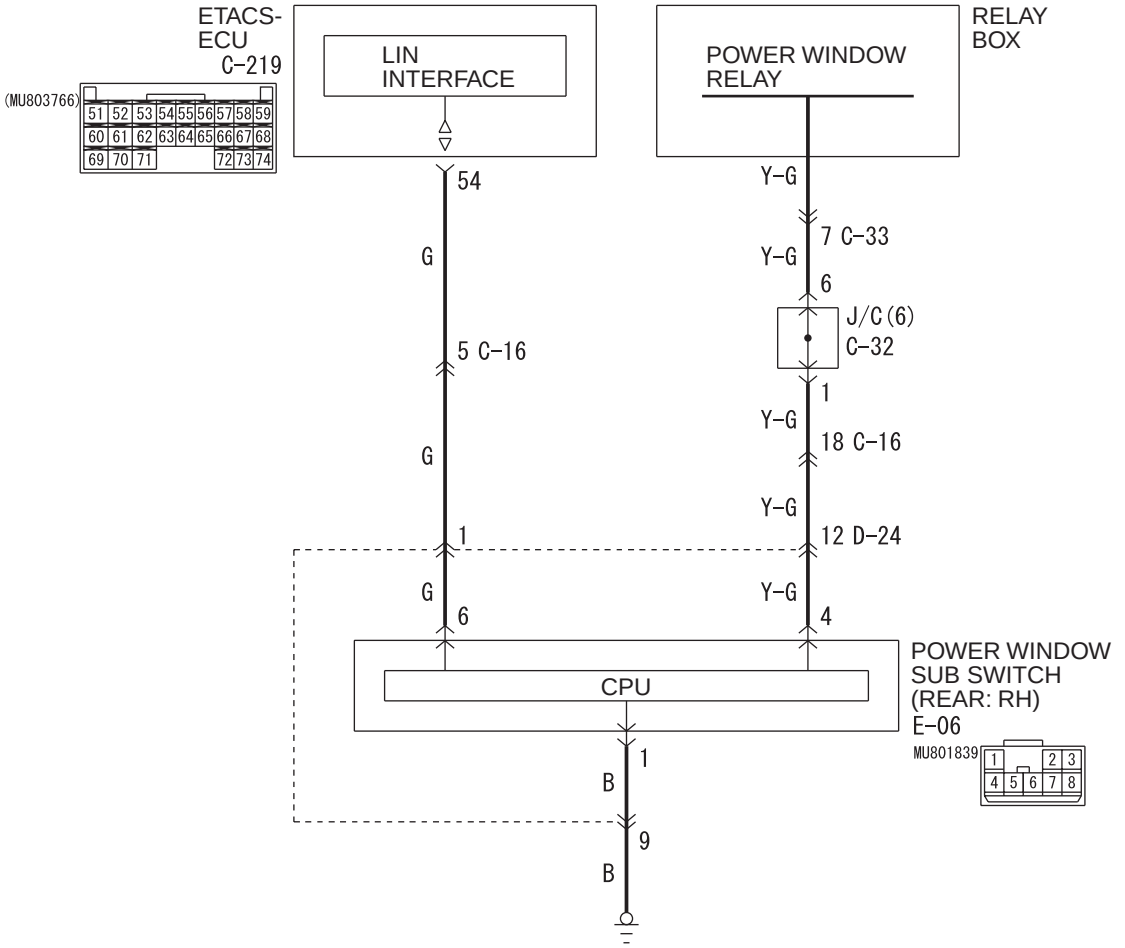
Q: Is the diagnosis code set?

YES : Replace the rear power window sub switch (LH).

NO : A poor connection, open circuit or other intermittent malfunction is present in the LIN bus lines between the rear power window sub switch (LH) and the ETACS-ECU (Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

Code No.U1511: Power window sub switch (RR) time-out

Rear Power Window Sub Switch (RH) LIN Communication Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

WAC54E005A

TROUBLE JUDGEMENT

The ETACS-ECU receives signal from the rear power window sub switch (RH). If signal cannot be received at all, diagnosis code No.U1511 will be set.

COMMENT ON TROUBLE SYMPTOM

The M.U.T.-III shows a diagnosis code status as active.

- Connector(s) or wiring harness in the LIN bus lines between the rear power window sub switch (RH) and the ETACS-ECU, the power supply system of the rear power window sub switch (RH), or the rear power window sub switch (RH) itself may be defective.

The M.U.T.-III shows a diagnosis code status as stored.

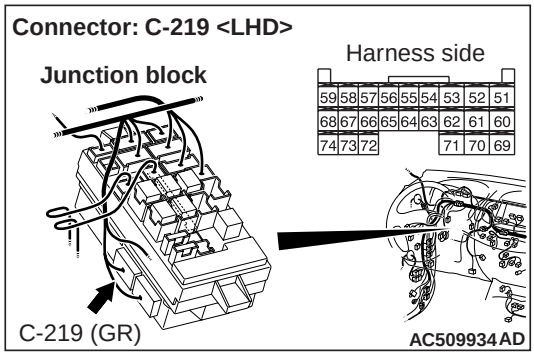
- If diagnosis code No.U1511 is stored as a past trouble, carry out diagnosis with particular emphasis on wiring and connector(s) in the LIN bus line between the rear power window sub switch (RH) and the ETACS-ECU, and the power supply system of the rear power window sub switch (RH). For diagnosis procedures, refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Treat Past Trouble .

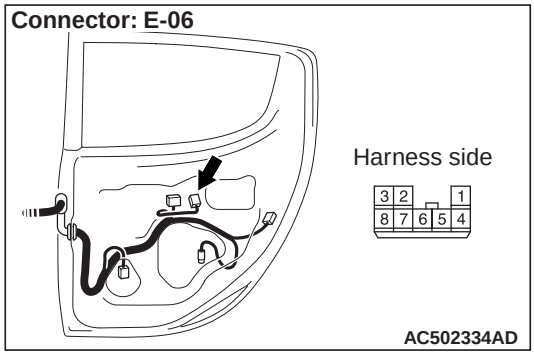
PROBABLE CAUSES

- Malfunction of the rear power window sub switch (RH)
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

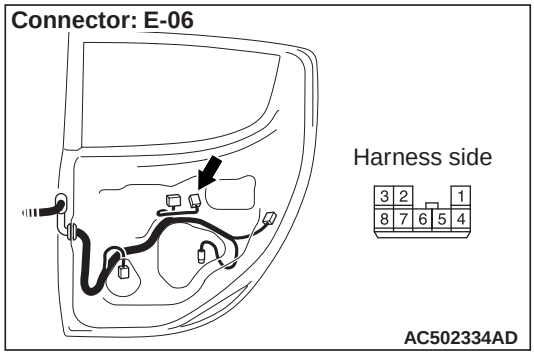
STEP 1. Connector check: C-219 ETACS-ECU connector, E-06 rear power window sub switch (RH) connector





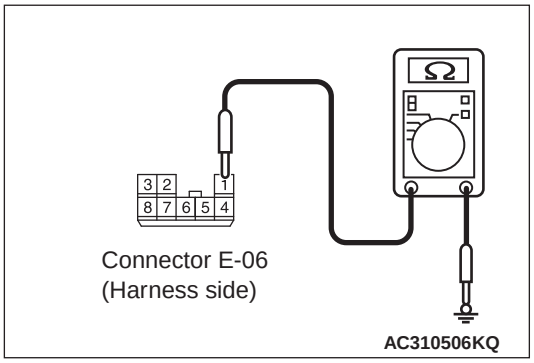
Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the defective connector.

STEP 2. Resistance measurement at the E-06 rear power window sub switch (RH) connector



(1) Disconnect the connector, and measure at the

wiring harness side.

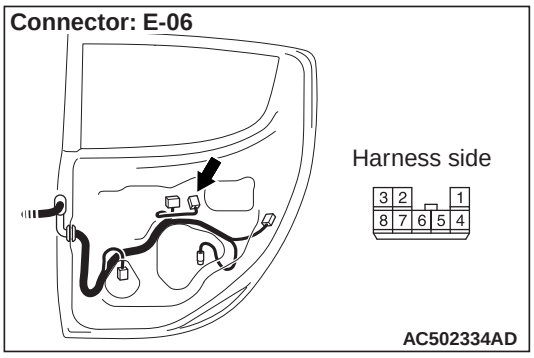


(2) Measure the resistance between the E-06 rear power window sub switch (RH) connector terminal No. 1 and the body earth.

OK: Continuity exists (2 Ω or less)

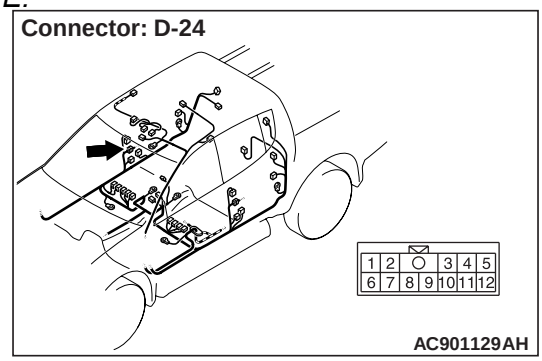
Q: Is the check result normal?
YES : Go to Step 4.
NO : Go to Step 3.

STEP 3. Check the wiring harness between E-06 rear power window sub switch (RH) connector terminal No. 1 to body earth



Check the earth wires for open circuit.

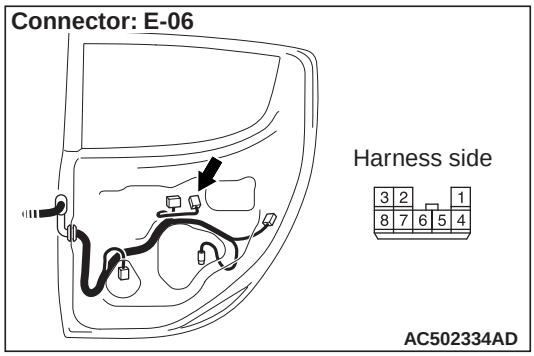
NOTE:



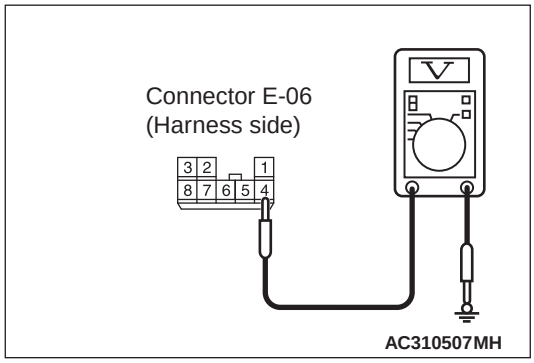
Prior to the wiring harness inspection, check intermediate connector D-24, and repair if necessary.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness.

STEP 4. Voltage measurement at the E-06 rear power window sub switch (RH) connector.



(1) Disconnect the connector, and measure at the wiring harness side.
(2) Ignition switch: ON position

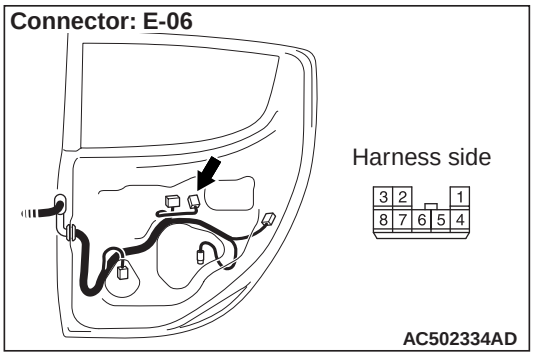


(3) Measure the voltage between the E-06 rear power window sub switch (RH) connector terminal No. 4 and the body earth.

OK: System voltage

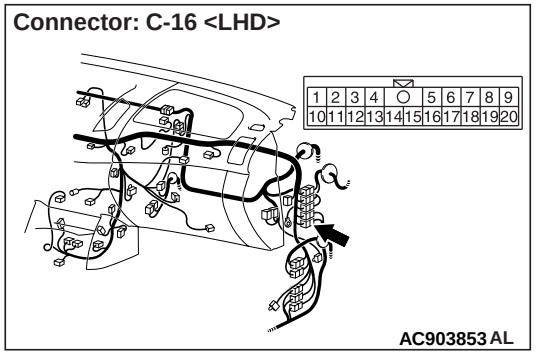
Q: Is the check result normal?
YES : Go to Step 6.
NO : Go to Step 5.

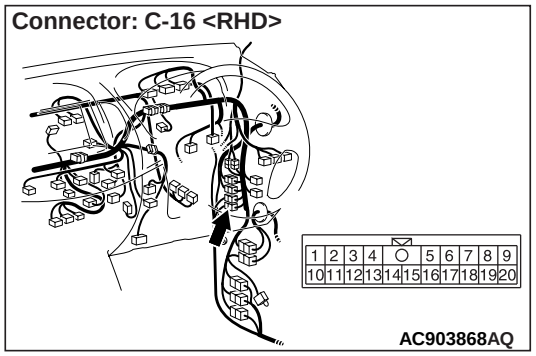
STEP 5. Check the wiring harness between E-06 rear power window sub switch (RH) connector terminal No. 4 and the power window relay

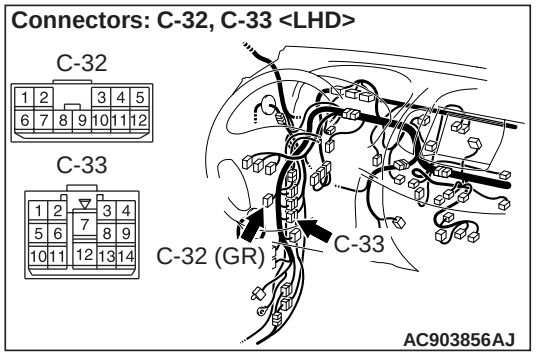


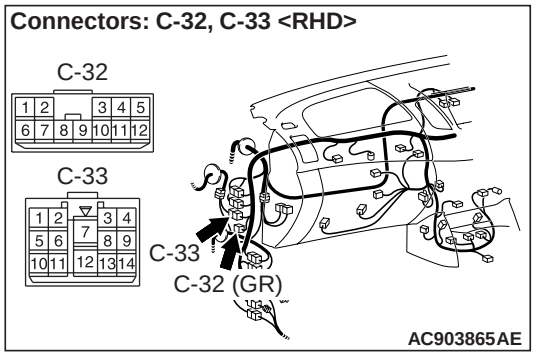
Check the power supply line for open circuit and short circuit.

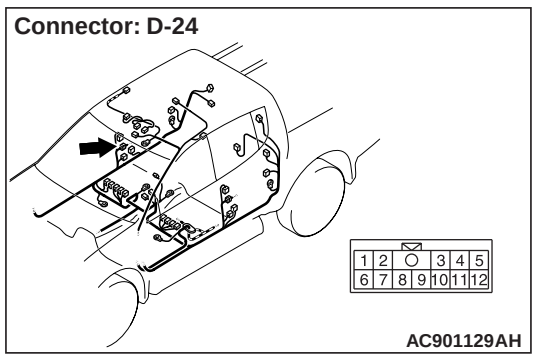
NOTE:











Prior to the wiring harness inspection, check interme-

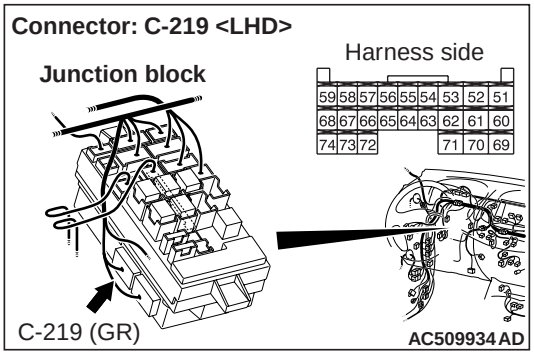
diate connectors C-16, C-33, D-24 and joint connector C-32, and repair if necessary.

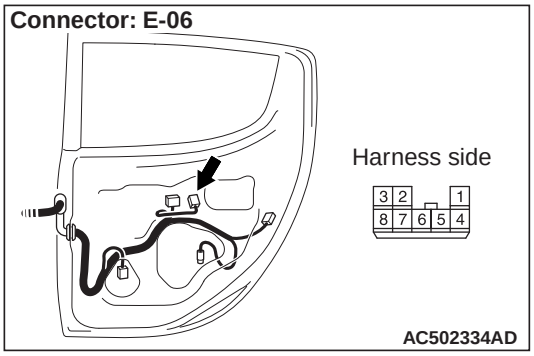
Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

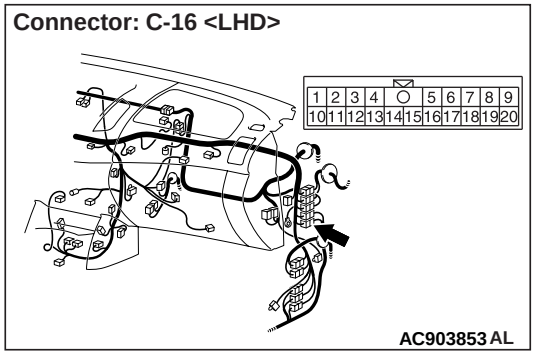
NO : Repair the wiring harness.

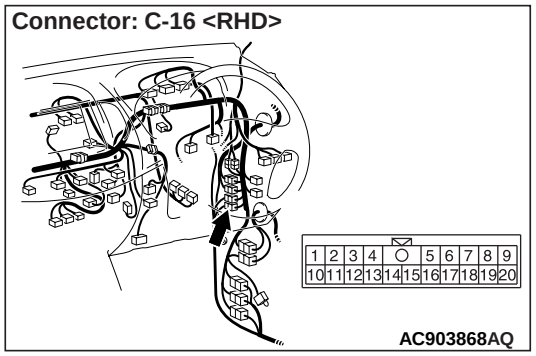
STEP 6. Check the wiring harness between C-219 ETACS-ECU connector terminal No.54 and E-06 rear power window sub switch (RH) connector terminal No.6.

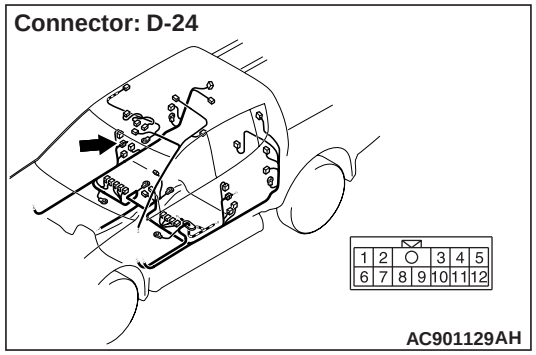




NOTE:







Prior to the wiring harness inspection, check intermediate connectors C-16 and D-24, and repair if necessary.

- Check the communication line for open circuit.

Q: Is the check result normal?
YES : Go to Step 7.
NO : Repair the wiring harness.

STEP 7. Check whether the diagnosis code is reset.

Check again if the diagnosis code is set to the ETACS-ECU.
(1) Erase the diagnosis code.
(2) Turn the ignition switch from "LOCK" (OFF) position to "ON" position.
(3) On completion, check that the diagnosis code is reset.

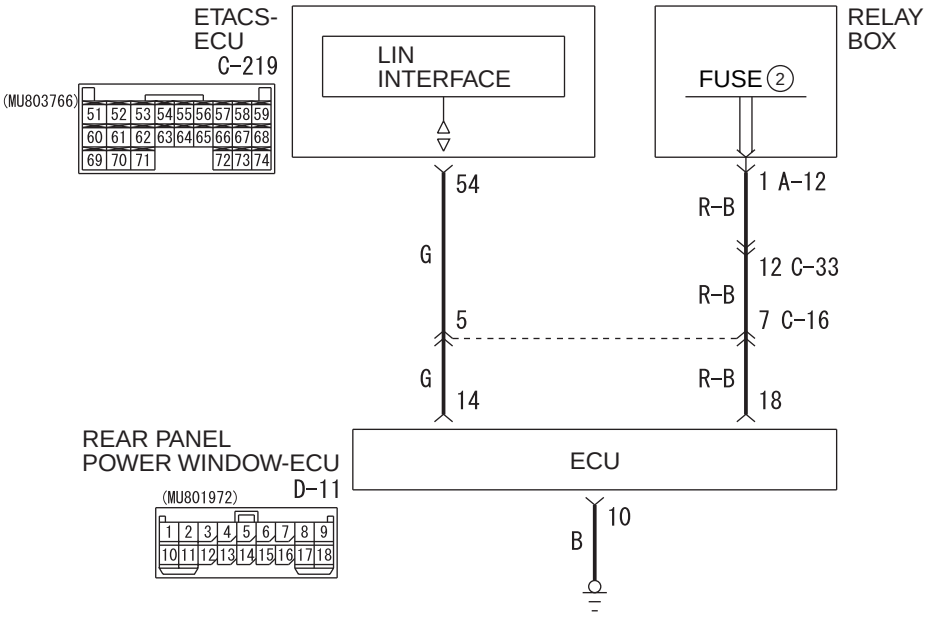
Q: Is the diagnosis code set?

YES : Replace the rear power window sub switch (RH).

NO : A poor connection, open circuit or other intermittent malfunction is present in the LIN bus lines between the rear power window sub switch (RH) and the ETACS-ECU (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions).

Code No.U1512: Rear panel power window-ECU time-out

Rear Panel Power Window LIN Communication Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

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TROUBLE JUDGEMENT

The ETACS-ECU receives signal from the rear panel power window-ECU. If signal cannot be received at all, diagnosis code No.U1512 will be set.

COMMENT ON TROUBLE SYMPTOM

The M.U.T.-III shows a diagnosis code status as active.

- Connector(s) or wiring harness in the LIN bus lines between the rear panel power window-ECU and the ETACS-ECU, the power supply system of the rear panel power window-ECU, or the rear panel power window-ECU itself may be defective.

The M.U.T.-III shows a diagnosis code status as stored.

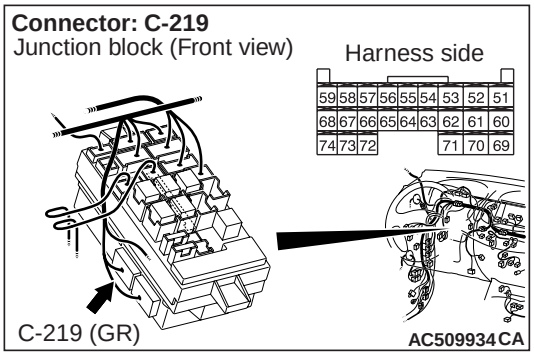
- If diagnosis code No.U1512 is stored as a past trouble, carry out diagnosis with particular emphasis on wiring and connector(s) in the LIN bus line between the rear panel power window-ECU and the ETACS-ECU, and the power supply system of the rear panel power window-ECU. For diagnosis procedures, refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Treat Past Trouble .

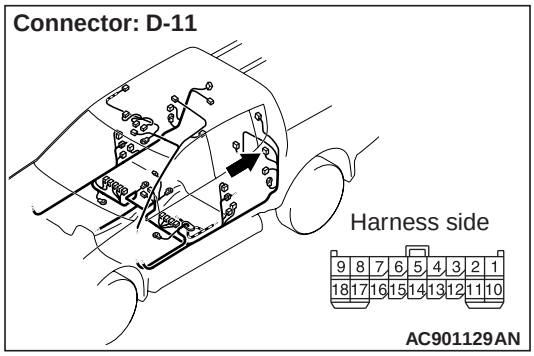
PROBABLE CAUSES

- Malfunction of the rear panel power window-ECU
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

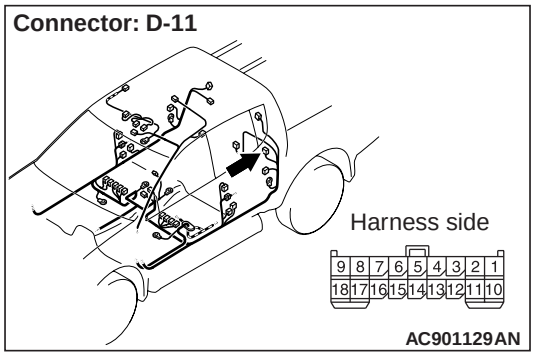
STEP 1. Connector check: C-219 ETACS-ECU connector, D-11 rear panel power window-ECU connector



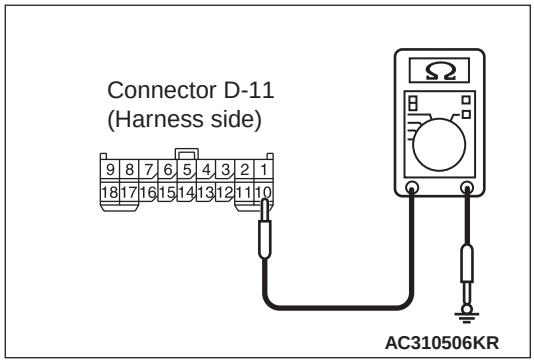


Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the defective connector.

STEP 2. Resistance measurement at the D-11 rear panel power window-ECU connector



(1) Disconnect the connector, and measure at the wiring harness side.

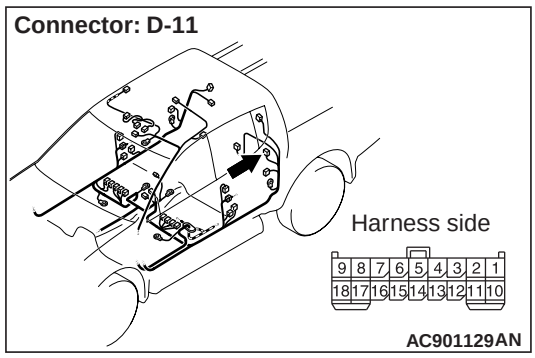


(2) Measure the resistance between the D-11 rear panel power window-ECU connector terminal No. 10 and the body earth.

OK: Continuity exists (2 Ω or less)

Q: Is the check result normal?
YES : Go to Step 4.
NO : Go to Step 3.

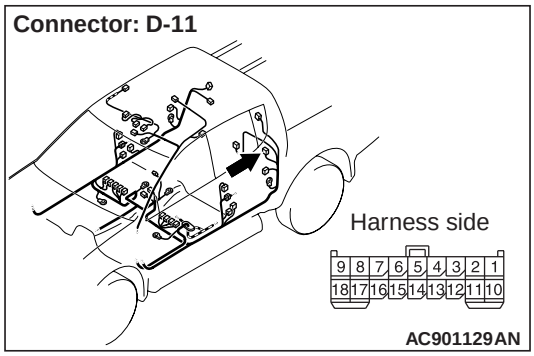
STEP 3. Check the wiring harness between D-11 rear panel power window-ECU connector terminal No. 10 to body earth



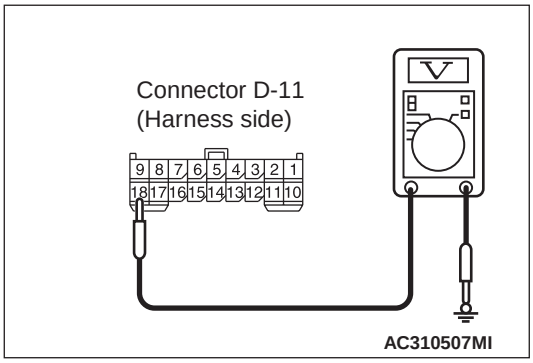
Check the earth wires for open circuit.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness.

STEP 4. Voltage measurement at the D-11 rear panel power window-ECU connector.



(1) Disconnect the connector, and measure at the wiring harness side.

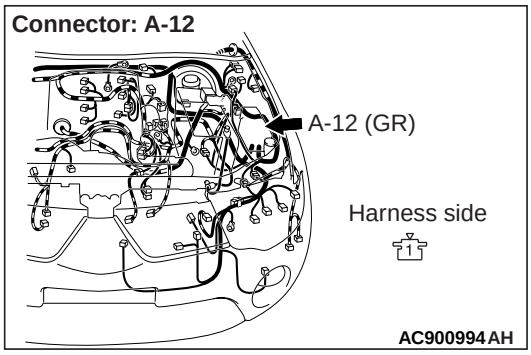


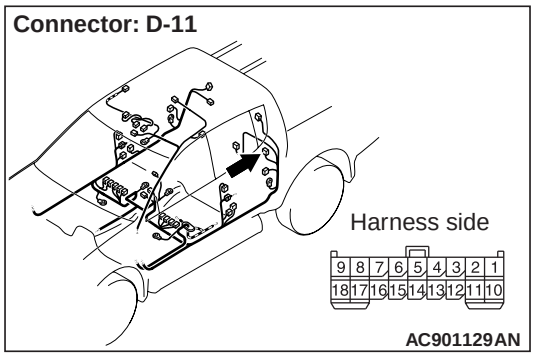
(2) Measure the voltage between the D-11 rear panel power window-ECU connector terminal No. 18 and the body earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 6.
NO : Go to Step 5.

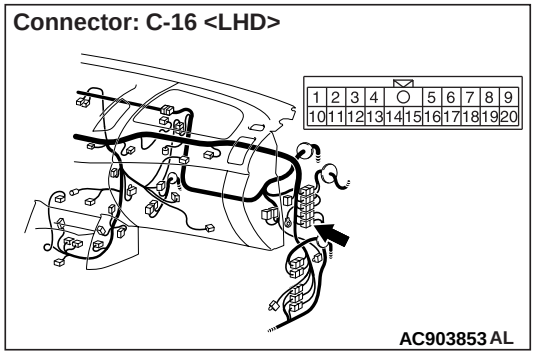
STEP 5. Check the wiring harness between D-11 rear panel power window-ECU connector terminal No. 18 and the A-12 relay box connector terminal No. 1

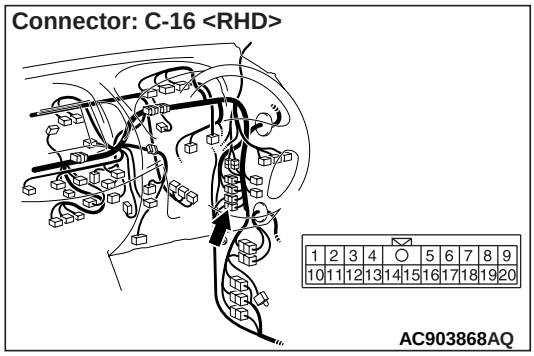


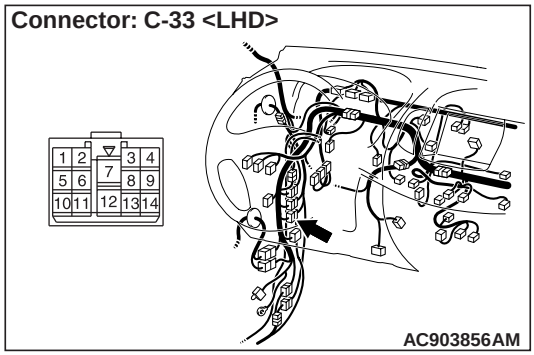


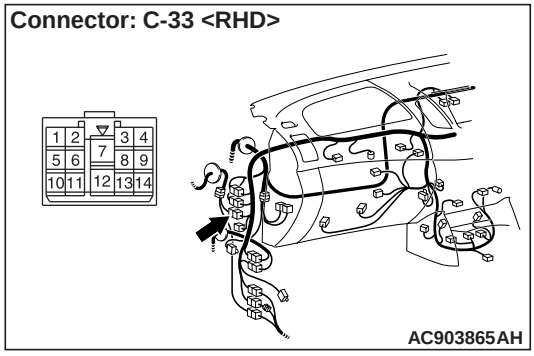
Check the power supply line for open circuit and short circuit.

NOTE:









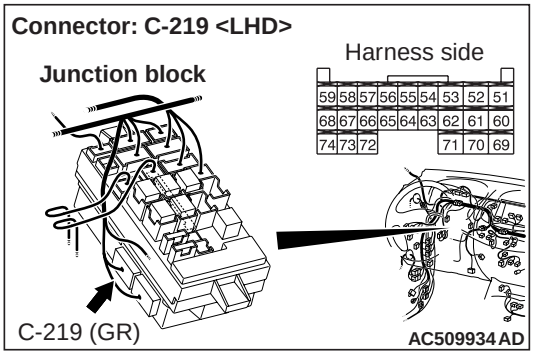
Prior to the wiring harness inspection, check intermediate connectors C-16 and C-33, and repair if necessary.

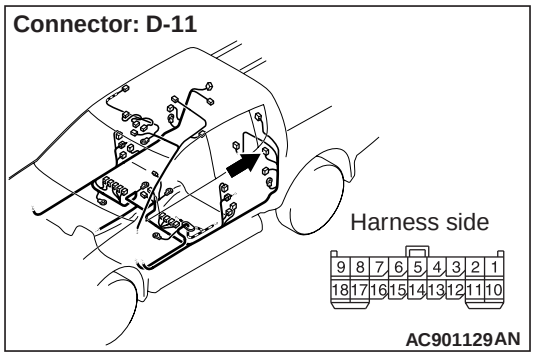
Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

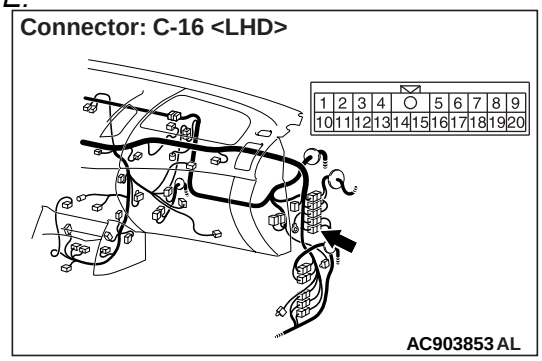
NO : Repair the wiring harness.

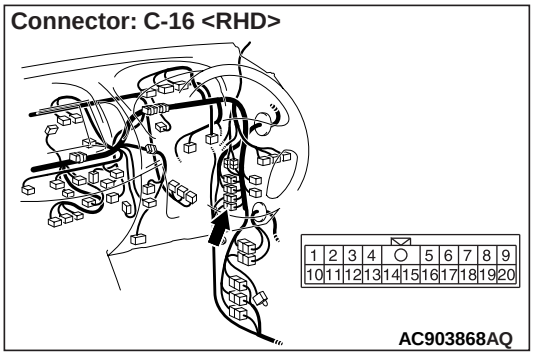
STEP 6. Check the wiring harness between C-219 ETACS-ECU connector terminal No.54 and D-11 rear panel power window-ECU connector terminal No.14.





NOTE:





Prior to the wiring harness inspection, check intermediate connector C-16, and repair if necessary.

- Check the communication line for open circuit.

Q: Is the check result normal?

YES : Go to Step 7.
NO : Repair the wiring harness.

STEP 7. Check whether the diagnosis code is reset.

Check again if the diagnosis code is set to the ETACS-ECU.
(1) Erase the diagnosis code.
(2) Turn the ignition switch from "LOCK" (OFF) position to "ON" position.
(3) On completion, check that the diagnosis code is reset.

Q: Is the diagnosis code set?

YES : Replace the rear panel power window-ECU.
NO : A poor connection, open circuit or other intermittent malfunction is present in the LIN bus lines between the rear panel power window-ECU and the ETACS-ECU (Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

Code No.U1530: Column-ECU checksum error

COMMENTS ON TROUBLE SYMPTOM
If any abnormality is found with the column-ECU, the ETACS-ECU stores the diagnosis code No.U1530.

PROBABLE CAUSES
- Malfunction of the lighting switch

DIAGNOSIS PROCEDURE

Check whether the diagnosis code is reset.
Check again if the diagnosis code is set to the ETACS-ECU.
(1) Erase the diagnosis code.
(2) Turn the ignition switch from "LOCK" (OFF) position to "ON" position.
(3) On completion, check that the diagnosis code is reset.

Q: Is the diagnosis code set?
YES : Replace the lighting switch.
NO : A poor connection, open circuit or other intermittent malfunction is present in the LIN bus lines between the column switch and the ETACS-ECU (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions).

Code No.U1532: LIN comm. lighting control sensor <Vehicles with auto lamp>

NOTE: When the diagnosis codes relating to the LIN communication error are set, make sure of the vehicle equipment. When the vehicle is not equipped with the system the ETACS-ECU communicates to, the diagnosis code is always set. This is not abnormal.

COMMENTS ON TROUBLE SYMPTOM
If any abnormality is found with the lighting control sensor, the ETACS-ECU stores the diagnosis code No.U1532.

PROBABLE CAUSES
- Malfunction of the lighting control sensor

DIAGNOSIS PROCEDURE

Check whether the diagnosis code is reset.
Check again if the diagnosis code is set to the ETACS-ECU.
(1) Erase the diagnosis code.
(2) Turn the ignition switch from "LOCK" (OFF) position to "ON" position.
(3) Check if diagnosis code is set.

Q: Is the diagnosis code set?
YES : Replace the lighting control sensor.
NO : A poor connection, open circuit or other intermittent malfunction is present in the LIN bus lines between the lighting control sensor and the ETACS-ECU (Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunction).

Code No.U1534: Power window main switch checksum error

COMMENTS ON TROUBLE SYMPTOM
If any abnormality is found with the power window main switch, the ETACS-ECU stores the diagnosis code No.U1534.

PROBABLE CAUSES
- Malfunction of the power window main switch

DIAGNOSIS PROCEDURE

Check whether the diagnosis code is reset.
Check again if the diagnosis code is set to the ETACS-ECU.
(1) Erase the diagnosis code.
(2) Turn the ignition switch from "LOCK" (OFF) position to "ON" position.
(3) On completion, check that the diagnosis code is

reset.

Q: Is the diagnosis code set?

YES : Replace the power window main switch.
NO : A poor connection, open circuit or other intermittent malfunction is present in the LIN bus lines between the power window main switch and the ETACS-ECU (Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

Code No.U1535: Power window sub switch (AS) checksum error

COMMENTS ON TROUBLE SYMPTOM
If any abnormality is found with the front power window sub switch, the ETACS-ECU stores the diagnosis code No.U1535.

PROBABLE CAUSES
- Malfunction of the front power window sub switch

DIAGNOSIS PROCEDURE

Check whether the diagnosis code is reset.
Check again if the diagnosis code is set to the ETACS-ECU.
(1) Erase the diagnosis code.
(2) Turn the ignition switch from "LOCK" (OFF) position to "ON" position.
(3) On completion, check that the diagnosis code is reset.

Q: Is the diagnosis code set?
YES : Replace the front power window sub switch.
NO : A poor connection, open circuit or other intermittent malfunction is present in the LIN bus lines between the front power window sub switch and the ETACS-ECU (Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

Code No.U1536: Power window sub switch (RL) checksum error

COMMENTS ON TROUBLE SYMPTOM
If any abnormality is found with the rear power window sub switch (LH), the ETACS-ECU stores the diagnosis code No.U1536.

PROBABLE CAUSES
- Malfunction of the rear power window sub switch (LH)

DIAGNOSIS PROCEDURE

Check whether the diagnosis code is reset.
Check again if the diagnosis code is set to the ETACS-ECU.
(1) Erase the diagnosis code.
(2) Turn the ignition switch from "LOCK" (OFF) position to "ON" position.
(3) On completion, check that the diagnosis code is reset.

Q: Is the diagnosis code set?
YES : Replace the rear power window sub switch (LH).
NO : A poor connection, open circuit or other intermittent malfunction is present in the LIN bus lines between the rear power window sub switch (LH) and the ETACS-ECU (Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

Code No.U1537: Power window sub switch (RR) checksum error

COMMENTS ON TROUBLE SYMPTOM
If any abnormality is found with the rear power window sub switch (RH), the ETACS-ECU stores the diagnosis code No.U1537.

PROBABLE CAUSES

- Malfunction of the rear power window sub switch (RH)

DIAGNOSIS PROCEDURE

Check whether the diagnosis code is reset.

Check again if the diagnosis code is set to the ETACS-ECU.

(1) Erase the diagnosis code.
(2) Turn the ignition switch from "LOCK" (OFF) position to "ON" position.
(3) On completion, check that the diagnosis code is reset.

Q: Is the diagnosis code set?

YES : Replace the rear power window sub switch (RH).

NO : A poor connection, open circuit or other intermittent malfunction is present in the LIN bus lines between the rear power window sub switch (RH) and the ETACS-ECU (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions).

Code No.U1538: Rear panel power window-ECU checksum error

COMMENTS ON TROUBLE SYMPTOM

If any abnormality is found with the rear panel power window-ECU, the ETACS-ECU stores the diagnosis code No.U1538.

PROBABLE CAUSES

- Malfunction of the rear panel power window-ECU

DIAGNOSIS PROCEDURE

Check whether the diagnosis code is reset.

Check again if the diagnosis code is set to the ETACS-ECU.

(1) Erase the diagnosis code.
(2) Turn the ignition switch from "LOCK" (OFF) position to "ON" position.
(3) On completion, check that the diagnosis code is reset.

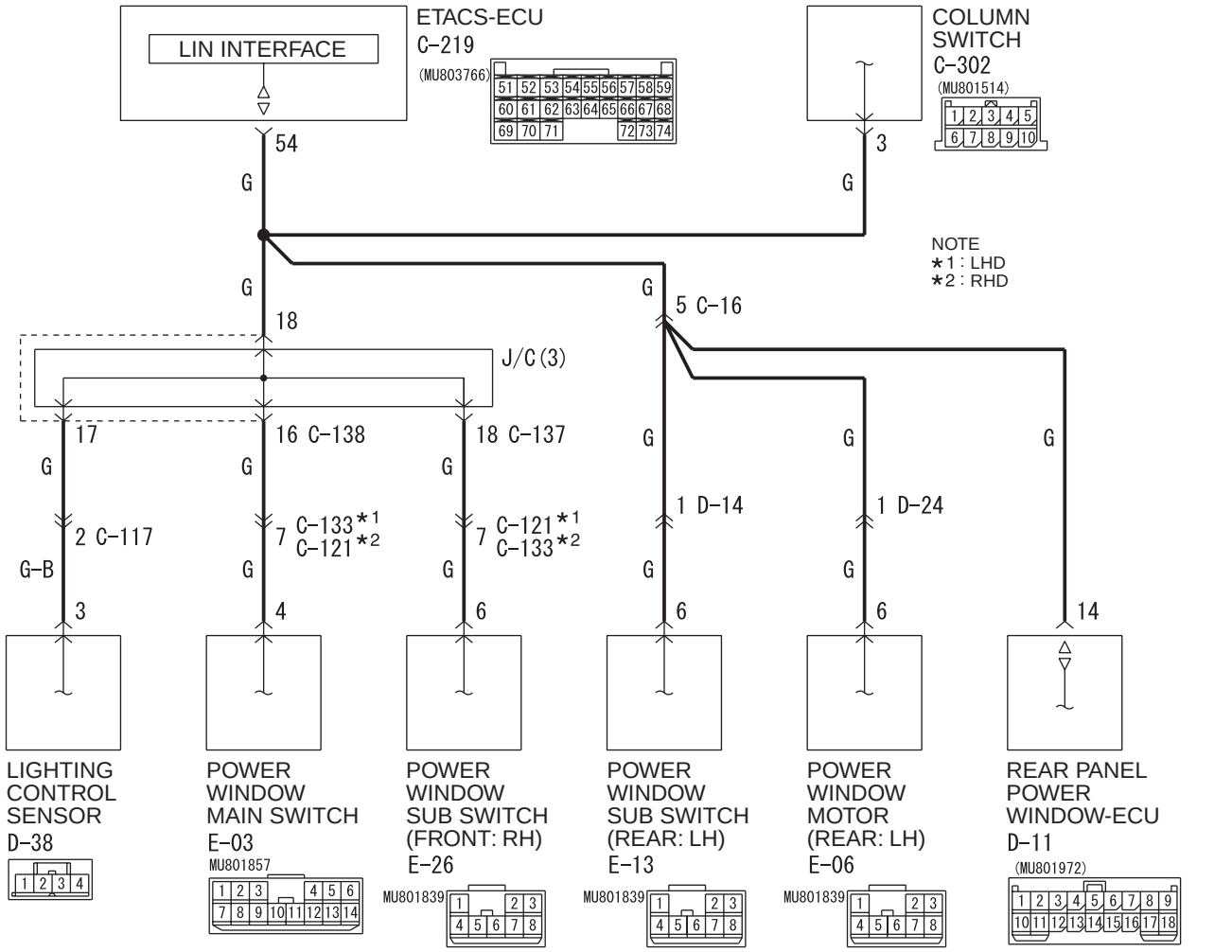
Q: Is the diagnosis code set?

YES : Replace the rear panel power window-ECU.

NO : A poor connection, open circuit or other intermittent malfunction is present in the LIN bus lines between the rear panel power window-ECU and the ETACS-ECU (Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunctions).

Code No.U1570 No bus activity error for LIN

LIN Communication Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver WAC54E063A

TROUBLE JUDGEMENT

The ETACS-ECU will set diagnosis code No. U1570 when no communication has been carried out for more than a certain period after the slave task received last valid data.

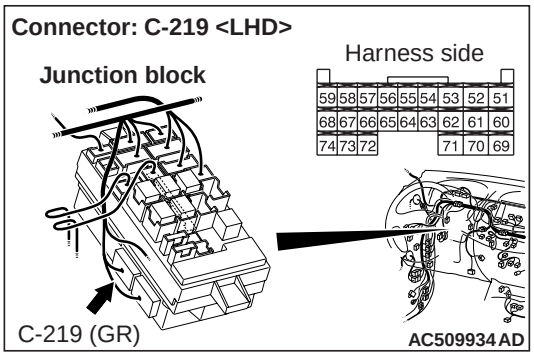
PROBABLE CAUSES

- Malfunction of the ETACS-ECU
- Malfunction of the slave ECU
- LIN bus lines shorted to power supply
- LIN bus lines shorted to earth

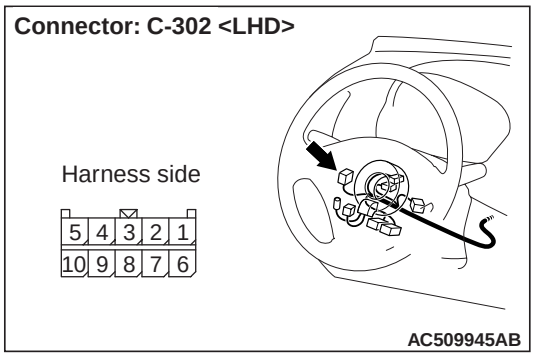
DIAGNOSIS PROCEDURE

STEP 1. Check the following connectors.

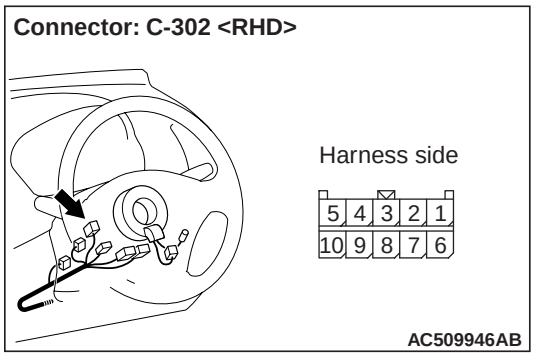
Connector: C-219 <LHD>



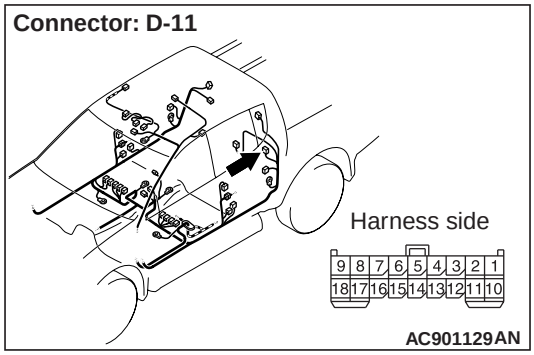
Connector: C-302 <LHD>



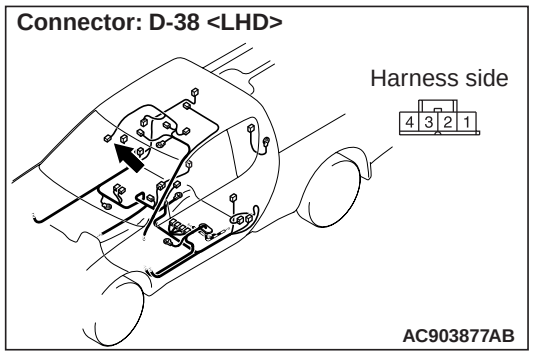
Connector: C-302 <RHD>



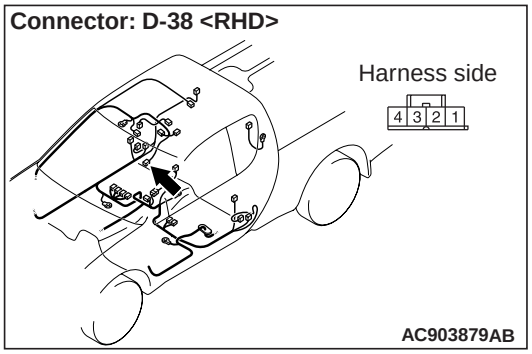
Connector: D-11



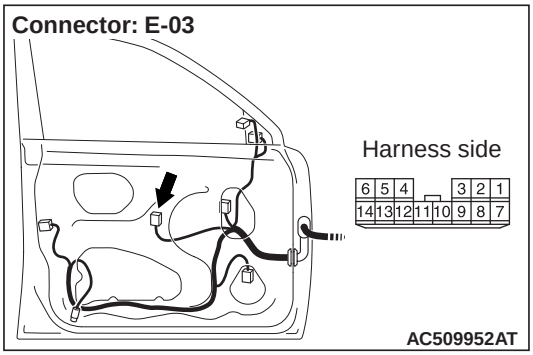
Connector: D-38 <LHD>



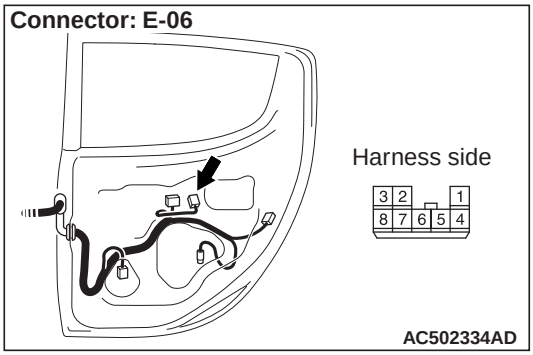
Connector: D-38 <RHD>



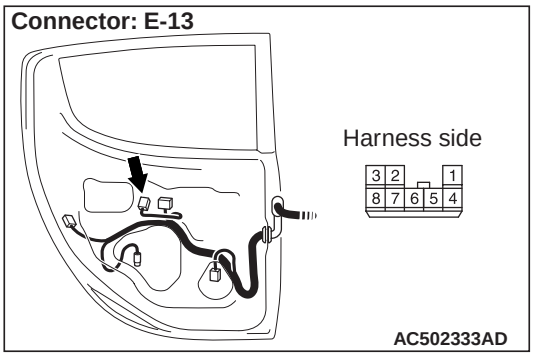
Connector: E-03



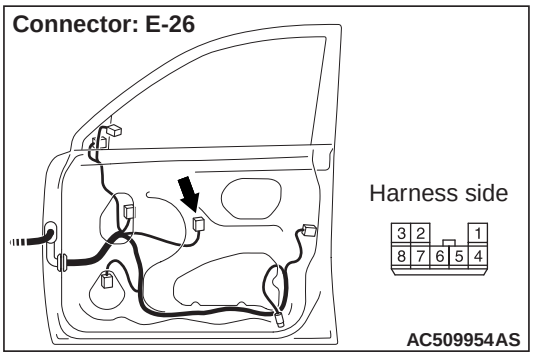
Connector: E-06



Connector: E-13



Connector: E-26



Check the following connectors:
- C-219 ETACS-ECU connector
- C-302 column switch connector
- D-38 lighting control sensor connector
- E-03 power window main switch connector
- E-26 front power window sub switch connector
- E-13 rear power window sub switch (LH) connector
- E-06 rear power window sub switch (RH) connector
- D-11 rear panel power window-ECU connector

Q: Are all the connectors in good condition?
YES : Go to Step 2.
NO : Repair the defective connector.

STEP 2. Measure the voltage at the LIN bus lines.
Check the LIN bus lines for short to power supply.
(1) Disconnect all the ECU connectors which are connected to the LIN bus lines.
(2) Turn the ignition switch from "LOCK" (OFF) to "ON" position.
(3) Measure the voltage between C-302 column switch connector terminal No.3 and earth.
- The voltmeter needle does not swing.

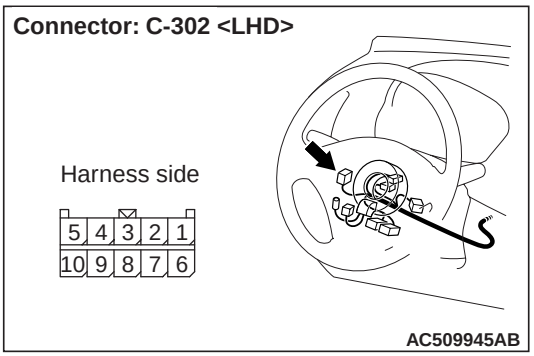
NOTE: If the LIN bus lines are short to power supply, the voltmeter indicates a constant value.

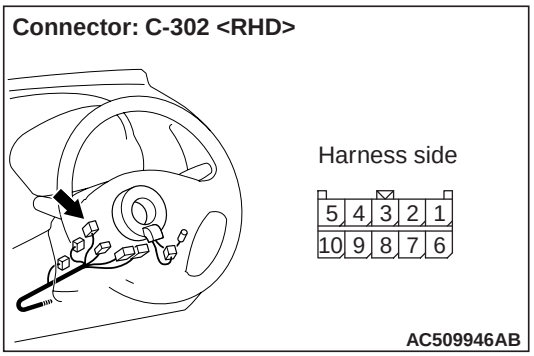
Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the wiring harness.

STEP 3. Measure the resistance at the LIN bus lines.
Check the LIN bus lines for short to earth.
(1) Disconnect all the ECU connectors which are connected to the LIN bus lines.
(2) Measure the resistance value between C-302 column switch connector terminal No.3 and earth.
- No continuity (1 kΩ or more)

Q: Is the check result normal?
YES : Go to Step 4.
NO : Repair the wiring harness.

STEP 4. Check the column switch.





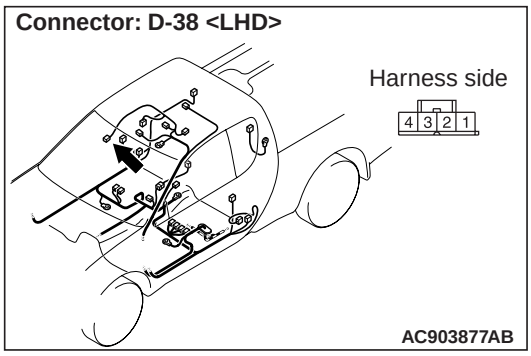
Disconnect C-302 column switch connector, and recheck whether diagnosis code No. U1570 is set.
(1) Connect all the relevant ECUs, and disconnect C-302 column switch connector only.
(2) Erase the diagnosis code.
(3) Turn the ignition switch from "LOCK" (OFF) to "ON" position.
(4) Check whether diagnosis code No. U1570 is set.

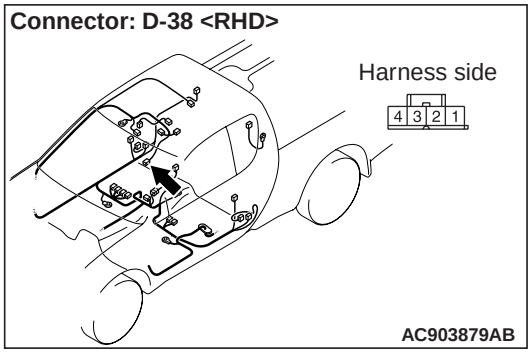
NOTE: If diagnosis code No. U1570 is not set, diagnosis code No. U1500 is set because the column switch is disconnected. This is normal.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is diagnosis code No. U1570 set?
YES : Reconnect the column switch connector, and go to Step 5.
NO : Replace the lighting switch.

STEP 5. Check the lighting control sensor.





Disconnect D-38 lighting control sensor connector, and recheck whether diagnosis code No. U1570 is set.

(1) Connect all the relevant ECUs, and disconnect D-38 lighting control sensor connector only.
(2) Erase the diagnosis code.
(3) Turn the ignition switch from "LOCK" (OFF) to "ON" position.
(4) Check whether diagnosis code No. U1570 is set.

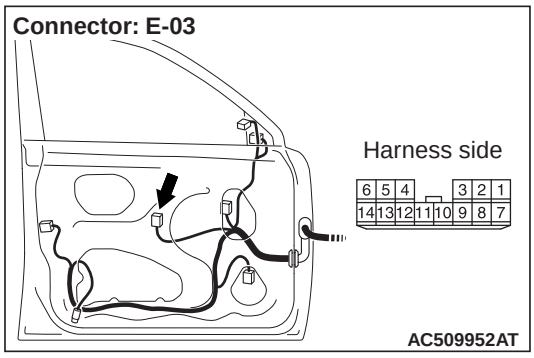
NOTE: If diagnosis code No. U1570 is not set, diagnosis code No. U1504 is set because the lighting control sensor is disconnected. This is normal.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is diagnosis code No. U1570 set?

YES : Reconnect the lighting control sensor connector, and go to Step 6.
NO : Replace the lighting control sensor.

STEP 6. Check the power window main switch.



Disconnect E-03 power window main switch connector, and recheck whether diagnosis code No. U1570 is set.

(1) Connect all the relevant ECUs, and disconnect E-03 power window main switch connector only.
(2) Erase the diagnosis code.
(3) Turn the ignition switch from "LOCK" (OFF) to "ON" position.
(4) Check whether diagnosis code No. U1570 is set.

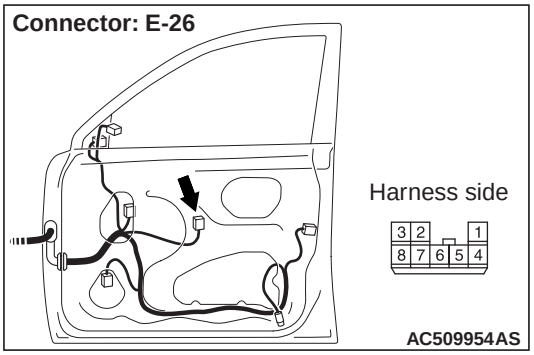
NOTE: If diagnosis code No. U1570 is not set, diagnosis code No. U1508 is set because the power window main switch is disconnected. This is normal.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is diagnosis code No. U1570 set?

YES : Reconnect the power window main switch connector, and go to Step 7.
NO : Replace the power window main switch.

STEP 7. Check the front power window sub switch.



Disconnect E-26 front power window sub switch connector, and recheck whether diagnosis code No. U1570 is set.

(1) Connect all the relevant ECUs, and disconnect E-26 front power window sub switch connector only.
(2) Erase the diagnosis code.
(3) Turn the ignition switch from "LOCK" (OFF) to "ON" position.

(4) Check whether diagnosis code No. U1570 is set.

NOTE: If diagnosis code No. U1570 is not set, diagnosis code No. U1509 is set because the front power window sub switch is disconnected. This is normal.

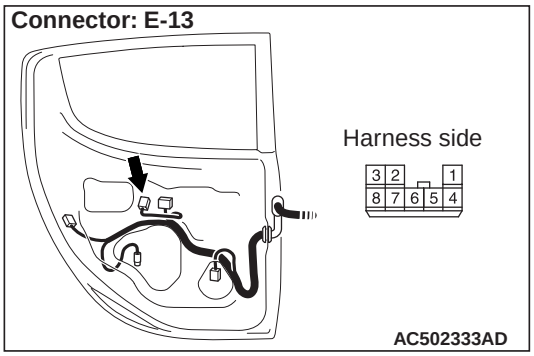
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is diagnosis code No. U1570 set?

YES : Reconnect the front power window sub switch connector, and go to Step 8.

NO : Replace the front power window sub switch.

STEP 8. Check the rear power window sub switch (LH).



Disconnect E-13 rear power window sub switch (LH) connector, and recheck whether diagnosis code No. U1570 is set.

(1) Connect all the relevant ECUs, and disconnect E-13 rear power window sub switch (LH) connector only.

(2) Erase the diagnosis code.

(3) Turn the ignition switch from "LOCK" (OFF) to "ON" position.

(4) Check whether diagnosis code No. U1570 is set.

NOTE: If diagnosis code No. U1570 is not set, diagnosis code No. U1510 is set because the rear power window sub switch (LH) is disconnected. This is normal.

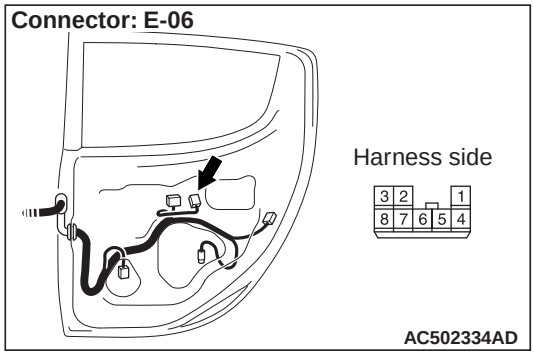
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is diagnosis code No. U1570 set?

YES : Reconnect the rear power window sub switch (LH) connector, and go to Step 9.

NO : Replace the rear power window sub switch (LH).

STEP 9. Check the rear power window sub switch (RH).



Disconnect E-06 rear power window sub switch (RH) connector, and recheck whether diagnosis code No. U1570 is set.

(1) Connect all the relevant ECUs, and disconnect E-06 rear power window sub switch (RH) connector only.

(2) Erase the diagnosis code.

(3) Turn the ignition switch from "LOCK" (OFF) to "ON" position.

(4) Check whether diagnosis code No. U1570 is set.

NOTE: If diagnosis code No. U1570 is not set, diagnosis code No. U1511 is set because the rear power window sub switch (RH) is disconnected. This is normal.

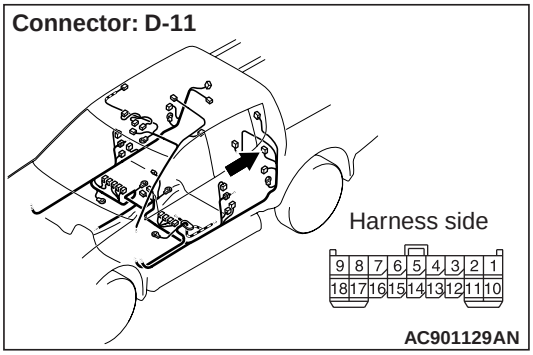
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is diagnosis code No. U1570 set?

YES : Reconnect the rear power window sub switch (RH) connector, and go to Step 10.

NO : Replace the rear power window sub switch (RH).

STEP 10. Check the rear panel power window-ECU.



Disconnect D-11 rear panel power window-ECU connector, and recheck whether diagnosis code No. U1570 is set.

(1) Connect all the relevant ECUs, and disconnect D-11 rear panel power window-ECU connector

only.
(2) Erase the diagnosis code.
(3) Turn the ignition switch from "LOCK" (OFF) to "ON" position.
(4) Check whether diagnosis code No. U1570 is set.

NOTE: If diagnosis code No. U1570 is not set, diagnosis code No. U1512 is set because the rear panel power window-ECU is disconnected. This is normal.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is diagnosis code No. U1570 set?

YES : Reconnect the rear panel power window-ECU connector, and go to Step 11.

NO : Replace the rear panel power window-ECU.

STEP 11. Recheck for diagnosis code.

Check again if the diagnosis code is set to the ETACS-ECU.
(1) Erase the diagnosis code.
(2) Turn the ignition switch from "LOCK" (OFF) to "ON" position.
(3) Check whether diagnosis code No. U1570 is set.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the diagnosis code set?

YES : Replace the ETACS-ECU and register the ID codes (Refer to GROUP 54A, Immobilizer System – On-vehicle service).

NO : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunctions).

GROUP 54C

CONTROLLER AREA NETWORK (CAN)

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CAN COMMUNICATION-RELATED DIAGNOSIS CODE TABLE 54C-142

GENERAL INFORMATION

M1548310001550

CAN, an abbreviation for Controller Area Network, is an ISO-certified international standard for a serial multiplex communication protocol*1. A communication circuit employing the CAN protocol connects each ECU, and sensor data can be shared among, which enables more reduction in wiring.

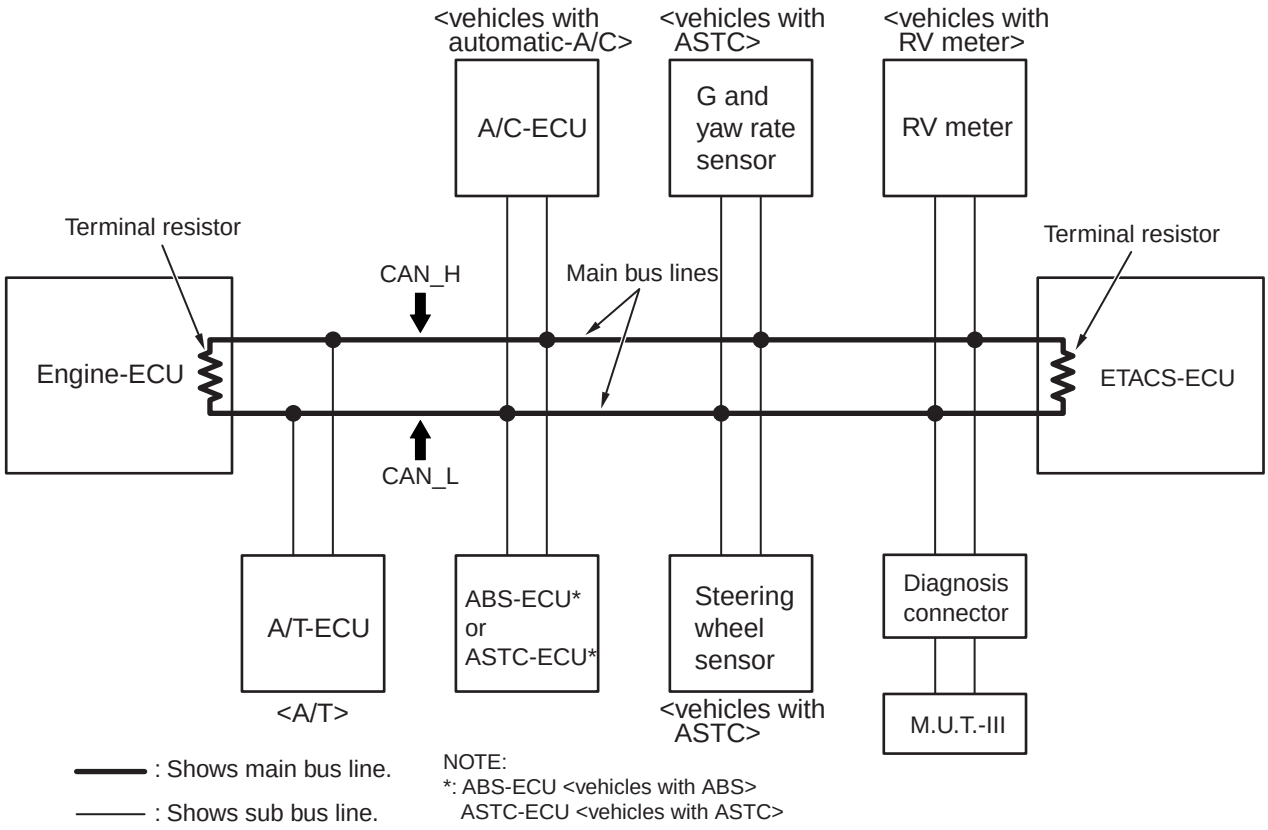
CAN offers the following advantages.

- Transmission rates are much faster than those in conventional communication (up to 1 Mbps*2), allowing much more data to be sent.
- It is exceptionally immune to noise, and the data obtained from each error detection device is more reliable.
- Each ECU connected via the CAN communicates independently, therefore if the ECU enters damaged mode, communications can be continued in some cases.

NOTE:

- **1: The regulations have been decided in detail, from software matters such as the necessary transmission rate for communication, the system, data format, and communication timing control method to hardware matters such as the harness type and length and the resistance values.*
- **2: bps=bit per second*

STRUCTURE



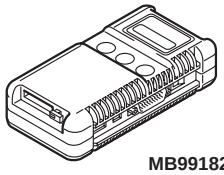
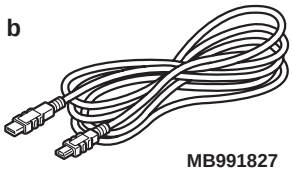
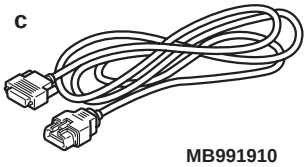
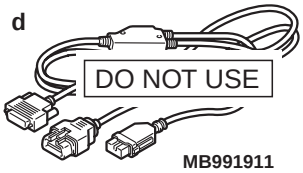
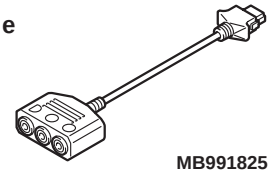
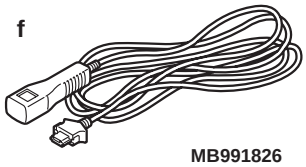
ACA01244AF

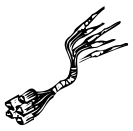
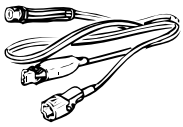
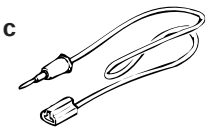
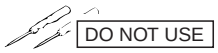
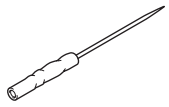
- The CAN bus line consists of two lines, CAN_L and CAN_H (CAN Low and CAN High, respectively), as well as two terminal resistors (A twisted-pair cable, highly resistant to noise, is used for the communications line).
- The CAN bus line connecting the two terminal resistors is the main bus line, and the CAN bus line connecting each ECU is the sub-bus line.
- The terminal resistors are installed in the engine-ECU and ETACS-ECU to stabilize communication signals (The terminal resistance is set at approximately 120 Ω).
- The following components are connected in the CAN bus line as follows.
  - Engine-ECU
  - A/T-ECU <A/T>
  - A/C-ECU <vehicles with automatic-A/C>
  - ABS-ECU <vehicles with ABS>
  - ASTC-ECU <vehicles with ASTC>

- Steering wheel sensor <vehicles with ASTC>
- G and yaw rate sensor <vehicles with ASTC>
- RV meter <vehicles with RV meter>
- ETACS-ECU

SPECIAL TOOL

M1548304200949

Tool	Number	Name	Use
a  MB991824 b  MB991827 c  MB991910 d  MB991911 e  MB991825 f  MB991826 MB991955	MB991955 a. MB991824 b. MB991827 c. MB991910 d. MB991911 e. MB991825 f. MB991826	M.U.T.-III sub-assembly a. Vehicle Communication Interface (V. C. I.) b. M.U.T.-III USB cable c. M.U.T.-III main harness A (Vehicles with CAN communication system) d. M.U.T.-III main harness B (Vehicles without CAN communication system) e. M.U.T.-III measure adapter f. M.U.T.-III trigger harness	⚠ CAUTION **For vehicles with CAN communication, use M.U.T.-III main harness A to send simulated vehicle speed. If you connect M.U.T.-III main harness B instead, the CAN communication does not function correctly.** CAN bus diagnosis

Tool	Number	Name	Use
a  b  c  d  MB991223	MB991223 a. MB991219 b. MB991220 c. MB991221 d. MB991222	Harness set a. Check harness b. LED harness c. LED harness adapter d. Probe	Continuity check and voltage measurement at harness wire or connector a. For checking connector pin contact pressure b. For checking power supply circuit c. For checking power supply circuit d. For connecting a locally sourced tester
 MB992006	MB992006	Extra fine probe	Continuity check and voltage measurement at harness wire or connector
	MB991709	Wiring harness set	Checking the ABS-ECU or ASTC-ECU

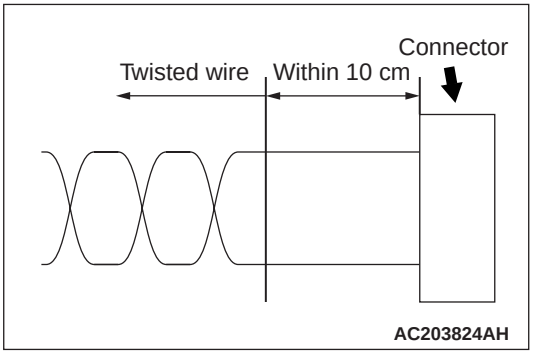
TEST EQUIPMENT

M1548304300195

Test equipment	Name	Use
 AC000019	Digital multimeter	Checking CAN bus circuit (for resistance and voltage measurements)

SERVICE PRECAUTIONS

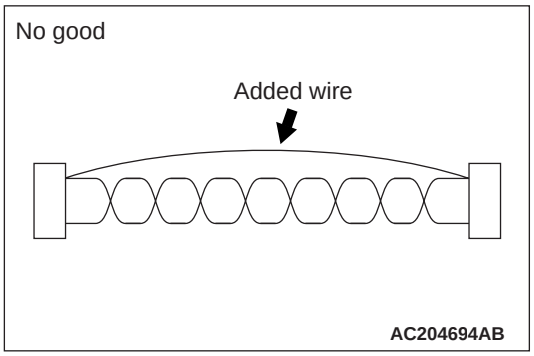
M1548302100184

Warnings in diagnosis section	Details regarding warning
⚠ CAUTION When servicing an CAN bus line, earth yourself by touching a metal object such as an unpainted water pipe. If you fail to do, a component connected to the CAN bus line may be broken.	–
⚠ CAUTION A digital multimeter should be used.	When measuring resistance value or voltage in CAN bus lines, use a digital multimeter. If not using a digital multimeter, the equipments, which are connected through the CAN communication lines, may be damaged.
⚠ CAUTION When measuring the resistance, disconnect the negative battery terminal.	Disconnect the negative battery terminal when measuring the resistance value in the CAN bus line. If you fail to do so, the equipments, which are connected through the CAN communication lines, may be damaged.
⚠ CAUTION The test wiring harness should be used.	Always use the test harness when measuring the voltage or resistance value at the female connector. If you fail to do so, connectors may be damaged.
⚠ CAUTION The strand end of the twist wire should be within 10 cm from the connector.	 If you repair the wire due to a defective connector or its terminal or harness wire, you should cut the wire so that the strand end of the twist wire should be within 10 cm from the connector as shown. If it exceeds 10 cm, twist the wiring harness just like the original twisted wire. If the strand end exceeds 10 cm, a communication error may be caused.
⚠ CAUTION Strictly observe the specified wiring harness repair procedure.	When you repair a CAN bus line, observe the precautions on how to repair the CAN bus line strictly. Refer to P.54C-8. If a new wire is added or a splice point is modified for the CAN_L or CAN_H line, an error in the CAN communication may be caused.

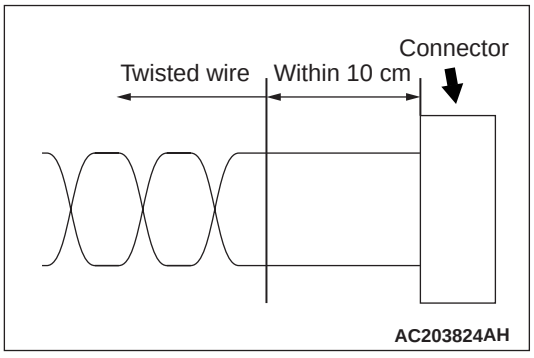
PRECAUTIONS ON HOW TO REPAIR THE CAN BUS LINES

M1548301900198

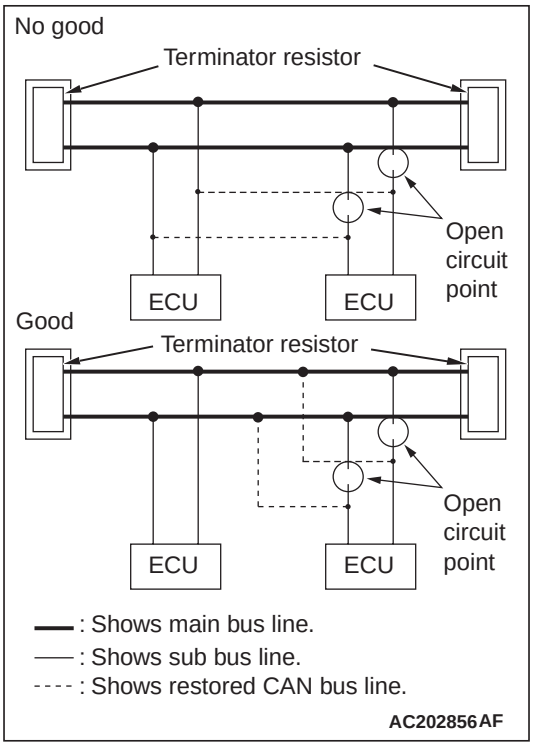
PRECAUTIONS ON HOW TO REPAIR THE CAN BUS LINES



- If the CAN bus line(s) are repaired, renew all the twisted wires between the end connectors. If the wiring harness is partially repaired, or only CAN_L or CAN_H line is repaired, noise suppression is deteriorated, causing a communication error.



- If the connector or wire on the main bus line or the sub-bus wire is replaced, the frayed end of the twisted wire should be within 10 cm from the connector. If it exceeds 10 cm, twist the wiring harness just like the original twisted wire. If the frayed end exceeds 10 cm, noise suppression is deteriorated, causing a communication error.



- If a sub-bus line is repaired, splice a new wire directly into the main bus line. If a new wire is spliced into the sub-bus line, which is connected to another device, the CAN communication will be disabled.

PRECAUTIONS ON HOW TO REPAIR THE TERMINATOR RESISTOR

If one-side terminator resistor is broken, the CAN communication will continue although noise suppression is deteriorated. No diagnosis codes may be set even if the terminator resistor was broken. If a damage is found, replace the ECU which incorporates the defective terminator resistor.

CAN BUS LINE REPAIR HARNESS (PART NAME AND NUMBER)

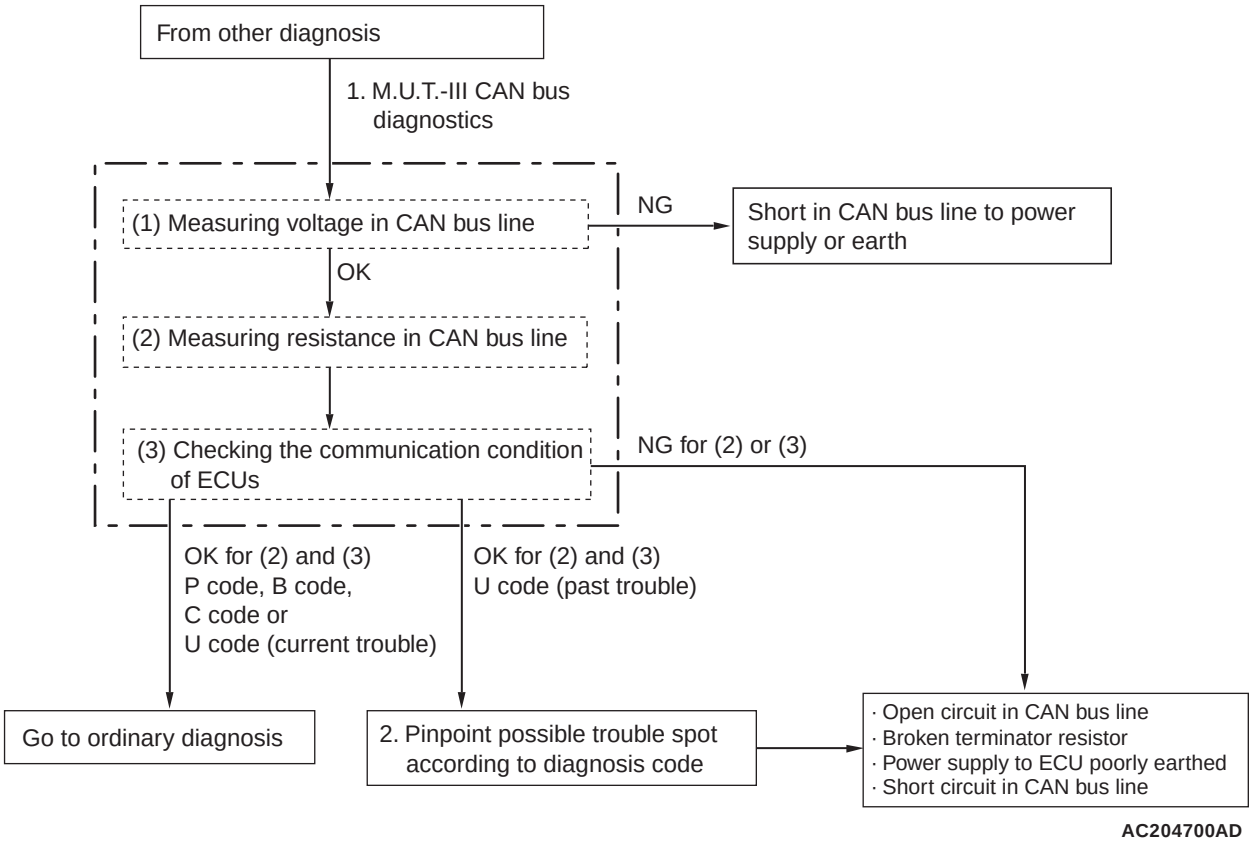
Part name	Part number
Twist pair cable	MN151514

EXPLANATION ABOUT THE M.U.T.-III CAN BUS DIAGNOSTICS

M1548300100252

The M.U.T.-III CAN bus diagnostics carries out the three checks below automatically, and then displays current condition of the CAN bus lines according to the check results.

CAN BUS LINE DIAGNOSTIC FLOW



1. M.U.T.-III CAN bus diagnostics

   The M.U.T.-III diagnoses CAN bus lines in accordance with the following strategy.

   NOTE: When the M.U.T.-III carries out the voltage and resistance measurements, it will cease the communication between each of the ECU. If the M.U.T.-III cannot cease the communication, it will carry out the voltage measurement.

   (1) Measuring voltage in CAN bus line

   Diagnoses the power supply (such as wires of higher voltage than CAN communication line) and earthing (such as wires of lower voltage than CAN communication line) of CAN bus lines for short circuit by measuring the voltages between the CAN_L line or H line and body earth.

Terminal to be diagnosed	Normal value	Measurement value	Trouble when the measurement value does not meet the normal value	Note
Measuring the voltage between the CAN_L line and body earth	1.0 V or more and 4.0 V or less	Less than 1.0 V	Short to earth of the CAN_L line	If the CAN_L or H line is shorted to earth or power supply, a diagnosis code may not be set.
		More than 4.0 V	Short to power supply of the CAN_L line	
Measuring the voltage between the CAN_H line and body earth	1.0 V or more and 4.0 V or less	Less than 1.0 V	Short to earth of the CAN_H line	
		More than 4.0 V	Short to power supply of the CAN_H line	

   (2) Measuring resistance in CAN bus line

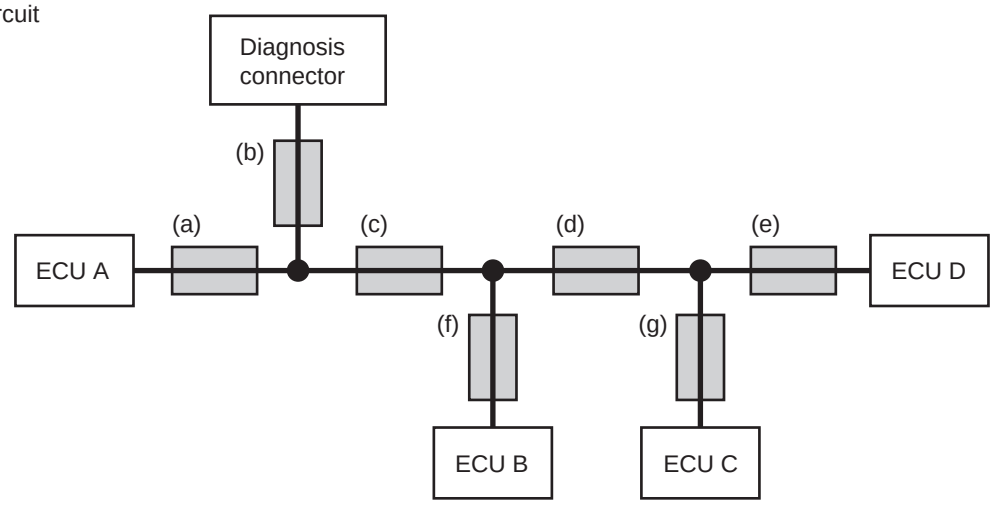
Checks the terminator resistors (incorporated in the ETACS-ECU or the engine-ECU), which are connected to each end of a CAN bus line, for breakage and a CAN bus main line for open circuit by measuring the resistance value between a CAN_L line and H line.

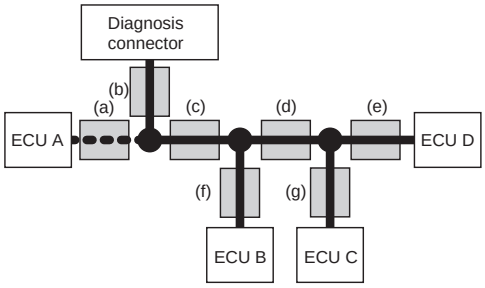
Normal value	Measurement value	Trouble when the measurement value does not meet the normal value	Note
60 ± 10 Ω	120 ± 20 Ω	Trouble in a CAN main line or terminator resistor	If only one terminator resistor is broken at either side, the CAN communication will continue although noise suppression is deteriorated. If a CAN main bus line is open circuit, the CAN communication is suspended at that open circuit point.
	No continuity	Trouble in CAN main bus line or between the diagnosis connector and main bus line	–
	Continuity (2 Ω or less)	CAN bus line (between CAN_L and H lines) is shorted	If a CAN bus line is shorted, all ECUs cease communicating each other (This fail-safe function is called "Bus off").
	Other than above	Poorly engaged connector	–

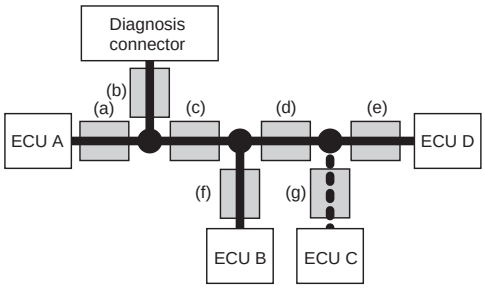
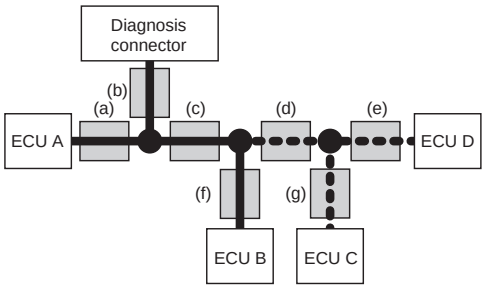
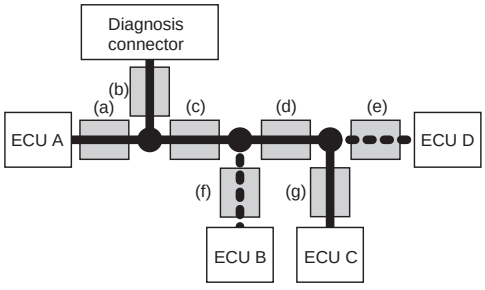
(3) Checking the communication condition of ECUs

The M.U.T.-III narrows down troubles in circuit by itself. Its strategy is as follows.

Reference circuit



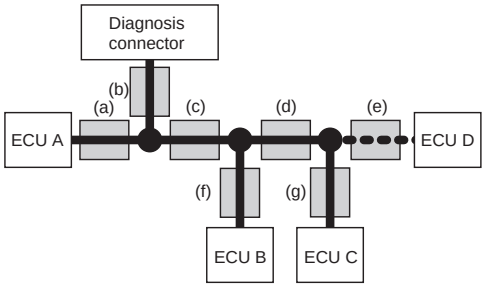
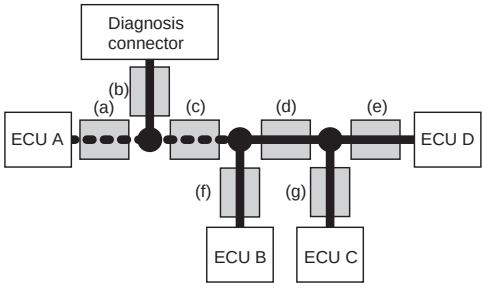
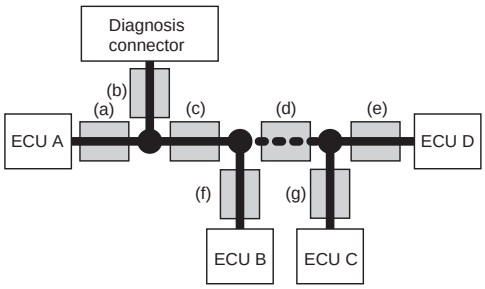
ECU which cannot communicate with the M.U.T.-III	Possible trouble spot	Logic for narrowing down trouble spot	
ECU A	CAN bus line (a) and power supply system to ECU A	ECU A communicates with the M.U.T.-III via CAN bus lines (a) and (b). The M.U.T.-III judges that CAN bus line (b) is normal, because it can communicate with other ECUs. Possible trouble may be present in CAN bus line (a) or the power supply system to ECU A.	 AC204742 AZ

ECU which cannot communicate with the M.U.T.-III	Possible trouble spot	Logic for narrowing down trouble spot	
ECU C	CAN bus line (g) and power supply system to ECU C	ECU C communicates with the M.U.T.-III via CAN bus lines (b), (c), (d) and (g). The M.U.T.-III judges that CAN bus lines (b), (c) and (d) are normal, because it can communicate with ECUs B and D. Possible trouble may be present in CAN bus line (g) or the power supply system to ECU C.	 AC204742BA
ECU C and ECU D	Trouble in CAN bus line (d)	ECUs C ad D communicate with the M.U.T.-III via CAN bus lines (b), (c), (d), (e) and (g). The M.U.T.-III judges that CAN bus lines (b) and (c) are normal, because it can communicate with ECU B. Possible trouble may be present in CAN bus line (d), (e) or (g) or the power supply system to ECU D or C. CAN bus line (d) is shared by ECUs C and D when they communicate with the M.U.T.-III, so CAN bus line (d) is suspected as ultimate cause. CAN bus line (g) or (e) and power supply systems to ECU C or D are also suspected as second cause.	 AC204742BB
ECU B and ECU D	CAN bus line (e) or (f) or power supply system to ECU B or D	ECUs B ad D communicate with the M.U.T.-III via CAN bus lines (b), (c), (d), (e) and (f). The M.U.T.-III judges that CAN bus lines (b), (c) and (d) are normal, because it can communicate with ECU C. Possible trouble may be present in CAN bus line (f) or (e) or the power supply system to ECU B or D.	 AC204742BC

2. If diagnosis code related to CAN communication is set as past trouble, isolate opens as described below.

   NOTE: If you pinpoint trouble spot according to diagnosis code, you should use time-out diagnosis code. diagnosis code related to failure information is set when the data to be set contains an error, so CAN bus line itself is probably normal.

   NOTE: Time-out diagnosis code codes are stored in each ECU memory individually. Therefore, it is possible that these diagnosis code codes have not been set simultaneously. If the trouble spot cannot be found when you diagnose by judging from multiple diagnosis code codes, check the communication lines between each ECU.

Diagnosis code to be set	Possible trouble spot	Logic for narrowing down trouble spot	
Time-out diagnosis code associated with ECU D is stored in ECU A, ECU B and ECU C. Time-out diagnosis code associated with ECUs A, B, C and D is stored in ECU. "Bus off" diagnosis code is stored in ECU D.	Trouble in CAN bus line (e) and power supply system to ECU D	When time-out diagnosis code associated with ECU D is stored in ECU A, B and C, or time-out diagnosis code associated with ECUs A, B and C is stored in ECU D, or "bus off" diagnosis code is stored in ECU D, CAN bus line (e) is suspected. When diagnosis code is not stored in ECU D, the power supply to ECU D is suspected.	 AC204742BD
Time-out diagnosis code associated with ECU A is stored in ECUs B, C and D. Time-out diagnosis code associated with ECUs B, C and D is stored in ECU A. "Bus off" diagnosis code is stored in ECU A.	Trouble in CAN bus line (a) or (c) and power supply system to ECU A.	When time-out diagnosis code associated with ECU A is stored in ECUs B, C and D, or time-out diagnosis code associated with ECUs B, C and D is stored in ECU A, or "bus off" diagnosis code is stored in ECU A, CAN bus line (a) or (c) is suspected. When diagnosis code is not stored in ECU A, the power supply to ECU A is suspected.	 AC204742BF
Time-out diagnosis code codes associated with ECUs C and D are stored in ECU A and ECU B. Time-out diagnosis code codes associated with ECUs A and B are stored in ECU C and ECU D.	Trouble in CAN bus line (d)	If time-out diagnosis code codes associated with ECUs C and D are stored in ECUs A and B, or time-out codes associated with ECUs A and B are stored in ECUs C and D, CAN bus line (d) is suspected. CAN bus line (g) or (e) and power supply systems to ECU C or D are also suspected as second cause.	 AC204742BQ

TROUBLESHOOTING

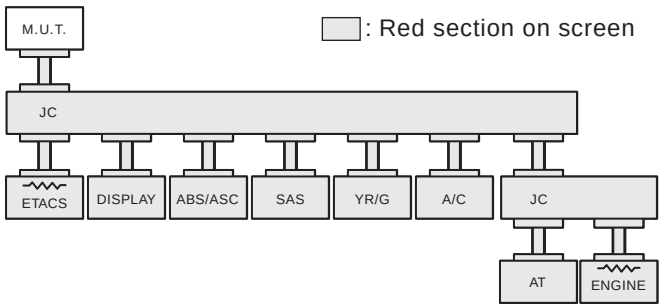
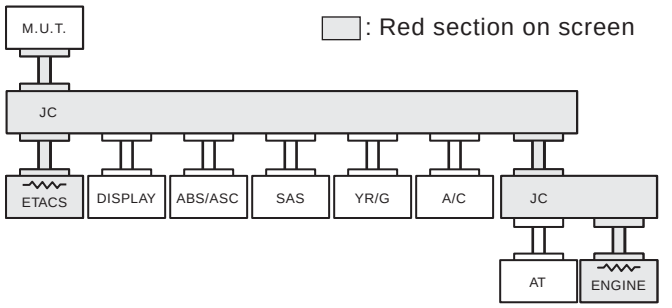
CAN BUS DIAGNOSTICS TABLE

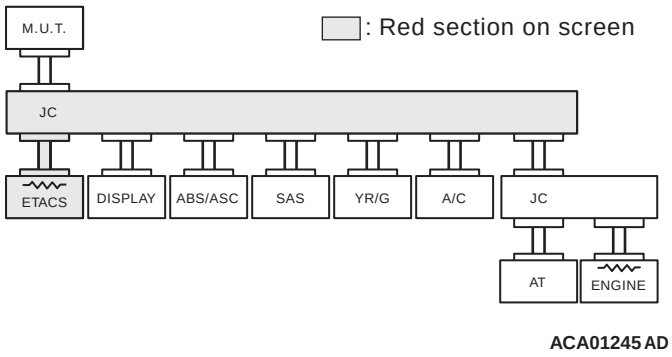
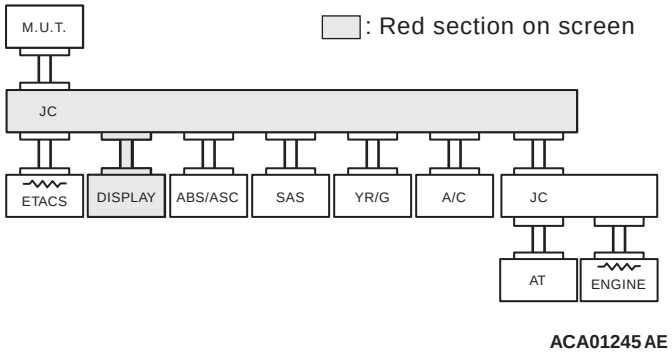
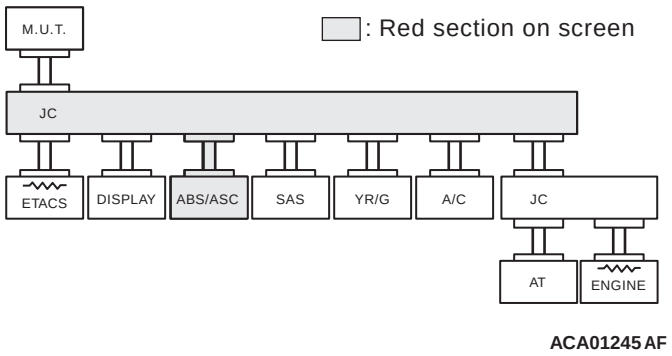
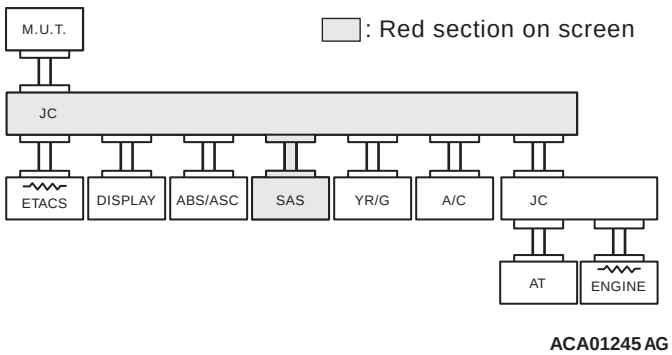
M1548300202222

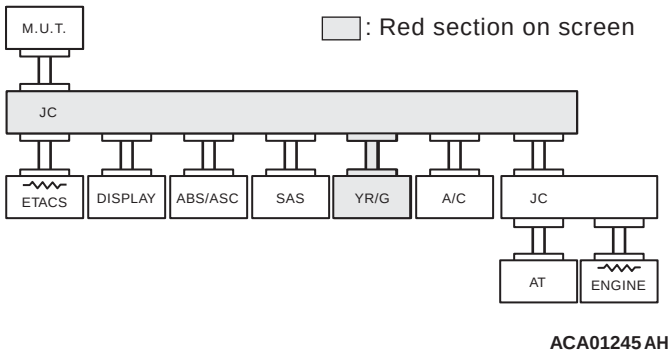
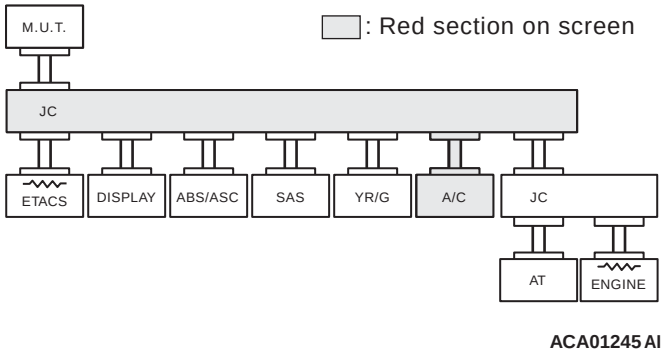
This diagnosis applies only to the CAN bus lines. If a different system is defective, proceed to the applicable diagnosis section for each system. Observe the diagnosis procedure below only when the CAN bus line is defective.

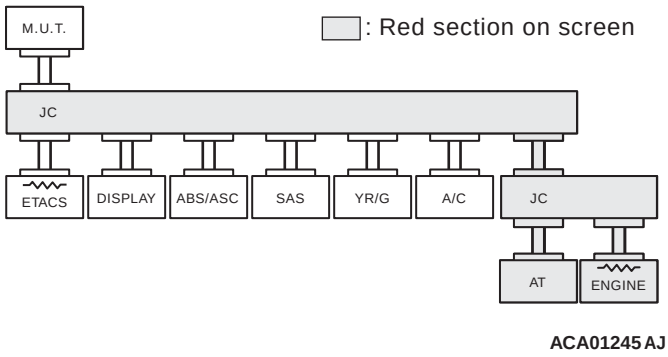
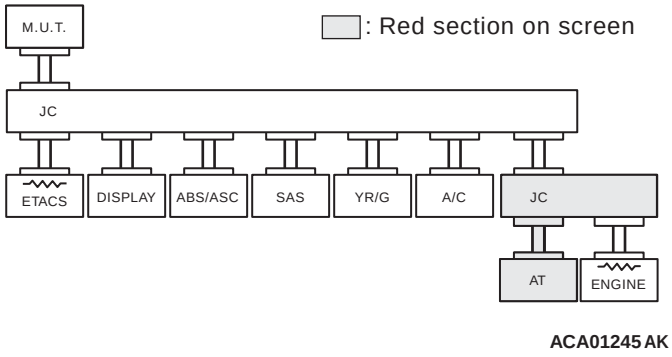
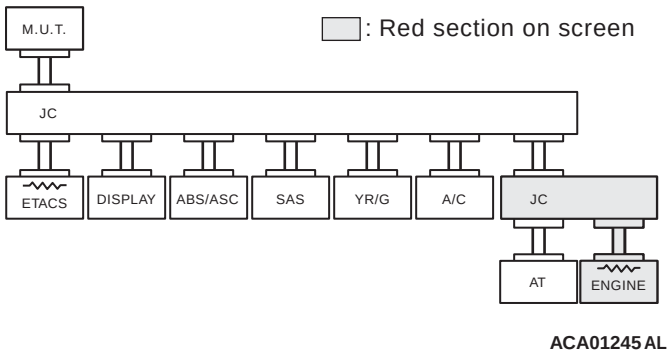
⚠ CAUTION

During diagnosis, a diagnosis code associated with another system may be set when the ignition switch is turned on with connector(s) disconnected. After completing the repair, confirm all systems for diagnosis code(s). If diagnosis code(s) are set, erase them all.

M.U.T.-III screen (The ECUs that are not adopted are not displayed.)	Comment	Diagnosis detail	Reference page
 ACA01245 AB	Short circuit to battery in red displayed area is estimated.	Diagnosis Item 1 Diagnose shorts in the power supply to CAN bus line	P.54C-20
	Earthing in red displayed area is estimated.	Diagnosis Item 2 Diagnose shorts in the earth to CAN bus line	P.54C-42
	Short circuit between CAN_H and CAN_L in red displayed area is estimated.	Diagnosis Item 3 Diagnose shorts between CAN_H and L lines	P.54C-64
 ACA01245 AC	Disconnection in red displayed area is estimated.	Diagnosis Item 4 Diagnose the terminator resistors	P.54C-81

M.U.T.-III screen (The ECUs that are not adopted are not displayed.)	Comment	Diagnosis detail	Reference page
 ACA01245 AD	Harness disconnection or loose connection in red displayed area is estimated.	Diagnosis Item 5 Diagnose when the M.U.T.-III cannot receive the data sent by ETACS-ECU.	P.54C-85
 ACA01245 AE	Harness disconnection or loose connection in red displayed area is estimated.	Diagnosis Item 6 Diagnose when the M.U.T.-III cannot receive the data sent by RV meter <vehicles with RV meter>.	P.54C-91
 ACA01245 AF	Harness disconnection or loose connection in red displayed area is estimated.	Diagnosis Item 7 Diagnose when the M.U.T.-III cannot receive the data sent by ABS-ECU <Vehicles with ABS> or ASTC-ECU <Vehicles with ASTC>	P.54C-97
 ACA01245 AG	Harness disconnection or loose connection in red displayed area is estimated.	Diagnosis Item 8 Diagnose when the M.U.T.-III cannot receive the data sent by steering wheel sensor <Vehicles with ASTC>	P.54C-107

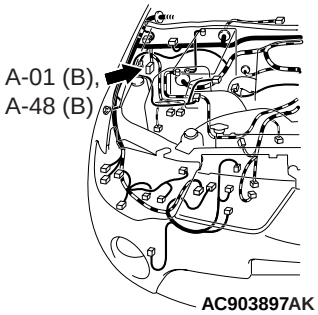
M.U.T.-III screen (The ECUs that are not adopted are not displayed.)	Comment	Diagnosis detail	Reference page
 ACA01245 AH	Harness disconnection or loose connection in red displayed area is estimated.	Diagnosis Item 9 Diagnose when the M.U.T.-III cannot receive the data sent by G and yaw rate sensor <Vehicles with ASTC>	P.54C-113
 ACA01245 AI	Harness disconnection or loose connection in red displayed area is estimated.	Diagnosis Item 10 Diagnose when the M.U.T.-III cannot receive the data sent by A/C-ECU. <vehicles with automatic-A/C>	P.54C-118

M.U.T.-III screen (The ECUs that are not adopted are not displayed.)	Comment	Diagnosis detail	Reference page
 ACA01245 AJ	Harness disconnection or loose connection in red displayed area is estimated.	Diagnosis Item 11 Diagnose the lines between the joint connectors (CAN1 and CAN2)	P.54C-124
 ACA01245 AK	Harness disconnection or loose connection in red displayed area is estimated.	Diagnosis Item 12 Diagnose when the M.U.T.-III cannot receive the data sent by A/T-ECU. <A/T>	P.54C-131
 ACA01245 AL	Harness disconnection or loose connection in red displayed area is estimated.	Diagnosis Item 13 Diagnose when the M.U.T.-III cannot receive the data sent by engine-ECU.	P.54C-137

CAN-RELATED CONNECTOR POSITION

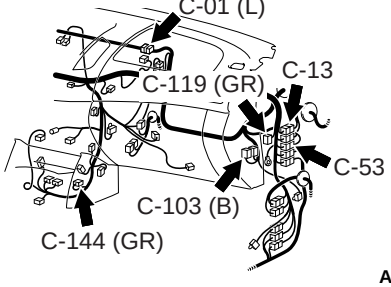
M1548304100878

Connectors: A-01, A-48



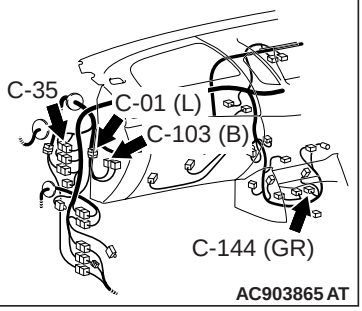
AC903897AK

Connectors: C-01, C-13, C-53, C-103, C-119, C-144 <LHD>



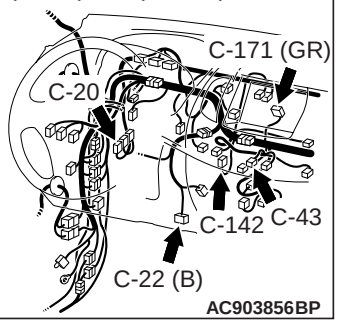
AC903853BK

Connectors: C-01, C-35, C-103, C-144 <RHD>



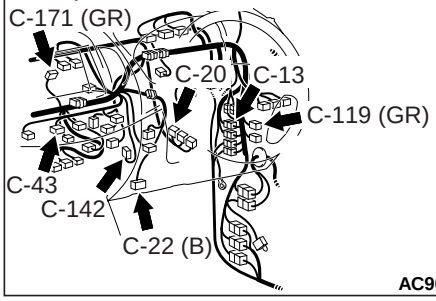
AC903865 AT

Connectors: C-20, C-22, C-43, C-142, C-171 <LHD>



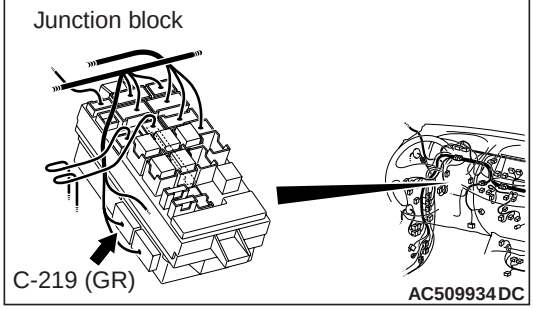
AC903856 BP

Connectors: C-13, C-20, C-22, C-43, C-119, C-142, C-171 <RHD>



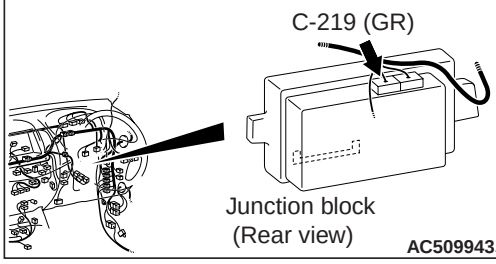
AC903868 CJ

Connector: C-219 <LHD>



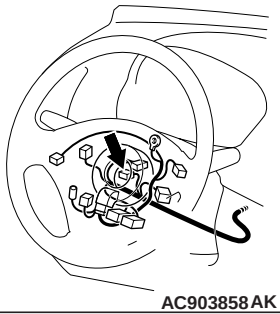
AC509934 DC

Connector: C-219 <RHD>



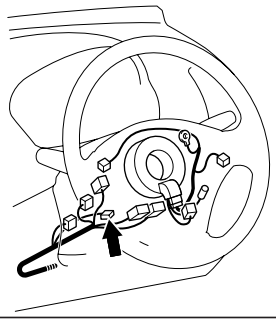
AC509943 AF

Connector: C-308 <LHD>



AC903858 AK

Connector: C-308 <RHD>



AC903869 AK

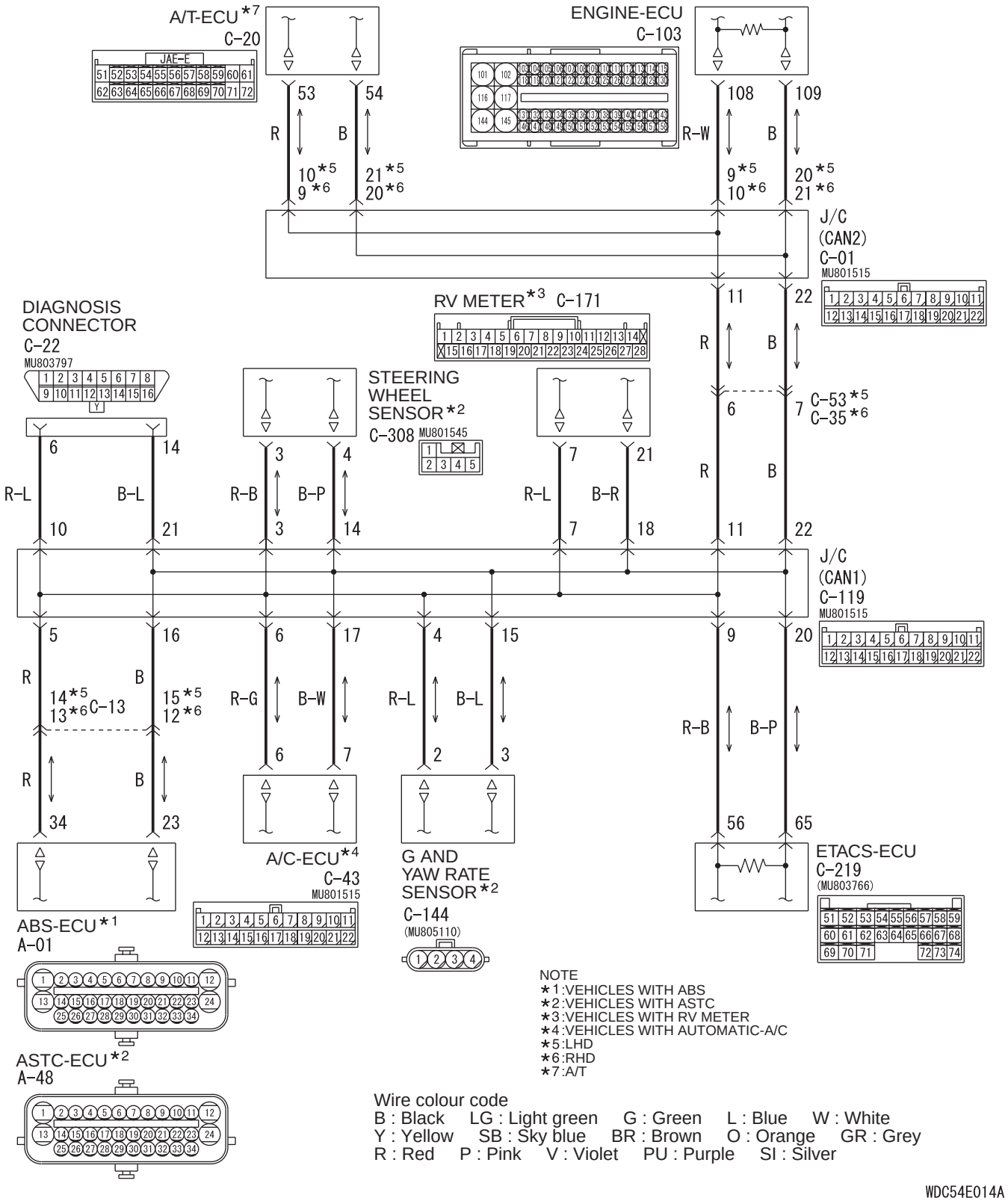
Connector No.	Connector name
A-01	ABS-ECU
A-48	ASTC-ECU
C-01	Joint connector (CAN2)
C-13	Intermediate connector (Instrument panel wiring harness and floor wiring harness combination)
C-20	A/T-ECU <A/T>
C-22	Diagnosis connector
C-35	Intermediate connector (Instrument panel wiring harness and floor wiring harness combination) <RHD>
C-43	A/C-ECU <Automatic A/C>
C-53	Intermediate connector (Instrument panel wiring harness and floor wiring harness combination) <LHD>
C-103	Engine-ECU
C-119	Joint connector (CAN1)
C-144	G and yaw rate sensor <vehicles with ASTC>

Connector No.	Connector name
C-171	RV meter <vehicles with RV meter>
C-219	ETACS-ECU
C-308	Steering wheel sensor <vehicles with ASTC>

CAN BUS DIAGNOSIS

Diagnosis Item 1: Diagnose shorts in the power supply to CAN bus line

⚠ CAUTION
When servicing a CAN bus line, earth yourself by touching a metal object such as an unpainted water pipe. If you fail to do, a component connected to the CAN bus line may be broken.



WDC54E014A

FUNCTION

When diagnosing the CAN bus lines, the M.U.T.-III measures the voltage of CAN_H and CAN_L line and detects the short to power supply or earth.

TROUBLE JUDGEMENT CONDITIONS

The M.U.T.-III judges the trouble when it is impossible to receive the periodically sent data and the voltage of CAN_H or CAN_L line is more than 4.0 V.

TROUBLESHOOTING HINTS

- Malfunction of the wiring harness
- Short to power supply of the connector
- Malfunction of each ECU

DIAGNOSIS PROCEDURE

STEP 1. Check the CAN bus lines. Voltage measurement at C-22 diagnosis connector.

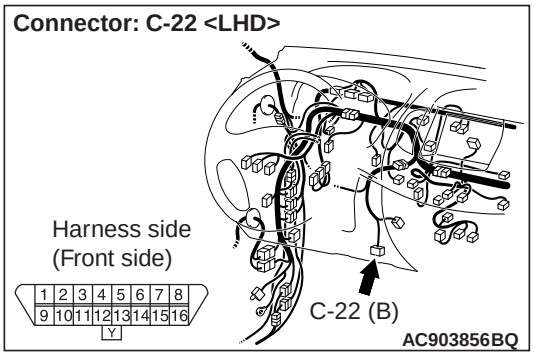
⚠ CAUTION

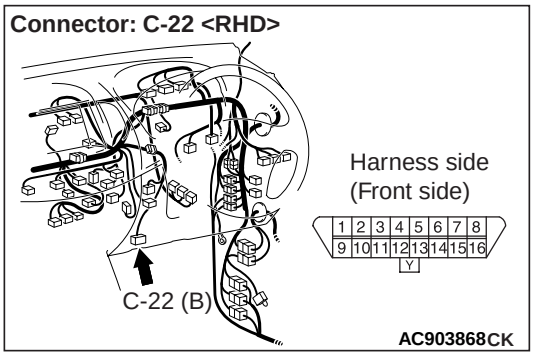
A digital multimeter should be used. For details refer to P.54C-7.

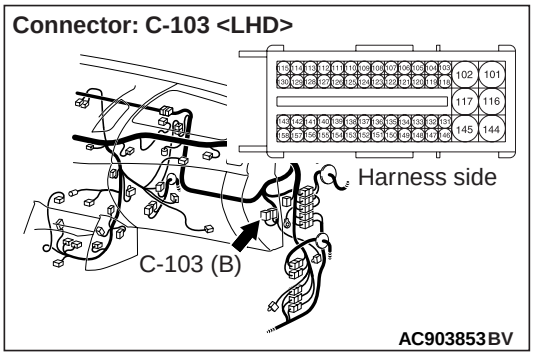
⚠ CAUTION

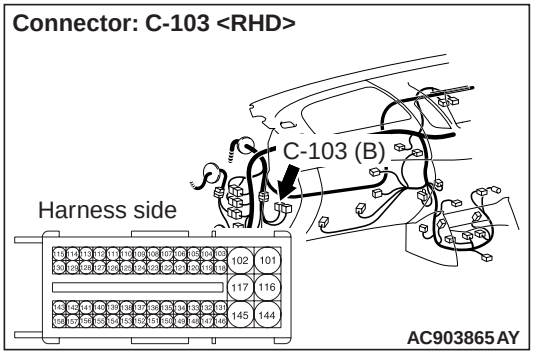
The test wiring harness should be used. For details refer to P.54C-7.

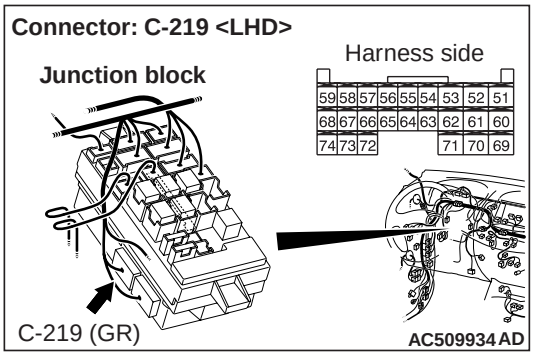
NOTE: This inspection allows you to check that there is a short to power supply in either CAN_H line or CAN_L line. Thus, in the following steps, check the CAN bus line that is defective.

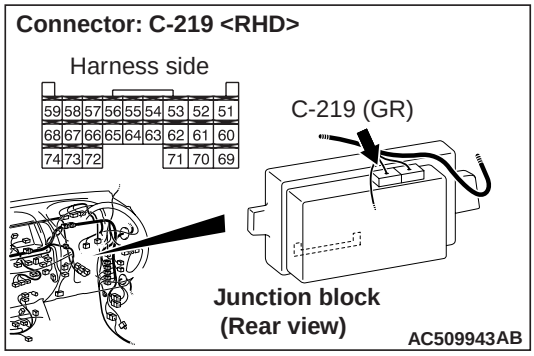




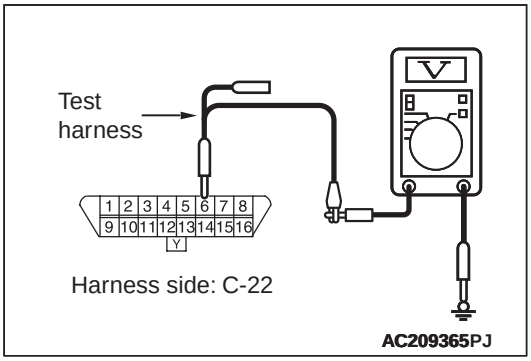






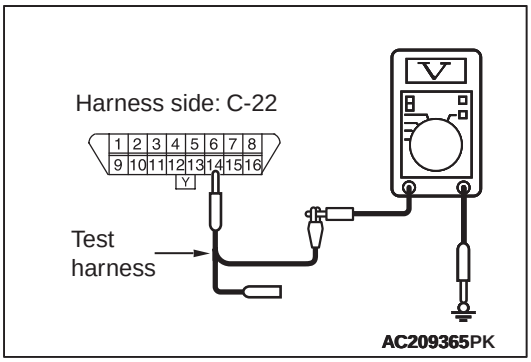


(1) Disconnect engine-ECU connector C-103 and ETACS-ECU connector C-219, and measure the voltage at the harness side of diagnosis connector C-22.
(2) Connect the negative battery terminal, and turn the ignition switch to the ON position.



(3) Voltage between C-22 diagnosis connector terminal No.6 (CAN_H) and body earth

OK: 4.0 V or less



(4) Voltage between C-22 diagnosis connector terminal No.14 (CAN_L) and body earth

OK: 4.0 V or less

(5) Disconnect the negative battery terminal.

Q: Is the check result normal?

YES : <Both of the measurement results show 4.0 V or less> Go to Step 23 .

NO : <Either of CAN_H line or CAN_L line the measurement results show more than 4.0 V> Go to Step 2.

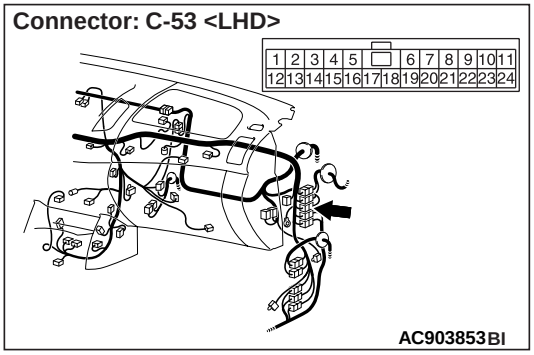
STEP 2. Check the CAN line. Voltage measurement at C-53 <LHD> or C-35 <RHD> intermediate connector.

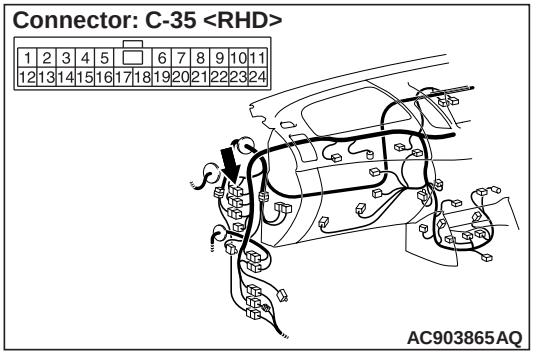
⚠ CAUTION

A digital multimeter should be used. For details refer to P.54C-7.

⚠ CAUTION

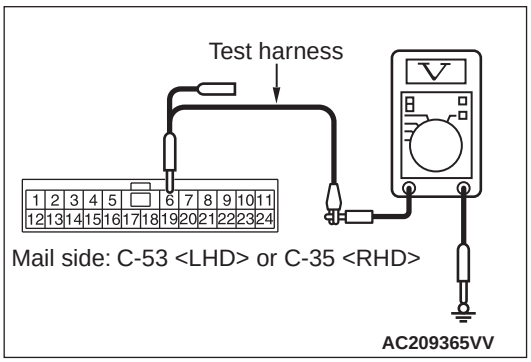
The test wiring harness should be used. For details refer to P.54C-7.





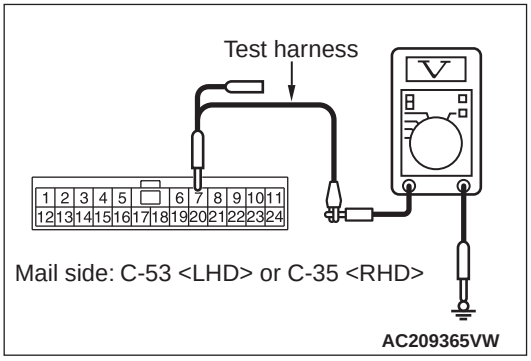
(1) Disconnect the intermediate connector, and measure at its male-side intermediate connector (at the control wiring harness side).

(2) Connect the negative battery terminal, and turn the ignition switch to the ON position.



(3) Voltage between C-53 <LHD> or C-35 <RHD> intermediate connector terminal No.6 (CAN_H) and body earth

OK: 4.0 V or less



(4) Voltage between C-53 <LHD> or C-35 <RHD> intermediate connector terminal No.7 (CAN_L) and body earth

OK: 4.0 V or less

(5) Disconnect the negative battery terminal.

Q: Is the check result normal?

YES : <4.0 V or less> Go to Step 7.

NO : <More than 4.0 V> Go to Step 3.

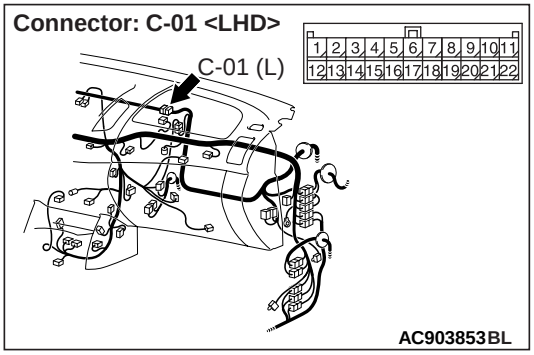
STEP 3. Check the CAN line between joint connector (CAN2) and the engine-ECU. Voltage measurement at C-01 joint connector (CAN2).

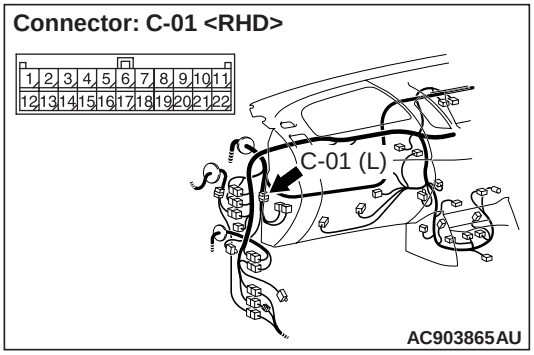
⚠ CAUTION

A digital multimeter should be used. For details refer to P.54C-7.

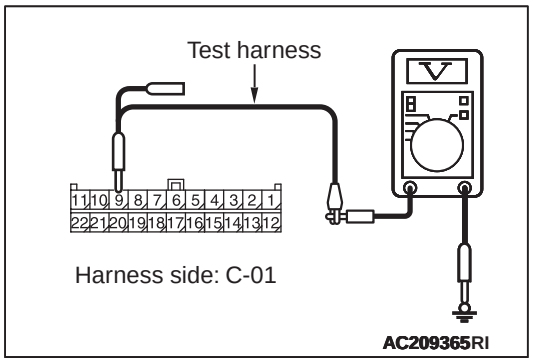
⚠ CAUTION

The test wiring harness should be used. For details refer to P.54C-7.



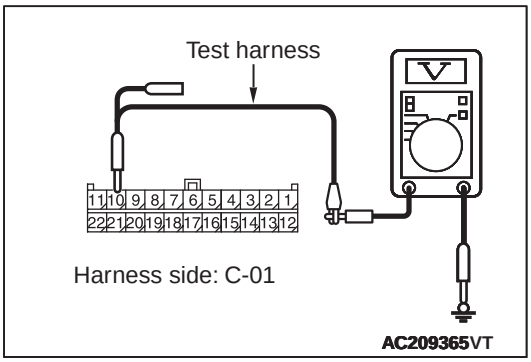


(1) Disconnect joint connector (CAN2), and measure at the wiring harness side.
(2) Connect the negative battery terminal, and turn the ignition switch to the ON position.



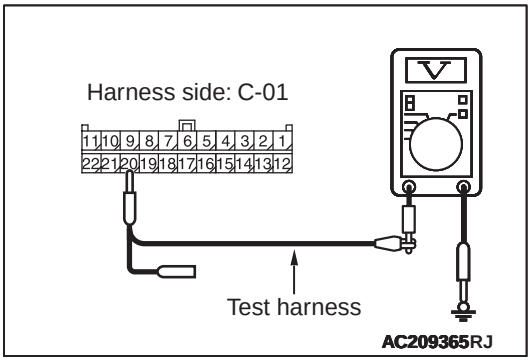
(3) Voltage between C-01 joint connector (CAN2) terminal No.9 (CAN_H) and body earth <LHD>

OK: 4.0 V or less



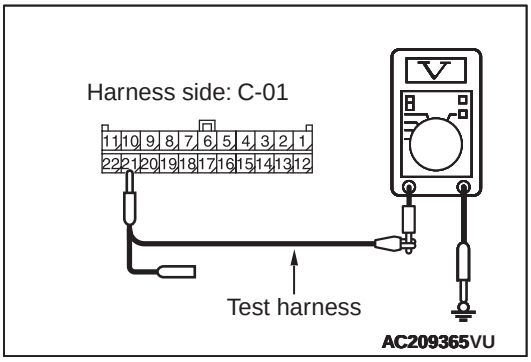
(4) Voltage between C-01 joint connector (CAN2) terminal No.10 (CAN_H) and body earth <RHD>

OK: 4.0 V or less



(5) Voltage between C-01 joint connector (CAN2) terminal No.20 (CAN_L) and body earth <LHD>

OK: 4.0 V or less



(6) Voltage between C-01 joint connector (CAN2) terminal No.21 (CAN_L) and body earth <RHD>

OK: 4.0 V or less

(7) Disconnect the negative battery terminal.

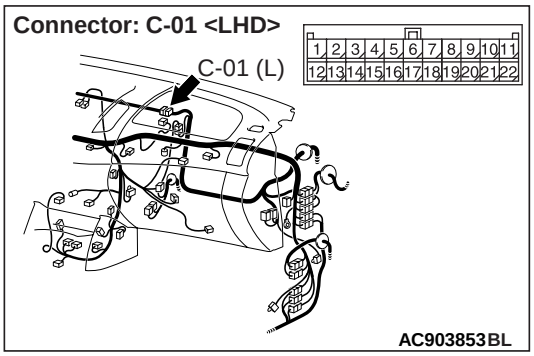
Q: Is the check result normal?

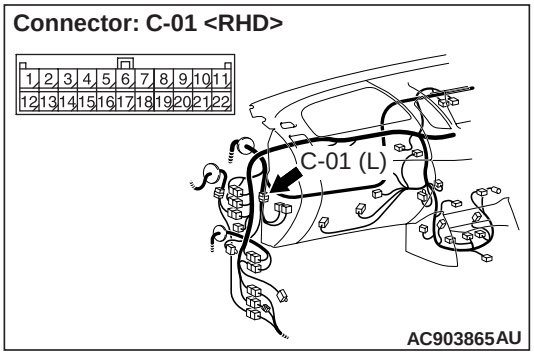
YES <M/T> : <4.0 V or less> Repair intermediate connector C-53 <LHD> or C-35 <RHD>, or the wiring harness between joint connector (CAN2) and intermediate connector C-53 <LHD> or C-35 <RHD>.
YES <A/T> : <4.0 V or less> Go to Step 4.
NO : <More than 4.0 V> Repair the wiring harness between joint connector (CAN2) and the engine-ECU connector.

STEP 4. Check the CAN line between joint connector (CAN2) and the A/T-ECU. Voltage measurement at C-01 joint connector (CAN2).

⚠ CAUTION
A digital multimeter should be used. For details refer to P.54C-7.

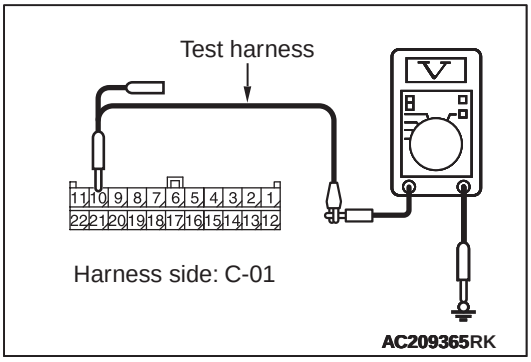
⚠ CAUTION
The test wiring harness should be used. For details refer to P.54C-7.





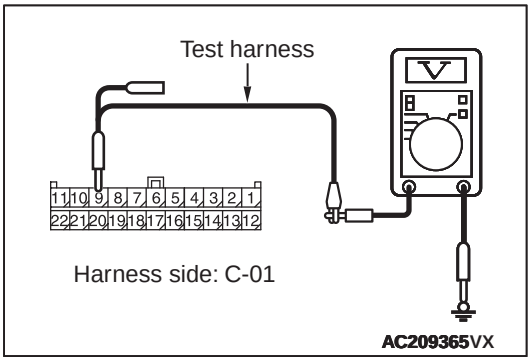
(1) Disconnect joint connector (CAN2), and measure at the wiring harness side.

(2) Connect the negative battery terminal, and turn the ignition switch to the ON position.



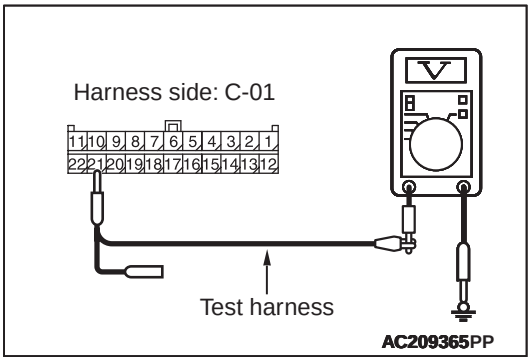
(3) Voltage between C-01 joint connector (CAN2) terminal No.10 (CAN_H) and body earth <LHD>

OK: 4.0 V or less



(4) Voltage between C-01 joint connector (CAN2) terminal No.9 (CAN_H) and body earth <RHD>

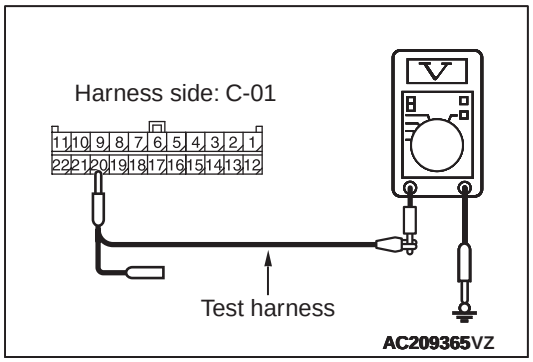
OK: 4.0 V or less



(5) Voltage between C-01 joint connector (CAN2)

terminal No.21 (CAN_L) and body earth <LHD>

OK: 4.0 V or less



(6) Voltage between C-01 joint connector (CAN2) terminal No.20 (CAN_L) and body earth <RHD>

OK: 4.0 V or less

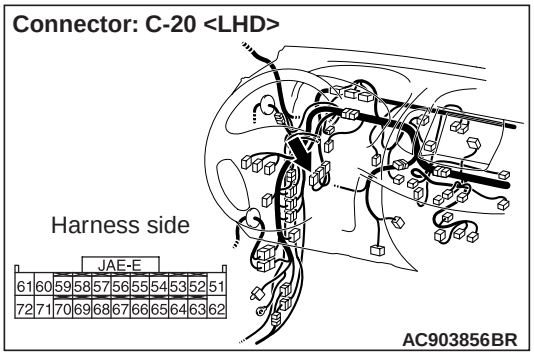
(7) Disconnect the negative battery terminal.

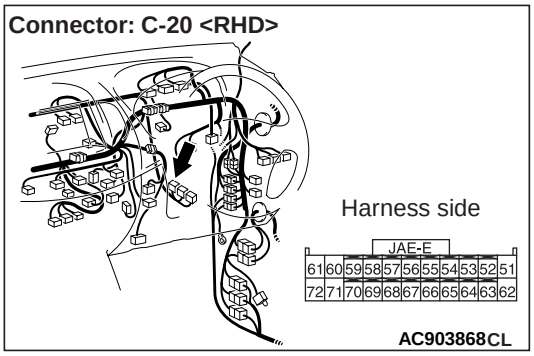
Q: Is the check result normal?

YES : <4.0 V or less> Repair intermediate connector C-53 <LHD> or C-35 <RHD>, or the wiring harness between joint connector (CAN2) and the intermediate connector C-53 <LHD> or C-35 <RHD>.

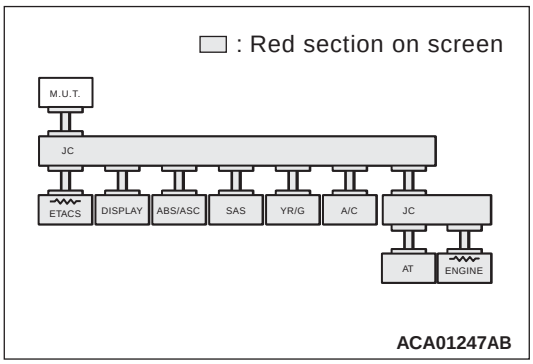
NO : <More than 4.0 V> Go to Step 5.

STEP 5. M.U.T.-III CAN bus diagnostics [A/T-ECU connector disconnected]





(1) Disconnect A/T-ECU connector C-20, and diagnose by using the M.U.T.-III.



(2) Diagnose CAN bus lines, and check if M.U.T.-III screen is as shown in the illustration.

Q: Does M.U.T.-III screen correspond to the illustration?

YES : Repair the wiring harness between joint connector (CAN2) and the A/T-ECU connector.

NO : Check the A/T-ECU connector, and repair if necessary. If the A/T-ECU connector is in good condition, go to Step 6.

STEP 6. M.U.T.-III CAN bus diagnostics (retest the system)

Diagnose CAN bus lines, and check if M.U.T.-III screen shows normal state.

Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

NO : Check the A/T-ECU connector, and repair if necessary. If the A/T-ECU connector is in good condition, replace the A/T-ECU.

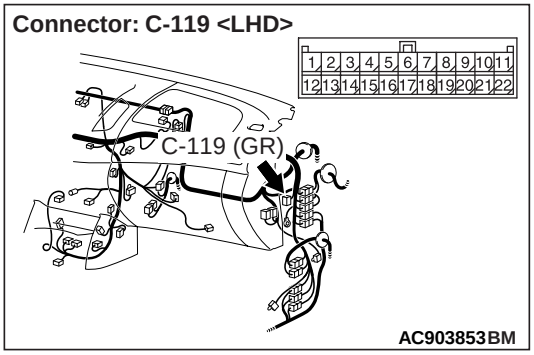
STEP 7. Check the CAN line between joint connector (CAN1) and the ETACS-ECU. Voltage measurement at C-119 joint connector (CAN1).

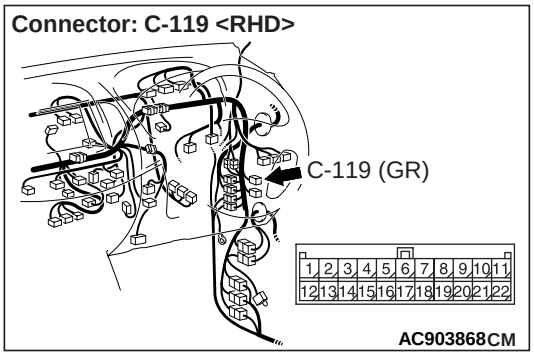
⚠ CAUTION

A digital multimeter should be used. For details refer to P.54C-7.

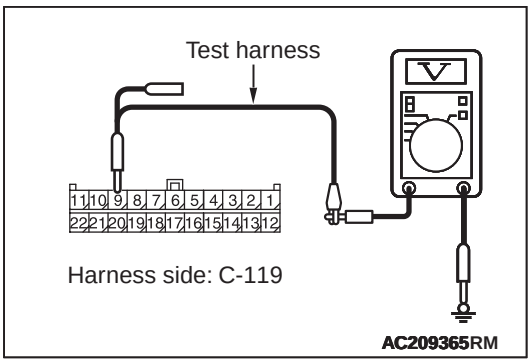
⚠ CAUTION

The test wiring harness should be used. For details refer to P.54C-7.



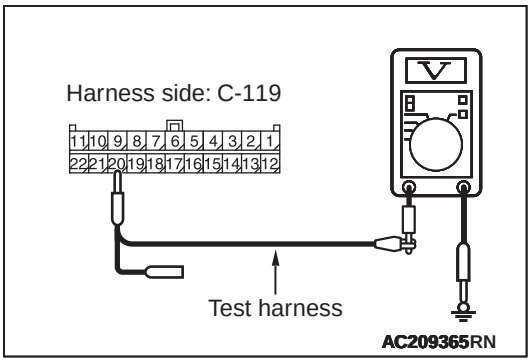


(1) Disconnect joint connector (CAN1), and measure at the wiring harness side.
(2) Connect the negative battery terminal, and turn the ignition switch to the ON position.



(3) Voltage between C-119 joint connector (CAN1) terminal No.9 (CAN_H) and body earth

OK: 4.0 V or less



(4) Voltage between C-119 joint connector (CAN1) terminal No.20 (CAN_L) and body earth

OK: 4.0 V or less

(5) Disconnect the negative battery terminal.

⚠ CAUTION

Strictly observe the specified wiring harness repair procedure. For details refer to P.54C-7.

Q: Is the check result normal?

YES : <4.0 V or less> Go to Step 8.

NO : <More than 4.0 V> Repair the wiring harness between joint connector (CAN1) and the ETACS-ECU connector.

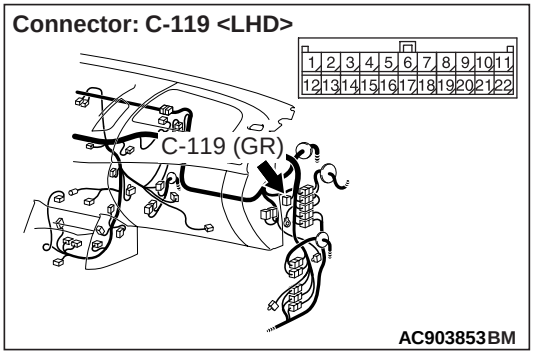
STEP 8. Check the CAN line between joint connector (CAN1) and the RV meter. Voltage measurement at C-119 joint connector (CAN1).

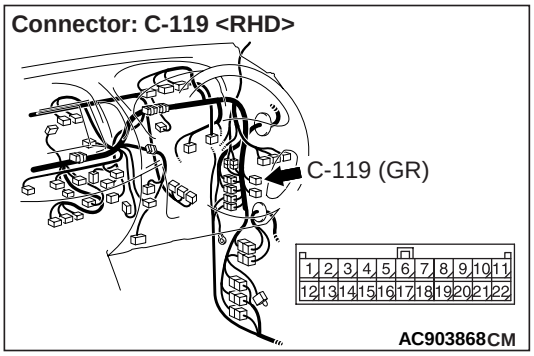
⚠ CAUTION

A digital multimeter should be used. For details refer to P.54C-7.

⚠ CAUTION

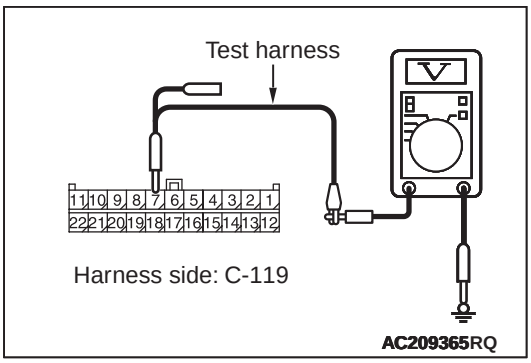
The test wiring harness should be used. For details refer to P.54C-7.





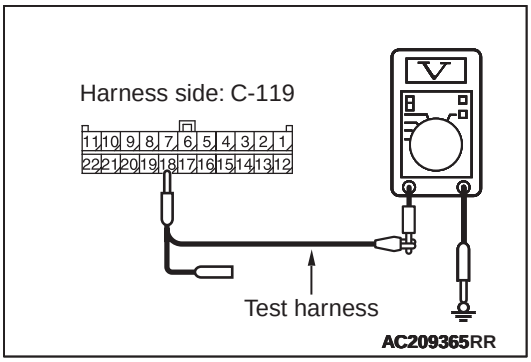
(1) Disconnect joint connector (CAN1), and measure at the wiring harness side.

(2) Connect the negative battery terminal, and turn the ignition switch to the ON position.



(3) Voltage between C-119 joint connector (CAN1) terminal No.7 (CAN_H) and body earth

OK: 4.0 V or less



(4) Voltage between C-119 joint connector (CAN1) terminal No.18 (CAN_L) and body earth

OK: 4.0 V or less

(5) Disconnect the negative battery terminal.

⚠ CAUTION

Strictly observe the specified wiring harness repair procedure. For details refer to P.54C-7.

Q: Is the check result normal?

YES <vehicles without ABS, ASTC and A/C> : <4.0 V or less> Go to Step 22.

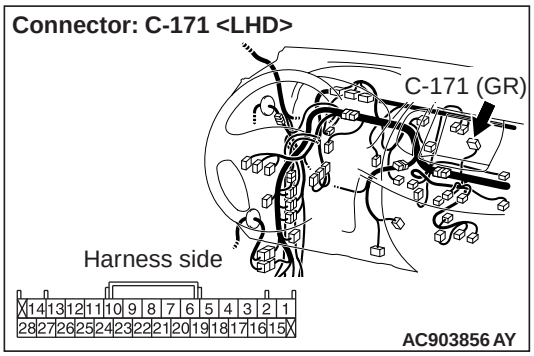
YES <vehicles with ABS> : <4.0 V or less> Go to Step 10.

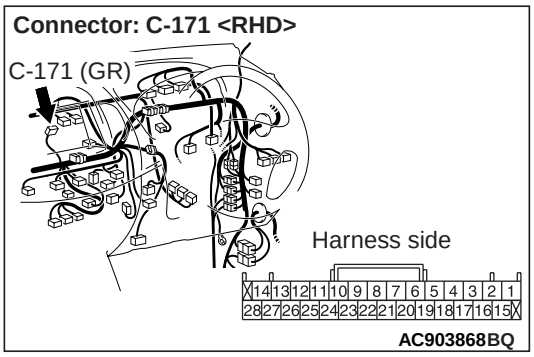
YES <vehicles with ASTC> : <4.0 V or less> Go to Step 13.

YES <vehicles without ABS and ASTC, and with A/C> : <4.0 V or less> Go to Step 20.

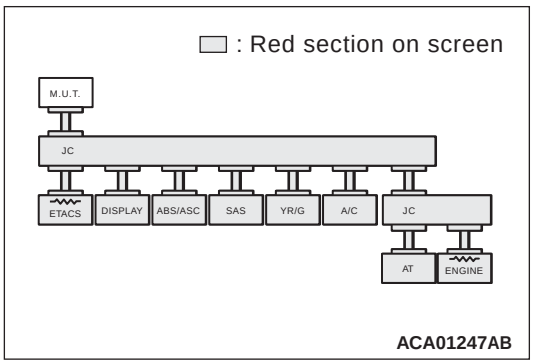
NO : <More than 4.0 V> Go to Step 9.

STEP 9. M.U.T.-III CAN bus diagnostics [RV meter connector disconnected]





(1) Disconnect RV meter connector C-171, and diagnose by using the M.U.T.-III.



(2) Diagnose CAN bus lines, and check if M.U.T.-III screen is as shown in the illustration.

Q: Does M.U.T.-III screen correspond to the illustration?

YES : Repair the wiring harness between joint connector (CAN1) and the RV meter connector.

NO : Check the RV meter connector, and repair if necessary. If the RV meter connector is in good condition, repair the RV meter power supply circuit. (Refer to GROUP 54A – RV meter .)

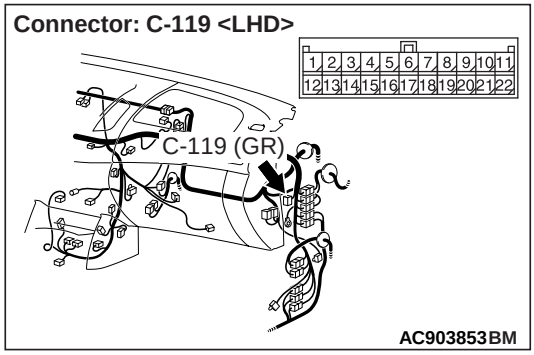
STEP 10. Check the CAN line between joint connector (CAN1) and the ABS-ECU. Voltage measurement at C-119 joint connector (CAN1).

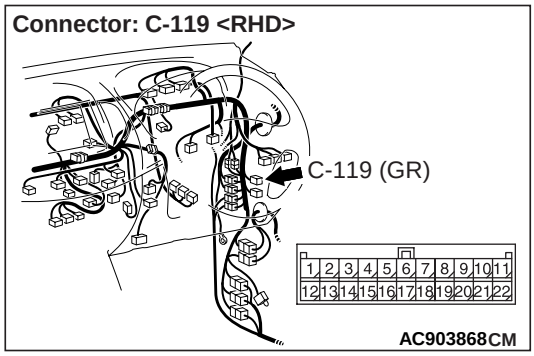
⚠ CAUTION

A digital multimeter should be used. For details refer to P.54C-7.

⚠ CAUTION

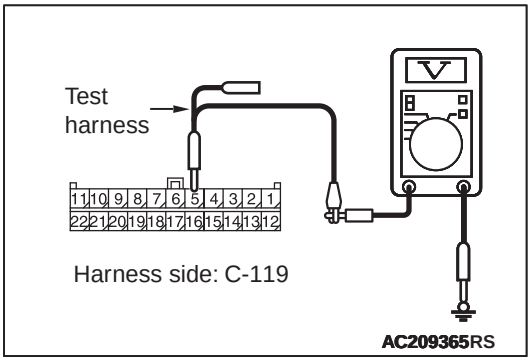
The test wiring harness should be used. For details refer to P.54C-7.





(1) Disconnect joint connector (CAN1), and measure at the wiring harness side.

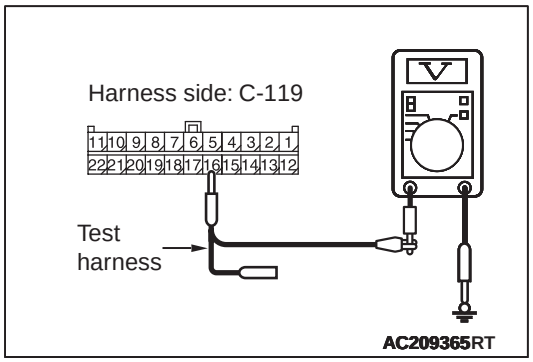
(2) Connect the negative battery terminal, and turn the ignition switch to the ON position.



(3) Voltage between C-119 joint connector (CAN1)

terminal No.5 (CAN_H) and body earth

OK: 4.0 V or less



(4) Voltage between C-119 joint connector (CAN1) terminal No.16 (CAN_L) and body earth

OK: 4.0 V or less

(5) Disconnect the negative battery terminal.

⚠ CAUTION

Strictly observe the specified wiring harness repair procedure. For details refer to P.54C-7.

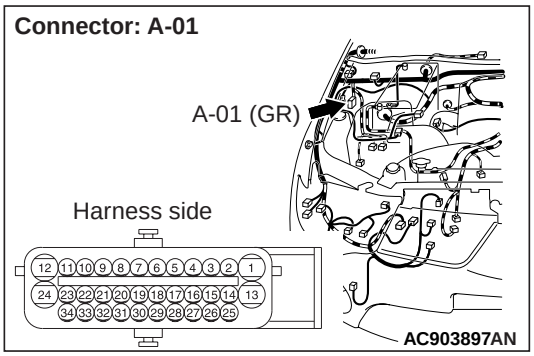
Q: Is the check result normal?

YES <vehicles without A/C> : <4.0 V or less> Go to Step 22.

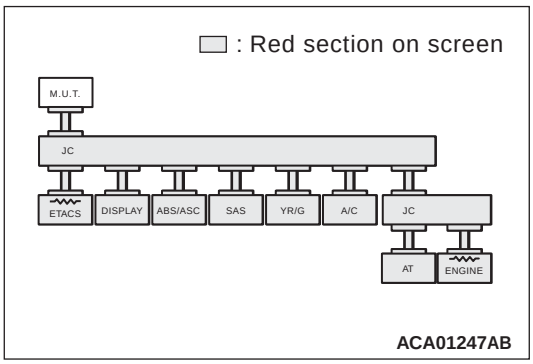
YES <vehicles with A/C> : <4.0 V or less> Go to Step 20.

NO : <More than 4.0 V> Go to Step 11.

STEP 11. M.U.T.-III CAN bus diagnostics [ABS-ECU connector disconnected]



(1) Disconnect ABS-ECU connector A-01, and diagnose by using the M.U.T.-III.



(2) Diagnose CAN bus lines, and check if M.U.T.-III screen is as shown in the illustration.

Q: Does M.U.T.-III screen correspond to the illustration?

YES : Check the intermediate connector (C-13), and repair if necessary. If the intermediate connector is in good condition, repair the wiring harness between joint connector (CAN1) and the ABS-ECU connector.

NO : Check the ABS-ECU connector, and repair if necessary. If the ABS-ECU connector is in good condition, go to Step 12.

STEP 12. M.U.T.-III CAN bus diagnostics (retest the system)

Diagnose CAN bus lines, and check if M.U.T.-III screen shows normal state.

Q: Is the check result normal?

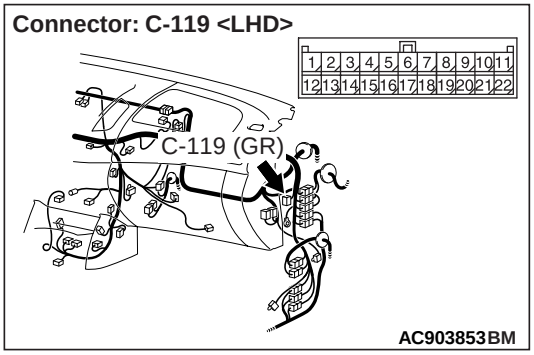
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

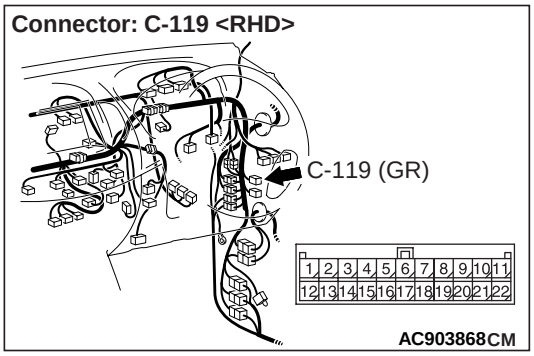
NO : Check the ABS-ECU connector, and repair if necessary. If the ABS-ECU connector is in good condition, replace the hydraulic unit assembly.

STEP 13. Check the CAN line between joint connector (CAN1) and the ASTC-ECU. Voltage measurement at C-119 joint connector (CAN1).

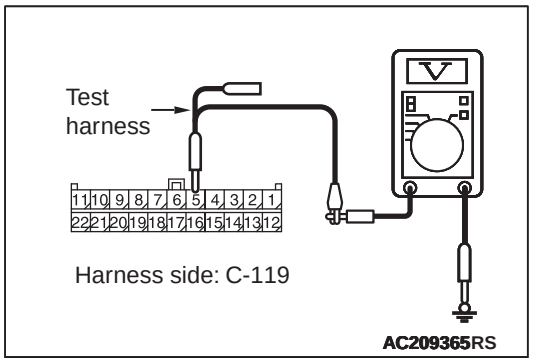
⚠ CAUTION
A digital multimeter should be used. For details refer to P.54C-7.

⚠ CAUTION
The test wiring harness should be used. For details refer to P.54C-7.



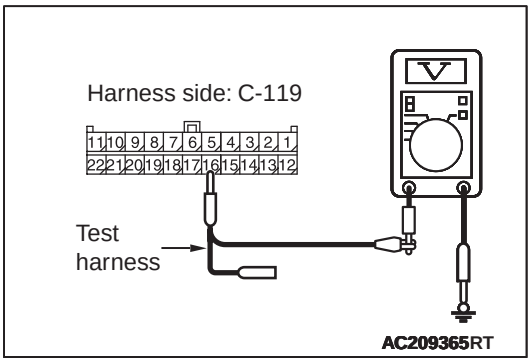


(1) Disconnect joint connector (CAN1), and measure at the wiring harness side.
(2) Connect the negative battery terminal, and turn the ignition switch to the ON position.



(3) Voltage between C-119 joint connector (CAN1) terminal No.5 (CAN_H) and body earth

OK: 4.0 V or less



(4) Voltage between C-119 joint connector (CAN1) terminal No.16 (CAN_L) and body earth

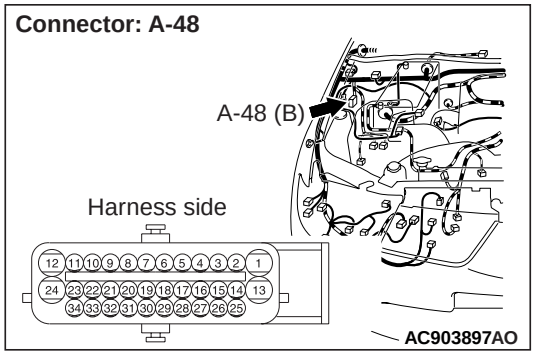
OK: 4.0 V or less

(5) Disconnect the negative battery terminal.

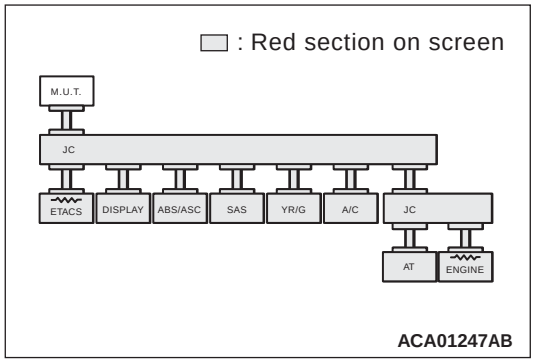
⚠ CAUTION
Strictly observe the specified wiring harness repair procedure. For details refer to P.54C-7.

Q: Is the check result normal?
YES : <4.0 V or less> Go to Step 16.
NO : <More than 4.0 V> Go to Step 14.

STEP 14. M.U.T.-III CAN bus diagnostics [ASTC-ECU connector disconnected]



(1) Disconnect ASTC-ECU connector A-48, and diagnose by using the M.U.T.-III.



(2) Diagnose CAN bus lines, and check if M.U.T.-III screen is as shown in the illustration.

Q: Does M.U.T.-III screen correspond to the illustration?

YES : Check the intermediate connector (C-13), and repair if necessary. If the intermediate connector is in good condition, repair the wiring harness between joint connector (CAN1) and the ASTC-ECU connector.

NO : Check the ASTC-ECU connector, and repair if necessary. If the ASTC-ECU connector is in good condition, go to Step 15.

STEP 15. M.U.T.-III CAN bus diagnostics (retest the system)

Diagnose CAN bus lines, and check if M.U.T.-III screen shows normal state.

Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

NO : Check the ASTC-ECU connector, and repair if necessary. If the ASTC-ECU connector is in good condition, replace the hydraulic unit assembly.

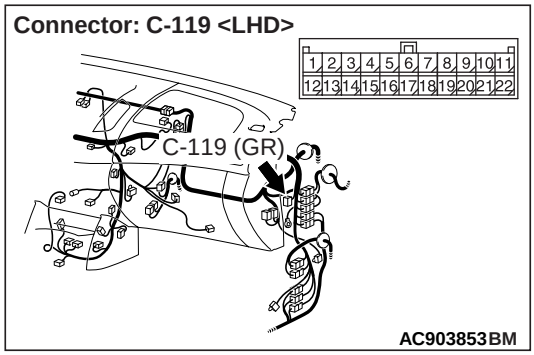
STEP 16. Check the CAN line between joint connector (CAN1) and the steering wheel sensor. Voltage measurement at C-119 joint connector (CAN1).

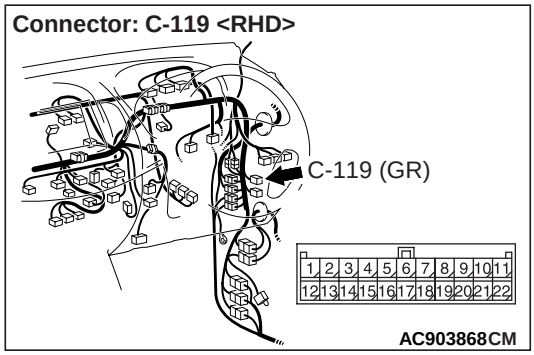
⚠ CAUTION

A digital multimeter should be used. For details refer to P.54C-7.

⚠ CAUTION

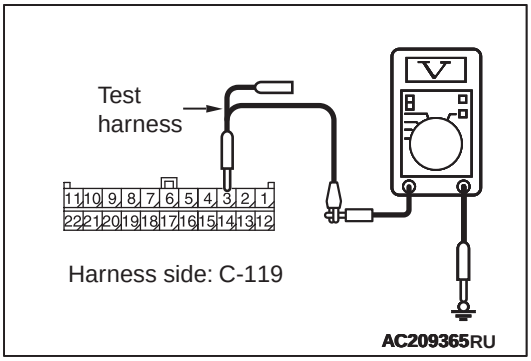
The test wiring harness should be used. For details refer to P.54C-7.





(1) Disconnect joint connector (CAN1), and measure at the wiring harness side.

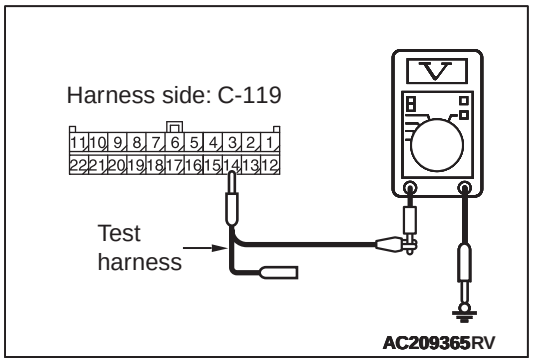
(2) Connect the negative battery terminal, and turn the ignition switch to the ON position.



(3) Voltage between C-119 joint connector (CAN1)

terminal No.3 (CAN_H) and body earth

OK: 4.0 V or less



(4) Voltage between C-119 joint connector (CAN1) terminal No.14 (CAN_L) and body earth

OK: 4.0 V or less

(5) Disconnect the negative battery terminal.

⚠ CAUTION

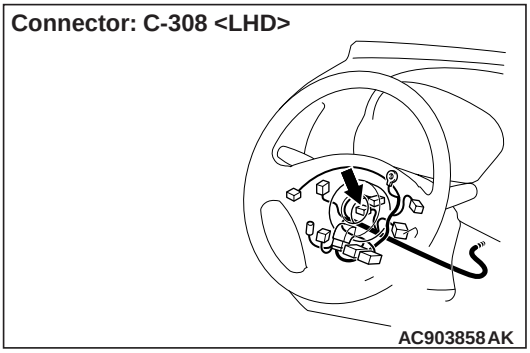
Strictly observe the specified wiring harness repair procedure. For details refer to P.54C-7.

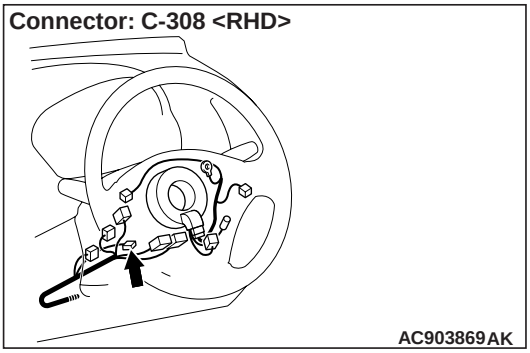
Q: Is the check result normal?

YES : <4.0 V or less> Go to Step 18.

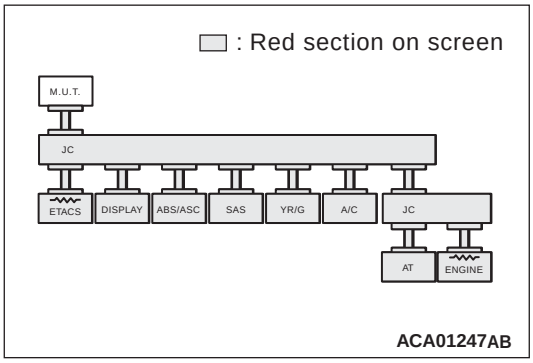
NO : <More than 4.0 V> Go to Step 17.

STEP 17. M.U.T.-III CAN bus diagnostics [steering wheel sensor connector disconnected]





(1) Disconnect steering wheel sensor connector C-308, and diagnose by using the M.U.T.-III.



(2) Diagnose CAN bus lines, and check if M.U.T.-III screen is as shown in the illustration.

Q: Does M.U.T.-III screen correspond to the illustration?

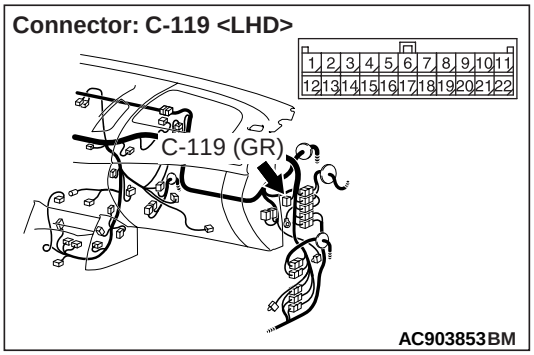
YES : Repair the wiring harness between joint connector (CAN1) and the steering wheel sensor connector.

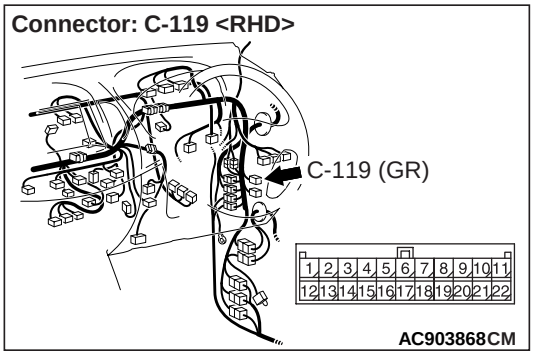
NO : Check the steering wheel sensor connector, and repair if necessary. If the steering wheel sensor connector is in good condition, repair the steering wheel sensor power supply circuit.

STEP 18. Check the CAN line between joint connector (CAN1) and the G and yaw rate sensor. Voltage measurement at C-119 joint connector (CAN1).

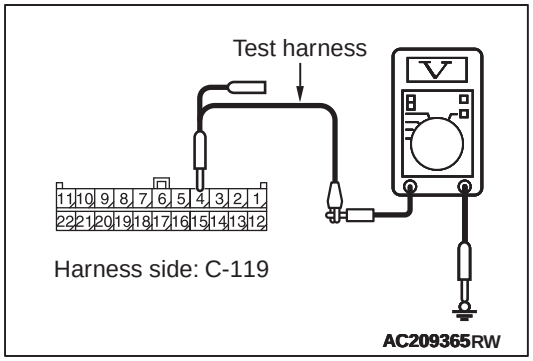
⚠ CAUTION
A digital multimeter should be used. For details refer to P.54C-7.

⚠ CAUTION
The test wiring harness should be used. For details refer to P.54C-7.

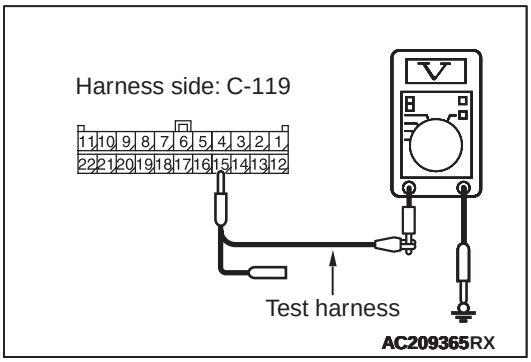




(1) Disconnect joint connector (CAN1), and measure at the wiring harness side.
(2) Connect the negative battery terminal, and turn the ignition switch to the ON position.



(3) Voltage between C-119 joint connector (CAN1) terminal No.4 (CAN_H) and body earth
OK: 4.0 V or less

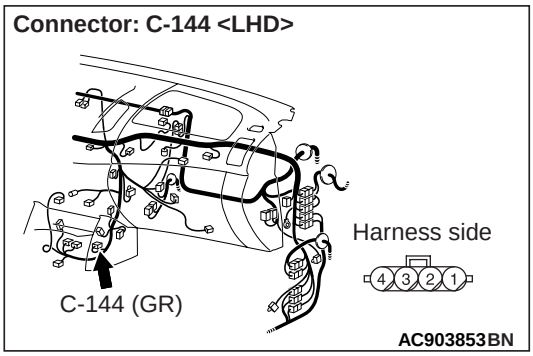


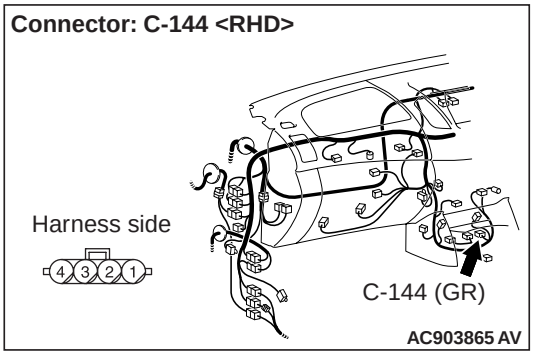
(4) Voltage between C-119 joint connector (CAN1) terminal No.15 (CAN_L) and body earth
OK: 4.0 V or less
(5) Disconnect the negative battery terminal.

⚠ CAUTION
Strictly observe the specified wiring harness repair procedure. For details refer to P.54C-7.

Q: Is the check result normal?
YES <vehicles without A/C> : <4.0 V or less> Go to Step 22.
YES <vehicles with A/C> : <4.0 V or less> Go to Step 20.
NO : <More than 4.0 V> Go to Step 19.

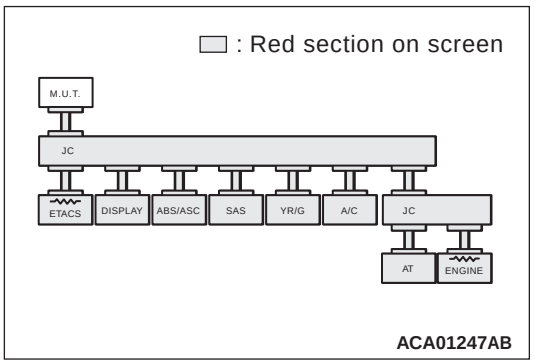
STEP 19. M.U.T.-III CAN bus diagnostics [G and yaw rate sensor connector disconnected]





(1) Disconnect G and yaw rate sensor connector C-

144, and diagnose by using the M.U.T.-III.



(2) Diagnose CAN bus lines, and check if M.U.T.-III screen is as shown in the illustration.

Q: Does M.U.T.-III screen correspond to the illustration?

YES : Repair the wiring harness between joint connector (CAN1) and the G and yaw rate sensor connector.

NO : Check the G and yaw rate sensor connector, and repair if necessary. If the G and yaw rate sensor connector is in good condition, repair the G and yaw rate sensor power supply circuit.

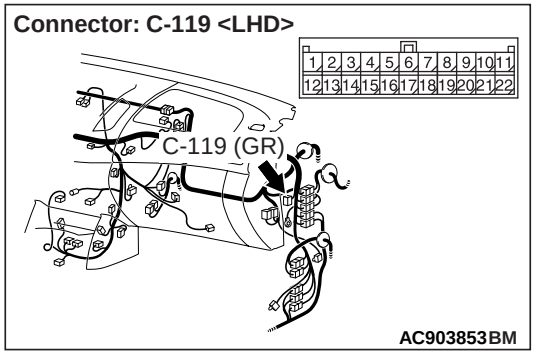
STEP 20. Check the CAN line between joint connector (CAN1) and the A/C-ECU. Voltage measurement at C-119 joint connector (CAN1).

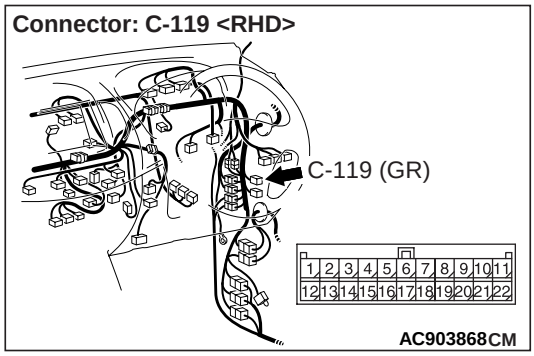
⚠ CAUTION

A digital multimeter should be used. For details refer to P.54C-7.

⚠ CAUTION

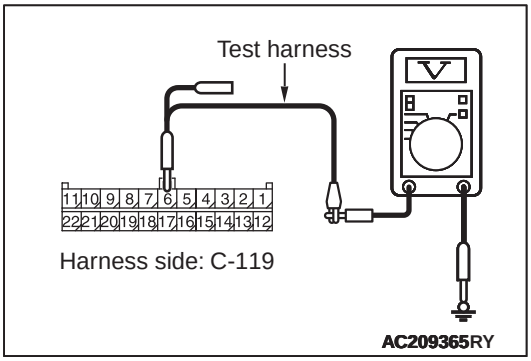
The test wiring harness should be used. For details refer to P.54C-7.





(1) Disconnect joint connector (CAN1), and measure at the wiring harness side.

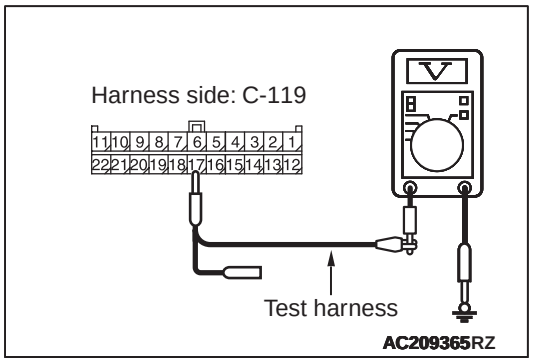
(2) Connect the negative battery terminal, and turn the ignition switch to the ON position.



(3) Voltage between C-119 joint connector (CAN1)

terminal No.6 (CAN_H) and body earth

OK: 4.0 V or less



(4) Voltage between C-119 joint connector (CAN1) terminal No.17 (CAN_L) and body earth

OK: 4.0 V or less

(5) Disconnect the negative battery terminal.

⚠ CAUTION

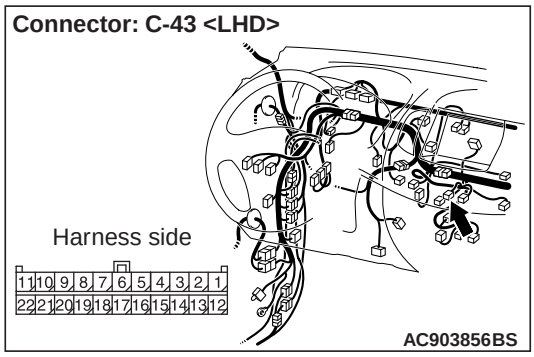
Strictly observe the specified wiring harness repair procedure. For details refer to P.54C-7.

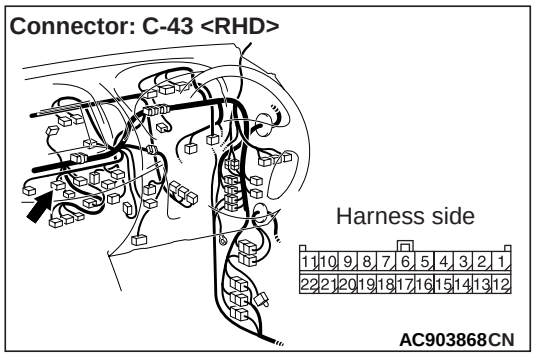
Q: Is the check result normal?

YES : <4.0 V or less> Go to Step 22.

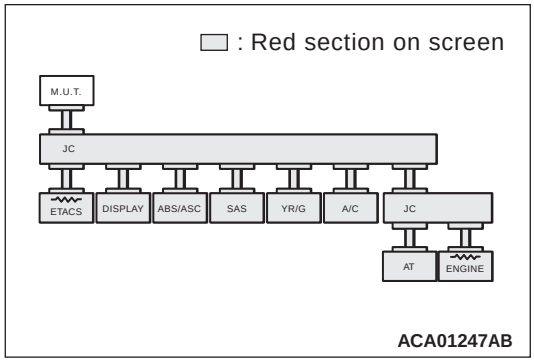
NO : <More than 4.0 V> Go to Step 21.

STEP 21. M.U.T.-III CAN bus diagnostics [A/C-ECU connector disconnected]





(1) Disconnect A/C-ECU connector C-43, and diagnose by using the M.U.T.-III.



(2) Diagnose CAN bus lines, and check if M.U.T.-III screen is as shown in the illustration.

Q: Does M.U.T.-III screen correspond to the illustration?

YES : Repair the wiring harness between joint connector (CAN1) and the A/C-ECU connector.

NO : Check the A/C-ECU connector, and repair if necessary. If the A/C-ECU connector is in good condition, repair the A/C-ECU power supply circuit. (Refer to GROUP 55B .)

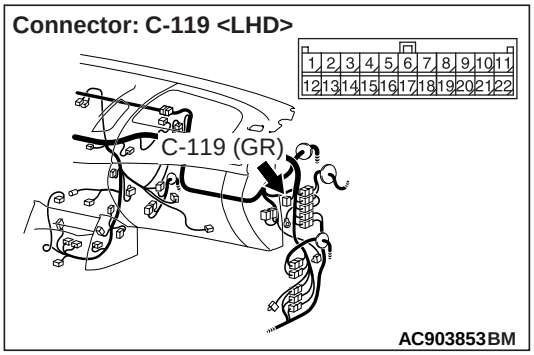
STEP 22. Check the CAN line between joint connector (CAN1) and the diagnosis connector. Voltage measurement at C-119 joint connector (CAN1).

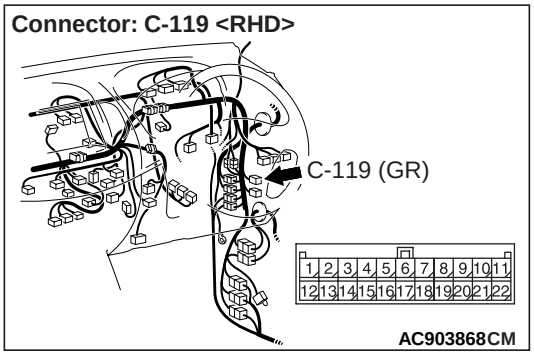
⚠ CAUTION

A digital multimeter should be used. For details refer to P.54C-7.

⚠ CAUTION

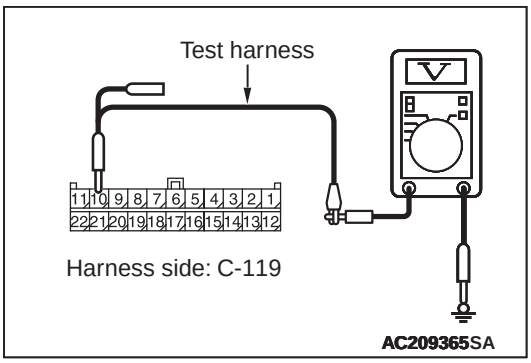
The test wiring harness should be used. For details refer to P.54C-7.





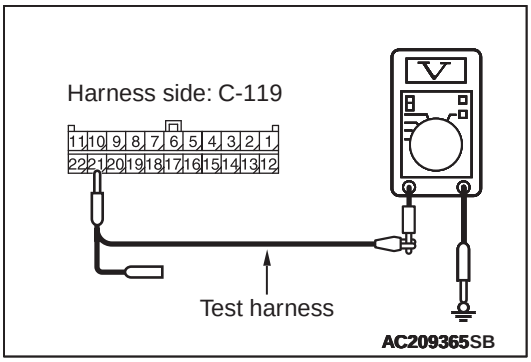
(1) Disconnect joint connector (CAN1), and measure at the wiring harness side.

(2) Connect the negative battery terminal, and turn the ignition switch to the ON position.



(3) Voltage between C-119 joint connector (CAN1) terminal No.10 (CAN_H) and body earth

OK: Less than 1.0 V



(4) Voltage between C-119 joint connector (CAN1) terminal No.21 (CAN_L) and body earth

OK: Less than 1.0 V

(5) Disconnect the negative battery terminal.

⚠ CAUTION

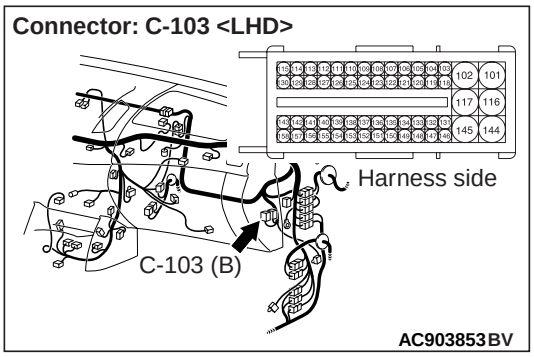
Strictly observe the specified wiring harness repair procedure. For details refer to P.54C-7.

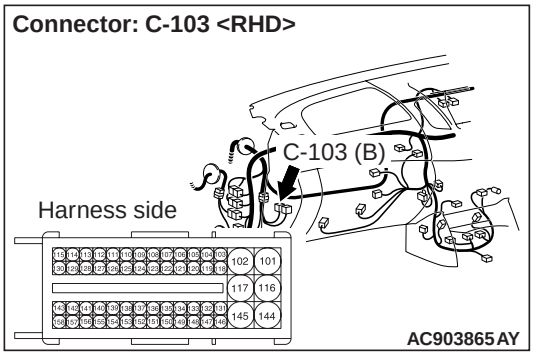
Q: Is the check result normal?

YES : <Less than 1.0 V> Repair the intermediate connector, or the wiring harness between joint connector (CAN1) and the intermediate connector C-53 <LHD> or C-35 <RHD>.

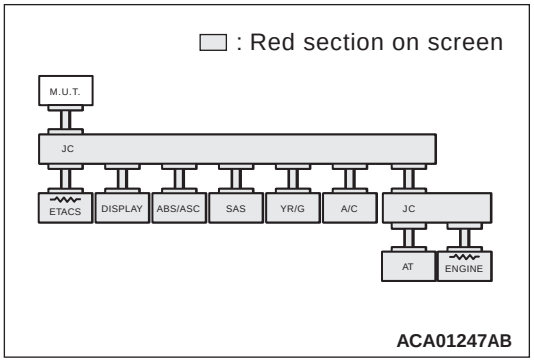
NO : <1.0 V or more> Repair the diagnosis connector, or the wiring harness between joint connector (CAN1) and the diagnosis connector.

STEP 23. M.U.T.-III CAN bus diagnostics [engine-ECU connector disconnected]





(1) Disconnect engine-ECU connector C-103 and diagnose by using the M.U.T.-III.



(2) Diagnose CAN bus lines, and check if M.U.T.-III screen is as shown in the illustration.

Q: Does M.U.T.-III screen correspond to the illustration?

YES : Go to Step 25.

NO : Check the engine-ECU connector, and repair if necessary. If the engine-ECU connector is in good condition, go to Step 24.

STEP 24. M.U.T.-III CAN bus diagnostics (retest the system)

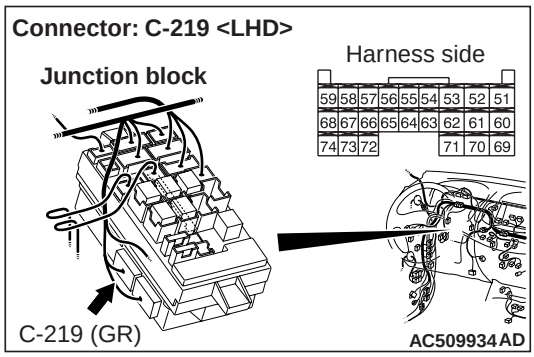
Diagnose CAN bus lines, and check if M.U.T.-III screen shows normal state.

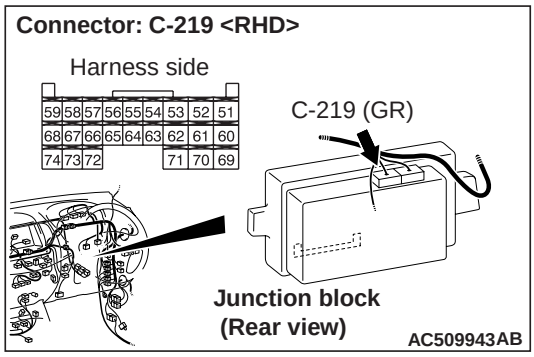
Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

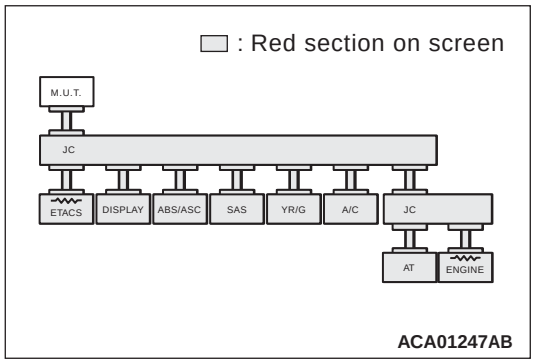
NO : Check the engine-ECU connector, and repair if necessary. If the engine-ECU connector is in good condition, replace the engine-ECU.

STEP 25. M.U.T.-III CAN bus diagnostics [ETACS-ECU connector disconnected]





(1) Disconnect ETACS-ECU connector C-219, and diagnose by using the M.U.T.-III.



(2) Diagnose CAN bus lines, and check if M.U.T.-III screen is as shown in the illustration.

Q: Does M.U.T.-III screen correspond to the illustration?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

NO : Check the ETACS-ECU connector, and repair if necessary. If the ETACS-ECU connector is in good condition, go to Step 26.

STEP 26. M.U.T.-III CAN bus diagnostics (retest the system)

Diagnose CAN bus lines, and check if M.U.T.-III screen shows normal state.

Q: Is the check result normal?

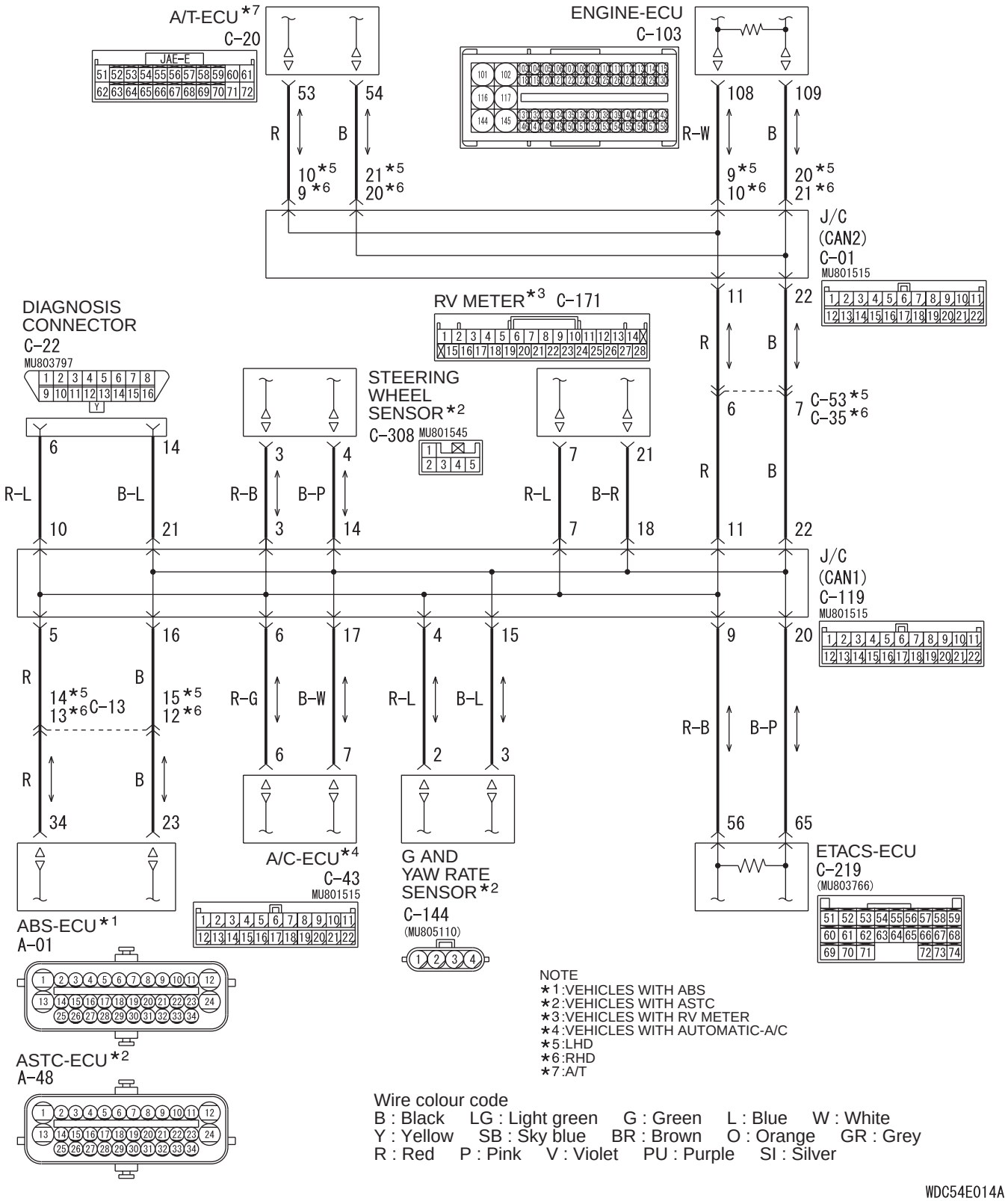
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

NO : Check the ETACS-ECU connector, and repair if necessary. If the ETACS-ECU connector is in good condition, replace the ETACS-ECU.

Diagnosis Item 2: Diagnose shorts in the earth to CAN bus line

⚠ CAUTION

When servicing a CAN bus line, earth yourself by touching a metal object such as an unpainted water pipe. If you fail to do, a component connected to the CAN bus line may be broken.



FUNCTION

When diagnosing the CAN bus lines, the M.U.T.-III measures the voltage of CAN_H and CAN_L line and detects the short to power supply or earth.

TROUBLE JUDGEMENT CONDITIONS

The M.U.T.-III judges the trouble when it is impossible to receive the periodically sent data and the voltage of CAN_H or CAN_L line is less than 1.0 V.

TROUBLESHOOTING HINTS

- Malfunction of the wiring harness
- Malfunction of the connector
- Malfunction of each ECU

DIAGNOSIS PROCEDURE

STEP 1. Check the CAN bus lines. Resistance measurement at C-22 diagnosis connector.

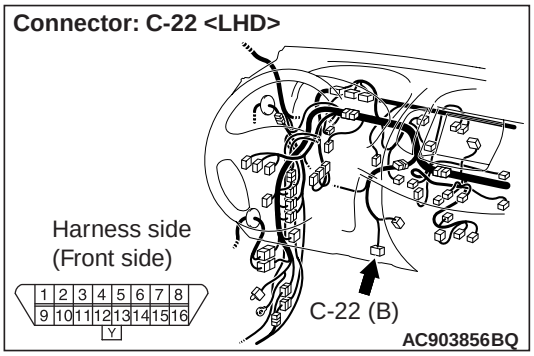
⚠ CAUTION

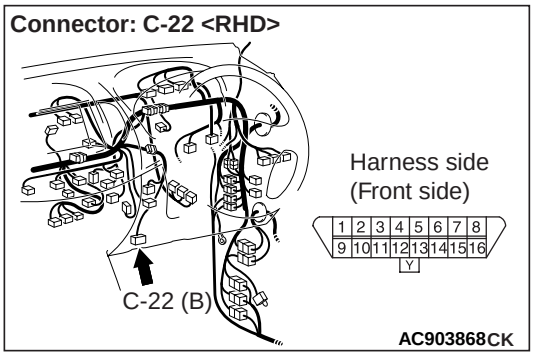
A digital multimeter should be used. For details refer to P.54C-7.

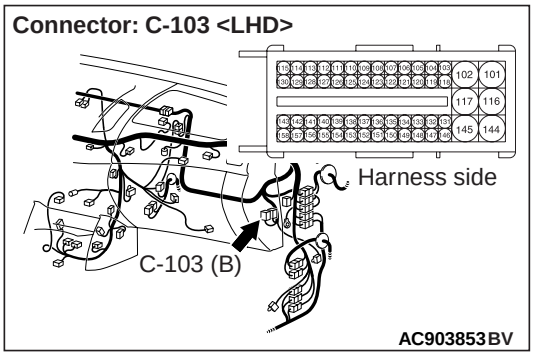
⚠ CAUTION

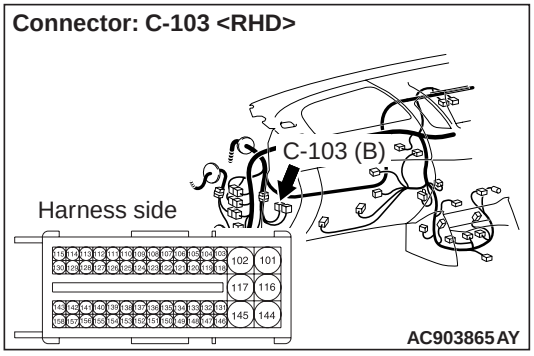
The test wiring harness should be used. For details refer to P.54C-7.

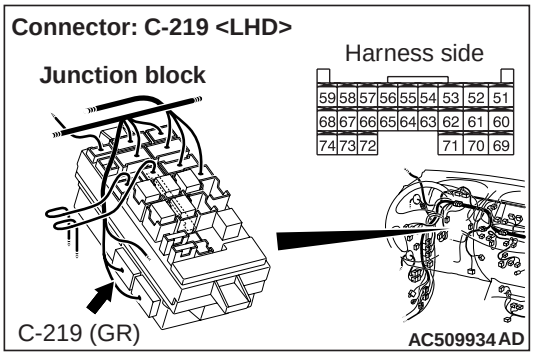
NOTE: This inspection allows you to check that there is a short to earth in either CAN_H line or CAN_L line. Thus, in the following steps, check the CAN bus line that is defective.

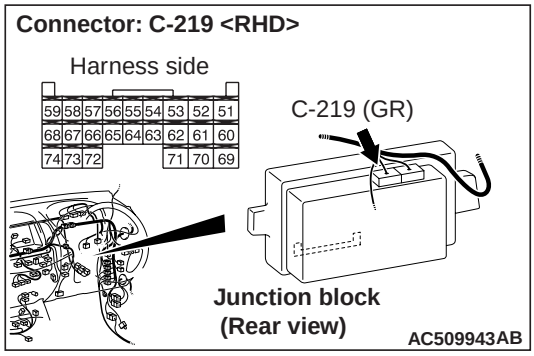










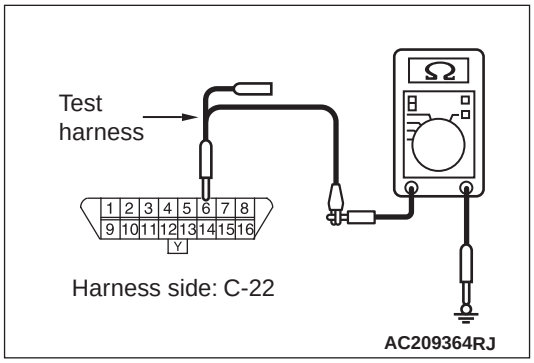


(1) Disconnect engine-ECU connector C-103 and ETACS-ECU connector C-219, and measure the resistance at harness side of diagnosis connector C-22.

⚠ CAUTION

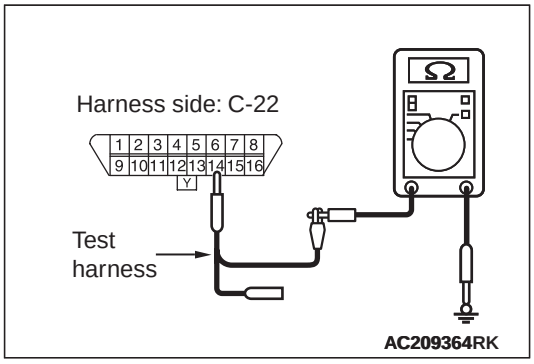
When measuring the resistance, disconnect the negative battery terminal. For details refer to P.54C-7.

(2) Ensure that the negative battery terminal is disconnected.



(3) Resistance between C-22 diagnosis connector terminal No.6 (CAN_H) and body earth

OK: 1 kΩ or more



(4) Resistance between C-22 diagnosis connector terminal No.14 (CAN_L) and body earth

OK: 1 kΩ or more

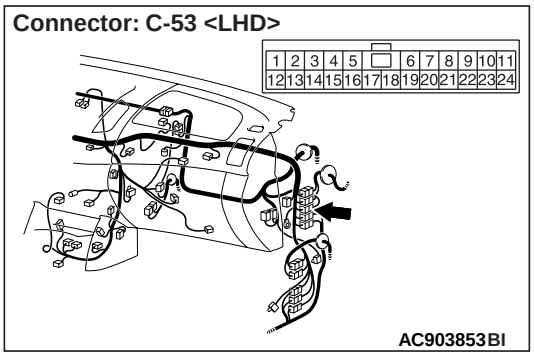
Q: Is the check result normal?

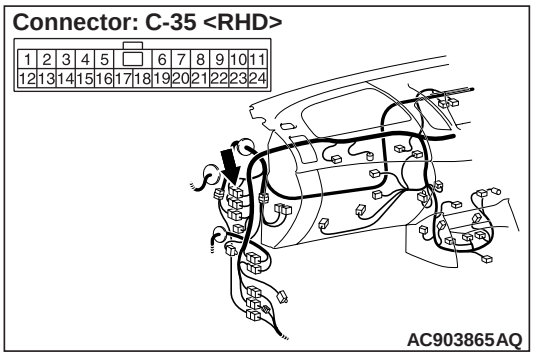
YES : <Both of the measurement results show 1 kΩ or more> Go to Step 23.
NO : <Either of CAN_H line or CAN_L line the measurement results show less than 1 kΩ > Go to Step 2.

STEP 2. Check the CAN line. Resistance measurement at C-53 <LHD> or C-35 <RHD> intermediate connector.

⚠ CAUTION
A digital multimeter should be used. For details refer to P.54C-7.

⚠ CAUTION
The test wiring harness should be used. For details refer to P.54C-7.

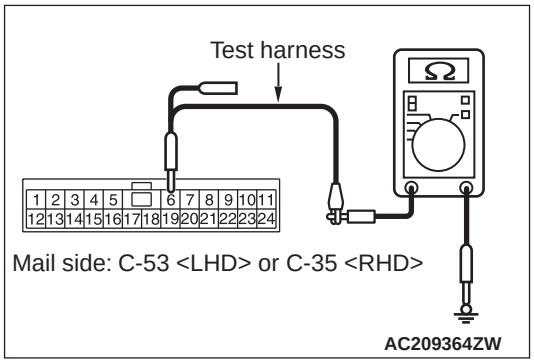




(1) Disconnect the intermediate connector C-53 <LHD> or C-35 <RHD>, and measure at its male-side intermediate connector (at the control wiring harness side).

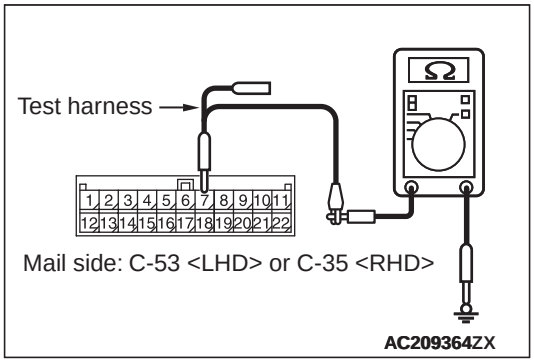
⚠ CAUTION
When measuring the resistance, disconnect the negative battery terminal. For details refer to P.54C-7.

(2) Ensure that the negative battery terminal is disconnected.



(3) Resistance between C-53 <LHD> or C-35 <RHD> intermediate connector terminal No.6 (CAN_H) and body earth

OK: 1 kΩ or more



(4) Resistance between C-53 <LHD> or C-35 <RHD> intermediate connector terminal No.7 (CAN_L) and body earth

OK: 1 kΩ or more

Q: Is the check result normal?
YES : <1 kΩ or more> Go to Step 7.
NO : <Less than 1 kΩ > Go to Step 3.

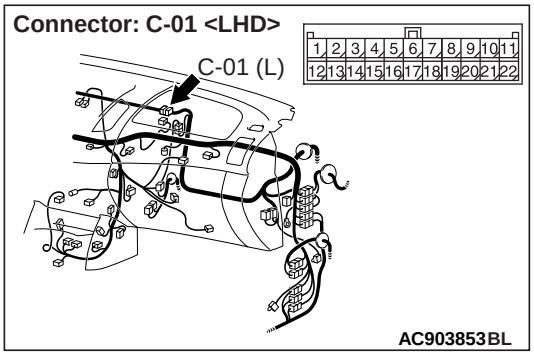
STEP 3. Check the CAN line between joint connector (CAN2) and the engine-ECU. Resistance measurement at C-01 joint connector (CAN2).

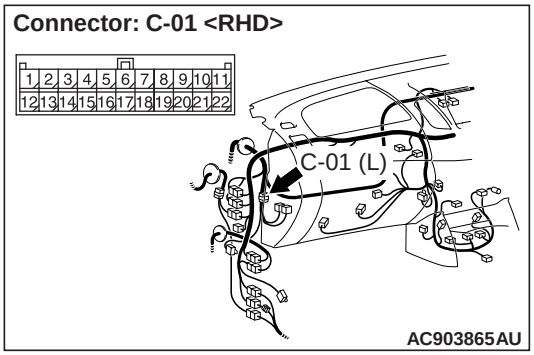
⚠ CAUTION

A digital multimeter should be used. For details refer to P.54C-7.

⚠ CAUTION

The test wiring harness should be used. For details refer to P.54C-7.



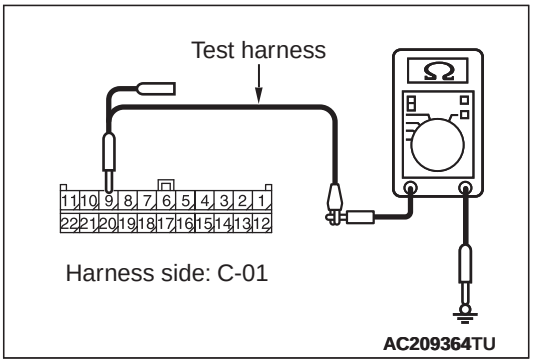


(1) Disconnect joint connector (CAN2), and measure at the wiring harness side.

⚠ CAUTION

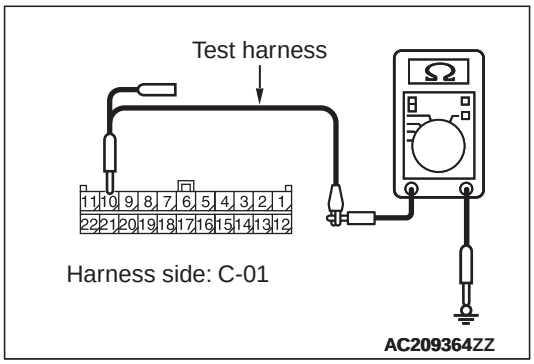
When measuring the resistance, disconnect the negative battery terminal. For details refer to P.54C-7.

(2) Ensure that the negative battery terminal is disconnected.



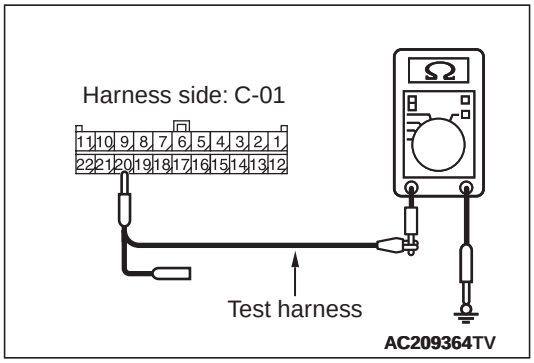
(3) Resistance between C-01 joint connector (CAN2) terminal No.9 (CAN_H) and body earth <LHD>

OK: 1 kΩ or more



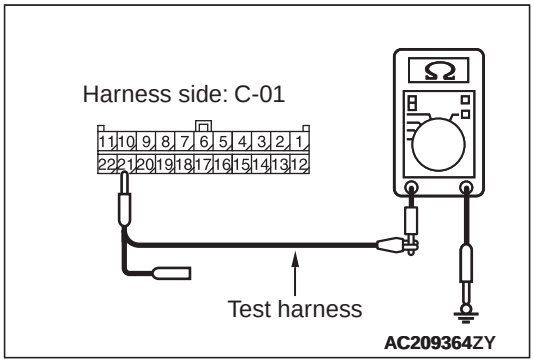
(4) Resistance between C-01 joint connector (CAN2) terminal No.10 (CAN_H) and body earth <RHD>

OK: 1 kΩ or more



(5) Resistance between C-01 joint connector (CAN2) terminal No.20 (CAN_L) and body earth <LHD>

OK: 1 kΩ or more



(6) Resistance between C-01 joint connector (CAN2) terminal No.21 (CAN_L) and body earth <RHD>

OK: 1 kΩ or more

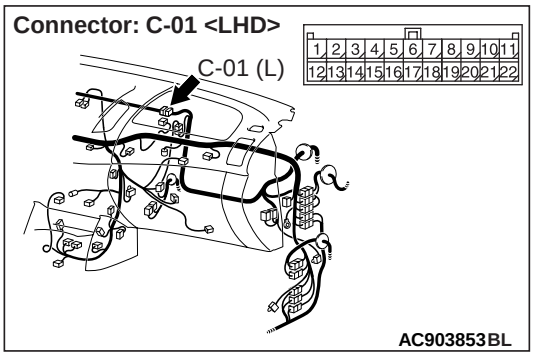
Q: Is the check result normal?

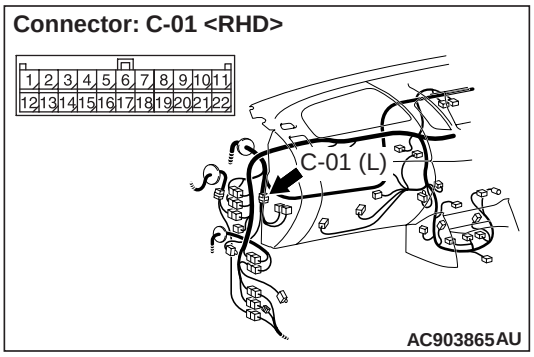
YES <M/T> : <1 kΩ or more> Repair intermediate connector C-53 <LHD> or C-35 <RHD>, or the wiring harness between joint connector (CAN2) and intermediate connector C-53 <LHD> or C-35 <RHD>.
YES <A/T> : <1 kΩ or more> Go to Step 4.
NO : <Less than 1 kΩ > Repair the wiring harness between joint connector (CAN2) and the engine-ECU connector.

STEP 4. Check the CAN line between joint connector (CAN2) and the A/T-ECU. Resistance measurement at C-01 joint connector (CAN2).

⚠ CAUTION
A digital multimeter should be used. For details refer to P.54C-7.

⚠ CAUTION
The test wiring harness should be used. For details refer to P.54C-7.

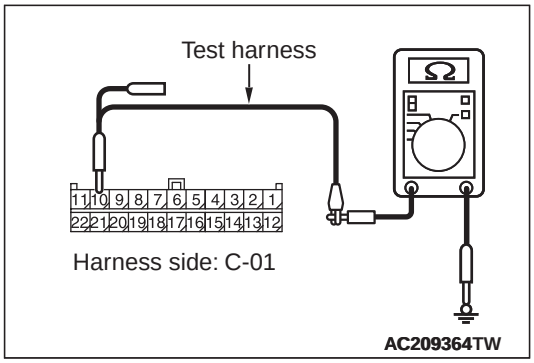




(1) Disconnect joint connector (CAN2), and measure at the wiring harness side.

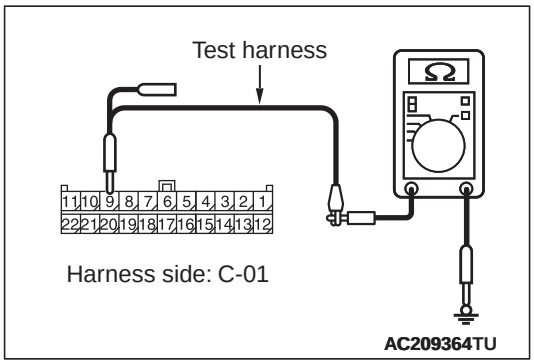
⚠ CAUTION
When measuring the resistance, disconnect the negative battery terminal. For details refer to P.54C-7.

(2) Ensure that the negative battery terminal is disconnected.



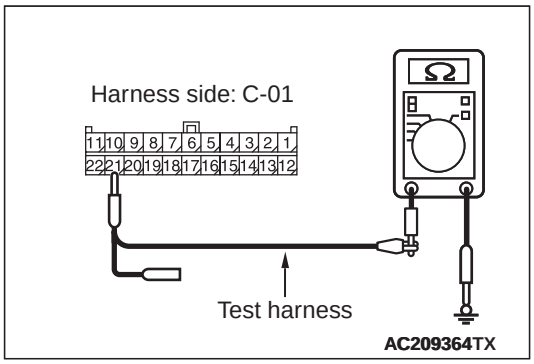
(3) Resistance between C-01 joint connector (CAN2) terminal No.10 (CAN_H) and body earth <LHD>

OK: 1 kΩ or more



(4) Resistance between C-01 joint connector (CAN2) terminal No.9 (CAN_H) and body earth <RHD>

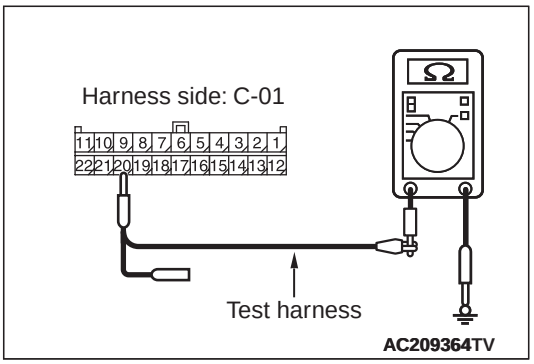
OK: 1 kΩ or more



(5) Resistance between C-01 joint connector (CAN2)

terminal No.21 (CAN_L) and body earth <LHD>

OK: 1 kΩ or more



(6) Resistance between C-01 joint connector (CAN2) terminal No.20 (CAN_L) and body earth <RHD>

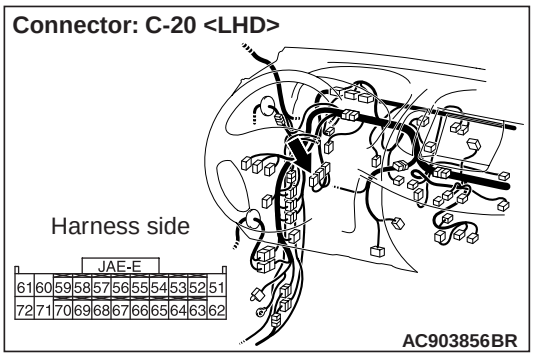
OK: 1 kΩ or more

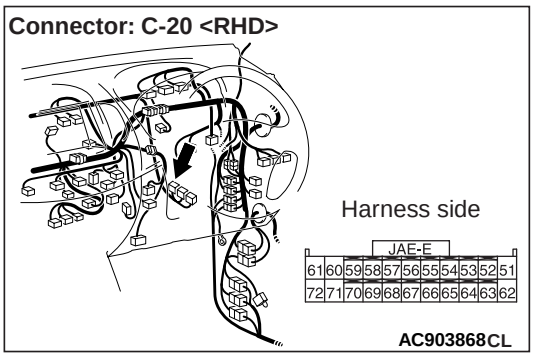
Q: Is the check result normal?

YES : <1 kΩ or more> Repair intermediate connector C-53 <LHD> or C-35 <RHD>, or the wiring harness between joint connector (CAN2) and intermediate connector C-53 <LHD> or C-35 <RHD>.

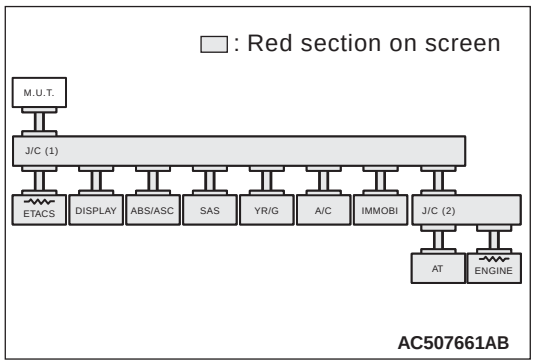
NO : <Less than 1 kΩ > Go to Step 5.

STEP 5. M.U.T.-III CAN bus diagnostics [A/T-ECU connector disconnected]





(1) Disconnect A/T-ECU connector C-20, and diagnose by using the M.U.T.-III.



(2) Diagnose CAN bus lines, and check if M.U.T.-III screen is as shown in the illustration.

Q: Does M.U.T.-III screen correspond to the illustration?

YES : Repair the wiring harness between joint connector (CAN2) and the A/T-ECU connector.

NO : Check the A/T-ECU connector, and repair if necessary. If the A/T-ECU connector is in good condition, go to Step 6.

STEP 6. M.U.T.-III CAN bus diagnostics (retest the system)

Diagnose CAN bus lines, and check if M.U.T.-III screen shows normal state.

Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

NO : Check the A/T-ECU connector, and repair if necessary. If the A/T-ECU connector is in good condition, replace the A/T-ECU.

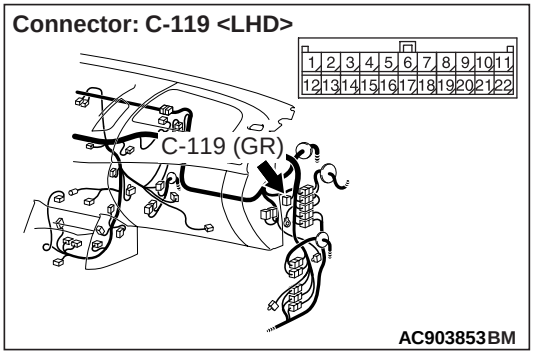
STEP 7. Check CAN line between joint connector (CAN1) and the ETACS-ECU. Resistance measurement at C-119 joint connector (CAN1).

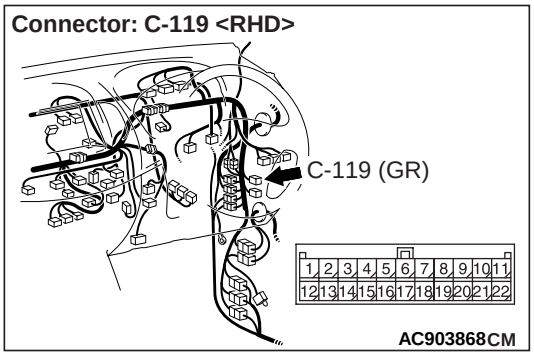
⚠ CAUTION

A digital multimeter should be used. For details refer to P.54C-7.

⚠ CAUTION

The test wiring harness should be used. For details refer to P.54C-7.



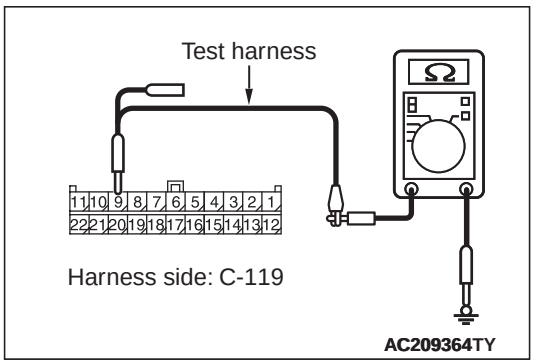


(1) Disconnect joint connector (CAN1), and measure at the wiring harness side.

⚠ CAUTION

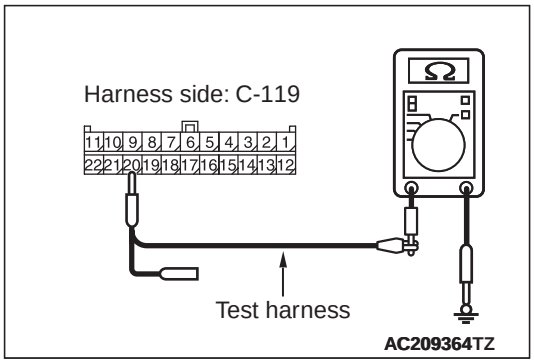
When measuring the resistance, disconnect the negative battery terminal. For details refer to P.54C-7.

(2) Ensure that the negative battery terminal is disconnected.



(3) Resistance between C-119 joint connector (CAN1) terminal No.9 (CAN_H) and body earth

OK: 1 kΩ or more



(4) Resistance between C-119 joint connector (CAN1) terminal No.20 (CAN_L) and body earth

OK: 1 kΩ or more

⚠ CAUTION

Strictly observe the specified wiring harness repair procedure. For details refer to P.54C-7.

Q: Is the check result normal?

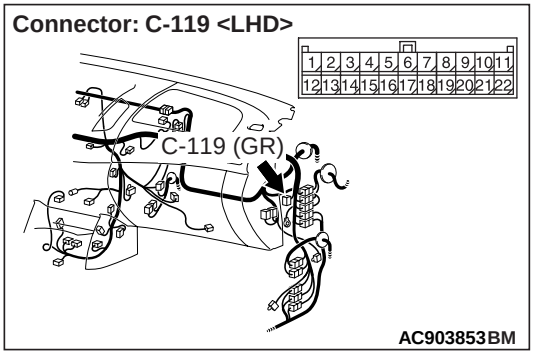
YES : <1 kΩ or more> Go to Step 8.

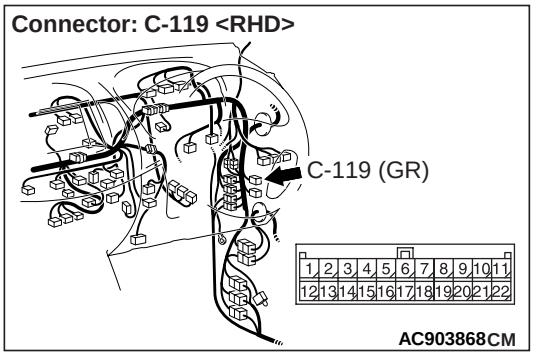
NO : <Less than 1 kΩ > Repair the wiring harness between joint connector (CAN1) and the ETACS-ECU connector.

STEP 8. Check the CAN line between joint connector (CAN1) and the RV meter. Resistance measurement at C-119 joint connector (CAN1).

⚠ CAUTION
A digital multimeter should be used. For details refer to P.54C-7.

⚠ CAUTION
The test wiring harness should be used. For details refer to P.54C-7.

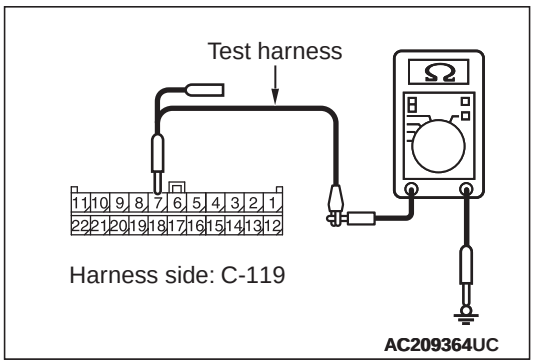




(1) Disconnect joint connector (CAN1), and measure at the wiring harness side.

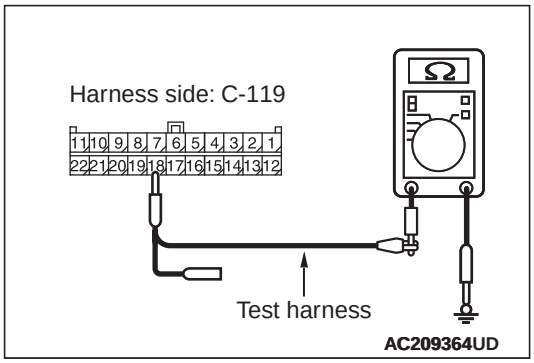
⚠ CAUTION
When measuring the resistance, disconnect the negative battery terminal. For details refer to P.54C-7.

(2) Ensure that the negative battery terminal is disconnected.



(3) Resistance between C-119 joint connector (CAN1) terminal No.7 (CAN_H) and body earth

OK: 1 kΩ or more



(4) Resistance between C-119 joint connector (CAN1) terminal No.18 (CAN_L) and body earth

OK: 1 kΩ or more

⚠ CAUTION
Strictly observe the specified wiring harness repair procedure. For details refer to P.54C-7.

Q: Is the check result normal?

YES <vehicles without ABS, ASTC and A/C> : <1 kΩ or more> Go to Step 22.

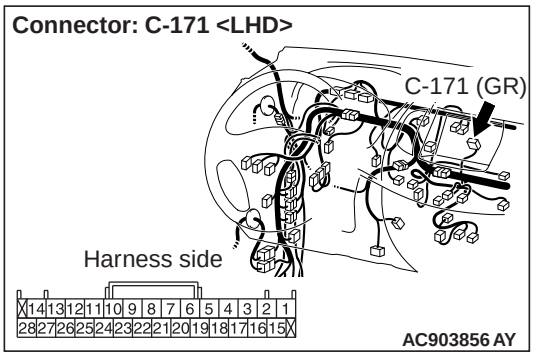
YES <vehicles with ABS> : <1 kΩ or more> Go to Step 10.

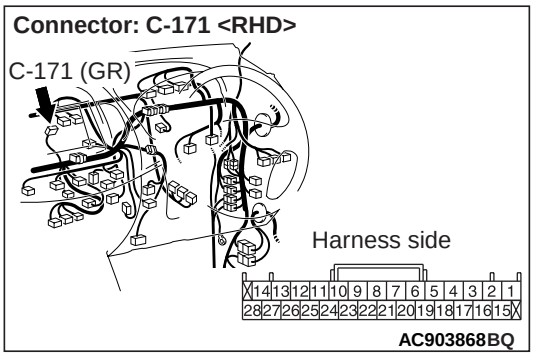
YES <vehicles with ABS> : <1 kΩ or more> Go to Step 13.

YES <vehicles without ABS and ASTC, and with A/C> : <1 kΩ or more> Go to Step 20.

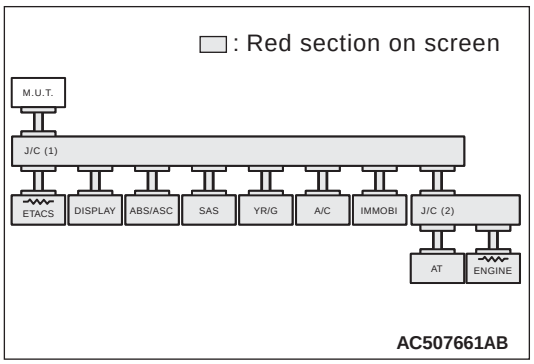
NO : <Less than 1 kΩ > Go to Step 9.

STEP 9. M.U.T.-III CAN bus diagnostics [RV meter connector disconnected]





(1) Disconnect RV meter connector C-171, and diagnose by using the M.U.T.-III.



(2) Diagnose CAN bus lines, and check if M.U.T.-III screen is as shown in the illustration.

Q: Does M.U.T.-III screen correspond to the illustration?

YES : Repair the wiring harness between joint connector (CAN1) and the RV meter connector.

NO : Check the RV meter connector, and repair if necessary. If the RV meter connector is in good condition, repair the RV meter power supply circuit. (Refer to GROUP 54A – RV meter .)

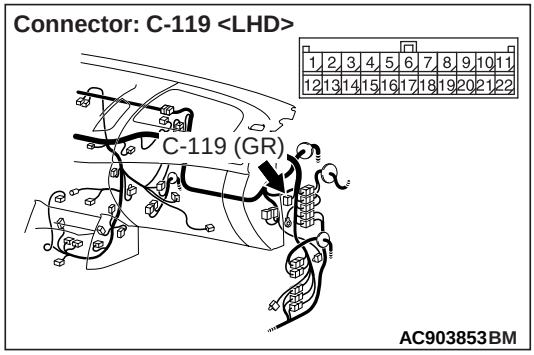
STEP 10. Check the CAN line between joint connector (CAN1) and the ABS-ECU. Resistance measurement at C-119 joint connector (CAN1).

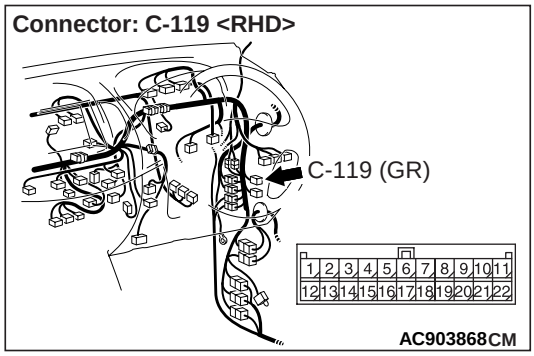
⚠ CAUTION

A digital multimeter should be used. For details refer to P.54C-7.

⚠ CAUTION

The test wiring harness should be used. For details refer to P.54C-7.



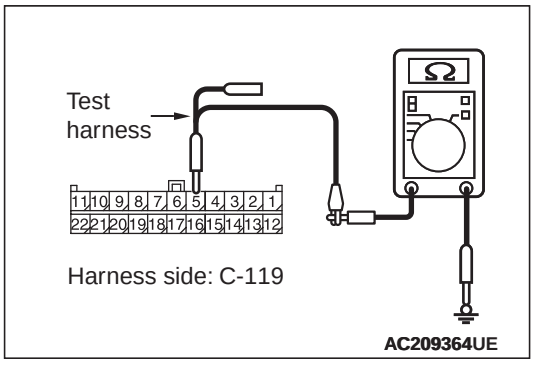


(1) Disconnect joint connector (CAN1), and measure at the wiring harness side.

⚠ CAUTION

When measuring the resistance, disconnect the negative battery terminal. For details refer to P.54C-7.

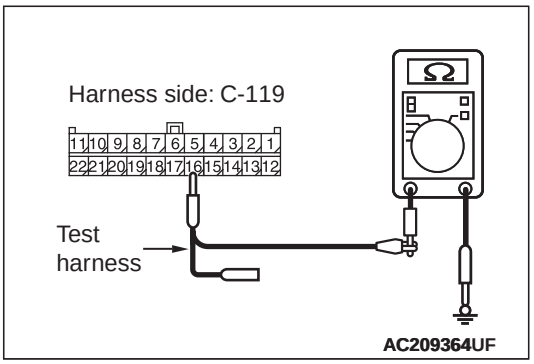
(2) Ensure that the negative battery terminal is disconnected.



(3) Resistance between C-119 joint connector

(CAN1) terminal No.5 (CAN_H) and body earth

OK: 1 kΩ or more



(4) Resistance between C-119 joint connector (CAN1) terminal No.16 (CAN_L) and body earth

OK: 1 kΩ or more

⚠ CAUTION

Strictly observe the specified wiring harness repair procedure. For details refer to P.54C-7.

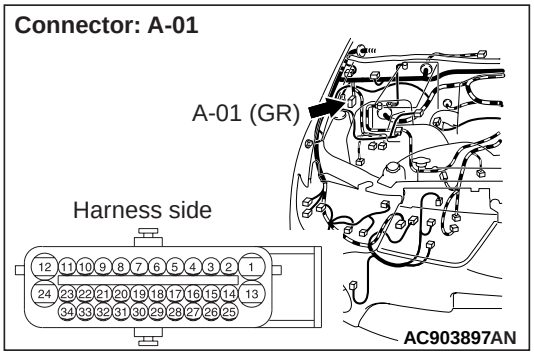
Q: Is the check result normal?

YES <vehicles without A/C> : <1 kΩ or more> Go to Step 22.

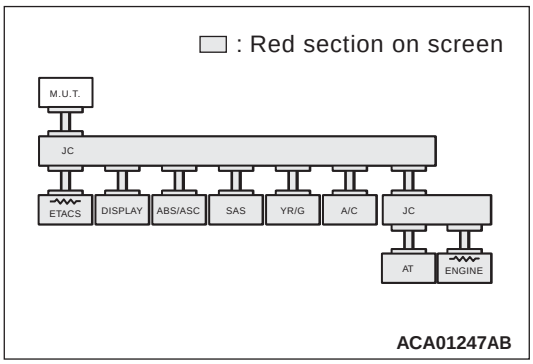
YES <vehicles with A/C> : <1 kΩ or more> Go to Step 20.

NO : <Less than 1 kΩ > Go to Step 11.

STEP 11. M.U.T.-III CAN bus diagnostics [ABS-ECU connector disconnected]



(1) Disconnect ABS-ECU connector A-01, and diagnose by using the M.U.T.-III.



(2) Diagnose CAN bus lines, and check if M.U.T.-III screen is as shown in the illustration.

Q: Does M.U.T.-III screen correspond to the illustration?

YES : Check intermediate connector (C-13), and repair if necessary. If the intermediate connector is in good condition, repair the wiring harness between joint connector (CAN1) and the ABS-ECU connector.

NO : Check the ABS-ECU connector, and repair if necessary. If the ABS-ECU connector is in good condition, go to Step 12.

STEP 12. M.U.T.-III CAN bus diagnostics (retest the system)

Diagnose CAN bus lines, and check if M.U.T.-III screen shows normal state.

Q: Is the check result normal?

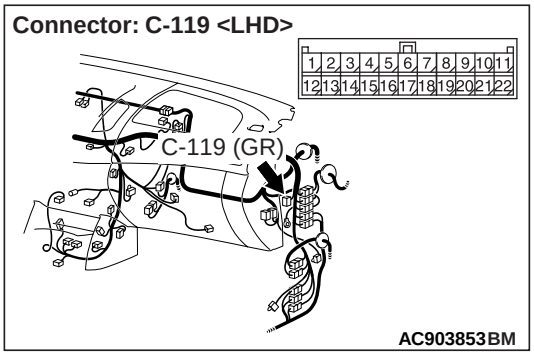
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

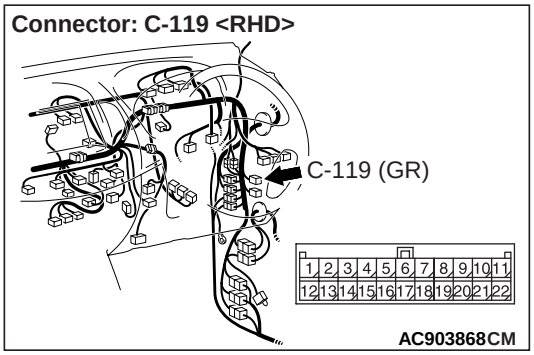
NO : Check the ABS-ECU connector, and repair if necessary. If the ABS-ECU connector is in good condition, replace the hydraulic unit assembly.

STEP 13. Check the CAN line between joint connector (CAN1) and the ASTC-ECU. Resistance measurement at C-119 joint connector (CAN1).

⚠ CAUTION
A digital multimeter should be used. For details refer to P.54C-7.

⚠ CAUTION
The test wiring harness should be used. For details refer to P.54C-7.

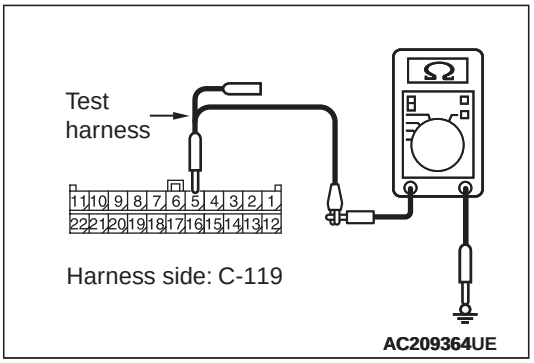




(1) Disconnect joint connector (CAN1), and measure at the wiring harness side.

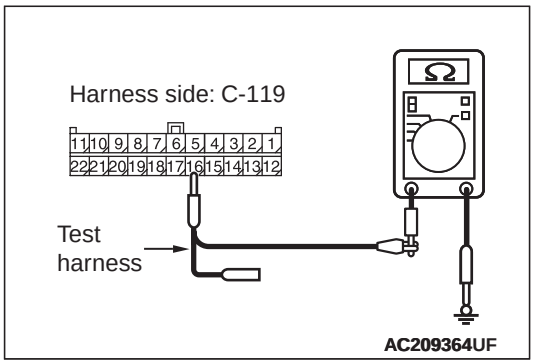
⚠ CAUTION
When measuring the resistance, disconnect the negative battery terminal. For details refer to P.54C-7.

(2) Ensure that the negative battery terminal is disconnected.



(3) Resistance between C-119 joint connector (CAN1) terminal No.5 (CAN_H) and body earth

OK: 1 kΩ or more



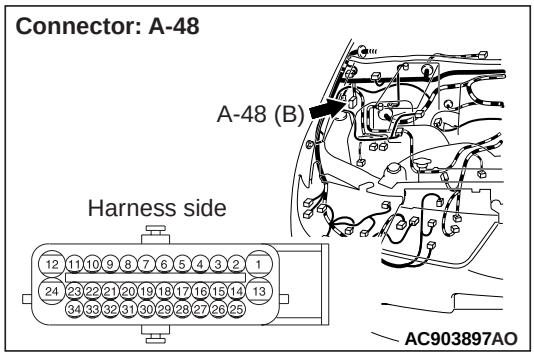
(4) Resistance between C-119 joint connector (CAN1) terminal No.16 (CAN_L) and body earth

OK: 1 kΩ or more

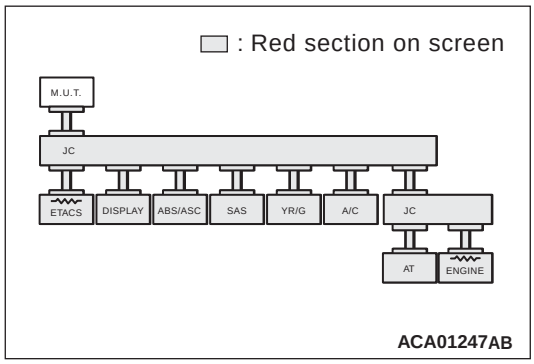
⚠ CAUTION
Strictly observe the specified wiring harness repair procedure. For details refer to P.54C-7.

Q: Is the check result normal?
YES : <1 kΩ or more> Go to Step 16.
NO : <Less than 1 kΩ > Go to Step 14.

STEP 14. M.U.T.-III CAN bus diagnostics [ASTC-ECU connector disconnected]



(1) Disconnect ASTC-ECU connector A-48, and diagnose by using the M.U.T.-III.



(2) Diagnose CAN bus lines, and check if M.U.T.-III screen is as shown in the illustration.

Q: Does M.U.T.-III screen correspond to the illustration?

YES : Check intermediate connector C-13, and repair if necessary. If the intermediate connector is in good condition, repair the wiring harness between joint connector (CAN1) and the ASTC-ECU connector.

NO : Check the ASTC-ECU connector, and repair if necessary. If the ASTC-ECU connector is in good condition, go to Step 15.

STEP 15. M.U.T.-III CAN bus diagnostics (retest the system)

Diagnose CAN bus lines, and check if M.U.T.-III screen shows normal state.

Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

NO : Check the ASTC-ECU connector, and repair if necessary. If the ASTC-ECU connector is in good condition, replace the hydraulic unit assembly.

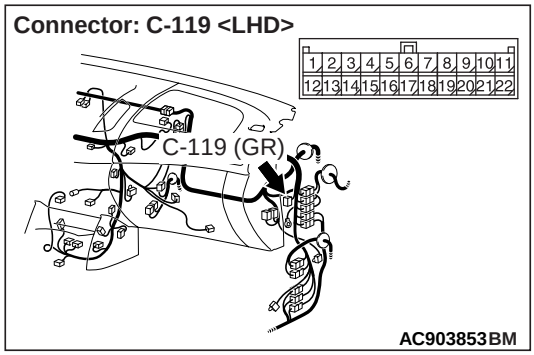
STEP 16. Check the CAN line between joint connector (CAN1) and the steering wheel sensor. Resistance measurement at C-119 joint connector (CAN1).

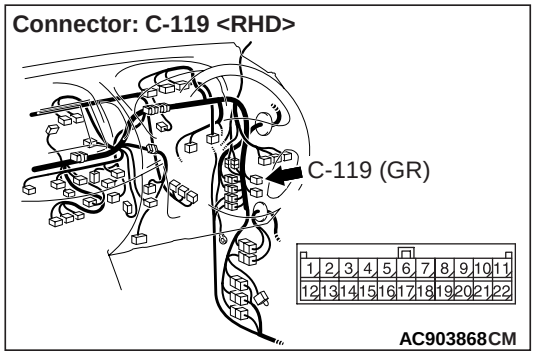
⚠ CAUTION

A digital multimeter should be used. For details refer to P.54C-7.

⚠ CAUTION

The test wiring harness should be used. For details refer to P.54C-7.



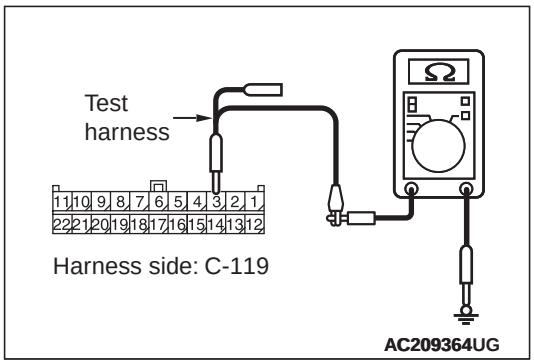


(1) Disconnect joint connector (CAN1), and measure at the wiring harness side.

⚠ CAUTION

When measuring the resistance, disconnect the negative battery terminal. For details refer to P.54C-7.

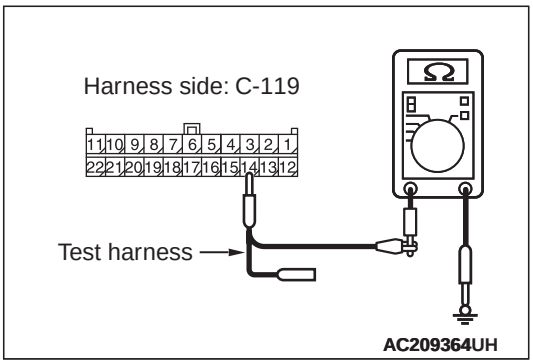
(2) Ensure that the negative battery terminal is disconnected.



(3) Resistance between C-119 joint connector

(CAN1) terminal No.3 (CAN_H) and body earth

OK: 1 kΩ or more



(4) Resistance between C-119 joint connector (CAN1) terminal No.14 (CAN_L) and body earth

OK: 1 kΩ or more

⚠ CAUTION

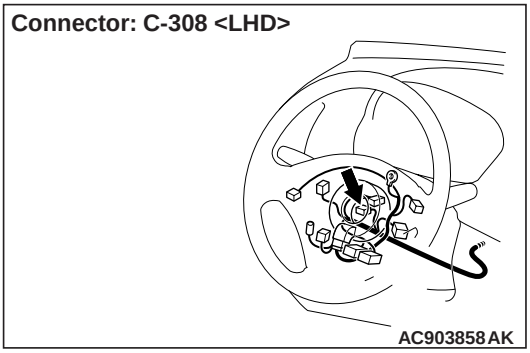
Strictly observe the specified wiring harness repair procedure. For details refer to P.54C-7.

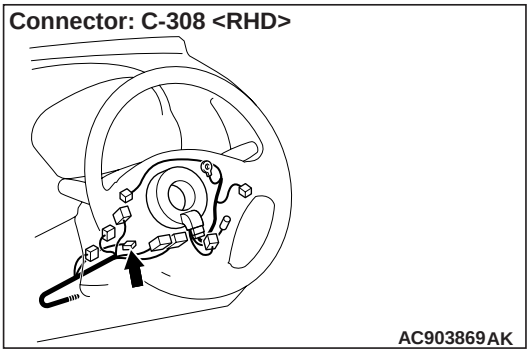
Q: Is the check result normal?

YES : <1 kΩ or more> Go to Step 18.

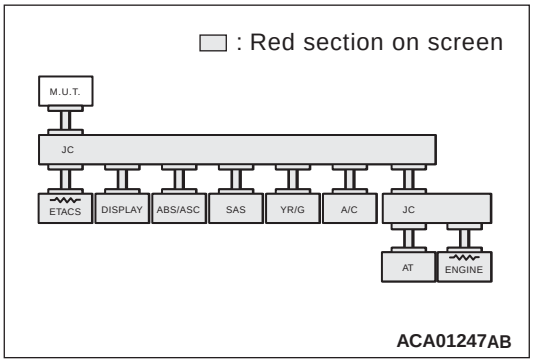
NO : <Less than 1 kΩ > Go to Step 17.

STEP 17. M.U.T.-III CAN bus diagnostics [steering wheel sensor connector disconnected]





(1) Disconnect steering wheel sensor connector C-308, and diagnose by using the M.U.T.-III.



(2) Diagnose CAN bus lines, and check if M.U.T.-III screen is as shown in the illustration.

Q: Does M.U.T.-III screen correspond to the illustration?

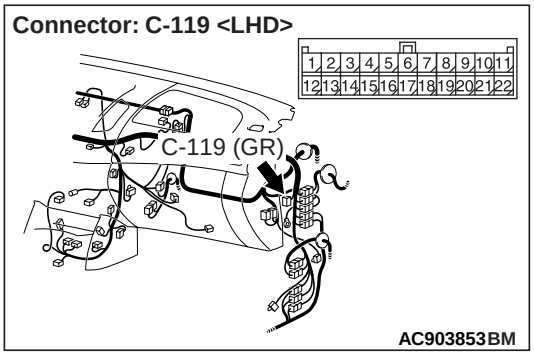
YES : Repair the wiring harness between joint connector (CAN1) and the steering wheel sensor connector.

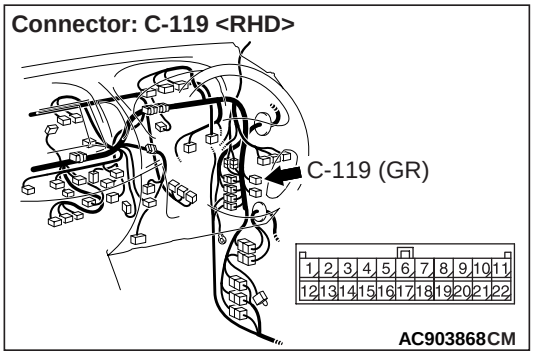
NO : Check the steering wheel sensor connector, and repair if necessary. If the steering wheel sensor connector is in good condition, repair the steering wheel sensor power supply circuit.

STEP 18. Check the CAN line between joint connector (CAN1) and the G and yaw rate sensor. Resistance measurement at C-119 joint connector (CAN1).

⚠ CAUTION
A digital multimeter should be used. For details refer to P.54C-7.

⚠ CAUTION
The test wiring harness should be used. For details refer to P.54C-7.

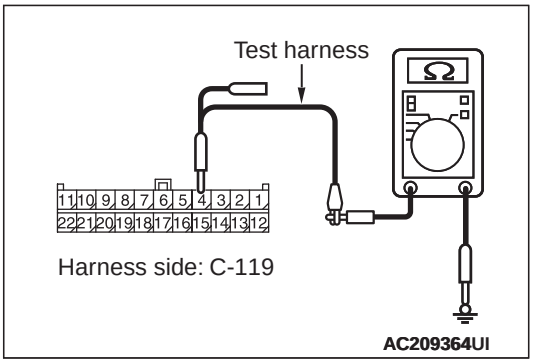




(1) Disconnect joint connector (CAN1), and measure at the wiring harness side.

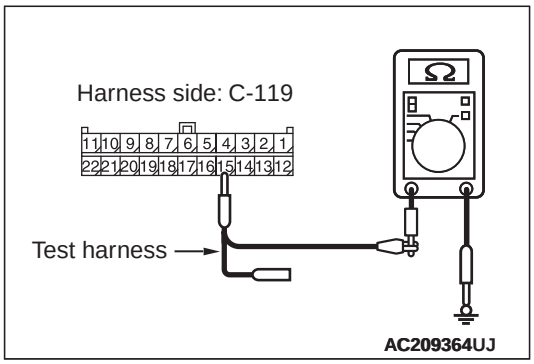
⚠ CAUTION
When measuring the resistance, disconnect the negative battery terminal. For details refer to P.54C-7.

(2) Ensure that the negative battery terminal is disconnected.



(3) Resistance between C-119 joint connector (CAN1) terminal No.4 (CAN_H) and body earth

OK: 1 kΩ or more



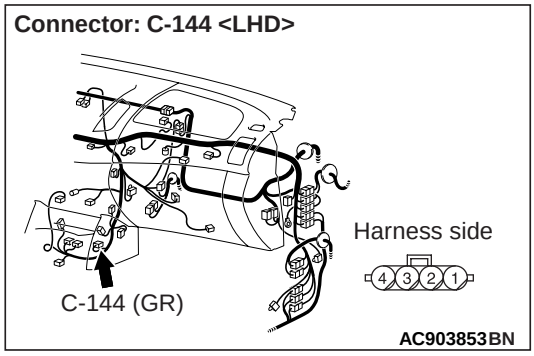
(4) Resistance between C-119 joint connector (CAN1) terminal No.15 (CAN_L) and body earth

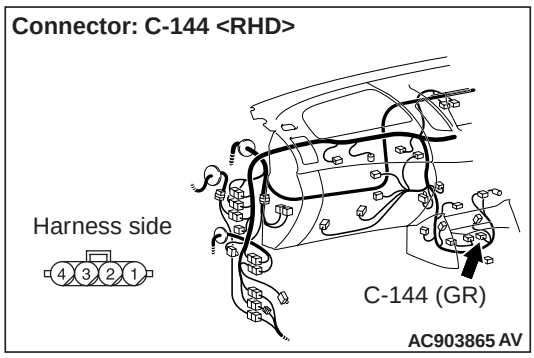
OK: 1 kΩ or more

⚠ CAUTION
Strictly observe the specified wiring harness repair procedure. For details refer to P.54C-7.

Q: Is the check result normal?
YES <vehicles without A/C> : <1 kΩ or more> Go to Step 22.
YES <vehicles with A/C> : <1 kΩ or more> Go to Step 20.
NO : <Less than 1 kΩ > Go to Step 19.

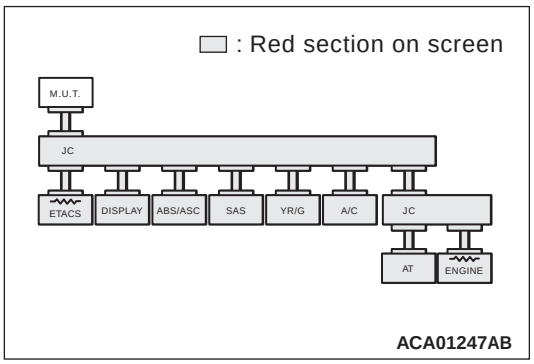
STEP 19. M.U.T.-III CAN bus diagnostics [G and yaw rate sensor connector disconnected]





(1) Disconnect G and yaw rate sensor connector C-

144, and diagnose by using the M.U.T.-III.



(2) Diagnose CAN bus lines, and check if M.U.T.-III screen is as shown in the illustration.

Q: Does M.U.T.-III screen correspond to the illustration?

YES : Repair the wiring harness between joint connector (CAN1) and the G and yaw rate sensor connector.

NO : Check the G and yaw rate sensor connector, and repair if necessary. If the G and yaw rate sensor connector is in good condition, repair the G and yaw rate sensor power supply circuit.

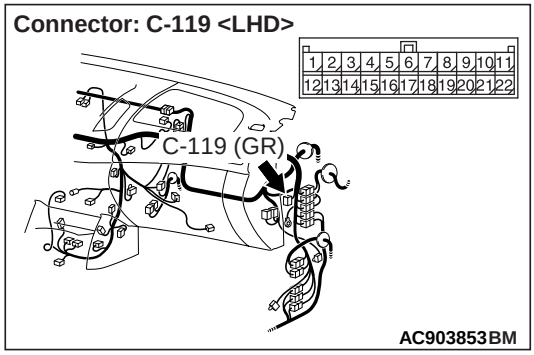
STEP 20. Check the CAN line between joint connector (CAN1) and the A/C-ECU. Resistance measurement at C-119 joint connector (CAN1).

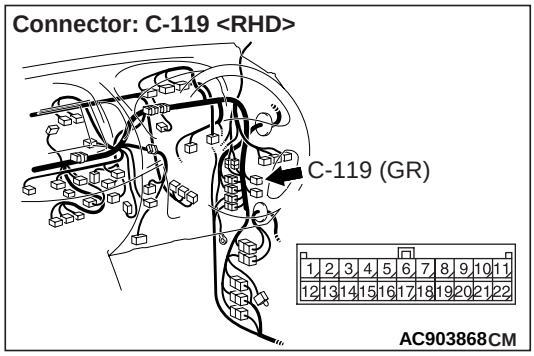
⚠ CAUTION

A digital multimeter should be used. For details refer to P.54C-7.

⚠ CAUTION

The test wiring harness should be used. For details refer to P.54C-7.



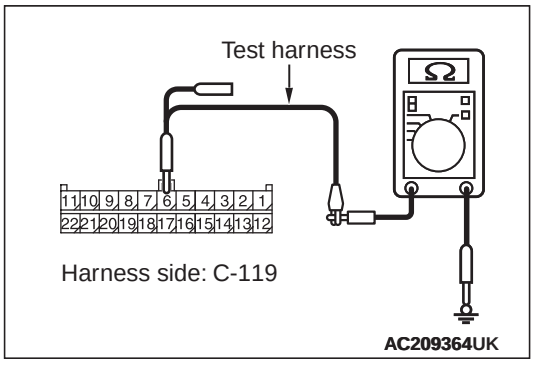


(1) Disconnect joint connector (CAN1), and measure at the wiring harness side.

⚠ CAUTION

When measuring the resistance, disconnect the negative battery terminal. For details refer to P.54C-7.

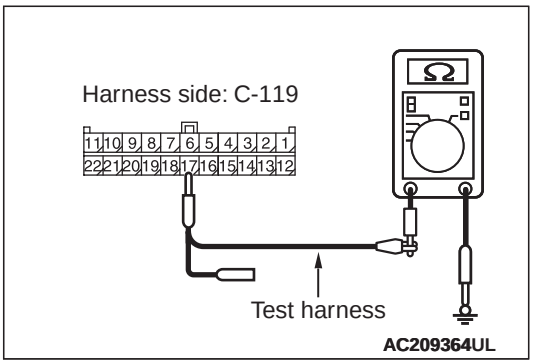
(2) Ensure that the negative battery terminal is disconnected.



(3) Resistance between C-119 joint connector

(CAN1) terminal No.6 (CAN_H) and body earth

OK: 1 kΩ or more



(4) Resistance between C-119 joint connector (CAN1) terminal No.17 (CAN_L) and body earth

OK: 1 kΩ or more

⚠ CAUTION

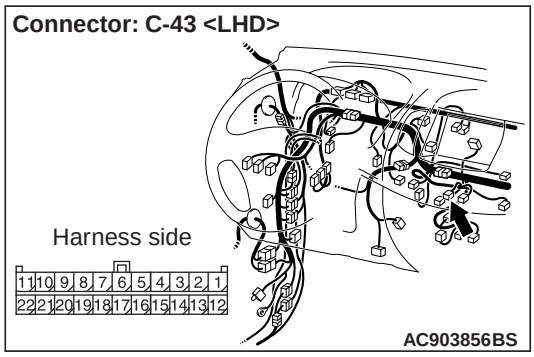
Strictly observe the specified wiring harness repair procedure. For details refer to P.54C-7.

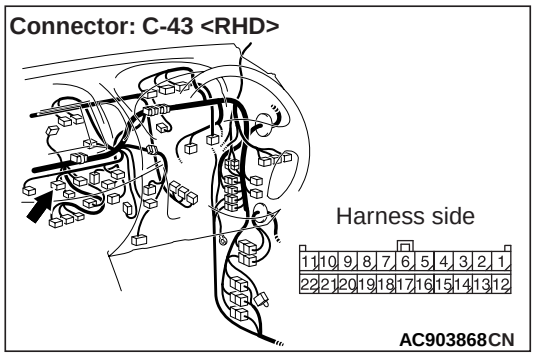
Q: Is the check result normal?

YES : <1 kΩ or more> Go to Step 22.

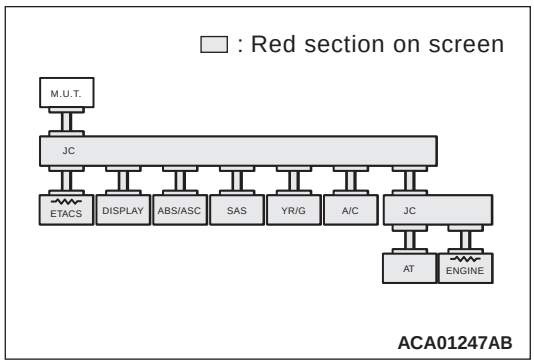
NO : <Less than 1 kΩ > Go to Step 21.

STEP 21. M.U.T.-III CAN bus diagnostics [A/C-ECU connector disconnected]





(1) Disconnect A/C-ECU connector C-43, and diagnose by using the M.U.T.-III.



(2) Diagnose CAN bus lines, and check if M.U.T.-III screen is as shown in the illustration.

Q: Does M.U.T.-III screen correspond to the illustration?

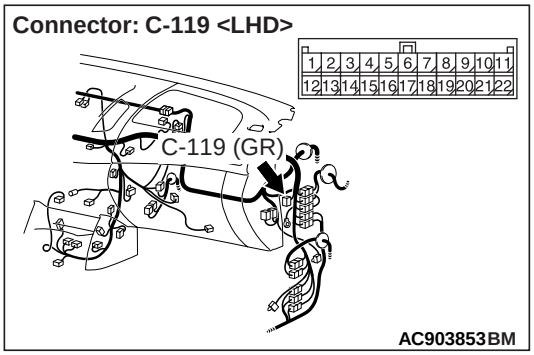
YES : Repair the wiring harness between joint connector (CAN1) and the A/C-ECU connector.

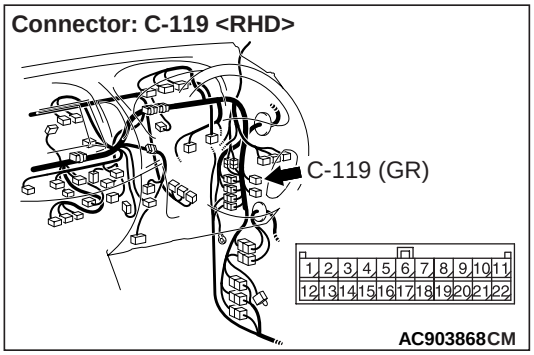
NO : Check the A/C-ECU connector, and repair if necessary. If the A/C-ECU connector is in good condition, repair the A/C-ECU power supply circuit. (Refer to GROUP 55B .)

STEP 22. Check the CAN line between joint connector (CAN1) and the diagnosis connector. Resistance measurement at C-119 joint connector (CAN1).

⚠ CAUTION
A digital multimeter should be used. For details refer to P.54C-7.

⚠ CAUTION
The test wiring harness should be used. For details refer to P.54C-7.

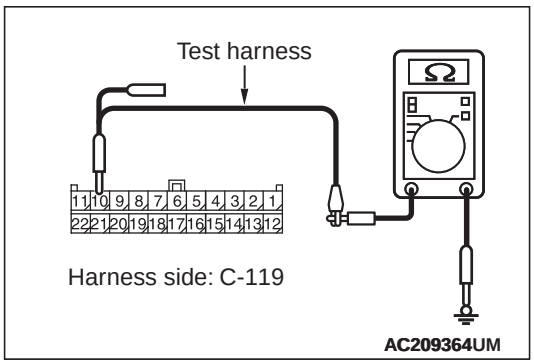




(1) Disconnect joint connector (CAN1), and measure at the wiring harness side.

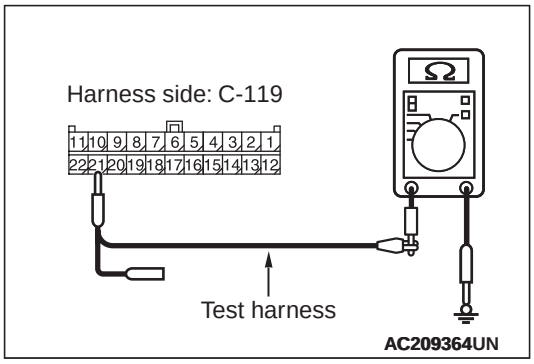
⚠ CAUTION
When measuring the resistance, disconnect the negative battery terminal. For details refer to P.54C-7.

(2) Ensure that the negative battery terminal is disconnected.



(3) Resistance between C-119 joint connector (CAN1) terminal No.10 (CAN_H) and body earth

OK: 1 kΩ or more



(4) Resistance between C-119 joint connector (CAN1) terminal No.21 (CAN_L) and body earth

OK: 1 kΩ or more

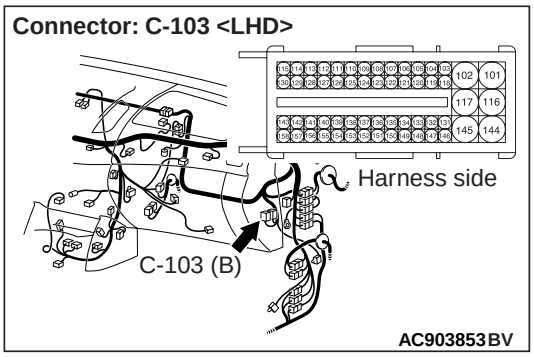
⚠ CAUTION
Strictly observe the specified wiring harness repair procedure. For details refer to P.54C-7.

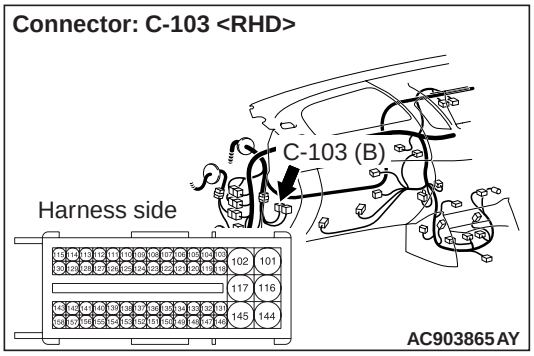
Q: Is the check result normal?

YES : <1 kΩ or more> Repair the intermediate connector C-53 <LHD> or C-35 <RHD>, or the wiring harness between joint connector (CAN1) and the intermediate connector C-53 <LHD> or C-35 <RHD>.

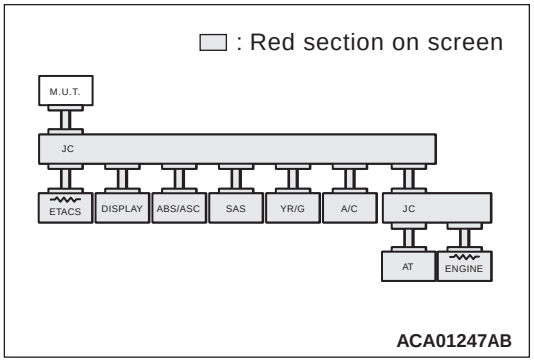
NO : <Less than 1 kΩ > Repair the diagnosis connector, or the wiring harness between joint connector (CAN1) and the diagnosis connector.

STEP 23. M.U.T.-III CAN bus diagnostics [engine-ECU connector disconnected]





(1) Disconnect engine-ECU connector C-103 and diagnose by using the M.U.T.-III.



(2) Diagnose CAN bus lines, and check if M.U.T.-III screen is as shown in the illustration.

Q: Does M.U.T.-III screen correspond to the illustration?

YES : Go to Step 25.

NO : Check the engine-ECU connector, and repair if necessary. If the engine-ECU connector is in good condition, go to Step 24.

STEP 24. M.U.T.-III CAN bus diagnostics (retest the system)

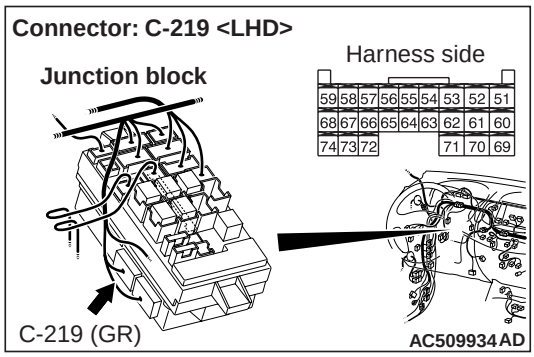
Diagnose CAN bus lines, and check if M.U.T.-III screen shows normal state.

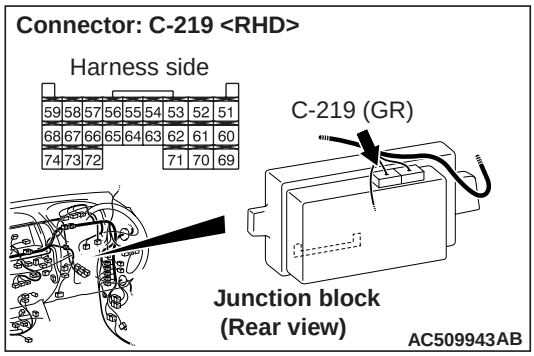
Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

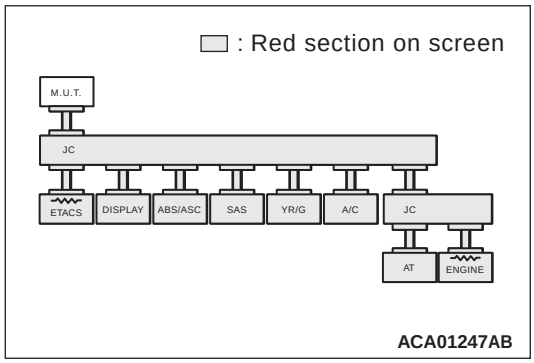
NO : Check the engine-ECU connector, and repair if necessary. If the engine-ECU connector is in good condition, replace the engine-ECU.

STEP 25. M.U.T.-III CAN bus diagnostics [ETACS-ECU connector disconnected]





(1) Disconnect ETACS-ECU connector C-219, and diagnose by using the M.U.T.-III.



(2) Diagnose CAN bus lines, and check if M.U.T.-III screen is as shown in the illustration.

Q: Does M.U.T.-III screen correspond to the illustration?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

NO : Check the ETACS-ECU connector, and repair if necessary. If the ETACS-ECU connector is in good condition, go to Step 26.

STEP 26. M.U.T.-III CAN bus diagnostics (retest the system)

Diagnose CAN bus lines, and check if M.U.T.-III screen shows normal state.

Q: Is the check result normal?

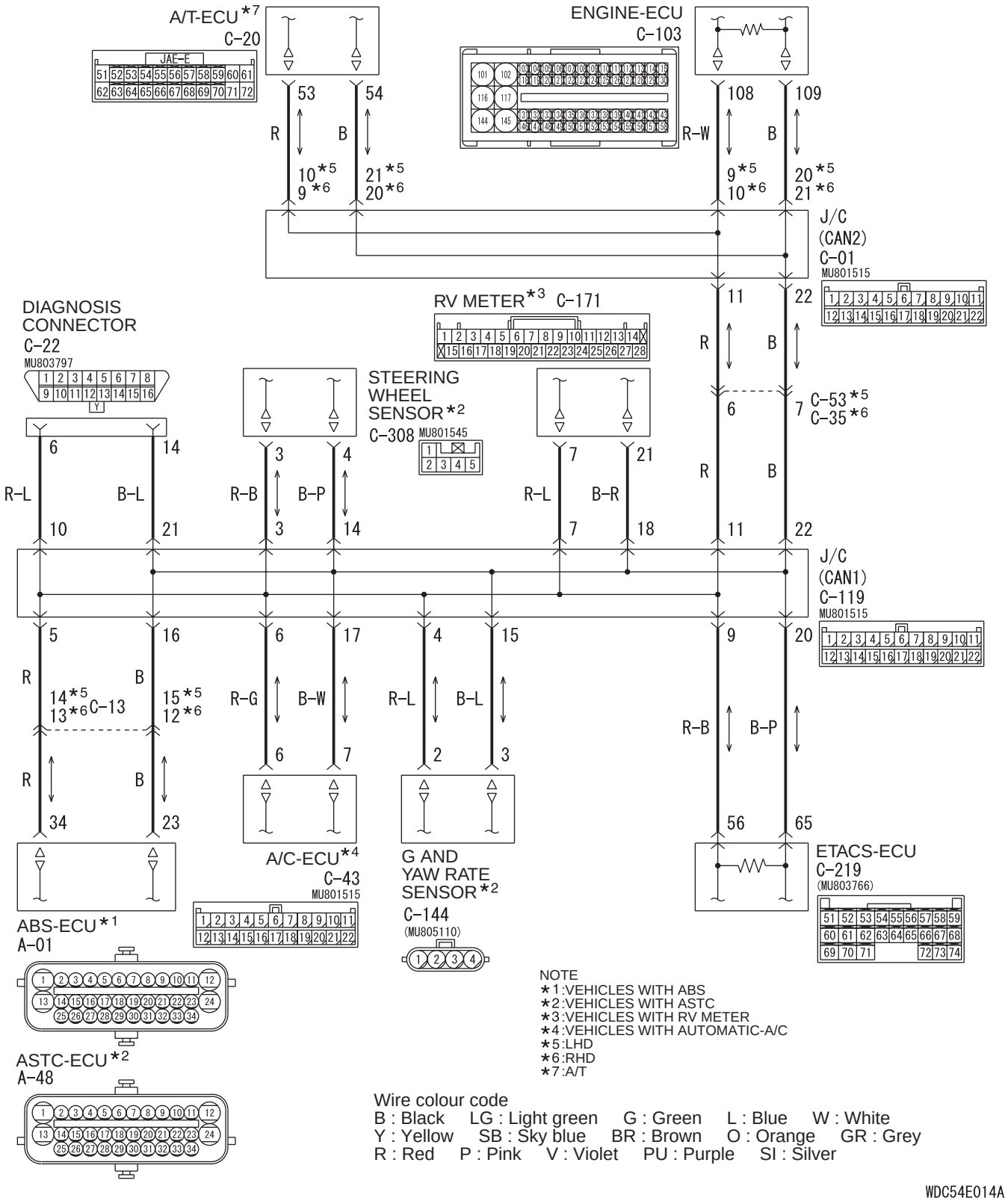
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/inspection Service Points – How to Cope with Intermittent Malfunction).

NO : Check the ETACS-ECU connector, and repair if necessary. If the ETACS-ECU connector is in good condition, replace the ETACS-ECU.

Diagnosis Item 3: Diagnose shorts between CAN_H and L lines

⚠ CAUTION

When servicing a CAN bus line, earth yourself by touching a metal object such as an unpainted water pipe. If you fail to do, a component connected to the CAN bus line may be broken.



FUNCTION

The M.U.T.-III judges a short between CAN_H and CAN_L line when all data from ECU cannot be received while checking periodically sent data from each ECU even if the voltage is normal.

TROUBLE JUDGEMENT CONDITIONS

Short circuit may be present between the CAN_L and H lines when the resistance between the CAN bus lines (CAN_L and H lines) is less than 2 Ω.

TROUBLESHOOTING HINTS

- Malfunction of the wiring harness

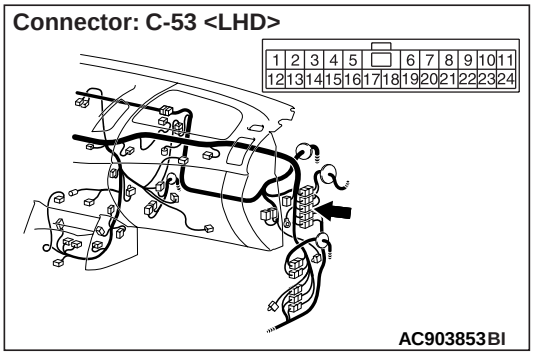
NOTE: The M.U.T.-III cannot receive all the periodically sent data from each ECU by the open circuit of harness between the diagnosis connector, the joint connector (CAN1) and the joint connector (CAN2). In addition, the M.U.T.-III measures the voltage itself and shows 2.5 V due to the open circuit of harness. Therefore, it is judged as a short between CAN_H and CAN_L line.

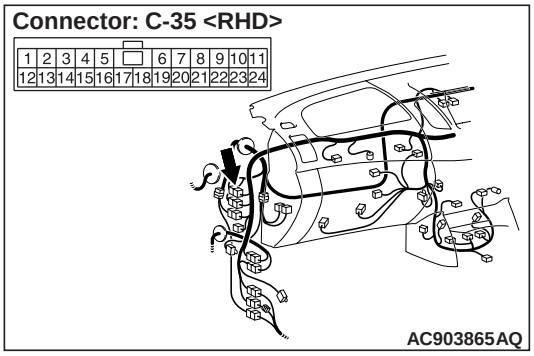
- Malfunction of the connector
- Malfunction of each ECU

DIAGNOSIS PROCEDURE

STEP 1. Connector check: C-53 <LHD> or C-35 <RHD> intermediate connector

⚠ CAUTION





The strand end of the twist wire should be within 10 cm from the connector. For details refer to P.54C-7.

Q: Is the check result normal?

YES : Go to Step 2.

NO : Repair the defective connector.

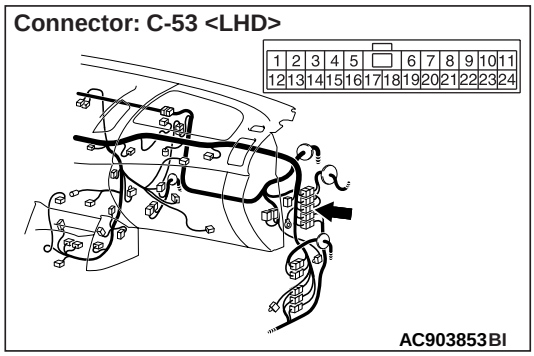
STEP 2. Resistance measurement at C-53 <LHD> or C-35 <RHD> intermediate connector.

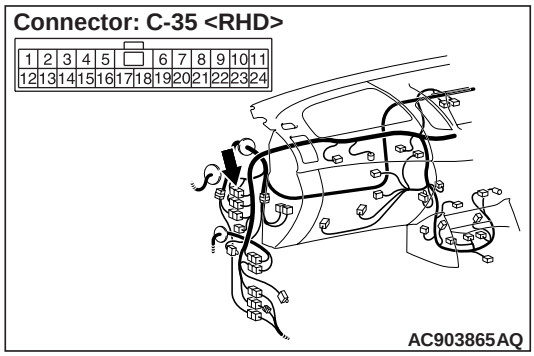
⚠ CAUTION

A digital multimeter should be used. For details refer to P.54C-7.

⚠ CAUTION

The test wiring harness should be used. For details refer to P.54C-7.





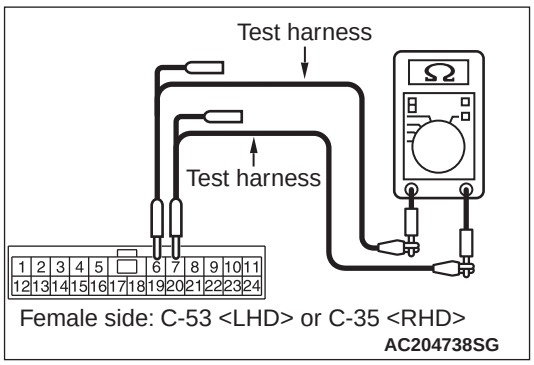
(1) Disconnect the connector, and measure at its female-side intermediate connector (at the instrument panel wiring harness side).

(2) Turn the ignition switch to the LOCK (OFF) position.

⚠ CAUTION

When measuring the resistance, disconnect the negative battery terminal. For details refer to P.54C-7.

(3) Ensure that the negative battery terminal is disconnected.



(4) Resistance between C-53 <LHD> or C-35

<RHD> intermediate connector terminal Nos.6 and 7

OK: 120 ± 20 Ω

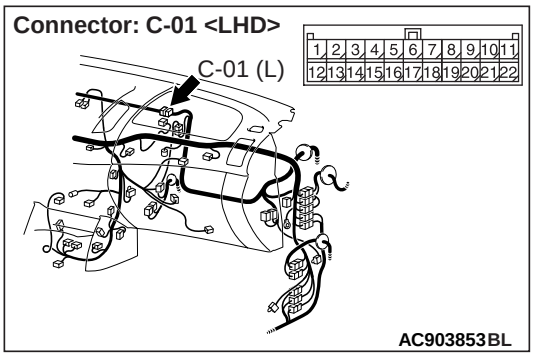
Q: Is the check result normal?

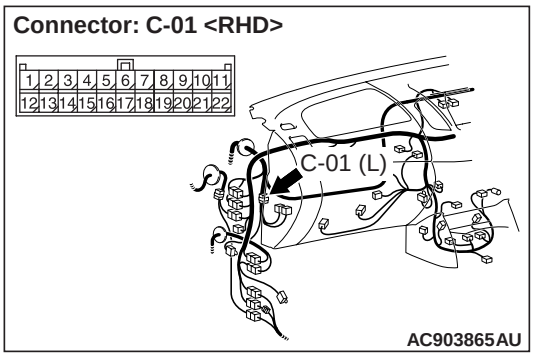
YES : <Within 120 ± 20 Ω> Go to Step 3.

NO : <Not within 120 ± 20 Ω> Go to Step 8.

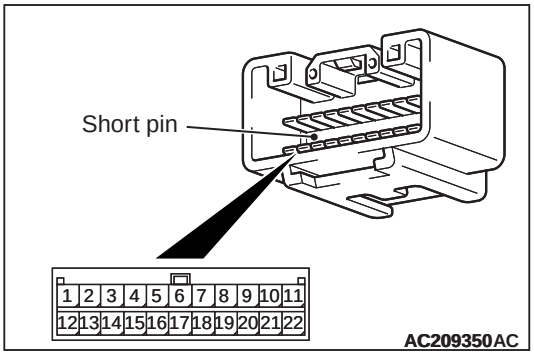
STEP 3. Connector check: C-01 joint connector (CAN2)

⚠ CAUTION





The strand end of the twist wire should be within 10 cm from the connector. For details refer to P.54C-7.



When checking the joint connector, ensure that its wiring harness side and its short pins are not damaged.

Q: Is the check result normal?

YES : Go to Step 4.

NO : Repair a defective connector or replace the joint connector.

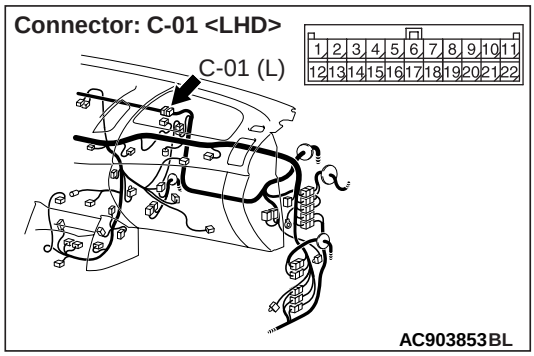
STEP 4. Resistance measurement at C-01 joint connector (CAN2).

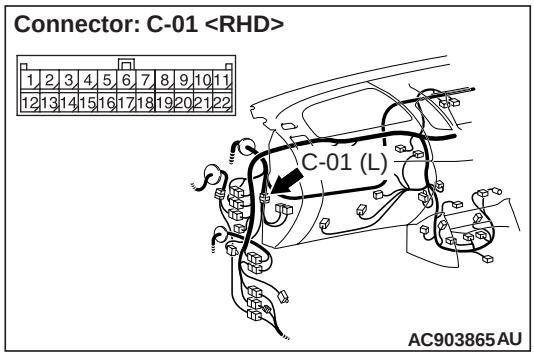
⚠ CAUTION

A digital multimeter should be used. For details refer to P.54C-7.

⚠ CAUTION

The test wiring harness should be used. For details refer to P.54C-7.





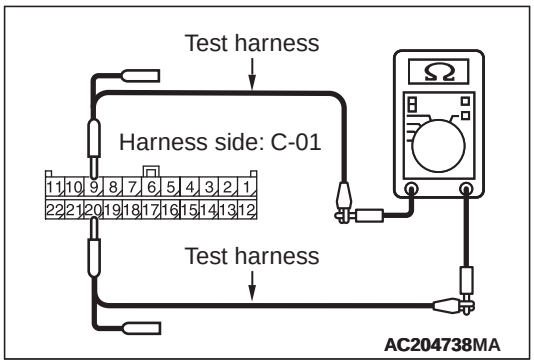
(1) Disconnect the connector, and measure at the wiring harness side.

(2) Turn the ignition switch to the LOCK (OFF) position.

⚠ CAUTION

When measuring the resistance, disconnect the negative battery terminal. For details refer to P.54C-7.

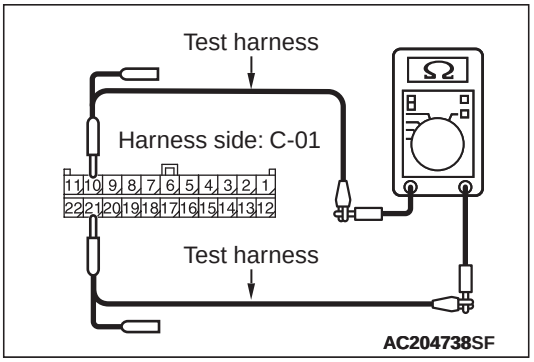
(3) Ensure that the negative battery terminal is disconnected.



(4) Resistance between C-01 joint connector (CAN2)

terminal Nos.9 and 20 <LHD>

OK: 120 ± 20 Ω



(5) Resistance between C-01 joint connector (CAN2) terminal Nos.10 and 21 <RHD>

OK: 120 ± 20 Ω

⚠ CAUTION

Strictly observe the specified wiring harness repair procedure. For details refer to P.54C-7.

Q: Is the check result normal?

YES <M/T> : <Within 120 ± 20 Ω> Repair the wiring harness between joint connector (CAN2) and intermediate connector C-53 <LHD> or C-35 <RHD>.

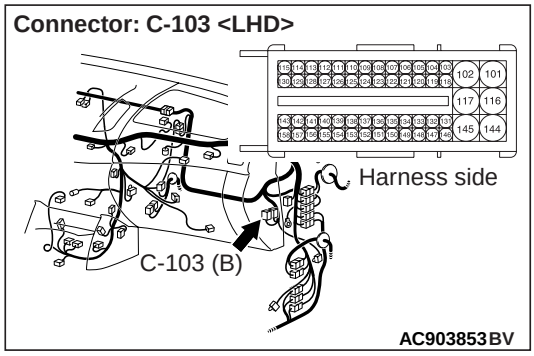
YES <A/T> : <Within 120 ± 20 Ω> Go to Step 6.

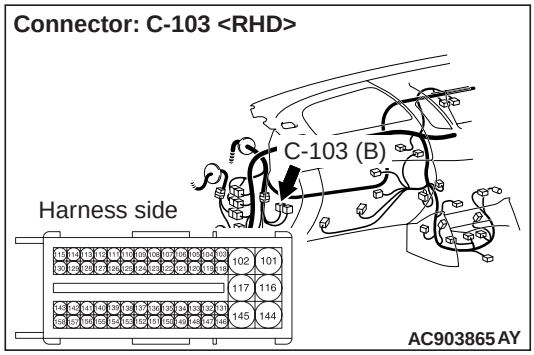
NO : <Not within 120 ± 20 Ω> Go to Step 5.

STEP 5. Resistance measurement at C-103 engine-ECU connector.

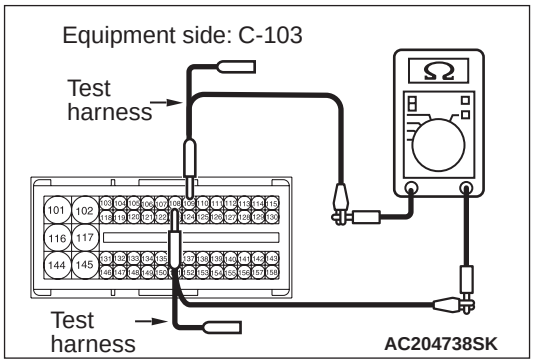
⚠ CAUTION

A digital multimeter should be used. For details refer to P.54C-7.





(1) Remove the engine-ECU, and measure at the equipment side.



(2) Resistance between C-103 engine-ECU connector terminal Nos.108 and 109

OK: 120 ± 20 Ω

⚠ CAUTION

Strictly observe the specified wiring harness repair procedure. For details refer to P.54C-7.

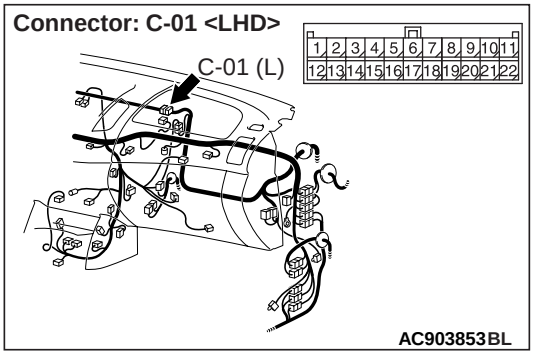
Q: Is the check result normal?

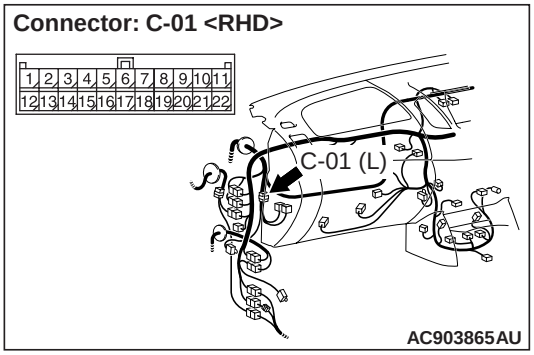
YES : <Within 120 ± 20 Ω> Repair the wiring harness between joint connector (CAN2) and the engine-ECU connector.
NO : <Not within 120 ± 20 Ω> Check the engine-ECU connector, and repair if necessary. If the engine-ECU connector is in good condition, replace the engine-ECU.

STEP 6. Resistance measurement at C-01 joint connector (CAN2).

⚠ CAUTION
A digital multimeter should be used. For details refer to P.54C-7.

⚠ CAUTION
The test wiring harness should be used. For details refer to P.54C-7.

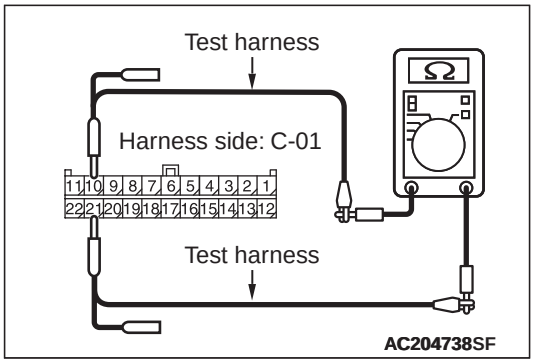




(1) Disconnect the connector, and measure at the wiring harness side.
(2) Turn the ignition switch to the LOCK (OFF) position.

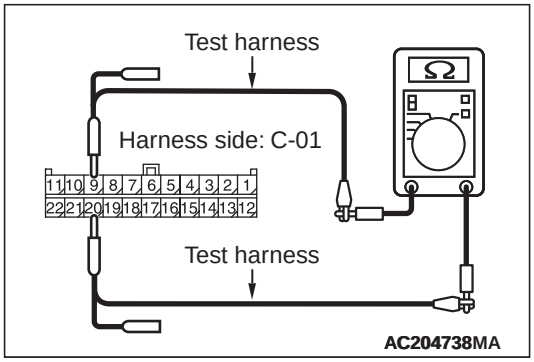
⚠ CAUTION
When measuring the resistance, disconnect the negative battery terminal. For details refer to P.54C-7.

(3) Ensure that the negative battery terminal is disconnected.



(4) Resistance between C-01 joint connector (CAN2) terminal Nos.10 and 21 <LHD>

OK: 1 kΩ or more



(5) Resistance between C-01 joint connector (CAN2) terminal Nos.9 and 20 <RHD>

OK: 1 kΩ or more

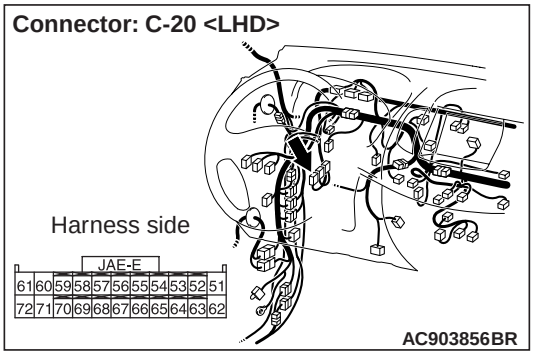
⚠ CAUTION
Strictly observe the specified wiring harness repair procedure. For details refer to P.54C-7.

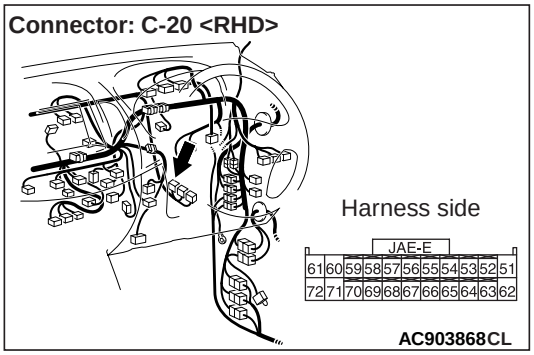
Q: Is the check result normal?
YES : <1 kΩ or more> Repair the wiring harness between joint connector (CAN2) and intermediate connector C-53 <LHD> or C-35 <RHD>.
NO : <Less than 1 kΩ> Go to Step 7.

STEP 7. Resistance measurement at C-20 A/T-ECU connector.

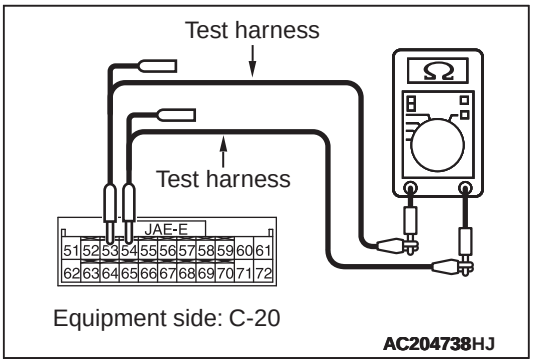
⚠ CAUTION

A digital multimeter should be used. For details refer to P.54C-7.





(1) Remove the A/T-ECU, and measure at the equipment side.



(2) Resistance between C-20 A/T-ECU connector terminal Nos.53 and 54

OK: 1 kΩ or more

⚠ CAUTION

Strictly observe the specified wiring harness repair procedure. For details refer to P.54C-7.

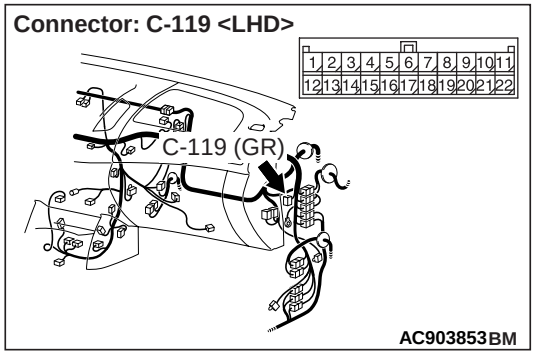
Q: Is the check result normal?

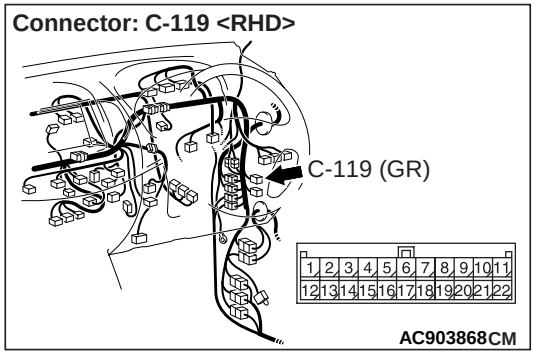
YES : <1 kΩ or more> Repair the wiring harness between joint connector (CAN2) and the A/T-ECU connector.

NO : <Less than 1 kΩ> Check the A/T-ECU connector, and repair if necessary. If the A/T-ECU connector is in good condition, replace the A/T-ECU.

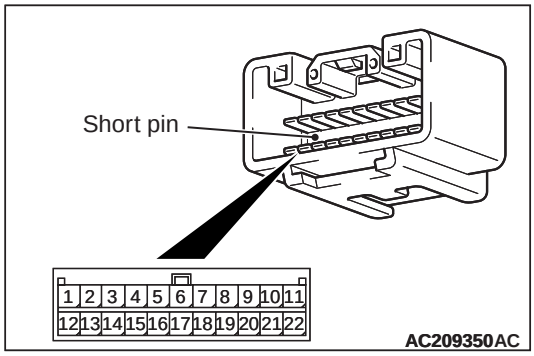
STEP 8. Connector check: C-119 joint connector (CAN1)

⚠ CAUTION





The strand end of the twist wire should be within 10 cm from the connector. For details refer to P.54C-7.



When checking the joint connector, ensure that its wiring harness side and its short pins are not damaged.

Q: Is the check result normal?

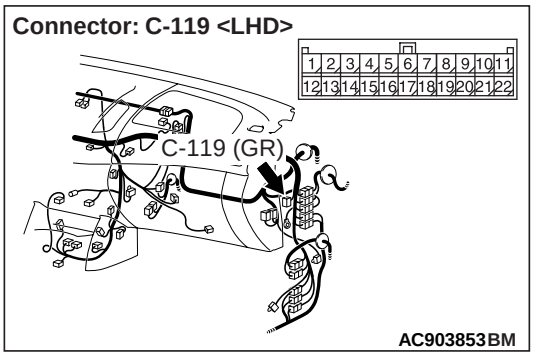
YES : Go to Step 9.

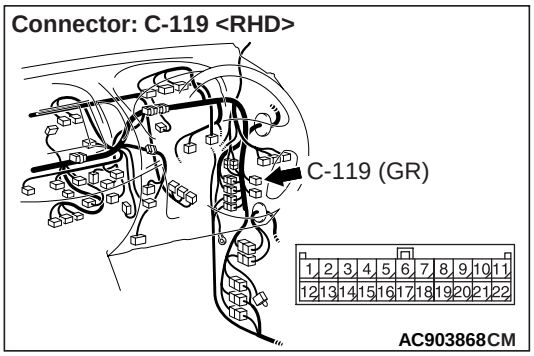
NO : Repair a defective connector or replace the joint connector.

STEP 9. Resistance measurement at C-119 joint connector (CAN1).

⚠ CAUTION
A digital multimeter should be used. For details refer to P.54C-7.

⚠ CAUTION
The test wiring harness should be used. For details refer to P.54C-7.

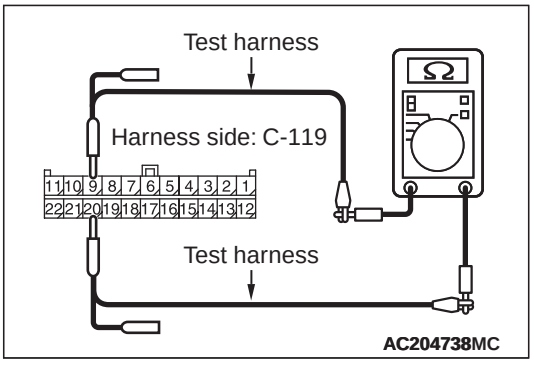




(1) Disconnect joint connector (CAN1), and measure at the wiring harness side.
(2) Turn the ignition switch to the LOCK (OFF) position.

⚠ CAUTION
When measuring the resistance, disconnect the negative battery terminal. For details refer to P.54C-7.

(3) Ensure that the negative battery terminal is disconnected.



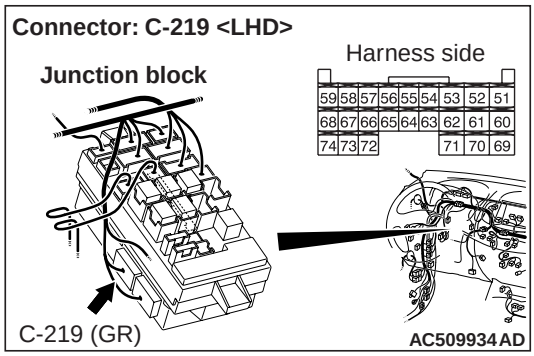
(4) Resistance between C-119 joint connector (CAN1) terminal Nos.9 and 20
OK: 120 ± 20 Ω

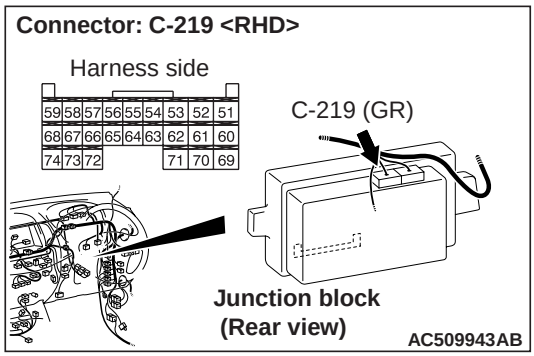
⚠ CAUTION
Strictly observe the specified wiring harness repair procedure. For details refer to P.54C-7.

Q: Is the check result normal?
YES : <Within 120 ± 20 Ω> Go to Step 11.
NO : <Not within 120 ± 20 Ω> Go to Step 10.

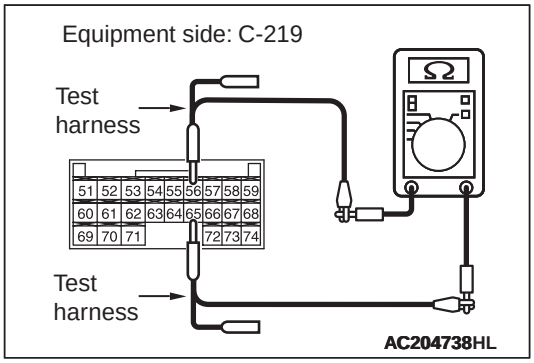
STEP 10. Resistance measurement at C-219 ETACS-ECU connector.

⚠ CAUTION
A digital multimeter should be used. For details refer to P.54C-7.





(1) Remove the ETACS-ECU, and measure at the equipment side.



(2) Resistance at C-219 ETACS-ECU connector

terminal Nos.56 and 65

OK: 120 ± 20 Ω

Q: Is the check result normal?

YES : <Within 120 ± 20 Ω> Repair the wiring harness between joint connector (CAN1) and the ETACS-ECU connector.

NO : <Not within 120 ± 20 Ω> Check the ETACS-ECU connector, and repair if necessary. If the ETACS-ECU connector is in good condition, replace the ETACS-ECU.

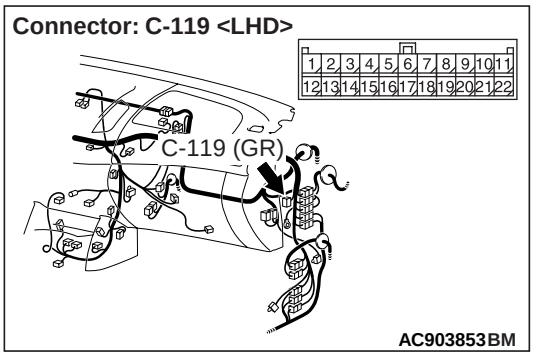
STEP 11. Resistance measurement at C-119 joint connector (CAN1).

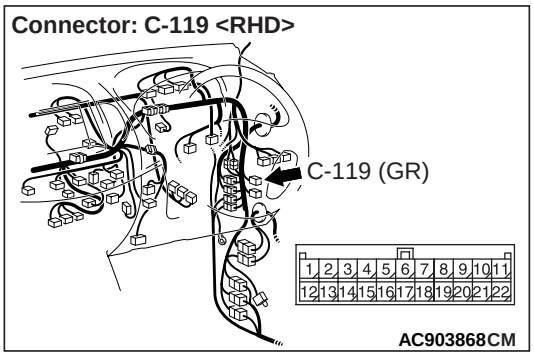
⚠ CAUTION

A digital multimeter should be used. For details refer to P.54C-7.

⚠ CAUTION

The test wiring harness should be used. For details refer to P.54C-7.





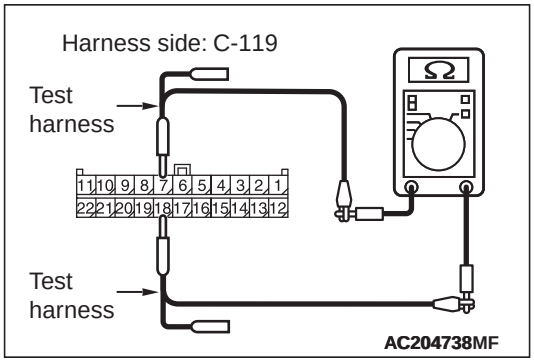
(1) Disconnect joint connector (CAN1), and measure at the wiring harness side.

(2) Turn the ignition switch to the LOCK (OFF) position.

⚠ CAUTION

When measuring the resistance, disconnect the negative battery terminal. For details refer to P.54C-7.

(3) Ensure that the negative battery terminal is disconnected.



(4) Resistance between C-119 joint connector (CAN1) terminal Nos.7 and 18

OK: 1 kΩ or more

⚠ CAUTION

Strictly observe the specified wiring harness repair procedure. For details refer to P.54C-7.

Q: Is the check result normal?

YES <vehicles without ABS, ASTC and A/C> : <1 kΩ or more> Go to Step 23.

YES <vehicles with ABS> : <1 kΩ or more> Go to Step 13.

YES <vehicles with ASTC> : <1 kΩ or more> Go to Step 15.

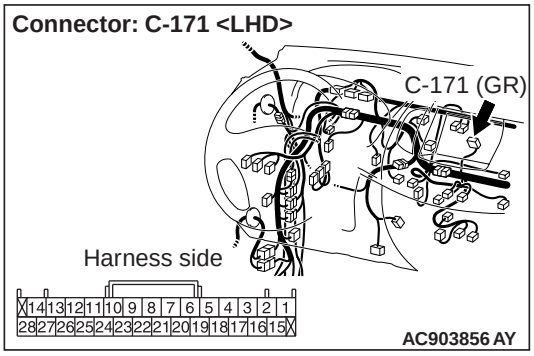
YES <vehicles without ABS and ASTC, and with A/C> : <1 kΩ or more> Go to Step 21.

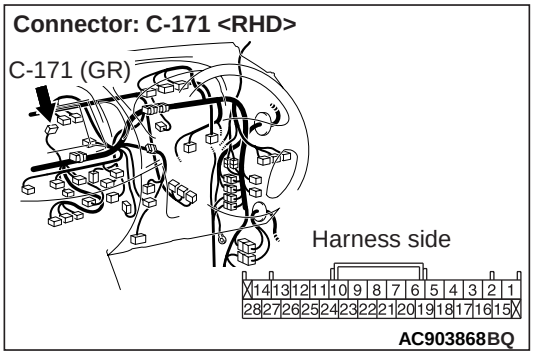
NO : <Less than 1 kΩ> Go to Step 12.

STEP 12. Resistance measurement at C-171 RV meter connector.

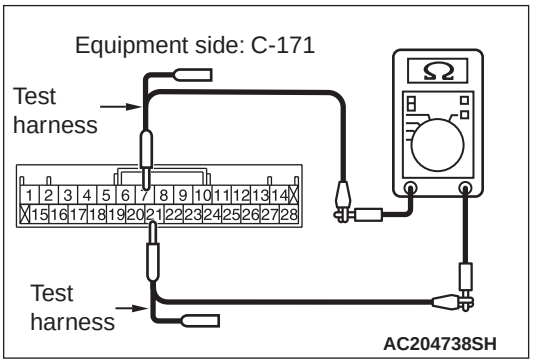
⚠ CAUTION

A digital multimeter should be used. For details refer to P.54C-7.





(1) Remove the RV meter, and measure at the equipment side.



(2) Resistance at C-171 RV meter connector terminal Nos.7 and 21

OK: 1 kΩ or more

Q: Is the check result normal?

YES : <1 kΩ or more> Repair the wiring harness between joint connector (CAN1) and the RV meter connector.

NO : <Less than 1 kΩ> Check the RV meter connector, and repair if necessary. If the RV meter connector is in good condition, replace the RV meter.

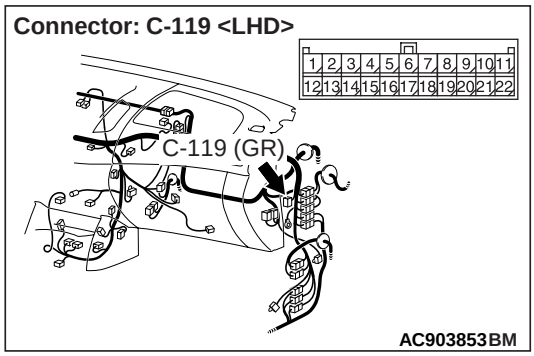
STEP 13. Resistance measurement at C-119 joint connector (CAN1).

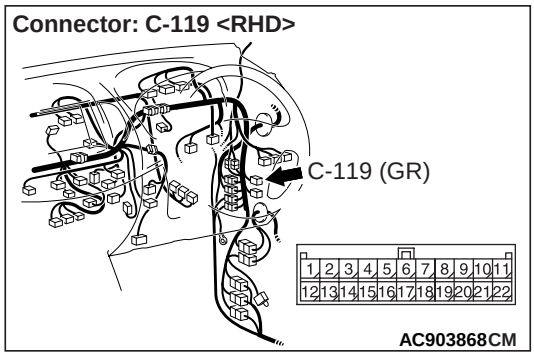
⚠ CAUTION

A digital multimeter should be used. For details refer to P.54C-7.

⚠ CAUTION

The test wiring harness should be used. For details refer to P.54C-7.





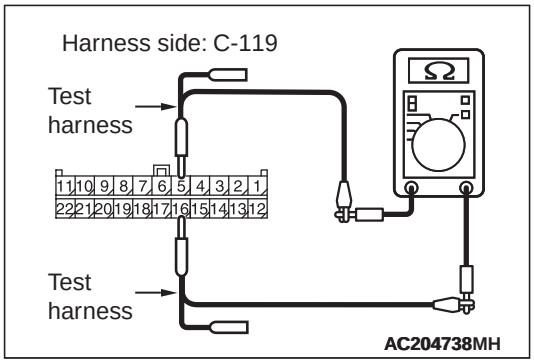
(1) Disconnect joint connector (CAN1), and measure at the wiring harness side.

(2) Turn the ignition switch to the LOCK (OFF) position.

⚠ CAUTION

When measuring the resistance, disconnect the negative battery terminal. For details refer to P.54C-7.

(3) Ensure that the negative battery terminal is disconnected.



(4) Resistance between C-119 joint connector

(CAN1) terminal Nos.5 and 16

OK: 1 kΩ or more

⚠ CAUTION

Strictly observe the specified wiring harness repair procedure. For details refer to P.54C-7.

Q: Is the check result normal?

YES <vehicles without A/C> : <1 kΩ or more> Go to Step 23.

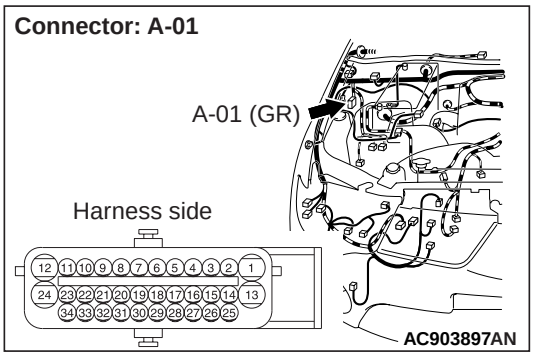
YES <vehicles with A/C> : <1 kΩ or more> Go to Step 21.

NO : <Less than 1 kΩ> Go to Step 14.

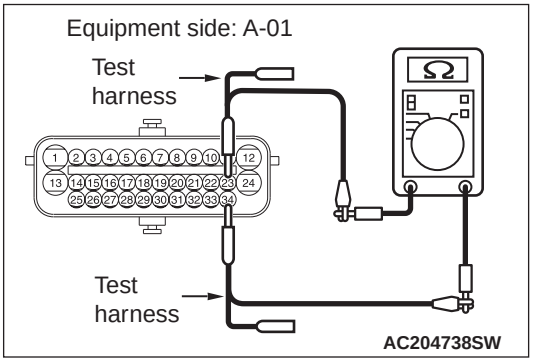
STEP 14. Resistance measurement at A-01 ABS-ECU connector.

⚠ CAUTION

A digital multimeter should be used. For details refer to P.54C-7.



(1) Remove the ABS-ECU, and measure at the equipment side.



(2) Resistance at A-01 ABS-ECU connector terminal Nos.23 and 34.

OK: 1 kΩ or more

Q: Is the check result normal?

YES : <1 kΩ or more> Check intermediate connector C-13, and repair if necessary. If the intermediate connector C-13 is in good condition, repair the wiring harness between joint connector (CAN1) and the ABS-ECU connector.

NO : <Less than 1 kΩ> Check the ABS-ECU connector, and repair if necessary. If the ABS-ECU connector is in good condition, replace the hydraulic unit assembly.

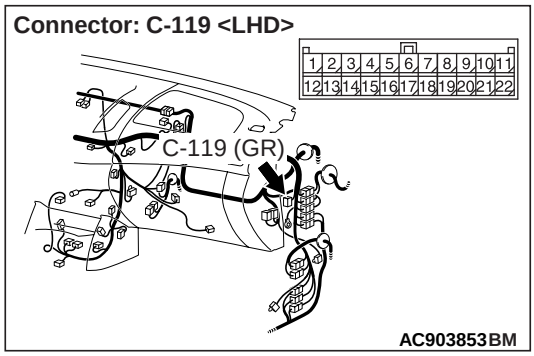
STEP 15. Resistance measurement at C-119 joint connector (CAN1).

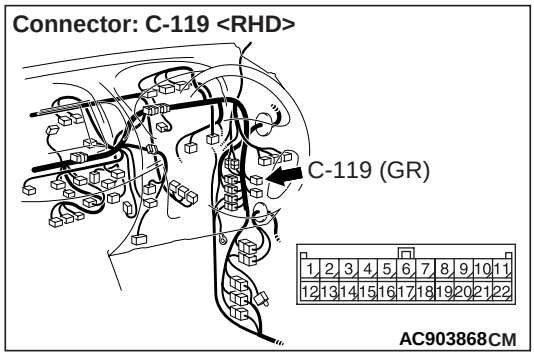
⚠ CAUTION

A digital multimeter should be used. For details refer to P.54C-7.

⚠ CAUTION

The test wiring harness should be used. For details refer to P.54C-7.





(1) Disconnect joint connector (CAN1), and measure at the wiring harness side.

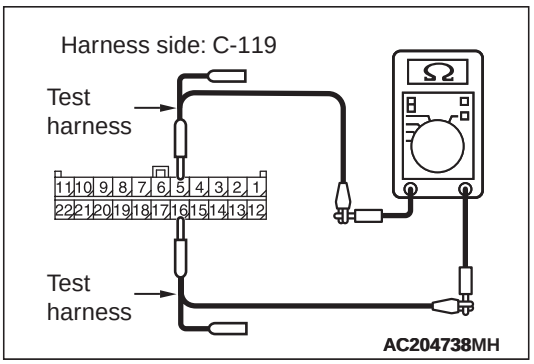
(2) Turn the ignition switch to the LOCK (OFF) position.

⚠ CAUTION

When measuring the resistance, disconnect the negative battery terminal. For details refer to P.54C-7.

(3) Ensure that the negative battery terminal is

disconnected.



(4) Resistance between C-119 joint connector (CAN1) terminal Nos.5 and 16

OK: 1 kΩ or more

⚠ CAUTION

Strictly observe the specified wiring harness repair procedure. For details refer to P.54C-7.

Q: Is the check result normal?

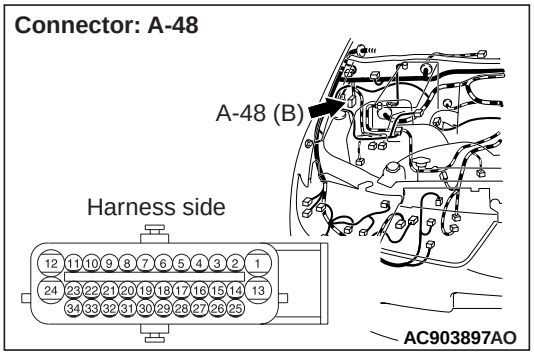
YES : <1 kΩ or more> Go to Step 17.

NO : <Less than 1 kΩ> Go to Step 16.

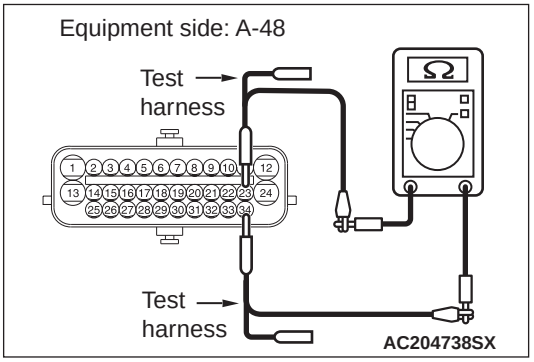
STEP 16. Resistance measurement at A-48 ASTC-ECU connector.

⚠ CAUTION

A digital multimeter should be used. For details refer to P.54C-7.



(1) Remove the ASTC-ECU, and measure at the equipment side.



(2) Resistance at A-48 ASTC-ECU connector terminal Nos.23 and 34

OK: 1 kΩ or more

Q: Is the check result normal?

YES : <1 kΩ or more> Check intermediate connector C-13, and repair if necessary. If the intermediate connector C-13 is in good condition, repair the wiring harness between joint connector (CAN1) and the ASTC-ECU connector.

NO : <Less than 1 kΩ> Check the ASTC-ECU connector, and repair if necessary. If the ASTC-ECU connector is in good condition, replace the hydraulic unit assembly.

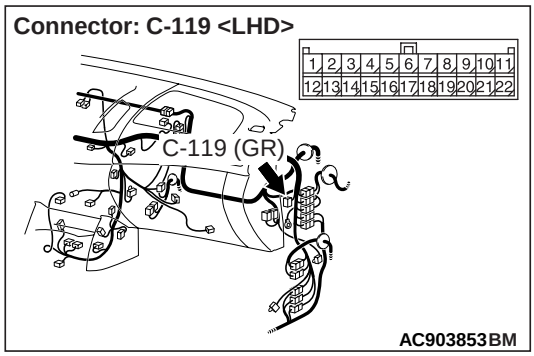
STEP 17. Resistance measurement at C-119 joint connector (CAN1).

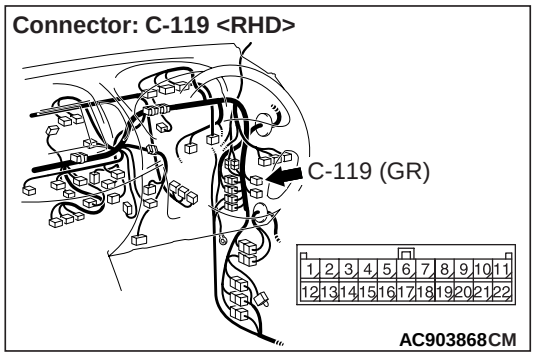
⚠ CAUTION

A digital multimeter should be used. For details refer to P.54C-7.

⚠ CAUTION

The test wiring harness should be used. For details refer to P.54C-7.





(1) Disconnect joint connector (CAN1), and measure at the wiring harness side.

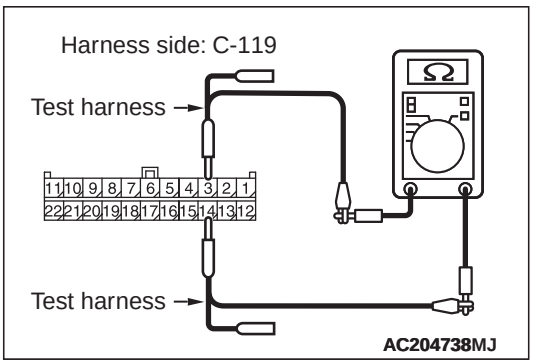
(2) Turn the ignition switch to the LOCK (OFF) position.

⚠ CAUTION

When measuring the resistance, disconnect the negative battery terminal. For details refer to P.54C-7.

(3) Ensure that the negative battery terminal is

disconnected.



(4) Resistance between C-119 joint connector (CAN1) terminal Nos.3 and 14

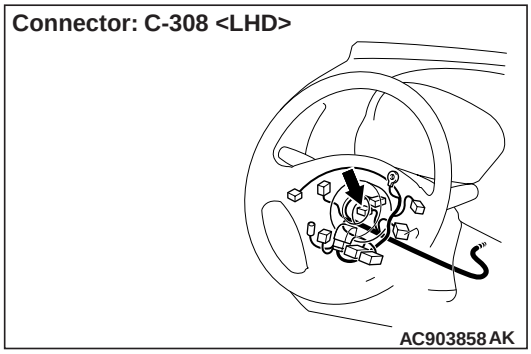
OK: 1 kΩ or more

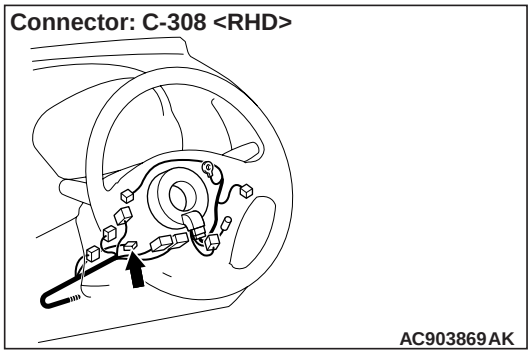
⚠ CAUTION
Strictly observe the specified wiring harness repair procedure. For details refer to P.54C-7.

Q: Is the check result normal?
YES : <1 kΩ or more> Go to Step 19.
NO : <Less than 1 kΩ> Go to Step 18.

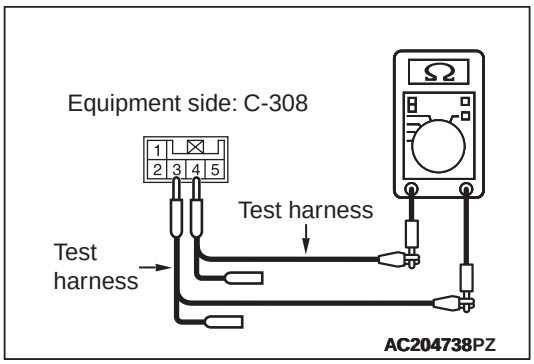
STEP 18. Resistance measurement at C-308 steering wheel sensor connector.

⚠ CAUTION
A digital multimeter should be used. For details refer to P.54C-7.





(1) Remove the steering wheel sensor, and measure at the equipment side.



(2) Resistance at C-308 steering wheel sensor connector terminal Nos.3 and 4

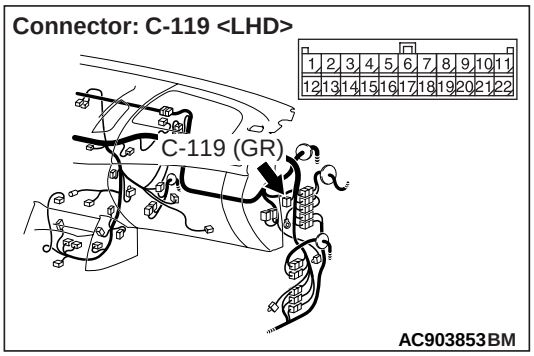
OK: 1 kΩ or more

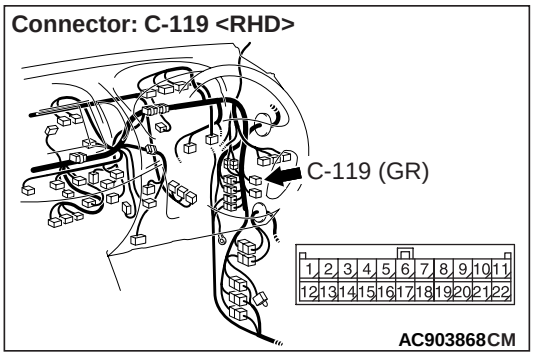
Q: Is the check result normal?
YES : <1 kΩ or more> Repair the wiring harness between joint connector (CAN1) and the steering wheel sensor connector.
NO : <Less than 1 kΩ> Check the steering wheel sensor connector, and repair if necessary. If the steering wheel sensor connector is in good condition, replace the steering wheel sensor.

STEP 19. Resistance measurement at C-119 joint connector (CAN1).

⚠ CAUTION
A digital multimeter should be used. For details refer to P.54C-7.

⚠ CAUTION
The test wiring harness should be used. For details refer to P.54C-7.

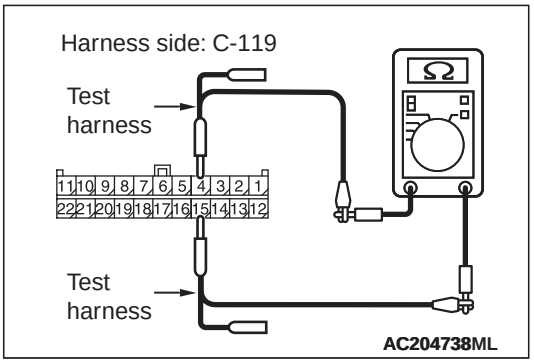




(1) Disconnect joint connector (CAN1), and measure at the wiring harness side.
(2) Turn the ignition switch to the LOCK (OFF) position.

⚠ CAUTION
When measuring the resistance, disconnect the negative battery terminal. For details refer to P.54C-7.

(3) Ensure that the negative battery terminal is disconnected.



(4) Resistance between C-119 joint connector (CAN1) terminal Nos.4 and 15

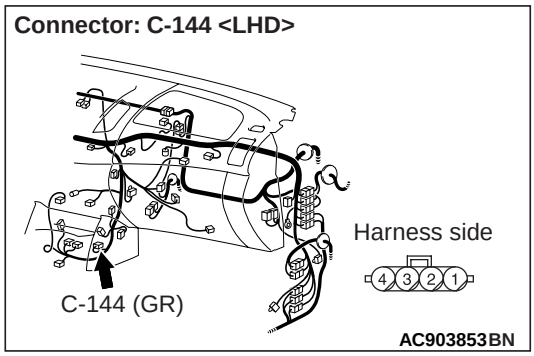
OK: 1 kΩ or more

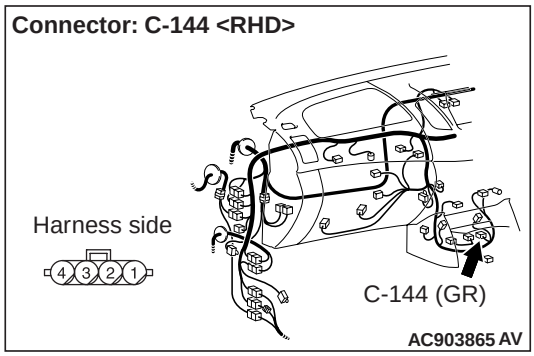
⚠ CAUTION
Strictly observe the specified wiring harness repair procedure. For details refer to P.54C-7.

Q: Is the check result normal?
YES <vehicles without A/C> : <1 kΩ or more> Go to Step 23.
YES <vehicles with A/C> : <1 kΩ or more> Go to Step 21.
NO : <Less than 1 kΩ> Go to Step 20.

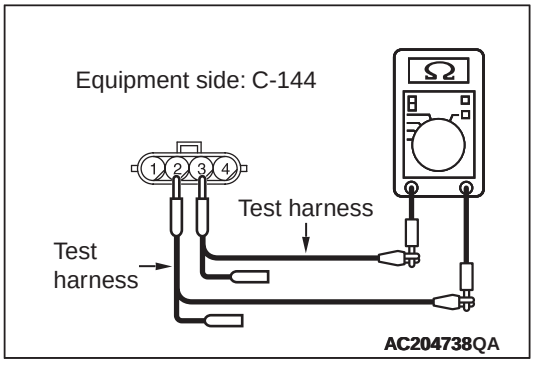
STEP 20. Resistance measurement at C-144 G and yaw rate sensor connector.

⚠ CAUTION
A digital multimeter should be used. For details refer to P.54C-7.





(1) Remove the G and yaw rate sensor, and measure at the equipment side.



(2) Resistance at C-144 G and yaw rate sensor

connector terminal Nos.2 and 3

OK: 1 kΩ or more

Q: Is the check result normal?

YES : <1 kΩ or more> Repair the wiring harness between joint connector (CAN1) and the G and yaw rate sensor connector.

NO : <Less than 1 kΩ> Check the G and yaw rate sensor connector, and repair if necessary. If the G and yaw rate sensor connector is in good condition, replace the G and yaw rate sensor.

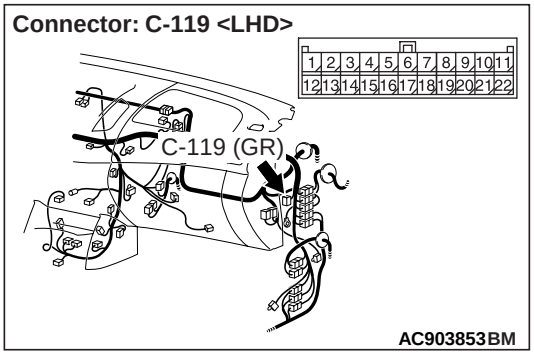
STEP 21. Resistance measurement at C-119 joint connector (CAN1).

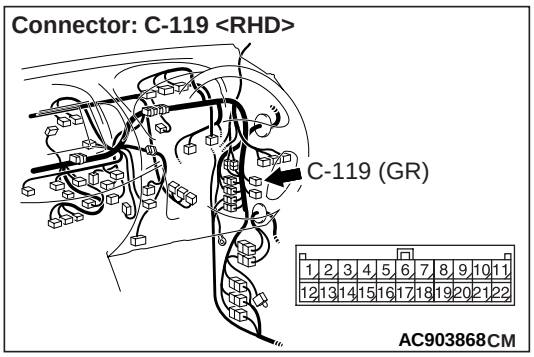
⚠ CAUTION

A digital multimeter should be used. For details refer to P.54C-7.

⚠ CAUTION

The test wiring harness should be used. For details refer to P.54C-7.





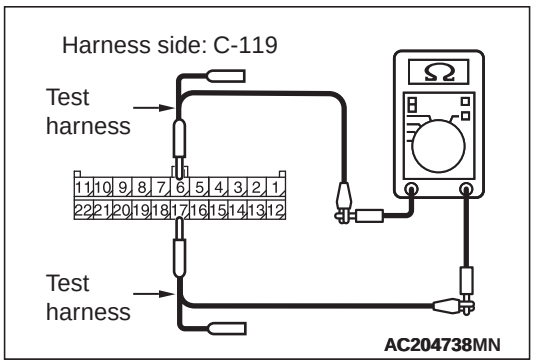
(1) Disconnect joint connector (CAN1), and measure at the wiring harness side.

(2) Turn the ignition switch to the LOCK (OFF) position.

⚠ CAUTION

When measuring the resistance, disconnect the negative battery terminal. For details refer to P.54C-7.

(3) Ensure that the negative battery terminal is disconnected.



(4) Resistance between C-119 joint connector (CAN1) terminal Nos.6 and 17

OK: 1 kΩ or more

⚠ CAUTION

Strictly observe the specified wiring harness repair procedure. For details refer to P.54C-7.

Q: Is the check result normal?

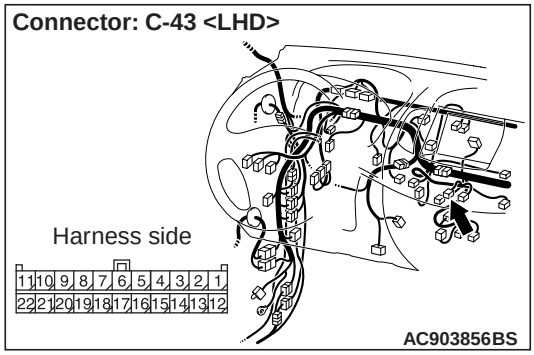
YES : <1 kΩ or more> Go to Step 23.

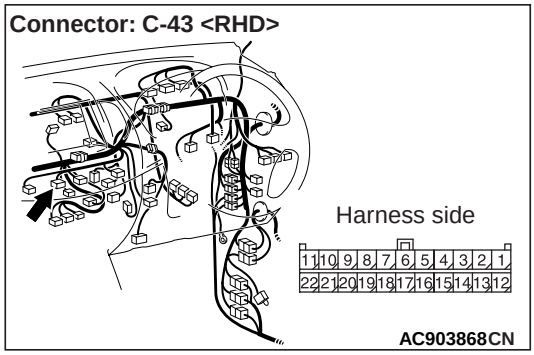
NO : <Less than 1 kΩ> Go to Step 22.

STEP 22. Resistance measurement at C-43 A/C-ECU connector.

⚠ CAUTION

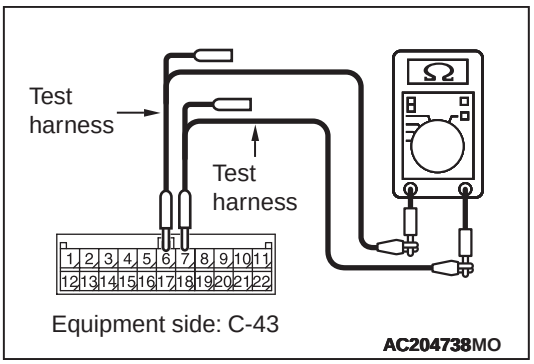
A digital multimeter should be used. For details refer to P.54C-7.





(1) Remove the A/C-ECU, and measure at the

equipment side.



(2) Resistance at C-43 A/C-ECU connector terminal Nos.6 and 7

OK: 1 kΩ or more

Q: Is the check result normal?

YES : <1 kΩ or more> Repair the wiring harness between joint connector (CAN1) and the A/C-ECU connector.

NO : <Less than 1 kΩ> Check the A/C-ECU connector, and repair if necessary. If the A/C-ECU connector is in good condition, replace the A/C-ECU.

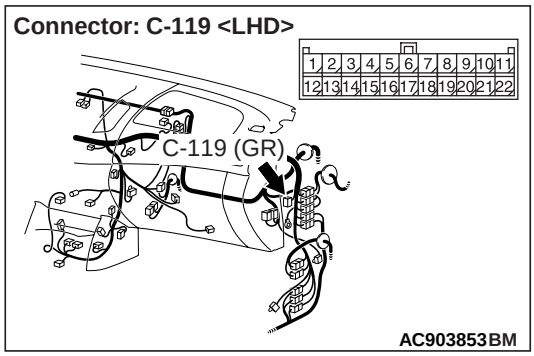
STEP 23. Resistance measurement at C-119 joint connector (CAN1).

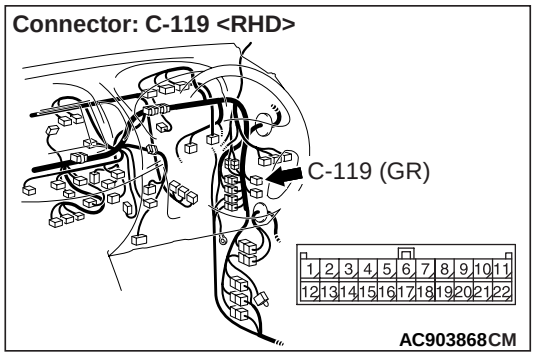
⚠ CAUTION

A digital multimeter should be used. For details refer to P.54C-7.

⚠ CAUTION

The test wiring harness should be used. For details refer to P.54C-7.





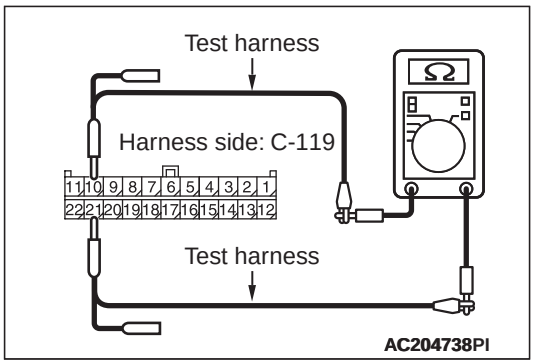
(1) Disconnect the joint connector (CAN1), and measure at the wiring harness side.

(2) Turn the ignition switch to the LOCK (OFF) position.

⚠ CAUTION

When measuring the resistance, disconnect the negative battery terminal. For details refer to P.54C-7.

(3) Ensure that the negative battery terminal is disconnected.



(4) Resistance between C-119 joint connector

(CAN1) terminal Nos.10 and 21

OK: 1 kΩ or more

⚠ CAUTION

Strictly observe the specified wiring harness repair procedure. For details refer to P.54C-7.

Q: Is the check result normal?

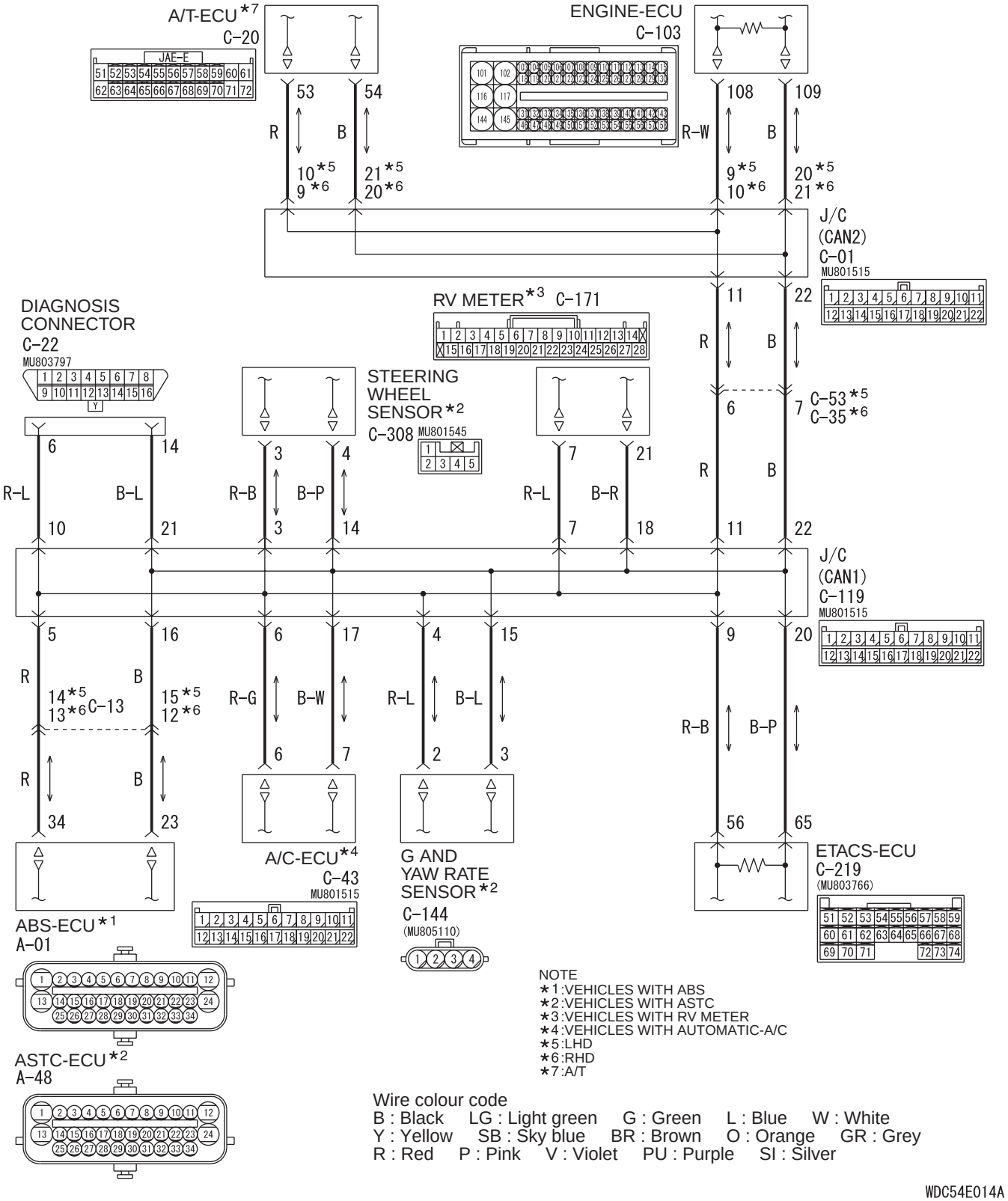
YES : <1 kΩ or more> Repair the wiring harness between joint connector (CAN1) and the intermediate connector C-53.

NO : <Less than 1 kΩ> Check the diagnosis connector, and repair if necessary. If the diagnosis connector is in good condition, repair the wiring harness between joint connector (CAN1) and the diagnosis connector.

Diagnosis Item 4: Diagnose the terminator resistors

⚠ CAUTION

When servicing a CAN bus line, earth yourself by touching a metal object such as an unpainted water pipe. If you fail to do, a component connected to the CAN bus line may be broken.



FUNCTION

The resistance in the communication errors condition cannot be measured by the CAN bus diagnostics, therefore, judge the terminator resistor only when receiving the each ECU periodically sent data normally.

TROUBLE JUDGEMENT CONDITIONS

The M.U.T.-III judges the trouble when the periodically sent data from each ECU can be received normally but the resistance value between CAN_H and CAN_L line is other than from 50 Ω to 70 Ω.

PROBABLE CAUSES

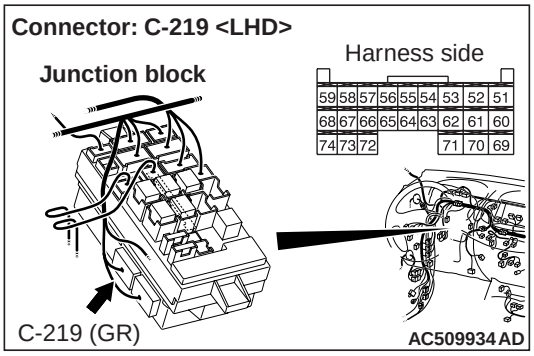
- Damaged harness wires and connectors
- Malfunction of the ETACS-ECU
- Malfunction of the engine-ECU

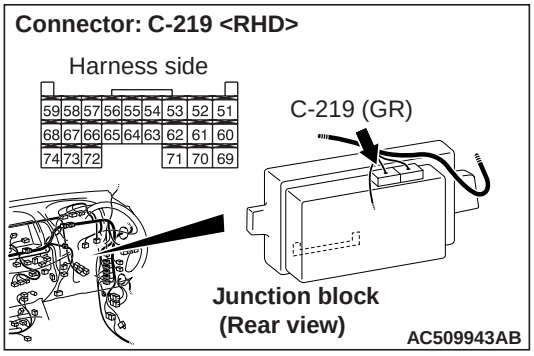
DIAGNOSIS PROCEDURE

STEP 1. Resistance measurement at C-219 ETACS-ECU connector.

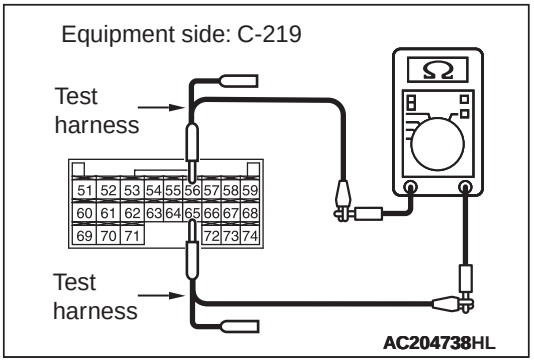
⚠ CAUTION

A digital multimeter should be used. For details refer to P.54C-7.





(1) Remove the ETACS-ECU, and measure at the equipment side.



(2) Resistance at C-219 ETACS-ECU connector terminal Nos.56 and 65

OK: 120 ± 20 Ω

Q: Is the check result normal?

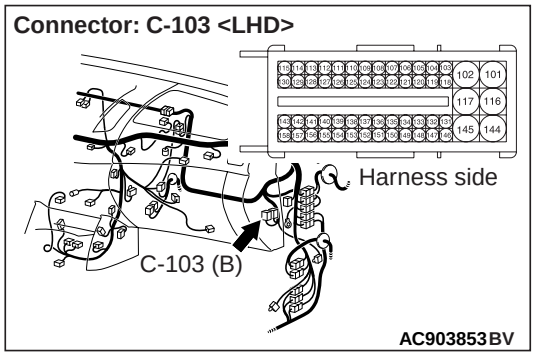
YES : <Within 120 ± 20 Ω> Go to Step 2.

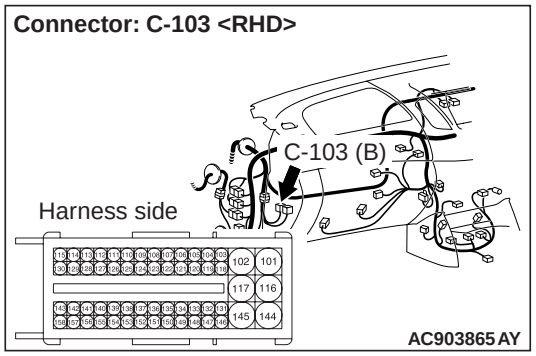
NO : <Not within 120 ± 20 Ω> Replace the ETACS-ECU.

STEP 2. Resistance measurement at C-103 engine-ECU connector.

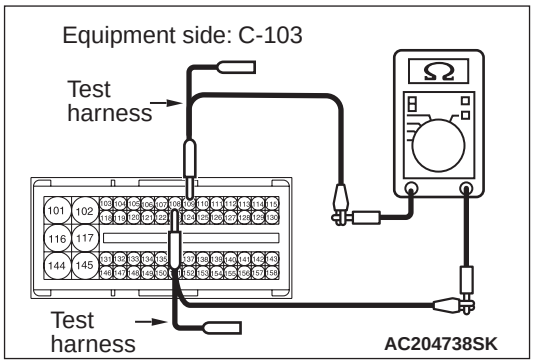
⚠ CAUTION

A digital multimeter should be used. For details refer to P.54C-7.





(1) Remove the engine-ECU, and measure at the equipment side.



(2) Resistance between C-103 engine-ECU

connector terminal Nos.108 and 109

OK: 120 ± 20 Ω

⚠ CAUTION

Strictly observe the specified wiring harness repair procedure. For details refer to P.54C-7.

Q: Is the check result normal?

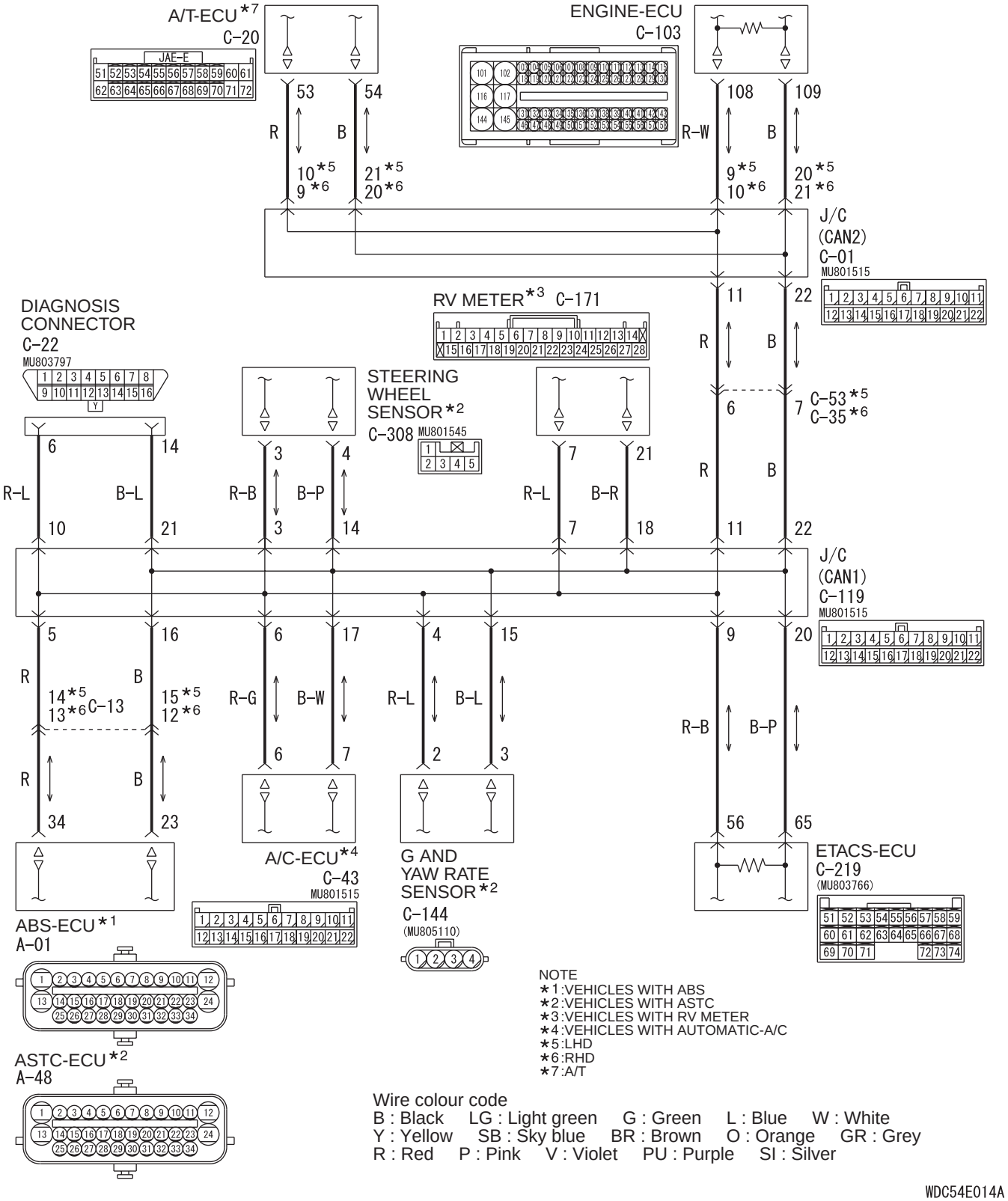
YES : <Within 120 ± 20 Ω> Repair the wiring harness between the ETACS-ECU connector and the engine-ECU connector.

NO : <Not within 120 ± 20 Ω> Replace the engine-ECU.

Diagnosis Item 5: Diagnose when the M.U.T.-III cannot receive the data sent by ETACS-ECU.

⚠ CAUTION

When servicing a CAN bus line, earth yourself by touching a metal object such as an unpainted water pipe. If you fail to do, a component connected to the CAN bus line may be broken.



WDC54E014A

FUNCTION

The diagnostic result demonstrates that "the M.U.T.-III cannot receive the sent data from the ETACS-ECU" when the M.U.T.-III checks the periodically sent data from each ECU.

TROUBLE JUDGEMENT CONDITIONS

M.U.T.-III judges the trouble when the periodically sent data from ETACS-ECU cannot be received.

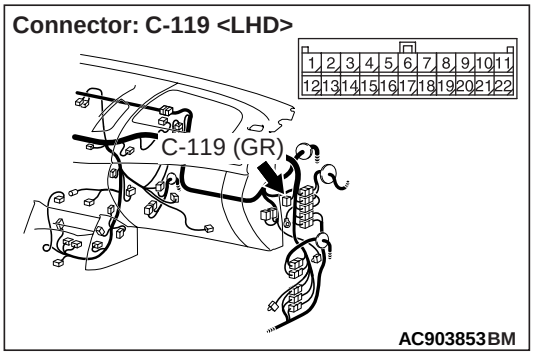
PROBABLE CAUSES

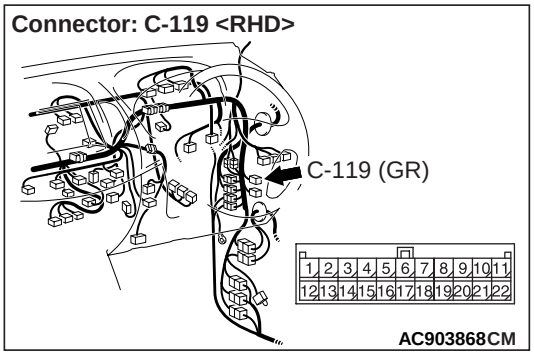
- Damaged harness wires and connectors
- Power supply circuit malfunction of the ETACS-ECU
- Malfunction of the ETACS-ECU

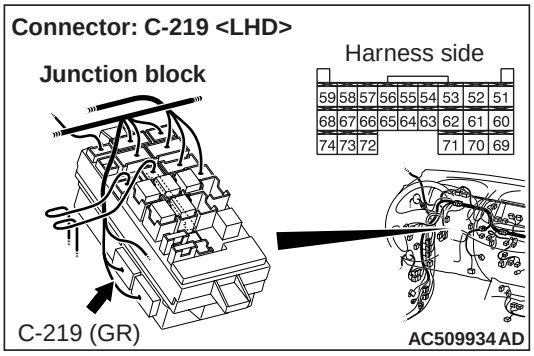
DIAGNOSIS PROCEDURE

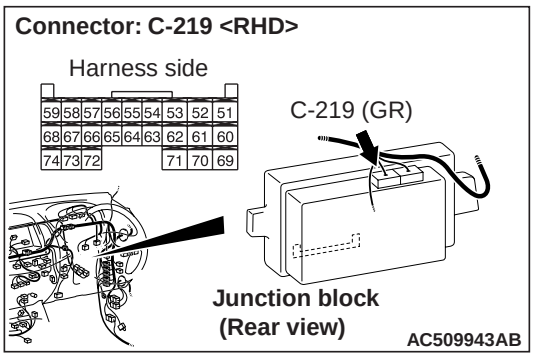
STEP 1. Connector check: C-119 joint connector (CAN1) and C-219 ETACS-ECU connector

⚠ CAUTION

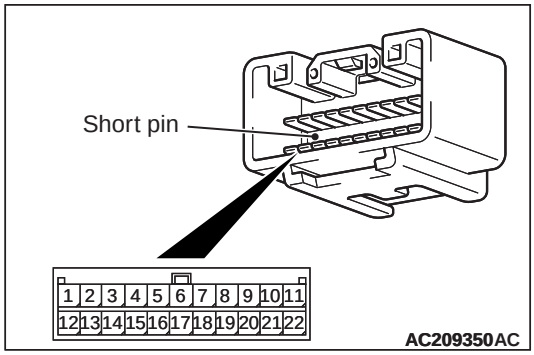








The strand end of the twist wire should be within 10 cm from the connector. For details refer to **P.54C-7****.**



When checking the joint connector, ensure that its wiring harness side and its short pins are not damaged.

Q: Is the check result normal?

YES : Go to Step 2.

NO : Repair the defective connector. Replace the joint connector as necessary.

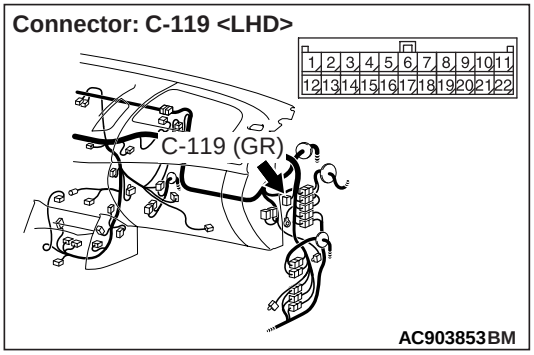
STEP 2. Resistance measurement at C-119 joint connector (CAN1) and C-219 ETACS-ECU connector.

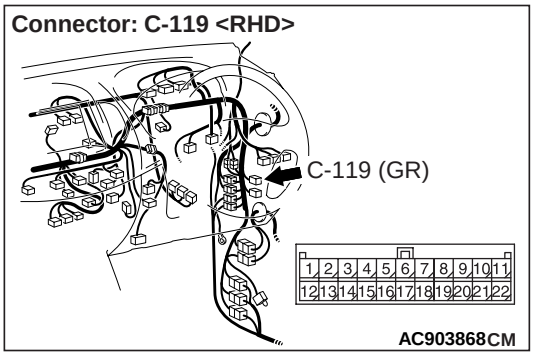
⚠ CAUTION

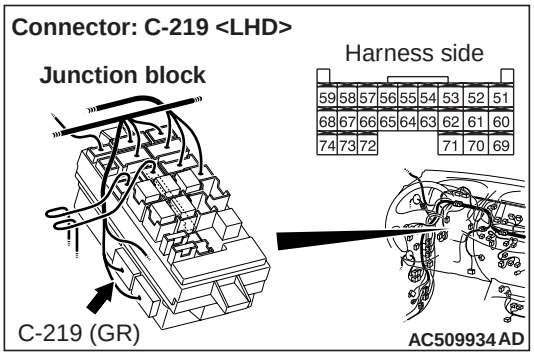
A digital multimeter should be used. For details refer to P.54C-7.

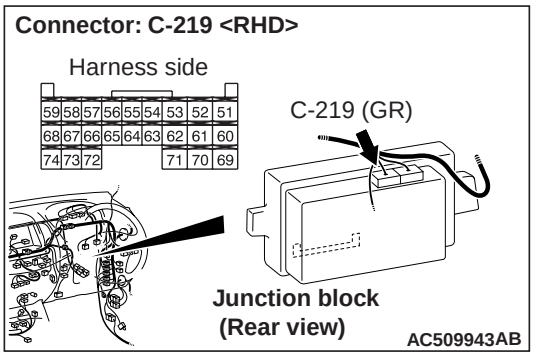
⚠ CAUTION

The test wiring harness should be used. For details refer to P.54C-7.









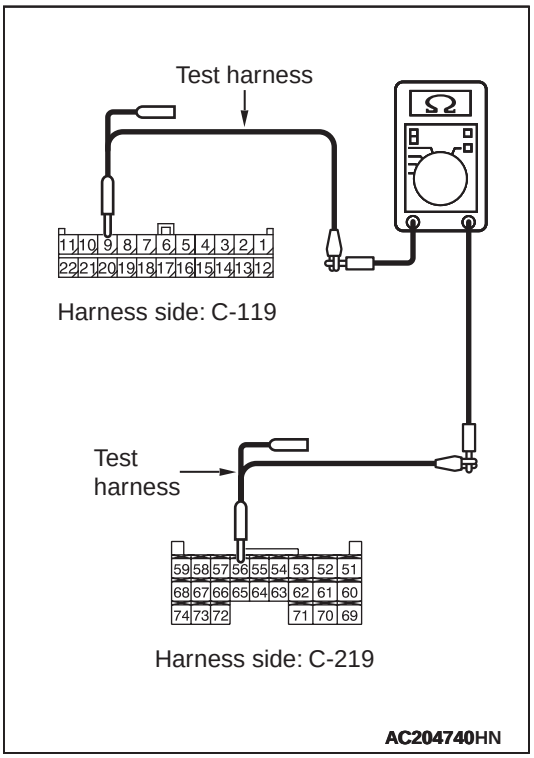
(1) Disconnect the joint connector (CAN1) and the ETACS-ECU connector, and measure at the wiring harness side.

(2) Turn the ignition switch to the LOCK (OFF) position.

⚠ CAUTION

When measuring the resistance, disconnect the negative battery terminal. For details refer to P.54C-7.

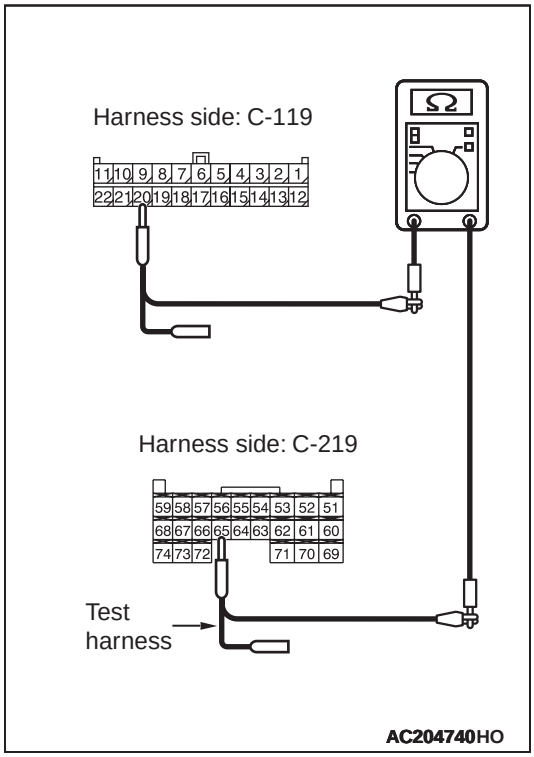
(3) Ensure that the negative battery terminal is disconnected.



(4) Continuity between C-119 joint connector (CAN1) terminal No.9 and C-219 ETACS-ECU connector

terminal No.56

OK: Continuity (2 Ω or less)



(5) Continuity between C-119 joint connector (CAN1) terminal No.20 and C-219 ETACS-ECU connector terminal No.65

OK: Continuity (2 Ω or less)

⚠ CAUTION

Strictly observe the specified wiring harness repair procedure. For details refer to P.54C-7.

Q: Is the check result normal?

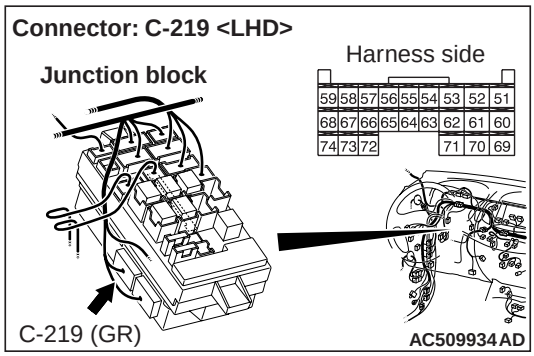
YES : <All the resistances measure 2 Ω or less> Go to Step 3 .

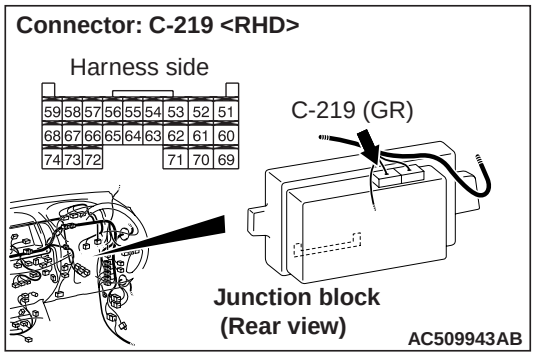
NO : <Either or all of the resistances measure more than 2 Ω> Repair the wiring harness between joint connector (CAN1) and the ETACS-ECU connector.

STEP 3. Resistance measurement at C-219 ETACS-ECU connector.

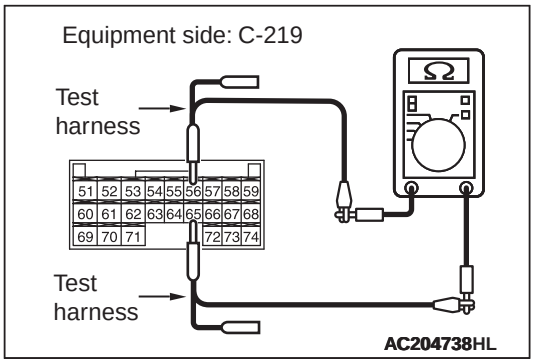
⚠ CAUTION

A digital multimeter should be used. For details refer to P.54C-7.





(1) Remove the ETACS-ECU, and measure at the equipment side.



(2) Resistance at C-219 ETACS-ECU connector terminal Nos.56 and 65

OK: 120 ± 20 Ω

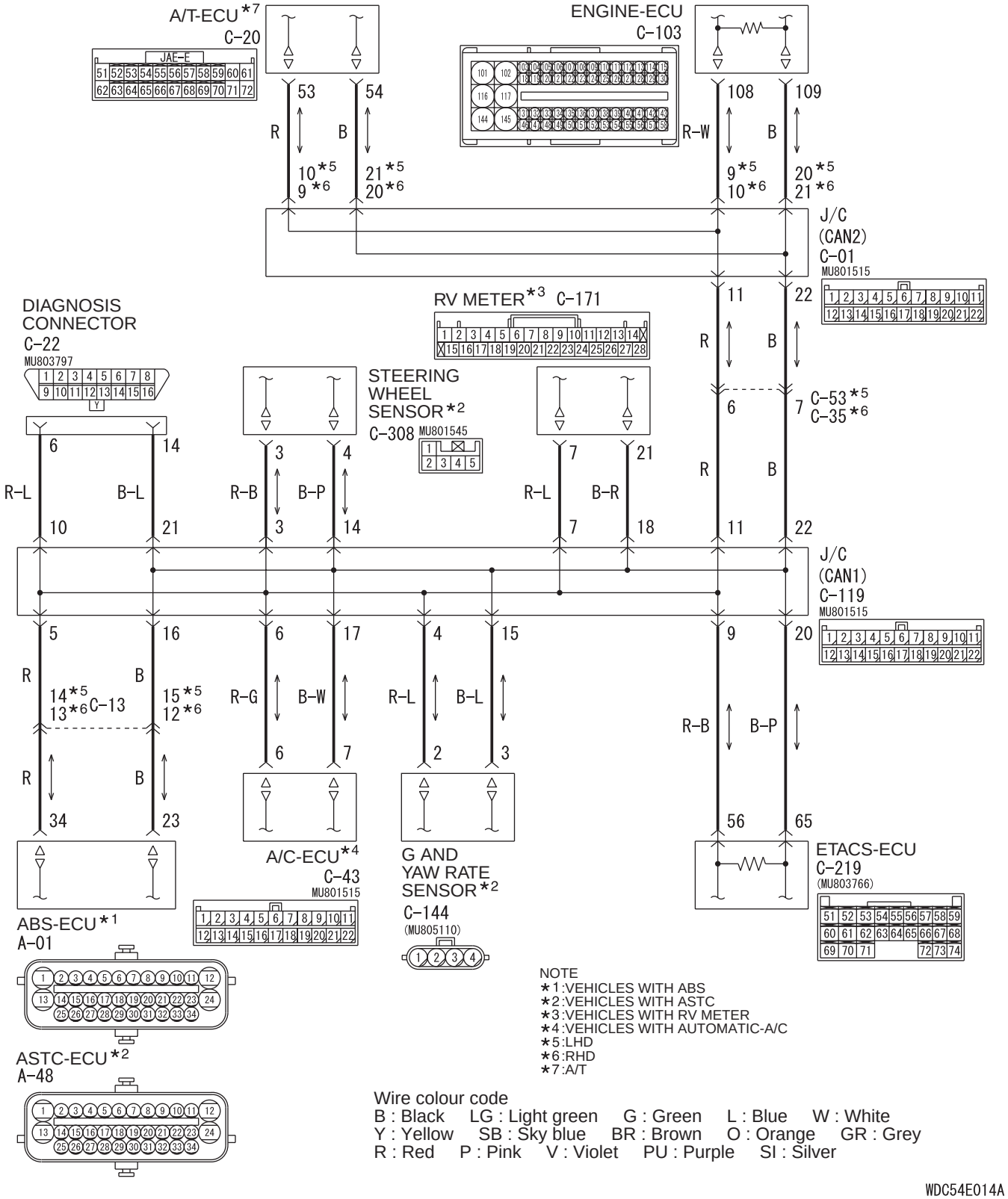
Q: Is the check result normal?

YES : <Within 120 ± 20 Ω> Power supply to the ETACS-ECU may be suspected. Refer to .

NO : <Not within 120 ± 20 Ω> Replace the ETACS-ECU.

Diagnosis Item 6: Diagnose when the M.U.T.-III cannot receive the data sent by RV meter <vehicles with RV meter>

⚠ CAUTION
When servicing a CAN bus line, earth yourself by touching a metal object such as an unpainted water pipe. If you fail to do, a component connected to the CAN bus line may be broken.



FUNCTION

The diagnostic result demonstrates that "the M.U.T.-III cannot receive the sent data from the RV meter <vehicles with RV meter>" when the M.U.T.-III checks the periodically sent data from each ECU.

TROUBLE JUDGEMENT CONDITIONS

M.U.T.-III judges the trouble when the periodically sent data from RV meter <vehicles with RV meter> cannot be received.

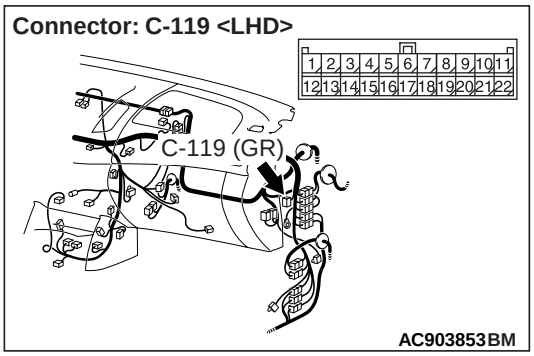
PROBABLE CAUSES

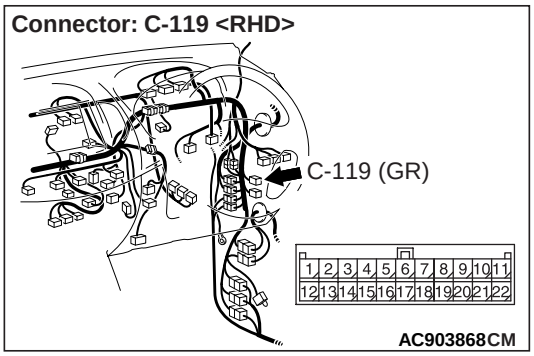
- Damaged harness wires and connectors
- Power supply circuit malfunction of the RV meter
- Malfunction of the RV meter <vehicles with RV meter>

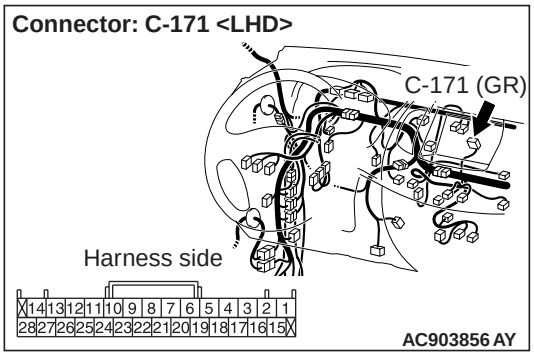
DIAGNOSIS PROCEDURE

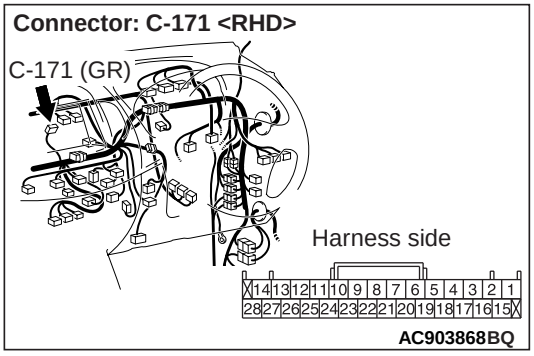
STEP 1. Connector check: C-119 joint connector (CAN1) and C-171 RV meter connector <vehicles with RV meter>

⚠ CAUTION

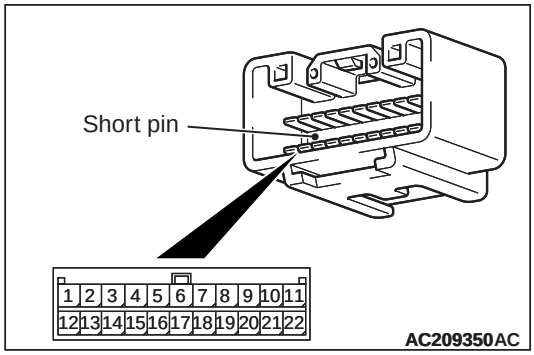








The strand end of the twist wire should be within 10 cm from the connector. For details refer to P.54C-7.



When checking the joint connector, ensure that its wiring harness side and its short pins are not damaged.

Q: Is the check result normal?

YES : Go to Step 2.

NO : Repair the defective connector. Replace the joint connector as necessary.

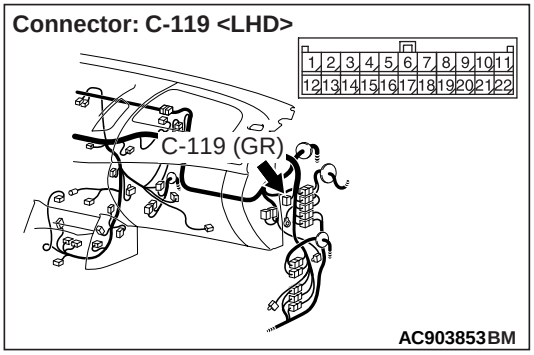
STEP 2. Resistance measurement at C-119 joint connector (CAN1) and C-171 RV meter connector.

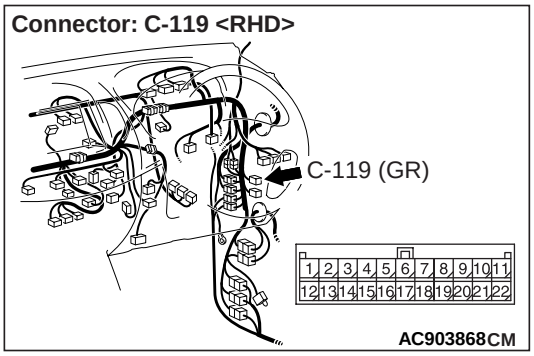
⚠ CAUTION

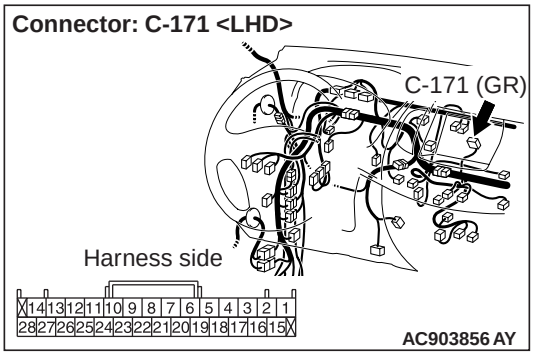
A digital multimeter should be used. For details refer to P.54C-7.

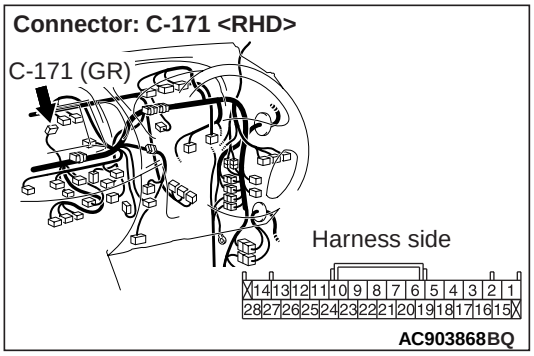
⚠ CAUTION

The test wiring harness should be used. For details refer to P.54C-7.









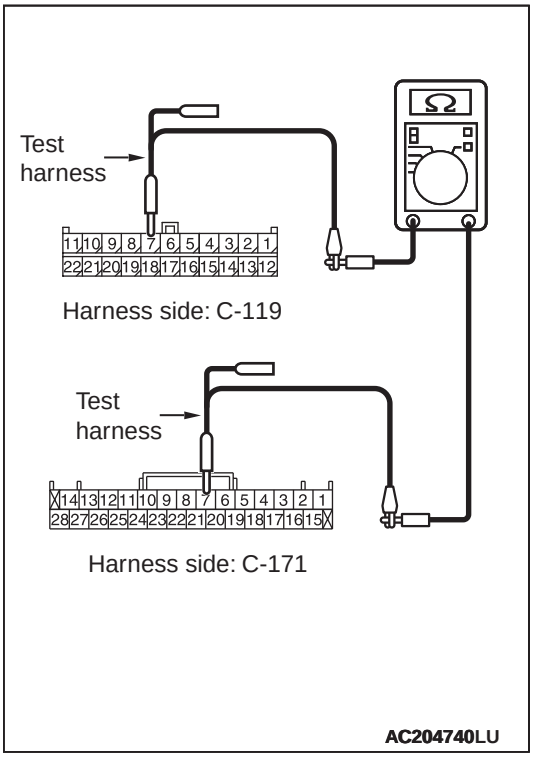
(1) Disconnect joint connector (CAN1) and the RV meter connector, and measure at the wiring harness side.

(2) Turn the ignition switch to the LOCK (OFF) position.

⚠ CAUTION

When measuring the resistance, disconnect the negative battery terminal. For details refer to P.54C-7.

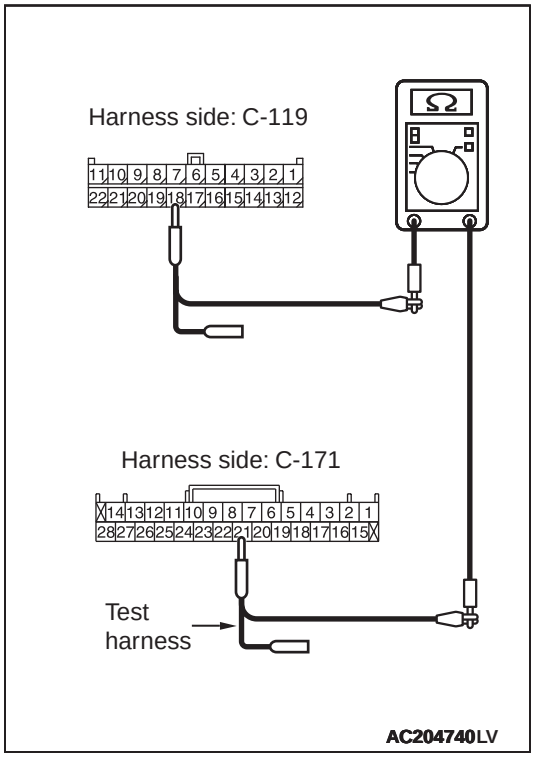
(3) Ensure that the negative battery terminal is disconnected.



(4) Continuity between C-119 joint connector (CAN1) terminal No.7 and C-171 RV meter connector

terminal No.7

OK: Continuity (2 Ω or less)



(5) Continuity between C-119 joint connector (CAN1) terminal No.18 and C-171 RV meter connector terminal No.21

OK: Continuity (2 Ω or less)

⚠ CAUTION

Strictly observe the specified wiring harness repair procedure. For details refer to P.54C-7.

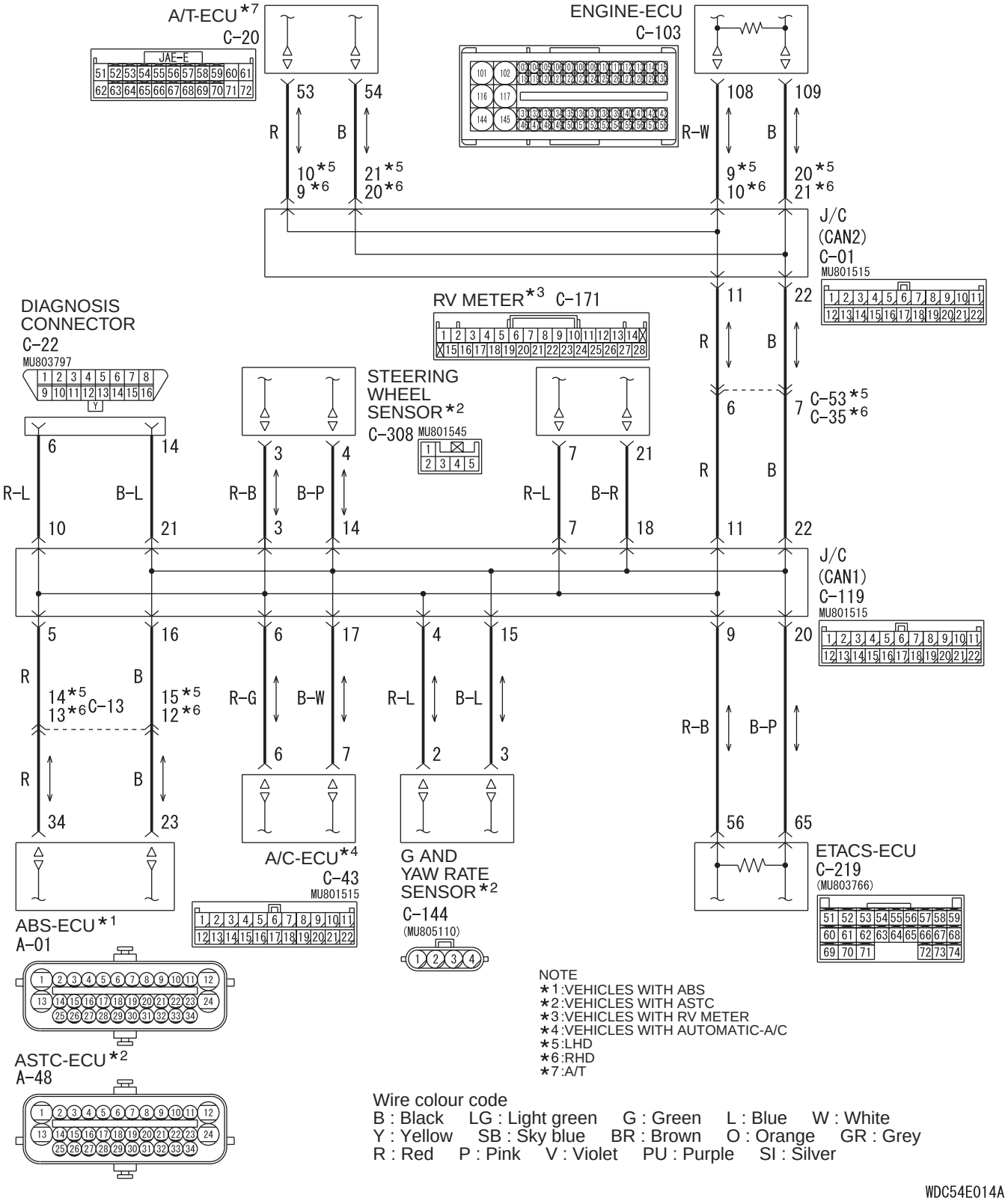
Q: Is the check result normal?

YES : <All the resistances measure 2 Ω or less> Power supply to the RV meter may be suspected. Diagnose the RV meter. Refer to .

NO : <Either or all of the resistances measure more than 2 Ω> Repair the wiring harness between joint connector (CAN1) and the RV meter connector.

Diagnosis Item 7: Diagnose when the M.U.T.-III cannot receive the data sent by ABS-ECU <vehicles with ABS> or ASTC-ECU <vehicles with ASTC>

⚠ CAUTION
When servicing a CAN bus line, earth yourself by touching a metal object such as an unpainted water pipe. If you fail to do, a component connected to the CAN bus line may be broken.



FUNCTION

The diagnostic result demonstrates that "the M.U.T.-III cannot receive the sent data from the ABS-ECU <vehicles with ABS> or ASTC-ECU <vehicles with ASTC>" when the M.U.T.-III checks the periodically sent data from each ECU.

TROUBLE JUDGEMENT CONDITIONS

M.U.T.-III judges the trouble when the periodically sent data from ABS-ECU <vehicles with ABS> or ASTC-ECU <vehicles with ASTC> cannot be received.

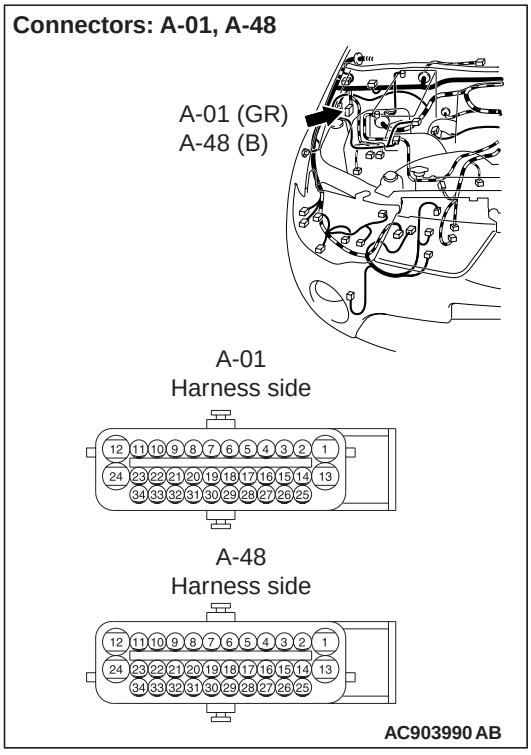
PROBABLE CAUSES

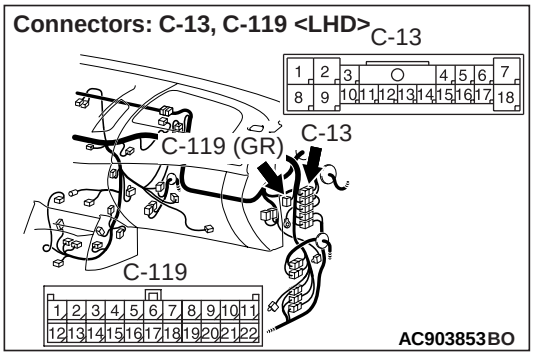
- Damaged harness wires and connectors
- Power supply circuit malfunction of the ABS-ECU <vehicles with ABS> or ASTC-ECU <vehicles with ASTC>
- Malfunction of the ABS-ECU <vehicles with ABS> or ASTC-ECU <vehicles with ASTC>

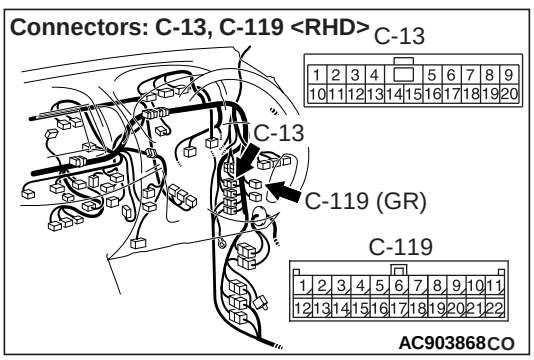
DIAGNOSIS PROCEDURE

STEP 1. Connector check: C-13 intermediate connector, C-119 joint connector (CAN1) and A-01 ABS-ECU <vehicles with ABS> or A-48 ASTC-ECU <vehicles with ASTC> connector

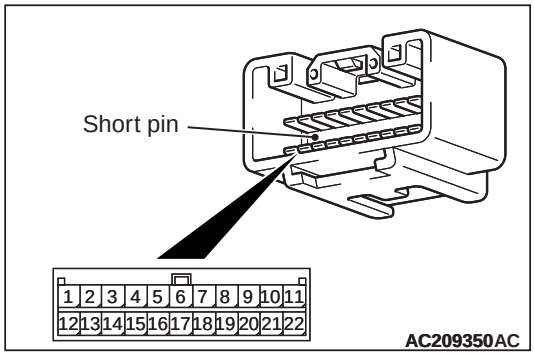
⚠ CAUTION







The strand end of the twist wire should be within 10 cm from the connector. For details refer to P.54C-7.



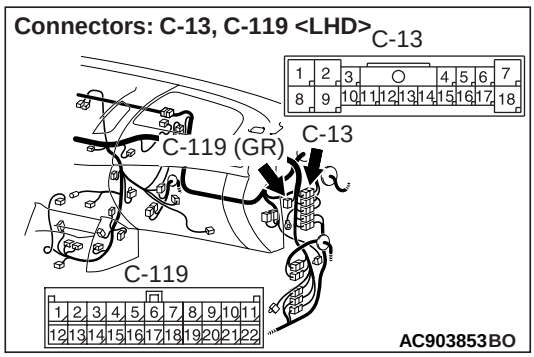
When checking the joint connector, ensure that its wiring harness side and its short pins are not damaged.

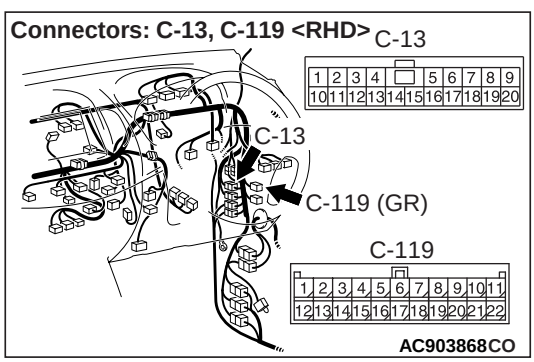
Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the defective connector. Replace the joint connector as necessary.

STEP 2. Resistance measurement at C-119 joint connector (CAN1) and C-13 intermediate connector.

⚠ CAUTION
A digital multimeter should be used. For details refer to P.54C-7.

⚠ CAUTION
The test wiring harness should be used. For details refer to P.54C-7.





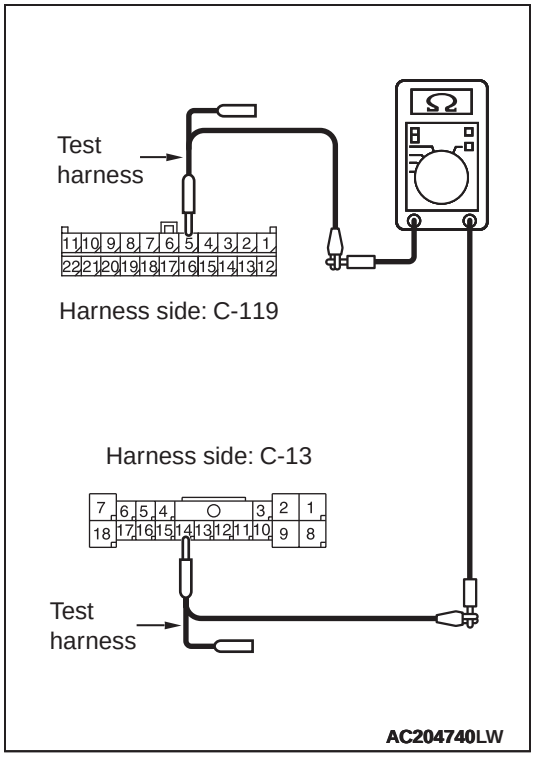
(1) Disconnect the joint connector (CAN1) and the intermediate connector, and measure at the wiring harness side.

(2) Turn the ignition switch to the LOCK (OFF) position.

⚠ CAUTION

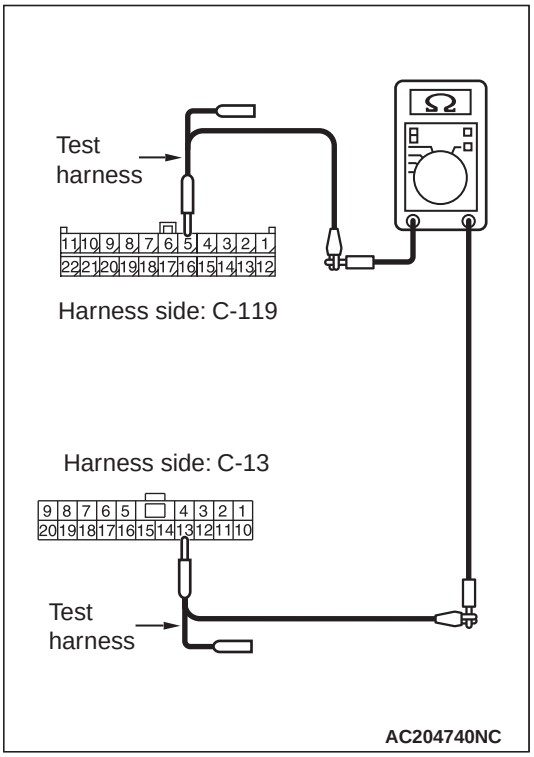
When measuring the resistance, disconnect the negative battery terminal. For details refer to P.54C-7.

(3) Ensure that the negative battery terminal is disconnected.



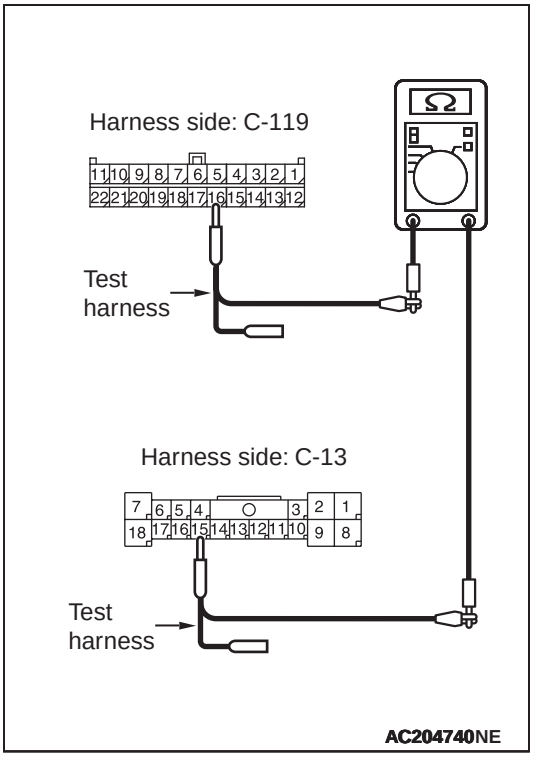
(4) Continuity between C-119 joint connector (CAN1) terminal No.5 and C-13 intermediate connector terminal No.14 <LHD>

OK: Continuity (2 Ω or less)



(5) Continuity between C-119 joint connector (CAN1) terminal No.5 and C-13 intermediate connector terminal No.13 <RHD>

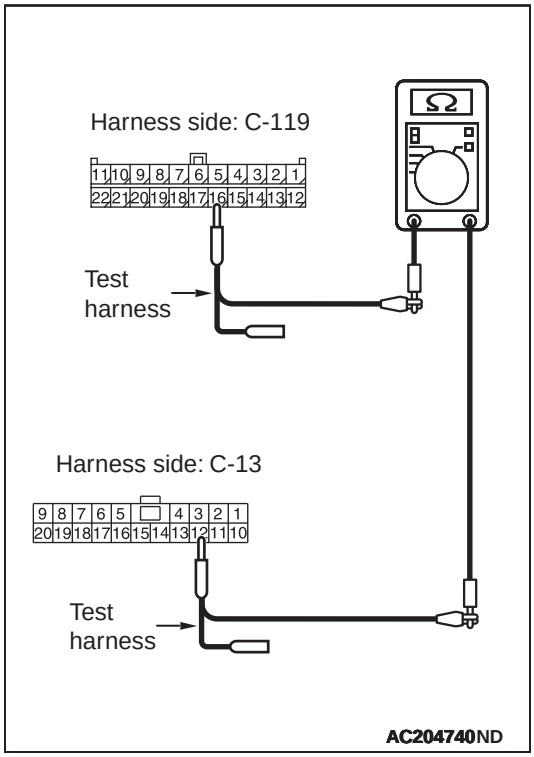
OK: Continuity (2 Ω or less)



(6) Continuity between C-119 joint connector (CAN1) terminal No.16 and C-13 intermediate connector

terminal No.15 <LHD>

OK: Continuity (2 Ω or less)



(7) Continuity between C-119 joint connector (CAN1) terminal No.16 and C-13 intermediate connector terminal No.12 <RHD>

OK: Continuity (2 Ω or less)

⚠ CAUTION

Strictly observe the specified wiring harness repair procedure. For details refer to P.54C-7.

Q: Is the check result normal?

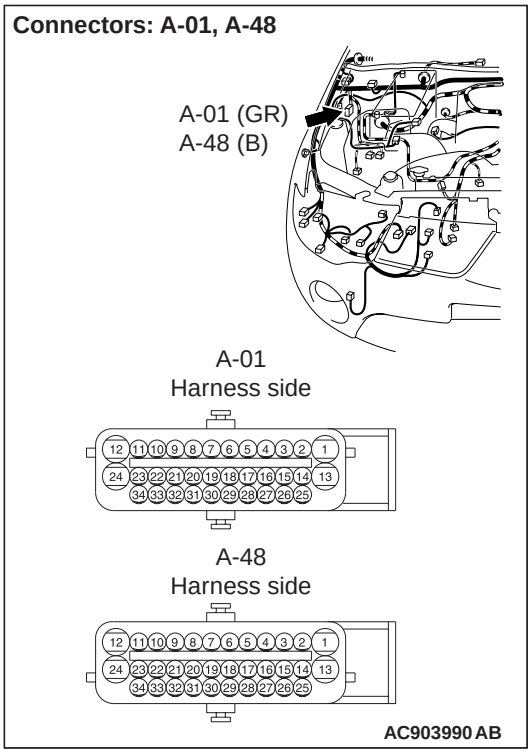
YES : <All the resistances measure 2 Ω or less> Go to Step 3 .

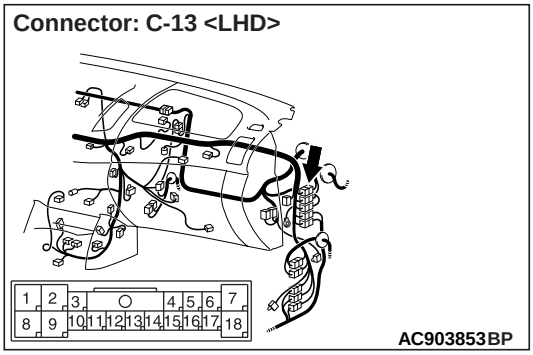
NO : <Either or all of the resistances measure more than 2 Ω> Repair the wiring harness between joint connector (CAN1) and intermediate connector (C-13).

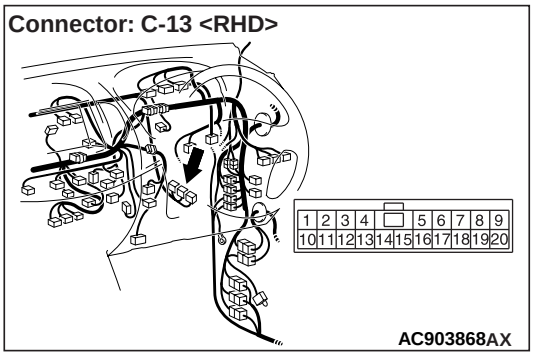
STEP 3. Resistance measurement at C-13 intermediate connector and A-01 ABS-ECU <vehicles with ABS> or A-48 ASTC-ECU <vehicles with ASTC> connector.

⚠ CAUTION
A digital multimeter should be used. For details refer to P.54C-7.

⚠ CAUTION
The test wiring harness should be used. For details refer to P.54C-7.







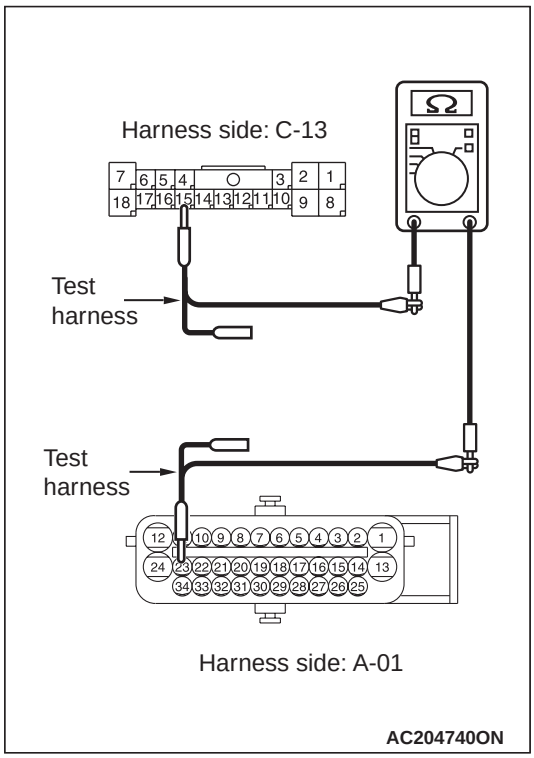
(1) Disconnect the intermediate connector and the ABS-ECU <vehicles with ABS> or ASTC-ECU <vehicles with ASTC> connector, and measure at the wiring harness side.
(2) Turn the ignition switch to the LOCK (OFF)

position.

⚠ CAUTION

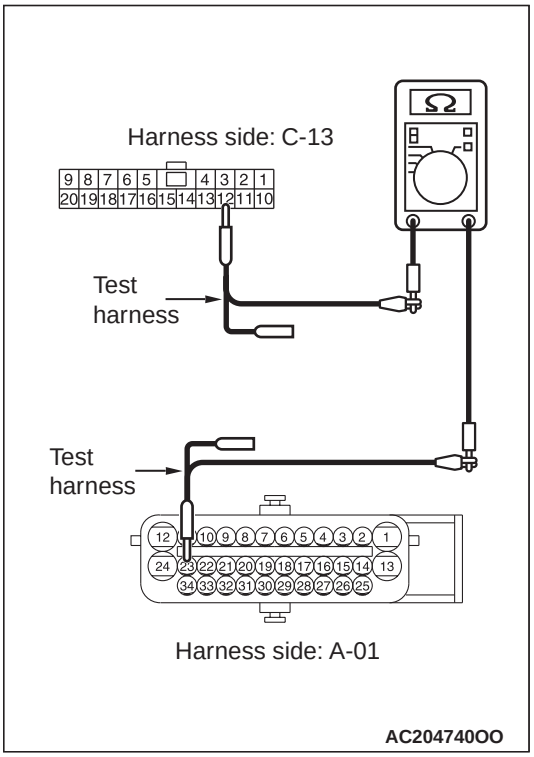
When measuring the resistance, disconnect the negative battery terminal. For details refer to P.54C-7.

(3) Ensure that the negative battery terminal is disconnected.



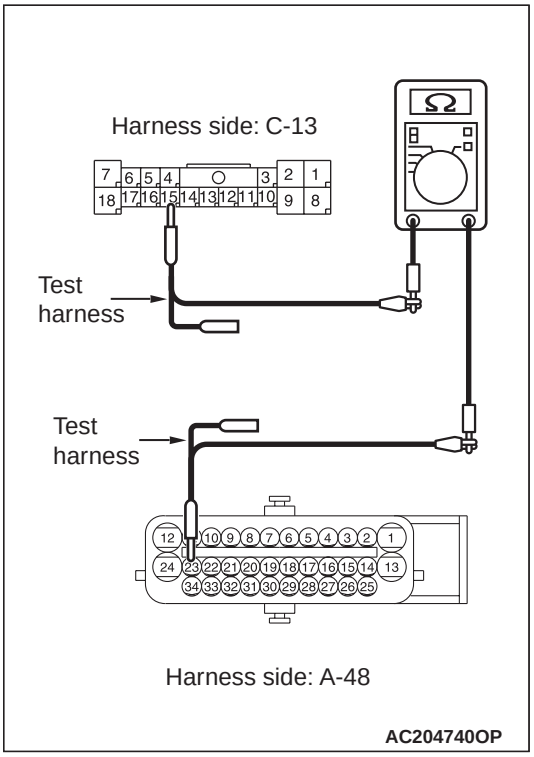
(4) Continuity between C-13 intermediate connector terminal No.15 and A-01 ABS-ECU connector terminal No.23 <LHD-vehicles with ABS>

OK: Continuity (2 Ω or less)



(5) Continuity between C-13 intermediate connector terminal No.12 and A-01 ABS-ECU connector terminal No.23 <RHD-vehicles with ABS>

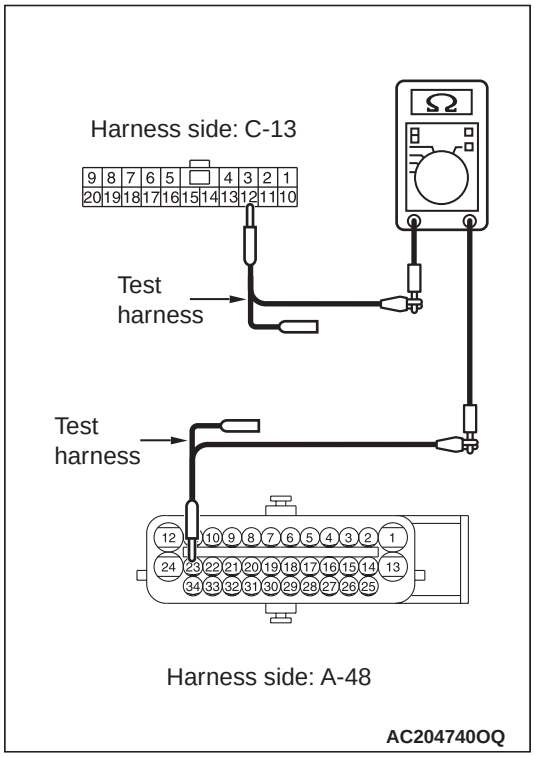
OK: Continuity (2 Ω or less)



(6) Continuity between C-13 intermediate connector terminal No.15 and A-48 ASTC-ECU connector

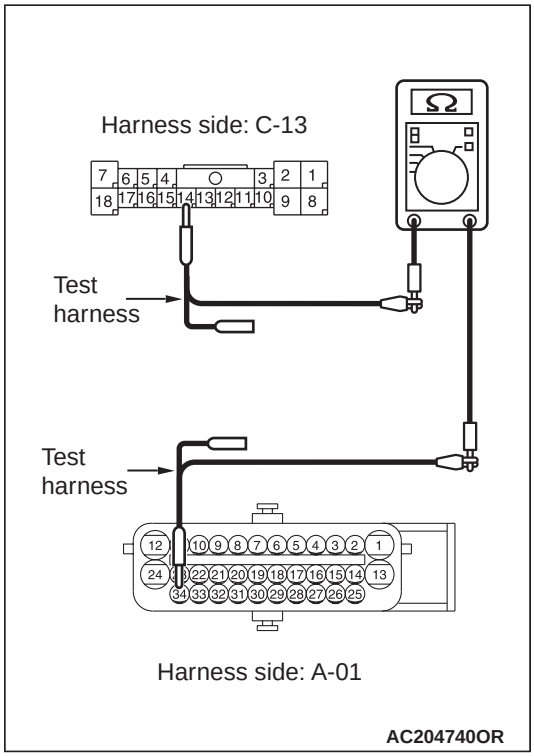
terminal No.23 <LHD-vehicles with ASTC>

OK: Continuity (2 Ω or less)



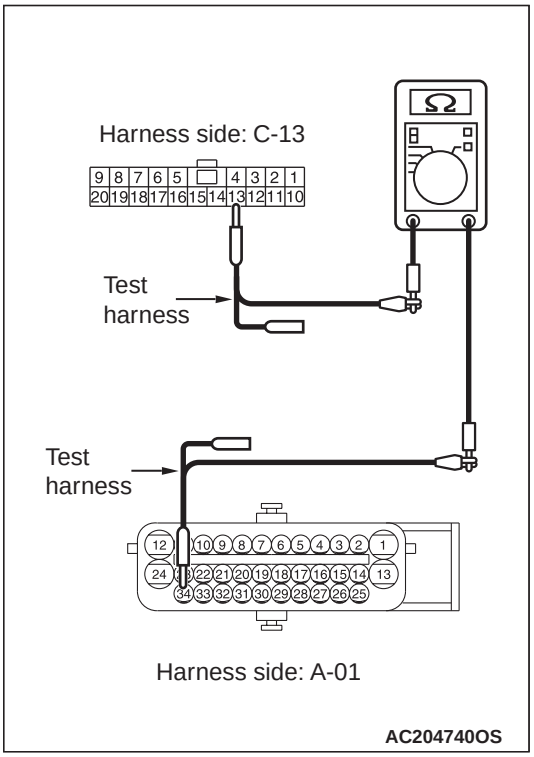
(7) Continuity between C-13 intermediate connector terminal No.12 and A-48 ASTC-ECU connector terminal No.23 <RHD-vehicles with ASTC>

OK: Continuity (2 Ω or less)



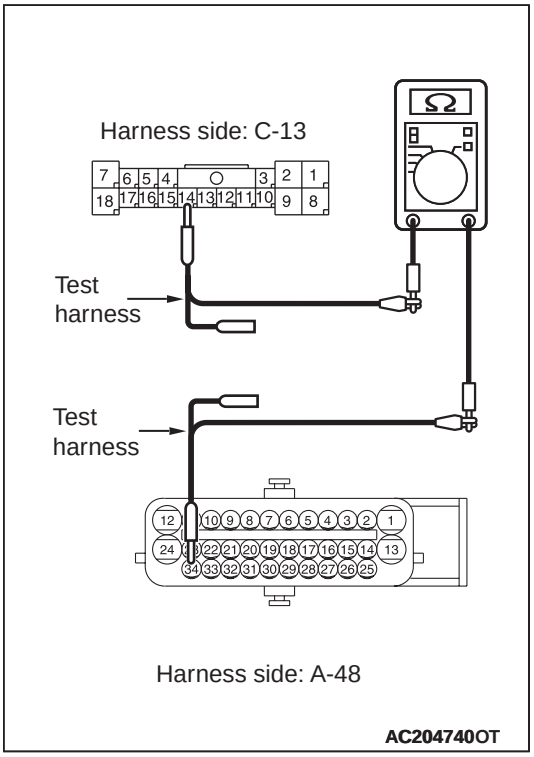
(8) Continuity between C-13 intermediate connector terminal No.14 and A-01 ABS-ECU connector terminal No.34 <LHD-vehicles with ABS>

OK: Continuity (2 Ω or less)



(9) Continuity between C-13 intermediate connector terminal No.13 and A-01 ABS-ECU connector terminal No.34 <RHD-vehicles with ABS>

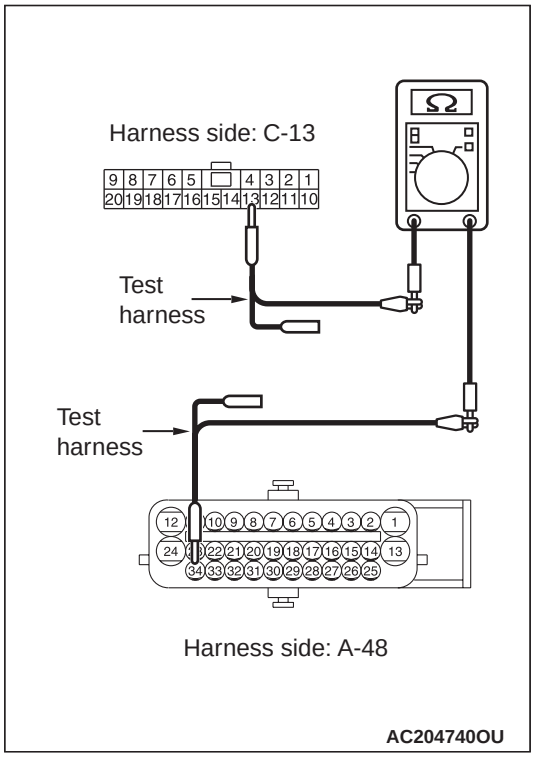
OK: Continuity (2 Ω or less)



(10)Continuity between C-13 intermediate connector terminal No.14 and A-48 ASTC-ECU connector

terminal No.34 <LHD-vehicles with ASTC>

OK: Continuity (2 Ω or less)



(11)Continuity between C-13 intermediate connector terminal No.13 and A-48 ASTC-ECU connector terminal No.34 <RHD-vehicles with ASTC>

OK: Continuity (2 Ω or less)

⚠ CAUTION

Strictly observe the specified wiring harness repair procedure. For details refer to P.54C-7.

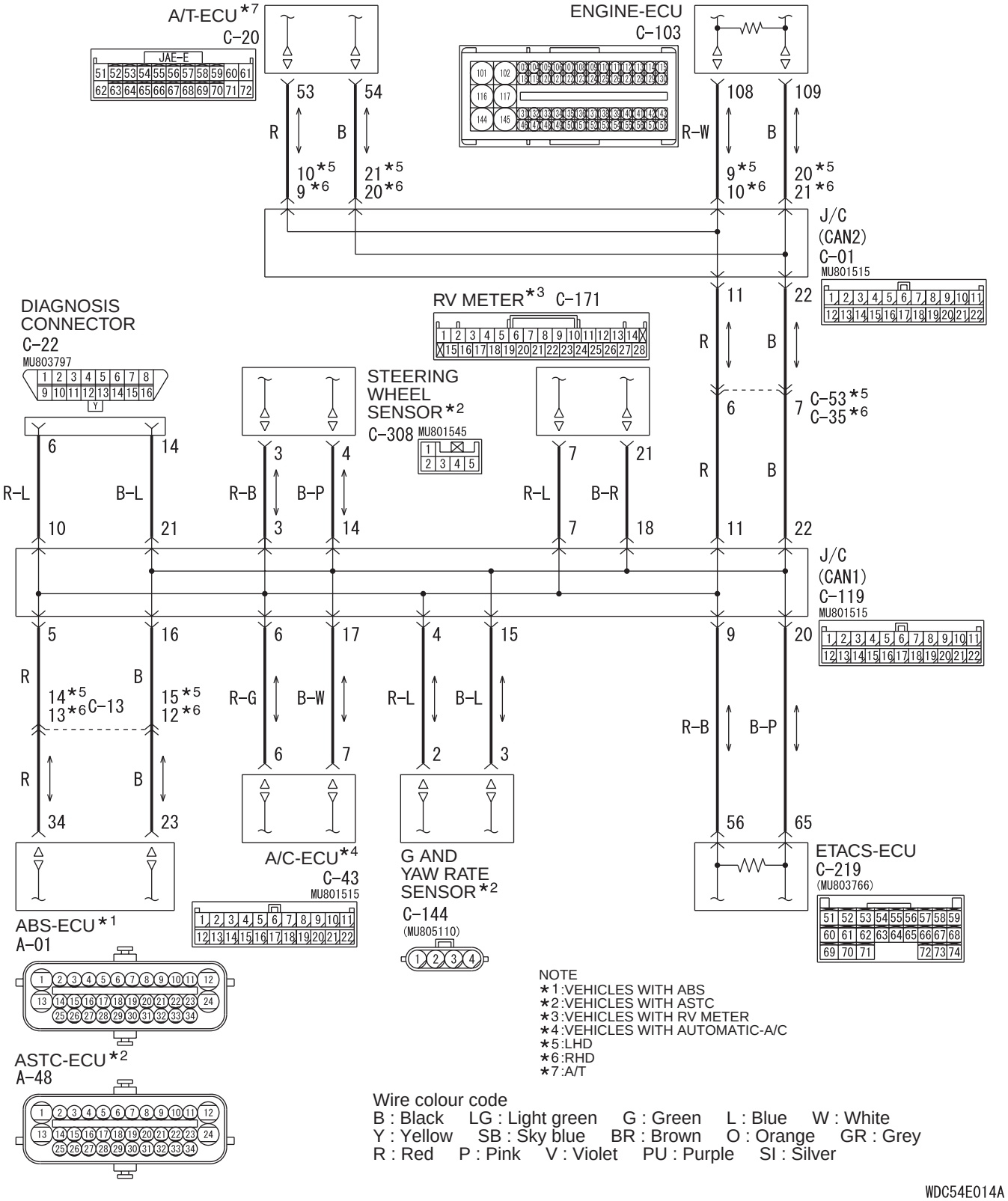
Q: Is the check result normal?

YES : <All the resistances measure 2 Ω or less> Power supply to the ABS-ECU <vehicles with ABS> or ASTC-ECU <vehicles with ASTC> may be suspected. Diagnose the ABS or ASTC. Refer to <vehicles with ABS> or <vehicles with ASTC>.

NO : <Either or all of the resistances measure more than 2 Ω> Repair the wiring harness between intermediate connector (C-13) and the ABS-ECU <vehicles with ABS> or ASTC-ECU <vehicles with ASTC> connector.

Diagnosis Item 8: Diagnose when the M.U.T.-III cannot receive the data sent by steering wheel sensor. <vehicles with ASTC>

⚠ CAUTION
When servicing a CAN bus line, earth yourself by touching a metal object such as an unpainted water pipe. If you fail to do, a component connected to the CAN bus line may be broken.



FUNCTION

The diagnostic result demonstrates that "the M.U.T.-III cannot receive the sent data from the steering wheel sensor" when the M.U.T.-III checks the periodically sent data from each ECU.

TROUBLE JUDGEMENT CONDITIONS

M.U.T.-III judges the trouble when the periodically sent data from steering wheel sensor cannot be received.

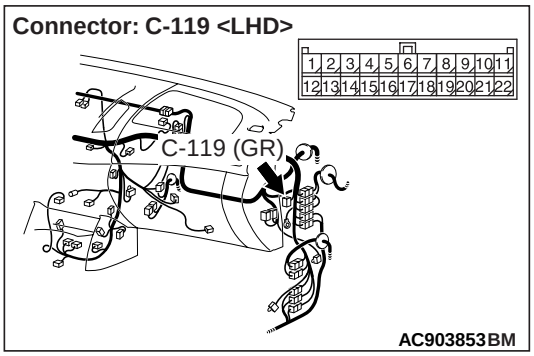
PROBABLE CAUSES

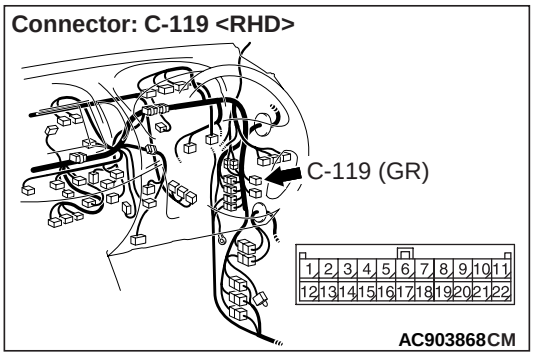
- Damaged harness wires and connectors
- Power supply circuit malfunction of the steering wheel sensor
- Malfunction of the steering wheel sensor

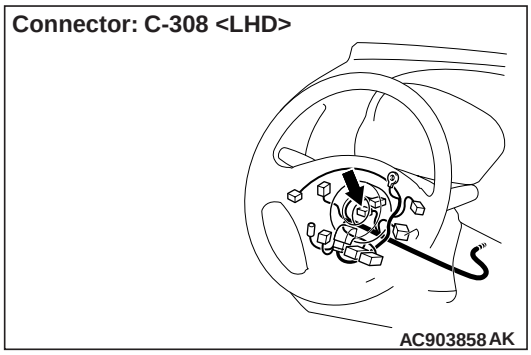
DIAGNOSIS PROCEDURE

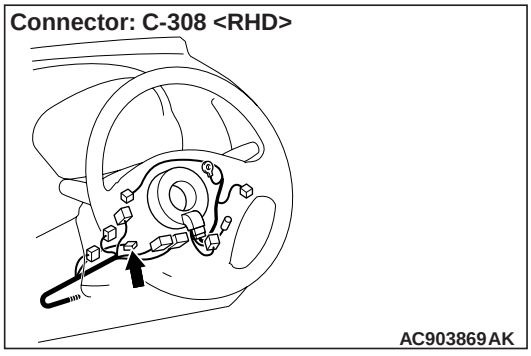
STEP 1. Connector check: C-119 joint connector (CAN1) and C-308 steering wheel sensor connector

⚠ CAUTION

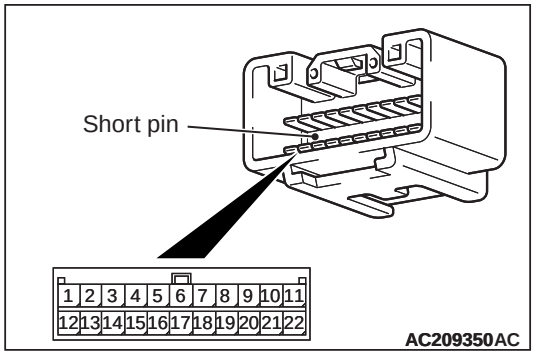








The strand end of the twist wire should be within 10 cm from the connector. For details refer to P.54C-7.



When checking the joint connector, ensure that its wiring harness side and its short pins are not damaged.

Q: Is the check result normal?

YES : Go to Step 2.

NO : Repair the defective connector. Replace the joint connector as necessary.

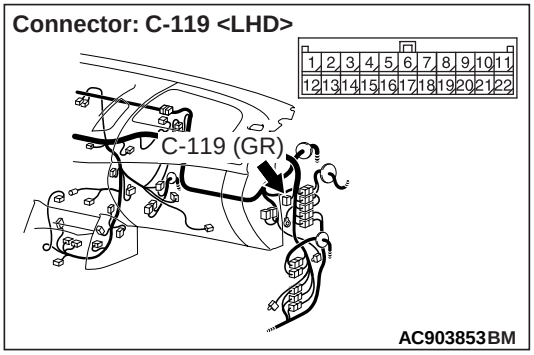
STEP 2. Resistance measurement at C-119 joint connector (CAN1) and C-308 steering wheel sensor connector.

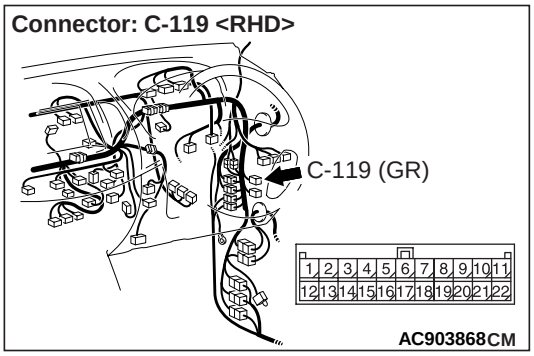
⚠ CAUTION

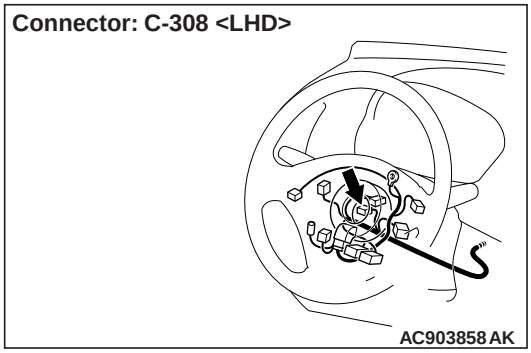
A digital multimeter should be used. For details refer to P.54C-7.

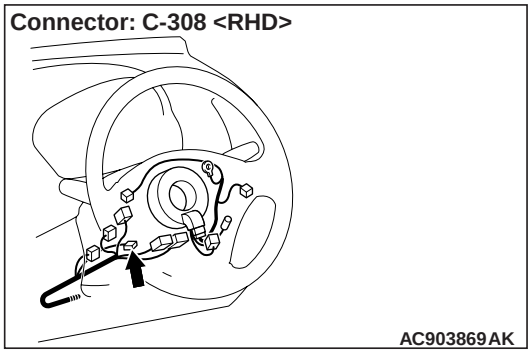
⚠ CAUTION

The test wiring harness should be used. For details refer to P.54C-7.









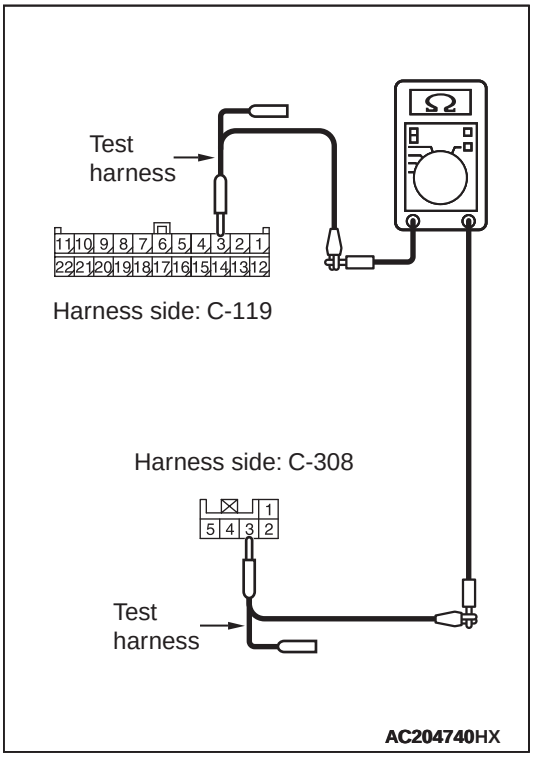
(1) Disconnect joint connector (CAN1) and the steering wheel sensor connector, and measure at the wiring harness side.

(2) Turn the ignition switch to the LOCK (OFF) position.

⚠ CAUTION

When measuring the resistance, disconnect the negative battery terminal. For details refer to P.54C-7.

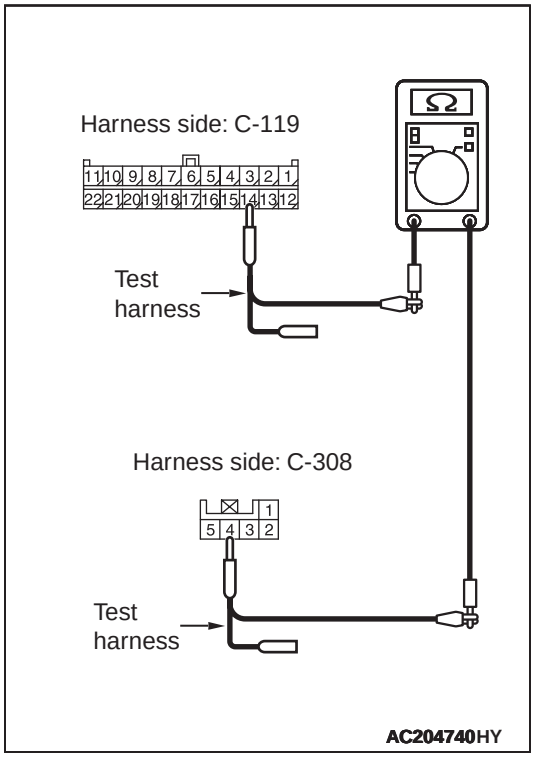
(3) Ensure that the negative battery terminal is disconnected.



(4) Continuity between C-119 joint connector (CAN1) terminal No.3 and C-308 steering wheel sensor

connector terminal No.3

OK: Continuity (2 Ω or less)



(5) Continuity between C-119 joint connector (CAN1) terminal No.14 and C-308 steering wheel sensor connector terminal No.4

OK: Continuity (2 Ω or less)

⚠ CAUTION

Strictly observe the specified wiring harness repair procedure. For details refer to P.54C-7.

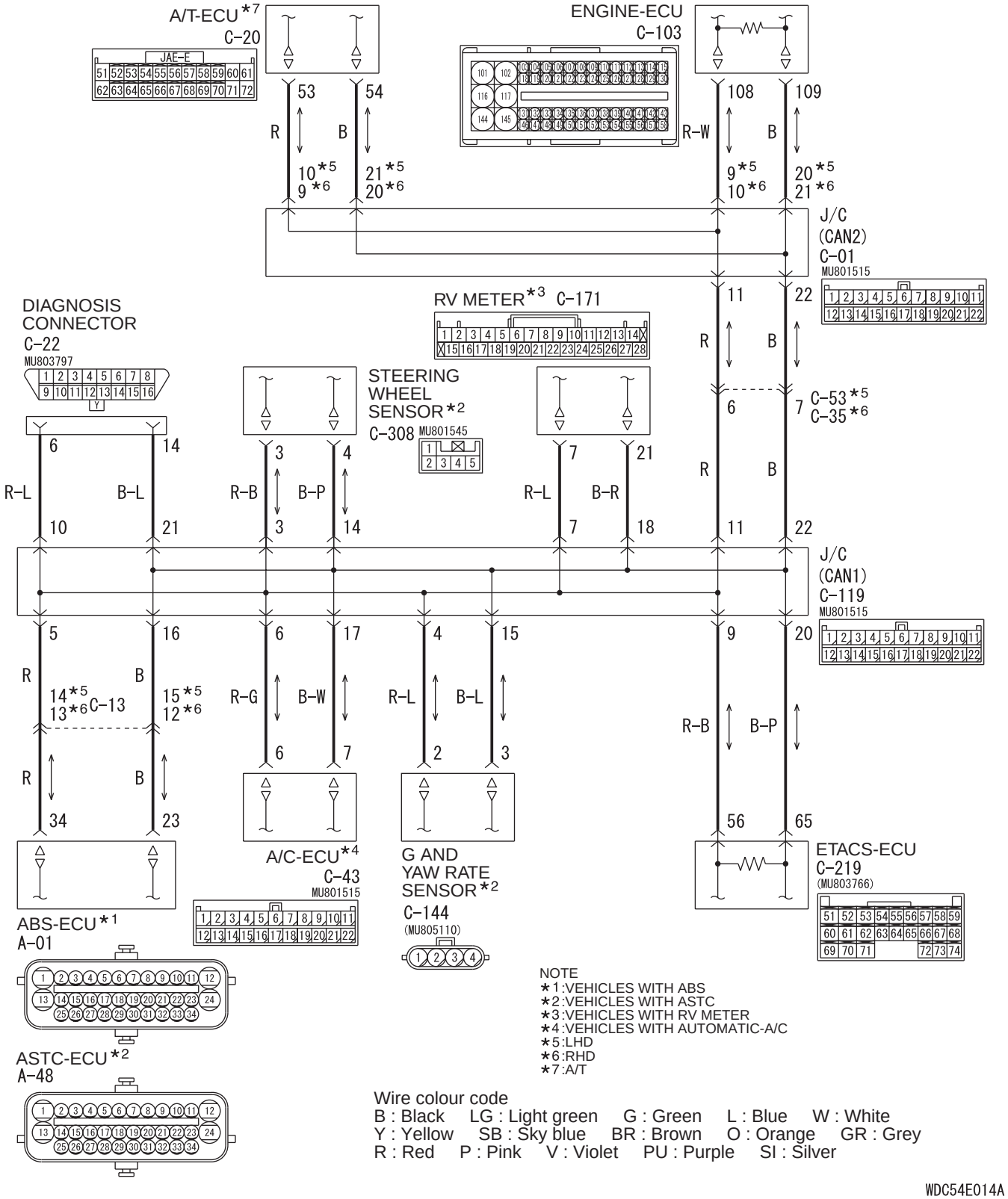
Q: Is the check result normal?

YES : <All the resistances measure 2 Ω or less> Power supply to the steering wheel sensor may be suspected. Diagnose the steering wheel sensor. Refer to .

NO : <Either or all of the resistances measure more than 2 Ω> Repair the wiring harness between joint connector (CAN1) and the steering wheel sensor connector.

Diagnosis Item 9: Diagnose when the M.U.T.-III cannot receive the data sent by G and yaw rate sensor. <vehicles with ASTC>

⚠ CAUTION
When servicing a CAN bus line, earth yourself by touching a metal object such as an unpainted water pipe. If you fail to do, a component connected to the CAN bus line may be broken.



FUNCTION

The diagnostic result demonstrates that "the M.U.T.-III cannot receive the sent data from the G and yaw rate sensor" when the M.U.T.-III checks the periodically sent data from each ECU.

TROUBLE JUDGEMENT CONDITIONS

M.U.T.-III judges the trouble when the periodically sent data from G and yaw rate sensor cannot be received.

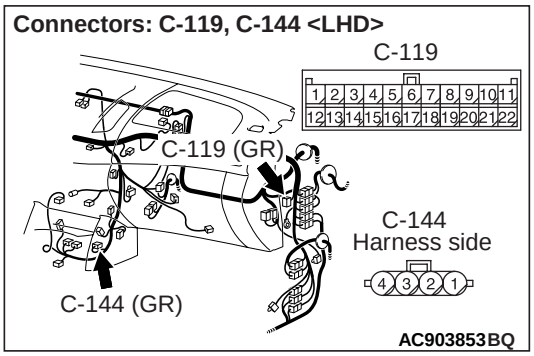
PROBABLE CAUSES

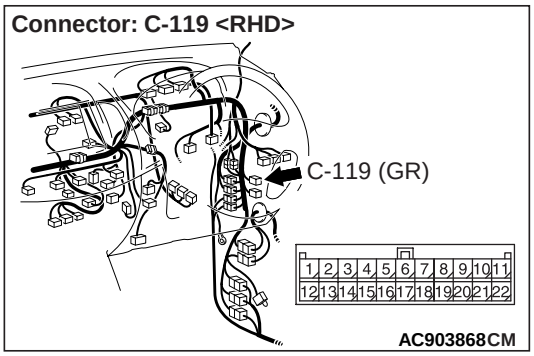
- Damaged harness wires and connectors
- Power supply circuit malfunction of the G and yaw rate sensor
- Malfunction of the G and yaw rate sensor

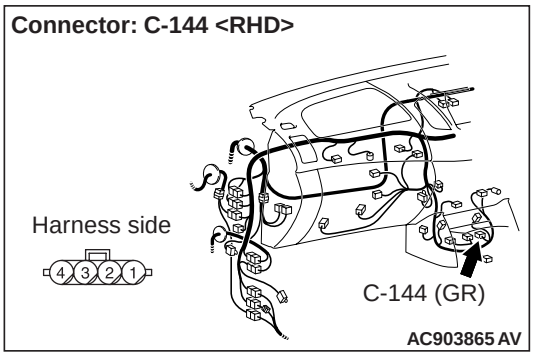
DIAGNOSIS PROCEDURE

STEP 1. Connector check: C-119 joint connector (CAN1) and C-144 G and yaw rate sensor connector

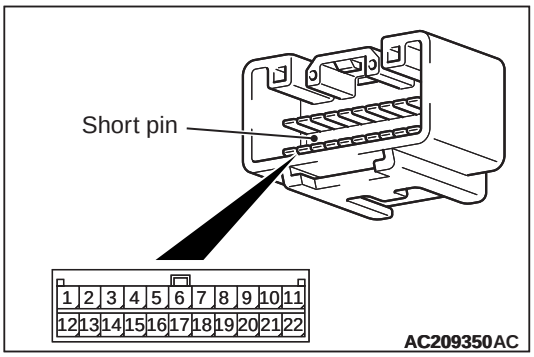
⚠ CAUTION







The strand end of the twist wire should be within 10 cm from the connector. For details refer to P.54C-7.



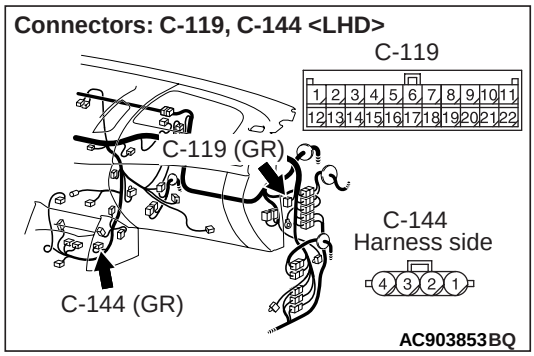
When checking the joint connector, ensure that its wiring harness side and its short pins are not damaged.

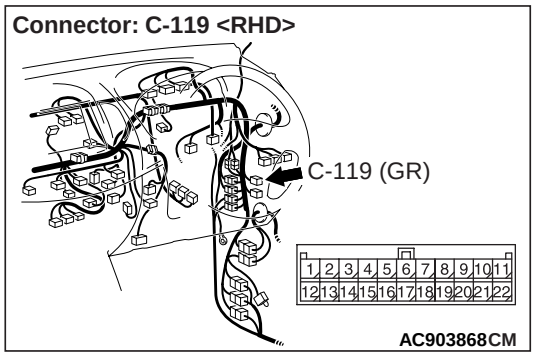
Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the defective connector. Replace the joint connector as necessary.

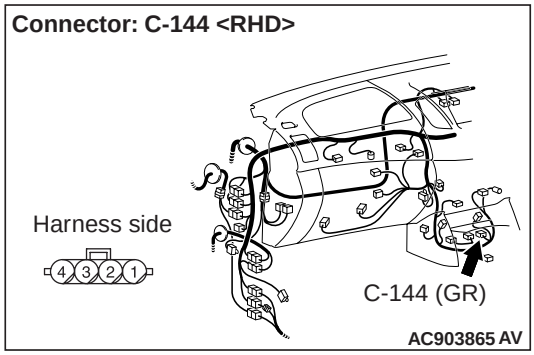
STEP 2. Resistance measurement at C-119 joint connector (CAN1) and C-144 G and yaw rate sensor connector.

⚠ CAUTION
A digital multimeter should be used. For details refer to P.54C-7.

⚠ CAUTION
The test wiring harness should be used. For details refer to P.54C-7.







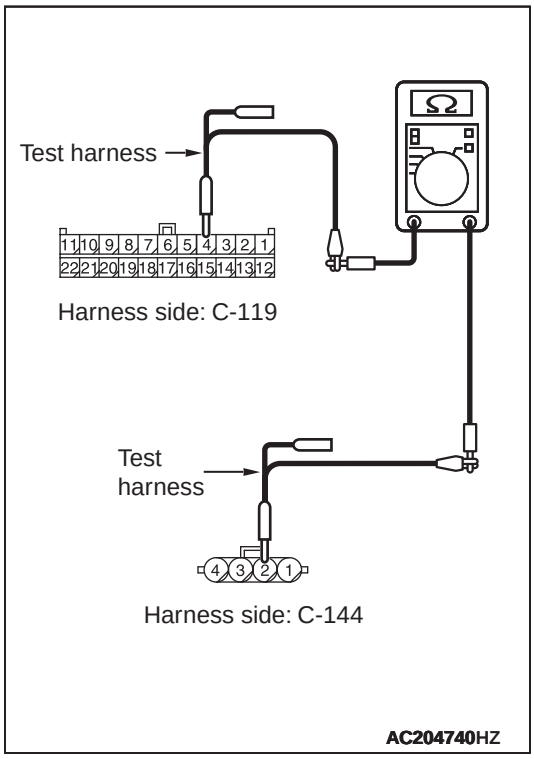
(1) Disconnect joint connector (CAN1) and the G and yaw rate sensor connector, and measure at the wiring harness side.
(2) Turn the ignition switch to the LOCK (OFF)

position.

⚠ CAUTION

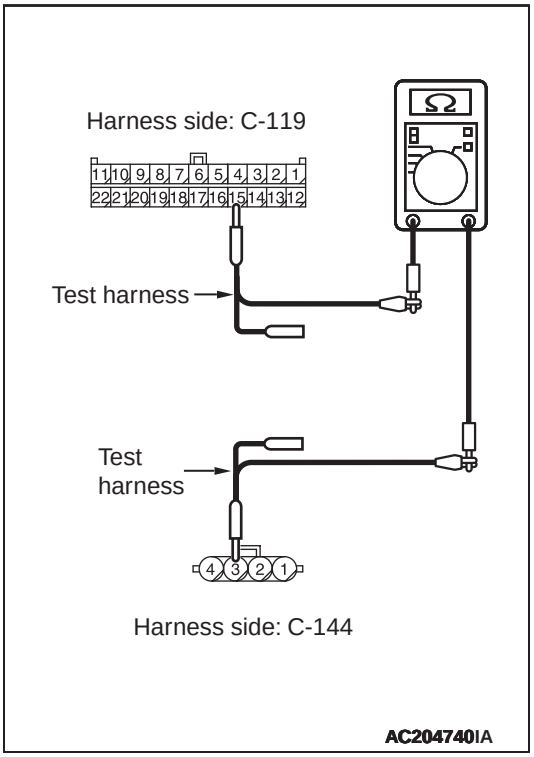
When measuring the resistance, disconnect the negative battery terminal. For details refer to P.54C-7.

(3) Ensure that the negative battery terminal is disconnected.



(4) Continuity between C-119 joint connector (CAN1) terminal No.4 and C-144 G and yaw rate sensor connector terminal No.2

OK: Continuity (2 Ω or less)



(5) Continuity between C-119 joint connector (CAN1) terminal No.15 and C-144 G and yaw rate sensor connector terminal No.3

OK: Continuity (2 Ω or less)

⚠ CAUTION

Strictly observe the specified wiring harness repair procedure. For details refer to P.54C-7.

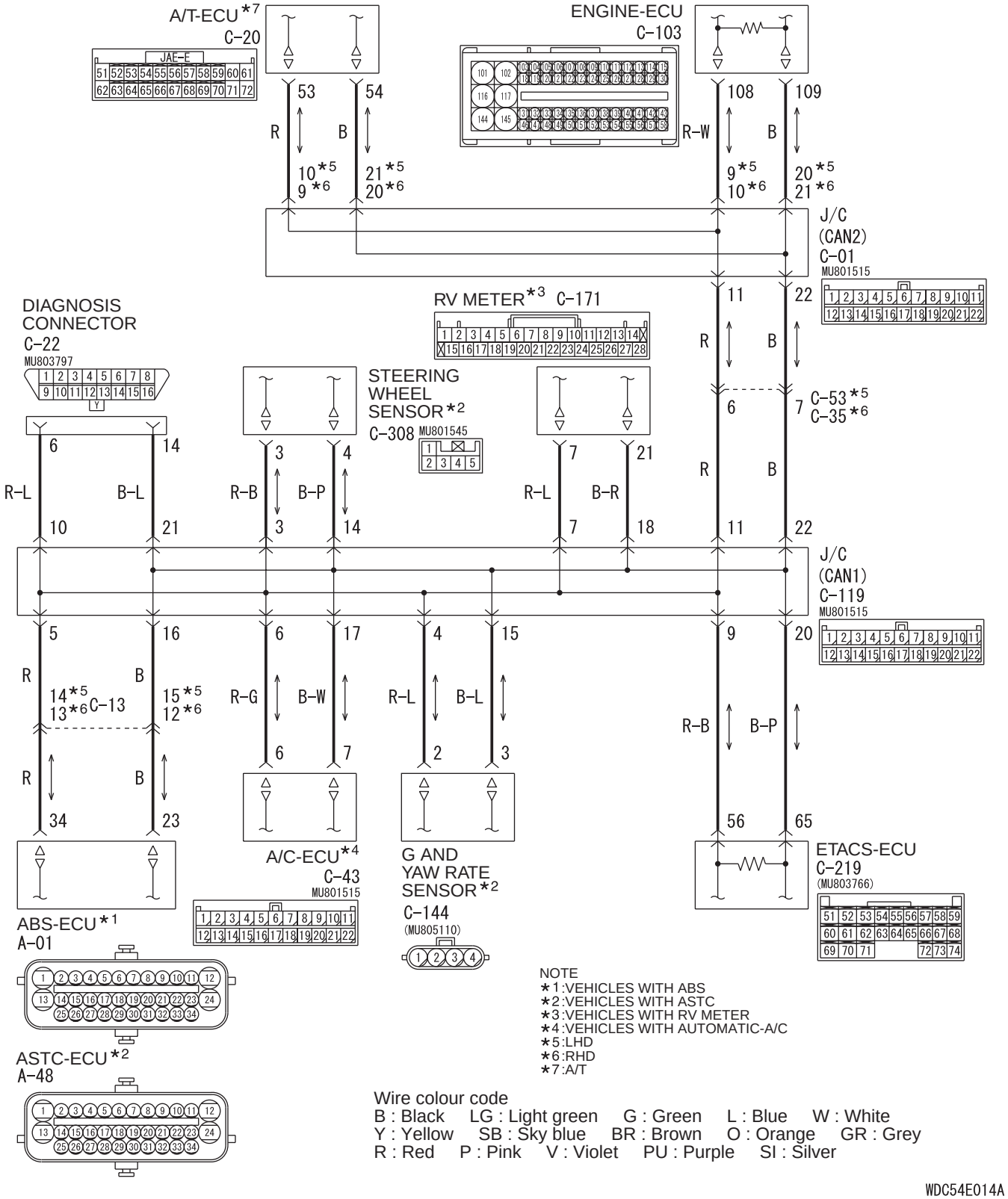
Q: Is the check result normal?

YES : <All the resistances measure 2 Ω or less> Power supply to the G and yaw rate sensor may be suspected. Diagnose the G and yaw rate sensor.

NO : <Either or all of the resistances measure more than 2 Ω> Repair the wiring harness between joint connector (CAN1) and the G and yaw rate sensor connector.

Diagnosis Item 10: Diagnose when the M.U.T.-III cannot receive the data sent by A/C-ECU. <vehicles with automatic-A/C>

⚠ CAUTION
When servicing a CAN bus line, earth yourself by touching a metal object such as an unpainted water pipe. If you fail to do, a component connected to the CAN bus line may be broken.



FUNCTION

The diagnostic result demonstrates that "the M.U.T.-III cannot receive the sent data from the A/C-ECU" when the M.U.T.-III checks the periodically sent data from each ECU.

TROUBLE JUDGEMENT CONDITIONS

M.U.T.-III judges the trouble when the periodically sent data from A/C-ECU cannot be received

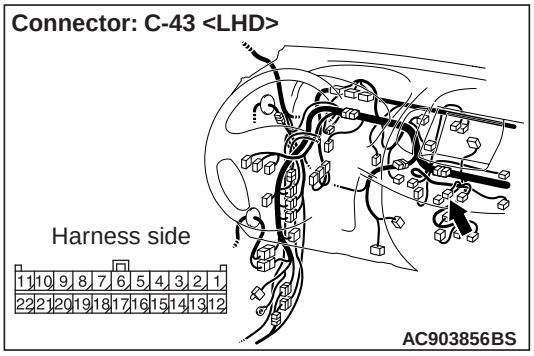
PROBABLE CAUSES

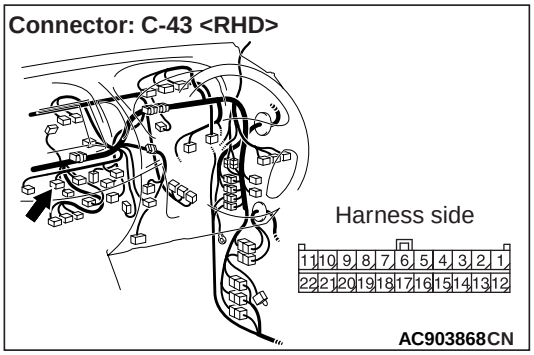
- Damaged harness wires and connectors
- Power supply circuit malfunction of the A/C-ECU
- Malfunction of the A/C-ECU

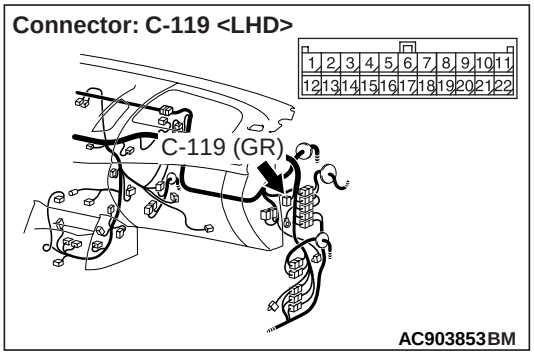
DIAGNOSIS PROCEDURE

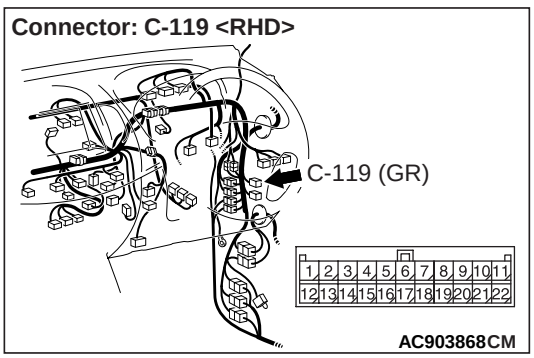
STEP 1. Connector check: C-119 joint connector (CAN1) and C-43 A/C-ECU connector

⚠ CAUTION

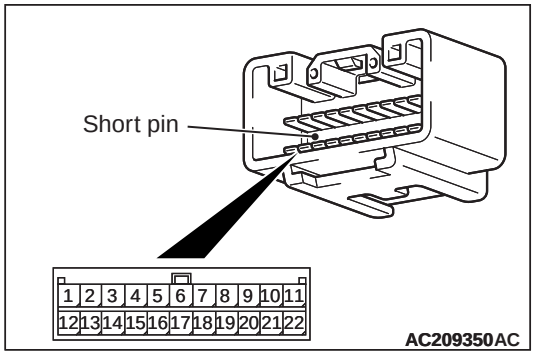








The strand end of the twist wire should be within 10 cm from the connector. For details refer to P.54C-7.



When checking the joint connector, ensure that its wiring harness side and its short pins are not damaged.

Q: Is the check result normal?

YES : Go to Step 2.

NO : Repair the defective connector. Replace the joint connector as necessary.

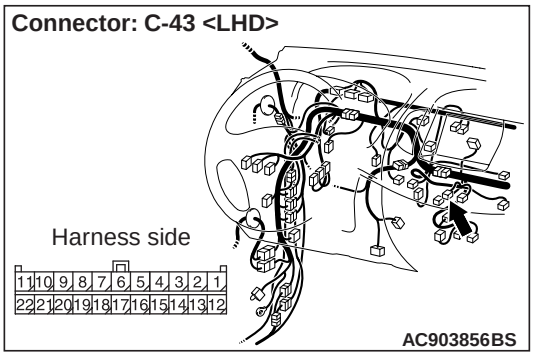
STEP 2. Resistance measurement at C-119 joint connector (CAN1) and C-43 A/C-ECU connector.

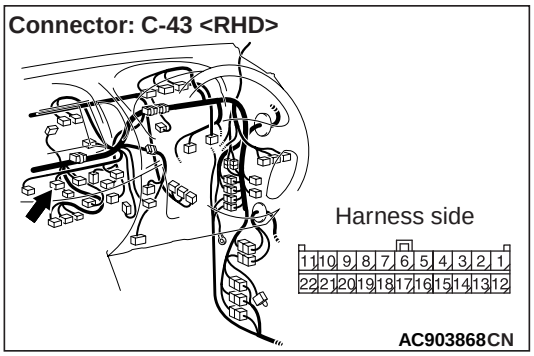
⚠ CAUTION

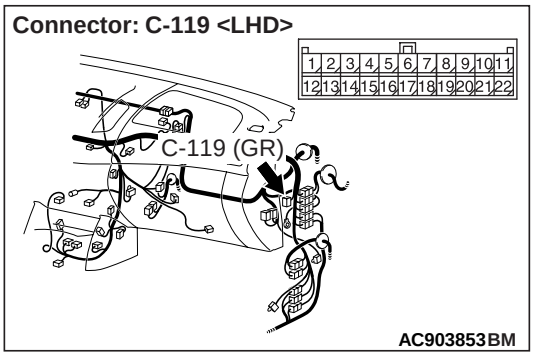
A digital multimeter should be used. For details refer to P.54C-7.

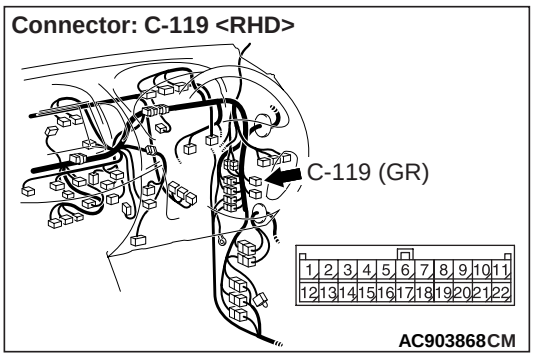
⚠ CAUTION

The test wiring harness should be used. For details refer to P.54C-7.









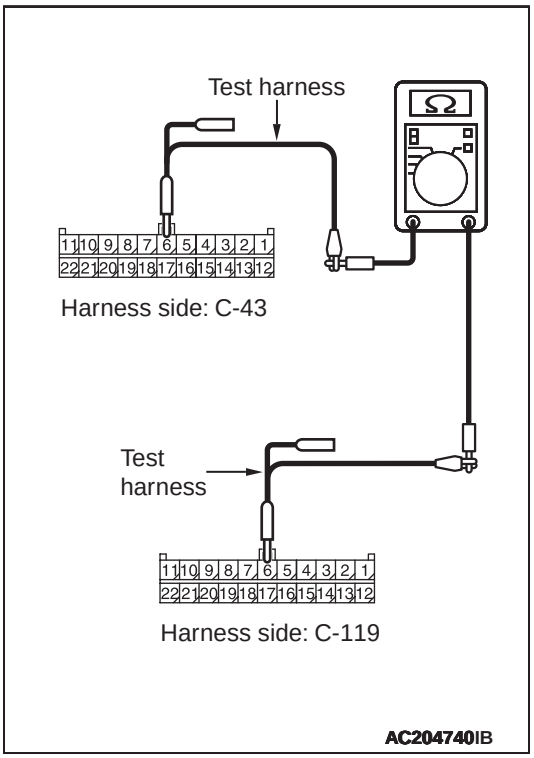
(1) Disconnect joint connector (CAN1) and the A/C-ECU connector, and measure at the wiring harness side.

(2) Turn the ignition switch to the LOCK (OFF) position.

⚠ CAUTION

When measuring the resistance, disconnect the negative battery terminal. For details refer to P.54C-7.

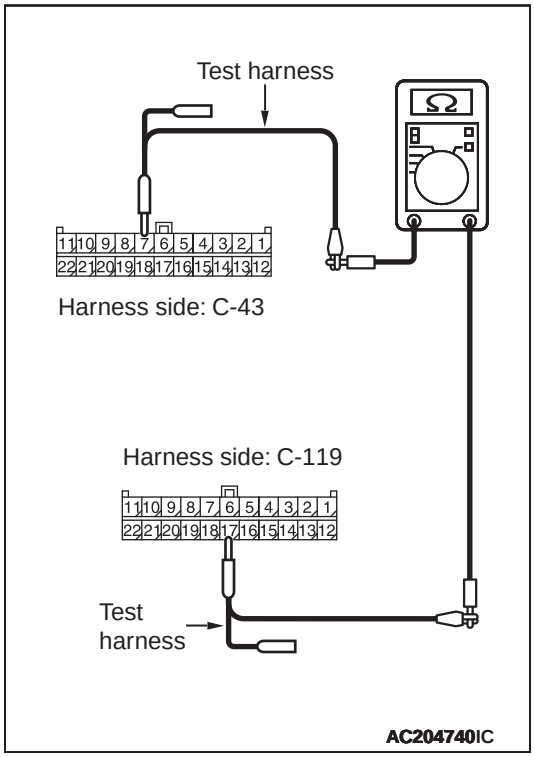
(3) Ensure that the negative battery terminal is disconnected.



(4) Continuity between C-119 joint connector (CAN1) terminal No.6 and C-43 A/C-ECU connector

terminal No.6

OK: Continuity (2 Ω or less)



(5) Continuity between C-119 joint connector (CAN1) terminal No.17 and C-43 A/C-ECU connector terminal No.7

OK: Continuity (2 Ω or less)

⚠ CAUTION

Strictly observe the specified wiring harness repair procedure. For details refer to P.54C-7.

Q: Is the check result normal?

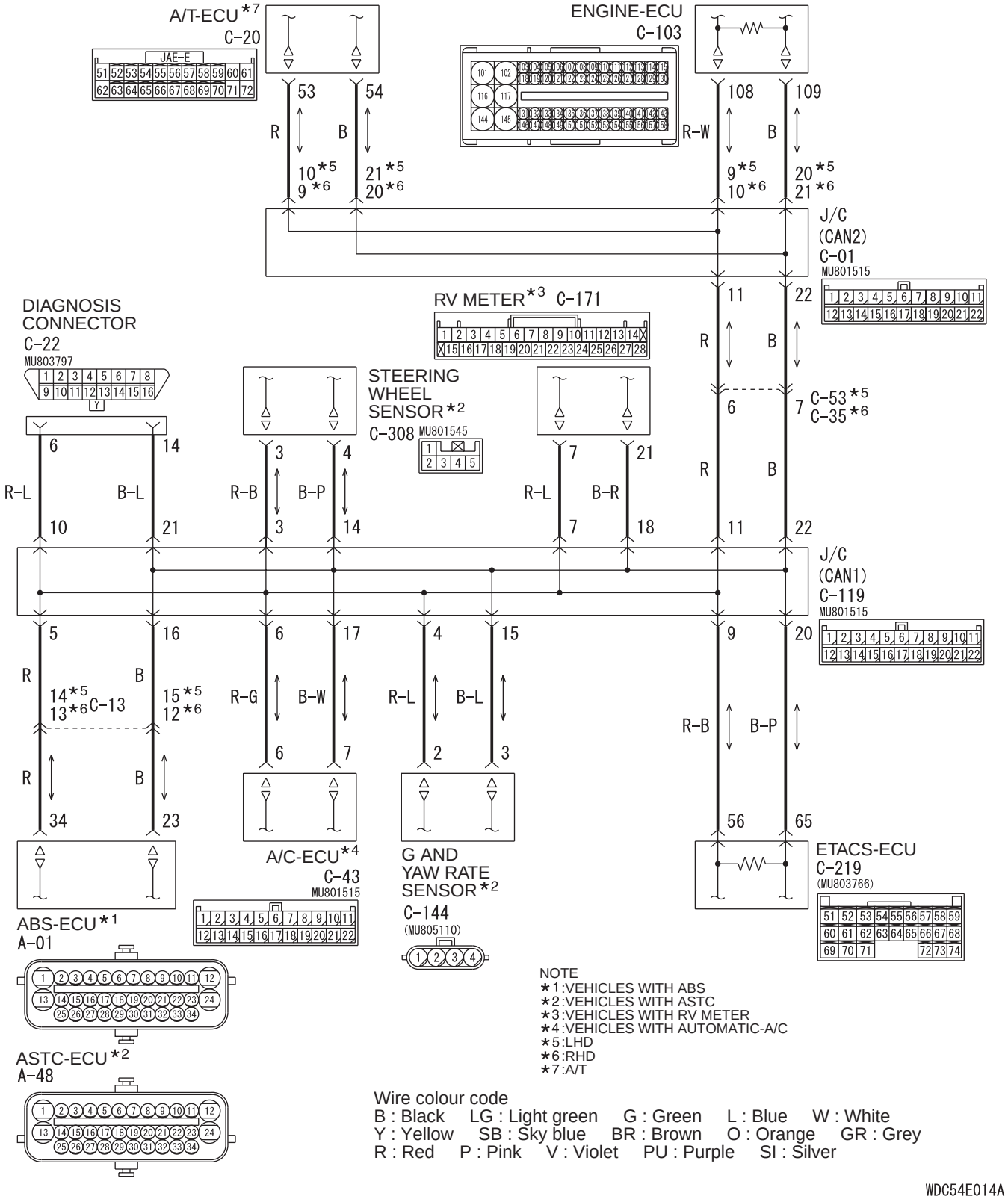
YES : <All the resistances measure 2 Ω or less> Power supply to the A/C-ECU may be suspected. Diagnose the A/C-ECU. Refer to .

NO : <Either or all of the resistances measure more than 2 Ω> Repair the wiring harness between joint connector (CAN1) and the A/C-ECU connector.

Diagnosis Item 11: Diagnose the lines between the joint connectors (CAN1 and CAN2)

⚠ CAUTION

When servicing a CAN bus line, earth yourself by touching a metal object such as an unpainted water pipe. If you fail to do, a component connected to the CAN bus line may be broken.



FUNCTION

The diagnostic result demonstrates that "diagnose the lines between the joint connectors (CAN1 and CAN2)" when the M.U.T.-III checks the periodically sent data from each ECU.

TROUBLE JUDGEMENT CONDITIONS

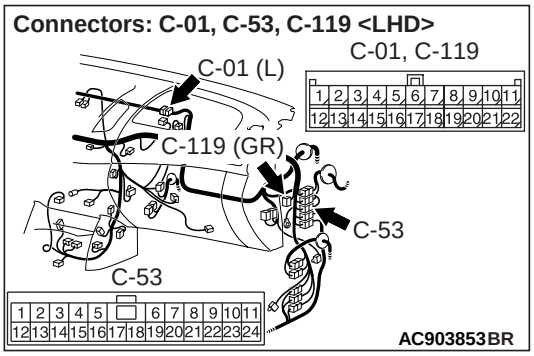
M.U.T.-III judges the trouble when the periodically sent data from engine-ECU and the A/T-ECU <A/T> cannot be received.

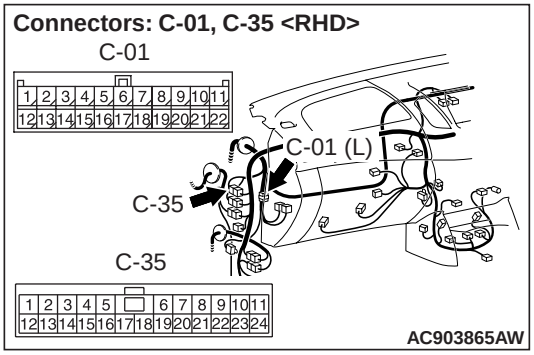
PROBABLE CAUSE
Damaged harness wires and connectors

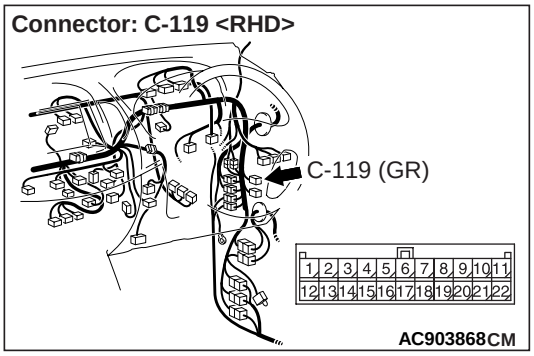
DIAGNOSIS PROCEDURE

STEP 1. Connector check: C-53 <LHD> or C-35 <RHD> intermediate connector, C-119 joint connector (CAN1) and C-01 joint connector (CAN2)

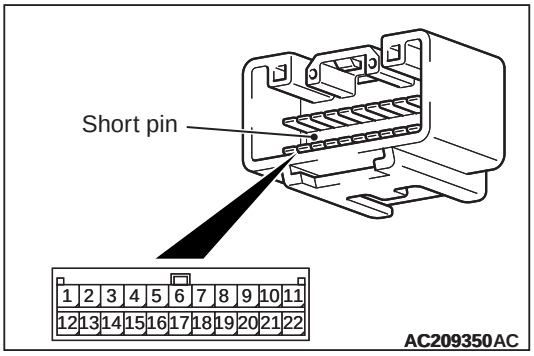
⚠ CAUTION







The strand end of the twist wire should be within 10 cm from the connector. For details refer to P.54C-7.



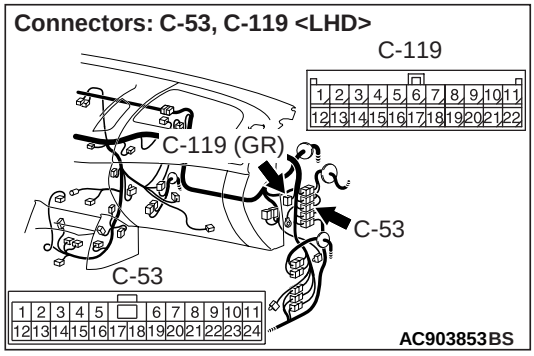
When checking the joint connector, ensure that its wiring harness side and its short pins are not damaged.

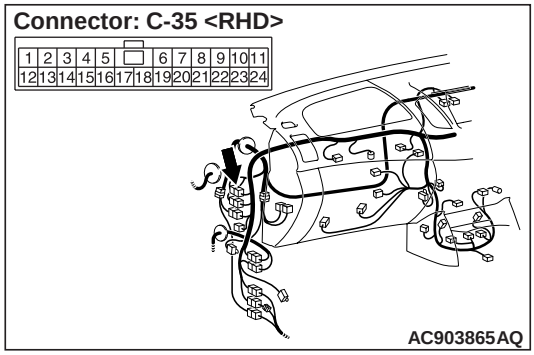
Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the defective connector. Replace the joint connector as necessary.

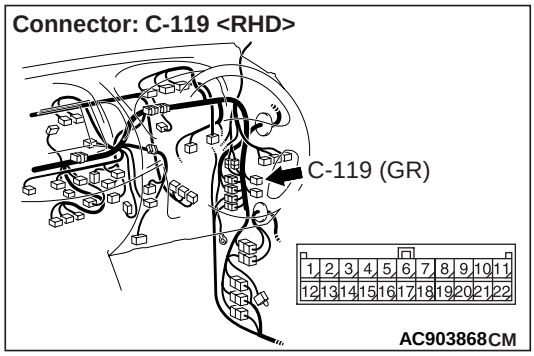
STEP 2. Resistance measurement at C-119 joint connector (CAN1) and C-53 <LHD> or C-35 <RHD> intermediate connector.

⚠ CAUTION
A digital multimeter should be used. For details refer to P.54C-7.

⚠ CAUTION
The test wiring harness should be used. For details refer to P.54C-7.







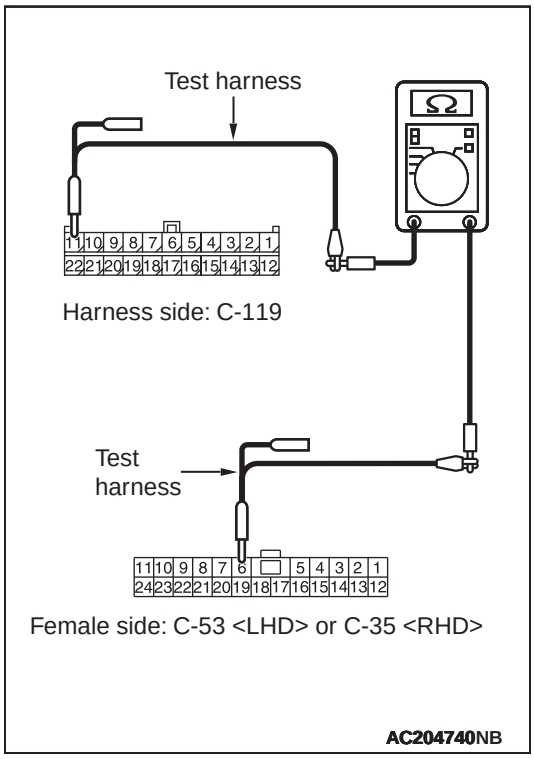
(1) Disconnect the joint connector (CAN1) and the intermediate connector, and measure at the wiring harness side.
(2) Turn the ignition switch to the LOCK (OFF)

position.

⚠ CAUTION

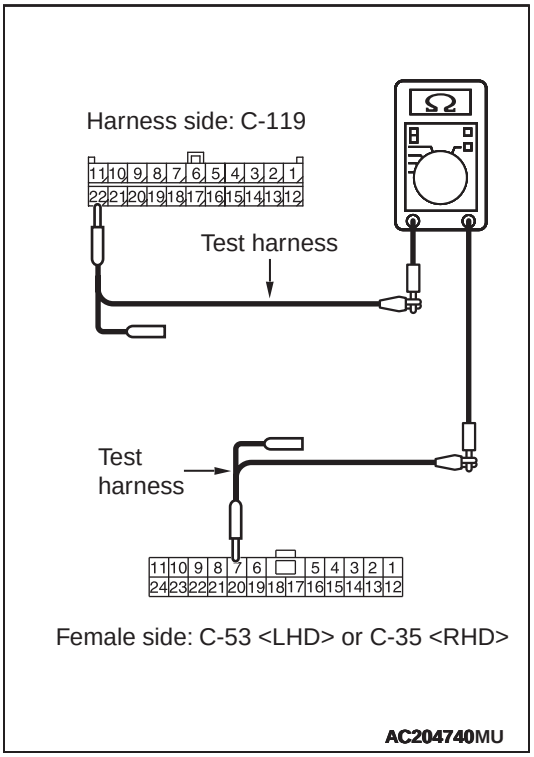
When measuring the resistance, disconnect the negative battery terminal. For details refer to P.54C-7.

(3) Ensure that the negative battery terminal is disconnected.



(4) Continuity between C-119 joint connector (CAN1) terminal No.11 and C-53 <LHD> or C-35 <RHD> intermediate connector terminal No.6

OK: Continuity (2 Ω or less)



(5) Continuity between C-119 joint connector (CAN1) terminal No.22 and C-53 <LHD> or C-35 <RHD> intermediate connector terminal No.7

OK: Continuity (2 Ω or less)

⚠ CAUTION

Strictly observe the specified wiring harness repair procedure. For details refer to P.54C-7.

Q: Is the check result normal?

YES : <All the resistances measure 2 Ω or less> Go to Step 3 .

NO : <Either or all of the resistances measure more than 2 Ω> Repair the wiring harness between joint connector (CAN1) and intermediate connector C-53 <LHD> or C-35 <RHD>.

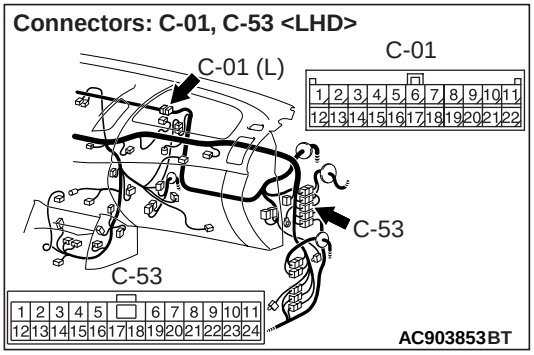
STEP 3. Resistance measurement at C-01 joint connector (CAN2) and C-53 <LHD> or C-35 <RHD> intermediate connector.

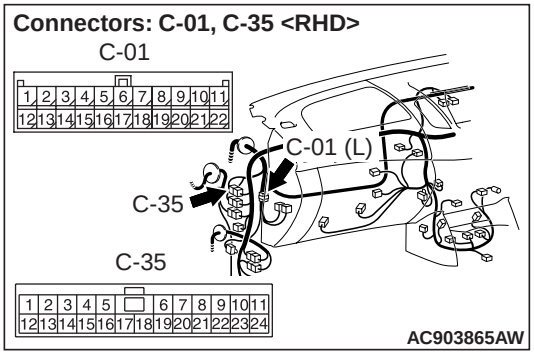
⚠ CAUTION

A digital multimeter should be used. For details refer to P.54C-7.

⚠ CAUTION

The test wiring harness should be used. For details refer to P.54C-7.





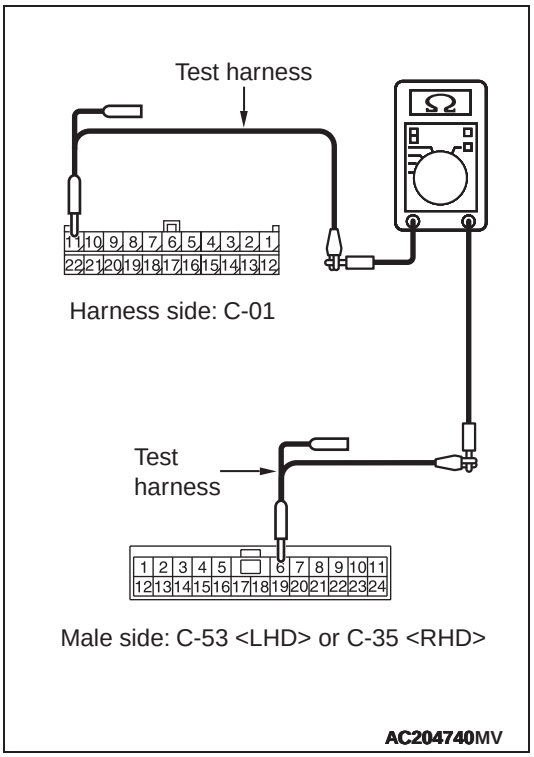
(1) Disconnect joint connector (CAN2) and the intermediate connector, and measure at the wiring harness side.

(2) Turn the ignition switch to the LOCK (OFF) position.

⚠ CAUTION

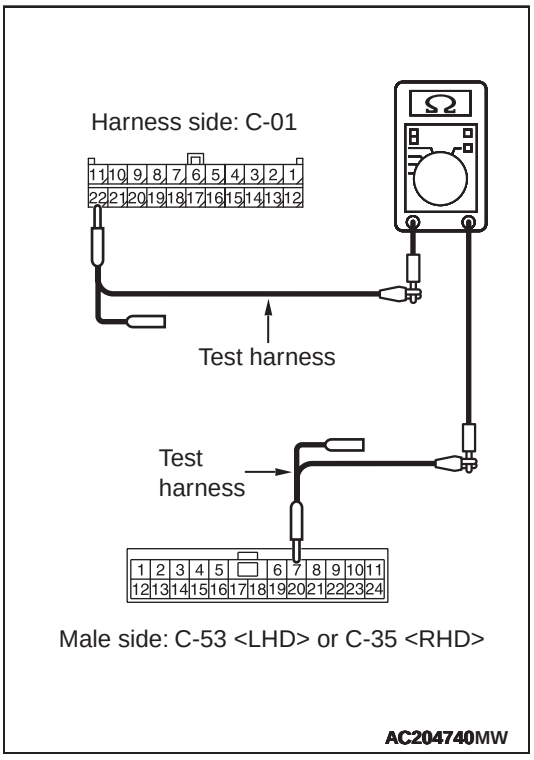
When measuring the resistance, disconnect the negative battery terminal. For details refer to P.54C-7.

(3) Ensure that the negative battery terminal is disconnected.



(4) Continuity between C-01 joint connector (CAN2) terminal No.11 and C-53 <LHD> or C-35 <RHD> intermediate connector terminal No.6

OK: Continuity (2 Ω or less)



(5) Continuity between C-01 joint connector (CAN2) terminal No.22 and C-53 <LHD> or C-35 <RHD>

intermediate connector terminal No.7

OK: Continuity (2 Ω or less)

⚠ CAUTION

Strictly observe the specified wiring harness repair procedure. For details refer to P.54C-7.

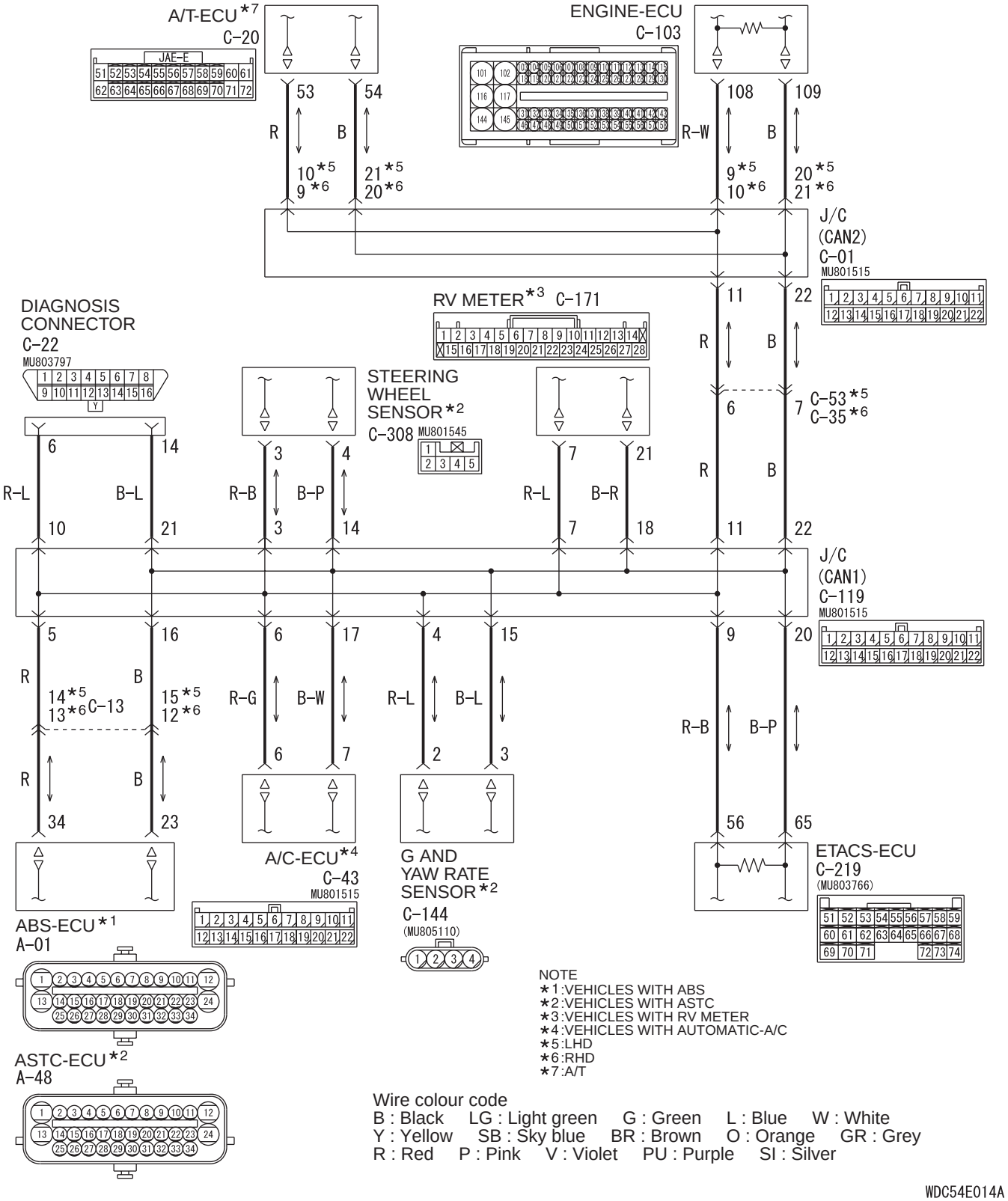
Q: Is the check result normal?

YES : <All the resistances measure 2 Ω or less> Follow diagnosis item 5, 6, 7, 8, 9, 10, 11, 13 and 14. Refer to P.54C-14.

NO : <Either or all of the resistances measure more than 2 Ω> Repair the wiring harness between the intermediate connector and the intermediate connector.

Diagnosis Item 12: Diagnose when the M.U.T.-III cannot receive the data sent by A/T-ECU. <A/T>

⚠ CAUTION
When servicing a CAN bus line, earth yourself by touching a metal object such as an unpainted water pipe. If you fail to do, a component connected to the CAN bus line may be broken.



FUNCTION

The diagnostic result demonstrates that "the M.U.T.-III cannot receive the sent data from the A/T-ECU" when the M.U.T.-III checks the periodically sent data from each ECU.

TROUBLE JUDGEMENT CONDITIONS

M.U.T.-III judges the trouble when the periodically sent data from A/T-ECU cannot be received.

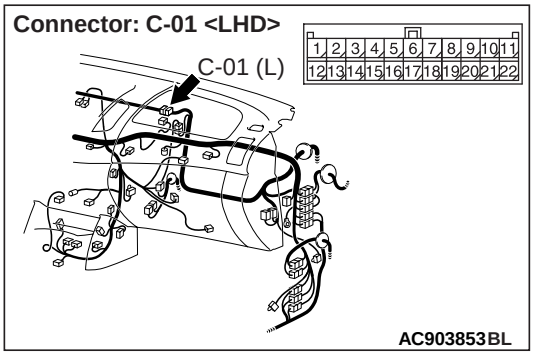
PROBABLE CAUSES

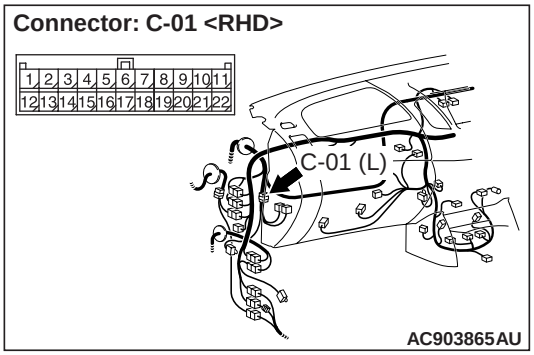
- Damaged harness wires and connectors
- Power supply circuit malfunction of the A/T-ECU
- Malfunction of the A/T-ECU

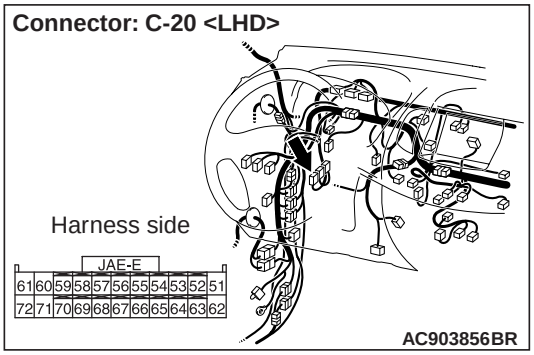
DIAGNOSIS PROCEDURE

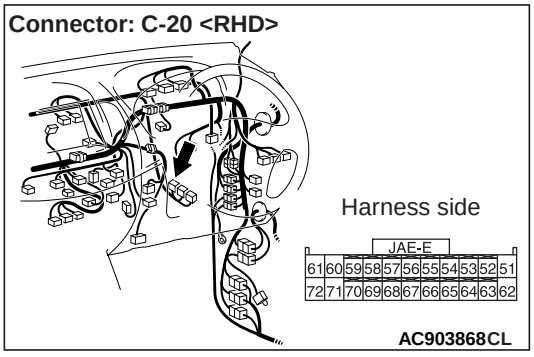
STEP 1. Connector check: C-01 joint connector (CAN2) and C-20 A/T-ECU connector

⚠ CAUTION

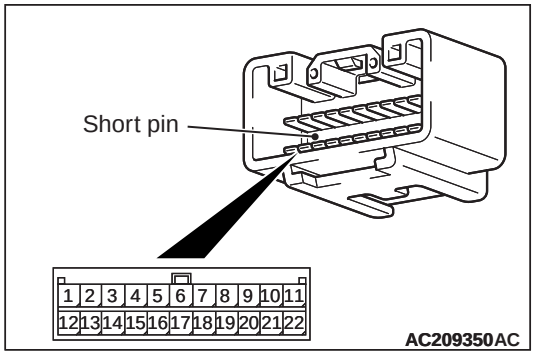








The strand end of the twist wire should be within 10 cm from the connector. For details refer to P.54C-7.



When checking the joint connector, ensure that its wiring harness side and its short pins are not damaged.

Q: Is the check result normal?

YES : Go to Step 2.

NO : Repair the defective connector. Replace the joint connector as necessary.

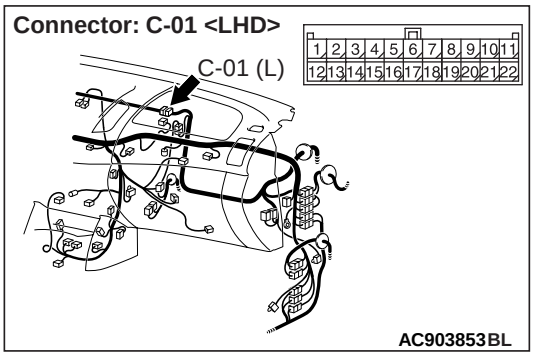
STEP 2. Resistance measurement at C-01 joint connector (CAN2) and C-20 A/T-ECU connector.

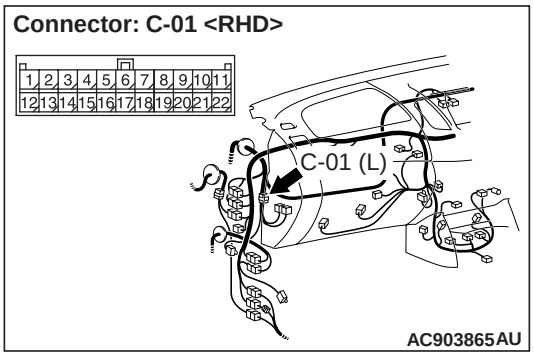
⚠ CAUTION

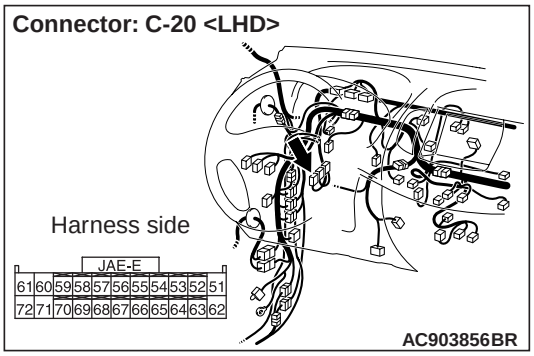
A digital multimeter should be used. For details refer to P.54C-7.

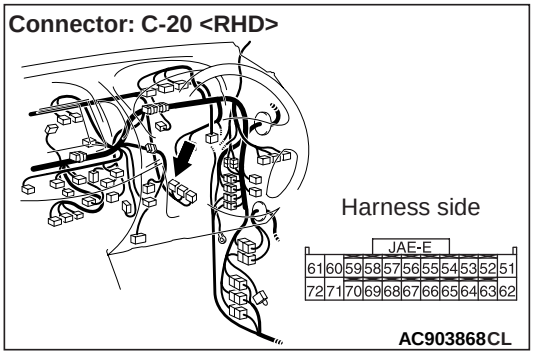
⚠ CAUTION

The test wiring harness should be used. For details refer to P.54C-7.









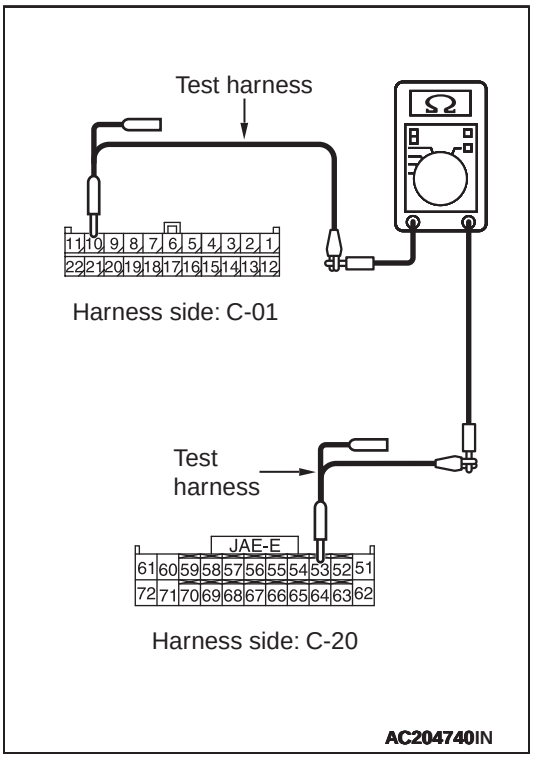
(1) Disconnect joint connector (CAN2) and the A/T-ECU connector, and measure at the wiring harness side.

(2) Turn the ignition switch to the LOCK (OFF) position.

⚠ CAUTION

When measuring the resistance, disconnect the negative battery terminal. For details refer to P.54C-7.

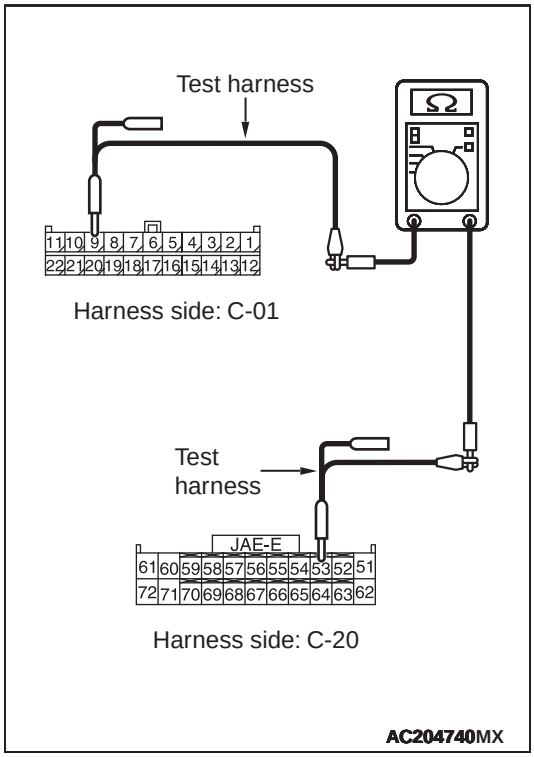
(3) Ensure that the negative battery terminal is disconnected.



(4) Continuity between C-01 joint connector (CAN2) terminal No.10 and C-20 A/T-ECU connector

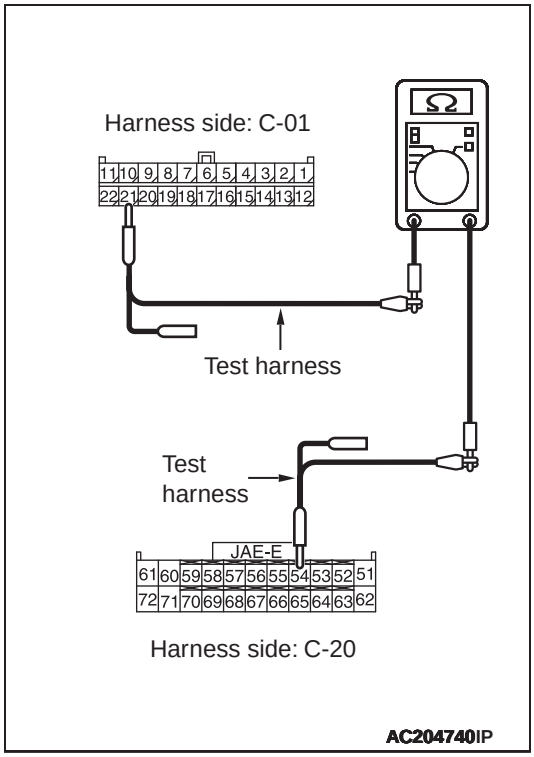
terminal No.53 <LHD>

OK: Continuity (2 Ω or less)



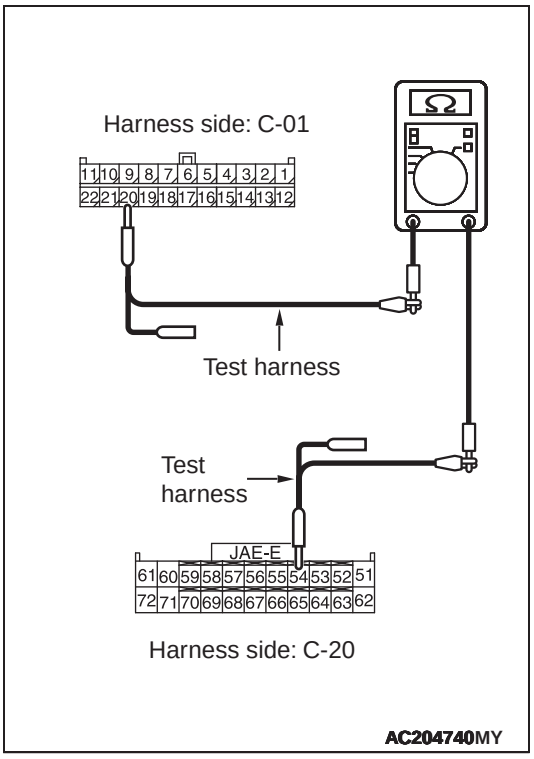
(5) Continuity between C-01 joint connector (CAN2) terminal No.9 and C-20 A/T-ECU connector terminal No.53 <RHD>

OK: Continuity (2 Ω or less)



(6) Continuity between C-01 joint connector (CAN2) terminal No.21 and C-20 A/T-ECU connector terminal No.54 <LHD>

OK: Continuity (2 Ω or less)



(7) Continuity between C-01 joint connector (CAN2) terminal No.20 and C-20 A/T-ECU connector terminal No.54 <RHD>

OK: Continuity (2 Ω or less)

⚠ CAUTION

Strictly observe the specified wiring harness repair procedure. For details refer to P.54C-7.

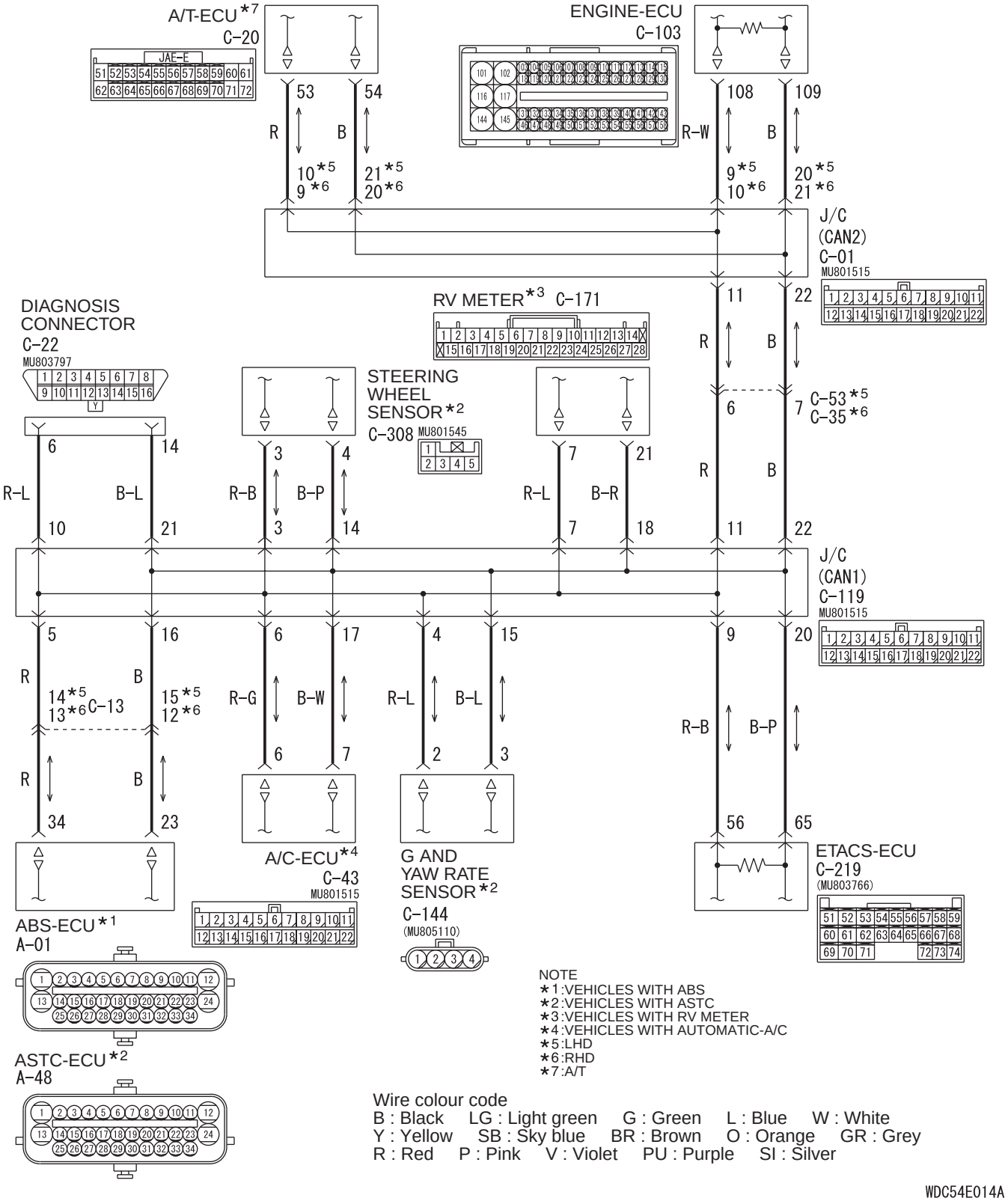
Q: Is the check result normal?

YES : <All the resistances measure 2 Ω or less> Power supply to the A/T-ECU may be suspected. Diagnose the A/T. Refer to .

NO : <Either or all of the resistances measure more than 2 Ω> Repair the wiring harness between joint connector (CAN2) and the A/T-ECU connector.

Diagnosis Item 13: Diagnose when the M.U.T.-III cannot receive the data sent by engine-ECU.

⚠ CAUTION
When servicing a CAN bus line, earth yourself by touching a metal object such as an unpainted water pipe. If you fail to do, a component connected to the CAN bus line may be broken.



FUNCTION

The diagnostic result demonstrates that "the M.U.T.-III cannot receive the sent data from the engine-ECU" when the M.U.T.-III checks the periodically sent data from each ECU.

TROUBLE JUDGEMENT CONDITIONS

M.U.T.-III judges the trouble when the periodically sent data from engine-ECU cannot be received.

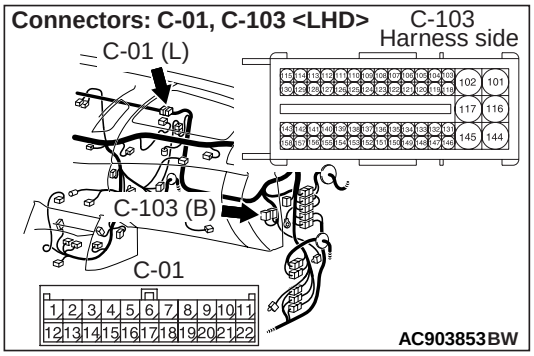
PROBABLE CAUSES

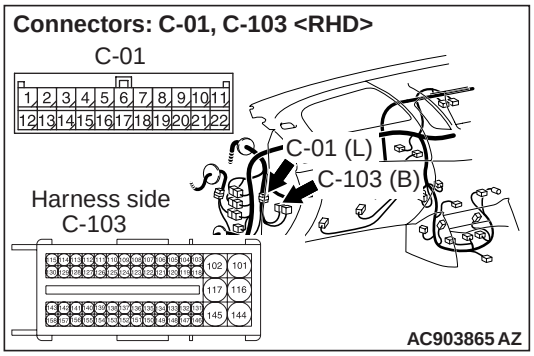
- Damaged harness wires and connectors
- Power supply circuit malfunction of the engine-ECU
- Malfunction of the engine-ECU

DIAGNOSIS PROCEDURE

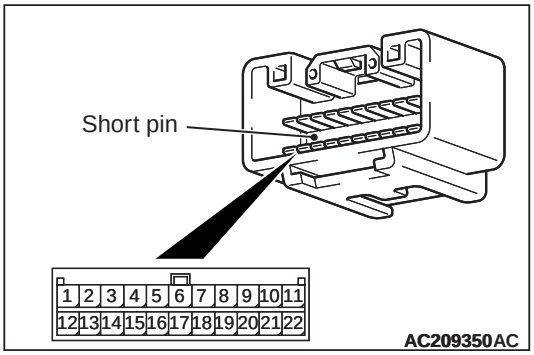
STEP 1. Connector check: C-01 joint connector (CAN2) and C-103 engine-ECU connector

⚠ CAUTION





The strand end of the twist wire should be within 10 cm from the connector. For details refer to P.54C-7.



When checking the joint connector, ensure that its wiring harness side and its short pins are not damaged.

Q: Is the check result normal?

YES : Go to Step 2.
NO : Repair the defective connector. Replace the joint connector as necessary.

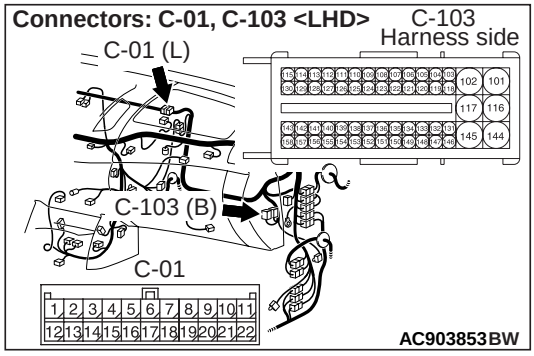
STEP 2. Resistance measurement at C-01 joint connector (CAN2) and C-103 engine-ECU connector.

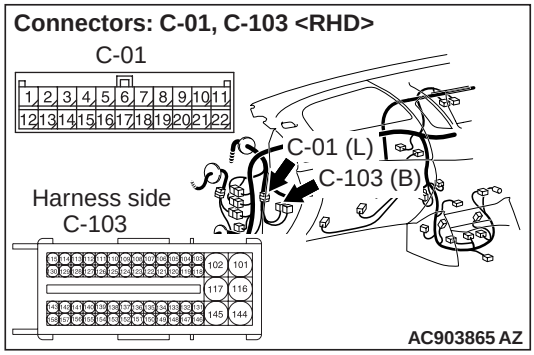
⚠ CAUTION

A digital multimeter should be used. For details refer to P.54C-7.

⚠ CAUTION

The test wiring harness should be used. For details refer to P.54C-7.





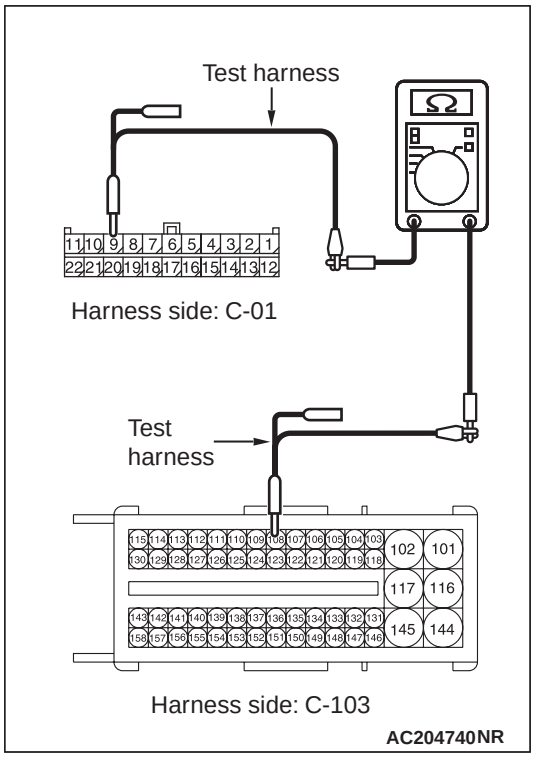
(1) Disconnect the joint connector (CAN2) and the engine-ECU connector, and measure at the wiring harness side.
(2) Turn the ignition switch to the LOCK (OFF) position.

⚠ CAUTION

When measuring the resistance, disconnect the negative battery terminal. For details refer to P.54C-7.

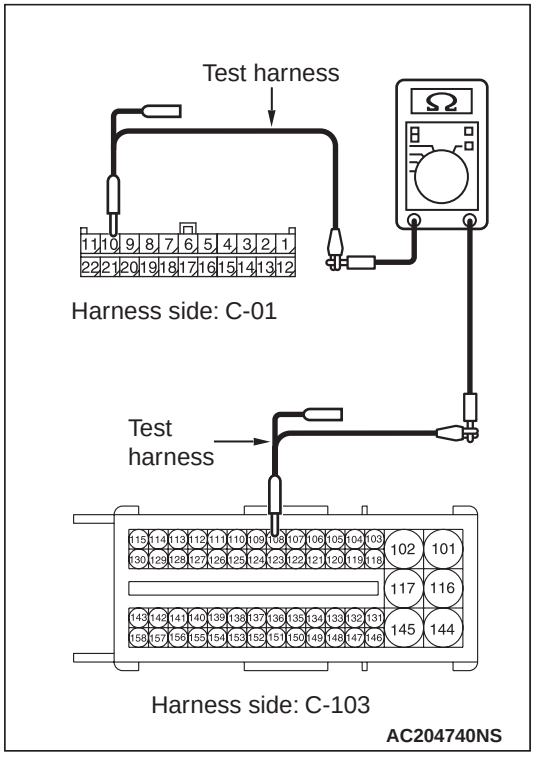
(3) Ensure that the negative battery terminal is

disconnected.



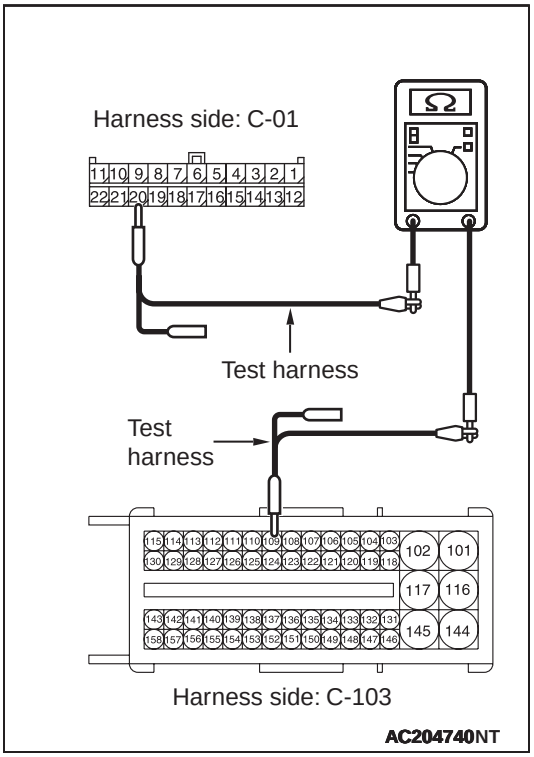
(4) Continuity between C-01 joint connector (CAN2) terminal No.9 and C-103 engine-ECU connector terminal No.108 <LHD>

OK: Continuity (2 Ω or less)



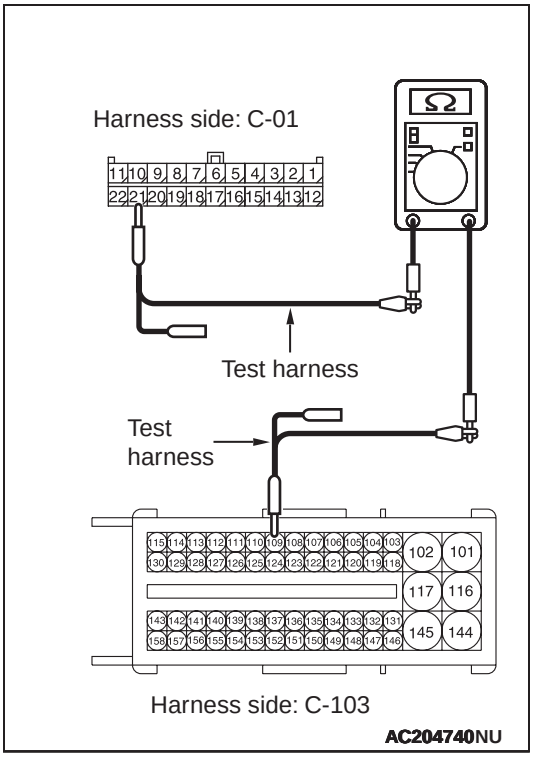
(5) Continuity between C-01 joint connector (CAN2) terminal No.10 and C-103 engine-ECU connector terminal No.108 <RHD>

OK: Continuity (2 Ω or less)



(6) Continuity between C-01 joint connector (CAN2) terminal No.20 and C-103 engine-ECU connector terminal No.109 <LHD>

OK: Continuity (2 Ω or less)



(7) Continuity between C-01 joint connector (CAN2) terminal No.21 and C-103 engine-ECU connector

terminal No.109 <RHD>

OK: Continuity (2 Ω or less)

⚠ CAUTION

Strictly observe the specified wiring harness repair procedure. For details refer to P.54C-7.

Q: Is the check result normal?

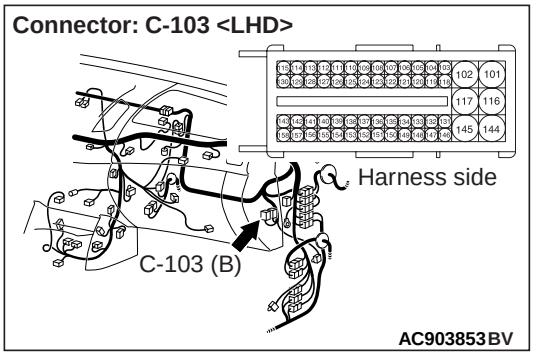
YES : <All the resistances measure 2 Ω or less> Go to Step 3 .

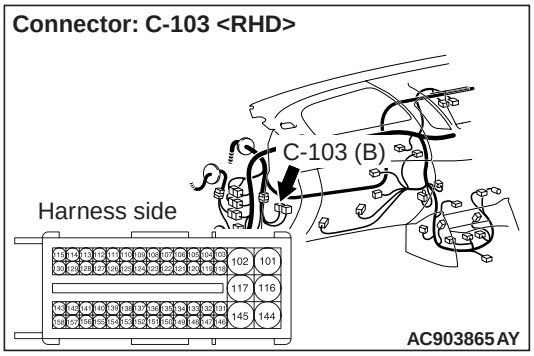
NO : <Either or all of the resistances measure more than 2 Ω> Repair the wiring harness between joint connector (CAN2) and the engine-ECU connector.

STEP 3. Resistance measurement at C-103 engine-ECU connector.

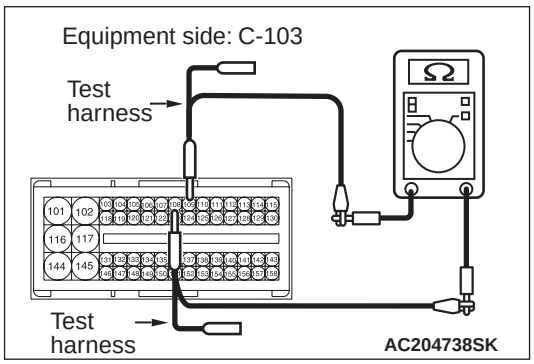
⚠ CAUTION

A digital multimeter should be used. For details refer to P.54C-7.





(1) Remove the engine-ECU, and measure at the equipment side.



(2) Resistance between C-103 engine-ECU connector terminal Nos.108 and 109

OK: 120 ± 20 Ω

⚠ CAUTION

Strictly observe the specified wiring harness repair procedure. For details refer to P.54C-7.

Q: Is the check result normal?

YES : <Within 120 ± 20 Ω> Power supply to the engine-ECU may be suspected. Diagnose the fuel system. Refer to .

NO : <Not within 120 ± 20 Ω> Replace the engine-ECU.

CAN COMMUNICATION-RELATED DIAGNOSIS CODE (U CODE) TABLE

M1548300302360

Code No.	Diagnostic item	Output ECU	Action
U1073	Bus Off	Engine-ECU, A/T-ECU, ABS-ECU, ASTC-ECU, ETACS-ECU	CAN main bus line diagnostics
U1100	Engine-ECU time-out (related to engine)	A/T-ECU, ASTC-ECU, ETACS-ECU	
U1101	A/T-ECU time-out (related to automatic transmission) <A/T>	Engine-ECU, ASTC-ECU, ETACS-ECU	
U1102	ASTC-ECU time-out	Engine-ECU, A/T-ECU	
U1104	Steering wheel sensor timeout error	ASTC-ECU	
U1105	G and yaw rate sensor timeout error		
U1109	ETACS-ECU time-out	Engine-ECU, A/T-ECU, ASTC-ECU	
U1110	A/C-ECU time-out	ETACS-ECU	
U1111	RV meter time-out		
U1117	Immobilizer-ECU time-out	Engine-ECU	
U1120	Failure information of Engine-ECU	A/T-ECU, ASTC-ECU	Diagnose CAN main bus lines and confirm input signals.
U1150	Failure information of vehicles speed	ETACS-ECU	
U1190	The network system diagnosis code output permitted signal cannot be received.	Engine-ECU, A/T-ECU, ASTC-ECU	
U1200	Steering wheel sensor communication error	ASTC-ECU	
U1201	Yaw rate sensor parity error		
U1202	G-sensor parity error		
U1204	Steering wheel sensor communication error		
U1205	G & yaw rate sensor message counter error		
19	ETACS CAN Timeout	RV meter	CAN main bus line diagnostics
26	Engine CAN timeout		
29	No receive fault detect signal		Diagnose CAN main bus lines and confirm input signals.

GROUP 55

HEATER, AIR CONDITIONER AND VENTILATION

CONTENTS

HEATER, AIR CONDITIONER AND VENTILATION 55A

AUTOMATIC AIR CONDITIONER 55B

GROUP 55A

HEATER, AIR CONDITIONER AND VENTILATION

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SERVICE SPECIFICATIONS

M1551000301407

Item		Standard value
Idle speed r/min (N or P range)		650 ± 50 (High power engine)
		700 ± 50 (Except high power engine)
Idle-up speed r/min (N or P range)		900 ± 100
Resistor resistance (for blower motor) Ω	Between terminal Nos. 1 and 4	2.54
	Between terminal Nos. 1 and 3	1.24
	Between terminal Nos. 1 and 2	0.60
A/C compressor air gap mm		0.3 – 0.6

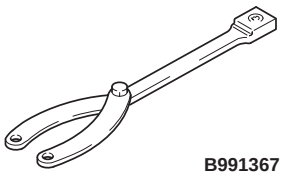
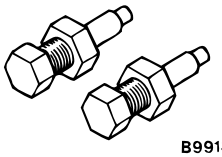
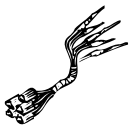
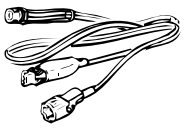
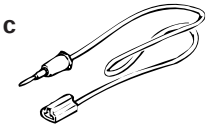
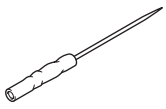
LUBRICANTS

M1551000400876

Item	Specified lubricant	Quantity
Compressor oil mL	ZXL 100PG	120 –140 (target value:120)
Each connection of refrigerant line	ZXL 100PG	As required
Refrigerant g	HFC134a (R134a)	555 ± 20

SPECIAL TOOL

M1551000600740

Tool	Number	Name	Use
 B991367	MB991367	Special spanner	Removal and installation of A/C compressor armature mounting nut
 B991386	MB991386	Pin	
a  b  c  d MB991223	MB991223 a. MB991219 b. MB991220 c. MB991221 d. MB991222	Harness set a. Test harness b. LED harness c. LED harness adapter d. Probe	Making voltage and resistance measurements during troubleshooting a. Connect pin contact pressure inspection b. Power circuit inspection c. Power circuit inspection d. Commercial tester connection
 MB992006	MB992006	Extra fine probe	Continuity check and voltage measurement at harness wire or connector

TROUBLESHOOTING

DIAGNOSIS TROUBLESHOOTING FLOW

M1554004700997

Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points .

TROUBLE SYMPTOM CHART

M1554005002265

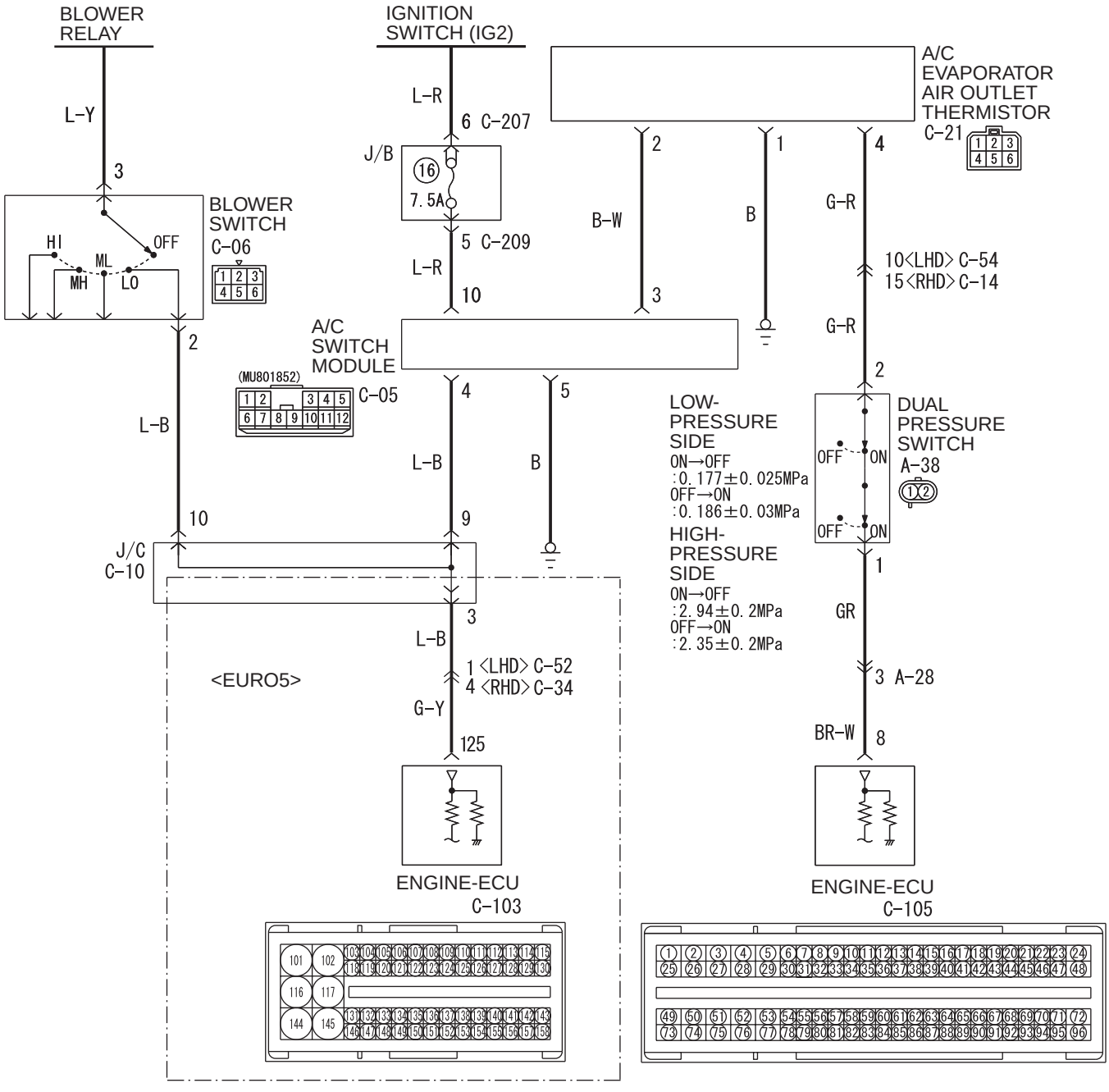
Trouble symptom	Inspection procedure number	Reference page
Cool air does not come	1	P.55A-6
The blower does not work	2	P.55A-17
The blower air volume cannot be changed	3	P.55A-26

Trouble symptom	Inspection procedure number	Reference page
The A/C compressor and clutch assembly does not work	4	P.55A-30
Condenser fan does not operate <Vehicles with condenser fan>	5	P.55A-36
The rear window demister does not work	6	P.55A-42
The PTC heater does not work <Vehicles with PTC heater>	7	P.55A-53

SYMPTOM PROCEDURES

Inspection Procedure 1: Cool air does not come

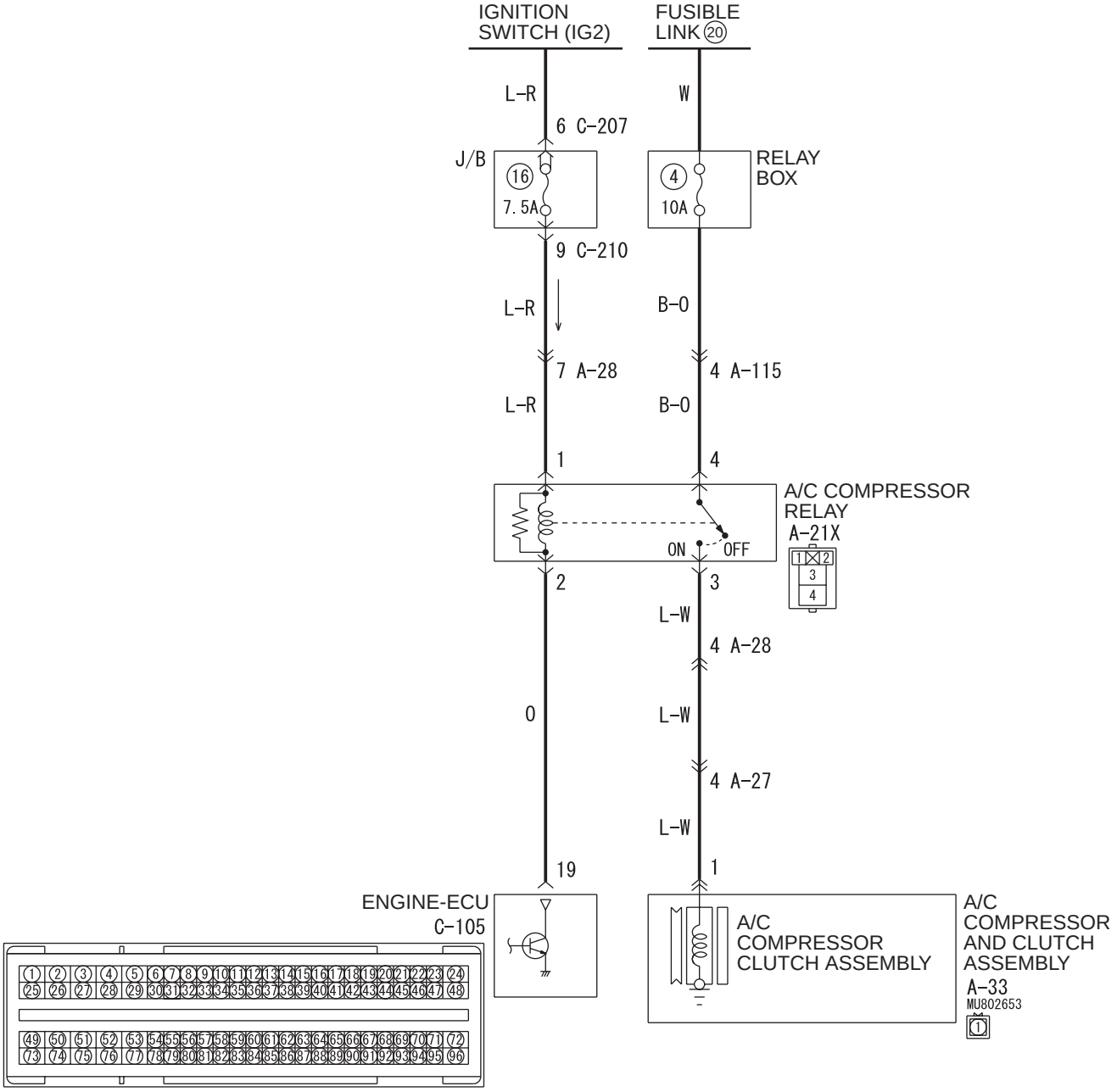
A/C Compressor Control Circuit



ACB01739
W7C55E000A

Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

A/C Compressor and Clutch Assembly Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

WBC55X001A

CIRCUIT OPERATION

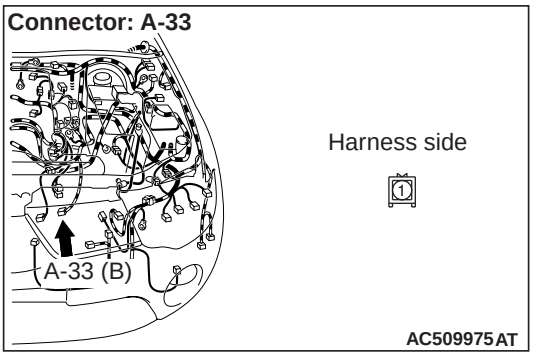
While the engine is running, with the blower switch ON, and when the temperature control dial is set to MAX COOL, if cool air does not come out from the vents, A/C compressor control circuit system may be defective.

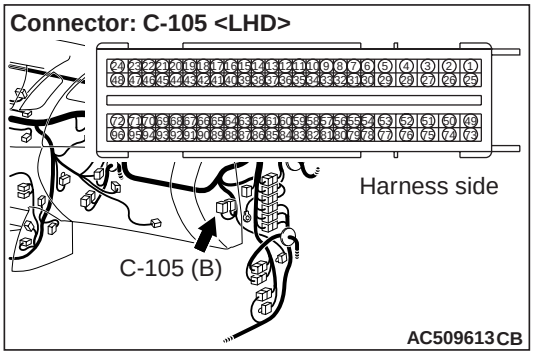
PROBABLE CAUSES

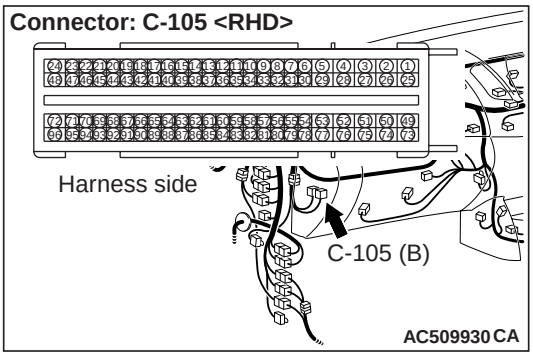
- Malfunction of the A/C evaporator air outlet thermistor
- Malfunction of the dual pressure switch
- Malfunction of the engine-ECU
- Damaged the wiring harness or connectors
- Improper amount of refrigerant

DIAGNOSIS PROCEDURE

STEP 1. Connector check: A-33 A/C compressor and clutch assembly connector and C-105 engine-ECU

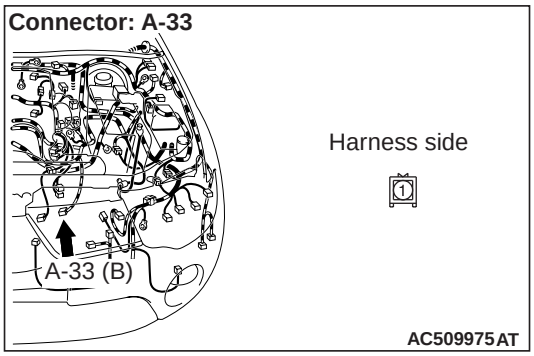




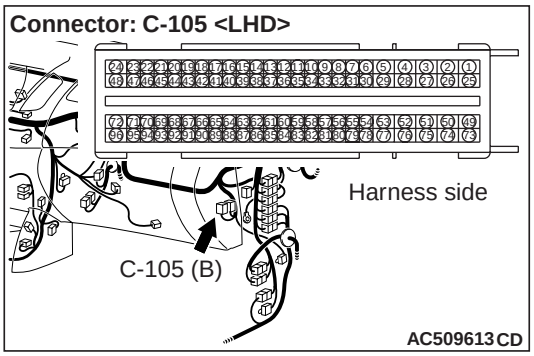


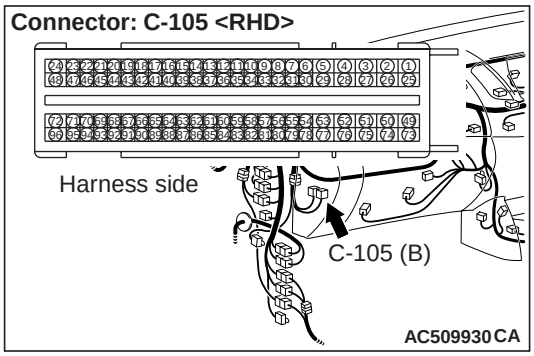
Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the connector.

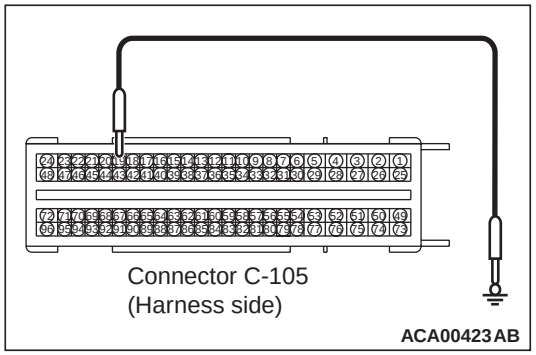
STEP 2. Voltage measurement at A-33 A/C compressor and clutch assembly connector.



(1) Disconnect the connector, and measure at the wiring harness side.
(2) Turn the ignition switch to the "ON" position.

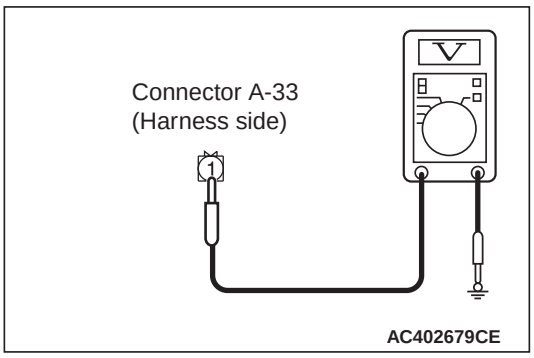






(3) Disconnect engine-ECU connector C-105 and

earth terminal 19.



(4) Voltage between terminal 1 and body earth.

OK: System voltage

Q: Is the check result normal?

YES : Go to Step 3.

NO : Refer to Inspection Procedure 4 " The A/C compressor and clutch assembly does not work P.55A-30 ".

STEP 3. Check that the blower motor operates when the blower switch is moved to the "4 (HI)" position.

(1) Turn the ignition switch to the "ON" position.

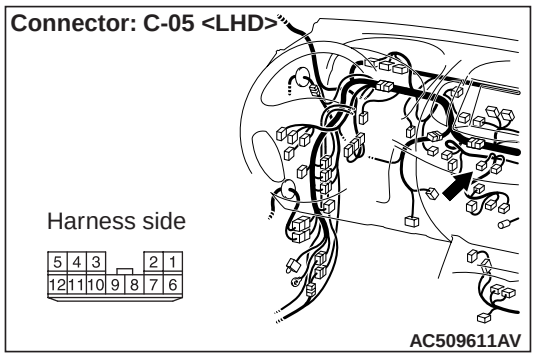
(2) Turn the blower switch to the "4 (HI) " position.

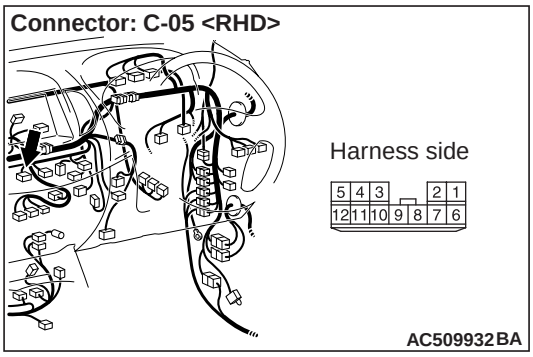
Q: Does the blower motor operate when the blower switch is moved to the "4 (HI)" position?

YES : Go to Step 4.

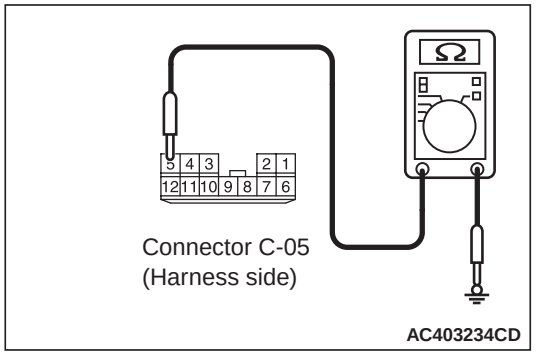
NO : Refer to Inspection procedure 2 "The blower does not work P.55A-17."

STEP 4. Resistance measurement at the C-05 A/C switch module connector.





(1) Disconnect the connector, and measure at the wiring harness side.



(2) Measure the resistance between terminal 5 and body earth.

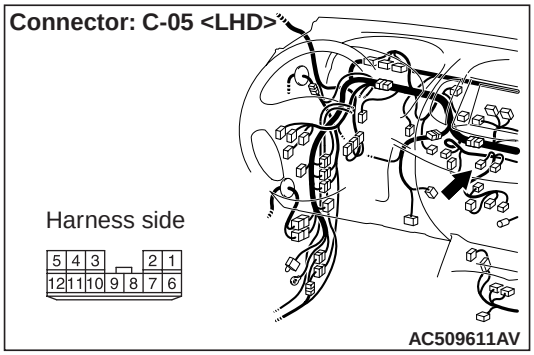
OK: Continuity (Less than 2Ω)

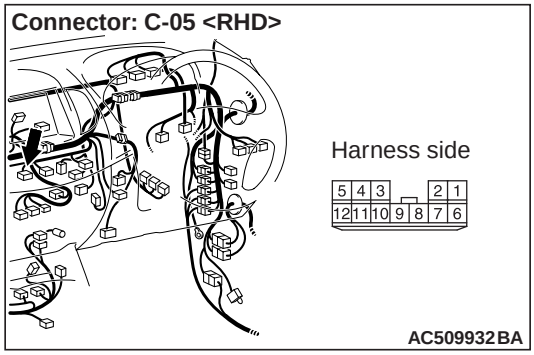
Q: Is the check result normal?

YES : Go to Step 6.

NO : Go to Step 5.

STEP 5. Check the wiring harness between C-05 A/C switch module connector terminal No.5 and body earth.





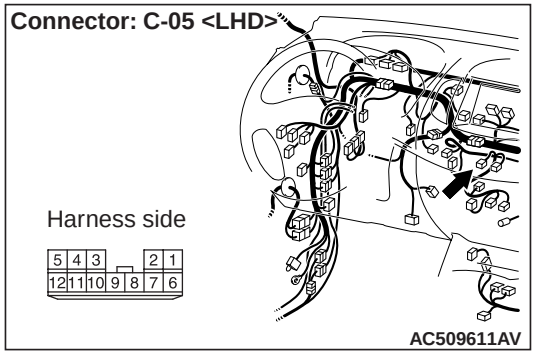
- Check the A/C switch module earth line for open circuit.

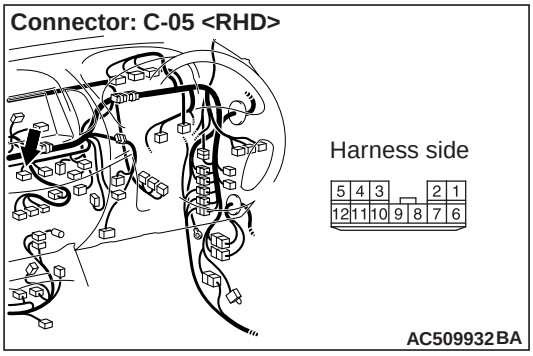
Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

NO : Repair the wiring harness.

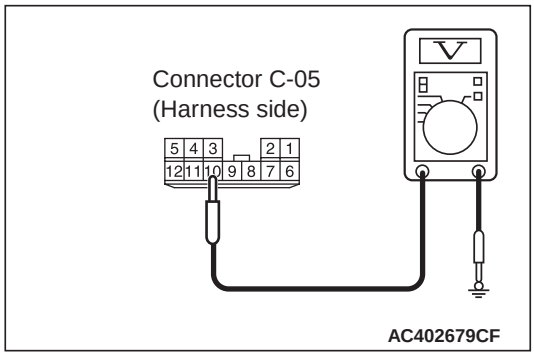
STEP 6. Voltage measurement at C-05 A/C switch module connector.





(1) Disconnect the connector, and measure at the wiring harness side.

(2) Turn the ignition switch to the "ON" position.



(3) Measure the voltage between terminal 10 and body earth.

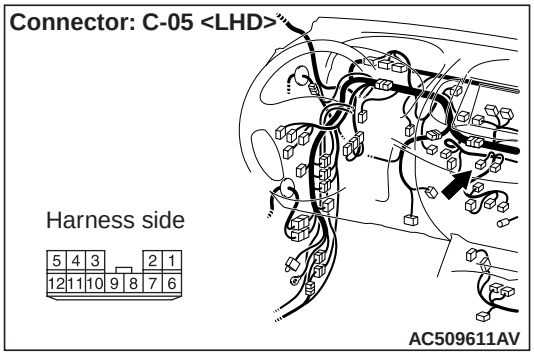
OK: System voltage

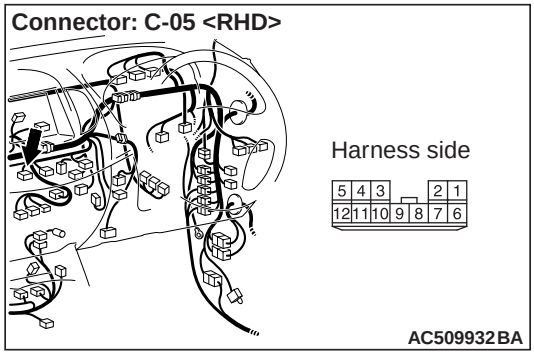
Q: Is the check result normal?

YES : Go to Step 8.

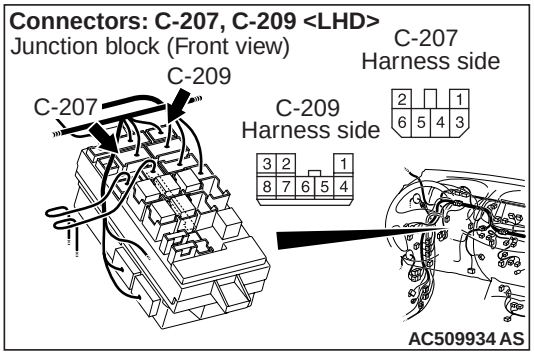
NO : Go to Step 7.

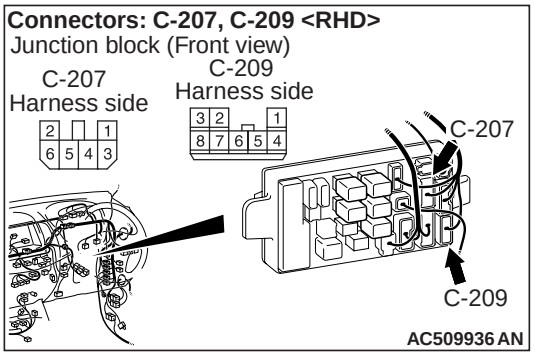
STEP 7. Check the wiring harness between C-05 A/C switch module connector terminal No.10 and the ignition switch (IG2).





NOTE:





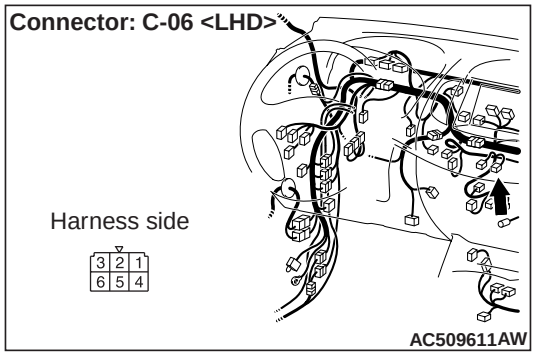
Prior to the wiring harness inspection, check junction block connector C-209 and C-207, and repair if necessary.

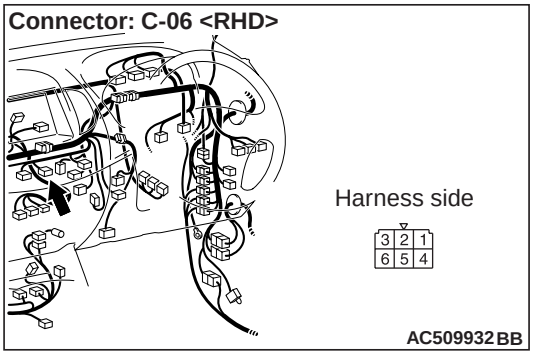
- Check the blower relay power supply line for open circuit.

Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness.

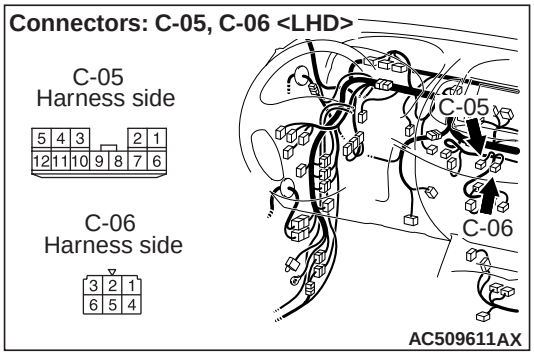
STEP 8. Connector check: C-06 blower switch connector

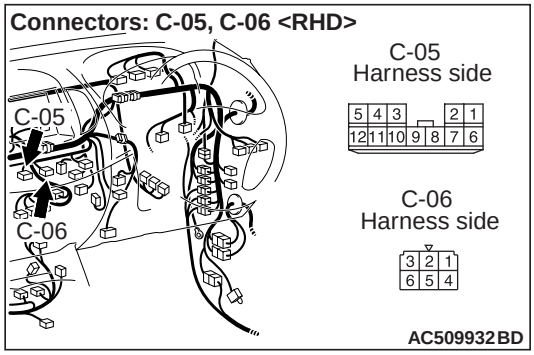




Q: Is the check result normal?
YES : Go to Step 9.
NO : Repair the connector.

STEP 9. Check the wiring harness between C-06 blower switch connector terminal No.2 and C-05 A/C switch module connector terminal No.4.





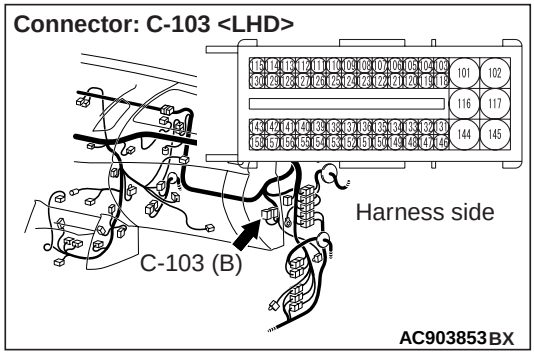
NOTE: Prior to the wiring harness inspection, check joint connector C-10 and repair if necessary.

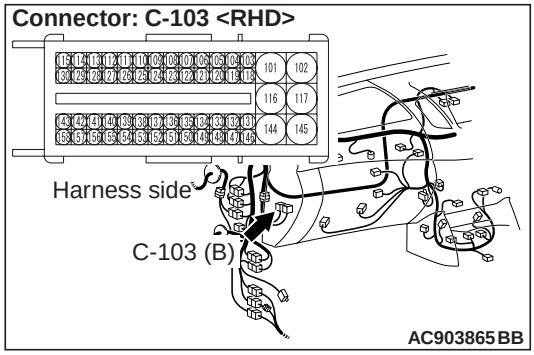
- Check the engine-ECU signal line for open and short circuit.
- Check the blower switch signal line and earth line for open and short circuit.

Q: Is the check result normal?

YES : Go to Step 10 <Vehicles for EURO5>.
YES : Go to Step 12 <Except for EURO5>.
NO : Repair the wiring harness.

STEP 10. Connector check: C-103 engine-ECU connector

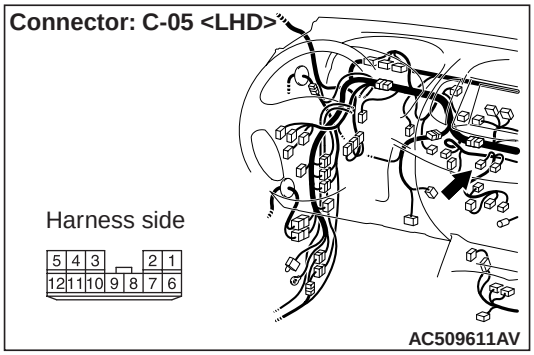


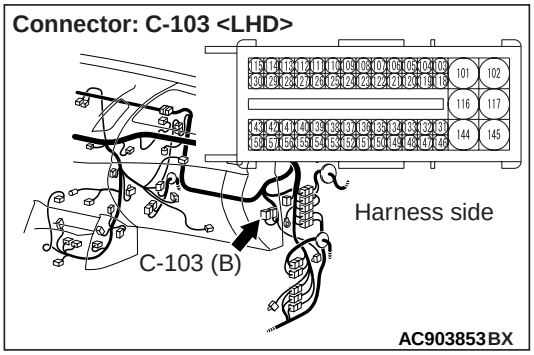


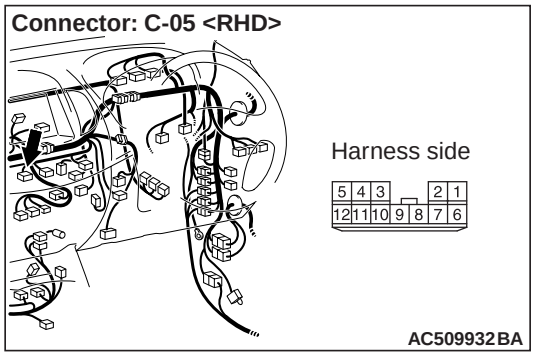
Q: Is the check result normal?

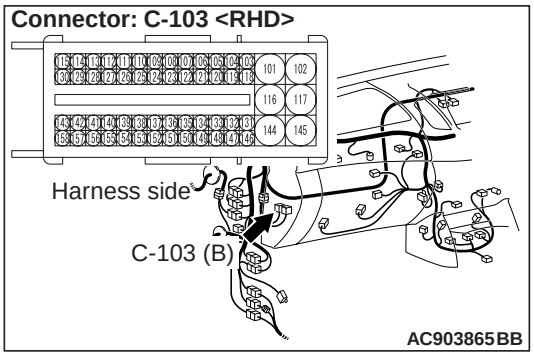
YES : Go to Step 11.
NO : Repair the connector.

STEP 11. Check the wiring harness between C-103 engine-ECU connector terminal No.125 and C-05 A/C switch module connector terminal No.4.









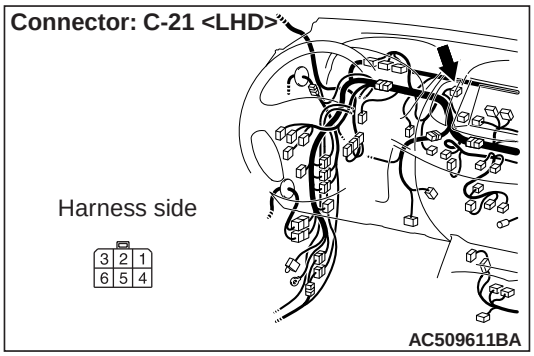
NOTE: Prior to the wiring harness inspection, check intermediate connector C-52 <LHD> or C-34 <RHD>, and repair if necessary.

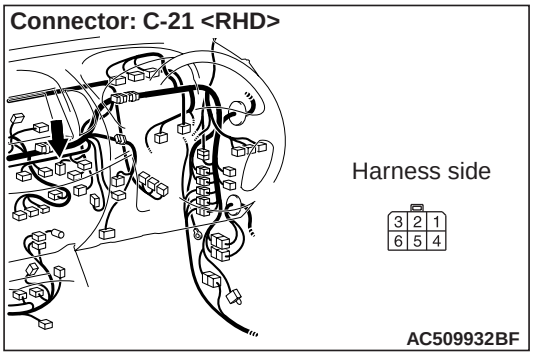
- Check the engine-ECU signal line for open and short circuit.

Q: Is the check result normal?

YES : Go to Step 12 .
NO : Repair the wiring harness.

STEP 12. Connector check: C-21 A/C evaporator air outlet thermistor connector

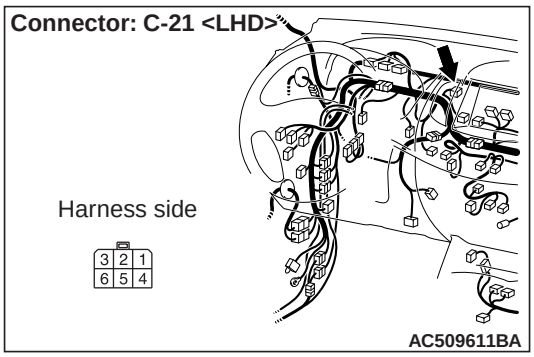


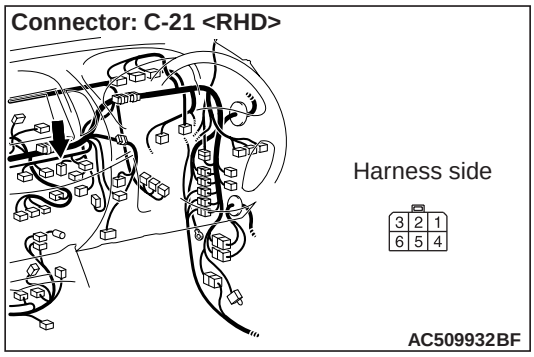


Q: Is the check result normal?

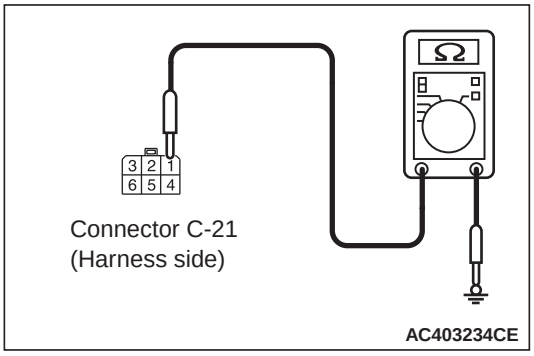
YES : Go to Step 13.
NO : Repair the connector.

STEP 13. Resistance measurement at the C-21 A/C evaporator air outlet thermistor connector.





(1) Disconnect the connector, and measure at the wiring harness side.

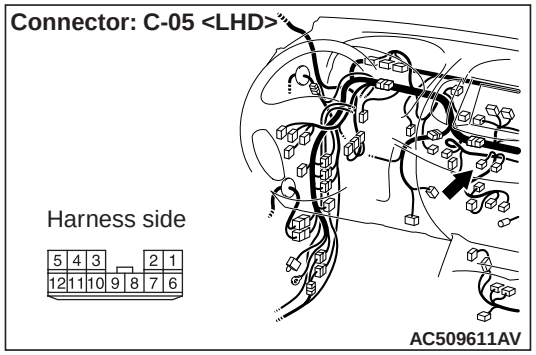


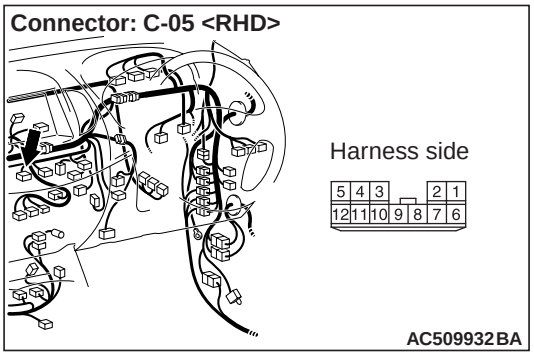
(2) Measure the resistance between terminal 1 and body earth.

OK: Continuity (Less than 2Ω)

Q: Is the check result normal?
YES : Go to Step 15.
NO : Go to Step 14.

STEP 14. Check the wiring harness between C-05 A/C switch module connector terminal No.5 and body earth.

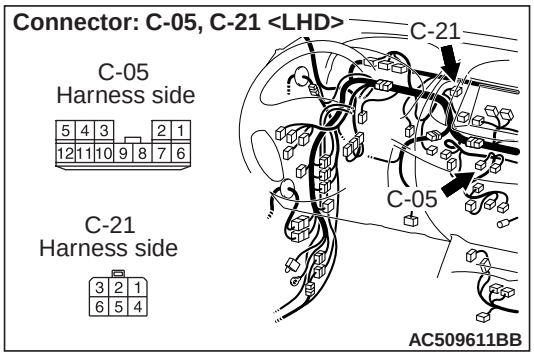


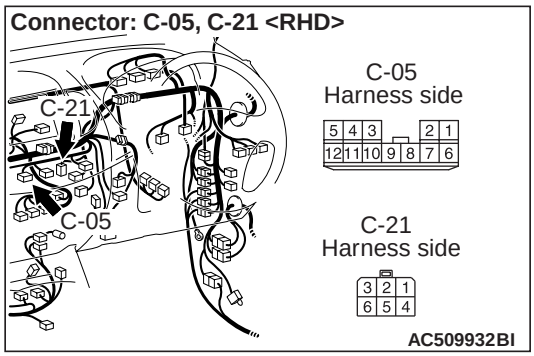


- Check the A/C switch module earth line for open circuit.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness.

STEP 15. Check the wiring harness between C-05 A/C switch module connector terminal No.3 and C-21 A/C evaporator air outlet thermistor connector terminal No.2.

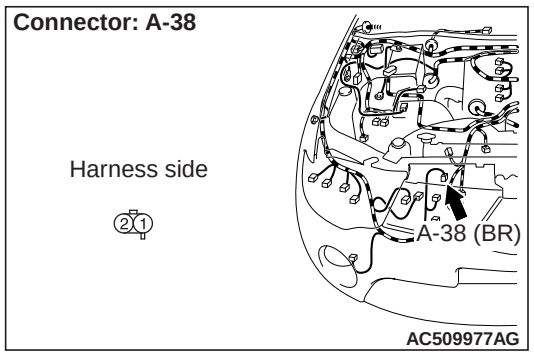




- Check the input line for open and short circuit.

Q: Is the check result normal?
YES : Go to Step 16.
NO : Repair the wiring harness.

STEP 16. Connector check: A-38 dual pressure switch connector

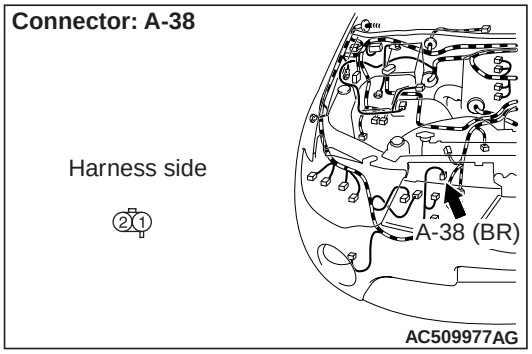


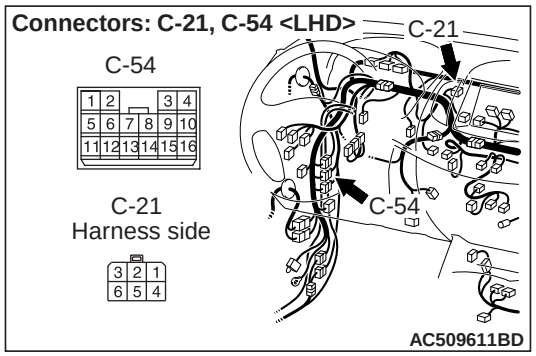
Q: Is the check result normal?
YES : Go to Step 17.
NO : Repair the connector.

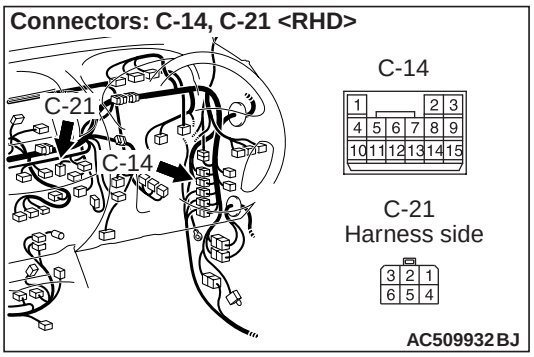
STEP 17. Check the dual pressure switch.
Refer to P.55A-65.

Q: Is the check result normal?
YES : Go to Step 18.
NO : Replace the A/C receiver assembly.

STEP 18. Check the wiring harness between C-21 A/C evaporator air outlet thermistor connector terminal No.4 and A-38 dual pressure switch connector terminal No.2.





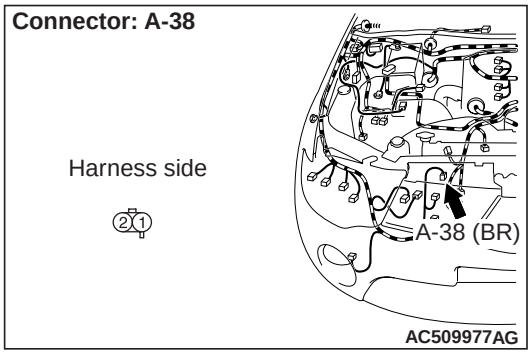


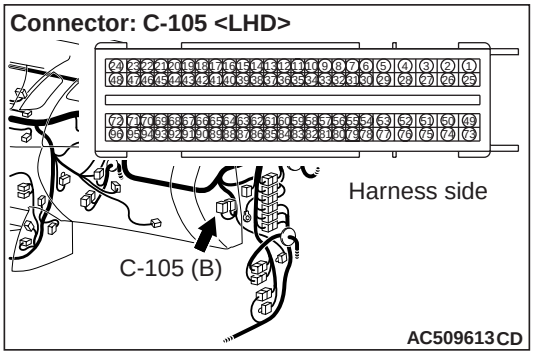
NOTE: Prior to the wiring harness inspection, check intermediate connector C-54 <LHD> or C-14 <RHD>, and repair if necessary.

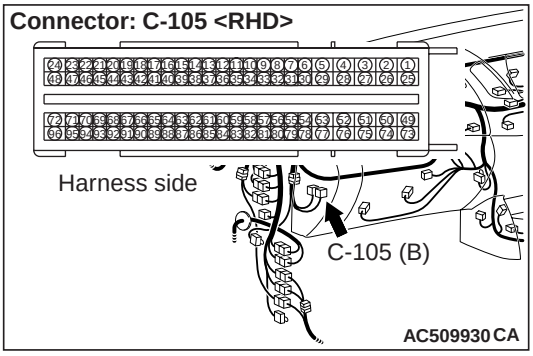
- Check the dual pressure switch signal line.

Q: Is the check result normal?
YES : Go to Step 19.
NO : Repair the wiring harness.

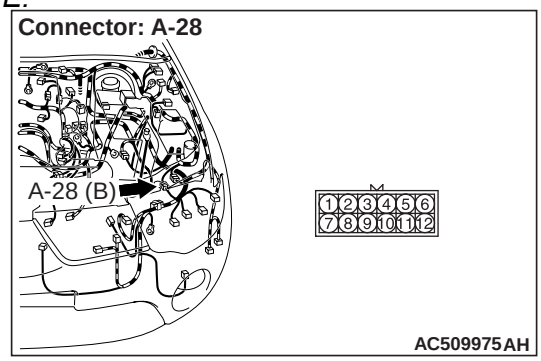
STEP 19. Check the wiring harness between A-38 dual pressure switch connector terminal No.1 and C-105 engine-ECU connector terminal No.15.







NOTE:



Prior to the wiring harness inspection, check intermediate connector A-28, and repair if necessary.

- Check the dual pressure switch signal line.

Q: Is the check result normal?

YES : Go to Step 20.
NO : Repair the wiring harness.

STEP 20. Check the A/C compressor clutch operation.

Refer to P.55A-81.

Q: Can the sound of the A/C compressor clutch (click) be heard?

YES : Go to Step 21.
NO : Replace the A/C compressor clutch.

STEP 21. Refrigerant level check

Check that the refrigerant level is adequate. Refer to P.55A-63.

Q: Is the check result normal?

YES : Go to Step 22.
NO : Charge or remove the refrigerant level. Refer to P.55A-63.

STEP 22. Replace the A/C switch module, and then recheck the trouble symptom

Check that the cooler works normally.

Q: Is the check result normal?

YES : This diagnosis is complete.
NO : Go to Step 23.

STEP 23. Replace the A/C evaporator air outlet thermistor, and then recheck the trouble symptom

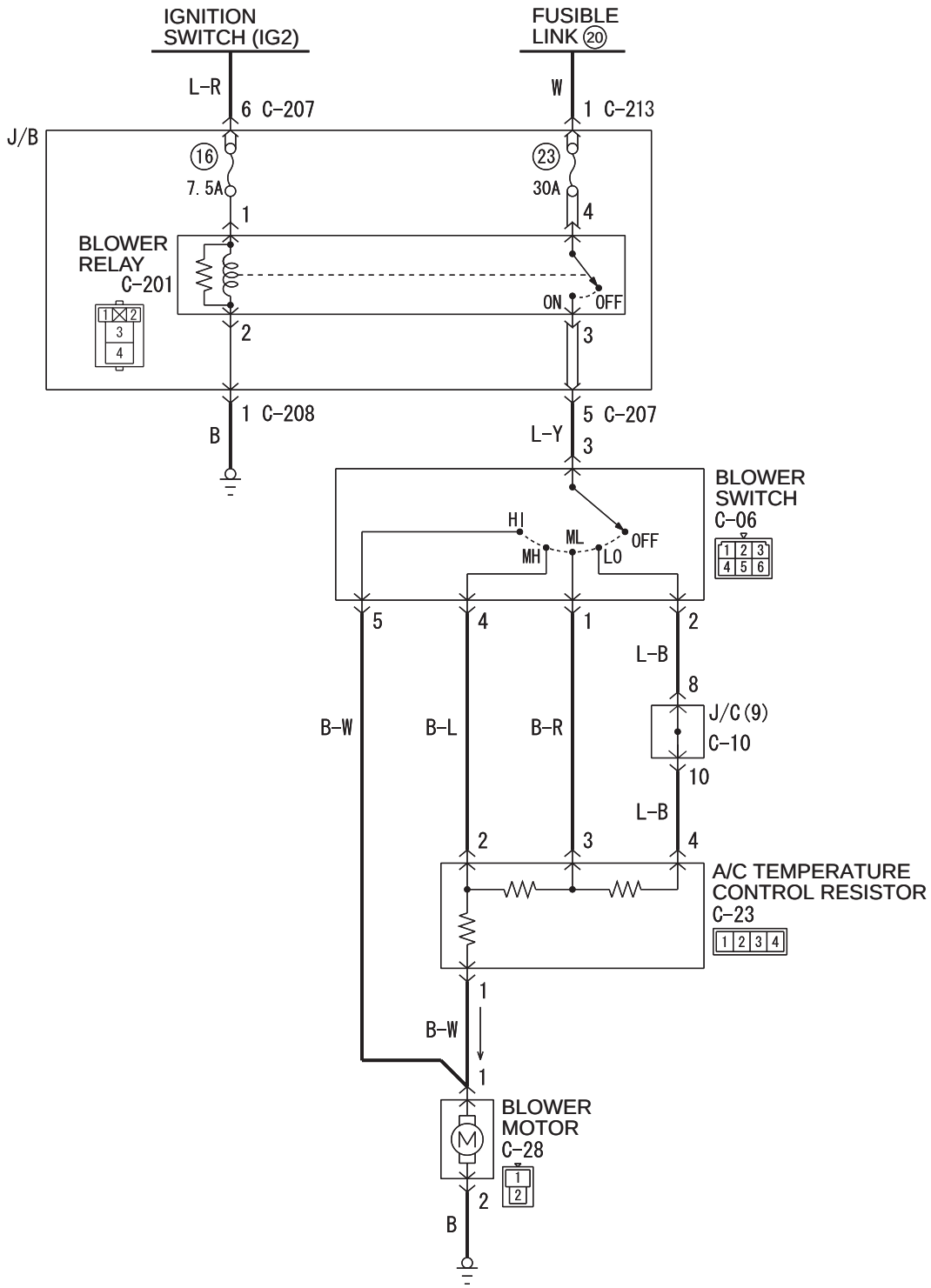
Check that the cooler works normally.

Q: Is the check result normal?

YES : This diagnosis is complete.
NO : Replace the engine-ECU.

Inspection Procedure 2: The blower does not work

Blower Motor Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

AC900880
W7C55E002A

COMMENTS ON TROUBLE SYMPTOM
If the blower motor does not operate, the blower motor circuit system may be defective.

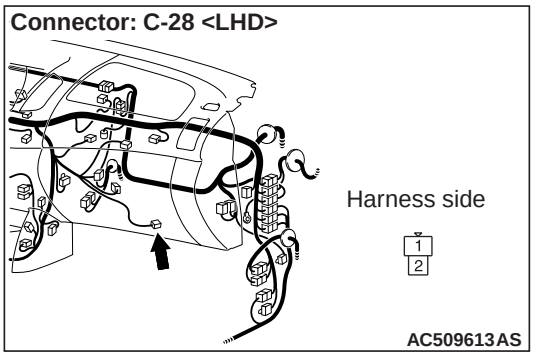
PROBABLE CAUSES
- Malfunction of the blower relay
- Malfunction of the blower motor
- Malfunction of the blower switch
- Damaged the wiring harness or connectors

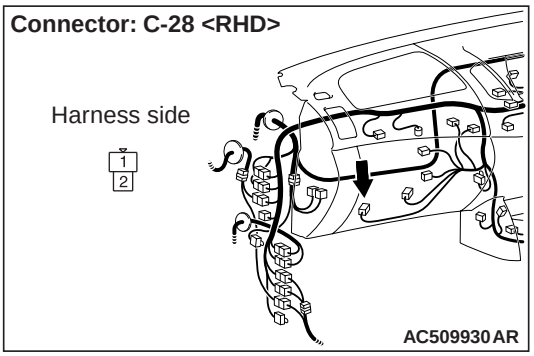
DIAGNOSIS PROCEDURE

STEP 1. Check that the blower motor operates when the blower switch is moved to the "4 (HI) " position.
(1) Turn the ignition switch to the "ON" position.
(2) Turn the blower switch to the "4 (HI) " position.

Q: Does the blower motor operate when the blower switch is moved to the "4 (HI) " position?
YES : Refer to Inspection procedure 3 "The blower air volume cannot be changed P.55A-26."
NO : Go to Step 2.

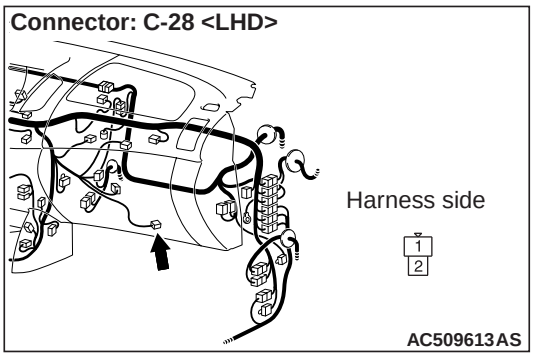
STEP 2. Connector check: C-28 blower motor connector

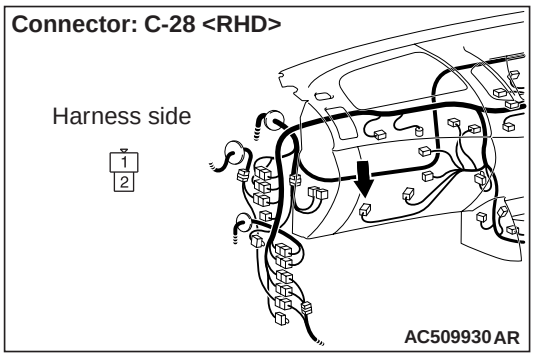




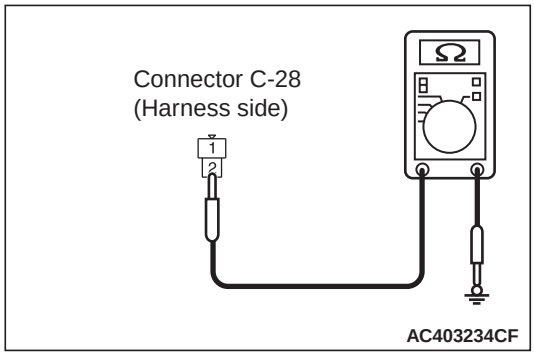
Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the connector.

STEP 3. Resistance measurement at the C-28 blower motor connector.





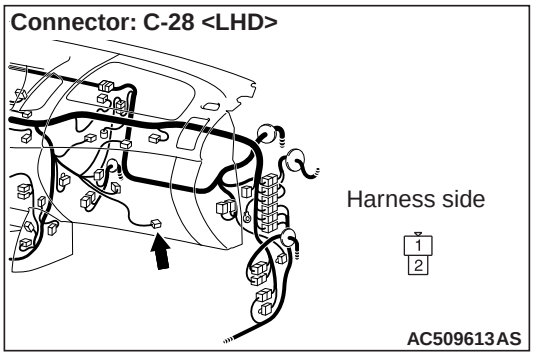
(1) Disconnect the connector, and measure at the wiring harness side.

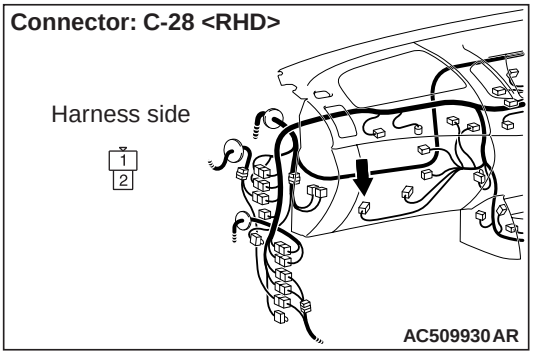


(2) Measure the resistance between terminal 2 and body earth.
OK: Continuity (Less than 2Ω)

Q: Is the check result normal?
YES : Go to Step 5.
NO : Go to Step 4.

STEP 4. Check the wiring harness between C-28 blower motor connector terminal No.2 and body earth.





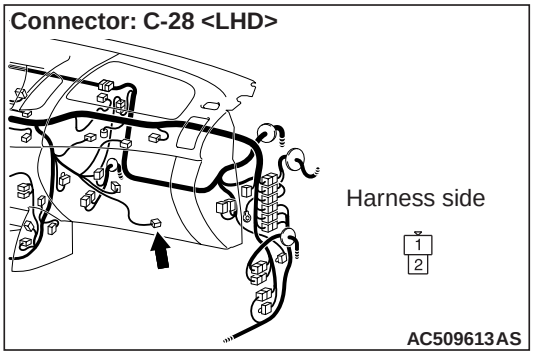
- Check the blower motor earth line for open circuit.

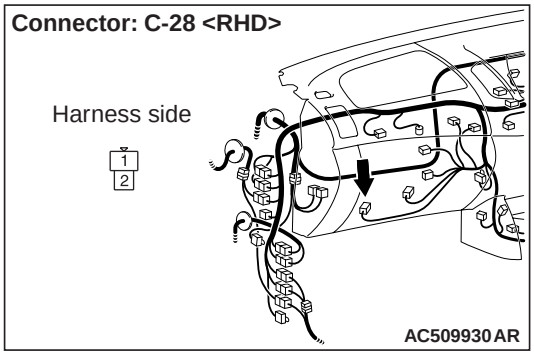
Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

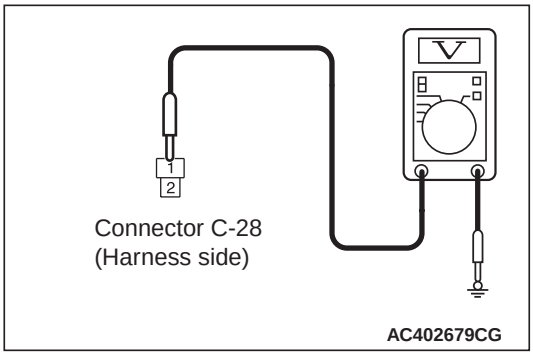
NO : Repair the wiring harness.

STEP 5. Voltage measurement at C-28 blower motor connector.





(1) Disconnect the connector, and measure at the wiring harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Turn the blower switch to the "4 (HI) " position.



(4) Measure the voltage between terminal 1 and body earth.

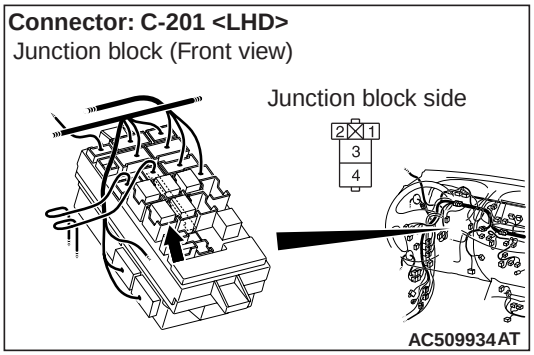
OK: System voltage

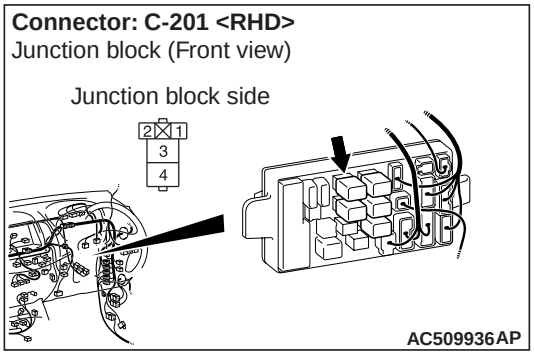
Q: Is the check result normal?

YES : Go to Step 18.

NO : Go to Step 6.

STEP 6. Connector check: C-201 blower relay connector





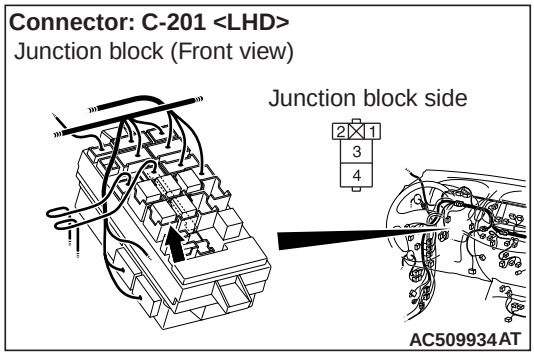
Q: Is the check result normal?
YES : Go to Step 7.
NO : Repair the connector.

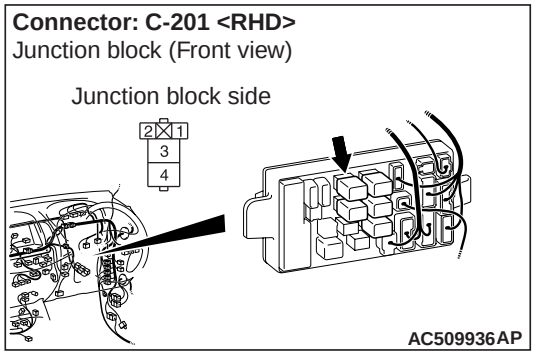
STEP 7. Check the blower relay continuity.

Refer to P.55A-66.

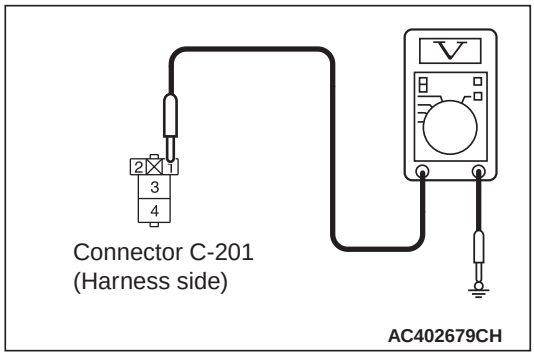
Q: Is the blower relay continuity in good condition?
YES : Go to Step 8.
NO : Replace the blower relay.

STEP 8. Voltage measurement at C-201 blower relay connector.





(1) Remove the relay, and measure at the junction block side.
(2) Turn the ignition switch to the "ON" position.

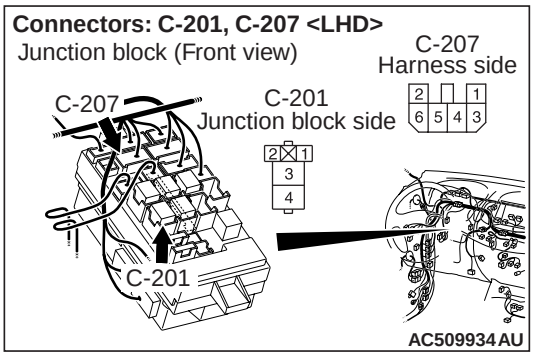


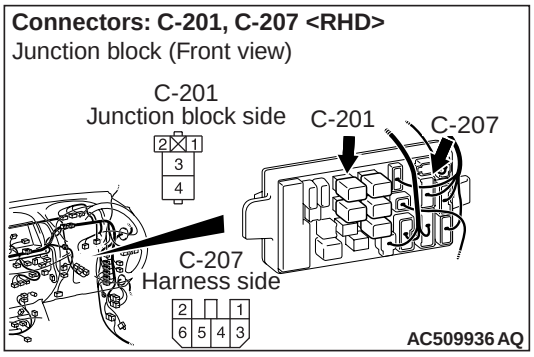
(3) Measure the voltage between terminal 1 and earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 10.
NO : Go to Step 9.

STEP 9. Check the wiring harness between C-201 blower relay connector terminal No.1 and the ignition switch (IG2).





NOTE: Prior to the wiring harness inspection, check junction block connector C-207, and repair if necessary.

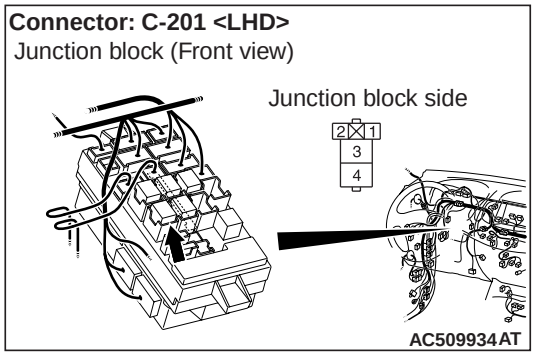
- Check the blower relay power supply line for open circuit.

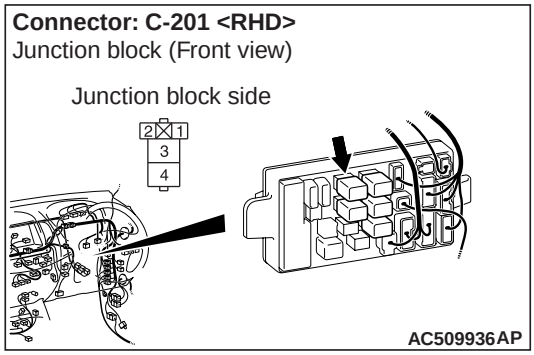
Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

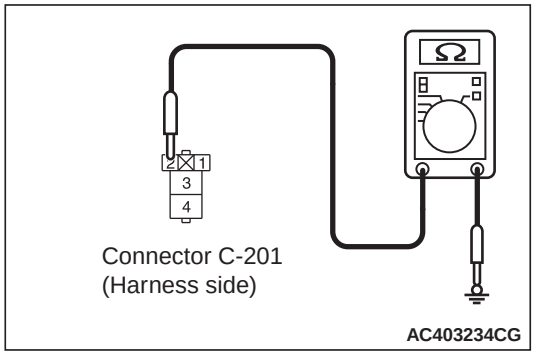
NO : Repair the wiring harness.

STEP 10. Measure the resistance at C-201 blower relay connector.





(1) Remove the relay, and measure at the junction block side.



(2) Measure the resistance Continuity between terminal 2 and body earth.

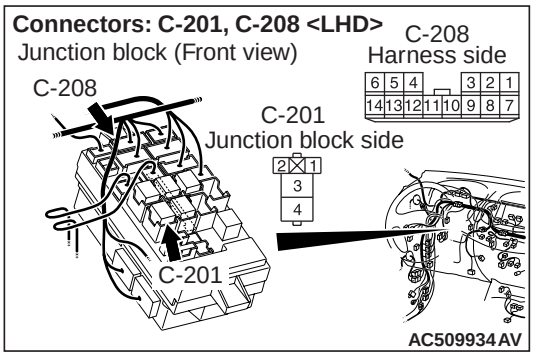
OK: Continuity (Less than 2Ω)

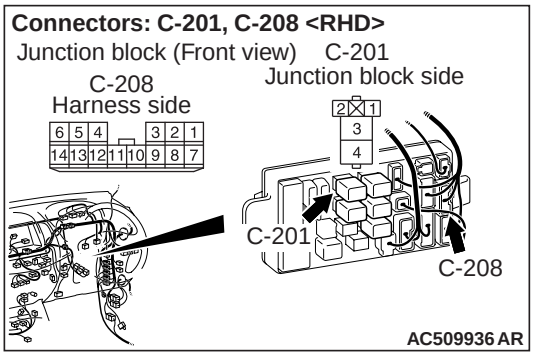
Q: Is the check result normal?

YES : Go to Step 12.

NO : Go to Step 11.

STEP 11. Check the wiring harness between C-201 blower relay connector terminal No.2 and earth.





NOTE: Prior to the wiring harness inspection, check junction block connectors C-208, and repair if necessary.

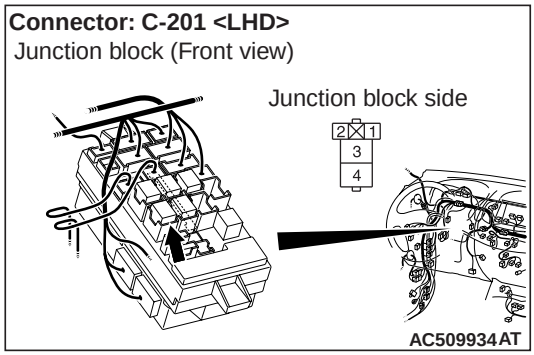
- Check the blower relay earth wires for open circuit.

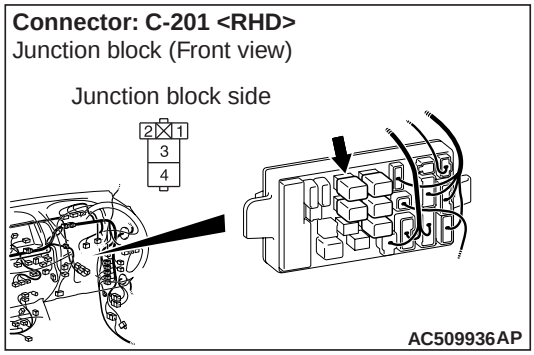
Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

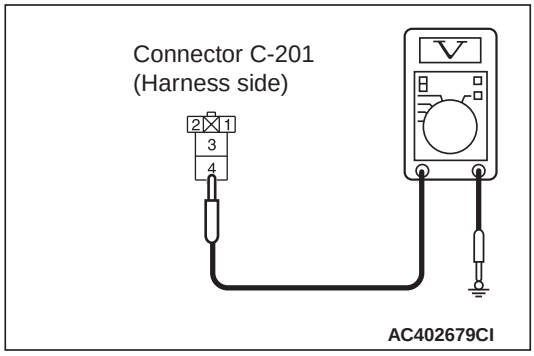
NO : Repair the wiring harness.

STEP 12. Measure the voltage at C-201 blower relay connector.





(1) Remove the relay, and measure at the junction block side.



(2) Measure the voltage between terminal 4 and body earth.

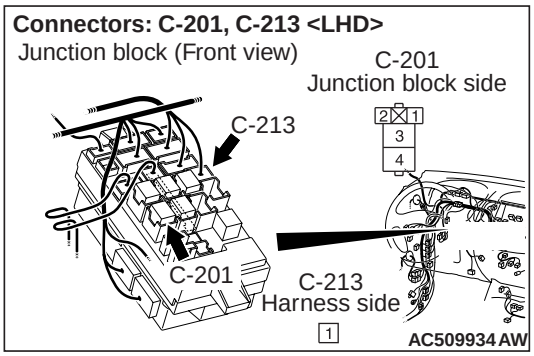
OK: System voltage

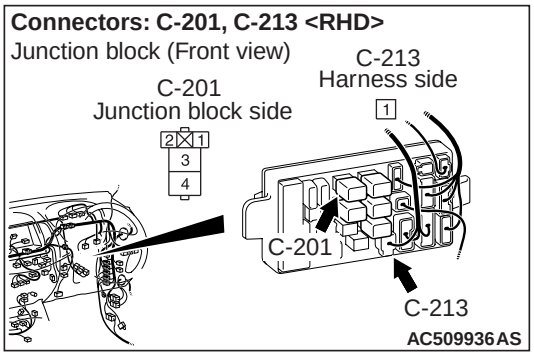
Q: Is the check result normal?

YES : Go to Step 14.

NO : Go to Step 13.

STEP 13. Check the wiring harness between C-201 blower relay connector terminal No.4 and fusible link (20).



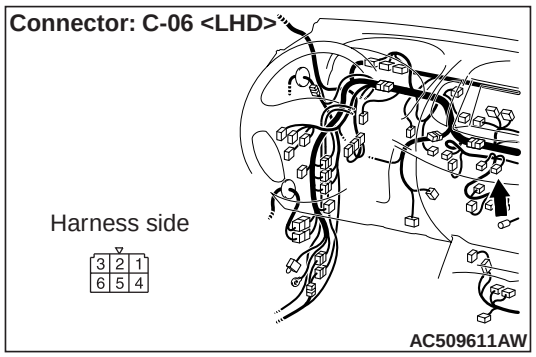


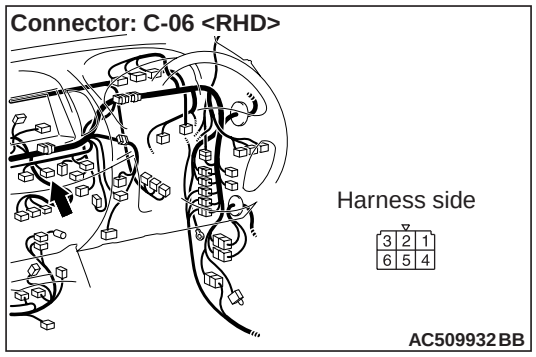
NOTE: Prior to the wiring harness inspection, check junction block connector C-213, and repair if necessary.

- Check the blower relay power supply line for open circuit.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness.

STEP 14. Connector check: C-06 blower switch connector



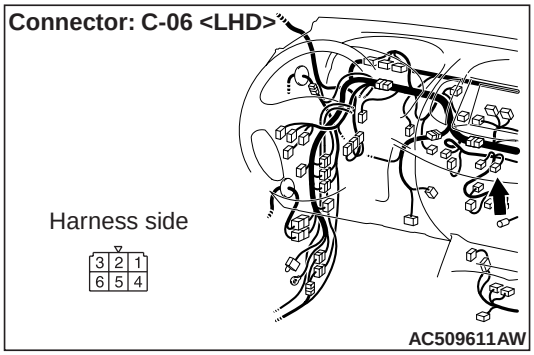


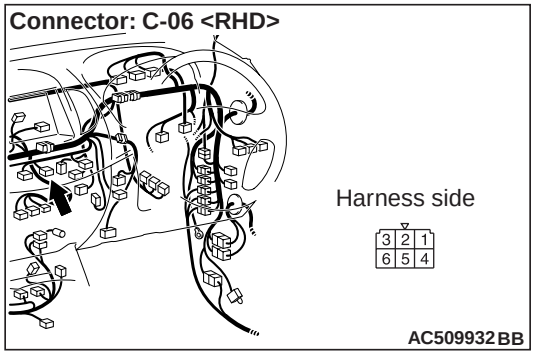
Q: Is the check result normal?
YES : Go to Step 15.
NO : Repair the connector.

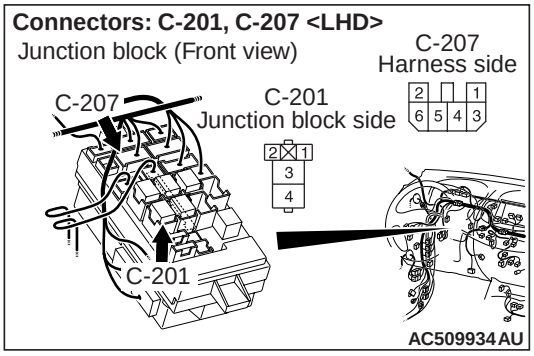
STEP 15. Check the blower switch continuity.
Refer to P.55A-71.

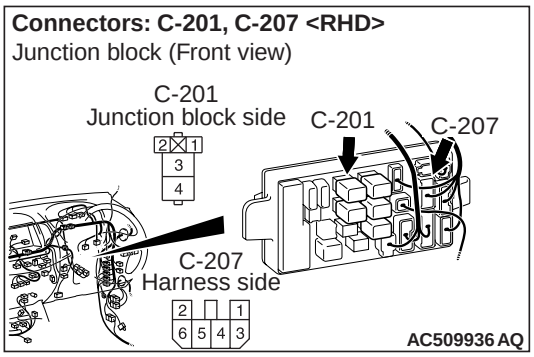
Q: Is the blower switch continuity in good condition?
YES : Go to Step 16.
NO : Replace the blower switch.

STEP 16. Check the wiring harness between C-06 blower switch connector terminal No.3 and C-201 blower relay connector terminal No.3.









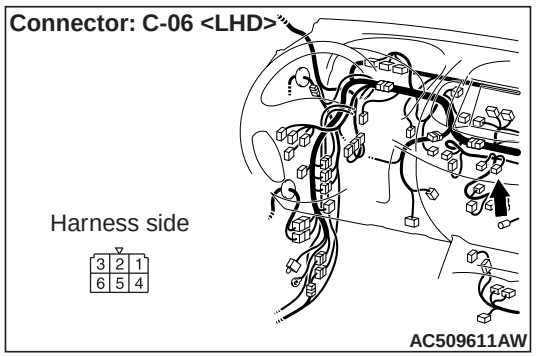
NOTE: Prior to the wiring harness inspection, check junction block connector C-207, and repair if necessary.

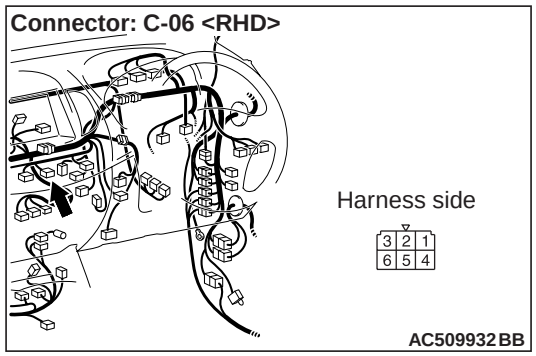
- Check the blower relay output line for open circuit.

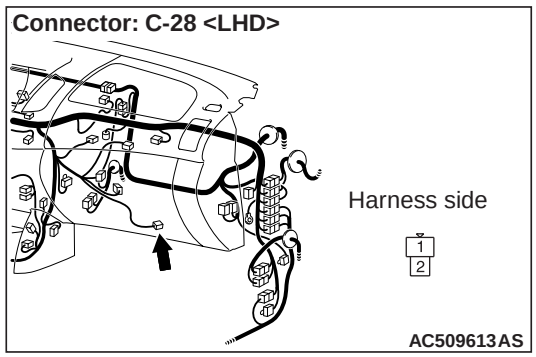
Q: Is the check result normal?

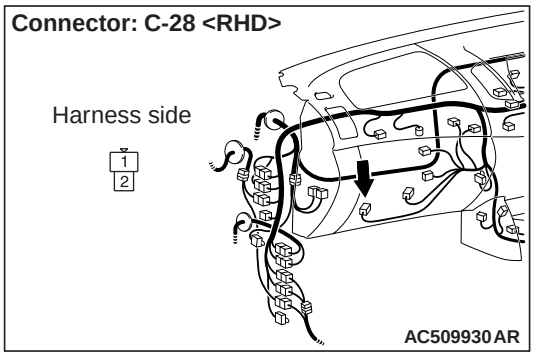
YES : Go to Step 17.
NO : Repair the wiring harness.

STEP 17. Check the wiring harness between C-28 blower motor connector terminal No.1 and C-06 blower switch connector terminal No.5.









- Check the blower motor power supply line for open circuit.

Q: Is the check result normal?

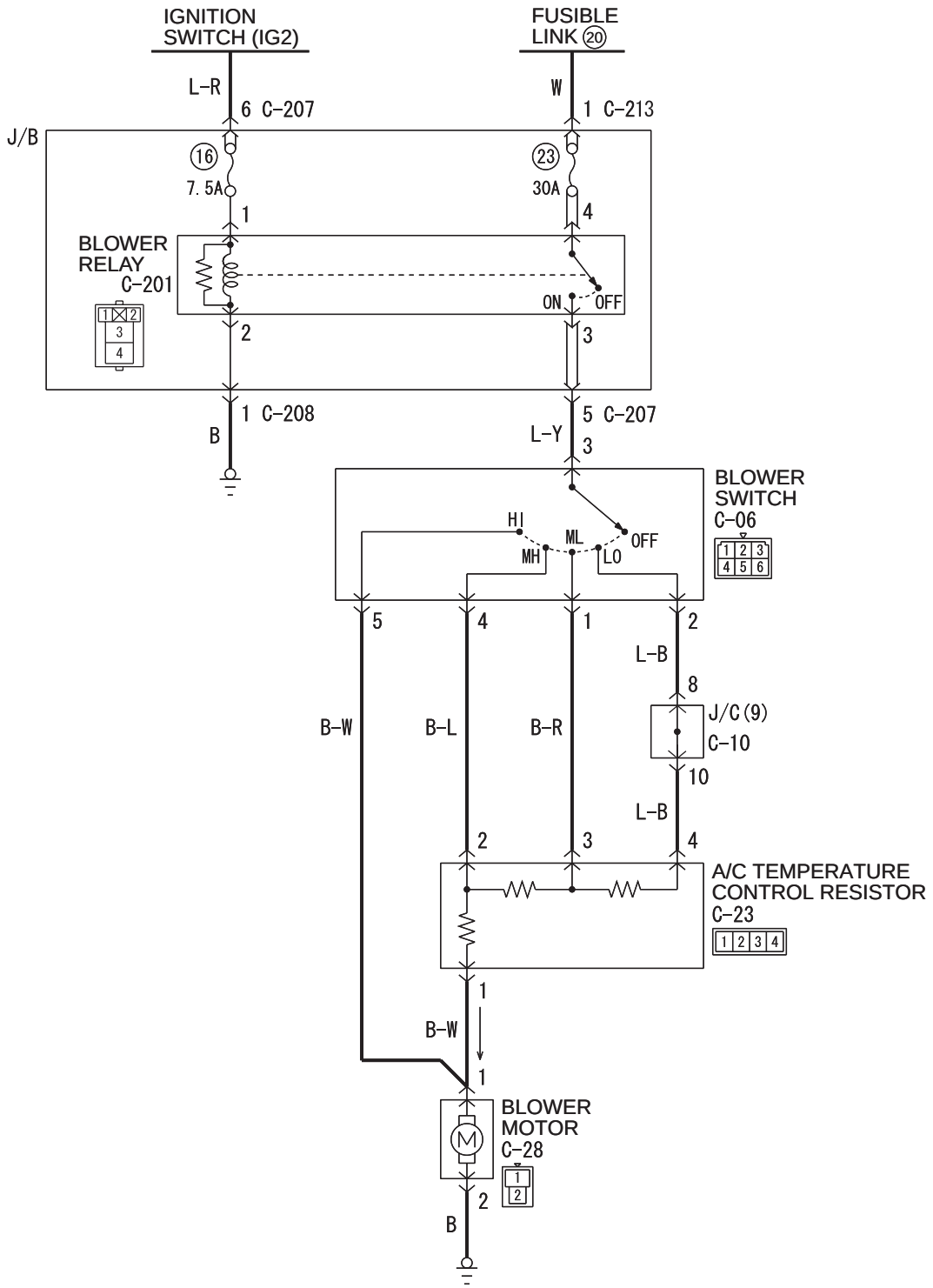
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness.

STEP 18. Check the blower motor operation.
Refer to P.55A-79.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction).
NO : Replace the blower motor.

Inspection Procedure 3: The blower air volume cannot be changed

Blower Motor Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

AC900880
W7C55E002A

COMMENTS ON TROUBLE SYMPTOM
If the blower air amount cannot be changed when the blower switch is operated, the blower switch may be defective.

PROBABLE CAUSES
- Malfunction of the A/C temperature control resistor
- Damaged the wiring harness or connectors
- Malfunction of the blower switch

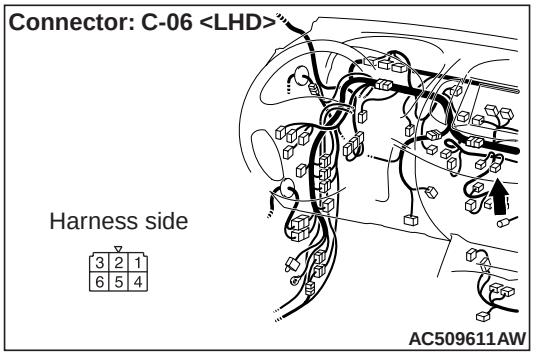
DIAGNOSIS PROCEDURE

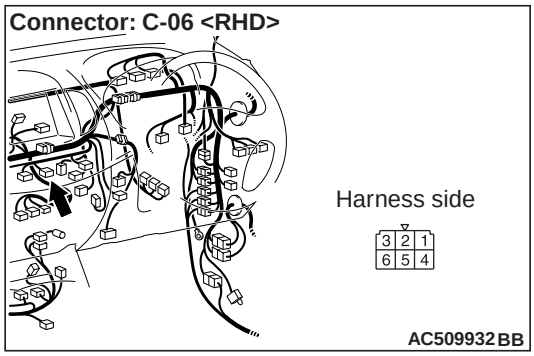
STEP 1. Check that the blower motor operates when the blower switch is moved to the "4 (HI)" position.

(1) Turn the ignition switch to the "ON" position.
(2) Turn the blower switch to the "4 (HI) " position.

Q: Does the blower motor operate when the blower switch is moved to the "4 (HI)" position?
YES : Go to Step 2.
NO : Refer to Inspection procedure 2 "The blower does not work P.55A-17."

STEP 2. Connector check: C-06 blower switch connector



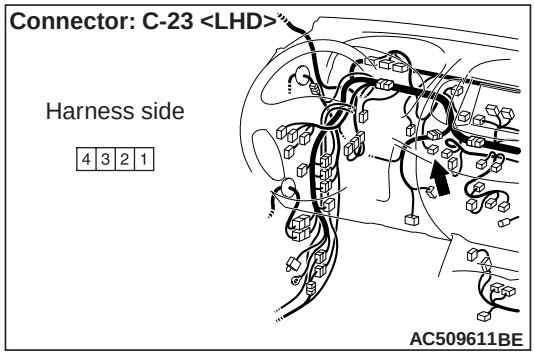


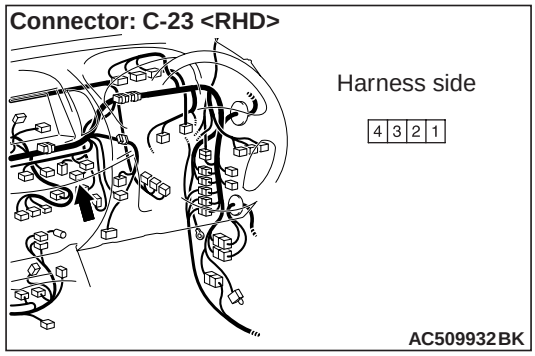
Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the connector.

STEP 3. Check the blower switch continuity.
Refer to P.55A-71.

Q: Is the blower switch continuity in good condition?
YES : Go to Step 4.
NO : Replace the blower switch.

STEP 4. Connector check: C-23 A/C temperature control resistor connector



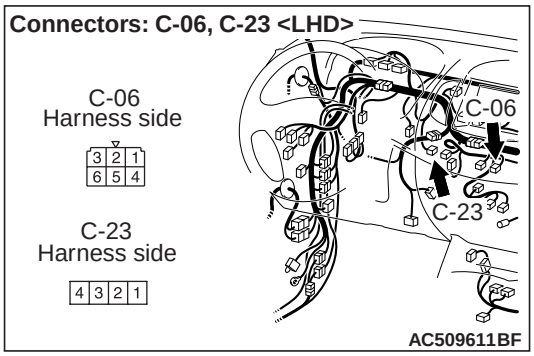


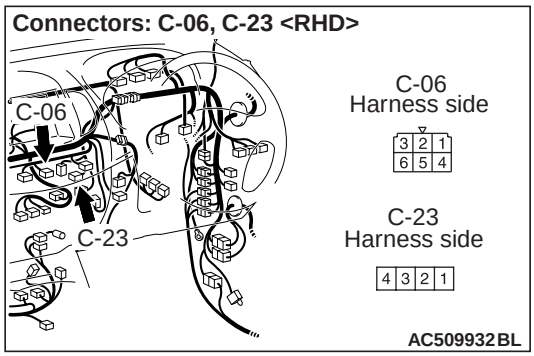
Q: Is the check result normal?
YES : Go to Step 5.
NO : Repair the connector.

STEP 5. Check the A/C temperature control resistor resistance value.
Refer to P.55A-79.

Q: Is the measured value at the standard value?
YES : Go to Step 6.
NO : Replace the A/C temperature control resistor.

STEP 6. Check the wiring harness between C-06 blower switch connector (terminals 2, 1 and 4) and C-23 A/C temperature control resistor connector (terminals 4, 3 and 2).



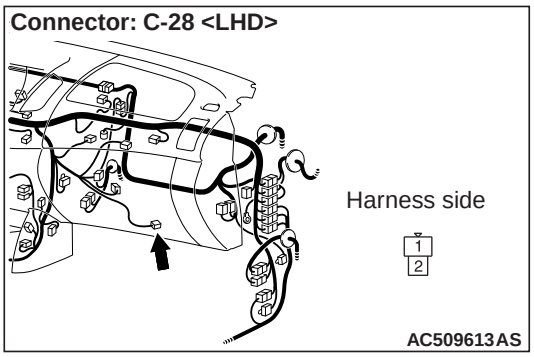


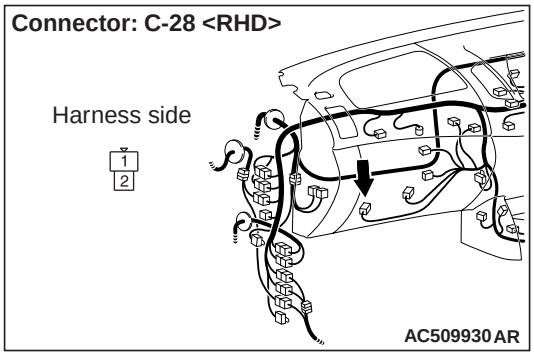
- Check the blower switch output line for open circuit.

Q: Is the check result normal?

YES : Go to Step 7.
NO : Repair the wiring harness.

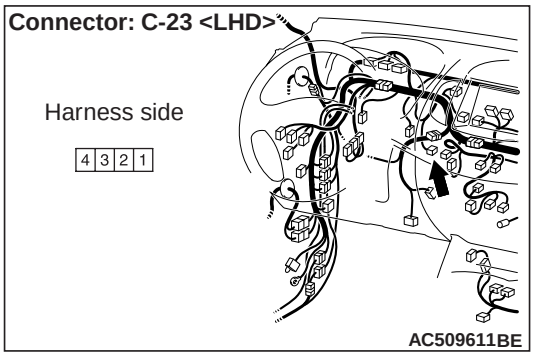
STEP 7. Connector check: C-28 blower motor connector

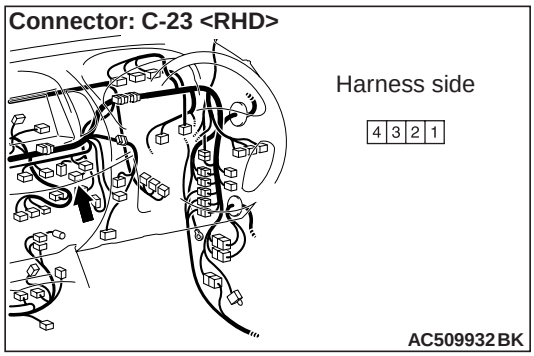


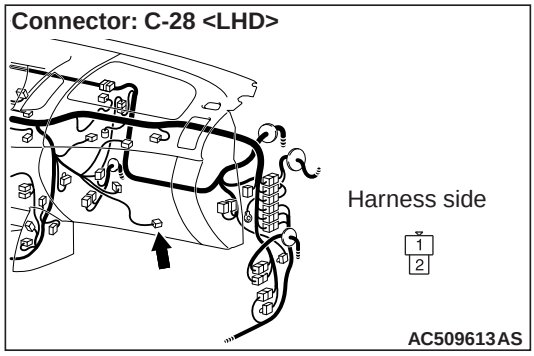


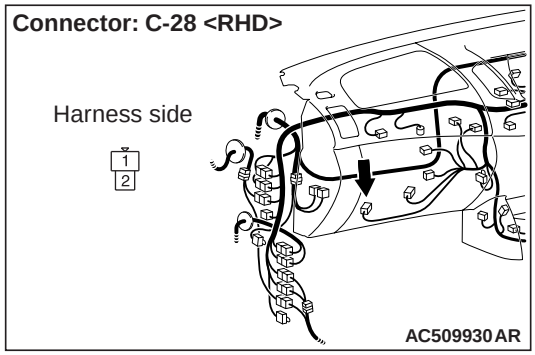
Q: Is the check result normal?
YES : Go to Step 8.
NO : Repair the connector.

STEP 8. Check the wiring harness between C-28 blower motor connector terminal No.1 and C-23 A/C temperature control resistor connector terminal No.1.









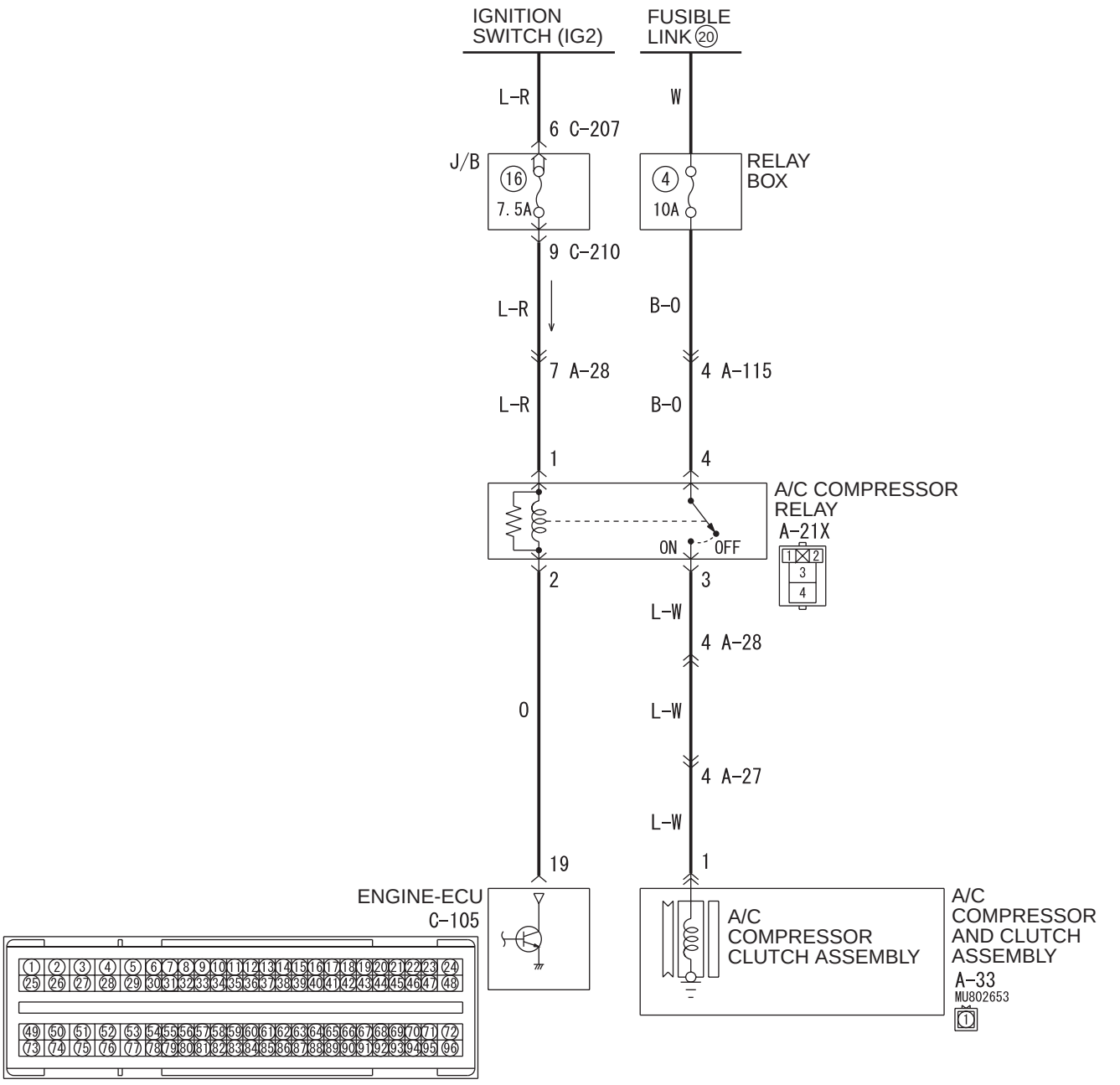
- Check the blower motor power supply line for open circuit.

Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness.

Inspection Procedure 4: The A/C compressor and clutch assembly does not work

A/C Compressor and Clutch Assembly Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

WBC55X001A

COMMENTS ON TROUBLE SYMPTOM

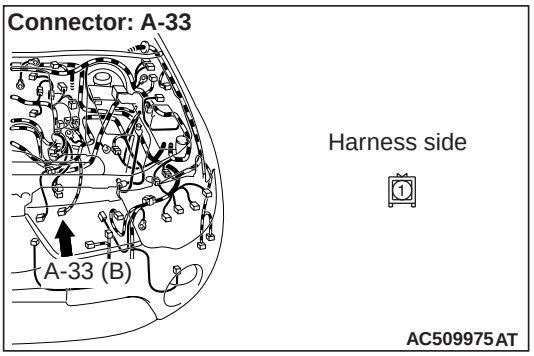
If the power is not supplied to the A/C compressor and clutch assembly, the A/C compressor and clutch assembly circuits may be defective..

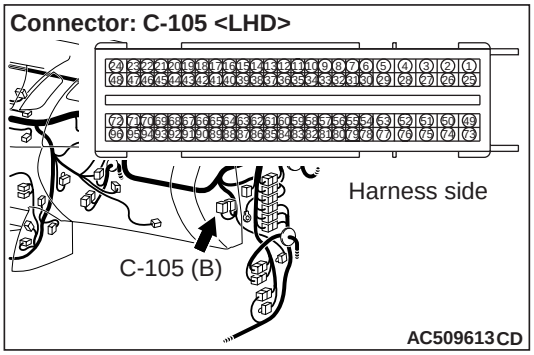
PROBABLE CAUSES

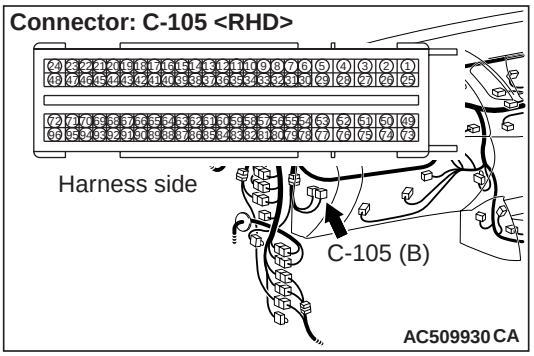
- Malfunction of A/C compressor and clutch assembly
- Malfunction of A/C compressor relay
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

STEP 1. Connector check: A-33 A/C compressor and clutch assembly connector C-105 engine-ECU

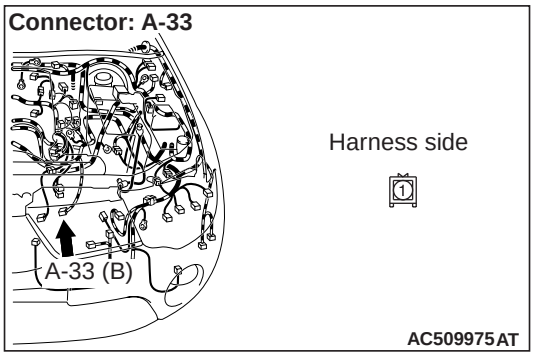




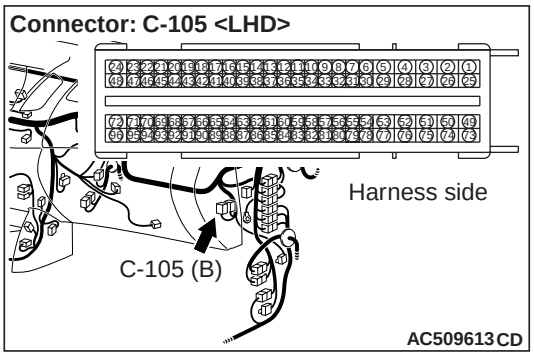


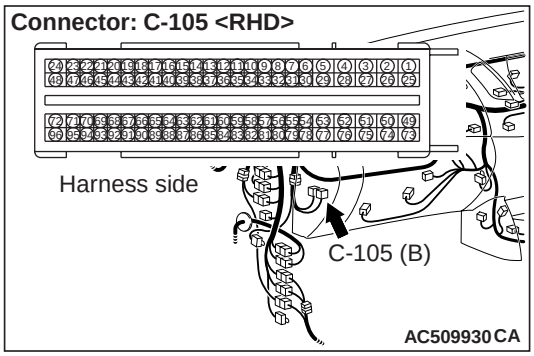
Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the connector.

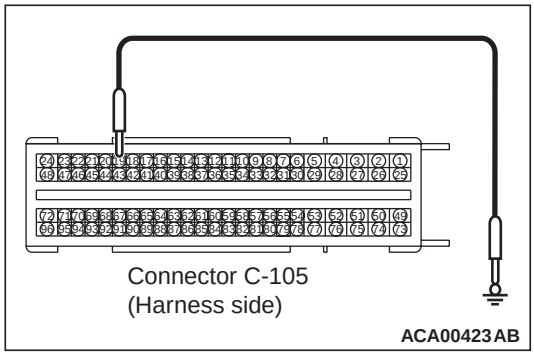
STEP 2. Voltage measurement at A-33 A/C compressor and clutch assembly connector.



(1) Disconnect the connector, and measure at the wiring harness side.
(2) Turn the ignition switch to the "ON" position.

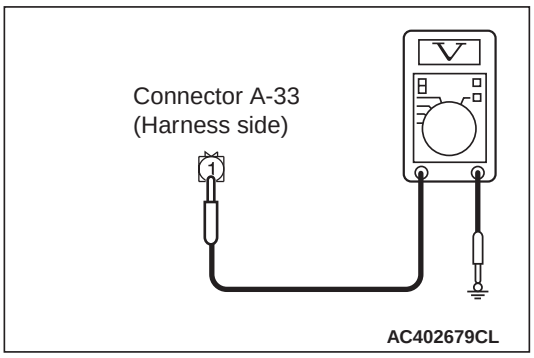






(3) Disconnect engine-ECU connector C-105 and

earth terminal 19.

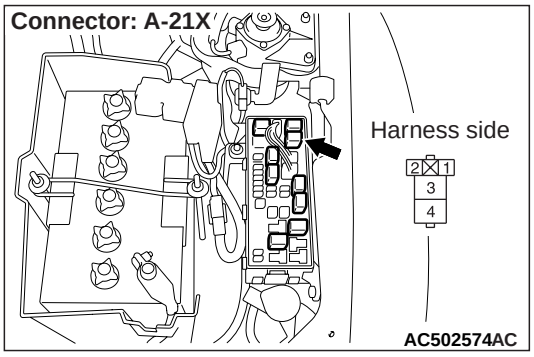


(4) Voltage between terminal 1 and body earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 9.
NO : Go to Step 3.

STEP 3. Connector check: A-21X A/C compressor relay connector



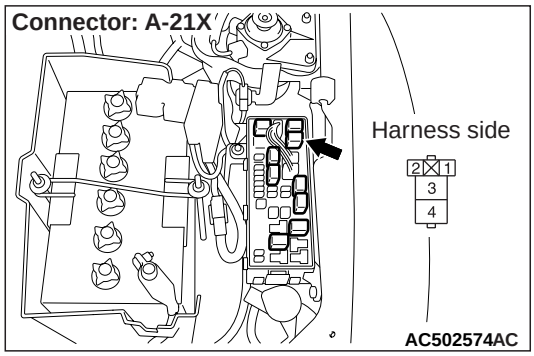
Q: Is the check result normal?
YES : Go to Step 4.
NO : Repair the connector.

STEP 4. Check the A/C compressor relay continuity.

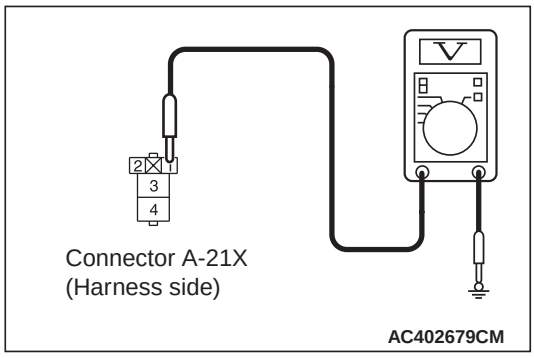
Refer to P.55A-66.

Q: Is the A/C compressor relay in good condition?
YES : Go to Step 5.
NO : Replace the A/C compressor relay.

STEP 5. Voltage measurement at A-21X A/C compressor relay connector.



(1) Remove the relay, and measure at the junction block side.
(2) Turn the ignition switch to the "ON" position.

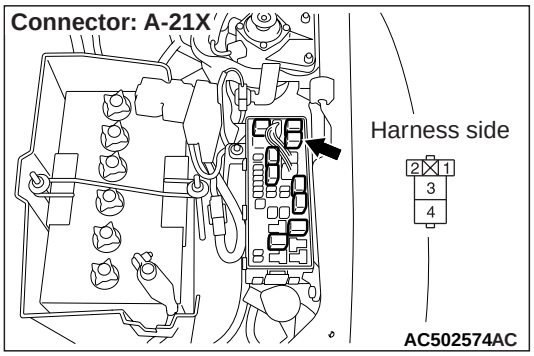


(3) Voltage between terminal 1 and body earth.

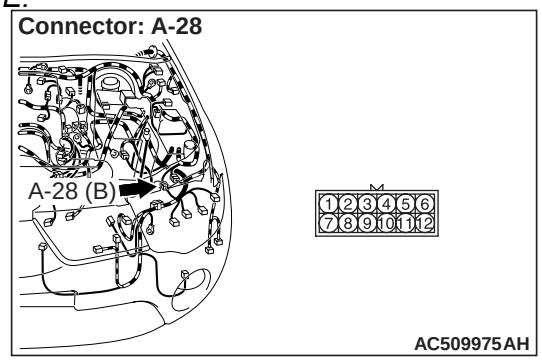
OK: System voltage

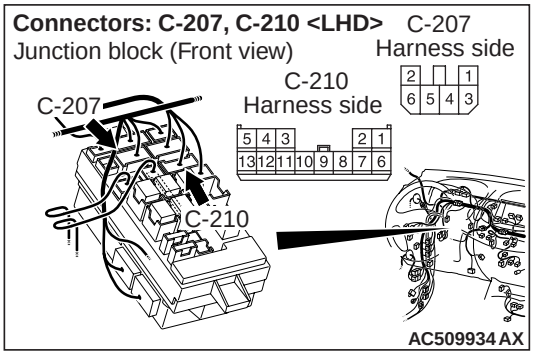
Q: Is the check result normal?
YES : Go to Step 7.
NO : Go to Step 6.

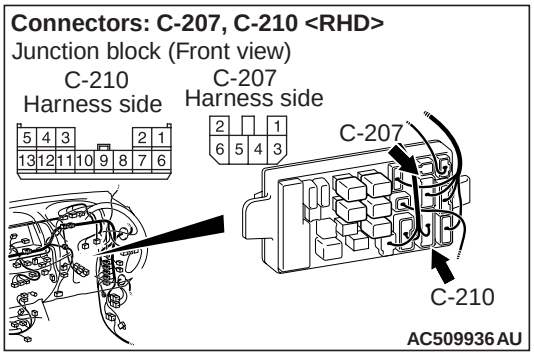
STEP 6. Check the wiring harness between A-21X A/C compressor relay connector terminal No.1 and the ignition switch (IG2).



NOTE:







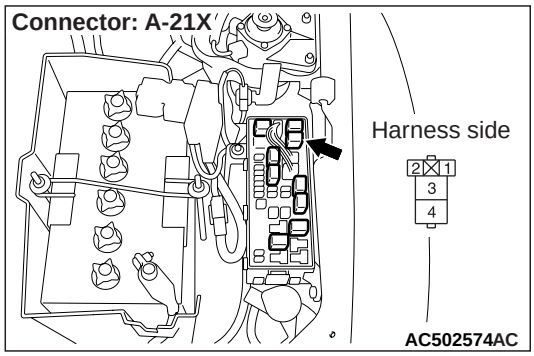
Prior to the wiring harness inspection, check intermediate connector A-28, junction block connector C-210 and C-207, and repair if necessary.

- Check the A/C compressor relay power supply line for open circuit.

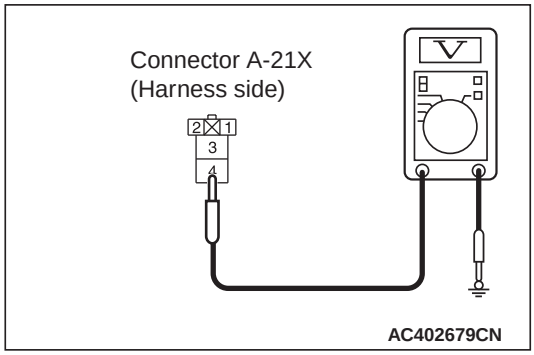
Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness.

STEP 7. Voltage measurement at A-21X A/C compressor relay connector.



(1) Remove the relay, and measure at the junction block side.



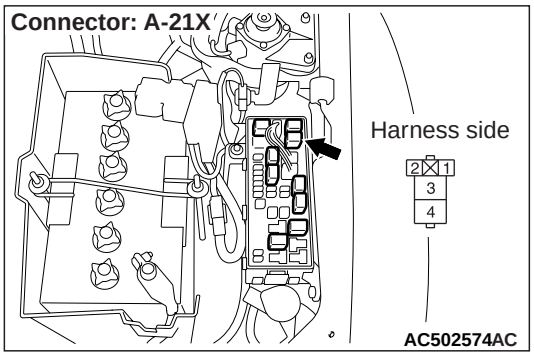
(2) Voltage between terminal 4 and body earth.

OK: System voltage

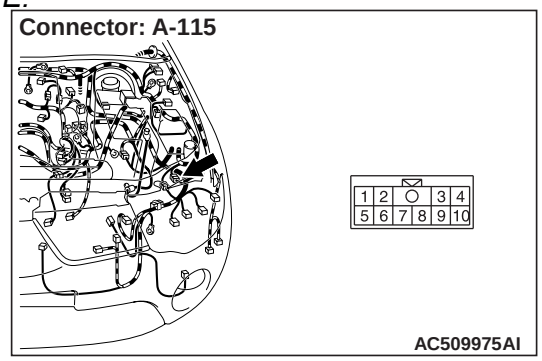
Q: Is the check result normal?

YES : Go to Step 9.
NO : Go to Step 8.

STEP 8. Check the wiring harness between A-21X A/C compressor relay connector terminal No.4 and the fusible link (20).



NOTE:



Prior to the wiring harness inspection, check intermediate connector A-115, and repair if necessary.

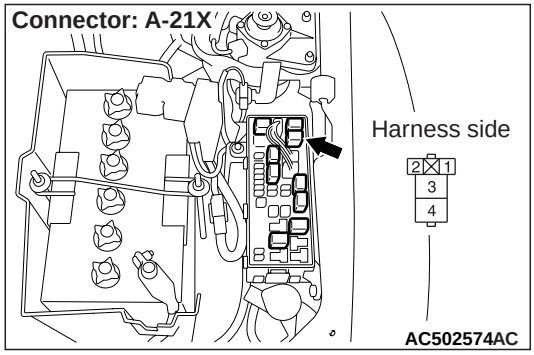
- Check the A/C compressor relay power supply line for open circuit.

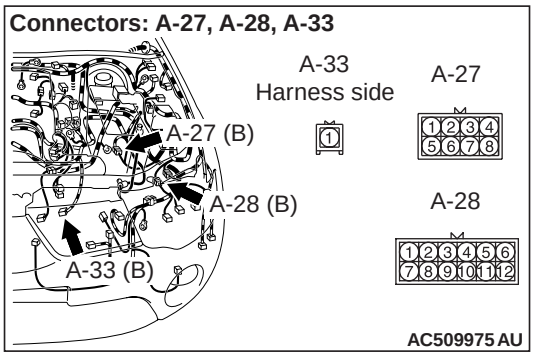
Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

NO : Repair the wiring harness.

STEP 9. Check the wiring harness between A-21X A/C compressor relay connector terminal No.3 and A-33 A/C compressor and clutch assembly connector terminal No.1.





NOTE: Prior to the wiring harness inspection, check intermediate connector A-28 and A-27, and repair if necessary.

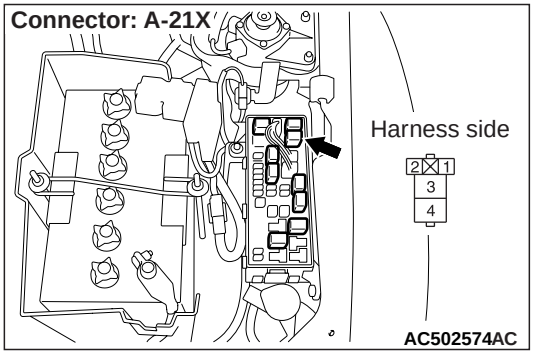
- Check the A/C compressor relay power supply line for open circuit.

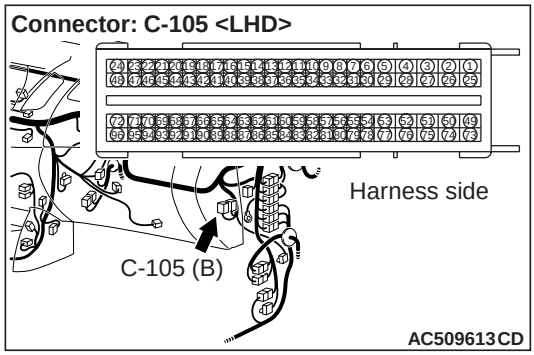
Q: Is the check result normal?

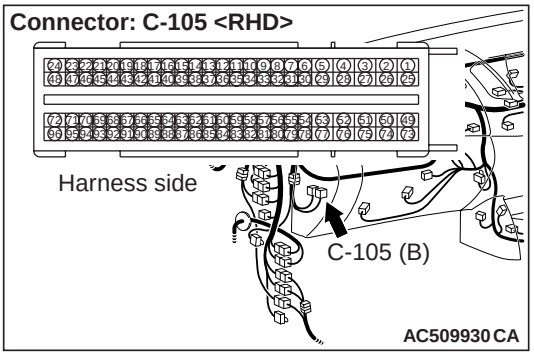
YES : Go to Step 10.

NO : Repair the wiring harness.

STEP 10. Check the wiring harness between A-21X A/C compressor relay connector terminal No.2 and C-105 engine-ECU connector terminal No.40.







- Check the A/C compressor power supply line for open circuit.

Q: Is the check result normal?

YES : Go to Step 11.
NO : Repair the wiring harness.

STEP 11. Check the A/C compressor clutch operation.

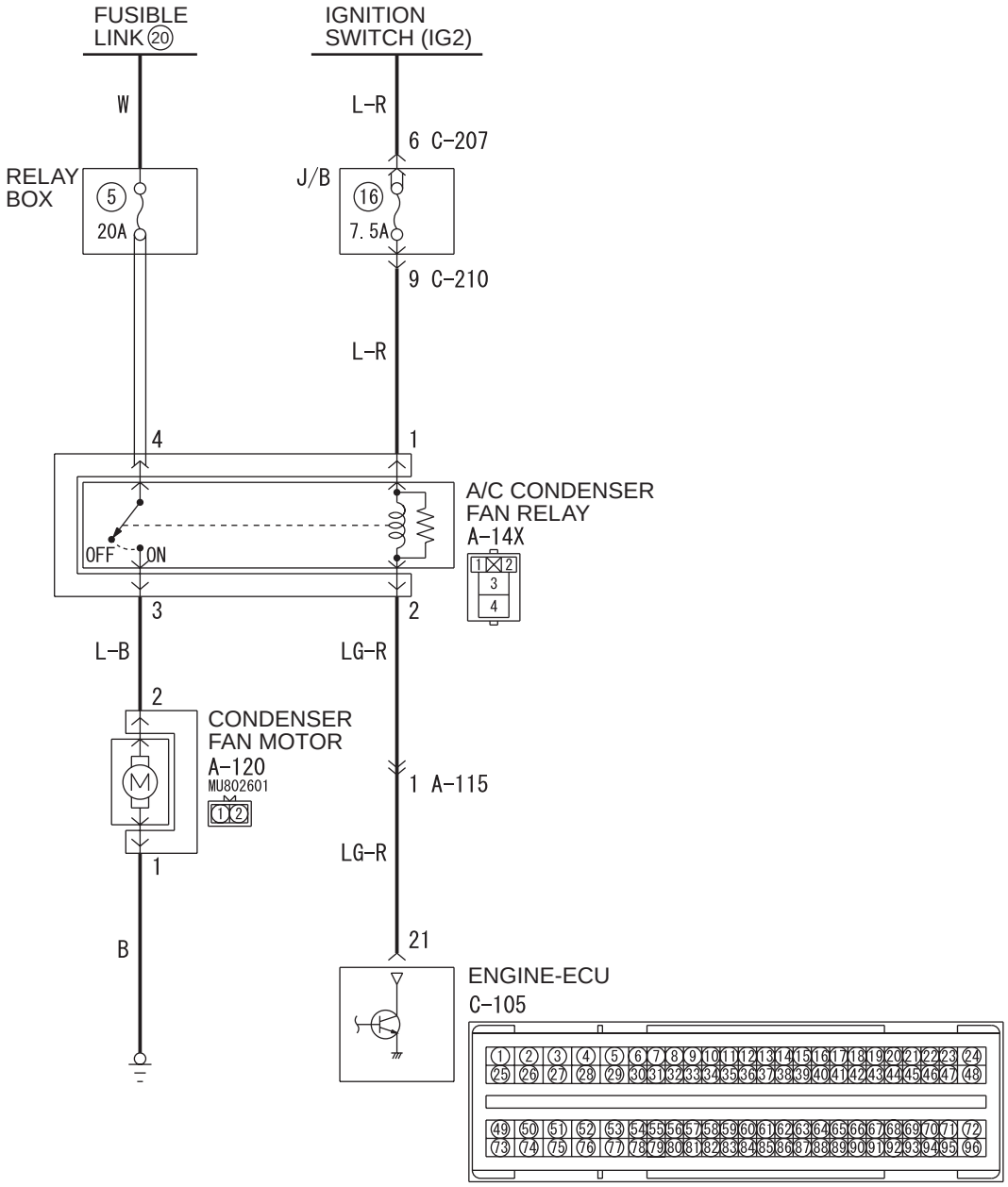
Refer to P.55A-81.

Q: Can the sound of the A/C compressor clutch (click) be heard?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction).
NO : Replace the A/C compressor clutch.

Inspection Procedure 5: Condenser Fan does not Operate. <Vehicles with Condenser Fan>

Condenser Fan Motor Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

WBC55X000A

COMMENTS ON TROUBLE SYMPTOM

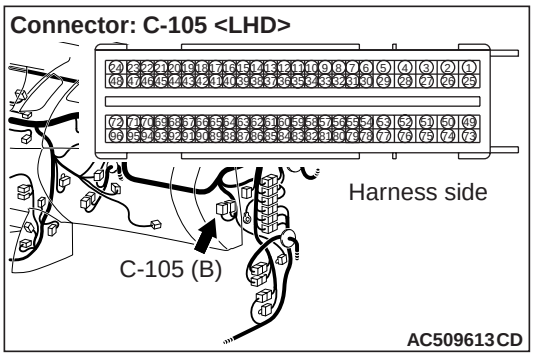
If the condenser fan does not function at all, the condenser fan motor circuit may be defective.

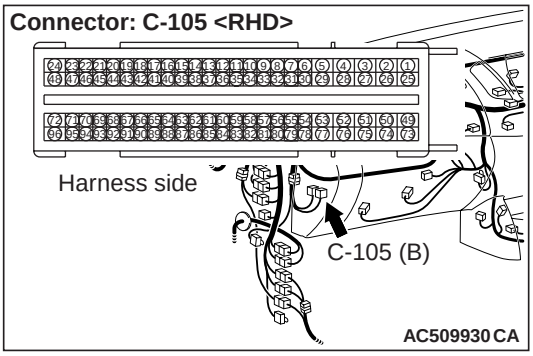
PROBABLE CAUSES

- Malfunction of A/C condenser fan motor
- Malfunction of A/C condenser fan relay
- Damaged harness wires and connectors
- Malfunction of engine-ECU

DIAGNOSIS PROCEDURE

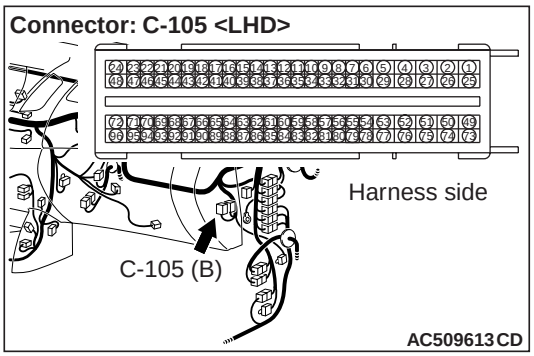
STEP 1. Connector check: C-105 engine-ECU connector

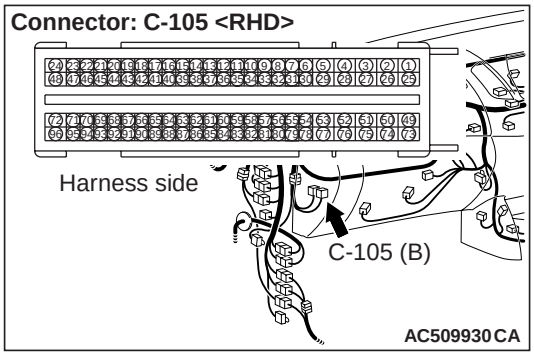


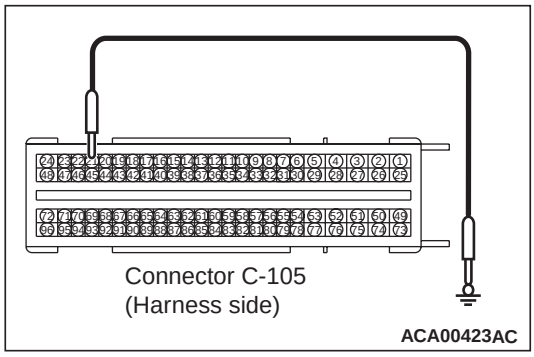


Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the connector.

STEP 2. Check of the condenser fan motor circuit



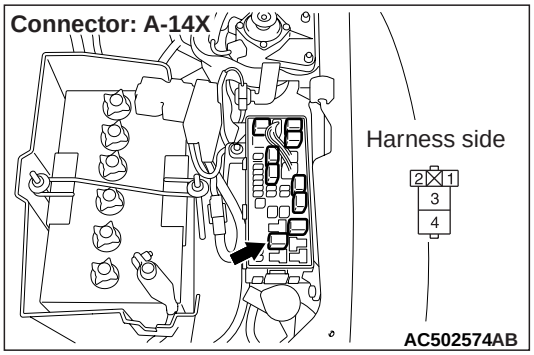




(1) Disconnect the C-105 connector, and connect the terminal No. 21 on the harness side to the body earth.
(2) Turn the ignition switch to the "ON" position.
(3) Check that the condenser fan operates normally.

Q: Is the check result normal?
YES : Replace the engine-ECU.
NO : Go to Step 3.

STEP 3. Connector check: A-14X A/C condenser fan relay connector

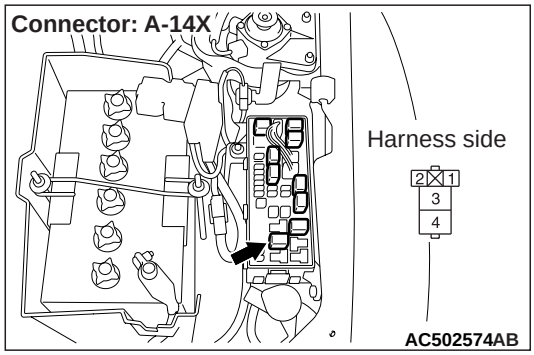


Q: Is the check result normal?
YES : Go to Step 4.
NO : Repair the connector.

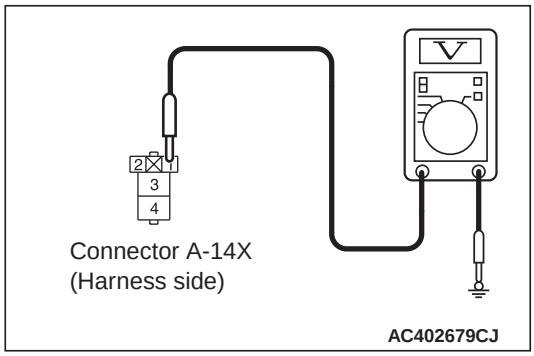
STEP 4. Check the A/C condenser fan relay continuity.
Refer to P.55A-66.

Q: Is the A/C condenser fan relay in good condition?
YES : Go to Step 5.
NO : Replace the A/C condenser fan relay.

STEP 5. Voltage measurement at A-14X A/C condenser fan relay connector.



(1) Remove the relay, and measure at the junction block side.
(2) Turn the ignition switch to the "ON" position.

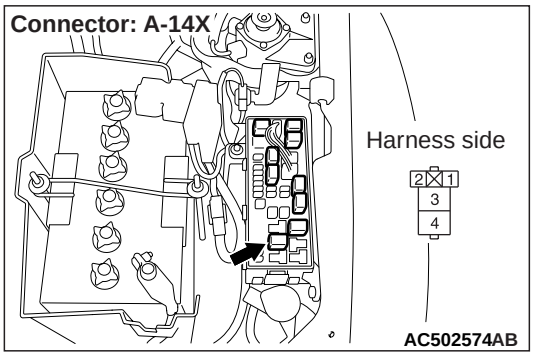


(3) Voltage between terminal 1 and body earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 7.
NO : Go to Step 6.

STEP 6. Check the wiring harness between A-14X A/C condenser fan relay connector terminal No.1 and the ignition switch (IG2).



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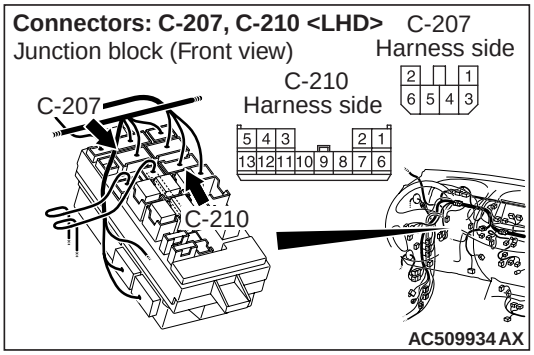
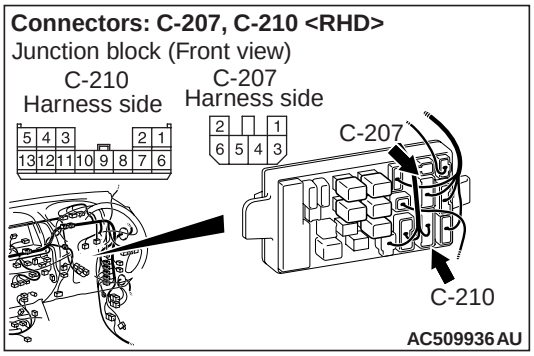




Prior to the wiring harness inspection, check junction block connectors C-210 and C-207, and repair if necessary.

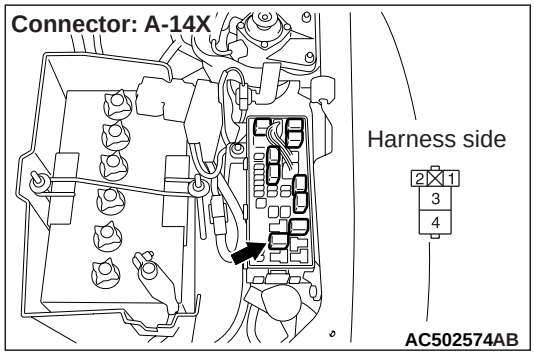
- Check the condenser fan relay power supply line for open circuit.

Q: Is the check result normal?

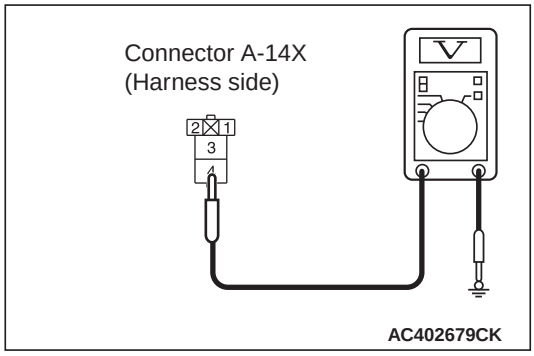
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

NO : Repair the wiring harness.

STEP 7. Voltage measurement at A-14X A/C condenser fan relay connector.



(1) Remove the relay, and measure at the junction block side.



(2) Voltage between terminal 4 and body earth.

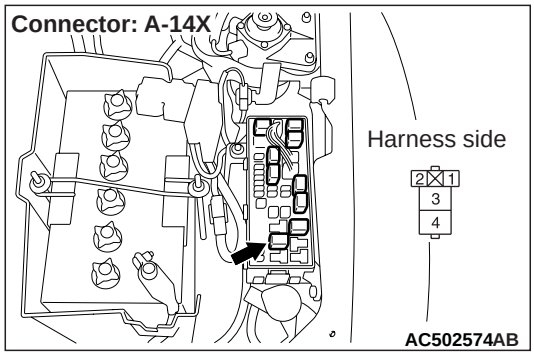
OK: System voltage

Q: Is the check result normal?

YES : Go to Step 9.

NO : Go to Step 8.

STEP 8. Check the wiring harness between A-14X A/C condenser fan relay connector terminal No.4 and the fusible link (20).



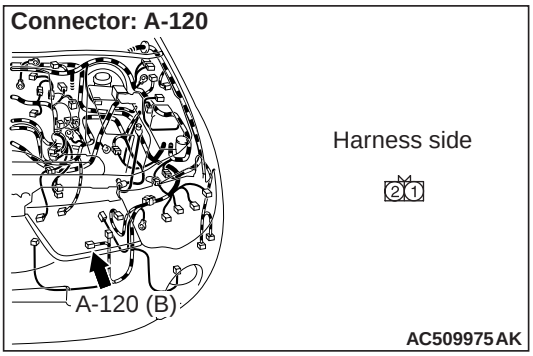
- Check the condenser fan relay power supply line for open circuit.

Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

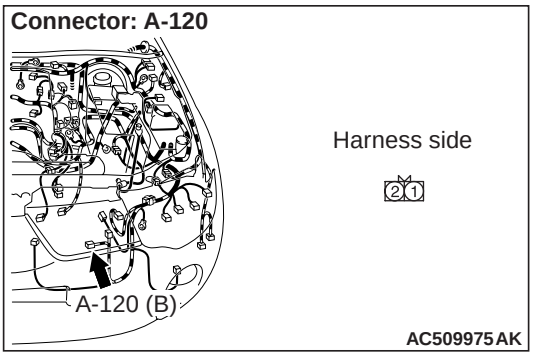
NO : Repair the wiring harness.

STEP 9. Connector check: A-120 A/C condenser fan motor connector

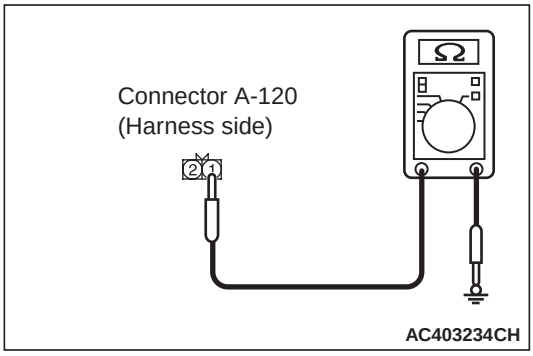


Q: Is the check result normal?
YES : Go to Step 10.
NO : Repair the connector.

STEP 10. Resistance measurement at the A-120 A/C condenser fan motor connector.



(1) Disconnect the connector, and measure at the wiring harness side.

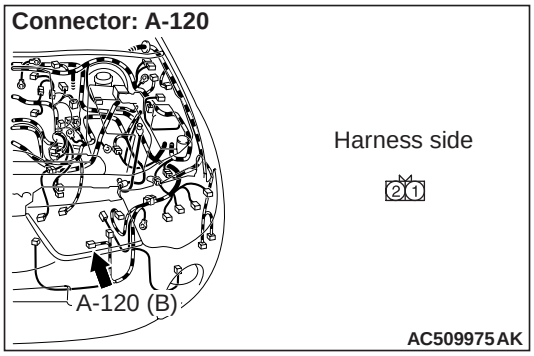


(2) Measure the resistance between terminal 1 and body earth.

OK: Continuity (Less than 2Ω)

Q: Is the check result normal?
YES : Go to Step 12.
NO : Go to Step 11.

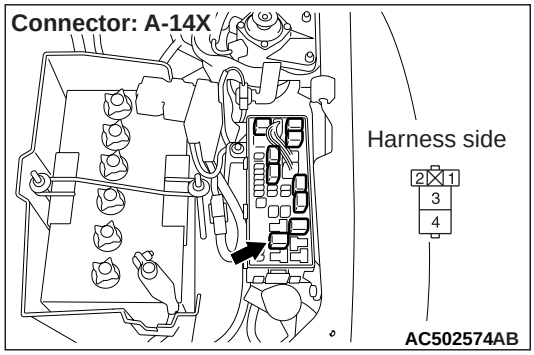
STEP 11. Check the wiring harness between A-120 A/C condenser fan motor connector terminal No.1 and body earth.

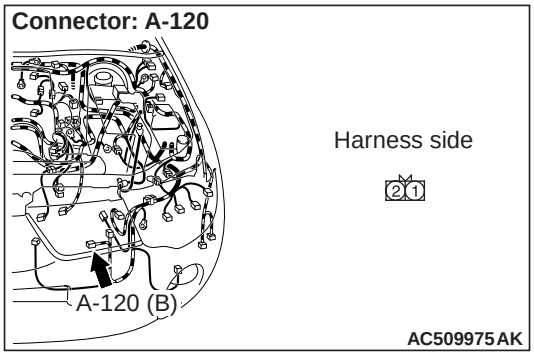


- Check the condenser fan motor earth line for open circuit.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness.

STEP 12. Check the wiring harness between A-14X A/C condenser fan relay connector terminal No.3 and A-120 A/C condenser fan motor connector terminal No.2.

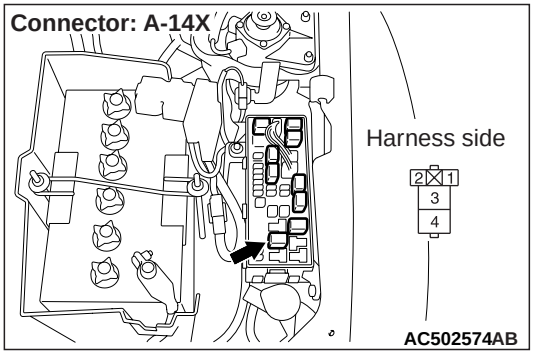


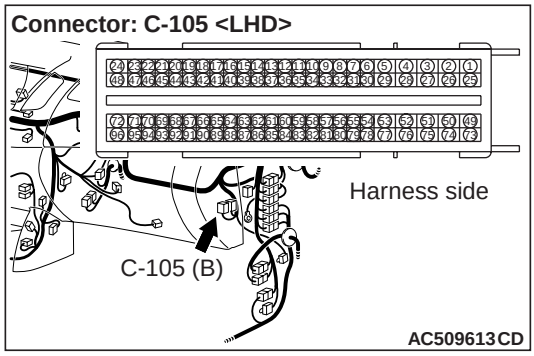


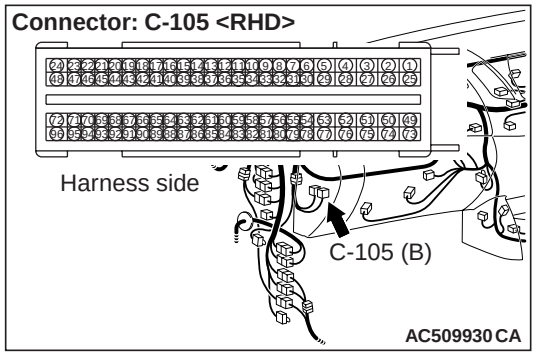
- Check the condenser fan motor power supply line for open circuit.

Q: Is the check result normal?
YES : Go to Step 13.
NO : Repair the wiring harness.

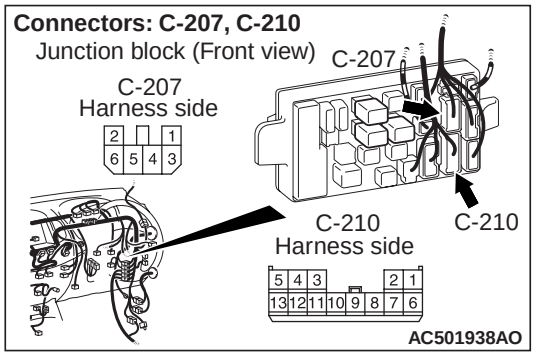
STEP 13. Check the wiring harness between A-14X A/C condenser fan relay connector terminal No.2 and C-105 engine-ECU connector terminal No.39.

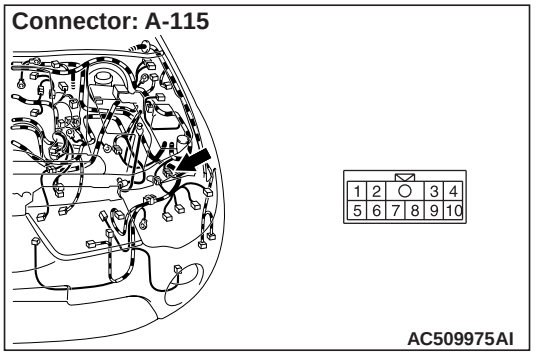






NOTE:





Prior to the wiring harness inspection, check junction block connectors A-115, and repair if necessary.

- Check the condenser fan motor power supply line for open circuit.

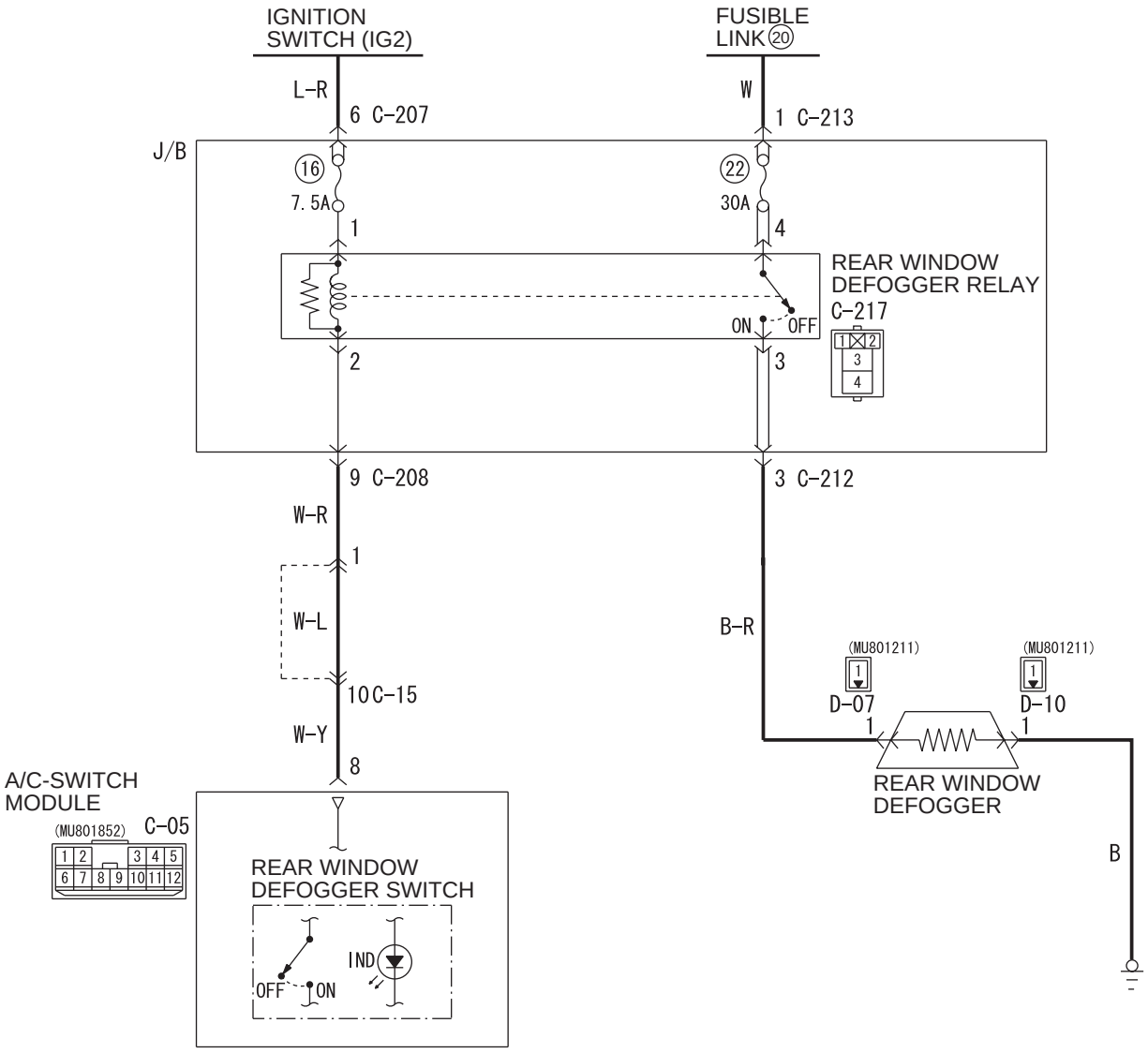
Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

NO : Repair the wiring harness.

Inspection Procedure 6: The Rear Window Defogger does not work

Rear Window Defogger Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

AC900619
W7C55X002A

CIRCUIT OPERATION

If the rear window defogger does not operate when the rear window defogger switch is turned on, the rear window defogger relay system may be defective.

PROBABLE CAUSES

- Malfunction of the A/C switch module
- Malfunction of the rear window defogger relay
- Damaged the wiring harness or connectors
- Malfunction of the rear window defogger

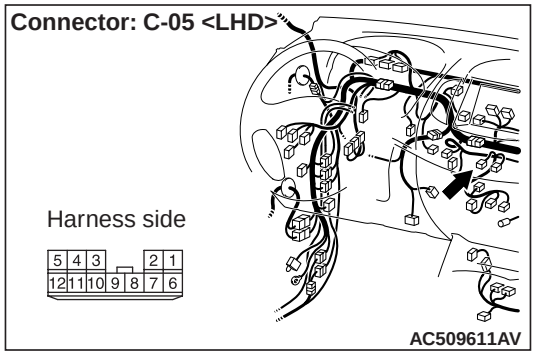
DIAGNOSIS PROCEDURE

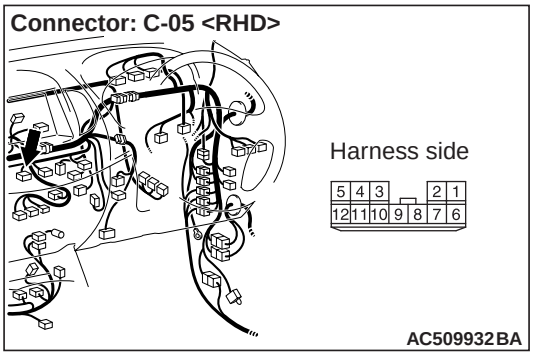
STEP 1. Check the A/C operation.

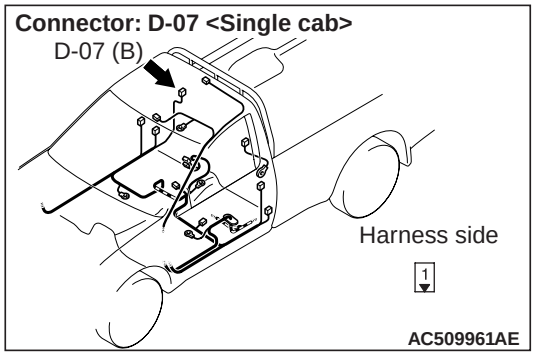
Q: Do the A/C work normally?

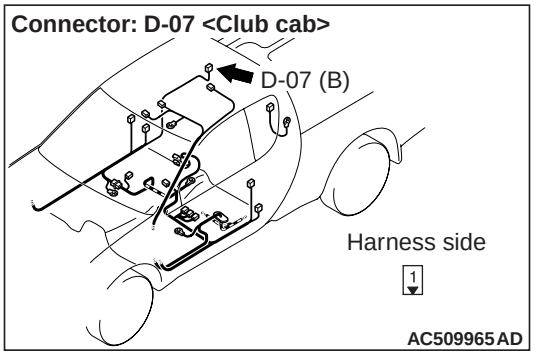
YES : Go to Step 2.
NO : Refer to Inspection procedure 1 "Cool air does not come P.55A-6."

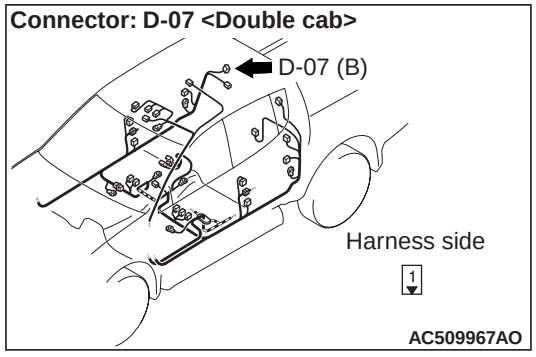
STEP 2. Connector check: C-05 A/C switch module connector and D-07 rear window defogger connector





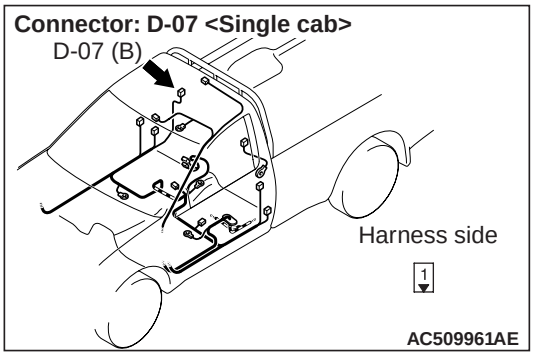


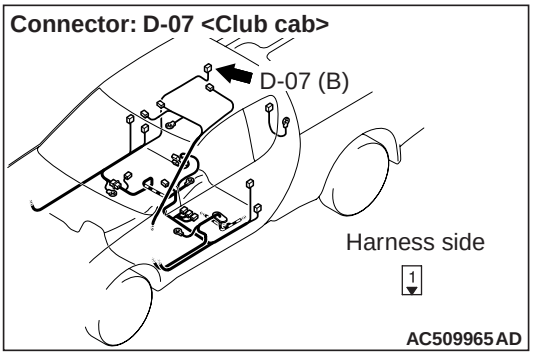


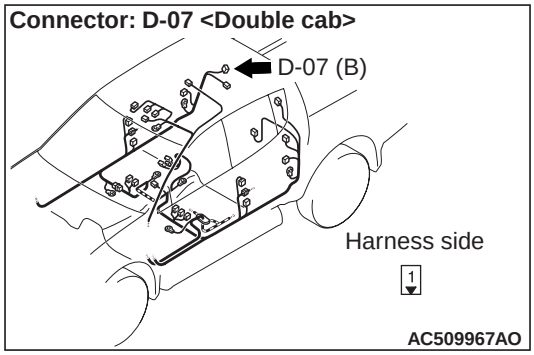


Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the connector.

STEP 3. Voltage measurement at D-07 rear window defogger connector.

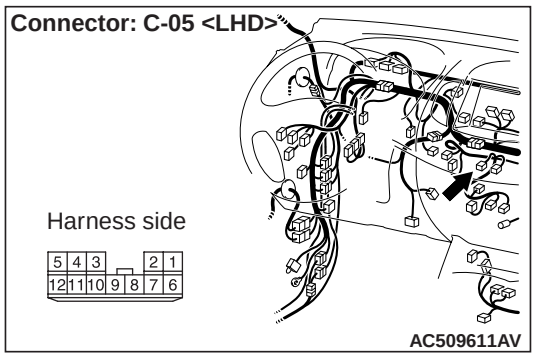


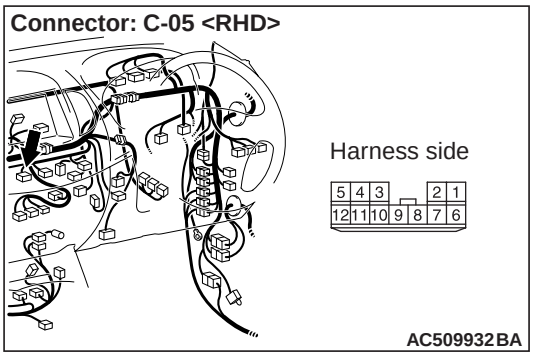


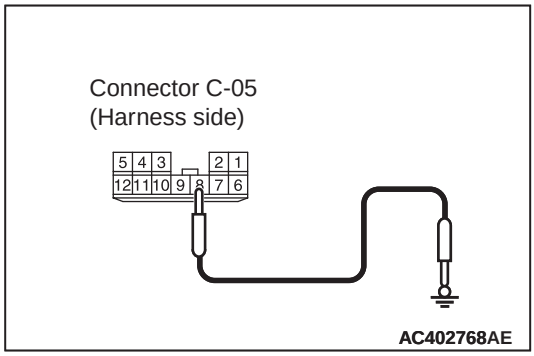


(1) Disconnect the connector, and measure at the wiring harness side.

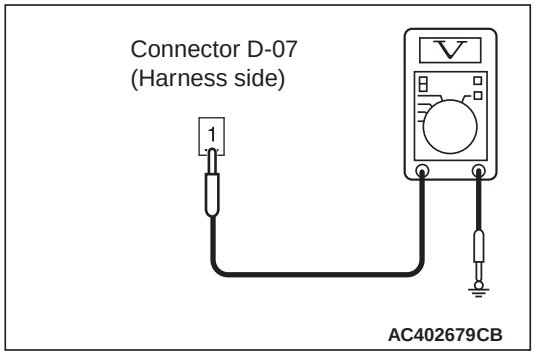
(2) Turn the ignition switch to the "ON" position.







(3) Disconnect A/C switch module connector C-05 and earth terminal 8.

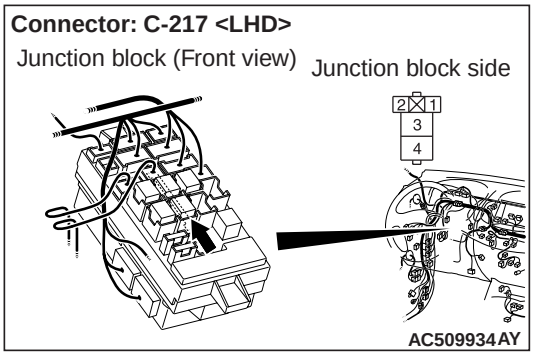


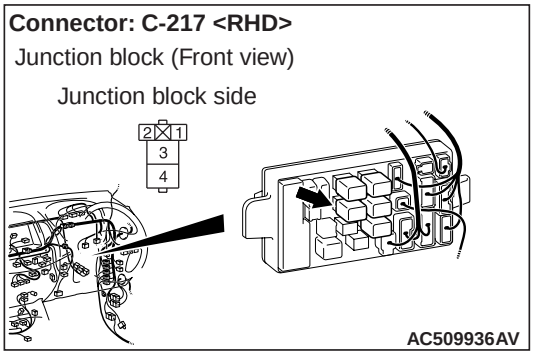
(4) Measure the voltage between terminal 1 and body earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 12.
NO : Go to Step 4.

STEP 4. Connector check: C-217 rear window defogger relay connector



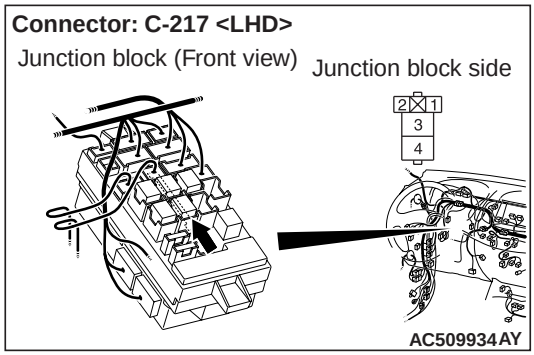


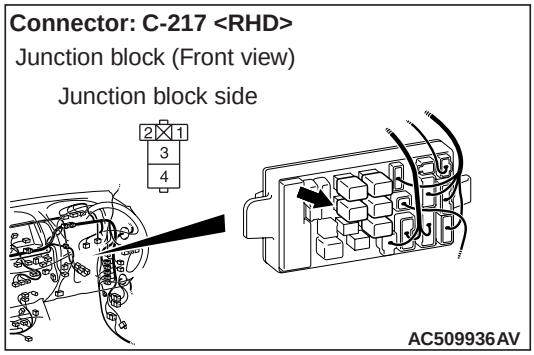
Q: Is the check result normal?
YES : Go to Step 5.
NO : Repair the connector.

STEP 5. Check the rear window defogger relay continuity.
Refer to .

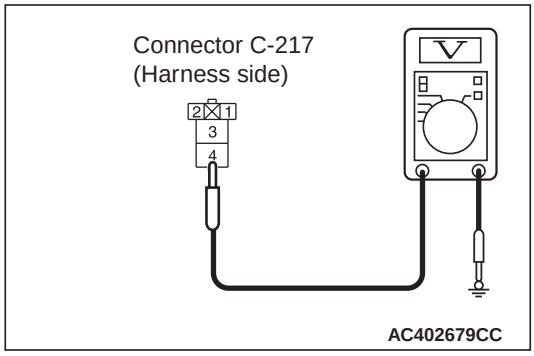
Q: Is the rear window defogger relay in good condition?
YES : Go to Step 6.
NO : Replace the rear window defogger relay.

STEP 6. Voltage measurement at C-217 rear window defogger relay connector.





(1) Remove the relay, and measure at the junction block side.

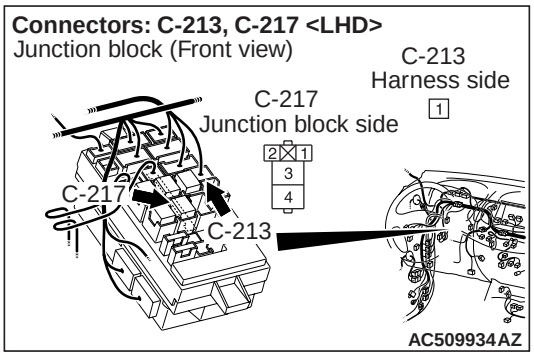


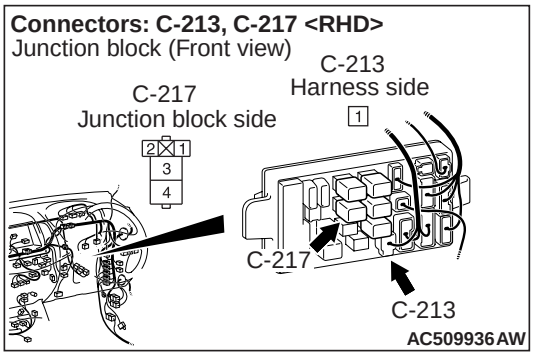
(2) Measure the voltage between terminal 4 and body earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 8.
NO : Go to Step 7.

STEP 7. Check the wiring harness between C-217 rear window defogger relay connector terminal No.4 and the fusible link (20).





NOTE: Prior to the wiring harness inspection, check junction block connector C-213, and repair if necessary.

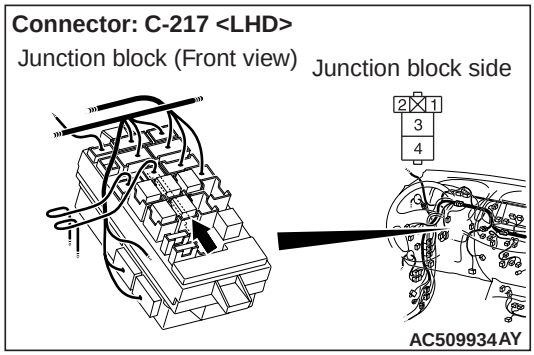
- Check the rear window defogger relay power supply line for open and short circuit.

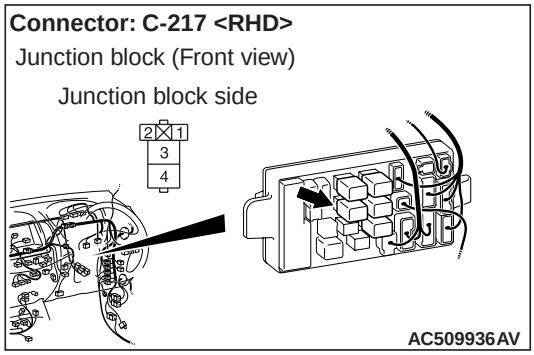
Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

NO : Repair the wiring harness.

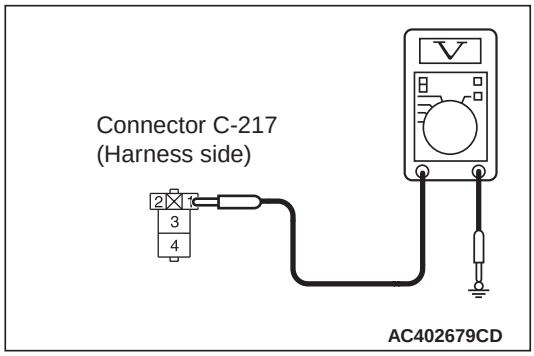
STEP 8. Voltage measurement at C-217 rear window defogger relay connector.





(1) Remove the relay, and measure at the junction block side.

(2) Turn the ignition switch to the "ON" earth position.



(3) Voltage between terminal 1 and body earth.

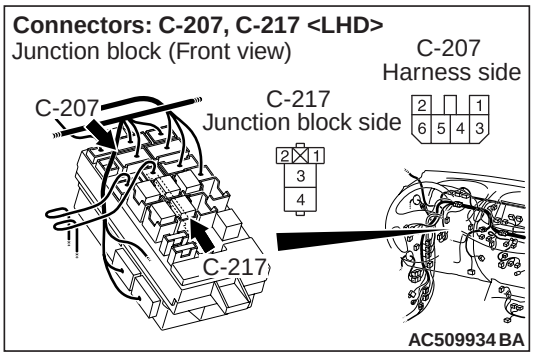
OK: System voltage

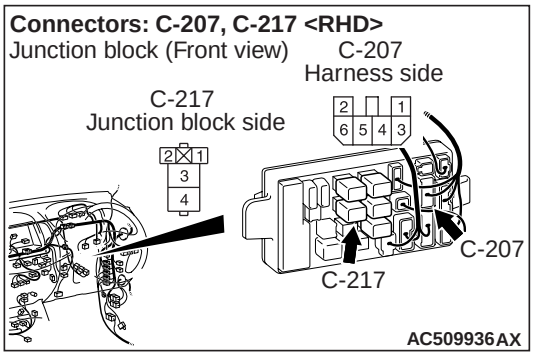
Q: Is the check result normal?

YES : Go to Step 10.

NO : Go to Step 9.

STEP 9. Check the wiring harness between C-217 rear window defogger relay connector No.1 and ignition switch (IG2).





NOTE: Prior to the wiring harness inspection, check junction block connector C-207, and repair if necessary.

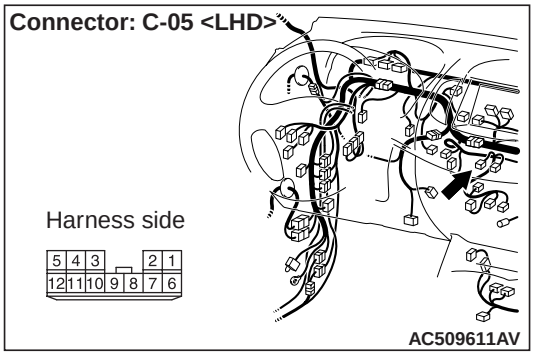
- Check the rear window defogger power supply line for open circuit.

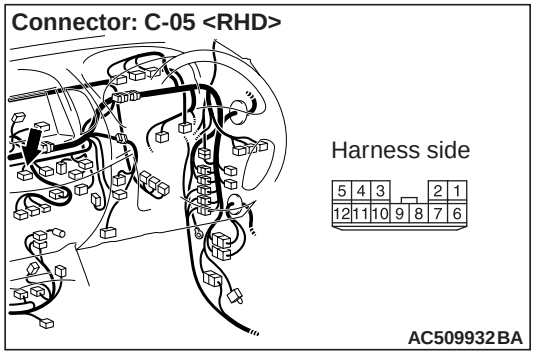
Q: Is the check result normal?

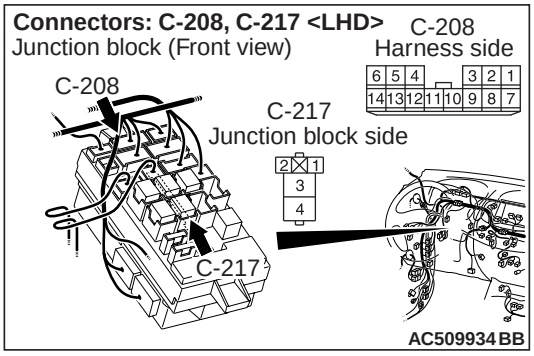
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

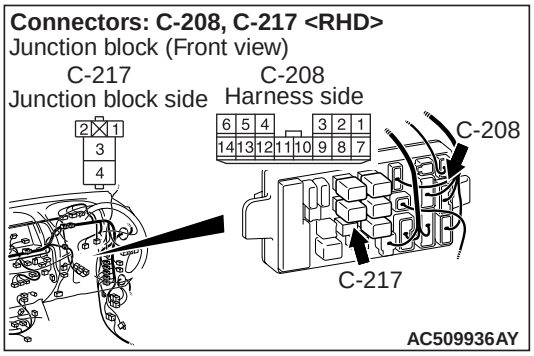
NO : Repair the wiring harness.

STEP 10. Check the wiring harness between C-217 rear window defogger relay connector No.2 and C-05 A/C switch module connector No.8.

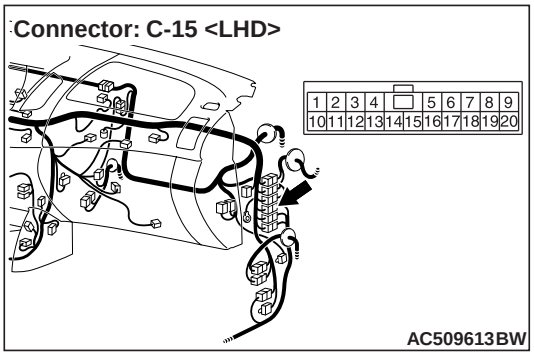


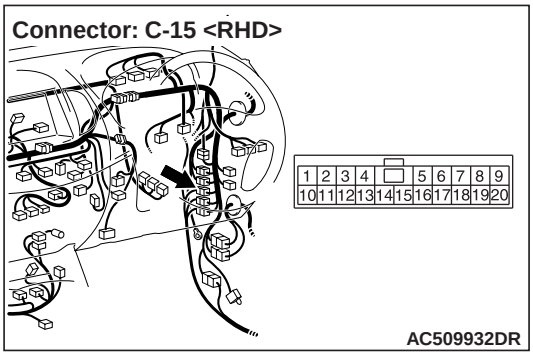






NOTE:



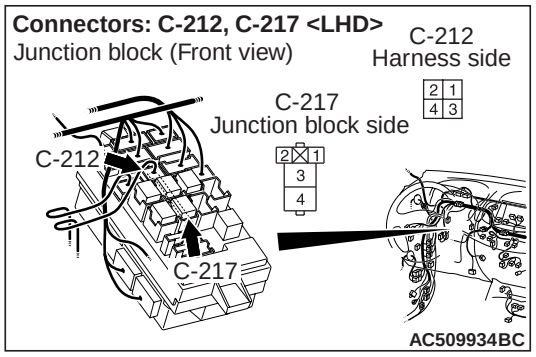


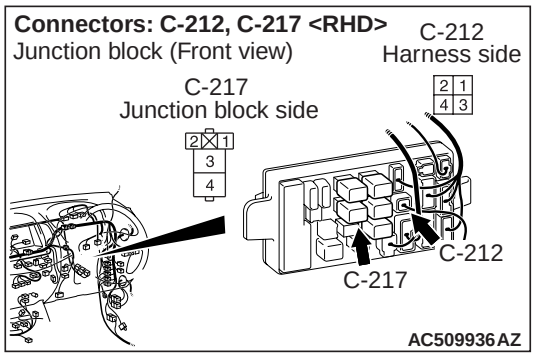
Prior to the wiring harness inspection, check junction block connector C-208 and intermediate connector C-15, and repair if necessary.

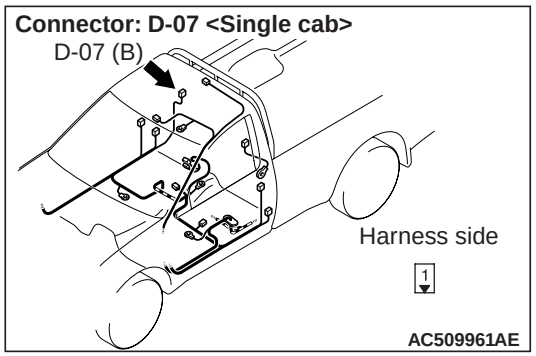
- Check the rear window defogger power supply line for open circuit.

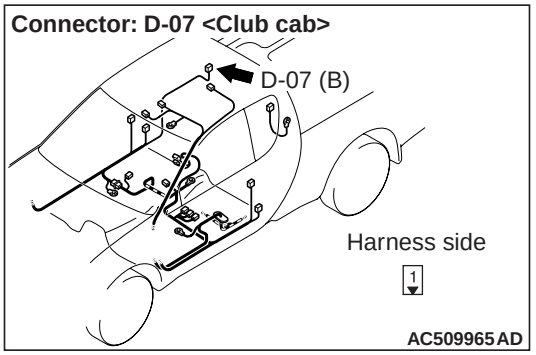
Q: Is the check result normal?
YES : Go to Step 11.
NO : Repair the wiring harness.

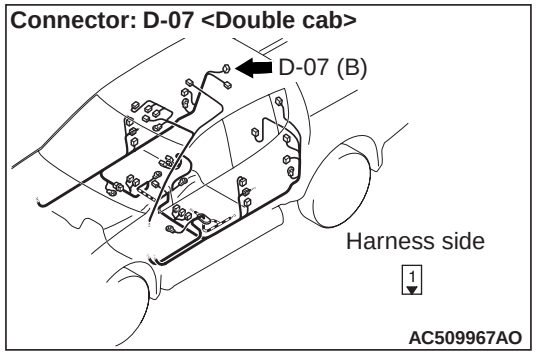
STEP 11. Check the wiring harness between C-217 rear window defogger relay connector No.3 and D-07 rear window defogger connector No.1.









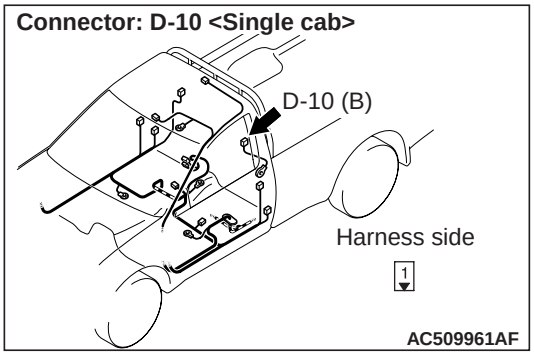


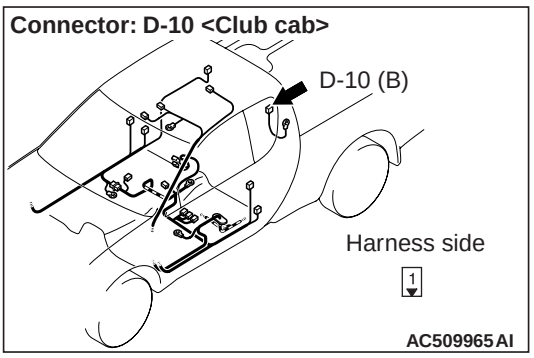
NOTE: Prior to the wiring harness inspection, check junction block connector C-212, and repair if necessary.

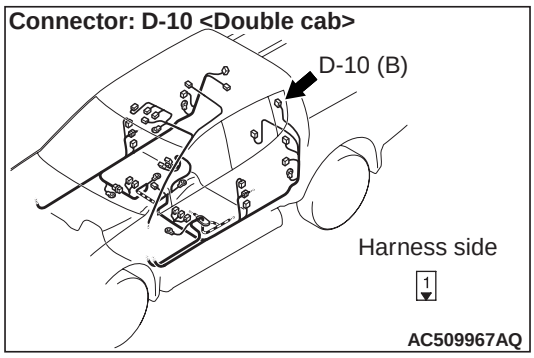
- Check the rear window defogger relay line for open and short circuit.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness.

STEP 12. Connector check: D-10 rear window defogger connector

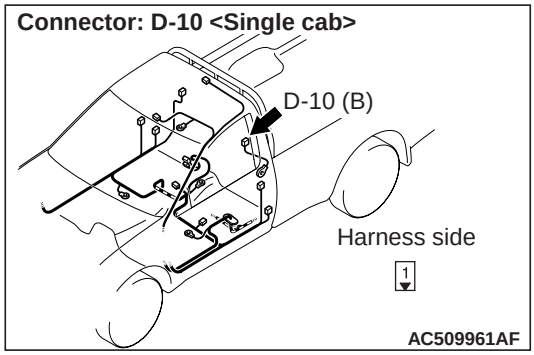


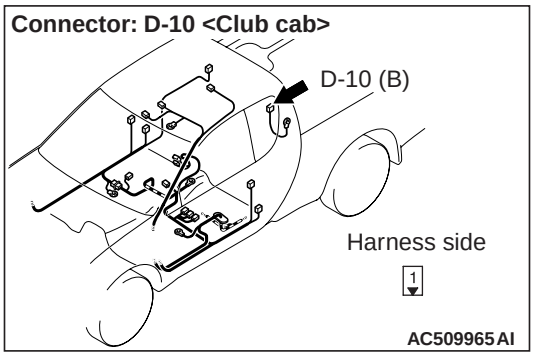


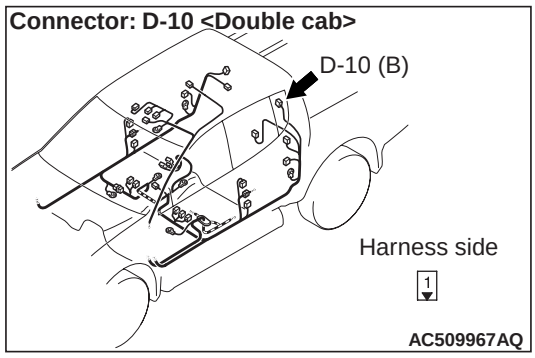


Q: Is the check result normal?
YES : Go to Step 13.
NO : Repair the connector.

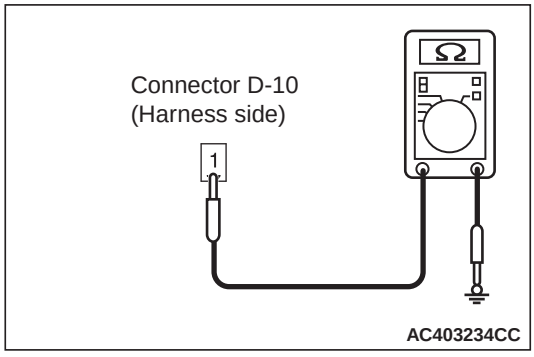
STEP 13. Resistance measurement at D-10 rear window defogger connector.







(1) Disconnect the connector, and measure at the wiring harness side.

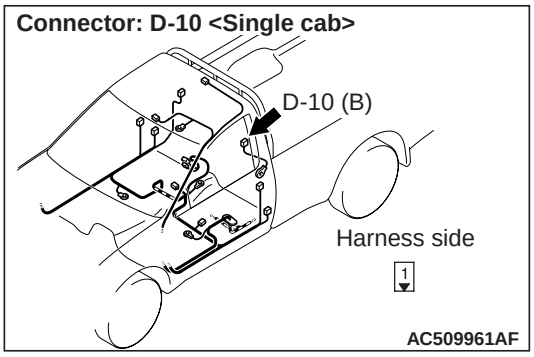


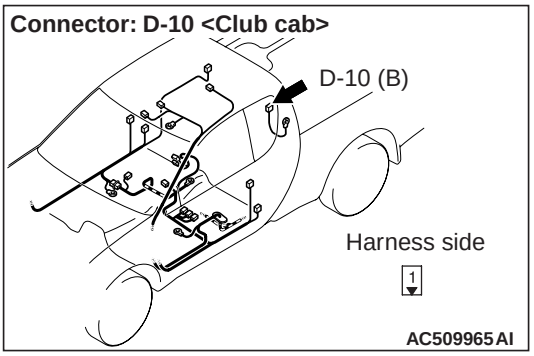
(2) Continuity between terminal 1 and body earth.

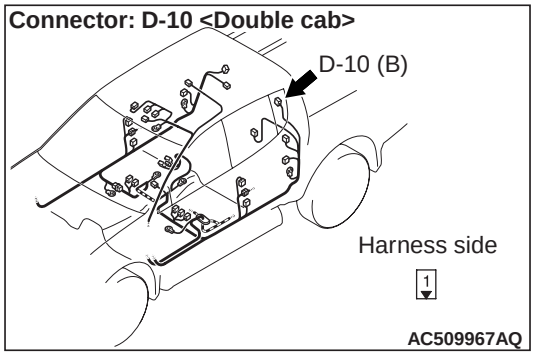
OK: Continuity (Less than 2Ω)

Q: Is the check result normal?
YES : Go to Step 15.
NO : Go to Step 14.

STEP 14. Check the wiring harness between D-10 rear window defogger connector terminal No.1 and earth.







- Check the rear window defogger earth line for open or short circuit.

Q: Is the check result normal?

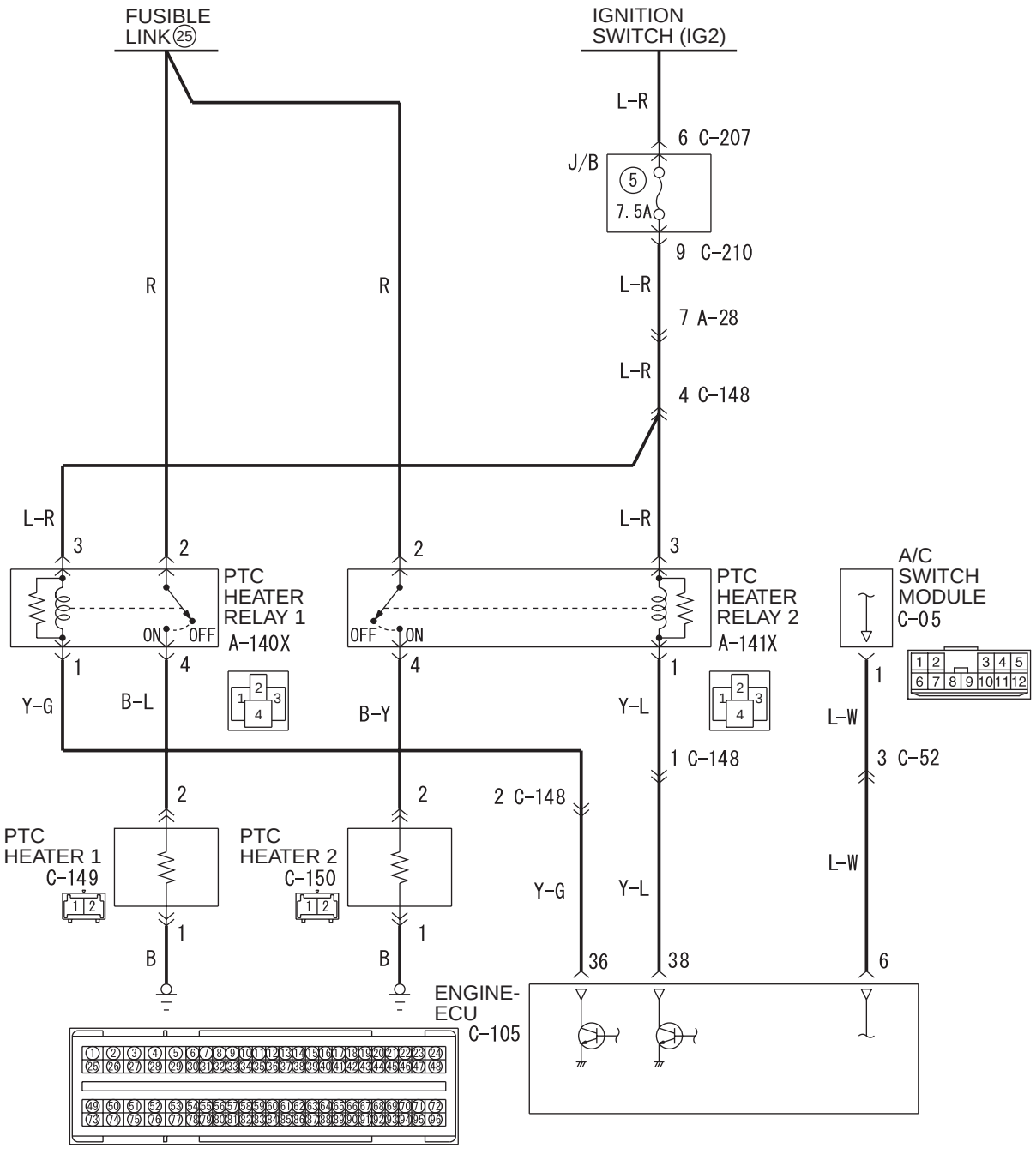
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction).
NO : Repair or replace the wiring harness.

STEP 15. Check the rear window defogger.
Refer to GROUP 54A, Rear Window rear window defogger Inspection .

Q: Does the rear window defogger work normally?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction).
NO : Repair the rear window defogger.

Inspection Procedure 7: The PTC heater does not work <Russia>

PTC Heater Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

ACA00403
W7C55E010A

COMMENTS ON TROUBLE SYMPTOM

When the PTC heater does not work under the following conditions, the heater switch system or the PTC heater circuit system may be defective.

PTC heater operating conditions

- heater switch: ON
- Air outlet: FOOT/DEF, FOOT, FACE/FOOT
- Temperature control dial: MAX HOT
- Coolant temperature: 80 degrees celsius or less

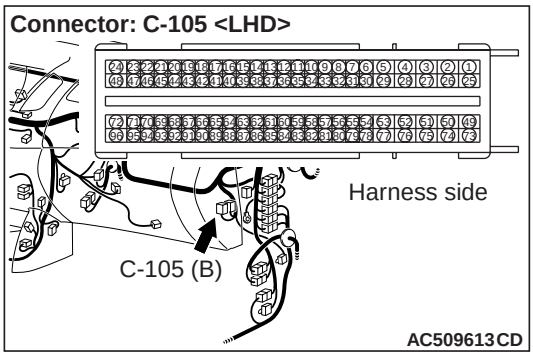
NOTE: When the coolant temperature becomes above 80 degrees celsius and PTC heater stops the operation, the PTC heater does not operate until coolant temperature becomes below 70 degrees celsius.

PROBABLE CAUSES

- Malfunction of the heater switch system
- Damaged the wiring harness or connectors
- Malfunction of the PTC heater relay 1
- Malfunction of the PTC heater relay 2
- Malfunction of the PTC heater 1
- Malfunction of the PTC heater 2

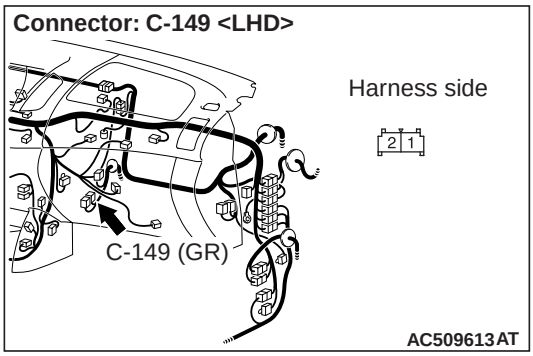
DIAGNOSIS PROCEDURE

STEP 1. Connector check: C-105 engine-ECU connector



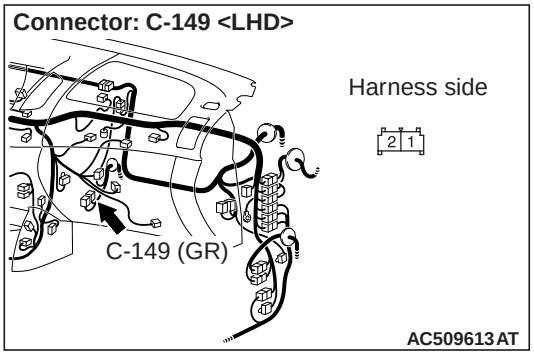
Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the connector.

STEP 2. Connector check: C-149 PTC heater 1 connector

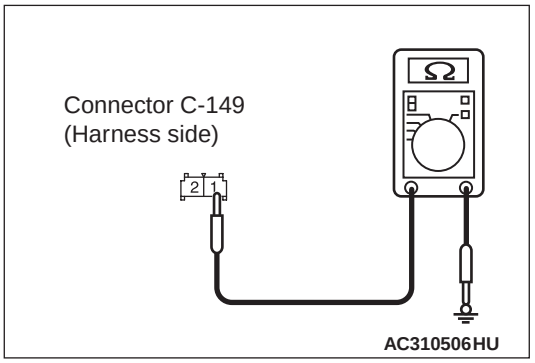


Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the connector.

STEP 3. Resistance measurement at the C-149 PTC heater 1 connector.



(1) Disconnect the connector, and measure at the wiring harness side.

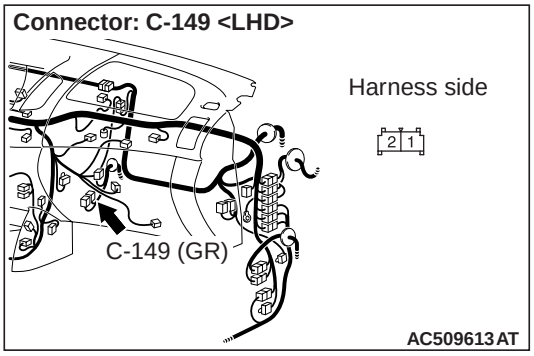


(2) Continuity between terminal 1 and body earth

OK: Continuity (Less than 2Ω)

Q: Is the check result normal?
YES : Go to Step 5.
NO : Go to Step 4.

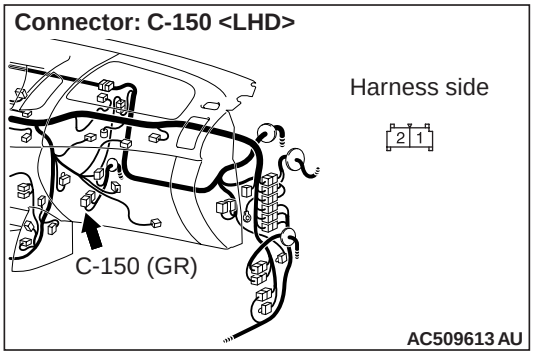
STEP 4. Check the wiring harness between C-149 PTC heater 1 connector terminal No.1 and body earth.



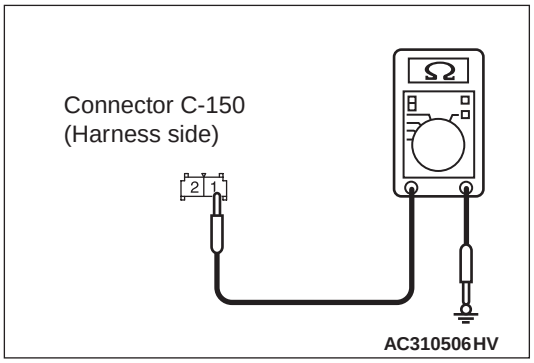
- Check the PTC heater earth line for open circuit.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction .)
NO : Repair the wiring harness.

STEP 5. Resistance measurement at the C-150 PTC heater 2 connector.



(1) Disconnect the connector, and measure at the wiring harness side.



(2) Continuity between terminal 1 and body earth

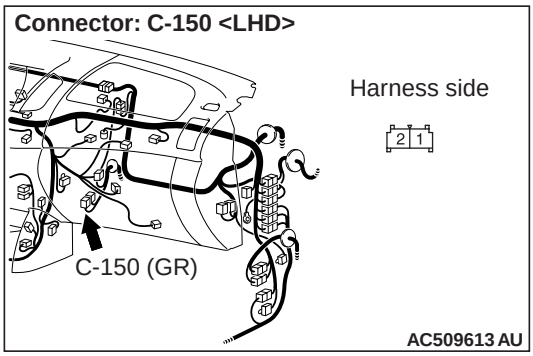
OK: Continuity (Less than 2Ω)

Q: Is the check result normal?

YES : Go to Step 7.

NO : Go to Step 6.

STEP 6. Check the wiring harness between C-150 PTC heater 2 connector terminal No.1 and body earth.



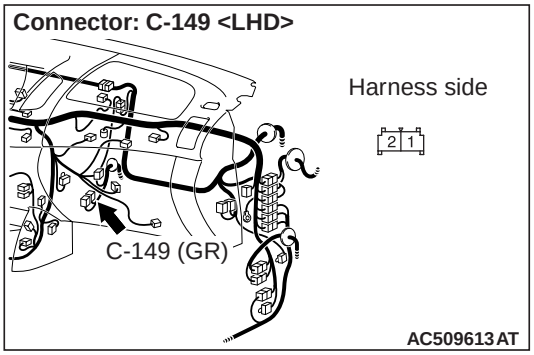
- Check the PTC heater earth line for open circuit.

Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction .)

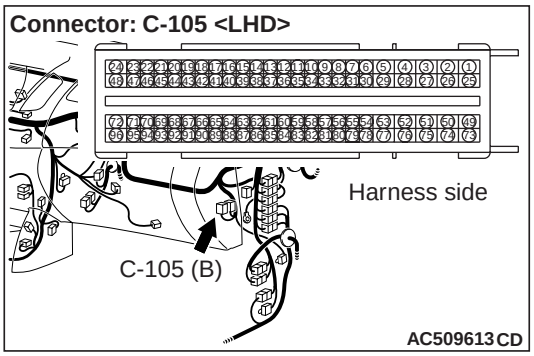
NO : Repair the wiring harness.

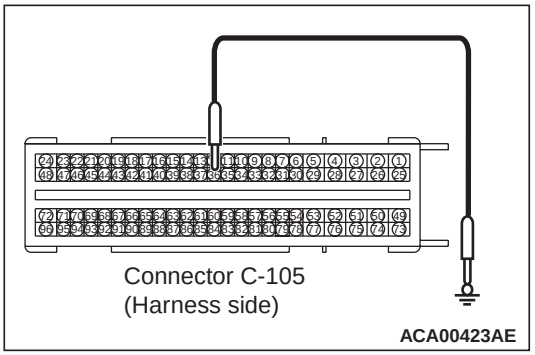
STEP 7. Voltage measurement at C-149 PTC heater 1 connector.



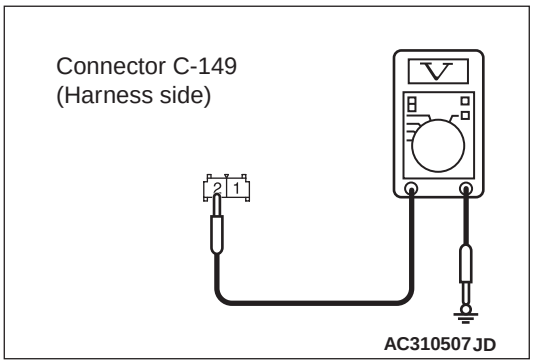
(1) Disconnect the connector, and measure at the wiring harness side.

(2) Turn the ignition switch to the "ON" position.





(3) Disconnect engine-ECU connector C-105 and earth terminal 36.



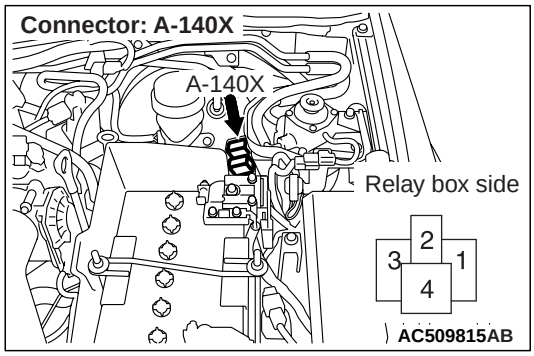
(4) Voltage between terminal 2 and body earth.

OK: System voltage

Q: Is the check result normal?

YES : Go to Step 16.
NO : Go to Step 8.

STEP 8. Connector check: A-140X PTC heater relay 1 controller connector



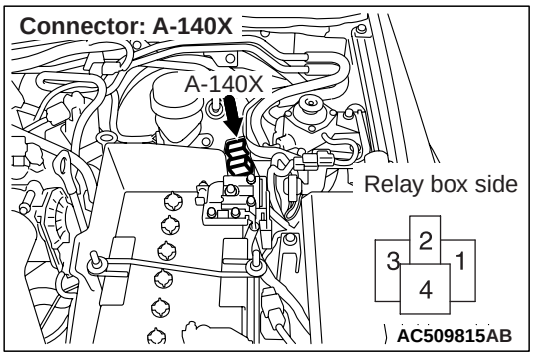
Q: Is the check result normal?
YES : Go to Step 9.
NO : Repair the connector.

STEP 9. Check the heater switch relay 1 continuity.

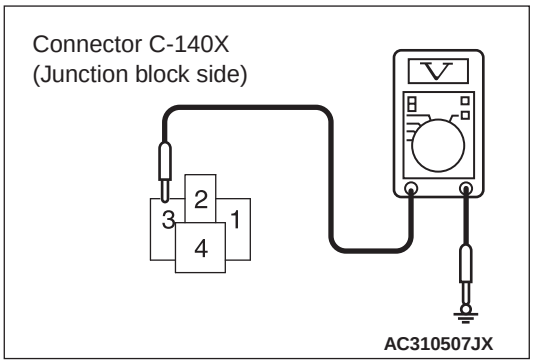
Refer to P.55A-66.

Q: Is the heater switch relay 1 in good condition?
YES : Go to Step 10.
NO : Replace the heater switch relay 1.

STEP 10. Voltage measurement at A-140X PTC heater relay 1 connector.



(1) Remove the relay, and measure at the relay box side.
(2) Turn the ignition switch to the "ON" position.

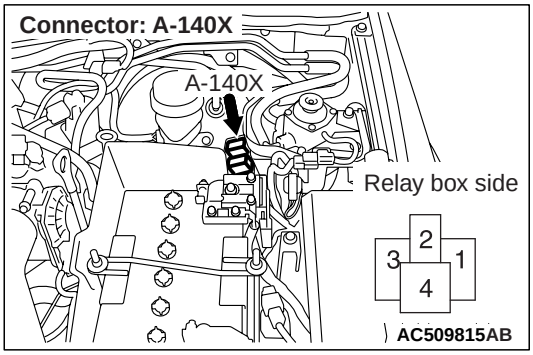


(3) Voltage between terminal 3 and body earth.

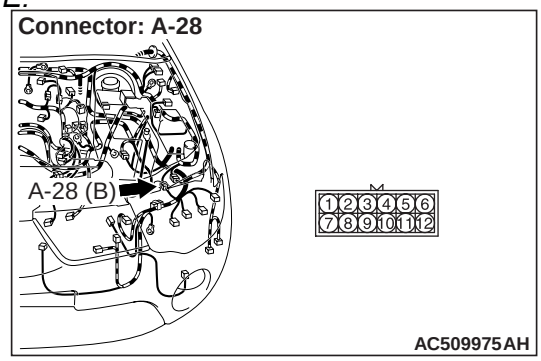
OK: System voltage

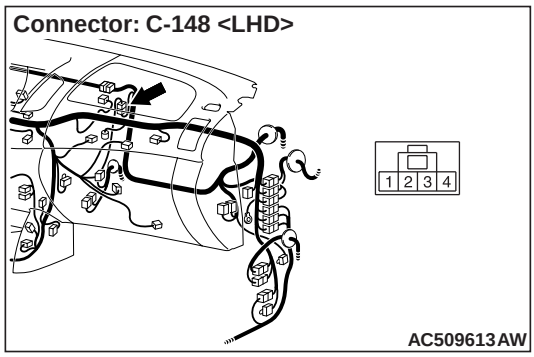
Q: Is the check result normal?
YES : Go to Step 12.
NO : Go to Step 11.

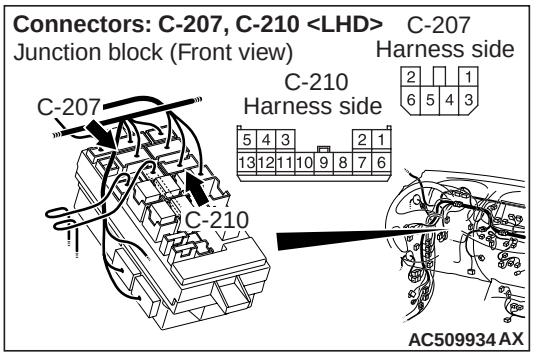
STEP 11. Check the wiring harness between A-140X PTC heater relay 1 connector terminal No.3 and the ignition switch (IG2).



NOTE:







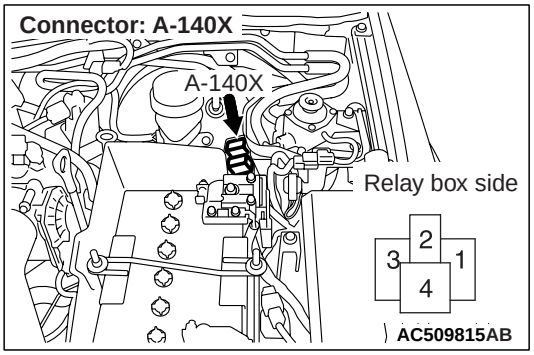
Prior to the wiring harness inspection, check intermediate connectors C-148, A-28, junction block connectors C-207 and C-210, and repair if necessary.

- Check the PTC heater relay 1 earth supply line for open circuit.

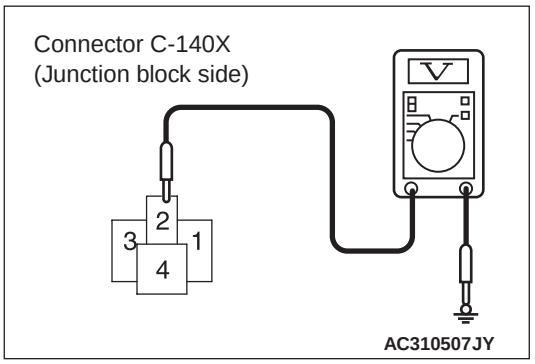
Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction .)
NO : Repair the wiring harness.

STEP 12. Voltage measurement at C-140X PTC heater relay 1 connector.



(1) Remove the relay, and measure at the relay block side.

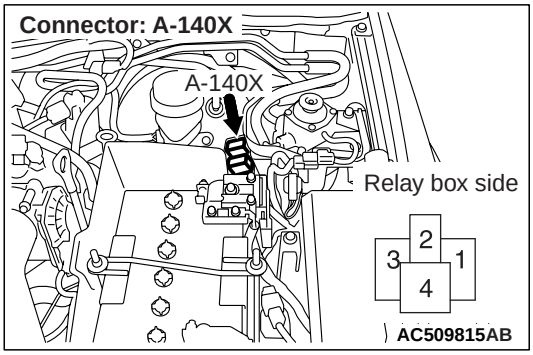


(2) Voltage between terminal 2 and body earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 14.
NO : Go to Step 13.

STEP 13. Check the wiring harness between A-140X PTC heater relay 1 connector terminal No.2 and the fusible link (25).



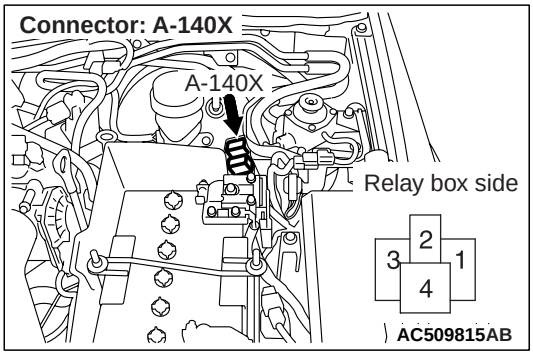
- Check the PTC heater relay 1 power supply line for open circuit.

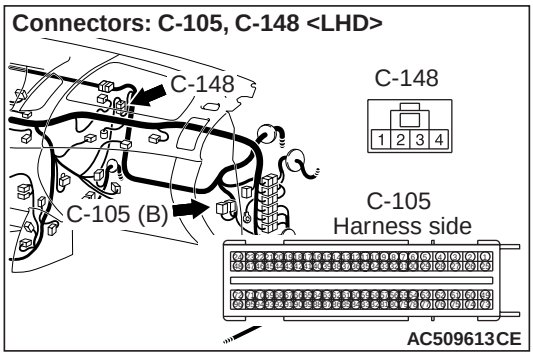
Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

NO : Repair the wiring harness.

STEP 14. Check the wiring harness between A-140X PTC heater relay 1 connector terminal No.1 and C-105 engine-ECU connector terminal No.36.





NOTE: Prior to the wiring harness inspection, check intermediate connector C-148, and repair if necessary.

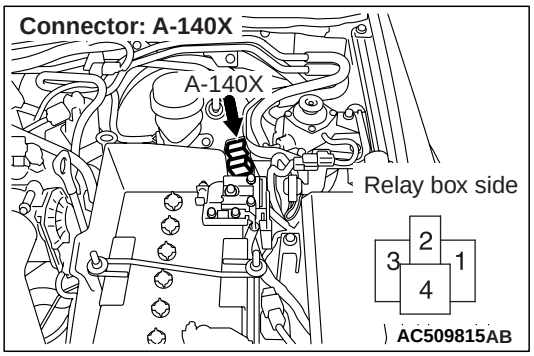
- Check the PTC heater relay 1 earth line for open and short circuit.

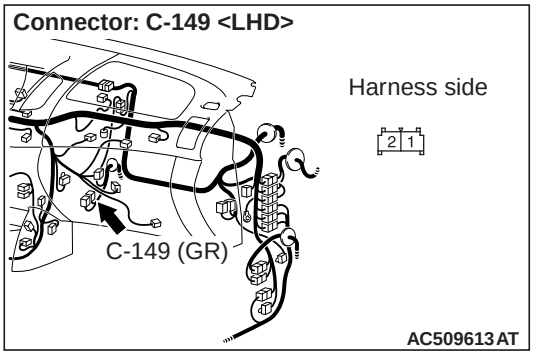
Q: Is the check result normal?

YES : Go to Step 15.

NO : Repair the wiring harness.

STEP 15. Check the wiring harness between A-140X PTC heater relay 1 connector terminal No.4 and C-149 PTC heater connector terminal No.2.





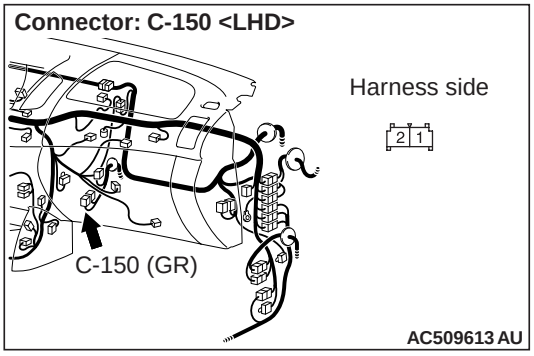
- Check the PTC heater relay 1 power supply line for open circuit.

Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

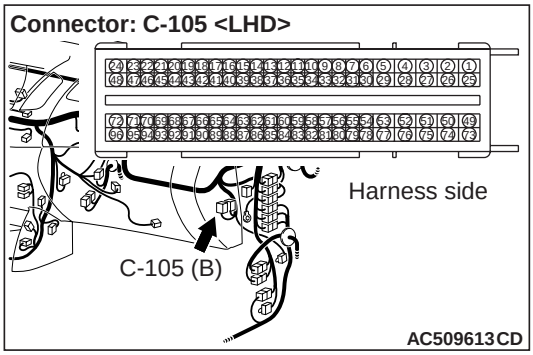
NO : Repair the wiring harness.

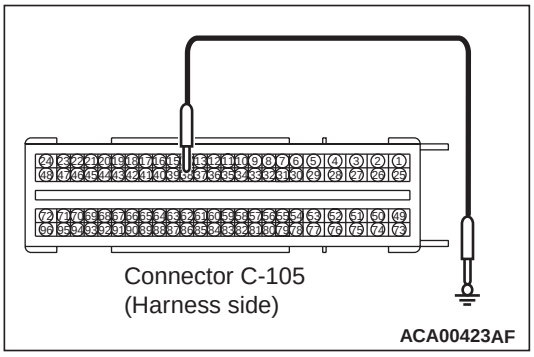
STEP 16. Voltage measurement at C-150 PTC heater 2 connector.



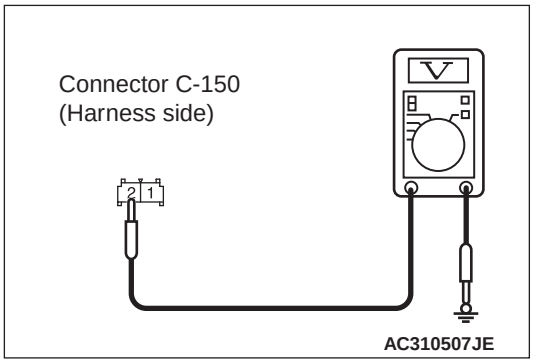
(1) Disconnect the connector, and measure at the wiring harness side.

(2) Turn the ignition switch to the "ON" position.





(3) Disconnect engine-ECU connector C-105 and earth terminal 38.

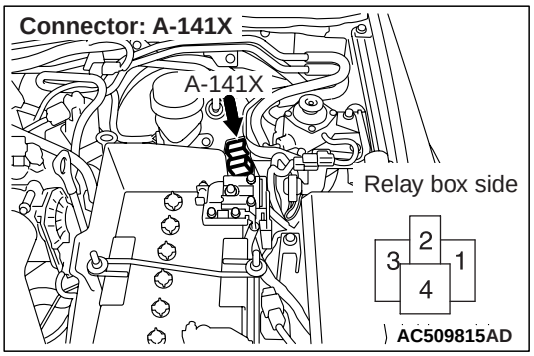


(4) Voltage between terminal 2 and body earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 25.
NO : Go to Step 17.

STEP 17. Connector check: A-141X PTC heater relay 2 controller connector

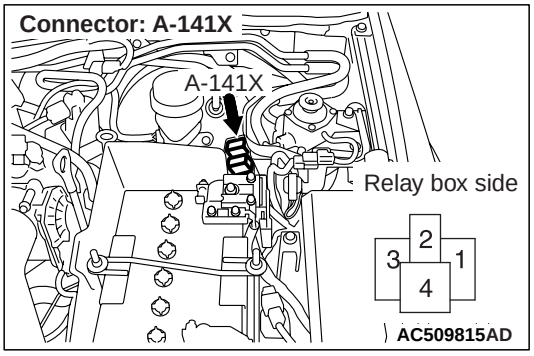


Q: Is the check result normal?
YES : Go to Step 18.
NO : Repair the connector.

STEP 18. Check the PTC heater relay 2 continuity.
Refer to P.55A-66.

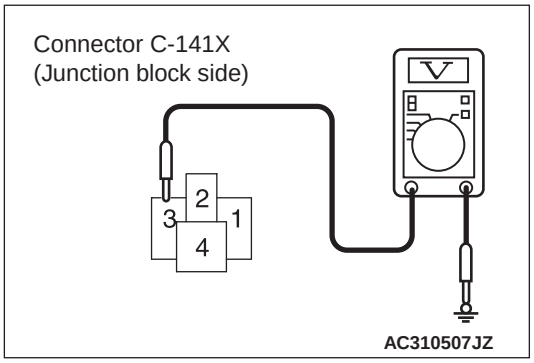
Q: Is the PTC heater relay 2 in good condition?
YES : Go to Step 19.
NO : Replace the PTC heater relay 2.

STEP 19. Voltage measurement at A-141X PTC heater relay 2 connector.



(1) Remove the relay, and measure at the relay block side.

(2) Turn the ignition switch to the "ON" position.

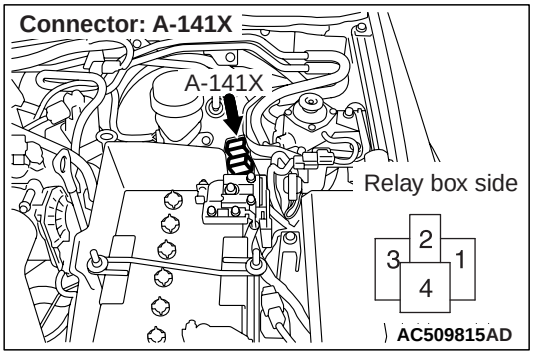


(3) Voltage between terminal 3 and body earth.

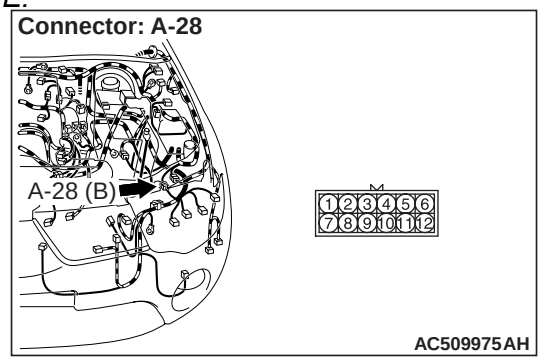
OK: System voltage

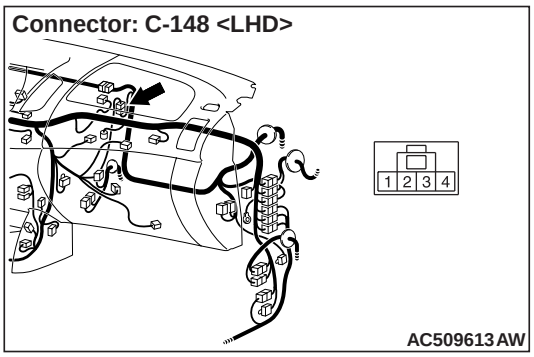
Q: Is the check result normal?
YES : Go to Step 21.
NO : Go to Step 20.

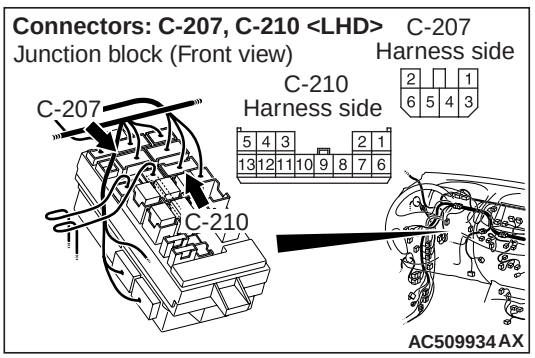
STEP 20. Check the wiring harness between A-141X PTC heater relay 2 connector terminal No.3 and the ignition switch (IG2).



NOTE:







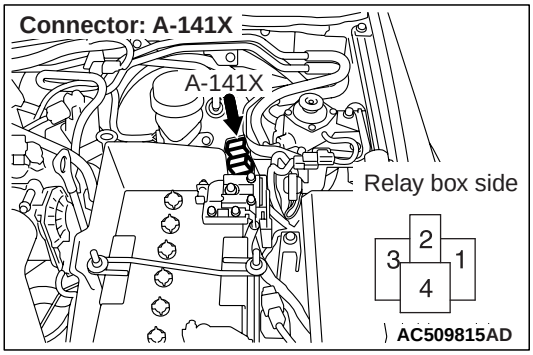
Prior to the wiring harness inspection, check junction block connectors C-207, C-210, intermediate connector A-28 and C-148, and repair if necessary.

- Check the PTC heater relay 2 power supply line for open circuit.

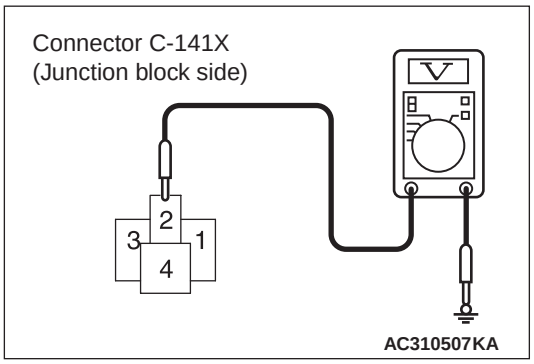
Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction .)
NO : Repair the wiring harness.

STEP 21. Voltage measurement at A-141X PTC heater relay 2 connector.



(1) Remove the relay, and measure at the relay block side.

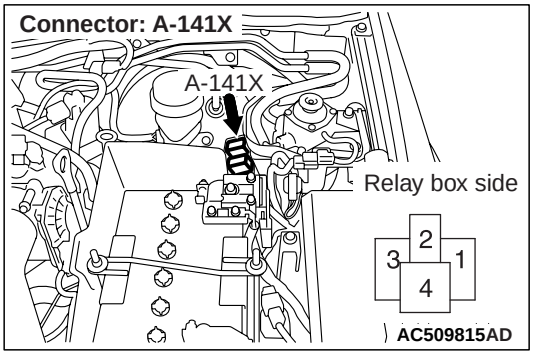


(2) Voltage between terminal 2 and body earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 23.
NO : Go to Step 22.

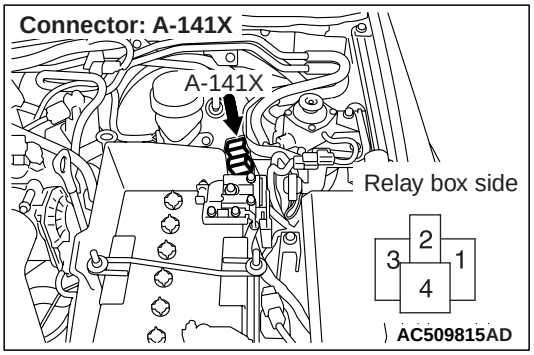
STEP 22. Check the wiring harness between A-141X PTC heater relay 2 connector terminal No.2 and the fusible link (25).

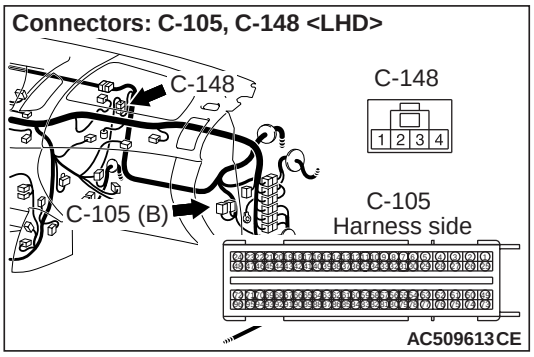


- Check the PTC heater relay 2 power supply line for open circuit.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness.

STEP 23. Check the wiring harness between A-141X PTC heater relay 2 connector terminal No.1 and C-105 engine-ECU connector terminal No.41.





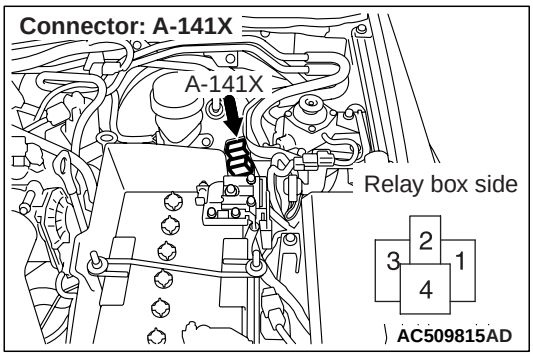
NOTE: Prior to the wiring harness inspection, check intermediate connector C-148, and repair if necessary.

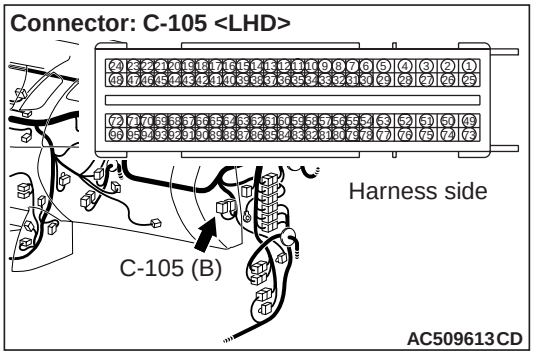
- Check the PTC heater relay 2 earth line for open and short circuit.

Q: Is the check result normal?

YES : Go to Step 24.
NO : Repair the wiring harness.

STEP 24. Check the wiring harness between A-141X PTC heater relay 2 connector terminal No.4 and C-150 PTC heater connector terminal No.2.

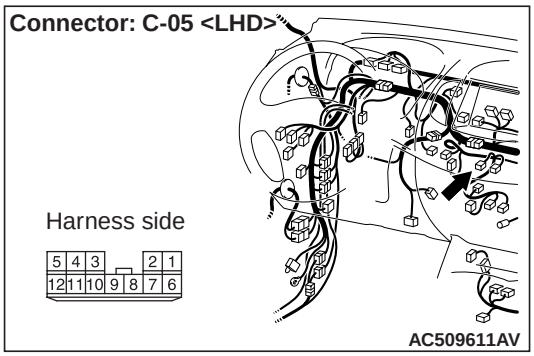




- Check the PTC heater power supply line for open circuit.

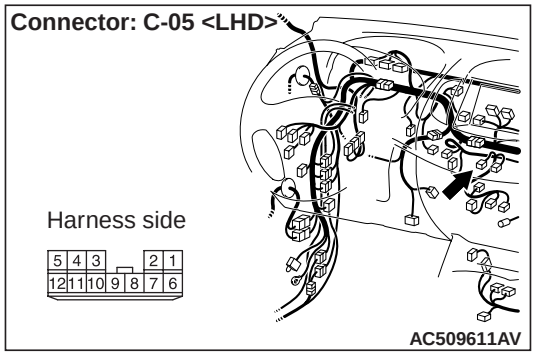
Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction .)
NO : Repair the wiring harness.

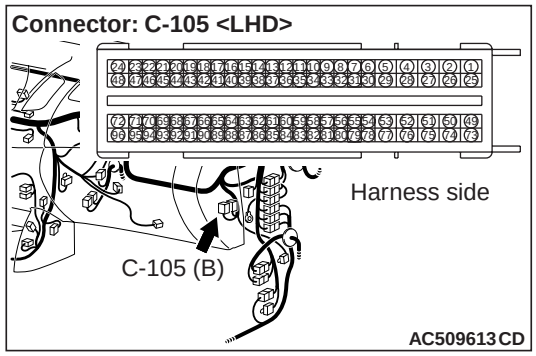
STEP 25. Connector check: C-05 A/C switch module controller connector



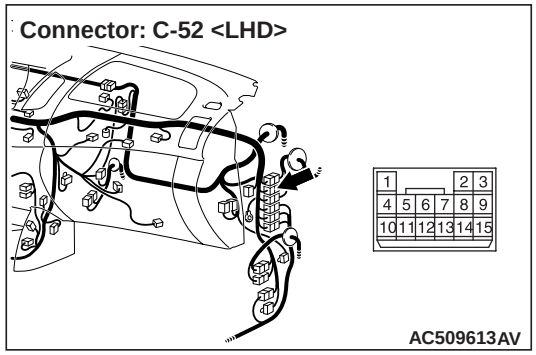
Q: Is the check result normal?
YES : Go to Step 26.
NO : Repair the connector.

STEP 26. Check the wiring harness between C-05 A/C switch module connector terminal No.1 and C-105 engine-ECU connector terminal No.35.





NOTE: Prior to the wiring harness inspection, check intermediate connector C-52, and repair if necessary.



Check the A/C control module input line for open and short circuit.

Q: Is the check result normal?
YES : Go to Step 27.
NO : Repair the wiring harness.

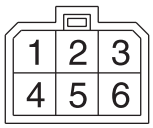
STEP 27. Check the trouble symptom
Check that the PTC heater works normally.

Q: Is the check result normal?
YES : This diagnosis is complete.
NO : Replace the engine-ECU.

CHECK AT A/C EVAPORATOR AIR OUTLET THERMISTOR TERMINALS

M1552010302738

<C-21>



AC501416AD

Terminal No.	Check items	Check conditions	Normal conditions
1	Earth	Always	1 V or less
2	Power supply	IG2: ON	System voltage
4	Output from A/C evaporator air outlet thermistor to engine-ECU	Blower switch: 4 Temperature control dial: MAX cool evaporator temperature of the back: 3°C or higher	System voltage
		Other than above	1 V or less
5	Communication with A/C switch module	Temperature control dial: MAX cool	System voltage
6	Communication with A/C switch module	Temperature control dial: MAX cool	System voltage

ON-VEHICLE SERVICE

A/C COMPRESSOR DRIVE BELT TENSION CHECK AND ADJUSTMENT

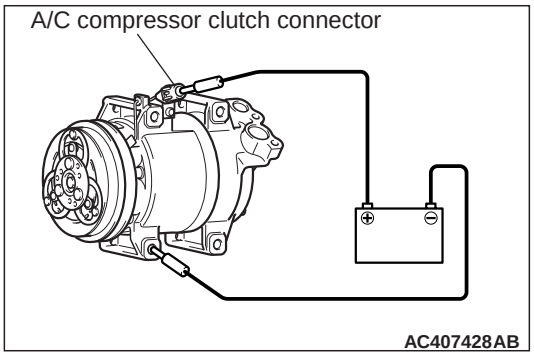
M1552001001327

Refer to GROUP 11A, On-vehicle Service – A/C compressor drive belt tension check and adjustment .

A/C COMPRESSOR CLUTCH TEST

M1552008500591

1. Disconnect the A/C compressor clutch connector to the A/C compressor clutch.



2. Connect positive battery voltage directly to the connector for the A/C compressor clutch.
3. If the A/C compressor clutch is normal, there will be a "click." If the pulley and armature do not make contact ("click"), there is a malfunction.

CHARGING AND DISCHARGING

M1552022200215

Use the refrigerant recovery unit to discharge refrigerant gas front the system.

NOTE: Refer to the Refrigerant Recovery and Recycling Unit instruction Manual for operation of the unit.

CHECK THE REFRIGERANT LEVEL

M1552021700165

Remove the refrigerant by the flon reclaim machine and replenish the specified quantity of refrigerant.

NOTE: Refer to the Refrigerant Recovery and Recycling Unit instruction Manual for operation of the unit.

REFILLING OF OIL IN THE A/C SYSTEM

M1552020000259

Too little oil will provide inadequate compressor lubrication and cause a compressor failure. Too much oil will increase discharge air temperature.

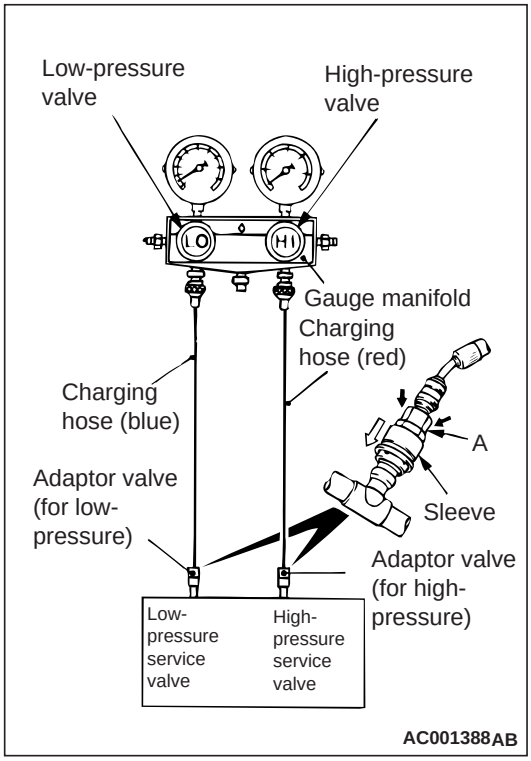
When a compressor is installed at the factory, it contains 120 mL of compressor oil. While the A/C system is in operation, the oil is carried through the entire system by the refrigerant. Some of this oil will be trapped and retained in various parts of the system.
When the following system components are changed, it is necessary to add oil to the system to replace the oil being removed with the component.

Compressor oil: ZXL 100PG
Quantity
Evaporator: 60 mL
Condenser: 15 mL
Flexible suction hose: 10 mL
Receiver: 10 mL

PERFORMANCE TEST

M1552001401121

1. The vehicles to be tested should be in a place that is not in direct sunlight.



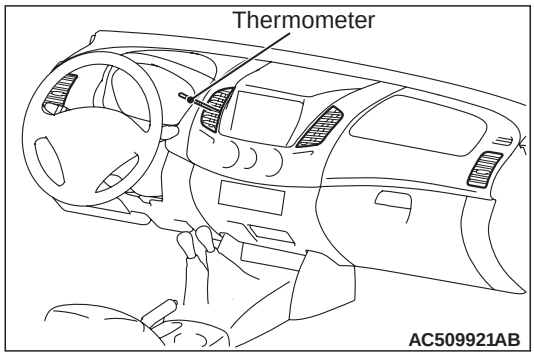
2. Close the high and low-pressure valve of the gauge manifold.
3. Connect the charging hose (blue) to the low-pressure valve and connect the charging hose (red) to the high-pressure valve of the gauge manifold.

⚠ CAUTION

- **To connect the quick joint, press section A firmly against the service valve until a click is heard.**
- **When connecting, run your hand along the hose while pressing to ensure that there are no bends in the hose.**

4. Install the quick joint (for low-pressure) to the charging hose (blue), and connect the quick joint (for high-pressure) to the charging hose (red).

   NOTE: The high-pressure service valve is on the A/C pipe and the low-pressure service valve is on the suction hose.
5. Connect the quick joint (for low-pressure) to the low-pressure service valve and connect the quick joint (for high-pressure) to the high-pressure service valve.
6. Start the engine.
7. Set the A/C controls as follows:
   - Mode selection dial: FACE position
   - Temperature control dial: MAX COOL position
   - Air selection: Recirculated air position
   - Blower speed selection dial: 4 position
8. Adjust engine speed to 900 r/min with A/C clutch engaged.
9. Engine should be warmed up with hood, doors and windows opened.



10. Insert a thermometer in the centre air outlet and operate the engine for 20 minutes.

NOTE: If the clutch cycles, take the reading before the clutch disengages.

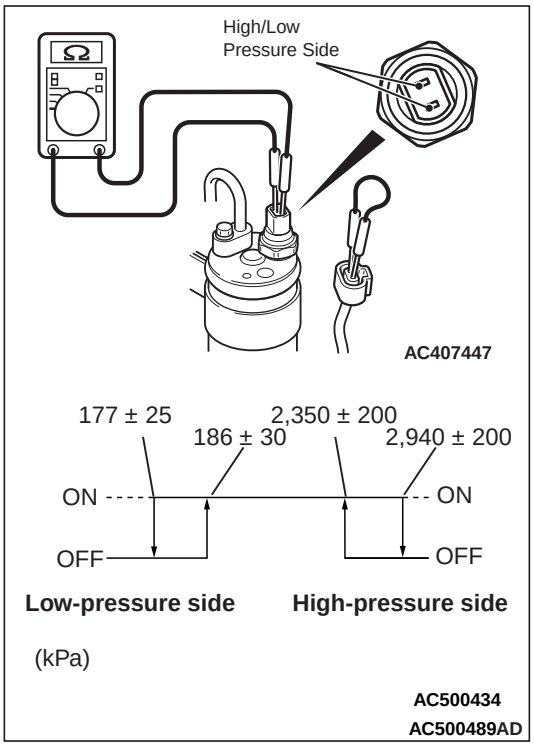
11. Note the discharge air temperature.

PERFORMANCE TEMPERATURE CHART

Garage ambient temperature °C	**25**	**30**	**35**	**40**
Discharge air temperature °C	7.0 – 14.0	12.0 – 19.0	18.5 – 26.0	27.0 – 34.5
Compressor high pressure kPa	1, 020 – 1, 220	1, 180 – 1, 420	1,380 – 1,680	1,680 – 2, 000
Compressor low pressure kPa	180 – 230	220 – 270	270 – 320	330 – 390

DUAL PRESSURE SWITCH CHECK

M1552010400621



1. Remove the dual pressure switch connector and connect the high/low pressure side terminals located on the harness side as shown in the illustration.
2. Install a gauge manifold to the high-pressure side service valve of the refrigerant line (Refer to P.55A-85).
3. When the high/low pressure sides of the dual pressure switch are at operation pressure (ON) the resistance should less than two ohms between the terminals. If open circuit, replace the switch.

COMPRESSOR NOISE CHECK

M1552008700517

You must first know the conditions when the noise occurs. These conditions are: weather, vehicle speed, in gear or neutral, engine temperature or any other special conditions.

Noises that develop during A/C operation can often be misleading. For example: what sounds like a failed front bearing or connecting rod, may be caused by loose bolts, nuts, mounting brackets, or a loose clutch assembly. Verify accessory drive belt tension (power steering or alternator).
Improper accessory drive belt tension can cause a misleading noise when the compressor is engaged and little or no noise when the compressor is disengaged.
Drive belts are speed-sensitive. That is, at different engine speeds, and depending upon belt tension, belts can develop unusual noises that are often mistaken for mechanical problems within the compressor.

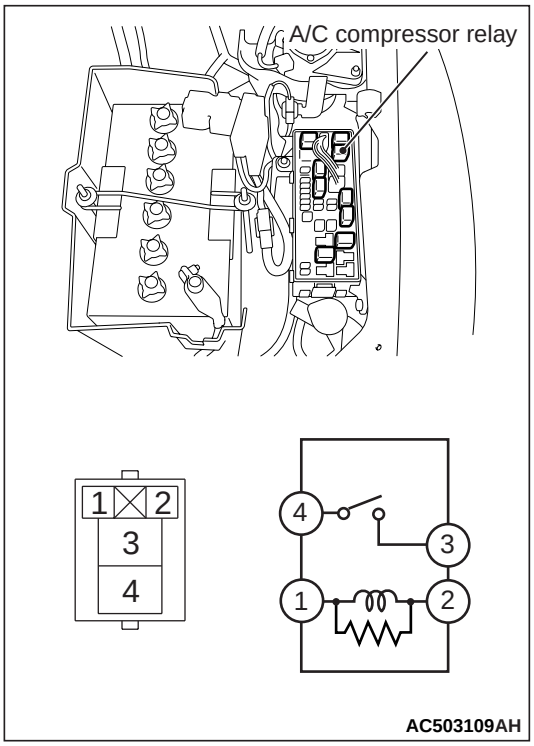
ADJUSTMENT

1. Select a quiet area for testing. Duplicate conditions as much as possible. Switch the compressor on and off several times to clearly identify compressor noise. To duplicate high ambient conditions (high head pressure), restrict air flow through the condenser. Install a manifold gauge set to make sure discharge pressure does not exceed 2,070 kPa.
2. Tighten all compressor mounting bolts, clutch mounting bolt, and compressor drive belt. Check to assure clutch coil is tight (no rotation or wobble).
3. Check refrigerant hoses for rubbing or interference that can cause unusual noises.
4. Check refrigerant charge (Refer to P.55A-63).
5. Recheck compressor noise as in Step 1.
6. If noise still exists, loosen compressor mounting bolts and retighten. Repeat Step 1.
7. If noise continues, replace compressor and repeat Step 1.

RELAY CONTINUITY CHECK

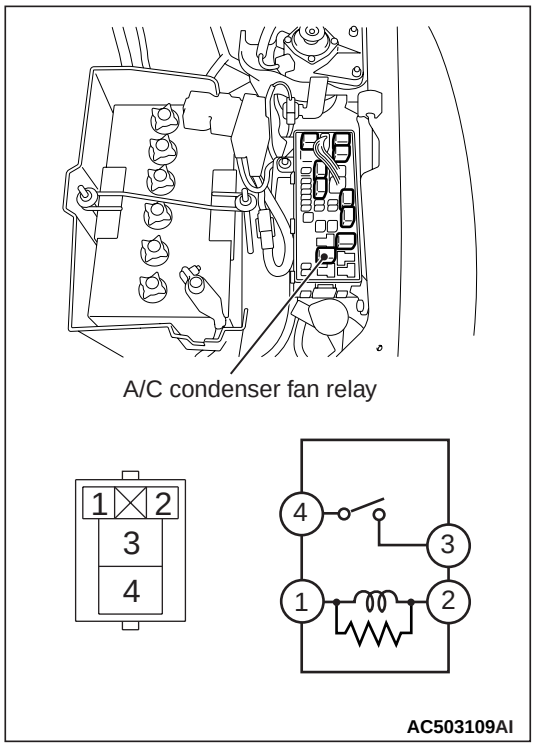
M1552008801540

A/C COMPRESSOR RELAY CONTINUITY CHECK



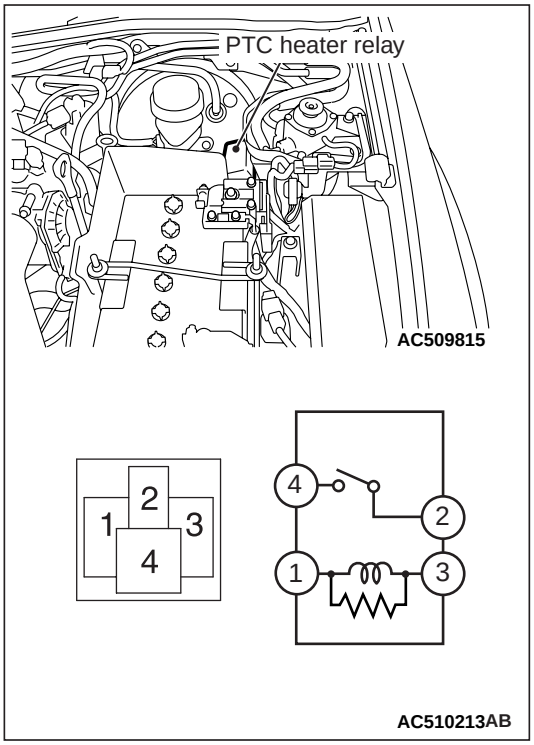
Battery voltage	Tester connection	Specified condition
Not applied	3 – 4	Open circuit
• Connect terminal 1 to the positive battery terminal • Connect terminal 2 to the negative battery terminal	3 – 4	Continuity (Less than 2Ω)

CONDENSER FAN RELAY CONTINUITY CHECK <VEHICLES WITH CONDENSER FAN>



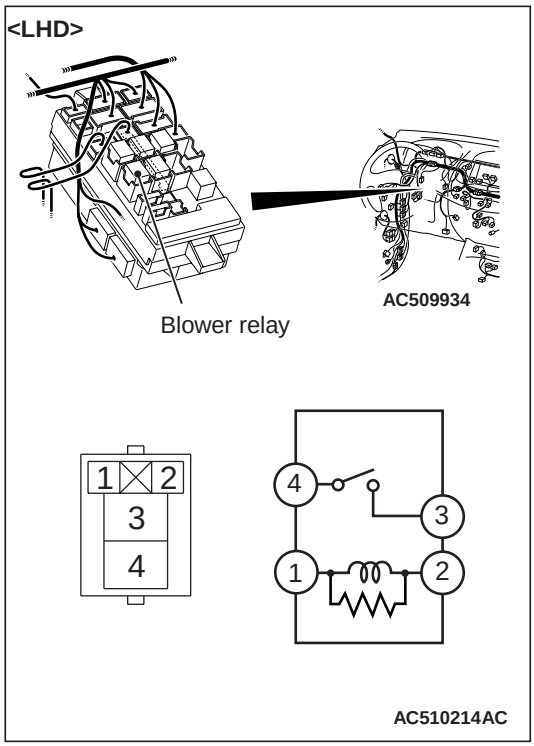
Battery voltage	Tester connection	Specified condition
Not applied	3 – 4	Open circuit
• Connect terminal 1 to the positive battery terminal • Connect terminal 2 to the negative battery terminal	3 – 4	Continuity (Less than 2Ω)

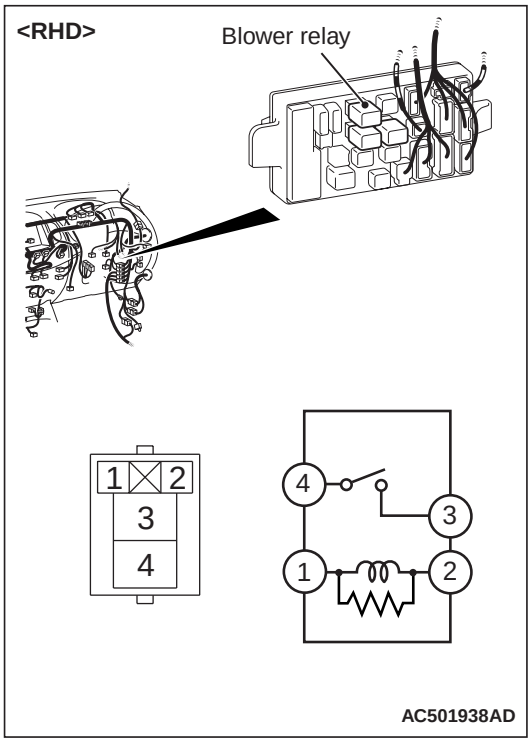
PTC HEATER RELAY CONTINUITY CHECK <VEHICLES WITH PTC HEATER>



Battery voltage	Tester connection	Specified condition
Not applied	1 – 3	Open circuit
• Connect terminal 2 to the positive battery terminal • Connect terminal 4 to the negative battery terminal	1 – 3	Continuity (Less than 2Ω)

BLOWER RELAY CONTINUITY CHECK





Battery voltage	Tester connection	Specified condition
Not applied	3 – 4	Open circuit
• Connect terminal 1 to the positive battery terminal • Connect terminal 2 to the negative battery terminal	3 – 4	Continuity (Less than 2Ω)

IDLE-UP OPERATION CHECK

M1552001601846

1. Before inspection and adjustment, set vehicle in the following condition:
   - Engine coolant temperature: 80 – 90 °C
   - Lamps, electric cooling fan and accessories: Set to OFF
   - Transmission: Neutral ("N" or "P" for vehicles with A/T)
   - Steering wheel: Straightforward
2. Check whether or not the idle speed is the standard value.

   Refer to GROUP 11A, On-vehicle Service – Idle Speed Adjustment .

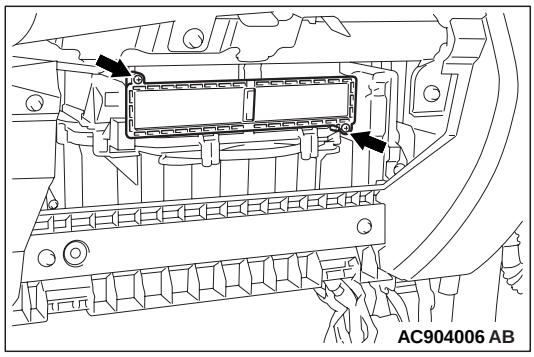
   Standard value:
   650 ± 50 r/min <High power engine>
   700 ± 50 r/min <Except high power engine>
3. When the A/C is running after turning the A/C switch to ON, and the blower switch to the 3(MH) or 4(HI) position, check to be sure that the idle speed is at the standard value.

   Standard value: 900 ± 100 r/min

   NOTE: It is not necessary to make an adjustment, because the idling speed is automatically adjusted by the ISC system. If, however, a deviation from the standard value occurs for some reason, check the ISC system.

REPLACE THE CLEAN AIR FILTER <Vehicles with Clean air filter>

M1552020600466

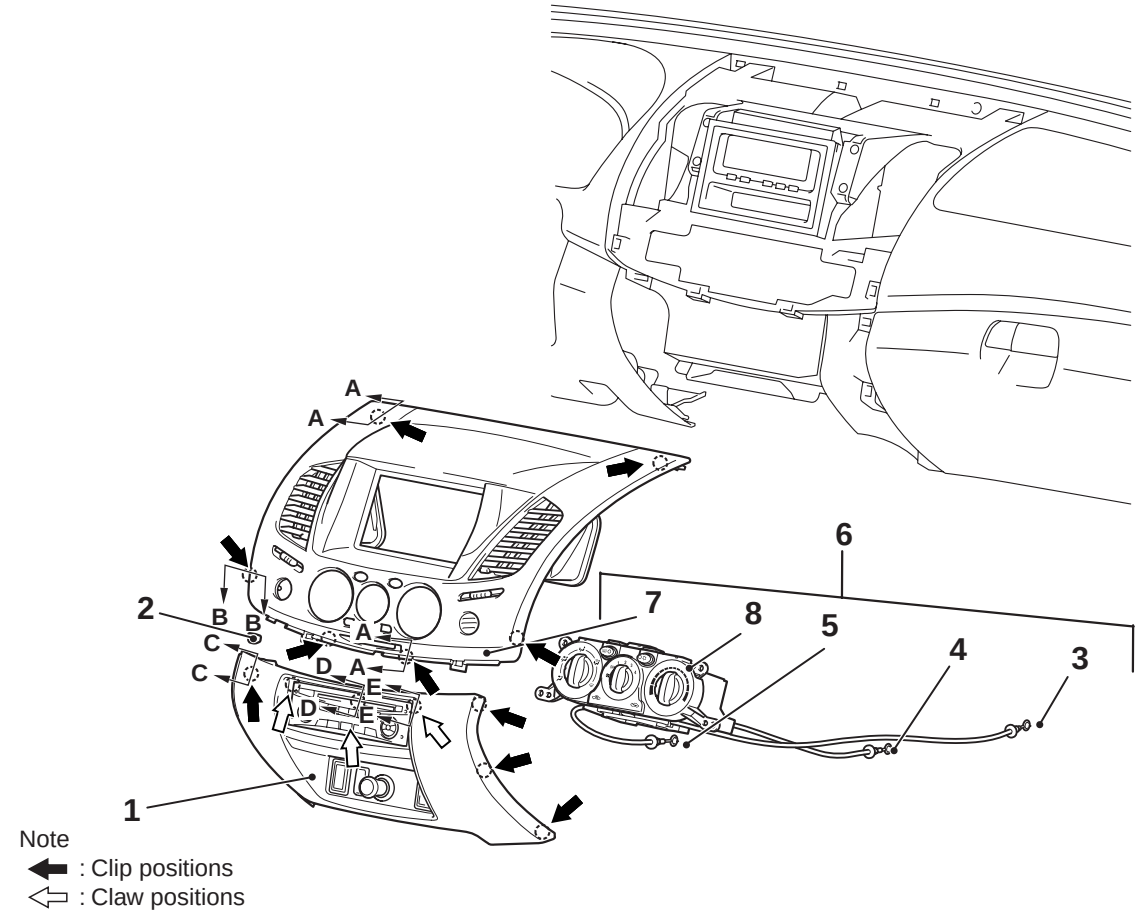


1. Remove the glove box (Refer to GROUP 52A – Instrumental Panel,).
2. Loosen the two screws as shown to replace the clean air filter.
3. Install the glove box.

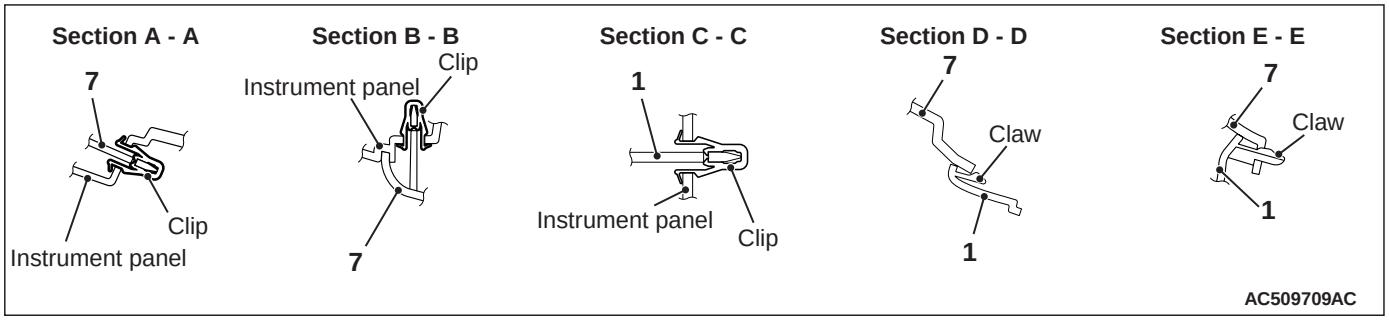
HEATER CONTROL ASSEMBLY AND A/C SWITCH

REMOVAL AND INSTALLATION

M1552002400950



AC809536 AC



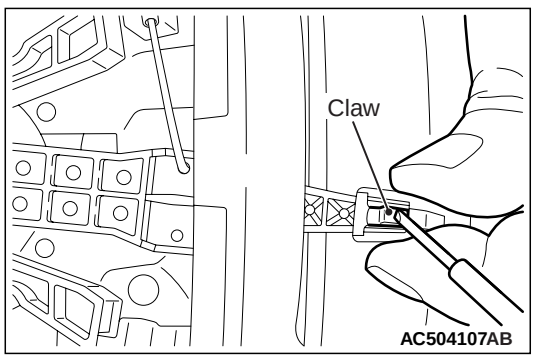
AC509709AC

Removal steps

1. Centre lower panel
<<A>> 2. Air selection lever knob
<<B>> >>C<< 3. Outside/Inside air selection damper control cable connection
<<B>> >>B<< 4. Mode selection damper control cable connection
<<B>> >>A<< 5. Air mixing damper control cable connection
6. Centre upper panel assembly
7. Centre upper panel
8. Heater control panel assembly

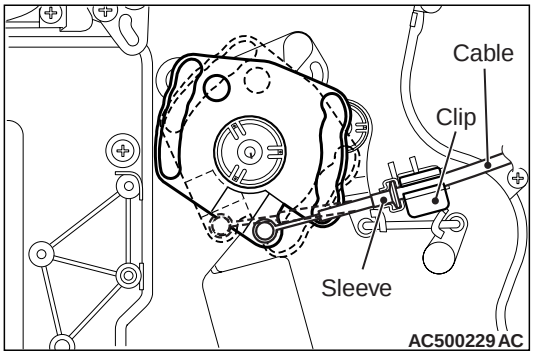
REMOVAL SERVICE POINTS

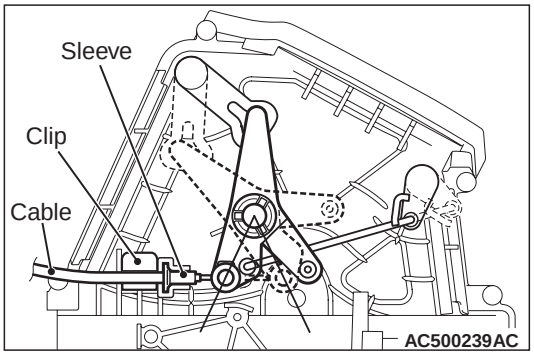
<<A>> AIR SELECTION LEVER KNOB REMOVAL

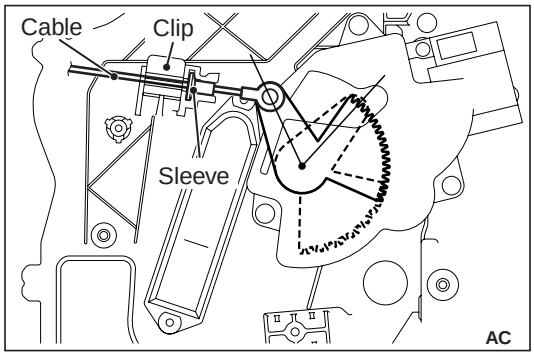


Lift the claw, and remove the air selection lever knob.

<<B>> OUTSIDE/INSIDE AIR SELECTION DAMPER CONTROL CABLE CONNECTION, AIR MIXING DAMPER CONTROL CABLE CONNECTION AND MODE SELECTION DAMPER CONTROL CABLE CONNECTION REMOVAL







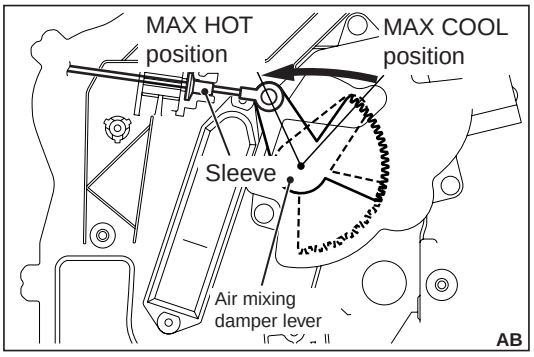
Always remove the cable by pressing the clip.

NOTE: When removing the cable, make sure that the sleeve does not become misaligned.

INSTALLATION SERVICE POINTS

>>A<< AIR MIXING DAMPER CONTROL CABLE CONNECTION

1. Set the Temperature control dial of the heater control assembly to MAX HOT position.

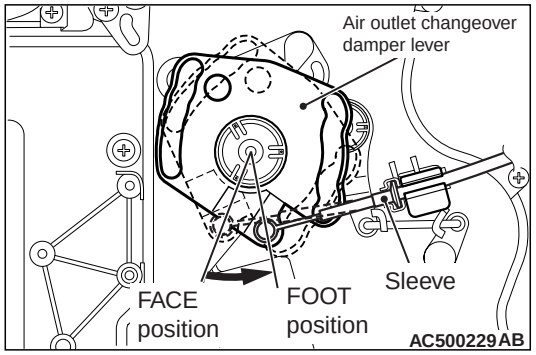


2. Turn the air mixing damper lever of heater unit to the MAX HOT position (Turn the damper lever to the left until it stops.) and then install the cable.
3. Install the cable to the clip and fix it while aligning the case.

   NOTE: When installing the cable to the case, make sure that the sleeve does not become misaligned.

>>B<< MODE SELECTION DAMPER CONTROL CABLE CONNECTION

1. Set the mode selection dial of the heater control assembly to FOOT position.

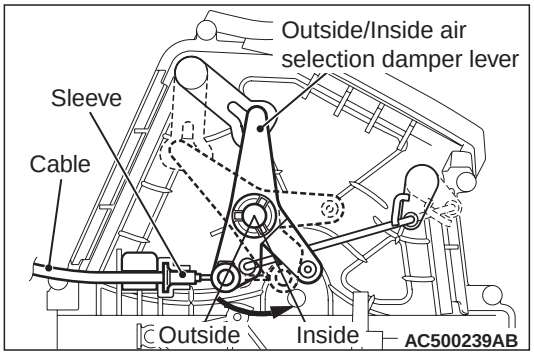


2. Turn the air outlet changeover damper lever of heater unit to the DEF position (Turn the damper lever to the left until it stops.) and then install the cable.
3. Install the cable to the clip and fix it while aligning the case.

   NOTE: When installing the cable to the case, make sure that the sleeve does not become misaligned.

>>C<< OUTSIDE/INSIDE AIR SELECTION DAMPER CONTROL CABLE CONNECTION

1. Set the air selection lever on the heater control panel assembly to the inside recirculation.



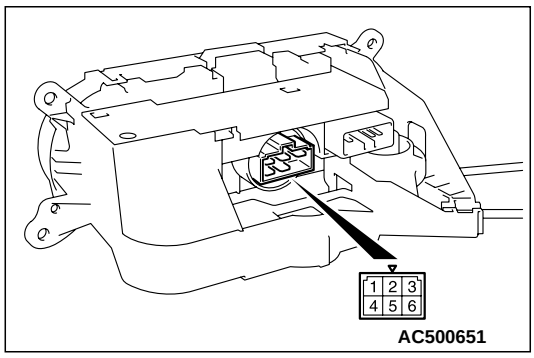
2. Set the outside/Inside air selection damper lever of the heater blower assembly to the inside position as shown in the illustration, and then connect the cable to the link pin.
3. Install the cable to the clip and fix it while aligning the case.

   NOTE: When installing the cable to the case, make sure that the sleeve does not become misaligned.

INSPECTION

M1552002500355

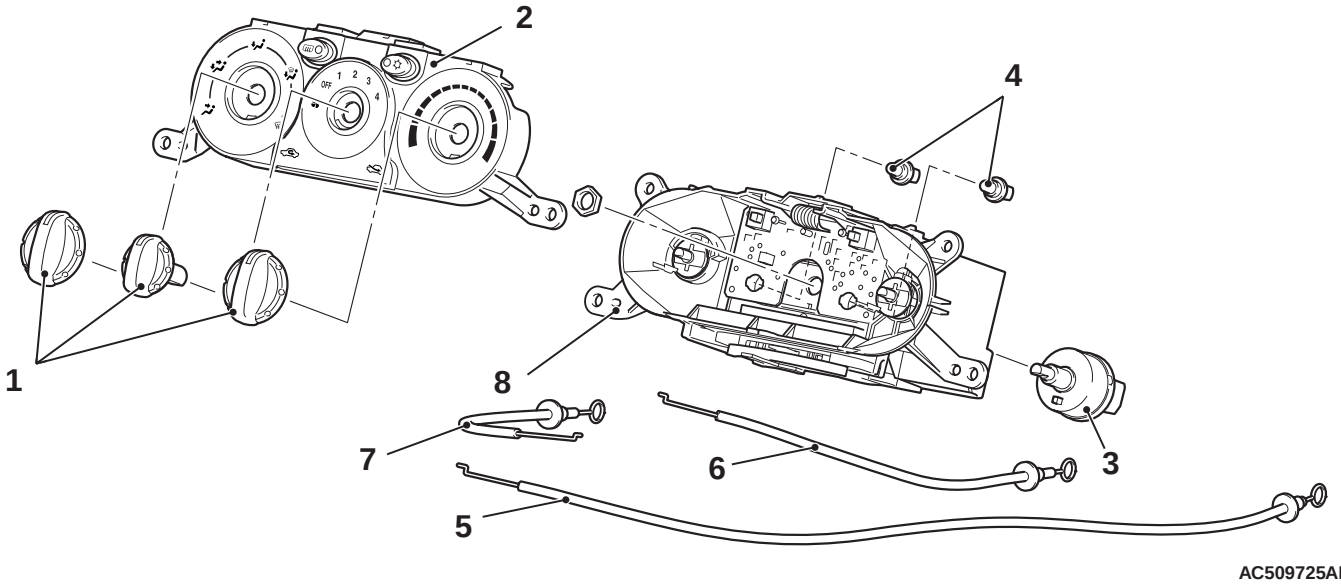
BLOWER SWITCH CONTINUITY CHECK



Switch position	Tester connection	Specified condition
OFF	1 – 3, 2 – 3, 3 – 4, 3 - 5	Open circuit
1	2 – 3	Continuity (Less than 2Ω)
2	1 – 3	
3	3 – 4	
4	3 – 5	

DISASSEMBLY AND REASSEMBLY

M1552014200566



Disassembly steps

1. Knob
2. Panel
3. Blower switch
4. Bulb

<<A>>
5. Outside/inside air selection damper control cable

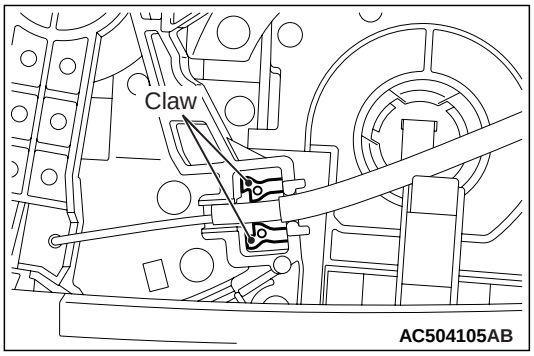
Disassembly steps (Continued)

<<A>>
6. Mode selection damper control cable

<<A>>
7. Air mixing damper control cable
8. Heater control

DISASSEMBLY SERVICE POINT

<<A>> OUTSIDE/INSIDE AIR SELECTION DAMPER CONTROL CABLE/ AIR MIXING DAMPER CONTROL CABLE/ MODE SELECTION DAMPER CONTROL CABLE REMOVAL



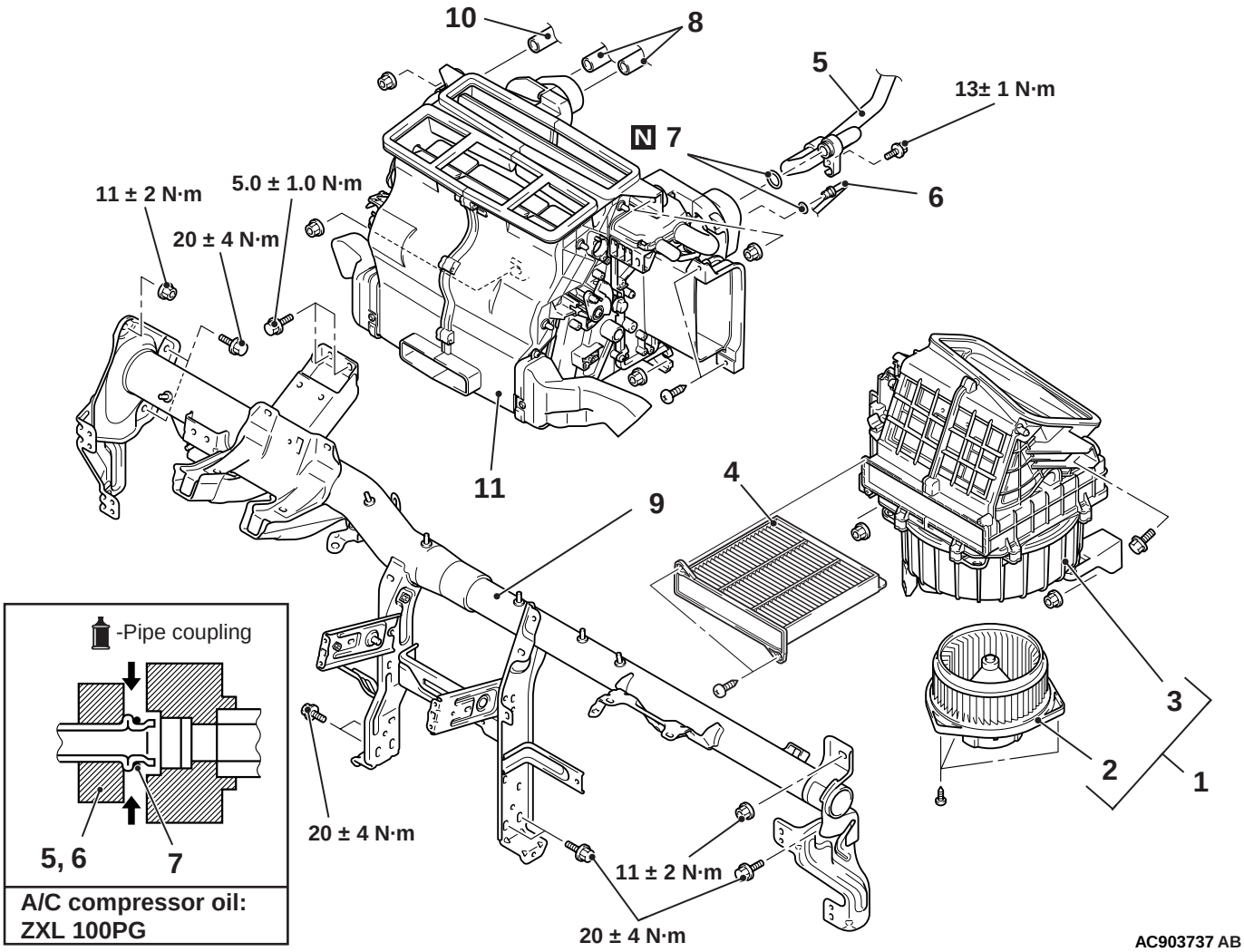
Spread out the claw section, and remove the cable.

HEATER UNIT AND COOLING UNIT

REMOVAL AND INSTALLATION

M1552016500411

Pre-removal and Post-installation Operation
- Refrigerant draining and Refilling (Refer to P.55A-63.)
- Steering column shaft assembly Removal and Installation (Refer to GROUP 37, Steering shaft).



Removal steps
- Glove box, passenger's side under cover <Except single cab>, Instrument panel side cover and glove box cover (Refer to GROUP 52A, Instrument Panel .) <<A>>
- <<A>>

1. Heater blower assembly
2. Blower motor
3. Case
4. Clean air filter <Vehicles with clean air filter>

Removal steps (Continued)
5. A/C compressor suction pipe connection
6. A/C condenser outlet pipe connection
7. A/C pipe O-ring
8. Heater hose
- Instrument panel assembly (Refer to GROUP 52A, Instrument Panel .)

9. Front deck crossmember
10. Hose
11. A/C cooling unit

REMOVAL SERVICE POINT

<<A>> A/C COMPRESSOR SUCTION PIPE AND A/C CONDENSER OUTLET PIPE DISCONNECTION

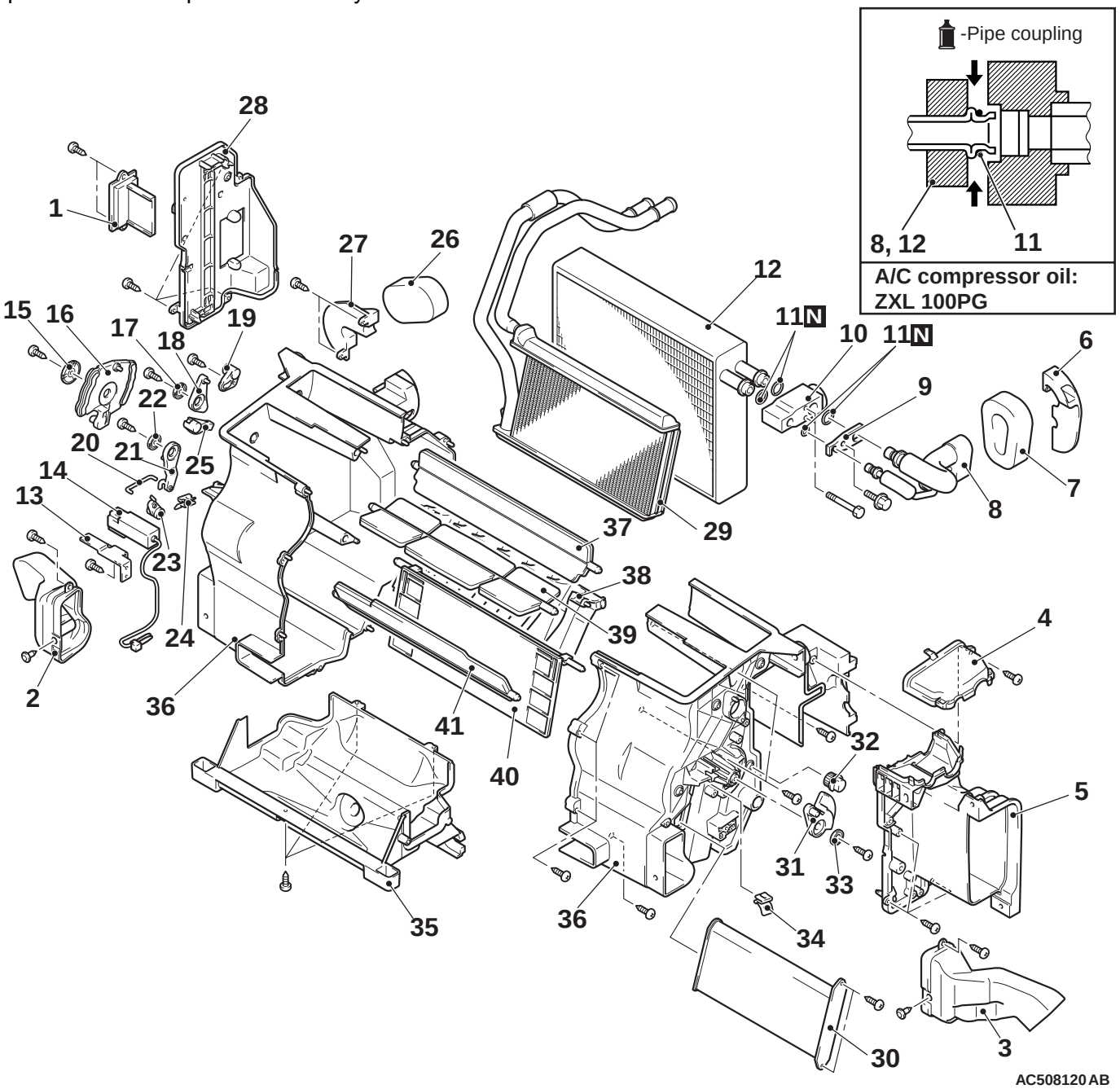
⚠ CAUTION

Use the plug which is not breathable because A/C compressor oil or receiver have high hygroscopicity.

Plug the removed nipple of the pipe, hose and expansion valve to prevent the entry of dust and dirt.

DISASSEMBLY AND REASSEMBLY <LHD>

M1551005401324



AC508120 AB

Disassembly steps

1. A/C temperature control resistor
2. Foot duct LH
3. Foot duct RH
4. Side cover upper

Disassembly steps (Continued)

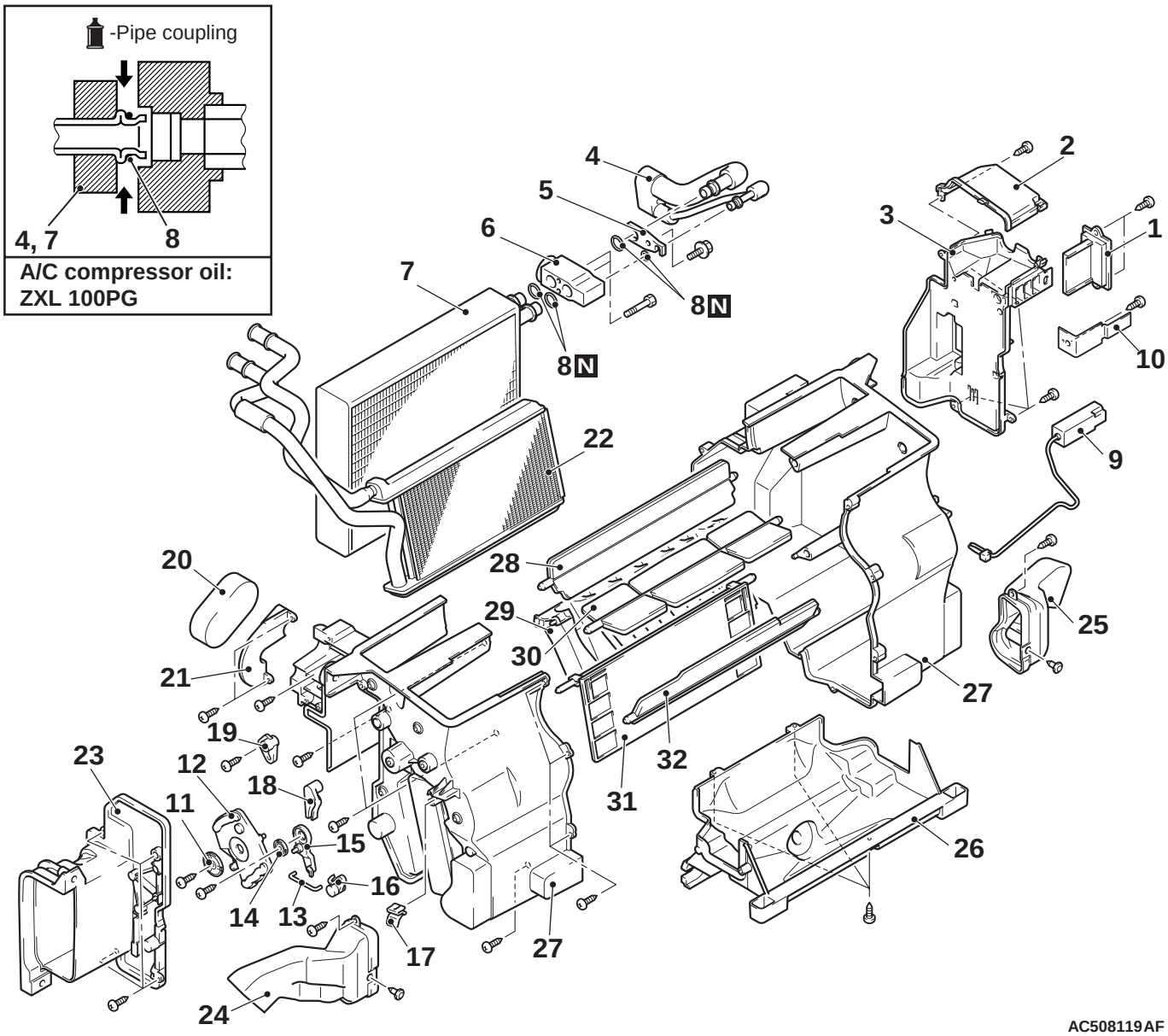
5. Side cover lower
6. Refrigerant dash cover
7. Refrigerant dash lining
8. A/C pipe

Disassembly steps (Continued)

9. A/C plate
10. A/C expansion valve
11. A/C pipe O-ring
12. A/C evaporator
13. A/C bracket
14. A/C evaporator air outlet thermistor
15. A/C washer
16. Heater air control damper link
17. A/C washer
18. Defroster sub lever
19. Vent lever
20. Rod
21. Foot lever A
22. A/C washer
23. Foot lever B
24. Cable clip
25. Defroster lever
26. Heater dash lining
27. Heater dash cover
28. Cover
29. Heater core
30. PTC heater <Vehicles with PTC heater>
31. Air mixing lever
32. Air mixing gear
33. A/C washer
34. Cable clip
35. Lower case
36. Case
37. Heater defroster air distribution damper
38. Air guide
39. Heater ventilation air distribution damper
40. Mode selection damper
41. Heater foot air distribution damper

DISASSEMBLY AND REASSEMBLY
<RHD>

M1551005401250



Disassembly steps

1. A/C temperature control resistor
2. Side cover upper
3. Side cover lower
4. A/C pipe
5. A/C plate
6. A/C expansion valve
7. A/C evaporator
8. A/C pipe O-ring
9. A/C evaporator air outlet thermistor
10. A/C bracket
11. A/C washer
12. Heater air control damper link
13. Rod
14. A/C washer
15. Foot lever A
16. Foot lever B

Disassembly steps (Continued)

17. Cable clip
18. Vent lever
19. Defroster lever
20. Heater dash lining
21. Heater dash cover
22. Heater core
23. Duct
24. Foot duct LH
25. Foot duct RH
26. Lower case
27. Case
28. Heater defroster air distribution damper
29. Air guide
30. Heater ventilation air distribution damper

Disassembly steps (Continued)

31. Mode selection damper
32. Heater foot air distribution damper

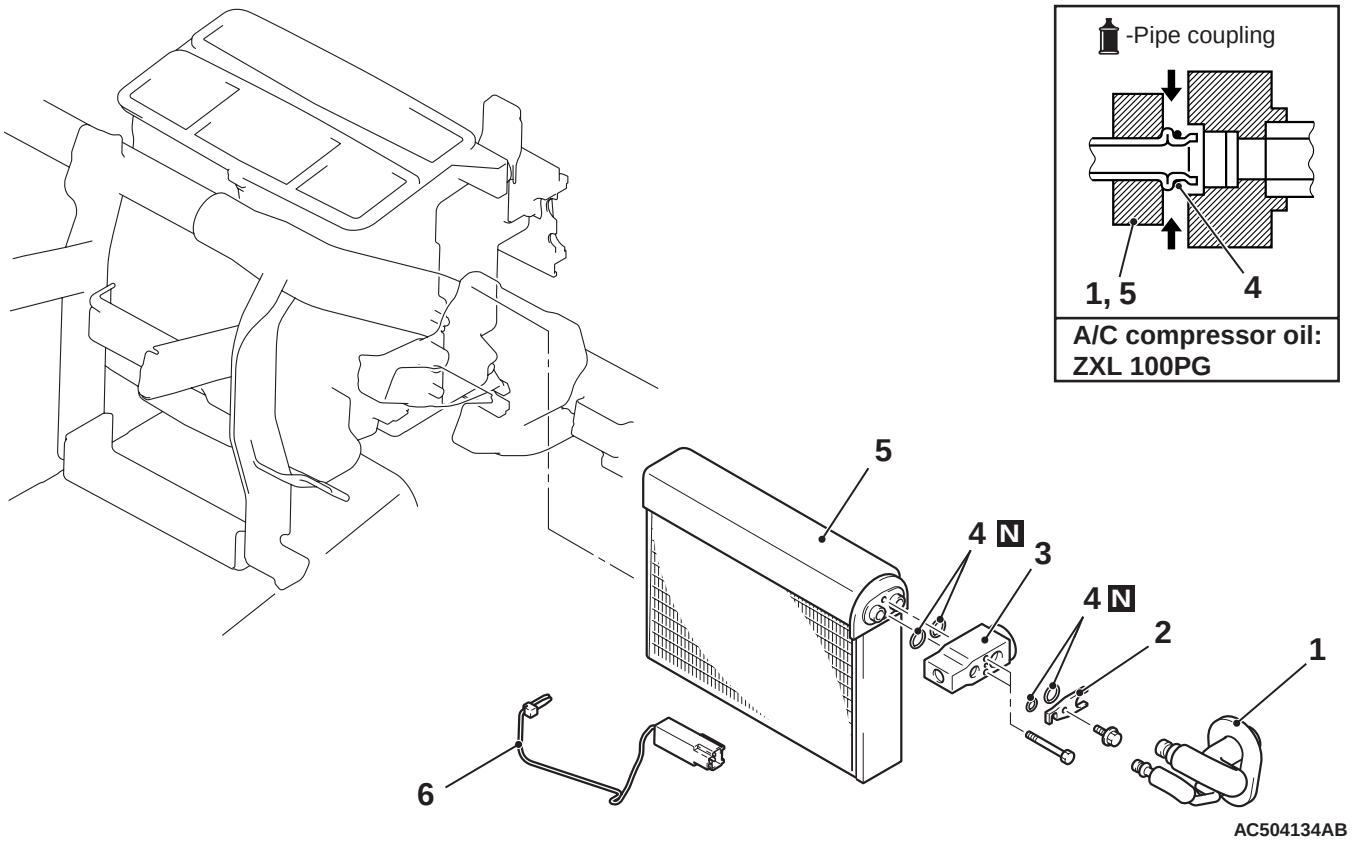
EVAPORATOR ASSEMBLY

REMOVAL AND INSTALLATION

M1552003600827

Pre-removal and Post-installation Operation

- Refrigerant draining and Refilling (Refer to P.55A-63.)
- Instrument Panel Removal and Installation (Refer to .)
- Steering column shaft assembly Removal and Installation (Refer to GROUP 37, Steering shaft).
- Clutch pedal assembly Removal and Installation (Refer to GROUP 21A, Clutch pedal).
- A/C compressor suction pipe and A/C condenser outlet pipe connection (Refer to P.55A-85).



Removal steps

- Heater blower assembly (Refer to P.55A-73.)

1. A/C pipe
2. A/C plate

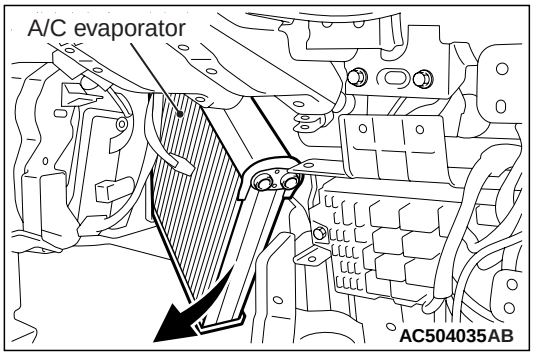
<<A>>

Removal steps (Continued)

3. A/C expansion valve
4. A/C pipe O-ring
5. A/C evaporator
6. A/C evaporator air outlet thermistor

REMOVAL SERVICE POINT

<<A>> A/C EVAPORATOR REMOVAL

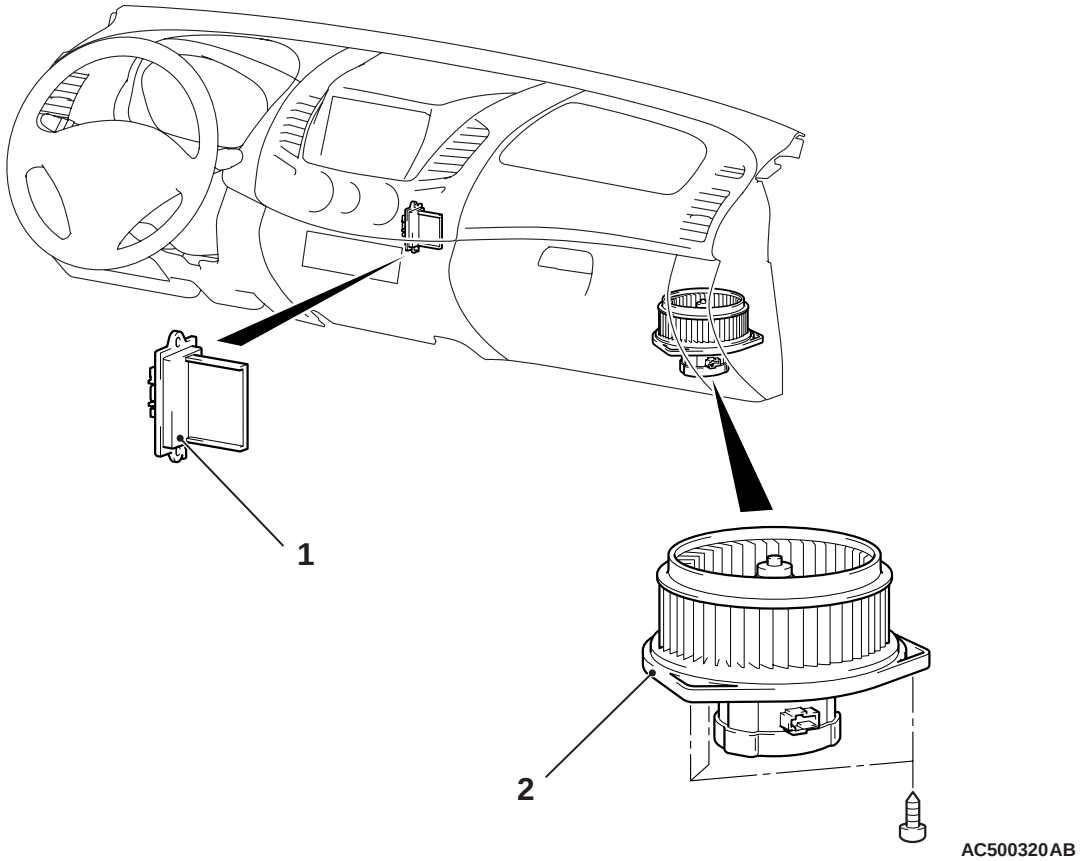


To remove the A/C evaporator, remove it while tilting to the direction of the arrow.

BLOWER ASSEMBLY AND RESISTOR

REMOVAL AND INSTALLATION

M1551002800717



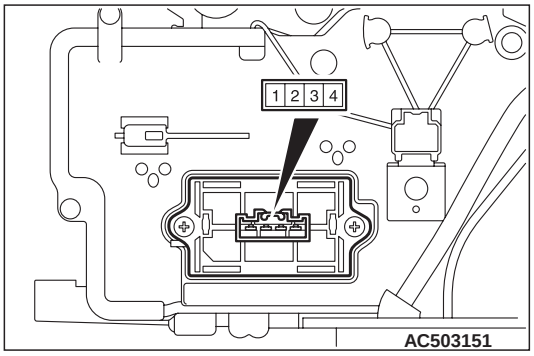
Resistor removal step
1. A/C temperature control resistor

Blower motor removal step
2. Blower motor

INSPECTION

M1551006300866

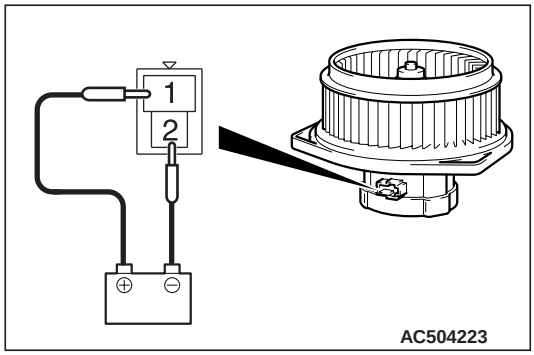
A/C TEMPERATURE CONTROL RESISTOR CHECK



STANDARD VALUE:

Measurement terminal	Standard value (Ω)
Between terminal Nos. 1 and 4	2.54
Between terminal Nos. 1 and 3	1.24
Between terminal Nos. 1 and 2	0.60

BLOWER FAN AND MOTOR CHECK



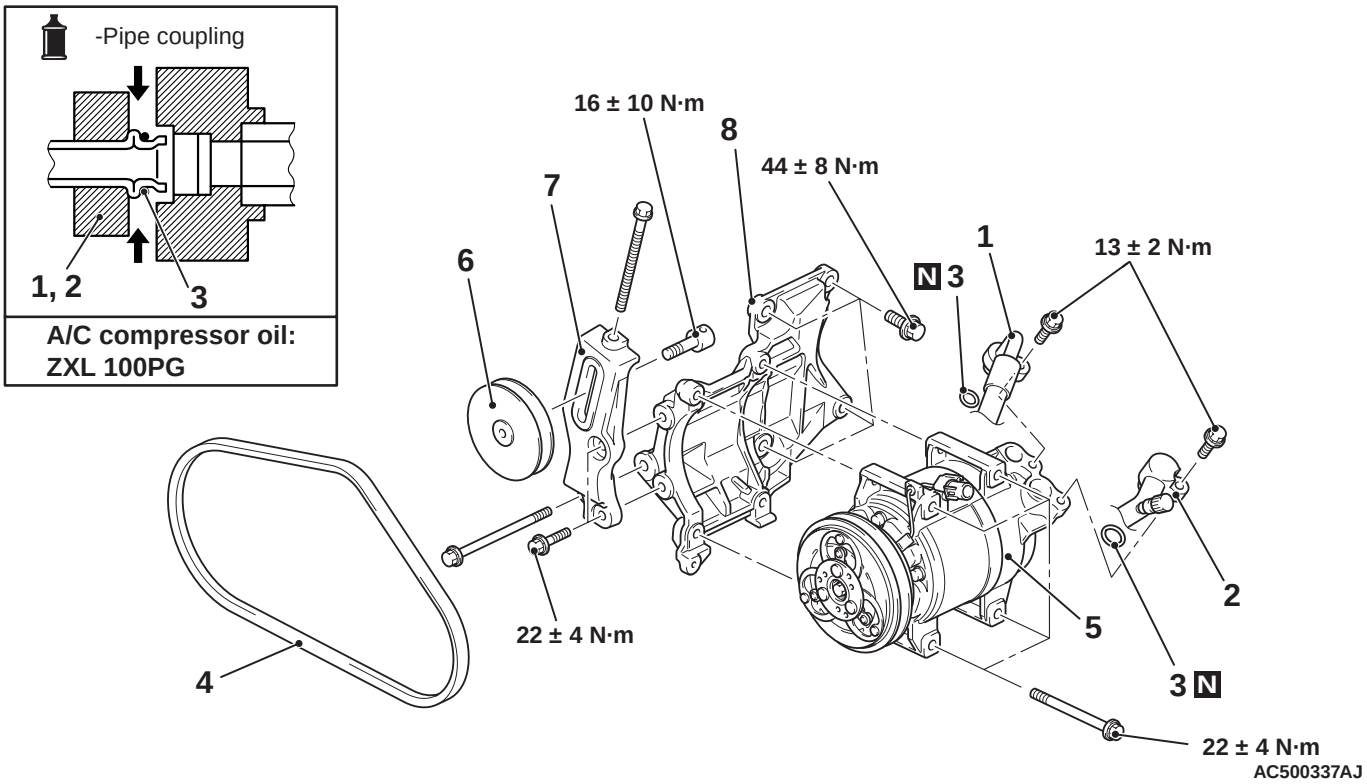
Check that the motor turns when applying battery power between the connector terminals. Also check to see that there is no abnormal sound emitted from the motor at this time.

COMPRESSOR ASSEMBLY

REMOVAL AND INSTALLATION

M1552004403007

Pre-removal Operation	Post-installation Operation
• Refrigerant Discharging (Refer to P.55A-63.) • Under skid plate, Engine room under cover removal (Refer to GROUP 51 .) • Front overfender Removal (Refer to GROUP 51 .)	• Refrigerant Charging (Refer to P.55A-63.) • A/C compressor drive belt tension check and adjustment (Refer to GROUP 11A, On-Vehicle Service, A/C compressor drive belt tension check and adjustment.) • Under skid plate, Engine room under cover installation (Refer to GROUP 51 .) • Front overfender installation (Refer to GROUP 51 .)



		Removal steps
<<A>>		1. A/C compressor discharge hose
<<A>>		2. A/C compressor suction hose
		3. A/C piping O-ring
<<B>>		4. A/C compressor drive belt
<<C>>	>>A<<	5. A/C compressor and clutch assembly
		6. Tension pulley
		7. A/C compressor tension pulley bracket
		8. A/C compressor bracket

REMOVAL SERVICE POINTS

<<A>> A/C COMPRESSOR DISCHARGE HOSE AND A/C COMPRESSOR SUCTION HOSE DISCONNECTION

⚠ CAUTION

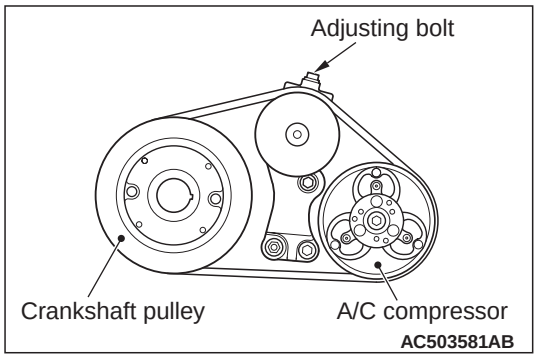
Use the plug which is not breathable because A/C compressor oil or receiver have high hygroscopicity.

Plug the removed nipple of the pipe to prevent the entry of dust and dirt.

<<B>> A/C COMPRESSOR DRIVE BELT REMOVAL

⚠ CAUTION

To reuse the drive belt, draw an arrow indicating the rotating direction (to the right) on the back of the belt using chalk, etc.



Turn the adjusting bolt anti-clockwise (in the left turn), and remove the drive belt.

<<C>> A/C COMPRESSOR AND CLUTCH ASSEMBLY REMOVAL

Be careful not to spill the A/C compressor oil and remove the A/C compressor.

INSTALLATION SERVICE POINT

>>A<< A/C COMPRESSOR AND CLUTCH ASSEMBLY INSTALLATION

When installing the new A/C compressor, install the A/C compressor after adjusting the oil volume as follows.

1. Measure the oil of A/C compressor removed.(X mL)
2. Drain the oil (Y mL) given by the following expression from a new A/C compressor, and then install the A/C compressor.

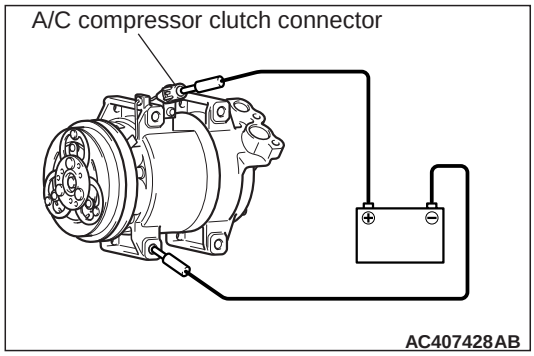
   120 mL - X mL = Y mL

   NOTE:
   - *120 mL shows the oil volume contained in the new A/C compressor.*
   - *Y mL shows the oil volume stored in the refrigerant line, condenser, and cooling unit, etc.*

INSPECTION

M1552004501053

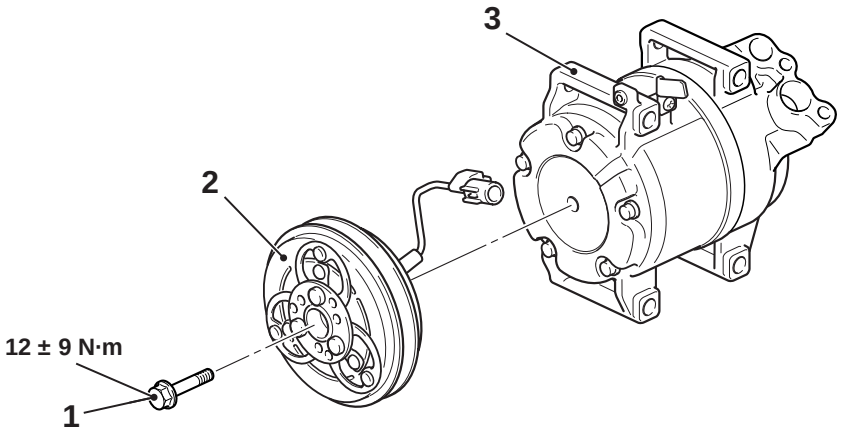
COMPRESSOR MAGNETIC CLUTCH OPERATION CHECK



Connect the connector battery to positive battery terminal in the A/C compressor, and then earth the battery (−) terminal to the A/C compressor itself. At this time, check that the magnetic clutch operating sound can be heard.

DISASSEMBLY AND REASSEMBLY

M1552004601856



Disassembly steps

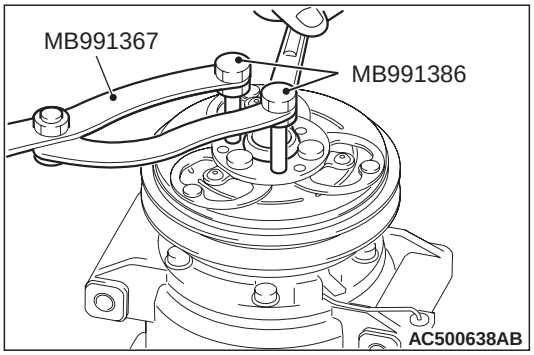
	>>B<<	•	Air gap adjustment
<<A>>	>>A<<	1.	Bolt

Disassembly steps (Continued)

2. A/C compressor clutch assembly
3. A/C compressor assembly

DISASSEMBLY SERVICE POINT

<<A>> BOLT REMOVAL



Use the special tools to remove the bolt.

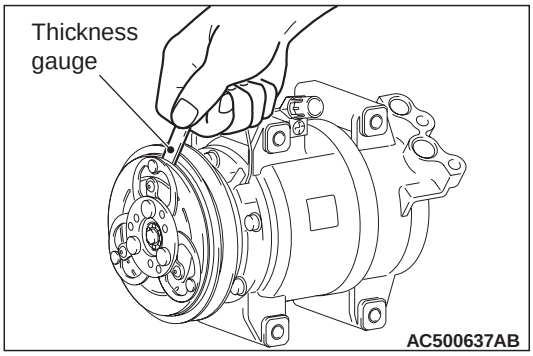
- Special spanner (MB991367)
- Pin (MB991386)

REASSEMBLY SERVICE POINTS

>>A<< BOLT INSTALLATION

Use the special tool as during removal to secure the armature and tighten the bolt.

>>B<< AIR GAP ADJUSTMENT



Check that the air gap of clutch satisfies the standard value.

Standard value: 0.3 – 0.6 mm

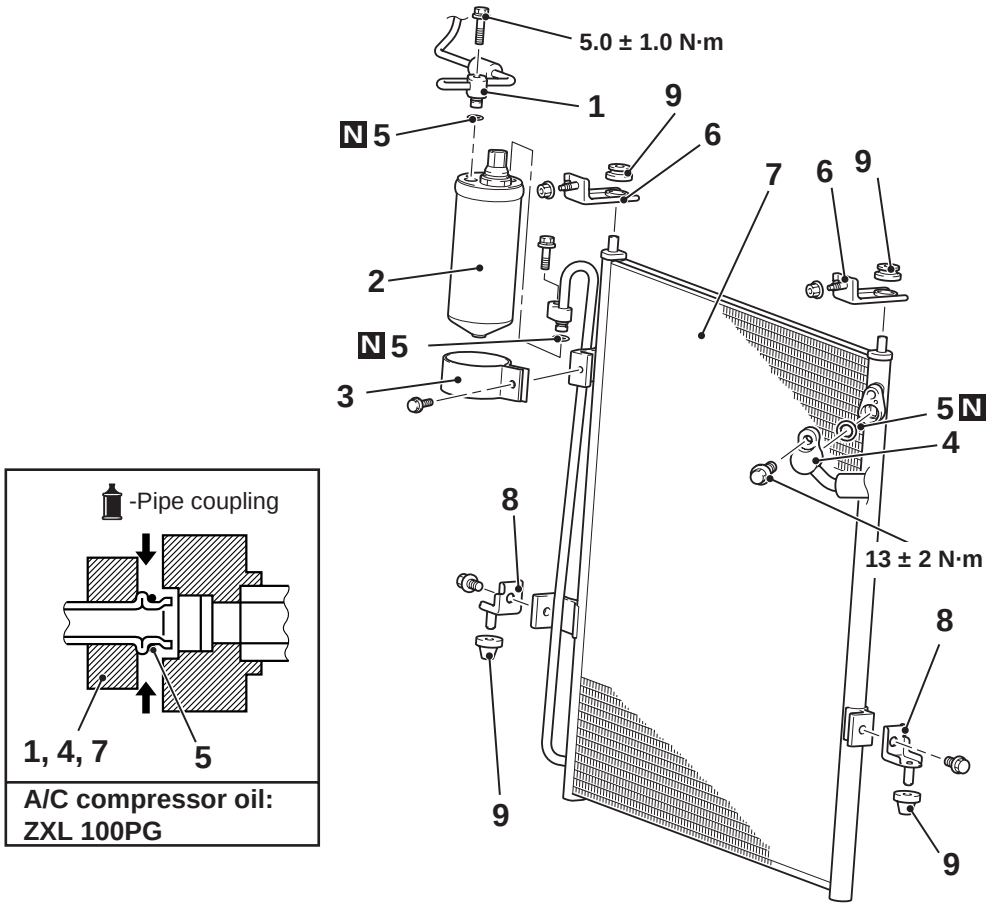
CONDENSER ASSEMBLY <Vehicles with condenser fan>

REMOVAL AND INSTALLATION

M1552015401588

Pre-removal and Post-installation Operation
- Refrigerant draining and Refilling (Refer to P.55A-63.)
- Radiator grilles (Refer to GROUP 51 .)

<VEHICLES WITHOUT CONDENSER FAN>



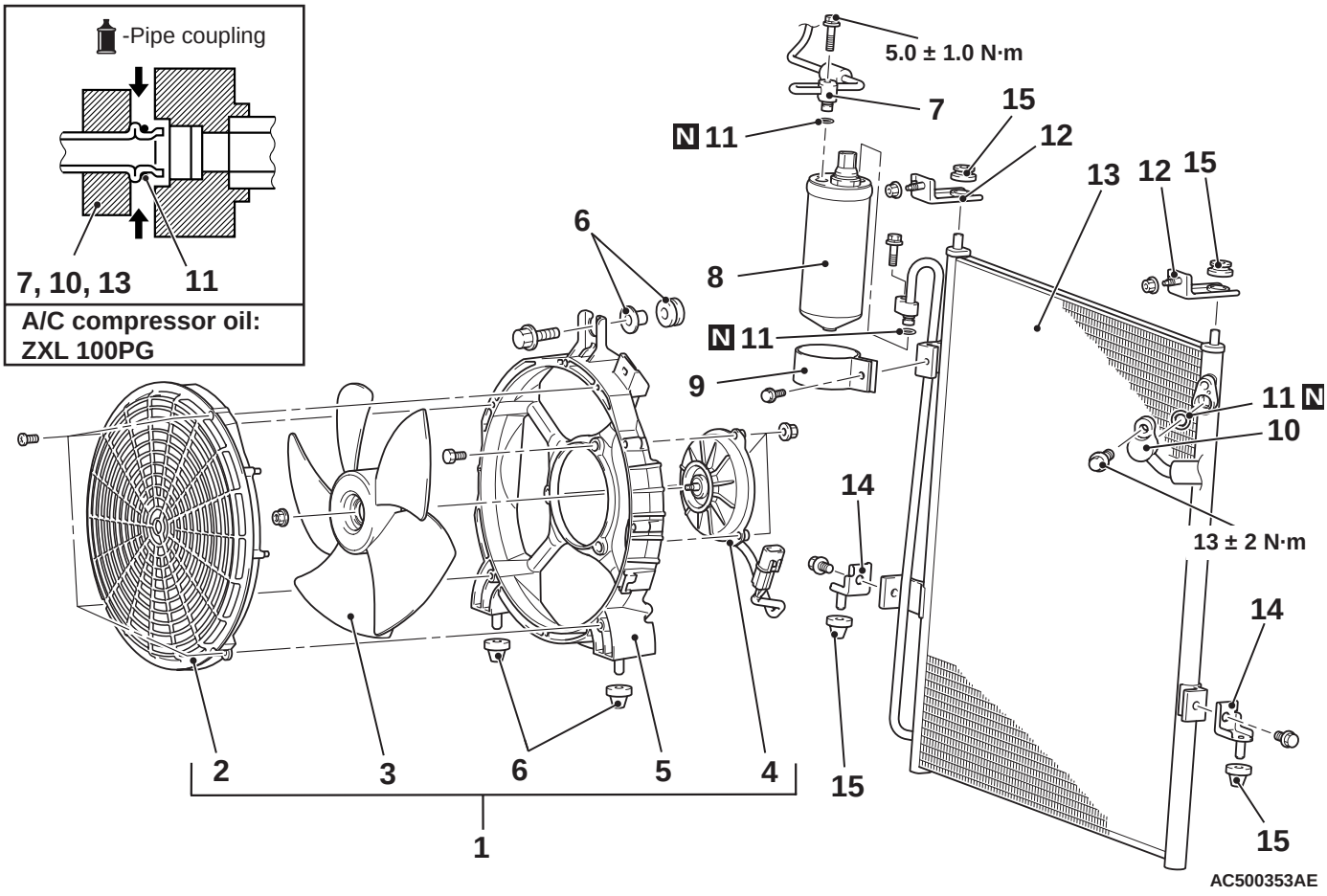
A/C condenser removal steps

<<A>> 1. A/C condenser outlet pipe
2. A/C receiver assembly
3. A/C condenser clamp (Receiver)
<<A>> 4. A/C compressor discharge hose
5. A/C pipe O-ring
- Air cleaner body (Refer to GROUP 15 .)

A/C condenser removal steps

6. A/C condenser bracket
7. A/C refrigerant condenser assembly
8. A/C condenser clamp (Condenser)
9. A/C condenser bushing

<VEHICLES WITH CONDENSER FAN>



A/C condenser fan removal steps

1. A/C condenser fan motor and shroud
2. A/C condenser grille
3. A/C condenser fan
4. A/C condenser fan motor
5. A/C condenser fan shroud
6. A/C condenser bushing

A/C condenser removal steps

<<A>> 7. A/C condenser outlet pipe
8. A/C receiver assembly
9. A/C condenser clamp (Receiver)
<<A>> 10. A/C compressor discharge hose
11. A/C pipe O-ring
- Air cleaner body (Refer to GROUP 15 .)

12. A/C condenser bracket
13. A/C refrigerant condenser assembly
14. A/C condenser clamp (Condenser)
15. A/C condenser bushing

REMOVAL SERVICE POINT

<<A>> A/C CONDENSER OUTLET PIPE AND A/C COMPRESSOR DISCHARGE HOSE DISCONNECTION

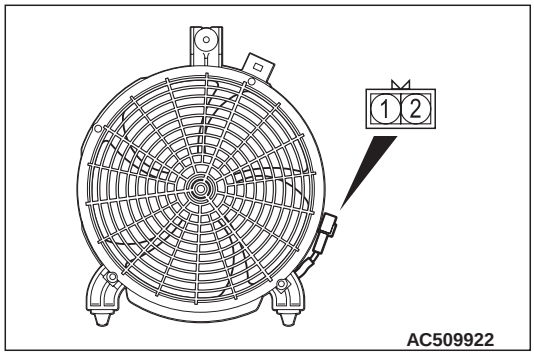
⚠ CAUTION

Use the plug which is not breathable because A/C compressor oil or receiver have high hygroscopicity.

Plug the removed nipple of the pipe, hose to prevent the entry of dust and dirt.

INSPECTION

M1551006300587



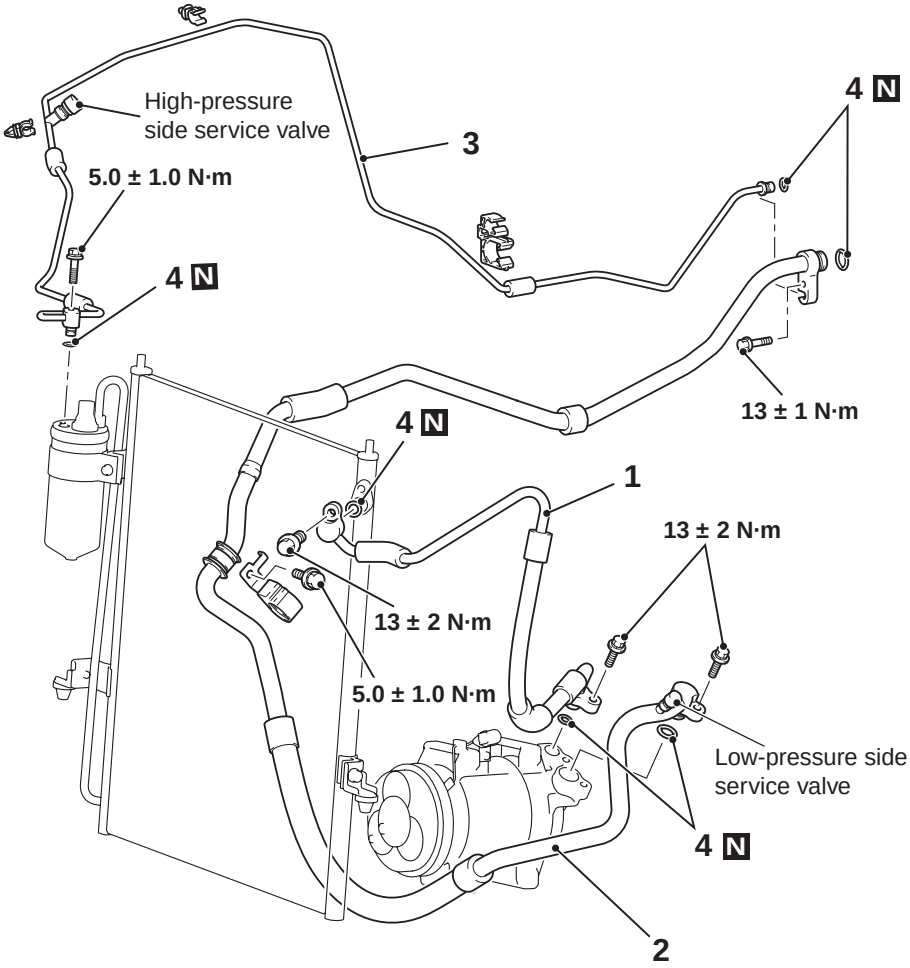
When battery voltage is applied between the terminals, check that the motor operates. Also, check that there is no abnormal noise.

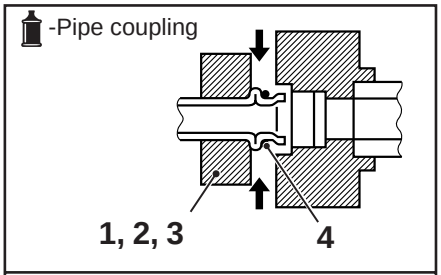
REFRIGERANT LINE

REMOVAL AND INSTALLATION

M1552006402420

Pre-removal and Post-installation Operation
- Refrigerant Draining and Refilling (Refer to P.55A-63.)
- Front overfender Removal and installation (Refer to GROUP 51 .)





A/C compressor oil: ZXL 100PG

AC805191AB

Removal steps

<<A>> 1. A/C compressor discharge hose
- Air cleaner body (Refer to GROUP 15 .)

<<A>> 2. A/C compressor suction hose

3. A/C condenser outlet pipe

4 A/C pipe O-ring

REMOVAL SERVICE POINT

<<A>> HOSE/PIPE DISCONNECTION

⚠ CAUTION

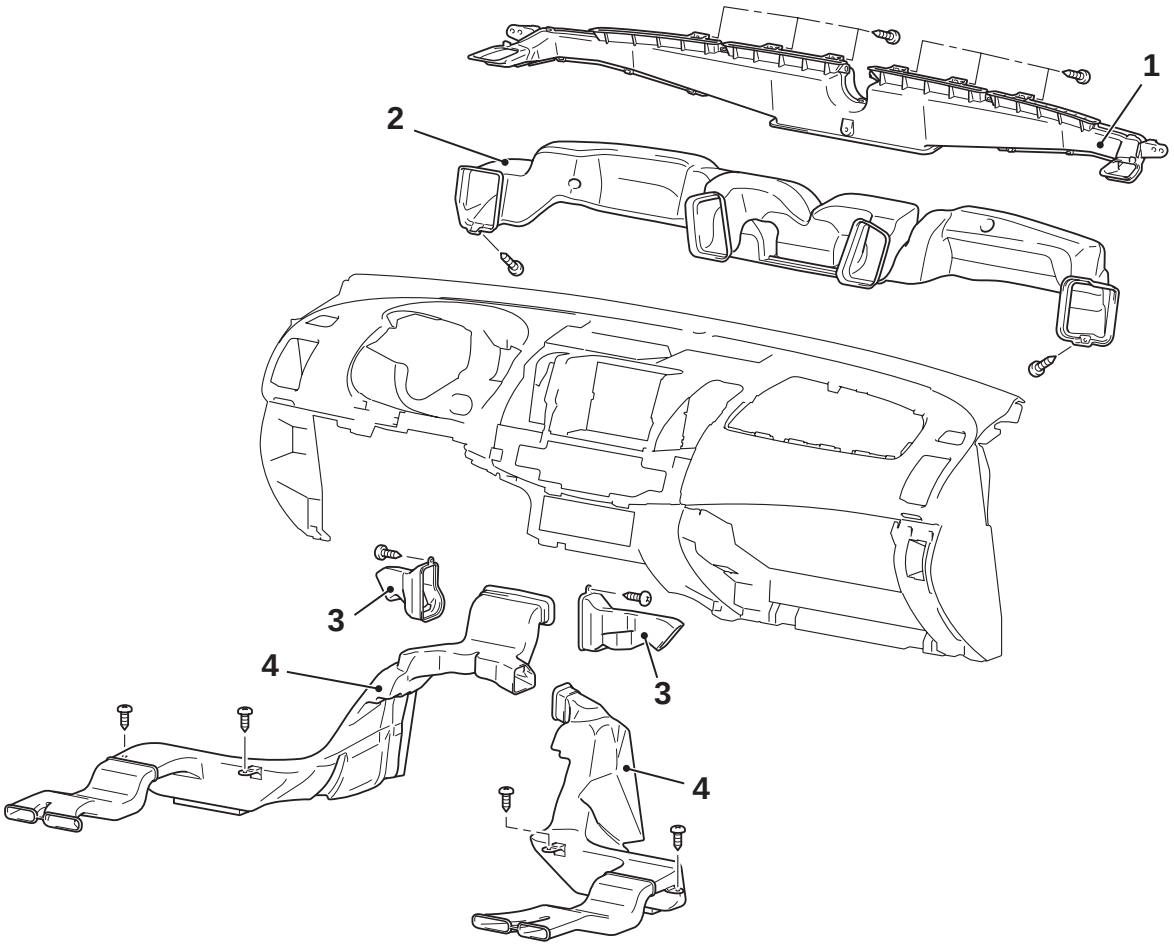
As the compressor oil and receiver are highly moisture absorbent, use a non-porous material to plug the hose and nipples.

To prevent the entry of other foreign bodies, plug the A/C refrigerant condenser assembly and A/C compressor and clutch assembly nipples.

DUCTS

REMOVAL AND INSTALLATION

M1553001001160



AC509695AC

Defroster nozzle and ventilation air distribution duct removal steps

- Instrument panel assembly (Refer to GROUP 52A, Instrument panel .)

1. Defroster nozzle
2. Ventilation air distribution duct

Foot duct and rear heater duct removal steps

- Lower panel assembly (Refer to GROUP 52A, Instrument panel .)

3. Foot duct

- Front floor console assembly (Refer to GROUP 52A, front floor console assembly .)
- Front seat assembly (Refer to GROUP 52A, Front Seat Assembly .)

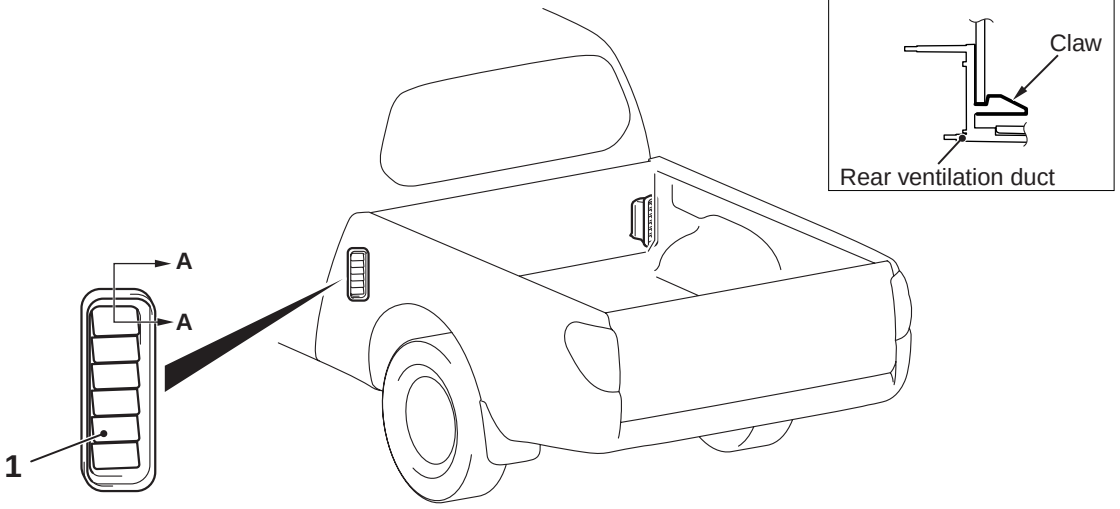
4. Rear heater duct

VENTILATORS

REMOVAL AND INSTALLATION

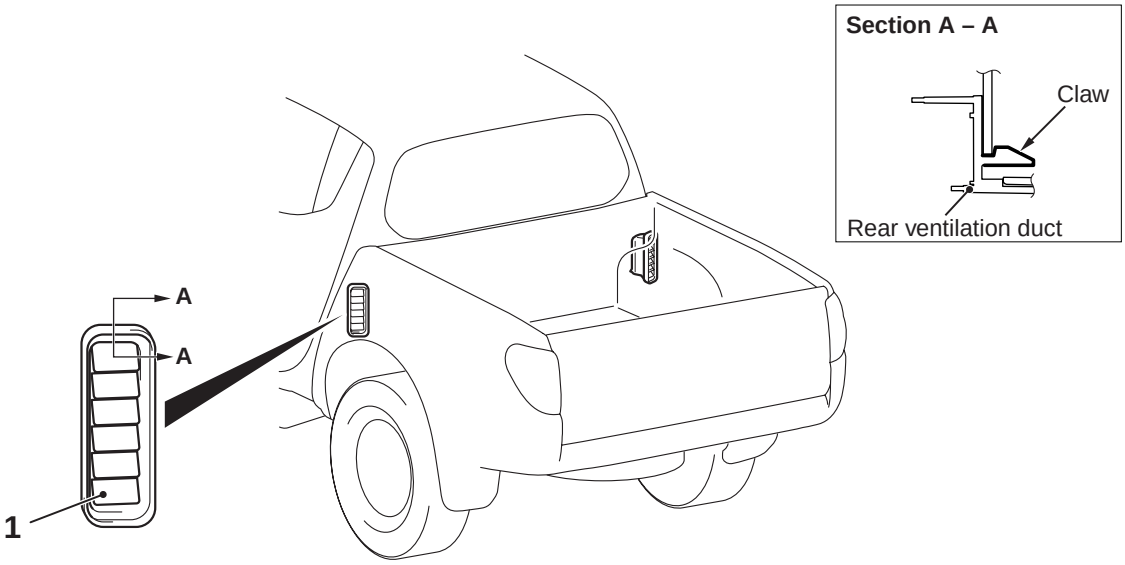
M1553002800683

<SINGLE CAB, CLUB CAB (Europe)>



AC500404AH

<DOUBLE CAB>



AC507125AC

Removal step

- Rear body

1. Rear ventilation duct

GROUP 55B

AUTOMATIC AIR CONDITIONER

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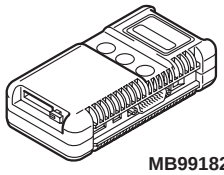
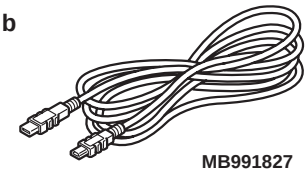
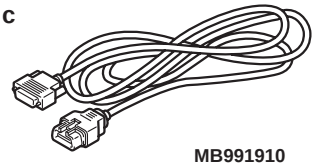
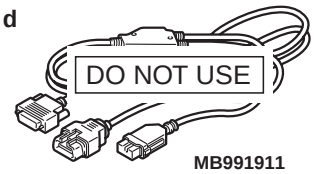
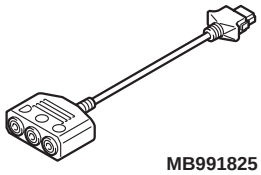
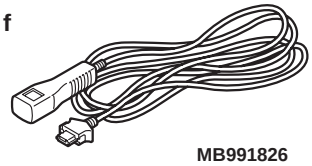
SERVICE SPECIFICATIONS

M1554000300317

Item		Standard value
Resistance value for air mixing damper control motor and potentiometer kΩ	MAX HOT	Approximately 1.20
	MAX COOL	Approximately 4.80
Resistance value for mode selection damper control motor and potentiometer kΩ	FACE	Approximately 1.20
	DEF	Approximately 4.80

SPECIAL TOOL

M1555000600281

Tool	Number	Name	Use
a  MB991824 b  MB991827 c  MB991910 d  MB991911 e  MB991825 f  MB991826 MB991955	MB991955 a. MB991824 b. MB991827 c. MB991910 d. MB991911 e. MB991825 f. MB991826	M.U.T.-III sub-assembly a. Vehicle Communication Interface (V. C. I). b. USB cable c. M.U.T.-III main harness A (applicable to vehicles with CAN communication) d. M.U.T.-III main harness B (applicable to vehicles without CAN communication) e. Measurement adapter f. Trigger harness	⚠ CAUTION **For vehicles with CAN communication, use M.U.T.-III main harness A to send simulated vehicle speed. If you connect M.U.T.-III main harness B instead, the CAN communication does not function correctly.** Check the A/C (The M.U.T.-III DTCs display, service data display and actuator test)

TROUBLESHOOTING

DIAGNOSIS TROUBLESHOOTING FLOW

M1554004700986

Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points .

DIAGNOSIS FUNCTION

M1554004800950

HOW TO READ DIAGNOSIS CODE

Connect the M.U.T.-III to the 16-pin diagnosis connector to read diagnosis code (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points).

HOW TO ERASE DIAGNOSIS CODE

Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points .

CHECK OF FREEZE FRAME DATA

To detect fault and store the diagnosis code, the ETACS-ECU obtains data before the confirmation of the diagnosis code and data when the diagnosis code is confirmed, and then stores the current condition of the ETACS-ECU. By analysing each data from M.U.T.-III, the troubleshooting can be performed more efficiently. Display items of the freeze frame data are as follows.

Display item list

Item No.	Item name	Data item	Unit
3	Elapsed time	Total elapsed time after a diagnosis code is generated	min*
4	Accumulated minute	Cumulative time for current malfunction of diagnosis code	min

*NOTE: *: Total elapsed time can be stored up to 65534 minutes. The display of M.U.T.-III is fixed to 65534 minutes after 65534 minutes have elapsed. Or, if the battery is disconnected, the total elapsed time cannot be measured properly. Thus, 65535 minutes (null value) is displayed. Since the value is calculated according to the information from the ETACS-ECU, a proper value may not be displayed when the ETACS-ECU time-out has occurred.*

DIAGNOSIS CODE CHART

M1554004901693

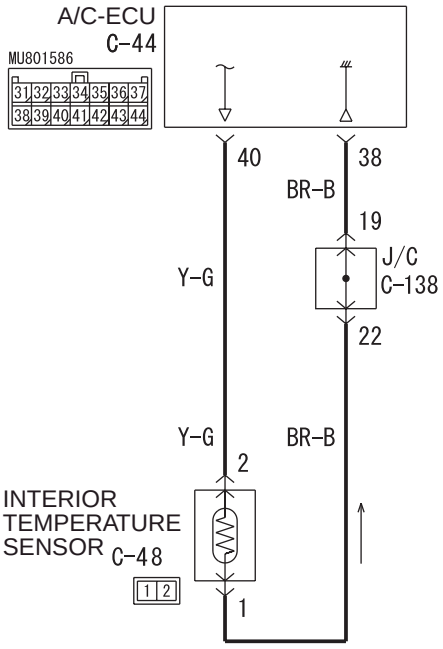
Code No.	Diagnostic item	Reference page	Service data display contents when diagnosis code is set
B1001	Interior temperature sensor system (short circuit)	P.55B-5	25°C
B1002	Interior temperature sensor system (open circuit)	P.55B-5	
B1011	Ambient temperature sensor system (short circuit)	P.55B-8	20°C
B1012	Ambient temperature sensor system (open circuit)	P.55B-8	
B1021	Air thermo sensor system (short circuit)	P.55B-11	–6°C
B1022	Air thermo sensor system (open circuit)	P.55B-11	
B1041	Potentiometer system for the air mixing damper (short to power supply)	P.55B-13	Moved to MAX HOT position
B1042	Potentiometer system for the air mixing damper (short to earth or open circuit)	P.55B-13	
B1045	Motor drive system for the air mixing damper <LHD>	P.55B-16	–
B1045	Motor drive system for the air mixing damper <RHD (Europe)>	P.55B-17	–

Code No.	Diagnostic item	Reference page	Service data display contents when diagnosis code is set
B1061	Potentiometer system for mode selection damper (short to power supply)	P.55B-18	Moved to DEF position
B1062	Potentiometer system for mode selection damper (short to earth or open circuit)	P.55B-18	
B1065	Motor drive system for mode selection damper	P.55B-20	–

DIAGNOSIS CODE PROCEDURES

Code No.B1001,B1002: Interior temperature sensor system

Interior Temperature Sensor Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

AC805734 AC
W6C55E000A

DIAGNOSIS CODE SET CONDITION

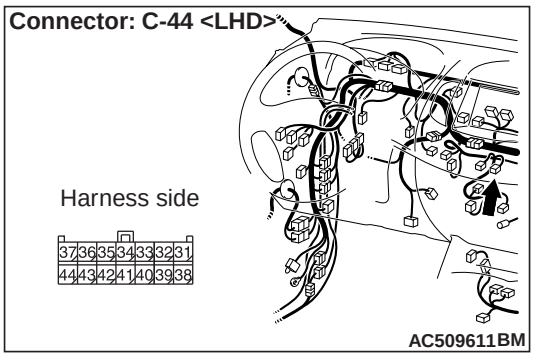
This code is set when the interior temperature sensor circuit is open (Code No.B1002) or is short (Code No.B1001).

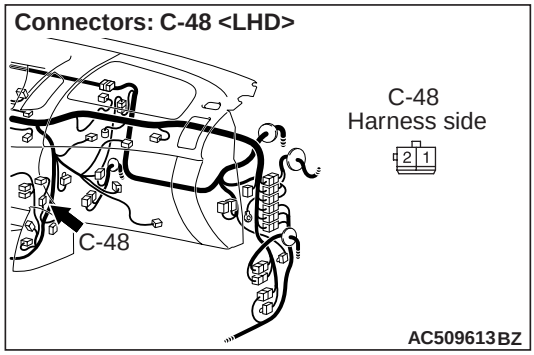
POSSIBLE CAUSES

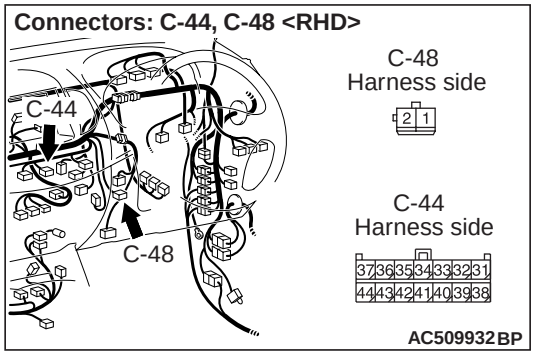
- Malfunction of the interior temperature sensor
- Damaged the wiring harness or connectors
- Malfunction of the automatic A/C control panel (A/C-ECU)

DIAGNOSIS PROCEDURE

STEP 1. Connector check: C-44 A/C-ECU connector and C-48 interior temperature sensor connector



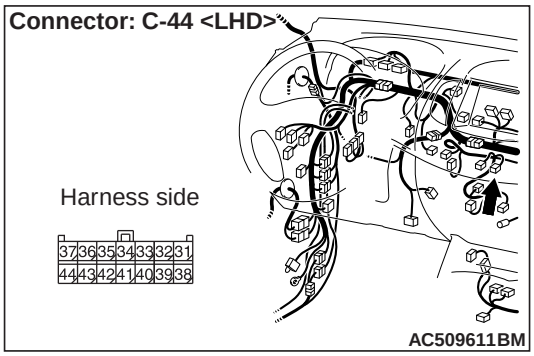


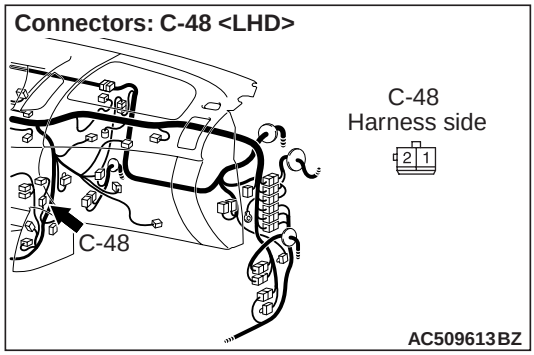


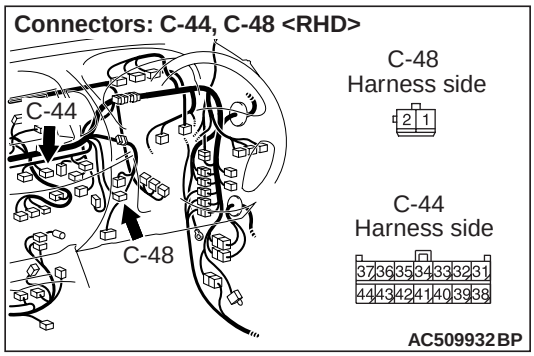
Q: Is the check result normal?

YES : Go to Step 2.
NO : Repair the connector.

STEP 2. Check the wiring harness between C-44 A/C-ECU connector (terminals 40 and 38) and C-48 interior temperature sensor connector (terminals 2 and 1).







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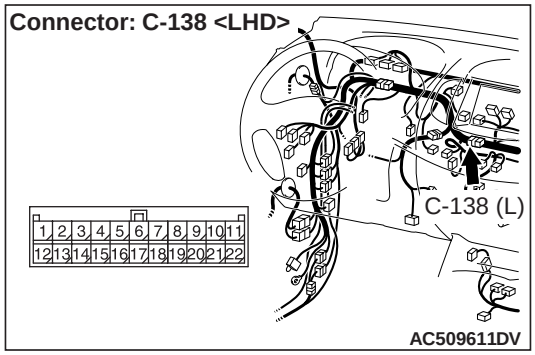
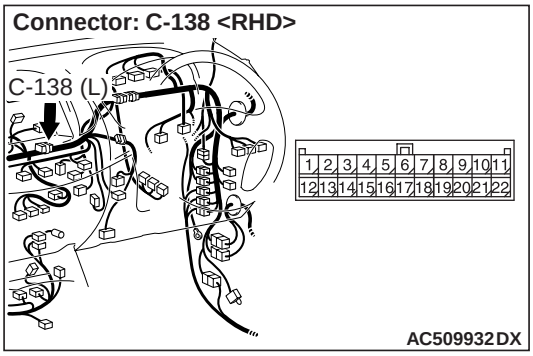




Prior to the wiring harness inspection, check joint connector C-138, and repair if necessary.

- Check the sensor signal line and earth line for open and short circuit.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the wiring harness.

STEP 3. Check the interior temperature sensor.
Refer to P.55B-99.

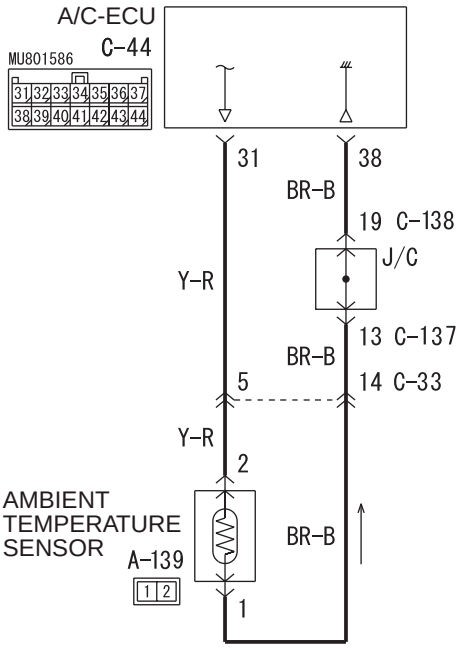
Q: Is the check result normal?
YES : Go to Step 4.
NO : Replace the interior temperature sensor.

STEP 4. Check whether the diagnosis code is reset.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction).
NO : Replace the automatic A/C control panel (A/C-ECU).

Code No. B1011,B1012: Ambient temperature sensor system

Ambient Temperature Sensor Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

W6C55E001A

COMMENTS ON TROUBLE SYMPTOM

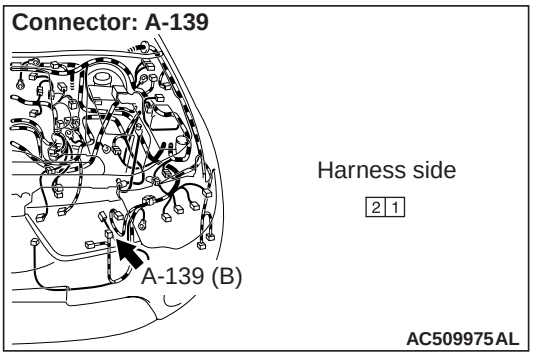
This code is set when the ambient temperature sensor circuit is open (Code No.B1012) or is short (Code No.B1011).

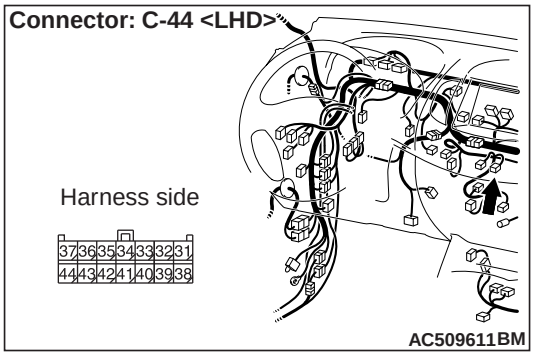
PROBABLE CAUSES

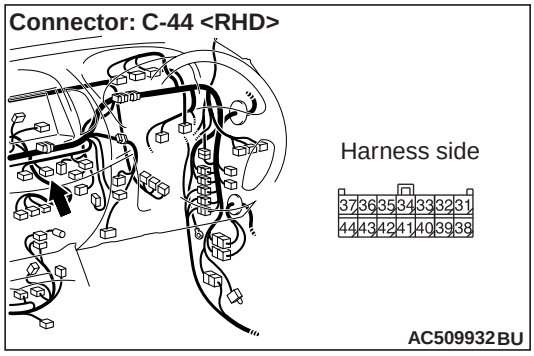
- Malfunction of the ambient temperature sensor
- Damaged the wiring harness and connectors
- Malfunction of the automatic A/C control panel (A/C-ECU)

DIAGNOSIS PROCEDURE

STEP 1. Connector check: A-139 ambient temperature sensor connector and C-44 A/C-ECU connector



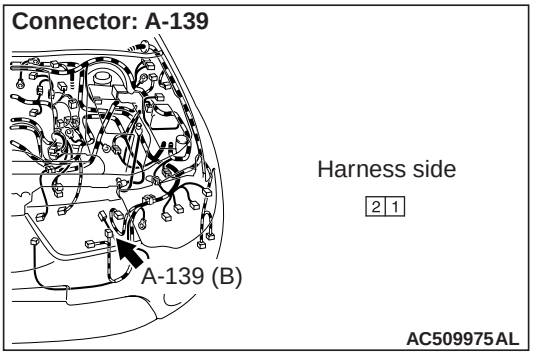


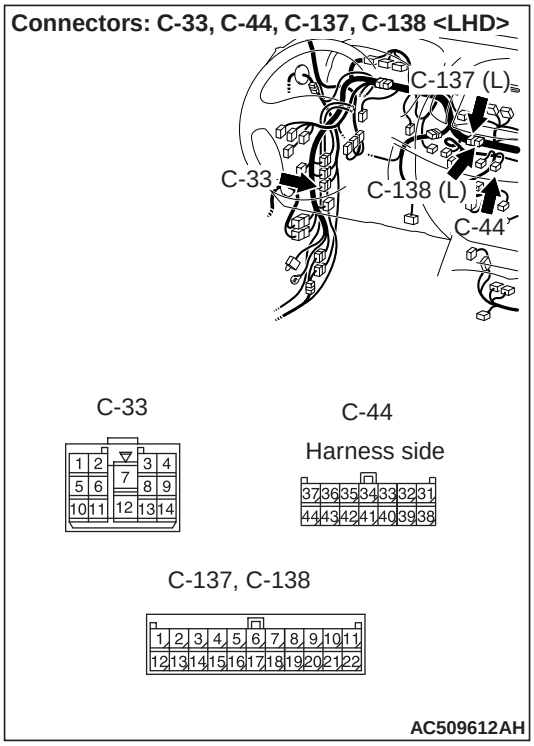


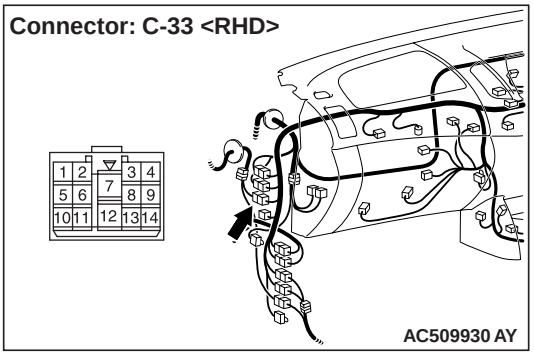
Q: Is the check result normal?

YES : Go to Step 2.
NO : Repair the connector.

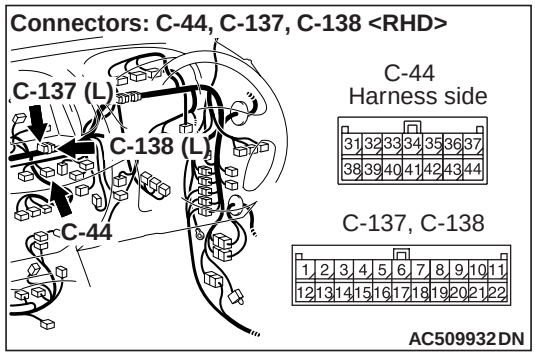
STEP 2. Check the wiring harness between A-139 ambient temperature sensor connector (terminals 1 and 2) and C-44 A/C-ECU connector (terminals 38 and 31).







NOTE:



Prior to the wiring harness inspection, check intermediate connector C-33, joint connectors C-137 and C-138, and repair if necessary.

- Check the sensor signal line and earth line for open and short circuit.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the wiring harness.

STEP 3. Check the ambient temperature sensor.
Refer to P.55B-99.

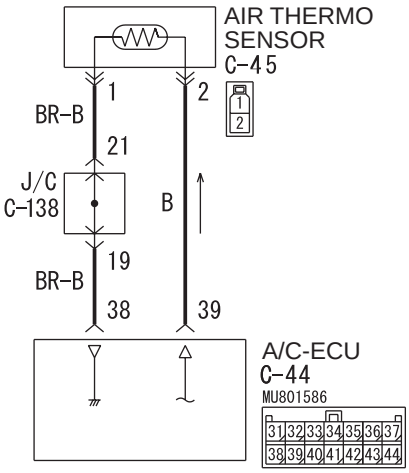
Q: Is the check result normal?
YES : Go to Step 4.
NO : Replace the ambient temperature sensor.

STEP 4. M.U.T.-III diagnosis code

Q: Is the diagnosis code set?
YES : Replace the automatic A/C control panel (A/C-ECU).
NO : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No. B1021,B1022: Air Thermo Sensor system

Air Thermo Sensor Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

W6C55E002A

COMMENTS ON TROUBLE SYMPTOM

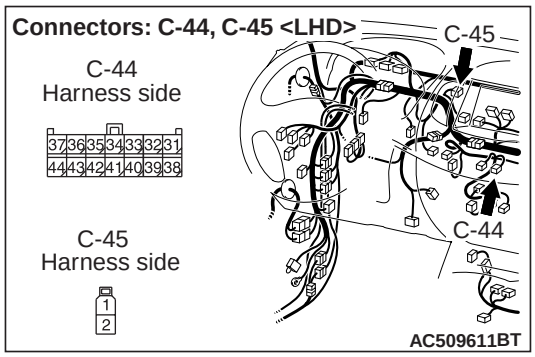
This code is set when the air thermo sensor circuit is open (Code No.B1022) or is short (Code No.B1021).

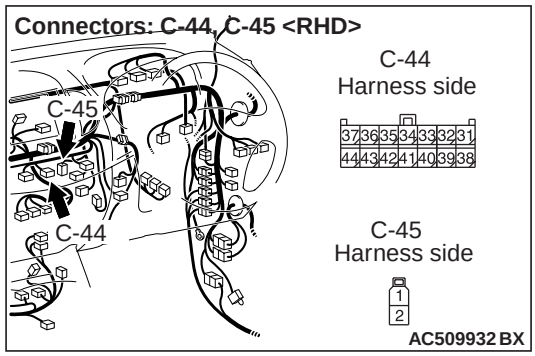
PROBABLE CAUSES

- Malfunction of the air thermo sensor
- Damaged the wiring harness or connectors
- Malfunction of the automatic A/C control panel (A/C-ECU)

DIAGNOSIS PROCEDURE

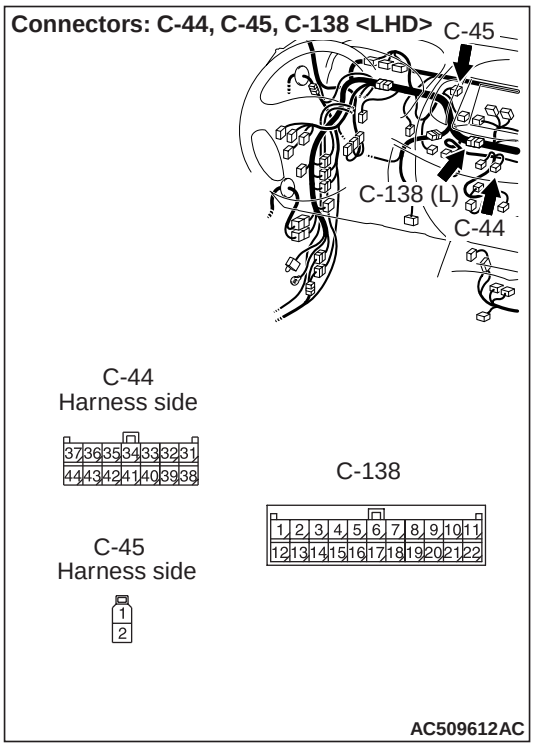
STEP 1. Connector check: C-44 A/C-ECU connector and C-45 air thermo sensor connector

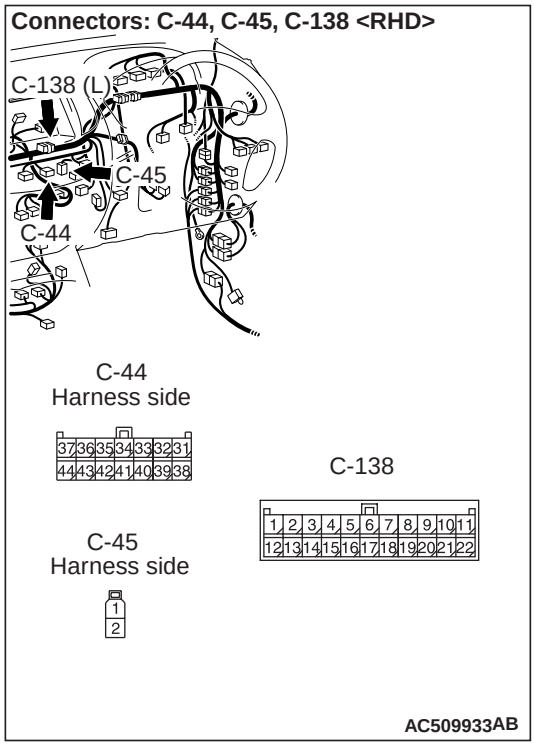




Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the connector.

STEP 2. Check the wiring harness between C-44 A/C-ECU connector (terminals 39 and 38) and C-45 air thermo sensor connector (terminals 2 and 1).





NOTE: Prior to the wiring harness inspection, check joint connector C-138, and repair if necessary.

- Check the sensor signal line and earth line for open and short circuit.

Q: Is the check result normal?

YES : Go to Step 3.
NO : Repair the wiring harness.

STEP 3. Replace the A/C evaporator air outlet thermistor, and then recheck the trouble symptom.

Check that the A/C works normally.

Q: Is the check result normal?

YES : This diagnosis is complete.
NO : Go to Step 4.

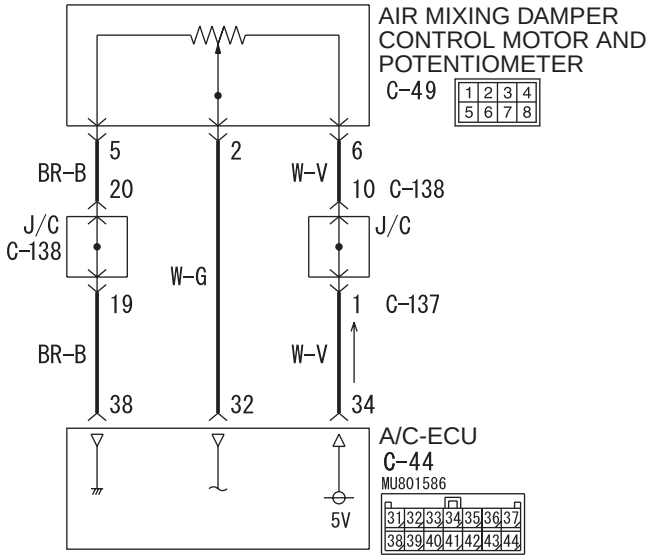
STEP 4. M.U.T.-III diagnosis code

Q: Is the diagnosis code set?

YES : Replace the automatic A/C control panel (A/C-ECU).
NO : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1041,B1042: Potentiometer system for the air mixing damper

Air Mixing Damper Control Motor And Potentiometer Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

W6C55E003A

DIAGNOSIS CODE SET CONDITION

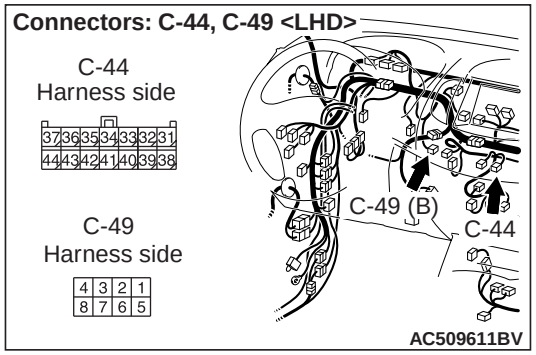
This code is set when the air mixing damper control motor potentiometer does not send any signal to the A/C-ECU due to short or open circuit.

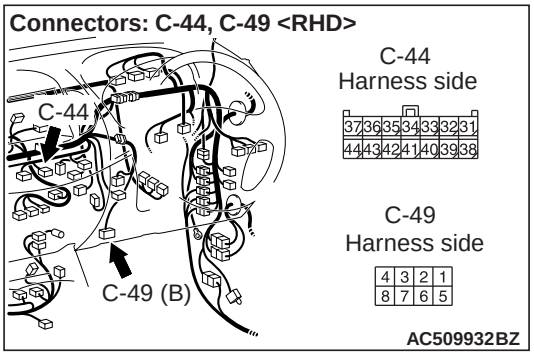
POSSIBLE CAUSES

- Malfunction of the air mixing damper control motor and potentiometer
- Damaged the wiring harness or connectors
- Malfunction of the automatic A/C control panel (A/C-ECU)

DIAGNOSIS PROCEDURE

STEP 1. Connector check: C-44 A/C-ECU connector and C-49 air mixing damper control motor and potentiometer connector

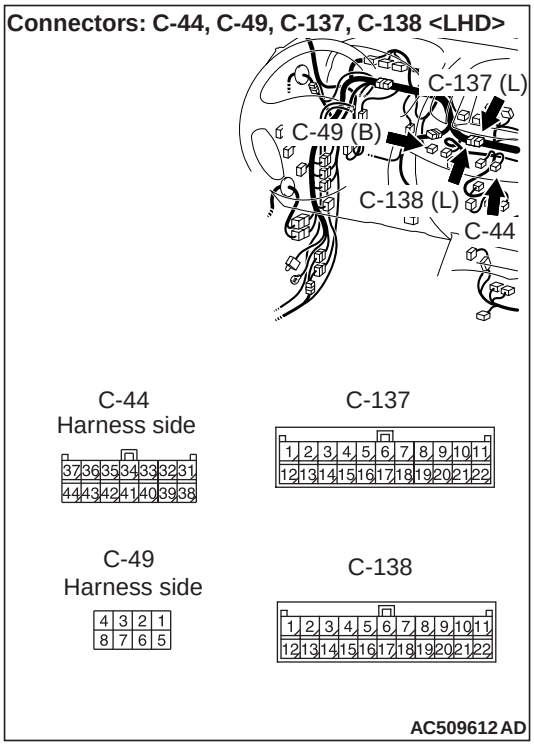


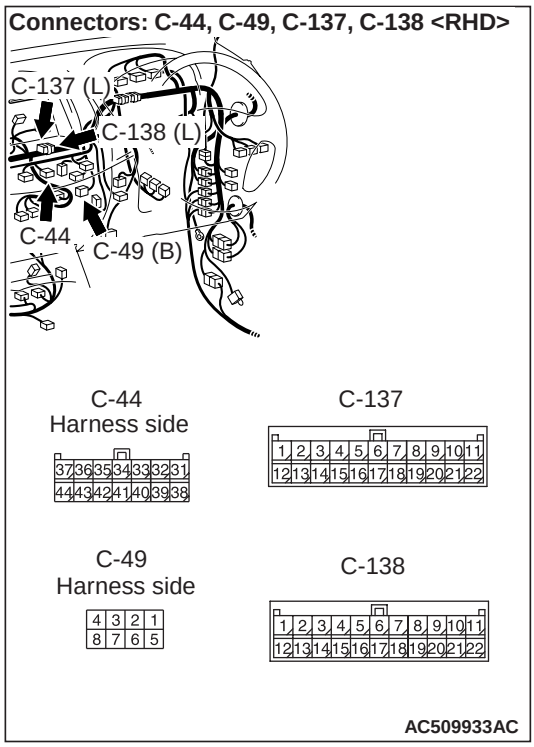


Q: Is the check result normal?

YES : Go to Step 2.
NO : Repair the connector.

STEP 2. Check the wiring harness between C-44 A/C-ECU connector (terminals 34, 32 and 38) and C-49 air mixing damper control motor and potentiometer connector (terminals 6, 2 and 5).





NOTE: Prior to the wiring harness inspection, check joint connector C-138 and C-137, and repair if necessary.

- Check the potentiometer power supply, earth and signal line for open and short circuit.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the wiring harness.

STEP 3. Check the air mixing damper control motor and potentiometer.
Refer to P.55B-97.

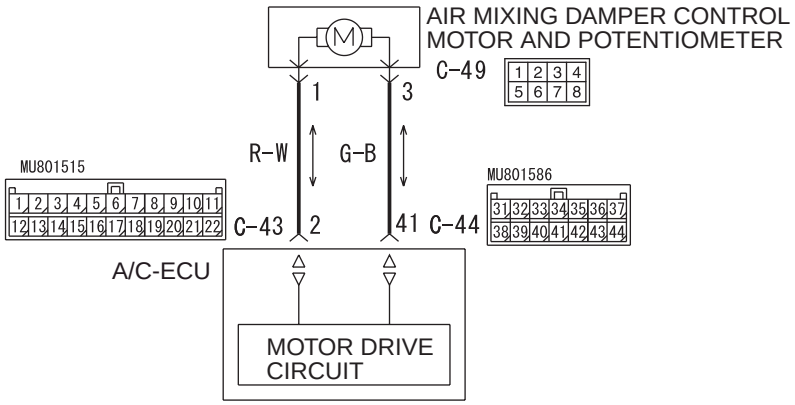
Q: Is the check result normal?
YES : Go to Step 4.
NO : Replace the air mixing damper control motor and potentiometer.

STEP 4. Check whether the diagnosis code is reset.

Q: Is the diagnosis code set?
YES : Replace the A/C-ECU.
NO : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1045: Motor drive system for the air mixing damper <LHD>

Air Mixing Damper Control Motor And Potentiometer Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

AC900842
W6C55E004A

DIAGNOSIS CODE SET CONDITION

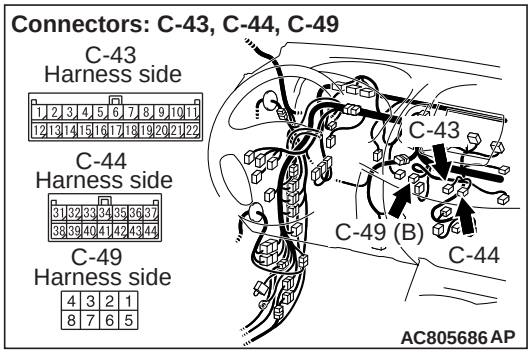
This code is set when the air mixing damper cannot be rotated to the preset opening angle.

POSSIBLE CAUSES

- Malfunction of the air mixing damper control motor and potentiometer
- Malfunction of the automatic A/C control panel (A/C-ECU)
- Damaged the wiring harness or connectors

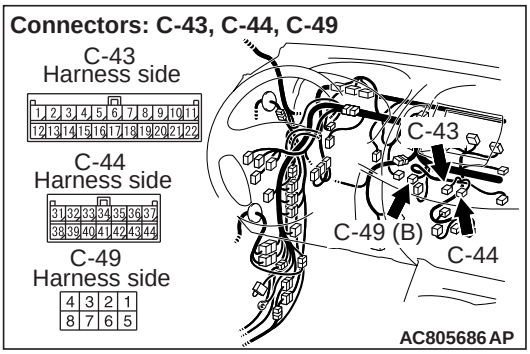
DIAGNOSIS PROCEDURE

STEP 1. Connector check: C-43,C-44 A/C-ECU connector and C-49 air mixing damper control motor and potentiometer connector



Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the connector.

STEP 2. Check the wiring harness between A/C-ECU connector C-43 terminal No.2, C-44 terminal No.41 and C-49 air mixing damper control motor and potentiometer connector (terminals 1 and 3).



- Check the motor activating lines for open and short circuit.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the wiring harness.

STEP 3. Check the air mixing damper control motor and potentiometer.

Refer to P.55B-97.

Q: Is the check result normal?
YES : Go to Step 4.
NO : Replace the air mixing damper control motor and potentiometer.

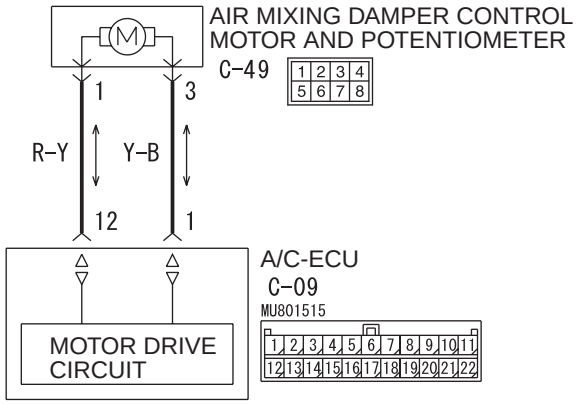
STEP 4. Check whether the diagnosis code is reset.

Q: Is the diagnosis code set?

YES : Replace the automatic A/C control panel (A/C-ECU).
NO : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No.B1045: Motor drive system for the air mixing damper <RHD>

Air Mixing Damper Control Motor And Potentiometer Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

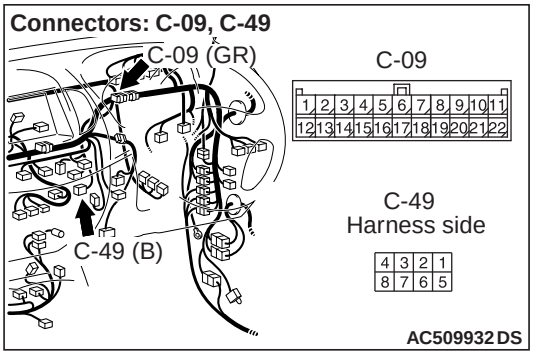
W6C55E004A

DIAGNOSIS CODE SET CONDITION
This code is set when the air mixing damper cannot be rotated to the preset opening angle.

POSSIBLE CAUSES
- Malfunction of the air mixing damper control motor and potentiometer
- Malfunction of the automatic A/C control panel (A/C-ECU)
- Damaged the wiring harness or connectors

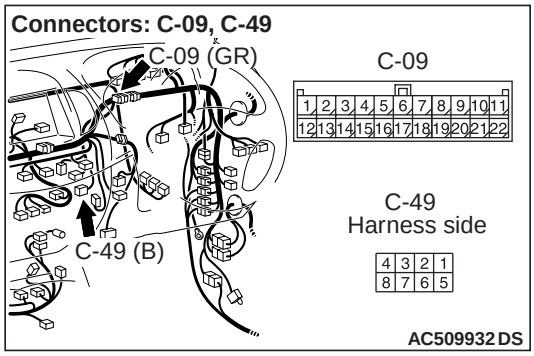
DIAGNOSIS PROCEDURE

STEP 1. Connector check: C-09 A/C-ECU connector and C-49 air mixing damper control motor and potentiometer connector



Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the connector.

STEP 2. Check the wiring harness between C-09 A/C-ECU connector (terminals 12 and 1) and C-49 air mixing damper control motor and potentiometer connector (terminals 1 and 3).



- Check the motor activating lines for open and short circuit.

Q: Is the check result normal?

YES : Go to Step 3.
NO : Repair the wiring harness.

STEP 3. Check the air mixing damper control motor and potentiometer.
Refer to P.55B-97.

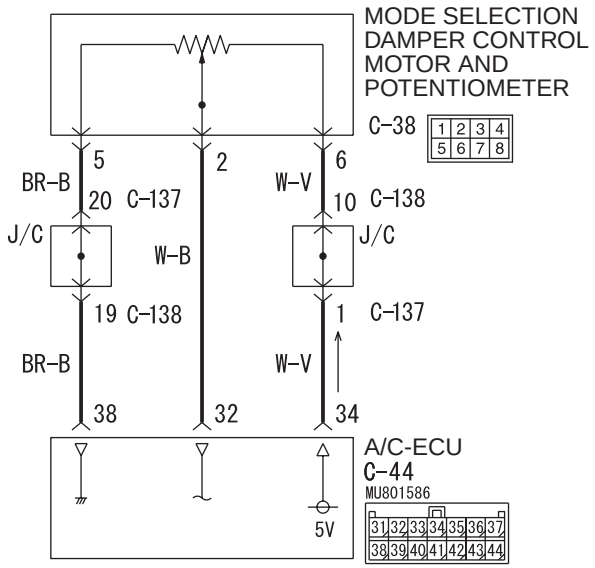
Q: Is the check result normal?
YES : Go to Step 4.
NO : Replace the air mixing damper control motor and potentiometer.

STEP 4. Check whether the diagnosis code is reset.

Q: Is the diagnosis code set?
YES : Replace the automatic A/C control panel (A/C-ECU).
NO : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

Code No. B1061,B1062: Potentiometer system for Mode Selection Damper

Mode Selection Damper Control Motor And Potentiometer Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

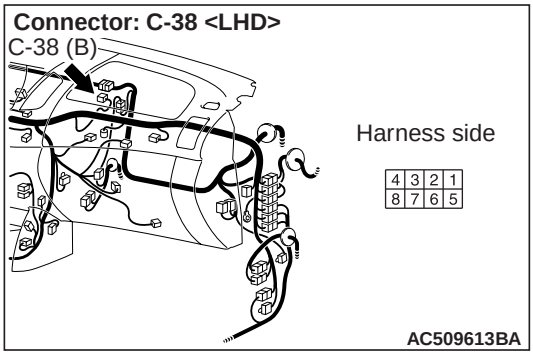
AC900623
W6C55E005A

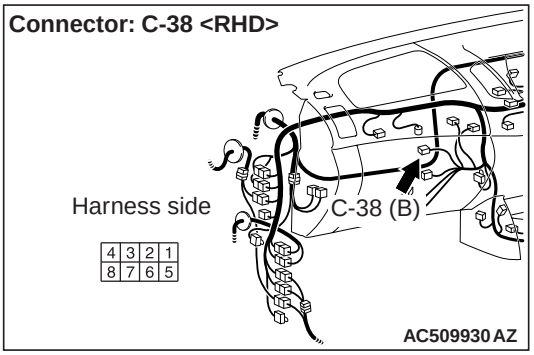
COMMENTS ON TROUBLE SYMPTOM
This code is set when the mode selection damper control motor potentiometer does not send any signal to the A/C-ECU due to short or open circuit.

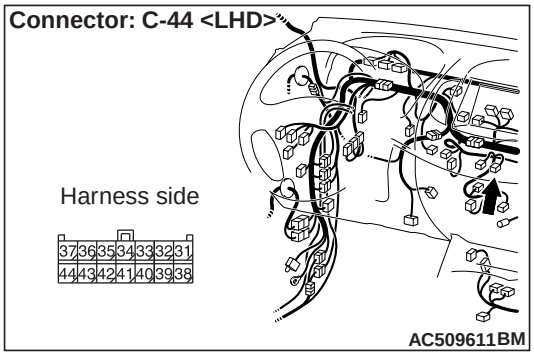
PROBABLE CAUSES
- Malfunction of the mode selection damper control motor and potentiometer
- Damaged the wiring harness or connectors
- Malfunction of the automatic A/C control panel (A/C-ECU)

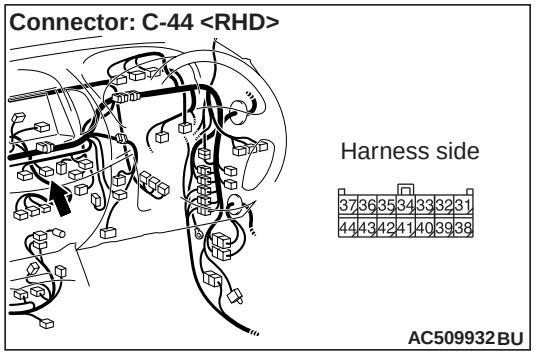
DIAGNOSIS PROCEDURE

STEP 1. Connector check: C-44 A/C-ECU connector and C-38 mode selection damper control motor and potentiometer connector



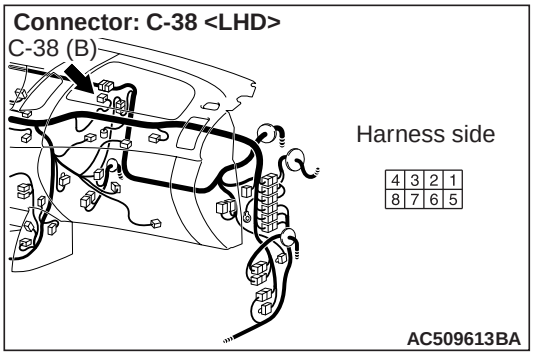


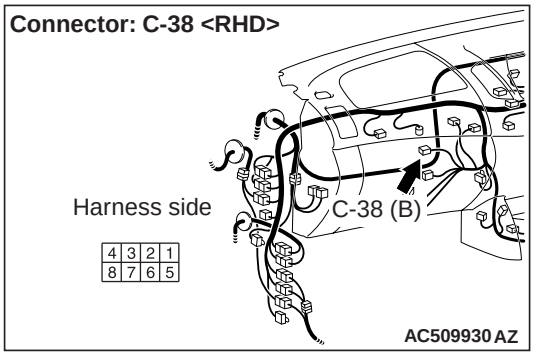


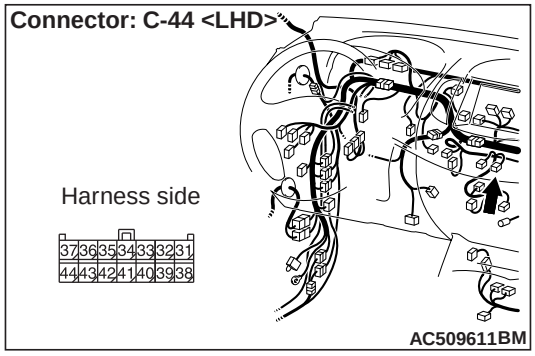


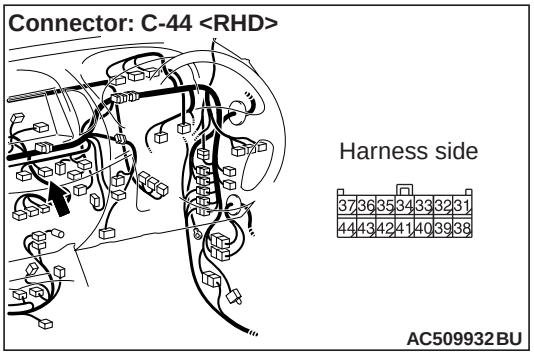
Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the connector.

STEP 2. Check the wiring harness between C-44 A/C-ECU connector (terminals 34, 32 and 38) and C-38 mode selection damper control motor and potentiometer connector (terminals 6, 2 and 5).









- Check the potentiometer power supply, earth and signal line for open and short circuit.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the wiring harness.

STEP 3. Check the mode selection damper control motor and potentiometer.
Refer to P.55B-97.

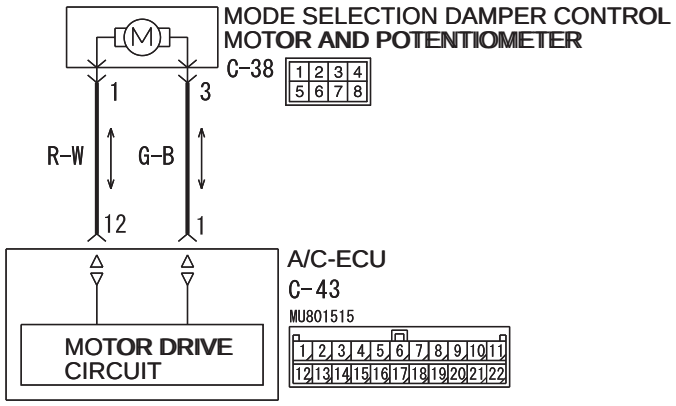
Q: Is the check result normal?
YES : Go to Step 4.
NO : Replace the mode selection damper control motor and potentiometer.

STEP 4. M.U.T.-III diagnosis code

Q: Is the diagnosis code set?
YES : Replace the automatic A/C control panel (A/C-ECU).
NO : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction)

Code No. B1065: Motor drive system for mode selection damper

Mode Selection Damper Control Motor And Potentiometer Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

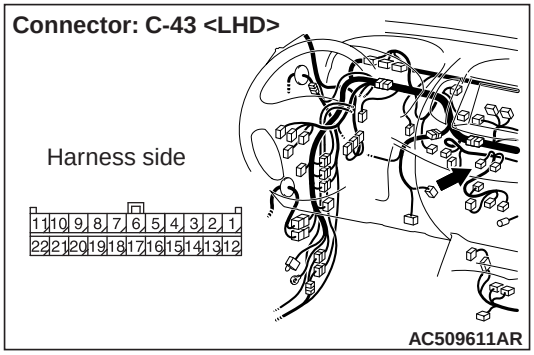
AC806070AB
W6U55X025A

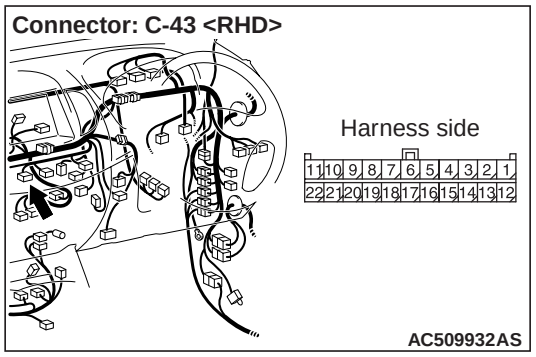
COMMENTS ON TROUBLE SYMPTOM
This code is set when the mode selection damper cannot be rotated to the preset opening angle.

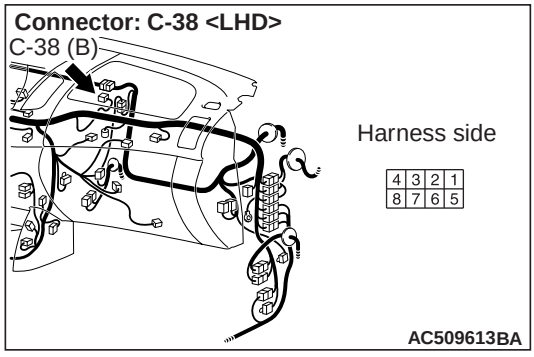
POSSIBLE CAUSES
- Malfunction of the rear mode selection damper control motor and potentiometer
- Malfunction of the automatic A/C control panel (A/C-ECU)
- Damaged the wiring harness or connectors

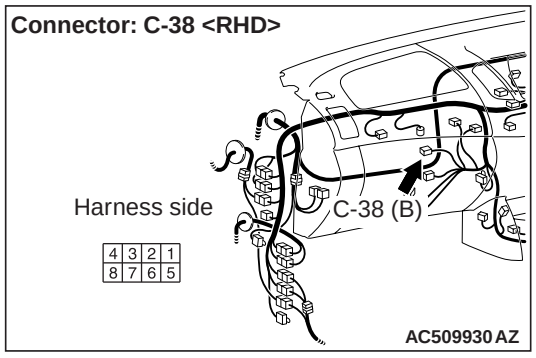
DIAGNOSIS PROCEDURE

STEP 1. Connector check: C-43 A/C-ECU connector and C-38 mode selection damper control motor and potentiometer connector



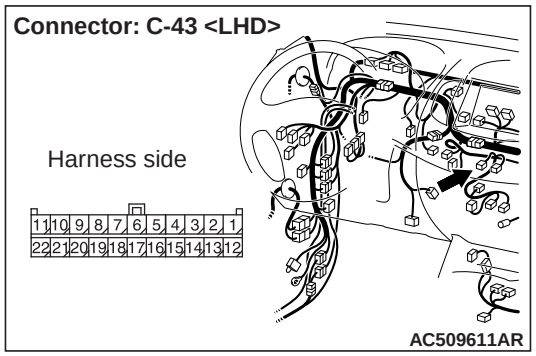


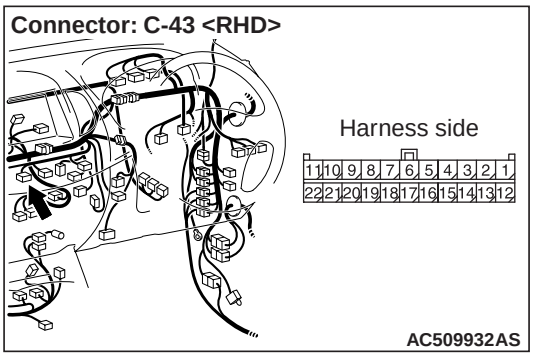


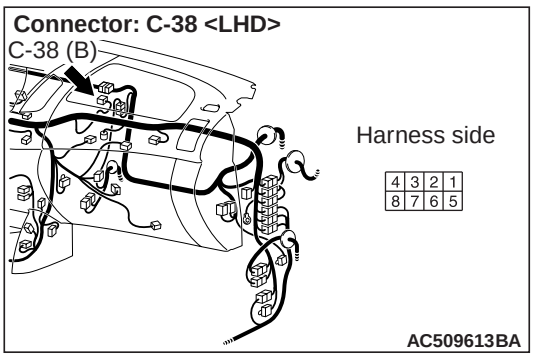


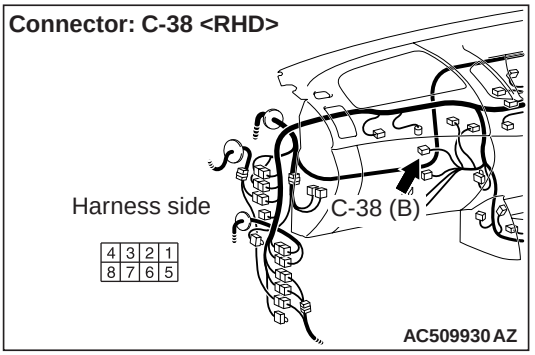
Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the connector.

STEP 2. Check the wiring harness between C-43 A/C-ECU connector (terminals 12 and 1) and C-38 mode selection damper control motor and potentiometer connector (terminals 1 and 3).









- Check the motor activating lines for open and short circuit.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the wiring harness.

STEP 3. Check the mode selection damper control motor and potentiometer.
Refer to P.55B-97.

Q: Is the check result normal?
YES : Go to Step 4.
NO : Replace the mode selection damper control motor and potentiometer.

STEP 4. M.U.T.-III diagnosis code

Q: Is the diagnosis code set?
YES : Replace the automatic air conditioner control panel (A/C-ECU).
NO : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

TROUBLE SYMPTOM CHART

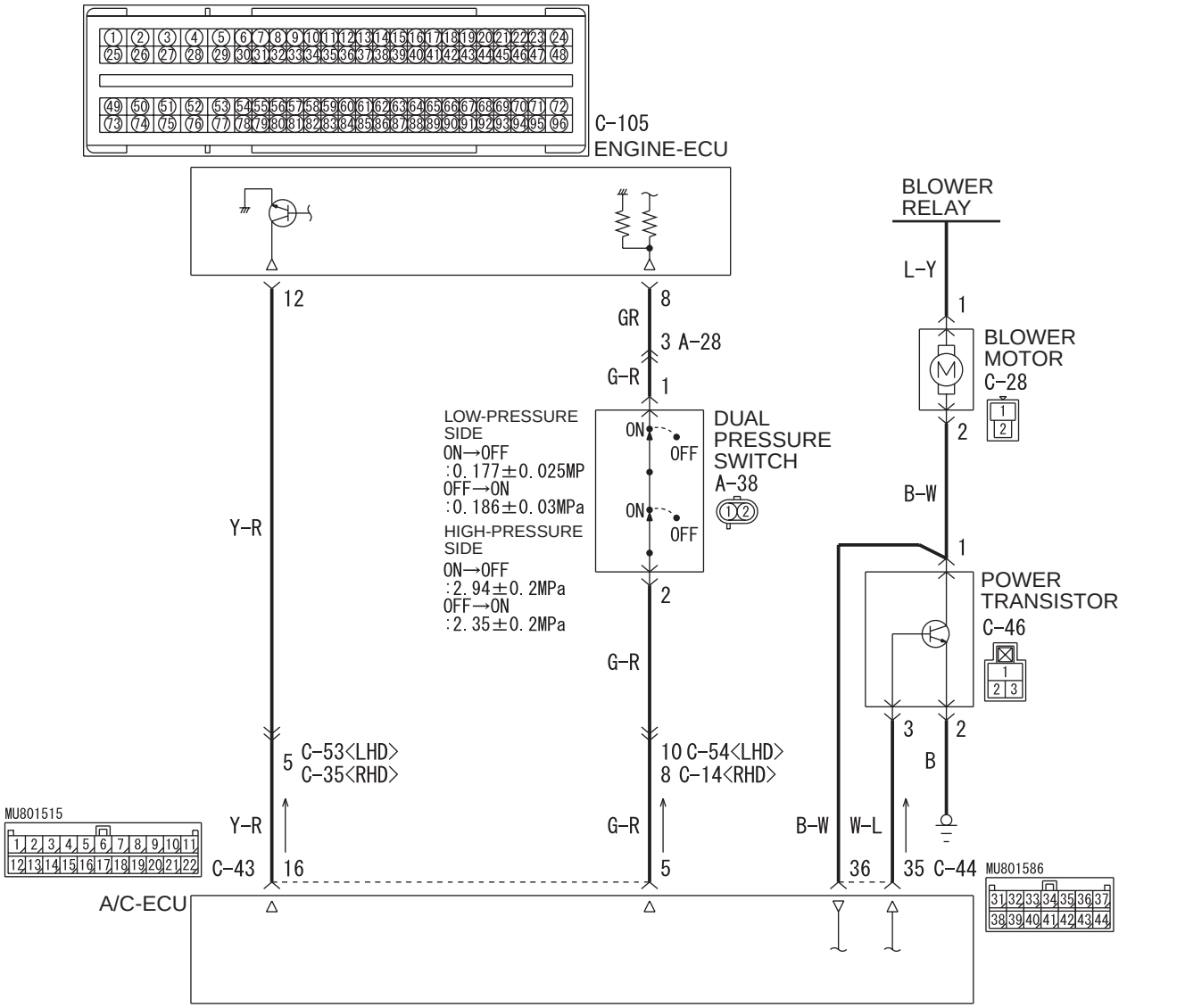
M1554005001875

Trouble symptom	Inspection procedure number	Reference page
Cool air does not come	1	P.55B-23
The blower does not work	2	P.55B-32
The blower air volume cannot be changed	3	P.55B-41
The inside/outside air changeover is impossible	4	P.55B-45
The A/C compressor does not work	5	P.55B-49
The rear window defogger does not work <Vehicles without rear panel power window>	6	P.55B-55
The rear window defogger does not work <Vehicles with rear panel power window>	7	P.55B-65
The PTC heater does not work	8	P.55B-72
A/C ECU power supply system	9	P.55B-87
The outlet air temperature can not be changed even if the amount of solar radiation changes	10	P.55B-87
Condenser fan does not operate	11	Refer to GROUP 55A, trouble symptom chart

SYMPTOM PROCEDURES

Inspection Procedure 1: Cool air does not come

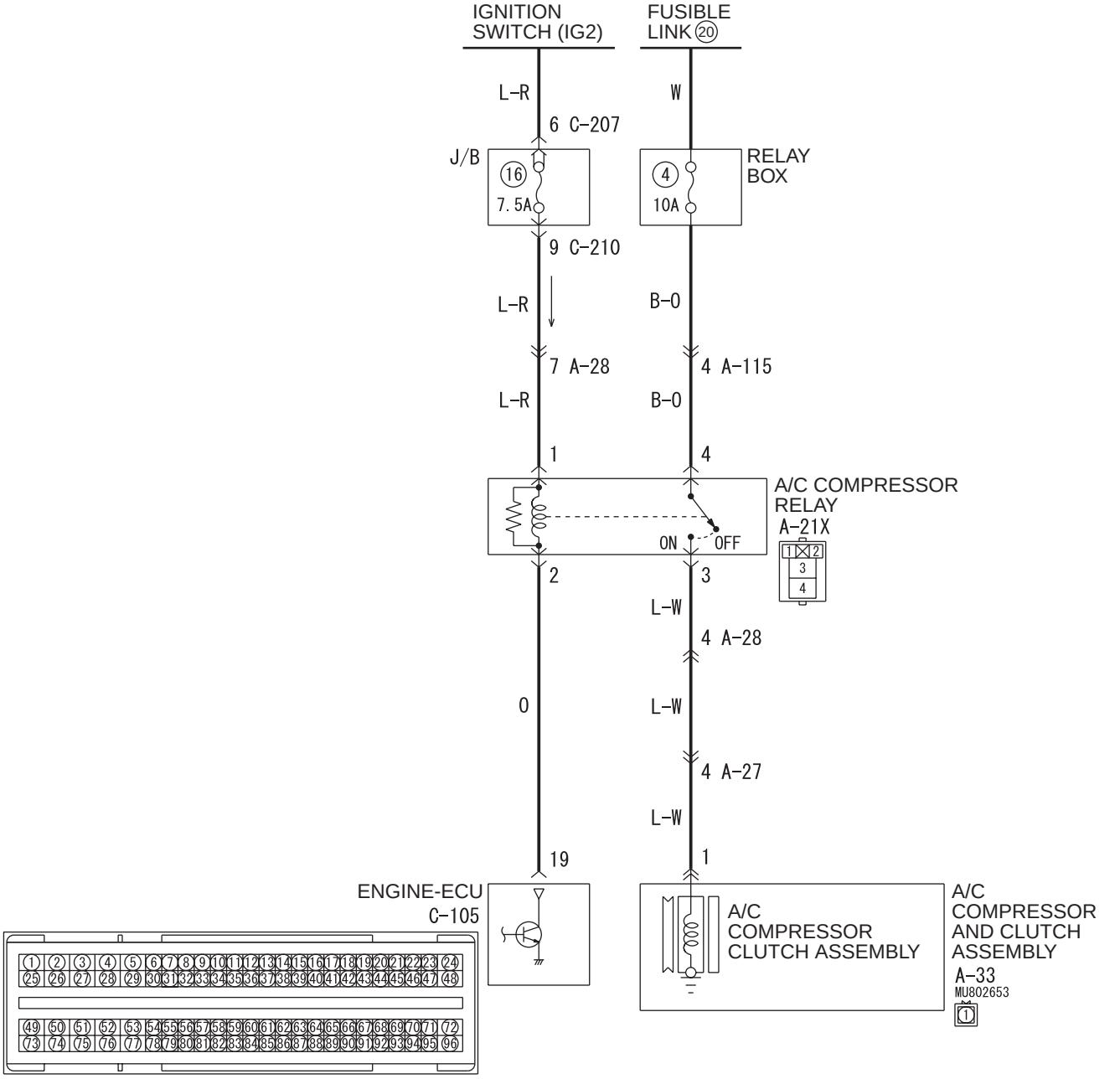
A/C-ECU System Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

WBC55X002A

A/C Compressor and Clutch Assembly Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

WBC55X001A

COMMENTS ON TROUBLE SYMPTOM

The blower system, the compressor system or the communication system between the engine-ECU and the A/C-ECU may be defective if there is no cool air coming from the spit hole.

PROBABLE CAUSES

- Malfunction of air thermo sensor
- Malfunction of dual pressure switch
- Damaged harness wires and connectors
- Malfunction of engine-ECU
- Malfunction of the automatic A/C control panel (A/C-ECU)

DIAGNOSIS PROCEDURE

STEP 1. Check the operation of the heater control panel

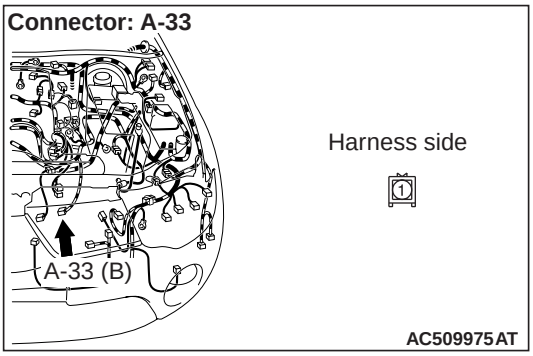
Check that the air selection switch, rear window defogger switch and air volume control dial can operate.

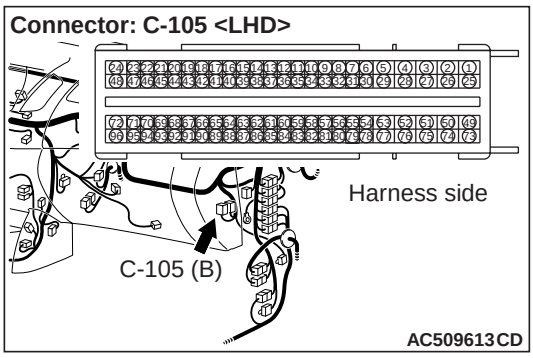
Q: Is the check result normal?

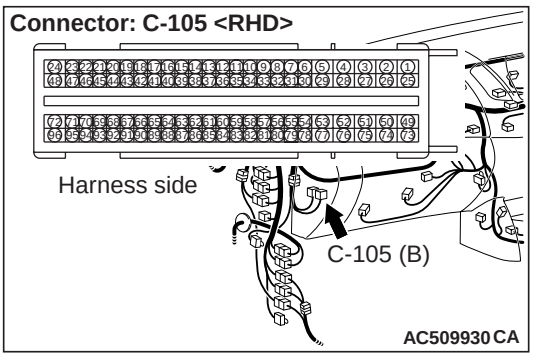
YES : Go to Step 2.

NO : Inspection Procedure 9: Refer to A/C-ECU power supply system P.55B-82.

STEP 2. Connector check: A-33 A/C compressor assembly connector and C-105 engine-ECU connector





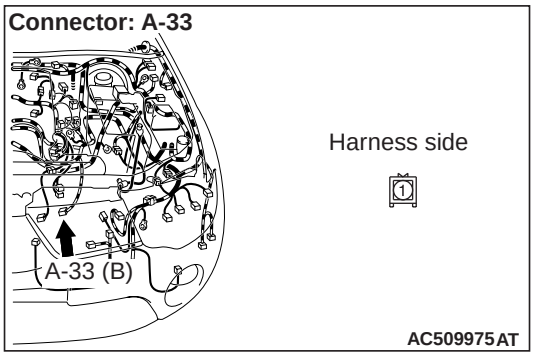


Q: Is the check result normal?

YES : Go to Step 3.

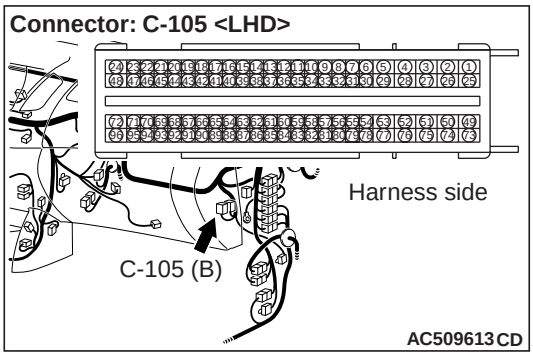
NO : Repair the connector.

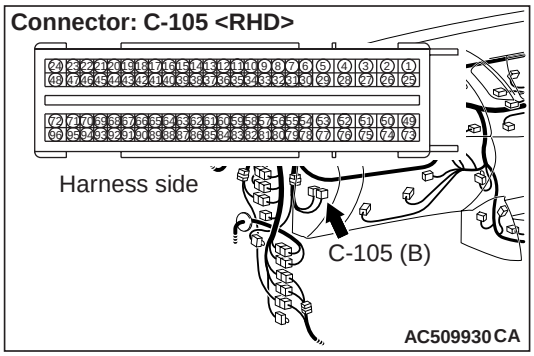
STEP 3. Voltage measurement at A-33 A/C compressor assembly connector.

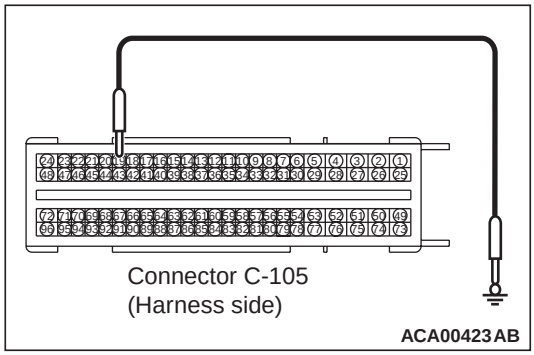


(1) Disconnect the connector, and measure at the wiring harness side.

(2) Turn the ignition switch to the "ON" position.

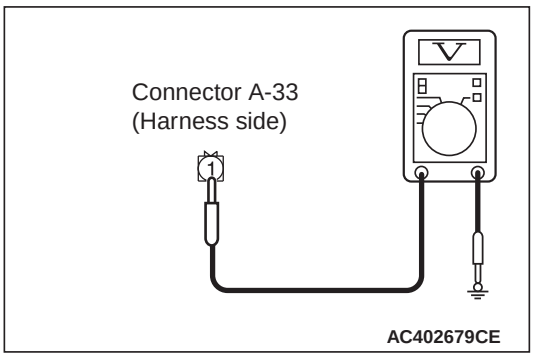






(3) Disconnect engine-ECU connector C-105 and

earth terminal 19.



(4) Voltage between terminal 1 and body earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 4.
NO : Refer to Inspection Procedure 5 " The compressor does not work P.55B-49 ".

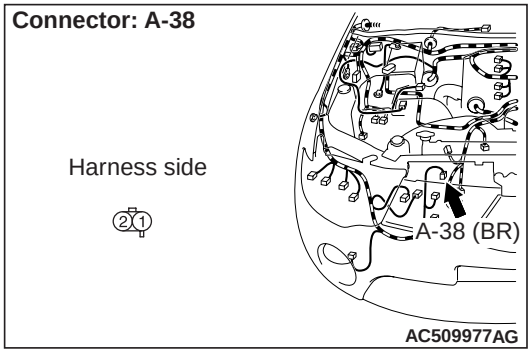
STEP 4. Check the blower motor operation

Check that the blower motor operates under the following conditions.

- ignition switch: ON
- Blower speed selection dial: MAX

Q: Is the check result normal?
YES : Go to Step 5.
NO : Refer to Inspection Procedure 2 " The blower does not work P.55B-32 ".

STEP 5. Connector check: A-38 dual pressure switch connector



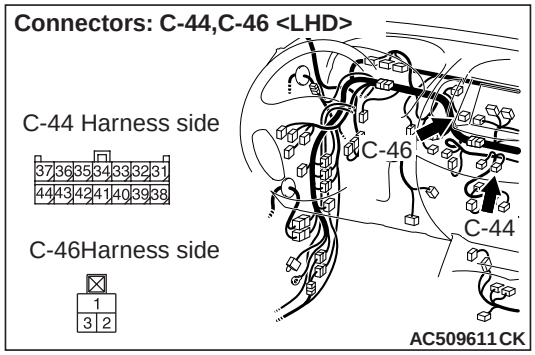
Q: Is the check result normal?
YES : Go to Step 6.
NO : Repair the connector.

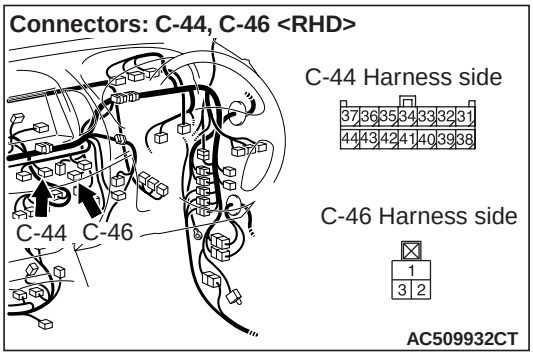
STEP 6. Check the dual pressure switch.

Refer to .

Q: Is the check result normal?
YES : Go to Step 7.
NO : Replace the dual pressure switch.

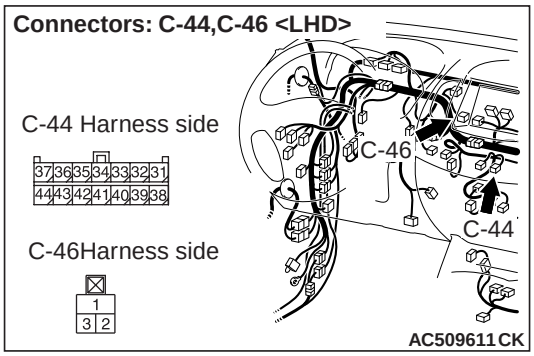
STEP 7. Connector check: C-46 power transistor connector and C-44 A/C-ECU connector

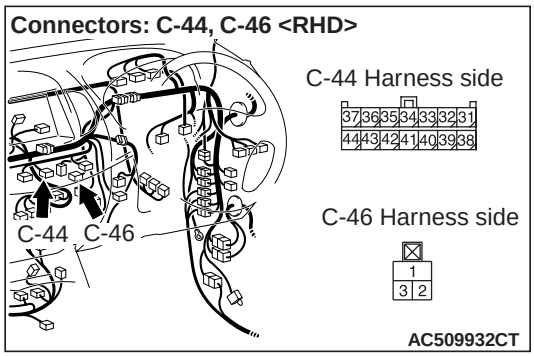




Q: Is the check result normal?
YES : Go to Step 8.
NO : Repair the connector.

STEP 8. Check the wiring harness between C-46 power transistor connector (terminals 1 and 3) and C-44 A/C-ECU connector (terminals 36 and 35).

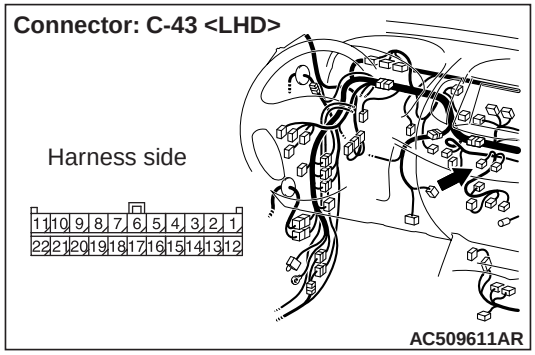


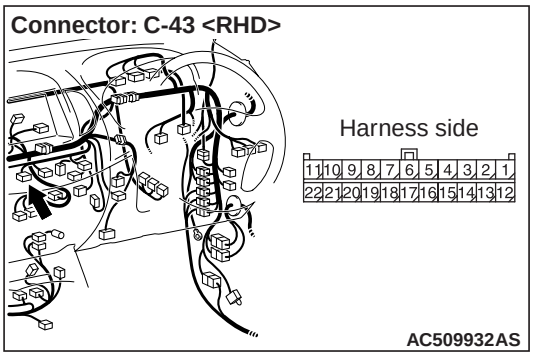


- Check the input line for open circuit.

Q: Is the check result normal?
YES : Go to Step 9.
NO : Repair the wiring harness.

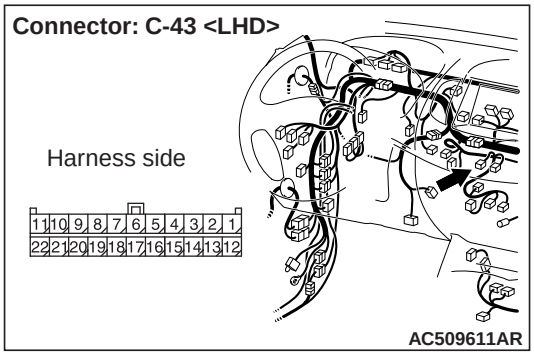
STEP 9. Connector check: C-43 A/C-ECU connector

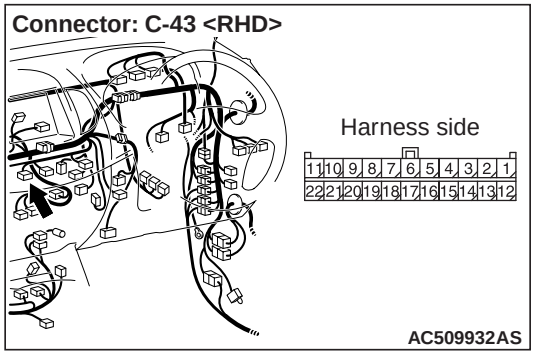


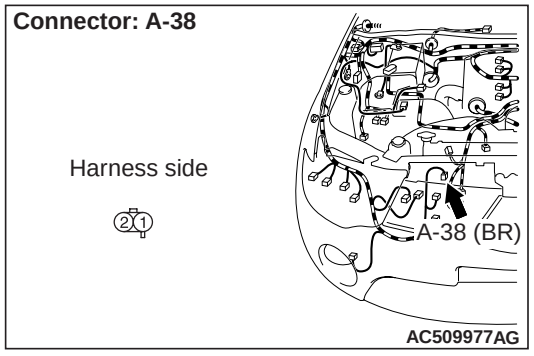


Q: Is the check result normal?
YES : Go to Step 10.
NO : Repair the connector.

STEP 10. Check the wiring harness between C-43 A/C-ECU connector terminal No.5 and A-38 dual pressure switch connector terminal No.2.







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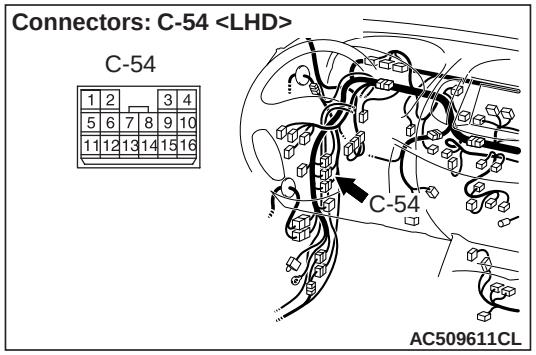
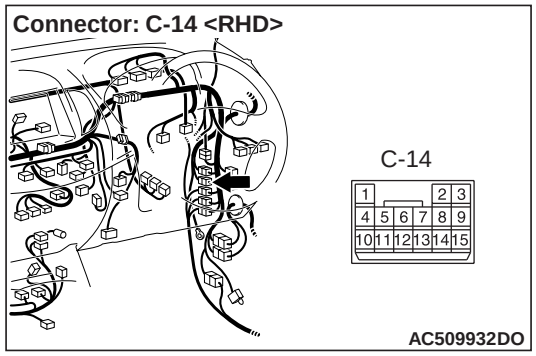


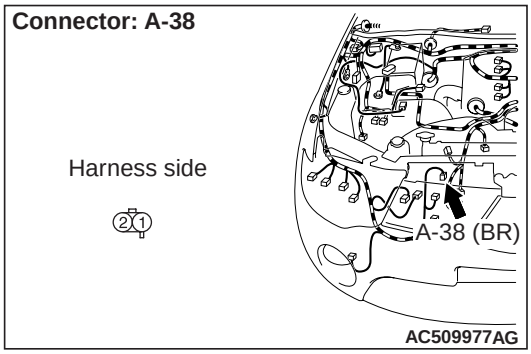


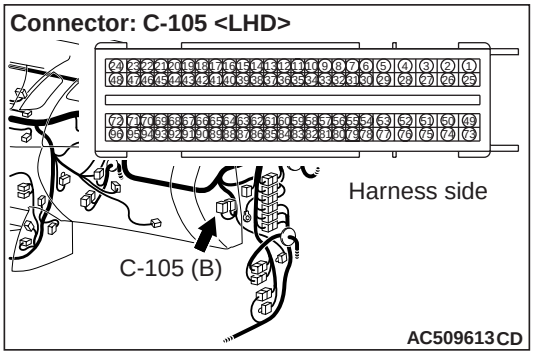
Prior to the wiring harness inspection, check intermediate connector C-54 <LHD> or C-14 <RHD>, and repair if necessary.

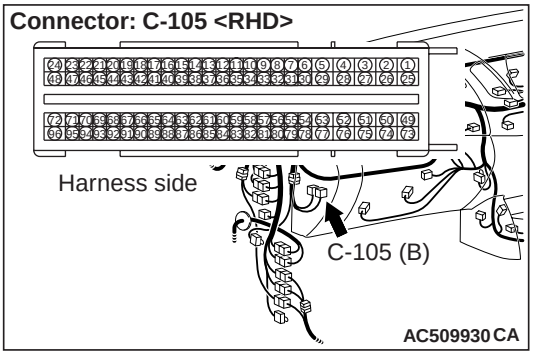
- Check the input line for open circuit.

Q: Is the check result normal?
YES : Go to Step 11.
NO : Repair the wiring harness.

STEP 11. Check the wiring harness between C-105 engine-ECU connector terminal No.8 and A-38 dual pressure switch connector terminal No.1.







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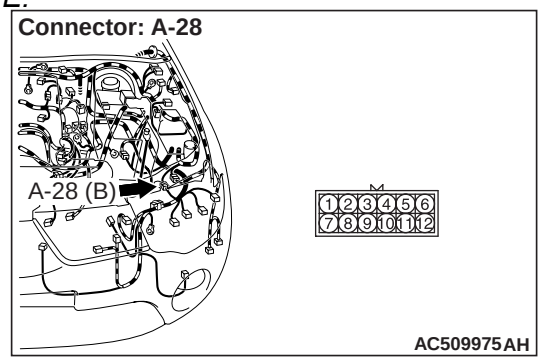


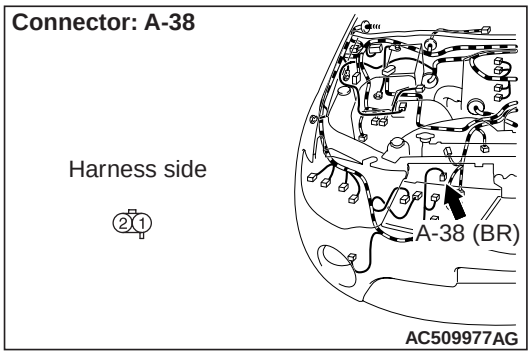
Prior to the wiring harness inspection, check intermediate connector A-28, and repair if necessary.

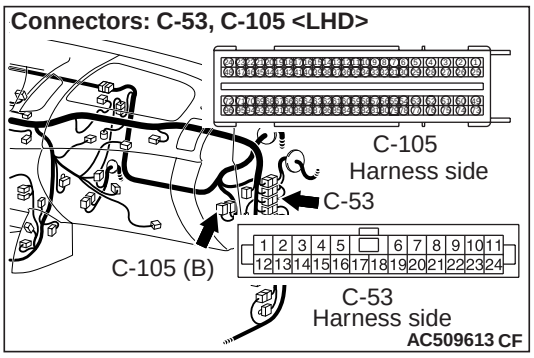
- Check the input line for open circuit.

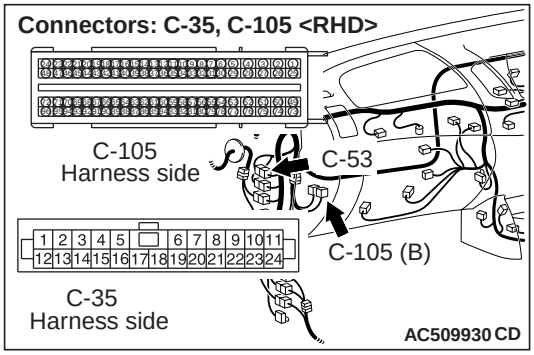
Q: Is the check result normal?

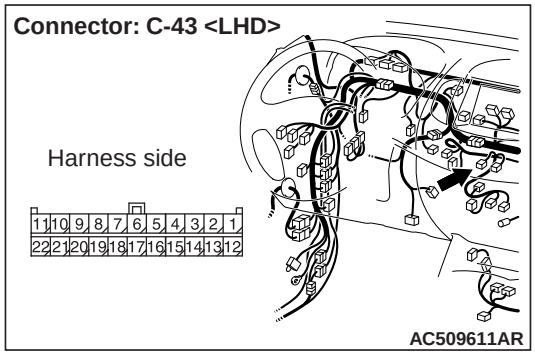
YES : Go to Step 12.
NO : Repair the wiring harness.

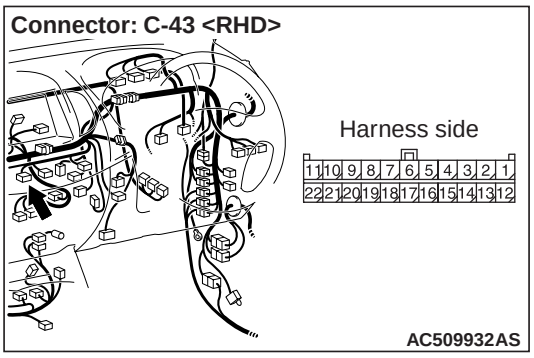
STEP 12. Check the wiring harness between C-105 engine-ECU connector terminal No.13 and C-43 A/C-ECU connector terminal No.16.











NOTE: Prior to the wiring harness inspection, check intermediate connector C-53 <LHD> or C-35 <RHD> and repair if necessary.

- Check the input line for open circuit.

Q: Is the check result normal?
YES : Go to Step 13.
NO : Repair the wiring harness.

STEP 13. Check the refrigerant level.
Refer to .

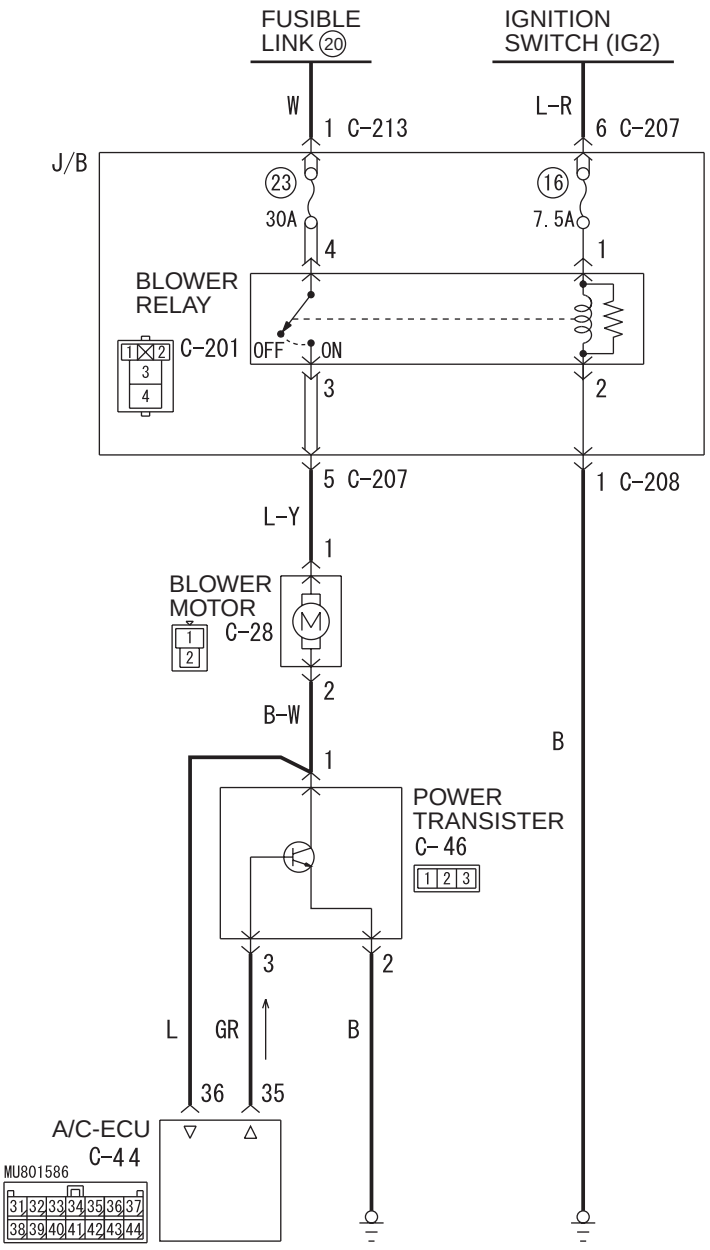
Q: Is the refrigerant level correct?
YES : Go to Step 14.
NO : Correct the refrigerant level (Refer to On-vehicle Service .)

STEP 14. Replace the A/C-ECU, and then recheck the trouble symptom
Check that the compressor works normally.

Q: Is the check result normal?
YES : This diagnosis is complete.
NO : Replace the engine-ECU.

Inspection Procedure 2: The blower does not work

Blower Motor Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

AC805774 AB
W7C55E006A

COMMENTS ON TROUBLE SYMPTOM

If the blower motor does not operate, the blower motor circuit system may be defective.

POSSIBLE CAUSES

- Malfunction of the blower relay
- Malfunction of the blower motor
- Damaged the wiring harness or connectors

DIAGNOSIS PROCEDURE

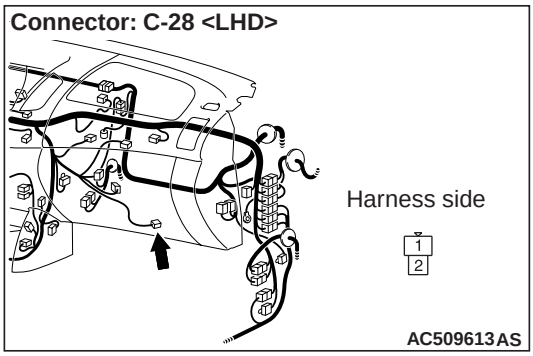
STEP 1. Check that the blower motor operates when the blower speed selection dial is moved to the "MAX " position.

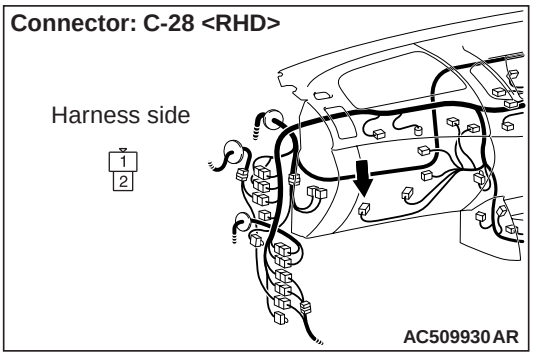
(1) Turn the ignition switch to the "ON" position.
(2) Turn the blower speed selection dial to the "MAX

" position.

Q: Does the blower motor operate when the blower speed selection dial is moved to the "MAX " position?
YES : Refer to Inspection procedure 3 "The blower air volume cannot be changed P.55B-41."
NO : Go to Step 2.

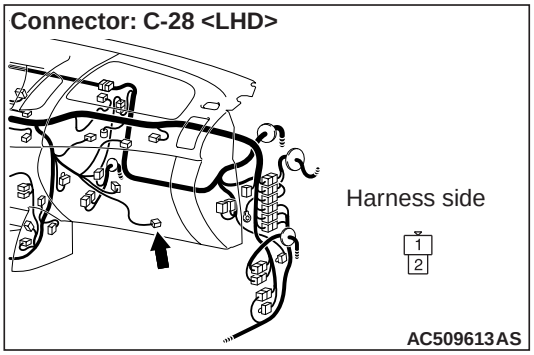
STEP 2. Connector check: C-28 blower motor connector

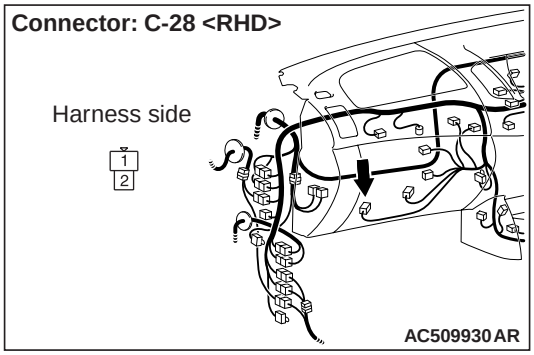




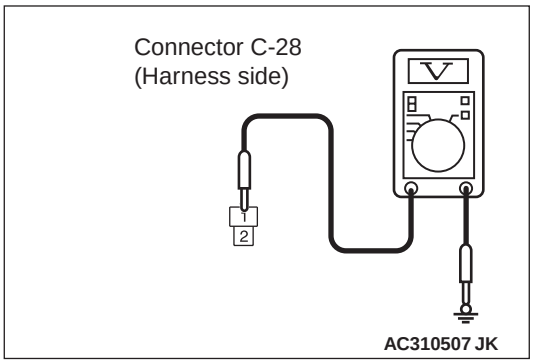
Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the connector.

STEP 3. Voltage measurement at C-28 blower motor connector.





(1) Disconnect the connector, and measure at the wiring harness side.
(2) Turn the ignition switch to the "ON" position.

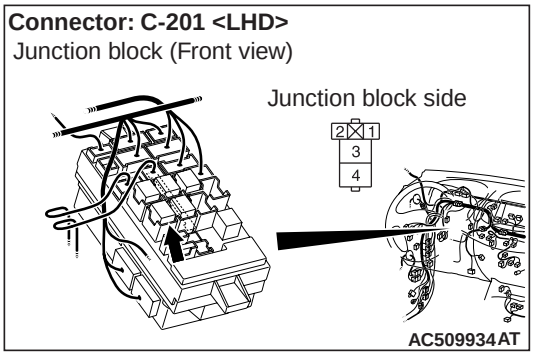


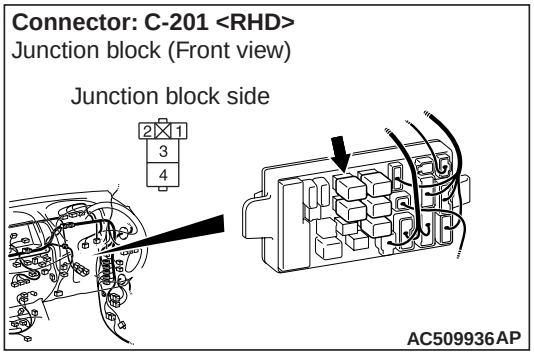
(3) Measure the voltage between terminal 1 and body earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 13.
NO : Go to Step 4.

STEP 4. Connector check: C-201 blower relay connector





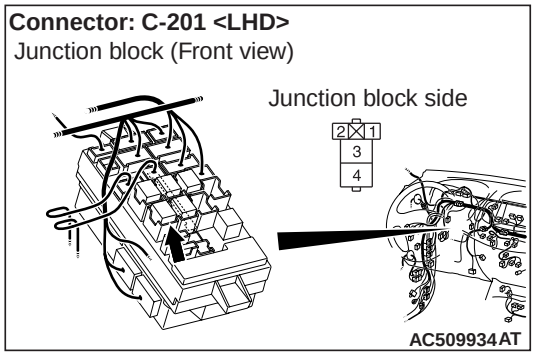
Q: Is the check result normal?
YES : Go to Step 5.
NO : Repair the connector.

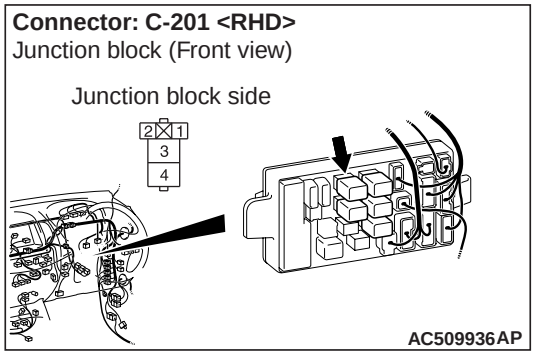
STEP 5. Check the blower relay continuity.

Refer to .

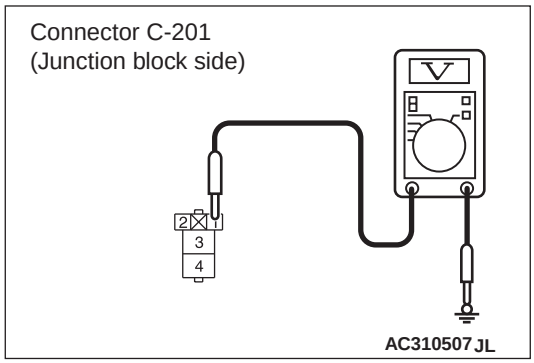
Q: Is the blower relay continuity in good condition?
YES : Go to Step 6.
NO : Replace the blower relay.

STEP 6. Voltage measurement at C-201 blower relay connector.





(1) Remove the relay, and measure at the junction block side.
(2) Turn the ignition switch to the "ON" position.

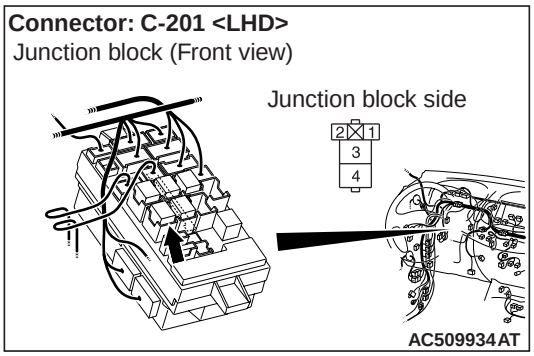


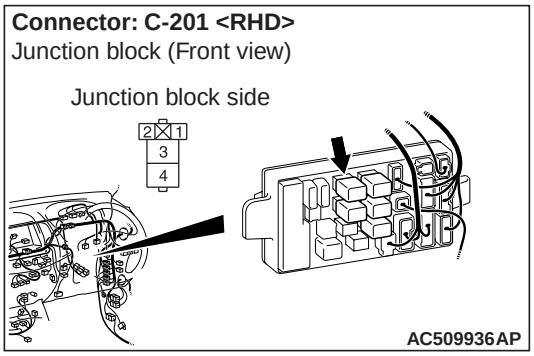
(3) Measure the voltage between terminal 1 and earth.

OK: System voltage

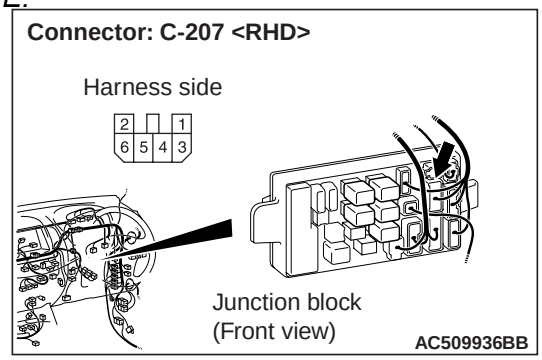
Q: Is the check result normal?
YES : Go to Step 8.
NO : Go to Step 7.

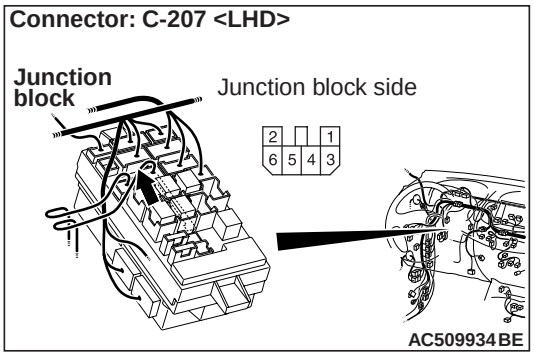
STEP 7. Check the wiring harness between C-201 blower relay connector terminal No.1 and the ignition switch (IG2).





NOTE:





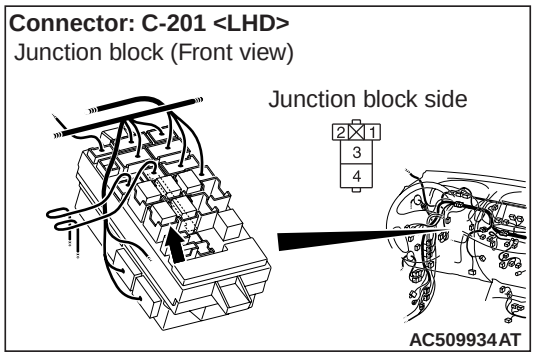
Prior to the wiring harness inspection, check junction block connector C-207, and repair if necessary.

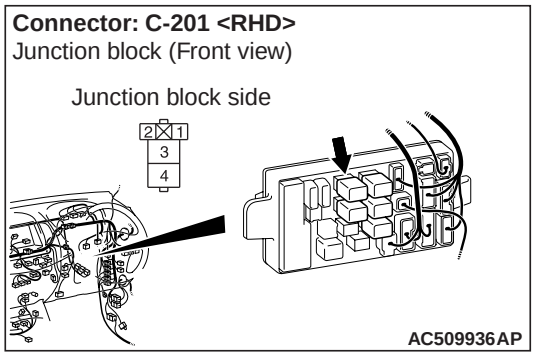
- Check the blower relay power supply line for open circuit.

Q: Is the check result normal?

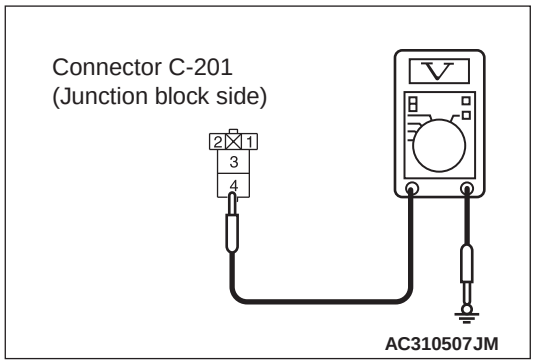
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness.

STEP 8. Measure the voltage at C-201 blower relay connector.





(1) Remove the relay, and measure at the junction block side.

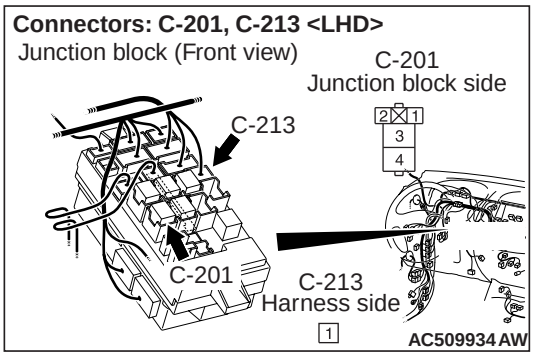


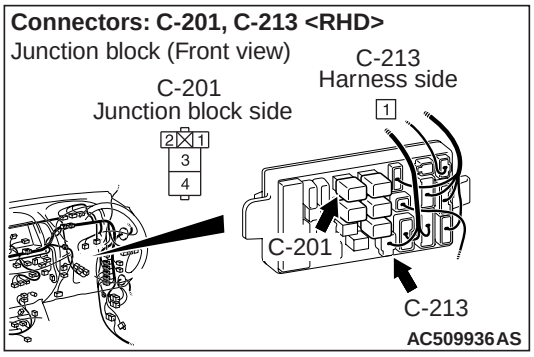
(2) Measure the voltage between terminal 4 and body earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 10.
NO : Go to Step 9.

STEP 9. Check the wiring harness between C-201 blower relay connector terminal No.4 and fusible link (20).





NOTE: Prior to the wiring harness inspection, check junction block connector C-213, and repair if necessary.

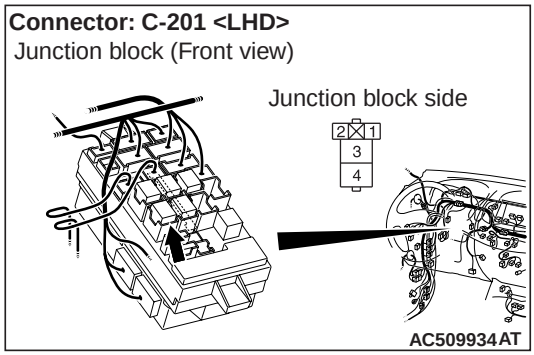
- Check the blower relay power supply line for open circuit.

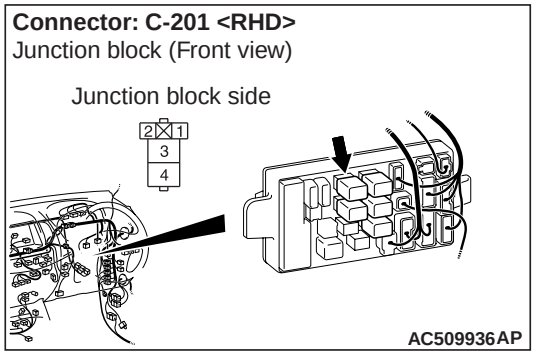
Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

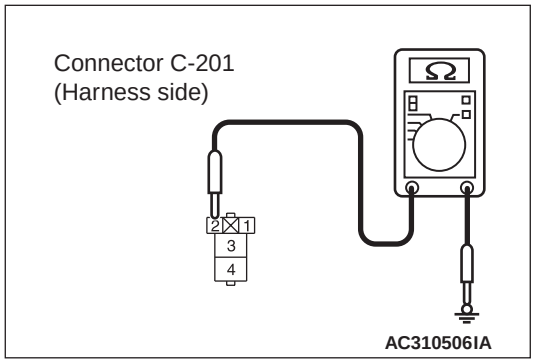
NO : Repair the wiring harness.

STEP 10. Resistance measurement at the C-201 blower relay connector.





(1) Disconnect the connector, and measure at the wiring harness side.



(2) Measure the resistance between terminal 2 and body earth.

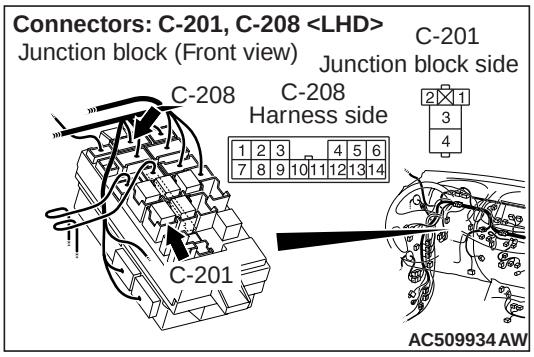
OK: Continuity (Less than 2Ω)

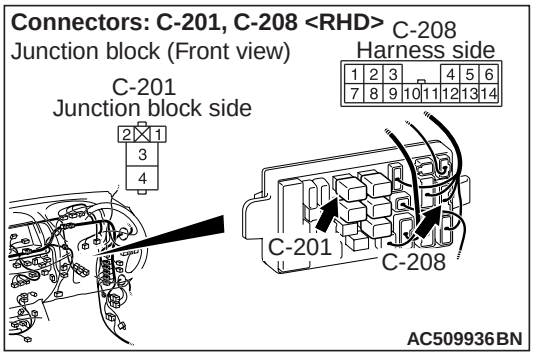
Q: Is the check result normal?

YES : Go to Step 12.

NO : Go to Step 11.

STEP 11. Check the wiring harness between C-201 blower relay connector terminal No.2 and earth.





NOTE: Prior to the wiring harness inspection, check junction block connector C-208, and repair if necessary.

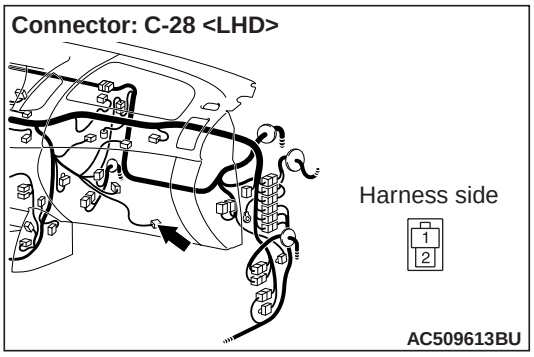
- Check the blower relay earth line for open circuit.

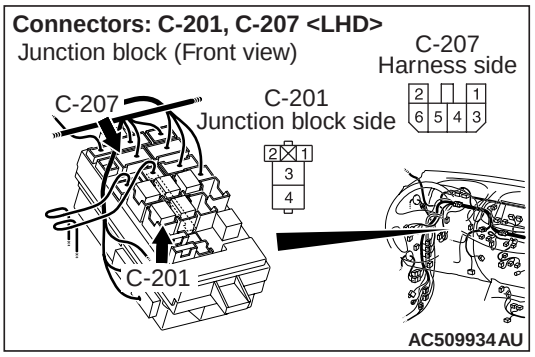
Q: Is the check result normal?

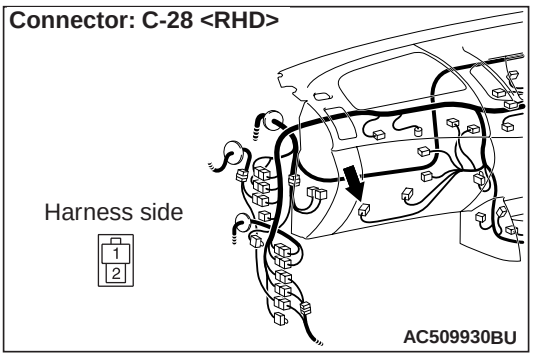
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

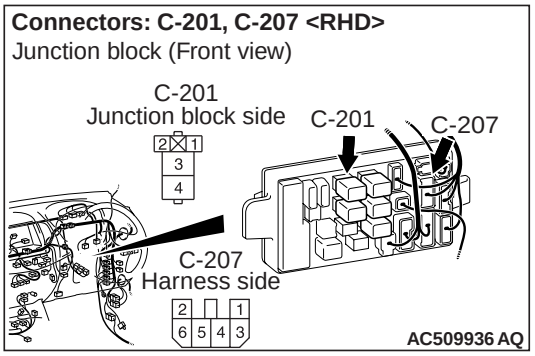
NO : Repair the wiring harness.

STEP 12. Check the wiring harness between C-201 blower relay connector terminal No.3 and C-28 blower motor connector terminal No.1.









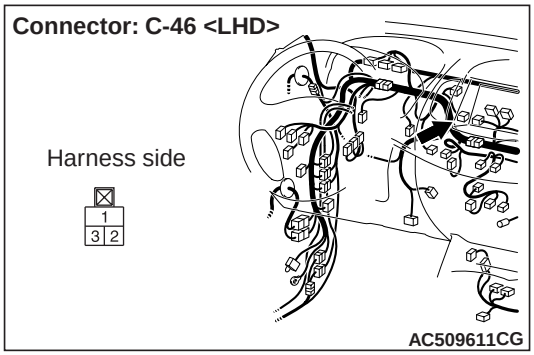
NOTE: Prior to the wiring harness inspection, check junction block connector C-207, and repair if necessary.

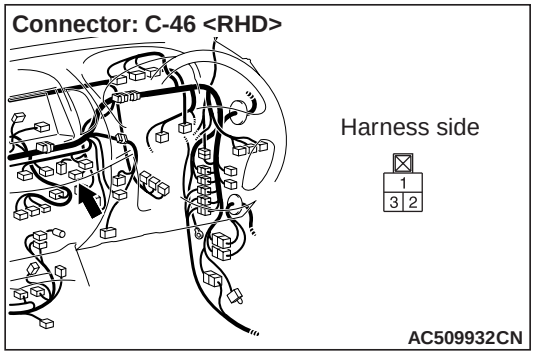
- Check the blower relay power supply line for open circuit.

Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness.

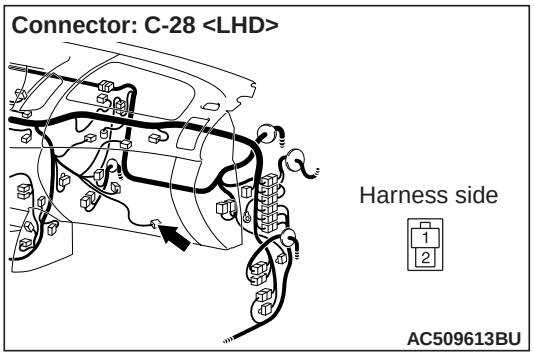
STEP 13. Connector check: C-46 power transistor connector

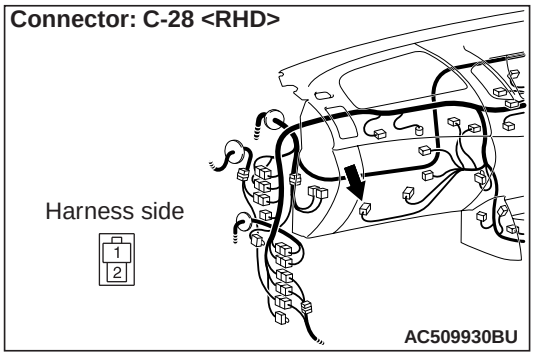


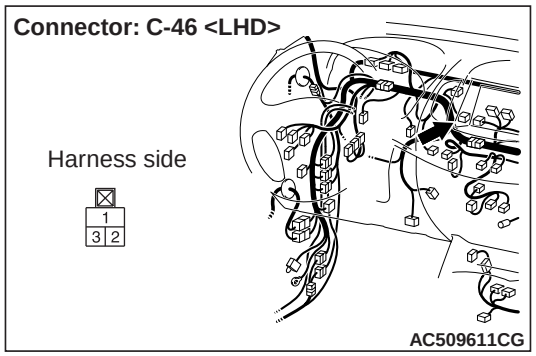


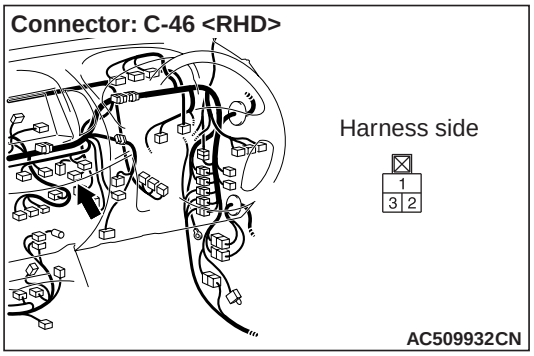
Q: Is the check result normal?
YES : Go to Step 14.
NO : Repair the connector.

STEP 14. Check the wiring harness between C-28 blower motor connector terminal No.2 and C-46 power transistor connector terminal No.1.





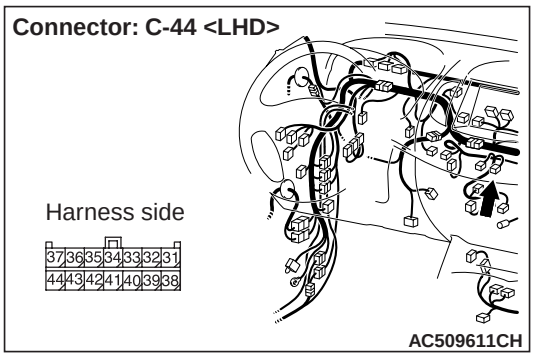


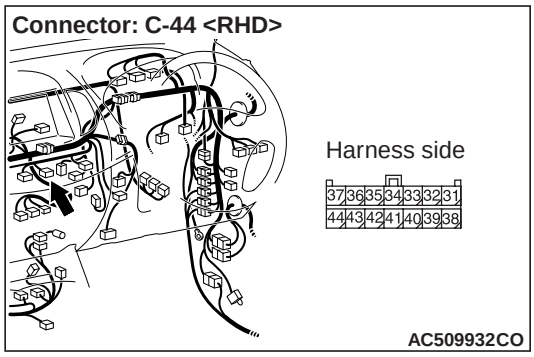


- Check the blower relay earth wires for open circuit.

Q: Is the check result normal?
YES : Go to Step 15.
NO : Repair the wiring harness.

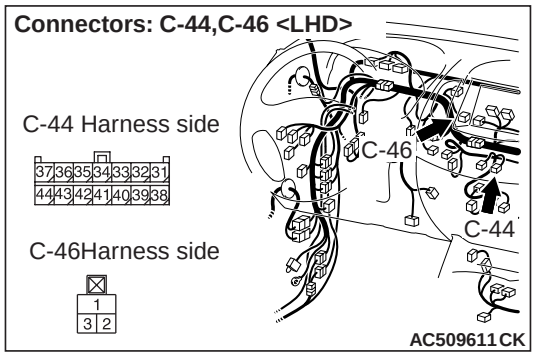
STEP 15. Connector check: C-44 A/C-ECU connector

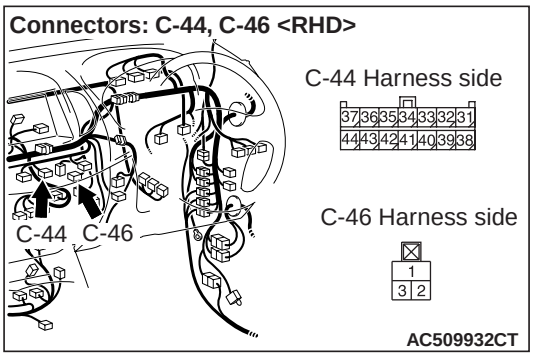




Q: Is the check result normal?
YES : Go to Step 16.
NO : Repair the connector.

STEP 16. Check the wiring harness between C-46 power transistor connector (terminals 1 and 3) and C-44 A/C-ECU connector (terminals 36 and 35).

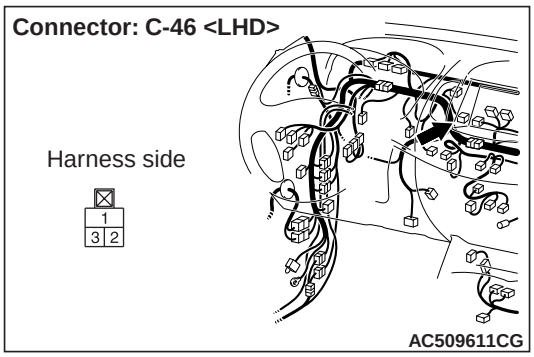


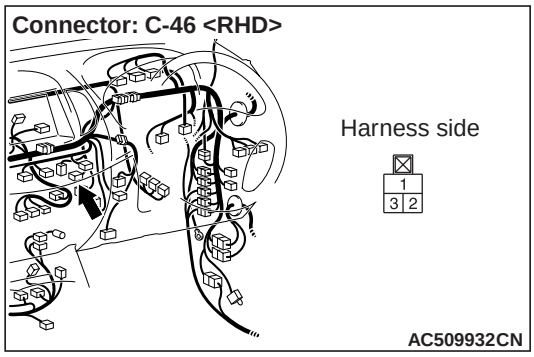


- Check the A/C-ECU input line for open circuit.

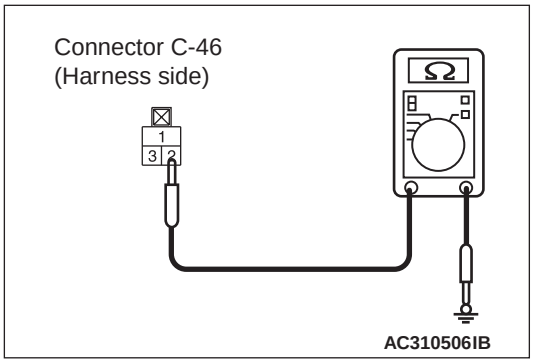
Q: Is the check result normal?
YES : Go to Step 17.
NO : Repair the wiring harness.

STEP 17. Resistance measurement at the C-46 power transistor connector.





(1) Disconnect the connector, and measure at the wiring harness side.



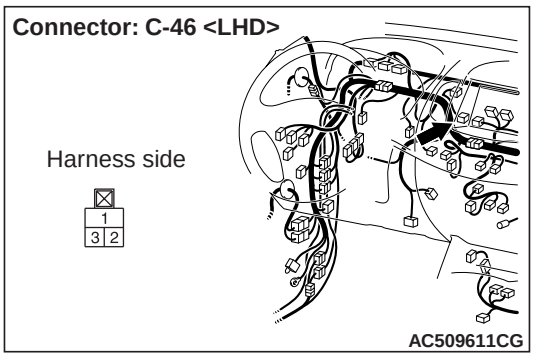
(2) Measure the resistance between terminal 2 and body earth.

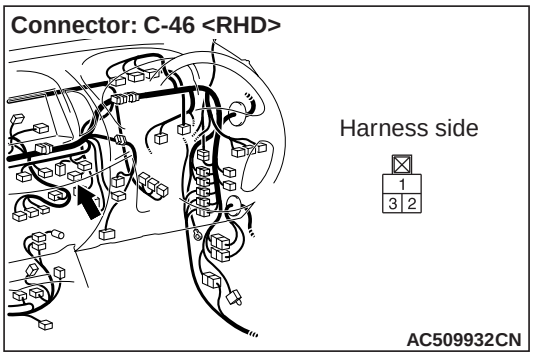
OK: Continuity (Less than 2Ω)

Q: Is the check result normal?

YES : Go to Step 19.
NO : Go to Step 18.

STEP 18. Check the wiring harness between C-46 power transistor connector terminal No.2 and body earth.





- Check the power transistor earth line for open circuit.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness.

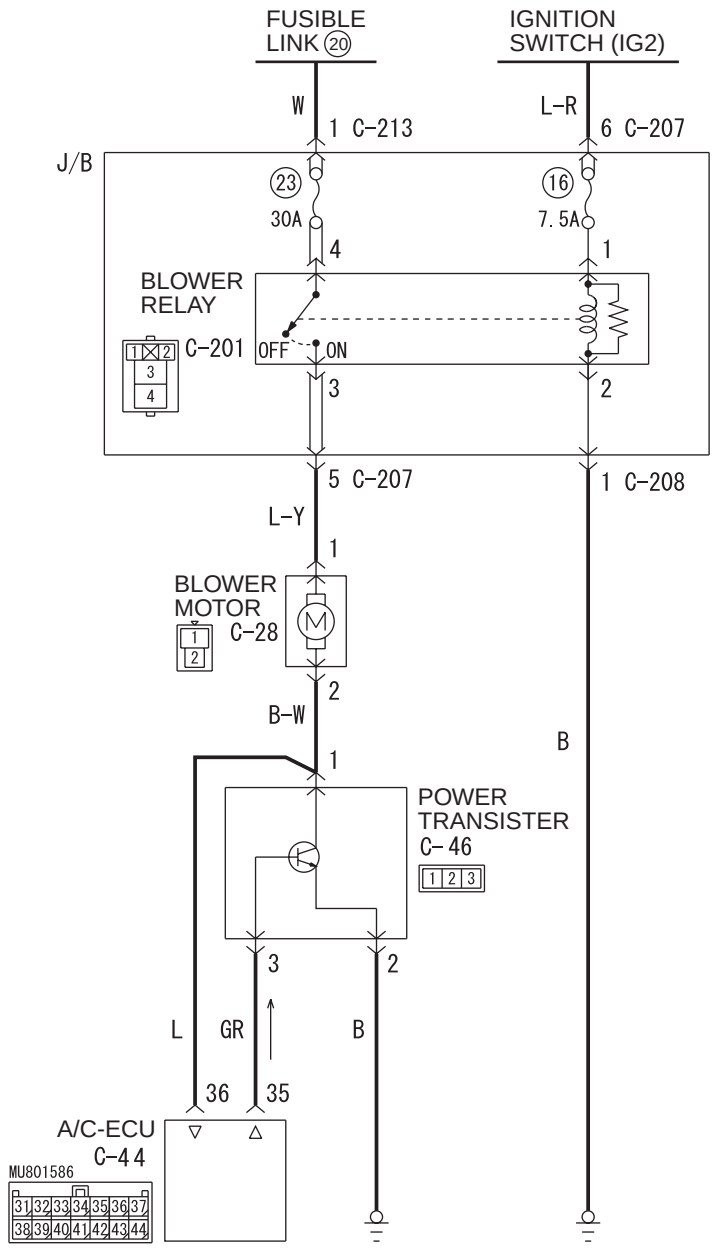
STEP 19. Replace the power transistor, and then recheck the trouble symptom

Check that the blower motor works normally.

Q: Is the check result normal?
YES : This diagnosis is complete.
NO : Replace the A/C-ECU.

Inspection Procedure 3: The blower air volume cannot be changed

Blower Motor Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

AC805774 AB
W7C55E006A

COMMENTS ON TROUBLE SYMPTOM

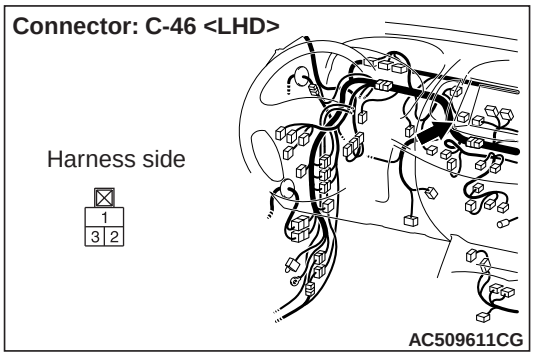
If the blower air amount cannot be changed when the blower switch is operated, the blower switch may be defective.

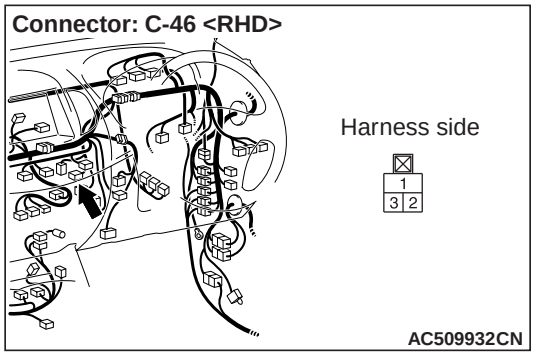
TROUBLESHOOTING HINTS

- Malfunction of the resistor
- Damaged the wiring harness or connectors
- Malfunction of the automatic A/C control panel (A/C-ECU)

DIAGNOSIS PROCEDURE

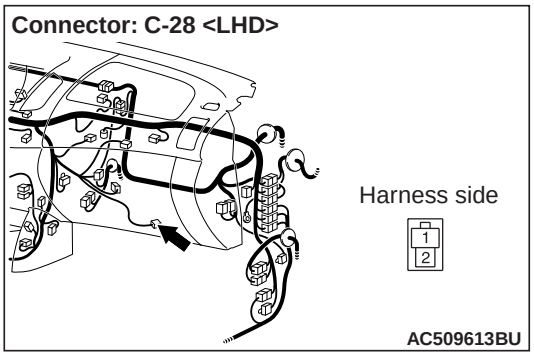
STEP 1. Connector check: C-46 power transistor connector

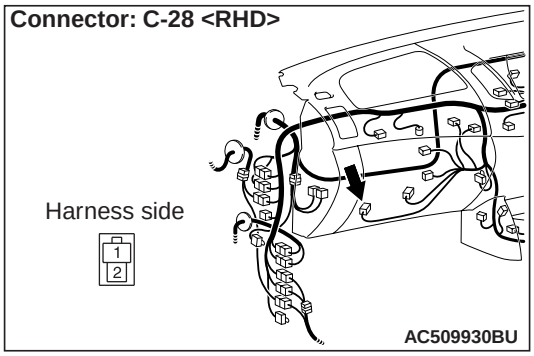


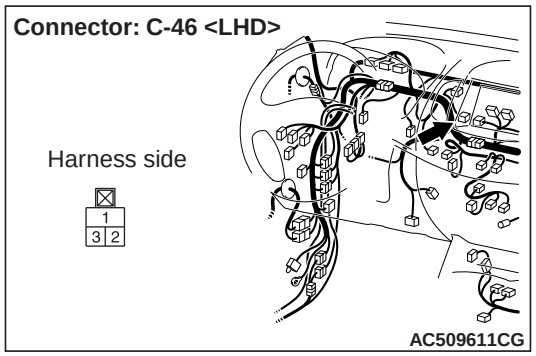


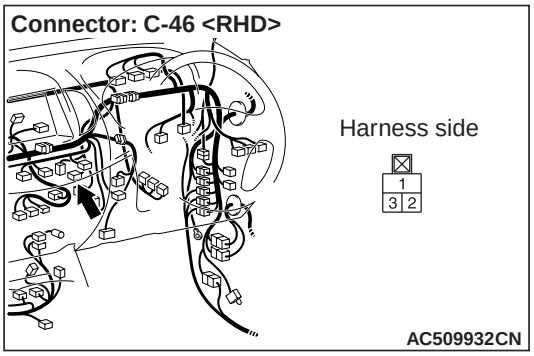
Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the connector.

STEP 2. Check the wiring harness between C-28 blower motor connector terminal No.2 and C-46 power transistor connector terminal No.1.





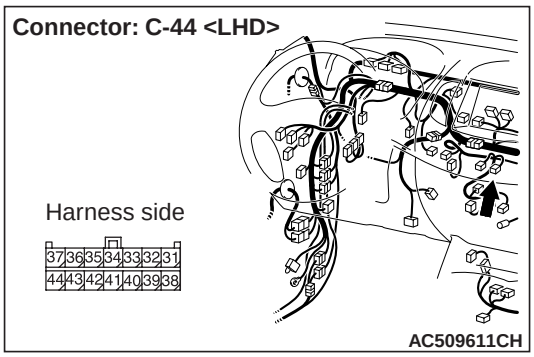


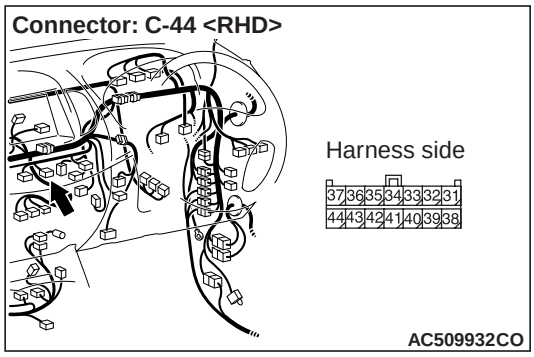


- Check the blower relay earth wires for open circuit.

Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the wiring harness.

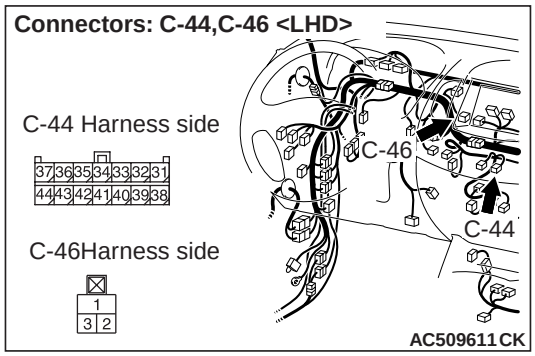
STEP 3. Connector check: C-44 A/C-ECU connector

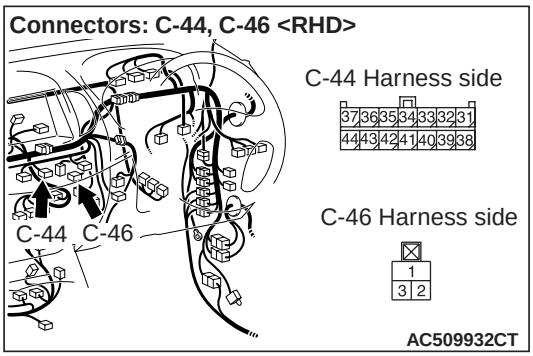




Q: Is the check result normal?
YES : Go to Step 4.
NO : Repair the connector.

STEP 4. Check the wiring harness between C-46 power transistor connector (terminals 1 and 3) and C-44 A/C-ECU connector (terminals 36 and 35).

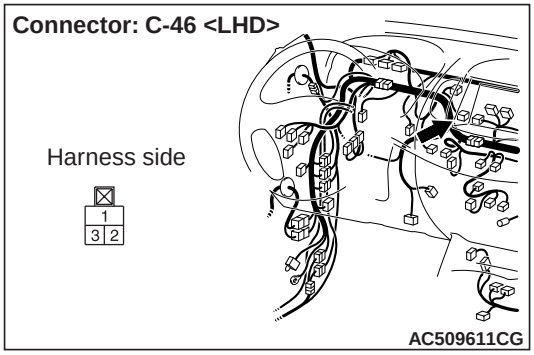


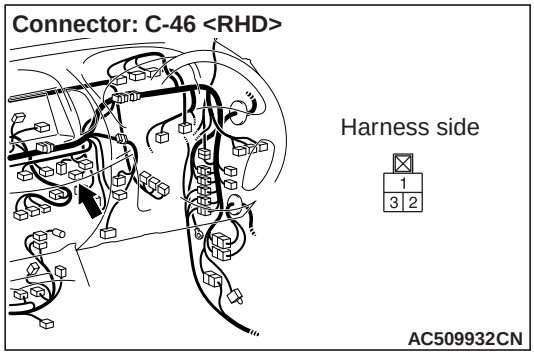


- Check the A/C-ECU input line for open circuit.

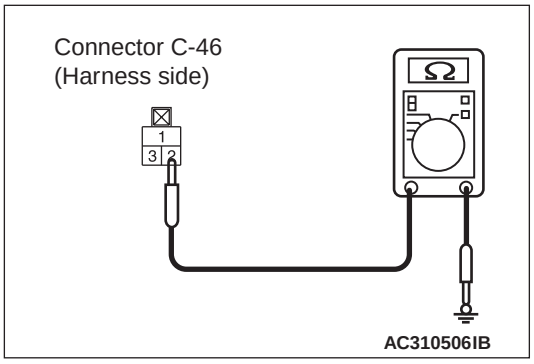
Q: Is the check result normal?
YES : Go to Step 5.
NO : Repair the wiring harness.

STEP 5. Resistance measurement at the C-46 power transistor connector.





(1) Disconnect the connector, and measure at the wiring harness side.



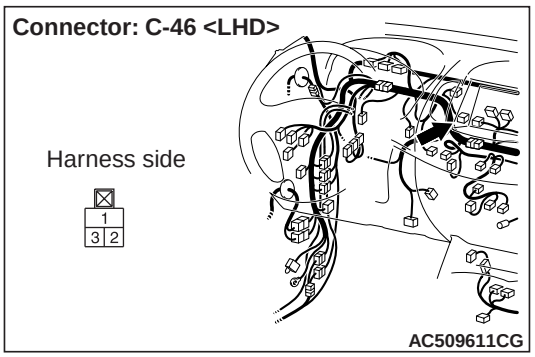
(2) Measure the resistance between terminal 2 and body earth.

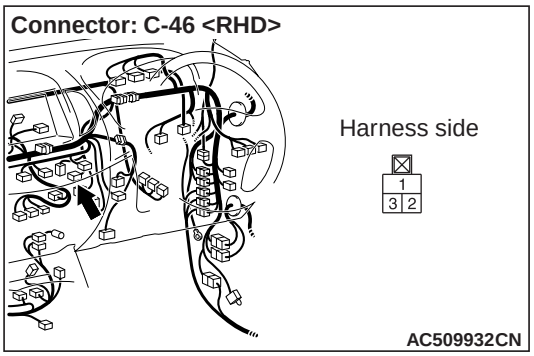
OK: Continuity (Less than 2Ω)

Q: Is the check result normal?

YES : Go to Step 7.
NO : Go to Step 6.

STEP 6. Check the wiring harness between C-46 power transistor connector terminal No.2 and body earth.





- Check the power transistor earth line for open circuit.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness.

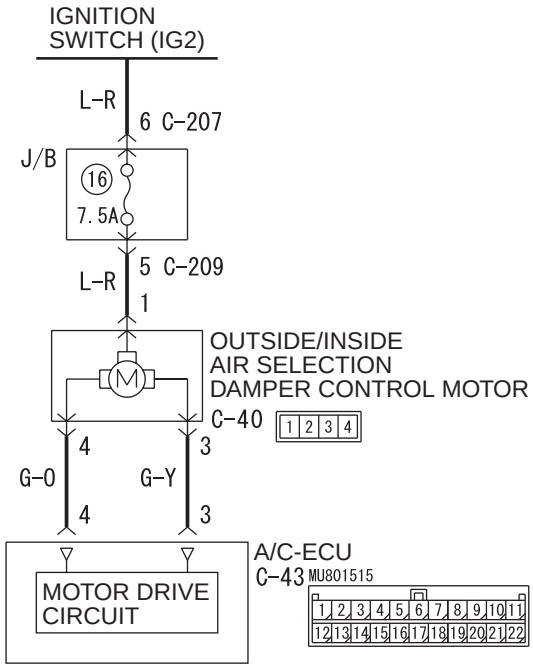
STEP 7. Replace the power transistor, and then recheck the trouble symptom

Check that the blower motor works normally.

Q: Is the check result normal?
YES : This diagnosis is complete.
NO : Replace the A/C-ECU.

Inspection Procedure 4: The inside/outside air changeover is impossible

Outside/Inside Air Selection Damper Control Motor Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

W7C55E007A

COMMENTS ON TROUBLE SYMPTOM

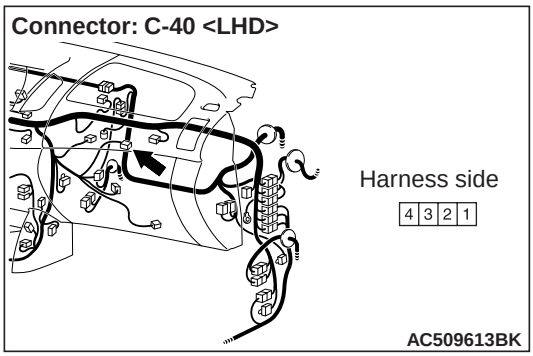
When inside air cannot be changed to outside air vice versa even if its changeover switch is on, the outside/inside air selection damper control motor system may be defective.

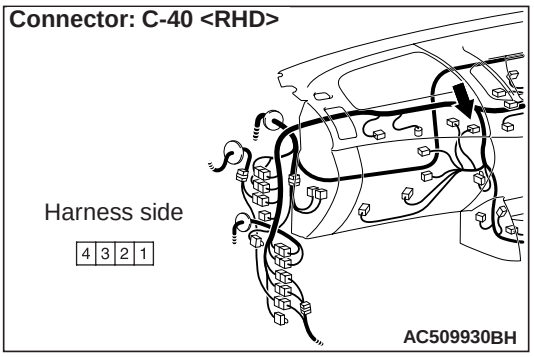
POSSIBLE CAUSES

- Malfunction of the outside/inside air selection damper control motor
- Damaged the wiring harness or connectors
- Malfunction of the automatic A/C control panel (A/C-ECU)

DIAGNOSIS PROCEDURE

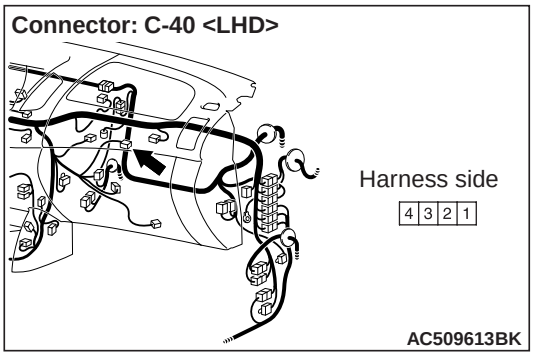
STEP 1. Connector check: C-40 outside/inside air selection damper control motor connector

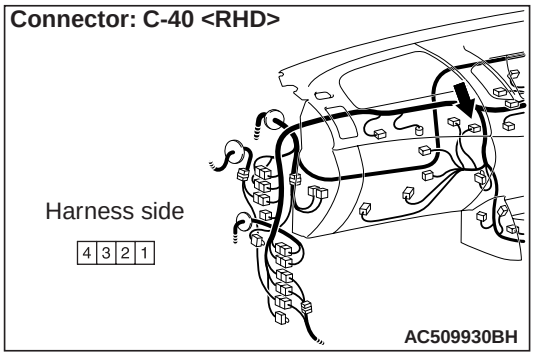




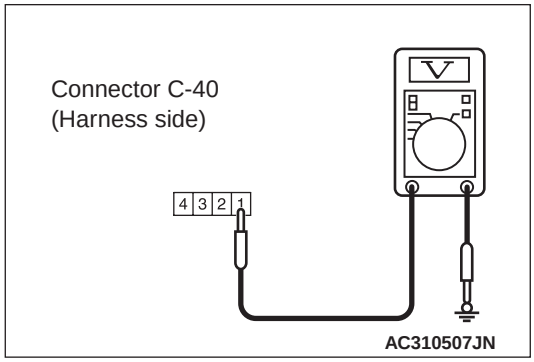
Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the connector.

STEP 2. Voltage measurement at C-40 outside/inside air selection damper control motor connector.





(1) Disconnect the connector, and measure at the wiring harness side.
(2) Turn the ignition switch to the ON position.

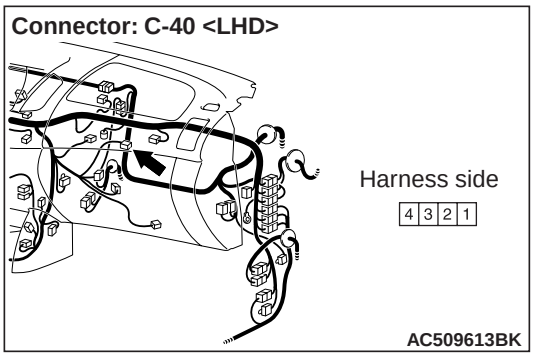


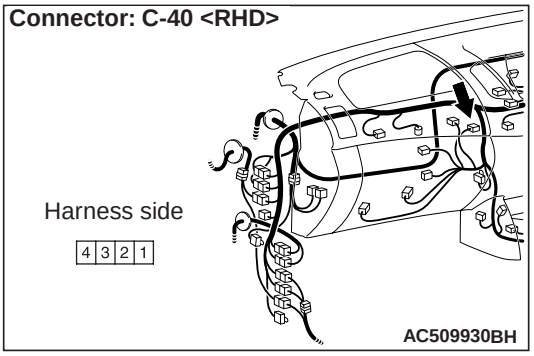
(3) Measure the voltage between terminal 1 and body earth.

OK: System voltage

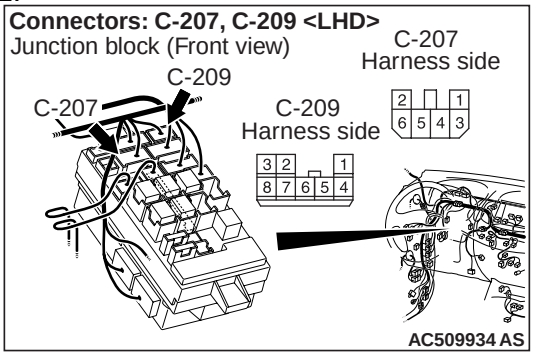
Q: Is the check result normal?
YES : Go to Step 4.
NO : Go to Step 3.

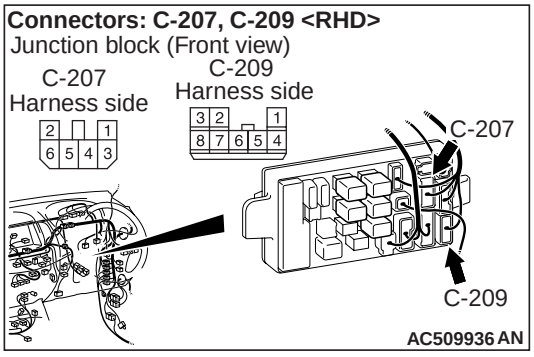
STEP 3. Check the wiring harness between C-40 outside/inside air selection damper control motor connector terminal No.1 and the ignition switch (IG2).





NOTE:





Prior to the wiring harness inspection, check junction block connectors C-209 and C-207, and repair if necessary.

- Check the motor power supply line for open circuit.

Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness.

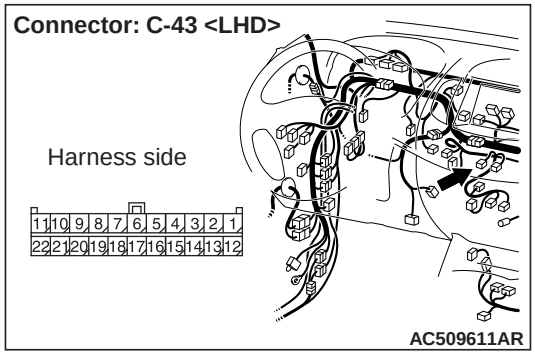
STEP 4. Check the outside/inside air selection damper control motor

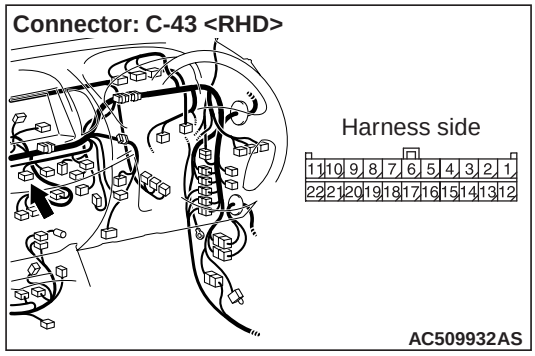
Refer to P.55B-99.

Q: Is the check result normal?

YES : Go to Step 5.
NO : Replace the outside/inside air selection damper control motor.

STEP 5. Connector check: C-43 A/C-ECU connector

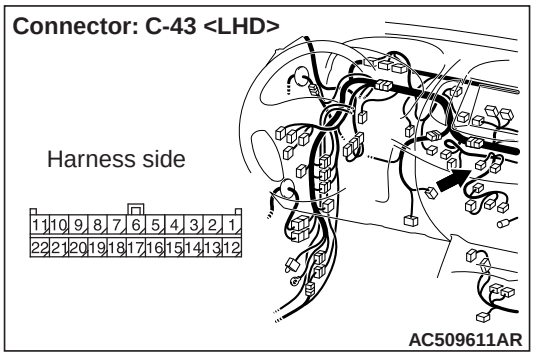


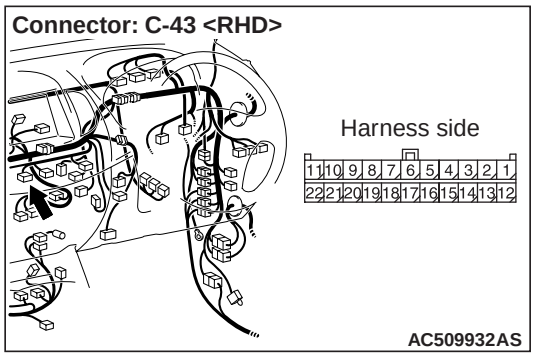


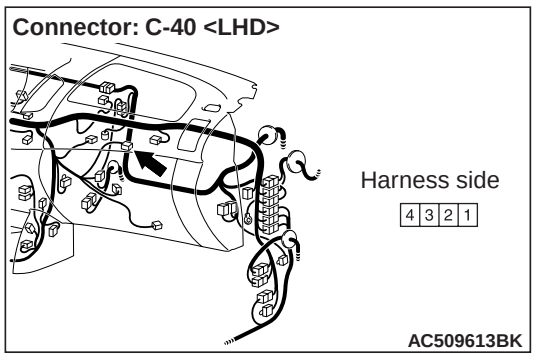
Q: Is the check result normal?

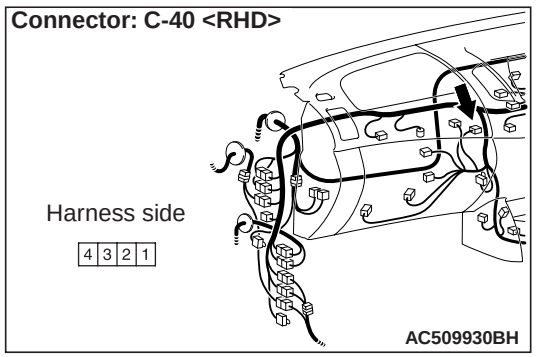
YES : Go to Step 6.
NO : Repair the connector.

STEP 6. Check the wiring harness between C-43 A/C-ECU connector (terminals 3 and 4) and C-40 outside/inside air selection damper control motor connector (terminals 3 and 4).









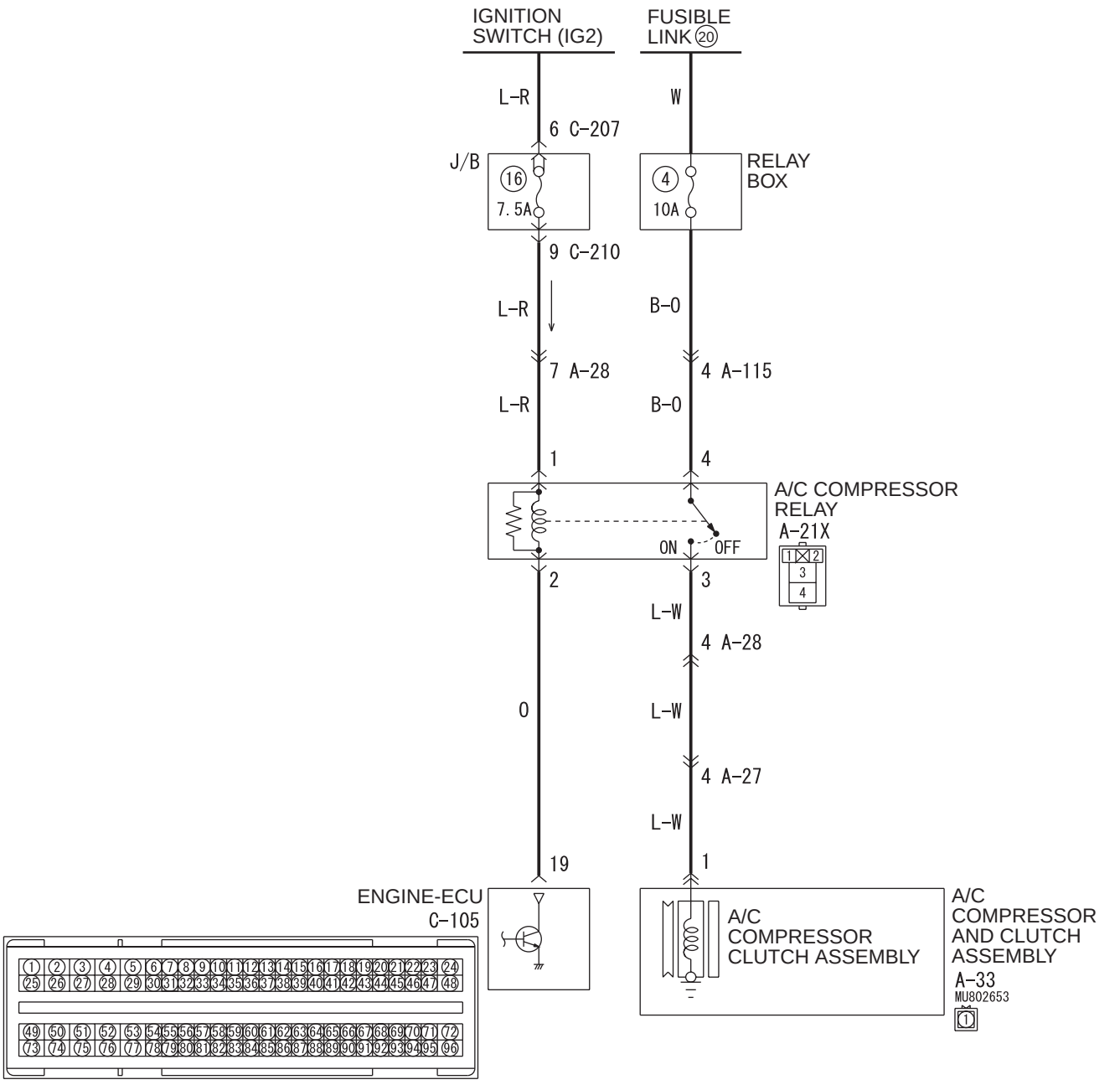
- Check the motor activating lines for open or short circuit.

Q: Is the check result normal?

YES : Replace the automatic A/C control panel (A/C-ECU).
NO : Repair the wiring harness.

Inspection Procedure 5: The A/C compressor does not work

A/C Compressor and Clutch Assembly Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

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COMMENTS ON TROUBLE SYMPTOM

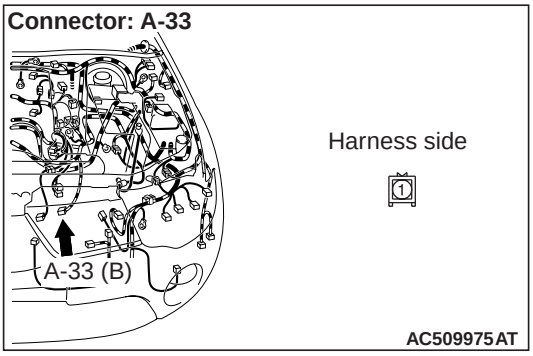
If the A/C compressor does not work, inadequate refrigerant quantity or the A/C compressor circuit is suspected..

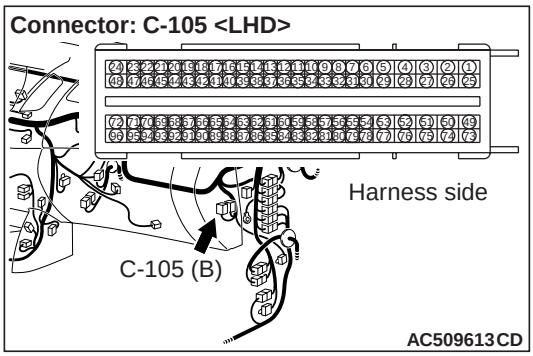
POSSIBLE CAUSES

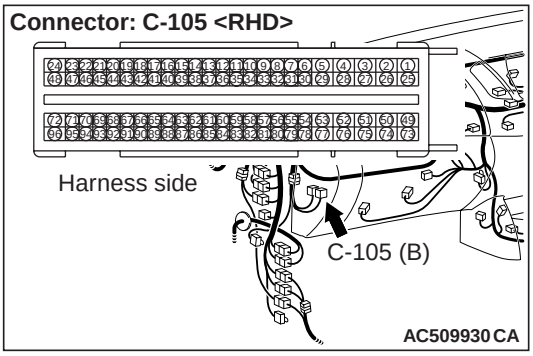
- Malfunction of A/C compressor
- Malfunction of A/C compressor relay
- Damaged harness wires and connectors
- Malfunction of engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. Connector check: A-33 A/C compressor connector and C-105 engine-ECU

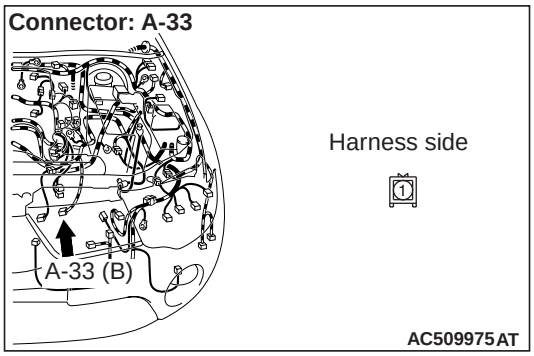




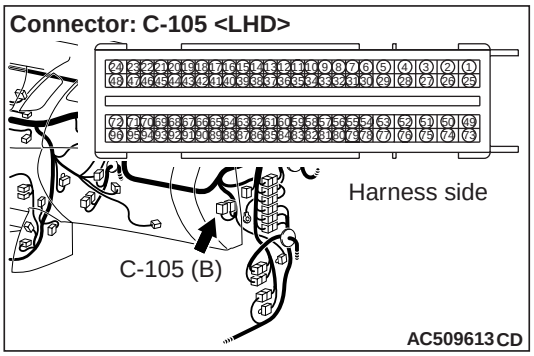


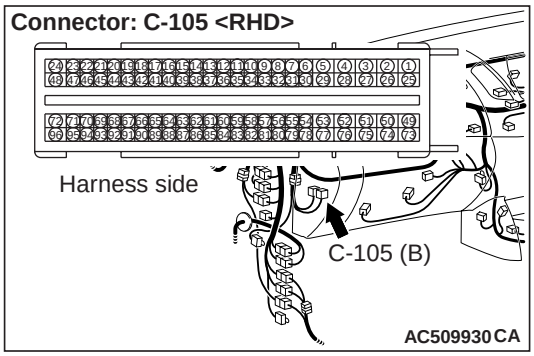
Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the connector.

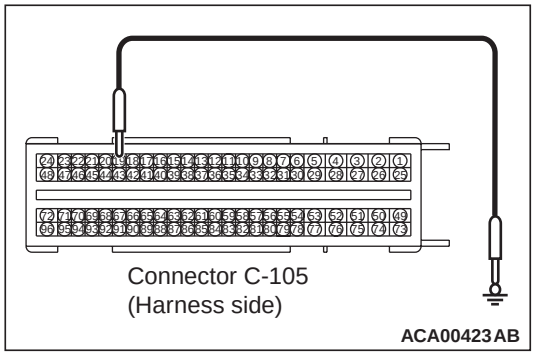
STEP 2. Voltage measurement at A-33 A/C compressor connector.



(1) Disconnect the connector, and measure at the wiring harness side.
(2) Turn the ignition switch to the "ON" position.

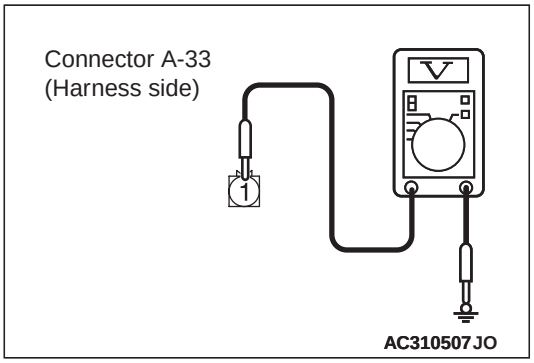






(3) Disconnect engine-ECU connector C-105 and

earth terminal 19.

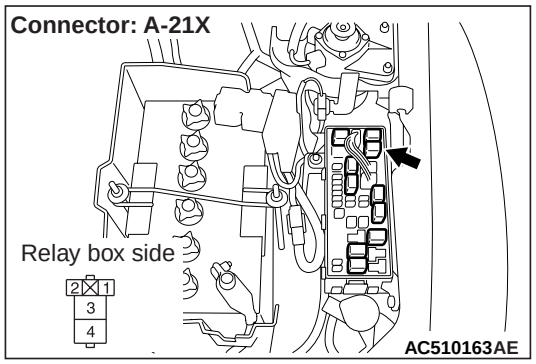


(4) Voltage between terminal 1 and body earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 11.
NO : Go to Step 3.

STEP 3. Connector check: A-21X A/C compressor relay connector



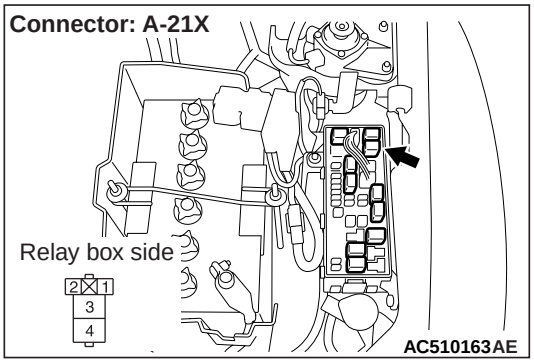
Q: Is the check result normal?
YES : Go to Step 4.
NO : Repair the connector.

STEP 4. Check the A/C compressor relay continuity.

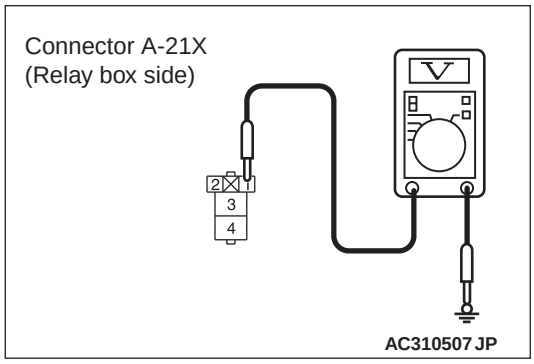
Refer to .

Q: Is the A/C compressor relay in good condition?
YES : Go to Step 5.
NO : Replace the A/C compressor relay.

STEP 5. Voltage measurement at A-21X A/C compressor relay connector.



(1) Remove the relay, and measure at the relay box side.
(2) Turn the ignition switch to the "ON" position.

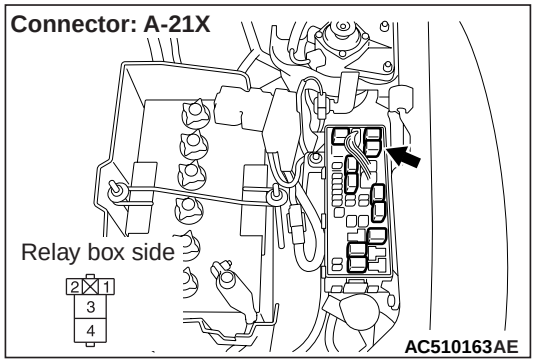


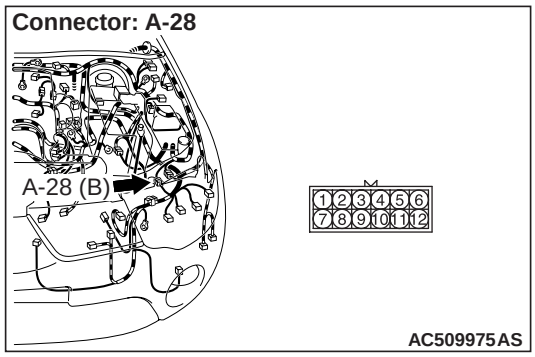
(3) Voltage between terminal 1 and body earth.

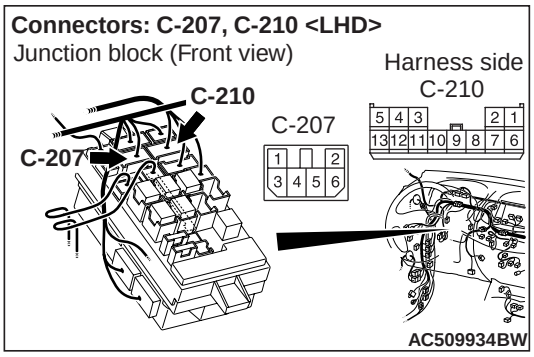
OK: System voltage

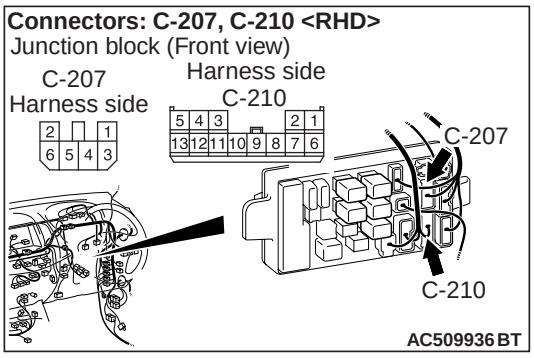
Q: Is the check result normal?
YES : Go to Step 7.
NO : Go to Step 6.

STEP 6. Check the wiring harness between A-21X A/C compressor relay connector terminal No.1 and the ignition switch (IG2).









NOTE: Prior to the wiring harness inspection, check intermediate connector A-28, junction connector C-207 and C-210 repair if necessary.

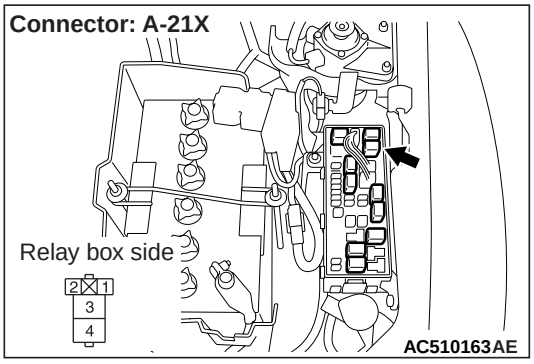
- Check the A/C compressor relay power supply line for open circuit.

Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

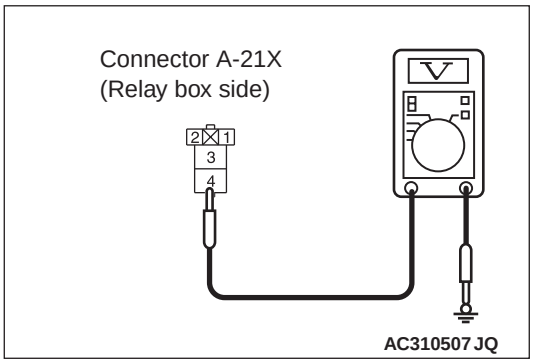
NO : Repair the wiring harness.

STEP 7. Voltage measurement at A-21X A/C compressor relay connector.



(1) Remove the relay, and measure at the relay box side.

(2) Turn the ignition switch to the "ON" position.



(3) Voltage between terminal 4 and body earth.

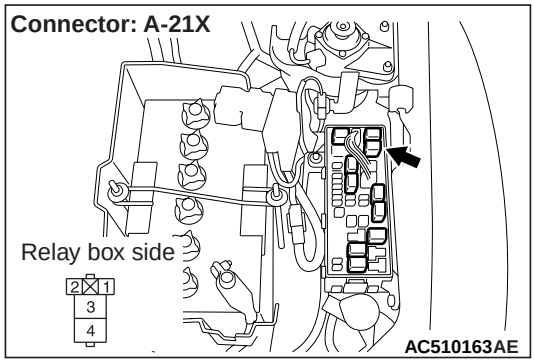
OK: System voltage

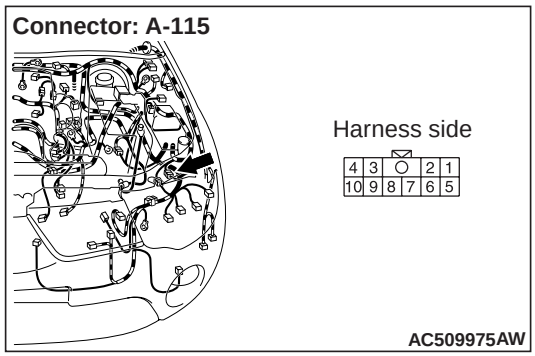
Q: Is the check result normal?

YES : Go to Step 9.

NO : Go to Step 8.

STEP 8. Check the wiring harness between A-21X A/C compressor relay connector terminal No.4 and the fusible link (20).





NOTE: Prior to the wiring harness inspection, check intermediate connector A-115 repair if necessary.

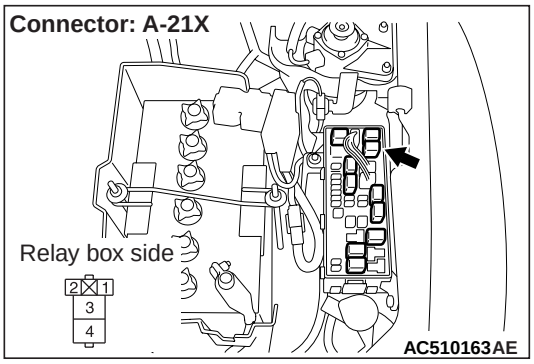
- Check the A/C compressor relay power supply line for open circuit.

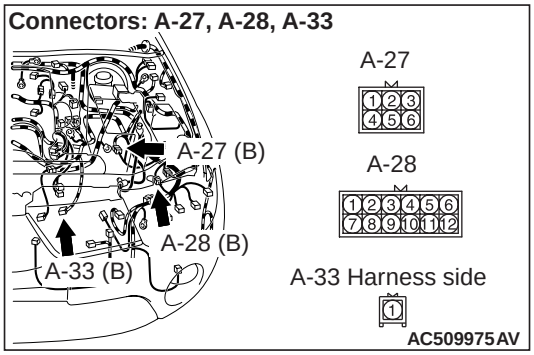
Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

NO : Repair the wiring harness.

STEP 9. Check the wiring harness between A-21X A/C compressor relay connector terminal No.3 and A-33 A/C compressor connector terminal No.1.





NOTE: Prior to the wiring harness inspection, check intermediate connector A-28 and A-27, and repair if necessary.

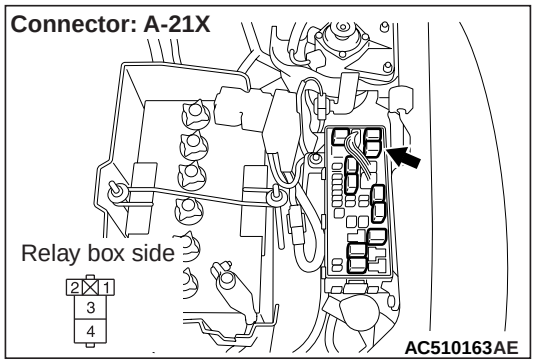
- Check the A/C compressor relay power supply line for open circuit.

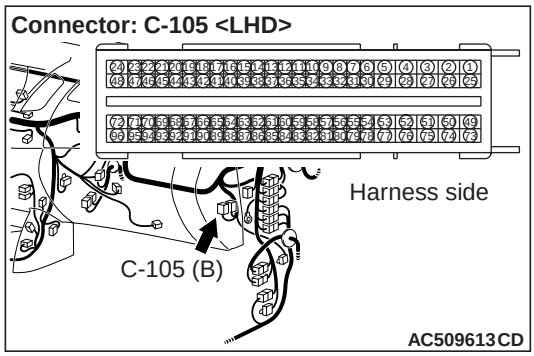
Q: Is the check result normal?

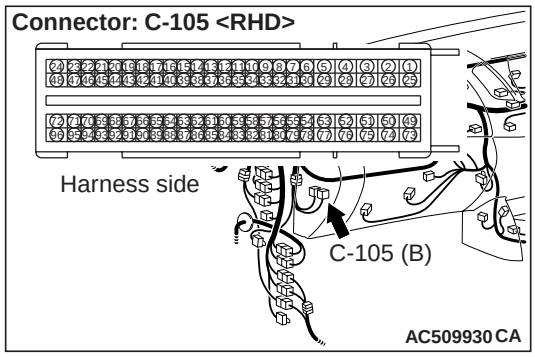
YES : Go to Step 10.

NO : Repair the wiring harness.

STEP 10. Check the wiring harness between A-21X A/C compressor relay connector terminal No.2 and C-105 engine-ECU connector terminal No.40.







- Check the A/C compressor power supply line for open circuit.

Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness.

STEP 11. Check the magnetic clutch operation.
Refer to .

Q: Can the sound of the magnetic clutch (click) be heard?
YES : Go to Step 12.
NO : Replace the compressor magnet clutch.

STEP 12. Check the refrigerant level.
Refer to .

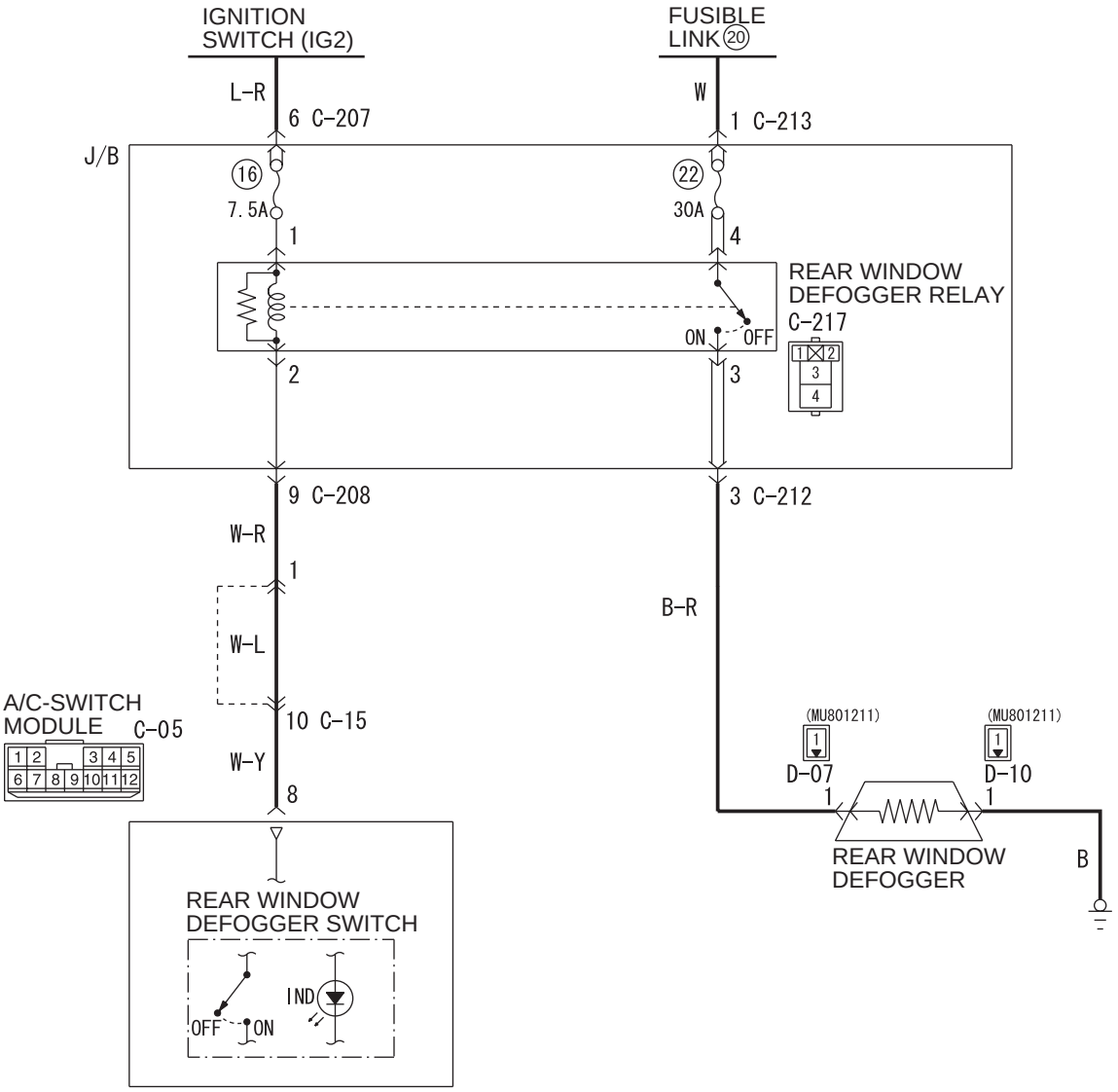
Q: Is the refrigerant level correct?
YES : Go to Step 13.
NO : Correct the refrigerant level (Refer to).

STEP 13. Replace the A/C-ECU, and then recheck the trouble symptom
Check that the compressor works normally.

Q: Is the check result normal?
YES : This diagnosis is complete.
NO : Replace the engine-ECU.

Inspection Procedure 6: The rear window defogger does not work <Vehicles without rear panel power window>

Rear Window Defogger Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

AC900630
W7C55X002A

COMMENTS ON TROUBLE SYMPTOM

If the rear window defogger does not operate when the rear window defogger switch is turned on, the rear window defogger relay system may be defective.

PROBABLE CAUSES

- Malfunction of the automatic A/C control panel (A/C-ECU)
- Malfunction of the rear window defogger relay
- Damaged the wiring harness or connectors
- Malfunction of the rear window defogger

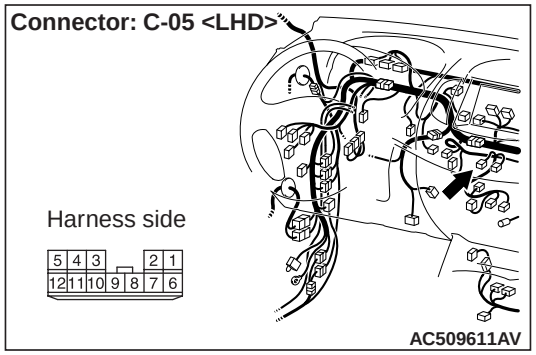
DIAGNOSIS PROCEDURE

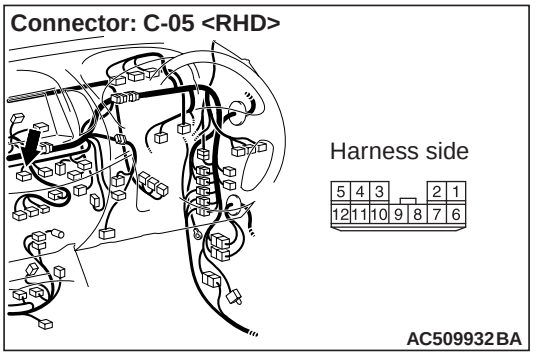
STEP 1. Check the A/C operation.

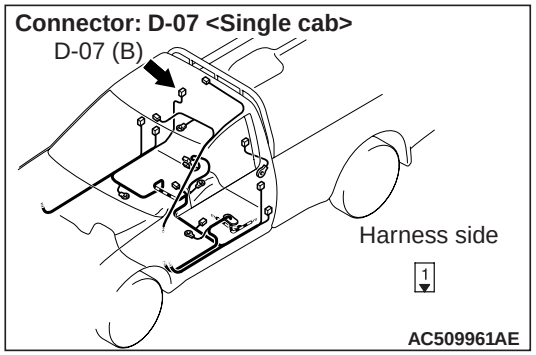
Q: Do the A/C work normally?

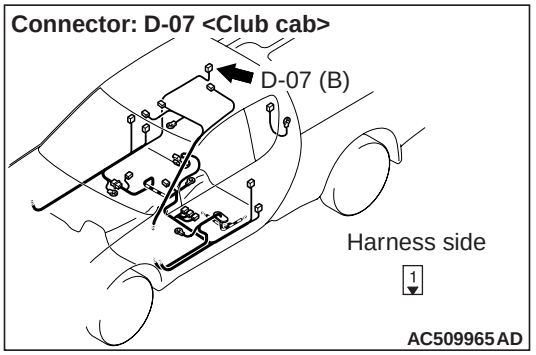
YES : Go to Step 2.
NO : Refer to Inspection procedure 1 "Cool air does not come P.55B-23."

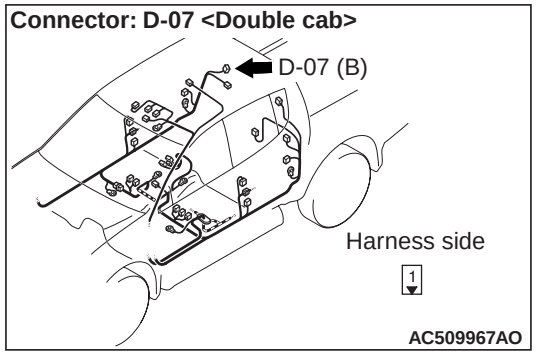
STEP 2. Connector check: C-05 A/C-switch module connector and D-07 rear window defogger connector





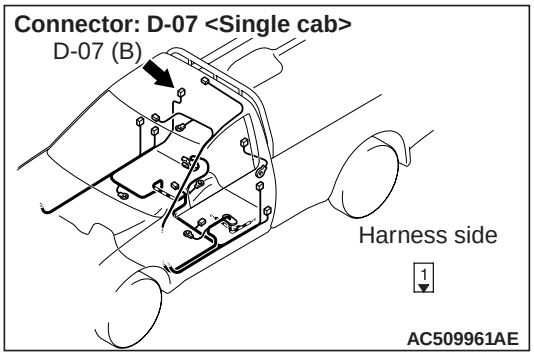


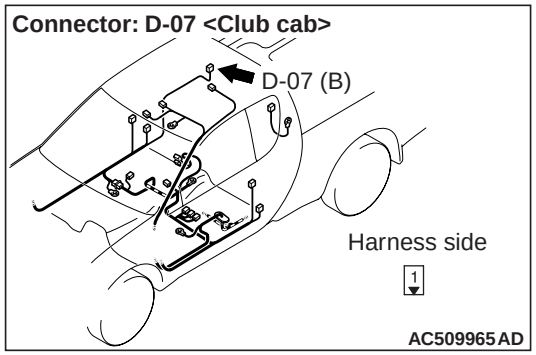


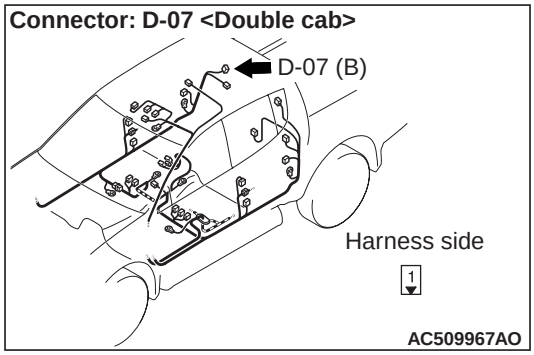


Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the connector.

STEP 3. Voltage measurement at D-07 rear window defogger connector.

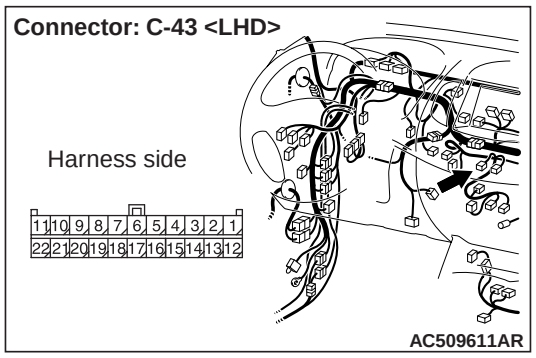


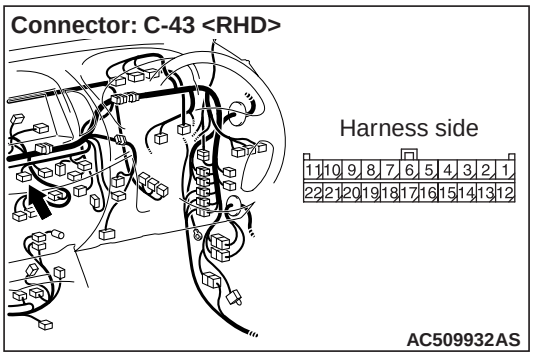




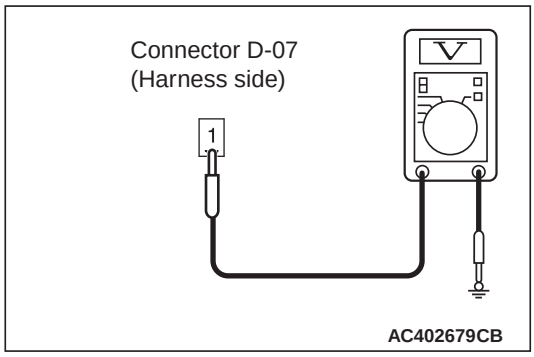
(1) Disconnect the connector, and measure at the wiring harness side.

(2) Turn the ignition switch to the "ON" position.





(3) Disconnect A/C-switch module connector C-05 and earth terminal 8.



(4) Measure the voltage between terminal 1 and body earth.

OK: System voltage

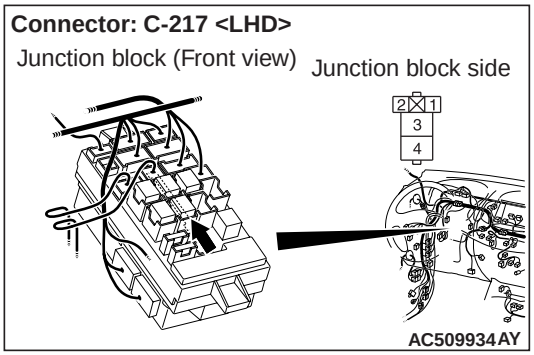
Q: Is the check result normal?
YES : Go to Step 11.
NO : Go to Step 4.

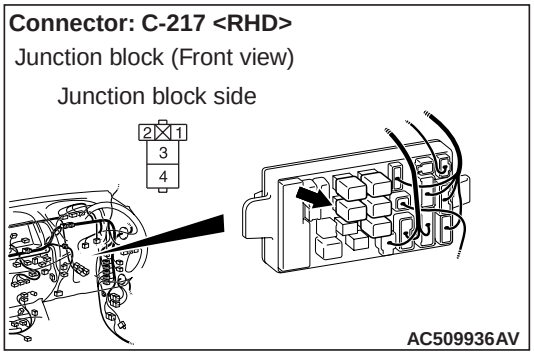
STEP 4. Check the rear window defogger relay continuity.

Refer to .

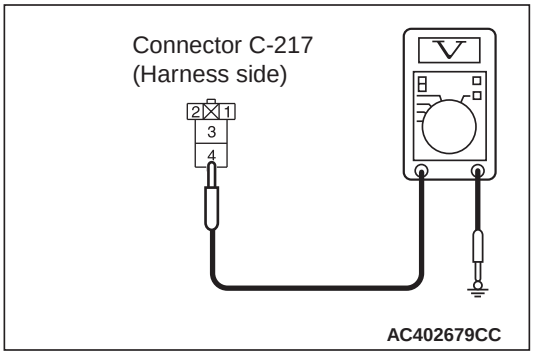
Q: Is the rear window defogger relay in good condition?
YES : Go to Step 5.
NO : Replace the rear window defogger relay.

STEP 5. Voltage measurement at C-217 rear window defogger relay connector.





(1) Remove the relay, and measure at the junction block side.



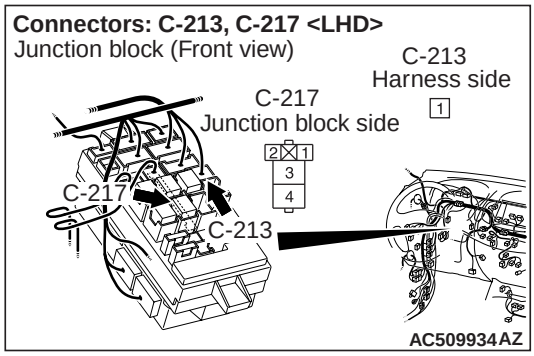
(2) Measure the voltage between terminal 4 and body earth.

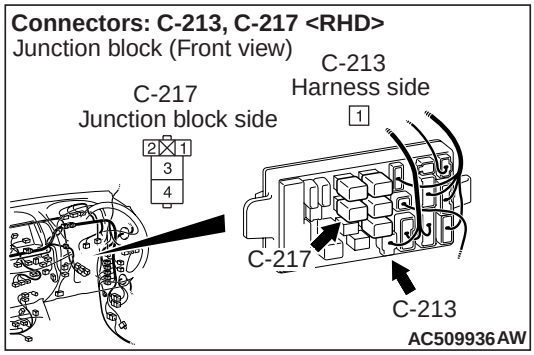
OK: System voltage

Q: Is the check result normal?

YES : Go to Step 7.
NO : Go to Step 6.

STEP 6. Check the wiring harness between C-217 rear window defogger relay connector terminal No.4 and the fusible link (20).





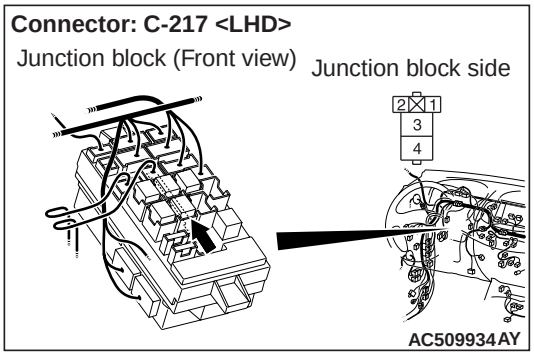
NOTE: Prior to the wiring harness inspection, check junction block connector C-213, and repair if necessary.

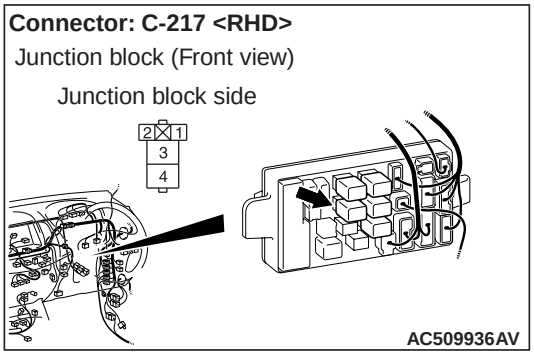
- Check the rear window defogger relay power supply line for open and short circuit.

Q: Is the check result normal?

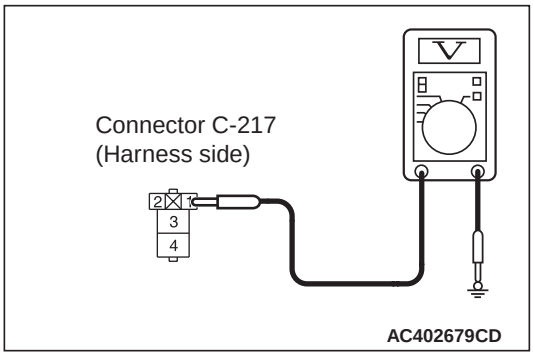
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness.

STEP 7. Voltage measurement at C-217 rear window defogger relay connector.





(1) Remove the relay, and measure at the junction block side.
(2) Turn the ignition switch to the "ON" earth position.



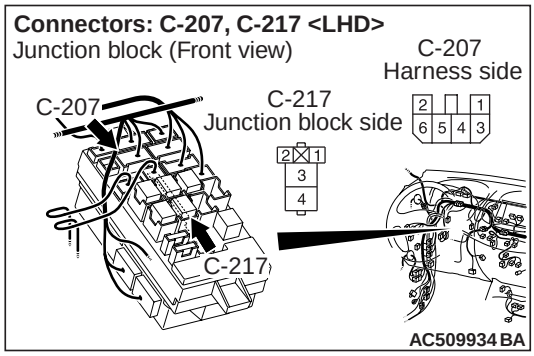
(3) Voltage between terminal 1 and body earth.

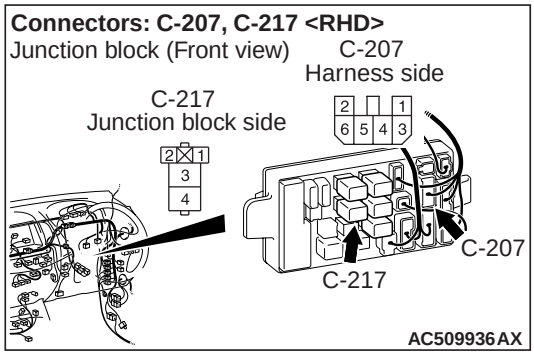
OK: System voltage

Q: Is the check result normal?

YES : Go to Step 9.
NO : Go to Step 8.

STEP 8. Check the wiring harness between C-217 rear window defogger relay connector No.1 and ignition switch (IG2).





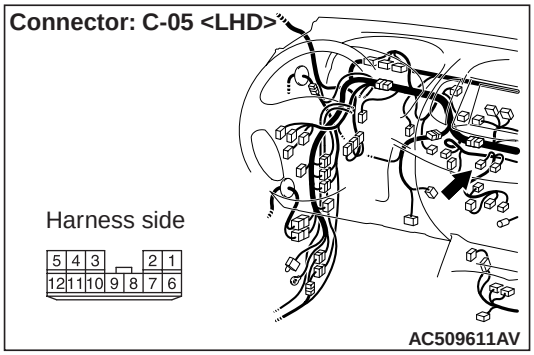
NOTE: Prior to the wiring harness inspection, check junction block connector C-207, and repair if necessary.

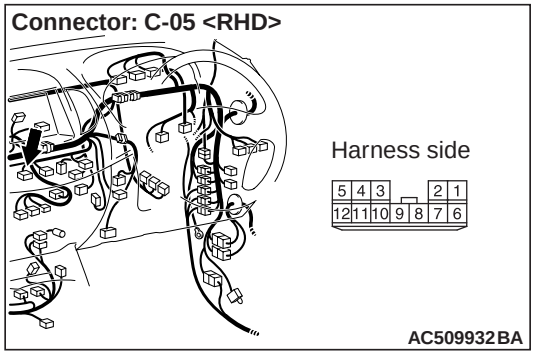
- Check the rear window defogger power supply line for open circuit.

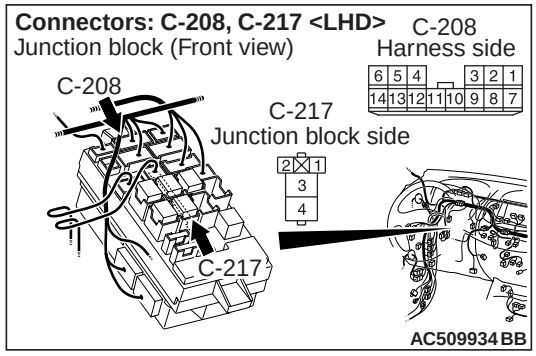
Q: Is the check result normal?

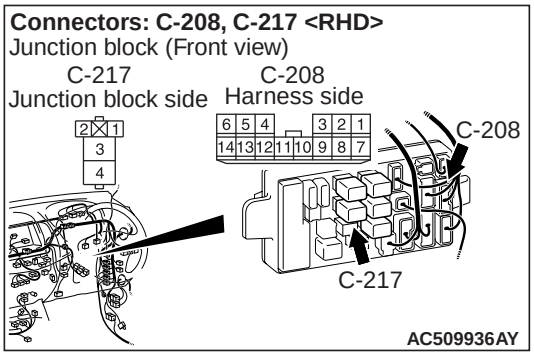
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness.

STEP 9. Check the wiring harness between C-217 rear window defogger relay connector No.2 and C-05 A/C-switch module connector No.8.

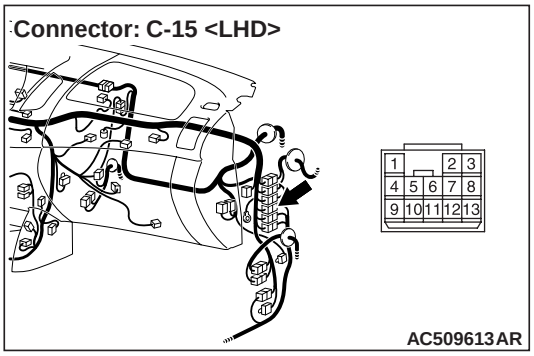


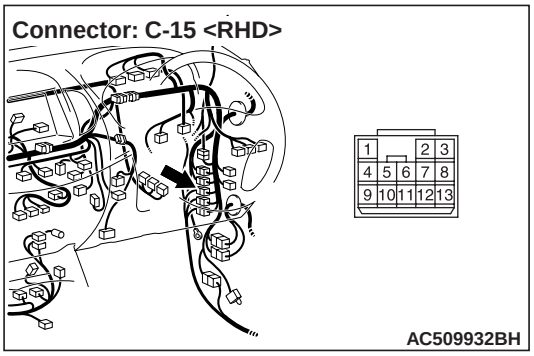






NOTE:



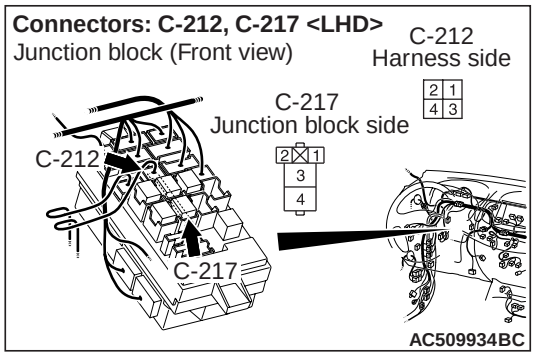


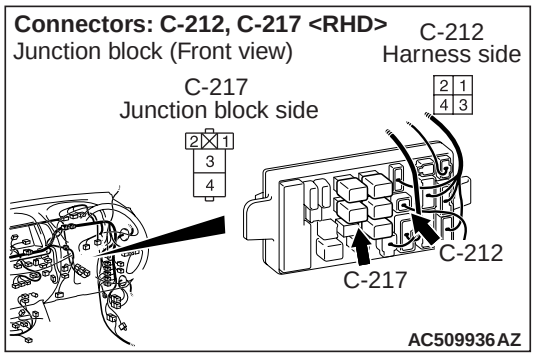
Prior to the wiring harness inspection, check junction block connector C-208 and intermediate connector C-15, and repair if necessary.

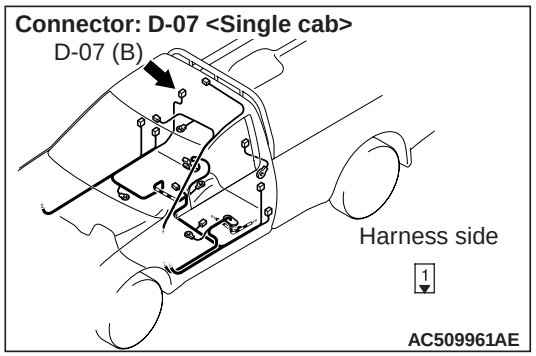
- Check the rear window defogger power supply line for open circuit.

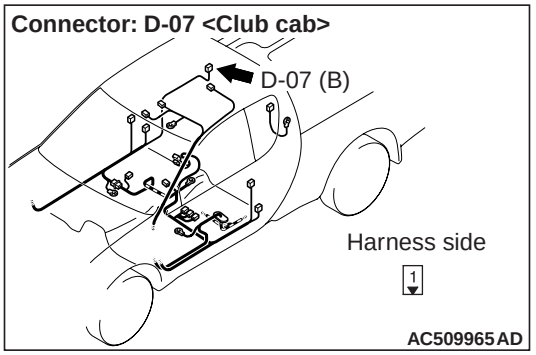
Q: Is the check result normal?
YES : Go to Step 10.
NO : Repair the wiring harness.

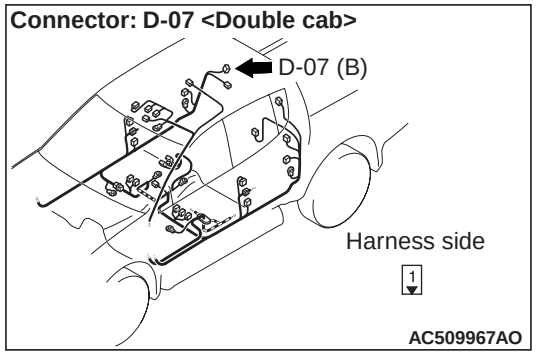
STEP 10. Check the wiring harness between C-217 rear window defogger relay connector No.3 and D-07 rear window defogger connector No.1.









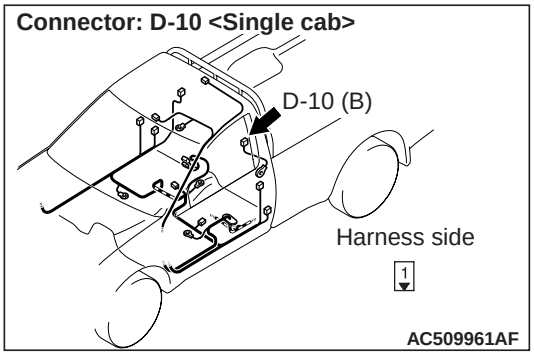


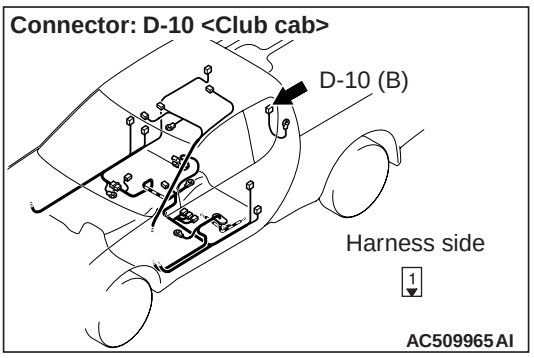
NOTE: Prior to the wiring harness inspection, check junction block connector C-212, and repair if necessary.

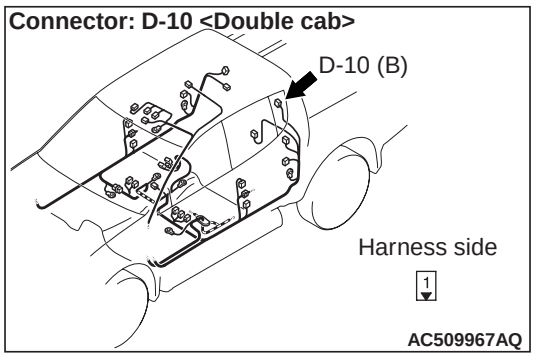
- Check the rear window defogger relay line for open and short circuit.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness.

STEP 11. Connector check: D-10 rear window defogger connector

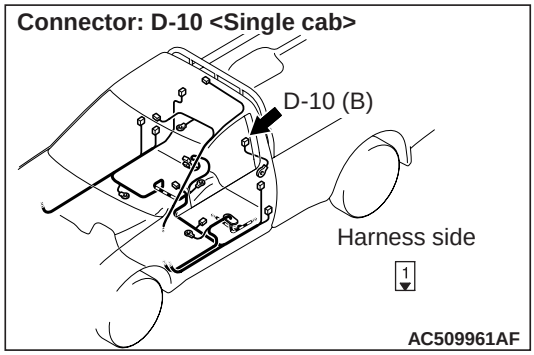


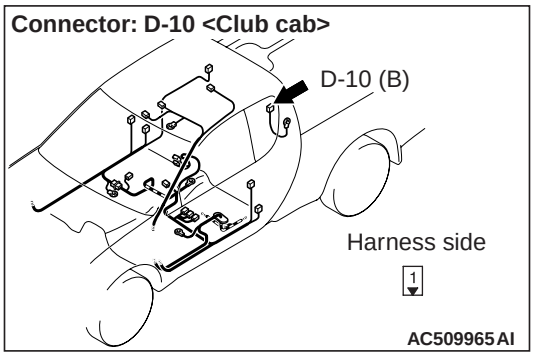


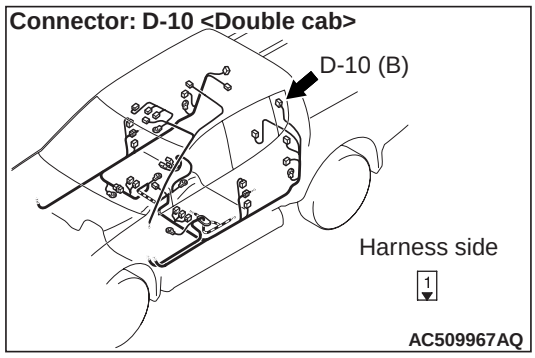


Q: Is the check result normal?
YES : Go to Step 12.
NO : Repair the connector.

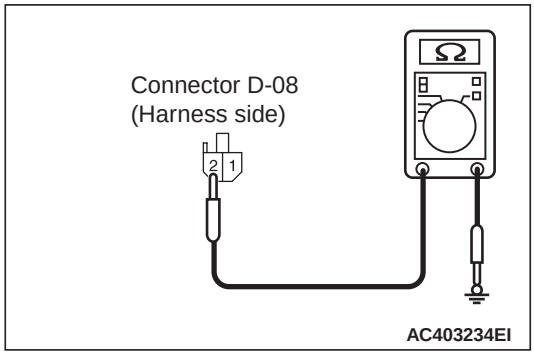
STEP 12. Resistance measurement at D-10 rear window defogger connector.







(1) Disconnect the connector, and measure at the wiring harness side.

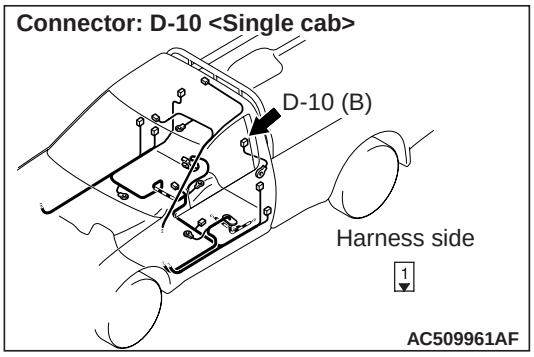


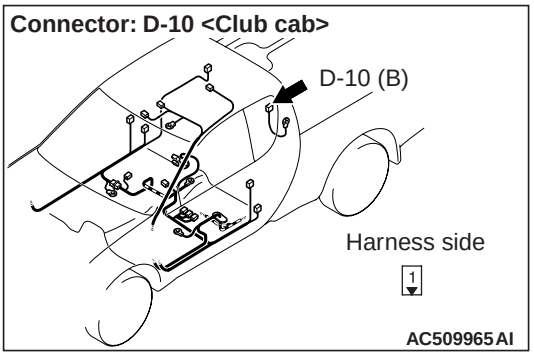
(2) Continuity between terminal 1 and body earth.

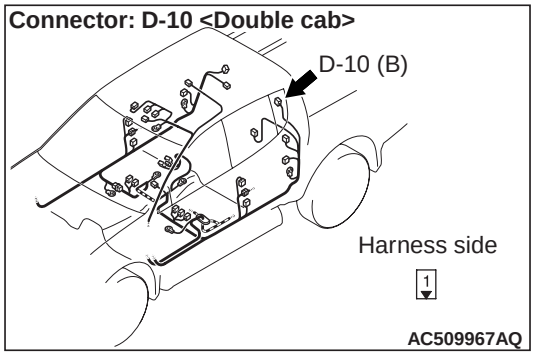
OK: Continuity (Less than 2Ω)

Q: Is the check result normal?
YES : Go to Step 14.
NO : Go to Step 13.

STEP 13. Check the wiring harness between D-10 rear window defogger connector terminal No.1 and earth.







- Check the rear window defogger earth line for open circuit.

Q: Is the check result normal?

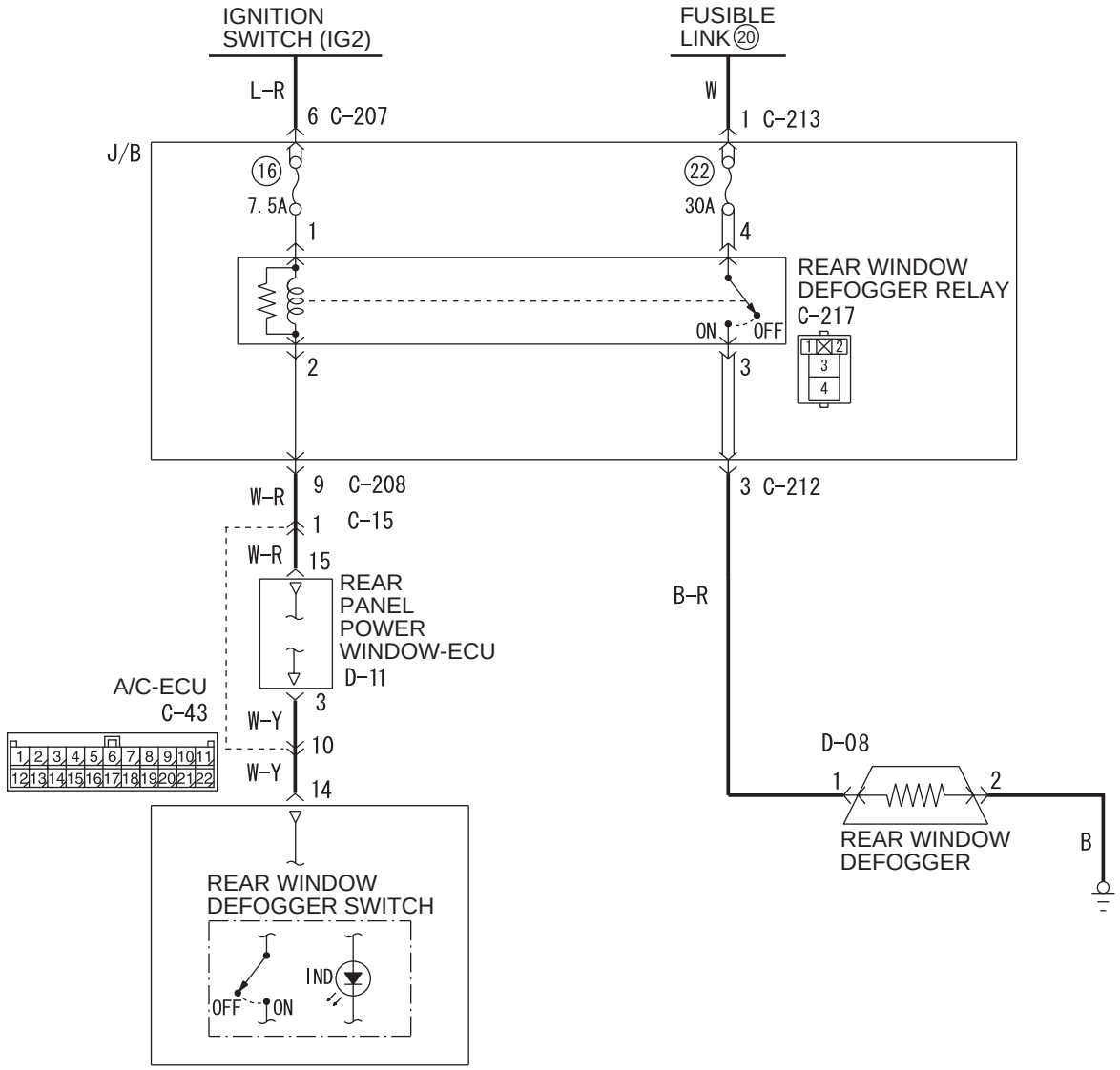
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction).
NO : Repair or replace the wiring harness.

STEP 14. Check the rear window defogger.
Refer to GROUP 54A, Rear Window rear window defogger Inspection .

Q: Does the rear window defogger work normally?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction).
NO : Repair the rear window defogger.

Inspection Procedure 7: The rear window defogger does not work <Vehicles with rear panel power window >

Rear Window Defogger Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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COMMENTS ON TROUBLE SYMPTOM

If the rear window defogger does not operate when the rear window defogger switch is turned on, the rear window defogger relay system may be defective.

PROBABLE CAUSES

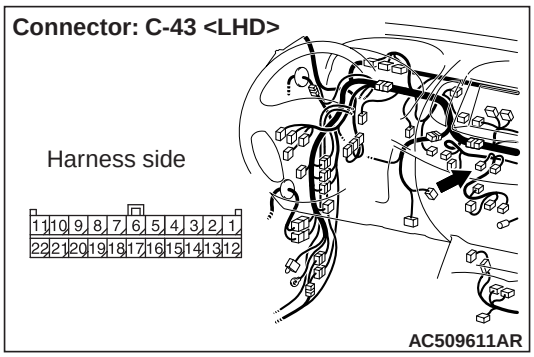
- Malfunction of the automatic A/C control panel (A/C-ECU)
- Malfunction of the rear panel power window-ECU
- Malfunction of the rear window defogger relay
- Damaged the wiring harness or connectors
- Malfunction of the rear window defogger

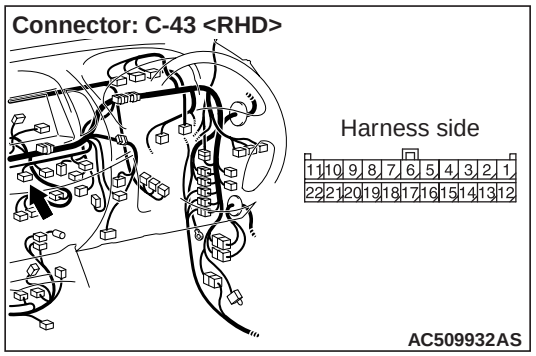
DIAGNOSIS PROCEDURE

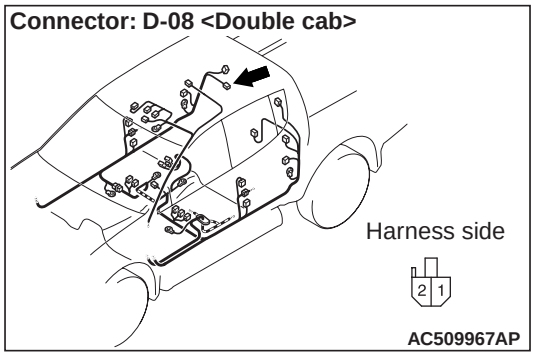
STEP 1. Check the A/C operation.

Q: Do the A/C work normally?
YES : Go to Step 2.
NO : Refer to Inspection procedure 1 "Cool air does not come P.55B-23."

STEP 2. Connector check: D-11 rear panel power window-ECU connector and D-08 rear window defogger connector

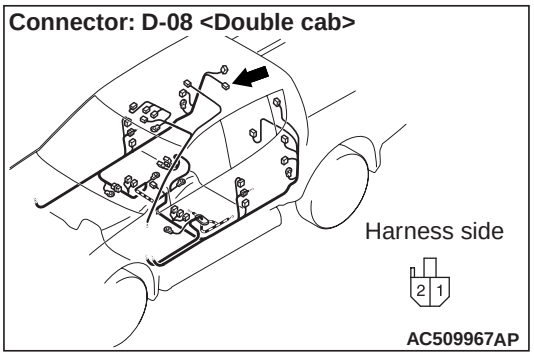




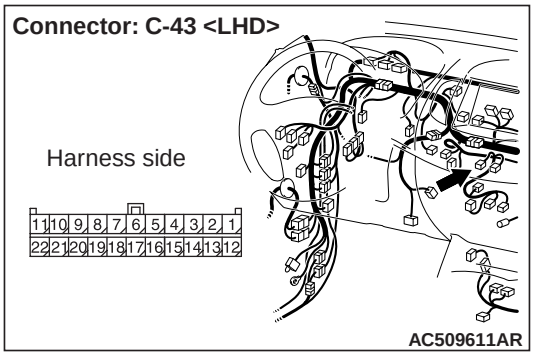


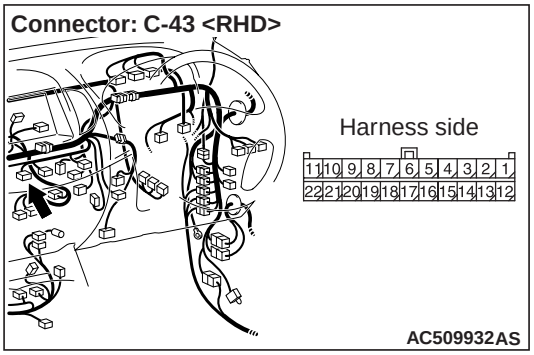
Q: Is the check result normal?
YES : Go to Step 3.
NO : Repair the connector.

STEP 3. Voltage measurement at D-08 rear window defogger connector.

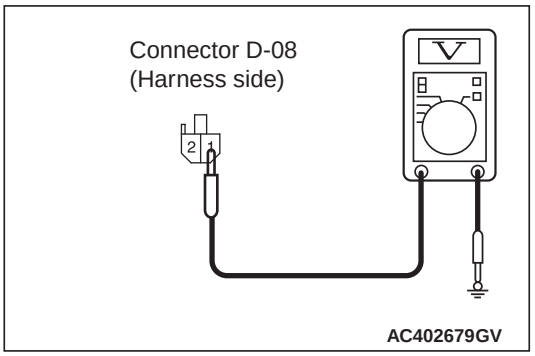


(1) Disconnect the connector, and measure at the wiring harness side.
(2) Turn the ignition switch to the "ON" position.





(3) Disconnect rear panel power window-ECU connector D-11 and earth terminal 15.



(4) Measure the voltage between terminal 1 and

body earth.

OK: System voltage

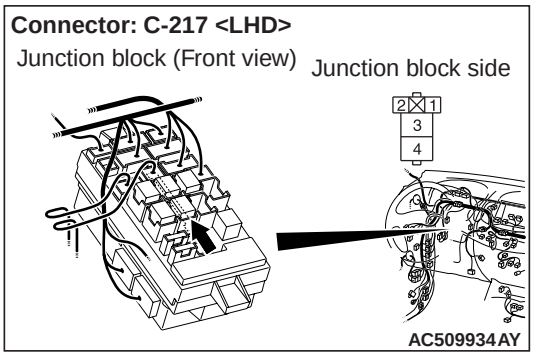
Q: Is the check result normal?
YES : Go to Step 11.
NO : Go to Step 4.

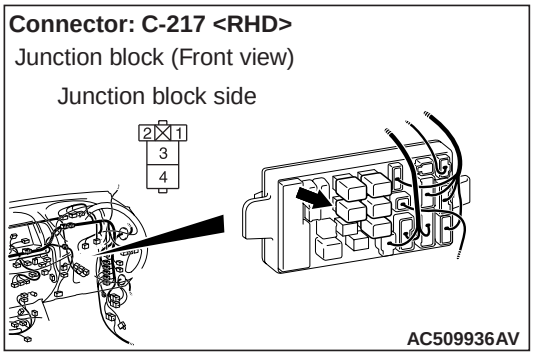
STEP 4. Check the rear window defogger relay continuity.

Refer to .

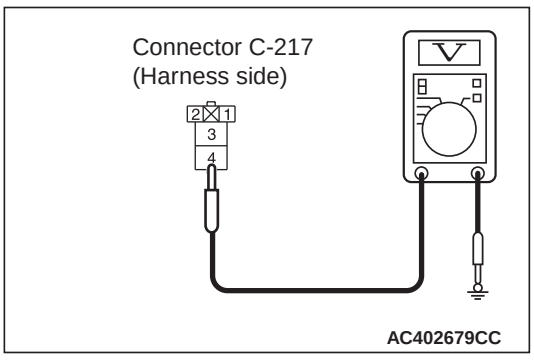
Q: Is the rear window defogger relay in good condition?
YES : Go to Step 5.
NO : Replace the rear window defogger relay.

STEP 5. Voltage measurement at C-217 rear window defogger relay connector.





(1) Remove the relay, and measure at the junction block side.

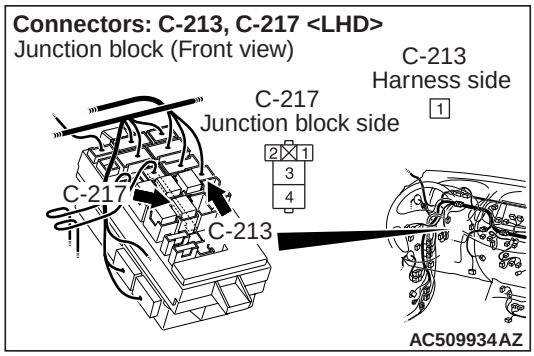


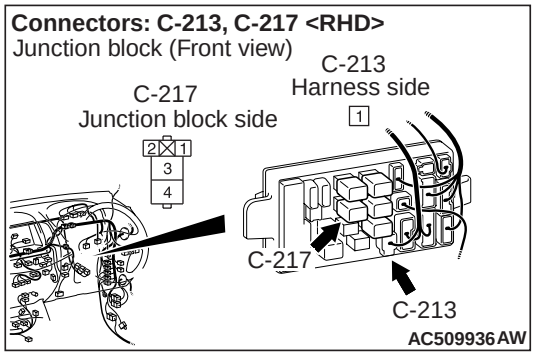
(2) Measure the voltage between terminal 4 and body earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 7.
NO : Go to Step 6.

STEP 6. Check the wiring harness between C-217 rear window defogger relay connector terminal No.4 and the fusible link (20).



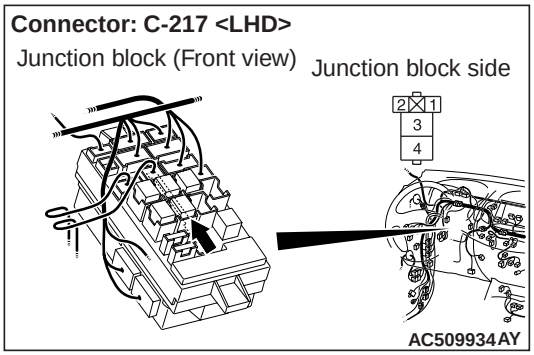


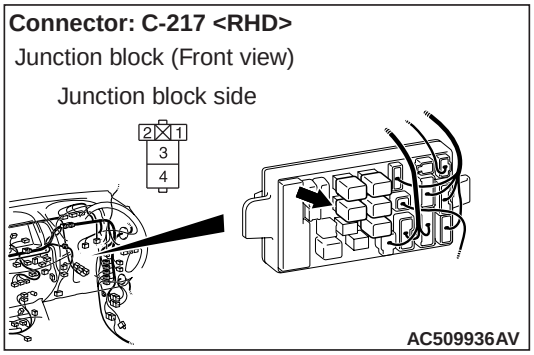
NOTE: Prior to the wiring harness inspection, check junction block connector C-213, and repair if necessary.

- Check the rear window defogger relay power supply line for open and short circuit.

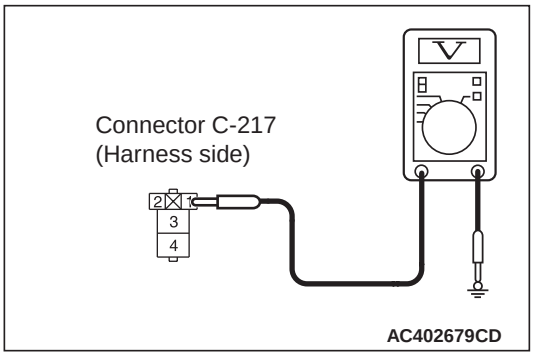
Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness.

STEP 7. Voltage measurement at C-217 rear window defogger relay connector.





(1) Remove the relay, and measure at the junction block side.
(2) Turn the ignition switch to the "ON" earth position.



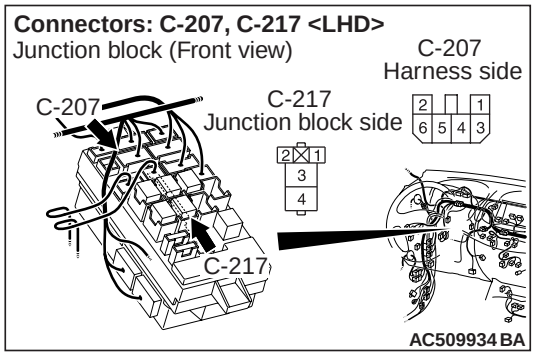
(3) Voltage between terminal 1 and body earth.

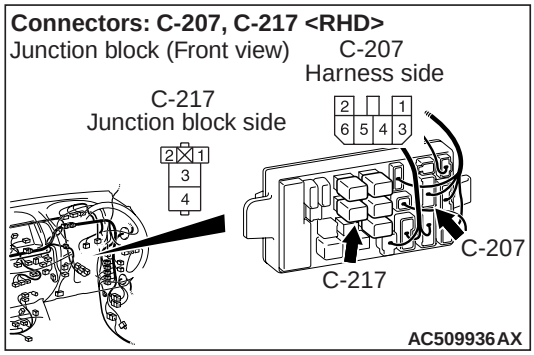
OK: System voltage

Q: Is the check result normal?

YES : Go to Step 9.
NO : Go to Step 8.

STEP 8. Check the wiring harness between C-217 rear window defogger relay connector No.1 and ignition switch (IG2).





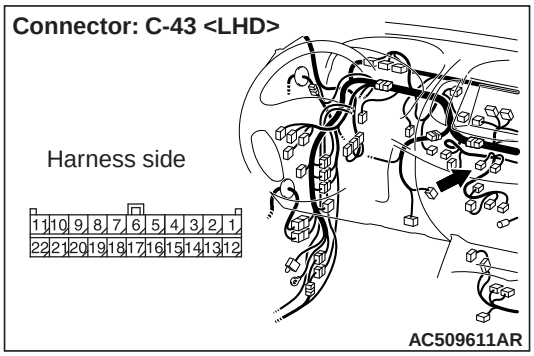
NOTE: Prior to the wiring harness inspection, check junction block connector C-207, and repair if necessary.

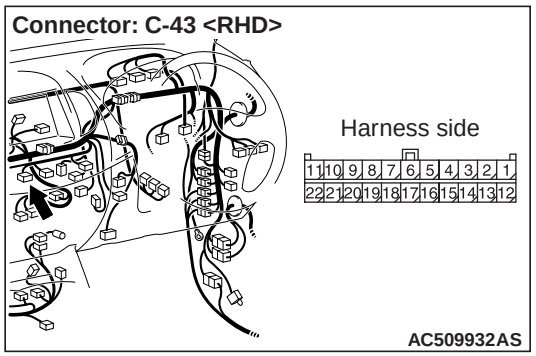
- Check the rear window defogger power supply line for open circuit.

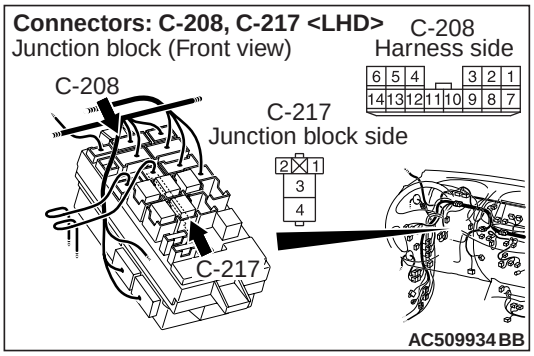
Q: Is the check result normal?

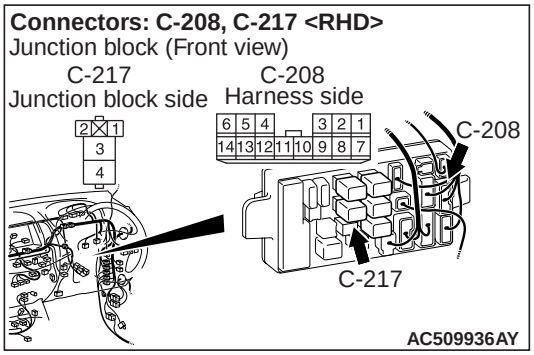
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness.

STEP 9. Check the wiring harness between C-217 rear window defogger relay connector No.2 and D-11 rear panel power window-ECU connector No.15.

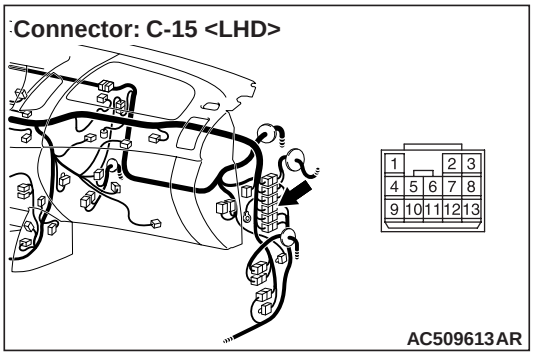


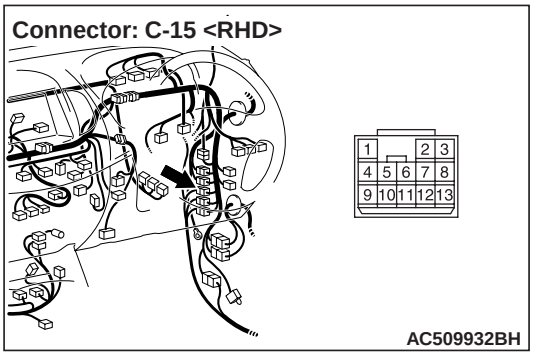






NOTE:



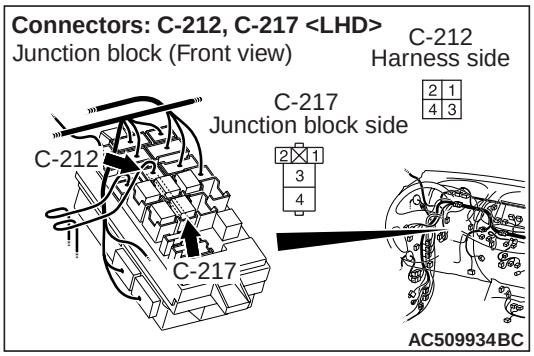


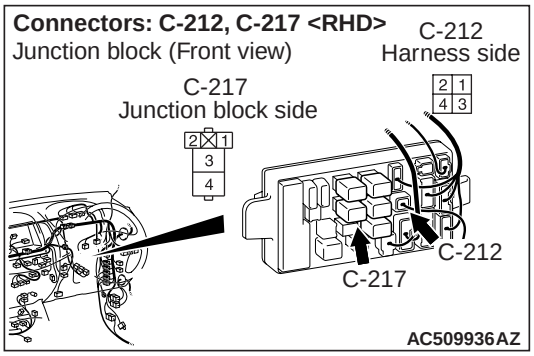
Prior to the wiring harness inspection, check junction block connector C-208 and intermediate connector C-15, and repair if necessary.

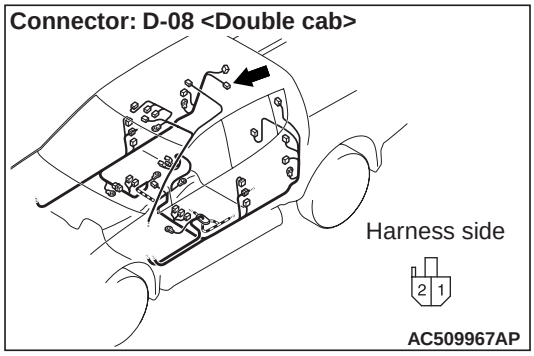
- Check the rear window defogger power supply line for open circuit.

Q: Is the check result normal?
YES : Go to Step 10.
NO : Repair the wiring harness.

STEP 10. Check the wiring harness between C-217 rear window defogger relay connector No.3 and D-08 rear window defogger connector No.1.







NOTE: Prior to the wiring harness inspection, check junction block connector C-212, and repair if necessary.

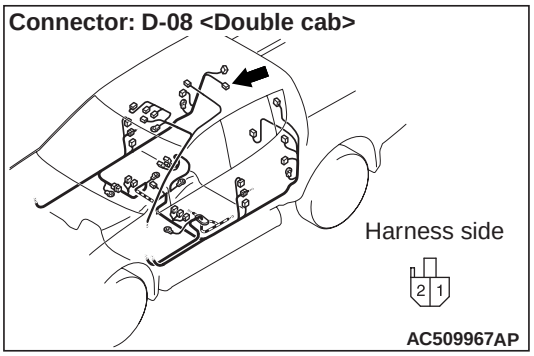
- Check the rear window defogger relay line for open or short circuit.

Q: Is the check result normal?

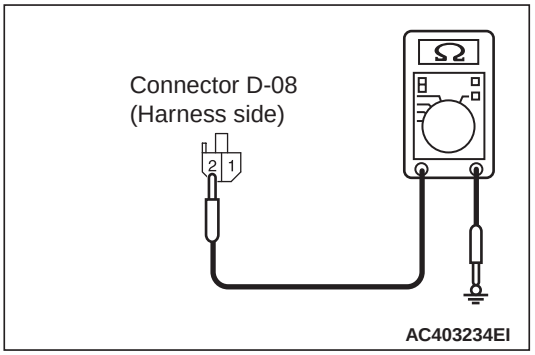
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

NO : Repair the wiring harness.

STEP 11. Resistance measurement at D-08 rear window defogger connector.



(1) Disconnect the connector, and measure at the wiring harness side.



(2) Continuity between terminal 2 and body earth.

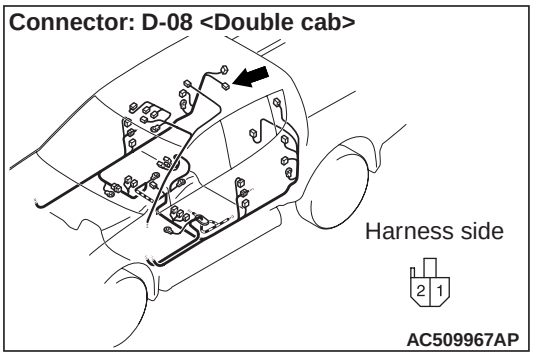
OK: Continuity (Less than 2Ω)

Q: Is the check result normal?

YES : Go to Step 13.

NO : Go to Step 12.

STEP 12. Check the wiring harness between D-08 rear window defogger connector terminal No.2 and earth.



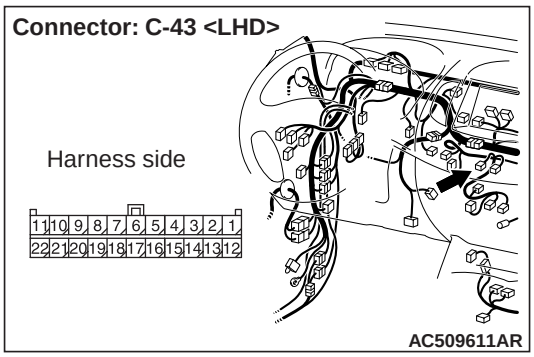
- Check the rear window defogger earth line for open circuit.

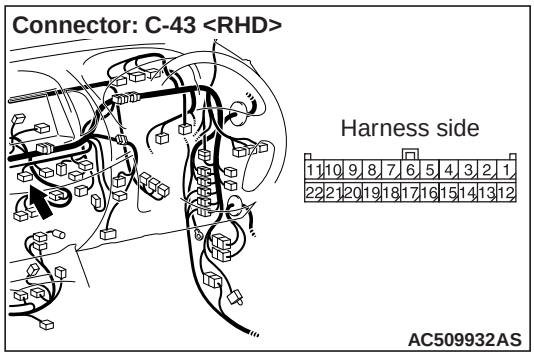
Q: Is the check result normal?

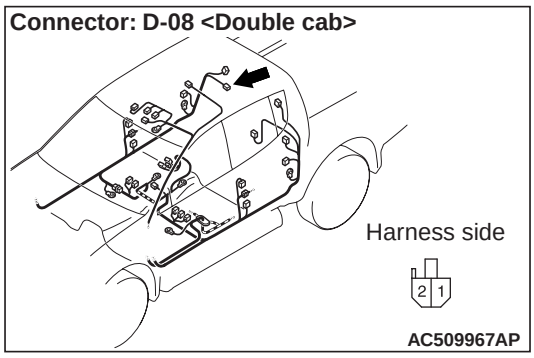
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

NO : Repair or replace the wiring harness.

STEP 13. Connector check: C-43 A/C-ECU connector



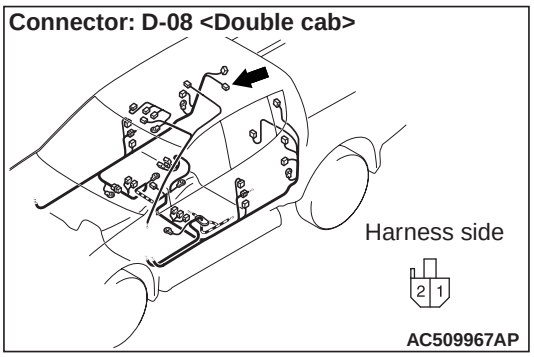




Q: Is the check result normal?

YES : Go to Step 14.
NO : Repair the connector.

STEP 14. Check the wiring harness between C-43 A/C-ECU connector terminal No.14 and D-11 rear panel power window-ECU connector terminal No.3.



NOTE: Prior to the wiring harness inspection, check intermediate connector C-15, and repair if necessary.

- Check the rear window defogger earth line for open circuit.

Q: Is the check result normal?

YES : Go to Step 15.
NO : Repair or replace the wiring harness.

STEP 15. Check the rear window defogger.

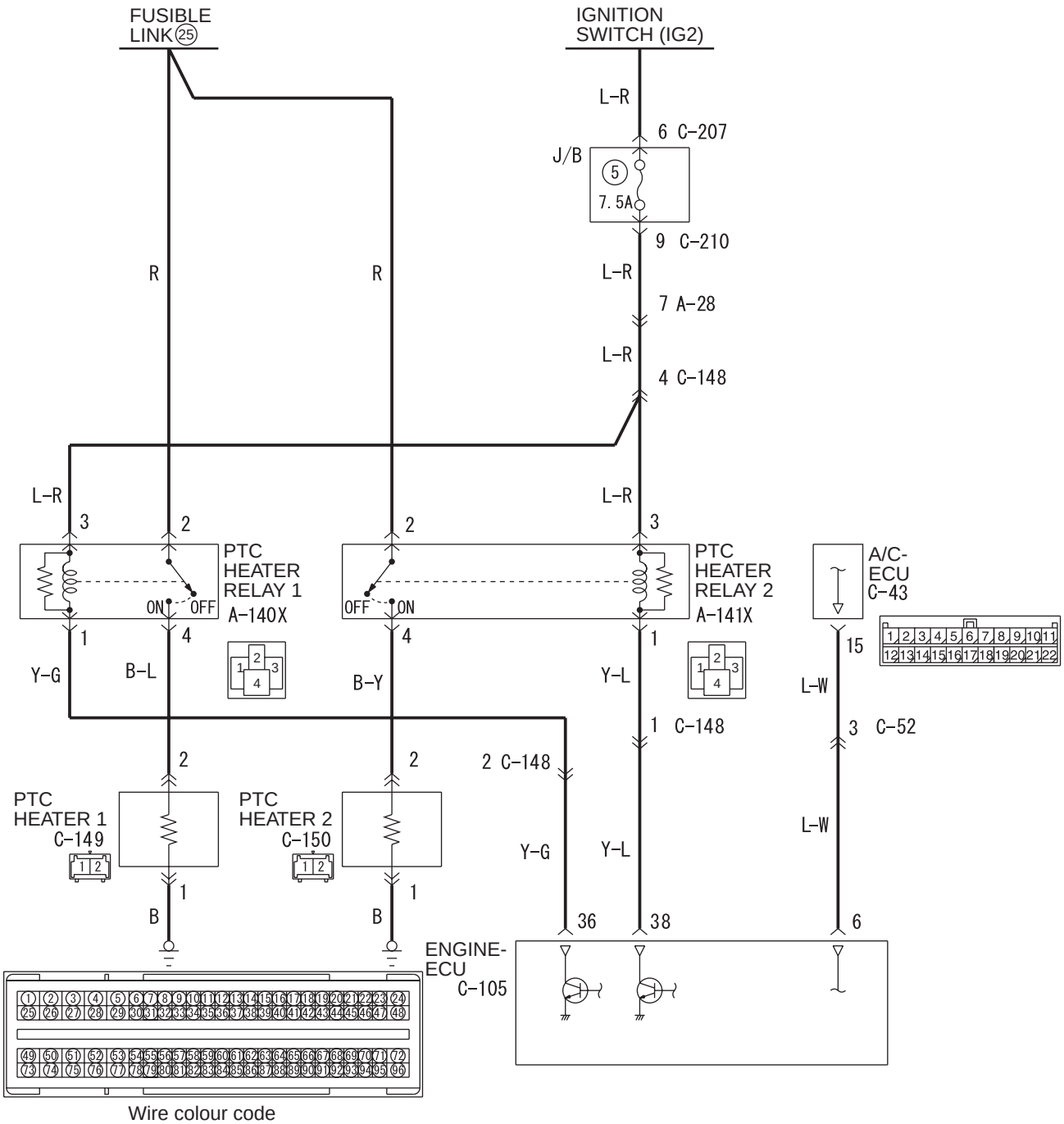
Refer to GROUP 54A, Rear Window rear window defogger Inspection .

Q: Does the rear window defogger work normally?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction).
NO : Repair the rear window defogger.

Inspection Procedure 8: The PTC heater does not work <Russia>

PTC Heater Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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COMMENTS ON TROUBLE SYMPTOM

When the PTC heater does not work under the following conditions, the heater switch system or the PTC heater circuit system may be defective.

PTC heater operating conditions

- heater switch: ON
- Air outlet: FOOT/DEF, FOOT, FACE/FOOT
- Temperature control dial: MAX HOT
- Coolant temperature: 80 degrees celsius or less

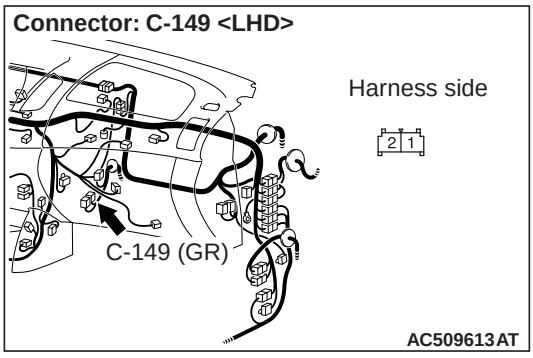
NOTE: When the coolant temperature becomes above 80 degrees celsius and PTC heater stops the operation, the PTC heater does not operate until coolant temperature becomes below 70 degrees celsius.

PROBABLE CAUSES

- Malfunction of the heater switch system
- Damaged the wiring harness or connectors
- Malfunction of the PTC heater relay 1
- Malfunction of the PTC heater relay 2
- Malfunction of the PTC heater 1
- Malfunction of the PTC heater 2

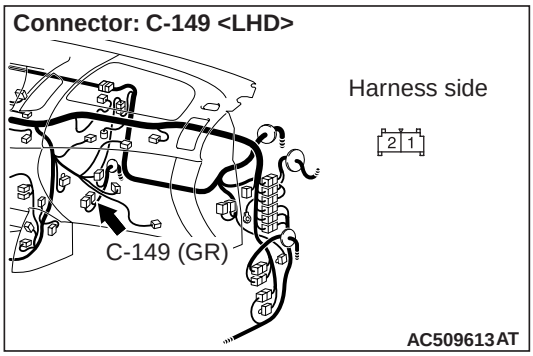
DIAGNOSIS PROCEDURE

STEP 1. Connector check: C-149 PTC heater 1 connector

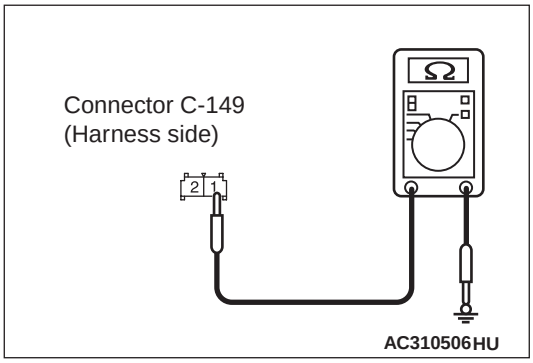


Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the connector.

STEP 2. Resistance measurement at the C-149 PTC heater 1 connector.



(1) Disconnect the connector, and measure at the wiring harness side.

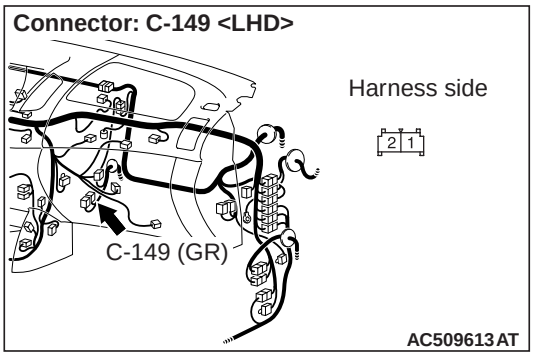


(2) Continuity between terminal 1 and body earth

OK: Continuity (Less than 2Ω)

Q: Is the check result normal?
YES : Go to Step 4.
NO : Go to Step 3.

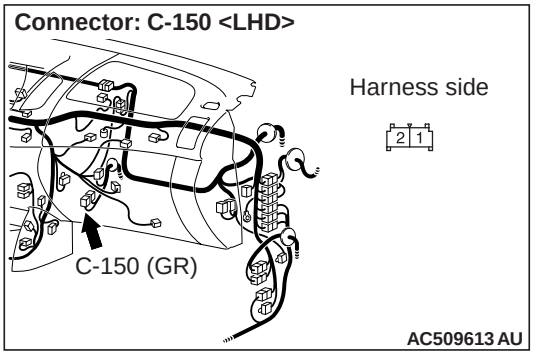
STEP 3. Check the wiring harness between C-149 PTC heater 1 connector terminal No.1 and body earth.



- Check the PTC heater earth line for open circuit.

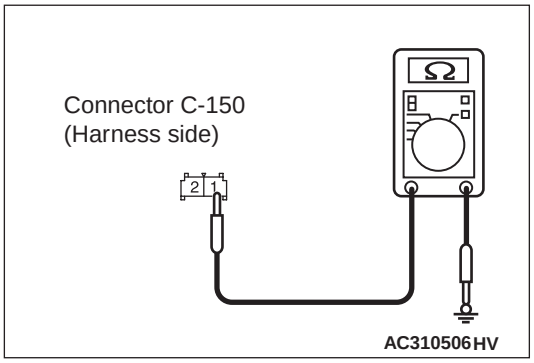
Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction .)
NO : Repair the wiring harness.

STEP 4. Resistance measurement at the C-150 PTC heater 2 connector.



(1) Disconnect the connector, and measure at the

wiring harness side.



(2) Continuity between terminal 1 and body earth

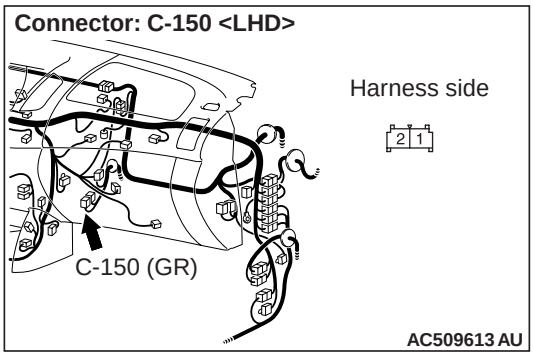
OK: Continuity (Less than 2Ω)

Q: Is the check result normal?

YES : Go to Step 6.

NO : Go to Step 5.

STEP 5. Check the wiring harness between C-150 PTC heater 2 connector terminal No.1 and body earth.



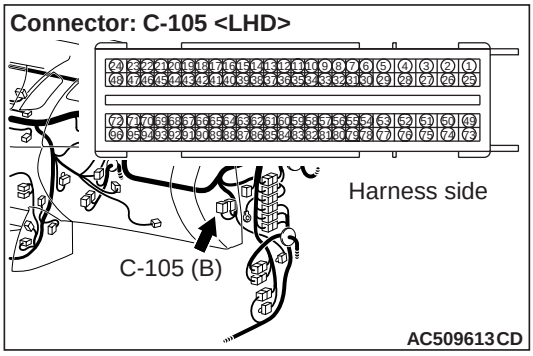
- Check the PTC heater earth line for open circuit.

Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction .)

NO : Repair the wiring harness.

STEP 6. Connector check: C-105 engine-ECU connector

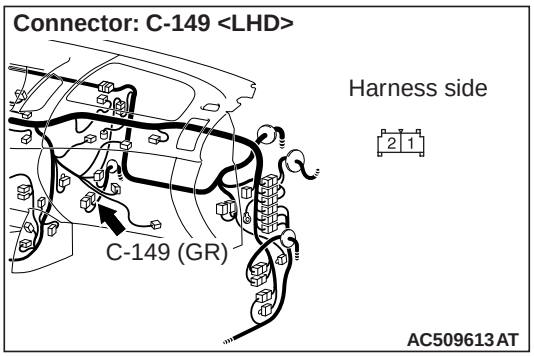


Q: Is the check result normal?

YES : Go to Step 7.

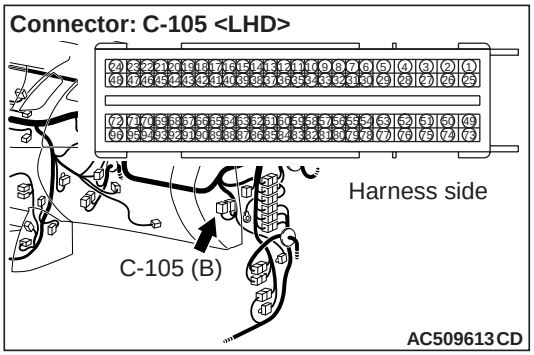
NO : Repair the connector.

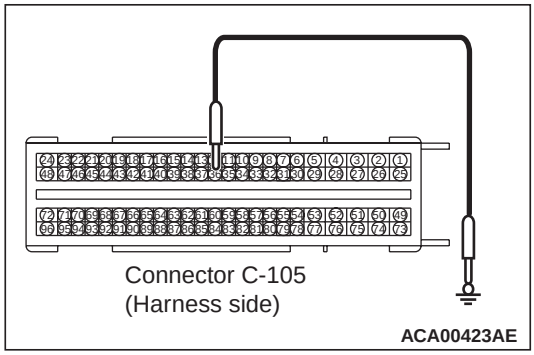
STEP 7. Voltage measurement at C-149 PTC heater 1 connector.



(1) Disconnect the connector, and measure at the wiring harness side.

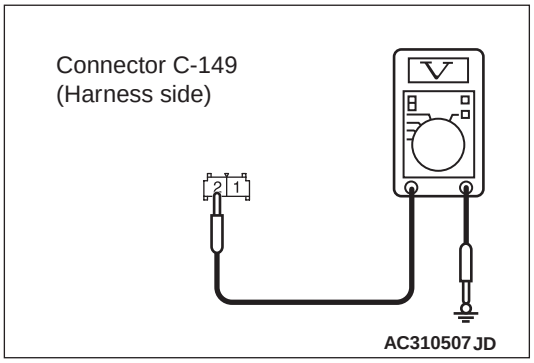
(2) Turn the ignition switch to the "ON" position.





(3) Disconnect engine-ECU connector C-105 and

earth terminal 36.

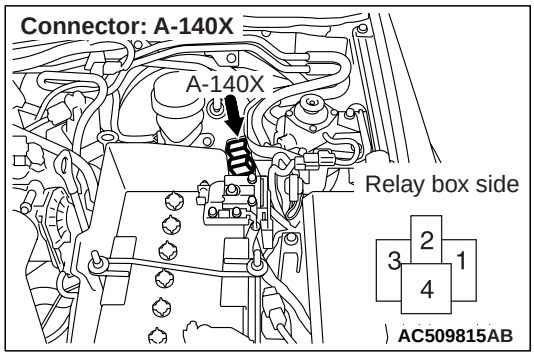


(4) Voltage between terminal 2 and body earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 16.
NO : Go to Step 8.

STEP 8. Connector check: A-140X PTC heater relay 1 controller connector

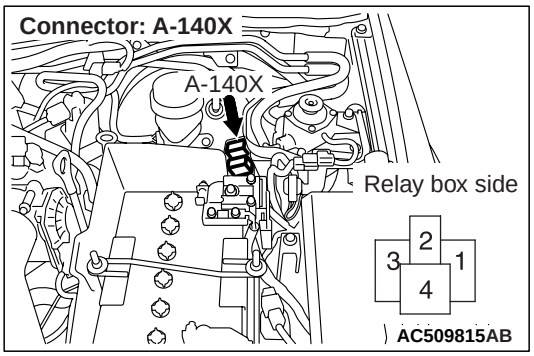


Q: Is the check result normal?
YES : Go to Step 9.
NO : Repair the connector.

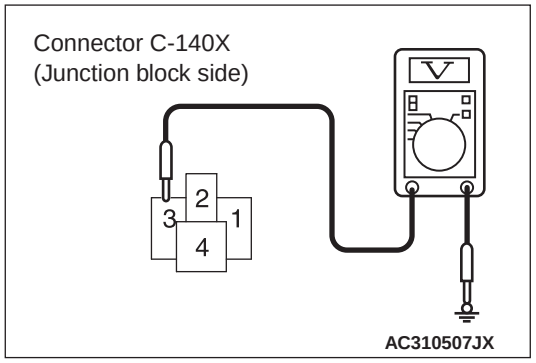
STEP 9. Check the PTC heater relay 1 continuity.
Refer to .

Q: Is the PTC heater relay 1 in good condition?
YES : Go to Step 10.
NO : Replace the PTC heater relay 1.

STEP 10. Voltage measurement at A-140X PTC heater relay 1 connector.



(1) Remove the relay, and measure at the relay block side.
(2) Turn the ignition switch to the "ON" position.

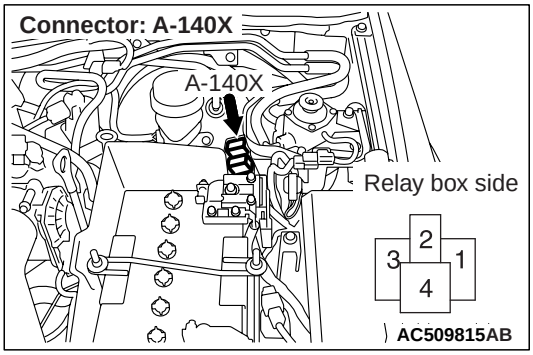


(3) Voltage between terminal 3 and body earth.

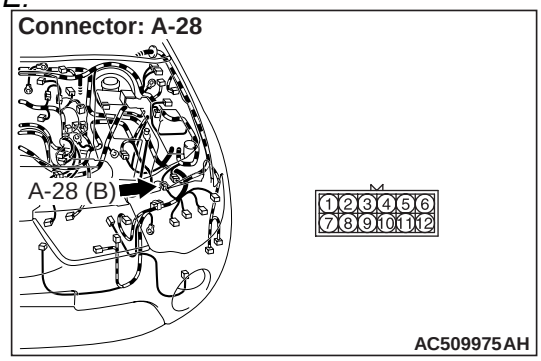
OK: System voltage

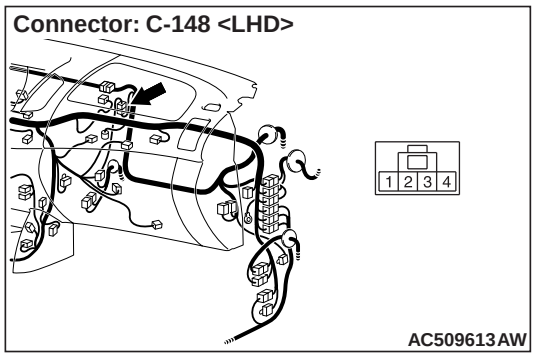
Q: Is the check result normal?
YES : Go to Step 12.
NO : Go to Step 11.

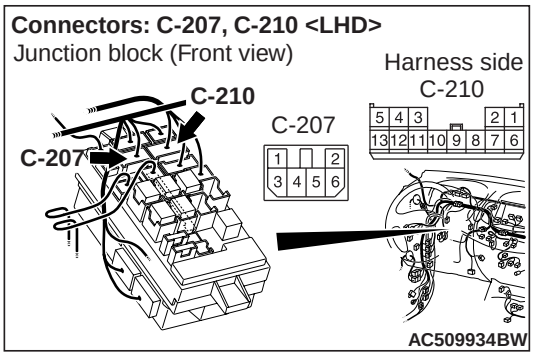
STEP 11. Check the wiring harness between A-140X PTC heater relay 1 connector terminal No.3 and the ignition switch (IG2).



NOTE:







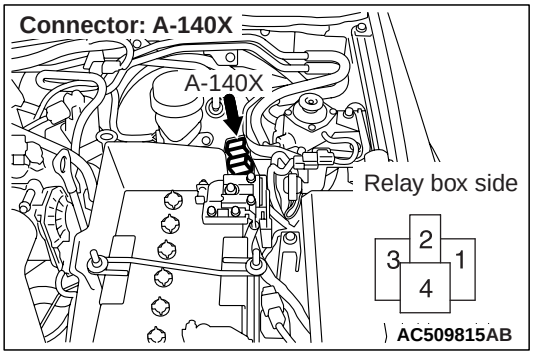
Prior to the wiring harness inspection, check intermediate connectors C-148, A-28 and junction block connector C-210,C-207 and repair if necessary.

- Check the PTC heater relay 1 earth supply line for open circuit.

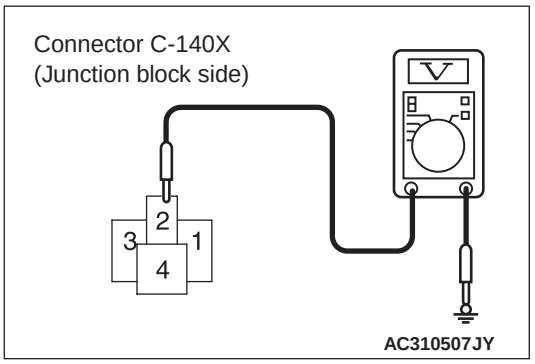
Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction .)
NO : Repair the wiring harness.

STEP 12. Voltage measurement at C-140X PTC heater relay 1 connector.



(1) Remove the relay, and measure at the relay block side.

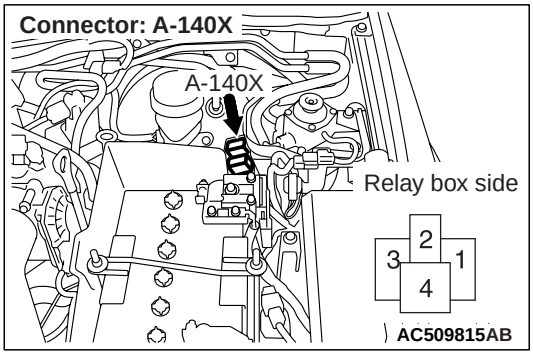


(2) Voltage between terminal 2 and body earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 14.
NO : Go to Step 13.

STEP 13. Check the wiring harness between A-140X PTC heater relay 1 connector terminal No.2 and the fusible link (25).



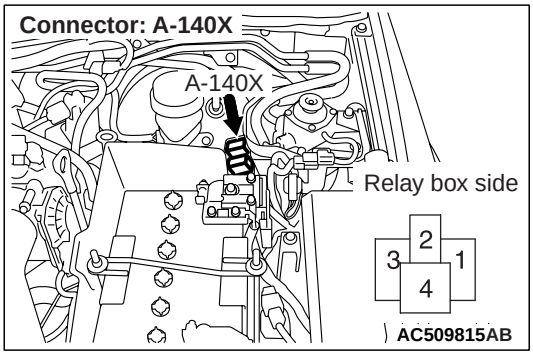
- Check the PTC heater relay 1 power supply line for open circuit.

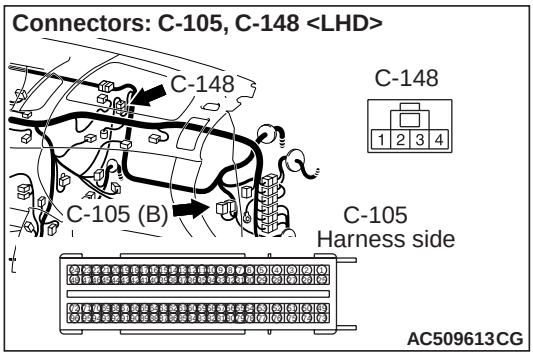
Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

NO : Repair the wiring harness.

STEP 14. Check the wiring harness between A-140X PTC heater relay 1 connector terminal No.1 and C-105 engine-ECU connector terminal No.38.





NOTE: Prior to the wiring harness inspection, check intermediate connector C-148, and repair if necessary.

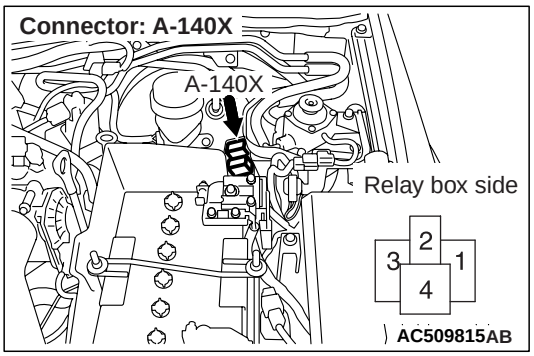
- Check the PTC heater relay 1 earth line for open and short circuit.

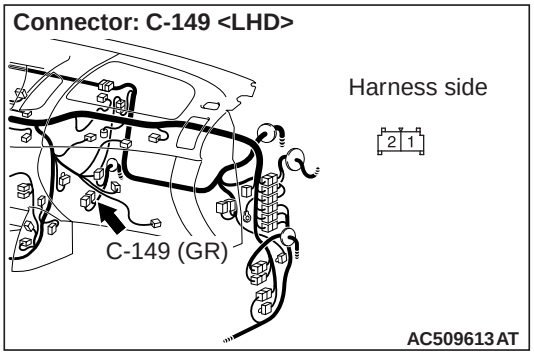
Q: Is the check result normal?

YES : Go to Step 15.

NO : Repair the wiring harness.

STEP 15. Check the wiring harness between A-140X PTC heater relay 1 connector terminal No.4 and C-149 PTC heater connector terminal No.2.





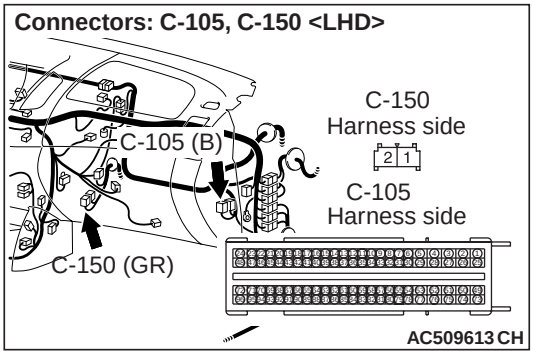
- Check the PTC heater relay 1 power supply line for open circuit.

Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

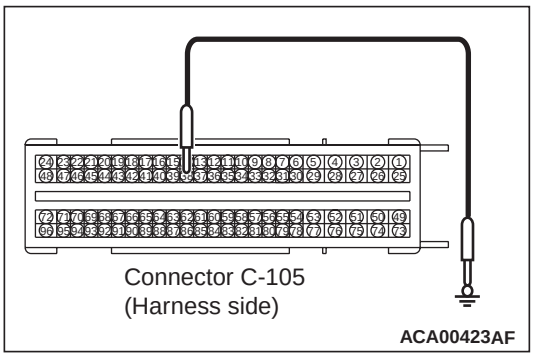
NO : Repair the wiring harness.

STEP 16. Voltage measurement at C-150 PTC heater 2 connector.

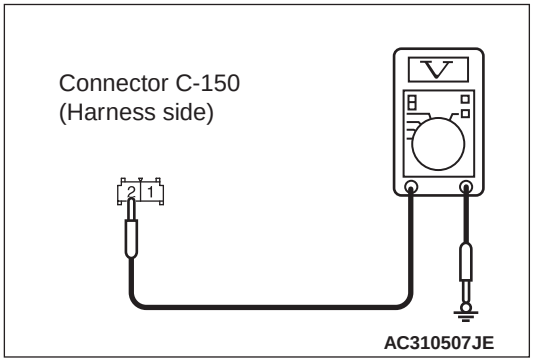


(1) Disconnect the connector, and measure at the wiring harness side.

(2) Turn the ignition switch to the "ON" position.



(3) Disconnect engine-ECU connector C-105 and earth terminal 41.

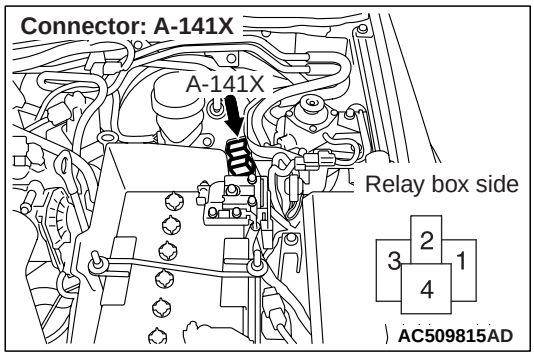


(4) Voltage between terminal 2 and body earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 25.
NO : Go to Step 17.

STEP 17. Connector check: A-141X PTC heater relay 2 controller connector

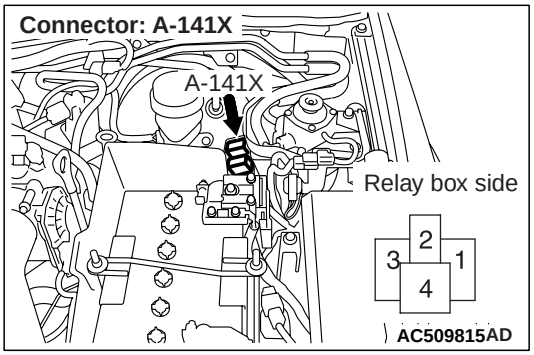


Q: Is the check result normal?
YES : Go to Step 18.
NO : Repair the connector.

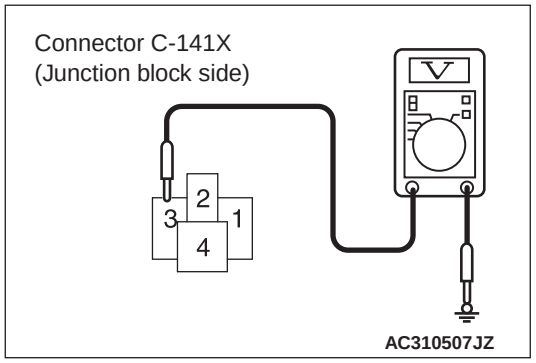
STEP 18. Check the PTC heater relay 2 continuity.
Refer to .

Q: Is the PTC heater relay 2 in good condition?
YES : Go to Step 19.
NO : Replace the PTC heater relay 2.

STEP 19. Voltage measurement at A-141X PTC heater relay 2 connector.



(1) Remove the relay, and measure at the relay block side.
(2) Turn the ignition switch to the "ON" position.

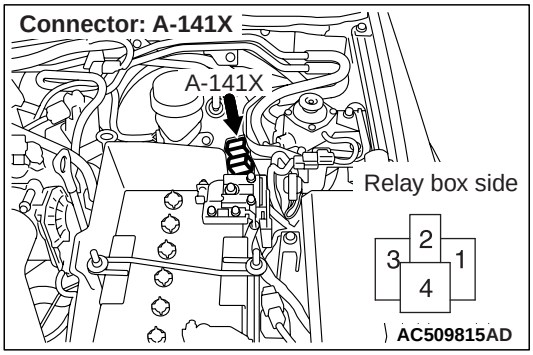


(3) Voltage between terminal 3 and body earth.

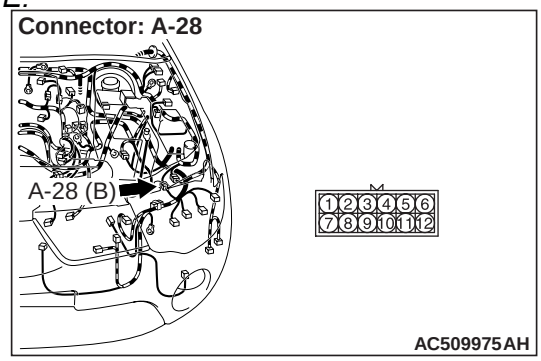
OK: System voltage

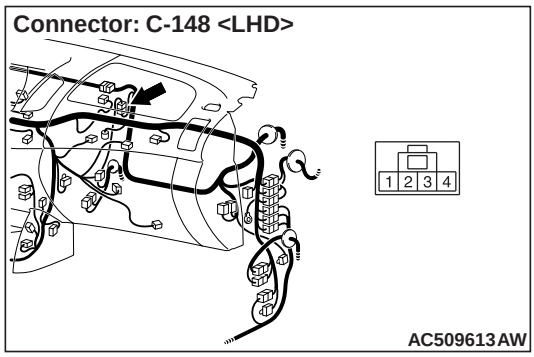
Q: Is the check result normal?
YES : Go to Step 21.
NO : Go to Step 20.

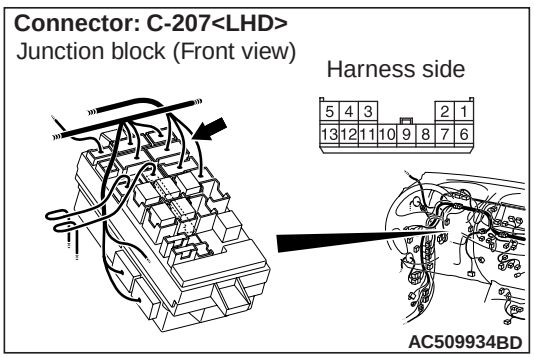
STEP 20. Check the wiring harness between A-141X PTC heater relay 2 connector terminal No.3 and the ignition switch (IG2).



NOTE:







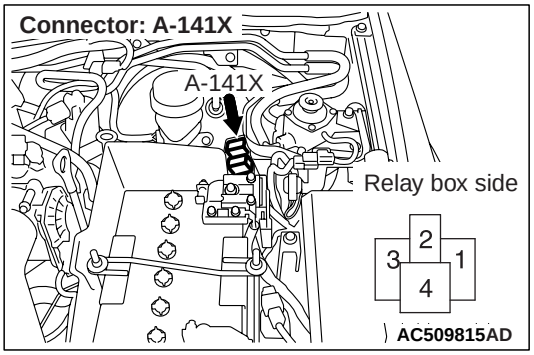
Prior to the wiring harness inspection, check junction block connectors C-207 and C-210, intermediate connector A-28 and C-148, and repair if necessary.

- Check the PTC heater relay 2 power supply line for open circuit.

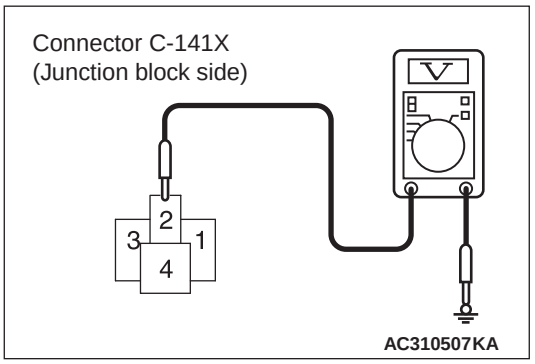
Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction .)
NO : Repair the wiring harness.

STEP 21. Voltage measurement at A-141X PTC heater relay 2 connector.



(1) Remove the relay, and measure at the relay block side.

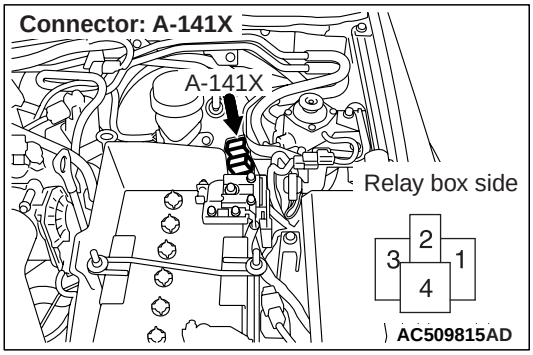


(2) Voltage between terminal 2 and body earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 23.
NO : Go to Step 22.

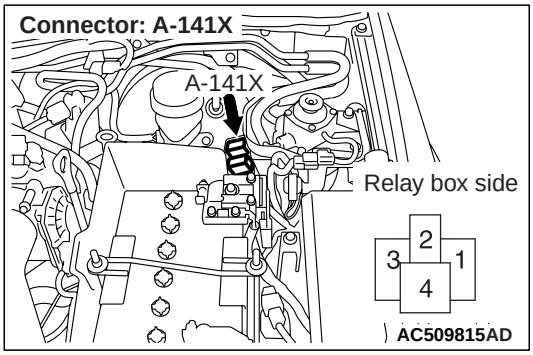
STEP 22. Check the wiring harness between A-141X PTC heater relay 2 connector terminal No.2 and the fusible link (25).

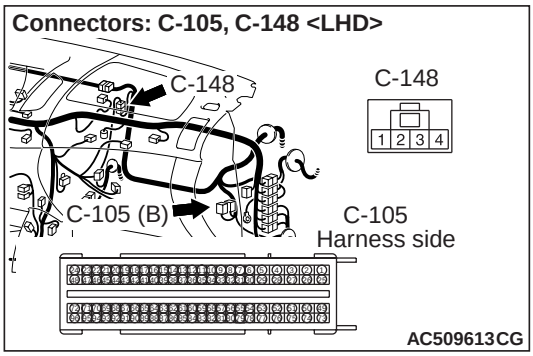


- Check the PTC heater relay 2 power supply line for open circuit.

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness.

STEP 23. Check the wiring harness between A-141X PTC heater relay 2 connector terminal No.1 and C-105 engine-ECU connector terminal No.41.



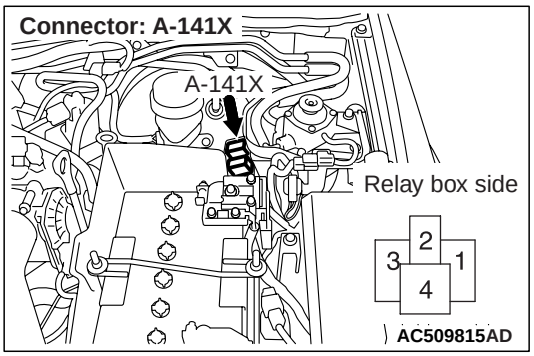


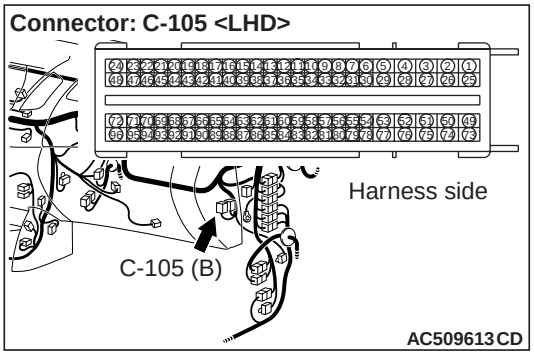
NOTE: Prior to the wiring harness inspection, check intermediate connector C-148, and repair if necessary.

- Check the PTC heater relay 2 earth line for open and short circuit.

Q: Is the check result normal?
YES : Go to Step 24.
NO : Repair the wiring harness.

STEP 24. Check the wiring harness between A-141X PTC heater relay 2 connector terminal No.4 and C-150 PTC heater connector terminal No.2.

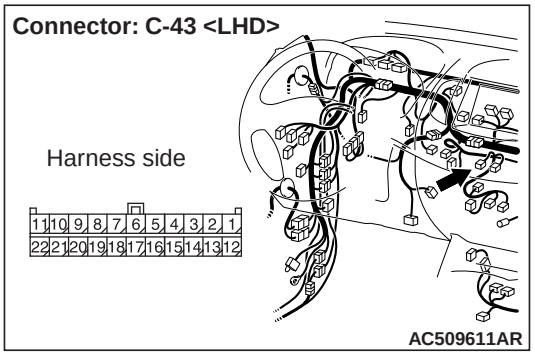




- Check the PTC heater power supply line for open circuit.

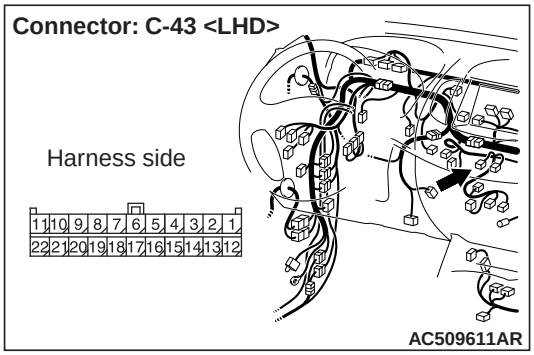
Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction .)
NO : Repair the wiring harness.

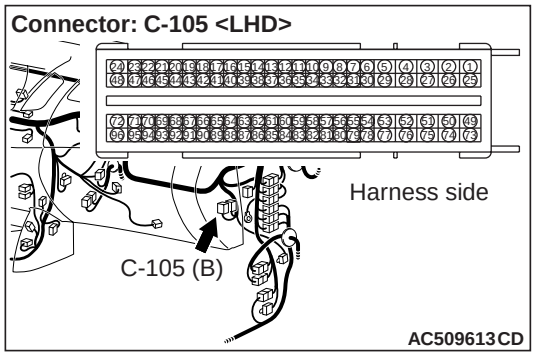
STEP 25. Connector check: C-43 A/C-ECU connector



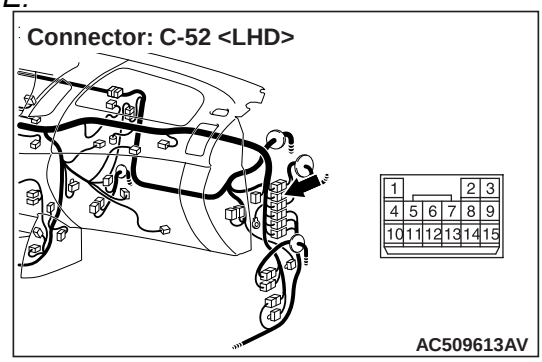
Q: Is the check result normal?
YES : Go to Step 26.
NO : Repair the connector.

STEP 26. Check the wiring harness between C-43 A/C-ECU connector terminal No.15 and C-105 engine-ECU connector terminal No.35.





NOTE:



Prior to the wiring harness inspection, check intermediate connector C-52, and repair if necessary.

- Check the A/C-ECU input line for open and short circuit.

Q: Is the check result normal?

YES : Go to Step 27.
NO : Repair the wiring harness.

STEP 27. Replace the A/C-ECU, and then recheck the trouble symptom

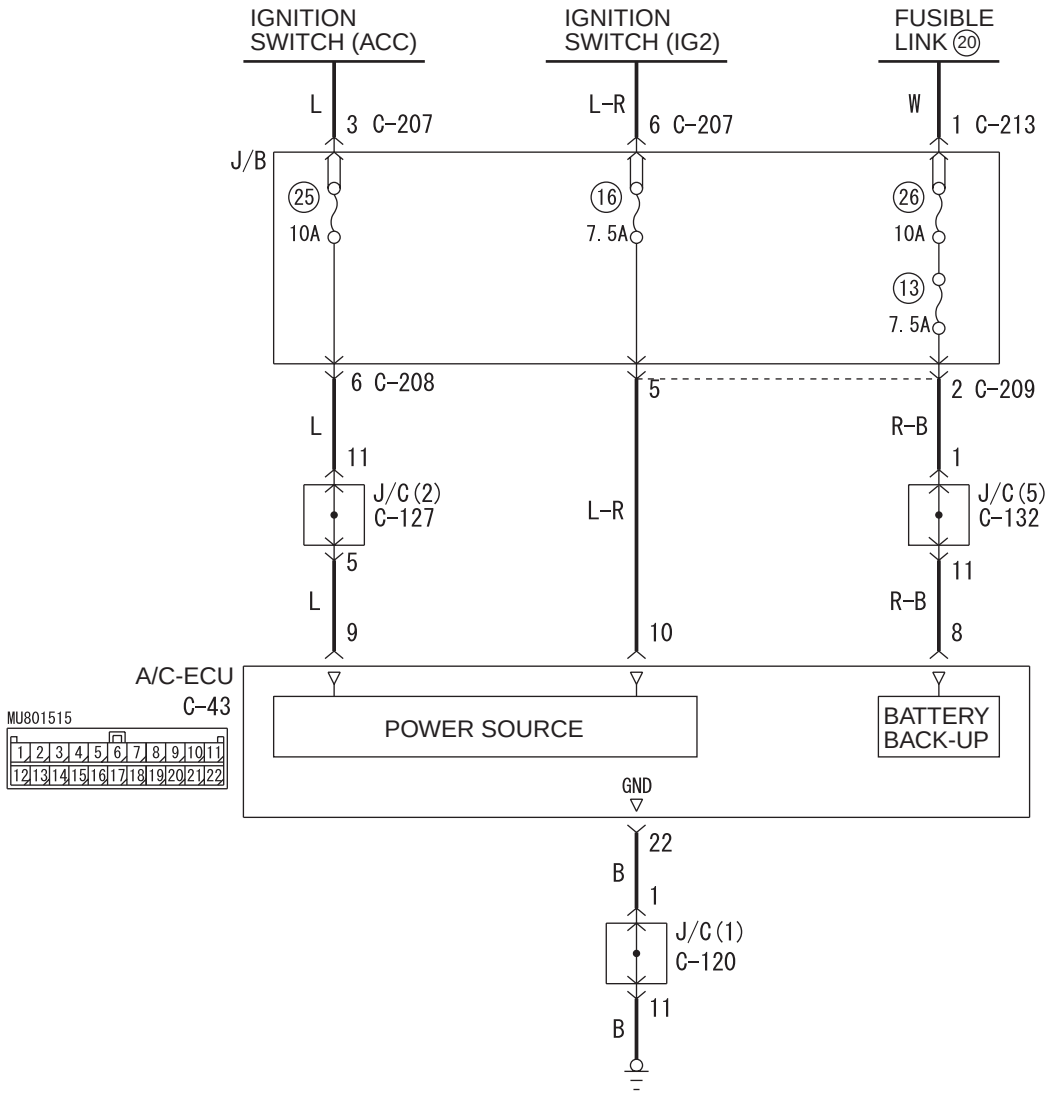
Check that the PTC heater works normally.

Q: Is the check result normal?

YES : This diagnosis is complete.
NO : Replace the engine-ECU.

Inspection Procedure 9: A/C-ECU power supply system

A/C-ECU Power Supply Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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COMMENTS ON TROUBLE SYMPTOM

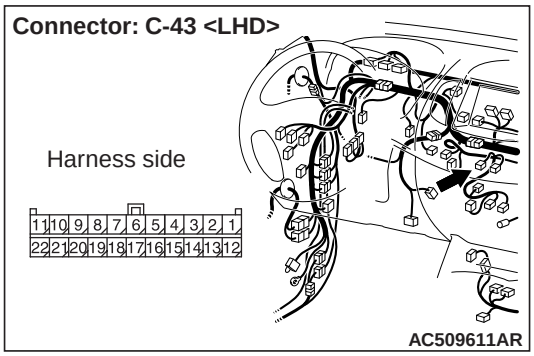
If a power supply is not provided to the A/C-ECU, the A/C-ECU power supply system or the earth system may be defective.

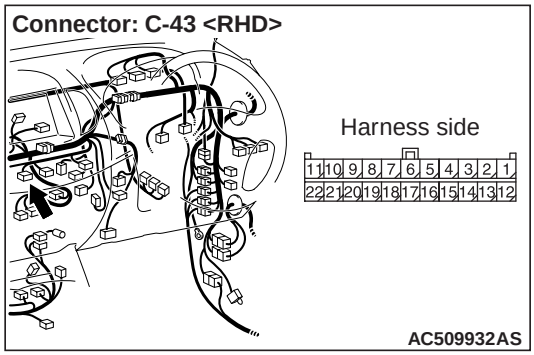
PROBABLE CAUSES

- Malfunction of the A/C-ECU
- Damaged harness wires and connectors

DIAGNOSIS PROCEDURE

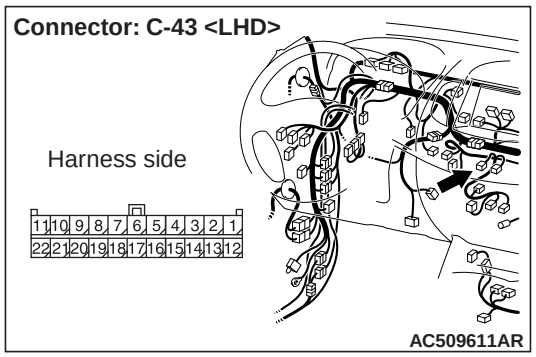
STEP 1. Connector check: C-43 A/C-ECU connector

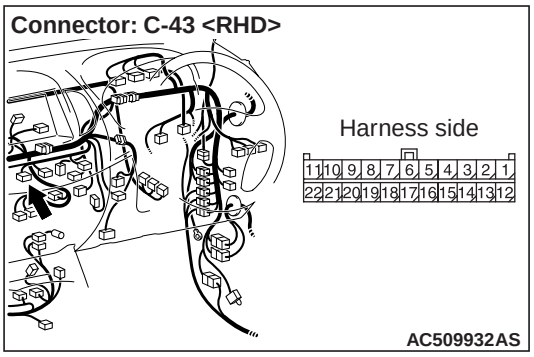




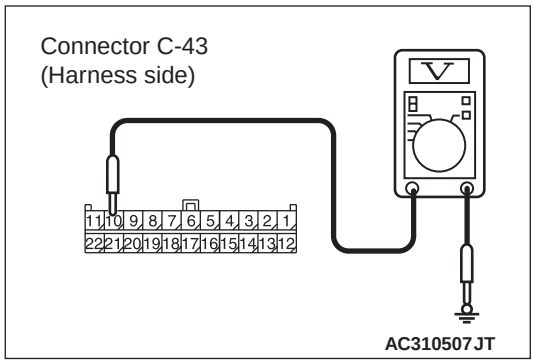
Q: Is the check result normal?
YES : Go to Step 2.
NO : Repair the connector.

STEP 2. Voltage measurement at C-43 A/C-ECU connector.





(1) Disconnect the connector, and measure at the wiring harness side.
(2) Turn the ignition switch to the ON position.

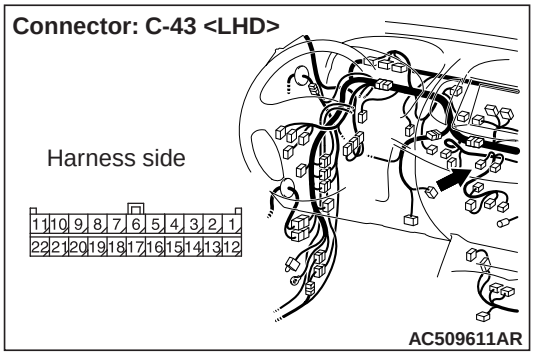


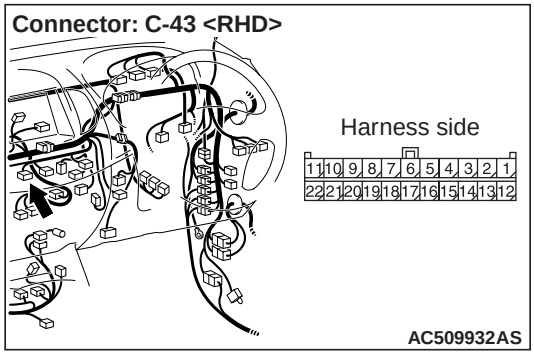
(3) Measure the voltage between terminal 10 and body earth.

OK: System voltage

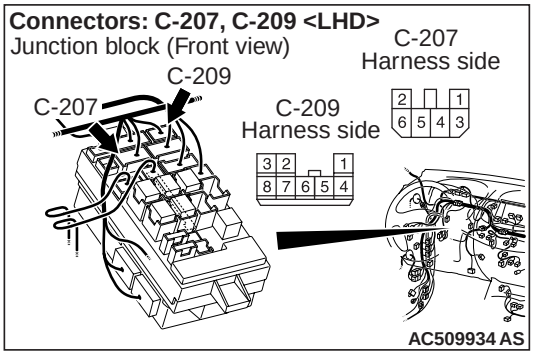
Q: Is the check result normal?
YES : Go to Step 4.
NO : Go to Step 3.

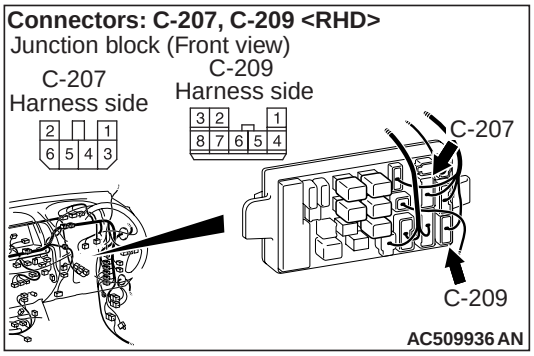
STEP 3. Check the wiring harness between C-43 A/C-ECU connector terminal No.10 and the ignition switch (IG2).





NOTE:





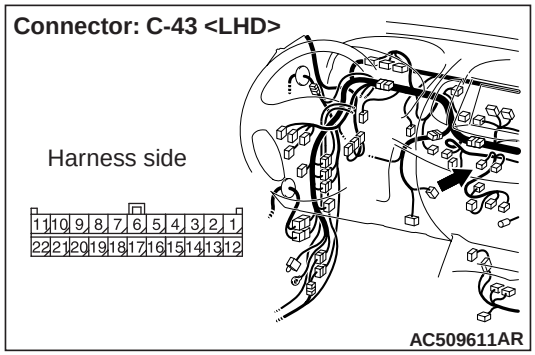
Prior to the wiring harness inspection, check junction block connector C-207 and C-209, and repair if necessary.

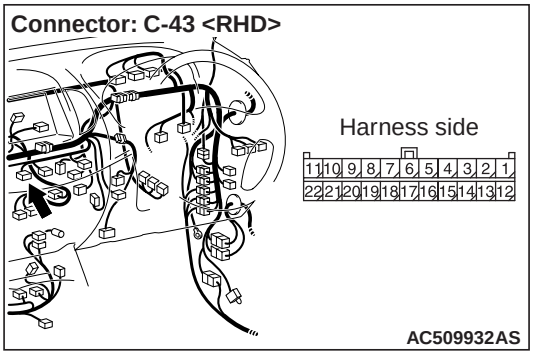
- Check the A/C-ECU power supply line for open circuit.

Q: Is the check result normal?

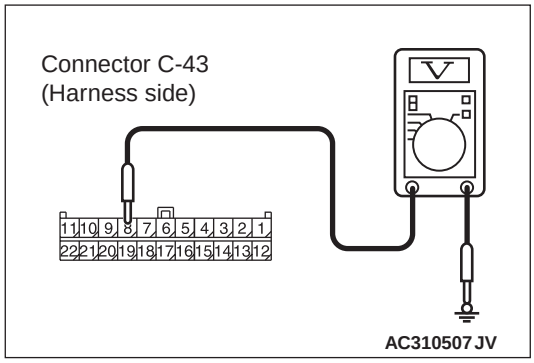
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness.

STEP 4. Voltage measurement at C-43 A/C-ECU connector.





(1) Disconnect the connector, and measure at the wiring harness side.

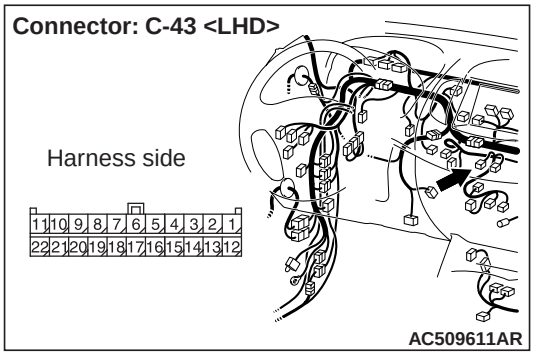


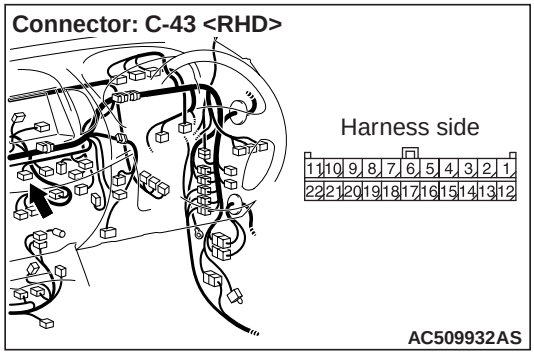
(2) Measure the voltage between terminal 8 and body earth.

OK: System voltage

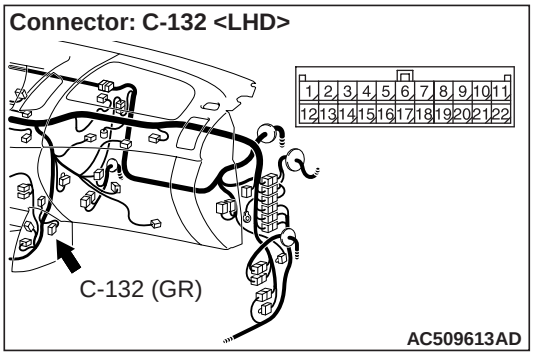
Q: Is the check result normal?
YES : Go to Step 6.
NO : Go to Step 5.

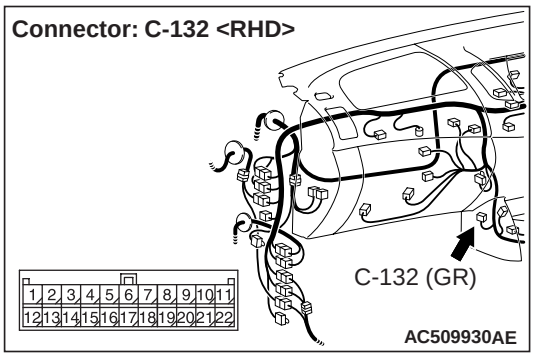
STEP 5. Check the wiring harness between C-43 A/C-ECU connector terminal No.8 and the fusible link (20).

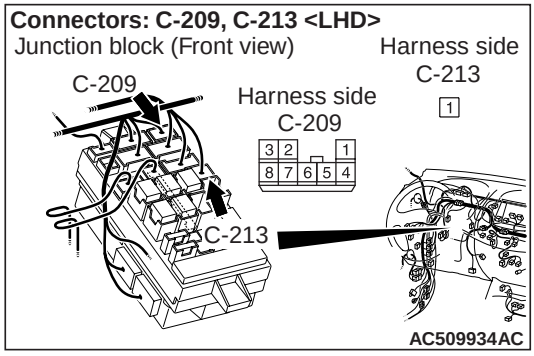


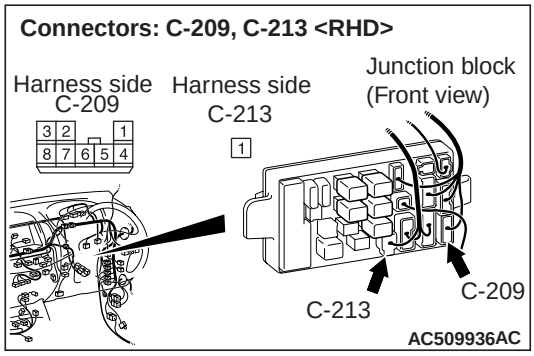


NOTE:









Prior to the wiring harness inspection, check joint connector C-132, junction block connector C-213 and C-209, and repair if necessary.

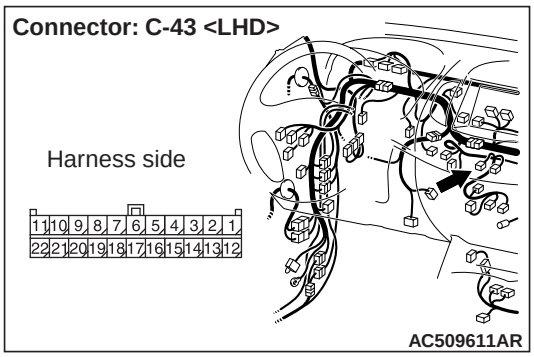
- Check the A/C-ECU power supply line for open circuit.

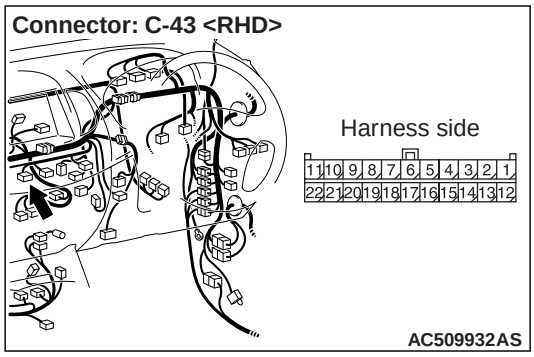
Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction).

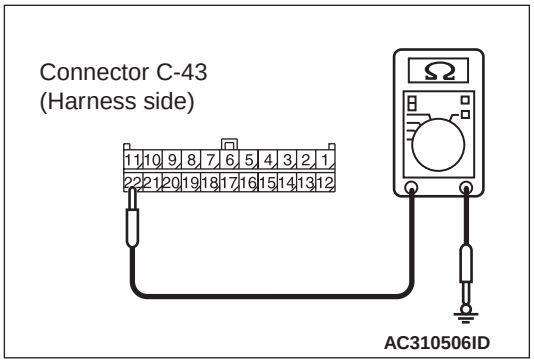
NO : Repair the wiring harness.

STEP 6. Resistance measurement at the C-43 A/C-ECU connector.





(1) Disconnect the connector, and measure at the wiring harness side.

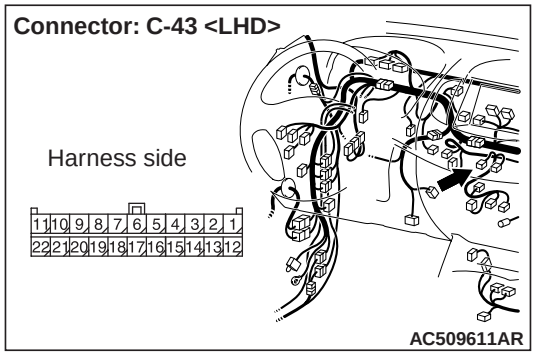


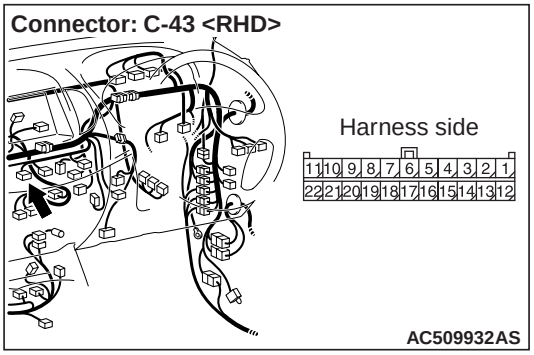
(2) Continuity between terminal 22 and body earth

OK: Continuity (Less than 2Ω)

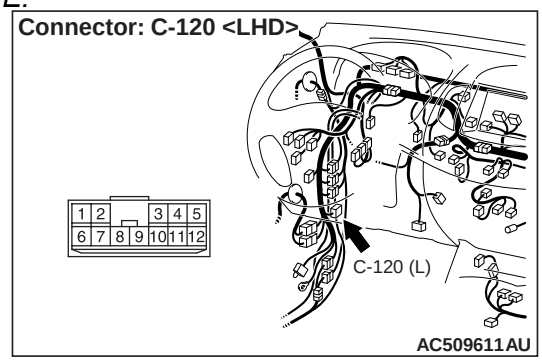
Q: Is the check result normal?
YES : Replace the A/C-ECU.
NO : Go to Step 7.

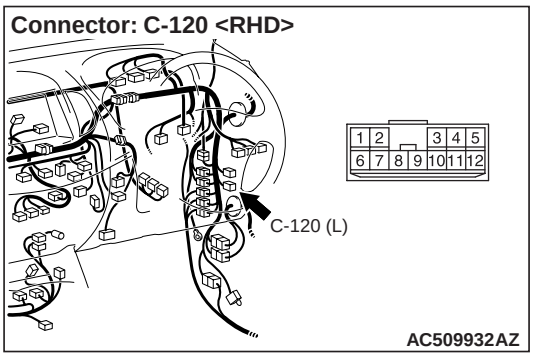
STEP 7. Check the wiring harness between C-43 A/C-ECU connector terminal No.22 and body earth.





NOTE:





Prior to the wiring harness inspection, check joint connector C-120, and repair if necessary.

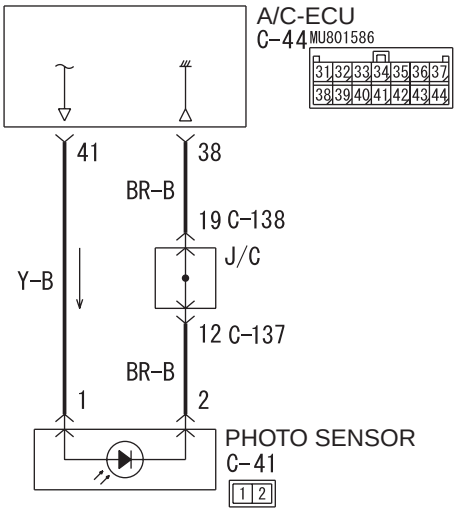
- Check the A/C-ECU earth line for open circuit.

Q: Is the check result normal?

YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction).
NO : Repair the wiring harness.

Inspection Procedure 9: The outlet air temperature can not be changed even if the amount of solar radiation changes

Photo Sensor Circuit



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple

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CIRCUIT OPERATION
When the blower air temperature can not be changed even if the amount of solar radiation is changed, the photo sensor may be defective.

PROBABLE CAUSES
- Malfunction of photo sensor
- Damaged harness wires and connectors
- Malfunction of the A/C-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-III diagnosis code.
Check whether the A/C sets a diagnosis code or not.

Q: Is the check result normal?
YES : Go to Step 2.
NO : Refer to diagnosis code chart P.55B-4.

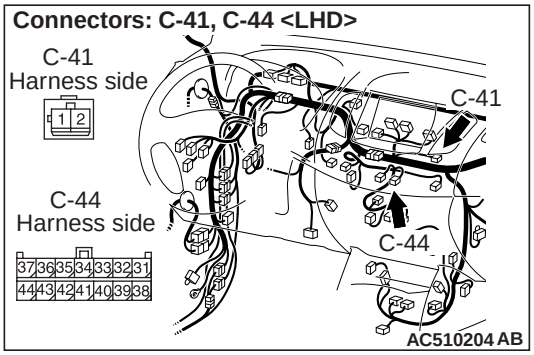
STEP 2. M.U.T.-III data list.
Check that the following data list display contents are normal. (Refer to P.55B-89.)
- Item 67: Photo sensor

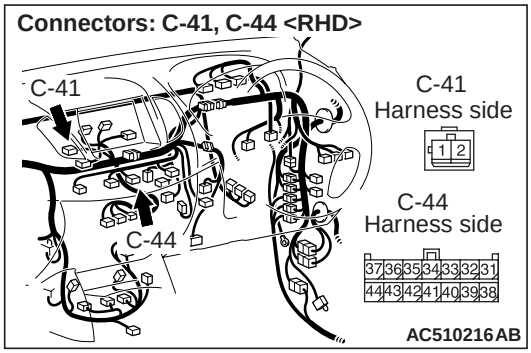
Q: Is the check result normal?
YES : Go to Step 3.
NO : Go to Step 4.

STEP 3. Recheck the trouble symptom

Q: Is the check result normal?
YES : The trouble can be an intermittent malfunction (Refer to GROUP 00, How to Cope with Intermittent Malfunction).
NO : Replace the automatic A/C control panel (A/C-ECU).

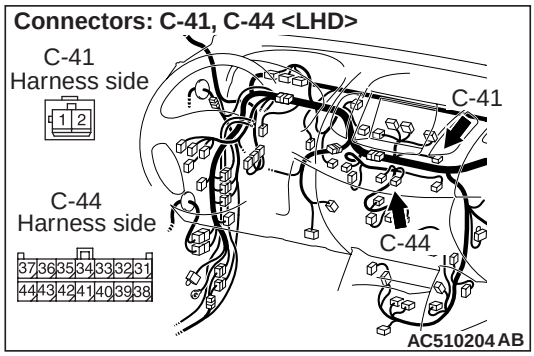
STEP 4. Connector check: C-41 photo sensor connector and C-44 A/C-ECU connector

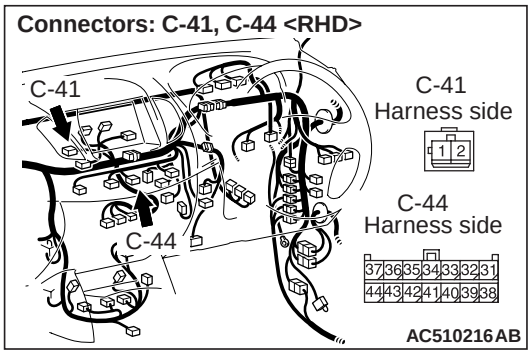




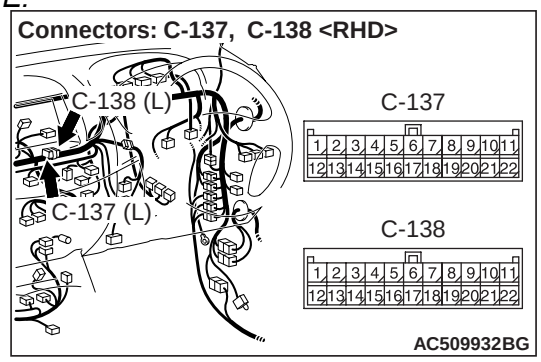
Q: Is the check result normal?
YES : Go to Step 5.
NO : Repair the connector.

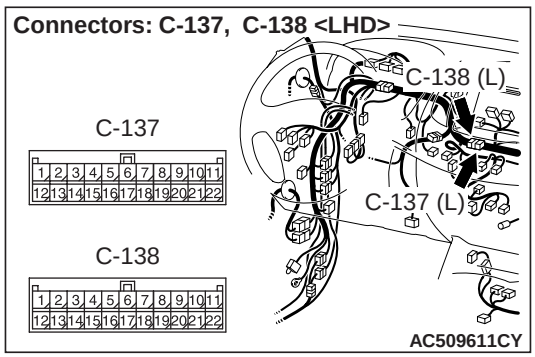
STEP 5. Check the wiring harness between C-41 photo sensor connector (terminal 1 and 2) and C-44 A/C-ECU connector (terminal 41 and 38).





NOTE:





Prior to the wiring harness inspection, check joint connector C-137 and C-138, and repair if necessary.

- Check the A/C-ECU input line for open circuit.

Q: Is the check result normal?
YES : Go to Step 6.
NO : Repair the wiring harness. Check that the A/C works normally.

STEP 6. Replace the photo sensor and recheck the trouble symptom

Check that the A/C works normally.

Q: Is the check result normal?

YES : This diagnosis is complete.

NO : Replace the automatic A/C control panel (A/C-ECU).

SERVICE DATA REFERENCE TABLE

M1554005101098

Item No.	Check items	Check contents
15	Illumination	Displays the illumination condition of the heater control panel.
19	Ambient temperature sensor	Displays the detected temperature of the Ambient temperature sensor.
20	Air thermo sensor	Displays the detected temperature of the air thermo sensor.
21	Interior temperature sensor	Displays the detected temperature of the Interior temperature sensor.
23	Temperature setting	Displays the set temperature.
24	Engine coolant TEMP. sensor	Displays the detected temperature of the Engine coolant TEMP. sensor
27	A/C Compressor drive request	Displays the operation of the A/C compressor.
28	Air conditioner switch	Displays the condition of the A/C switch.
30	PTC heater drive request	Displays the condition of the PTC heater drive request signal.
34	Idle up request	Displays the idle-up condition.
45	In/out select damp poten (target)	Displays the target position of the inside/outside air selection damper.
46	In/out select damp potentiometer	Displays the condition of inside/outside air selection damper control motor.
55	Air outlet c/o potentiometer	Displays the set air outlet position.
56	Air outlet c/o potentio. (Target)	Displays the target position of the mode selection damper.
60	Rear defogger switch	Displays the condition of the rear window defogger switch.
63	Air mix potentiometer	Displays the condition of air mixing damper control motor.
67	Photo sensor	Displays the volume of insolation.
68	Front blower fan	Displays the air volume of the blower.
69	Front blower fan (Target)	Displays the target value of the blower motor.
72	Rear defogger relay	Displays the condition of the rear window demister relay.

ACTUATOR TEST TABLE

M1554005200393

Item No.	Check items	Drive content
1	A/C compressor drive*	OFF
		ON

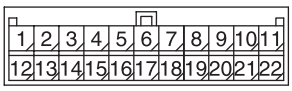
Item No.	Check items	Drive content
2	idle up request*	OFF
		ON
4	Rear defogger	OFF
		ON
5	In/out select damper	Fresh
		Recirc
6	Air mixing damper motor	0% (MAX COOL) – 100% (MAX COOL)
7	Front blower fan	0 V (OFF) – 12 V (MAX)
8	Air outlet c/o dumper	AUTO
		bi-level 1
		bi-level 2
		bi-level 3
		bi-level 4
		bi-level 5
		DEF
		DEF/FOOT 1
		DEF/FOOT 2
		DEF/FOOT 3
		DEF/FOOT 4
		DEF/FOOT 5
		FACE
		FOOT
9	PTC heater drive request	OFF
		ON

*NOTE: *: Drive at the engine operation*

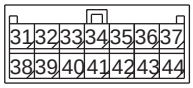
CHECK AT THE A/C-ECU TERMINALS

M1552010302749

C-43



C-44



AC509349AC

Terminal No.	Check items	Check conditions	Normal conditions
1	Air mix damper motor (COOL)	When the front air conditioner is moved to the COOL position	System voltage
		When the front air conditioner is moved to the HOT position	0 – 1 V
2	Mode selection damper control motor (FACE)	When moving toward FACE position	System voltage
		When moving toward DEF position	0 – 1 V

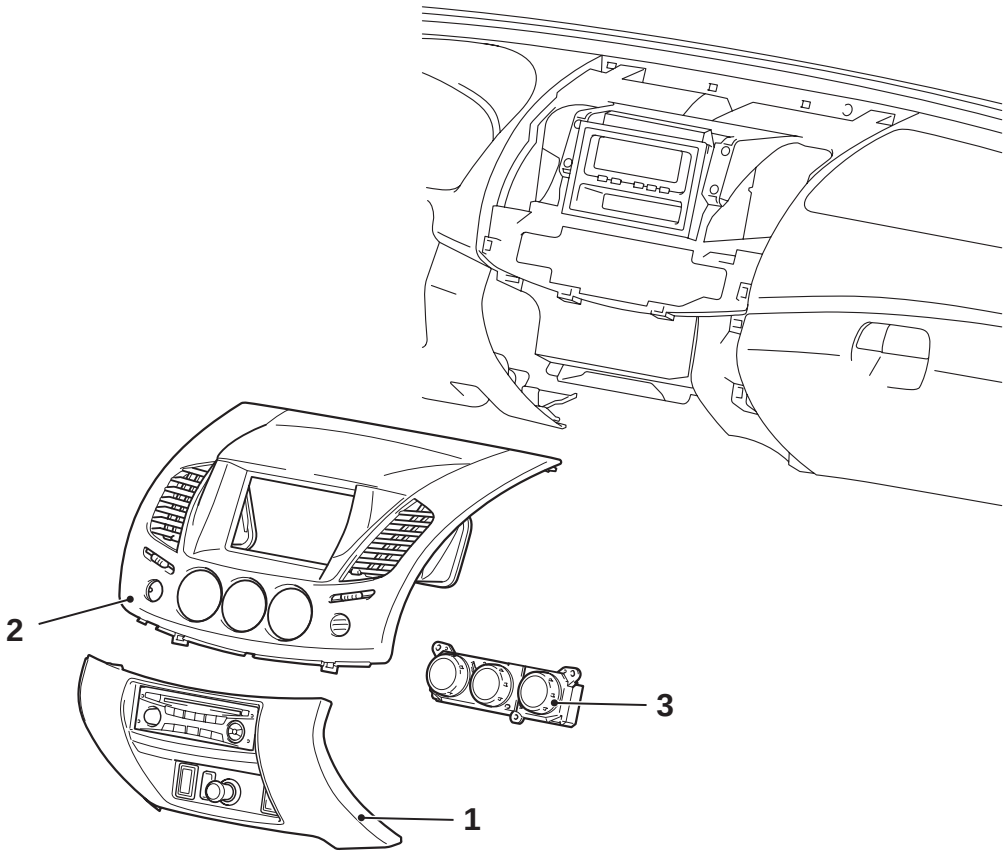
Terminal No.	Check items	Check conditions	Normal conditions
3	Outside/Inside air selection damper control motor	When the damper is moved to the inside air recirculation position	1 V or less
		When the damper is moved to the fresh air position	System voltage
4	Outside/Inside air selection damper control motor	When the damper is moved to the inside air recirculation position	System voltage
		When the damper is moved to the fresh air position	1 V or less
5	Output to the engine-ECU	A/C stopped	1 V or less
		• A/C switch: ON • Blower switch: ON	System voltage
6	Rear cooler switch (front) indicator	Rear cooler switch (front): ON	System voltage
		Rear cooler switch (front): OFF	1.0 V or less
7	Input from diagnosis	Ignition switch: ON	Approximately 5 V
8	Battery power supply	Always	System voltage
10	Battery power supply	IG2: ON	System voltage
11	Communication with combination meter	–	–
12	Air mix damper motor (HOT)	When the front air conditioner is moved to the HOT position	System voltage
		When the front air conditioner is moved to the COOL position	0 – 1 V
13	Mode selection damper control motor (DEF)	When moving toward DEF position	System voltage
		When moving toward FACE position	0 – 1 V
14	Rear defogger relay	IG2: ON	System voltage
15	Rear cooler relay	IG2: ON	System voltage
16	Output to the engine-ECU (A/C2)	When the A/C is under low load	System voltage
		When the A/C is under high load	1 V or less
18	Front blower relay	IG2: ON	System voltage
22	Earth	Always	1.0 V or less
32	Air mixing damper control motor and potentiometer input	MAX COOL position	Approximately 1
33	Mode selection damper control motor and potentiometer input	DEF position	0.5 – 0.8 V
34	Sensor power supply:	Ignition switch: IG2	5 V
35	Power transistor (DRAIN)	Air volume control dial: Maximum air volume (Preset temperature 18°C)	0 – 2 V

Terminal No.	Check items	Check conditions	Normal conditions
36	Power transistor (GATE)	Air volume control dial: Maximum air volume (Preset temperature 18°C)	System voltage
37	Tail lamp relay	Tail lamp: ON	System voltage
38	Sensor earth	Always	1 V or less
39	Air thermo sensor	Sensor probe temperature 25°C (1.5k Ω)	2.2 V
40	Interior temperature sensor	Sensor probe temperature: 25°C (4kΩ)	2.1 – 2.7 V
41	Photo sensor input	–	–
43	Rear cooler switch (front)	Rear cooler switch (front): ON	System voltage
		Rear cooler switch (front): OFF	1 V or less
44	Earth	Always	1 V or less

HEATER CONTROL UNIT

REMOVAL AND INSTALLATION

M1554014700750



AC809580 AB

Removal steps

1. Centre lower panel assembly (Refer to GROUP 52A, Instrument Panel .)

Removal steps (Continued)

2. Centre upper panel assembly (Refer to GROUP 52A, Instrument Panel .)
3. Automatic A/C control panel (A/C-ECU)

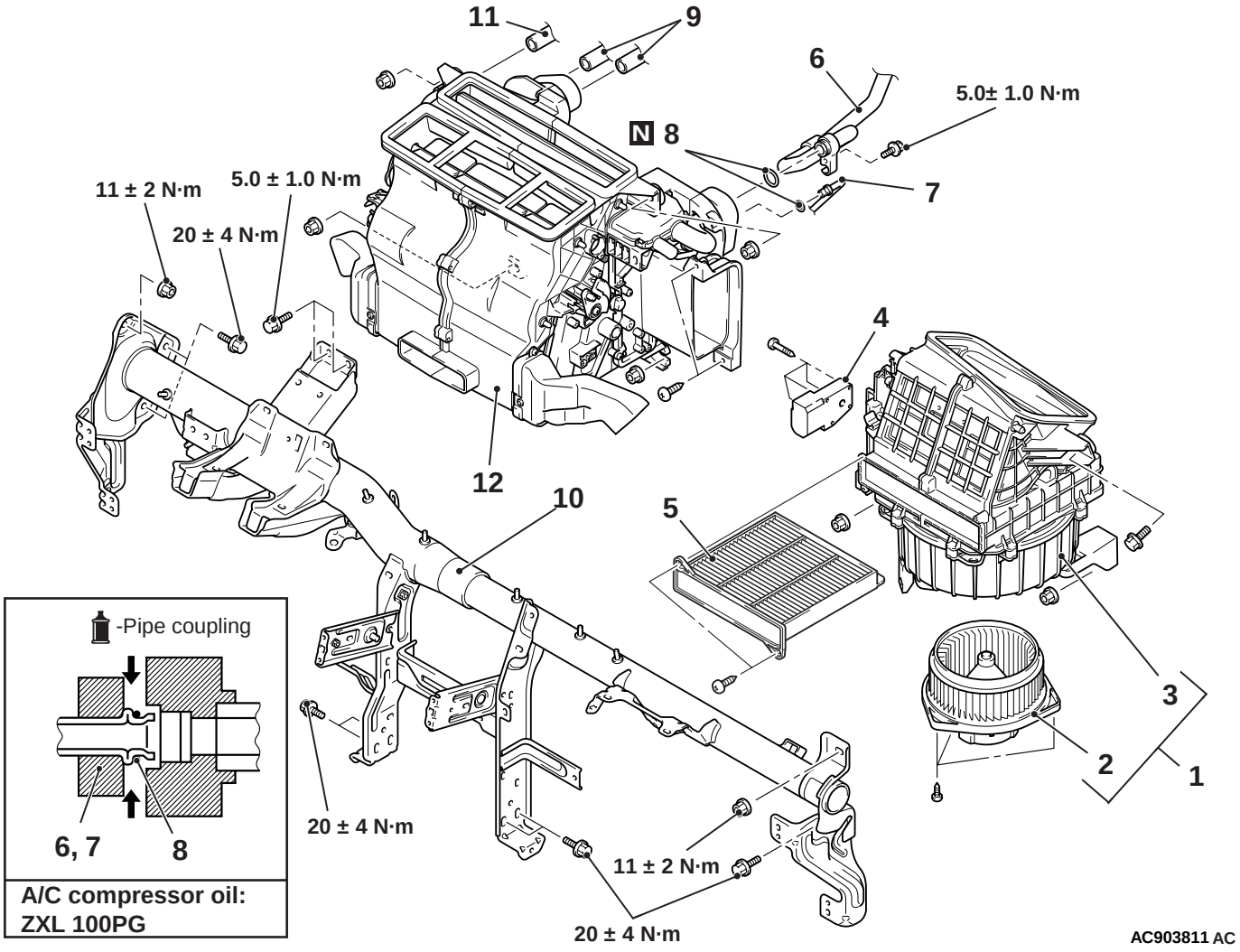
HEATER UNIT

REMOVAL AND INSTALLATION

M1554009100406

Pre-removal and Post-installation Operation

- Refrigerant draining and Refilling (Refer to .)
- Steering column shaft assembly Removal and Installation (Refer to GROUP 37, Steering shaft).



Removal steps

- Glove box, passenger's side under cover <Except single cab>, Instrument panel side cover and glove box cover (Refer to GROUP 52A, Instrument Panel .)

1. Heater blower assembly
2. Blower motor
3. Case
4. Inside/outside air selection damper control motor
5. Clean air filter <Vehicles with clean air filter>

<<**A**>> 6. A/C compressor suction pipe connection

<<**A**>> 7. A/C condenser outlet pipe connection

8. A/C pipe O-ring
9. Heater hose

Removal steps (Continued)

- Instrument panel assembly (Refer to GROUP 52A, Instrument Panel .)

10. Front deck crossmember
11. Hose
12. A/C cooling unit

REMOVAL SERVICE POINT

<<A>> A/C COMPRESSOR SUCTION PIPE AND A/C CONDENSER OUTLET PIPE DISCONNECTION

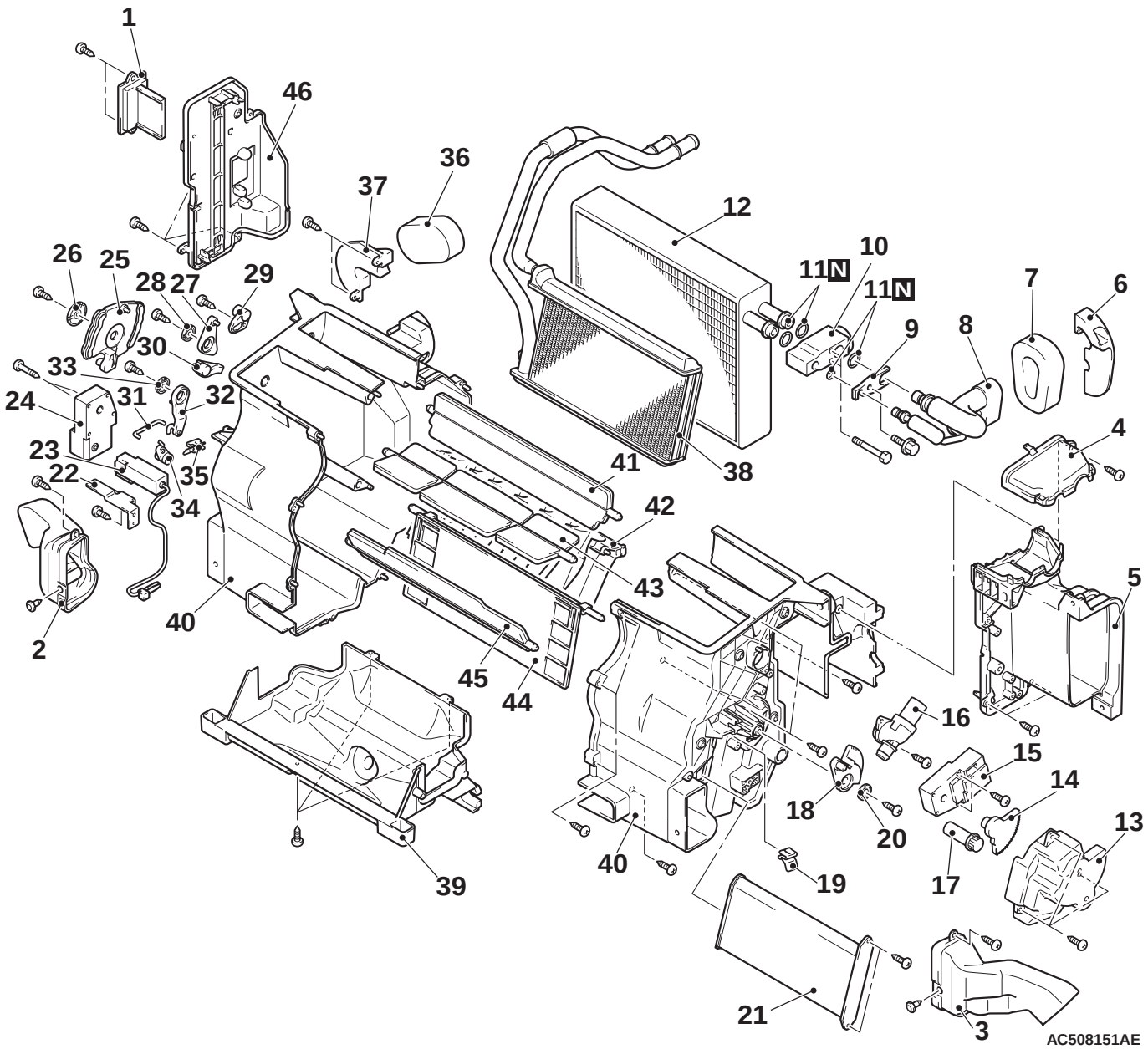
⚠ **CAUTION**

Use the plug which is not breathable because A/C compressor oil or receiver have high hygroscopicity.

Plug the removed nipple of the pipe, hose and expansion valve to prevent the entry of dust and dirt.

DISASSEMBLY AND REASSEMBLY

M1551005401335



Disassembly steps

1. Power transistor
2. Foot duct LH
3. Foot duct RH
4. Side cover upper
5. Side cover lower
6. Refrigerant dash cover
7. Refrigerant dash lining
8. A/C pipe
9. A/C plate
10. A/C expansion valve
11. A/C pipe O-ring
12. A/C evaporator
13. Air mix cover

Disassembly steps (Continued)

14. Air mixing lever A
15. Air mixing damper control motor and potentiometer
16. Aspirator
17. Air mixing gear
18. Air mixing lever B
19. Cable clip
20. A/C washer
21. PTC heater <Vehicles with PTC heater>
22. A/C bracket
23. Air thermo sensor

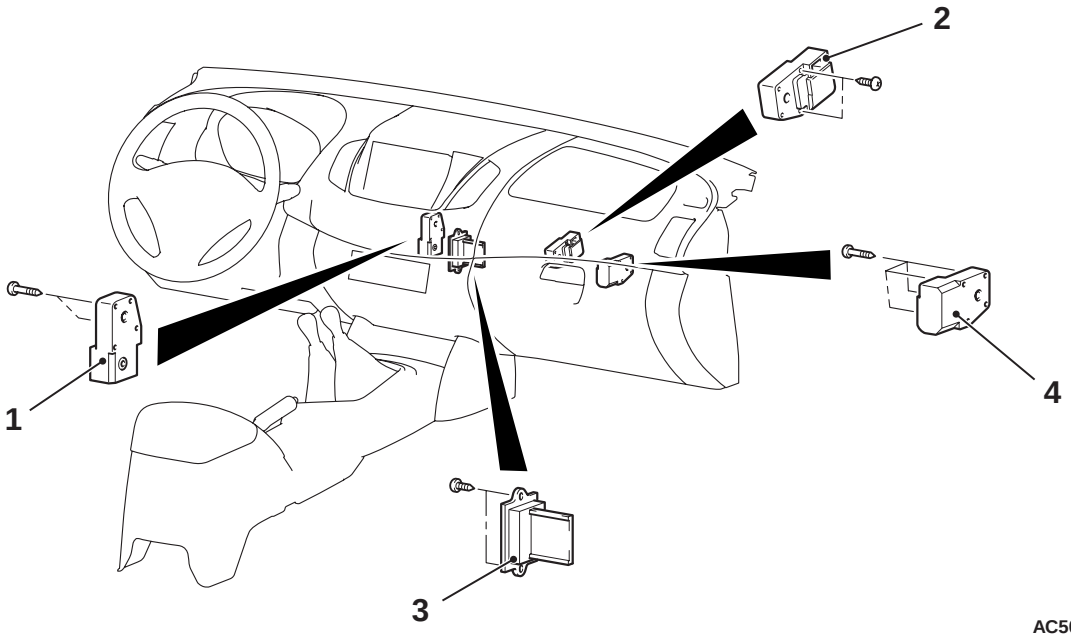
Disassembly steps (Continued)

24. Mode selection damper control motor and potentiometer
25. Heater air control damper link
26. A/C washer
27. Defroster sub lever
28. A/C washer
29. Vent lever
30. Defroster lever
31. Rod
32. Foot lever A
33. A/C washer
34. Foot lever B
35. Cable clip
36. Heater dash lining
37. Heater dash cover
38. Heater core
39. Lower case
40. Case
41. Heater defroster air distribution damper
42. Air guide
43. Heater ventilation air distribution damper
44. Mode selection damper
45. Heater foot air distribution damper
46. Cover

MODE SELECTION DAMPER CONTROL MOTOR, AIR MIXING DAMPER CONTROL MOTOR AND POWER TRANSISTOR

REMOVAL AND INSTALLATION

M1554022100151



AC509817AB

Mode selection damper control motor removal step

- Lower panel assembly (Refer to GROUP 52A, Instrument Panel .)

1. Mode selection damper control motor and potentiometer

Air mixing damper control motor removal step

- Glove box (Refer to GROUP 52A, Instrument Panel .)

2. Air mixing damper control motor and potentiometer

Power transistor removal step

3. Power transistor

Outside/inside air selection damper control motor removal step

- Glove box (Refer to GROUP 52A, Instrument Panel .)

4. Outside/inside air selection damper control motor

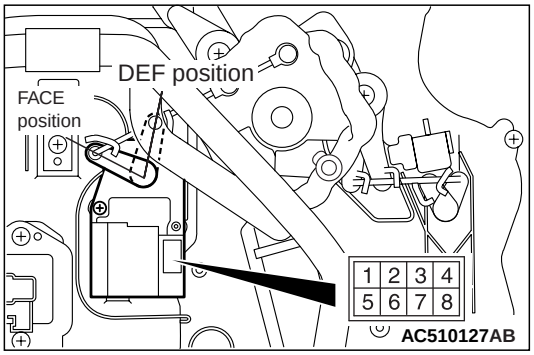
INSPECTION

M1552014304543

CHECK THE MODE SELECTION DAMPER CONTROL MOTOR AND POTENTIOMETER

⚠ CAUTION

Stop energizing when the lever is set to the operation stopping position.



MOTOR CHECK

Battery connection (+) terminal	Battery connection (-) terminal	Lever operation
3	1	Rotate to the DEF side
1	3	Rotate to the FACE side

Potentiometer check

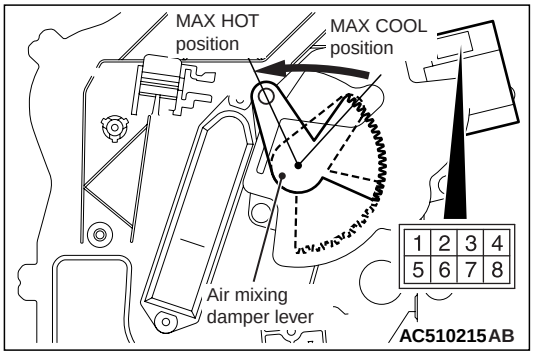
When the resistance value between connector terminals 2 and 6 is measured while checking the motor, check that the resistance value changes gradually within the standard value.

Standard value: 1.20 (FACE) – 4.80 (DEF) kΩ

CHECK THE AIR MIXING DAMPER CONTROL MOTOR AND POTENTIOMETER

⚠ CAUTION

Stop energizing when the lever is set to the operation stopping position.



MOTOR CHECK

Battery connection (+) terminal	Battery connection (-) terminal	Lever operation
3	1	Rotate to the HOT side.
1	3	Rotate to the COOL side.

Potentiometer check

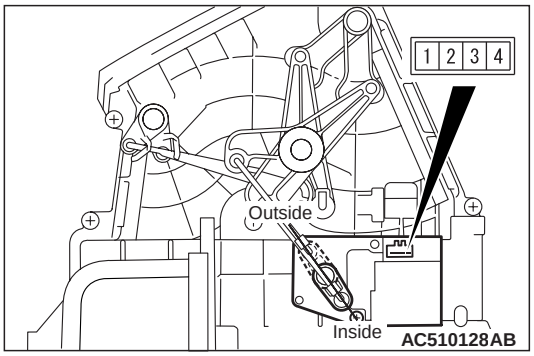
When the resistance value between connector terminals 2 and 6 is measured while checking the motor, check that the resistance value changes gradually within the standard value.

Standard value: 1.20 (MAX HOT) – 4.80 (MAX COOL) kΩ

CHECK THE OUTSIDE/INSIDE AIR SELECTION DAMPER CONTROL MOTOR

⚠ CAUTION

Stop energizing when the lever is set to the operation stopping position.



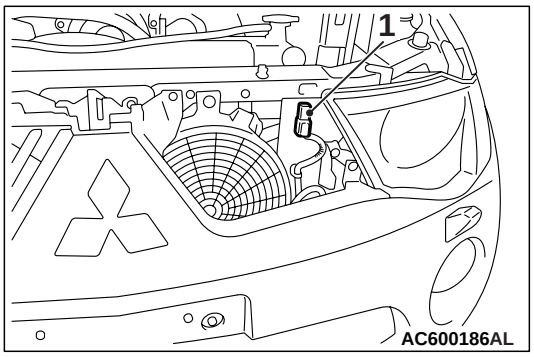
MOTOR CHECK

Battery connection (+) terminal	Battery connection (-) terminal	Lever operation
1	4	Rotate to the HOT side.
1	3	Rotate to the COOL side.

SENSORS

REMOVAL AND INSTALLATION

M1554017500120



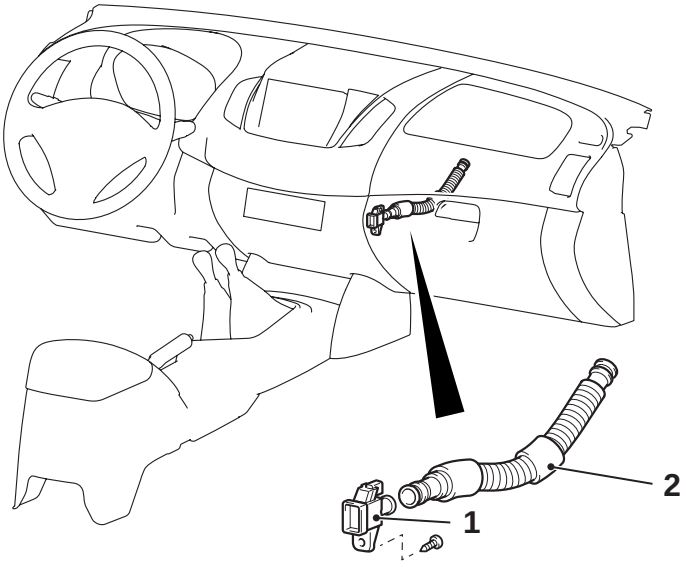
Removal steps

- Radiator grille (Refer to GROUP 51, Radiator grille).

1. Ambient temperature sensor

REMOVAL AND INSTALLATION

M1554001900538



Interior temperature sensor removal steps

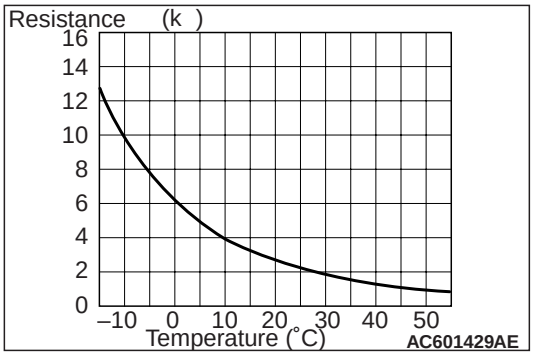
- Glove box (Refer to GROUP 52A, Instrument Panel).

1. Interior temperature sensor
2. Aspirator hose

INSPECTION

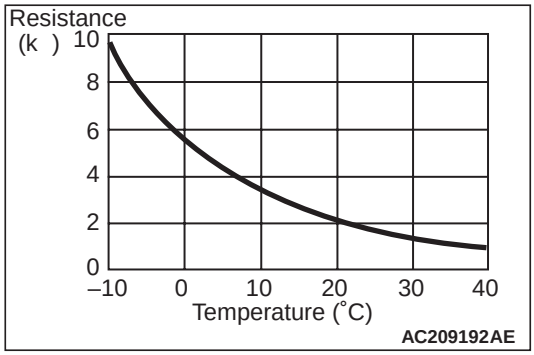
M1552014304899

AMBIENT TEMPERATURE SENSOR



Check to see that the resistance shown in the graph is almost satisfied when measuring the resistance between the sensor terminals under two or more different temperature conditions.

INTERIOR TEMPERATURE SENSOR



Check to see that the resistance shown in the graph is almost satisfied when measuring the resistance between the sensor terminals under two or more different temperature conditions.

OTHER PARTS

OTHER PARTS

M1554004000705

The other service procedures and components are the same as the heater and the manual A/C.

- On-vehicle service
- Blower assembly
- Blower motor and outside/inside air selection damper control motor
- Compressor
- Condenser assembly
- Refrigerant line
- Ducts
- Ventilators

GROUP 70

COMPONENT LOCATIONS

CONTENTS

ECU 70-2

SENSOR. 70-5

RELAY 70-11

INSPECTION CONNECTOR AND SPARE CONNECTOR. 70-13

SOLENOID AND SOLENOID VALVE 70-13

FUSIBLE LINK AND FUSE 70-15

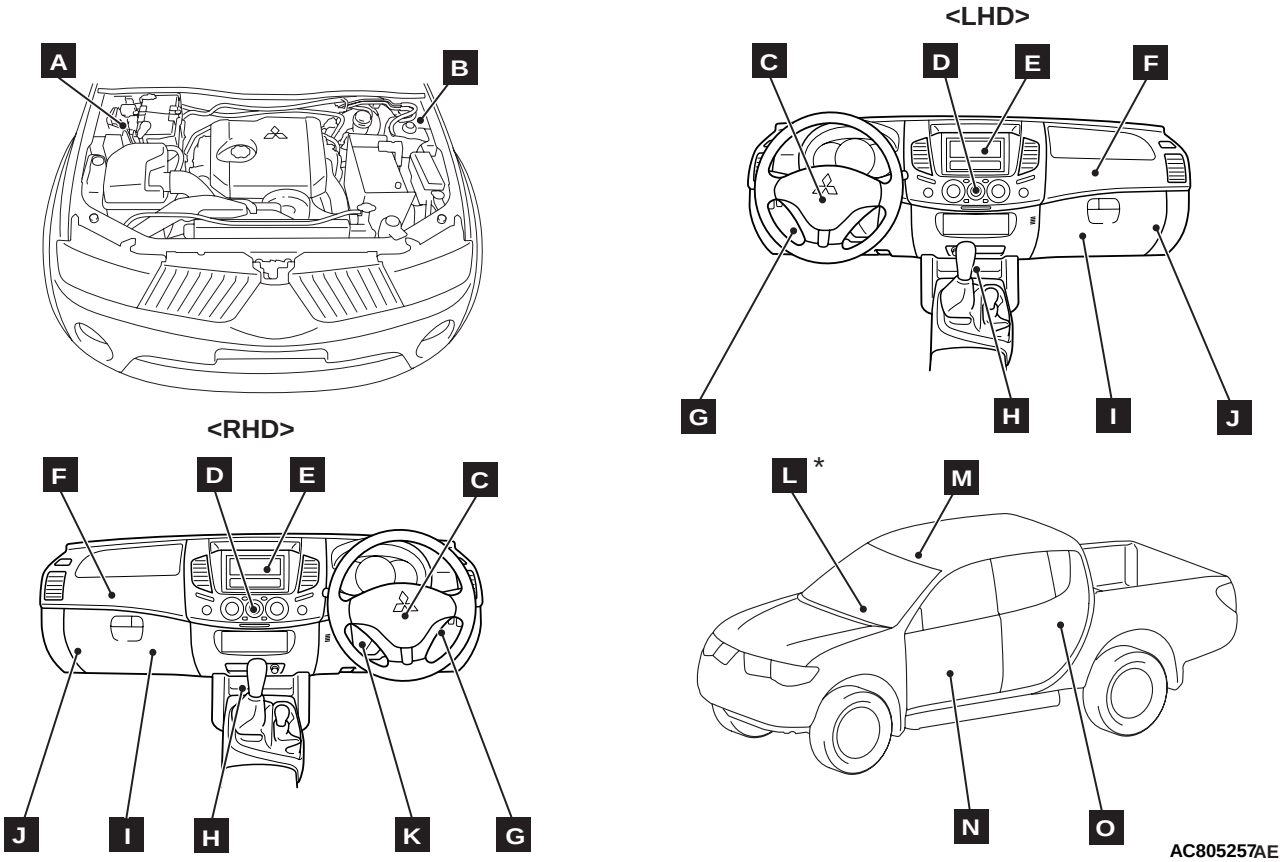
EARTH CABLE. 70-16

EARTH 70-17

ECU

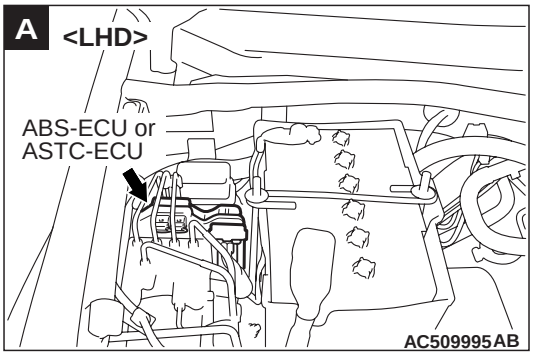
M1701000501897

Name		Symbol	Name	Symbol
4WD indicator -ECU		I	Glow control unit <Euro5>	B
A/C-ECU <Automatic A/C>		D	Hands free-ECU	F
A/C switch module <Heater, manual A/C>		D	Multivision display <MMCS>	E
A/T-ECU	LHD	G	Power window main switch (incorporating CPU)	N
	RHD	K	Power window sub switch (incorporating CPU)	L
ABS-ECU		A	Rear differential lock-ECU <4WD>	I
ASTC-ECU		A	Rear panel power window-ECU	O
Column switch (incorporating column-ECU		C	SRS-ECU	H
Engine-ECU		J	Sunroof motor assembly (incorporating ECU)	M
ETACS-ECU		G	USB box	F



*NOTE: *: also equipped on the rear doors.*

A <LHD>



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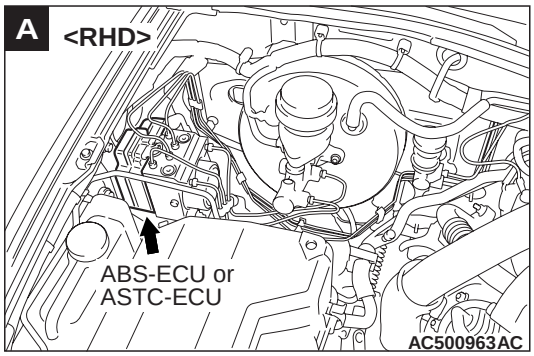

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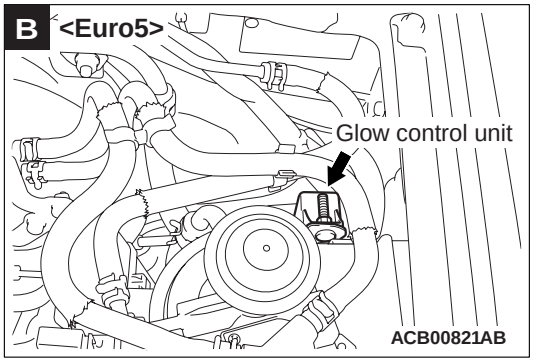

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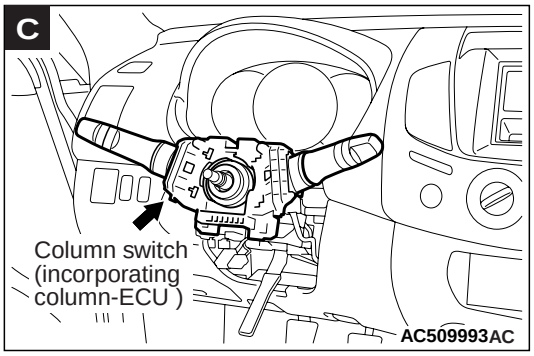
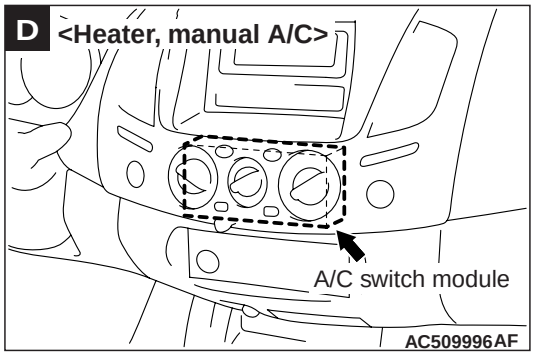
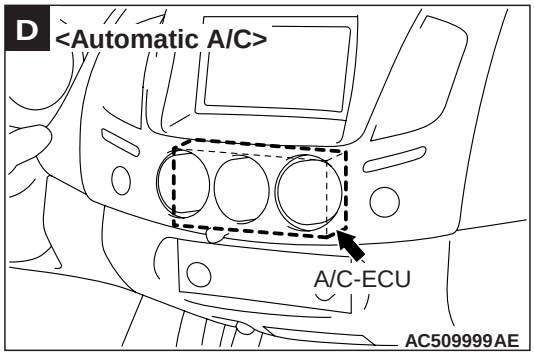


D <Heater, manual A/C>



D <Automatic A/C>



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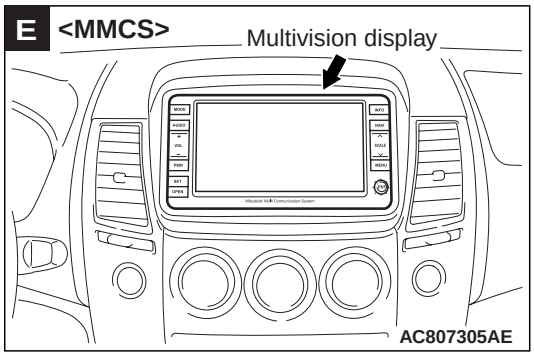

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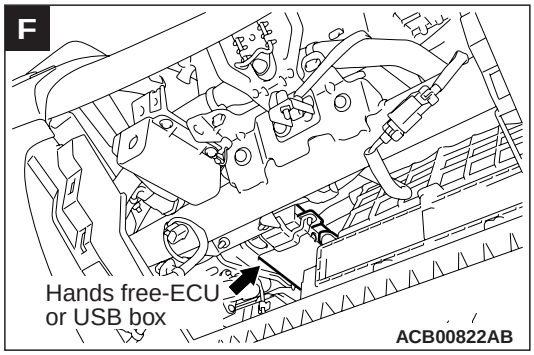

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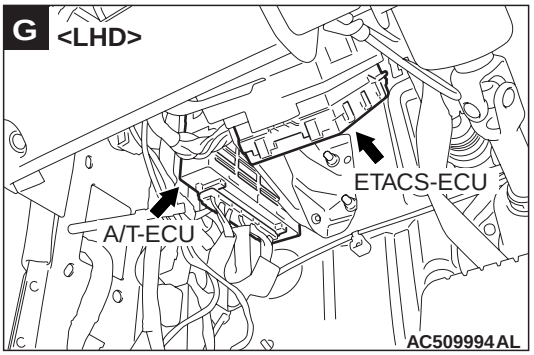

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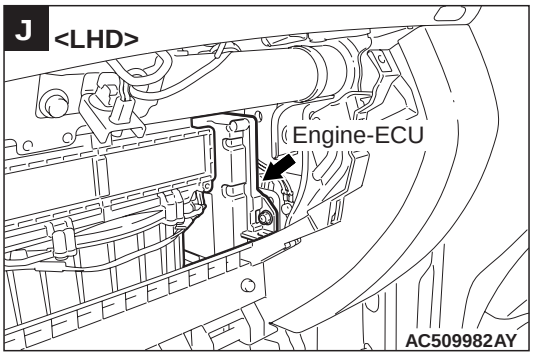

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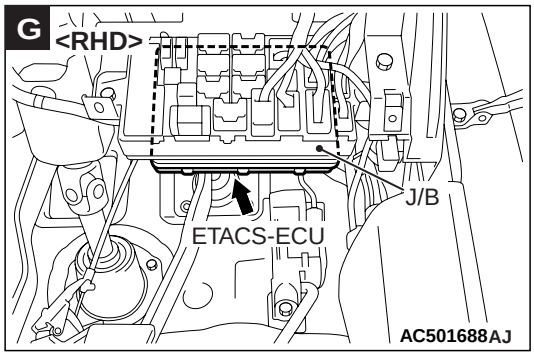

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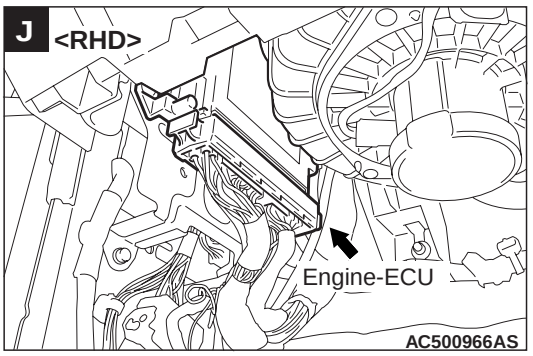

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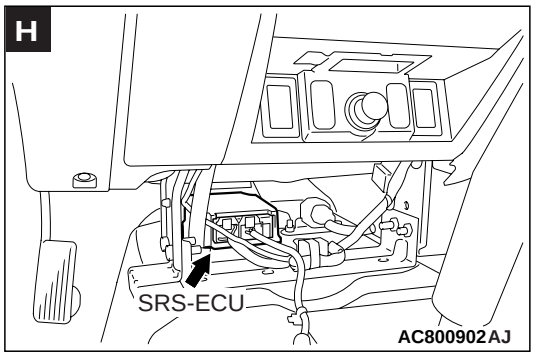

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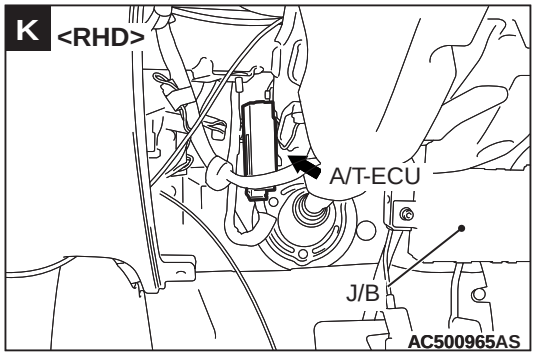

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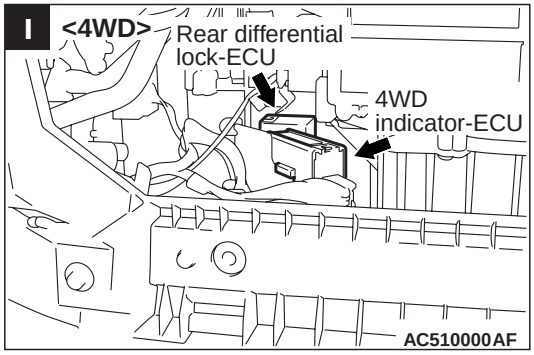

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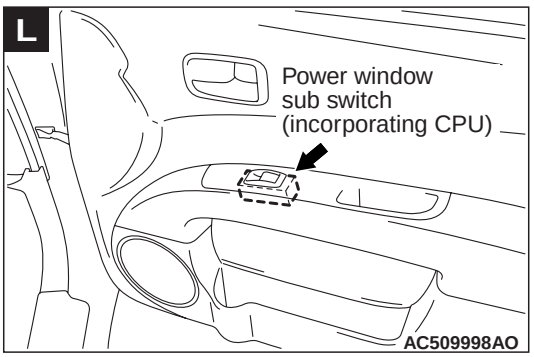
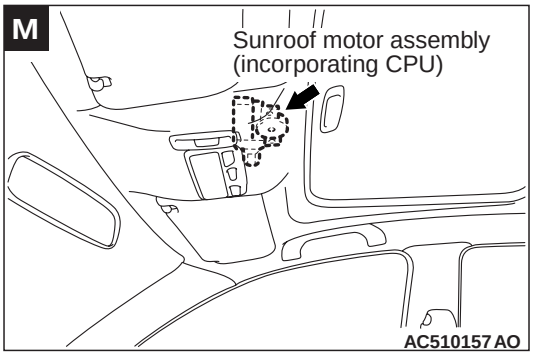
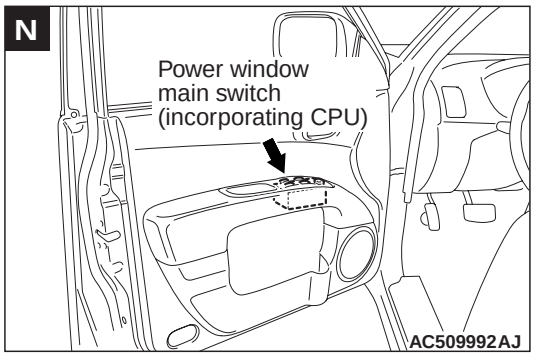
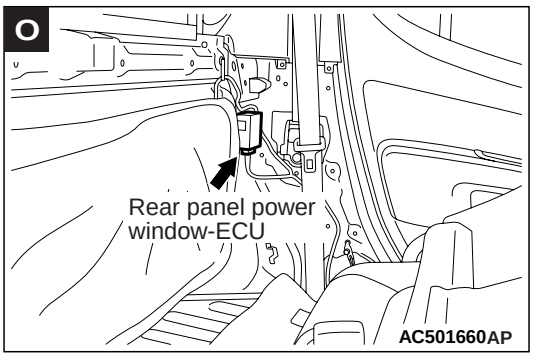






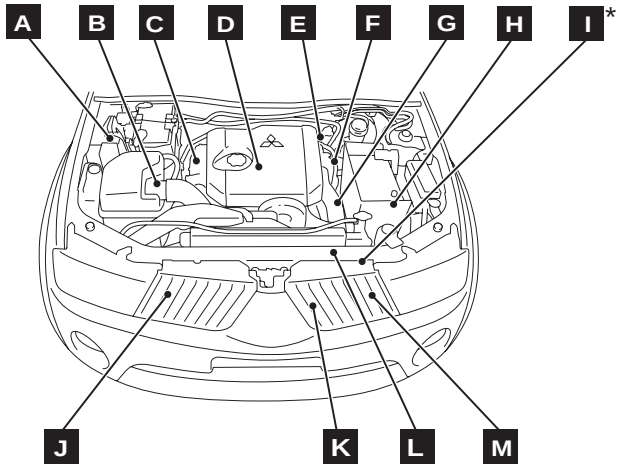


SENSOR

M1701000603124

Name	Symbol	Name	Symbol
A/T control solenoid valve assembly (incorporating A/T fluid temperature sensor)	N	G-sensor <ABS-4WD>	R
Accelerator pedal position sensor	P	G and yaw rate sensor <ASTC>	R
Air flow sensor (incorporating intake air temperature sensor No.1)	B	Input shaft speed sensor <A/T>	N
Air thermo sensor <Automatic A/C>	Q	Intake air temperature sensor No.2 <Except Euro5>	F
Ambient air temperature sensor (for air conditioner)	M	Interior temperature sensor <Automatic A/C>	S
Ambient air temperature sensor (for RV meter)	J	Lighting control sensor <Vehicles with auto lamp>	T
Battery current sensor <Euro5>	H	Manifold absolute pressure sensor	F
Camshaft position sensor	E	No.1 exhaust gas temperature sensor <Euro5>	C
Crank angle sensor	K	No.2 exhaust gas temperature sensor <Euro5>	V
EGR gas temperature sensor <Euro5>	D	No.3 exhaust gas temperature sensor <Euro5>	W
Electronic-controlled throttle valve (incorporating throttle position sensor)	F	Output shaft speed sensor <A/T>	N
Engine coolant temperature sensor	G	Rail pressure sensor	E

Name	Symbol	Name	Symbol
Exhaust differential pressure sensor <Euro5>	A	Rear wheel speed sensor	Y
Front impact sensor	I	Side impact sensor	X
Front wheel speed sensor	U	Steering wheel sensor <ASTC>	O
Fuel temperature sensor	L	Vehicle speed sensor <2WD-M/T, 4WD>	N



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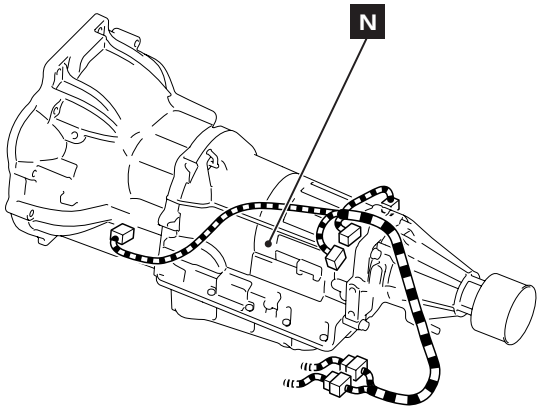

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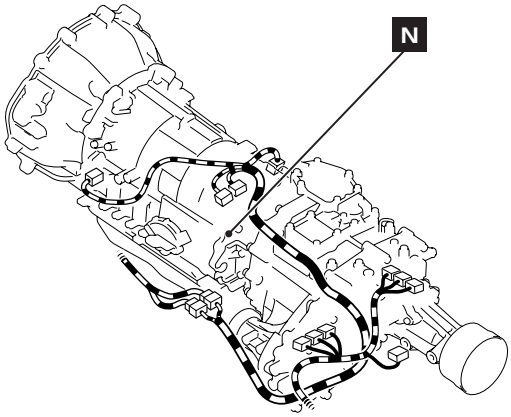

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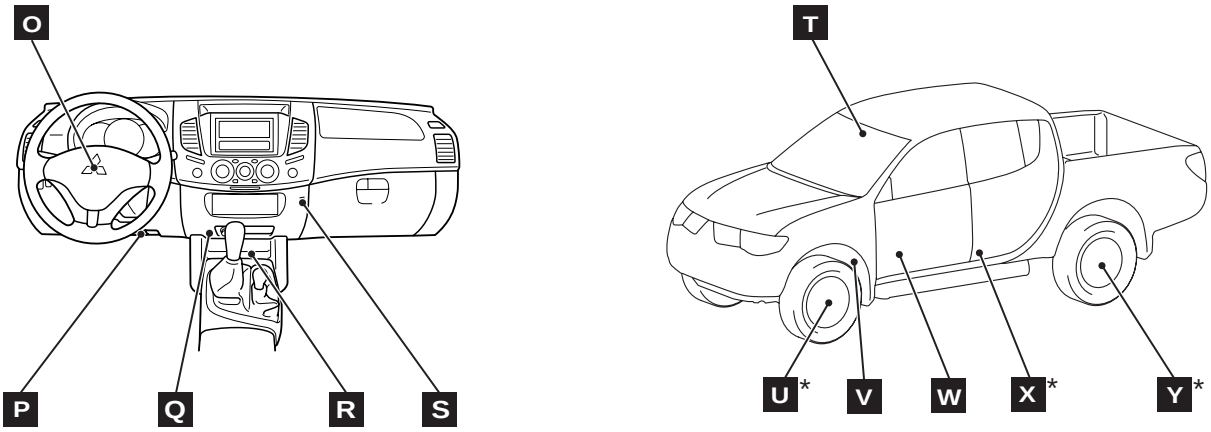

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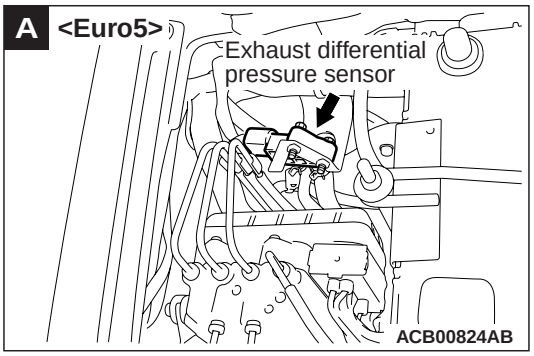
*NOTE: *: also equipped at the right side.*

A <Euro5>



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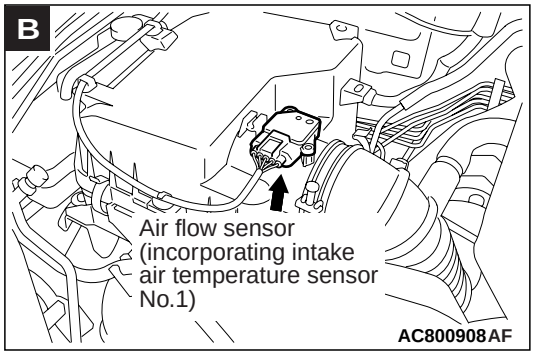

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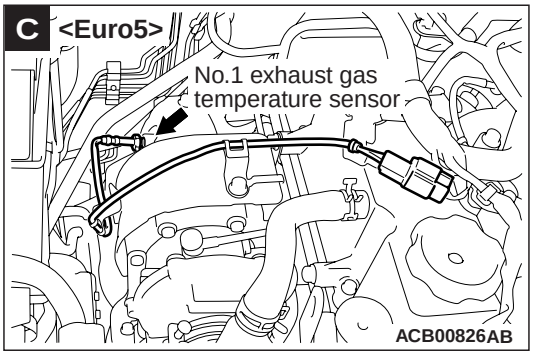

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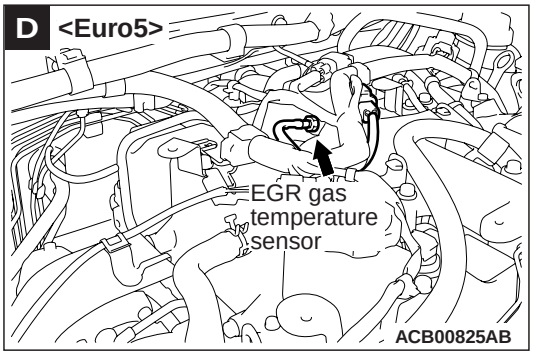

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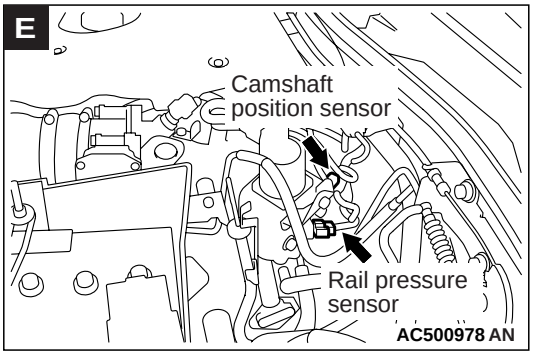

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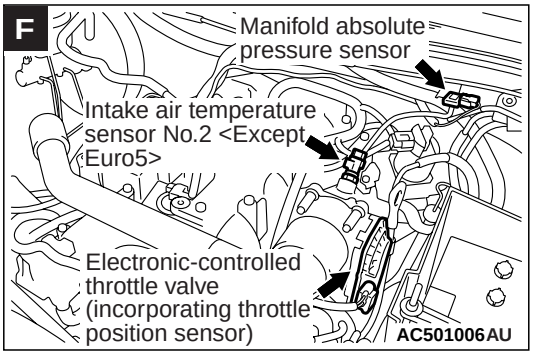

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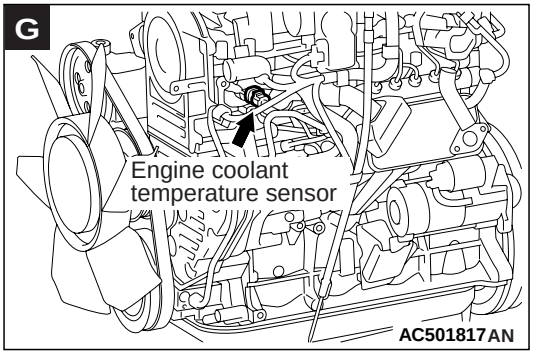

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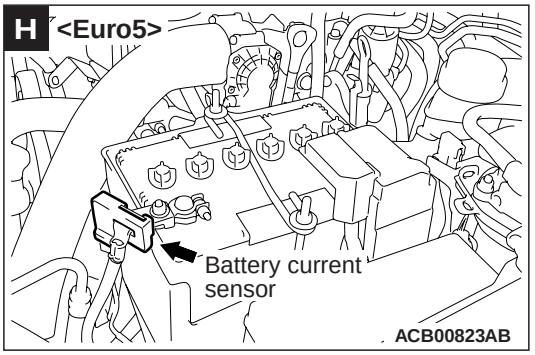

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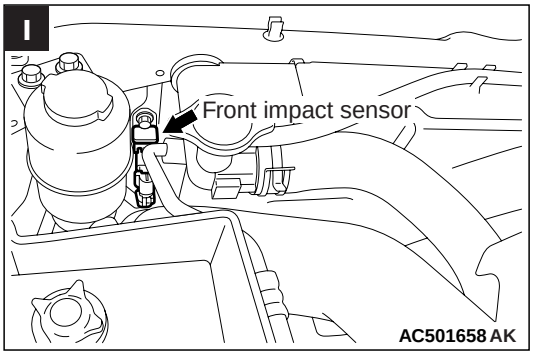

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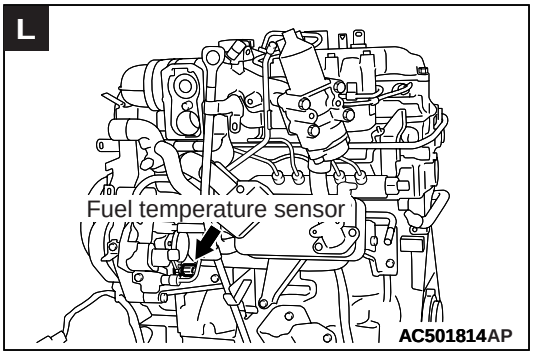

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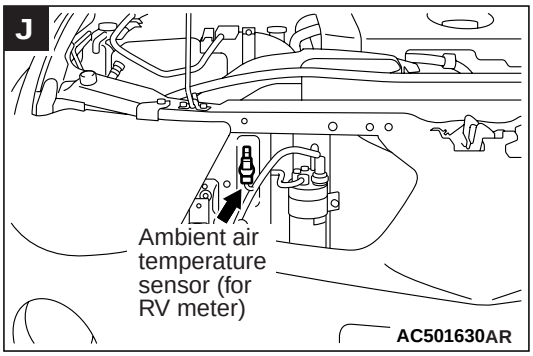

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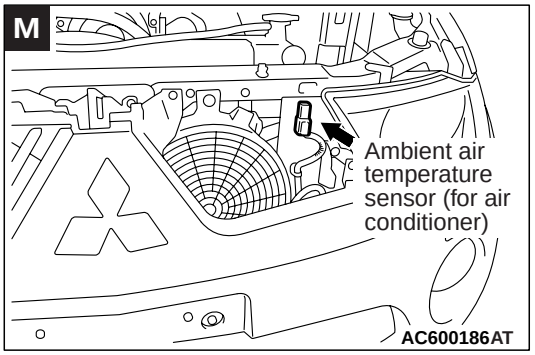

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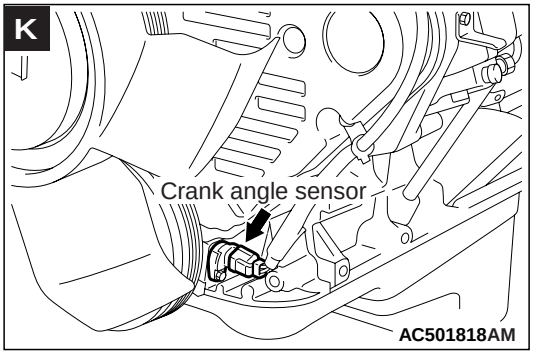

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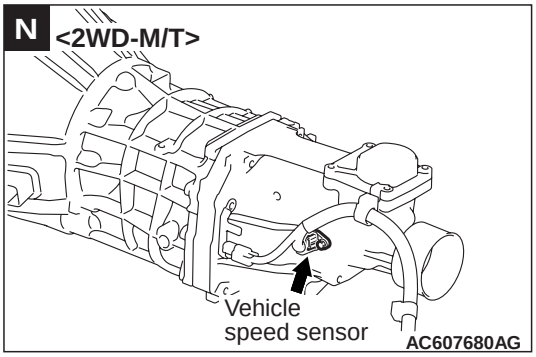

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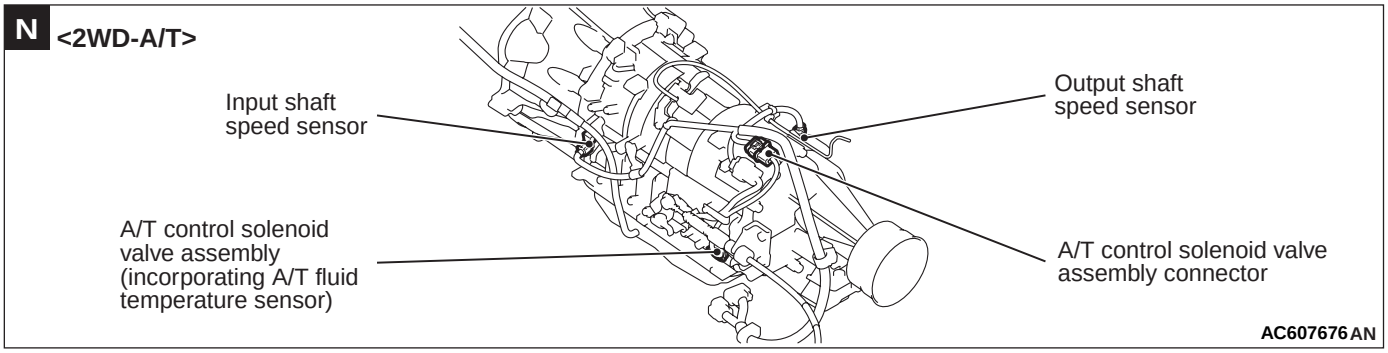

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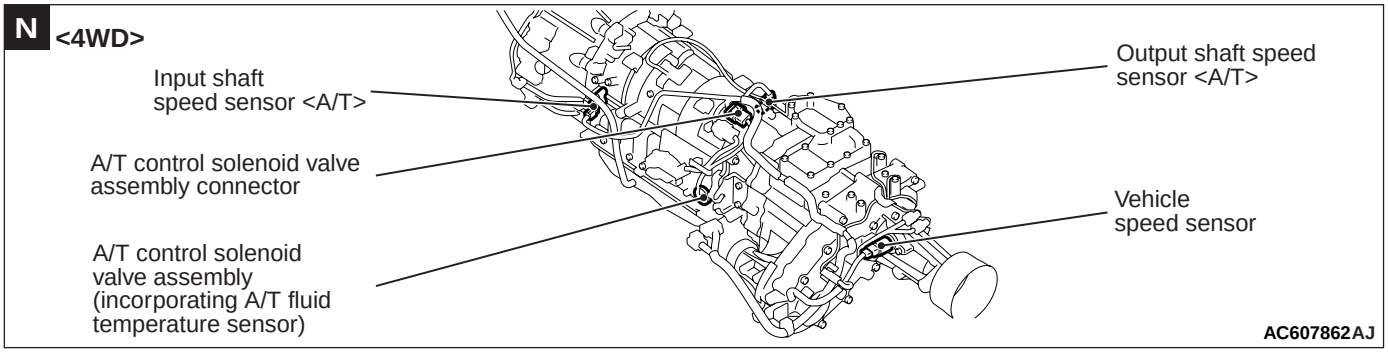

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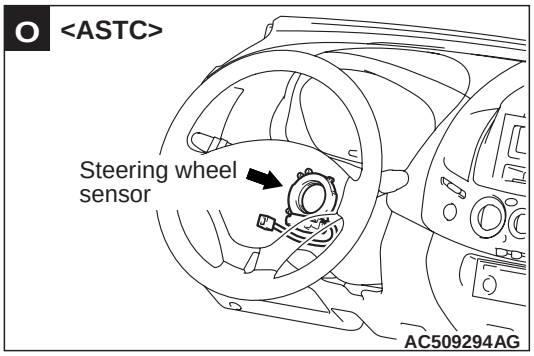

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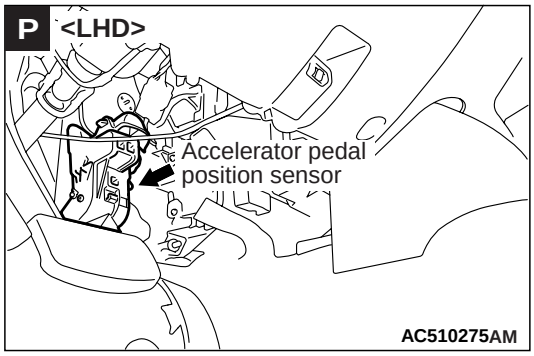

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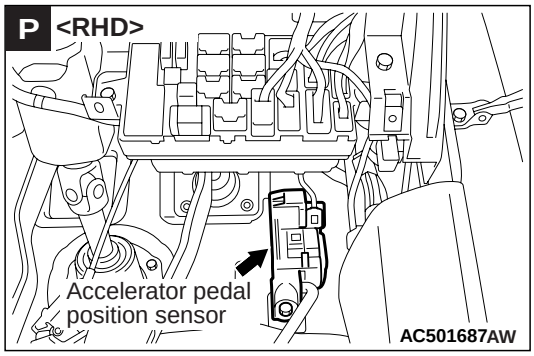

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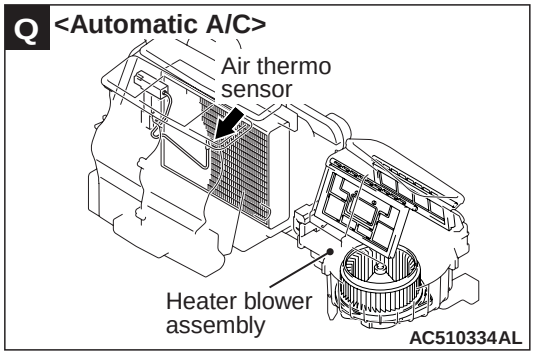

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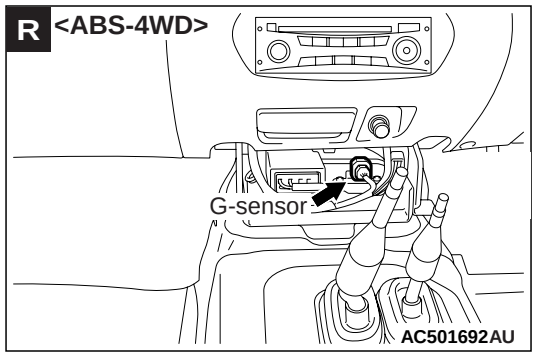

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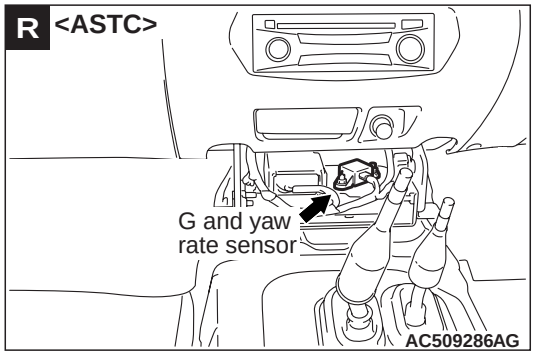

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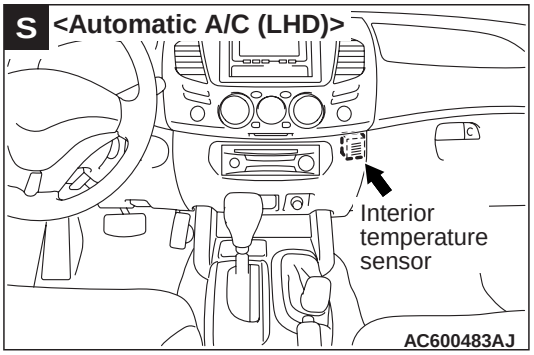

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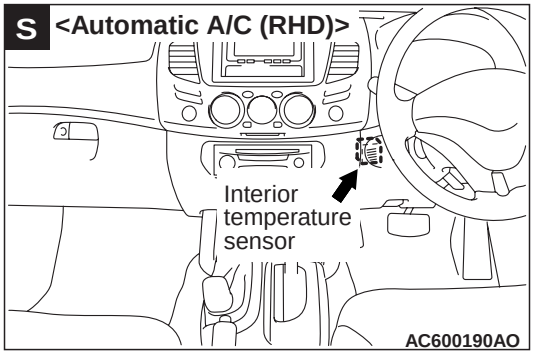
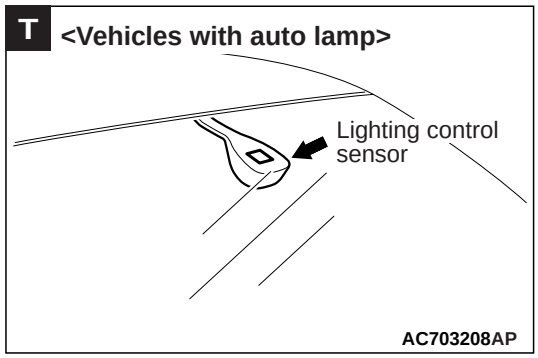


T <Vehicles with auto lamp>



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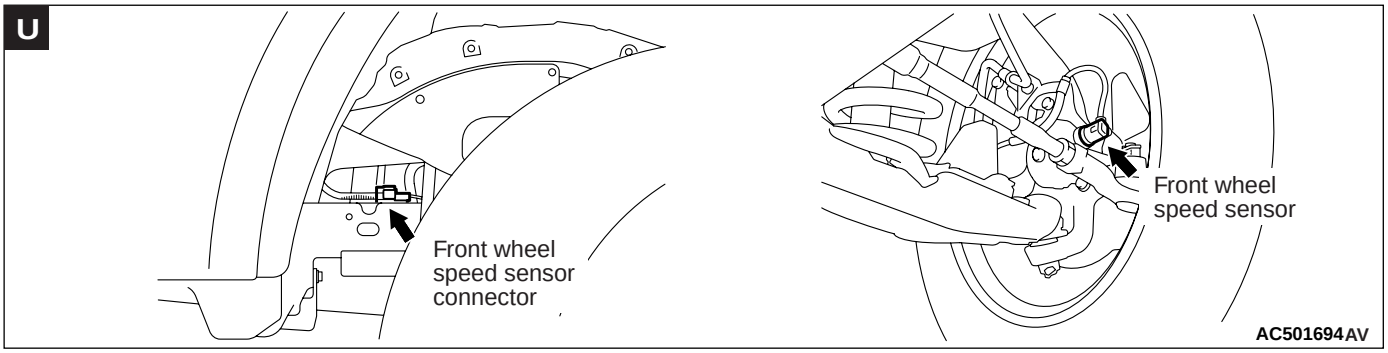

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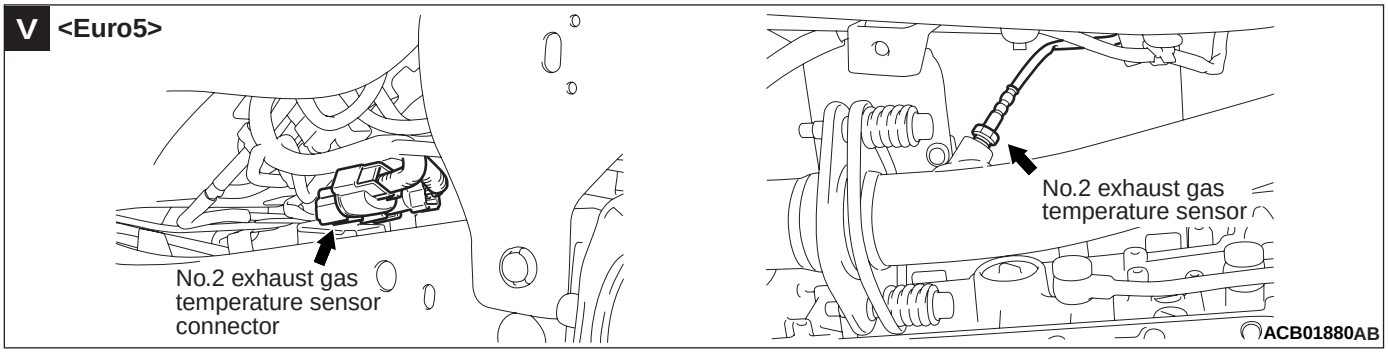

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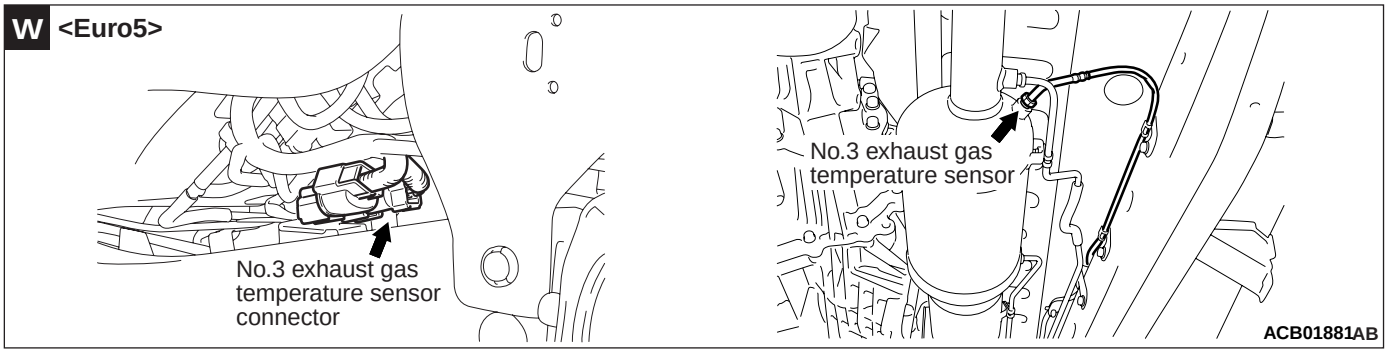
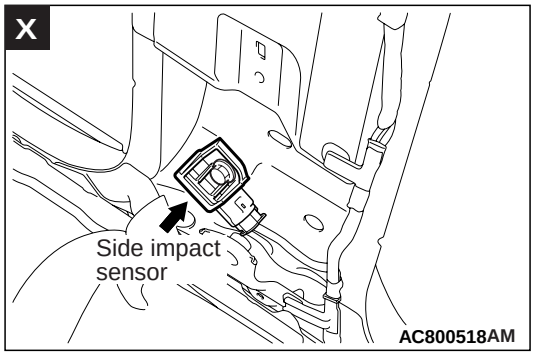
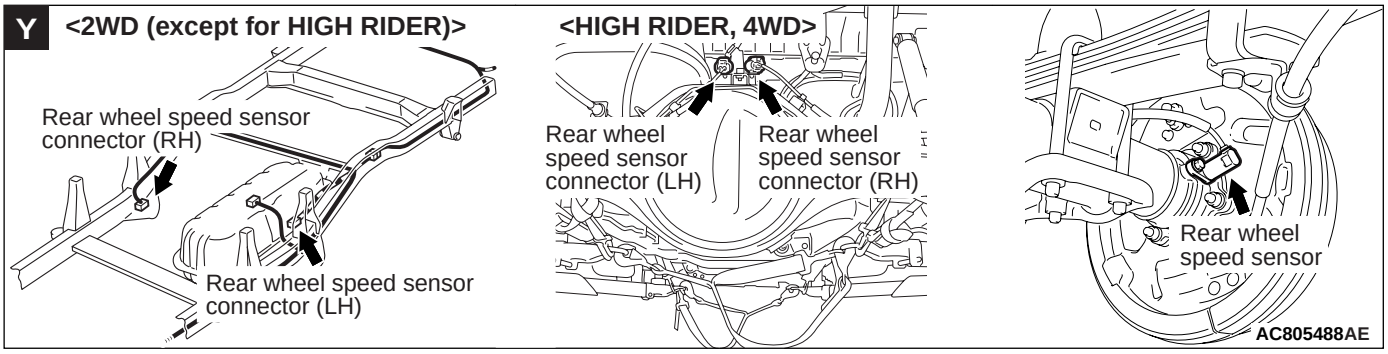


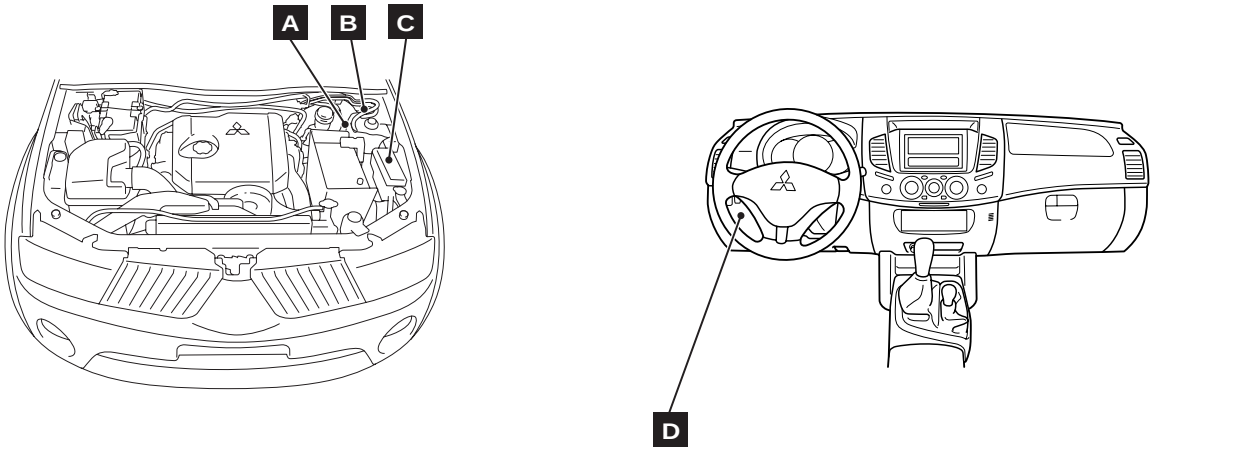




RELAY

M1701000402332

Name	Symbol	Name	Symbol
A/C compressor relay	C	Headlamp relay (LO)	C
A/T control relay	C	Headlamp washer relay	C
Accessory socket relay	D	Heated seat relay	D
Blow-by heater relay	C	Horn relay	C
Blower relay	D	Power window relay	C
Condenser fan relay <Vehicles for Israel>	C	Rear fog lamp relay	D
Engine control relay	C	PTC heater relay 1	A
Front fog lamp relay	C	PTC heater relay 2	A
Glow plug relay <Except Euro5>	B	Rear window defogger relay	D
Headlamp relay (HI)	C	Starter relay	C


A
B
C
D
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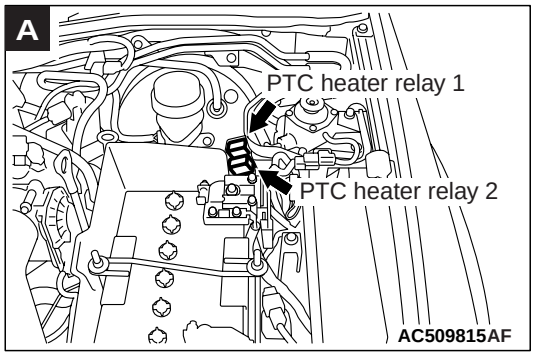
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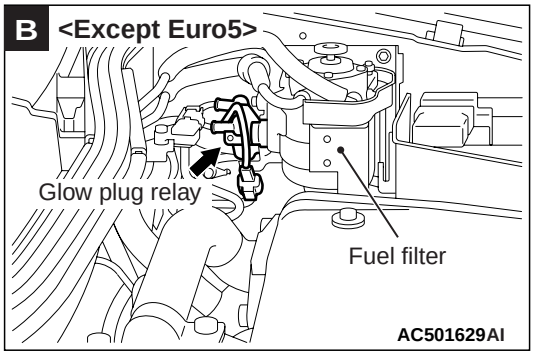
PTC heater relay 1
PTC heater relay 2
AC509815AF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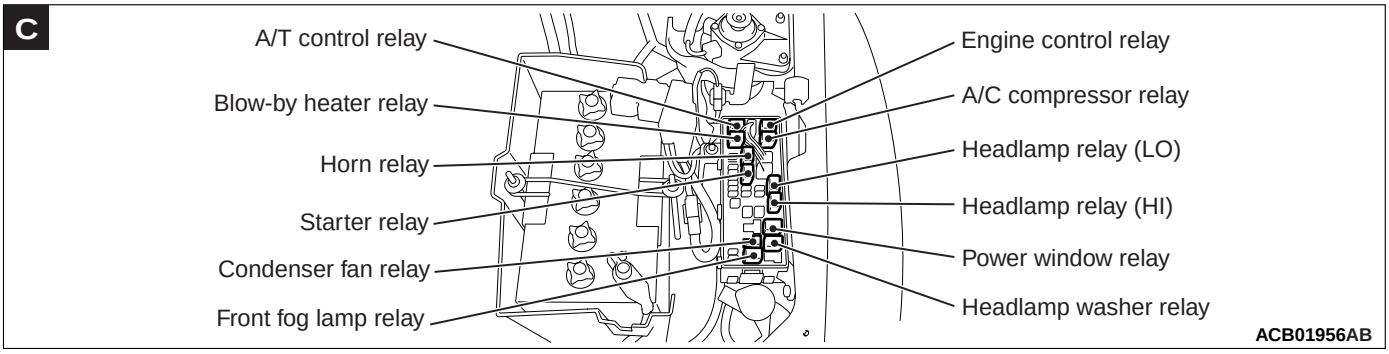
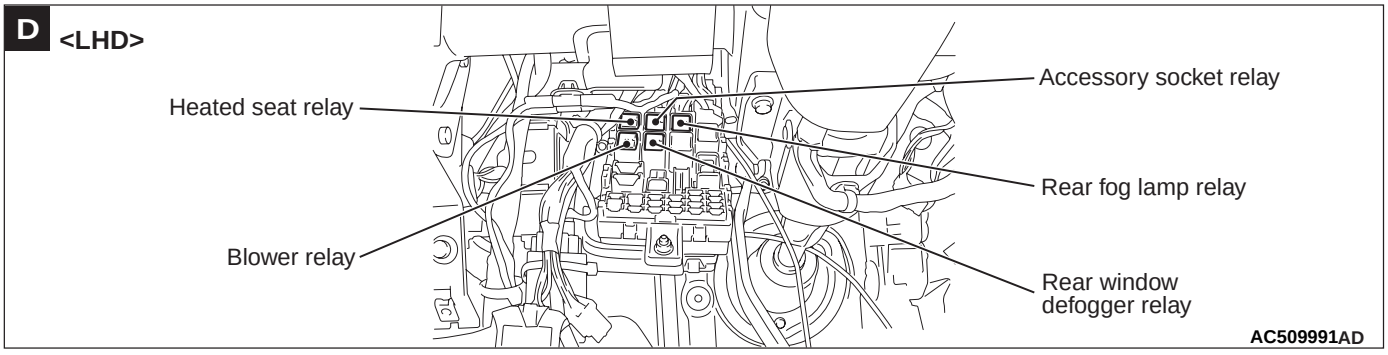
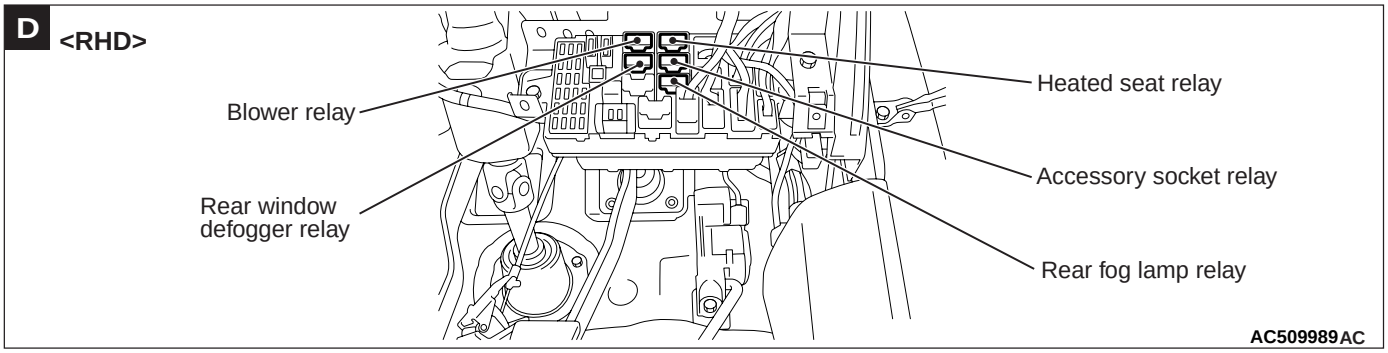
<Except Euro5>
Glow plug relay
Fuel filter
AC501629AI


C
A/T control relay
Blow-by heater relay
Horn relay
Starter relay
Condenser fan relay
Front fog lamp relay
Engine control relay
A/C compressor relay
Headlamp relay (LO)
Headlamp relay (HI)
Power window relay
Headlamp washer relay
ACB01956AB


D
<LHD>
Heated seat relay
Blower relay
Accessory socket relay
Rear fog lamp relay
Rear window defogger relay
AC509991AD



INSPECTION TERMINAL LOCATION

M1701000201089

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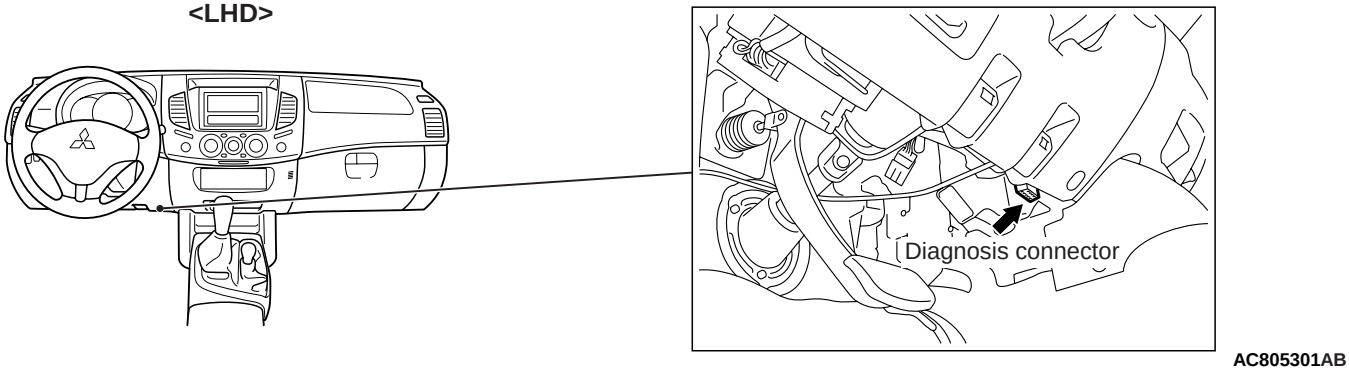

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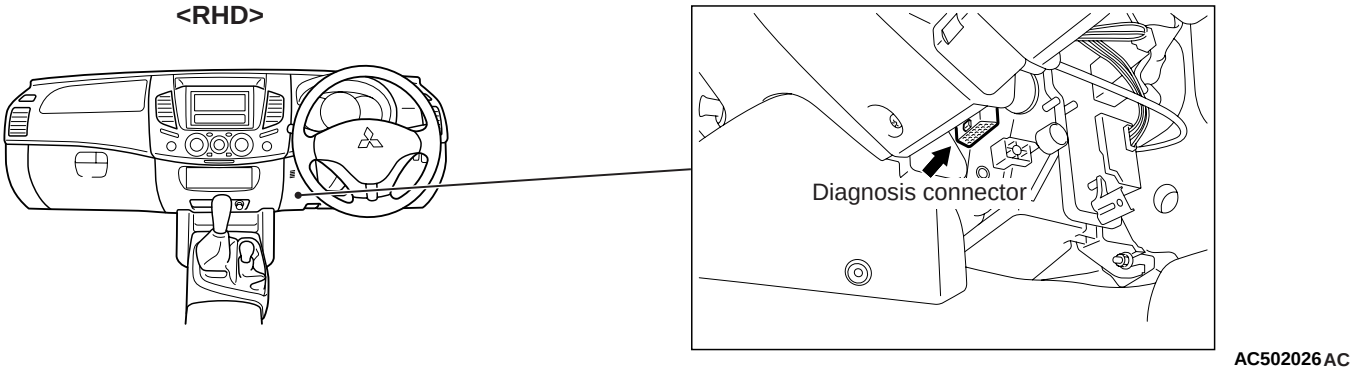
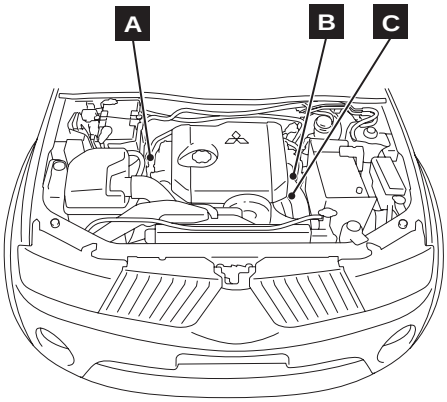


SOLENOID VALVE

M1701000802277

Name	Symbol	Name	Symbol
A/T control solenoid valve assembly (incorporating solenoid valve)	D	Suction control valve	B
Solenoid valve 1 <Vehicles for Europe (4WD)>	A	Variable geometry control solenoid valve <Euro5>	C
Solenoid valve 2 <Vehicles for Europe (4WD)>	A		



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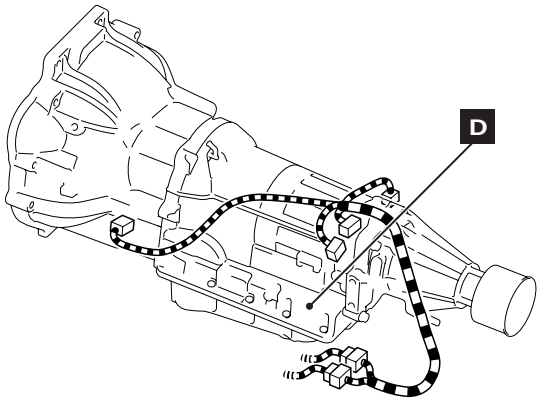

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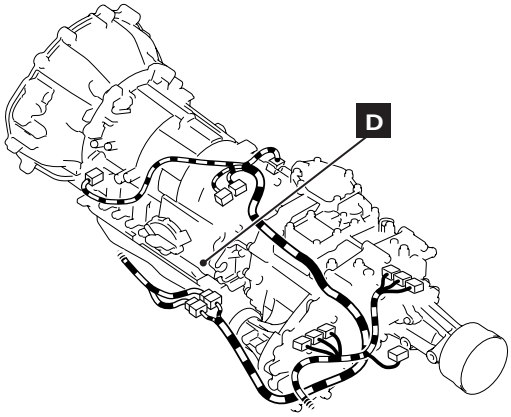

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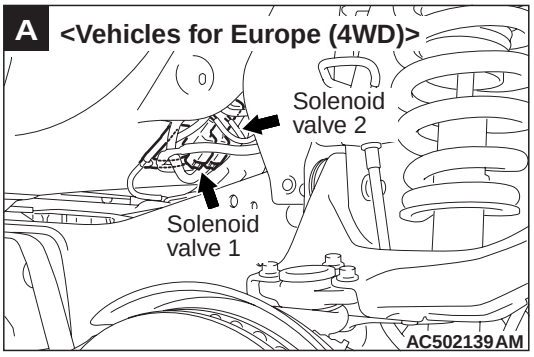
A <Vehicles for Europe (4WD)>



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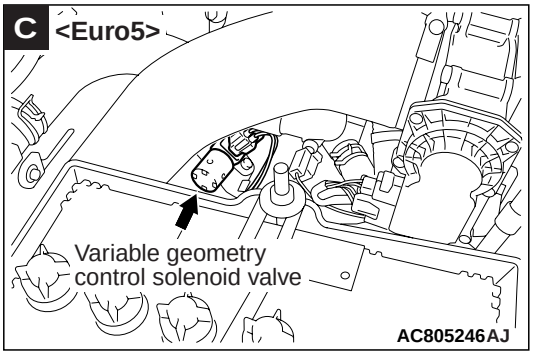

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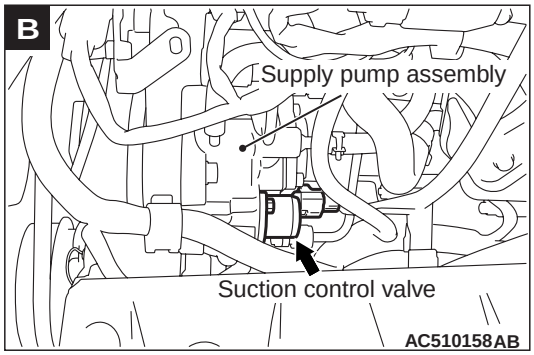
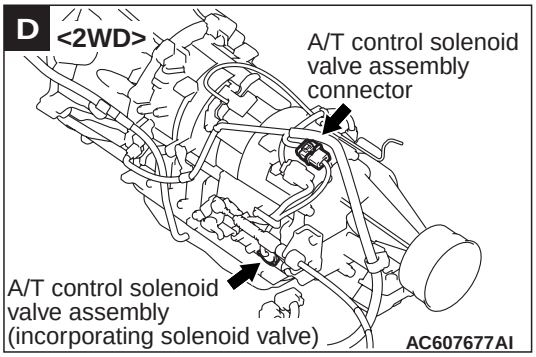


AC510158AB

D <2WD>



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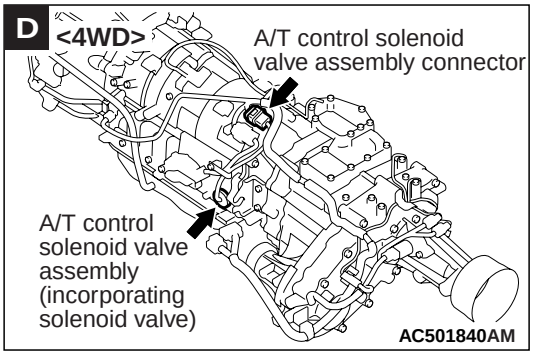
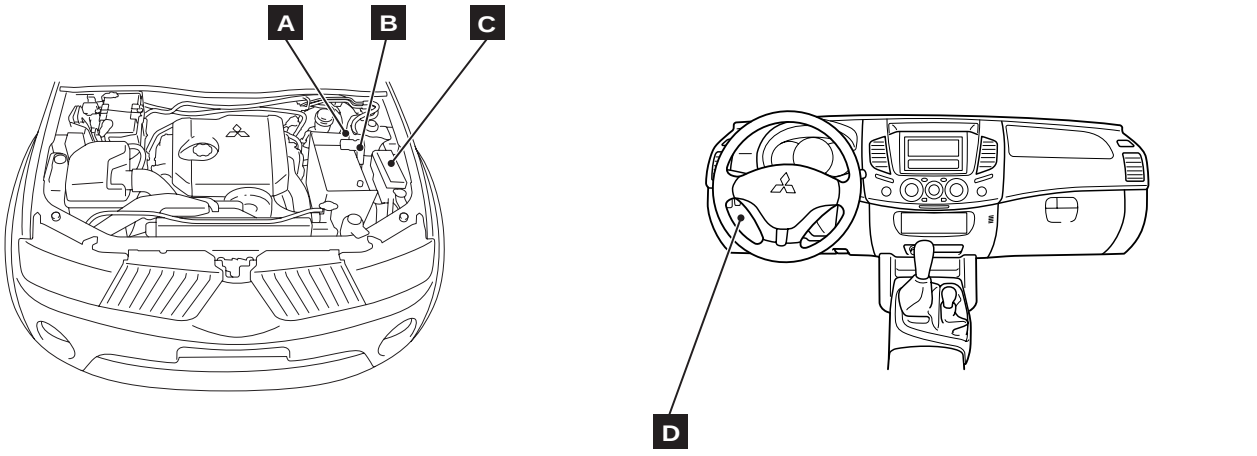
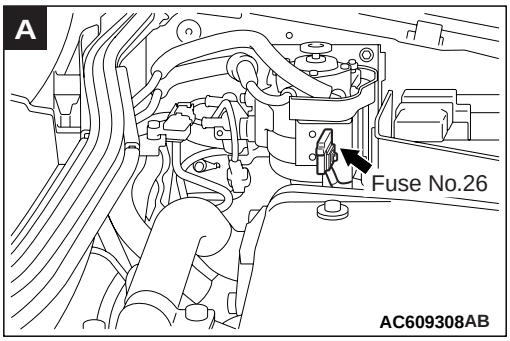


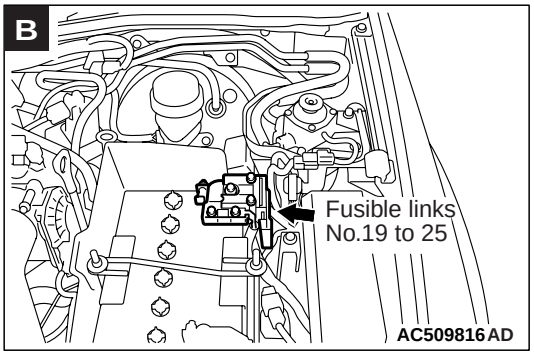
FUSIBLE LINK AND FUSE

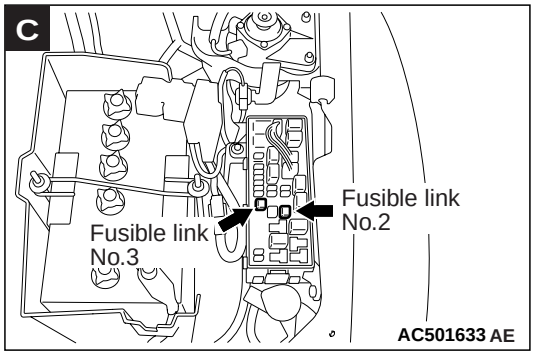
M1701000101394

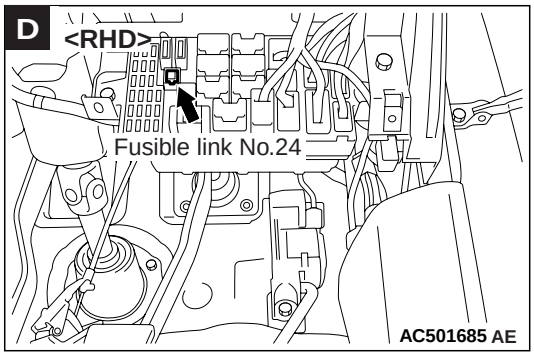
Name	Symbol	Name	Symbol
Fusible links No.19 to 25 (Battery positive terminal)	B	Fuses No.4, 5 and 6 to 18 (Engine compartment)	C
Fusible links No.2 and 3 (Engine compartment)	C	Fuse No.26 (Engine compartment)	A
Fusible link No.24 (Passenger compartment)	D	Fuses No.1 to 23, 25 and 26 (Passenger compartment)	D

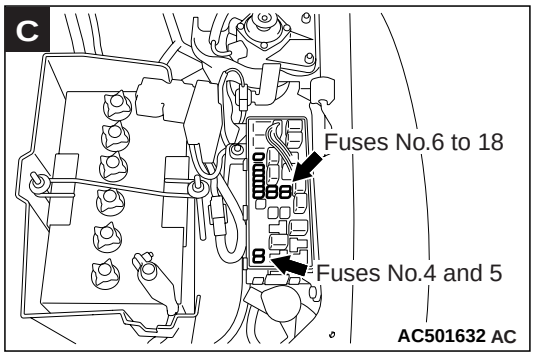


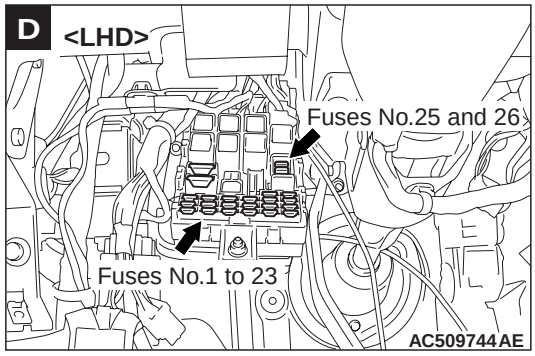


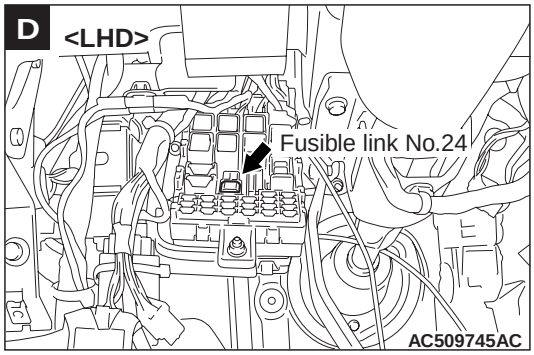


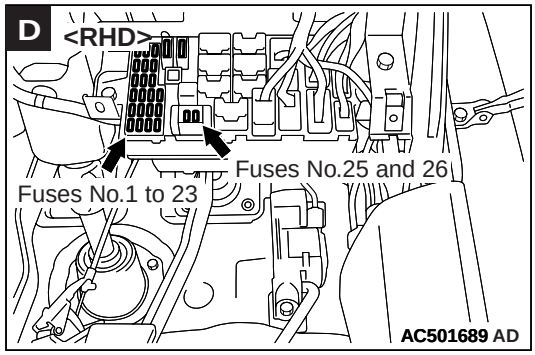












EARTH CABLE

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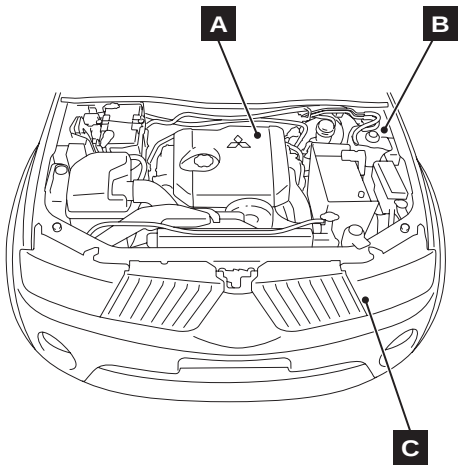

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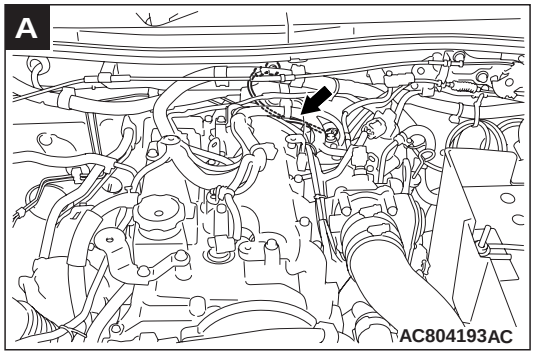

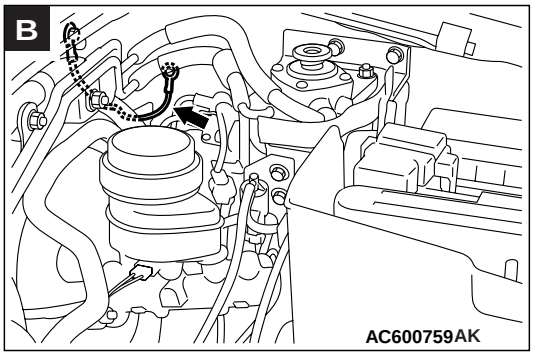

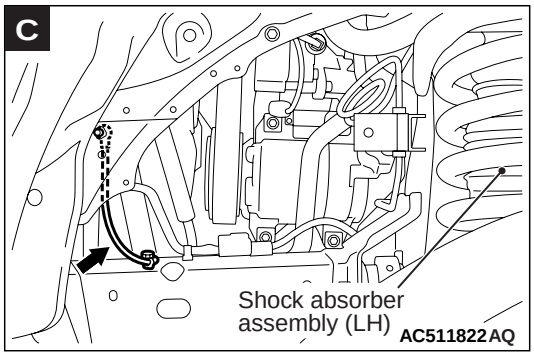

EARTH

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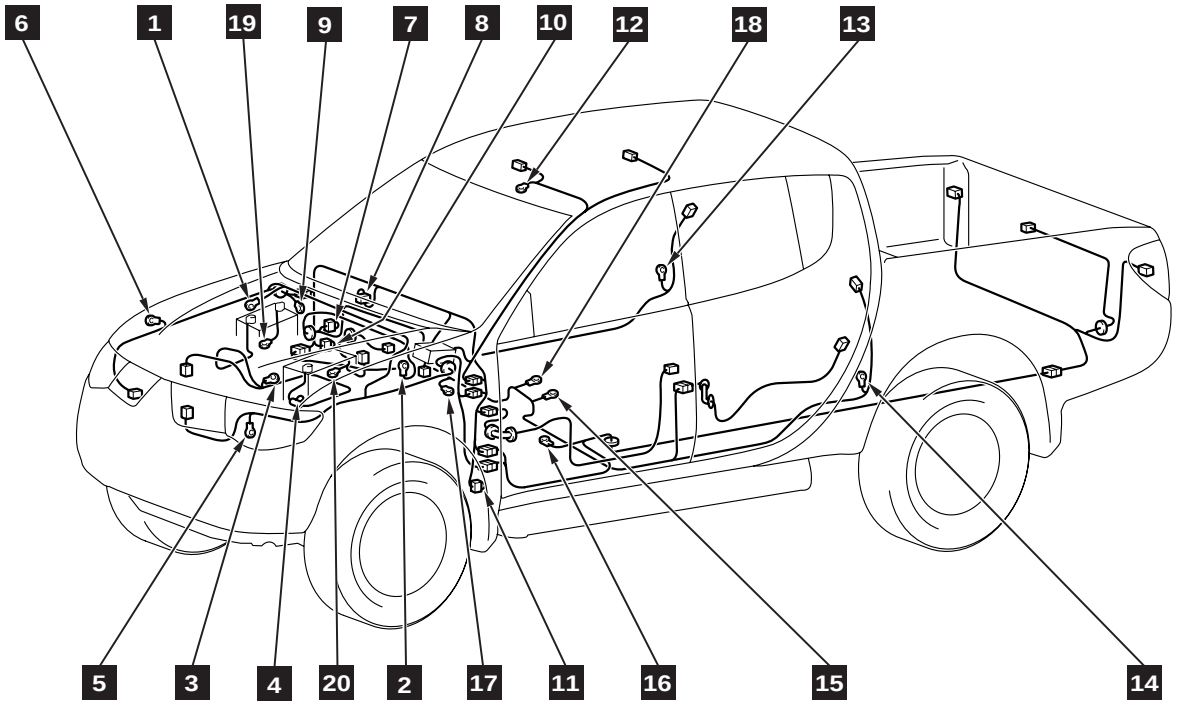

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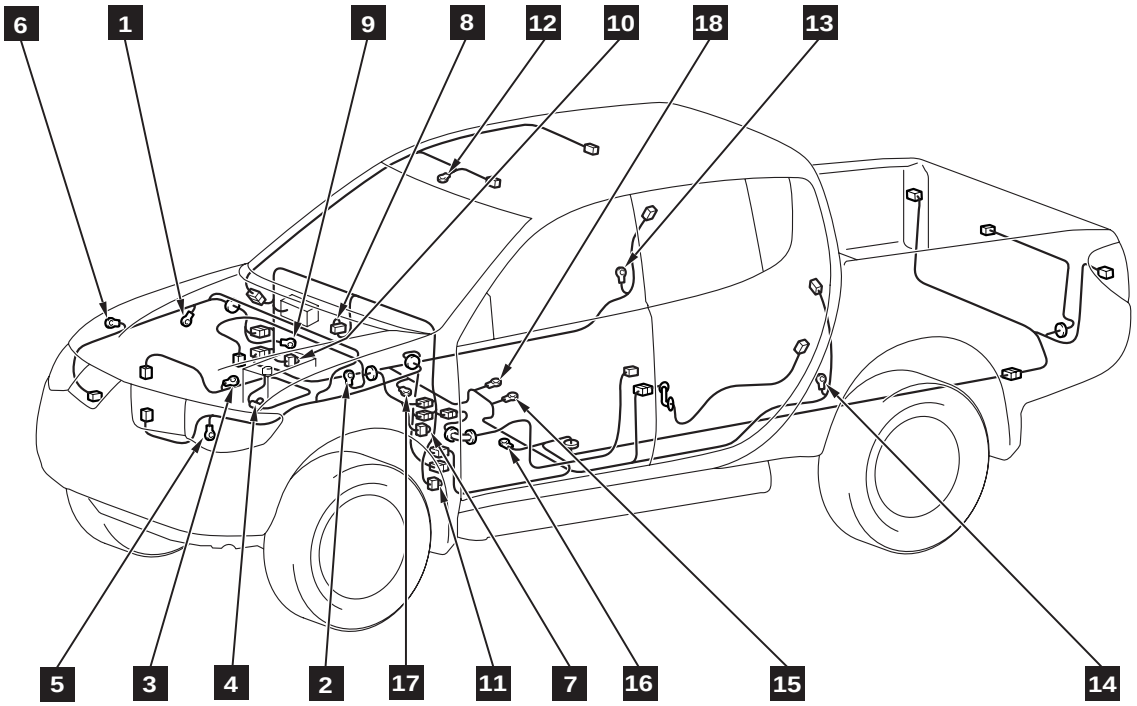
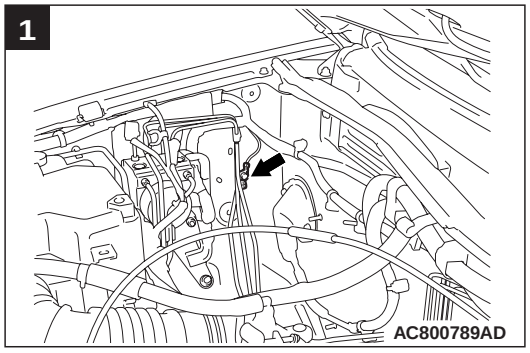
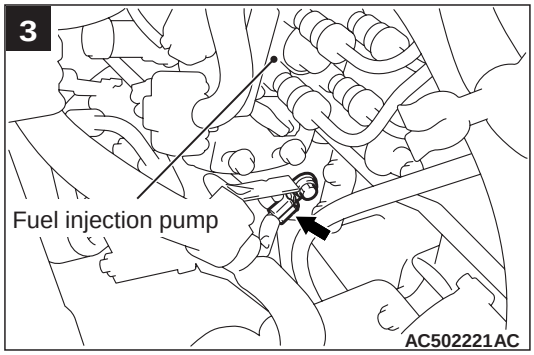
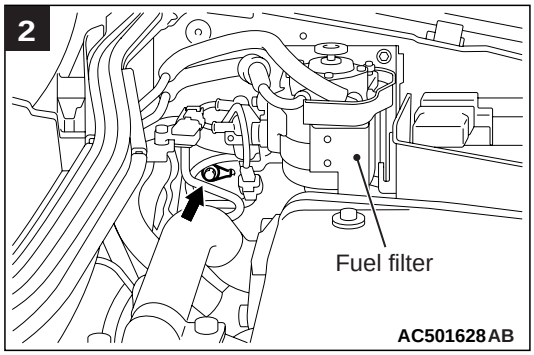


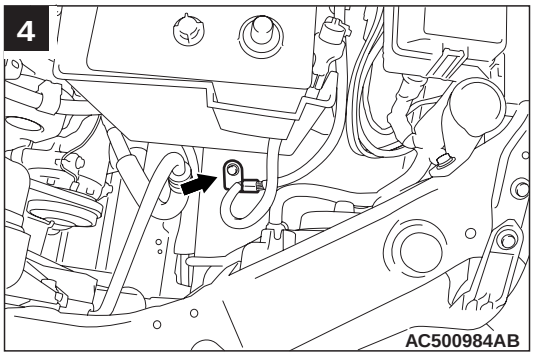
AC509447AC

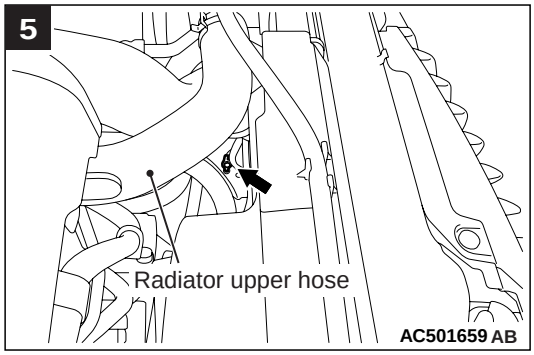
NOTE: Same earth numbers are used in the circuit diagram.







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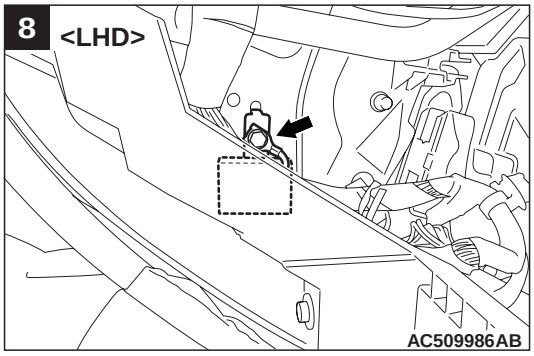
Radiator upper hose
AC501659 AB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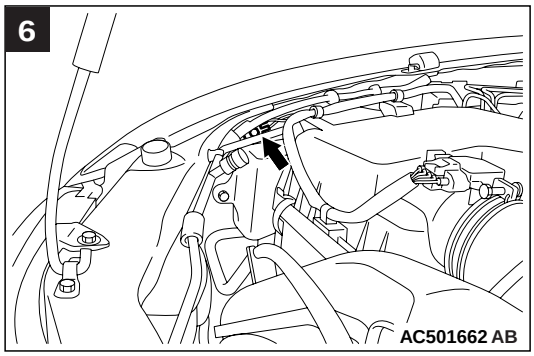
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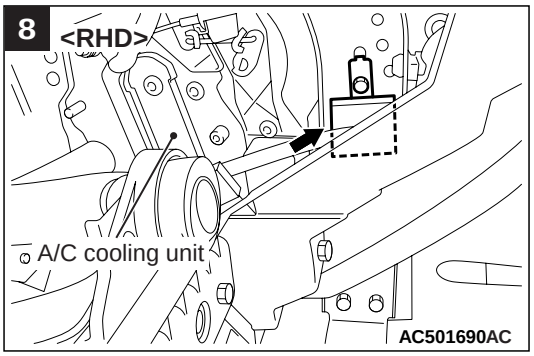
AC501662 AB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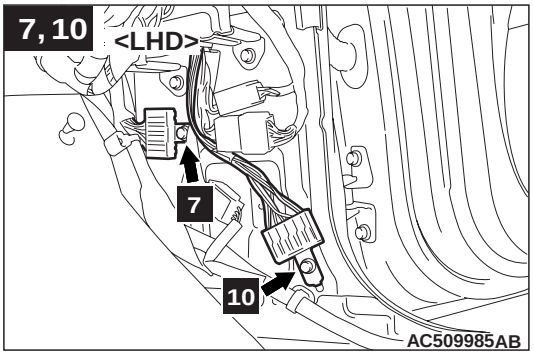
A/C cooling unit
AC501690AC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7
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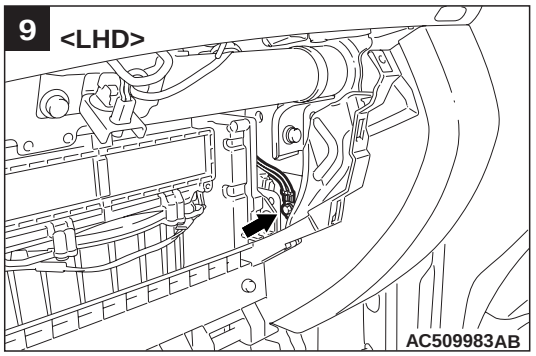
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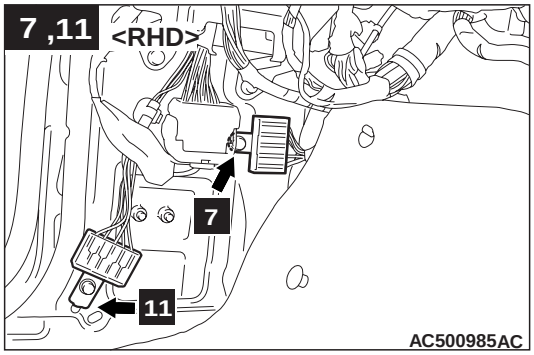
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7
11
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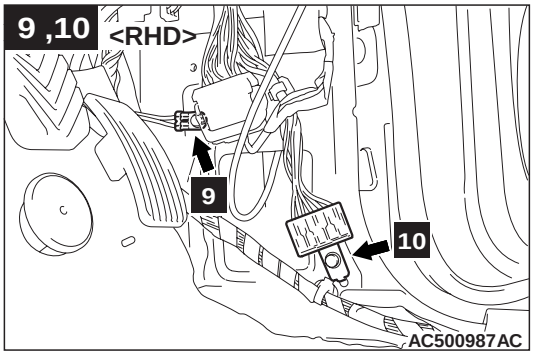
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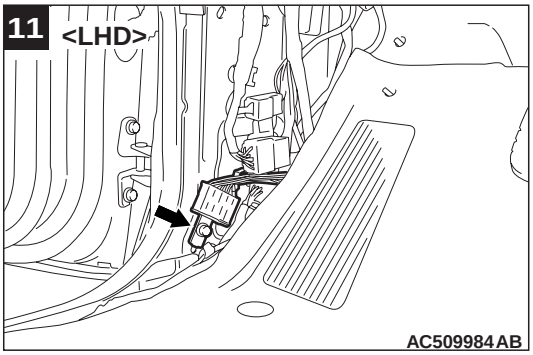

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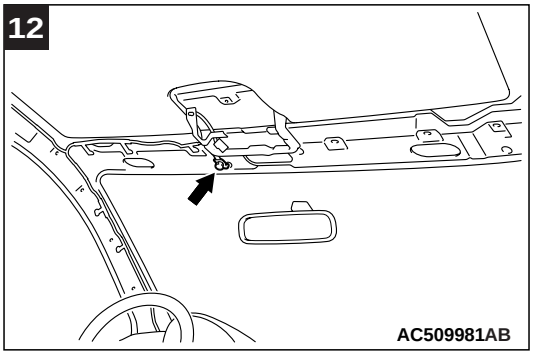

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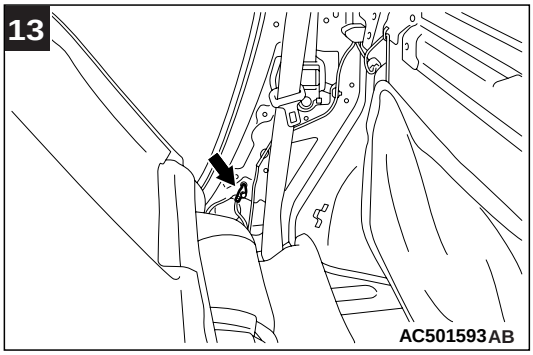

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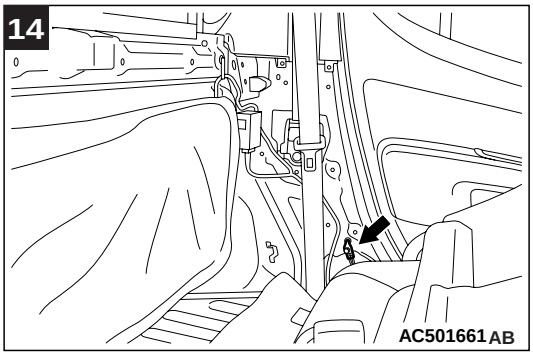
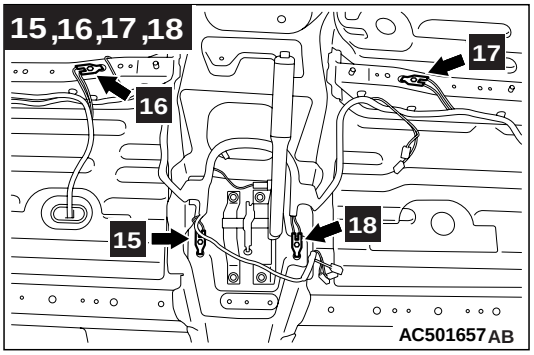
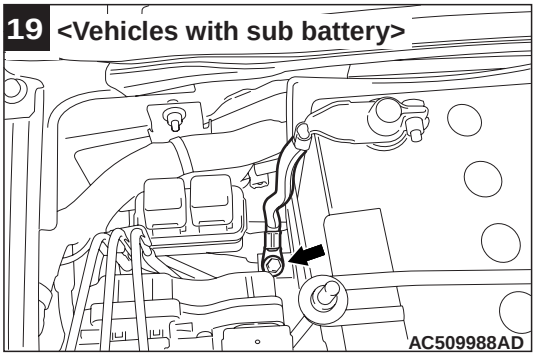


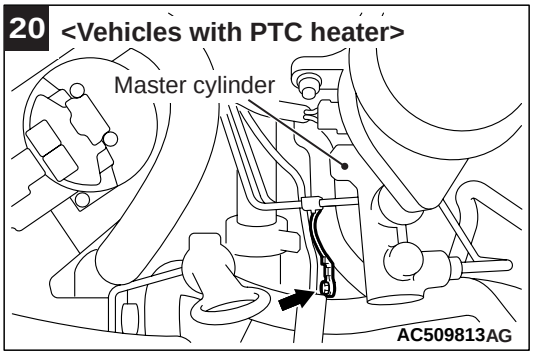
15,16,17,18



19 <Vehicles with sub battery>



20 <Vehicles with PTC heater>



GROUP 80

CONFIGURATION DIAGRAMS

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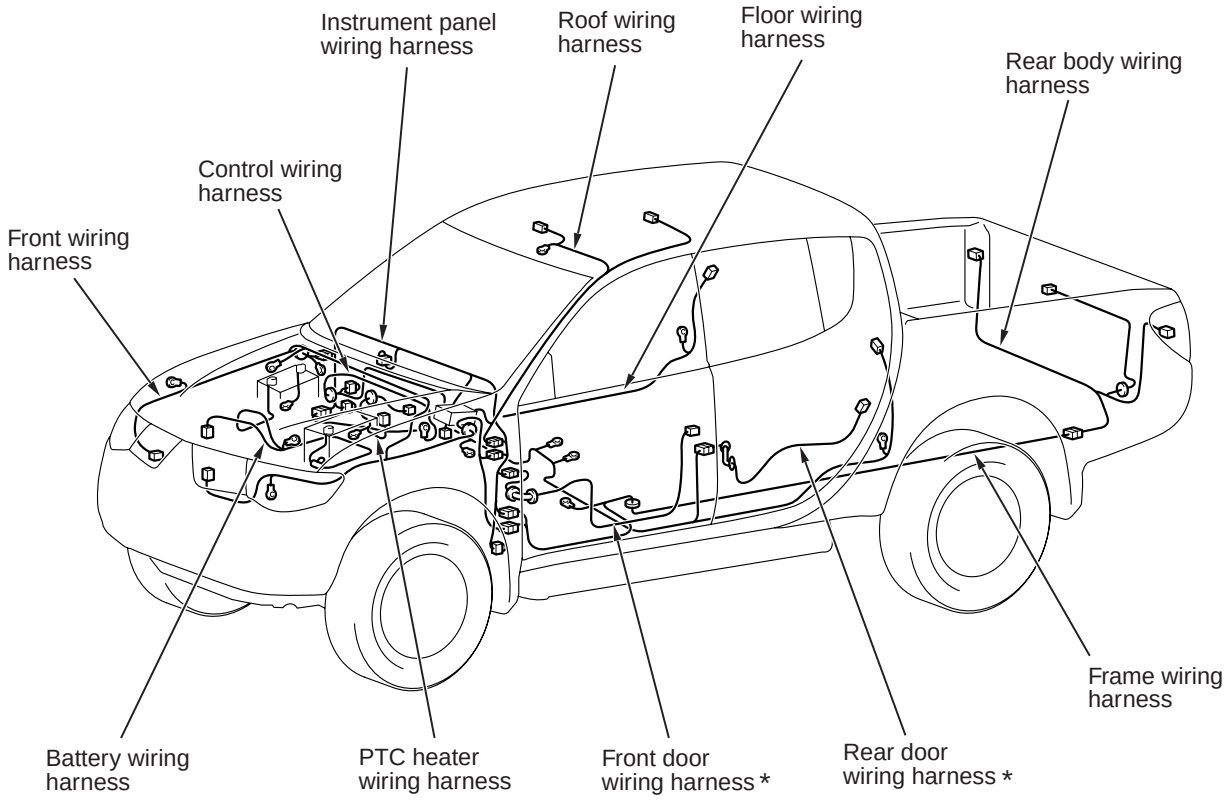
OVERALL CONFIGURATION DIAGRAM

OVERALL CONFIGURATION DIAGRAM
<LHD>

M1801000103320



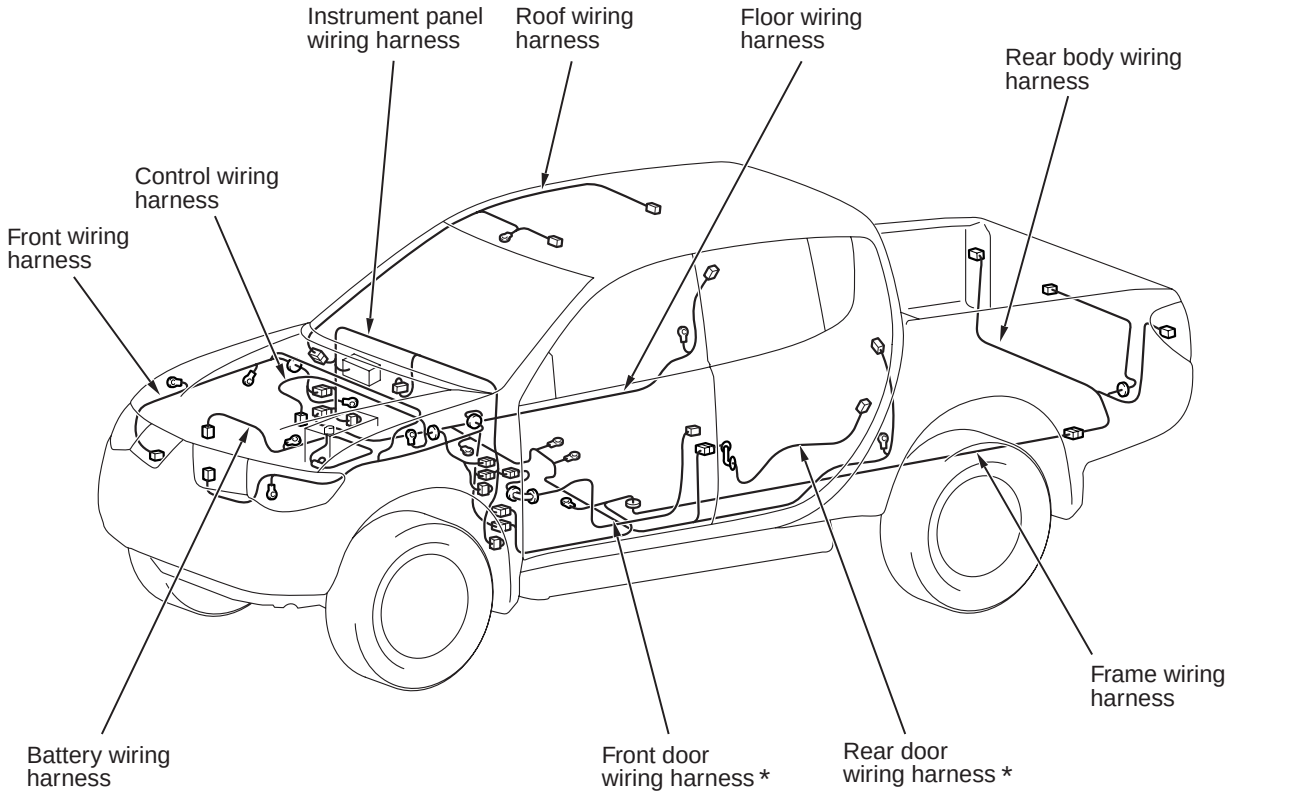
AC809485AB

NOTE:

1. *This illustration shows only major wiring harnesses.*
2. **: also equipped at the right side.*

OVERALL CONFIGURATION DIAGRAM
<RHD>

M1801000101498



AC509447AB

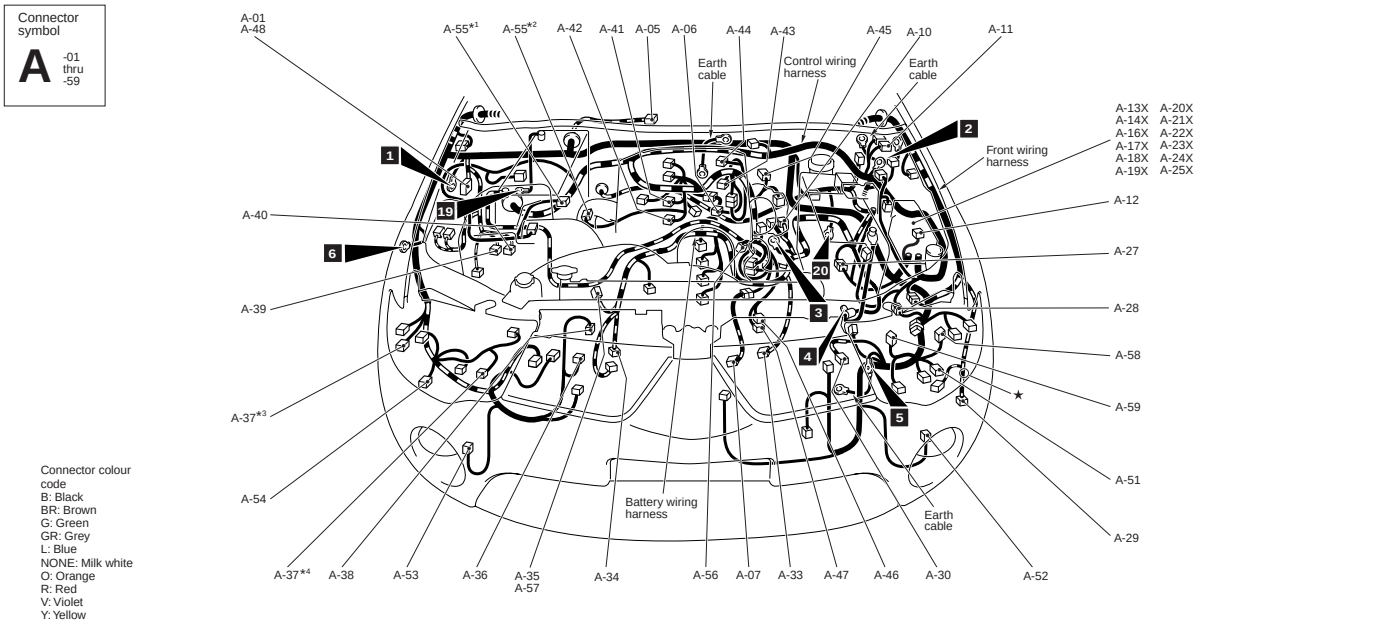
NOTE:

1. *This illustration shows only major wiring harnesses.*
2. **: also equipped at the right side.*

ENGINE COMPARTMENT

ENGINE COMPARTMENT <LHD>

M1801000308642

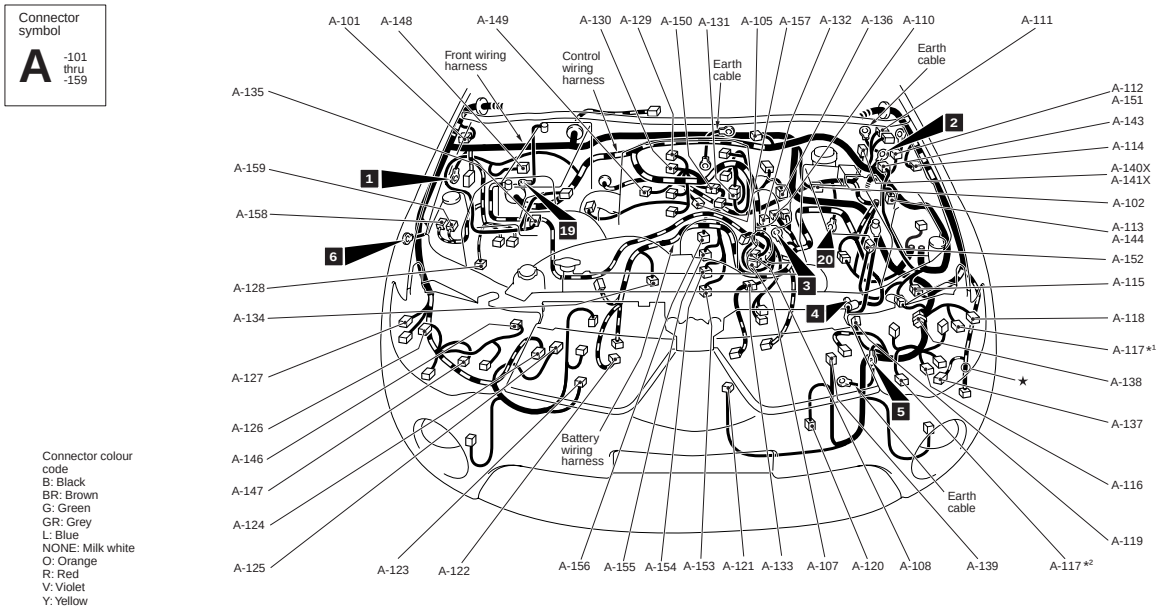


- A-01 (34-GR) ABS-ECU
- A-05 (5-GR) Windshield wiper motor
- A-06 (1) Glow plugs <Except Euro5>
- A-07 (3-B) Crank angle sensor
- A-10 (1) Starter
- A-11 (1) Glow plug relay <Except Euro5>
- A-12 (1-GR) Front wiring harness and relay box combination
- A-13X (4) Front fog lamp relay
- A-14X (4) Condenser fan relay <Vehicles for Israel>
- A-16X (4) Starter relay
- A-17X (4) Horn relay
- A-18X (4) Blow-by heater relay
- A-19X (4) A/T control relay
- A-20X (4) Engine control relay
- A-21X (4) A/C compressor relay
- A-22X (4) Headlamp relay (LO)
- A-23X (4) Headlamp relay (HI)
- A-24X (4) Power window relay
- A-25X (4) Headlamp washer relay
- A-27 (8-B) Front wiring harness and battery wiring harness combination
- A-28 (12-B) Front wiring harness and control wiring harness combination
- A-29 (2-GR) Washer motor
- A-30 (2-Y) Front impact sensor (LH)
- A-33 (1-B) A/C compressor and clutch assembly
- A-34 (1) Alternator
- A-35 (1-B) Engine oil pressure switch <Except vehicles with high power engine>
- A-36 (2-B) Ambient air temperature sensor (for RV meter)
- A-37 (2-B) Position lamp (RH)
- A-38 (2-BR) Dual pressure switch
- A-39 (2-B) Solenoid valve 1 <Vehicles for Europe (4WD)>
- A-40 (2-B) Solenoid valve 2 <Vehicles for Europe (4WD)>
- A-41 (2-GR) Injector 2
- A-42 (2-GR) Injector 1
- A-43 (3-B) Camshaft position sensor
- A-44 (3-B) Rail pressure sensor
- A-45 (6-GR) EGR valve assembly
- A-46 (2-B) Fuel temperature sensor
- A-47 (2-GR) Suction control valve
- A-48 (34-B) ASTC-ECU
- A-51 (3-GR) Headlamp levelling unit (LH)
- A-52 (2-B) Front fog lamp (LH)
- A-53 (2-B) Front fog lamp (RH)
- A-54 (3-GR) Headlamp levelling unit (RH)
- A-55 (2-B) Blow-by hose heater
- A-56 (2-BR) Variable geometry control solenoid valve <Euro5>
- A-57 (1-L) Engine oil pressure switch <Vehicles with high power engine>
- A-58 (2-B) Headlamp (LO: LH) <4-bulb type>
- A-59 (2-B) Headlamp (HI: LH) <4-bulb type>

NOTE:

1. **1: Except vehicles with high power engine*
2. **2: Vehicles with high power engine*
3. **3: 2-bulb type headlamp*
4. **4: 4-bulb type headlamp*

ENGINE COMPARTMENT <LHD> (CONTINUED)



ACB01362AC

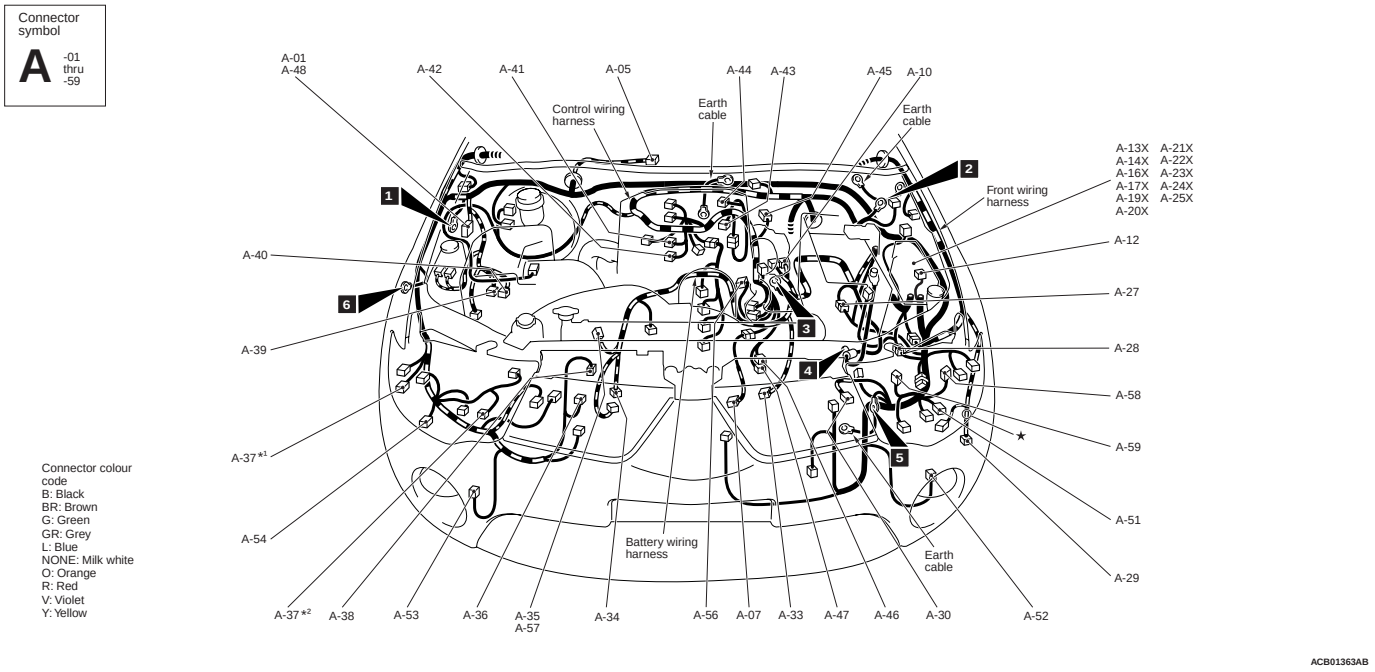
A-101 (2-GR) Side turn-signal lamp (RH)
A-102 (2-GR) Brake fluid level switch
A-105 (3-L) Manifold absolute pressure sensor
A-107 (2-B) Engine coolant temperature sensor
A-108 (1-B) Engine coolant temperature gauge unit
A-110 (1-B) Starter
A-111 (1) Glow plug relay <Except Euro5>
A-112 (2-B) Glow plug relay <Except Euro5>
A-113 (2-B) No connection <Except vehicles for Russia>
A-114 (2-GR) Side turn-signal lamp (LH)
A-115 (12) Front wiring harness and control wiring harness combination
A-116 (3-B) Headlamp (LH) <2-bulb type>
A-117 (2-B) Position lamp (LH)
A-118 (2-BR) Front turn-signal lamp (LH)
A-119 (2-B) Front wheel speed sensor (LH)
A-120 (2-B) Condenser fan motor <Vehicles for Israel>
A-121 (1-B) Horn (HI)
A-122 (4-GR) Alternator
A-123 (1-B) Horn (LO)
A-124 (2-Y) Front impact sensor (RH)
A-125 (2-B) Front wheel speed sensor (RH)
A-126 (3-B) Headlamp (RH) <2-bulb type>
A-127 (2-BR) Front turn-signal lamp (RH)
A-128 (2-GR) Free wheel engage switch <Vehicles for Europe (4WD)>
A-129 (2-GR) Injector 4
A-130 (2-GR) Injector 3
A-131 (6-B) Fuel pressure sensor harness and control harness combination
A-132 (6-B) Electronic-controlled throttle valve
A-133 (3-B) Crank angle sensor harness and control harness combination
A-134 (1-B) Power steering fluid pressure switch
A-135 (5-B) Air flow sensor
A-136 (2-B) Intake air temperature sensor No.2 <Except Euro5>
A-137 (2-GR) Headlamp washer motor
A-138 (4) Spare connector (for trailer)
A-139 (2-B) Ambient temperature sensor (for air conditioner)
A-140X(4) PTC heater relay 1
A-141X(4) PTC heater relay 2
A-143 (2-B) Fuel filter pressure switch <Vehicles for Russia and Morocco>
A-144 (2) Water level switch <Vehicles for Russia>
A-146 (2-B) Headlamp (HI: RH) <4-bulb type>
A-147 (2-B) Headlamp (LO: RH) <4-bulb type>
A-148 (3-B) Exhaust differential pressure sensor <Euro5>
A-149 (2-B) No.1 exhaust gas temperature sensor <Euro5>
A-150 (4-B) Control wiring harness and glow wiring harness combination <Euro5>
A-151 (12-B) Glow control unit <Euro5>
A-152 (4-GR) Battery current sensor <Euro5>
A-153 (1-B) Glow plugs 1 <Euro5>
A-154 (1-B) Glow plugs 2 <Euro5>
A-155 (1-B) Glow plugs 3 <Euro5>
A-156 (1-B) Glow plugs 4 <Euro5>
A-157 (2-B) EGR gas temperature sensor <Euro5>
A-158 (3-B) No.3 exhaust gas temperature sensor <Euro5>
A-159 (2-B) No.2 exhaust gas temperature sensor <Euro5>

ENGINE COMPARTMENT <RHD>

M1801000308653

NOTE:

1. **1: 2-bulb type headlamp*
2. **2: 4-bulb type headlamp*

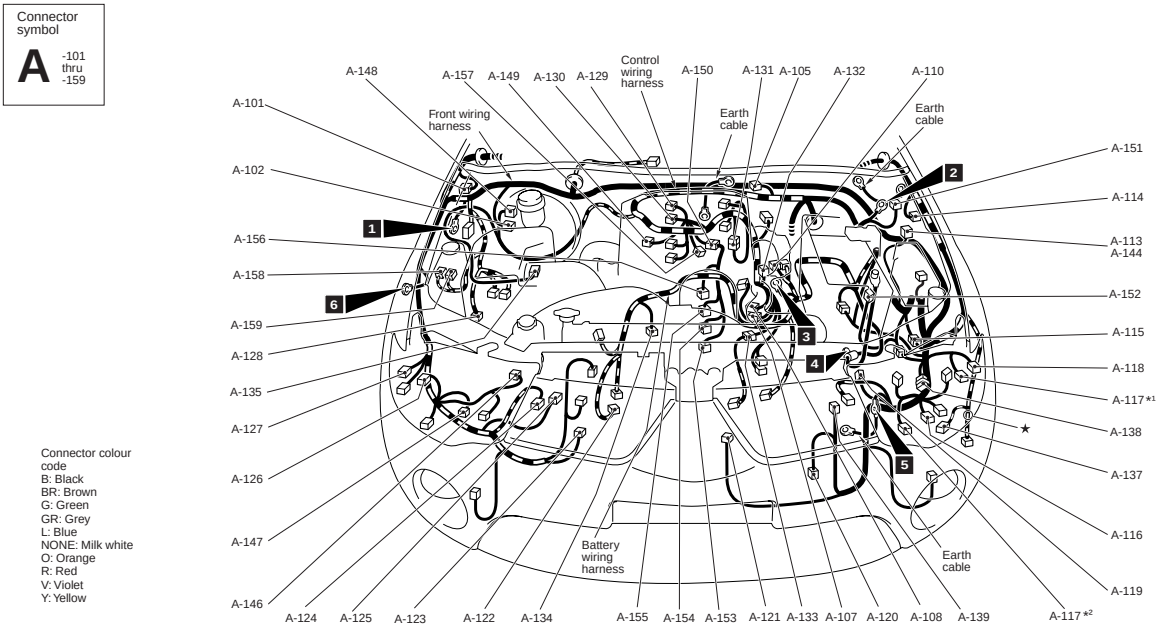


A-01	(34-GR)	ABS-ECU
A-05	(5-GR)	Windshield wiper motor
A-07	(3-B)	Crank angle sensor
A-10	(1)	Starter
A-12	(1-GR)	Front wiring harness and relay box combination
A-13X	(4)	Front fog lamp relay
A-14X	(4)	No connection
A-16X	(4)	Starter relay
A-17X	(4)	Horn relay
A-19X	(4)	A/T control relay
A-20X	(4)	Engine control relay
A-21X	(4)	A/C compressor relay
A-22X	(4)	Headlamp relay (LO)
A-23X	(4)	Headlamp relay (HI)
A-24X	(4)	Power window relay
A-25X	(4)	Headlamp washer relay
A-27	(8-B)	Front wiring harness and battery wiring harness combination
A-28	(12-B)	Front wiring harness and control wiring harness combination
A-29	(2-GR)	Washer motor
A-30	(2-Y)	Front impact sensor (LH)
A-33	(1-B)	A/C compressor and clutch assembly
A-34	(1)	Alternator
A-35	(1-B)	Engine oil pressure switch <Except vehicles with high power engine>
A-36	(2-B)	Ambient air temperature sensor (for RV meter)
A-37	(2-B)	Position lamp (RH)
A-38	(2-BR)	Dual pressure switch
A-39	(2-B)	Solenoid valve 1
A-40	(2-B)	Solenoid valve 2
A-41	(2-GR)	Injector 2
A-42	(2-GR)	Injector 1
A-43	(3-B)	Camshaft position sensor
A-44	(3-B)	Rail pressure sensor
A-45	(6-GR)	EGR valve assembly
A-46	(2-B)	Fuel temperature sensor
A-47	(2-GR)	Suction control valve
A-48	(34-B)	ASTC-ECU
A-51	(3-GR)	Headlamp levelling unit (LH)
A-52	(2-B)	Front fog lamp (LH)
A-53	(2-B)	Front fog lamp (RH)
A-54	(3-GR)	Headlamp levelling unit (RH)
A-56	(2-BR)	Variable geometry control solenoid valve
A-57	(1-L)	Engine oil pressure switch <Vehicles with high power engine>
A-58	(2-B)	Headlamp (LO: LH) <4-bulb type>
A-59	(2-B)	Headlamp (HI: LH) <4-bulb type>

NOTE:

1. **1: 2-bulb type headlamp*
2. **2: 4-bulb type headlamp*

ENGINE COMPARTMENT <RHD> (CONTINUED)



ACB01363AC

A-101 (2-GR) Side turn-signal lamp (RH)
A-102 (2-GR) Brake fluid level switch
A-105 (3-L) Manifold absolute pressure sensor
A-107 (2-B) Engine coolant temperature sensor
A-108 (1-B) Engine coolant temperature gauge unit
A-110 (1-B) Starter
A-113 (2-B) No connection <Vehicles without fuel-line heater>
A-114 (2-GR) Side turn-signal lamp (LH)
A-115 (12) Front wiring harness and control wiring harness combination
A-116 (3-B) Headlamp (LH) <2-bulb type>
A-117 (2-B) Position lamp (LH)
A-118 (2-BR) Front turn-signal lamp (LH)
A-119 (2-B) Front wheel speed sensor (LH)
A-120 (2-B) No connection
A-121 (1-B) Horn (HI)
A-122 (4-GR) Alternator
A-123 (1-B) Horn (LO)
A-124 (2-Y) Front impact sensor (RH)
A-125 (2-B) Front wheel speed sensor (RH)
A-126 (3-B) Headlamp (RH) <2-bulb type>
A-127 (2-BR) Front turn-signal lamp (RH)
A-128 (2-GR) Free wheel engage switch
A-129 (2-GR) Injector 4
A-130 (2-GR) Injector 3
A-131 (6-B) Fuel pressure sensor harness and control harness combination
A-132 (6-B) Electronic-controlled throttle valve
A-133 (3-B) Crank angle sensor harness and control harness combination
A-134 (1-B) Power steering fluid pressure switch
A-135 (5-B) Air flow sensor
A-137 (2-GR) Headlamp washer motor
A-138 (4) Spare connector (for trailer)
A-139 (2-B) Ambient temperature sensor (for air conditioner)
A-144 (2) No connection <Vehicles with fuel-line heater>
A-146 (2-B) Headlamp (HI: RH) <4-bulb type>
A-147 (2-B) Headlamp (LO: RH) <4-bulb type>
A-148 (3-B) Exhaust differential pressure sensor
A-149 (2-B) No.1 exhaust gas temperature sensor
A-150 (4-B) Control wiring harness and glow wiring harness combination
A-151 (12-B) Glow control unit
A-152 (4-GR) Battery current sensor
A-153 (1-B) Glow plugs 1
A-154 (1-B) Glow plugs 2
A-155 (1-B) Glow plugs 3
A-156 (1-B) Glow plugs 4
A-157 (2-B) EGR gas temperature sensor
A-158 (3-B) No.3 exhaust gas temperature sensor
A-159 (2-B) No.2 exhaust gas temperature sensor

NOTE:

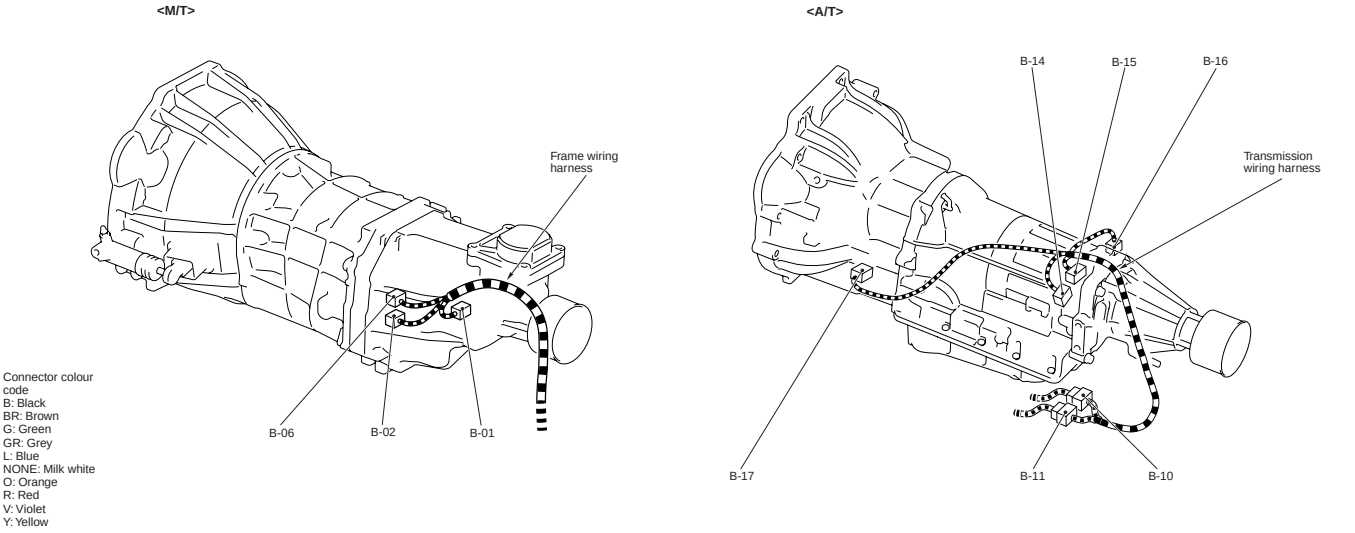
1. **1: 2-bulb type headlamp*
2. **2: 4-bulb type headlamp*

TRANSMISSION

TRANSMISSION <2WD>

M1801000500835

Connector symbol
B

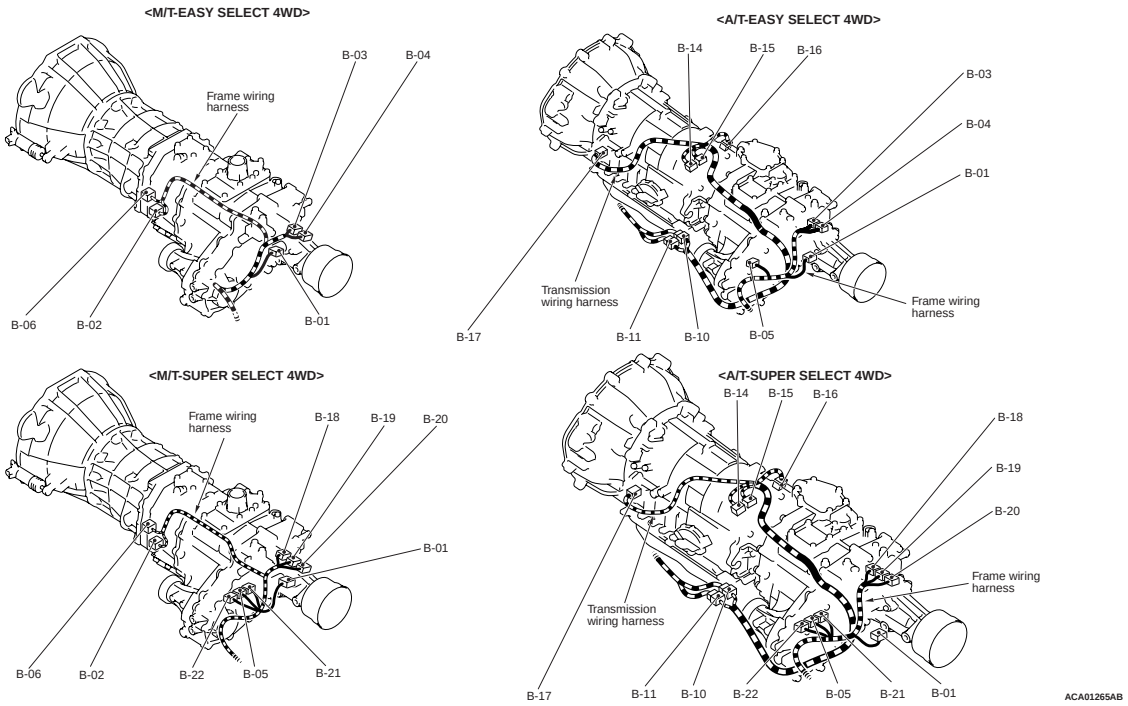


B-01 (3-B) Vehicle speed sensor <M/T>
B-02 (2-B) Back-up lamp switch <M/T>
B-06 (2-GR) 1ST rail switch <M/T>
B-10 (12-B) Control wiring harness and transmission wiring harness combination <A/T>
B-11 (10-B) Control wiring harness and transmission wiring harness combination <A/T>
B-14 (10-B) Inhibitor switch <A/T>
B-15 (10-B) A/T control solenoid valve assembly
B-16 (3-GR) Output shaft speed sensor <A/T>
B-17 (3-B) Input shaft speed sensor <A/T>

TRANSMISSION <4WD>

M1801000501032

Connector symbol
B



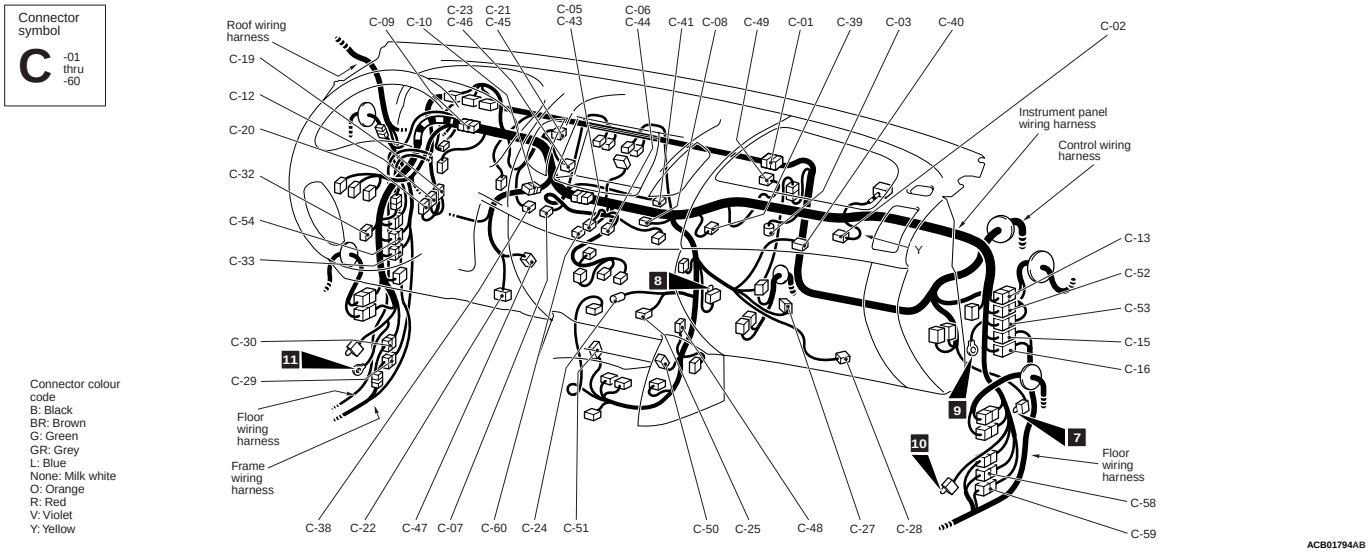
Connector colour code
B: Black
BR: Brown
G: Green
GR: Grey
L: Blue
NONE: Milk white
O: Orange
R: Red
V: Violet
Y: Yellow

B-01	(3-B)	Vehicle speed sensor
B-02	(2-B)	Back-up lamp switch <M/T>
B-03	(2-B)	4WD detection switch <Easy select 4WD>
B-04	(2-GR)	High range/low range detection switch <Easy select 4WD>
B-05	(1)	4LLc switch <A/T or vehicles with high power engine>
B-06	(2-GR)	1ST rail switch <M/T>
B-10	(12-B)	Control wiring harness and transmission wiring harness combination <A/T>
B-11	(10-B)	Control wiring harness and transmission wiring harness combination <A/T>
B-14	(10-B)	Inhibitor switch <A/T>
B-15	(10-B)	A/T control solenoid valve assembly
B-16	(3-GR)	Output shaft speed sensor <A/T>
B-17	(3-B)	Input shaft speed sensor <A/T>
B-18	(1-BR)	Centre differential lock detection switch <Super select 4WD>
B-19	(1-B)	2WD/4WD detection switch <Super select 4WD>
B-20	(1)	High /low detection switch <Super select 4WD>
B-21	(1-B)	4WD operation detection switch <Super select 4WD>
B-22	(1-GR)	Centre differential lock operation detection switch <Super select 4WD>

INSTRUMENT PANEL

INSTRUMENT PANEL <LHD>

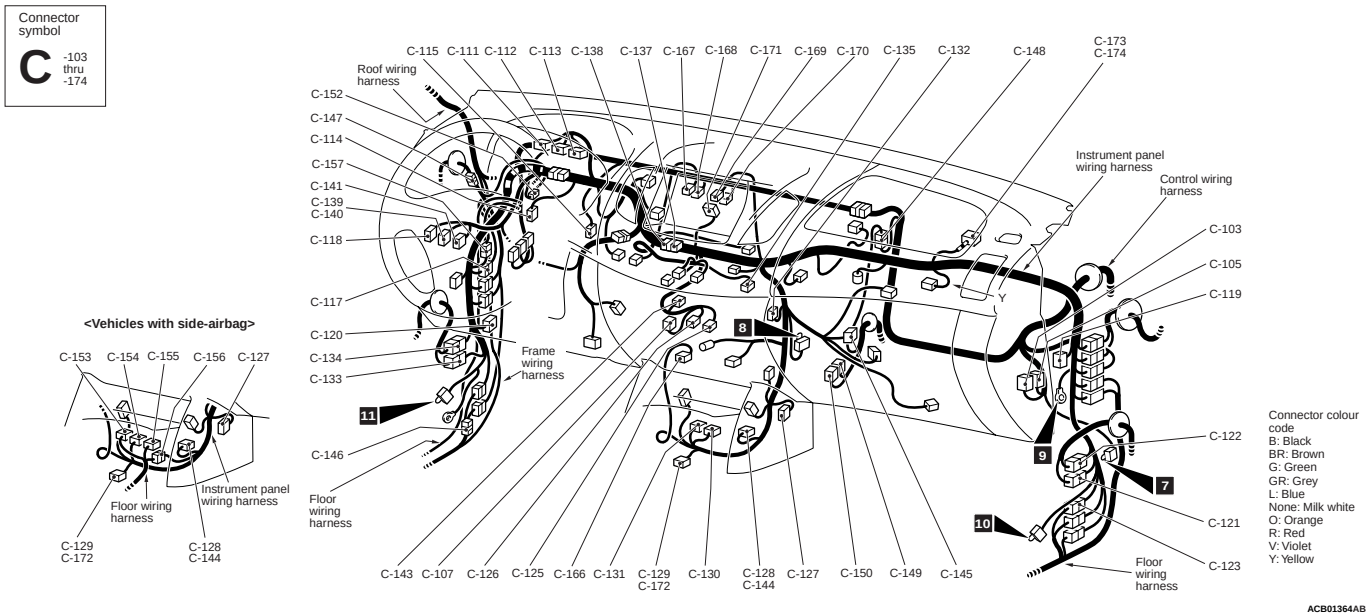
M1801000702448



C-01 (22-L) J/C (CAN2)
C-02 (2-R) Passenger's (front) air bag module (squib)
C-03 (2) Glove box lamp
C-05 (12) A/C switch module <Heater, manual A/C>
C-06 (6) Blower switch <Heater, manual A/C>
C-07 (4) Hazard warning switch
C-08 (12-B) J/C (8)
C-09 (22-GR) J/C (7)
C-10 (12-GR) J/C (9)
C-12 (16) A/T-ECU
C-13 (18) Instrument panel wiring harness and front wiring harness combination
C-15 (20) Instrument panel wiring harness and floor wiring harness combination
C-16 (20) Instrument panel wiring harness and floor wiring harness combination
C-19 (26) A/T-ECU
C-20 (22) A/T-ECU
C-21 (6) A/C evaporator air outlet thermistor <Manual A/C>
C-22 (16-B) Diagnosis connector
C-23 (4) A/C temperature control resister <Heater, manual A/C>
C-24 (2) Down lamp
C-25 (2) Cigarette lighter
C-27 (10) 4WD indicator-ECU
C-28 (2) Blower motor
C-29 (20) Frame wiring harness and front wiring harness combination
C-30 (16) Instrument panel wiring harness and frame wiring harness combination
C-32 (12-GR) J/C (6)
C-33 (14) Instrument panel wiring harness and front wiring harness combination
C-38 (6-B) Mode selection damper control motor and potentiometer <Automatic A/C>
C-39 (6-Y) Passenger's air bag cut off switch
C-40 (4) Outside/ inside air selection damper control motor <Automatic A/C>
C-41 (2) No connection
C-43 (22) A/C-ECU <Automatic A/C>
C-44 (14) A/C-ECU <Automatic A/C>
C-45 (2) Air thermo sensor <Automatic A/C>
C-46 (3) Power transistor <Automatic A/C>
C-47 (1) Parking brake switch <Stick type>
C-48 (2) Interior temperature sensor <Automatic A/C>
C-49 (6-B) Air mixing damper control motor and potentiometer <Automatic A/C>
C-50 (6) Heated seat switch (RH)
C-51 (6) Heated seat switch (LH)
C-52 (16) Instrument panel wiring harness and control wiring harness combination
C-53 (24) Instrument panel wiring harness and control wiring harness combination
C-54 (16) Instrument panel wiring harness and front wiring harness combination
C-58 (16) Instrument panel wiring harness and floor wiring harness combination

C-59 (20) Instrument panel wiring harness and floor wiring harness combination
C-60 (1) Roof antenna <Vehicles with MMCS>

INSTRUMENT PANEL <LHD> (CONTINUED)



C-103 (58-B) Engine-ECU
C-105 (96-B) Engine-ECU
C-107 (1-B) Radio or spare connector (for audio system)
C-111 (14) Combination meter
C-112 (12) Combination meter
C-113 (24) Combination meter
C-114 (4) Stop lamp switch
C-115 (6-B) Accelerator pedal position sensor
C-117 (10) Instrument panel wiring harness and roof wiring harness combination
C-118 (10) Remote controlled mirror switch
C-119 (22-GR) J/C (CAN1)
C-120 (12-L) J/C (1)
C-121 (20) Instrument panel wiring harness and front door wiring harness (RH) combination
C-122 (16) Instrument panel wiring harness and front door wiring harness (RH) combination
C-123 (4-Y) Instrument panel wiring harness and floor wiring harness combination
C-125 (14) Radio and CD player or spare connector (for audio system)
C-126 (22) Radio and CD player or spare connector (for audio system)
C-127 (22-GR) J/C (2)
C-128 (3-B) G-sensor <ABS>
C-129 (8) Overdrive switch <4A/T>
C-130 (22-Y) SRS-ECU <Vehicles without side-airbag>
C-131 (20-Y) SRS-ECU <Vehicles without side-airbag>
C-132 (22-GR) J/C (5)
C-133 (20) Instrument panel wiring harness and front door wiring harness (LH) combination
C-134 (16) Instrument panel wiring harness and front door wiring harness (LH) combination
C-135 (3) Passenger's air bag cut off indicator lamp
C-137 (22-L) J/C (3)
C-138 (22-L) J/C (3)
C-139 (6) Rear differential lock switch
C-140 (6) ASC switch
C-141 (6-GR) Headlamp levelling switch
C-143 (1) Roof antenna <Vehicles without MMCS>
C-144 (4-GR) G and yaw rate sensor <ASTC>
C-145 (10-B) Rear differential lock-ECU
C-146 (3) Spare connector (for trailer)
C-147 (4) Spare connector (for trailer)
C-148 (4) Control wiring harness and PTC heater wiring harness combination
C-149 (2-GR) PTC heater
C-150 (2-GR) PTC heater
C-152 (2) Clutch switch <Cruise control system-M/T>

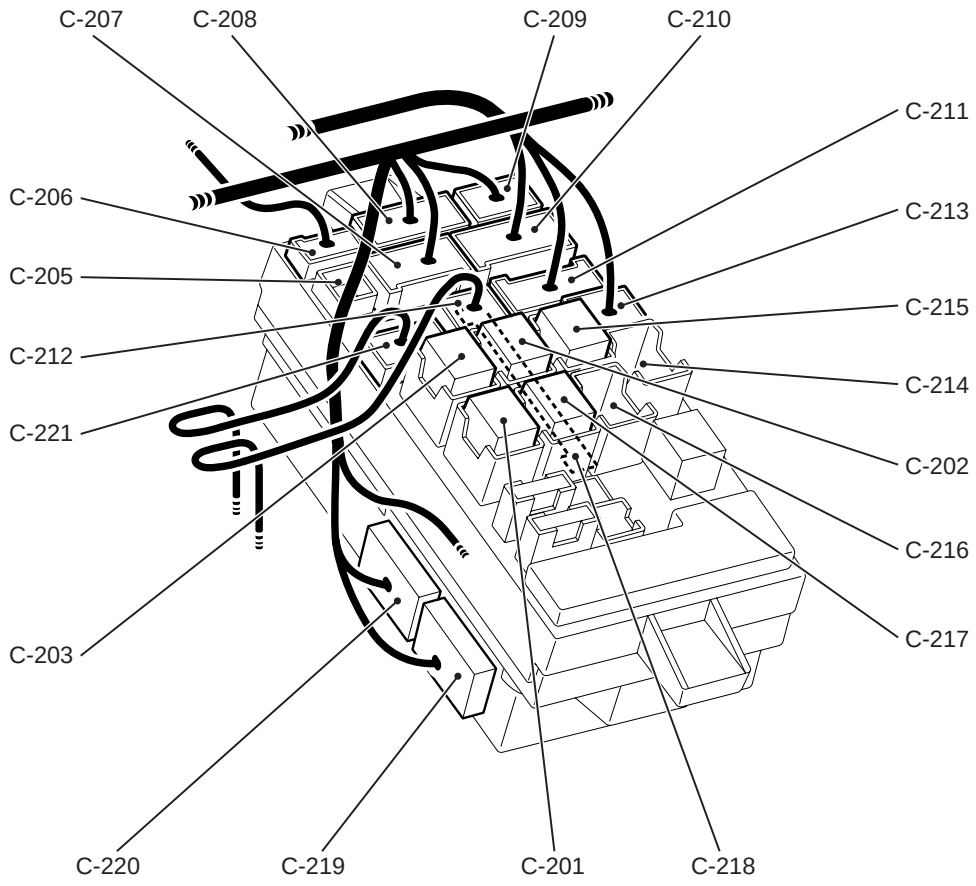
C-153	(16-Y)	SRS-ECU <Vehicles with side-airbag>
C-154	(23-Y)	SRS-ECU <Vehicles with side-airbag>
C-155	(16-Y)	SRS-ECU <Vehicles with side-airbag>
C-156	(4-Y)	Instrument panel wiring harness and floor wiring harness combination <Vehicles with side-airbag>
C-157	(4-Y)	Instrument panel wiring harness and roof wiring harness combination
C-166	(8)	Rear panel power window switch
C-167	(32-GR)	Multivision display <Vehicles with MMCS>
C-168	(7-G)	Multivision display <Vehicles with MMCS>
C-169	(5-GR)	Multivision display <Vehicles with MMCS>
C-170	(17-GR)	Multivision display <Vehicles with MMCS>
C-171	(28-GR)	RV meter
C-172	(8)	Shift switch assembly <5A/T>
C-173	(28)	Hands free-ECU
C-174	(28)	USB box

INSTRUMENT PANEL <LHD> (CONTINUED)

Connector symbol

C -201 thru -221

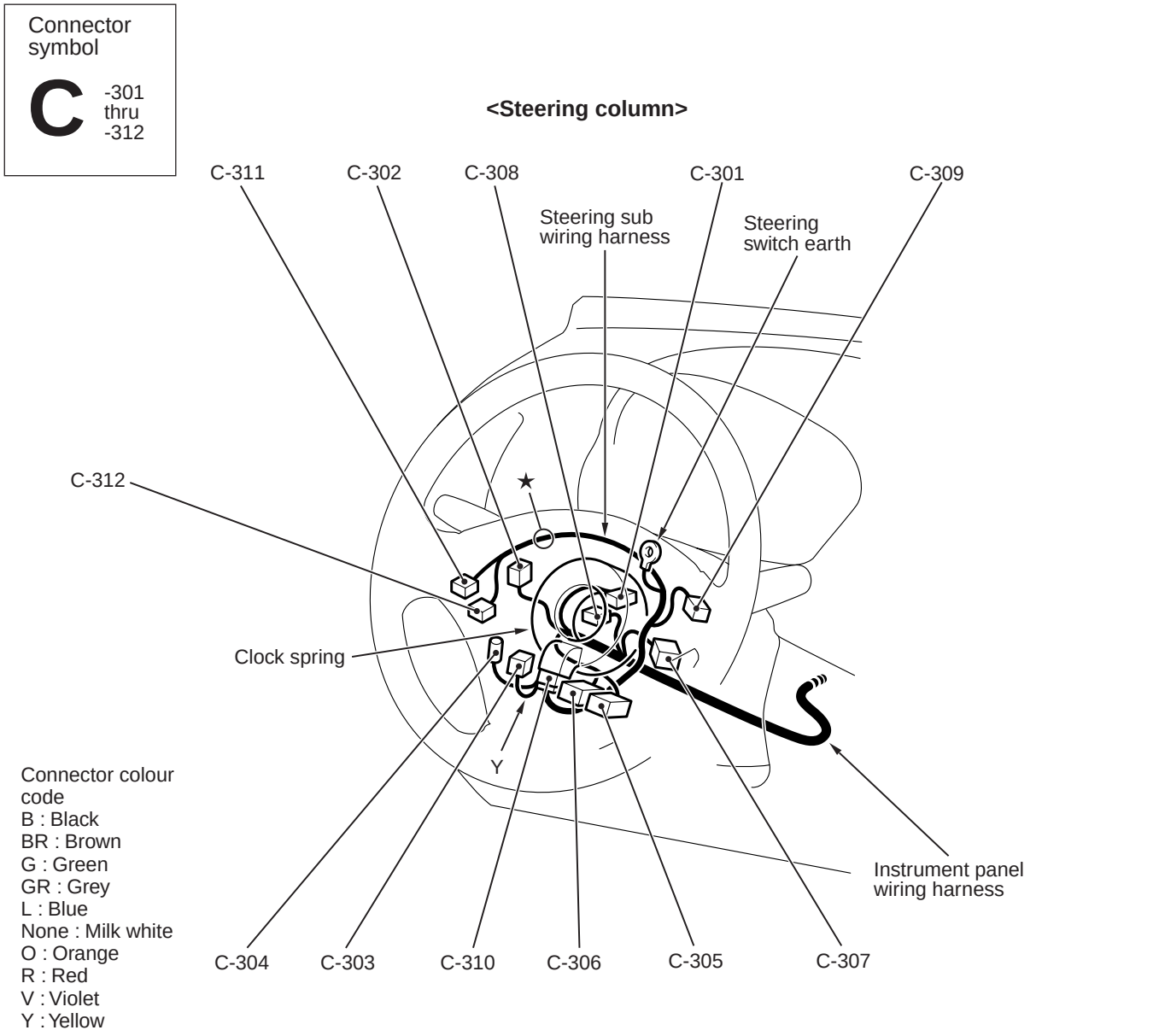
<J/B>



AC508841AC

C-201	(4)	Blower relay
C-202	(4)	Accessory socket relay
C-203	(4)	Heated seat relay
C-205	(4)	No connection
C-206	(4)	Roof wiring harness and J/B combination
C-207	(6)	Instrument panel wiring harness and J/B combination
C-208	(14)	Instrument panel wiring harness and J/B combination
C-209	(8)	Instrument panel wiring harness and J/B combination
C-210	(13)	Front wiring harness and J/B combination
C-211	(10)	Front wiring harness and J/B combination
C-212	(4)	Floor wiring harness and J/B combination
C-213	(1)	Front wiring harness and J/B combination
C-214	(4)	No connection
C-215	(4)	Rear fog lamp relay
C-216	(4)	No connection
C-217	(4)	Rear window defogger relay
C-218	(20)	ETACS-ECU
C-219	(24-GR)	ETACS-ECU
C-220	(24)	ETACS-ECU
C-221	(10)	Frame wiring harness and J/B combination

INSTRUMENT PANEL <LHD> (CONTINUED)

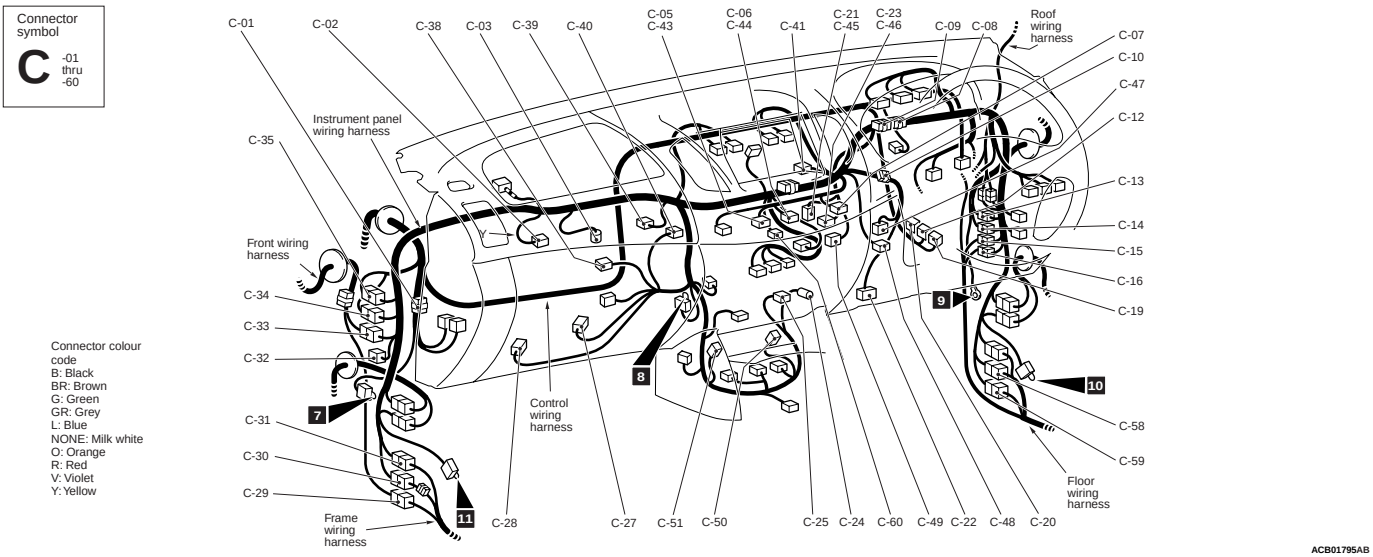


ACB01365AB

C-301	(7)	Key reminder switch
C-302	(10)	Column switch
C-303	(2)	Driver's air bag module (squib)
C-304	(1)	Horn switch
C-305	(4-Y)	Clock spring
C-306	(6-B)	Clock spring
C-307	(6)	Ignition switch
C-308	(5)	Steering wheel sensor <ASTC>
C-309	(4-L)	Cruise control switch
C-310	(5)	Clock spring and steering sub wiring harness combination
C-311	(5-R)	Steering wheel audio remote control switch
C-312	(4)	Steering wheel voice control switch

INSTRUMENT PANEL <RHD>

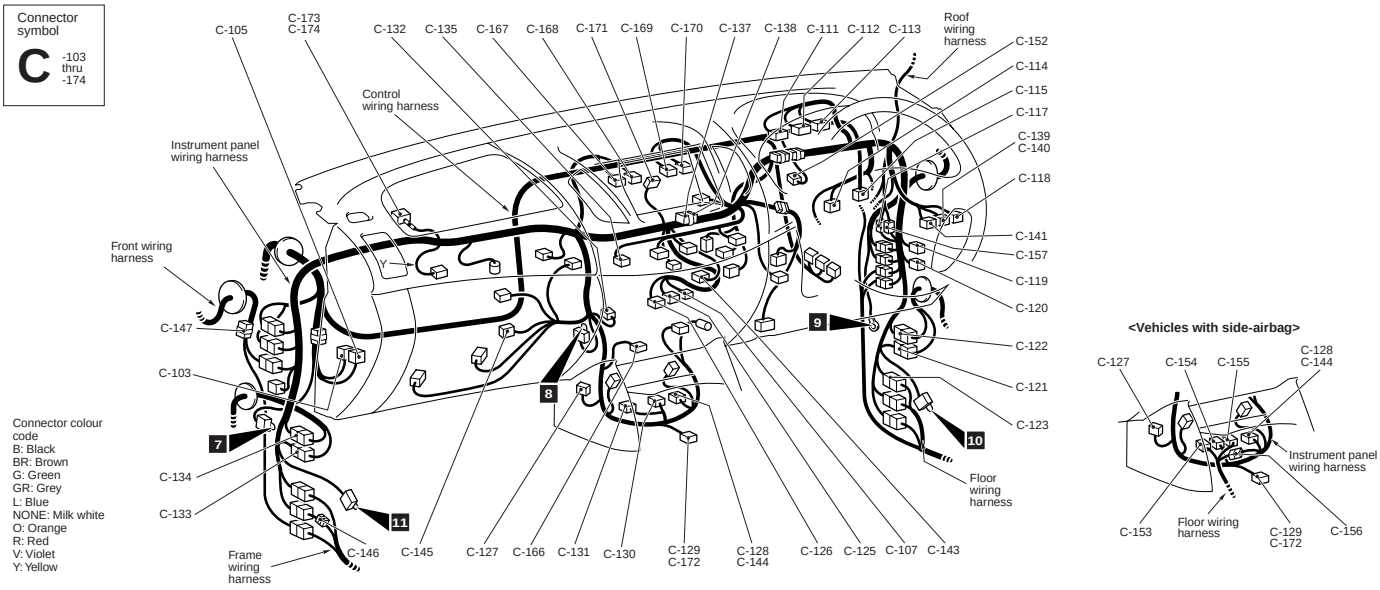
M1801000702459



C-01 (22-L) J/C (CAN2)
C-02 (2-R) Passenger's (front) air bag module (squib)
C-03 (2) Glove box lamp
C-05 (12) A/C switch module <Heater, manual A/C>
C-06 (6) Blower switch <Heater, manual A/C>
C-07 (4) Hazard warning switch
C-08 (12-B) J/C (8)
C-09 (22-GR) J/C (7)
C-10 (12-GR) J/C (9)
C-12 (16) A/T-ECU
C-13 (20) Instrument panel wiring harness and front wiring harness combination
C-14 (16) Instrument panel wiring harness and front wiring harness combination
C-15 (20) Instrument panel wiring harness and floor wiring harness combination
C-16 (20) Instrument panel wiring harness and floor wiring harness combination
C-19 (26) A/T-ECU
C-20 (22) A/T-ECU
C-21 (6) A/C evaporator air outlet thermistor <Manual A/C>
C-22 (16-B) Diagnosis connector
C-23 (4) A/C temperature control resister <Manual A/C>
C-24 (2) Down lamp
C-25 (2) Cigarette lighter
C-27 (10) 4WD indicator-ECU
C-28 (2) Blower motor
C-29 (20) Frame wiring harness and front wiring harness combination
C-30 (16) Instrument panel wiring harness and frame wiring harness combination
C-31 (10) Instrument panel wiring harness and frame wiring harness combination
C-32 (12-GR) J/C (6)
C-33 (14) Instrument panel wiring harness and front wiring harness combination
C-34 (16) Instrument panel wiring harness and control wiring harness combination
C-35 (24) Instrument panel wiring harness and control wiring harness combination
C-38 (6-B) Mode selection damper control motor and potentiometer <Automatic A/C>
C-39 (6-Y) Passenger's air bag cut off switch
C-40 (4) Outside/ inside air selection damper control motor <Automatic A/C>
C-41 (2) No connection
C-43 (22) A/C-ECU <Automatic A/C>
C-44 (14) A/C-ECU <Automatic A/C>
C-45 (2) Air thermo sensor <Automatic A/C>
C-46 (3) Power transistor <Automatic A/C>
C-47 (1) Parking brake switch <Stick type>
C-48 (2) Interior temperature sensor <Automatic A/C>
C-49 (6-B) Air mixing damper control motor and potentiometer <Automatic A/C>
C-50 (6) Heated seat switch (RH)
C-51 (6) Heated seat switch (LH)
C-58 (16) Instrument panel wiring harness and floor wiring harness combination

C-59 (20) Instrument panel wiring harness and floor wiring harness combination
C-60 (1) Roof antenna <Vehicles with MMCS>

INSTRUMENT PANEL <RHD> (CONTINUED)



C-103 (58-B) Engine-ECU
C-105 (96-B) Engine-ECU
C-107 (1-B) Radio or spare connector (for audio system)
C-111 (14) Combination meter
C-112 (12) Combination meter
C-113 (24) Combination meter
C-114 (4) Stop lamp switch
C-115 (6-B) Accelerator pedal position sensor
C-117 (6) Instrument panel wiring harness and roof wiring harness combination
C-118 (10) Remote controlled mirror switch
C-119 (22-GR) J/C (CAN1)
C-120 (12-L) J/C (1)
C-121 (20) Instrument panel wiring harness and front door wiring harness (RH) combination
C-122 (16) Instrument panel wiring harness and front door wiring harness (RH) combination
C-123 (4-Y) Instrument panel wiring harness and floor wiring harness combination
C-125 (14) Radio and CD player or spare connector (for audio system)
C-126 (22) Radio and CD player or spare connector (for audio system)
C-127 (22-GR) J/C (2)
C-128 (3-B) G-sensor <ABS>
C-129 (8) Overdrive switch <4A/T>
C-130 (22-Y) SRS-ECU <Vehicles without side-airbag>
C-131 (20-Y) SRS-ECU <Vehicles without side-airbag>
C-132 (22-GR) J/C (5)
C-133 (20) Instrument panel wiring harness and front door wiring harness (LH) combination
C-134 (16) Instrument panel wiring harness and front door wiring harness (LH) combination
C-135 (3) Passenger's air bag cut off indicator lamp
C-137 (22-L) J/C (3)
C-138 (22-L) J/C (3)
C-139 (6) Rear differential lock switch
C-140 (6) ASC switch
C-141 (6-GR) Headlamp levelling switch
C-143 (1) Roof antenna <Vehicles without MMCS>
C-144 (4-GR) G and yaw rate sensor <ASTC>
C-145 (10-B) Rear differential lock-ECU
C-146 (3) Spare connector (for trailer)
C-147 (4) Spare connector (for trailer)
C-152 (2) Clutch switch <Cruise control system-M/T>
C-153 (16-Y) SRS-ECU <Vehicles with side-airbag>
C-154 (23-Y) SRS-ECU <Vehicles with side-airbag>

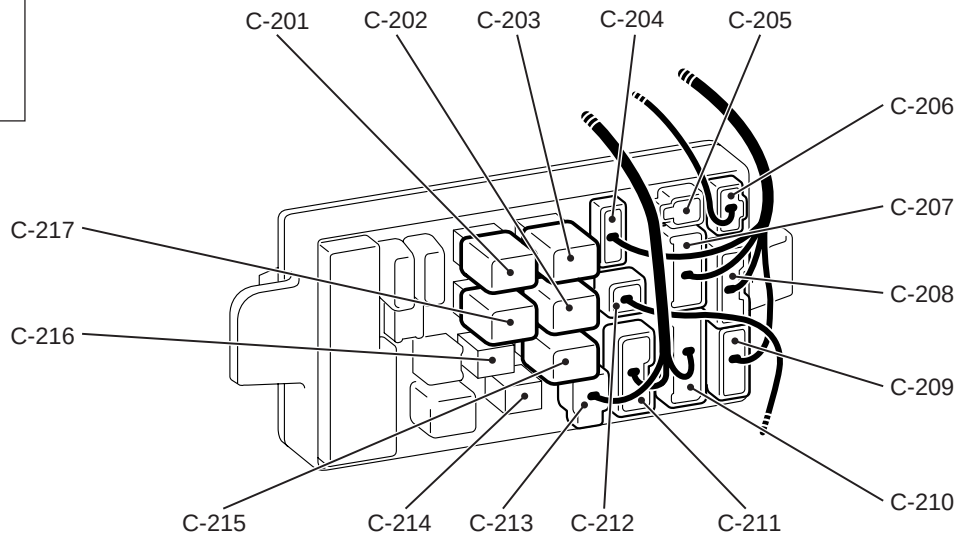
C-155	(16-Y)	SRS-ECU <Vehicles with side-airbag>
C-156	(4-Y)	Instrument panel wiring harness and floor wiring harness combination <Vehicles with side-airbag>
C-157	(4-Y)	Instrument panel wiring harness and roof wiring harness combination
C-166	(8)	Rear panel power window switch
C-167	(32-GR)	Multivision display <Vehicles with MMCS>
C-168	(7-G)	Multivision display <Vehicles with MMCS>
C-169	(5-GR)	Multivision display <Vehicles with MMCS>
C-170	(17-GR)	Multivision display <Vehicles with MMCS>
C-171	(28-GR)	RV meter
C-172	(8)	Shift switch assembly <5A/T>
C-173	(28)	Hands free-ECU
C-174	(28)	USB box

INSTRUMENT PANEL <RHD> (CONTINUED)

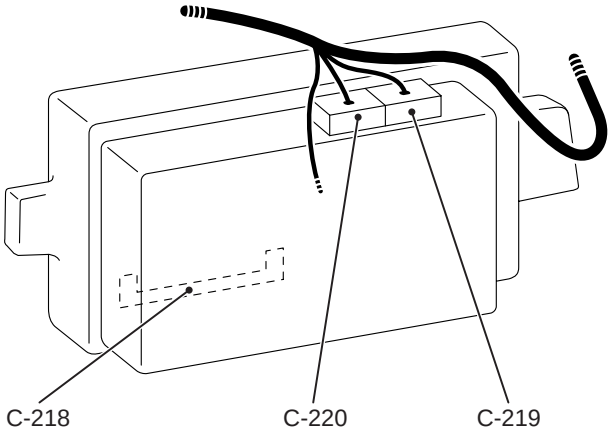
Connector symbol

C -201 thru -220

<J/B (Front view) >



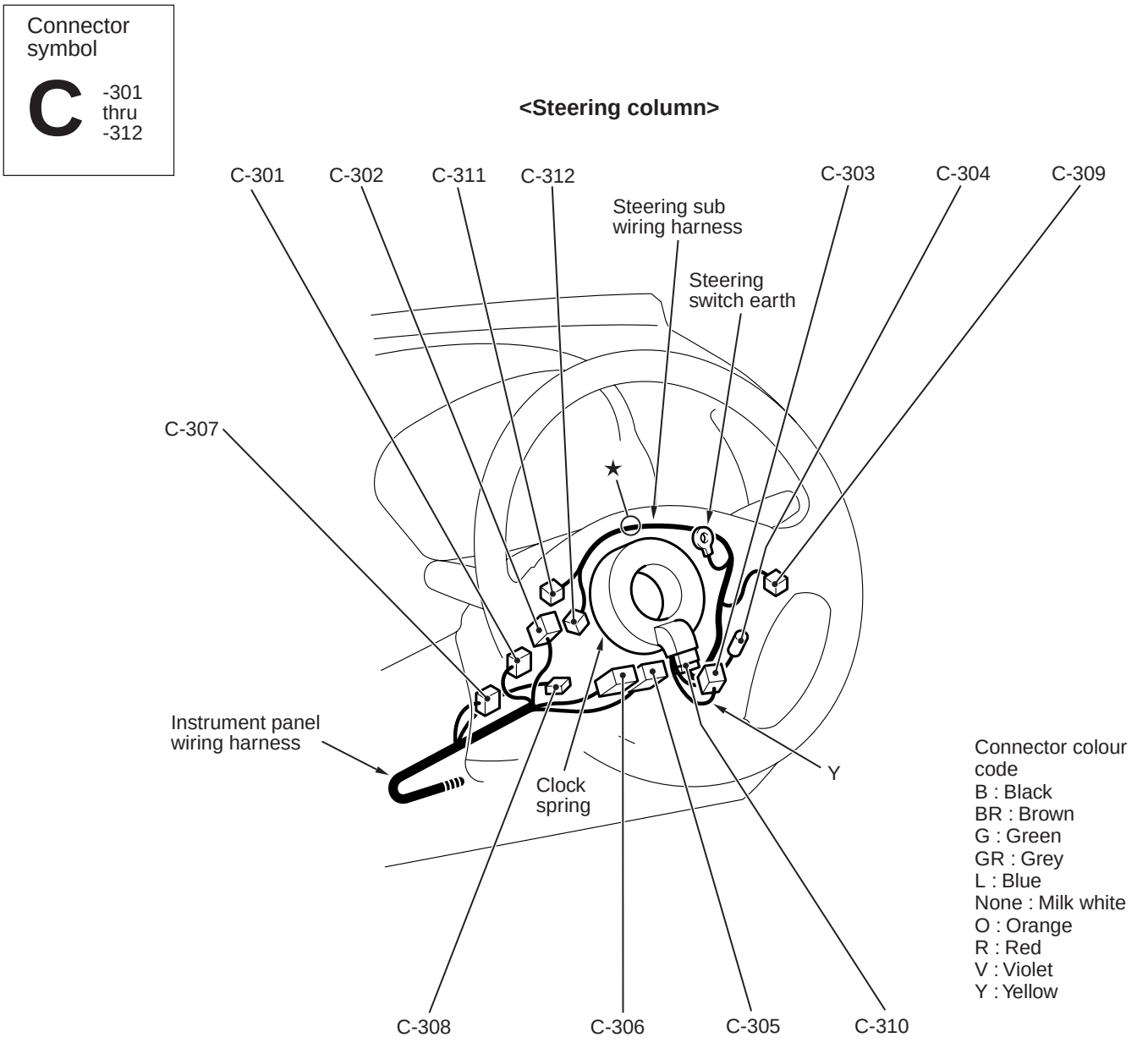
<J/B (Rear view) >



AC509451AC

C-201 (4) Blower relay
C-202 (4) Accessory socket relay
C-203 (4) Heated seat relay
C-204 (10) Instrument panel wiring harness and J/B combination
C-205 (4) No connection
C-206 (4) Roof wiring harness and J/B combination
C-207 (6) Instrument panel wiring harness and J/B combination
C-208 (14) Instrument panel wiring harness and J/B combination
C-209 (8) Instrument panel wiring harness and J/B combination
C-210 (13) Front wiring harness and J/B combination
C-211 (10) Front wiring harness and J/B combination
C-212 (4) Floor wiring harness and J/B combination
C-213 (1) Front wiring harness and J/B combination
C-214 (4) No connection
C-215 (4) Rear fog lamp relay
C-216 (4) No connection
C-217 (4) Rear window defogger relay
C-218 (20) ETACS-ECU
C-219 (24-GR) ETACS-ECU
C-220 (24) ETACS-ECU

INSTRUMENT PANEL <RHD> (CONTINUED)

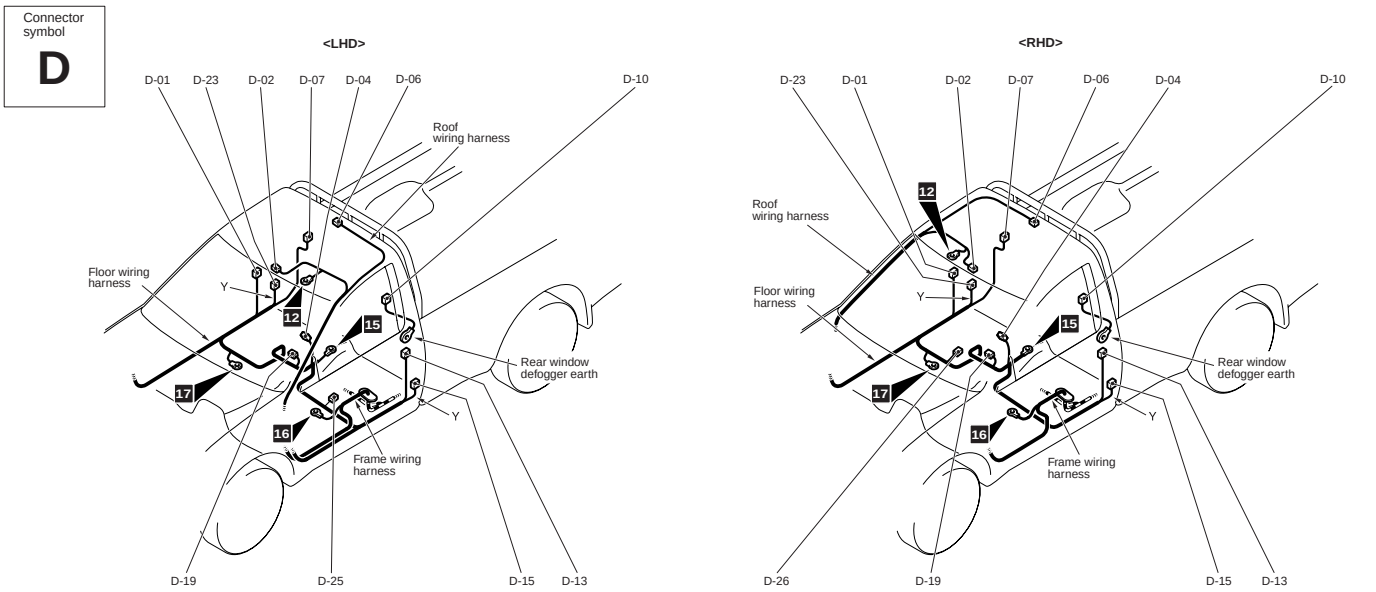


C-301	(7)	Key reminder switch
C-302	(10)	Column switch
C-303	(2)	Driver's air bag module (squib)
C-304	(1)	Horn switch
C-305	(4-Y)	Clock spring
C-306	(6-B)	Clock spring
C-307	(6)	Ignition switch
C-308	(5)	Steering wheel sensor <ASTC>
C-309	(4-L)	Cruise control switch
C-310	(5-B)	Clock spring and steering sub wiring harness combination
C-311	(5-R)	Steering wheel audio remote control switch
C-312	(4)	Steering wheel voice control switch

FLOOR AND ROOF

FLOOR AND ROOF <SINGLE CAB>

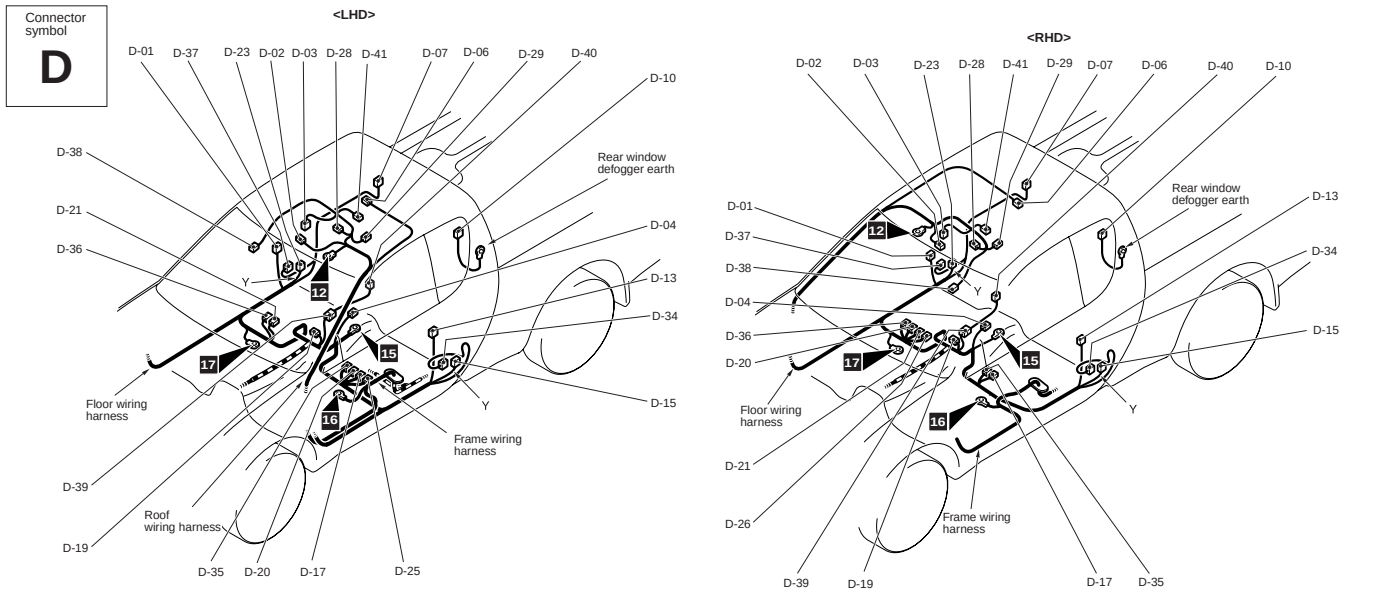
M1801000904761



D-01	(3)	Door switch (front: RH)
D-02	(4)	Clock
D-04	(2)	Accessory socket
D-06	(2)	Rear room lamp
D-07	(1-B)	Rear window defogger (+)
D-10	(1-B)	Rear window defogger (-)
D-13	(3)	Door switch (front: LH)
D-15	(2-B)	Seat belt pre-tensioner (LH)
D-19	(1-B)	Parking brake switch <Lever type>
D-23	(2-B)	Seat belt pre-tensioner (RH)
D-25	(2)	Seat belt switch (LH)
D-26	(2)	Seat belt switch (RH)

FLOOR AND ROOF <CLUB CAB>

M1801000905645

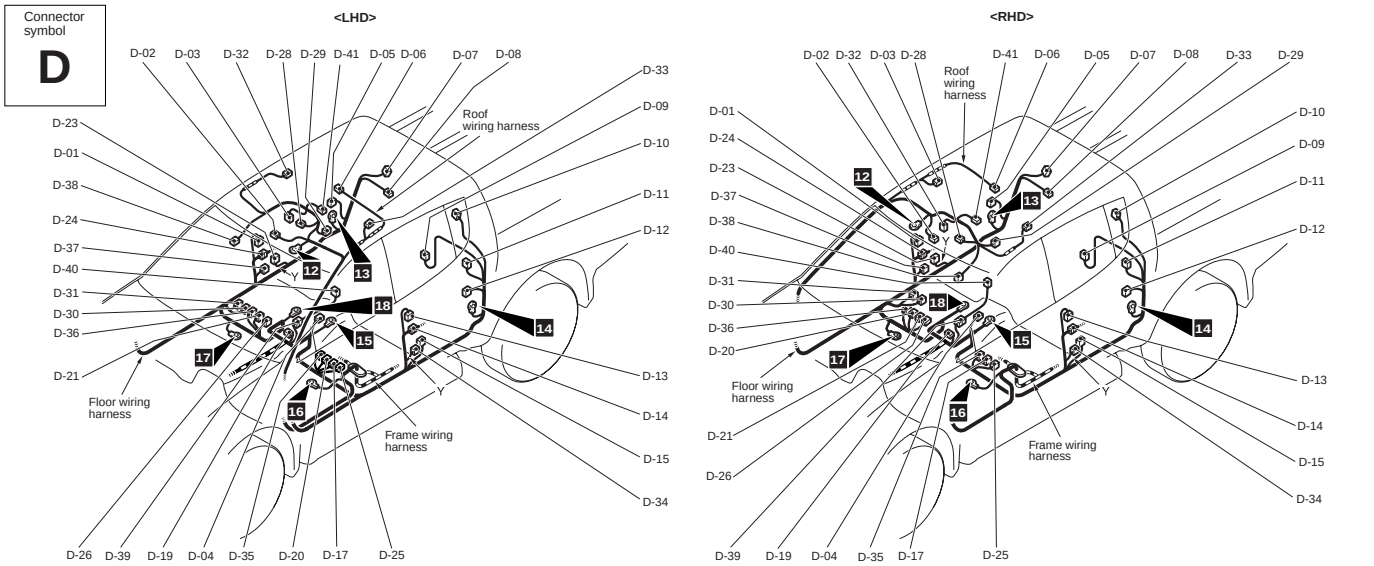


D-01	(3)	Door switch (front: RH)
D-02	(4)	Clock
D-03	(2)	Front room lamp
D-04	(2)	Accessory socket
D-06	(2-GR)	Rear room lamp
D-07	(1-B)	Rear window defogger (+)
D-10	(1-B)	Rear window defogger (-)
D-13	(3)	Door switch (front: LH)
D-15	(2-B)	Seat belt pre-tensioner (LH)
D-17	(3)	Heated seat (LH)
D-19	(1-B)	Parking brake switch
D-20	(2)	Power seat assembly (Driver's side)

D-21 (3) Heated seat (RH)
D-23 (2-B) Seat belt pre-tensioner (RH)
D-25 (2) Seat belt switch (LH)
D-26 (2) Seat belt switch (RH)
D-28 (10) Sunroof motor assembly
D-29 (6-B) Sunroof switch
D-34 (2-Y) Side impact sensor (LH)
D-35 (2-Y) Side-airbag module (squib) (LH)
D-36 (2-Y) Side-airbag module (squib) (RH)
D-37 (2-Y) Side impact sensor (RH)
D-38 (4) Lighting control sensor <Vehicles with auto lamp>
D-39 (6) Floor wiring harness and AUX adapter wiring harness combination
D-40 (6) Audio adapter and audio and video adapter
D-41 (3) Microphone unit

FLOOR AND ROOF <DOUBLE CAB>

M1801000905656

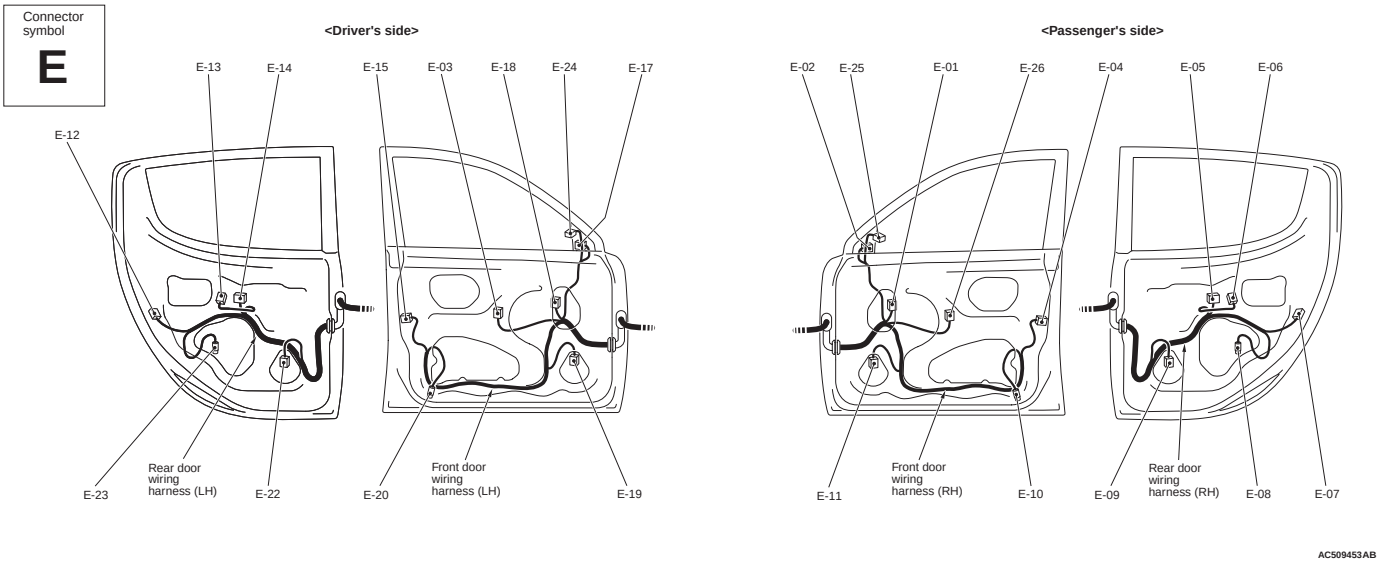


D-01 (3) Door switch (front: RH)
D-02 (4) Clock
D-03 (2) Front room lamp
D-04 (2) Accessory socket
D-05 (3) Door switch (rear: RH)
D-06 (2-GR) Rear room lamp <without sunroof>
D-07 (1-B) Rear window defogger (+) <without rear panel power window>
D-08 (2) Rear window defogger <with rear panel power window>
D-09 (6-B) Rear panel power window motor
D-10 (1-B) Rear window defogger (-) <without rear panel power window>
D-11 (18) Rear panel power window-ECU
D-12 (3) Door switch (rear: LH)
D-13 (3) Door switch (front: LH)
D-14 (12) Floor wiring harness and rear door wiring harness (LH) combination
D-15 (2-B) Seat belt pre-tensioner (LH)
D-17 (3) Heated seat (LH)
D-19 (1-B) Parking brake switch
D-20 (2) Power seat assembly (Driver's side)
D-21 (3) Heated seat (RH)
D-23 (2-B) Seat belt pre-tensioner (RH)
D-24 (12) Floor wiring harness and rear door wiring harness (RH) combination
D-25 (2) Seat belt switch (LH)
D-26 (2) Seat belt switch (RH)
D-28 (10) Sunroof motor assembly
D-29 (6-B) Sunroof switch
D-30 (18) Audio amplifier
D-31 (18) Audio amplifier
D-32 (2-B) Curtain air bag module (squib) (RH)
D-33 (2-B) Curtain air bag module (squib) (LH)
D-34 (2-Y) Side impact sensor (LH)
D-35 (2-Y) Side-airbag module (squib) (LH)
D-36 (2-Y) Side-airbag module (squib) (RH)
D-37 (2-Y) Side impact sensor (RH)
D-38 (4) Lighting control sensor <Vehicles with auto lamp>
D-39 (6) Floor wiring harness and AUX adapter wiring harness combination
D-40 (6) Audio adapter and audio and video adapter
D-41 (3) Microphone unit

DOOR

DOOR <LHD>

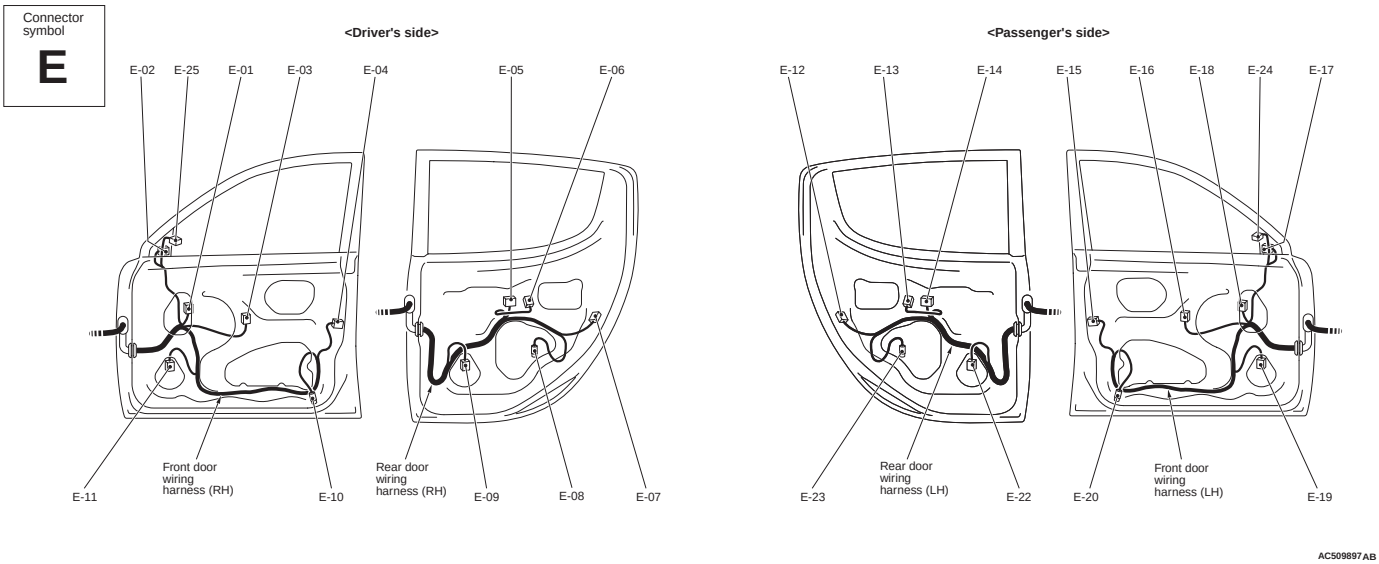
M1801001402730



E-01	(6-B)	Power window motor (front: RH)
E-02	(7)	Remote controlled mirror (RH)
E-03	(14)	Power window main switch
E-04	(6-B)	Front door lock actuator (RH)
E-05	(6-B)	Power window motor (rear: RH)
E-06	(8)	Power window sub switch (rear: RH)
E-07	(6-B)	Rear door lock actuator (RH)
E-08	(2)	Door courtesy lamp (rear: RH)
E-09	(2)	Rear door speaker (RH)
E-10	(2)	Door courtesy lamp (front: RH)
E-11	(2)	Front door speaker (RH)
E-12	(6-B)	Rear door lock actuator (LH)
E-13	(8)	Power window sub switch (rear: LH)
E-14	(6-B)	Power window motor (rear: LH)
E-15	(6-B)	Front door lock actuator (LH)
E-17	(7)	Remote controlled mirror (LH)
E-18	(6-B)	Power window motor (front: LH)
E-19	(2)	Front door speaker (LH)
E-20	(2)	Door courtesy lamp (front: LH)
E-22	(2)	Rear door speaker (LH)
E-23	(2)	Door courtesy lamp (rear: LH)
E-24	(2-B)	Tweeter (LH)
E-25	(2-B)	Tweeter (RH)
E-26	(8)	Power window sub switch (front: RH)

DOOR <RHD>

M1801001401588



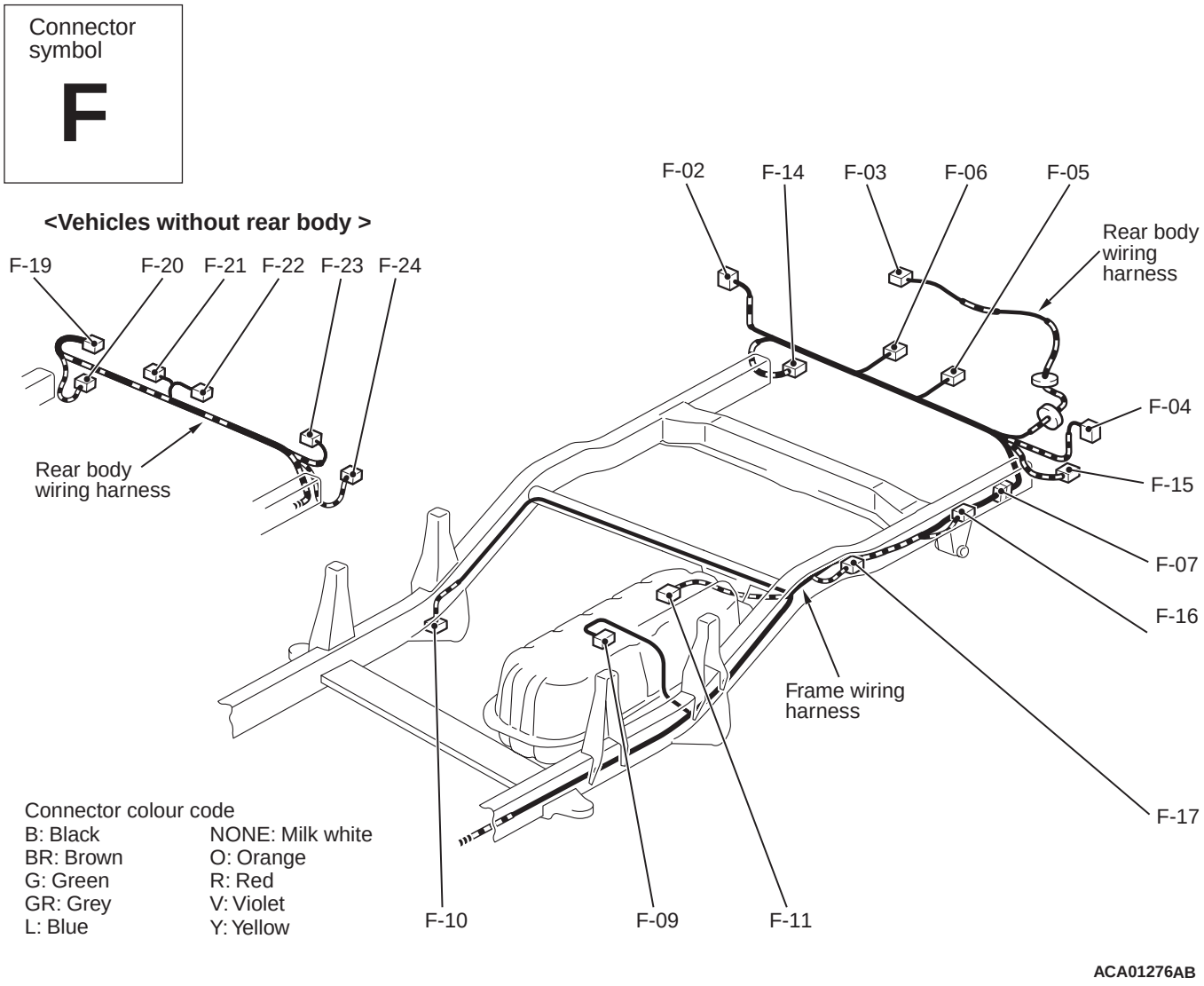
E-01	(6-B)	Power window motor (front: RH)
E-02	(7)	Remote controlled mirror (RH)
E-03	(14)	Power window main switch
E-04	(6-B)	Front door lock actuator (RH)
E-05	(6-B)	Power window motor (rear: RH)
E-06	(8)	Power window sub switch (rear: RH)
E-07	(6-B)	Rear door lock actuator (RH)
E-08	(2)	Door courtesy lamp (rear: RH)
E-09	(2)	Rear door speaker (RH)
E-10	(2)	Door courtesy lamp (front: RH)

E-11 (2) Front door speaker (RH)
E-12 (6-B) Rear door lock actuator (LH)
E-13 (8) Power window sub switch (rear: LH)
E-14 (6-B) Power window motor (rear: LH)
E-15 (6-B) Front door lock actuator (LH)
E-16 (8) Power window sub switch (front: LH)
E-17 (7) Remote controlled mirror (LH)
E-18 (6-B) Power window motor (front: LH)
E-19 (2) Front door speaker (LH)
E-20 (2) Door courtesy lamp (front: LH)
E-22 (2) Rear door speaker (LH)
E-23 (2) Door courtesy lamp (rear: LH)
E-24 (2-B) Tweeter (LH)
E-25 (2-B) Tweeter (RH)

FRAME

FRAME <2WD EXCEPT HIGH RIDER>

M1801003700441



ACA01276AB

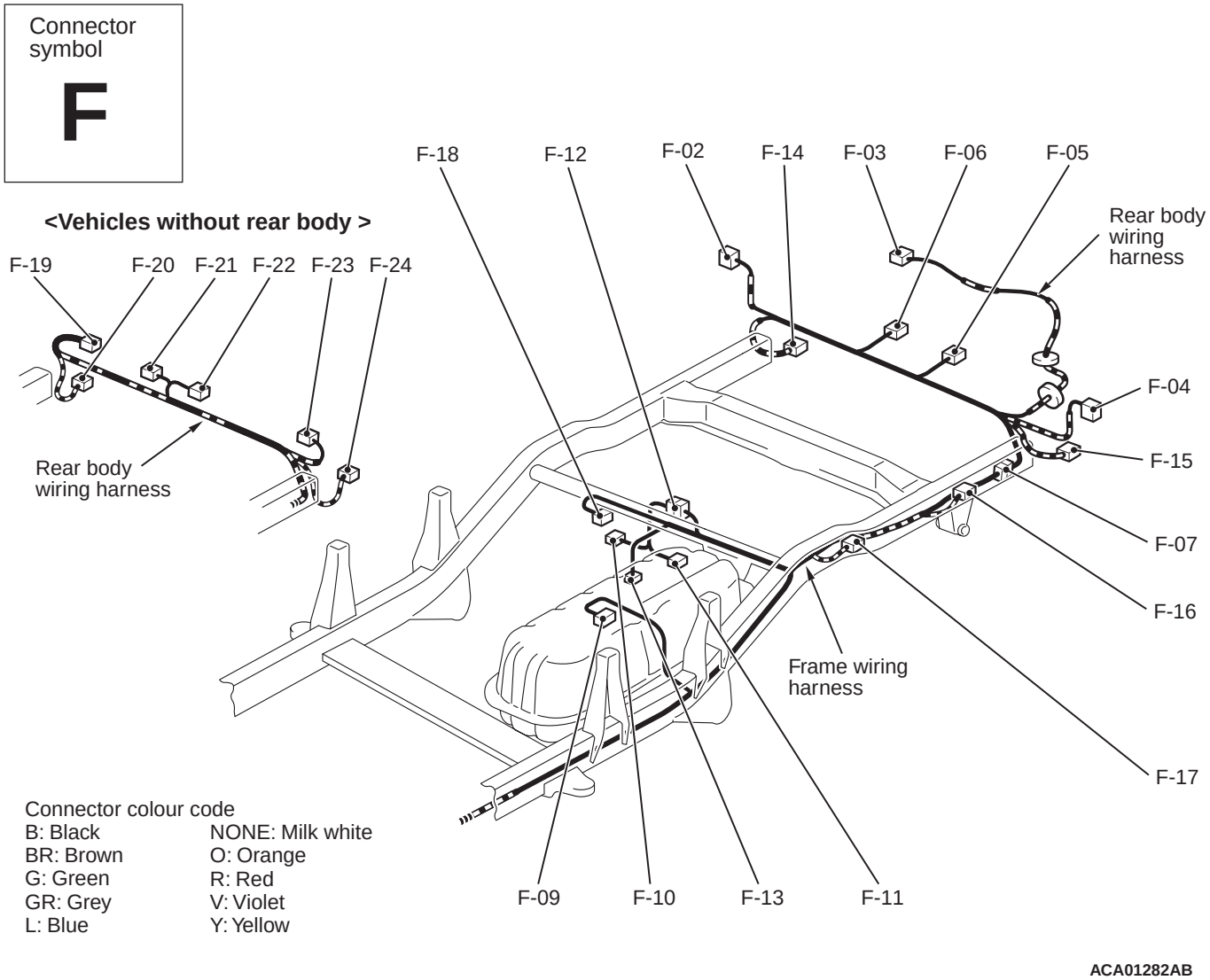
F-02 (6-B) Rear combination lamp (RH)
<Vehicles with rear body>

F-03 (2-B) High-mounted stop lamp

F-04 (6-B) Rear combination lamp (LH) <Vehicles with rear body>
F-05 (2-GR) Licence plate lamp (LH) <Vehicles with rear body>
F-06 (2-GR) Licence plate lamp (RH) <Vehicles with rear body>
F-07 (8-B) Rear body wiring harness and frame wiring harness combination
F-09 (2) Fuel gauge unit
F-10 (2-B) Rear wheel speed sensor (RH)
F-11 (2-B) Rear wheel speed sensor (LH)
F-14 (2-B) Rear fog lamp (RH) <Vehicles with rear body>
F-15 (2-B) Rear fog lamp (LH) <Vehicles with rear body>
F-16 (3-B) Spare connector (for trailer)
F-17 (1-B) Spare connector (for ACC socket)
F-19 (6) Rear combination lamp (RH) <Vehicles without rear body>
F-20 (2-B) No connection <Vehicles without rear body>
F-21 (2-B) Licence plate lamp (RH) <Vehicles without rear body>
F-22 (2-B) Licence plate lamp (LH) <Vehicles without rear body>
F-23 (6) Rear combination lamp (LH) <Vehicles without rear body>
F-24 (2-B) No connection <Vehicles without rear body>

FRAME <HIGHT RIDER, 4WD>

M1801003700452



ACA01282AB

F-02 (6-B) Rear combination lamp (RH) <Vehicles with rear body>
F-03 (2-B) High-mounted stop lamp
F-04 (6-B) Rear combination lamp (LH) <Vehicles with rear body>
F-05 (2-GR) Licence plate lamp (LH) <Vehicles with rear body>
F-06 (2-GR) Licence plate lamp (RH) <Vehicles with rear body>
F-07 (8-B) Rear body wiring harness and frame wiring harness combination

F-09	(2)	Fuel gauge unit
F-10	(2-GR)	Rear wheel speed sensor (RH)
F-11	(2-B)	Rear wheel speed sensor (LH)
F-12	(4-B)	ABS wiring harness and frame wiring harness combination
F-13	(2-GR)	Rear differential lock detection switch
F-14	(2-B)	Rear fog lamp (RH) <Vehicles with rear body>
F-15	(2-B)	Rear fog lamp (LH) <Vehicles with rear body>
F-16	(3-B)	Spare connector (for trailer)
F-17	(1-B)	Spare connector (for ACC socket)
F-18	(2-B)	Air pump assembly <Rear differential lock system>
F-19	(6)	Rear combination lamp (RH) <Vehicles without rear body>
F-20	(2-B)	Rear fog lamp (RH) <Vehicles without rear body>
F-21	(2-B)	Licence plate lamp (RH) <Vehicles without rear body>
F-22	(2-B)	Licence plate lamp (LH) <Vehicles without rear body>
F-23	(6)	Rear combination lamp (LH) <Vehicles without rear body>
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GROUP 90

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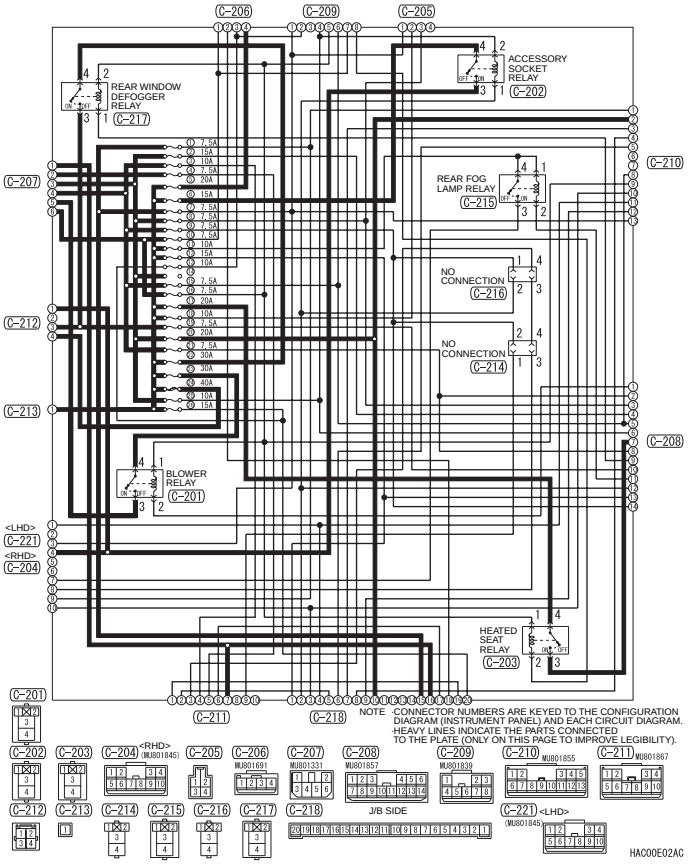
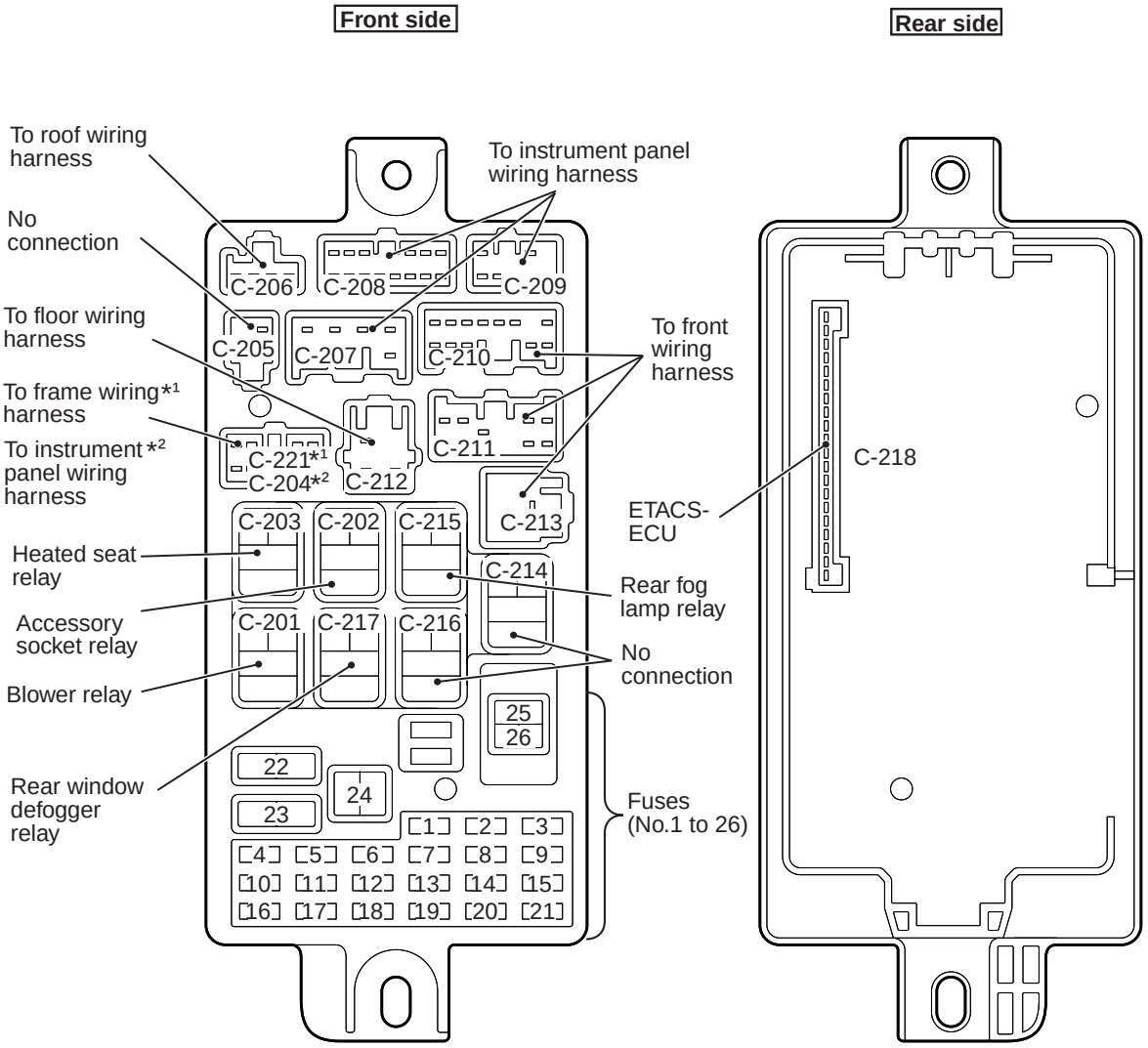
J/B

M1901000202569





AC407410AM

NOTE:

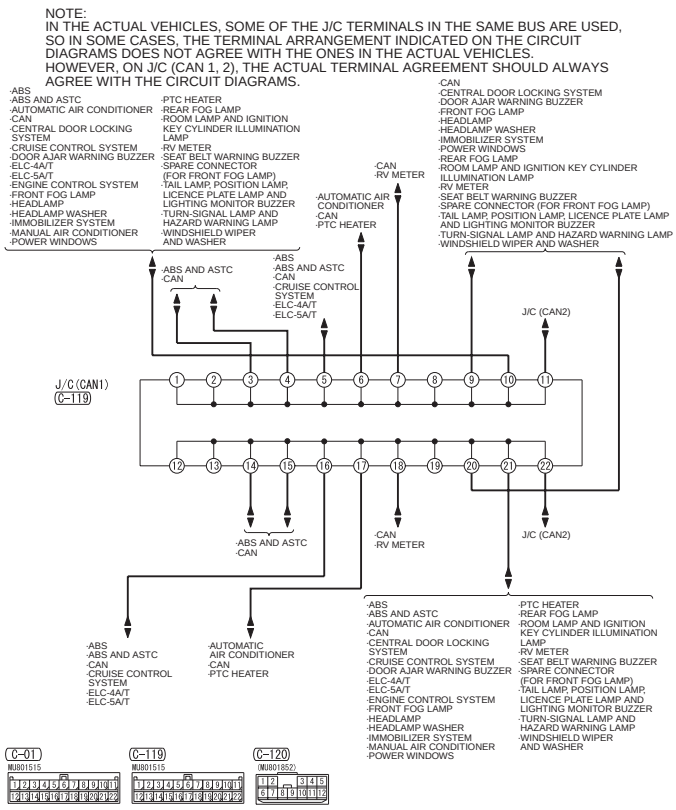
1. **1: LHD*
2. **2: RHD*

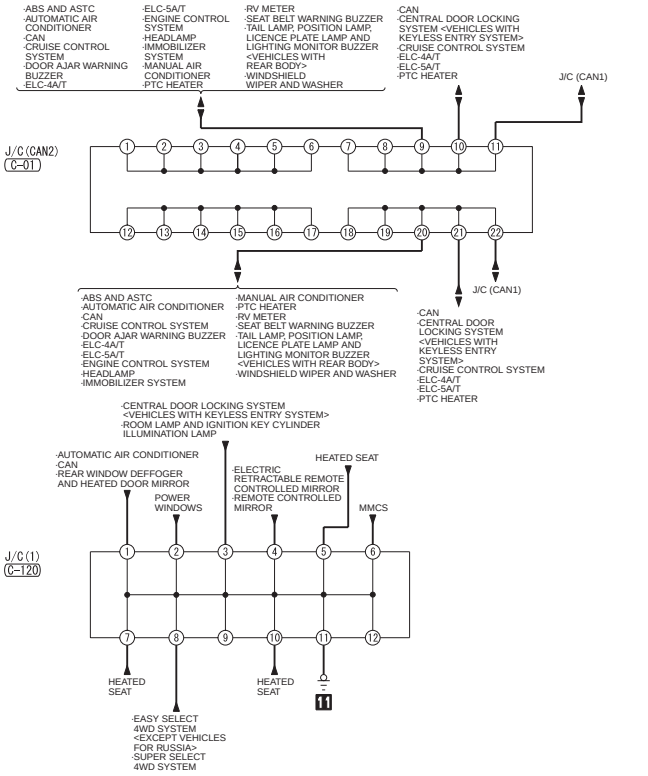
JOINT CONNECTOR (J/C)

J/C <LHD>

M1901014205431

NOTE:
IN THE ACTUAL VEHICLES, SOME OF THE J/C TERMINALS IN THE SAME BUS ARE USED, SO IN SOME CASES, THE TERMINAL ARRANGEMENT INDICATED ON THE CIRCUIT DIAGRAMS DOES NOT AGREE WITH THE ONES IN THE ACTUAL VEHICLES. HOWEVER, ON J/C (CAN 1, 2), THE ACTUAL TERMINAL AGREEMENT SHOULD ALWAYS AGREE WITH THE CIRCUIT DIAGRAMS.





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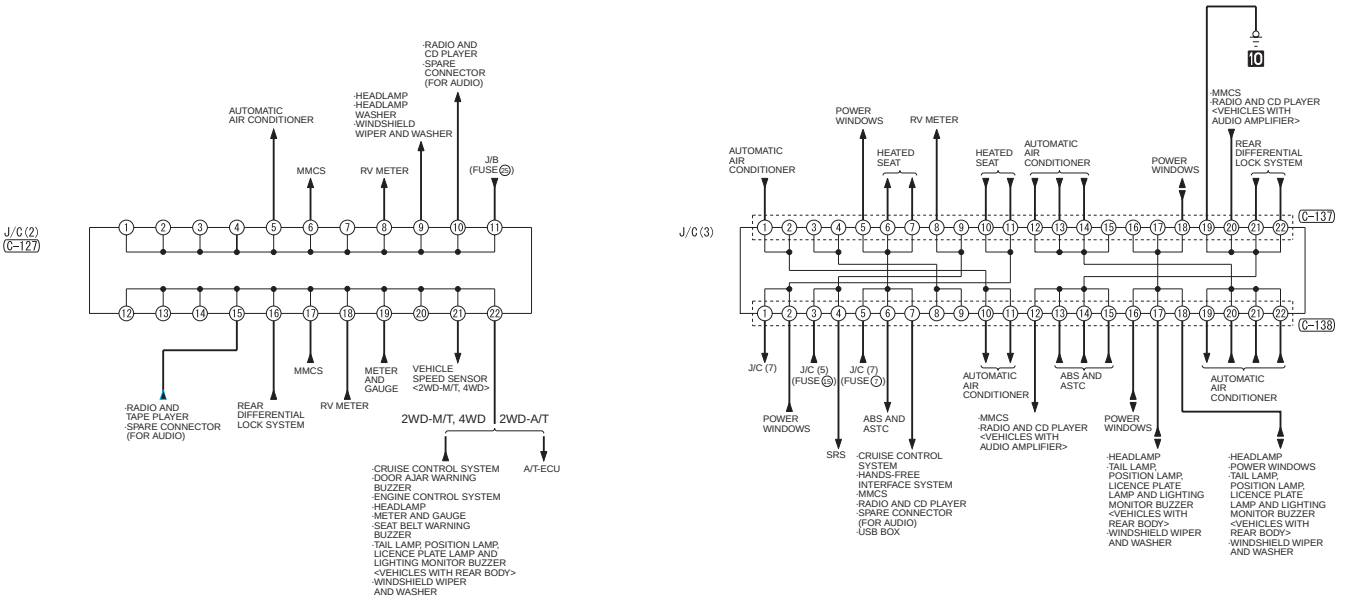

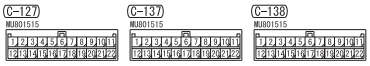

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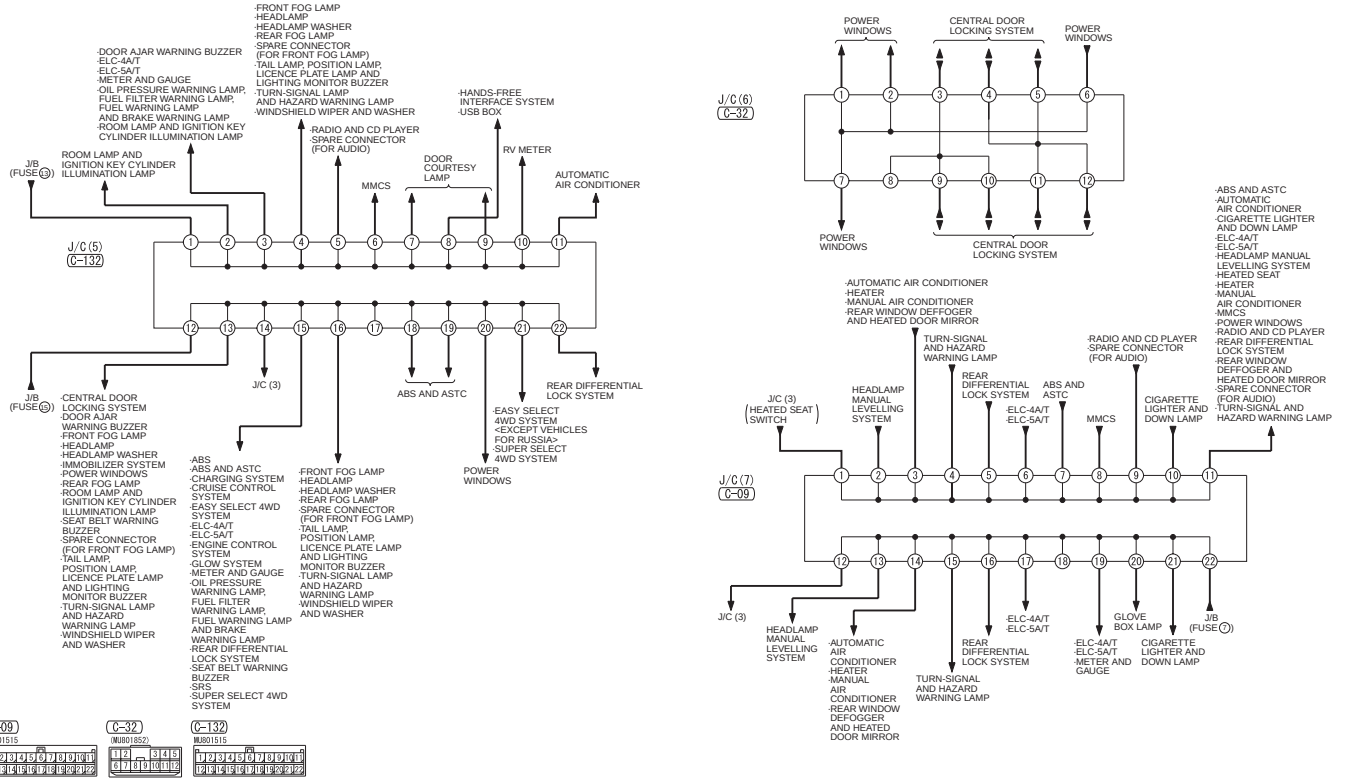

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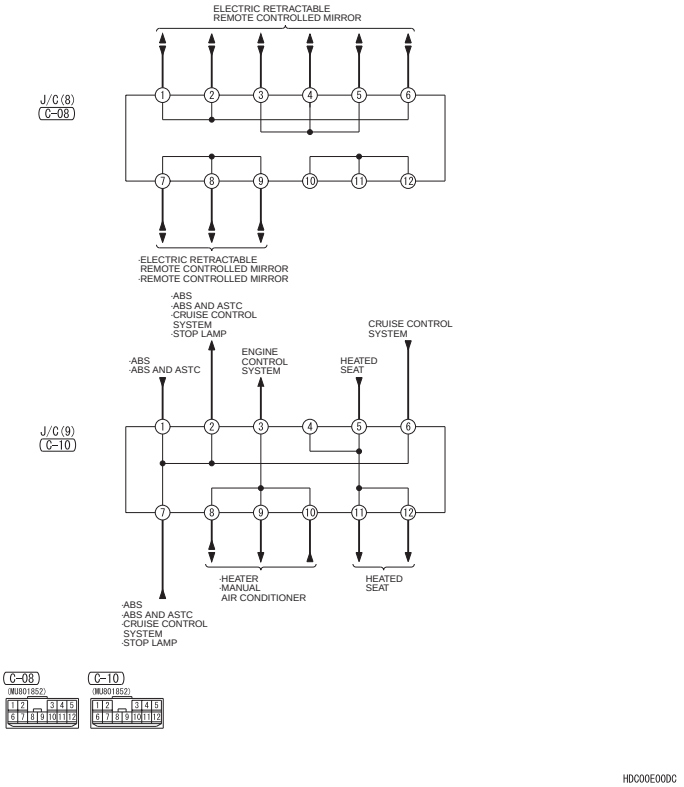

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J/C <RHD>

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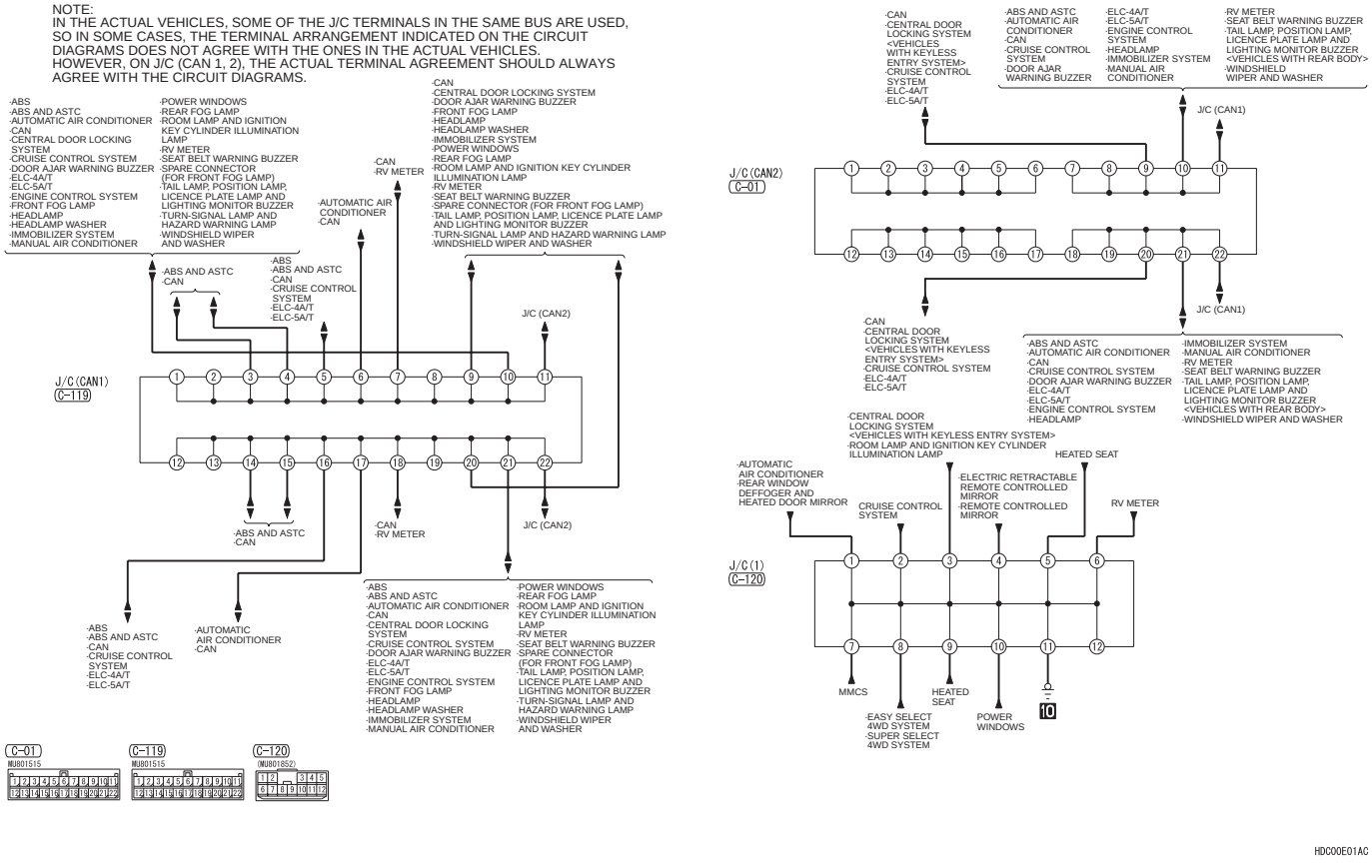
NOTE:
IN THE ACTUAL VEHICLES, SOME OF THE J/C TERMINALS IN THE SAME BUS ARE USED, SO IN SOME CASES, THE TERMINAL ARRANGEMENT INDICATED ON THE CIRCUIT DIAGRAMS DOES NOT AGREE WITH THE ONES IN THE ACTUAL VEHICLES. HOWEVER, ON J/C (CAN 1, 2), THE ACTUAL TERMINAL AGREEMENT SHOULD ALWAYS AGREE WITH THE CIRCUIT DIAGRAMS.



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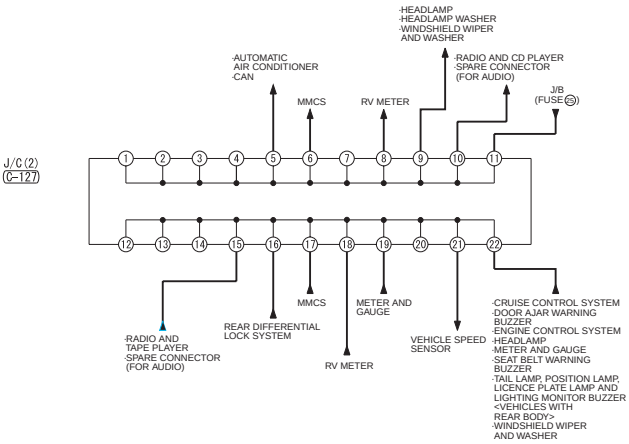

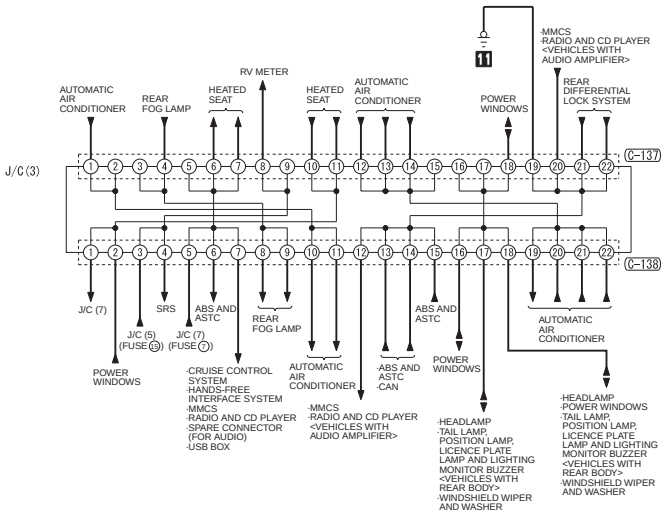

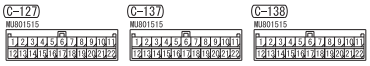

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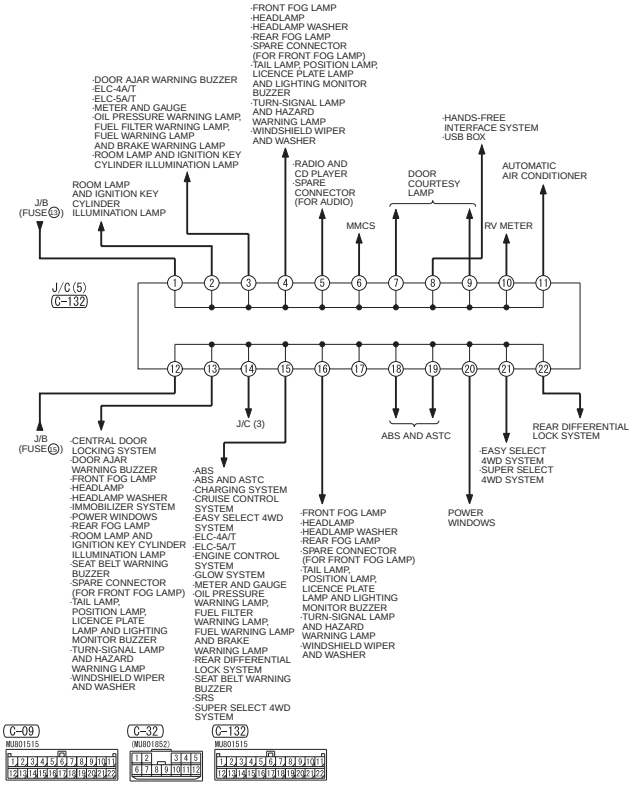

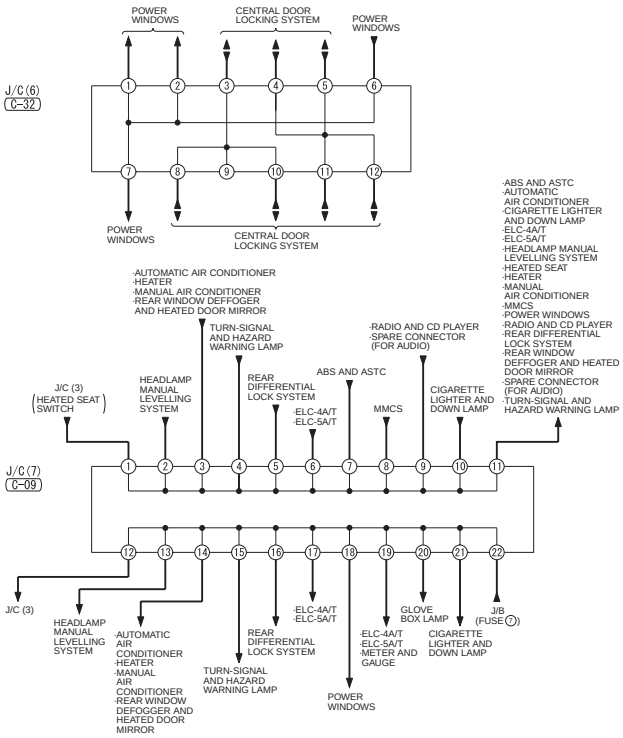

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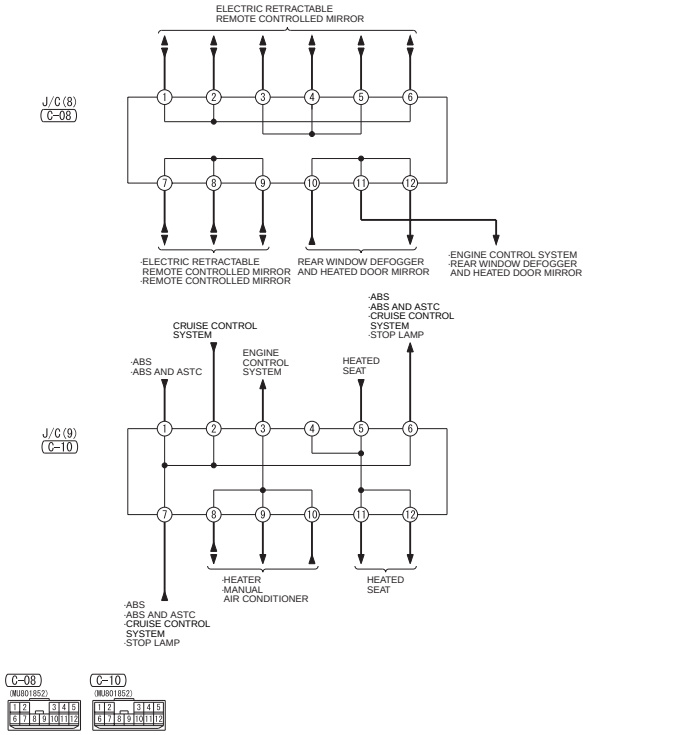

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CENTRALIZED JUNCTION

M1901000304108

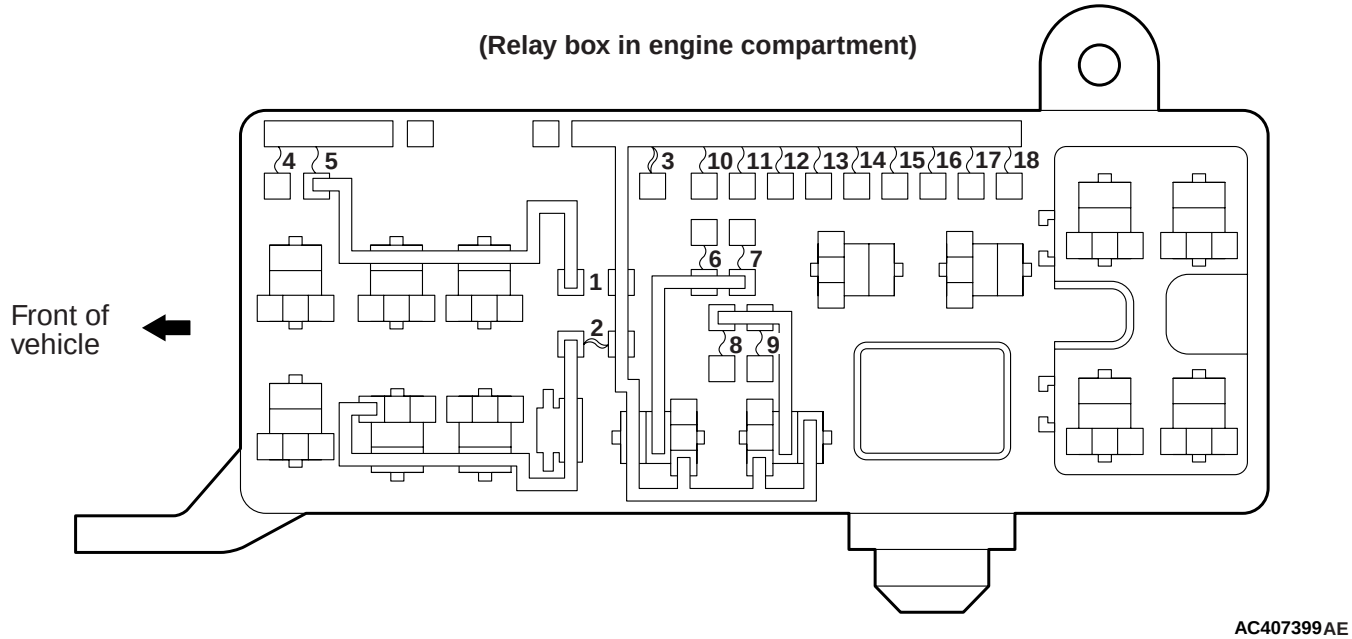
FUSIBLE LINK AND FUSE

ENGINE COMPARTMENT

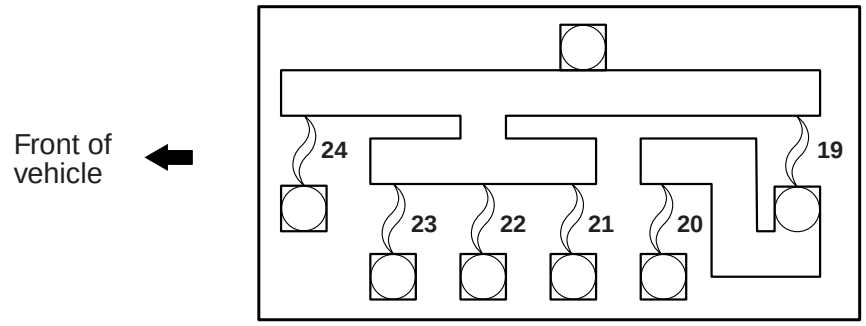
No.	Power source circuit	Name	Rated capacity (A)	Housing colour	Load circuit
1	–	Fusible link	–	–	–
2	Fusible link No.23		40	Green	Power window main switch, power window sub switch, rear panel power window-ECU, headlamp washer motor and headlamp washer relay
3			40	Green	Engine-ECU, starter and ETACS-ECU

No.	Power source circuit	Name	Rated capacity (A)	Housing colour	Load circuit
4	Fusible link No.20	Fuse	10	Red	A/C compressor and clutch assembly
5			20	Yellow	Condenser fan motor or no connection
6	Headlamp relay: HI		10	Red	Combination meter, headlamp (LH) <2-bulb type> and headlamp (HI: LH) <4-bulb type>
7			10	Red	Headlamp (RH) <2-bulb type> and headlamp (HI: RH) <4-bulb type>
8	Headlamp relay: LO		10	Red	Headlamp (LH) <2-bulb type>, headlamp (LO: LH) <4-bulb type>, headlamp levelling unit and headlamp levelling switch
9			10	Red	Headlamp (RH) <2-bulb type> and headlamp (LO: RH) <4-bulb type>
10	Fusible link No.23		20	Yellow	Air flow sensor, engine control relay, engine-ECU, glow control unit <Euro5>, variable geometry control solenoid valve <Euro5> and vehicle speed sensor
11			7.5	Brown	Alternator
12			15	Blue	ABS-ECU, ASTC-ECU, high-mounted stop lamp and rear combination lamp (stop)
13			10	Red	Horn and horn relay
14			20	Yellow	A/T control solenoid valve assembly and A/T-ECU
15			10	Red	ETACS-ECU
16			–	–	–
17			15	Blue	Combination meter, front fog lamp, front fog lamp relay and spare connector (for front fog lamp relay)
18			20	Yellow	Audio amplifier

No.	Power source circuit	Name	Rated capacity (A)	Housing colour	Load circuit
19	Battery/Alternator	Fusible link	130	–	Circuit of fusible link No. 20/circuit of fusible link No. 21 to 25 and fuse No. 26
20	Fusible link No. 19/ Alternator		100	–	Circuit of fuse Nos. 4 and 5 in engine compartment, circuit of fuse Nos.5, 6, 11, 12, 17, 18, 22, 23 and 26 in passenger compartment and circuit of fusible link No.24 in passenger compartment
21	Battery/Fusible link No. 19		30	–	ABS-ECU and ASTC-ECU
22			50	–	ABS-ECU and ASTC-ECU
23			120	–	Circuit of fusible link Nos. 2 and 3 in engine compartment, circuit of fuse Nos. 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 17 and 18 in engine compartment and headlamp relay
24			80	–	Glow control unit <Euro5> and glow plugs <Except Euro5>
25			80	White	PTC heater 1 and PTC heater 2
26		Fuse	30	Green	Blow-by hose heater

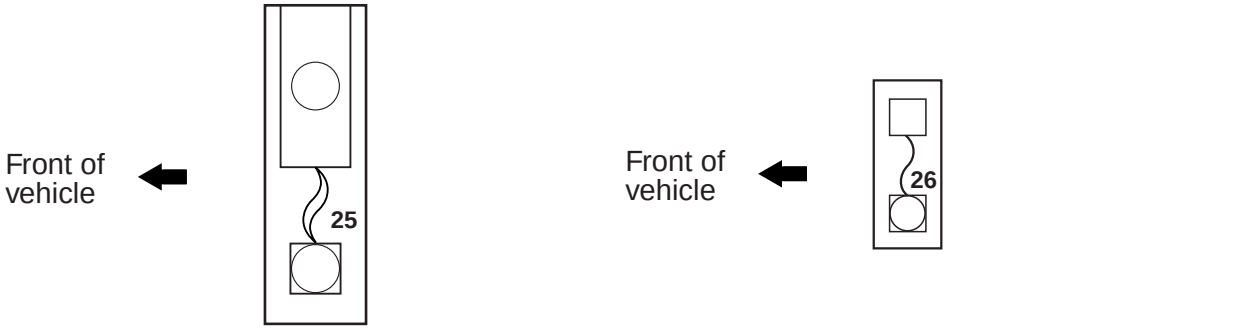


(Fusible link box connected directly to battery positive terminal)



AC207459AE

(Fusible link box connected directly to battery positive terminal) **(Fuse box)**



AC510276AF

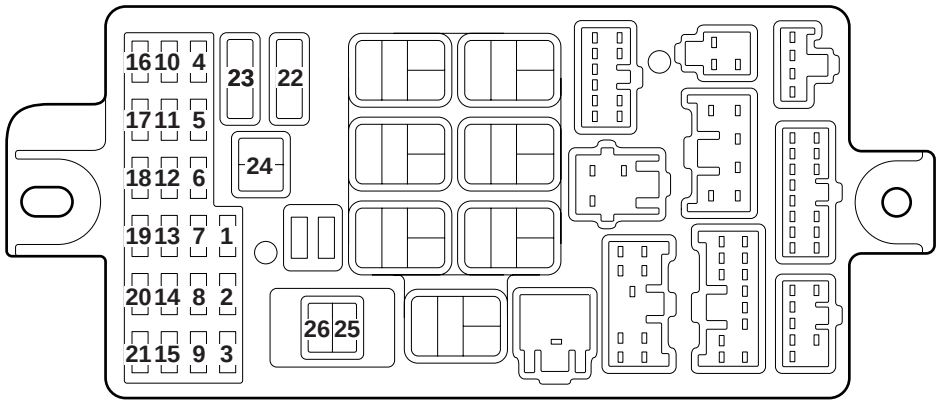
PASSENGER COMPARTMENT

No.	Power source circuit	Name	Rated capacity (A)	Housing colour	Load circuit
1	ETACS-ECU (tail lamp relay)	Fuse	7.5	Brown	Licence plate lamp, rear combination lamp (tail: LH) and position lamp (LH)
2	Ignition switch (ACC)		15	Blue	Cigarette lighter
3	Ignition switch (IG1)		10	Red	–
4	Ignition switch (ST)		7.5	Brown	Starter relay
5	Fusible link No.20		20	Yellow	Sunroof motor assembly
6			15	Blue	Accessory socket and spare connector (for ACC socket)

No.	Power source circuit	Name	Rated capacity (A)	Housing colour	Load circuit
7	ETACS-ECU (tail lamp relay)		7.5	Brown	A/C switch module, A/C-ECU, ASC switch, combination meter, cruise control switch, down lamp, glove box lamp, hazard waning switch, headlamp levelling switch, heated seat switch, over drive switch <4A/T>, position lamp (RH), rear combination lamp (tail: RH), rear differential lock switch, rear panel power window switch, shift switch assembly <5A/T>, steering wheel audio remote control switch and steering wheel voice control switch
8	Ignition switch (ACC)		7.5	Brown	Remote controlled mirror
9	Ignition switch (IG1)		7.5	Brown	Engine-ECU
10	Ignition switch (IG2)		7.5	Brown	ETACS-ECU and Sunroof motor assembly
11	Fusible link No.20		10	Red	Combination meter, rear fog lamp and rear fog lamp relay
12			15	Blue	ETACS-ECU and diagnosis connector
13			10	Red	A/C-ECU, clock, column switch, combination meter, door courtesy lamp, front room lamp, hands free-ECU, lighting control sensor, key reminder switch, multivision display, radio/CD player, rear room lamp, RV meter, spare connector (for audio system) and USB box
14	Ignition switch (ACC)		–	–	–
15	Ignition switch (IG1)		7.5	Brown	ABS-ECU, ASTC-ECU, column switch, combination meter, ETACS-ECU, g and yaw rate sensor, passenger's air bag cut off indicator, rear differential lock-ECU, rear panel power window-ECU, RV meter, solenoid valve, spare connector (for trailer), SRS-ECU, steering wheel sensor and 4WD indicator-ECU
16	Ignition switch (IG2)		7.5	Brown	A/C compressor relay, A/C-ECU, A/C switch module, blower relay, blow-by heater relay, condenser fan relay, heated seat relay, outside/inside air selection damper control motor, PTC heater relay and rear window defogger relay
17	Fusible link No.20		20	Yellow	Heated seat and heated seat switch
18			10	Red	–

No.	Power source circuit	Name	Rated capacity (A)	Housing colour	Load circuit
19	Rear window defogger relay		7.5	Brown	Remote controlled mirror
20	Ignition switch (ACC)		20	Yellow	ETACS-ECU
21	Ignition switch (IG1)		7.5	Blown	ASTC-ECU, A/T control relay, A/T-ECU, combination meter, engine-ECU <M/T>, input shaft speed sensor <A/T>, multivision display, output shaft speed sensor <A/T>, rear combination lamp (back-up) and SRS-ECU
22	Fusible link No.20		30	Green	Circuit of fuse No. 19 in passenger compartment and rear window defogger
23			30	Green	A/C temperature control resister, A/C switch module and blower motor
24		Fusible link	40	Green	Power seat assembly
25	Ignition switch (ACC)	Fuse	10	Red	Accessory socket relay, A/C-ECU, clock, ETACS-ECU, RV meter, multivision display, radio/CD player and spare connector (for audio system)
26	Fusible link No.20		15	Blue	Circuit of fuse No. 13 in passenger compartment and ETACS-ECU

(in junction block)

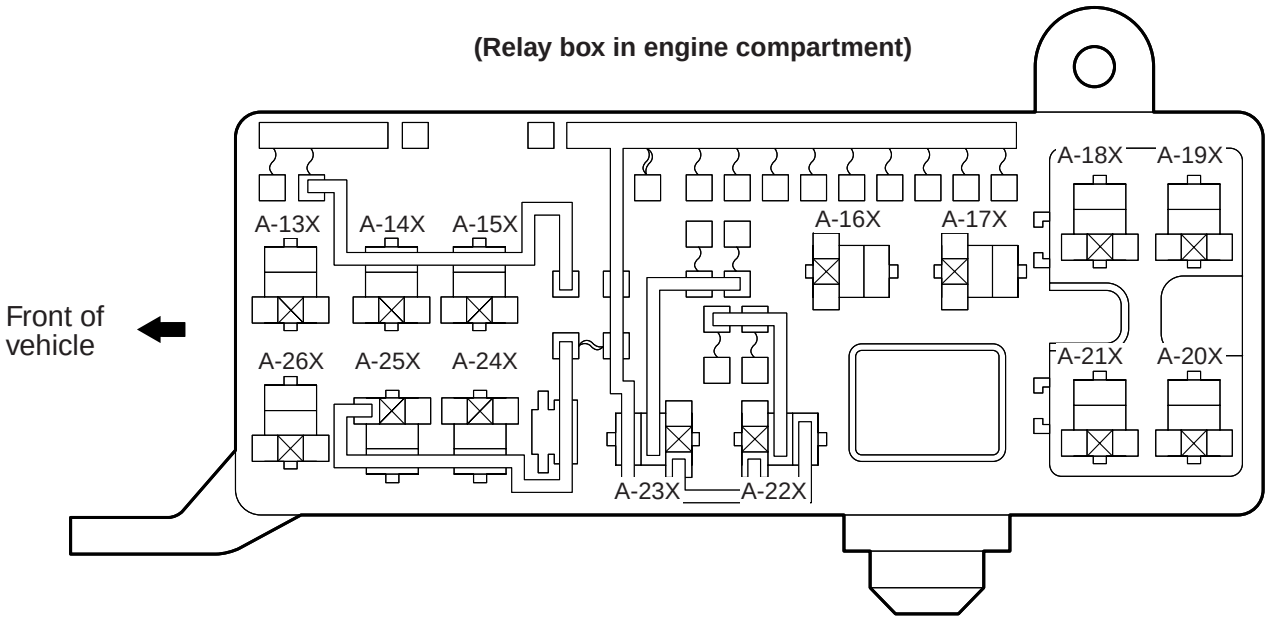


AC500721AB

CENTRALIZED RELAY

Connector No.	Name	Connector No.	Name
A-13X	Front fog lamp relay	A-21X	A/C compressor relay
A-14X	Condenser fan relay <Vehicles for Israel>	A-22X	Headlamp relay (LO)
A-15X	–	A-23X	Headlamp relay (HI)
A-16X	Starter relay	A-24X	Power window relay
A-17X	Horn relay	A-25X	Headlamp washer relay
A-18X	Blow-by heater relay	A-26X	–
A-19X	A/T control relay	A-140X	PTC heater relay 1
A-20X	Engine control relay	A-141X	PTC heater relay 2

(Relay box in engine compartment)



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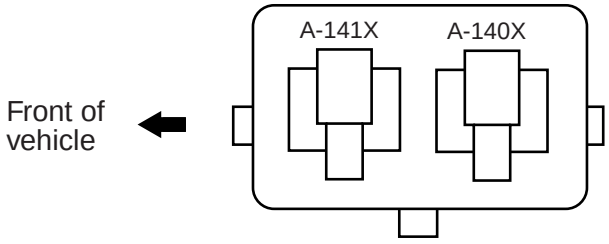
(Relay box in engine compartment)



ACB01953AB

POWER DISTRIBUTION SYSTEM

POWER DISTRIBUTION SYSTEM <LHD>

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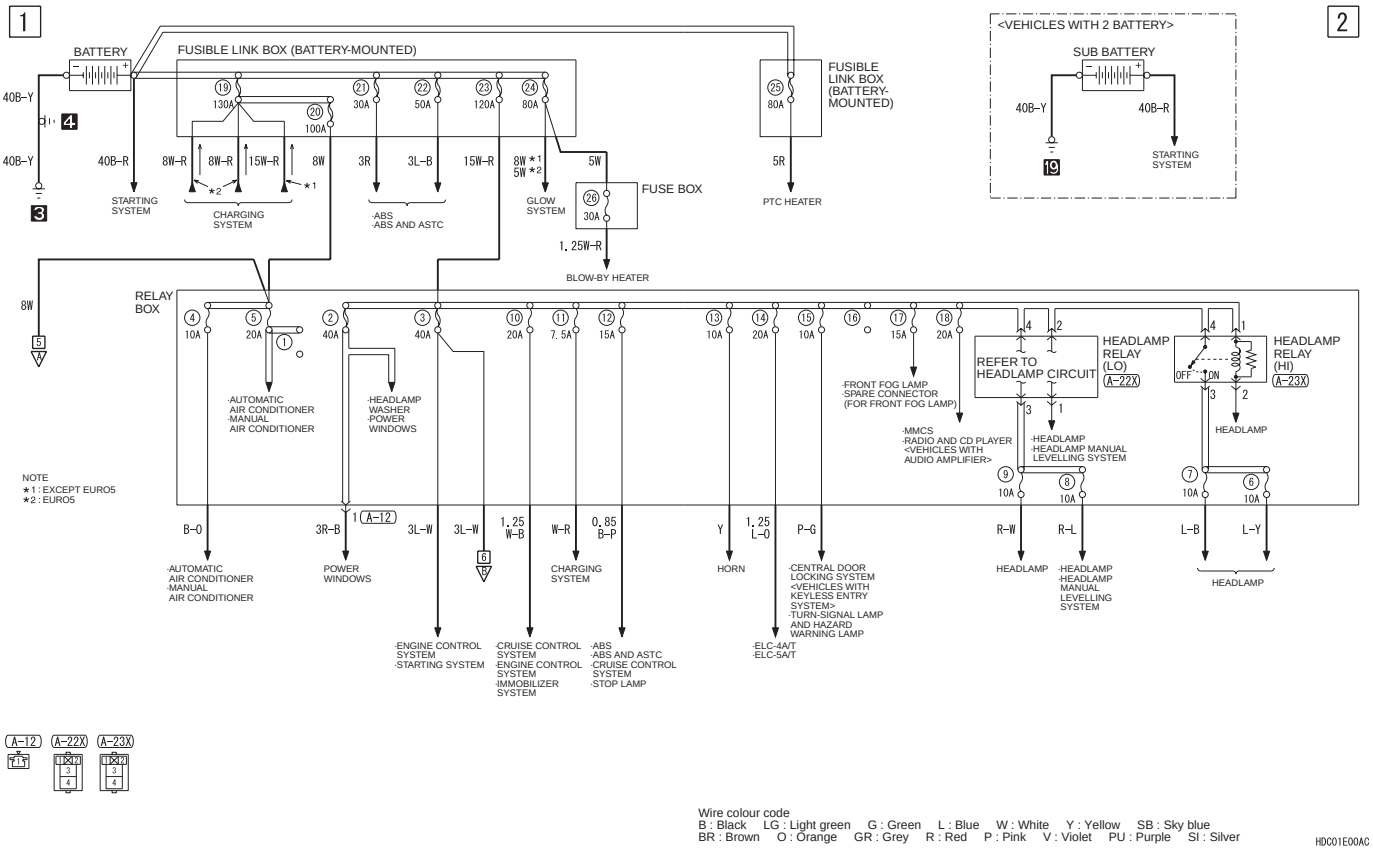

Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

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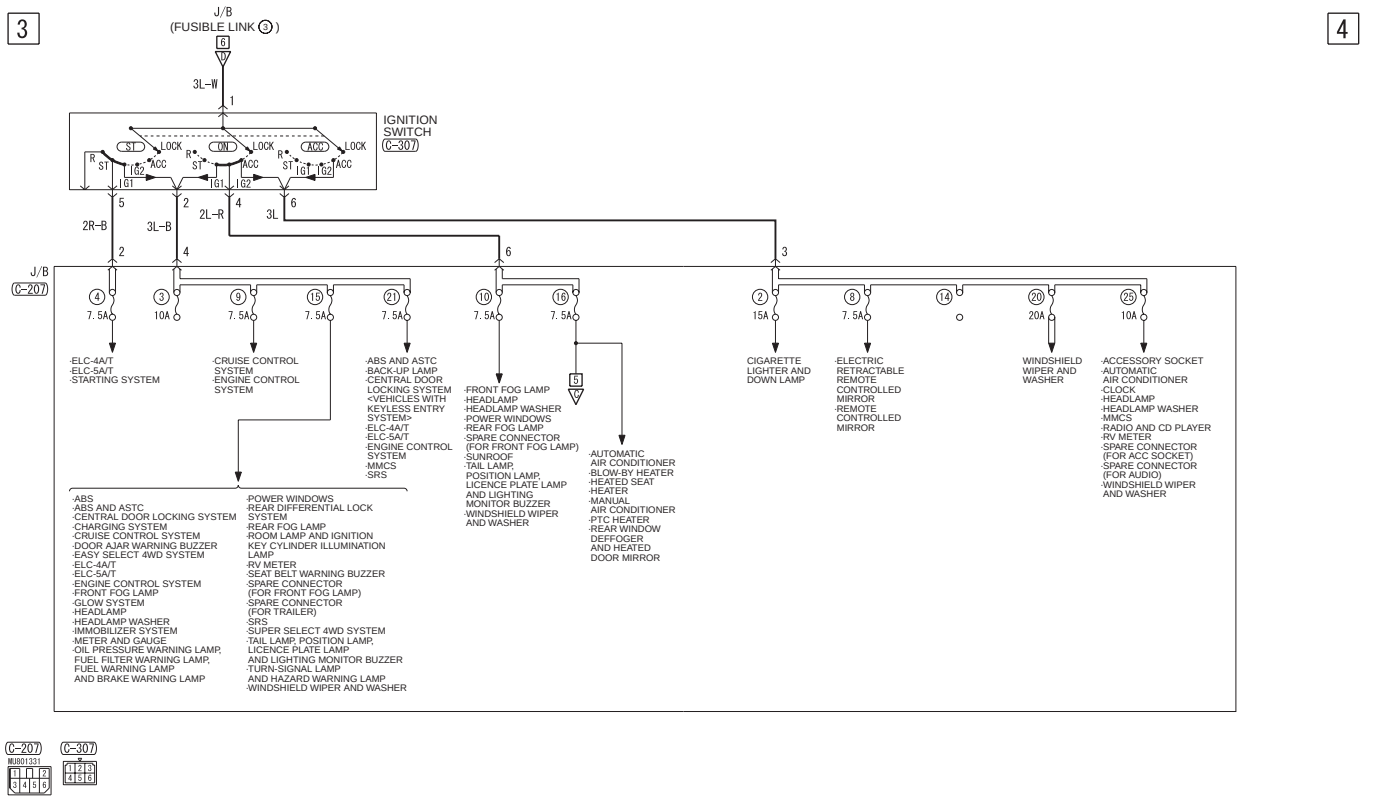

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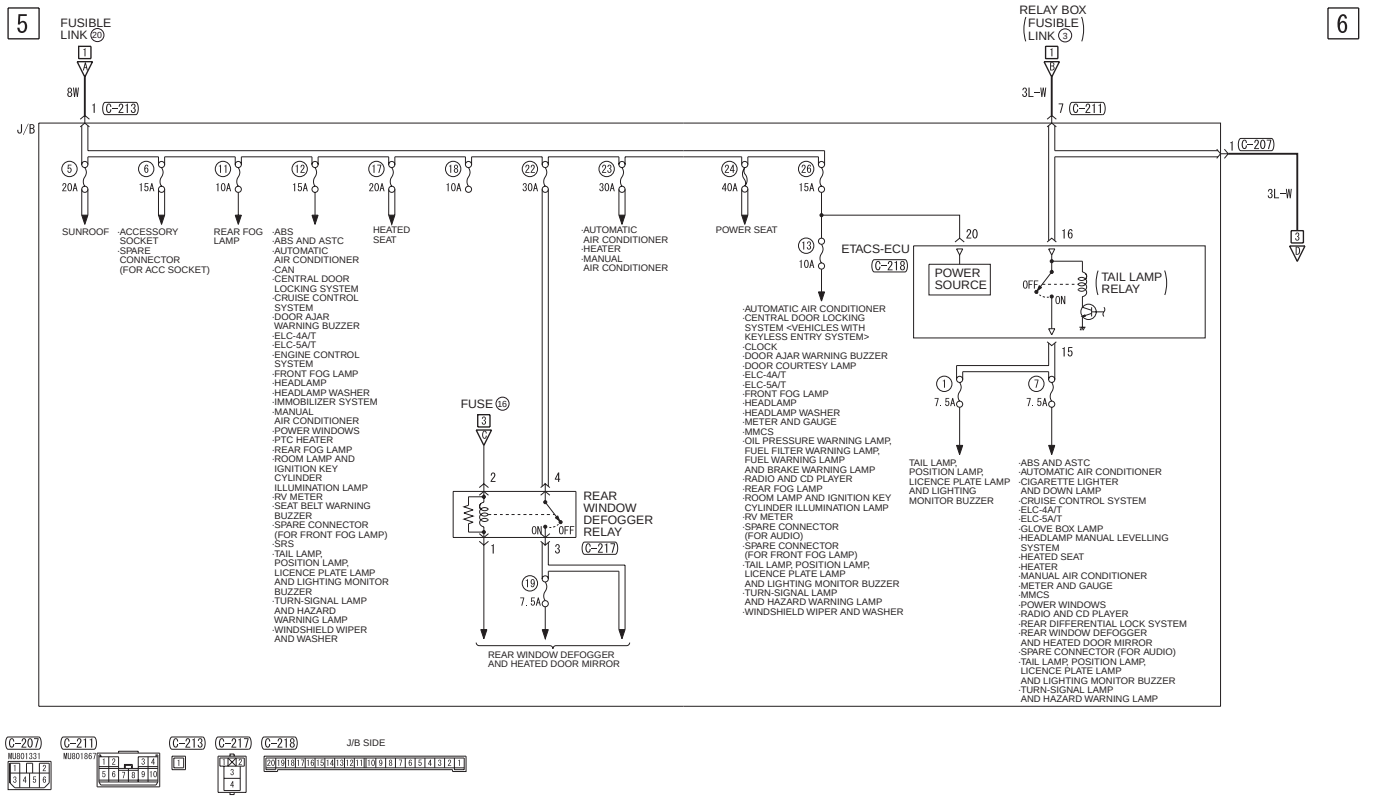

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POWER DISTRIBUTION SYSTEM <RHD>

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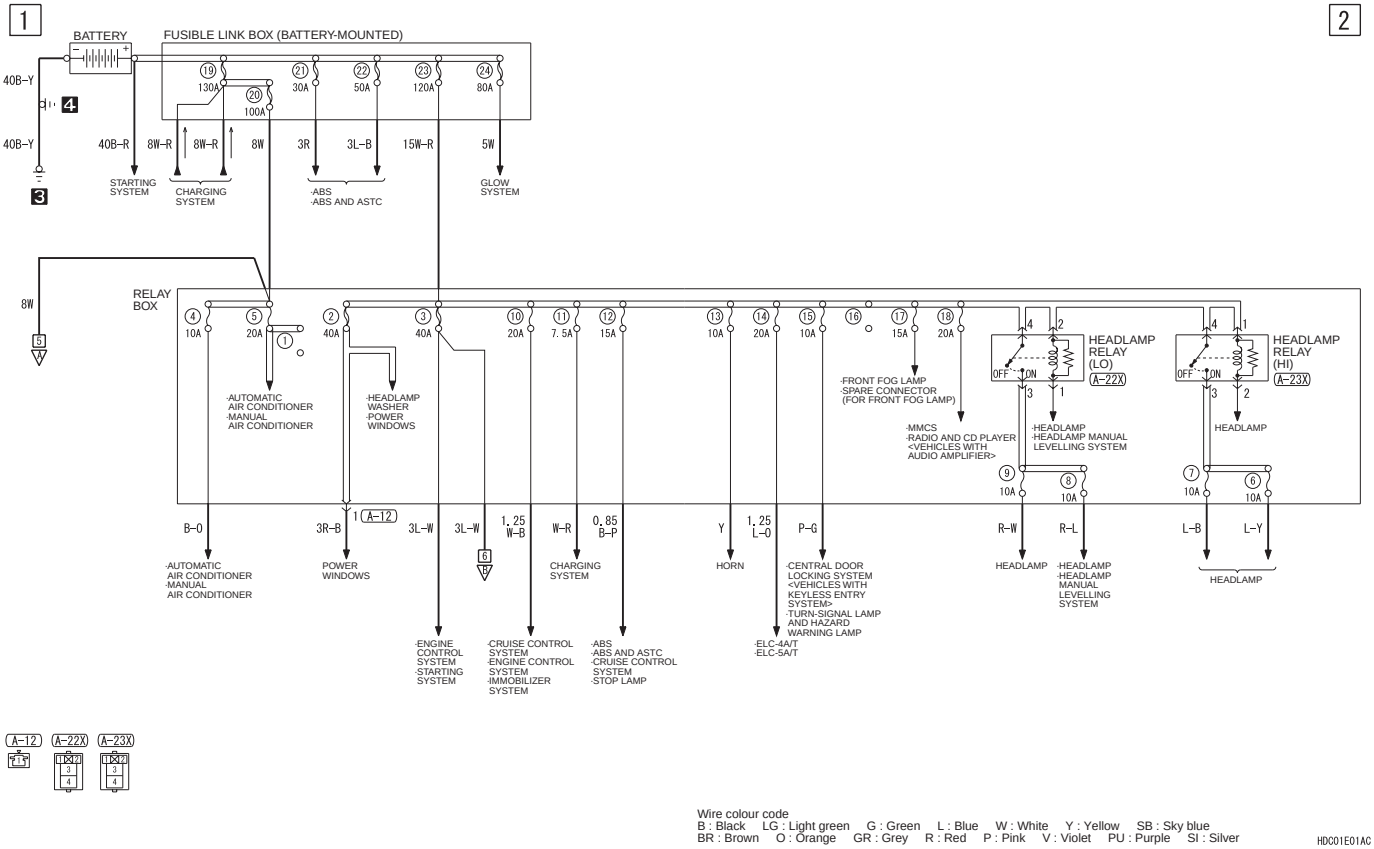

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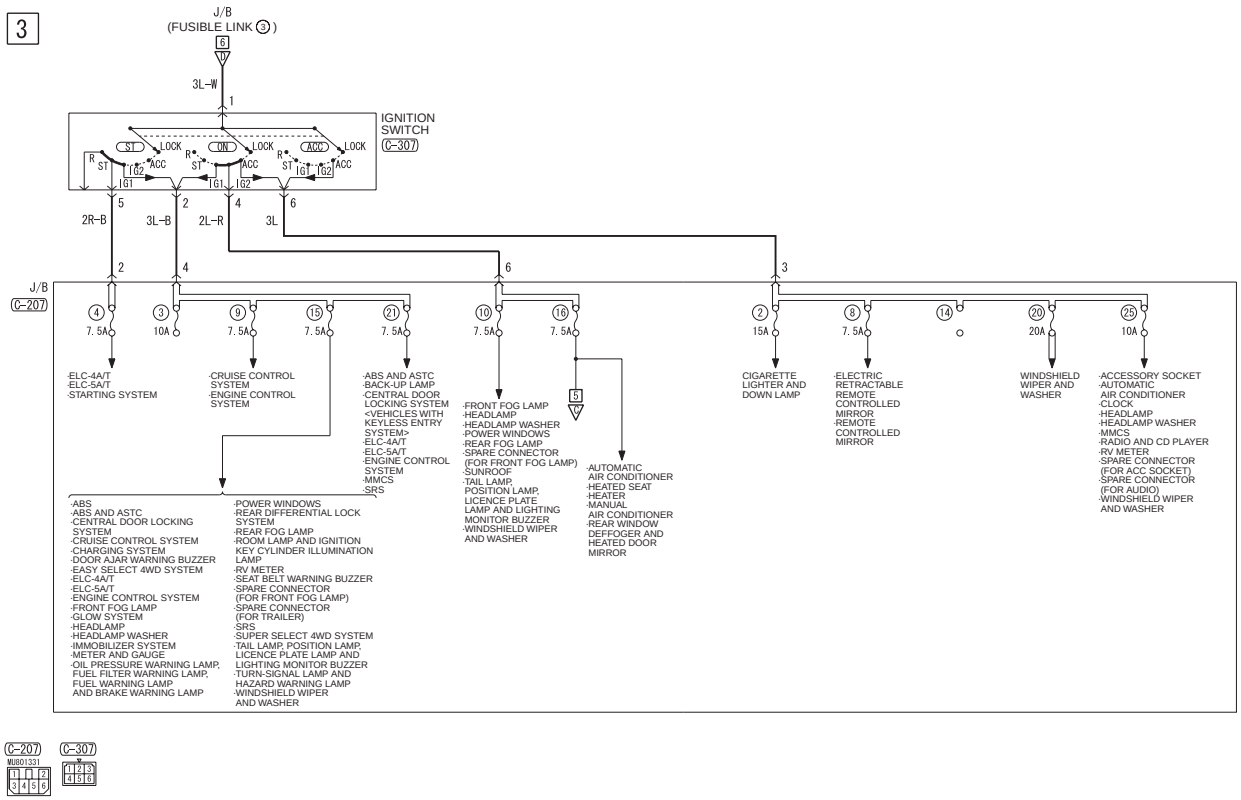

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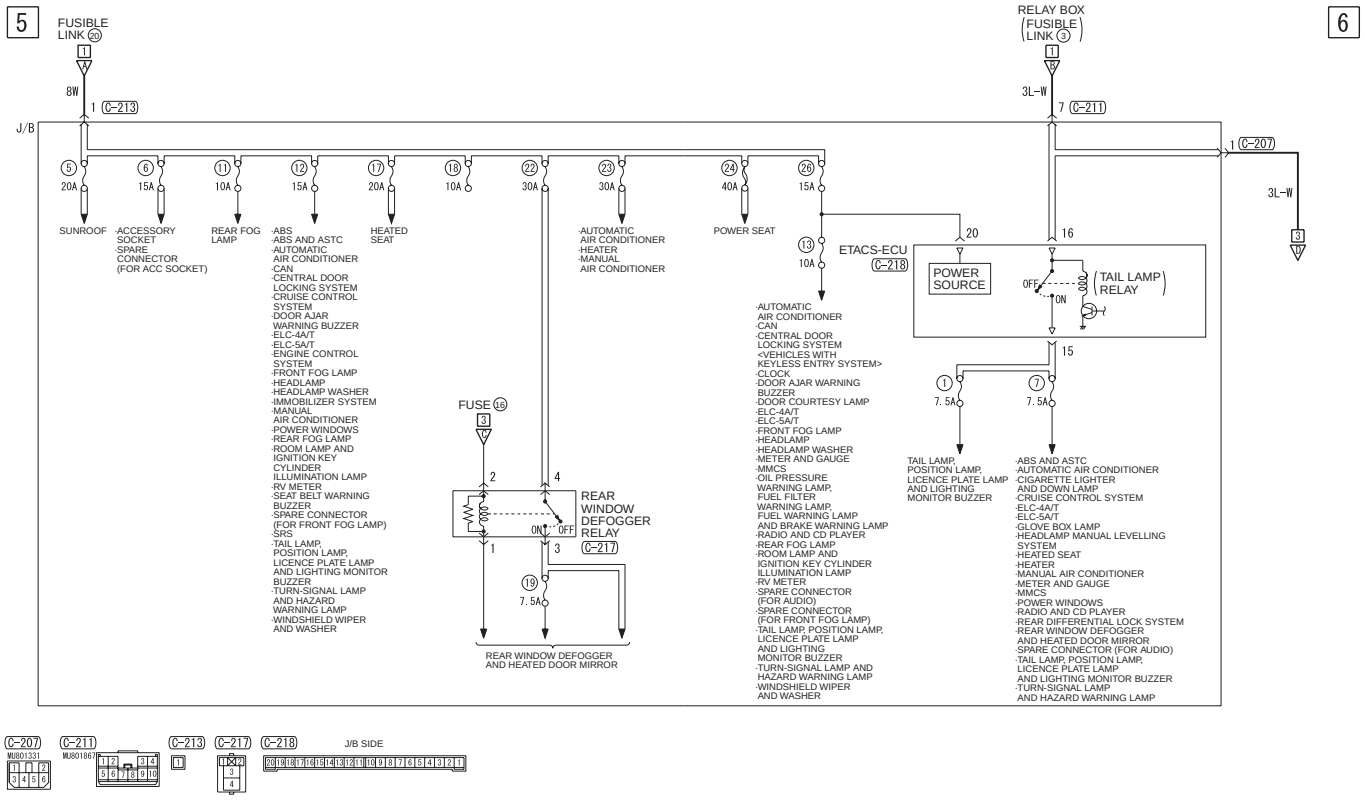

Wire colour code
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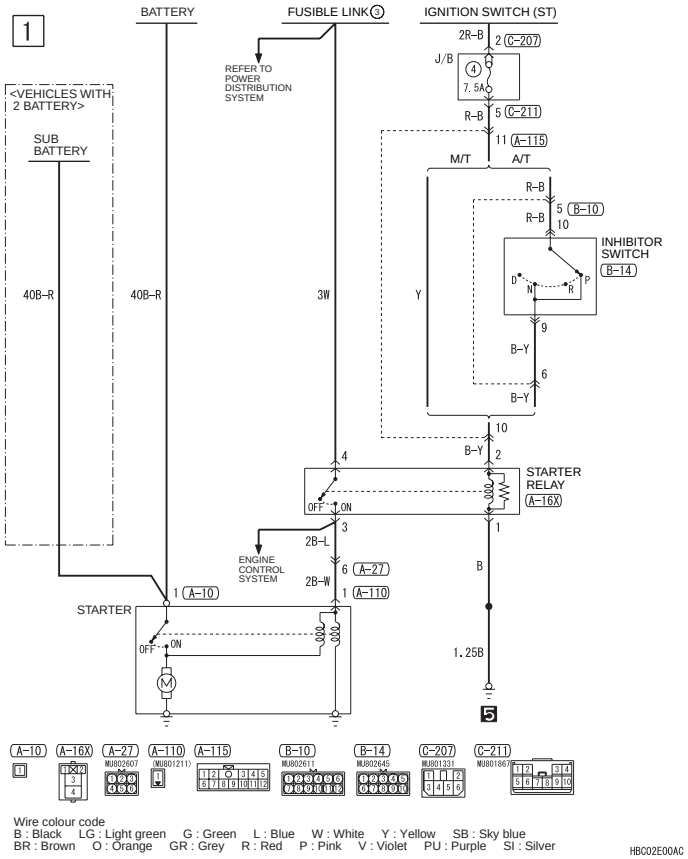
HDC01E01CC

STARTING SYSTEM

M1901000506056



Wire colour code
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HBC02E00AC

CHARGING SYSTEM

CHARGING SYSTEM <EXCEPT EURO5>

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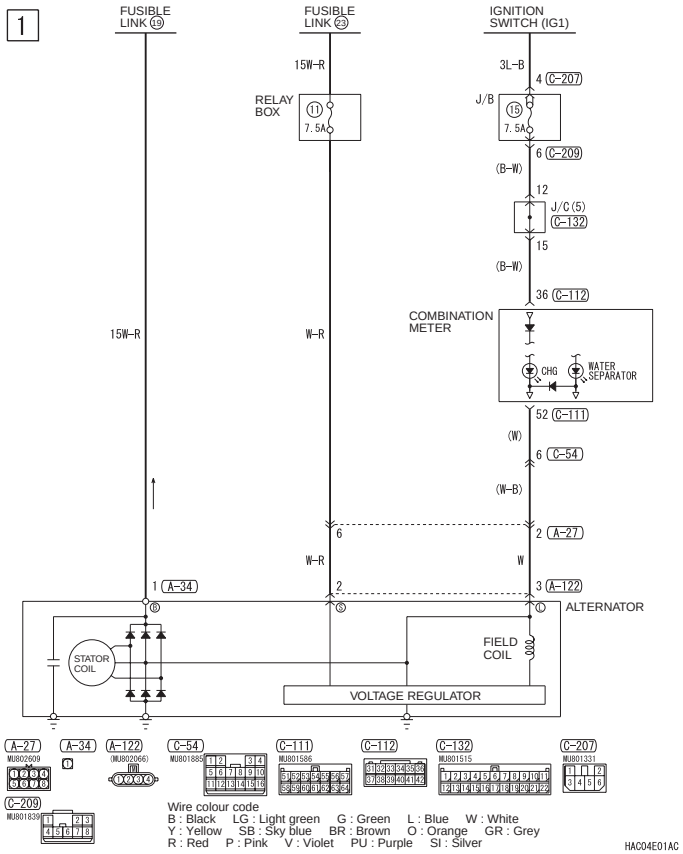

CHARGING SYSTEM <EURO5>

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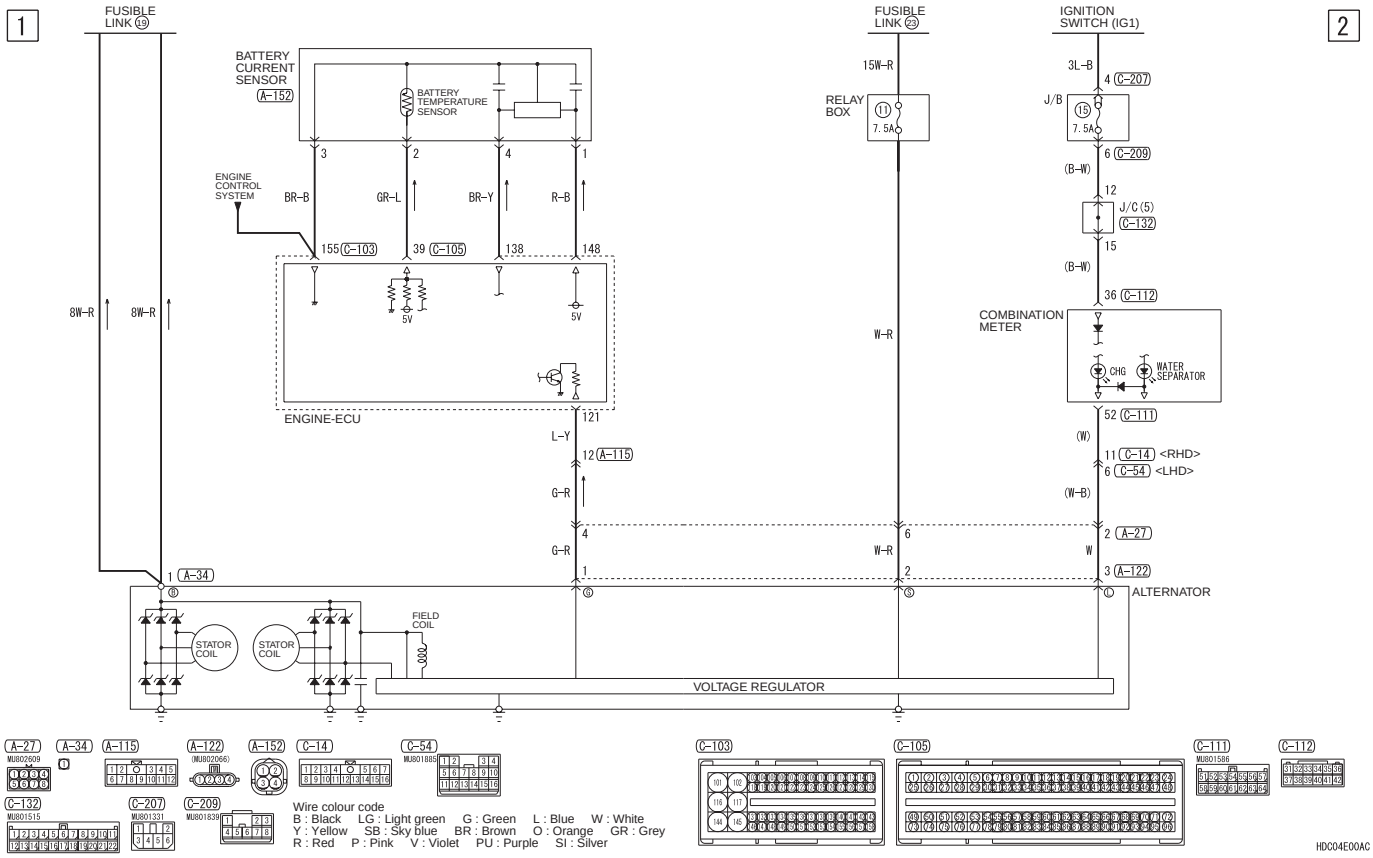

GLOW SYSTEM

GLOW SYSTEM <EXCEPT EURO5>

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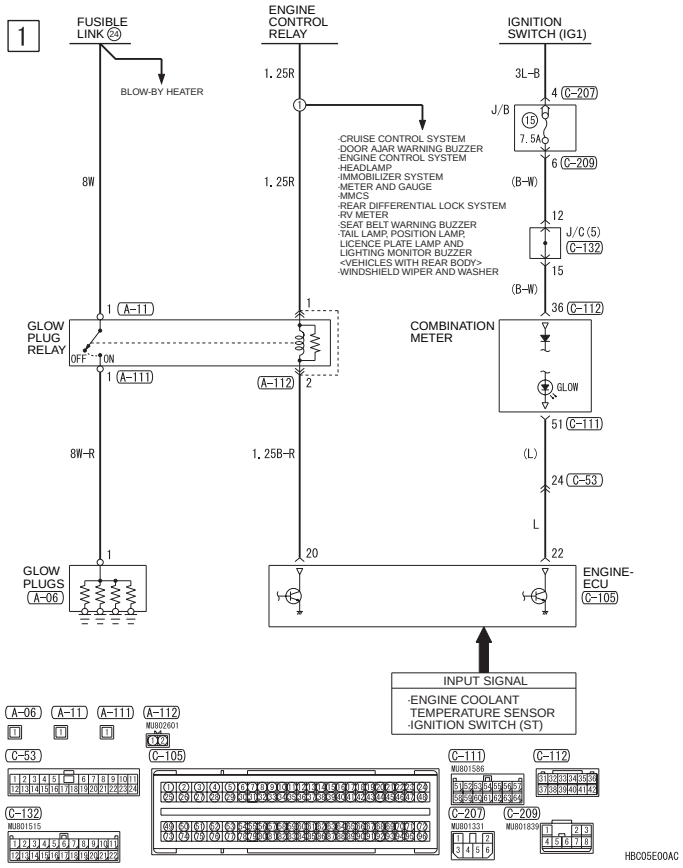

GLOW SYSTEM <EURO5>

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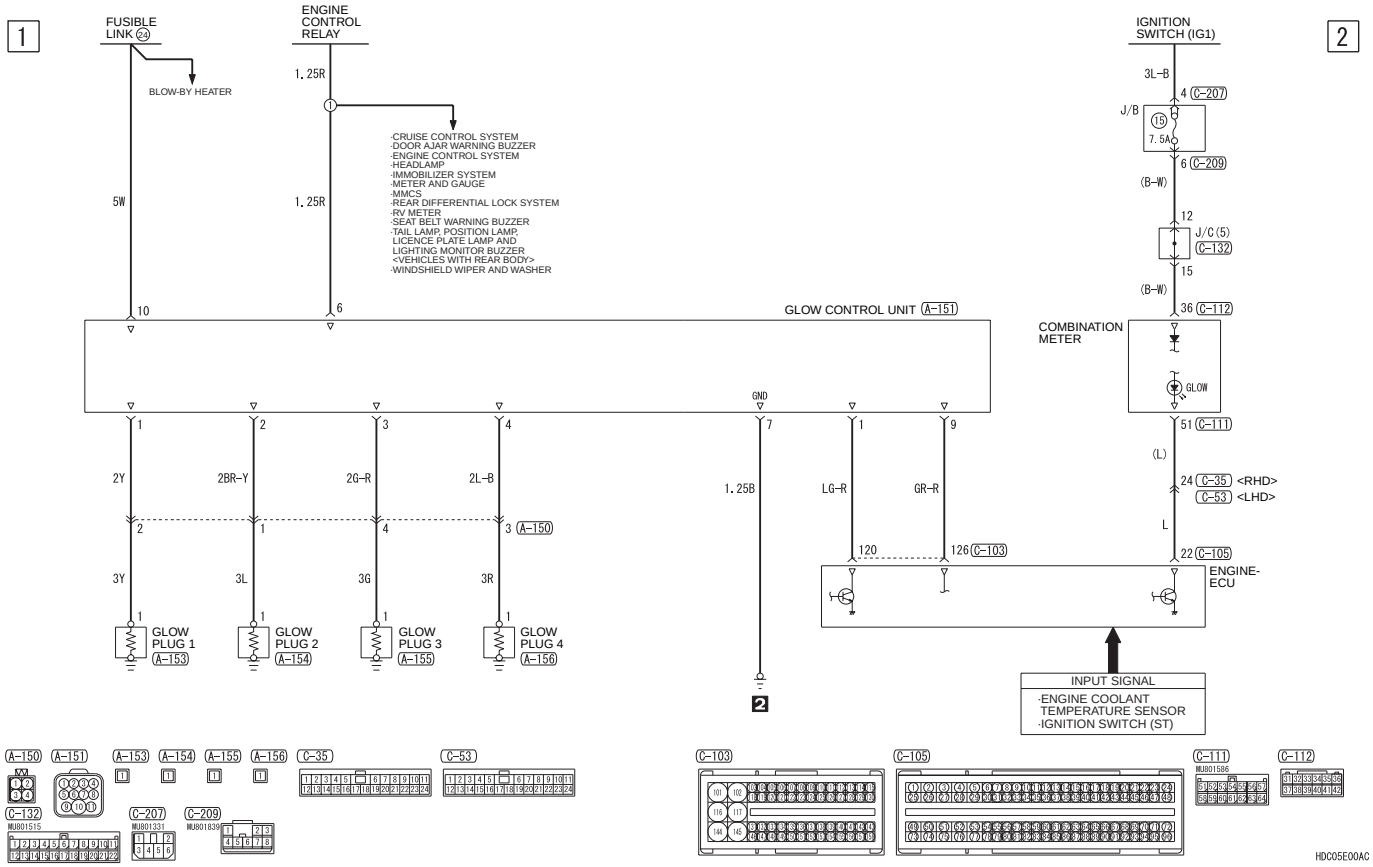
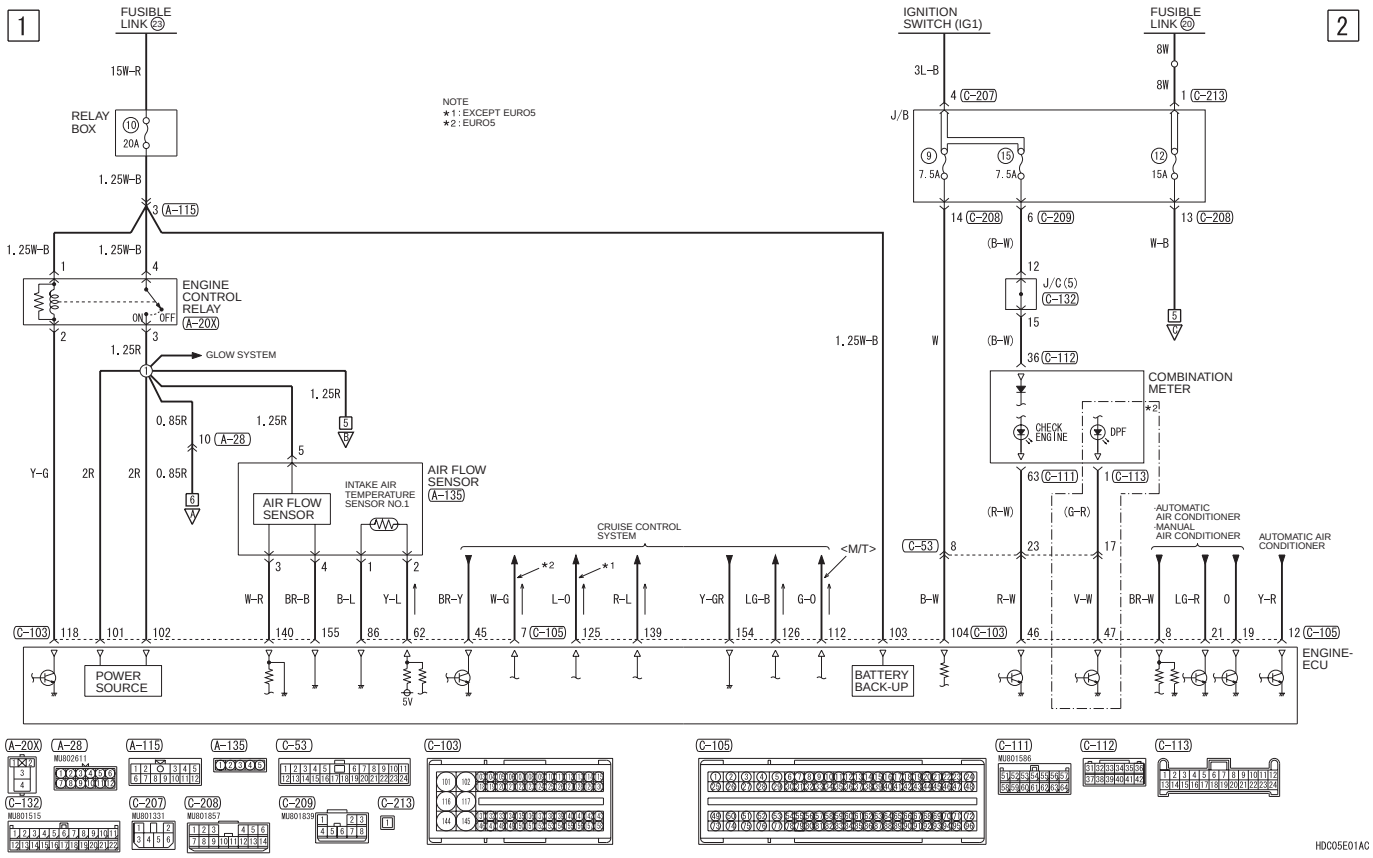


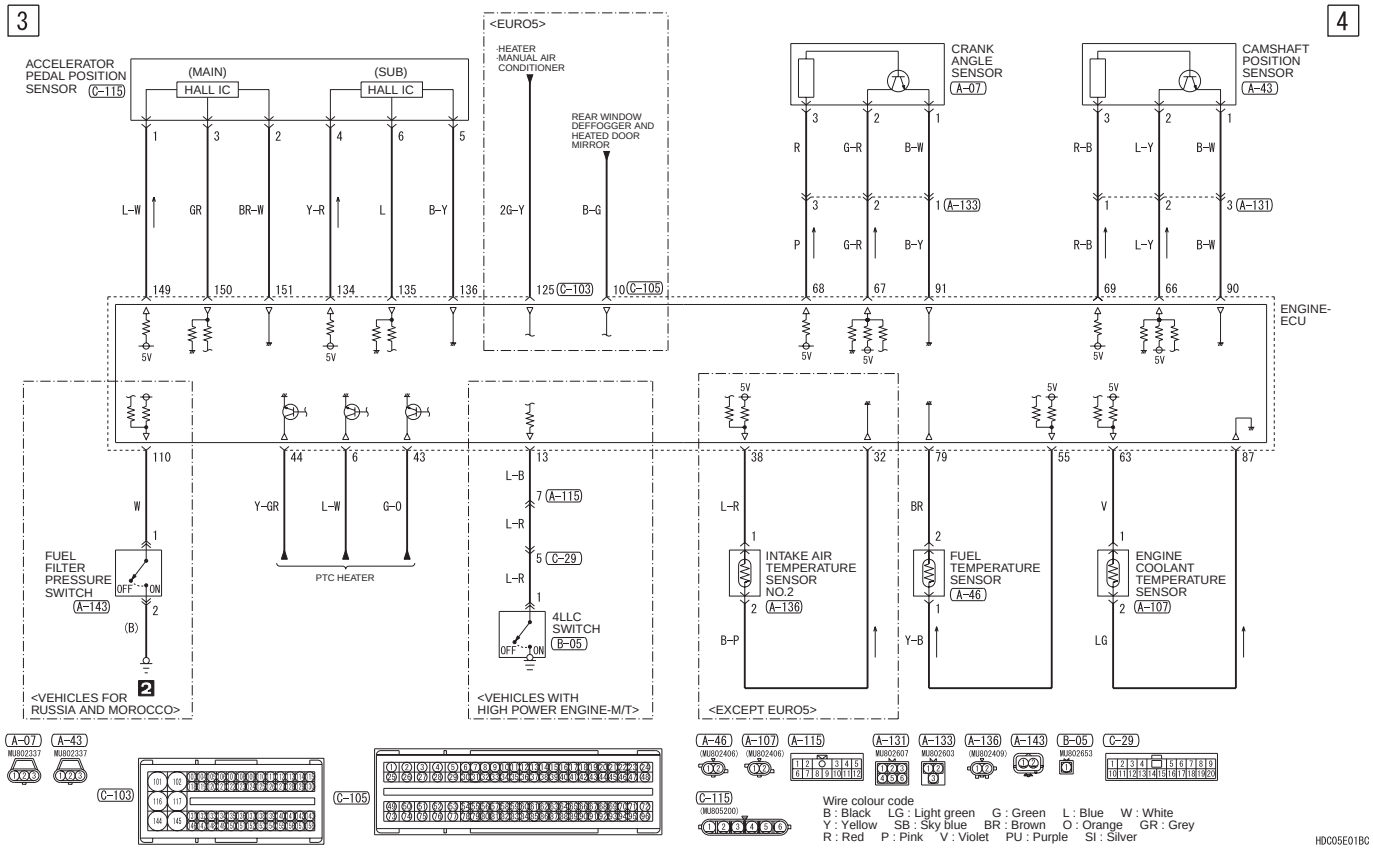
ENGINE CONTROL SYSTEM

ENGINE CONTROL SYSTEM <LHD>

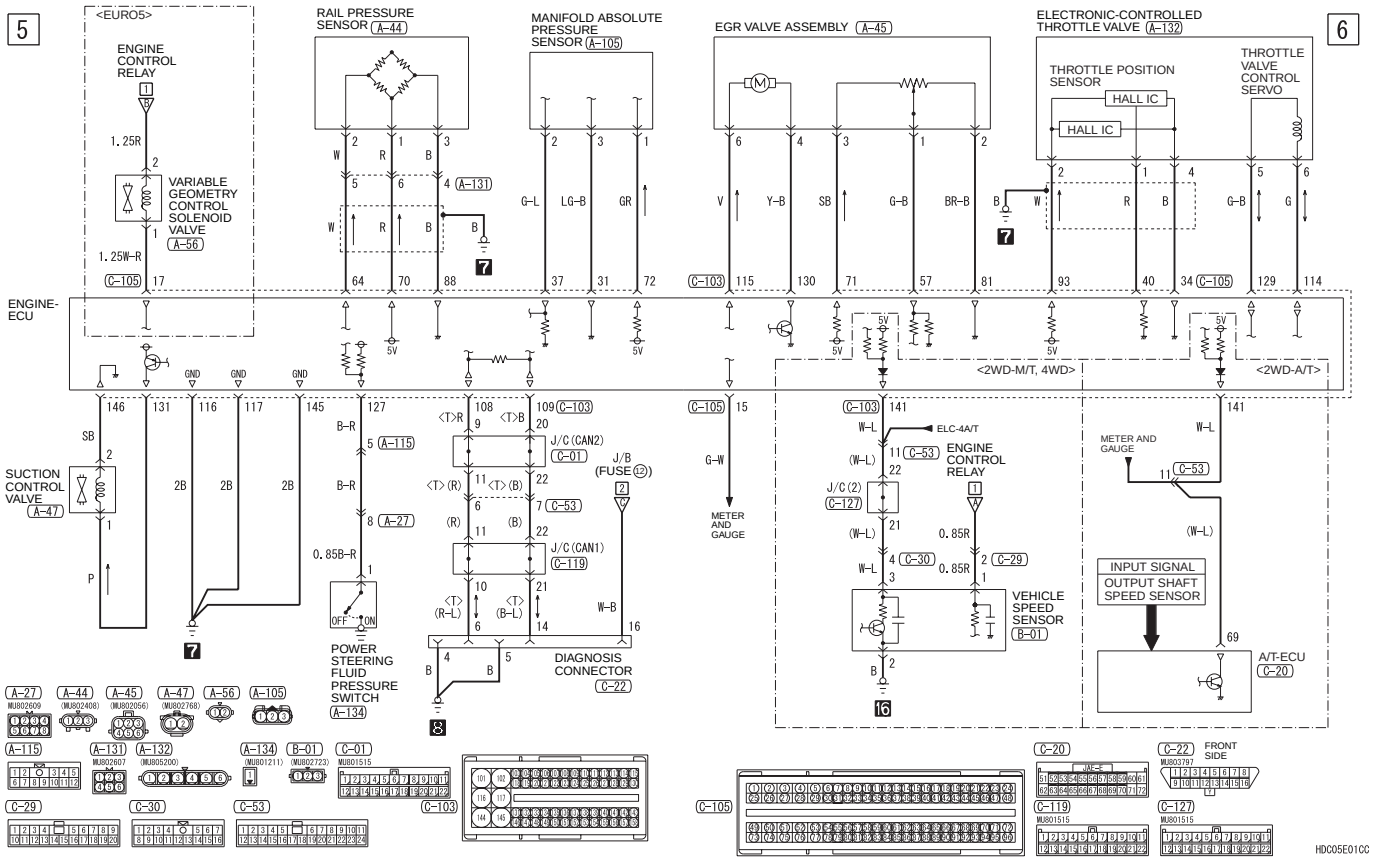
M1901000811376



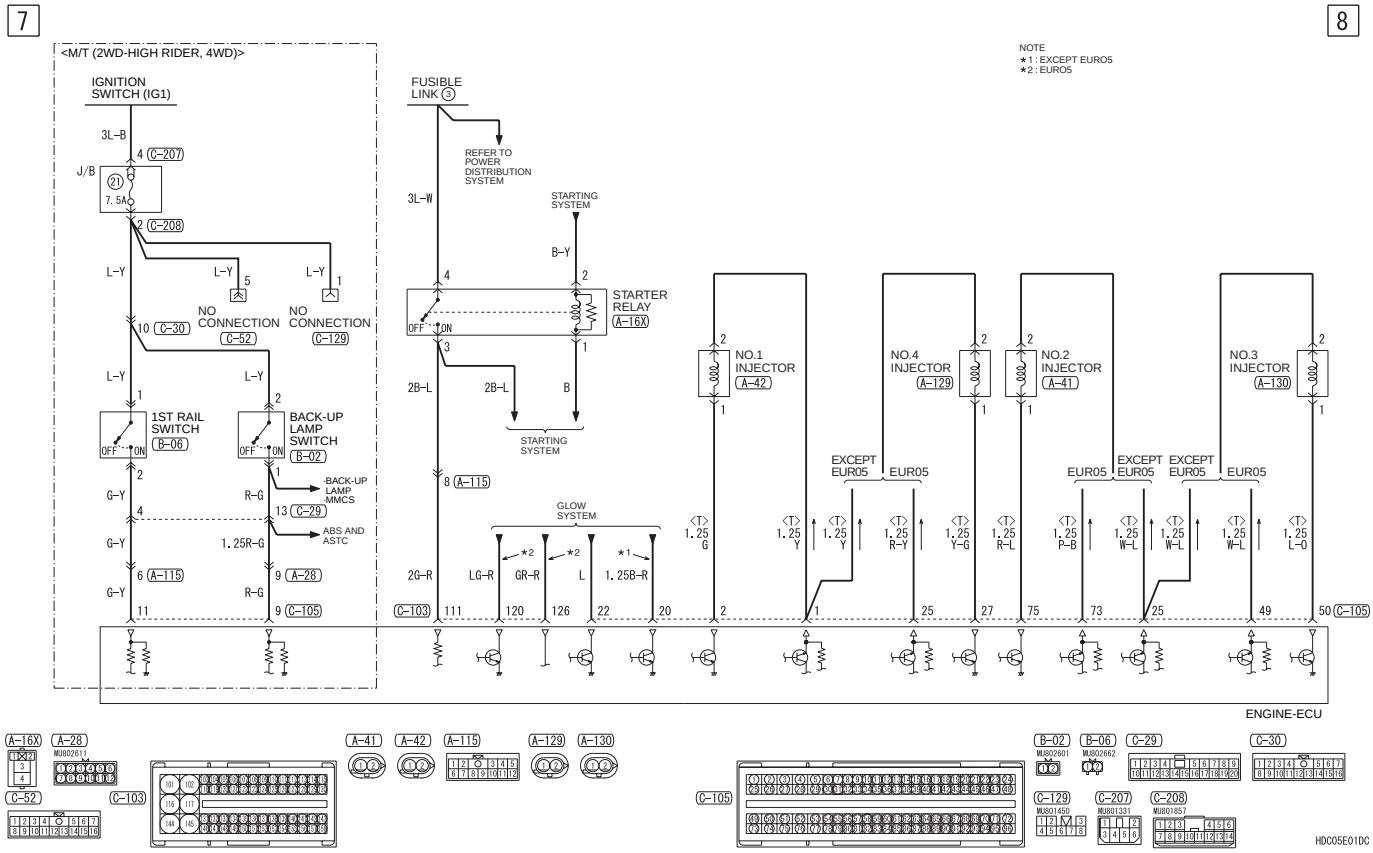
ENGINE CONTROL SYSTEM <LHD> (CONTINUED)



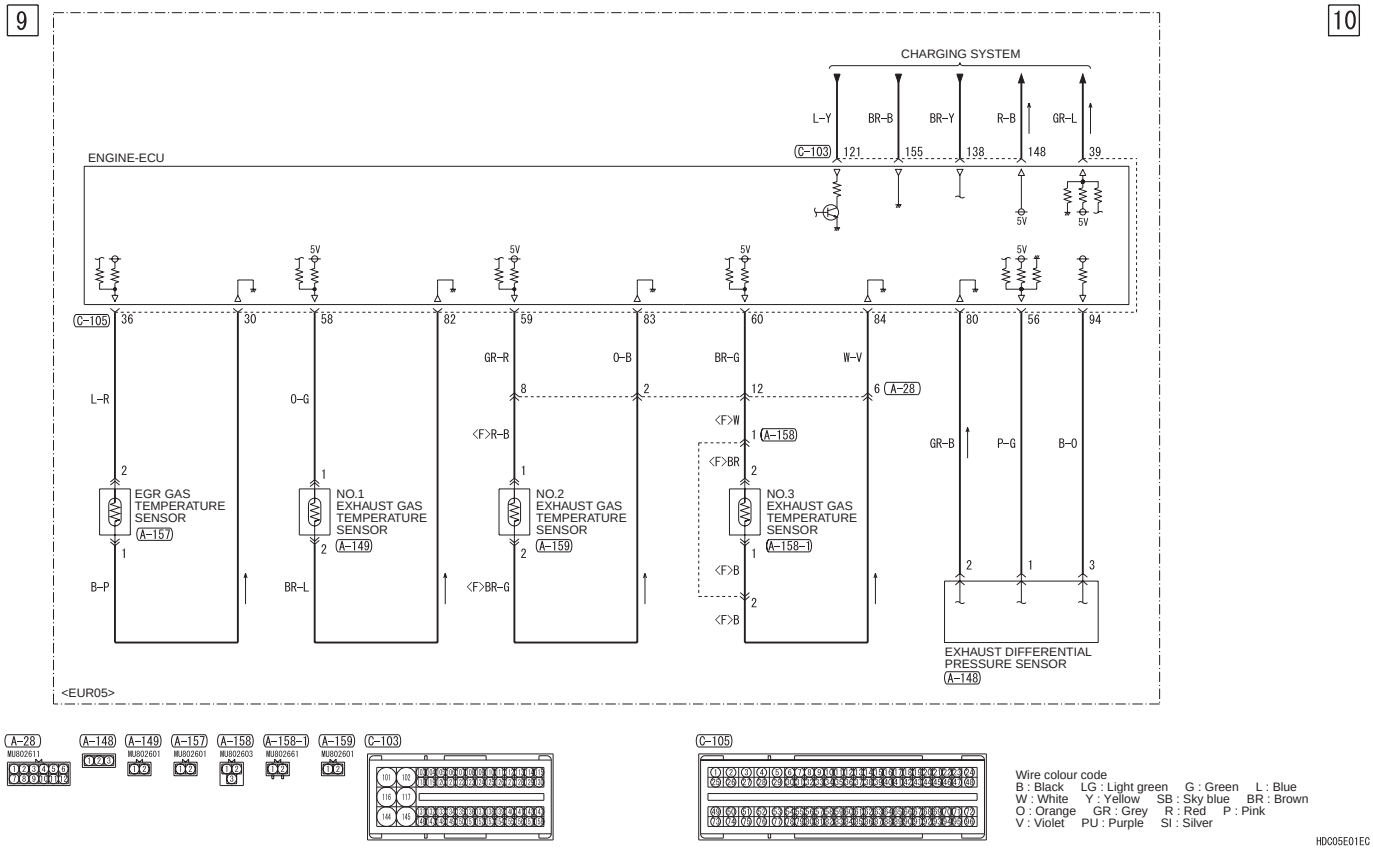
ENGINE CONTROL SYSTEM <LHD> (CONTINUED)



ENGINE CONTROL SYSTEM <LHD> (CONTINUED)

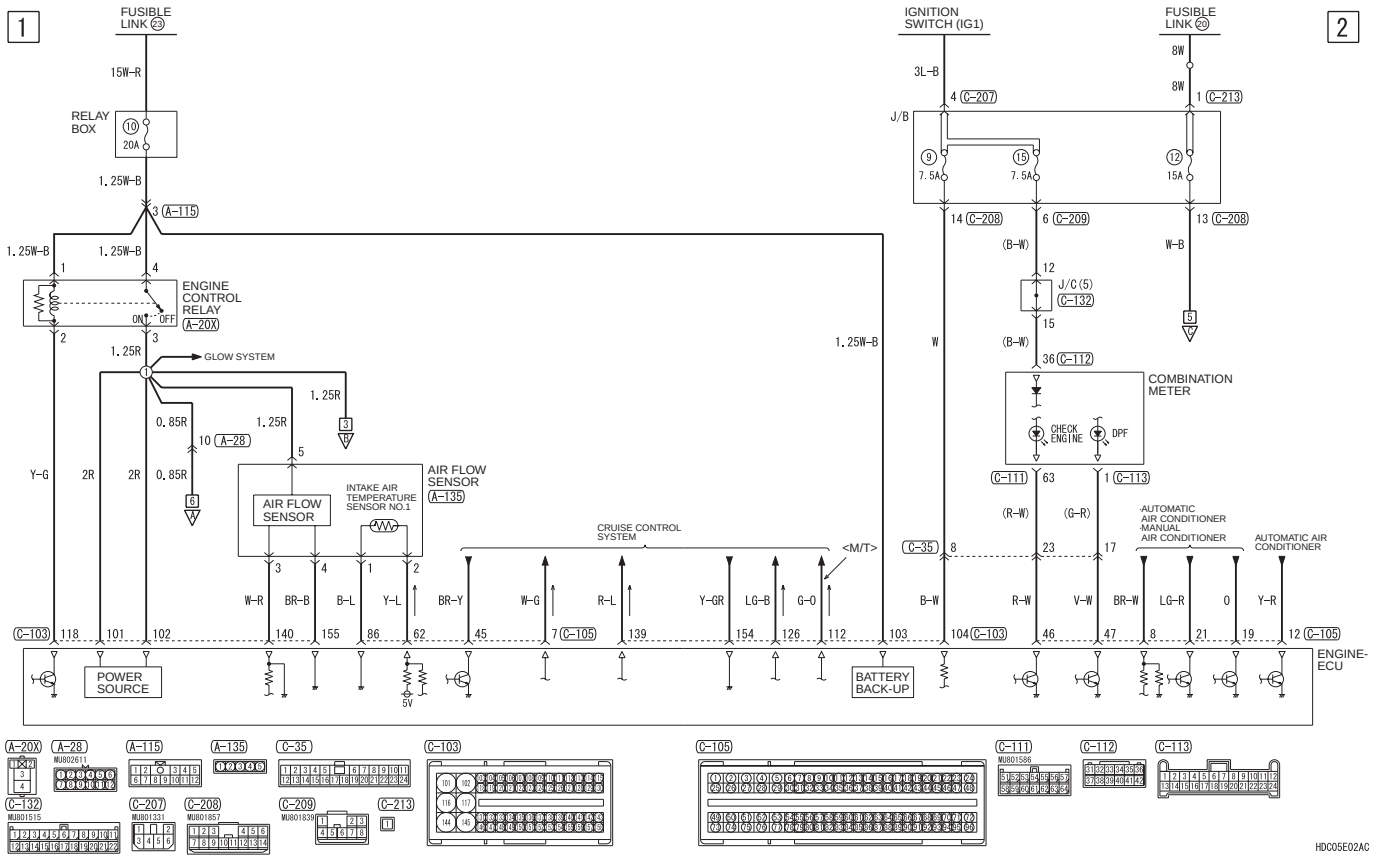


ENGINE CONTROL SYSTEM <LHD> (CONTINUED)

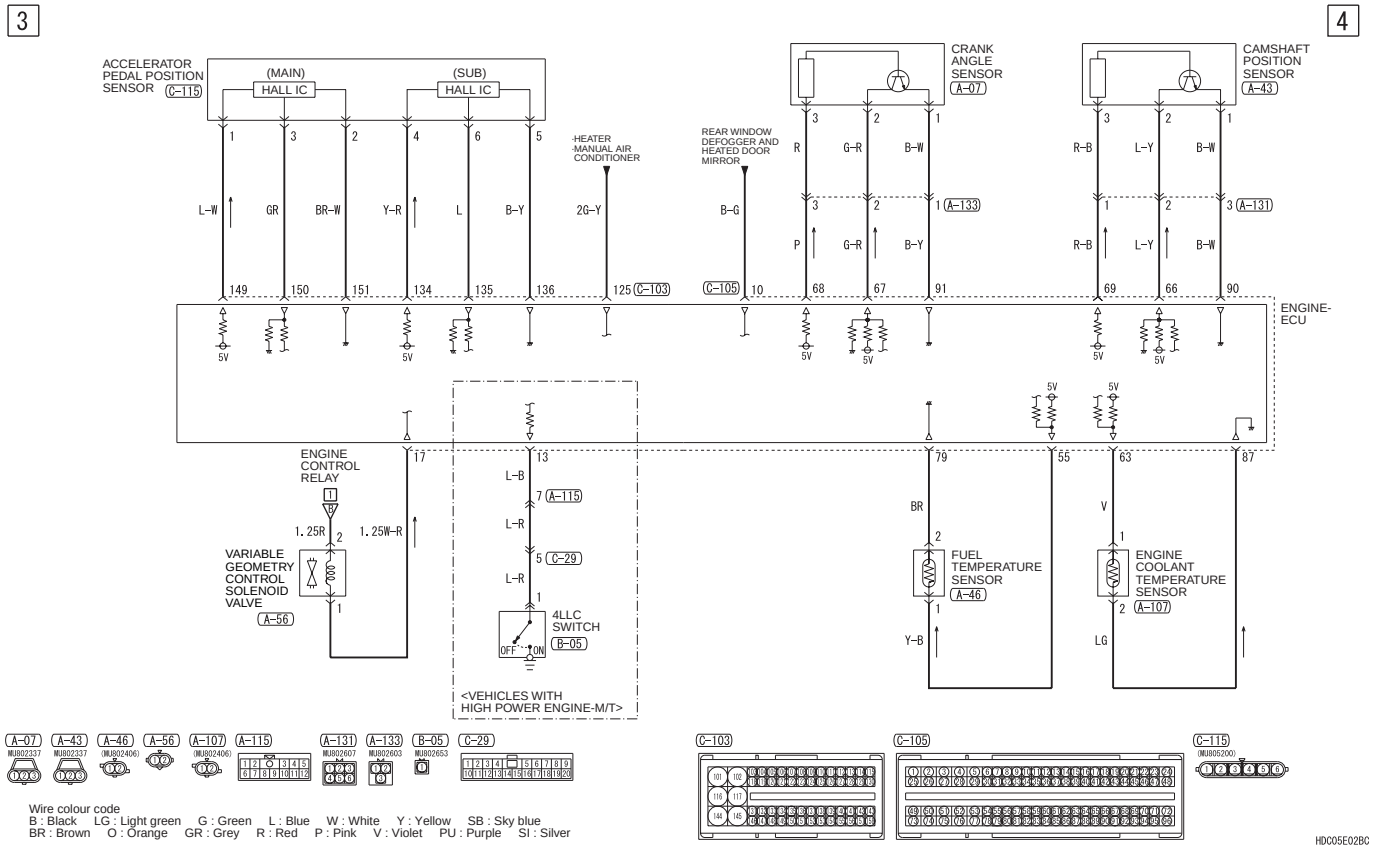


ENGINE CONTROL SYSTEM <RHD>

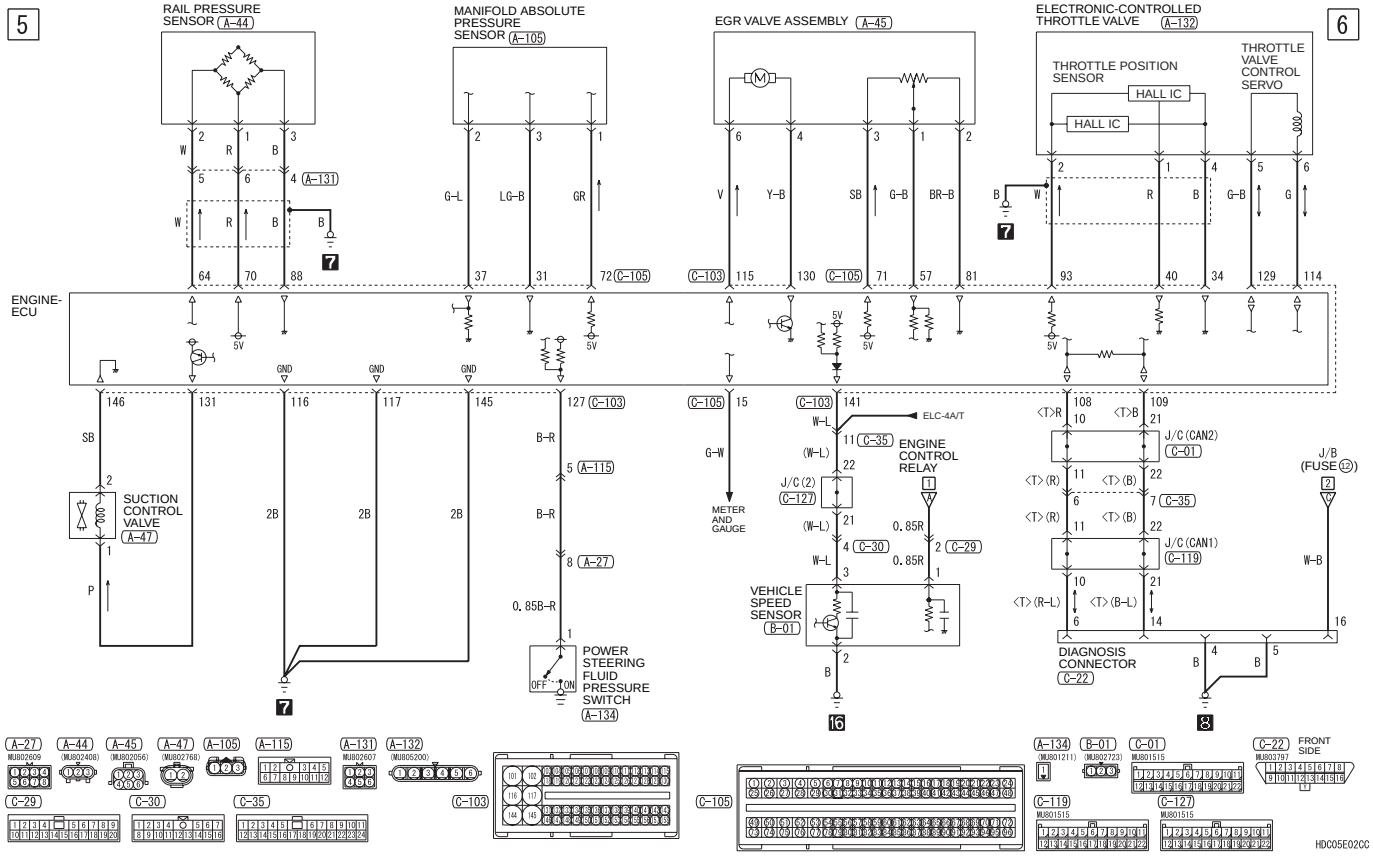
M1901000811387



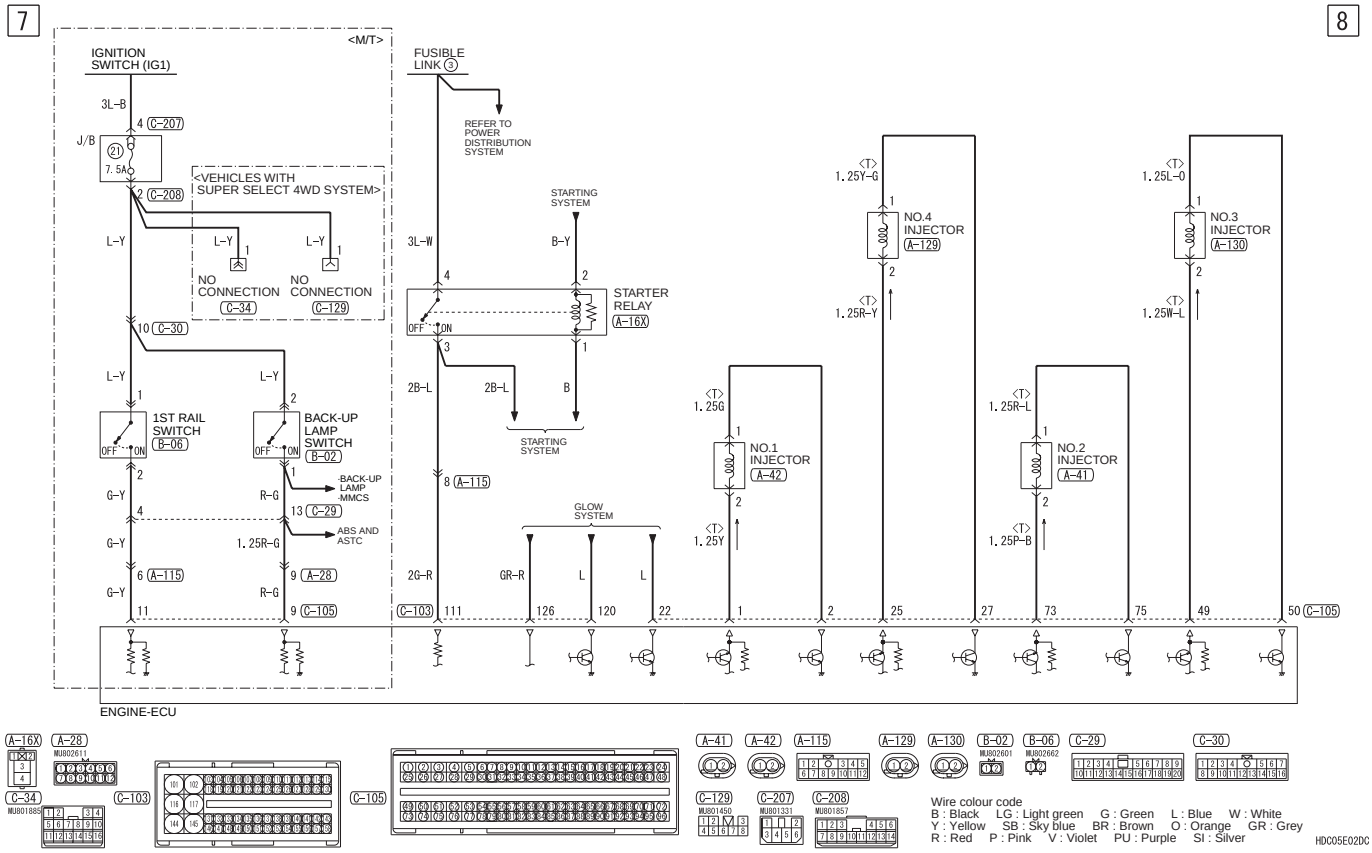
ENGINE CONTROL SYSTEM <RHD> (CONTINUED)



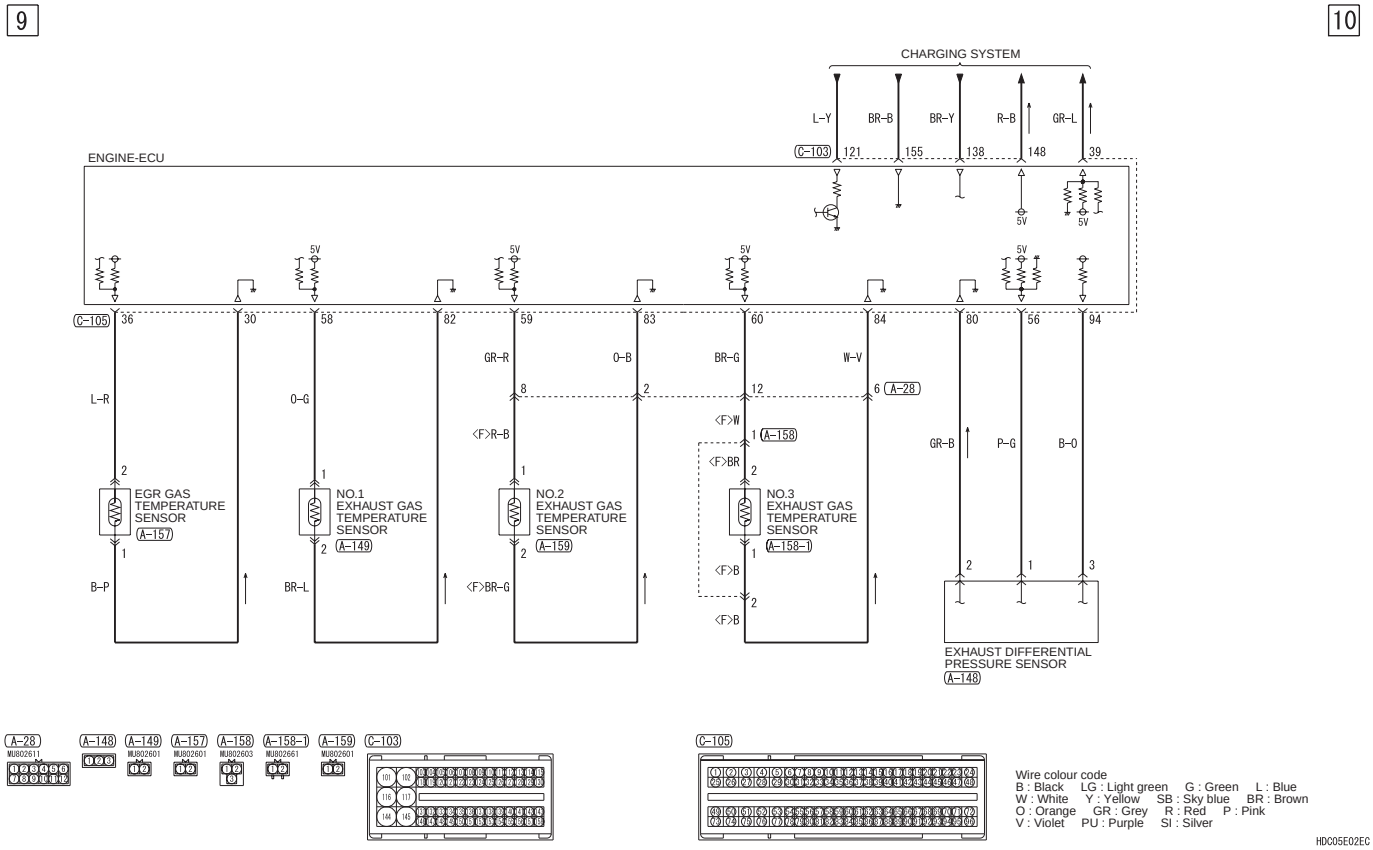
ENGINE CONTROL SYSTEM <RHD> (CONTINUED)



ENGINE CONTROL SYSTEM <RHD> (CONTINUED)



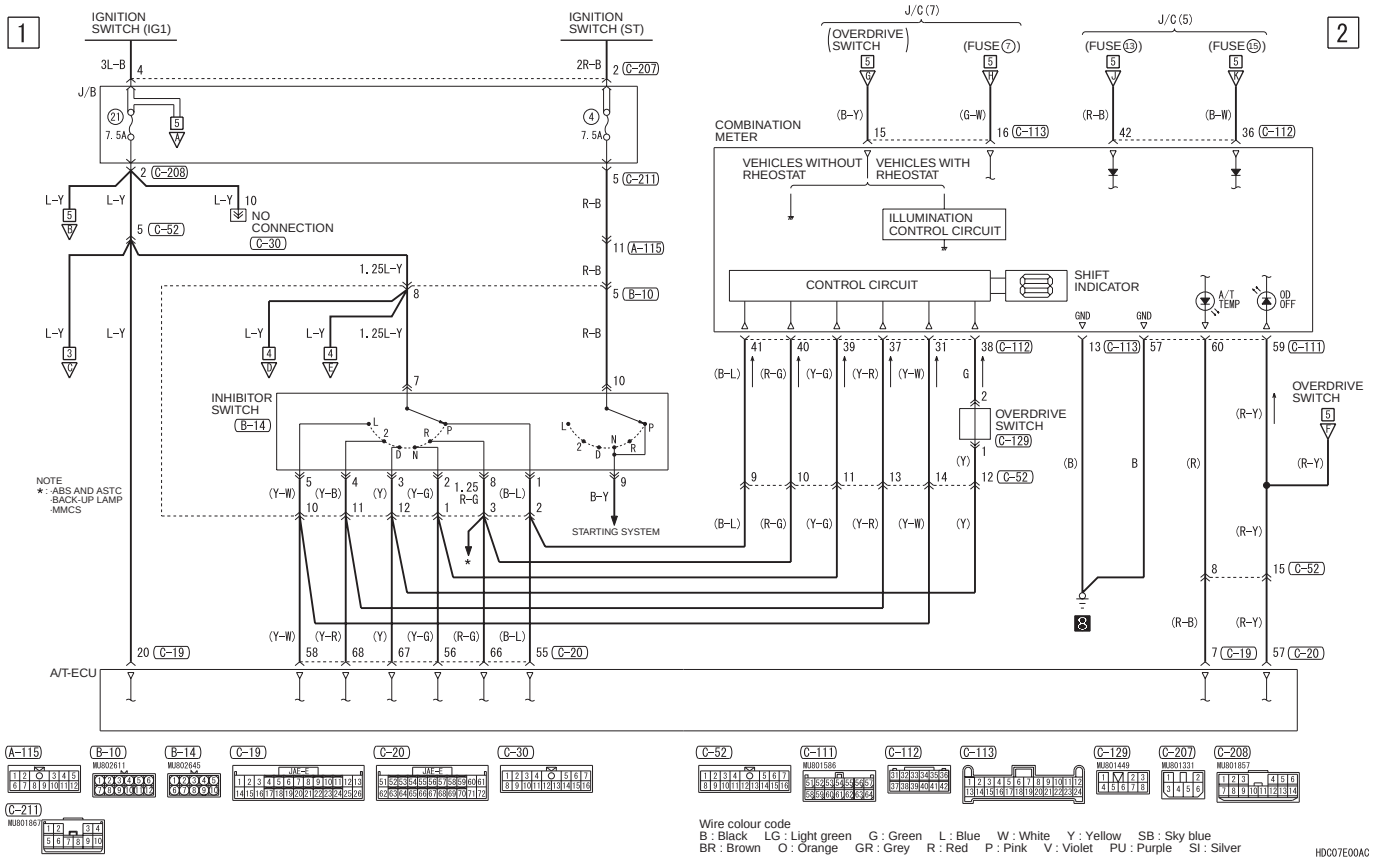
ENGINE CONTROL SYSTEM <RHD> (CONTINUED)



ELC-4A/T

ELC-4A/T <LHD>

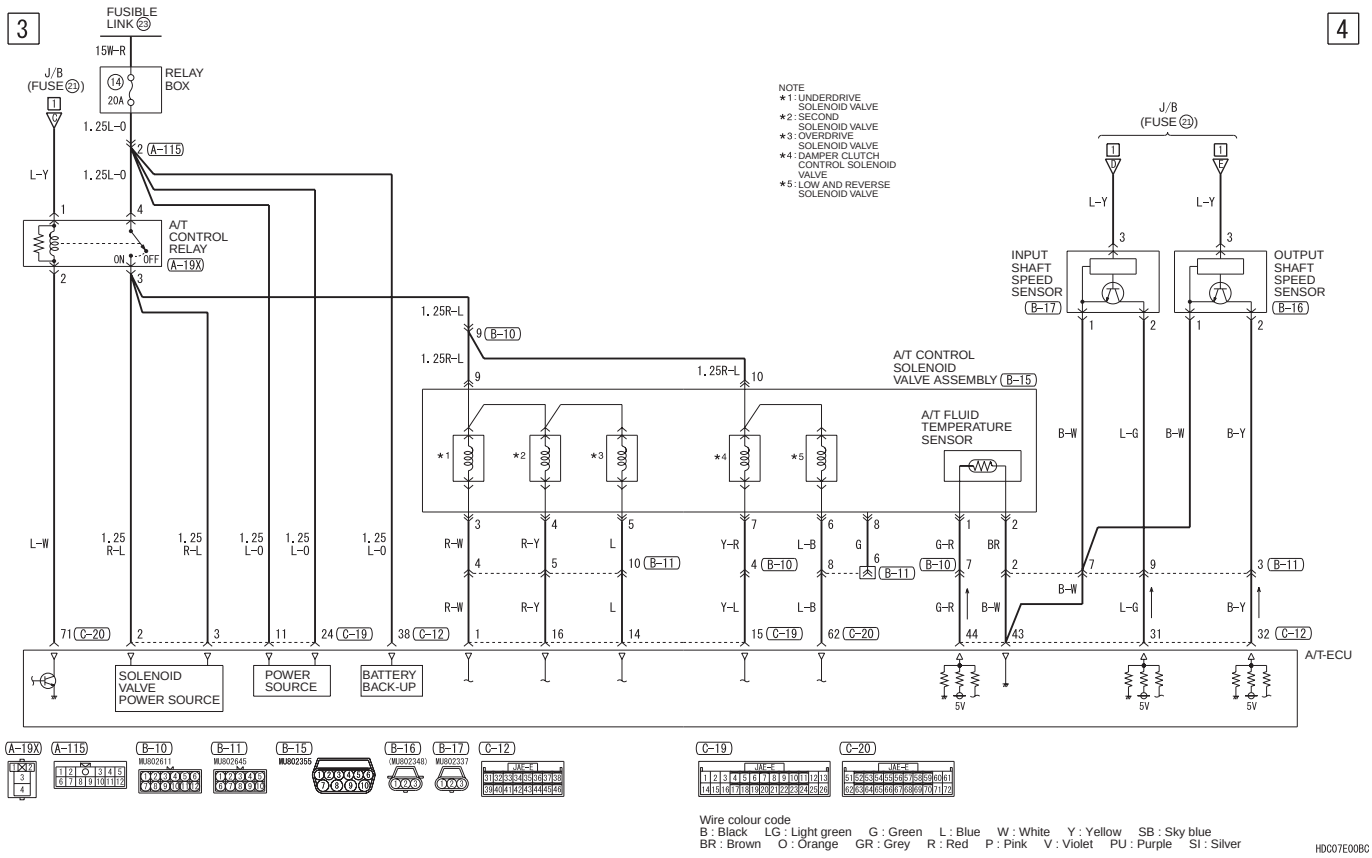
M1901024101035



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HDC07E00AC

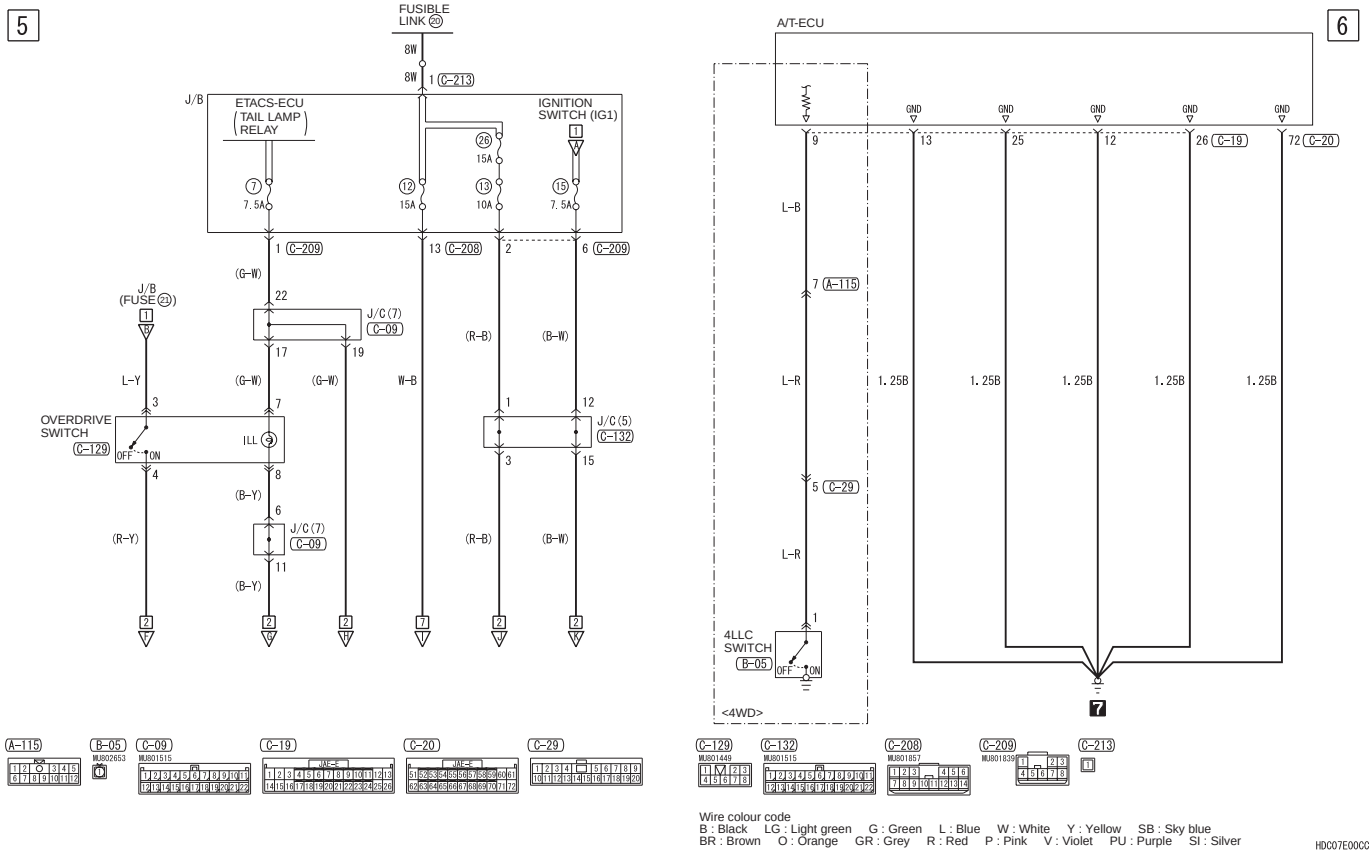
ELC-4A/T <LHD> (CONTINUED)



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HDC07E00BC

ELC-4A/T <LHD> (CONTINUED)



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HDC07E00CC

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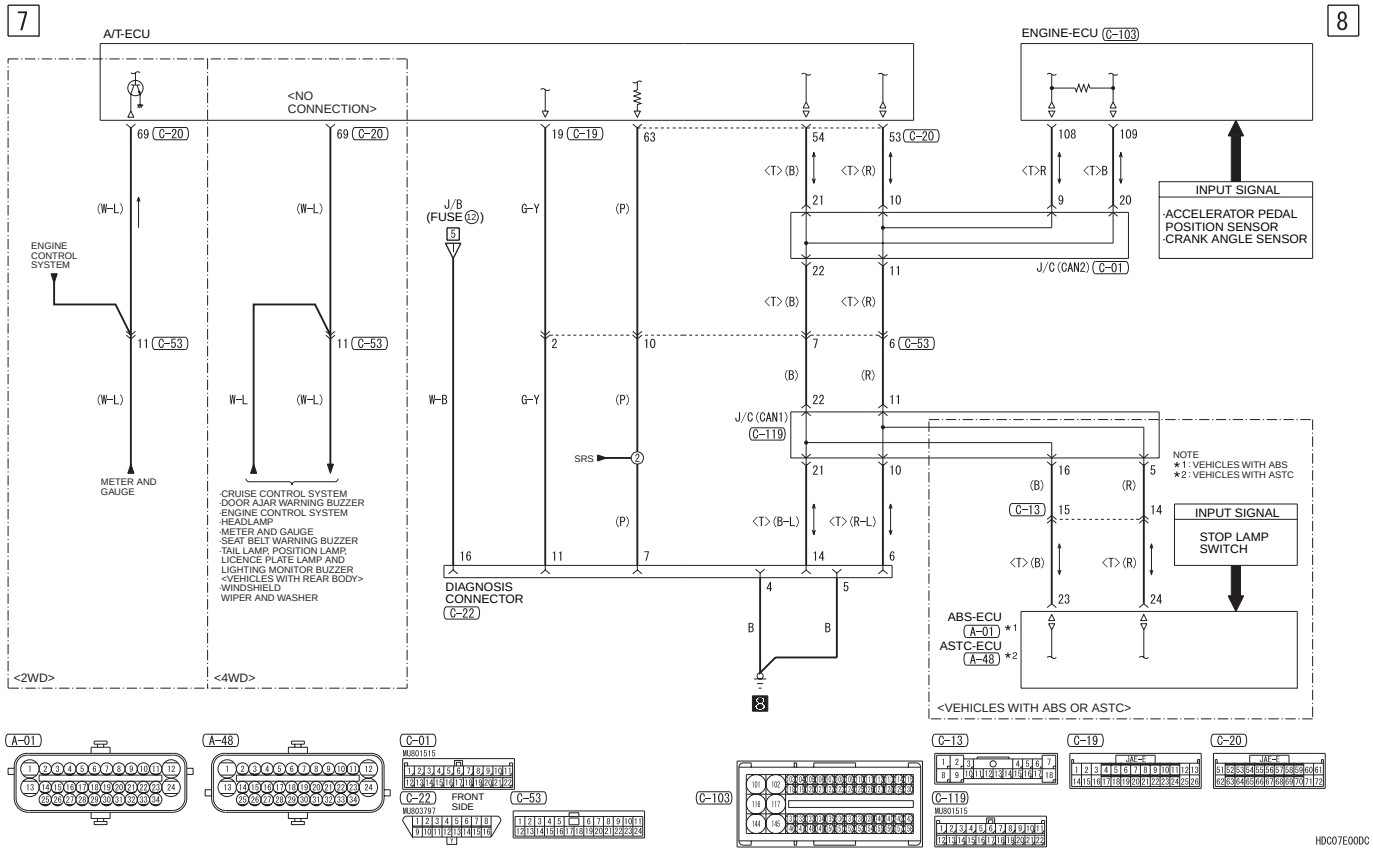

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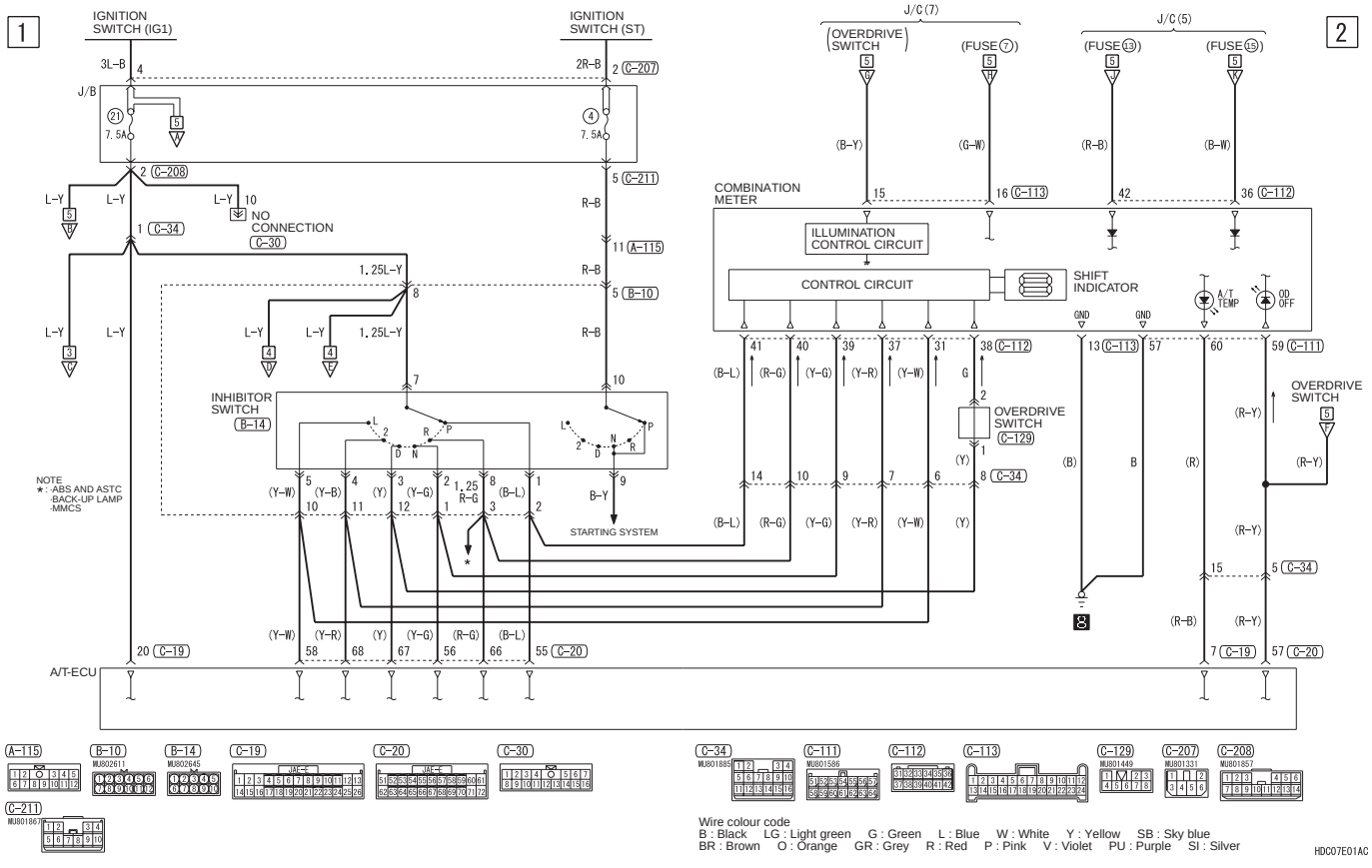

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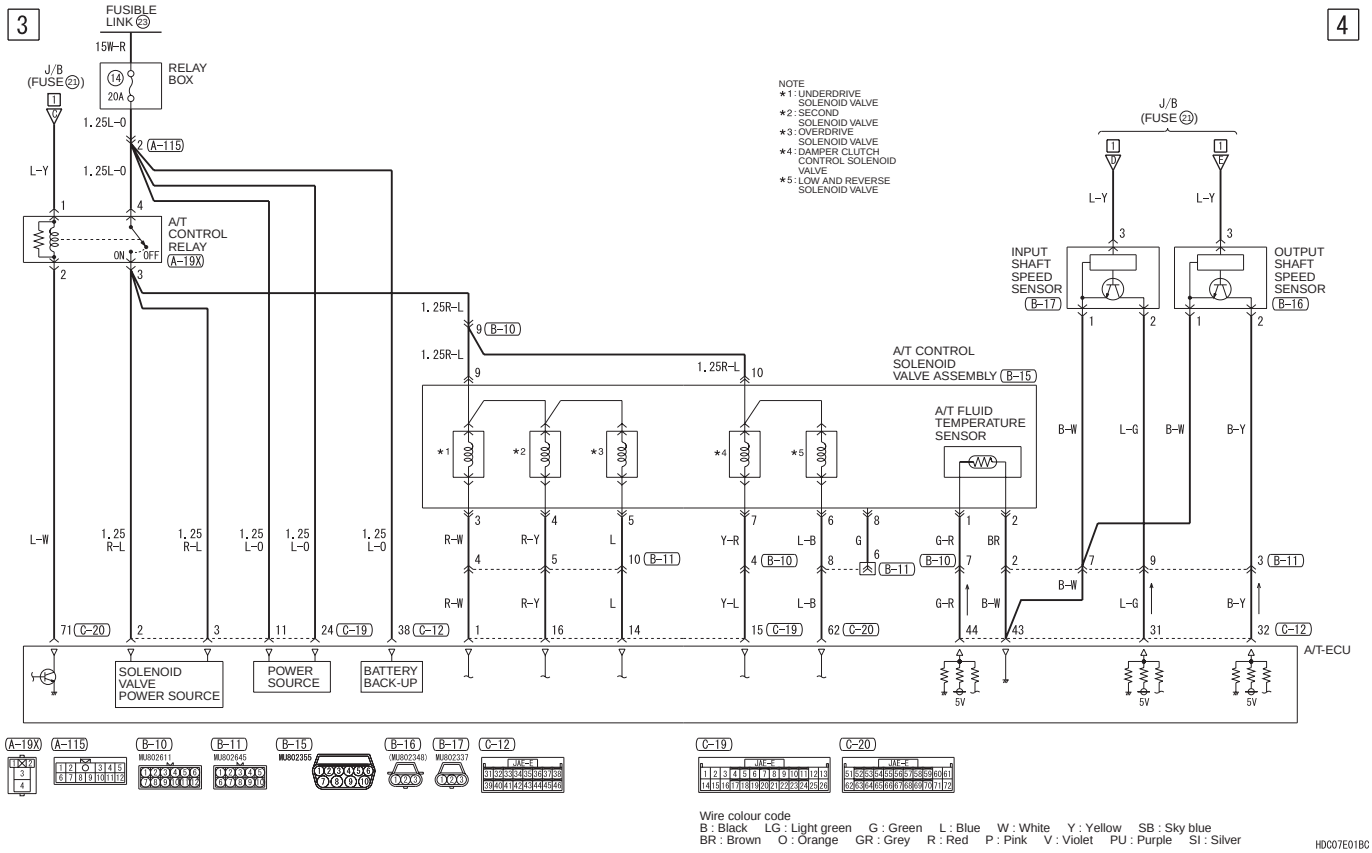
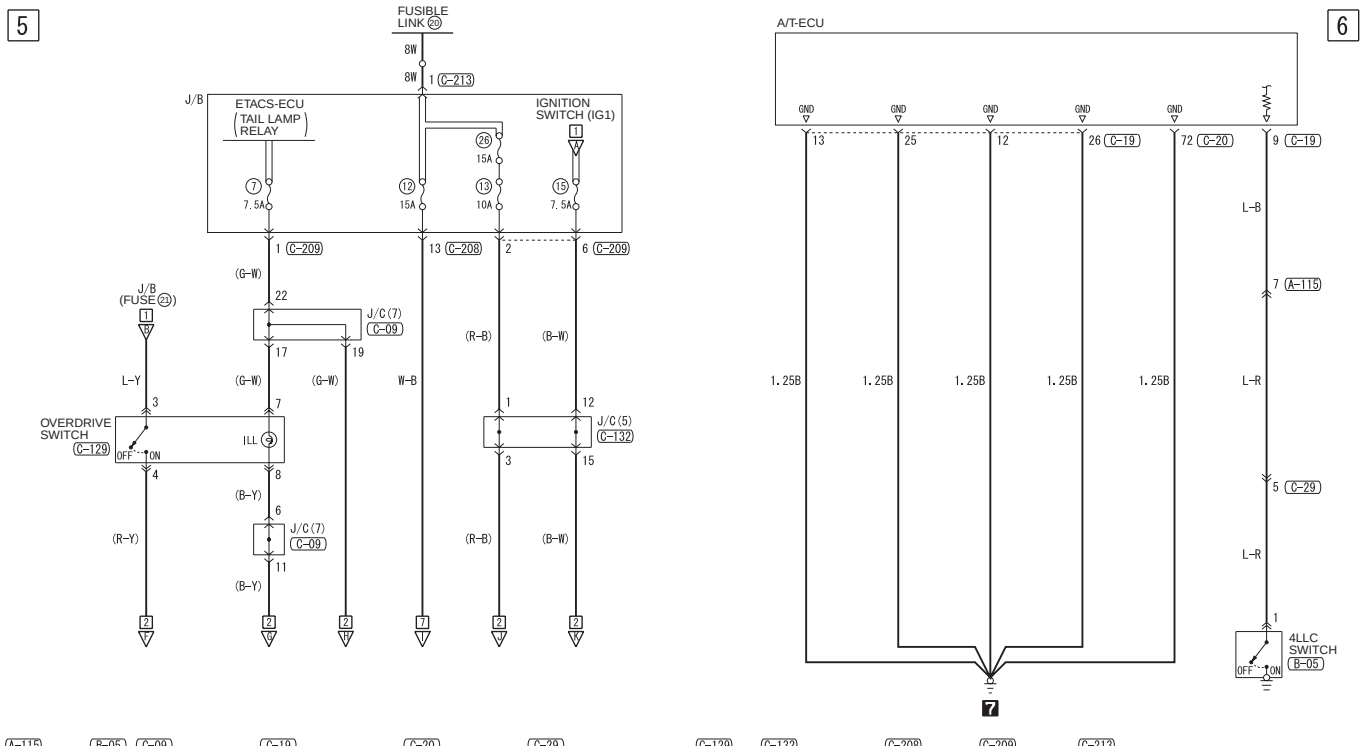


Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HDC07E01BC

ELC-4A/T <RHD> (CONTINUED)



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
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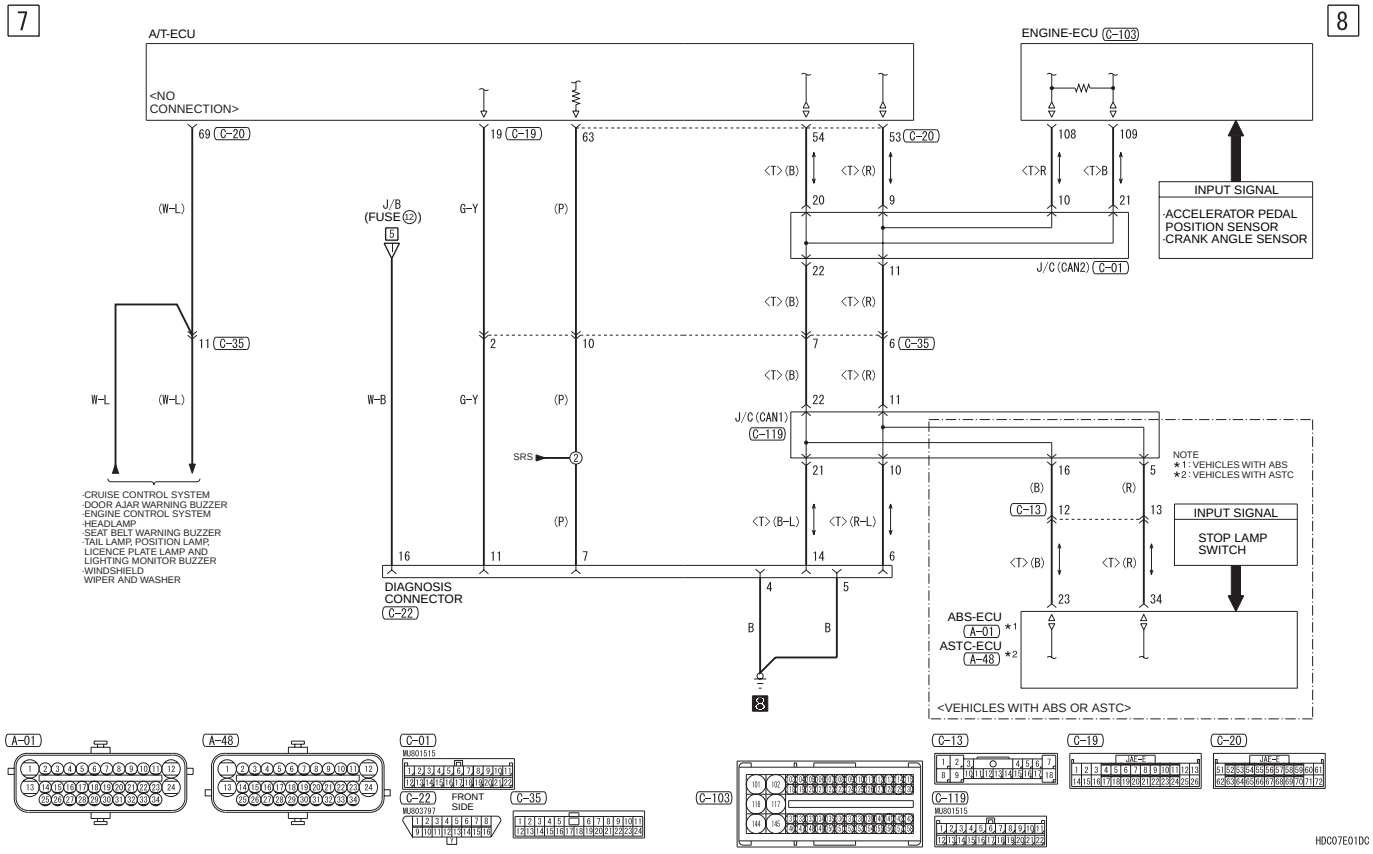
HDC07E01CC

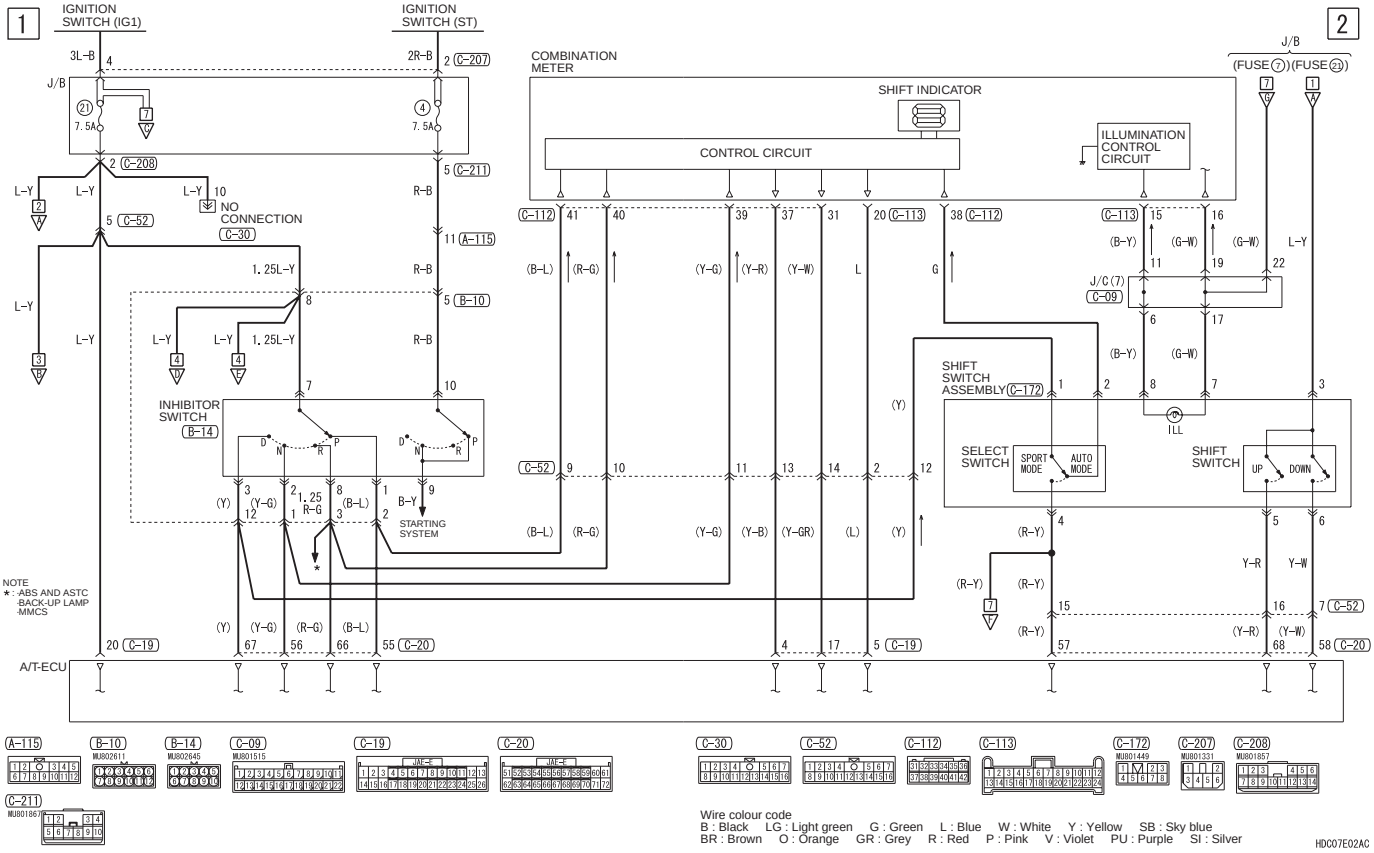
ELC-4A/T <RHD> (CONTINUED)



ELC-5A/T

ELC-5A/T <LHD>

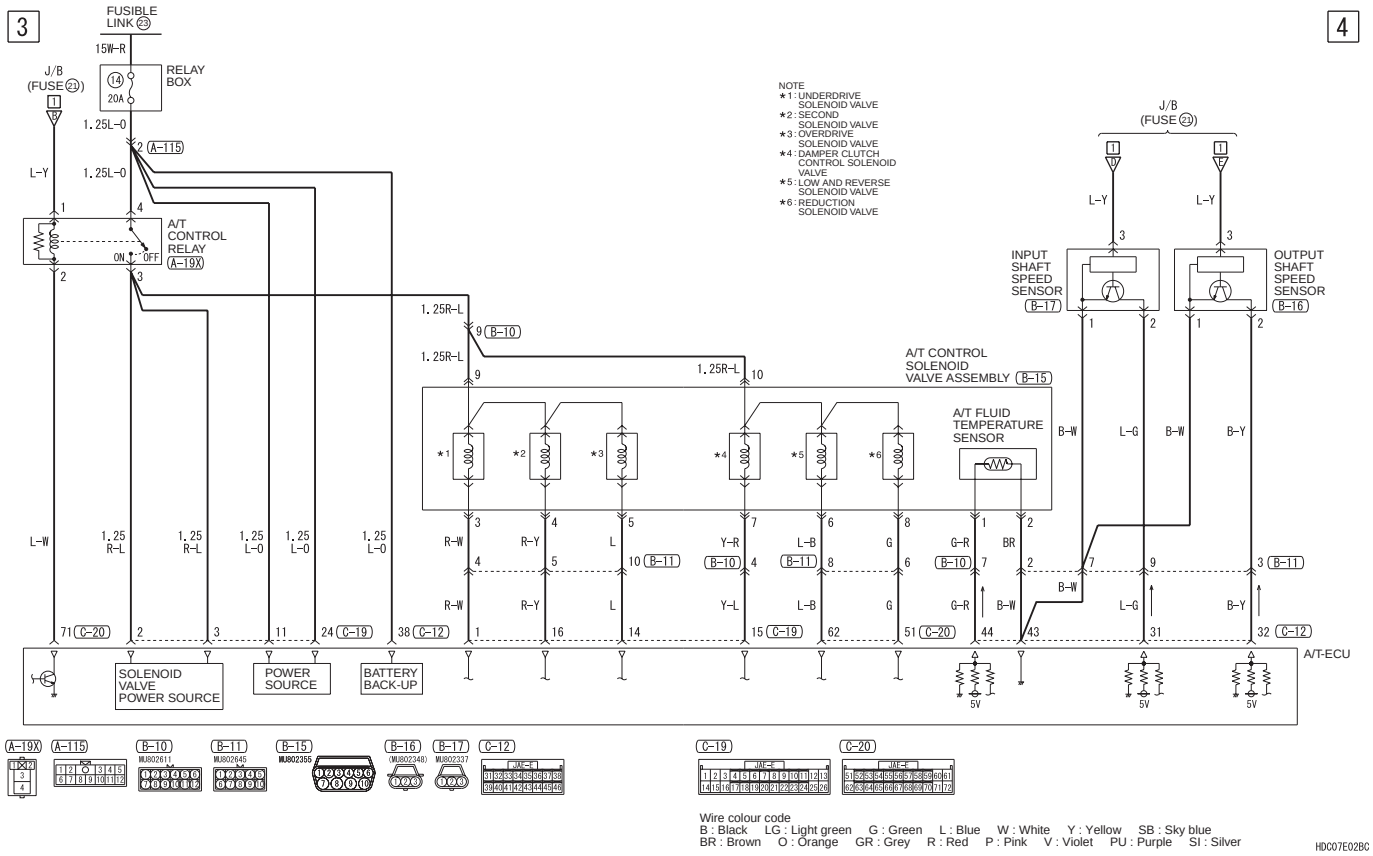
M1901035300267



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HDC07E02AC

ELC-5A/T <LHD> (CONTINUED)



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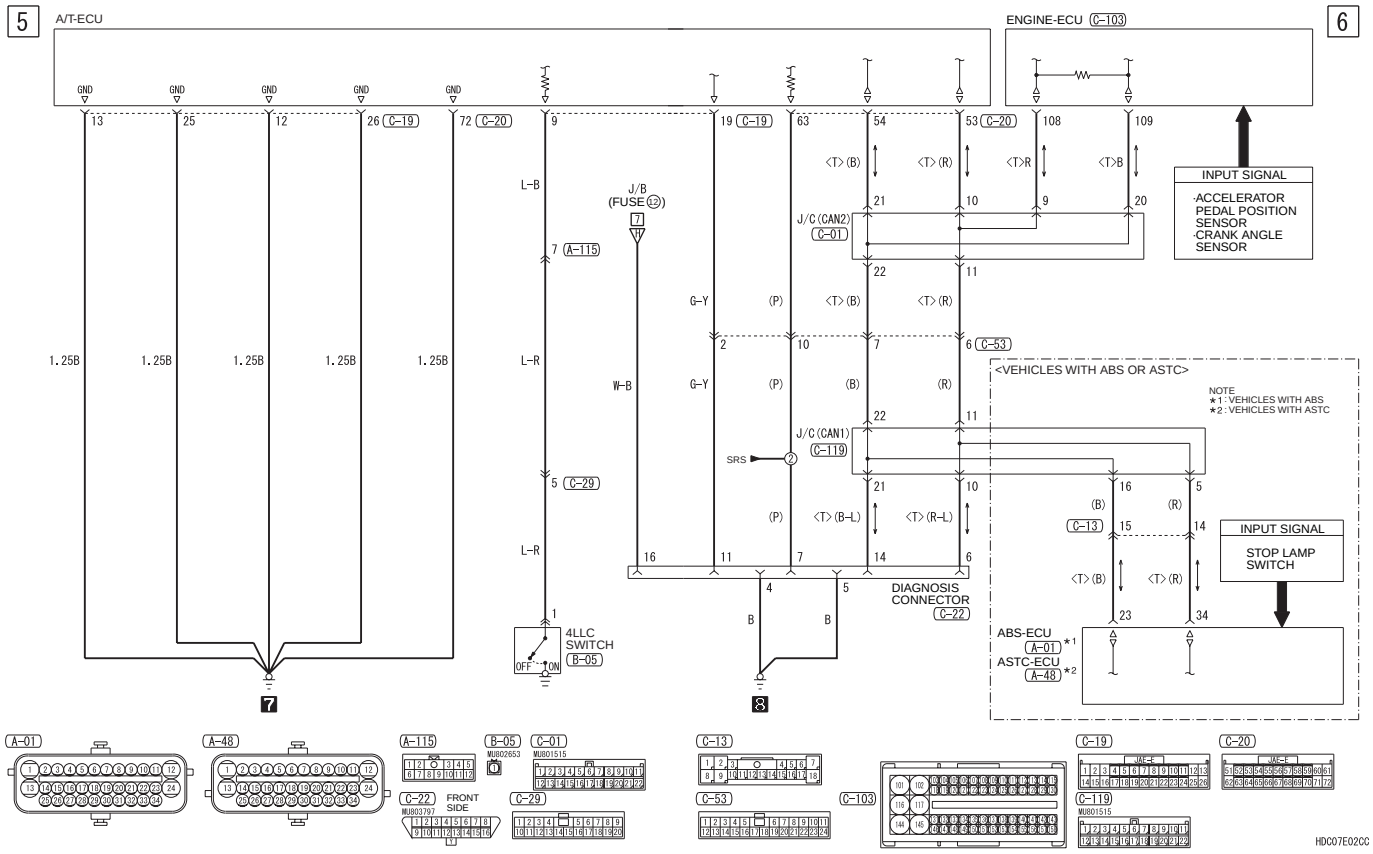

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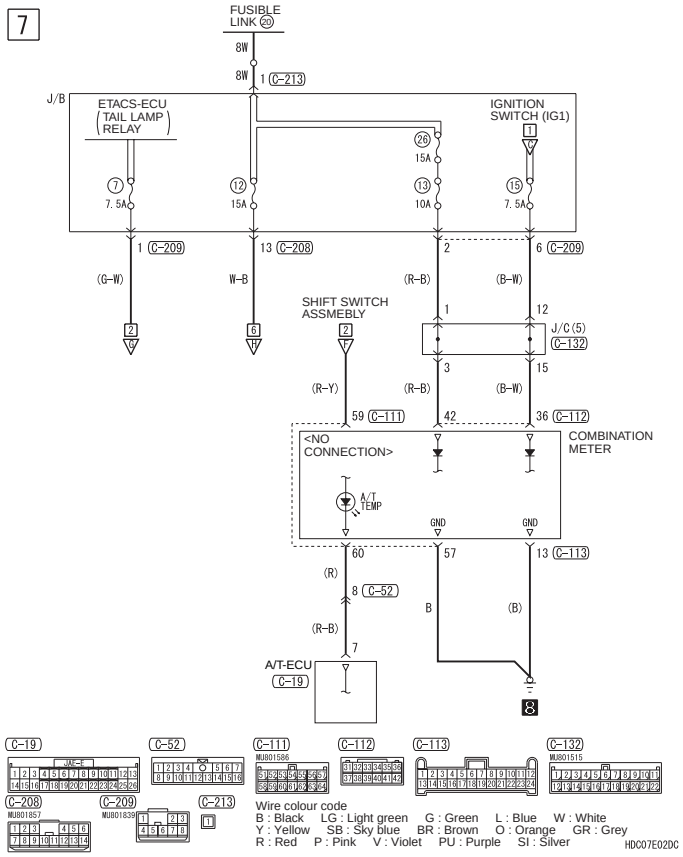

ELC-5A/T <RHD>

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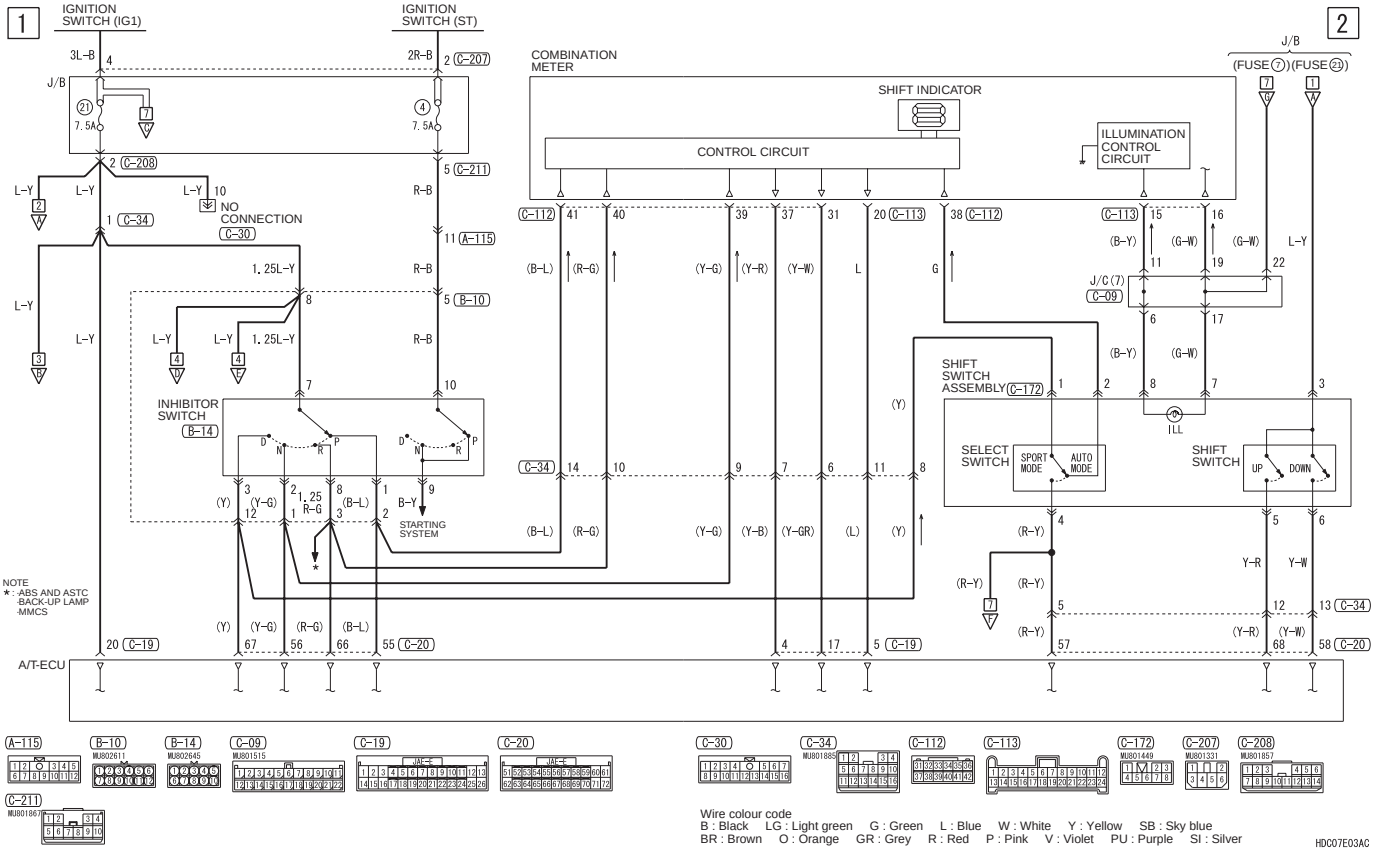
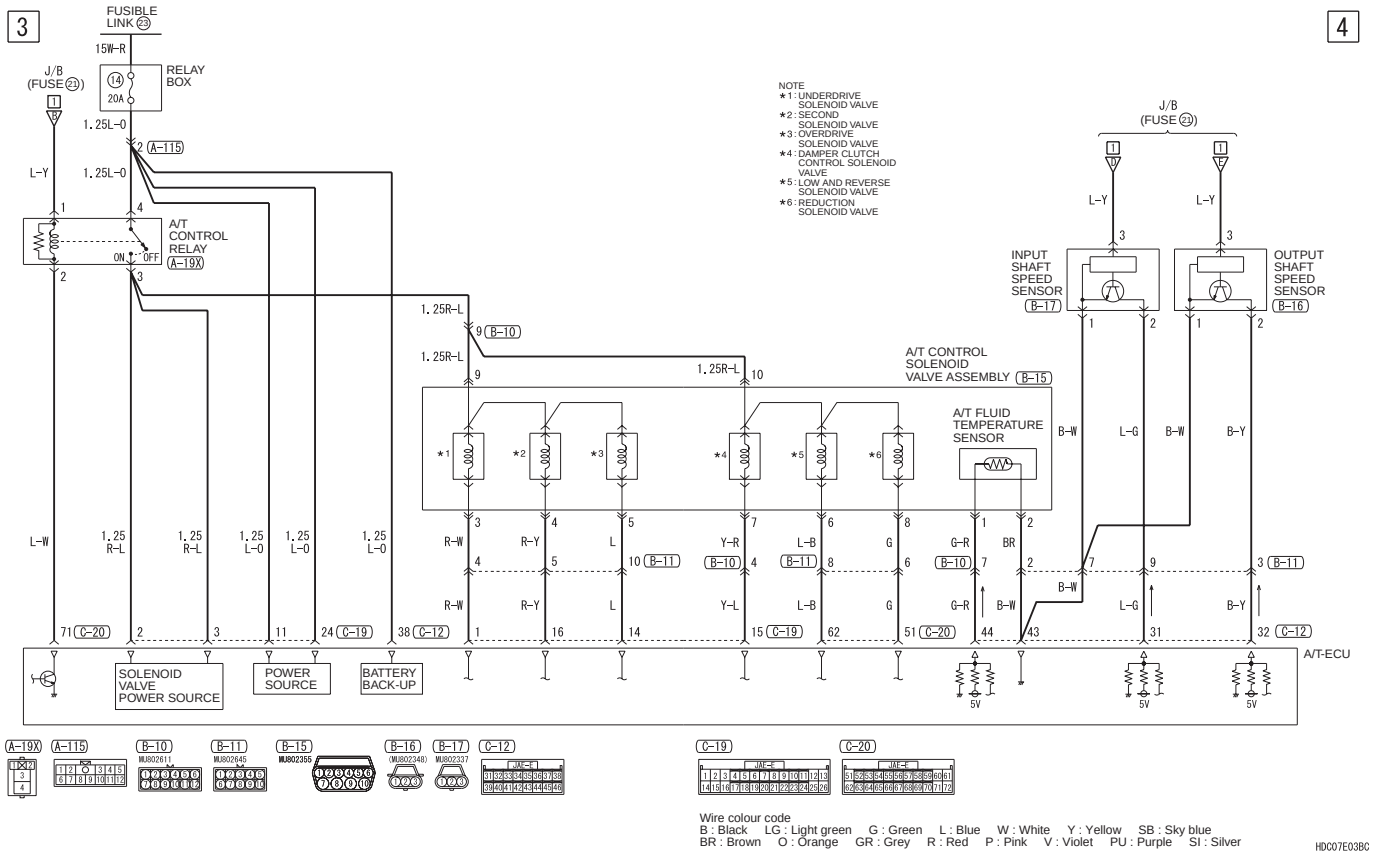


ELC-5A/T <RHD> (CONTINUED)



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HDC07E03BC

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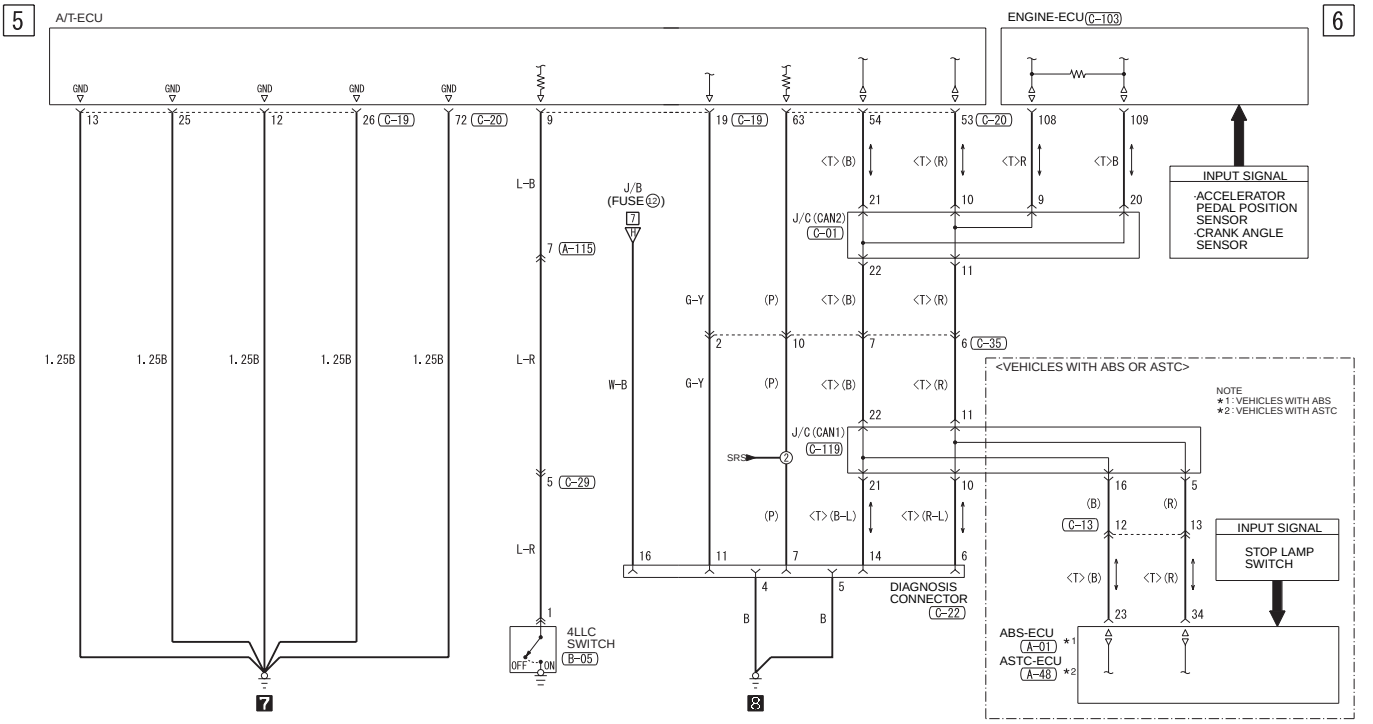

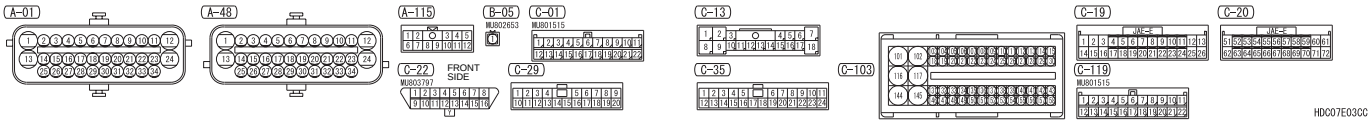

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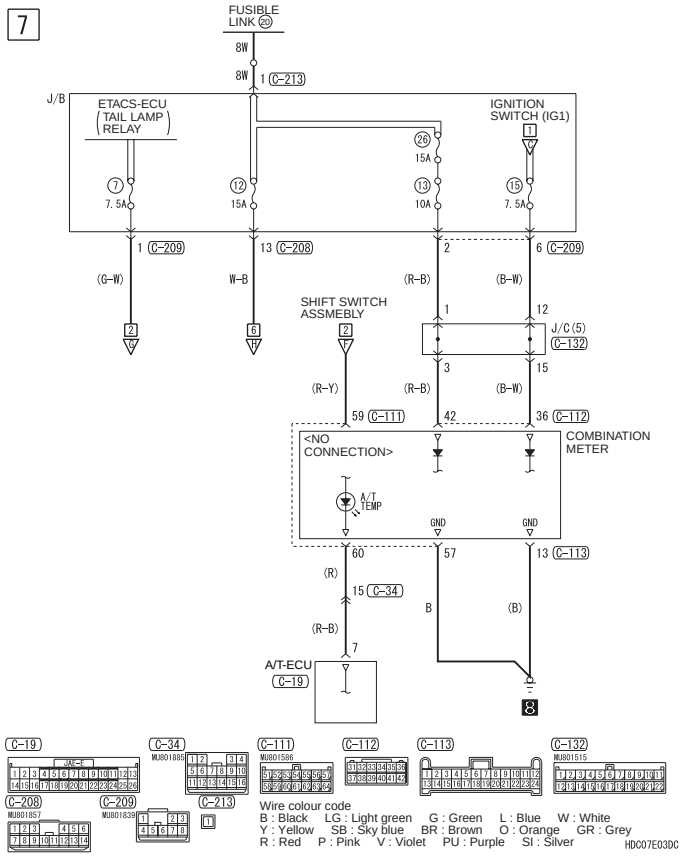
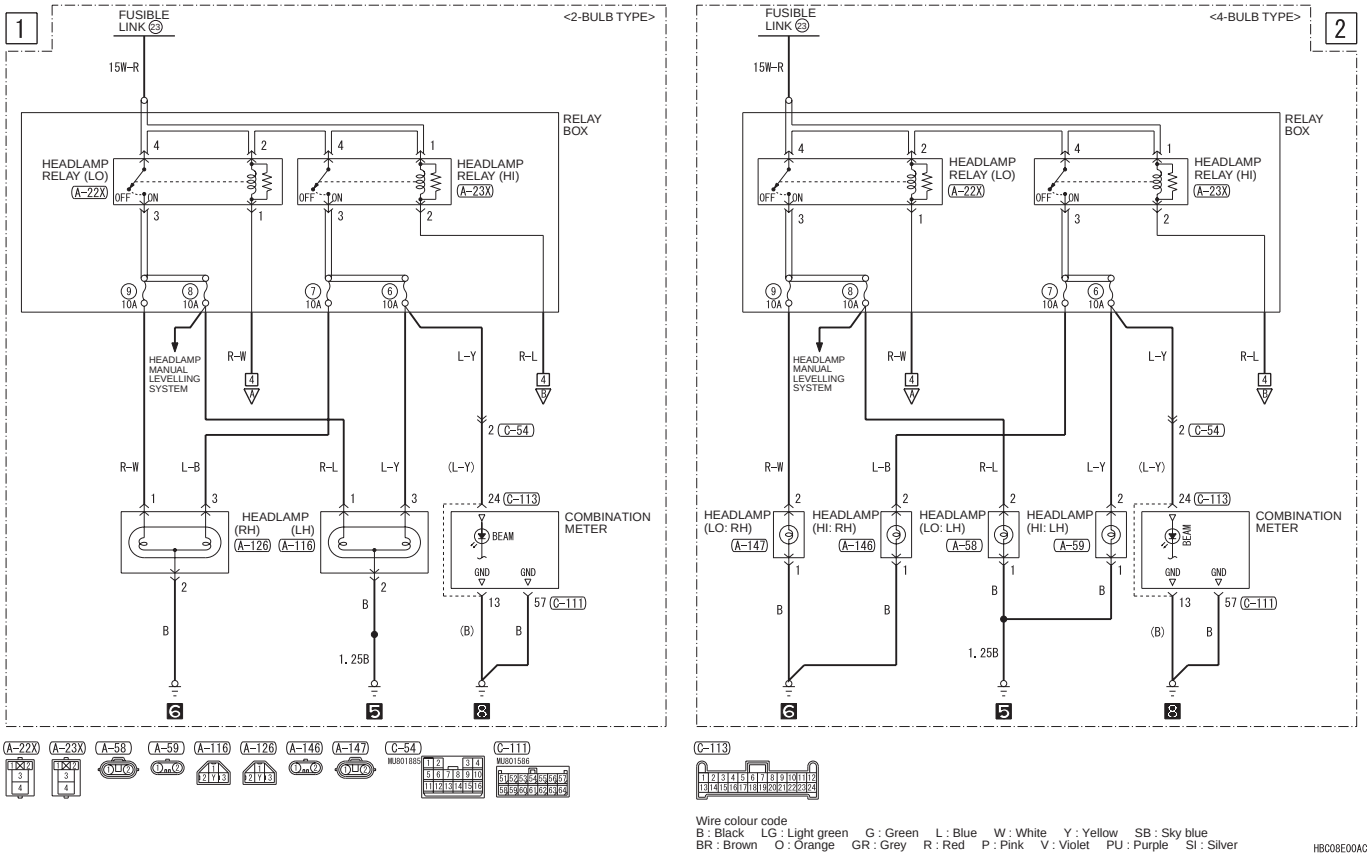


HEADLAMP

HEADLAMP <LHD (VEHICLES WITHOUT DAYTIME RUNNING LIGHT)>

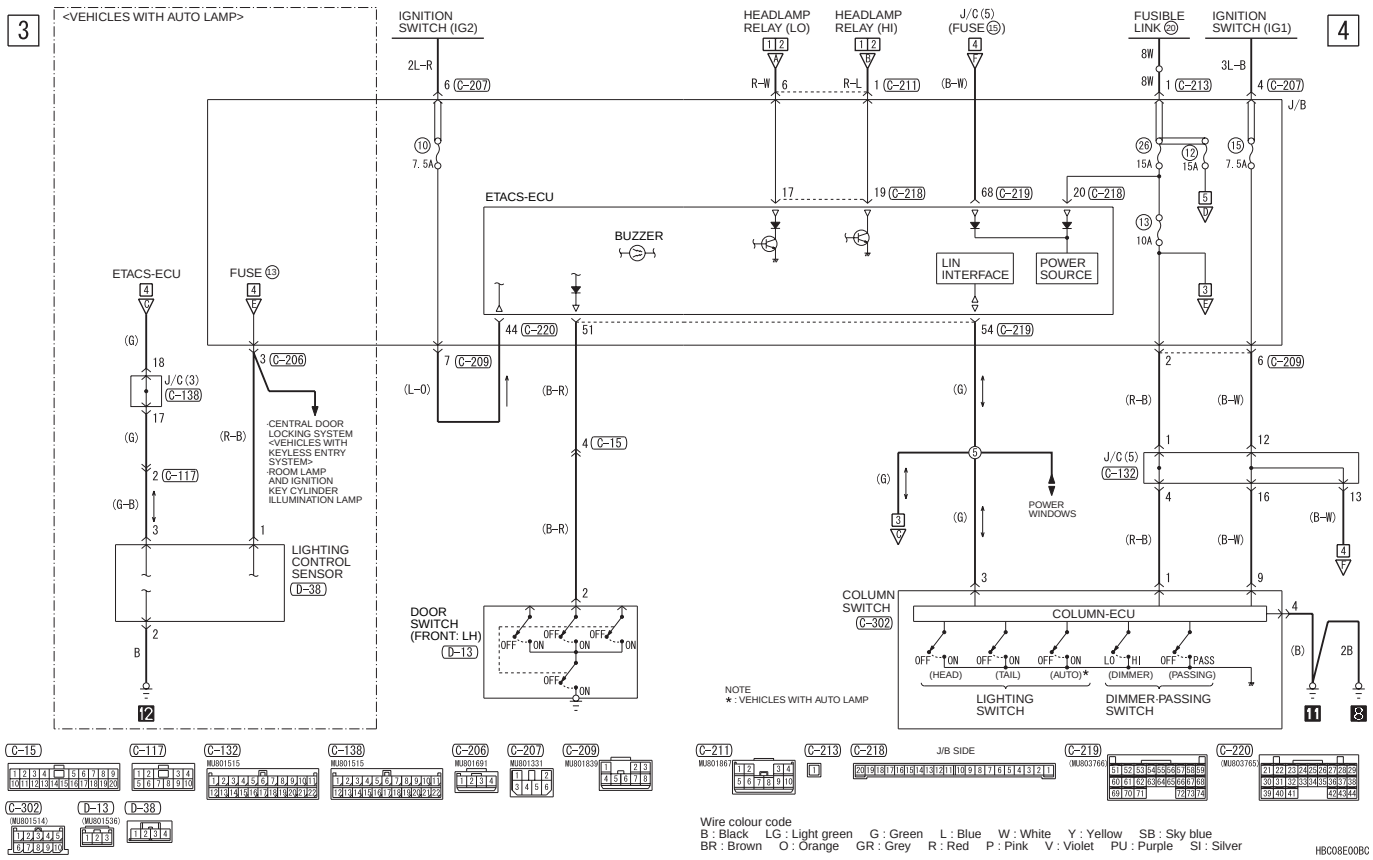
M1901001506725



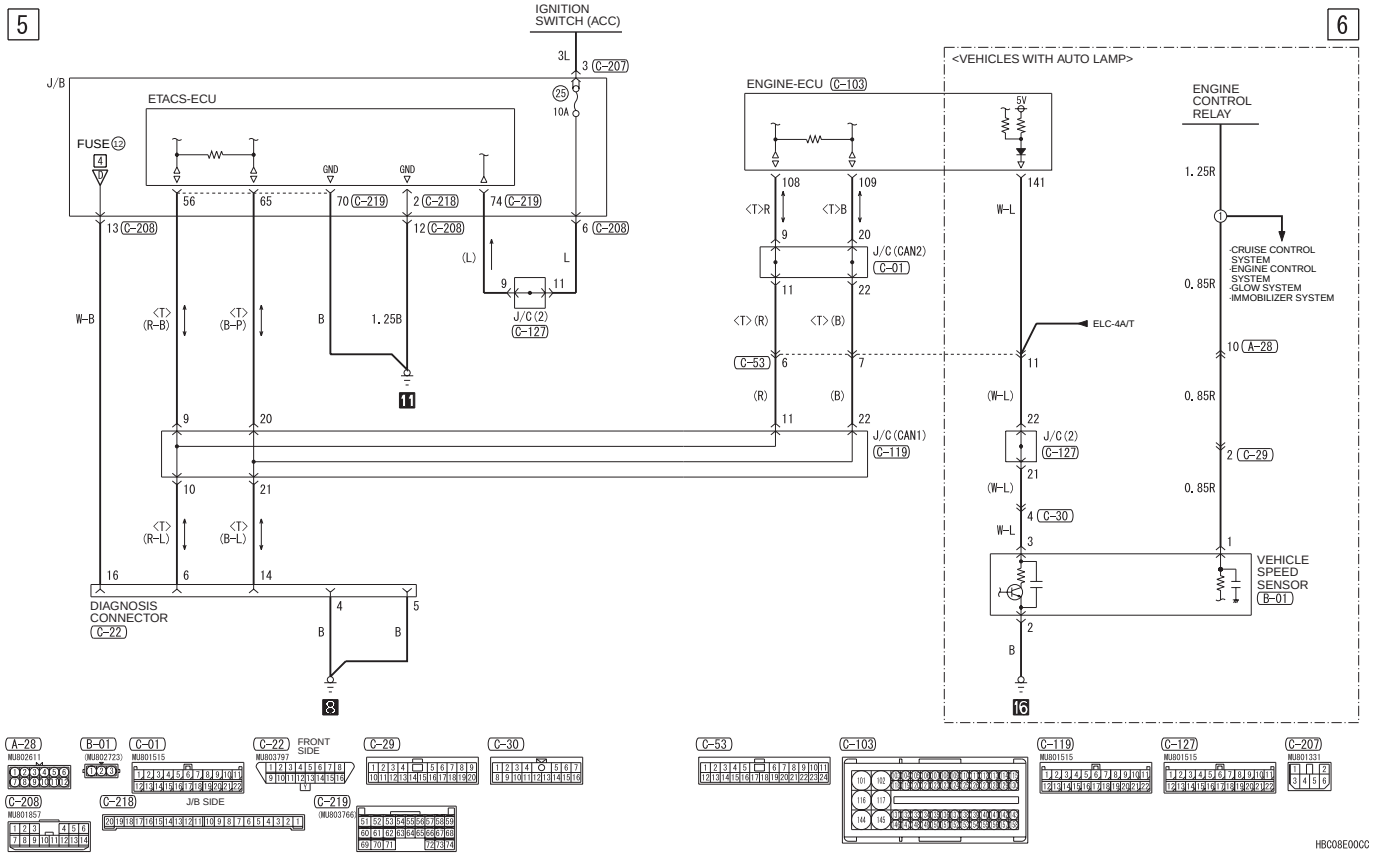
Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HBC08E00AC

HEADLAMP <LHD (VEHICLES WITHOUT DAYTIME RUNNING LIGHT)> (CONTINUED)

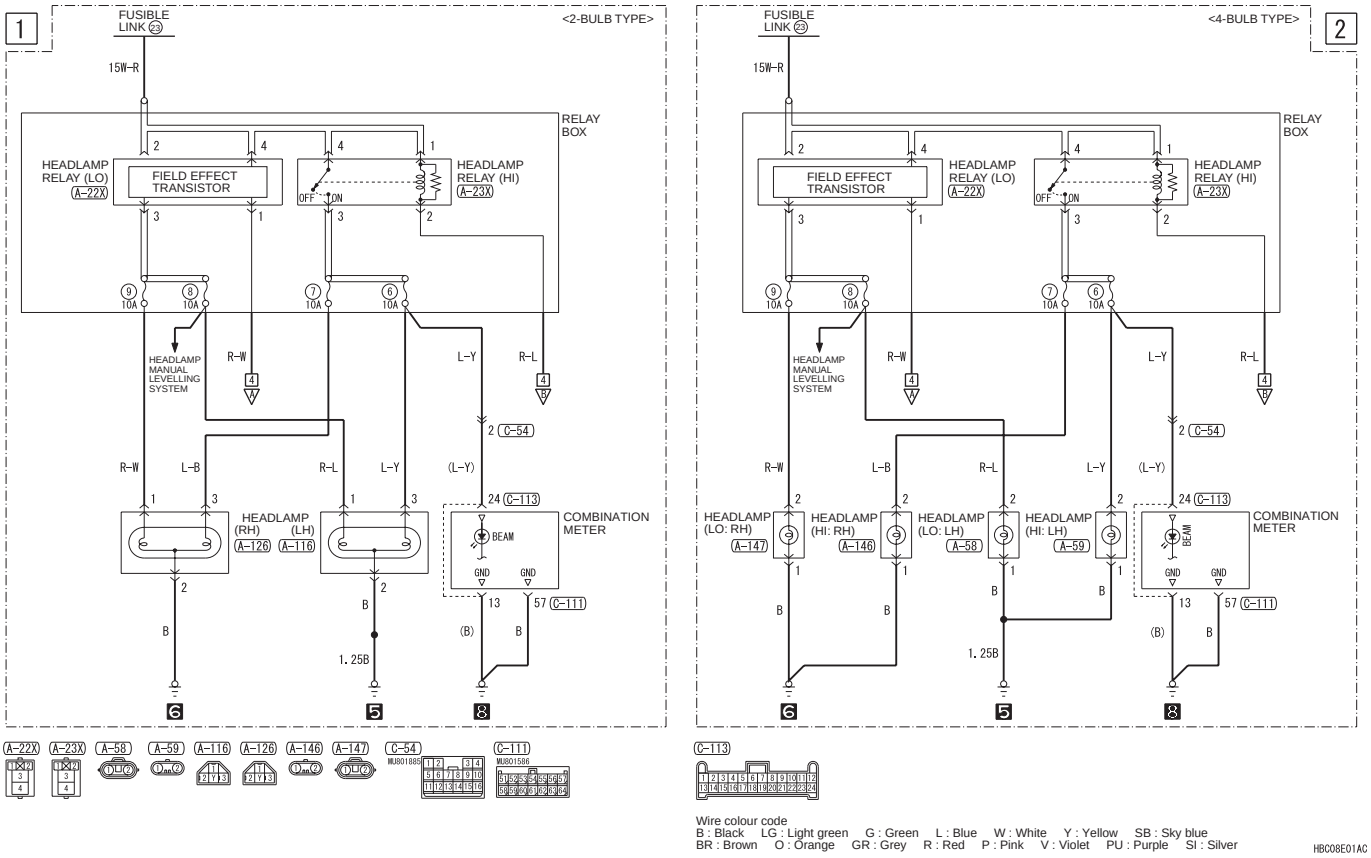


HEADLAMP <LHD (VEHICLES WITHOUT DAYTIME RUNNING LIGHT)> (CONTINUED)



HEADLAMP <LHD (VEHICLES WITH DAYTIME RUNNING LIGHT)>

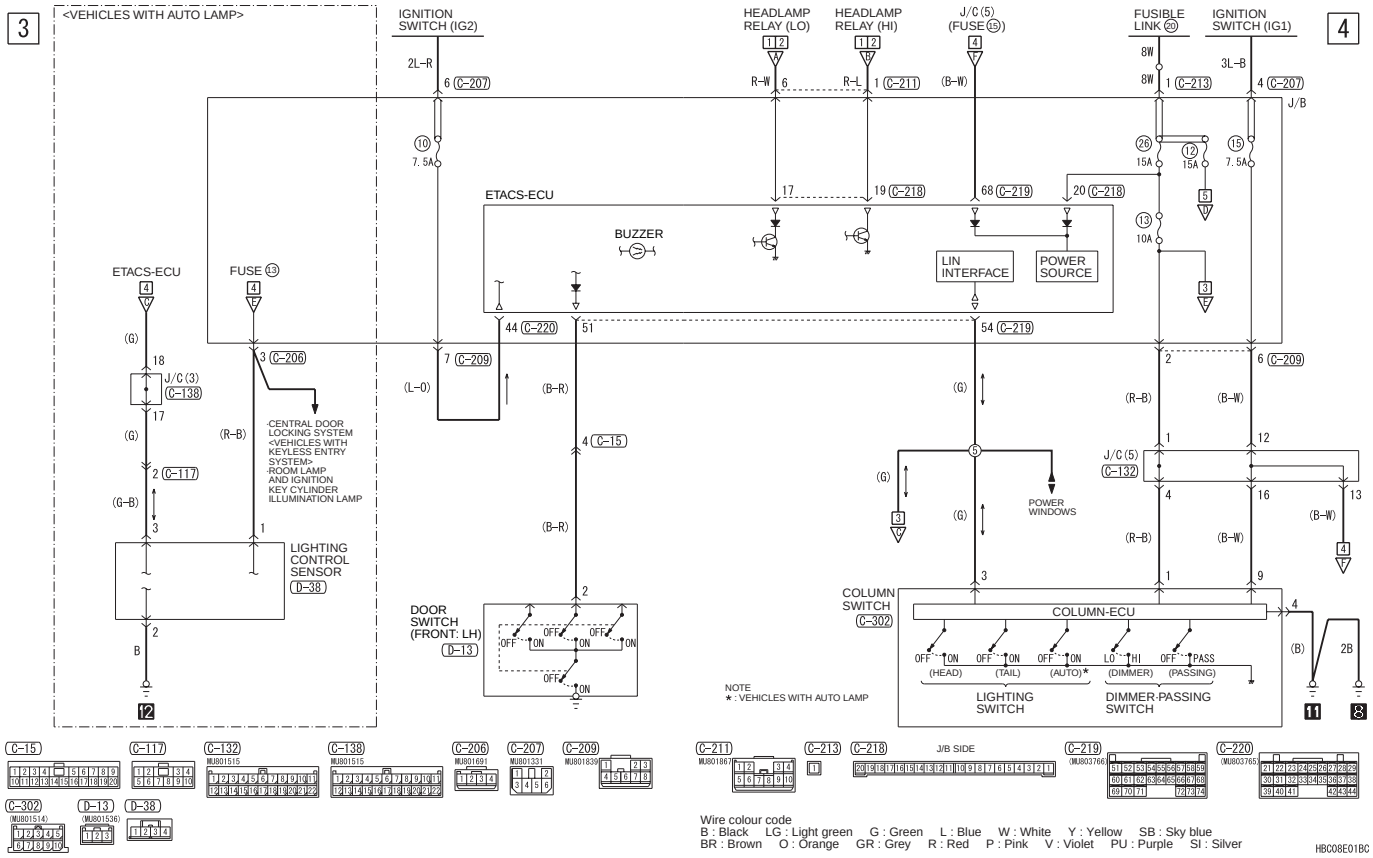
M1901001506736



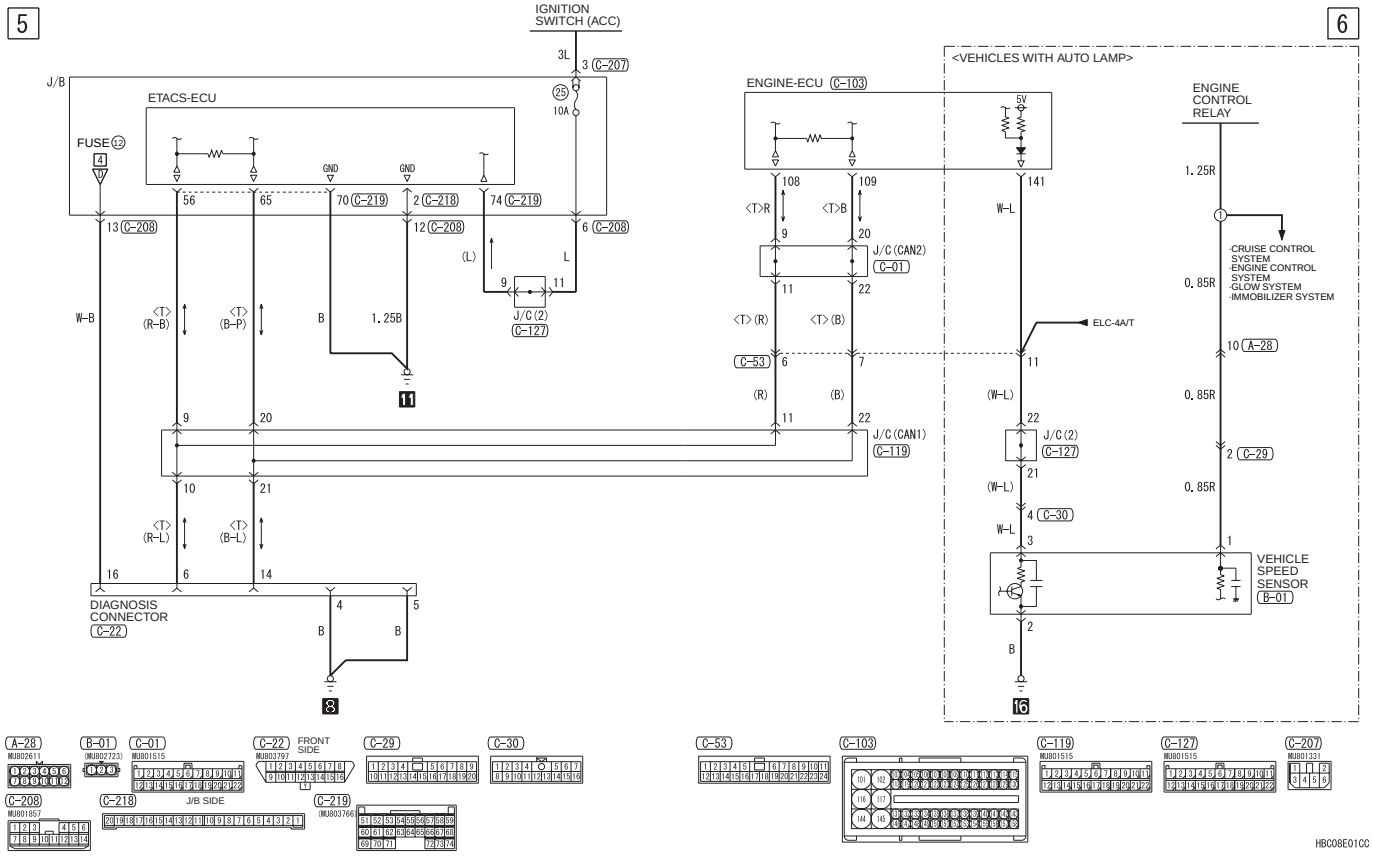
Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HBC08E01AC

HEADLAMP <LHD (VEHICLES WITH DAYTIME RUNNING LIGHT)> (CONTINUED)

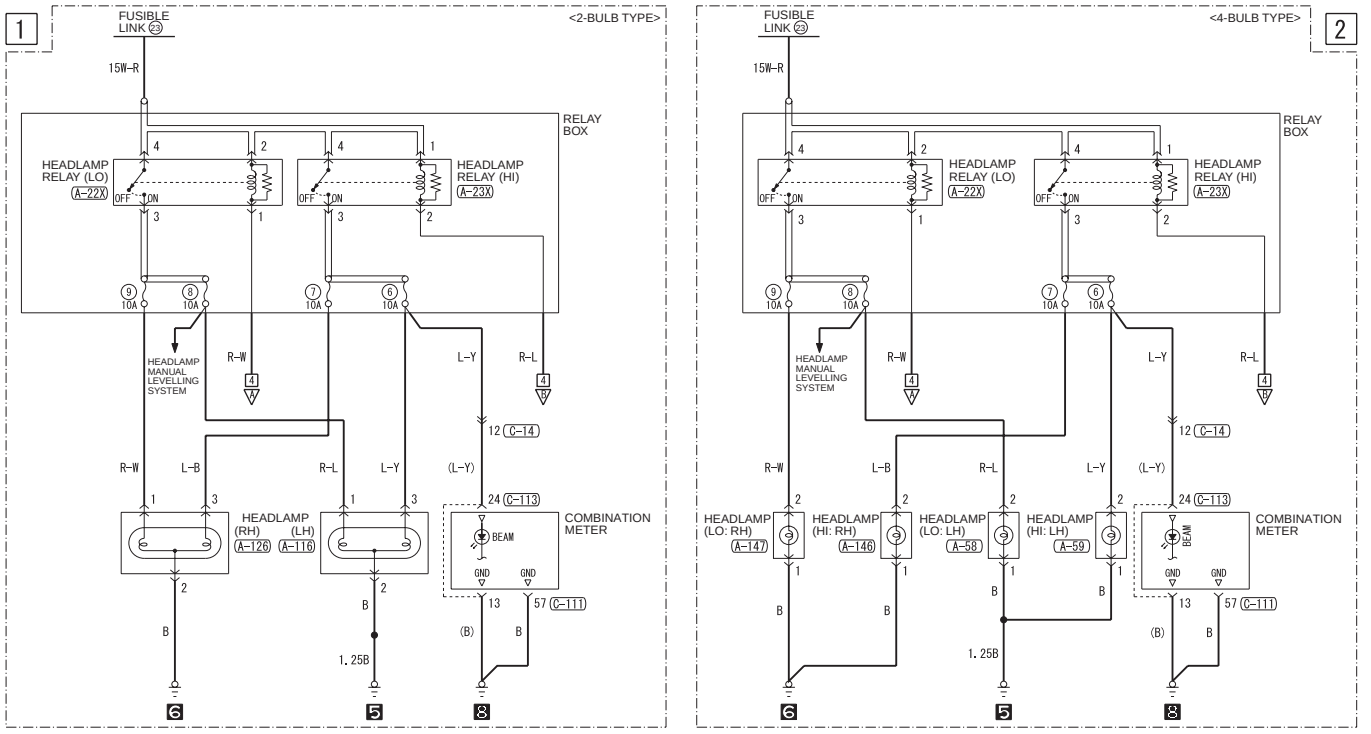


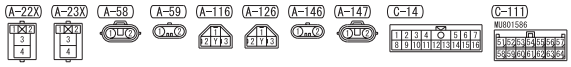
HEADLAMP <LHD (VEHICLES WITH DAYTIME RUNNING LIGHT)> (CONTINUED)

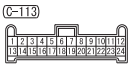


HEADLAMP <RHD>

M1901001506747



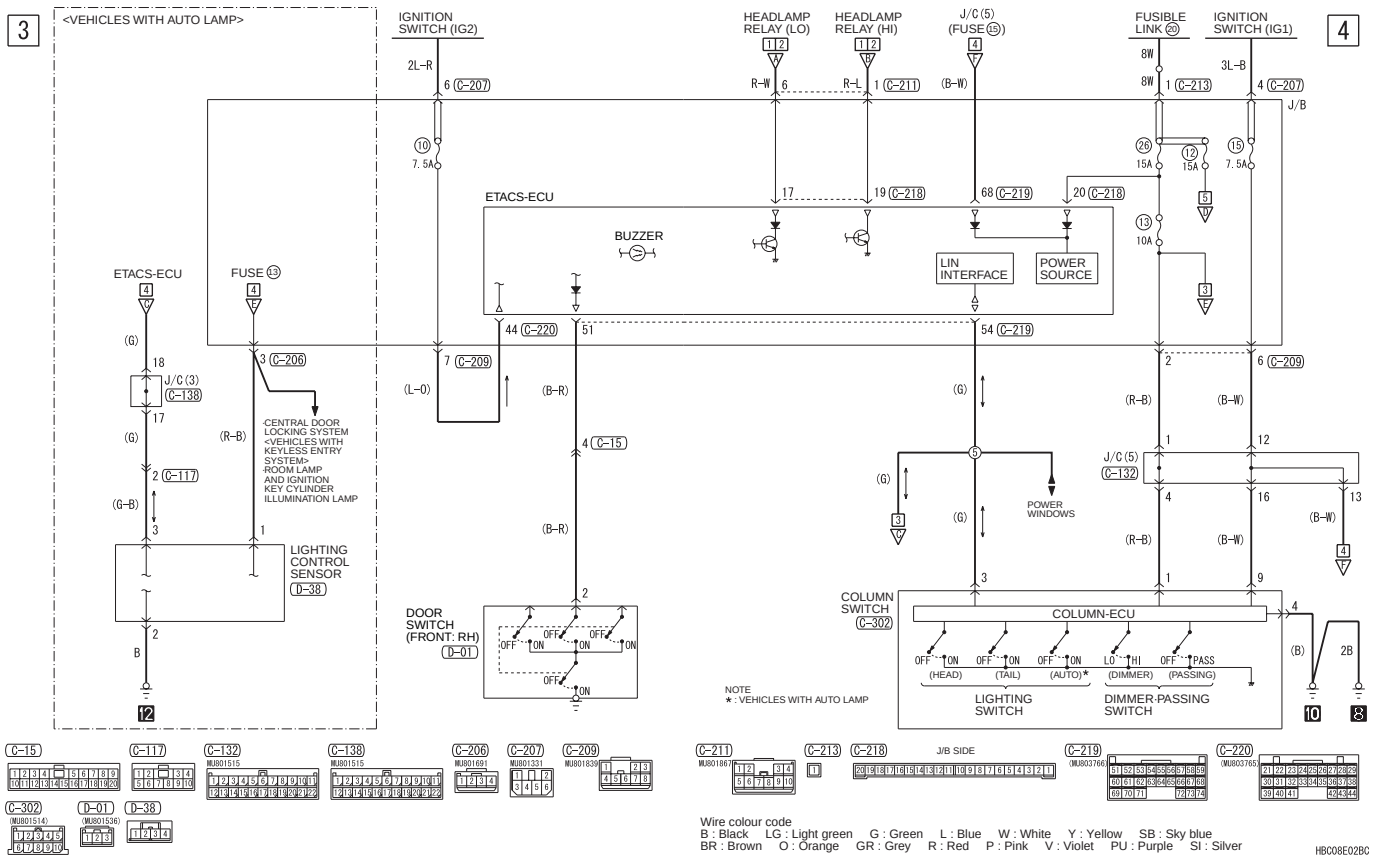




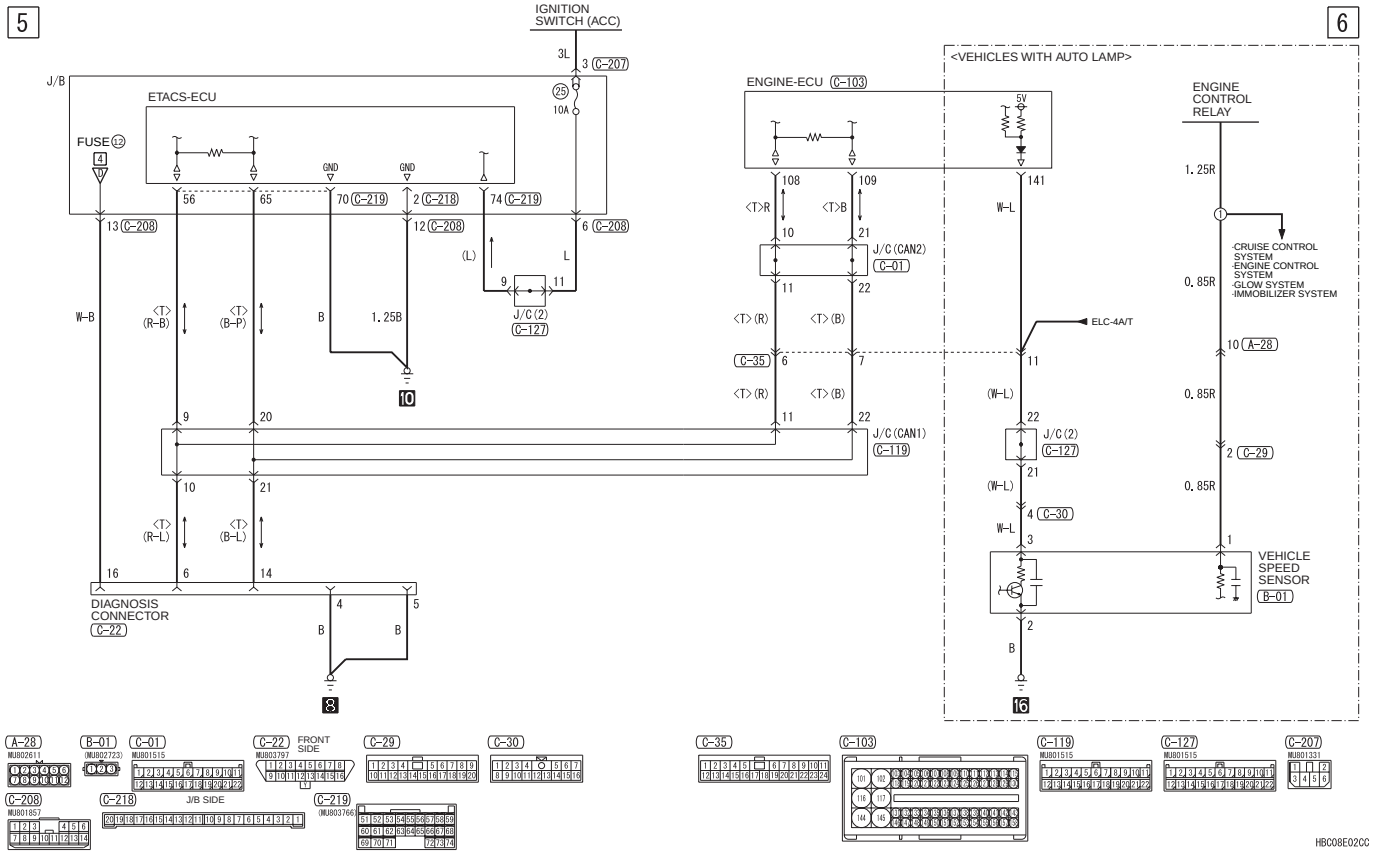
Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HBC08E02AC

HEADLAMP <RHD> (CONTINUED)



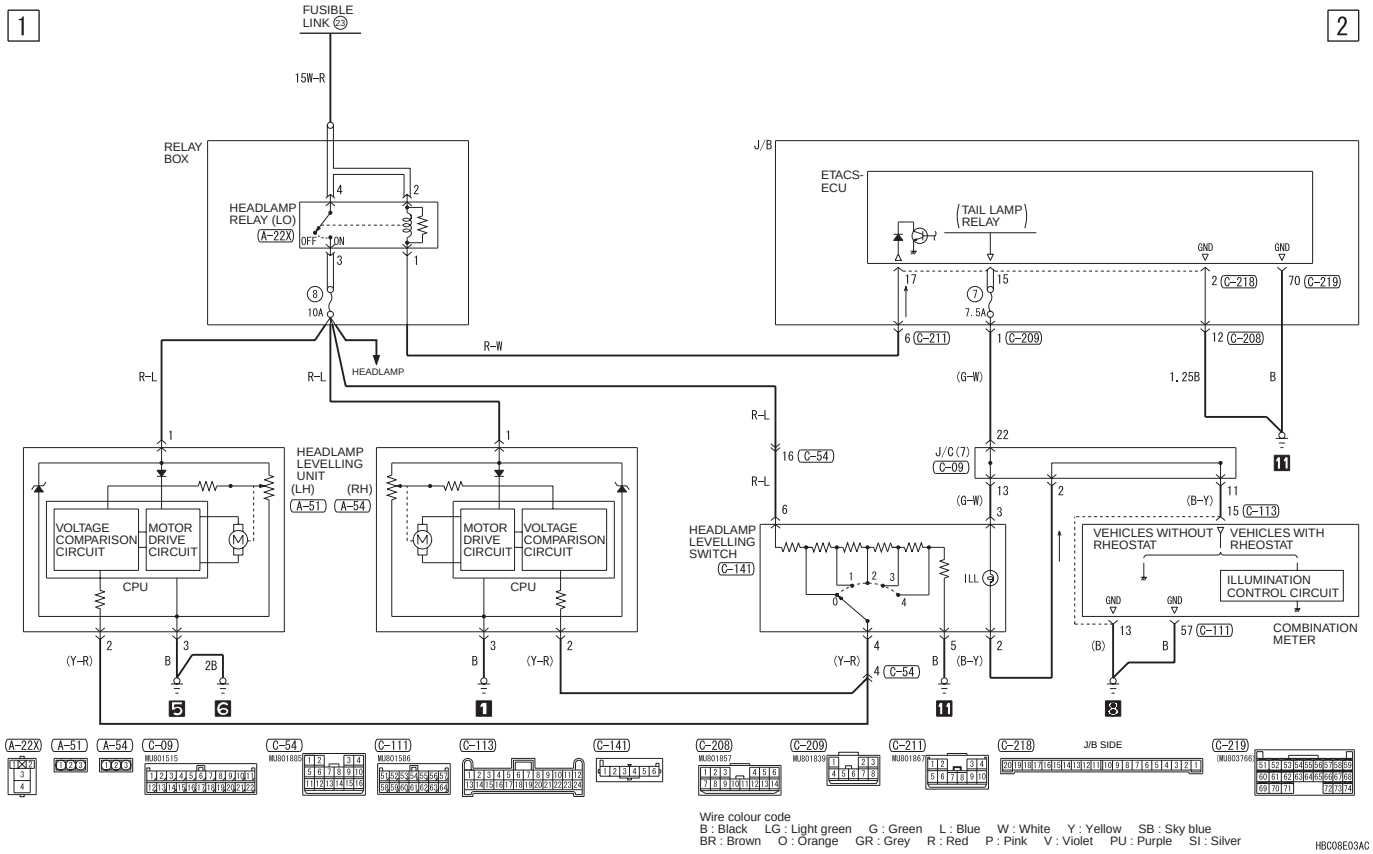
HEADLAMP <RHD> (CONTINUED)



HEADLAMP MANUAL LEVELLING SYSTEM

HEADLAMP MANUAL LEVELLING SYSTEM <LHD (VEHICLES WITHOUT DAYTIME RUNNING LIGHT)>

M1901025301225

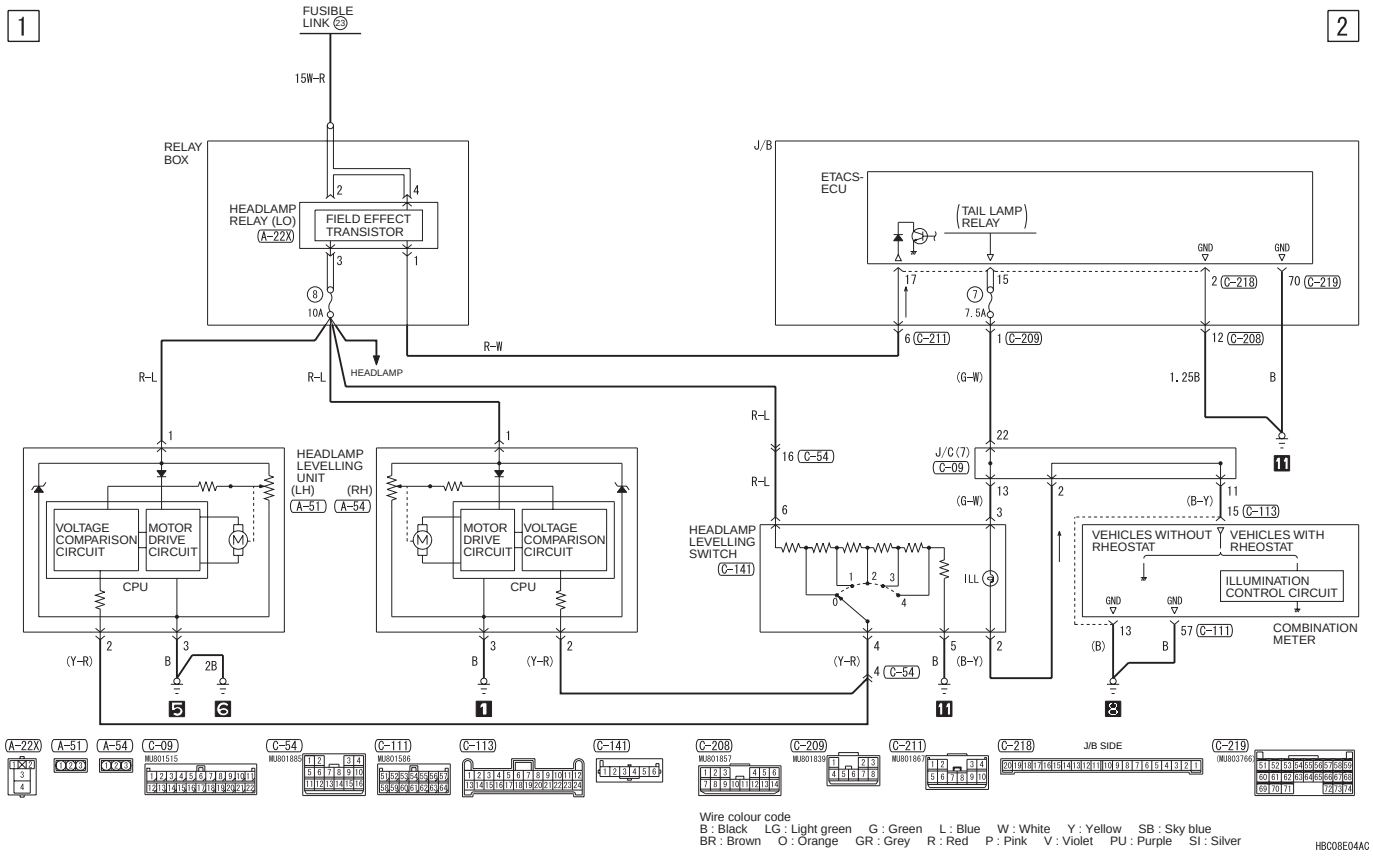


Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HBC08E03AC

HEADLAMP MANUAL LEVELLING SYSTEM <LHD (VEHICLES WITH DAYTIME RUNNING LIGHT)>

M1901025301236

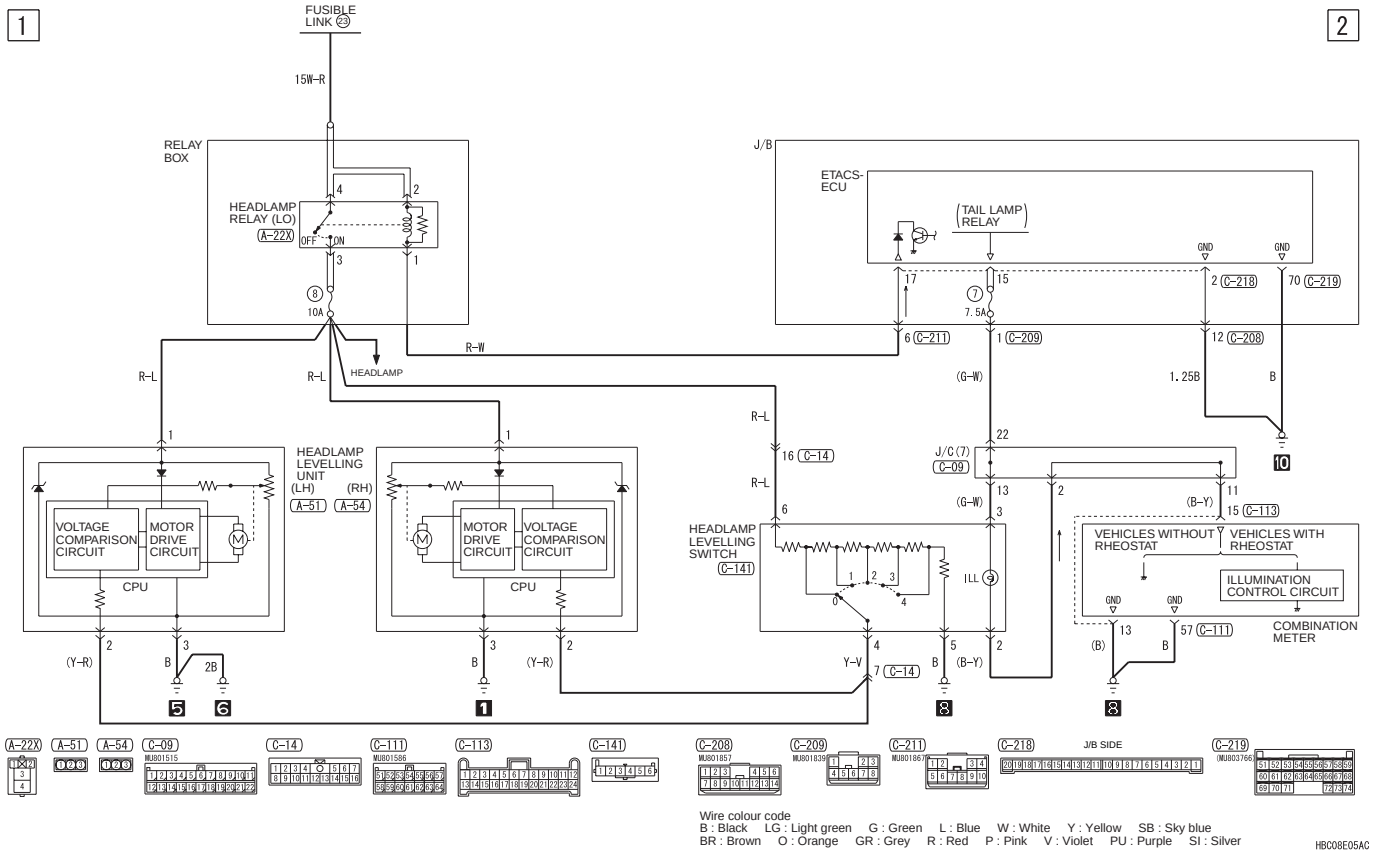


Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HBC08E04AC

HEADLAMP MANUAL LEVELLING SYSTEM <RHD>

M1901025301247



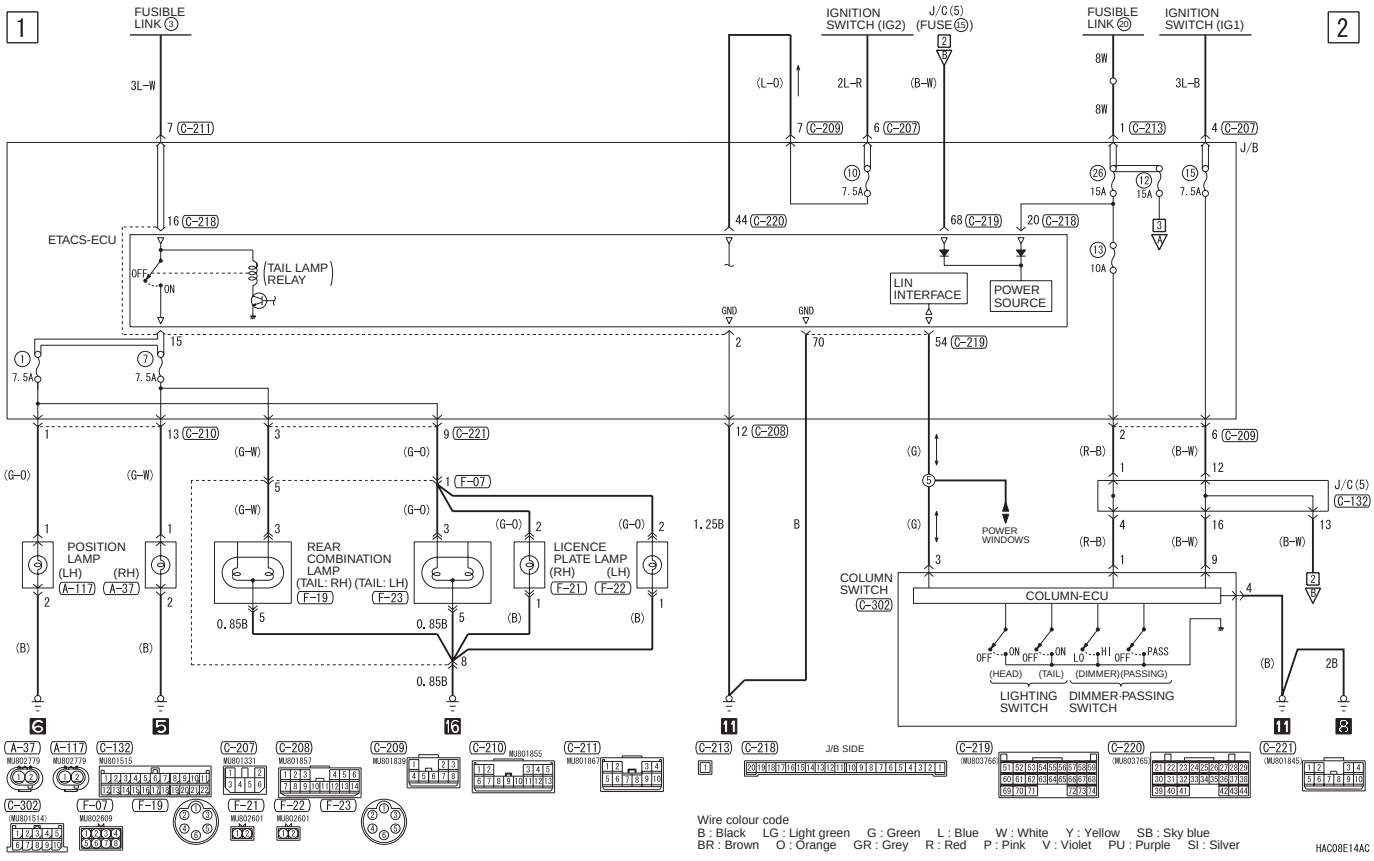
Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HBC08E05AC

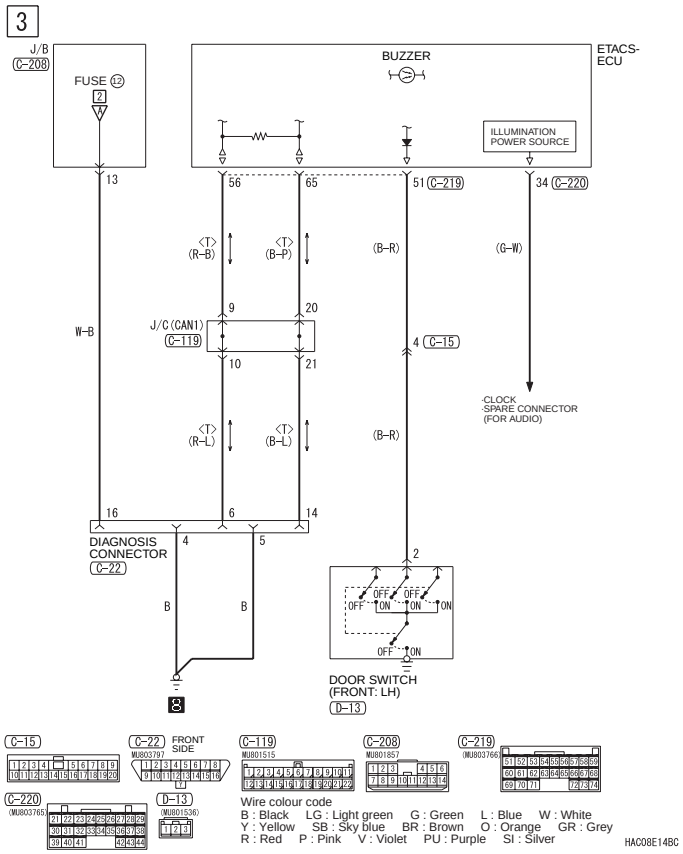
TAIL LAMP, POSITION LAMP, LICENCE PLATE LAMP AND LIGHTING MONITOR BUZZER

TAIL LAMP, POSITION LAMP, LICENCE PLATE LAMP AND LIGHTING MONITOR BUZZER <VEHICLES WITHOUT REAR BODY (LHD)>

M1901001703281

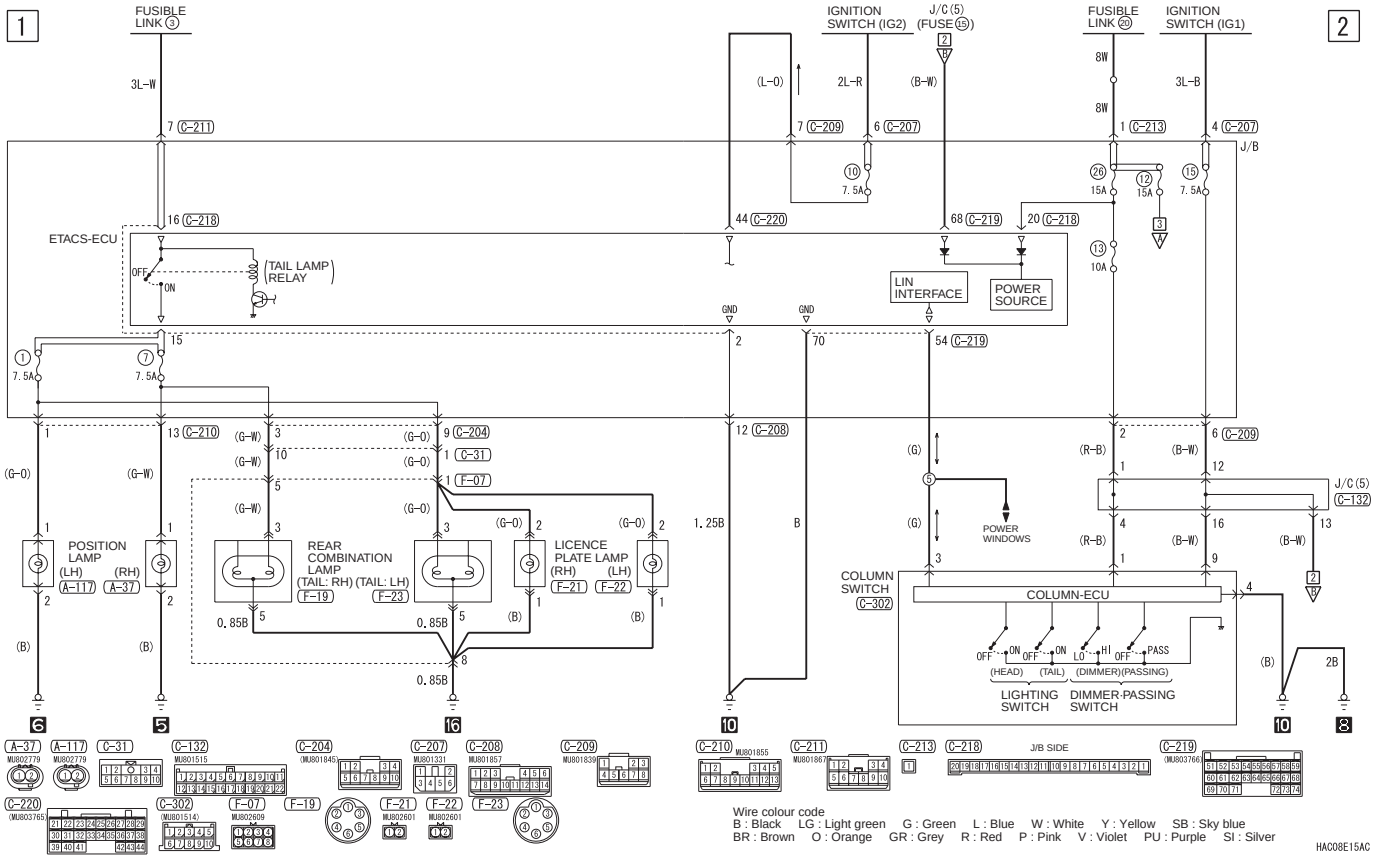


TAIL LAMP, POSITION LAMP, LICENCE PLATE LAMP AND LIGHTING MONITOR BUZZER <VEHICLES WITHOUT REAR BODY (LHD)> (CONTINUED)



TAIL LAMP, POSITION LAMP, LICENCE PLATE LAMP AND LIGHTING MONITOR BUZZER <VEHICLES WITHOUT REAR BODY (RHD)>

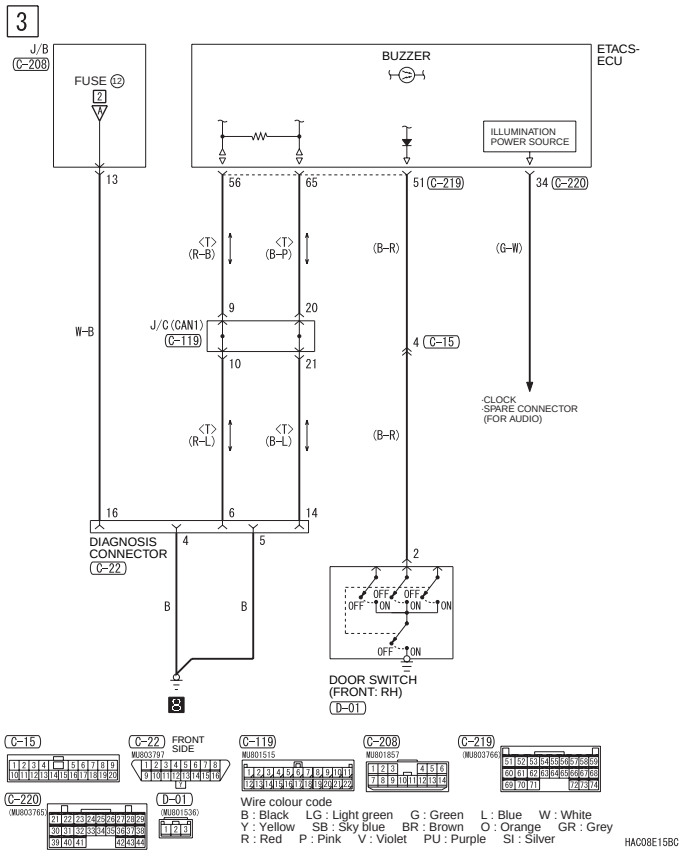
M1901001703292



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

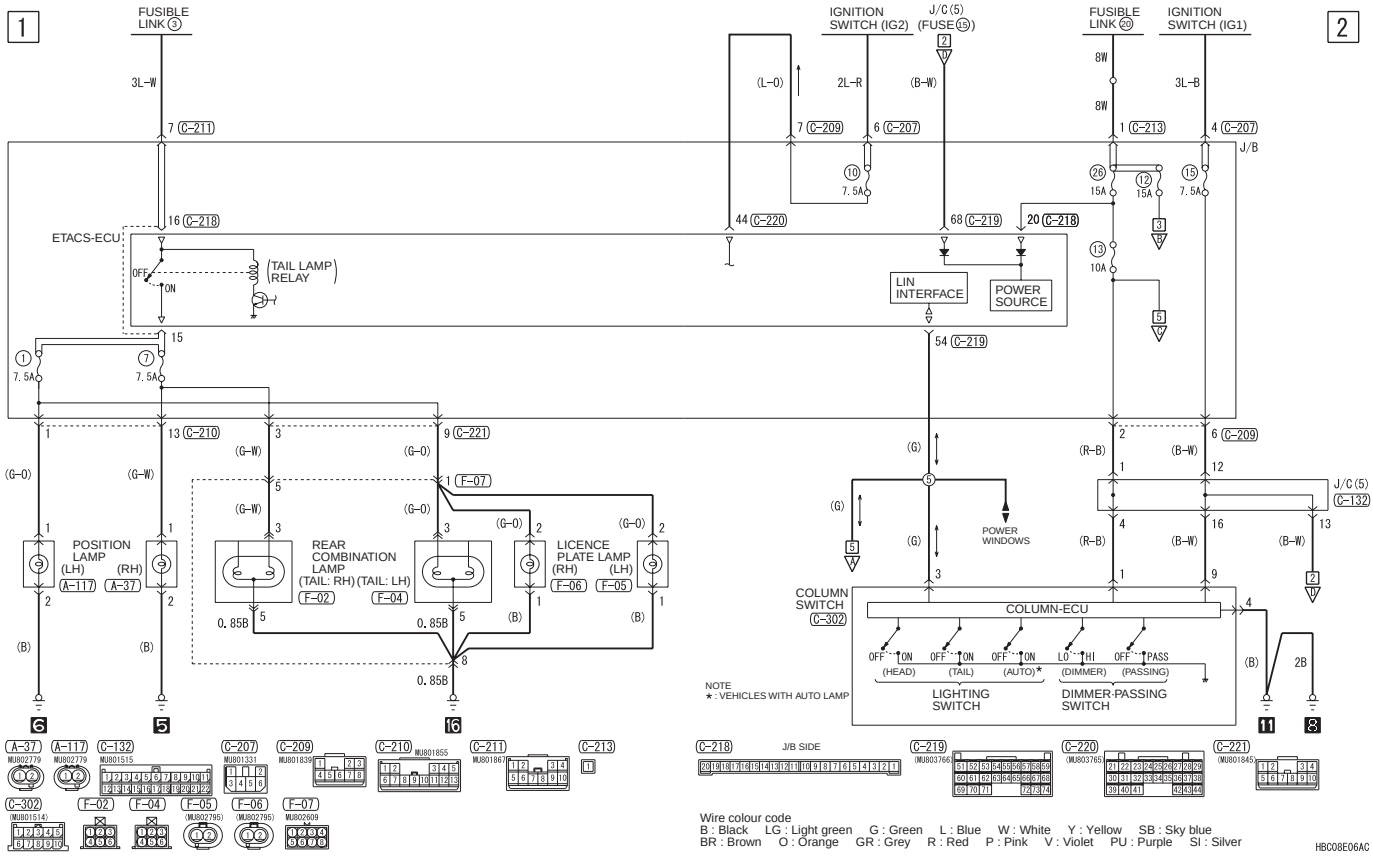
HAC08E15AC

TAIL LAMP, POSITION LAMP, LICENCE PLATE LAMP AND LIGHTING MONITOR BUZZER <VEHICLES WITHOUT REAR BODY (RHD)> (CONTINUED)



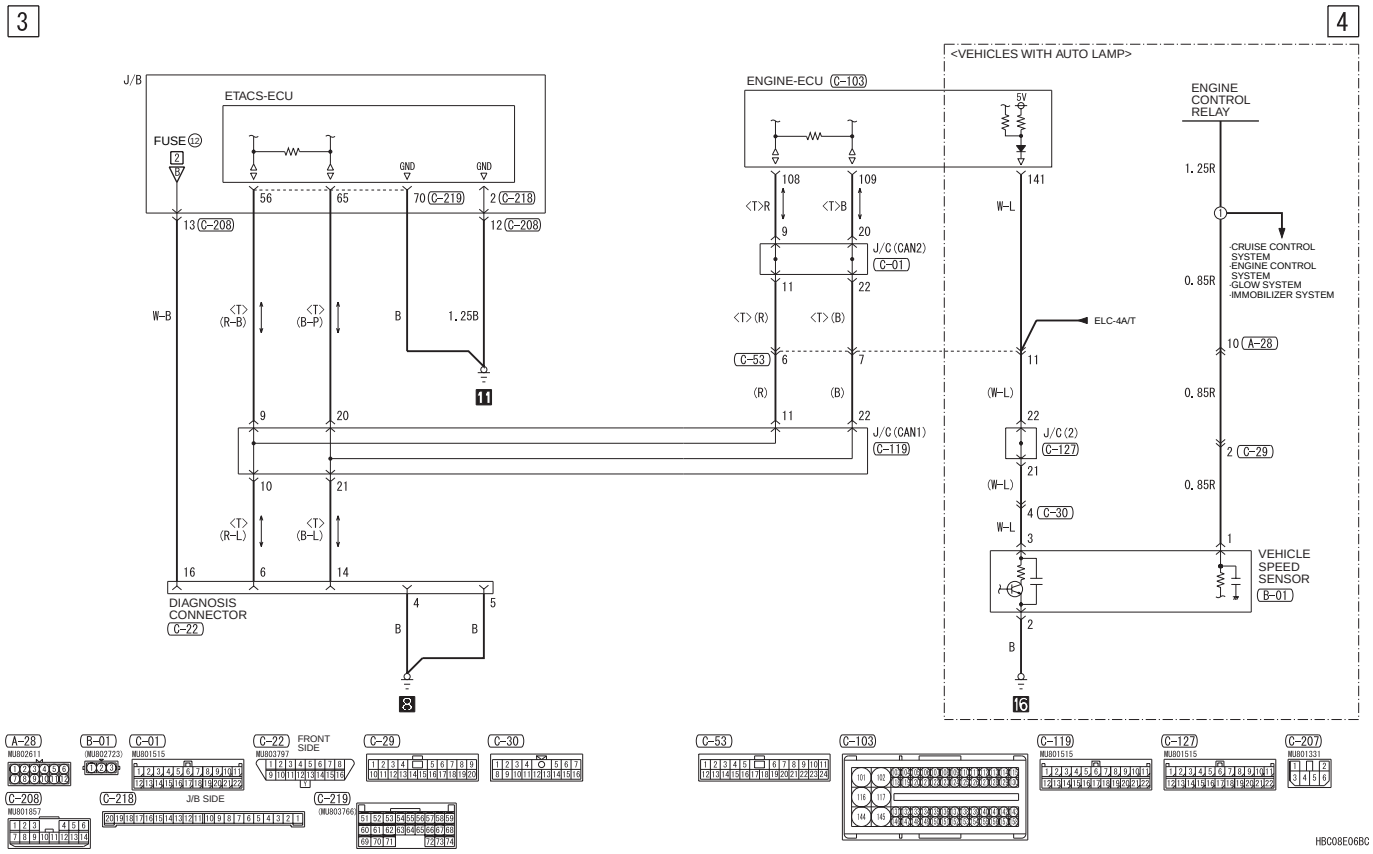
TAIL LAMP, POSITION LAMP, LICENCE PLATE LAMP AND LIGHTING MONITOR BUZZER <VEHICLES WITH REAR BODY (LHD)>

M1901001703560

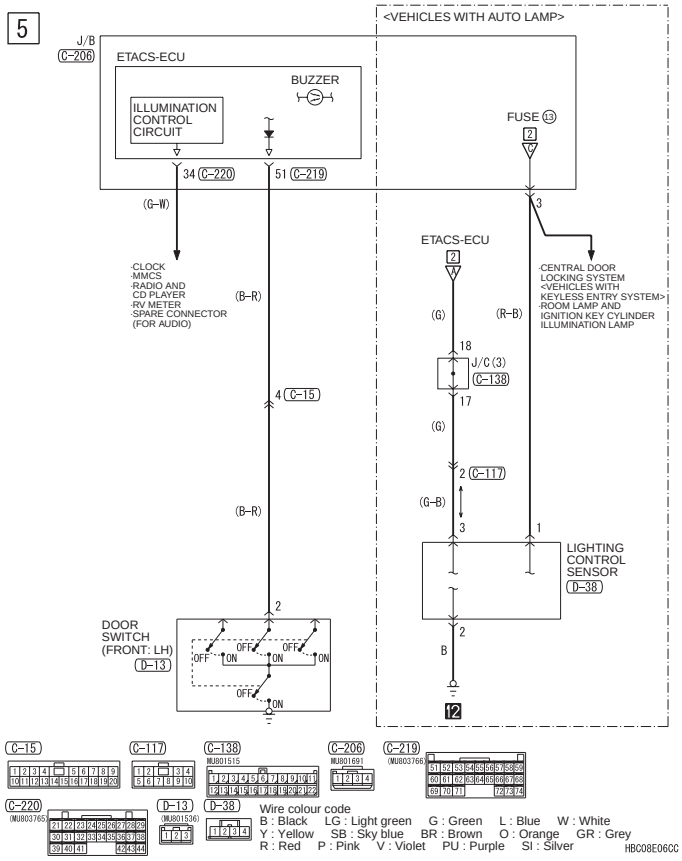


Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

TAIL LAMP, POSITION LAMP, LICENCE PLATE LAMP AND LIGHTING MONITOR BUZZER <VEHICLES WITH REAR BODY (LHD)> (CONTINUED)

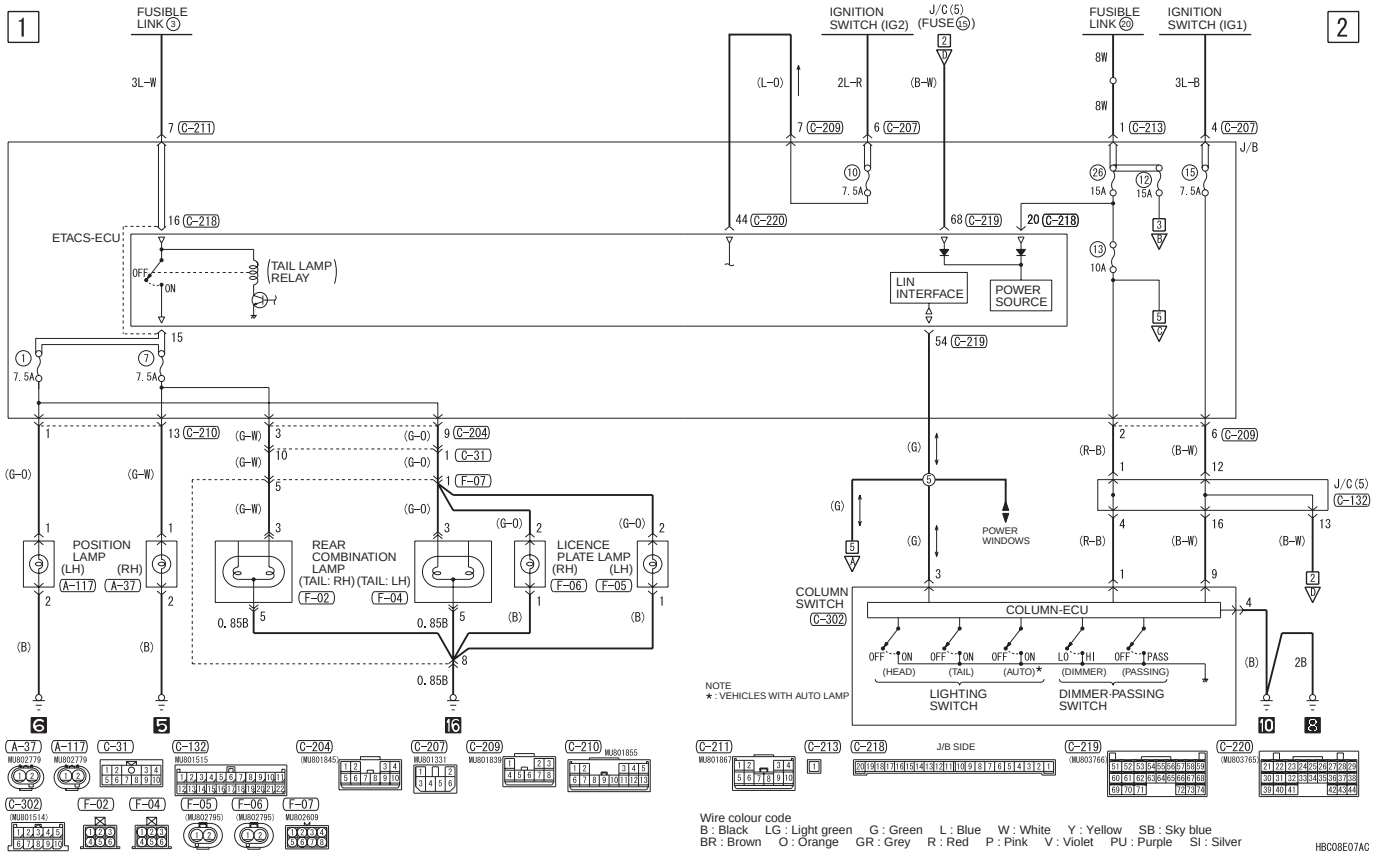


TAIL LAMP, POSITION LAMP, LICENCE PLATE LAMP AND LIGHTING MONITOR BUZZER <VEHICLES WITH REAR BODY (LHD)> (CONTINUED)



TAIL LAMP, POSITION LAMP, LICENCE PLATE LAMP AND LIGHTING MONITOR BUZZER <VEHICLES WITH REAR BODY (RHD)>

M1901001703571



Wire colour code
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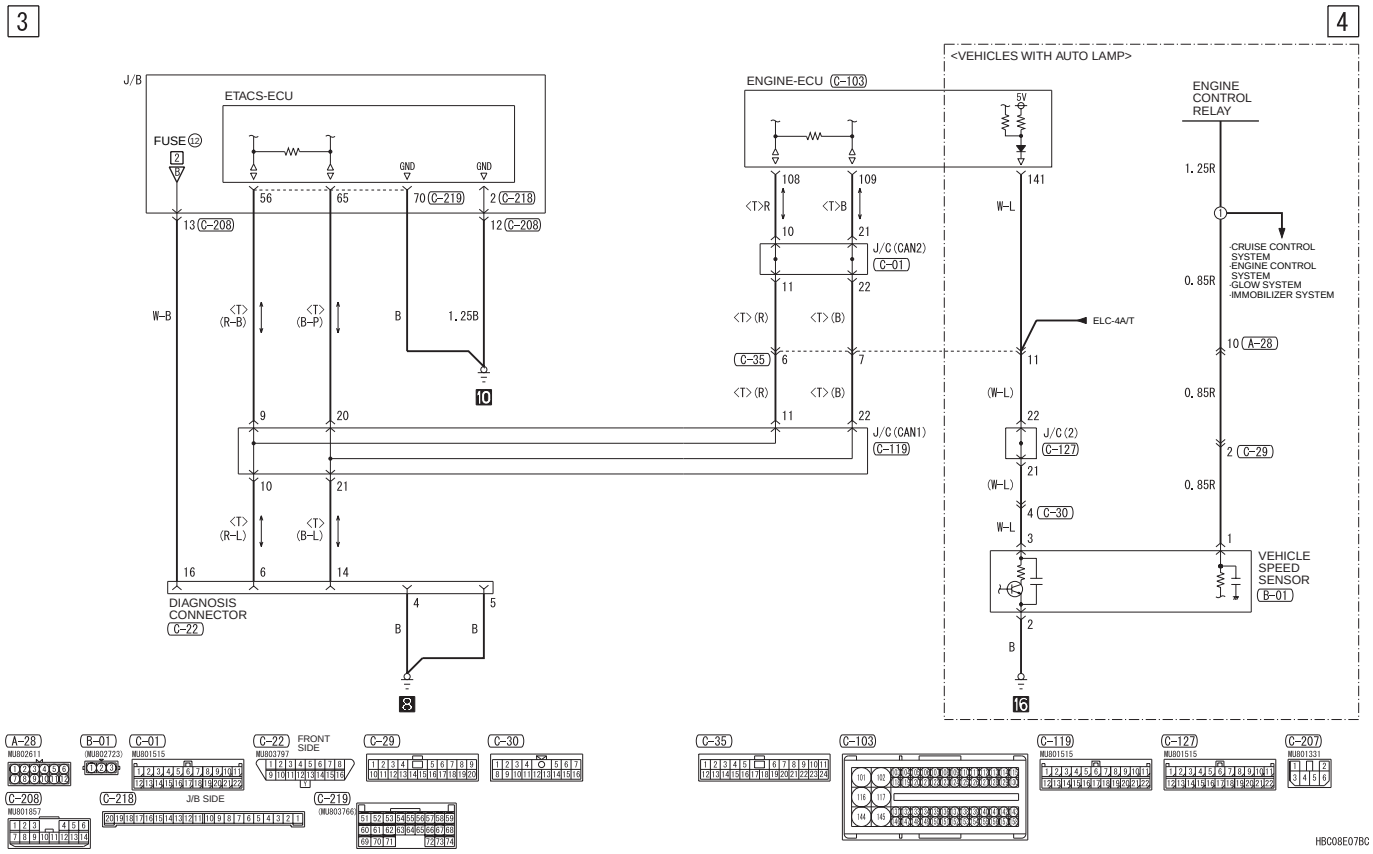
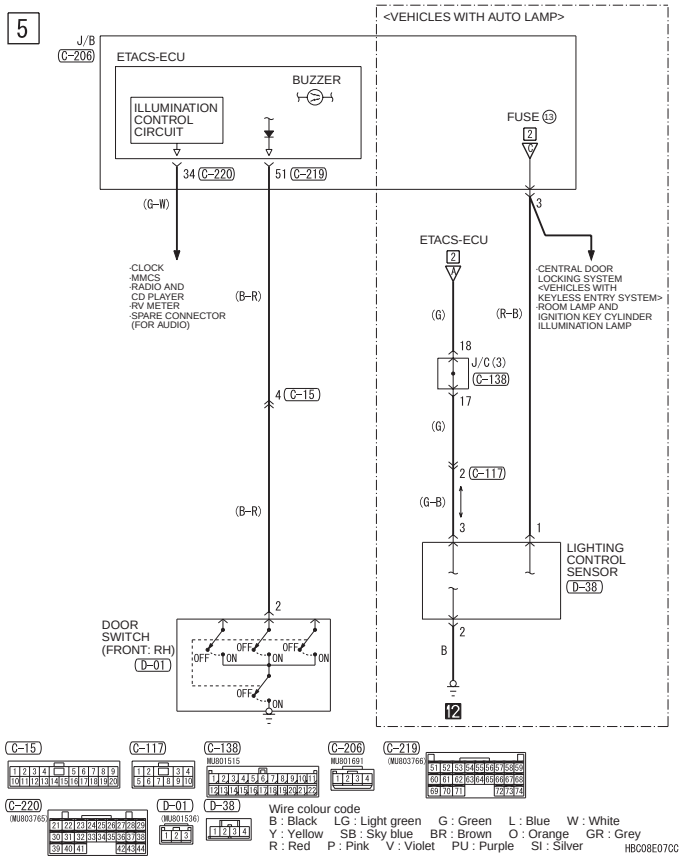
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HBC08E07AC

TAIL LAMP, POSITION LAMP, LICENCE PLATE LAMP AND LIGHTING MONITOR BUZZER <VEHICLES WITH REAR BODY (RHD)> (CONTINUED)



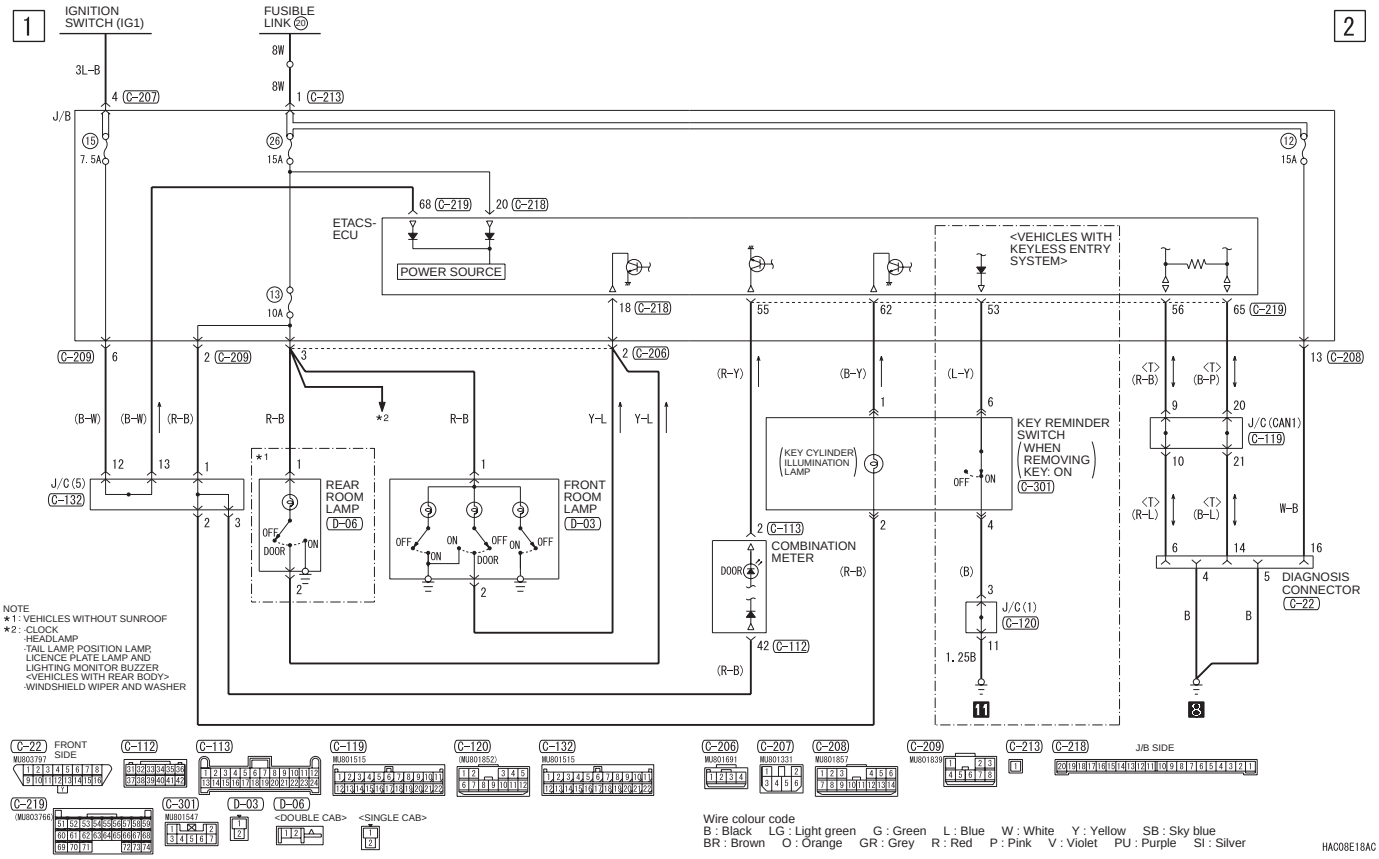
TAIL LAMP, POSITION LAMP, LICENCE PLATE LAMP AND LIGHTING MONITOR BUZZER <VEHICLES WITH REAR BODY (RHD)> (CONTINUED)



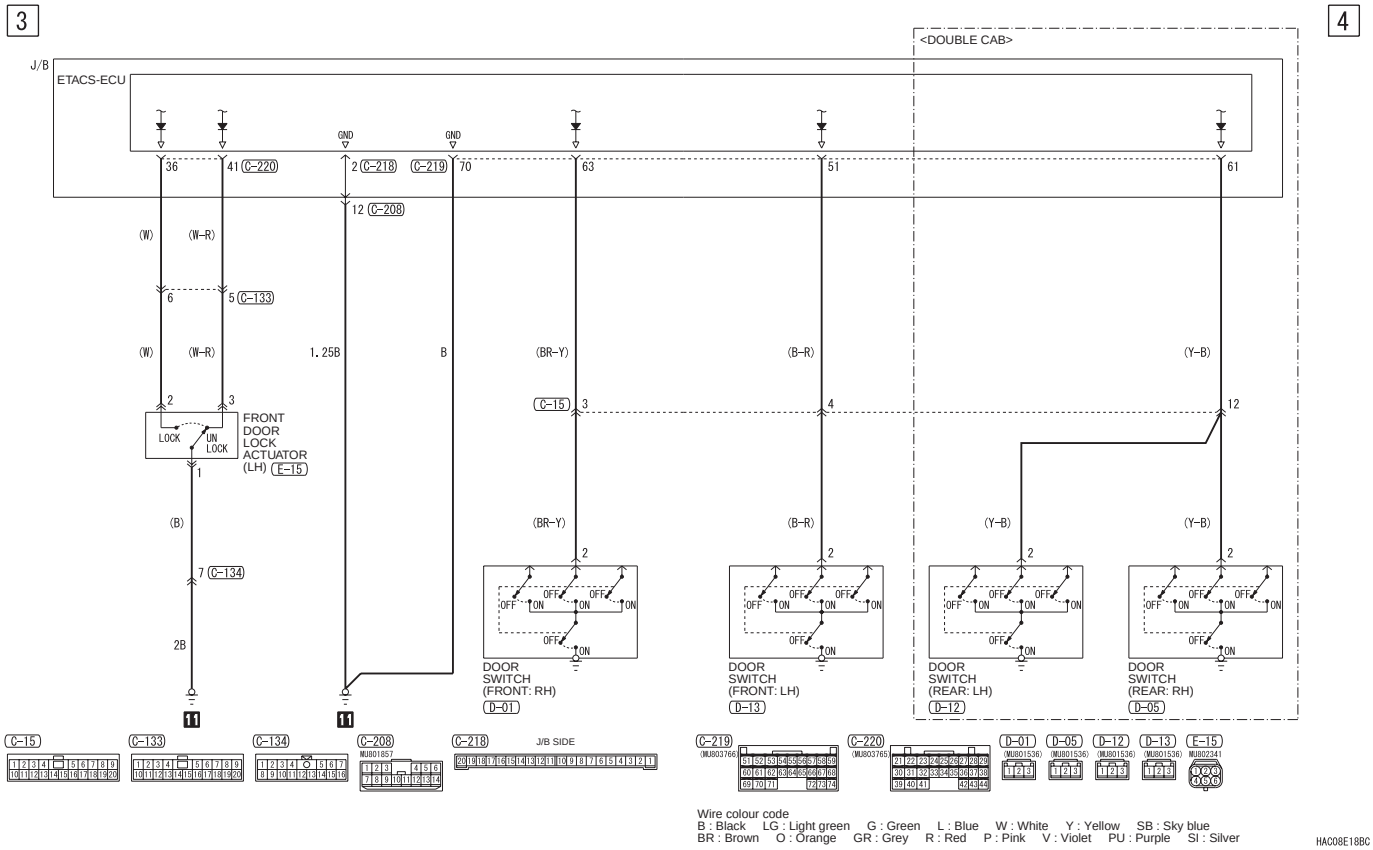
ROOM LAMP AND IGNITION KEY CYLINDER ILLUMINATION LAMP

ROOM LAMP AND IGNITION KEY CYLINDER ILLUMINATION LAMP <LHD>

M1901024200385



ROOM LAMP AND IGNITION KEY CYLINDER ILLUMINATION LAMP <LHD> (CONTINUED)

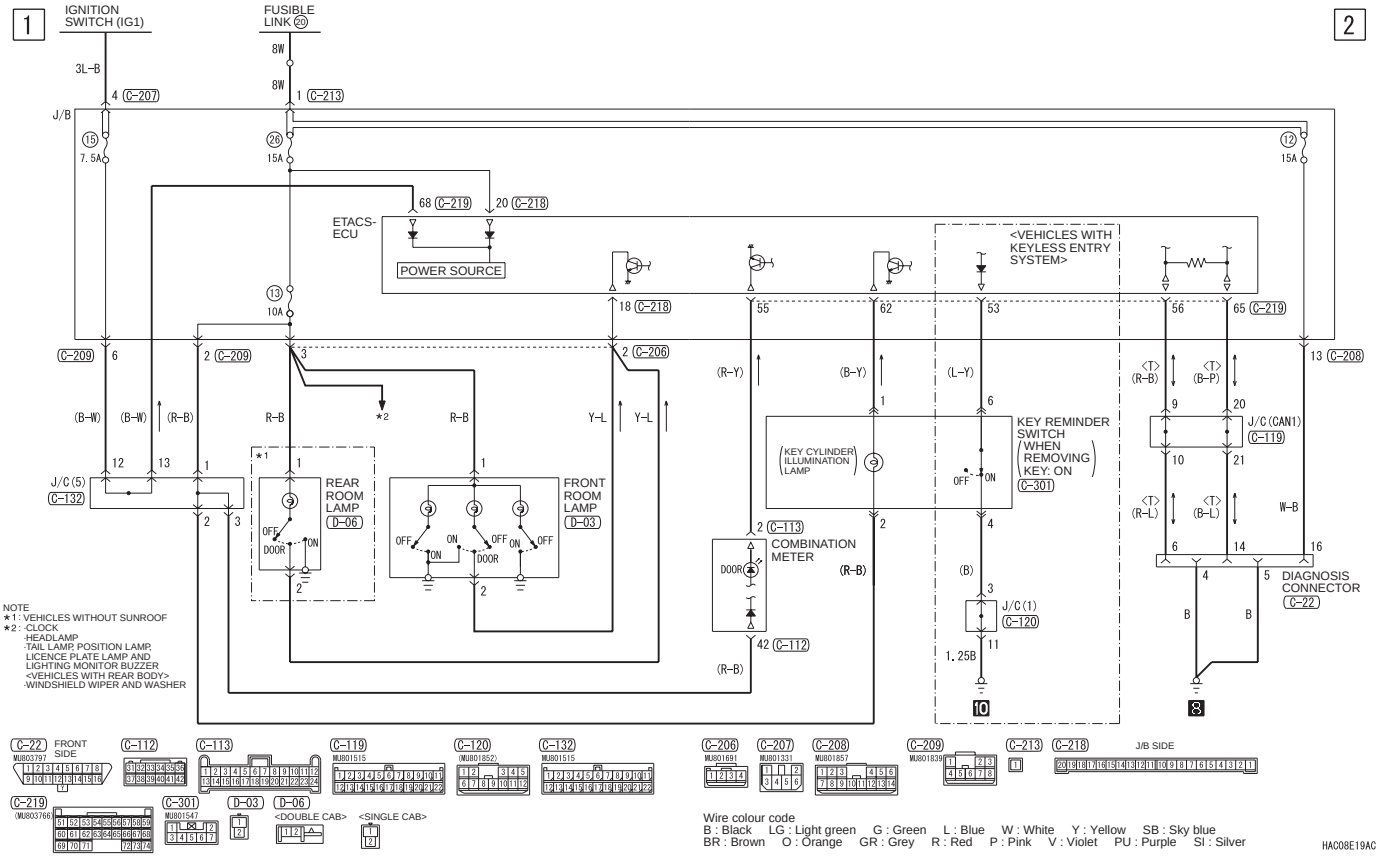


Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

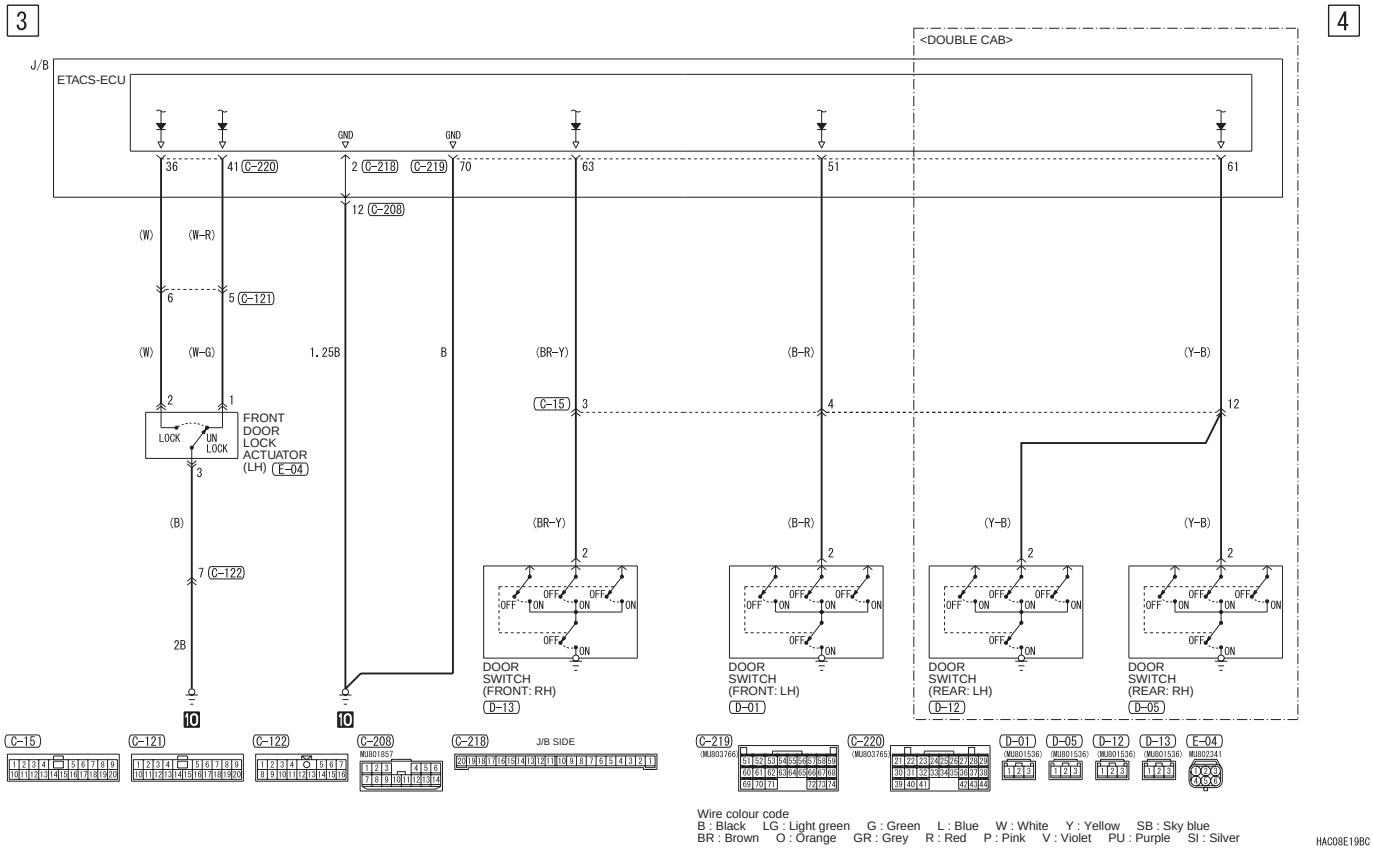
HAC08E18BC

ROOM LAMP AND IGNITION KEY CYLINDER ILLUMINATION LAMP <RHD>

M1901024200396



ROOM LAMP AND IGNITION KEY CYLINDER ILLUMINATION LAMP <RHD> (CONTINUED)



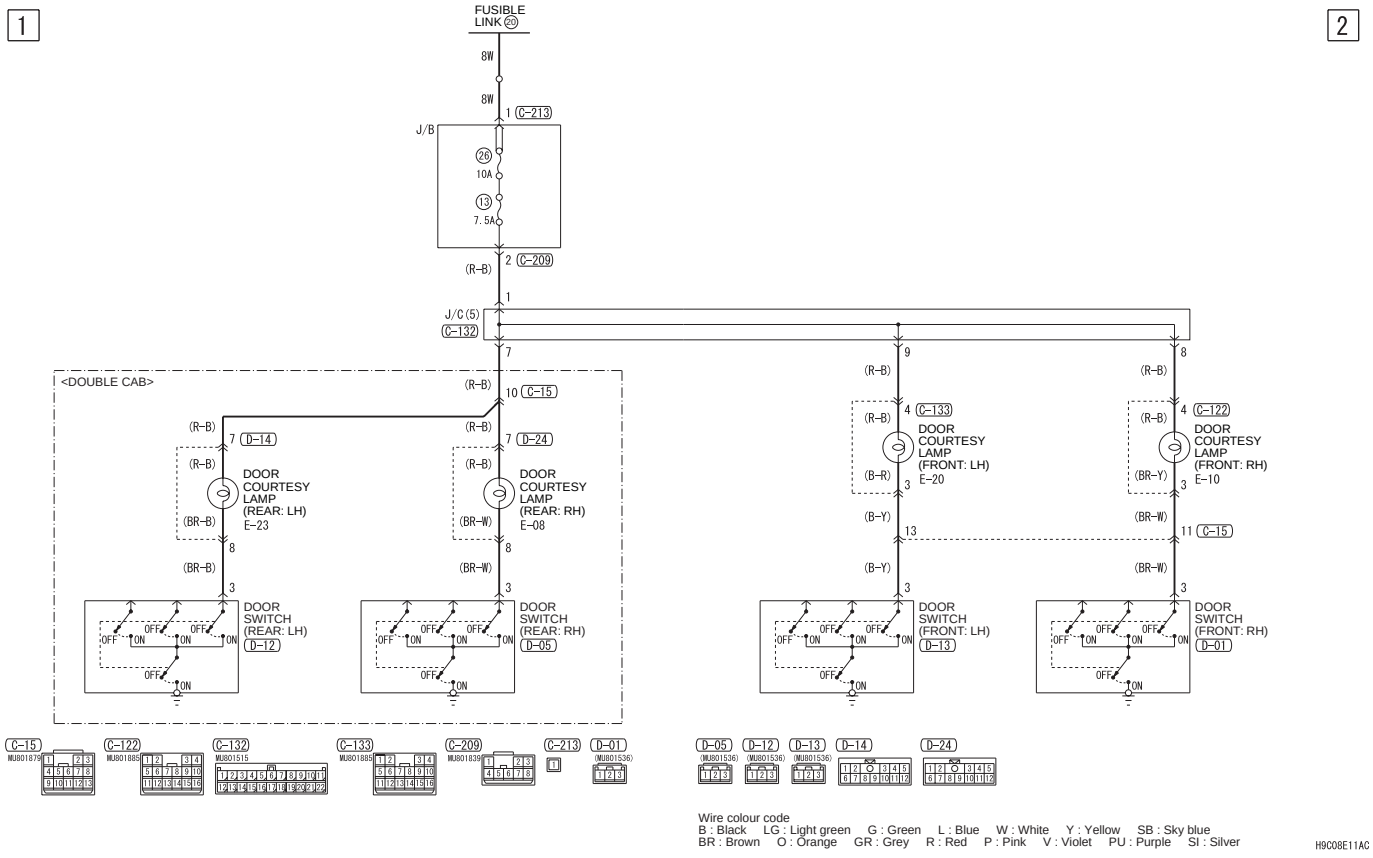
Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HAC08E19BC

DOOR COURTESY LAMP

DOOR COURTESY LAMP <LHD>

M1901027600177



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
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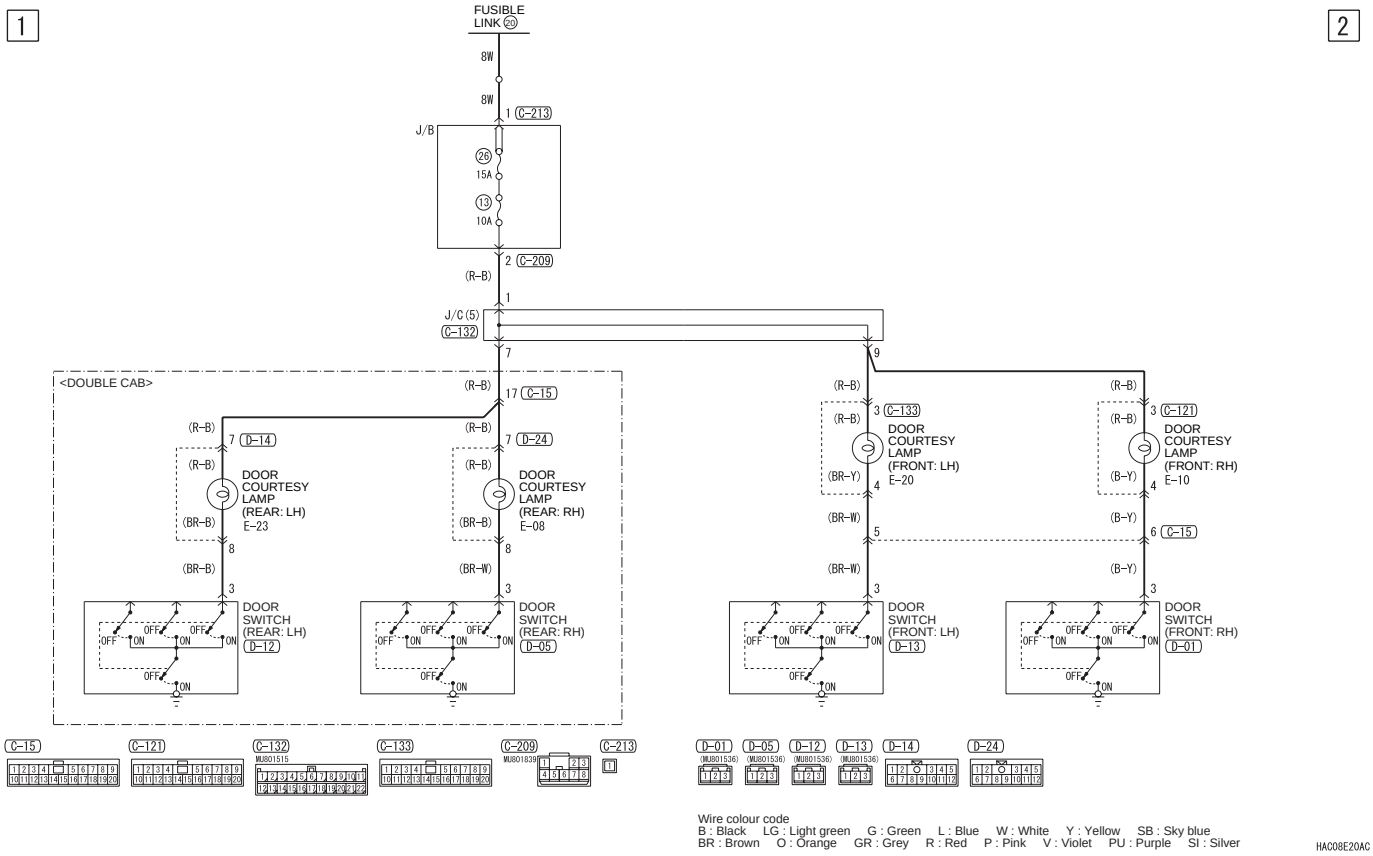
H9C08E11AC

DOOR COURTESY LAMP <RHD>

M1901027600304



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
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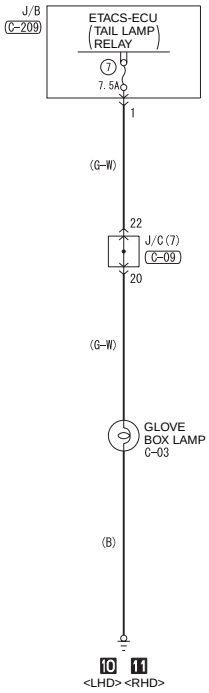
HAC08E20AC

GLOVE BOX LAMP

M1901002201830

1



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
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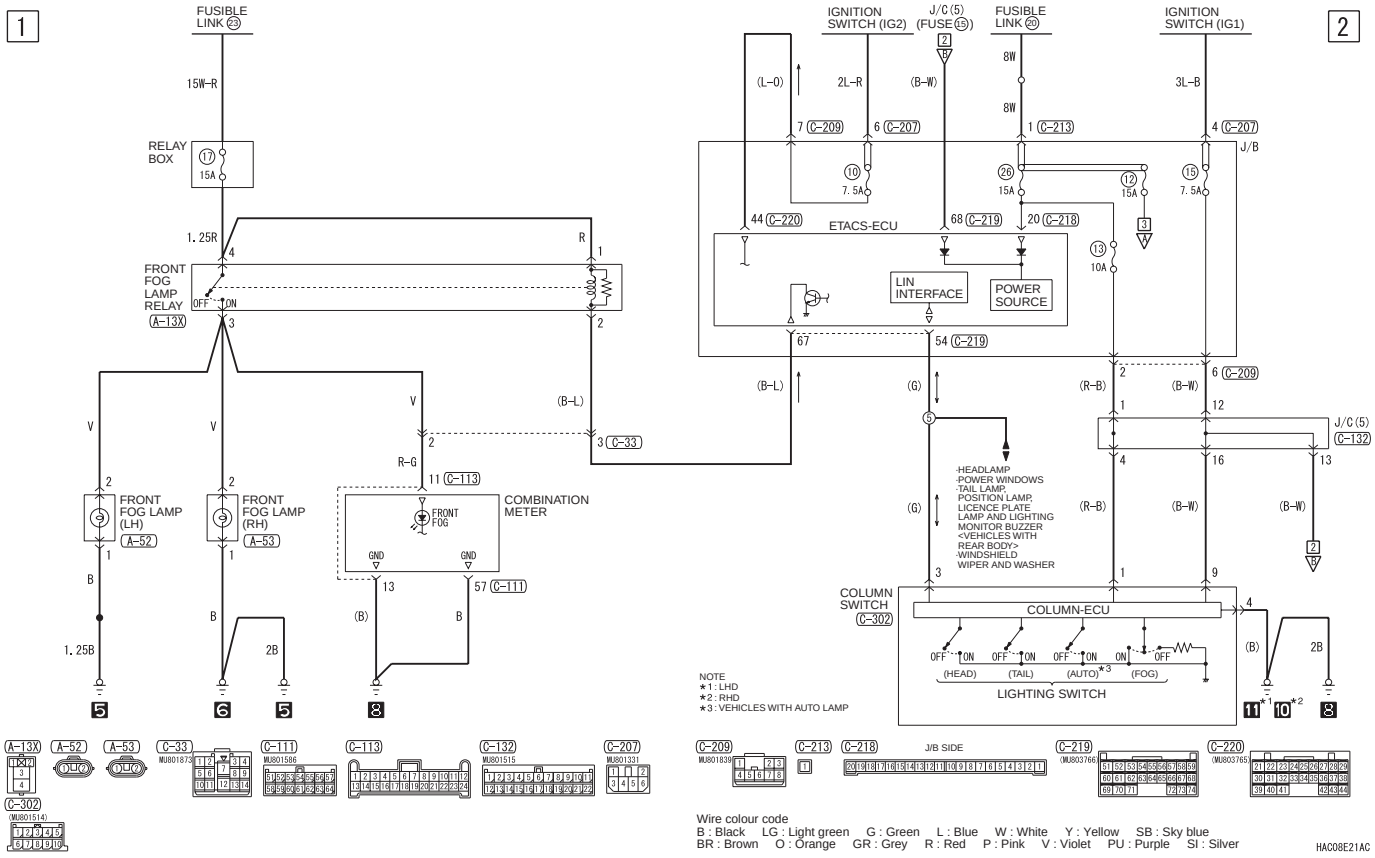
H9C08E13AC

FRONT FOG LAMP

M1901011902335



Wire colour code
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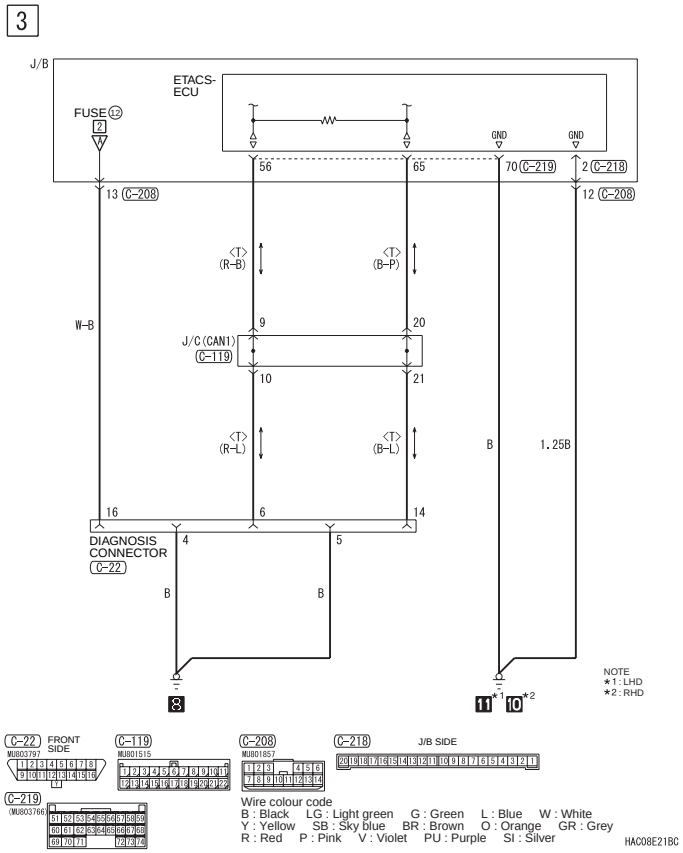
HAC08E21AC

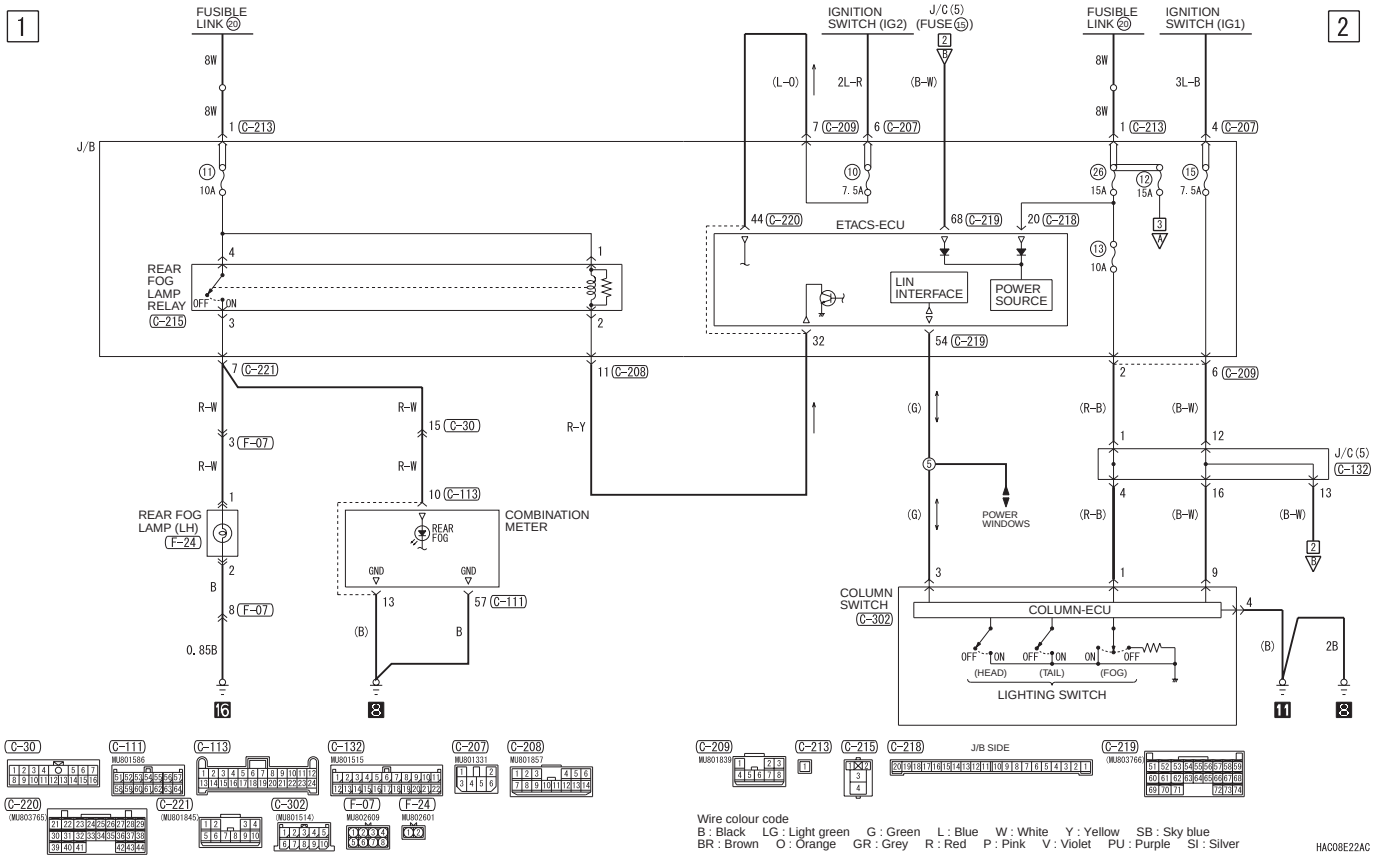
FRONT FOG LAMP (CONTINUED)



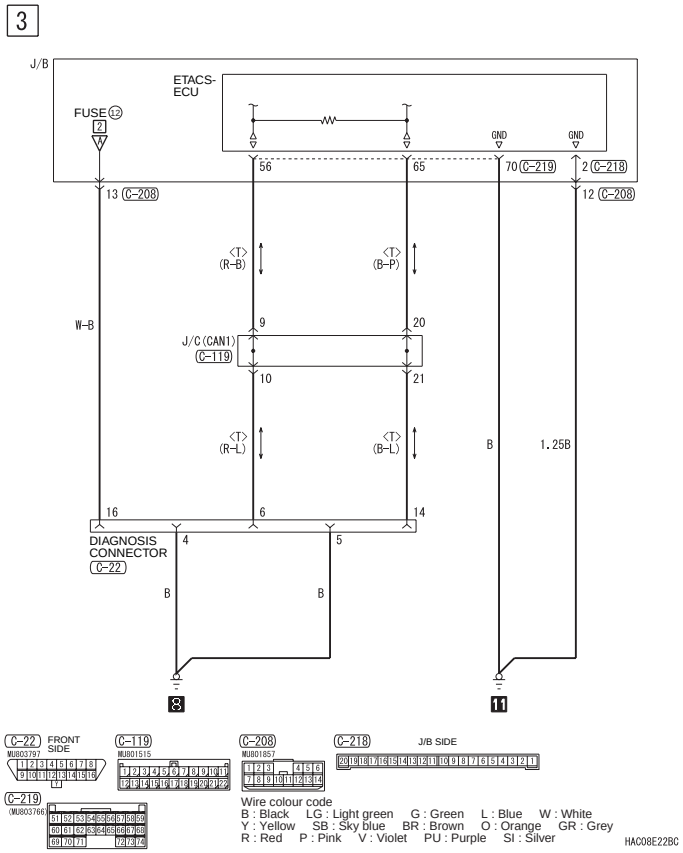
REAR FOG LAMP

REAR FOG LAMP <VEHICLES WITHOUT REAR BODY (LHD)>

M1901012001774

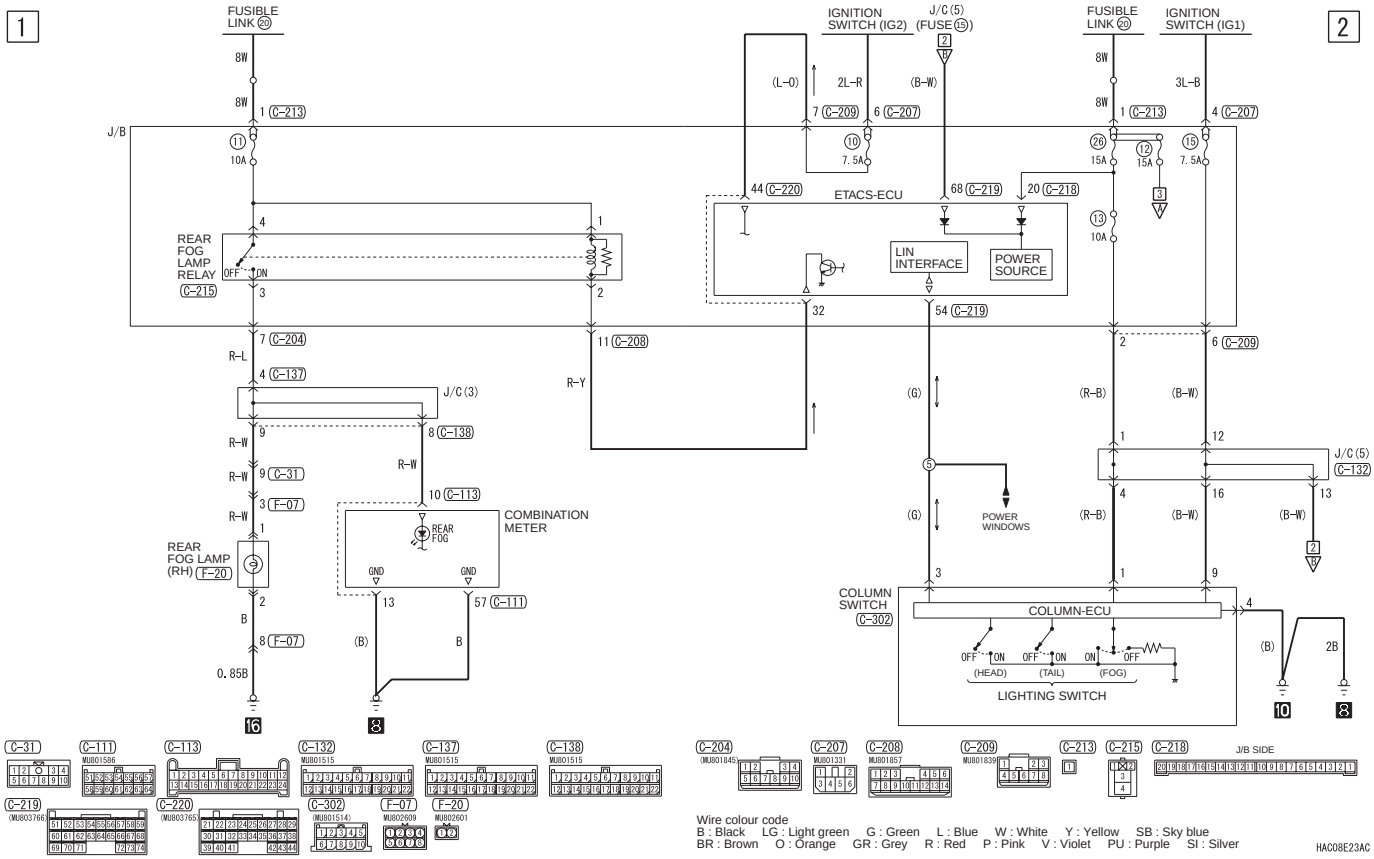


REAR FOG LAMP <VEHICLES WITHOUT REAR BODY (LHD)> (CONTINUED)

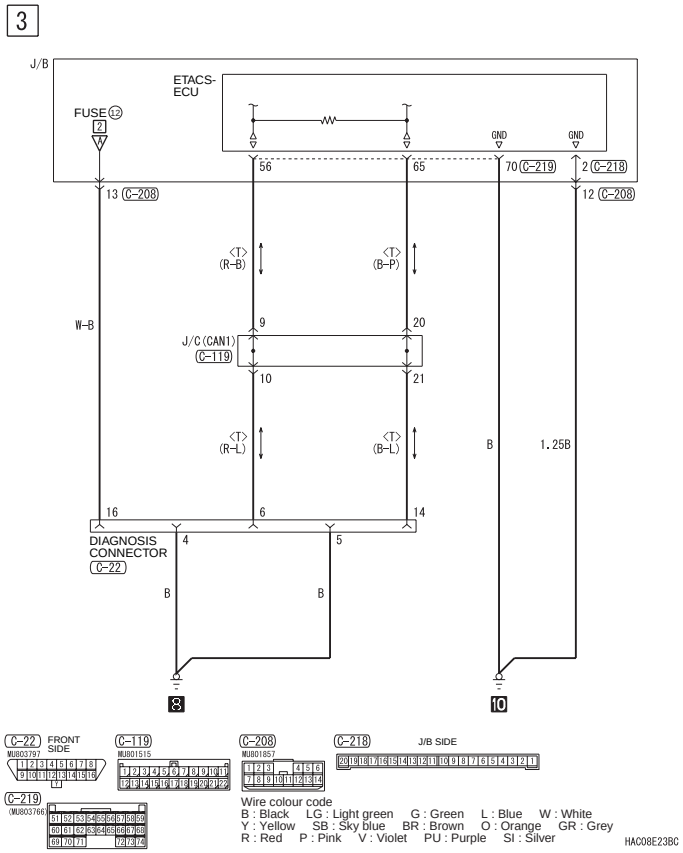


REAR FOG LAMP <VEHICLES WITHOUT REAR BODY (RHD)>

M1901012001785

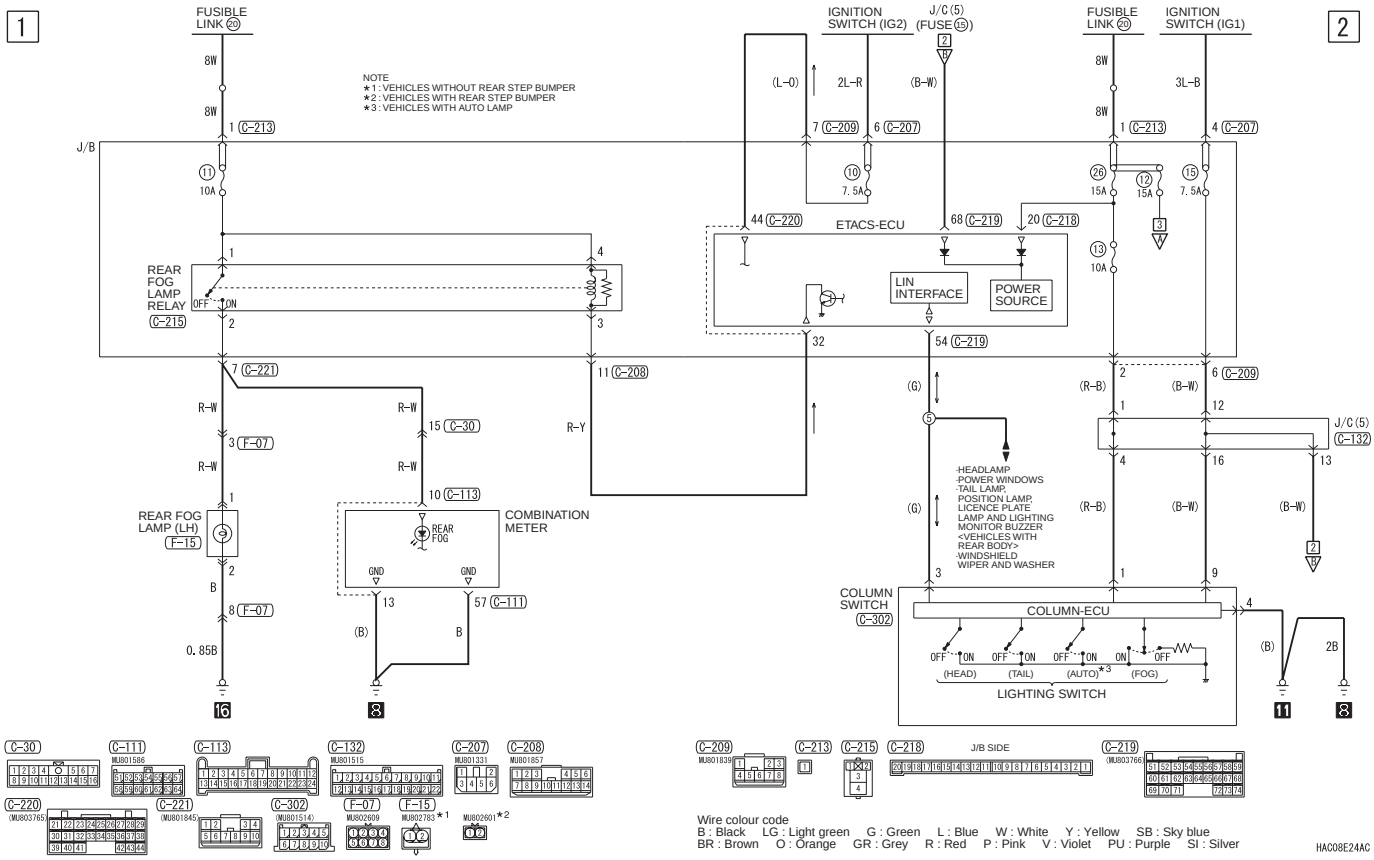


REAR FOG LAMP <VEHICLES WITHOUT REAR BODY (RHD)> (CONTINUED)

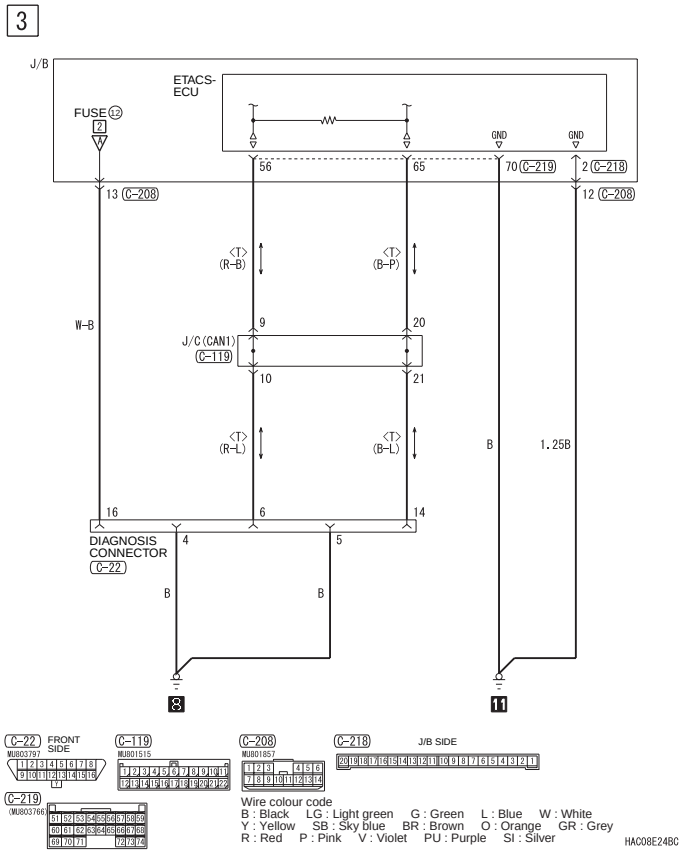


REAR FOG LAMP <VEHICLES WITH REAR BODY (LHD)>

M1901012001796

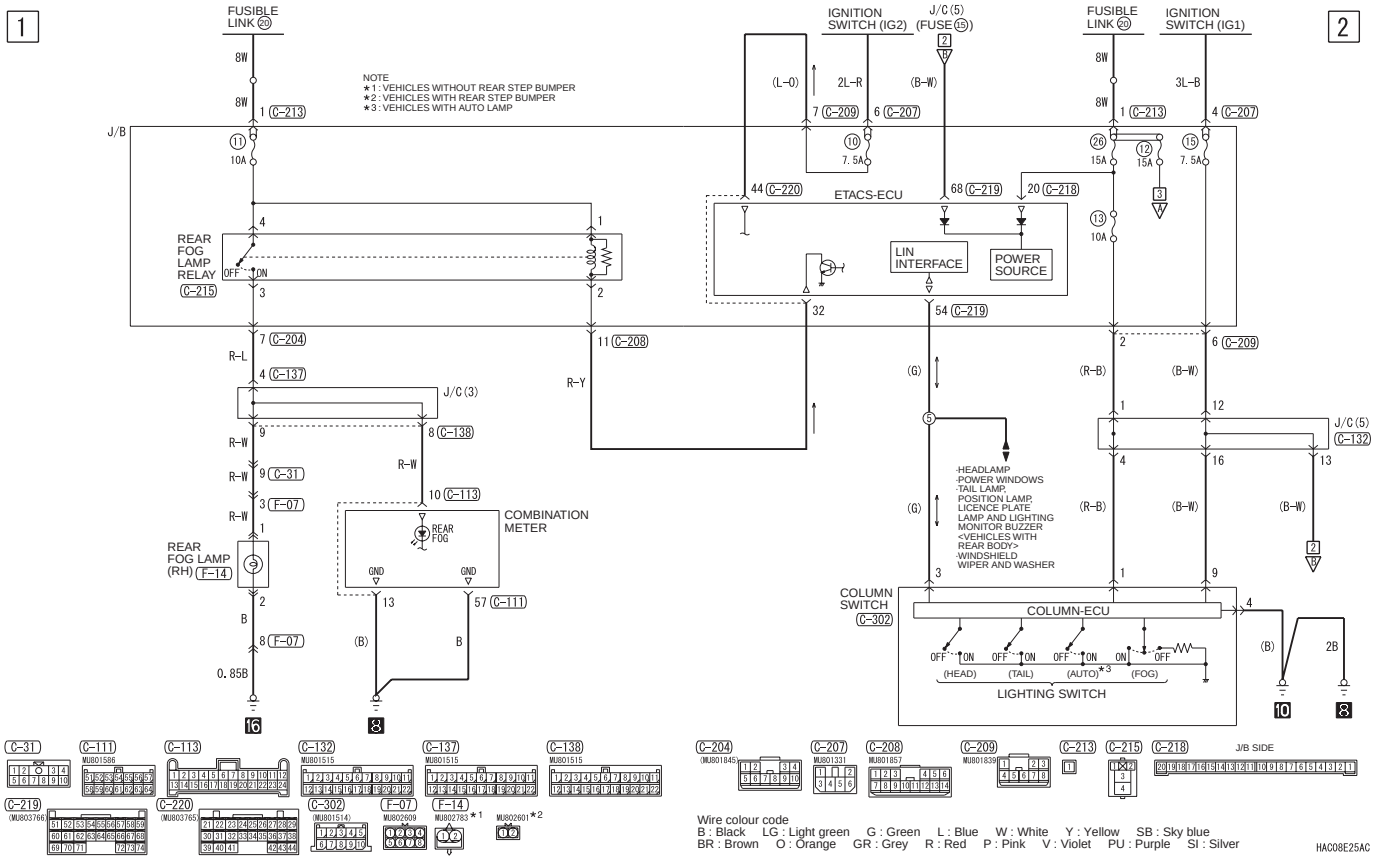


REAR FOG LAMP <VEHICLES WITH REAR BODY (LHD)> (CONTINUED)



REAR FOG LAMP <VEHICLES WITH REAR BODY (RHD)>

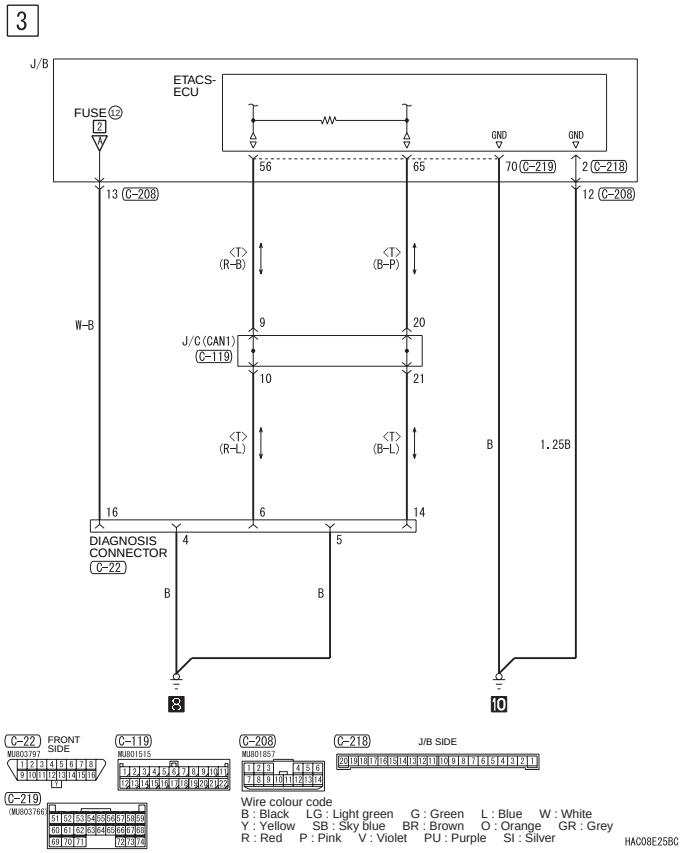
M1901012001804



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HAC08E25AC

REAR FOG LAMP <VEHICLES WITH REAR BODY (RHD)> (CONTINUED)



HORN

M1901003302747

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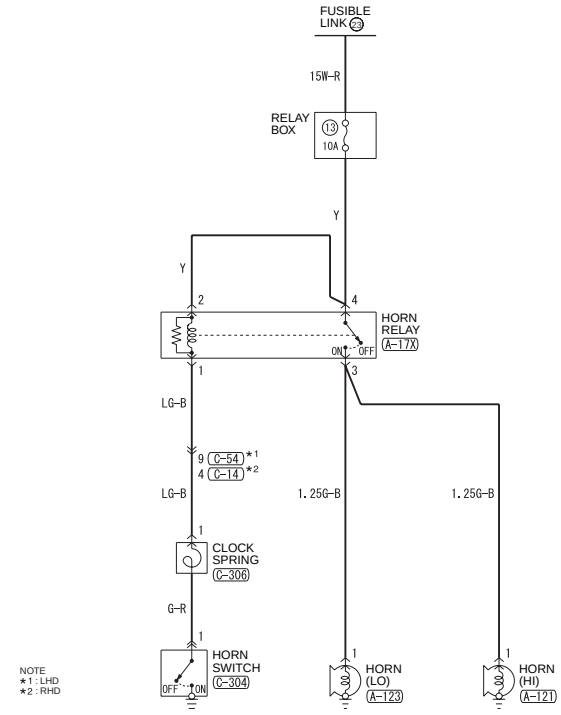

Wire colour code
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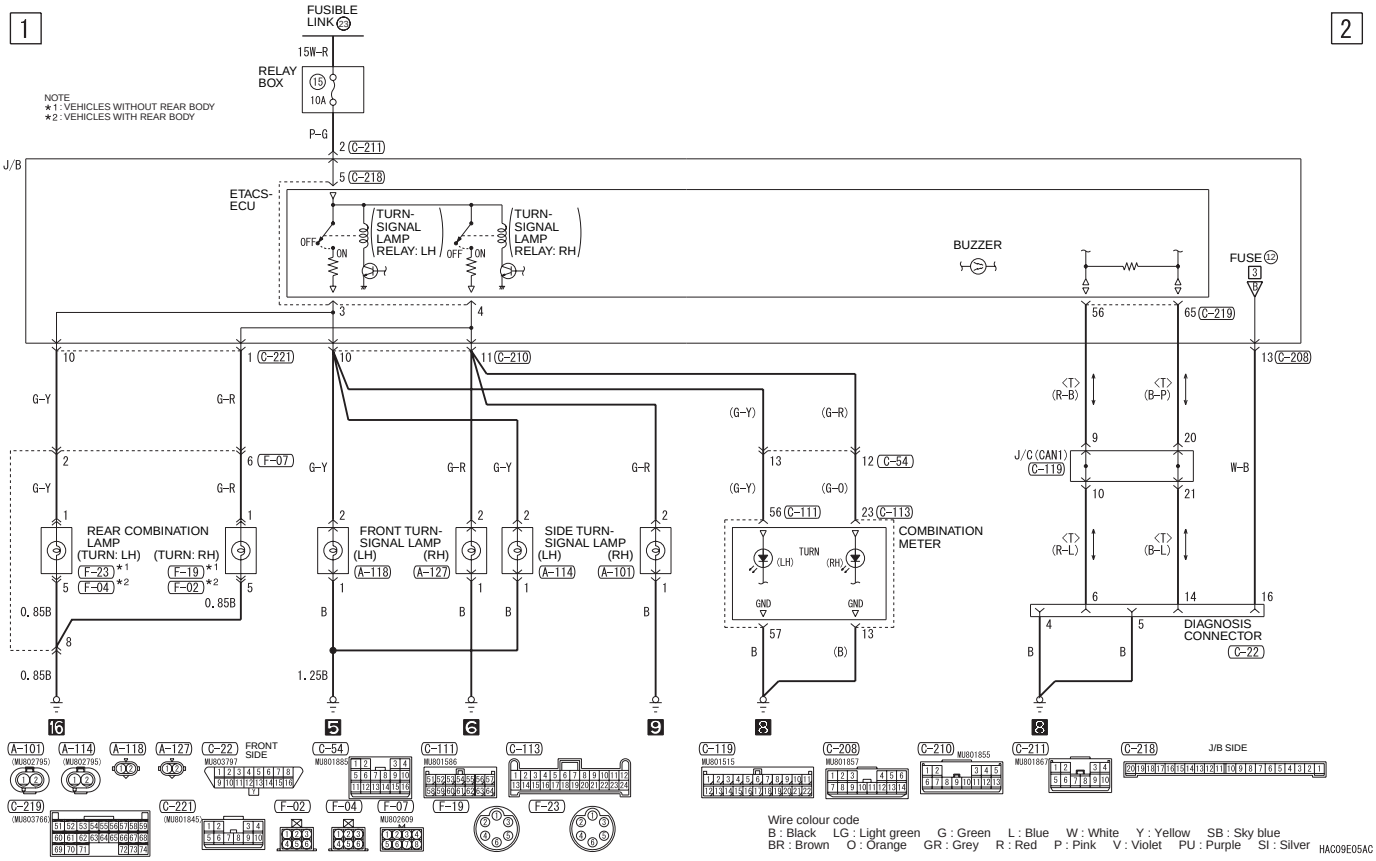
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HAC09E04AC

TURN-SIGNAL LAMP AND HAZARD WARNING LAMP

TURN-SIGNAL LAMP AND HAZARD WARNING LAMP <LHD>

M1901002904162



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
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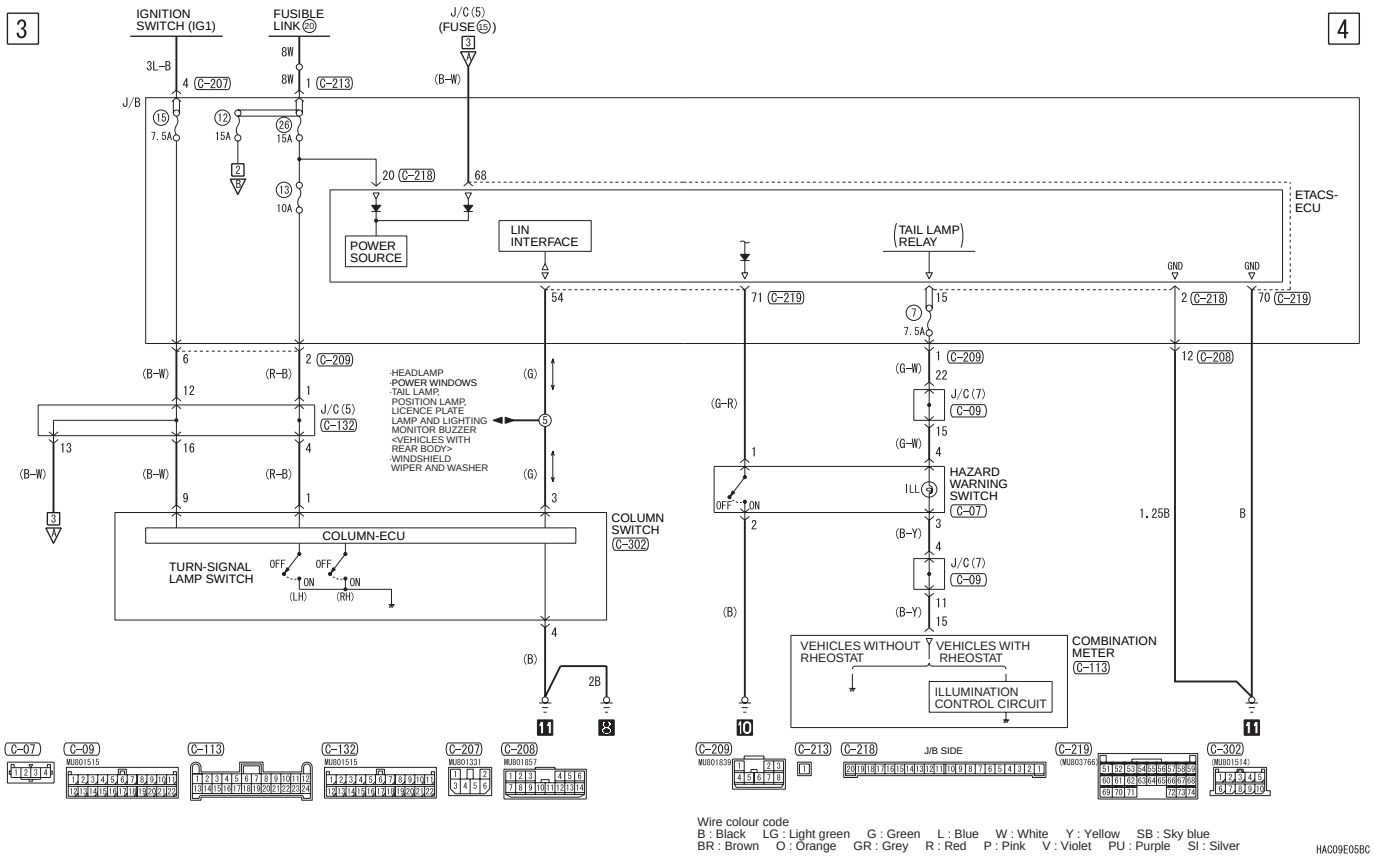
HAC09E05AC

TURN-SIGNAL LAMP AND HAZARD WARNING LAMP <LHD> (CONTINUED)



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
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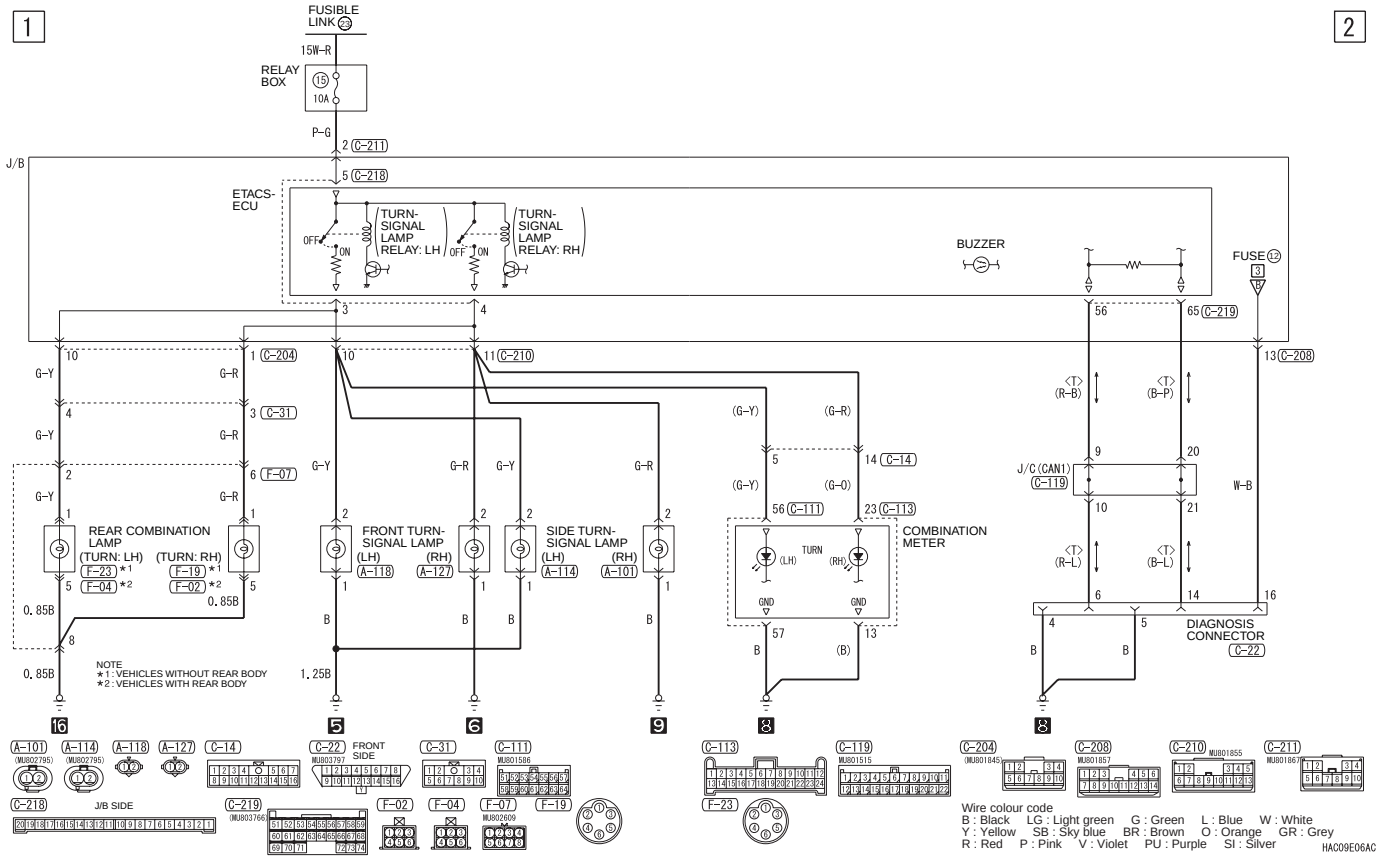
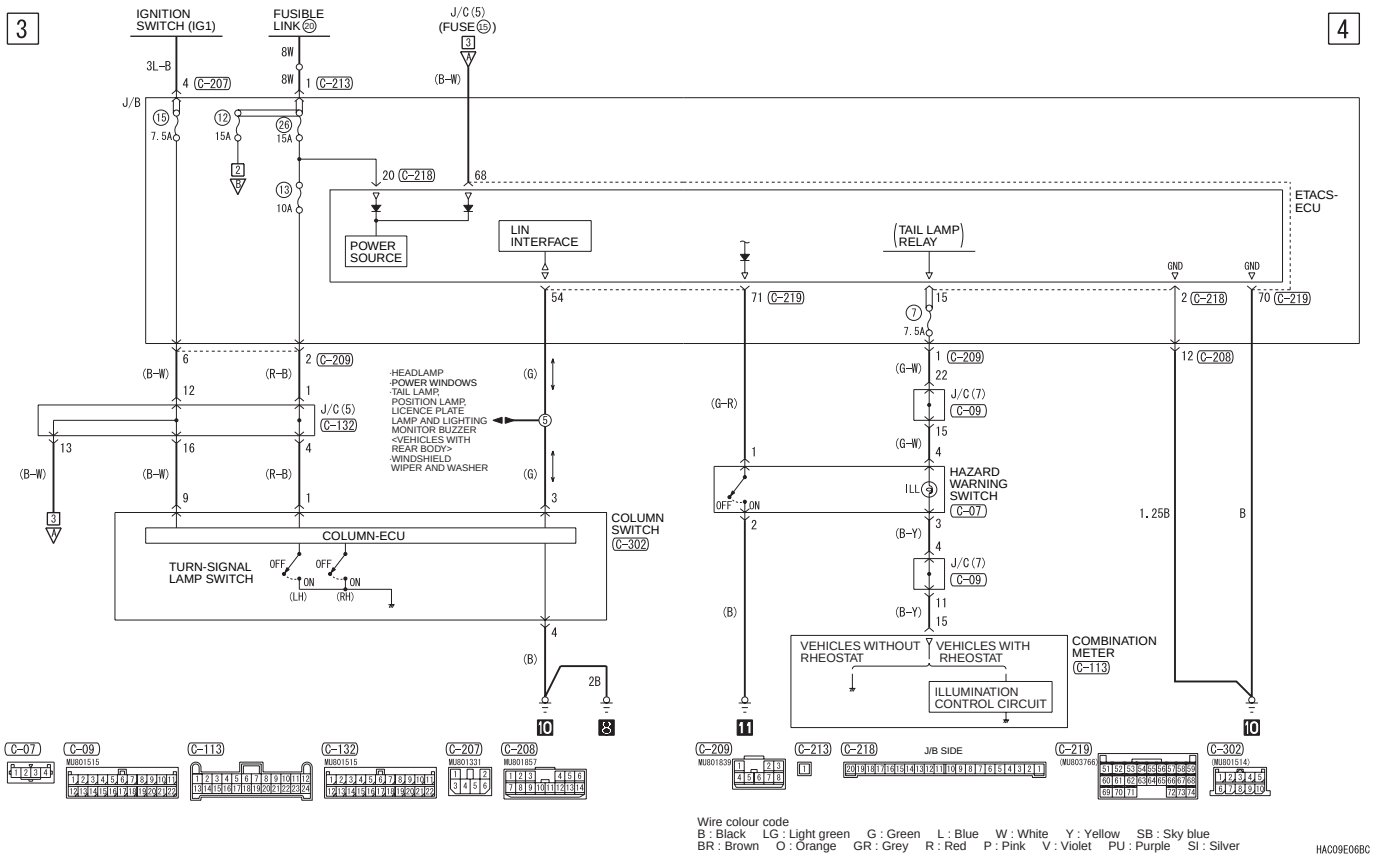
HAC09E05BC

TURN-SIGNAL LAMP AND HAZARD WARNING LAMP <RHD>

M1901002904173



TURN-SIGNAL LAMP AND HAZARD WARNING LAMP <RHD> (CONTINUED)



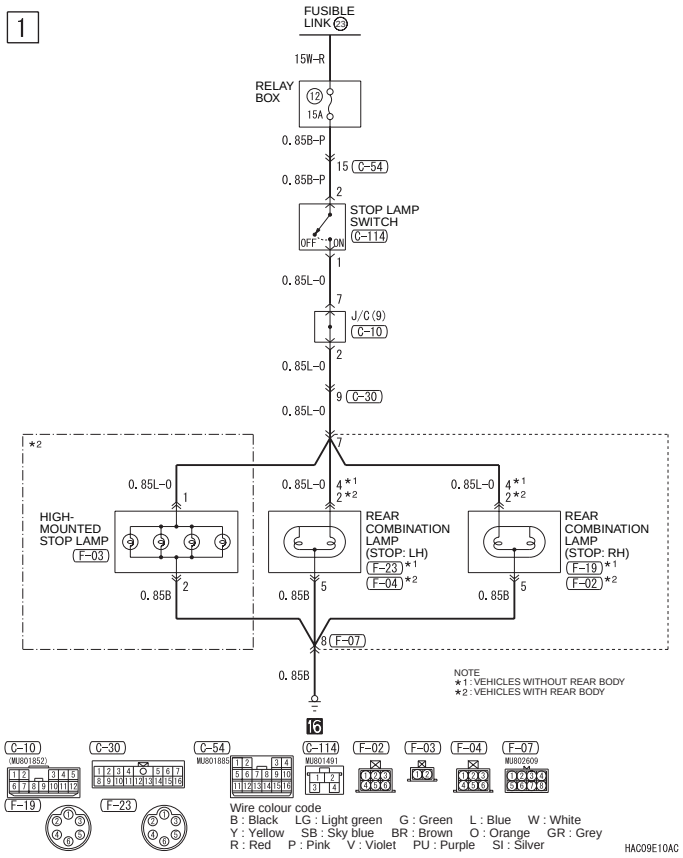
Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HAC09E06BC

STOP LAMP

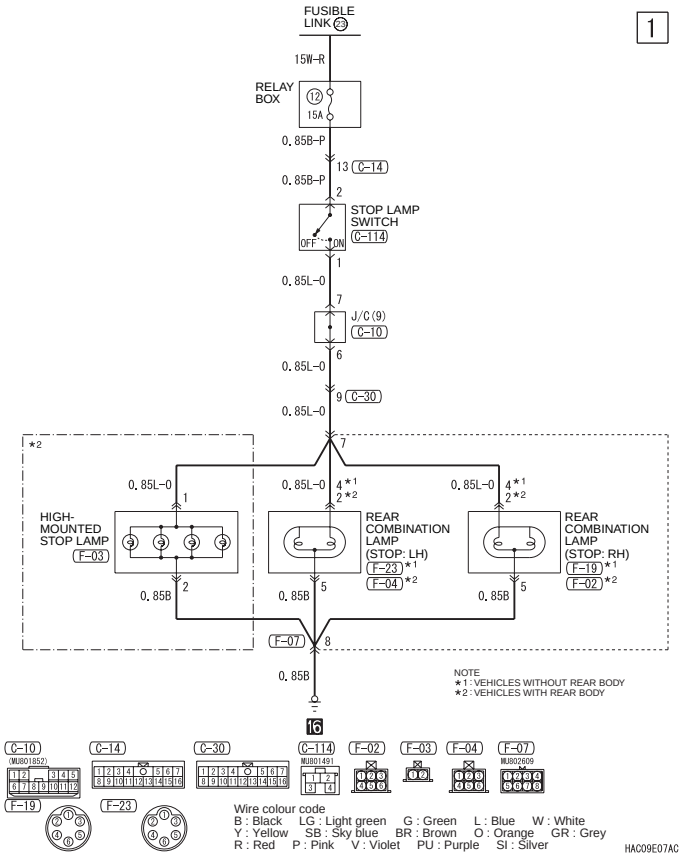
STOP LAMP <LHD>

M1901003004065



STOP LAMP <RHD>

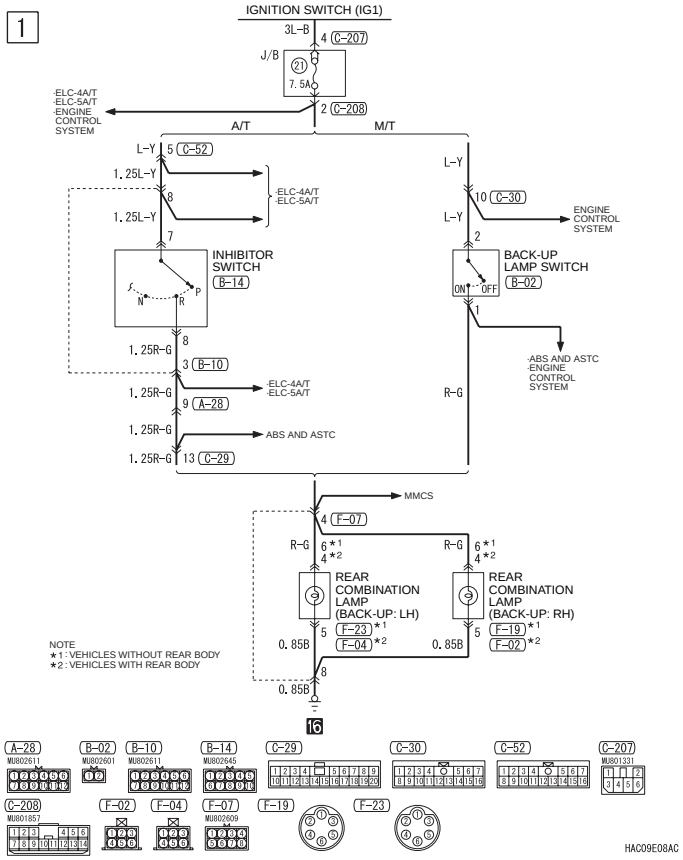
M1901003004043



BACK-UP LAMP

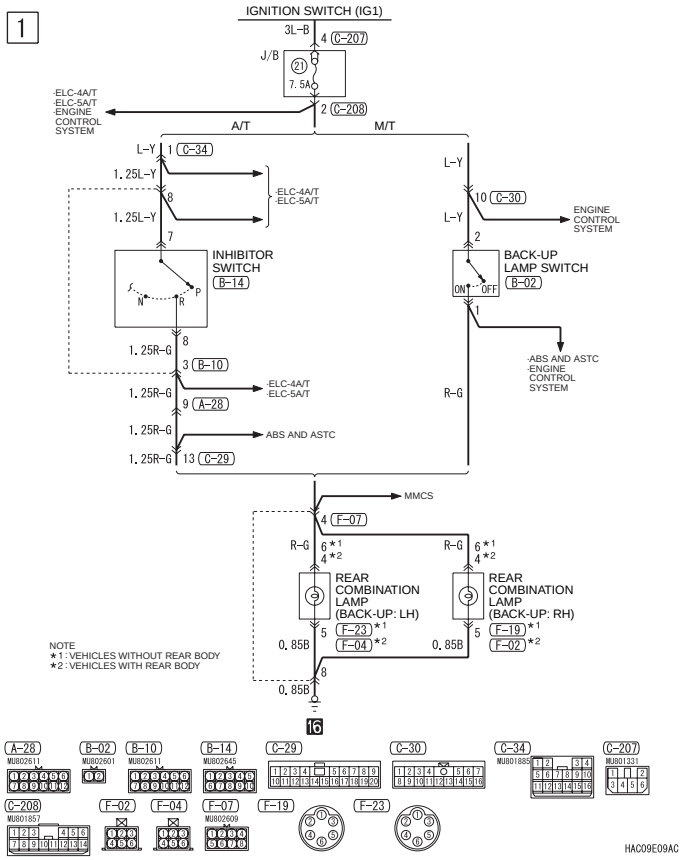
BACK-UP LAMP <LHD>

M1901003104879



BACK-UP LAMP <RHD>

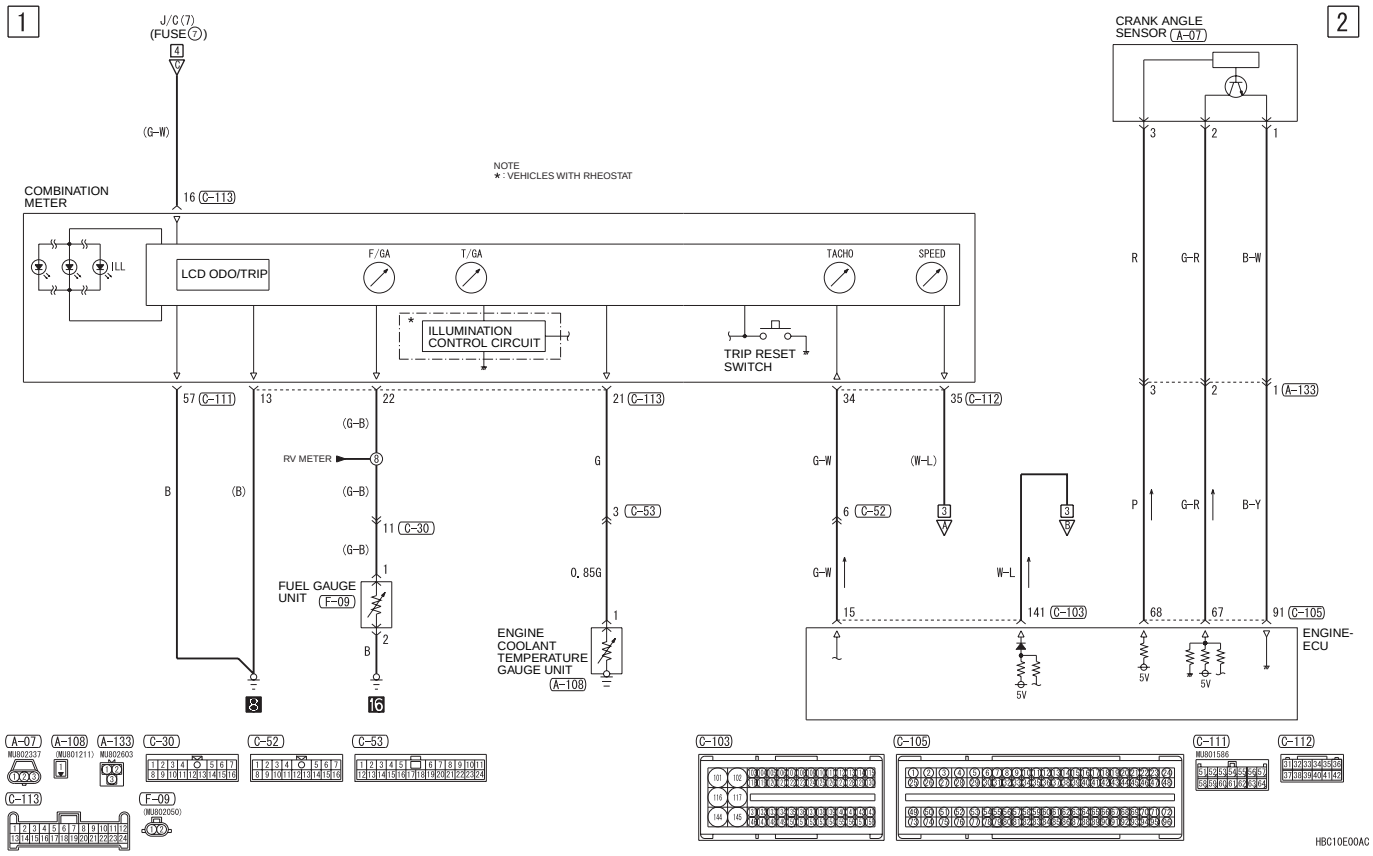
M1901003104880



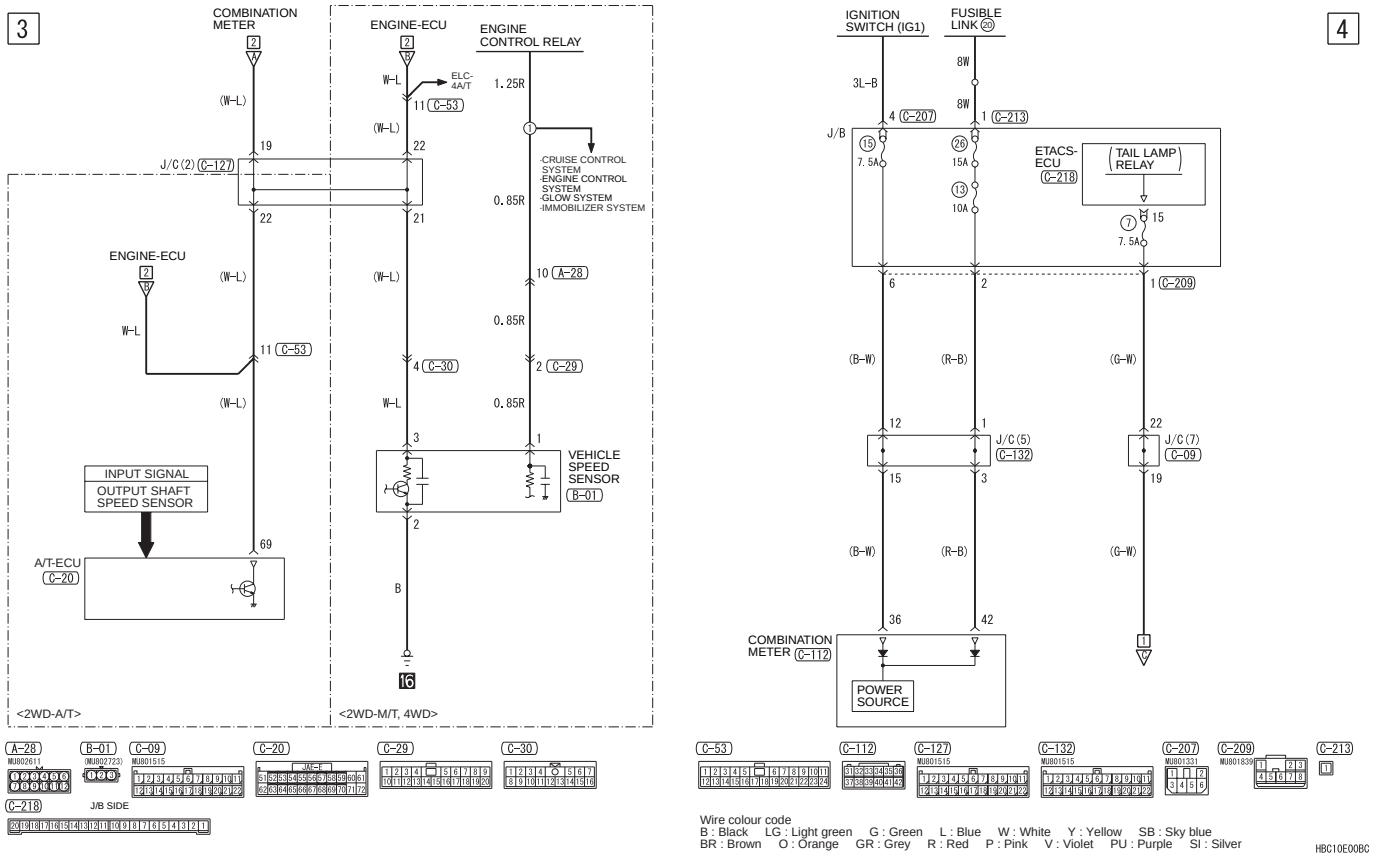
METER AND GAUGE

METER AND GAUGE <LHD>

M1901003506475



METER AND GAUGE <LHD> (CONTINUED)

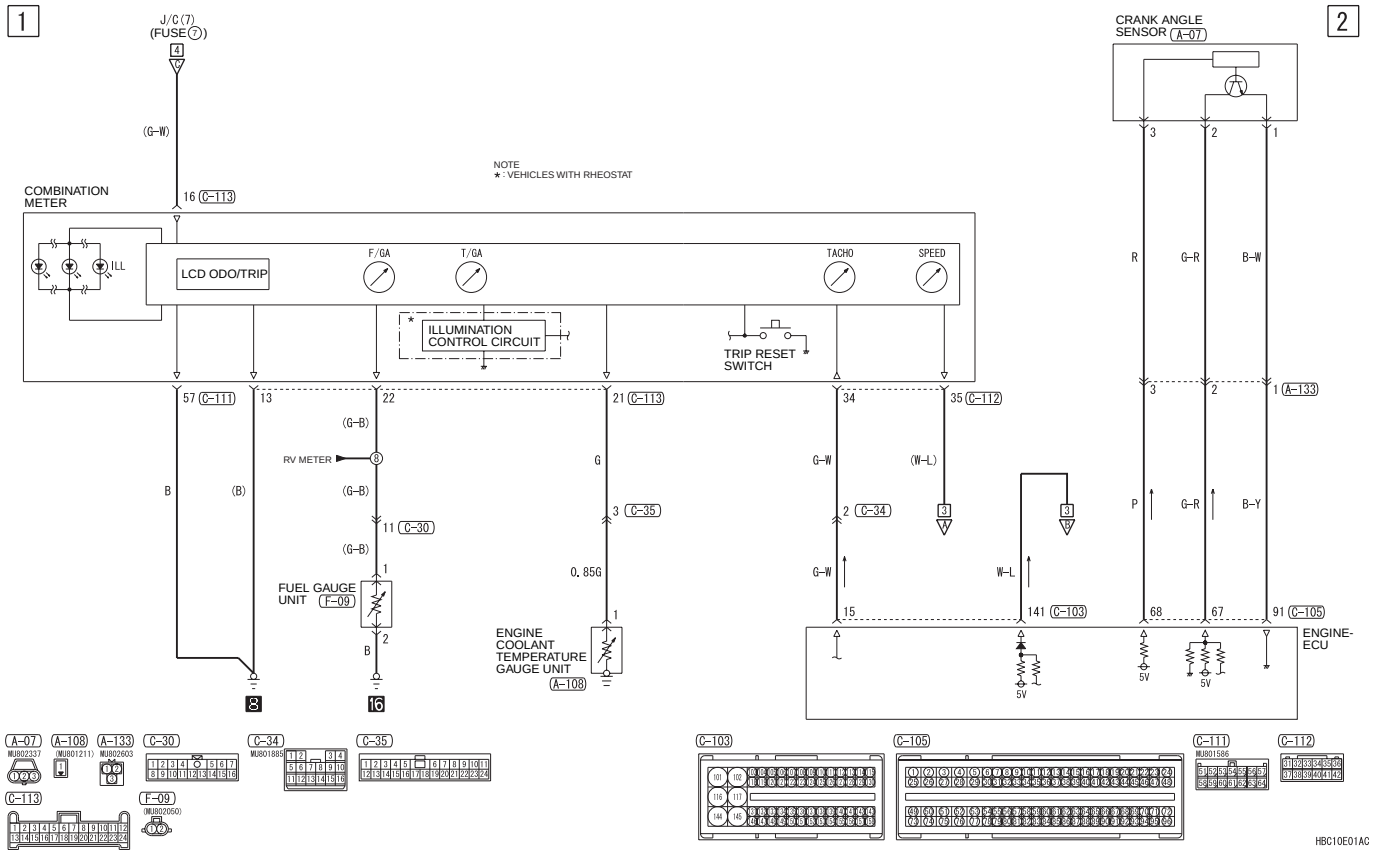


Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HBC10E00BC

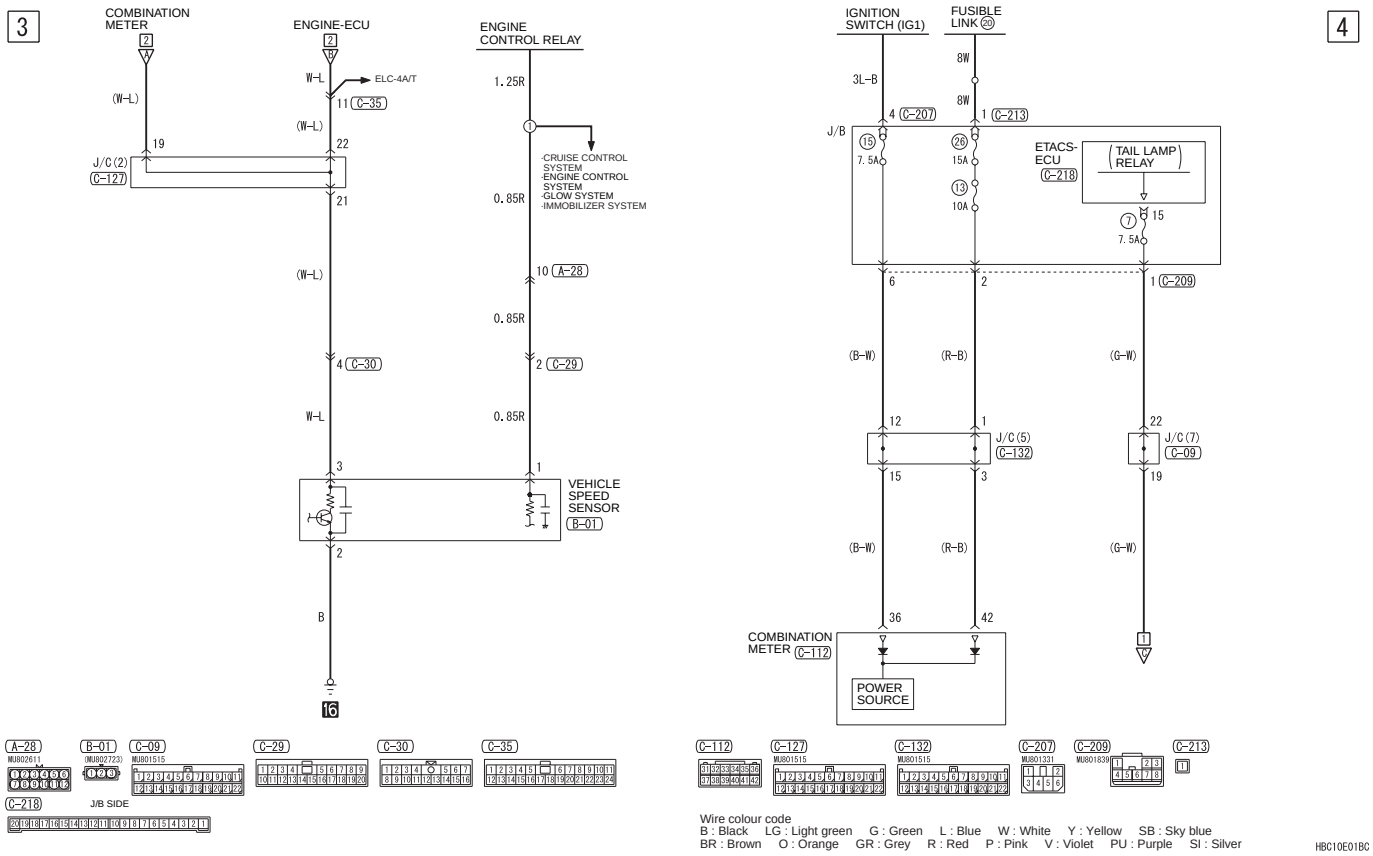
METER AND GAUGE <RHD>

M1901003506486



HBC10E01AC

METER AND GAUGE <RHD> (CONTINUED)



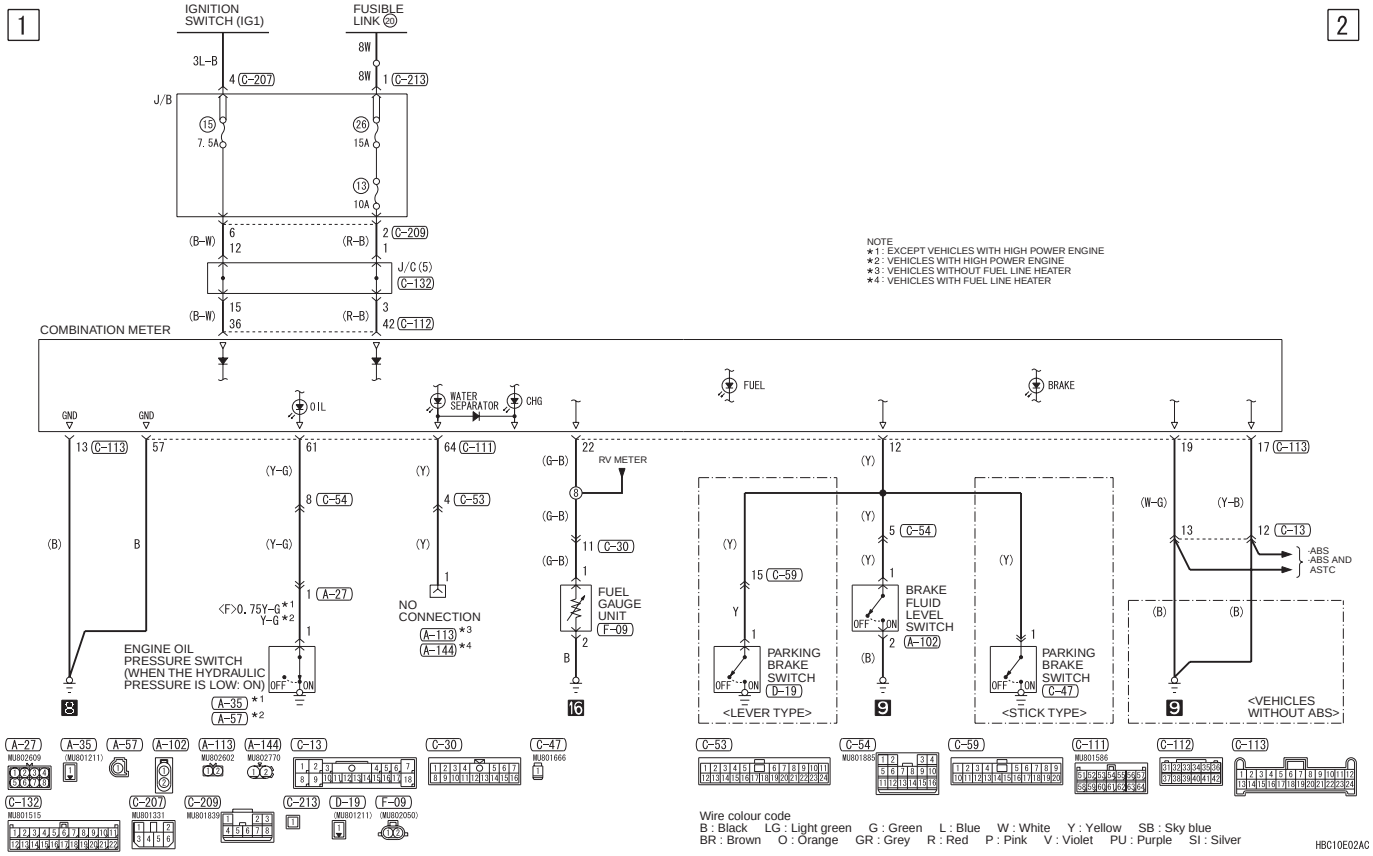
Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HBC10E01BC

WARNING LAMP

OIL PRESSURE WARNING LAMP, FUEL FILTER WARNING LAMP, FUEL WARNING LAMP AND BRAKE WARNING LAMP <LHD (VEHICLES FOR EUROPE)>

M1901011802361

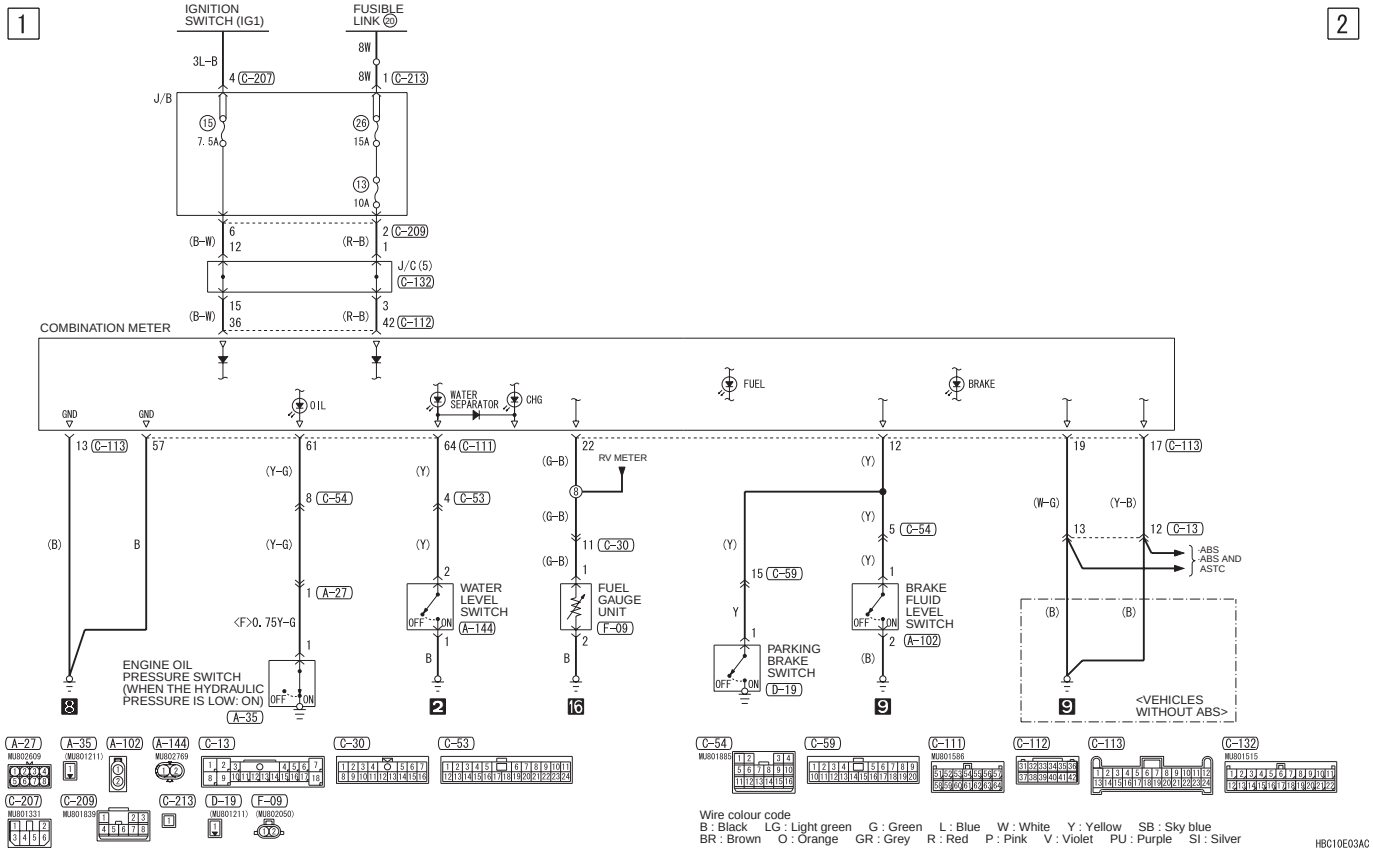


Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HBC10E02AC

OIL PRESSURE WARNING LAMP, FUEL FILTER WARNING LAMP, FUEL WARNING LAMP AND BRAKE WARNING LAMP <VEHICLES FOR RUSSIA>

M1901011802372

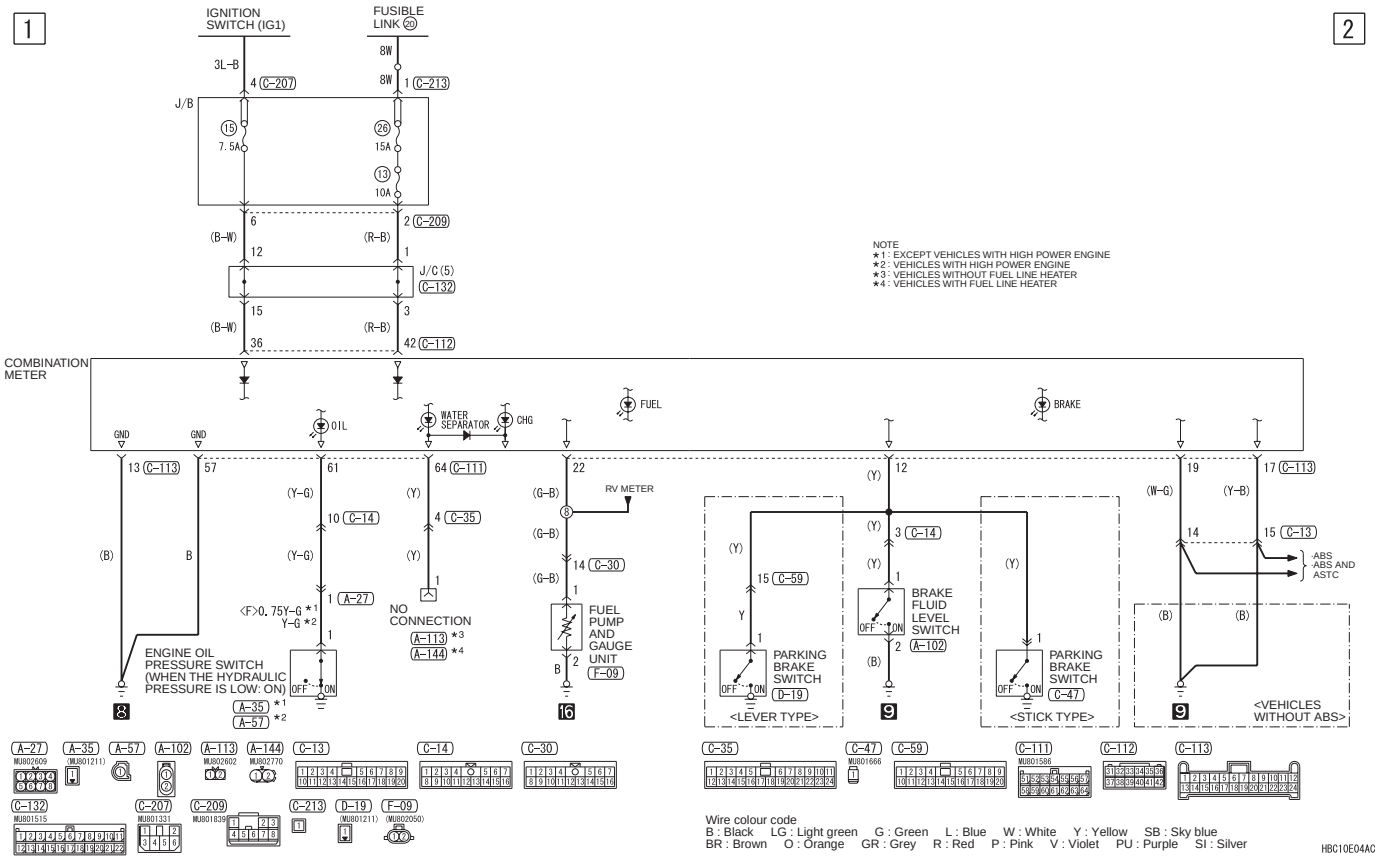


Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HBC10E03AC

OIL PRESSURE WARNING LAMP, FUEL FILTER WARNING LAMP, FUEL WARNING LAMP AND BRAKE WARNING LAMP <RHD>

M1901011802383



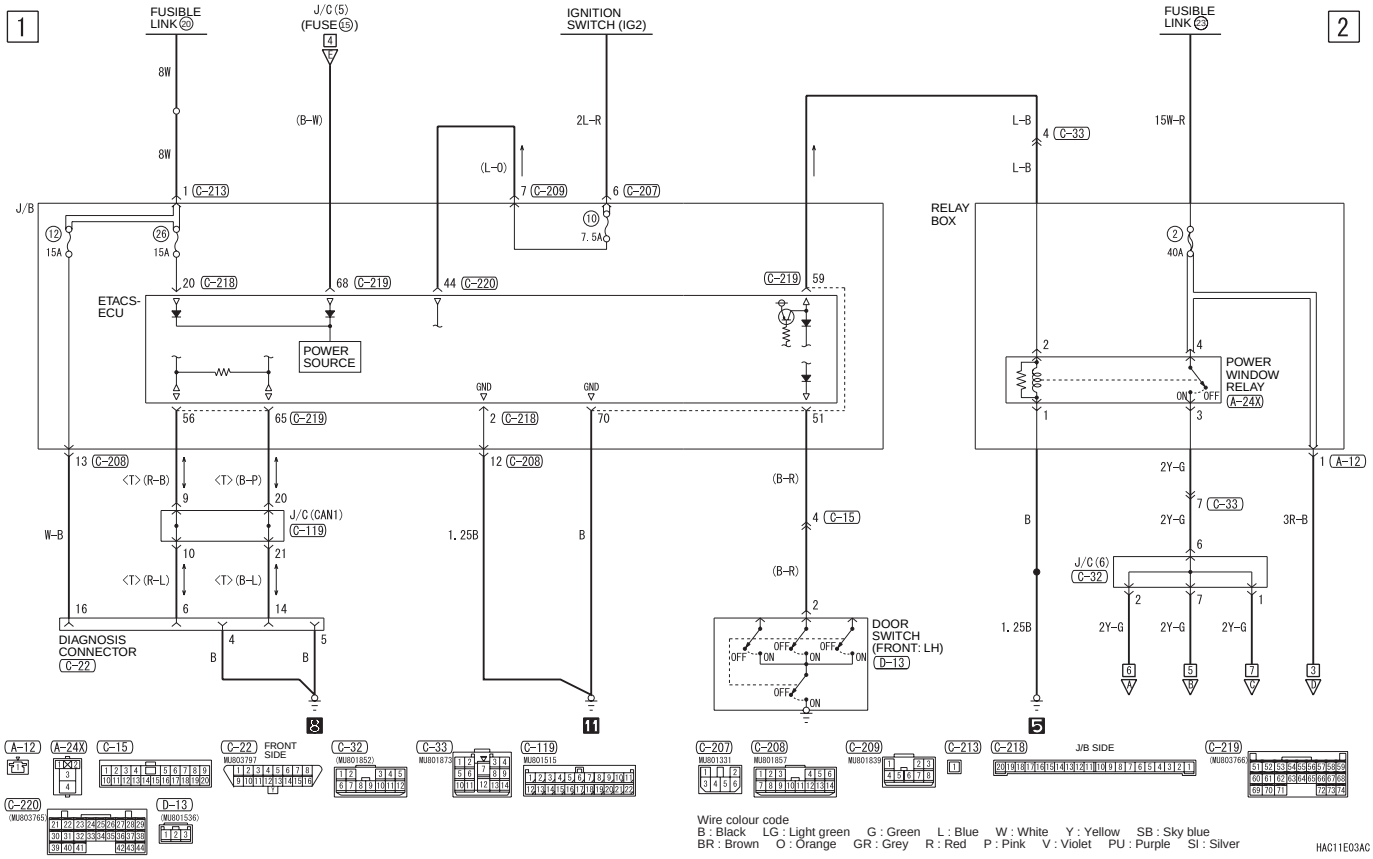
Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HBC10E04AC

POWER WINDOWS

POWER WINDOWS <LHD>

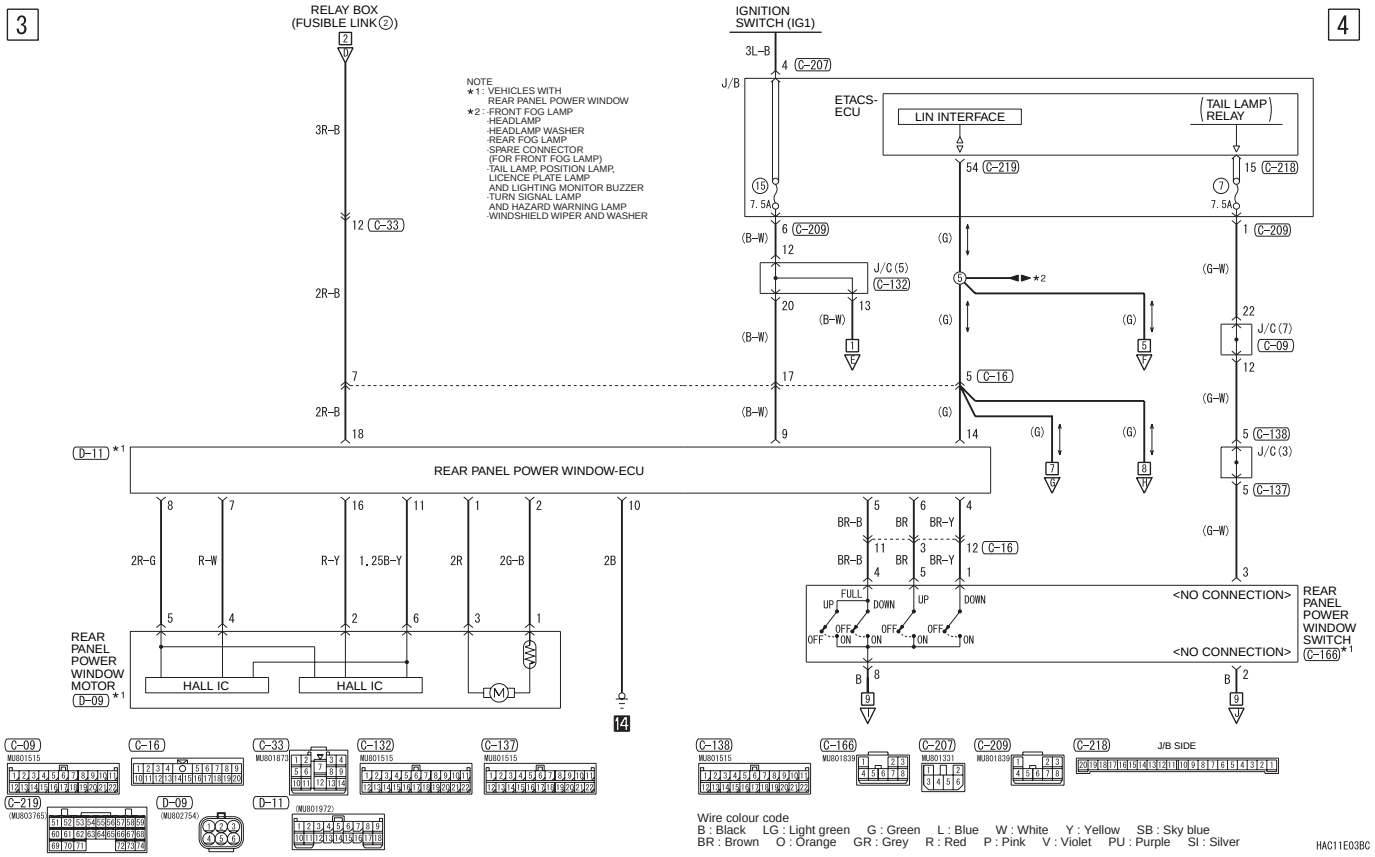
M1901004604963



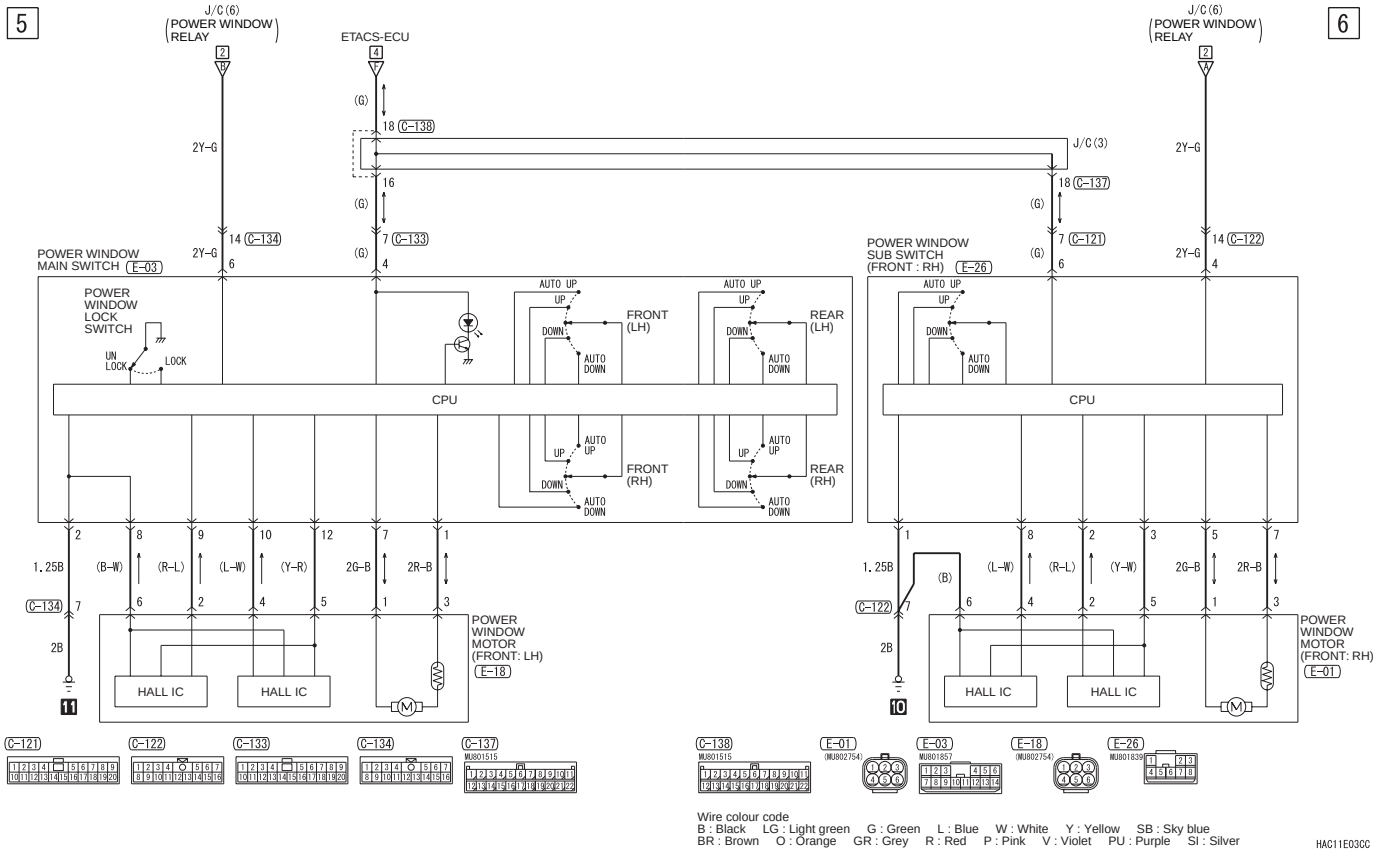
Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HAC11E03AC

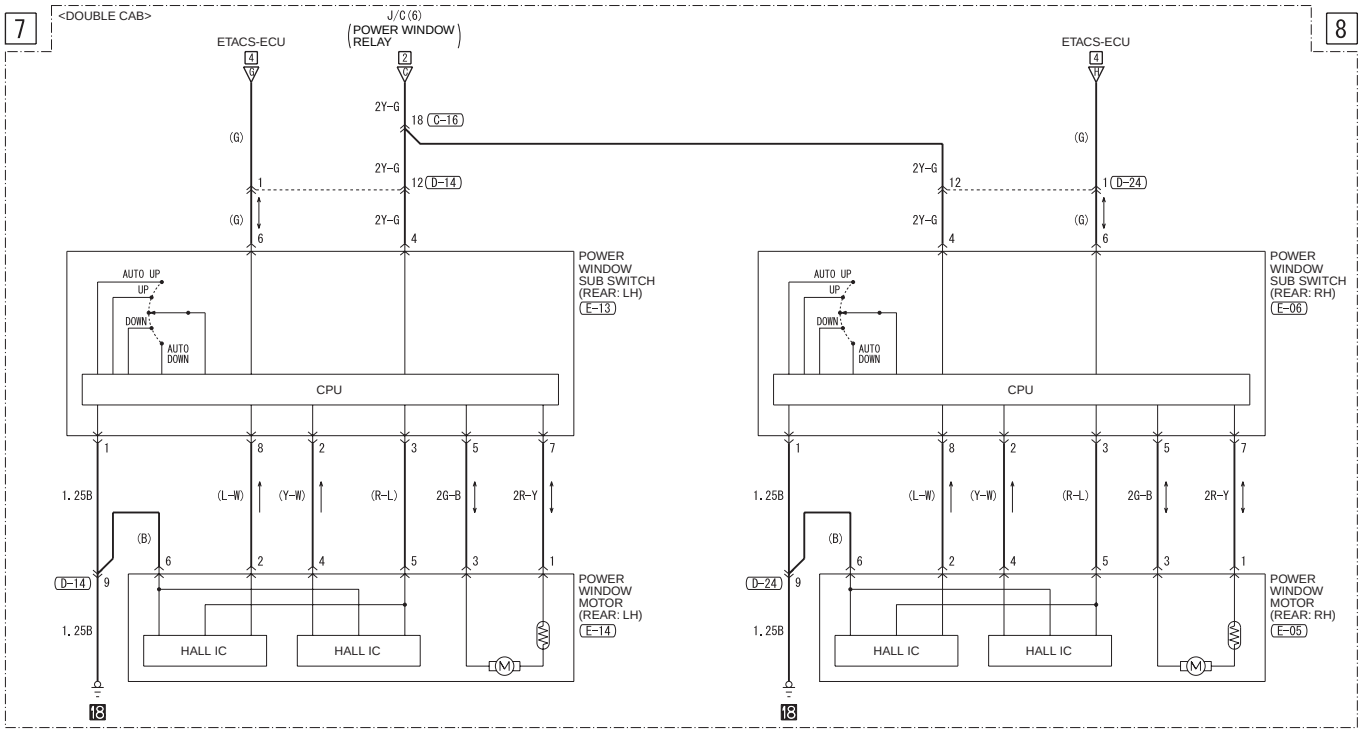
POWER WINDOWS <LHD> (CONTINUED)



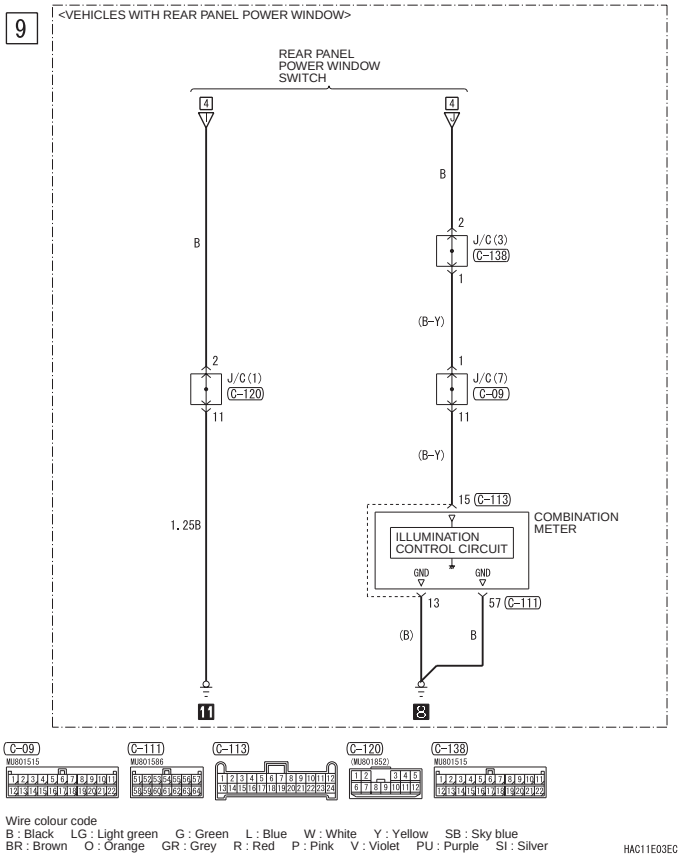
POWER WINDOWS <LHD> (CONTINUED)



POWER WINDOWS <LHD> (CONTINUED)

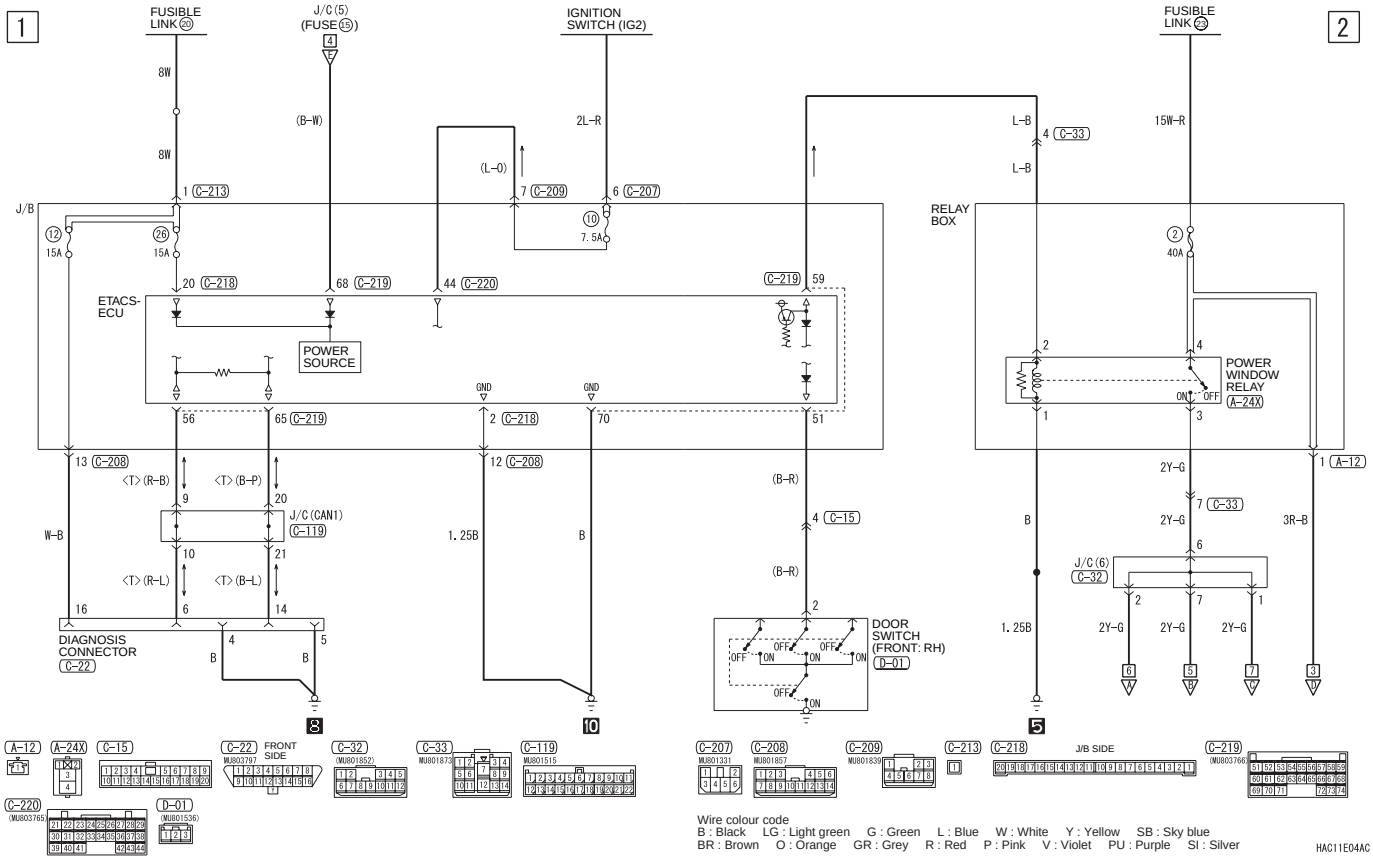


POWER WINDOWS <LHD> (CONTINUED)



POWER WINDOWS <RHD>

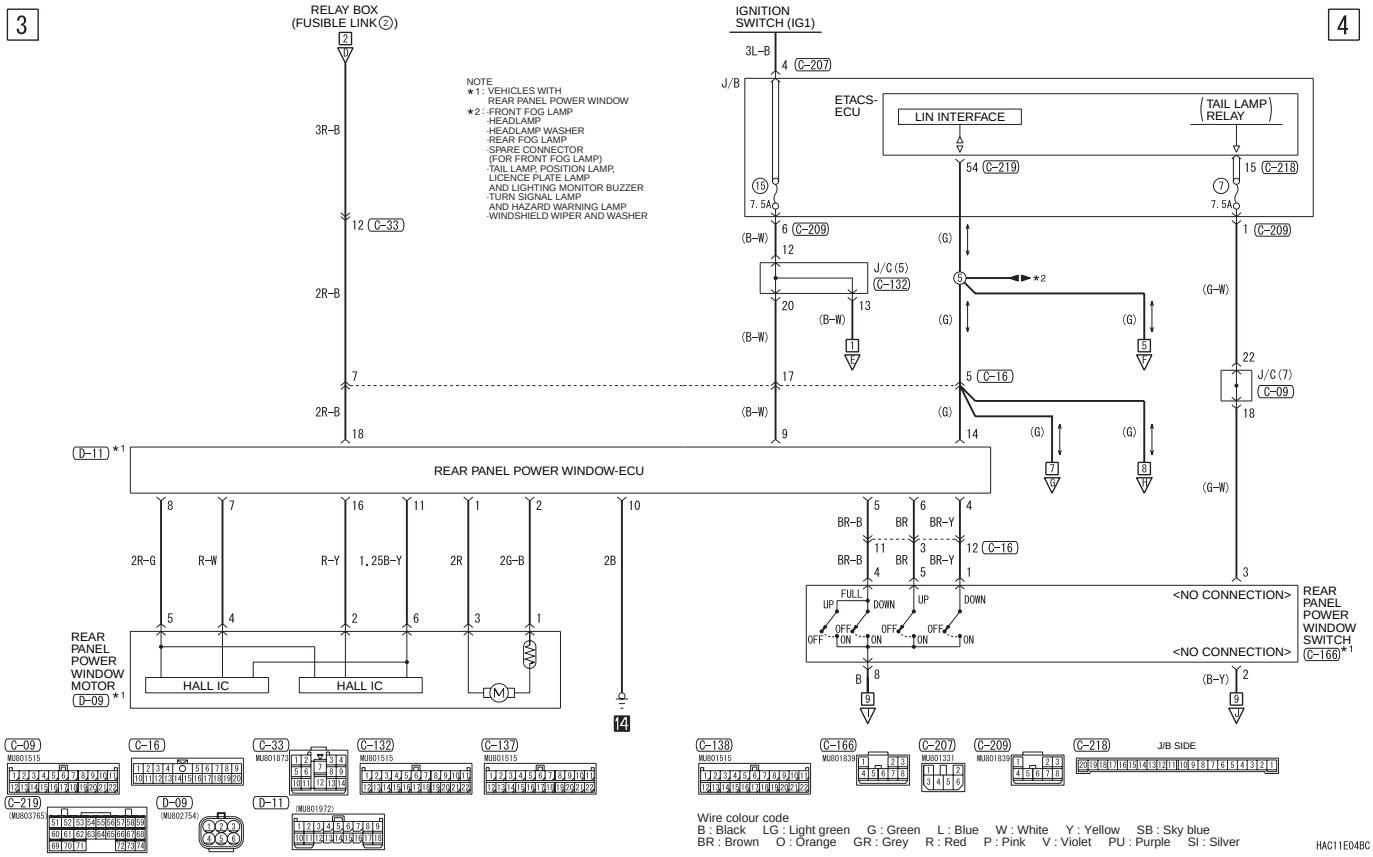
M1901004604974



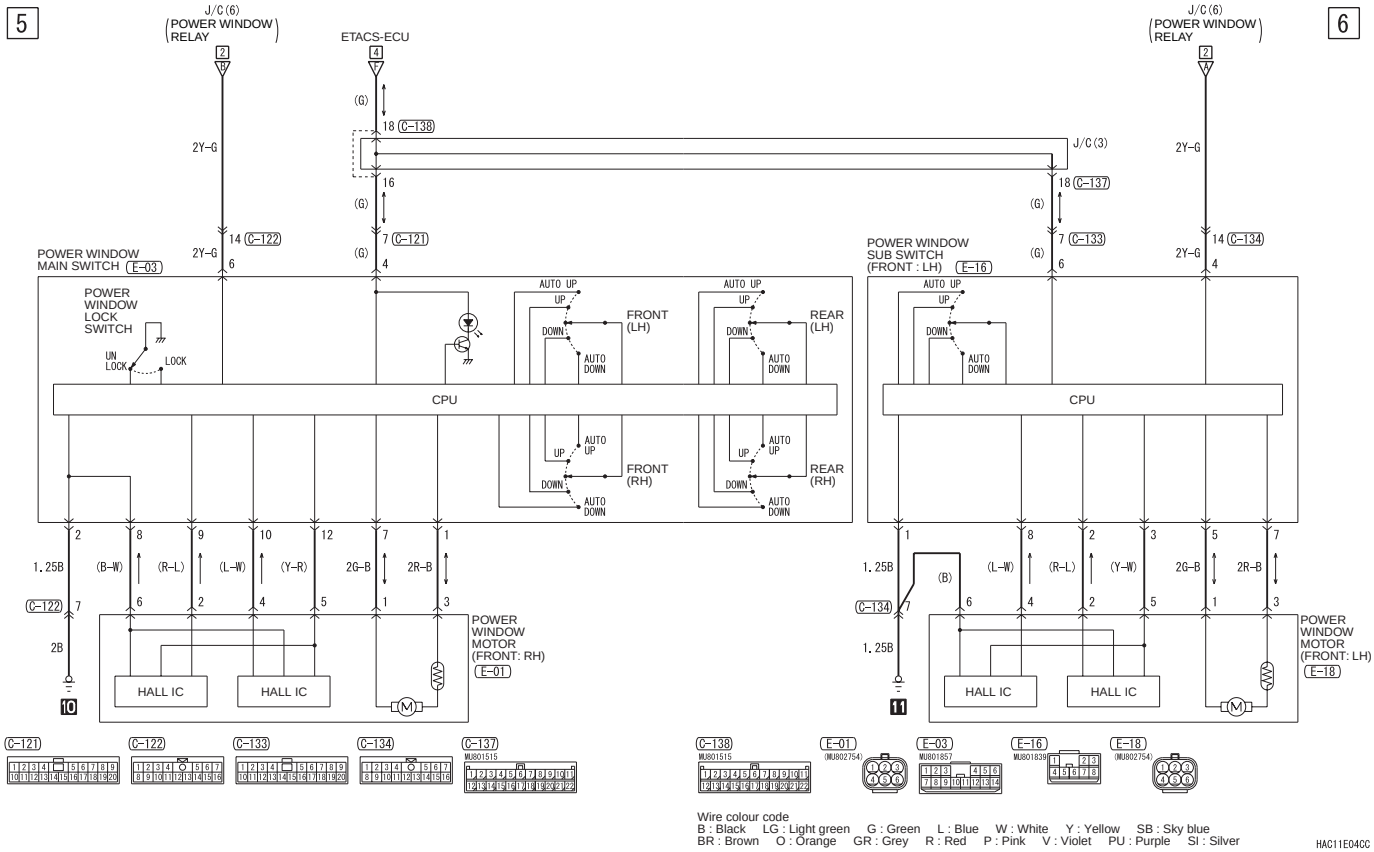
Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HAC11E04AC

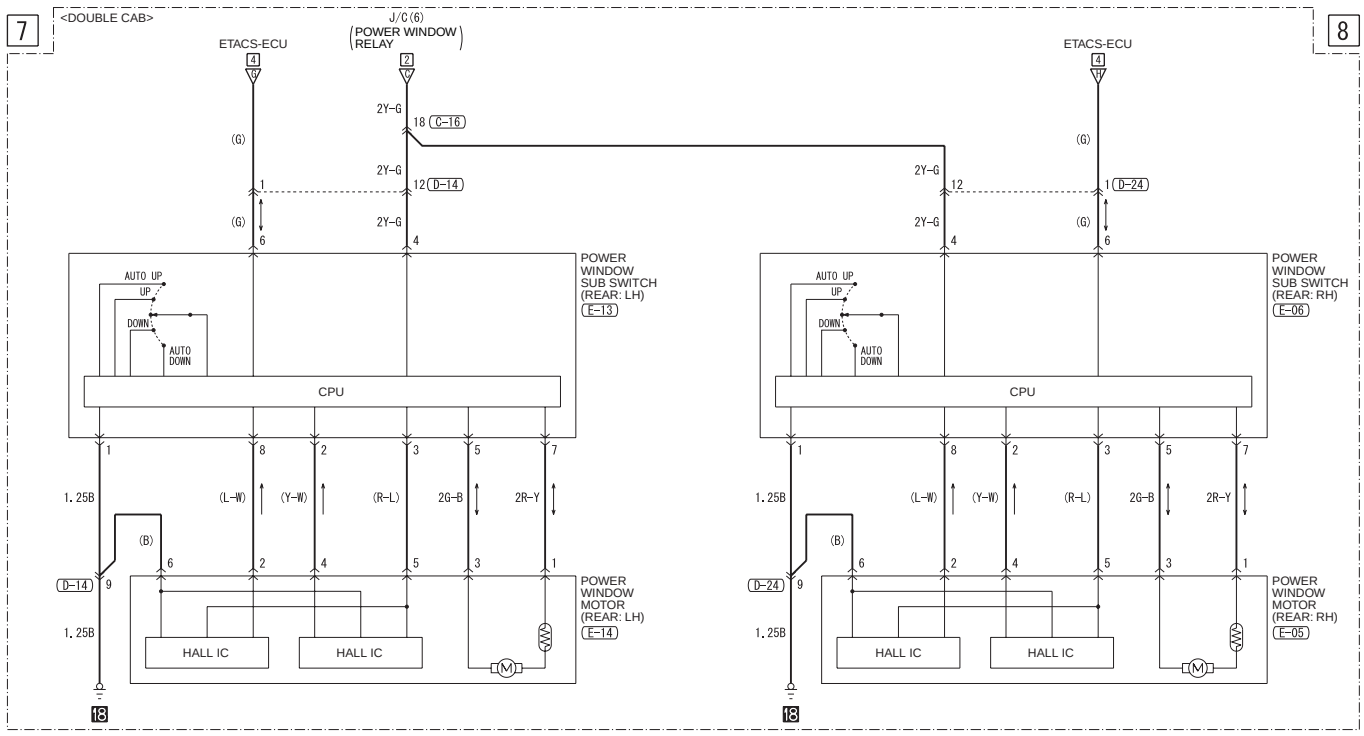
POWER WINDOWS <RHD> (CONTINUED)



POWER WINDOWS <RHD> (CONTINUED)



POWER WINDOWS <RHD> (CONTINUED)



Wire colour code
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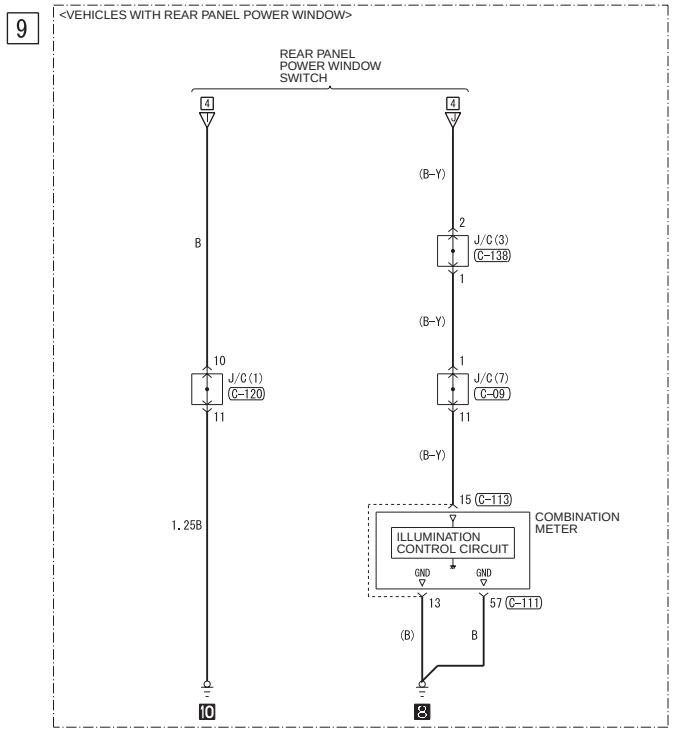
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HAC11E04DC

POWER WINDOWS <RHD> (CONTINUED)



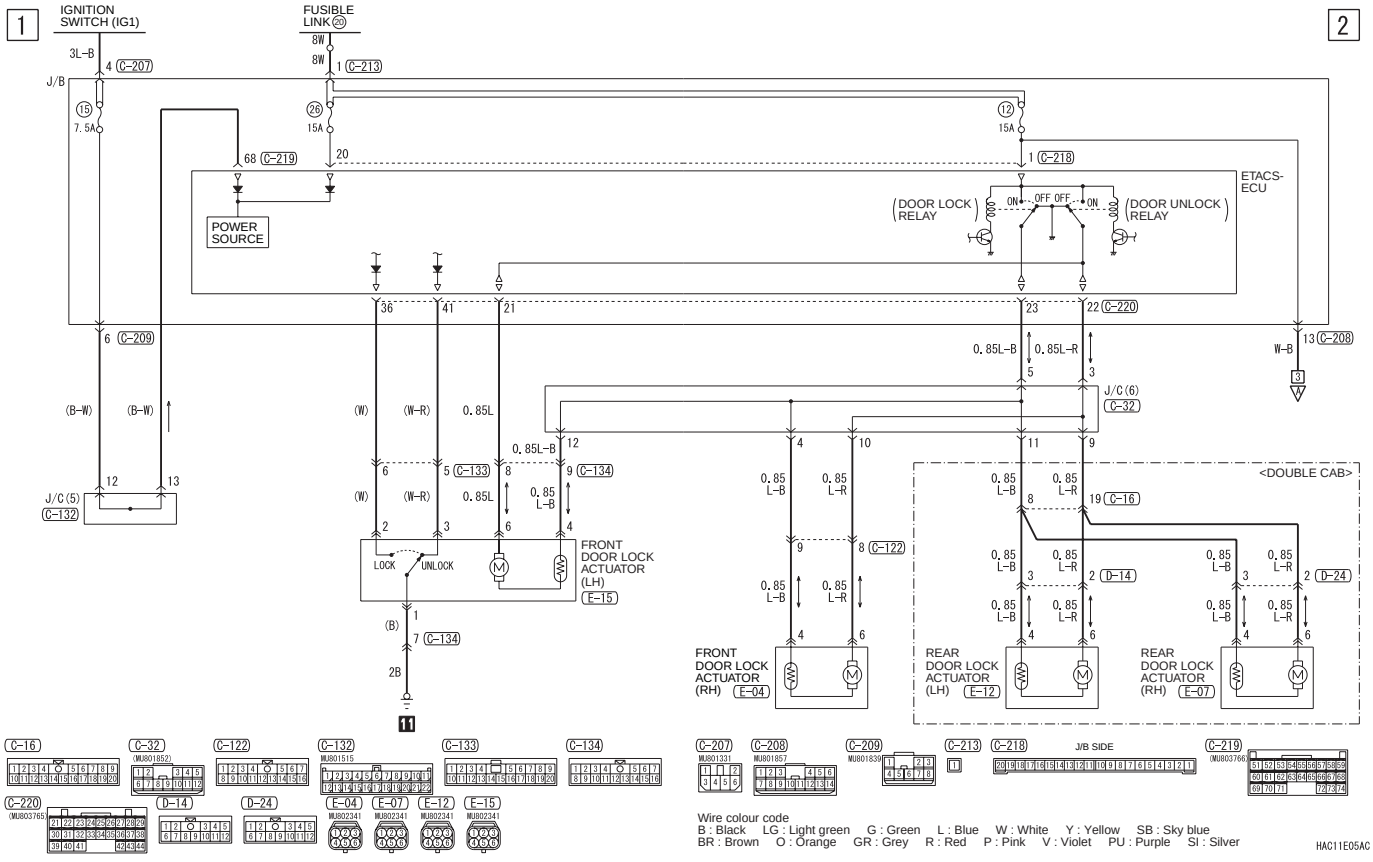
Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HAC11E04EC

CENTRAL DOOR LOCKING SYSTEM

CENTRAL DOOR LOCKING SYSTEM <VEHICLES WITHOUT KEYLESS ENTRY SYSTEM (LHD)>

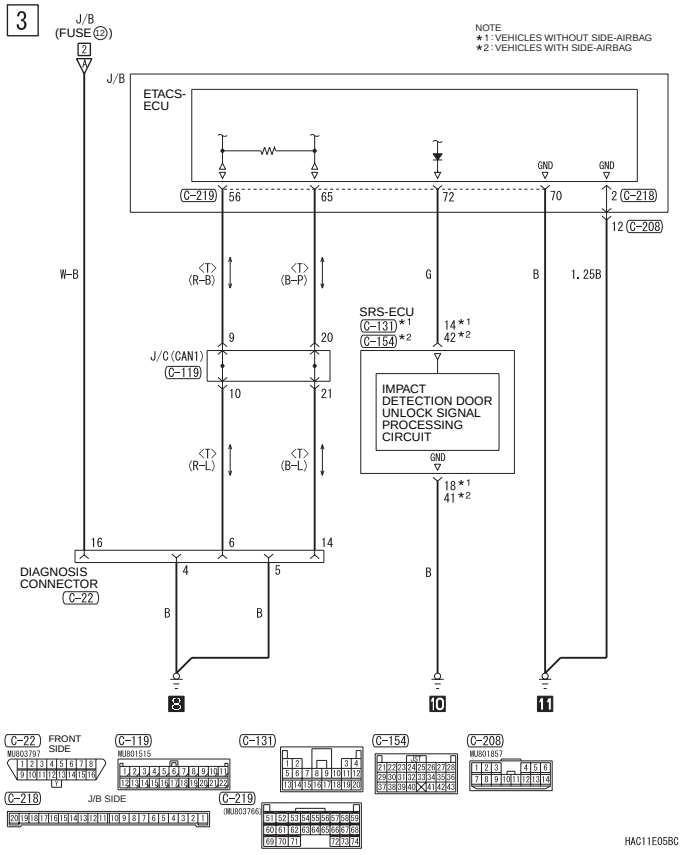
M1901004707602



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

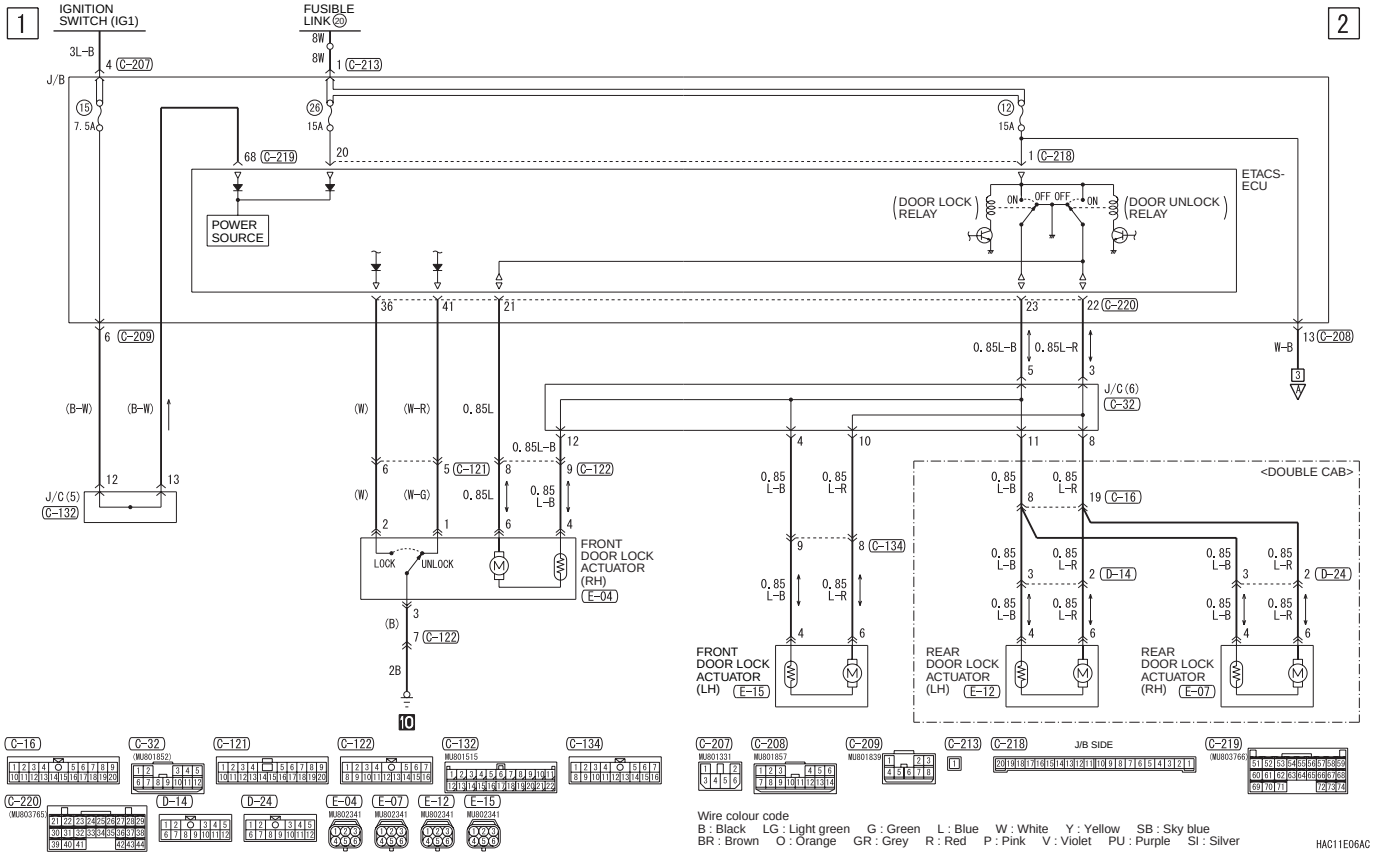
HAC11E05AC

CENTRAL DOOR LOCKING SYSTEM <VEHICLES WITHOUT KEYLESS ENTRY SYSTEM (LHD)> (CONTINUED)



CENTRAL DOOR LOCKING SYSTEM <VEHICLES WITHOUT KEYLESS ENTRY SYSTEM (RHD)>

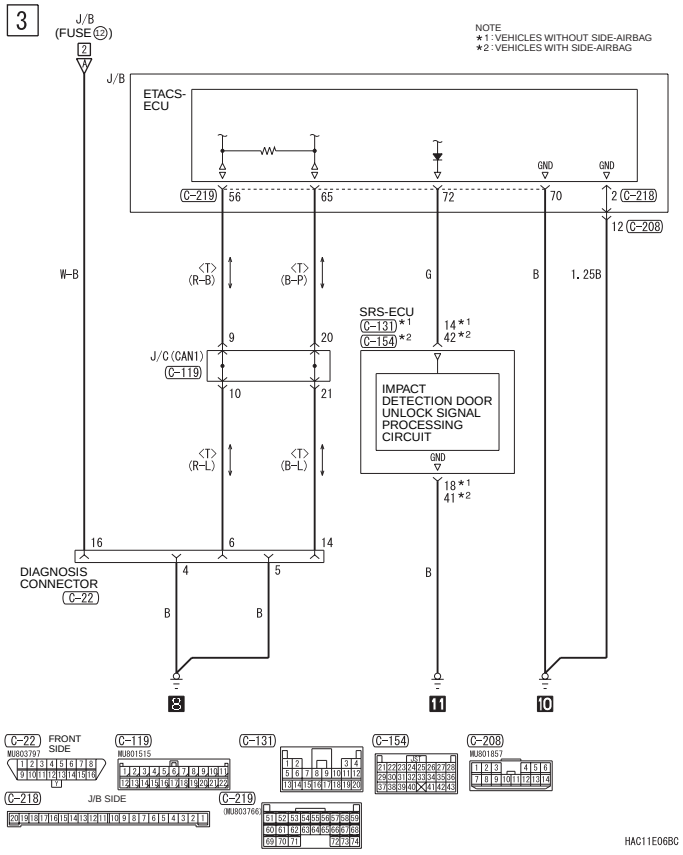
M1901004707613



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

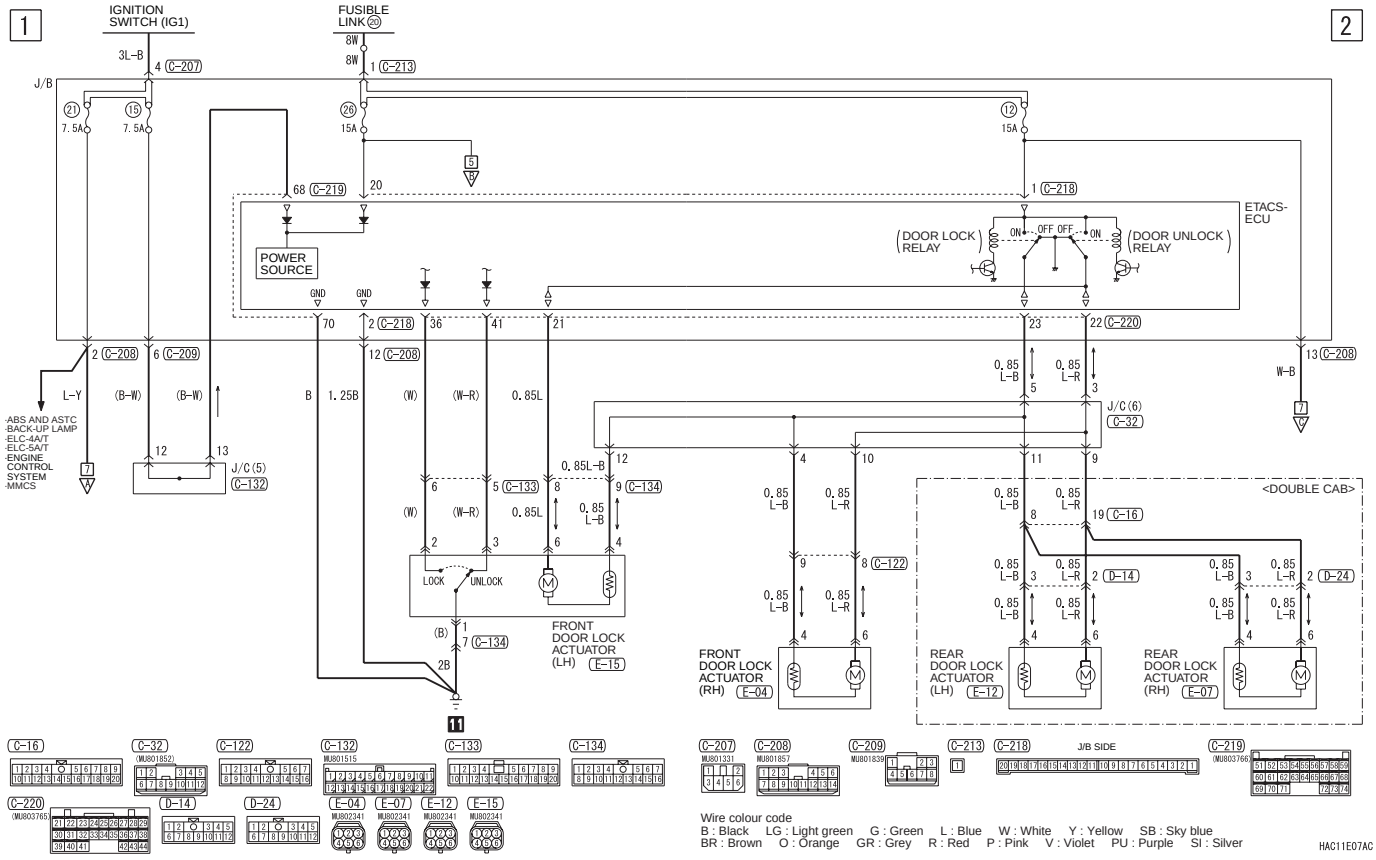
HAC11E06AC

CENTRAL DOOR LOCKING SYSTEM <VEHICLES WITHOUT KEYLESS ENTRY SYSTEM (RHD)> (CONTINUED)



CENTRAL DOOR LOCKING SYSTEM <VEHICLES WITH KEYLESS ENTRY SYSTEM (LHD)>

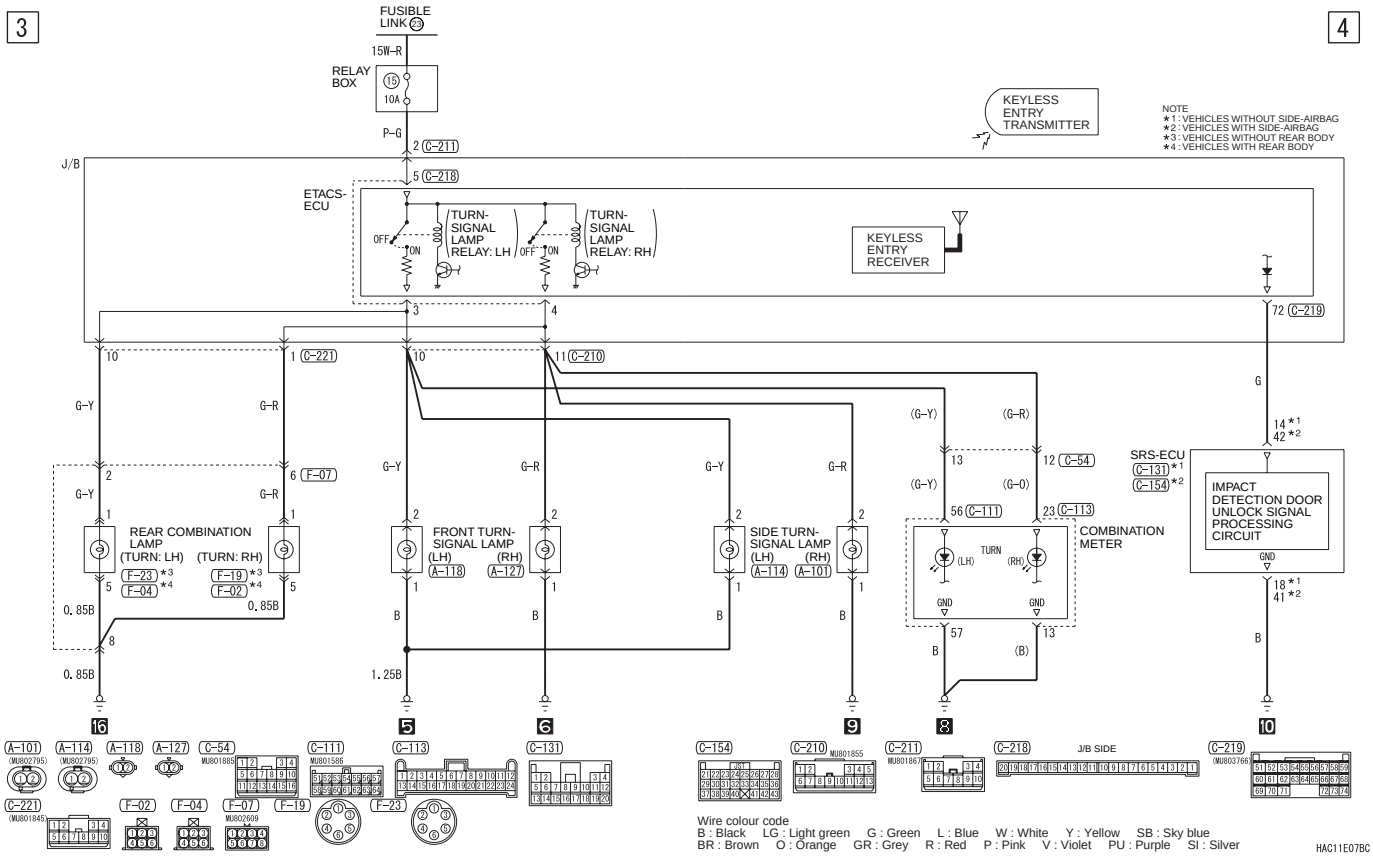
M1901004707624



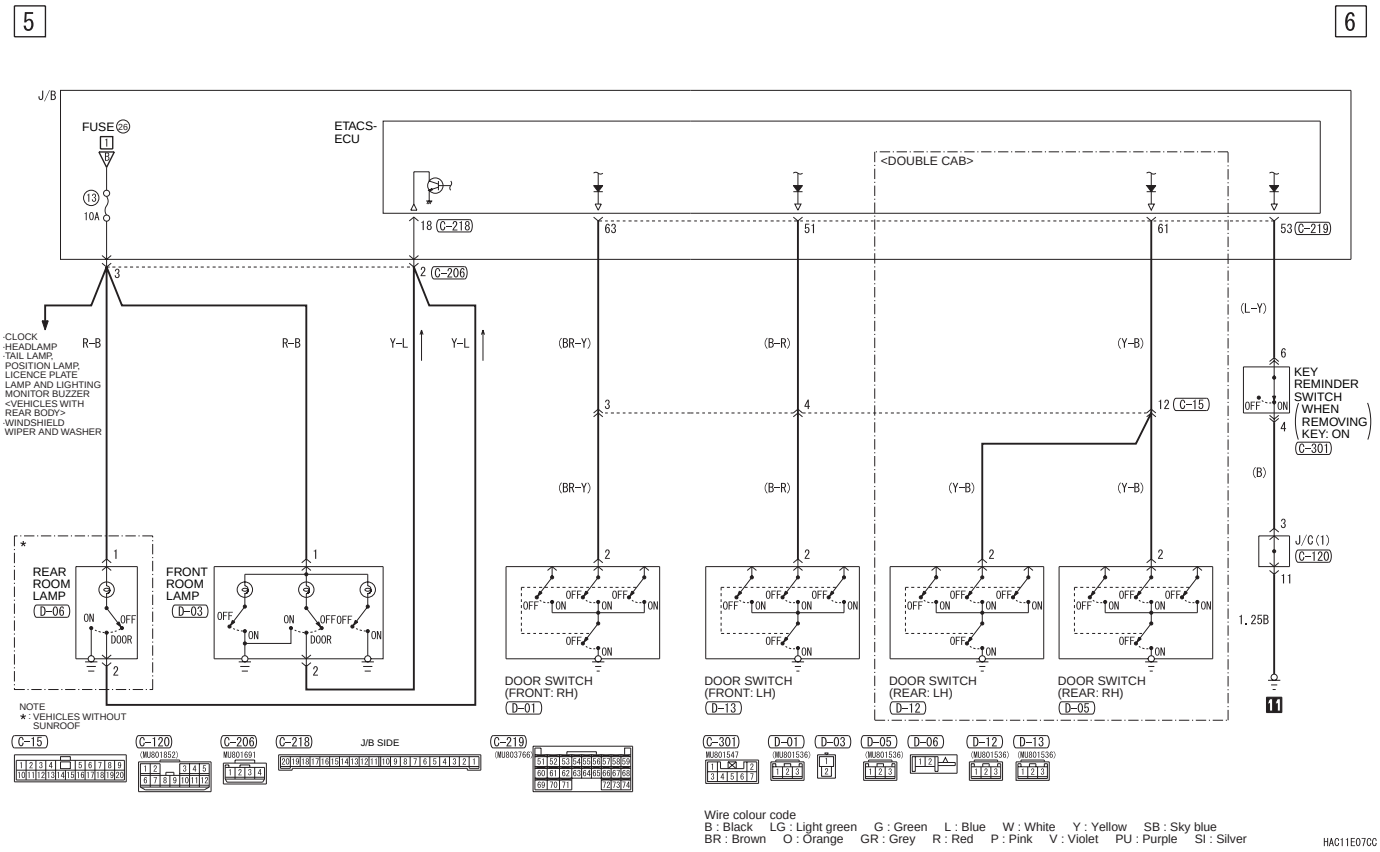
Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HAC11E07AC

CENTRAL DOOR LOCKING SYSTEM <VEHICLES WITH KEYLESS ENTRY SYSTEM (LHD)> (CONTINUED)



CENTRAL DOOR LOCKING SYSTEM <VEHICLES WITH KEYLESS ENTRY SYSTEM (LHD)> (CONTINUED)



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

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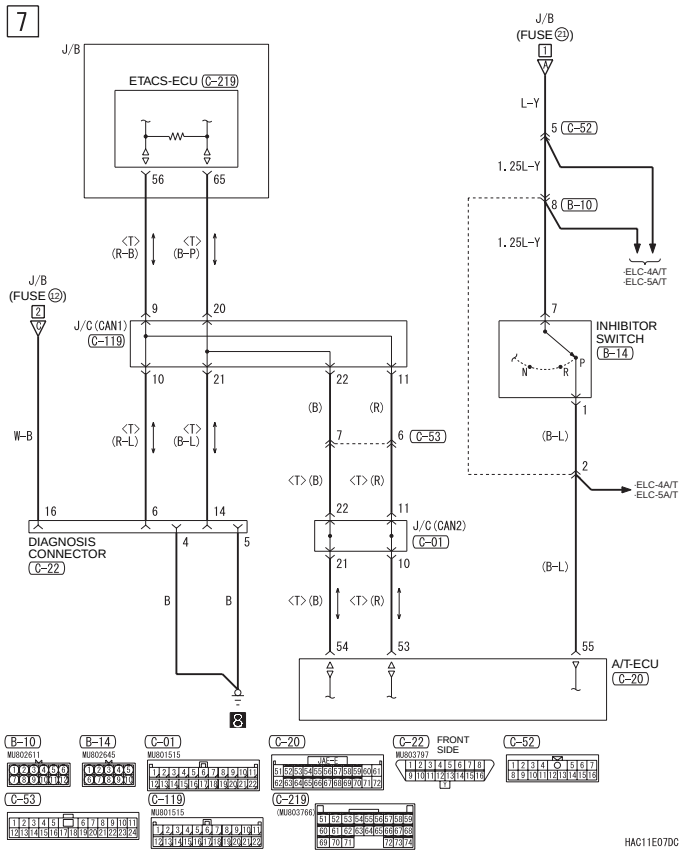
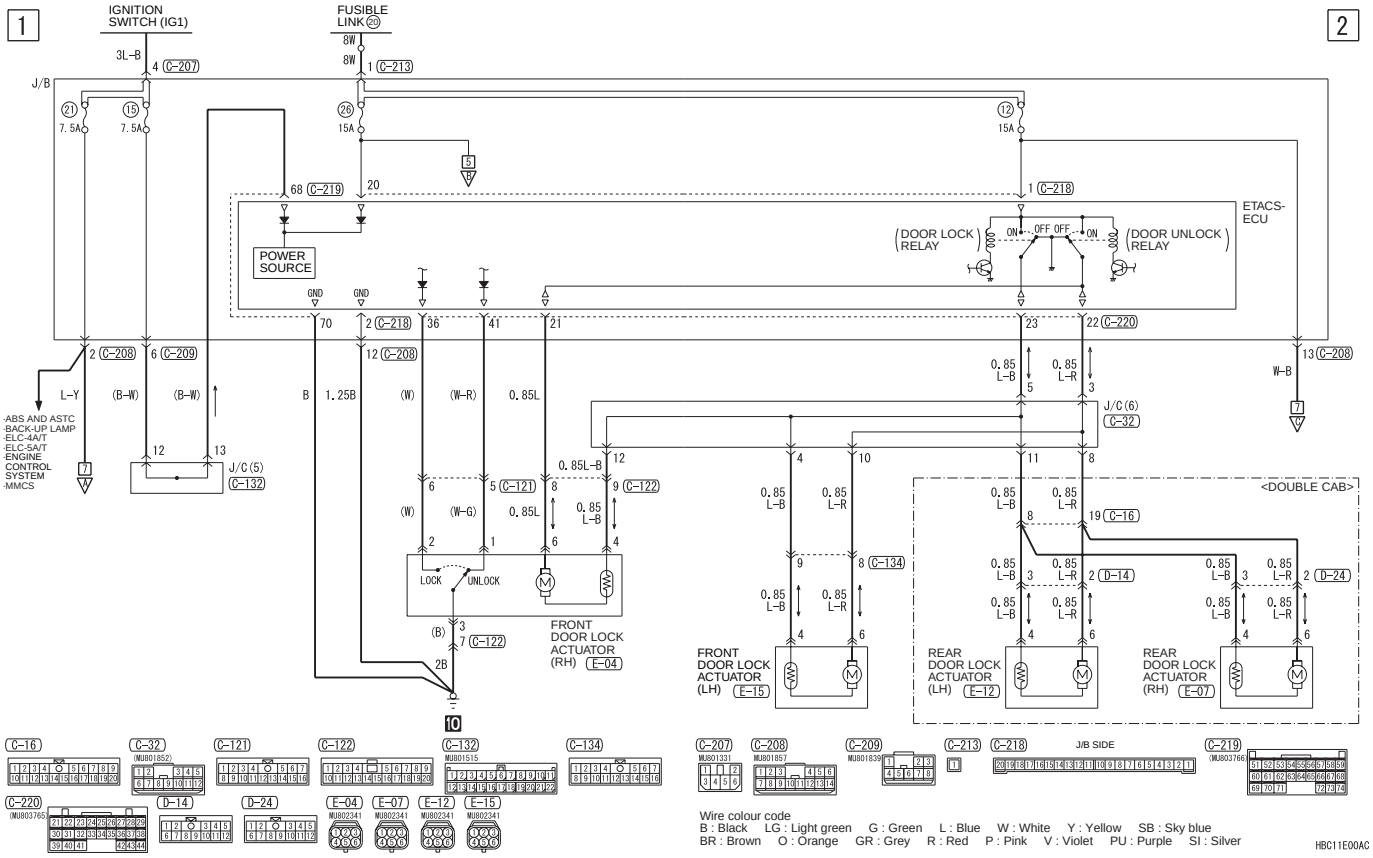
CENTRAL DOOR LOCKING SYSTEM <VEHICLES WITH KEYLESS ENTRY SYSTEM (LHD)> (CONTINUED)

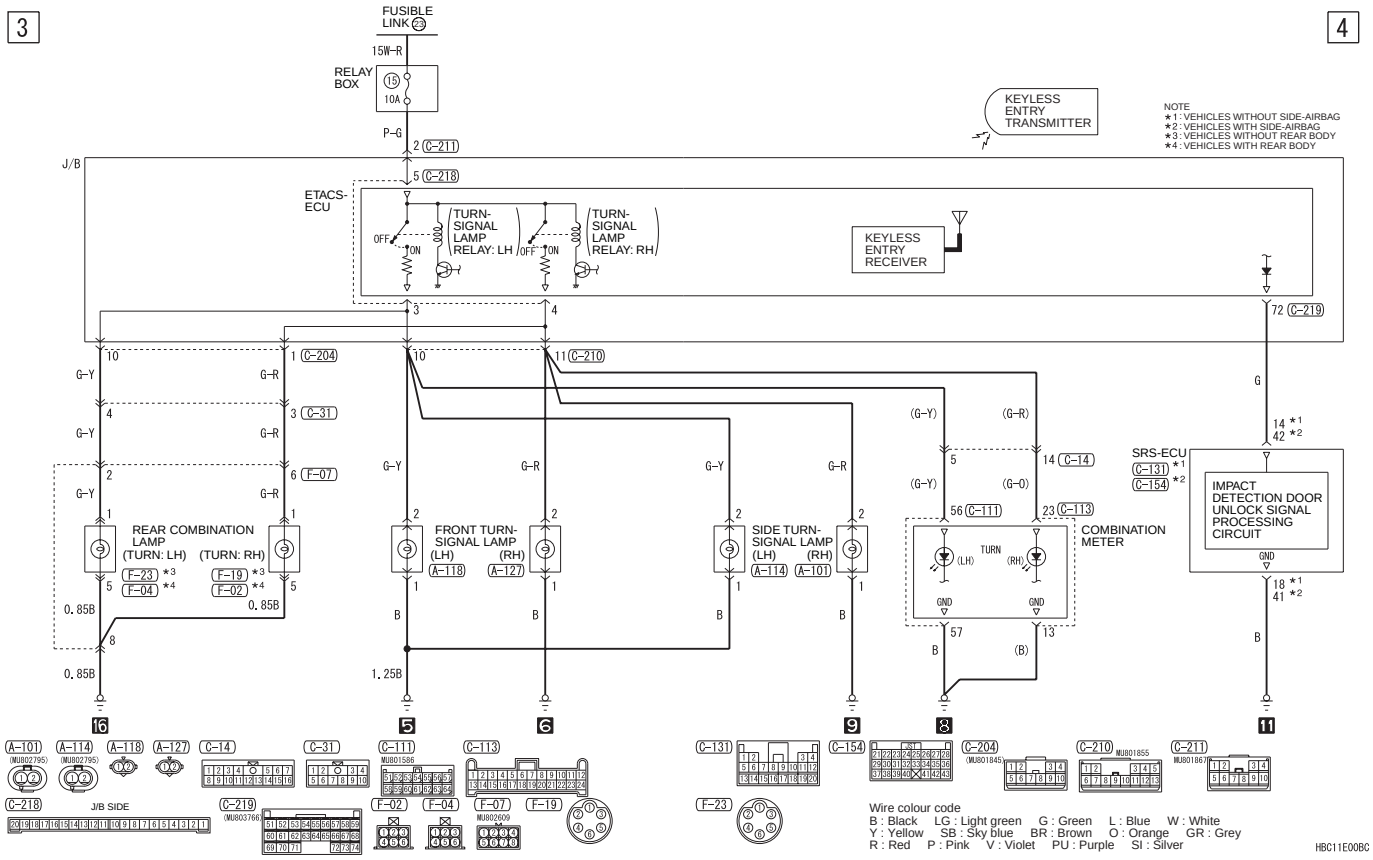


CENTRAL DOOR LOCKING SYSTEM <VEHICLES WITH KEYLESS ENTRY SYSTEM (RHD)>

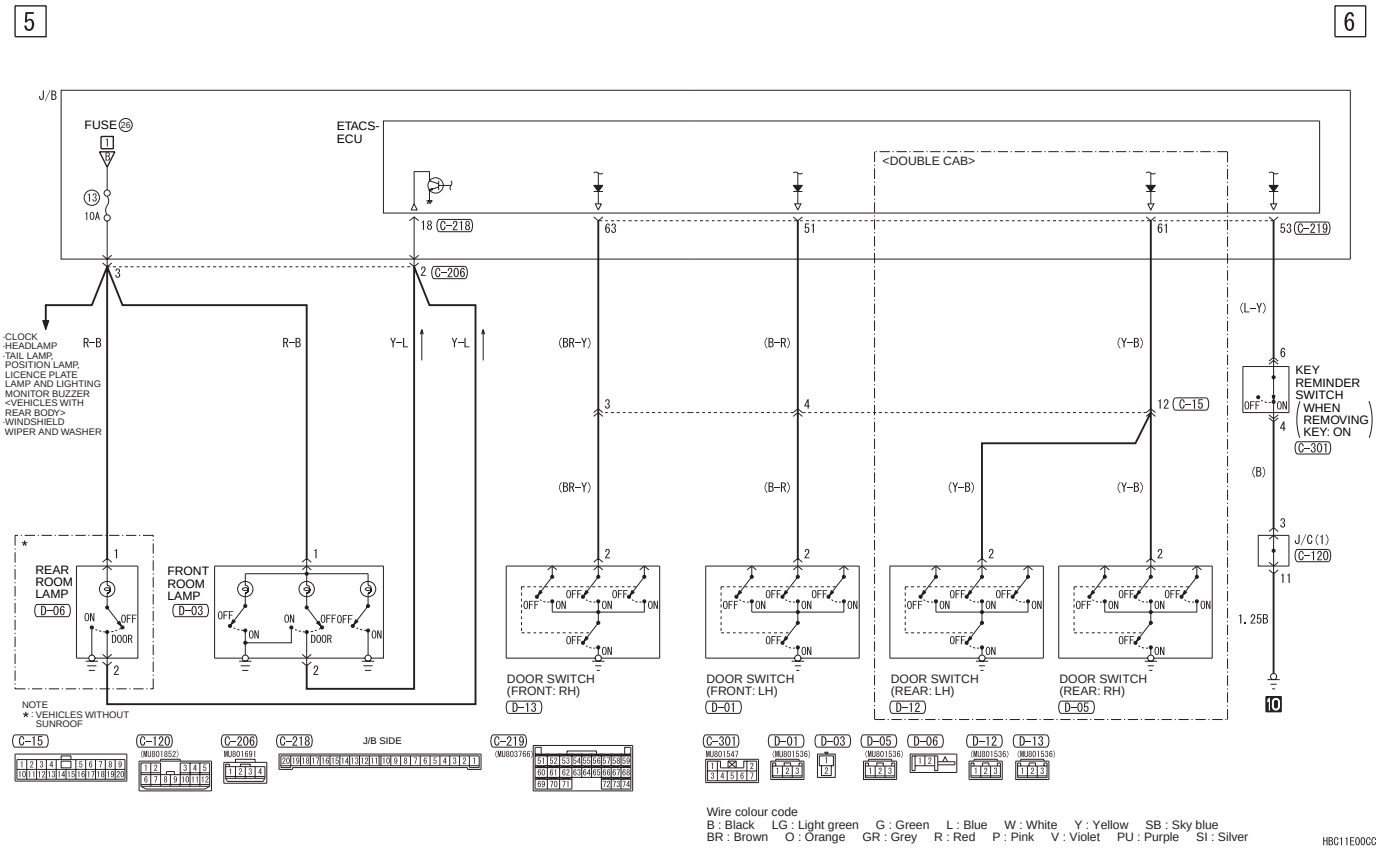
M1901004708100



CENTRAL DOOR LOCKING SYSTEM <VEHICLES WITH KEYLESS ENTRY SYSTEM (RHD)> (CONTINUED)



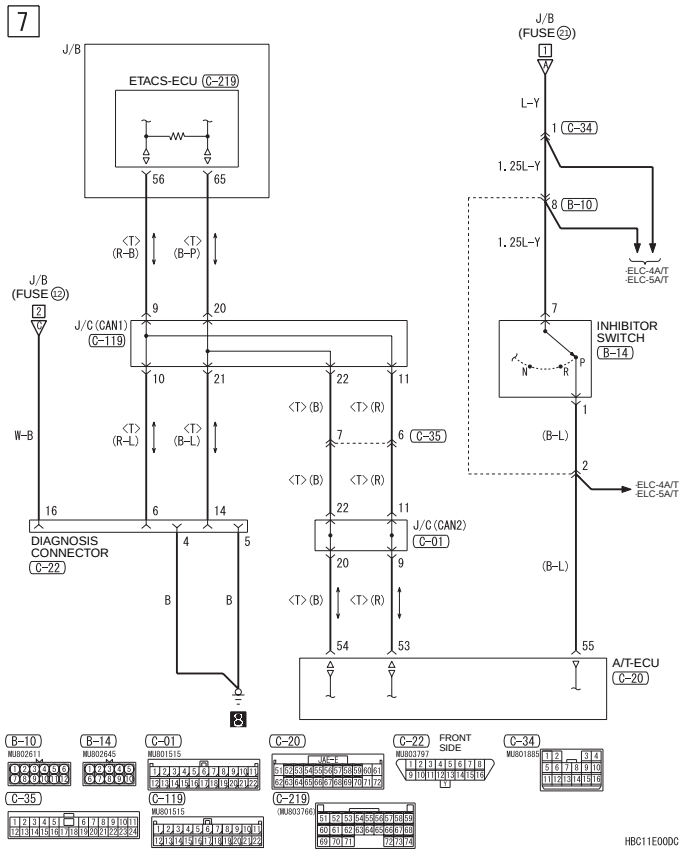
CENTRAL DOOR LOCKING SYSTEM <VEHICLES WITH KEYLESS ENTRY SYSTEM (RHD)> (CONTINUED)



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

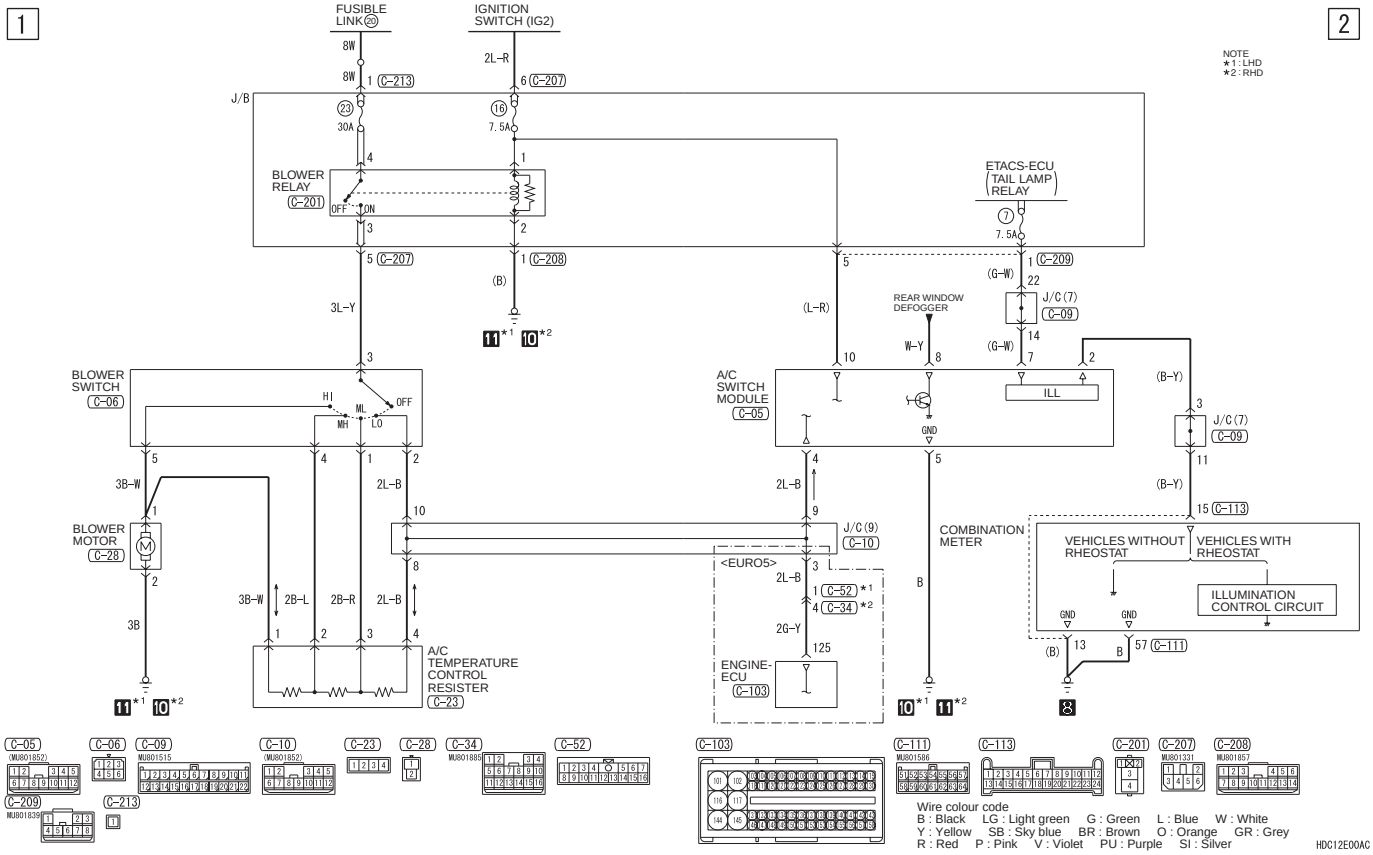
HBC11E00CC

CENTRAL DOOR LOCKING SYSTEM <VEHICLES WITH KEYLESS ENTRY SYSTEM (RHD)> (CONTINUED)



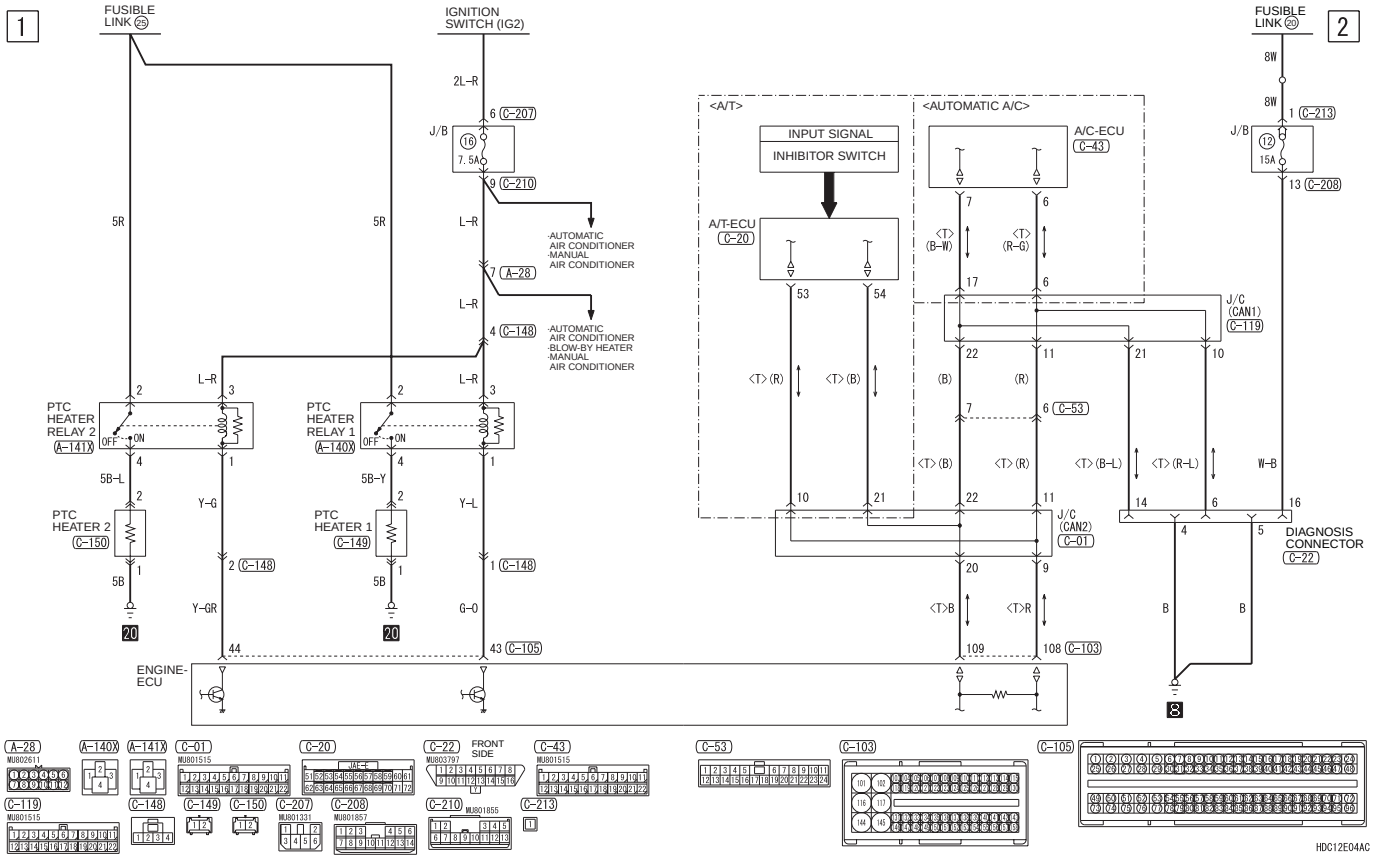
HEATER

M1901013301198

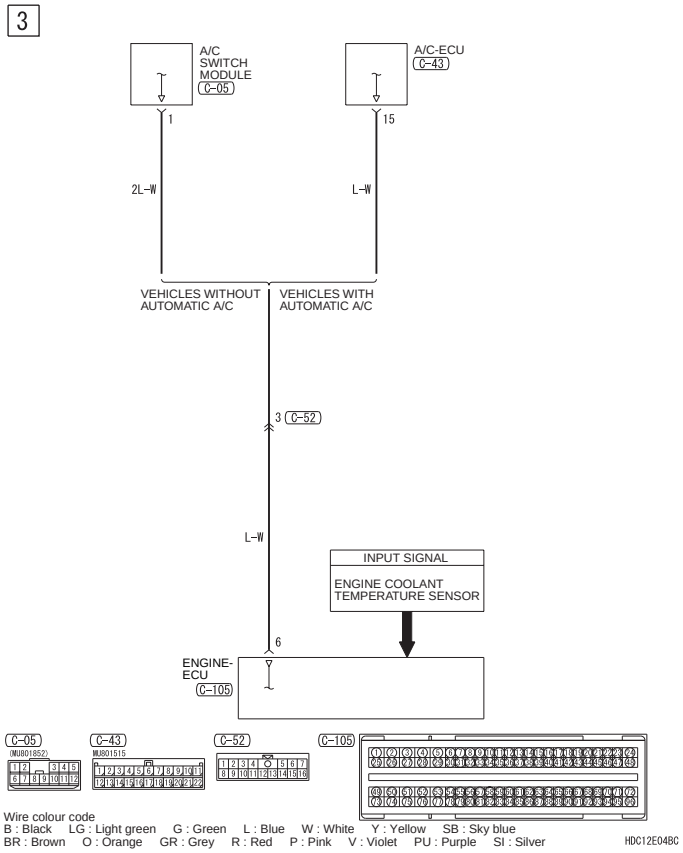


PTC HEATER

M1901020601124



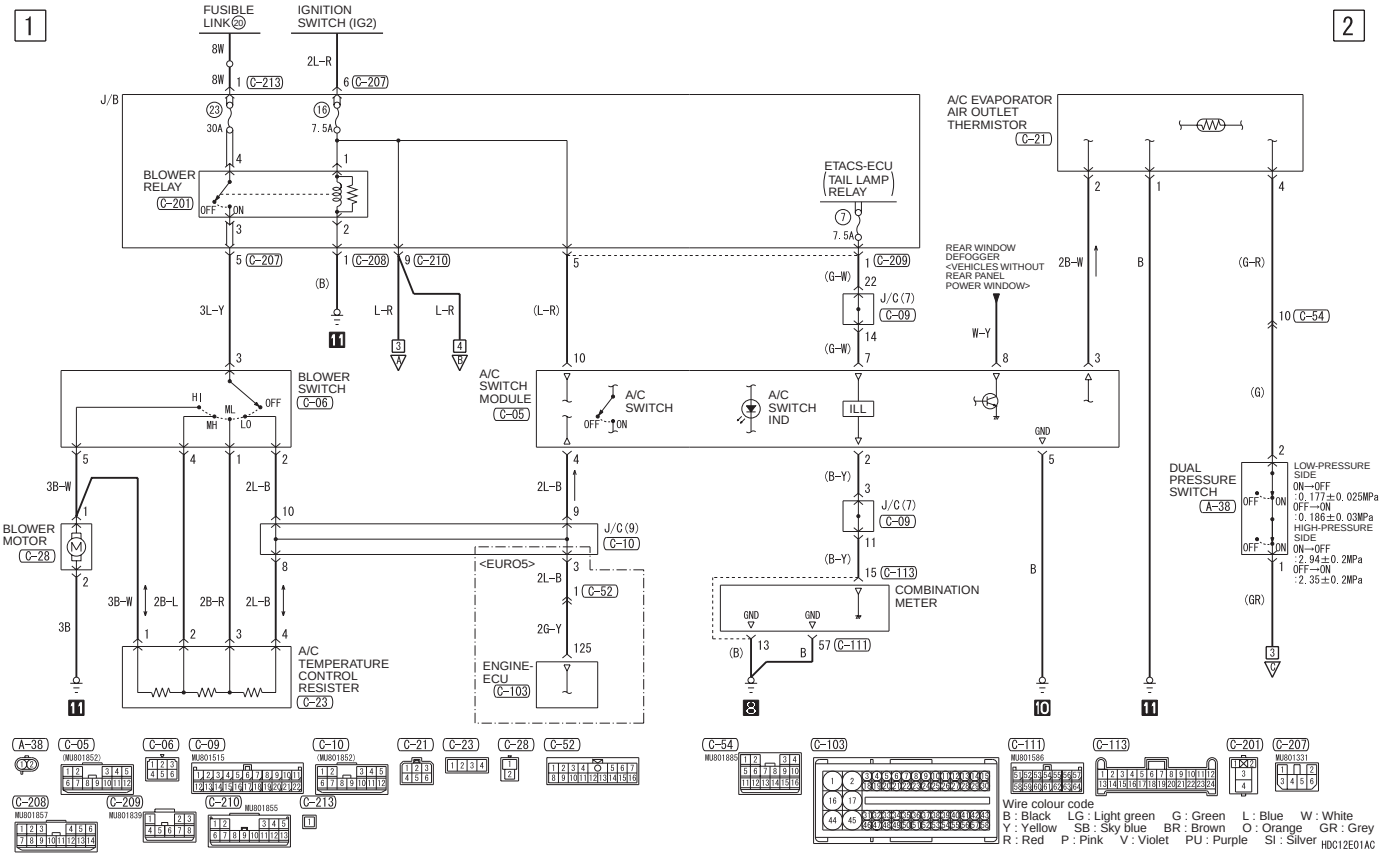
PTC HEATER (CONTINUED)



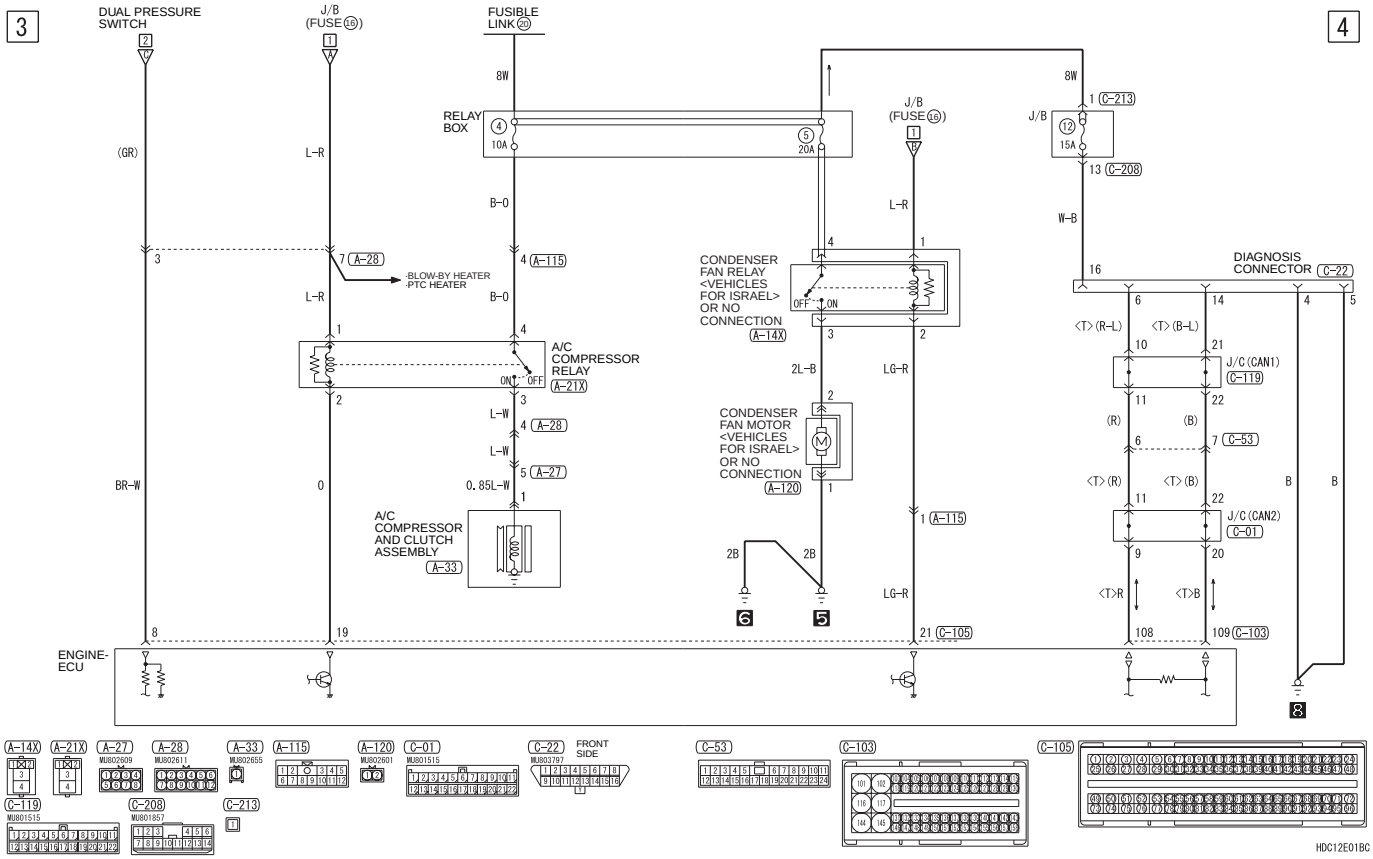
MANUAL AIR CONDITIONER

MANUAL AIR CONDITIONER <LHD>

M1901005503643



MANUAL AIR CONDITIONER <LHD> (CONTINUED)



MANUAL AIR CONDITIONER <RHD>

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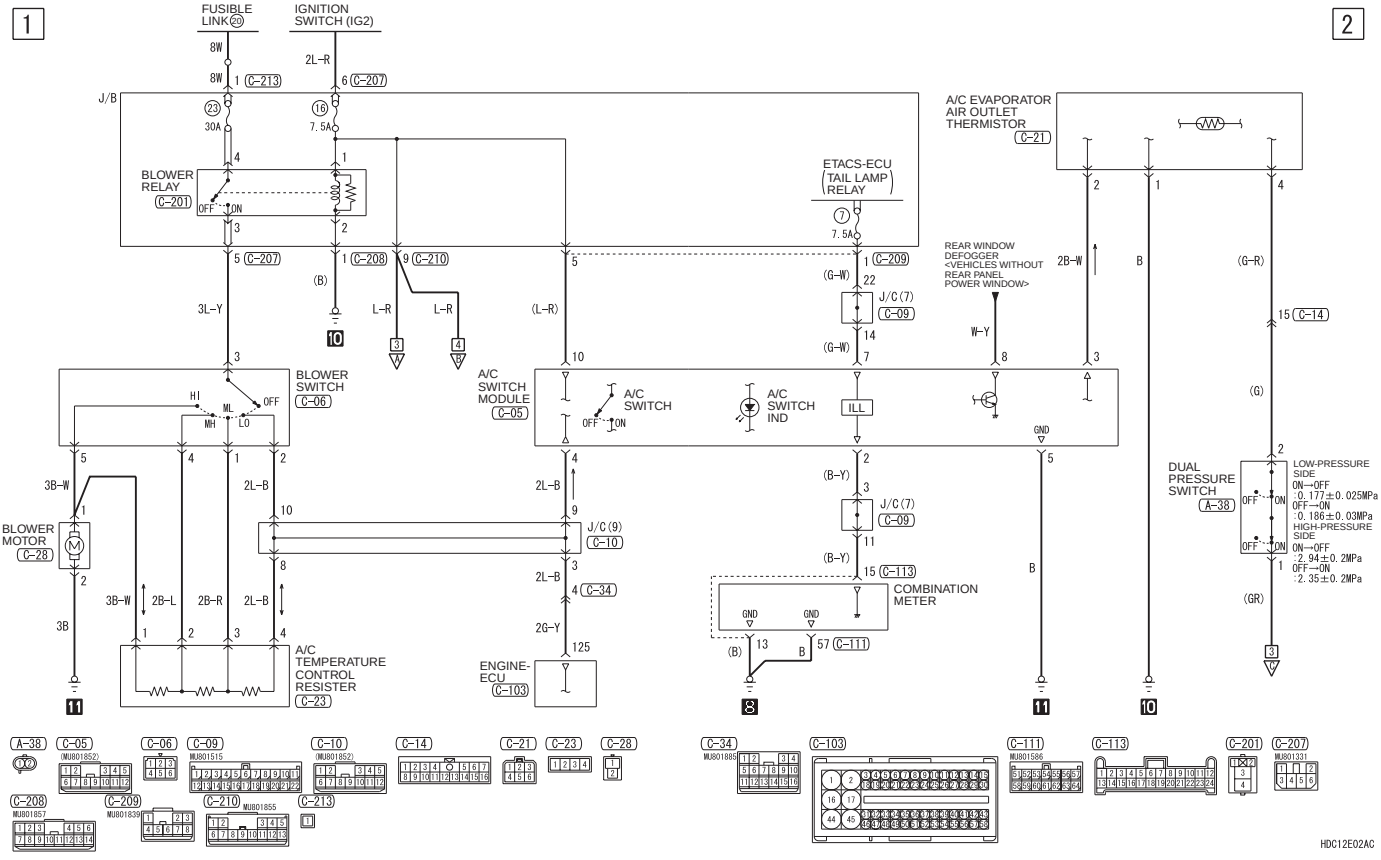
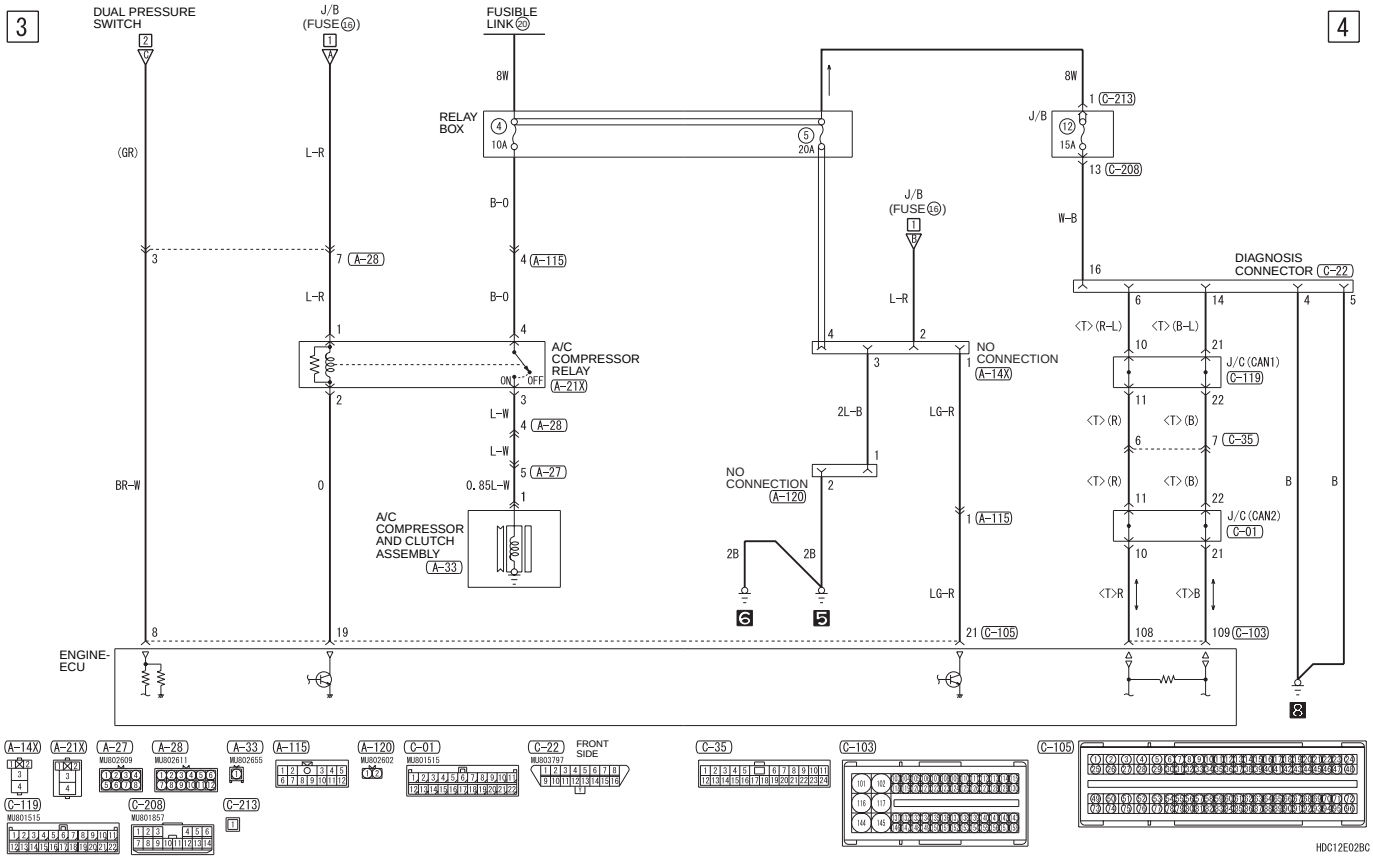


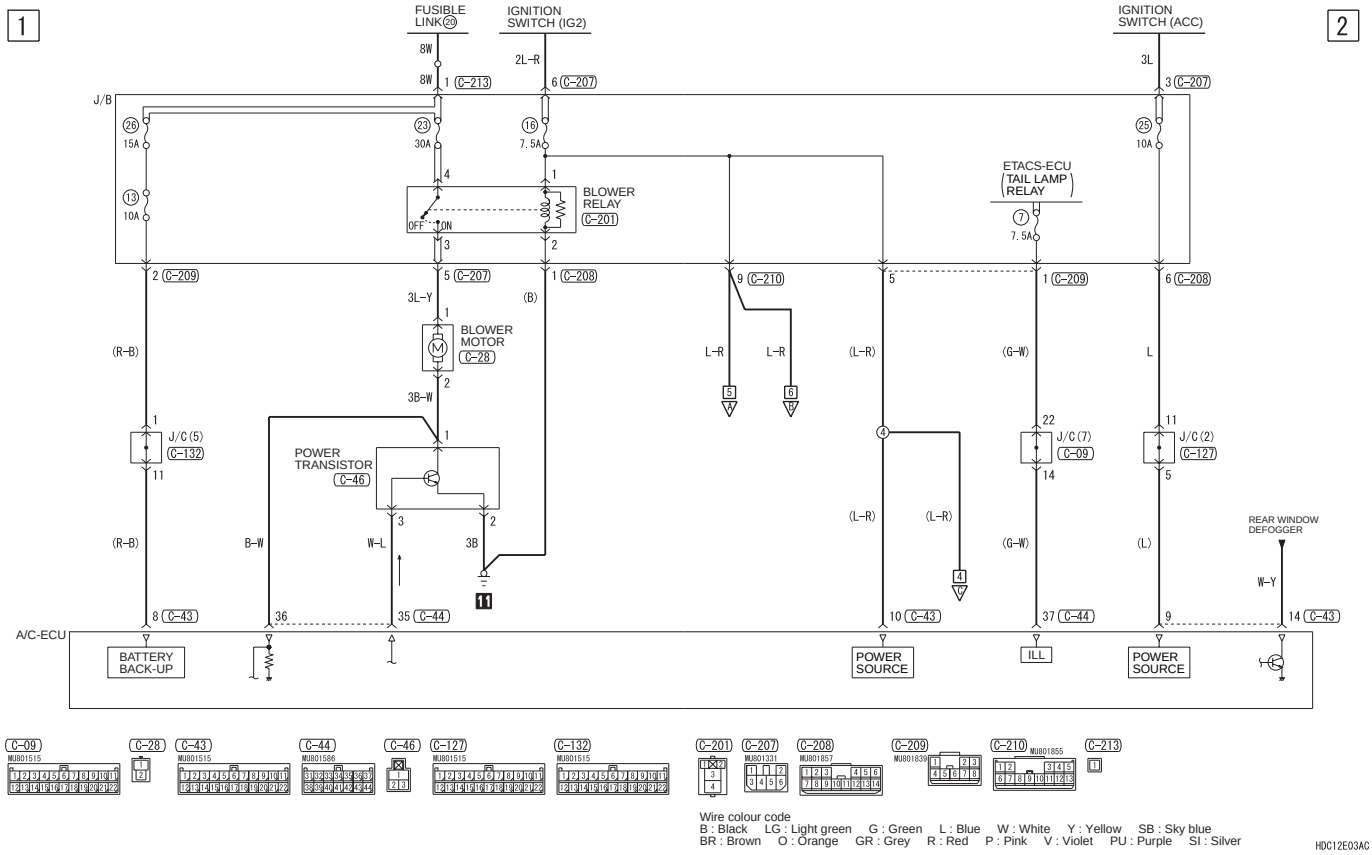
MANUAL AIR CONDITIONER <RHD> (CONTINUED)



AUTOMATIC AIR CONDITIONER

AUTOMATIC AIR CONDITIONER <LHD>

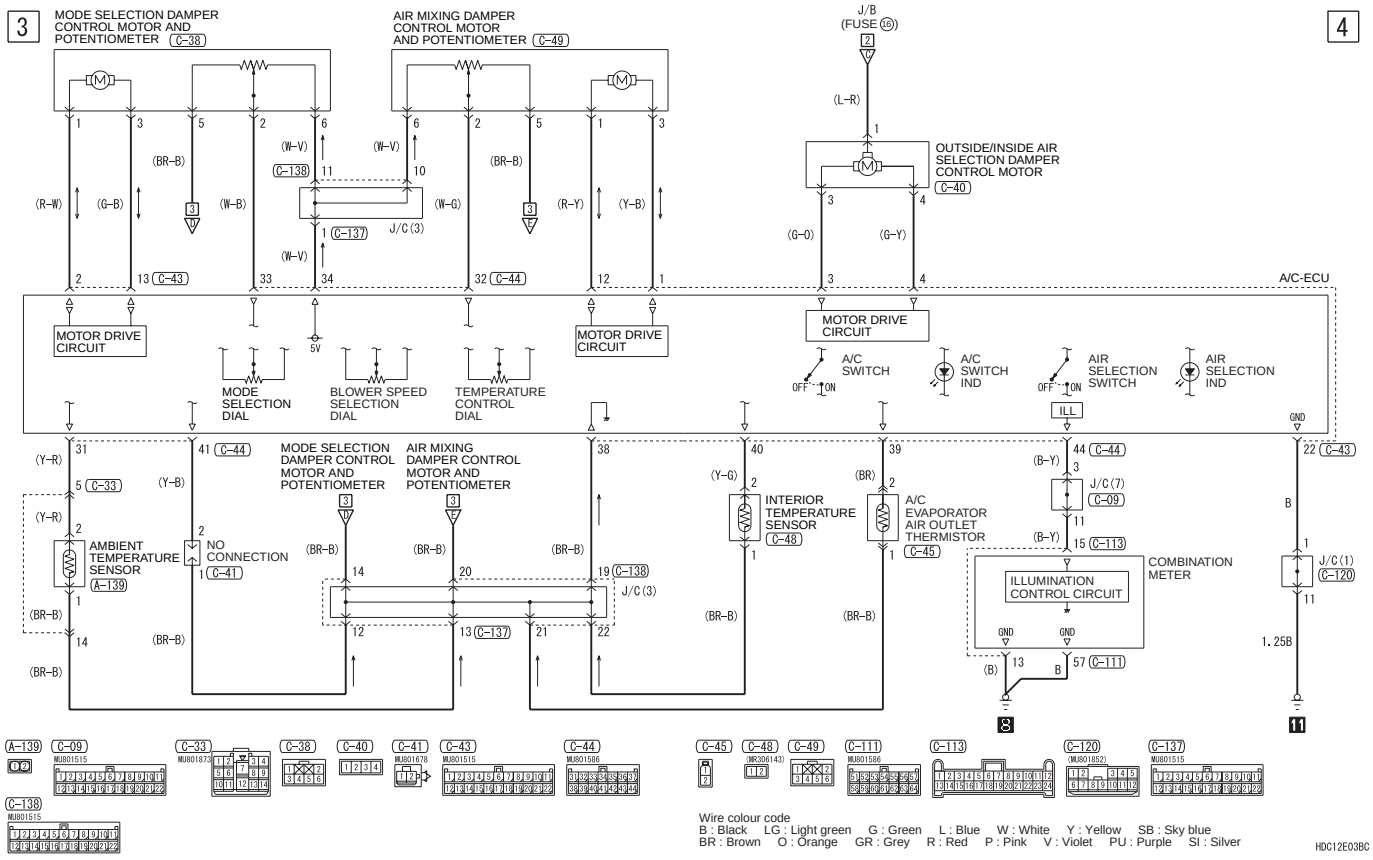
M1901005603651



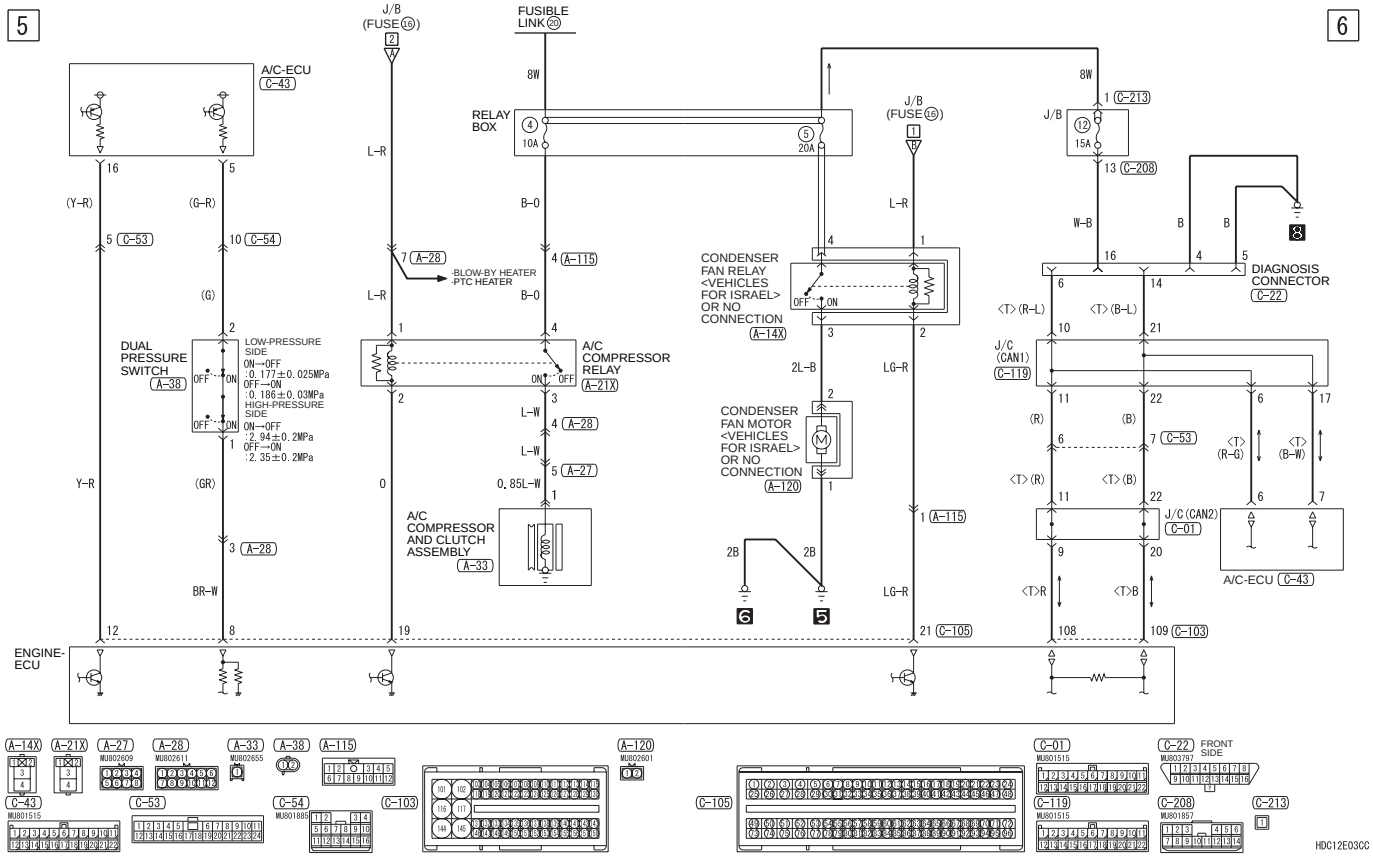
Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HDC12E03AC

AUTOMATIC AIR CONDITIONER <LHD> (CONTINUED)

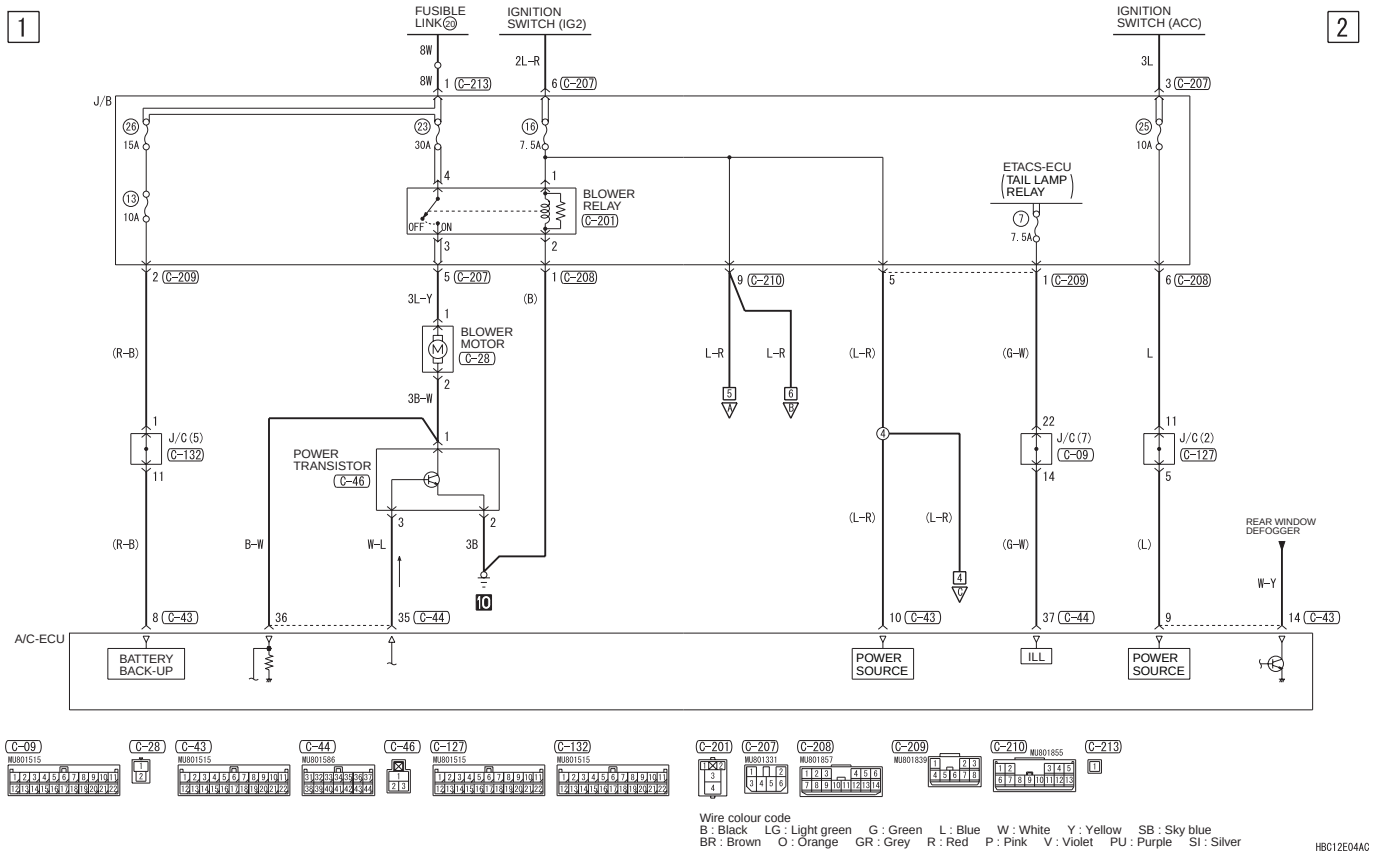


AUTOMATIC AIR CONDITIONER <LHD> (CONTINUED)



AUTOMATIC AIR CONDITIONER <RHD>

M1901005603402



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
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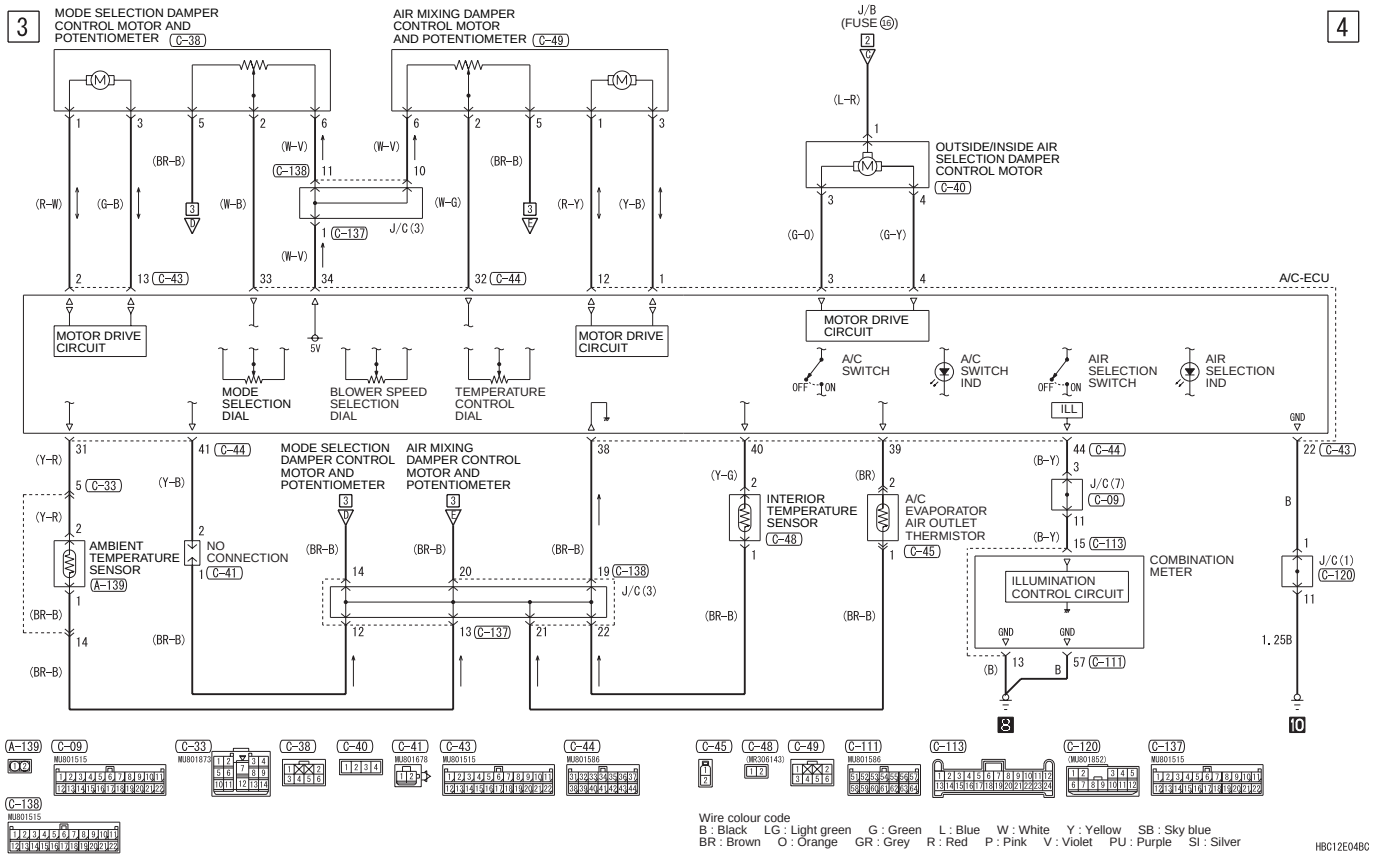
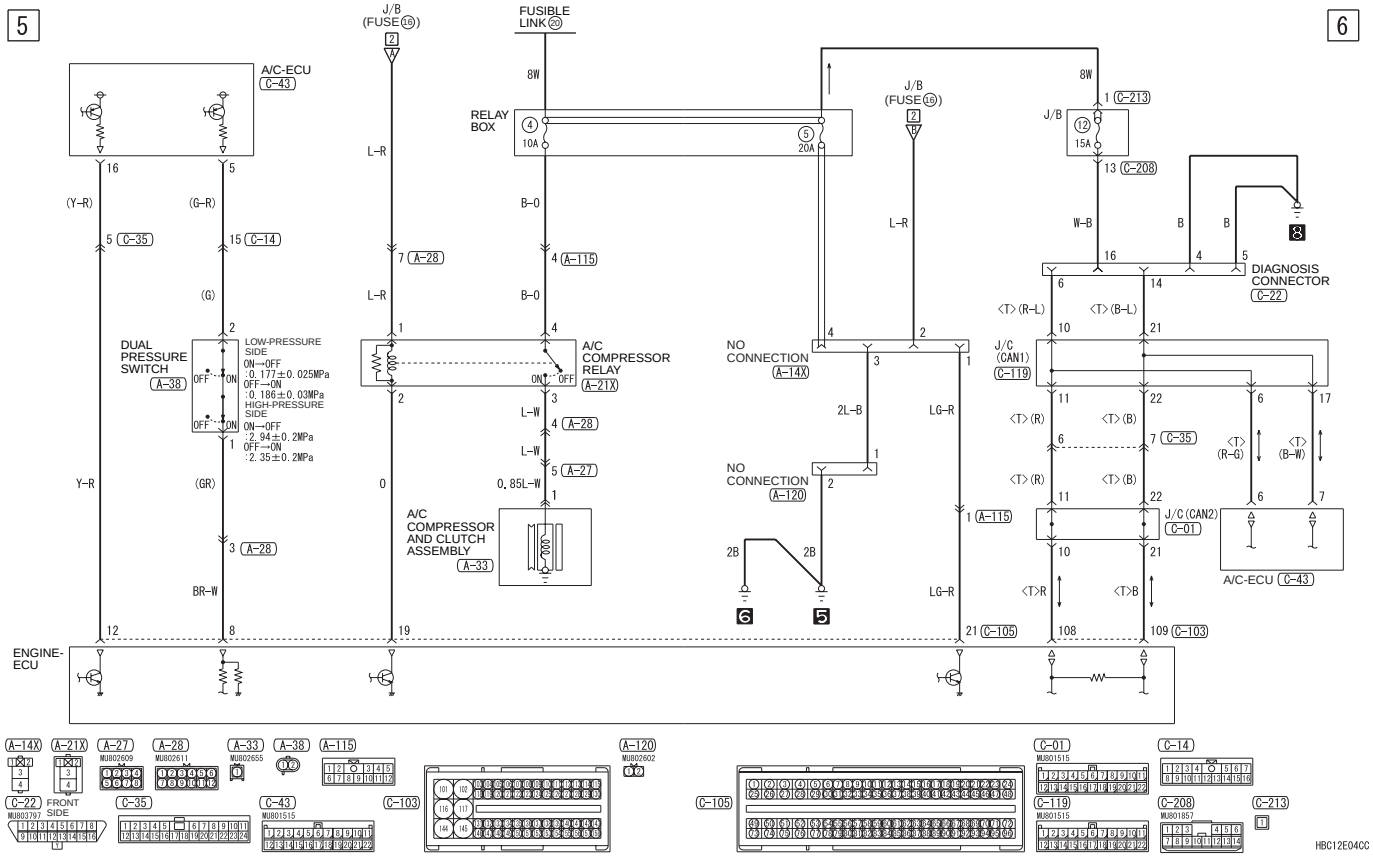
HBC12E04AC

AUTOMATIC AIR CONDITIONER <RHD> (CONTINUED)



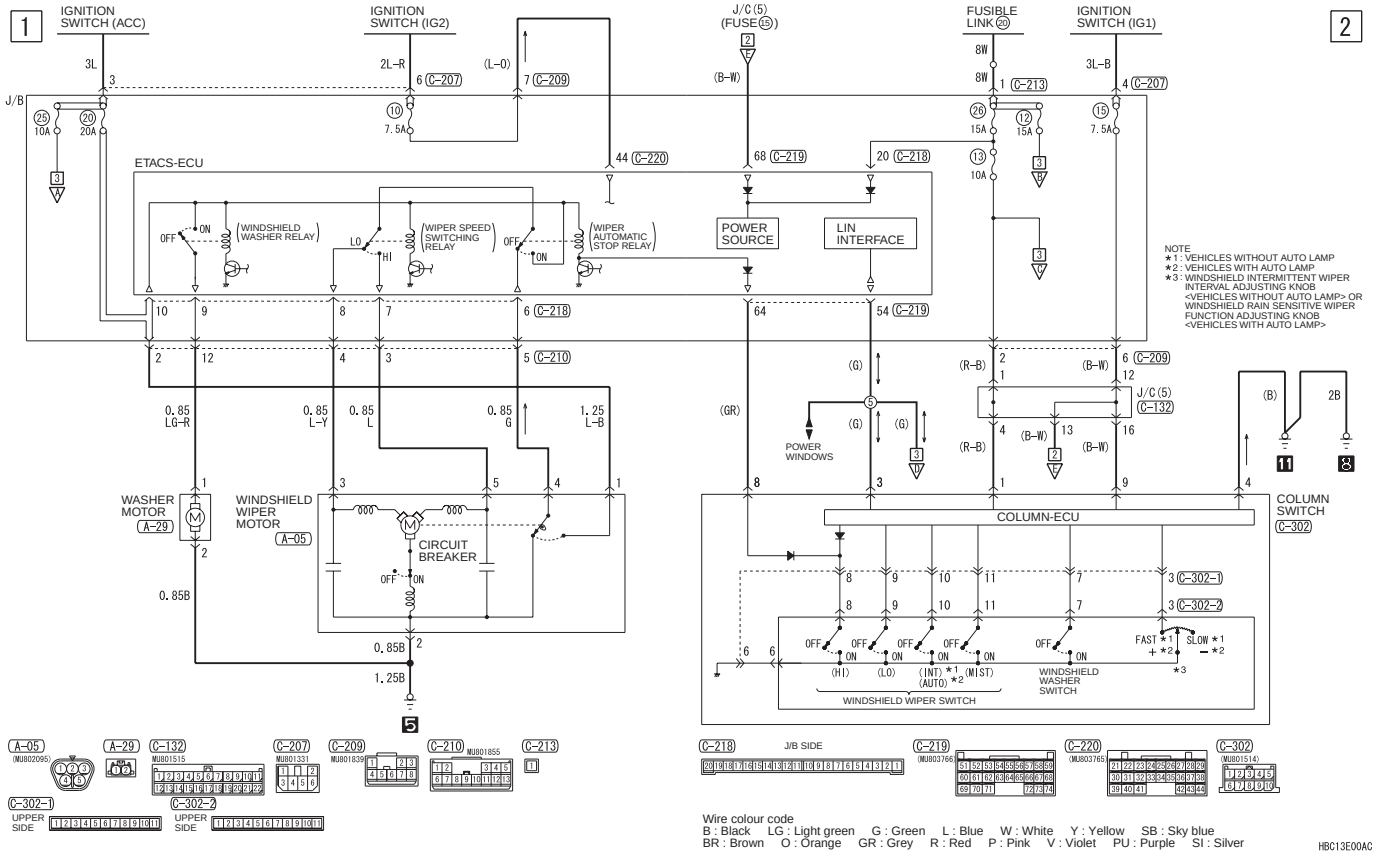
AUTOMATIC AIR CONDITIONER <RHD> (CONTINUED)



WINDSHIELD WIPER AND WASHER

WINDSHIELD WIPER AND WASHER
<LHD>

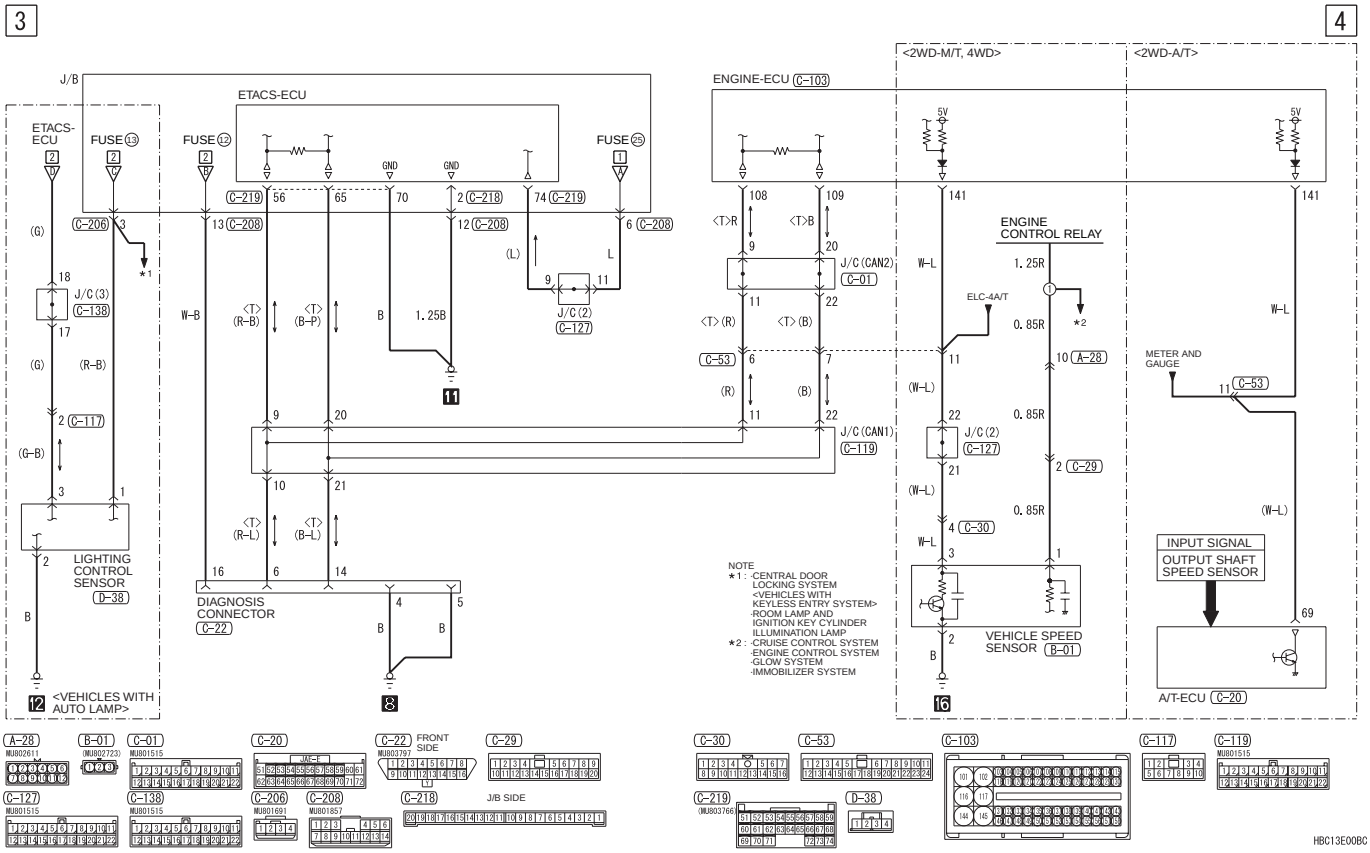
M1901006105343



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

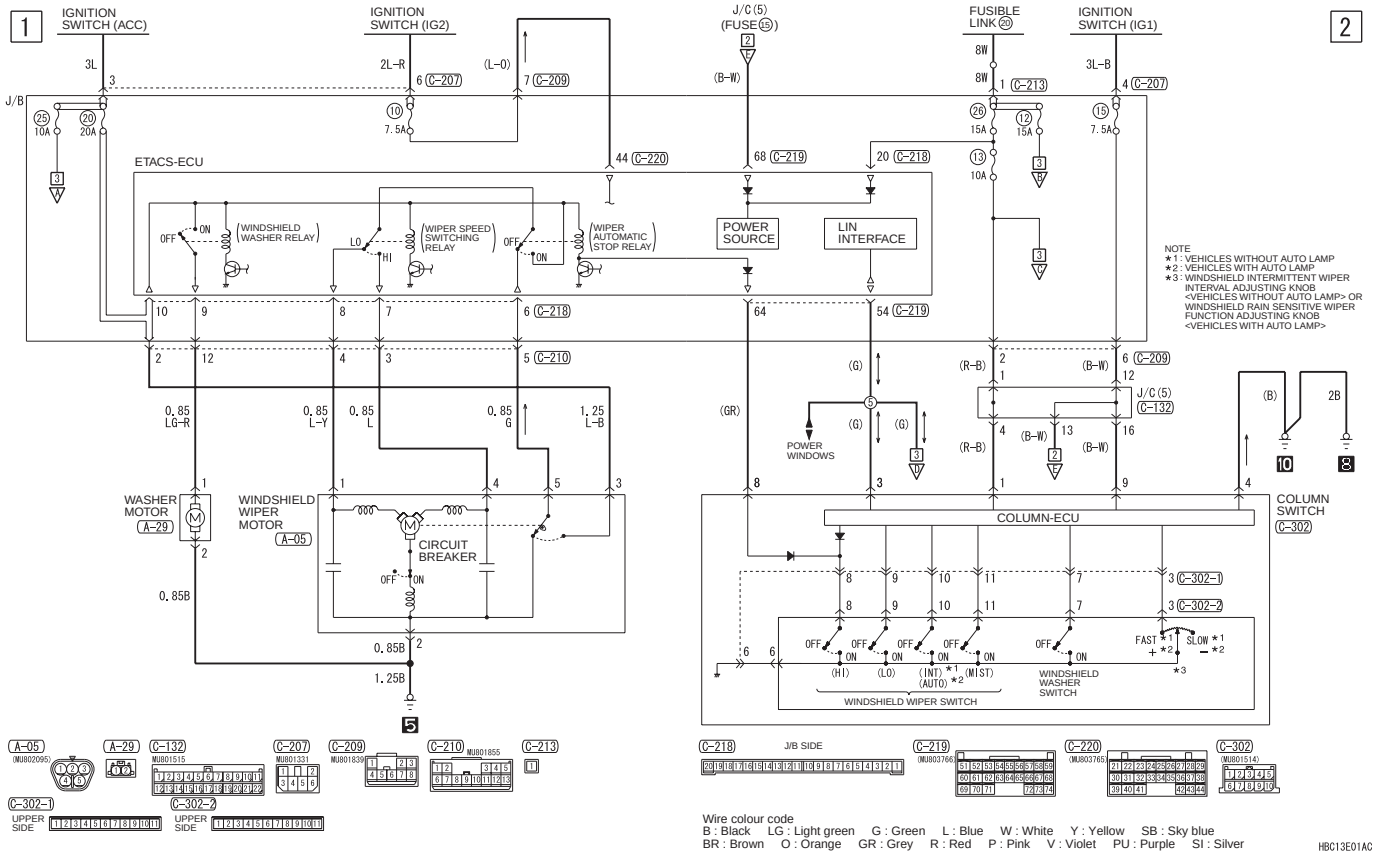
HBC13E00AC

WINDSHIELD WIPER AND WASHER <LHD> (CONTINUED)



WINDSHIELD WIPER AND WASHER
<RHD>

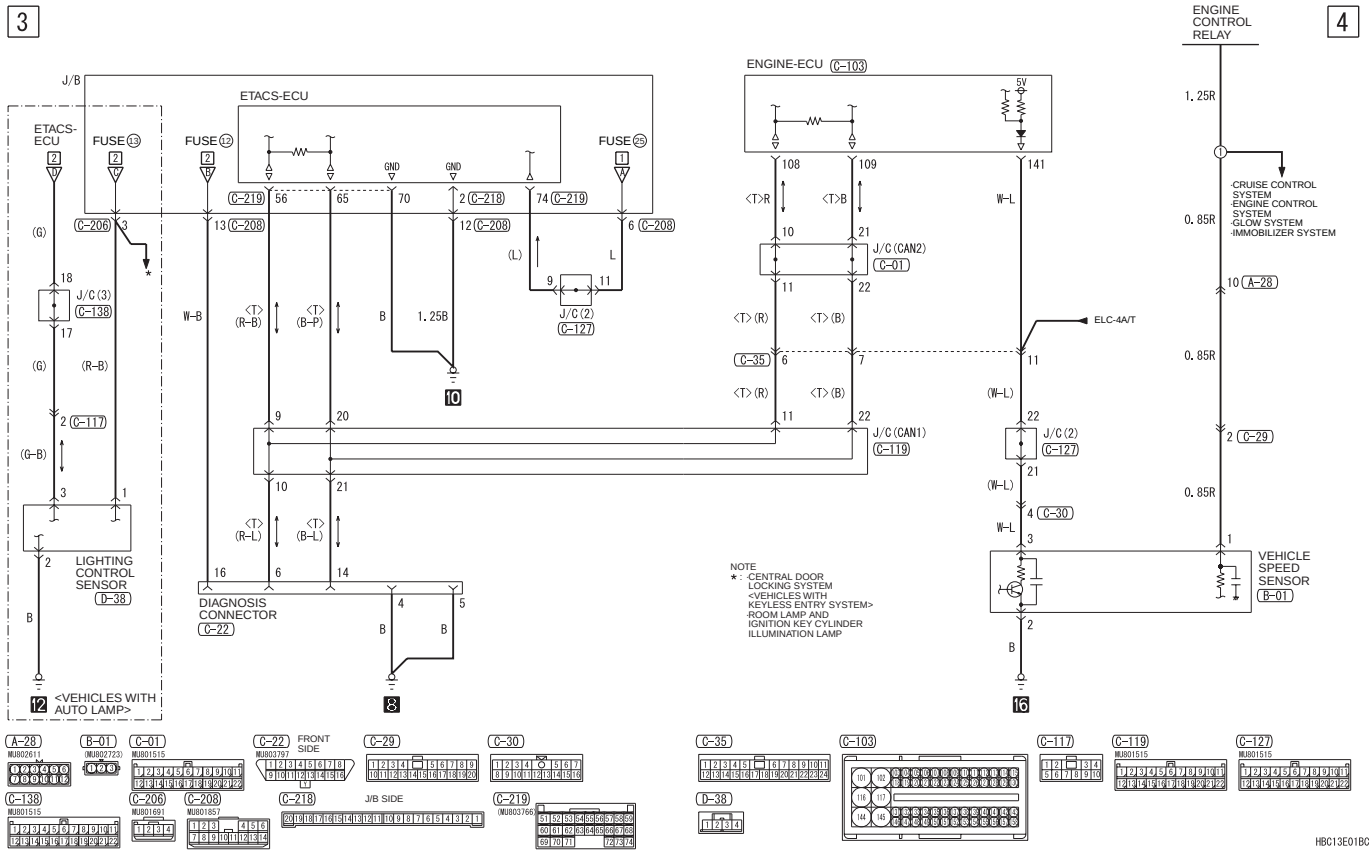
M1901006105354



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

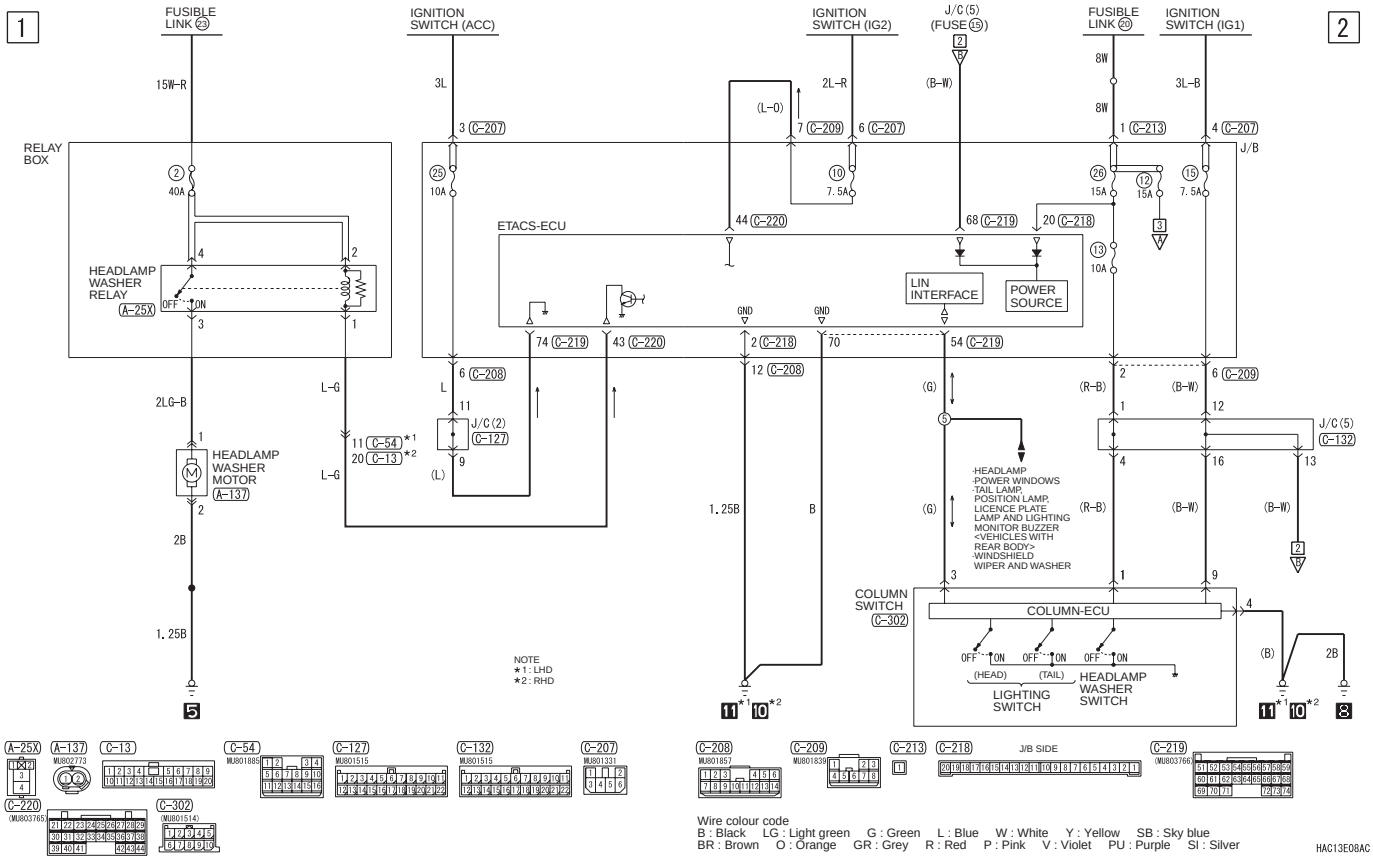
HBC13E01AC

WINDSHIELD WIPER AND WASHER <RHD> (CONTINUED)



HEADLAMP WASHER

M1901018900631



Wire colour code
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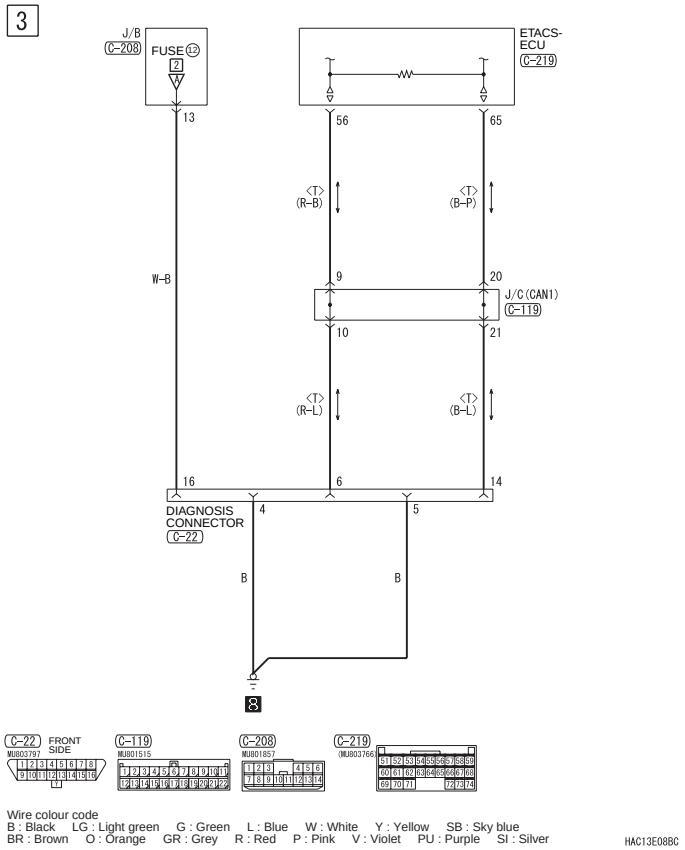
HEADLAMP WASHER (CONTINUED)



Wire colour code
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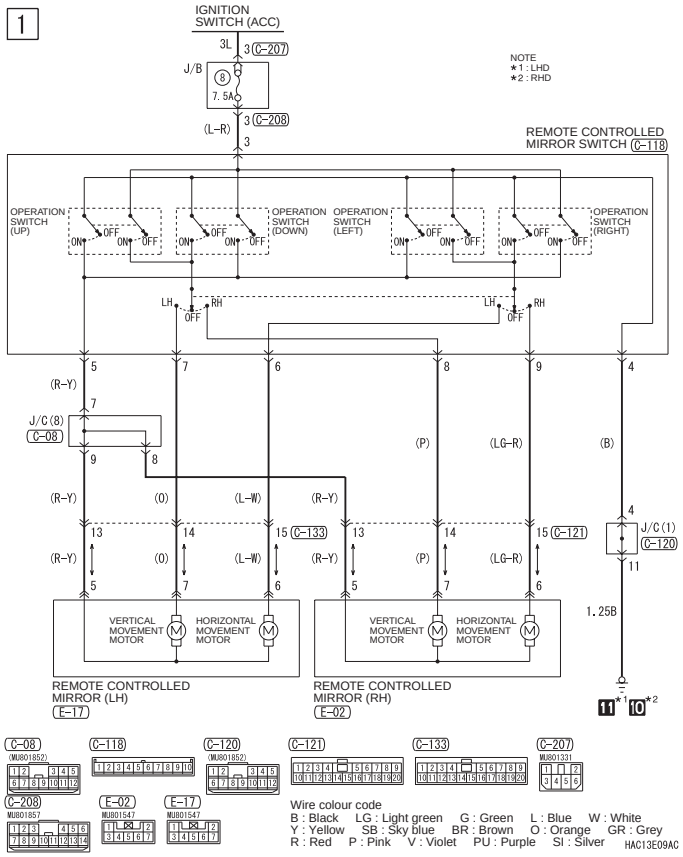
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HAC13E08BC

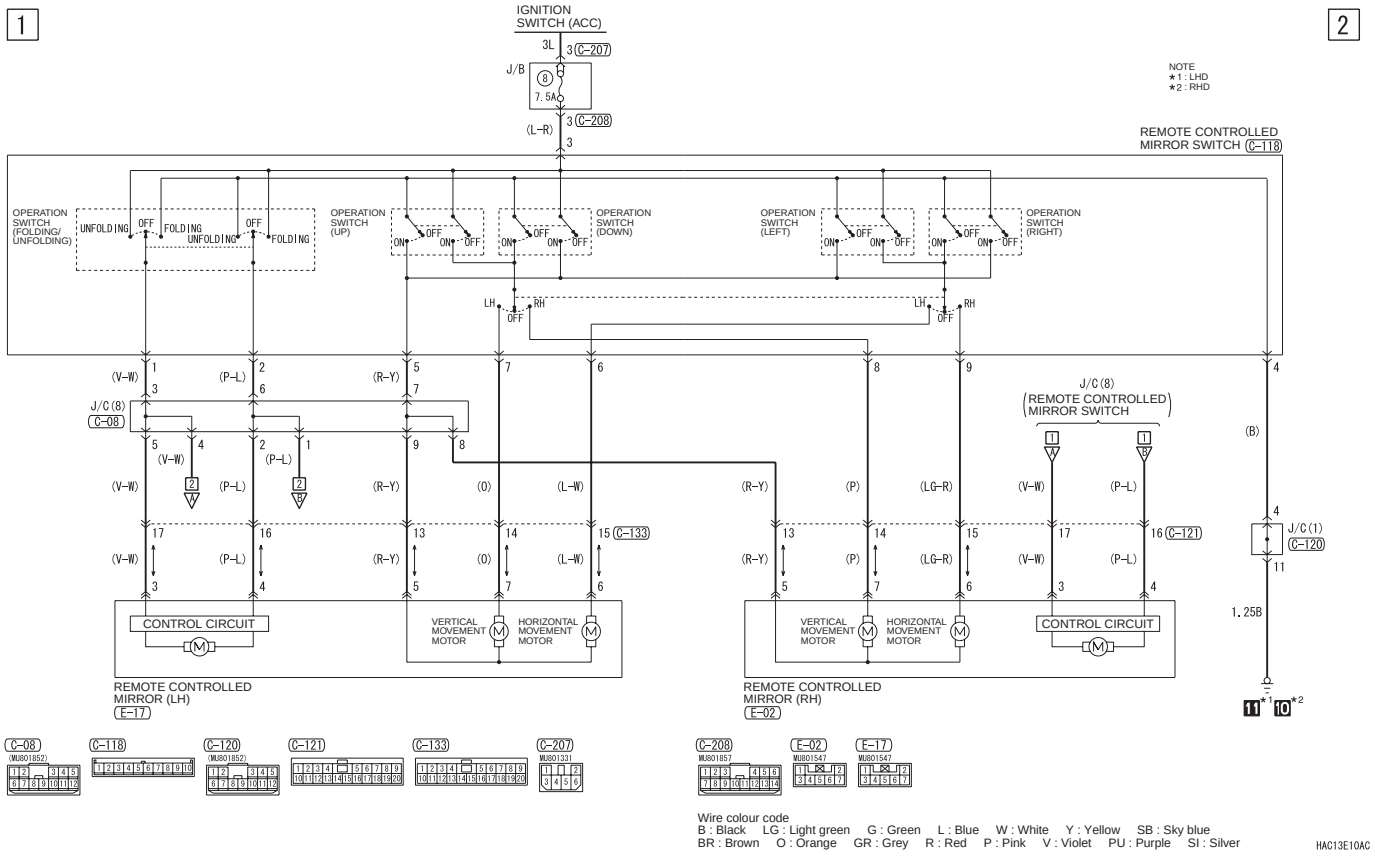
REMOTE CONTROLLED MIRROR

M1901006503174



ELECTRIC RETRACTABLE REMOTE CONTROLLED MIRROR

M1901006601313



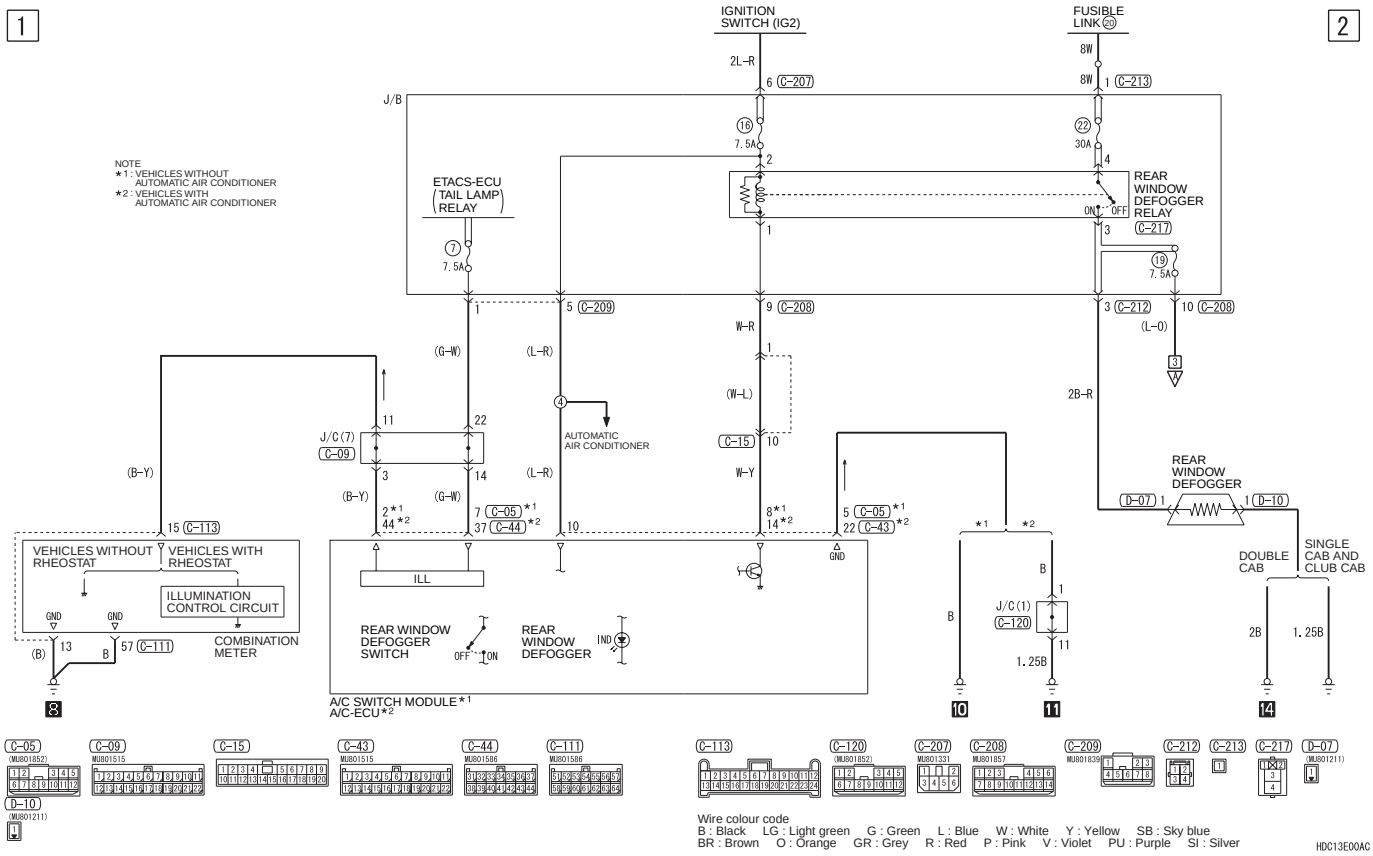
Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HAC13E10AC

REAR WINDOW DEFOGGER AND HEATED DOOR MIRROR

REAR WINDOW DEFOGGER AND HEATED DOOR MIRROR <VEHICLES WITHOUT REAR PANEL POWER WINDOW (LHD)>

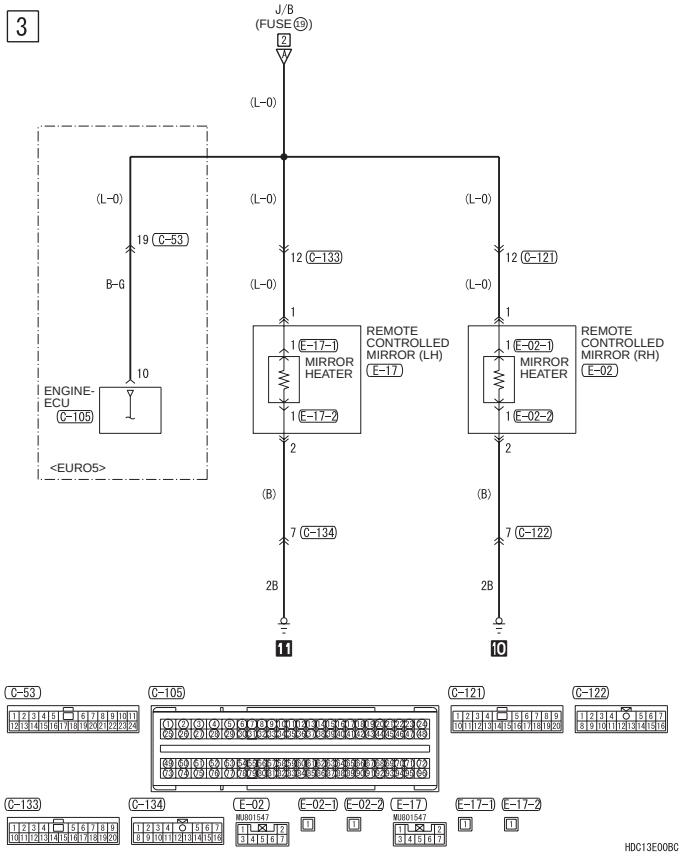
M1901027800342



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

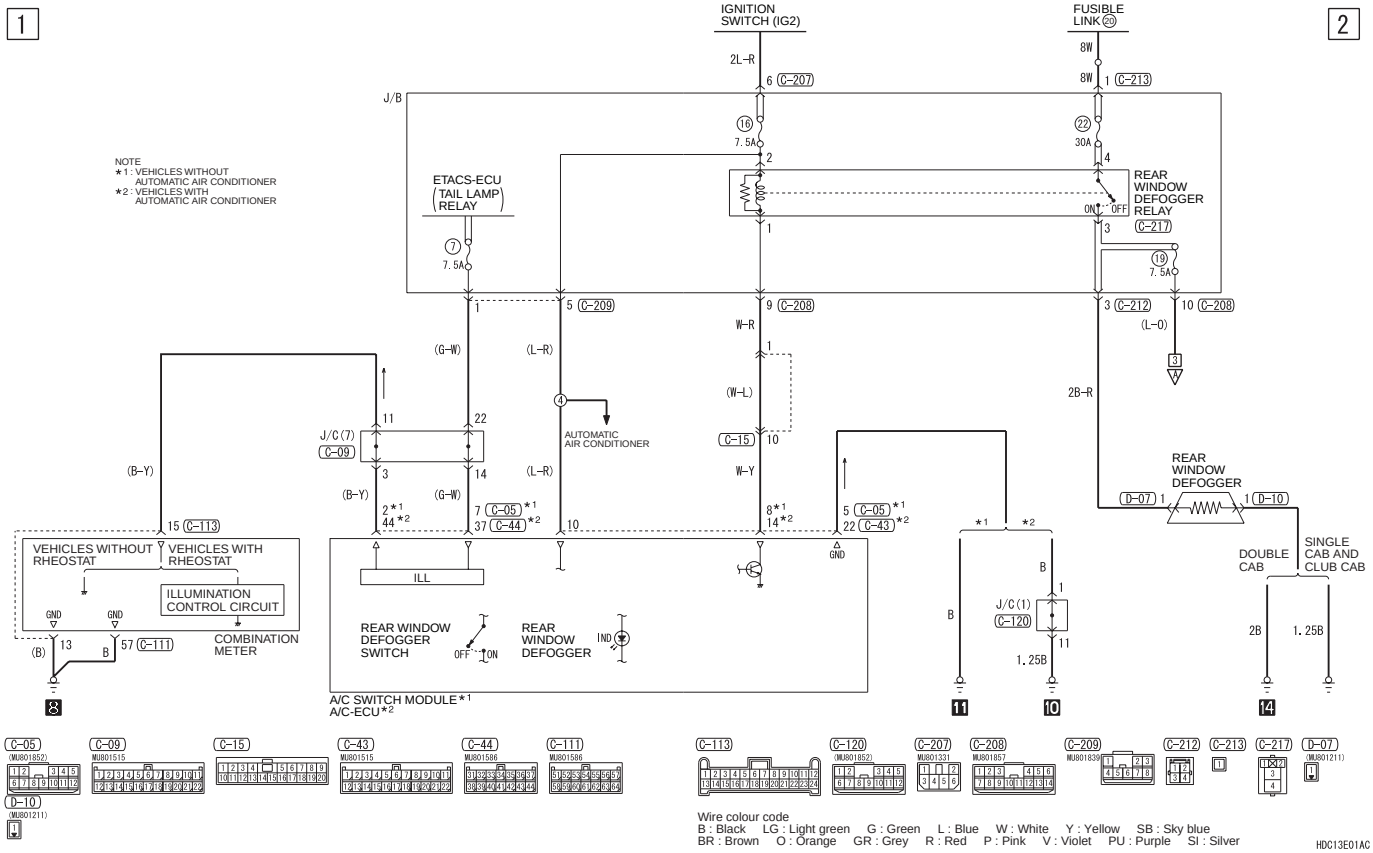
HDC13E00AC

REAR WINDOW DEFOGGER AND HEATED DOOR MIRROR <VEHICLES WITHOUT REAR PANEL POWER WINDOW (LHD)> (CONTINUED)



REAR WINDOW DEFOGGER AND HEATED DOOR MIRROR <VEHICLES WITHOUT REAR PANEL POWER WINDOW (RHD)>

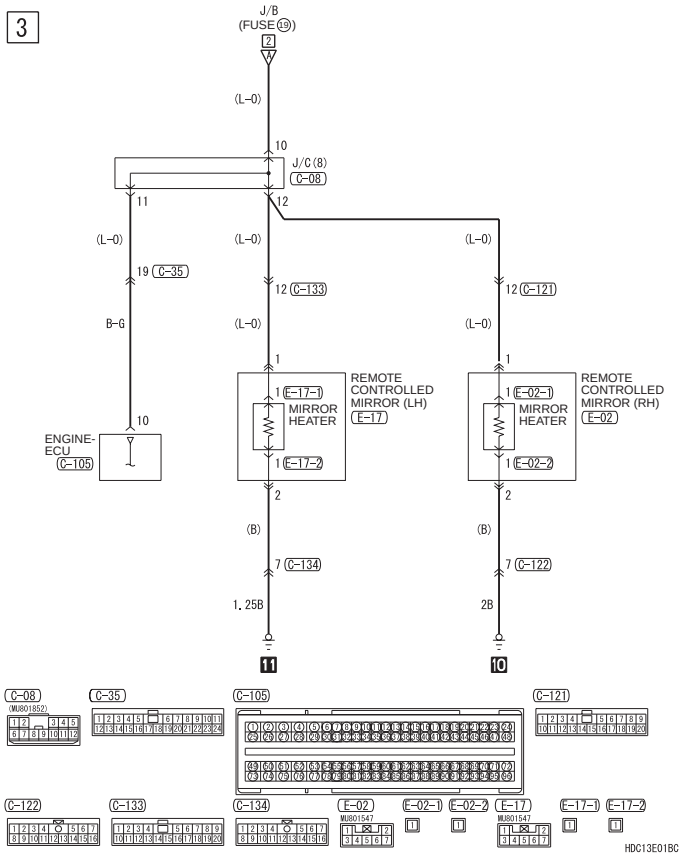
M1901027800353



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

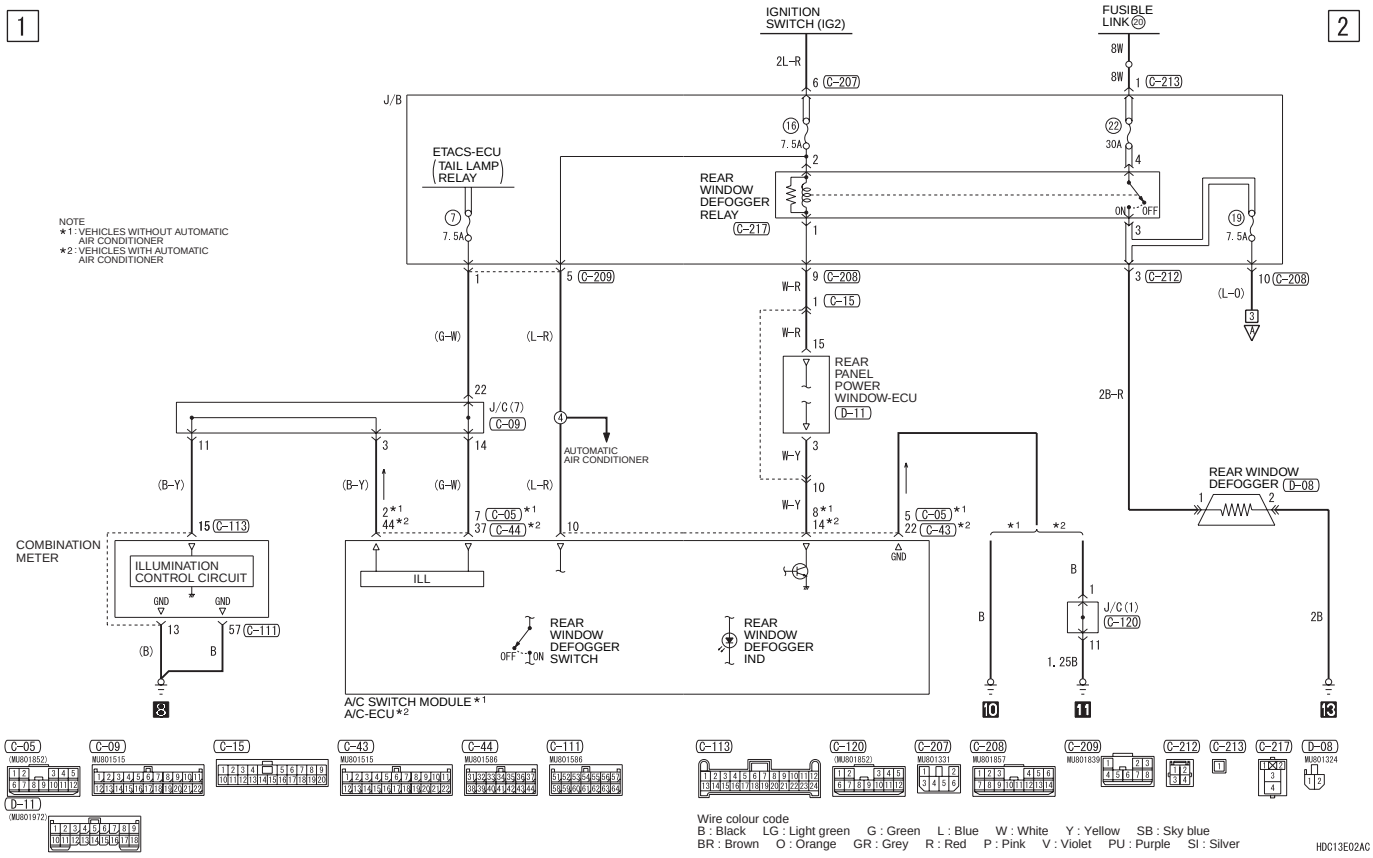
HDC13E01AC

REAR WINDOW DEFOGGER AND HEATED DOOR MIRROR <VEHICLES WITHOUT REAR PANEL POWER WINDOW (RHD)> (CONTINUED)



REAR WINDOW DEFOGGER AND HEATED DOOR MIRROR <VEHICLES WITH REAR PANEL POWER WINDOW (LHD)>

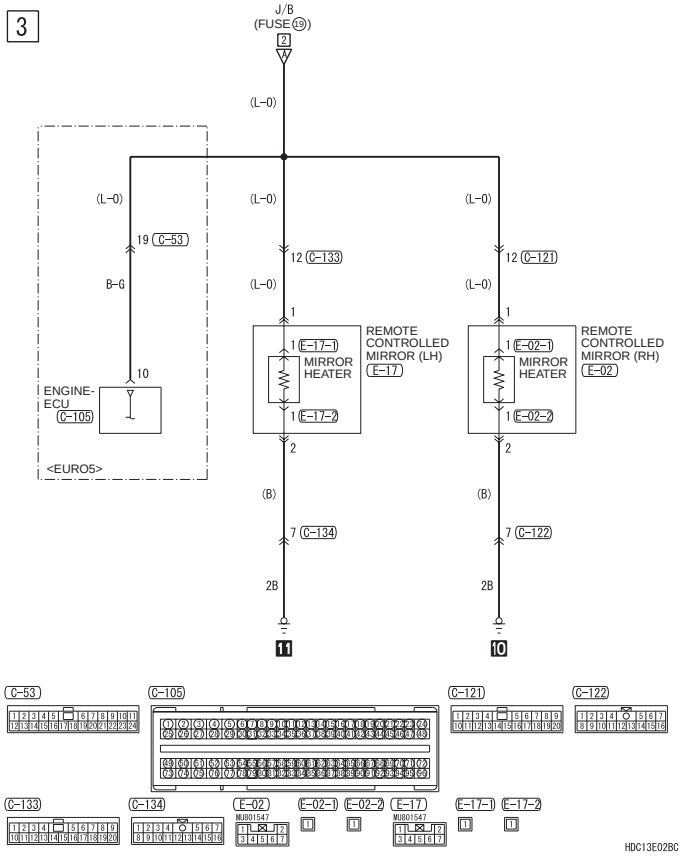
M1901027800364



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

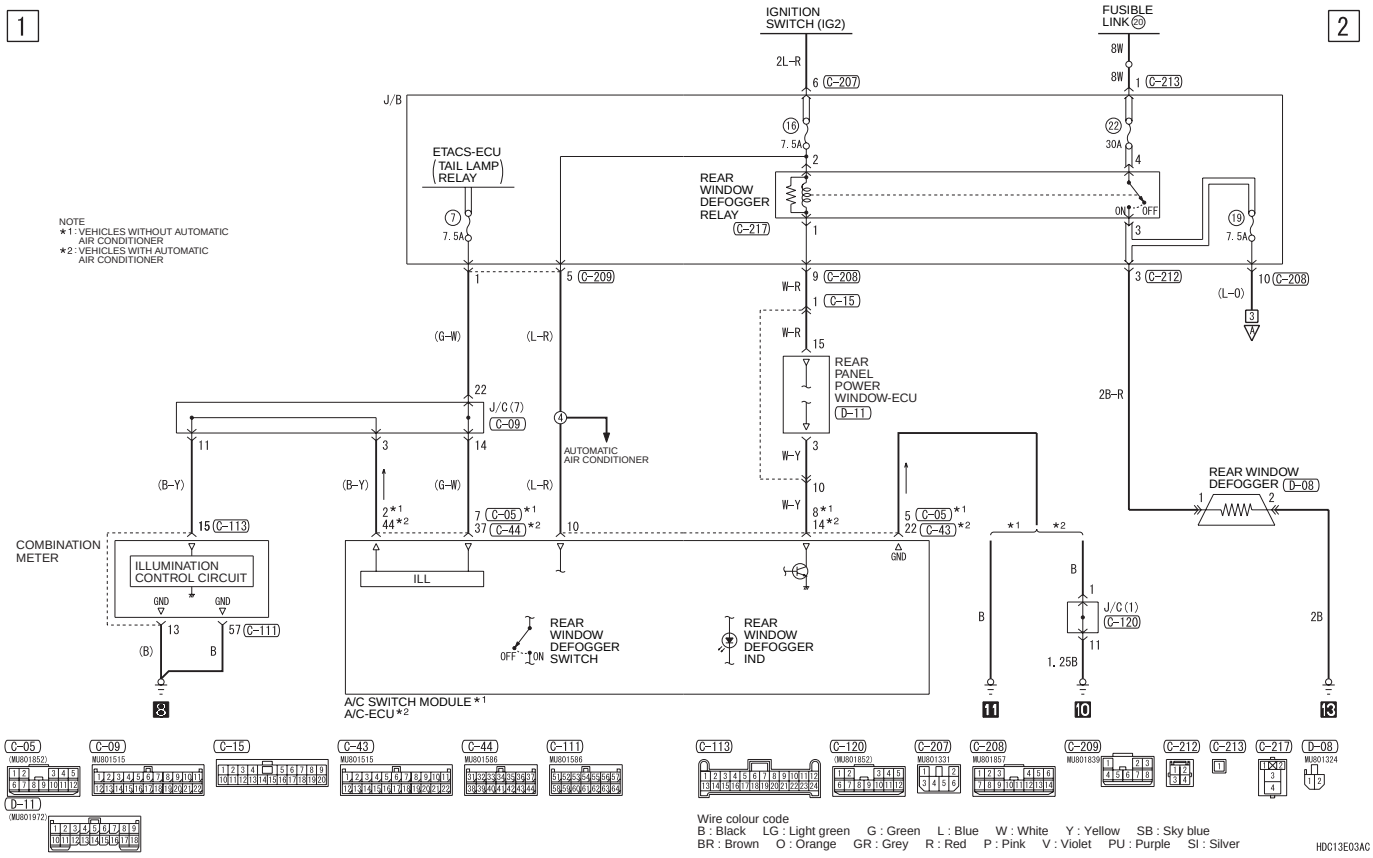
HDC13E02AC

REAR WINDOW DEFOGGER AND HEATED DOOR MIRROR <VEHICLES WITH REAR PANEL POWER WINDOW (LHD)> (CONTINUED)



REAR WINDOW DEFOGGER AND HEATED DOOR MIRROR <VEHICLES WITH REAR PANEL POWER WINDOW (RHD)>

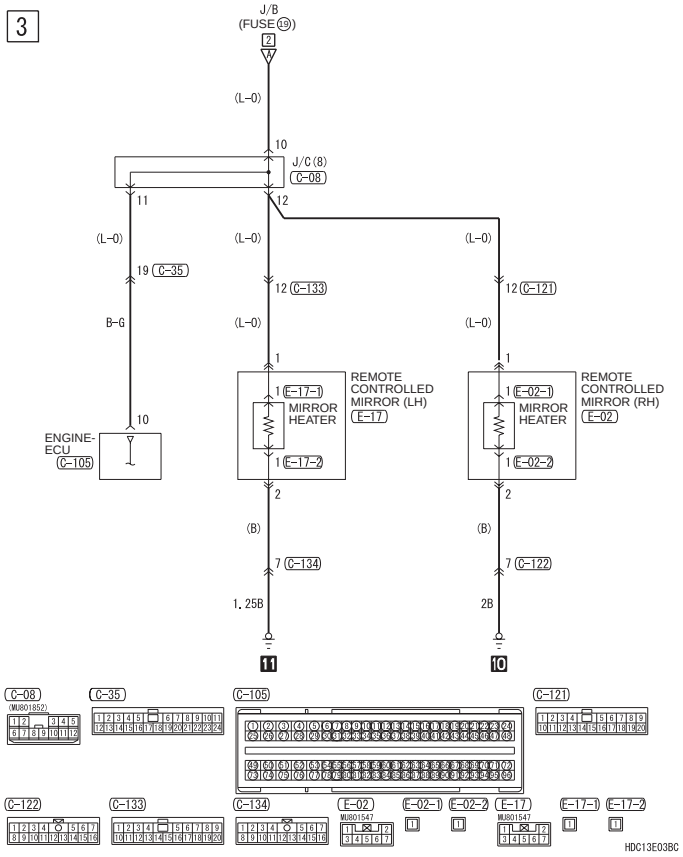
M1901027800375



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

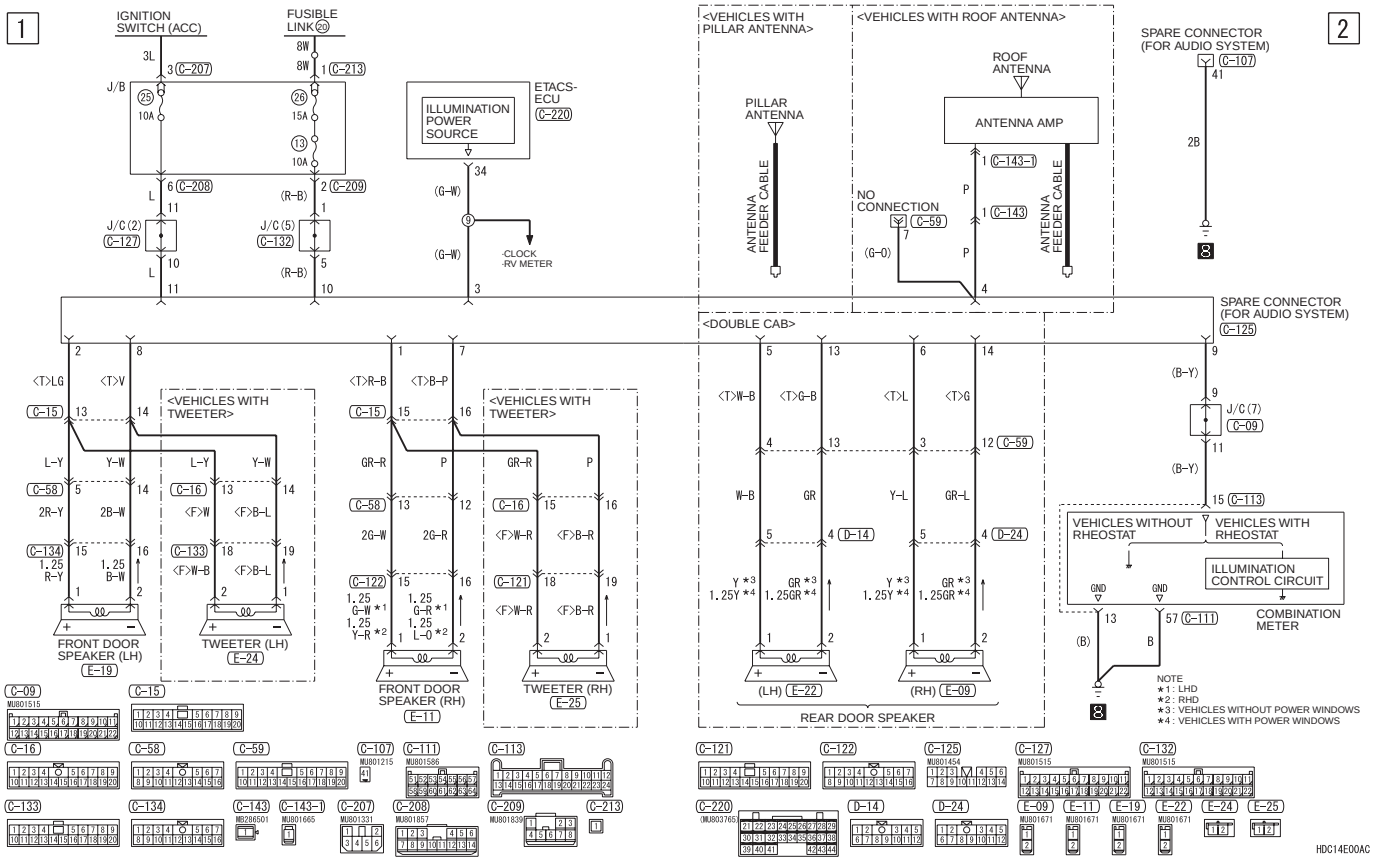
HDC13E03AC

REAR WINDOW DEFOGGER AND HEATED DOOR MIRROR <VEHICLES WITH REAR PANEL POWER WINDOW (RHD)> (CONTINUED)

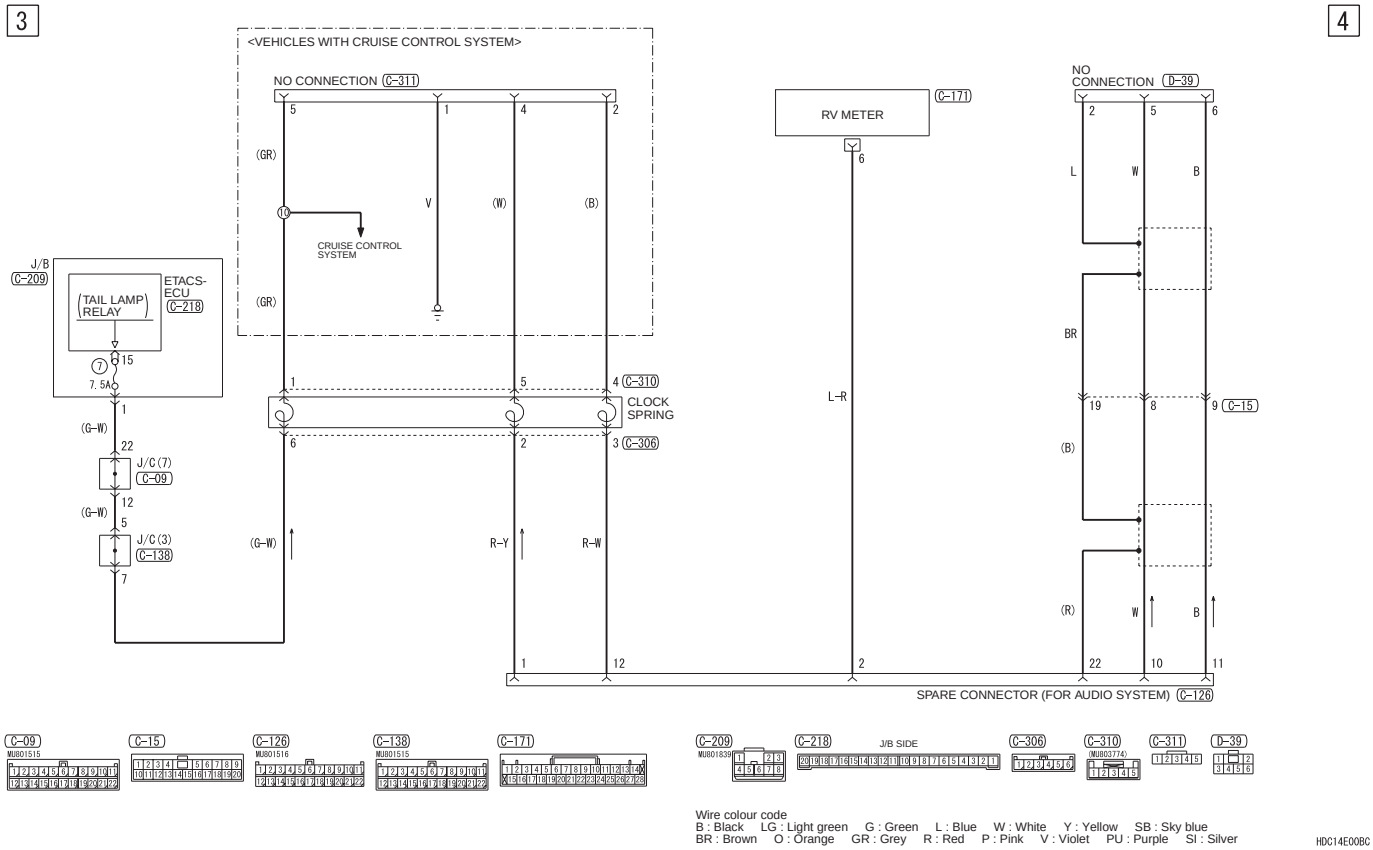


SPARE CONNECTOR (FOR AUDIO)

M1901019002433



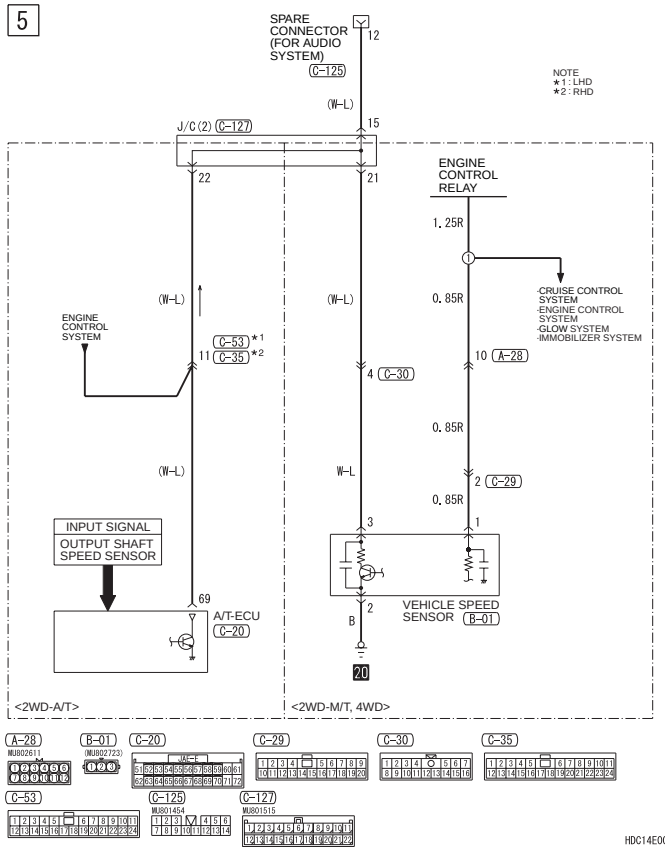
SPARE CONNECTOR (FOR AUDIO) (CONTINUED)



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HDC14E00BC

SPARE CONNECTOR (FOR AUDIO) (CONTINUED)

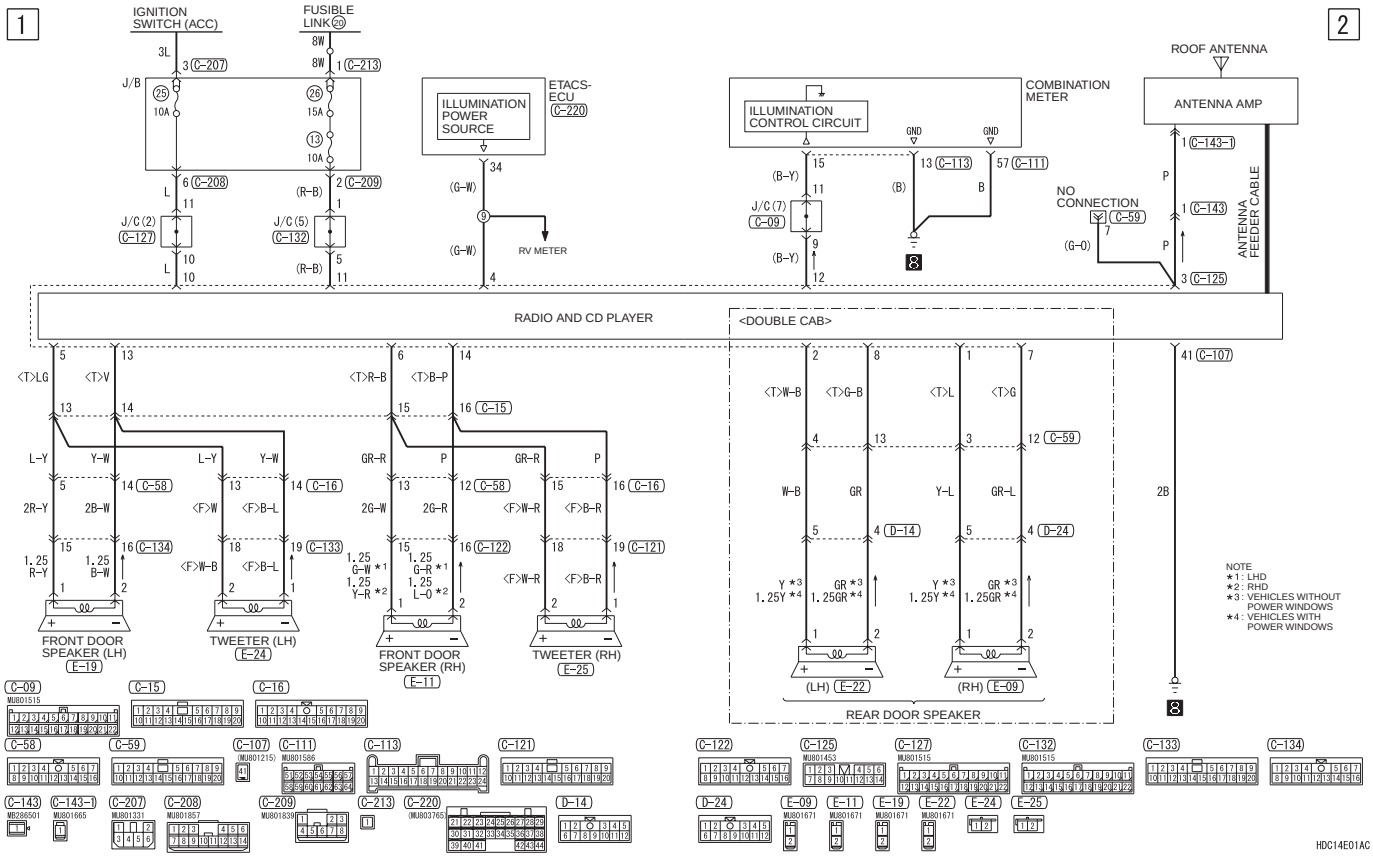


HDC14E00CC

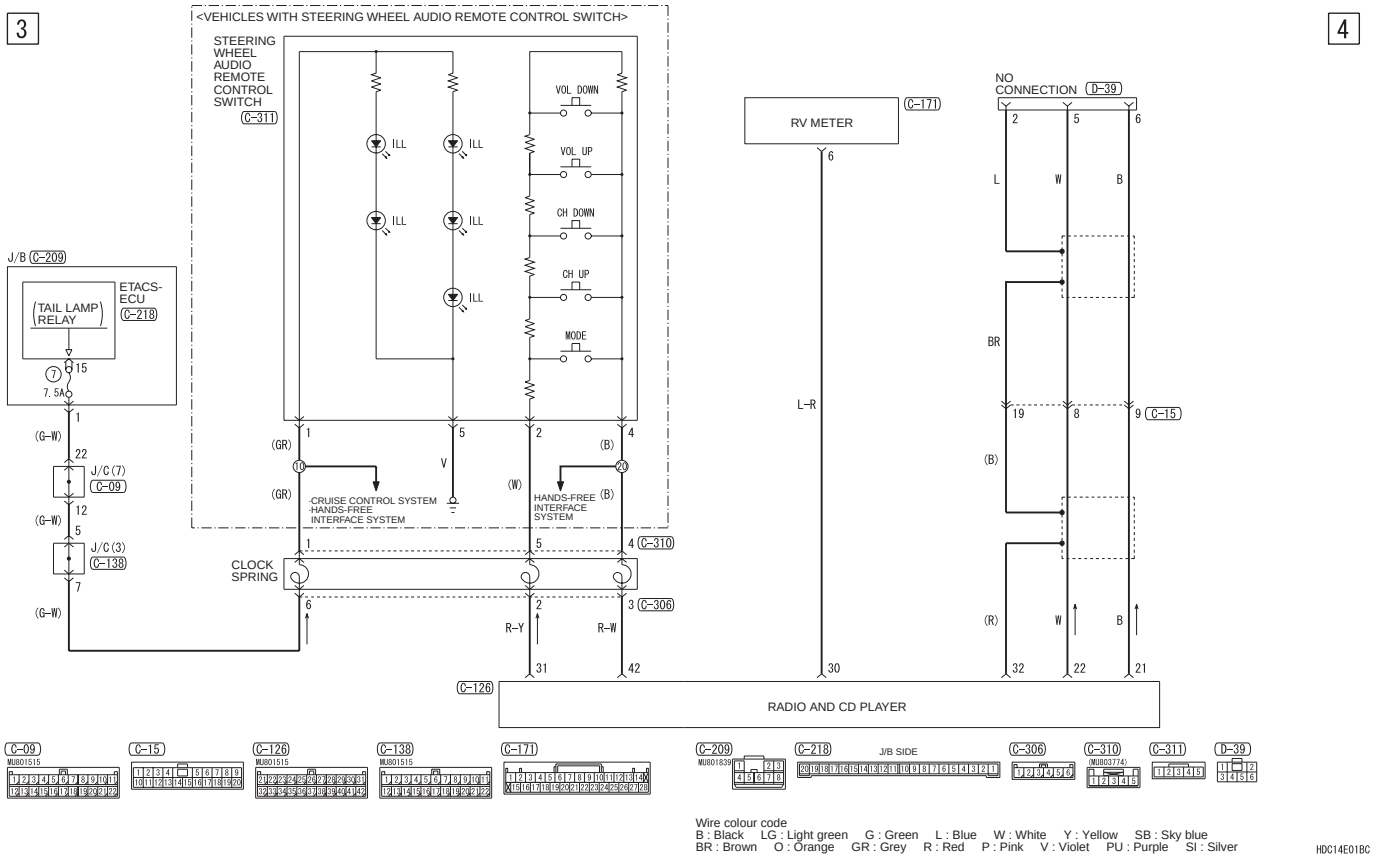
RADIO AND CD PLAYER

RADIO AND CD PLAYER <VEHICLES WITHOUT AUDIO AMPLIFIER>

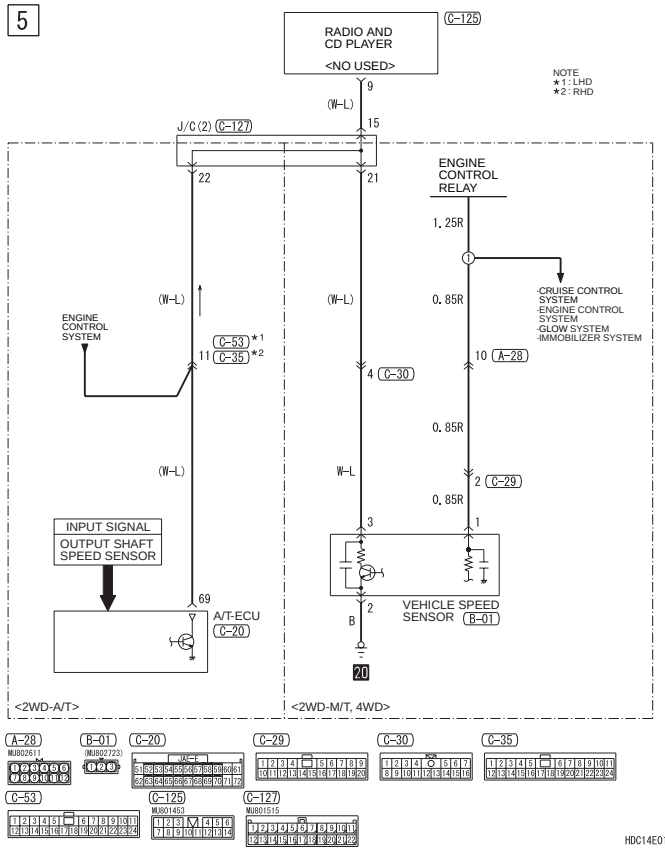
M1901028101275



RADIO AND CD PLAYER <VEHICLES WITHOUT AUDIO AMPLIFIER> (CONTINUED)

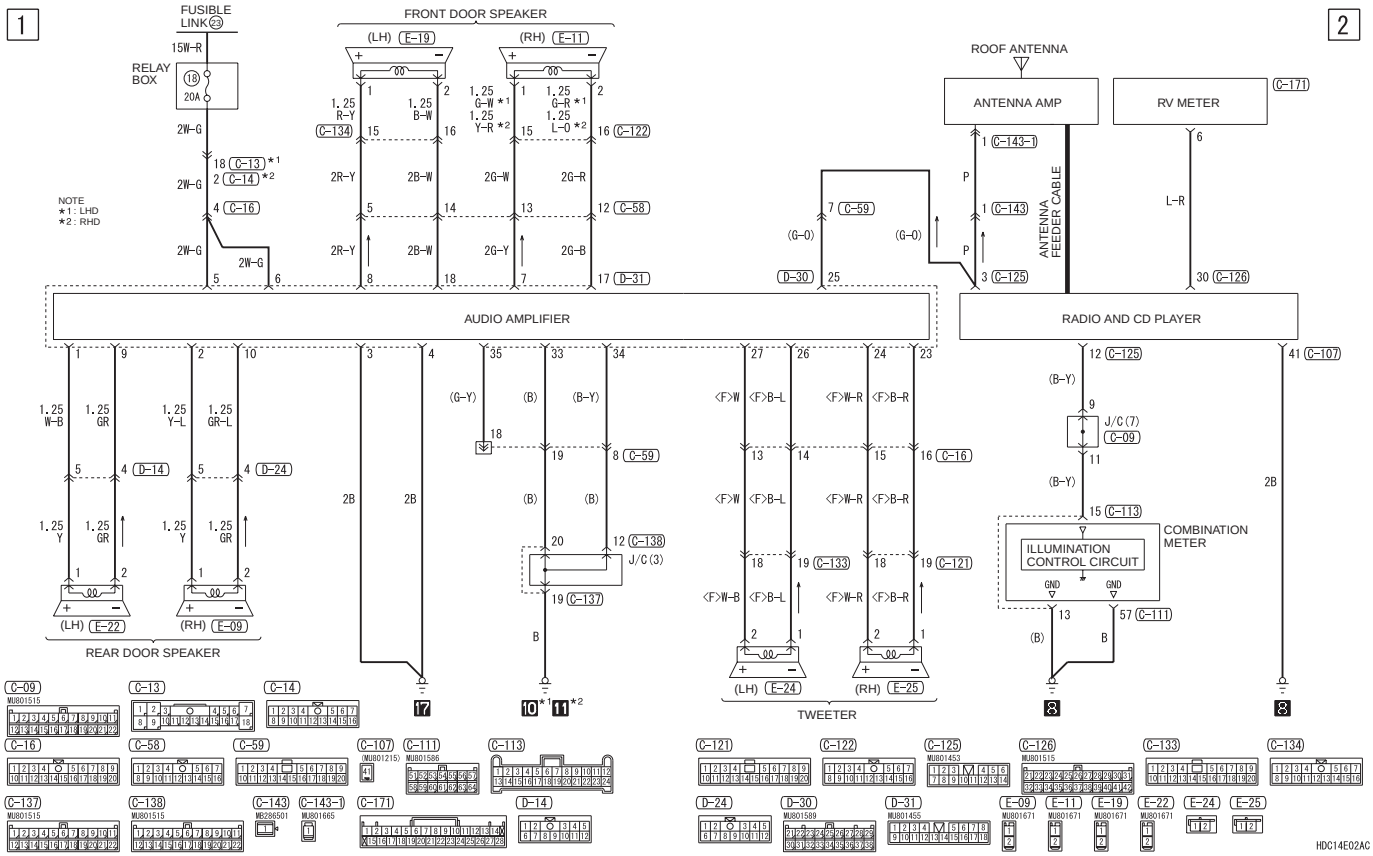


RADIO AND CD PLAYER <VEHICLES WITHOUT AUDIO AMPLIFIER> (CONTINUED)

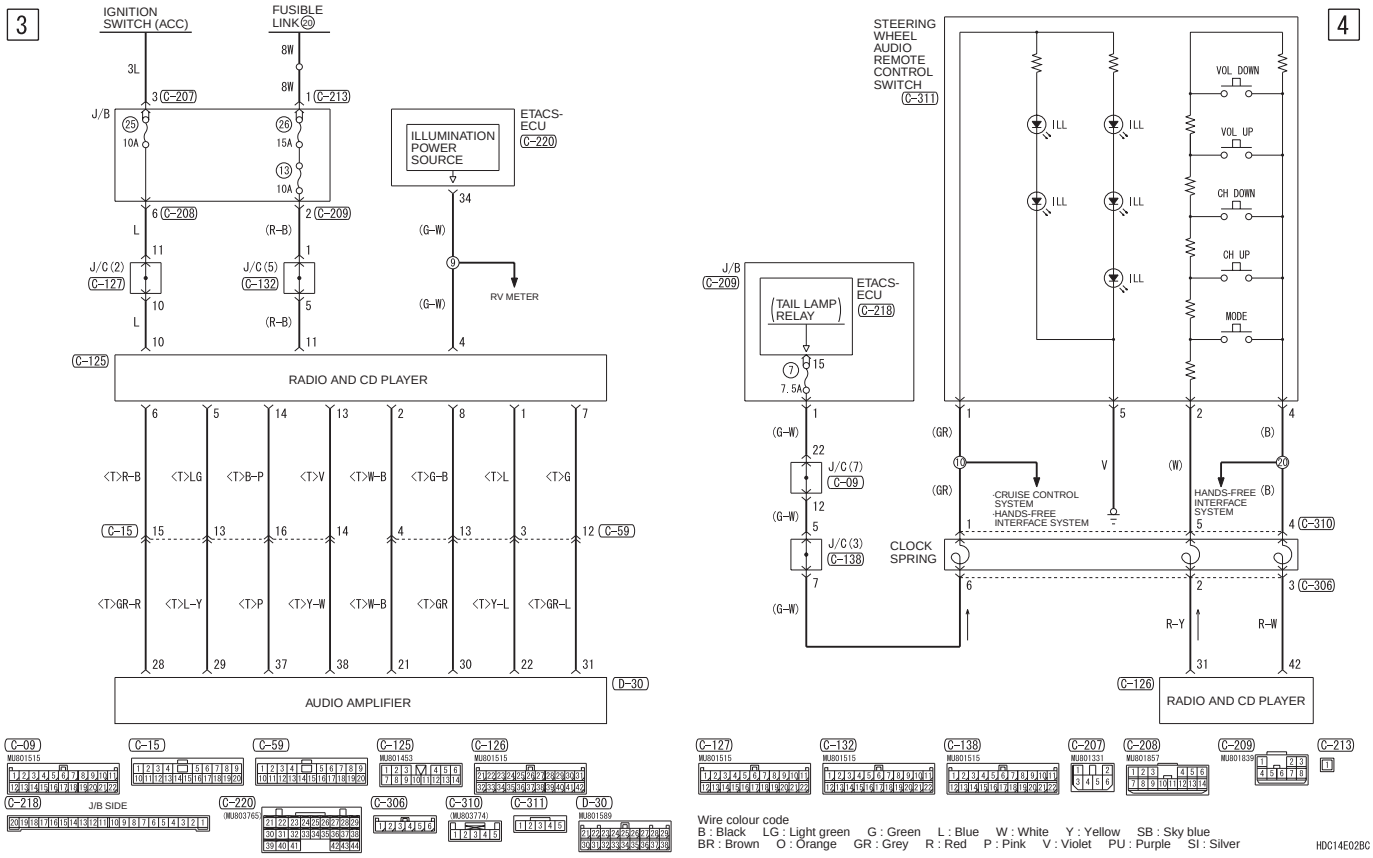


RADIO AND CD PLAYER <VEHICLES WITH AUDIO AMPLIFIER>

M1901028101286



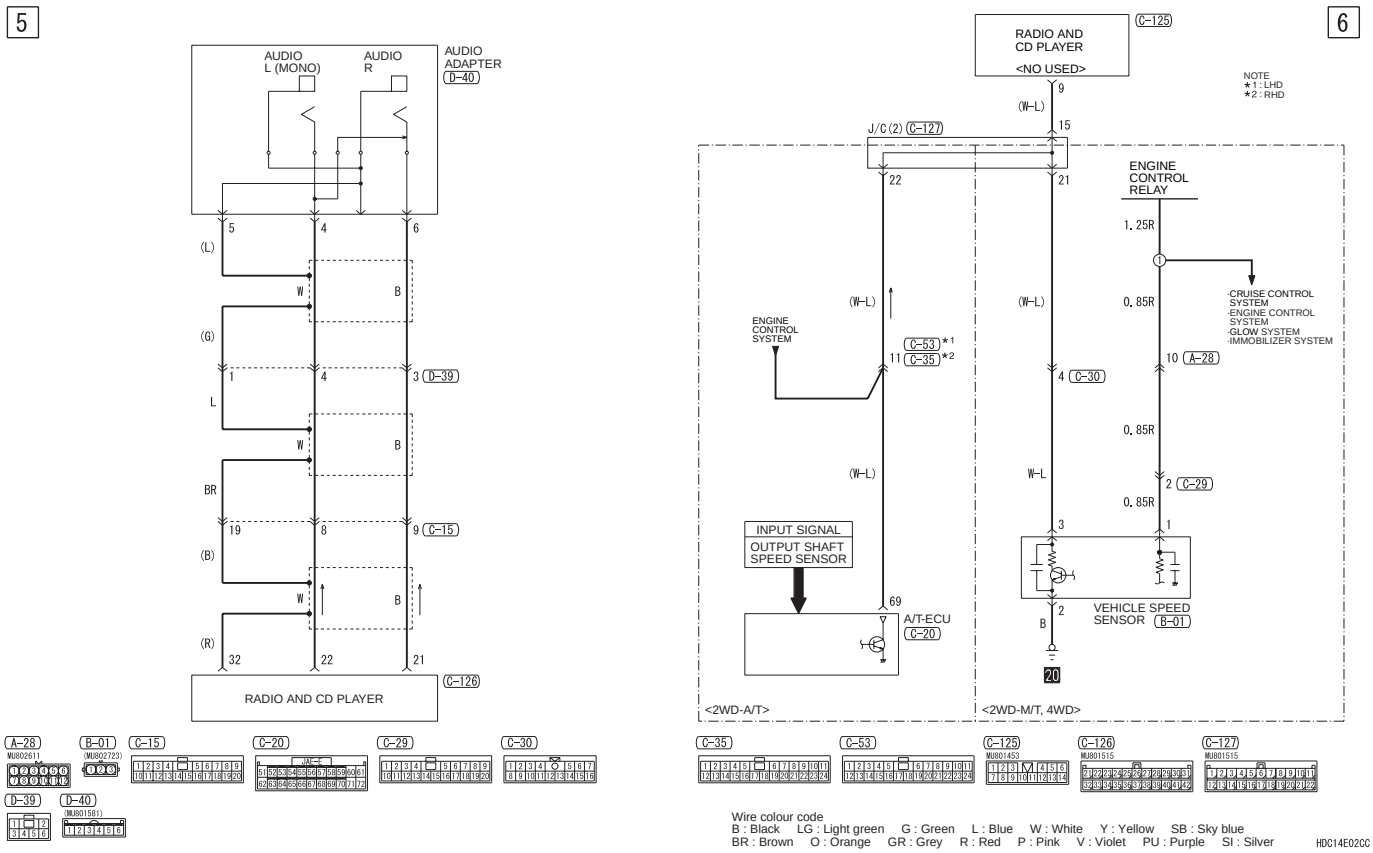
RADIO AND CD PLAYER <VEHICLES WITH AUDIO AMPLIFIER> (CONTINUED)



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HDC14E02BC

RADIO AND CD PLAYER <VEHICLES WITH AUDIO AMPLIFIER> (CONTINUED)

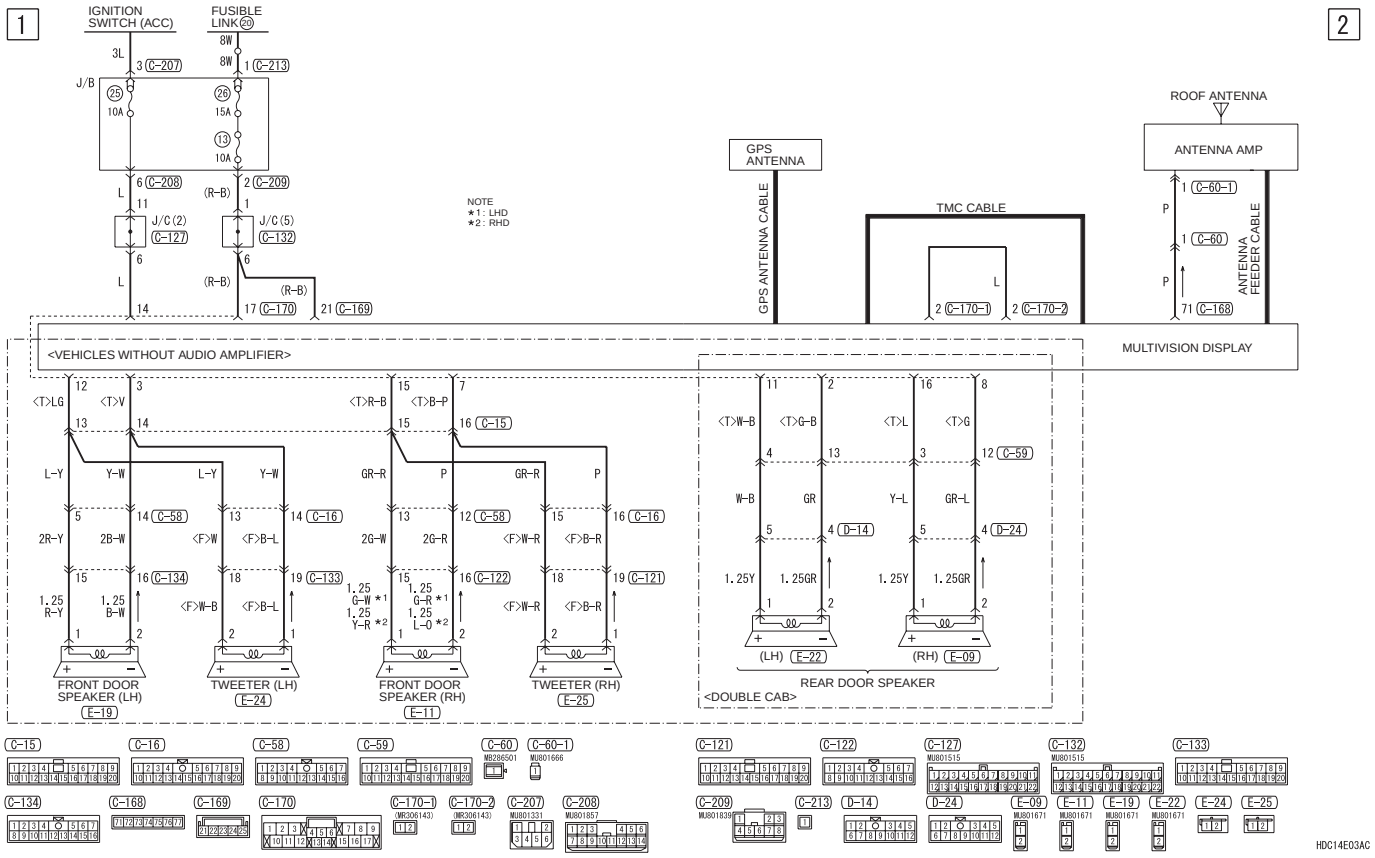


Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

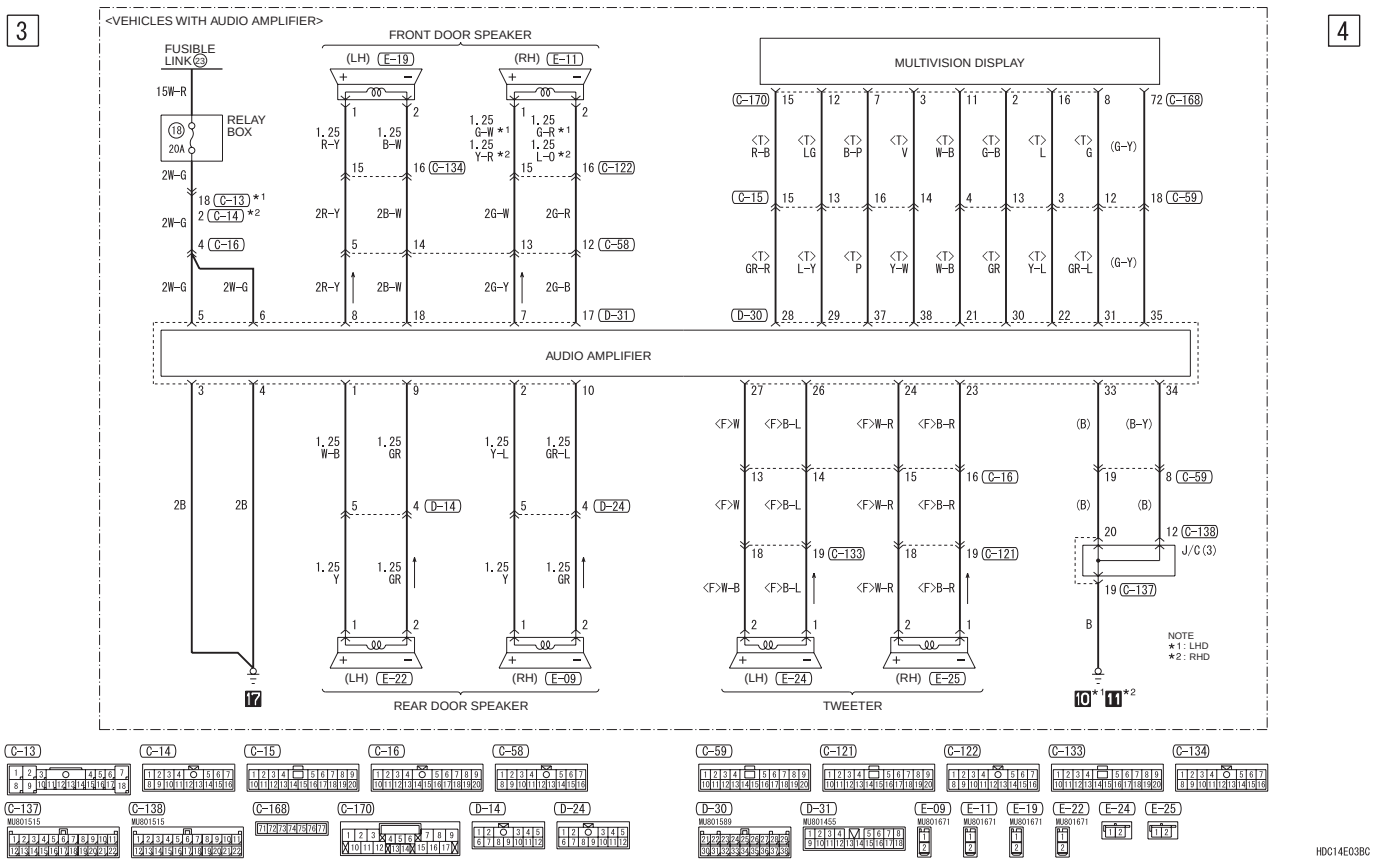
HDC14E02CC

MITSUBISHI MULTI COMMUNICATION SYSTEM (MMCS)

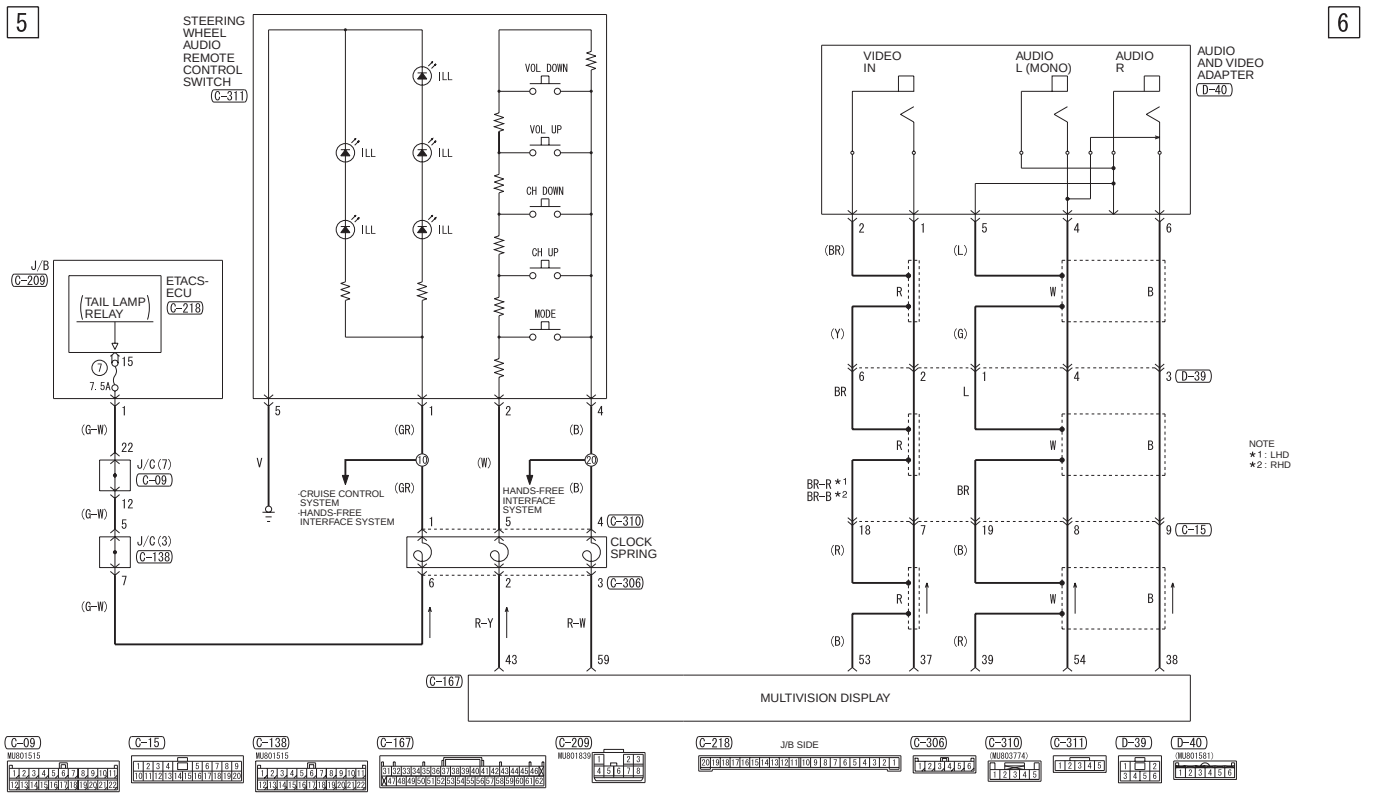
M1901007502356



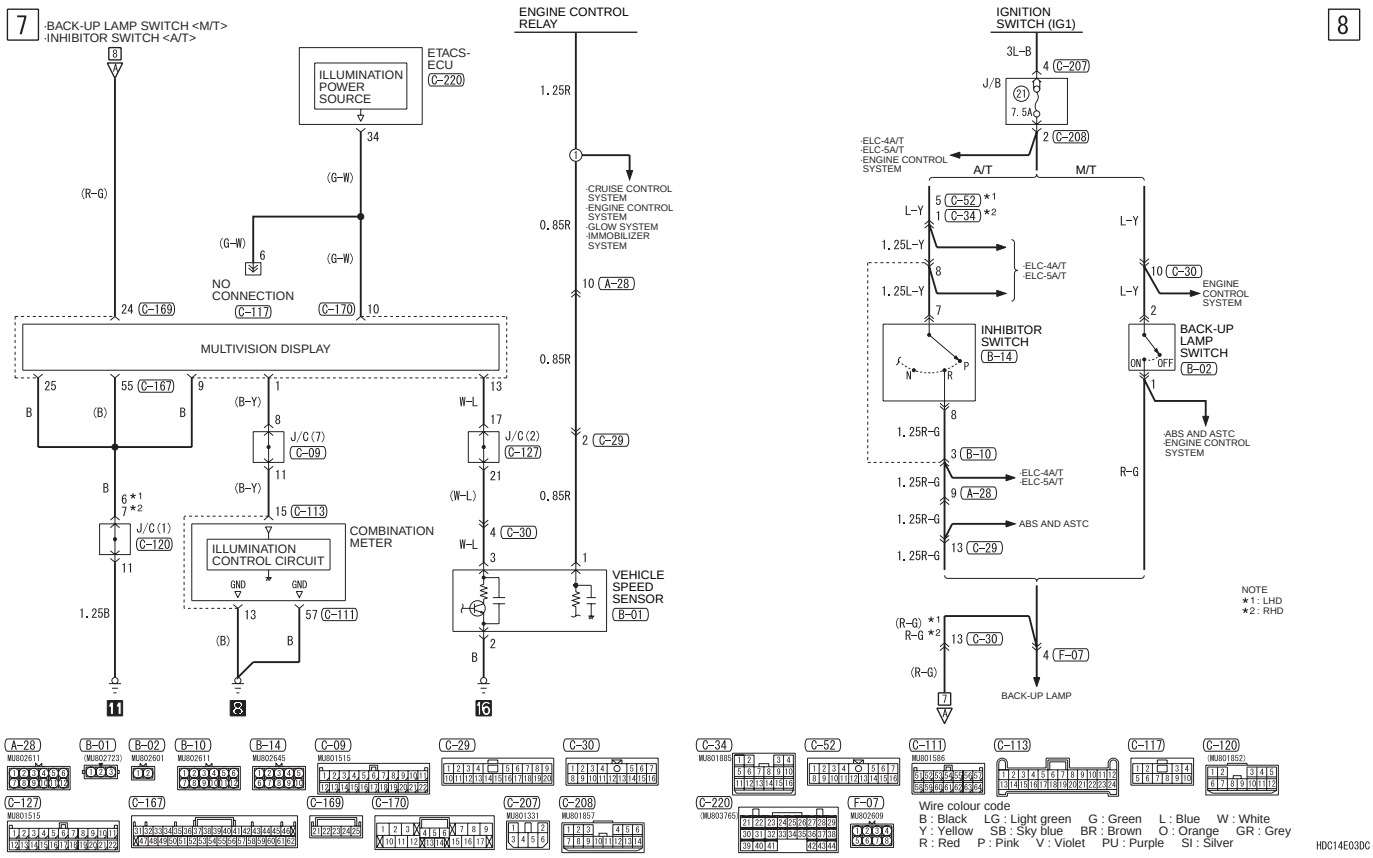
MITSUBISHI MULTI COMMUNICATION SYSTEM (MMCS) (CONTINUED)



MITSUBISHI MULTI COMMUNICATION SYSTEM (MMCS) (CONTINUED)

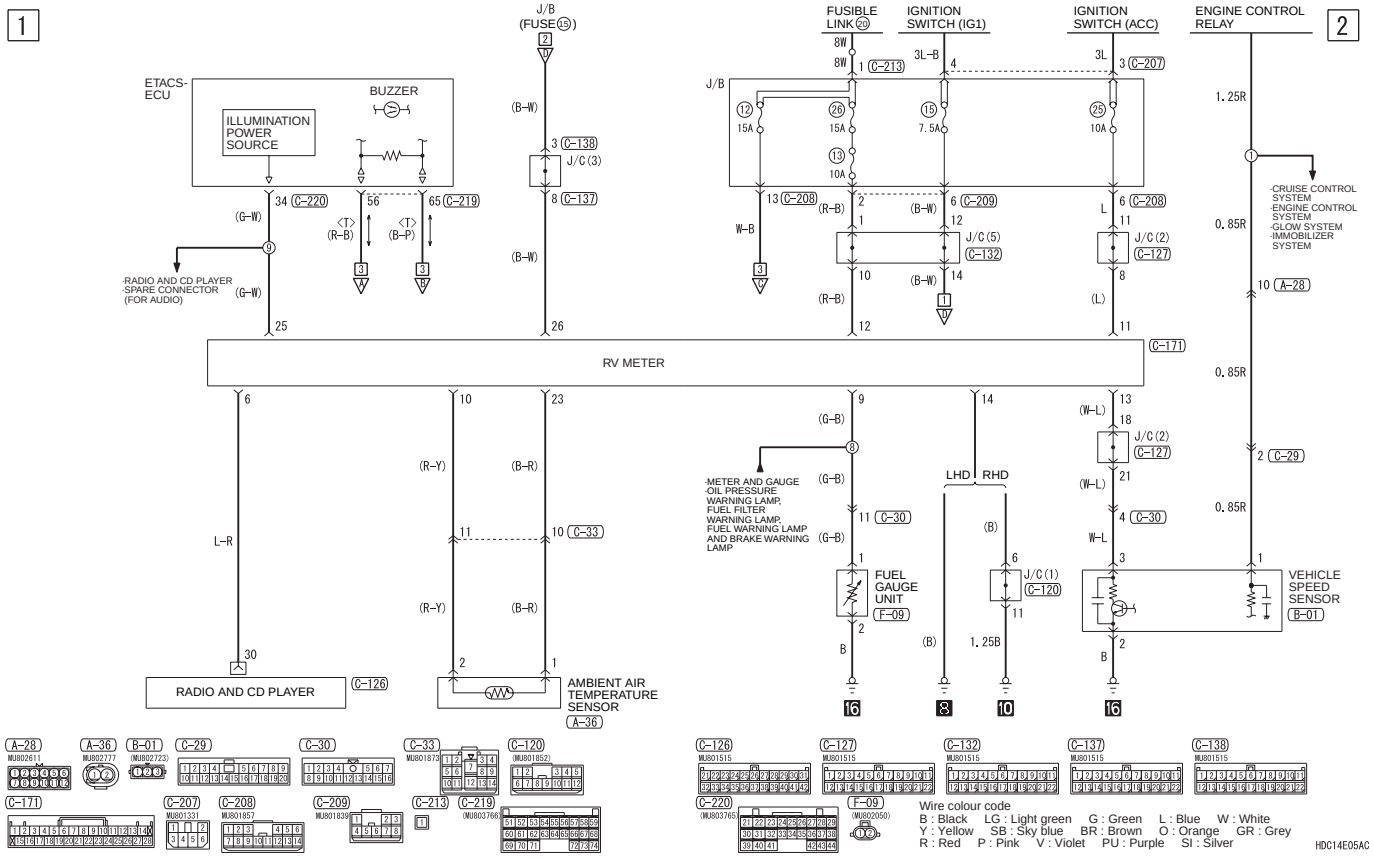


MITSUBISHI MULTI COMMUNICATION SYSTEM (MMCS) (CONTINUED)

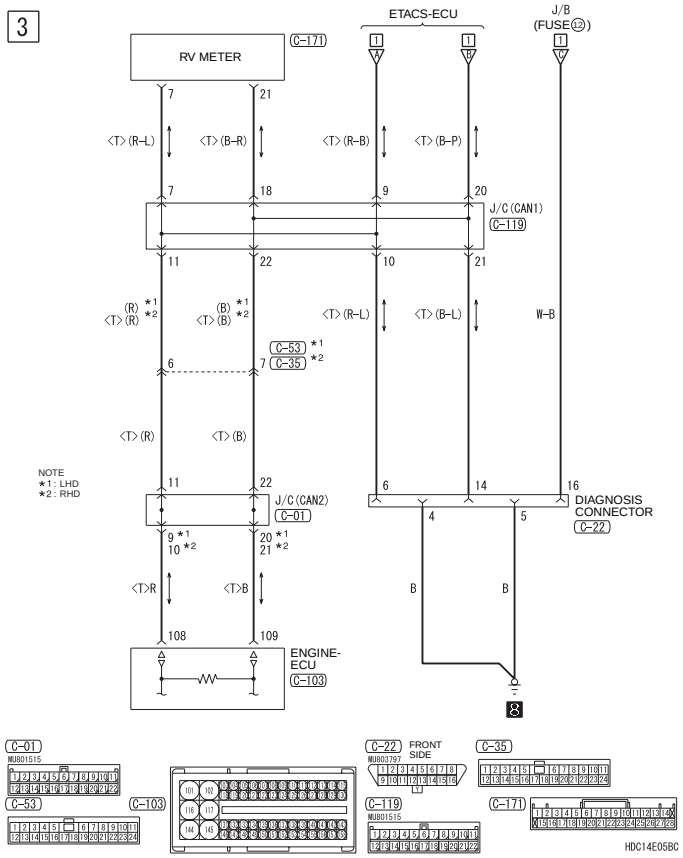


RV METER

M1901024600695

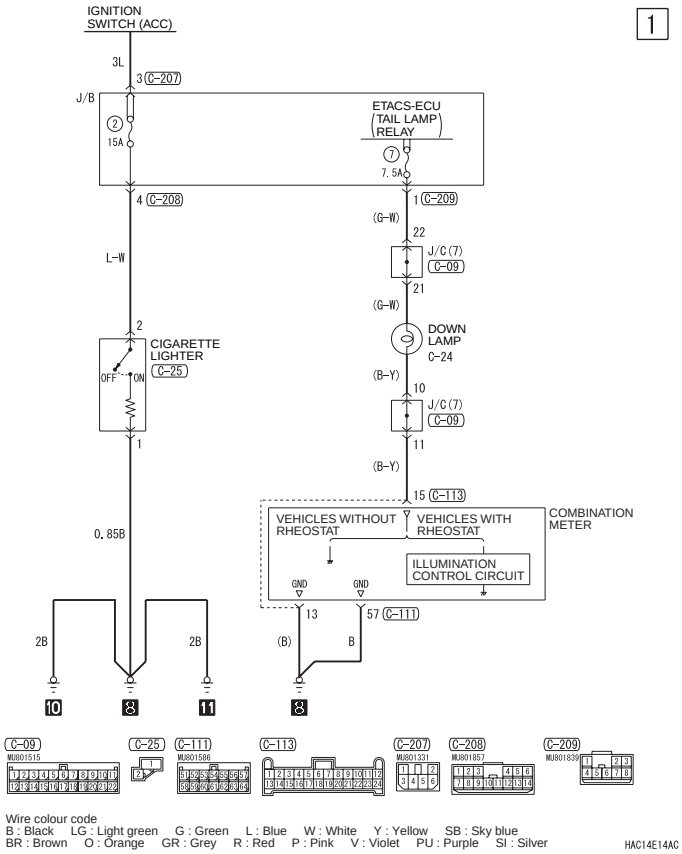


RV METER (CONTINUED)



CIGARETTE LIGHTER AND DOWN LAMP

M1901028200127

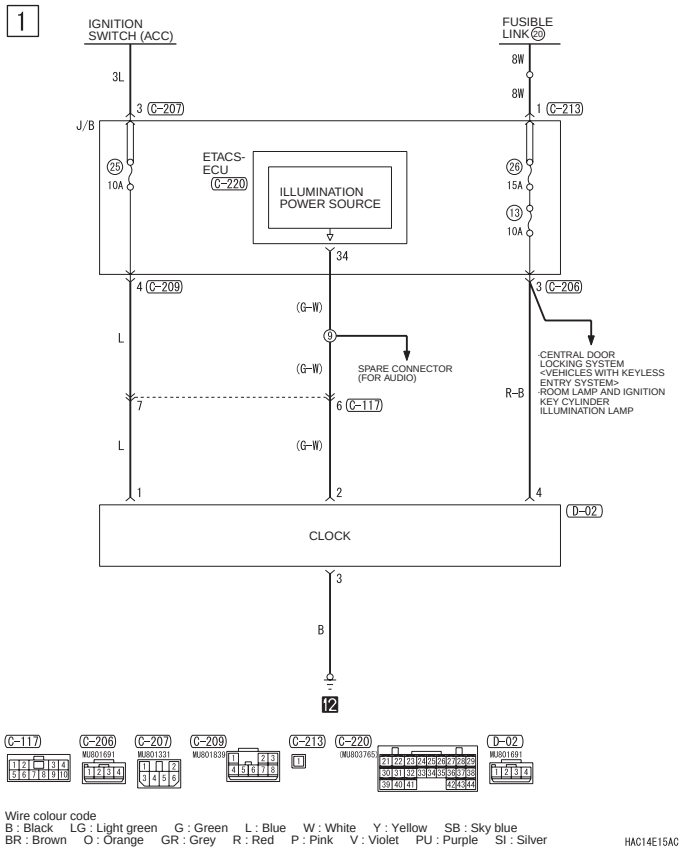


Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HAC14E14AC

CLOCK

M1901007701982



Wire colour code
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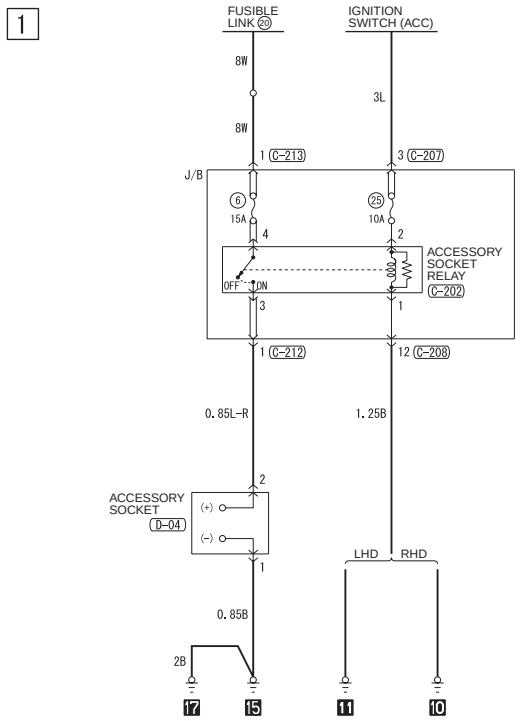
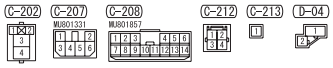
HAC14E15AC

ACCESSORY SOCKET

M1901019101084

1





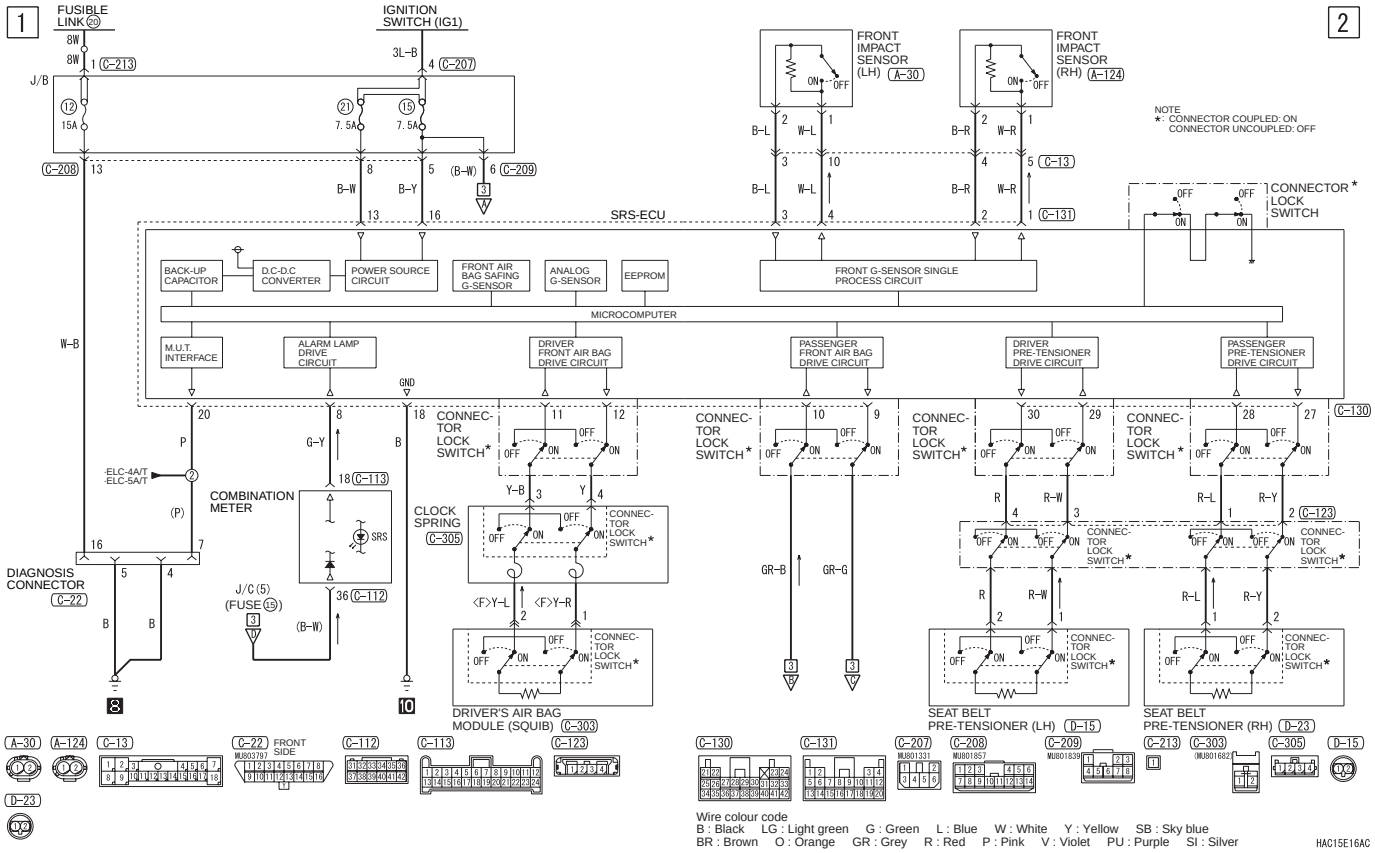
Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HAC14E16AC

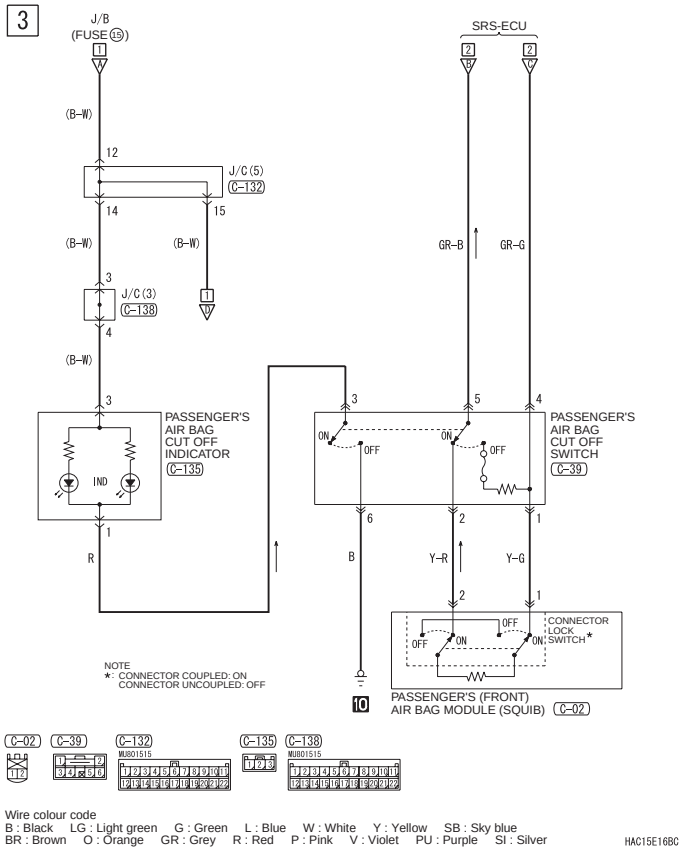
SRS

SRS <VEHICLES WITHOUT SIDE-AIRBAG (LHD)>

M1901021002151



SRS <VEHICLES WITHOUT SIDE-AIRBAG (LHD)> (CONTINUED)

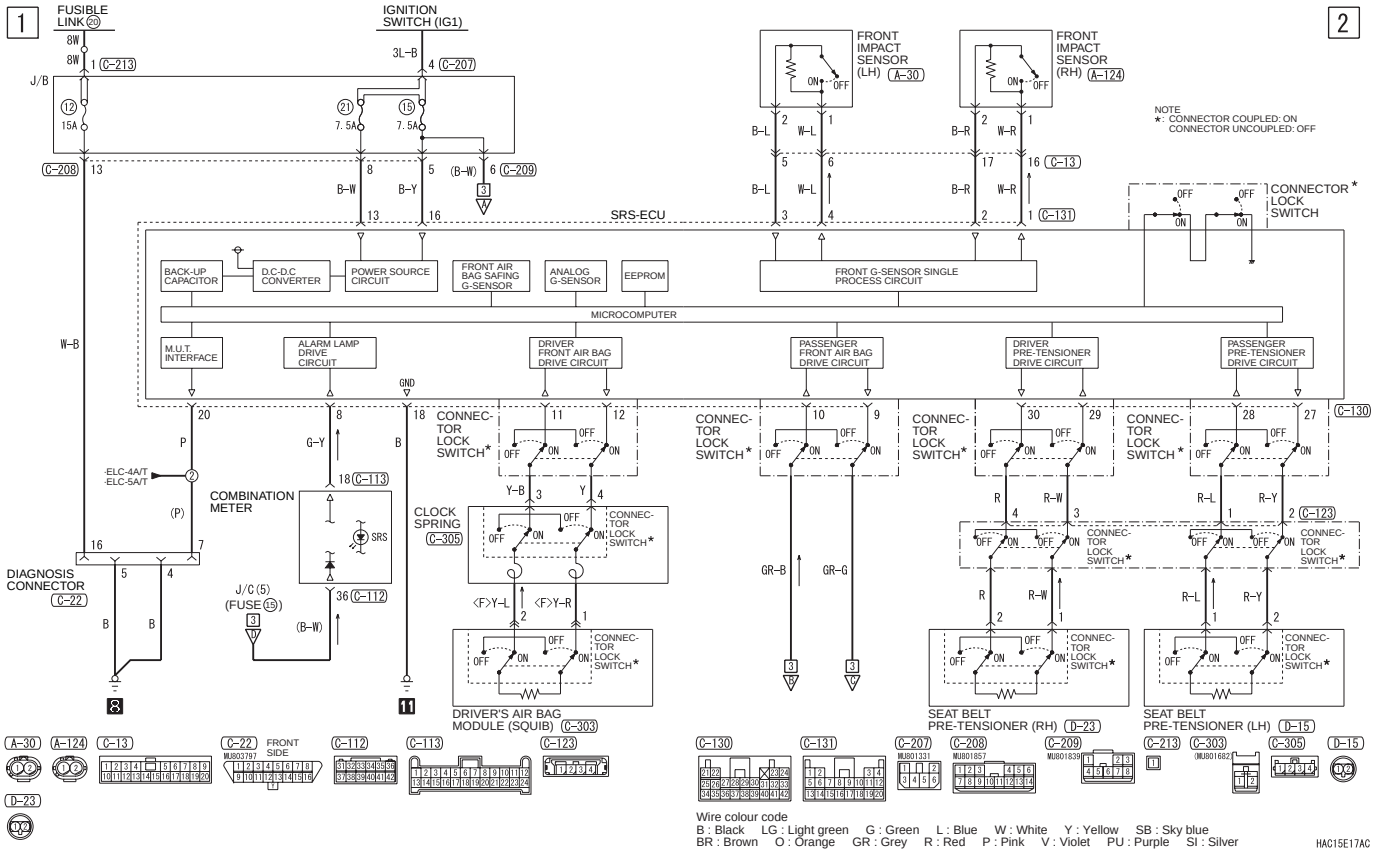


Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

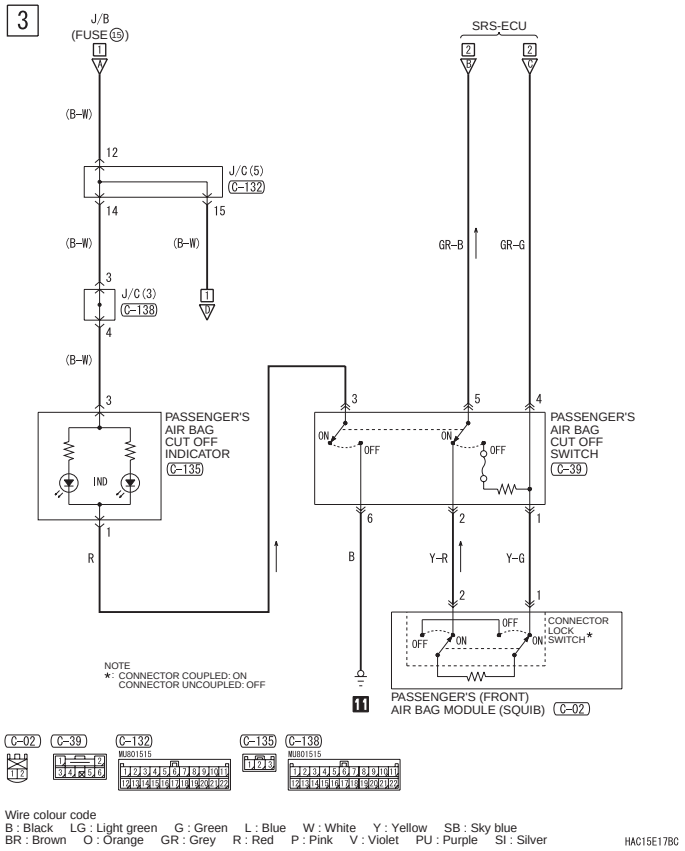
HAC15E16BC

SRS <VEHICLES WITHOUT SIDE-AIRBAG (RHD)>

M1901021002162



SRS <VEHICLES WITHOUT SIDE-AIRBAG (RHD)> (CONTINUED)



Wire colour code
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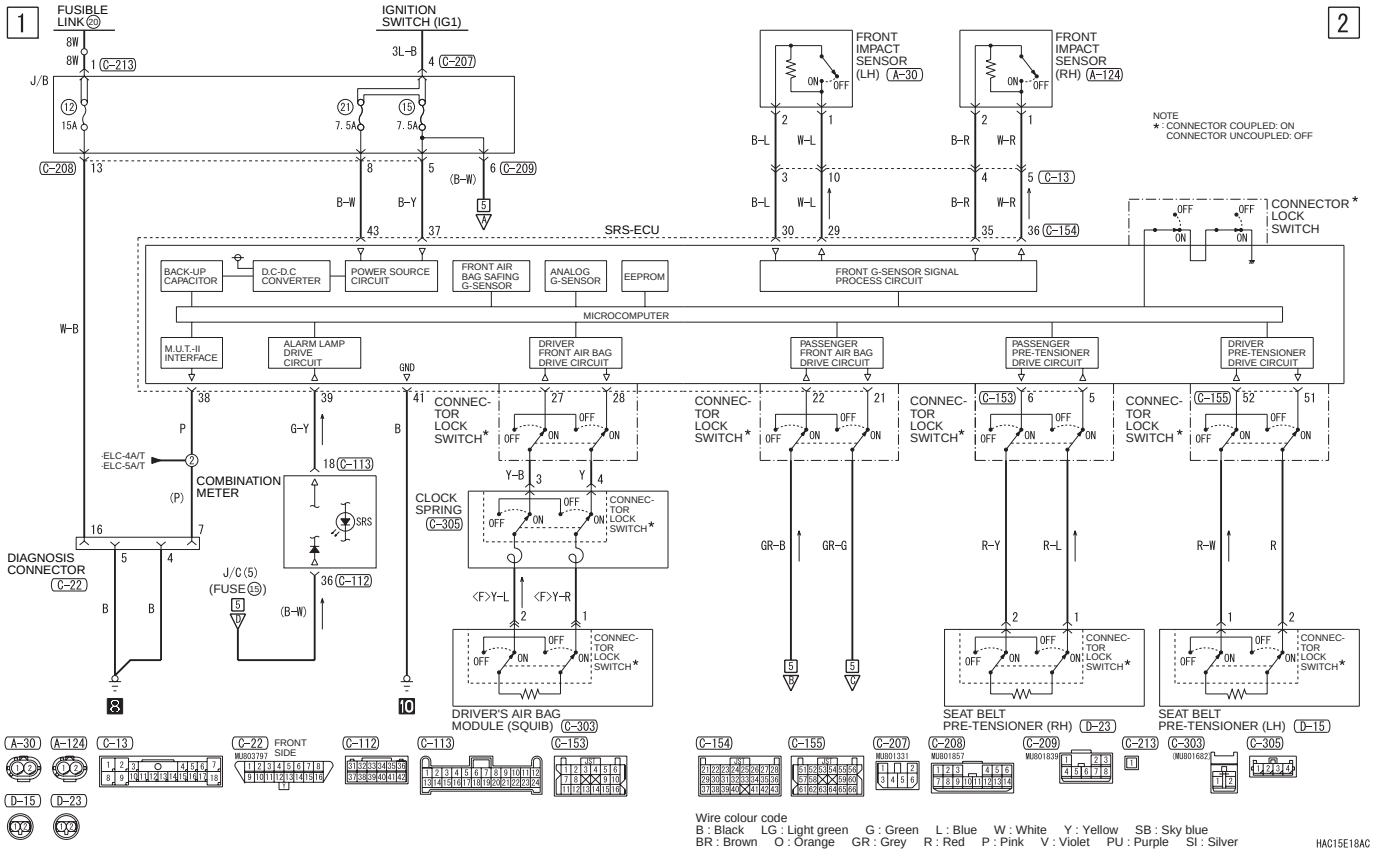
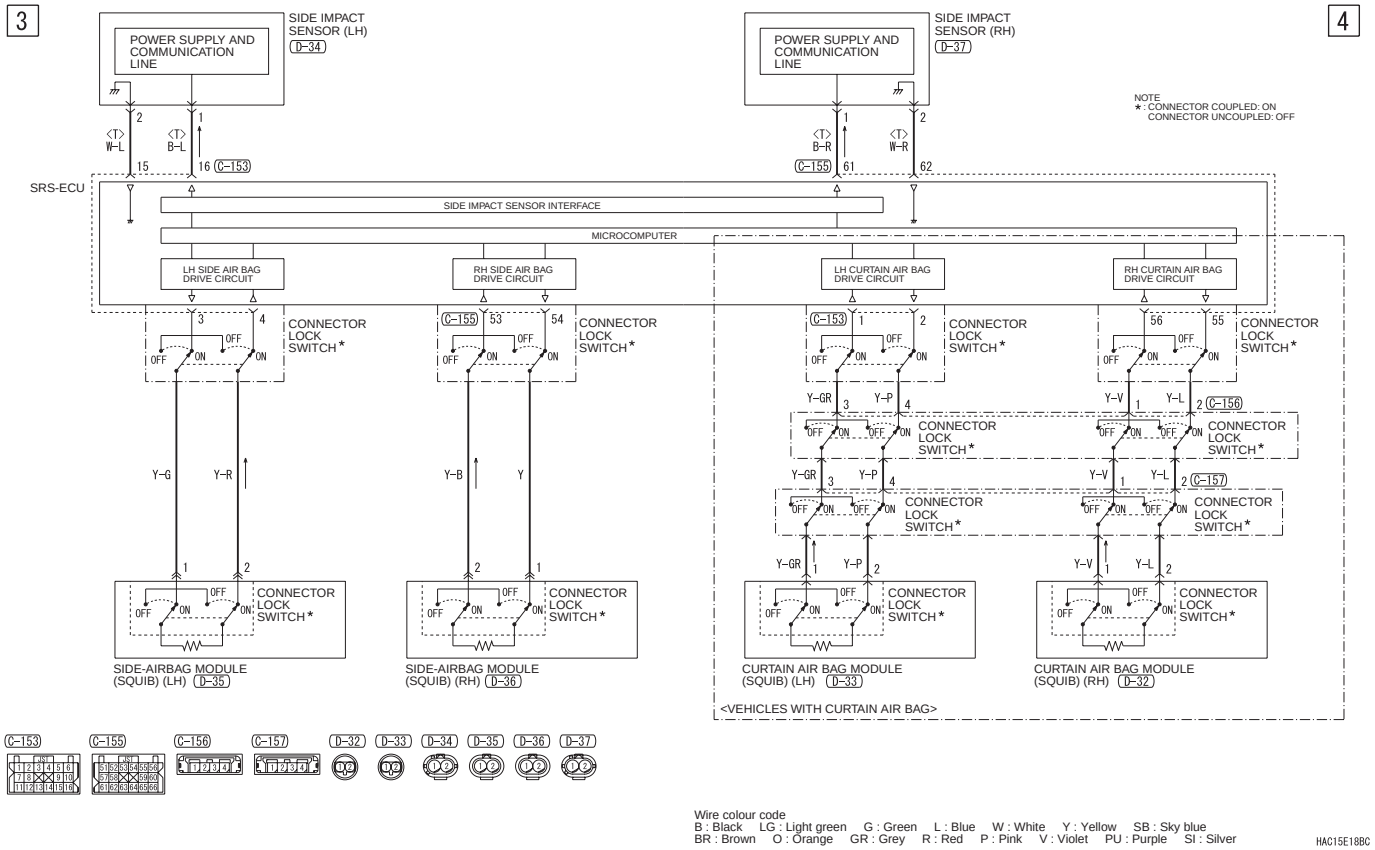
HAC15E17BC

SRS <VEHICLES WITH SIDE-AIRBAG (LHD)>

M1901021002173



SRS <VEHICLES WITH SIDE-AIRBAG (LHD)> (CONTINUED)



Wire colour code
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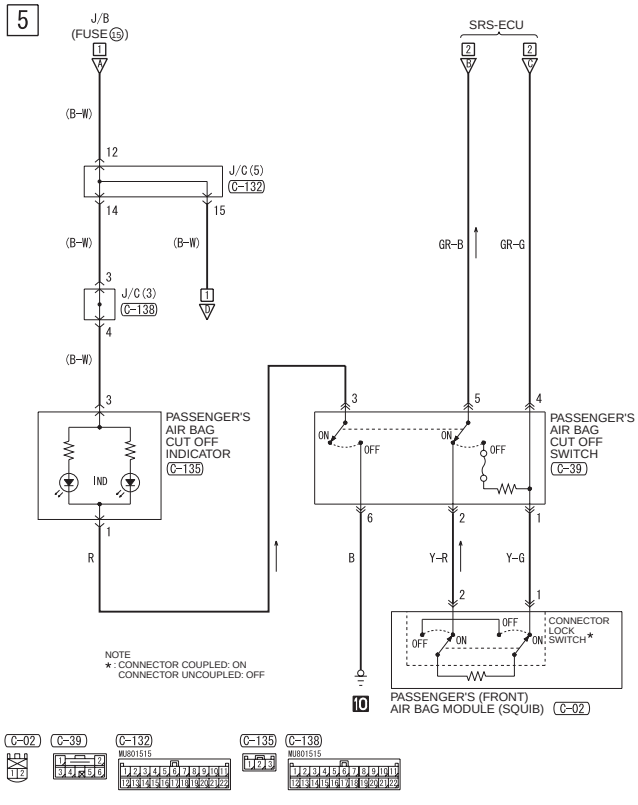
HAC15E18BC

SRS <VEHICLES WITH SIDE-AIRBAG (LHD)> (CONTINUED)



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
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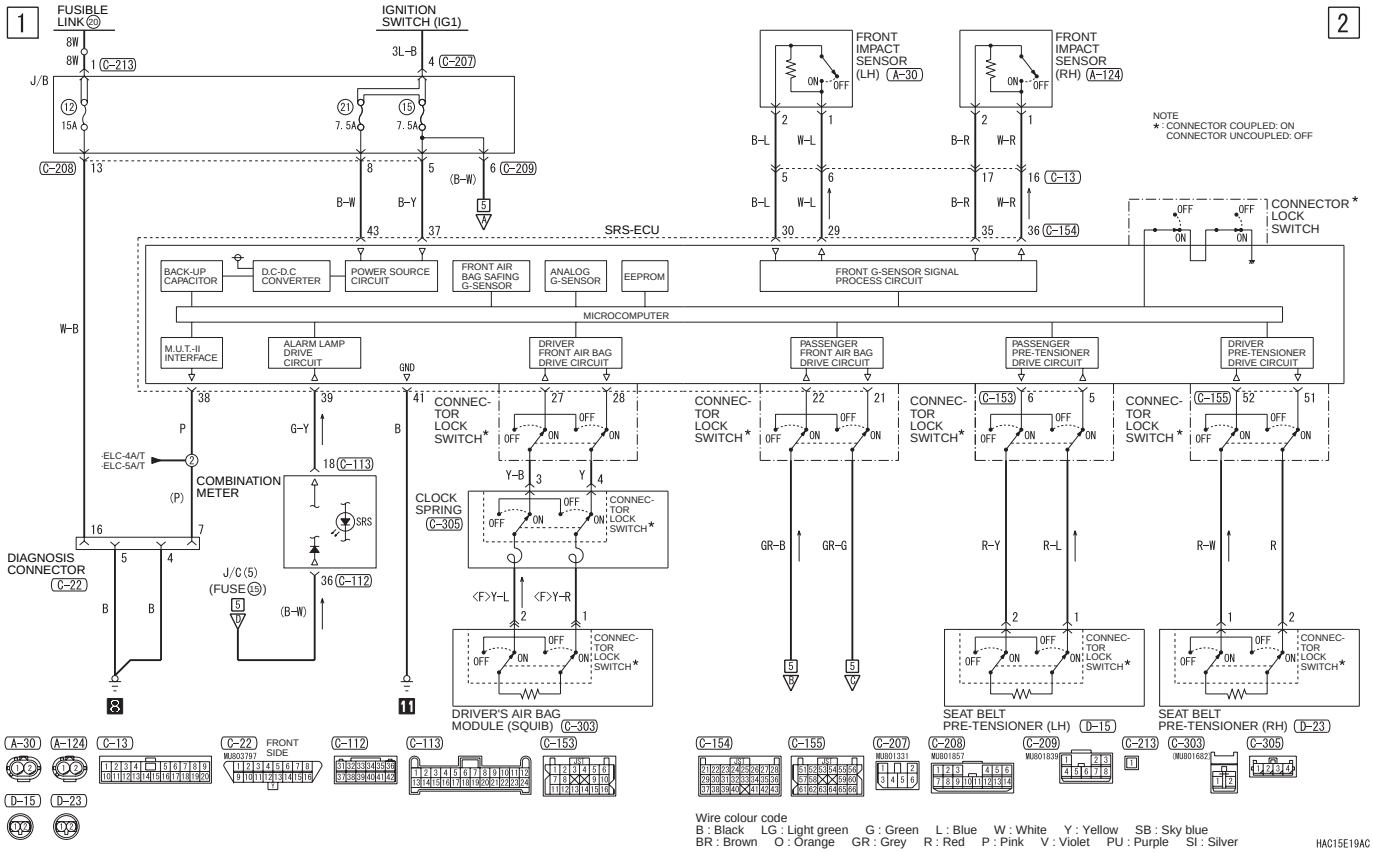
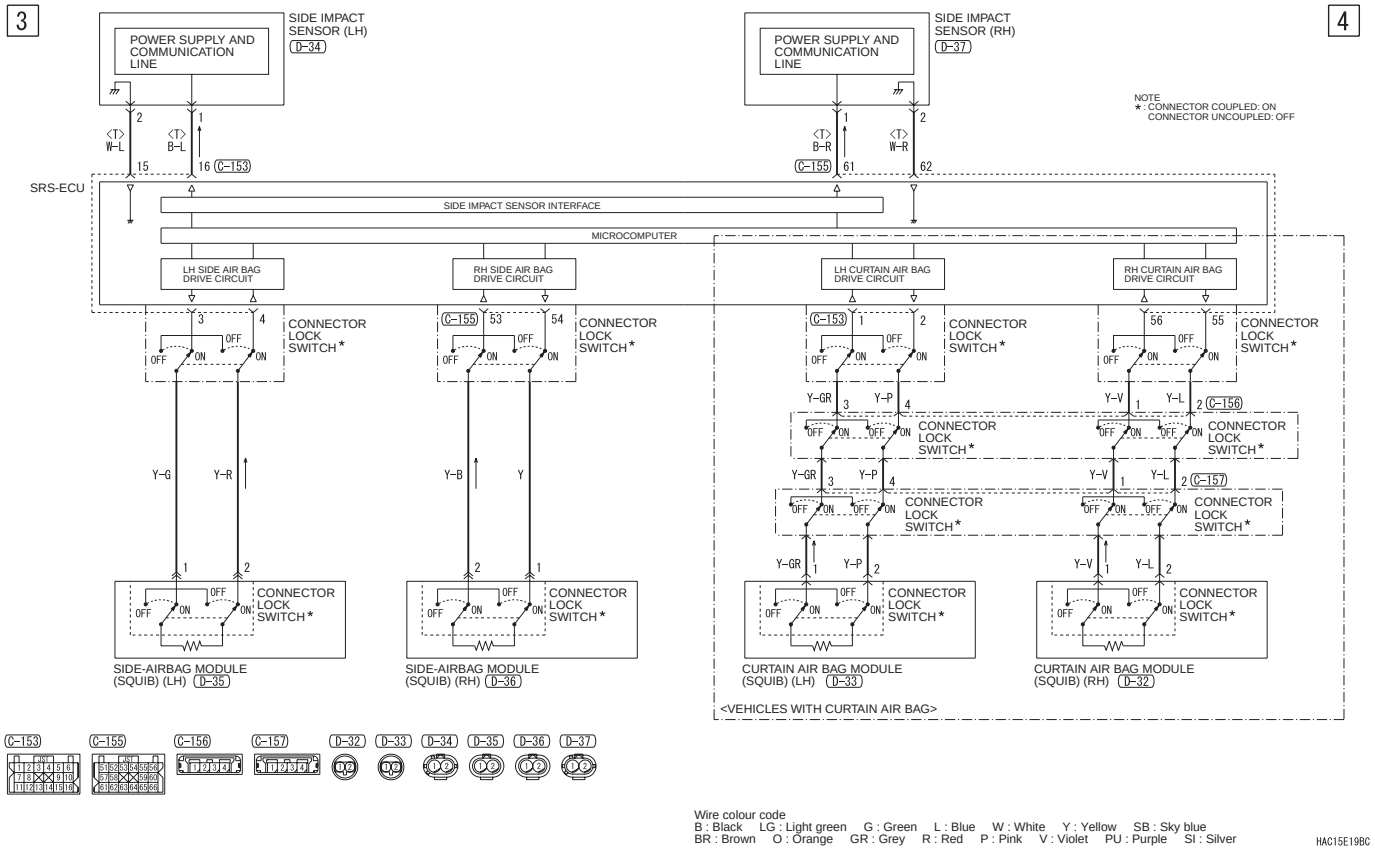
HAC15E18CC

SRS <VEHICLES WITH SIDE-AIRBAG (RHD)>

M1901021002184



SRS <VEHICLES WITH SIDE-AIRBAG (RHD)> (CONTINUED)



Wire colour code
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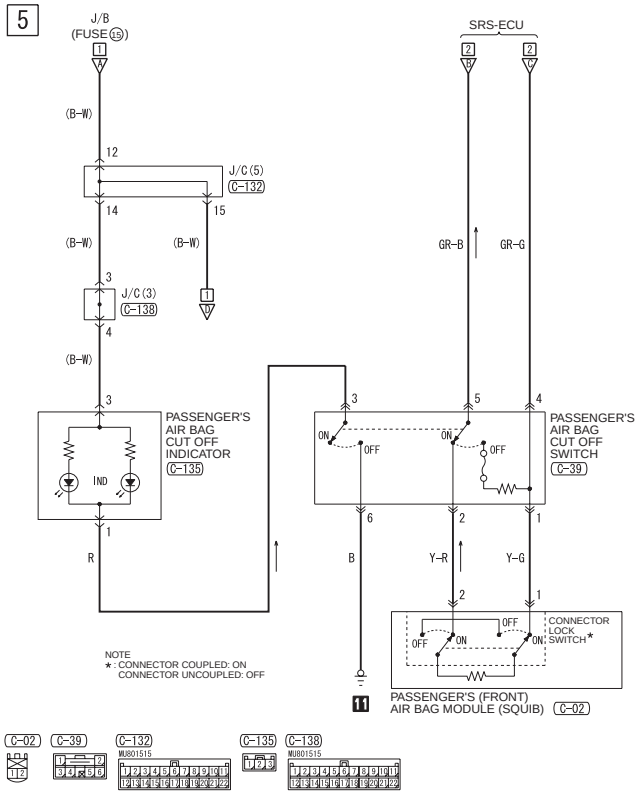
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HAC15E19BC

SRS <VEHICLES WITH SIDE-AIRBAG (RHD)> (CONTINUED)



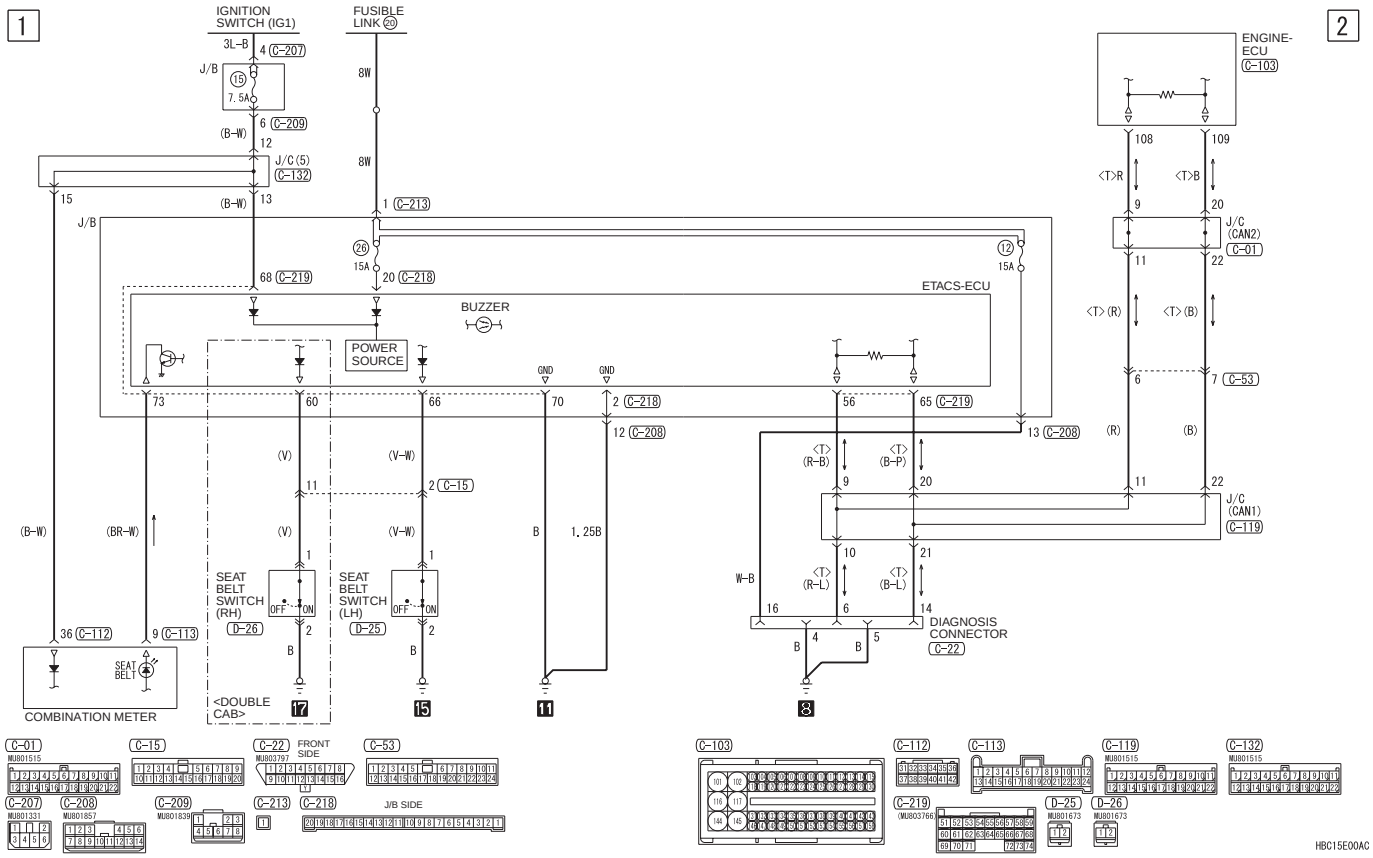
Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HAC15E19CC

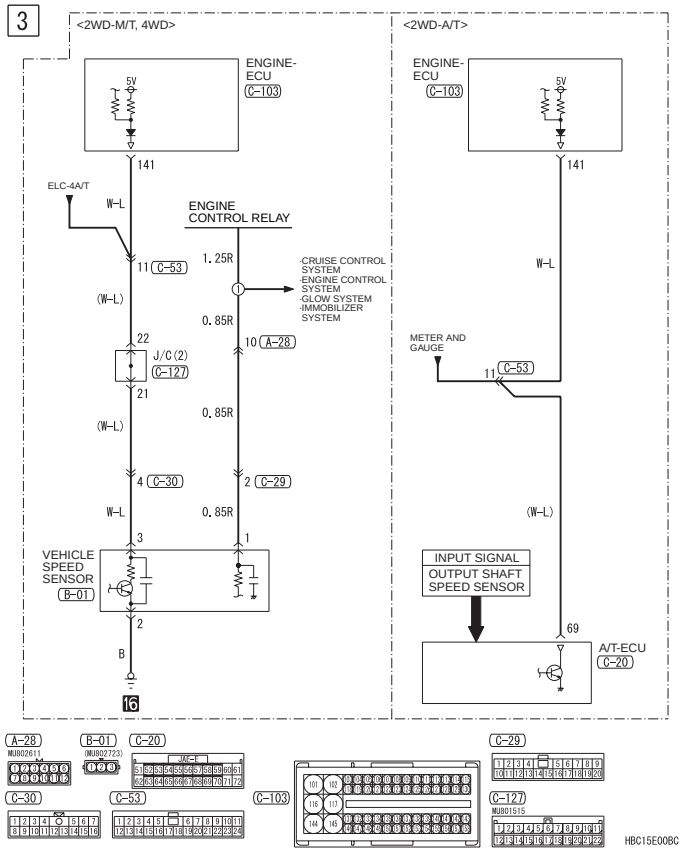
SEAT BELT WARNING BUZZER

SEAT BELT WARNING BUZZER <LHD>

M1901011202284

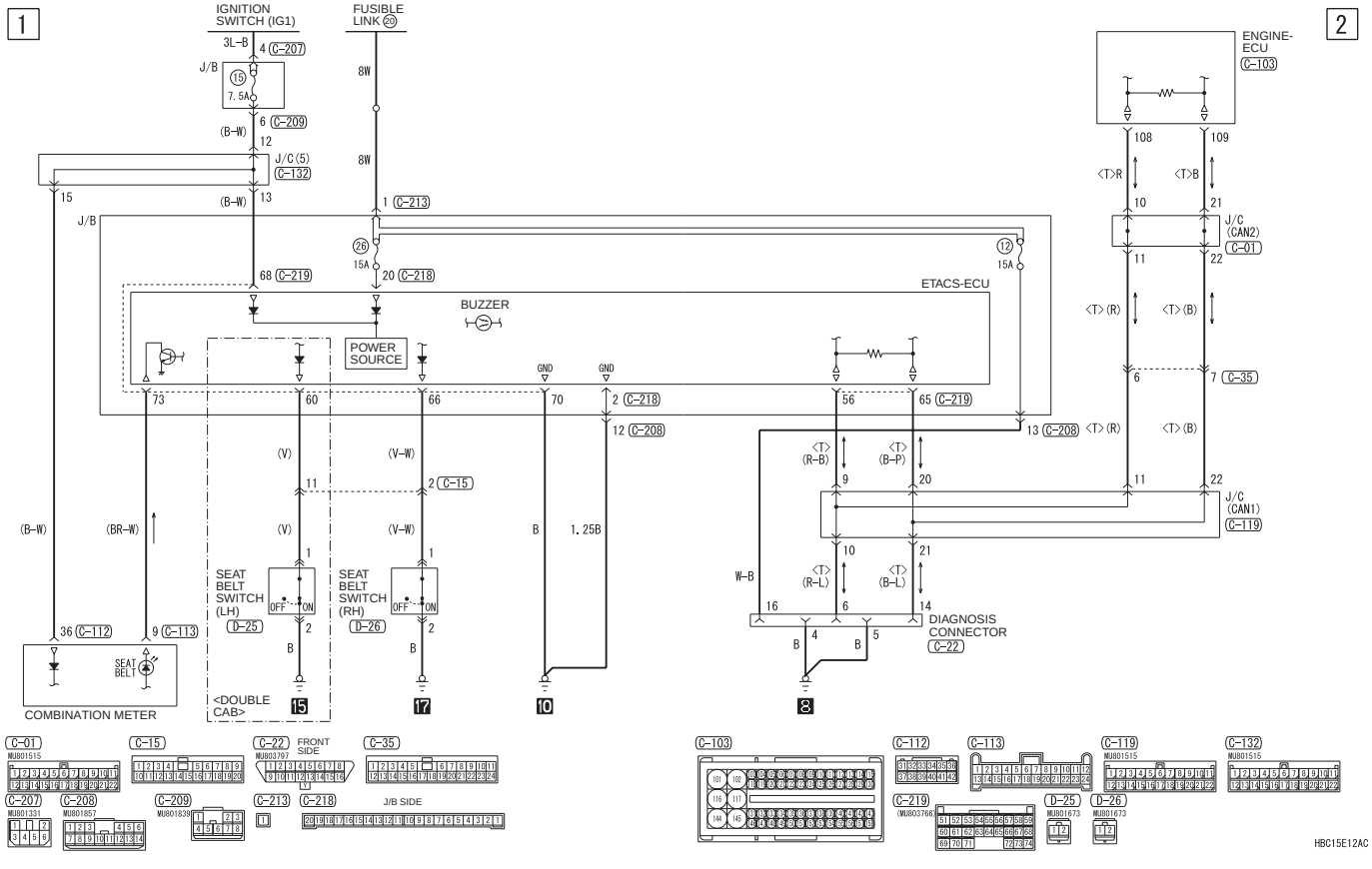


SEAT BELT WARNING BUZZER <LHD> (CONTINUED)

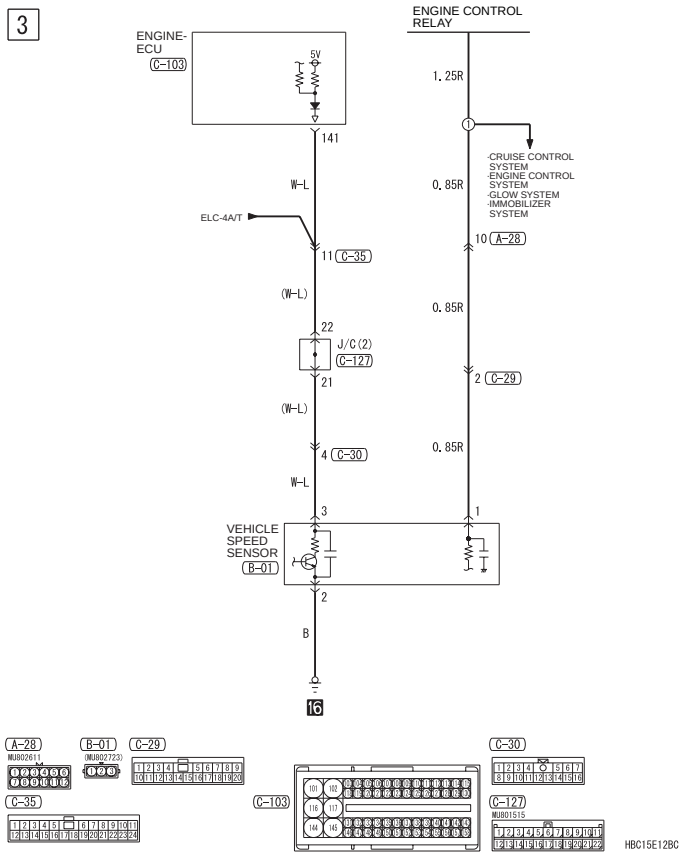


SEAT BELT WARNING BUZZER <RHD>

M1901011202295



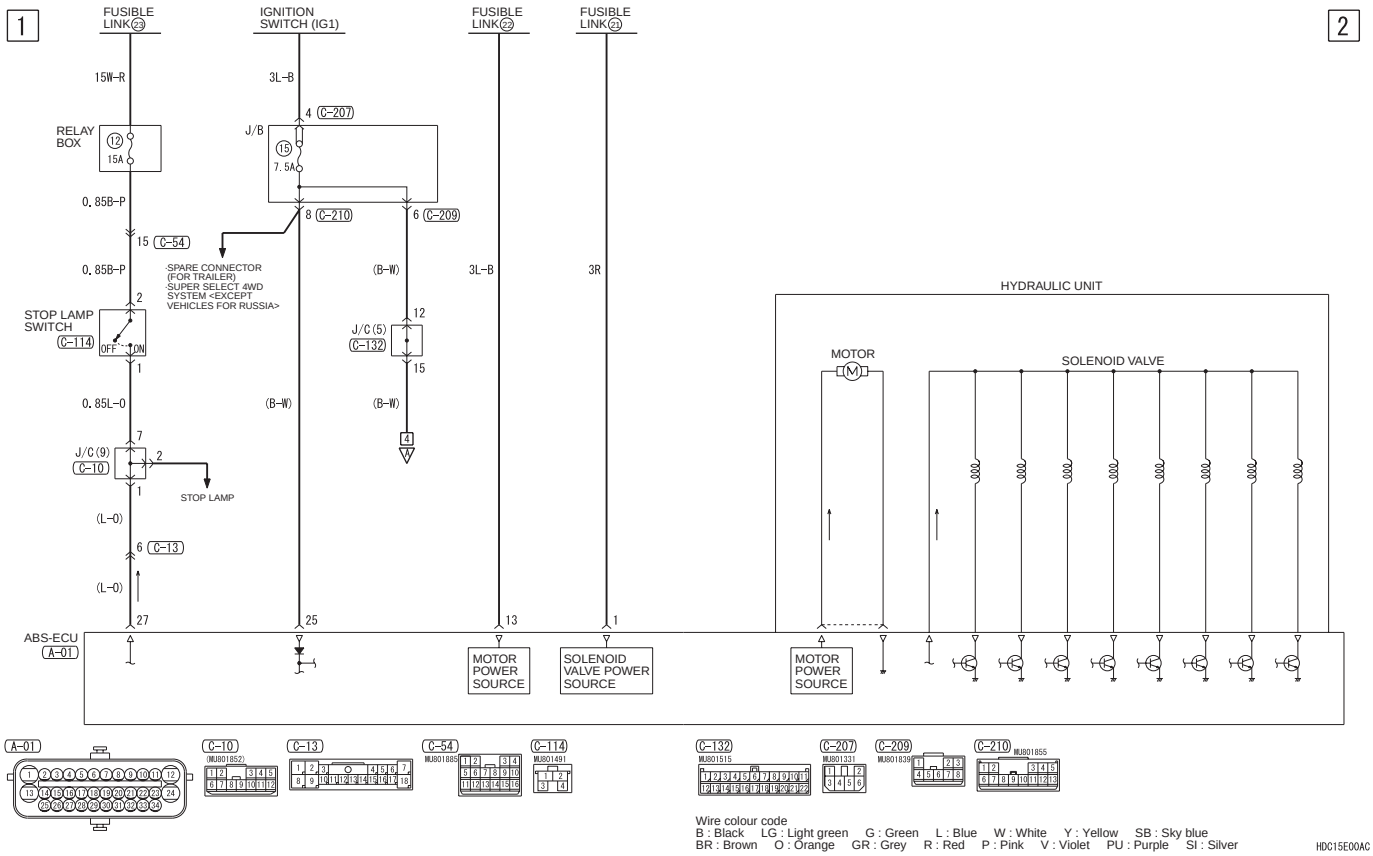
SEAT BELT WARNING BUZZER <RHD> (CONTINUED)



ANTI-SKID BRAKING SYSTEM (ABS)

ABS <VEHICLES WITHOUT ASTC (LHD)>

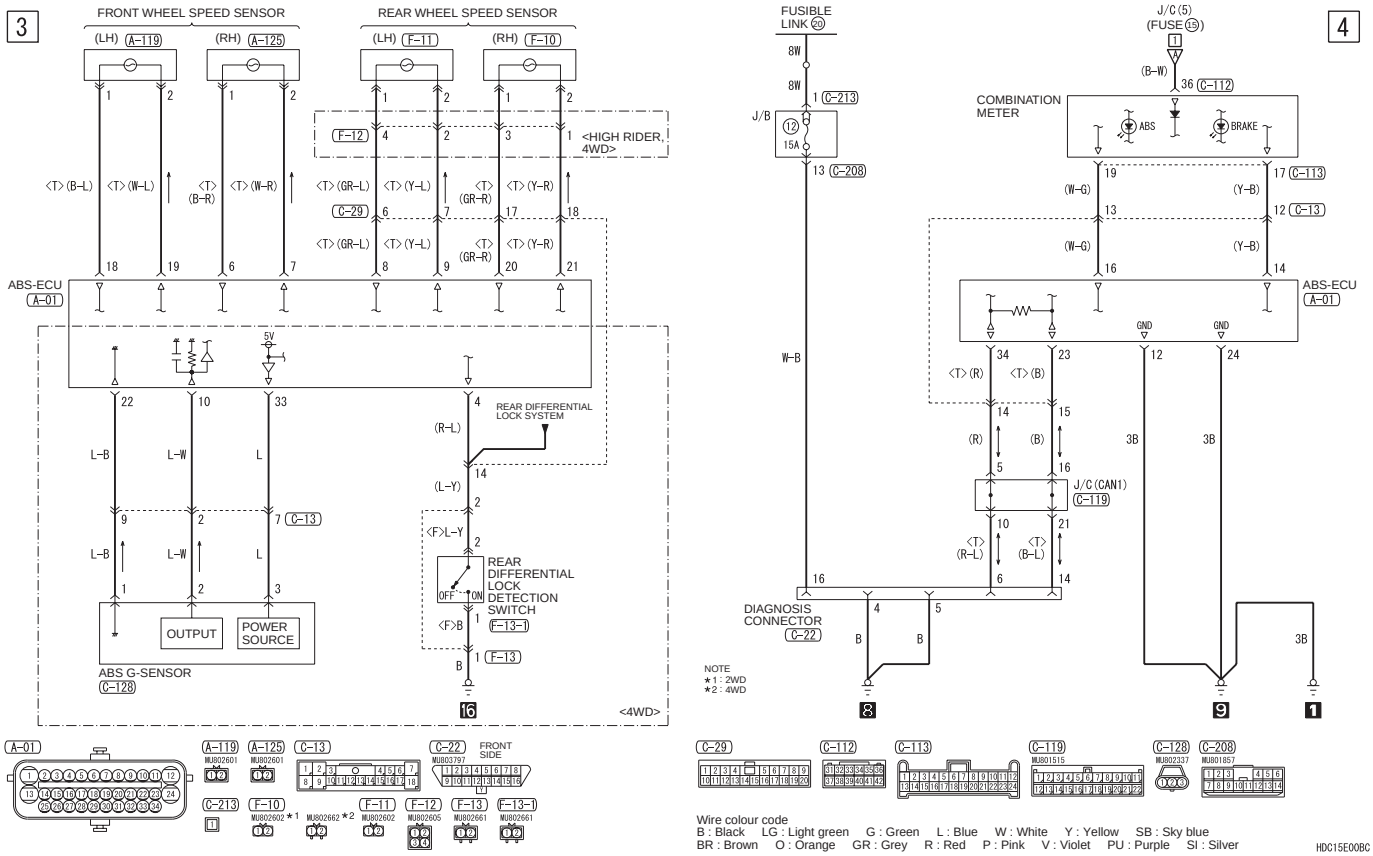
M1901019201757



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HDC15E00AC

ABS <VEHICLES WITHOUT ASTC (LHD)> (CONTINUED)

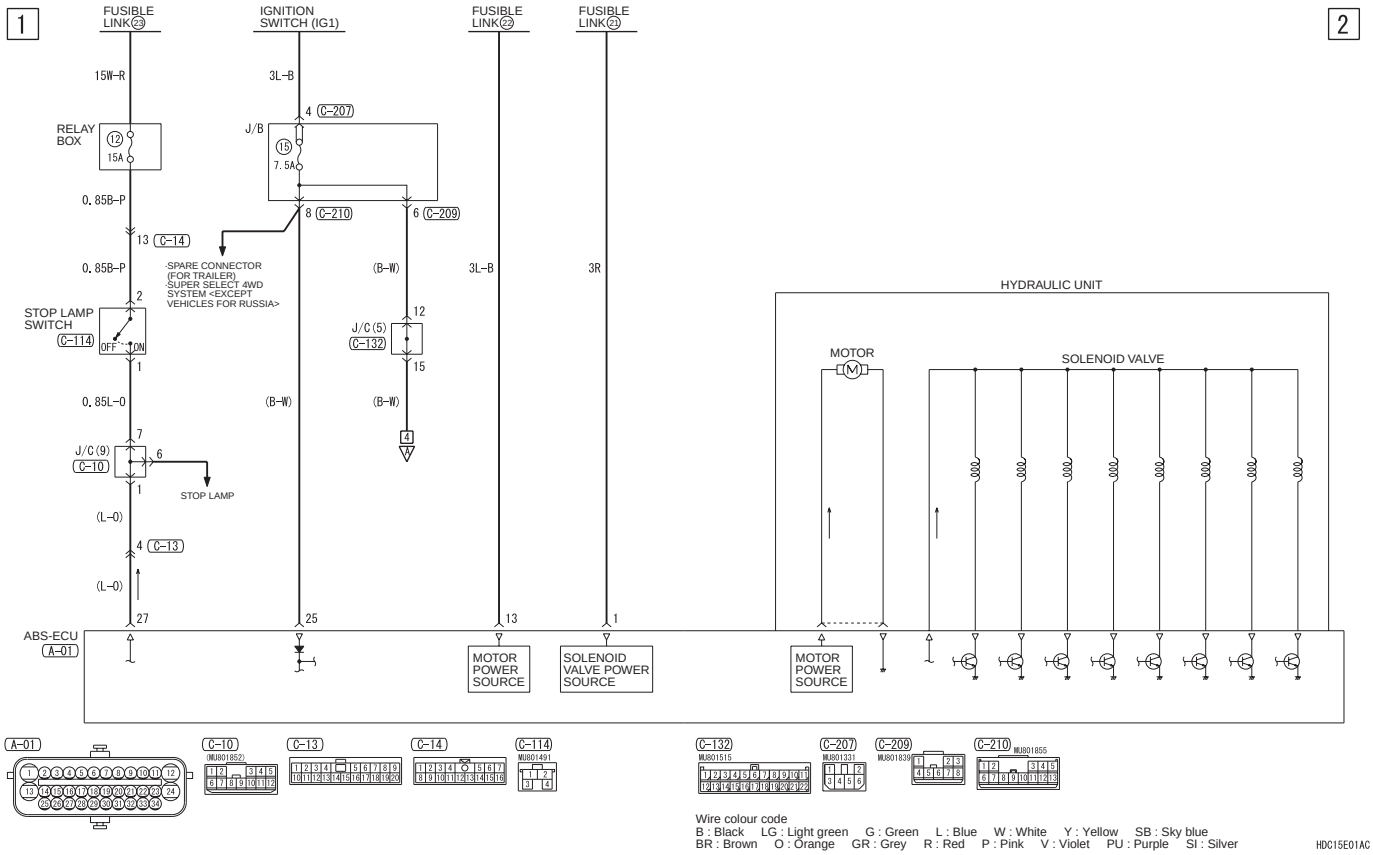


Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HDC15E00BC

ABS <VEHICLES WITHOUT ASTC (RHD)>

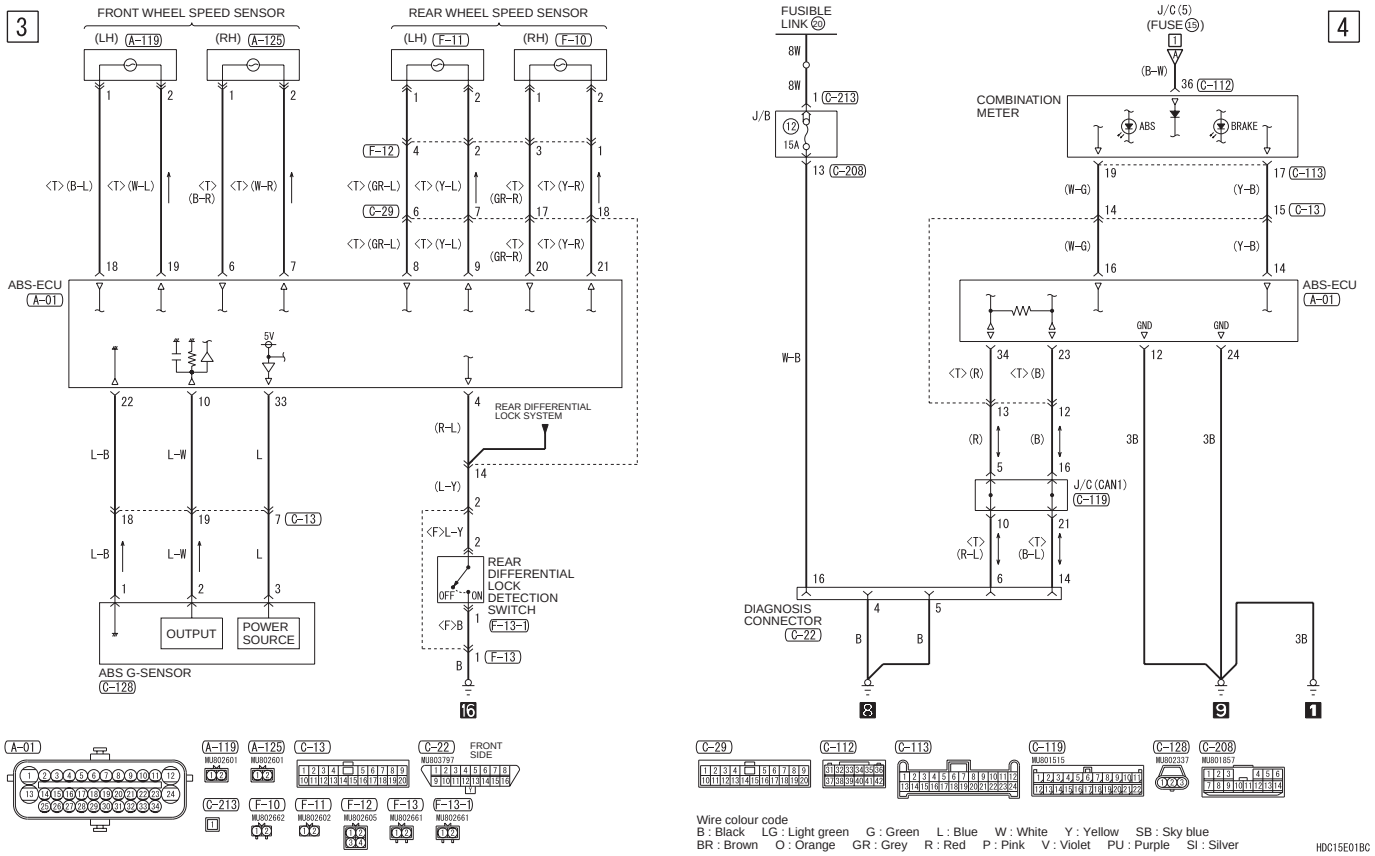
M1901019201768



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HDC15E01AC

ABS <VEHICLES WITHOUT ASTC (RHD)> (CONTINUED)



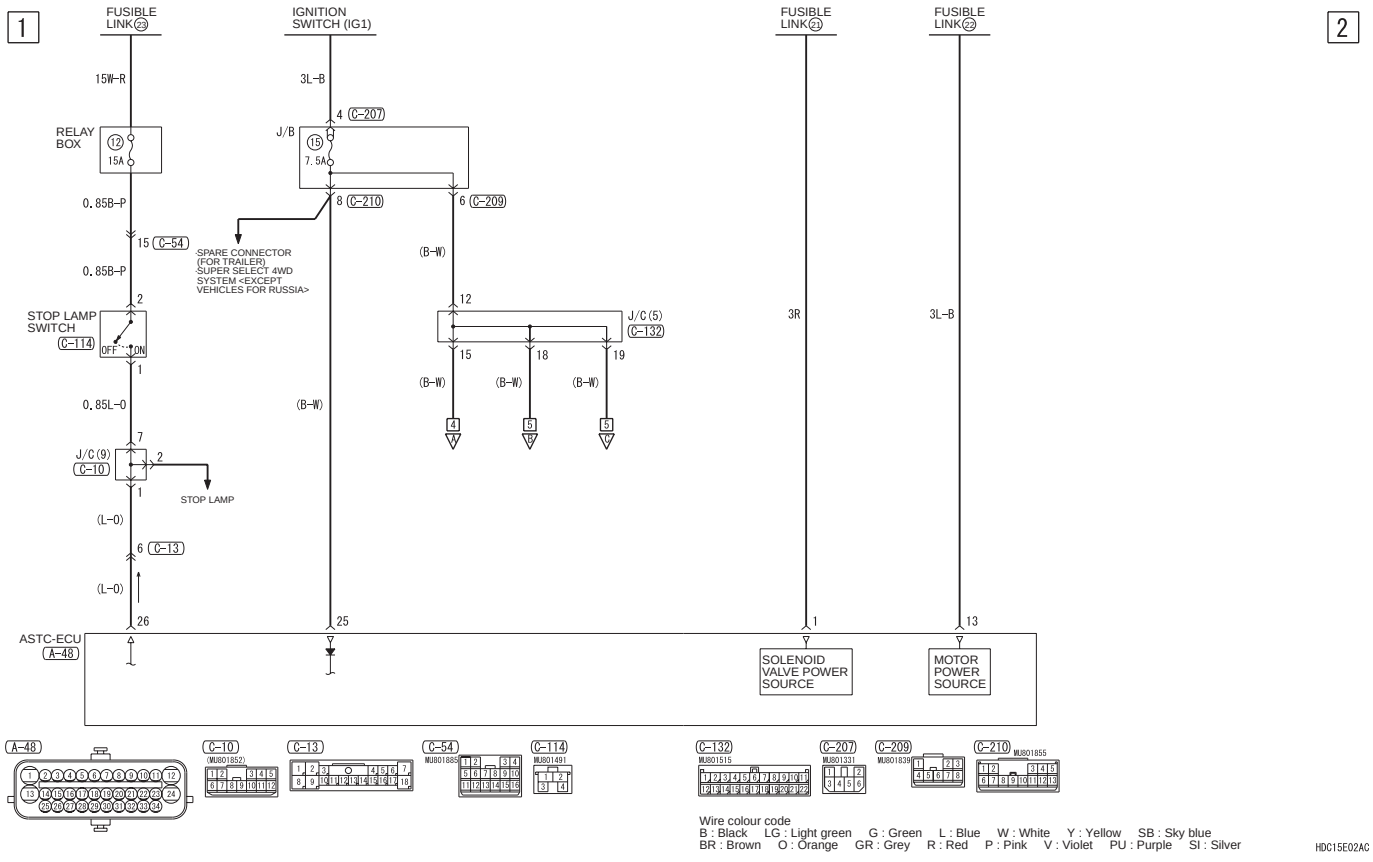
Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HDC15E01BC

ANTI-SKID BRAKING SYSTEM (ABS) AND ACTIVE STABILITY AND TRACTION CONTROL SYSTEM (ASTC)

ABS AND ASTC <LHD>

M1901034700154



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

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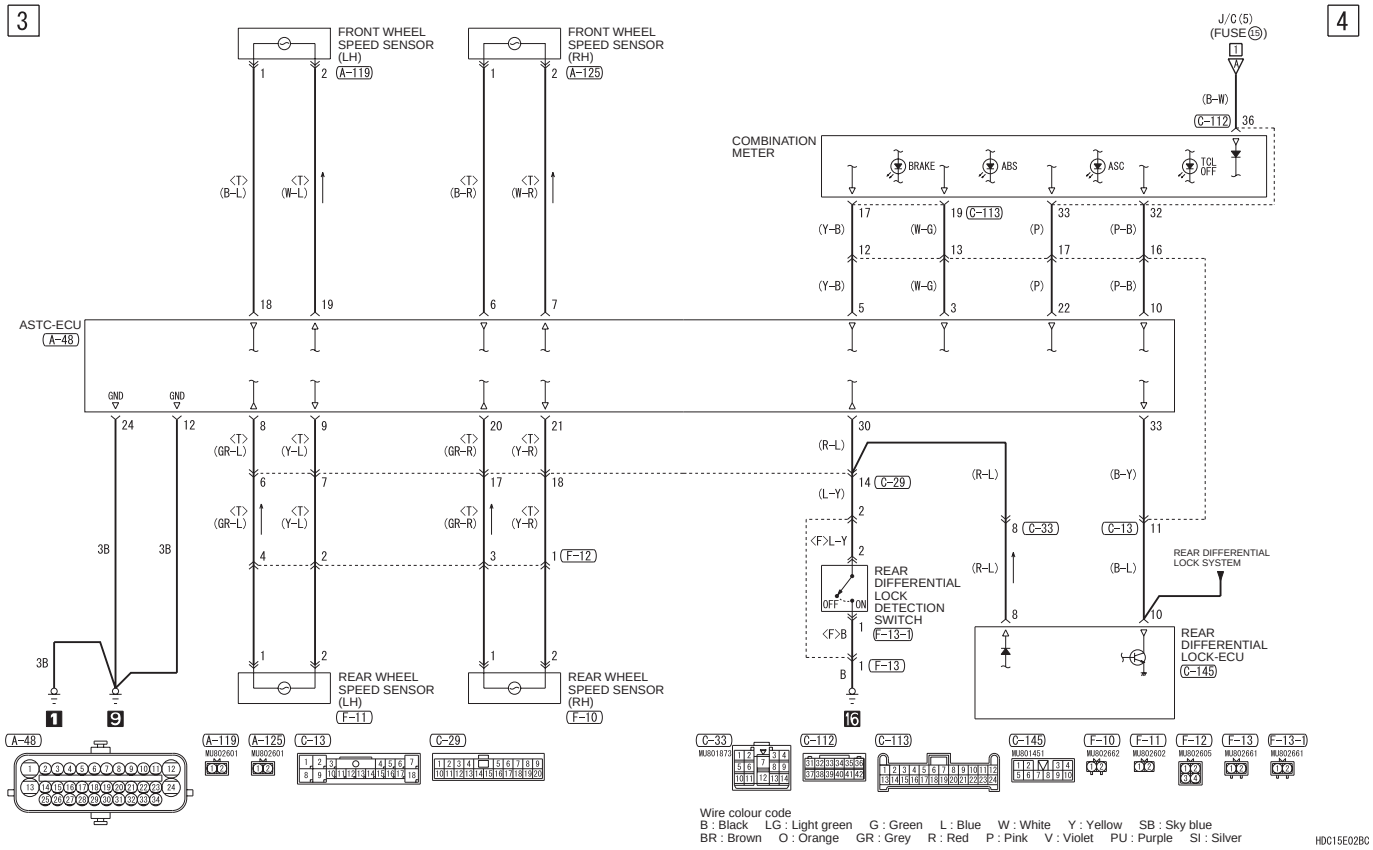
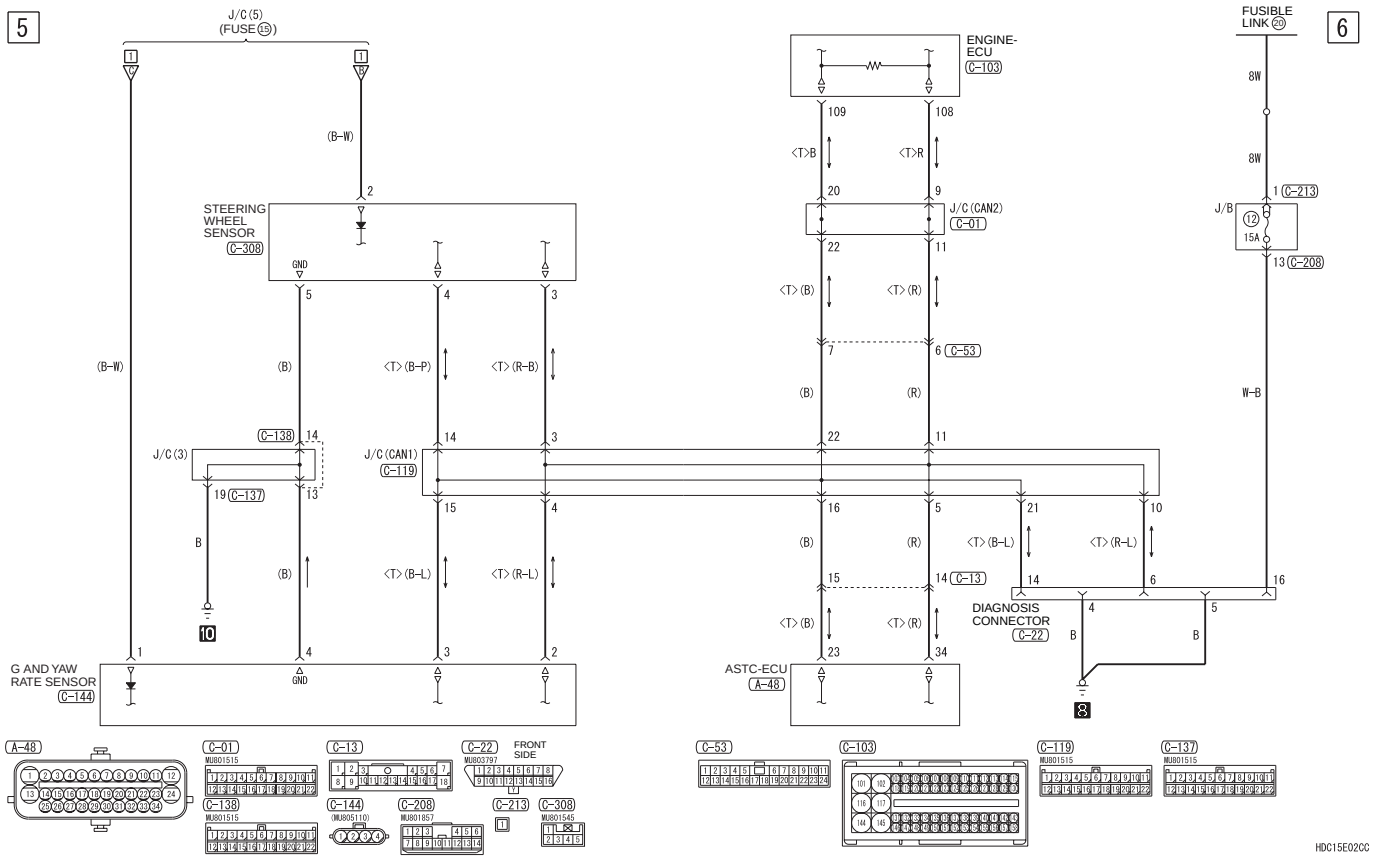
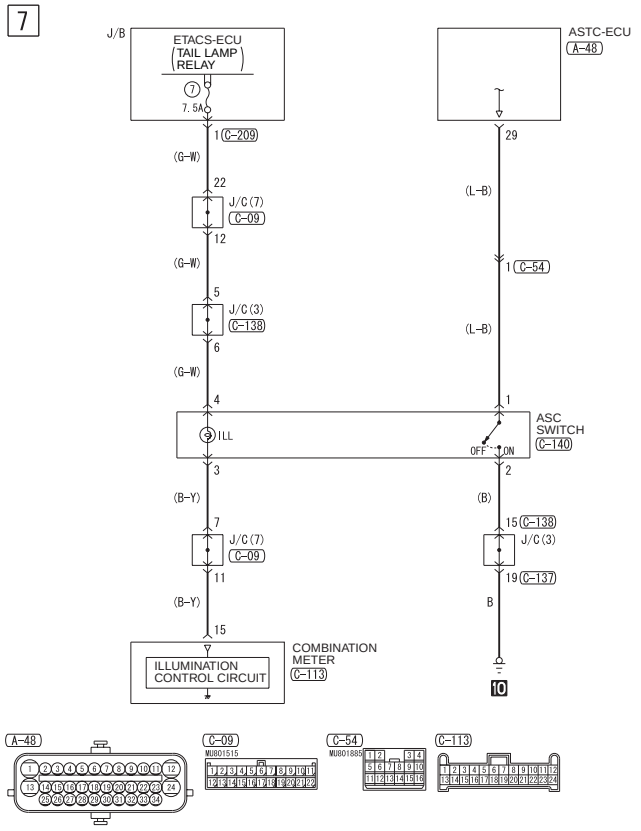


ABS AND ASTC <LHD> (CONTINUED)



ABS AND ASTC <LHD> (CONTINUED)

7



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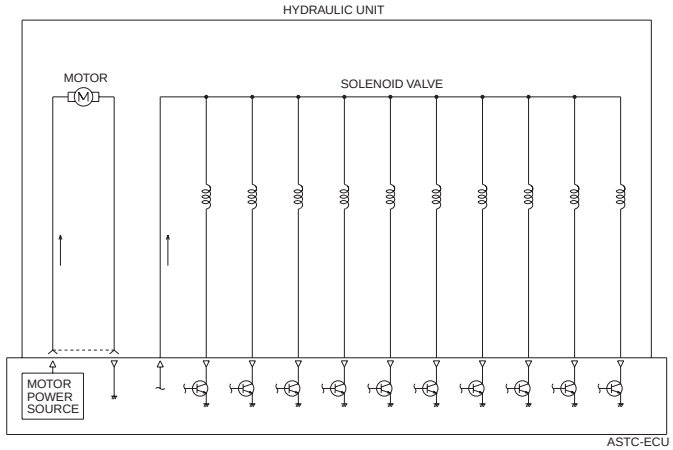
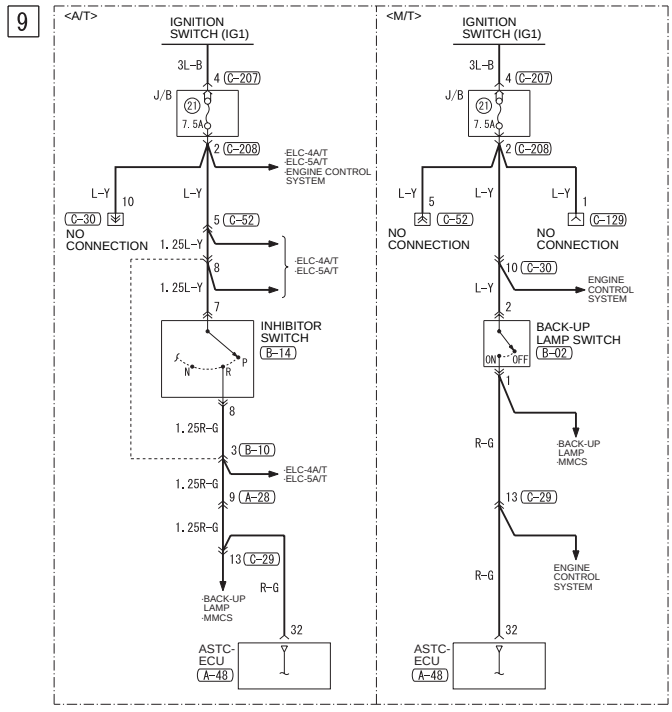


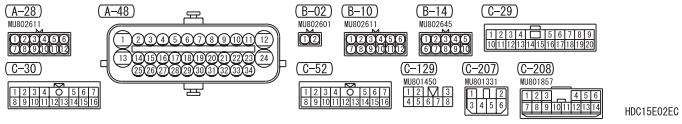
Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HDC15E02DC

ABS AND ASTC <LHD> (CONTINUED)

9

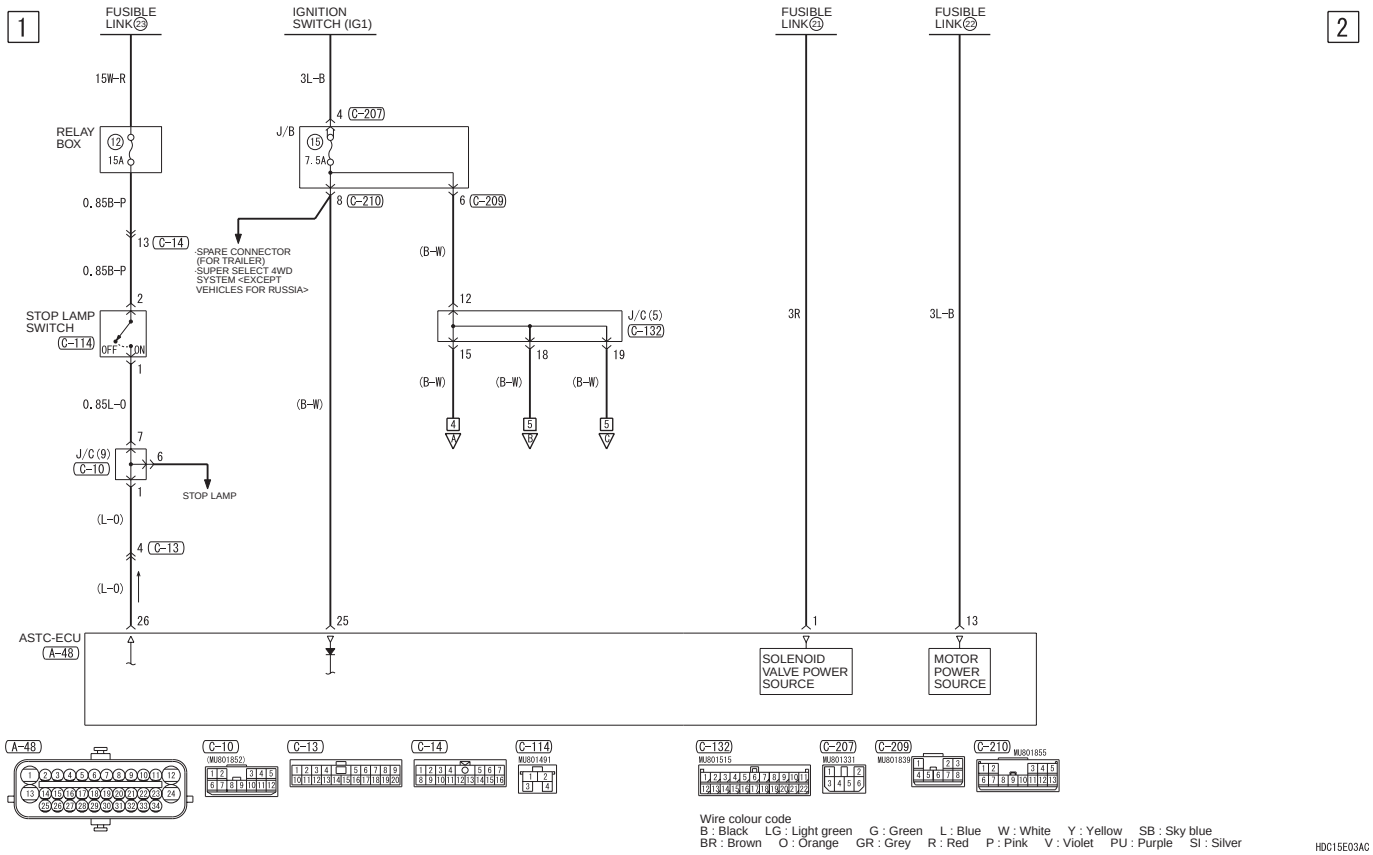




HDC15E02EC

ABS AND ASTC <RHD>

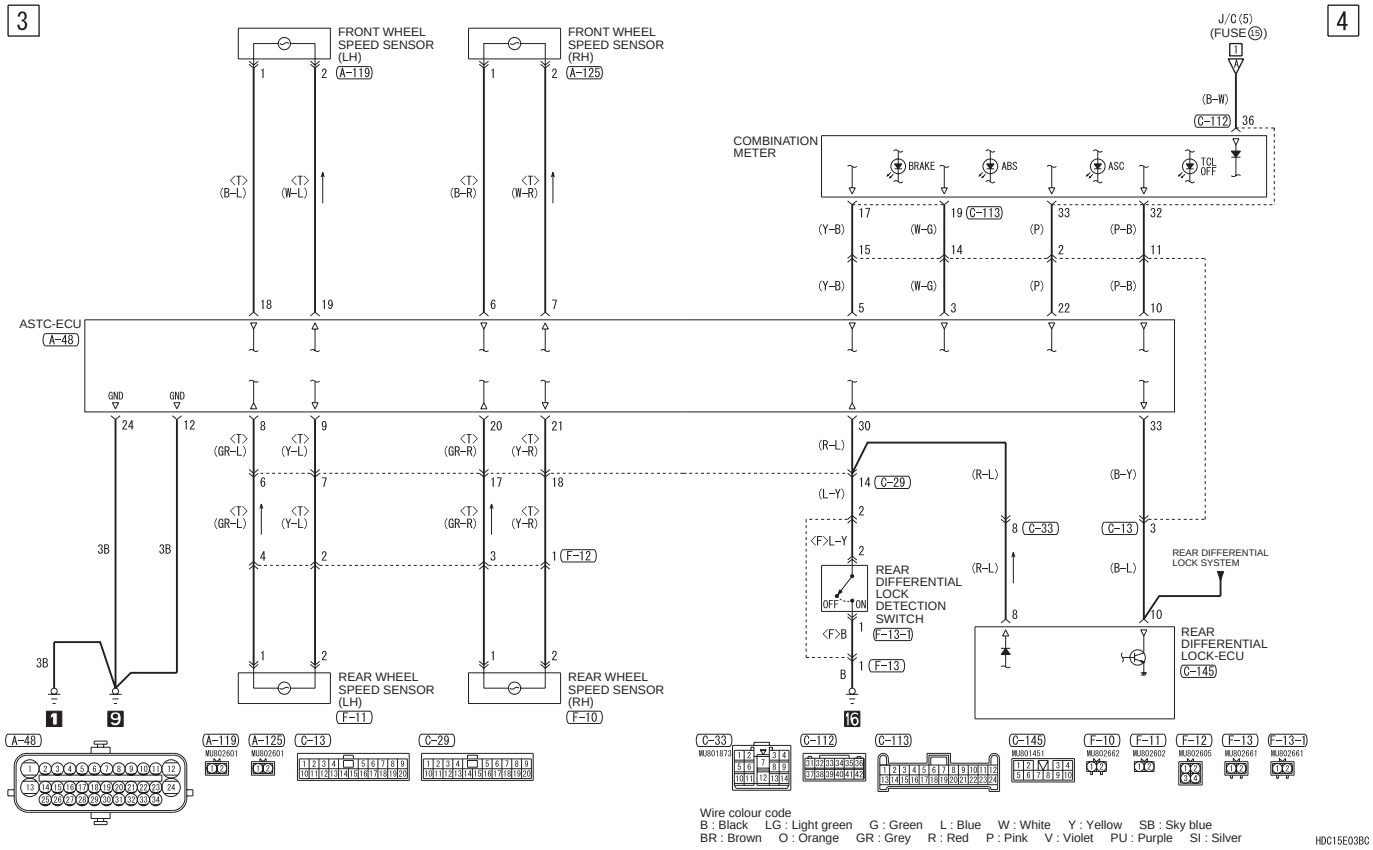
M1901034700165



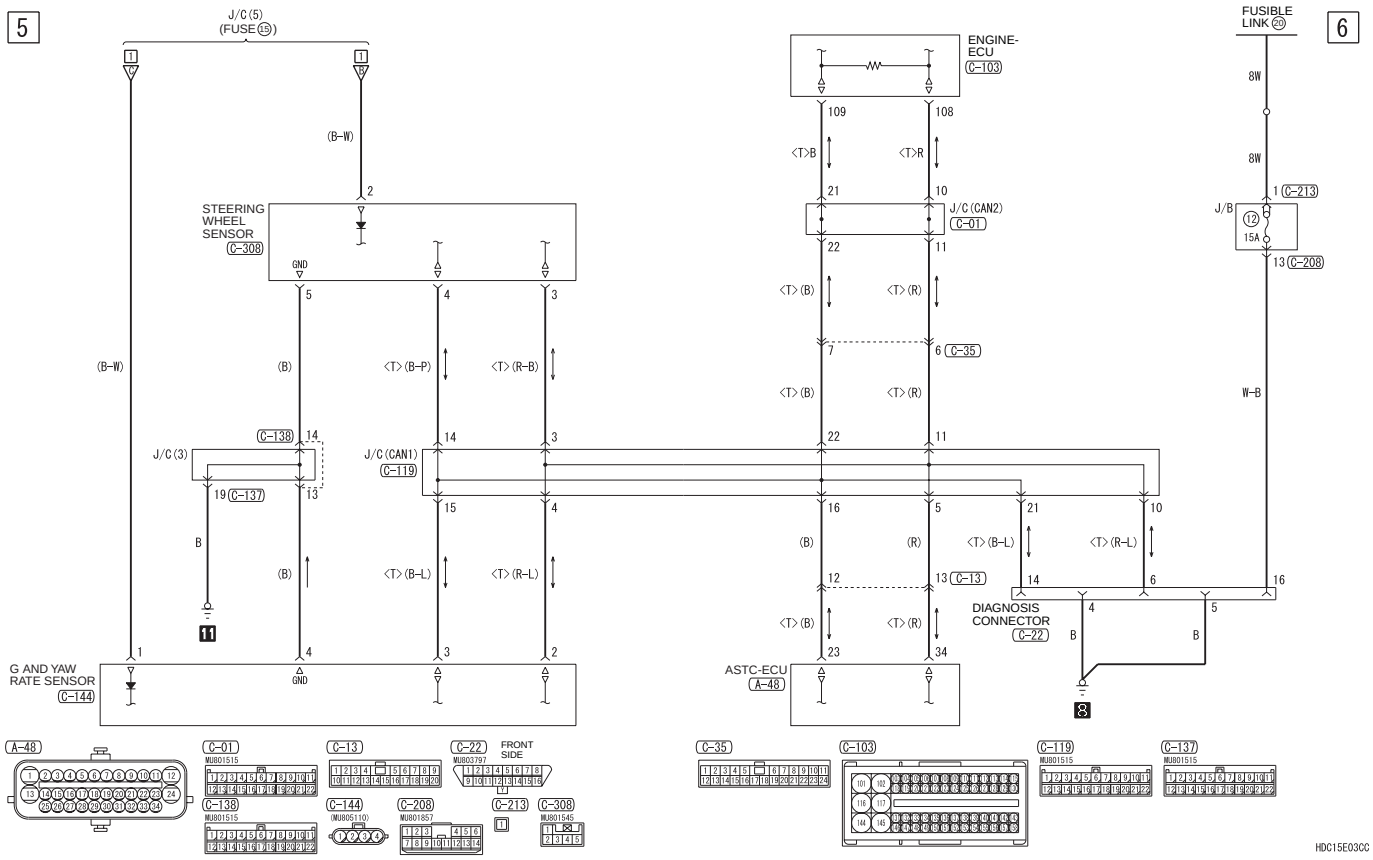
Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HDC15E03AC

ABS AND ASTC <RHD> (CONTINUED)

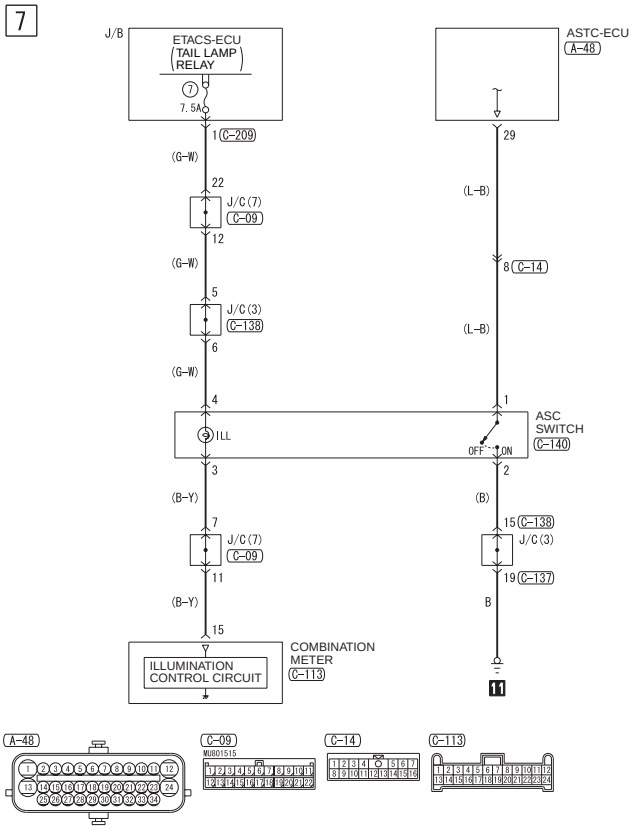


ABS AND ASTC <RHD> (CONTINUED)



ABS AND ASTC <RHD> (CONTINUED)

7



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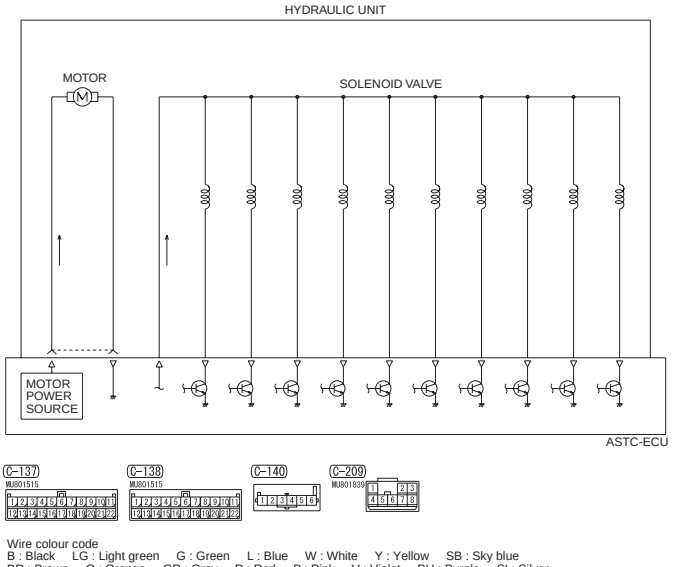
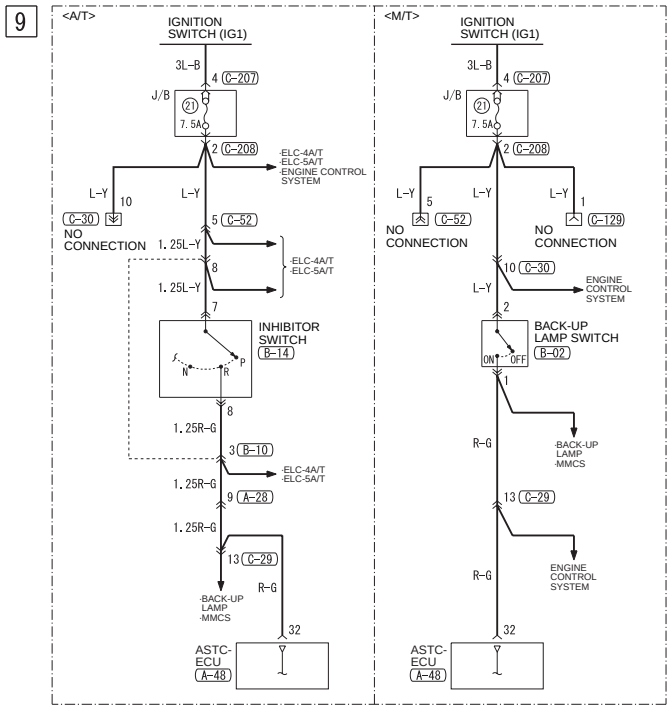


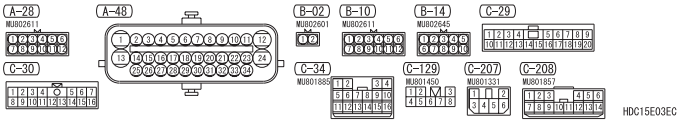
Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HDC15E03DC

ABS AND ASTC <RHD> (CONTINUED)

9



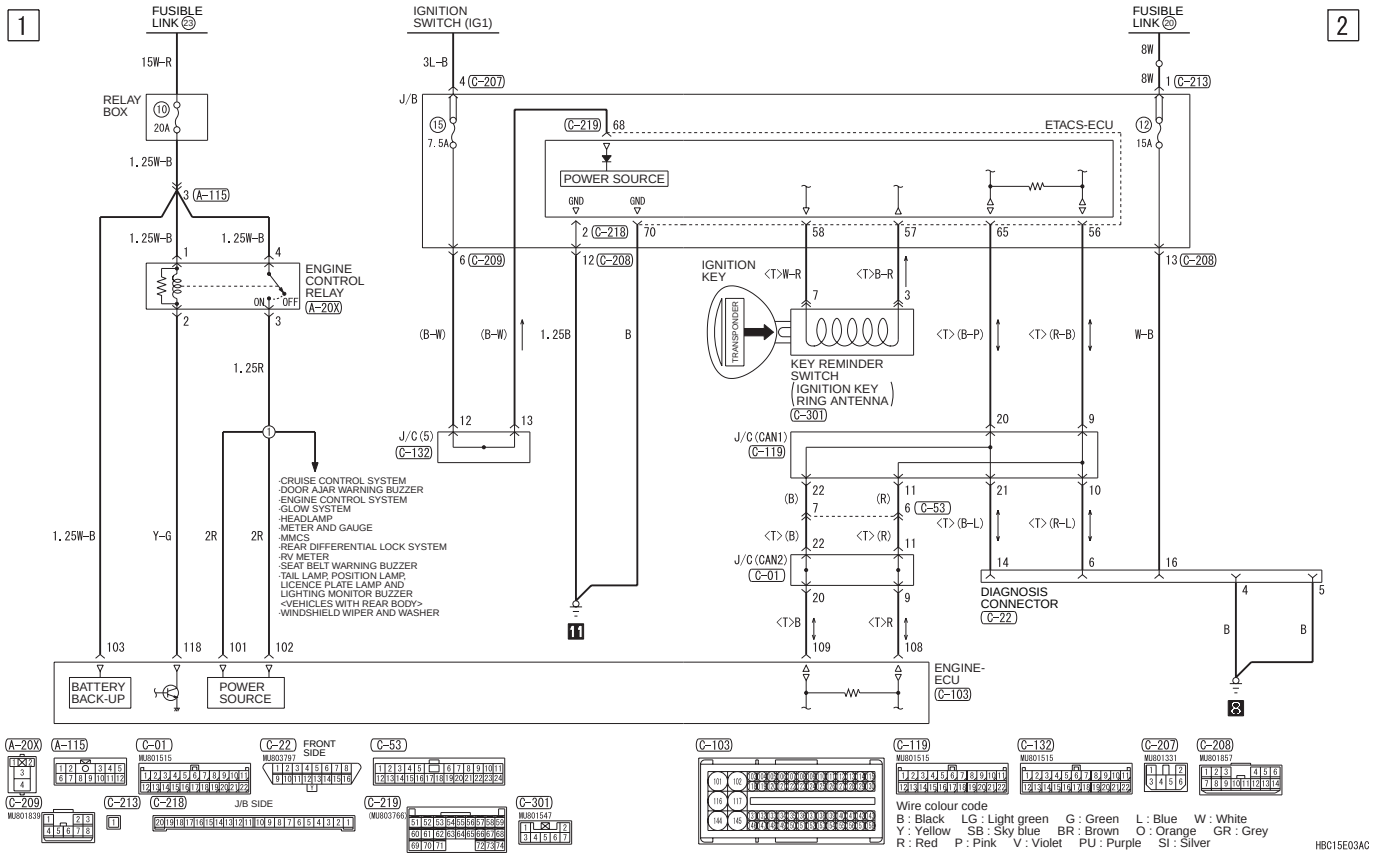


HDC15E03EC

IMMOBILIZER SYSTEM

IMMOBILIZER SYSTEM <LHD>

M1901013605083



IMMOBILIZER SYSTEM <RHD>

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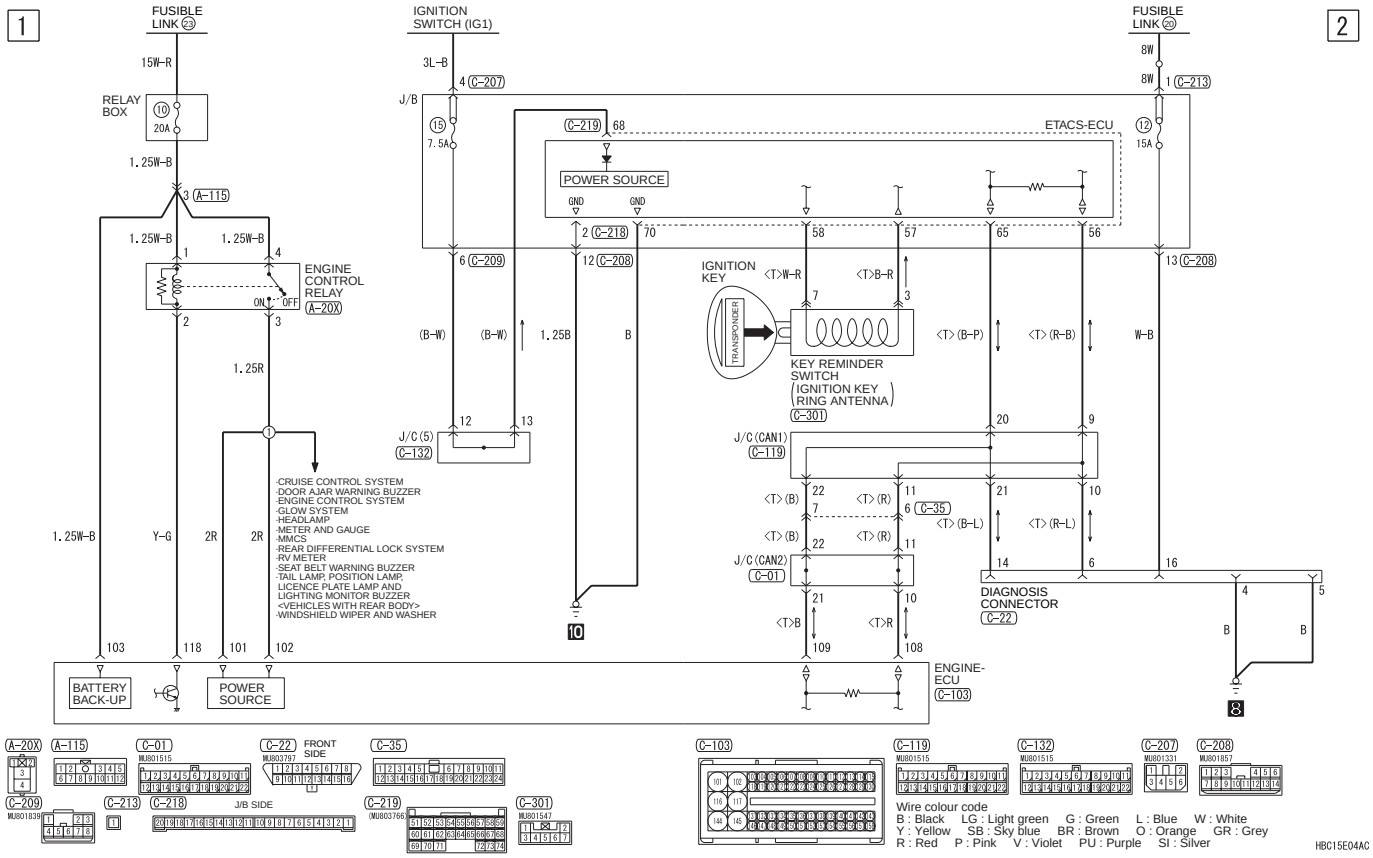
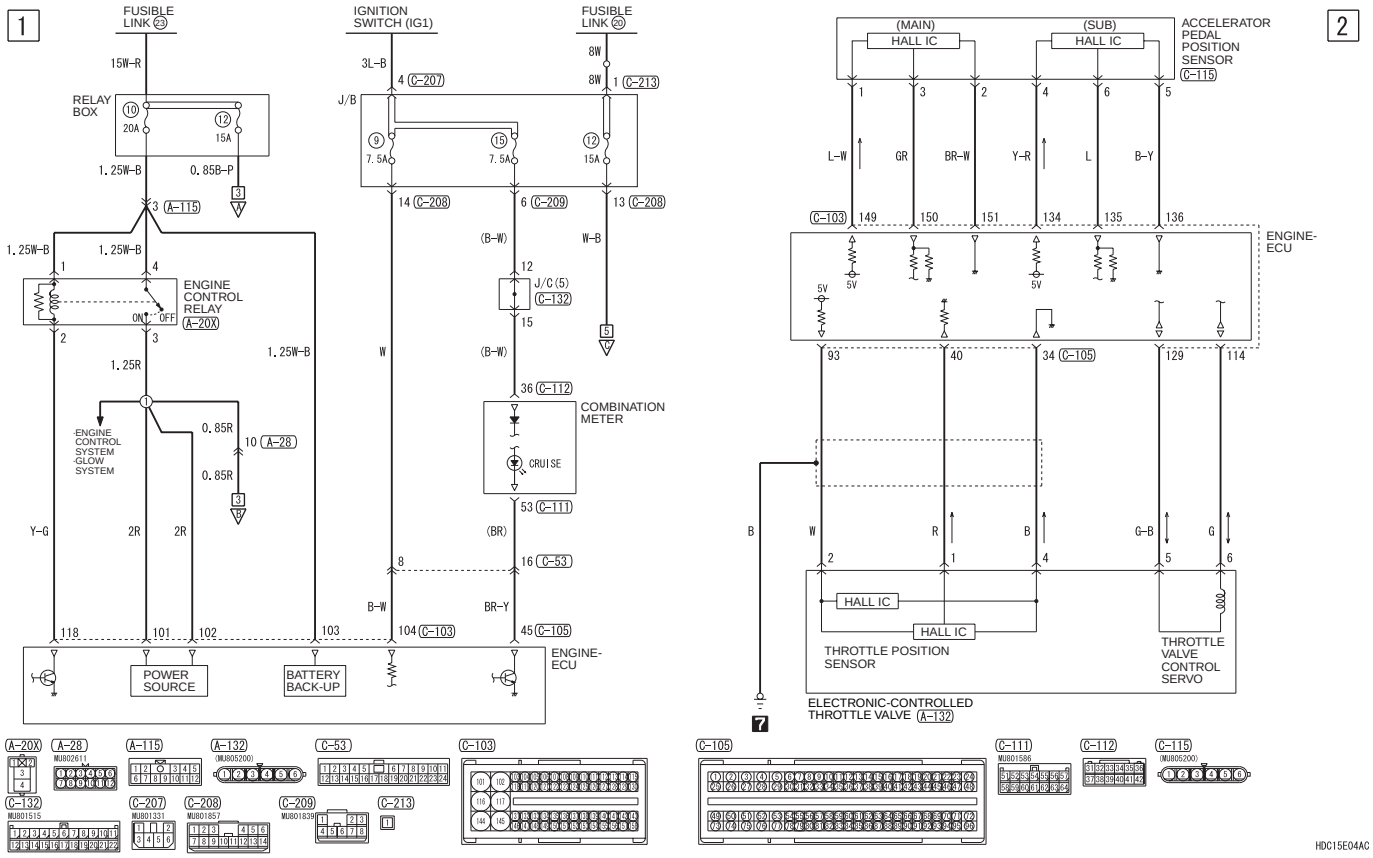


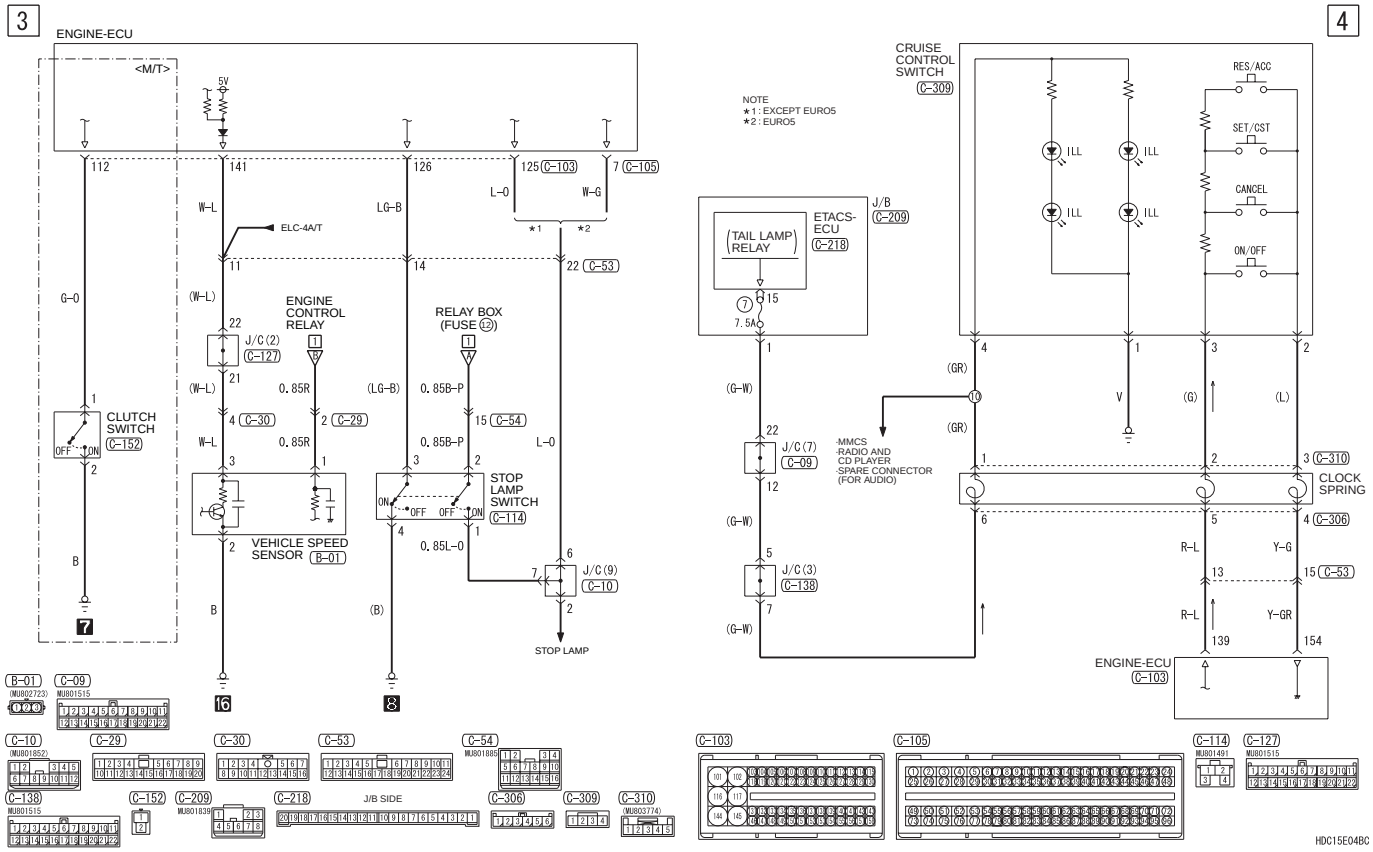
CRUISE CONTROL SYSTEM

CRUISE CONTROL SYSTEM <LHD>

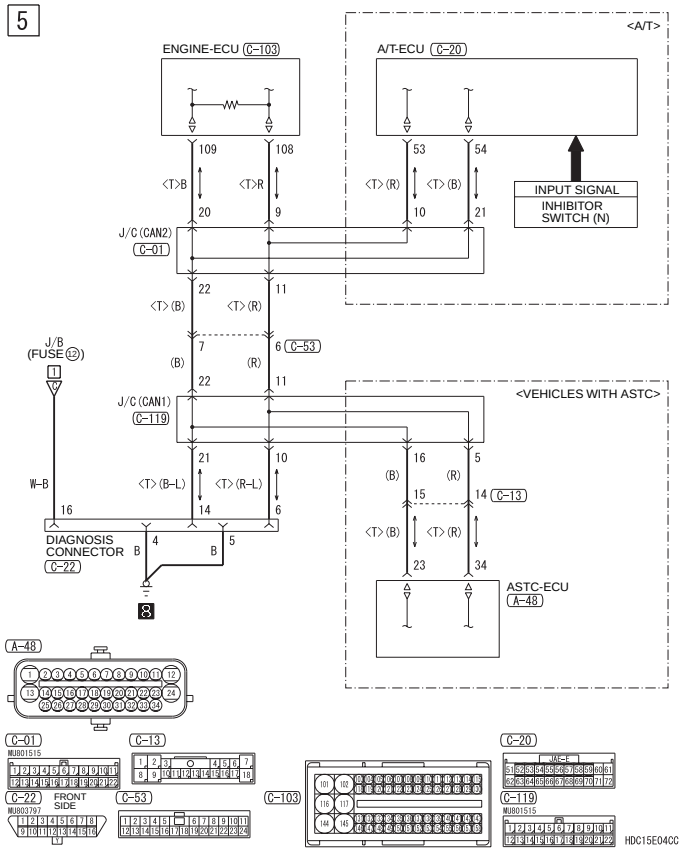
M1901032901906



CRUISE CONTROL SYSTEM <LHD> (CONTINUED)

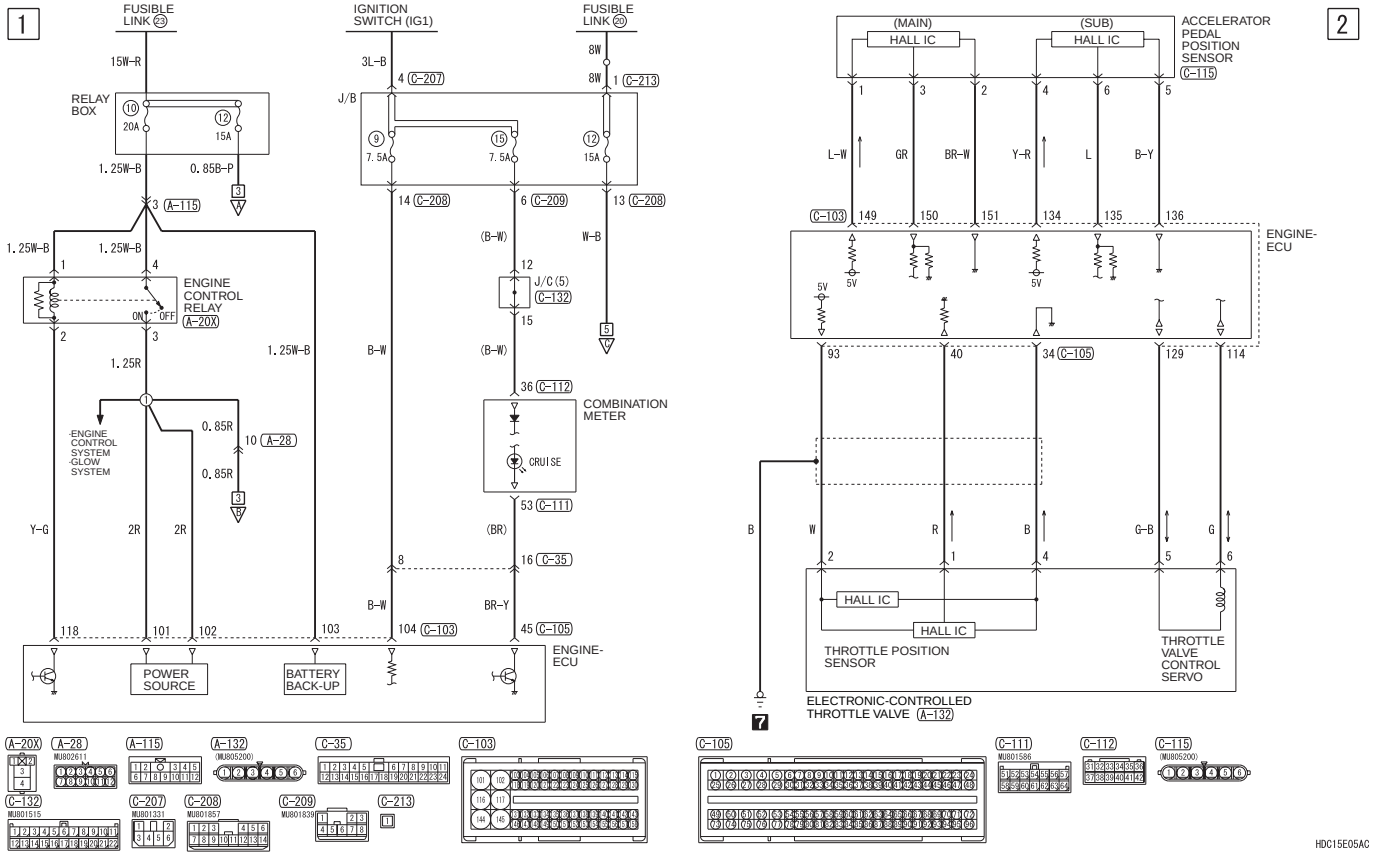


CRUISE CONTROL SYSTEM <LHD> (CONTINUED)

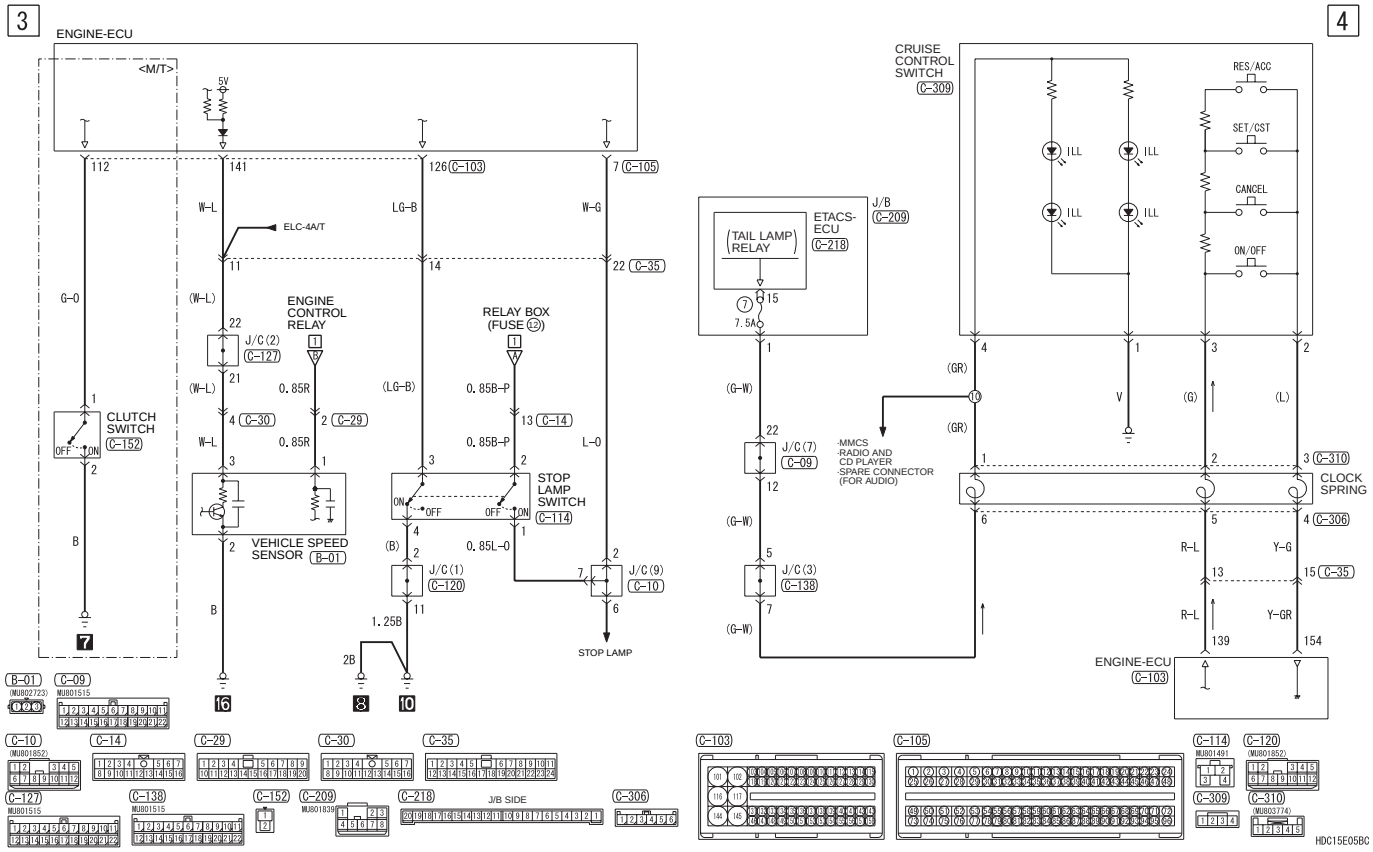


CRUISE CONTROL SYSTEM <RHD>

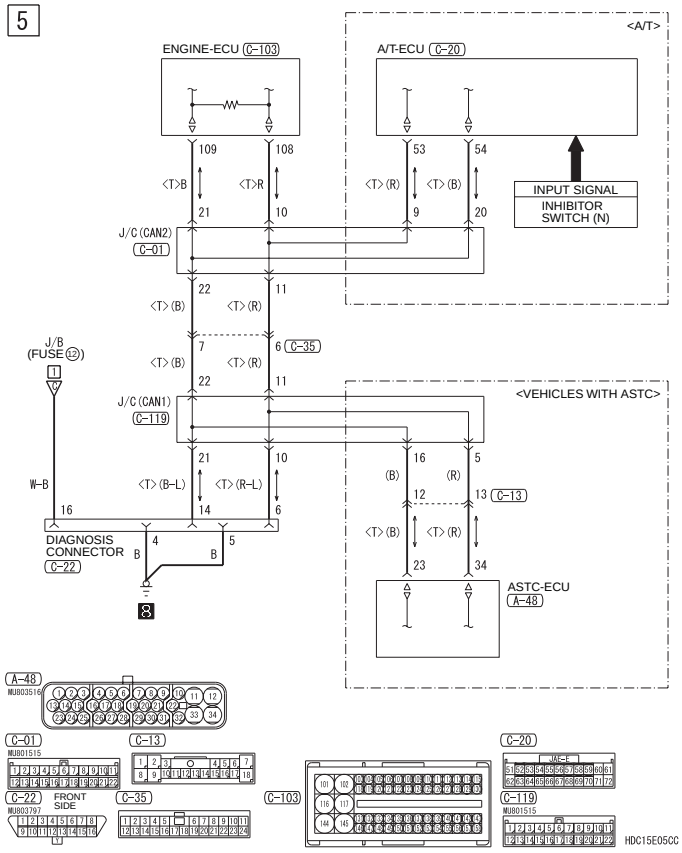
M1901032901917



CRUISE CONTROL SYSTEM <RHD> (CONTINUED)

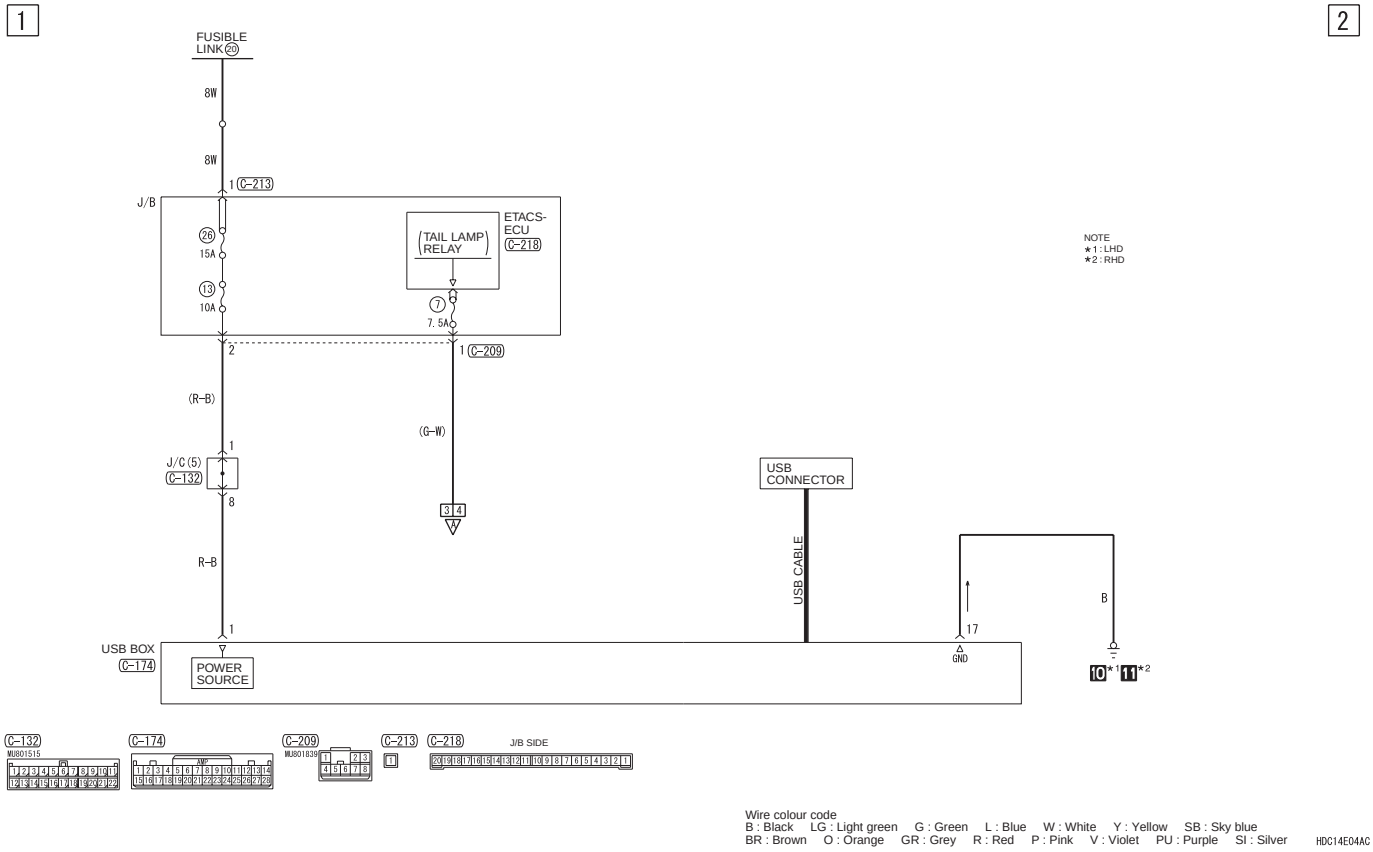


CRUISE CONTROL SYSTEM <RHD> (CONTINUED)



USB BOX

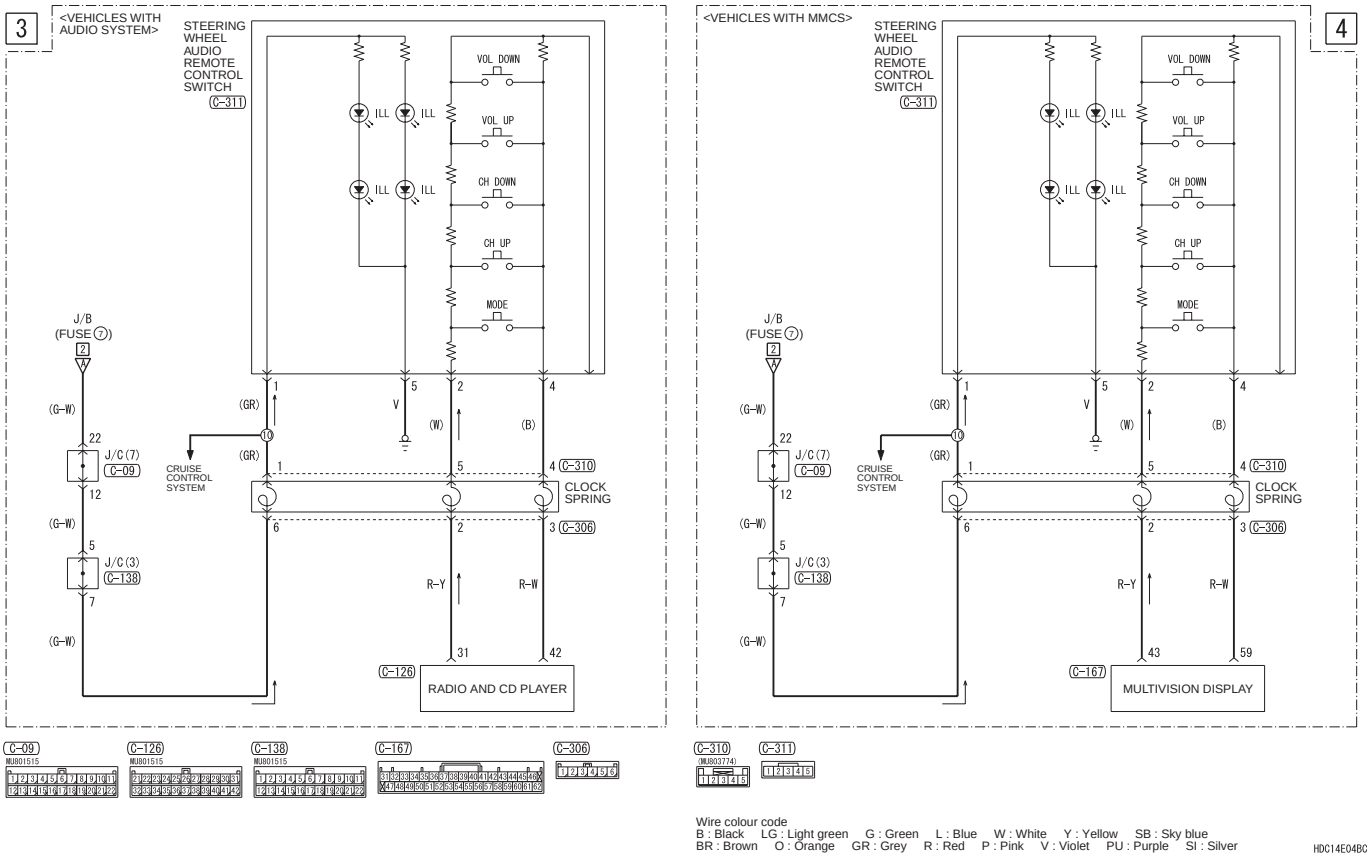
M1901035000664



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HDC14E04AC

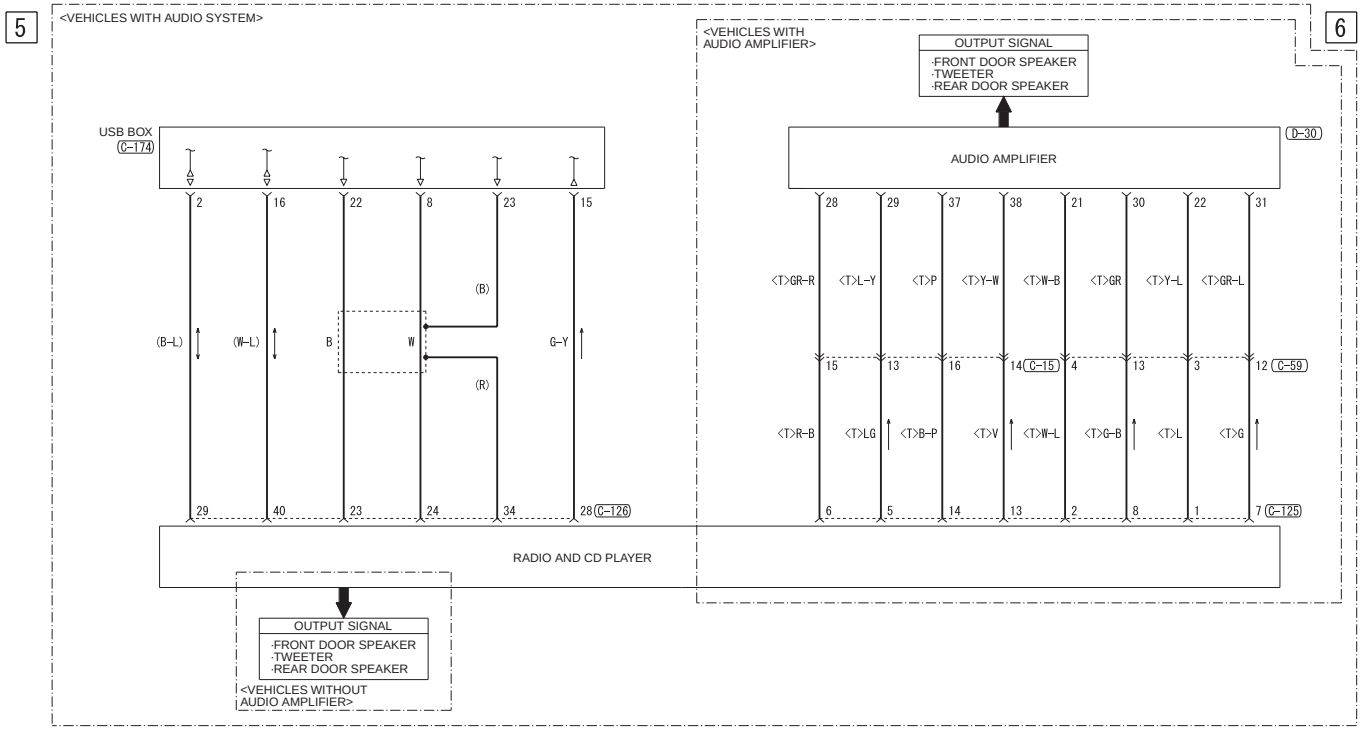
USB BOX (CONTINUED)



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HDC14E04BC

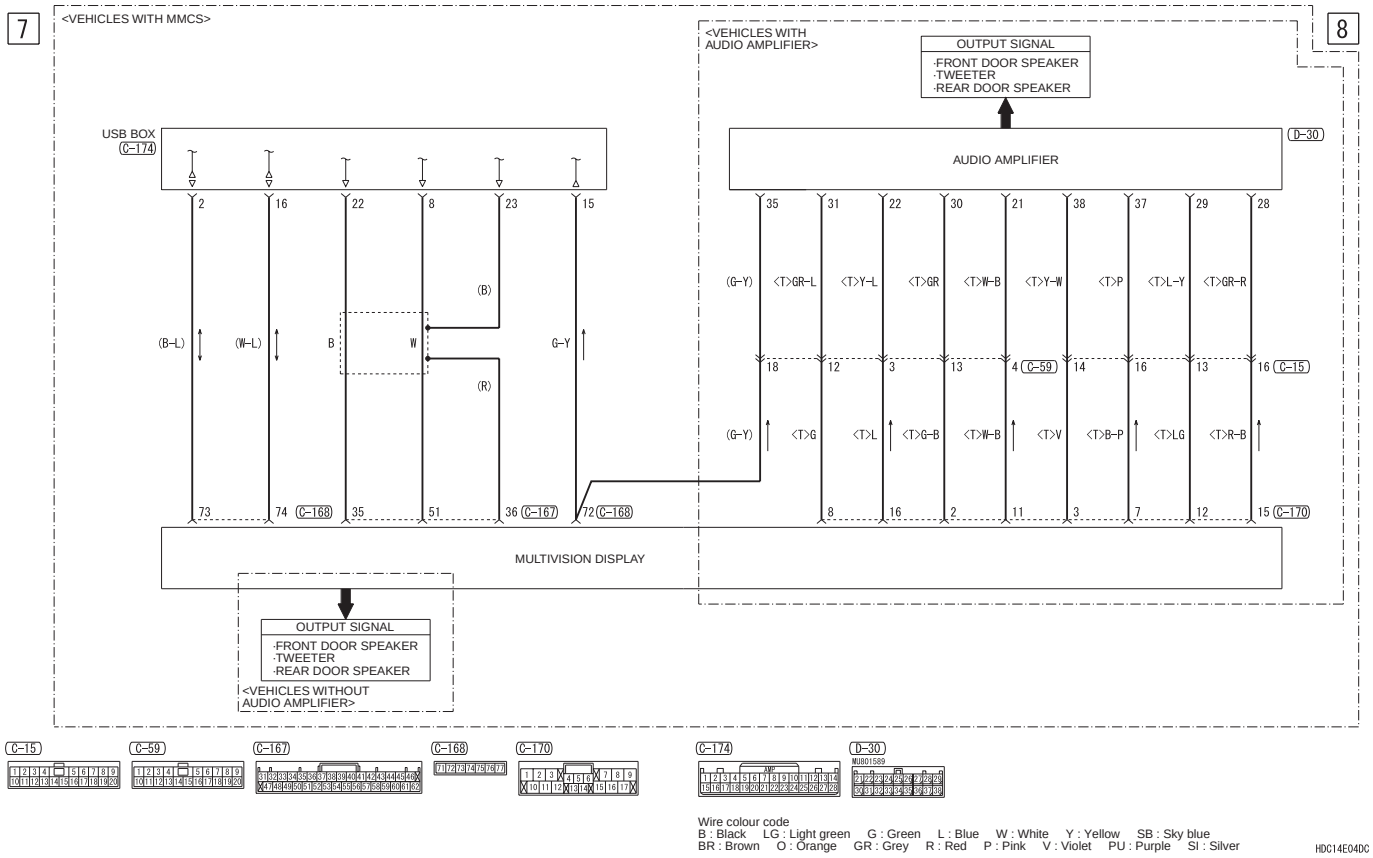
USB BOX (CONTINUED)



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HDC14E04CC

USB BOX (CONTINUED)

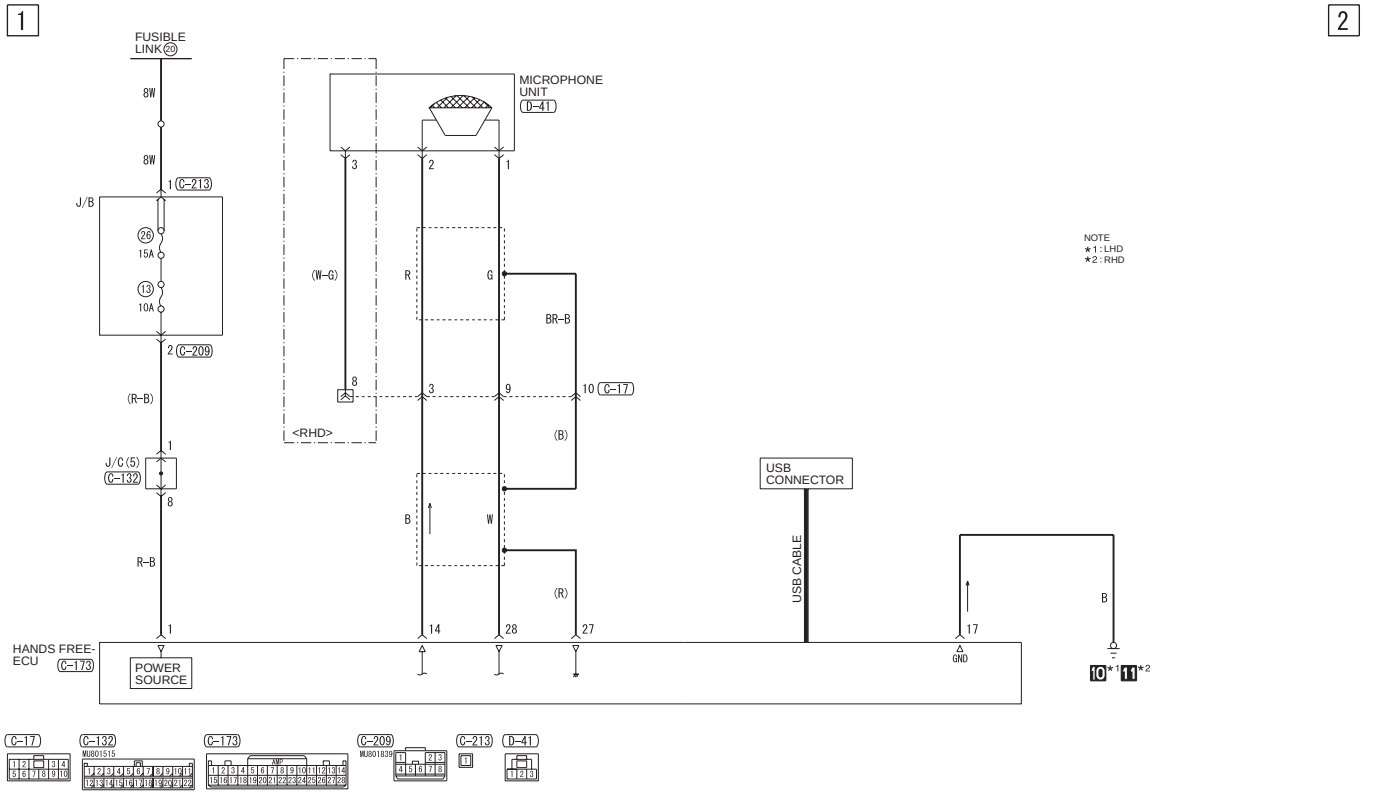


Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HDC14E04DC

HANDS-FREE INTERFACE SYSTEM

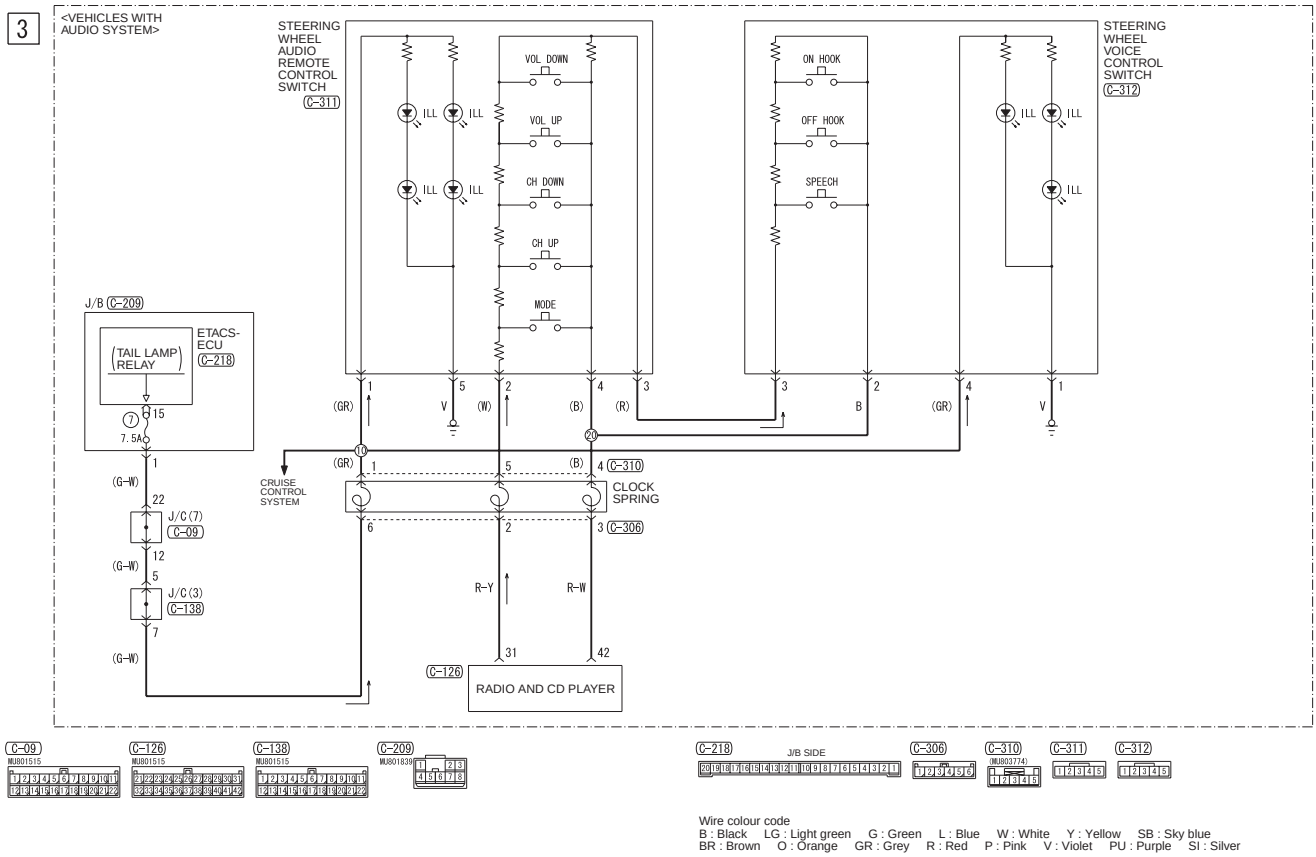
M1901036100482



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HDC15E06AC

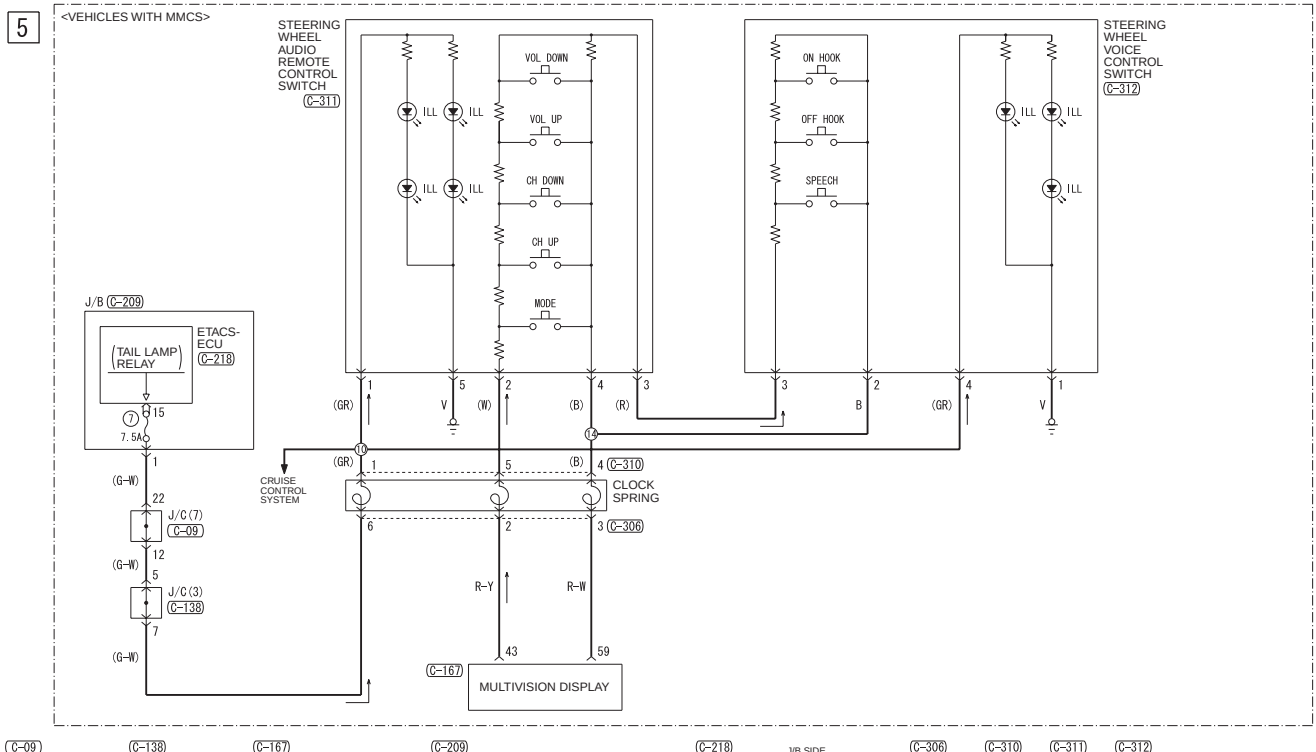
HANDS-FREE INTERFACE SYSTEM (CONTINUED)



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HDC15E06BC

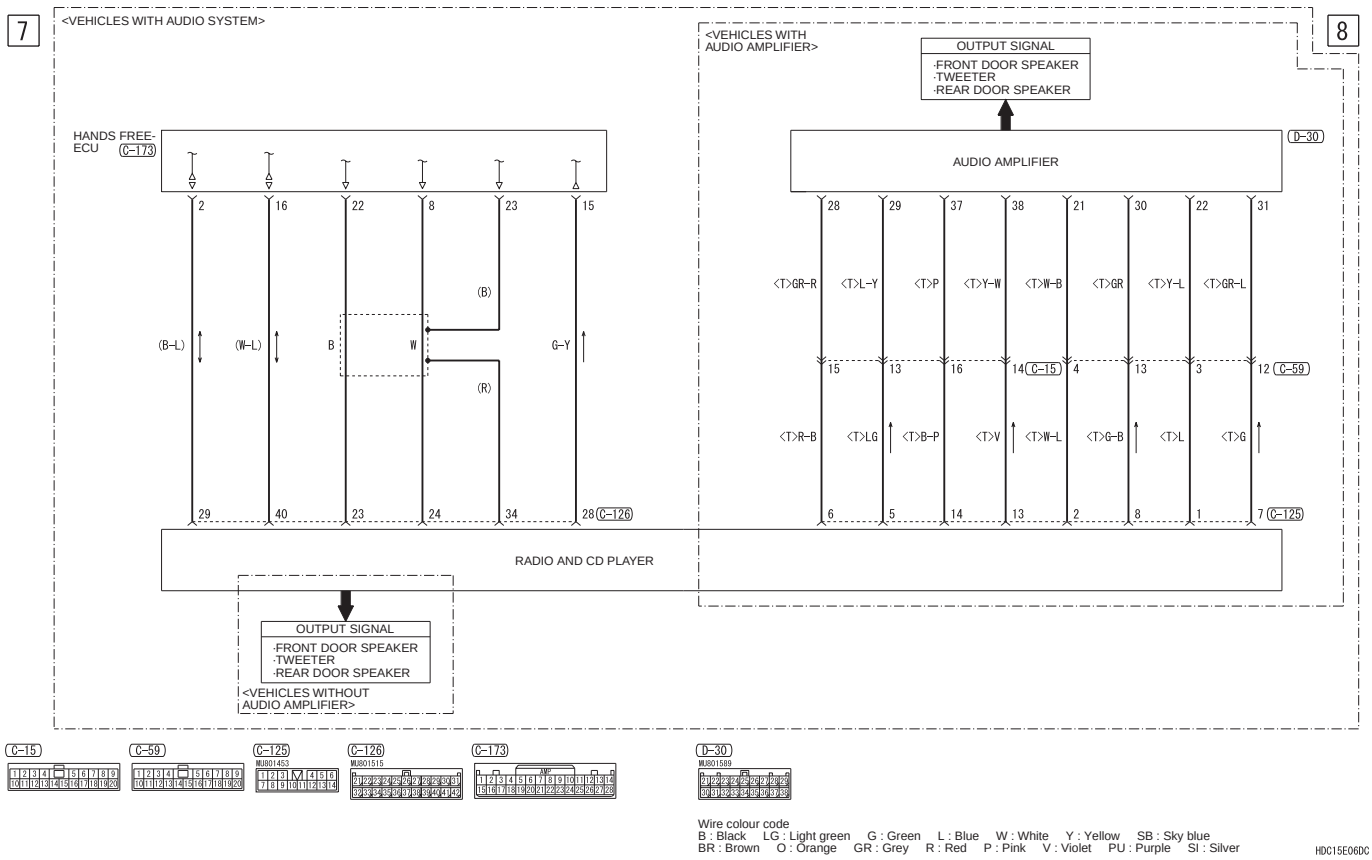
HANDS-FREE INTERFACE SYSTEM (CONTINUED)



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HDC15E06CC

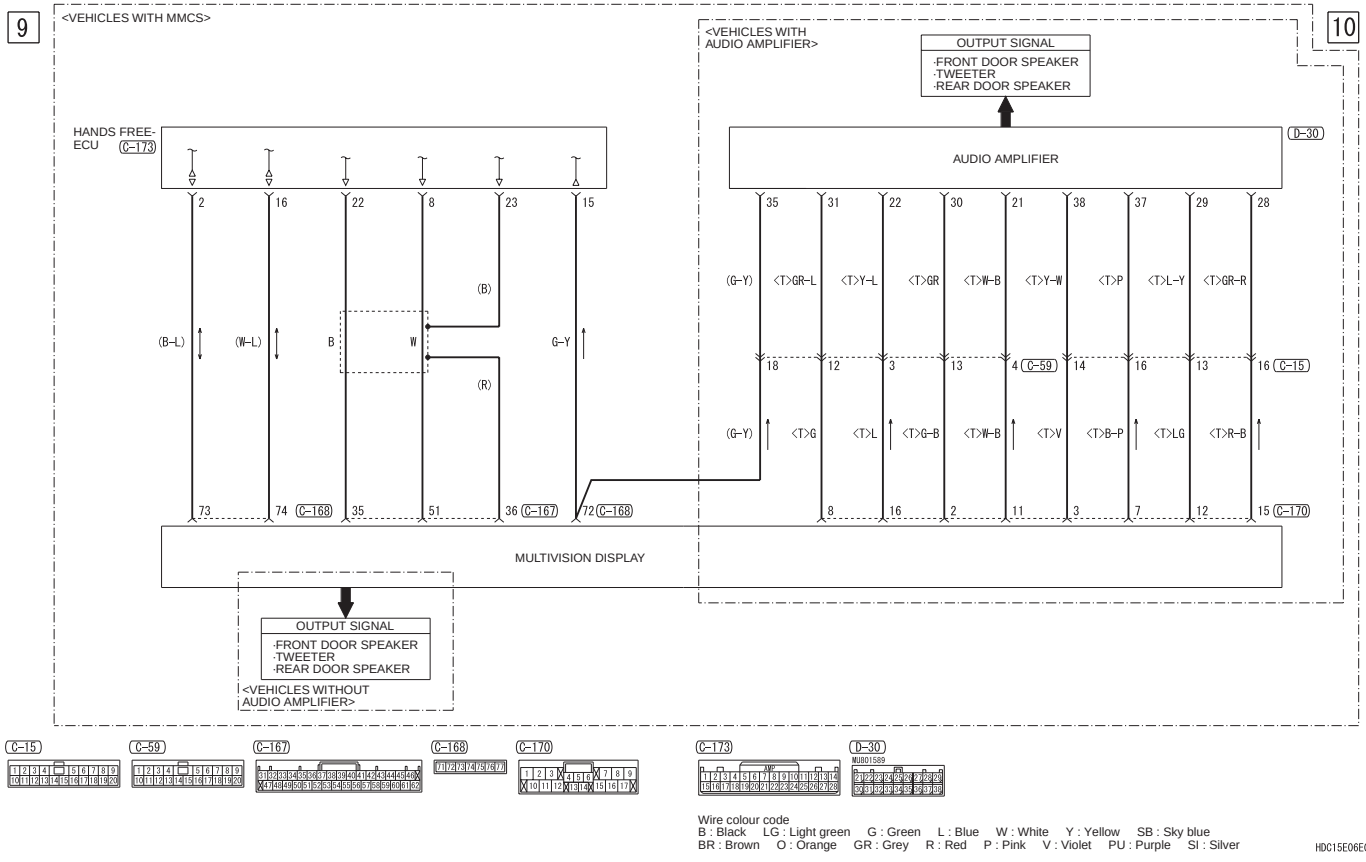
HANDS-FREE INTERFACE SYSTEM (CONTINUED)



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HDC15E06DC

HANDS-FREE INTERFACE SYSTEM (CONTINUED)

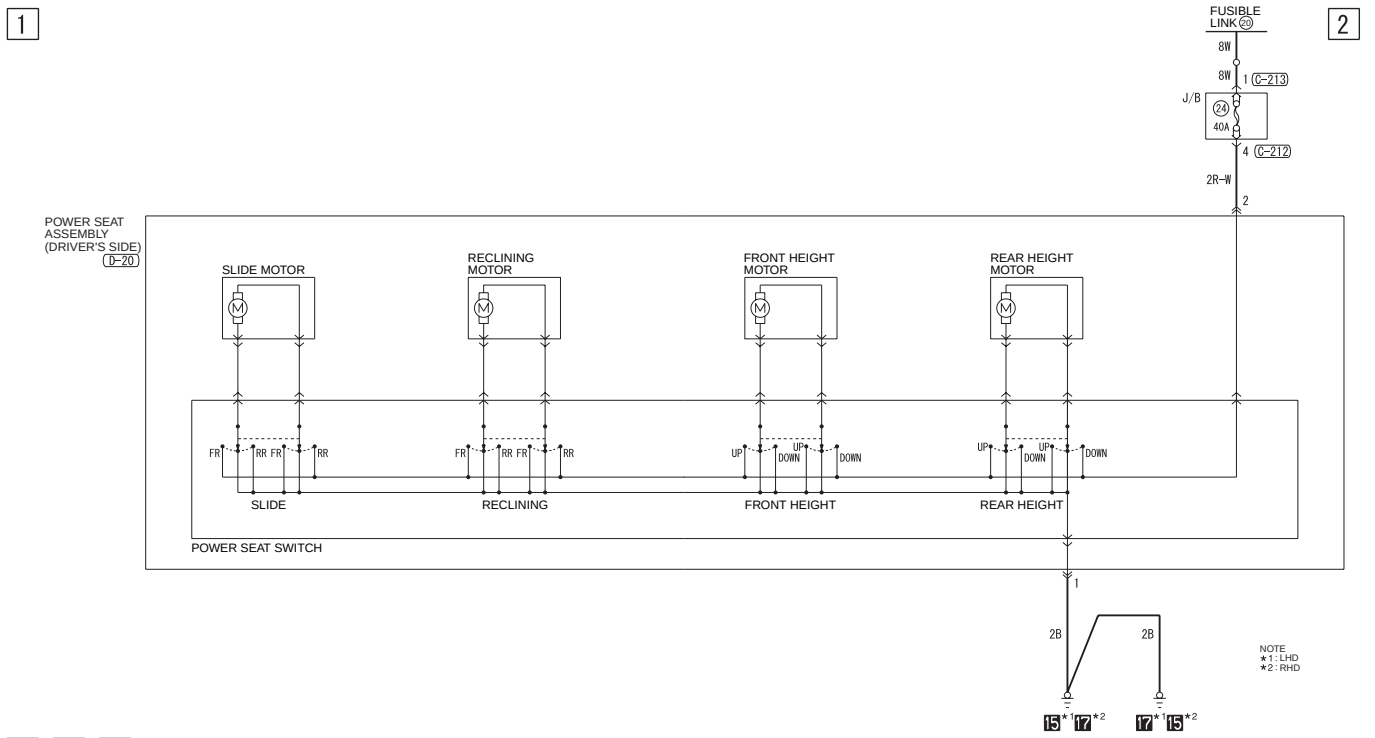


Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HDC15E06EC

POWER SEAT

M1901010401323



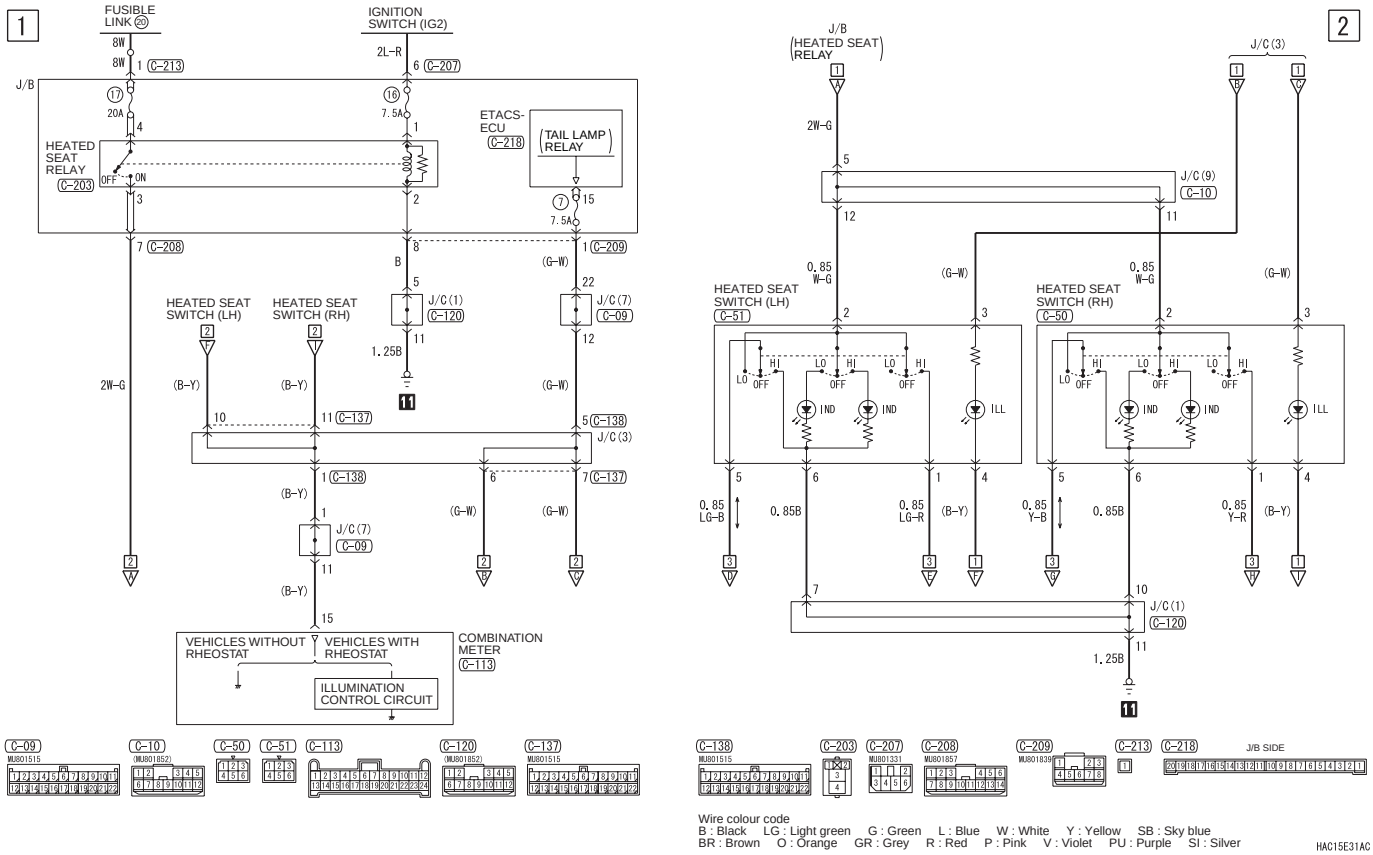
Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HAC15E30AC

HEATED SEAT

HEATED SEAT <LHD>

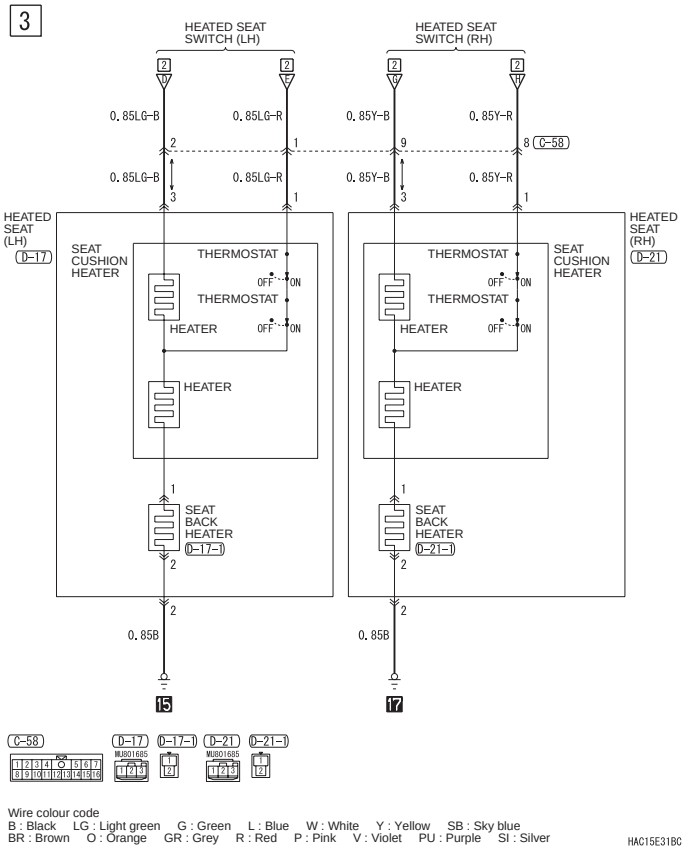
M1901010702178



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HAC15E31AC

HEATED SEAT <LHD> (CONTINUED)

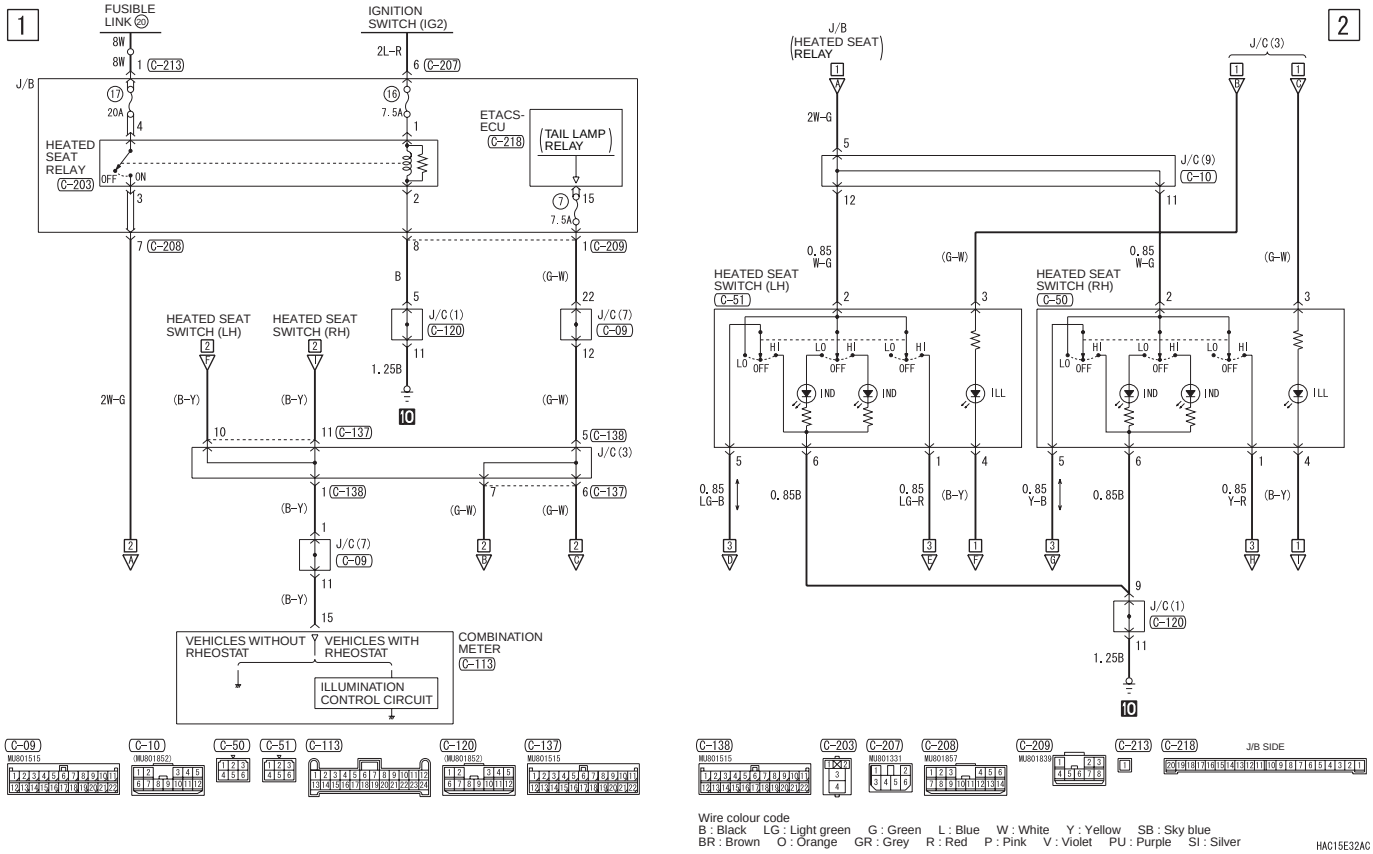


Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HAC15E31BC

HEATED SEAT <RHD>

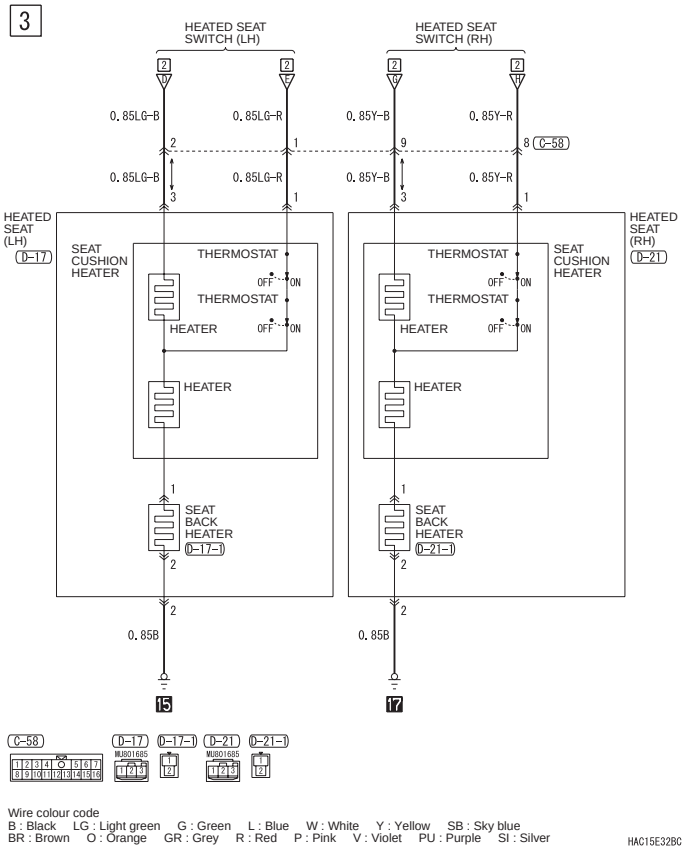
M1901010702189



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HAC15E32AC

HEATED SEAT <RHD> (CONTINUED)

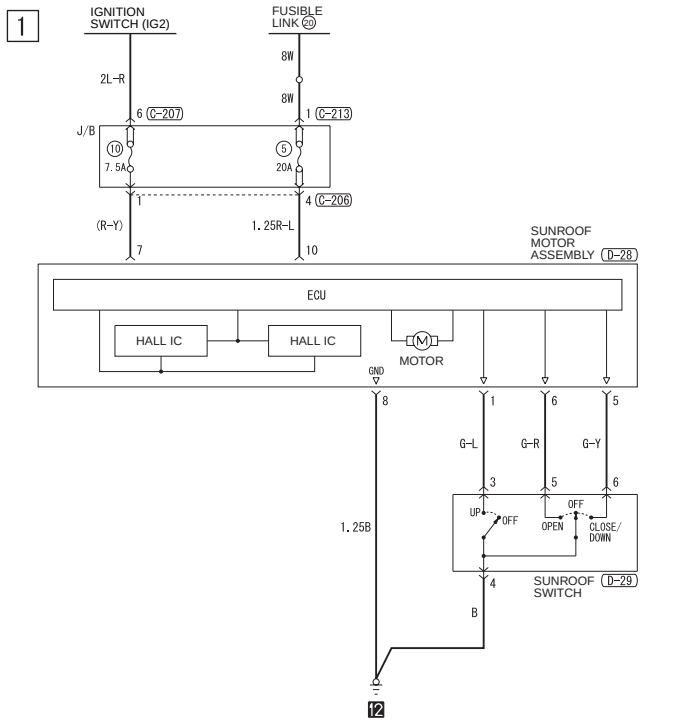


Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HAC15E32BC

SUNROOF

M1901009903126



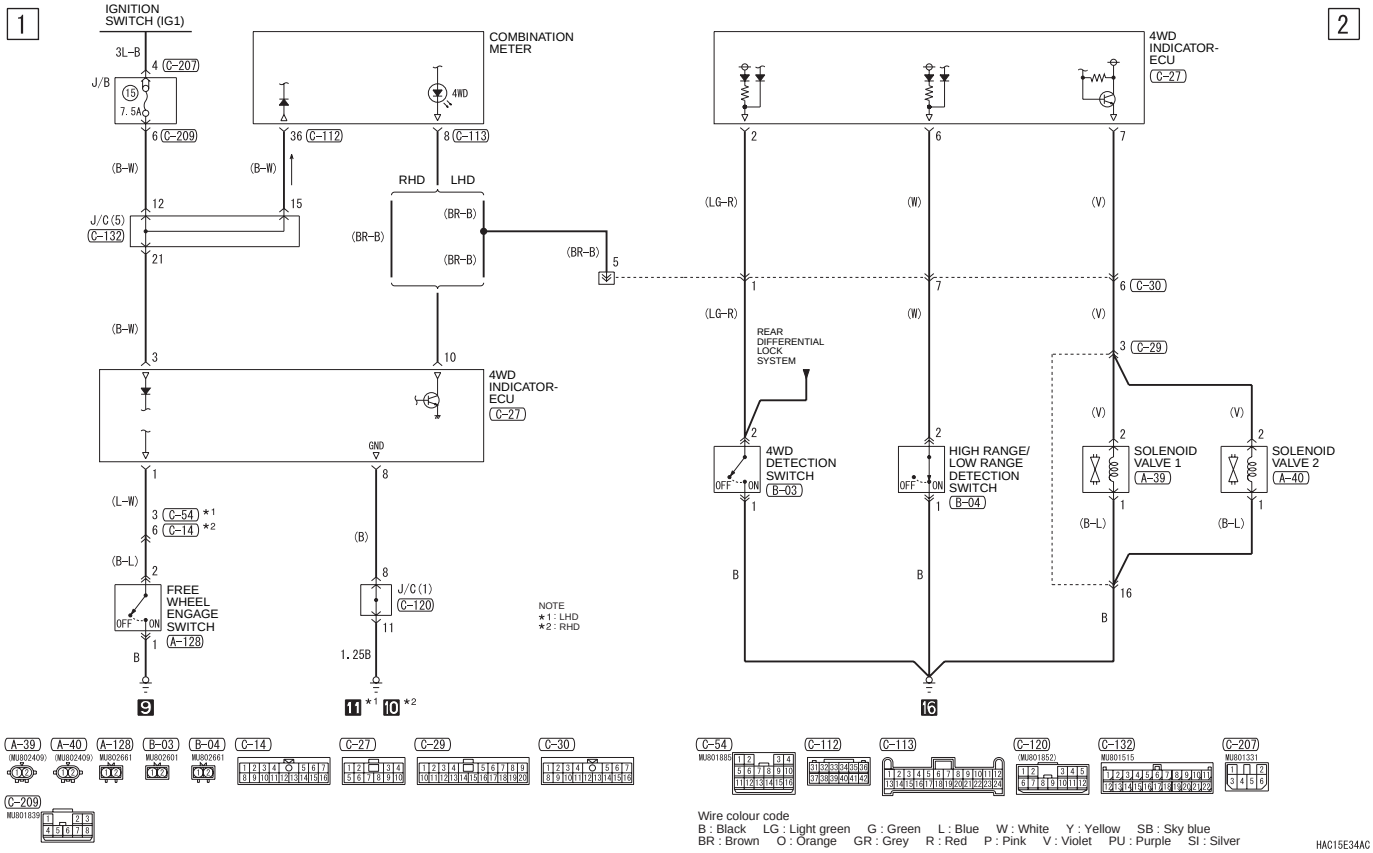
Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HAC15E33AC

EASY SELECT 4WD SYSTEM

EASY SELECT 4WD SYSTEM <VEHICLES FOR EUROPE>

M1901024800343

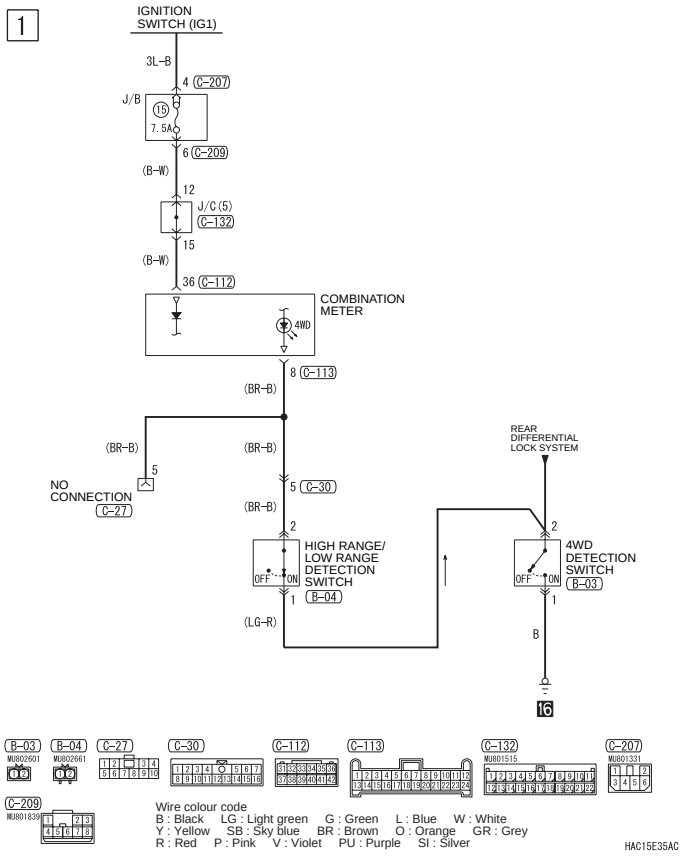


Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HAC15E34AC

EASY SELECT 4WD SYSTEM <VEHICLES FOR RUSSIA>

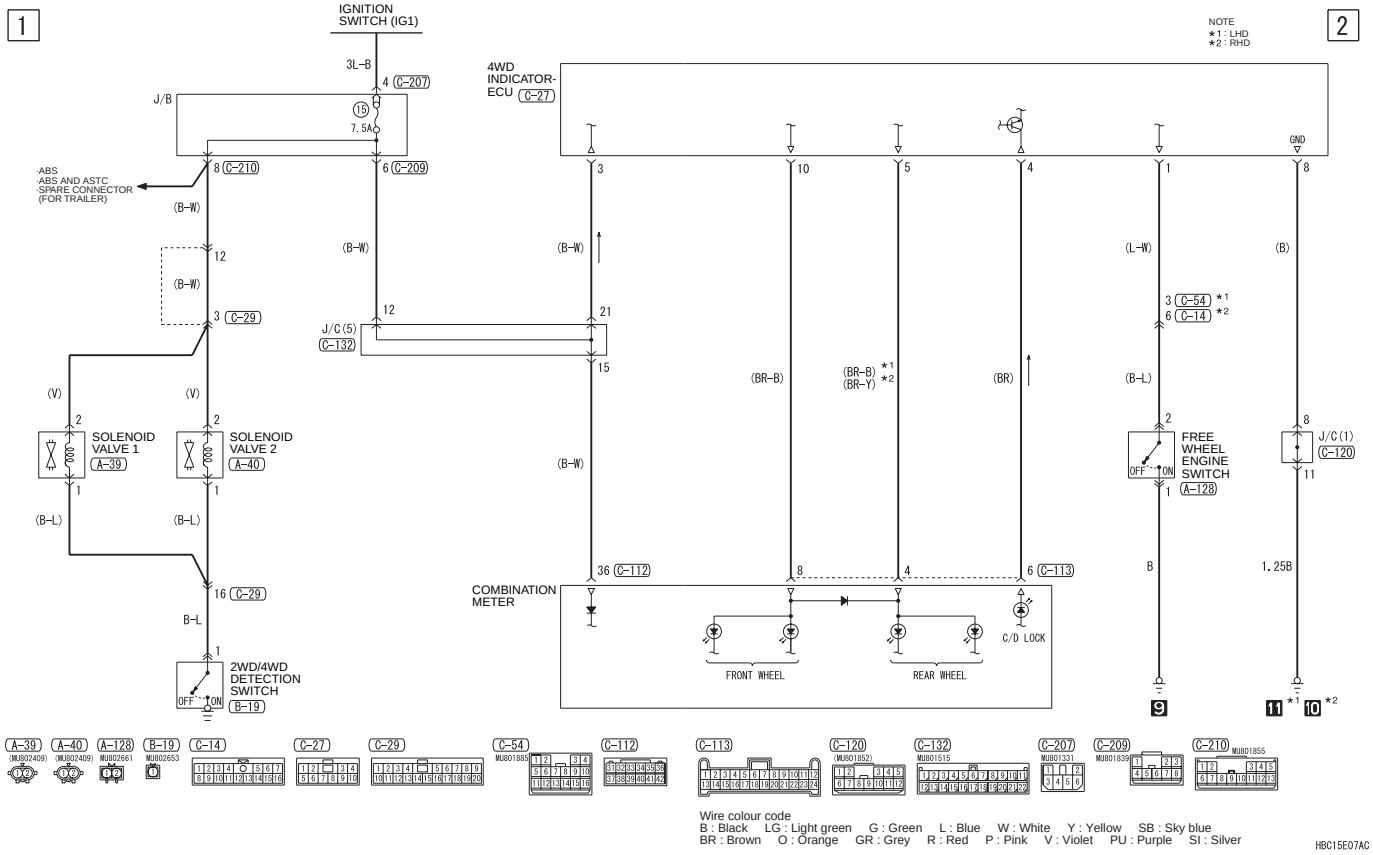
M1901024800354



SUPER SELECT 4WD SYSTEM

SUPER SELECT 4WD SYSTEM <VEHICLES FOR EUROPE>

M1901034200160

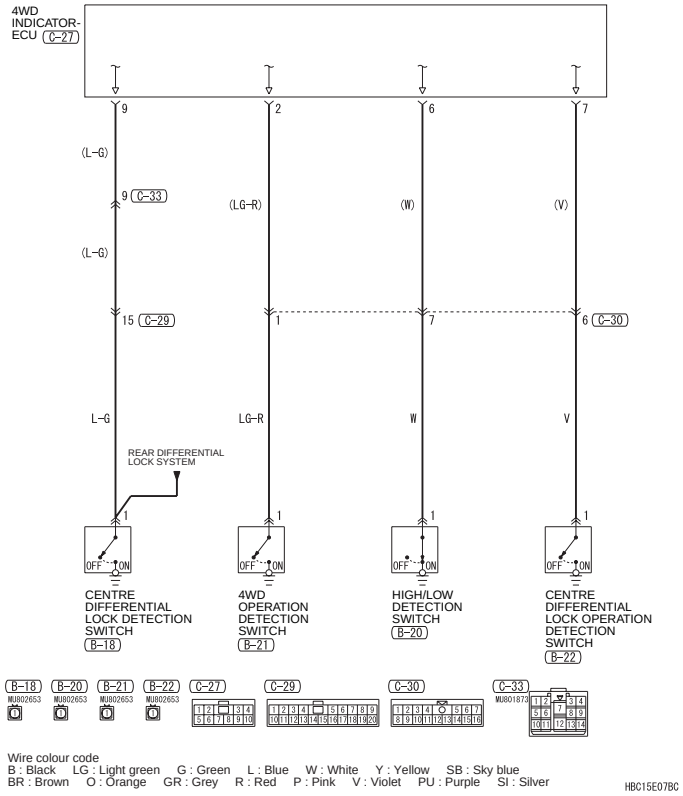


Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HBC15E07AC

SUPER SELECT 4WD SYSTEM <VEHICLES FOR EUROPE> (CONTINUED)

3

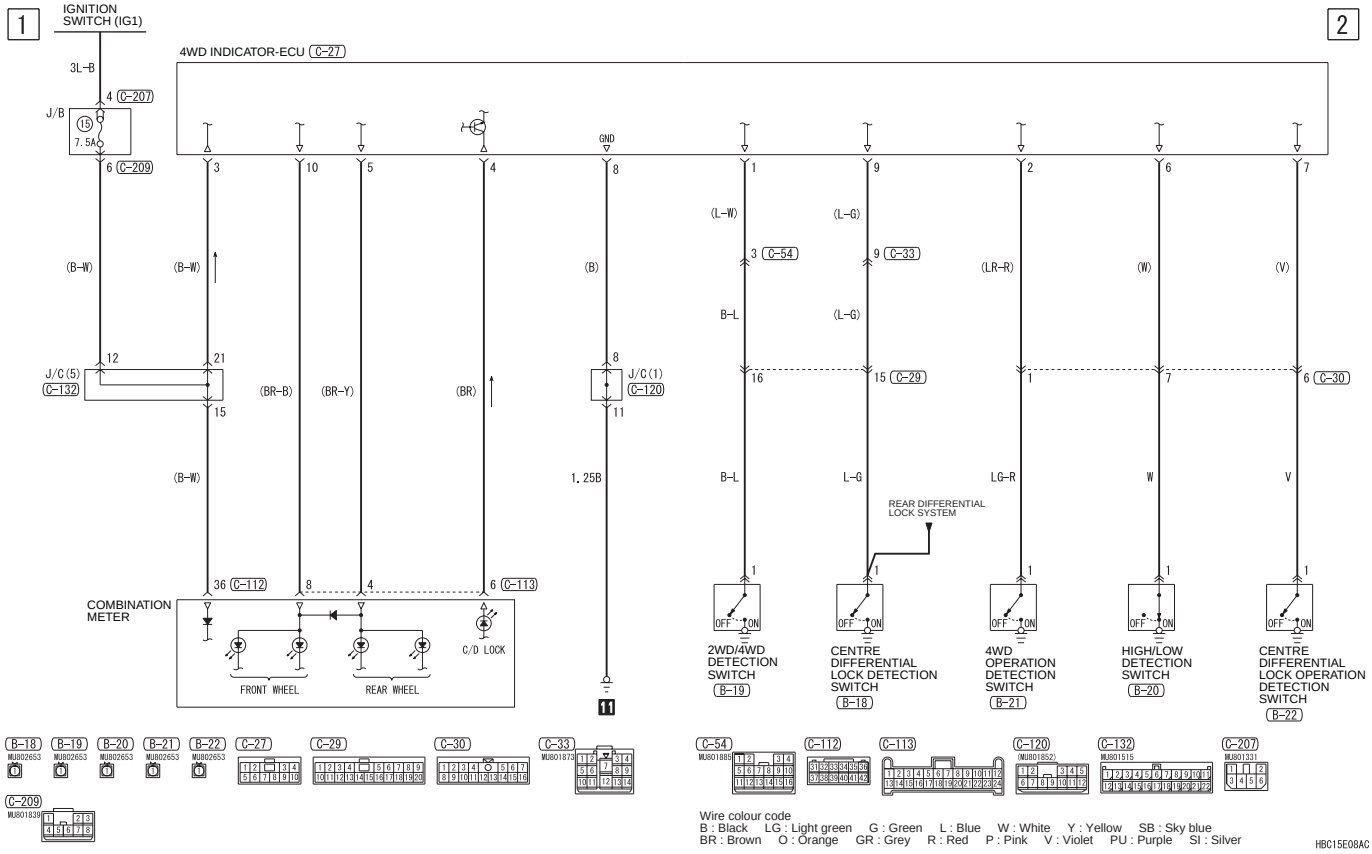


Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HBC15E07BC

SUPER SELECT 4WD SYSTEM <VEHICLES FOR RUSSIA>

M1901034200171

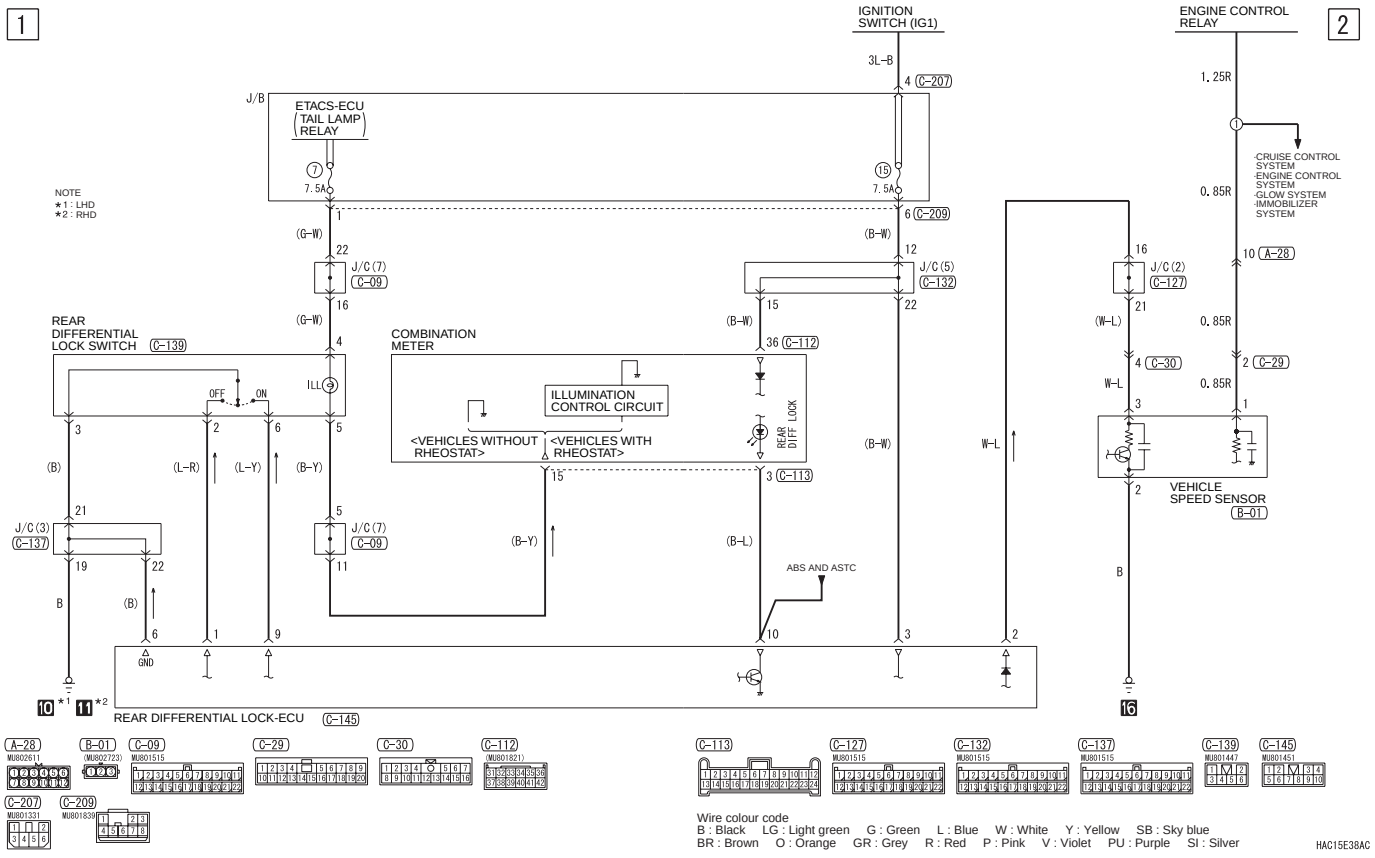


Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HBC15E08AC

REAR DIFFERENTIAL LOCK SYSTEM

M1901014300477



Wire colour code
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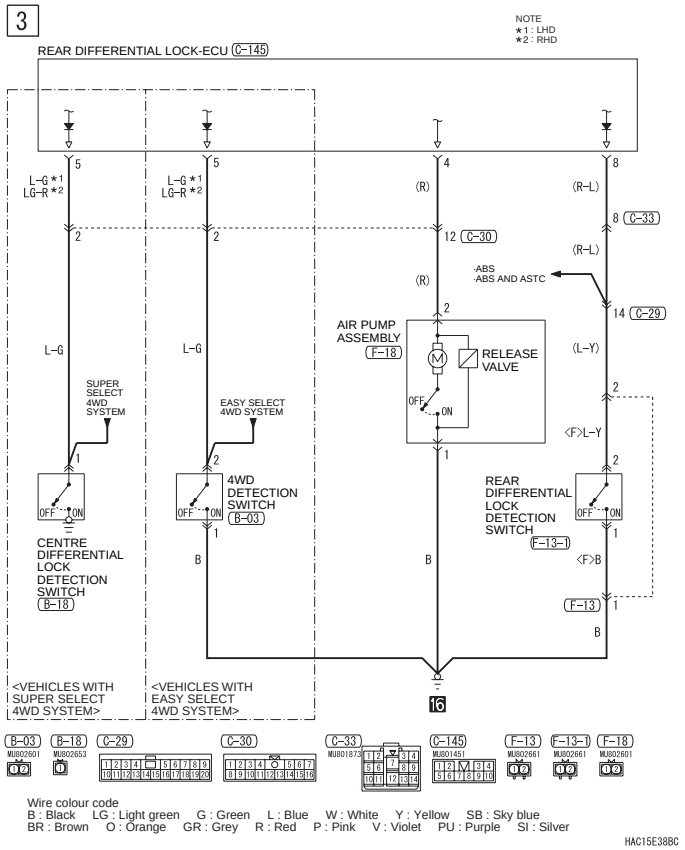
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

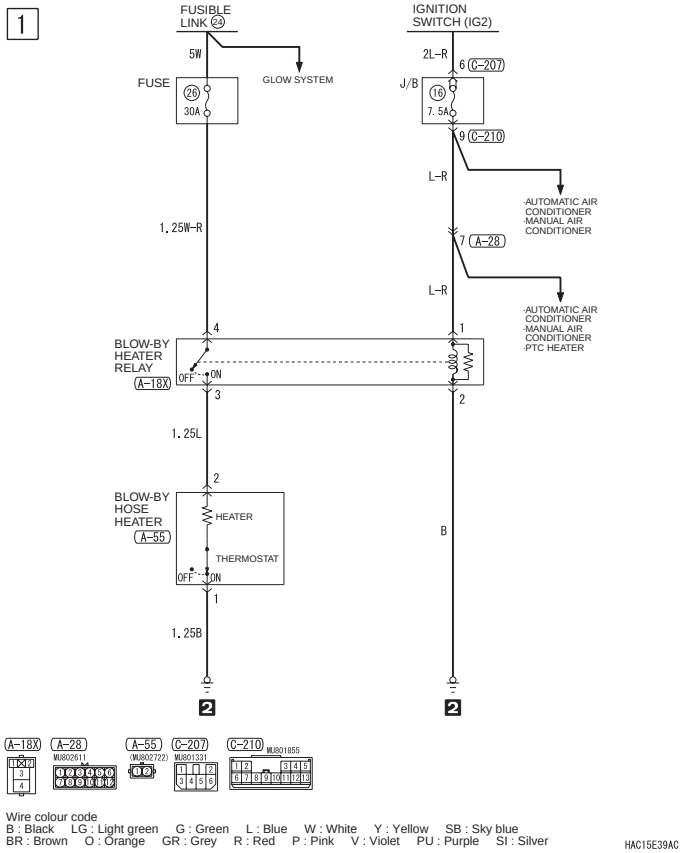
HAC15E38AC

REAR DIFFERENTIAL LOCK SYSTEM (CONTINUED)



BLOW-BY HEATER

M1901034100118

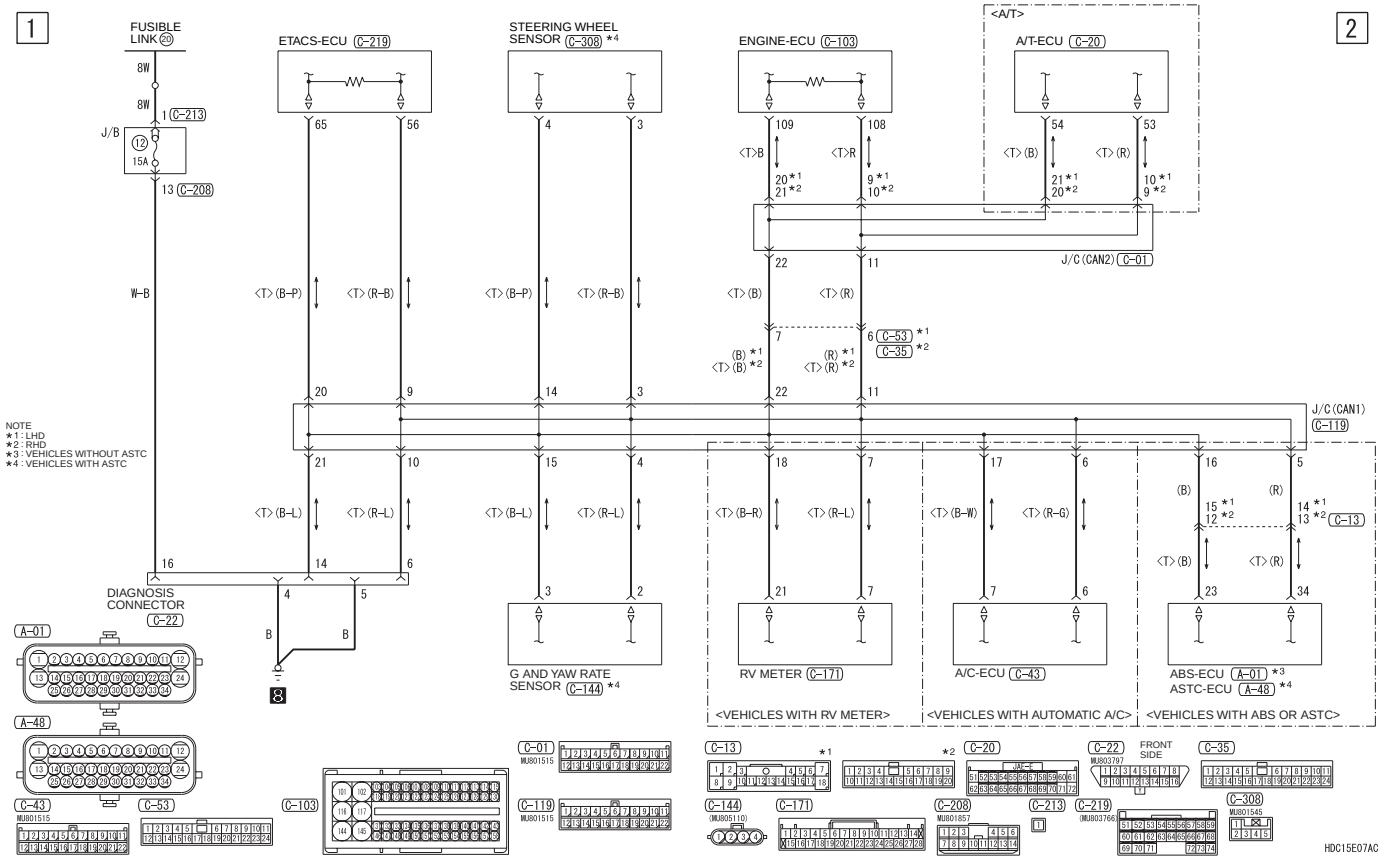


Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HAC15E39AC

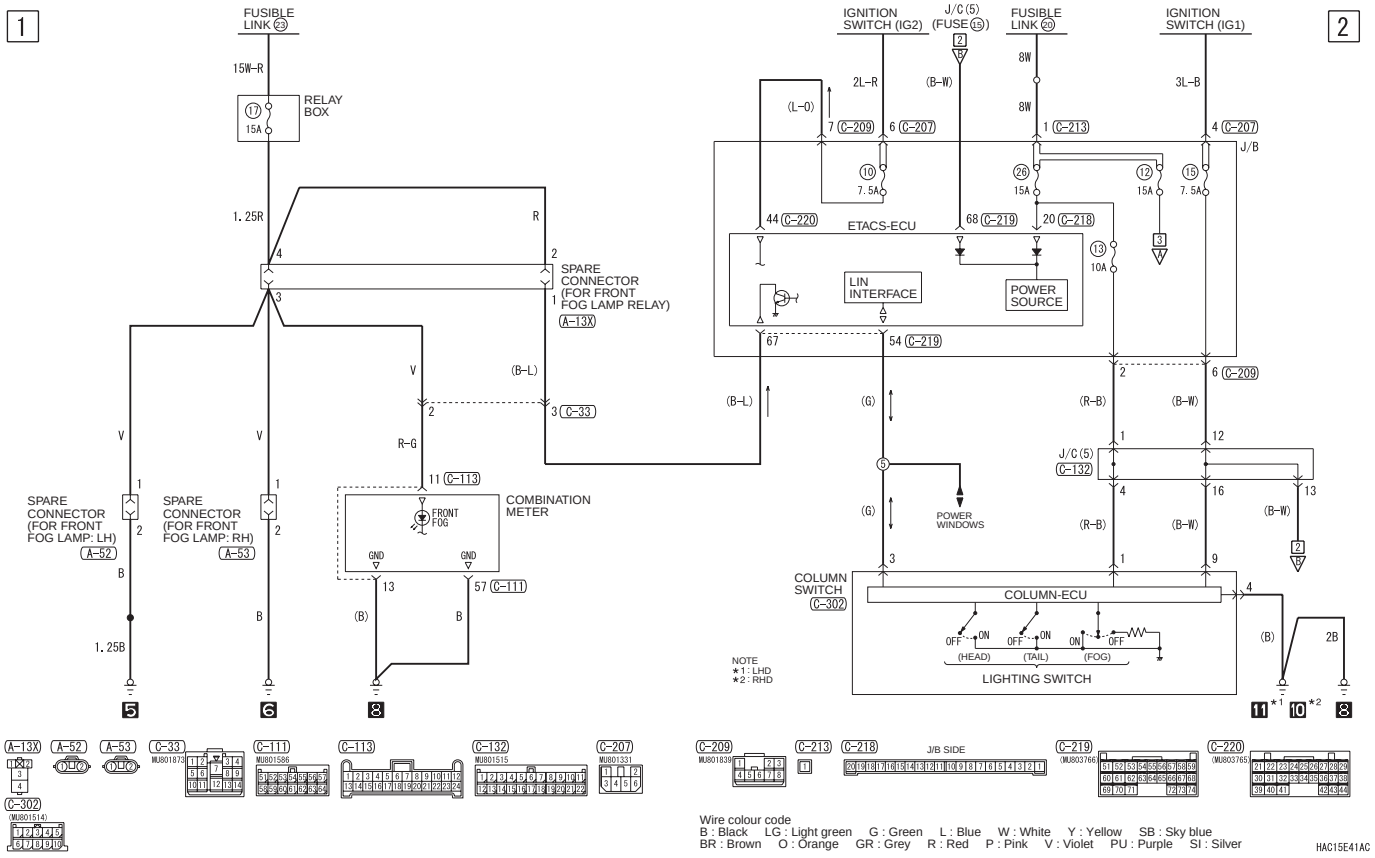
CAN

M1901021103593



SPARE CONNECTOR (FOR FRONT FOG LAMP)

M1901024900458

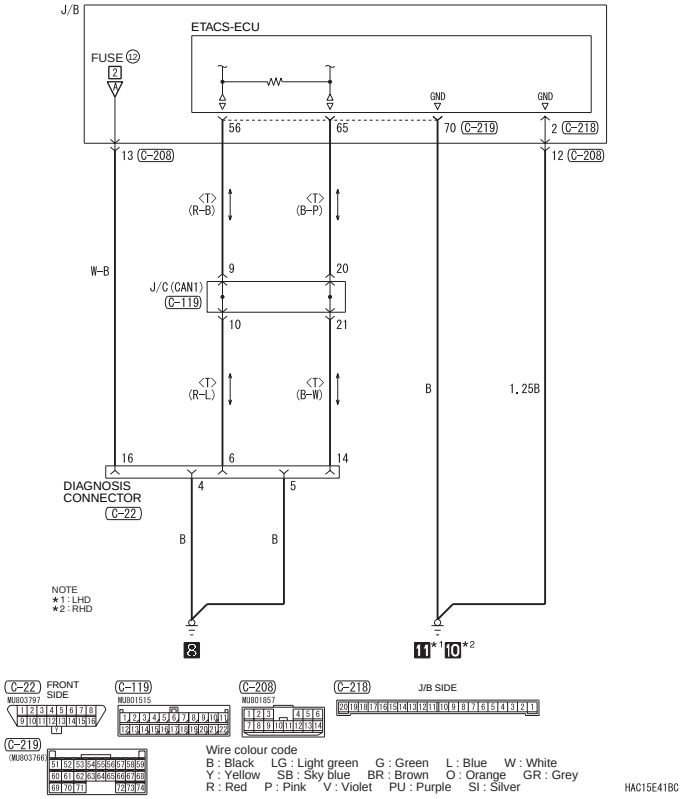


Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HAC15E41AC

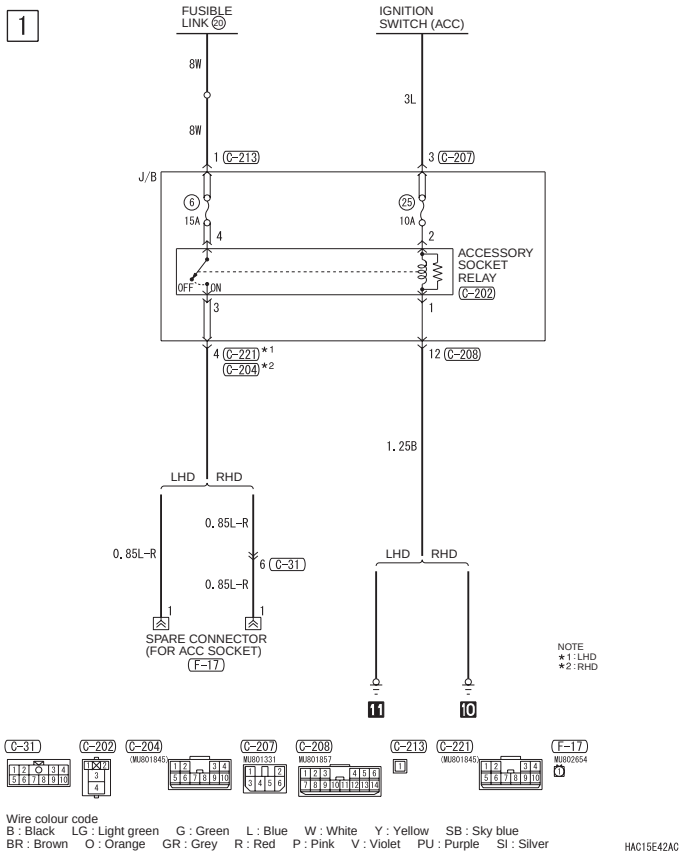
SPARE CONNECTOR (FOR FRONT FOG LAMP) (CONTINUED)

3



SPARE CONNECTOR (FOR ACC SOCKET)

M1901027500073



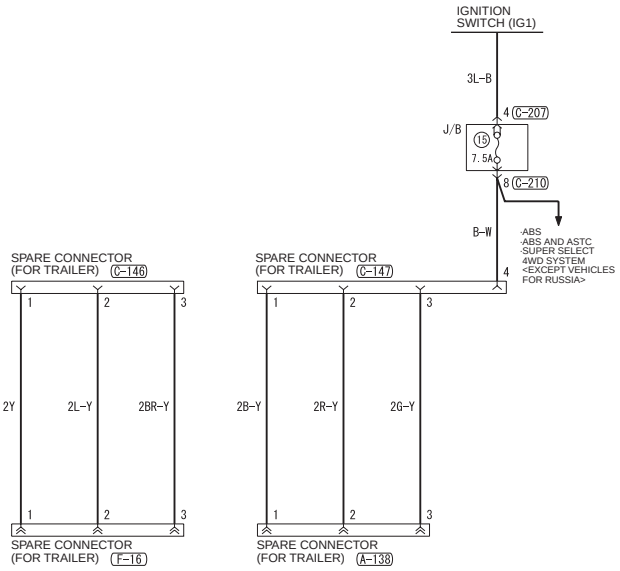
Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HAC15E42AC

SPARE CONNECTOR (FOR TRAILER)

M1901021200353

1



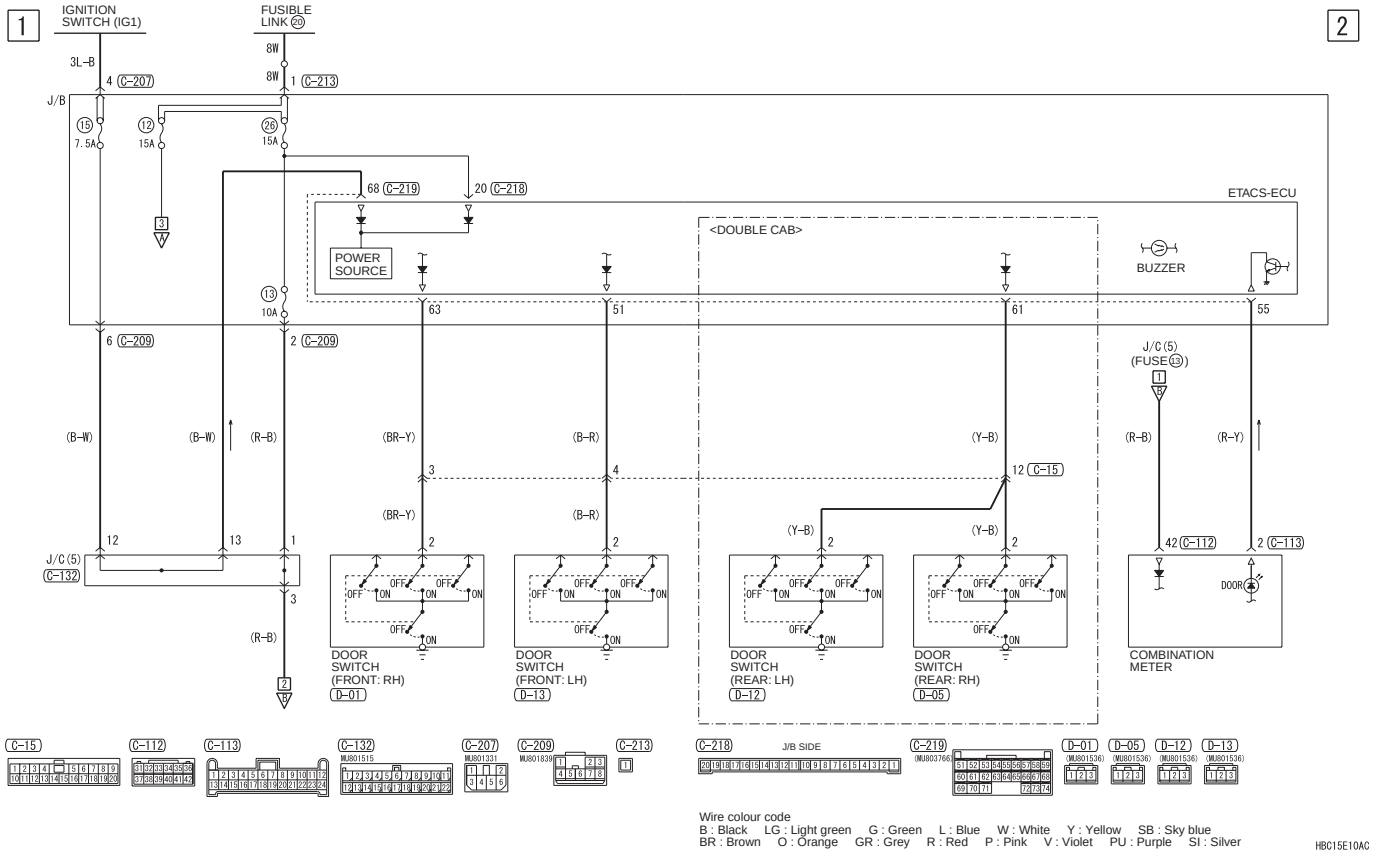
Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Grey R : Red P : Pink V : Violet PU : Purple SI : Silver

HAC15E43AC

DOOR AJAR WARNING BUZZER

DOOR AJAR WARNING BUZZER <LHD>

M1901016603439



Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
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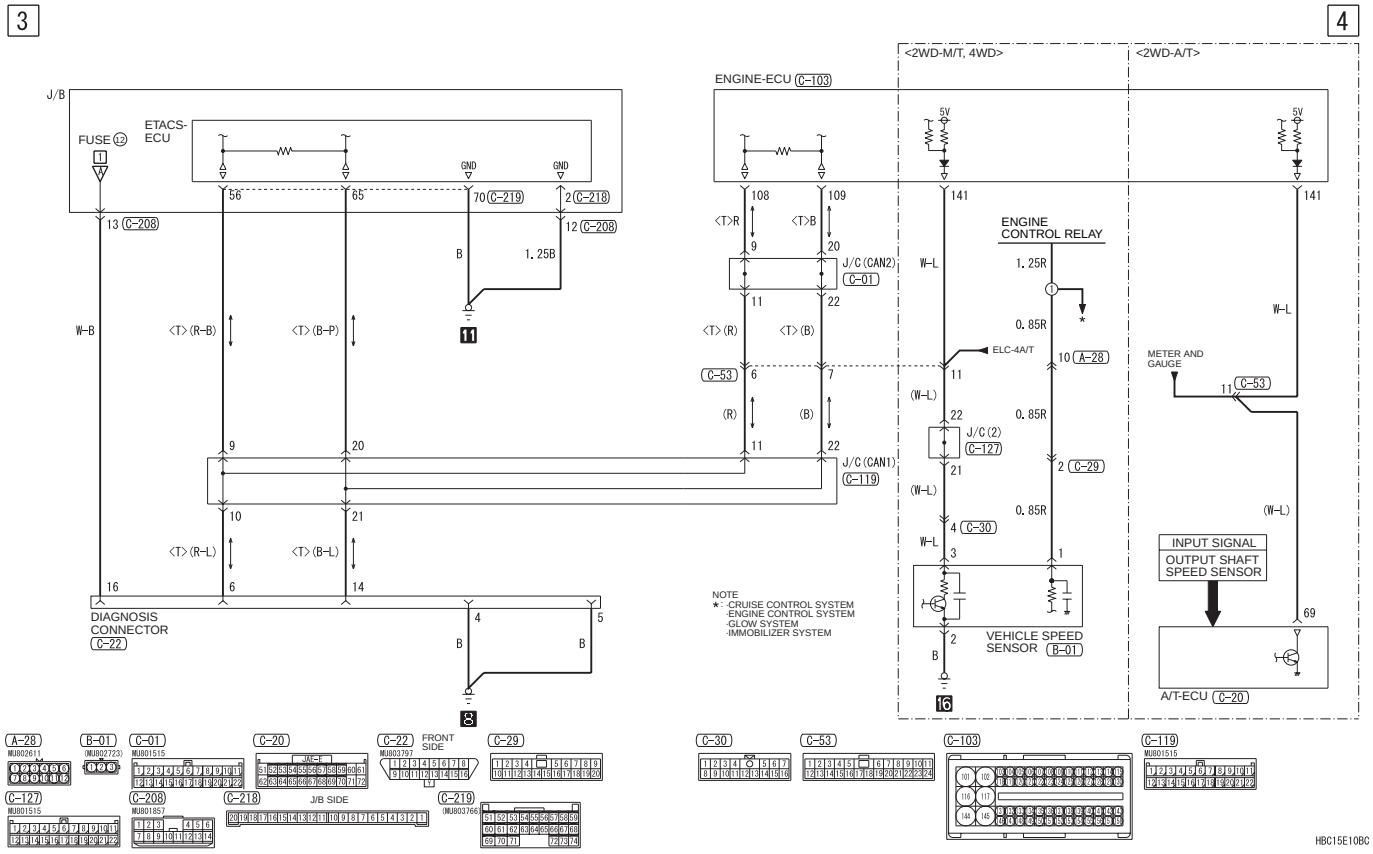
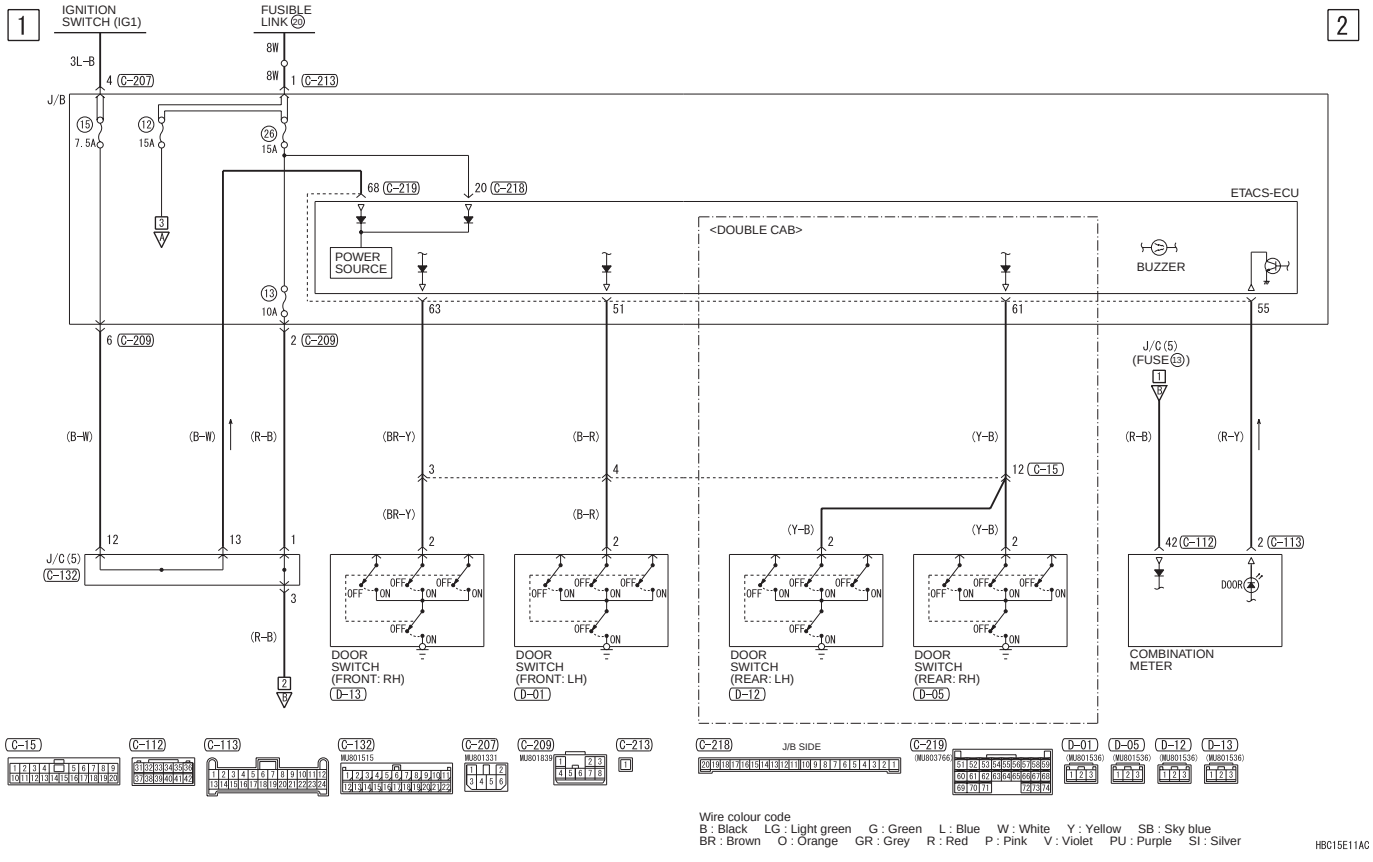
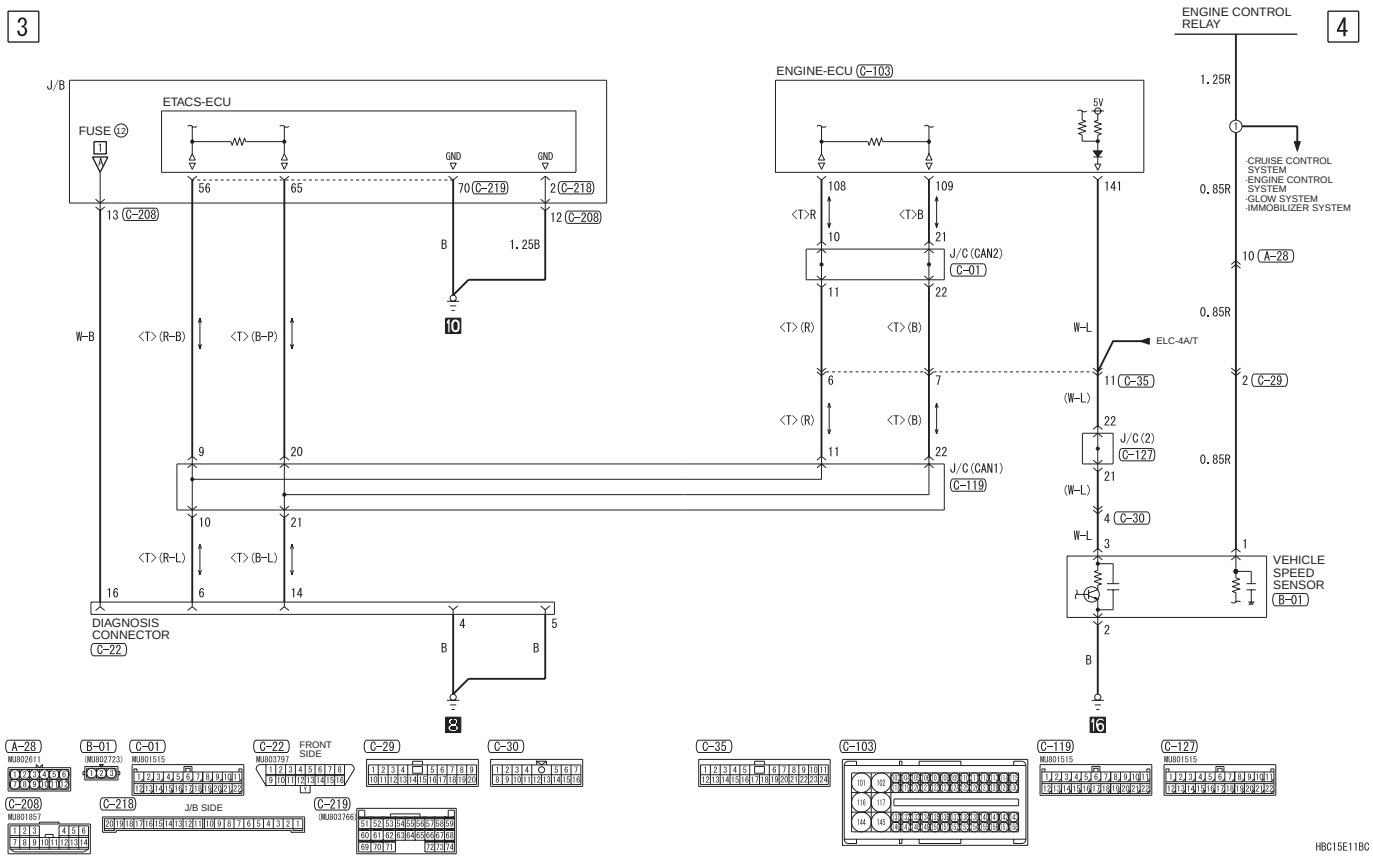
HBC15E10AC

DOOR AJAR WARNING BUZZER <LHD> (CONTINUED)



DOOR AJAR WARNING BUZZER <RHD>

M1901016603440



DOOR AJAR WARNING BUZZER <RHD> (CONTINUED)