GROUP 13A

MULTIPORT FUEL INJECTION (MPI)

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GENERAL INFORMATION

M1131000102428

The Multipoint Fuel Injection System consists of sensors which detect the engine conditions, the engine-ECU which controls the system based on signals from these sensors, and actuators which operate under the control of the engine-ECU. The engine-ECU carries out activities such as fuel injection control, idle speed control and ignition timing control. In addition, the engine-ECU is equipped with several diagnosis modes which simplify troubleshooting when a problem develops.

FUEL INJECTION CONTROL

The injector drive times and injector timing are controlled so that the optimum air/fuel mixture is supplied to the engine to correspond to the continually-changing engine operation conditions.
A single injector is mounted at the intake port of each cylinder. Fuel is sent under pressure from the fuel tank by the fuel pump, with the pressure being regulated by the fuel pressure regulator. The fuel thus regulated is distributed to each of the injectors.
Fuel injection is normally carried out once for each cylinder for every two rotations of the crankshaft. The firing order is 1-3-4-2. This is called sequential fuel injection. The engine-ECU provides a richer air/fuel mixture by carrying out "open-loop" control when the engine is cold or operating under high load conditions in order to maintain engine performance. In addition, when the engine is warm or operating under normal conditions, the engine-ECU controls the air/fuel mixture by using the oxygen sensor signal to carry out "closed-loop" control in order to obtain the theoretical air/fuel mixture ratio that provides the maximum cleaning performance from the three way catalyst.

IDLE SPEED CONTROL

The idle speed is kept at the optimum speed by controlling the amount of air that bypasses the throttle valve in accordance with changes in idling conditions and engine load during idling. The engine-ECU drives the idle speed control motor to keep the engine running at the pre-set idle target speed in accordance with the engine coolant temperature and air conditioner load. In addition, when the air conditioner switch is turned off and on while the engine is idling, the idle speed control motor operates to adjust the throttle valve bypass air amount in accordance with the engine load conditions in order to avoid fluctuations in the engine speed.

IGNITION TIMING CONTROL

The power transistor located in the ignition primary circuit turns ON and OFF to control the primary current flow to the ignition coil. This controls the ignition timing in order to provide the optimum ignition timing with respect to the engine operating conditions. The ignition timing is determined by the engine-ECU from the engine speed, intake air volume, engine coolant temperature and atmospheric pressure.

SELF-DIAGNOSIS FUNCTION

- When an abnormality is detected in one of the sensors or actuators related to emission control, the engine warning lamp (check engine lamp) illuminates as a warning to the driver.
- When an abnormality is detected in one of the sensors or actuators, a diagnosis code corresponding to the abnormality is output.
- The RAM data inside the engine-ECU that is related to the sensors and actuators can be read by means of the M.U.T.-II/III. In addition, the actuators can be force-driven under certain circumstances.

OTHER CONTROL FUNCTIONS

1. Fuel Pump Control

Turns the fuel pump relay ON so that current is supplied to the fuel pump while the engine is cranking or running.

2. A/C Relay Control

Turns the compressor clutch of the A/C ON and OFF.

3. Oil feeder control valve control

The engine-ECU effects duty cycle control on the engine oil feeder control valve, in accordance with the engine speed. This regulates the supply of engine oil to the intake rocker starft, which switches the cams.

4. Fan Motor Control

The revolutions of the radiator fan and condenser fan are controlled in response to the engine coolant temperature and vehicle speed.

5. Purge Control Solenoid Valve Control

(Refer to GROUP 17 – Engine And Emission Control – Evaporative Emission Control System P.17-9).

6. EGR Control Solenoid Valve Control

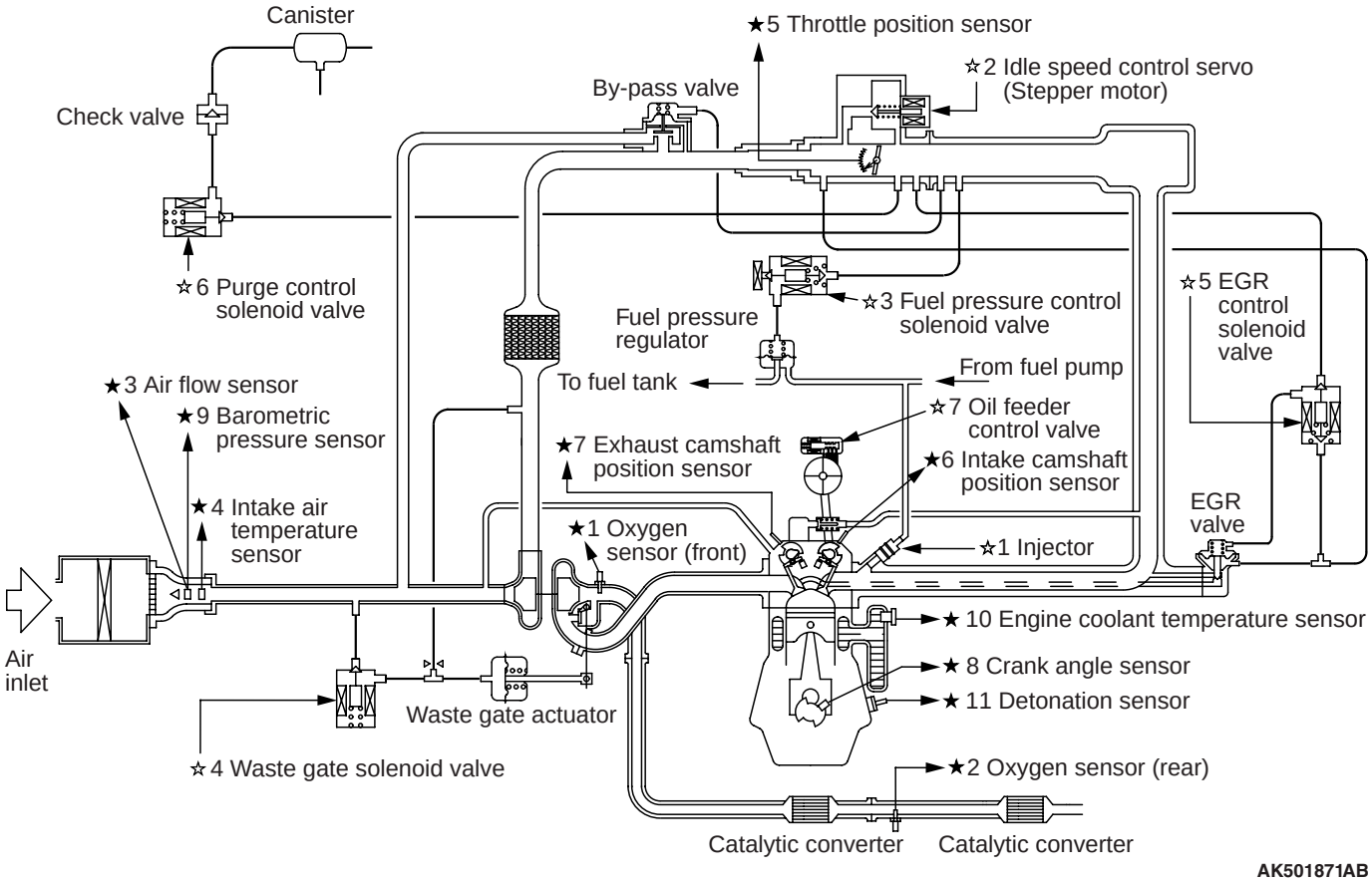
(Refer to GROUP 17 – Engine And Emission Control – Exhaust Gas Recirculation (EGR) System P.17-13).

GENERAL SPECIFICATIONS

Items		Specifications
Throttle body	Throttle bore mm	60
	Throttle position sensor	Variable resistor type
	Idle speed control servo	Stepper motor type
Engine-ECU	Identification No.	E6T46983
Sensors	Air flow sensor	Karman vortex type
	Barometric pressure sensor	Semiconductor type
	Intake air temperature sensor	Thermistor type
	Engine coolant temperature	Thermistor type
	Oxygen sensor	Zirconia type
	Vehicle speed sensor	Magnetic resistive element type
	Intake camshaft position sensor	Hall element type
	Exhaust camshaft position sensor	Hall element type
	Crank angle sensor	Hall element type
	Detonation sensor	Piezoelectric type
	Power steering fluid pressure switch	Contact switch type
Actuators	Engine control relay type	Contact switch type
	Fuel pump relay type	Contact switch type
	Injector type and number	Electromagnetic type, 4
	Injector identification mark	MDL 560P
	Oil feeder control valve	Duty cycle type solenoid valve
	EGR control solenoid valve	Duty cycle type solenoid valve
	Purge control solenoid valve	Duty cycle type solenoid valve
	Fuel pressure control solenoid valve	ON/OFF type solenoid valve
	Waste gate solenoid valve	Duty cycle type solenoid valve
Fuel pressure regulator	Regulator pressure kPa	294

MULTI-POINT FUEL INJECTION SYSTEM DIAGRAM

★1 Oxygen sensor (front) ★2 Oxygen sensor (rear) ★3 Air flow sensor ★4 Intake air temperature sensor ★5 Throttle position sensor ★6 Intake camshaft position sensor ★7 Exhaust camshaft position sensor ★8 Crank angle sensor ★9 Barometric pressure sensor ★10 Engine coolant temperature sensor ★11 Detonation sensor	● Power supply ● Ignition switch-IG ● Ignition switch-ST ● A/C switch ● A/C load signal ● Power steering fluid pressure switch ● Alternator FR terminal ● Clutch switch ● Transmission oil temperature sensor ● Vehicle speed sensor	⇨	Engine-ECU	⇨ ☆1 Injector ☆2 Idle speed control servo (Stepper motor) ☆3 Fuel pressure control solenoid valve ☆4 Waste gate solenoid valve ☆5 EGR control solenoid valve ☆6 Purge control solenoid valve ☆7 Oil feeder control valve	● Engine control relay ● Fuel pump relay 2 ● Fuel pump relay 3 ● A/C relay ● Ignition coil ● Fan controller ● Condenser fan relay(High) ● Condenser fan relay(Low) ● Engine warning lamp ● Diagnosis output ● Alternator G terminal ● Air flow sensor reset signal ● Oxygen sensor heater (Front) ● Oxygen sensor heater (Rear) ● Tachometer ● Transmission oil temperature warning lamp



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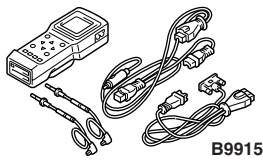
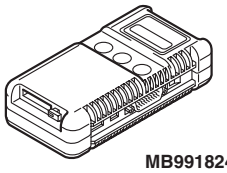
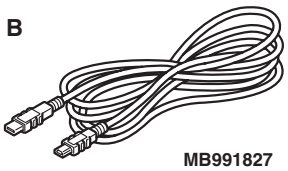
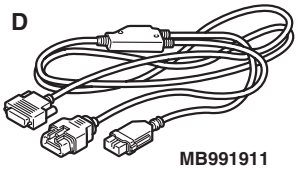
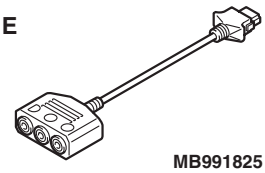
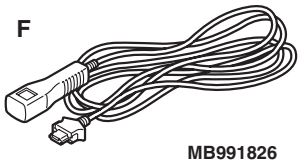
SERVICE SPECIFICATIONS

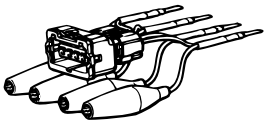
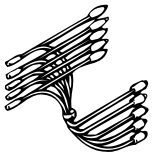
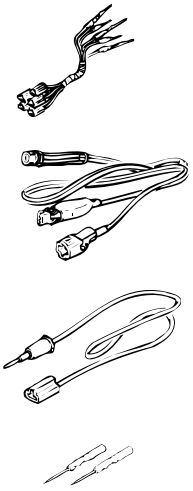
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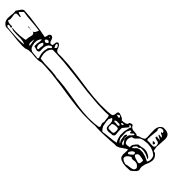
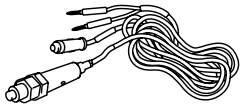
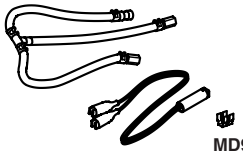
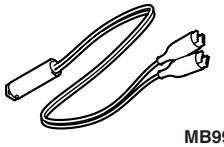
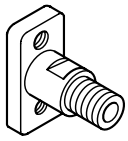
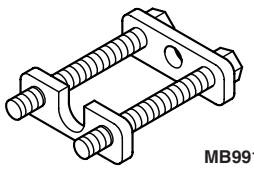
Items		Specifications
Basic idle speed r/min		800 ± 50
Throttle position sensor adjusting voltage mV		535 – 735
Throttle position sensor resistance kΩ		3.5 – 6.5
Idle speed control servo coil resistance (at 20°C) Ω		28 – 33
Intake air temperature sensor resistance kΩ	–20°C	13 – 17
	0°C	5.3 – 6.7
	20°C	2.3 – 3.0
	40°C	1.0 – 1.5
	60°C	0.56 – 0.76
	80°C	0.30 – 0.42
Engine coolant temperature sensor resistance kΩ	–20°C	14 – 17
	0°C	5.1 – 6.5
	20°C	2.1 – 2.7
	40°C	0.9 – 1.3
	60°C	0.48 – 0.68
	80°C	0.26 – 0.36
Oxygen sensor output voltage (at racing) V		0.6 – 1.0
Oxygen sensor heater resistance (at 20°C) Ω	Front	4.5 – 8.0
	Rear	11 – 18
Fuel pressure kPa	Vacuum hose disconnection	289 – 309 at curb idle
	Vacuum hose connection	Approximately 230 at curb idle
Fuel pressure control solenoid valve resistance (at 20°C) Ω		28 – 36
Fuel pump resistance Ω		0.45 – 0.65
Injector coil restance (at 20°C) Ω		2 – 3
Injector fuel leakage rate Drop/minute		1 or less
Resistor (for injector) resistance (at 20°C) Ω		5.8 – 6.2
Oil feeder control valve (at 20°C) Ω		6.9 – 7.2

SPECIAL TOOLS

M1131000601583

Tool	Number	Name	Use
 B991502	MB991502	M.U.T.-II sub assembly	• Reading diagnosis code • MPI system inspection • Measurement of fuel pressure
A  MB991824 B  MB991827 C  DO NOT USE MB991910 D  MB991911 E  MB991825 F  MB991826 MB991955	MB991955 A: MB991824 B: MB991827 C: MB991910 D: MB991911 E: MB991825 F: MB991826	M.U.T.-III sub assembly A: Vehicle communication interface (V.C.I.) B: M.U.T.-III USB cable C: M.U.T.-III main harness A (Vehicles with CAN communication system) D: M.U.T.-III main harness B (Vehicles without CAN communication system) E: M.U.T.-III measurement adapter F: M.U.T.-III trigger harness	• Reading diagnosis code • MPI system inspection • Measurement of fuel pressure **⚠ CAUTION** **If you connect M.U.T.-III main harness A to a vehicle without CAN communication system to use the M.U.T.-III, a pulse signal may interfere with the simulated vehicle speed lines, thus causing the M.U.T.-III inoperative. Therefore, use the M.U.T.-III main harness B (MB991911) instead.**
 MB991348	MB991348	Test harness set	• Inspection using an oscilloscope

Tool	Number	Name	Use
	MB991709	Test harness	• Measurement of voltage during troubleshooting • Inspection using an oscilloscope • Check of idle control servo
	MD998478	Test harness (3-pin, triangle)	• Measurement of voltage during Troubleshooting • Inspection using an oscilloscope
 MB991536	MD991536	Check harness for throttle position sensor adjustment	• Measurement of voltage during Troubleshooting • Adjusting of throttle position sensor
	MD998464	Test harness (4-pin, square)	• Measurement of voltage during Troubleshooting • Inspection of oxygen sensor (front)
 MB991658	MB991658	Test harness	• Measurement of voltage during Troubleshooting • Inspection of oxygen sensor (rear)
 MB991223	MB991223 A: MB991219 B: MB991220 C: MB991221 D: MB991222	Harness set A: Test harness B: LED harness C: LED harness adapter D: Probe	• Check at the ECU terminals A: Connector pin contact inspection B: Power circuit inspection C: Power circuit inspection D: Commercial tester connection

Tool	Number	Name	Use
	MD998709	Adaptor hose	Measurement of fuel pressure
	MD998742	Hose adaptor	
 MB991637	MB991637	Fuel pressure gauge set	
 MB991981	MB991981	Fuel pressure gauge set	
 MD998706	MD998706	Injector test set	Checking the spray condition of injectors
 MB991607	MB991607	Injector test harness	
 MD998741	MD998741	Injector test adaptor	
 MB991976	MB991976	Clip	

TROUBLESHOOTING

DIAGNOSIS TROUBLESHOOTING FLOW

Refer to P.00-5, GROUP 00 – How to Use Troubleshooting/Inspection Service Points.

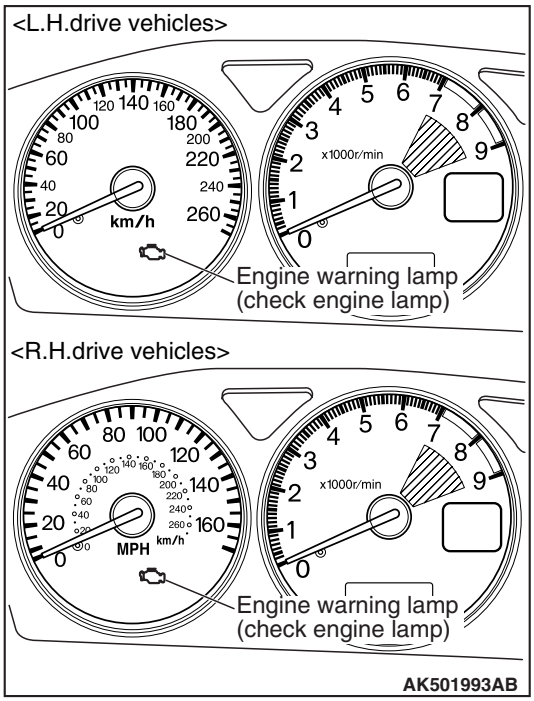
NOTE: If the engine-ECU is replaced, the steering lock cylinder and ignition key should be replaced together with it.

M1131150001572

DIAGNOSIS FUNCTION

M1131155501527

ENGINE WARNING LAMP (CHECK ENGINE LAMP)



If an abnormality occurs in any of the following items related to the Multipoint Fuel Injection (MPI) system, the engine warning lamp will illuminate.
If the lamp remains illuminated or if the lamp illuminates while the engine is running, check the diagnosis code output.

ENGINE WARNING LAMP INSPECTION ITEMS

Code No.	Diagnosis item
–	Engine-ECU
P0090	Fuel pressure control valve system
P0100	Air flow sensor system
P0105	Barometric pressure sensor system
P0110	Intake air temperature sensor system
P0115	Engine coolant temperature sensor system
P0120	Throttle position sensor system
P0125*	Feedback system monitor
P0130	Oxygen sensor (front) system
P0135	Oxygen sensor heater (front) system
P0136	Oxygen sensor (rear) system
P0141	Oxygen sensor heater (rear) system
P0170	Abnormal fuel system
P0201	No. 1 injector system
P0202	No. 2 injector system
P0203	No. 3 injector system
P0204	No. 4 injector system
P0234	Turbocharger wastegate system malfunction
P0243	Waste gate solenoid valve system
P0300	Random cylinder misfire detection system
P0301*	No. 1 cylinder misfire detection system
P0302*	No. 2 cylinder misfire detection system
P0303*	No. 3 cylinder misfire detection system
P0304*	No. 4 cylinder misfire detection system
P0325	Detonation sensor system
P0335	Crank angle sensor system
P0340	Exhaust camshaft position sensor system
P0403	EGR control solenoid valve system
P0421	Warm up catalyst malfunction
P0443	Purge control solenoid valve system
P0500	Vehicle speed sensor system
P0505	Idle speed control system
P0551*	Power steering fluid pressure switch system
P0710	Transmission oil temperature sensor system
P1012	Intake camshaft position sensor system
P1021	Oil feeder control valve system
P1603*	Battery back-up line system

NOTE:

- *If the engine warning lamp illuminates because of a malfunction of the engine-ECU, communication between M.U.T.-II/III and the engine-ECU is impossible. In this case, the diagnosis code cannot be read.*
- *After the engine-ECU has detected a malfunction, the engine warning lamp illuminates when the engine is next turned on and the same malfunction is re-detected. However, for items marked with a "*" in the diagnosis code number column, the engine warning lamp illuminates only on the first detection of the malfunction.*
- *After the engine warning lamp illuminates, it will be switched off under the following conditions.*
  - *When the engine-ECU monitored the power train malfunction three times* met set condition requirements, it detected no malfunction.*

  **: In this case, "one time" indicates from engine start to stop.*
  - *For misfiring malfunction, when driving conditions (engine speed, engine coolant temperature, etc.) are similar to those when the malfunction was first recorded.*
- *Sensor 1 indicates, the sensor mounted at a position closest to the engine, and sensor 2 indicates the sensor mounted at the position second closest to the engine.*

METHOD OF READING AND ERASING DIAGNOSIS CODES

Refer to P.00-5, GROUP 00 – How to Use Troubleshooting/Inspection Service Points.

DIAGNOSIS USING DIAGNOSIS 2 MODE

1. Switch the diagnosis mode of the engine control unit to DIAGNOSIS 2 mode using the M.U.T.-II/III.
2. Carry out a road test.
3. Take a reading of the diagnosis code and repair the problem location.
4. Turn the ignition switch to "LOCK" (OFF) position and then back to "ON" position again.

NOTE: By turning the ignition switch to "LOCK" (OFF) position, the ENGINE-ECU will switch the diagnosis mode from DIAGNOSIS 2 mode to DIAGNOSIS 1 mode.

5. Erase the diagnosis codes.

INSPECTION USING M.U.T.-II/III DATA LIST AND ACTUATOR TESTING

1. Carry out inspection by means of the data list and the actuator test function, if there is an abnormality, check and repair the chassis harness and components.
2. After repairing, re-check using the M.U.T.-II/III and check that the abnormal input and output have returned to normal as a result of the repairs.
3. Erase the diagnosis code memory.
4. Remove the M.U.T.-II/III, and then start the engine again and carry out a road test to confirm that the problem has disappeared.

FREEZE FRAME DATA

When the engine-ECU detects a malfunction and stores a diagnosis code, it also stores a current status of the engine. This function is called "Freeze frame data". By analyzing this "Freeze frame" data with the M.U.T.-II/III, an effective troubleshooting can be performed.
The display items of freeze frame data are shown below.

DISPLAY ITEM LIST

Item No.	Data		Unit
21	Engine coolant temperature sensor		°C
22	Engine speed		r/min.
24	Vehicle speed		km/h
81	Long-term fuel compensation (long-term fuel trim)		%
82	Short-term fuel compensation (short-term fuel trim)		%
88	Fuel control condition	Open loop	OL
		Closed loop	CL
		Open loop due to drive condition	OL-DRV.
		Open loop due to system malfunction	OL-SYS.
		Closed loop based on one oxygen sensor	CL- HO2S
87	Calculation load value		%
–	Diagnosis code during data recording		–

NOTE: If malfunctions have been detected in multiple systems, store one malfunction only, which has been detected first.

DRIVE CYCLE

By carrying out the test drive in the following three drive cycle patterns, the all monitoring can be accomplished for the diagnosis codes that is required by the vehicle driving to identify the fault. In other words, doing such a drive allows to regenerate any kind of trouble which involves illuminating the engine warning lamp (check engine lamp) and to verify the repair procedure has eliminated the trouble [the engine warning lamp (check engine lamp) is no longer illuminated].

⚠ CAUTION

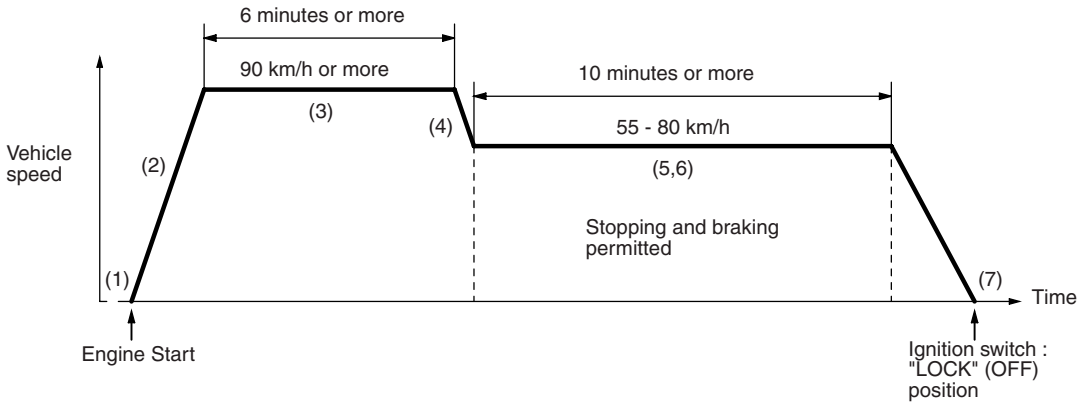
Two technicians should always be in the vehicle when carrying out a test drive.

NOTE: Check that the diagnosis code is not output before traveling in the Drive cycle pattern. Erase the diagnosis code if it has been output.

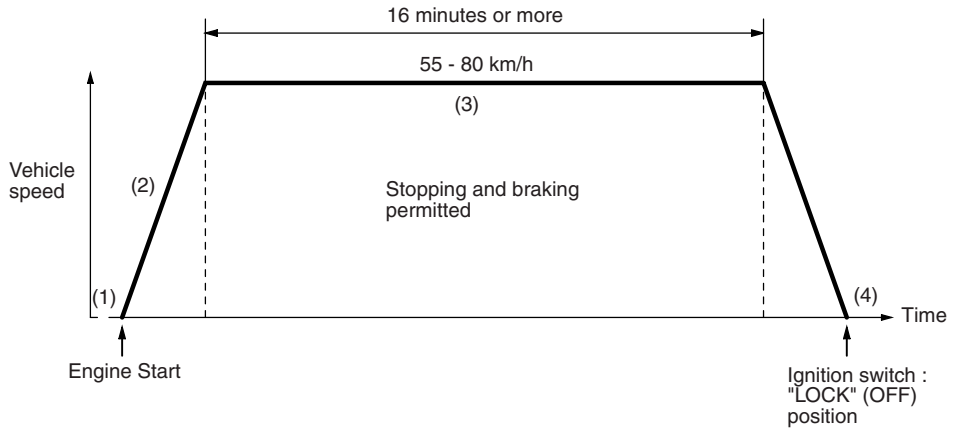
DRIVE CYCLE PATTERN LIST

Procedure	Monitor item	Diagnosis code
1	Catalytic converter monitor	P0421
2	Oxygen sensor (front) monitor	P0130
3	Other monitor	P0136, P0201, P0202, P0203, P0204, P0300, P0301, P0302, P0303, P0304, P0325, P0500, P0551

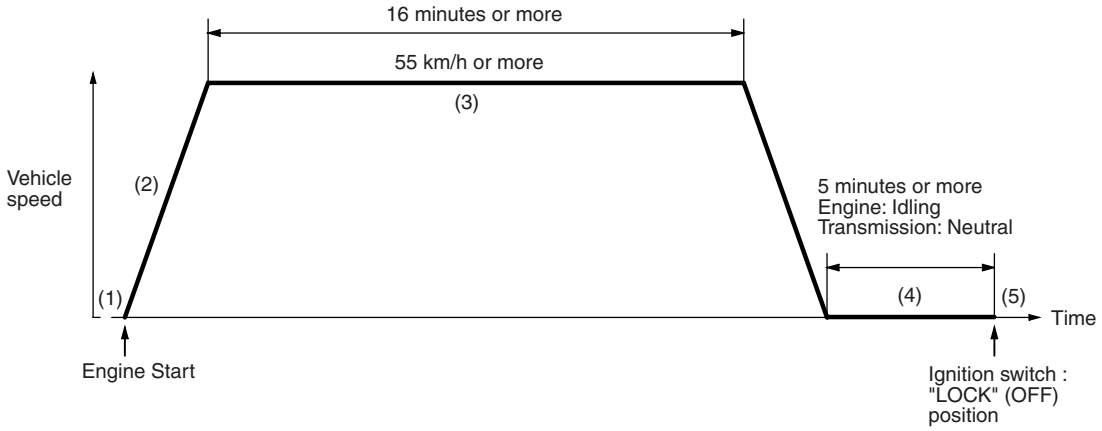
Procedure 1

Catalytic converter monitor	
Diagnosis code No.	P0421
Drive cycle pattern	One trip monitor [from start to ignition switch to "LOCK" (OFF) position] will be completed while traveling with the following drive cycle pattern. It will take 16 minutes or more.  AK301815AB
Inspection condition	• Atmospheric temperature: −10°C or more
Test procedure	1. Engine: start 2. Accelerate until the vehicle speed is 90 km/h or more. 3. Travel for 6 minutes or more while keeping the vehicle speed at 90 km/h or more. 4. Decelerate until the vehicle speed is within 80 km/h or less. 5. While traveling at 55 − 80 km/h for 10 minutes or more, fully close the throttle at least once in 2 minutes and decelerate for 10 seconds or more. • Do not repeat deceleration too often. • Vehicle speed may go below 55 km/h after the deceleration. • Stopping and braking are permitted. (If stopped or drive at 55 km/h or less for more than 5 minutes the monitoring may be stopped. In this case please restart monitoring from the beginning.) 6. After completing the above deceleration, bring the vehicle speed back to 55 − 80 km/h and keep it in the range until starting the deceleration again. • Repeat the above deceleration at least 5 times. 7. Return the vehicle to the shop, then turn the ignition switch to "LOCK" (OFF) position.

Procedure 2

Oxygen sensor (front) monitor	
Diagnosis code No.	P0130
Drive cycle pattern	One trip monitor [from start to ignition switch to "LOCK" (OFF) position] will be completed while traveling with the following drive cycle pattern. It will take 16 minutes or more.  AK301816AB
Inspection conditions	• Engine coolant temperature: After engine warm up • Atmospheric temperature: −10°C or more
Test procedure	1. Engine: start 2. Accelerate until the vehicle speed is 55 − 80 km/h. 3. While keeping the accelerator pedal opening degree constant, keep the vehicle speed at 55 − 80km/h and travel for 16 minutes or more. • Stopping and braking during this operation are permitted. 4. Return the vehicle to the shop, then turn the ignition switch to "LOCK" (OFF) position.

Procedure 3

Other monitor	
Diagnosis code No.	P0136, P0201, P0202, P0203, P0204, P0300, P0301, P0302, P0303, P0304, P0325, P0500, P0551
Drive cycle pattern	One trip monitor [from start to ignition switch to "LOCK" (OFF) position] will be completed while traveling with the following drive cycle pattern. It will take 21 minutes or more.  AK301817AB
Inspection conditions	• Engine coolant temperature: After engine warm up • Atmospheric temperature: −10°C or more
Test procedure	1. Engine: start 2. Accelerate until the vehicle speed is 55 km/h. 3. While keeping the accelerator pedal opening degree constant, keep the vehicle speed at 55 km/h and travel for 16 minutes or more. 4. Return the vehicle to the shop. 5. After stopping the vehicle, continue idling for 5 minutes, and then turn the ignition switch to "LOCK" (OFF) position.

READINESS TEST STATUS

The engine-ECU monitors the following main diagnosis items, judges if these items are in good condition or not, and the stores its history. This history can be read out by using M.U.T.-II/III. (If the ECU has judged a item before, the M.U.T.-II/III displays "Complete").

In addition, if diagnosis codes are erased or the battery cable is disconnected, this history will also be erased (the memory will be reset).

- Catalyst: P0421
- Oxygen sensor: P0130
- Oxygen sensor heater: P0135, P0141

FAIL-SAFE FUNCTION REFERENCE TABLE

When the main sensor malfunctions are detected by the diagnosis function, the vehicle is controlled by means of the pre-set control logic to maintain safe conditions for driving.

Malfunctioning item	Control contents during malfunction
Air flow sensor	1. Uses the throttle position sensor signal and engine speed signal (crank angle sensor signal) to take reading of the basic injector drive time and basic ignition timing from the pre-set mapping. 2. Fixes the idle speed control servo in the appointed position so idle control is not performed.
Intake air temperature sensor	Controls as if the intake air temperature is 25°C.
Barometric pressure sensor	Controls as if the barometric pressure is 101 kPa.
Throttle position sensor	No increase in fuel injection amount during acceleration due to the throttle position sensor signal.
Engine coolant temperature sensor	Controls as if the engine coolant temperature is 80°C.
Intake camshaft position sensor	Turns the oil feeder control valve OFF, and sets the valve timing to the most retarded angle.
Exhaust camshaft position sensor	1. Injects fuel simultaneously into all cylinders (provided that the TDC of the No. 1 cylinder is not detected even once after the ignition switch has been turned "ON"). 2. Cuts the supply of fuel 4 seconds after detecting a failure (provided that the TDC of the No. 1 cylinder is not detected even once after the ignition switch has been turned "ON").
Oxygen sensor (front)	Air-fuel ratio feedback control (closed loop control) is not performed.
Oxygen sensor (rear)	Performs the feedback control (closed loop control) of the air-fuel ratio by using only the signal of the oxygen (front) installed on the front of the catalytic converter.
Detonation sensor	Fixes the ignition timing as that for regular gasoline.
Ignition coil (incorporating power transistor)	Cuts off the fuel supply to cylinders with an abnormal ignition.
Alternator FR terminal	Does not control the output of the alternator according to an electrical load. (works as a normal alternator)
Misfiring	If the detected misfiring causes damage to the catalyst, the misfiring cylinder will be shut down.

INSPECTION CHART FOR DIAGNOSIS CODE

M1131151001962

Code No.	Diagnosis item	Reference page
P0090	Fuel pressure control solenoid valve system	P.13A-19
P0100	Air flow sensor system	P.13A-24
P0105	Barometric pressure sensor system	P.13A-35
P0110	Intake air temperature sensor system	P.13A-45
P0115	Engine coolant temperature sensor system	P.13A-52
P0120	Throttle position sensor system	P.13A-60
P0125*	Feedback system monitor	P.13A-70
P0130	Oxygen sensor (front) system	P.13A-75
P0135	Oxygen sensor heater (front) system	P.13A-82
P0136	Oxygen sensor (rear) system	P.13A-88
P0141	Oxygen sensor heater (rear) system	P.13A-95
P0170	Abnormal fuel system	P.13A-101
P0201	No. 1 Injector system	P.13A-105
P0202	No. 2 Injector system	P.13A-111
P0203	No. 3 Injector system	P.13A-117
P0204	No. 4 Injector system	P.13A-123
P0234	Turbocharger wastegate system malfunction	P.13A-129
P0243	Waste gate solenoid valve system	P.13A-130
P0300	Random cylinder misfire detection system	P.13A-135
P0301*	No. 1 cylinder misfire detection system	P.13A-139
P0302*	No. 2 cylinder misfire detection system	P.13A-142
P0303*	No. 3 cylinder misfire detection system	P.13A-145
P0304*	No. 4 cylinder misfire detection system	P.13A-148
P0325	Detonation sensor system	P.13A-151
P0335	Crank angle sensor system	P.13A-155
P0340	Exhaust camshaft position sensor system	P.13A-166
P0403	EGR control solenoid valve system	P.13A-175
P0421	Warm up catalyst malfunction	P.13A-180
P0443	Purge control solenoid valve system	P.13A-182
P0500	Vehicle speed sensor system	P.13A-187
P0505	Idle speed control system	P.13A-190
P0513	Immobilizer system	P.13A-195
P0551*	Power steering fluid pressure switch system	P.13A-197
P0622	Alternator FR terminal system	P.13A-203
P0710	Transmission oil temperature sensor system	P.13A-208

Code No.	Diagnosis item	Reference page
P1012	Intake camshaft position system	P.13A-216
P1021	Oil feeder control valve system	P.13A-225
P1603*	Battery back-up line system	P.13A-230

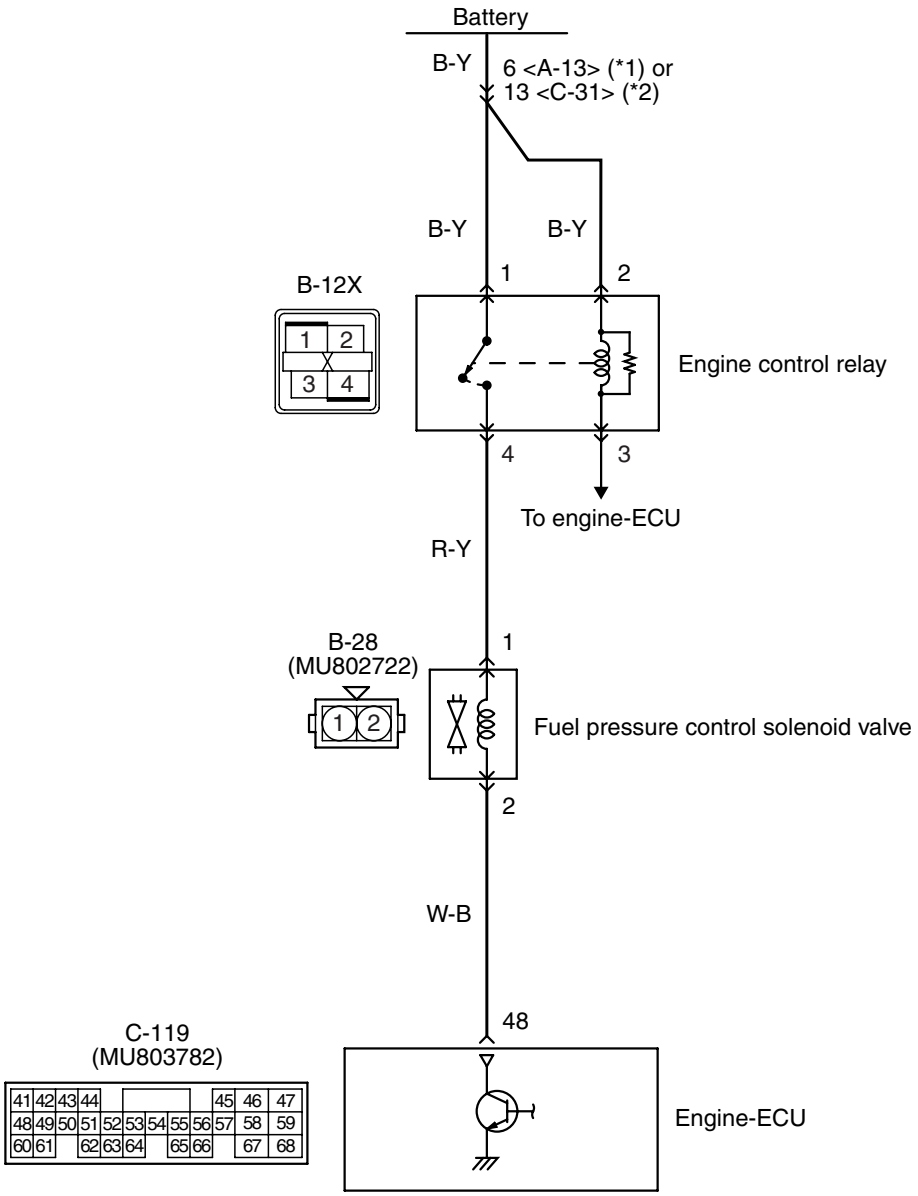
NOTE:

- *Do not replace the engine-ECU until a through terminal check reveals there are no short/open circuit.*
- *Check that the engine-ECU earth circuit is normal before checking for the cause of the problem.*
- *After the engine-ECU has detected a malfunction, a diagnosis code is recorded the next time the engine is started and the same malfunction is re-detected. However, for items marked with "*", the diagnosis code is recorded on the first detection of the malfunction.*
- *Sensor 1 indicates the sensor mounted at a position closest to the engine, and sensor 2 indicates the sensor mounted at the position second closest to the engine.*

INSPECTION PROCEDURE FOR DIAGNOSIS CODES

Code No. P0090: Fuel Pressure Control Solenoid Valve System

Fuel pressure control solenoid valve circuit



NOTE
*1: L.H. drive vehicles
*2: R.H. drive vehicles

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

AK501799AB

OPERATION

- Power is supplied from the engine control relay (terminal No. 4) to the fuel pressure control solenoid valve (terminal No. 1).
- The engine-ECU (terminal No. 48) causes the power transistor in the unit to be ON to supply power to the fuel pressure control solenoid valve (terminal No. 2).

FUNCTION

- In response to a signal from the engine-ECU, the fuel pressure control solenoid valve switches the pressure to be introduced into the fuel pressure regulator between the intake manifold negative pressure and atmospheric pressure.

TROUBLE JUDGMENT

Check Condition

- Battery voltage is 10 V or more.

Judgment Criterion

- Surge voltage cannot be detected within 1 seconds from the time when the fuel pressure control solenoid valve has changed from ON to OFF.

PROBABLE CAUSES

- Failed fuel pressure control solenoid valve
- Open/short circuit in fuel pressure control solenoid valve circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-II/III actuator test

- Item No. 09: Fuel pressure control solenoid valve

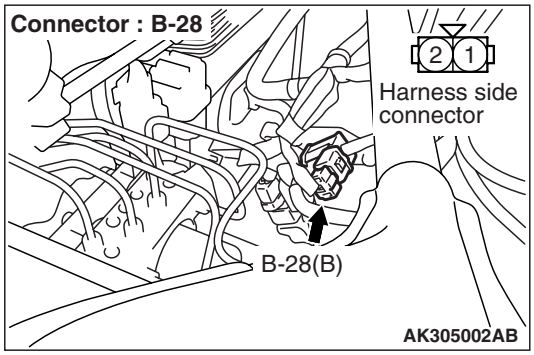
  OK: Operating sound can be heard and the valve vibrates.

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points) P.00-5.

NO : Go to Step 2 .

STEP 2. Connector check: B-28 fuel pressure control solenoid valve connector

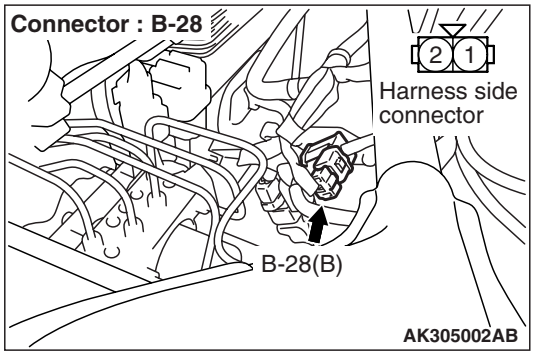


Q: Is the check result normal?

YES : Go to Step 3 .

NO : Repair or replace the connector.

STEP 3. Perform resistance measurement at B-28 fuel pressure control solenoid valve connector.



- Disconnect connector, and measure at solenoid valve side.
- Resistance between terminal No. 1 and No. 2.

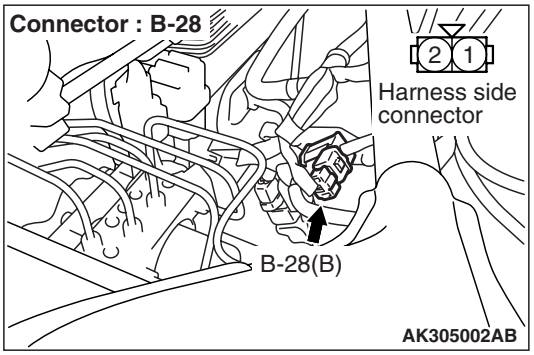
  OK: 28 – 36 Ω (at 20°C)

Q: Is the check result normal?

YES : Go to Step 4 .

NO : Replace the fuel pressure control solenoid valve.

STEP 4. Perform voltage measurement at B-28 fuel pressure control solenoid valve connector.

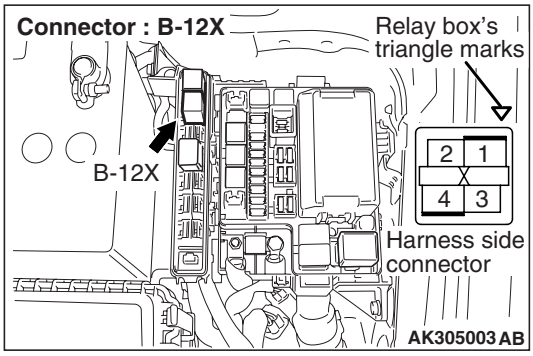


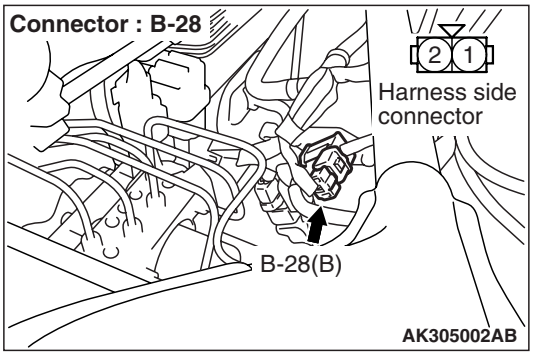
- Disconnect connector, and measure at harness side.
- Ignition switch: "ON"
- Voltage between terminal No. 1 and earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 6 .
NO : Go to Step 5 .

STEP 5. Connector check: B-12X engine control relay connector

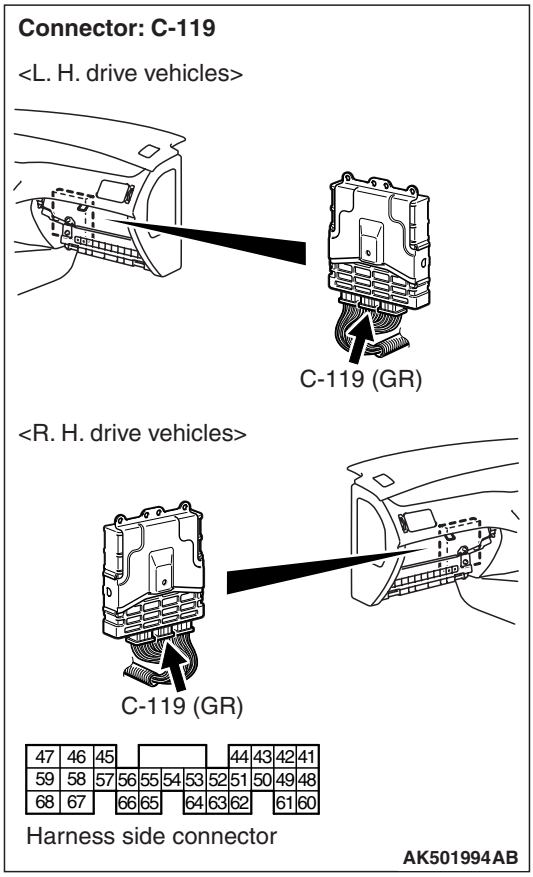




Q: Is the check result normal?
YES : Check and repair harness between B-28 (terminal No. 1) fuel pressure control solenoid valve connector and B-12X (terminal No. 4) engine control relay connector.
- Check power supply line for open/short circuit.

NO : Repair or replace the connector.

STEP 6. Perform voltage measurement at C-119 engine-ECU connector.

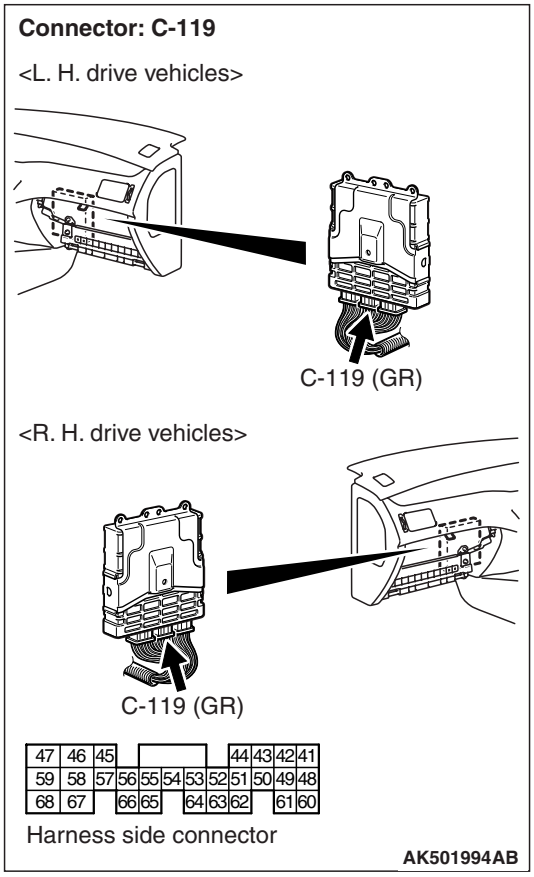


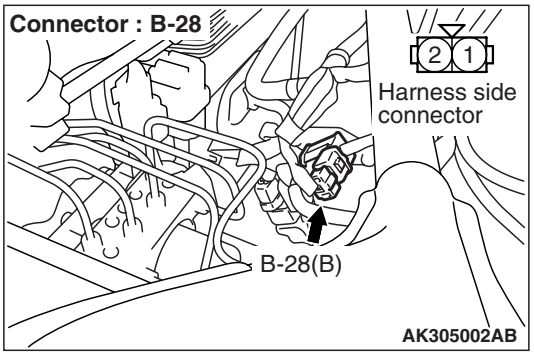
- Disconnect connector, and measure at harness side.
- Ignition switch: "ON"
- Voltage between terminal No. 48 and earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 8 .
NO : Go to Step 7 .

STEP 7. Connector check: C-119 engine-ECU connector





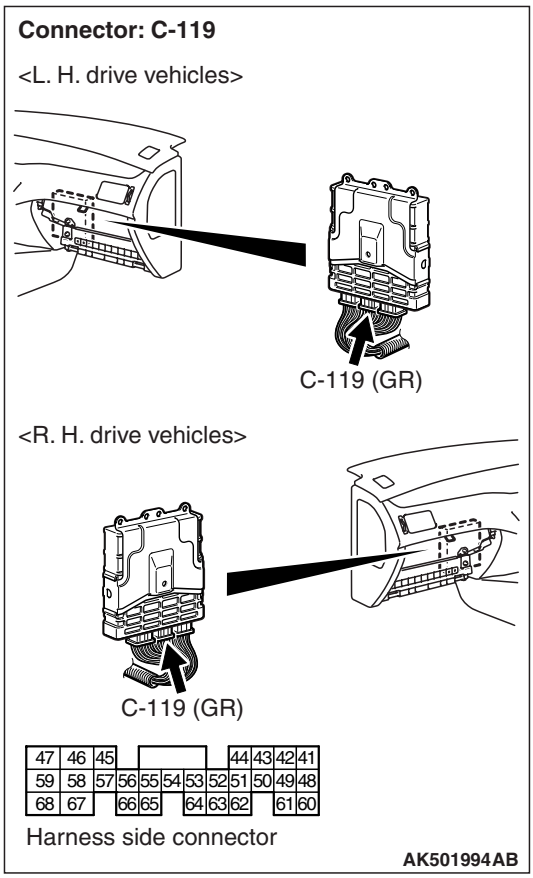
Q: Is the check result normal?

YES : Check and repair harness between B-28 (terminal No. 2) fuel pressure control solenoid valve connector and C-119 (terminal No. 48) engine-ECU connector.

- Check output line for open/short circuit.

NO : Repair or replace the connector.

STEP 8. Connector check: C-119 engine-ECU connector

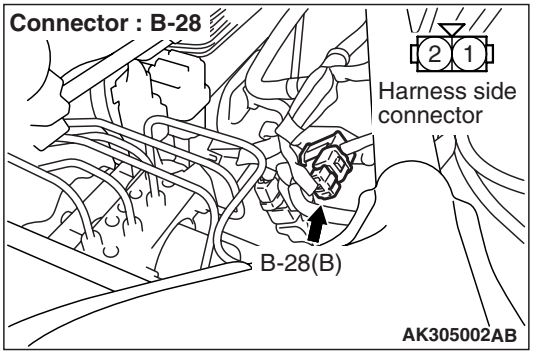


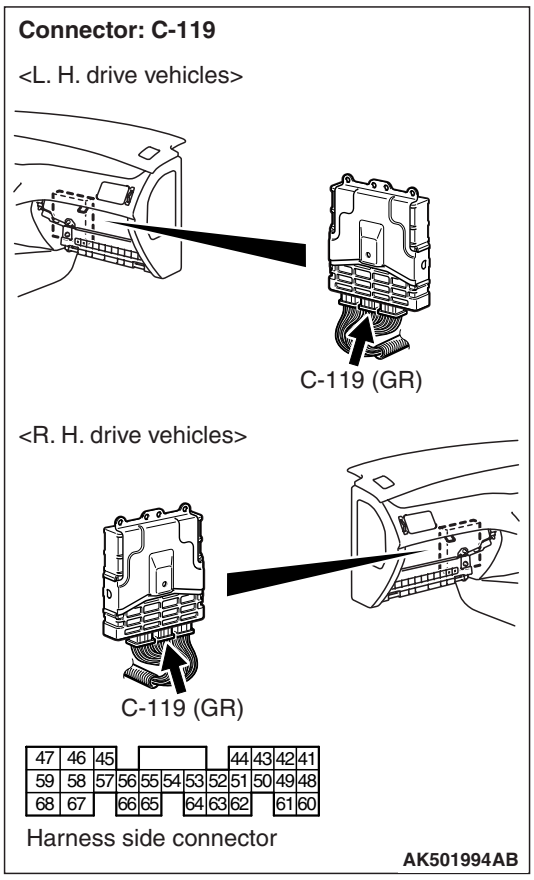
Q: Is the check result normal?

YES : Go to Step 9 .

NO : Repair or replace the connector.

STEP 9. Check harness between B-28 (terminal No. 2) fuel pressure control solenoid valve connector and C-119 (terminal No. 48) engine-ECU connector.

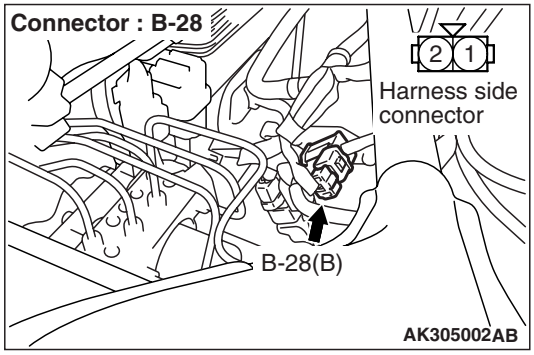


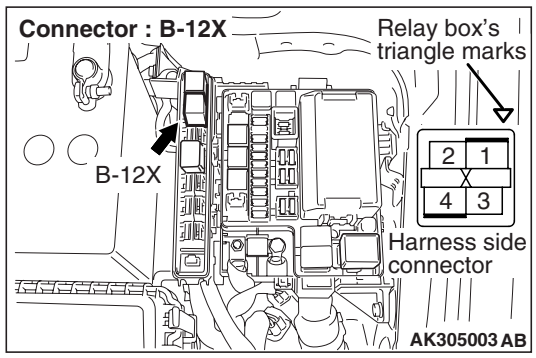


- Check output line for damage.

Q: Is the check result normal?
YES : Go to Step 10 .
NO : Repair the damaged harness wire.

STEP 10. Check harness between B-28 (terminal No. 1) fuel pressure control solenoid valve connector and B-12X (terminal No. 4) engine control relay connector.





- Check power supply line for damage.

Q: Is the check result normal?
YES : Go to Step 11 .
NO : Repair the damaged harness wire.

STEP 11. M.U.T.-II/III actuator test

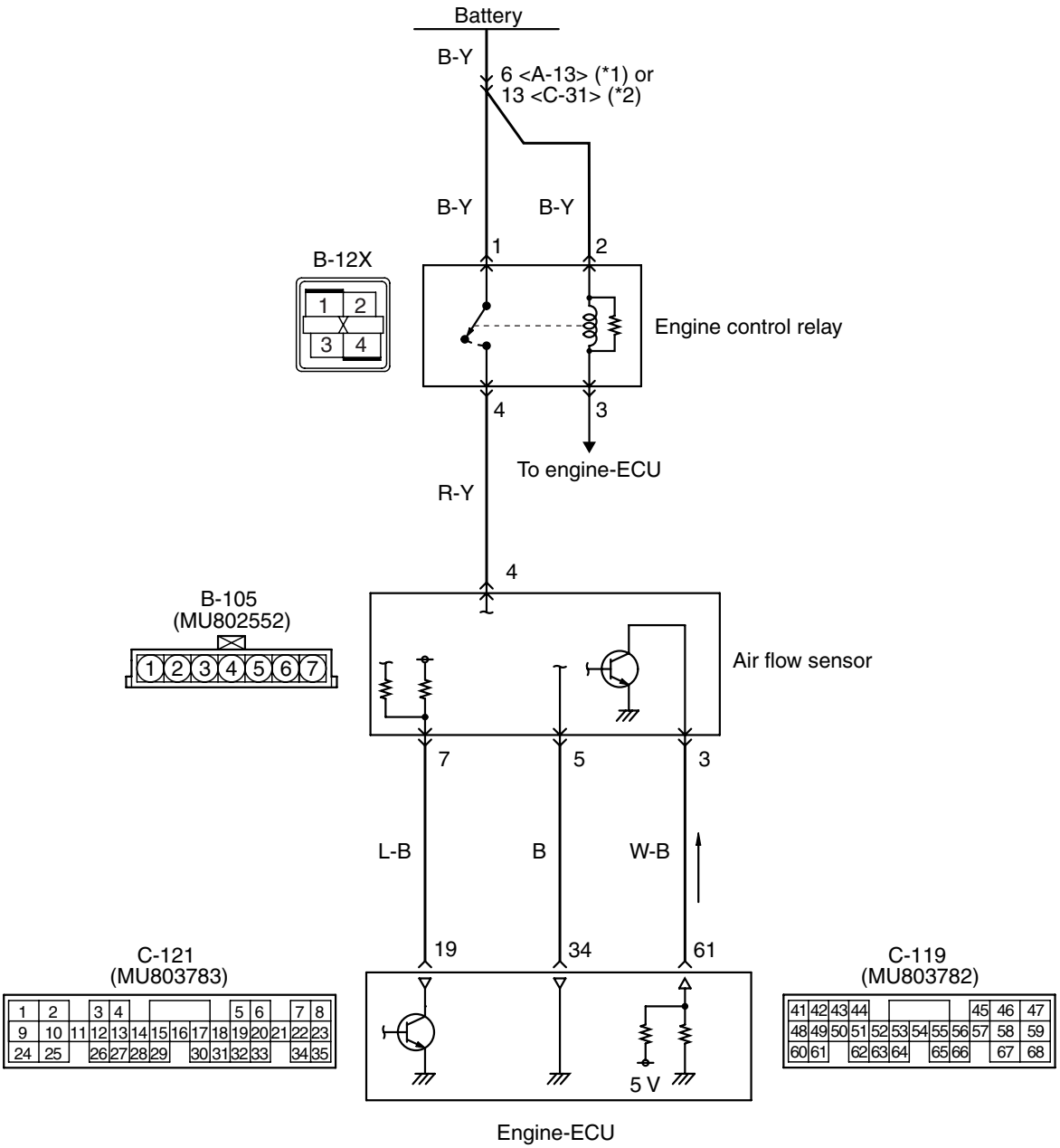
- Item No. 09: Fuel pressure control solenoid valve

OK: Operating sound can be heard and the valve vibrates.

Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-5).
NO : Replace the engine-ECU.

Code No. P0100: Air Flow Sensor System

Air flow sensor circuit



NOTE
*1: L.H. drive vehicles
*2: R.H. drive vehicles

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

AK501800AB

OPERATION

- Power is supplied to the air flow sensor (terminal No. 4) from the engine control relay (terminal No. 4) and earthed to the engine-ECU (terminal No. 34) from the air flow sensor (terminal No. 5).
- A power voltage of 5 V is applied to the air flow sensor output terminal (terminal No. 3) from the engine-ECU (terminal No. 61).
- An air flow sensor filter reset signal is inputted to the air flow sensor (terminal No. 7) from the engine-ECU (terminal No. 19).

FUNCTION

- Air flow sensor outputs a pulse signal proportional to the intake air flow rate.
- The engine-ECU determines the basic injection timing of the injector using the pulse signal output from the air flow sensor and the engine speed signal.
- When the throttle position sensor output is low, the engine-ECU causes the power transistor in the unit to be ON to send an air flow sensor filter reset signal to the air flow sensor. In response to the reset signal, the air flow sensor resets the filter circuit to improve the ability of the air flow sensor to measure the air flow rate in the area where the intake air flow rate is low.

TROUBLE JUDGMENT

Check Condition

- Engine speed of 500 r/min. or more.

Judgment Criterion

- The sensor output frequency of 3.3 Hz or more for 2 seconds.

PROBABLE CAUSES

- Failed air flow sensor
- Open/short circuit in air flow sensor circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-II/III data list

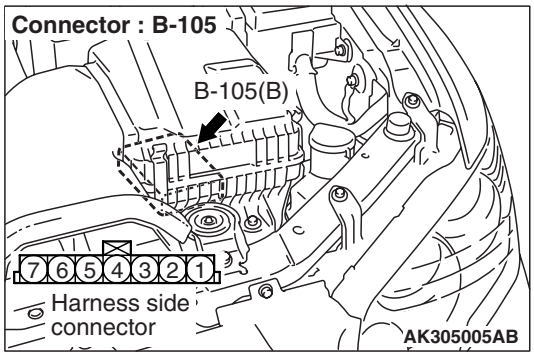
- Refer to Data List Reference Table P.13A-372.
  a. Item No. 12: Air flow sensor

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-5).

NO : Go to Step 2 .

STEP 2. Connector check: B-105 air flow sensor connector

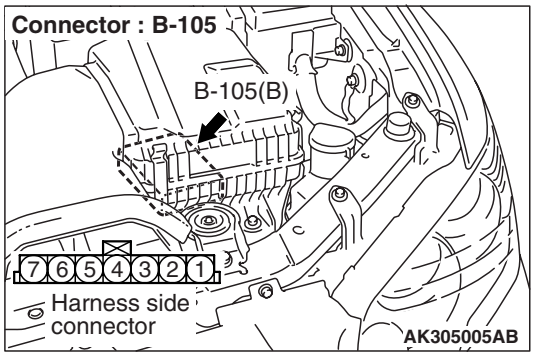


Q: Is the check result normal?

YES : Go to Step 3 .

NO : Repair or replace the connector.

STEP 3. Perform voltage measurement at B-105 air flow sensor connector.



- Disconnect connector, and measure at harness side.
- Ignition switch: "ON"
- Voltage between terminal No. 3 and earth.

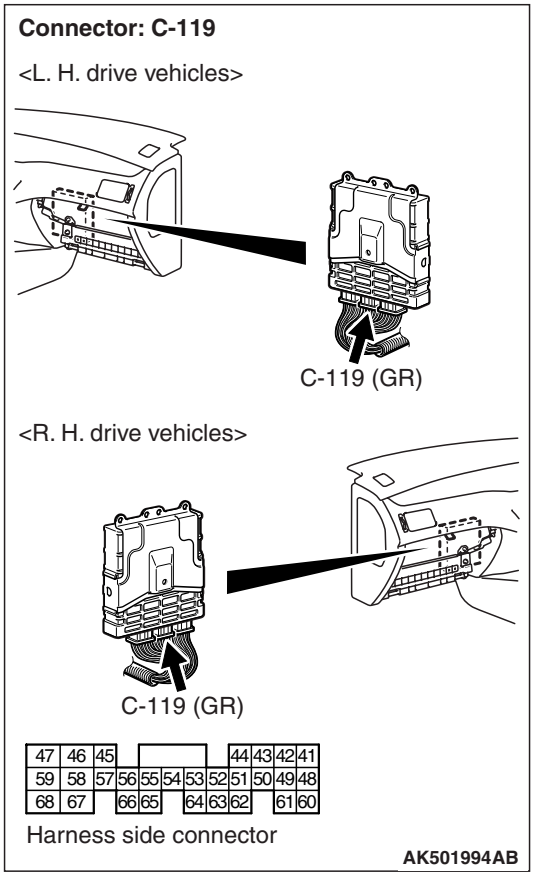
OK: 4.9 – 5.1 V

Q: Is the check result normal?

YES : Go to Step 9 .

NO : Go to Step 4 .

STEP 4. Perform voltage measurement at C-119 engine-ECU connector.



- Measure engine-ECU terminal voltage.
- Ignition switch: "ON"
- Voltage between terminal No. 61 and earth.

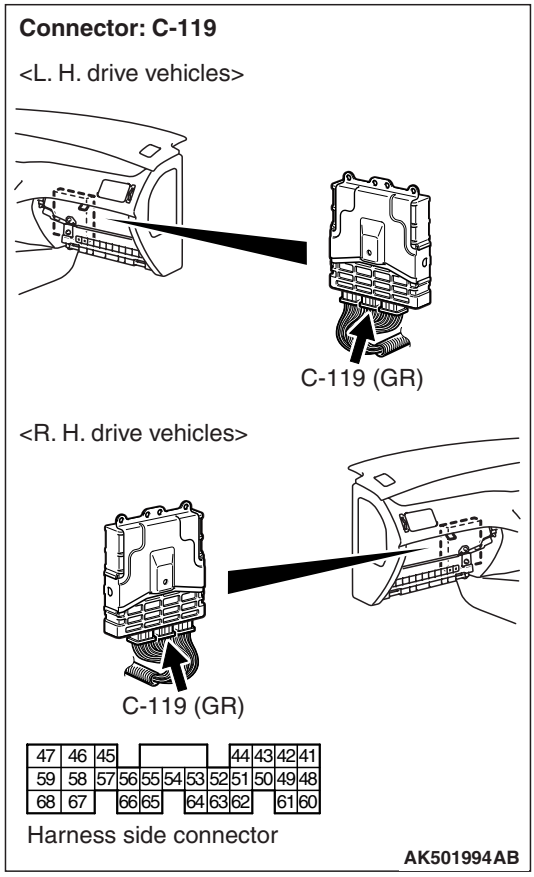
OK: 4.9 – 5.1 V

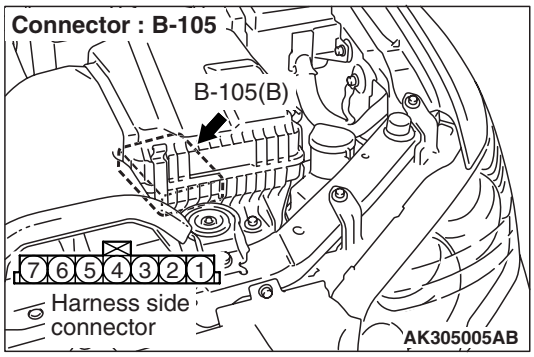
Q: Is the check result normal?

YES : Go to Step 5 .

NO : Go to Step 6 .

STEP 5. Connector check: C-119 engine-ECU connector





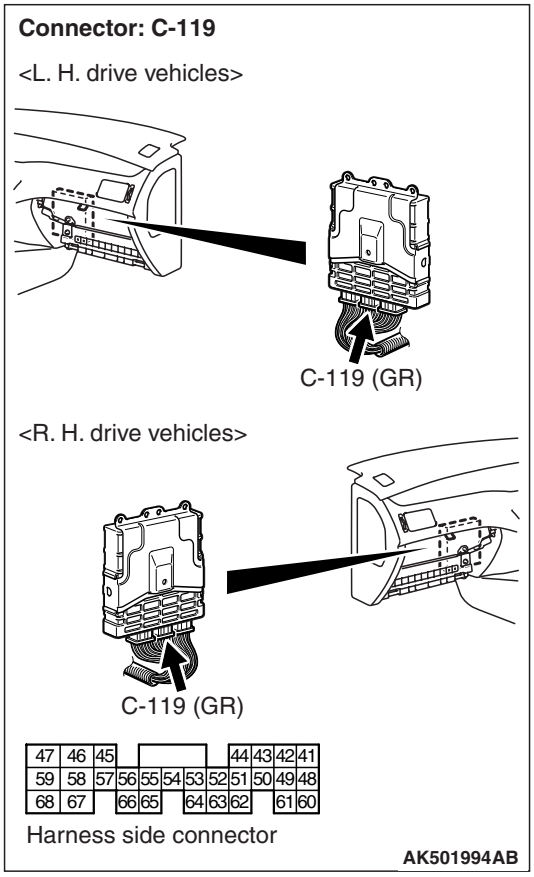
Q: Is the check result normal?

YES : Check and repair harness between B-105 (terminal No. 3) air flow sensor connector and C-119 (terminal No. 61) engine-ECU connector.

- Check output line for open circuit.

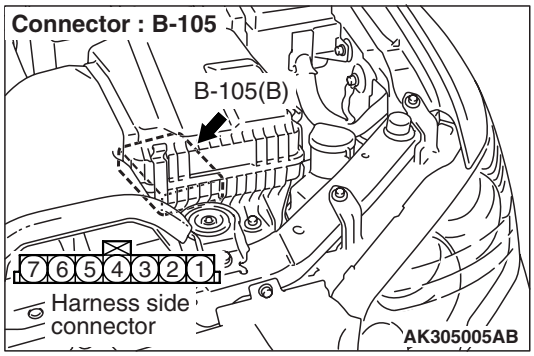
NO : Repair or replace the connector.

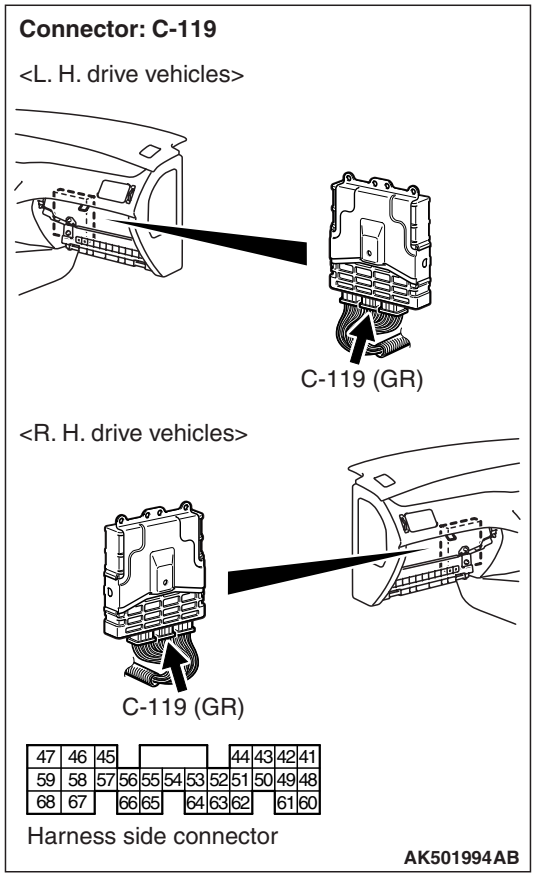
STEP 6. Connector check: C-119 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair or replace the connector.

STEP 7. Check harness between B-105 (terminal No. 3) air flow sensor connector and C-119 (terminal No. 61) engine-ECU connector.





- Check output line for short circuit.

Q: Is the check result normal?
YES : Go to Step 8 .
NO : Repair the damaged harness wire.

STEP 8. M.U.T.-II/III data list

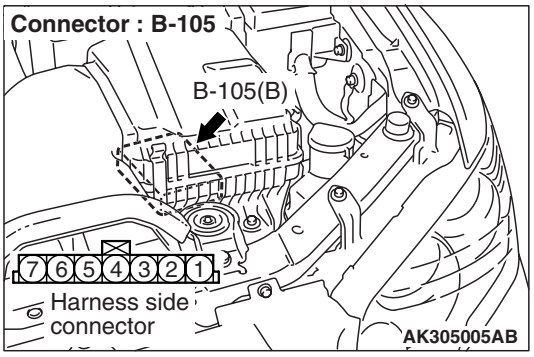
- Refer to Data List Reference Table P.13A-372.
  a. Item No. 12: Air flow sensor

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-5).

NO : Replace the engine-ECU.

STEP 9. Perform voltage measurement at B-105 air flow sensor connector.



- Disconnect connector, and measure at harness side.
- Ignition switch: "ON"
- Voltage between terminal No. 4 and earth.

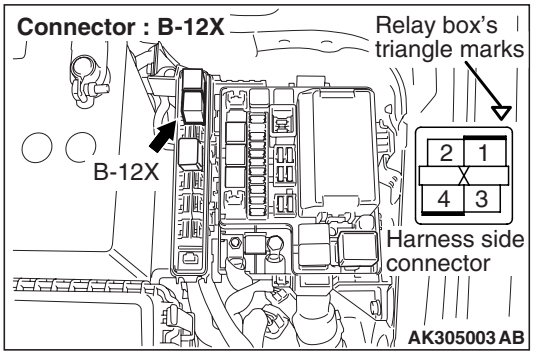
OK: System voltage

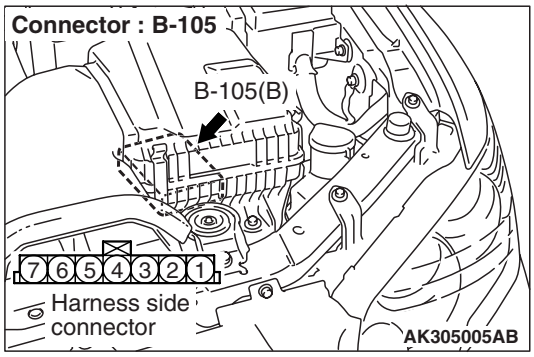
Q: Is the check result normal?

YES : Go to Step 11 .

NO : Go to Step 10 .

STEP 10. Connector check: B-12X engine control relay connector





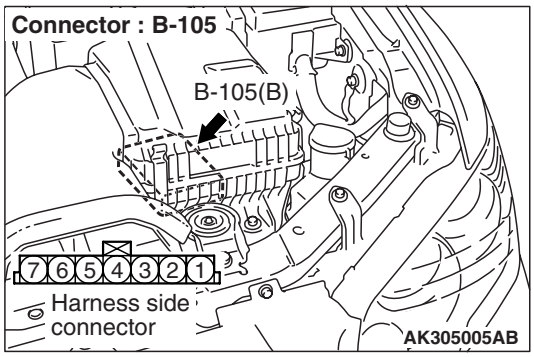
Q: Is the check result normal?

YES : Check and repair harness between B-105 (terminal No. 4) air flow sensor connector and B-12X (terminal No. 4) engine control relay connector.

- Check power supply line for open/short circuit.

NO : Repair or replace the connector.

STEP 11. Perform resistance measurement at B-105 air flow sensor connector.



- Disconnect and measure at harness side.
- Resistance between terminal No. 5 and earth.

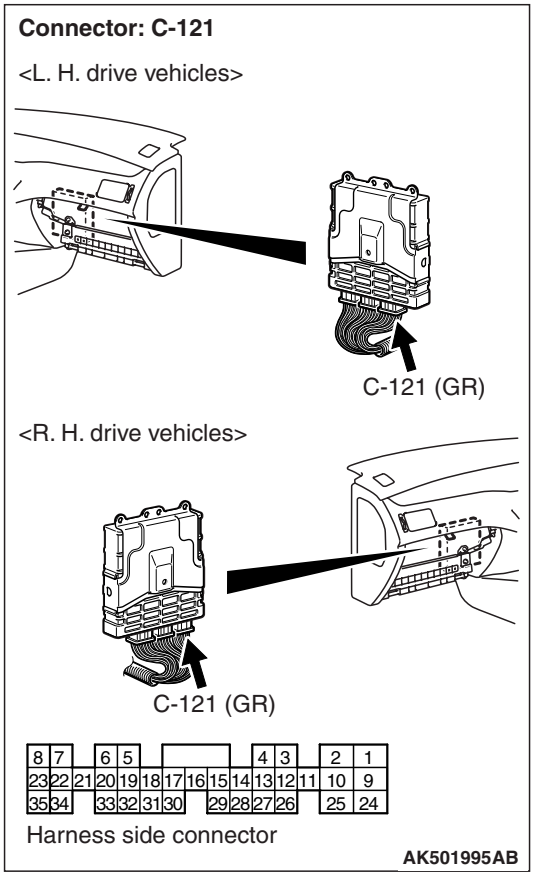
OK: 2 Ω or less

Q: Is the check result normal?

YES : Go to Step 14 .

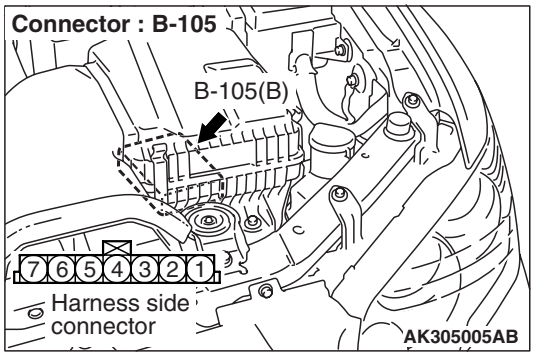
NO : Go to Step 12 .

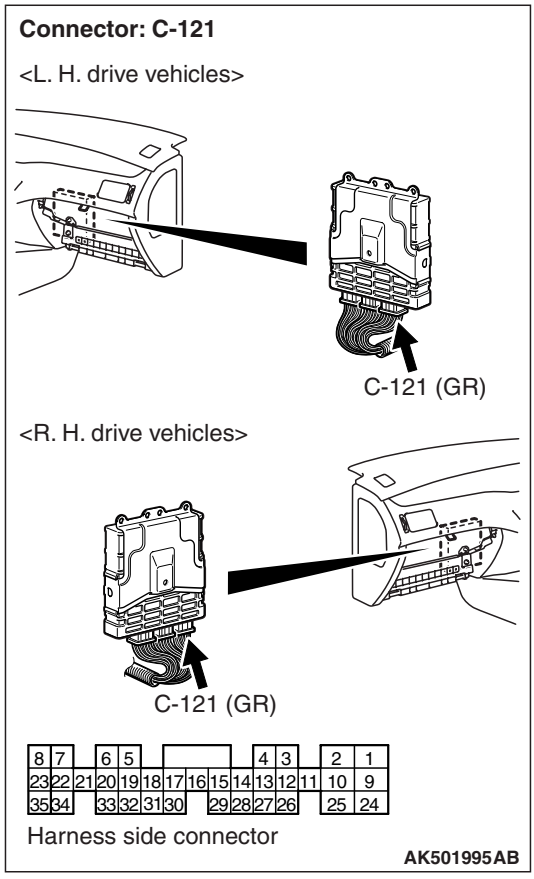
STEP 12. Connector check: C-121 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 13 .
NO : Repair or replace the connector.

STEP 13. Check harness between B-105 (terminal No. 5) air flow sensor connector and C-121 (terminal No. 34) engine-ECU connector.

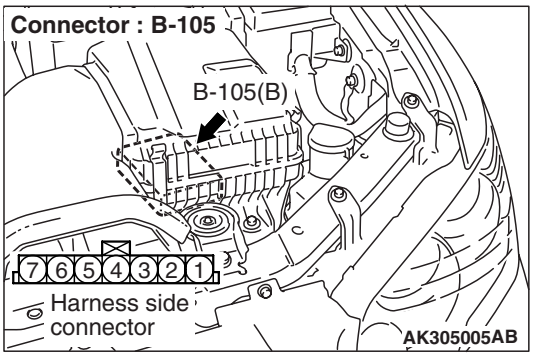




- Check earthing line for open circuit and damage.

Q: Is the check result normal?
YES : Go to Step 8 .
NO : Repair the damaged harness wire.

STEP 14. Perform voltage measurement at B-105 air flow sensor connector.

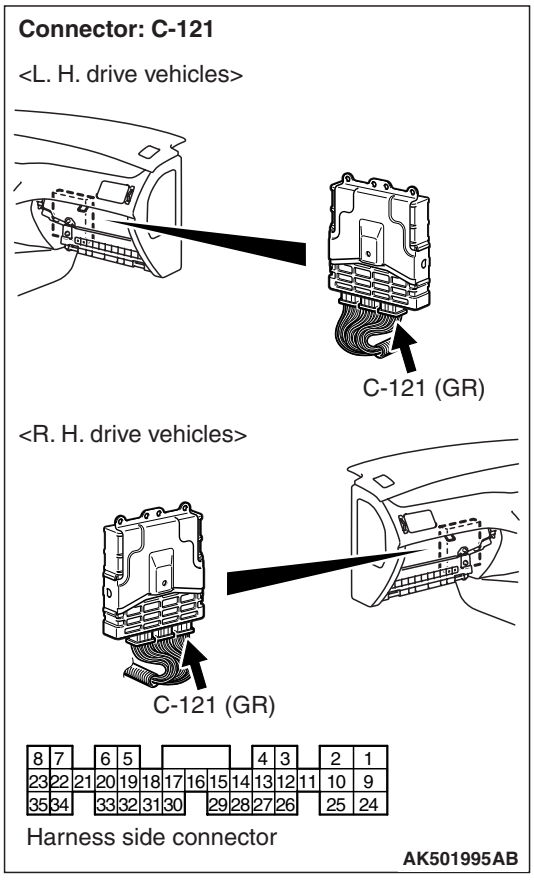


- Use special tool test harness (MB991709) to connect connector, and measure at pick-up harness.
- Ignition switch: "ON"
- Voltage between terminal No. 7 and earth.

OK: 6 – 9 V

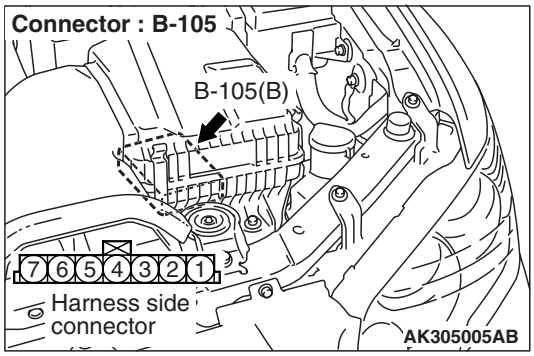
Q: Is the check result normal?
YES : Go to Step 17 .
NO : Go to Step 15 .

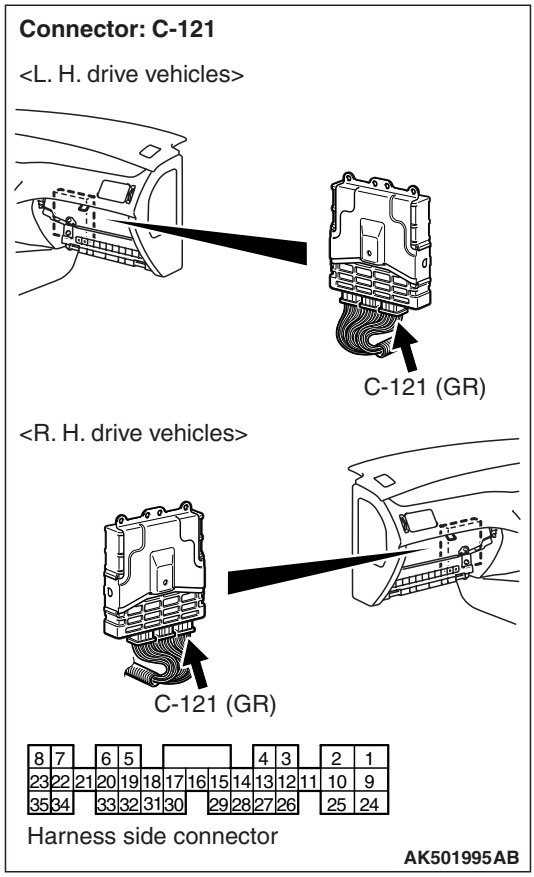
STEP 15. Connector check: C-121 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 16 .
NO : Repair or replace the connector.

STEP 16. Check harness between B-105 (terminal No. 7) air flow sensor connector and C-121 (terminal No. 19) engine-ECU connector.

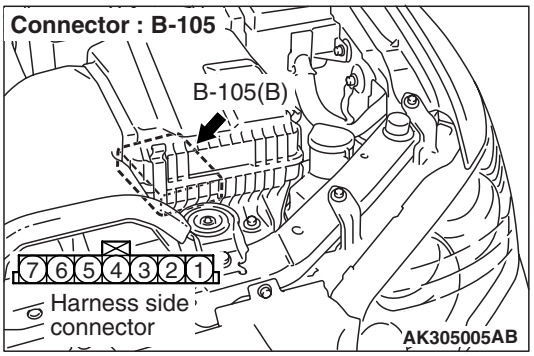




- Check reset signal line for short circuit.

Q: Is the check result normal?
YES : Replace the air flow sensor.
NO : Repair the damaged harness wire.

STEP 17. Perform voltage measurement at B-105 air flow sensor connector.

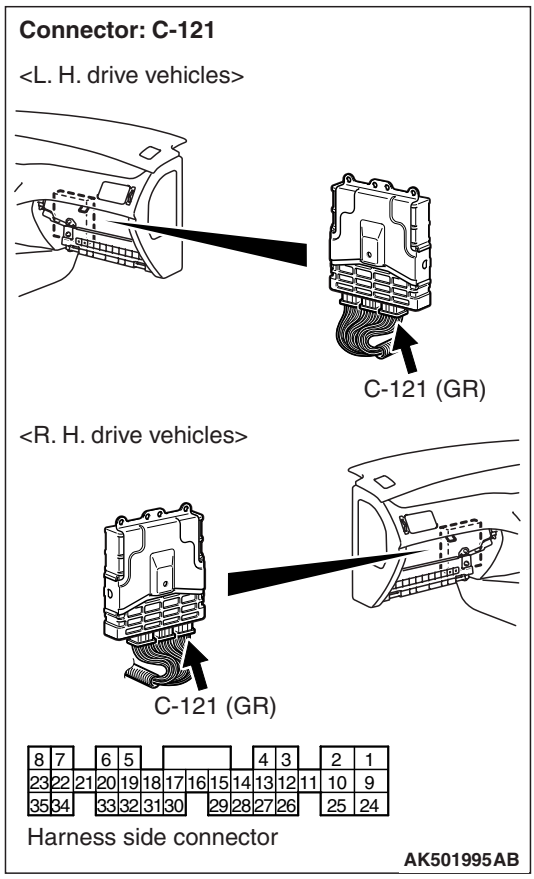


- Use special tool test harness (MB991709) to connect connector, and measure at pick-up harness.
- Transmission: Neutral
- Voltage between terminal No. 7 and earth.

OK:
0 – 1 V (Engine: Idling)
6 – 9 V (Engine: 3,000 r/min.)

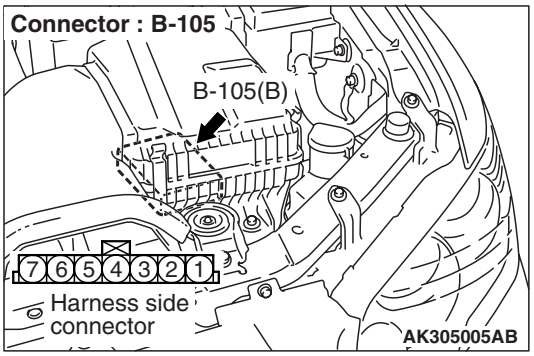
Q: Is the check result normal?
YES : Go to Step 20 .
NO : Go to Step 18 .

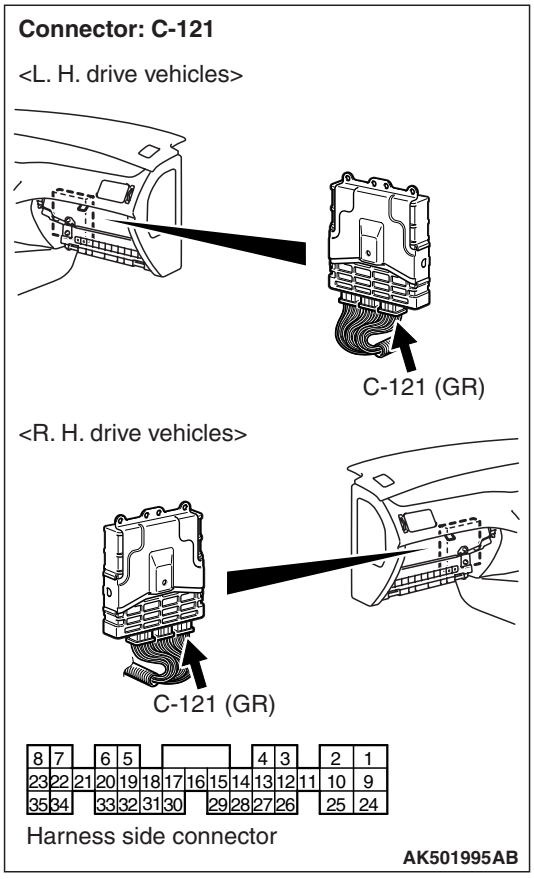
STEP 18. Connector check: C-121 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 19 .
NO : Repair or replace the connector.

STEP 19. Check harness between B-105 (terminal No. 7) air flow sensor connector and C-121 (terminal No. 19) engine-ECU connector.

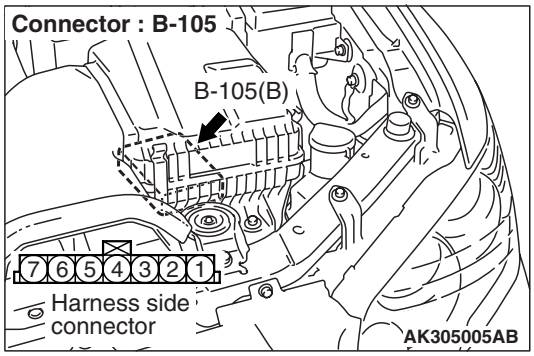




- Check reset signal line for open circuit and damage.

Q: Is the check result normal?
YES : Go to Step 8 .
NO : Repair the damaged harness wire.

STEP 20. Perform output wave pattern measurement at B-105 air flow sensor connector (Using an oscilloscope).



- Use special tool test harness (MB991709) to connect connector, and measure at pick-up harness.
- Engine: Idling
- Transmission: Neutral
- Voltage between terminal No. 3 and earth.

OK: Waveforms should be displayed on inspection procedure using an oscilloscope (Refer to P.13A-385) and noise should not be displayed in the waveform.

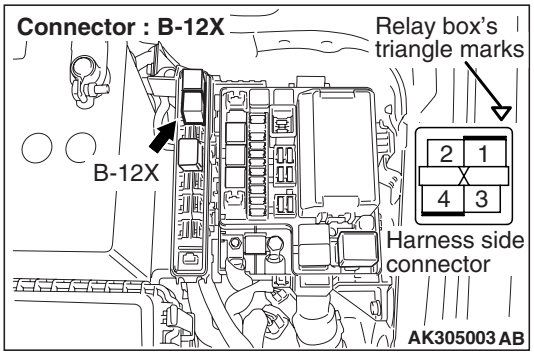
Q: Is the check result normal?
YES : Go to Step 8 .
NO : Go to Step 21 .

STEP 21. Replace the air flow sensor.

- After replacing the air flow sensor, re-check the trouble symptoms.

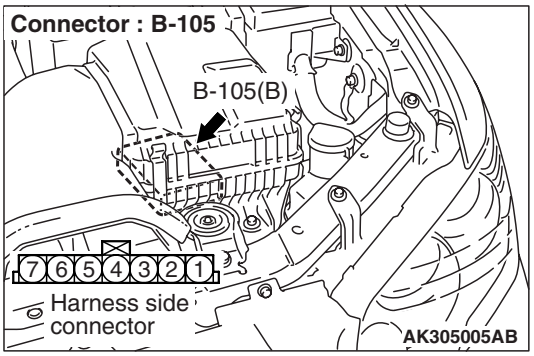
Q: Is the check result normal?
YES : Go to Step 22 .
NO : The check is end.

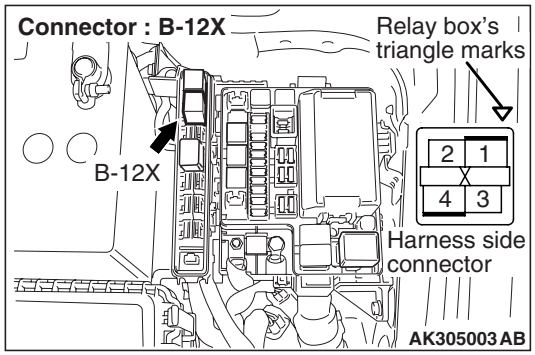
STEP 22. Connector check: B-12X engine control relay connector



Q: Is the check result normal?
YES : Go to Step 23 .
NO : Repair or replace the connector.

STEP 23. Check harness between B-105 (terminal No. 4) air flow sensor connector and B-12X (terminal No. 4) engine control relay connector.

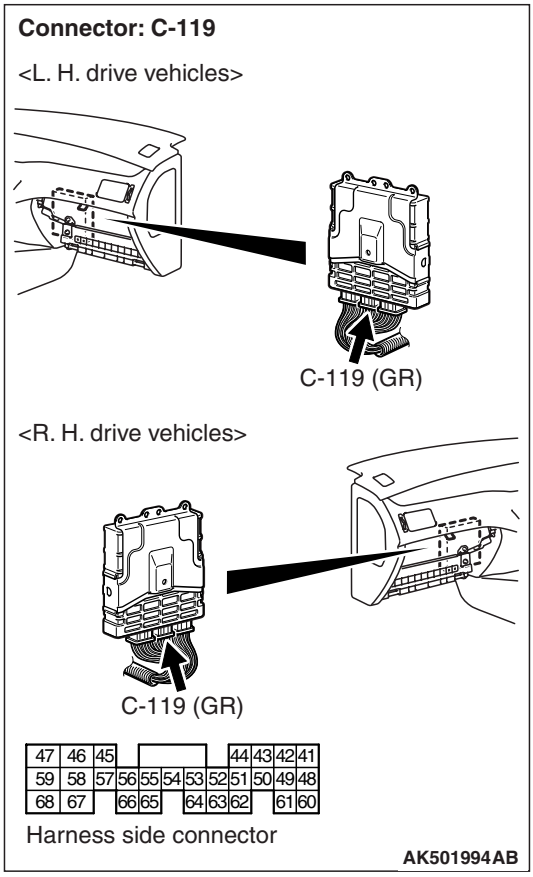




- Check power supply line for damage.

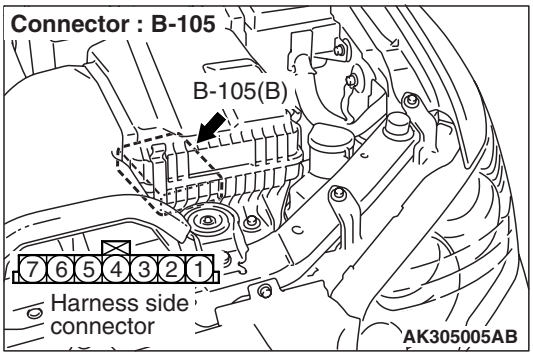
Q: Is the check result normal?
YES : Go to Step 24 .
NO : Repair the damaged harness wire.

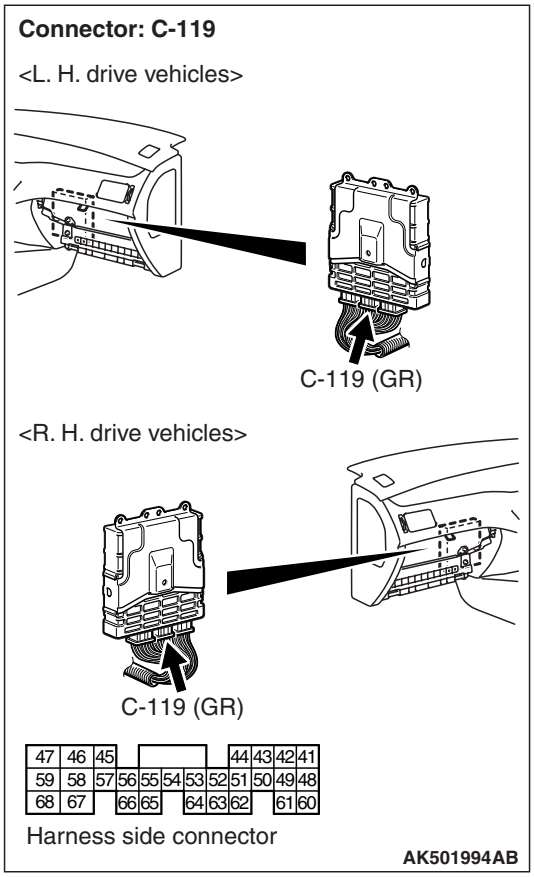
STEP 24. Connector check: C-119 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 25 .
NO : Repair or replace the connector.

STEP 25. Check harness between B-105 (terminal No. 3) air flow sensor connector and C-119 (terminal No. 61) engine-ECU connector.

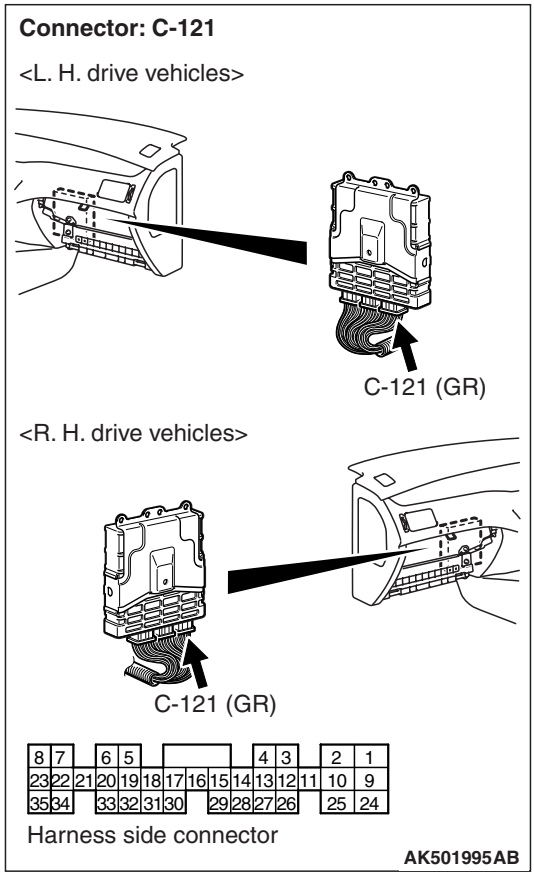


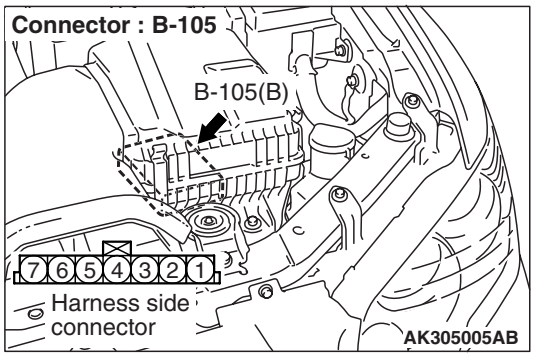


- Check output line for damage.

Q: Is the check result normal?
YES : Go to Step 26 .
NO : Repair the damaged harness wire.

STEP 26. Connector check: C-121 engine-ECU connector



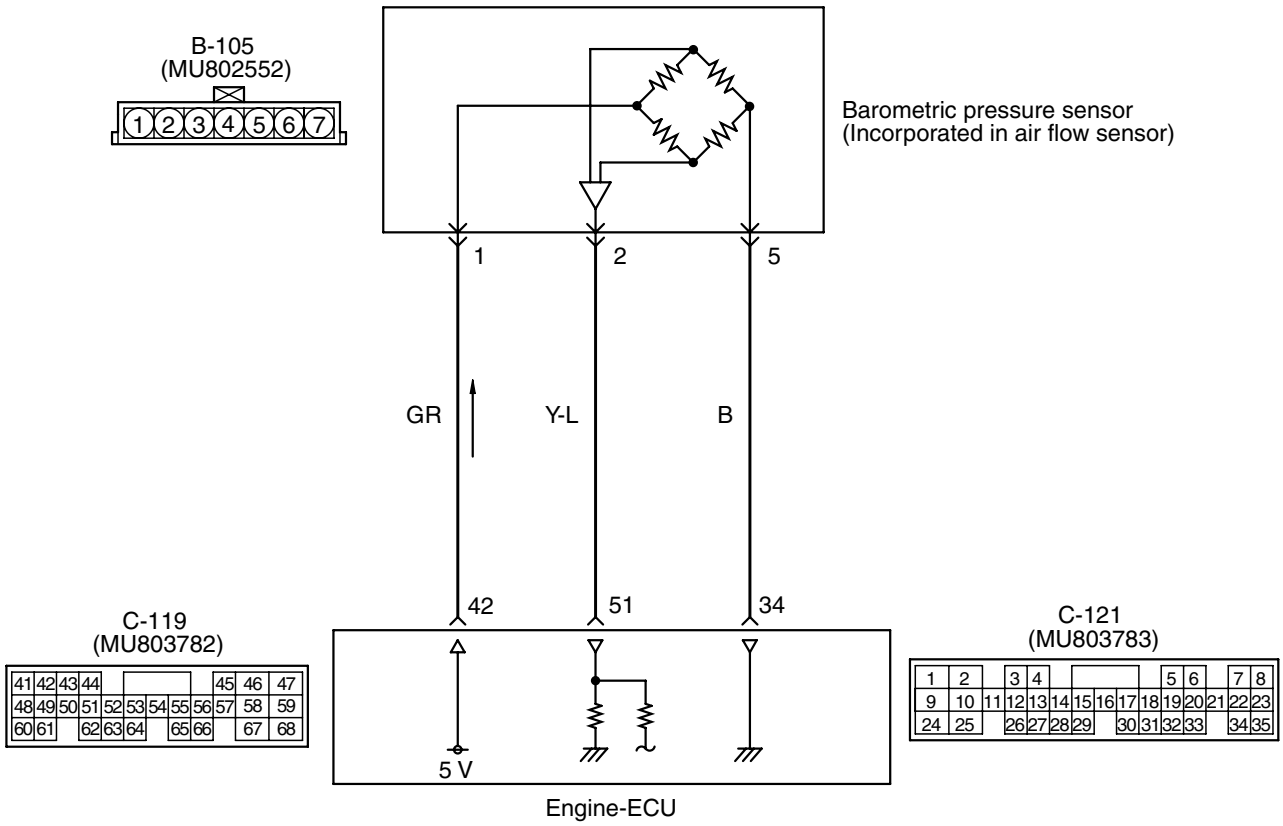


Q: Is the check result normal?
YES : Check and repair harness between B-105 (terminal No. 5) air flow sensor connector and C-121 (terminal No. 34) engine-ECU connector.
- Check earthing line for damage.

No : Repair or replace the connector.

Code No. P105: Barometric Pressure Sensor System

Barometric pressure sensor circuit



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

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OPERATION

- A power voltage of 5 V is applied to the barometric pressure sensor power terminal (terminal No. 1) of the air flow sensor connector from the engine-ECU (terminal No. 42) and earthed to the engine-ECU (terminal No. 34) from the air flow sensor (terminal No. 5).
- The sensor signal is inputted to the engine-ECU (terminal No. 51) from the barometric pressure sensor output terminal (terminal No. 2) of the air flow sensor connector.

FUNCTION

- The barometric pressure sensor converts the barometric pressure into a voltage signal and inputs the signal to the engine-ECU.
- In response to the signal, the engine-ECU corrects the fuel injection amount, etc.

TROUBLE JUDGMENT

Check Condition

- 2 seconds after the ignition switch has been placed in the "ON" position or the engine has started up.

Judgment Criterion

- The sensor output voltage of 4.5 V or more (Barometric pressure above 114 kPa or equivalent) for 2 seconds.

or

- The sensor output voltage 0.2 V or less (Barometric pressure below 53 kPa or equivalent) for 2 seconds.

PROBABLE CAUSES

- Failed barometric pressure sensor
- Open/short circuit in barometric pressure sensor circuit or loose connector contact
- Failed engine-ECU

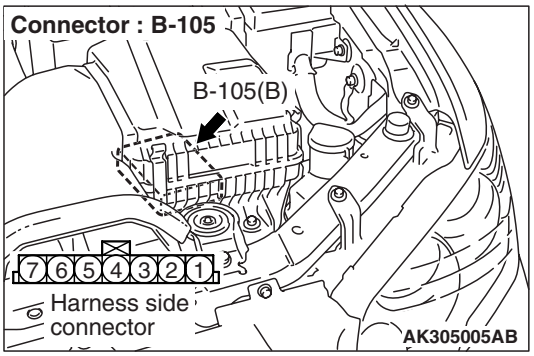
DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-II/III data list

- Refer to Data List Reference Table P.13A-372.
  a. Item No. 25: Barometric pressure sensor

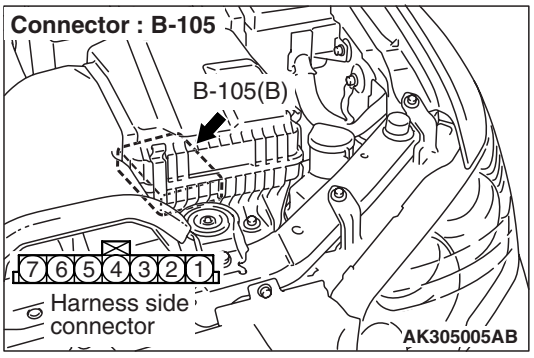
Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-5).
NO : Go to Step 2 .

STEP 2. Connector check: B-105 air flow sensor connector



Q: Is the check result normal?
YES : Go to Step 3 .
NO : Repair or replace the connector.

STEP 3. Perform voltage measurement at B-105 air flow sensor connector.

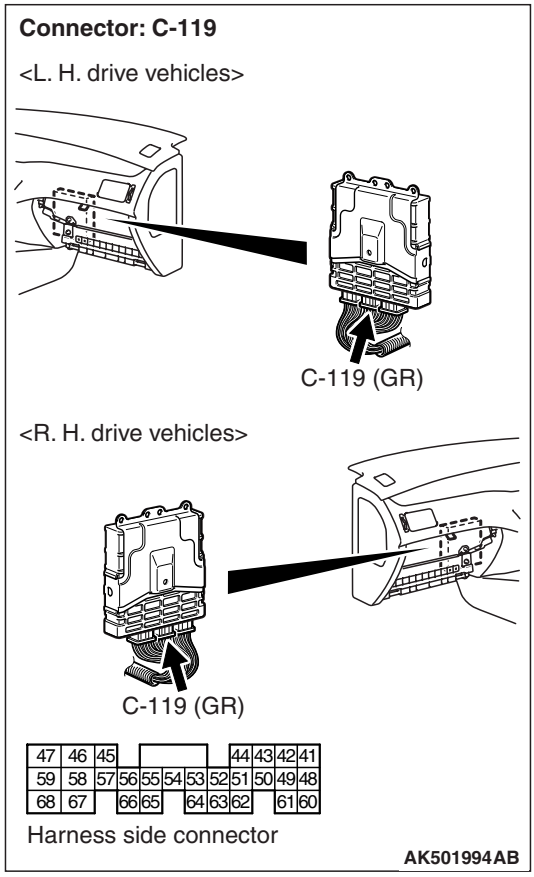


- Disconnect connector, and measure at harness side.
- Ignition switch: "ON"
- Voltage between terminal No. 1 and earth.

OK: 4.9 – 5.1 V

Q: Is the check result normal?
YES : Go to Step 9 .
NO : Go to Step 4 .

STEP 4. Perform voltage measurement at C-119 engine-ECU connector.

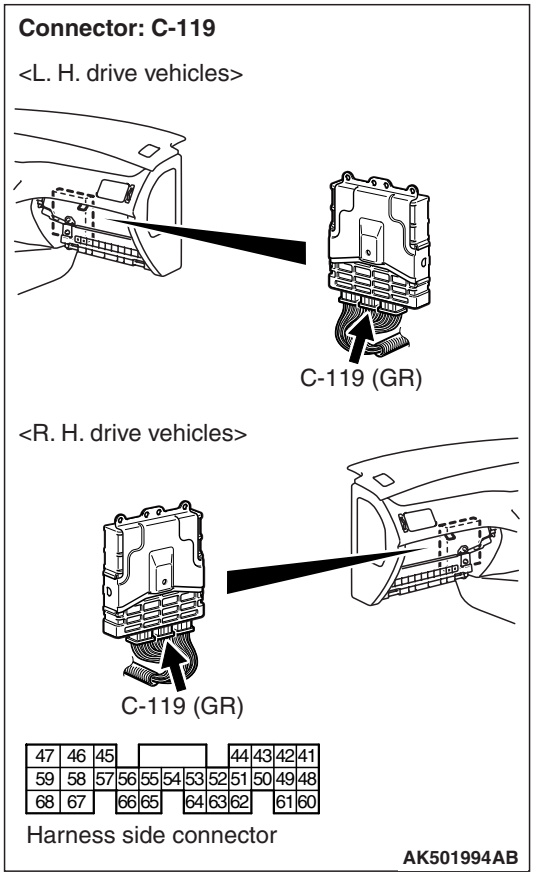


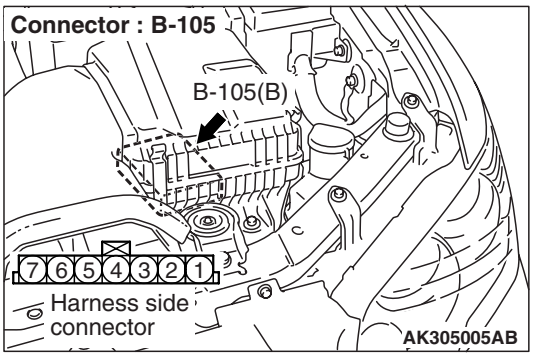
- Measure engine-ECU terminal voltage.
- Ignition switch: "ON"
- Voltage between terminal No. 42 and earth.

OK: 4.9 – 5.1 V

Q: Is the check result normal?
YES : Go to Step 5 .
NO : Go to Step 6 .

STEP 5. Connector check: C-119 engine-ECU connector





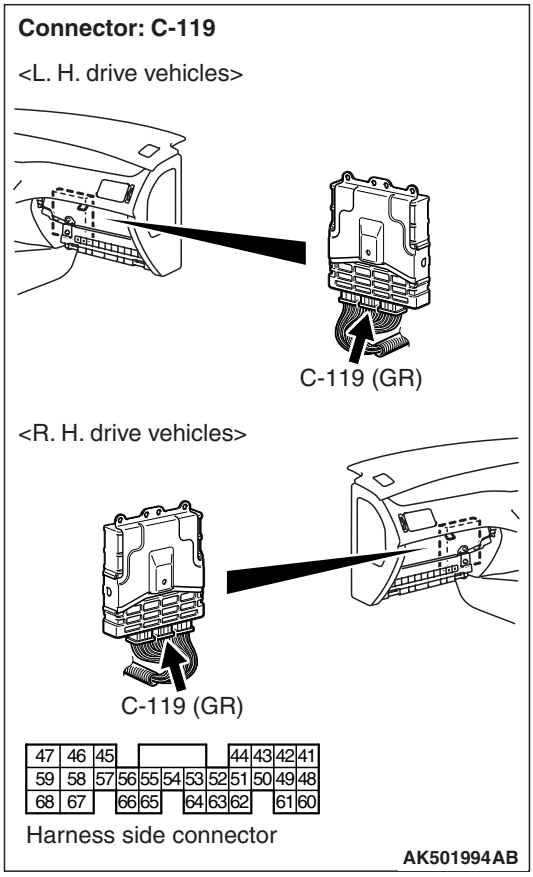
Q: Is the check result normal?

YES : Check and repair harness between B-105 (terminal No. 1) air flow sensor connector and C-119 (terminal No. 42) engine-ECU connector.

- Check power supply line for open circuit.

NO : Repair or replace the connector.

STEP 6. Connector check: C-119 engine-ECU connector

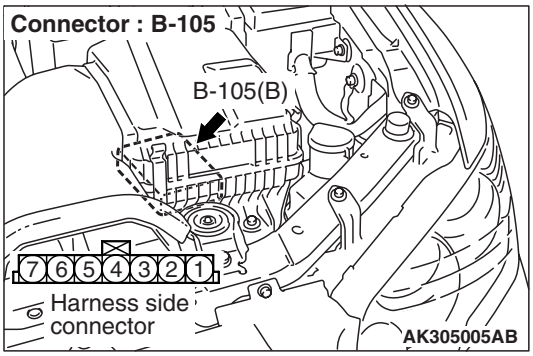


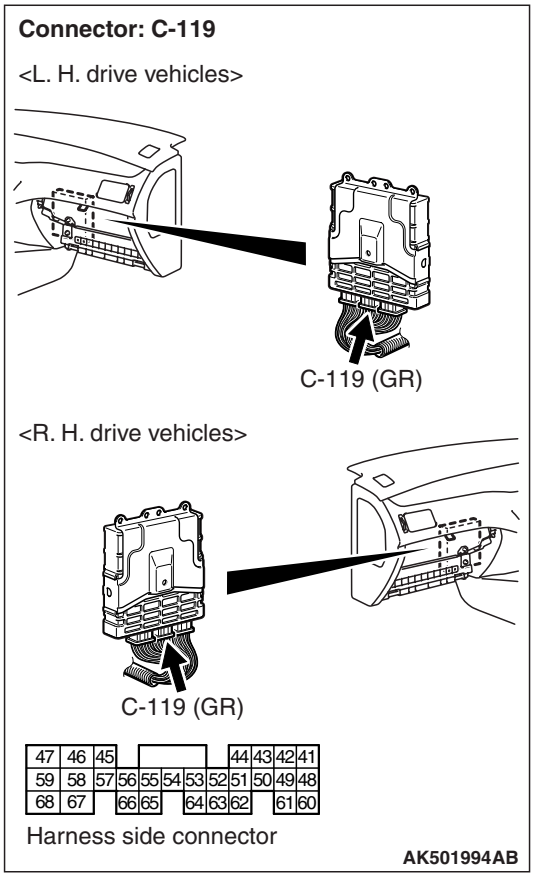
Q: Is the check result normal?

YES : Go to Step 7 .

NO : Repair or replace the connector.

STEP 7. Check harness between B-105 (terminal No. 1) air flow sensor connector and C-119 (terminal No. 42) engine-ECU connector.





- Check power supply line for short circuit.

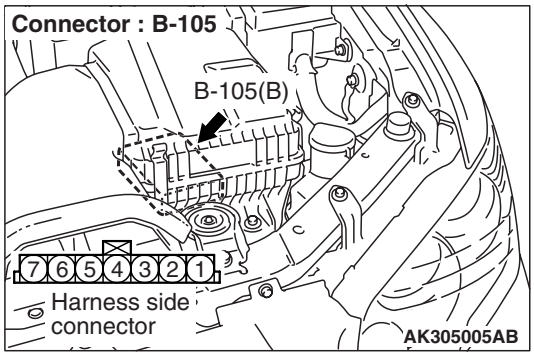
Q: Is the check result normal?
YES : Go to Step 8 .
NO : Repair the damaged harness wire.

STEP 8. M.U.T.-II/III data list

- Refer to Data List Reference Table P.13A-372.
  a. Item No. 25: Barometric pressure sensor

Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-5).
NO : Replace the engine-ECU.

STEP 9. Perform resistance measurement at B-105 air flow sensor connector.

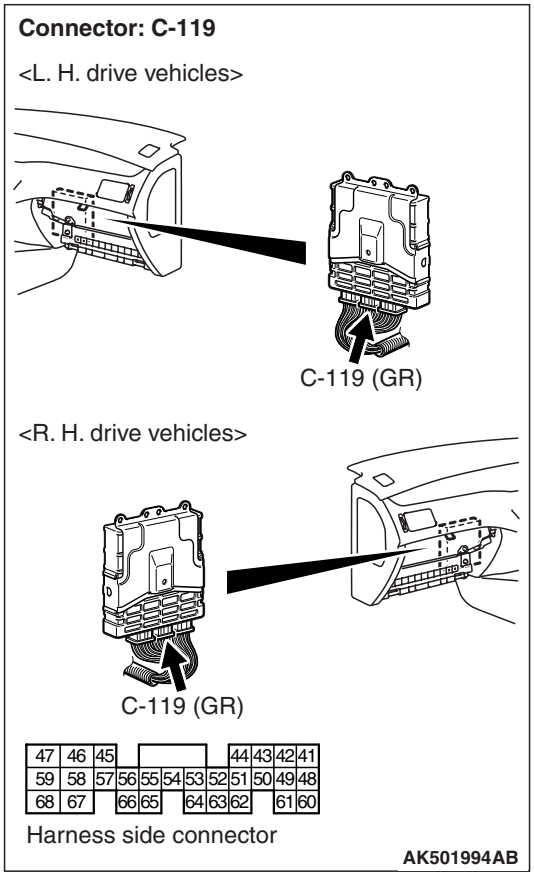


- Disconnect connector, and measure at harness side.
- Resistance between terminal No. 5 and earth.

OK: 2 Ω or less

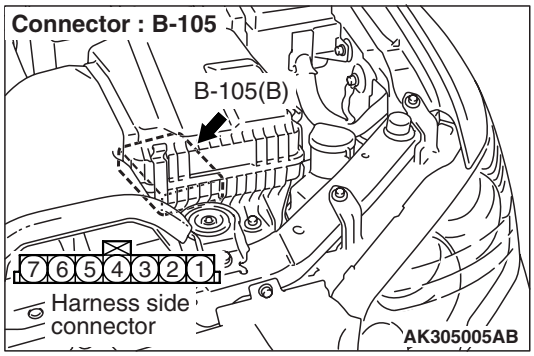
Q: Is the check result normal?
YES : Go to Step 12 .
NO : Go to Step 10 .

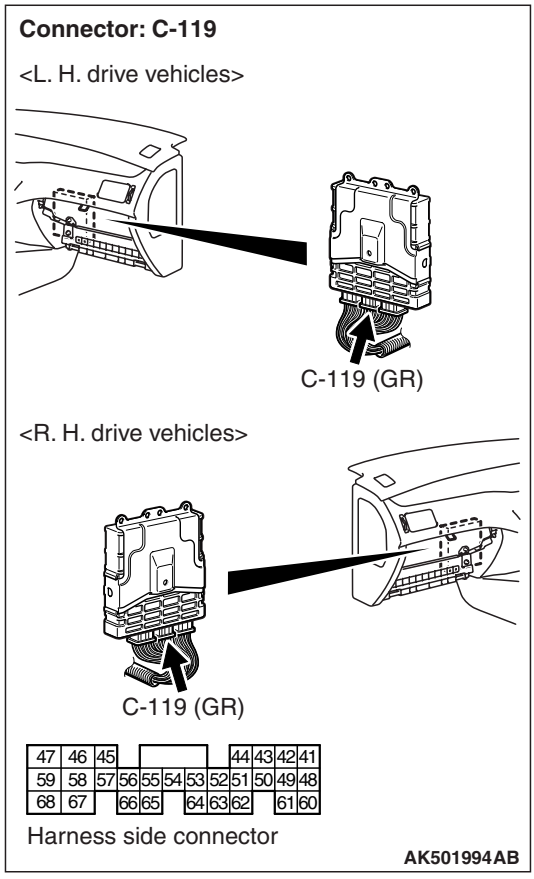
STEP 10. Connector check: C-119 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 11 .
NO : Repair or replace the connector.

STEP 11. Check harness between B-105 (terminal No. 5) air flow sensor connector and C-119 (terminal No. 34) engine-ECU connector.

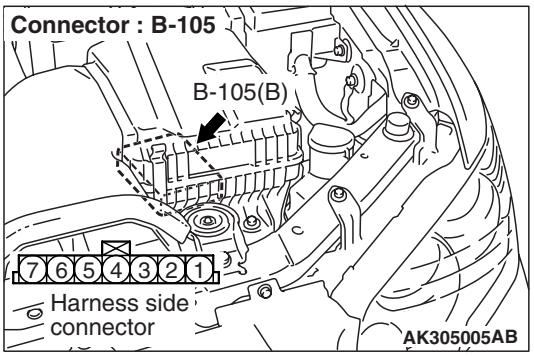




- Check earthing line for open circuit or damage.

Q: Is the check result normal?
YES : Go to Step 8 .
NO : Repair the damaged harness wire.

STEP 12. Perform voltage measurement at B-105 air flow sensor connector.



- Use special tool test harness (MB991709) to connect only terminal No. 1, No. 2 and No. 5, and then measure at pick-up harness.
- Ignition switch: "ON"
- Voltage between terminal No. 1 and earth.

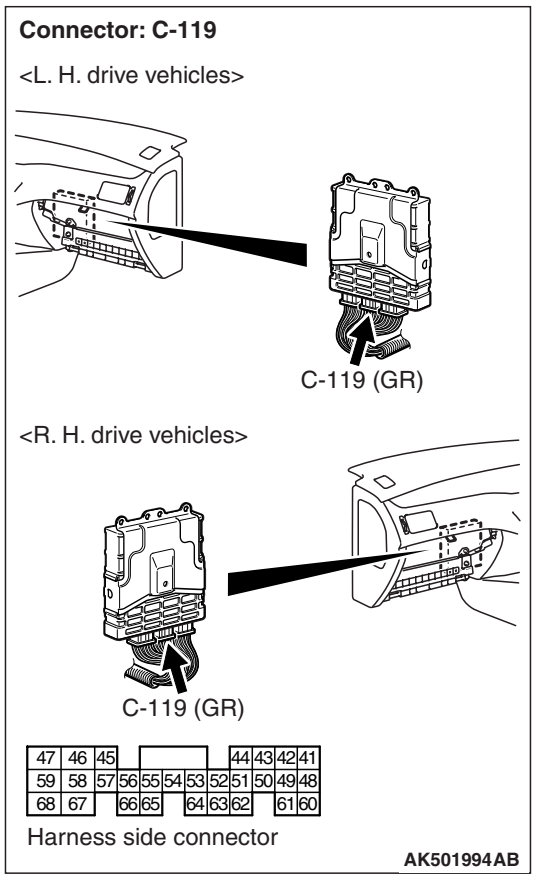
OK: 4.9 – 5.1 V

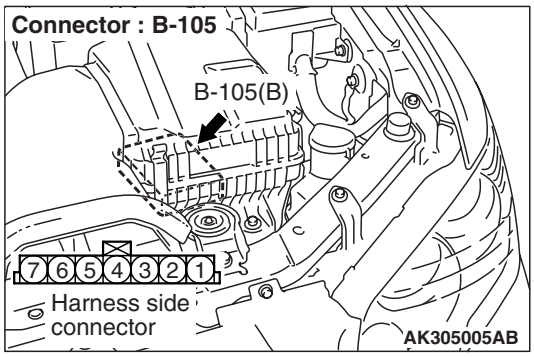
Q: Is the check result normal?

YES : Go to Step 14 .

NO : Go to Step 13 .

STEP 13. Connector check: C-119 engine-ECU connector





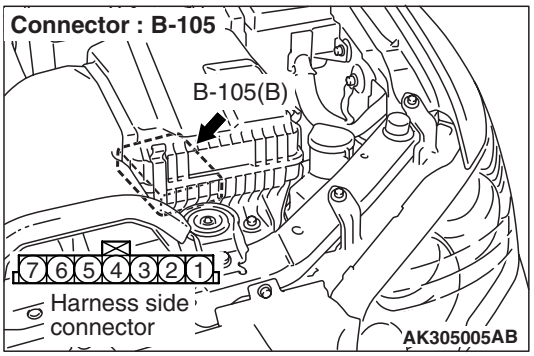
Q: Is the check result normal?

YES : Check and repair harness between B-105 (terminal No. 1) air flow sensor connector and C-119 (terminal No. 42) engine-ECU connector.

- Check power supply line for damage.

NO : Repair or replace the connector.

STEP 14. Perform voltage measurement at B-105 air flow sensor connector.



- Use special tool test harness (MB991709) to connect only terminal No. 1, No. 2 and No. 5, and then measure at pick-up harness.
- Ignition switch: "ON"
- Voltage between terminal No. 5 and earth.

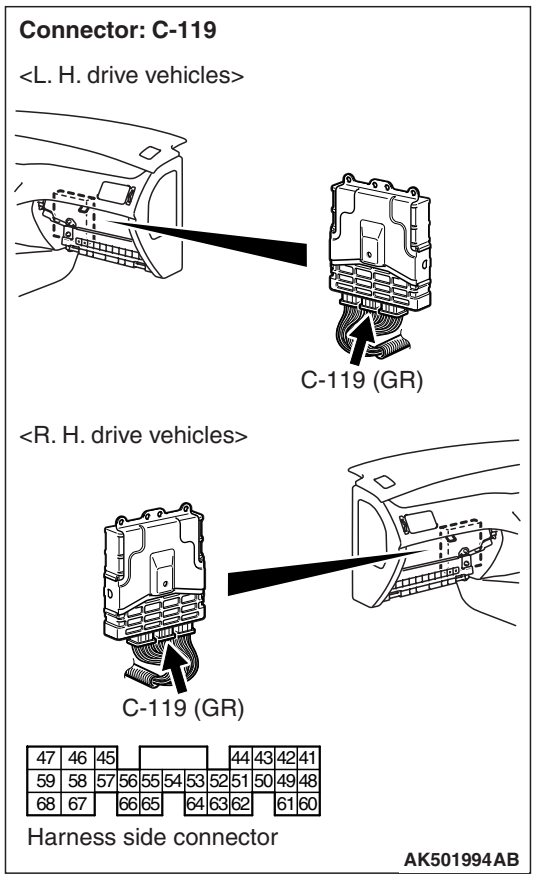
OK: 0.5 V or less

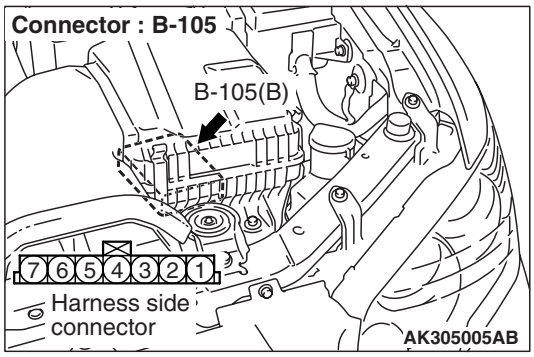
Q: Is the check result normal?

YES : Go to Step 16 .

NO : Go to Step 15 .

STEP 15. Connector check: C-119 engine-ECU connector





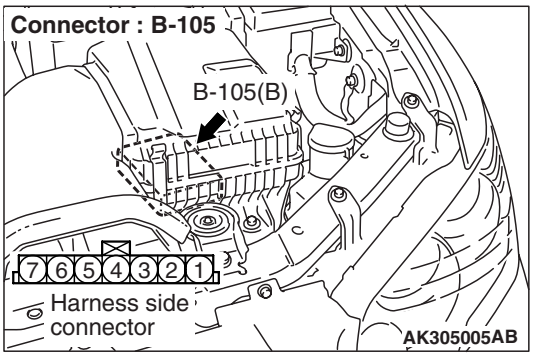
Q: Is the check result normal?

YES : Check and repair harness between B-105 (terminal No. 5) air flow sensor connector and C-119 (terminal No. 34) engine-ECU connector.

- Check earthing line for damage.

NO : Repair or replace the connector.

STEP 16. Perform voltage measurement at B-105 air flow sensor connector.

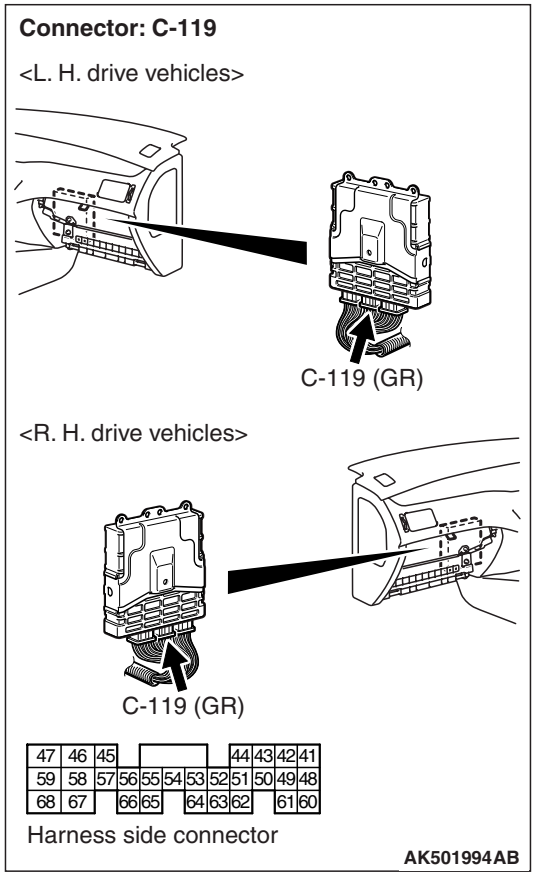


- Use special tool test harness (MB991709) to connect only terminal No. 1, No. 2 and No. 5, and then measure at pick-up harness.
- Ignition switch: "ON"
- Voltage between terminal No. 2 and earth.

OK:
Altitude 0 m: 3.8 – 4.2 V
Altitude 600 m: 3.5 – 3.9 V
Altitude 1,200 m: 3.3 – 3.7 V
Altitude 1,800 m: 3.0 – 3.4 V

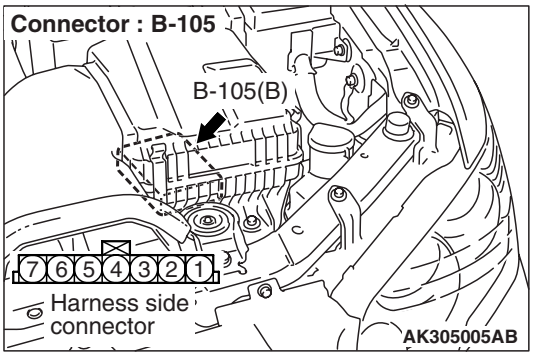
Q: Is the check result normal?
YES : Go to Step 19 .
NO : Go to Step 17 .

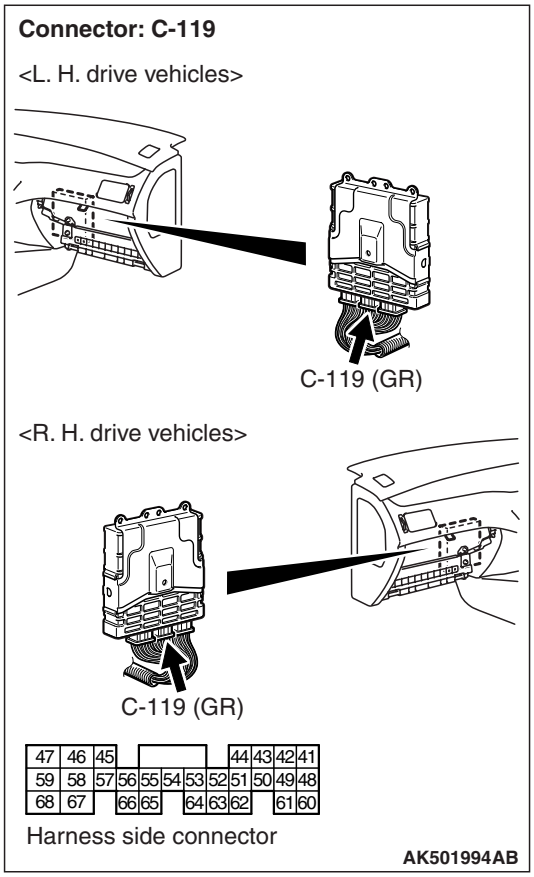
STEP 17. Connector check: C-119 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 18 .
NO : Repair or replace the connector.

STEP 18. Check harness between B-105 (terminal No. 2) air flow sensor connector and C-119 (terminal No. 51) engine-ECU connector.

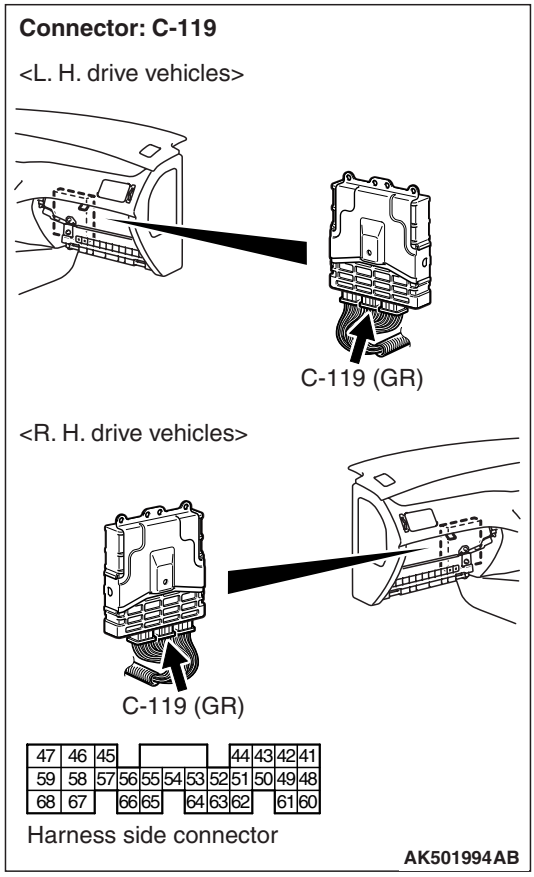




- Check output line for short circuit and damage.

Q: Is the check result normal?
YES : Replace the air flow sensor.
NO : Repair the damaged harness wire.

STEP 19. Perform voltage measurement at C-119 engine-ECU connector.

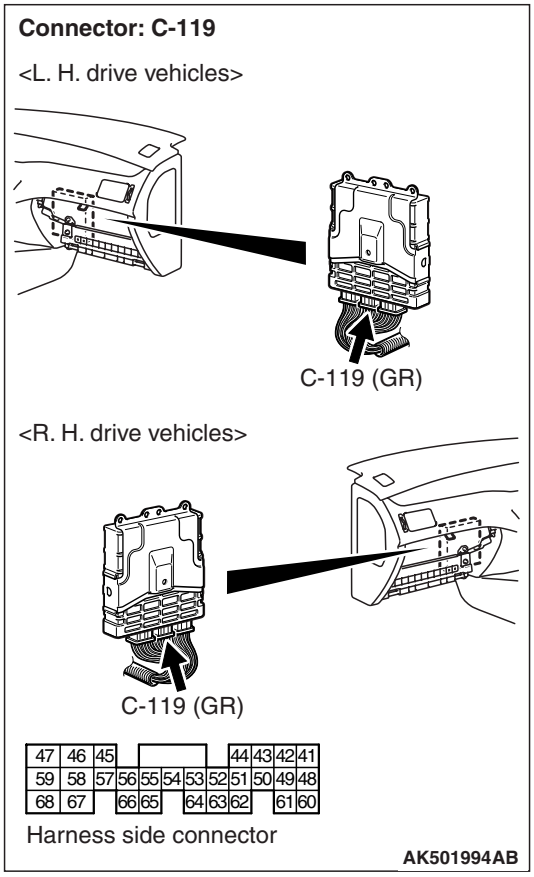


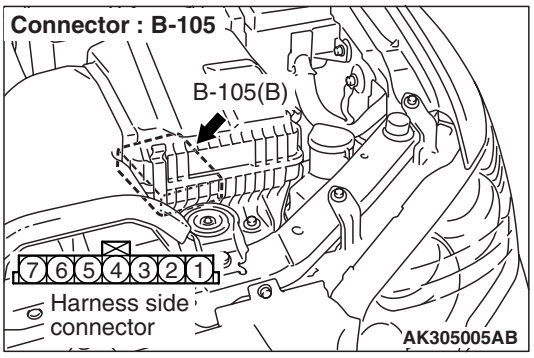
- Measure engine-ECU terminal voltage.
- Ignition switch: "ON"
- Voltage between terminal No. 51 and earth.

OK:
Altitude 0 m: 3.8 – 4.2 V
Altitude 600 m: 3.5 – 3.9 V
Altitude 1,200 m: 3.3 – 3.7 V
Altitude 1,800 m: 3.0 – 3.4 V

Q: Is the check result normal?
YES : Go to Step 21 .
NO : Go to Step 20 .

STEP 20. Connector check: C-119 engine-ECU connector





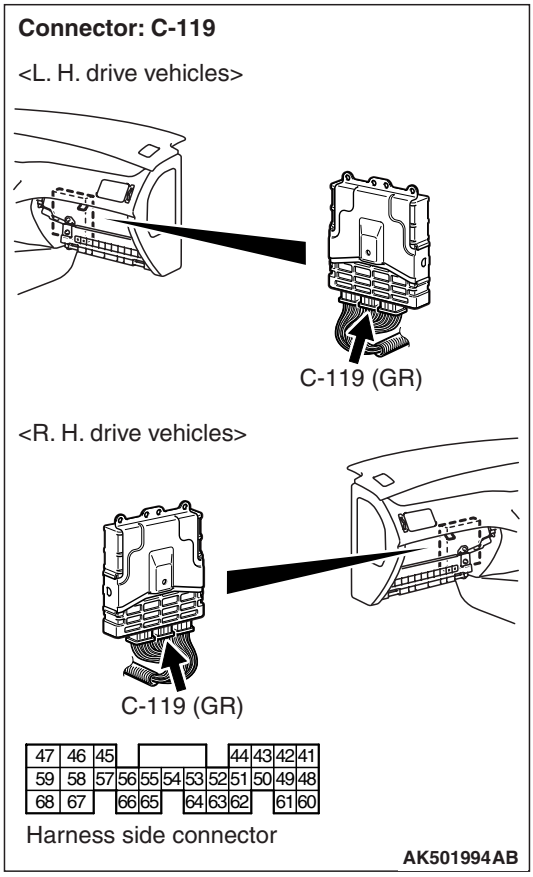
Q: Is the check result normal?

YES : Check and repair harness between B-105 (terminal No. 2) air flow sensor connector and C-119 (terminal No. 51) engine-ECU connector.

- Check output line for open circuit and damage.

NO : Repair or replace the connector.

STEP 21. Connector check: C-119 engine-ECU connector



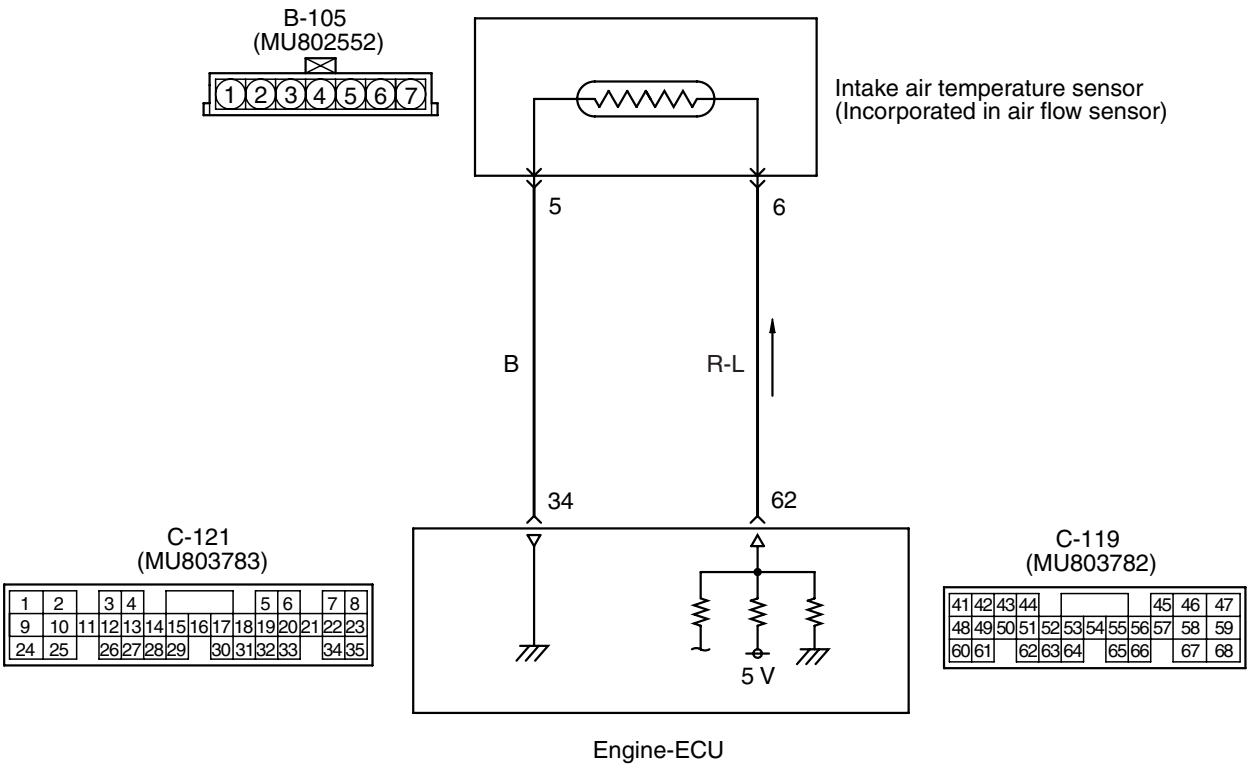
Q: Is the check result normal?

YES : Go to Step 8 .

NO : Repair or replace the connector.

Code No. P0110: Intake Air Temperature Sensor System

Intake air temperature sensor circuit



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

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OPERATION

- A power voltage of 5 V is applied to the intake air temperature sensor output terminal (terminal No. 6) of the air flow sensor connector from the engine-ECU (terminal No. 62)
- The power voltage is earthed to the engine-ECU (terminal No. 34) from the air flow sensor (terminal No. 5).

FUNCTION

- The intake air temperature sensor converts the intake air temperature into a voltage and inputs the voltage signal to the engine-ECU.
- In response to the signal, the engine-ECU corrects the fuel injection amount, etc.
- The intake air temperature sensor is a kind of resistor, which has characteristics to reduce its resistance as the intake air temperature rises. Therefore, the sensor output voltage varies with the intake air temperature, and becomes lower as the intake air temperature rises.

TROUBLE JUDGMENT

Check Condition

- 2 seconds later after the ignition switch has been in "ON" position or the engine has started up.

Judgment Criterion

- The sensor output voltage of 4.6 V or more (intake air temperature below –45°C or equivalent) for 2 seconds.

or

- The sensor output voltage of 0.2 V or loss (intake air temperature above 125 °C or equivalent) for 2 seconds.

PROBABLE CAUSES

- Failed intake air temperature sensor
- Open/short circuit in intake air temperature sensor circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-II/III data list

- Item No. 13: Intake air temperature sensor

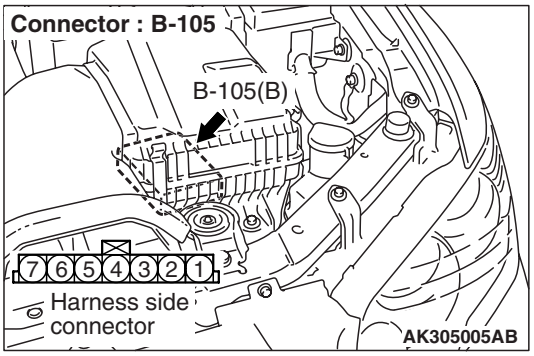
OK: At ambient temperature or equivalent.

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-5).

NO : Go to Step 2 .

STEP 2. Connector check: B-105 air flow sensor connector



Q: Is the check result normal?

YES : Go to Step 3 .

NO : Repair or replace the connector.

STEP 3. Check intake air temperature sensor itself.

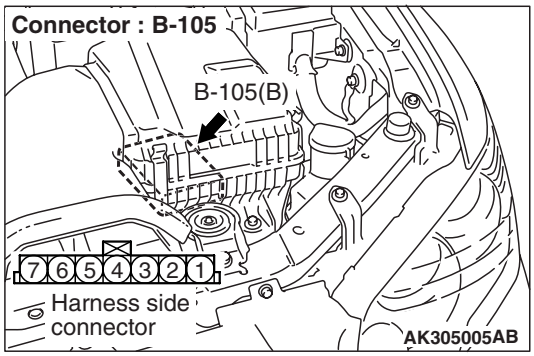
- Check intake air temperature sensor itself (Refer to P.13A-403).

Q: Is the check result normal?

YES : Go to Step 4 .

NO : Replace the air flow sensor.

STEP 4. Perform resistance measurement at B-105 air flow sensor connector.



- Disconnect connector, and measure at harness side.
- Resistance between terminal No. 5 and earth.

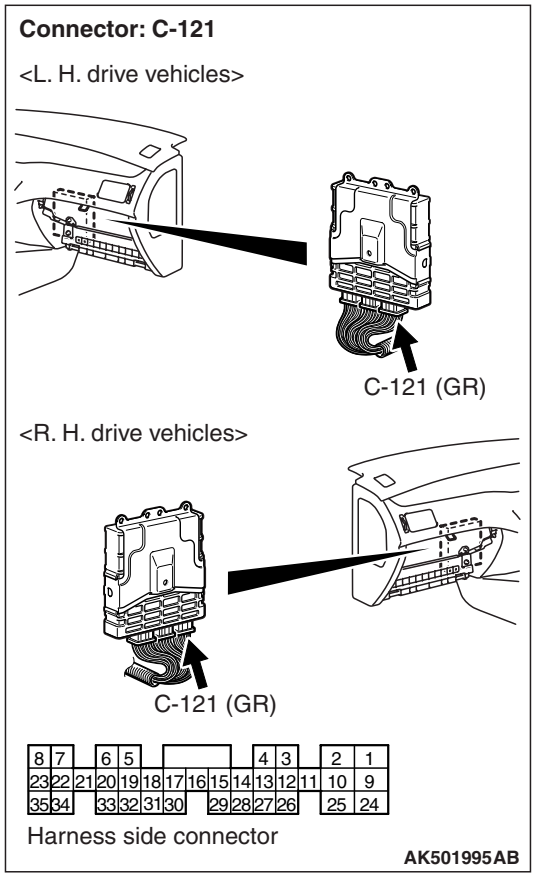
OK: 2 Ω or less

Q: Is the check result normal?

YES : Go to Step 8 .

NO : Go to Step 5 .

STEP 5. Connector check: C-121 engine-ECU connector

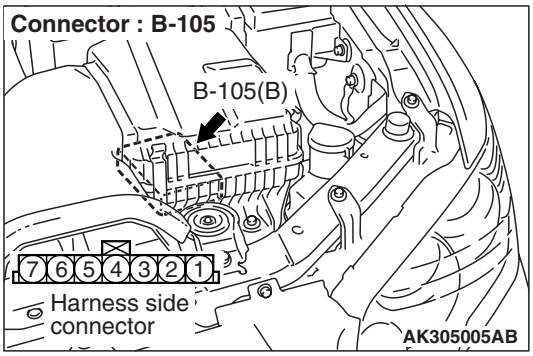


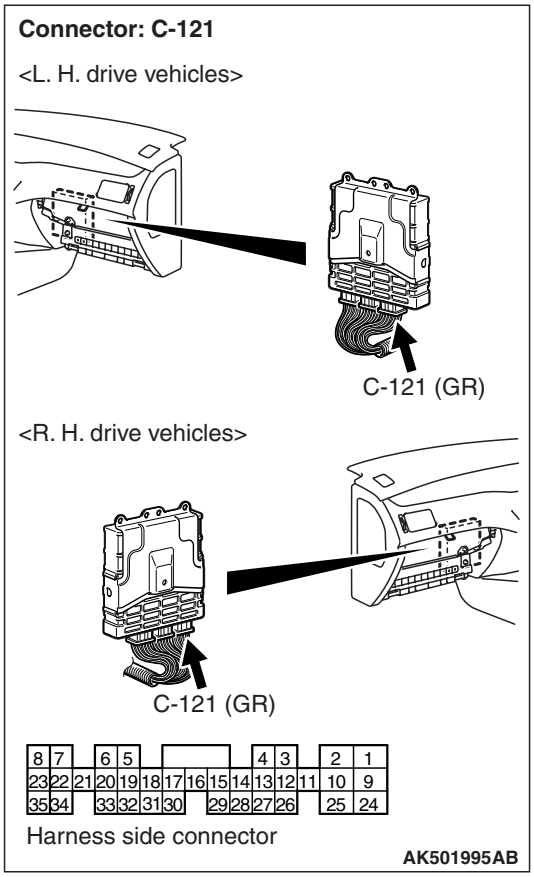
Q: Is the check result normal?

YES : Go to Step 6 .

NO : Repair or replace the connector.

STEP 6. Check harness between B-105 (terminal No. 5) air flow sensor connector and C-121 (terminal No. 34) engine-ECU connector.





- Check earthing line for open circuit and damage.

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair the damaged harness wire.

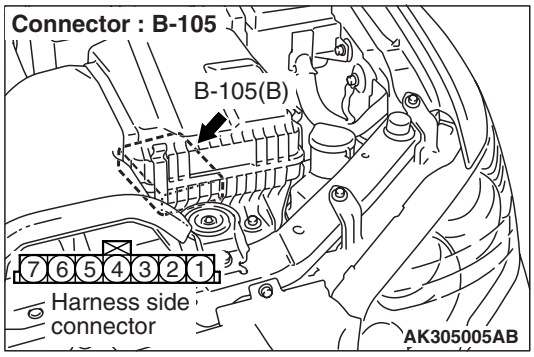
STEP 7. M.U.T.-II/III data list

- Item No. 13: Intake air temperature sensor

  OK: At ambient temperature or equivalent.

Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-5).
NO : Replace the engine-ECU.

STEP 8. Perform voltage measurement at B-105 air flow sensor connector.

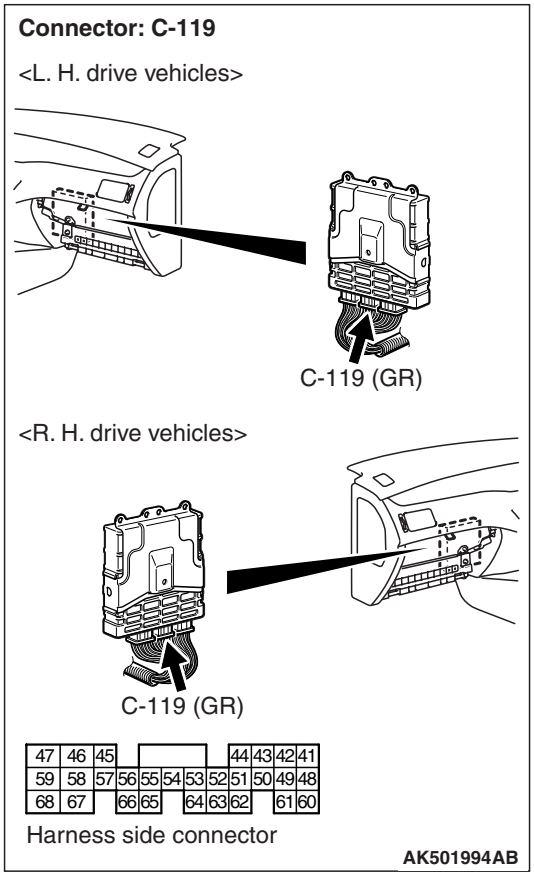


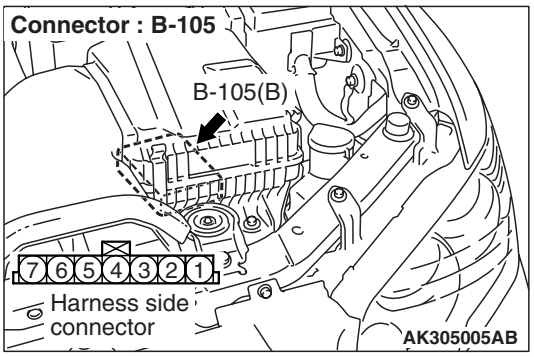
- Disconnect connector, and measure at harness side.
- Ignition switch: "ON"
- Voltage between terminal No. 6 and earth.

  OK: 4.5 – 4.9 V

Q: Is the check result normal?
YES : Go to Step 13 .
NO : Go to Step 9 .

STEP 9. Perform voltage measurement at C-119 engine-ECU connector.





- Measure engine-ECU terminal voltage.
- Disconnect B-105 air flow sensor connector.
- Ignition switch: "ON"
- Voltage between terminal No. 62 and earth.

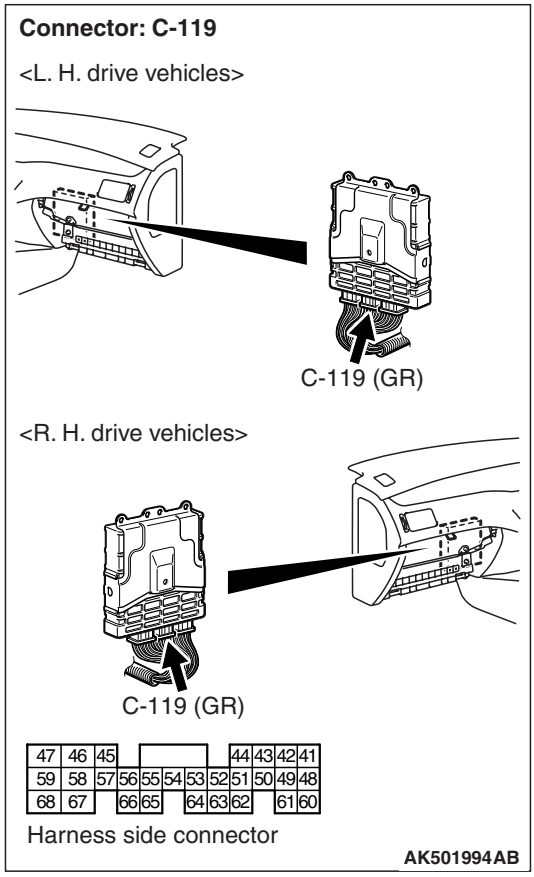
OK: 4.5 – 4.9 V

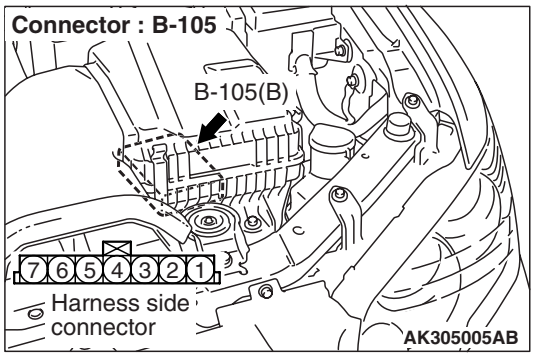
Q: Is the check result normal?

YES : Go to Step 10 .

NO : Go to Step 11 .

STEP 10. Connector check: C-119 engine-ECU connector





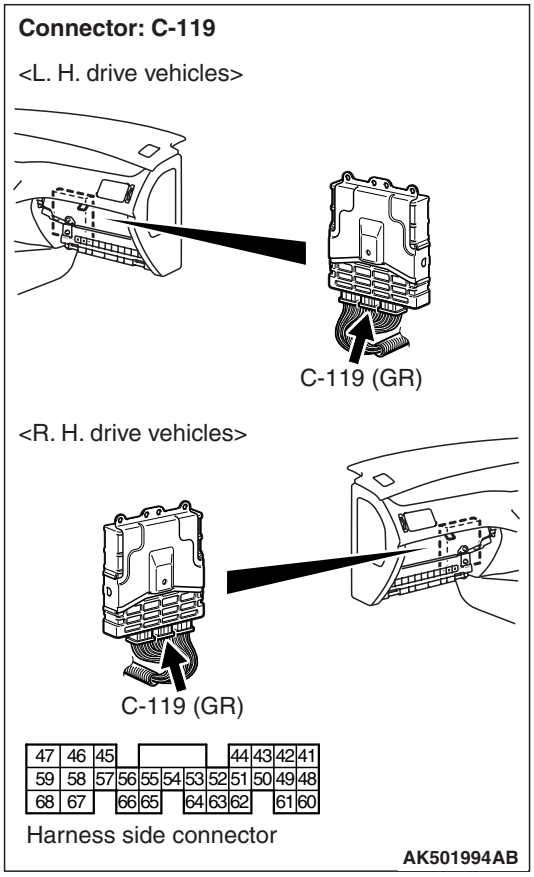
Q: Is the check result normal?

YES : Check and repair harness between B-105 (terminal No. 6) air flow sensor connector and C-119 (terminal No. 62) engine-ECU connector.

- Check output line for open circuit.

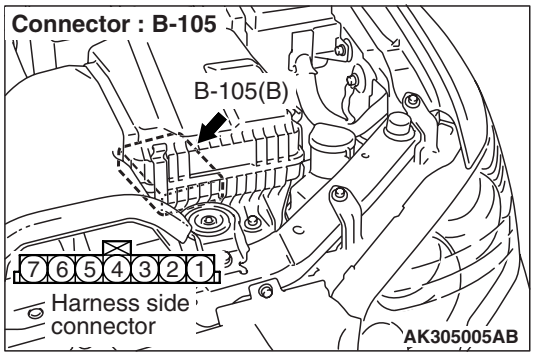
NO : Repair or replace the connector.

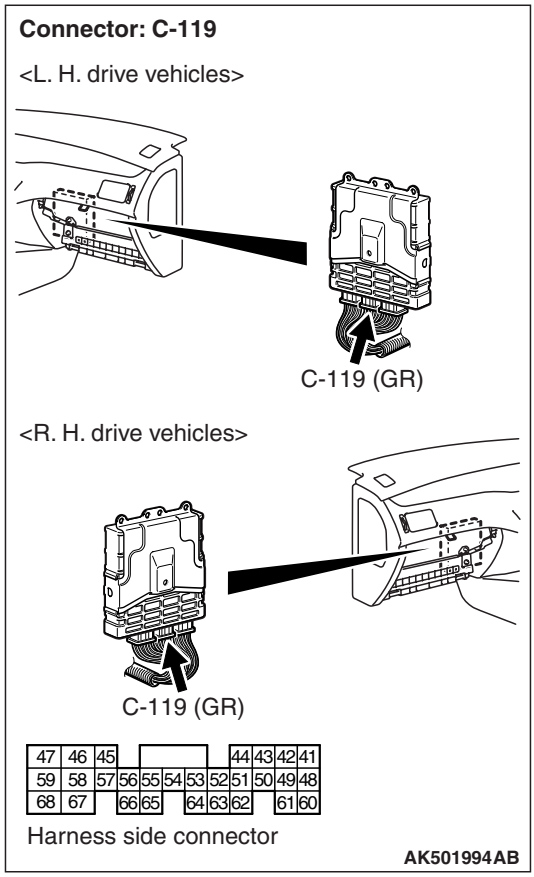
STEP 11. Connector check: C-119 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 12 .
NO : Repair or replace the connector.

STEP 12. Check harness between B-105 (terminal No. 6) air flow sensor connector and C-119 (terminal No. 62) engine-ECU connector.

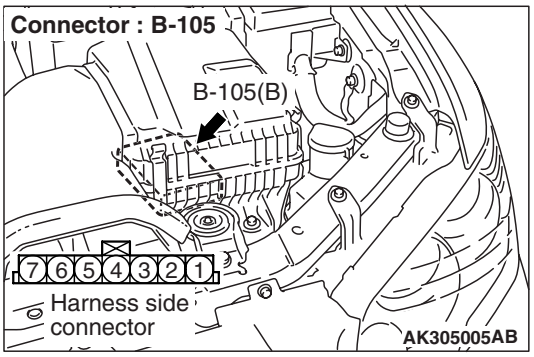




- Check output line for short circuit.

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair the damaged harness wire.

STEP 13. Perform voltage measurement at B-105 air flow sensor connector.



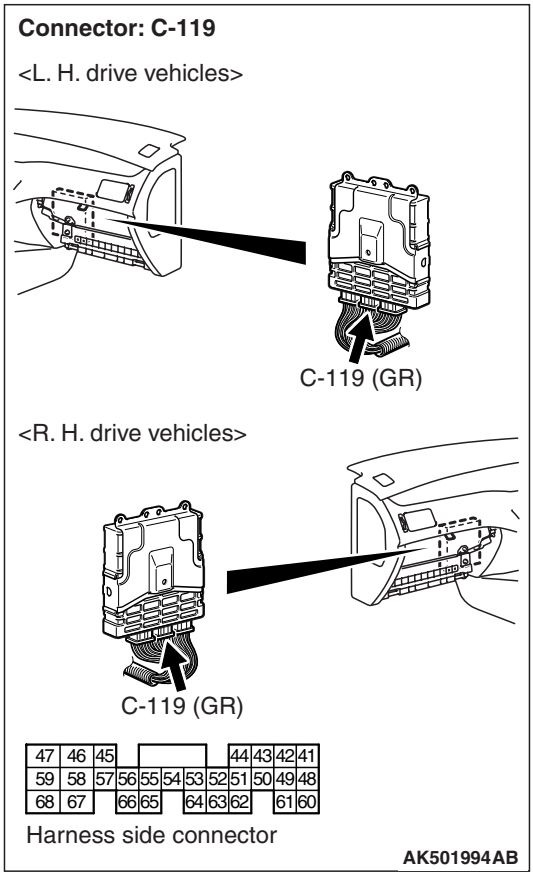
- Use special tool test harness (MB991709) to connect only terminal No. 5 and No. 6, and then measure at pick-up harness.
- Ignition switch: "ON"
- Voltage between terminal No. 6 and earth.

OK:

Ambient temperature at –20°C: 3.8 – 4.4 V
Ambient temperature at 0°C: 3.2 – 3.8 V
Ambient temperature at 20°C: 2.3 – 2.9 V
Ambient temperature at 40°C: 1.5 – 2.1 V
Ambient temperature at 60°C: 0.8 – 1.4 V
Ambient temperature at 80°C: 0.4 – 1.0 V

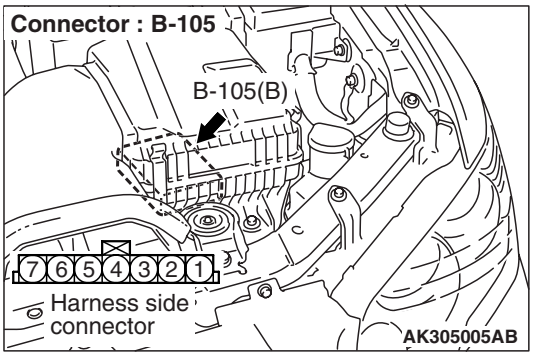
Q: Is the check result normal?
YES : Go to Step 7 .
NO : Go to Step 14 .

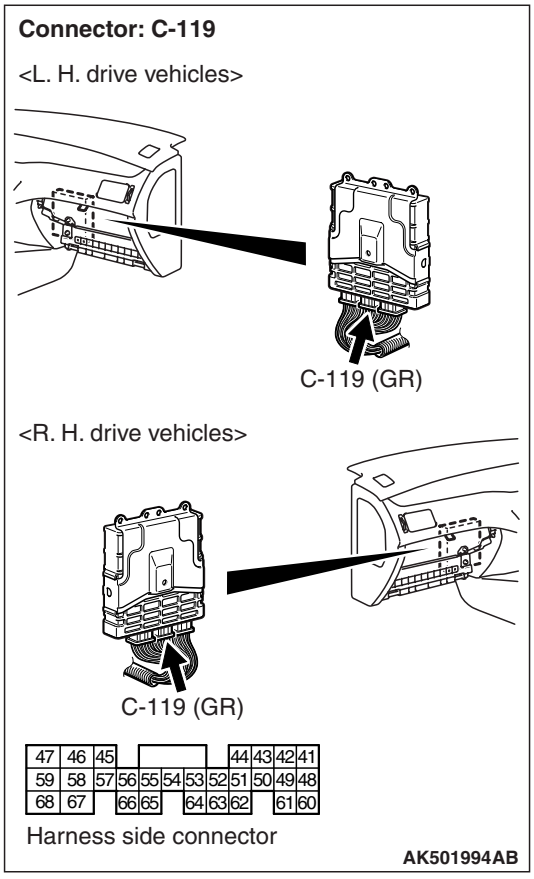
STEP 14. Connector check: C-119 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 15 .
NO : Repair or replace the connector.

STEP 15. Check harness between B-105 (terminal No. 6) air flow sensor connector and C-119 (terminal No. 62) engine-ECU connector.

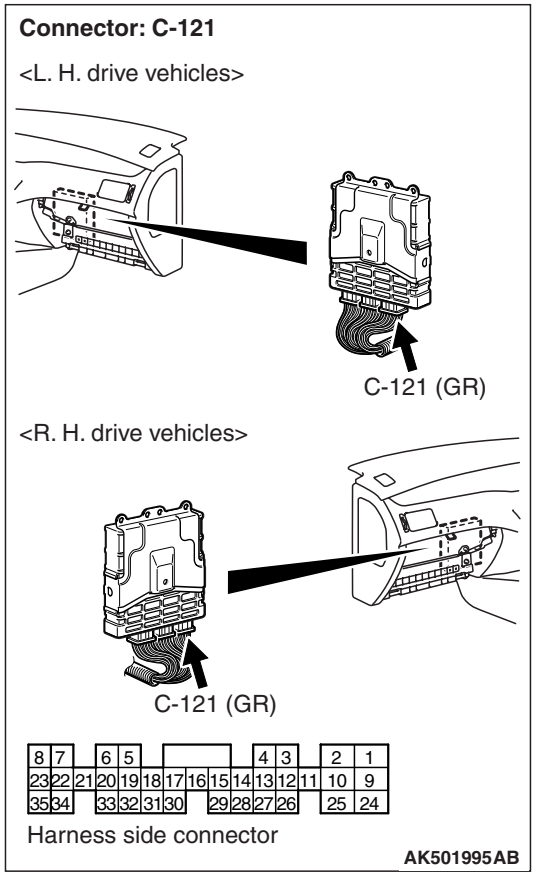


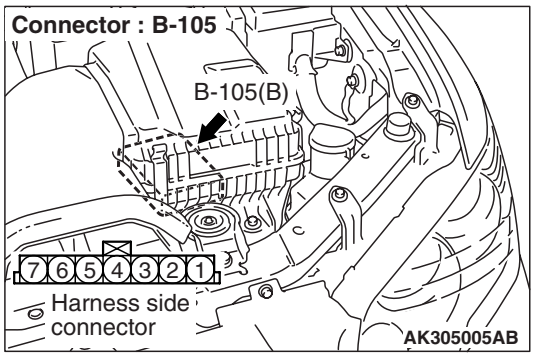


- Check output line for damage.

Q: Is the check result normal?
YES : Go to Step 16 .
NO : Repair the damaged harness wire.

STEP 16. Connector check: C-121 engine-ECU connector



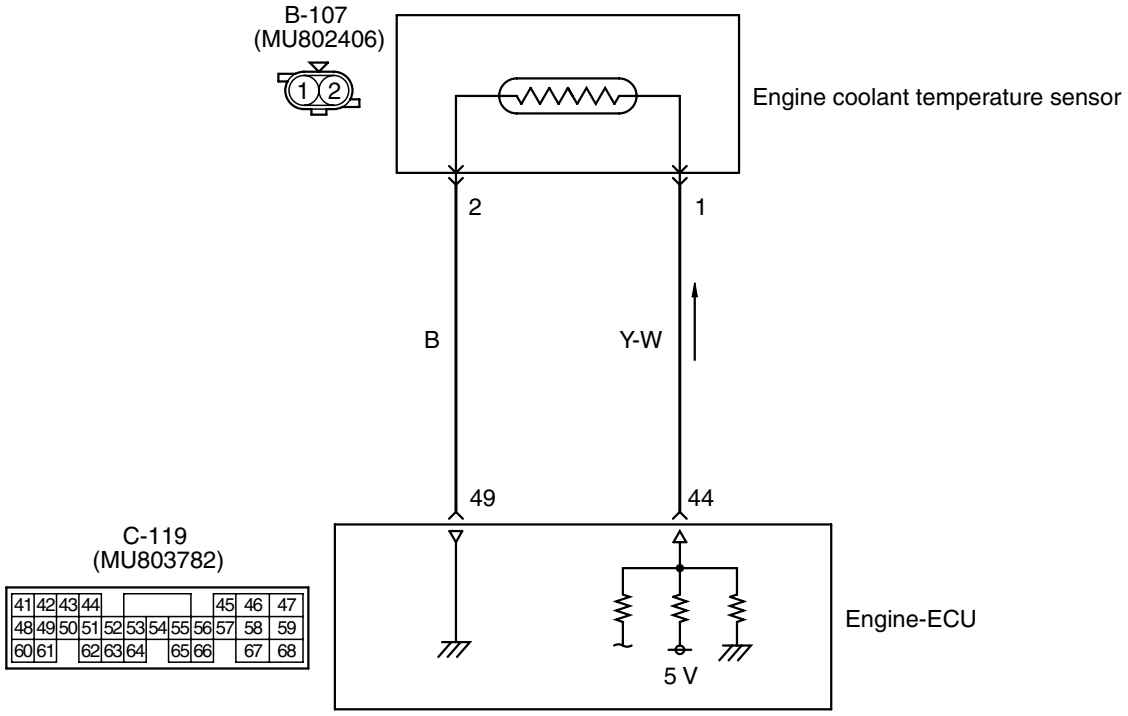


Q: Is the check result normal?
YES : Check and repair harness between B-105 (terminal No. 5) air flow sensor connector and C-121 (terminal No. 34) engine-ECU connector.
- Check earthing line for damage.

NO : Repair or replace the connector.

Code No. P0115: Engine Coolant Temperature Sensor System

Engine coolant temperature sensor circuit



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

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OPERATION

- A power voltage of 5 V is applied to the engine coolant temperature sensor output terminal (terminal No. 1) from the engine-ECU (terminal No. 44).
- The power voltage is earthed to the engine-ECU (terminal No. 49) from the engine coolant temperature sensor (terminal No. 2).

FUNCTION

- The engine coolant temperature sensor converts the engine coolant temperature into a voltage signal, and inputs the voltage to the engine-ECU.
- In response to the signal, the engine-ECU controls the fuel infection amount and the fast idle speed when the engine is cold state.
- The engine coolant temperature sensor is a kind of resistor, which has characteristics to reduce its resistance as the engine coolant temperature rises. Therefore, the sensor output voltage varies with the engine coolant temperature, and becomes lower as the engine coolant temperature rises.

TROUBLE JUDGMENT

Check Condition

- 2 seconds later after the ignition switch has been in "ON" position or the engine has started up.

Judgment Criteria

- The sensor output voltage of 4.6 V or more (engine coolant temperature of −45°C or equivalent) for 2 seconds,

or

- The sensor output voltage of 0.1 V or less (engine coolant temperature of 140°C or more, or equivalent) for 2 seconds.

Check Conditions
- Ignition switch: "ON"
- Engine speed of 50 r/min. or more

Judging Conditions
- The sensor output voltage rises 1.6 V or more (engine coolant temperature below 40°C or equivalent) from 1.6 V or less (engine coolant temperature above 40°C or equivalent).
- Thereafter, the sensor output voltage is 1.6 V or more for 5 minutes.

PROBABLE CAUSES
- Failed engine coolant temperature sensor
- Open/short circuit in engine coolant temperature sensor circuit or loose connector contact
- Failed engine-ECU

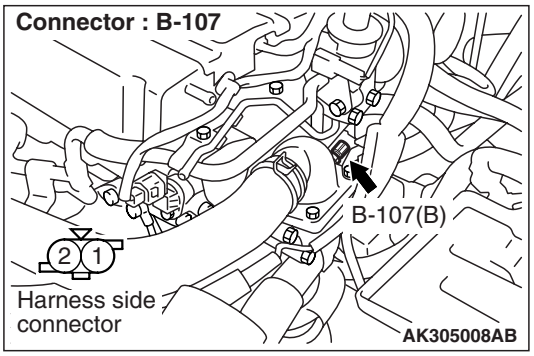
DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-II/III data list
- Item No. 21: Engine coolant temperature sensor

OK:
Engine cold state: At ambient temperature or equivalent.
Engine hot state: At 80 – 120°C

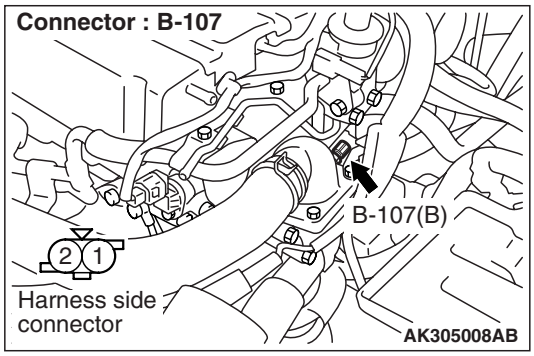
Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-5).
NO : Go to Step 2 .

STEP 2. Connector check: B-107 engine coolant temperature sensor connector



Q: Is the check result normal?
YES : Go to Step 3 .
NO : Repair or replace the connector.

STEP 3. Perform resistance measurement at B-107 engine coolant temperature sensor connector.

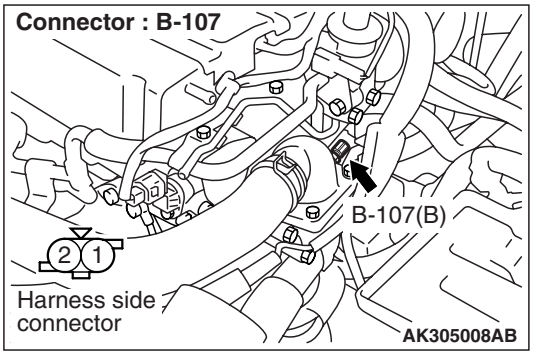


- Disconnect connector, and measure at sensor side.
- Resistance between terminal No. 1 and No. 2.

OK:
Engine coolant temperature at –20°C: 14 – 17 kΩ
Engine coolant temperature at 0°C: 5.1 – 6.5 kΩ
Engine coolant temperature at 20°C: 2.1 – 2.7 kΩ
Engine coolant temperature at 40°C: 0.9 – 1.3 kΩ
Engine coolant temperature at 60°C: 0.48 – 0.68 kΩ
Engine coolant temperature at 80°C: 0.26 – 0.36 kΩ

Q: Is the check result normal?
YES : Go to Step 4 .
NO : Replace the engine coolant temperature sensor.

STEP 4. Perform voltage measurement at B-107 engine coolant temperature sensor connector.

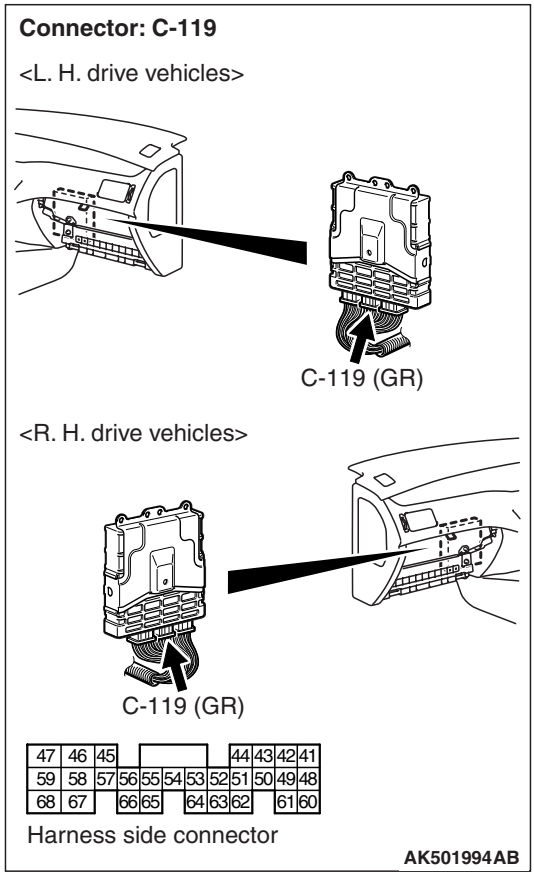


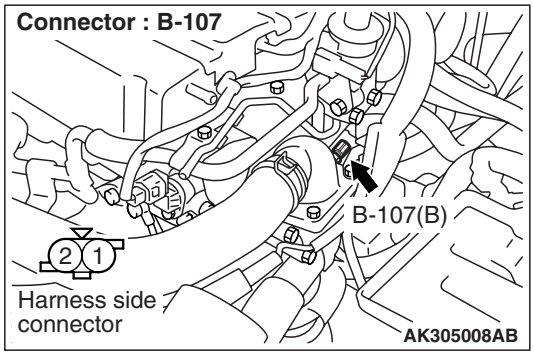
- Disconnect connector, and measure at harness side.
- Ignition switch: "ON"
- Voltage between terminal No. 1 and earth.

OK: 4.5 – 4.9 V

Q: Is the check result normal?
YES : Go to Step 10 .
NO : Go to Step 5 .

STEP 5. Perform voltage measurement at C-119 engine-ECU connector.



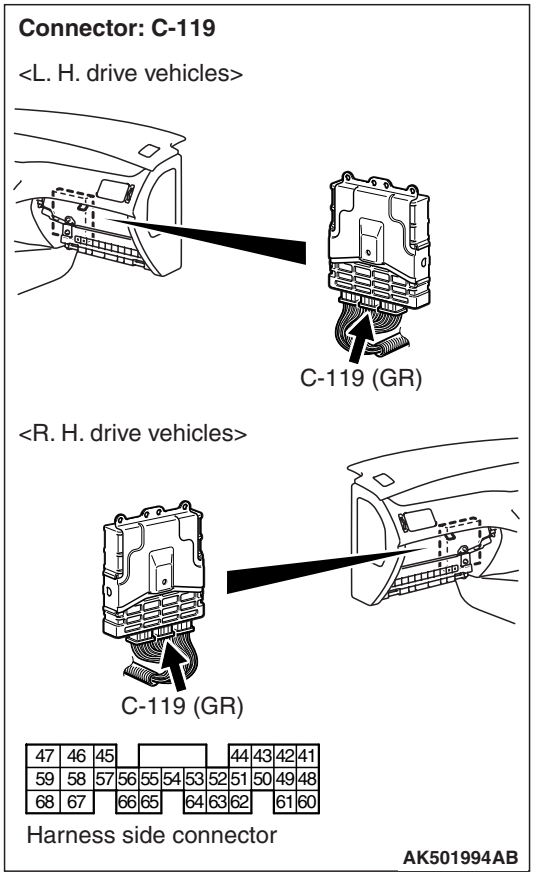


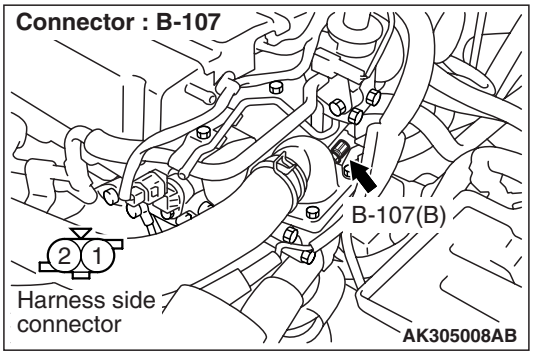
- Measure engine-ECU terminal voltage.
- Disconnect B-107 engine coolant temperature sensor.
- Ignition switch: "ON"
- Voltage between terminal No. 44 and earth.

OK: 4.5 – 4.9 V

Q: Is the check result normal?
YES : Go to Step 6 .
NO : Go to Step 7 .

STEP 6. Connector check: C-119 engine-ECU connector





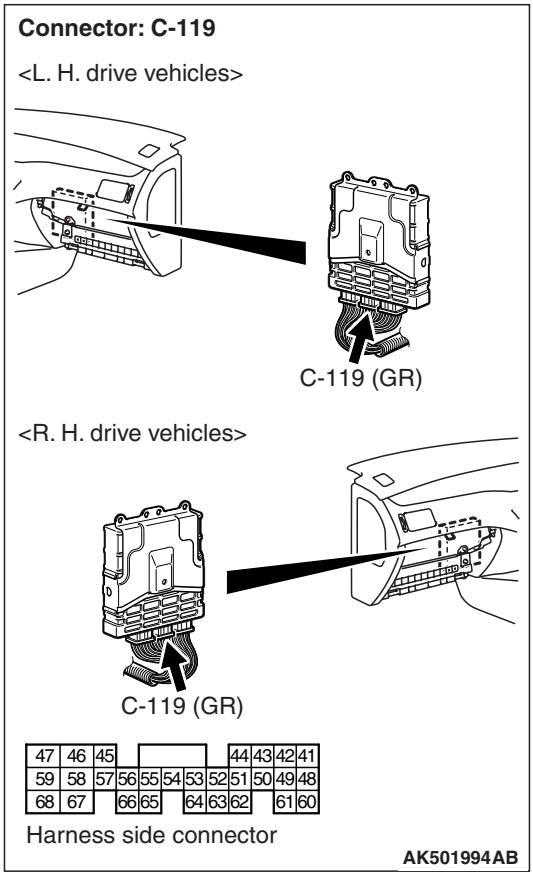
Q: Is the check result normal?

YES : Check and repair harness between B-107 (terminal No. 1) engine coolant temperature sensor connector and C-119 (terminal No. 44) engine-ECU connector.

- Check output line for open circuit.

NO : Repair or replace the connector.

STEP 7. Connector check: C-119 engine-ECU connector

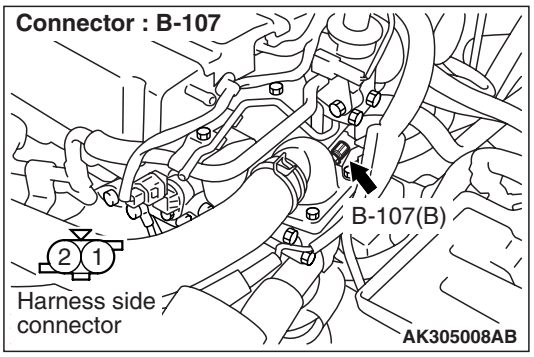


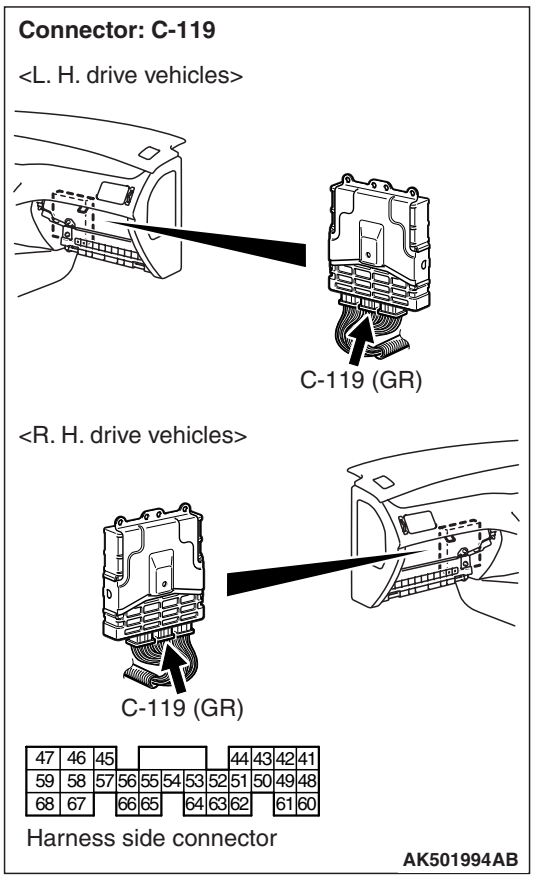
Q: Is the check result normal?

YES : Go to Step 8 .

NO : Repair or replace the connector.

STEP 8. Check harness between B-107 (terminal No. 1) engine coolant temperature sensor connector and C-119 (terminal No. 44) engine-ECU connector.





- Check output line for short circuit.

Q: Is the check result normal?
YES : Go to Step 9 .
NO : Repair the damaged harness wire.

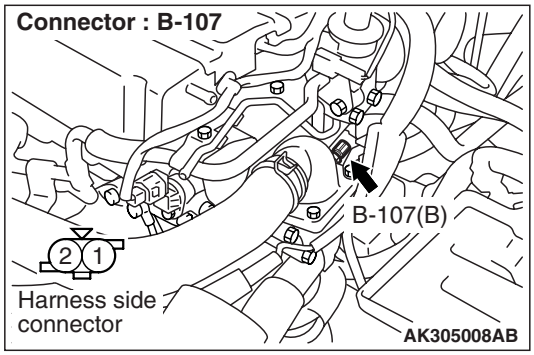
STEP 9. M.U.T.-II/III data list

- Item No. 21: Engine coolant temperature sensor

OK:
Engine cold state: At ambient temperature or equivalent.
Engine hot state: At 80 – 120°C

Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-5).
NO : Replace the engine-ECU.

STEP 10. Perform resistance measurement at B-107 engine coolant temperature sensor connector.



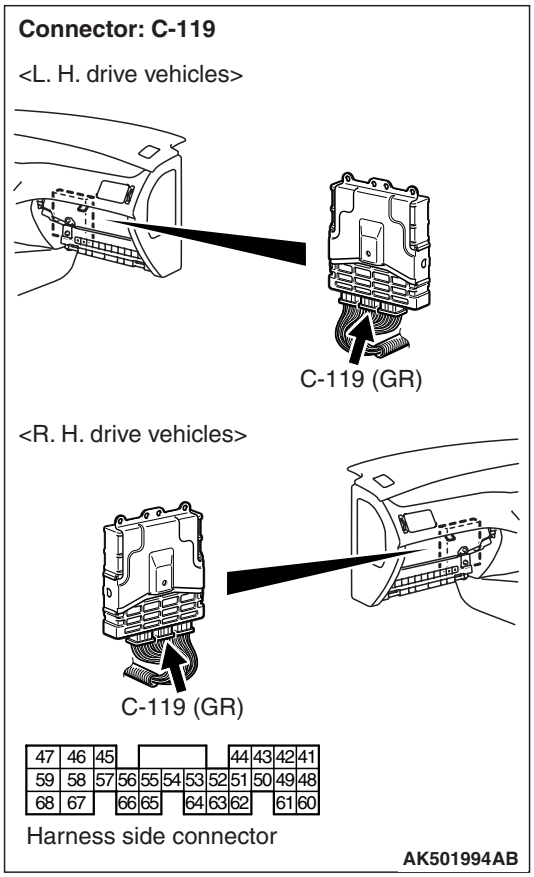
- Disconnect connector and measure at harness side.
- Resistance between terminal No. 2 and earth.

OK: 2 Ω or less

Q: Is the check result normal?
YES : Go to Step 13 .
NO : Go to Step 11 .

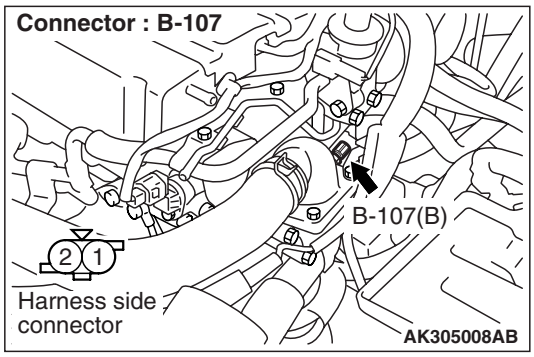
STEP 11. Connector check: C-119 engine-ECU connector

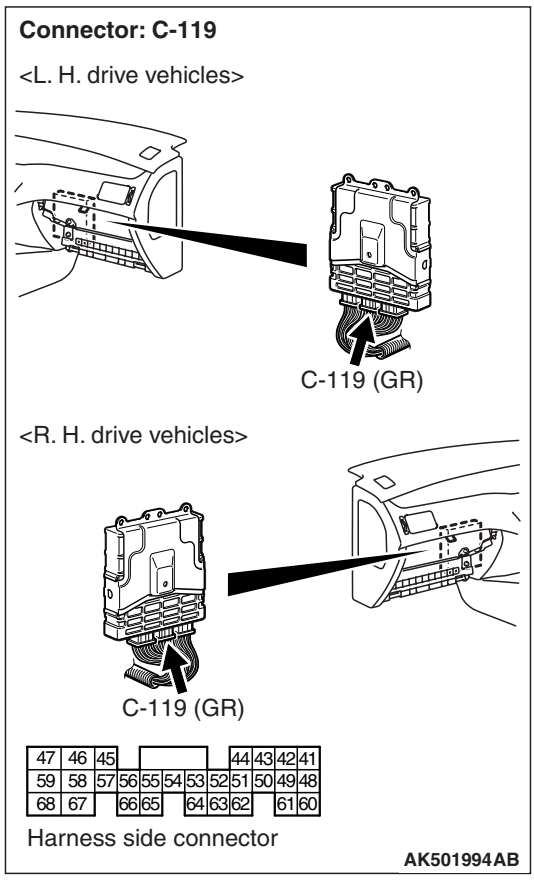
Q: Is the check result normal?



YES : Go to Step 12 .
NO : Repair or replace the connector.

STEP 12. Check harness between B-107 (terminal No. 2) engine coolant temperature sensor connector and C-119 (terminal No. 49) engine-ECU connector.

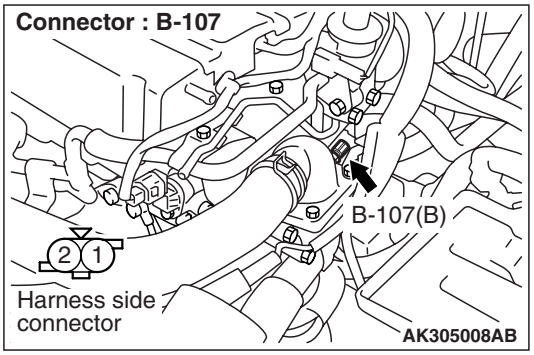




- Check earthing line for open circuit and damage.

Q: Is the check result normal?
YES : Go to Step 9 .
NO : Repair the damaged harness wire.

STEP 13. Perform voltage measurement at B-107 engine coolant temperature sensor connector.



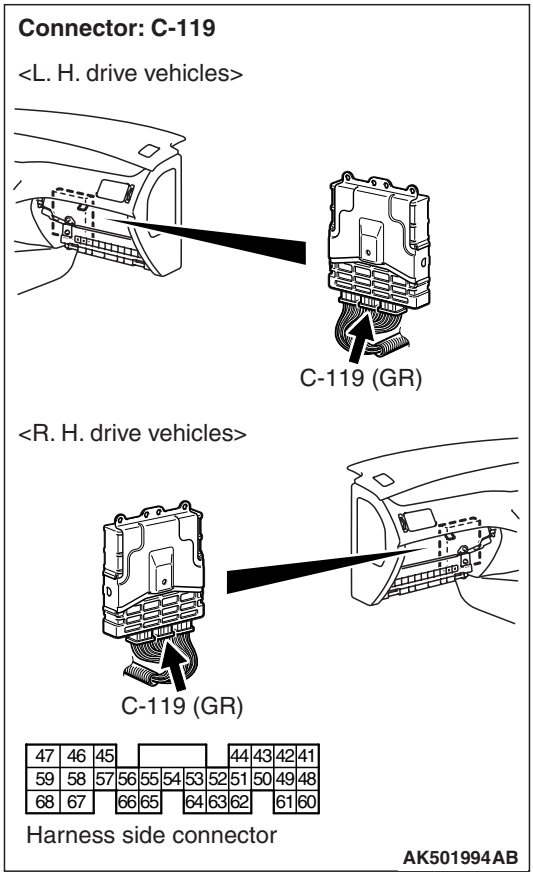
- Use special tool test harness (MB991658) to connect connector, and measure at pick-up harness.
- Ignition switch: "ON"
- Voltage between terminal No. 1 and earth.

OK:

Engine coolant temperature at −20°C: 3.9 – 4.5 V
Engine coolant temperature at 0°C: 3.2 – 3.8 V
Engine coolant temperature at 20°C: 2.3 – 2.9 V
Engine coolant temperature at 40°C: 1.3 – 1.9 V
Engine coolant temperature at 60°C: 0.7 – 1.3 V
Engine coolant temperature at 80°C: 0.3 – 0.9 V

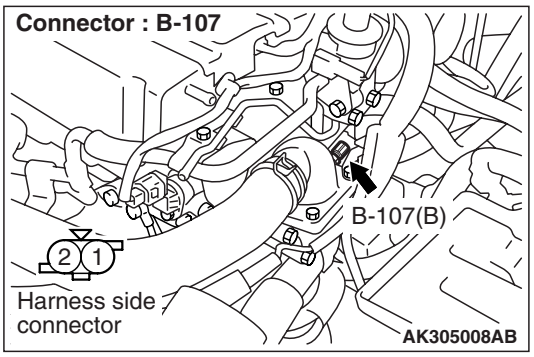
Q: Is the check result normal?
YES : Go to Step 9 .
NO : Go to Step 14 .

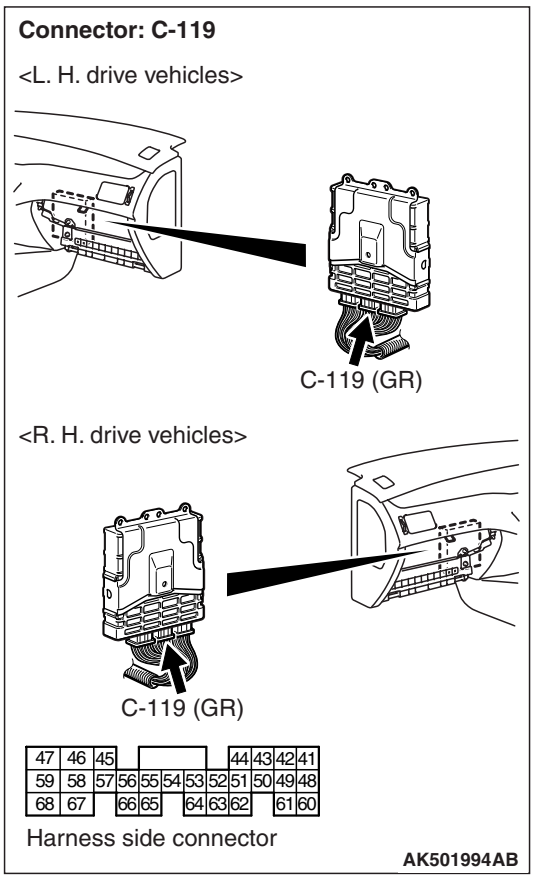
STEP 14. Connector check: C-119 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 15 .
NO : Repair or replace the connector.

STEP 15. Check harness between B-107 (terminal No. 1) engine coolant temperature sensor connector and C-119 (terminal No. 44) engine-ECU connector.

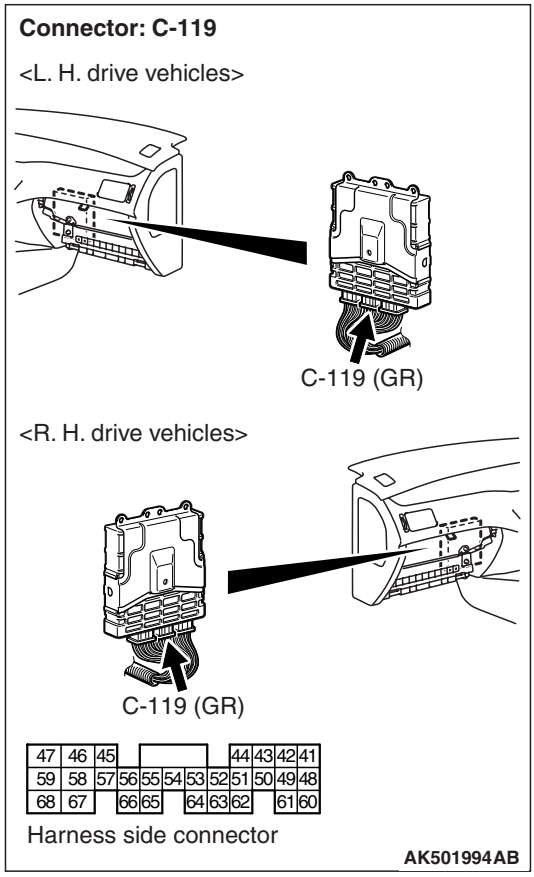


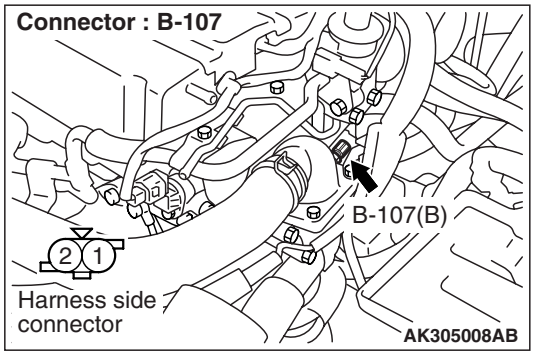


- Check output line for damage.

Q: Is the check result normal?
YES : Go to Step 16 .
NO : Repair the damaged harness wire.

STEP 16. Connector check: C-119 engine-ECU connector



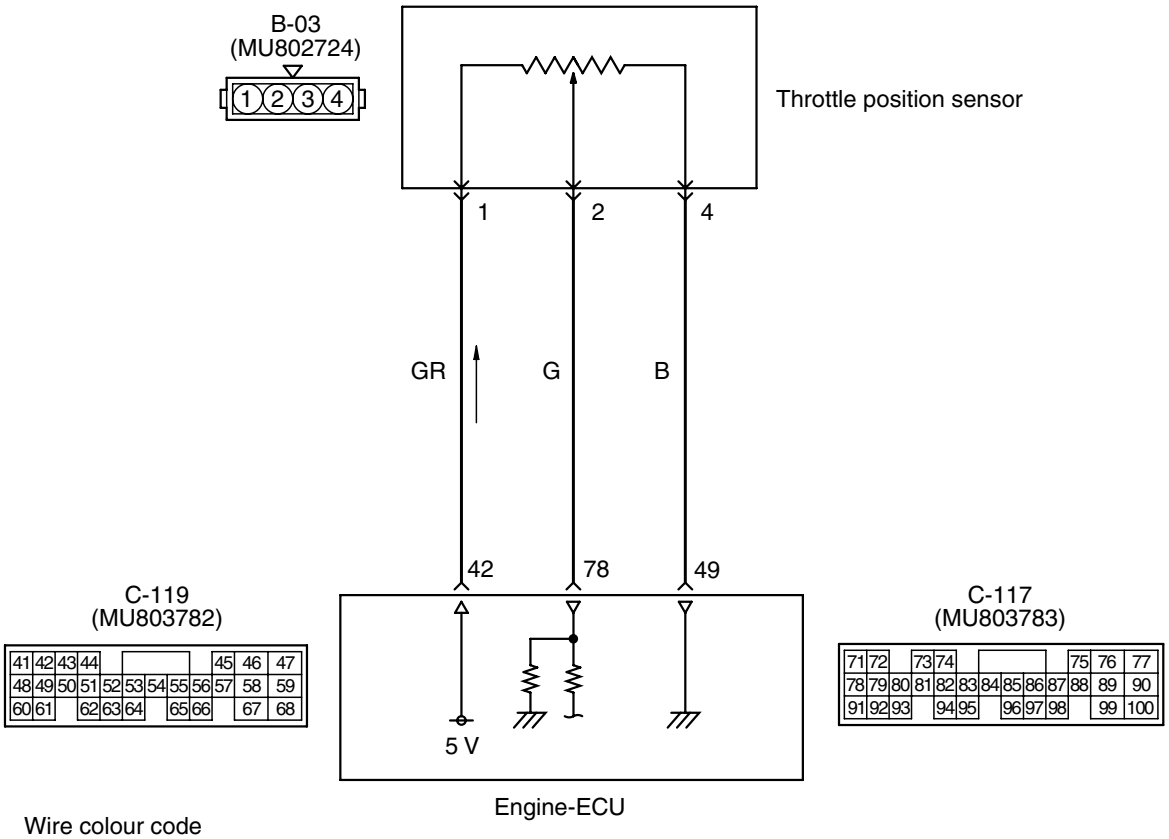


Q: Is the check result normal?
YES : Check harness between B-107 (terminal No. 2) engine coolant temperature sensor connector and C-119 (terminal No. 49) engine-ECU connector.
- Check earthing line for damage.

NO : Repair or replace the connector.

Code No. P0120: Throttle Position Sensor System

Throttle position sensor circuit



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

AK501804AB

OPERATION

- The power voltage of 5 V is applied to the throttle position sensor (terminal No. 1) from the engine-ECU (terminal No. 42).
- The power voltage is earthed to the engine-ECU (terminal No. 49) from the throttle position sensor (terminal No. 4).
- The sensor signal is inputted to the engine-ECU (terminal No. 78) from the throttle position sensor output terminal (terminal No. 2).

FUNCTION

- The throttle position sensor converts the opening of the throttle valve into a voltage and inputs the voltage signal to the engine-ECU.
- In response to the signal, the engine-ECU checks the opening of the throttle valve.

TROUBLE JUDGMENT

Check Condition

- Ignition switch: "ON" (Exclude 2 seconds after the ignition switch has been in "ON" position or just after the engine has started up.)

Judgment Criterion

- The sensor output voltage is 0.2 V or less for 2 seconds.

Check Conditions

- Engine speed of 1,000 r/min. or less.
- Volumetric efficiency 60% or less.

Judgment Criterion

- The sensor output voltage is 2.0 V or more for 2 seconds.

PROBABLE CAUSES

- Failed throttle position sensor
- Open/short circuit in throttle position sensor circuit or loose connector contact
- Failed engine-ECU

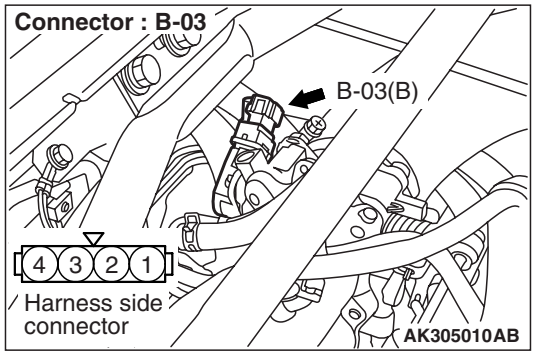
DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-II/III data list

- Refer to Data List Reference Table P.13A-372.
  a. Item No. 14: Throttle position sensor

Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-5).
NO : Go to Step 2 .

STEP 2. Connector check: B-03 throttle position sensor connector



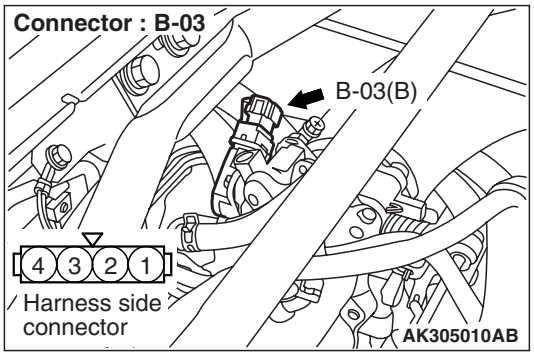
Q: Is the check result normal?
YES : Go to Step 3 .
NO : Repair or replace the connector.

STEP 3. Check throttle position sensor itself.

- Check throttle position sensor itself (Refer to P.13A-404).

Q: Is the check result normal?
YES : Go to Step 4 .
NO : Replace the throttle position sensor.

STEP 4. Perform voltage measurement at B-03 throttle position sensor connector.

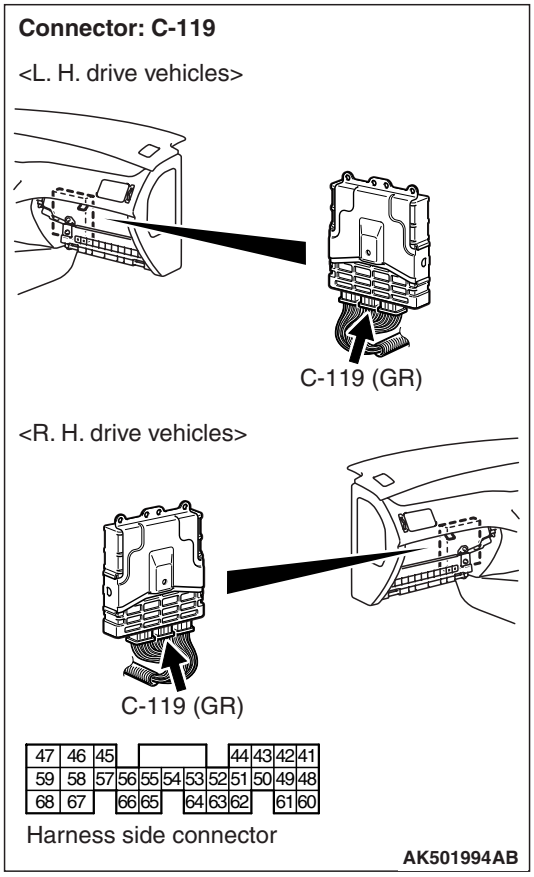


- Disconnect connector, and measure at harness side.
- Ignition switch: "ON"
- Voltage between terminal No. 1 and earth.

OK: 4.9 – 5.1 V

Q: Is the check result normal?
YES : Go to Step 10 .
NO : Go to Step 5 .

STEP 5. Perform voltage measurement at C-119 engine-ECU connector.



- Measure engine-ECU terminal voltage.
- Ignition switch: "ON"
- Voltage between terminal No. 42 and earth.

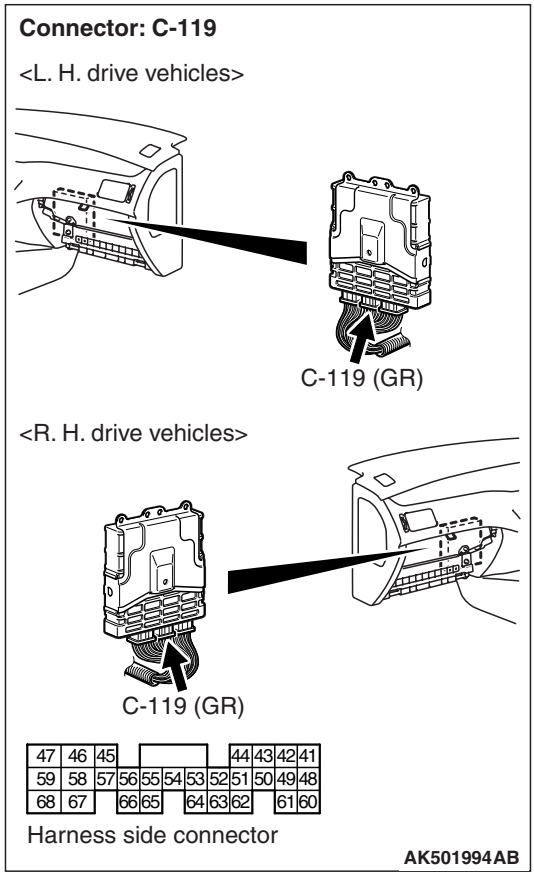
OK: 4.9 – 5.1 V

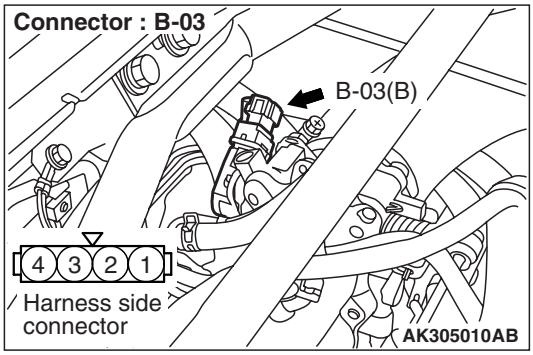
Q: Is the check result normal?

YES : Go to Step 6 .

NO : Go to Step 7 .

STEP 6. Connector check: C-119 engine-ECU connector





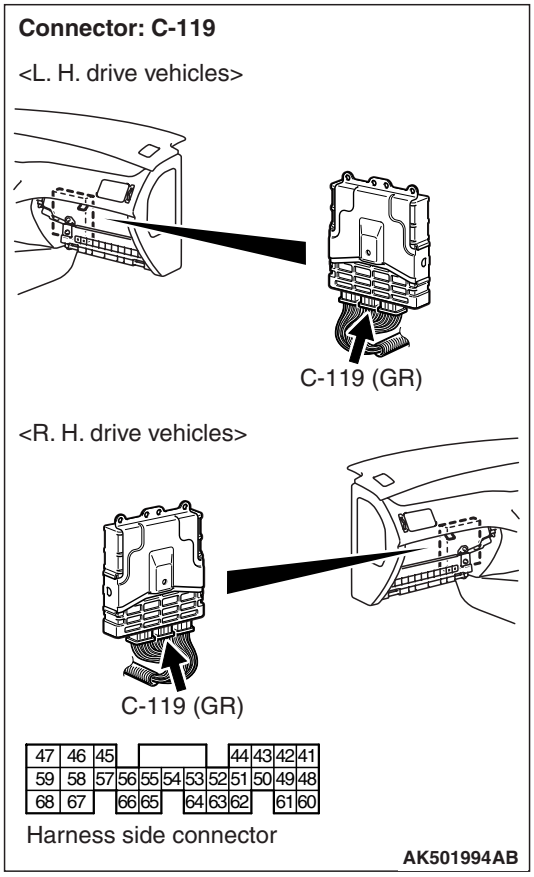
Q: Is the check result normal?

YES : Check and repair harness between B-03 (terminal No. 1) throttle position sensor connector and C-119 (terminal No. 42) engine-ECU connector.

- Check power supply line for open circuit.

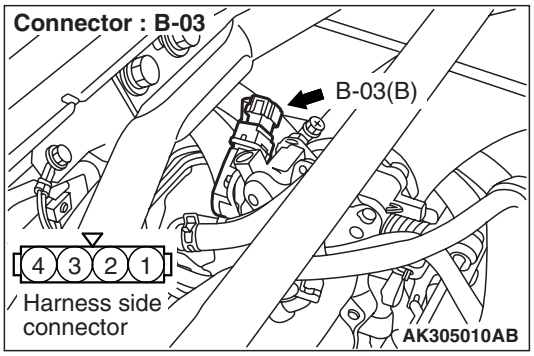
NO : Repair or replace the connector.

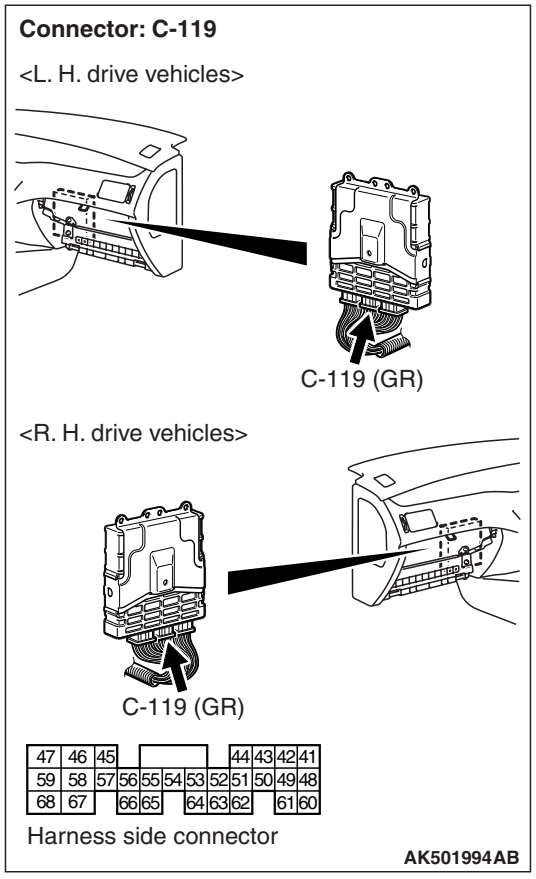
STEP 7. Connector check: C-119 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 8 .
NO : Repair or replace the connector.

STEP 8. Check harness between B-03 (terminal No. 1) throttle position sensor connector and C-119 (terminal No. 42) engine-ECU connector.





- Check power supply line for short circuit.

Q: Is the check result normal?
YES : Go to Step 9 .
NO : Repair the damaged harness wire.

STEP 9. M.U.T.-II/III data list

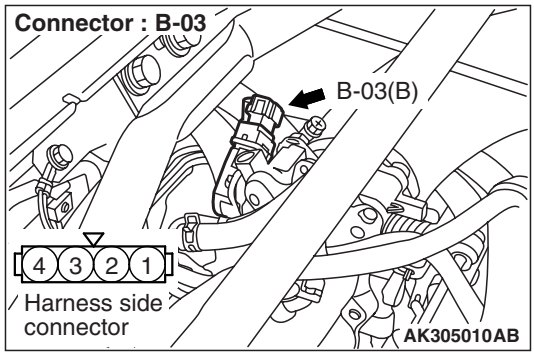
- Refer to Data List Reference Table P.13A-372.
  a. Item No. 14: Throttle position sensor

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-5).

NO : Replace the engine-ECU.

STEP 10. Perform resistance measurement at B-03 throttle position sensor connector.



- Disconnect connector, and measure at harness side.
- Resistance between terminal No. 4 and earth.

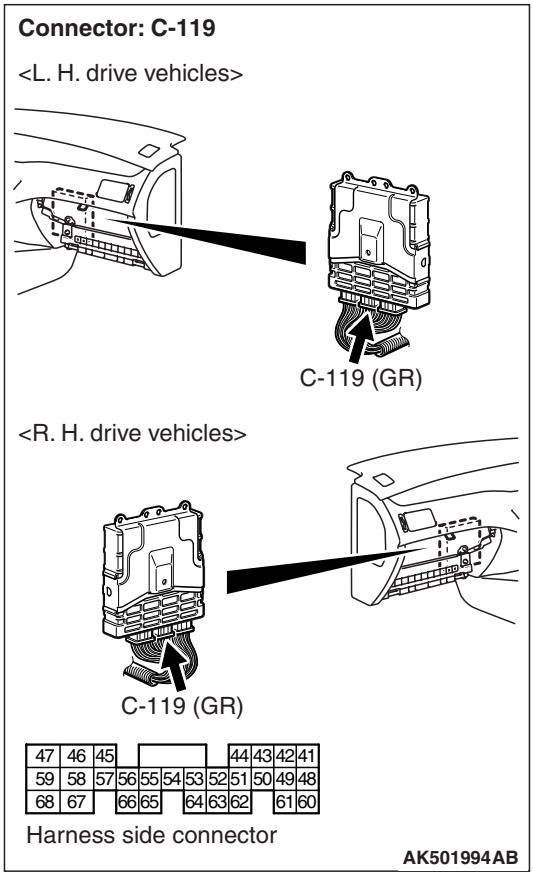
OK: 2 Ω or less

Q: Is the check result normal?

YES : Go to Step 13 .

NO : Go to Step 11 .

STEP 11. Connector check: C-119 engine-ECU connector

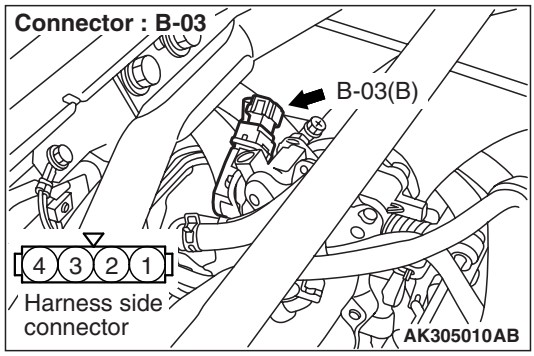


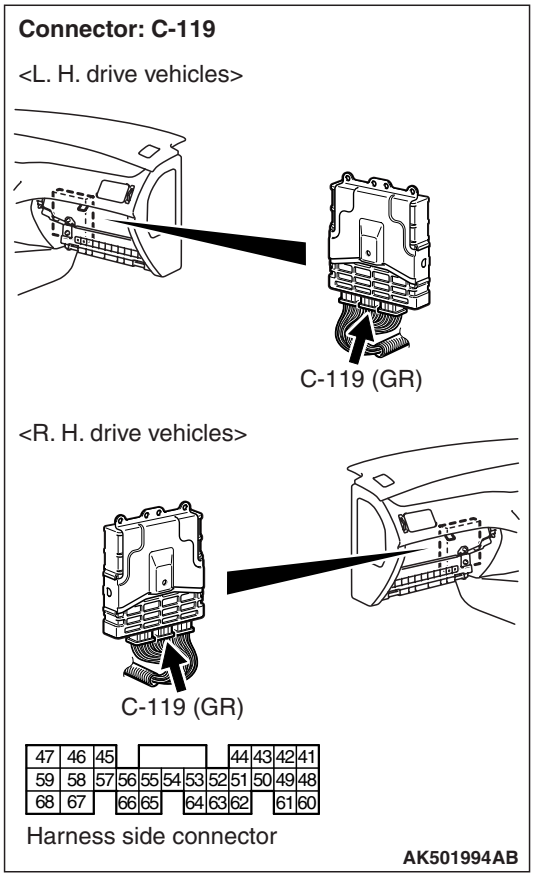
Q: Is the check result normal?

YES : Go to Step 12 .

NO : Repair or replace the connector.

STEP 12. Check harness between B-03 (terminal No. 4) throttle position sensor connector and C-119 (terminal No. 49) engine-ECU connector.

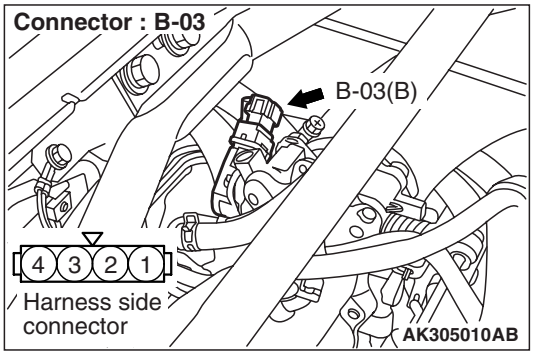




- Check earthing line for open circuit and damage.

Q: Is the check result normal?
YES : Go to Step 9 .
NO : Repair the damaged harness wire.

STEP 13. Perform voltage measurement at B-03 throttle position sensor connector.

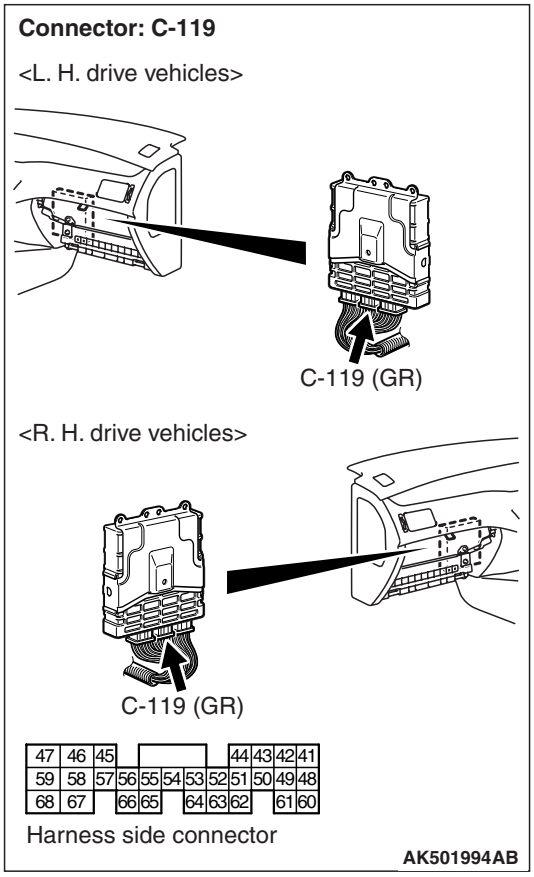


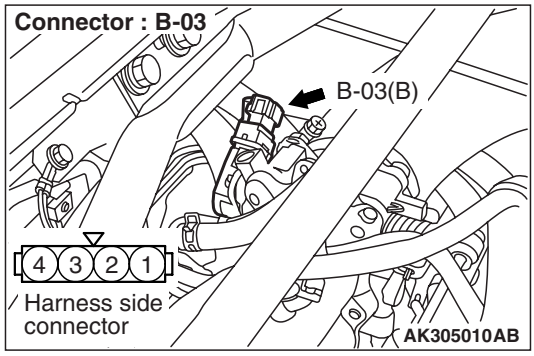
- Use special tool test harness (MB991536) to connect connector, and measure at pick-up harness.
- Ignition switch: "ON"
- Voltage between terminal No. 1 and earth.

OK: 4.9 – 5.1 V

Q: Is the check result normal?
YES : Go to Step 15 .
NO : Go to Step 14 .

STEP 14. Connector check: C-119 engine-ECU connector





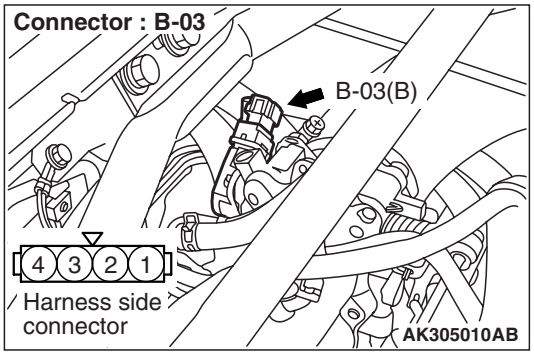
Q: Is the check result normal?

YES : Check and repair harness between B-03 (terminal No. 1) throttle position sensor connector and C-119 (terminal No. 42) engine-ECU connector.

- Check power supply line for damage.

NO : Repair or replace the connector.

STEP 15. Perform voltage measurement at B-03 throttle position sensor connector.



- Use special tool test harness (MB991536) to connect connector, and measure at pick-up harness.
- Ignition switch: "ON"
- Voltage between terminal No. 4 and earth.

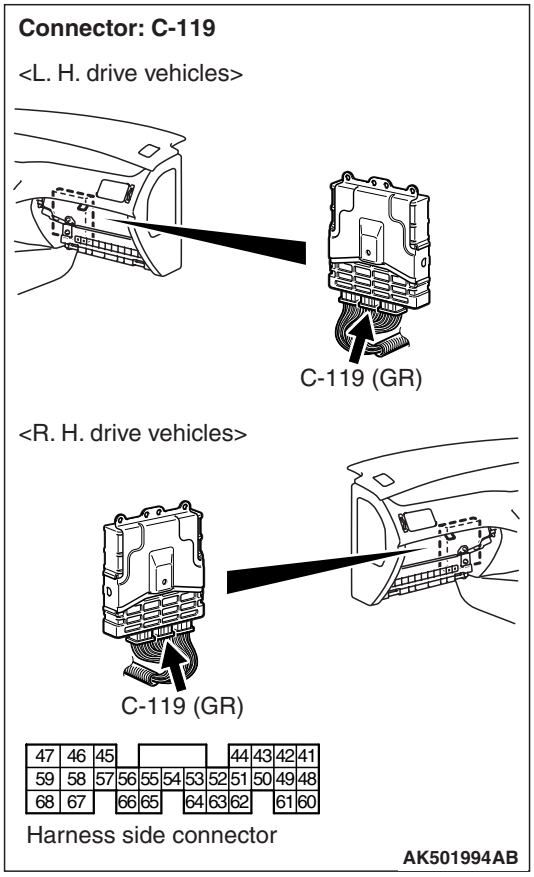
OK: 0.5 V or less

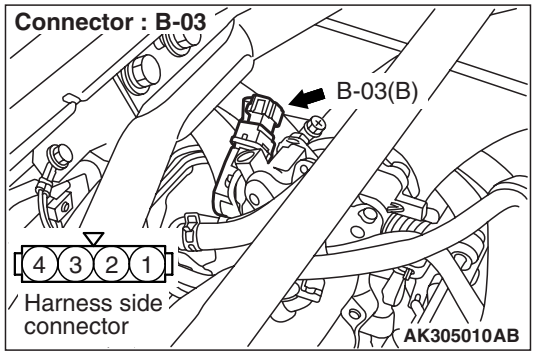
Q: Is the check result normal?

YES : Go to Step 17 .

NO : Go to Step 16 .

STEP 16. Connector check: C-119 engine-ECU connector





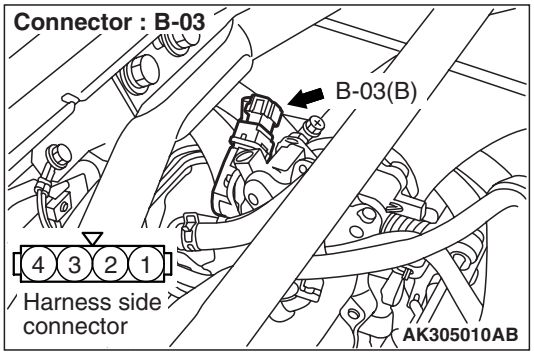
Q: Is the check result normal?

YES : Check and repair harness between B-03 (terminal No. 4) throttle position sensor connector and C-119 (terminal No. 49) engine-ECU connector.

- Check earthing line for damage.

NO : Repair or replace the connector.

STEP 17. Perform voltage measurement at B-03 throttle position sensor connector.



- Use special tool test harness (MB991536) to connect connector, and measure at pick-up harness.
- Ignition switch: "ON"
- Voltage between terminal No. 2 and earth.

OK:

Accelerator pedal fully released: 0.536 – 0.735 V

Accelerator pedal fully depressed: 4.5 – 5.0 V

Q: Is the check result normal?

YES : Go to Step 20 .

NO : Go to Step 18 .

STEP 18. Adjust throttle position sensor

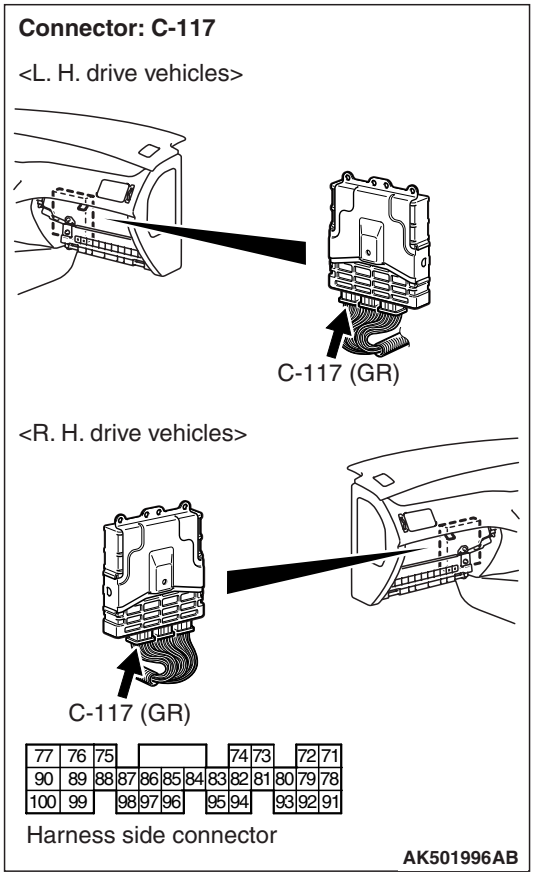
- Adjust throttle position sensor (Refer to P.13A-395).

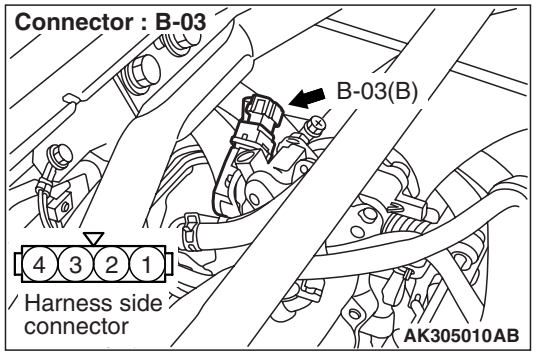
Q: Is the adjusted value normal?

YES : Go to Step 19 .

NO : Adjust throttle position sensor.

STEP 19. Connector check: C-117 engine-ECU connector





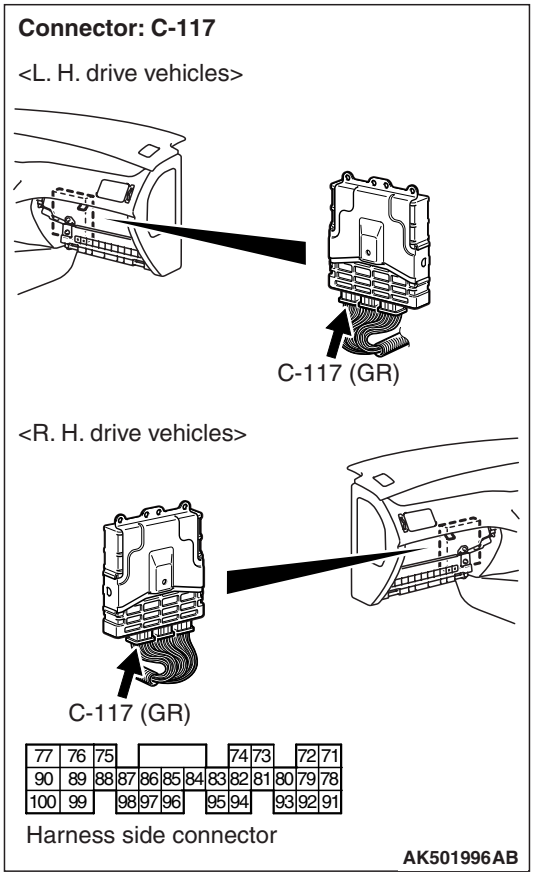
Q: Is the check result normal?

YES : Check and repair harness between B-03 (terminal No. 2) throttle position sensor connector and C-117 (terminal No. 78) engine-ECU connector.

- Check output line for short circuit and damage.

NO : Repair or replace the connector.

STEP 20. Perform voltage measurement at C-117 engine-ECU connector



- Measure engine-ECU terminal voltage.
- Ignition switch: "ON"
- Voltage between terminal No. 78 and earth.

OK:

Accelerator pedal fully released: 0.536 – 0.735 V

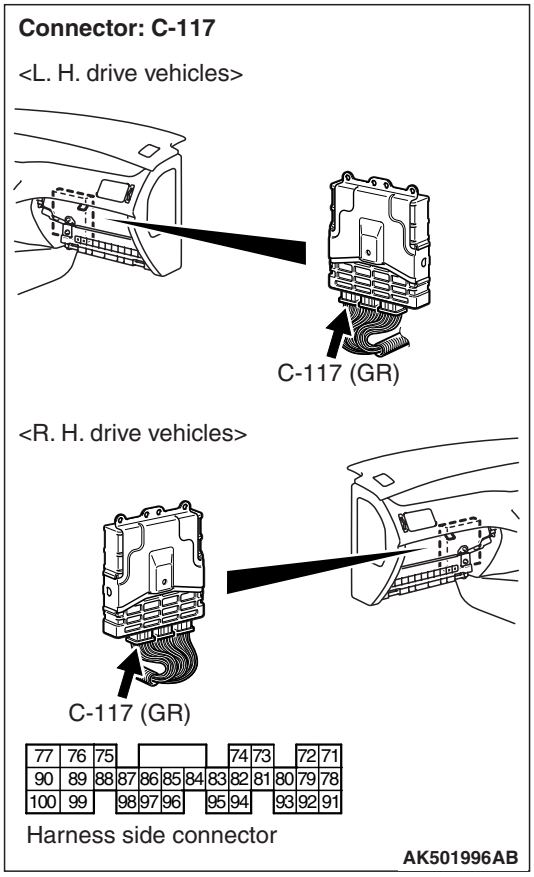
Accelerator pedal fully depressed: 4.5 – 5.0 V

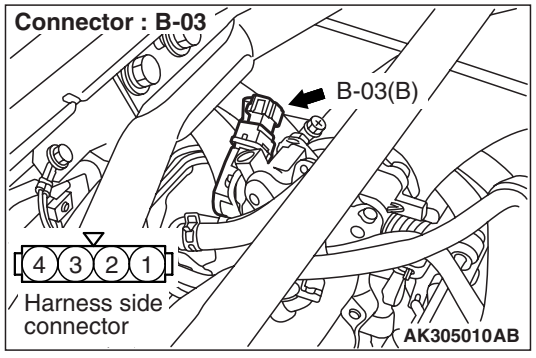
Q: Is the check result normal?

YES : Go to Step 22 .

NO : Go to Step 21 .

STEP 21. Connector check: C-117 engine-ECU connector





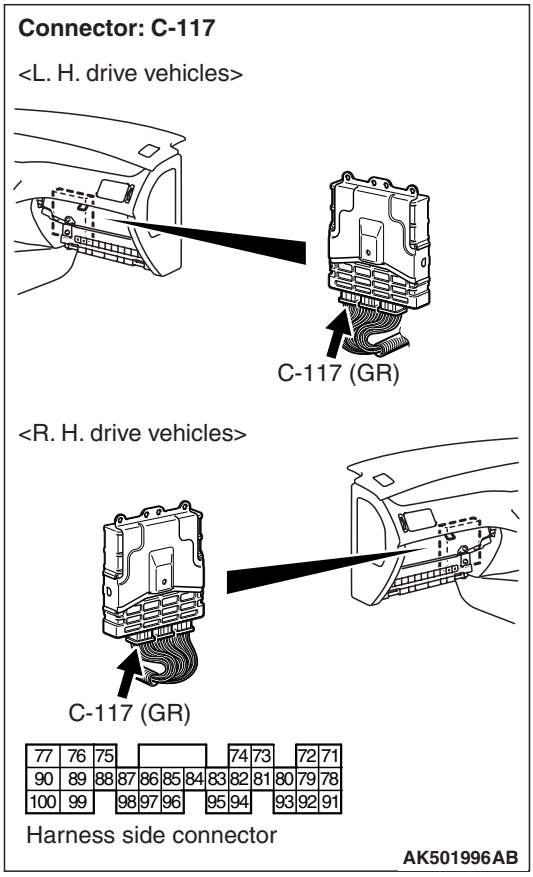
Q: Is the check result normal?

YES : Check and repair harness between B-03 (terminal No. 2) throttle position sensor connector and C-117 (terminal No. 78) engine-ECU connector.

- Check output line for open circuit and damage.

NO : Repair or replace the connector.

STEP 22. Connector check: C-117 engine-ECU connector



Q: Is the check result normal?

YES : Go to Step 9 .

NO : Repair or replace the connector.

Code No. P0125: Feedback system monitor

OPERATION

- Refer to P0201 injector circuit P.13A-105.

Refer to P0202 injector circuit P.13A-111.
Refer to P0203 injector circuit P.13A-117.
Refer to P0204 injector circuit P.13A-123.

- Refer to P0130 Oxygen sensor (front) circuit P.13A-75.

FUNCTION

- The engine-ECU effects air-fuel ratio feedback control in accordance with the signals from the oxygen sensor (front).
- If the heated oxygen sensor (front) has deteriorated, corrections will be made by the oxygen sensor (rear).
- Diagnosis code P0125 becomes stored in memory if a failure is detected in the above air-fuel ratio feedback control system.

TROUBLE JUDGMENT

Check Conditions

- The engine coolant temperature is approximately 76°C or more.
- Within the range of air-fuel ratio feedback operation.
- Not in slowing down operation.

Judgment Criterion

- The oxygen sensor output voltage is not deviated from 0.5 V for 30 seconds.

PROBABLE CAUSES

- Failed oxygen sensor (front)
- Harness damage in oxygen sensor (front) circuit or loose connector contact
- Failed oxygen sensor (rear)
- Failed fuel system
- Failed exhaust system
- Failed engine-ECU

NOTE: When the oxygen sensor (front) begins to deteriorate, the oxygen sensor output voltage will deviate from the voltage when the sensor was new (normally 0.5 volt at stoichiometric ratio). This deviation will be corrected by the oxygen sensor (rear). If the oxygen sensor (rear) responds poorly because it has deteriorated, it will improperly correct the oxygen sensor (front). Thus, even when closed loop control is being effected, the fluctuation of the oxygen sensor (front) output voltage decreases, without intersecting with 0.5 volt. As a result, there is a possibility of diagnosis code P0125 becoming registered.

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-II/III diagnosis code

Q: Is any other diagnosis code than P0125 output?
YES : Inspection chart for diagnosis code (Refer to P.13A-17).
NO : Go to Step 2 .

STEP 2. M.U.T.-II/III data list

- Refer to Data List Reference Table P.13A-372.

a. Item No. 12: Air flow sensor
b. Item No. 21: Engine coolant temperature sensor
c. Item No. 25: Barometric pressure sensor
d. Item No. 59: Oxygen sensor (rear)

Q: Are the check results normal?
YES : Go to Step 3 .
NO : Perform the diagnosis code classified check procedure for the sensor that has shown an abnormal data valve (Refer to Inspection Chart for Diagnosis Codes P.13A-17).

STEP 3. Check for intake of air from intake hose and inlet manifold.

Q: Is the check result normal?
YES : Go to Step 4 .
NO : Repair.

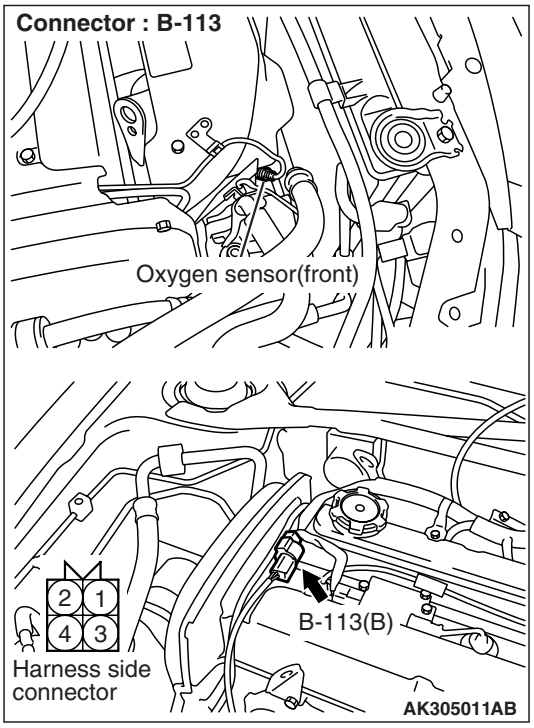
STEP 4. Check for leakage of exhaust emission from exhaust manifold.

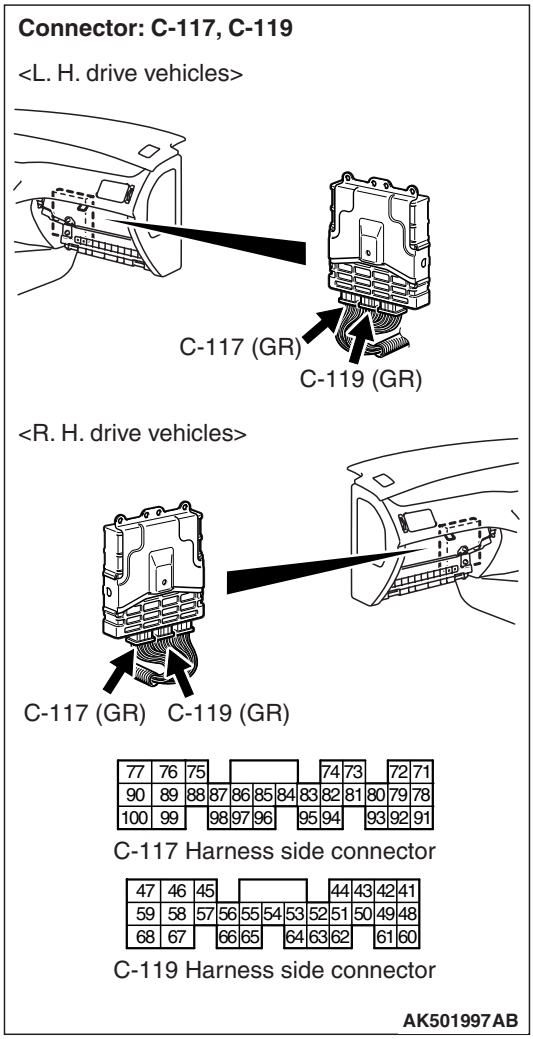
Q: Is the check result normal?
YES : Go to Step 5 .
NO : Repair.

STEP 5. Check throttle body (throttle valve portion) for contamination.

Q: Is the check result normal?
YES : Go to Step 6 .
NO : Clean throttle body (throttle valve portion) (Refer to P.13A-395).

STEP 6. Connector check: B-113 oxygen sensor (front) connector, C-117 and C-119 engine-ECU connector





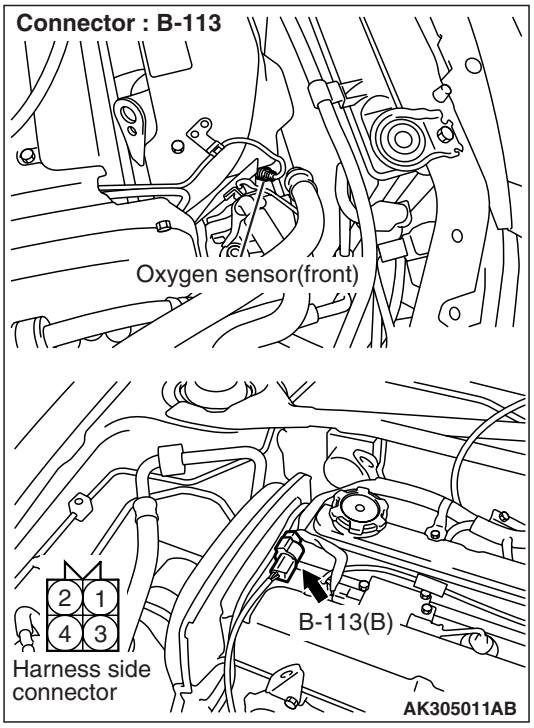
Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair or replace the connector.

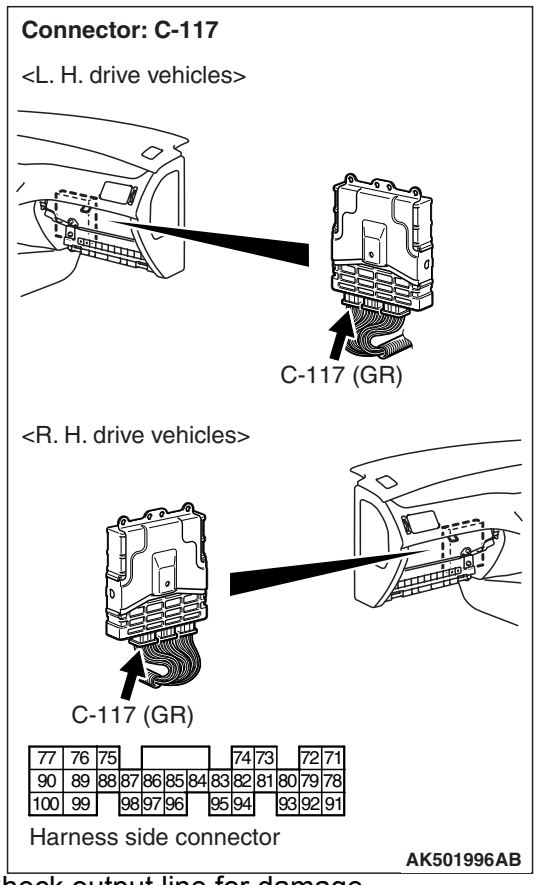
STEP 7. Check oxygen sensor (front) itself.

- Check oxygen sensor (front) itself (Refer to P.13A-404).

Q: Is the check result normal?
YES : Go to Step 8 .
NO : Replace the oxygen sensor (front).

STEP 8. Check harness between B-113 oxygen sensor (front) connector and C-117 engine-ECU connector.

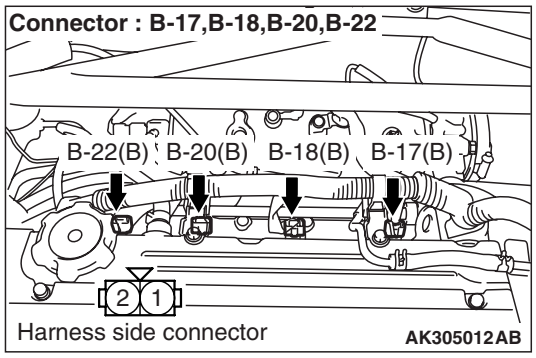




- Check output line for damage.

Q: Is the check result normal?
YES : Go to Step 9 .
NO : Repair the damaged harness wire.

STEP 9. Connector check: Injector connector



a. B-22 (No. 1 injector connector)
b. B-20 (No. 2 injector connector)
c. B-18 (No. 3 injector connector)
d. B-17 (No. 4 injector connector)

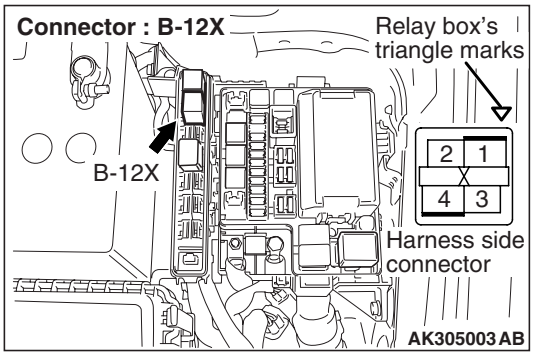
Q: Are the check results normal?
YES : Go to Step 10 .
NO : Repair or replace the connector.

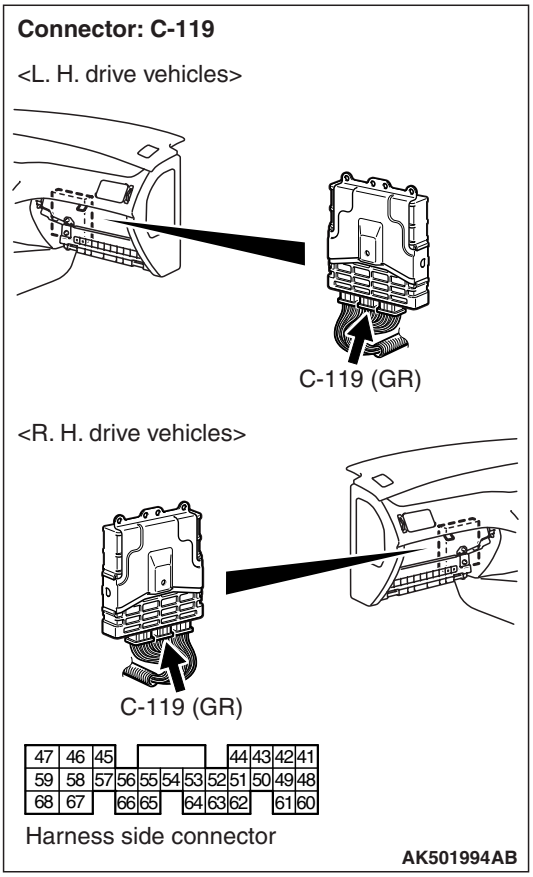
STEP 10. Check injector itself.

- Check Injector itself (Refer to P.13A-406).

Q: Is the check result normal?
YES : Go to Step 11 .
NO : Replace the injector.

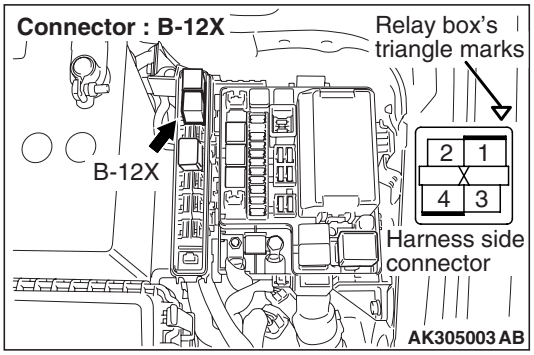
STEP 11. Connector check: B-12X engine control relay connector and C-119 engine-ECU connector.

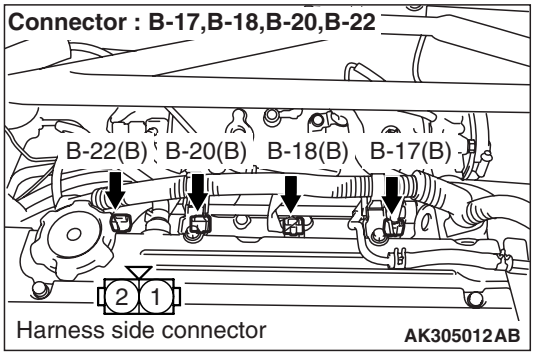




Q: Is the check result normal?
YES : Go to Step 12 .
NO : Repair or replace the connector.

STEP 12. Check harness between B-12X engine control relay connector and injector connector.



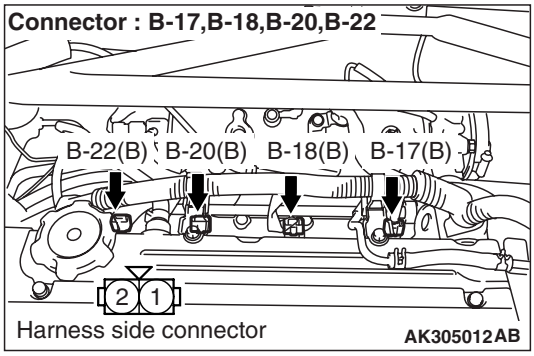


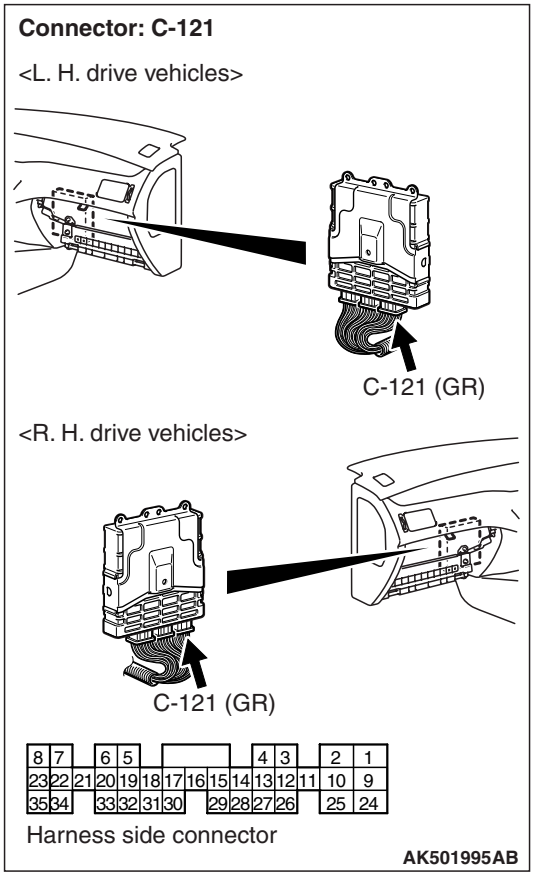
NOTE: Before checking harness, check intermediate connector C-105, and repair if necessary.

a. Check harness between B-12X (terminal No. 4) engine control relay connector and B-22 (terminal No. 1) No. 1 injector connector.
b. Check harness between B-12X (terminal No. 4) engine control relay connector and B-20 (terminal No. 1) No. 2 injector connector.
c. Check harness between B-12X (terminal No. 4) engine control relay connector and B-18 (terminal No. 1) No. 3 injector connector.
d. Check harness between B-12X (terminal No. 4) engine control relay connector and B-17 (terminal No. 1) No. 4 injector connector.
   - Check power supply line for damage.

Q: Are the check results normal?
YES : Go to Step 13 .
NO : Repair the damaged harness wire.

STEP 13. Check harness between injector connector and C-121 engine-ECU connector.





a. Check harness between B-22 (terminal No. 2) No. 1 injector connector and C-121 (terminal No. 1) engine-ECU connector.
b. Check harness between B-20 (terminal No. 2) No. 2 injector connector and C-121 (terminal No. 9) engine-ECU connector.
c. Check harness between B-18 (terminal No. 2) No. 3 injector connector and C-121 (terminal No. 24) engine-ECU connector.
d. Check harness between B-17 (terminal No. 2) No. 4 injector connector and C-121 (terminal No. 2) engine-ECU connector.

Q: Are the check results normal?
YES : Go to Step 14 .
NO : Repair the damaged harness wire.

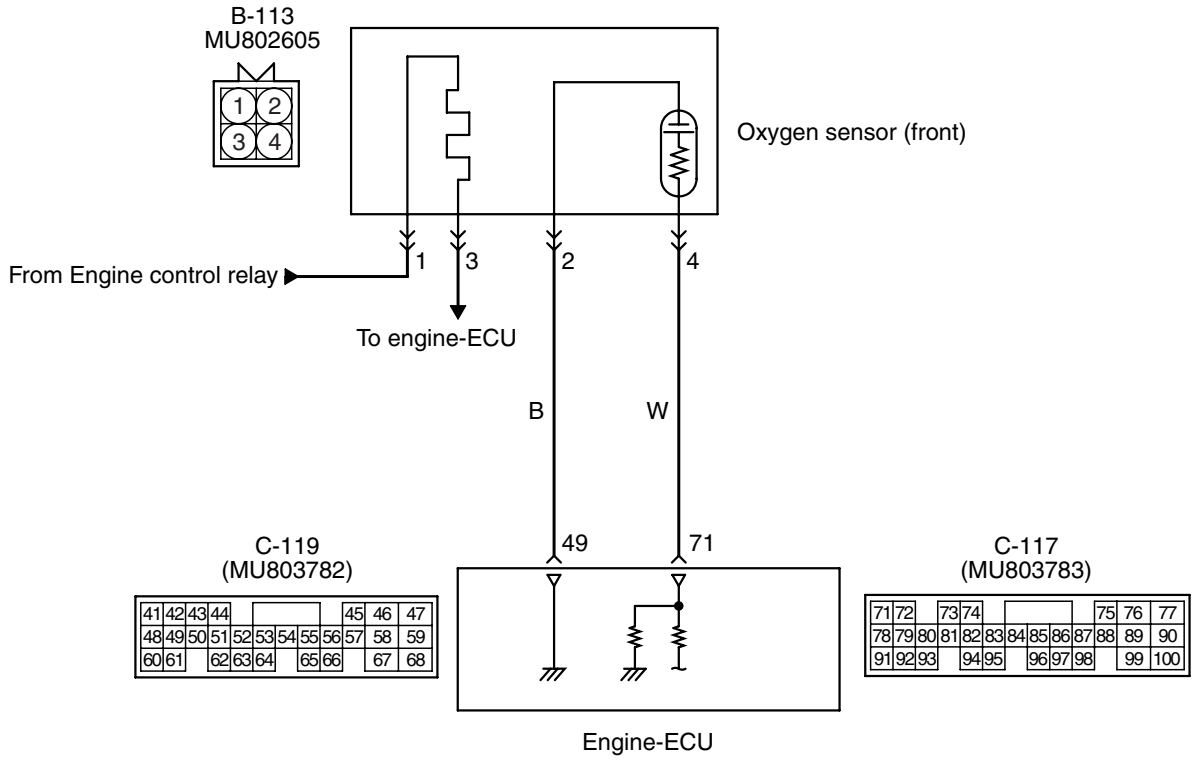
STEP 14. Fuel pressure measurement.

- Fuel pressure measurement (Refer to P.13A-396).

Q: Is the check result normal?
YES : Replace the engine-ECU.
NO : Repair.

Code No. P0130: Oxygen Sensor (front) System

Oxygen sensor (front) circuit



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

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OPERATION

- The sensor signal is inputted to the engine-ECU (terminal No. 71) from the oxygen sensor (front) output terminal (terminal No. 4).
- The oxygen sensor (front) (terminal No. 2) is earthed with engine-ECU (terminal No. 49).

FUNCTION

- The oxygen sensor (front) converts the concentration of oxygen in the exhaust emission into a voltage and inputs the signal to the engine-ECU.
- When the air-fuel ratio is richer than the theoretical air-fuel ratio, the oxygen sensor (front) outputs a voltage of about 1 V. When it is leaner than the theoretical air-fuel ratio, it outputs a voltage of about 0 V.
- In response to the signal, the engine-ECU controls the fuel infection amount so that the air-fuel ratio can be equivalent to the theoretical air-fuel ratio.

TROUBLE JUDGMENT

Check Conditions

- After 3 or more minutes from when the engine has started up.
- Engine coolant temperature approximately 80°C or more.
- Volumetric efficiency 25% or more.
- Engine speed of 1,200 r/min. or more.

Judgment Criterion

- When the oxygen sensor (front) output voltage is 0.2 V or less, and a power voltage of 5 V is applied to the oxygen sensor (front) in the engine-ECU, the sensor output voltage is 4.5 V or more.

PROBABLE CAUSES

- Failed oxygen sensor (front)
- Open/short circuit in oxygen sensor (front) circuit or loose connector contact
- Failed engine-ECU

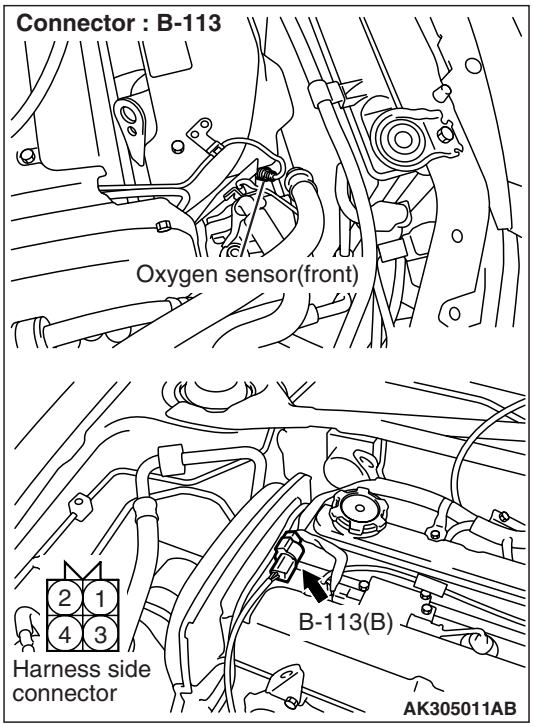
DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-II/III data list

- Refer to Data List Reference Table P.13A-372.
  a. Item No. 11: Oxygen sensor (front)

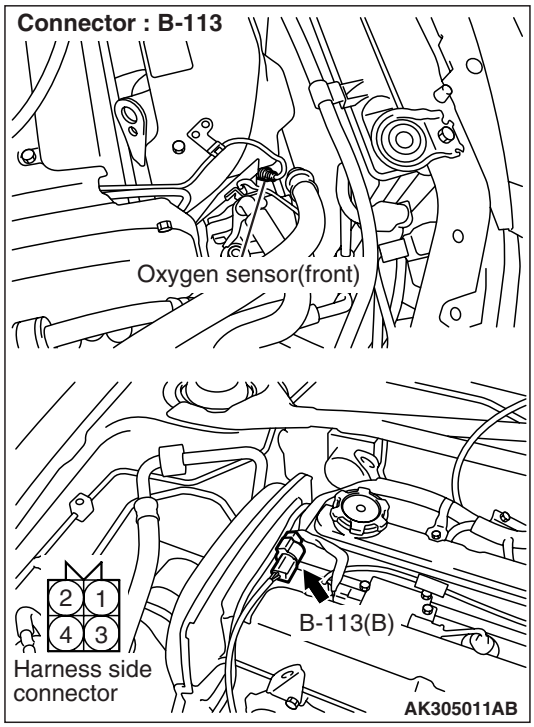
Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-5).
NO : Go to Step 2 .

STEP 2. Connector check: B-113 oxygen sensor (front) connector



Q: Is the check result normal?
YES : Go to Step 3 .
NO : Repair or replace the connector.

STEP 3. Perform resistance measurement at B-113 oxygen sensor (front) connector

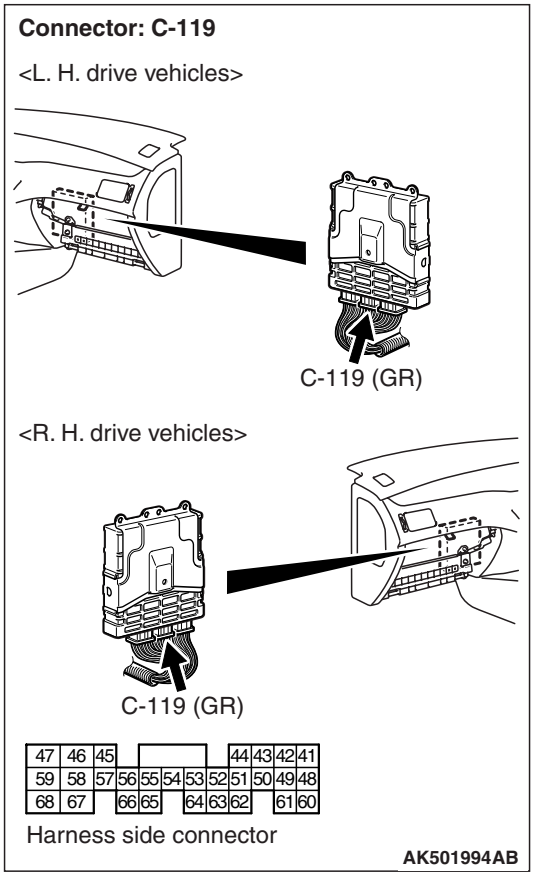


- Disconnect connector, and measure at harness side.
- Resistance between terminal No. 2 and earth.

OK: 2 Ω or less

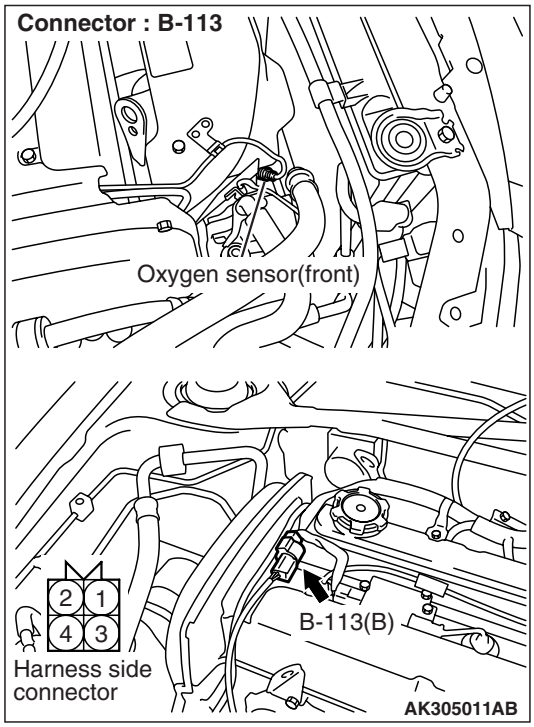
Q: Is the check result normal?
YES : Go to Step 7 .
NO : Go to Step 4 .

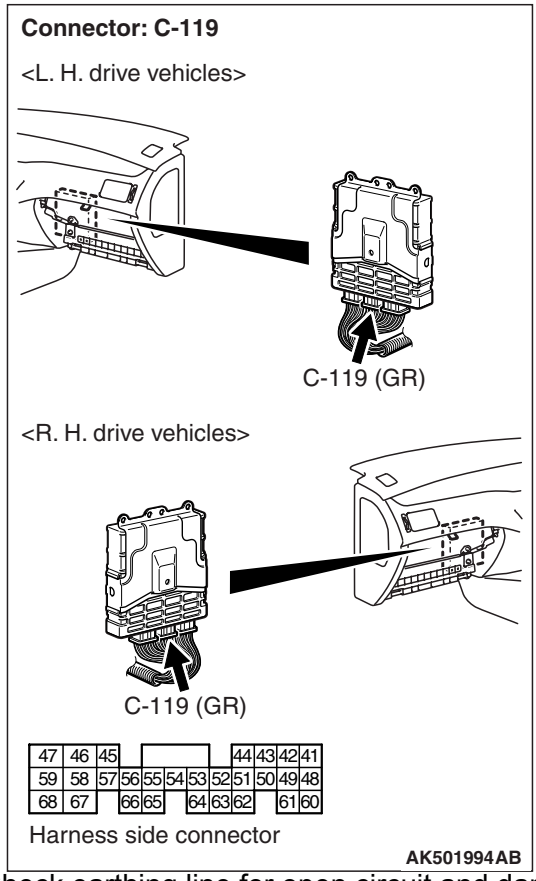
STEP 4. Connector check: C-119 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 5 .
NO : Repair or replace the connector.

STEP 5. Check harness between B-113 (terminal No. 2) oxygen sensor connector and C-119 (terminal No. 49) engine-ECU connector.





- Check earthing line for open circuit and damage.

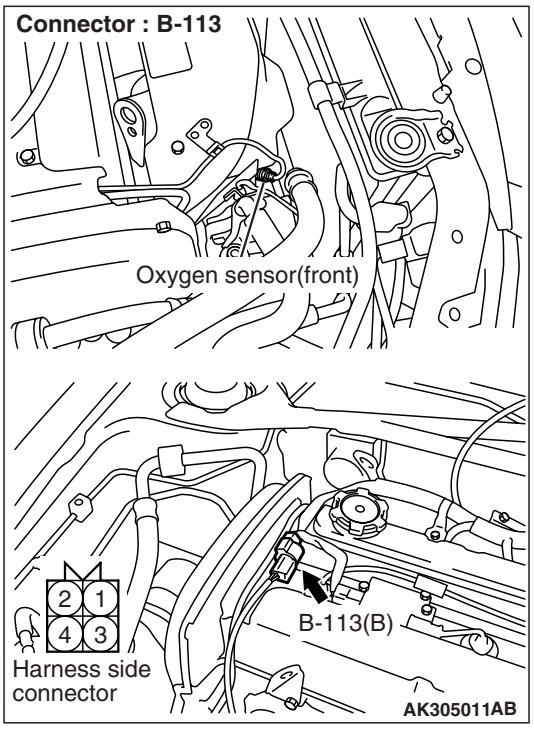
Q: Is the check result normal?
YES : Go to Step 6 .
NO : Repair the damaged harness wire.

STEP 6. M.U.T.-II/III data list

- Refer to Data List Reference Table P.13A-372.
  a. Item No. 11: Oxygen sensor (front)

Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-5).
NO : Replace the engine-ECU.

STEP 7. Perform voltage measurement at B-113 oxygen sensor (front) connector.

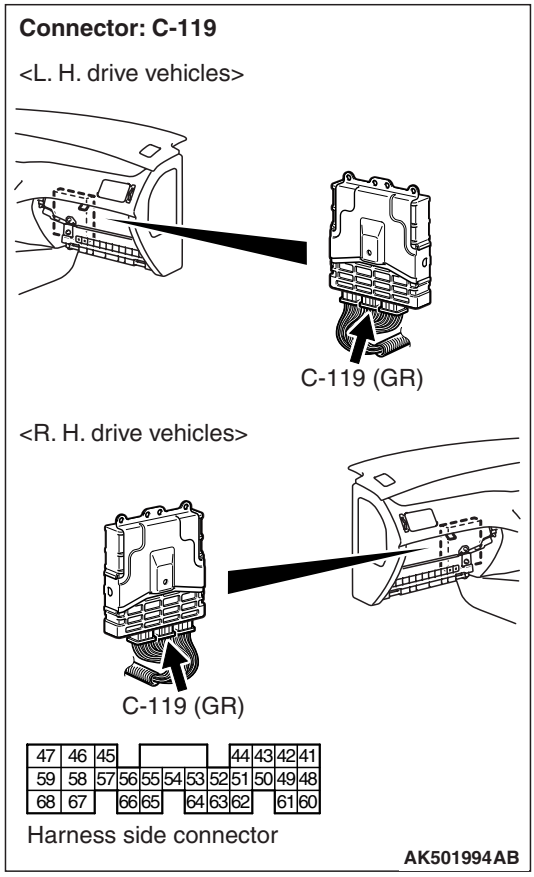


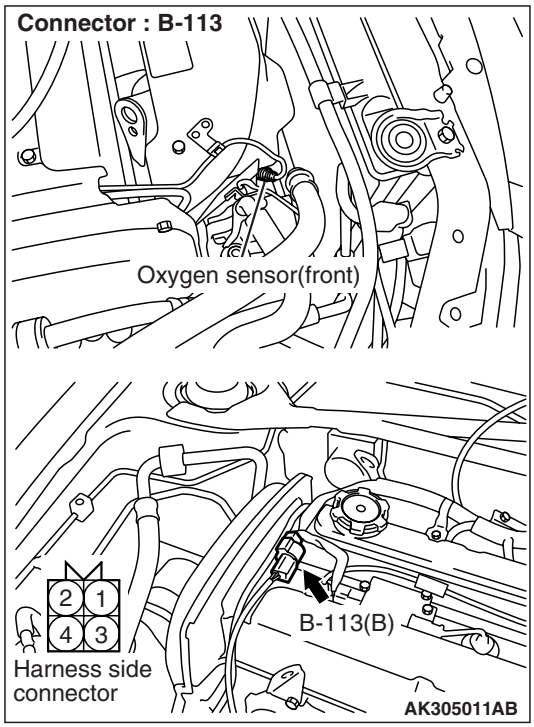
- Use special tool test harness (MD998464) to connect connector, and measure at pick-up harness.
- Engine: After warm-up
- Ignition switch: "ON"
- Voltage between terminal No. 2 and earth.

OK: 0.5 V or less

Q: Is the check result normal?
YES : Go to Step 9 .
NO : Go to Step 8 .

STEP 8. Connector check: C-119 engine-ECU connector



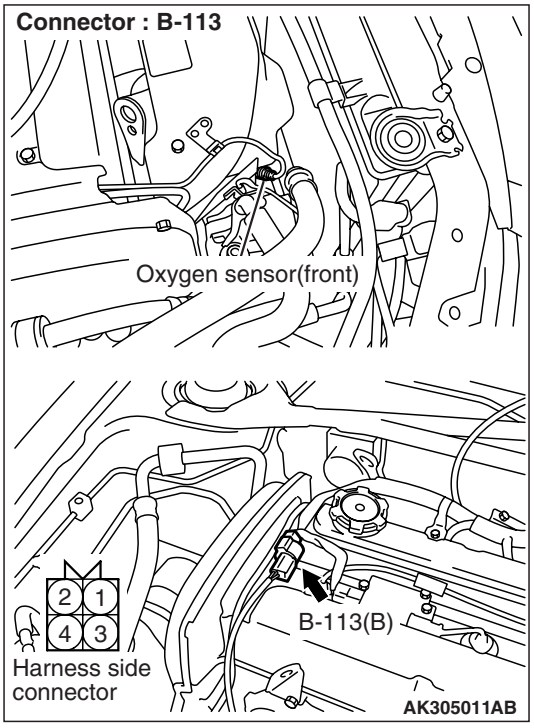


Q: Is the check result normal?

YES : Check and repair harness between B-113 (terminal No. 2) oxygen sensor (front) connector and C-119 (terminal No. 49) engine-ECU connector.
- Check earthing line for damage.

NO : Repair or replace the connector.

STEP 9. Perform voltage measurement at B-113 oxygen sensor (front) connector.



- Use special tool test harness (MD998464) to connect connector, and measure at pick-up harness.
- Engine: After warm-up
- Voltage between terminal No. 4 and earth.

OK:

600 – 1,000 mV when 200 mV or lower abrupt racing is done a few seconds after abrupt deceleration from 4,000 r/min.

Q: Is the check result normal?

YES : Go to Step 12 .

NO : Go to Step 10 .

STEP 10. Check oxygen sensor (front) itself

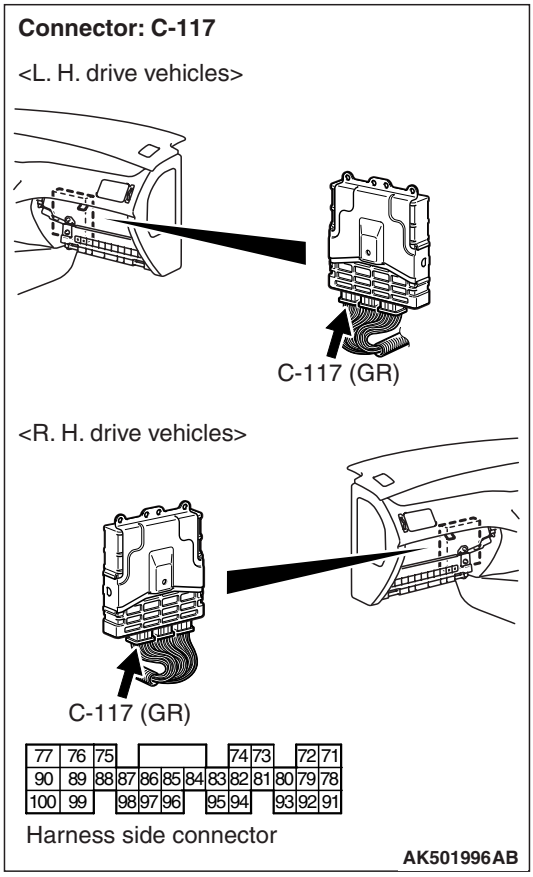
- Check oxygen sensor itself (Refer to P.13A-404).

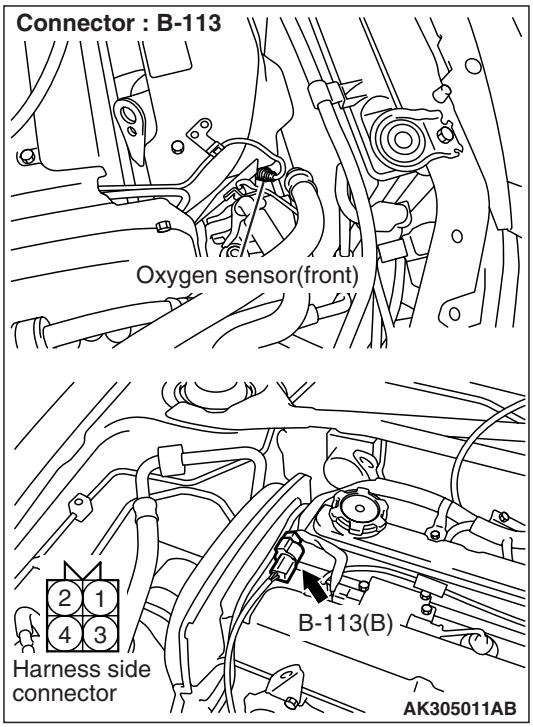
Q: Is the check result normal?

YES : Go to Step 11 .

NO : Replace the oxygen sensor (front).

STEP 11. Connector check: C-117 engine-ECU connector

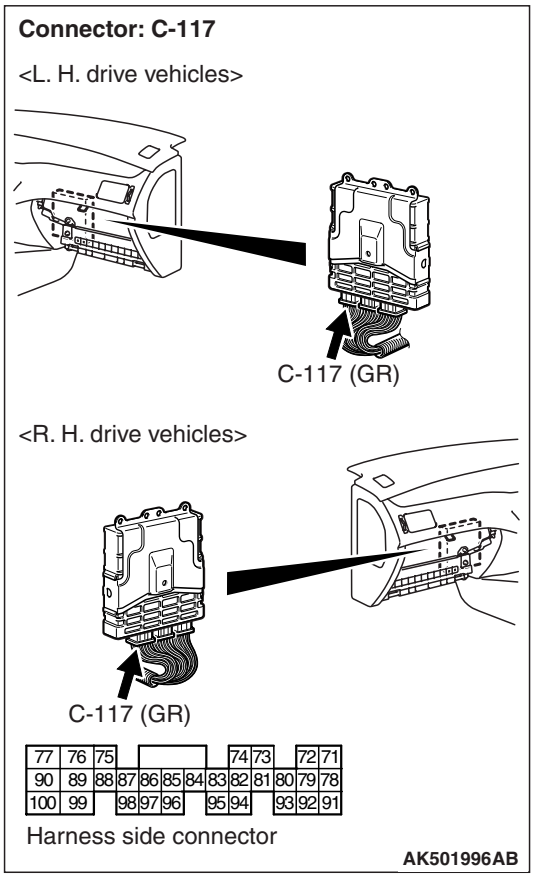




Q: Is the check result normal?
YES : Check and repair harness between B-113 (terminal No. 4) oxygen sensor (front) connector and C-117 (terminal No. 71) engine-ECU connector.
- Check output line for damage.

NO : Repair or replace the connector.

STEP 12. Perform voltage measurement at C-117 engine-ECU connector.

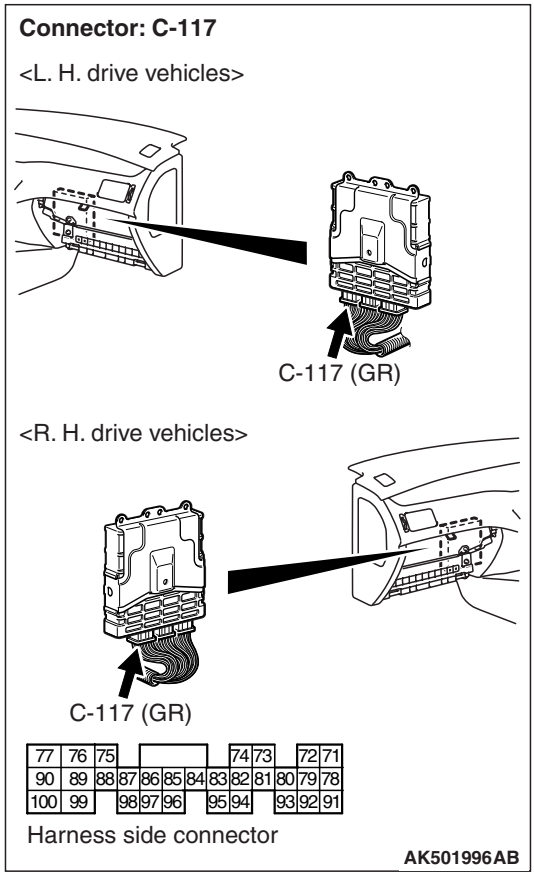


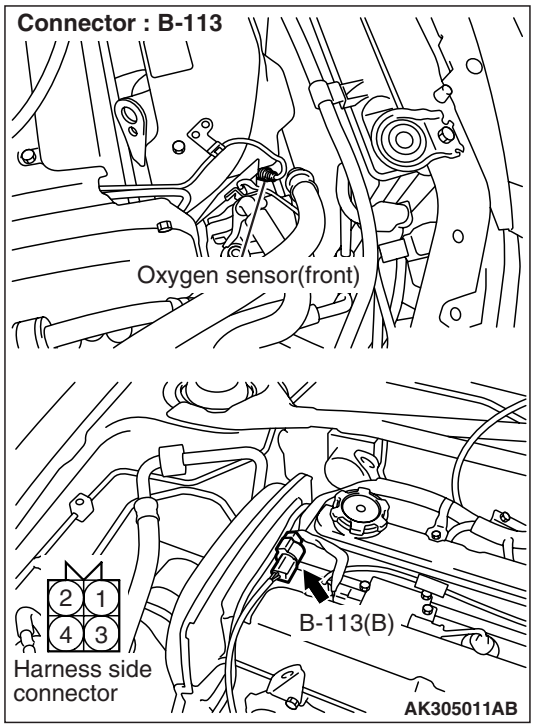
- Measure engine-ECU terminal voltage.
- Transmission: Neutral
- Engine: After warm-up
- Voltage between terminal No. 71 and earth.

OK:
600 – 1,000 mV when 200 mV or lower abrupt racing is done a few seconds after abrupt deceleration from 4,000 r/min.

Q: Is the check result normal?
YES : Go to Step 14 .
NO : Go to Step 13 .

STEP 13. Connector check: C-117 engine-ECU connector





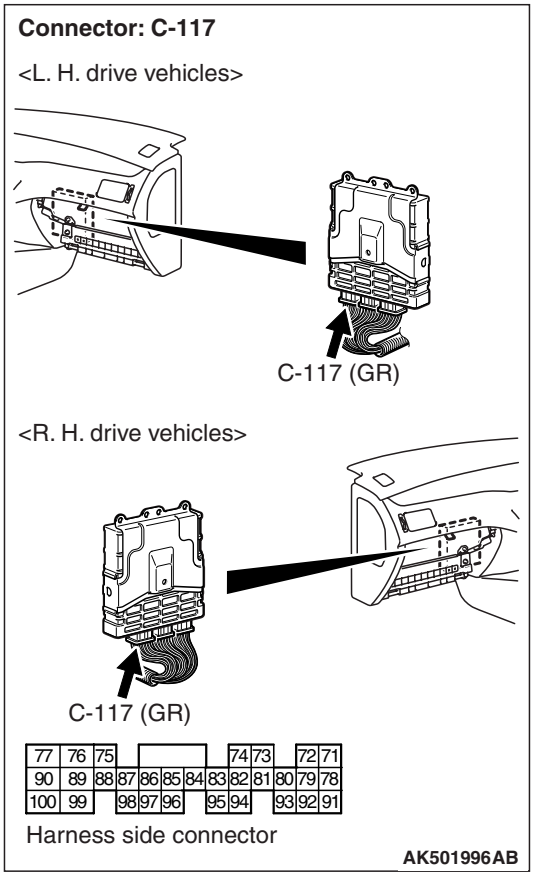
Q: Is the check result normal?

YES : Check and repair harness between B-113 (terminal No. 4) oxygen sensor (front) connector and C-117 (terminal No. 71) engine-ECU connector.

- Check output line for open circuit.

NO : Repair or replace the connector.

STEP 14. Connector check: C-117 engine-ECU connector



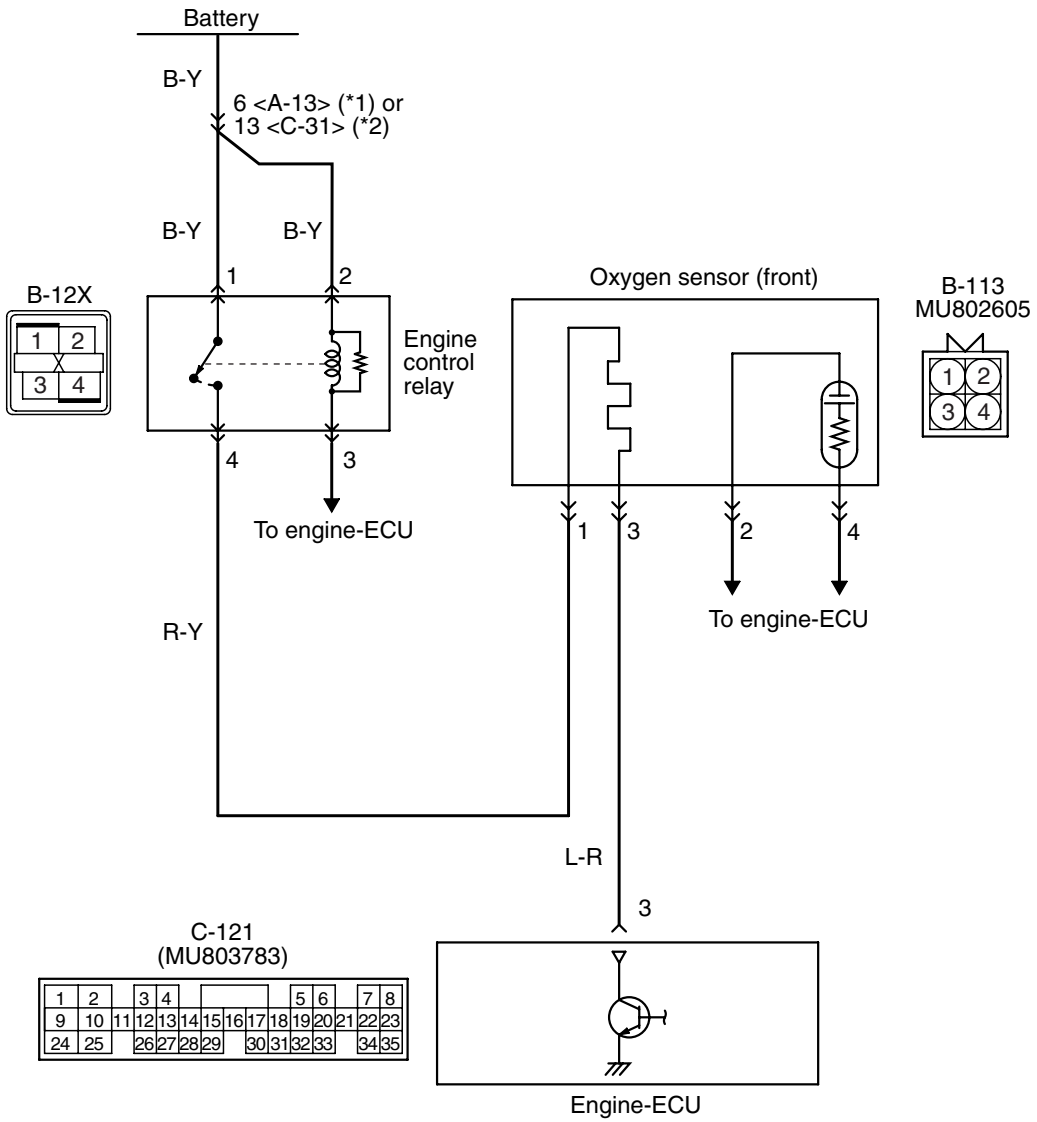
Q: Is the check result normal?

YES : Go to Step 6 .

NO : Repair or replace the connector.

Code No. P0135: Oxygen Sensor Heater (front) System

Oxygen sensor heater (front) circuit



NOTE
*1: L.H. drive vehicles
*2: R.H. drive vehicles

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

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OPERATION

- Power is supplied to the heater power terminal (terminal No. 1) of the oxygen sensor (front) connector from the engine control relay (terminal No. 4).
- The heater (terminal No. 3) of the oxygen sensor (front) connector is controlled by the power transistor in the engine-ECU (terminal No. 3).

FUNCTION

- The power supply to the oxygen sensor heater (front) is controlled by the ON/OFF control of the power transistor in the engine-ECU.
- Heating the oxygen sensor heater (front) enables the oxygen sensor to provide good response even when the exhaust emission temperature is low.

TROUBLE JUDGMENT

Check Conditions

- The engine coolant temperature is 20°C or higher.
- The oxygen sensor heater: (front) is ON.
- The engine speed of 50 r/min. or more.
- A/C relay: OFF
- Radiator fan: OFF
- The system voltage is 11 – 16 V.

Judging Criterion

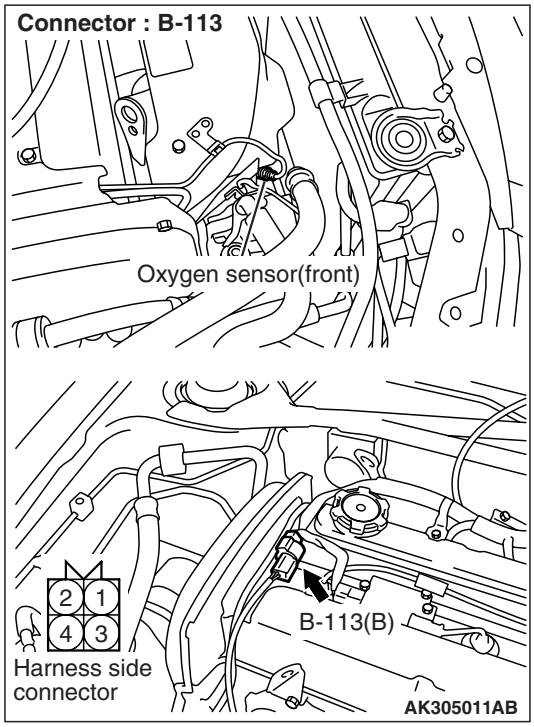
- The heater current of oxygen sensor heater (front) 0.2 A or less or 3.5 A or more for 4 seconds.

PROBABLE CAUSES

- Failed oxygen sensor heater (front)
- Open/short circuit in oxygen sensor heater (front) circuit or loose connector contact
- Failed engine-ECU

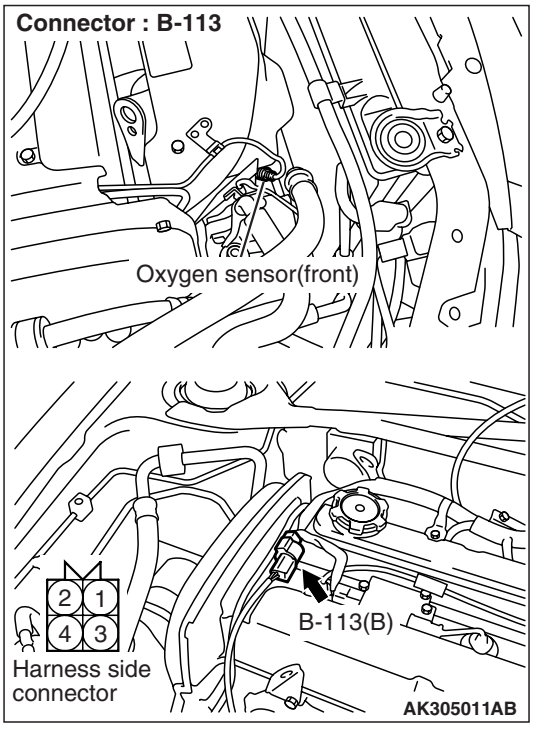
DIAGNOSIS PROCEDURE

STEP 1. Connector check: B-113 oxygen sensor (front) connector



Q: Is the check result normal?
YES : Go to Step 2 .
NO : Repair or replace the connector.

STEP 2. Perform resistance measurement at B-113 oxygen sensor (front) connector.

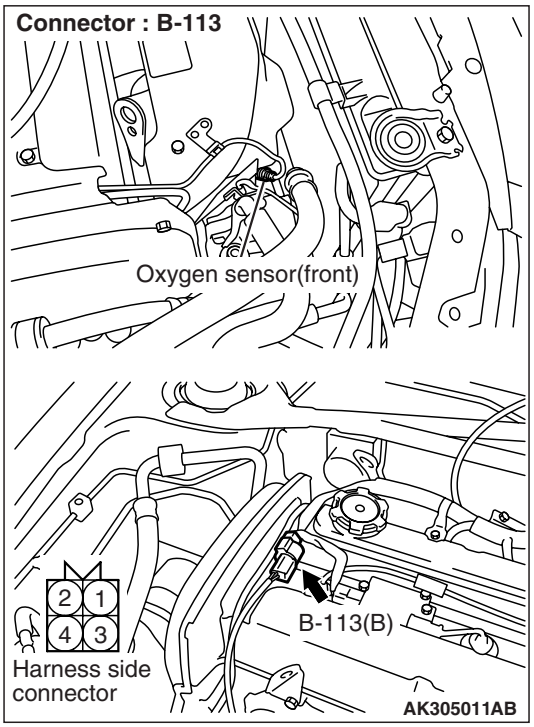


- Disconnect connector, and measure at sensor side.
- Resistance between terminal No. 1 and No. 3.

OK: 4.5 – 8.0 Ω

Q: Is the check result normal?
YES : Go to Step 3 .
NO : Replace the oxygen sensor (front).

STEP 3. Perform voltage measurement at B-113 oxygen sensor (front) connector.



- Disconnect connector, and measure at harness side.
- Ignition switch: "ON"
- Voltage between terminal No. 1 and earth.

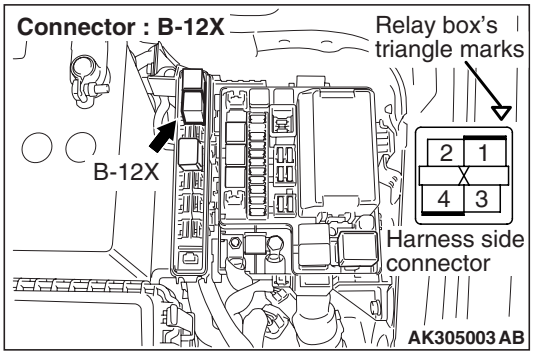
OK: System voltage

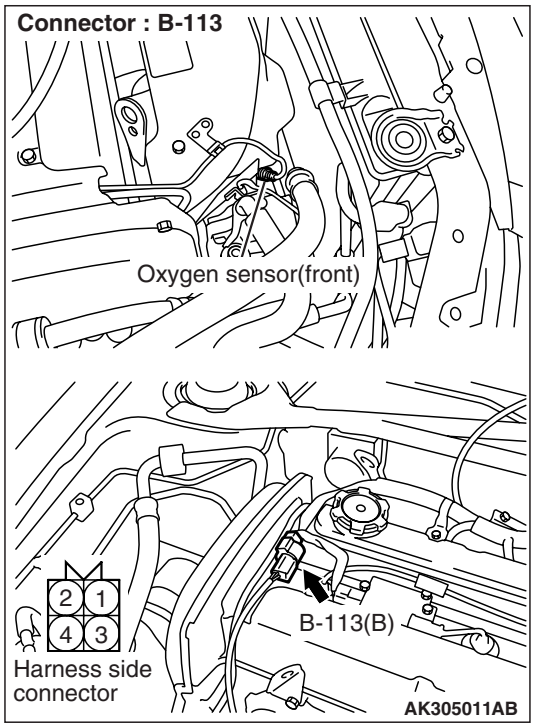
Q: Is the check result normal?

YES : Go to Step 5 .

NO : Go to Step 4 .

STEP 4. Connector check: B-12X engine control relay connector





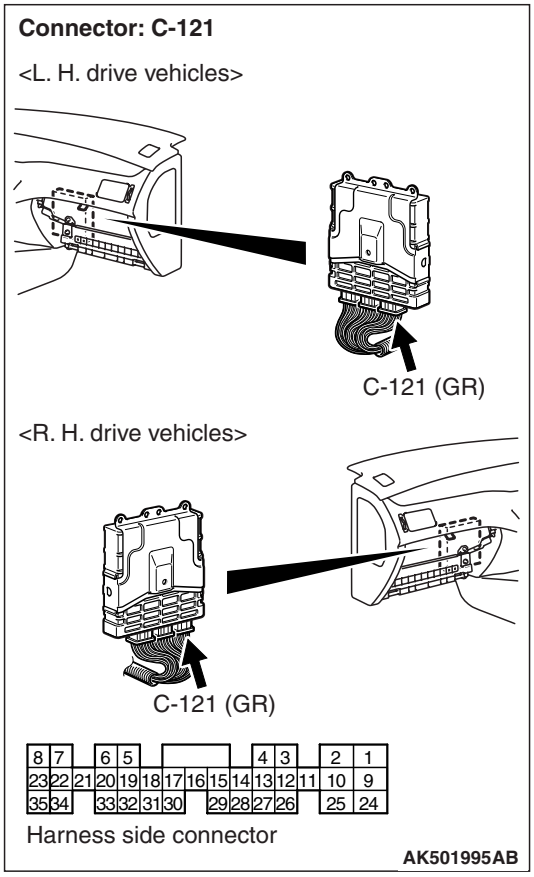
Q: Is the check result normal?

YES : Check and repair harness between B-113 (terminal No. 1) oxygen sensor (front) connector and B-12X (terminal No. 4) engine control relay connector.

- Check power supply line for open/short circuit.

NO : Repair or replace the connector.

STEP 5. Perform voltage measurement at C-121 engine-ECU connector.

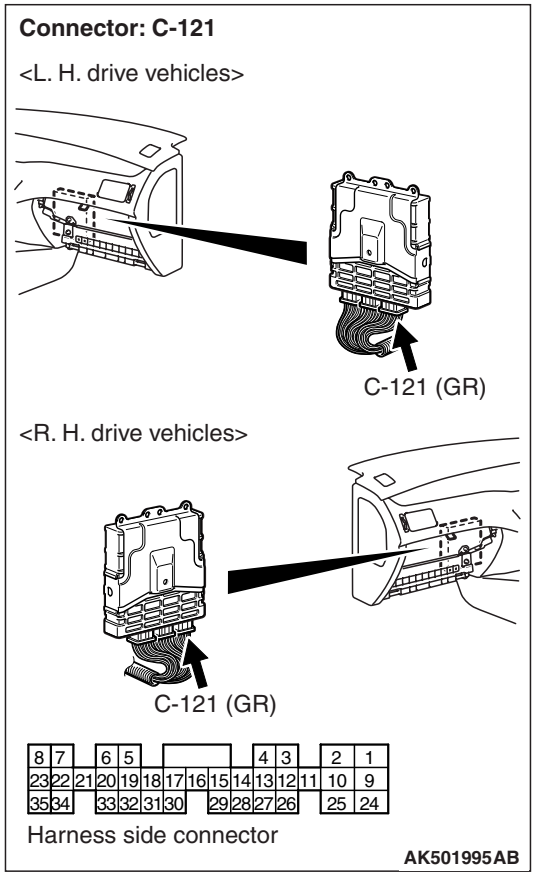


- Measure engine-ECU terminal voltage.
- Ignition switch: "ON"
- Voltage between terminal No. 3 and earth.

OK: System voltage

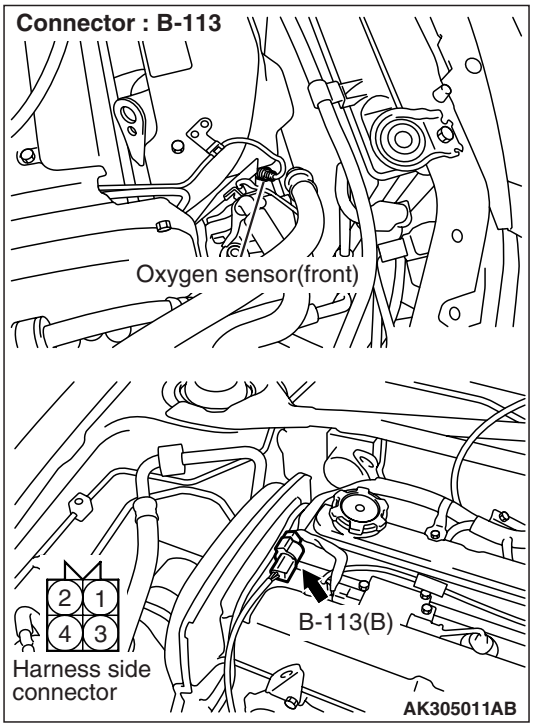
Q: Is the check result normal?
YES : Go to Step 8 .
NO : Go to Step 6 .

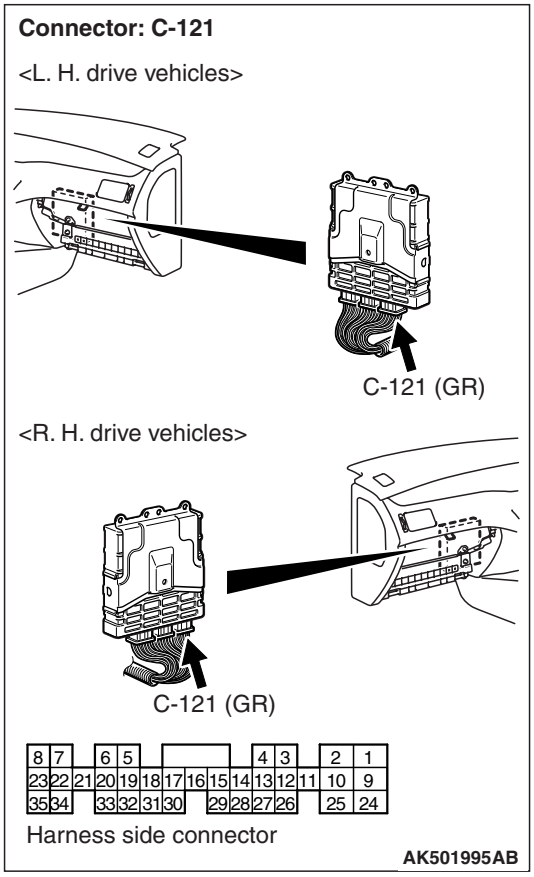
STEP 6. Connector check: C-121 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair or replace the connector.

STEP 7. Check harness between B-113 (terminal No. 3) oxygen sensor connector and C-121 (terminal No. 3) engine-ECU connector.

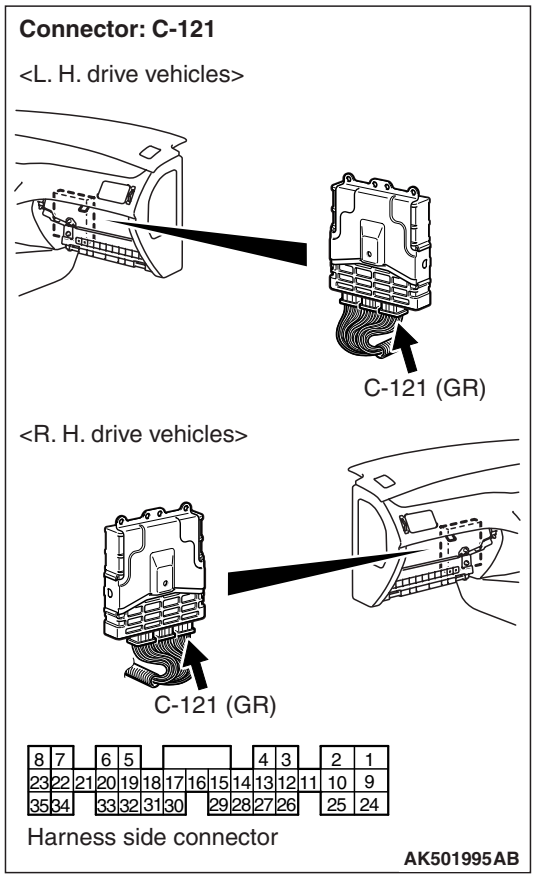




- Check earthing line for open/short circuit.

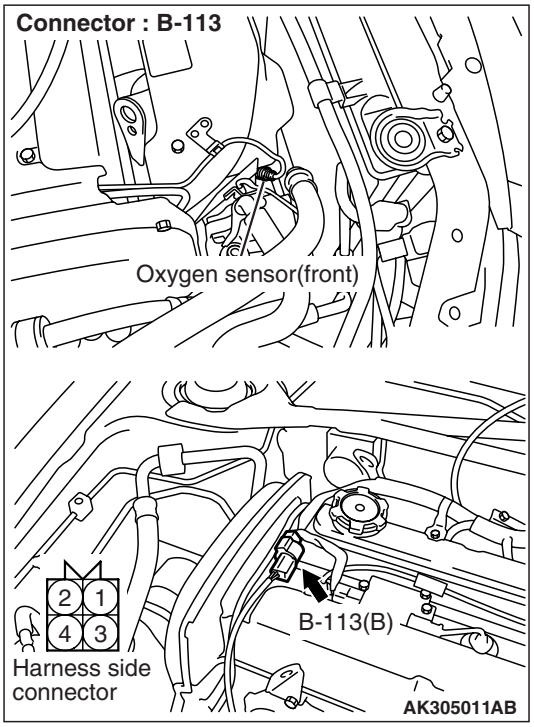
Q: Is the check result normal?
YES : Replace the engine-ECU.
NO : Repair the damaged harness wire.

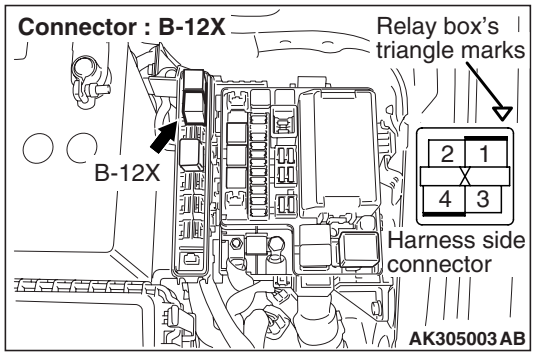
STEP 8. Connector check: C-121 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 9 .
NO : Repair or replace the connector.

STEP 9. Check harness between B-113 (terminal No. 1) oxygen sensor (front) connector and B-12X (terminal No. 4) engine control relay connector.

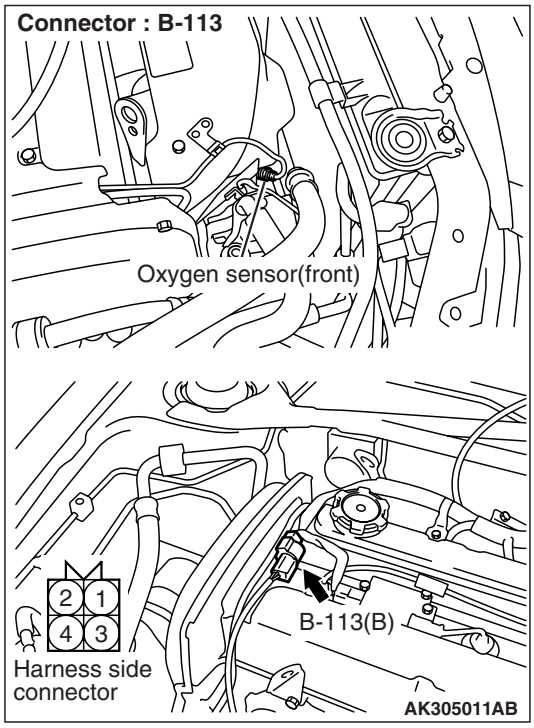


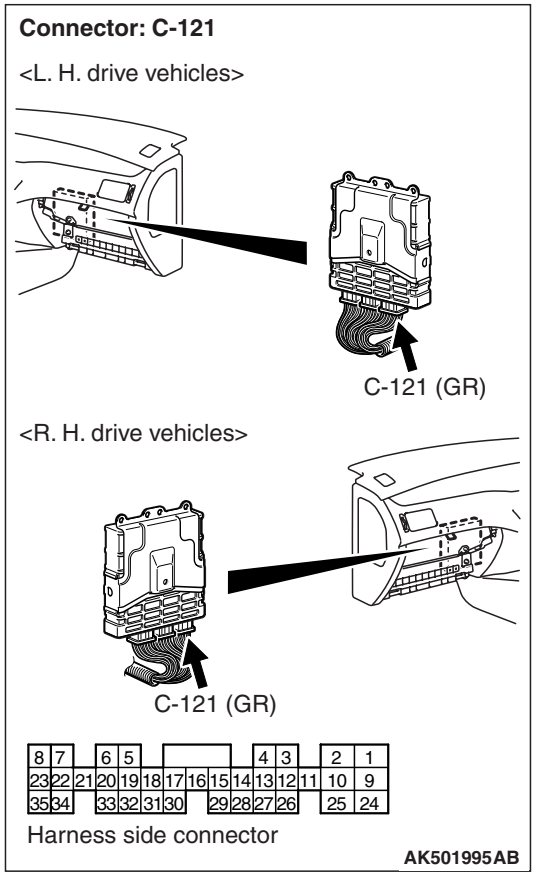


- Check power supply line for damage.

Q: Is the check result normal?
YES : Go to Step 10 .
NO : Repair the damaged harness wire.

STEP 10. Check harness between B-113 (terminal No. 3) oxygen sensor (front) connector and C-121 (terminal No. 3) engine-ECU connector.





- Check earthing line for damage.

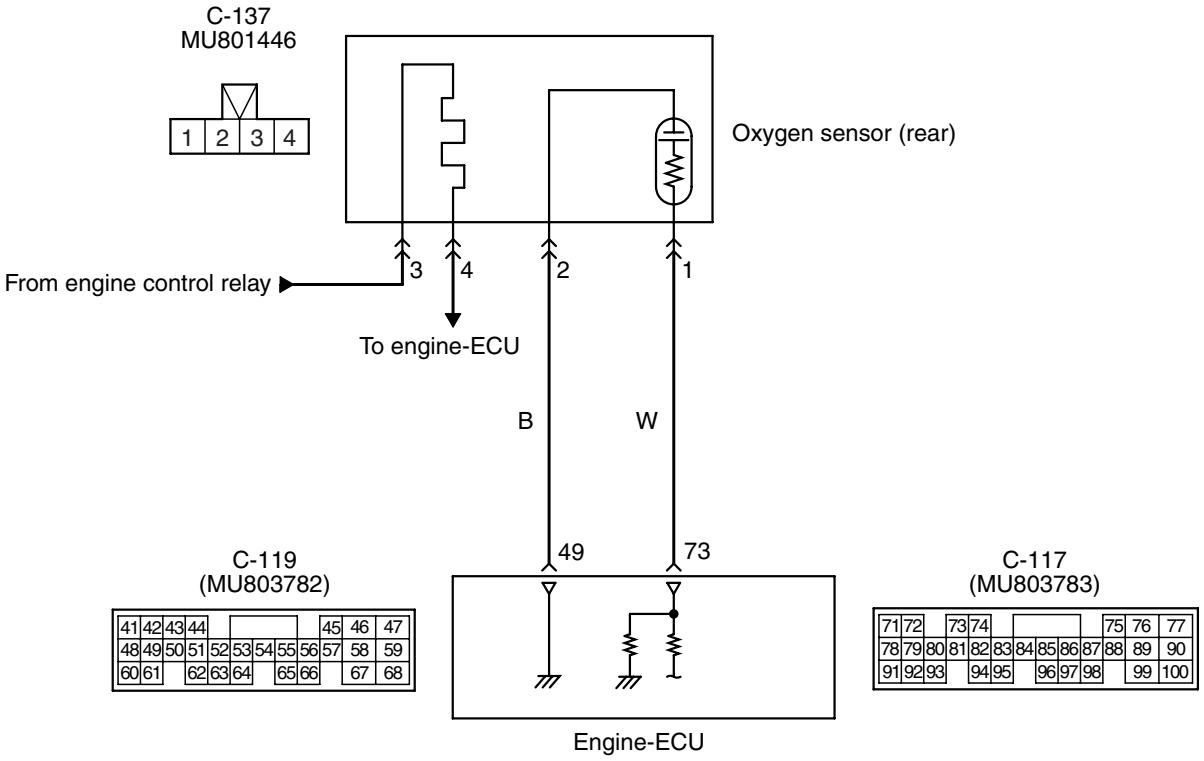
Q: Is the check result normal?
YES : Go to Step 11 .
NO : Repair the damaged harness wire.

STEP 11. Check the trouble symptoms.

Q: Does trouble symptom persist?
YES : Replace the engine-ECU.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-5).

Code No. P0136: Oxygen Sensor (rear) System

Oxygen sensor (rear) circuit



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

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OPERATION

- The sensor signal is inputted to the engine-ECU (terminal No. 73) from the oxygen sensor (rear) output terminal (terminal No. 1).
- The oxygen sensor (rear) (terminal No. 2) is earthed with engine-ECU (terminal No. 49).

FUNCTION

- The oxygen sensor (rear) converts the concentration of oxygen in the exhaust emission into a voltage signal and inputs the voltage signal to the engine-ECU.

- When the air-fuel ratio is richer than the theoretical air-fuel ratio, the oxygen sensor (rear) outputs a voltage of about 1 V. When it is leaner than the theoretical air-fuel ratio, it outputs a voltage of about 0 V.
- In response to the signal, the engine-ECU controls the fuel infection amount so that the air-fuel ratio can be equivalent to the theoretical air-fuel ratio.

TROUBLE JUDGMENT

Check Conditions

- Above 3 minutes later after the engine has started up.
- The engine coolant temperature is 80°C or higher.
- The volumetric efficiency is 25% or more.
- The engine speed is 1,200 r/min. or more.

Judgment Criterion

- When the oxygen sensor (rear) output voltage is 0.2 V or less, and a power voltage of 5 V is applied to the oxygen sensor (rear) in the engine-ECU, the sensor output voltage is 4.5 V or more.

PROBABLE CAUSES

- Failed oxygen sensor (rear)
- Open/short circuit in oxygen sensor (rear) circuit or loose connector contact
- Failed engine-ECU

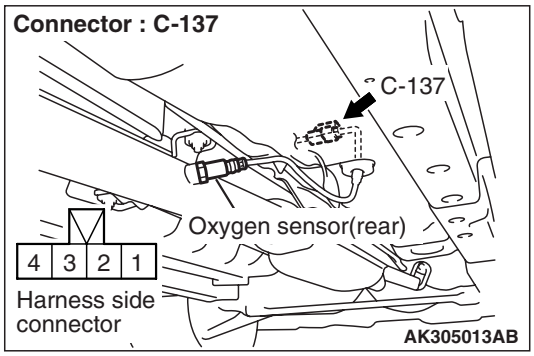
DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-II/III data list

- Refer to Data List Reference Table P.13A-372.
  a. Item No. 59: Oxygen sensor (rear)

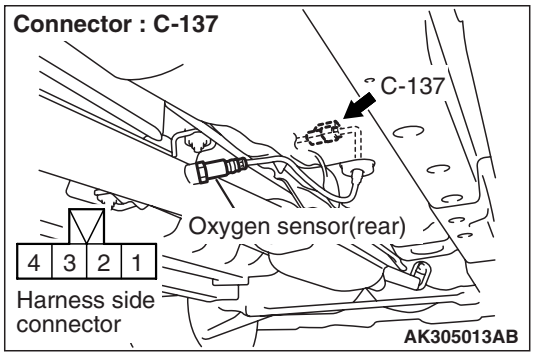
Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-5).
NO : Go to Step 2 .

STEP 2. Connector check: C-137 oxygen sensor (rear) connector



Q: Is the check result normal?
YES : Go to Step 3 .
NO : Repair or replace the connector.

STEP 3. Perform resistance measurement at C-137 oxygen sensor (rear) connector.

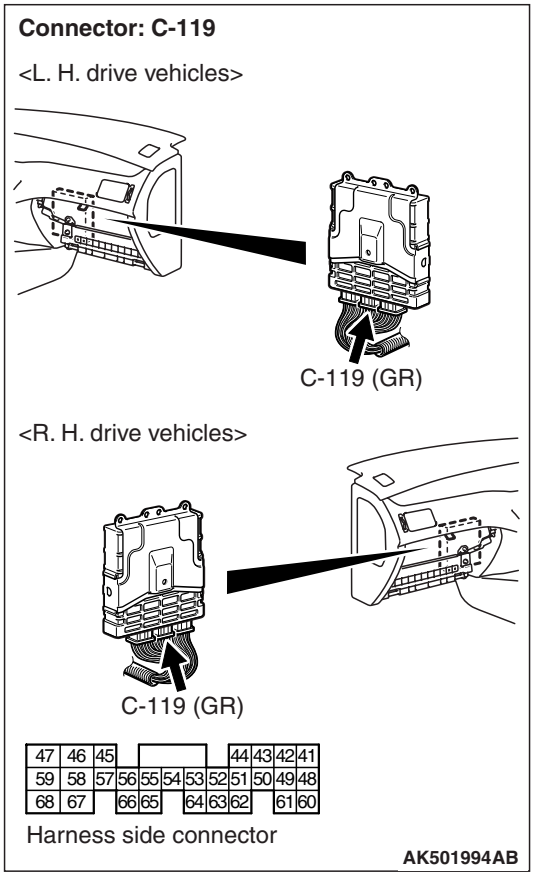


- Disconnect connector, and measure at harness side.
- Resistance between terminal No. 2 and earth.

OK: 2 Ω or less

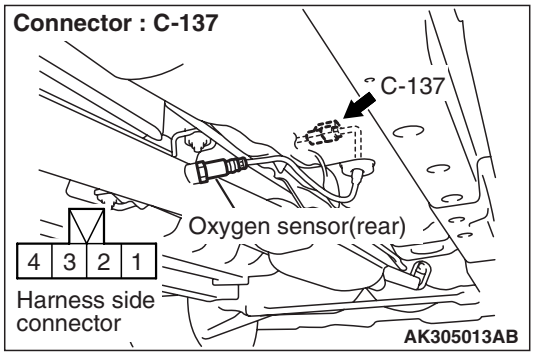
Q: Is the check result normal?
YES : Go to Step 7 .
NO : Go to Step 4 .

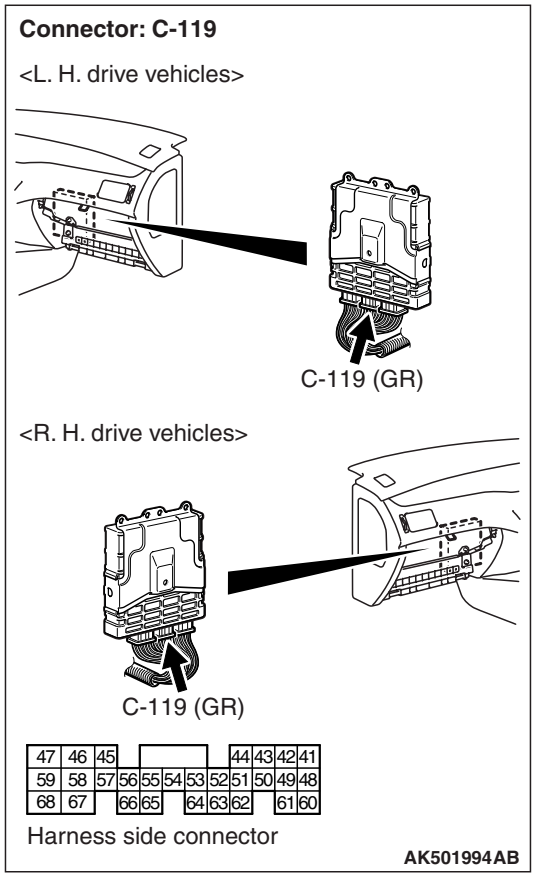
STEP 4. Connector check: C-119 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 5 .
NO : Repair or replace the connector.

STEP 5. Check harness between C-137 (terminal No. 2) oxygen sensor (rear) connector and C-119 (terminal No. 49) engine-ECU connector.





- Check earthing line for open circuit and damage.

Q: Is the check result normal?
YES : Go to Step 6 .
NO : Repair the damaged harness wire.

STEP 6. M.U.T.-II/III data list

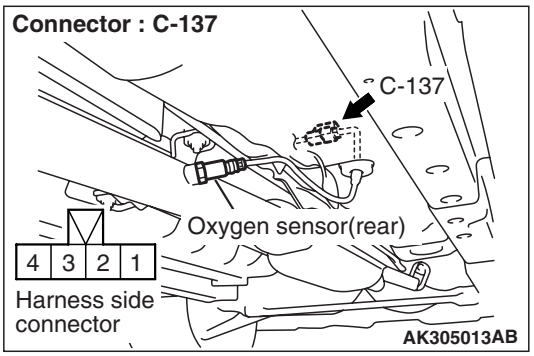
- Refer to Data List Reference Table P.13A-372.
  a. Item No. 59: Oxygen sensor (rear)

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-5).

NO : Replace the engine-ECU.

STEP 7. Perform voltage measurement at C-137 oxygen sensor (rear) connector.



- Use special tool test harness (MB991658) to connect connector, and measure at pick-up harness.
- Engine: After warm-up
- Ignition switch: "ON"
- Voltage between terminal No. 2 and earth.

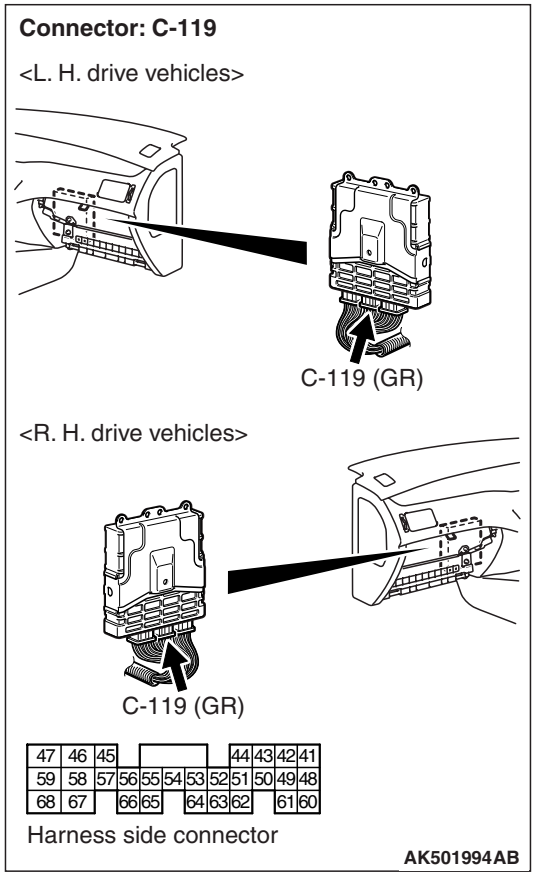
OK: 0.5 V or less

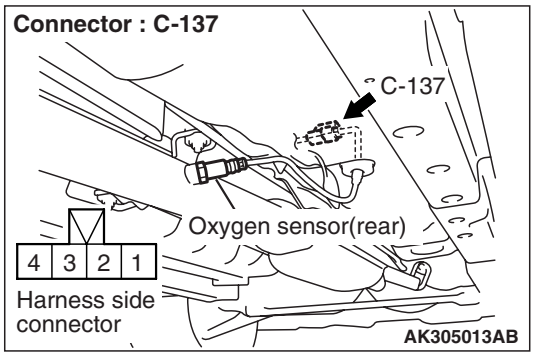
Q: Is the check result normal?

YES : Go to Step 9 .

NO : Go to Step 8 .

STEP 8. Connector check: C-119 engine-ECU connector





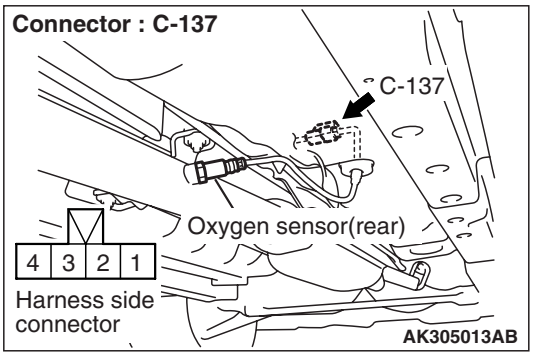
Q: Is the check result normal?

YES : Check and repair harness between C-137 (terminal No. 2) oxygen sensor (rear) connector and C-119 (terminal No. 49) engine-ECU connector.

- Check earthing line for damage.

NO : Repair or replace the connector.

STEP 9. Perform voltage measurement at C-137 oxygen sensor (rear) connector.



- Use special tool test harness (MB991658) to connect connector, and measure at pick-up harness.
- Engine: After warm-up
- Voltage between terminal No. 1 and earth.

OK:

600 – 1,000 mV when 200 mV or lower abrupt racing is done a few seconds after abrupt deceleration from 4,000 r/min.

Q: Is the check result normal?

YES : Go to Step 12 .

NO : Go to Step 10 .

STEP 10. Check oxygen sensor (rear) itself

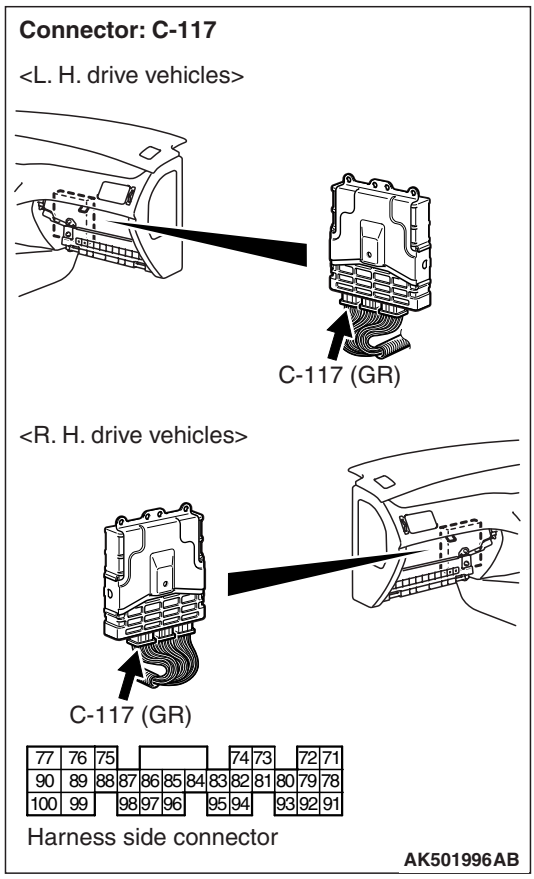
- Check oxygen sensor (rear) itself (Refer to P.13A-404).

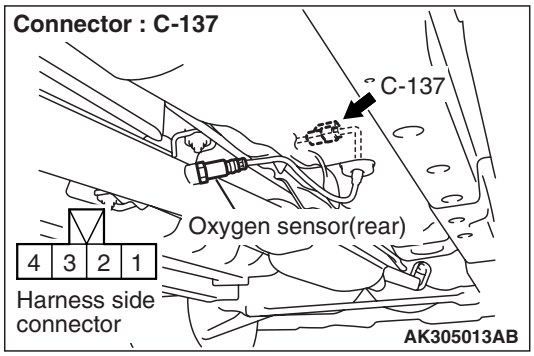
Q: Is the check result normal?

YES : Go to Step 11 .

NO : Replace the oxygen (rear) sensor.

STEP 11. Connector check: C-117 engine-ECU connector





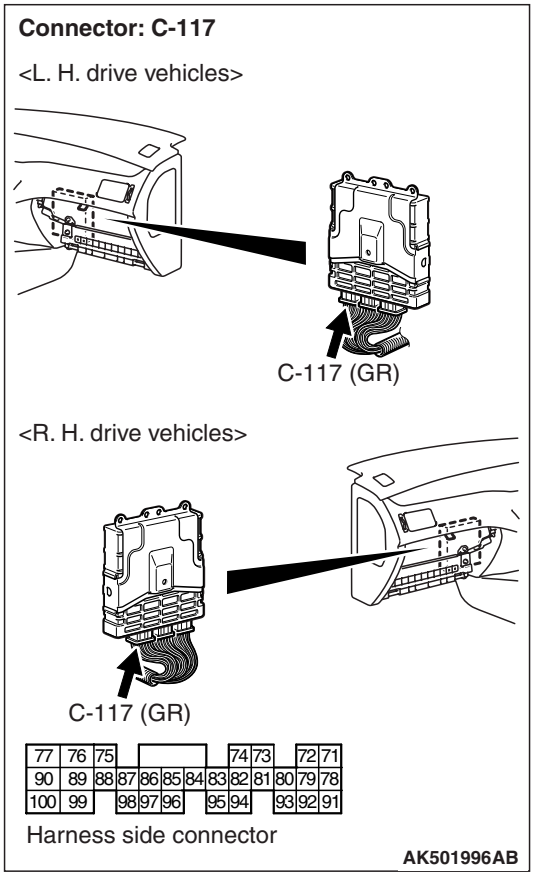
Q: Is the check result normal?

YES : Check and repair harness between C-137 (terminal No. 1) oxygen sensor (rear) connector and C-117 (terminal No. 73) engine-ECU connector.

- Check output line for damage.

NO : Repair or replace the connector.

STEP 12. Perform voltage measurement at C-117 engine-ECU connector.



- Measure engine-ECU terminal voltage.
- Transmission: Neutral
- Engine: After warm-up
- Voltage between terminal No. 73 and earth.

OK:

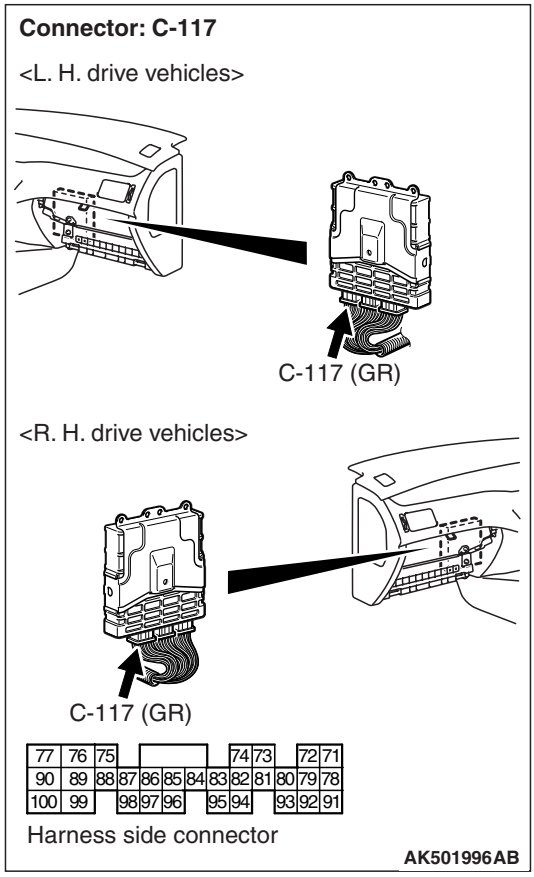
600 – 1,000 mV when 200 mV or lower abrupt racing is done a few seconds after abrupt deceleration from 4,000 r/min.

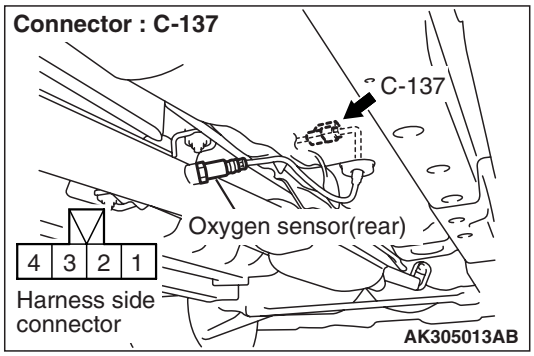
Q: Is the check result normal?

YES : Go to Step 14 .

NO : Go to Step 13 .

STEP 13. Connector check: C-117 engine-ECU connector





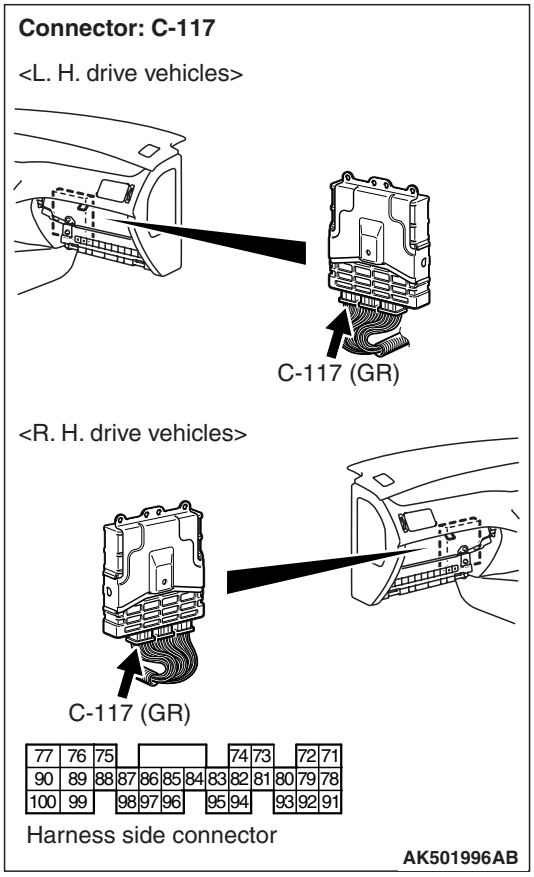
Q: Is the check result normal?

YES : Check and repair harness between C-137 (terminal No. 1) oxygen sensor (rear) connector and C-117 (terminal No. 73) engine-ECU connector.

- Check output line for open circuit.

NO : Repair or replace the connector.

STEP 14. Connector check: C-117 engine-ECU connector



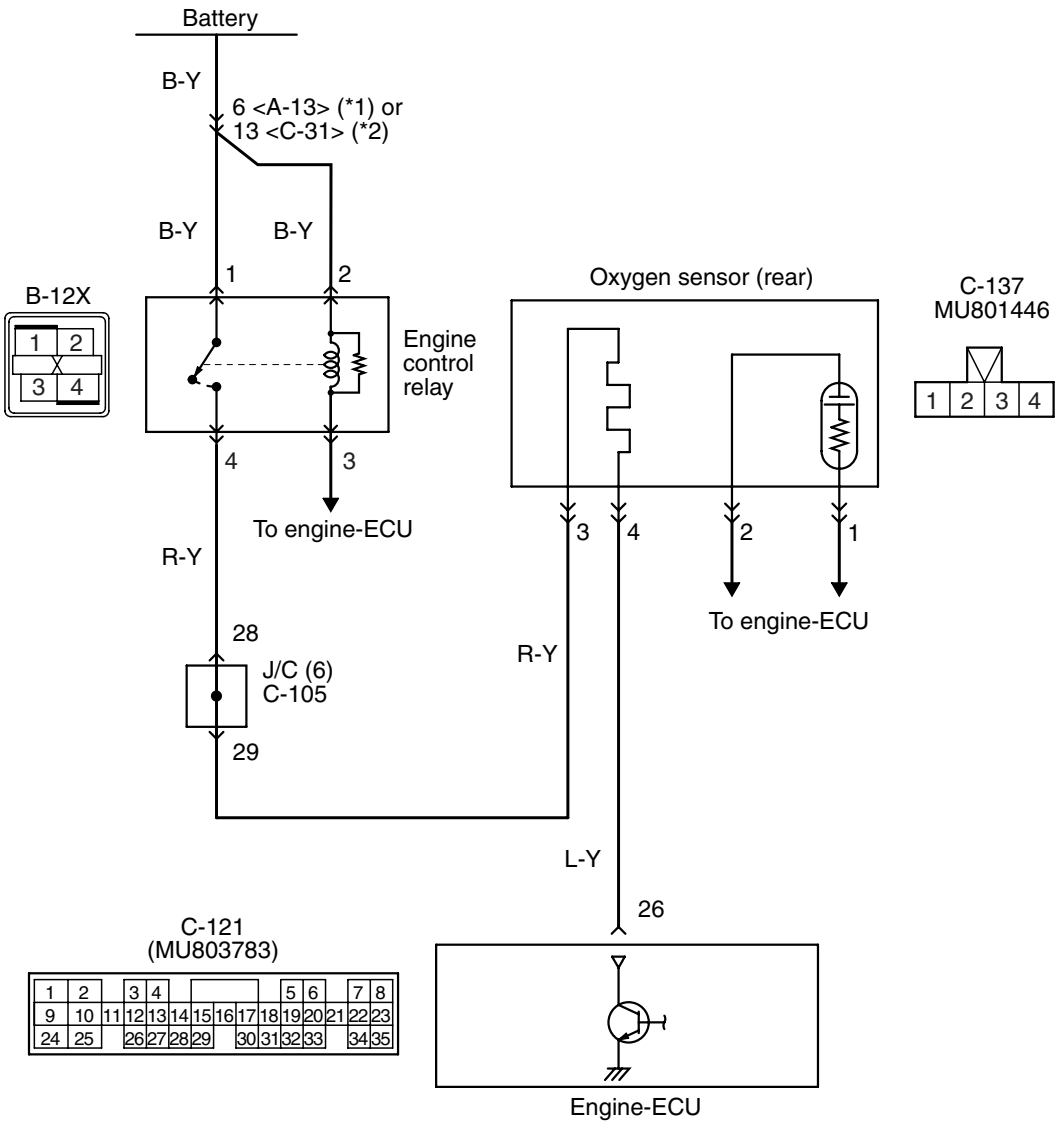
Q: Is the check result normal?

YES : Go to Step 6 .

NO : Repair or replace the connector.

Code No. P0141: Oxygen Sensor Heater (rear) System

Oxygen sensor heater (rear) circuit



NOTE
*1: L.H. drive vehicles
*2: R.H. drive vehicles

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

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OPERATION

- Power is supplied to the heater power terminal (terminal No. 3) of the oxygen sensor (rear) connector from the engine control relay (terminal No. 4).
- The heater (terminal No. 4) of the oxygen sensor (rear) connector is controlled by the power transistor in the engine-ECU (terminal No. 26).

FUNCTION

- The power supply to the oxygen sensor heater (rear) is controlled by the ON/OFF control of the power transistor in the engine-ECU.
- Heating the oxygen sensor heater (rear) enables the oxygen sensor to provide good response even when the exhaust emission temperature is low.

TROUBLE JUDGMENT

Check Conditions

- The engine coolant temperature is 20°C or higher.
- The oxygen sensor heater (rear) is ON.
- The engine speed is 50 r/min. or more.
- A/C relay: OFF
- Radiator fan: OFF
- The system voltage is 11 – 16 V.

Judgment Criterion

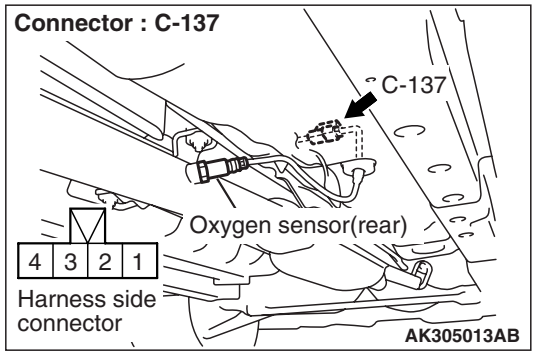
- The heater current of oxygen sensor (rear) heater 0.2 A or less or 3.5 A or more for 4 seconds.

PROBABLE CAUSES

- Failed oxygen sensor heater (rear)
- Open/short circuit in oxygen sensor (rear) circuit or loose connector contact
- Failed engine-ECU

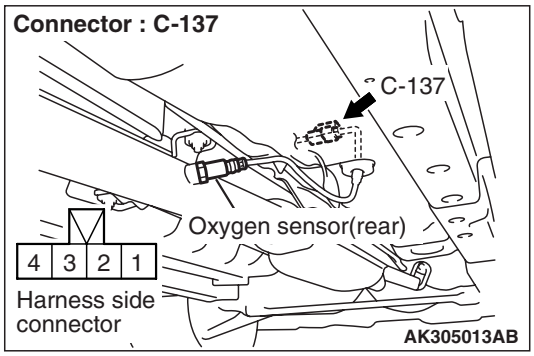
DIAGNOSIS PROCEDURE

STEP 1. Connector check: C-137 oxygen sensor (rear) connector



Q: Is the check result normal?
YES : Go to Step 2 .
NO : Repair or replace the connector.

STEP 2. Perform resistance measurement at C-137 oxygen sensor (rear) connector.

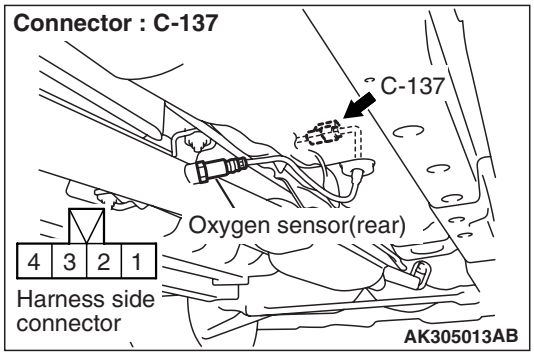


- Disconnect connector, and measure at sensor side.
- Resistance between terminal No. 3 and No. 4.

OK: 11 – 18 Ω

Q: Is the check result normal?
YES : Go to Step 3 .
NO : Replace the oxygen (rear) sensor.

STEP 3. Perform voltage measurement at C-137 oxygen sensor (rear) connector.

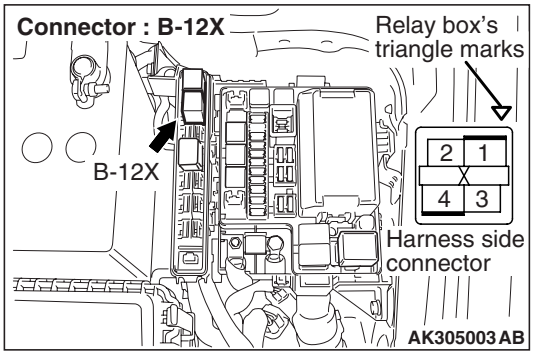


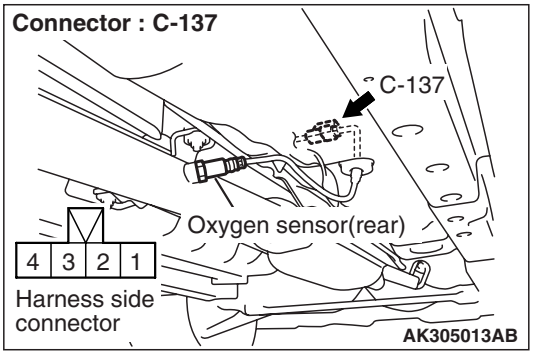
- Disconnect connector, and measure at harness side.
- Ignition switch: "ON"
- Voltage between terminal No. 3 and earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 5 .
NO : Go to Step 4 .

STEP 4. Connector check: B-12X engine control relay connector





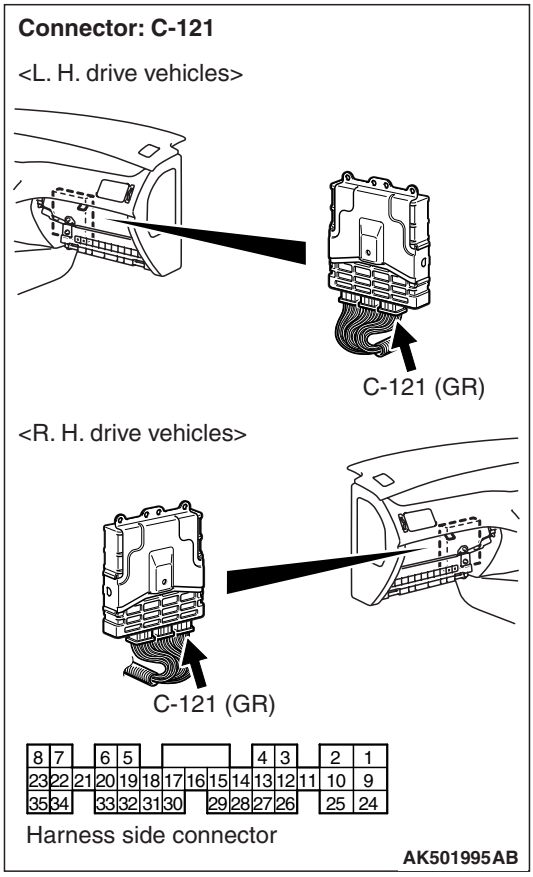
Q: Is the check result normal?

YES : Check intermediate connector C-105, and repair if necessary. If intermediate connector are normal, check and repair harness between C-137 (terminal No. 3) oxygen sensor (rear) connector and B-12X (terminal No. 4) engine control relay connector.

- Check power supply line for open/short circuit.

NO : Repair or replace the connector.

STEP 5. Perform voltage measurement at C-121 engine-ECU connector.



- Measure engine-ECU terminal voltage.
- Ignition switch: "ON"
- Voltage between terminal No. 26 and earth.

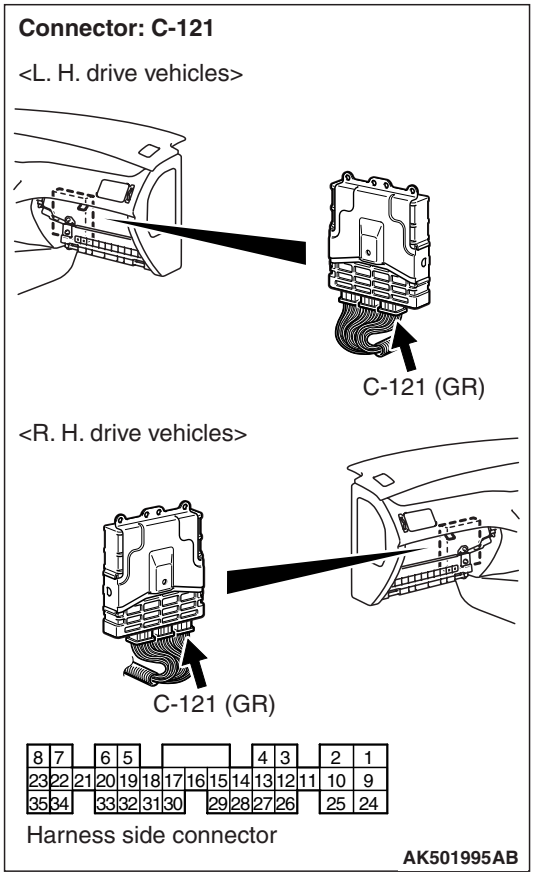
OK: System voltage

Q: Is the check result normal?

YES : Go to Step 8 .

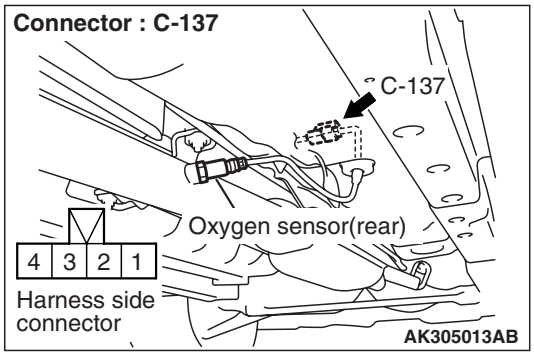
NO : Go to Step 6 .

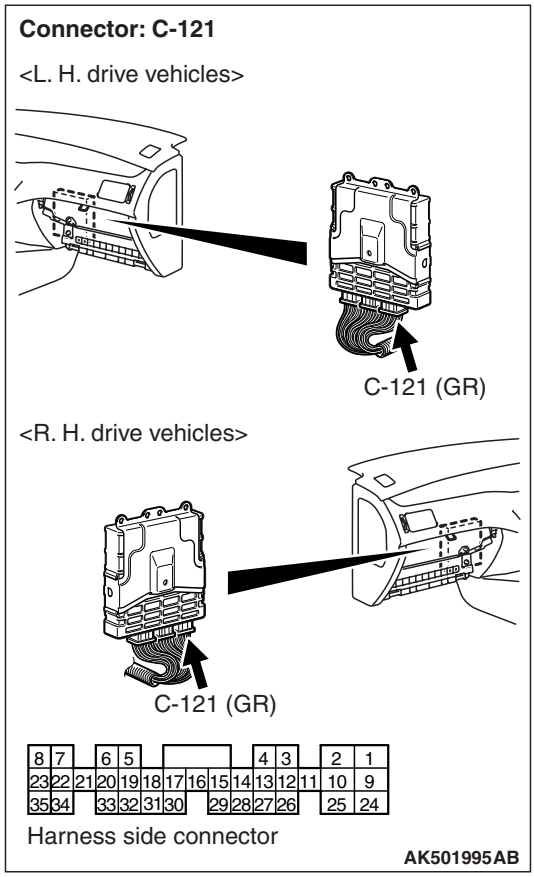
STEP 6. Connector check: C-121 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair or replace the connector.

STEP 7. Check harness between C-137 (terminal No. 4) oxygen sensor connector and C-121 (terminal No. 26) engine-ECU connector.

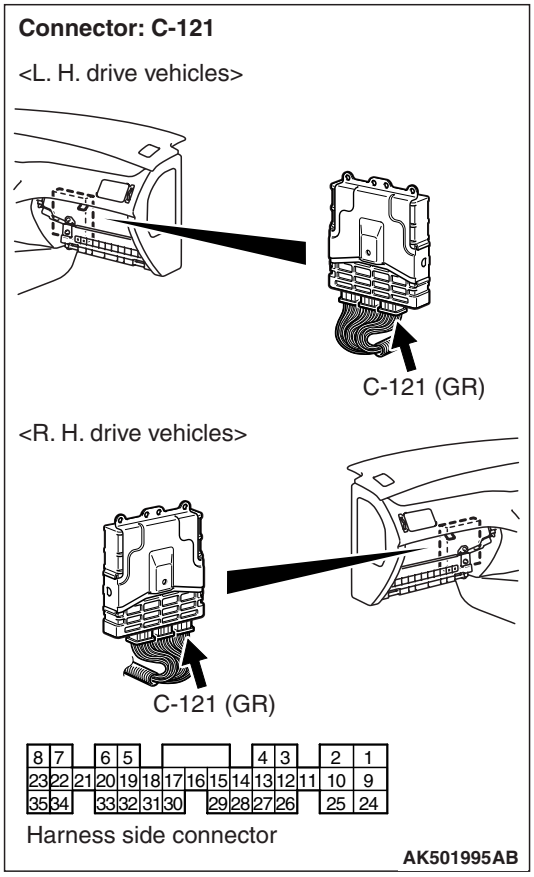




- Check earthing line for open/short circuit.

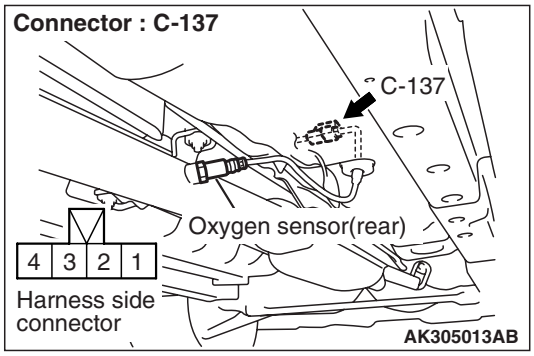
Q: Is the check result normal?
YES : Replace the engine-ECU.
NO : Repair the damaged harness wire.

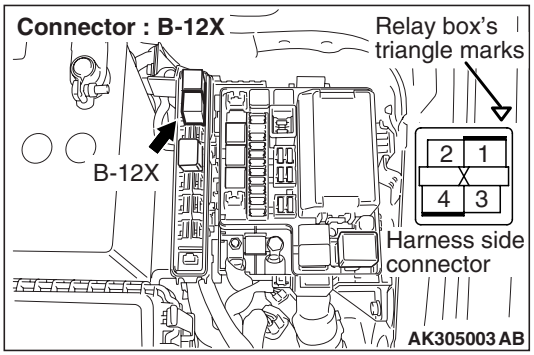
STEP 8. Connector check: C-121 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 9 .
NO : Repair or replace the connector.

STEP 9. Check harness between C-137 (terminal No. 3) oxygen sensor (rear) connector and B-12X (terminal No. 4) engine control relay connector.

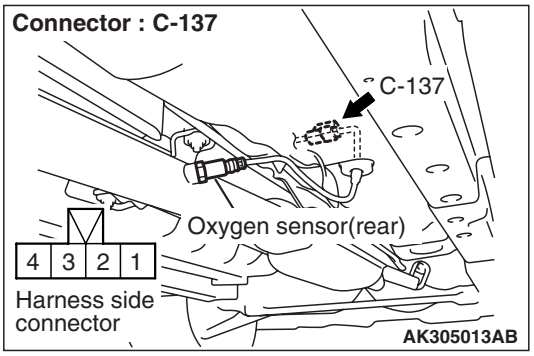


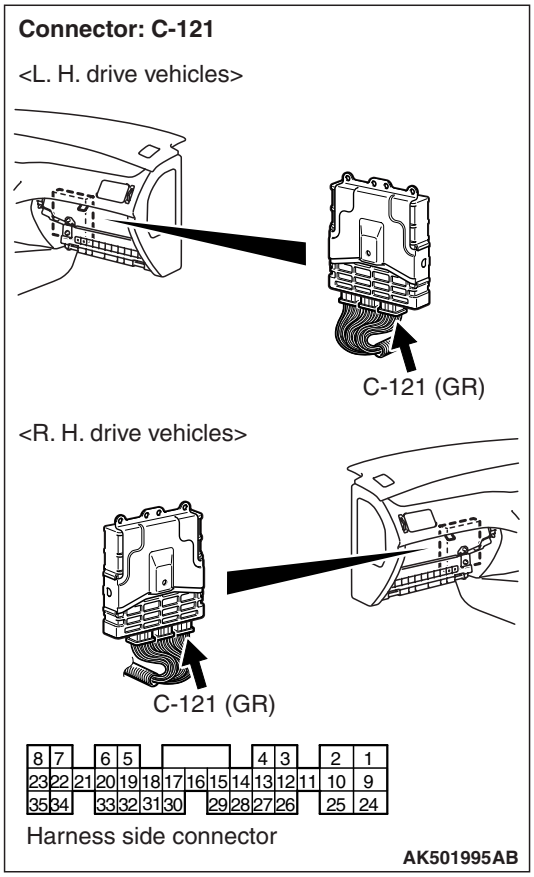


NOTE: Before checking harness, check intermediate connector C-105, and repair if necessary.
- Check power supply line for damage.

Q: Is the check result normal?
YES : Go to Step 10 .
NO : Repair the damaged harness wire.

STEP 10. Check harness between C-137 (terminal No. 4) oxygen sensor (rear) connector and C-121 (terminal No. 26) engine-ECU connector.





- Check earthing line for damage.

Q: Is the check result normal?
YES : Go to Step 11 .
NO : Repair the damaged harness wire.

STEP 11. Check the trouble symptoms.

Q: Does trouble symptom persist?
YES : Replace the engine-ECU.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-5).

Code No. P0170: Abnormal Fuel System

OPERATION

- Refer to P0201 injector circuit P.13A-105.
- Refer to P0202 injector circuit P.13A-111.
- Refer to P0203 injector circuit P.13A-117.
- Refer to P0204 injector circuit P.13A-123.

FUNCTION

- If the fuel system goes out of order, the fuel correction value will become larger.
- The engine-ECU checks whether the fuel correction value is within the standard limits.

TROUBLE JUDGMENT

Check Condition

- In learning air-fuel ratio

Judgment Criteria

- Fuel injection amount correction value remains unusually low for more than 5 seconds.

or

- Fuel injection amount correction value remains unusually high for more than 5 seconds.

PROBABLE CAUSES

- Failed fuel supply system
- Failed oxygen sensor (front)
- Failed intake air temperature sensor
- Failed air flow sensor
- Failed purge control solenoid valve
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-II/III diagnosis code

Q: Is any other diagnosis code than P0170 output?
YES : Inspection Chart for Diagnosis Code (Refer to P.13A-17).
NO : Go to Step 2 .

STEP 2. M.U.T.-II/III data list

- Refer to Data List Reference Table P.13A-372.
  a. Item No. 12: Air flow sensor
  b. Item No. 13: Intake air temperature sensor
  c. Item No. 21: Engine coolant temperature sensor
  d. Item No. 22: Barometric pressure sensor

Q: Are the check results normal?
YES : Go to Step 3 .
NO : Perform the diagnosis code classified check procedure for the sensor that has shown an abnormal data value (Refer to Inspection Chart for Diagnosis Codes P.13A-17).

STEP 3. Check for intake of air from intake hose and intake manifold.

Q: Is the check result normal?
YES : Go to Step 4 .
NO : Repair.

STEP 4. Check for leakage of exhaust emission from exhaust manifold.

Q: Is the check result normal?
YES : Go to Step 5 .
NO : Repair.

STEP 5. Check throttle body (throttle valve portion) for contamination.

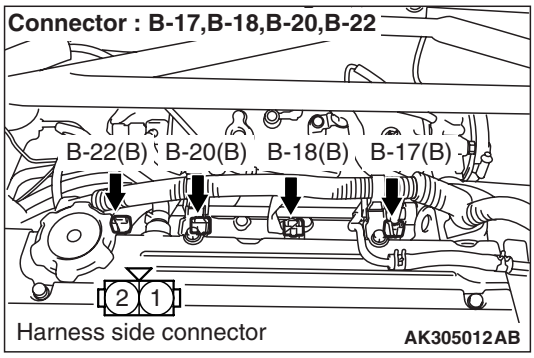
Q: Is the check result normal?
YES : Go to Step 6 .
NO : Clean throttle body (throttle valve portion) (Refer to P.13A-395).

STEP 6. M.U.T.-II/III data list

- Refer to Data List Reference Table P.13A-372.
  a. Item No. 11: Oxygen sensor (front)

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Check oxygen sensor (front) system (Refer to Code No. P0130 P.13A-75).

STEP 7. Connector Check: Injector connector



a. B-22 (No. 1 injector connector).
b. B-20 (No. 2 injector connector).
c. B-18 (No. 3 injector connector).
d. B-17 (No. 4 injector connector).

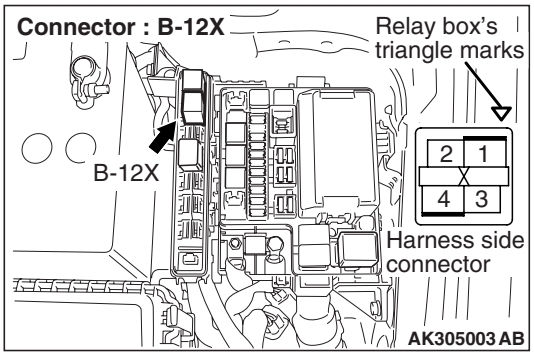
Q: Are the check results normal?
YES : Go to Step 8 .
NO : Repair or replace the connector.

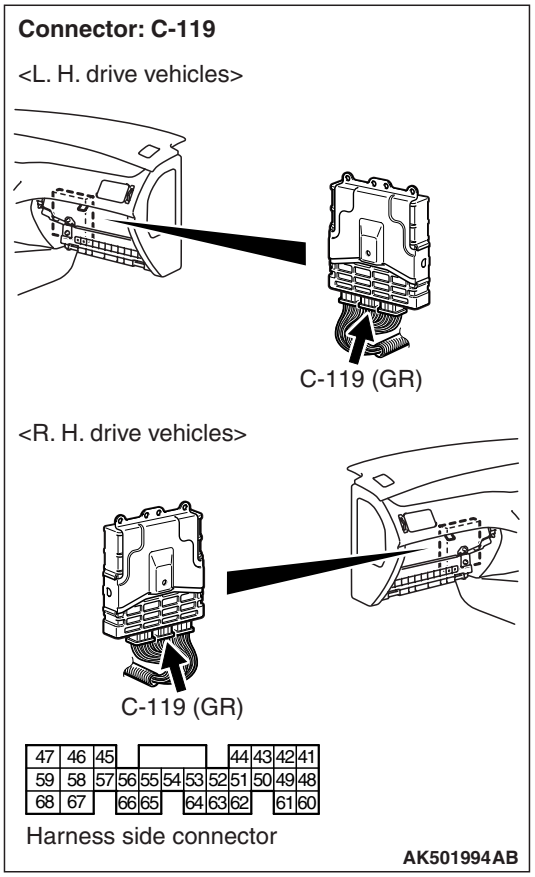
STEP 8. Check injector itself.

- Check Injector itself (Refer to P.13A-406).

Q: Is the check result normal?
YES : Go to Step 9 .
NO : Replace the injector.

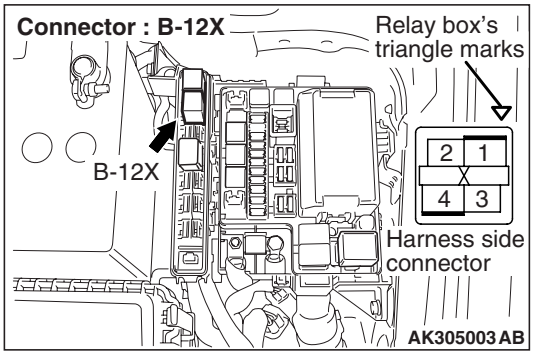
STEP 9. Connector check: B-12X engine control relay connector and C-119 engine-ECU connector

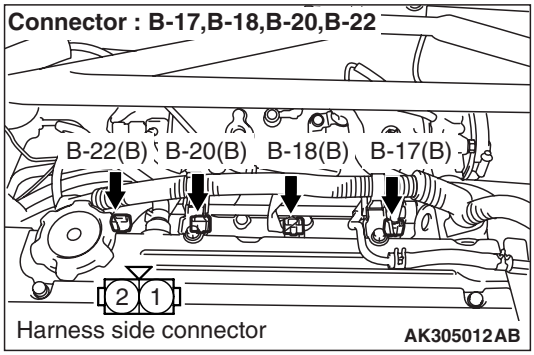




Q: Is the check result normal?
YES : Go to Step 10 .
NO : Repair or replace the connector.

STEP 10. Check harness between B-12X engine control relay connector and injector connector.



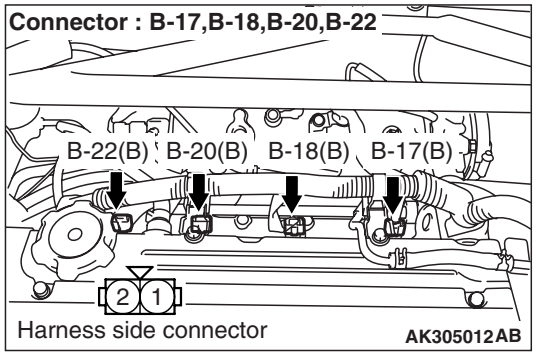


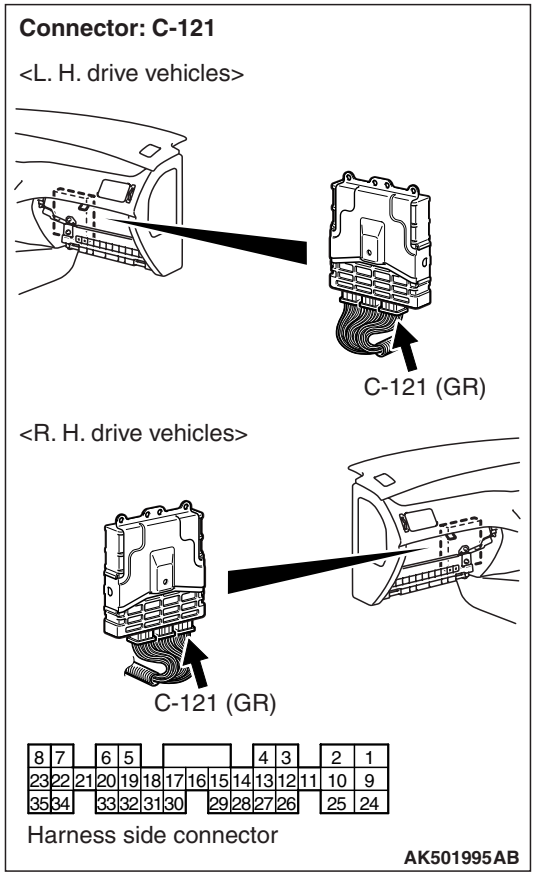
NOTE: Before checking harness, check intermediate connector C-105, and repair if necessary.

a. Check harness between B-12X (terminal No. 4) engine control relay connector and B-22 (terminal No. 1) No. 1 injector connector.
b. Check harness between B-12X (terminal No. 4) engine control relay connector and B-20 (terminal No. 1) No. 2 injector connector.
c. Check harness between B-12X (terminal No. 4) engine control relay connector and B-18 (terminal No. 1) No. 3 injector connector.
d. Check harness between B-12X (terminal No. 4) engine control relay connector and B-17 (terminal No. 1) No. 4 injector connector.
   - Check power supply line for damage.

Q: Are the check results normal?
YES : Go to Step 11 .
NO : Repair the damaged harness wire.

STEP 11. Check harness between injector connector and C-121 engine-ECU connector.





a. Check harness between B-22 (terminal No. 2) No. 1 injector connector and C-121 (terminal No. 1) engine-ECU connector.
b. Check harness between B-20 (terminal No. 2) No. 2 injector connector and C-121 (terminal No. 9) engine-ECU connector.
c. Check harness between B-18 (terminal No. 2) No. 3 injector connector and C-121 (terminal No. 24) engine-ECU connector.
d. Check harness between B-17 (terminal No. 2) No. 4 injector connector and C-121 (terminal No. 2) engine-ECU connector.

Q: Are the check results normal?
YES : Go to Step 12 .
NO : Repair the damaged harness wire.

STEP 12. Check purge control solenoid valve itself.

- Check purge control solenoid valve itself (Refer to GROUP 17 – Emission Control System – Evaporative Emission Control System P.17-11).

Q: Is the check result normal?

YES : Go to Step 13 .

NO : Replace the purge control solenoid valve.

STEP 13. Fuel pressure measurement

- Fuel pressure measurement (Refer to P.13A-396).

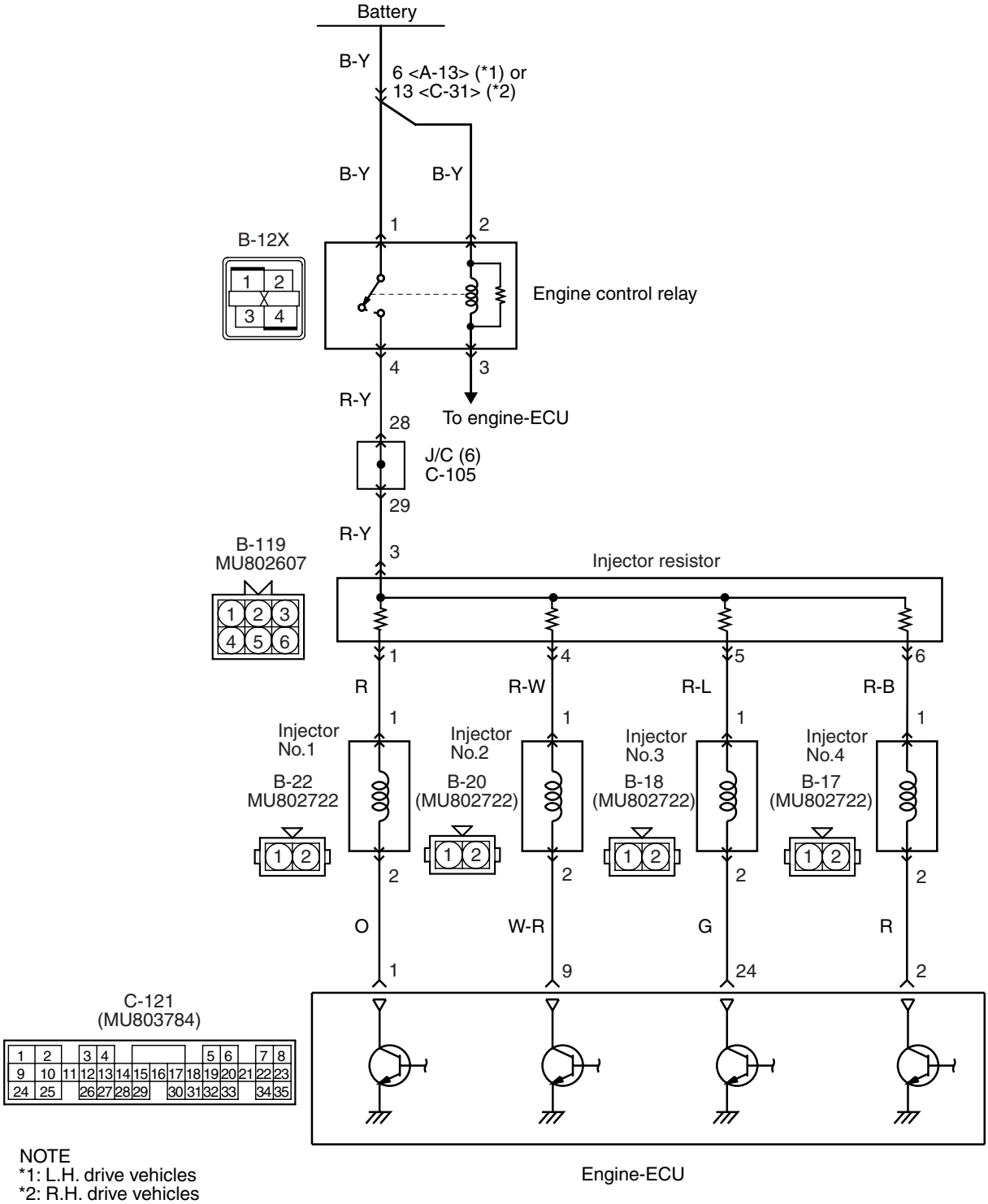
Q: Is the check result normal?

YES : Replace the engine-ECU.

NO : Repair.

Code No. P0201: No. 1 Injector System

Injector circuit



NOTE
*1: L.H. drive vehicles
*2: R.H. drive vehicles

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

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OPERATION

- Power is supplied to the injector (terminal No. 1) from the engine control relay (terminal No. 4) via the injector resistor.
- The engine-ECU (terminal No. 1) makes the power transistor in the unit be in "ON" position, and that makes currents go on the injector (terminal No. 2).

FUNCTION

- The engine-ECU controls the power supply interval of the injector.
- The fuel injection amount of the injector depends on the power supply interval.

TROUBLE JUDGMENT

Check Conditions

- The engine speed is 50 – 1,000 r/min.
- The throttle position sensor output voltage is 1.15 V or less.
- Injector not in forced drive (actuator test) mode.

Judgment Criterion

- No surge voltage of the injector detected for 2 seconds.

PROBABLE CAUSES

- Failed No. 1 injector
- Open/short circuit in injector circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-II/III actuator test

- Item No. 01: No. 1 injector

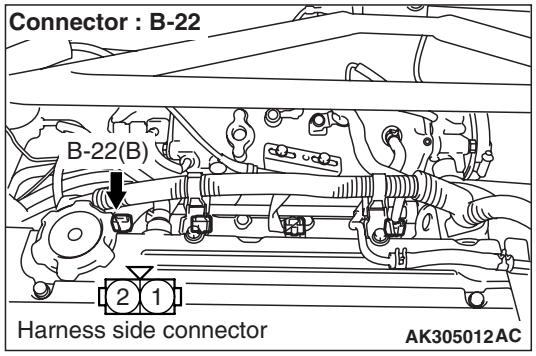
OK: Idling state varies.

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-5).

NO : Go to Step 2 .

STEP 2. Connector check: B-22 No. 1 injector connector

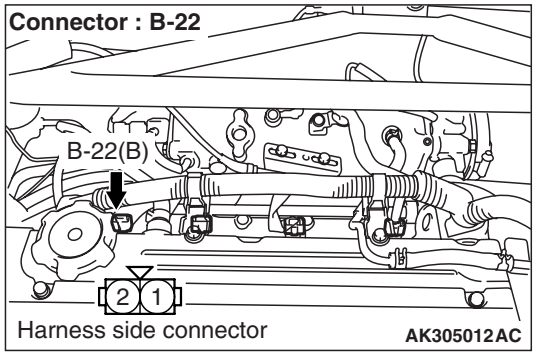


Q: Is the check result normal?

YES : Go to Step 3 .

NO : Repair or replace the connector.

STEP 3. Perform resistance measurement at B-22 No. 1 injector connector.



- Disconnect connector, and measure at injector side.
- Resistance between terminal No. 1 and No. 2.

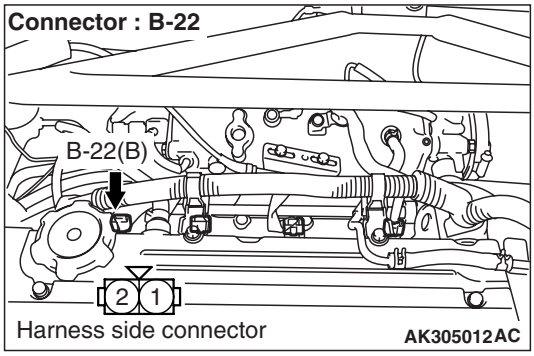
OK: 2 – 3 Ω

Q: Is the check result normal?

YES : Go to Step 4 .

NO : Replace the No. 1 injector.

STEP 4. Perform voltage measurement at B-22 No. 1 injector connector.

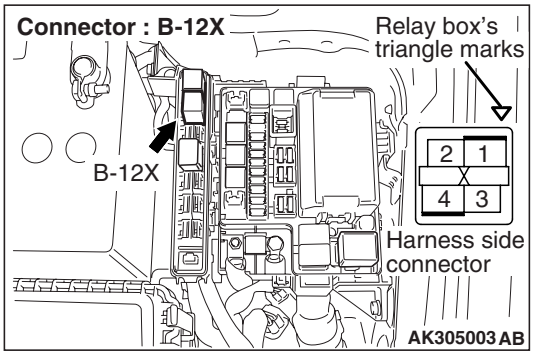


- Disconnect connector, and measure at harness side.
- Ignition switch: "ON"
- Voltage between terminal No. 1 and earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 8 .
NO : Go to Step 5 .

STEP 5. Connector check: B-12X engine control relay connector



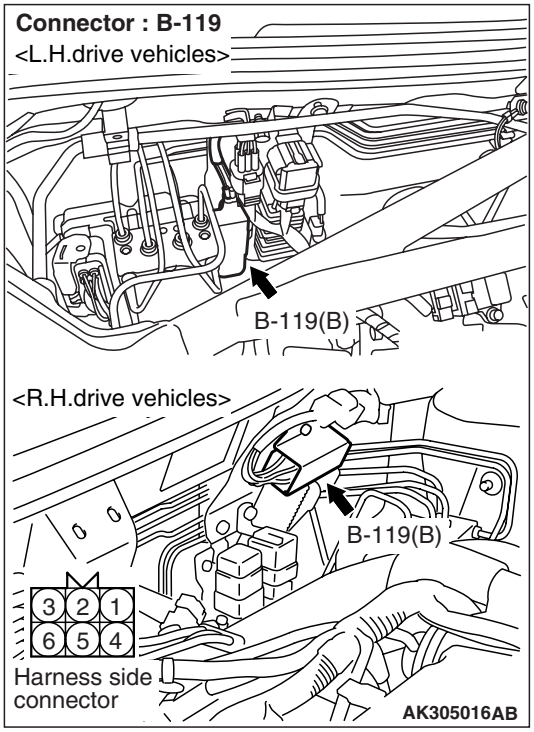
Q: Is the check result normal?
YES : Go to Step 6 .
NO : Repair or replace the connector.

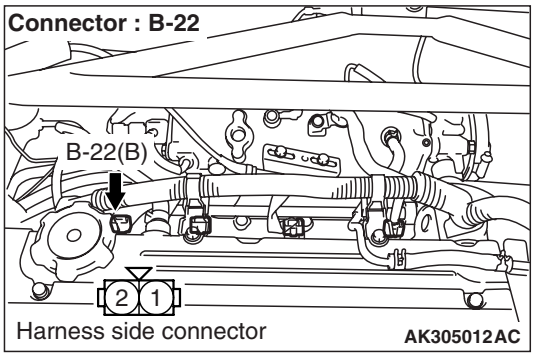
STEP 6. Check injector resistor itself.

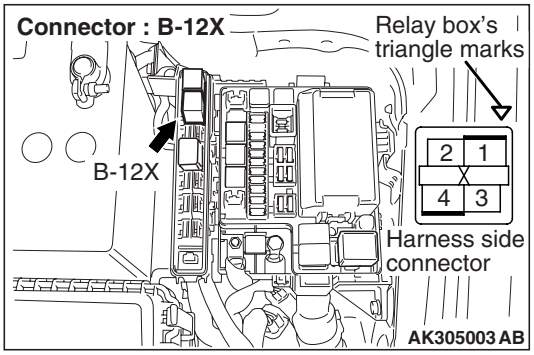
- Check injector resistor itself (Refer to P.13A-407).

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Replace the injector resistor.

STEP 7. Check harness between B-119 (terminal No. 1) injector resistor connector and B-22 (terminal No. 1) No. 1 injector connector.





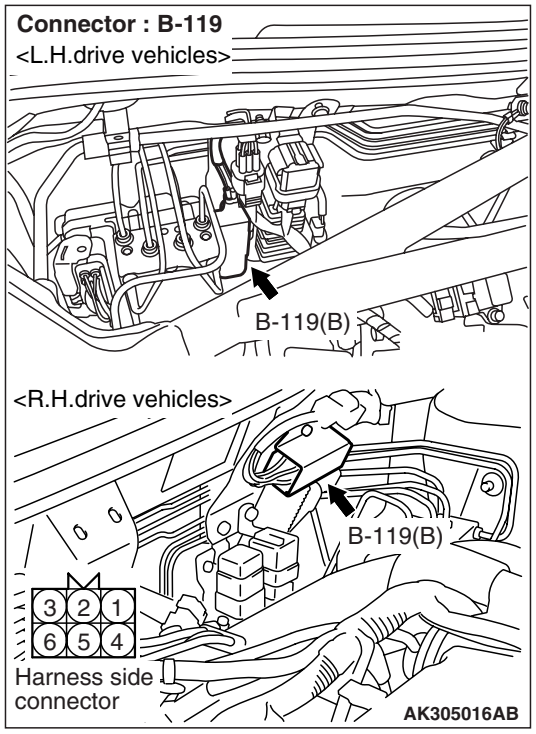


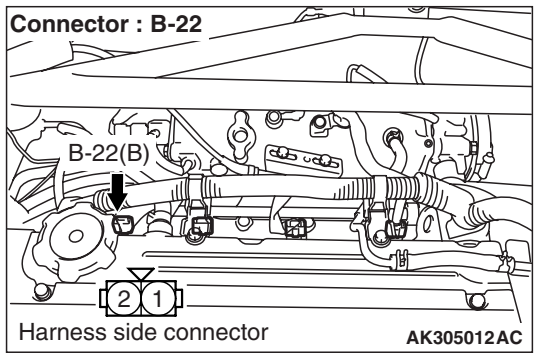
- Check power supply line for open/short circuit.

Q: Is the check result normal?
YES : Check intermediate connector C-105, and repair if necessary. If intermediate connector are normal, check and repair harness between B-119 (terminal No. 3) injector resistor connector and B-12X (terminal No. 4) engine control relay connector.
- Check power supply line for open/short circuit.

NO : Repair the damaged harness wire.

STEP 8. Check harness between B-119 (terminal No. 1) injector resistor connector and B-22 (terminal No. 1) No. 1 injector connector.

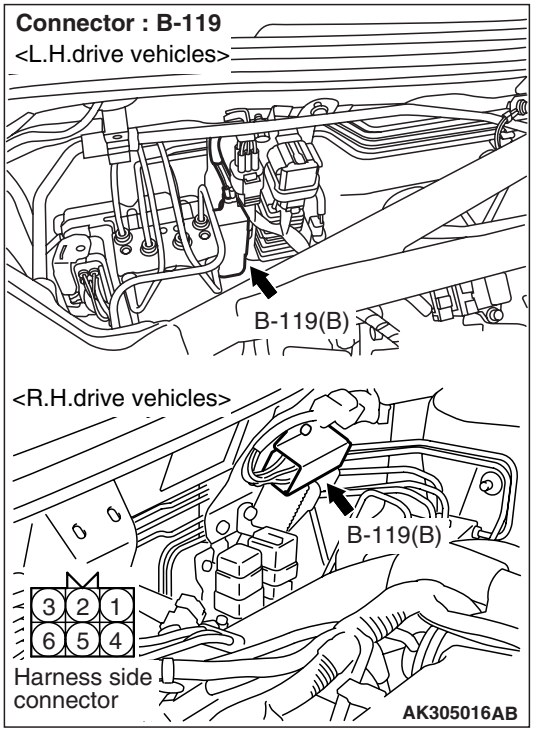


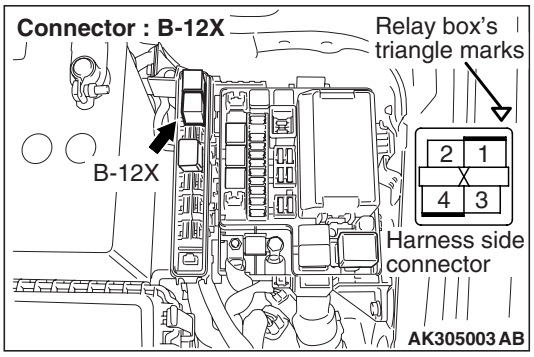


- Check power supply line for damage.

Q: Is the check result normal?
YES : Go to Step 9 .
NO : Repair the damaged harness wire.

STEP 9. Check harness between B-119 (terminal No. 3) injector resistor connector and B-12X (terminal No. 4) engine control relay connector.

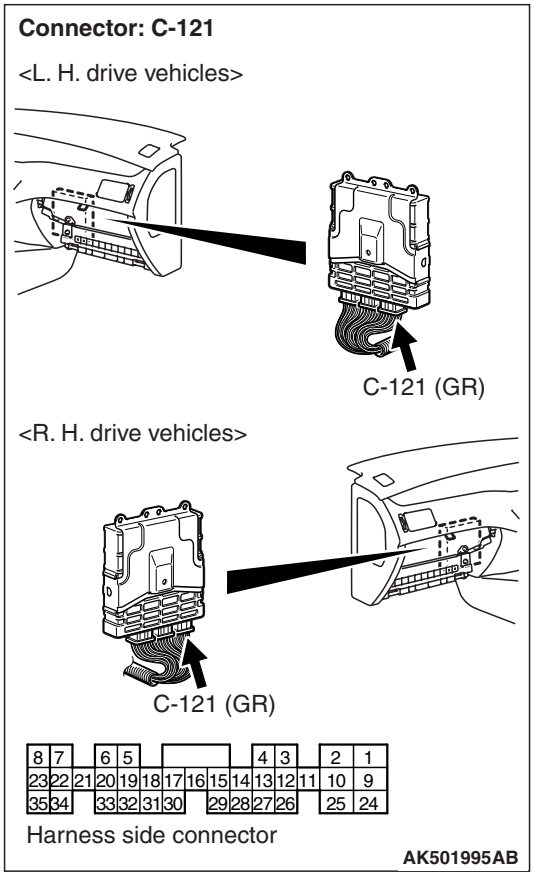




NOTE: Before checking harness, check intermediate connector C-105, and repair if necessary.
- Check power supply line for damage.

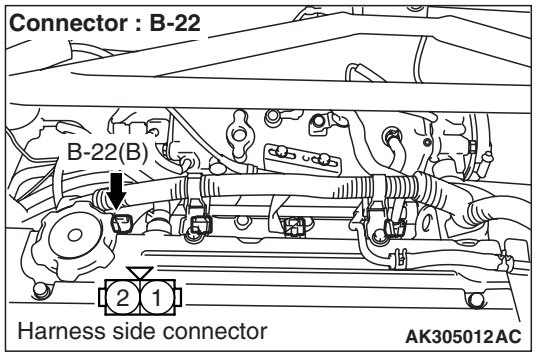
Q: Is the check result normal?
YES : Go to Step 10 .
NO : Repair the damaged harness wire.

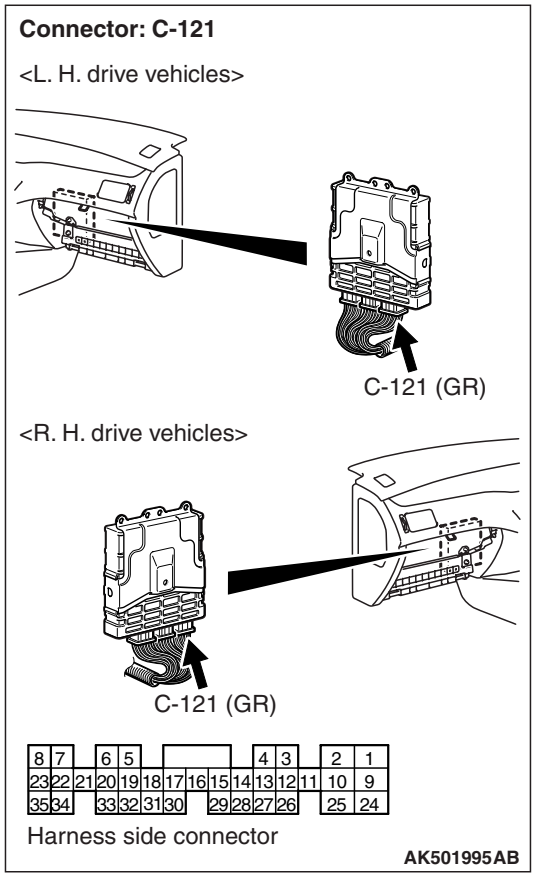
STEP 10. Connector check: C-121 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 11 .
NO : Repair or replace the connector.

STEP 11. Check harness between B-22 (terminal No. 2) No. 1 injector connector and C-121 (terminal No. 1) engine-ECU connector.

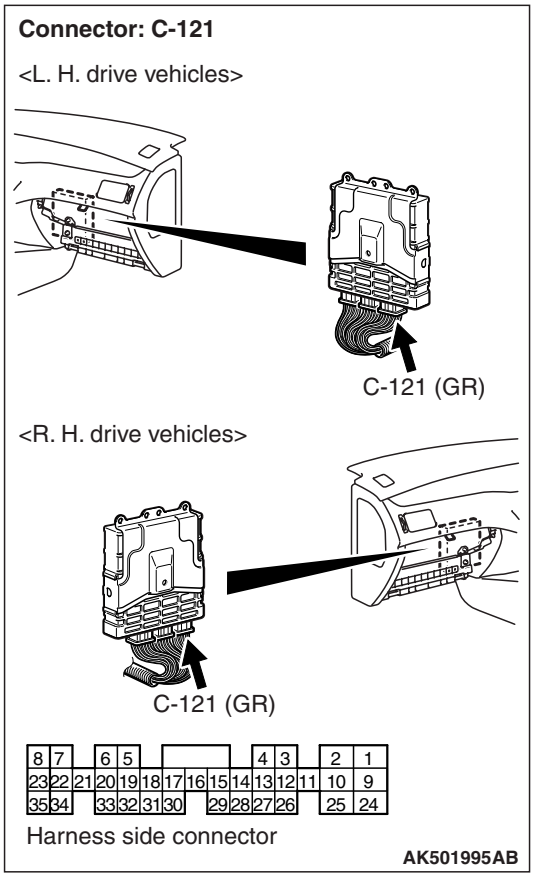




- Check output line for open/short circuit and damage.

Q: Is the check result normal?
YES : Go to Step 12 .
NO : Repair the damaged harness wire.

STEP 12. Perform signal wave pattern measurement at C-121 engine-ECU connector (Using an oscilloscope).



- Engine: Idling
- Transmission: Neutral
- Voltage between terminal No. 1 and earth.

  OK: Waveforms should be display on Inspection procedure using an oscilloscope (Refer to P.13A-385).

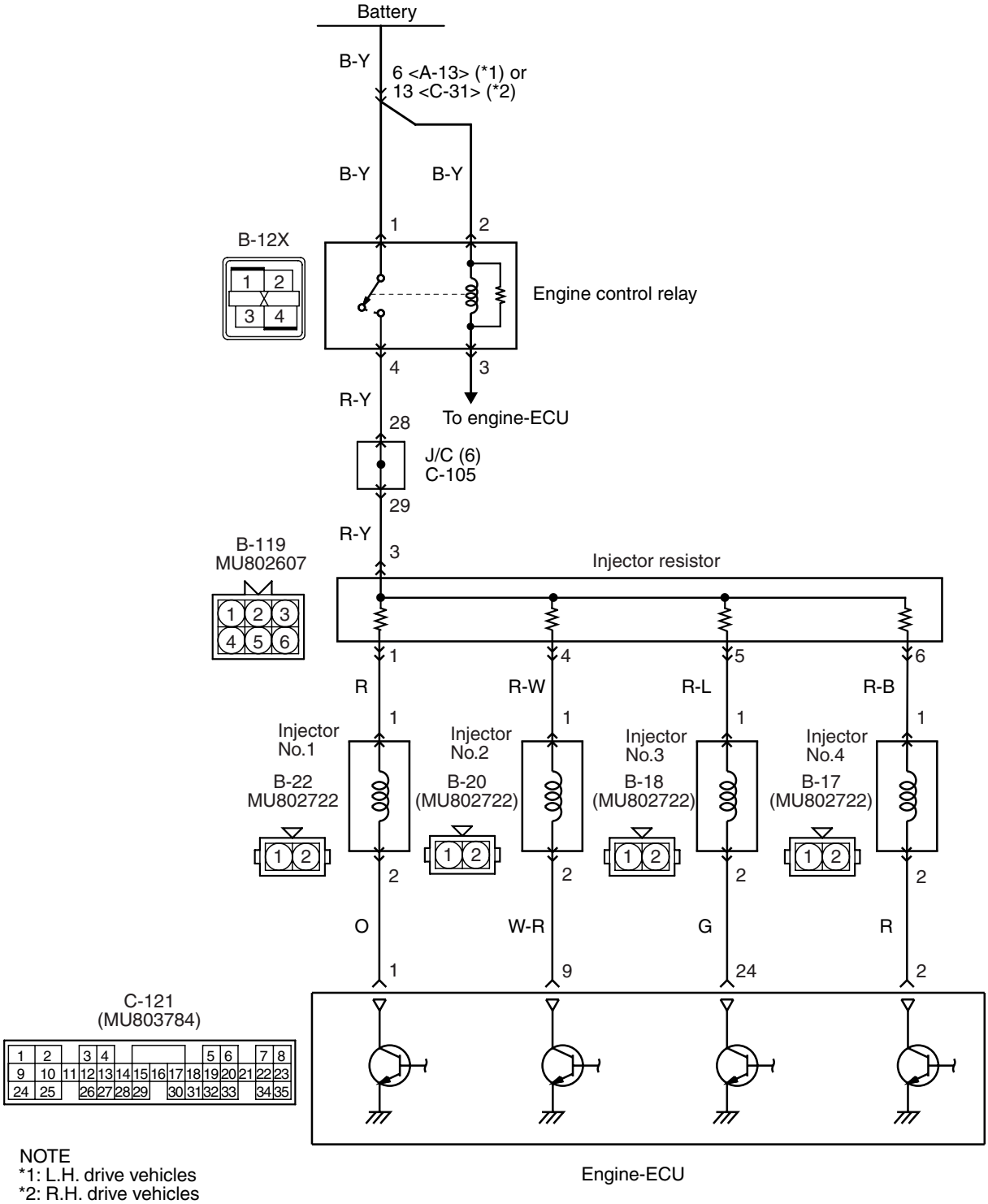
Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-5).

NO : Replace the engine-ECU.

Code No. P0202: No. 2 Injector System

Injector circuit



NOTE
*1: L.H. drive vehicles
*2: R.H. drive vehicles

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

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OPERATION

- Power is supplied to the injector (terminal No. 1) from the engine control relay (terminal No. 4) via the injector resistor.
- The engine-ECU (terminal No. 9) makes the power transistor in the unit be in "ON" position, and that makes currents go on the injector (terminal No. 2).

FUNCTION

- The engine-ECU controls the power supply interval of the injector.
- The fuel injection amount of the injector depends on the power supply interval.

TROUBLE JUDGMENT

Check Conditions

- The engine speed is 50 – 1,000 r/min.
- The throttle position sensor output voltage is 1.15 V or less.
- Injector not in forced drive (actuator test) mode.

Judgment Criterion

- No surge voltage of the injector detected for 2 seconds.

PROBABLE CAUSES

- Failed No. 2 injector
- Open/short circuit in No. 2 injector circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-II/III actuator test

- Item No. 02: No. 2 injector

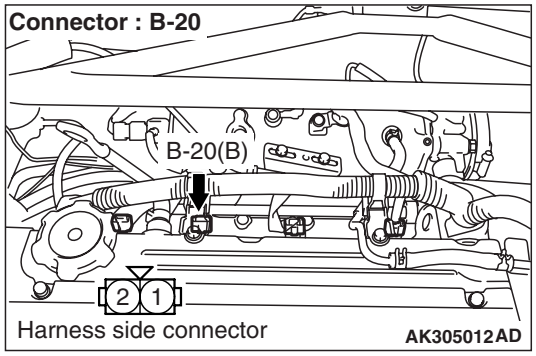
OK: Idling state varies.

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-5).

NO : Go to Step 2 .

STEP 2. Connector check: B-20 No. 2 injector connector

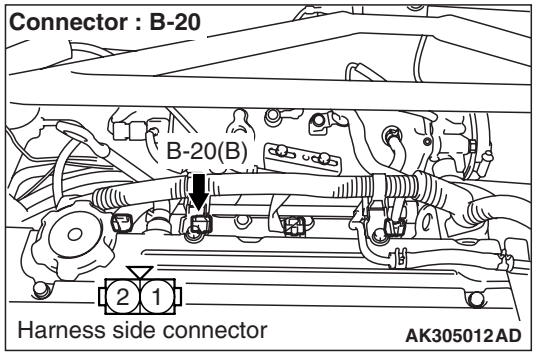


Q: Is the check result normal?

YES : Go to Step 3 .

NO : Repair or replace the connector.

STEP 3. Perform resistance measurement B-20 No. 2 injector connector.



- Disconnect connector, and measure at injector side.
- Resistance between terminal No. 1 and No. 2.

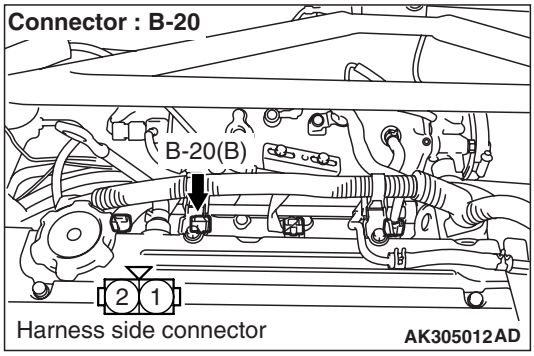
OK: 2 – 3 Ω

Q: Is the check result normal?

YES : Go to Step 4 .

NO : Replace the No. 2 injector.

STEP 4. Perform voltage measurement at B-20 No. 2 injector connector.

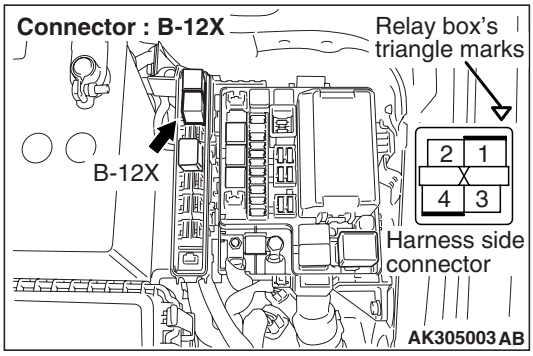


- Disconnect connector, and measure at harness side.
- Ignition switch: "ON"
- Voltage between terminal No. 1 and earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 8 .
NO : Go to Step 5 .

STEP 5. Connector check: B-12X engine control relay connector



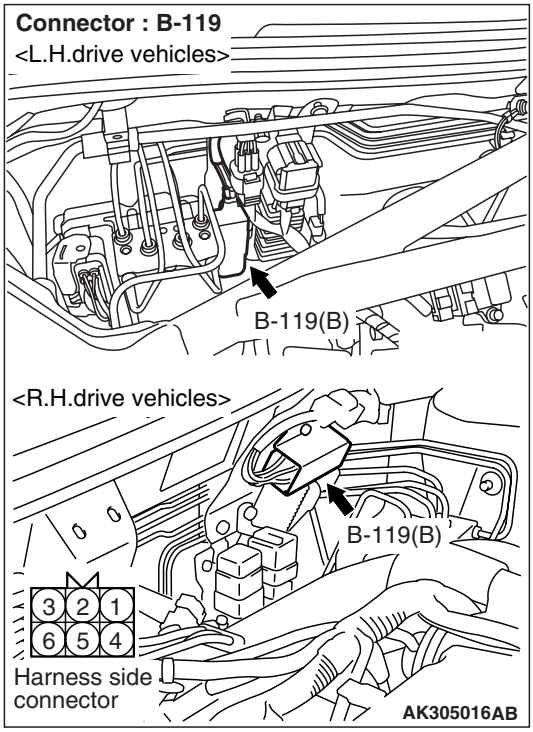
Q: Is the check result normal?
YES : Go to Step 6 .
NO : Repair or replace the connector.

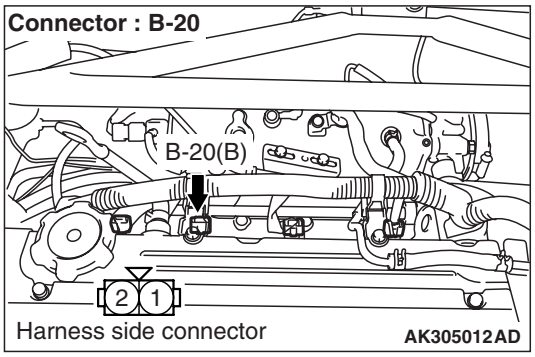
STEP 6. Check injector resistor itself.

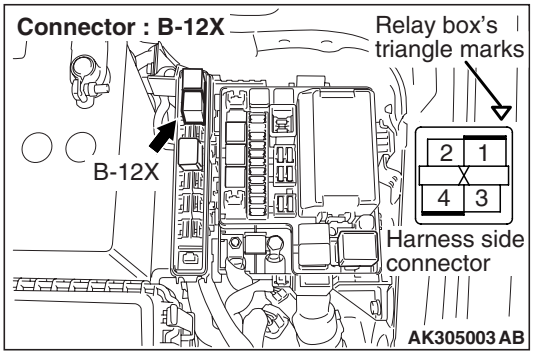
- Check injector resistor itself (Refer to P.13A-407)

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Replace the injector resistor.

STEP 7. Check harness between B-119 (terminal No. 4) injector resistor connector and B-20 (terminal No. 1) No. 2 injector connector.





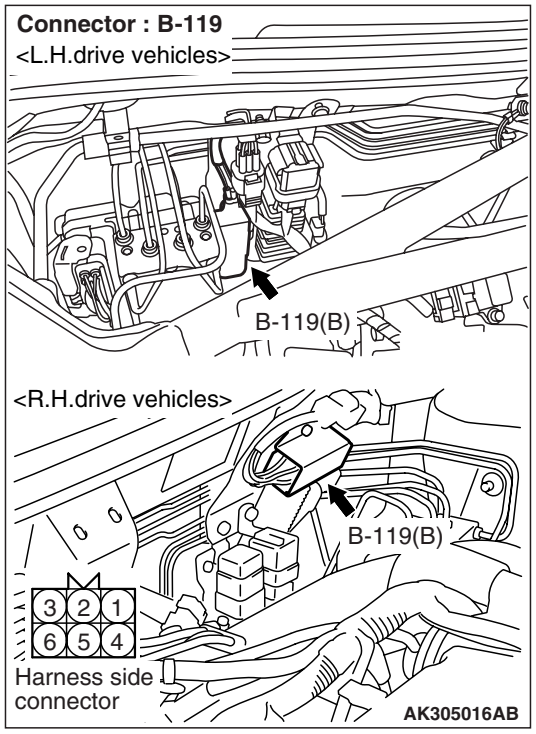


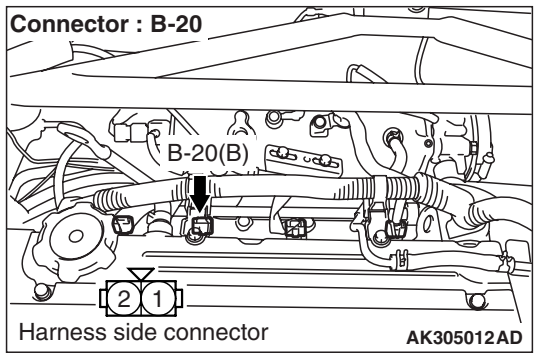
- Check power supply line for open/short circuit.

Q: Is the check result normal?
YES : Check intermediate connector C-105, and repair if necessary. If intermediate connector are normal, check and repair harness between B-119 (terminal No. 3) injector resistor connector and B-12X (terminal No. 4) engine control relay connector.
- Check power supply line for open/short circuit.

NO : Repair the damaged harness wire.

STEP 8. Check harness between B-119 (terminal No. 4) injector resistor connector and B-20 (terminal No. 1) No. 2 injector connector.

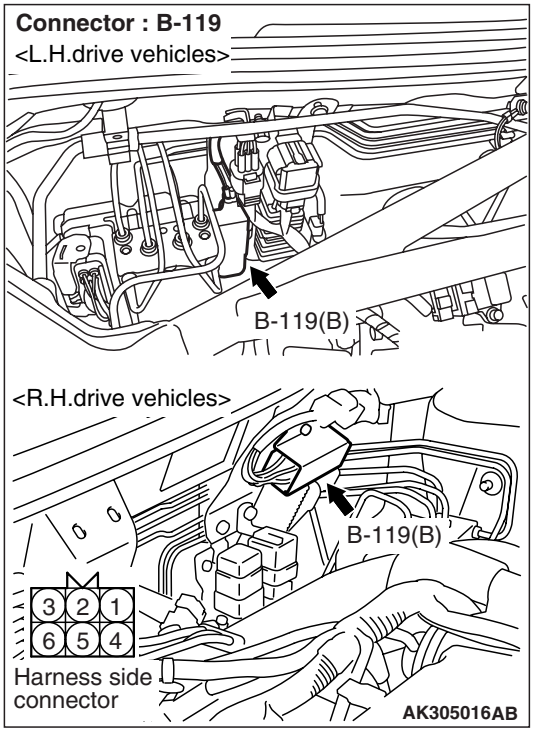


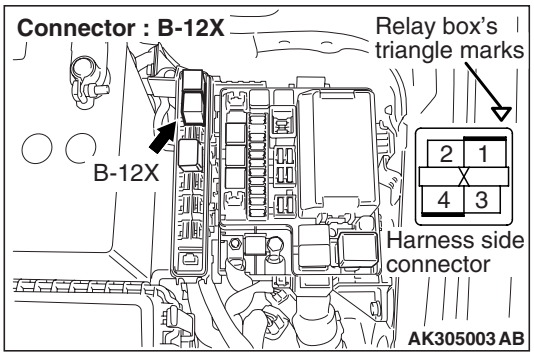


- Check power supply line for damage.

Q: Is the check result normal?
YES : Go to Step 9 .
NO : Repair the damaged harness wire.

STEP 9. Check harness between B-119 (terminal No. 3) injector resistor connector and B-12X (terminal No. 4) engine control relay connector.

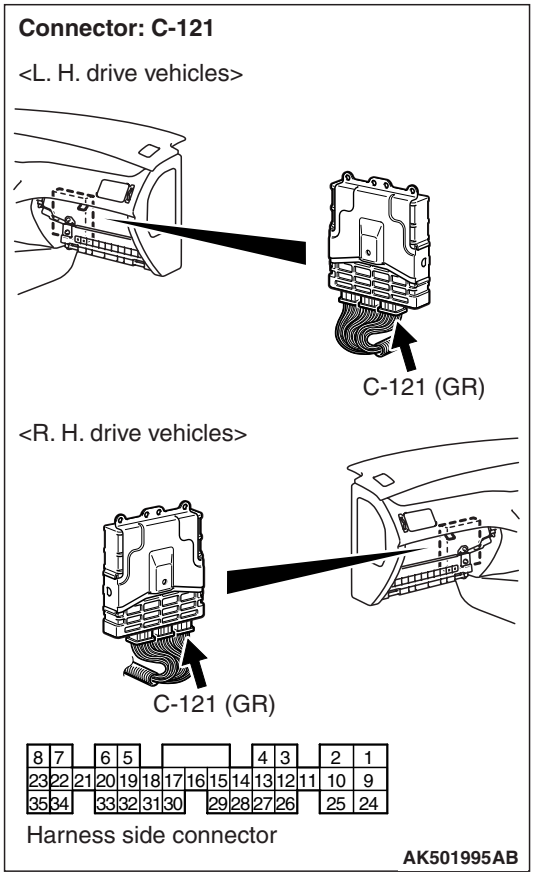




NOTE: Before checking harness, check intermediate connector C-105, and repair if necessary.
- Check power supply line for damage.

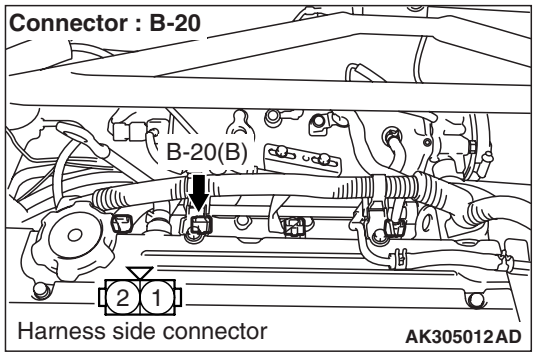
Q: Is the check result normal?
YES : Go to Step 10 .
NO : Repair the damaged harness wire.

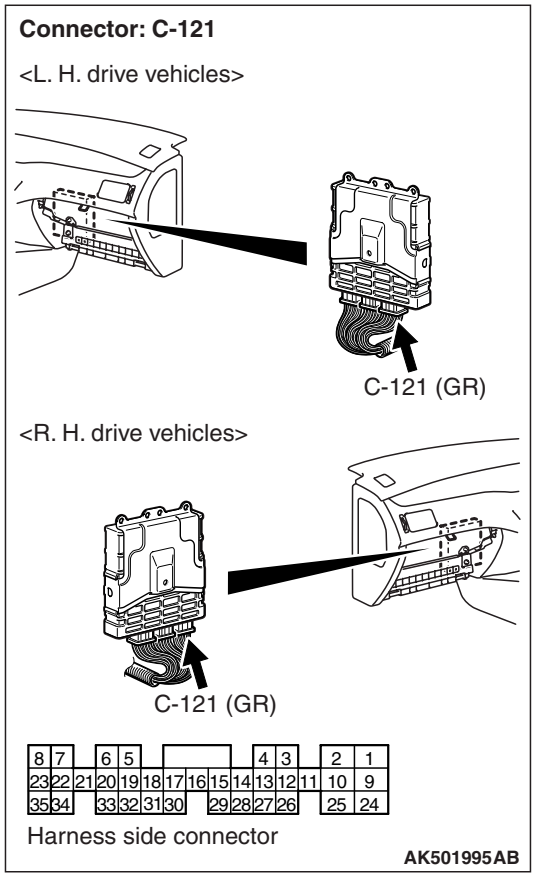
STEP 10. Connector check: C-121 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 11 .
NO : Repair or replace the connector.

STEP 11. Check harness between B-20 (terminal No. 2) No. 2 injector connector and C-121 (terminal No. 9) engine-ECU connector.

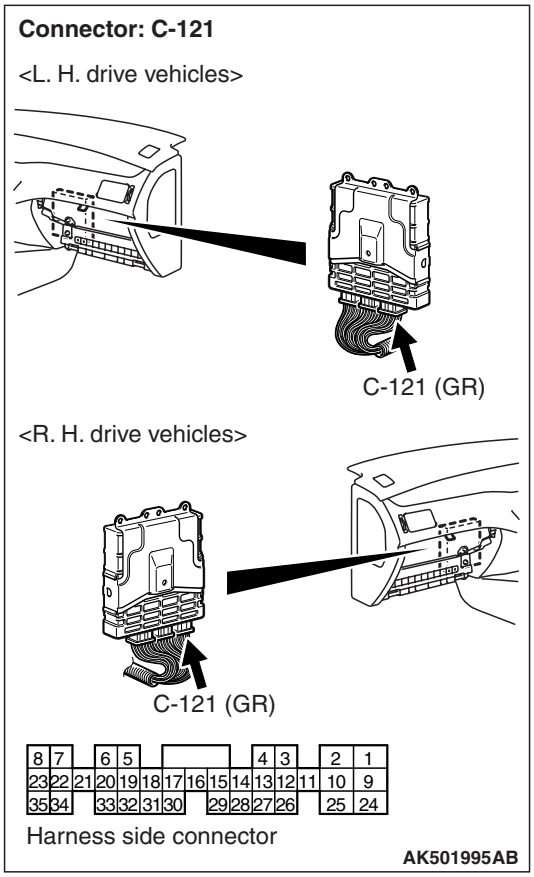




- Check output line for open/short circuit or damage.

Q: Is the check result normal?
YES : Go to Step 12 .
NO : Repair the damaged harness wire.

STEP 12. Perform signal wave pattern measurement at C-121 engine-ECU connector (Using an oscilloscope).



- Engine: Idling
- Transmission: Neutral
- Voltage between terminal No. 9 and earth.

  OK: Waveform should be display on Inspection procedure using an oscilloscope (Refer to P.13A-385).

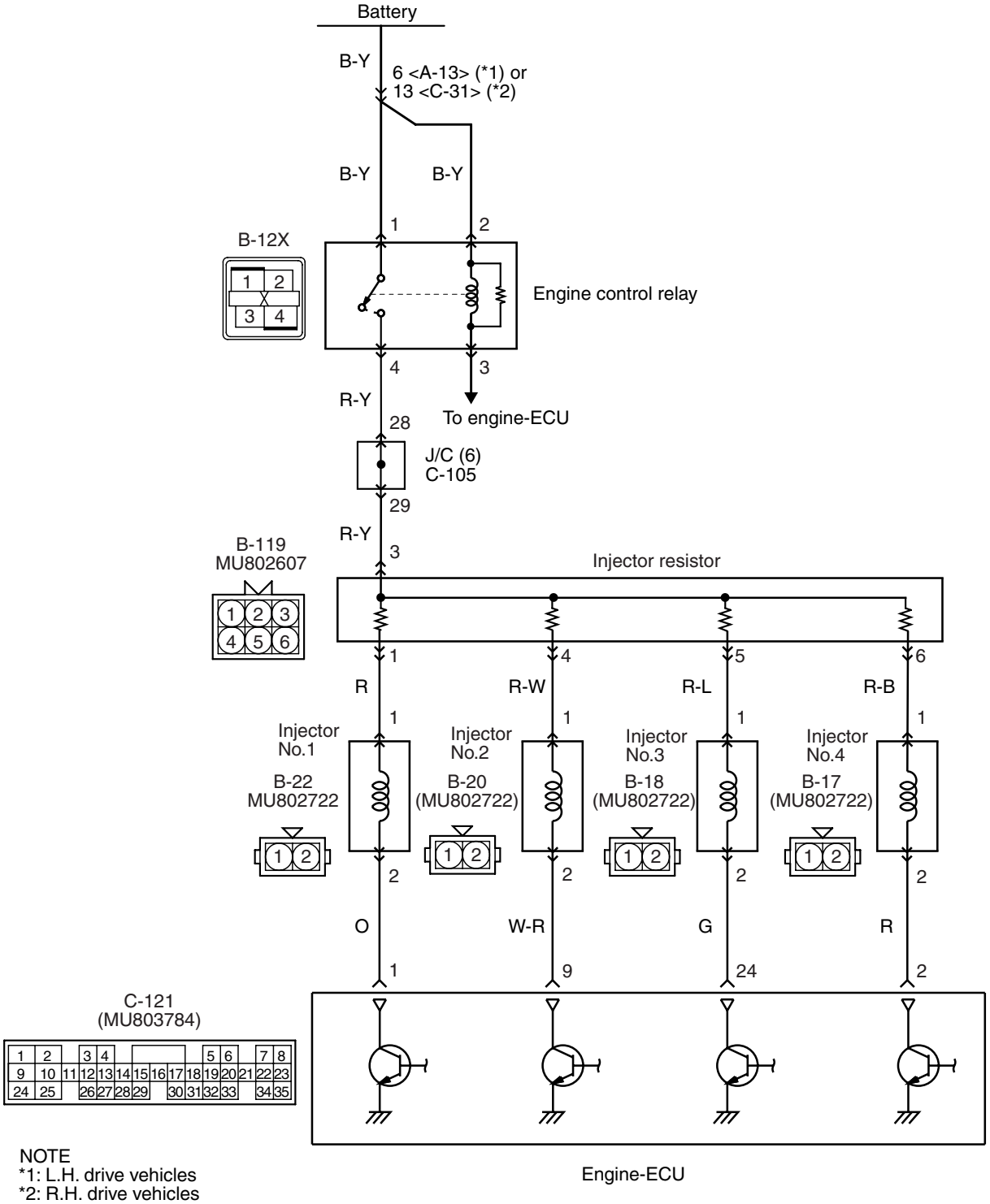
Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-5).

NO : Replace the engine-ECU.

Code No. P0203: No. 3 Injector System

Injector circuit



NOTE
*1: L.H. drive vehicles
*2: R.H. drive vehicles

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

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OPERATION

- Power is supplied to the injector (terminal No. 1) from the engine control relay (terminal No. 4) via the injector resistor.
- The engine-ECU (terminal No. 24) makes the power transistor in the unit be in "ON" position, and that makes currents go on the injector (terminal No. 2).

FUNCTION

- The engine-ECU controls the power supply interval of the injector.
- The fuel injection amount of the injector depends on the power supply interval.

TROUBLE JUDGMENT

Check Conditions

- The engine speed is 50 – 1,000 r/min.
- The throttle position sensor output voltage is 1.15 V or less.
- Injector not in forced drive (actuator test) mode.

Judgment Criterion

- No surge voltage of the injector detected for 2 seconds.

PROBABLE CAUSES

- Failed No. 3 injector
- Open/short circuit in No. 3 injector circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-II/III actuator test

- Item No. 03: No. 3 injector

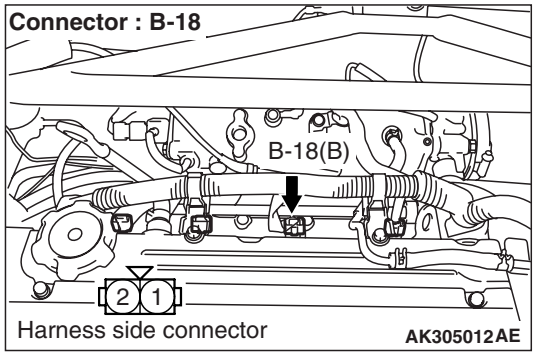
OK: Idling state varies.

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-5).

NO : Go to Step 2 .

STEP 2. Connector check: B-18 No. 3 injector connector

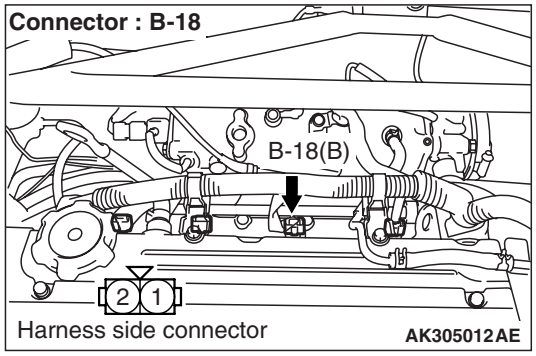


Q: Is the check result normal?

YES : Go to Step 3 .

NO : Repair or replace the connector.

STEP 3. Perform resistance measurement at B-18 No. 3 injector connector.



- Disconnect connector, and measure at injector side.
- Resistance between terminal No. 1 and No. 2.

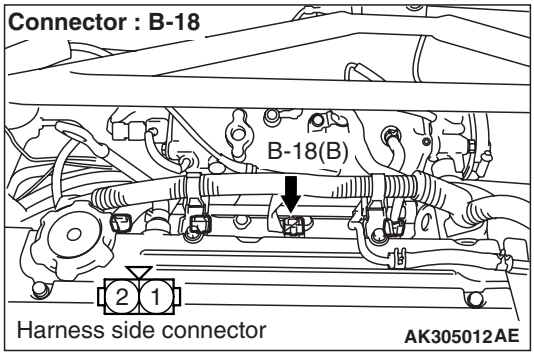
OK: 2 – 3 Ω

Q: Is the check result normal?

YES : Go to Step 4 .

NO : Replace the No. 3 injector.

STEP 4. Perform voltage measurement at B-18 No. 3 injector connector.

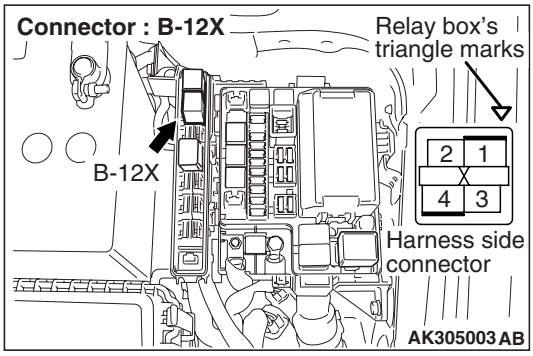


- Disconnect connector, and measure at harness side.
- Ignition switch: "ON"
- Voltage between terminal No. 1 and earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 8 .
NO : Go to Step 5 .

STEP 5. Connector check: B-12X engine control relay connector



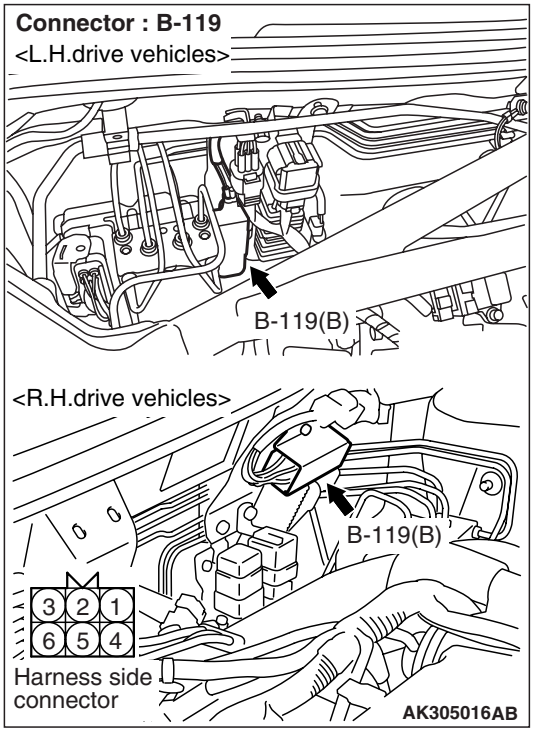
Q: Is the check result normal?
YES : Go to Step 6 .
NO : Repair or replace the connector.

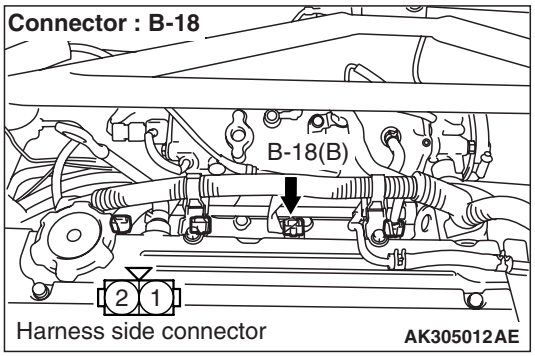
STEP 6. Check injector resistor itself.

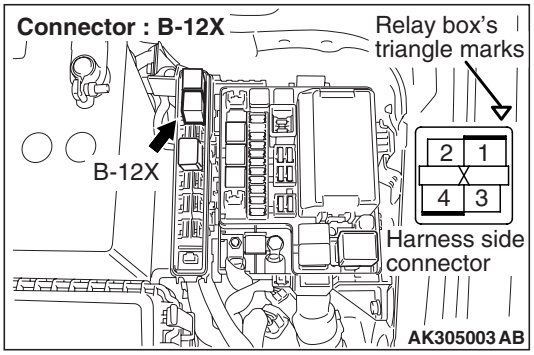
- Check injector resistor itself (Refer to P.13A-407).

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Replace the injector resistor.

STEP 7. Check harness between B-119 (terminal No. 5) injector resistor connector and B-18 (terminal No. 1) No. 3 injector connector.





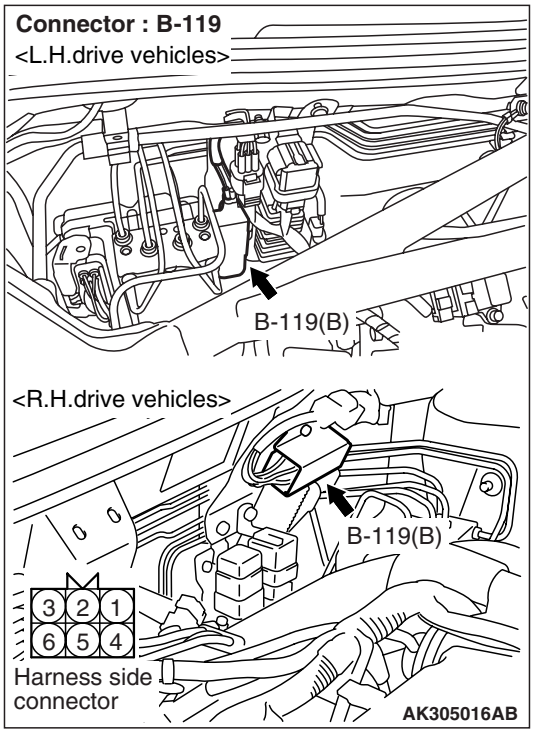


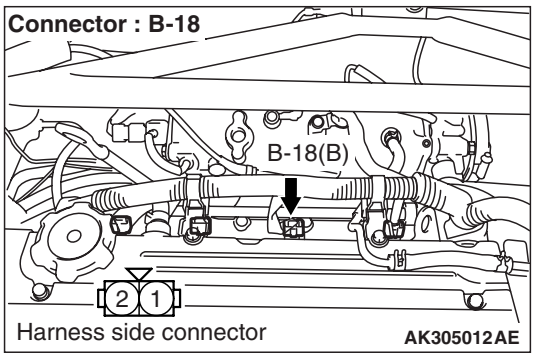
- Check power supply line for open/short circuit.

Q: Is the check result normal?
YES : Check intermediate connector C-105, and repair if necessary. If intermediate connector are normal, check and repair harness between B-119 (terminal No. 3) injector resistor connector and B-12X (terminal No. 4) engine control relay connector.
- Check power supply line for open/short circuit.

NO : Repair the damaged harness wire.

STEP 8. Check harness between B-119 (terminal No. 5) injector resistor connector and B-18 (terminal No. 1) No. 3 injector connector.

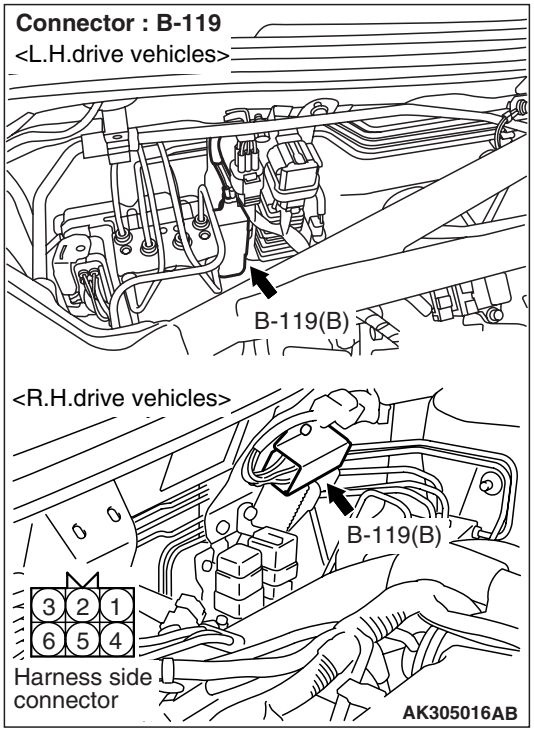


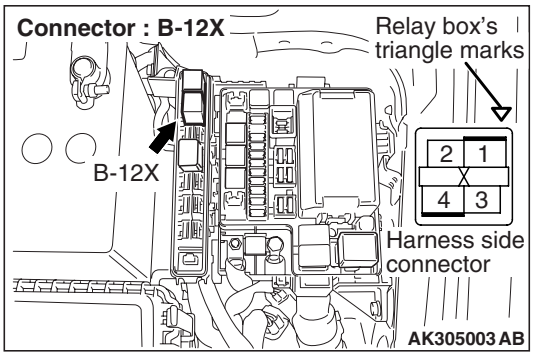


- Check power supply line for damage.

Q: Is the check result normal?
YES : Go to Step 9 .
NO : Repair the damaged harness wire.

STEP 9. Check harness between B-119 (terminal No. 3) injector resistor connector and B-12X (terminal No. 4) engine control relay connector.

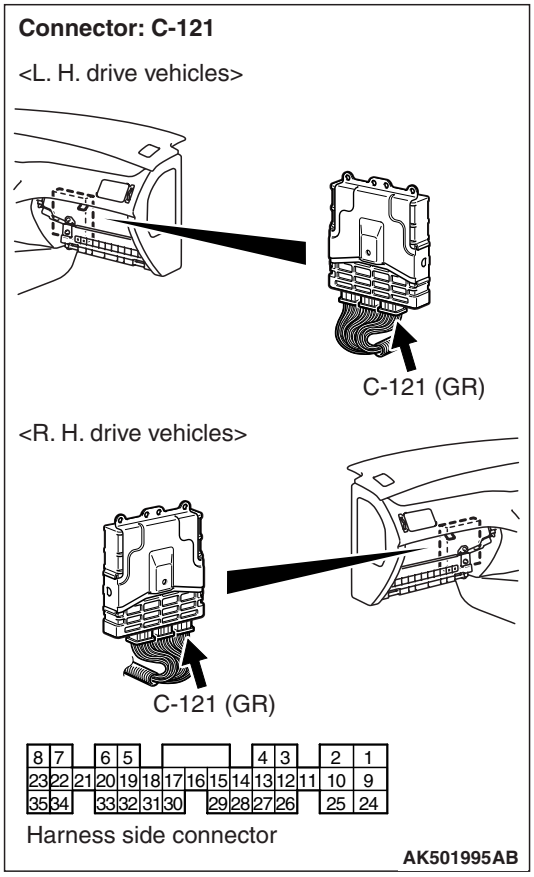




NOTE: Before checking harness, check intermediate connector C-105, and repair if necessary.
- Check power supply line for damage.

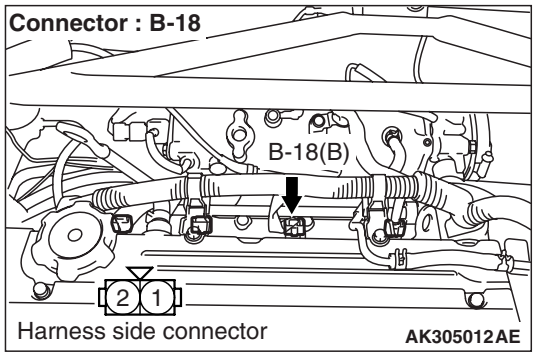
Q: Is the check result normal?
YES : Go to Step 10 .
NO : Repair the damaged harness wire.

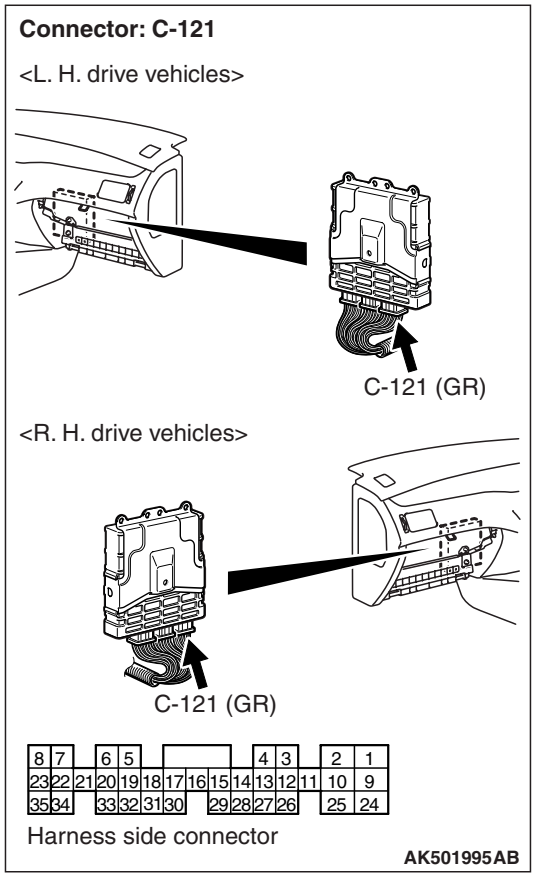
STEP 10. Connector check: C-121 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 11 .
NO : Repair or replace the connector.

STEP 11. Check harness between B-18 (terminal No. 2) No. 3 injector connector and C-121 (terminal No. 24) engine-ECU connector.

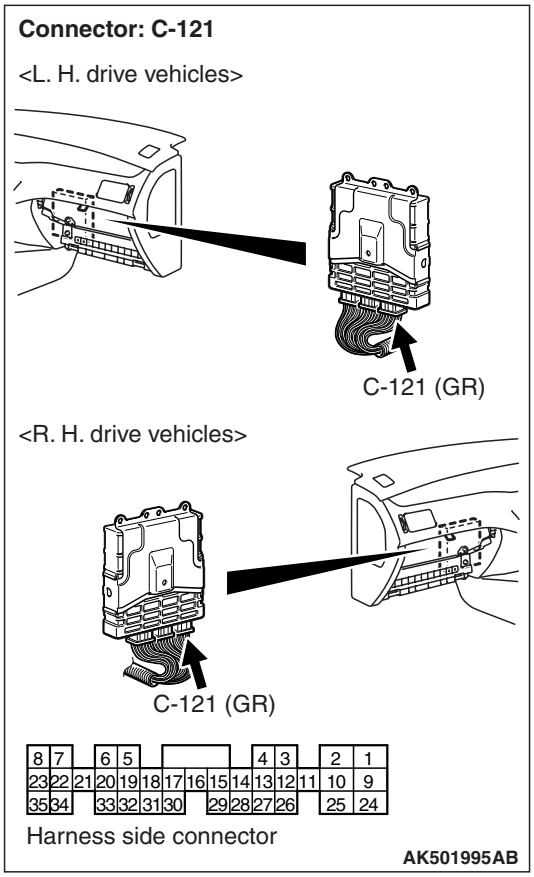




- Check output line for open/short circuit and damage.

Q: Is the check result normal?
YES : Go to Step 12 .
NO : Repair the damaged harness wire.

STEP 12. Perform signal wave pattern measurement at C-121 engine-ECU connector (Using an oscilloscope).



- Engine: Idling
- Transmission: Neutral
- Voltage between terminal No. 24 and earth.

  OK: Waveform should be display on Inspection procedure using an oscilloscope (Refer to P.13A-385).

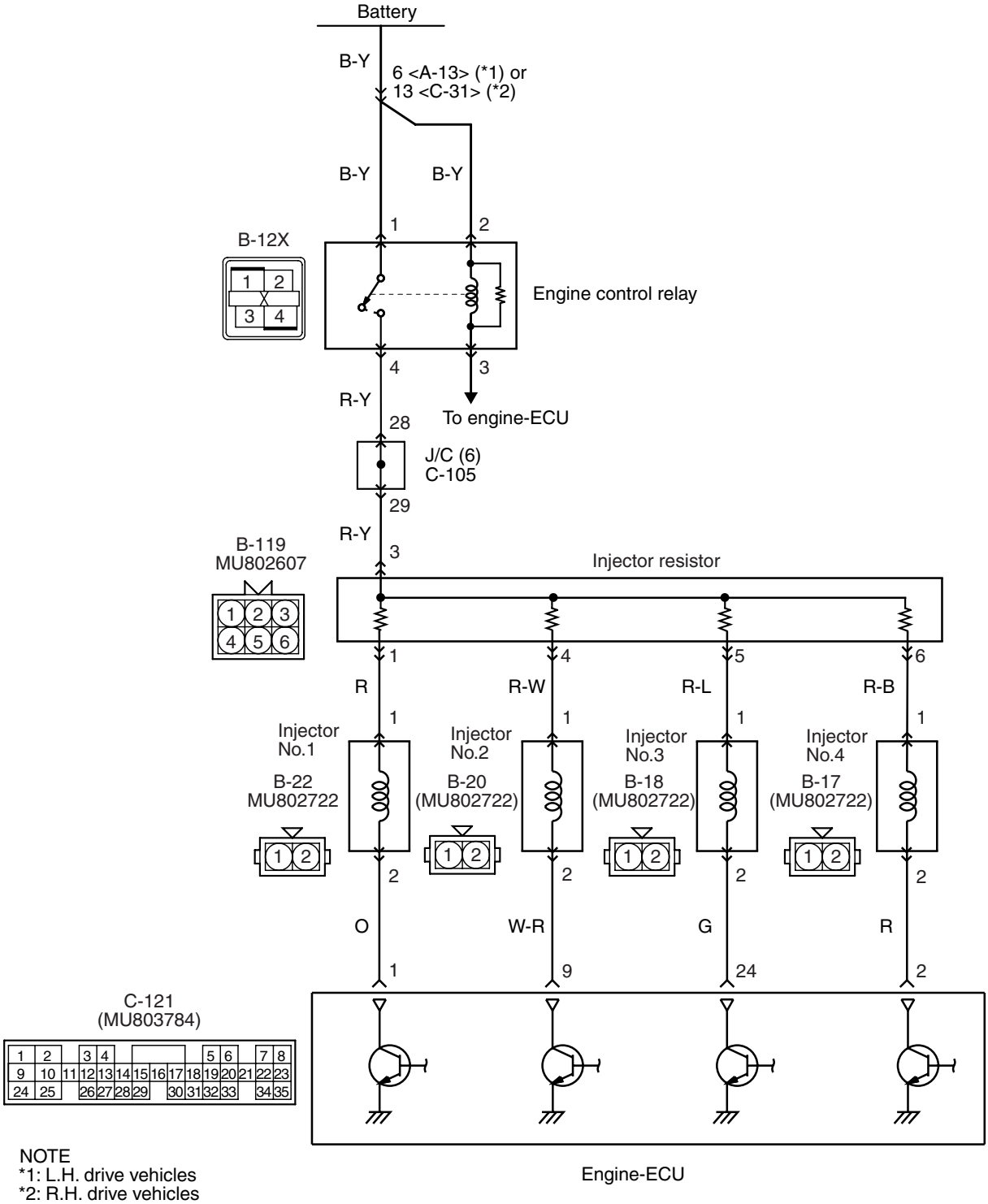
Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-5).

NO : Replace the engine-ECU.

Code No. P0204: No. 4 Injector System

Injector circuit



NOTE
*1: L.H. drive vehicles
*2: R.H. drive vehicles

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

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OPERATION

- Power is supplied to the injector (terminal No. 1) from the engine control relay (terminal No. 4) via the injector resistor.
- The engine-ECU (terminal No. 2) makes the power transistor in the unit be in "ON" position, and that makes currents go on the injector (terminal No. 2).

FUNCTION

- The engine-ECU controls the power supply interval of the injector.
- The fuel injection amount of the injector depends on the power supply interval.

TROUBLE JUDGMENT

Check Conditions

- The engine speed is 50 – 1,000 r/min.
- The throttle position sensor output voltage is 1.15 V or less.
- Injector not in forced drive (actuator test) mode.

Judgment Criterion

- No surge voltage of the injector detected for 2 seconds.

PROBABLE CAUSES

- Failed No. 4 injector
- Open/short circuit in No. 4 injector circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-II/III actuator test

- Item No. 04: No. 4 injector

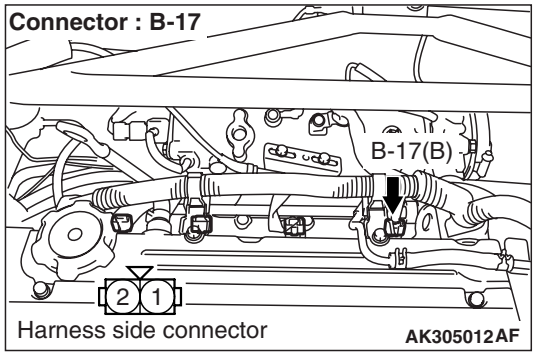
OK: Idling state varies.

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-5).

NO : Go to Step 2 .

STEP 2. Connector check: B-17 No. 4 injector connector

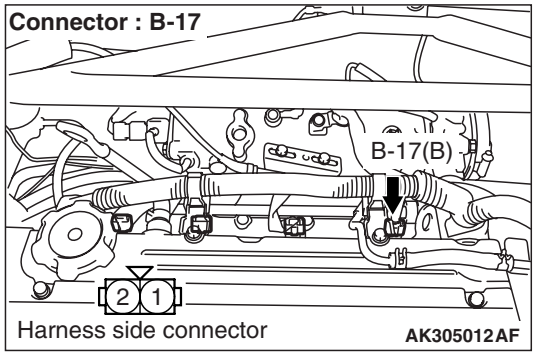


Q: Is the check result normal?

YES : Go to Step 3 .

NO : Repair or replace the connector.

STEP 3. Perform resistance measurement at B-17 No. 4 injector connector.



- Disconnect connector, and measure at injector side.
- Resistance between terminal No. 1 and No. 2.

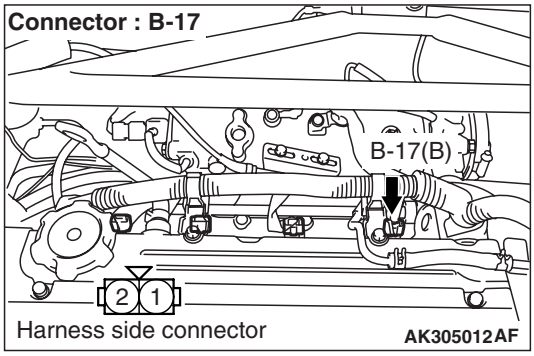
OK: 2 – 3 Ω

Q: Is the check result normal?

YES : Go to Step 4 .

NO : Replace the No. 4 injector.

STEP 4. Perform voltage measurement at B-17 No. 4 injector connector

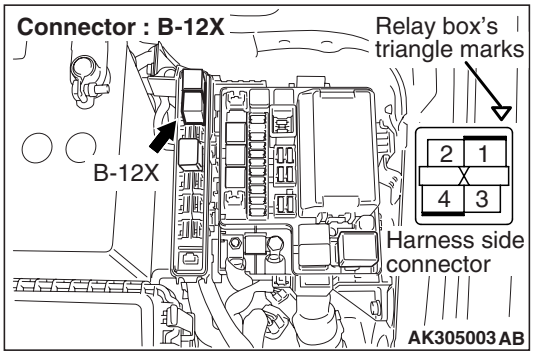


- Disconnect connector, and measure at harness side.
- Ignition switch: "ON"
- Voltage between terminal No. 1 and earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 8 .
NO : Go to Step 5 .

STEP 5. Connector check: B-12X engine control relay connector



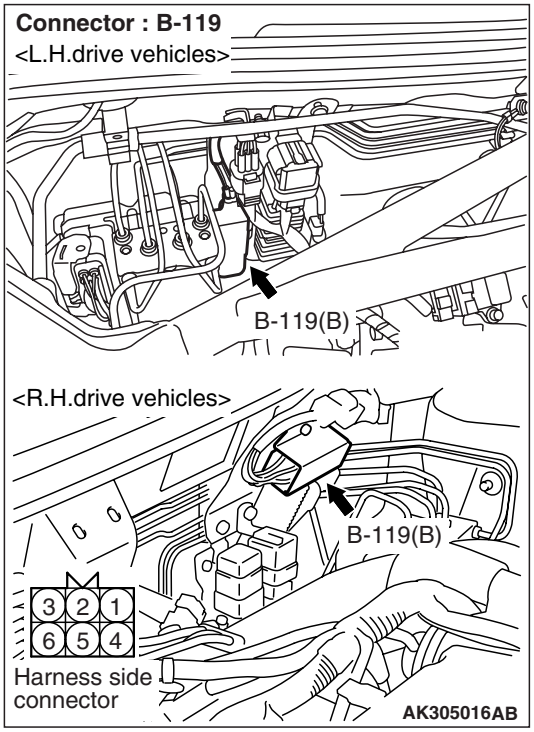
Q: Is the check result normal?
YES : Go to Step 6 .
NO : Repair or replace the connector.

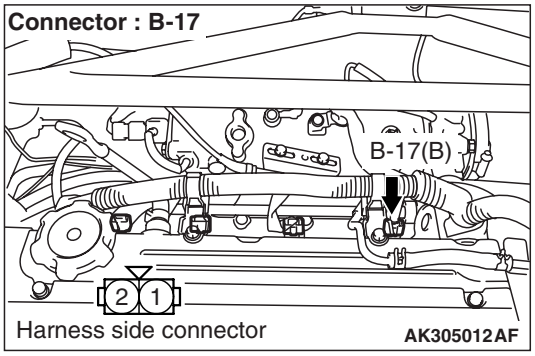
STEP 6. Check injector resistor itself.

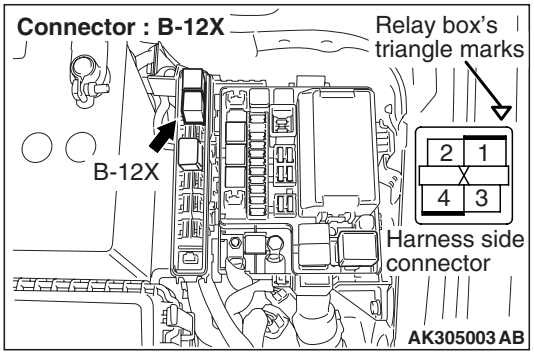
- Check injector resistor itself (Refer to P.13A-407).

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Replace the injector resistor.

STEP 7. Check harness between B-119 (terminal No. 6) injector resistor connector and B-17 (terminal No. 1) No. 4 injector connector.





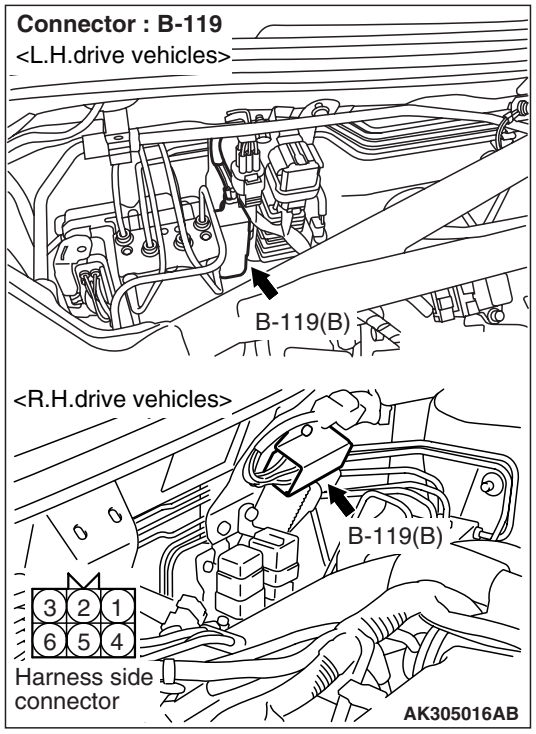


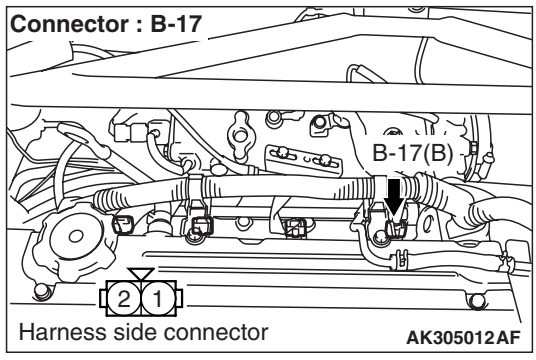
- Check power supply line for open/short circuit.

Q: Is the check result normal?
YES : Check intermediate connector C-105, and repair if necessary. If intermediate connector are normal, check and repair harness between B-119 (terminal No. 3) injector resistor connector and B-12X (terminal No. 4) engine control relay connector.
- Check power supply line for open/short circuit.

NO : Repair the damaged harness wire.

STEP 8. Check harness between B-119 (terminal No. 6) injector resistor connector and B-17 (terminal No. 1) No. 4 injector connector.

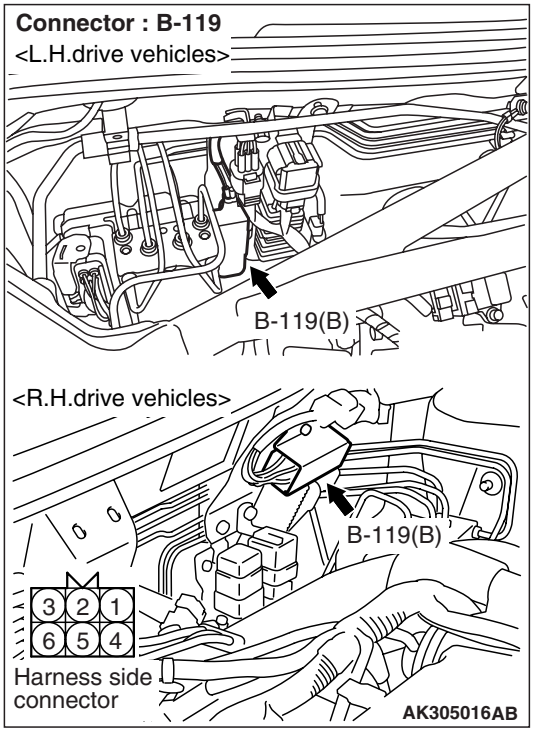


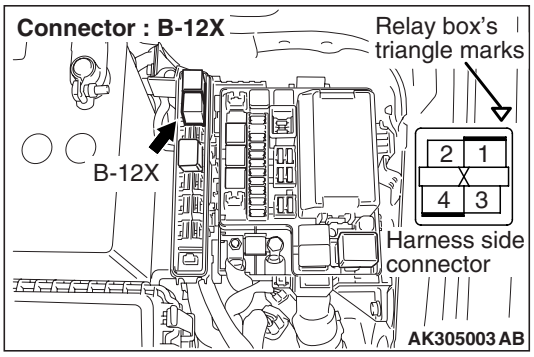


- Check power supply line for damage.

Q: Is the check result normal?
YES : Go to Step 9 .
NO : Repair the damaged harness wire.

STEP 9. Check harness between B-119 (terminal No. 3) injector resistor connector and B-12X (terminal No. 4) engine control relay connector.

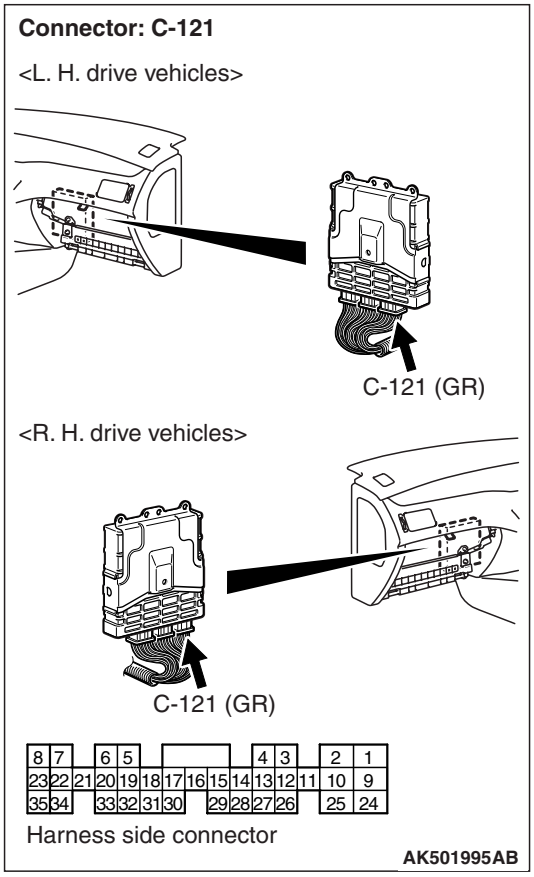




NOTE: Before checking harness, check intermediate connector C-105, and repair if necessary.
- Check power supply line for damage.

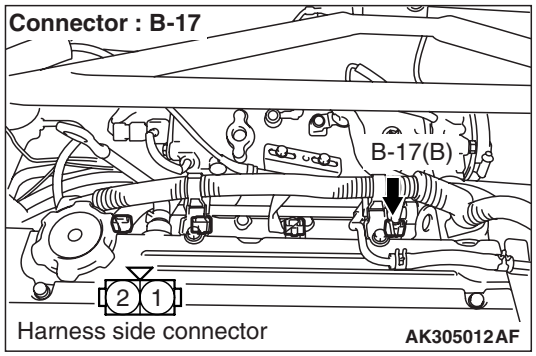
Q: Is the check result normal?
YES : Go to Step 10 .
NO : Repair the damaged harness wire.

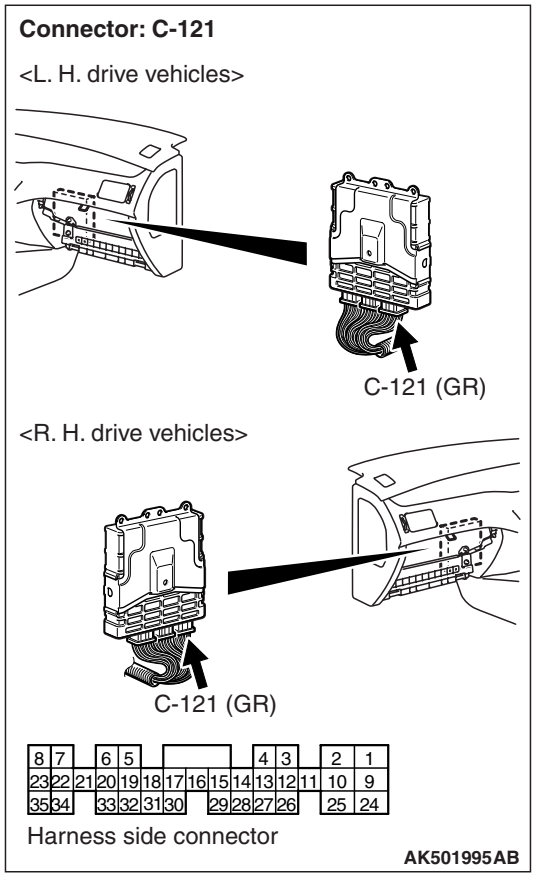
STEP 10. Connector check: C-121 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 11 .
NO : Repair or replace the connector.

STEP 11. Check harness between B-17 (terminal No. 2) No. 4 injector connector and C-121 (terminal No. 2) engine-ECU connector.

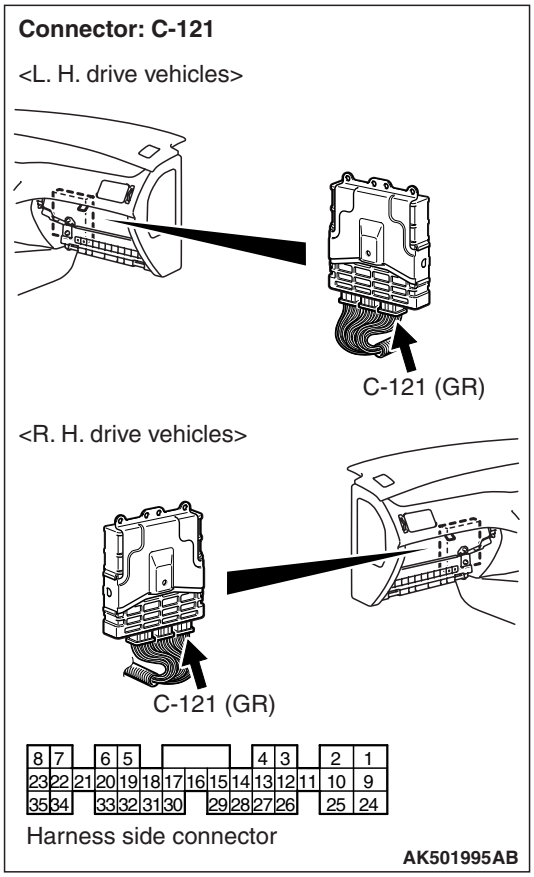




- Check output line for open/short circuit and damage.

Q: Is the check result normal?
YES : Go to Step 12 .
NO : Repair the damaged harness wire.

STEP 12. Perform signal wave pattern measurement at C-121 engine-ECU connector (Using an oscilloscope).



- Engine: Idling
- Transmission: Neutral
- Voltage between terminal No. 2 and earth.

  OK: Waveform should be display on Inspection procedure using an oscilloscope (Refer to P.13A-385).

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-5).

NO : Replace the engine-ECU.

Code No. P0234: Turbocharger Wastegate System Malfunction

FUNCTION

- The engine-ECU checks that the engine is not overcharged by always monitoring intake air volume.
- The engine-ECU protects the engine by shutting off fuel when an overcharged condition is detected.

TROUBLE JUDGMENT

Check Condition

- Waste gate solenoid valve is normal.

Judgment Criterion

- The volumetric efficiency continues to be the status having more than the specified valve for the stipulated period.

PROBABLE CAUSES

- Failed turbocharger wastages actuator
- Failed supercharging pressure control system
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. Check turbocharger supercharging pressure.

- Check turbocharger supercharging pressure (Refer to GROUP 15 – On-vehicle Service – Turbocharger Supercharging Pressure P.15-2).

Q: Is the check result normal?
YES : Go to Step 2 .
NO : Repair or replace.

STEP 2. Check supercharging pressure control system.

- Check supercharging pressure control system (Refer to GROUP 15 – On-vehicle Service – Supercharging Pressure Control System P.15-3).

Q: Is the check result normal?
YES : Go to Step 3 .
NO : Repair or replace.

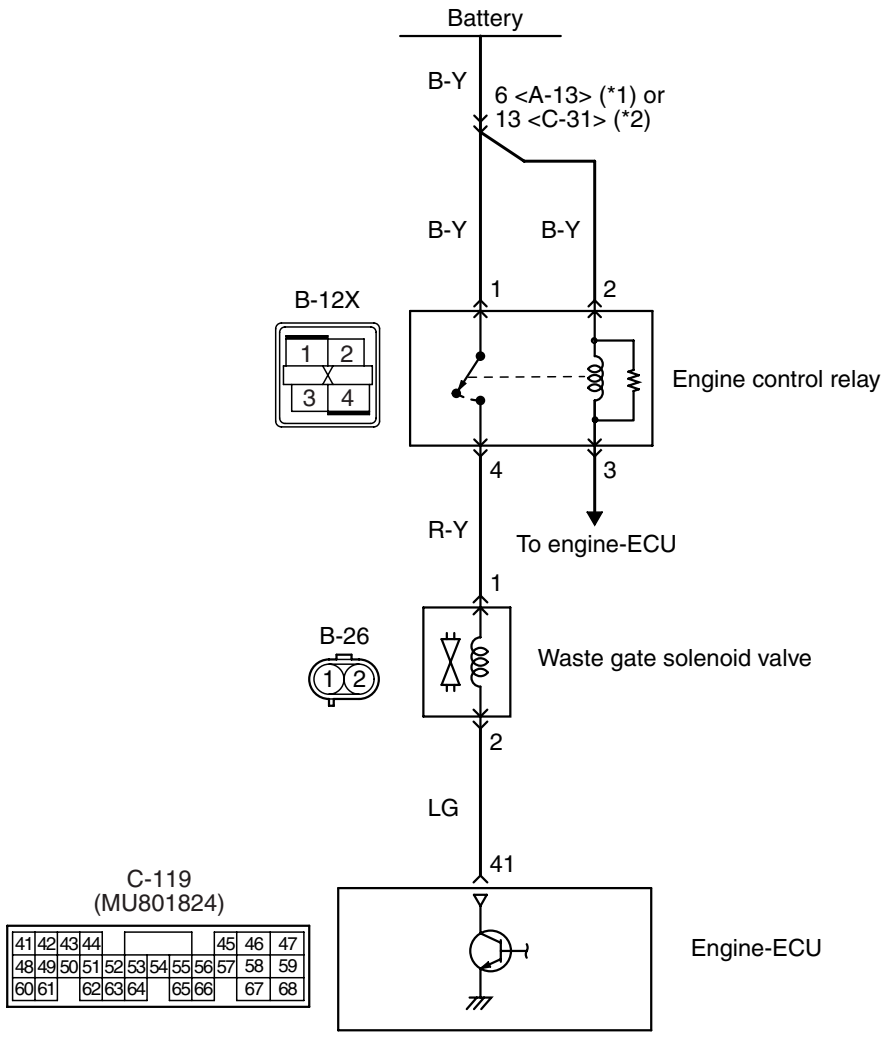
STEP 3. M.U.T.-II/III diagnosis code.

- Reconfirmation of diagnosis code.

Q: Is the diagnosis code?
YES : Replace the engine-ECU.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-5).

Code No. P0243: Waste Gate Solenoid Valve System

Waste gate solenoid valve circuit



NOTE
*1: L.H. drive vehicles
*2: R.H. drive vehicles
Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Gray
R: Red P: Pink V: Violet PU: Purple

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OPERATION

- Power is supplied from the engine control relay (terminal No. 4) to the waste gate solenoid valve (terminal No. 1).
- The engine-ECU (terminal No. 41) causes the power transistor in the unit to be ON to supply power to the waste gate solenoid valve (terminal No. 2).

FUNCTION

- In response to a signal from the engine-ECU, the waste gate solenoid valve controls the turbo charge pressure to be introduced into the waste gate actuator of the turbo charger.

TROUBLE JUDGMENT

Check Condition

- Battery voltage is 10 V or more.

Judgment Criterion

- Surge voltage cannot be detected within 1 seconds from the time when the waste gate solenoid valve has changed from ON to OFF.

PROBABLE CAUSES

- Failed waste gate solenoid valve
- Open/short circuit in waste gate solenoid valve sensor circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-II/III actuator test

- Item No. 12: Waste gate solenoid valve

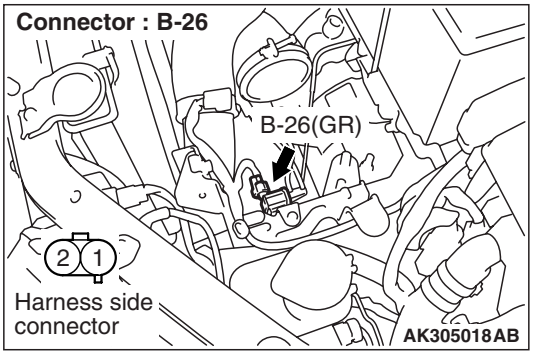
  OK: Operating sound can be heard and the valve vibrates.

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-5).

NO : Go to Step 2 .

STEP 2. Connector check: B-26 waste gate solenoid valve connector

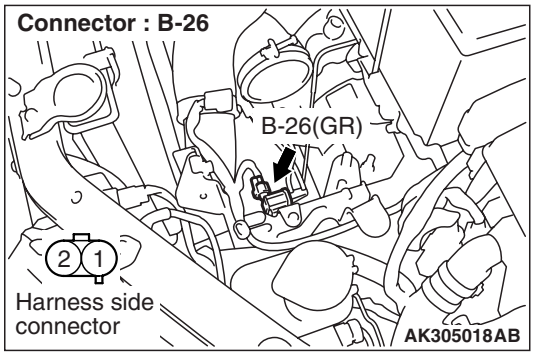


Q: Is the check result normal?

YES : Go to Step 3 .

NO : Repair or replace the connector.

STEP 3. Perform resistance measurement at B-26 waste gate solenoid valve connector.



- Disconnect connector, and measure at solenoid valve side.
- Resistance between terminal No. 1 and No. 2.

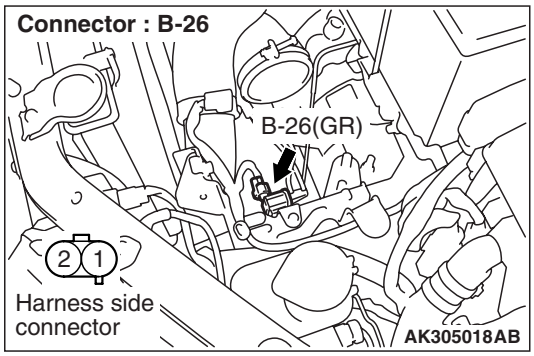
  OK: 29 – 35 Ω (at 20°C)

Q: Is the check result normal?

YES : Go to Step 4 .

NO : Replace the waste gate solenoid valve.

STEP 4. Perform voltage measurement at B-26 waste gate solenoid valve connector.



- Disconnect connector, and measure at harness side.
- Ignition switch: "ON"
- Voltage between terminal No. 1 and earth.

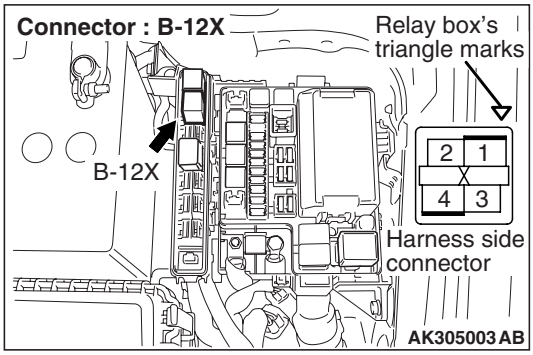
  OK: System voltage

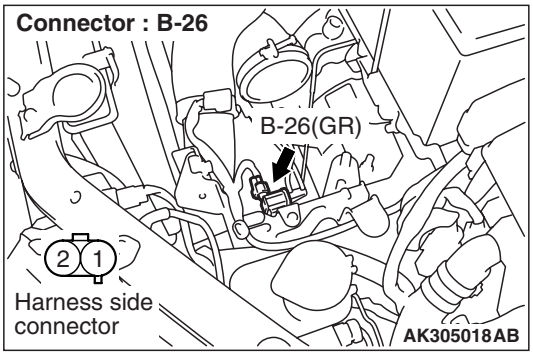
Q: Is the check result normal?

YES : Go to Step 6 .

NO : Go to Step 5 .

STEP 5. Connector check: B-12X engine control relay connector



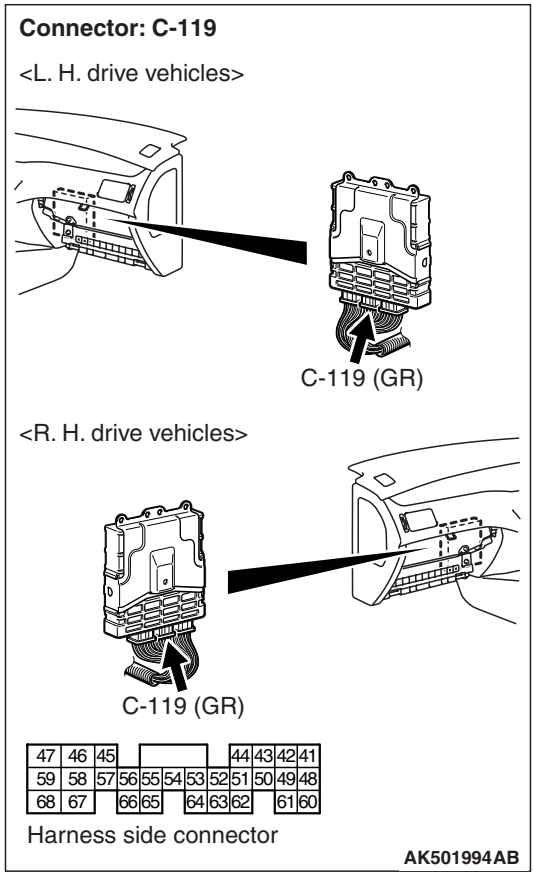


Q: Is the check result normal?

YES : Check and repair harness between B-26 (terminal No. 1) waste gate solenoid valve connector and B-12X (terminal No. 4) engine control relay connector.
- Check power supply line for open/short circuit.

NO : Repair or replace the connector.

STEP 6. Perform voltage measurement at C-119 engine-ECU connector.



- Disconnect connector, and measure at harness side.
- Ignition switch: "ON"
- Voltage between terminal No. 41 and earth.

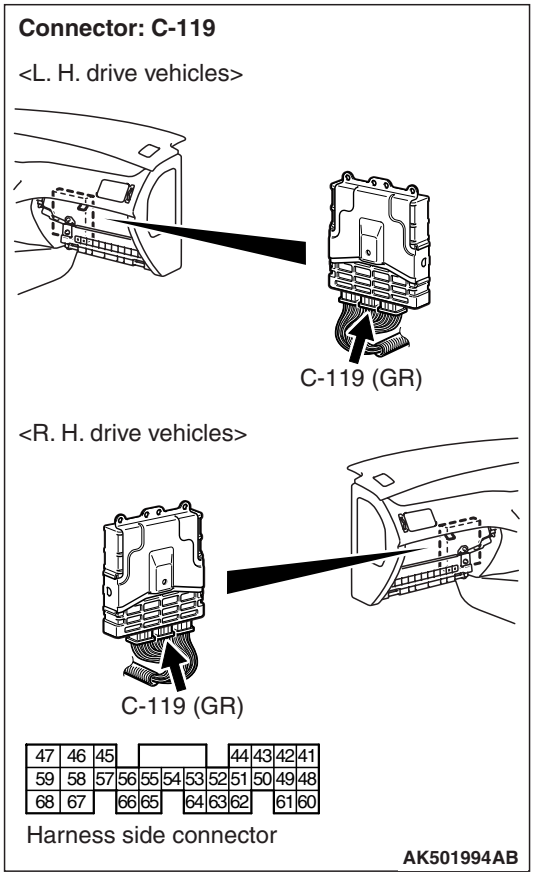
OK: System voltage

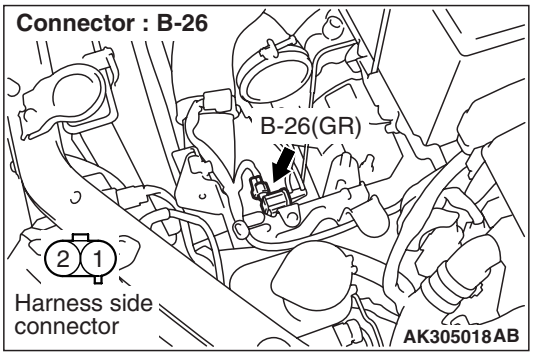
Q: Is the check result normal?

YES : Go to Step 8 .

NO : Go to Step 7 .

STEP 7. Connector check: C-119 engine-ECU connector





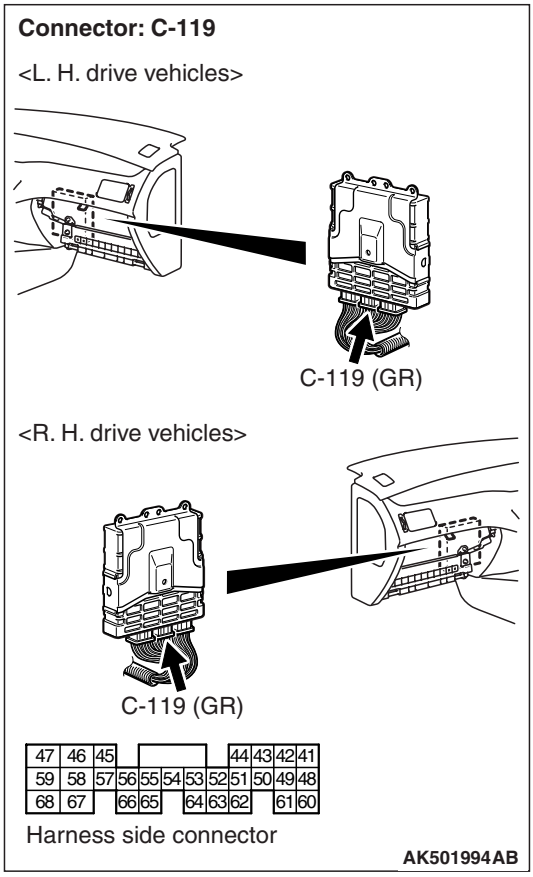
Q: Is the check result normal?

YES : Check and repair harness between B-26 (terminal No. 2) waste gate solenoid valve connector and C-119 (terminal No. 41) engine-ECU connector.

- Check output line for open/short circuit.

NO : Repair or replace the connector.

STEP 8. Connector check: C-119 engine-ECU connector

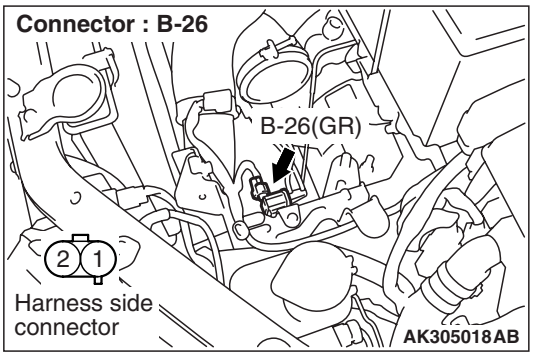


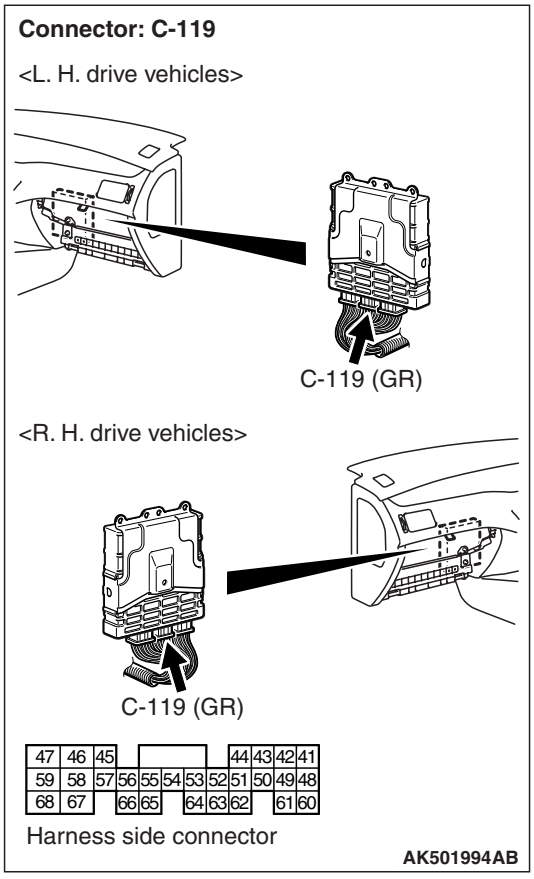
Q: Is the check result normal?

YES : Go to Step 9 .

NO : Repair or replace the connector.

STEP 9. Check harness between B-26 (terminal No. 2) waste gate solenoid valve connector and C-119 (terminal No. 41) engine-ECU connector.

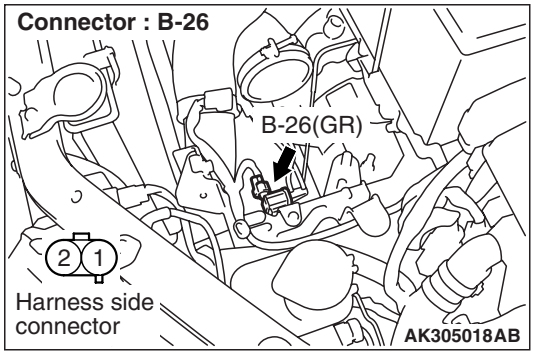


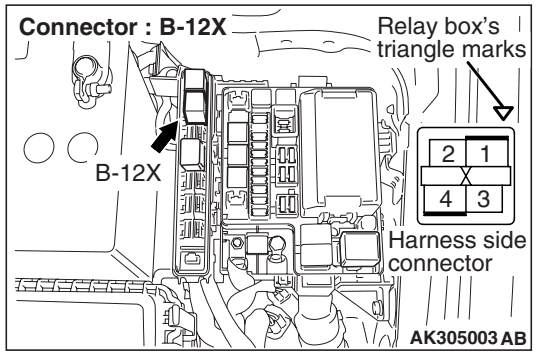


- Check output line for damage.

Q: Is the check result normal?
YES : Go to Step 10 .
NO : Repair the damaged harness wire.

STEP 10. Check harness between B-26 (terminal No. 1) waste gate solenoid valve connector and B-12X (terminal No. 4) engine control relay connector.





- Check power supply line for damage.

Q: Is the check result normal?
YES : Go to Step 11 .
NO : Repair the damaged harness wire.

STEP 11. M.U.T.-II/III actuator test

- Item No. 12: Waste gate solenoid valve

  OK: Operating sound can be heard and the valve vibrates.

Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-5).
NO : Replace the engine-ECU.

Code No. P0300: Random Cylinder Misfire Detected

OPERATION

- Refer to P0201 injector circuit P.13A-105.
- Refer to P0202 injector circuit P.13A-111.
- Refer to P0203 injector circuit P.13A-117.
- Refer to P0204 injector circuit P.13A-123.

FUNCTION

- If a misfire occurs while the engine is running, the engine speed changes for an instant.
- The engine-ECU checks for such changes in engine speed.

TROUBLE JUDGMENT

Check Conditions

- The engine speed is 500 – 6,500 r/min.
- The engine coolant temperature is –10°C or higher.
- The barometric pressure is 76 kPa or more.
- The volumetric efficiency is 30 – 55%.
- The adaptive learning has been completed with the vane that generates the crankshaft position signals.
- During the engine operation except the shift change or low speed driving and rapid acceleration and deceleration, also intermittent operation of air compressor (A/C: within the 3 seconds after changing to ON from OFF or to OFF from ON).
- The throttle deviation is within the range of –0.06 V/10ms to 0.06 V/10ms.

Judgment Criteria

- Misfire has occurred more frequently than allowed during the last 200 revolutions (When the catalyst temperature is higher than 950°C).

or

- Misfire has occurred in 15 or more of the last 1,000 revolutions (corresponding to 1.5 times the limit of emission standard).

PROBABLE CAUSES

- Ignition system related part(s) failed
- Failed crank angle sensor
- Incorrect air-fuel ratio
- Low compression pressure
- Failed coolant temperature sensor
- Skipping of timing belt teeth.
- EGR system and EGR valve failed
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-II/III data list

- Item No. 22: Crank angle sensor

  OK: Keep the engine speed constant to make the pulse width of output waveform constant.

Q: Is the check result normal?

YES : Go to Step 2 .

NO : Check crank angle sensor system (Refer to Code No. P0335 P.13A-155).

STEP 2. M.U.T.-II/III data list

- Refer to Data List Reference Table P.13A-372.

a. Item No. 21: Engine coolant temperature sensor
b. Item No. 81: Long-term fuel compensation
c. Item No. 82: Short-term fuel compensation

Q: Are the check results normal?

YES : Go to Step 3 .

NO : Perform the diagnosis code classified check procedure for the sensor that has shown an abnormal data valve (Refer to, Inspection Chart for Diagnosis Codes P.13A-17).

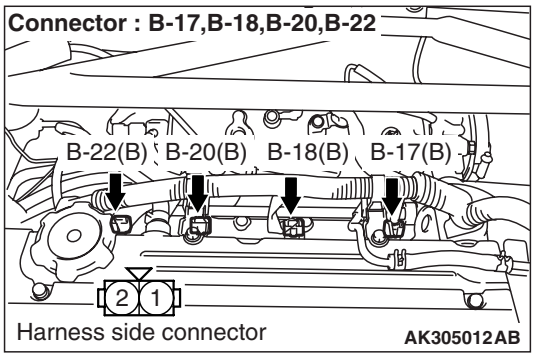
STEP 3. Check ignition coil spark.

Q: Is the check result normal?

YES : Go to Step 4 .

NO : Check ignition circuit system (Refer to Inspection procedure 30 <L.H. drive vehicles>P.13A-356 or Inspection procedure 31 <R.H. drive vehicles>P.13A-363).

STEP 4. Connector check: Injector connector



a. B-22 (No. 1 injector connector)
b. B-20 (No. 2 injector connector)
c. B-18 (No. 3 injector connector)
d. B-17 (No. 4 injector connector)

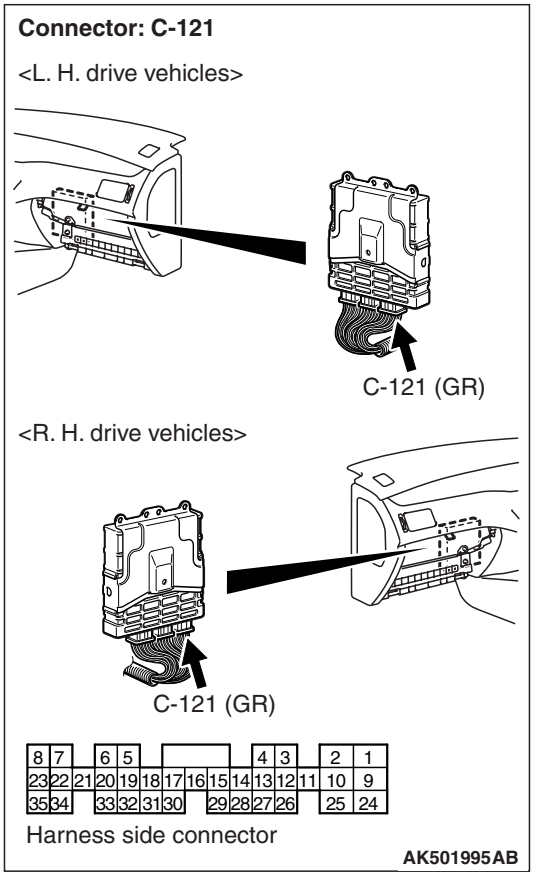
Q: Are the check results normal?
YES : Go to Step 5 .
NO : Repair or replace the connector.

STEP 5. Check injector itself.

- Check Injector itself (Refer to P.13A-406).

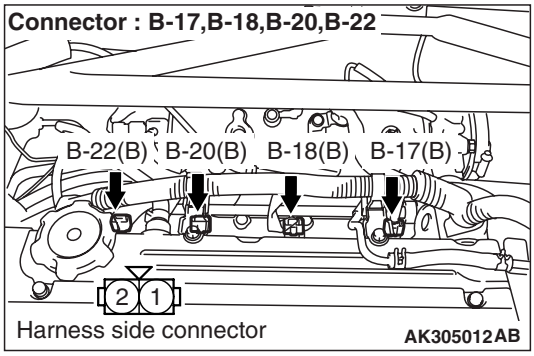
Q: Is the check result normal?
YES : Go to Step 6 .
NO : Replace the injector.

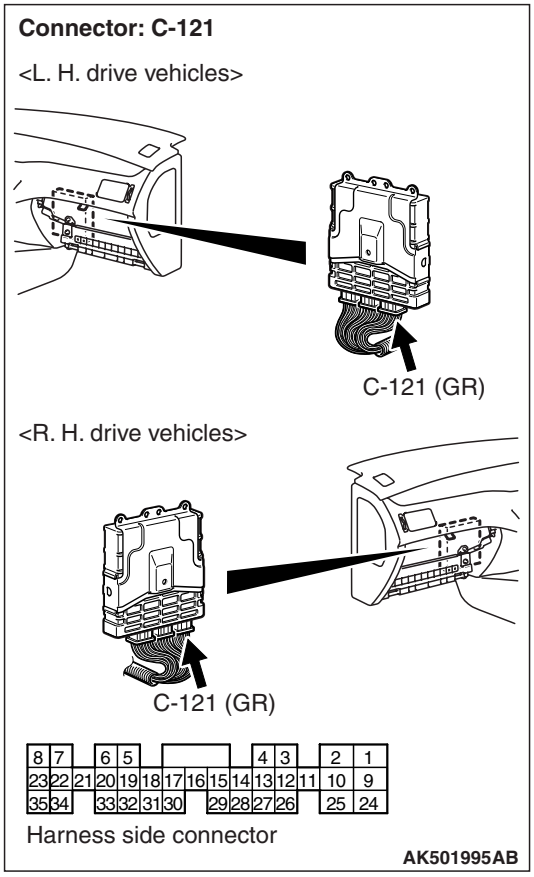
STEP 6. Connector check: C-121 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair or replace the connector.

STEP 7. Check harness between injector connector and C-121 engine-ECU connector.





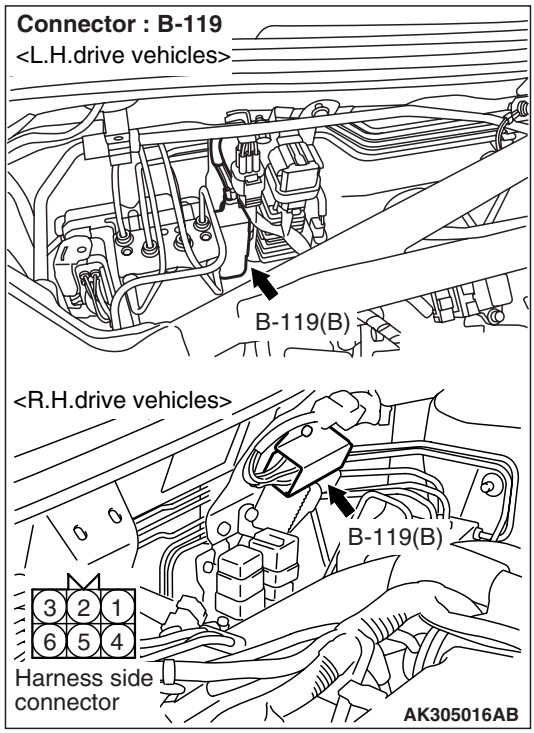
a. Check harness between B-22 (terminal No. 2) No. 1 injector connector and C-121 (terminal No. 1) engine-ECU connector.
b. Check harness between B-20 (terminal No. 2) No. 2 injector connector and C-121 (terminal No. 9) engine-ECU connector.
c. Check harness between B-18 (terminal No. 2) No. 3 injector connector and C-121 (terminal No. 24) engine-ECU connector.
d. Check harness between B-17 (terminal No. 2) No. 4 injector connector and C-121 (terminal No. 2) engine-ECU connector.
   - Check output line for damage.

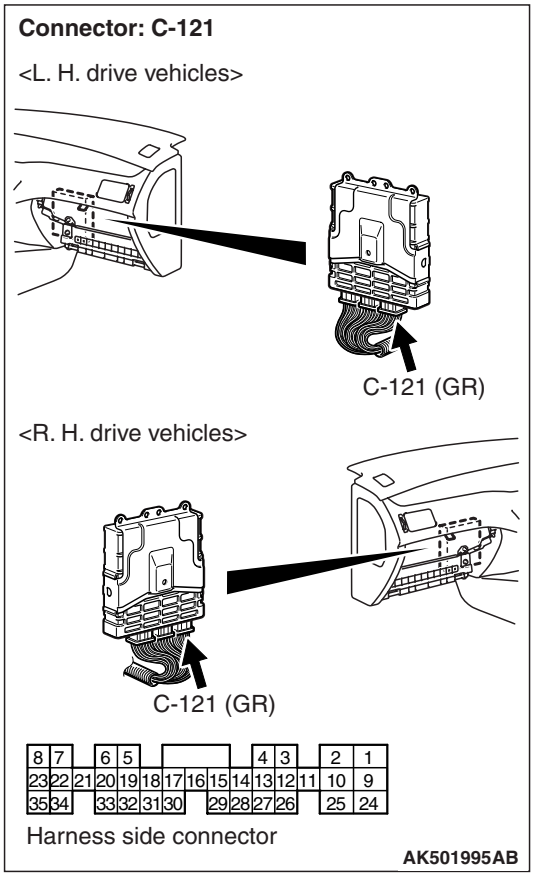
Q: Are the check results normal?
YES : Go to Step 8 .
NO : Repair the damaged harness wire.

STEP 8. Check injector resistor itself.
- Check injector resistor itself (Refer to P.13A-407).

Q: Is the check result normal?
YES : Go to Step 9 .
NO : Replace the injector resistor.

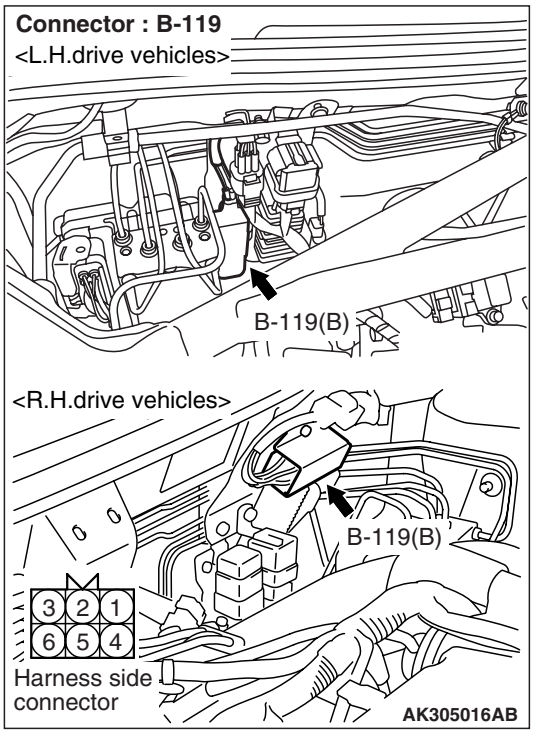
STEP 9. Connector check: B-119 injector resistor connector and C-121 engine-ECU connector

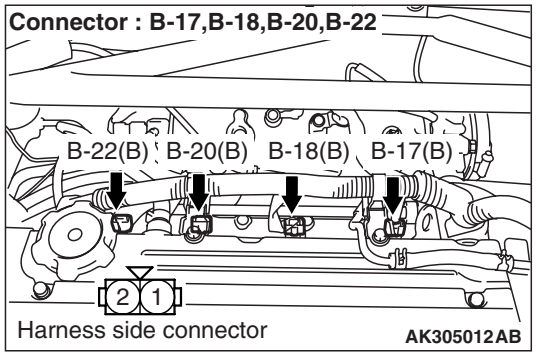




Q: Is the check result normal?
YES : Go to Step 10 .
NO : Repair or replace the connector.

STEP 10. Check harness between B-119 injector resistor connector and injector connector.





a. Check harness between B-119 (terminal No. 1) injector resistor connector and B-22 (terminal No. 1) No. 1 injector connector.
b. Check harness between B-119 (terminal No. 4) injector resistor connector and B-20 (terminal No. 1) No. 2 injector connector.
c. Check harness between B-119 (terminal No. 5) injector resistor connector and B-18 (terminal No. 1) No. 3 injector connector.
d. Check harness between B-119 (terminal No. 6) injector resistor connector and B-17 (terminal No. 1) No. 4 injector connector.
   - Check output line for damage.

Q: Are the check results normal?
YES : Go to Step 11 .
NO : Repair the damaged harness wire.

STEP 11. Fuel pressure measurement.

- Fuel pressure measurement (Refer to fuel pressure test P.13A-396).

Q: Is the check result normal?
YES : Go to Step 12 .
NO : Repair.

STEP 12. Check for intake of air from intake hose and inlet manifold.

Q: Is the check result normal?
YES : Go to Step 13 .
NO : Repair.

STEP 13. Check for skipped timing belt teeth.

Q: Is the check result normal?
YES : Go to Step 14 .
NO : Repair.

STEP 14. Exhaust gas recirculation system check.

- Exhaust gas recirculation system check (Refer to GROUP 17 – Exhaust gas recirculation (EGR) system P.17-14).

Q: Is the check result normal?
YES : Replace the engine-ECU
NO : Repair.

Code No. P0301: No. 1 Cylinder Misfire Detection System

OPERATION

- Refer to P0201 injector circuit P.13A-105.

FUNCTION

- If a misfire occurs while the engine is running, the engine speed changes for an instant.
- The engine-ECU checks for such changes in engine speed.

TROUBLE JUDGMENT

Check Conditions

- The engine speed is 500 – 6,500 r/min.
- The engine coolant temperature is –10°C or higher.
- The barometric pressure is 76 kPa or more.
- The volumetric efficiency is 30 – 55%.
- The adaptive learning has been completed with the vane that generates the crankshaft position signals.
- During the engine operation except the shift change or low speed driving and rapid acceleration and deceleration, also intermittent operation of air compressor (A/C: within the 3 seconds after changing to ON from OFF or to OFF from ON).
- The throttle deviation is within the range of –0.06 V/10ms to 0.06 V/10ms.

Judgment Criteria

- Misfire has occurred more frequently than allowed during the last 200 revolutions (When the catalyst temperature is higher than 950°C).

or

- Misfire has occurred in 15 or more of the last 1,000 revolutions (corresponding to 1.5 times the limit of emission standard).

PROBABLE CAUSES

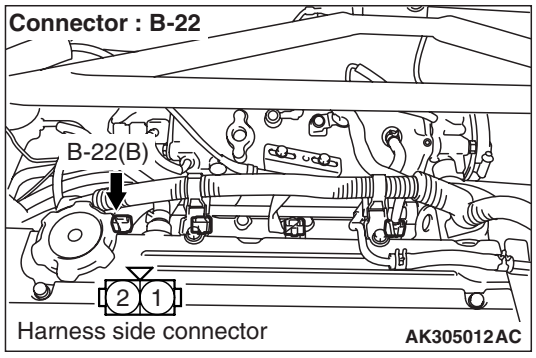
- Ignition system related part(s) failed
- Low compression pressure
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. Check ignition coil spark.

Q: Is the check result normal?
YES : Go to Step 2 .
NO : Check ignition Circuit System (Refer to Inspection procedure 30 <L.H. drive vehicles>P.13A-356 or Inspection procedure 31 <R.H. drive vehicles>P.13A-363).

STEP 2. Connector check: B-22 No. 1 injector connector



Q: Is the check result normal?
YES : Go to Step 3 .
NO : Repair or replace the connector.

STEP 3. Check No. 1 injector itself.

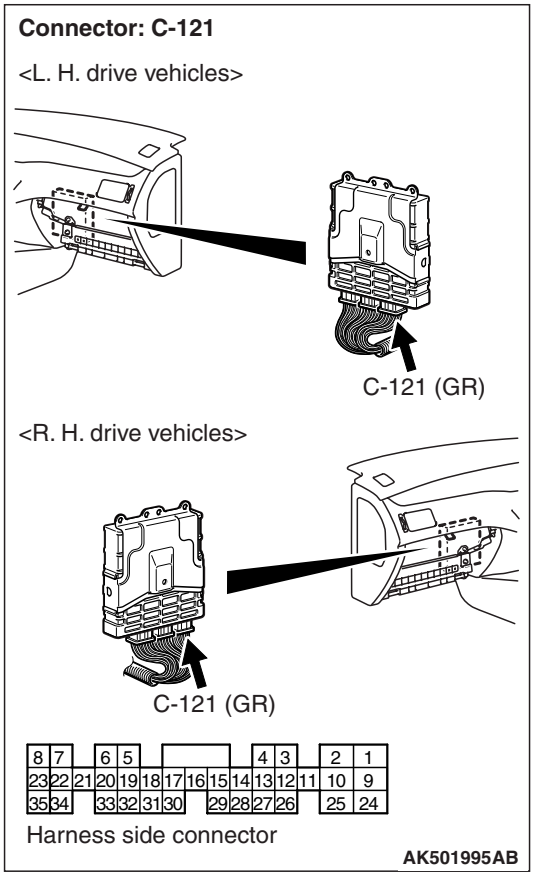
- Check Injector itself (Refer to P.13A-406).

Q: Is the check result normal?

YES : Go to Step 4 .

NO : Replace the No. 1 injector.

STEP 4. Connector check: C-121 engine-ECU connector

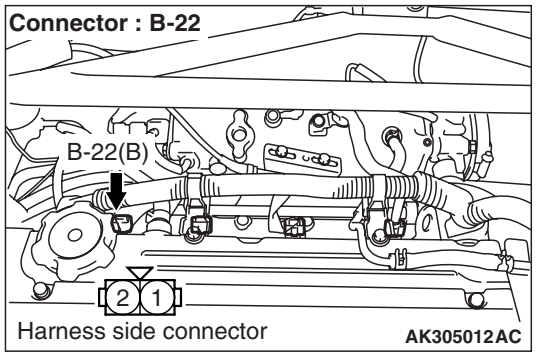


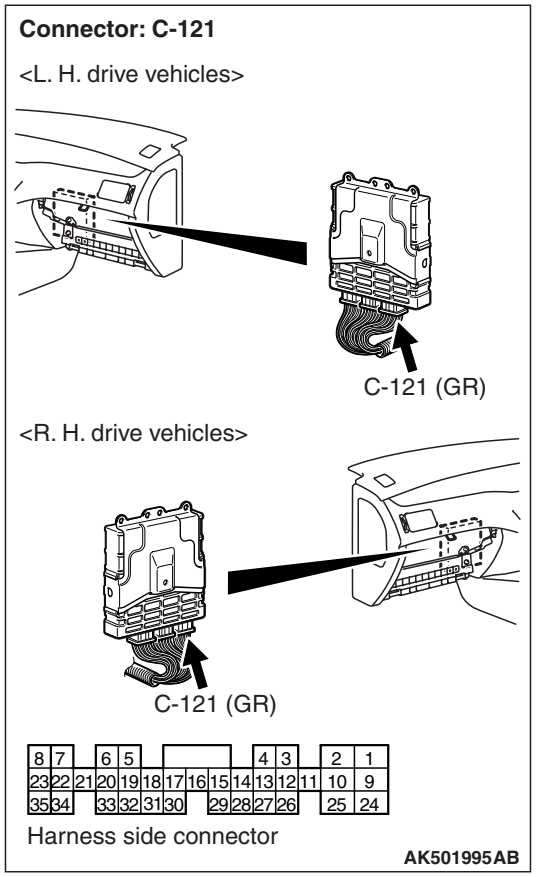
Q: Is the check result normal?

YES : Go to Step 5 .

NO : Repair or replace the connector.

STEP 5. Check harness between B-22 (terminal No. 2) No. 1 injector connector and C-121 (terminal No. 1) engine-ECU connector





- Check output line for damage.

Q: Is the check result normal?

YES : Go to Step 6 .

NO : Repair the damaged harness wire.

STEP 6. Check injector resistor itself.

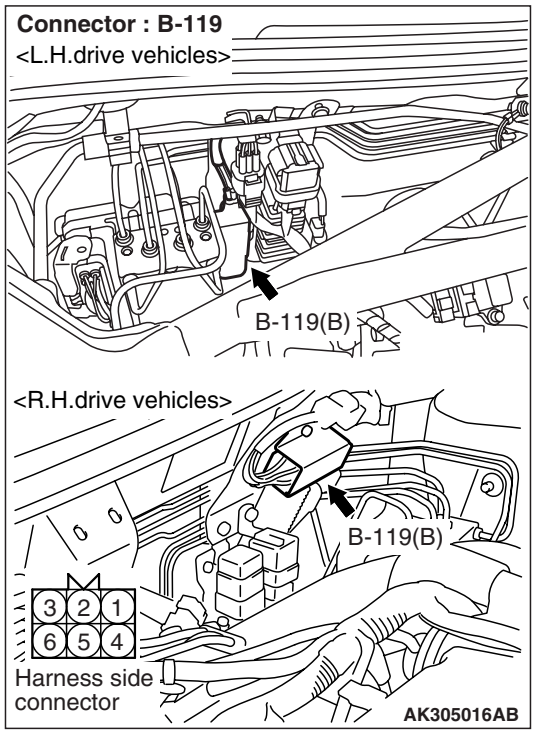
- Check injector resistor itself (Refer to P.13A-407).

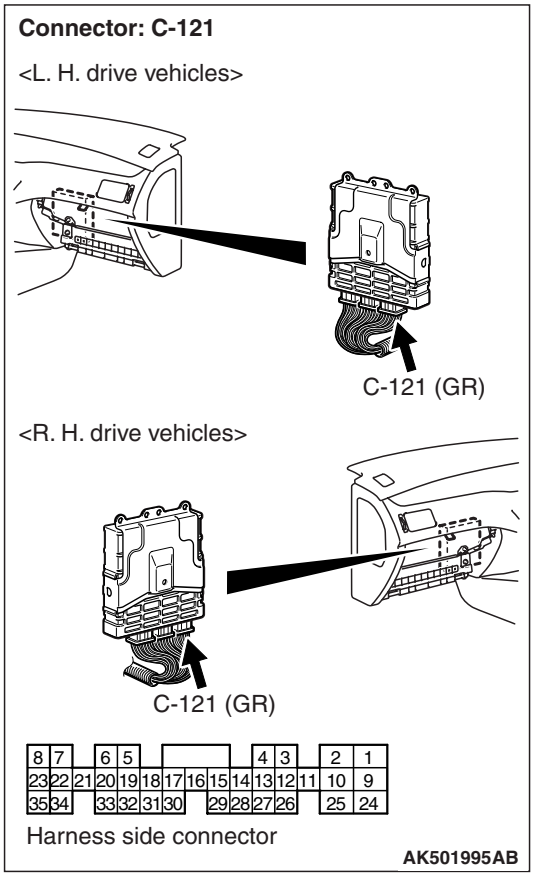
Q: Is the check result normal?

YES : Go to Step 7 .

NO : Replace the injector resistor.

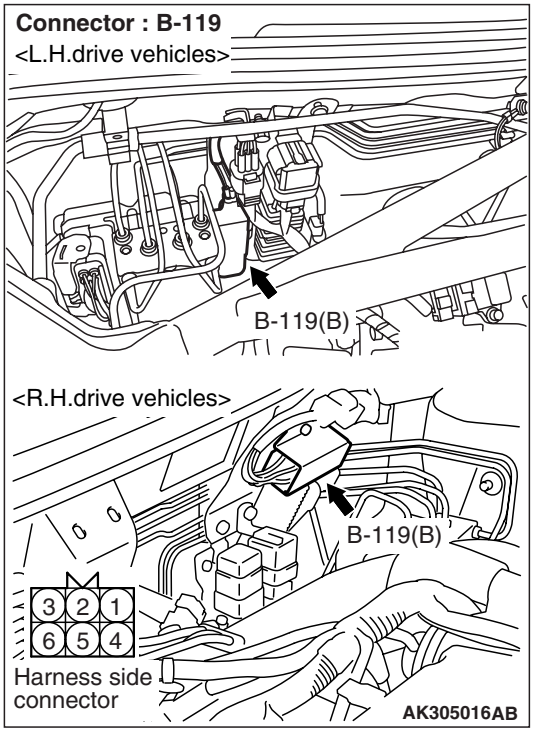
STEP 7. Connector check: B-119 injector resistor connector and C-121 engine-ECU connector

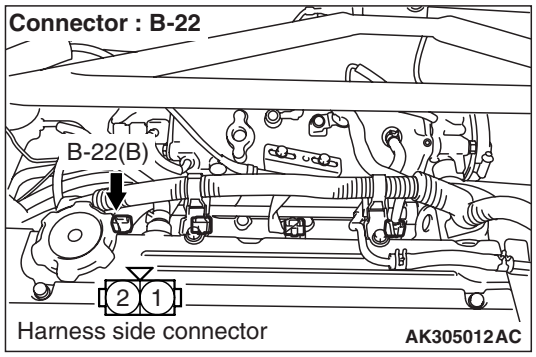




Q: Is the check result normal?
YES : Go to Step 8 .
NO : Repair or replace the connector.

STEP 8. Check harness between B-119 (terminal No. 1) injector resistor connector and B-22 (terminal No. 1) No.1 injector connector.





Q: Is the check result normal?
YES : Go to Step 9 .
NO : Repair the damaged harness wire.

STEP 9. Fuel pressure measurement.

- Fuel pressure measurement (Refer to fuel pressure test P.13A-396).

Q: Is the check result normal?
YES : Replace the engine-ECU.
NO : Repair.

Code No. P0302: No. 2 Cylinder Misfire Detection System

OPERATION

- Refer to P0202 injector circuit P.13A-111.

FUNCTION

- If a misfire occurs while the engine is running, the engine speed changes for an instant.
- The engine-ECU checks for such changes in engine speed.

TROUBLE JUDGMENT

Check Conditions

- The engine speed is 500 – 6,500 r/min.
- The engine coolant temperature is –10°C or higher.
- The barometric pressure is 76 kPa or more.
- The volumetric efficiency is 30 – 55%.
- The adaptive learning has been completed with the vane that generates the crankshaft position signals.
- During the engine operation except the shift change or low speed driving and rapid acceleration and deceleration, also intermittent operation of air compressor (A/C: within the 3 seconds after changing to ON from OFF or to OFF from ON).
- The throttle deviation is within the range of –0.06 V/10ms to 0.06 V/10ms.

Judgment Criteria

- Misfire has occurred more frequently than allowed during the last 200 revolutions (When the catalyst temperature is higher than 950°C).

or

- Misfire has occurred in 15 or more of the last 1,000 revolutions (corresponding to 1.5 times the limit of emission standard).

PROBABLE CAUSES

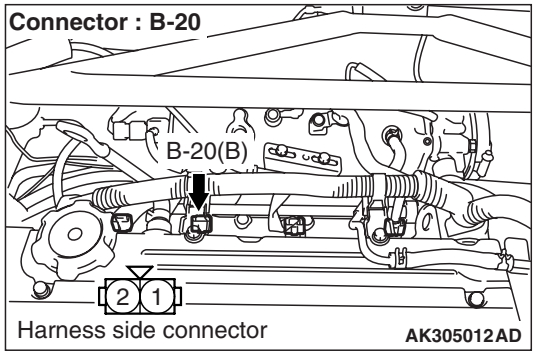
- Ignition system related part(s) failed
- Low compression pressure
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. Check ignition coil spark.

Q: Is the check result normal?
YES : Go to Step 2 .
NO : Check ignition circuit system (Refer to Inspection procedure 30 <L.H. drive vehicles>P.13A-356 or Inspection procedure 31 <R.H. drive vehicles>P.13A-363).

STEP 2. Connector check: B-20 No. 2 injector connector



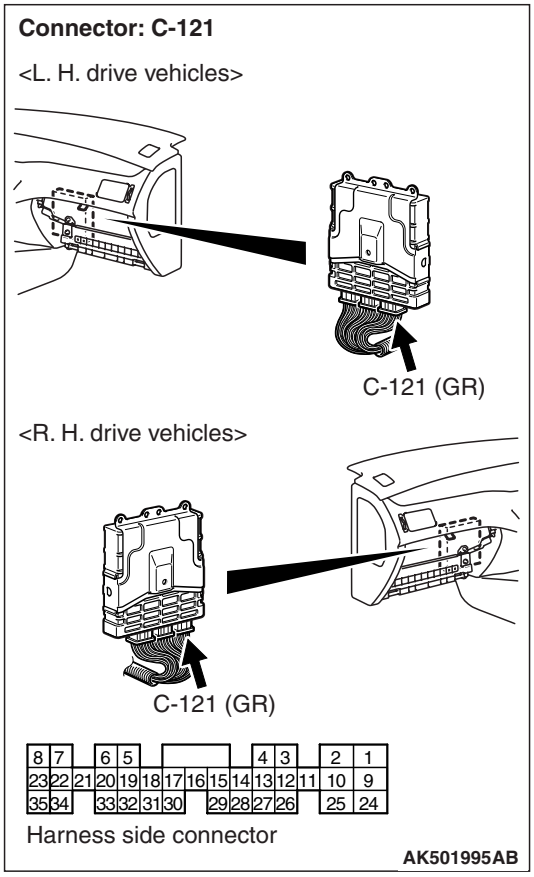
Q: Is the check result normal?
YES : Go to Step 3 .
NO : Repair or replace the connector.

STEP 3. Check No. 2 injector itself.

- Check Injector itself (Refer to P.13A-406).

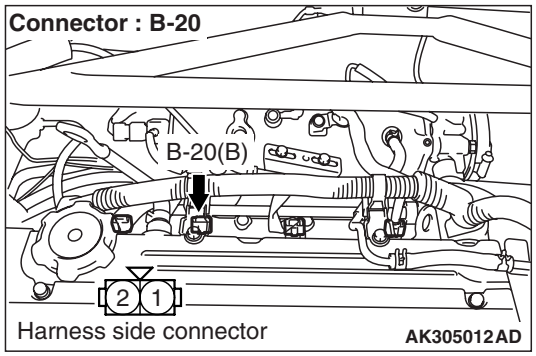
Q: Is the check result normal?
YES : Go to Step 4 .
NO : Replace the No. 2 injector.

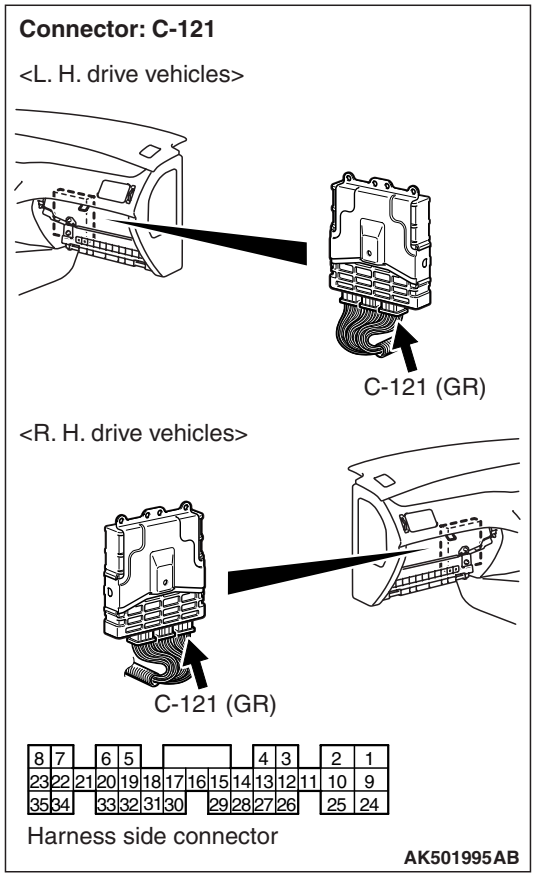
STEP 4. Connector check: C-121 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 5 .
NO : Repair or replace the connector.

STEP 5. Check harness between B-20 (terminal No. 2) No. 2 injector connector and C-121 (terminal No. 9) engine-ECU connector





- Check output line for damage.

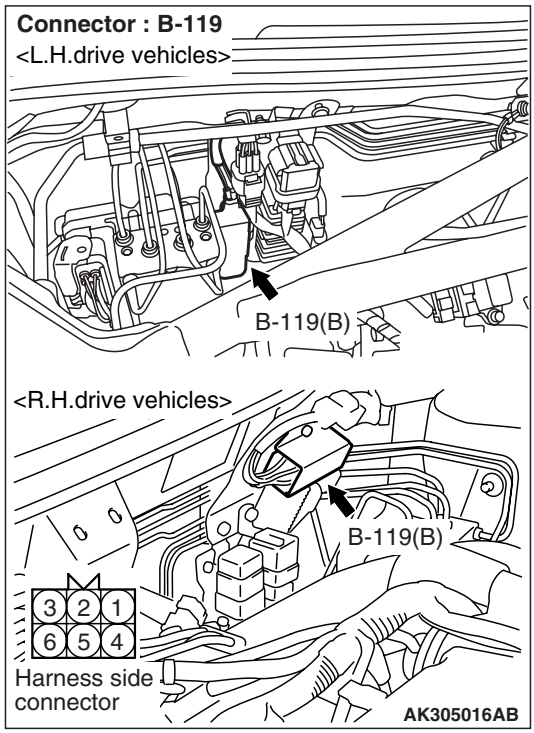
Q: Is the check result normal?
YES : Go to Step 6 .
NO : Repair the damaged harness wire.

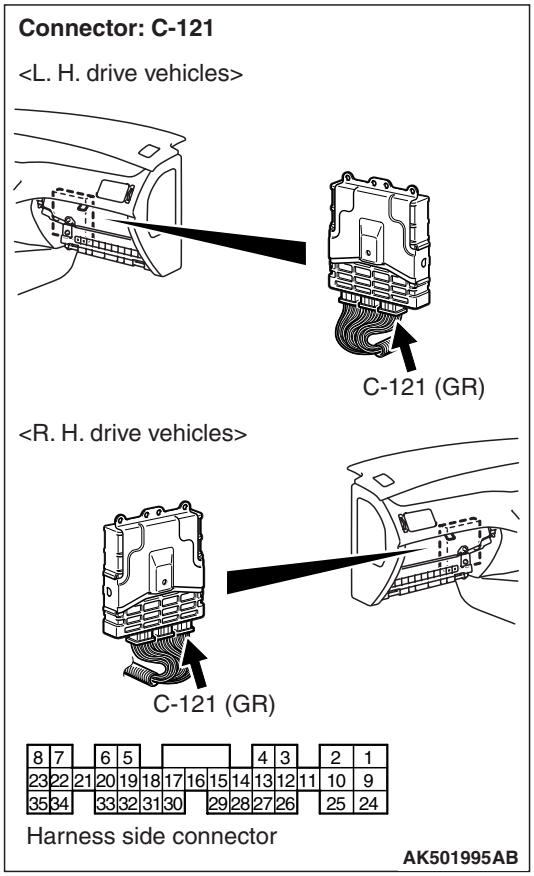
STEP 6. Check injector resistor itself.

- Check injector resistor itself (Refer to P.13A-407).

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Replace the injector resistor.

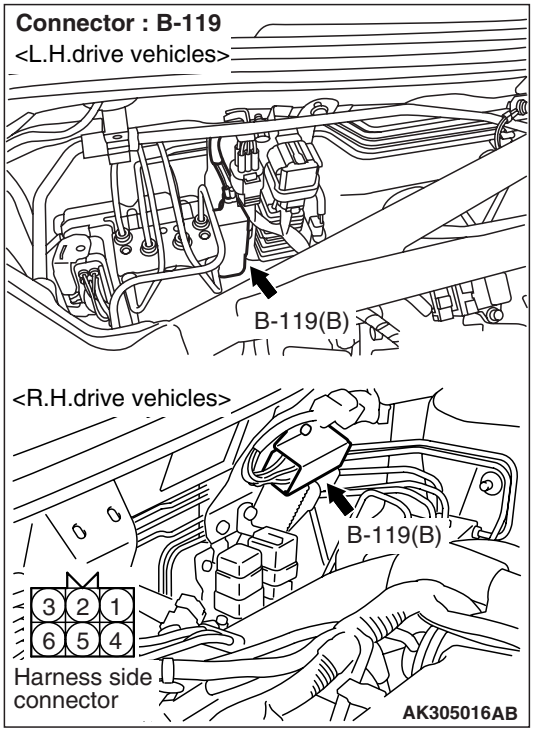
STEP 7. Connector check: B-119 injector resistor connector and C-121 engine-ECU connector

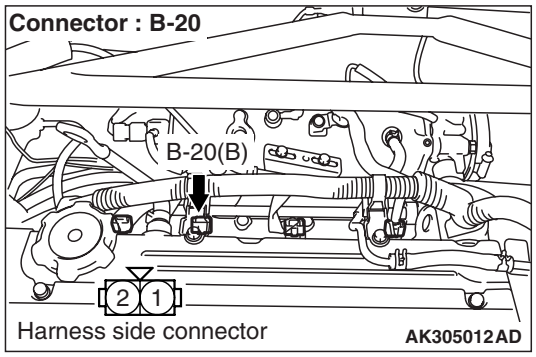




Q: Is the check result normal?
YES : Go to Step 8 .
NO : Repair or replace the connector.

STEP 8. Check harness between B-119 (terminal No. 4) injector resistor connector and B-20 (terminal No. 1) No.2 injector connector.





- Check output line for damage.

Q: Is the check result normal?
YES : Go to Step 9 .
NO : Repair the damaged harness wire.

STEP 9. Fuel pressure measurement.

- Fuel pressure measurement (Refer to fuel pressure test P.13A-396).

Q: Is the check result normal?
YES : Replace the engine-ECU.
NO : Repair.

Code No. P0303: No. 3 Cylinder Misfire Detection System

OPERATION

- Refer to P0203 injector circuit P.13A-117.

FUNCTION

- If a misfire occurs while the engine is running, the engine speed changes for an instant.
- The engine-ECU checks for such changes in engine speed.

TROUBLE JUDGMENT

Check Conditions

- The engine speed is 500 – 6,500 r/min.
- The engine coolant temperature is –10°C or higher.
- The barometric pressure is 76 kPa or more.
- The volumetric efficiency is 30 – 55%.
- The adaptive learning has been completed with the vane that generates the crankshaft position signals.
- During the engine operation except the shift change or low speed driving and rapid acceleration and deceleration, also intermittent operation of air compressor (A/C: within the 3 seconds after changing to ON from OFF or to OFF from ON).
- The throttle deviation is within the range of –0.06 V/10ms to 0.06 V/10ms.

Judgment Criteria

- Misfire has occurred more frequently than allowed during the last 200 revolutions (When the catalyst temperature is higher than 950°C).

or

- Misfire has occurred in 15 or more of the last 1,000 revolutions (corresponding to 1.5 times the limit of emission standard).

PROBABLE CAUSES

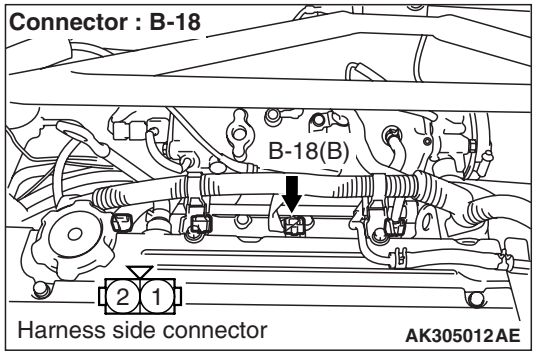
- Ignition system related part(s) failed
- Low compression pressure
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. Check ignition coil spark.

Q: Is the check result normal?
YES : Go to Step 2 .
NO : Check ignition circuit system (Refer to Inspection procedure 30 <L.H. drive vehicles>P.13A-356 or Inspection procedure 31 <R.H. drive vehicles>P.13A-363).

STEP 2. Connector check: B-18 No. 3 injector connector



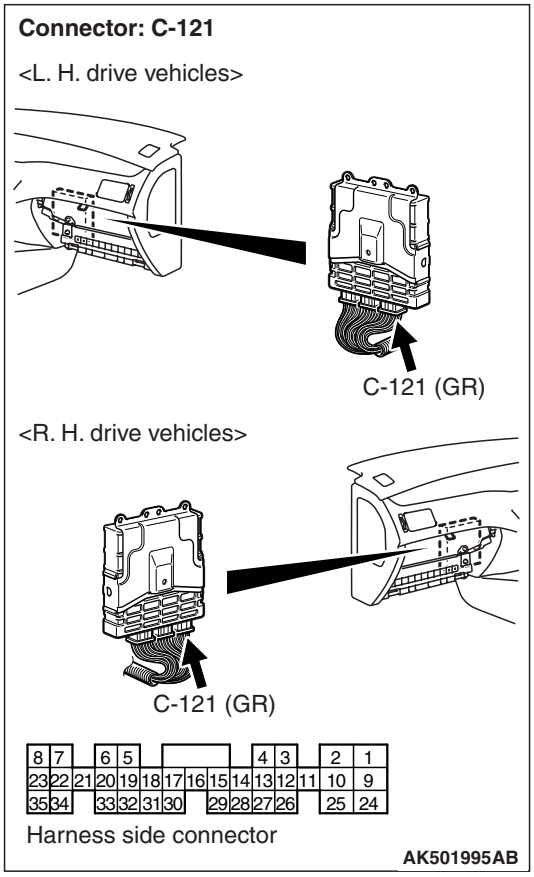
Q: Is the check result normal?
YES : Go to Step 3 .
NO : Repair or replace the connector.

STEP 3. Check No. 3 injector itself.

- Check Injector itself (Refer to P.13A-406).

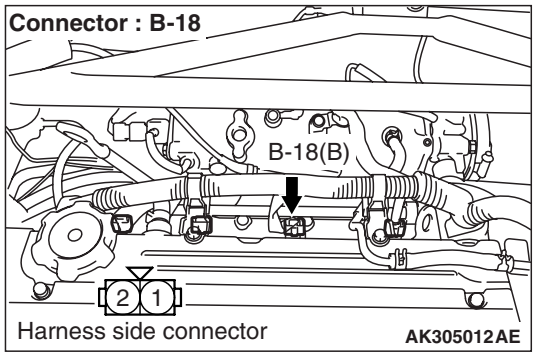
Q: Is the check result normal?
YES : Go to Step 4 .
NO : Replace the No. 3 injector.

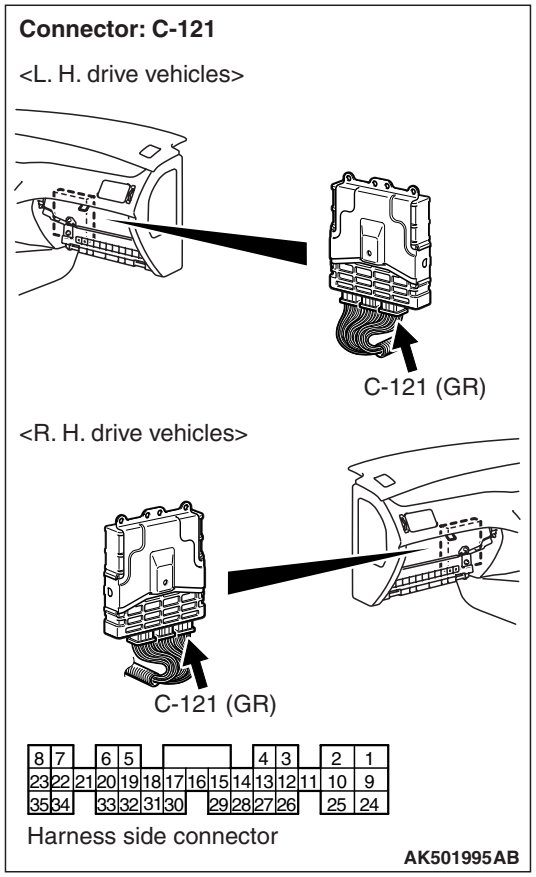
STEP 4. Connector check: C-121 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 5 .
NO : Repair or replace the connector.

STEP 5. Check harness between B-18 (terminal No. 2) No. 3 injector connector and C-121 (terminal No. 24) engine-ECU connector





- Check output line for damage.

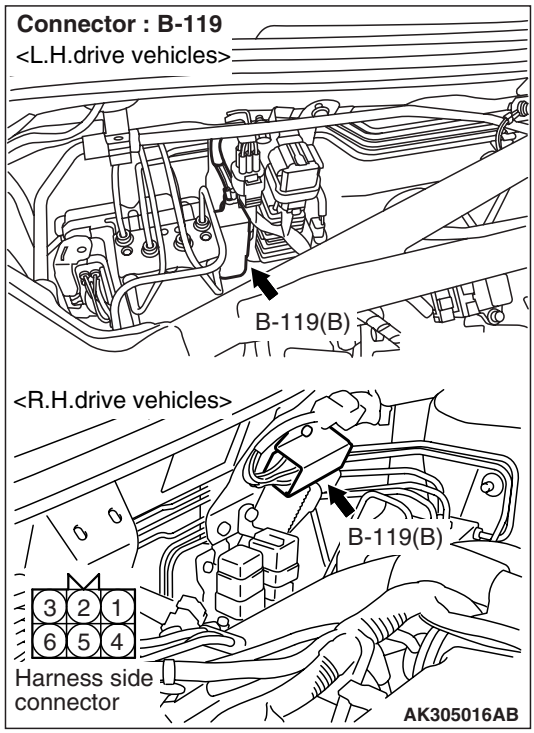
Q: Is the check result normal?
YES : Go to Step 6 .
NO : Repair the damaged harness wire.

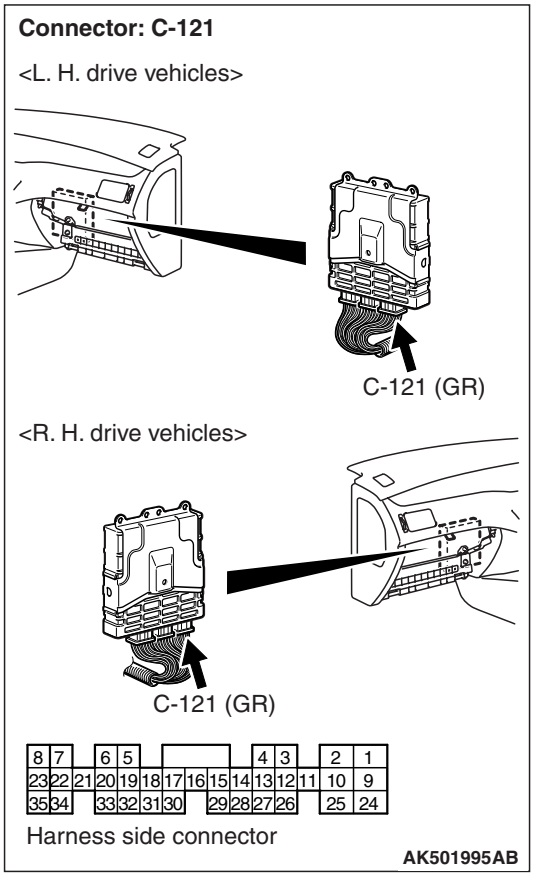
STEP 6. Check injector resistor itself.

- Check injector resistor itself (Refer to P.13A-407).

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Replace the injector resistor.

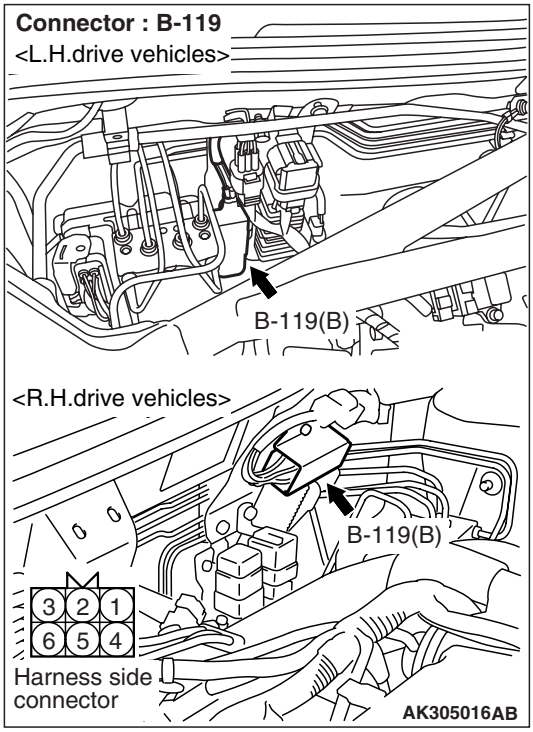
STEP 7. Connector check: B-119 injector resistor connector and C-121 engine-ECU connector

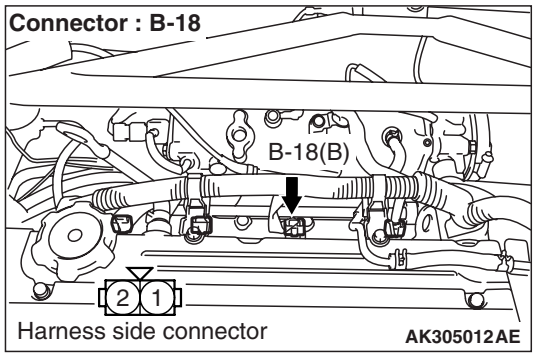




Q: Is the check result normal?
YES : Go to Step 8 .
NO : Repair or replace the connector.

STEP 8. Check harness between B-119 (terminal No. 5) injector resistor connector and B-18 (terminal No. 1) No.3 injector connector.





- Check output line for damage.

Q: Is the check result normal?
YES : Go to Step 9 .
NO : Repair the damaged harness wire.

STEP 9. Fuel pressure measurement.

- Fuel pressure measurement (Refer to fuel pressure test P.13A-396).

Q: Is the check result normal?
YES : Replace the engine-ECU.
NO : Repair.

Code No. P0304: No. 4 Cylinder Misfire Detection System

OPERATION

- Refer to P0204 injector circuit P.13A-123.

FUNCTION

- If a misfire occurs while the engine is running, the engine speed changes for an instant.
- The engine-ECU checks for such changes in engine speed.

TROUBLE JUDGMENT

Check Conditions

- The engine speed is 500 – 6,500 r/min.
- The engine coolant temperature is –10°C or higher.
- The barometric pressure is 76 kPa or more.
- The volumetric efficiency is 30 – 55%.
- The adaptive learning has been completed with the vane that generates the crankshaft position signals.
- During the engine operation except the shift change or low speed driving and rapid acceleration and deceleration, also intermittent operation of air compressor (A/C: within the 3 seconds after changing to ON from OFF or to OFF from ON).
- The throttle deviation is within the range of –0.06 V/10ms to 0.06 V/10ms.

Judgment Criteria

- Misfire has occurred more frequently than allowed during the last 200 revolutions (When the catalyst temperature is higher than 950°C).

or

- Misfire has occurred in 15 or more of the last 1,000 revolutions (corresponding to 1.5 times the limit of emission standard).

PROBABLE CAUSES

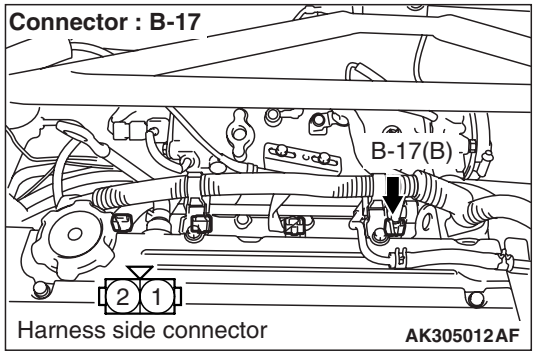
- Ignition system related part(s) failed
- Low compression pressure
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. Check the ignition coil spark.

Q: Is the check result normal?
YES : Go to Step 2 .
NO : Check ignition Circuit System (Refer to Inspection procedure 30 <L.H. drive vehicles>P.13A-356 or Inspection procedure 31 <R.H. drive vehicles>P.13A-363).

STEP 2. Connector check: B-17 No. 4 injector connector



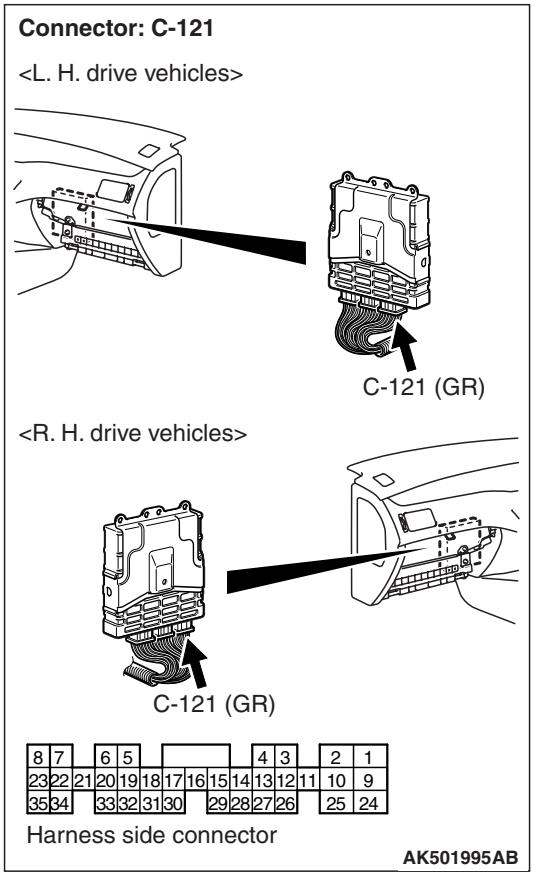
Q: Is the check result normal?
YES : Go to Step 3 .
NO : Repair or replace the connector.

STEP 3. Check No. 4 injector itself.

- Check Injector itself (Refer to P.13A-406).

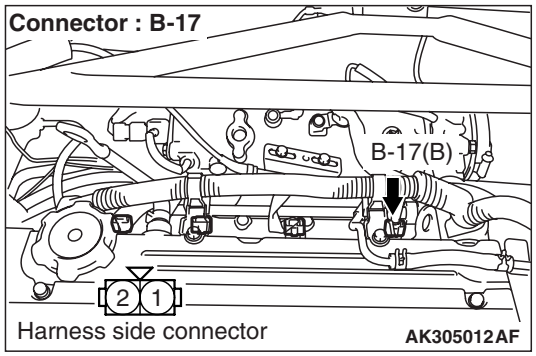
Q: Is the check result normal?
YES : Go to Step 4 .
NO : Replace the No. 4 injector.

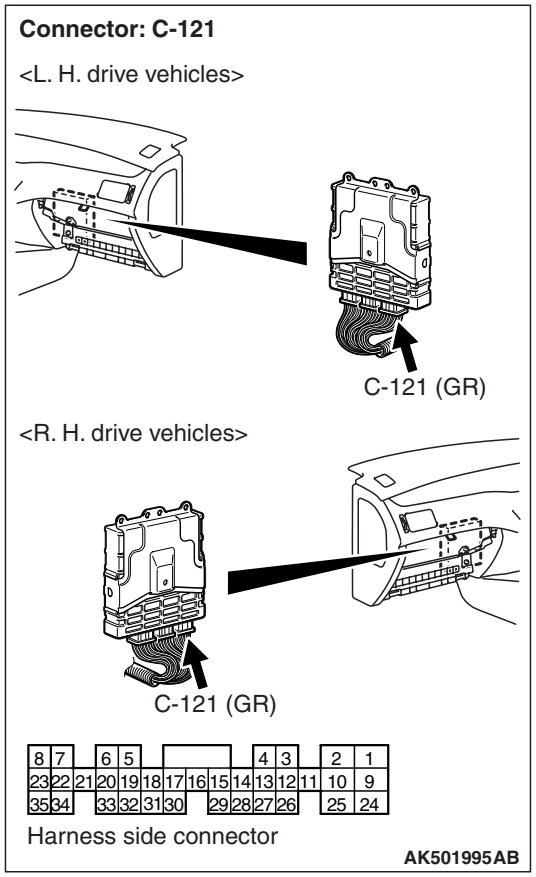
STEP 4. Connector check: C-121 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 5 .
NO : Repair or replace the connector.

STEP 5. Check harness between B-17 (terminal No. 2) No. 4 injector connector and C-121 (terminal No. 2) engine-ECU connector.





- Check output line for damage.

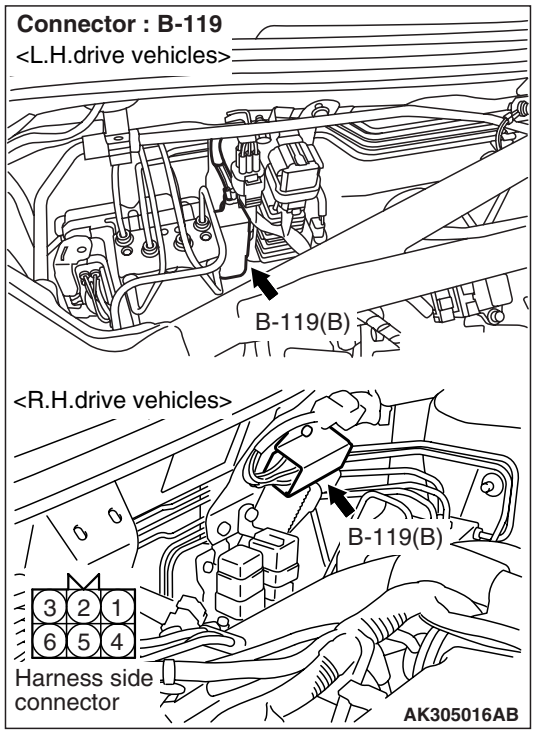
Q: Is the check result normal?
YES : Go to Step 6 .
NO : Repair the damaged harness wire.

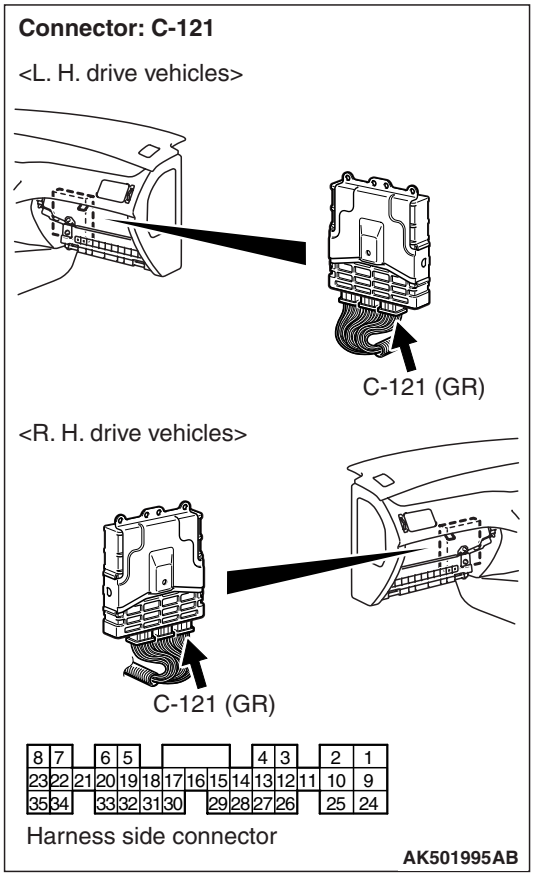
STEP 6. Check injector resistor itself.

- Check injector resistor itself (Refer to P.13A-407).

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Replace the injector resistor.

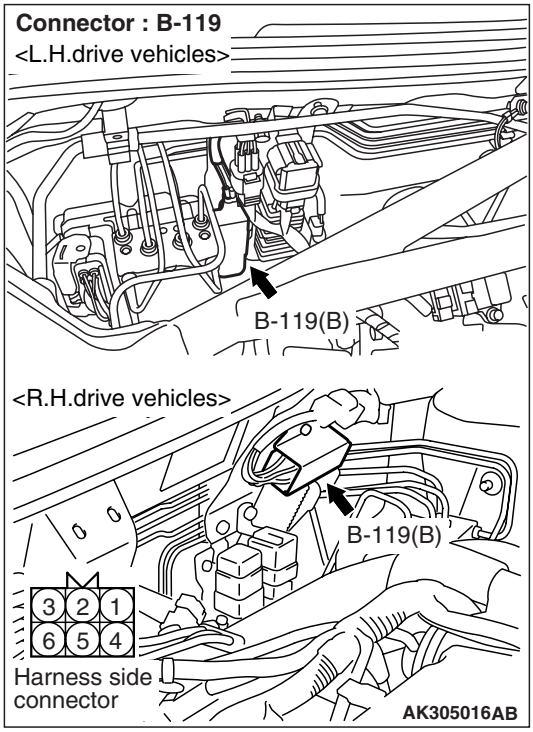
STEP 7. Connector check: B-119 injector resistor connector and C-121 engine-ECU connector

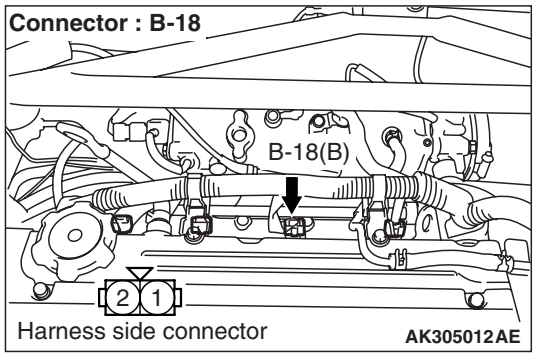




Q: Is the check result normal?
YES : Go to Step 8 .
NO : Repair or replace the connector.

STEP 8. Check harness between B-119 (terminal No. 6) injector resistor connector and B-18 (terminal No. 1) No. 4 injector connector.





- Check output line for damage.

Q: Is the check result normal?
YES : Go to Step 9 .
NO : Repair the damaged harness wire.

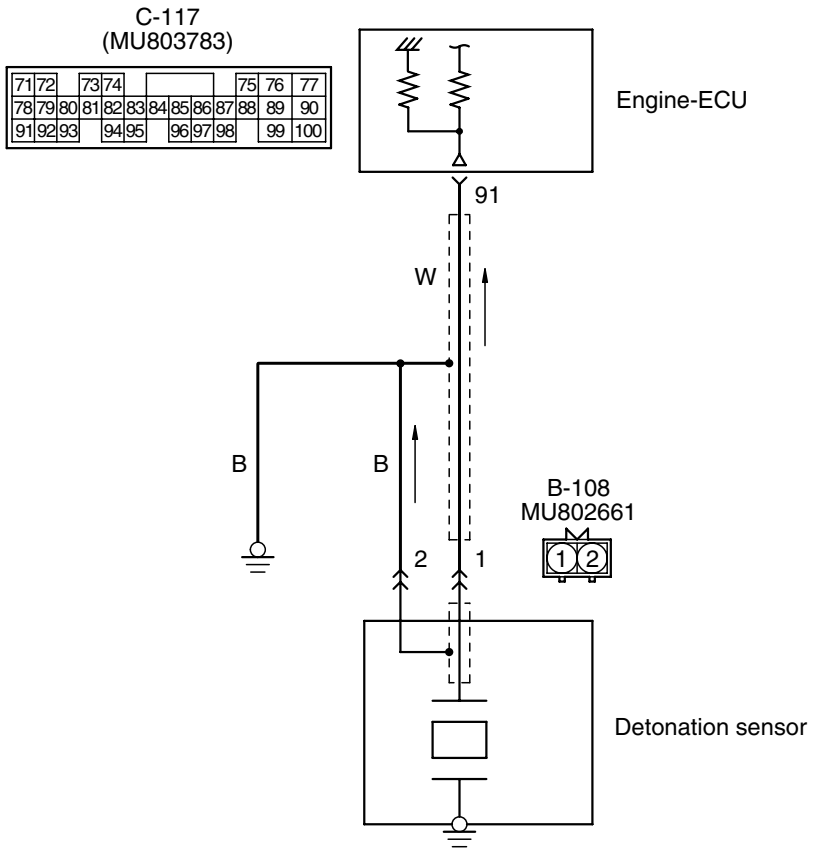
STEP 9. Fuel pressure measurement.

- Fuel pressure measurement (Refer to fuel pressure test P.13A-396).

Q: Is the check result normal?
YES : Replace the engine-ECU.
NO : Repair.

Code No. P0325: Detonation Sensor System

Detonation sensor circuit



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

AK501811AB

OPERATION

- The sensor signal is inputted to the engine-ECU (terminal No. 91) from the detonation sensor (terminal No. 1).

FUNCTION

- The detonation sensor detects the vibration of the cylinder block caused by detonation waves, and inputs a signal to the engine-ECU.
- In response to the signal, the engine-ECU provides controls to retard the ignition timing when the detonation occurs.

TROUBLE JUDGMENT

Check Conditions

- Ignition switch: "ON"
- Excluding for 2 seconds after ignition switch is set to "ON" position or 2 seconds after engine start is completed.
- The engine speed is 2,000 r/min. or more.
- The volumetric efficiency is 30% or more.

Judgment Criterion

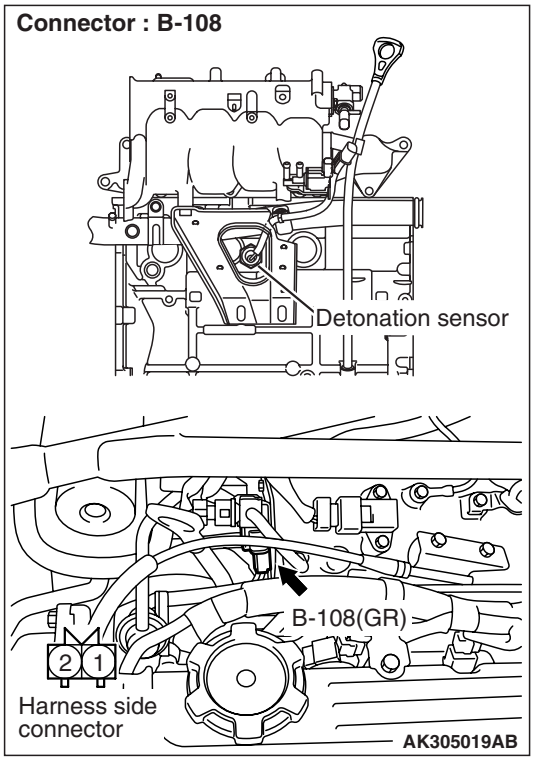
- The change amount of the detonation sensor output voltage (the detonation sensor peak voltage in every half a turn of the crankshaft) is below 0.06 V or less in 200 consecutive times.

PROBABLE CAUSES

- Failed detonation sensor
- Open/short circuit in detonation sensor circuit or loose connector contact
- Failed engine-ECU

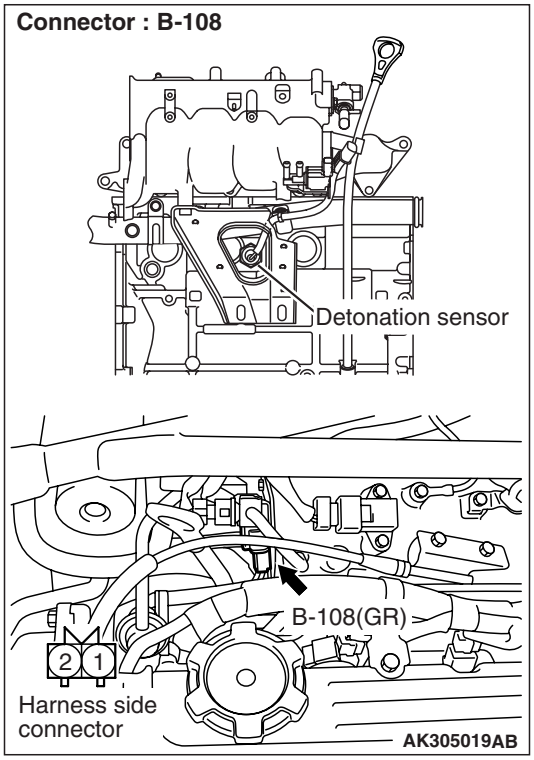
DIAGNOSIS PROCEDURE

STEP 1. Connector check: B-108 detonation sensor connector



Q: Is the check result normal?
YES : Go to Step 2 .
NO : Repair or replace the connector.

STEP 2. Perform resistance measurement at B-108 detonation sensor connector.

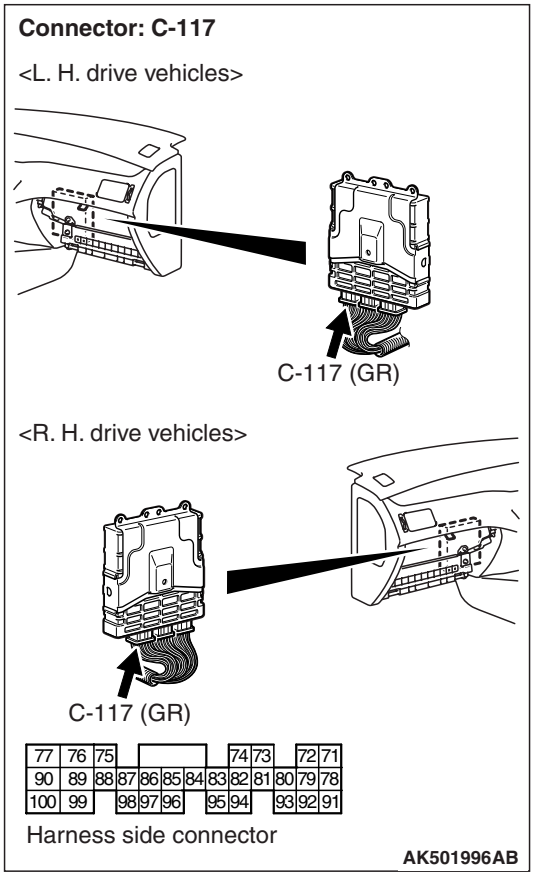


- Disconnect connector, and measure at harness side.
- Resistance between terminal No. 2 and earth.

OK: 2 Ω or less

Q: Is the check result normal?
YES : Go to Step 3 .
NO : Check and repair harness between B-108 (terminal No. 2) detonation sensor connector and body earth.
- Check earthing line for open circuit and damage.

STEP 3. Connector check: C-117 engine-ECU connector

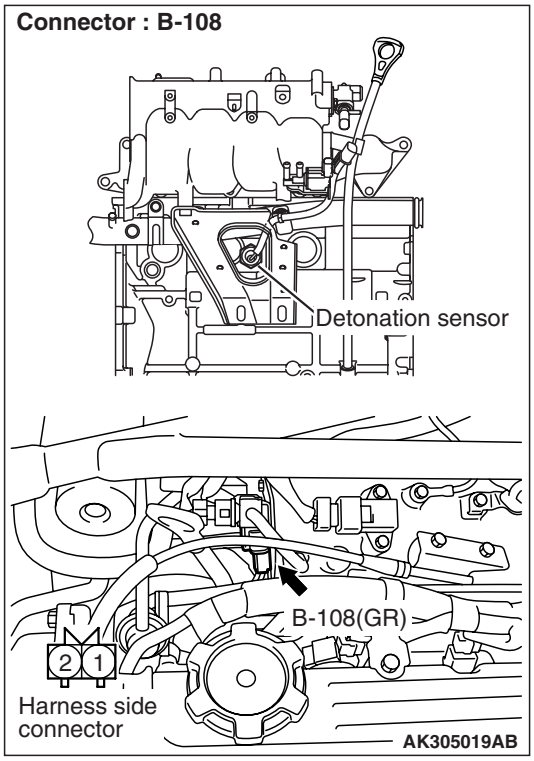


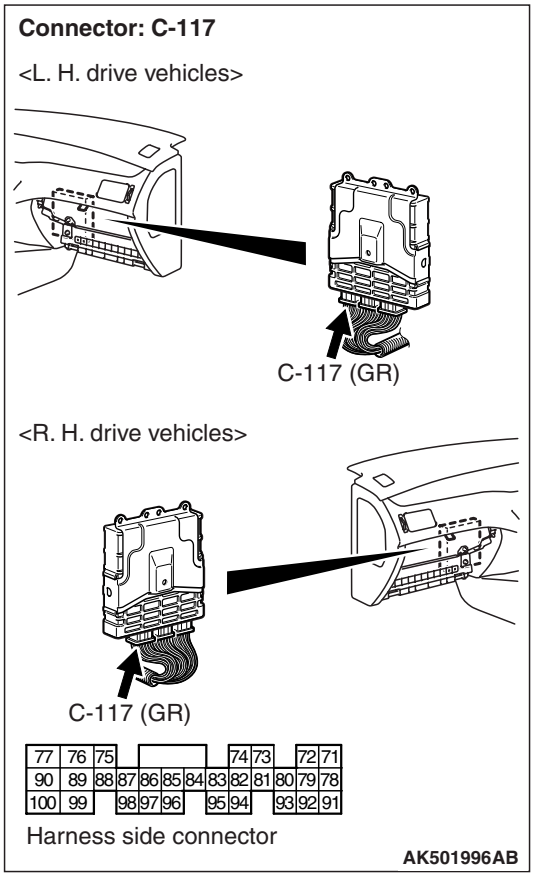
Q: Is the check result normal?

YES : Go to Step 4 .

NO : Repair or replace the connector.

STEP 4. Check harness between B-108 (terminal No. 1) detonation sensor connector and C-117 (terminal No. 91) engine-ECU connector.





- Check output line for open/short circuit and damage.

Q: Is the check result normal?
YES : Go to Step 5 .
NO : Repair the damaged harness wire.

STEP 5. Check the trouble symptoms.

Q: Does trouble symptom persist?
YES : Go to Step 6 .
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-5).

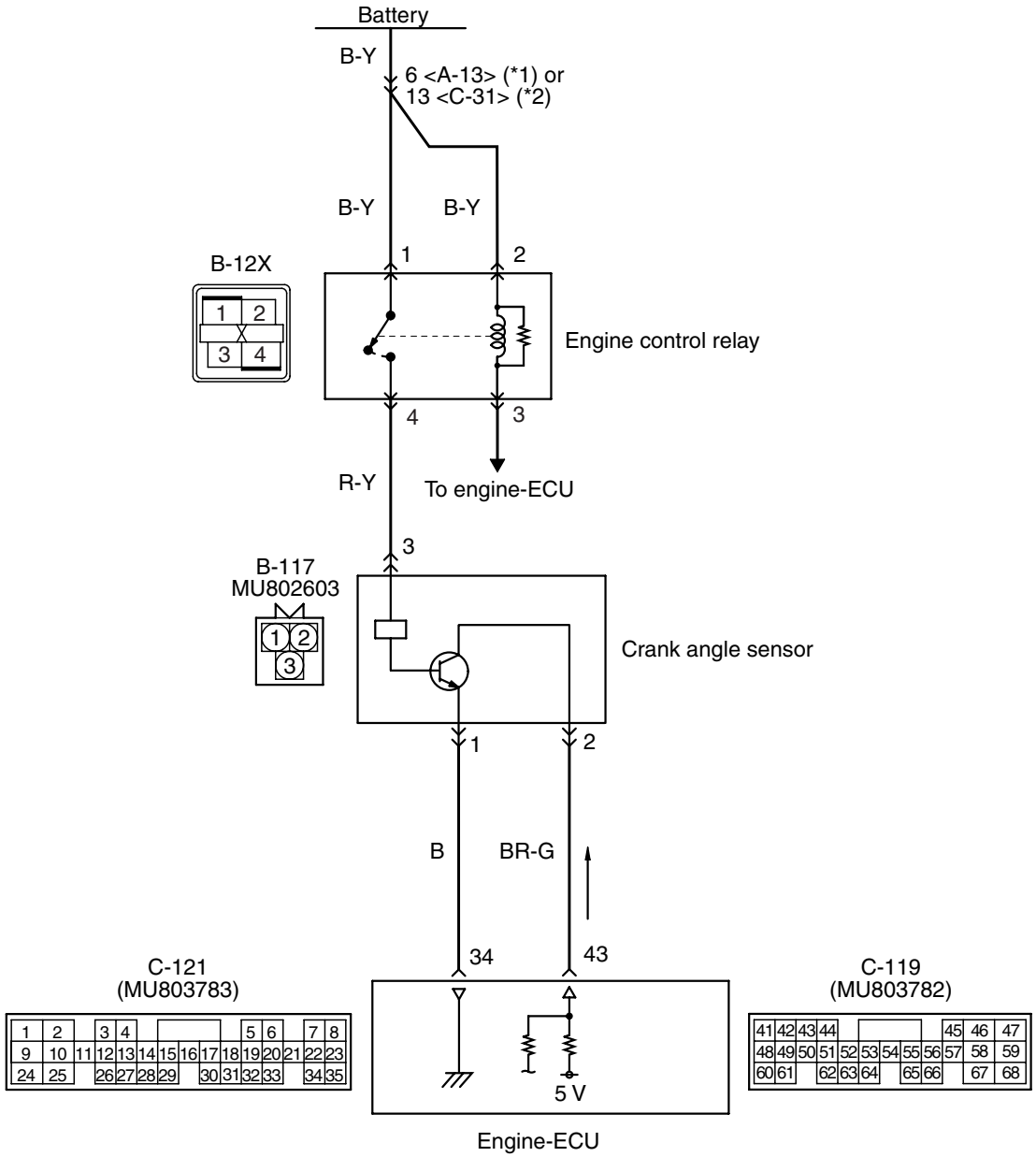
STEP 6. Replace the detonation sensor.

- After replacing the detonation sensor, re-check the trouble symptoms.

Q: Does trouble symptom persist?
YES : Replace the engine-ECU.
NO : The check is end.

Code No. P0335: Crank Angle Sensor System

Crank angle sensor circuit



NOTE
*1: L.H. drive vehicles
*2: R.H. drive vehicles

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

AK501812AB

OPERATION

- Power is supplied to the crank angle sensor (terminal No. 3) from the engine control relay (terminal No. 4) and is earthed to the engine-ECU (terminal No. 34) from the crank angle sensor (terminal No. 1).
- A power voltage of 5 V is applied to the crank angle sensor output terminal (terminal No. 2) from the engine-ECU (terminal No. 43).

FUNCTION

- The crank angle sensor detects the crank angle (position) and inputs a pulse signal to the engine-ECU.
- In response to the signal, the engine-ECU controls the injector, etc.

TROUBLE JUDGMENT

Check Condition

- Engine in cranking state.

Judgment Criterion

- The sensor output voltage remains unchanged (no pulse signal is inputted) for 2 seconds.

PROBABLE CAUSES

- Failed crank angle sensor
- Open/short circuit in crank angle sensor circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-II/III data list

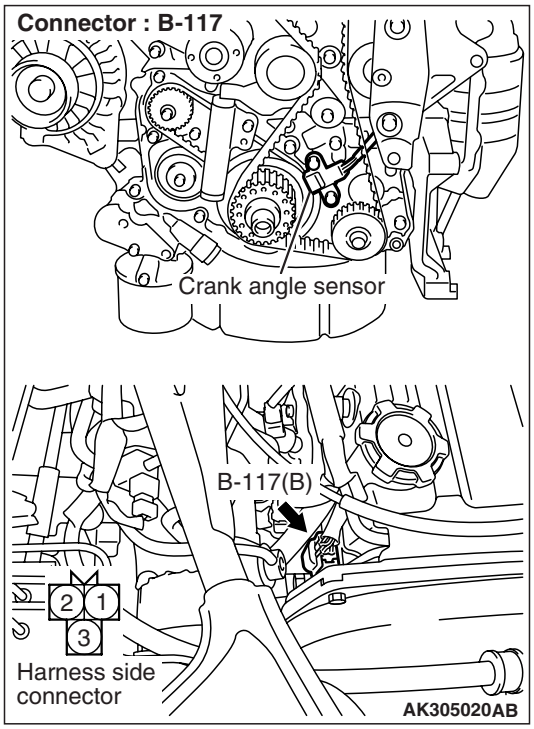
- Refer to Data List Reference Table P.13A-372.
  a. Item No. 22: Crank angle sensor

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-5).

NO : Go to Step 2 .

STEP 2. Connector check: B-117 crank angle sensor connector

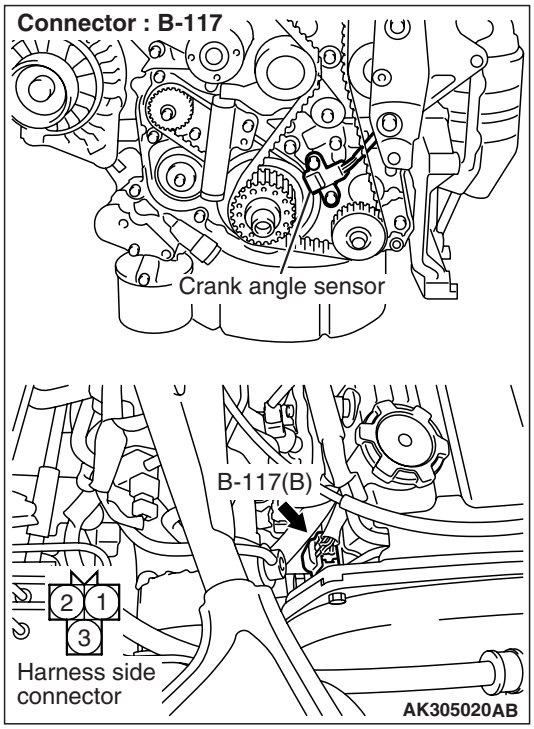


Q: Is the check result normal?

YES : Go to Step 3 .

NO : Repair or replace the connector.

STEP 3. Perform voltage measurement at B-117 crank angle sensor connector.

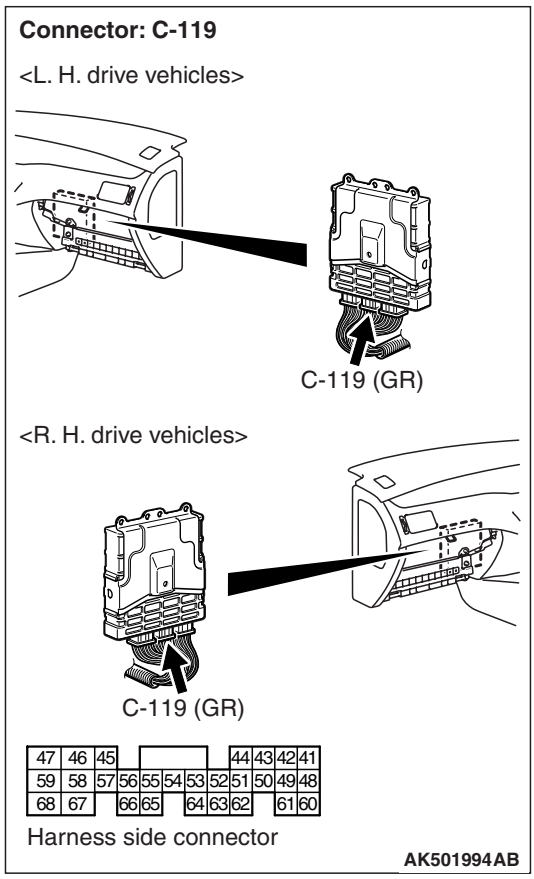


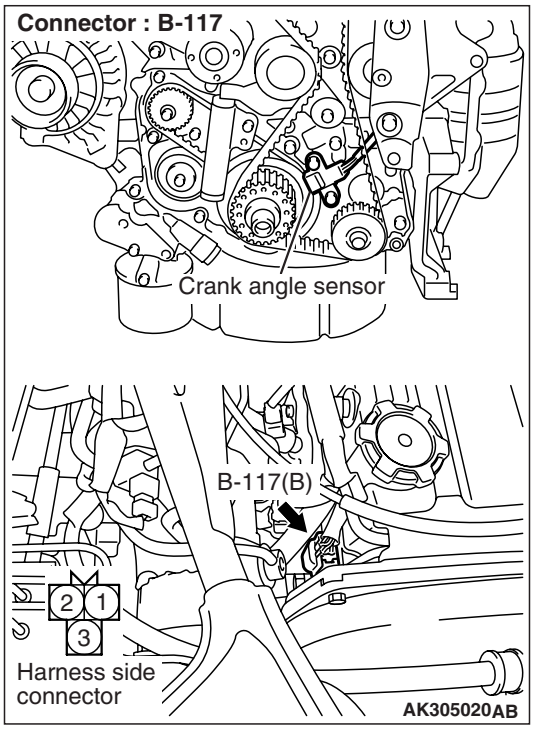
- Disconnect connector, and measure at harness side.
- Ignition switch: "ON"
- Voltage between terminal No. 2 and earth.

OK: 4.9 – 5.1 V

Q: Is the check result normal?
YES : Go to Step 9 .
NO : Go to Step 4 .

STEP 4. Perform voltage measurement at C-119 engine-ECU connector.



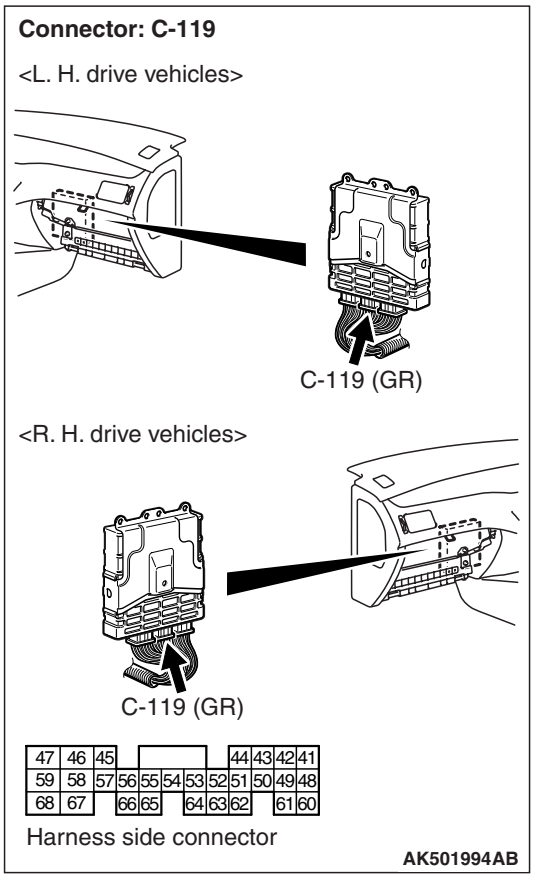


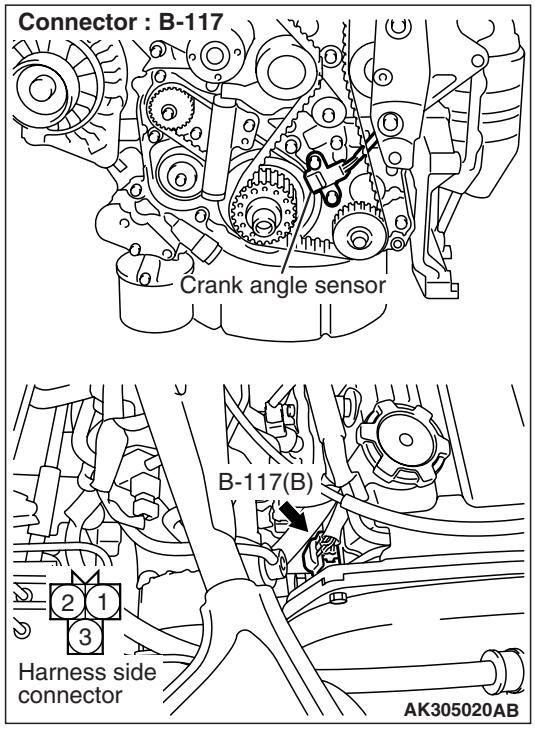
- Measure engine-ECU terminal voltage.
- Disconnect B-117 crank angle sensor connector.
- Ignition switch: "ON"
- Voltage between terminal No. 43 and earth.

OK: 4.9 – 5.1 V

Q: Is the check result normal?
YES : Go to Step 5 .
NO : Go to Step 6 .

STEP 5. Connector check: C-119 engine-ECU connector

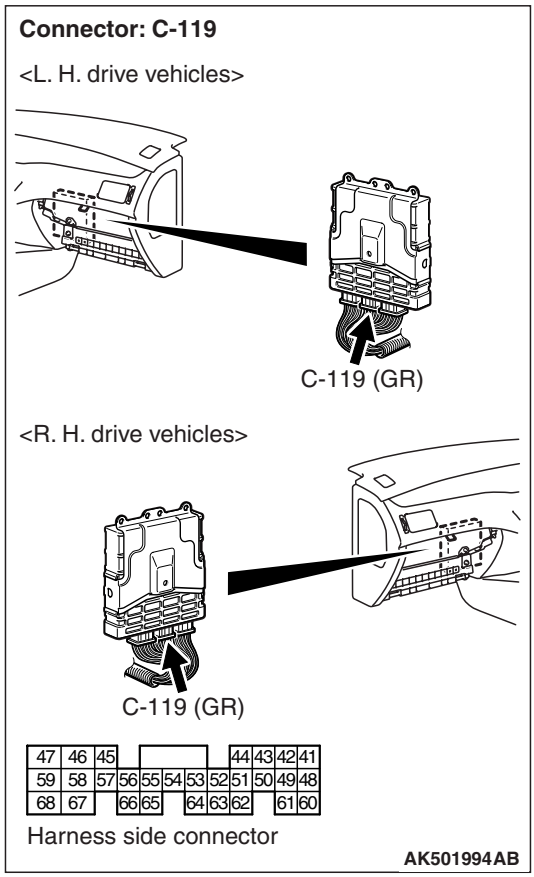




Q: Is the check result normal?
YES : Check and repair harness between B-117 (terminal No. 2) crank angle sensor connector and C-119 (terminal No. 43) engine-ECU connector.
- Check output line for open circuit.

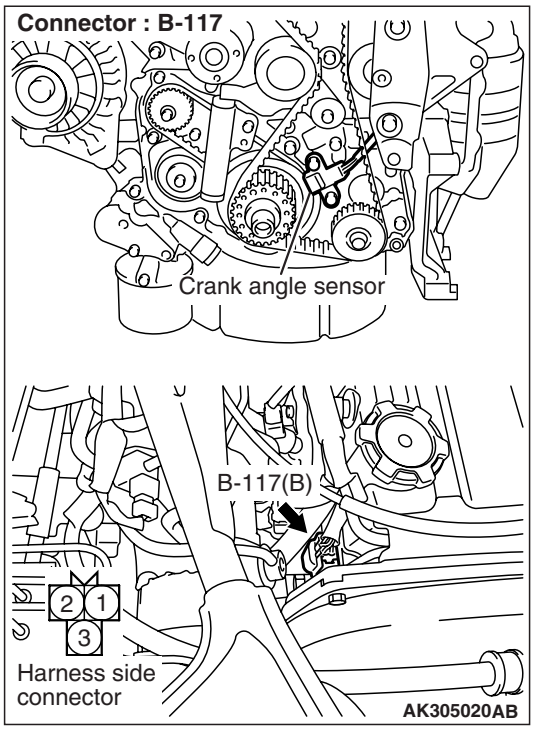
NO : Repair or replace the connector.

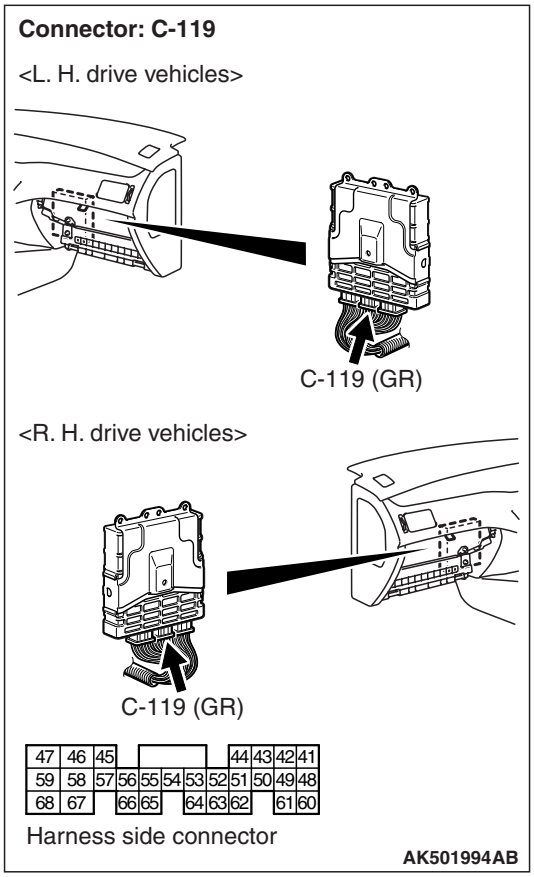
STEP 6. Connector check: C-119 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair or replace the connector.

STEP 7. Check harness between B-117 (terminal No. 2) crank angle sensor connector and C-119 (terminal No. 43) engine-ECU connector.





- Check output line for short circuit.

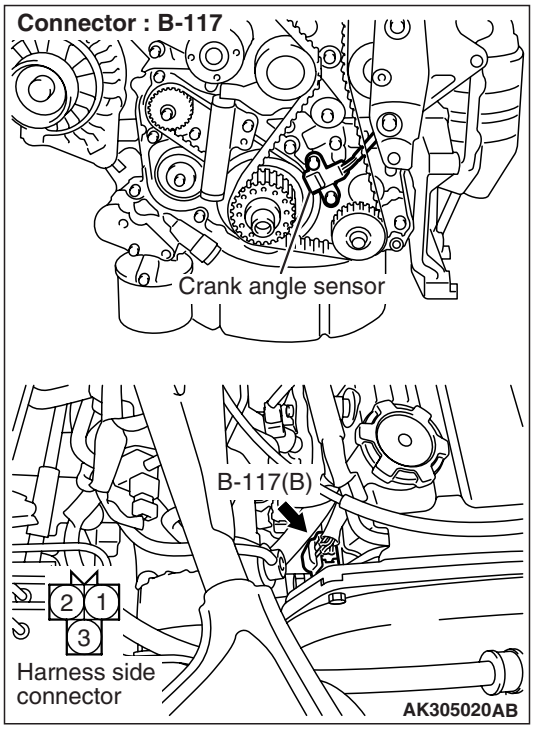
Q: Is the check result normal?
YES : Go to Step 8 .
NO : Repair the damaged harness wire.

STEP 8. M.U.T.-II/III data list

- Refer to Data List Reference Table P.13A-372.
  a. Item No. 22: Crank angle sensor

Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-5).
NO : Replace the engine-ECU.

STEP 9. Perform voltage measurement at B-117 crank angle sensor connector.

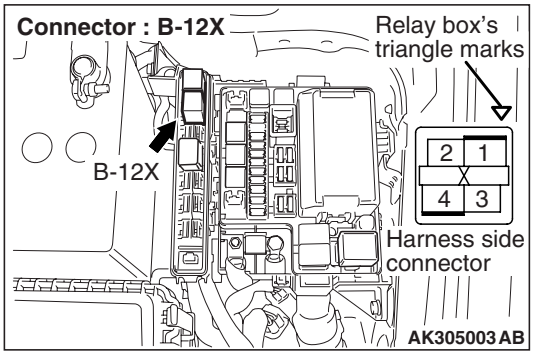


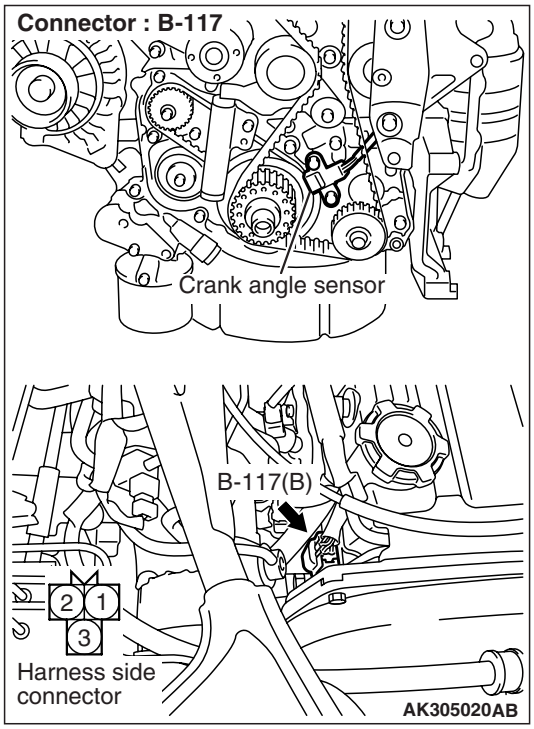
- Disconnect connector, and measure at harness side.
- Ignition switch: "ON"
- Voltage between terminal No. 3 and earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 11 .
NO : Go to Step 10 .

STEP 10. Connector check: B-12X engine control relay connector





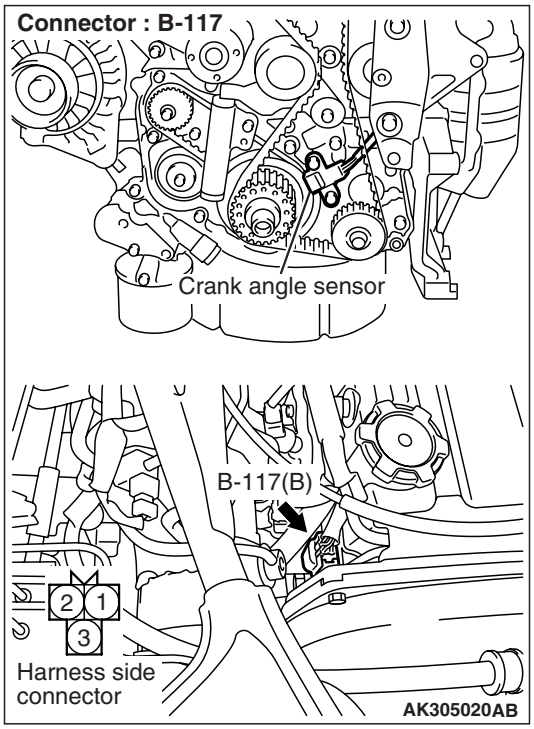
Q: Is the check result normal?

YES : Check and repair harness between B-117 (terminal No. 3) crank angle sensor connector and B-12X (terminal No. 4) engine control relay connector.

- Check power supply line for open/short circuit.

NO : Repair or replace the connector.

STEP 11. Perform resistance measurement at B-117 crank angle sensor connector.



- Disconnect connector, and measure at harness side.
- Resistance between terminal No. 1 and earth.

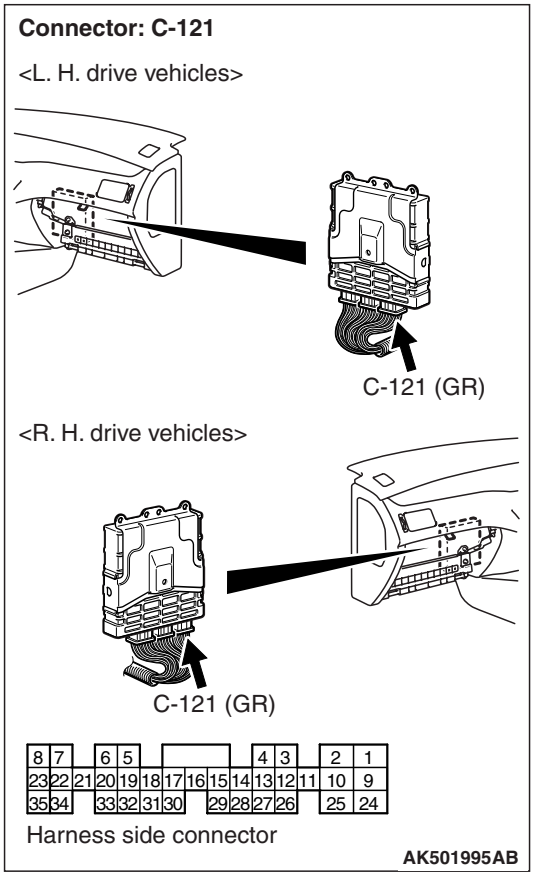
OK: 2 Ω or less

Q: Is the check result normal?

YES : Go to Step 14 .

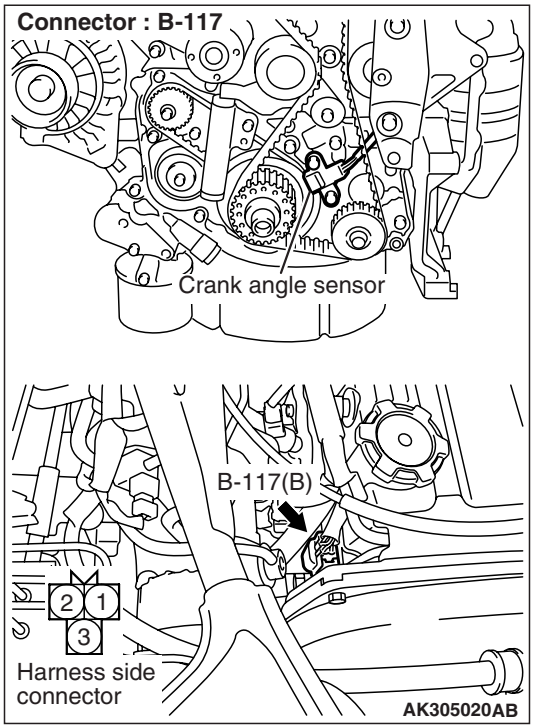
NO : Go to Step 12 .

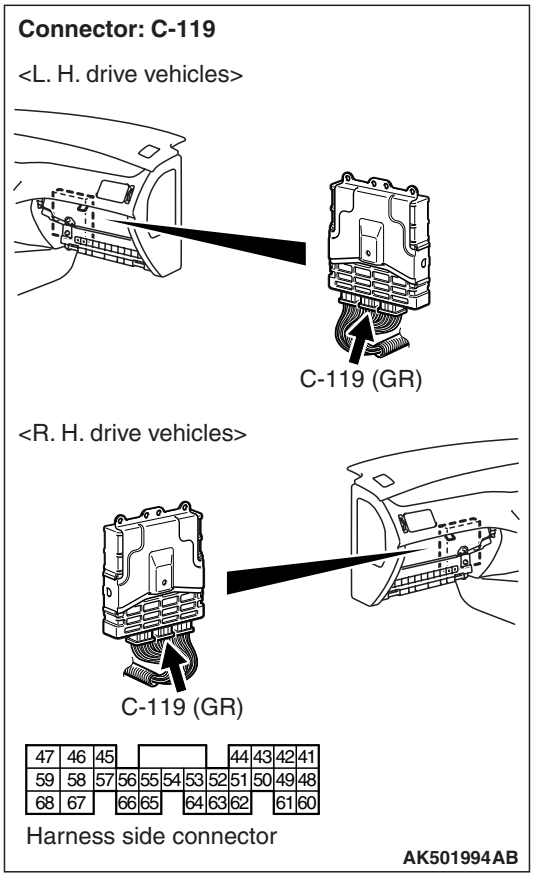
STEP 12. Connector check: C-121 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 13 .
NO : Repair or replace the connector.

STEP 13. Check harness between B-117 (terminal No. 1) crank angle sensor connector and C-121 (terminal No. 34) engine-ECU connector.

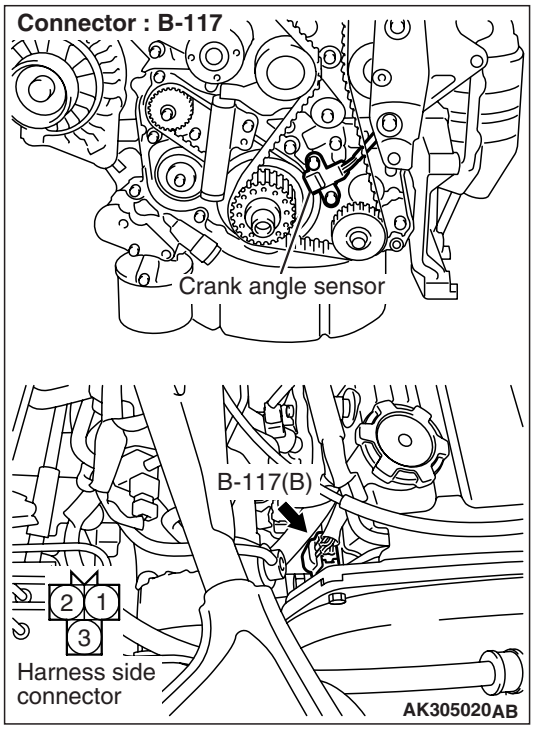




- Check earthing line for open circuit and damage.

Q: Is the check result normal?
YES : Go to Step 8 .
NO : Repair the damaged harness wire.

STEP 14. Perform output wave pattern measurement at B-117 crank angle sensor connector (Using an oscilloscope).

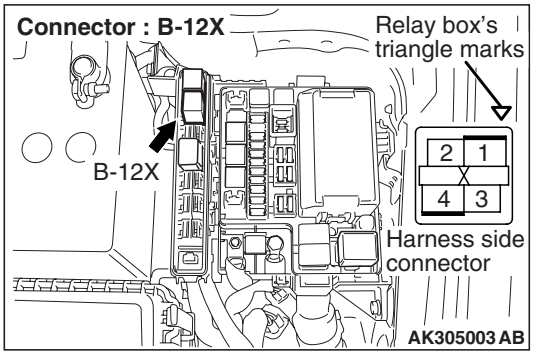


- Use special tool test harness (MD998478) to connect connector, and measure at pick-up harness.
- Engine: Idling
- Transmission: Neutral
- Voltage between terminal No. 2 and earth.

OK: Waveforms should be displayed on Inspection procedure using an oscilloscope (Refer to P.13A-385), its maximum value should be 4.8 V or more, and its minimum value should be 0.6 V or less with no noise in waveform.

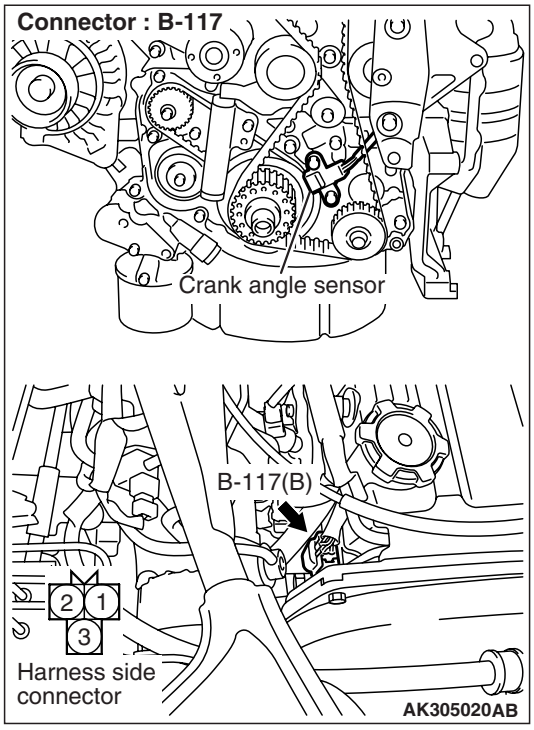
Q: Is the check result normal?
YES : Go to Step 8 .
NO : Go to Step 15 .

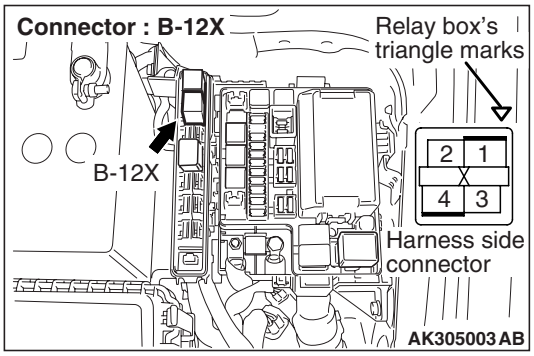
STEP 15. Connector check: B-12X engine control relay connector



Q: Is the check result normal?
YES : Go to Step 16 .
NO : Repair or replace the connector.

STEP 16. Check harness between B-117 (terminal No. 3) crank angle sensor connector and B-12X (terminal No. 4) engine control relay connector.

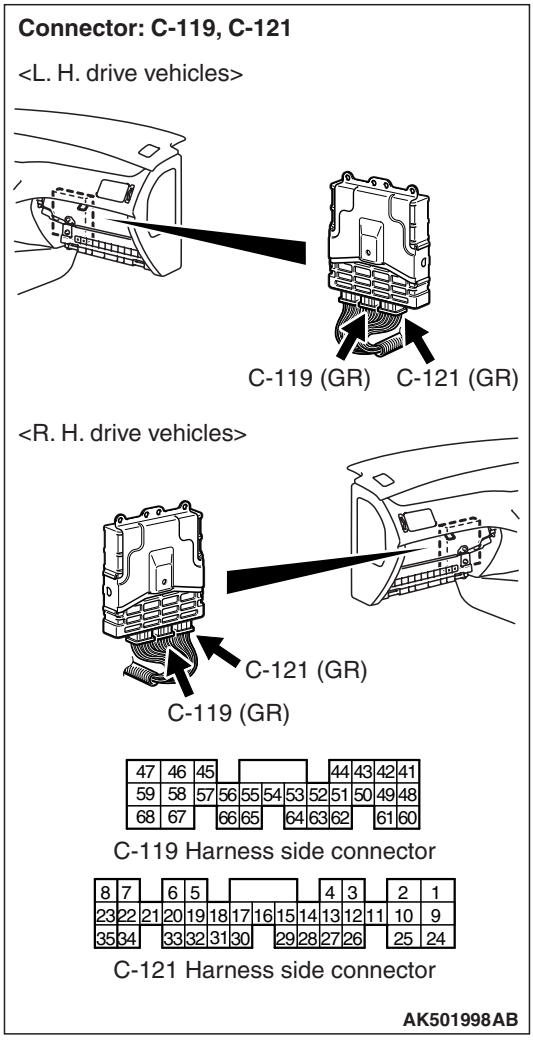




- Check power supply line for damage.

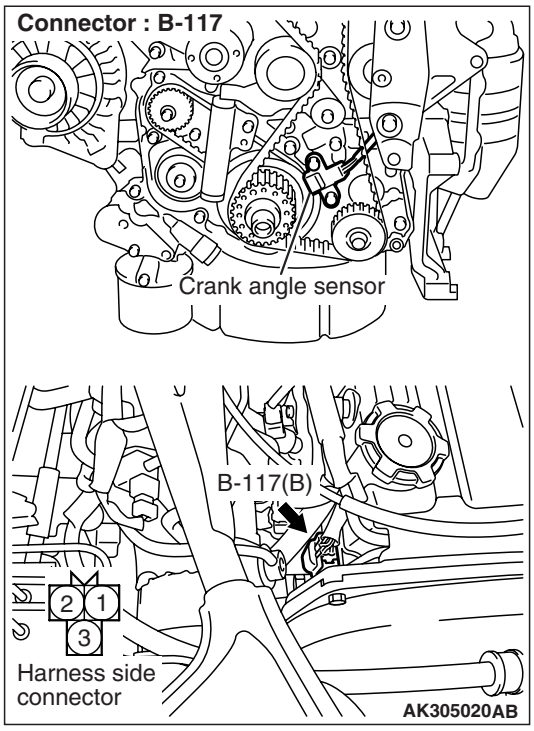
Q: Is the check result normal?
YES : Go to Step 17 .
NO : Repair the damaged harness wire.

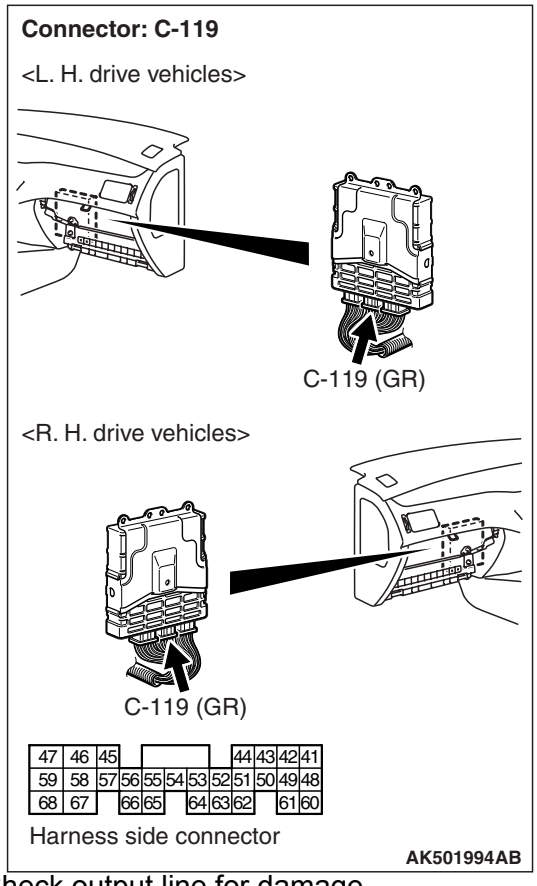
STEP 17. Connector check: C-119 and C-121 engine-ECU connectors



Q: Is the check result normal?
YES : Go to Step 18 .
NO : Repair or replace the connector.

STEP 18. Check harness between B-117 (terminal No. 2) crank angle sensor connector and C-119 (terminal No. 43) engine-ECU connector.

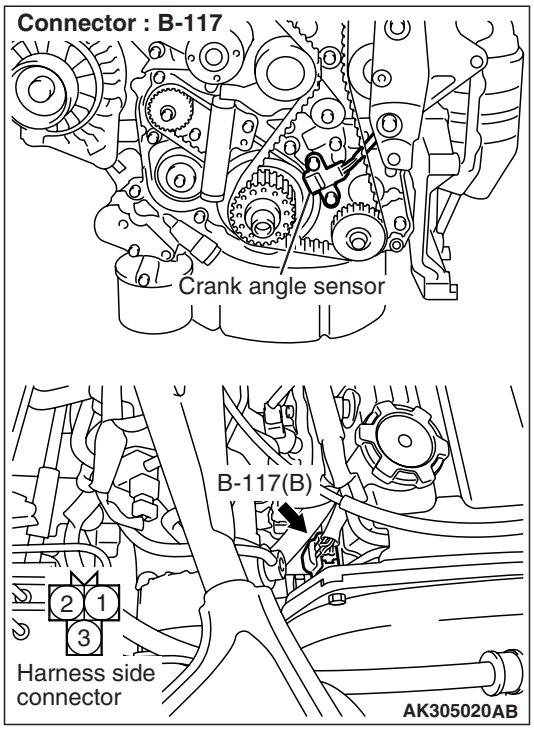


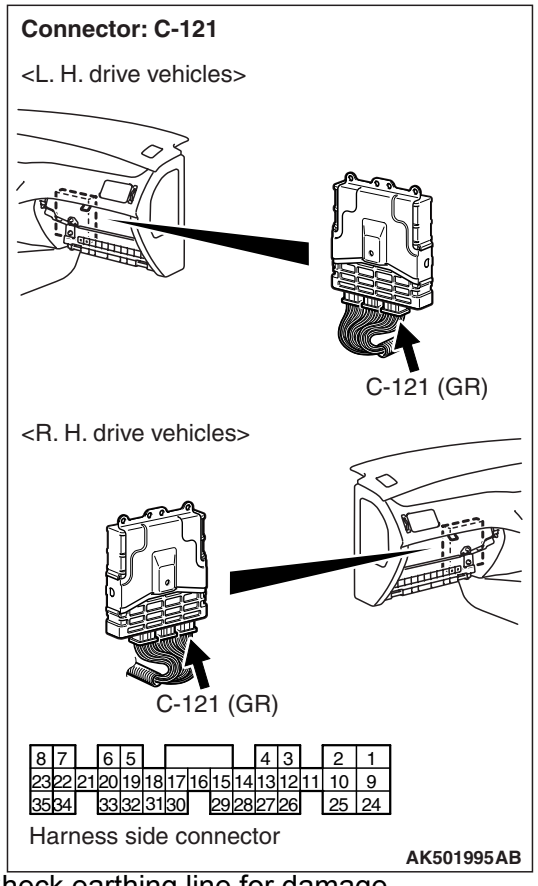


- Check output line for damage.

Q: Is the check result normal?
YES : Go to Step 19 .
NO : Repair the damaged harness wire.

STEP 19. Check harness between B-117 (terminal No. 1) crank angle sensor connector and C-121 (terminal No. 34) engine-ECU connector.





- Check earthing line for damage.

Q: Is the check result normal?
YES : Go to Step 20 .
NO : Repair the damaged harness wire.

STEP 20. Check the crankshaft sensing blade

Q: Is the check result normal?

YES : Go to Step 21 .

NO : Replace the crankshaft sensing blade.

STEP 21: M.U.T.-II/III data list

- Refer to Data List Reference Table P.13A-372.
  a. Item No. 22: Crank angle sensor

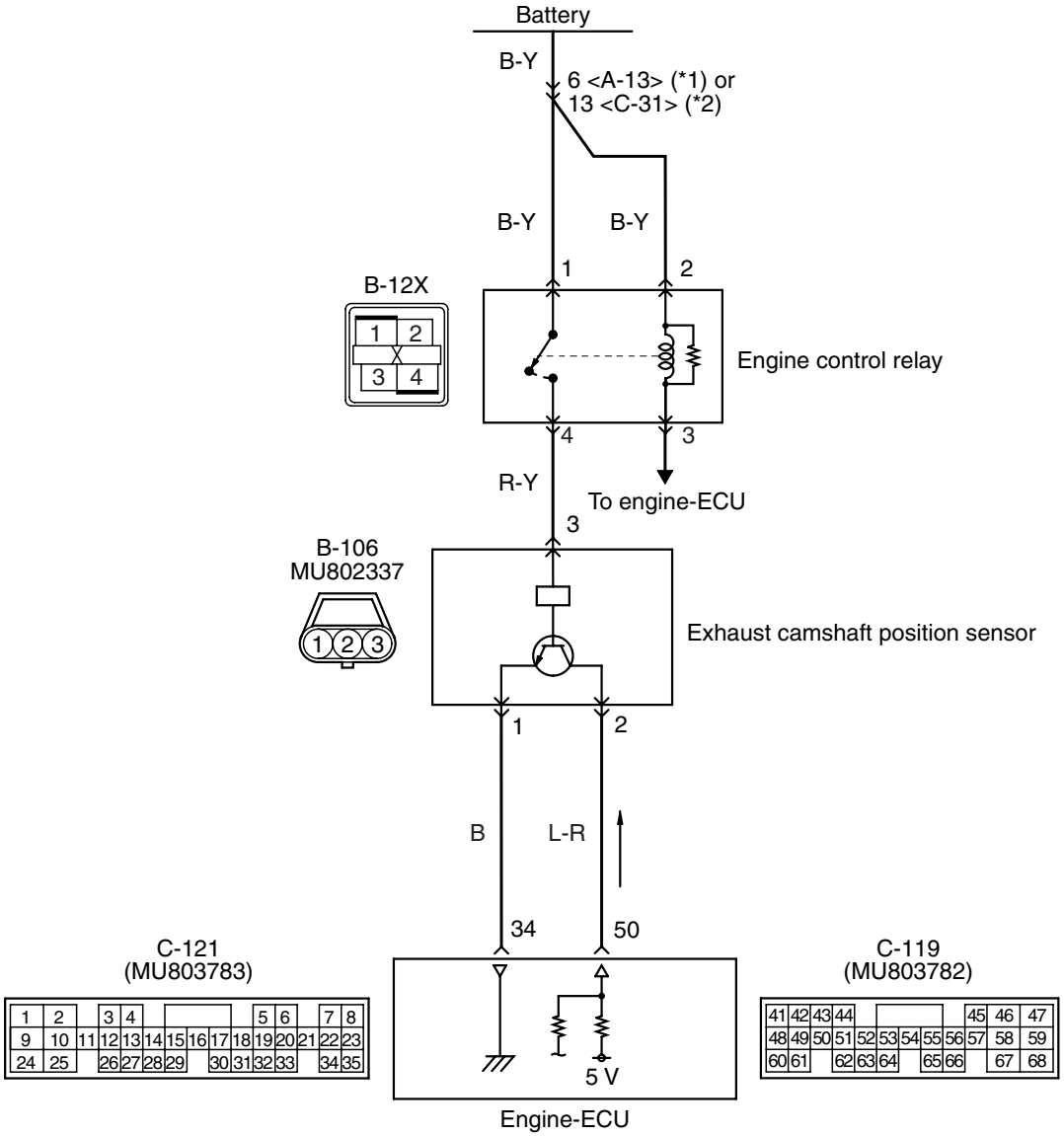
Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-5).

NO : Replace the crank angle sensor.

Code No. P0340: Exhaust Camshaft Position Sensor System

Exhaust camshaft position sensor circuit



NOTE
*1: L.H. drive vehicles
*2: R.H. drive vehicles

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

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OPERATION

- Power is supplied to the exhaust camshaft position sensor (terminal No. 3) from the engine control relay (terminal No. 4) and is earthed to the engine-ECU (terminal No. 34) from the exhaust camshaft position sensor (terminal No. 1).
- A power voltage of 5 V is applied to the exhaust camshaft position sensor output terminal (terminal No. 2) from the engine-ECU (terminal No. 50).

FUNCTION

- The exhaust camshaft position sensor detects the top dead center on the compression stroke of the No. 1 cylinder and inputs a pulse signal to the engine-ECU.

TROUBLE JUDGMENT

Check Conditions

- Ignition switch: "ON"
- Engine speed of 50 r/min. or more.

Judgment Criterion

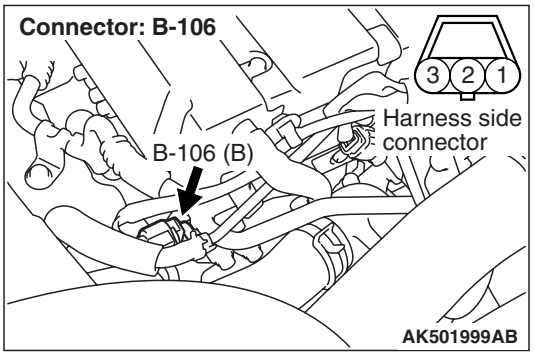
- The sensor output voltage remains unchanged (no pulse signal is inputted) for 2 seconds.

PROBABLE CAUSES

- Failed exhaust camshaft position sensor
- Open/short circuit in exhaust camshaft position sensor circuit or loose connector contact
- Failed engine-ECU

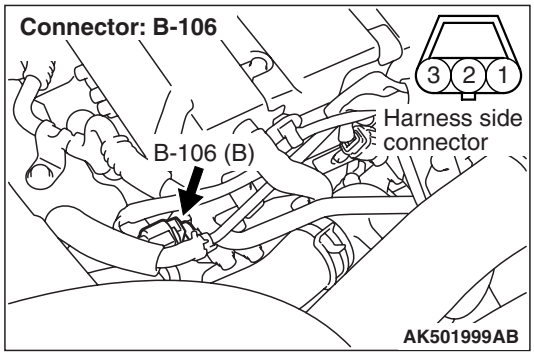
DIAGNOSIS PROCEDURE

STEP 1. Connector check: B-106 exhaust camshaft position sensor connector



Q: Is the check result normal?
YES : Go to Step 2 .
NO : Repair or replace the connector.

STEP 2. Perform voltage measurement at B-106 exhaust camshaft position sensor connector.

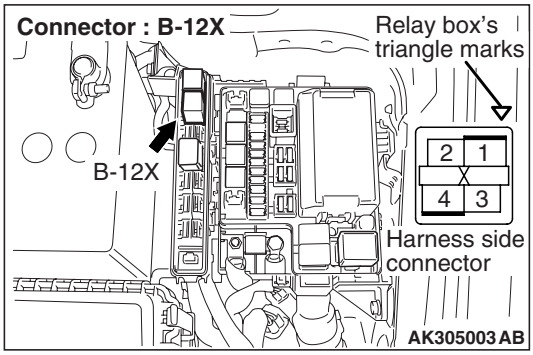


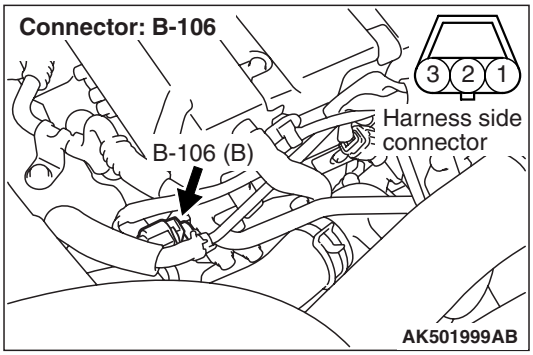
- Disconnect connector, and measure at harness side.
- Ignition switch: "ON"
- Voltage between terminal No. 3 and earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 4 .
NO : Go to Step 3 .

STEP 3. Connector check: B-12X engine control relay connector





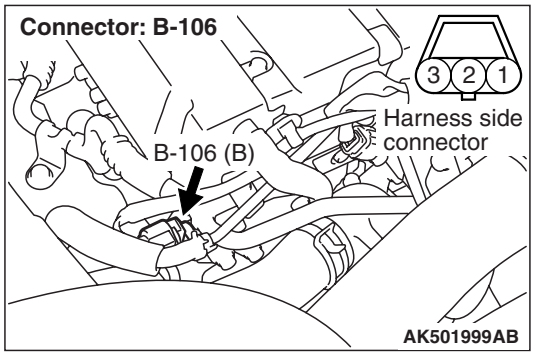
Q: Is the check result normal?

YES : Check and repair harness between B-106 (terminal No. 3) exhaust camshaft position sensor connector and B-12X (terminal No. 4) engine control relay connector.

- Check power supply line for open/short circuit.

NO : Repair or replace the connector.

STEP 4. Perform voltage measurement at B-106 exhaust camshaft position sensor connector.



- Disconnect connector, and measure at harness side.
- Ignition switch: "ON"
- Voltage between terminal No. 2 and earth.

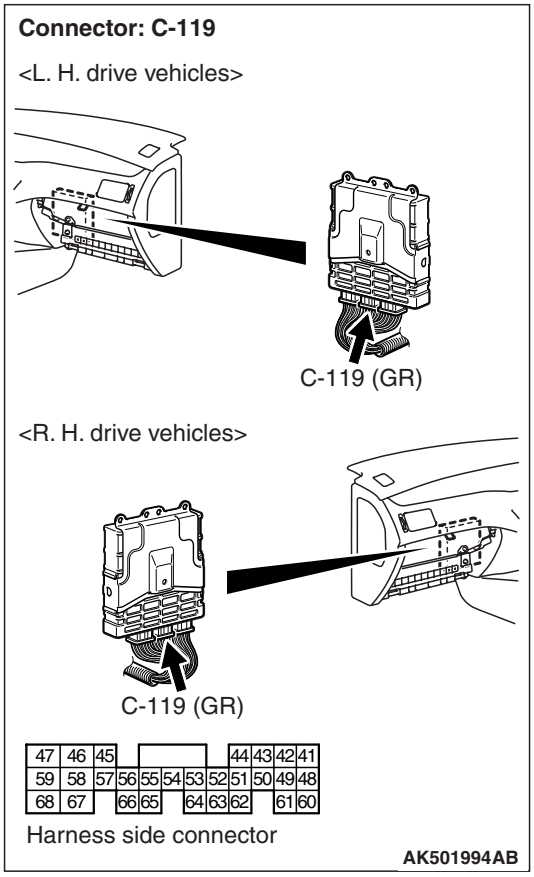
OK: 4.9 – 5.1 V

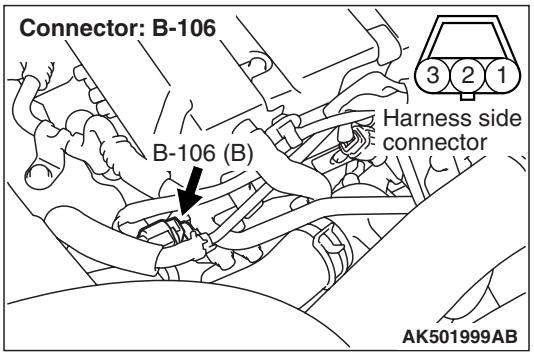
Q: Is the check result normal?

YES : Go to Step 10 .

NO : Go to Step 5 .

STEP 5. Perform voltage measurement at C-119 engine-ECU connector.





- Measure engine-ECU terminal voltage.
- Disconnect B-106 exhaust camshaft position sensor connector.
- Ignition switch: "ON"
- Voltage between terminal No. 50 and earth.

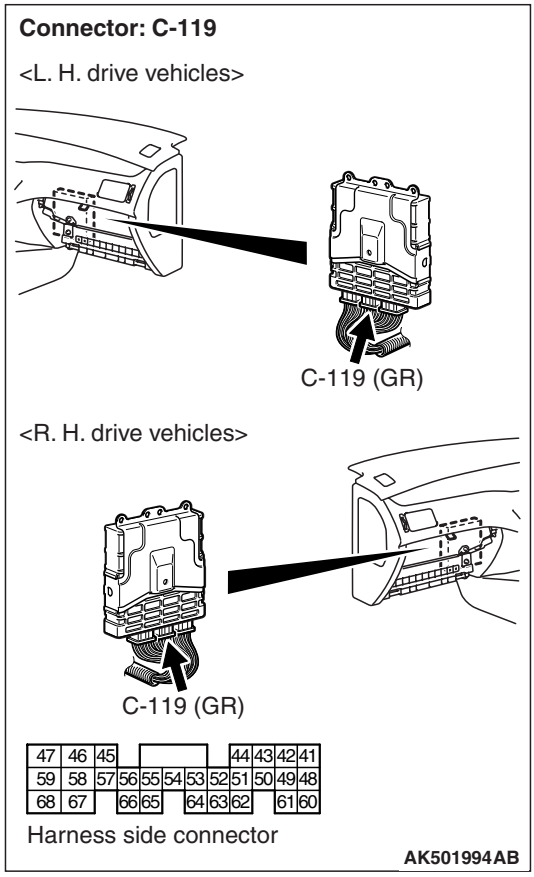
OK: 4.9 – 5.1 V

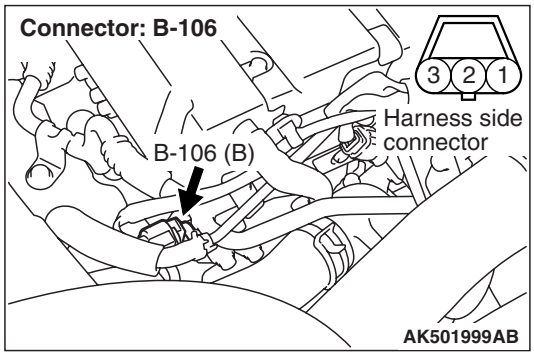
Q: Is the check result normal?

YES : Go to Step 6 .

NO : Go to Step 7 .

STEP 6. Connector check: C-119 engine-ECU connector





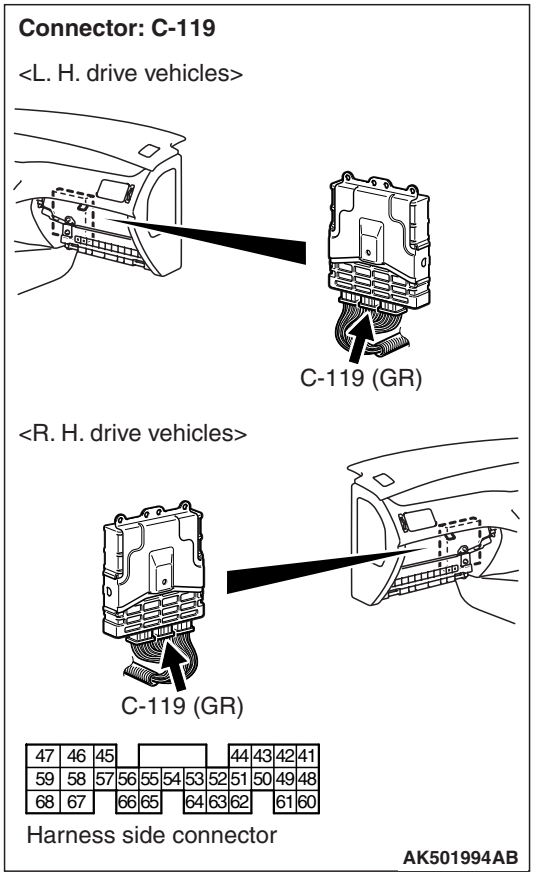
Q: Is the check result normal?

YES : Check and repair harness between B-106 (terminal No. 2) exhaust camshaft position sensor connector and C-119 (terminal No. 50) engine-ECU connector.

- Check output line for open circuit.

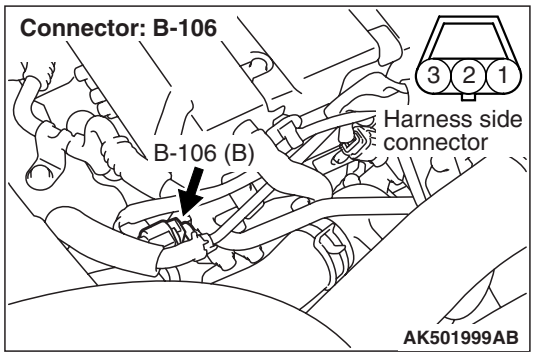
NO : Repair or replace the connector.

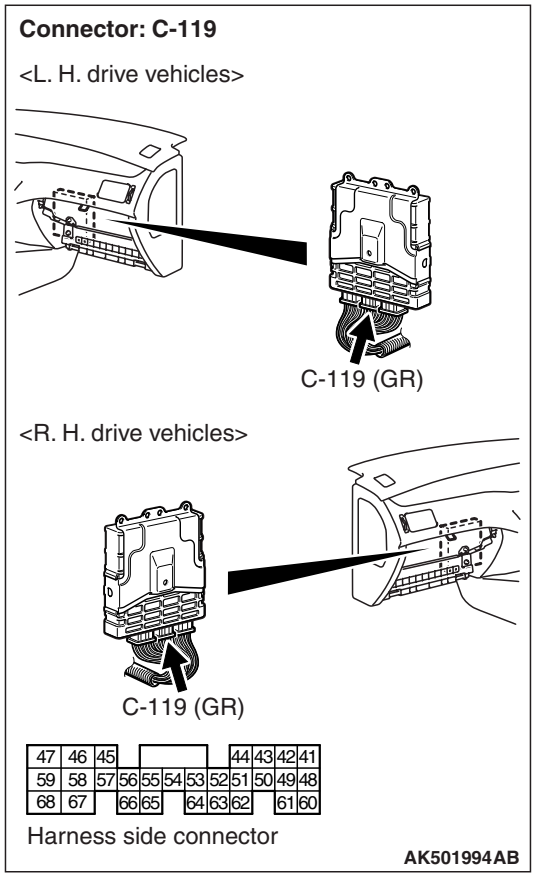
STEP 7. Connector check: C-119 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 8 .
NO : Repair or replace the connector.

STEP 8. Check harness between B-106 (terminal No. 2) camshaft position sensor connector and C-119 (terminal No. 50) engine-ECU connector.





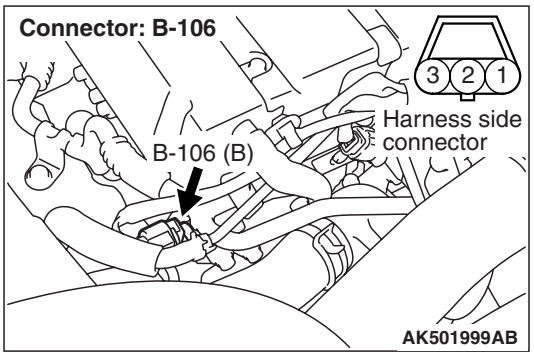
- Check output line for short circuit.

Q: Is the check result normal?
YES : Go to Step 9 .
NO : Repair the damaged harness wire.

STEP 9. Check the trouble symptoms.

Q: Does trouble symptom persist?
YES : Replace the engine-ECU.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-5).

STEP 10. Perform resistance measurement at B-106 exhaust camshaft position sensor connector.

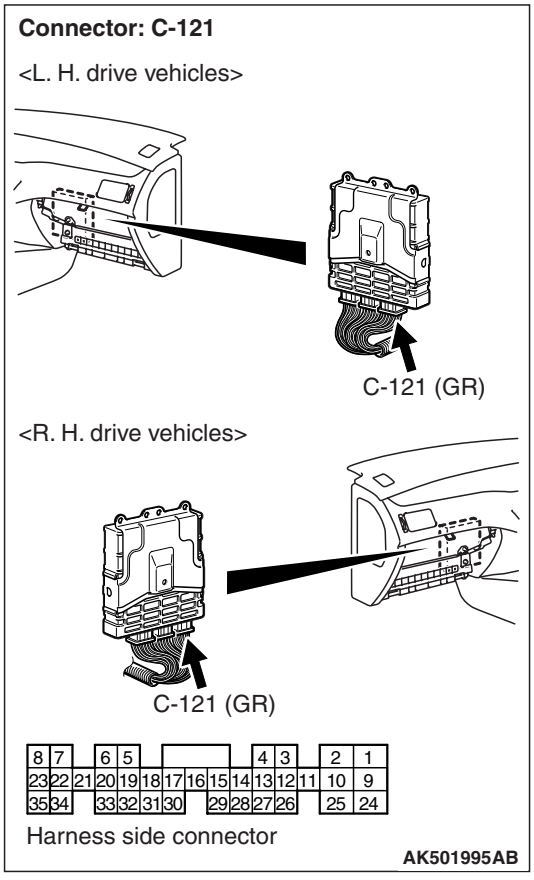


- Disconnect connector, and measure at harness side.
- Resistance between terminal No. 1 and earth.

OK: 2 Ω or less

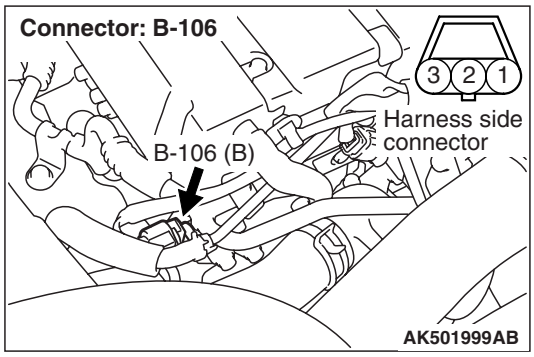
Q: Is the check result normal?
YES : Go to Step 13 .
NO : Go to Step 11 .

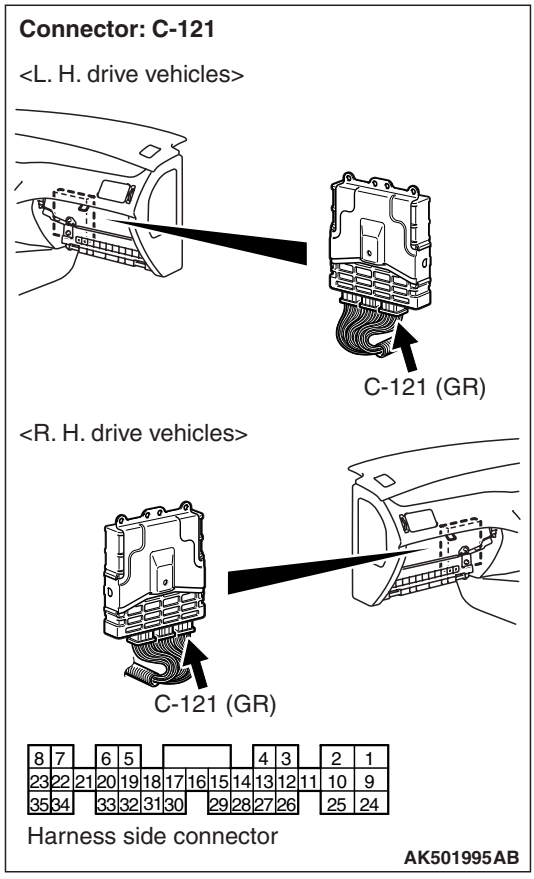
STEP 11. Connector check: C-121 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 12 .
NO : Repair or replace the connector.

STEP 12. Check harness between B-106 (terminal No. 1) camshaft position sensor connector and C-121 (terminal No. 34) engine-ECU connector.

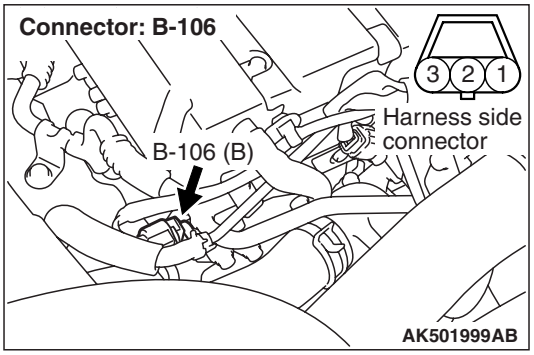




- Check earthing line for open circuit and damage.

Q: Is the check result normal?
YES : Go to Step 9 .
NO : Repair the damaged harness wire.

STEP 13. Perform output wave pattern measurement at B-106 exhaust camshaft position sensor connector (Using an oscilloscope).

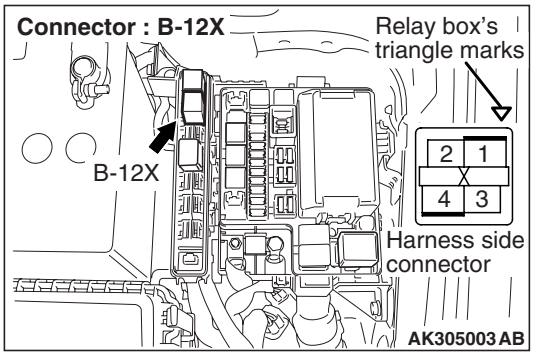


- Use special tool test harness (MB991709) to connect connector, and measure at pick-up harness.
- Engine: Idling
- Transmission: Neutral
- Voltage between terminal No. 2 and earth.

OK: Waveforms should be displayed on Inspection procedure using an oscilloscope (Refer to P.13A-385), its maximum value should be 4.8 V or more, and its minimum value should be 0.6 V or less with no noise in waveform.

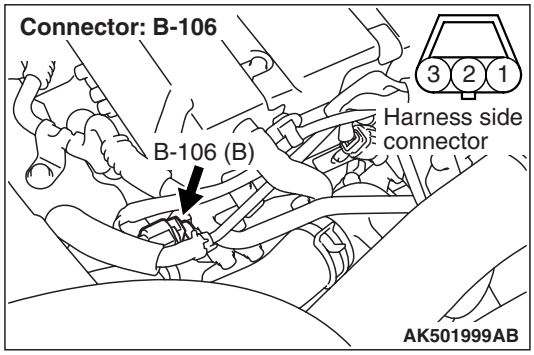
Q: Is the check result normal?
YES : Go to Step 9 .
NO : Go to Step 14 .

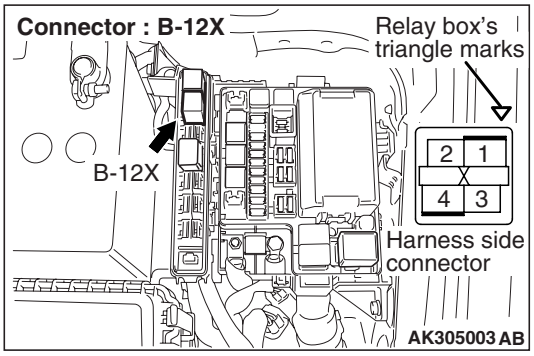
STEP 14. Connector check: B-12X engine control relay connector.



Q: Is the check result normal?
YES : Go to Step 15 .
NO : Repair or replace the connector.

STEP 15. Check harness between B-106 (terminal No. 3) exhaust camshaft position sensor connector and B-12X (terminal No. 4) engine control relay connector.

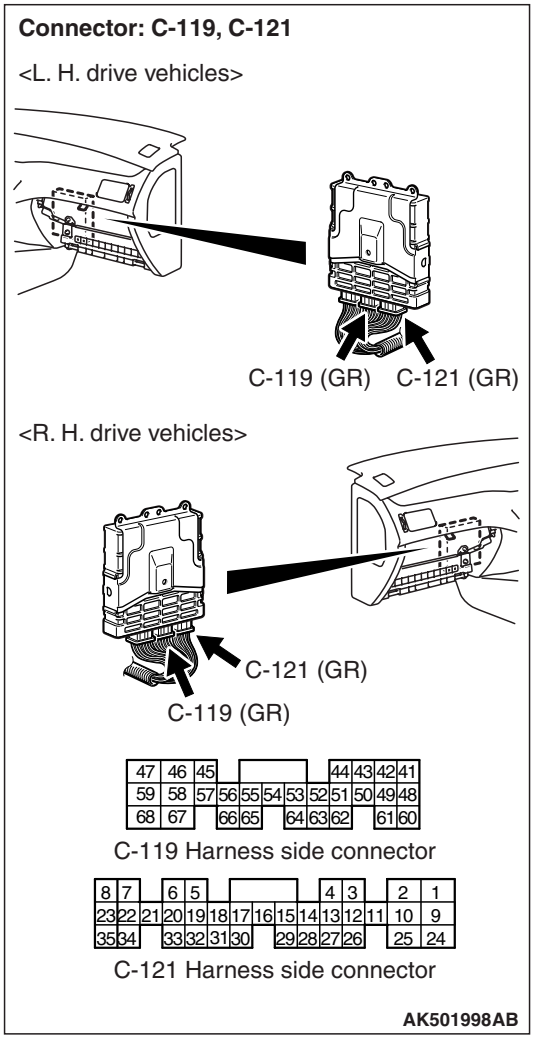




- Check power supply line for damage.

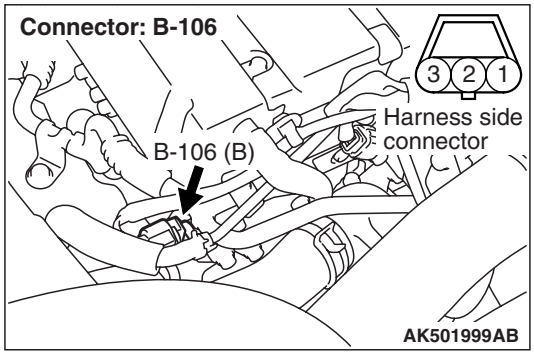
Q: Is the check result normal?
YES : Go to Step 16 .
NO : Repair the damaged harness wire.

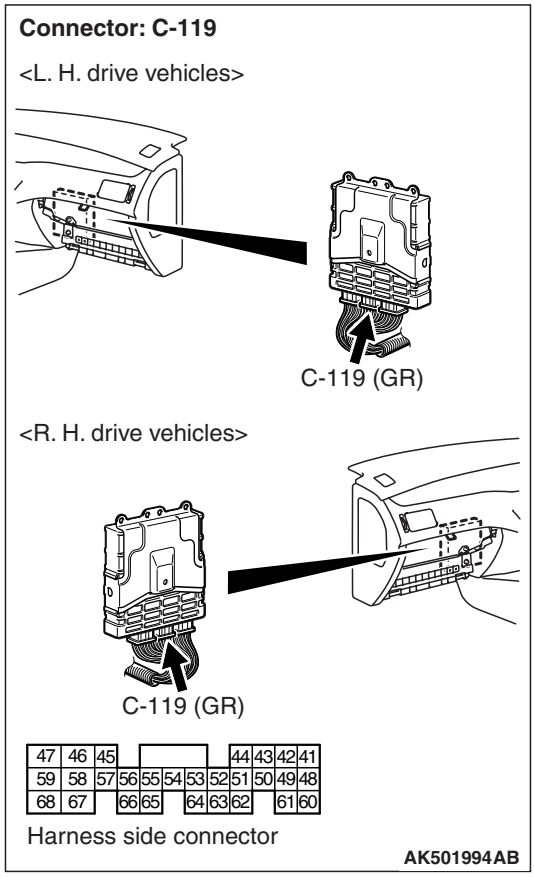
STEP 16. Connector check: C-119 and C-121 engine-ECU connectors



Q: Is the check result normal?
YES : Go to Step 17 .
NO : Repair or replace the connector.

STEP 17. Check harness between B-106 (terminal No. 2) exhaust camshaft position sensor connector and C-119 (terminal No. 50) engine-ECU connector.

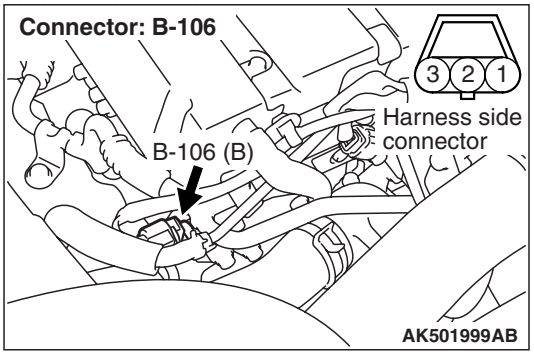


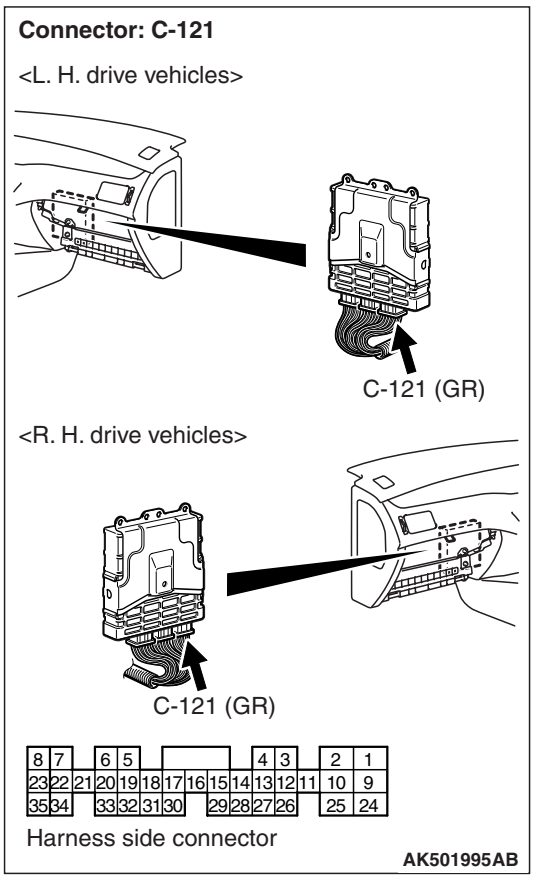


- Check output line for damage.

Q: Is the check result normal?
YES : Go to Step 18 .
NO : Repair the damaged harness wire.

STEP 18. Check harness between B-106 (terminal No. 1) exhaust camshaft position sensor connector and C-121 (terminal No. 34) engine-ECU connector.





- Check earthing line for damage.

Q: Is the check result normal?
YES : Go to Step 19 .
NO : Repair the damaged harness wire.

STEP 19. Check the exhaust camshaft position sensing cylinder.

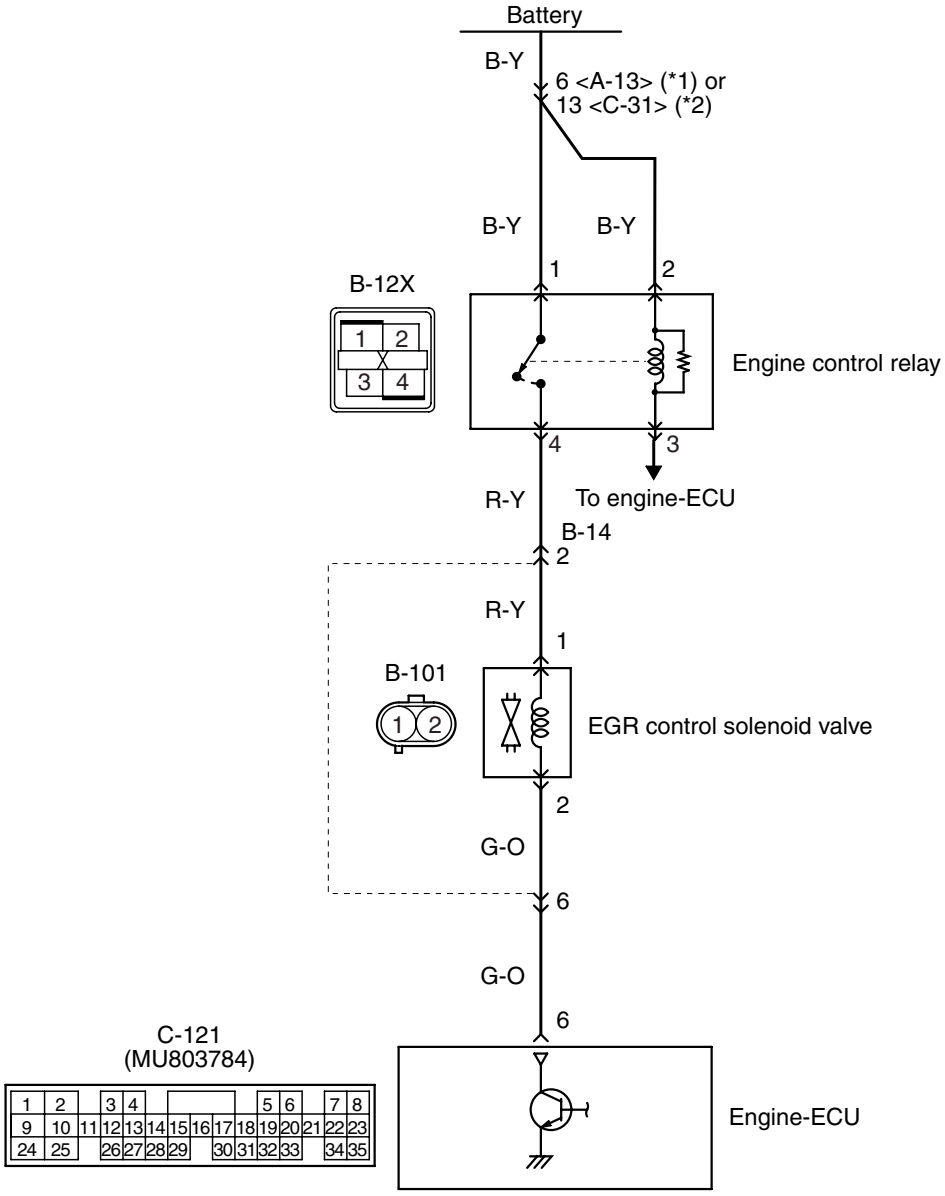
Q: Is the check result normal?
YES : Go to Step 20 .
NO : Replace the exhaust camshaft position sensing cylinder.

STEP 20. Check the trouble symptoms.

Q: Does trouble symptom persist?
YES : Replace the exhaust camshaft position sensor.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-5).

Code No. P0403: Exhaust Gas Recirculation (EGR) Control Solenoid Valve

EGR control solenoid valve circuit



NOTE
*1: L.H. drive vehicles
*2: R.H. drive vehicles

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

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OPERATION

- Power is supplied to the EGR control solenoid valve (terminal No. 1) from the engine control relay (terminal No. 4).
- The engine-ECU (terminal No. 6) makes the power transistor in the unit be in "ON", and that makes currents go on the EGR control solenoid valve (terminal No. 2).

FUNCTION

- In response to the signal from the engine-ECU, the EGR control solenoid valve controls the operation of the EGR valve.

TROUBLE JUDGMENT

Check Condition

- The battery voltage is 10 V or more.

Judgment Criterion

- When the EGR control solenoid valve is turned to "LOCK" (OFF) position from "ON" position, none of solenoid coil surge voltage (system voltage of +2 V) is detected.

PROBABLE CAUSES

- Failed EGR control solenoid valve
- Open/short circuit in EGR control solenoid valve circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-II/III actuator test

- Item No. 10: EGR control solenoid valve

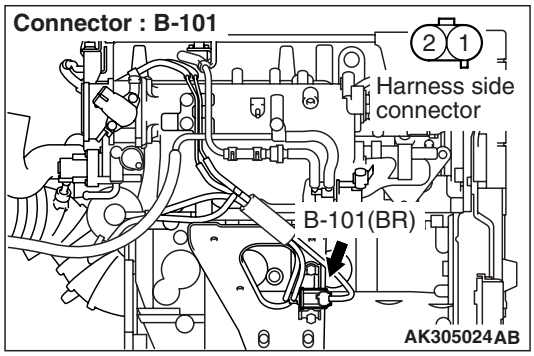
  OK: Operating sound can be heard and the valve vibrates.

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-5).

NO : Go to Step 2 .

STEP 2. Connector check: B-101 EGR control solenoid valve connector

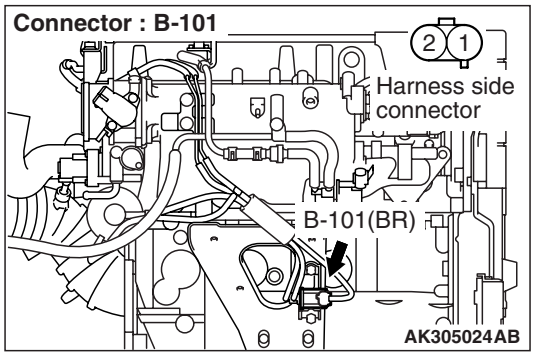


Q: Is the check result normal?

YES : Go to Step 3 .

NO : Repair or replace the connector.

STEP 3. Perform resistance measurement at B-101 EGR control solenoid valve connector.



- Disconnect connector, and measure at solenoid valve side.
- Resistance between terminal No. 1 and No. 2.

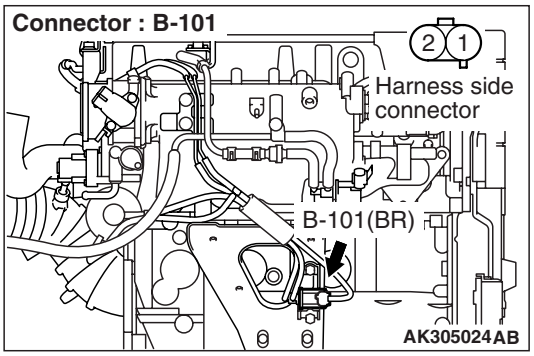
  OK: 29 – 35 Ω (at 20°C)

Q: Is the check result normal?

YES : Go to Step 4 .

NO : Replace the EGR control solenoid valve.

STEP 4. Perform voltage measurement at B-101 EGR control solenoid valve connector.



- Disconnect connector, and measure at harness side.
- Ignition switch: "ON"
- Voltage between terminal No. 1 and earth.

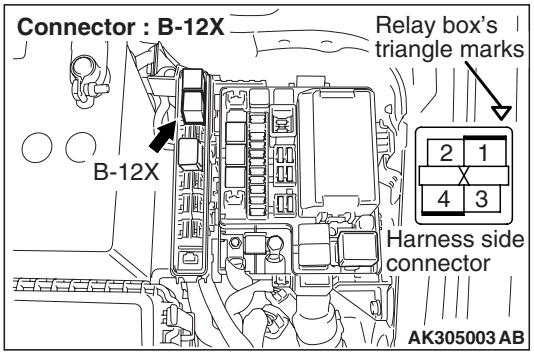
OK: System voltage

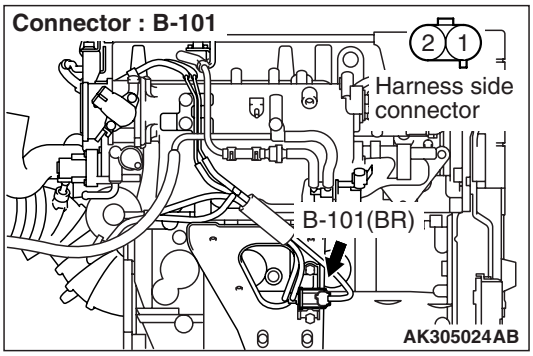
Q: Is the check result normal?

YES : Go to Step 6 .

NO : Go to Step 5 .

STEP 5. Connector check: B-12X engine control relay connector





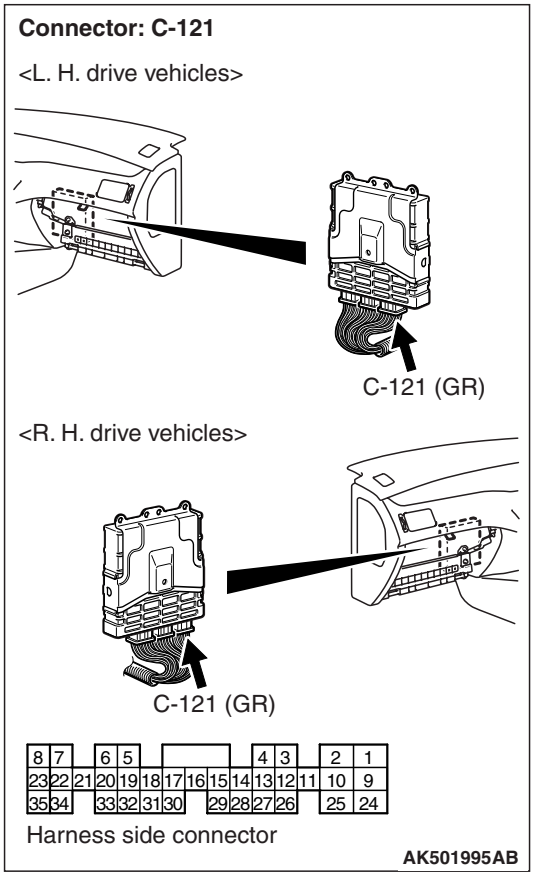
Q: Is the check result normal?

YES : Check intermediate connector B-14, and repair if necessary. If intermediate connector is normal, check and repair harness between B-101 (terminal No. 1) EGR control solenoid valve connector and B-12X (terminal No. 4) engine control relay connector.

- Check power supply line for open/short circuit.

NO : Repair or replace the connector.

STEP 6. Perform voltage measurement at C-121 engine-ECU connector.



- Disconnect connector, and measure at harness side.
- Ignition switch: "ON"
- Voltage between terminal No. 6 and earth.

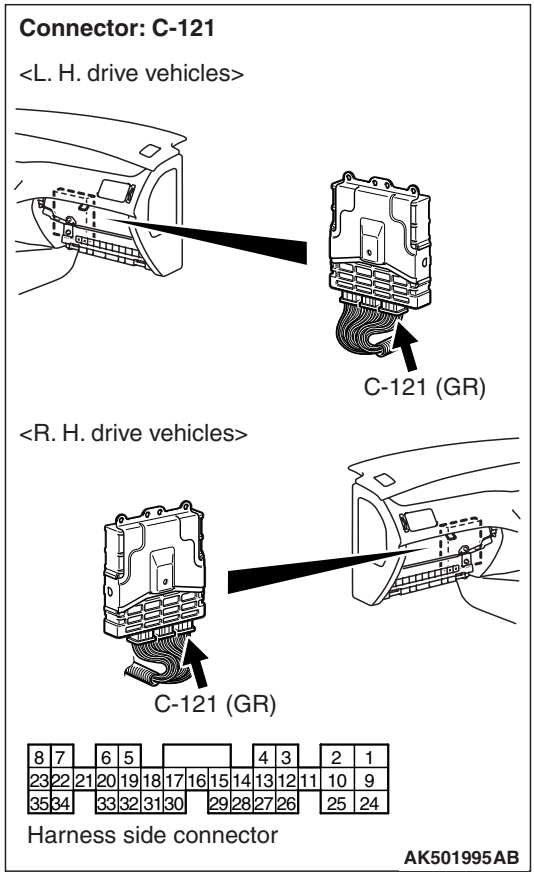
OK: System voltage

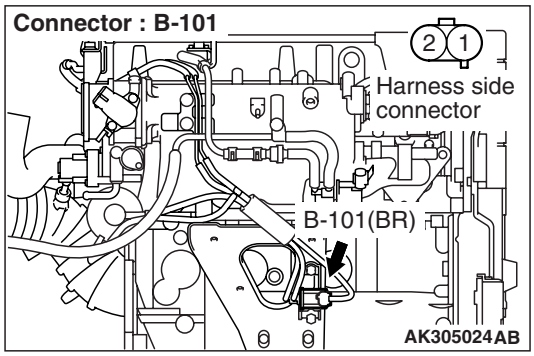
Q: Is the check result normal?

YES : Go to Step 8 .

NO : Go to Step 7 .

STEP 7. Connector check: C-121 engine-ECU connector





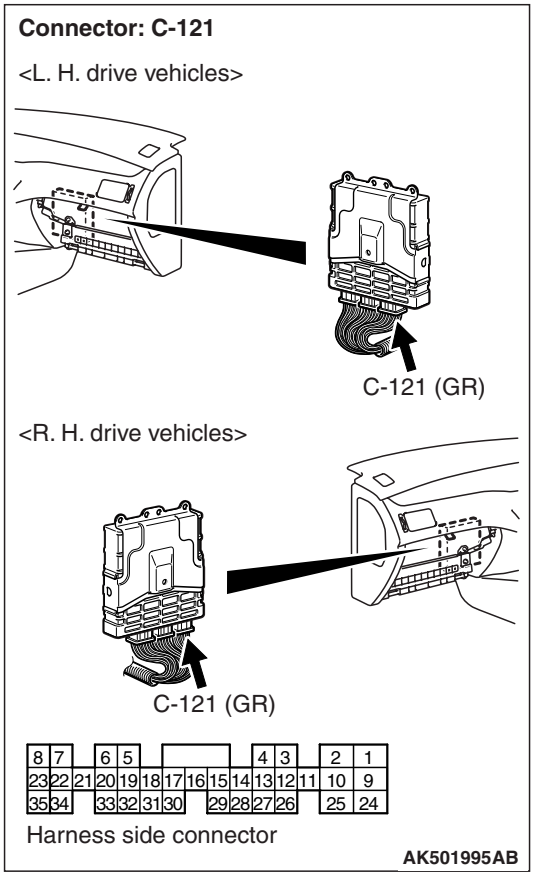
Q: Is the check result normal?

YES : Check intermediate connector B-14, and repair if necessary. If intermediate connector is normal, check and repair harness between B-101 (terminal No. 2) EGR control solenoid valve connector and C-121 (terminal No. 6) engine-ECU connector.

- Check output line for open/short circuit.

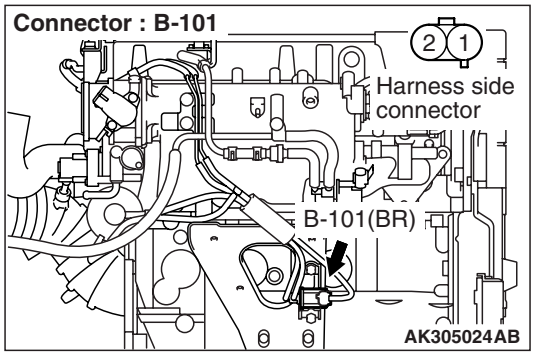
NO : Repair or replace the connector.

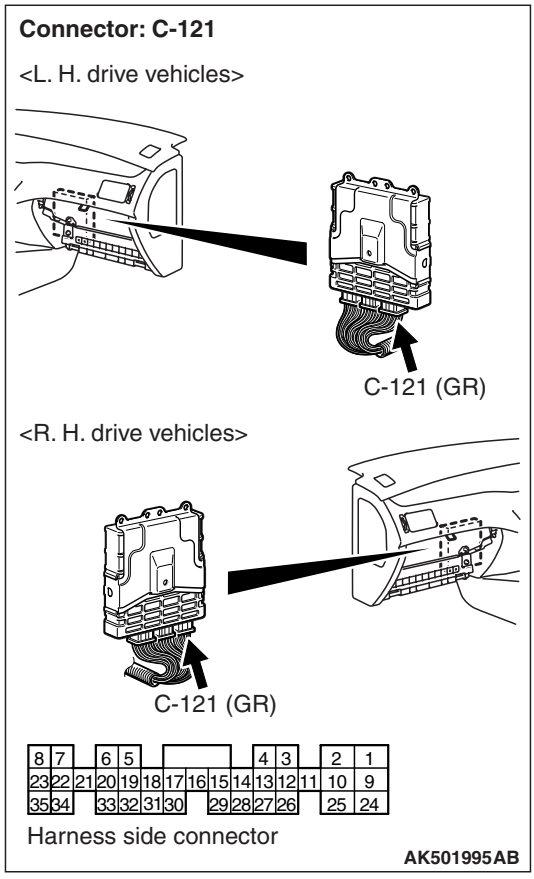
STEP 8. Connector check: C-121 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 9 .
NO : Repair or replace the connector.

STEP 9. Check harness between B-101 (terminal No. 2) EGR control solenoid valve connector and C-121 (terminal No. 6) engine-ECU connector.

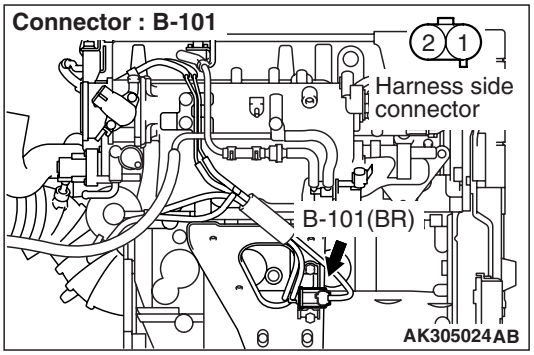


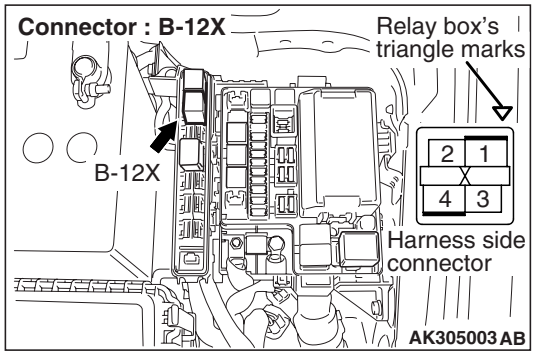


NOTE: Before checking harness, check intermediate connector B-14, and repair if necessary.
- Check output line for damage.

Q: Is the check result normal?
YES : Go to Step 10 .
NO : Repair the damaged harness wire.

STEP 10. Check harness between B-101 (terminal No. 1) EGR control solenoid valve connector and B-12X (terminal No. 4) engine control relay connector.





NOTE: Before checking harness, check intermediate connector B-14, and repair if necessary.

- Check power supply line for damage.

Q: Is the check result normal?

YES : Go to Step 11 .

NO : Repair the damaged harness wire.

STEP 11. M.U.T.-II /III actuator test

- Item No. 10: EGR control solenoid valve

  OK: Operating sound can be heard and the valve vibrates.

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-5).

NO : Replace the engine-ECU.

Code No. P0421: Warm up Catalyst Malfunction

FUNCTION

- The signal from the oxygen sensor (rear) differs from the oxygen sensor (front). That is because the catalytic converter purifies exhaust gas. When the catalytic converter has deteriorated, the signal from the oxygen sensor (front) becomes similar to the oxygen sensor (rear).
- The engine-ECU compares the output of the front and rear oxygen sensor signals.

TROUBLE JUDGMENT

Check Conditions

- The engine speed is 3,000 r/min. or less.
- The accelerator pedal is fully depressed.
- Airflow sensor output is 8 gm/s or higher.
- 3 seconds or longer has elapsed after the above-mentioned conditions have been met.
- Engine running, intake air temperature is –10°C or higher.
- Under the closed-loop control.
- Vehicle speed is 1.5 km/h or more.
- The engine-ECU monitors for this condition for 7 cycles of 10 seconds each during the drive cycle.
- Short-term fuel trim is higher than –25% or lower than +25%.
- Accumulated air flow sensor output is 2,931 g or higher.

Judgment Criterion

- The oxygen sensor (rear) signal frequency divided by oxygen sensor (front) signal frequency = 0.8 or more.

PROBABLE CAUSES

- Catalytic converter deteriorated
- Failed oxygen sensor (front)
- Failed oxygen sensor (rear)
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. Check for leakage of exhaust emission from exhaust manifold.

Q: Is the check result normal?
YES : Go to Step 2 .
NO : Repair.

STEP 2. M.U.T.-II/III data list

- Refer to Data List Reference Table P.13A-372.
  a. Item No. 11: Oxygen sensor (front)
  b. Item No. 59: Oxygen sensor (rear)

Q: Is the check result normal?
YES : Go to Step 3 .
NO : Perform the diagnosis code classified check procedure for the sensor that has shown an abnormal data valve (Refer to Inspection Chart for Diagnosis Codes P.13A-17).

STEP 3. M.U.T.-II/III data list

- Item No. 11: Oxygen sensor (front)

  OK: 0 – 0.4 and 0.6 – 1.0 volt should alternate 15 times or more within 10 seconds (engine speed at 2,000 r/min.).

Q: Is the check result normal?
YES : Go to Step 4 .
NO : Replace the oxygen sensor (front).

STEP 4. Replace the oxygen sensor (rear).

- After replacing the oxygen sensor (rear), re-check the trouble symptoms.

Q: Is the check result normal?
YES : The check is end.
NO : Go to Step 5 .

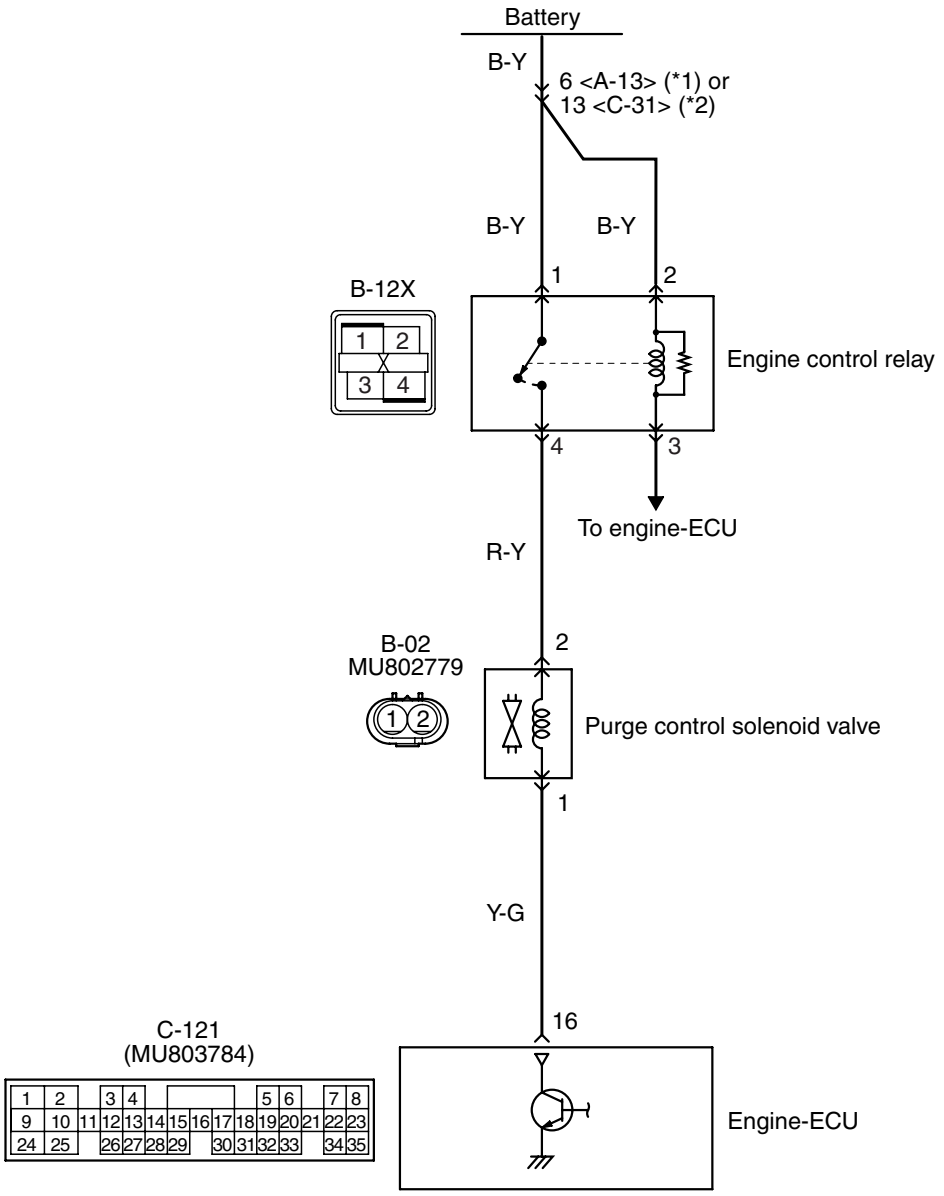
STEP 5. Replace the catalytic converter.

- After replacing the catalytic converter, re-check the trouble symptoms.

Q: Is the check result normal?
YES : The check is end.
NO : Replace the engine-ECU.

Code No. P0443: Purge Control Solenoid Valve System

Purge control solenoid valve circuit



NOTE
*1: L.H. drive vehicles
*2: R.H. drive vehicles

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

AK501815AB

OPERATION

- Power is supplied to the purge control solenoid valve (terminal No. 2) from the engine control relay (terminal No. 4).
- The engine-ECU (terminal No. 16) makes the power transistor in the unit be in "ON" position, and that makes currents go on the purge control solenoid valve (terminal No. 1).

FUNCTION

- In response to a signal from the engine-ECU, the purge control solenoid valve controls the flow rate of the purge air to be introduced into the surge tank.

TROUBLE JUDGMENT

Check Conditions

- Ignition switch: "ON"
- The battery voltage is 10 V or more.

Judgment Criterion

- The surge voltage (system voltage +2 V) of solenoid coil is not detected when the purge control solenoid valve is turned to OFF from ON.

PROBABLE CAUSES

- Failed purge control solenoid valve
- Open/short circuit in purge control solenoid value circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-II/III actuator test

- Item No. 08: Purge control solenoid valve

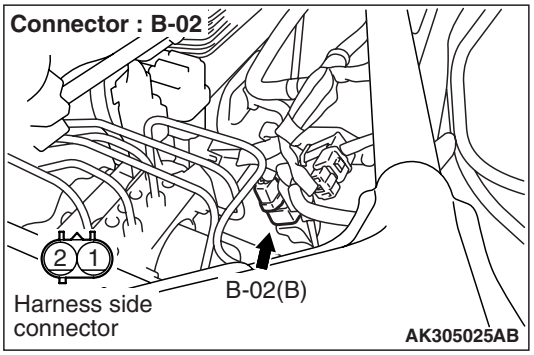
OK: Operating sound can be heard and the valve vibrates

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-5).

NO : Go to Step 2 .

STEP 2. Connector check: B-02 purge control solenoid valve connector

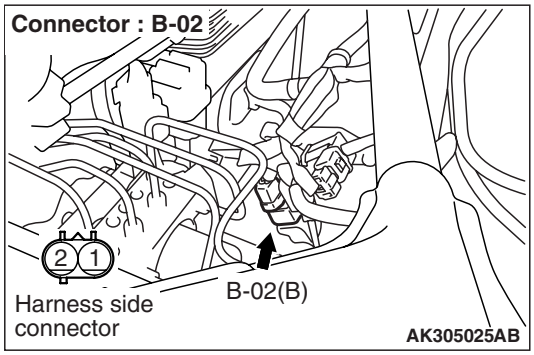


Q: Is the check result normal?

YES : Go to Step 3 .

NO : Repair or replace the connector.

STEP 3. Perform resistance measurement at B-02 purge control solenoid valve connector.



- Disconnect connector, and measure at solenoid valve side.
- Resistance between terminal No. 1 and No. 2.

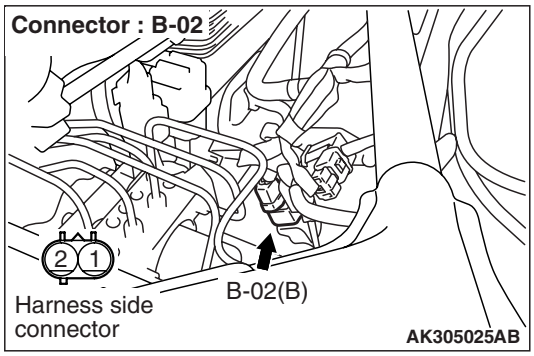
OK: 30 – 34 Ω (at 20°C)

Q: Is the check result normal?

YES : Go to Step 4 .

NO : Replace the purge control solenoid valve.

STEP 4. Perform voltage measurement at B-02 purge control solenoid valve connector.



- Disconnect connector, and measure at harness side.
- Ignition switch: "ON"
- Voltage between terminal No. 2 and earth.

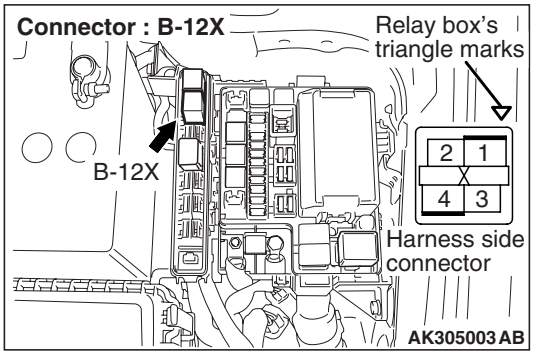
OK: System voltage

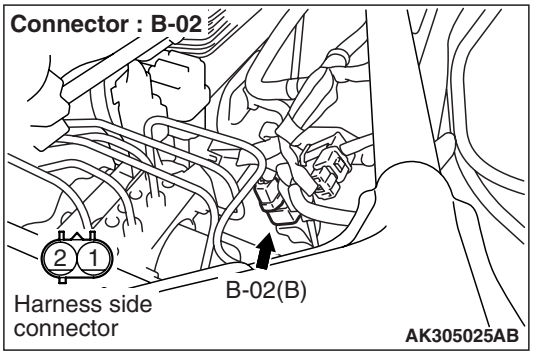
Q: Is the check result normal?

YES : Go to Step 6 .

NO : Go to Step 5 .

STEP 5. Connector check: B-12X engine control relay connector.





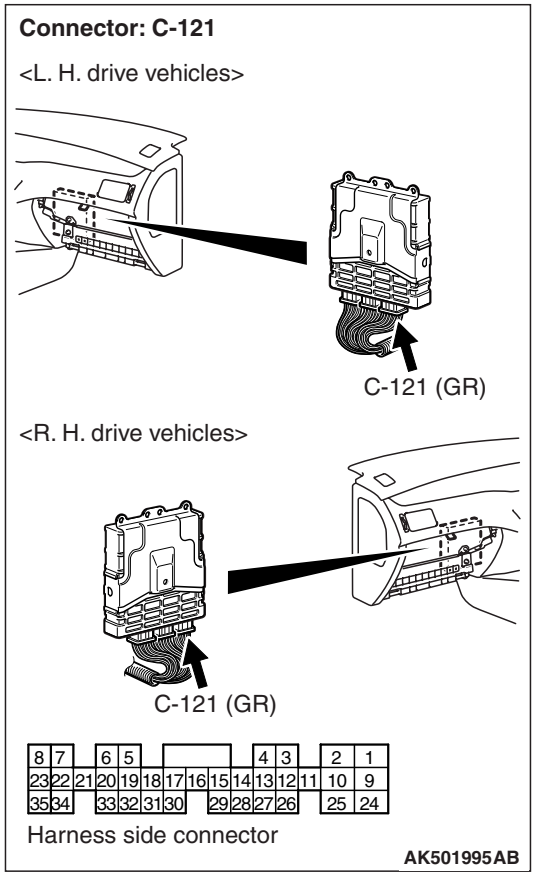
Q: Is the check result normal?

YES : Check and repair harness between B-02 (terminal No. 2) purge control solenoid valve connector and B-12X (terminal No. 4) engine control relay connector.

- Check power line for open/short circuit.

NO : Repair or replace the connector.

STEP 6. Perform voltage measurement at C-121 engine-ECU connector.



- Disconnect connector, and measure at harness side.
- Ignition switch: "ON"
- Voltage between terminal No. 16 and earth.

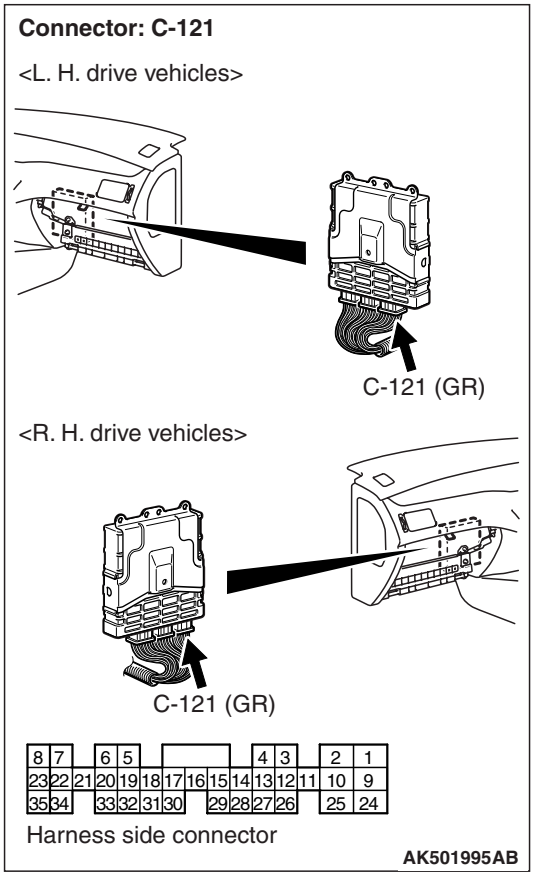
OK: System voltage

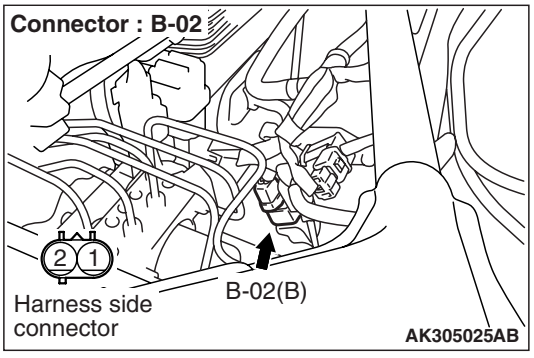
Q: Is the check result normal?

YES : Go to Step 8 .

NO : Go to Step 7 .

STEP 7. Connector check: C-121 engine-ECU connector





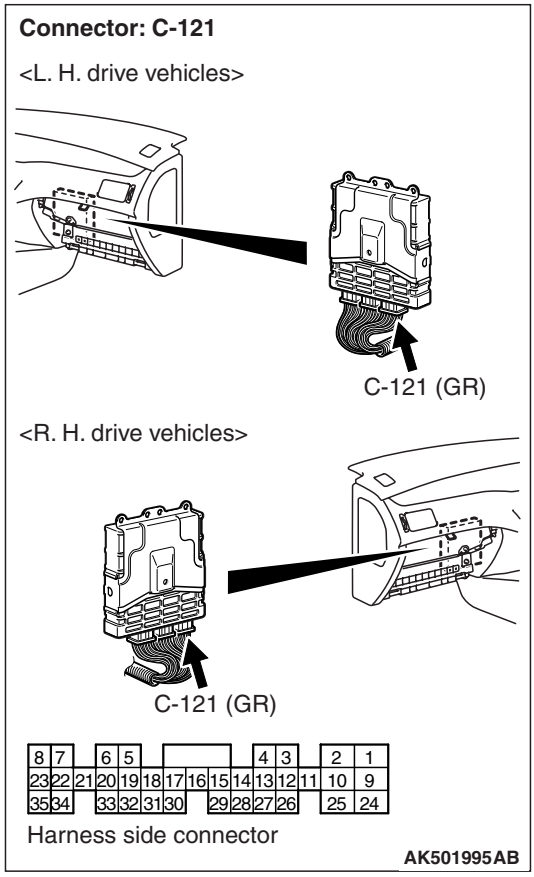
Q: Is the check result normal?

YES : Check and repair harness between B-02 (terminal No. 1) purge control solenoid valve connector and C-121 (terminal No. 16) engine-ECU connector.

- Check output line for open/short circuit.

NO : Repair or replace the connector.

STEP 8. Connector check: C-121 engine-ECU connector

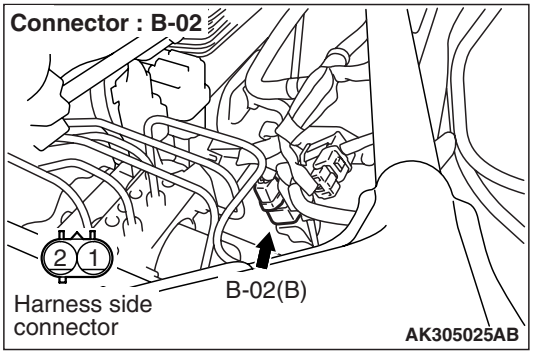


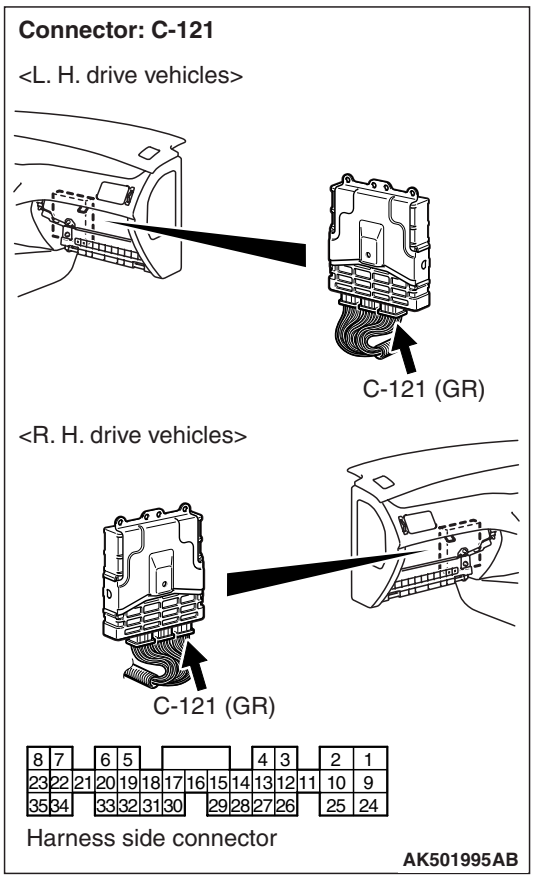
Q: Is the check result normal?

YES : Go to Step 9 .

NO : Repair or replace the connector.

STEP 9. Check harness between B-02 (terminal No. 1) purge control solenoid valve connector and C-121 (terminal No. 16) engine-ECU connector.

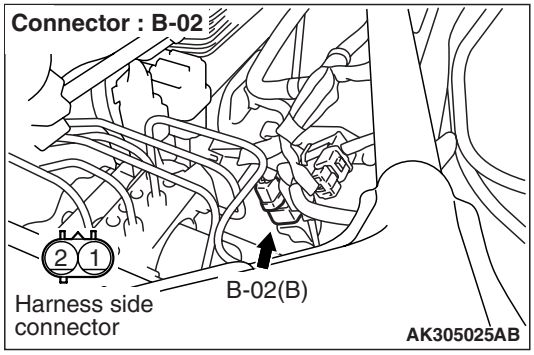


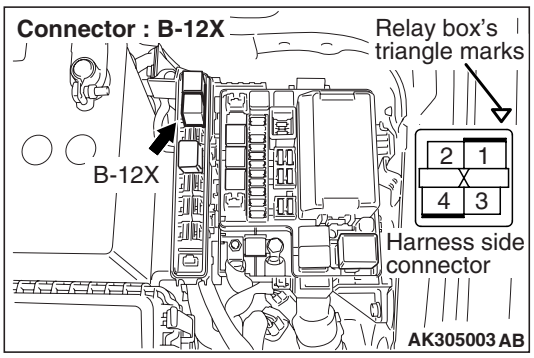


- Check output line for damage.

Q: Is the check result normal?
YES : Go to Step 10 .
NO : Repair the damaged harness wire.

STEP 10. Check harness between B-02 (terminal No. 2) purge control solenoid valve connector and B-12X (terminal No. 4) engine control relay connector.





- Check power supply line for damage.

Q: Is the check result normal?
YES : Go to Step 11 .
NO : Repair the damaged harness wire.

STEP 11. M.U.T.-II/III actuator test

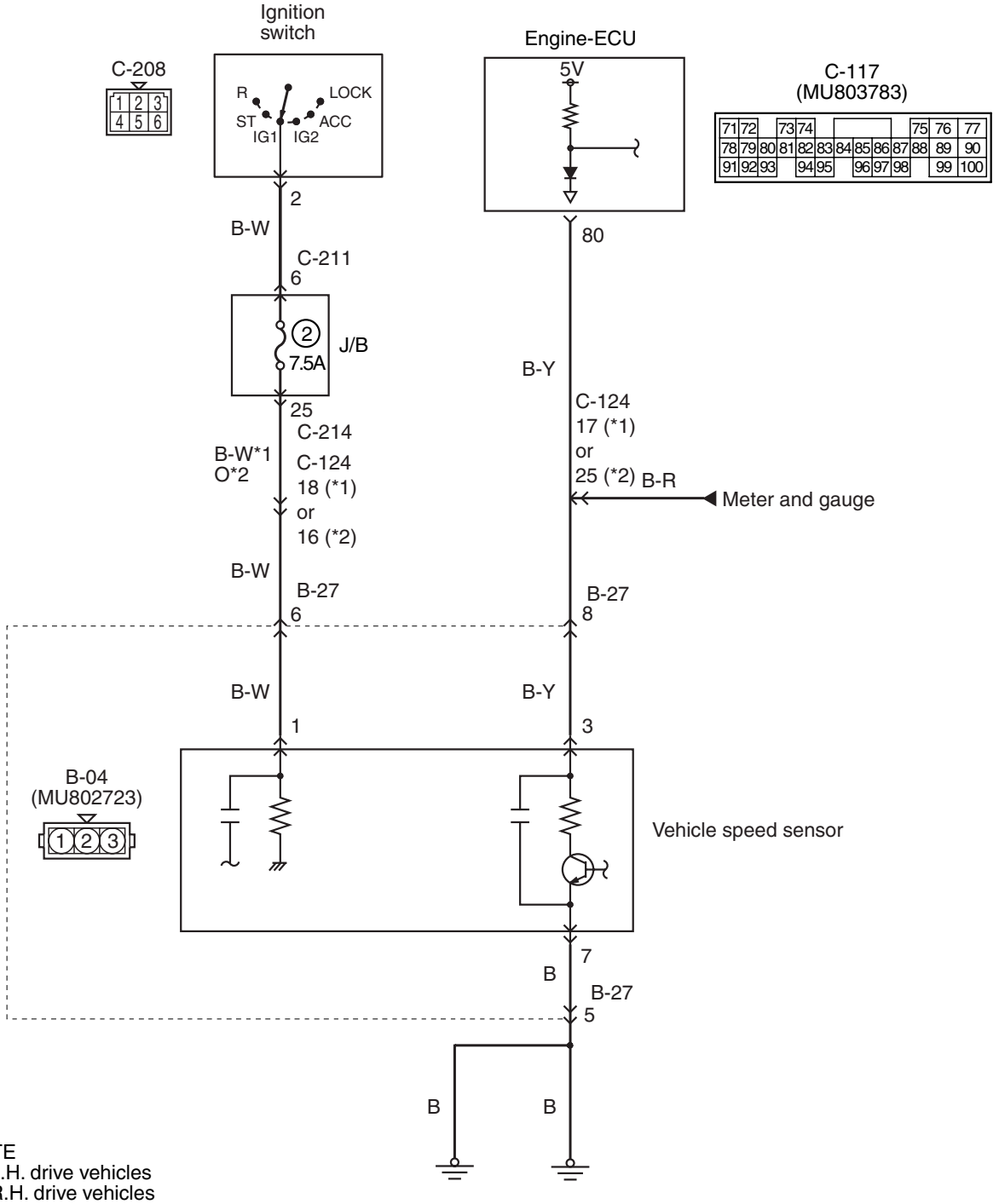
- Item No. 08: purge control solenoid valve

OK: Operating sound can be heard and the valve vibrates.

Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-5).
NO : Replace the engine-ECU.

Code No. P0500: Vehicle Speed Sensor System

Vehicle speed sensor circuit



NOTE
*1: L.H. drive vehicles
*2: R.H. drive vehicles

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

AK501816AB

OPERATION

- A power voltage of 5 V is applied to the vehicle speed sensor (terminal No. 3) from the engine-ECU (terminal No. 80).

FUNCTION

- The vehicle speed sensor converts the vehicle speed to the voltage, and then input it into the engine-ECU.

TROUBLE JUDGMENT

Check Conditions

- 2 seconds later after the engine has started up.
- The engine speed is 2,000 – 4,000 r/min.
- The volumetric efficiency is 60 – 80%.

Judgment Criterion

- The sensor output voltage remains unchanged (no pulse signal is inputted) for 2 seconds.

PROBABLE CAUSES

- Failed Vehicle speed sensor
- Open/short circuit in vehicle speed sensor circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. Check the speedometer

Q: Is the check result normal?

YES : Go to Step 2 .

NO : Check the speedometer (Refer to GROUP 54A –Combination Meter Assembly – On-vehicle Service P.54A-53).

STEP 2. M.U.T.-II/III data list

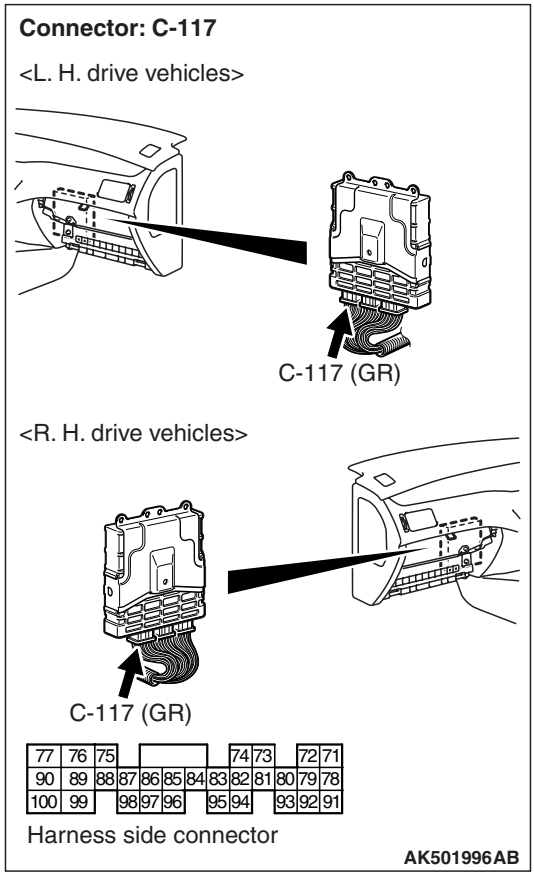
- Refer to Data List Reference Table P.13A-372.
  a. Item No. 24: Vehicle speed sensor

Q: Is the check result normal?

YES : Go to Step 3 .

NO : Intermittent malfunction (Refer to GROUP 00 - How to Use Troubleshooting/Inspection Service Points P.00-5).

STEP 3. Connector check: C-117 engine-ECU connector

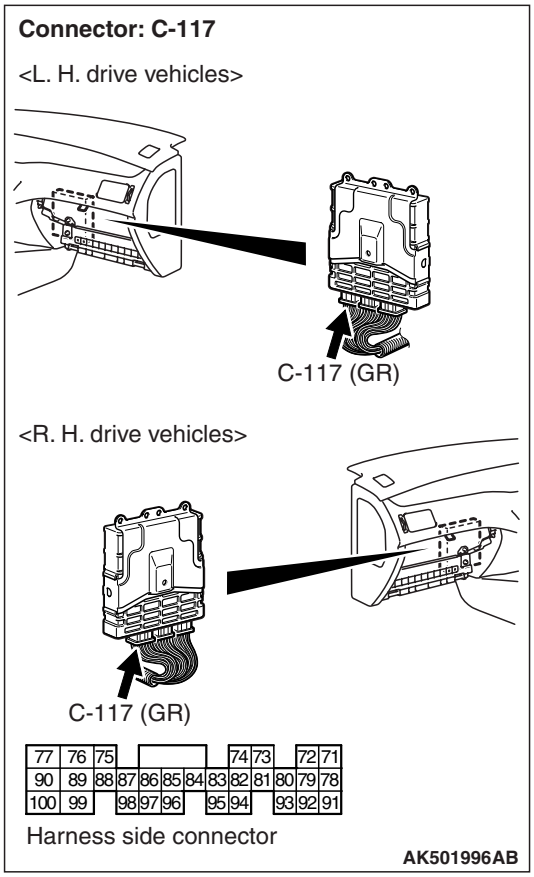


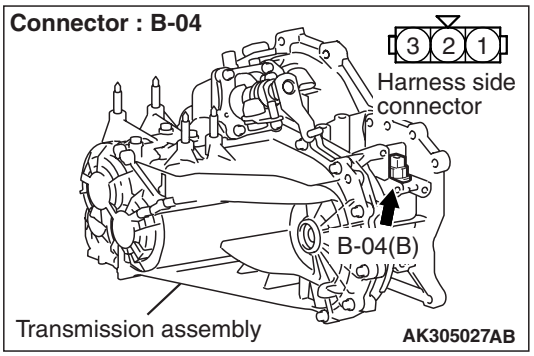
Q: Is the check result normal?

YES : Go to Step 4 .

NO : Repair or replace the connector.

STEP 4. Check harness between C-117 (terminal No. 80) engine-ECU connector and B-04 (terminal No. 3) vehicle speed sensor connector.





NOTE: Before checking harness, check intermediate connectors B-27 and C-124, and repair if necessary.

- Check output line for open circuit and damage.

Q: Is the check result normal?

YES : Go to Step 5 .

NO : Repair the damaged harness wire.

STEP 5. Check the trouble symptoms.

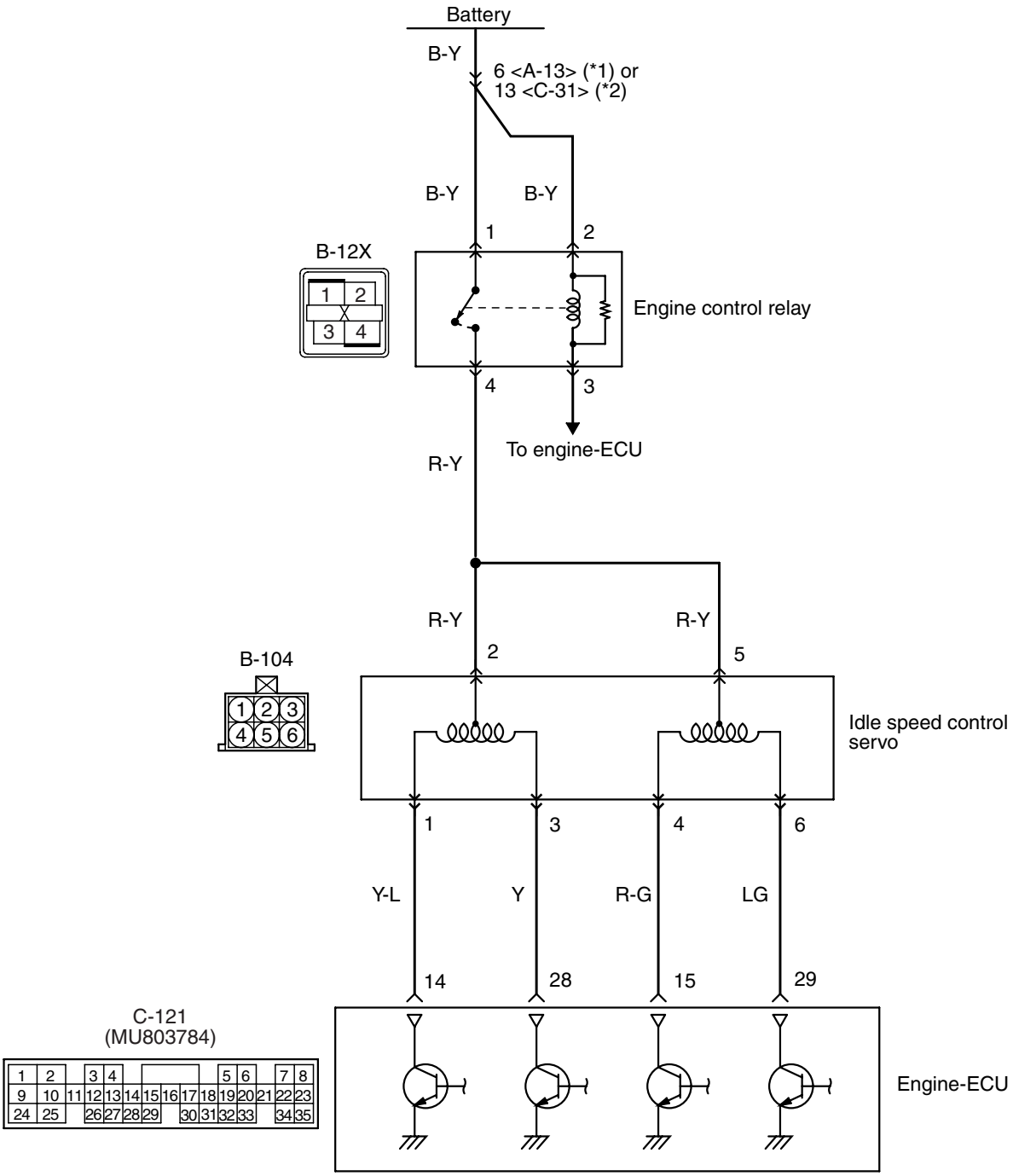
Q: Does trouble symptom persist?

YES : Replace the engine-ECU.

NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-5).

Code No P0505: Idle Speed Control Servo System

Idle speed control servo circuit



NOTE
*1: L.H. drive vehicles
*2: R.H. drive vehicles

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

AK501817AB

OPERATION

- The power is supplied to the idle speed control servo (terminal No. 2 and No. 5) from the engine control relay (terminal No. 4).
- The engine-ECU (terminal No. 14, No. 15, No. 28 and No. 29) makes power transistor in the unit be in "ON" position in order, and that makes currents go on the idle speed control servo (terminal No. 1, No. 3, No. 4 and No. 6).

FUNCTION

- The idle speed control servo opens and closes the servo valve in response to a signal from the engine-ECU to control the intake air flow rate during idling.

TROUBLE JUDGMENT

Check Conditions

- Vehicle speed has reached 1.5 km/h at least once.
- Under the closed loop idle speed control.

Judgment Criterion

- Actual idle speed has continued to be higher than the target idle speed by 300 r/min. or more for 10 seconds.

Check Conditions

- Vehicle speed has reached 1.5 km/h at least once.
- During idle speed closed loop control.
- The highest temperature at the last drive is 45°C or less.
- Engine coolant temperature is approximately 80°C or less.
- Battery voltage is 10 V or more.
- The barometric pressure is 76 kPa or higher.
- Intake air temperature is −10°C or more.

Judgment Criterion

- Actual idle speed has continued to be higher than the target idle speed by 200 r/min. or more for 10 seconds.

Check Conditions

- During idle speed closed loop control.
- Engine coolant temperature is approximately 80°C or less.
- Battery voltage is 10 V or more.
- Power steering fluid pressure switch is off.
- Volumetric efficiency is 40% or lower.
- The barometric pressure is 76 kPa or higher.
- Intake air temperature is −10°C or more.

Judgment Criterion

- Actual idle speed has continued to be higher than the target idle speed by 100 r/min. or more for 10 seconds.

PROBABLE CAUSES

- Failed idle speed control servo
- Open/short circuit in idle speed control servo circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-II/III data list

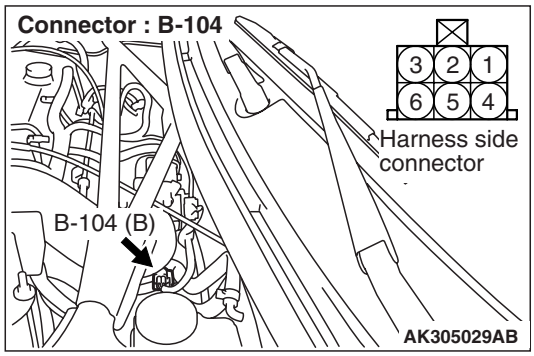
- Refer to Data List Reference Table P.13A-372.
  a. Item No. 45: Idle speed control servo

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 − How to Use Troubleshooting/Inspection Service Points P.00-5).

NO : Go to Step 2 .

STEP 2. Connector check: B-104 idle speed control servo connector



Q: Is the check result normal?

YES : Go to Step 3 .

NO : Repair or replace the connector.

STEP 3. Check idle speed control servo itself.

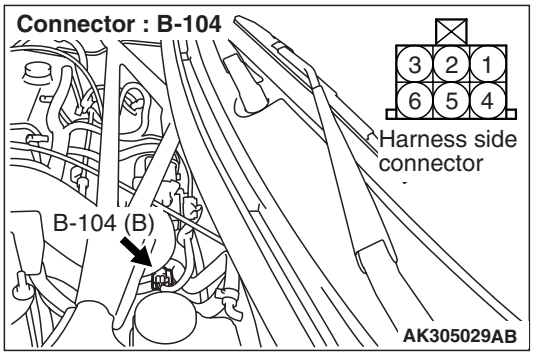
- Check idle speed control servo itself (Refer to P.13A-408).

Q: Is the check result normal?

YES : Go to Step 4 .

NO : Replace the idle speed control servo.

STEP 4. Perform voltage measurement at B-104 idle speed control servo connector.



- Disconnect connector, and measure at harness side.
- Ignition switch: "ON"
- Voltage between terminal No. 2 and earth, also between terminal No. 5 and earth.

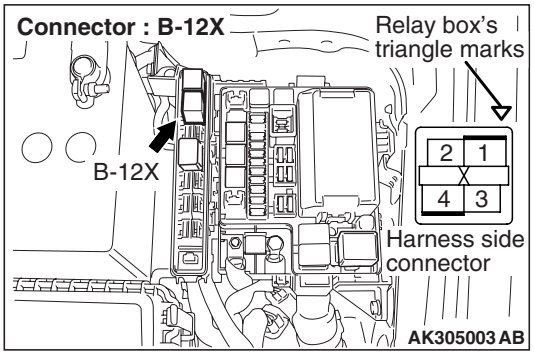
OK: System voltage

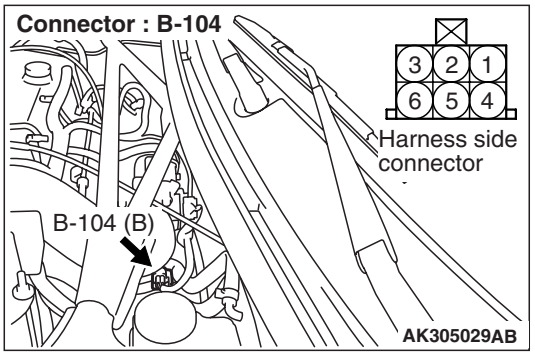
Q: Is the check result normal?

YES : Go to Step 6 .

NO : Go to Step 5 .

STEP 5. Connector check: B-12X engine control relay connector





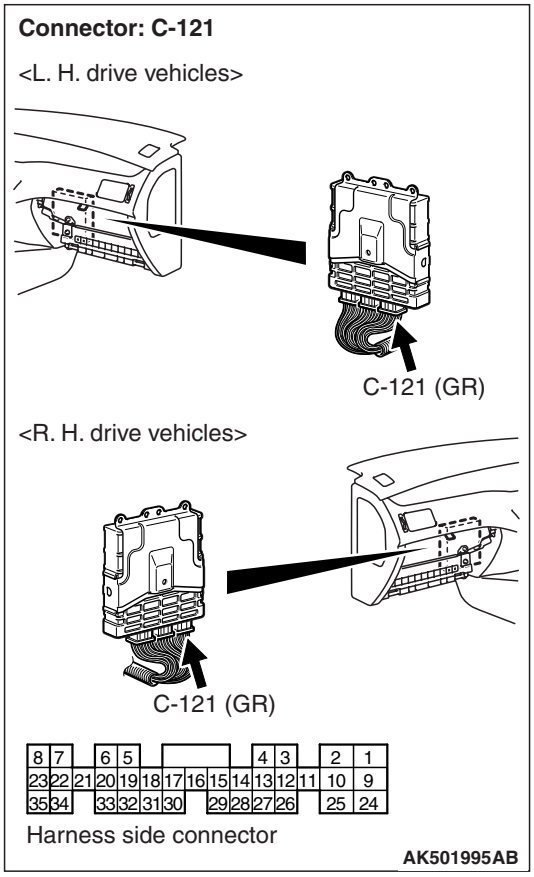
Q: Is the check result normal?

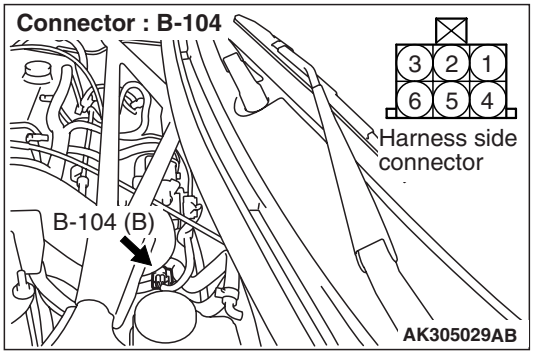
YES : Check and repair harness between B-104 (terminal No. 2 or No. 5) idle speed control servo connector and B-12X (terminal No. 4) engine control relay connector.

- Check power supply line for open/short circuit.

NO : Repair or replace the connector.

STEP 6. Perform voltage measurement at C-121 engine-ECU connector.





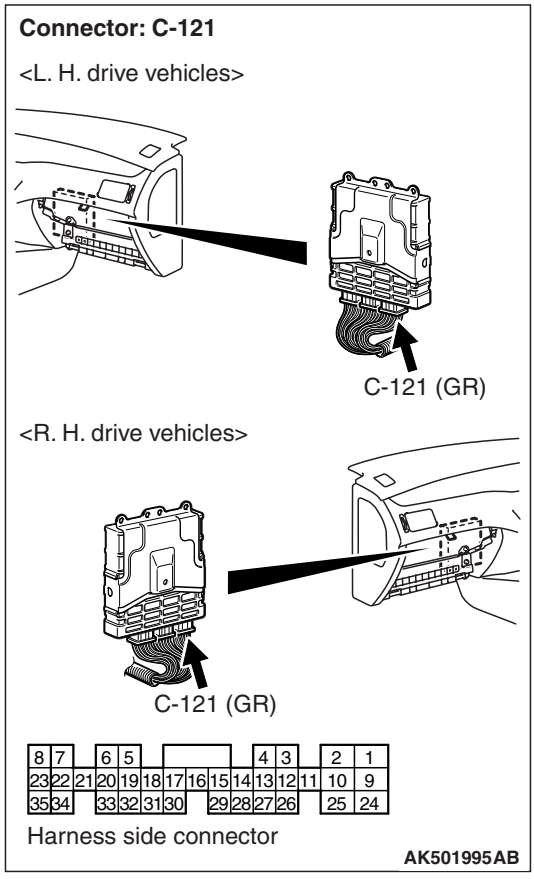
- Disconnect connector, and measure at harness side.
- Ignition switch: "ON"
- Voltage between terminal No. 14 and earth, between terminal No. 15 and earth, between terminal No. 28 and earth, also voltage between terminal No. 29 and earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Check and repair harness between B-104 idle speed control servo and C-121 engine-ECU.

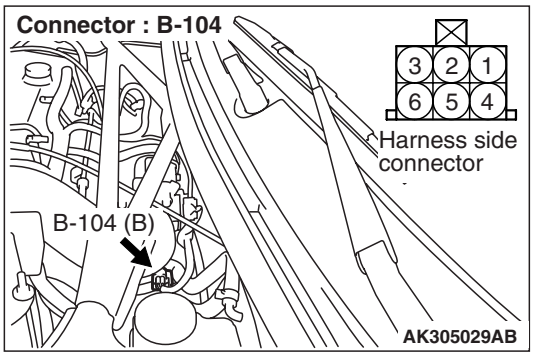
1. Harness between idle speed control servo terminal No. 1 and engine-ECU connector terminal No. 14
2. Harness between idle speed control servo terminal No. 3 and engine-ECU connector terminal No. 28
3. Harness between idle speed control servo terminal No. 4 and engine-ECU connector terminal No. 15
4. Harness between idle speed control servo terminal No. 6 and engine-ECU connector terminal No. 29
   - Check power supply line for open/short circuit.

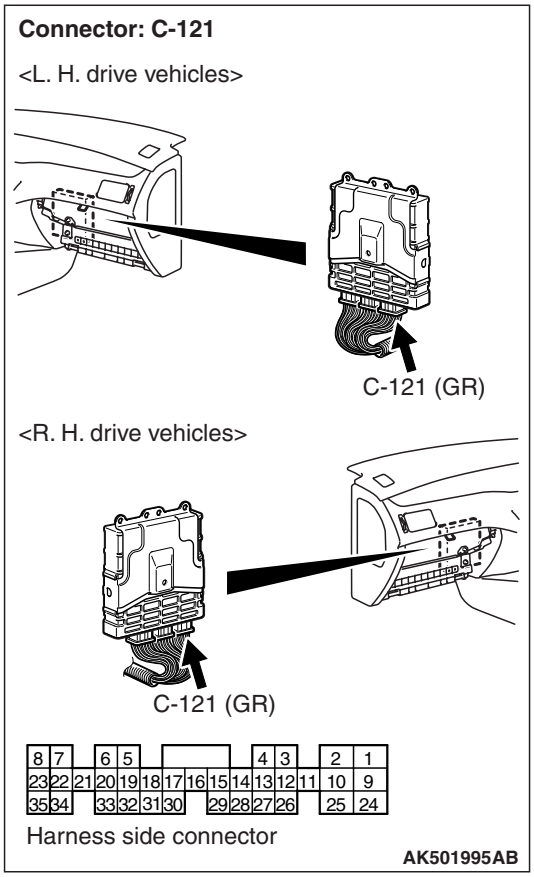
STEP 7. Connector check: C-121 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 8 .
NO : Repair or replace the connector.

STEP 8. Check harness between B-104 idle speed control servo and C-121 engine-ECU connector.



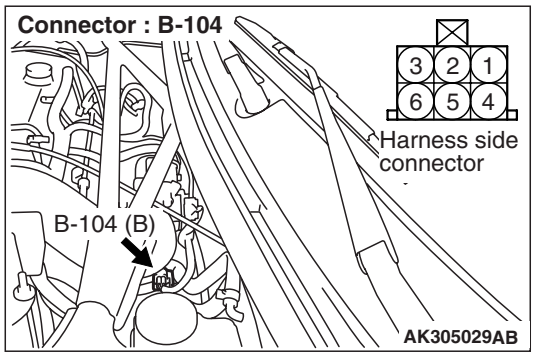


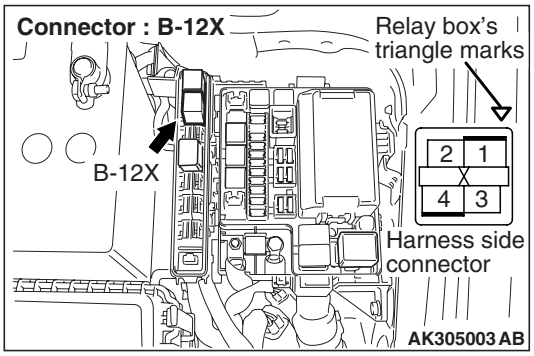
1. Harness between idle speed control servo terminal No. 1 and engine-ECU connector terminal No. 14
2. Harness between idle speed control servo terminal No. 3 and engine-ECU connector terminal No. 28
3. Harness between idle speed control servo terminal No. 4 and engine-ECU connector terminal No. 15
4. Harness between idle speed control servo terminal No. 6 and engine-ECU connector terminal No. 29

- Check output line for damage.

Q: Is the check result normal?
YES : Go to Step 9 .
NO : Repair the damaged harness wire.

STEP 9. Check harness between B-104 (terminal No. 2 or No. 5) idle speed control servo connector and B-12X (terminal No. 4) engine control relay connector.





- Check power supply line for damage.

Q: Is the check result normal?
YES : Go to Step 10 .
NO : Repair the damaged harness wire.

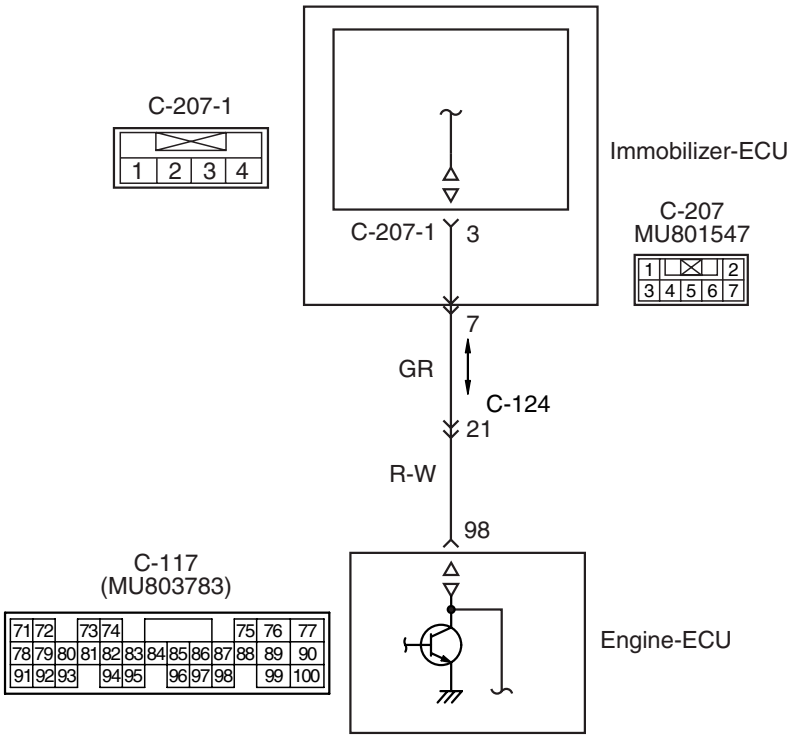
STEP 10. M.U.T.-II/III data list

- Refer to Data List Reference Table P.13A-372.
  a. Item No. 45: Idle speed control servo

Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-5).
NO : Replace the engine-ECU.

Code No. P0513: Immobilizer System

Immobilizer system circuit



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

AK501818AB

OPERATION

- The signals are sent and received between engine-ECU (terminal No. 98) and immobilizer-ECU (terminal No. 7).

FUNCTION

- Engine-ECU sends or receives the control signals to or from immobilizer-ECU to certify the ignition key.

NOTE:

- *If the registered ignition keys are close each other when starting the engine, radio interference may cause this code to be displayed.*
- *This code may be displayed when registering the key encrypted code.*

TROUBLE JUDGMENT

Check Condition

- Ignition switch: "ON"

Judgment Criterion

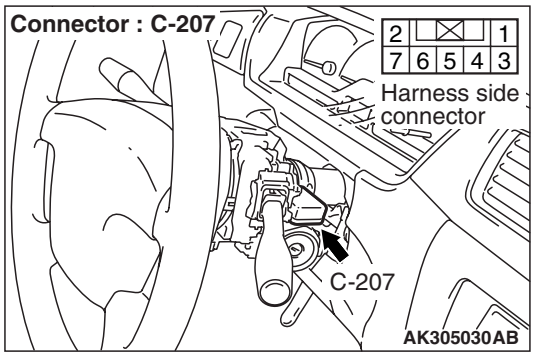
- When the communication error between the engine-ECU and the immobilizer-ECU continues for 2 seconds or more.

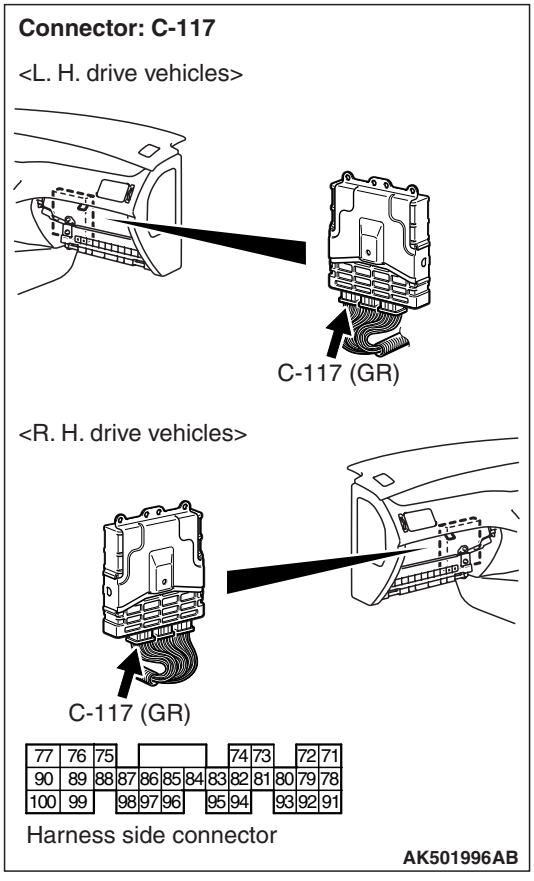
PROBABLE CAUSES

- Open/short circuit in immobilizer system circuit or loose connector contact
- Failed immobilizer-ECU
- Failed engine-ECU

DIAGNOSIS PROCEDURE

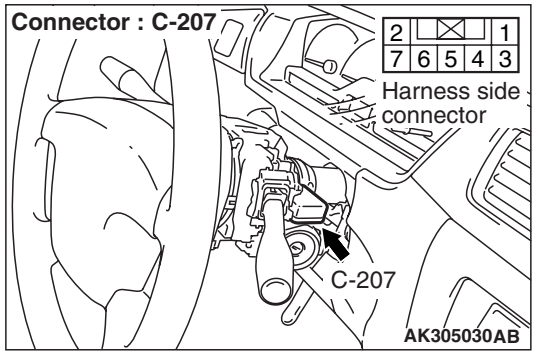
STEP 1. Connector check: C-207 immobilizer-ECU connector and C-117 engine-ECU connector

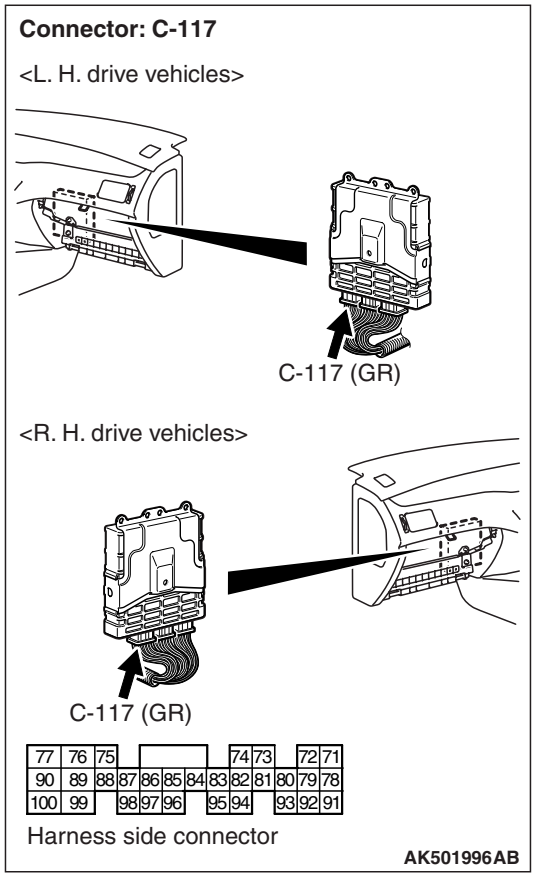




Q: Is the check result normal?
YES : Go to Step 2 .
NO : Repair or replace the connector.

STEP 2. Check harness between C-207 (terminal No. 7) immobilizer-ECU connector and C-117 (terminal No. 98) engine-ECU connector.





NOTE: Before checking harness, check intermediate connector C-124, and repair if necessary.

- Check output line for open/short circuit and damage.

Q: Is the check result normal?
YES : Go to Step 3 .
NO : Repair the damaged harness wire.

STEP 3. Check the trouble symptoms.

Q: Does trouble symptom persist?
YES : Go to Step 4 .
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-5).

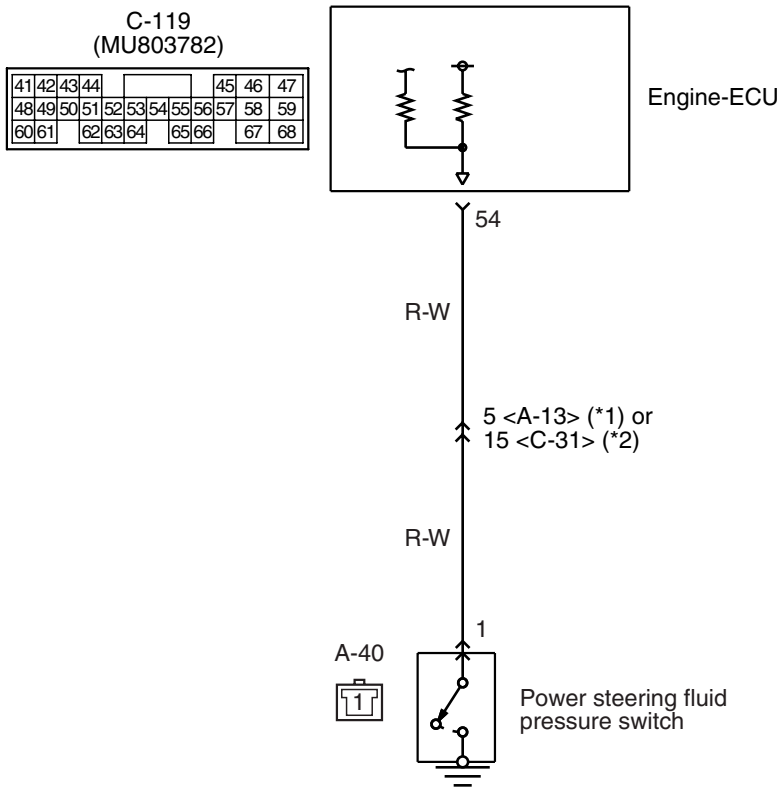
STEP 4. Replace the immobilizer-ECU.

- After replacing the immobilizer-ECU, re-check the trouble symptoms.

Q: Does trouble symptom persist?
YES : Replace the engine-ECU.
NO : The check is end.

Code No. P0551: Power Steering Fluid Pressure Switch System

Power steering fluid pressure switch circuit



NOTE
*1: L.H. drive vehicles
*2: R.H. drive vehicles

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

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CONDITION

- The battery voltage is applied to the power steering fluid pressure switch (terminal No. 1) from the engine-ECU (terminal No. 54).

FUNCTION

- It is detected whether a load is applied on the power steering fluid pump by steering or not, and the signal is inputted to the engine-ECU. When the power steering fluid pressure switch "ON" signal (a large load on the power steering fluid pump) is inputted, the engine-ECU provides the idle-up control.

TROUBLE JUDGMENT

Check Conditions

- The engine coolant temperature is 30°C or higher.
- Drive for 4 seconds or more with the vehicle speed is 50 km/h or more. Stop the vehicle (vehicle speed is 1.5 km/h or less). Repeat 10 times is more.

Judgment Criterion

- The power steering fluid pressure switch remains in "ON" position.

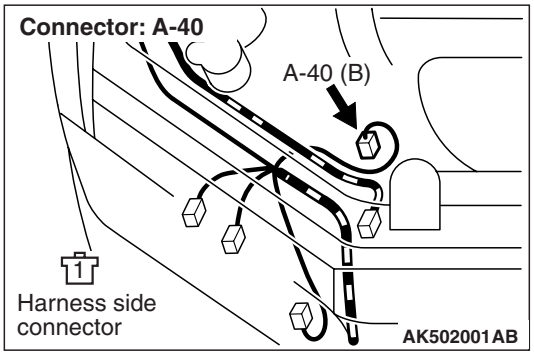
PROBABLE CAUSES

- Failed power steering fluid pressure switch
- Open/short circuit in power steering fluid pressure switch circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

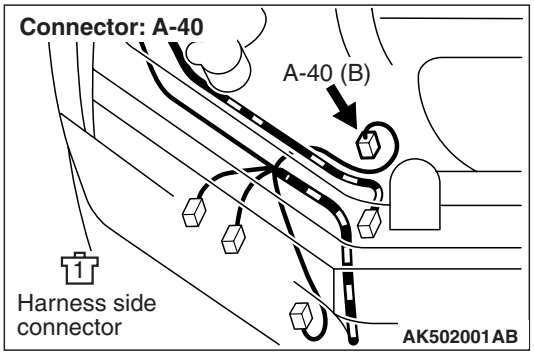
NOTE:
**1: L.H. drive vehicles*
**2: R.H. drive vehicles*

STEP 1. Connector check: A-40 power steering fluid pressure switch connector



Q: Is the check result normal?
YES : Go to Step 2 .
NO : Repair or replace the connector.

STEP 2. Perform voltage measurement at A-40 power steering fluid pressure switch connector.

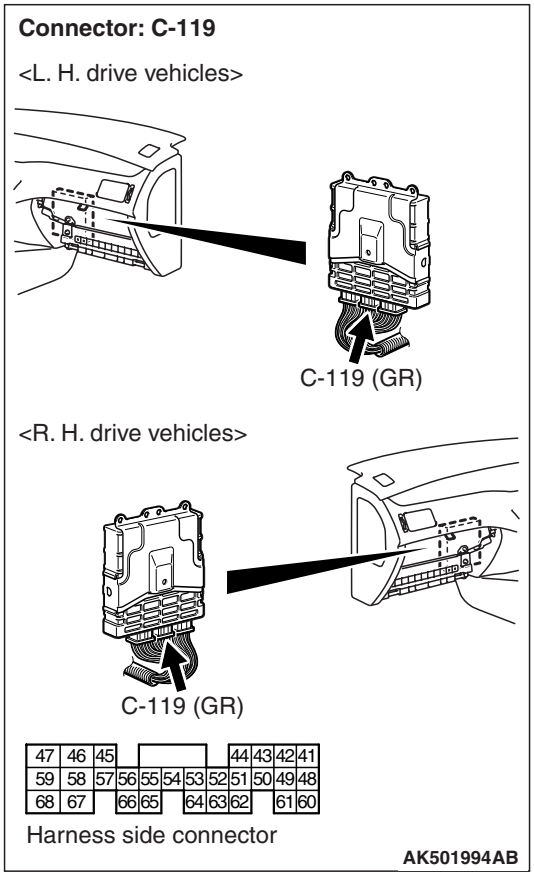


- Disconnect connector, and measure at harness side.
- Ignition switch: "ON"
- Voltage between terminal No. 1 and earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 8 .
NO : Go to Step 3 .

STEP 3. Perform voltage measurement at C-119 engine-ECU connector.



- Measure engine-ECU terminal voltage.
- Ignition switch: "ON"
- Voltage between terminal No. 54 and earth.

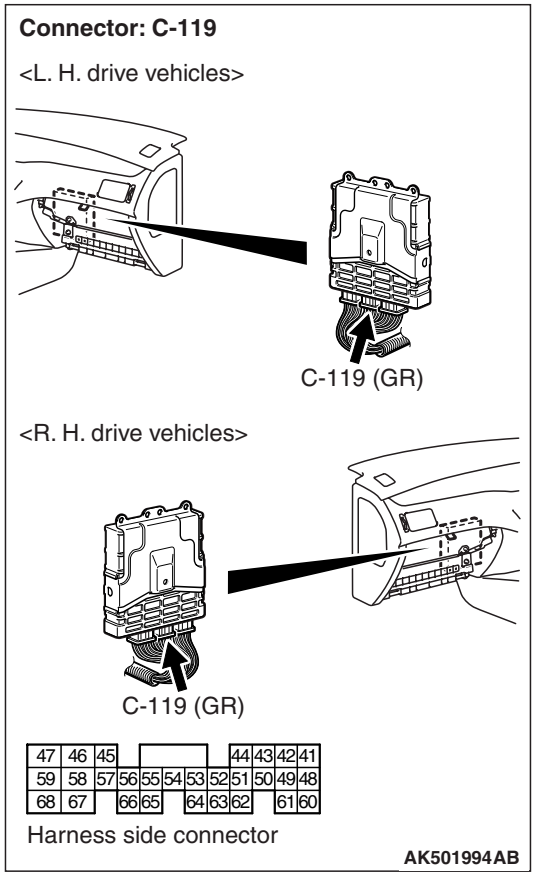
OK: System voltage

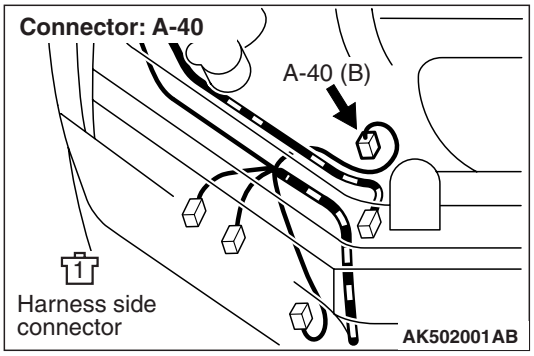
Q: Is the check result normal?

YES : Go to Step 4 .

NO : Go to Step 5 .

STEP 4. Connector check: C-119 engine-ECU connector





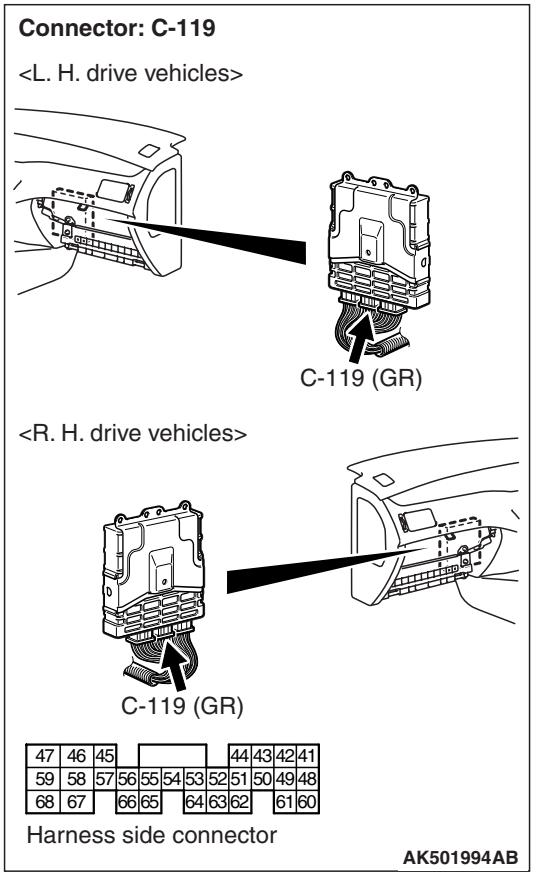
Q: Is the check result normal?

YES : Check intermediate connector A-13[*1] or C-31[*2], and repair if necessary. If intermediate connector is normal, check and repair harness between A-40 (terminal No. 1) power steering fluid pressure switch connector and C-119 (terminal No. 54) engine-ECU connector.

- Check output line for open circuit.

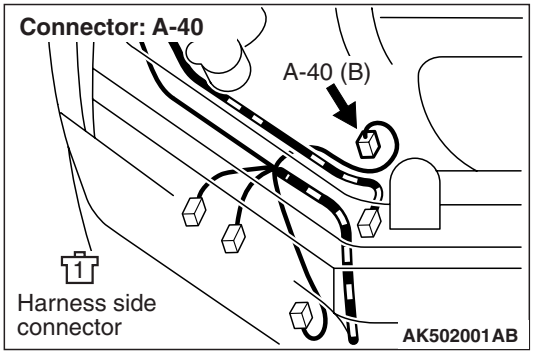
NO : Repair or replace the connector.

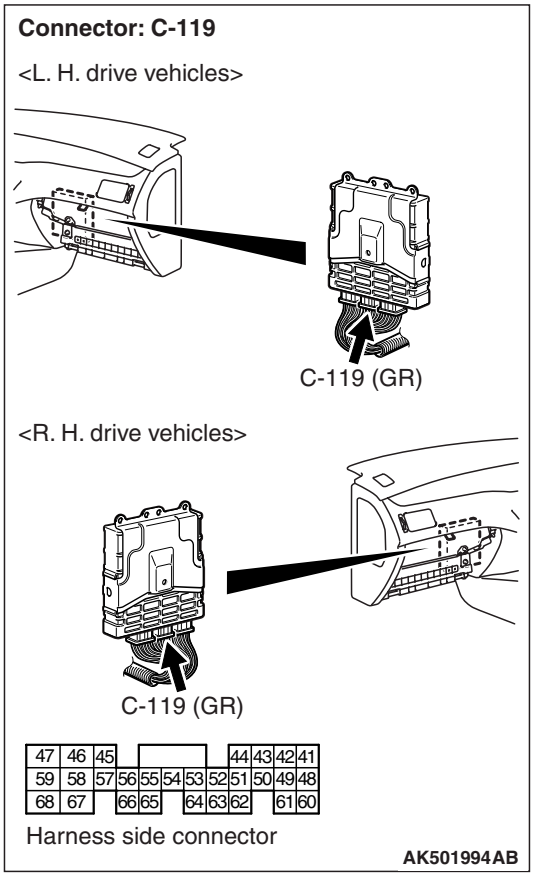
STEP 5. Connector check: C-119 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 6 .
NO : Repair or replace the connector.

STEP 6. Check harness between A-40 (terminal No. 1) power steering fluid pressure switch connector and C-119 (terminal No. 54) engine-ECU connector.





*NOTE: Before checking harness, check intermediate connector A-13[*1] or C-31[*2], and repair if necessary.*

- Check output line for short circuit.

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair the damaged harness wire.

STEP 7. M.U.T.-II/III data list

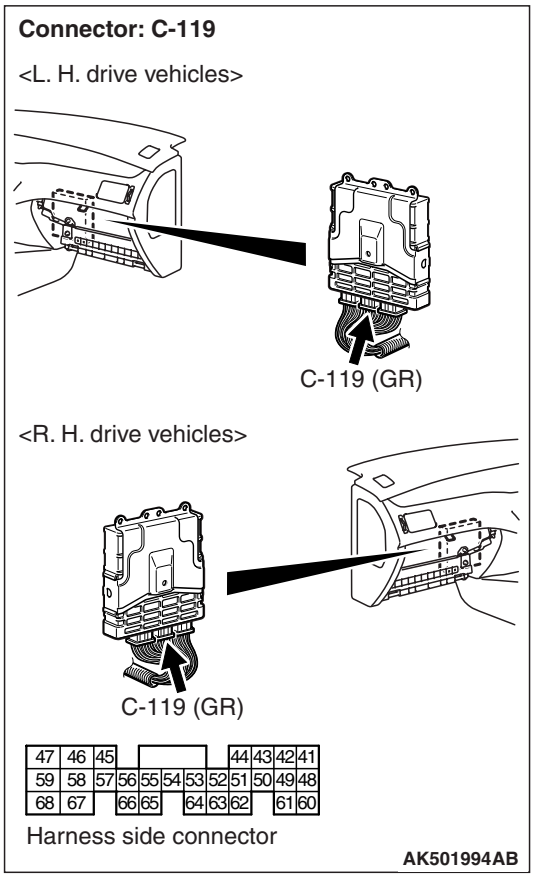
- Refer to Data List Reference Table P.13A-372.
  a. Item No. 27: Power steering fluid pressure switch

Q: Is the check result normal?

YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-5).

NO : Replace the engine-ECU.

STEP 8. Perform voltage measurement at C-119 engine-ECU connector.



- Measure engine-ECU terminal voltage.
- Engine: Idling
- Voltage between terminal No. 54 and earth.

OK:

System voltage (Steering wheel: Stationary)

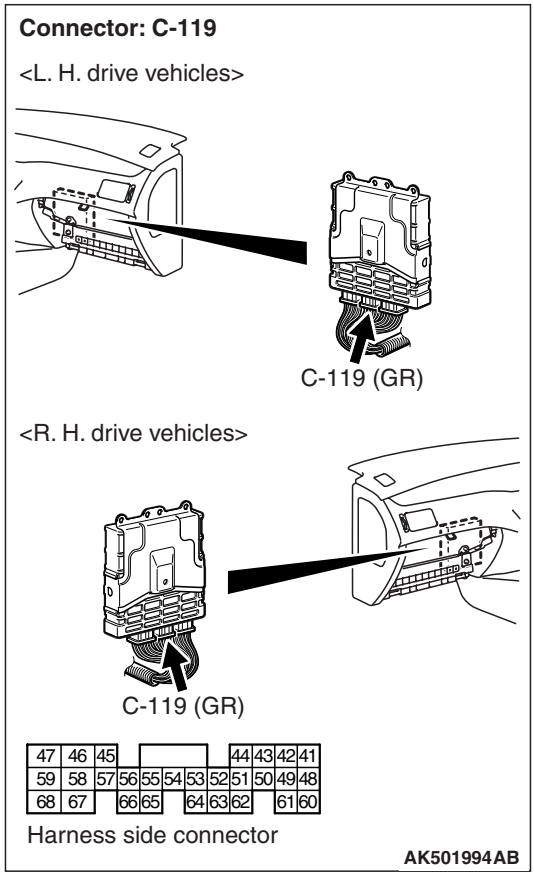
1 V or less (Steering wheel: Turned)

Q: Is the check result normal?

YES : Go to Step 11 .

NO : Go to Step 9 .

STEP 9. Connector check: C-119 engine-ECU connector

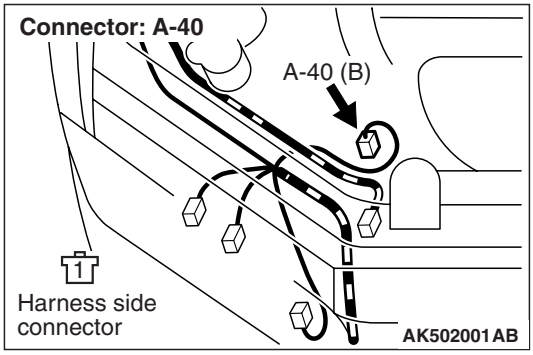


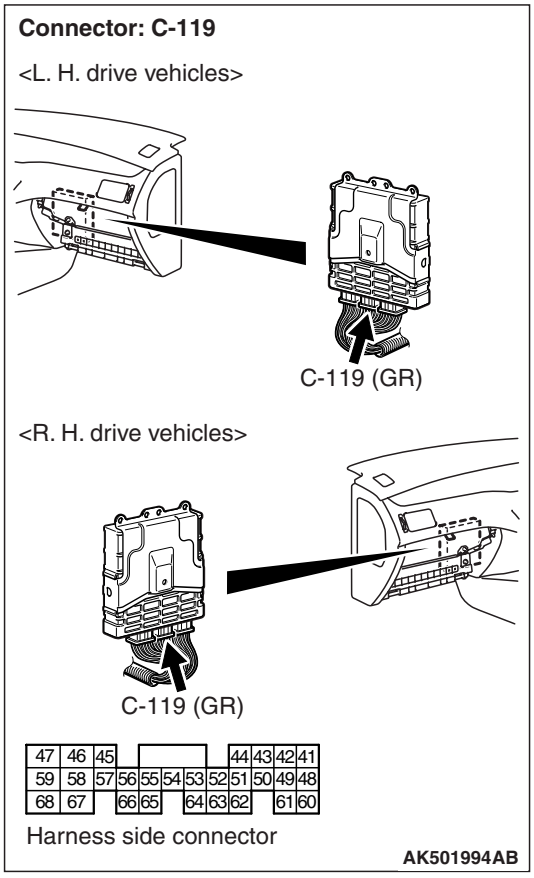
Q: Is the check result normal?

YES : Go to Step 10 .

NO : Repair or replace the connector.

STEP 10. Check harness between A-40 (terminal No. 1) power steering fluid pressure switch connector and C-119 (terminal No. 54) engine-ECU connector.





*NOTE: Before checking harness, check intermediate connector A-13[*1] or C-31[*2], and repair if necessary.*

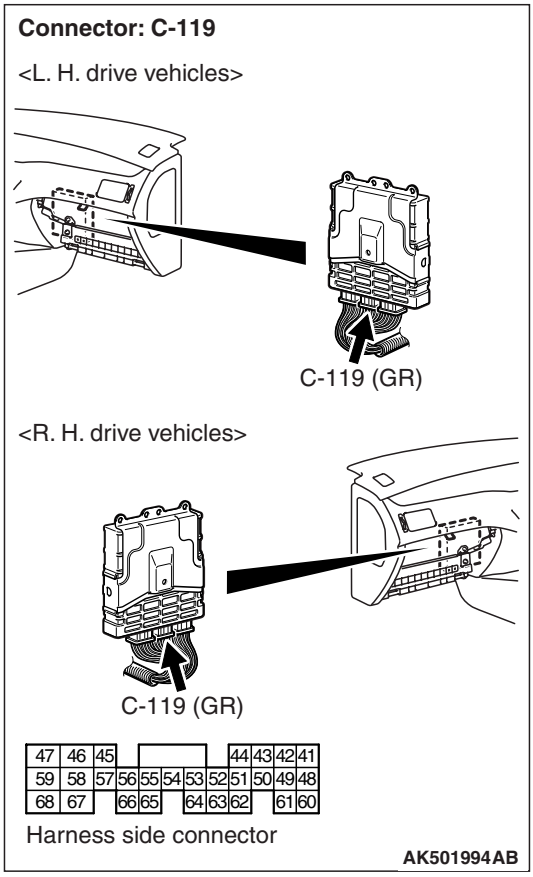
- Check output line for damage.

Q: Is the check result normal?

YES : Replace the power steering fluid pressure switch.

NO : Repair the damaged harness wire.

STEP 11. Connector check: C-119 engine-ECU connector



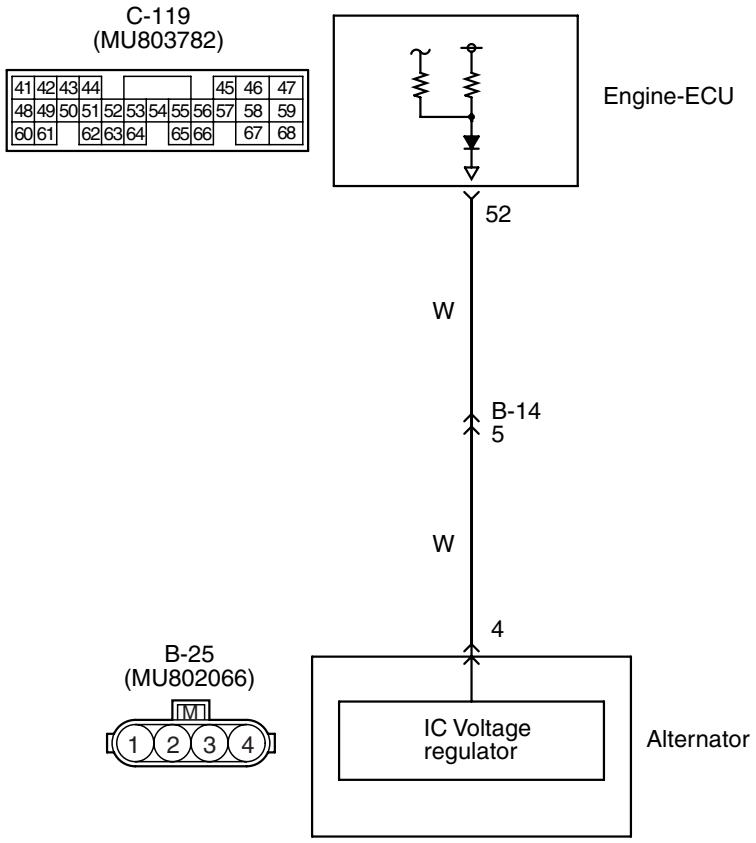
Q: Is the check result normal?

YES : Go to Step 7 .

NO : Repair or replace the connector.

Code No. P0622: Alternator FR Terminal System

Alternator FR terminal circuit



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

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OPERATION

- The energized state of the alternator field coil is inputted from the alternator (terminal No. 4) to the engine-ECU (terminal No. 52).

FUNCTION

- A signal of the power supply duty ratio for the alternator field coil is inputted to the engine-ECU.
- In response to the signal, the engine-ECU detects the alternator output current and controls the idling speed according to the output current (electric load).

TROUBLE JUDGMENT

Check Condition

- Engine speed is 50 r/min. or more.

Judgment Criterion

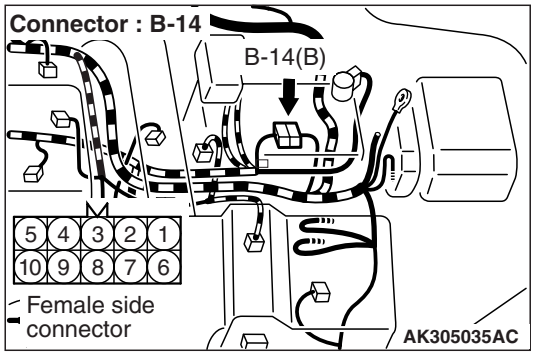
- Input voltage from alternator FR terminal is the system voltage or more for 20 seconds.

PROBABLE CAUSES

- Open circuit in alternator FR terminal circuit
- Failed engine-ECU

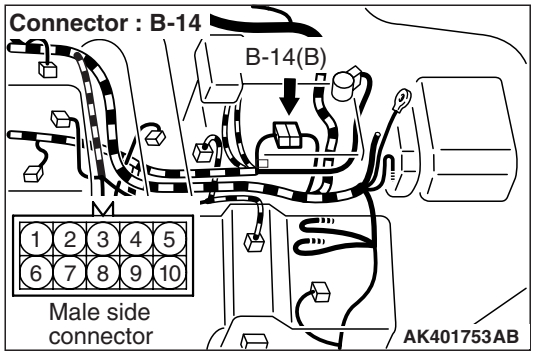
DIAGNOSIS PROCEDURE

STEP 1. Connector check: B-14 intermediate connector



Q: Is the check result normal?
YES : Go to Step 2 .
NO : Repair or replace the connector.

STEP 2. Perform voltage measurement at B-14 intermediate connector.

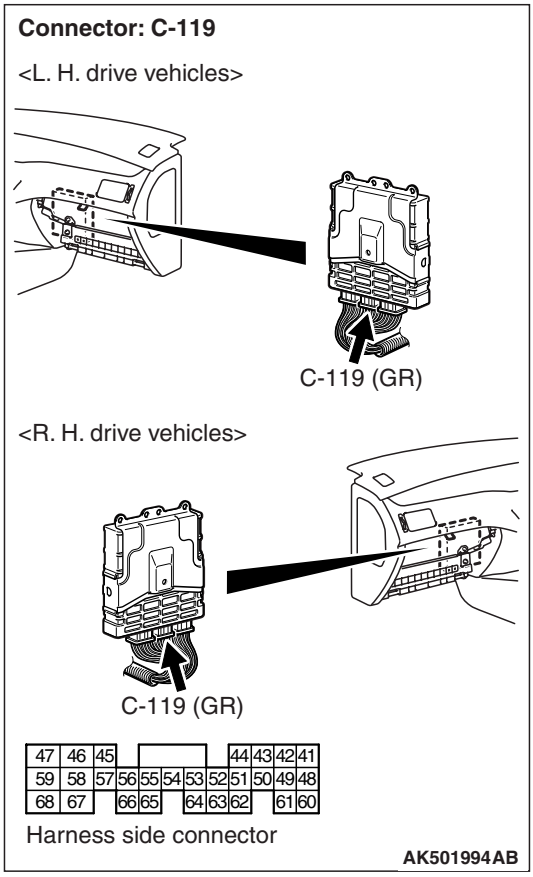


- Disconnect connector, and measure at male connector side.
- Ignition switch: "ON"
- Voltage between terminal No. 5 and earth.

OK: System voltage

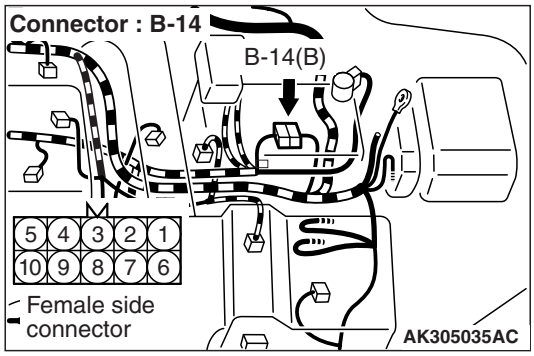
Q: Is the check result normal?
YES : Go to Step 6 .
NO : Go to Step 3 .

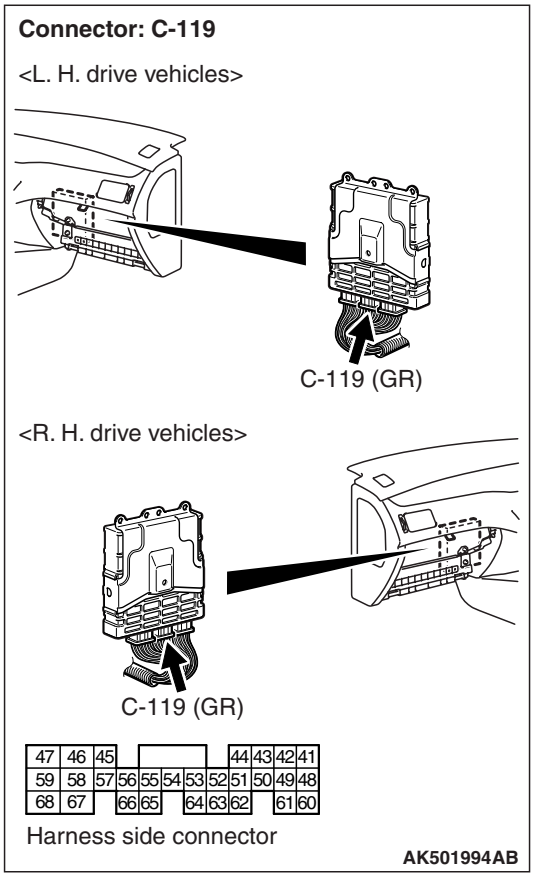
STEP 3. Connector check: C-119 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 4 .
NO : Repair or replace the connector.

STEP 4. Check harness between B-14 (terminal No. 5) intermediate connector and C-119 (terminal No. 52) engine-ECU connector.





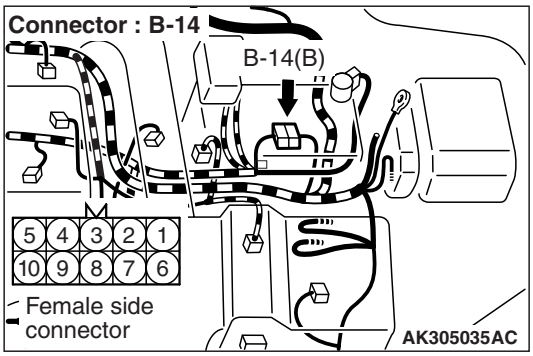
- Check output line for short circuit.

Q: Is the check result normal?
YES : Go to Step 5 .
NO : Repair the damaged harness wire.

STEP 5. Check the trouble symptoms.

Q: Does trouble symptom persist?
YES : Replace the engine-ECU.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-5).

STEP 6. Perform voltage measurement at B-14 intermediate connector.

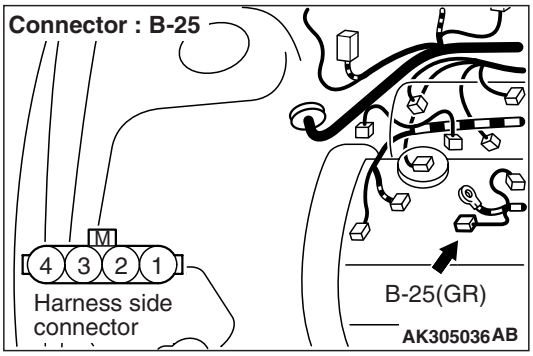


- Use special tool test harness (MB991658) to connect connector, and measure at pick-up harness.
- Ignition switch: "ON"
- Voltage between terminal No. 5 and earth.

OK: System voltage

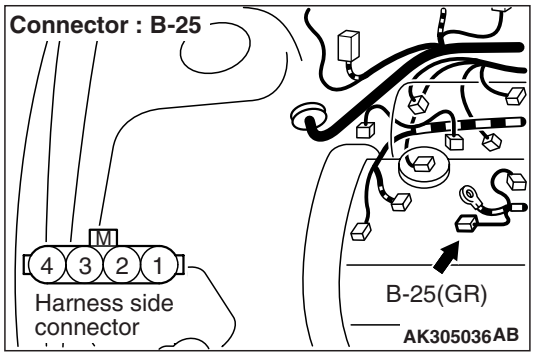
Q: Is the check result normal?
YES : Go to Step 9 .
NO : Go to Step 7 .

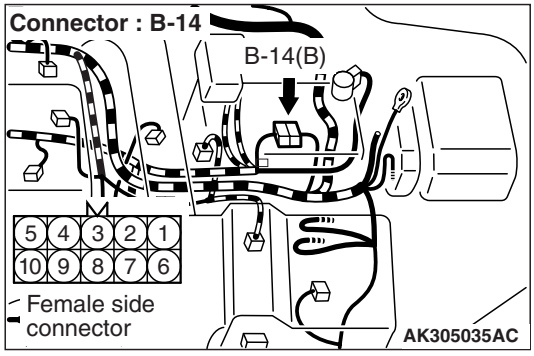
STEP 7. Connector check: B-25 alternator connector



Q: Is the check result normal?
YES : Go to Step 8 .
NO : Repair or replace the connector.

STEP 8. Check harness between B-25 (terminal No. 4) alternator connector and B-14 (terminal No. 5) intermediate connector.

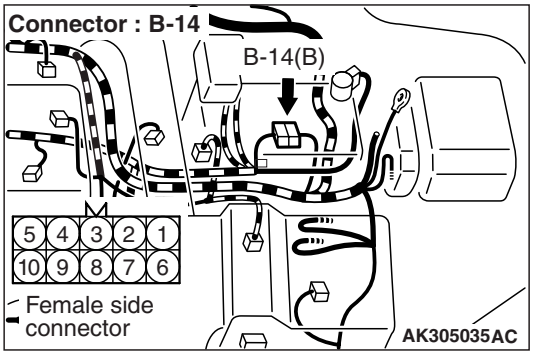




- Check output line for short circuit.

Q: Is the check result normal?
YES : Replace the alternator.
NO : Repair the damaged harness wire.

STEP 9. Perform voltage measurement at B-14 intermediate connector.

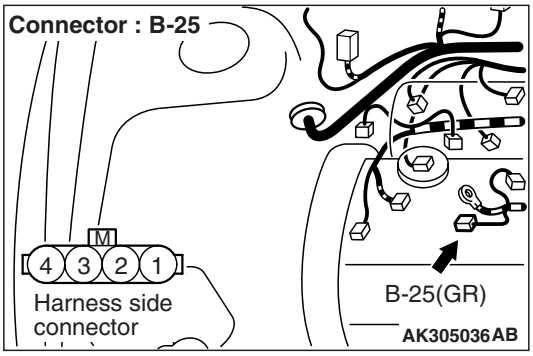


- Use special tool test harness (MB991658) to connect connector, and measure at pick-up harness.
- Engine: Idle after warm-up
- Transmission: Neutral
- Radiator fan: Inactive
- Voltage between terminal No. 5 and earth.

  OK: Switching the headlamps to ON from OFF causes the voltage to fall.

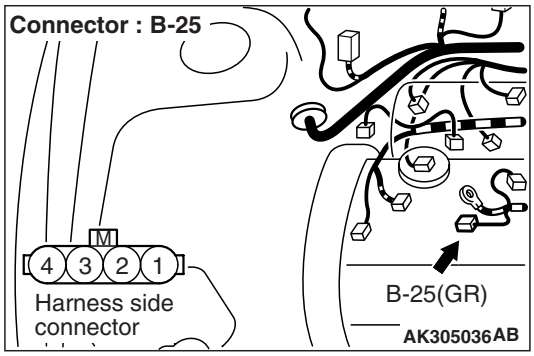
Q: Is the check result normal?
YES : Go to Step 5 .
NO : Go to Step 10 .

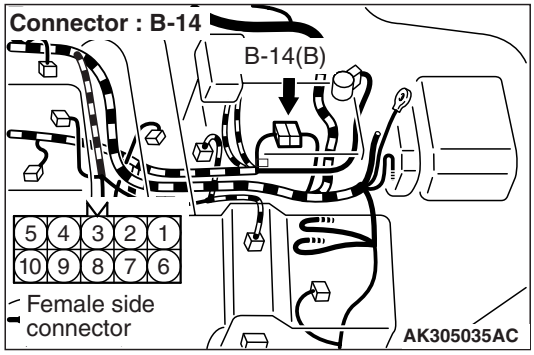
STEP 10. Connector check: B-25 alternator connector



Q: Is the check result normal?
YES : Go to Step 11 .
NO : Repair or replace the connector.

STEP 11. Check harness between B-25 (terminal No. 4) alternator connector and B-14 (terminal No. 5) intermediate connector.

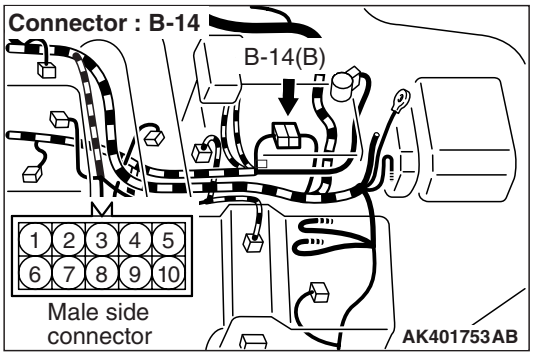


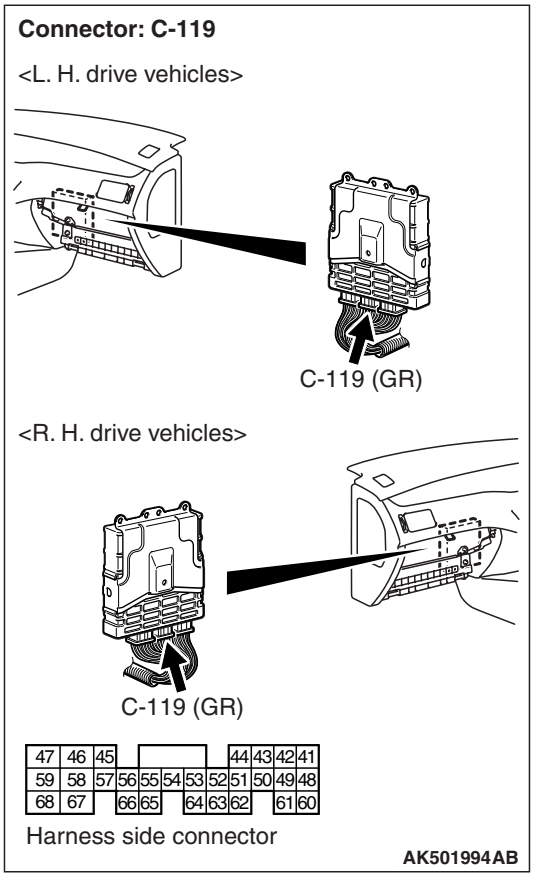


- Check output line for damage.

Q: Is the check result normal?
YES : Go to Step 12 .
NO : Repair the damaged harness wire.

STEP 12. Check harness between B-14 (terminal No. 5) intermediate connector and C-119 (terminal No. 52) engine-ECU connector.





- Check output line for damage.

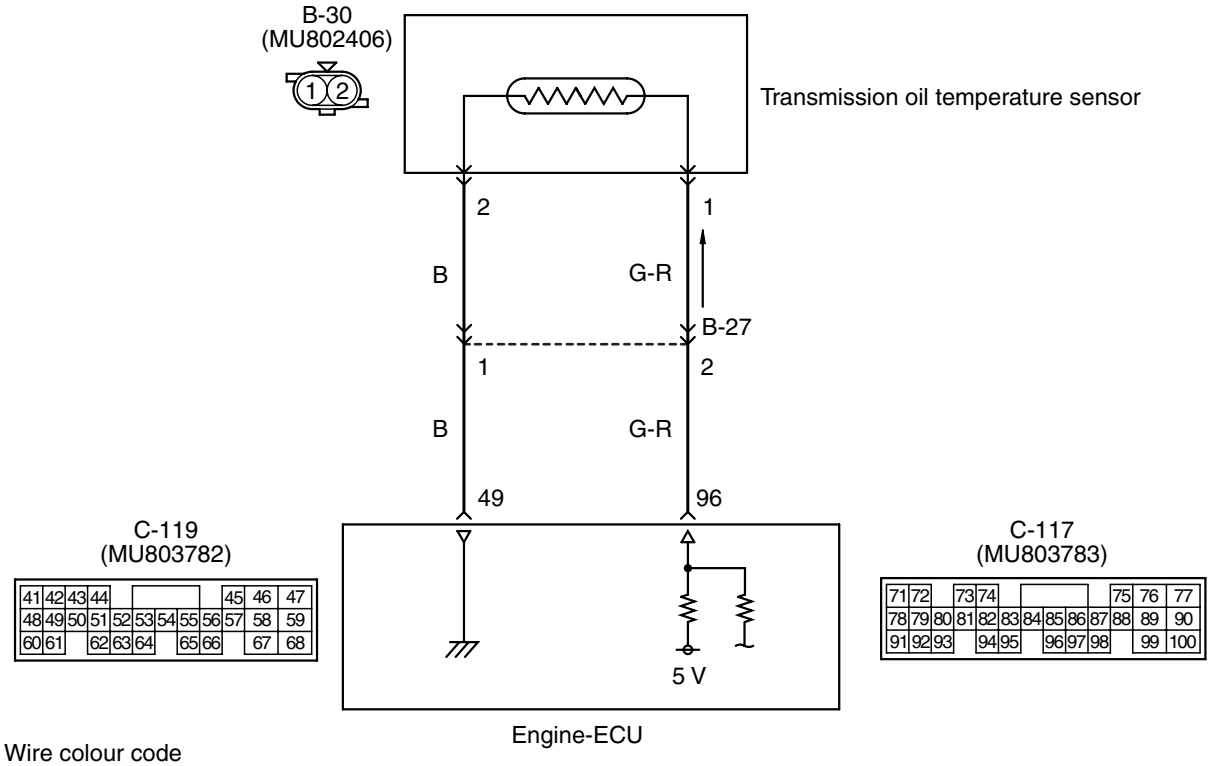
Q: Is the check result normal?
YES : Go to Step 13 .
NO : Repair the damaged harness wire.

STEP 13. Check the trouble symptoms.

Q: Does trouble symptom persist?
YES : Replace the alternator.
NO : Intermittent malfunction (Refer to Group 00 – How to Use troubleshooting/Inspection Service Points P.00-5).

Code No. P0710: Transmisson Oil Temperature Sensor System

Transmission oil temperature sensor circuit



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

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OPERATION

- A power voltage of 5 V is applied to the transmission oil temperature sensor output terminal (terminal No. 1) from the engine-ECU (terminal No. 96).
- The power voltage is earthed to the engine-ECU (terminal No. 49) from the transmission oil temperature sensor (terminal No. 2).

FUNCTION

- The transmission oil temperature sensor converts the transmission oil temperature into a voltage signal, and inputs the voltage to the engine-ECU.
- The engine-ECU controls the boost pressure, based on this signal.
- The transmission oil temperature sensor is a kind of resistor, which has characteristics to reduce its resistance as the transmission oil temperature rises. Therefore, the sensor output voltage varies with the transmission oil temperature, and becomes lower as the transmission oil temperature rises.

TROUBLE JUDGMENT

Check Conditions

- 2 seconds later after the ignition switch has been in "ON" position or the engine has started up.
- The engine coolant temperature of 82°C or more.

Judgment Criteria

- The sensor output voltage of 4.8 V or more (transmission oil temperature of −40°C or equivalent) for 2 seconds,

or

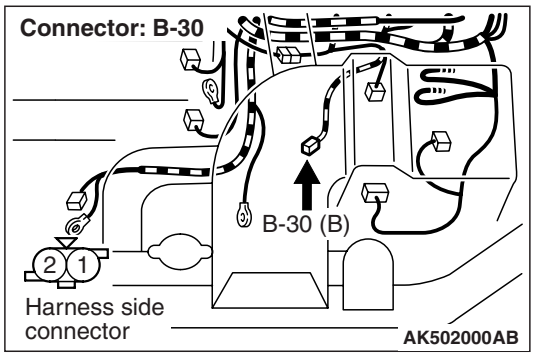
- The sensor output voltage of 0.1 V or less (transmission oil temperature of 150°C or more, or equivalent) for 2 seconds.

PROBABLE CAUSES

- Failed transmission oil temperature sensor
- Open/short circuit in transmission oil temperature sensor circuit or loose connector contact
- Failed engine-ECU

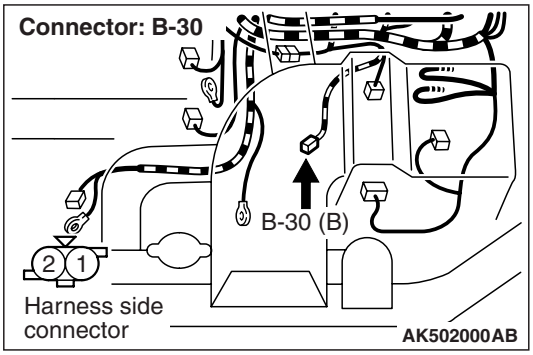
DIAGNOSIS PROCEDURE

STEP 1. Connector check: B-30 transmission oil temperature sensor connector



Q: Is the check result normal?
YES : Go to Step 3 .
NO : Repair or replace the connector.

STEP 2. Perform resistance measurement at B-30 transmission oil temperature sensor connector.

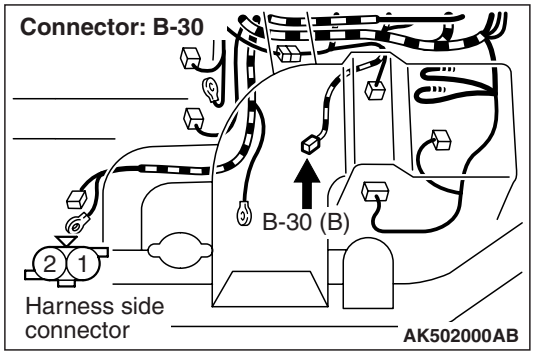


- Disconnect connector, and measure at sensor side.
- Resistance between terminal No. 1 and No. 2.

OK:
Transmission oil temperature at –20°C: 14 – 17 kΩ
Transmission oil temperature at 0°C: 5.1 – 6.5 kΩ
Transmission oil temperature at 20°C: 2.1 – 2.7 kΩ
Transmission oil temperature at 40°C: 0.9 – 1.3 kΩ
Transmission oil temperature at 60°C: 0.48 – 0.68 kΩ
Transmission oil temperature at 80°C: 0.26 – 0.36 kΩ

Q: Is the check result normal?
YES : Go to Step 3 .
NO : Replace the transmission oil temperature sensor.

STEP 3. Perform voltage measurement at B-30 transmission oil temperature sensor connector.

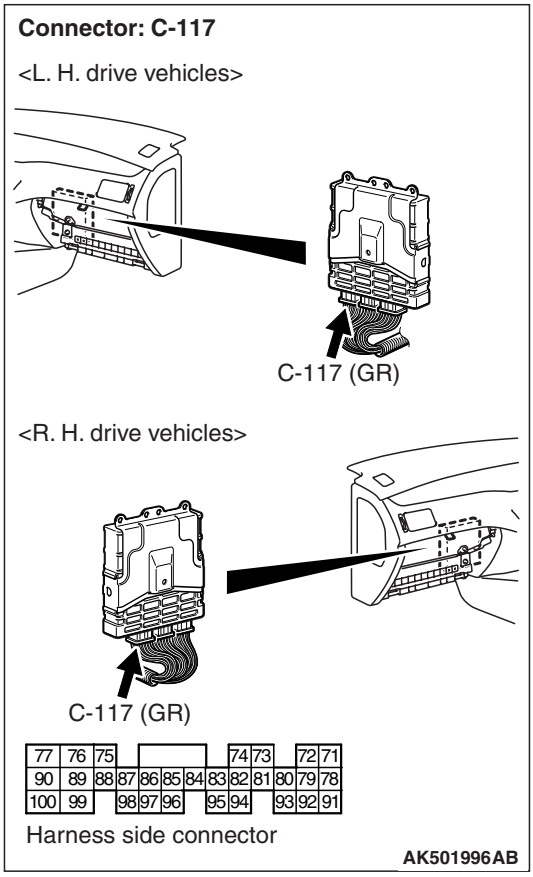


- Disconnect connector, and measure at harness side.
- Ignition switch: "ON"
- Voltage between terminal No. 1 and earth.

OK: 4.5 – 4.9 V

Q: Is the check result normal?
YES : Go to Step 9 .
NO : Go to Step 4 .

STEP 4. Perform voltage measurement at C-117 engine-ECU connector.

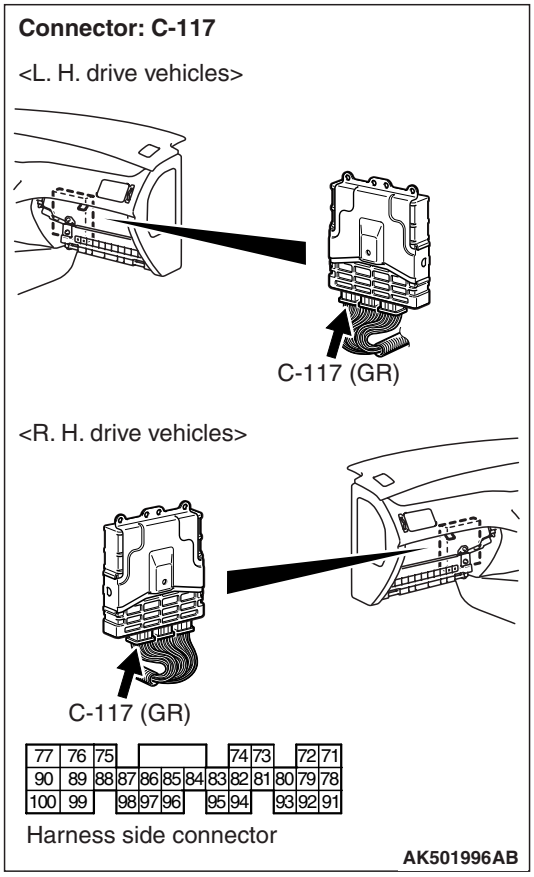


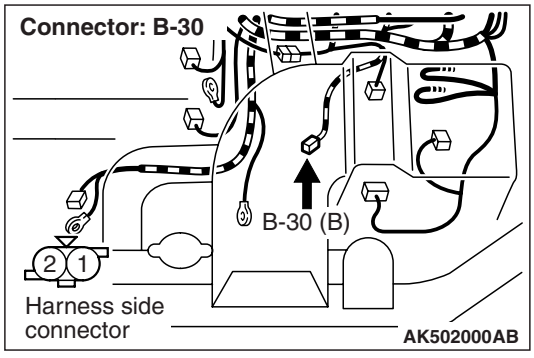
- Measure engine-ECU terminal voltage.
- Disconnect B-30 transmission oil temperature sensor.
- Ignition switch: "ON"
- Voltage between terminal No. 96 and earth.

OK: 4.5 – 4.9 V

Q: Is the check result normal?
YES : Go to Step 5 .
NO : Go to Step 6 .

STEP 5. Connector check: C-117 engine-ECU connector





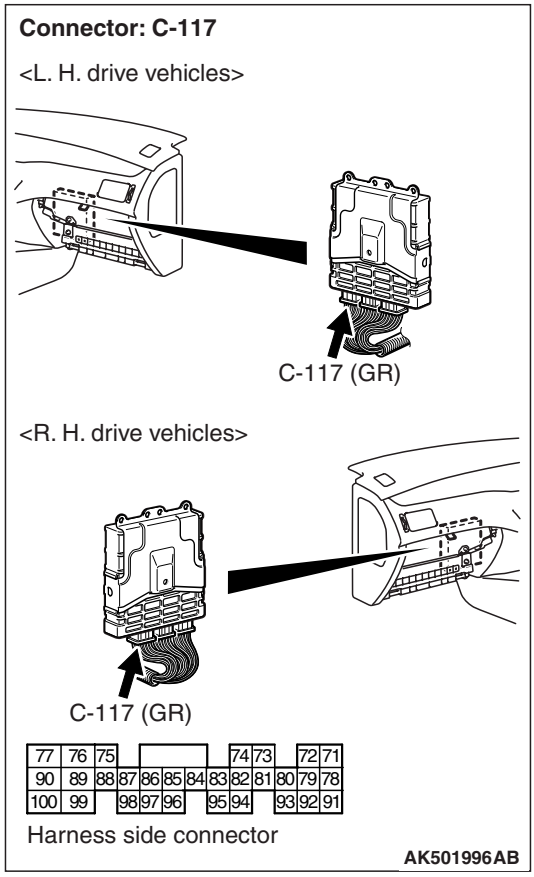
Q: Is the check result normal?

YES : Check intermediate connector B-27, and repair if necessary. If intermediate connector is normal, check and repair harness between B-30 (terminal No. 1) transmission oil temperature sensor connector and C-117 (terminal No. 96) engine-ECU connector.

- Check output line for open circuit.

NO : Repair or replace the connector.

STEP 6. Connector check: C-117 engine-ECU connector

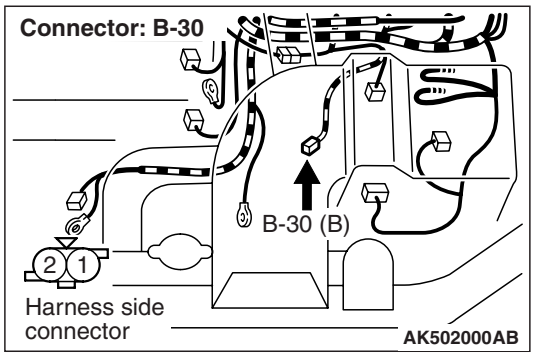


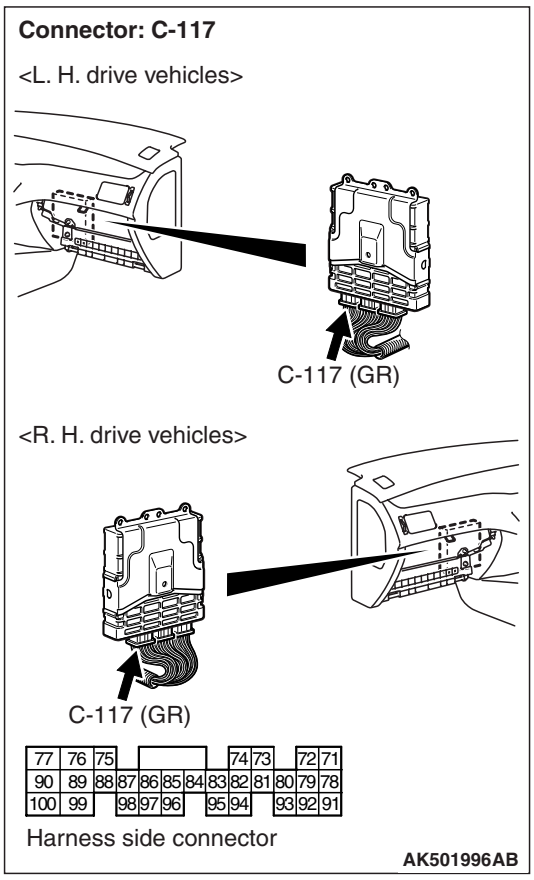
Q: Is the check result normal?

YES : Go to Step 7 .

NO : Repair or replace the connector.

STEP 7. Check harness between B-30 (terminal No. 1) transmission oil temperature sensor connector and C-117 (terminal No. 96) engine-ECU connector.





NOTE: Before checking harness, checking intermediate connector B-27, and repair if necessary.

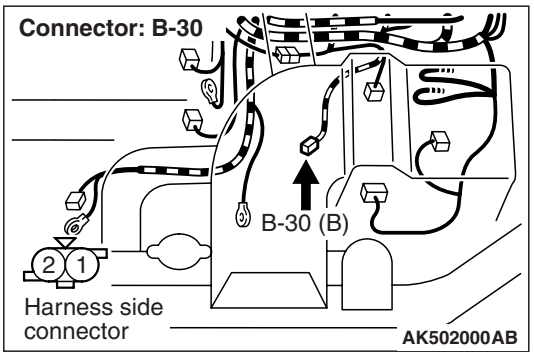
- Check output line for short circuit.

Q: Is the check result normal?
YES : Go to Step 8 .
NO : Repair the damaged harness wire.

STEP 8. Check the trouble symptoms.

Q: Does trouble symptom persist?
YES : Replace the engine-ECU.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-5).

STEP 9. Perform resistance measurement at B-30 transmission oil temperature sensor connector.

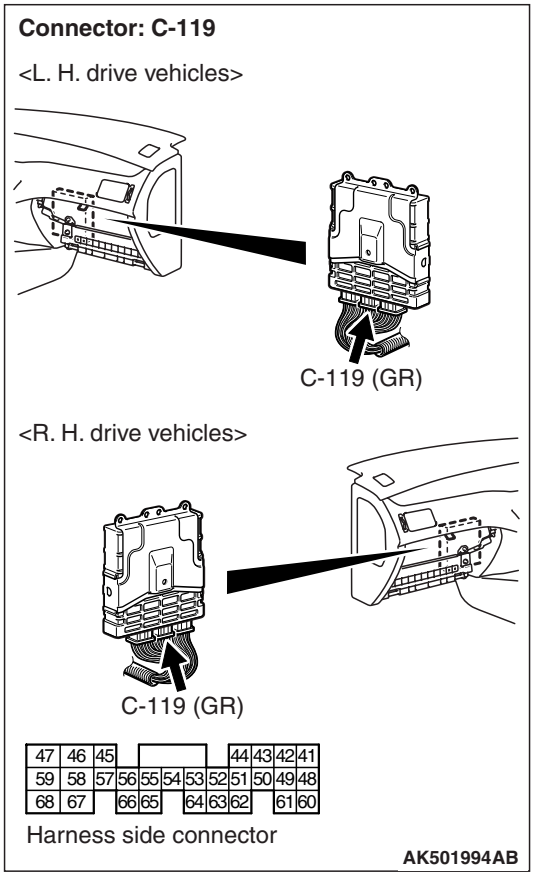


- Disconnect connector and measure at harness side.
- Resistance between terminal No. 2 and earth.

OK: 2 Ω or less

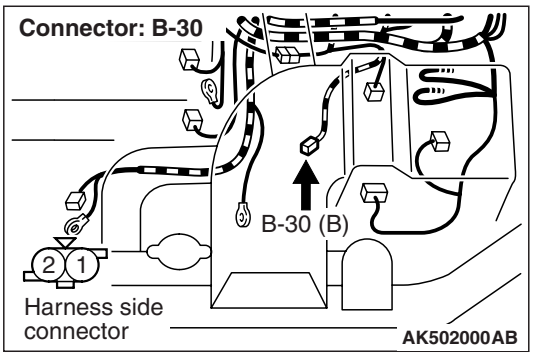
Q: Is the check result normal?
YES : Go to Step 12 .
NO : Go to Step 10 .

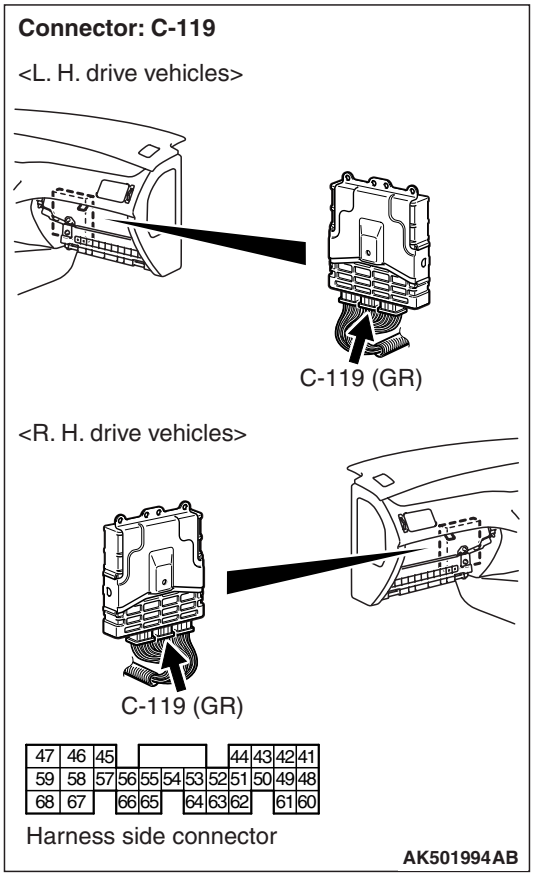
STEP 10. Connector check: C-119 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 11 .
NO : Repair or replace the connector.

STEP 11. Check harness between B-30 (terminal No. 2) transmission oil temperature sensor connector and C-119 (terminal No. 49) engine-ECU connector.



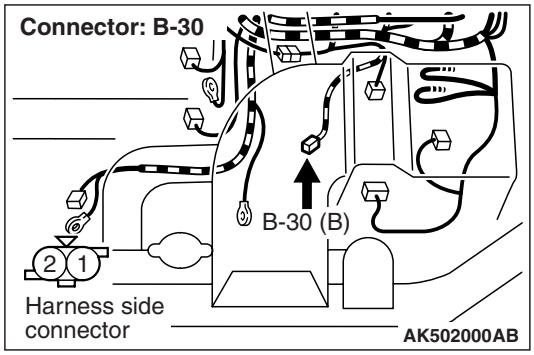


NOTE: Before checking harness, checking intermediate connector B-27, and repair if necessary.

- Check earthing line for open circuit and damage.

Q: Is the check result normal?
YES : Go to Step 8 .
NO : Repair the damaged harness wire.

STEP 12. Perform voltage measurement at B-30 transmission oil temperature sensor connector.

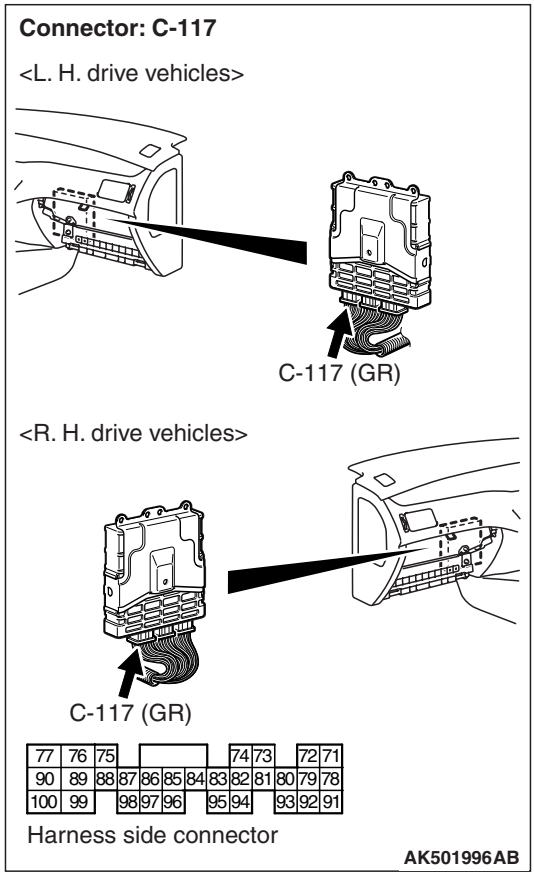


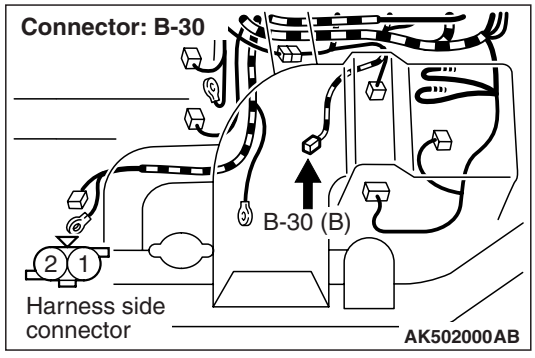
- Use special tool test harness (MB991658) to connect connector, and measure at pick-up harness.
- Ignition switch: "ON"
- Voltage between terminal No. 1 and earth.

OK:
Transmission oil temperature at –20°C: 3.9 – 4.5 V
Transmission oil temperature at 0°C: 3.2 – 3.8 V
Transmission oil temperature at 20°C: 2.3 – 2.9 V
Transmission oil temperature at 40°C: 1.3 – 1.9 V
Transmission oil temperature at 60°C: 0.7 – 1.3 V
Transmission oil temperature at 80°C: 0.3 – 0.9 V

Q: Is the check result normal?
YES : Go to Step 14 .
NO : Go to Step 13 .

STEP 13. Connector check: C-117 engine-ECU connector





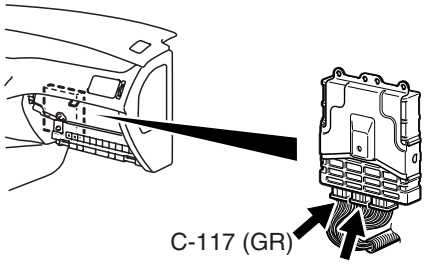
Q: Is the check result normal?
YES : Check intermediate connector B-27, and repair if necessary. If intermediate connector is normal, check harness between B-30 (terminal No. 1) transmission oil temperature sensor connector and C-117 (terminal No. 96) engine-ECU connector.
- Check output line for damage.

NO : Repair or replace the connector.

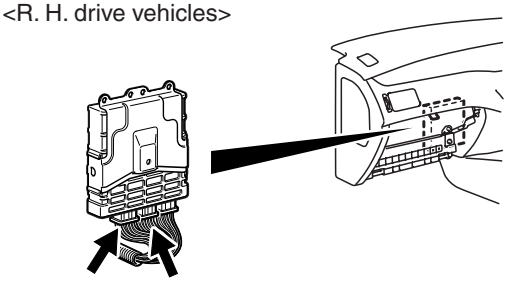
STEP 14. Connector check: C-117 and C-119 engine-ECU connector

Connector: C-117, C-119

<L. H. drive vehicles>



<R. H. drive vehicles>



77	76	75						74	73			72	71	
90	89	88	87	86	85	84	83	82	81	80	79	78		
100	99		98	97	96		95	94		93	92	91		

C-117 Harness side connector

47	46	45						44	43	42	41			
59	58	57	56	55	54	53	52	51	50	49	48			
68	67		66	65		64	63	62		61	60			

C-119 Harness side connector

AK501997AB

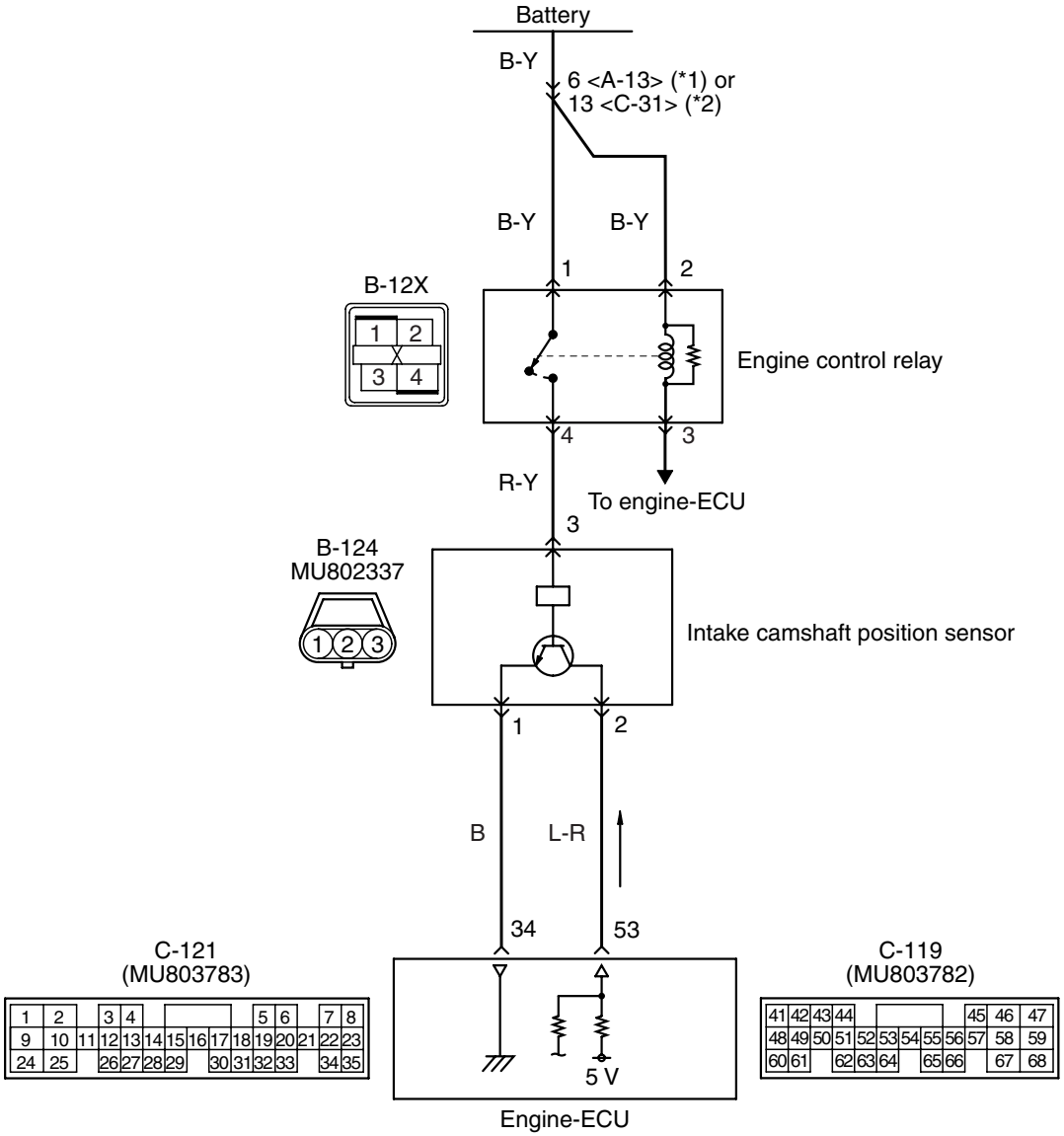
Q: Is the check result normal?

YES : Go to Step 8 .

NO : Repair or replace the connector.

Code No. P1012: Intake Camshaft Position Sensor System

Intake camshaft position sensor circuit



NOTE
*1: L.H. drive vehicles
*2: R.H. drive vehicles

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

AK501813AC

OPERATION

- Power is supplied to the intake camshaft position sensor (terminal No. 3) from the engine control relay (terminal No. 4) and is earthed to the engine-ECU (terminal No. 34) from the intake camshaft position sensor (terminal No. 1).
- A power voltage of 5 V is applied to the intake camshaft position sensor output terminal (terminal No. 2) from the engine-ECU (terminal No. 53).

FUNCTION

- The intake camshaft position sensor detects the top dead center on the compression stroke of the No. 1 cylinder and inputs a pulse signal to the engine-ECU.

TROUBLE JUDGMENT

Check Condition

- Engine: During the engine cranking and the driving.

Judgment Criterion

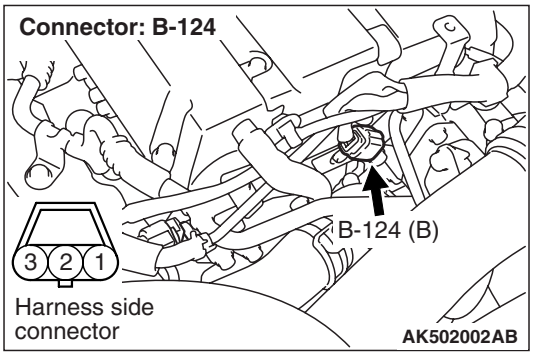
- The sensor output voltage remains unchanged (no pulse signal is inputted) for 4 seconds.

PROBABLE CAUSE

- Failed intake camshaft position sensor
- Open/short circuit in intake camshaft position sensor circuit or loose connector contact
- Failed engine-ECU

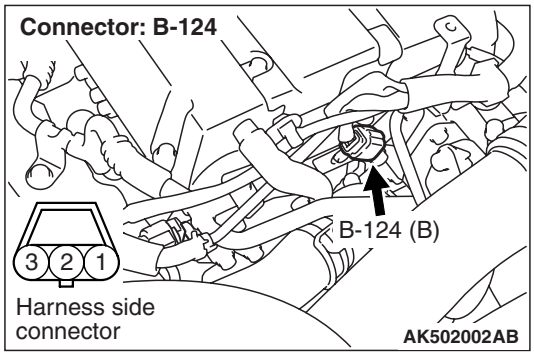
DIAGNOSIS PROCEDURE

STEP 1. Connector check: B-124 intake camshaft position sensor connector



Q: Is the check result normal?
YES : Go to Step 2 .
NO : Repair or replace the connector.

STEP 2. Perform voltage measurement at B-124 intake camshaft position sensor connector.

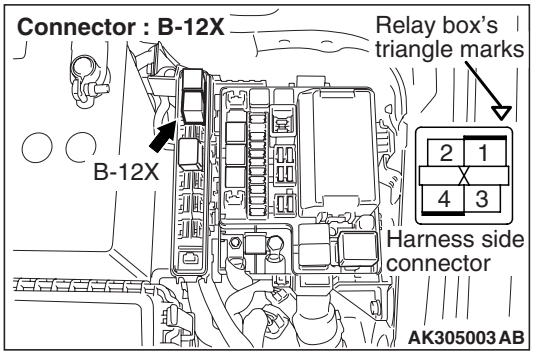


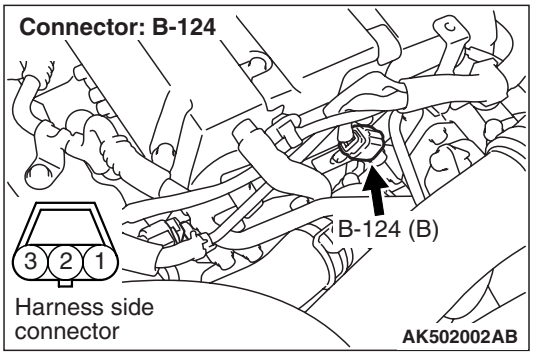
- Disconnect connector, and measure at harness side.
- Ignition switch: "ON"
- Voltage between terminal No. 3 and earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 4 .
NO : Go to Step 3 .

STEP 3. Connector check: B-12X engine control relay connector





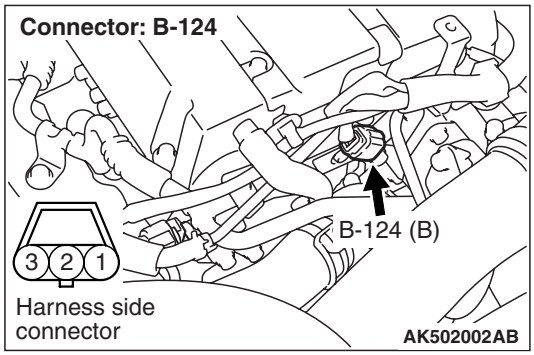
Q: Is the check result normal?

YES : Check and repair harness between B-124 (terminal No. 3) intake camshaft position sensor connector and B-12X (terminal No. 4) engine control relay connector.

- Check power supply line for open/short circuit.

NO : Repair or replace the connector.

STEP 4. Perform voltage measurement at B-124 intake camshaft position sensor connector.



- Disconnect connector, and measure at harness side.
- Ignition switch: "ON"
- Voltage between terminal No. 2 and earth.

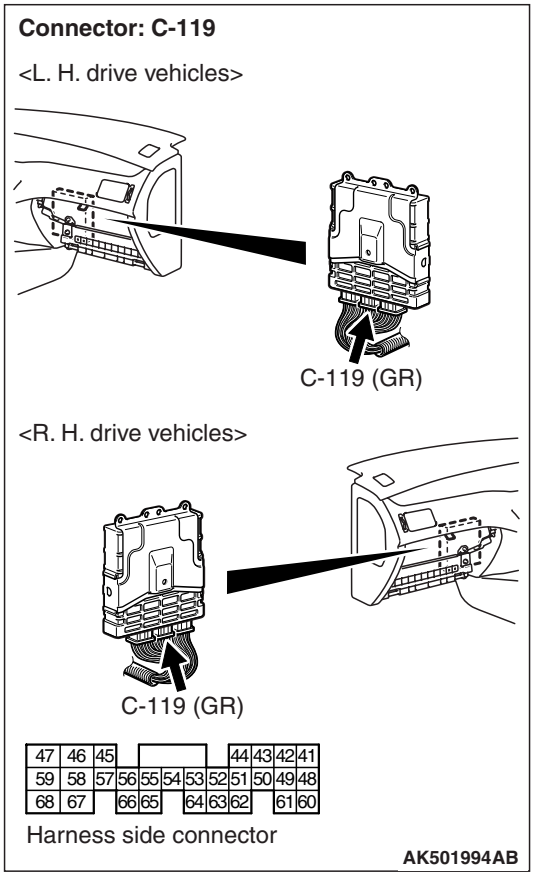
OK: 4.9 – 5.1 V

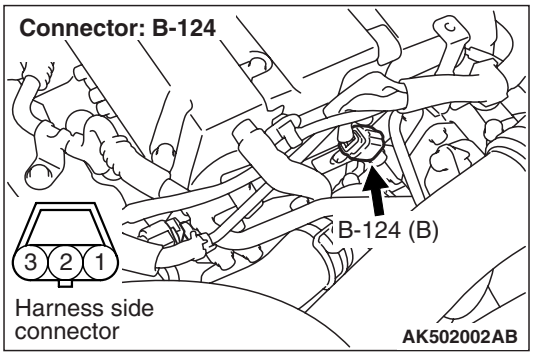
Q: Is the check result normal?

YES : Go to Step 10 .

NO : Go to Step 5 .

STEP 5. Perform voltage measurement at C-119 engine-ECU connector.





- Measure engine-ECU terminal voltage.
- Disconnect B-124 intake camshaft position sensor connector.
- Ignition switch: "ON"
- Voltage between terminal No. 53 and earth.

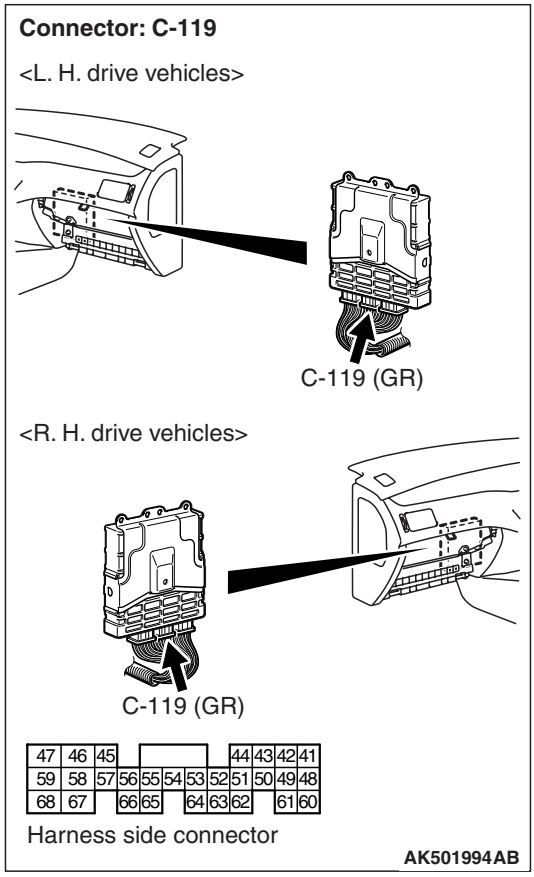
OK: 4.9 – 5.1 V

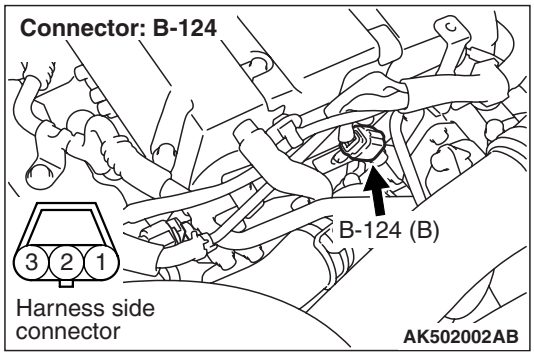
Q: Is the check result normal?

YES : Go to Step 6 .

NO : Go to Step 7 .

STEP 6. Connector check: C-119 engine-ECU connector



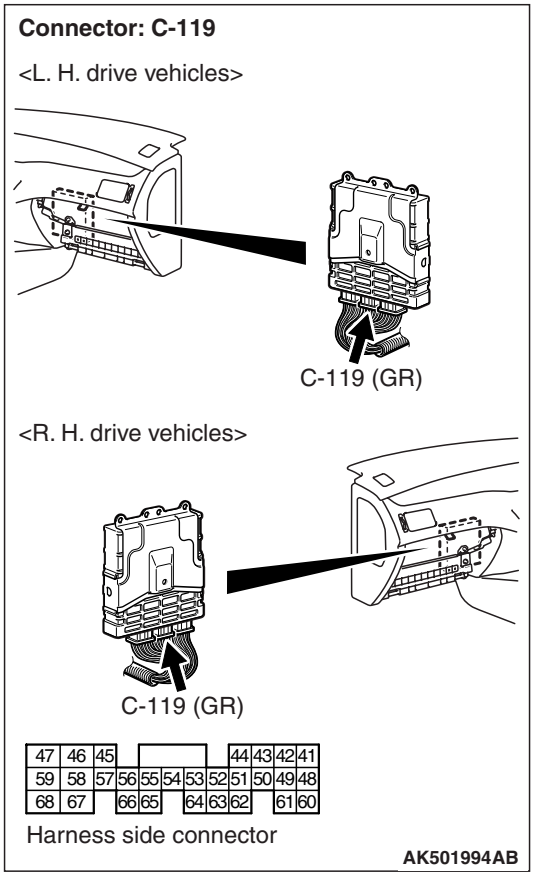


Q: Is the check result normal?

YES : Check and repair harness between B-124 (terminal No. 2) intake camshaft position sensor connector and C-119 (terminal No. 53) engine-ECU connector.
- Check output line for open circuit.

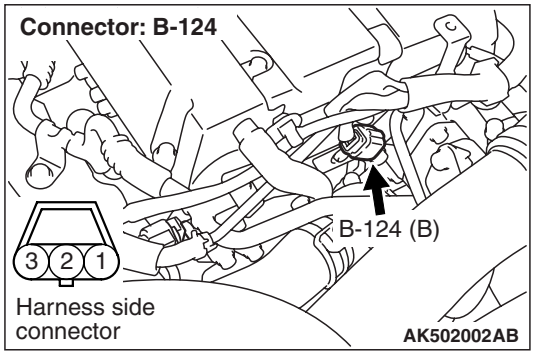
NO : Repair or replace the connector.

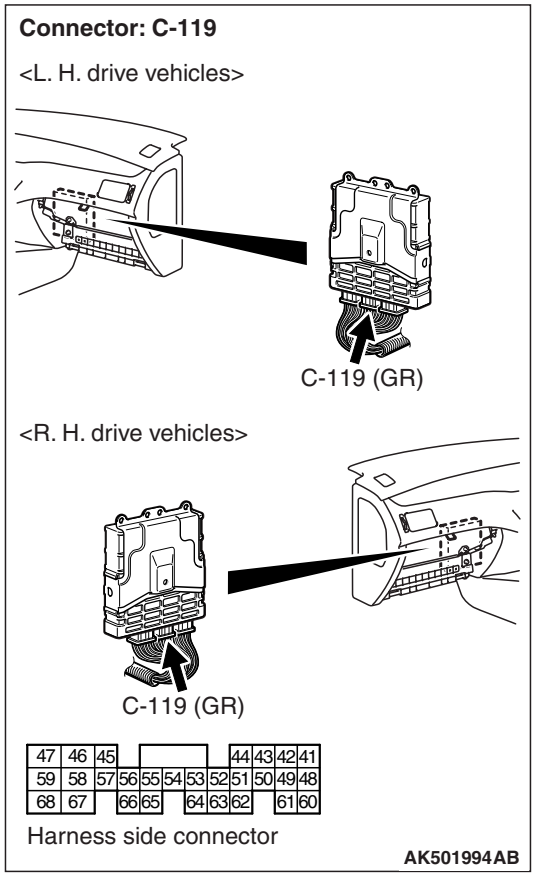
STEP 7. Connector check: C-119 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 8 .
NO : Repair or replace the connector.

STEP 8. Check harness between B-124 (terminal No. 2) intake camshaft position sensor connector and C-119 (terminal No. 53) engine-ECU connector.





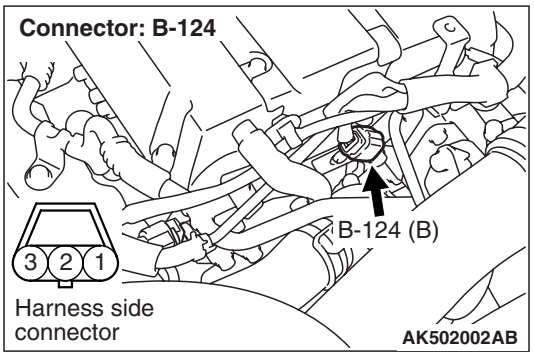
- Check output line for short circuit.

Q: Is the check result normal?
YES : Go to Step 9 .
NO : Repair the damaged harness wire.

STEP 9. Check the trouble symptoms.

Q: Does trouble symptom persist?
YES : Replace the engine-ECU.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-5).

STEP 10. Perform resistance measurement at B-124 intake camshaft position sensor connector.

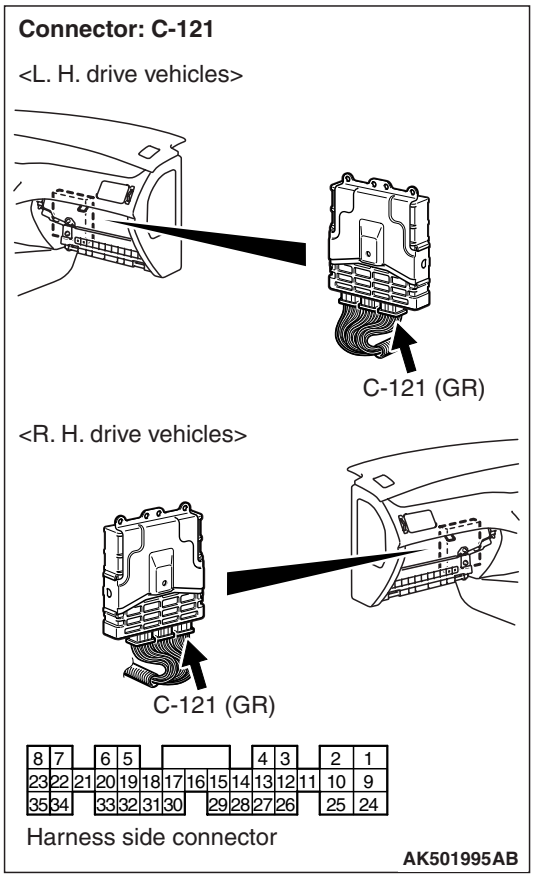


- Disconnect connector, and measure at harness side.
- Resistance between terminal No. 1 and earth.

OK: 2 Ω or less

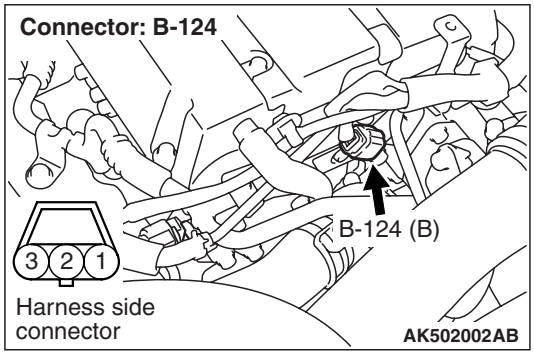
Q: Is the check result normal?
YES : Go to Step 13 .
NO : Go to Step 11 .

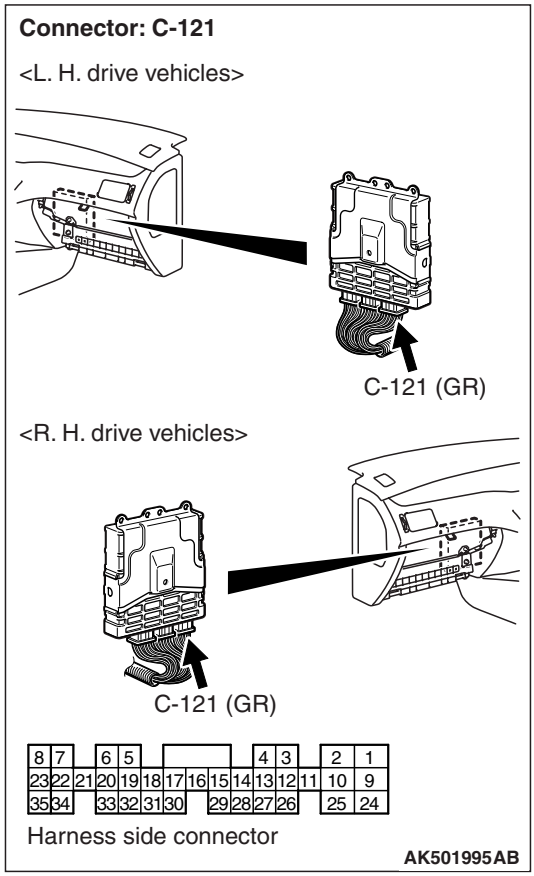
STEP 11. Connector check: C-121 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 12 .
NO : Repair or replace the connector.

STEP 12. Check harness between B-124 (terminal No. 1) intake camshaft position sensor connector and C-121 (terminal No. 34) engine-ECU connector.

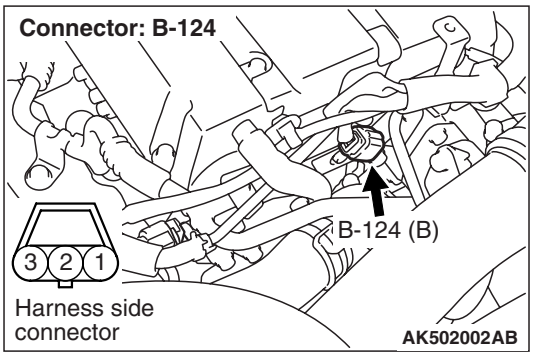




- Check earthing line for open circuit and damage.

Q: Is the check result normal?
YES : Go to Step 9 .
NO : Repair the damaged harness wire.

STEP 13. Perform output wave pattern measurement at B-124 intake camshaft position sensor connector (Using an oscilloscope).

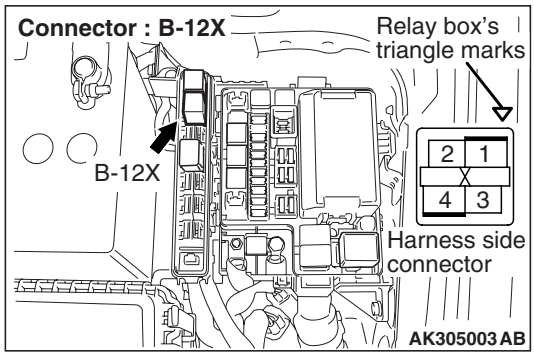


- Use special tool test harness (MB991709) to connect connector, and measure at pick-up harness.
- Engine: Idling
- Transmission: Neutral
- Voltage between terminal No. 2 and earth.

  OK: Waveforms should be displayed on Inspection procedure using an oscilloscope (Refer to P.13A-385), its maximum value should be 4.8 V or more, and its minimum value should be 0.6 V or less with no noise in waveform.

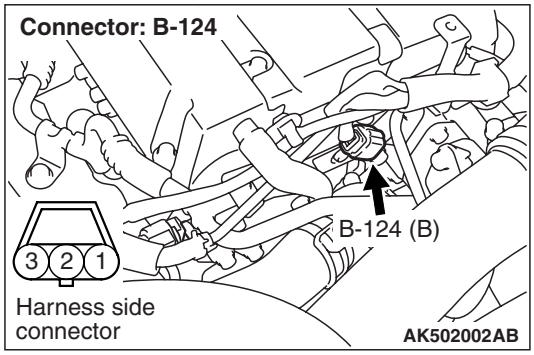
Q: Is the check result normal?
YES : Go to Step 9 .
NO : Go to Step 14 .

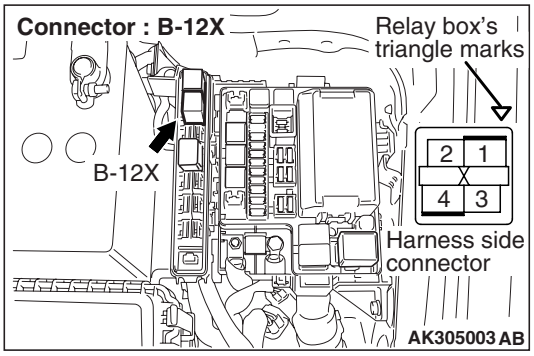
STEP 14. Connector check: B-12X engine control relay connector.



Q: Is the check result normal?
YES : Go to Step 15 .
NO : Repair or replace the connector.

STEP 15. Check harness between B-124 (terminal No. 3) intake camshaft position sensor connector and B-12X (terminal No. 4) engine control relay connector.

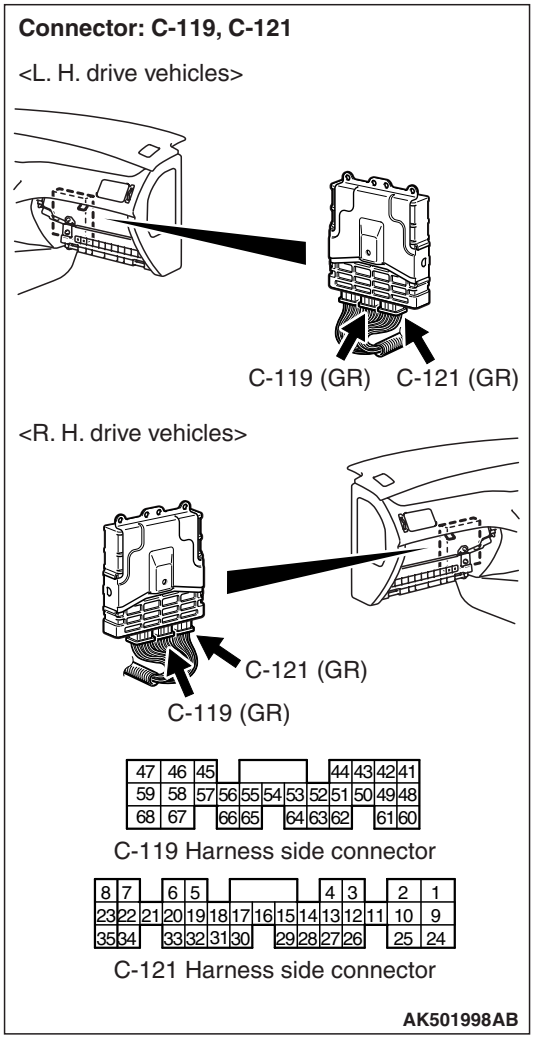




- Check power supply line for damage.

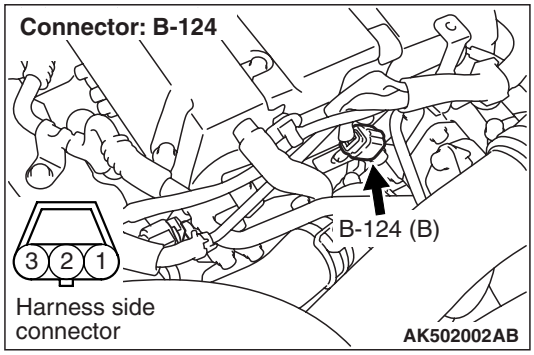
Q: Is the check result normal?
YES : Go to Step 16 .
NO : Repair the damaged harness wire.

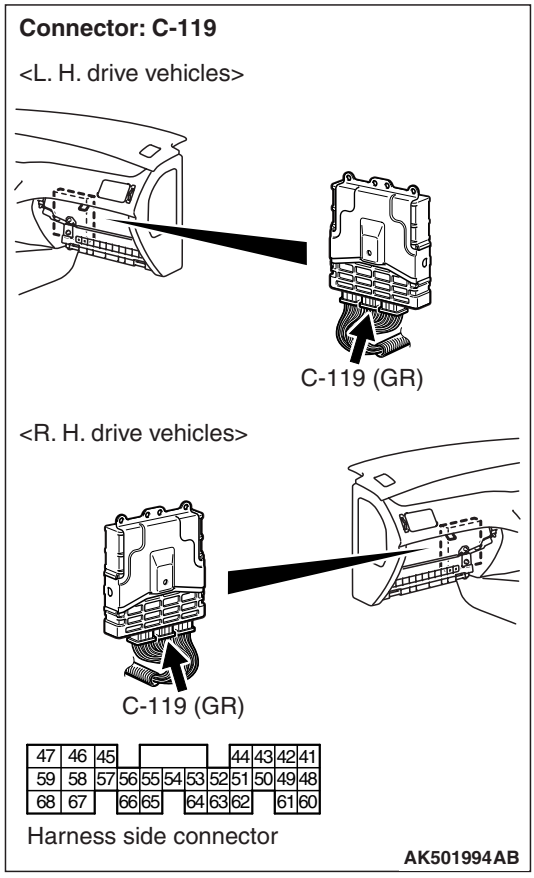
STEP 16. Connector check: C-119 and C-121 engine-ECU connectors



Q: Is the check result normal?
YES : Go to Step 17 .
NO : Repair or replace the connector.

STEP 17. Check harness between B-124 (terminal No. 2) intake camshaft position sensor connector and C-119 (terminal No. 53) engine-ECU connector.

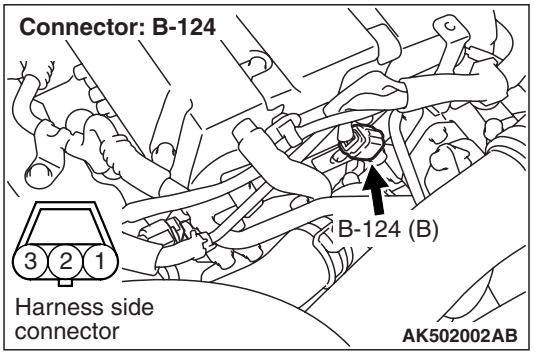


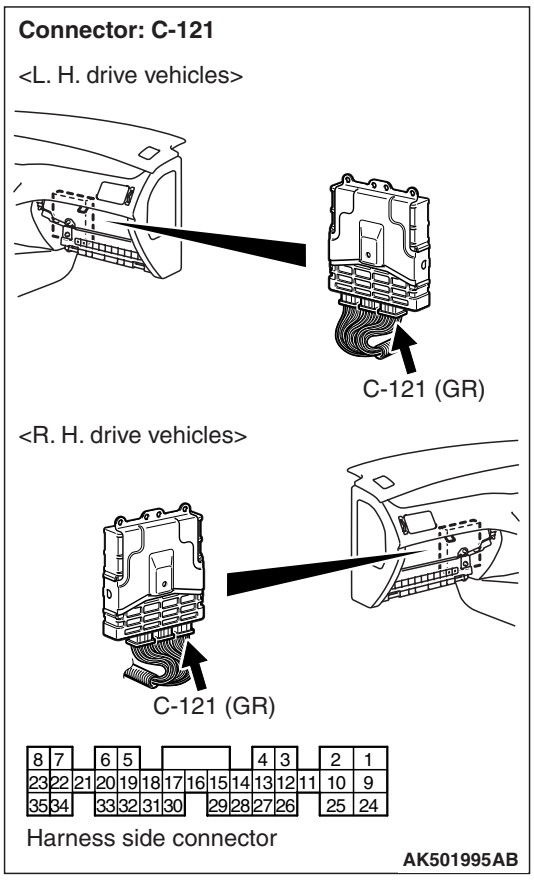


- Check output line for damage.

Q: Is the check result normal?
YES : Go to Step 18 .
NO : Repair the damaged harness wire.

STEP 18. Check harness between B-124 (terminal No. 1) intake camshaft position sensor connector and C-121 (terminal No. 34) engine-ECU connector.





- Check earthing line for damage.

Q: Is the check result normal?
YES : Go to Step 19 .
NO : Repair the damaged harness wire.

STEP 19. Check the intake camshaft position sensing cylinder.

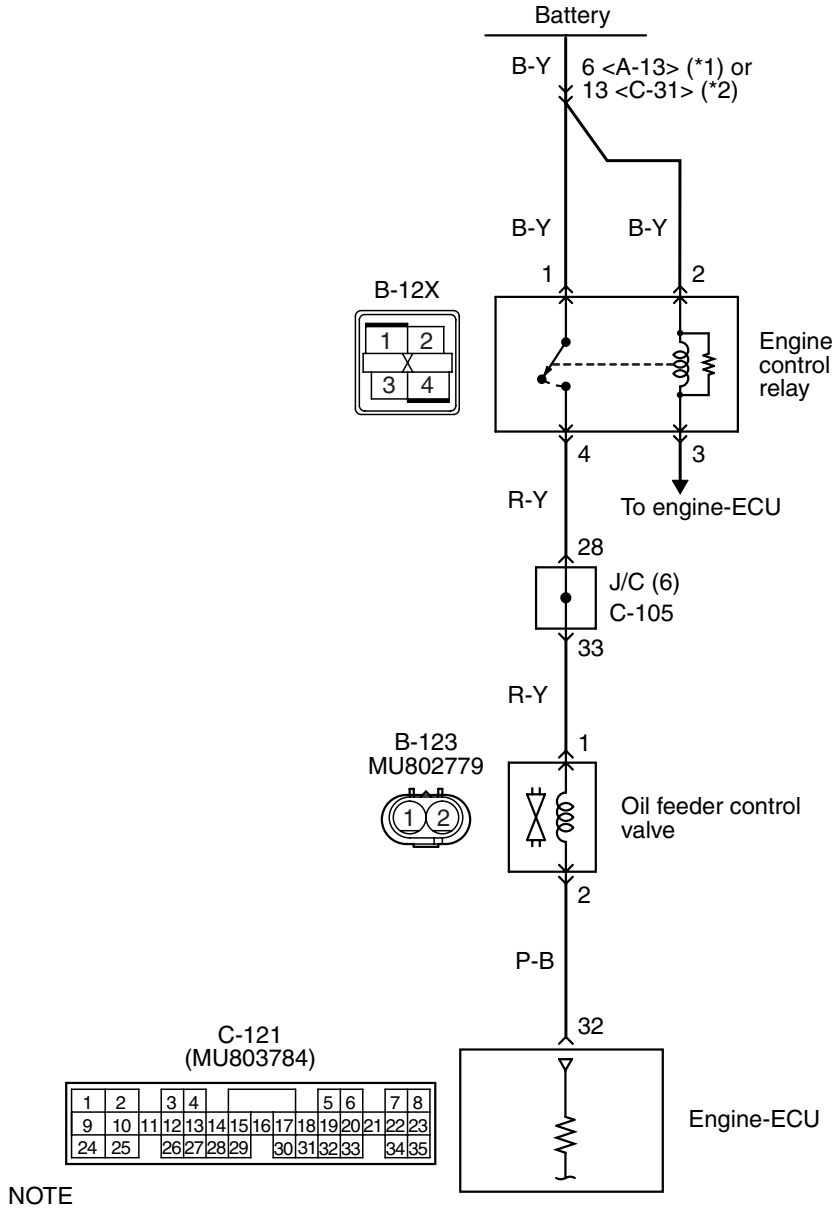
Q: Is the check result normal?
YES : Go to Step 20 .
NO : Replace the intake camshaft position sensing cylinder.

STEP 20. Check the trouble symptoms.

Q: Does trouble symptom persist?
YES : Replace the intake camshaft position sensor.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-5).

Code No. P1021: Oil Feeder Control Valve System

Oil feeder control valve circuit



NOTE
*1: L.H. drive vehicles
*2: R.H. drive vehicles

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

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OPERATION

- Power is supplied to the oil feeder control valve (terminal No. 1) from the engine control relay (terminal No. 4).
- The engine-ECU (terminal No. 32) makes the power transistor in the unit be in ON position, and that makes currents go on the oil feeder control valve (terminal No. 2).

FUNCTION

- The oil feeder control valve controls the phase angle of the intake camshaft by the signal from the engine-ECU.

TROUBLE JUDGMENT

Check Condition

- The oil feeder control valve does not operate.

Judgment Criterion

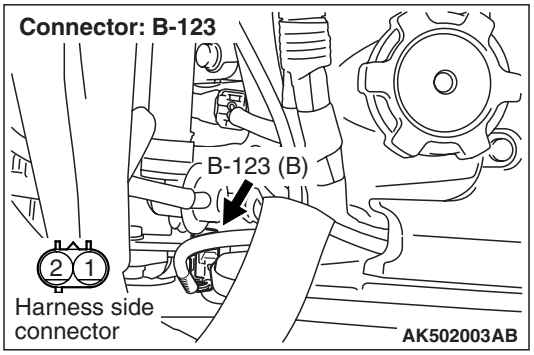
- The oil feeder control valve drive terminal voltage of the engine-ECU is not normal for 4 seconds or more.

PROBABLE CAUSE

- Failed oil feeder control valve
- Open/short circuit in oil feeder control valve circuit or loose connector contact
- Failed engine-ECU

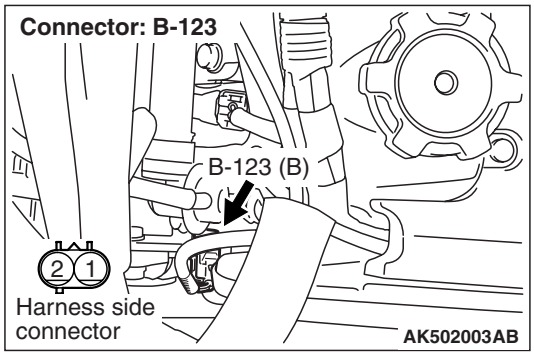
DIAGNOSIS PROCEDURE

STEP 1. Connector check: B-123 oil feeder control valve connector



Q: Is the check result normal?
YES : Go to Step 2 .
NO : Repair or replace the connector.

STEP 2. Perform resistance measurement at B-123 oil feeder control valve connector.

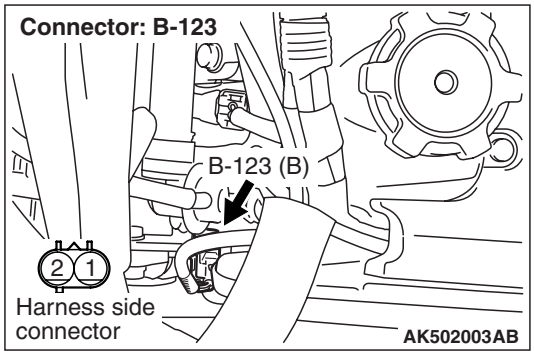


- Disconnect connector, and measure at control valve side.
- Resistance between terminal No. 1 and No. 2.

OK: 6.9 – 7.9 Ω (at 20°C)

Q: Is the check result normal?
YES : Go to Step 3 .
NO : Replace the oil feeder control valve.

STEP 3. Perform voltage measurement at B-123 oil feeder control valve connector.

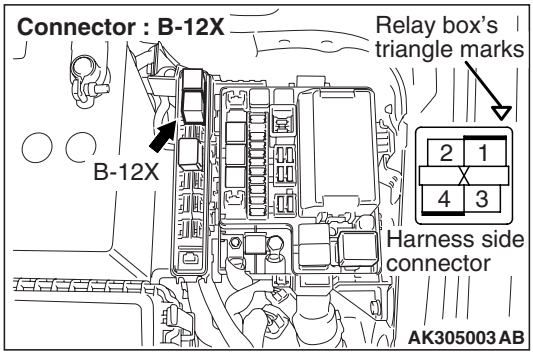


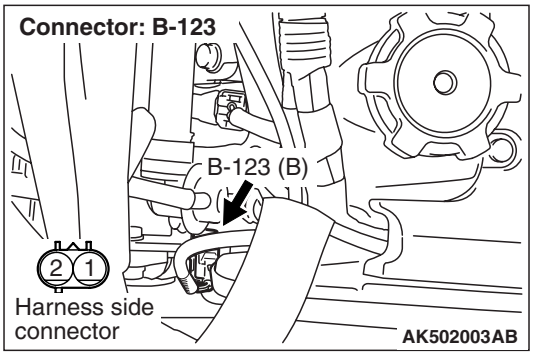
- Disconnect connector, and measure at harness side.
- Ignition switch: ON
- Voltage between terminal No. 1 and earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 5 .
NO : Go to Step 4 .

STEP 4. Connector check: B-12X engine control relay connector





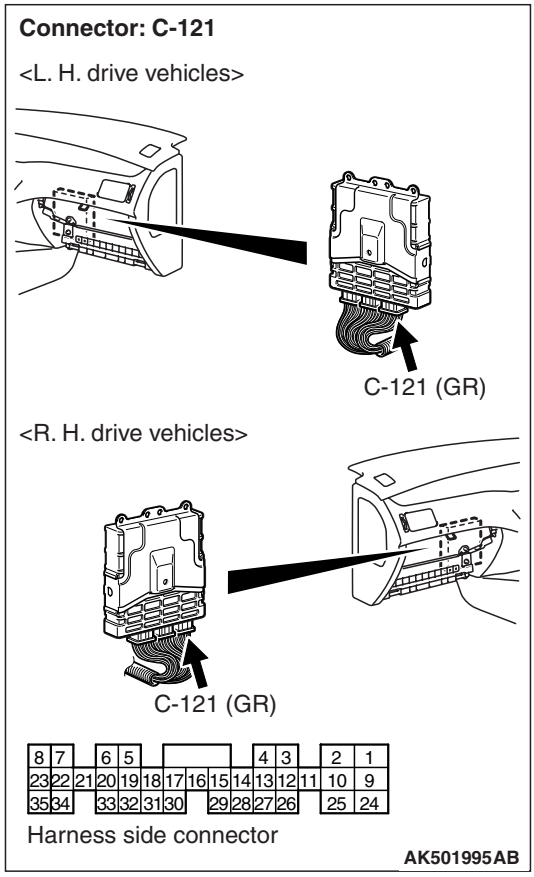
Q: Is the check result normal?

YES : Check intermediate connector C-105, and repair if necessary. If intermediate connector is normal, check and repair harness between B-123 (terminal No. 1) oil feeder control valve connector and B-12X (terminal No. 4) engine control relay connector.

- Check power line for open/short circuit.

NO : Repair or replace the connector.

STEP 5. Perform voltage measurement at C-121 engine-ECU connector.



- Disconnect connector, and measure at harness side.
- Ignition switch: ON
- Voltage between terminal No. 32 and earth.

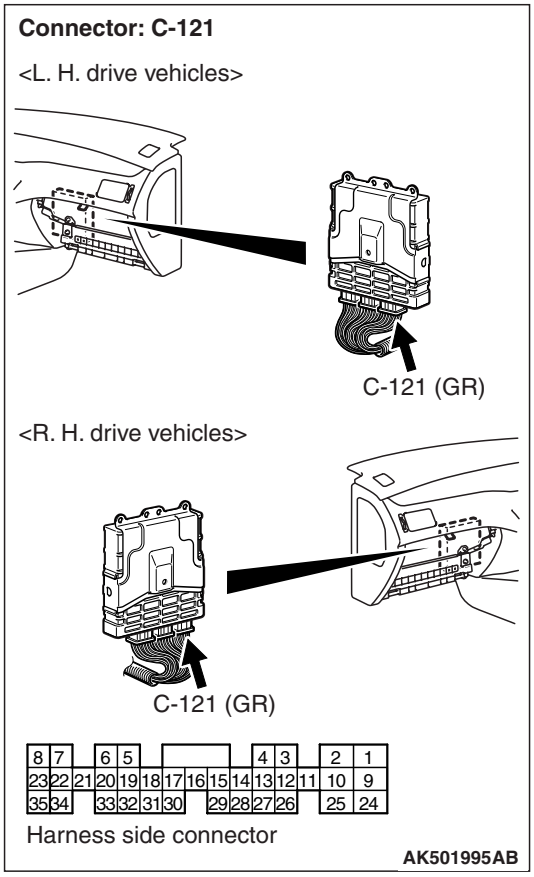
OK: System voltage

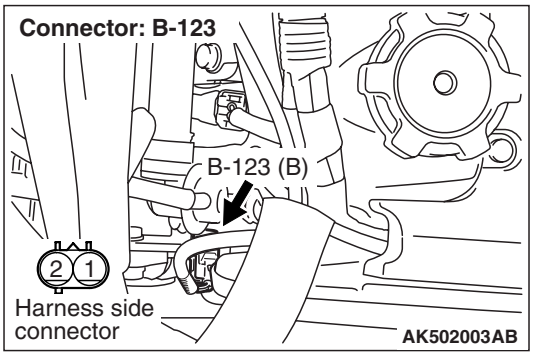
Q: Is the check result normal?

YES : Go to Step 7 .

NO : Go to Step 6 .

STEP 6. Connector check: C-121 engine-ECU connector





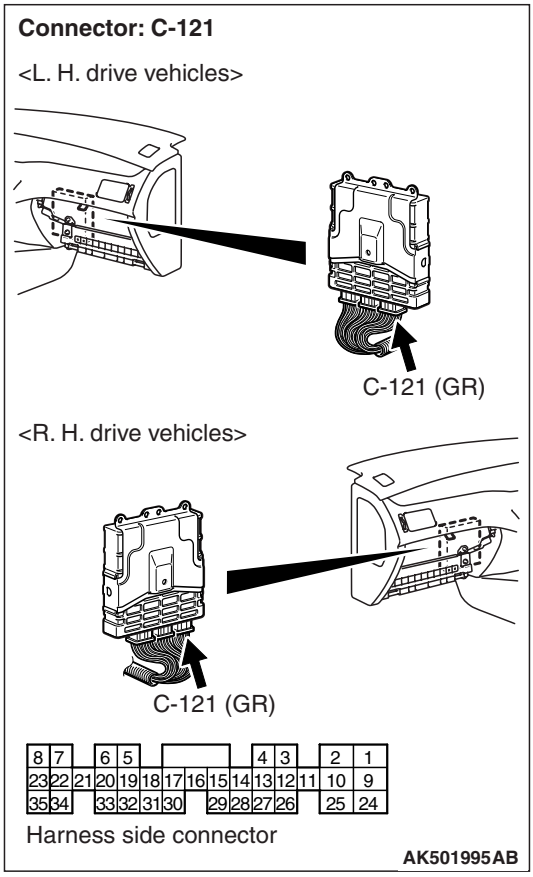
Q: Is the check result normal?

YES : Check and repair harness between B-123 (terminal No. 2) oil feeder control valve connector and C-121 (terminal No. 32) engine-ECU connector.

- Check output line for open/short circuit.

NO : Repair or replace the connector.

STEP 7. Connector check: C-121 engine-ECU connector

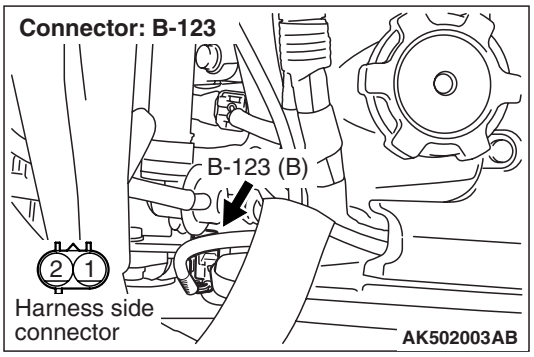


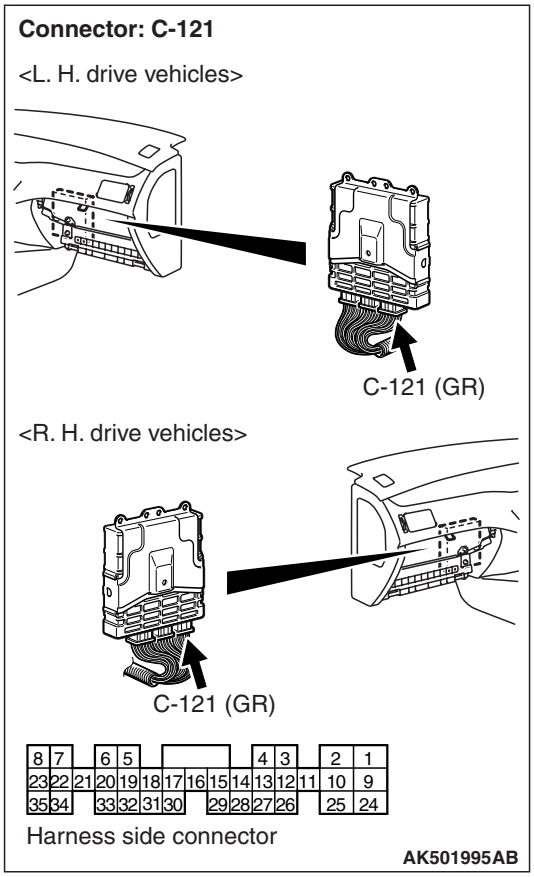
Q: Is the check result normal?

YES : Go to Step 8 .

NO : Repair or replace the connector.

STEP 8. Check harness between B-123 (terminal No. 2) oil feeder control valve connector and C-121 (terminal No. 32) engine-ECU connector.

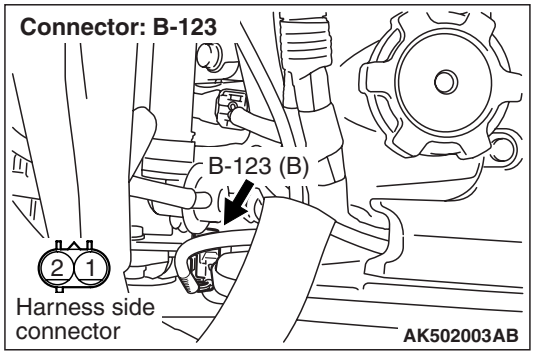


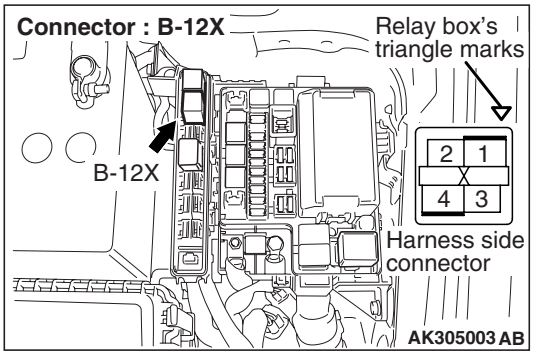


- Check output line for damage.

Q: Is the check result normal?
YES : Go to Step 9 .
NO : Repair the damaged harness wire.

STEP 9. Check harness between B-123 (terminal No. 1) oil feeder control valve connector and B-12X (terminal No. 4) engine control relay connector.





NOTE: Before checking harness, check intermediate connector C-105, and repair if necessary.

- Check power supply line for damage.

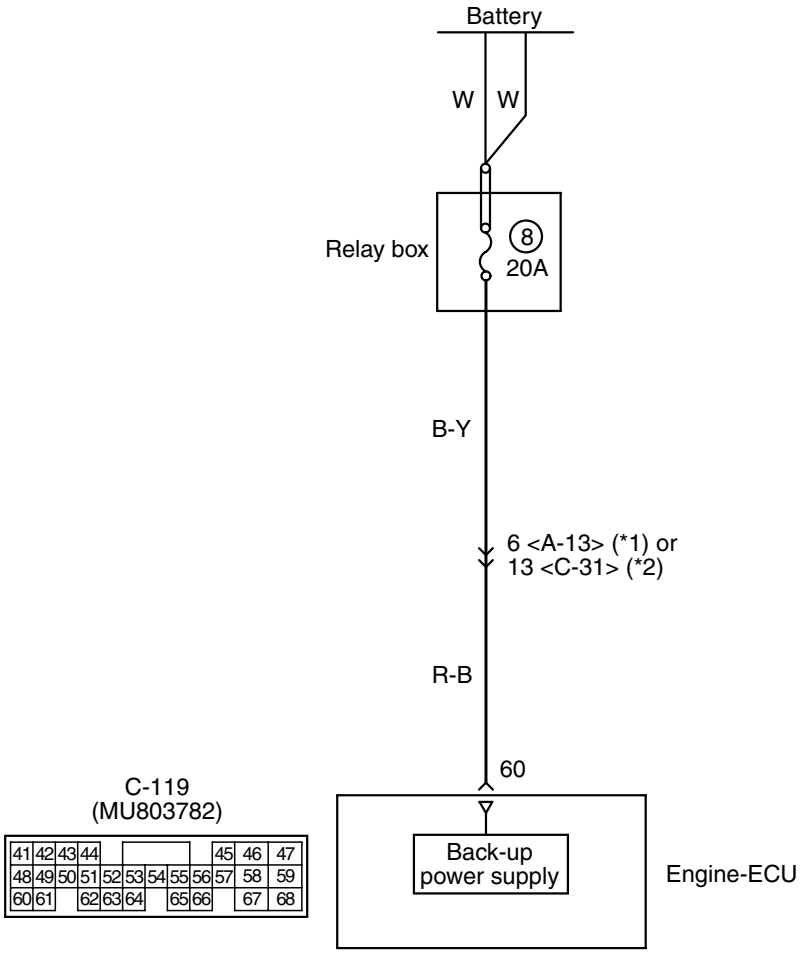
Q: Is the check result normal?
YES : Go to Step 10 .
NO : Repair the damaged harness wire.

STEP 10. Check the trouble symptoms.

Q: Does trouble symptom persist?
YES : Replace the engine-ECU.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-5).

Code No. P1603: Battery Back-up Line System

Battery back-up circuit



NOTE
*1: L.H. drive vehicles
*2: R.H. drive vehicles

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

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OPERATION

- Power is directly supplied to the engine-ECU (terminal No. 60) from the battery.

FUNCTION

- The engine-ECU is check the open circuit of battery back-up line.

TROUBLE JUDGMENT

Check Condition

- Ignition switch: "ON"

Judgment Criterion

- The battery back-up line voltage 6 V or less.

PROBABLE CAUSES

- Open/short circuit in battery back-up line circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-II/III diagnosis code

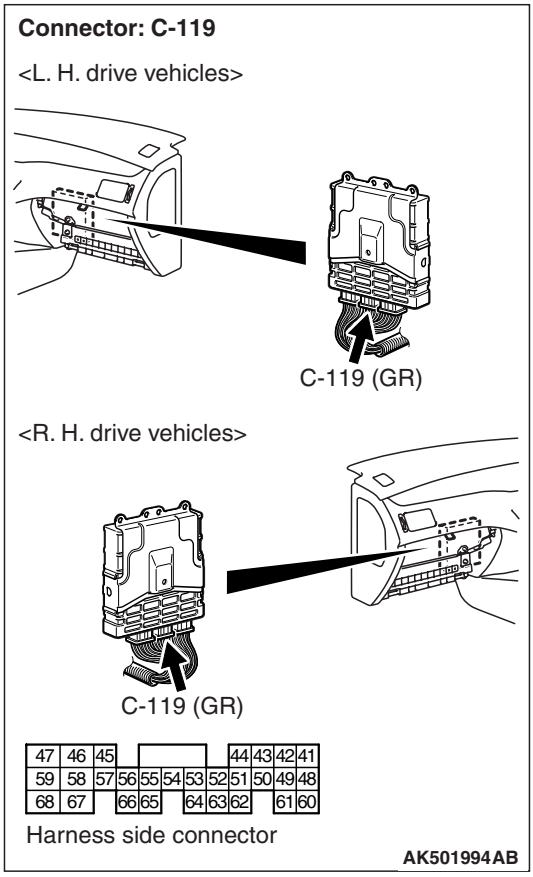
- Temporarily place the ignition switch in "LOCK" (OFF) position, and 10 seconds after that, place it in "ON" position again.

Q: Is the diagnosis code P1603 set?

YES : Go to Step 2 .

NO : Intermittent malfunction (Refer to GROUP 00 – How to use Troubleshooting/Inspection Service Points P.00-5).

STEP 2. Perform voltage measurement at C-119 engine-ECU connector.



- Disconnect connector, and measure at harness side.
- Ignition switch: "ON"
- Voltage between terminal No. 60 and earth.

OK: System voltage

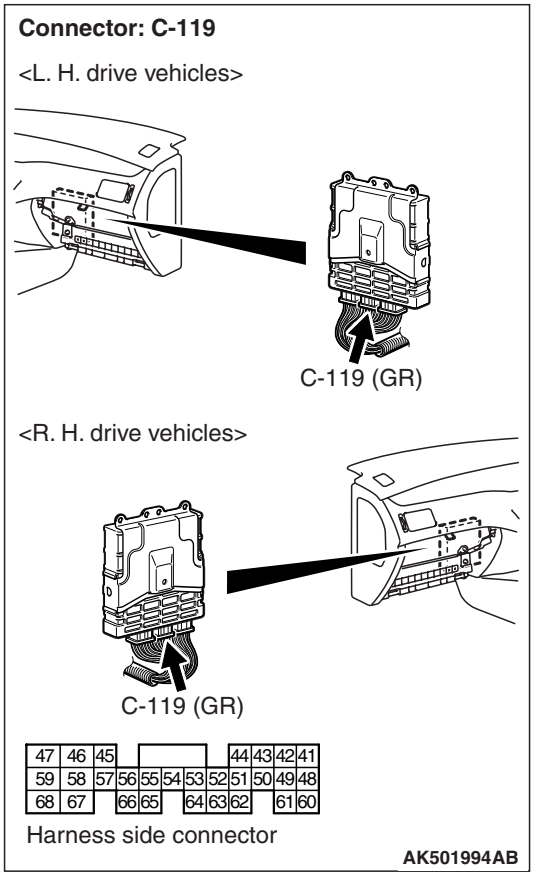
Q: Is the check result normal?

YES : Go to Step 3 .

NO : Check intermediate connector A-13, <L.H. drive vehicles> or C-31 <R.H. drive vehicles>, and repair if necessary. If intermediate connector is normal, check and repair harness between battery and C-119 (terminal No. 60) engine-ECU connector.

- Check power supply line for open/short circuit.

STEP 3. Connector check: C-119 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 4 .
NO : Repair or replace the connector.

STEP 4. Check the trouble symptoms.

Q: Does trouble symptom persist?
YES : Replace the engine-ECU.
NO : Intermittent malfunction (Refer to GROUP 00 − How to Use Troubleshooting/Inspection Service Points P.00-5).

INSPECTION CHART FOR TROUBLE SYMPTOMS

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Items	Trouble symptom		Inspection procedure No.
Communication with M.U.T.-II/III is impossible	Communication with all system is not possible		1
	Communication with engine-ECU only is not possible		2
Engine warning lamp	The engine warning lamp does not illuminate right after the ignition switch is turned to the "ON" position		3
	The engine warning lamp remains illuminating and never goes out		4
Starting	Starting impossible (starter inoperative)	The starter is impossible to operate.	5
	Starting impossible (Starter operative but no initial combustion)	The starter is operative and cranks the engine, but none of initial combustion is in the cylinders and the engine is not started.	6
	Starting impossible (Initial combustion but no complete combustion)	The initial combustion occurs, but the engine stalls soon due to the incomplete combustion.	7
	Improper starting (Long time to start)	It is long cranking to start the engine.	
Improper idling	Unstable idling (Rough idling, hunting)	The engine speed is not constant and changeable during the idling. Usually, the judgment can be based on the movement of the tachometer pointer, also on the vibration transmitted to the steering wheel, sift lever, vehicle body and so on.	8
	Improper idling speed	The proper idling speed is not satisfied.	
	Engine stalled during idling (Die out)	The engine stalls during the idling in no relation to the vehicle movement.	
Engine stalls	The engine stalls when starting the car (Pass out)	The engine stalls during the operation, or when the accelerator pedal is depressed from the idling.	9
	The engine stalls when decelerating	The engine stalls at the deceleration.	10

Items	Trouble symptom		Inspection procedure No.
Driving	Hesitation, sag	The response of vehicle speed (engine speed) is delayed when the accelerator pedal is depressed, or the vehicle speed (engine speed) is temporarily dropped during the acceleration. These phenomena are called "hesitation" and the serious hesitation is called "sag".	12
	Poor acceleration	The engine cannot obtain the acceleration corresponding to the degree of throttle opening although the engine is smooth at the constant speed.	
	Stumble	The engine speed increase is delayed when the accelerator pedal is initially depressed at the starting.	
	Surge	The vehicle body is repeated to vibrate jollity in the forward and backward directions at the constant speed or acceleration.	
	The feeling of impact or vibration when accelerating	The large impact feeling occurs at the acceleration.	13
	The feeling of impact or vibration when decelerating	The large impact feeling occurs at the deceleration.	14
	Knocking	Sharp sound like a hammer striking on the cylinder walls during the driving can be heard and wrongly affects the driving.	15
	Ignition timing offset	The basic ignition timing is deviated from the datum value.	16
Stopping	Run on (Dieseling)	The engine continues to run after the ignition switch is in "LOCK (OFF)" position.	17
Exhaust gas	Odor, white smoke, black smoke, high-concentration CO/HC during idling	The exhaust gas is extremely rank odor, white smoke or black smoke. The concentration of CO & HC is high during the idling.	18
Charging performance	Battery rundown	The battery is soon rundown or the charging ability of battery is small.	19
Cooling performance	Overheating	The temperature of engine cooling water is extremely high.	20
	Abnormal rotation of fan Motor	The fan motor is abnormally rotated when the ignition switch is in "ON" position in no relation to the engine cooling water temperature.	21

Items	Trouble symptom		Inspection procedure No.
A/C performance	Poor A/C Performance	The temperature of air cooling from A/C is not efficient or very far from the target temperature.	22

PROBLEM SYMPTOMS TABLE

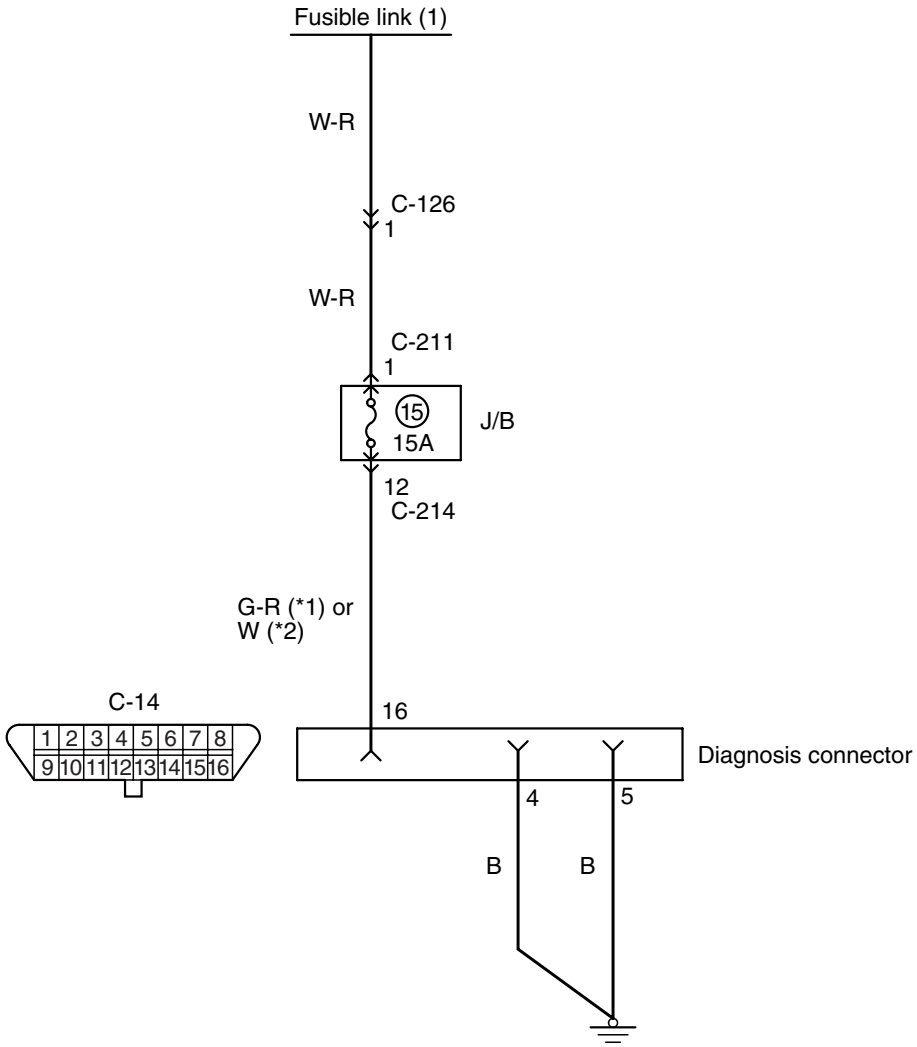
Inspection procedure No.	Trouble symptom	Reference page
1	Communication with all system is not possible	P.13A-237
2	Communication with engine-ECU only is not possible	P.13A-240
3	The engine warning lamp does not illuminate right after the ignition switch is turned "ON" position	P.13A-243
4	The engine warning lamp remains illuminating and never goes out	P.13A-252
5	Starting impossible (No initial combustion)	P.13A-255
6	Starting impossible (Starter operative but no initial combustion)	P.13A-262
7	Starting impossible (Initial combustion but no complete combustion)	P.13A-264
	Starting impossible (Long time to start)	
8	Unstable idling (Rough idling, hunting)	P.13A-268
	Improper idling speed (Too high or too low)	
	Engine stalls during idling (Die out)	
9	The engine stalls when starting the car (pass out)	P.13A-275
10	The engine stalls when decelerating	P.13A-277
11	Engine does not revolve up	P.13A-279
12	Hesitation, sag	P.13A-281
	Poor acceleration	
	Stumble	
	Surge	
13	The feeling of impact or vibration when accelerating	P.13A-283
14	The feeling of impact or vibration when decelerating	P.13A-285
15	Knocking	P.13A-285
16	Ignition timing offset	P.13A-287
17	Run on (Dieseling)	P.13A-288
18	Odor, white smoke, black smoke, high-concentration CO/HC during idling	P.13A-289
19	Battery rundown	P.13A-291
20	Overheating	P.13A-296
21	Abnormal rotation of fan motor	P.13A-297
22	Poor A/C performance	P.13A-300
23	Engine-ECU power supply, engine control relay, ignition switch-IG1 system	P.13A-302
24	Fuel pump system	P.13A-313

Inspection procedure No.	Trouble symptom	Reference page
25	Radiator fan control relay system	P.13A-324
26	Condenser fan control relay system	P.13A-330
27	A/C switch system	P.13A-341
28	A/C compressor relay system	P.13A-344
29	A/C load signal system	P.13A-352
30	Ignition circuit system <L.H. drive vehicles>	P.13A-356
31	Ignition circuit system <R.H. drive vehicles>	P.13A-363

SYMPTOM PROCEDURES

Inspection Procedure 1: Communication with All System is not Possible

Diagnosis connector circuit



NOTE
*1: L.H. drive vehicles
*2: R.H. drive vehicles

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

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OPERATION

- Battery voltage is applied to diagnosis connector (terminal No.16).
- Diagnosis connector (terminals No. 4 and 5) are earthed to the vehicle body.

COMMENTS ON TROUBLE SYMPTOM

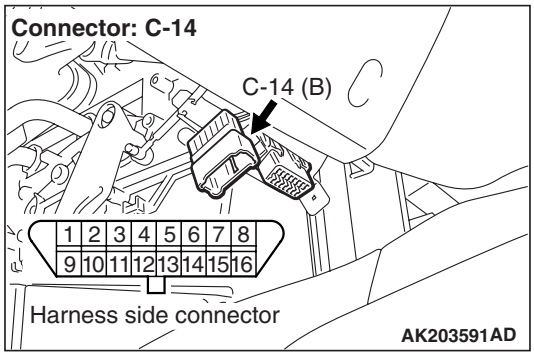
- Failure is possibly caused by failed power supply circuit or failed earthing circuit of diagnosis connector.

PROBABLE CAUSES

- Failed diagnosis connector
- Open/short circuit in diagnosis connector circuit.
- Failed M.U.T.-II/III

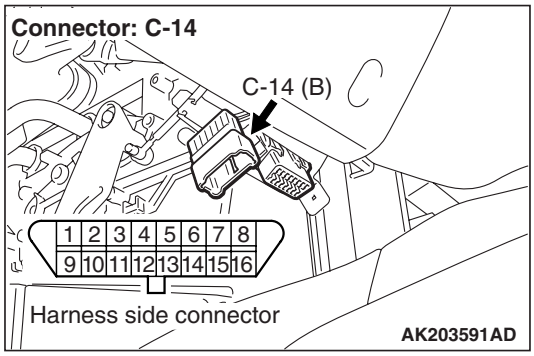
DIAGNOSIS PROCEDURE

STEP 1. Connector check: C-14 diagnosis connector



Q: Is the check result normal?
YES : Go to Step 2 .
NO : Repair or replace the connector.

STEP 2. Perform resistance measurement at C-14 diagnosis connector.

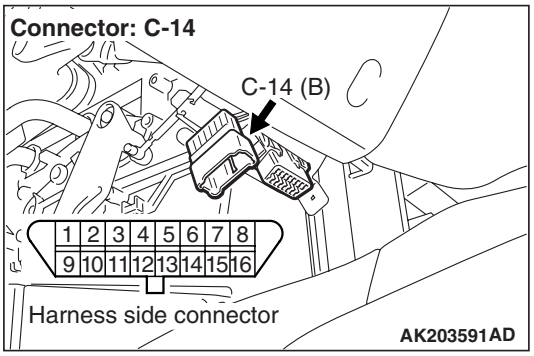


- Disconnect connector, and measure at harness side.
- Resistance between terminal No. 4 and earth, also between terminal No. 5 and earth.

OK: 2 Ω or less

Q: Is the check result normal?
YES : Go to Step 3 .
NO : Check and repair harness between C-14 (terminal No. 4) diagnosis connector and body earth, also between C-14 (terminal No. 5) diagnosis connector and body earth.
- Check earthing line for open circuit and damage.

STEP 3. Perform voltage measurement at C-14 diagnosis connector.



- Disconnect connector, and measure at the harness side.
- Voltage between terminal No. 16 and earth.

OK: System voltage

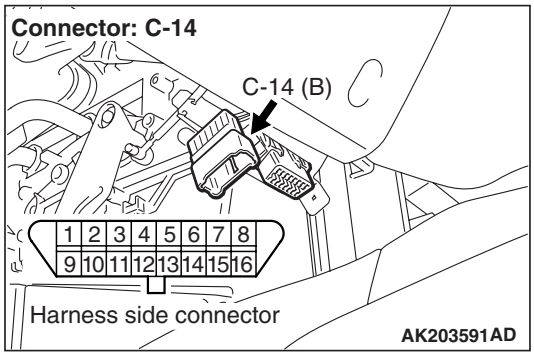
Q: Is the check result normal?
YES : Go to Step 4 .
NO : Check intermediate connectors C-126, C-211 and C-214, and repair if necessary. If connectors are normal, check and repair harness between C-14 (terminal No. 16) diagnosis connector and battery.
- Check power supply line for open/short circuit.

STEP 4. Replace M.U.T.-II/III.

- After replacing the M.U.T.-II/III, re-check the trouble symptoms.

Q: Does trouble symptom persist?
YES : Go to Step 5 .
NO : The check is end.

STEP 5. Check harness between C-14 (terminal No. 16) diagnosis connector and battery.



NOTE: Before checking harness, check intermediate connectors C-126, C-211 and C-214, and repair if necessary.

- Check power supply line for damage.

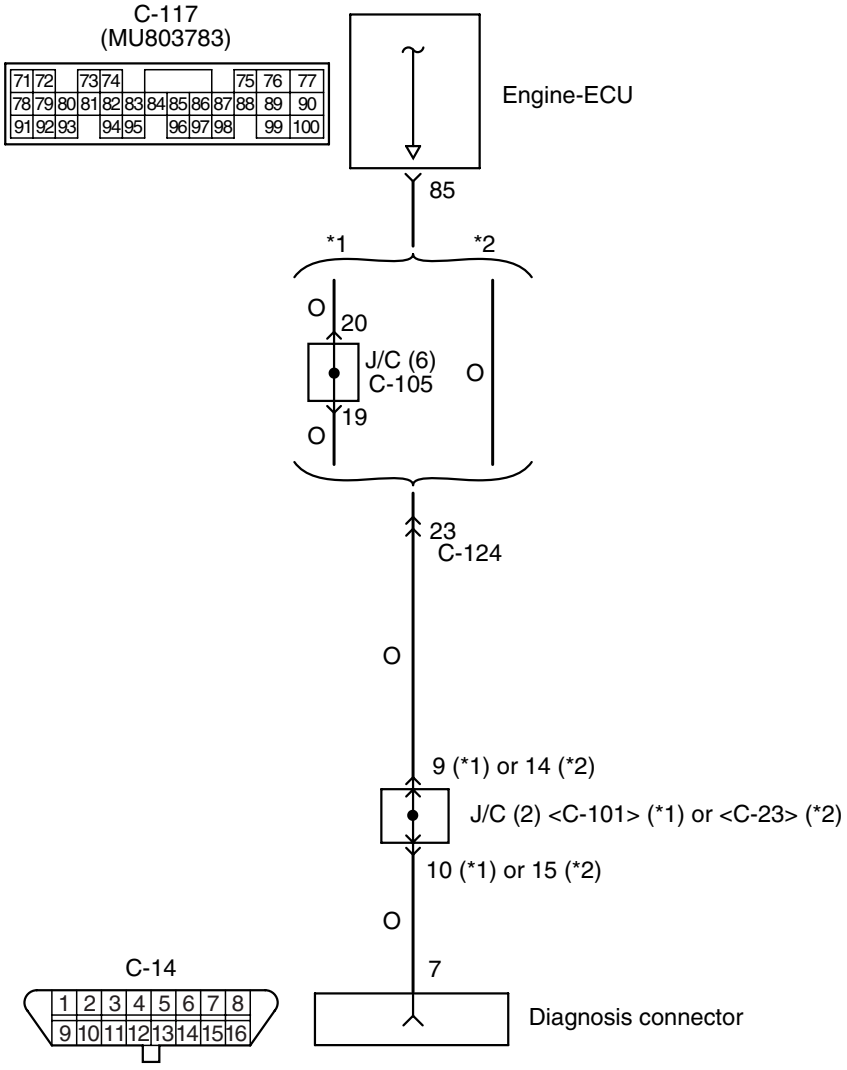
Q: Is the check result normal?

YES : Check and repair harness between C-14 (terminal No. 4 and No. 5) diagnosis connector and body earth.
- Check earthing line for damage.

NO : Repair the damaged harness wire.

Inspection Procedure 2: Communication with Engine-ECU only is not Possible.

Diagnosis connector circuit



NOTE
*1: L.H. drive vehicles
*2: R.H. drive vehicles

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

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OPERATION

- There is data communication between diagnosis connector output terminal (terminal No. 7) and engine-ECU (terminal No. 85).

COMMENTS ON TROUBLE SYMPTOM

- Failure is possibly caused by failed power supply circuit or failed earthing circuit of engine-ECU.

PROBABLE CAUSES

- Open/short circuit in engine-ECU power circuit
- Short circuit in diagnosis connector circuit
- Failed engine-ECU

DIAGNOSIS PROCEDURE

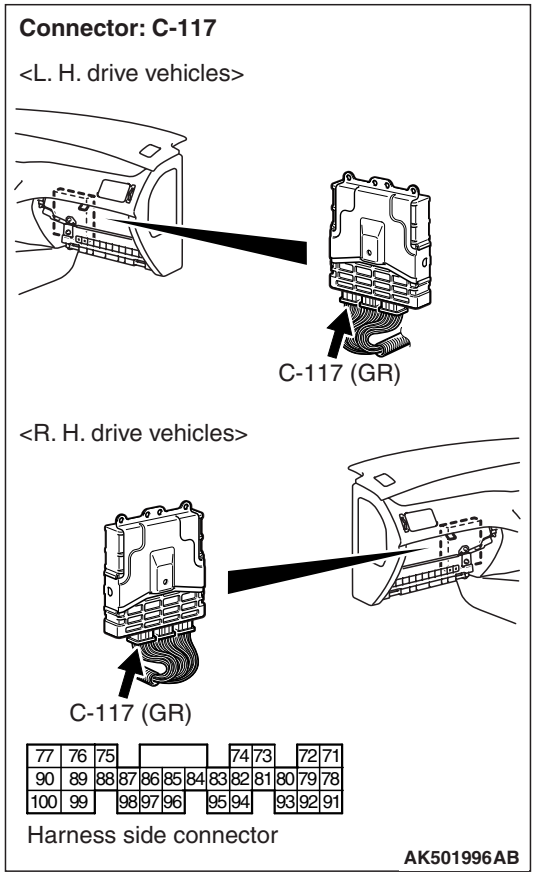
NOTE:
**1: L.H. drive vehicles*
**2: R.H. drive vehicles*

STEP 1. Check engine warning lamp.

- Ignition switch: OFF → ON

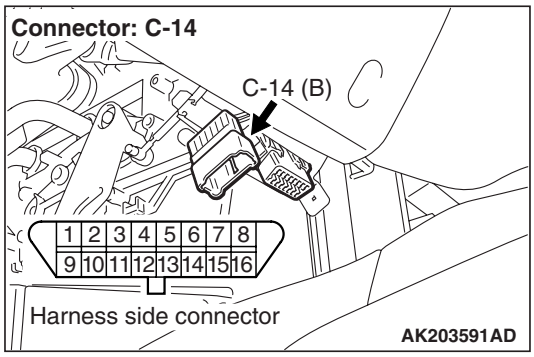
Q: Is lamp illuminating for few seconds?
YES : Go to Step 2 .
NO : Check engine-ECU power supply, engine control relay and ignition switch IG1 system (Refer to Inspection Procedure 23 P.13A-302).

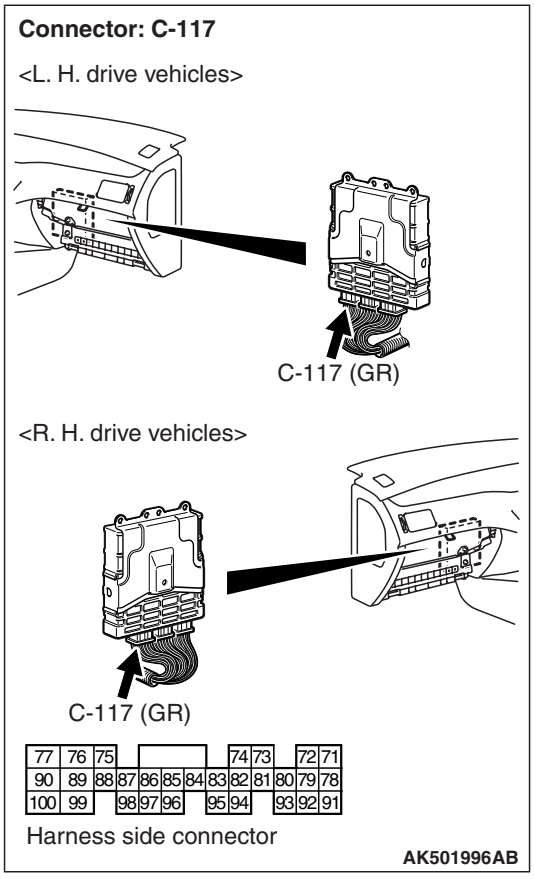
STEP 2. Connector check: C-117 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 3 .
NO : Repair or replace the connector.

STEP 3. Check harness between C-14 (terminal No. 7) diagnosis connector and C-117 (terminal No. 85) engine-ECU connector.





*NOTE: Before Checking harness, check intermediate connectors C-105*1, C-124 and C-101*1 or C-23*2, and repair if necessary.*

- Check communication line for open/short circuit and damage.

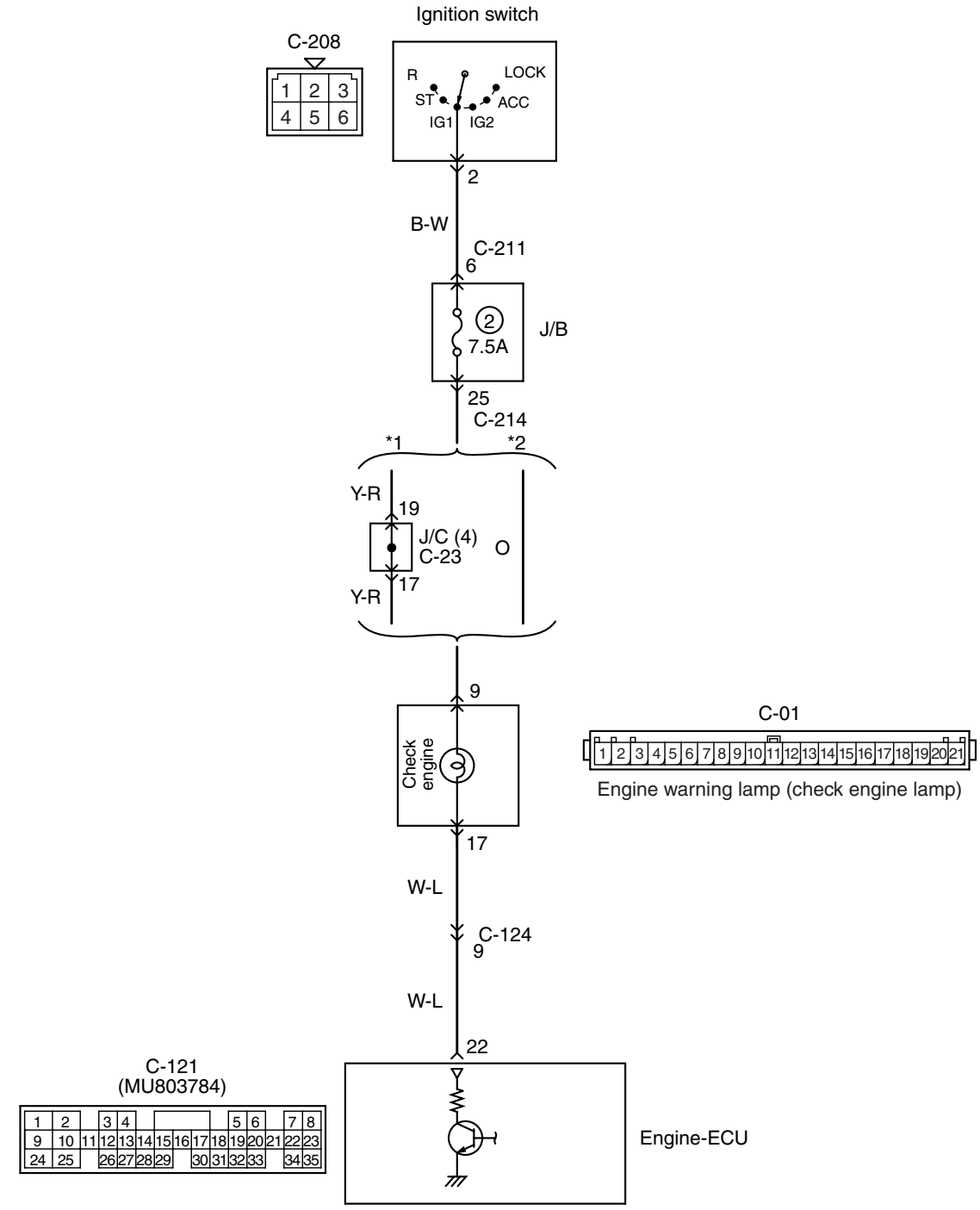
Q: Is the check result normal?
YES : Go to Step 4 .
NO : Repair the damaged harness wire.

STEP 4. Check the trouble symptom.

Q: Does trouble symptom persist?
YES : Replace the engine-ECU.
NO : Intermittent malfunction (Refer to GROUP 00 − How to Use Troubleshooting/Inspection Service Points P.00-5).

Inspection Procedure 3: The Engine Warning Lamp does not Illuminate Right after the Ignition Switch is Turned to the "ON" Position

Engine warning lamp (check engine lamp) circuit



NOTE
*1: L.H. drive vehicles
*2: R.H. drive vehicles

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

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OPERATION

- Battery voltage is applied to engine warning lamp of combination meter connector (terminal No. 9) from ignition switch.
- Engine-ECU (terminal No. 22) makes power transistor in unit be in "ON" position, and that makes currents go on engine warning lamp of combination meter connector (terminal No. 17).

COMMENTS ON TROUBLE SYMPTOM

- Engine-ECU turns on engine warning lamp for 5 seconds to check for burnt-out bulb immediately after ignition switch is turned to ON.
- If engine warning lamp is not lit just after turning ignition switch to "ON" position, failure is possibly caused by burn-out bulb, open/short circuit or other faults.

PROBABLE CAUSES

- Engine warming lamp bulb burnt out
- Failed ignition switch
- Open/short circuit in engine warning lamp circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. Check engine start-up.

Q: Is engine started?

YES : Go to Step 2 .

NO : Check engine-ECU power supply, engine control relay and ignition switch IG1 system (Refer to Inspection Procedure 23 P.13A-302).

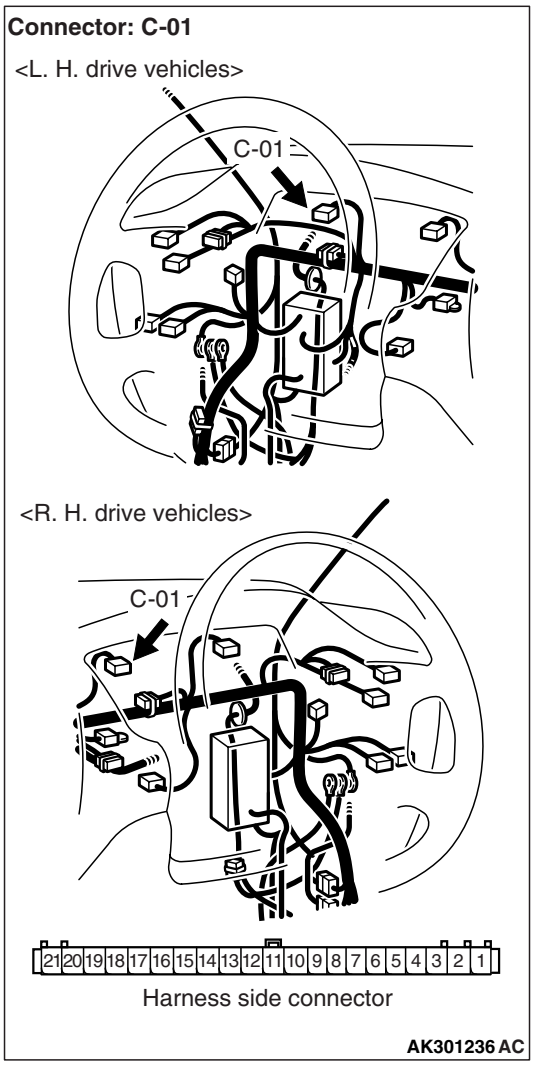
STEP 2. Check engine warning lamp for burnt-out bulb.

Q: Is the check result normal?

YES : Go to Step 3 .

NO : Replace the engine warning lamp.

STEP 3. Connector check: C-01 combination meter connector

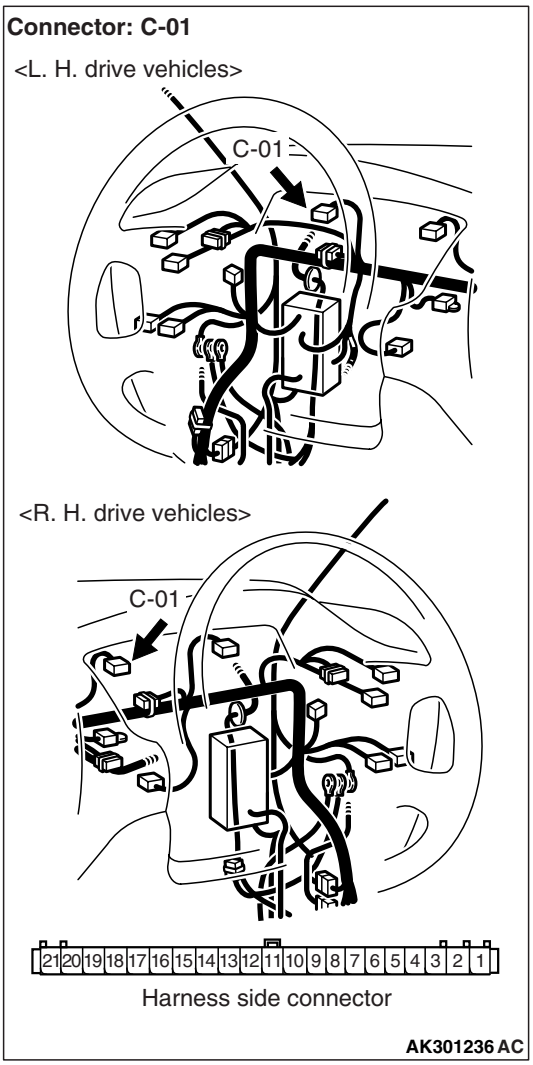


Q: Is the check result normal?

YES : Go to Step 4 .

NO : Repair or replace the connector.

STEP 4. Perform voltage measurement at C-01 combination meter connector.



- Disconnect connector, and measure at the harness side.
- Ignition switch: "ON"
- Voltage between terminal No. 9 and earth.

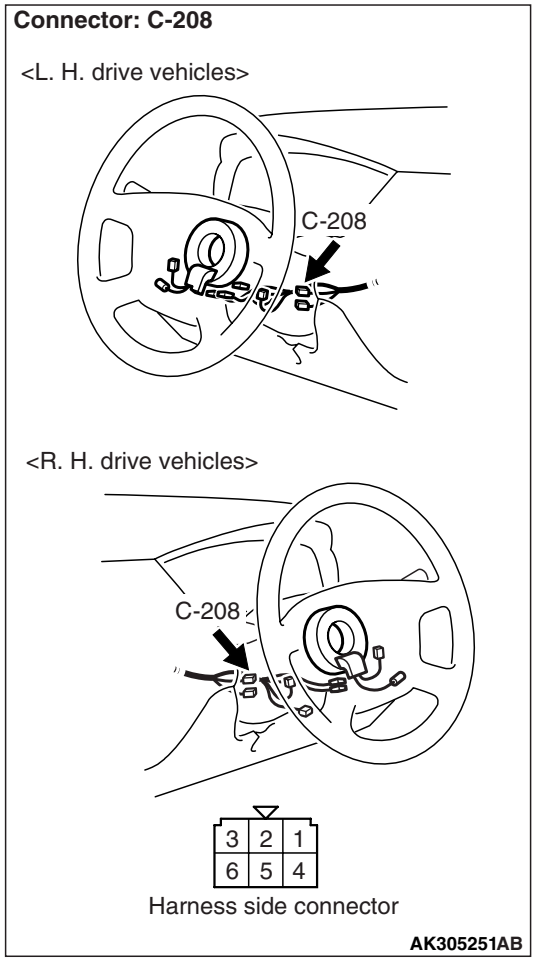
OK: System voltage

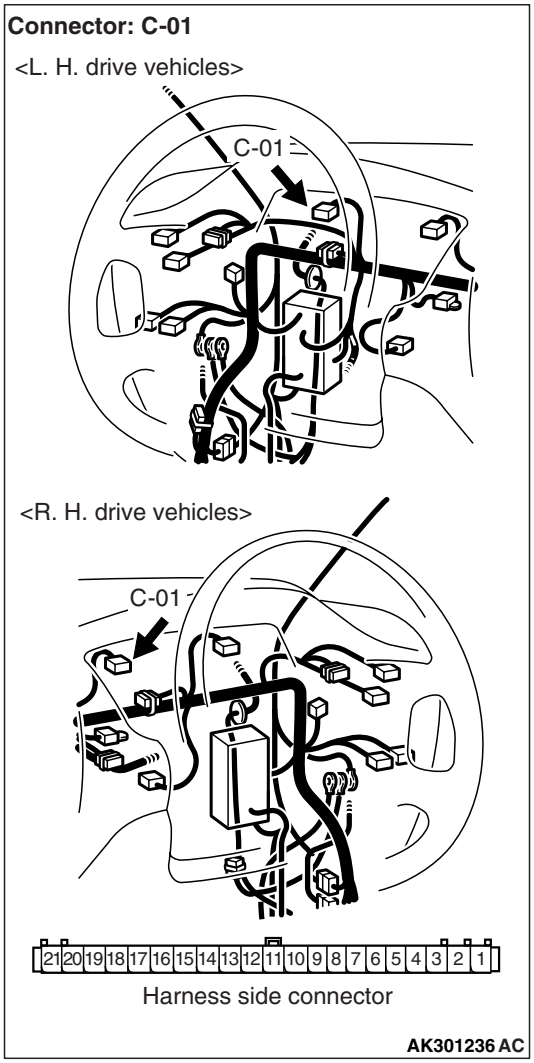
Q: Is the check result normal?

YES : Go to Step 6 .

NO : Go to Step 5 .

STEP 5. Connector check: C-208 ignition switch connector





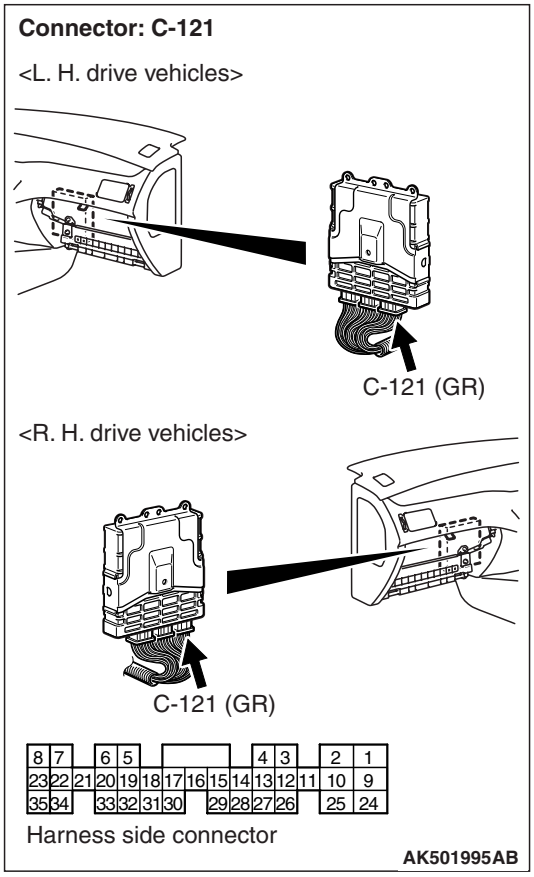
Q: Is the check result normal?

YES : Check intermediate connectors C-23 <L.H. drive vehicles> or C-214 and C-211, and repair if necessary. If intermediate connectors are normal, check and repair harness between C-01 (terminal No. 9) combination meter connector and C-208 (terminal No. 2) ignition switch connector.

- Check power supply line for open/short circuit.

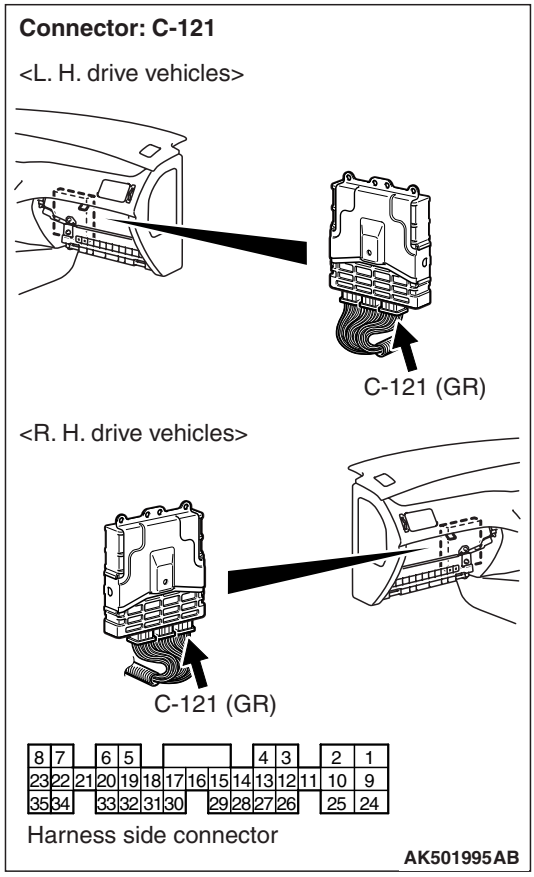
NO : Repair or replace the connector.

STEP 6. Connector check: C-121 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair or replace the connector.

STEP 7. Perform voltage measurement at C-121 engine-ECU connector.

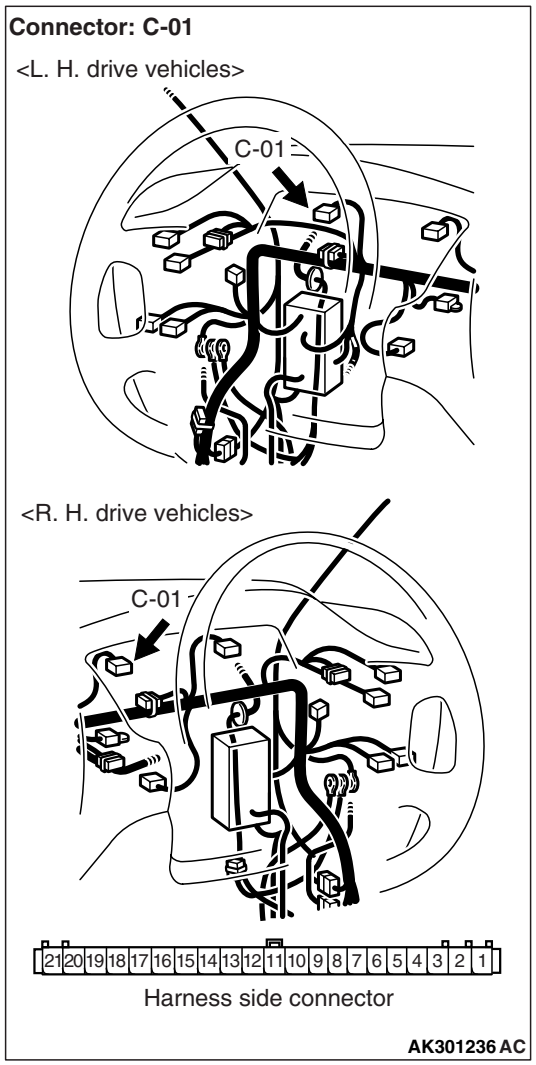


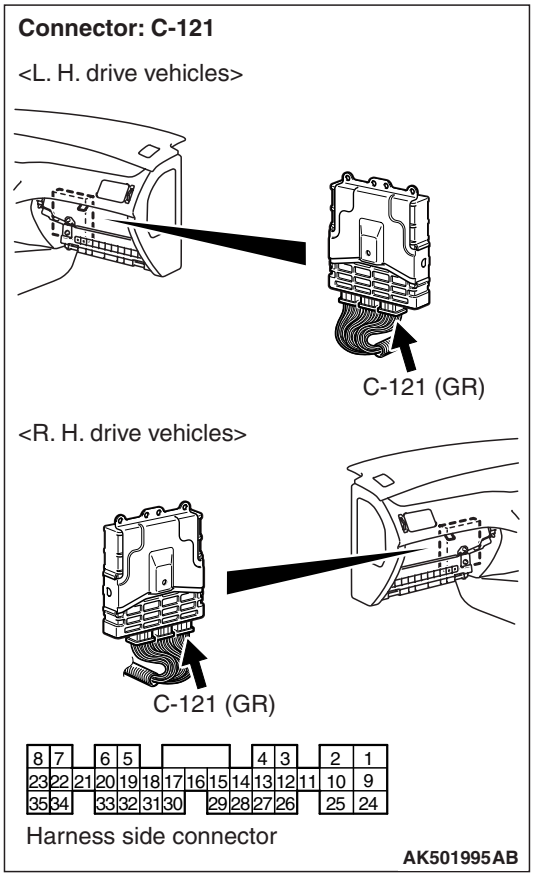
- Disconnect connector, and measure at the harness side.
- Ignition switch: "ON"
- Voltage between terminal No. 22 and earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 9 .
NO : Go to Step 8 .

STEP 8. Connector check: C-01 combination meter connector





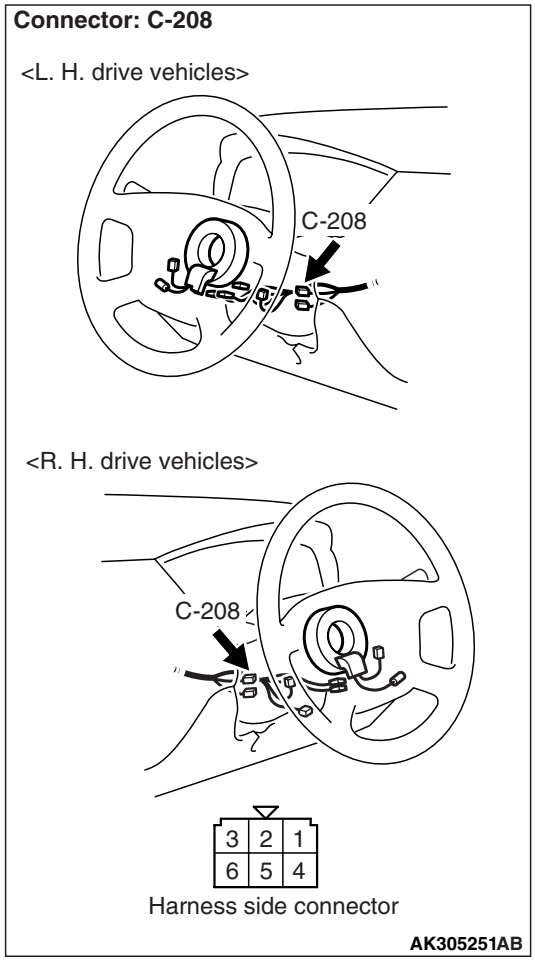
Q: Is the check result normal?

YES : Check intermediate connector C-124, and repair if necessary. If intermediate connector is normal, check and repair harness between C-01 (terminal No. 17) combination meter connector and C-121 (terminal No. 22) engine-ECU connector.

- Check output line for open/short circuit.

NO : Repair or replace the connector.

STEP 9. Connector check: C-208 ignition switch connector

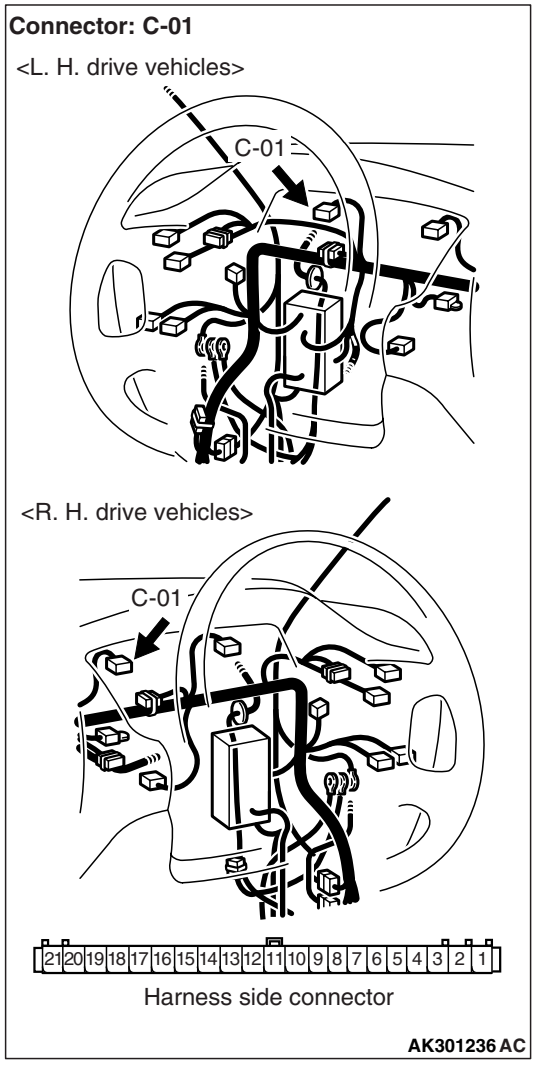


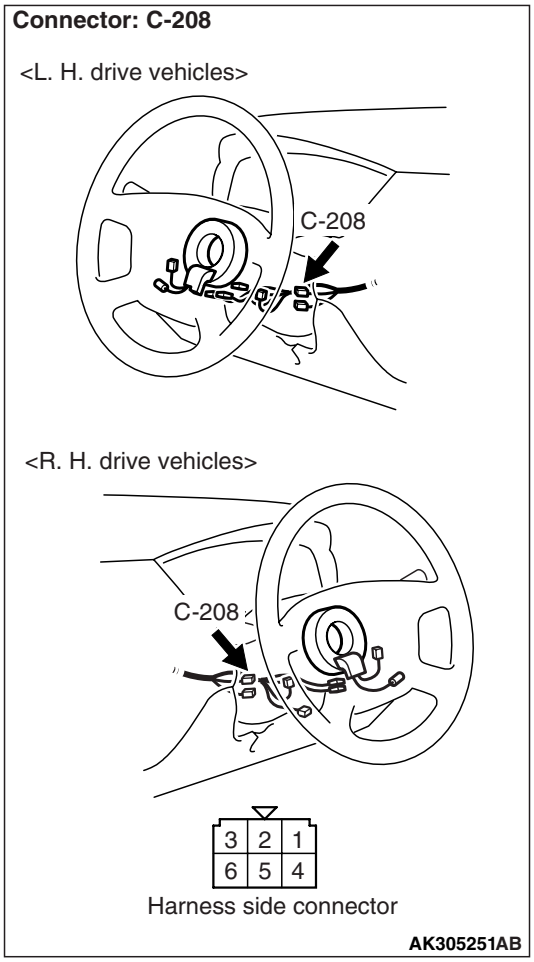
Q: Is the check result normal?

YES : Go to Step 10 .

NO : Repair or replace the connector.

STEP 10. Check harness between C-01 (terminal No. 9) combination connector and C-208 (terminal No. 2) ignition switch connector.





NOTE: Before checking harness, check intermediate connectors C-23 <L.H. drive vehicles>, C-211and C-214, and repair if necessary.

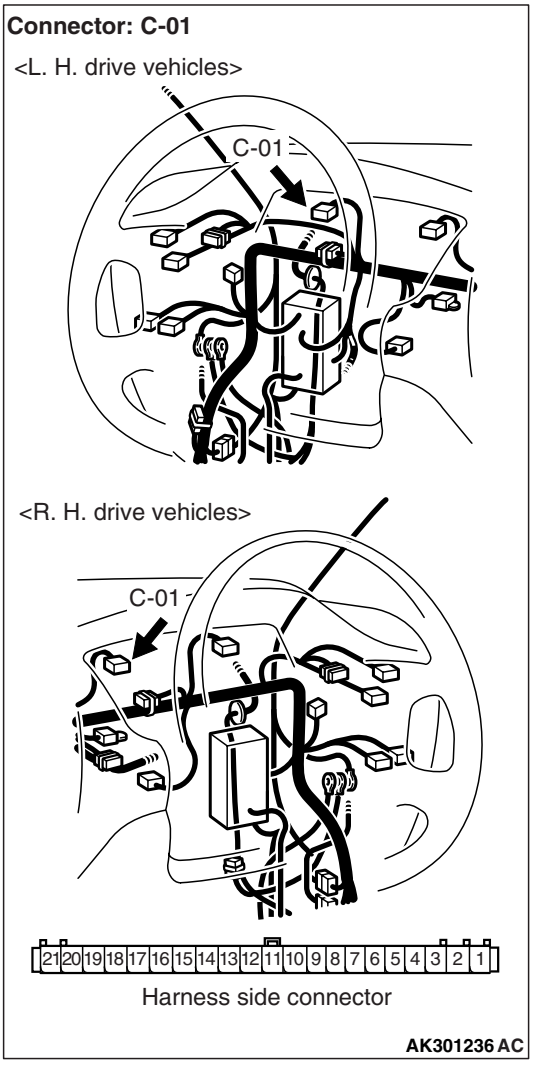
- Check power supply line for damage.

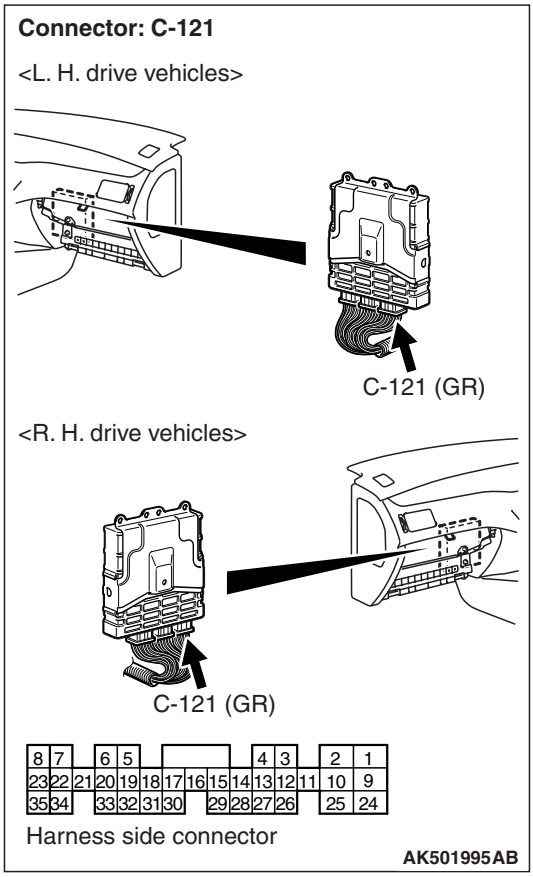
Q: Is the check result normal?

YES : Go to Step 11.

NO : Repair the damaged harness wire.

STEP 11. Check harness between C-01 (terminal No. 17) combination connector and C-121 (terminal No. 22) engine-ECU connector.





NOTE: Before checking harness, check intermediate connector C-124, and repair if necessary.

- Check output line for damage.

Q: Is the check result normal?

YES : Go to Step 12.

NO : Repair the damaged harness wire.

STEP 12. Check the trouble symptoms.

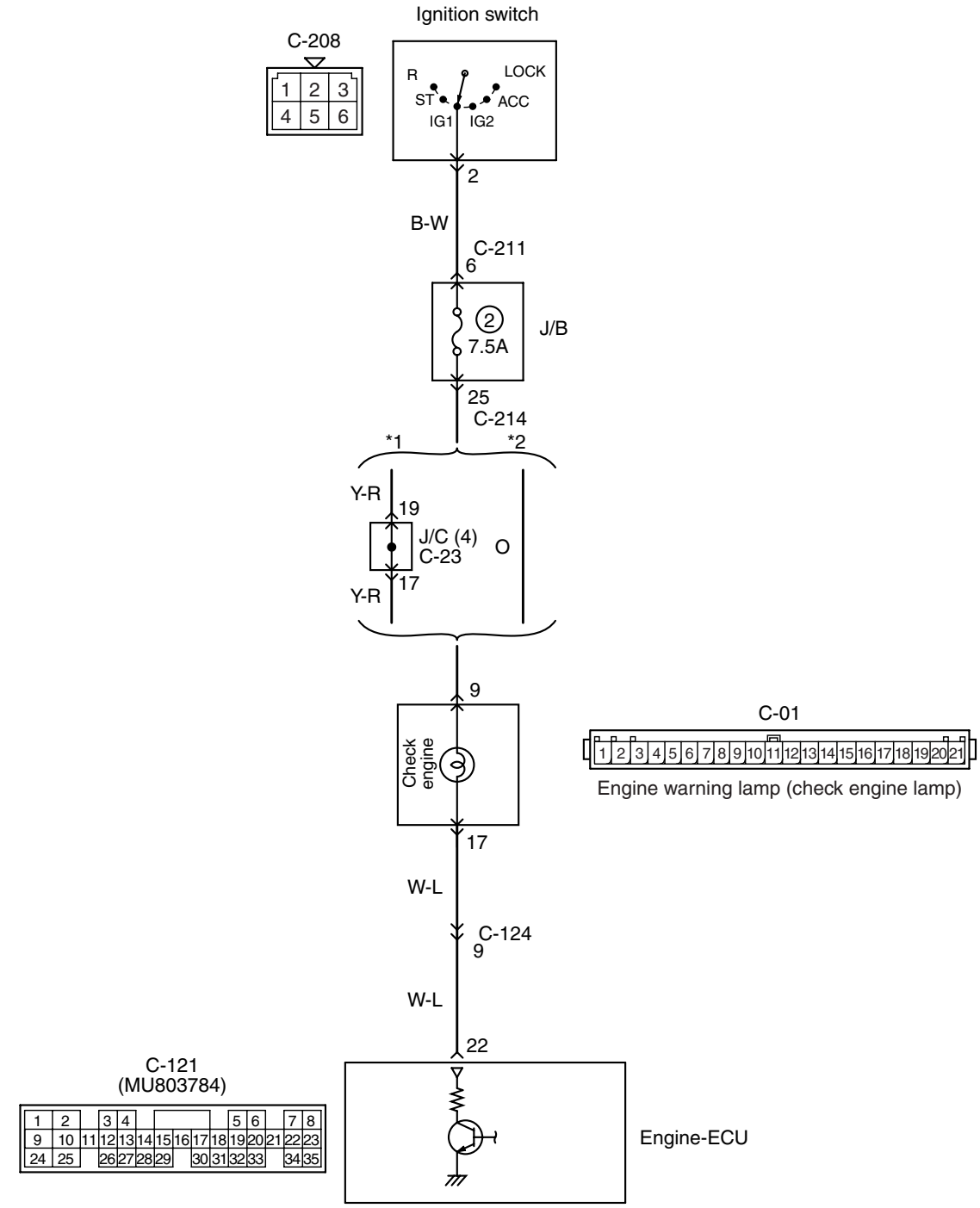
Q: Does trouble symptom persist?

YES : Replace the engine-ECU.

NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-5).

Inspection Procedure 4: The Engine Warning Lamp Remains Illuminating and never goes out

Engine warning lamp (check engine lamp) circuit



NOTE
*1: L.H. drive vehicles
*2: R.H. drive vehicles

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

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OPERATION

- Battery voltage is applied to engine warning lamp (terminal No. 9) from ignition switch.
- Engine-ECU (terminal No. 22) makes power transistor in unit be in "ON" position, and that makes currents go on engine warning lamp (terminal No. 17).

COMMENTS ON TROUBLE SYMPTOM

- Engine-ECU has detected failed sensor or failed actuator. Or failure is possibly caused by short circuit or other faults.

PROBABLE CAUSES

- Short circuit in between engine warning lamp and engine-ECU circuit.
- Failed engine-ECU

DIAGNOSIS PROCEDURE

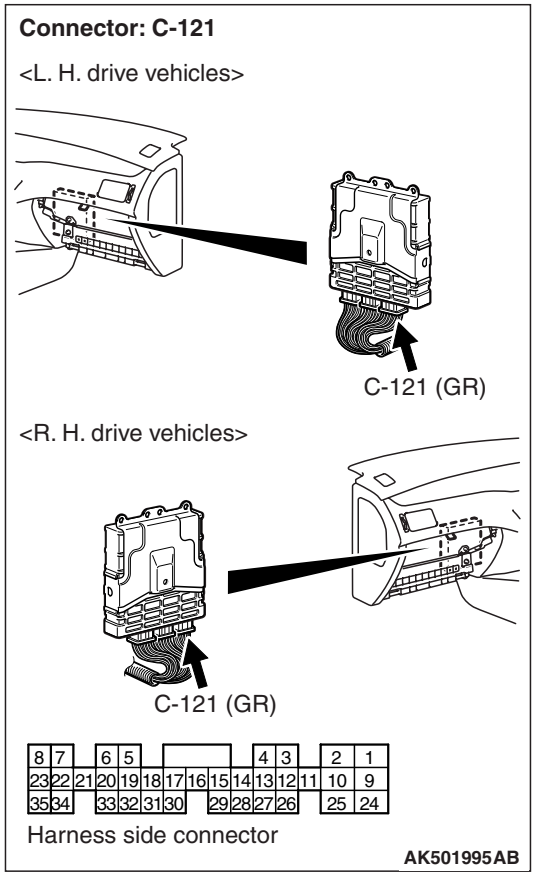
STEP 1. M.U.T.-II/III diagnosis code

Q: Diagnosis code set?

YES : Inspection chart for diagnosis code (Refer to P.13A-17).

NO : Go to Step 2 .

STEP 2. Connector check: C-121 engine-ECU connector

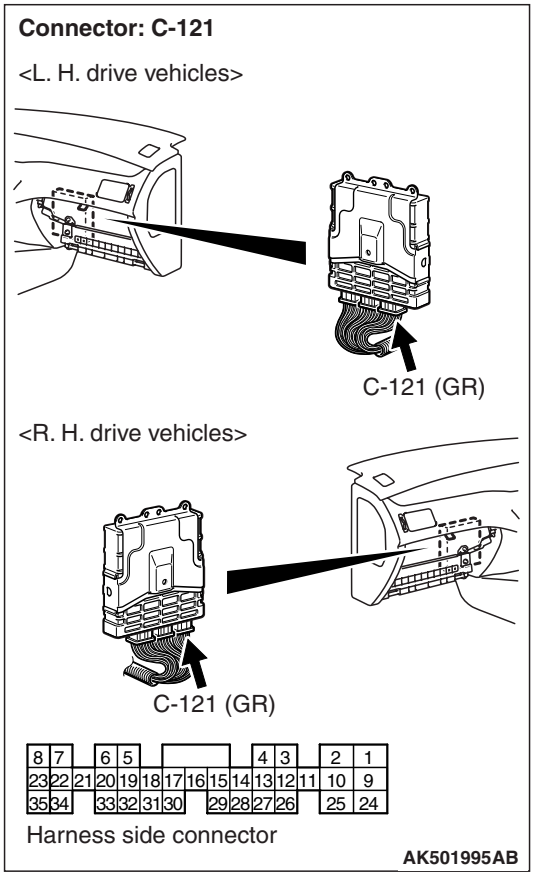


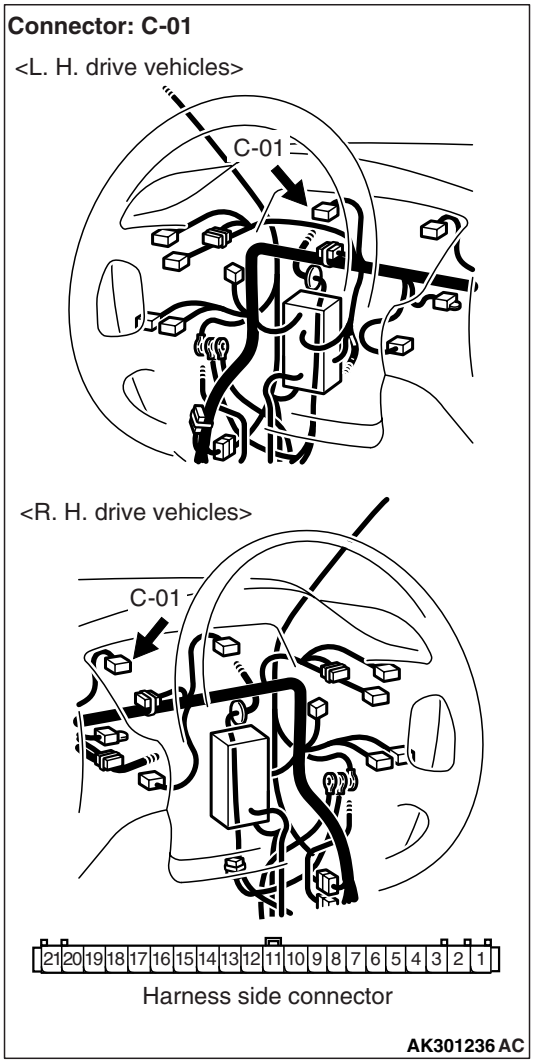
Q: Is the check result normal?

YES : Go to Step 3 .

NO : Repair or replace the connector.

STEP 3. Perform voltage measurement at C-121 engine-ECU connector.





- Disconnect connector, and measure at the harness side.
- Ignition switch: "ON"
- Voltage between terminal No. 22 and earth.

OK: System voltage

Q: Is the check result normal?

YES : Go to Step 4 .

NO : Check intermediate connector C-124, and repair if necessary. If intermediate connector is normal, check and repair harness between C-01 (terminal No. 17) combination meter connector and C-121 (terminal No. 22) engine-ECU connector.

- Check output line for short circuit.

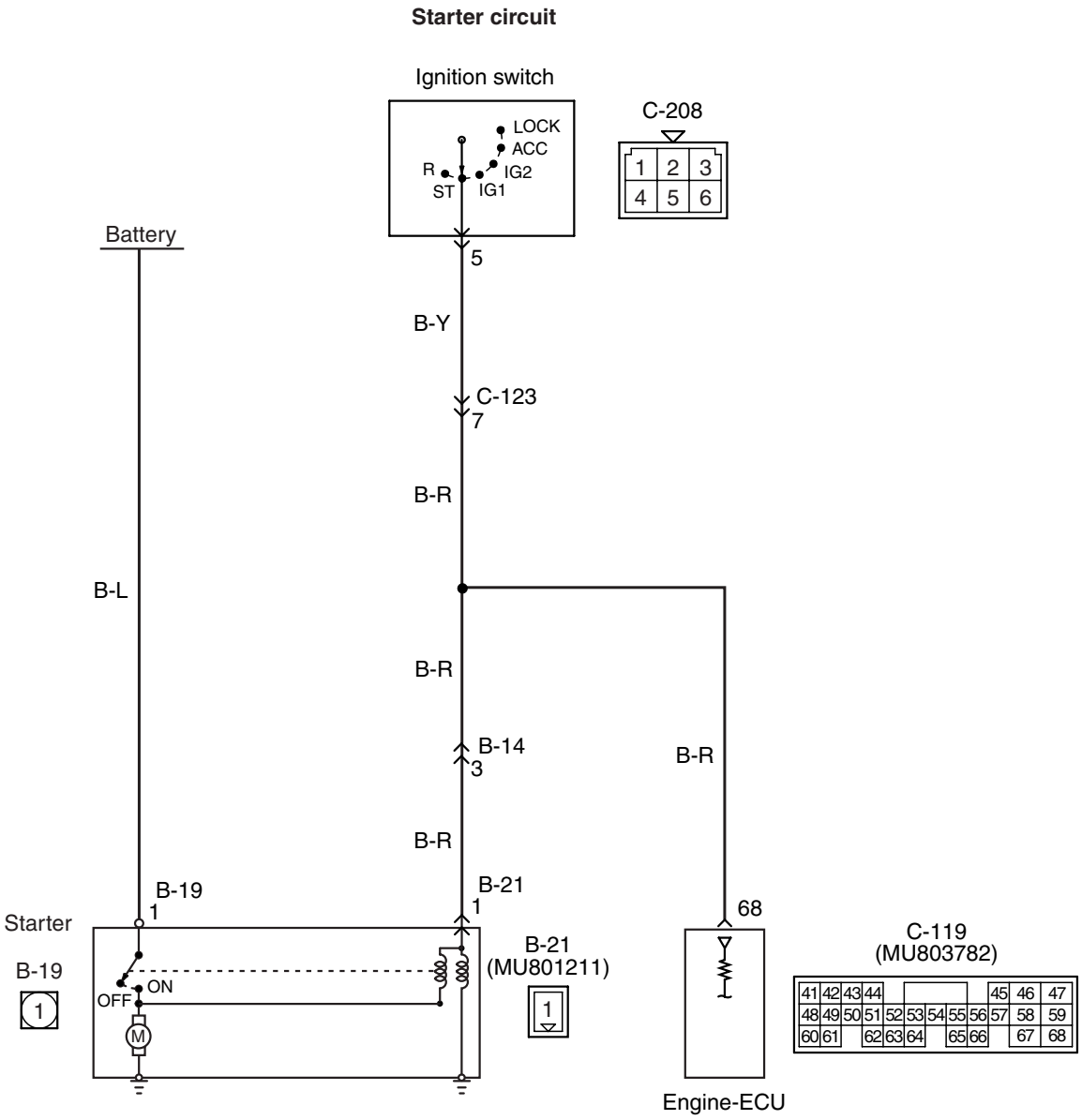
STEP 4. Check the trouble symptoms.

Q: Does trouble symptom persist?

YES : Replace the engine-ECU.

NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-5).

Inspection Procedure 5: Starting Impossible (No Initial Combustion)



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

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OPERATION

- If the ignition switch is turned to "START" position, battery voltage is applied to starter (terminal No. 1).
- If the ignition switch is turned to "START" position, battery voltage is applied to engine-ECU (terminal No. 68) from ignition switch. Because of this, engine-ECU detects that the engine is cranked.

COMMENT ON TROUBLE SYMPTOM

- Failure is possibly caused by failed starter itself or failed related circuit.

PROBABLE CAUSES

- Failed battery
- Failed starter motor
- Open/short circuit in starter associated circuit or loose connector contact

DIAGNOSIS PROCEDURE

STEP 1. Check battery voltage.

- Measure battery voltage at cranking.

OK: 8 V or higher

Q: Is the check result normal?
YES : Go to Step 2 .
NO : Check battery (Refer to GROUP 54A – Battery – On-vehicle Service – Battery Test P.54A-5).

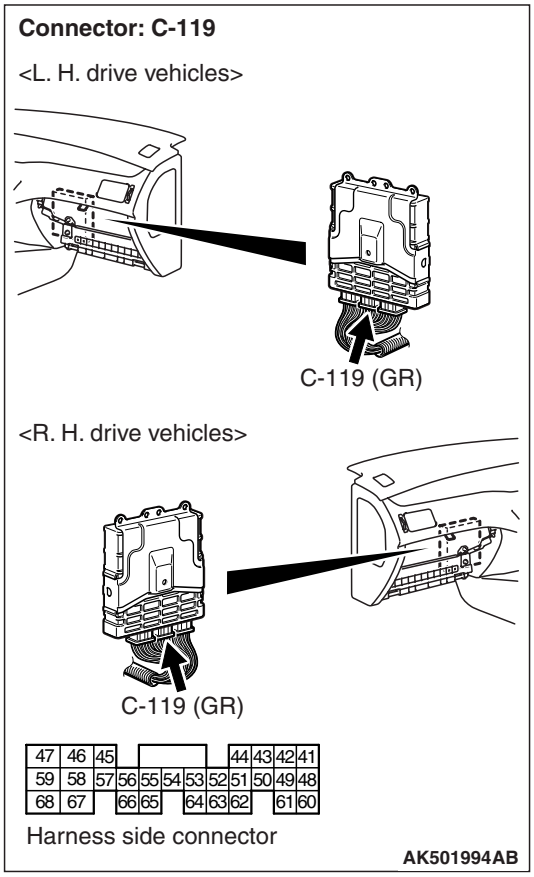
STEP 2. M.U.T.-II/III data list

- Item No. 18: Cranking signal

OK:
ON (Ignition switch: ST)
OFF (Ignition switch: ON)

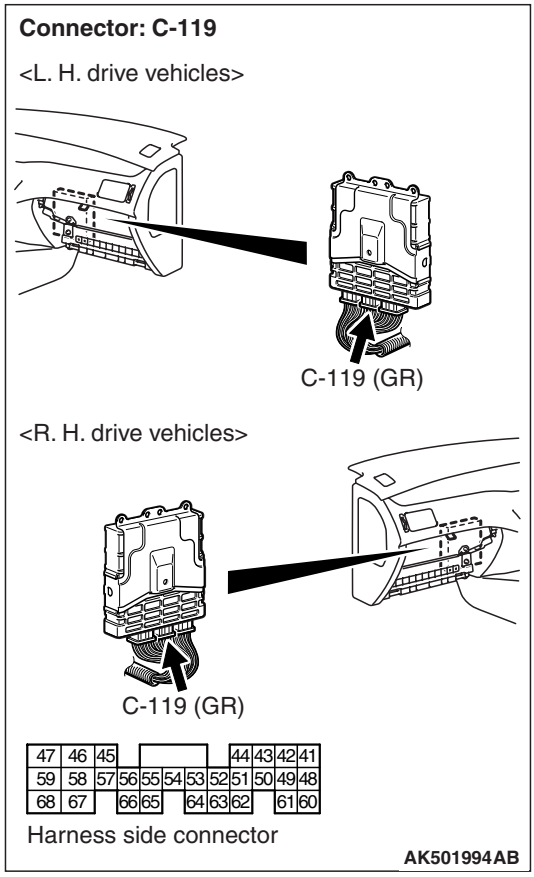
Q: Is the check result normal?
YES : Go to Step 8 .
NO : Go to Step 3 .

STEP 3. Connector check: C-119 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 4 .
NO : Repair or replace the connector.

STEP 4. Perform voltage measurement at C-119 engine-ECU connector.

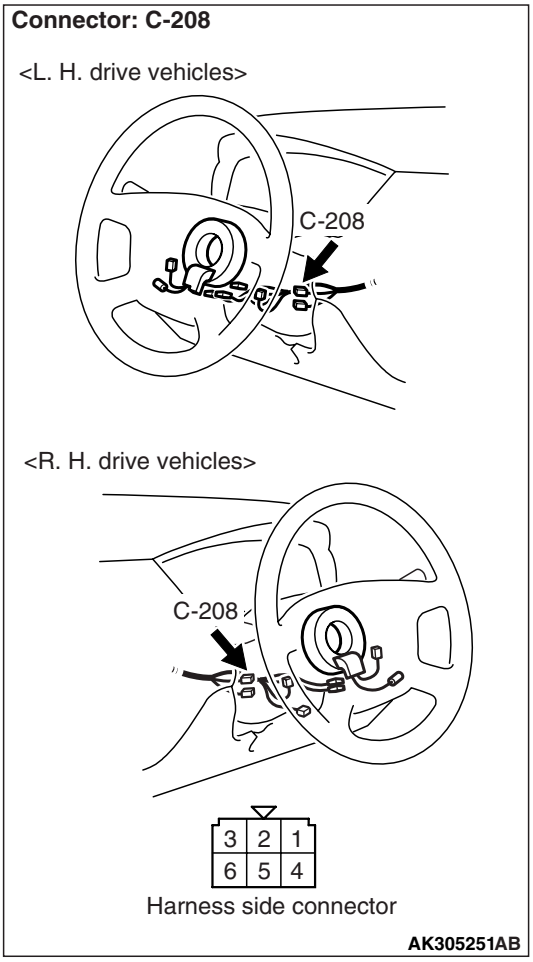


- Disconnect connector, and measure at the harness side.
- Ignition switch: ST
- Voltage between terminal No. 68 and earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Go to Step 5 .

STEP 5. Connector check: C-208 ignition switch connector

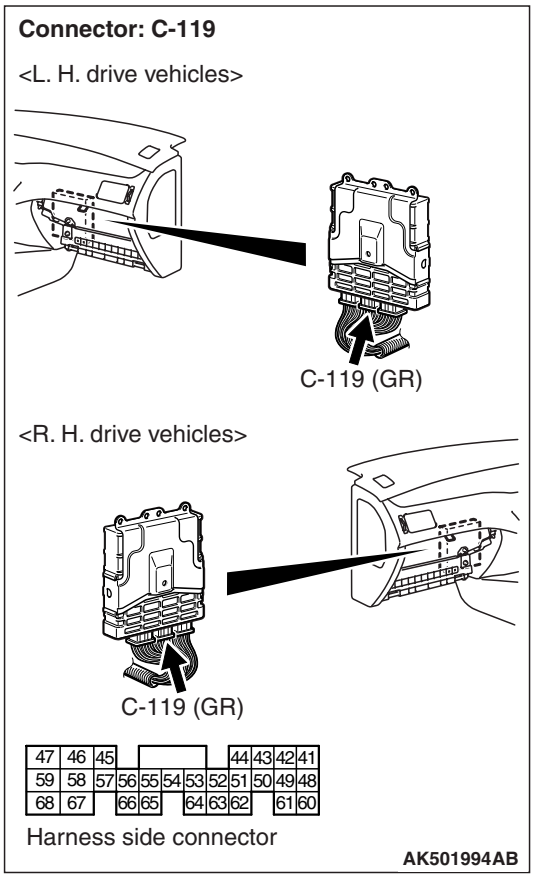


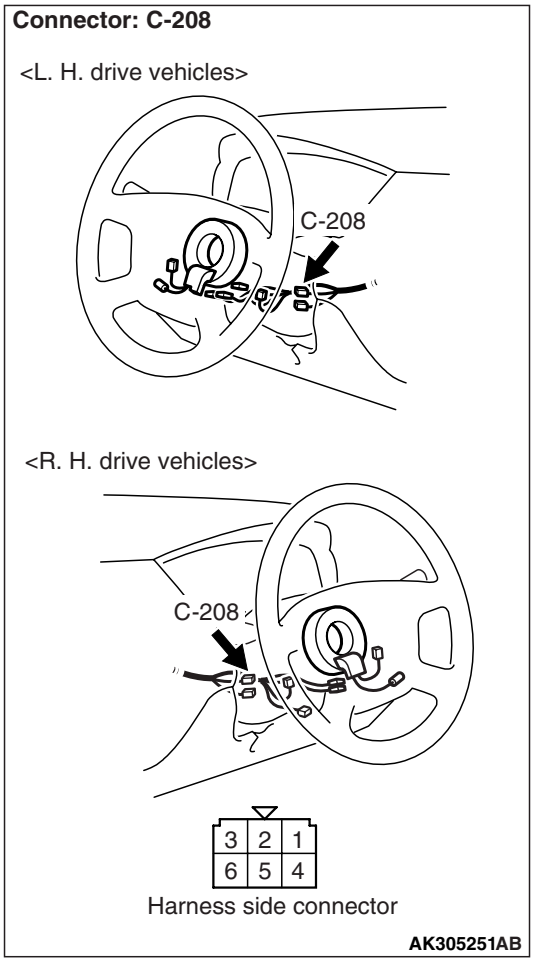
Q: Is the check result normal?

YES : Go to Step 6 .

NO : Repair or replace the connector.

STEP 6. Check ignition switch.





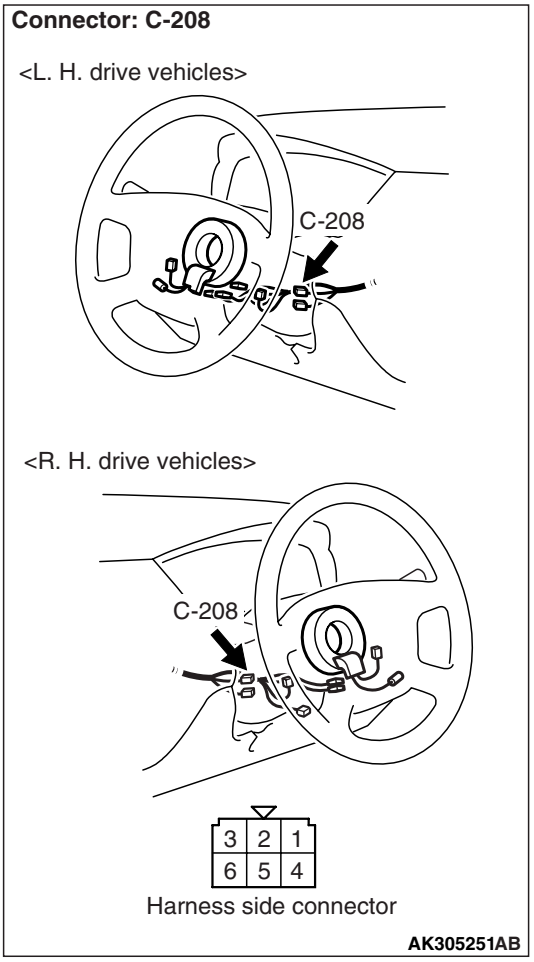
- Check ignition switch (Refer to GROUP 54A – Ignition Switch – Ignition Switch – Inspection P.54A-30).

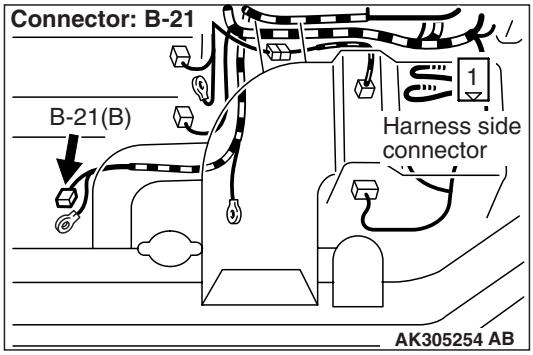
Q: Is the check result normal?

YES : Check intermediate connectors C-123, and repair if necessary. If intermediate connectors are normal, check and repair harness between C-119 (terminal No. 68) inhibitor switch connector and C-208 (terminal No. 5) ignition switch connector.
- Check power supply line for open/short circuit.

NO : Replace the ignition switch.

STEP 7. Connector check: C-208 ignition switch connector and B-21 starter connector





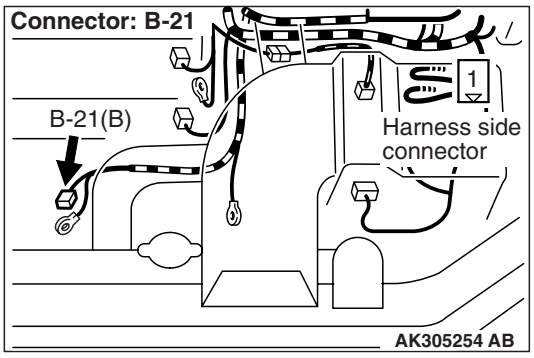
Q: Is the check result normal?

YES : Check intermediate connectors C-123 and B-14, and repair if necessary. If intermediate connectors are normal, check and repair harness between C-208 (terminal No. 5) ignition switch connector and B-21 (terminal No. 1) starter connector.

- Check output line for short circuit.

NO : Repair or replace the connector.

STEP 8. Connector check: B-21 starter connector

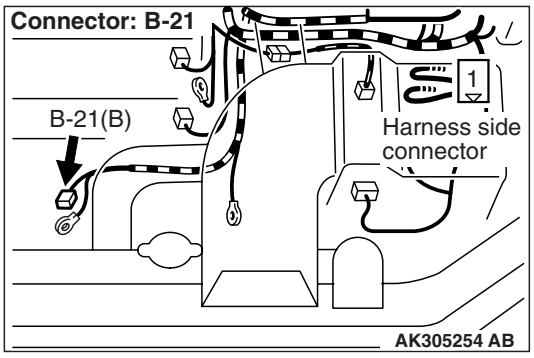


Q: Is the check result normal?

YES : Go to Step 9 .

NO : Repair or replace the connector.

STEP 9. Perform voltage measurement at B-21 starter connector.



- Disconnect connector, and measure at the harness side.
- Ignition switch: ST
- Voltage between terminal No. 1 and earth.

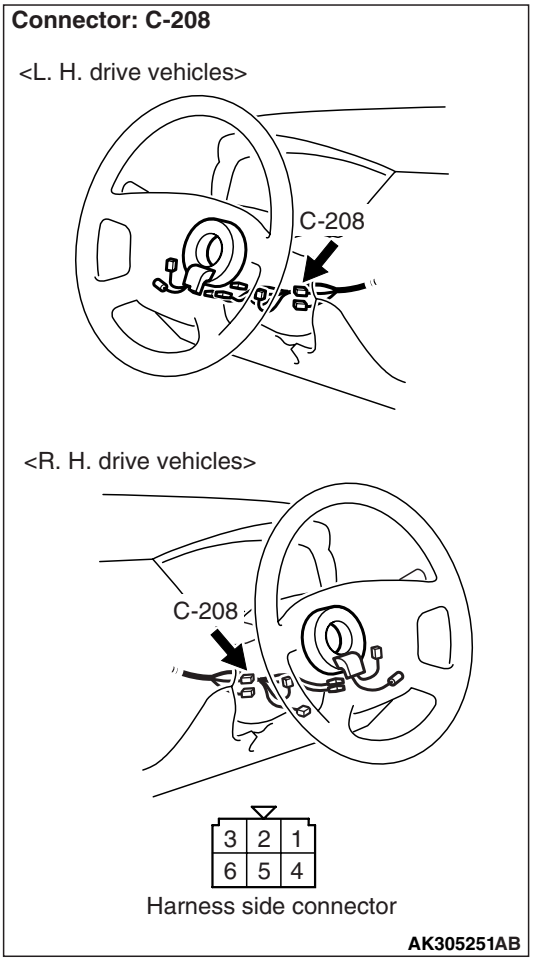
OK: System voltage

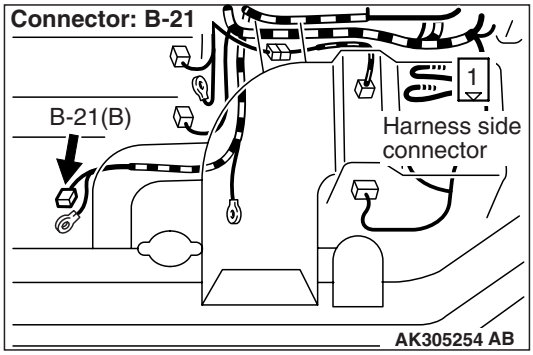
Q: Is the check result normal?

YES : Go to Step 11 .

NO : Go to Step 10 .

STEP 10. Connector check: C-208 ignition switch connector





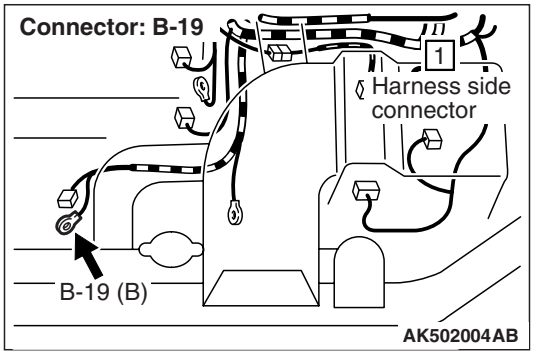
Q: Is the check result normal?

YES : Check intermediate connectors B-14 and C-123, and repair if necessary. If intermediate connectors are normal, check and repair harness between C-208 (terminal No. 5) ignition switch connector and B-21 (terminal No. 1) starter connector.

- Check output line for open circuit and damage.

NO : Repair or replace the connector.

STEP 11. Connector check: B-19 starter connector

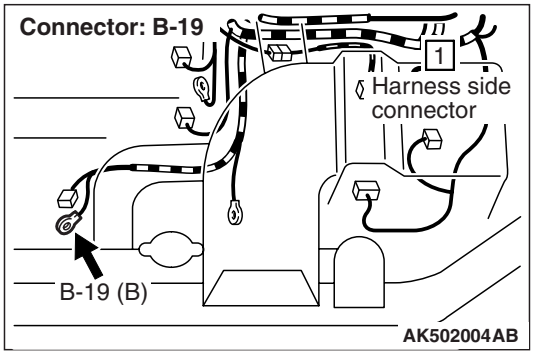


Q: Is the check result normal?

YES : Go to Step 12 .

NO : Repair or replace the connector.

STEP 12. Perform voltage measurement at B-19 starter connector.



- Disconnect connector, and measure at the harness side.
- Voltage between terminal No. 1 and earth.

OK: System voltage

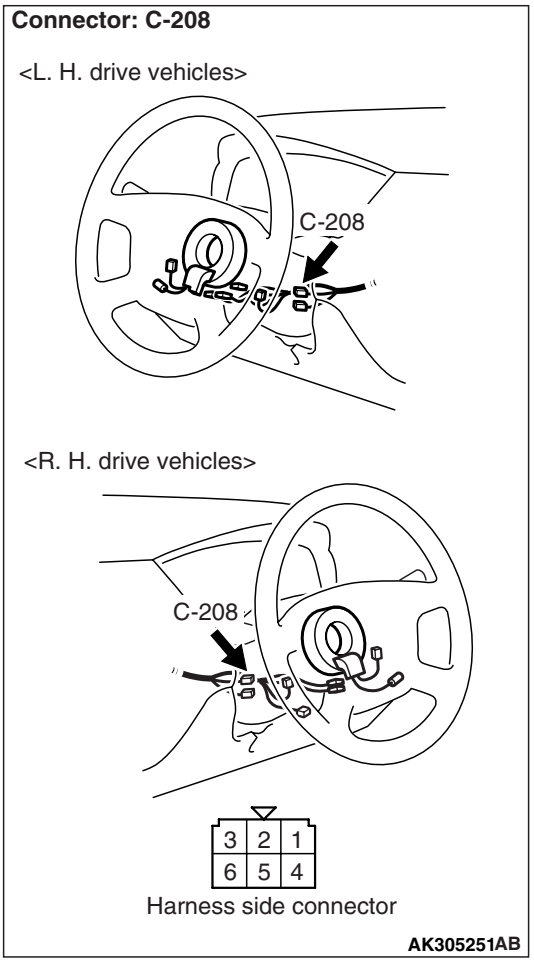
Q: Is the check result normal?

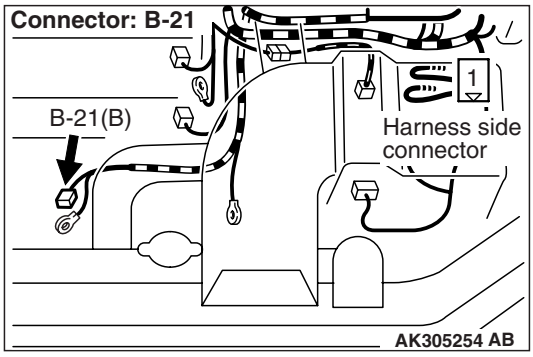
YES : Go to Step 13 .

NO : Check and repair harness between B-19 (terminal No. 1) starter connector and battery.

- Check power supply line for open/short circuit.

STEP 13. Check harness between C-208 (terminal No. 5) ignition switch connector and B-21 (terminal No. 1) starter connector.





NOTE: Before checking harness, check intermediate connectors B-14 and C-123, and repair if necessary.

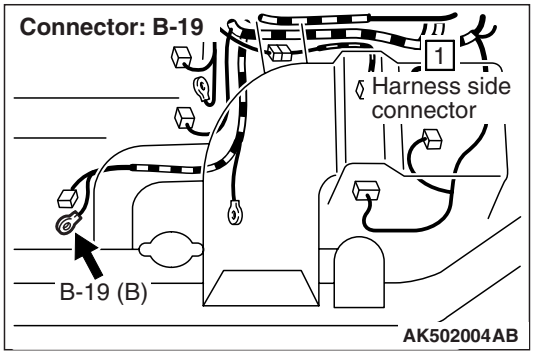
- Check output line for damage.

Q: Is the check result normal?

YES : Go to Step 14 .

NO : Repair the damaged harness wire.

STEP 14. Check harness between B-19 (terminal No. 1) starter connector and battery.



- Check power supply line for damage.

Q: Is the check result normal?

YES : Replace the starter.

NO : Repair the damaged harness wire.

Inspection Procedure 6: Starting impossible (Starter Operative but No Initial Combustion)

OPERATION

- Refer to inspection procedure, ignition circuit system <L. H. drive vehicles>P.13A-356 or ignition circuit system <R. H. drive vehicles>P.13A-363

COMMENTS ON TROUBLE SYMPTOM

- Failure is possibly caused by failed ignition circuit, failed fuel feed or other faults.

PROBABLE CAUSES

- Failed battery
- Timing belt broken
- Failed idle speed control
- Throttle valve fouled around
- Failed ignition system
- Failed fuel system
- Failed immobilizer system
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. Check battery voltage.

- Measure battery voltage at cranking.

OK: 8 V or higher

Q: Is the check result normal?
YES : Go to Step 2 .
NO : Check battery (Refer to GROUP 54A – Battery – On-vehicle Service – Battery test P.54A-5).

STEP 2. Check engine warning lamp for burnt out bulb

Q: Is the check result normal?
YES : Go to Step 3 .
NO : Check engine-ECU power supply, engine control relay and ignition switch IG1 system (Refer to Inspection Procedure 23 P.13A-302).

STEP 3. M.U.T.-II/III diagnosis code

Q: Diagnosis code set?
YES : Inspection chart for diagnosis codes (Refer to P.13A-17).
NO : Go to Step 4 .

STEP 4. M.U.T.-II/III actuator test

- Item No. 07: Fuel pump

OK: Operating sound of fuel pump can be heard.

Q: Is the check result normal?
YES : Go to Step 5 .
NO : Check fuel pump system (Refer to Inspection Procedure 24 P.13A-313).

STEP 5. Check timing belt for breakage.

- Engine: Cranking

OK: Camshaft rotates.

Q: Is the check result normal?
YES : Go to Step 6 .
NO : Replace the timing belt.

STEP 6. Check the engine start ability.

- With depressing the accelerator pedal slightly, and start the engine.

Q: Is the start ability good?
YES : Go to Step 7 .
NO : Go to Step 8 .

STEP 7. Check idling speed control for operating sound.

- Check idle speed control servo for operating sound (Refer to P.13A-408).

Q: Is the check result normal?
YES : Clean throttle body (throttle valve portion) (Refer to P.13A-395).
NO : Check idle speed control servo system (Refer to code No. P0505 P.13A-190).

STEP 8. M.U.T.-II/III data list

- Item No. 18: Cranking signal

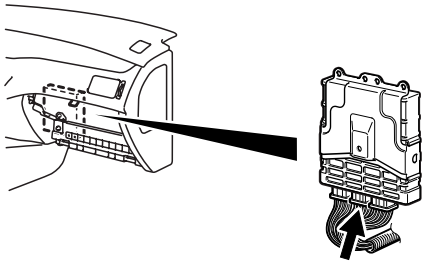
OK:
ON (Ignition switch: ST)
OFF (Ignition switch: ON)

Q: Is the check result normal?
YES : Go to Step 10 .
NO : Go to Step 9 .

STEP 9. Connector check: C-119 engine-ECU connector

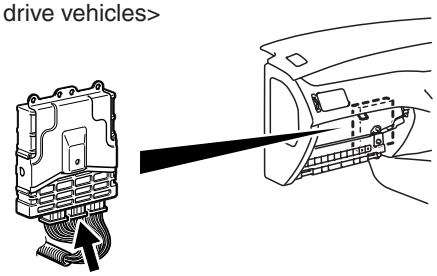
Connector: C-119

<L. H. drive vehicles>

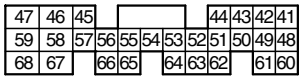


C-119 (GR)

<R. H. drive vehicles>



C-119 (GR)

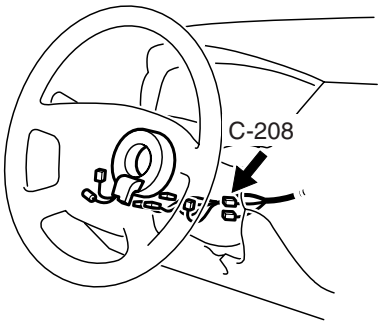


Harness side connector

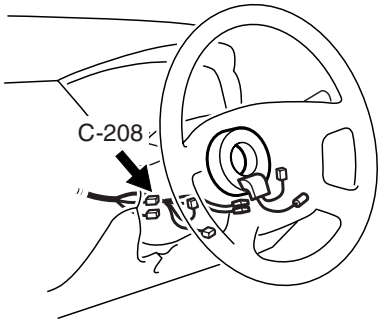
AK501994AB

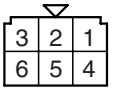
Connector: C-208

<L. H. drive vehicles>



<R. H. drive vehicles>





Harness side connector

AK305251AB

Q: Is the check result normal?

YES : Check intermediate connector C-123, and repair if necessary. If intermediate connector is normal, check and repair harness between C-208 (terminal No. 9) ignition switch connector and C-119 (terminal No. 68) engine-ECU connector.

- Check output line for open/short circuit.

NO : Repair or replace the connector.

STEP 10. M.U.T.-II/III data list

- Refer to Data List Reference Table P.13A-372.
  a. Item No. 22: Crank angle sensor

Q: Is the check result normal?

YES : Go to Step 11 .

NO : Check crank angle sensor system (Refer to Code No. P0335 P.13A-155).

STEP 11. Check injector for operating sound.

- Check injector for operating sound (Refer to P.13A-406).

Q: Can operating sound be heard?

YES : Go to Step 12 .

NO : Check the injector system of the defective cylinder
(Refer to Code No. 0201: No. 1 injector system P.13A-105).
(Refer to Code No. 0202: No. 2 injector system P.13A-111).
(Refer to Code No. 0203: No. 3 injector system P.13A-117).
(Refer to Code No. 0204: No. 4 injector system P.13A-123).

STEP 12. Check ignition coil spark

Q: Is the check result normal?

YES : Go to Step 13 .

NO : Check ignition circuit system (refer to inspection procedure 30 <L. H. drive vehicles>P.13A-356 or inspection procedure 31 <R. H. drive vehicles>P.13A-363).

STEP 13. Replace the engine-ECU.

- After replacing the engine-ECU, re-check the trouble symptoms.

Q: Does trouble symptom persist?

YES : Check for foreign matters (water, kerosene, etc.) in fuel and replace if necessary.

NO : The check is end.

Inspection Procedure 7: Starting Impossible (Initial Combustion but no Complete Combustion), Starting (Long Time to Start)

COMMENTS ON TROUBLE SYMPTOM

- Failure is possibly caused by poor ignition, incorrect air-fuel ratio at cranking, improper fuel pressure or other faults.

PROBABLE CAUSES

- Failed battery
- Failed ignition system
- Failed fuel system
- Failed air-fuel ratio control system
- Failed idle speed control system
- Failed intake system
- Failed exhaust gas cleaning system
- Throttle valve fouled around
- Timing belt not in place
- Compression pressure improper
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. Check battery condition.

Q: Have the battery terminal been disconnected?

YES : After warm-up engine, idle for about 10 minutes.

NO : Go to Step 2 .

STEP 2. Check battery voltage.

- Measure battery voltage at cranking.

OK: 8 V or higher

Q: Is the check result normal?

YES : Go to Step 3 .

NO : Check battery (Refer to GROUP 54A – Battery – On-vehicle Service – Battery Test P.54A-5).

STEP 3. M.U.T.-II/III diagnosis code

Q: Diagnosis code set?

YES : Inspection chart for diagnosis codes (Refer to P.13A-17).

NO : Go to Step 4 .

STEP 4. M.U.T.-II/III data list

- Refer to Data List Reference Table P.13A-372.
  a. Item No. 13: Intake air temperature sensor
  b. Item No. 21: Engine coolant temperature sensor
  c. Item No. 25: Barometric pressure sensor

Q: Are the check results normal?

YES : Go to Step 5 .

NO : Perform the diagnosis code classified check procedure for the sensor that has shown an abnormal data value (Refer to Inspection Chart for Diagnosis Codes P.13A-17).

STEP 5. Check start ability.

- With depressing the accelerator pedal slightly, and start the engine.

Q: Is the start ability good?
YES : Go to Step 6 .
NO : Go to Step 7 .

STEP 6. Check idle speed control servo for operating sound.

- Check idle speed control servo for operating sound (Refer to P.13A-408).

Q: Is the check result normal?
YES : Clean throttle body (throttle valve portion) (Refer to P.13A-395).
NO : Check idle speed control servo system (Refer to Code No. P0505 P.13A-190).

STEP 7. M.U.T.-II/III actuator test

- Refer to Actuator Test Reference Table P.13A-378.
  a. Item No. 07: Fuel pump

  OK: Operating sound of fuel pump can be heard.

Q: Is the check result normal?
YES : Go to Step 8 .
NO : Check fuel pump system (Refer to Inspection Procedure 24 P.13A-313).

STEP 8. Check air intake from intake hose and intake manifold.

Q: Is the check result normal?
YES : Go to Step 9 .
NO : Repair.

STEP 9. Check injector for operating sound.

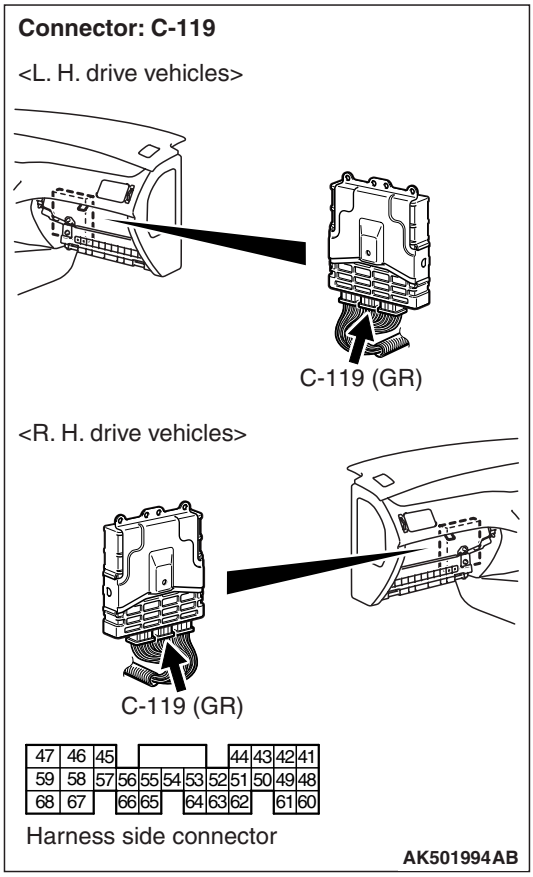
- Check injector for operating sound at engine cranking (Refer to P.13A-406).

Q: Can operating sound be heard?
YES : Go to Step 10 .
NO : Check the injector system of the defective cylinder
(Refer to Code No. 0201: No. 1 injector system P.13A-105).
(Refer to Code No. 0202: No. 2 injector system P.13A-111).
(Refer to Code No. 0203: No. 3 injector system P.13A-117).
(Refer to Code No. 0204: No. 4 injector system P.13A-123).

STEP 10. Check timing marks of timing belt.

Q: Is the check result normal?
YES : Go to Step 11 .
NO : Align timing marks.

STEP 11. Perform voltage measurement at C-119 engine-ECU connector.

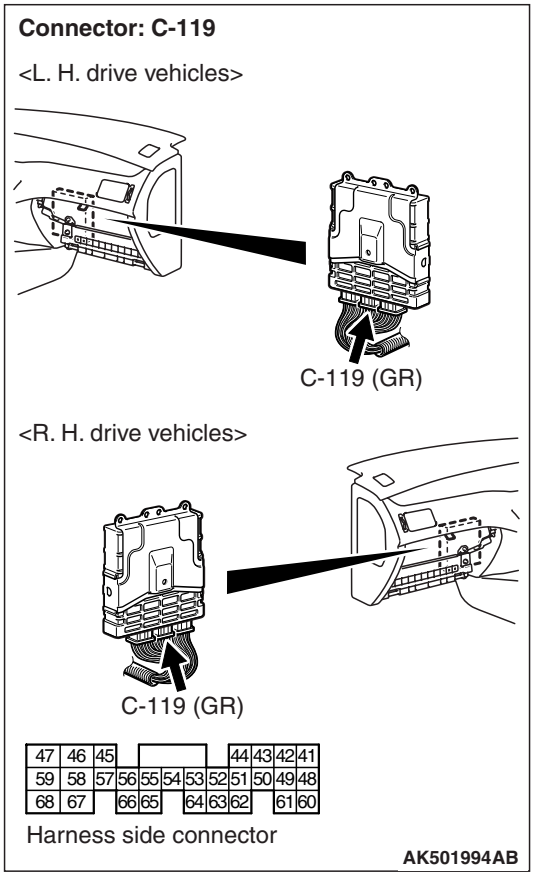


- Measure engine-ECU terminal voltage.
- Voltage between terminal No. 46 and earth also between terminal No. 58 and earth.

  OK: System voltage

Q: Is the check result normal?
YES : Go to Step 13 .
NO : Go to Step 12 .

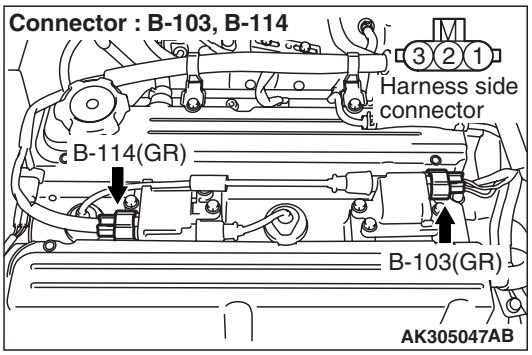
STEP 12. Connector check: C-119 engine-ECU connector



Q: Is the check result normal?
YES : Check and repair harness between C-119 (terminal No. 46 and No. 58) engine-ECU connector and body earth.
- Check earth line for open circuit and damage.

NO : Repair or replace the connector.

STEP 13. Connector check: B-103 and B-114 ignition coil connectors.



Q: Is the check result normal?
YES : Go to Step 14 .
NO : Repair or replace the connector.

STEP 14. Check ignition coil spark.

Q: Is the check result normal?
YES : Go to Step 19 .
NO : Go to Step 15 .

STEP 15. Check spark plug.

Q: Is the check result normal?
YES : Go to Step 16 .
NO : Replace the spark plug.

STEP 16. Check spark plug cable itself.

- Check spark plug cable itself (Refer to GROUP 16 – Ignition System – On-vehicle Service P.16-29).

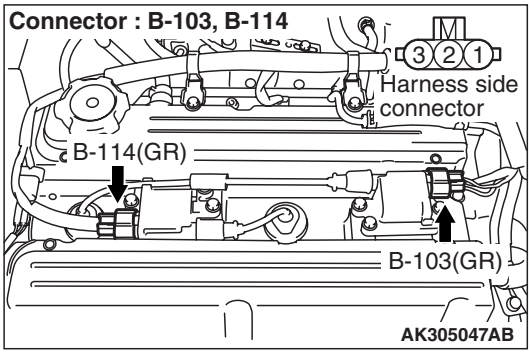
Q: Is the check result normal?
YES : Go to Step 17 .
NO : Replace the spark plug cable.

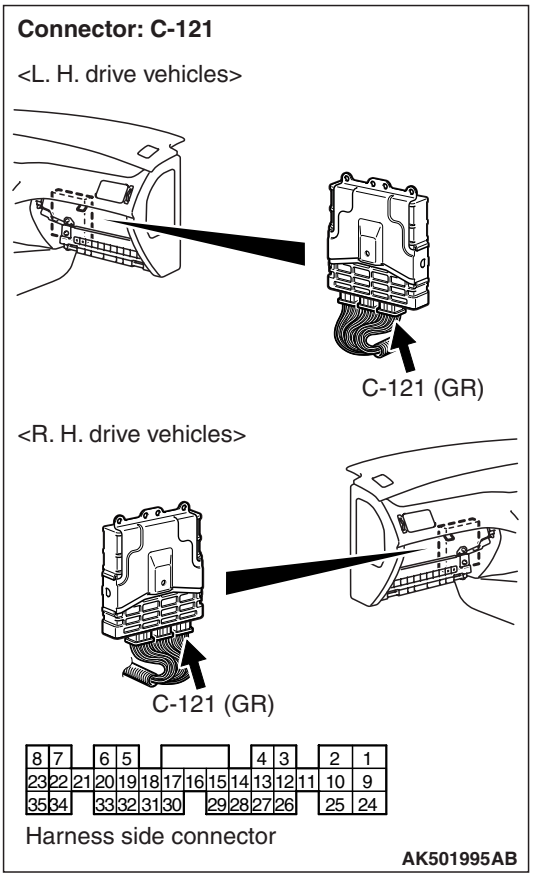
STEP 17. Check ignition coil itself.

- Check ignition coil itself (Refer to GROUP 16 – Ignition System – On-vehicle Service P.16-28).

Q: Is the check result normal?
YES : Go to Step 18 .
NO : Replace the ignition coil.

STEP 18. Check harness between ignition coil connector terminal No. 2 of each cylinder and body earth.





- Check earthing line for open circuit and damage.

Q: Is the check result normal?
YES : Check and repair harness between ignition coil connector terminal No. 3 of each cylinder and C-121 engine-ECU connector.
- Check signal line for open/short circuit and damage.

NO : Repair the damaged harness wire.

STEP 19. Check spray condition of injector.
- Check each injector for spray condition (Refer to P.13A-406).

Q: Is the check result normal?
YES : Go to Step 20 .
NO : Replace the injector.

STEP 20. Check compression pressure.
- Check compression pressure (Refer to GROUP 11A – On-vehicle Service P.11A-11).

Q: Is the check result normal?
YES : Go to Step 21 .
NO : Repair.

STEP 21. Check EGR control solenoid valve itself.
- Check EGR control solenoid valve itself (Refer to GROUP 17 – Emission Control System – Exhaust Gas Recirculation (EGR) System P.17-15).

Q: Is the check result normal?
YES : Go to Step 22 .
NO : Replace the EGR control solenoid valve.

STEP 22. Check EGR valve itself.
- Check EGR valve itself (Refer to GROUP 17 – Emission Control System – Exhaust Gas Recirculation (EGR) System P.17-15).

Q: Is the check result normal?
YES : Go to Step 23 .
NO : Replace the EGR valve.

STEP 23. Replace the engine-ECU.
- After replacing the engine-ECU, re-check the trouble symptoms.

Q: Does trouble symptom persist?
YES : Check for foreign matters (water, kerosene, etc.) in fuel and replace if necessary.
NO : The check is end.

Inspection Procedure 8: Unstable Idling (Rough Idling, hunting), Improper Idling Speed (Too High or too Low), Engine Stalls During Idling (Die Out)

COMMENTS ON TROUBLE SYMPTOM

- Probable causes can be widely found in ignition system, air-fuel ratio control system, idle speed control system, fuel system, etc. A sudden engine stall is possibly caused by poor connector contact.

PROBABLE CAUSES

- Failed ignition system
- Failed fuel system
- Failed air-fuel ratio control system
- Failed idle speed control system
- Failed intake/exhaust system
- Failed emission gas cleaning system
- Throttle valve body fouled
- Timing belt out of place
- Compression pressure improper
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. Check battery condition.

Q: Has the battery terminal been disconnected?
YES : After warm-up engine, idle for about 10 minutes.
NO : Go to Step 2 .

STEP 2. M.U.T.-II/III diagnosis code

Q: Diagnosis code set?
YES : Inspection chart for diagnosis code (Refer to P.13A-17).
NO : Go to Step 3 .

STEP 3. M.U.T.-II/III data list

- Refer to Data List Reference Table P.13A-372.
  a. Item No. 12: Air flow sensor
  b. Item No. 13: Intake air temperature sensor
  c. Item No. 14: Throttle position sensor
  d. Item No. 21: Engine coolant temperature sensor
  e. Item No. 25: Barometric pressure sensor

Q: Are the check results normal?
YES : Go to Step 4 .
NO : Perform the diagnosis code classified check Procedure for the sensor that has shown an abnormal data value (Refer to Inspection Chart for Diagnosis Codes P.13A-17).

STEP 4. M.U.T.-II/III data list

- Refer to Data List Reference Table P.13A-372.
  a. Item 27: Power steering fluid pressure switch

Q: Is the check result normal?
YES : Go to Step 5 .
NO : Check power steering fluid pressure switch system (Refer to Code No. P0551 P.13A-197).

STEP 5. Check idle speed control servo for operating sound.

- Check idle speed control servo for operating sound (Refer to P.13A-408).

Q: Is the check result normal?
YES : Go to Step 6 .
NO : Check idle speed control servo system (Refer to Code No. P0505 P.13A-190).

STEP 6. Check throttle body (throttle valve portion) for contamination.

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Clean throttle body (throttle valve portion) (Refer to P.13A-395).

STEP 7. Check air intake from intake hose and intake manifold.

Q: Is the check result normal?
YES : Go to Step 8 .
NO : Repair.

STEP 8. Check injector for operating sound.

- Check injector for operating sound (Refer to P.13A-406).

Q: Can operating sound be heard?
YES : Go to Step 9 .
NO : Check the injector system of the defective cylinder.
(Refer to Code No. P0201: No. 1 injector system P.13A-105).
(Refer to Code No. P0202: No. 2 injector system P.13A-111).
(Refer to Code No. P0203: No. 3 injector system P.13A-117).
(Refer to Code No. P0204: No. 4 injector system P.13A-123).

STEP 9. Check timing marks of timing belt.

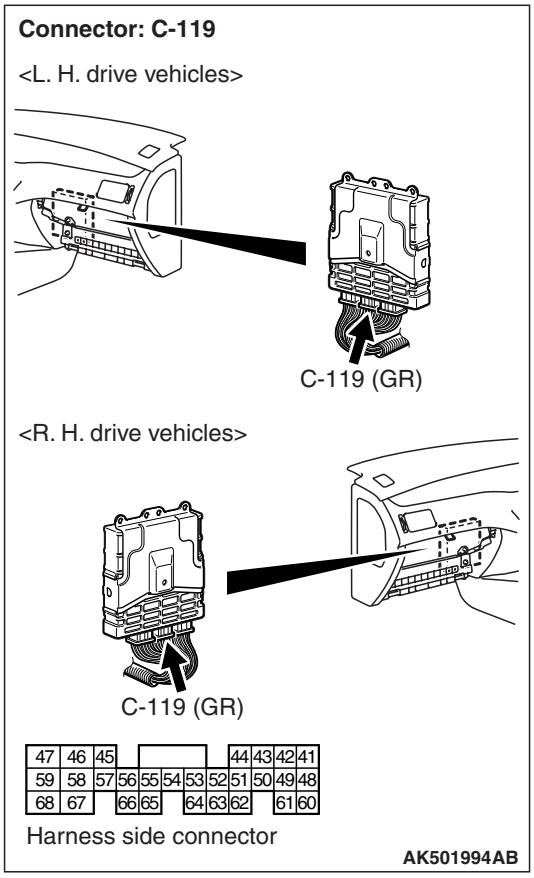
Q: Is the check result normal?
YES : Go to Step 10 .
NO : Align timing marks.

STEP 10. M.U.T.-II/III data list

- Refer to Data List Reference Table P.13A-372.
  a. Item No. 11: Oxygen sensor (front)

Q: Is the check result normal?
YES : Go to Step 11 .
NO : Check the oxygen sensor (front) system (Refer to Code No. P0130 P.13A-75).

STEP 11. Perform voltage measurement at C-119 engine-ECU.

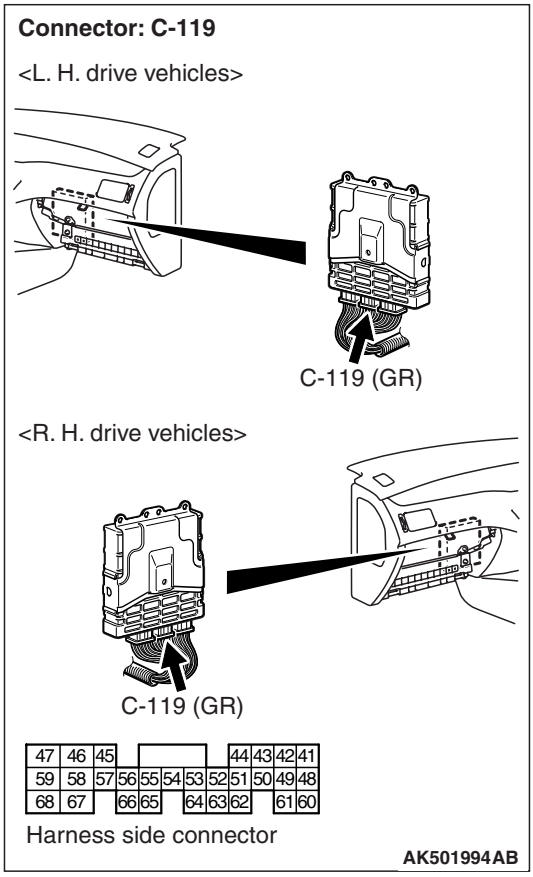


- Measure engine-ECU terminal voltage.
- Ignition switch: "ON"
- Voltage between terminal No. 46 and earth, also between terminal No. 58 and earth.

OK: 0.5 V or less

Q: Is the check result normal?
YES : Go to Step 13 .
NO : Go to Step 12 .

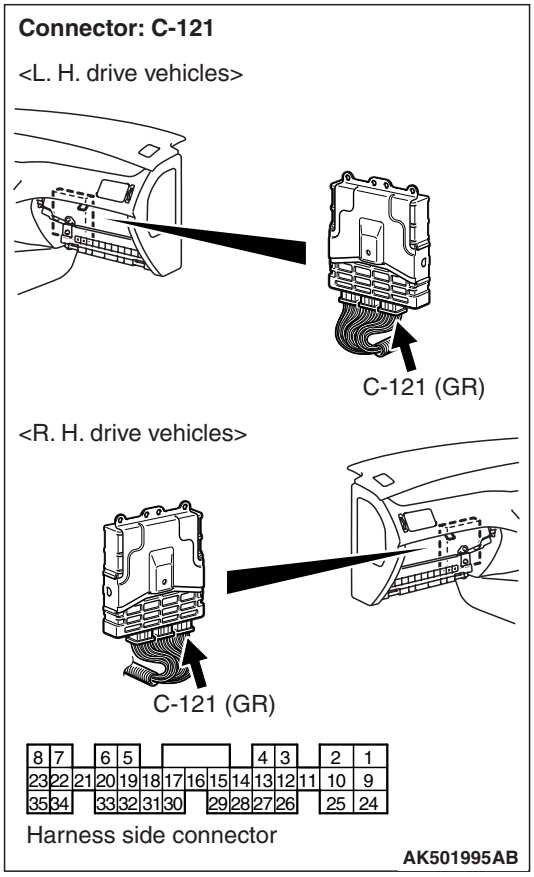
STEP 12. Connector check: C-119 engine-ECU connector



Q: Is the check result normal?
YES : Check and repair harness between C-119 (terminal No. 46 and No. 58) engine-ECU connector and body earth.
- Check earthing line for open circuit and damage.

NO : Repair or replace the connector.

STEP 13. Perform voltage measurement at C-121 engine-ECU connector.

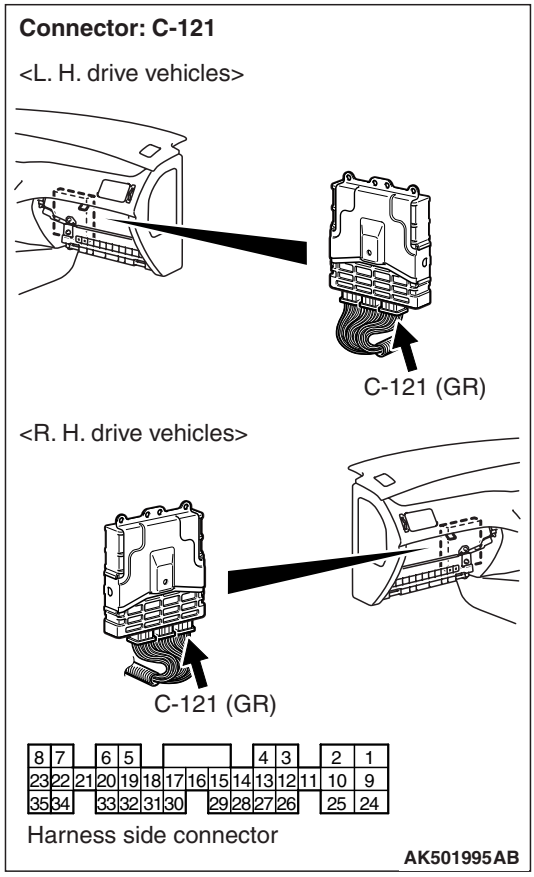


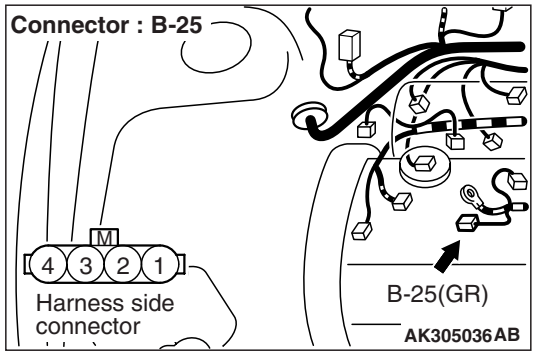
- Measure engine-ECU terminal voltage.
- Engine: Idling after warm-up
- Transmission: Neutral
- Radiator fan: Not operating
- Voltage between terminal No. 8 and earth.

  OK: Switching the head lamps to ON from OFF causes the voltage to increase by 0.2 – 3.5 V.

Q: Is the check result normal?
YES : Go to Step 16 .
NO : Go to Step 14 .

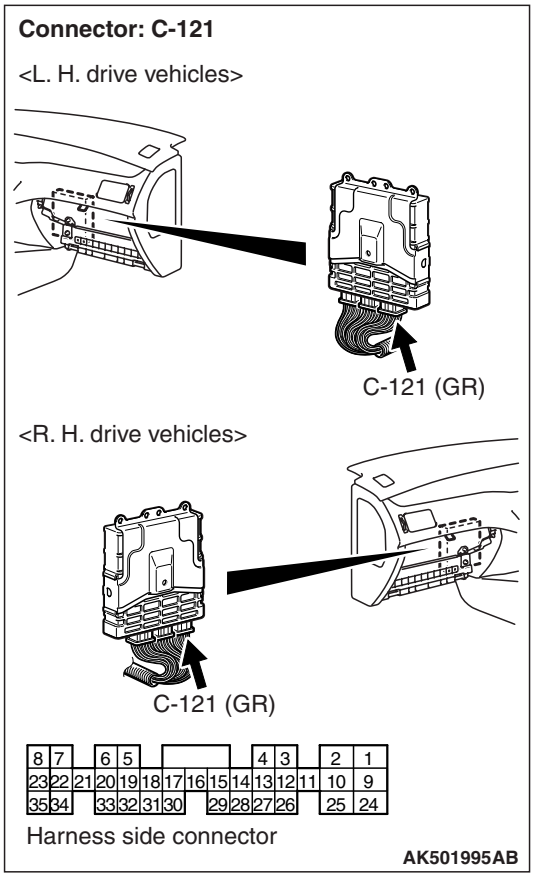
STEP 14. Connector check: C-121 engine-ECU connector and B-25 alternator connector.

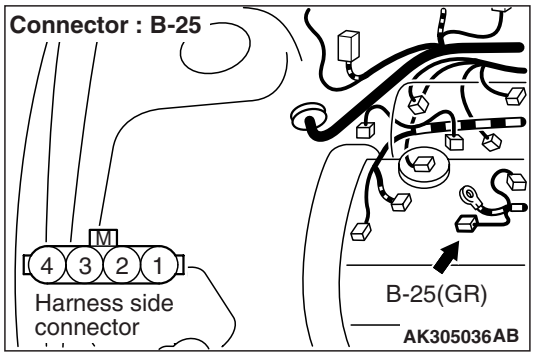




Q: Is the check result normal?
YES : Go to Step 19 .
NO : Repair or replace the connector.

STEP 15. Check harness between C-121 (terminal No. 8) engine-ECU connector and B-25 (terminal No. 1) alternator connector.



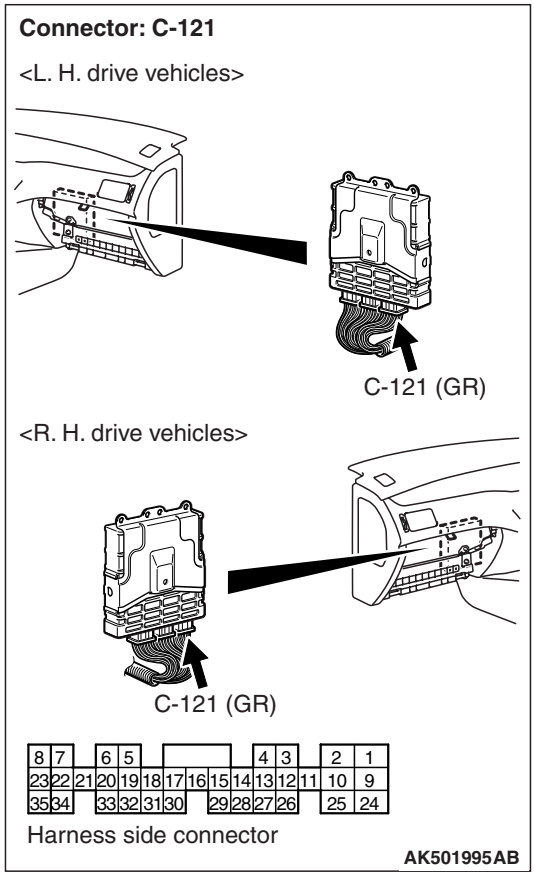


NOTE: Before checking harness, check intermediate connector B-14 and repair if necessary.

- Check output line for open/short circuit and damage.

Q: Is the check result normal?
YES : Go to Step 16 .
NO : Repair the damaged harness wire.

STEP 16. Perform voltage measurement at C-121 engine-ECU connector.

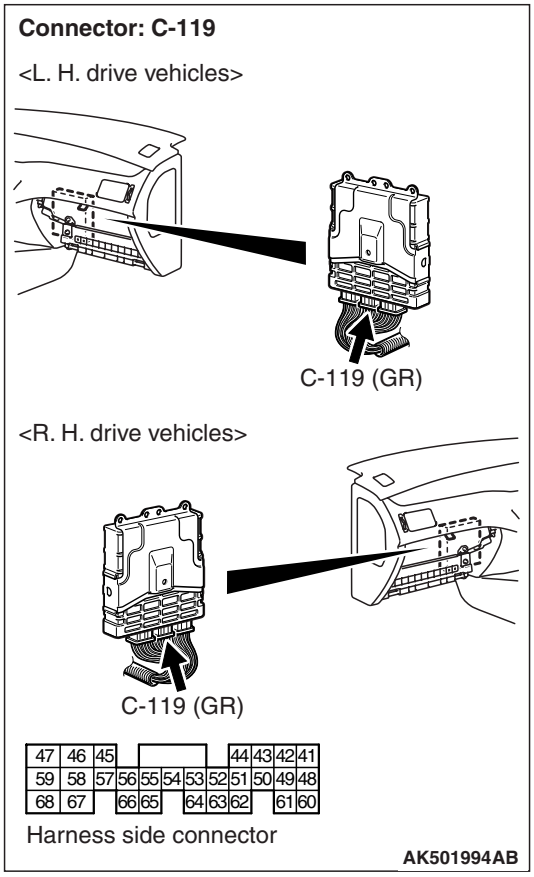


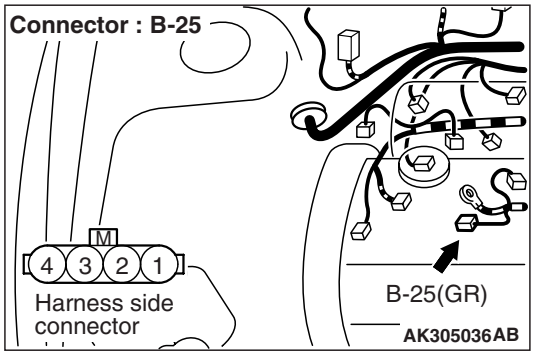
- Measure engine-ECU terminal voltage.
- Engine: Idling after warm-up
- Transmission: Neutral
- Radiator fan: Not operating
- Voltage between terminal No. 8 and earth.

  OK: Switching the head lamps to ON from OFF causes the voltage to fall.

Q: Is the check result normal?
YES : Go to Step 20 .
NO : Go to Step 17 .

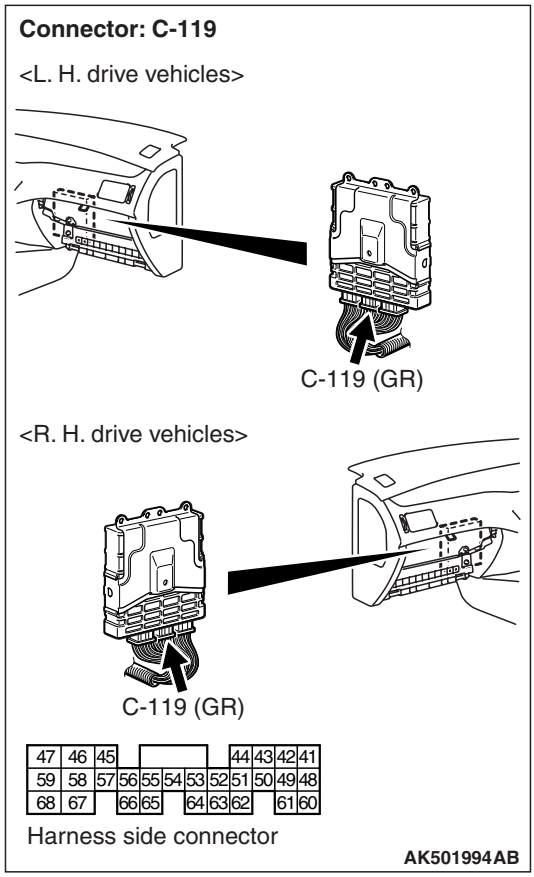
STEP 17. Connector check: C-119 engine-ECU connector and B-25 alternator connector.

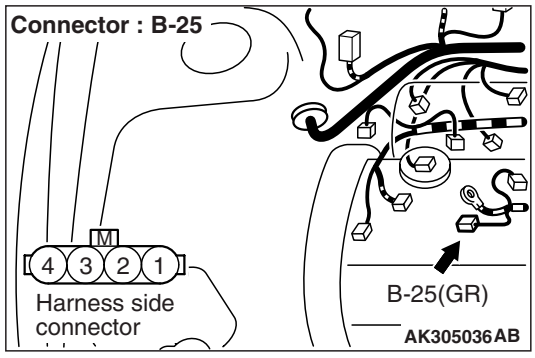




Q: Is the check result normal?
YES : Go to Step 18 .
NO : Repair or replace the connector.

STEP 18. Check harness between C-119 (terminal No. 52) engine-ECU connector and B-25 (terminal No. 4) alternator connector.





NOTE: Before checking harness, check intermediate connector B-14, and repair if necessary.

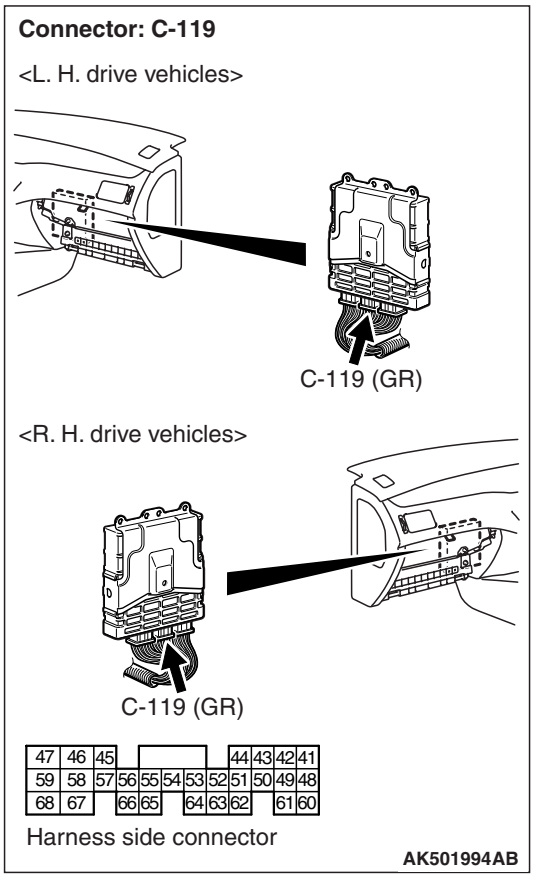
- Check output line for open/short circuit and damage.

Q: Is the check result normal?
YES : Go to Step 19 .
NO : Repair the damaged harness wire.

STEP 19. Check the trouble symptoms.

Q: Does trouble symptom persist?
YES : Replace the alternator.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-5).

STEP 20. Perform voltage measure at C-119 engine-ECU connector.

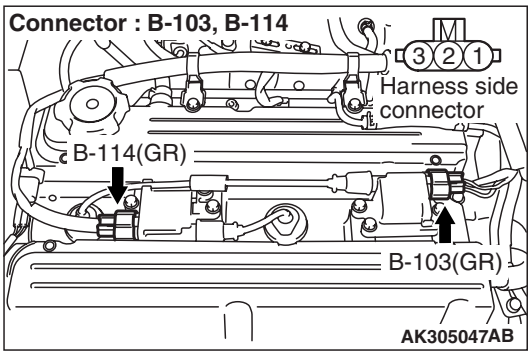


- Measure engine-ECU terminal voltage.
- Engine: Idling
- A/C switch: ON (A/C compressor ON)
- Voltage between terminal No. 65 and earth.

OK:
1 V or less (with outside air temperature sensor ambient temperature at 18°C or higher and A/C set for maximum air flow at minimum temperature)
System voltage (with A/C set for minimum air flow at room temperature)

Q: Is the check result normal?
YES : Go to Step 21 .
NO : Check A/C load signal system (Refer to Inspection Procedure 29 P.13A-352).

STEP 21. Connector check: B-103 and B-114 ignition coil connectors.



Q: Is the check result normal?
YES : Go to Step 22 .
NO : Repair or replace the connector.

STEP 22. Check ignition coil spark.

Q: Is the check result normal?
YES : Go to Step 27 .
NO : Go to Step 23 .

STEP 23. Check spark plug.

Q: Is the check result normal?
YES : Go to Step 24 .
NO : Replace the spark plug.

STEP 24. Check spark plug cable.

- Check spark plug cable itself (Refer to GROUP 16 – Ignition System – On-vehicle Service P.16-29).

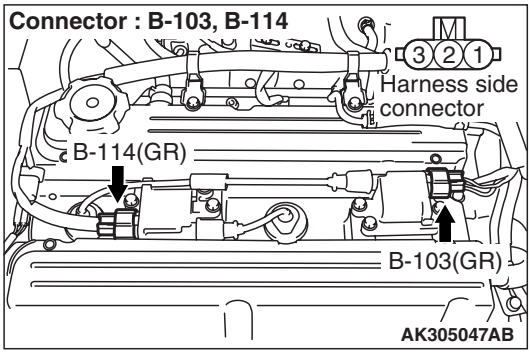
Q: Is the check result normal?
YES : Go to Step 25 .
NO : Replace the spark plug cable.

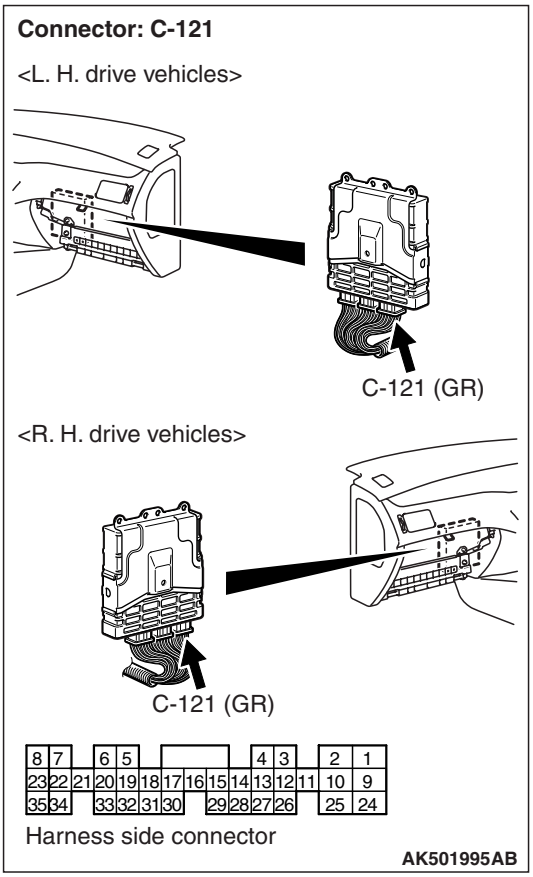
STEP 25. Check ignition coil itself.

- Check ignition coil itself (Refer to GROUP 16 – Ignition System – On-vehicle Service P.16-28).

Q: Is the check result normal?
YES : Go to Step 26 .
NO : Replace the ignition coil.

STEP 26. Check harness between ignition coil connector terminal No. 2 of each cylinder and body earth.





- Check earthing line for open/short circuit and damage.

Q: Is the check result normal?
YES : Check and repair harness between ignition coil connector terminal No. 3 of each cylinder and C-121 engine-ECU.
- Check signal line for open/short and damage.

NO : Repair the damaged harness wire.

STEP 27. Check injector for spray condition.
- Check each injector for spray condition (Refer to P.13A-406).

Q: Is the check result normal?
YES : Go to Step 28 .
NO : Replace the injector.

STEP 28. Check compression pressure.
- Check compression pressure (Refer to GROUP 11A – On-vehicle Service P.11A-11).

Q: Is the check result normal?
YES : Go to Step 29 .
NO : Repair.

STEP 29. Check purge control solenoid valve itself.
- Check purge control solenoid valve itself (Refer to GROUP 17 – Emission Control System – Evaporative Emission Control System P.17-11).

Q: Is the check result normal?
YES : Go to Step 30 .
NO : Replace the purge control solenoid valve.

STEP 30. Check EGR control solenoid valve itself.
- Check EGR control solenoid valve itself (Refer to GROUP 17 – Emission Control System – Exhaust Gas Recirculation (EGR) System P.17-15).

Q: Is the check result normal?
YES : Go to Step 31 .
NO : Replace the EGR control solenoid valve.

STEP 31. Check EGR valve itself.
- Check EGR valve itself (Refer to GROUP 17 – Emission Control System – Exhaust Gas Recirculation (EGR) System P.17-15).

Q: Is the check result normal?
YES : Go to Step 32 .
NO : Replace the EGR valve.

STEP 32. M.U.T.-II/III actuator test
- Item No. 07: Fuel pump

OK: Operating sounds of fuel pump can be heard.

Q: Is the check result normal?
YES : Go to Step 33 .
NO : Check fuel pump system (Refer to inspection Procedure 24 P.13A-313).

STEP 33. Replace the engine-ECU

- After engine-ECU is replaced, re-check for trouble symptoms.

Q: Does trouble system persist?

YES : Check for foreign matters (water, kerosene, etc.) in fuel and replace if necessary.

NO : The check is end.

Inspection Procedure 9: The Engine Stalls when Starting the Car (Pass Out)

COMMENT ON TROUBLE SYMPTOM

- Engine stall on starting is possibly caused by misfire due to failed spark plug, improper air-fuel ratio at accelerator pedal depression or other faults.

PROBABLE CAUSES

- Failed ignition system
- Failed intake system
- Failed emission gas cleaning system
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-II/III diagnosis code

Q: Diagnosis code set?

YES : Inspection chart for diagnosis code (Refer to P.13A-17).

NO : Go to Step 2 .

STEP 2. Check EGR control solenoid valve itself.

- Check EGR control solenoid valve itself (Refer to GROUP 17 – Emission Control System – Exhaust Gas Recirculation (EGR) System P.17-15).

Q: Is the check result normal?

YES : Go to Step 3 .

NO : Replace the EGR control solenoid valve.

STEP 3. Check EGR valve itself.

- Check EGR valve itself (Refer to GROUP 17 – Emission Control System – Exhaust Gas Recirculation (EGR) System P.17-15).

Q: Is the check result normal?

YES : Go to Step 4 .

NO : Replace the EGR valve.

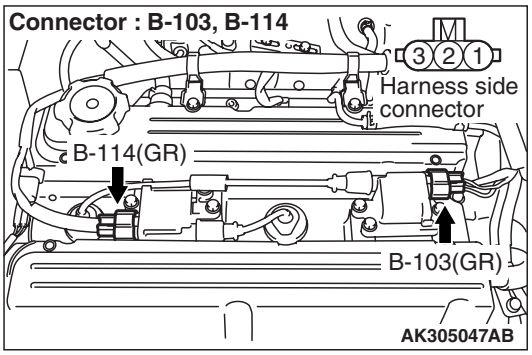
STEP 4. Check air intake from intake hose and intake manifold.

Q: Is the check result normal?

YES : Go to Step 5 .

NO : Repair or replace the connector.

STEP 5. Connector check: B-103 and B-114 ignition connectors



Q: Is the check result normal?

YES : Go to Step 6 .

NO : Repair or replace the connector.

STEP 6. Check ignition coil spark.

Q: Is the check result normal?

YES : Replace the engine-ECU.

NO : Go to Step 7 .

STEP 7. Check spark plug.

Q: Is the check result normal?

YES : Go to Step 8 .

NO : Replace the spark plug.

STEP 8.Check spark plug cable itself.

- Check spark plug cable itself (Refer to GROUP 16 – Ignition System – On-vehicle Service P.16-29).

Q: Is the check result normal?

YES : Go to Step 9 .

NO : Replace the spark plug cable.

STEP 9. Check ignition coil itself.

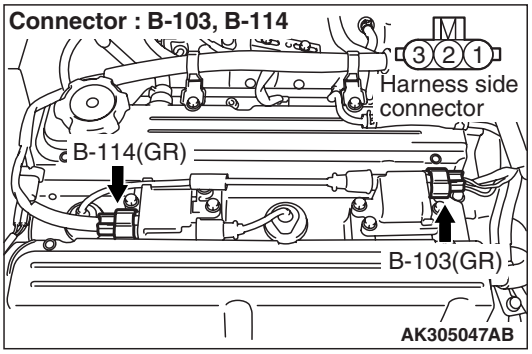
- Check ignition coil itself (Refer to GROUP 16 – Ignition System – On-vehicle Service P.16-28).

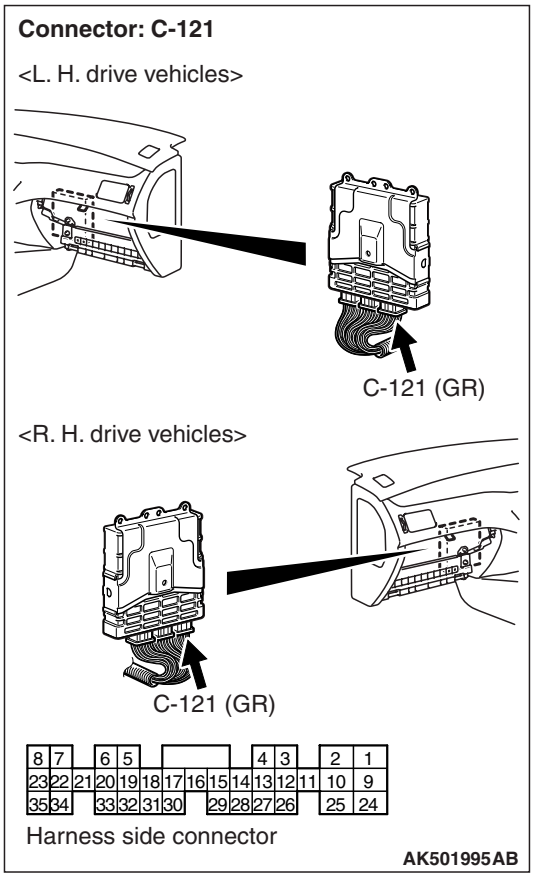
Q: Is the check result normal?

YES : Go to Step 10 .

NO : Replace the ignition coil.

STEP 10. Check harness between ignition coil connector terminal No. 2 of each cylinder and body earth.





- Check earthing line for open circuit and damage.

Q: Is the check result normal?

YES : Check and repair harness between ignition coil connector terminal No. 3 of each cylinder and C-121 engine-ECU connector.

- Check signal line for open/short circuit and damage.

NO : Repair the damaged harness wire.

Inspection Procedure 10: The Engine Stalls when Decelerating

COMMENT ON TROUBLE SYMPTOM

- Engine stall on deceleration is possibly caused by insufficient air intake, improper air-fuel ratio due to failed exhaust gas recirculation system or other faults.

PROBABLE CAUSES

- Failed idle speed system
- Failed ignition system
- Failed emission control system
- Throttle valve fouled
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-II/III diagnosis code

Q: Diagnosis code set?
YES : Inspection chart for diagnosis code (Refer to P.13A-17).
NO : Go to Step 2 .

STEP 2. M.U.T.-II/III data list

- Refer to Data List Reference Table P.13A-372.
  a. Item No. 14: Throttle position sensor

Q: Is the check result normal?
YES : Go to Step 3 .
NO : Check throttle position sensor system (Refer to Code No. P0120 P.13A-60).

STEP 3. M.U.T.-II/III data list

- Item No. 45: Idle speed control servo position

  OK: Idle speed control servo drops to 0 – 2 steps at deceleration (engine at 1,000 r/min or higher).

Q: Is the check result normal?
YES : Go to Step 4 .
NO : Check idle speed control servo system (Refer to Code No. P0505 P.13A-190).

STEP 4. Check EGR control solenoid valve itself.

- Check EGR control solenoid valve itself (Refer to GROUP 17 – Emission Control System – Exhaust Gas Recirculation (EGR) System P.17-15).

Q: Is the check result normal?
YES : Go to Step 5 .
NO : Replace the EGR control solenoid valve.

STEP 5. Check EGR valve itself.

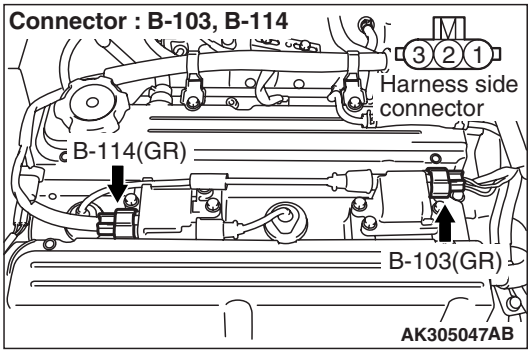
- Check EGR valve itself (Refer to GROUP 17 – Emission Control System – Exhaust Gas Recirculation (EGR) System P.17-15).

Q: Is the check result normal?
YES : Go to Step 6 .
NO : Replace the EGR valve.

STEP 6. Check throttle body (throttle valve portion) for contamination.

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Clean throttle body (throttle valve portion) (Refer to P.13A-395).

STEP 7. Connector check: B-103 and B-114 ignition coil connectors



Q: Is the check result normal?
YES : Go to Step 8 .
NO : Repair or replace the connector.

STEP 8. Check ignition coil spark.

Q: Is the check result normal?
YES : Replace the engine-ECU.
NO : Go to Step 9 .

STEP 9. Check spark plug.

Q: Is the check result normal?
YES : Go to Step 10 .
NO : Replace the spark plug.

STEP 10. Check spark plug cable itself.

- Check spark plug cable itself (Refer to GROUP 16 – Ignition System – On-vehicle Service P.16-29).

Q: Is the check result normal?

YES : Go to Step 11 .

NO : Replace the spark plug cable.

STEP 11. Check ignition coil itself.

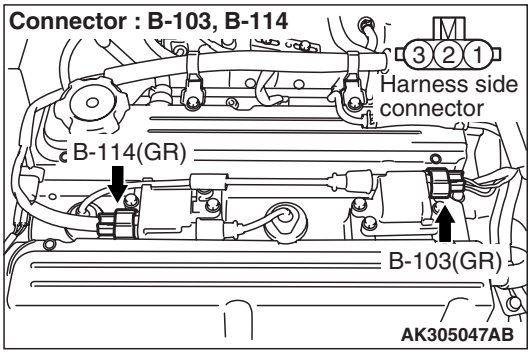
- Check ignition coil itself (Refer to GROUP 16 – Ignition System – On-vehicle Service P.16-28).

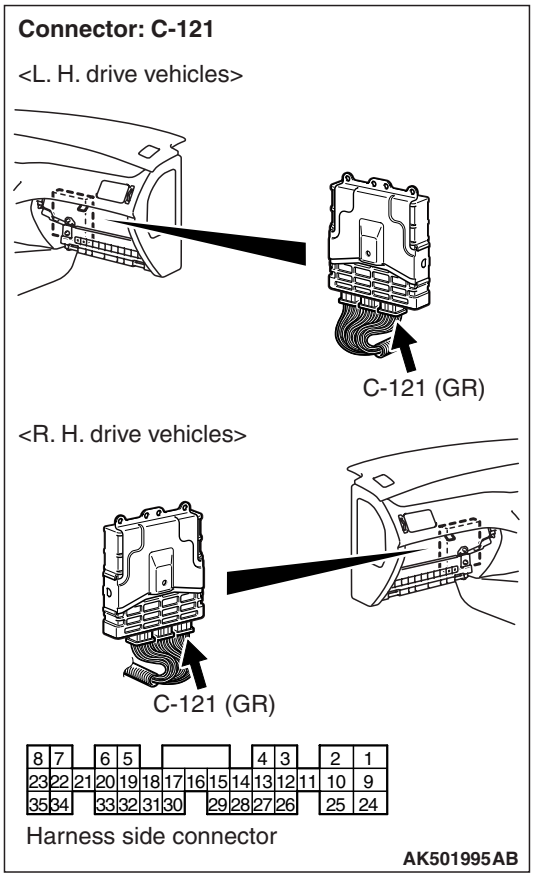
Q: Is the check result normal?

YES : Go to Step 12 .

NO : Replace the ignition coil.

STEP 12. Check harness between ignition coil connector terminal No. 2 of each cylinder and body earth.





- Check earthing line for open circuit and damage.

Q: Is the check result normal?

YES : Check and repair harness between ignition coil connector terminal No. 3 of each cylinder and C-121 engine-ECU connector.
  - Check signal line for open/short circuit and damage.

NO : Repair the damaged harness wire.

Inspection Procedure 11: Engine does not Revole Up

COMMENTS ON TROUBLE SYMPTOM

- Failure is possibly caused by failed fuel system, ignition system or other faults.

PROBABLE CAUSES

- Failed ignition system
- Failed fuel system
- Timing belt out of place
- Failed engine-ECU

DIAGNOSIS PROCEDURE

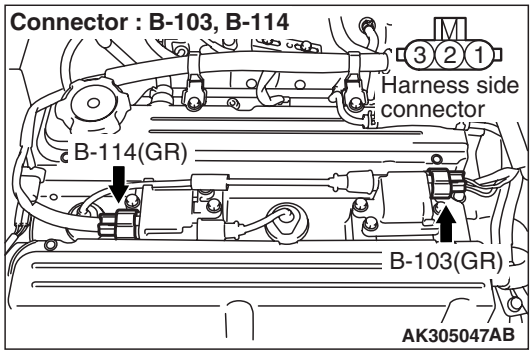
STEP 1. M.U.T.-II/III diagnosis code

Q: Diagnosis code set?
YES : Inspection chart for diagnosis code (Refer to P.13A-17).
NO : Go to Step 2 .

STEP 2. Check timing marks of timing belt.

Q: Is the check result normal?
YES : Go to Step 3 .
NO : Align match marks.

STEP 3. Connector check: B-103 and B-114 ignition coil connectors



Q: Is the check result normal?
YES : Go to Step 4 .
NO : Repair or replace the connector.

STEP 4. Check ignition coil spark.

Q: Is the check result normal?
YES : Go to Step 9 .
NO : Go to Step 5 .

STEP 5. Check spark plug.

Q: Is the check result normal?
YES : Go to Step 6 .
NO : Replace the spark plug.

STEP 6. Check spark plug cable itself.

- Check spark plug cable itself (Refer to GROUP 16 – Ignition System – On-vehicle Service P.16-29).

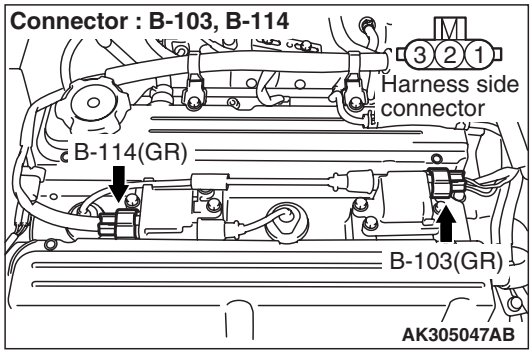
Q: Is the check result normal?
YES : Go to Step 7 .
NO : Replace the spark plug cable.

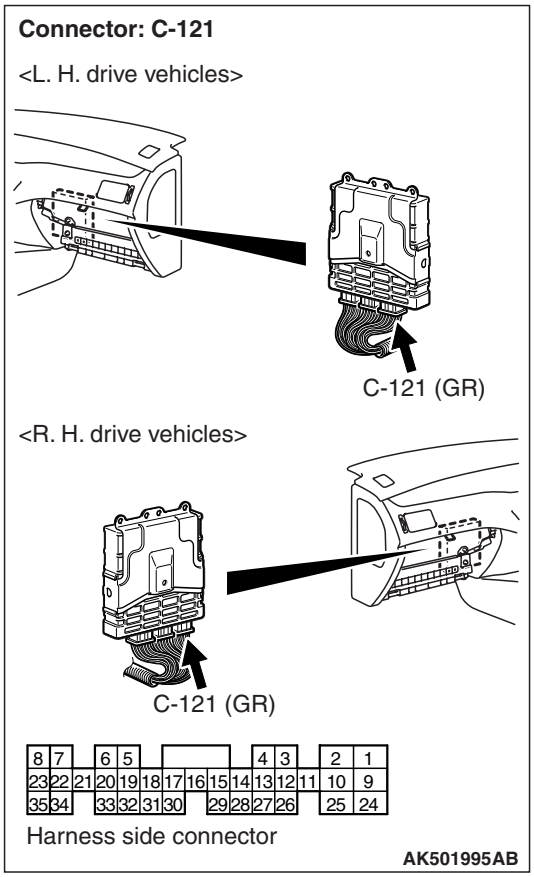
STEP 7. Check ignition coil itself.

- Check ignition coil itself (Refer to GROUP 16 – Ignition System – On-vehicle Service P.16-28).

Q: Is the check result normal?
YES : Go to Step 8 .
NO : Replace the ignition coil.

STEP 8. Check harness between ignition coil connector terminal No. 2 of each cylinder and body earth.





- Check earthing line for open circuit or damage.

Q: Is the check result normal?

YES : Check and repair harness between ignition coil connector terminal No. 3 of each cylinder and C-121 engine-ECU connector.
- Check signal line for open/short circuit and damage.

NO : Repair the damaged harness wire.

STEP 9. Fuel pressure measurement.

- Fuel pressure measurement (Refer to P.13A-396).

Q: Is the check result normal?

YES : Replace the engine-ECU.

NO : Repair.

Inspection Procedure 12: Hesitation, Sag,Poor Acceleration, Stumble or Surge

COMMENTS ON TROUBLE SYMPTOM

- Failure is possibly caused by failed ignition system, improper air-fuel ratio, improper compression pressure or other faults.

PROBABLE CAUSES

- Failed air-fuel ratio control system
- Failed ignition system
- Failed fuel system
- Failed intake and exhaust system
- Failed emission control system
- Failed turbocharger system
- Throttle valve fouled
- Improper compression pressure
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-II/III diagnosis code

Q: Diagnosis code set?
YES : Inspection chart for diagnosis code (Refer to P.13A-17).
NO : Go to Step 2 .

STEP 2. Check injector for operating sound.

- Check injector for operating sound (Refer to P.13A-406).

Q: Can operating sound be heard?
YES : Go to Step 3 .
NO : Check the injector system of the defective cylinder.
(Refer to code No. P0201: No. 1 injector system P.13A-105).
(Refer to code No. P0202: No. 2 injector system P.13A-111).
(Refer to code No. P0203: No. 3 injector system P.13A-117).
(Refer to code No. P0204: No. 4 injector system P.13A-123).

STEP 3. M.U.T.-II/III data list

- Refer to Data List Reference Table P.13A-372.
  a. Item No. 13: Intake air temperature sensor
  b. Item No. 14: Throttle position sensor
  c. Item No. 21: Engine coolant temperature sensor
  d. Item No. 25: Barometric pressure sensor

Q: Are the check results normal?
YES : Go to Step 4 .
NO : Perform the diagnosis code classified check procedure for the sensor that has shown an abnormal data value (Refer to Inspection Chart for Diagnosis Codes P.13A-17).

STEP 4. Check Purge control solenoid valve itself.

- Check Purge control solenoid valve itself (Refer to GROUP 17 – Emission Control System – Evaporative Emission Control System P.17-11).

Q: Is the check result normal?
YES : Go to Step 5 .
NO : Replace the purge control solenoid valve.

STEP 5. Check EGR control solenoid valve itself.

- Check EGR control solenoid valve itself (Refer to GROUP 17 – Emission Control System – Exhaust Gas Recirculation (EGR) SystemP.17-15).

Q: Is the check result normal?
YES : Go to Step 6 .
NO : Replace the EGR control solenoid valve.

STEP 6. Check EGR valve itself.

- Check EGR valve itself (Refer to GROUP 17 – Emission Control System – Exhaust Gas Recirculation (EGR) System P.17-15).

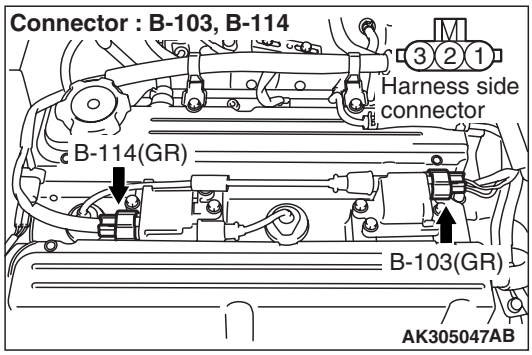
Q: Is the check result normal?
YES : Go to Step 7 .
NO : Replace the EGR valve.

STEP 7. M.U.T.-II/III data list

- Refer to Data List Reference Table P.13A-372.
  a. Item No. 11: Oxygen sensor (front)

Q: Is the check result normal?
YES : Go to Step 8 .
NO : Check oxygen sensor (front) system (Refer to Code No. P0130 P.13A-75).

STEP 8. Connector check: B-103 and B-114 ignition coil connectors



Q: Is the check result normal?
YES : Go to Step 9 .
NO : Repair or replace the connector.

STEP 9. Check ignition coil spark.

Q: Is the check result normal?
YES : Go to Step 14 .
NO : Go to Step 10 .

STEP 10. Check spark plug.

Q: Is the check result normal?
YES : Go to Step 11 .
NO : Replace the spark plug.

STEP 11. Check spark plug cable itself.

- Check spark plug cable itself (Refer to GROUP 16 – Ignition System – On-vehicle Service P.16-29).

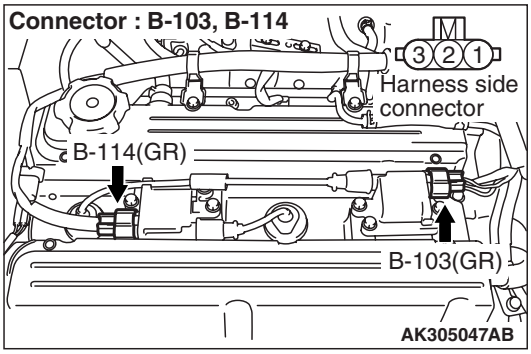
Q: Is the check result normal?
YES : Go to Step 12 .
NO : Replace the spark plug cable.

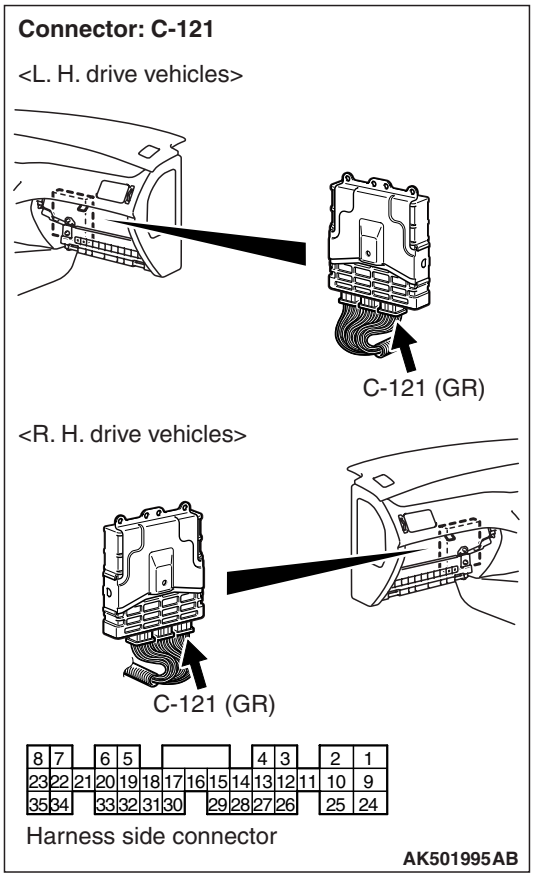
STEP 12. Check ignition coil itself.

- Check ignition coil itself (Refer to GROUP 16 – Ignition System – On-vehicle Service P.16-28).

Q: Is the check result normal?
YES : Go to Step 13 .
NO : Replace the ignition coil.

STEP 13. Check harness between ignition coil connector terminal No. 2 of each cylinder and body earth.





- Check earthing line for open circuit and damage.

Q: Is the check result normal?
YES : Check and repair harness between ignition coil connector terminal No. 3 of each cylinder and C-121 engine-ECU connector.
  - Check signal line for open or short circuit or damage.

NO : Repair the damaged harness wire.

STEP 14. Check throttle body (throttle valve portion) for contamination.

Q: Is the check result normal?
YES : Go to Step 15 .
NO : Clean throttle body (throttle valve portion) (Refer to P.13A-395).

STEP 15. M.U.T.-II/III actuator test.
- Item No. 12: Waste gate solenoid valve

OK: Operating sound is audible on actuation.

Q: Is the check result normal?
YES : Go to Step 16 .
NO : Check waste gate solenoid valve system (Refer to Code No. P0243 P.13A-130).

STEP 16. Check turbo charger supercharging pressure.
- Check turbo charger output pressure (Refer to GROUP 15 –Intake Exhaust –On-vehicle Service P.15-2).

Q: Is the check result normal?
YES : Go to Step 17 .
NO : Repair.

STEP 17. Check supercharging pressure control system.
- Check supercharging pressure control system (Refer to GROUP 15 –Intake Exhaust –On-vehicle Service P.15-3).

Q: Is the check result normal?
YES : Go to Step 18 .
NO : Repair.

STEP 18. M.U.T.-II/III actuator test.
- Item No. 09: Fuel pressure control solenoid valve

OK: Operating sound is audible on actuation.

Q: Is the check result normal?
YES : Go to Step 19 .
NO : Check fuel pressure control solenoid valve system (Refer to Code No. P0443 P.13A-182).

STEP 19.Fuel pressure measurement.
- Fuel pressure measurement (Refer to P.13A-396).

Q: Is the check result normal?
YES : Go to Step 20 .
NO : Repair.

STEP 20. Check compression pressure.
- Check compression pressure (Refer to GROUP 11A – On-vehicle Service P.11A-11).

Q: Is the check result normal?
YES : Replace the engine-ECU.
NO : Repair.

Inspection Procedure 13: The Feeling of Impact or Vibration when Accelerating

COMMENT ON TROUBLE SYMPTOM
- Failure is possibly caused by failed ignition leak with rise in spark plug-required voltage at acceleration.

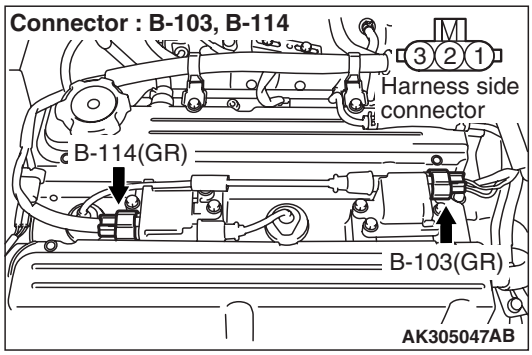
PROBABLE CAUSES
- Failed ignition system
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-II/III diagnosis code

Q: Diagnosis code set?
YES : Inspection chart for diagnosis code (Refer to P.13A-17).
NO : Go to Step 2 .

STEP 2. Connector check: B-103 and B-114 ignition coil connectors



Q: Is the check result normal?
YES : Go to Step 3 .
NO : Repair or replace the connector.

STEP 3. Check ignition coil spark.

Q: Is the check result normal?
YES : Replace the engine-ECU.
NO : Go to Step 4 .

STEP 4. Check spark plug.

Q: Is the check result normal?
YES : Go to Step 5 .
NO : Replace the spark plug.

STEP 5. Check spark plug cable itself.

- Check spark plug cable itself (Refer to GROUP 16 – Ignition System – On-vehicle Service P.16-29).

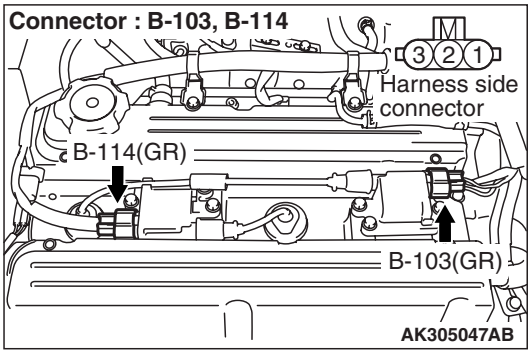
Q: Is the check result normal?
YES : Go to Step 6 .
NO : Replace the spark plug cable.

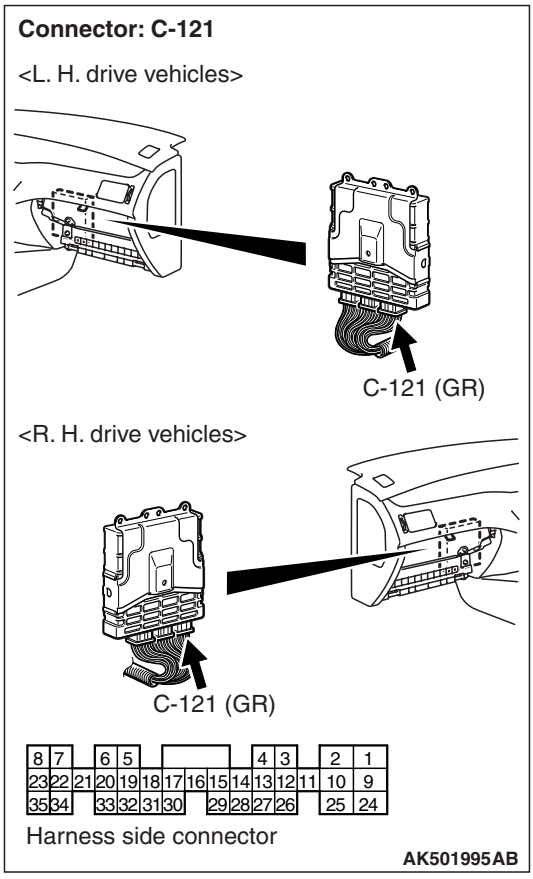
STEP 6. Check ignition coil itself.

- Check ignition coil itself (Refer to GROUP 16 – Ignition System – On-vehicle Service P.16-28).

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Replace the ignition coil.

STEP 7. Check harness between ignition coil connector terminal No. 2 of each cylinder and body earth.





- Check earthing line for open circuit and damage.

Q: Is the check result normal?
YES : Check and repair harness between ignition coil connector terminal No. 3 of each cylinder and C-121 engine-ECU connector.
  - Check signal line for open/short circuit and damage.

NO : Repair the damaged harness wire.

Inspection Procedure 14: The Feeling of Impact or Vibration when Decelerating

COMMENT ON TROUBLE SYMPTOM

- Failure is possibly caused by insufficient air intake due to failed idle speed control system.

PROBABLE CAUSES

- Failed idle speed system
- Throttle valve body fouled
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-II/III diagnosis code

Q: Diagnosis code set?
YES : Inspection chart for diagnosis code (Refer to P.13A-17).
NO : Go to Step 2 .

STEP 2. Check idle speed control servo for operating sound.

- Check idle speed control servo for operating sound (Refer to P.13A-408).

Q: Is the check result normal?
YES : Go to Step 3 .
NO : Check idle speed control servo system (Refer to Code No. P0505 P.13A-190).

STEP 3. M.U.T.-II/III data list

- Refer to Data List Reference Table P.13A-372.
  a. Item No. 14: Throttle position sensor

Q: Is the check result normal?
YES : Go to Step 4 .
NO : Check throttle position sensor system (Refer to Code No. P0120 P.13A-60).

STEP 4. Check throttle body (throttle valve portion) contamination.

Q: Is the check result normal?
YES : Replace the engine-ECU.
NO : Clean throttle body (throttle valve portion) (Refer to P.13A-395).

Inspection Procedure 15: Knocking

COMMENT ON TROUBLE SYMPTOM

- Failure is possibly caused by failed detonation control, improper thermal value of spark plug or other faults.

PROBABLE CAUSES

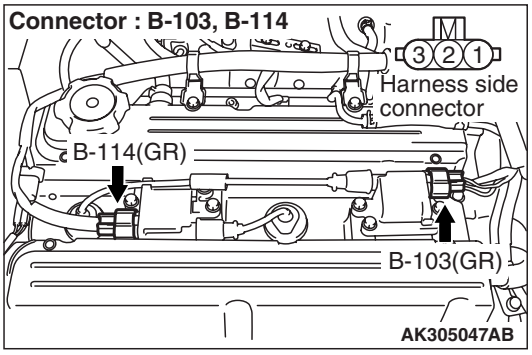
- Defective detonation sensor
- Failed detonation control system
- Failed ignition system
- Defective spark plug
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-II/III diagnosis code

Q: Diagnosis code set?
YES : Inspection chart for diagnosis code (Refer to P.13A-17).
NO : Go to Step 2 .

STEP 2. Connector check: B-103 and B-114 ignition coil connectors



Q: Is the check result normal?
YES : Go to Step 3 .
NO : Repair the damaged harness wire.

STEP 3. Check ignition coil spark.

Q: Is the check result normal?
YES : Check detonation sensor (Refer to Code No. P0325 P.13A-151).
NO : Go to Step 4 .

STEP 4. Check spark plug.

Q: Is the check result normal?
YES : Go to Step 5 .
NO : Replace the spark plug.

STEP 5. Check spark plug cable itself.

- Check spark plug cable itself (Refer to GROUP 16 –Ignition System – On-vehicle Service P.16-29).

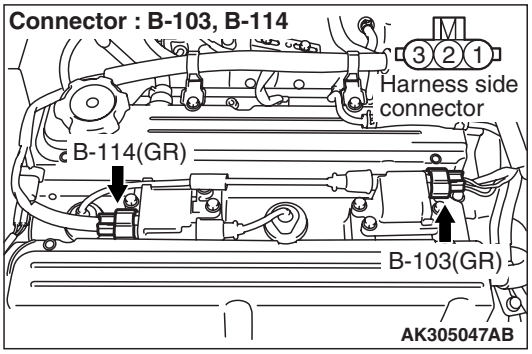
Q: Is the check result normal?
YES : Go to Step 6 .
NO : Replace the spark plug cable.

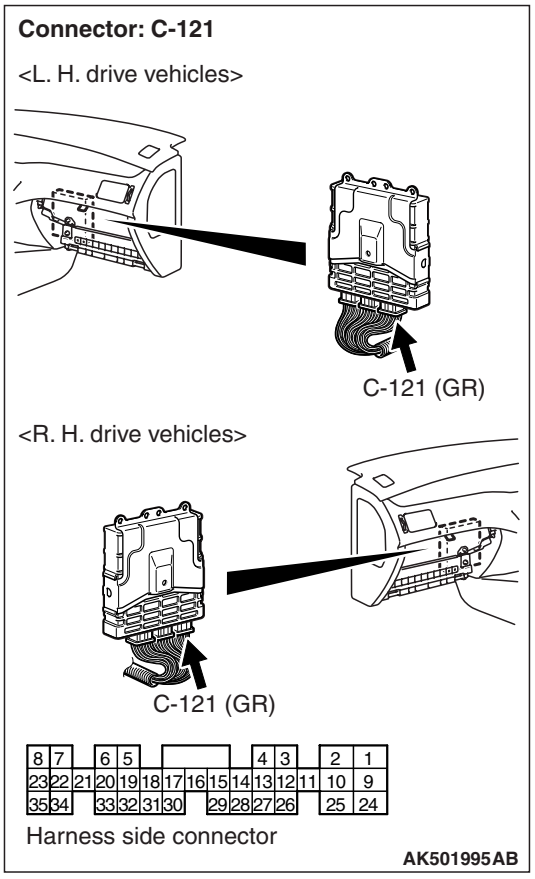
STEP 6. Check ignition coil itself.

- Check ignition coil itself (Refer to GROUP 16 – Ignition System – On-vehicle Service P.16-28).

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Replace the ignition coil.

STEP 7. Check harness between ignition coil connector terminal No. 2 of each cylinder and body earth.





- Check earthing line for open circuit or damage.

Q: Is the check result normal?
YES : Check and repair harness between ignition coil connector terminal No. 3 of each cylinder and C-121 engine-ECU connector.
  - Check signal line for open/short circuit and damage.

NO : Repair the damaged harness wire.

Inspection Procedure 16: Ignition Timing Offset

COMMENT ON TROUBLE SYMPTOM

- Failure is possibly caused by failed crank angle sensor, failed exhaust camshaft position sensor, improper installed timing belt or other faults.

PROBABLE CAUSE

- Failed crank angle sensor
- Failed exhaust camshaft position sensor
- Improperly installed timing belt
- Failed engine-ECU

DIAGNOSIS PROCEDURE

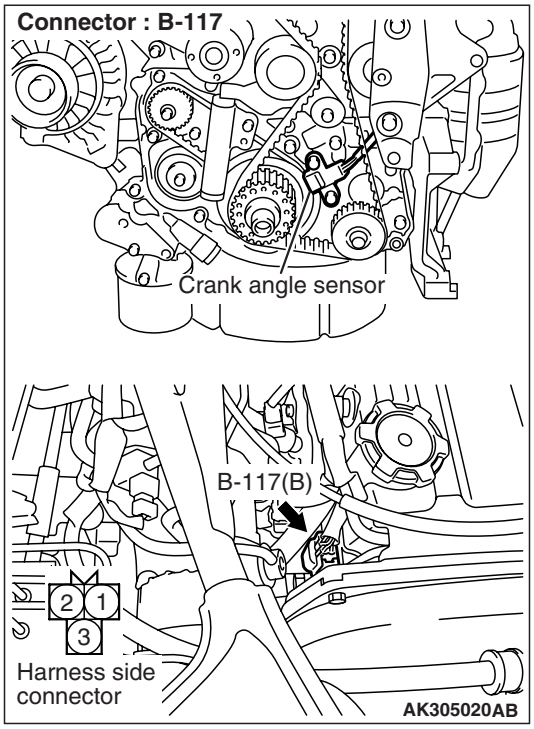
STEP 1. M.U.T.-II/III diagnosis code

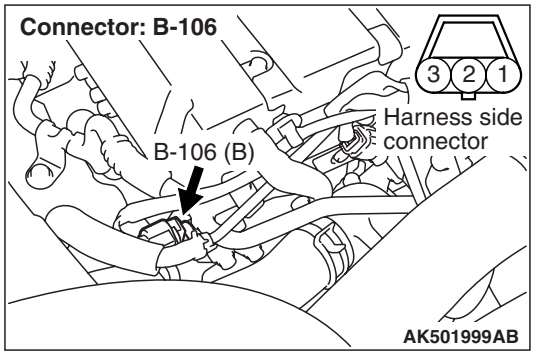
Q: Diagnosis code set?

YES : Inspection chart for diagnosis code (Refer to P.13A-17).

NO : Go to Step 2 .

STEP 2. Perform output wave pattern measurement of crank angle sensor and exhaust camshaft position sensor (Using an oscilloscope).





Crank Angle Sensor

- Use special tool test harness (MD998478) to connect B-117 crank angle sensor connector, and measure at pick-up harness.
- Engine: Idling
- Transmission: Neutral
- Voltage between terminal No. 2 and earth.

Exhaust camshaft Position Sensor

- Use special tool test harness (MB991709) to connect B-106 exhaust camshaft position sensor connector, and measure at pick-up harness.
- Engine: Idling
- Transmission: Neutral
- Voltage between terminal No. 2 and earth.

OK: Output waveform timings of both sensors are the same as the check procedure (Refer to P.13A-385) using an oscilloscope.

Q: Is the check result normal?
YES : Go to Step 3 .
NO : Go to Step 4 .

STEP 3. Check the trouble symptoms.

Q: Does trouble symptom persist?
YES : Replace the engine-ECU.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-5).

STEP 4. Check crank angle sensor and exhaust camshaft position sensor mounted conditions.

Q: Is the check result normal?
YES : Go to Step 5 .
NO : Repair.

STEP 5. Check timing marks of timing belt.

Q: Is the check result normal?
YES : Go to Step 6 .
NO : Align timing marks.

STEP 6. Check crank angle sensor vane.

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Replace the crank angle sensor vane.

STEP 7. Check exhaust camshaft position sensing cylinder.

Q: Is the check result normal?
YES : Go to Step 8 .
NO : Replace the exhaust camshaft position sensing cylinder.

STEP 8. Replace crank angle sensor.
- After replacing the crank angle sensor, re-check the trouble symptoms.

Q: Does trouble symptom persist?
YES : Go to Step 9 .
NO : The check is end.

STEP 9. Replace exhaust camshaft position sensor.
- After replacing the exhaust camshaft position sensor, re-check the trouble symptoms.

Q: Does trouble symptom persist?
YES : Replace the engine-ECU.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-5).

Inspection Procedure 17: Run on (Dieseling)

COMMENT ON TROUBLE SYMPTOM
- Failure is possibly caused by leakage from injector.

PROBABLE CAUSES
- Failed injector
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. Check injector for spray condition.
- Check each injector for spray condition (Refer to P.13A-406).

Q: Does trouble symptom persist?
YES : Replace the engine-ECU.
NO : Replace the injector.

Inspection Procedure 18: Odor, White Smoke, Black Smoke, and High-Concentration CO/HC During Idling

COMMENT ON TROUBLE SYMPTOM

- Failure is possibly caused by improper air-fuel ratio, deteriorated catalyst, failed ignition system, failed fuel system, failed compression pressure or other faults.

PROBABLE CAUSES

- Failed air-fuel control system
- Failed ignition system
- Failed fuel system
- Failed intake and exhaust system
- Failed emission control system
- Failed compression pressure
- Failed catalytic converter
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-II/III diagnosis code

Q: Diagnosis code set?
YES : Inspection chart for diagnosis code (Refer to P.13A-17).
NO : Go to Step 2 .

STEP 2. Check injector for operating sound.

- Check injector for operating sound (Refer to P.13A-406).

Q: Can operating sound be heard?
YES : Go to Step 3 .
NO : Check the injector system of the defective cylinder.
(Refer to Code No. P0201: No. 1 injector system P.13A-105).
(Refer to Code No. P0202: No. 2 injector system P.13A-111).
(Refer to Code No. P0203: No. 3 injector system P.13A-117).
(Refer to Code No. P0204: No. 4 injector system P.13A-123).

STEP 3. Check ignition timing.

- Check ignition timing (Refer to GROUP 11A – On-vehicle Service P.11A-9).

Q: Is the check result normal?
YES : Go to Step 4 .
NO : Check for offset ignition timing (Refer to Inspection Procedure 16 P.13A-287).

STEP 4. M.U.T.-II/III data list

- Refer to Data List Reference Table P.13A-372.
  a. Item No. 12: Air flow sensor
  b. Item No. 13: Intake air temperature sensor
  c. Item No. 21: Engine coolant temperature sensor
  d. Item No. 25: Barometric pressure sensor

Q: Are the check results normal?
YES : Go to Step 5 .
NO : Perform the diagnosis code classified check procedure for the sensor that has shown an abnormal data value (Refer to Inspection Chart for Diagnosis Codes P.13A-17).

STEP 5. Check air intake from intake hose and intake manifold.

Q: Is the check result normal?
YES : Go to Step 6 .
NO : Repair.

STEP 6. Check for emission leakage from exhaust manifold.

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair.

STEP 7. Check throttle body (throttle valve portion) for contamination.

Q: Is the check result normal?
YES : Go to Step 8 .
NO : Clean throttle body (throttle valve portion) (Refer to P.13A-395).

STEP 8. M.U.T.-II/III data list

- Refer to Data List Reference Table P.13A-372.
  a. Item No. 11: Oxygen sensor (front)

Q: Is the check result normal?
YES : Go to Step 9 .
NO : Check oxygen sensor (front) system (Refer to Code No. P0130 P.13A-75).

STEP 9. Check Purge control solenoid valve itself.

- Check Purge control solenoid valve itself (Refer to GROUP 17 – Emission Control System – Evaporative Emission Control System P.17-11).

Q: Is the check result normal?
YES : Go to Step 10 .
NO : Replace the purge control solenoid valve.

STEP 10. Check EGR control solenoid valve itself.

- Check the EGR control solenoid valve itself (Refer to GROUP 17 – Emission Control System – Exhaust Gas Recirculation (EGR) System P.17-15).

Q: Is the check result normal?
YES : Go to Step 11 .
NO : Replace the EGR control solenoid valve.

STEP 11. Check EGR valve itself.

- Check EGR valve itself (Refer to GROUP 17 – Emission Control System – Exhaust Gas Recirculation (EGR) System P.17-15).

Q: Is the check result normal?
YES : Go to Step 12 .
NO : Replace the EGR valve.

STEP 12. Fuel pressure measurement.

- Fuel pressure measurement (Refer to P.13A-396).

Q: Is the check result normal?
YES : Go to Step 13 .
NO : Repair.

STEP 13. Check positive crankcase ventilation valve itself.

- Check positive crankcase ventilation valve itself (Refer to GROUP 17 – Emission Control System – Evaporative Emission Control System P.17-9).

Q: Is the check result normal?
YES : Go to Step 14 .
NO : Replace the positive crankcase ventilation valve.

STEP 14. Check spark plug.

Q: Is the check result normal?
YES : Go to Step 15 .
NO : Replace the spark plug.

STEP 15. Check spark plug cable itself.

- Check spark plug cable itself (Refer to GROUP 16 – Ignition System – On-vehicle Service P.16-29).

Q: Is the check result normal?
YES : Go to Step 16 .
NO : Replace the spark plug cable.

STEP 16. Check ignition coil itself.

- Check ignition coil itself (Refer to GROUP 16 – Ignition System – On-vehicle Service P.16-28).

Q: Is the check result normal?
YES : Go to Step 17 .
NO : Replace the ignition coil.

STEP 17. Check compression pressure.

- Check compression pressure (Refer to GROUP 11A – On-vehicle Service P.11A-11).

Q: Is the check result normal?
YES : Go to Step 18 .
NO : Repair.

STEP 18. Check injector for spraying condition.

- Check each injector for spray condition (Refer to P.13A-406).

Q: Does trouble symptom persist?
YES : Go to Step 19 .
NO : Replace the injector.

STEP 19. Replace catalytic converter.

- After replacing the catalytic converter re-check the trouble symptoms.

Q: Does trouble symptom persist?
YES : Replace the engine-ECU.
NO : The check is end.

Inspection Procedure 19: Battery Rundown

COMMENT ON TROUBLE SYMPTOM

- Failure is possibly caused by failed alternator, failed generation control circuit or other faults.

PROBABLE CAUSES

- Failed battery
- Alternator G terminal short-circuit
- Failed alternator
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. Check battery voltage.

- Measure battery voltage during cranking.

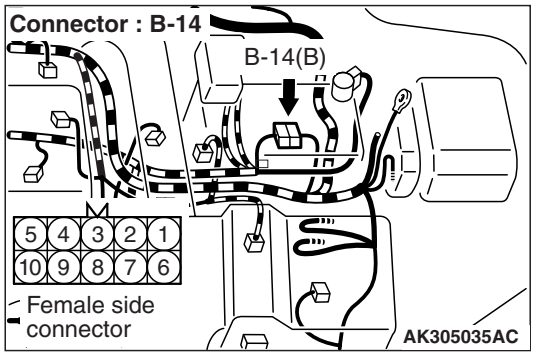
OK: 8 V or more

Q: Is the check result normal?

YES : Go to Step 2 .

NO : Check battery (Refer to GROUP 54A – Battery – On-vehicle Service – Battery test P.54A-5).

STEP 2. Connector check: B-14 intermediate connector

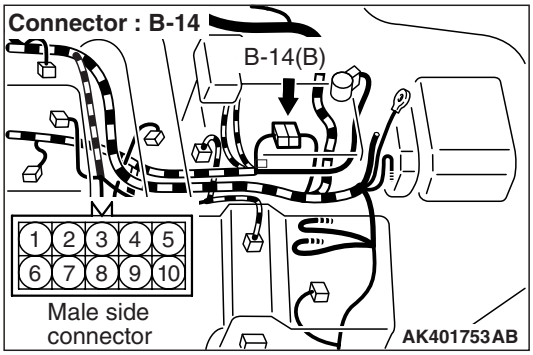


Q: Is the check result normal?

YES : Go to Step 3 .

NO : Repair or replace the connector.

STEP 3. Perform voltage measurement at B-14 intermediate connector.



- Disconnect connector, and measure at male connector side.
- Ignition switch: "ON"
- Voltage between terminal No. 9 and earth.

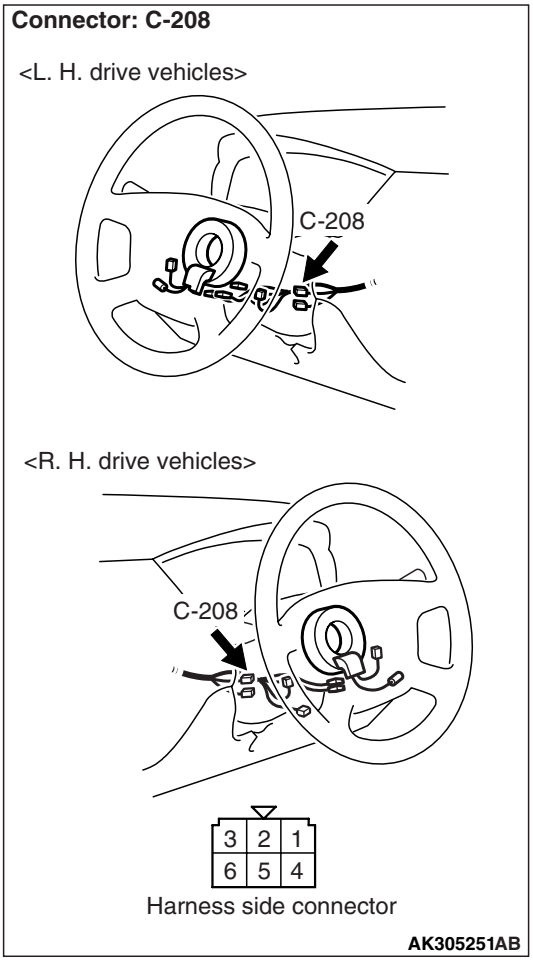
OK: System voltage

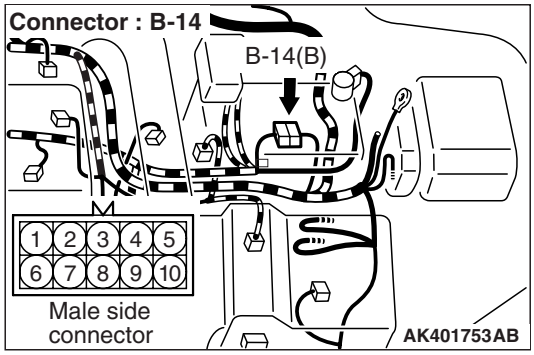
Q: Is the check result normal?

YES : Go to Step 5 .

NO : Go to Step 4 .

STEP 4. Connector check: C-208 ignition switch connector





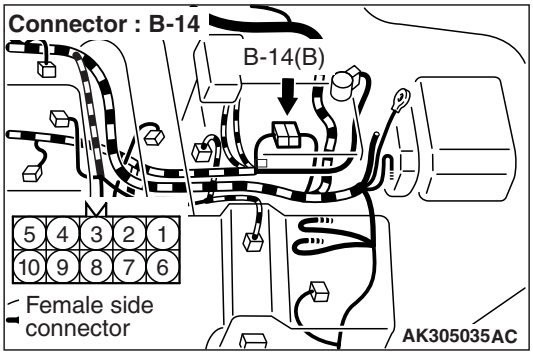
Q: Is the check result normal?

YES : Check intermediate connectors C-01, C-23 <L.H. drive vehicles>, C-124, C-211 and C-214, and repair if necessary. If intermediate connectors are normal, check and repair harness between B-14 (terminal No. 9) intermediate connector and C-208 (terminal No. 2) ignition switch connector.

- Check power supply line for open/short circuit.

NO : Repair or replace the connector.

STEP 5. Perform voltage measurement at B-14 intermediate connector.



- Disconnect connector, and measure at female connector side.
- Ignition switch: "ON"
- Voltage between terminal No. 10 and earth.

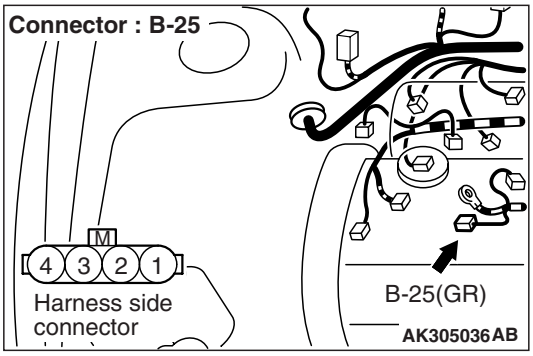
OK: System voltage

Q: Is the check result normal?

YES : Go to Step 10 .

NO : Go to Step 6 .

STEP 6. Connector check: B-25 alternator connector

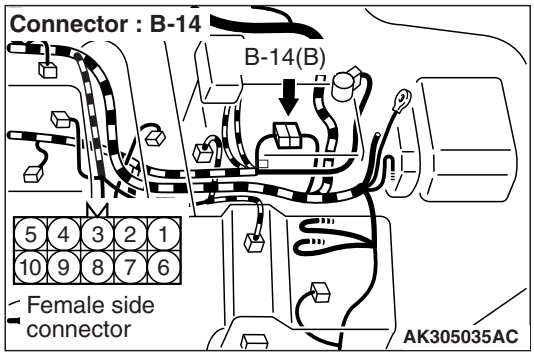


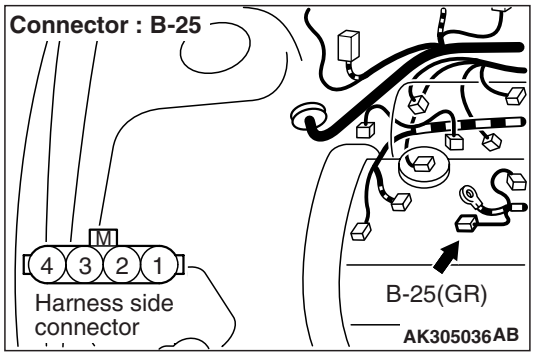
Q: Is the check result normal?

YES : Go to Step 7 .

NO : Repair or replace the connector.

STEP 7. Check harness between B-14 (terminal No. 10) intermediate connector and B-25 (terminal No. 1) alternator connector.

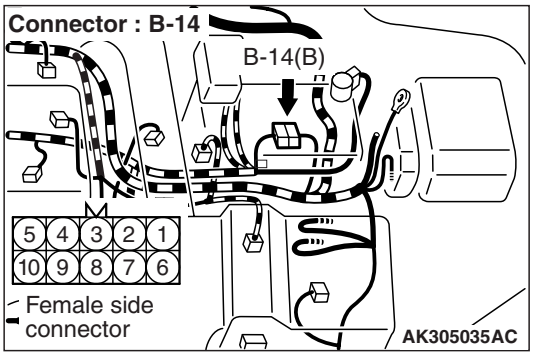


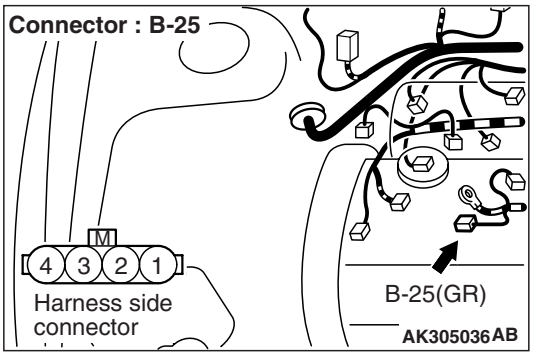


- Check output line for short circuit.

Q: Is the check result normal?
YES : Go to Step 8 .
NO : Repair the damaged harness wire.

STEP 8. Check harness between B-14 (terminal No. 9) intermediate connector and B-25 (terminal No. 3) alternator connector.

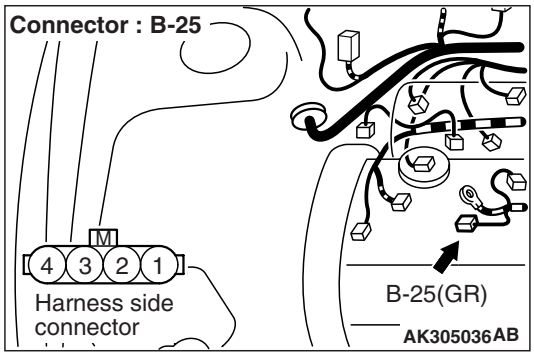


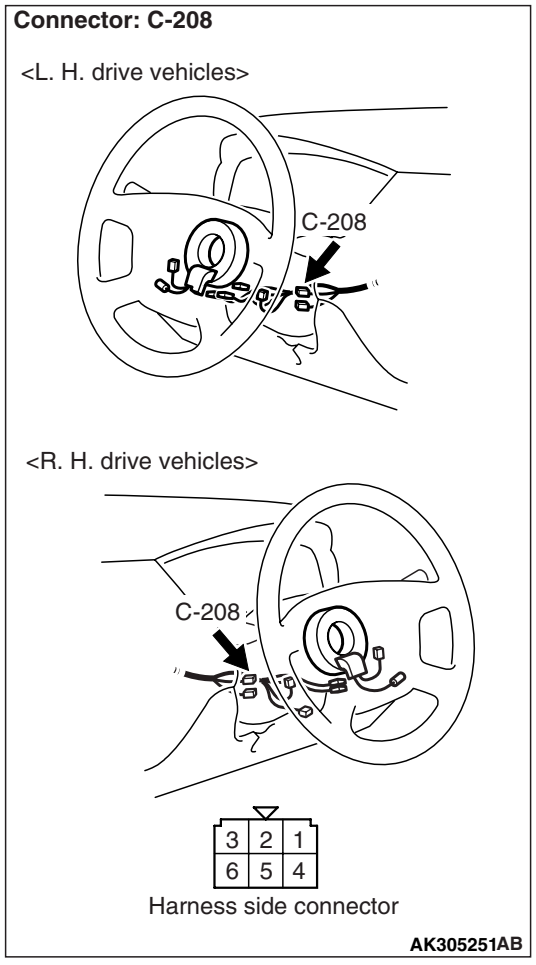


- Check power supply line for open/short circuit.

Q: Is the check result normal?
YES : Go to Step 9 .
NO : Repair the damaged harness wire.

STEP 9. Check harness between B-25 (terminal No. 3) alternator connector and C-208 (terminal No. 2) ignition switch connector.



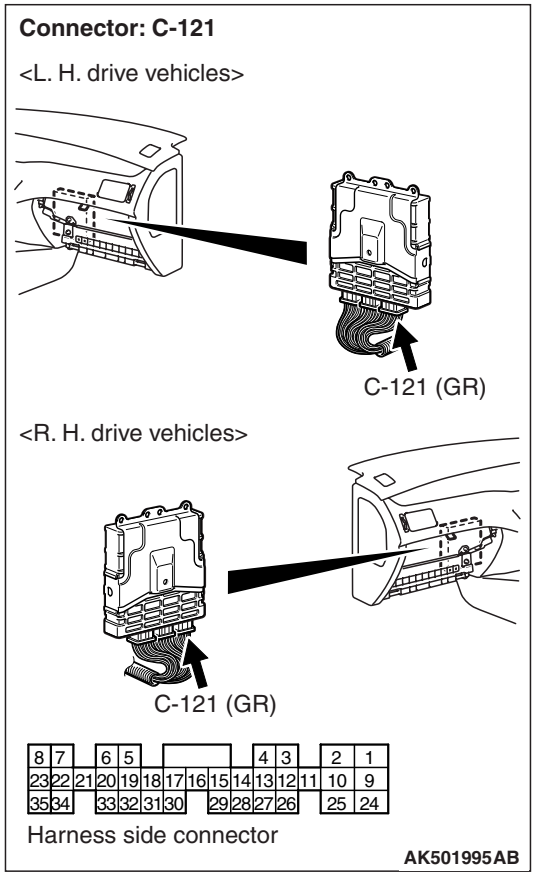


NOTE: Before checking harness, check intermediate connectors C-01, C-23 <L.H. drive vehicles>, C-124, C-211 and C-214, and repair if necessary.

- Check power supply line for damage.

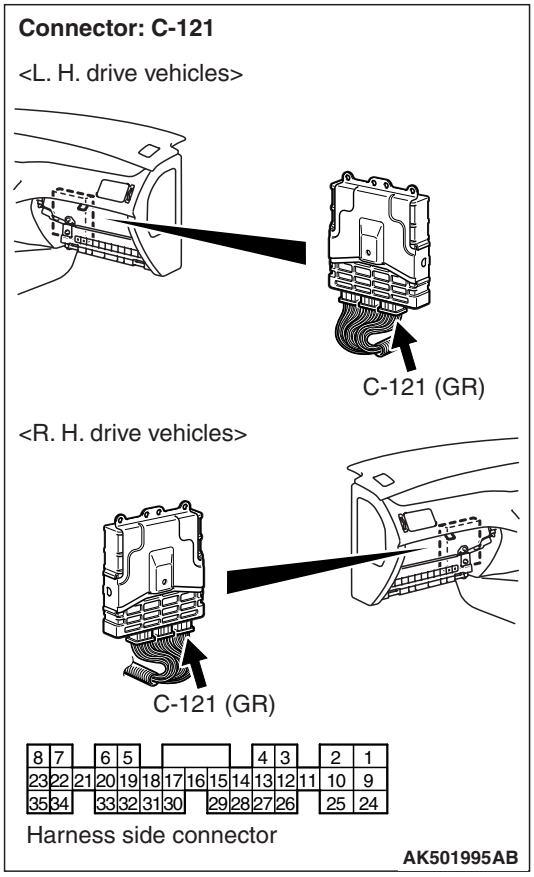
Q: Is the check result normal?
YES : Replace the alternator.
NO : Repair the damaged harness wire.

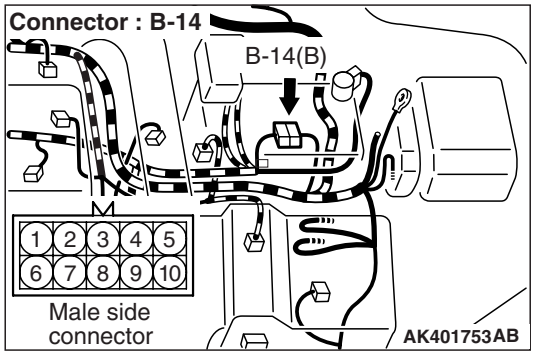
STEP 10. Connector check: C-121 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 11 .
NO : Repair or replace the connector.

STEP 11. Perform voltage measurement at C-121 engine-ECU connector.



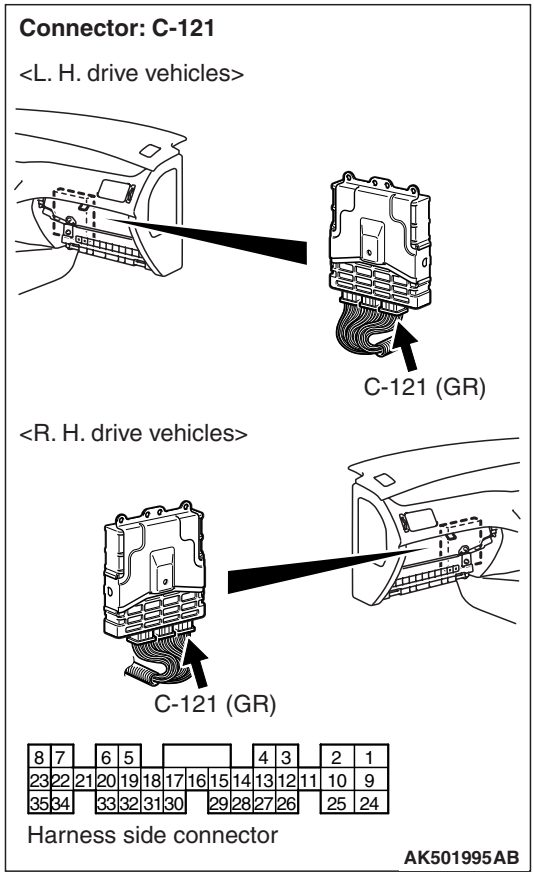


- Disconnect connector, and measure at harness side.
- Ignition switch: "ON"
- Voltage between terminal No. 8 and earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 12 .
NO : Check and repair harness between B-14 (terminal No. 10) intermediate connector and C-121 (terminal No. 8) engine-ECU connector.
- Check output line for short circuit.

STEP 12. Perform voltage measurement at C-121 engine-ECU connector.



- Measure engine-ECU terminal voltage.
- Engine: Idling after warm-up
- Transmission: Neutral
- Radiator fan: Inactive
- Voltage between terminal No. 8 and earth.

OK: Switching the head lamps to ON from OFF causes the voltage to increase by 0.2 – 3.5 V.

Q: Is the check result normal?
YES : Go to Step 13 .
NO : Replace the alternator.

STEP 13. Check the trouble symptoms.

Q: Does trouble symptom persist?
YES : Replace the engine-ECU.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-5).

Inspection Procedure 20: Overheating

COMMENT ON TROUBLE SYMPTOM

- Failure is possibly caused by failed engine cooling system, failed fan controller, failed engine coolant temperature sensor or other faults.

PROBABLE CAUSES

- Insufficient or deteriorated engine coolant
- Failed fan controller
- Failed engine coolant temperature sensor
- Failed thermostat
- Failed water pump
- Failed radiator core
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-II/III diagnosis code

Q: Diagnosis code set?
YES : Inspection chart for diagnosis code (Refer to P.13A-17).
NO : Go to Step 2 .

STEP 2. Check engine coolant.

NOTE: If engine coolant level falls too early, check for leaky spots, and repair if necessary.

- Check engine coolant (Refer to GROUP 14 – On-vehicle Service P.14-15).

Q: Is the check result normal?
YES : Go to Step 3 .
NO : Replace or add engine coolant.

STEP 3. M.U.T.-II/III actuator test

- Item No. 21: Fan controller

OK: Fan motor rotating

Q: Is the check result normal?
YES : Go to Step 4 .
NO : Check radiator fan control relay system (Refer to Inspection Procedure 25 P.13A-324).

STEP 4. M.U.T.-II/III data list

- Item No. 21: Engine coolant temperature sensor

OK:
Engine cold state: At ambient temperature (atmospheric temperature) or equivalent.
Engine hot state: At 80 – 120 °C

Q: Is the check result normal?
YES : Go to Step 5 .
NO : Check engine coolant temperature sensor system (Refer to Code No. P0115 P.13A-52).

STEP 5. Check thermostat.

- Check thermostat (Refer to GROUP 14 – Thermostat P.14-19).

Q: Is the check result normal?
YES : Go to Step 6 .
NO : Replace the thermostat.

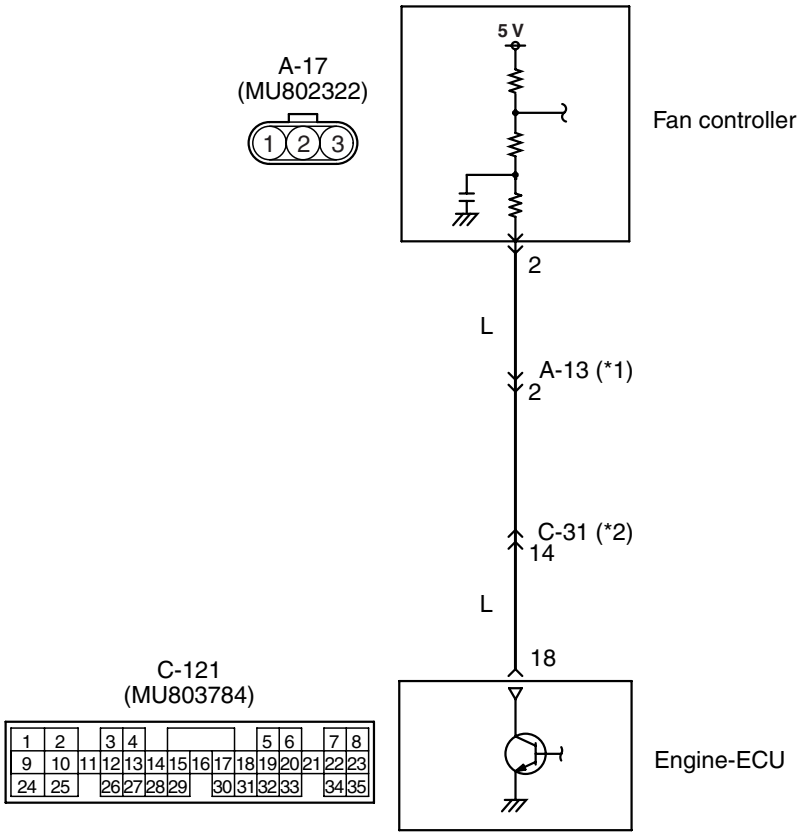
STEP 6. Check water pump.

- Check water pump.

Q: Is the check result normal?
YES : Replace the radiator.
NO : Replace the water pump.

Inspection Procedure 21: Abnormal Rotation of Fan Motor

Fan controller circuit



NOTE
*1: L.H. drive vehicles
*2: R.H. drive vehicles

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

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OPERATION

- The control (duty) signal is inputted to the fan controller (terminal No. 2) from the engine-ECU (terminal No. 18).

FUNCTION

- The engine-ECU inputs a duty signal suitable for the engine coolant temperature, vehicle speed and A/C switch position to the fan controller. In response to the signal, the fan controller controls the rotating speeds of the radiator fan and A/C condenser fan. (The fan speed becomes higher as the average voltage of the terminal comes nearer to 5 V.)

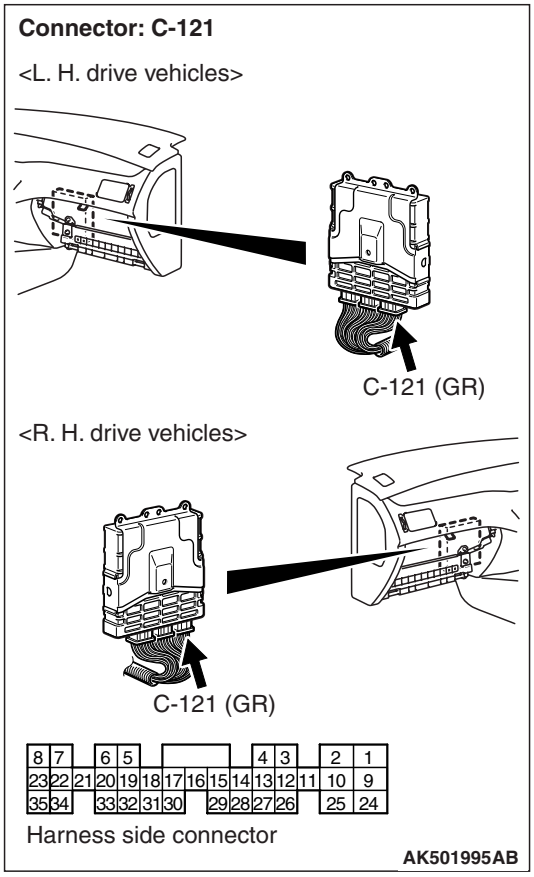
PROBABLE CAUSES

- Failed fan controller
- Open/short circuit in fan controller circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

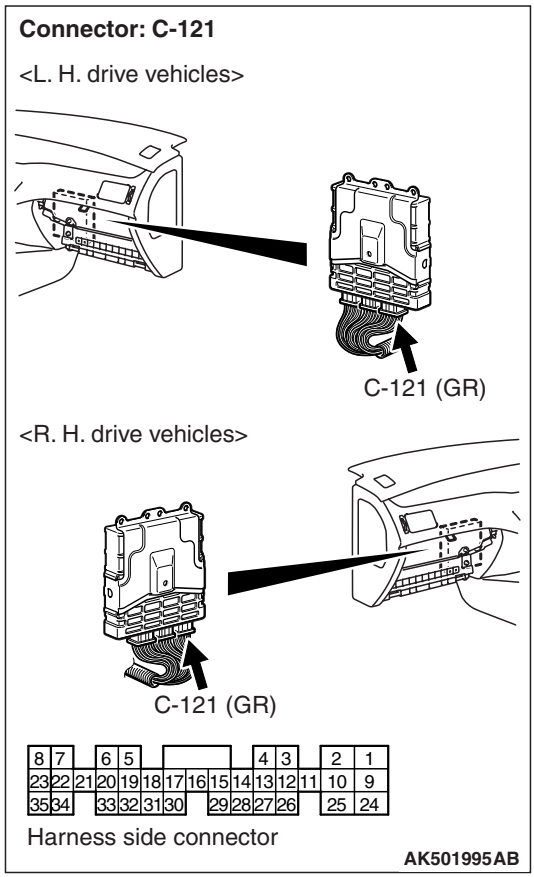
NOTE:
**1: L.H. drive vehicles*
**2: R.H. drive vehicles*

STEP 1. Connector check: C-121 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 2 .
NO : Repair or replace the connector.

STEP 2. Check at C-121 engine-ECU connector.



- Disconnect connector, and measure at harness side.
- Ignition switch: "ON"
- Short-circuit terminal No. 18 to earth.

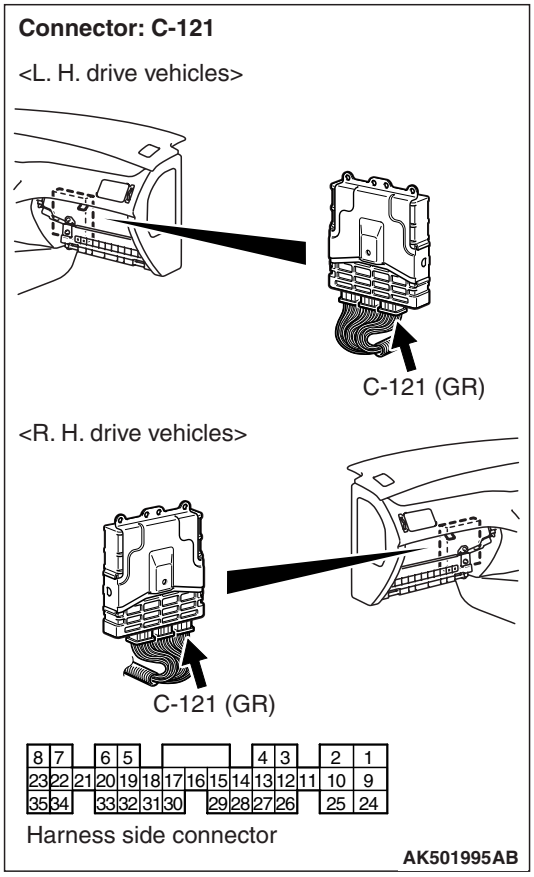
OK: Fan motor stops rotating.

Q: Is the check result normal?
YES : Go to Step 3 .
NO : Go to Step 4 .

STEP 3. Check the trouble symptoms.

Q: Does trouble symptom persist?
YES : Replace the engine-ECU.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-5).

STEP 4. Perform voltage measurement at C-121 engine-ECU connector.

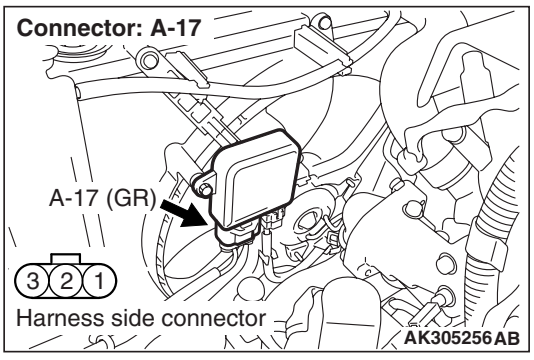


- Disconnect connector, and measure at harness side.
- Ignition switch: "ON"
- Voltage between terminal No. 18 and earth.

OK: 4.9 – 5.1 V

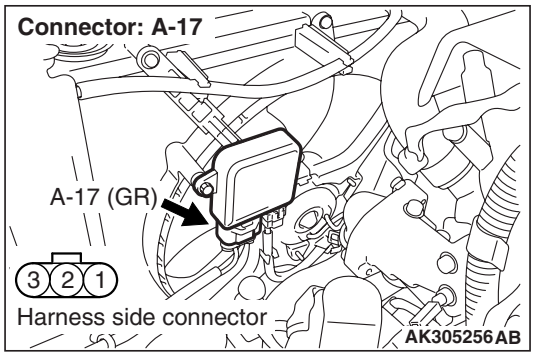
Q: Is the check result normal?
YES : Replace the fan controller.
NO : Go to Step 5 .

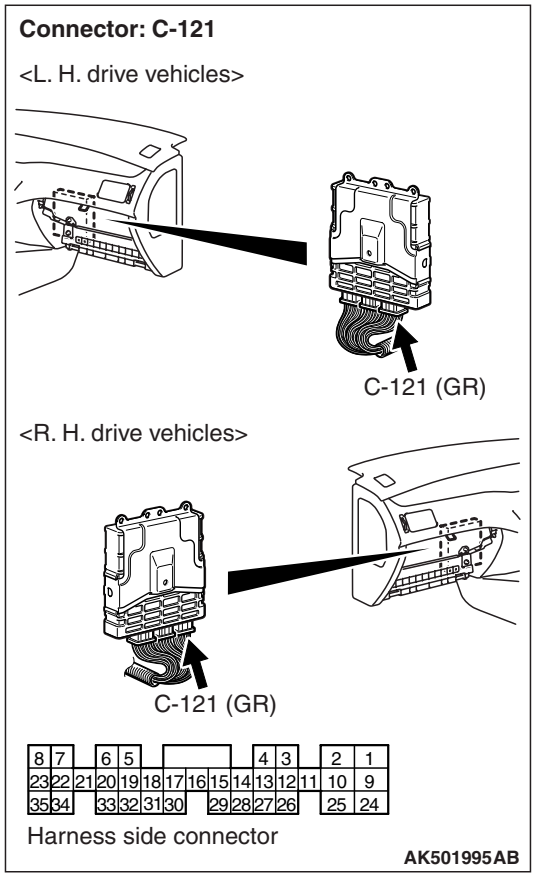
STEP 5. Connector check: A-17 fan controller connector



Q: Is the check result normal?
YES : Go to Step 6 .
NO : Repair or replace the connector.

STEP 6. Check harness between A-17 (terminal No. 2) fan controller connector and C-121 (terminal No. 18) engine-ECU connector.





*NOTE: Before checking harness, check intermediate connector A-13*1 or 31*2, and repair if necessary.*

- Check output line for open circuit.

Q: Is the check result normal?
YES : Replace the fan controller.
NO : Repair the damaged harness wire.

Inspection Procedure 22: Poor A/C Performance

COMMENT ON TROUBLE SYMPTOM

- Failure is possibly caused by short /overcharged A/C refrigerant, failed A/C control system, failed fan control system or other faults.

PROBABLE CAUSES

- Short or overcharged A/C refrigerant
- Failed A/C compressor
- Failed fan controller
- Failed A/C-ECU
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. M.U.T.-II/III diagnosis code

Q: Diagnosis code set?
YES : Inspection chart for diagnosis code (Refer to P.13A-17).
NO : Go to Step 2 .

STEP 2. A/C compressor magnet clutch operation check.

- Engine: Idling
- A/C set temperature:
  Maximum Cool when temperature in cabin is 25°C or more
  Maximum Hot when temperature in cabin is 25°C or less

OK:
Magnet clutch active (when A/C is ON)
Magnet clutch inactive (when A/C is OFF)

Q: Is the check result normal?
YES : Go to Step 5 .
NO : Go to Step 3 .

STEP 3. M.U.T.-II/III data list

- Item No. 28: A/C switch
  a. Engine: Idling
  b. A/C set temperature:
  Maximum Cool when temperature in cabin is 25°C or more
  Maximum Hot when temperature in cabin is 25°C or less

OK:
ON (when A/C is ON)
OFF (when A/C is OFF)

Q: Is the check result normal?
YES : Go to Step 4 .
NO : Check A/C switch (Refer to Inspection Procedure 27 P.13A-341).

STEP 4. M.U.T.-II/III data list

- Item No. 49: A/C relay
  a. Engine: Idling
  b. A/C set temperature:
  Maximum Hot when temperature in cabin is 25°C or less
  Maximum Cool when temperature in cabin is 25°C or more

OK:
ON (when A/C is ON)
OFF (when A/C is OFF)

Q: Is the check result normal?
YES : Check A/C system (Refer to GROUP 55 – Troubleshooting P.55-29).
NO : Check A/C compressor relay (Refer to Inspection procedure 28 P.13A-344).

STEP 5. Check charged amount of A/C refrigerant.

- Check charged amount of A/C refrigerant (Refer to GROUP 55 – On-vehicle Service P.55-104).

Q: Is the check result normal?

YES : Go to Step 6 .

NO : Adjust charged amount of A/C refrigerant.

STEP 6. M.U.T.-II/III actuator test

- Item No. 21: Fan controller

OK: Fan motor rotates.

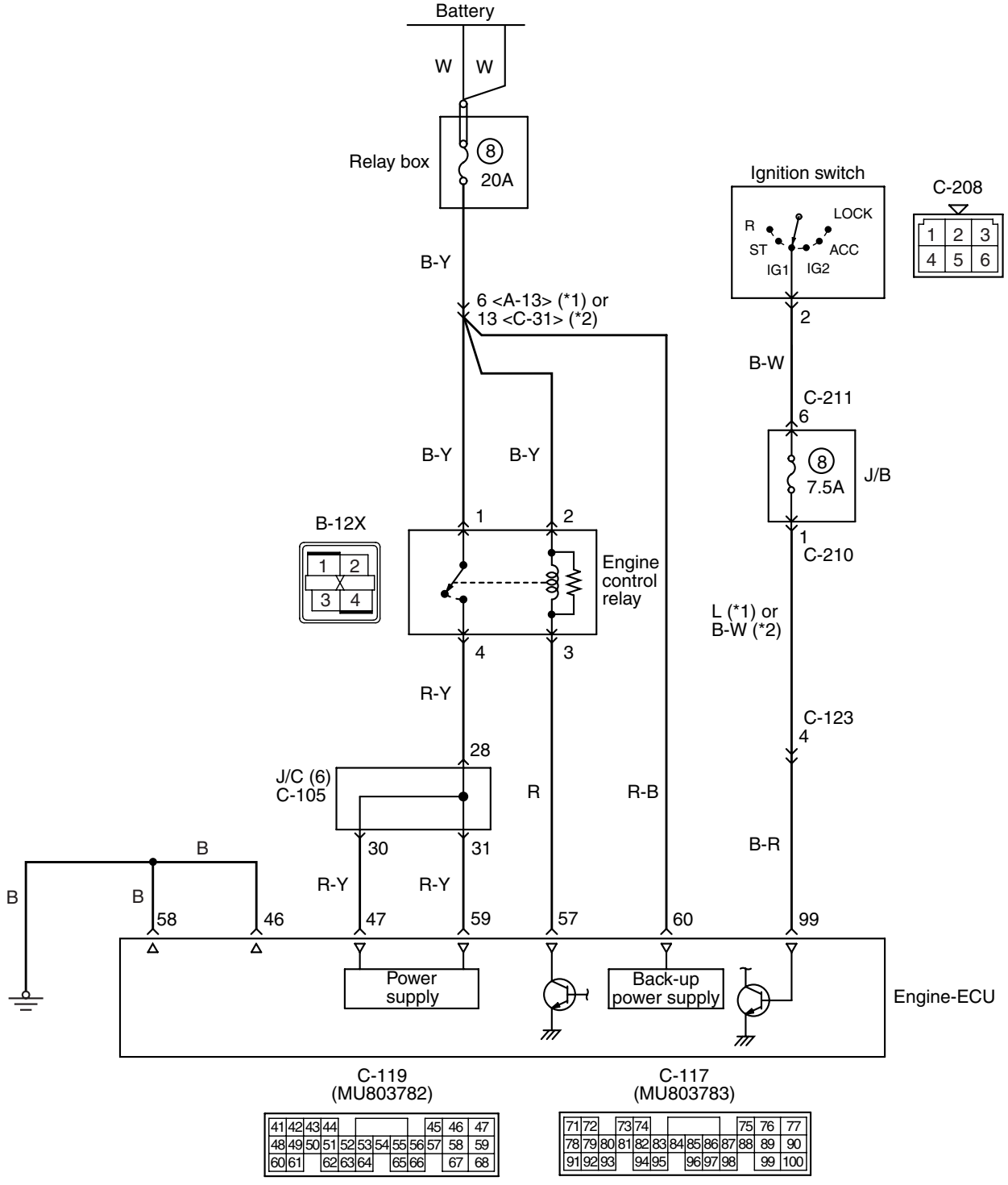
Q: Is the check result normal?

YES : Check A/C load signal system (Refer to Inspection Procedure 29 P.13A-352).

NO : Check radiator fan control relay system (Refer to Inspection Procedure 25 P.13A-324).

Inspection Procedure 23: Engine-ECU Power Supply, Engine Control Relay, Ignition Switch-IG1 System

Power supply and ignition switch-IG circuit



NOTE
*1: L.H. drive vehicles
*2: R.H. drive vehicles

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

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OPERATION

- The battery voltage is applied to the engine control relay (terminal No. 1 and No. 4).
- The engine-ECU (terminal No. 57) makes the power transistor in the unit be in "ON" position and makes currents go on the engine control relay coil, and that makes the relay be in "ON" position.
- When the engine control relay is in "ON" position, the battery voltage is supplied to the engine-ECU, the sensor and the actuator from the engine control relay (terminal No. 4).
- The engine-ECU (terminal No. 46, No. 58) is grounded to the vehicle body.

FUNCTION

- When the ignition switch ON signal is input to the engine-ECU, the engine-ECU places the engine control relay in the ON position. Accordingly, the battery voltage is supplied to the engine-ECU, sensor and actuator.

PROBABLE CAUSES

- Failed engine control relay
- Open/short circuit in engine control relay circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

NOTE:
**1: L.H. drive vehicles*
**2: R.H. drive vehicles*

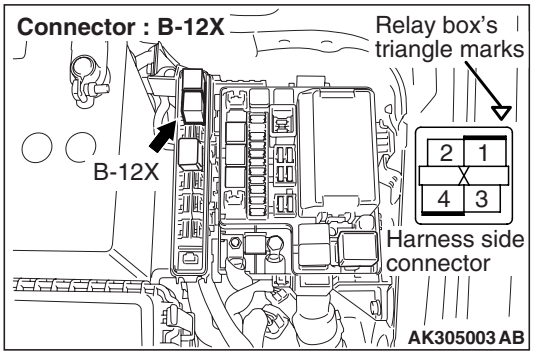
STEP 1. Check battery voltage.

- Measure battery voltage during cranking.

OK: 8 V or more

Q: Is the check result normal?
YES : Go to Step 2 .
NO : Check battery (Refer to GROUP 54A – Battery – On-vehicle Service – Battery test P.54A-5).

STEP 2. Connector check: B-12X engine control relay connector



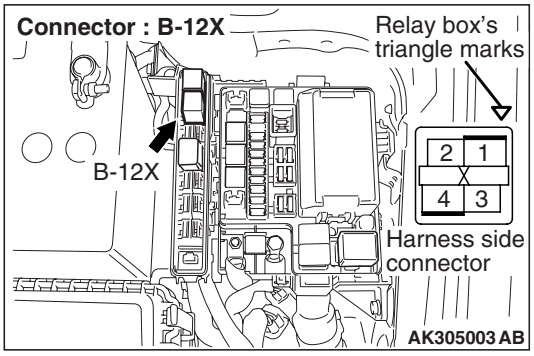
Q: Is the check result normal?
YES : Go to Step 3 .
NO : Repair or replace the connector.

STEP 3. Check engine control relay.

- Check engine control relay (Refer to P.13A-401).

Q: Is the check result normal?
YES : Go to Step 4 .
NO : Replace the engine control relay.

STEP 4. Perform voltage measurement at B-12X engine control relay connector.

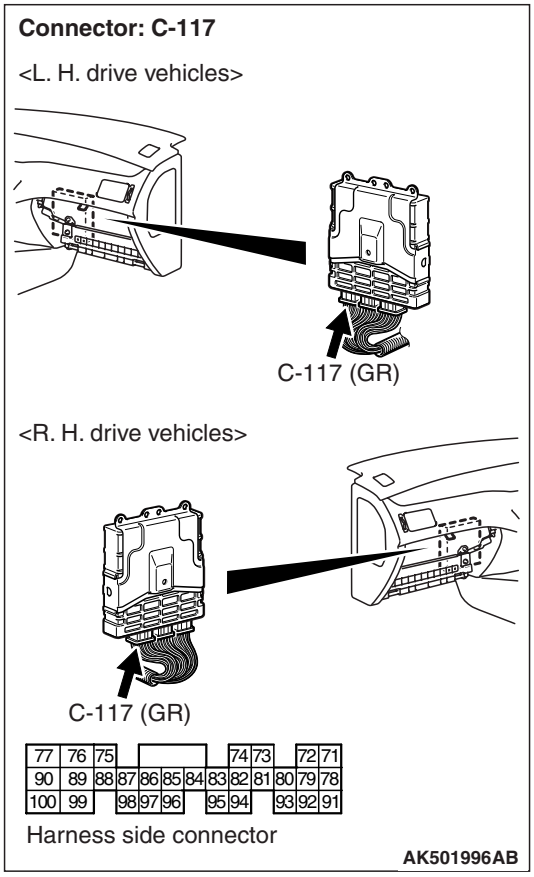


- Remove relay, and measure at relay box side.
- Voltage between terminal No. 1 and earth, also between terminal No. 2 and earth.

OK: System voltage

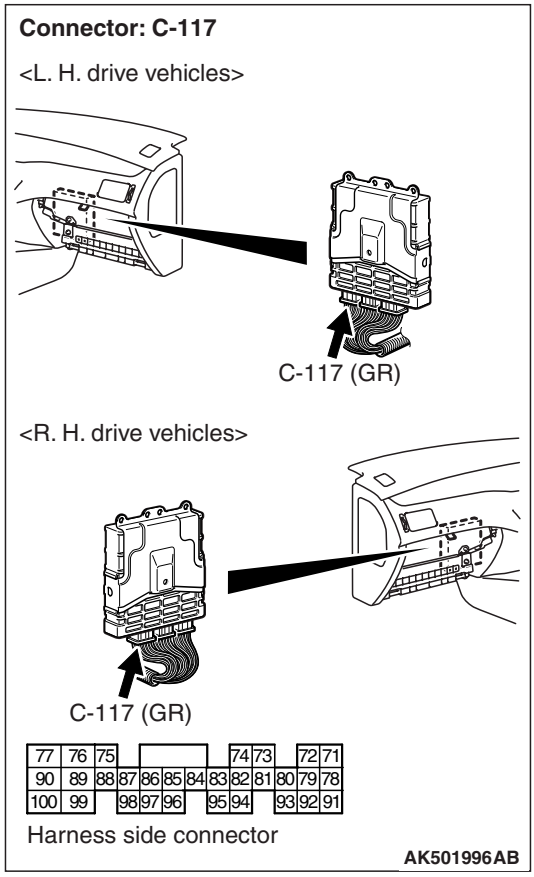
Q: Is the check result normal?
YES : Go to Step 5 .
NO : Check intermediate connector A-13*1 or C-31*2, and repair if necessary. If intermediate connector is normal, check and repair harness between B-12X (terminal No. 1, No. 2) engine control relay connector and battery.
- Check power supply line for open/short circuit.

STEP 5. Connector check: C-117 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 6 .
NO : Repair or replace the connector.

STEP 6. Perform voltage measurement at C-117 engine-ECU connector.

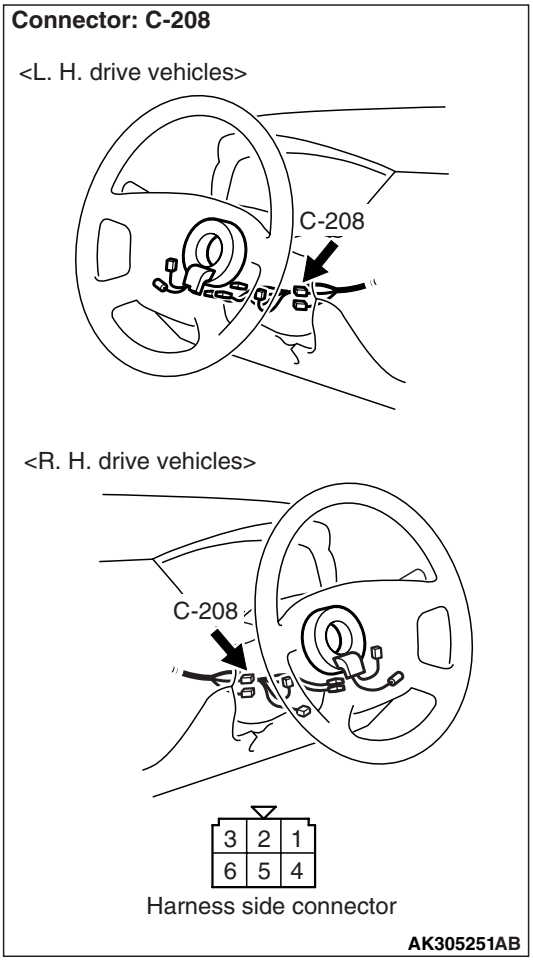


- Disconnect connector, and measure at harness side.
- Ignition switch: "ON"
- Voltage between terminal No. 99 and earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 9 .
NO : Go to Step 7 .

STEP 7. Connector check: C-208 ignition switch connector



Q: Is the check result normal?

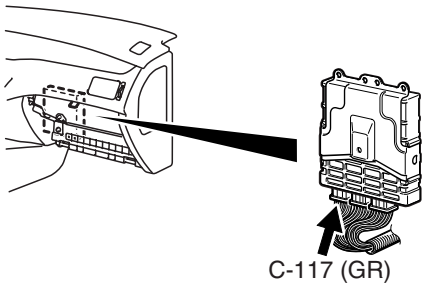
YES : Go to Step 8 .

NO : Repair or replace the connector.

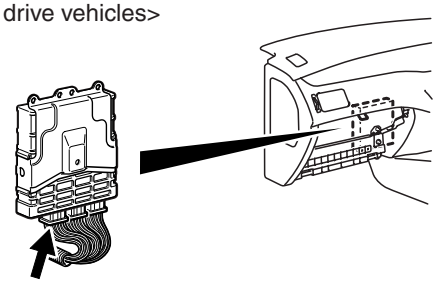
STEP 8. Check ignition switch.

Connector: C-117

<L. H. drive vehicles>



<R. H. drive vehicles>



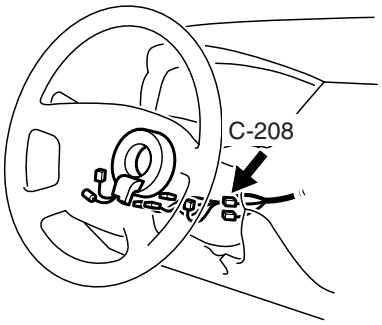
77	76	75						74	73			72	71	
90	89	88	87	86	85	84	83	82	81	80	79	78		
100	99		98	97	96		95	94		93	92	91		

Harness side connector

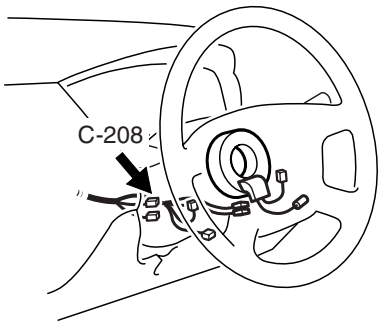
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Connector: C-208

<L. H. drive vehicles>



<R. H. drive vehicles>



3	2	1
6	5	4

Harness side connector

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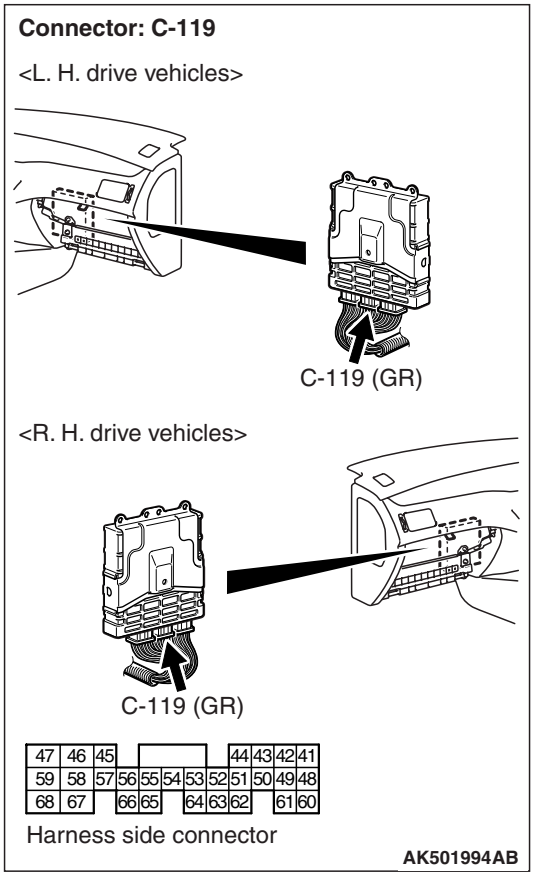
- Check ignition switch (Refer to GROUP 54A – Ignition Switch – Ignition Switch – Inspection P.54A-30).

Q: Is the check result normal?

YES :
- Check intermediate connectors C-123, C-210 and C-211, then repair if necessary. If intermediate connectors are normal, check and repair harness between C-117(terminal No. 99) engine-ECU connector and C-208 (terminal No. 2) ignition switch connector.
  - Check power supply line for open/short circuit.

NO : Replace the ignition switch.

STEP 9. Perform voltage measurement at C-119 engine-ECU connector.



- Disconnect connector, and measure at harness side.
- Voltage between terminal No. 60 and earth.

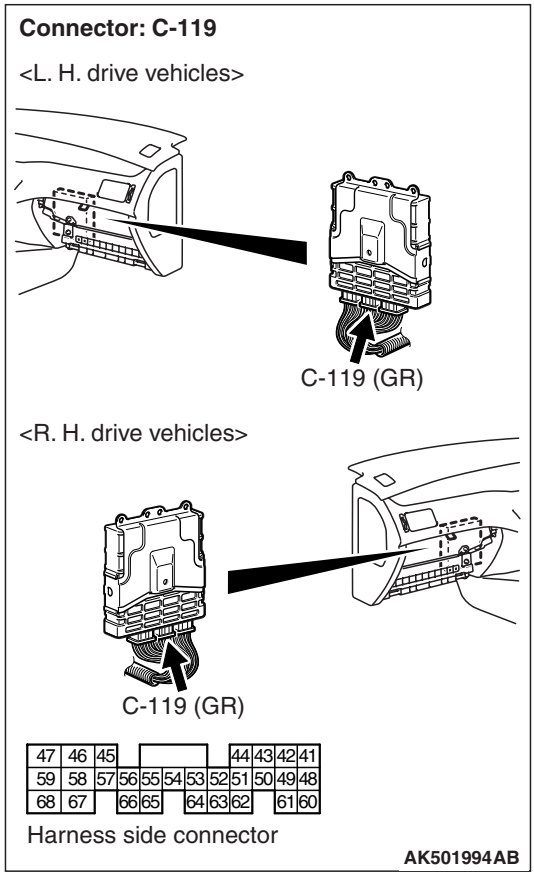
OK: System voltage

Q: Is the check result normal?

YES : Go to Step 10 .

NO :
- Check intermediate connector A-13[*1] or C-31[*2] and repair if necessary. If intermediate connector is normal, check and repair harness between C-119 (terminal No. 60) engine-ECU connector and battery.
  - Check power supply line for short circuit.

STEP 10. Connector check: C-119 engine-ECU connector

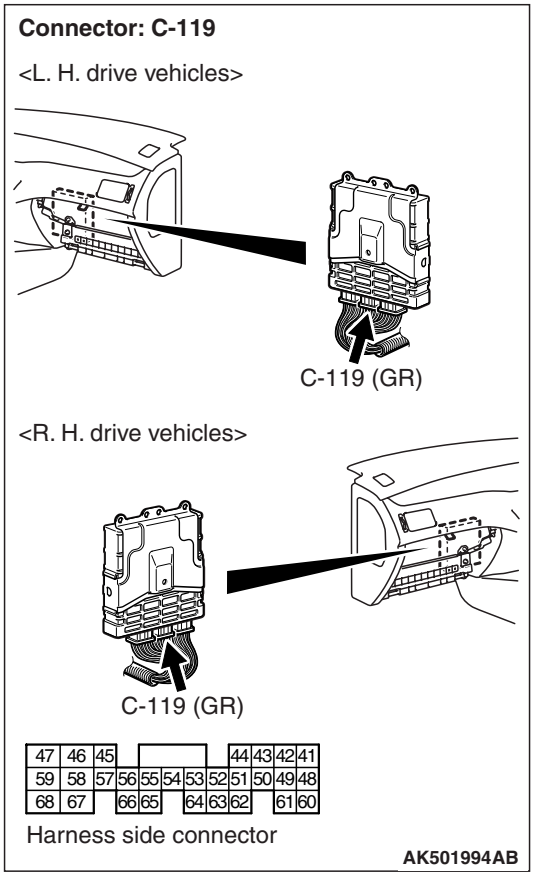


Q: Is the check result normal?

YES : Go to Step 11 .

NO : Repair or replace the connector.

STEP 11. Perform resistance measurement at C-119 engine-ECU connector.

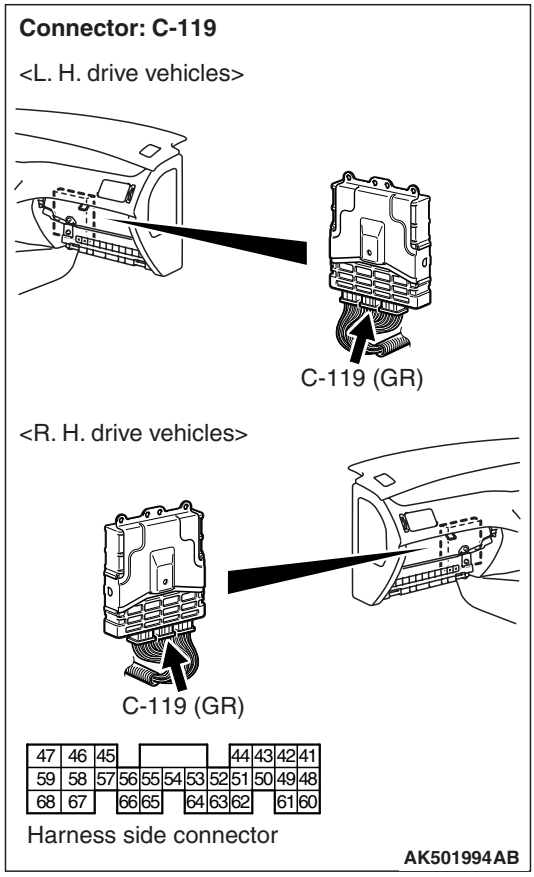


- Disconnect connector, and measure at harness side.
- Resistance between terminal No. 46 and earth, and No. 58 and earth.

OK: 2 Ω or less

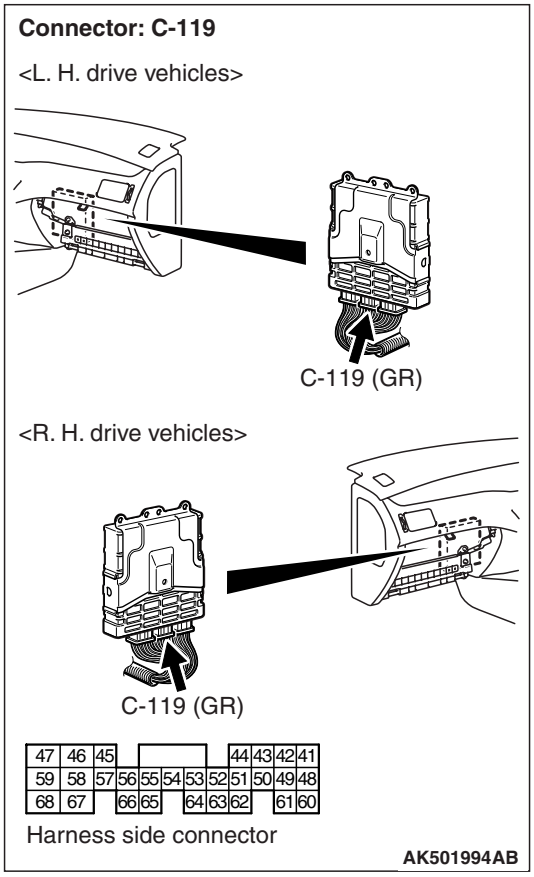
Q: Is the check result normal?
YES : Go to Step 12 .
NO : Check and repair harness between C-119 (terminal No. 46 and No. 58) engine-ECU connector and body earth.
- Check earthing line for open circuit and damage.

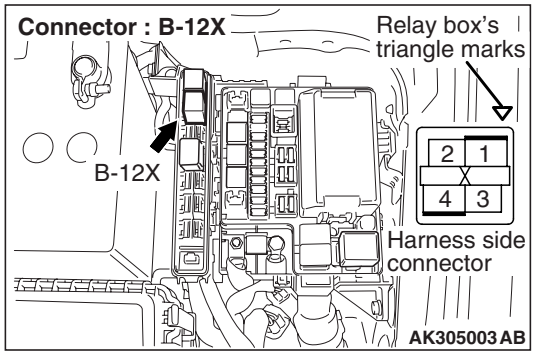
STEP 12. Connector check: C-119 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 13 .
NO : Repair or replace the connector.

STEP 13. Perform voltage measurement at C-119 engine-ECU connector.





- Disconnect connector, and measure at harness side.
- Voltage between terminal No. 57 and earth.

OK: System voltage

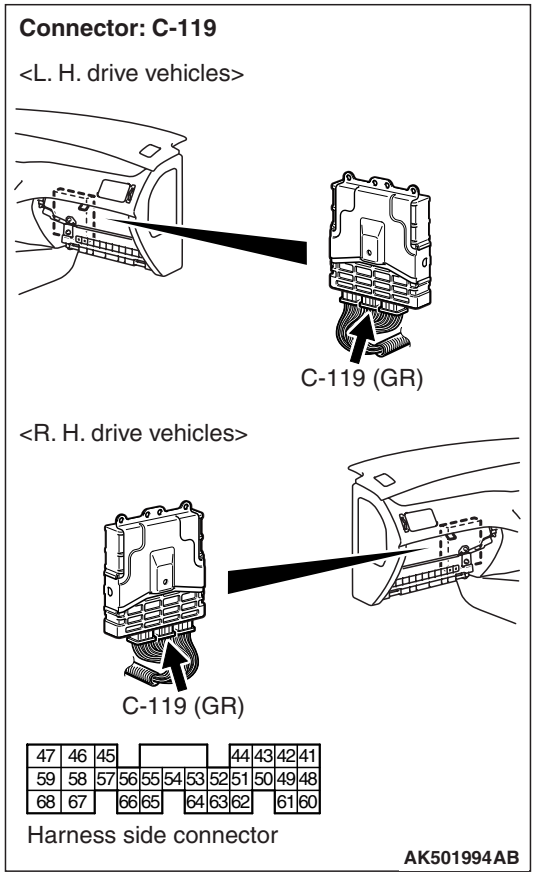
Q: Is the check result normal?

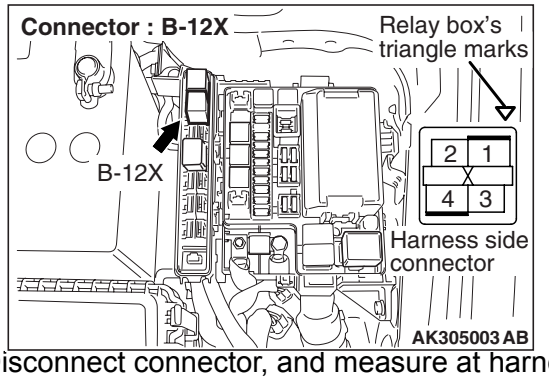
YES : Go to Step 14 .

NO : Check and repair harness between B-12X (terminal No. 3) engine control relay connector and C-119 (terminal No. 57) engine-ECU connector.

- Check earthing line for open/short circuit.

STEP 14. Perform voltage measurement at C-119 engine-ECU connector.





- Disconnect connector, and measure at harness side.
- Using jumper wire, connect C-119 (terminal No. 57) engine-ECU connector and earth.
- Voltage between terminal No. 47 and earth, and No. 59 and earth.

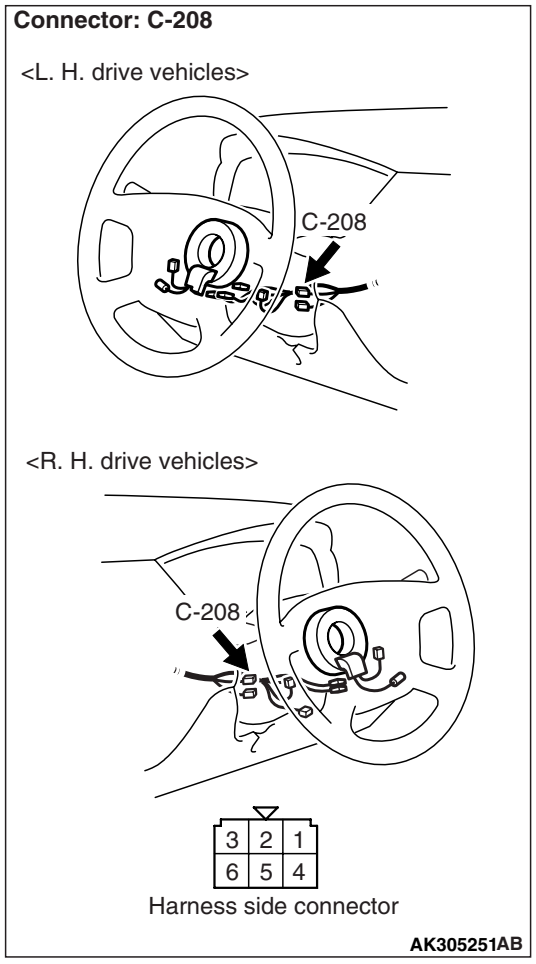
OK: System voltage

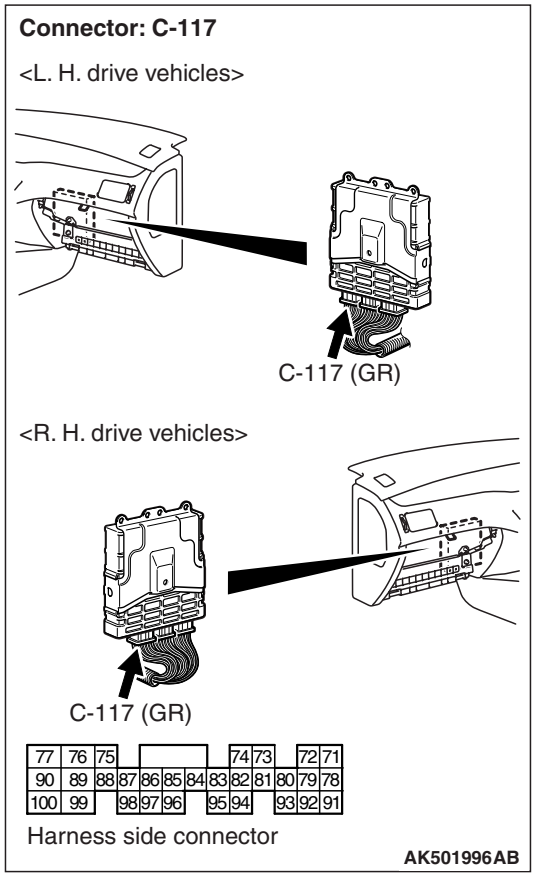
Q: Is the check result normal?

YES : Go to Step 15 .

NO : Check intermediate connector C-105 and repair if necessary. If intermediate connector is normal, check and repair harness between C-119 (terminal No. 47 and No. 59) engine-ECU connector and B-12X (terminal No. 4) engine control relay connector.

STEP 15. Check harness between C-208 (terminal No. 2) ignition switch connector and C-117 (terminal No. 99) engine-ECU connector.





NOTE: Before checking harness, check intermediate connectors C-123, C-210 and C-211, and repair if necessary.

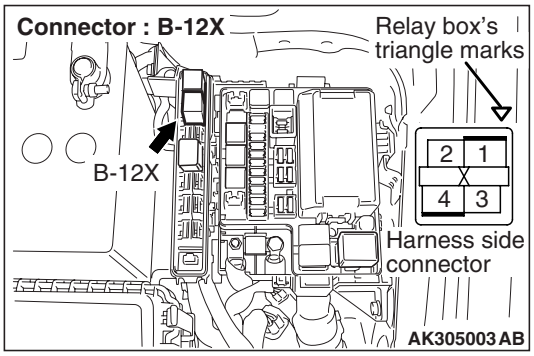
- Check power supply line for damage.

Q: Is the check result normal?

YES : Go to Step 16 .

NO : Repair the damaged harness wire.

STEP 16. Check harness between B-12X (terminal No. 1, No. 2) engine control relay connector and battery.



*NOTE: Before checking harness, check intermediate connector A-13[*1] or C-31[*2], and repair if necessary.*

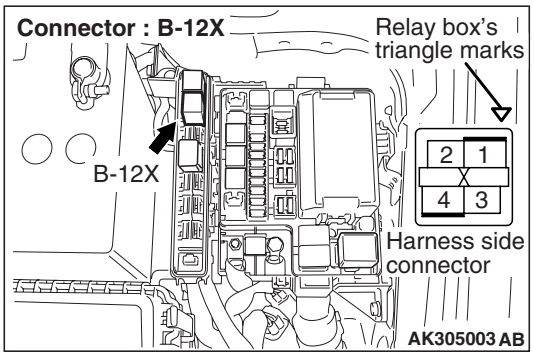
- Check power supply line for damage.

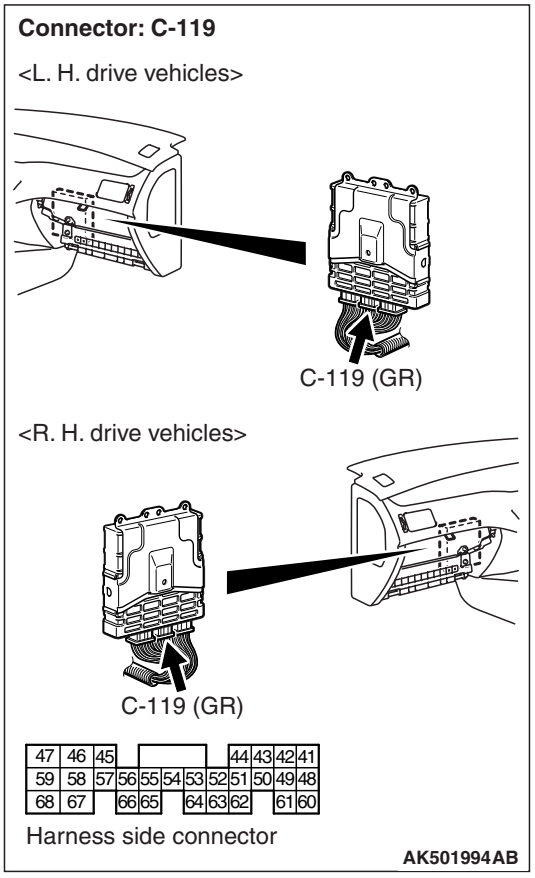
Q: Is the check result normal?

YES : Go to Step 17 .

NO : Repair the damaged harness wire.

STEP 17. Check harness between B-12X (terminal No. 3) engine control relay connector and C-119 (terminal No. 57) engine-ECU connector.





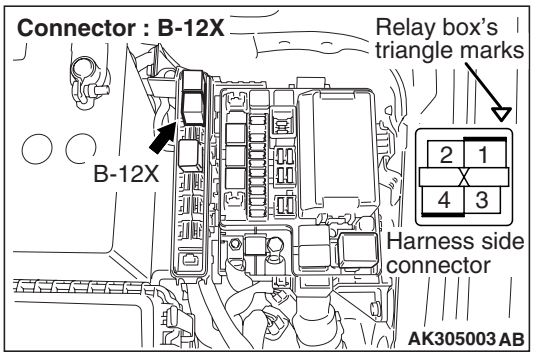
- Check earthing line for damage.

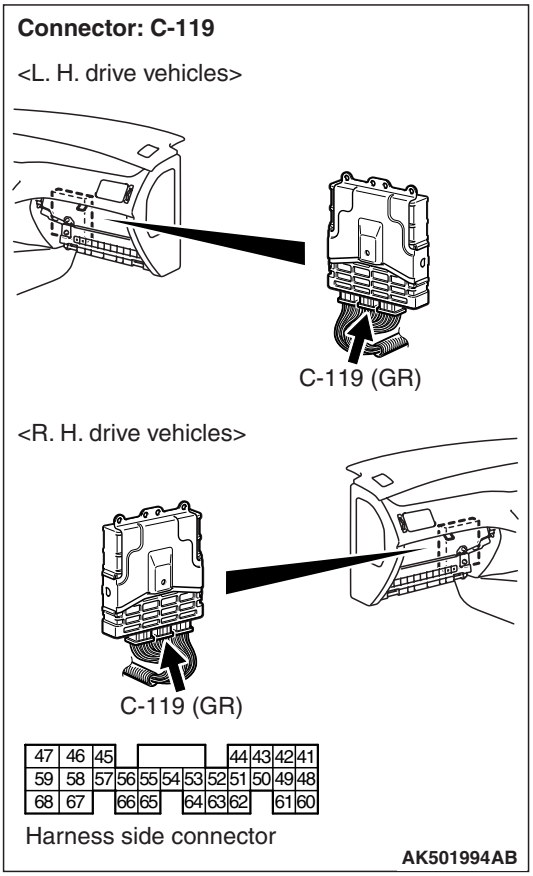
Q: Is the check result normal?

YES : Go to Step 18 .

NO : Repair the damaged harness wire.

STEP 18. Check harness between B-12X (terminal No. 4) engine control relay connector and C-119 (terminal No. 47 and No. 59) engine-ECU connector.





NOTE: Before checking harness, check intermediate connector C-105, and repair if necessary.

- Check output line for damage.

Q: Is the check result normal?

YES : Go to Step 19 .

NO : Repair the damaged harness wire.

STEP 19. Check the trouble symptoms.

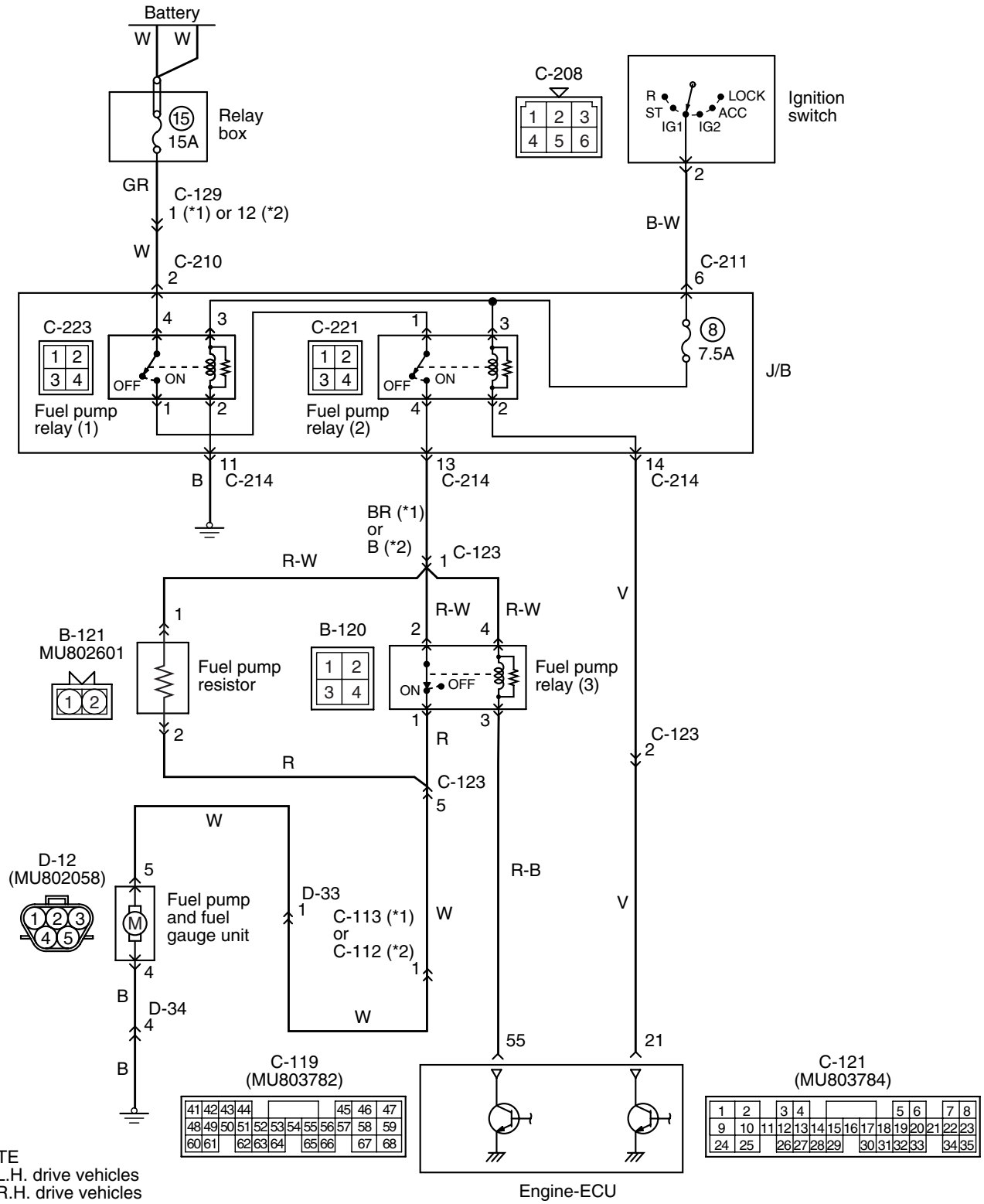
Q: Does trouble symptom persist?

YES : Replace the engine-ECU.

NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-5).

Inspection Procedure 24: Fuel Pump System

Fuel pump circuit



NOTE
*1: L.H. drive vehicles
*2: R.H. drive vehicles

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

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OPERATION

- The battery voltage is applied to the fuel pump relay (1) (terminal No. 3) form the ignition switch.
- When the ignition switch is turned to the "ON" position, the battery voltage is applied to the fuel pump relay (2) (terminal No. 1) from the fuel pump relay 1 (terminal No. 1).
- Battery voltage is applied to the fuel pump relay (2) (terminal No. 3) from the ignition switch.
- During cranking and while the engine is running, the engine-ECU turns ON the power transistor in the engine-ECU in order to earth the coil of the fuel pump relay (2). Consequently, the fuel pump relay 2 turns ON, and the fuel pump relay (2) (terminal No. 4) supplies the battery voltage to the fuel pump and the fuel pump circuit resistor.
- While the engine operates with a low load, the engine-ECU turns ON the power transistor in the engine-ECU in order to earth the coil of the fuel pump relay (3). Consequently, the fuel pump relay (3) turns OFF, and the fuel pump resistor (terminal No. 2) supplies the battery voltage to the fuel pump (terminal No. 5).
- While the engine operates with a high load, the engine-ECU turns OFF the power transistor in the engine-ECU, causing the fuel pump relay (3) to turn ON. Consequently, the fuel pump relay (3) (terminal No. 1) supplies power directly to the fuel pump (terminal No. 5).

FUNCTION

- The engine-ECU turns the fuel pump relay ON during cranking and engine operation, and supplies the drive power to the fuel pump.
- When operating with a low load, the engine-ECU supplies power to the fuel pump via the resistor. When operating with a high load, power is directly supplied and the fuel pump fuel discharge amount is increased.

PROBABLE CAUSES

- Failed fuel pump relay
- Failed fuel pump
- Failed fuel pump resistor
- Open/short circuit in fuel pump drive circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

NOTE:
**1: L.H. drive vehicles*
**2: R.H. drive vehicles*

STEP 1. M.U.T.-II/III actuator test

- Refer to Actuator Test Reference Table P.13A-378.
  a. Item No. 07: Fuel pump

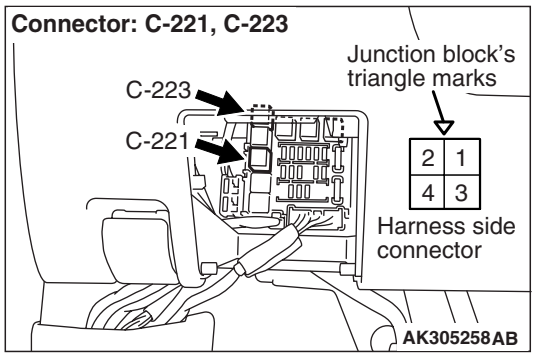
Q: Is the check result normal?
YES : Go to Step 2 .
NO : Go to Step 3 .

STEP 2. M.U.T.-II/III actuator test

- Refer to Actuator Test Reference Table P.13A-378.
  a. Item No. 13: Fuel pump 3

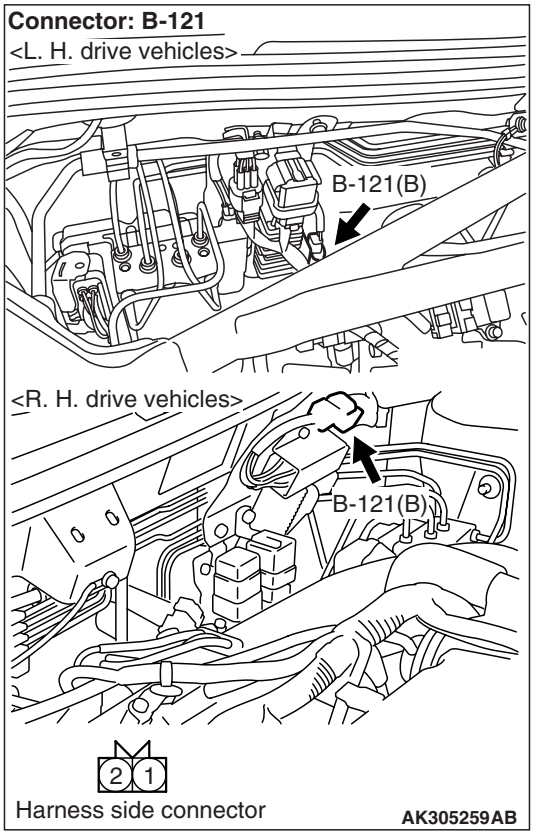
Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-5.)
NO : Go to Step 18 .

STEP 3. Connector check: C-223 fuel pump relay (1) connector and C-221 fuel pump relay (2) connector.



Q: Is the check result normal?
YES : Go to Step 4 .
NO : Repair or replace the connector.

STEP 4. Connector check: B-121 fuel pump resistor connector.



Q: Is the check result normal?
YES : Go to Step 5 .
NO : Repair or replace the connector.

STEP 5. Check fuel pump relay (1) and fuel pump relay (2).

- Fuel pump relay (1) and fuel pump relay (2), continuity check (Refer to P.13A-402).

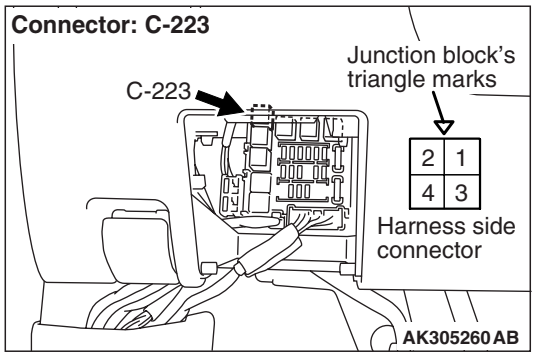
Q: Is the check result normal?
YES : Go to Step 6 .
NO : Replace the fuel pump relay.

STEP 6. Check fuel pump resistor.

- Check fuel pump resistor (Refer to P.13A-403).

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Replace the fuel pump resistor.

STEP 7. Perform voltage measurement at C-223 fuel pump relay (1) connector.

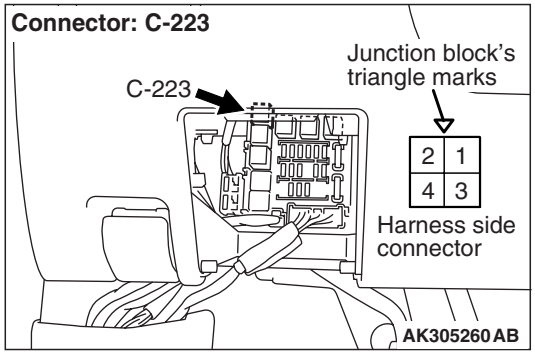


- Remove relay, and measure at junction block side.
- Ignition switch: "ON"
- Voltage between terminal No. 4 and earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 8 .
NO : Check intermediate connector C-129 and C-210 and repair if necessary. If intermediate connector is normal, check and repair harness between C-223 (terminal No. 4) fuel pump relay (1) connector and battery.
- Check power supply line for open/short circuit.

STEP 8. Perform voltage measurement at C-223 fuel pump relay (1) connector.

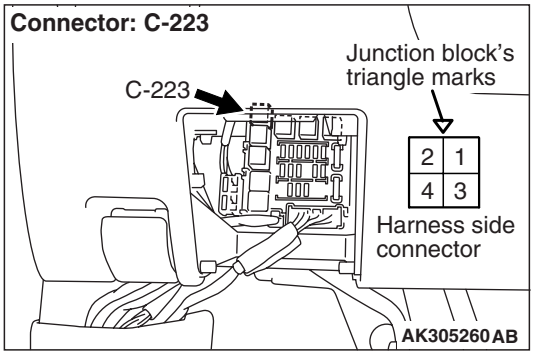


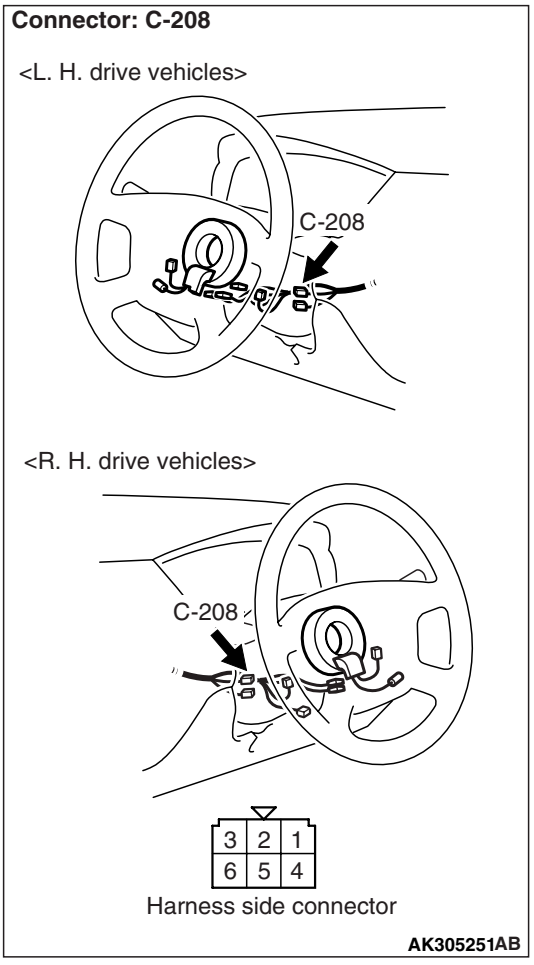
- Disconnect connector, and measure at harness side.
- Ignition switch: "ON"
- Voltage between terminal No. 3 and earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 10 .
NO : Go to Step 9 .

STEP 9. Check harness between C-223 (terminal No. 3) fuel pump relay (1) connector and C-208 (terminal No. 2) ignition switch connector.





NOTE: Before checking harness, check intermediate connector C-211 repair if necessary.

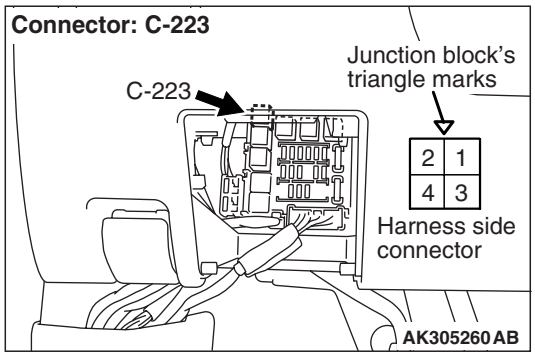
- Check power supply line for open/short circuit.

Q: Is the check result normal?

YES : Check ignition switch (Refer to GROUP 54 – Ignition switch – Ignition switch – Inspection P.54A-30).

NO : Repair the damaged harness wire.

STEP 10. Perform resistance measurement at C-223 fuel pump relay (1) connector.



- Disconnect connector, and measure at harness side.
- Resistance between terminal No. 2 and earth.

OK: 2Ω or less

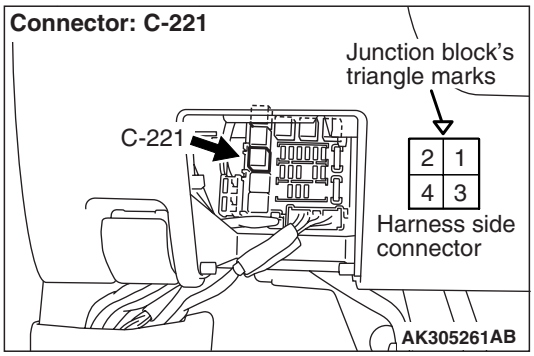
Q: Is the check result normal?

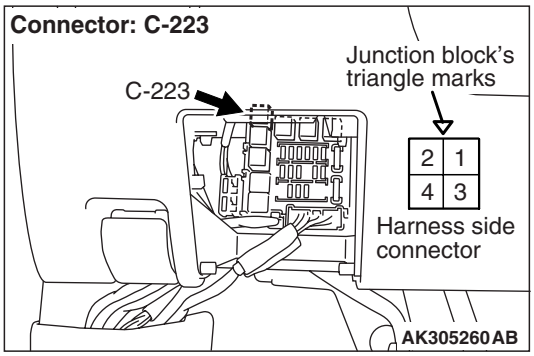
YES : Go to Step 11 .

NO : Check intermediate connector C-214, and repair if necessary. If intermediate connector normal, check and repair harness between C-223 (terminal No. 2) fuel pump relay (1) connector and body earth.

- Check earthing line for open circuit and damage.

STEP 11. Perform voltage measurement at C-221 fuel pump relay (2) connector.





- Remove relay, and measure at junction block side.
- Ignition switch: "ON"
- Voltage between terminal No. 1 and earth and No. 3 and earth.

OK: System voltage

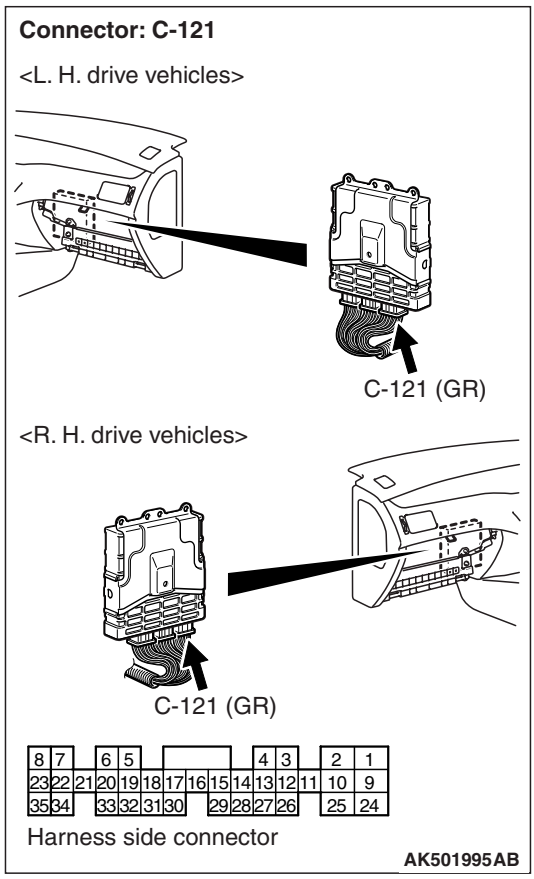
Q: Is the check result normal?

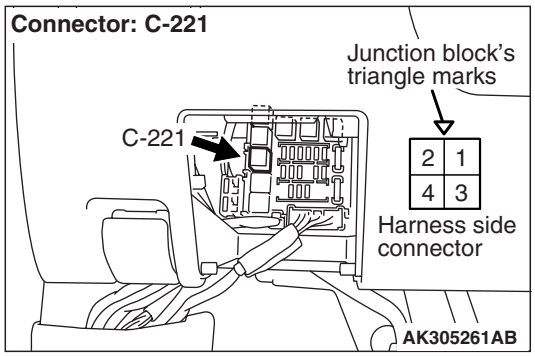
YES : Go to Step 12 .

NO : Check and repair harness between C-223 (terminal No. 1 and No. 3) fuel pump relay (1) connector and C-221 (terminal No. 1 and No. 3) fuel pump relay (2) connector.

- Check power supply line for open/short circuit.

STEP 12. Perform voltage measurement at C-121 engine-ECU connector.





- Disconnect connector, and measure at harness side.
- Ignition switch: "ON"
- Voltage between terminal No. 21 and earth.

OK: System voltage

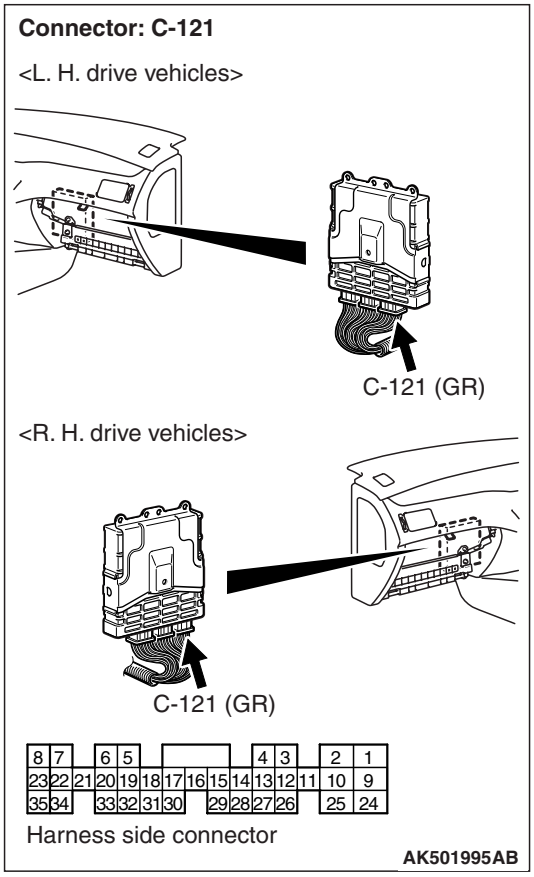
Q: Is the check result normal?

YES : Go to Step 13 .

NO : Check intermediate connector C-123 and C-214, and repair if necessary. If intermediate connector normal, check and repair harness between C-221 (terminal No. 2) fuel pump relay (2) connector and C-121 (terminal No. 21) engine-ECU connector.

- Check earthing line for open/short circuit.

STEP 13. Perform voltage measurement at C-121 engine-ECU connector.

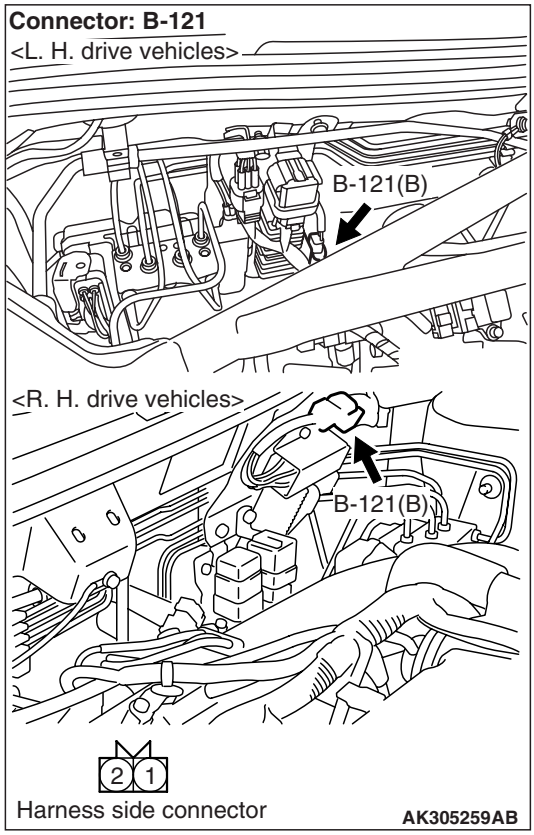


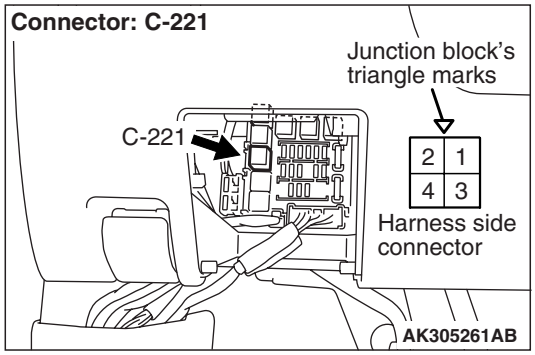
- Disconnect connector, and measure at harness side.
- Ignition switch: "ON"
- Voltage between terminal No. 21 and earth.

OK: Fuel pump operates (Operation sounds are heard)

Q: Is the check result normal?
YES : Go to Step 14 .
NO : Replace the engine-ECU.

STEP 14. Perform voltage measurement at B-121 fuel pump resistor connector.



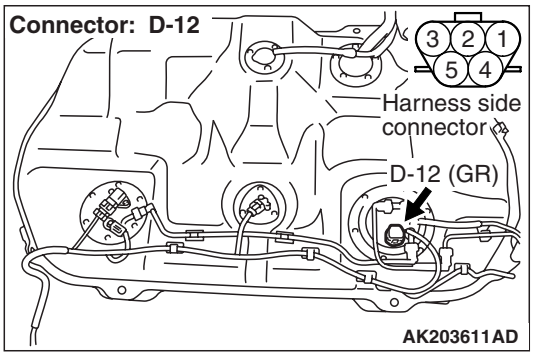


- Disconnect connector, and measure at harness side.
- Ignition switch: "ON"
- Voltage between terminal No. 1 and earth.

OK: System voltage

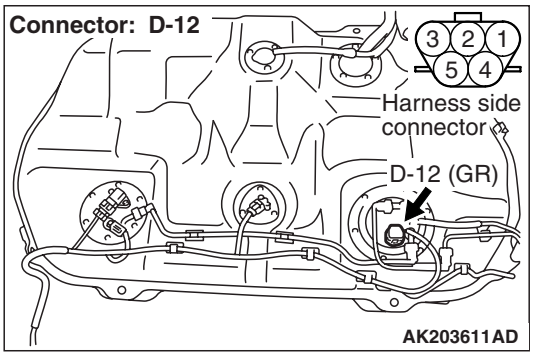
Q: Is the check result normal?
YES : Go to Step 15 .
NO : Check intermediate connectors C-123, C-214, and repair if necessary. If intermediate connector are normal, check and repair harness between C-221 (terminal No. 4) fuel pump relay (2) connector and B-121 (terminal No. 1) fuel pump resistor connector.
- Check power supply line for open/short circuit.

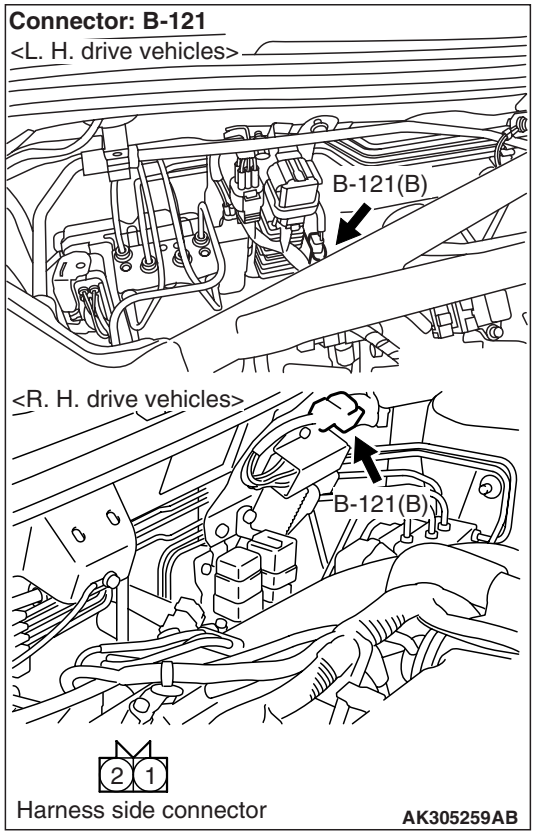
STEP 15. Check connector: D-12 fuel pump connector.



Q: Is the check result normal?
YES : Go to Step 16 .
NO : Repair or replace the connector.

STEP 16. Perform voltage measurement at D-12 fuel pump connector.



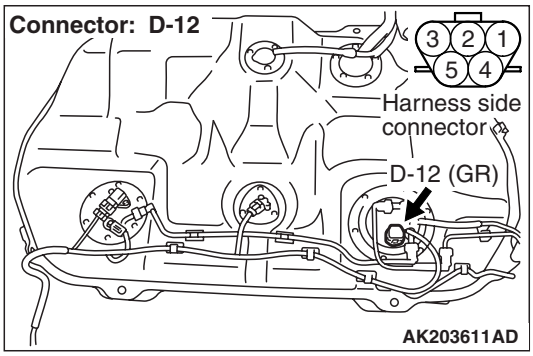


- Disconnect connector, and measure at harness side.
- Ignition switch: "ON"
- Voltage between terminal No. 5 and earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 17 .
NO : Check intermediate connectors C-113*1, C-112*2 C-123 and D-33, and repair if necessary. If intermediate connector are normal, check and repair harness between B-121 (terminal No. 2) fuel pump resistor connector and D-12 (terminal No. 5) fuel pump connector.
- Check power supply line for open/short circuit.

STEP 17. Perform resistance measurement at D-12 fuel pump connector.



- Disconnect connector, and measure at harness side.
- Resistance between terminal No. 4 and earth.

OK: 2Ω or less

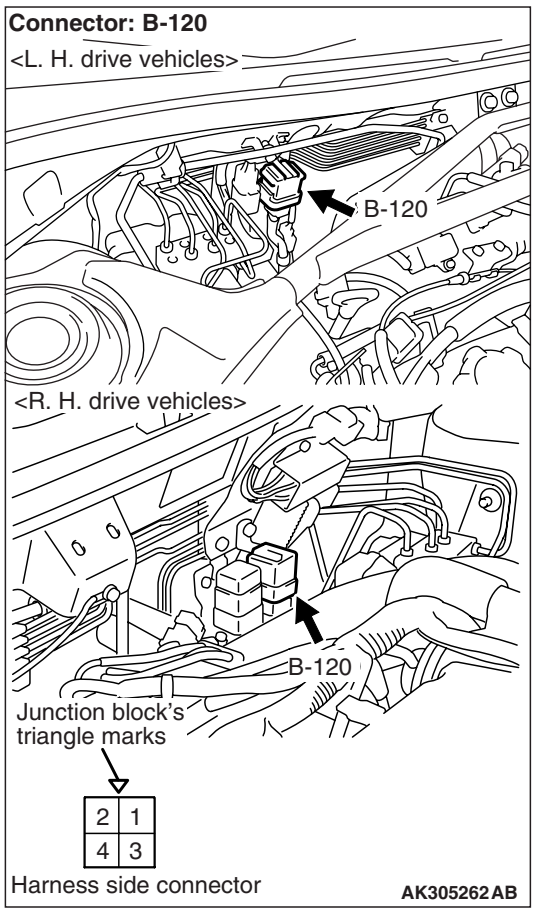
Q: Is the check result normal?

YES : Replace fuel pump.

NO : Check intermediate connector D-34, and repair if necessary. If intermediate connector is normal, check and repair harness between D-12 (terminal No. 4) fuel pump connector and body earth.

- Check earthing line for open circuit and damage.

STEP 18. Check connector: B-120 fuel pump relay (3) connector.



Q: Is the check result normal?

YES : Go to Step 19 .

NO : Repair or replace the connector.

STEP 19. Check fuel pump relay (3).

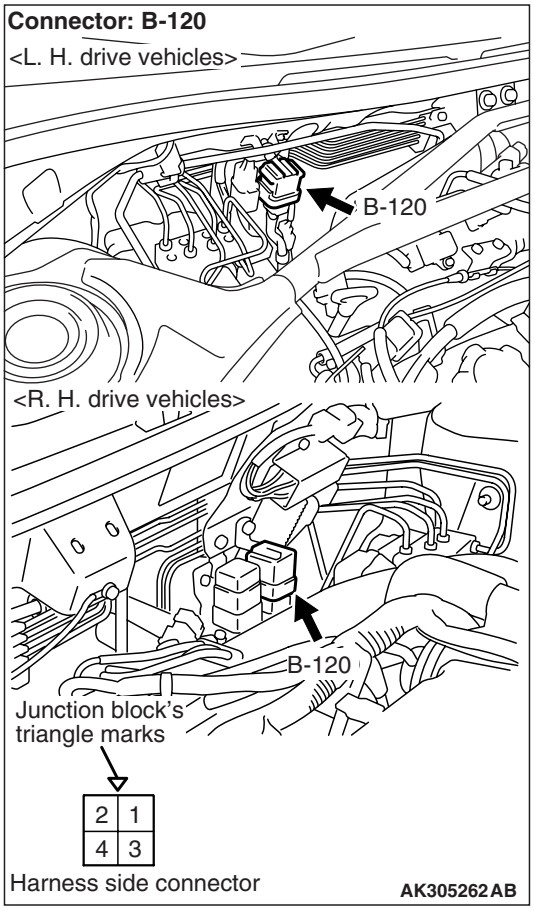
- Fuel pump relay (3) continuity check (Refer to P.13A-402).

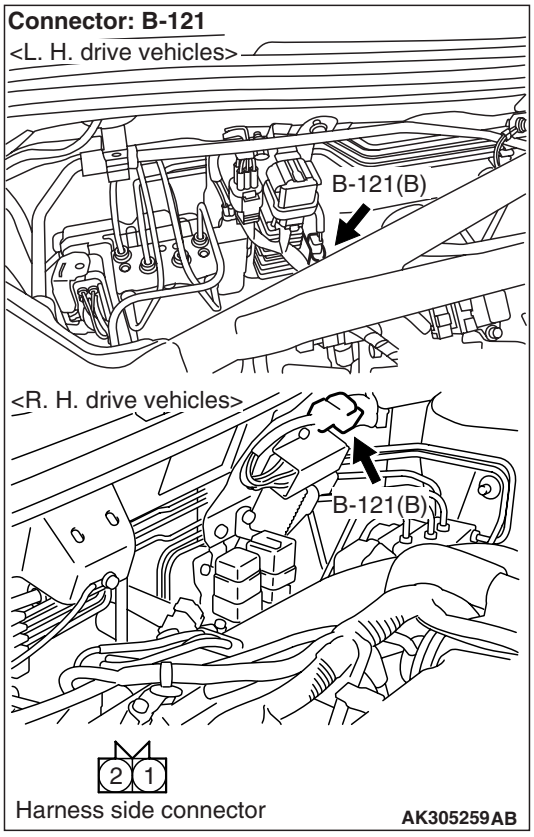
Q: Is the check result normal?

YES : Go to Step 20 .

NO : Replace the fuel pump relay (3).

STEP 20. Perform voltage measurement at B-120 fuel pump relay (3) connector.



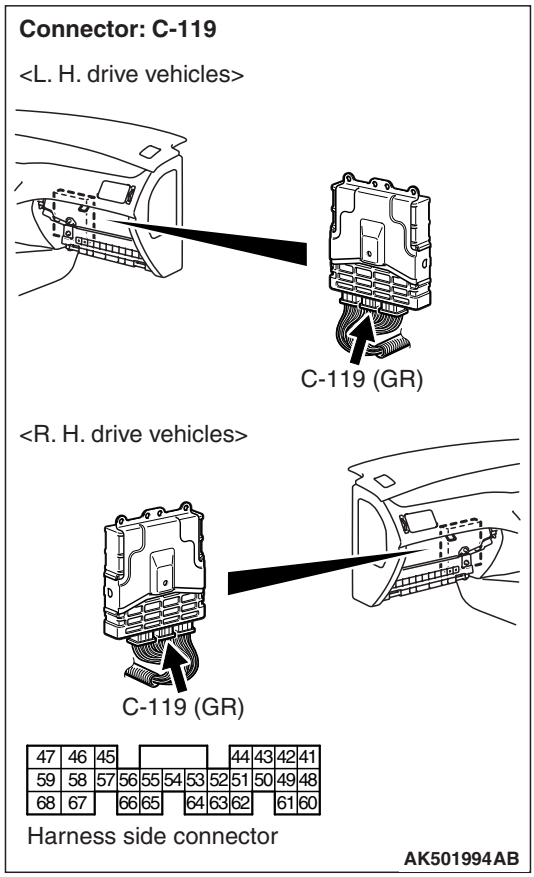


- Remove relay, and measure at junction block side.
- Ignition switch: "ON"
- Voltage between terminal No. 2 and earth, and No. 4 and earth.

OK: System voltage

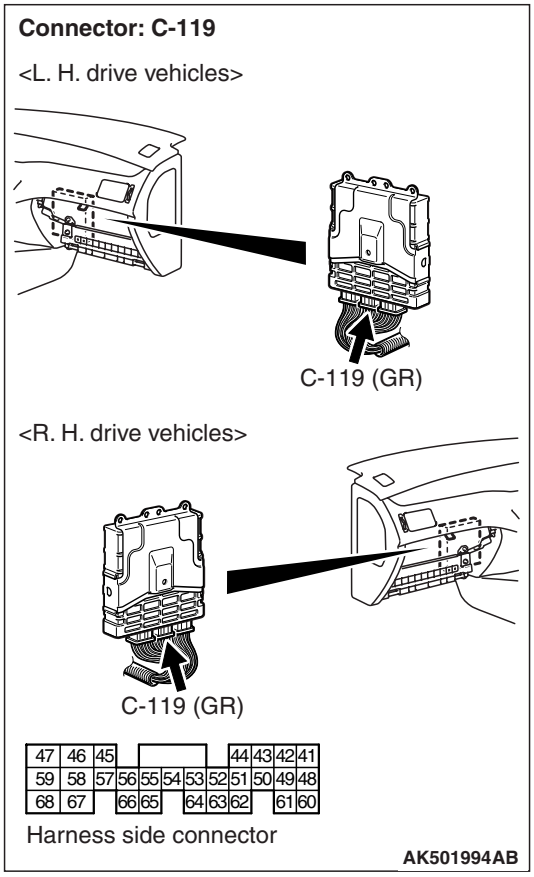
Q: Is the check result normal?
YES : Go to Step 21 .
NO : Check intermediate connector C-123, and repair if necessary. If intermediate connector is normal, check and repair harness between B-120 (terminal No. 2 and No. 4) fuel pump relay (3) connector and B-121 (terminal No. 1) fuel pump resistor connector.
- Check power supply line for damage.

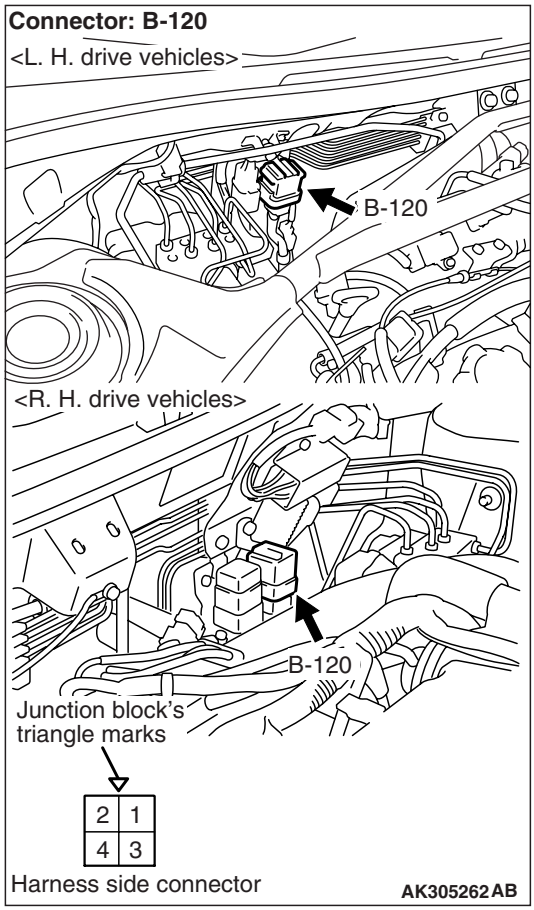
STEP 21. Connector check: C-119 engine-ECU connector.



Q: Is the check result normal?
YES : Go to Stop 22 .
NO : Repair or replace the connector.

STEP 22. Perform voltage measurement at C-119 engine-ECU connector.





- Disconnect connector, and measure at harness side.
- Ignition switch: "ON"
- Disconnect C-121 (terminal No. 21) engine-ECU connector and earth.
- Voltage between terminal No. 55 and earth.

OK: System voltage

Q: Is the check result normal?

YES : Go to Step 23 .

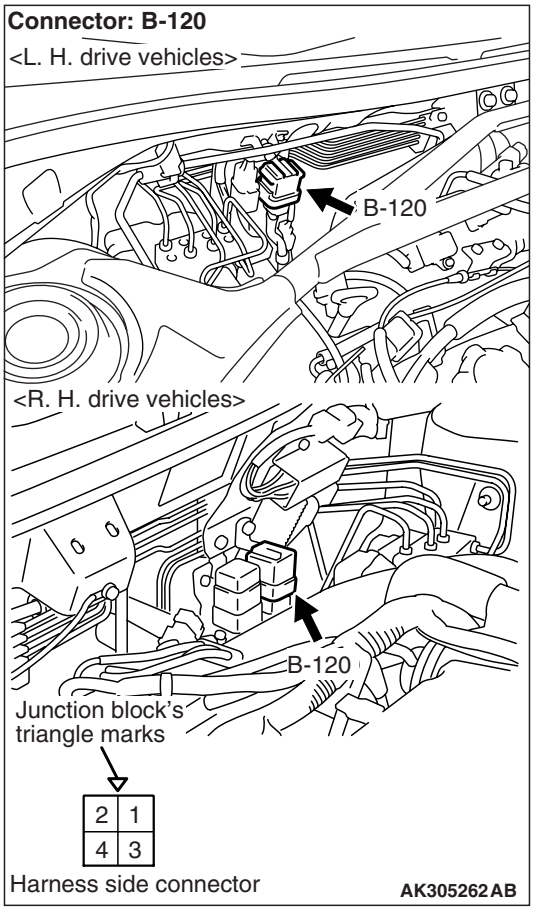
NO : Check and repair harness between C-119 (terminal No.55) engine-ECU connector and B-120 (terminal No.3) fuel pump relay (3) connector.

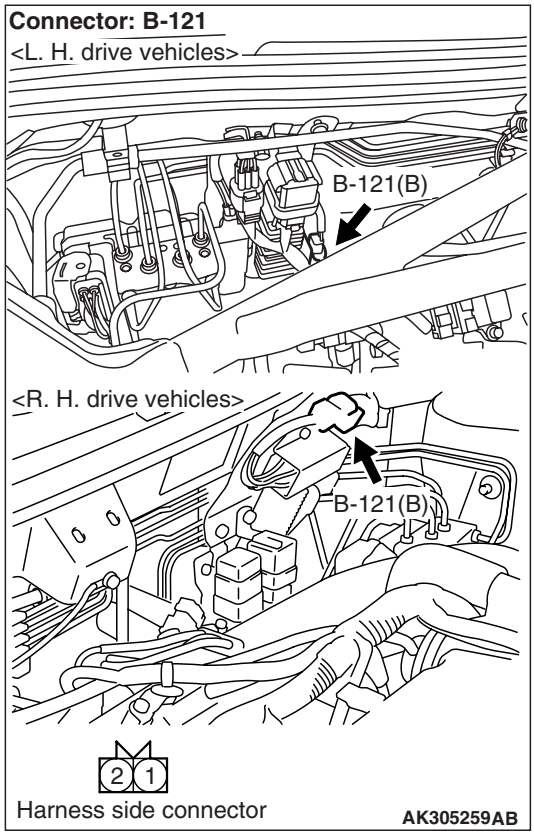
- Check earthing line for open circuit and damage.

STEP 23. Check harness between B-120 (terminal No. 2 and No. 4) fuel pump relay (3) connector and B-121 (terminal No. 1) fuel pump resistor connector.

NOTE: Before checking harness, check intermediate connector C-123, and repair if necessary.

- Check power supply line for damage.





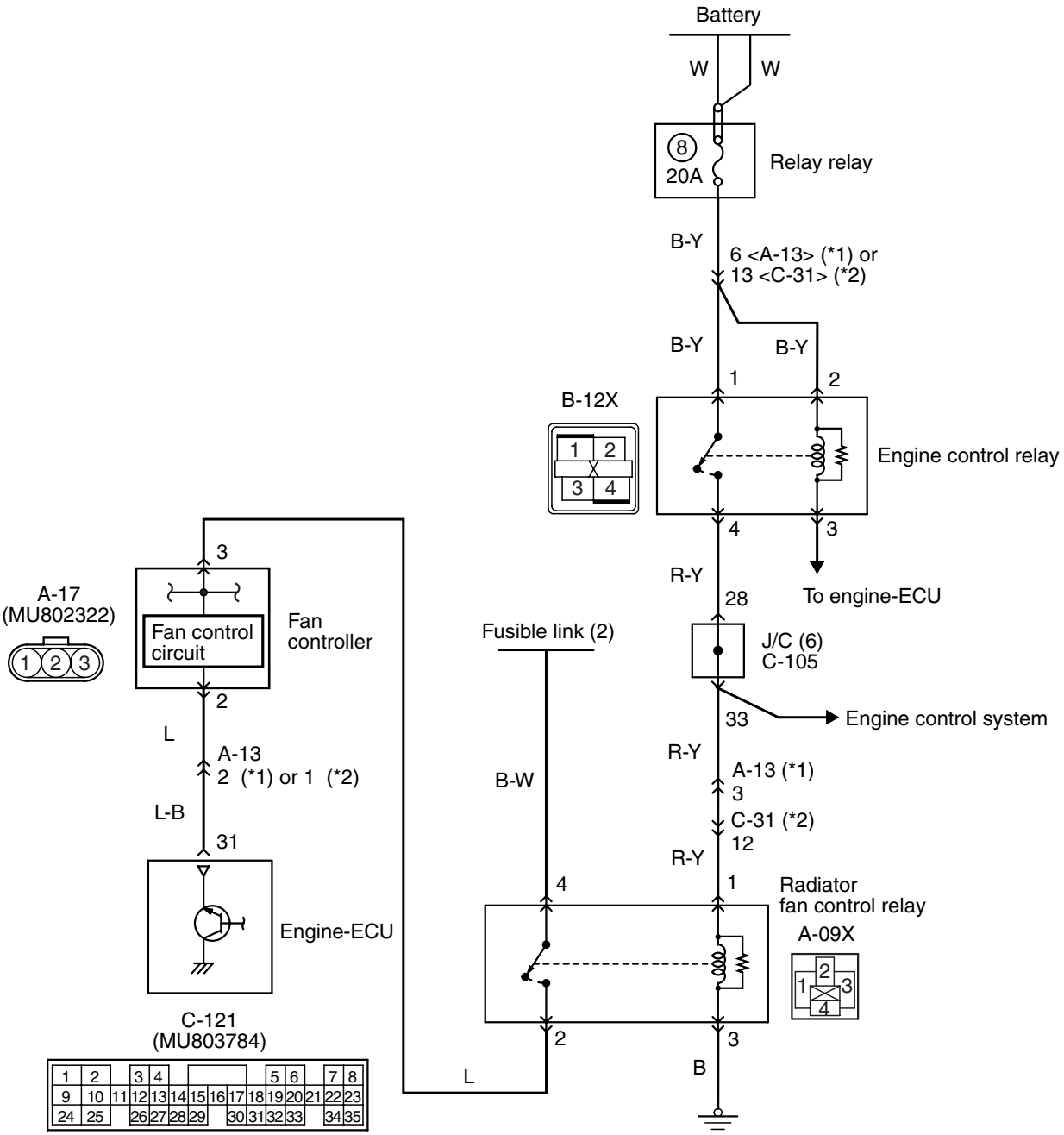
Q: Is the check result normal?

YES : Replace the engine-ECU.

NO : Repair the damaged harness wire.

Inspection Procedure 25: Radiator Fan Control Relay System

Radiator fan control relay circuit



NOTE
*1: L.H. drive vehicles
*2: R.H. drive vehicles
Wire colour code
B: Black LG: Light green G: Green L: Blue W: White Y: Yellow SB: Sky blue BR: Brown O: Orange GR: Gray
R: Red P: Pink V: Violet PU: Purple

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OPERATION

- The battery voltage is applied to the fan control relay (terminal No. 1) form the engine control relay (terminal No. 4) and is earthed to the vehicle body from the radiator fan control relay (terminal No. 3).
- The battery voltage is applied to the radiator fan control relay (terminal No. 4).
- When the radiator fan control relay is in "ON" position, the battery voltage is supplied to the fan controller (terminal No.3) from the radiator fan control relay (terminal No. 2).

FUNCTION

- When the engine control relay turns "ON", the radiator fan control relay turns "ON" simultaneously, and power is supplied to the fan controller. The radiator fan motor is driven when the fan motor drive signal is input to the fan controller from the engine-ECU.

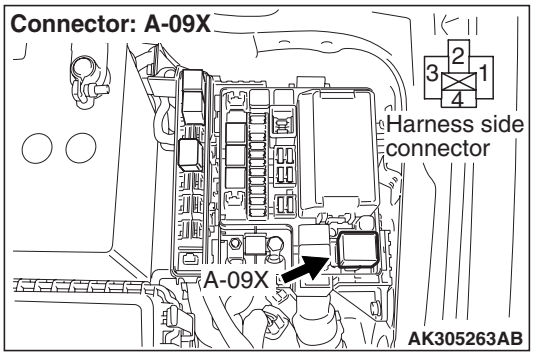
PROBABLE CAUSES

- Failed radiator fan control relay
- Failed fan controller
- Failed radiator fan motor
- Failed engine-ECU

DIAGNOSIS PROCEDURE

NOTE:
**1: L.H. drive vehicles*
**2: R.H. drive vehicles*

STEP 1. Connector check: A-09X radiator fan control relay connector.



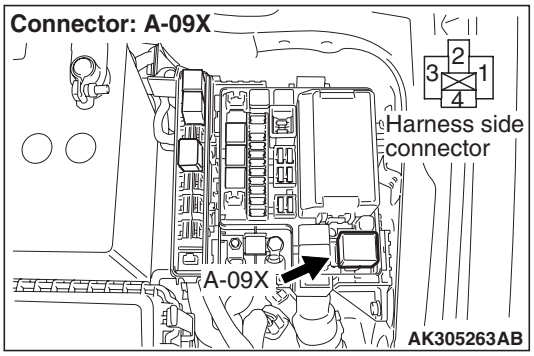
Q: Is the check result normal?
YES : Go to Step 2 .
NO : Repair or replace the connector.

STEP 2. Check radiator fan control relay.

- Check radiator fan control relay (Refer to GROUP 14 – On-vehicle Service P.14-17).

Q: Is the check result normal?
YES : Go to Step 3 .
NO : Replace the fan control relay.

STEP 3. Perform resistance measurement at A-09X radiator fan control relay connector.

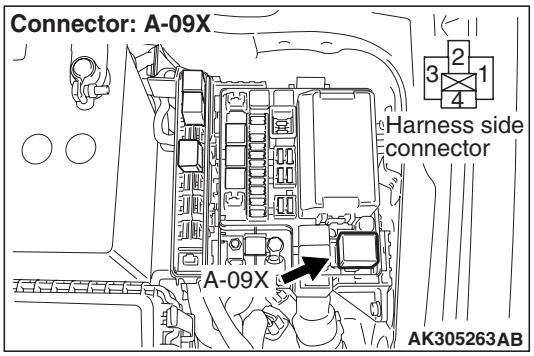


- Remove relay, and measure at relay box side.
- Resistance between terminal No.3 and earth.

OK: 2Ω or less

Q: Is the check result normal?
YES : Go to Step 4 .
NO : Check and repair harness between A-09X (terminal No. 3) radiator fan control relay connector and body earth.
- Check and earthing line for open circuit and damage.

STEP 4. Perform voltage measurement at A-09X radiator fan control relay connector.

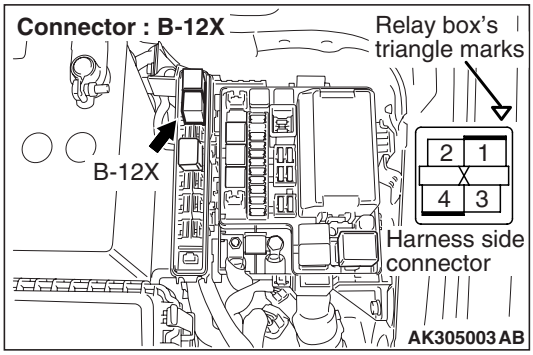


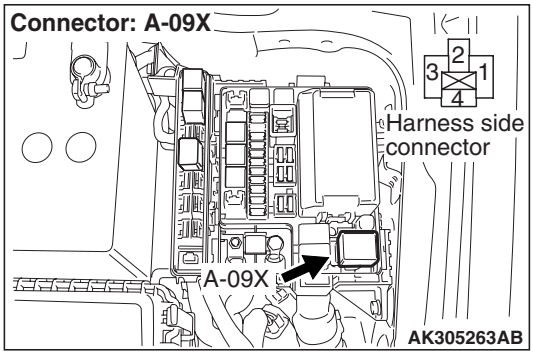
- Remove relay, and measure at relay box side.
- Ignition switch: "ON"
- Voltage between terminal No. 1 and earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 6 .
NO : Go to Step 5 .

STEP 5. Connector check: B-12X engine control relay connector.





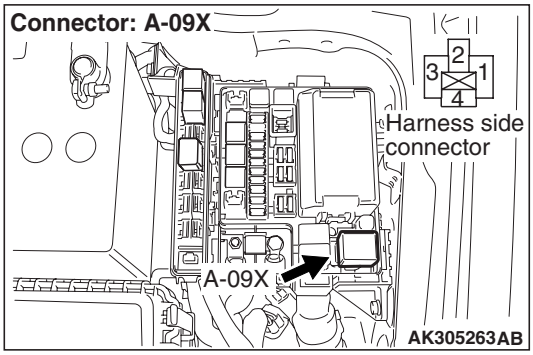
Q: Is the check result normal?

YES : Check intermediate connectors A-13*1 or C-31*2 and C-105, and repair if necessary. If intermediate connectors are normal, check and repair harness between B-12X (terminal No. 4) engine control relay connector and A-09X (terminal No. 1) radiator fan control relay connector.

- Check power supply line for open/short circuit.

NO : Repair or replace the connector.

STEP 6. Perform voltage measurement at A-09X radiator fan control relay connector.



- Remove relay, and measure at relay box side.
- Voltage between terminal No. 4 and earth.

OK: System voltage

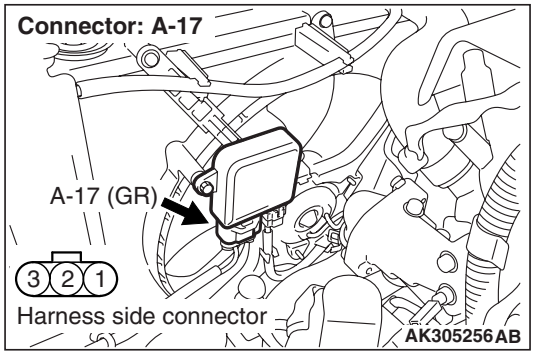
Q: Is the check result normal?

YES : Go to Step 7 .

NO : Check and repair harness between battery and A-09X (terminal No. 4) radiator fan control relay connector.

- Check power supply line for open/short circuit.

STEP 7. Connector check: A-17 fan controller connector

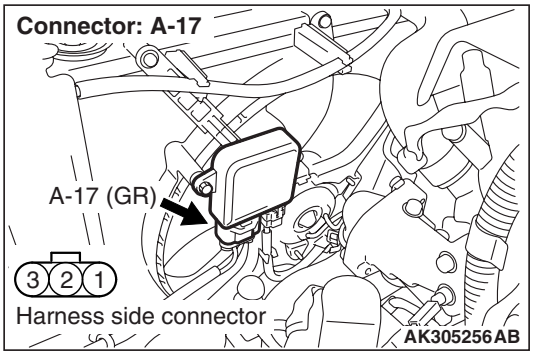


Q: Is the check result normal?

YES : Go to Step 8 .

NO : Repair or replace the connector.

STEP 8. Perform voltage measurement at A-17 fan controller connector.

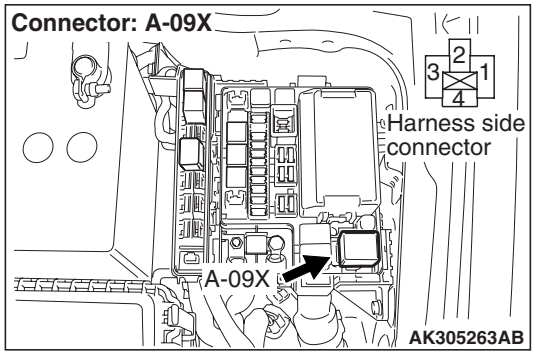


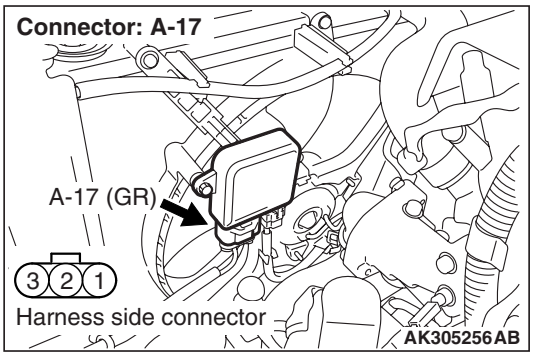
- Disconnect connector, and measure at harness side.
- Ignition switch: "ON"
- Voltage between terminal No. 3 and earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 12 .
NO : Go to Step 9 .

STEP 9. Check harness between A-09X (terminal No. 2) radiator fan control relay connector and A-17 (terminal No. 3) fan controller connector.

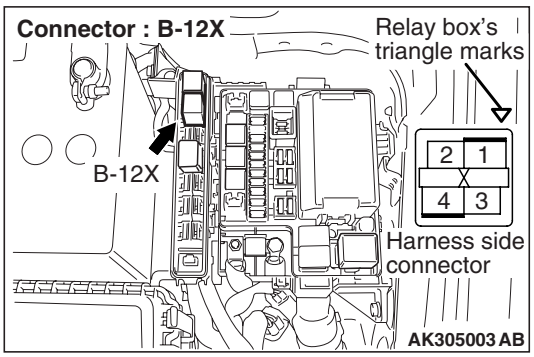




- Check output line for open/short circuit.

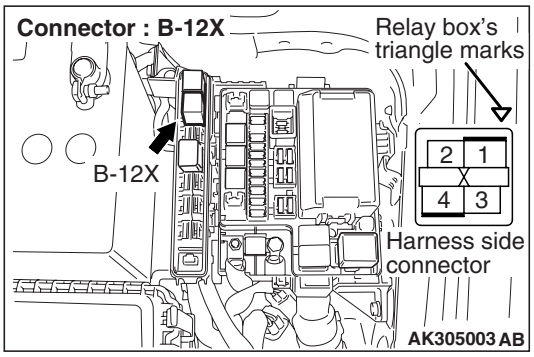
Q: Is the check result normal?
YES : Go to Step 10 .
NO : Repair the damaged harness wire.

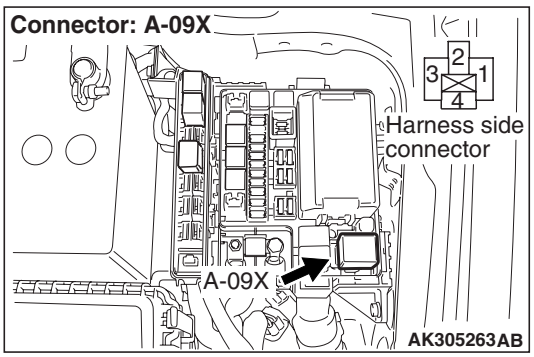
STEP 10. Connector check: B-12X engine control relay connector



Q: Is the check result normal?
YES : Go to Step 11 .
NO : Repair or replace the connector.

STEP 11. Check harness between B-12X (terminal No. 4) engine control relay connector and A-09X (terminal No. 1) radiator fan control relay connector.





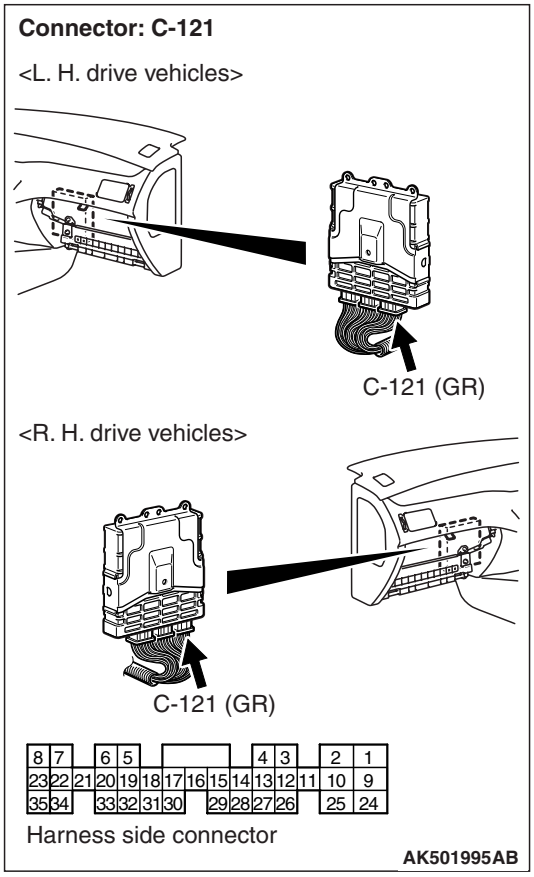
*NOTE: Before checking harness, check intermediate connectors A-13*1 or C-31*2 and C-105, and repair if necessary.*

- Check power supply line for damage.

Q: Is the check result normal?
YES : Check and repair harness between A-09X (terminal No. 3) radiator fan control relay connector and body earth.
  - Check earthing line for damage.

NO : Repair the damaged harness wire.

STEP 12. Connector check: C-121 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 13 .
NO : Repair or replace the connector.

STEP 13. Check radiator fan motor drive.

- Disconnect C-121 engine-ECU connector.
- Ignition switch: "ON"

OK: Radiator fan motor rotates at a high speed

Q: Is the check result normal?
YES : Go to Step 14 .
NO : Go to Step 15 .

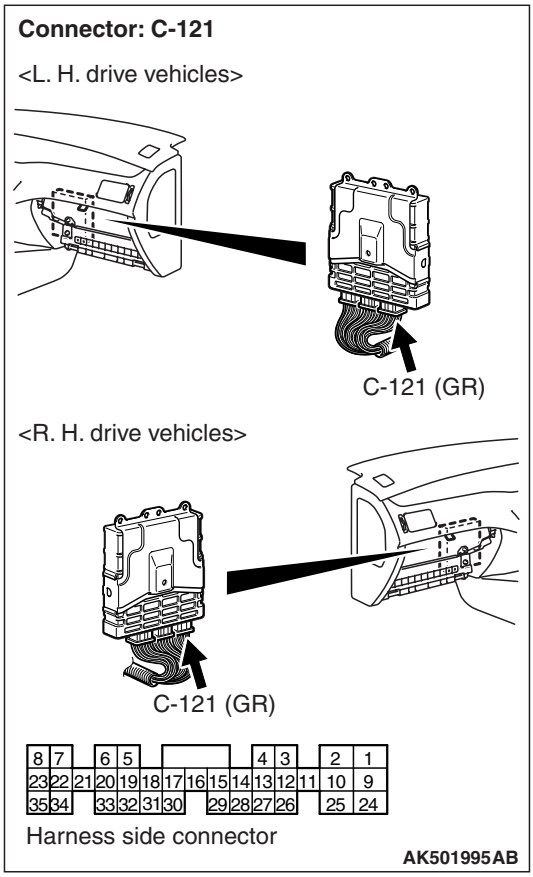
STEP 14. M.U.T.-II/III actuator test

- Item No. 21: Fan controller

OK: Radiator fan motor rotates

Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-5.)
NO : Replace the engine-ECU.

STEP 15. Perform voltage measurement at C-121 engine-ECU connector.

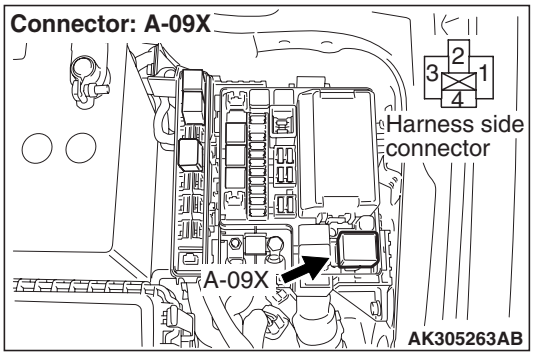


- Disconnect connector, and measure at harness side.
- Ignition switch: "ON"
- Voltage between terminal No. 18 and earth.

OK: 4.9 – 5.1 V

Q: Is the check result normal?
YES : Go to Step 16 .
NO : Go to Step 18 .

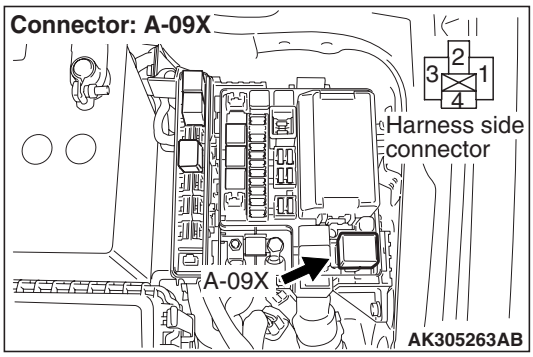
STEP 16. Check harness between A-09X (terminal No. 4) radiator fan control relay connector and battery.

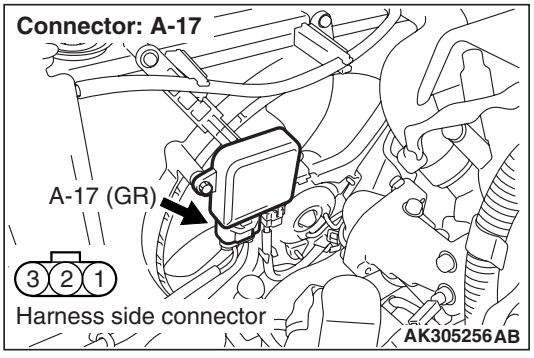


- Check power supply line for damage.

Q: Is the check result normal?
YES : Go to Step 17 .
NO : Repair the damaged harness wire.

STEP 17. Check harness between A-09X (terminal No. 2) radiator fan control relay connector and A-17 (terminal No. 3) fan controller connector.

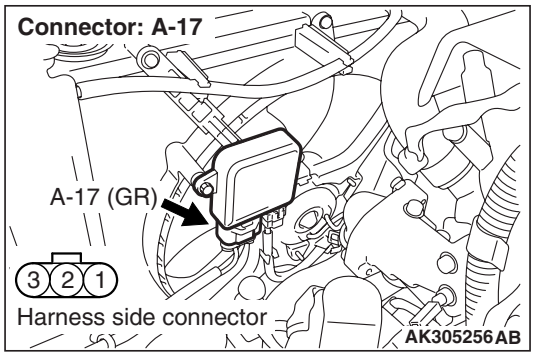


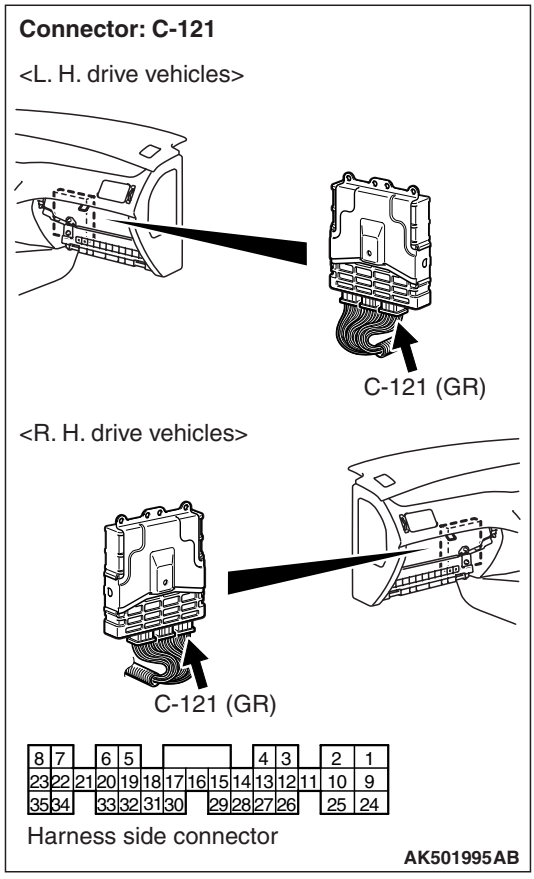


- Check output line for damage.

Q: Is the check result normal?
YES : Replace the radiator fan motor and fan controller.
NO : Repair the damaged harness wire.

STEP 18. Check harness between A-17 (terminal No. 2) fan controller connector and C-121 (terminal No. 18) engine-ECU connector.





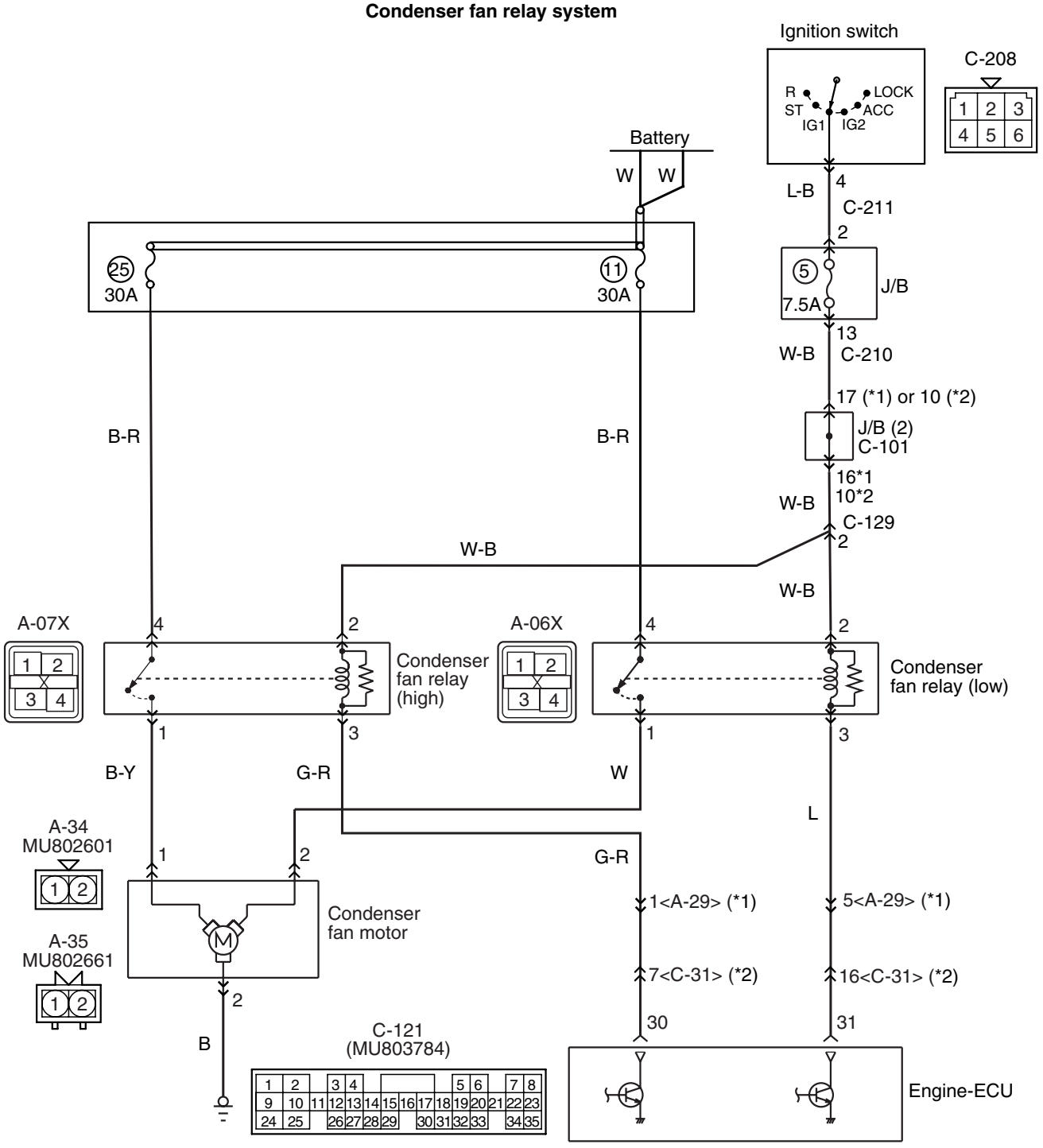
*NOTE: Before checking harness, check intermediate connectors A-13*1 or C-31*2 and repair if necessary.*

- Check output line for short circuit.

Q: Is the check result normal?
YES : Replace the radiator fan motor and fan controller.
NO : Repair the damaged harness wire.

Inspection Procedure 26: Condenser Fan Relay System

Condenser fan relay system



NOTE
*1: L.H. drive vehicles
*2: R.H. drive vehicles

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

AK501831AB

OPERATION

- The battery voltage is applied on the engine-ECU (terminal No. 31) form the condenser fan control relay (low).
- The battery is applied on the engine-ECU (terminal No. 30) from the condenser fan control relay (high).

FUNCTION

- The engine-ECU condenser fan control relay turns "ON" with the signal from the engine-ECU, and power is supplied to the condenser fan motor.

PROBABLE CAUSES

- Failed condenser fan relay (high)
- Failed condenser fan relay (low)
- Failed condenser fan motor
- Open/short circuit in condenser fan control relay circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

NOTE:
**1: L.H. drive vehicles*
**2: R.H. drive vehicles*

STEP 1. Check condenser fan motor.

- Check condenser fan motor (Refer to GROUP 55 – Heater, Air conditioner and Ventilation –Condenser and condenser fan motor – Inspection P.55-127).

Q: Is the check result normal?
YES : Go to Step 2 .
NO : Replace the condenser fan motor.

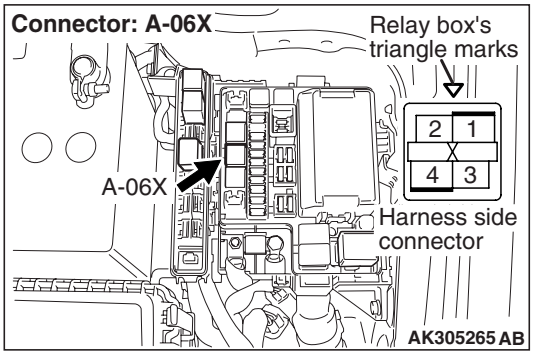
STEP 2. M.U.T.-II/III actuator test

- Item No. 38: Condenser fan (low)

OK: Condenser fan motor rotates (low)

Q: Is the check result normal?
YES : Go to Step 3 .
NO : Go to Step 14 .

STEP 3. Connector check: A-06X condenser fan relay (low) connector.



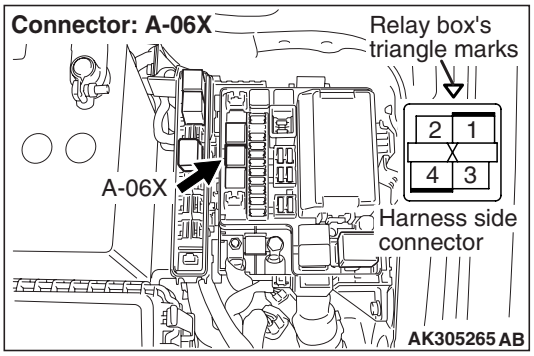
Q: Is the check result normal?
YES : Go to Step 4 .
NO : Repair or replace the connector.

STEP 4. Check condenser fan relay (low).

- Check condenser fan relay (low) (Refer to GROUP 55 – On-vehicle Service P.55-107).

Q: Is the check result normal?
YES : Go to Step 5 .
NO : Replace the condenser fan relay (low).

STEP 5. Perform voltage measurement at A-06X condenser fan relay (low) connector.

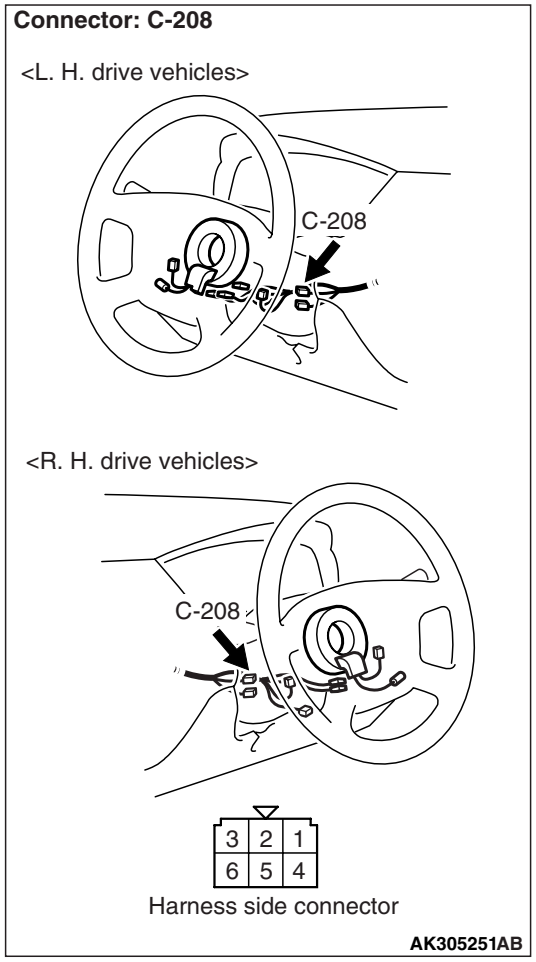


- Remove relay, and measure at relay box side.
- Ignition switch: "ON"
- Voltage between terminal No. 2 and earth.

OK: System voltage

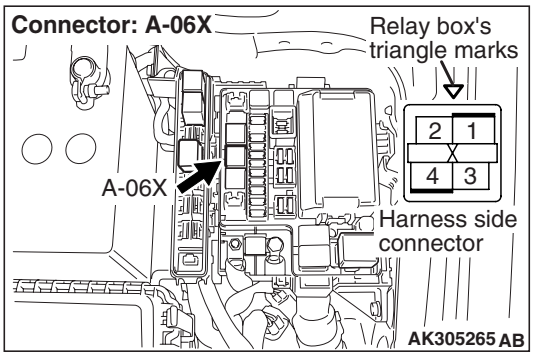
Q: Is the check result normal?
YES : Go to Step 8 .
NO : Go to Step 6 .

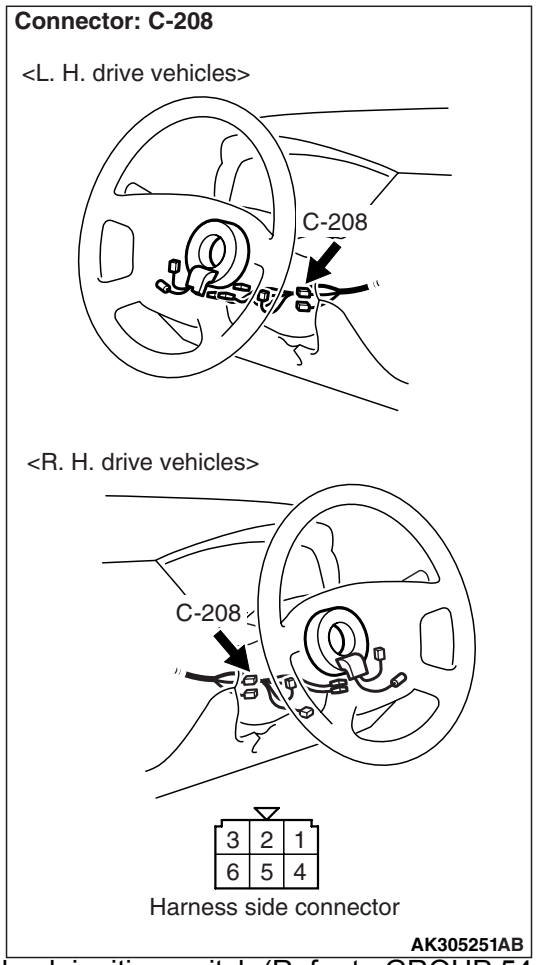
STEP 6. Connector check: C-208 ignition switch connector.



Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair or replace the connector.

STEP 7. Check ignition switch.



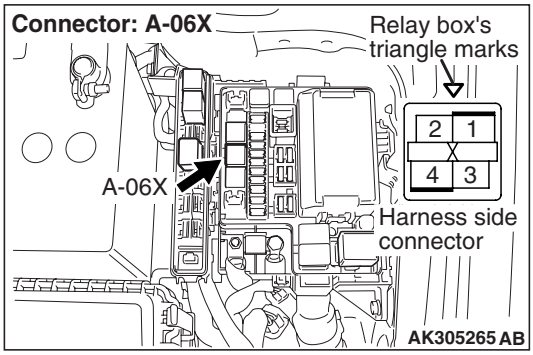


- Check ignition switch (Refer to GROUP 54A – Ignition switch – Ignition switch – Inspection P.54A-30).

Q: Is the check result normal?
YES : Check intermediate connectors C-101, C-129, C-210 and C-211, and repair if necessary. If intermediate connectors are normal, check and repair harness between A-06X (terminal No. 2) condenser fan relay (low) connector and C-208 (terminal No. 4) ignition switch connector.
- Check power supply for open circuit and damage.

NO : Replace the ignition switch.

STEP 8. Perform voltage measurement at A-06X condenser fan relay (low) connector.



- Remove relay, and measure at relay box side.
- Voltage between terminal No. 4 and earth.

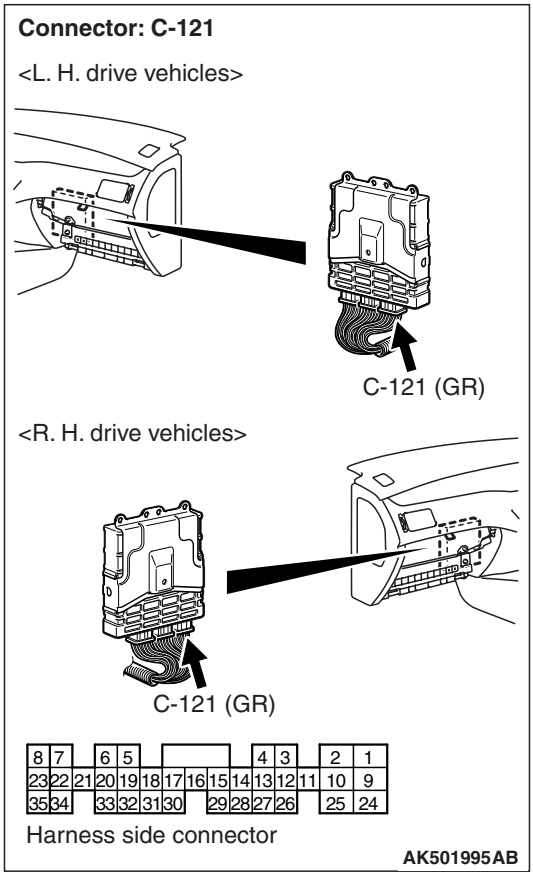
OK: System voltage

Q: Is the check result normal?

YES : Check and repair harness between battery and A-08X (terminal No. 4) condenser fan relay connector.
- Check power supply for open circuit and damage.

NO : Go to Step 9 .

STEP 9. Perform voltage measurement at C-121 engine-ECU connector.



- Measure engine-ECU terminal voltage.
- Ignition switch: "ON"
- Voltage between terminal No. 31 and earth.

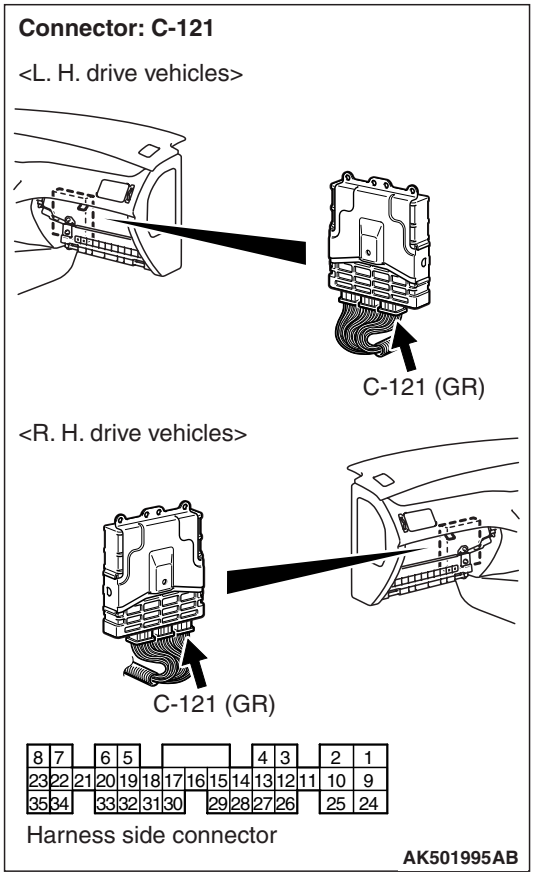
OK: System voltage

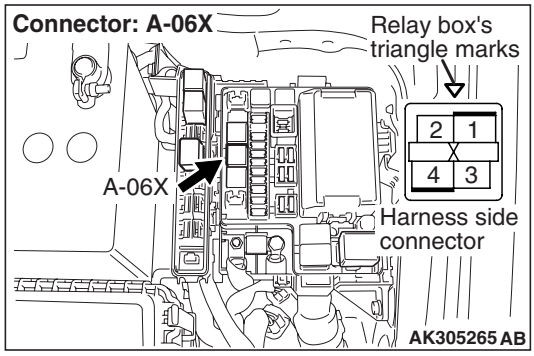
Q: Is the check result normal?

YES : Go to Step 11 .

NO : Go to Step 10 .

STEP 10. Connector check: C-121 engine-ECU connector.





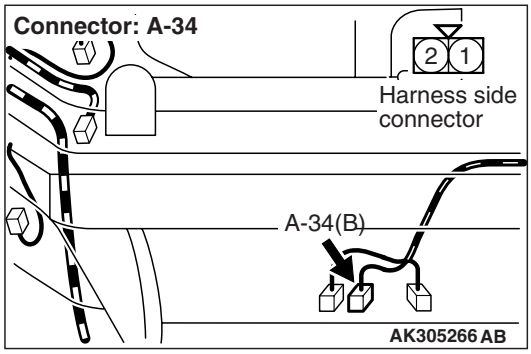
Q: Is the check result normal?

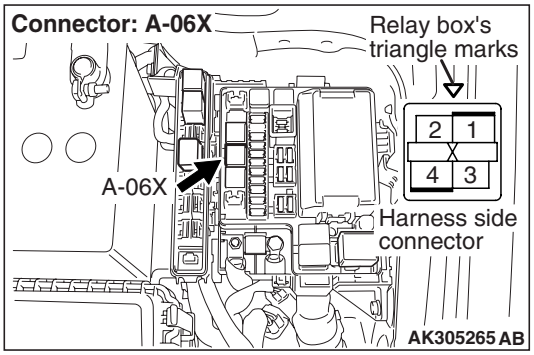
YES : Check intermediate connectors A-29*1 or C-31*2, and repair if necessary. If intermediate connectors are normal, check and repair harness between A-06X (terminal No. 3) condenser fan relay (low) connector and C-121 (terminal No. 31) engine-ECU connector.

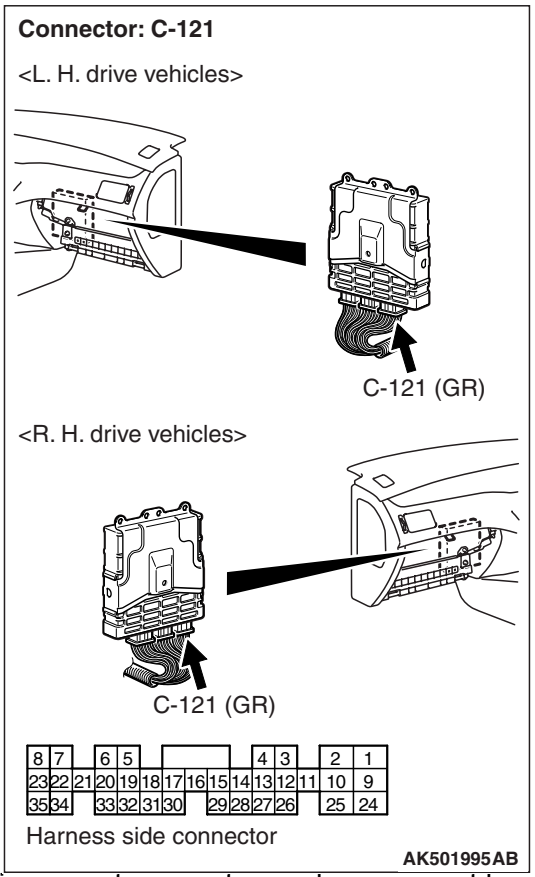
- Check power supply for open circuit and damage.

NO : Repair or replace the connector.

STEP 11. Perform voltage measurement at A-34 condenser fan motor connector.







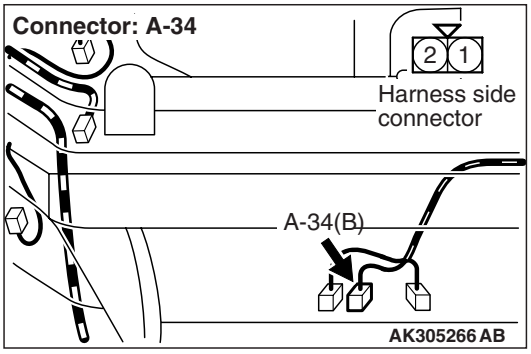
- Disconnect connector, and measure at harness side.
- Disconnect C-121 engine-ECU connector, and earth terminal No. 31.
- Ignition switch: "ON"

- Voltage between terminal No. 2 and earth.

  OK: System voltage

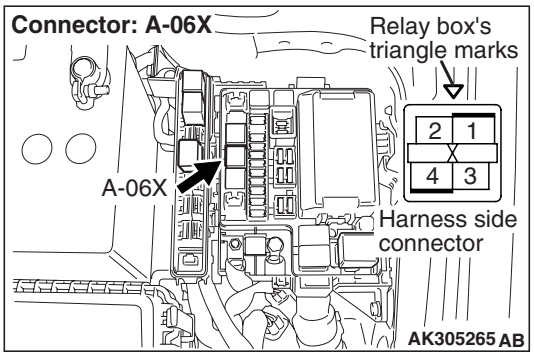
Q: Is the check result normal?
YES : Go to Step 12 .
NO : Check and repair harness between A-06X (terminal No. 3) condenser fan relay (low) connector and C-121 (terminal No. 31) engine-ECU connector.
- Check power supply for open circuit.

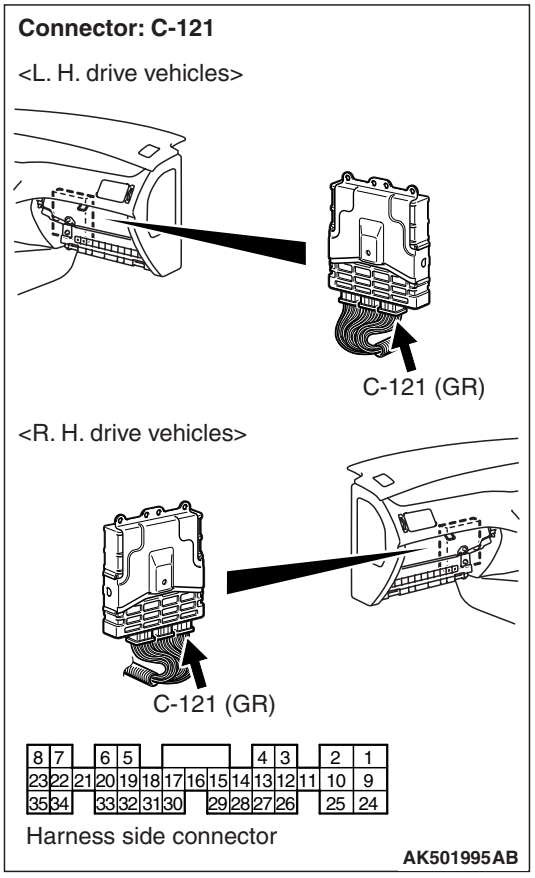
STEP 12. Connector check: A-34 condenser fan motor connector.



Q: Is the check result normal?
YES : Go to Step 13 .
NO : Repair or replace the connector.

STEP 13. Check harness between A-06X (terminal No. 3) condenser fan relay (low) connector and C-121 (terminal No. 31) engine-ECU connector.





*NOTE: Before checking harness, check intermediate connector A-29*1 or C-31*2, and repair if necessary.*
- Check output line for damage.

Q: Is the check result normal?
YES : Replace the engine-ECU.
NO : Repair the damaged harness wire.

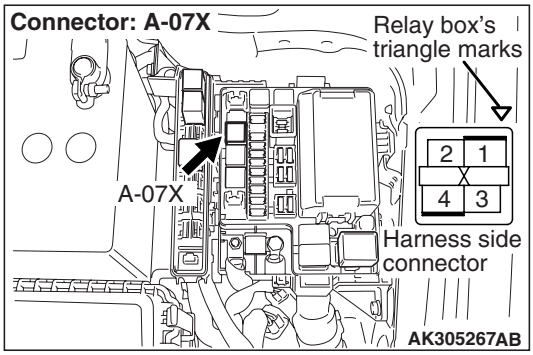
STEP 14. M.U.T.-II/III actuator test

- Item No. 38: Condenser fan (high)

  OK: Condenser fan motor rotates (high speed)

Q: Is the check result normal?
YES : Replace the engine-ECU.
NO : Go to Step 15 .

STEP 15. Connector check: A-07X condenser fan relay (high) connector.



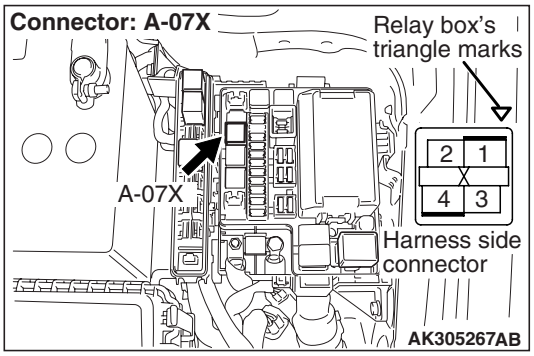
Q: Is the check result normal?
YES : Go to Step 16 .
NO : Repair or replace the connector.

STEP 16. Check condenser fan relay (high).

- Check condenser fan relay (high) (Refer to GROUP 55 – On-vehicle Service P.55-107).

Q: Is the check result normal?
YES : Go to Step 17 .
NO : Replace the condenser fan relay (high).

STEP 17. Perform voltage measurement at A-07X condenser fan relay (high) connector.

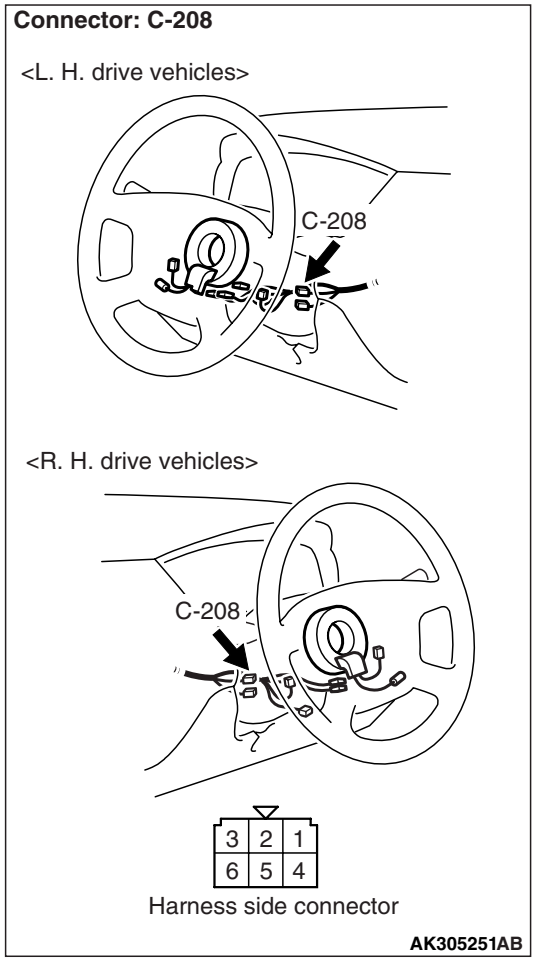


- Remove relay, and measure at relay box side.
- Ignition switch: "ON"
- Voltage between terminal No. 2 and earth.

  OK: System voltage

Q: Is the check result normal?
YES : Go to Step 20 .
NO : Go to Step 18 .

STEP 18. Connector check: C-208 ignition switch connector.

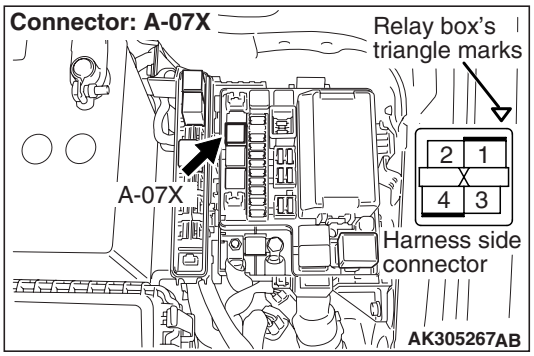


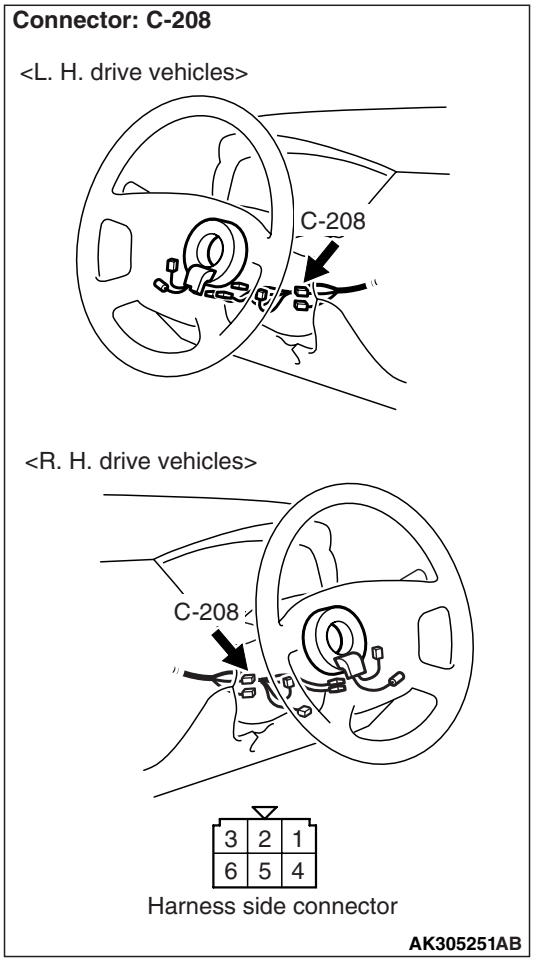
Q: Is the check result normal?

YES : Go to Step 19 .

NO : Repair or replace the connector.

STEP 19. Check ignition switch.





- Check ignition switch (Refer to GROUP 54 – ignition switch P.54A-30).

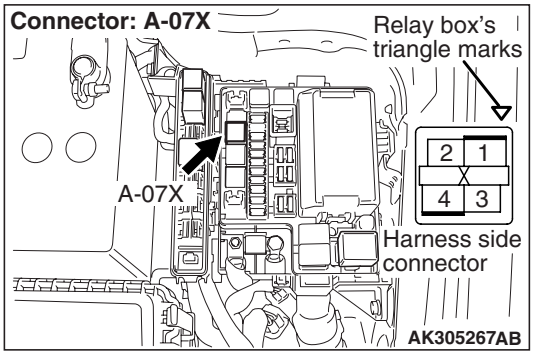
Q: Is the check result normal?

YES : Check intermediate connectors C-101, C-129, C-210 and C-211 and repair if necessary. If intermediate connectors are normal, check and repair harness between A-07X (terminal No. 2) condenser fan relay (high) connector and C-208 (terminal No. 4) ignition switch connector.

- Check power supply for open circuit and damage.

NO : Replace the ignition switch.

STEP 20. Perform voltage measurement at A-07X condenser fan relay (high) connector.



- Remove relay, and measure at relay box side.
- Voltage between terminal No. 4 and earth.

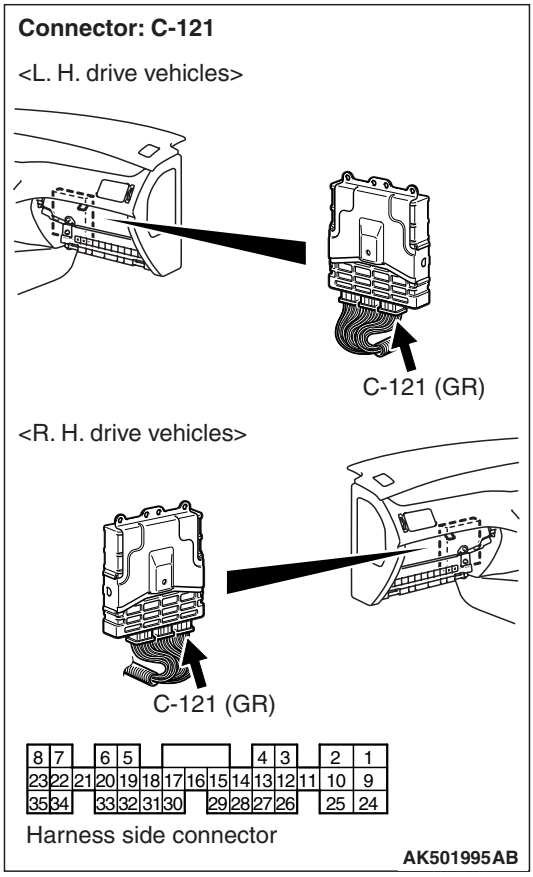
OK: System voltage

Q: Is the check result normal?

YES : Check and repair harness between battery and A-07X (terminal No. 4) condenser fan relay (high) connector.
- Check power supply for open circuit and damage.

NO : Go to Step 21 .

STEP 21. Perform voltage measurement at C-121 engine-ECU connector.



- Measure engine-ECU terminal voltage.
- Ignition switch: "ON"
- Voltage between terminal No. 30 and earth.

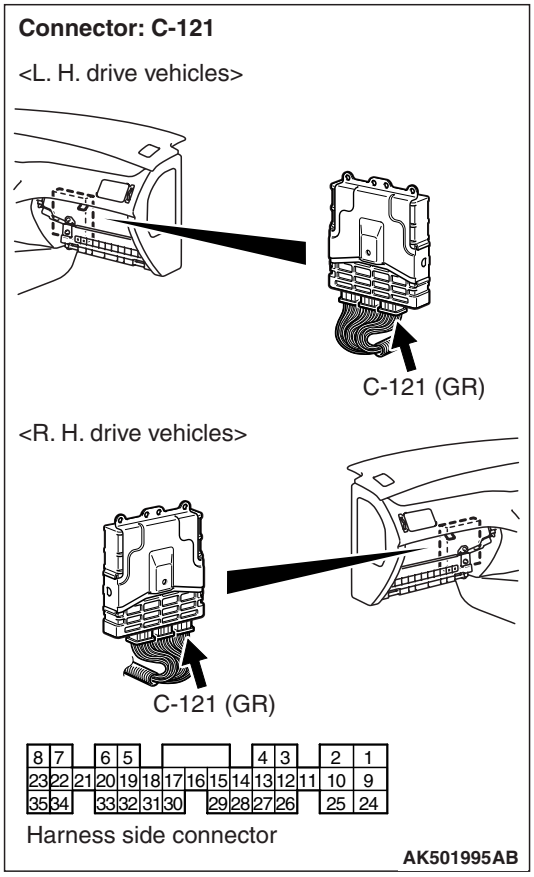
OK: System voltage

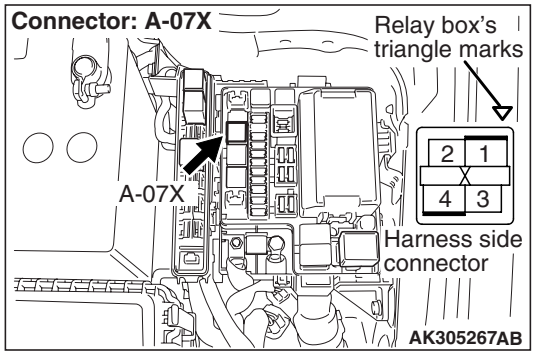
Q: Is the check result normal?

YES : Go to Step 23 .

NO : Go to Step 22 .

STEP 22. Connector check: C-121 engine-ECU connector.





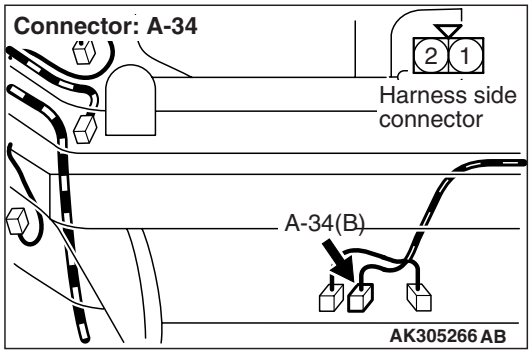
Q: Is the check result normal?

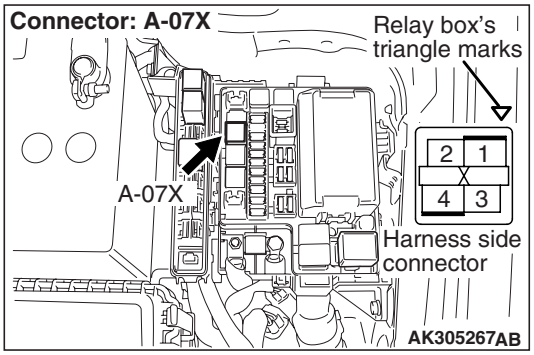
YES : Check intermediate connectors A-29*1 or C-31*2, and repair if necessary. If intermediate connectors are normal, check and repair harness between A-07X (terminal No. 3) condenser fan relay (high) connector and C-121 (terminal No. 30) engine-ECU connector.

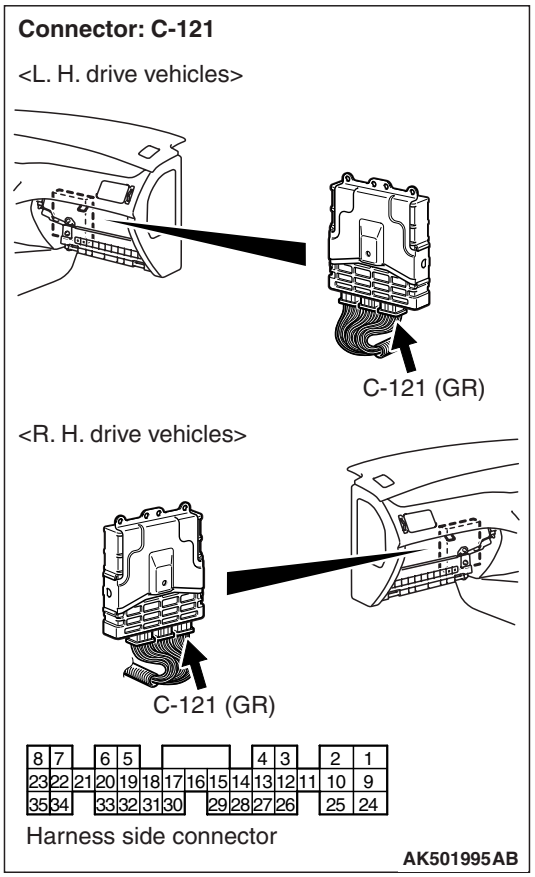
- Check power supply for open circuit and damage.

NO : Repair or replace the connector.

STEP 23. Perform voltage measurement at A-34 condenser fan motor connector.







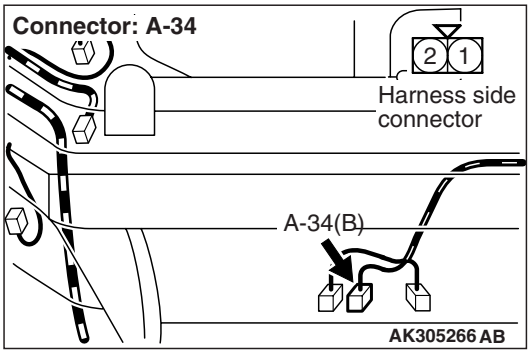
- Disconnect connector, and measure at harness side.
- Disconnect C-121 engine-ECU connector, and earth terminal No. 30.
- Ignition switch: "ON"

- Voltage between terminal No. 2 and earth.

  OK: System voltage

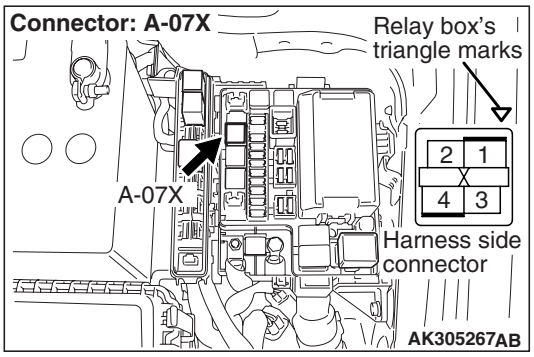
Q: Is the check result normal?
YES : Go to Step 24 .
NO : Check intermediate connectors A-29*[1] or C-31*[2], and repair if necessary. If intermediate connectors are normal, check and repair harness between A-07X (terminal No. 3) condenser fan relay (high) connector and C-121 (terminal No. 30) engine-ECU connector.
- Check power supply for open circuit and damage.

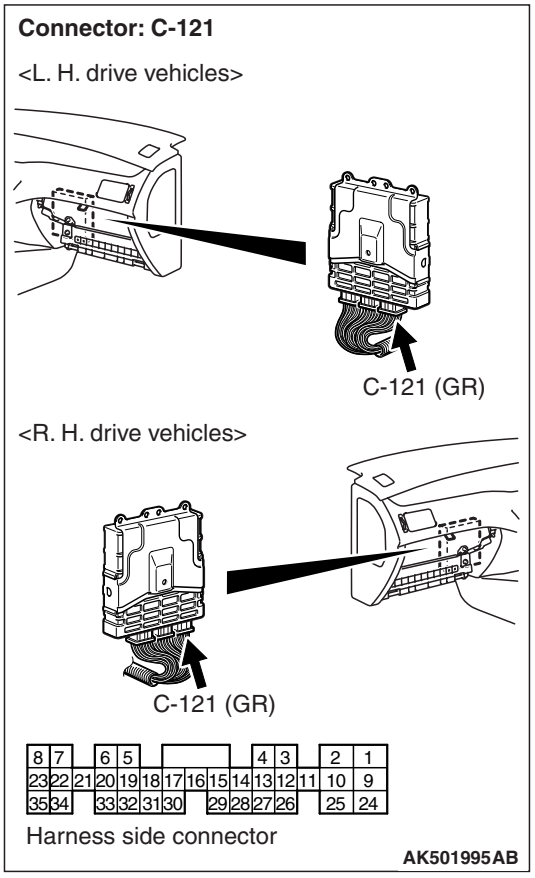
STEP 24. Connector check: A-34 condenser fan motor connector.



Q: Is the check result normal?
YES : Go to Step 25 .
NO : Repair or replace the connector.

STEP 25. Check harness between A-07X (terminal No. 3) condenser fan relay (high) connector and C-121 (terminal No. 30) engine-ECU connector.

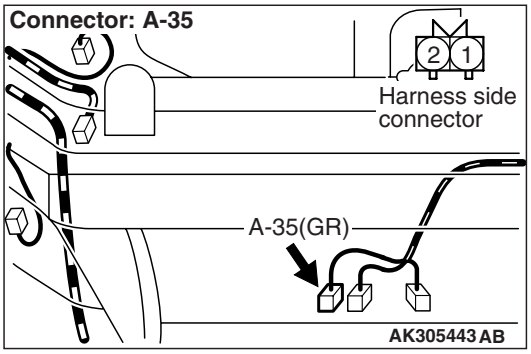




NOTE: Before checking harness, check intermediate connector A-29[1] or C-31*[2], and repair if necessary.*
- Check output line for damage.

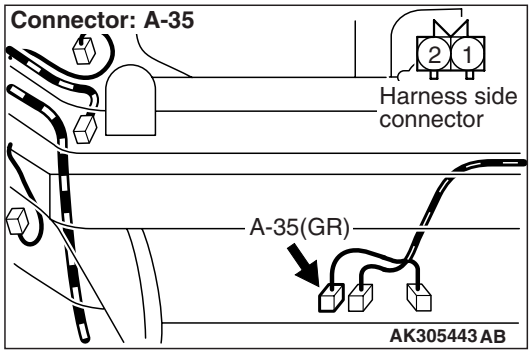
Q: Is the check result normal?
YES : Go to Step 26 .
NO : Repair the damaged harness wire.

STEP 26. Connector check: A-35 condenser fan motor connector.



Q: Is the check result normal?
YES : Go to Step 27 .
NO : Repair or replace the connector.

STEP 27. Perform resistance measurement at A-35 condenser fan motor connector.



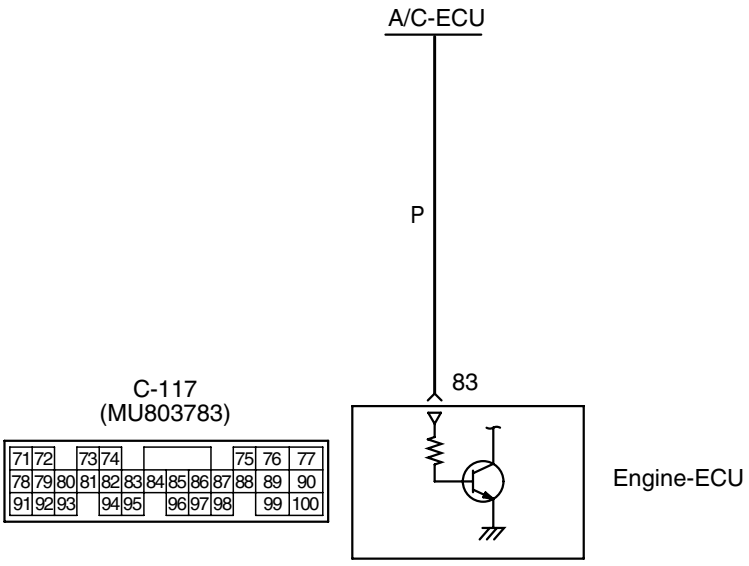
- Disconnect connector, and measure at harness side.
- Resistance between terminal No. 2 and earth.

OK: 2 Ω or less

Q: Is the check result normal?
YES : Replace the engine-ECU.
NO : Repair the damaged harness wire.

Inspection Procedure 27: A/C Switch System

A/C Switch circuit



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

AK501832AB

OPERATION

- The battery voltage is applied to the engine-ECU (terminal No. 83) from the A/C-ECU (terminal No. 1).

FUNCTION

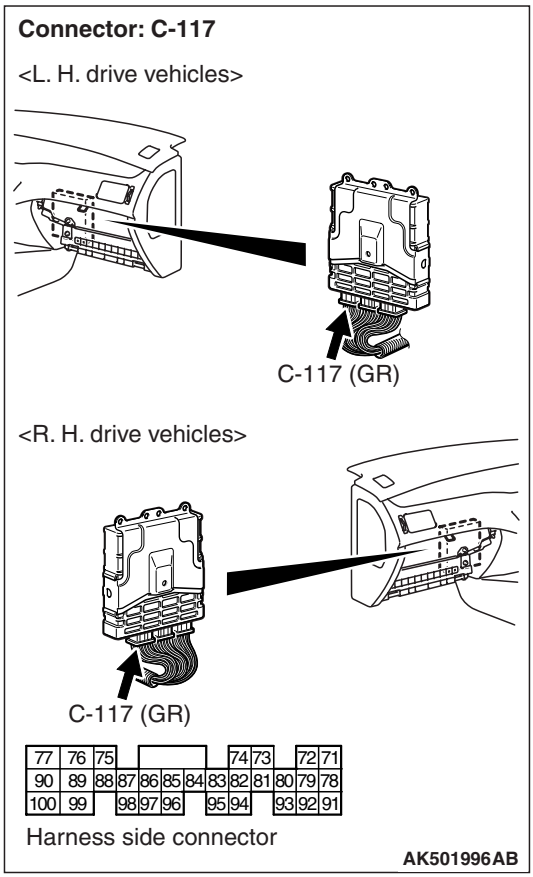
- When the A/C switch is in "ON" position, A/C switch ON signal is inputted to the engine-ECU from the A/C-ECU. In response to the signal, the engine-ECU controls the A/C compressor relay.

PROBABLE CAUSES

- Failed A/C
- Failed A/C system
- Open/short circuit in A/C circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. Perform voltage measurement at C-117 engine-ECU connector.

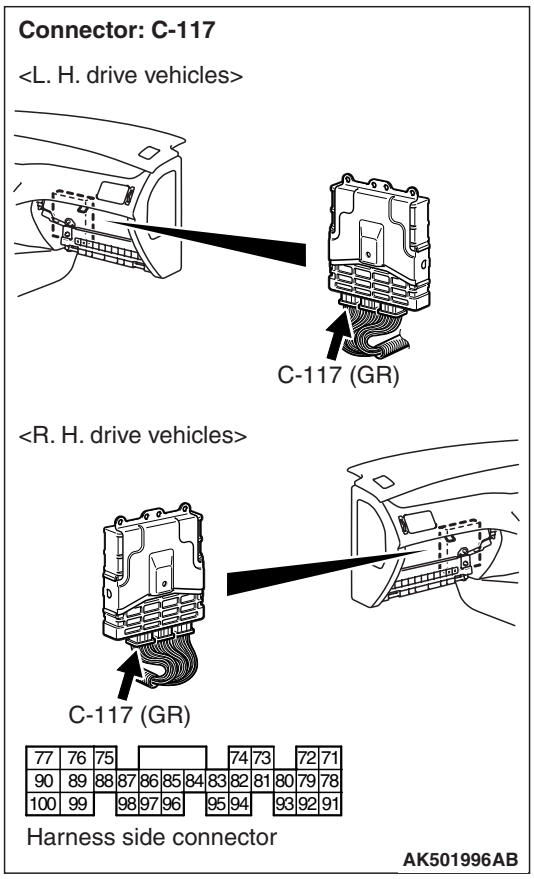


- Measure engine-ECU terminal voltage.
- Engine: Idling
- A/C set temperature:
  Maximum Cool when temperature in cabin is 25°C or more
  Maximum Hot when temperature in cabin is 25°C or less
- Voltage between terminal No. 83 and earth.

OK:
System voltage (when A/C is ON)
0.5 V or less (when A/C is OFF)

Q: Is the check result normal?
YES : Go to Step 2 .
NO : Check A/C system (Refer to GROUP 55 – Troubleshooting – Check Chart for Trouble Symptoms P.55-29)

STEP 2. Connector check: C-117 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 3 .
NO : Repair or replace the connector.

STEP 3. M.U.T.-II/III data list

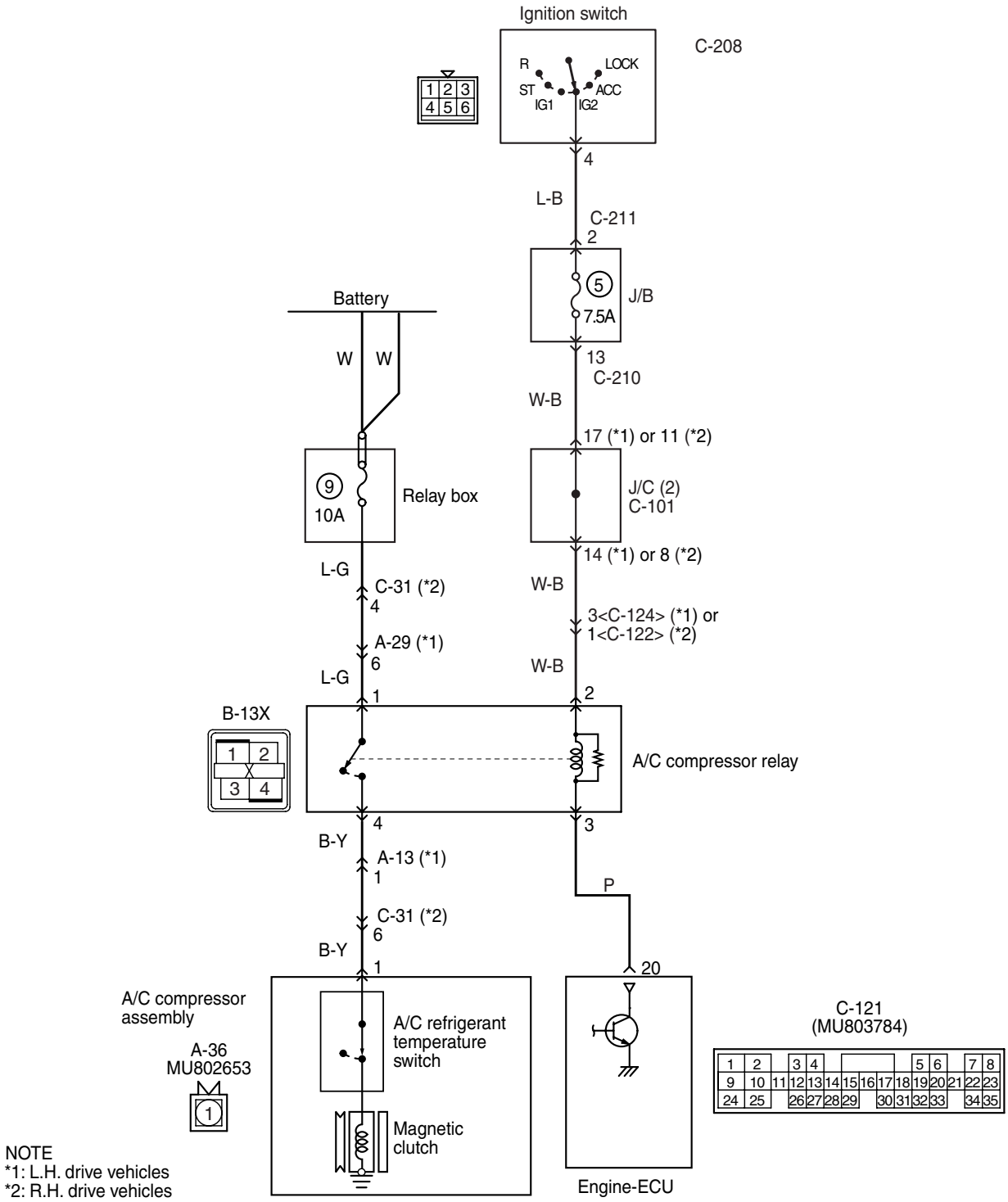
- Item No. 28: A/C switch
  a. Engine: Idling
  b. A/C set temperature:
  Maximum Cool when temperature in cabin is 25°C or more
  Maximum Hot when temperature in cabin is 25°C or less

OK:
ON (when A/C is ON)
OFF (when A/C is OFF)

Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-5).
NO : Replace the engine-ECU.

Inspection Procedure 28: A/C Compressor Relay System

A/C compressor relay Circuit



NOTE
*1: L.H. drive vehicles
*2: R.H. drive vehicles

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

AK501833AB

OPERATION

- The battery voltage is applied to the A/C compressor relay (terminal No. 1).
- The battery voltage is applied to the A/C compressor relay (terminal No. 2) from the ignition switch. The engine-ECU (terminal No. 20) makes the power transistor in the unit be in "ON" position and makes currents go on the A/C compressor relay coil, and that makes the relay be in "ON" position.
- When the A/C compressor is in "ON" position, the battery voltage is supplied to the A/C compressor (terminal No. 4) from the A/C compressor relay assembly (terminal No. 1).

FUNCTION

- When the A/C switch "ON" signal is input to the engine-ECU, the engine-ECU places the A/C compressor relay in the "ON" position. Accordingly, the battery voltage supplied to the A/C compressor operates the magnet clutch.

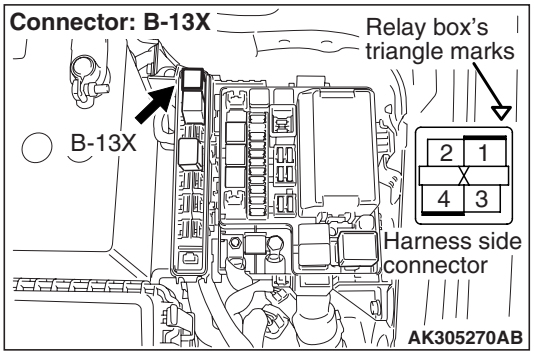
PROBABLE CAUSES

- Failed A/C compressor relay
- Failed A/C compressor magnet clutch
- Open/short circuit in A/C compressor relay circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

NOTE:
**1: L.H. drive vehicles*
**2: R.H. drive vehicles*

STEP 1. Connector check: B-13X A/C compressor relay connector



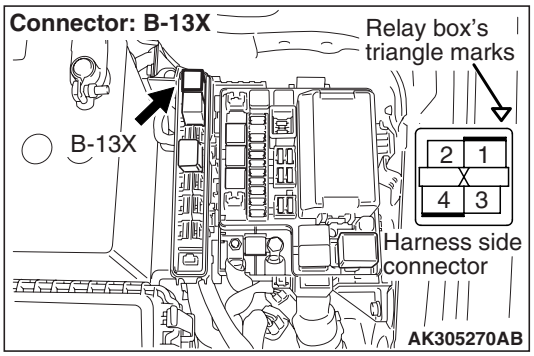
Q: Is the check result normal?
YES : Go to Step 2 .
NO : Repair or replace the connector.

STEP 2. A/C compressor relay check.

- Check A/C compressor relay (Refer to GROUP 55 – On-vehicle Service – Power Relay Check P.55-107).

Q: Is the check result normal?
YES : Go to Step 3 .
NO : Replace the A/C compressor relay.

STEP 3. Perform voltage measurement at B-13X A/C compressor relay connector.

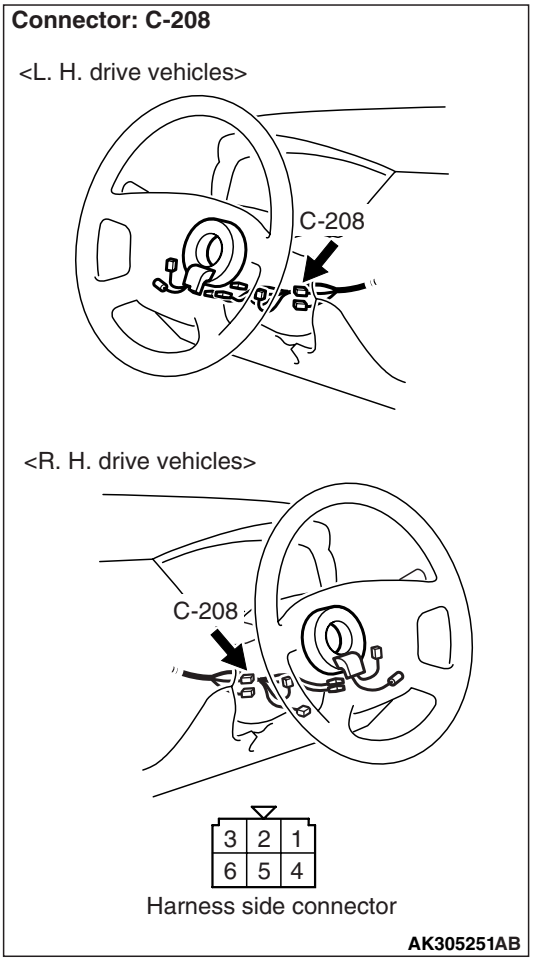


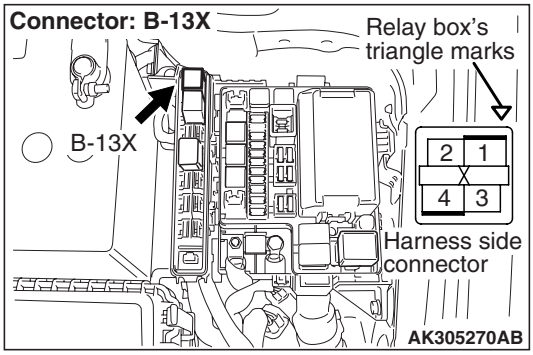
- Remove relay, and measure at relay box side.
- Ignition switch: "ON"
- Voltage between terminal No. 2 and earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 5 .
NO : Go to Step 4 .

STEP 4. Connector check: C-208 ignition switch connector





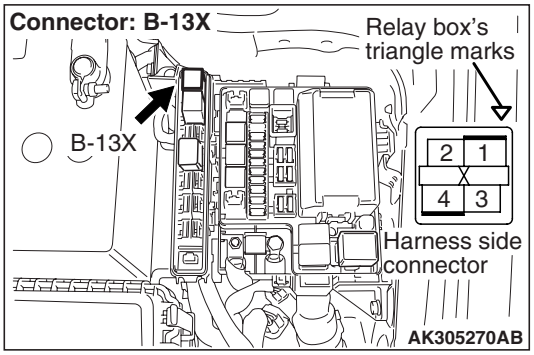
Q: Is the check result normal?

YES : Check intermediate connectors C-124[*1] or C-122[*2], C-210 and C-211, and repair if necessary. If intermediate connectors are normal, check and repair harness between B-13X (terminal No. 2) A/C compressor relay connector and C-208 (terminal No. 4) ignition switch connector.

- Check power supply line for open/short circuit.

NO : Repair or replace the connector.

STEP 5. Perform voltage measurement at B-13X A/C compressor relay connector.



- Remove relay, and measure at relay box side.
- Voltage between terminal No. 1 and earth.

OK: System voltage

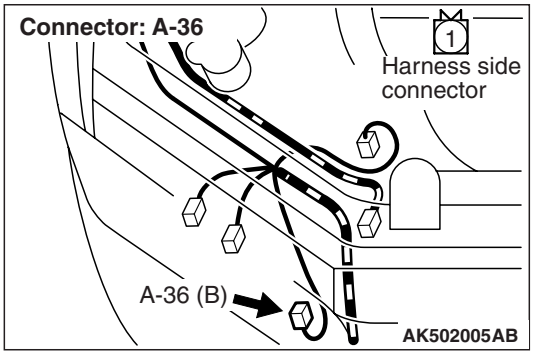
Q: Is the check result normal?

YES : Go to Step 6 .

NO : Check intermediate connector A-29[*1] or C-31[*2], and repair if necessary. If intermediate connector is normal, check and repair harness between B-13X (terminal No. 1) A/C compressor relay connector and battery.

- Check power supply line for open/short circuit.

STEP 6. Connector check: A-36 A/C compressor assembly connector

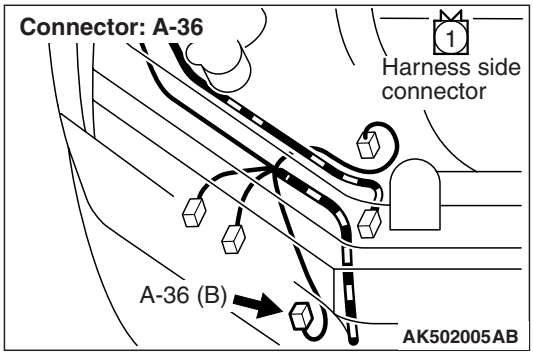


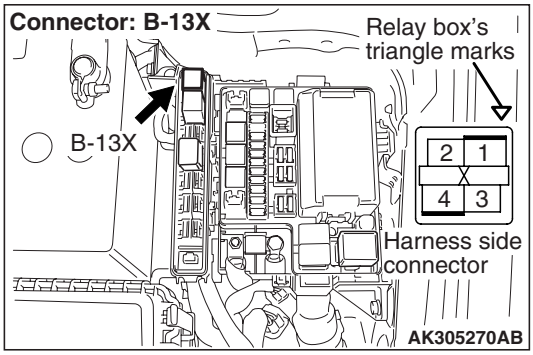
Q: Is the check result normal?

YES : Go to Step 7 .

NO : Repair or replace the connector.

STEP 7. Perform voltage measurement at A-36 A/C compressor assembly connector.





- Disconnect connector, and measure at harness side.
- Remove B-13X (terminal No. 1 and No. 4) A/C compressor relay and short-circuit of harness side connector.
- Ignition switch: "ON"
- Voltage between terminal No. 1 and earth.

OK: System voltage

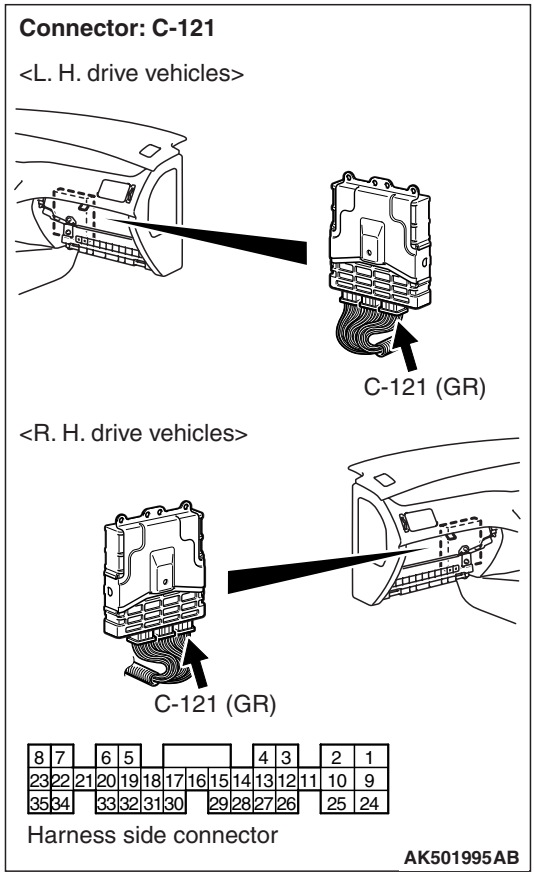
Q: Is the check result normal?

YES : Go to Step 8 .

NO : Check intermediate connector A-13[*1] or C-31[*2], and repair if necessary. If intermediate connector is normal, check and repair harness between A-36 (terminal No. 1) A/C compressor assembly connector and B-13X (terminal No. 4) A/C compressor relay connector.

- Check output line for open/short circuit.

STEP 8. Perform voltage measurement at C-121 engine-ECU connector.



- Disconnect connector, and measure at harness side.
- Ignition switch: "ON"
- Voltage between terminal No. 20 and earth.

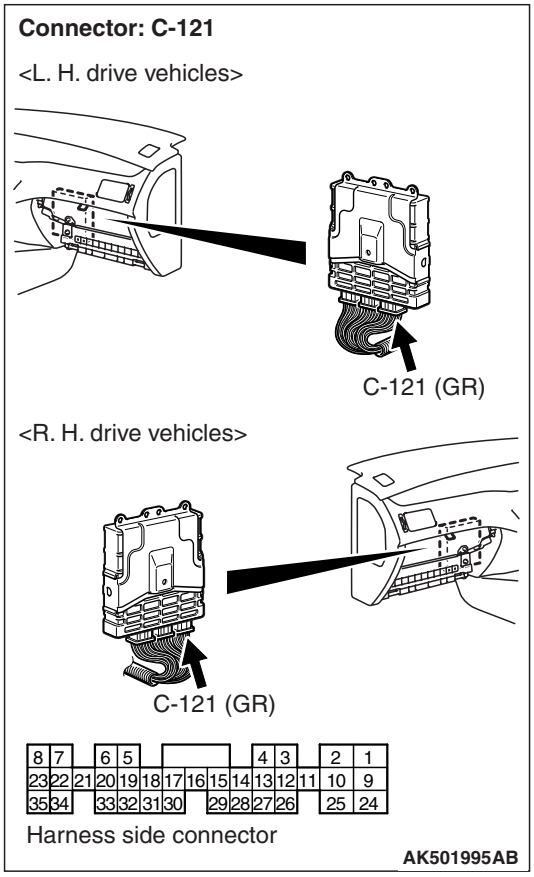
OK: System voltage

Q: Is the check result normal?

YES : Go to Step 12 .

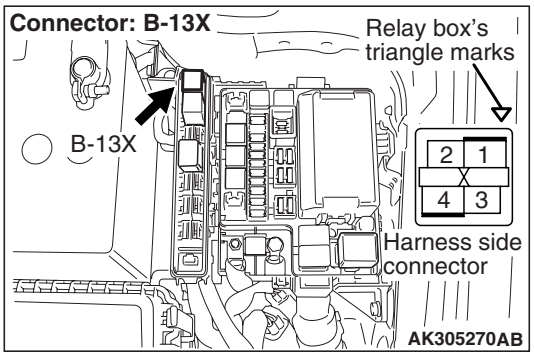
NO : Go to Step 9 .

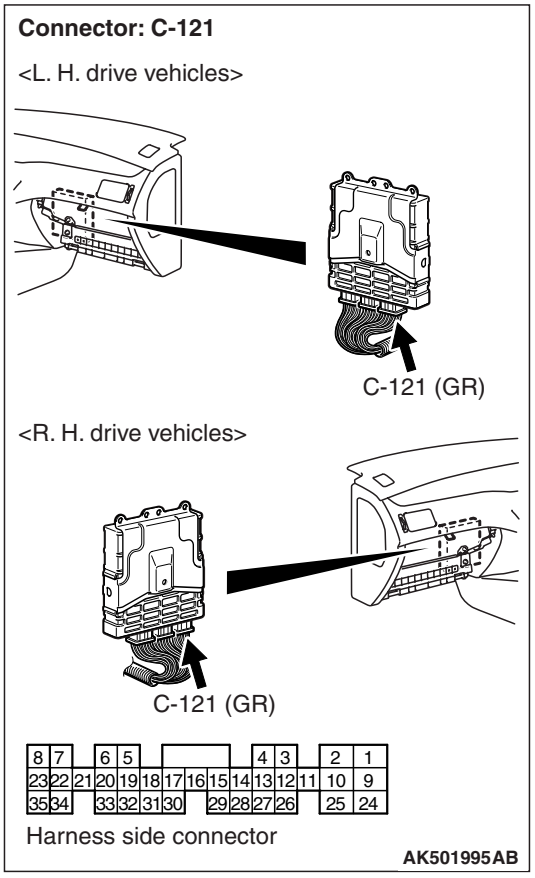
STEP 9. Connector check: C-121 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 10 .
NO : Repair or replace the connector.

STEP 10. Check harness between B-13X (terminal No. 3) A/C compressor relay connector and C-121 (terminal No. 20) engine-ECU connector.





- Check earthing line for open/short circuit.

Q: Is the check result normal?
YES : Go to Step 11 .
NO : Repair the damaged harness wire.

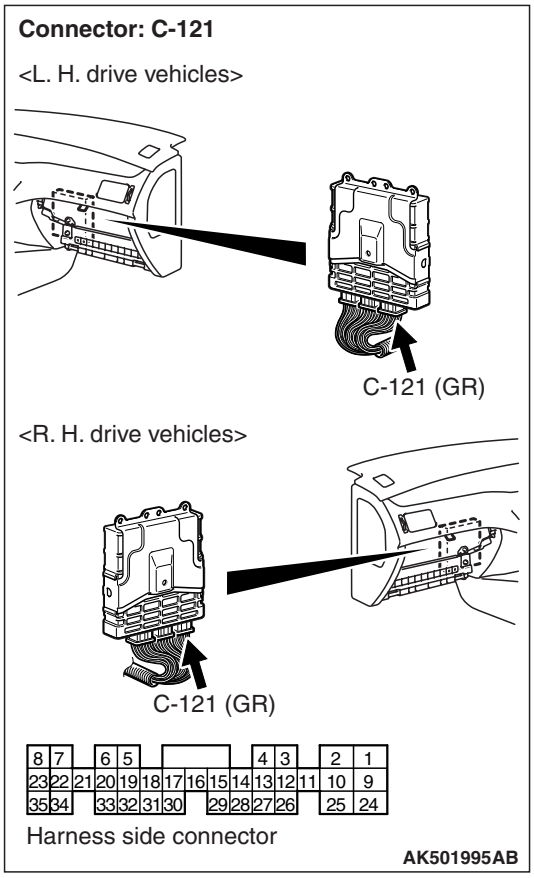
STEP 11. M.U.T.-II/III data list

- Item No. 49: A/C relay
  a. Engine: Idling
  b. A/C set temperature:
  Maximum Cool when temperature in cabin is 25°C or more
  Maximum Hot when temperature in cabin is 25°C or less

OK:
ON (when A/C is ON)
OFF (when A/C is OFF)

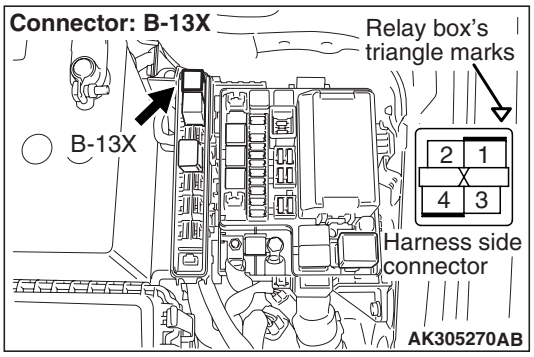
Q: Is the check result normal?
YES : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-5).
NO : Replace the engine-ECU.

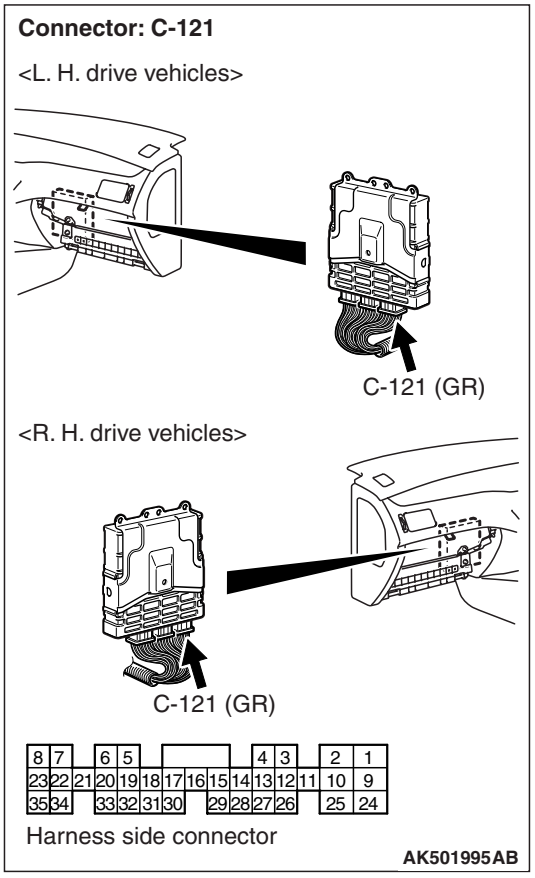
STEP 12. Connector check: C-121 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 13 .
NO : Repair or replace the connector.

STEP 13. Check harness between B-13X (terminal No. 3) A/C compressor relay connector and C-121 (terminal No. 20) engine-ECU connector.

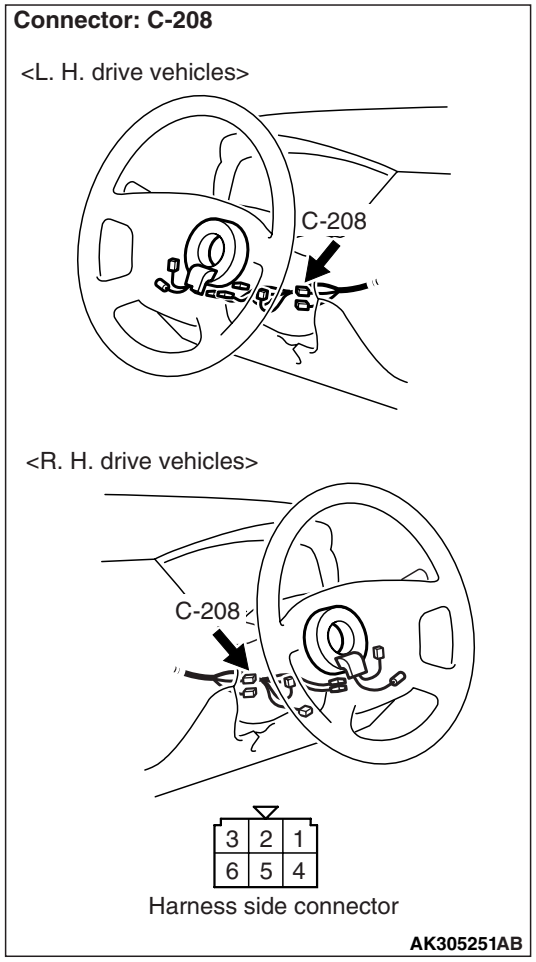




- Check earthing line for damage.

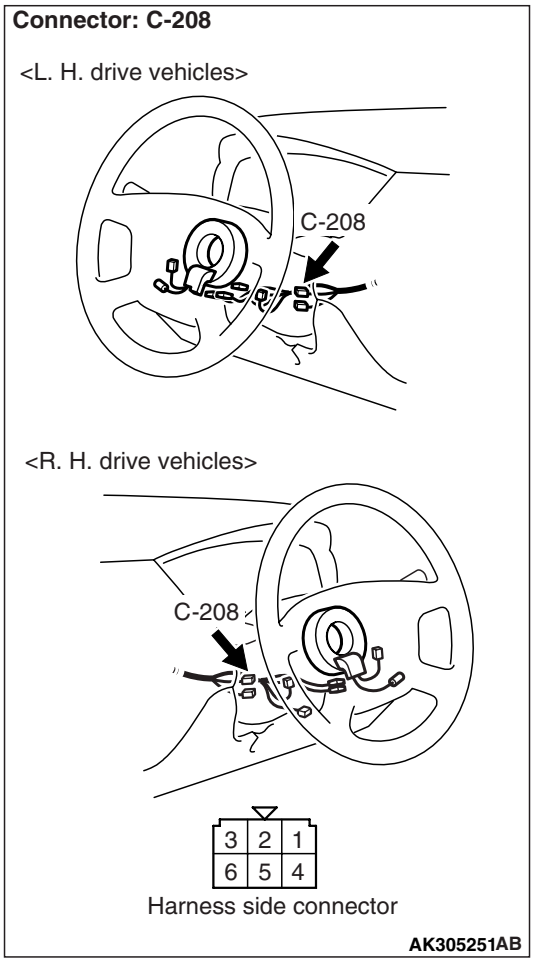
Q: Is the check result normal?
YES : Go to Step 14 .
NO : Repair the damaged harness wire.

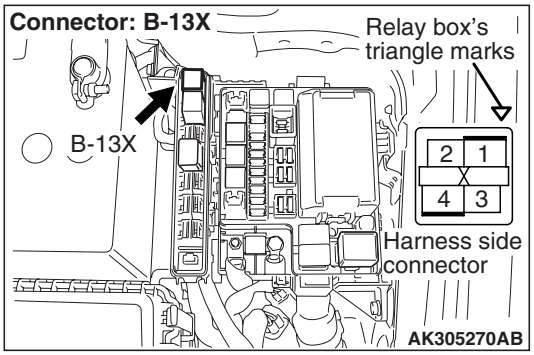
STEP 14. Connector check: C-208 ignition switch connector



Q: Is the check result normal?
YES : Go to Step 15 .
NO : Repair or replace the connector.

STEP 15. Check harness between C-208 (terminal No. 4) ignition switch connector and B-13X (terminal No. 2) A/C compressor relay connector.



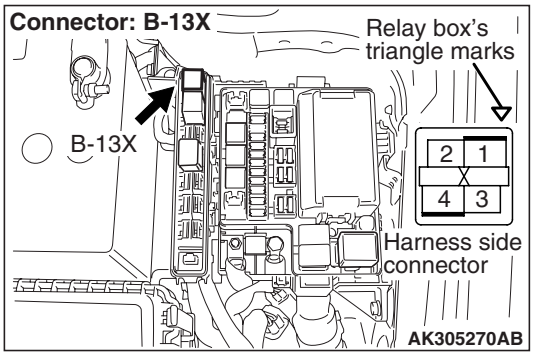


*NOTE: Before checking harness, check intermediate connectors C-124[*1] or C-122[*2], C-210 and C-211, and repair if necessary.*

- Check power supply line for damage.

Q: Is the check result normal?
YES : Go to Step 16 .
NO : Repair the damaged harness wire.

STEP 16. Check harness between battery and B-13X (terminal No. 1) A/C compressor relay connector.



*NOTE: Before checking harness, check intermediate connector A-29[*1] or C-31[*2], and repair if necessary.*

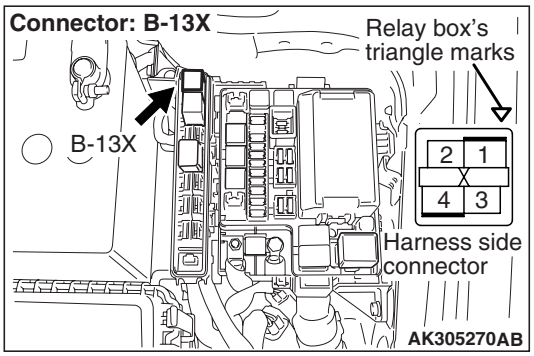
- Check power supply line for damage.

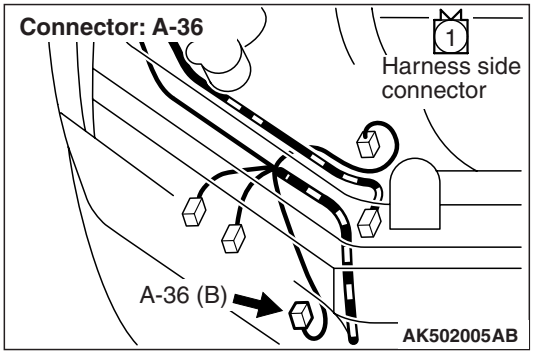
Q: Is the check result normal?

YES : Go to Step 17 .

NO : Repair the damaged harness wire.

STEP 17. Check harness between B-13X (terminal No. 4) A/C compressor relay connector and A-36 (terminal No. 1) A/C compressor assembly connector.





*NOTE: Before checking harness, check intermediate connector A-13[*1] or C-31[*2], and repair if necessary.*

- Check output line for damage.

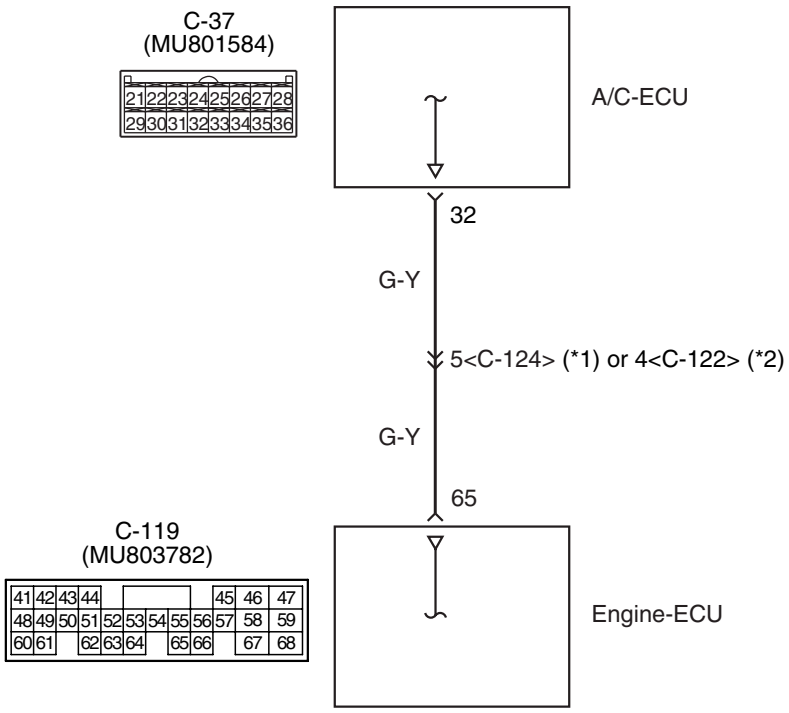
Q: Is the check result normal?

YES : Replace the A/C compressor magnet clutch.

NO : Repair the damaged harness wire.

Inspection Procedure 29: A/C Load Signal System

A/C load signal circuit



NOTE
*1: L.H. drive vehicles
*2: R.H. drive vehicles

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

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OPERATION

- The A/C load signal is inputted to the engine-ECU (terminal No. 65) from the A/C-ECU (terminal No. 32).

FUNCTION

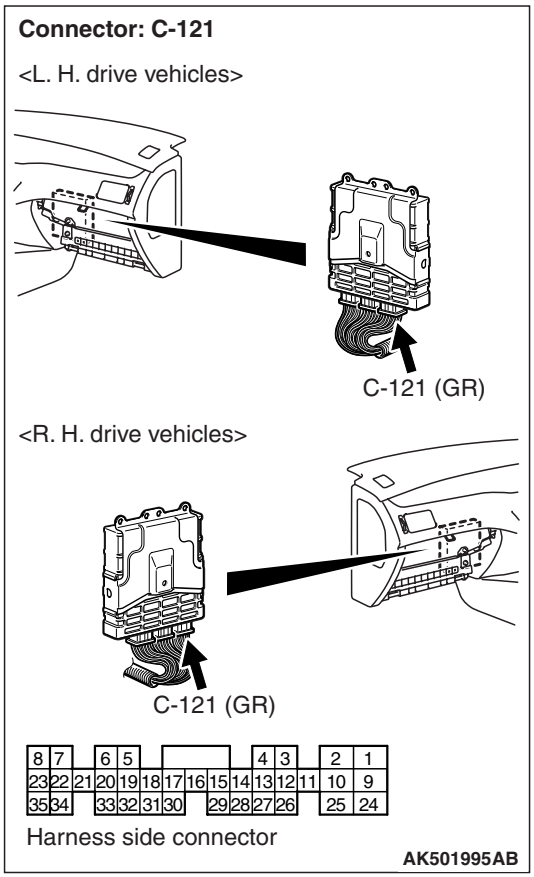
- The magnitude of the A/C compressor load is detected and input to the engine-ECU. The engine-ECU provides A/C idle up control according to the A/C compressor load condition.

PROBABLE CAUSES

- Failed A/C-ECU
- Open/short circuit in A/C load signal circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. Perform voltage measurement at C-121 engine-ECU connector.

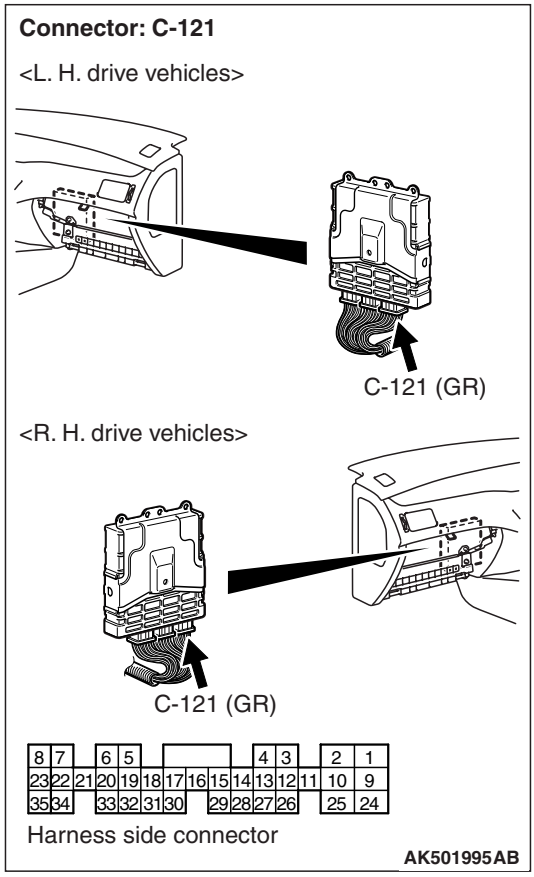


- Measure engine-ECU terminal voltage.
- Engine: Idling
- A/C switch: ON (A/C compressor in driven state)
- Voltage between terminal No. 65 and earth

OK:
1 V or less (when the A/C is under low load)
System voltage (when the A/C is under high load)

Q: Is the check result normal?
YES : Go to Step 2 .
NO : Go to Step 4 .

STEP 2. Connector check: C-121 engine-ECU connector

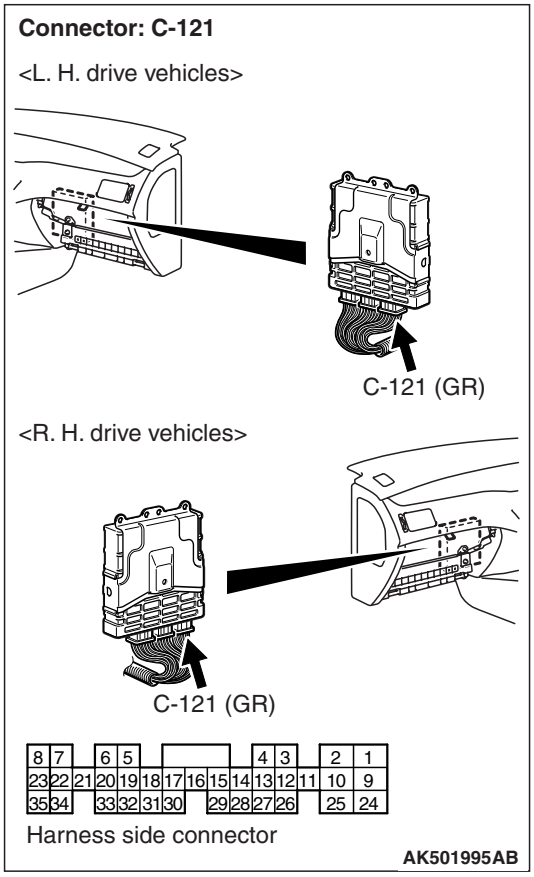


Q: Is the check result normal?
YES : Go to Step 3 .
NO : Repair or replace the connector.

STEP 3. Check the trouble symptoms.

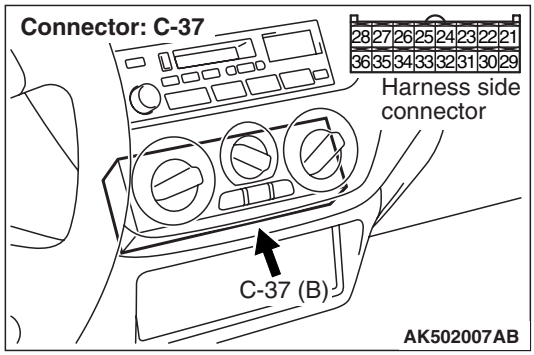
Q: Does trouble symptom persist?
YES : Replace the engine-ECU.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-5).

STEP 4. Connector check: C-121 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 5 .
NO : Repair or replace the connector.

STEP 5. Perform voltage measurement at C-37 A/C-ECU connector.

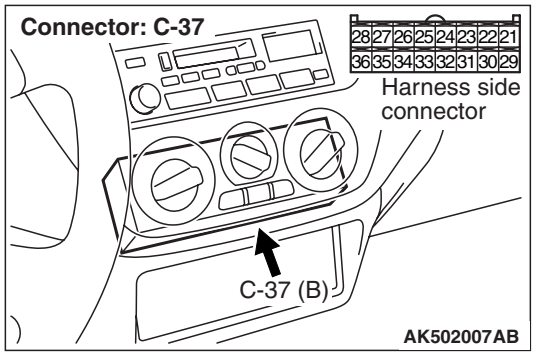


- Measure A/C-ECU terminal voltage.
- Engine: Idling
- A/C switch: ON (A/C compressor in driven state)
- Voltage between terminal No. 32 and earth

OK: System voltage (when the A/C is under high load)

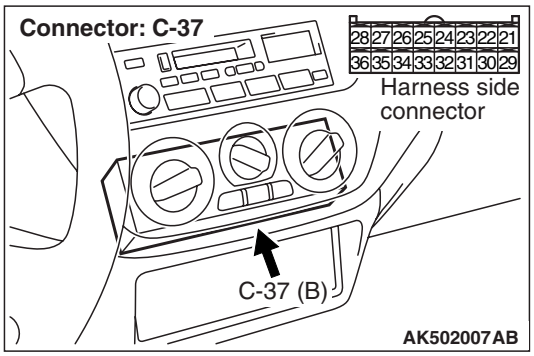
Q: Is the check result normal?
YES : Go to Step 8 .
NO : Go to Step 6 .

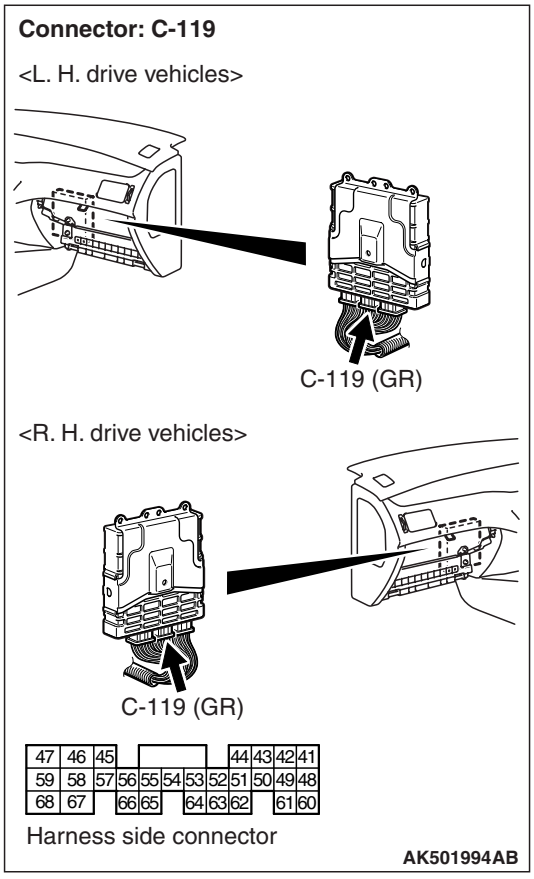
STEP 6. Connector Check: C-37 A/C-ECU connector



Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair or replace the connector.

STEP 7. Check harness between C-37 (terminal No. 32) A/C-ECU connector and C-119 (terminal No. 65) engine-ECU connector.





*NOTE: Before checking harness, check intermediate connector C-124[*1] or C-122[*2], and repair if necessary.*

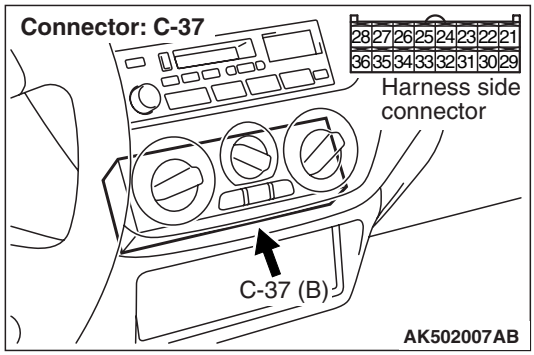
- Check output line for short circuit.

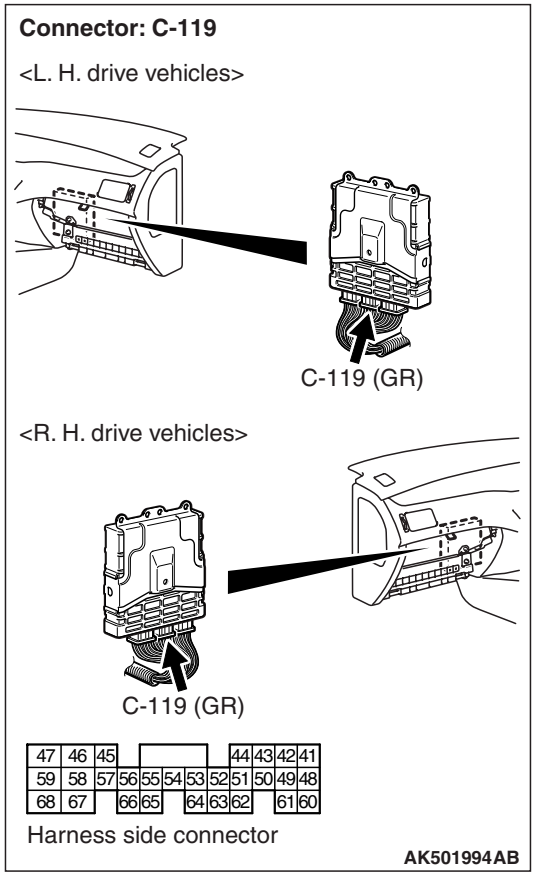
Q: Is the check result normal?

YES : Check Air conditioner (Refer to GROUP 55 – Troubleshooting – Check Chart For Trouble Symptoms P.55-29).

NO : Repair the damaged harness wire.

STEP 8. Connector check: C-37 A/C-ECU connector





Q: Is the check result normal?

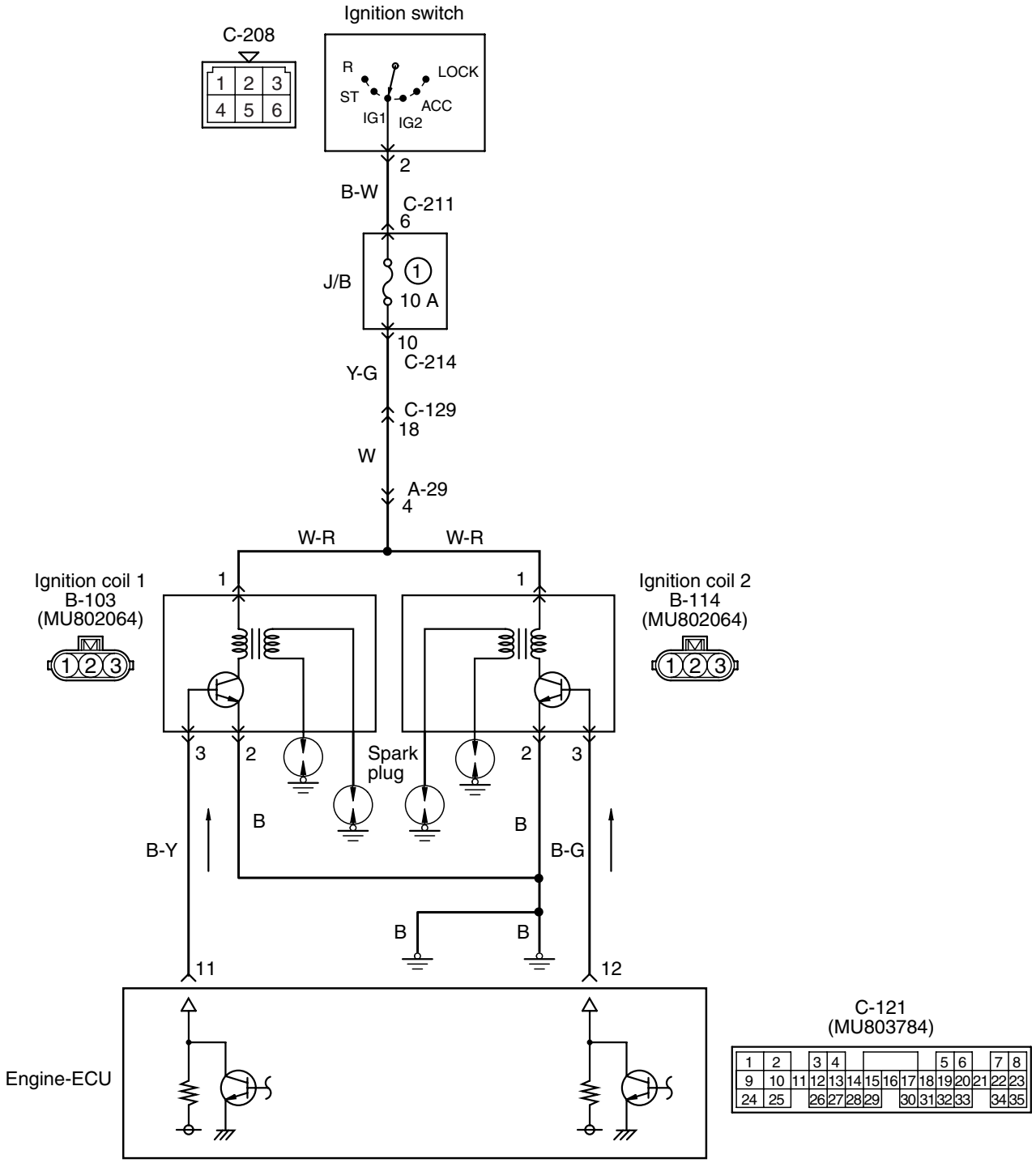
YES : Check intermediate connector C-124[*1] or C-122[*2], and repair if necessary. If intermediate connector is normal, check and repair harness between C-37 (terminal No. 32) A/C-ECU connector and C-119 (terminal No. 65) engine-ECU connector.

- Check output line for open circuit.

NO : Repair or replace the connector.

Inspection Procedure 30: Ignition Circuit System <L. H. drive vehicles>

Ignition circuit



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

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OPERATION

- The battery voltage is applied to the ignition coil (terminal No. 1) from the ignition switch and is earthed to the vehicle body from the ignition coil (terminal No. 2).
- A power voltage of 12 V is applied to the ignition coil output terminal (terminal No. 3) from the engine-ECU (terminal No. 11 and No. 12).

FUNCTION

- When the engine-ECU makes the power transistor in the unit be in "OFF" position, the battery voltage in the unit is applied to the power transistor unit, and that makes the power transistor unit be in "ON" position. The engine-ECU makes the power transistor in the unit be in "ON", and that makes the power transistor unit be in "OFF" position.
- In response to the signal from the engine-ECU, the power transistor unit is in "ON" position. The primary current is going to the ignition coil. When the power transistor unit is in "OFF" position, the primary current is interrupted and high voltage is generated in the secondary coil.

PROBABLE CAUSES

- Failed ignition coil
- Failed spark plug
- Failed spark plug cable
- Open/short circuit in ignition primary circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. Check spark plug cable itself.

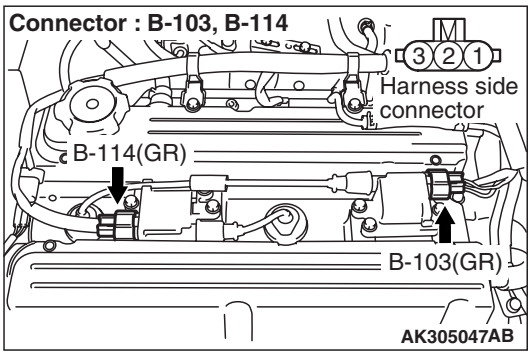
- Check spark plug cable itself (Refer to GROUP 16 – Ignition System – On-vehicle Service P.16-29).

Q: Is the check result normal?
YES : Go to Step 2 .
NO : Replace the spark plug cable.

STEP 2. Check spark plug.

Q: Is the check result normal?
YES : Go to Step 3 .
NO : Replace the spark plug.

STEP 3. Connector check: B-103 and B-114 ignition coil connectors



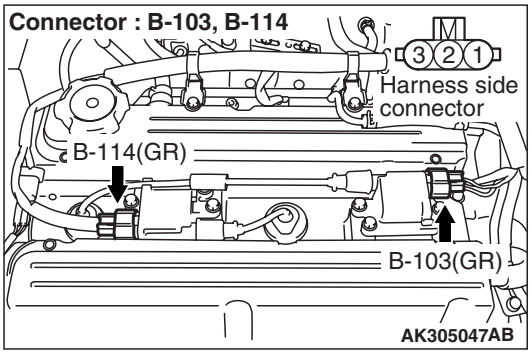
Q: Is the check result normal?
YES : Go to Step 4 .
NO : Repair or replace the connector.

STEP 4. Check ignition coil itself.

- Check ignition coil itself (Refer to GROUP 16 – Ignition System – On-vehicle Service P.16-28).

Q: Is the check result normal?
YES : Go to Step 5 .
NO : Replace the ignition coil.

STEP 5. Perform voltage measurement at B-103 and B-114 ignition coil connectors.

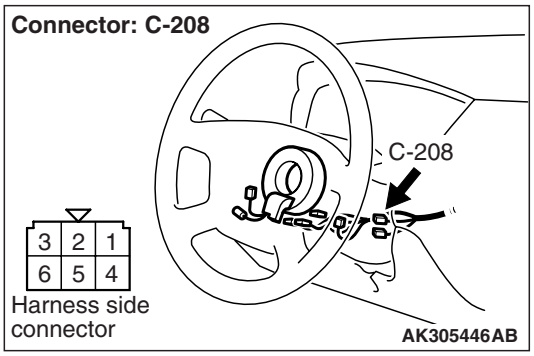


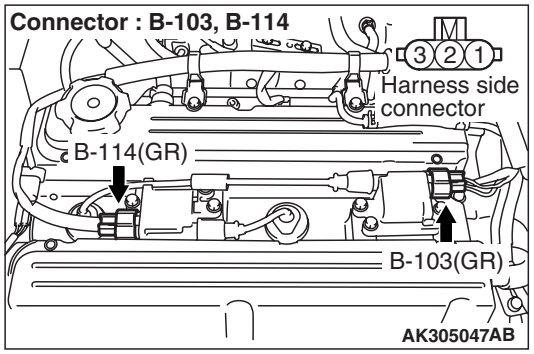
- Disconnect connector, and measure at harness side.
- Ignition switch: "ON"
- Voltage between terminal No. 1 and earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 7 .
NO : Go to Step 6 .

STEP 6. Connector check: C-208 ignition switch connector





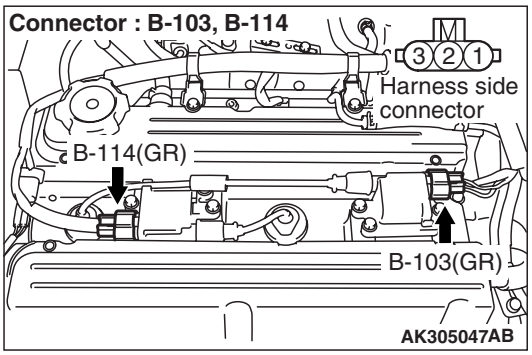
Q: Is the check result normal?

YES : Check intermediate connectors A-29, C-129, C-211 and C-214, and repair if necessary. If intermediate connectors are normal, check and repair harness between C-208 (terminal No. 2) ignition switch connector and B-114 (terminal No. 1) ignition coil connector, also between C-208 (terminal No. 2) ignition switch connector and B-103 (terminal No. 1) ignition coil connector.

- Check power supply line for open/short circuit.

NO : Repair or replace the connector.

STEP 7. Perform voltage measurement at B-103 and B-114 ignition coil connectors.



- Disconnect connector, and measure at harness side.
- Engine: Cranking
- Voltage between terminal No. 3 and earth.

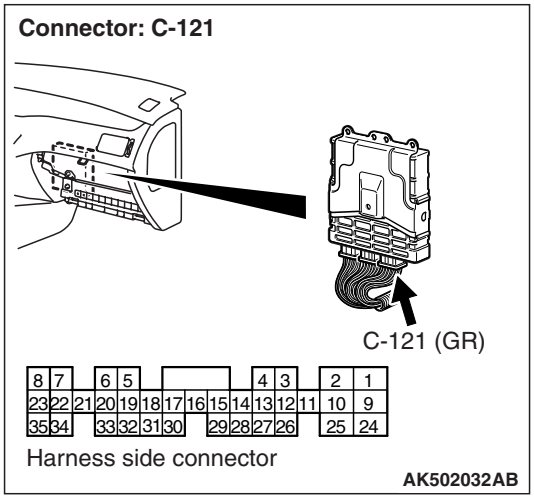
OK: 0.5 – 4.0 V

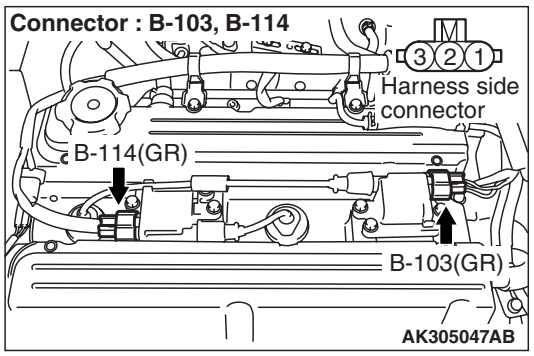
Q: Is the check result normal?

YES : Go to Step 13 .

NO : Go to Step 8 .

STEP 8. Perform voltage measurement at C-121 engine-ECU connector.





- Measure engine-ECU terminal voltage.
- Disconnect B-103 and B-114 ignition coil connectors.
- Engine: Cranking
- Voltage between terminal No. 11 and earth, also between terminal No. 12 and earth.

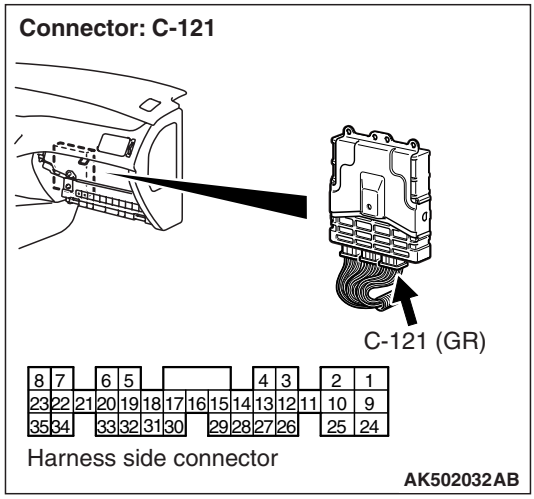
OK: 0.5 – 4.0 V

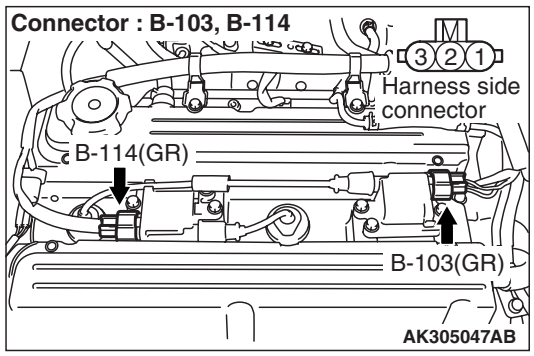
Q: Is the check result normal?

YES : Go to Step 9 .

NO : Go to Step 10 .

STEP 9. Connector check: C-121 engine-ECU connector





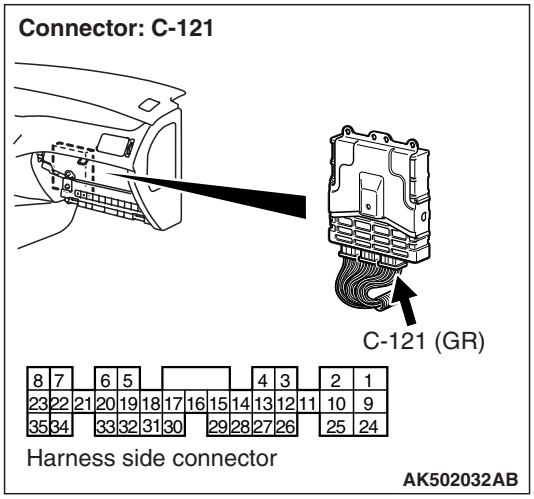
Q: Is the check result normal?

YES : Check and repair harness between B-114 (terminal No. 3) ignition coil connector and C-121 (terminal No. 12) engine-ECU connector, also between B-103 (terminal No. 3) ignition coil connector and C-121 (terminal No. 11) engine-ECU connector.

- Check output line for open circuit.

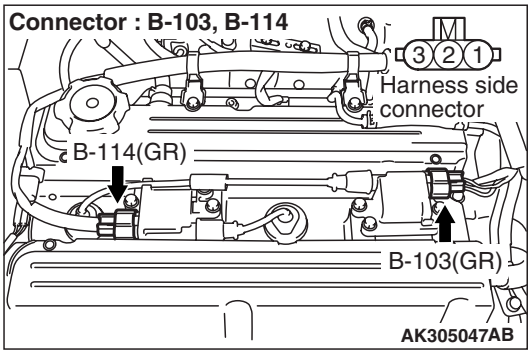
NO : Repair or replace the connector.

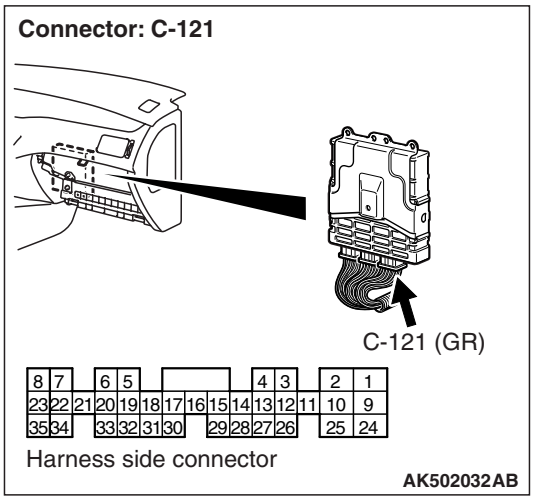
STEP 10. Connector check: C-121 engine-ECU connector



Q: Is the check result normal?
YES : Go to Step 11 .
NO : Repair or replace the connector.

STEP 11. Check harness between B-114 (terminal No. 3) ignition coil connector and C-121 (terminal No. 12) engine-ECU connector, also between B-103 (terminal No. 3) ignition coil connector and C-121 (terminal No. 11) engine-ECU connector.





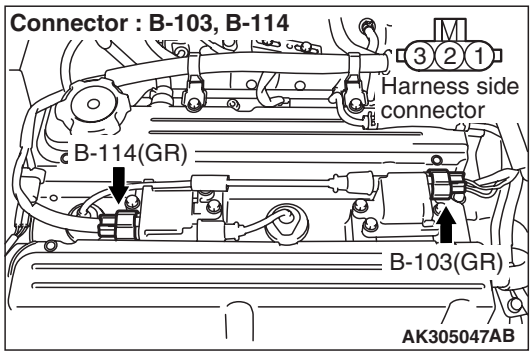
- Check output line for short circuit.

Q: Is the check result normal?
YES : Go to Step 12 .
NO : Repair the damaged harness wire.

STEP 12. Check the trouble symptoms.

Q: Does trouble symptom persist?
YES : Replace the engine-ECU.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-5).

STEP 13. Perform resistance measurement at B-103 and B-114 ignition coil connectors.



- Disconnect connector, and measure at harness side.
- Resistance between terminal No. 2 and earth.

OK: 2 Ω or less

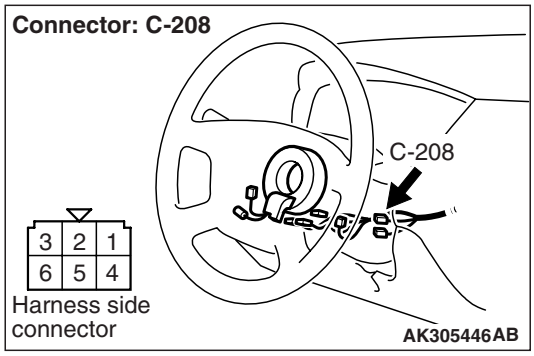
Q: Is the check result normal?

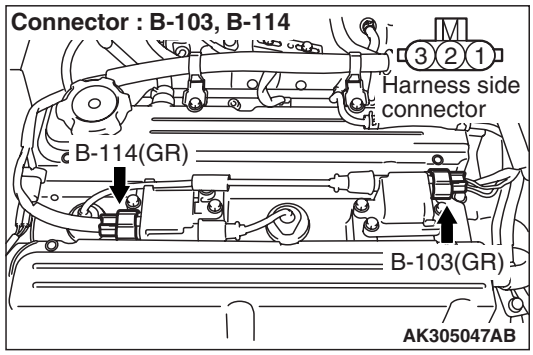
YES : Go to Step 14 .

NO : Check and repair harness between B-103 (terminal No. 2) ignition coil connector and body earth, also between B-114 (terminal No. 2) ignition coil connector and body earth.

- Check earthing line for open circuit and damage.

STEP 14. Check harness between C-208 (terminal No. 2) ignition switch connector and B-103 (terminal No. 1) ignition coil connector, also between C-208 (terminal No. 2) ignition switch connector and B-114 (terminal No. 1) ignition coil connector.





NOTE: Before checking harness, check intermediate connectors A-29, C-129, C-211 and C-214, and repair if necessary.

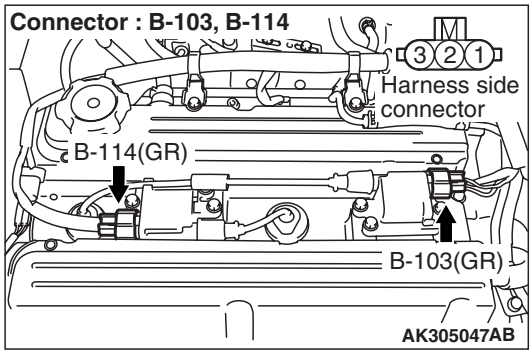
- Check power supply line for damage.

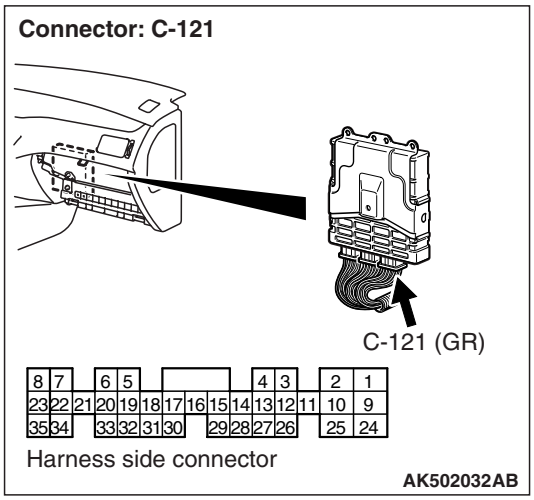
Q: Is the check result normal?

YES : Go to Step 15 .

NO : Repair the damaged harness wire.

STEP 15. Check harness between B-114 (terminal No. 3) ignition coil connector and C-121 (terminal No. 12) engine-ECU connector, also between B-103 (terminal No. 3) ignition coil connector and C-121 (terminal No. 11) engine-ECU connector.



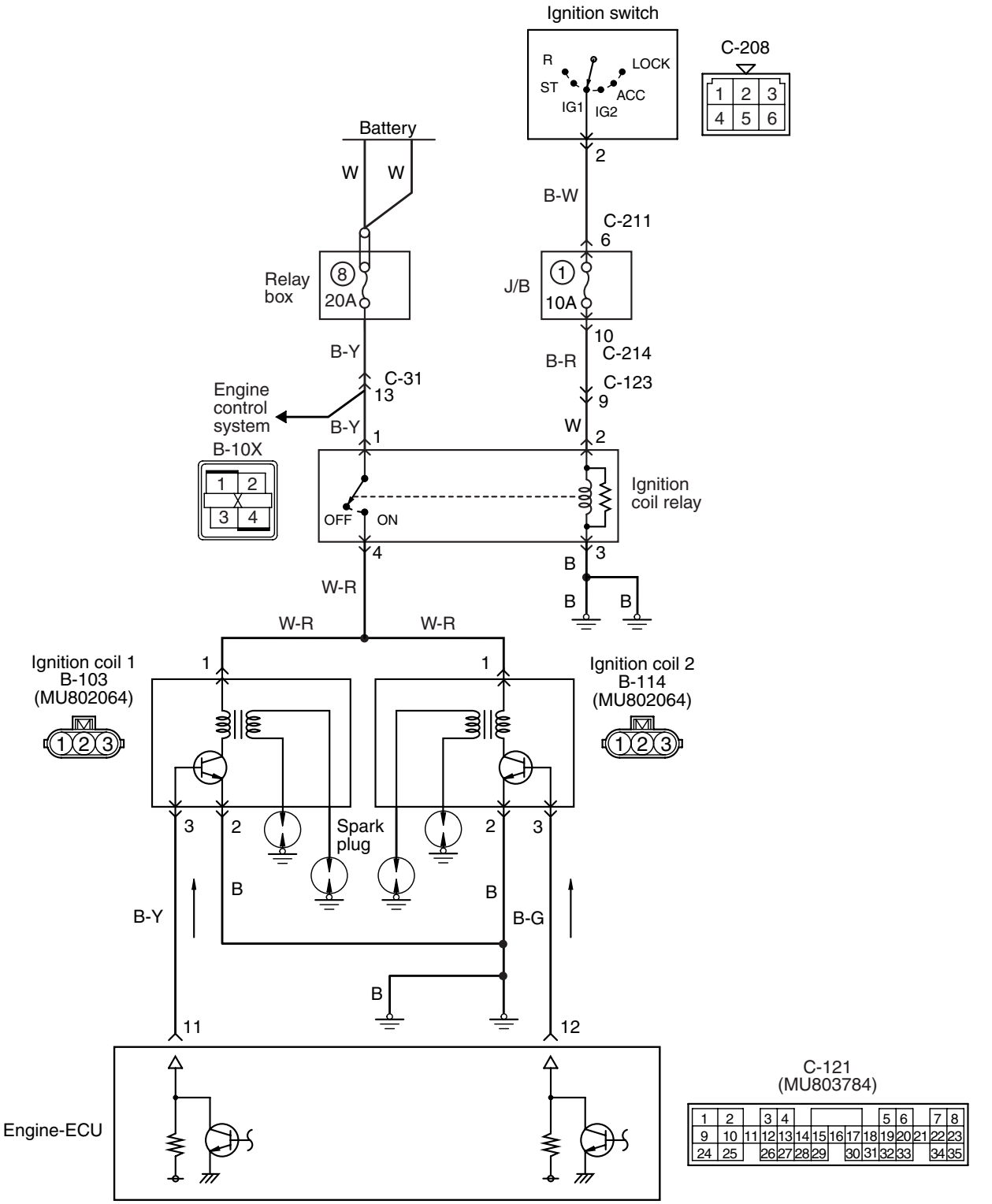


- Check output line for damage.

Q: Is the check result normal?
YES : Go to Step 12 .
NO : Repair the damaged harness wire.

Inspection Procedure 31: Ignition Circuit System <R. H. drive vehicles>

Ignition circuit



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

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OPERATION

- The battery voltage is applied to the ignition coil relay (terminal No. 2) from the ignition switch and is earthed to the vehicle body from the ignition coil relay (terminal No. 3).
- The battery voltage is applied to the ignition coil relay (terminal No. 1) from the battery and is earthed to the vehicle body from the ignition coil (terminal No. 2).
- A power voltage of 12 V is applied to the ignition coil output terminal (terminal No. 3) from the engine-ECU (terminal No. 11 and No. 12).

FUNCTION

- When the engine-ECU makes the power transistor in the unit be in "OFF" position, the battery voltage in the unit is applied to the power transistor unit, and that makes the power transistor unit be in "ON" position. The engine-ECU makes the power transistor in the unit be in "ON", and that makes the power transistor unit be in "OFF" position.
- In response to the signal from the engine-ECU, the power transistor unit is in "ON" position. The primary current is going to the ignition coil. When the power transistor unit is in "OFF" position, the primary current is interrupted and high voltage is generated in the secondary coil.

PROBABLE CAUSES

- Failed ignition coil
- Failed ignition coil relay
- Failed spark plug
- Failed spark plug cable
- Open/short circuit in ignition primary circuit or loose connector contact
- Failed engine-ECU

DIAGNOSIS PROCEDURE

STEP 1. Check spark plug cable itself.

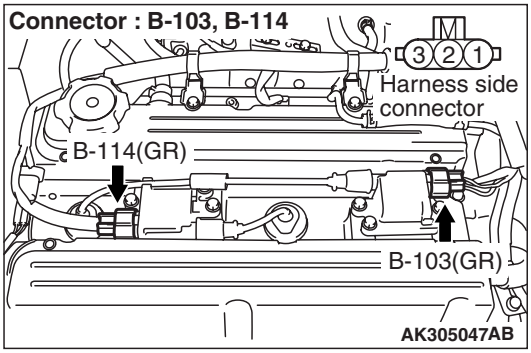
- Check spark plug cable itself (Refer to GROUP 16 – Ignition System – On-vehicle Service P.16-29).

Q: Is the check result normal?
YES : Go to Step 2 .
NO : Replace the spark plug cable.

STEP 2. Check spark plug.

Q: Is the check result normal?
YES : Go to Step 3 .
NO : Replace the spark plug.

STEP 3. Connector check: B-103 and B-114 ignition coil connectors



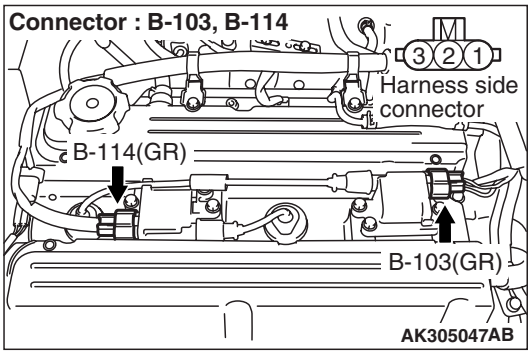
Q: Is the check result normal?
YES : Go to Step 4 .
NO : Repair or replace the connector.

STEP 4. Check ignition coil itself.

- Check ignition coil itself (Refer to GROUP 16 – Ignition System – On-vehicle Service P.16-28).

Q: Is the check result normal?
YES : Go to Step 5 .
NO : Replace the ignition coil.

STEP 5. Perform voltage measurement at B-103 and B-114 ignition coil connectors.

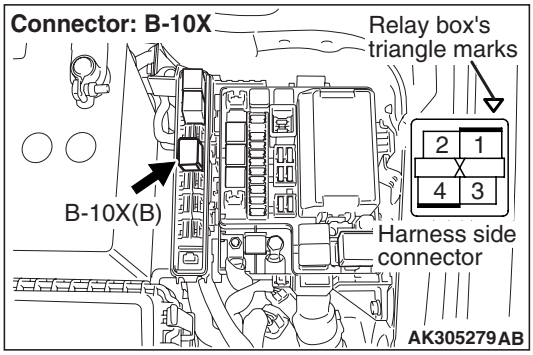


- Disconnect connector, and measure at harness side.
- Ignition switch: "ON"
- Voltage between terminal No. 1 and earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 12 .
NO : Go to Step 6 .

STEP 6. Connector check: B-10X ignition coil relay connector



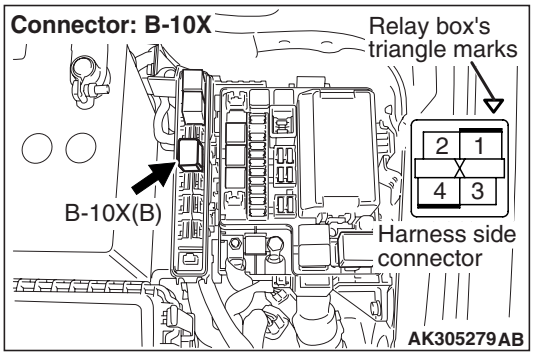
Q: Is the check result normal?
YES : Go to Step 7 .
NO : Repair or replace the connector.

STEP 7. Check ignition coil relay.

- Check ignition coil relay (Refer to GROUP 16 – Ignition System – On-vehicle Service P.16-28).

Q: Is the check result normal?
YES : Go to Step 8 .
NO : Replace the ignition coil relay.

STEP 8. Perform voltage measurement at B-10X ignition coil relay connector.

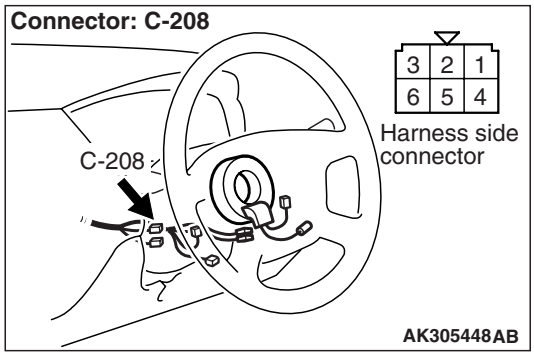


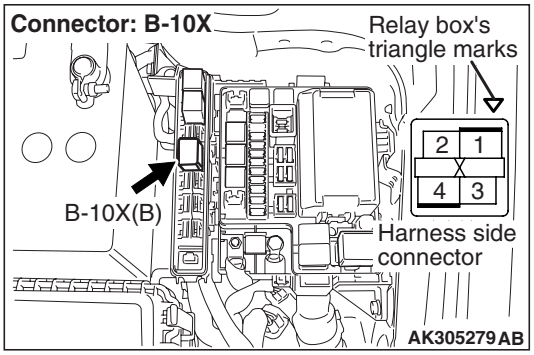
- Remove relay, and measure at relay box side.
- Ignition switch: "ON"
- Voltage between terminal No. 2 and earth.

OK: System voltage

Q: Is the check result normal?
YES : Go to Step 10 .
NO : Go to Step 9 .

STEP 9. Connector check: C-208 ignition switch connector

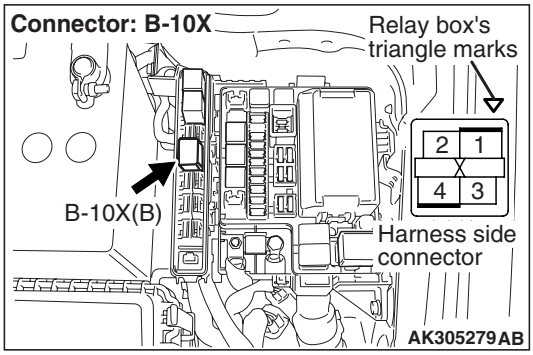




Q: Is the check result normal?
YES : Check intermediate connectors C-123, C-211 and C-214, and repair if necessary. If intermediate connectors are normal, check and repair harness between C-208 (terminal No. 2) ignition switch connector and B-10X (terminal No. 2) ignition coil relay connector.
- Check power supply line for open/short circuit.

NO : Repair or replace the connector.

STEP 10. Perform resistance measurement at B-10X connector.



- Remove relay, and measure at relay box side.
- Resistance between terminal No. 3 and earth.

OK: 2 Ω or less

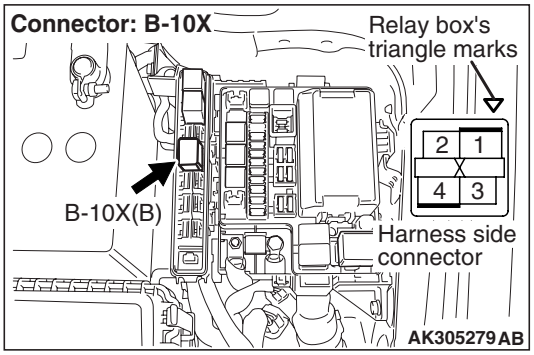
Q: Is the check result normal?

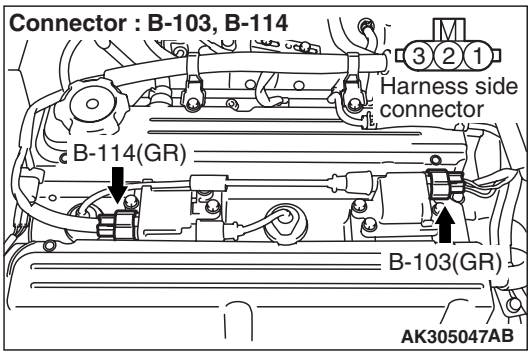
YES : Go to Step 11 .

NO : Check and repair harness between B-10X (terminal No. 3) ignition coil relay connector and body earth.

- Check earthing line for open circuit and damage.

STEP 11. Perform voltage measurement at B-10X ignition coil relay connector.





- Remove relay, and measure at relay box side.
- Voltage between terminal No. 1 and earth.

OK: System voltage

Q: Is the check result normal?

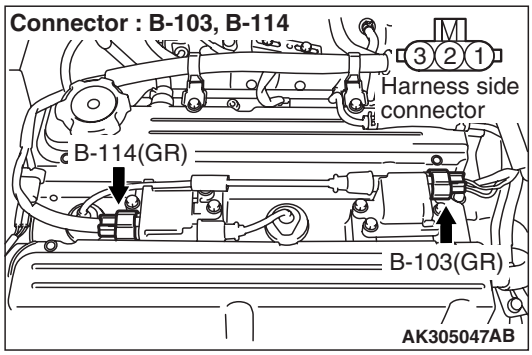
YES : Check and repair harness between B-10X (terminal No. 4) ignition coil relay connector and B-103 (terminal No. 1) ignition coil connector, also between B-10X (terminal No. 4) ignition coil relay connector and B-114 (terminal No. 1) ignition coil connector.

- Check power supply line for open/short circuit.

NO : Check intermediate connector C-31 and repair if necessary. If intermediate connector is normal, check and repair harness between B-10X (terminal No. 1) ignition coil relay connector and battery.

- Check power supply line for open/short circuit.

STEP 12. Perform voltage measurement at B-103 and B-114 ignition coil connectors.

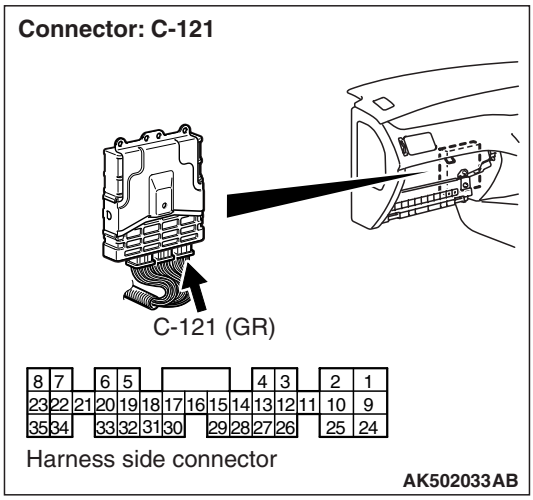


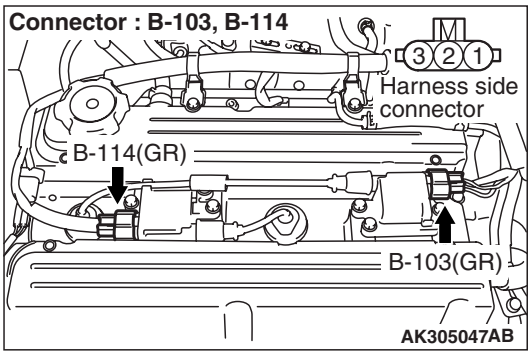
- Disconnect connector, and measure at harness side.
- Engine: Cranking
- Voltage between terminal No. 3 and earth.

OK: 0.5 – 4.0 V

Q: Is the check result normal?
YES : Go to Step 18 .
NO : Go to Step 13 .

STEP 13. Perform voltage measurement at C-121 engine-ECU connector.



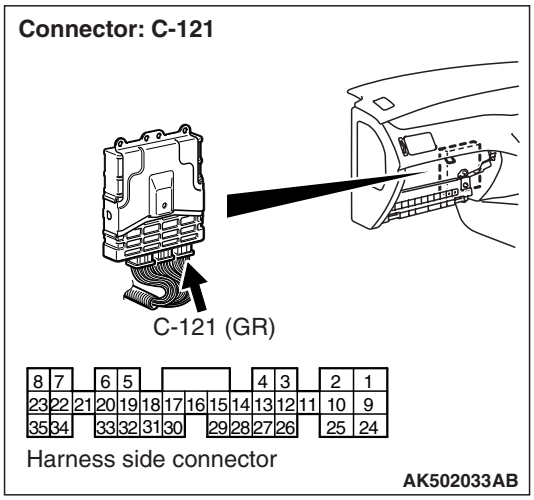


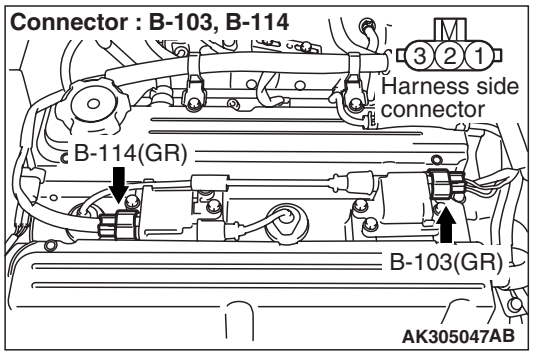
- Measure engine-ECU terminal voltage.
- Disconnect B-103 and B-114 ignition coil connectors.
- Engine: Cranking
- Voltage between terminal No. 11 and earth, also between terminal No. 12 and earth.

OK: 0.5 – 4.0 V

Q: Is the check result normal?
YES : Go to Step 14 .
NO : Go to Step 15 .

STEP 14. Connector check: C-121 engine-ECU connector





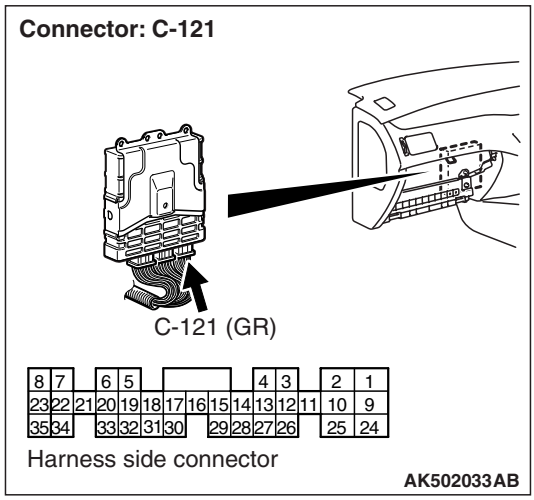
Q: Is the check result normal?

YES : Check and repair harness between B-114 (terminal No. 3) ignition coil connector and C-121 (terminal No. 12) engine-ECU connector, also between B-103 (terminal No. 3) ignition coil connector and C-121 (terminal No. 11) engine-ECU connector.

- Check output line for open circuit.

NO : Repair or replace the connector.

STEP 15. Connector check: C-121 engine-ECU connector

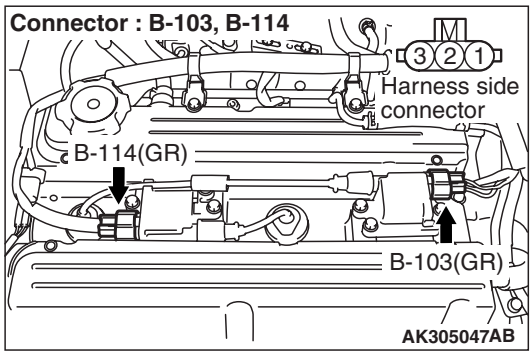


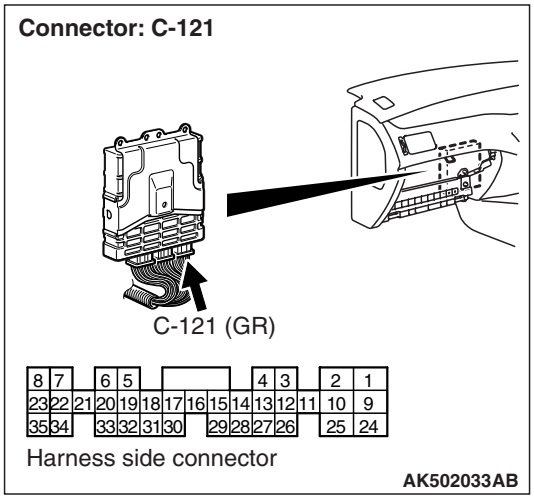
Q: Is the check result normal?

YES : Go to Step 16 .

NO : Repair or replace the connector.

STEP 16. Check harness between B-114 (terminal No. 3) ignition coil connector and C-121 (terminal No. 12) engine-ECU connector, also between B-103 (terminal No. 3) ignition coil connector and C-121 (terminal No. 11) engine-ECU connector.





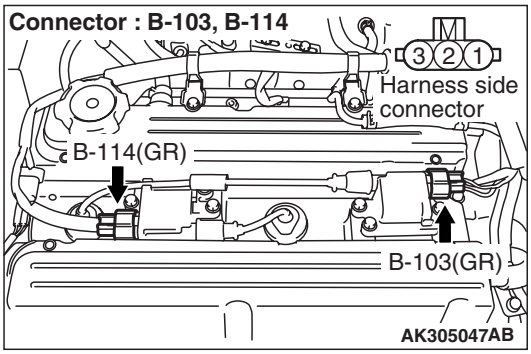
- Check output line for short circuit.

Q: Is the check result normal?
YES : Go to Step 17 .
NO : Repair the damaged harness wire.

STEP 17. Check the trouble symptoms.

Q: Does trouble symptom persist?
YES : Replace the engine-ECU.
NO : Intermittent malfunction (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points P.00-5).

STEP 18. Perform resistance measurement at B-103 and B-114 ignition coil connectors.



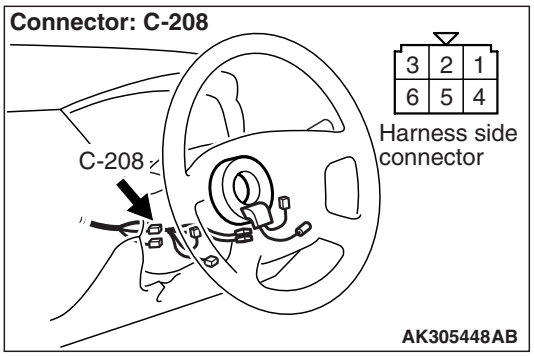
- Disconnect connector, and measure at harness side.
- Resistance between terminal No. 2 and earth.

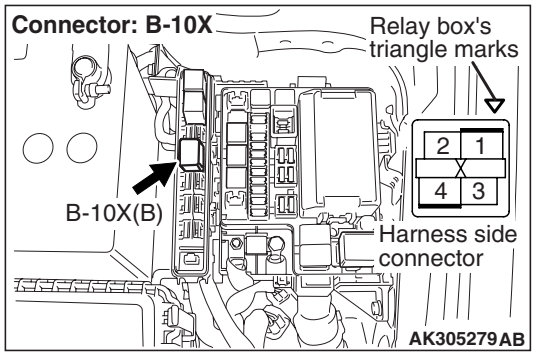
OK: 2 Ω or less

Q: Is the check result normal?
YES : Go to Step 19 .
NO : Check and repair harness between B-103 (terminal No. 2) ignition coil connector and body earth, also between B-114 (terminal No. 2) ignition coil connector and body earth.

- Check earthing line for open circuit and damage.

STEP 19. Check harness between C-208 (terminal No. 2) ignition switch connector and B-10X (terminal No. 2) ignition coil relay connector.



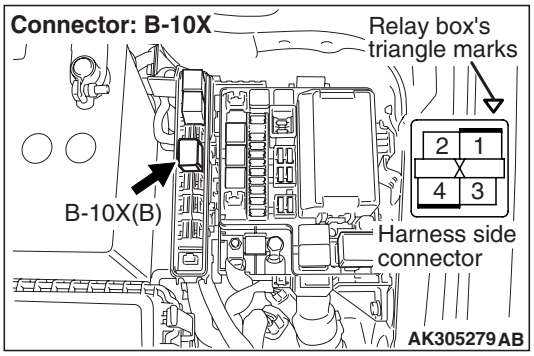


NOTE: Before checking harness, check intermediate connectors C-123, C-211 and C-214, and repair if necessary.

- Check power supply line for damage.

Q: Is the check result normal?
YES : Go to Step 20 .
NO : Repair the damaged harness wire.

STEP 20. Check harness between battery and B-10X (terminal No. 1) ignition coil relay connector.

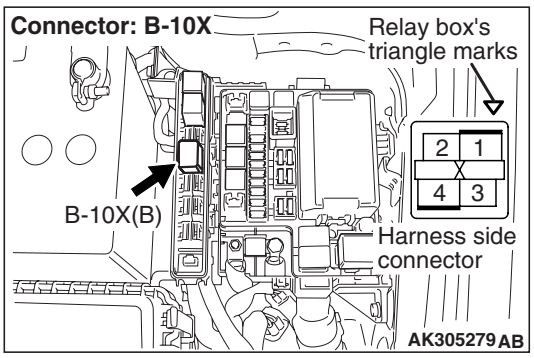


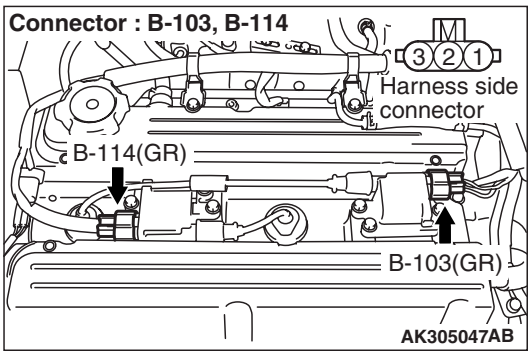
NOTE: Before checking harness, check intermediate connector C-31 and repair if necessary.

- Check power supply line for damage.

Q: Is the check result normal?
YES : Go to Step 21 .
NO : Repair the damaged harness wire.

STEP 21. Check harness between B-10X (terminal No. 4) ignition coil relay connector and B-103 (terminal No. 1) ignition coil connector, also between B-10X (terminal No. 4) ignition coil relay connector and B-114 (terminal No. 1) ignition coil connector.

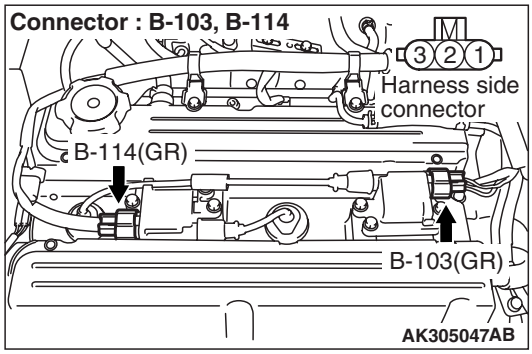


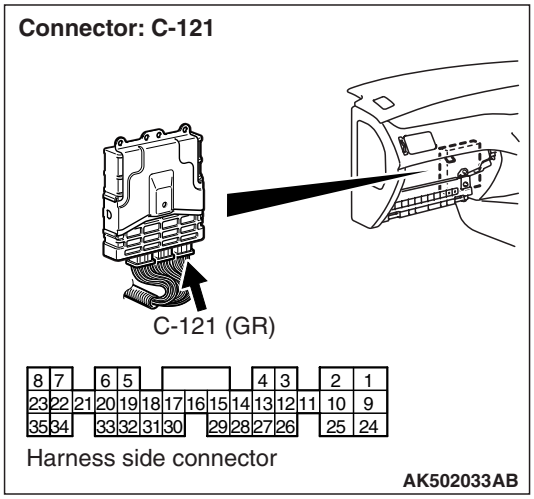


- Check power supply line for damage.

Q: Is the check result normal?
YES : Go to Step 22 .
NO : Repair the damaged harness wire.

STEP 22. Check harness between B-103 (terminal No. 3) ignition coil connector and C-121 (terminal No. 12) engine-ECU connector, also between B-114 (terminal No. 3) ignition coil connector and C-121 (terminal No. 11) engine-ECU connector.





- Check output line for damage.

Q: Is the check result normal?
YES : Go to Step 17 .
NO : Repair the damaged harness wire.

DATA LIST REFERENCE TABLE

M1131152002117

Item No.	Inspection item	Inspection condition		Normal condition	Inspection procedure No.	Reference page
11	Oxygen sensor	Engine: After warm-up (leaner by deceleration, richer by acceleration)	Excessive deceleration from 4,000 r/min	200 mV or less	Code No. P0130	P.13A-75
			At excessive acceleration	600 – 1,000 mV		
		Engine: After warm-up (using oxygen sensor, check air-fuel ratio as well as control status by engine-ECU.	Idle operation	400 mV or less ⇔ 600 – 1,000 mV (altered)		
			2,500 r/min			
12	Air flow sensor *1	• Engine coolant temperature: 80 –95°C • Lamps, electric cooling fan and all accessories: OFF • Transmission: Neutral	Idle operation	17 – 43 Hz	–	–
			2,500 r/min	40 – 100 Hz		
			Acceleration	According to acceleration, frequency is amplified.		
13	Intake air temperature sensor	Ignition switch: "ON" or engine running	Intake air temperature: –20°C	–20°C	Code No. P0110	P.13A-45
			Intake air temperature: 0°C	0°C		
			Intake air temperature: 20°C	20°C		
			Intake air temperature: 40°C	40°C		
			Intake air temperature: 80°C	80° C		
14	Throttle position sensor	Ignition switch: "ON"	Release accelerator pedal fully	535 – 735 mV	Code No. P0120	P.13A-60
			Depress accelerator pedal gradually	Increased according to accelerator pedal stroke		
			Depress accelerator pedal fully	4,500 – 5,000 mV		
16	Power supply voltage	Ignition switch: "ON"		System voltage	Procedure No. 23	P.13A-302
18	Cranking signal (ignition switch-ST)	Ignition switch: "ON"	Engine: Stopped	OFF	Procedure No. 23	P.13A-302
			Engine: Cranking	ON		

Item No.	Inspection item	Inspection condition		Normal condition	Inspection procedure No.	Reference page
21	Engine coolant temperature sensor	Ignition switch: "ON" or engine running	Coolant temperature: −20°C	−20°C	Code No. P0115	P.13A-52
			Coolant temperature: 0°C	0°C		
			Coolant temperature: 20°C	20°C		
			Coolant temperature: 40°C	40°C		
			Coolant temperature: 80°C	80°C		
22	Crank angle sensor	• Engine: Cranking • Tachometer: Connected	Compare engine speed on tachometer with the value displayed on M.U.T.-II/III	Matched	–	–
		Engine: Idle operation	Coolant temperature: −20°C	1,200 – 1,400 r/min		
			Coolant temperature: 0°C	1,200 – 1,400 r/min		
			Coolant temperature: 20°C	1,200 – 1,400 r/min		
			Coolant temperature: 40°C	1,050 – 1,250 r/min		
			Coolant temperature: 80°C	750 – 950 r/min		
25	Barometric pressure sensor	Ignition switch: "ON"	Altitude: 0 m	101 kPa	Code No.P0105	P.13A-35
			Altitude: 600 m	95 kPa		
			Altitude: 1,200 m	88 kPa		
			Altitude: 1,800 m	81 kPa		
27	Power steering fluid pressure switch	Engine: Idle operation	Steering wheel: Not operated	OFF	Code No.P0551	P.13A-197
			Steering wheel: Operated	ON		
28	A/C switch	Engine: Idle	AC switch: OFF	OFF	Procedure No. 27	P.13A-341
			AC switch: ON / A/C compressor is not driven	OFF		
			AC switch: ON / A/C compressor is driven	ON		
34	Air flow sensor reset signal	Engine: After engine warm-up	Idle operation	ON	Code No. P0100	P.13A-24
			3,000 r/min	OFF		

Item No.	Inspection item	Inspection condition		Normal condition	Inspection procedure No.	Reference page
37	Volumetric efficiency	• Engine coolant temperature: 80 – 95°C • Lamps, electric cooling fan and all accessories: OFF	Idle operation	15 – 35%	–	–
			2,500 r/min	15 – 35%		
			Excessive acceleration	According to acceleration, volumetric efficiency is increased.		
41	Injectors *2	Engine: Cranking	Coolant temperature: 0°C (all cylinders in simultaneous injecting operation)	18 – 307 ms	–	–
			Coolant temperature: 20°C	7.0 – 12 ms		
			Coolant temperature: 80°C	2.9 – 4.9 ms		
	Injectors *3	• Engine coolant temperature: 80 – 95°C • Lamps, electric cooling fan and all accessories: OFF • Transmission: Neutral	Idle operation	1.5 – 2.7 ms		
			2,500 r/min	1.2 – 2.4 ms		
			Excessive acceleration	Increased		
44	Ignition advance	• Engine: After warm-up • Install timing light (for use to measure actual ignition timing)	Idle operation	0 – 10° BTDC	–	–
			2,500 r/m	20 – 40° BTDC		
45	Idle speed control (stepper motor) servo position *4	• Engine coolant temperature: 80 – 95°C • Lighting, electric cooling fan and accessories: OFF • Transmission: Neutral • Engine: Idle operation (When A/C switch is ON, A/C compressor must be ON)	A/C switch: OFF	2 – 25 steps	–	–
			A/C switch: OFF → ON	Increased 10 – 70 steps		

Item No.	Inspection item	Inspection condition			Normal condition	Inspection procedure No.	Reference page
49	A/C relay	Engine: After warm-up, idle operation after warm-up	A/C switch: OFF		OFF	Procedure No. 28	P.13A-344
			A/C switch: ON	A/C compressor is not driven	OFF		
				A/C compressor is driven	ON		
59	Oxygen sensor (rear)	Engine: After warm-up	At excessive acceleration		0 mV or less ⇔ 600 – 1,000 mV (altered)	Code No.P0136	P.13A-88
7E	Variable valve timing phase angle	Engine: After warm-up	Idling without load		0 – 5°CA	–	–
			2,500 r/min without any load		8 – 12°CA		
12 *5	Air flow sensor	• Engine coolant temperature: 80 –95°C • Lamps, electric cooling fan and all accessories: OFF • Transmission: Neutral	Idle operation		19 – 6.7 gm/s	–	–
			2,500 r/min		7.9 – 12.1 gm/s		
			Acceleration		According to acceleration, frequency is amplified.		
13 *5	Intake air temperature sensor	Ignition switch: "ON" or engine running	Intake air temperature: –20°C		–20°C	Code No. P0110	P.13A-45
			Intake air temperature: 0°C		0°C		
			Intake air temperature: 20°C		20°C		
			Intake air temperature: 40°C		40°C		
			Intake air temperature: 80°C		80° C		
21 *5	Engine coolant temperature sensor	Ignition switch: "ON" or engine running	Coolant temperature: –20°C		–20°C	Code No. P0115	P.13A-52
			Coolant temperature: 0°C		0°C		
			Coolant temperature: 20°C		20°C		
			Coolant temperature: 40°C		40°C		
			Coolant temperature: 80°C		80°C		

Item No.	Inspection item	Inspection condition		Normal condition	Inspection procedure No.	Reference page
22 *5	Crank angle sensor	• Engine: Cranking • Tachometer: Connected	Compare engine speed on tachometer with the value displayed on M.U.T.-II/III	Matched	–	–
		Engine: Idle operation	Coolant temperature: –20°C	1,200 – 1,400 r/min		
			Coolant temperature: 0°C	1,200 – 1,400 r/min		
			Coolant temperature: 20°C	1,200 – 1,400 r/min		
			Coolant temperature: 40°C	1,050 – 1,250 r/min		
			Coolant temperature: 80°C	750 – 950 r/min		
24 *5	Vehicle speed sensor	Drive 40 km/h		Approximately 40 km/h	Code No. P0500	P.13A-187
81 *5	Long-term fuel compensation	Engine: After warm-up 2,500 r/min without any load (during closed loop)		–12.5 to 12.5%	Code No. P0170	P.13A-101
82 *5	Shot-term fuel compensation	Engine: After warm-up 2,500 r/min without any load (during closed loop)		–20 to 20%	Code No. P0170	P.13A-101
87 *5	Calculation load value	Engine: After warm-up	Idle operation	15 – 35%	–	–
			2,500 r/min	15 – 35%		
88 *5	Fuel control condition	Engine: After warm-up	2,500 r/min	Closed loop	–	–
			Acceleration	Open loop –drive condition		
8A *5	Throttle position sensor (Throttle opening angle)	Ignition switch: "ON"	Set to Idle position	0 – 1%	Code No. P0120	P.13A-60
			Release accelerator pedal gradually	Increased according to accelerator pedal stroke		
			Release accelerator pedal fully	80 – 100%		

Item No.	Inspection item	Inspection condition		Normal condition	Inspection procedure No.	Reference page
A1 *5	Oxygen sensor	Engine: After warm-up (leaner by deceleration, richer by acceleration)	Excessive deceleration from 4,000 r/min	0.2 V or less	Code No. P0130	P.13A-75
			At excessive acceleration	0.6 – 1 V		
		Engine: After warm-up (using oxygen sensor, check air-fuel ratio as well as control status by engine-ECU.	Idle operation	0.2 V or less		
			2,500 r/min	0.6 – 1 V		
A2 *5	Oxygen sensor (rear)	Engine: After warm-up	At excessive acceleration	0 V or less ⇔ 0.6 – 1 V (altered)	Code No.P0136	P.13A-88

NOTE:

**1: On the new vehicle (mileage: 500 km or less), air flow sensor output frequency may be higher by approximately 10%.*

**2: Injector drive time ranges shown are when power voltage is 11 V and the cranking speed is 250 r/min. or less.*

**3: On the new vehicle (mileage: 500 km or less), injector drive time may be longer by approximately 10%.*

**4: On the new vehicle (mileage: 500 km or less), the number of steps of stepper motor may be larger by approximately 30 steps.*

**5: When service data in check mode is selected, the data is not displayed.*

ACTUATOR TEST REFERENCE TABLE

M1131152501324

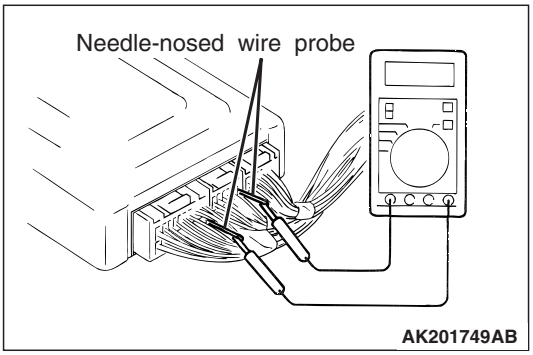
Item No.	Inspection item	Drive content	Inspection conditions		Normal condition	Code No. /Inspection procedure No.	Reference page
01	Injector	Cut off No. 1 injector	Engine: After warm-up, idle operation (Cut off injectors sequentially to check for a cylinder that does not change engine in idle status.		Engine is changed (becomes unstable or stalled)	Code No. P0201	P.13A-105
02		Cut off No. 2 injector				Code No. P0202	P.13A-111
03		Cut off No. 3 injector				Code No. P0203	P.13A-117
04		Cut off No. 4 injector				Code No. P0204	P.13A-123
07	Fuel pump	Drive fuel pump to circulate fuel	Ignition switch: "ON"	Hold return hose with fingers to feel pulse of fuel flowing	Pulse is felt	Procedure No. 24	P.13A-313
				Check for pump operating noise near fuel tank	Operating noise audible		
08	Purge control solenoid valve	Switch solenoid valve from OFF to ON	Ignition switch: "LOCK" (OFF)		When the valve is actuated, operating noise is audible	Code No. P0443	P.13A-182
09	Fuel pressure control solenoid valve	Switch solenoid valve from OFF to ON	Ignition switch: "ON"		When the valve is actuated, operating noise is audible	Code No. P0090	P.13A-19
10	EGR control solenoid valve	Switch solenoid valve from OFF to ON	Ignition switch: "ON"		When the valve is actuated, operating noise is audible.	Code No. P0403	P.13A-175
12	Waste gate solenoid valve	Switch solenoid valve from OFF to ON	Ignition switch: "ON"		When the valve is actuated, operating noise is audible	Code No. P0243	P.13A-130
13	Fuel pump relay 3	Fuel pump Relay 3 turns from OFF to ON	Ignition switch: "ON"		Sound of Operation is heard	Procedure No. 24	P.13A-313
17	Basic ignition timing	Switch engine-ECU to ignition timing adjusting mode	• Engine: Idle operation • Install timing light		5° BTDC	–	–

Item No.	Inspection item	Drive content	Inspection conditions	Normal condition	Code No. /Inspection procedure No.	Reference page
21	Fan controller	Actuate fan motor	• Ignition switch: "ON" • A/C switch: ON	Fan motor is rotated	Procedure No. 25	P.13A-324
37	Condenser fan (high)	Condenser fan motor is driven.	Ignition switch: "ON"	Fan motor rotates at high speed	Procedure No. 26	P.13A-330
38	Condenser fan (low)	Condenser fan motor is driven.	Ignition switch: "ON"	Fan motor rotates at low speed		

CHECK AT THE ENGINE-ECU TERMINALS

M1131153500744

TERMINAL VOLTAGE CHECK CHART



1. Connect a needle-nosed wire probe to a voltmeter probe.
2. Insert the needle-nosed wire probe into each of the engine-ECU connector terminals from the wire side, and measure the voltage while referring to the check chart.

NOTE:

1. *Make the voltage measurement with the engine-ECU connector connected.*
2. *You may find it convenient to pull out the engine-ECU to make it easier to reach the connector terminals.*
3. *The checks can be carried out off the order given in the chart.*

⚠ CAUTION

Short-circuiting the positive (+) probe between a connector terminal and earth could damage the vehicle wiring, the sensor, engine-ECU or all of them. Be careful to prevent this!

3. If voltmeter shows any division from standard value, check the corresponding sensor, actuator and related electrical wiring, then repair or replace.
4. After repair or replacement, recheck with the voltmeter to confirm that the repair has corrected the problem.

Engine-ECU Connector Terminal Arrangement

Terminal No.	Check item	Check condition (Engine condition)	Normal condition
1	No. 1 injector	While engine is idling after having warmed up, suddenly depress the accelerator pedal.	From 11 – 14 V, momentarily drops slightly
9	No. 2 injector		
24	No. 3 injector		
2	No. 4 injector		
3	Oxygen sensor heater (front)	Engine: Idling after warming up	1 V or less
		Engine r/min: 5,000 r/min	System voltage
6	EGR control solenoid valve	Ignition switch: "ON"	System Voltage
		While engine is idling, suddenly depress the accelerator pedal.	From system voltage, momentarily drops
8	Alternator G terminal	• Engine: Warm, idle (radiator fan: OFF) • Headlamp: OFF → ON • Stop lamp: OFF → ON • Rear defogger switch: OFF → ON	Voltage increases by 0.2 – 3.5 V
11	Ignition coil – No. 1, No. 4	Engine r/min: 3,000 r/min	0.3 – 3.0 V
12	Ignition coil – No. 2, No. 3		
14	Stepper motor coil <A1>	• Engine: Soon after the warmed up engine is started • A/C switch: OFF → ON (A/C compressor is operating) • Headlight switch: OFF → ON	System voltage ⇔ 1V or less (Changes repeatedly)
28	Stepper motor coil <A2>		
15	Stepper motor coil <B1>		
29	Stepper motor coil <B2>		
16	Purge control solenoid valve	Ignition switch: "ON"	System voltage
		Running at 3,500 r/min while engine is warming up after having been started.	1 V or less
18	Fan controller	Radiator fan is not operating	0 – 0.3 V
		Radiator fan is operating	0.7 V or more
19	Air flow sensor reset signal	Engine: Idle speed	0 – 1 V
		Engine r/min: 3,000 r/min	6 – 9 V
20	A/C relay	• Engine: Idle speed • A/C switch: OFF → ON (A/C compressor is operating)	System voltage or Momentarily 6 V or more → 1 V or less
21	Fuel pump relay 2	Ignition switch: "ON"	System voltage
		Engine: Idle speed	1 V or less
22	Engine warning lamp	Ignition switch: "LOCK" (OFF) → "ON"	1 V or less → System voltage (After several seconds have elapsed)
26	Oxygen sensor heater (rear)	Engine: Idling after warming up	1 V or less
		Engine: Racing	System voltage

Terminal No.	Check item	Check condition (Engine condition)		Normal condition
30	Condenser fan motor relay (high)	Fan inactive state (Engine coolant temperature: 90°C or less)		System voltage
		Fan high-speed rotation state (Engine coolant temperature: 105°C or less)		1 V or less
31	Condenser fan motor relay (low)	Fan inactive state (Engine coolant temperature: 90°C or less)		System voltage
		Fan low-speed rotation state (Engine coolant temperature: 95 – 100°C or less)		1 V or less
33	Oil feeder control valve	Ignition switch: "ON"		System voltage
		High-load running		4.0 – 10 V
41	Waste gate solenoid valve	Ignition switch: "ON"		System voltage
		Engine: After warm-up, idle operation (When using premium gasoline)		1 V or less
42	Sensor impressed voltage	Ignition switch: "ON"		4.9 – 5.1 V
43	Crank angle sensor	Engine: Cranking		0.4 – 4.0 V
		Engine: Idling speed		1.5 – 2.5 V
44	Engine coolant temperature sensor	Ignition switch: "ON"	When engine coolant temperature is –20°C	3.9 – 4.5 V
			When engine coolant temperature is 0°C	3.2 – 3.8 V
			When engine coolant temperature is 20°C	2.3 – 2.9 V
			When engine coolant temperature is 40°C	1.3 – 1.9 V
			When engine coolant temperature is 60°C	0.7 – 1.3 V
			When engine coolant temperature is 80°C	0.3 – 0.9 V
45	Tachometer signal	Engine r/min: 3,000 r/min		0.3 – 3.0 V
47	Power supply	Ignition switch: "ON"		System voltage
59				
48	Fuel pressure control solenoid valve	Ignition switch: "ON"		System voltage
		Engine: Cranking → Idle operation (within approximately 2 minutes or less)		1 V or less → System voltage
50	Exhaust camshaft position sensor	Engine: Cranking		0.4 – 3.0 V
		Engine: Idling		1.5 – 3.0 V
51	Barometric pressure sensor	Ignition switch: "ON"	Altitude: 0 m	3.8 – 4.2 V
			Altitude: 600 m	3.5 – 3.9 V
			Altitude: 1,200 m	3.3 – 3.7 V
			Altitude: 1,800 m	3.0 – 3.4 V

Terminal No.	Check item	Check condition (Engine condition)		Normal condition
52	Alternator FR terminal	• Engine: Warm, idle (radiator fan: OFF) • Headlamp: OFF → ON • Stop lamp: OFF → ON • Rear defogger switch: OFF → ON		Voltage decreases
53	Intake camshaft position sensor	Engine: Cranking		0.4 – 3.0 V
		Engine: Idling		1.5 – 3.0 V
54	Power steering fluid pressure switch	Engine: Idling after warming up	When steering wheel is stationary	System voltage
			When steering wheel is turned	1 V or less
55	Fuel pump relay 3	While engine is idling, suddenly depress the accelerator pedal.		Temporarily rises slightly from 1 V or less.
57	Control relay (Power supply)	Ignition switch: "LOCK" (OFF)		System voltage
		Ignition switch: "ON"		1 V or less
60	Backup power supply	Ignition switch: "LOCK" (OFF)		System voltage
61	Air flow sensor	Engine: Idle speed		2.2 – 3.2 V
		Engine r/min: 2,500 r/min		
62	Intake air temperature sensor	Ignition switch: "ON"	When intake air temperature is –20°C	3.8 – 4.4 V
			When intake air temperature is 0°C	3.2 – 3.8 V
			When intake air temperature is 20°C	2.3 – 2.9 V
			When intake air temperature is 40°C	1.5 – 2.1 V
			When intake air temperature is 60°C	0.8 – 1.4 V
			When intake air temperature is 80°C	0.4 – 1.0 V
65	A/C load signal	Refer to GROUP 55 - Troubleshooting (Inspection at the Automatic compressor - ECU Terminal)		
68	Ignition switch-ST	Engine: Cranking		8 V or more
71	Oxygen sensor (front)	Engine: Running at 2,500 r/min after warmed up (Check using a digital type voltmeter)		0 ⇔ 0.8 V (Changes repeatedly)
73	Oxygen sensor (rear)	Engine: Idling after warmed up (Check using a digital type voltmeter)		0 ⇔ 0.6 V (Changes repeatedly)
78	Throttle position sensor	Ignition switch: "ON"	Set throttle valve to idle Position	0.535 – 0.735 V
			Fully open throttle valve	4.4 – 5.3 V
80	Vehicle speed sensor	• Ignition switch: "ON" • Move the vehicle forword slowly		0 ⇔ 5 V Changes repeatedly

Terminal No.	Check item	Check condition (Engine condition)		Normal condition
83	A/C switch	Engine: Idle speed	Turn the A/C switch OFF	0.5 V or less
			Turn the A/C switch ON (A/C compressor is operating)	System voltage
96	Transmission oil temperature sensor	Ignition switch: "ON"	Transmission oil temperature is –20°C	3.9 – 4.5 V
			Transmission oil temperature is 0°C	3.2 – 3.8 V
			Transmission oil temperature is 20°C	2.3 – 2.9 V
			Transmission oil temperature is 40°C	1.3 – 1.9 V
			Transmission oil temperature is 60°C	0.7 – 1.3 V
			Transmission oil temperature is 80°C	0.3 – 0.9 V
99	Ignition switch-IG	Ignition switch: "ON"		System voltage

CHECK CHART FOR RESISTANCE AND CONTINUITY BETWEEN TERMINALS

1. Turn the ignition switch to "LOCK" (OFF) position.
2. Disconnect the engine-ECU connector.
3. Measure the resistance and check for continuity between the terminals of the engine-ECU harness-side connector while referring to the check chart.

   NOTE:
   1. *When measuring resistance and checking continuity, a harness for checking contact pin pressure should be used instead of inserting a test probe.*
   2. *Checking need not be carried out in the order given in the chart.*

⚠ CAUTION

If the terminals that should be checked are mistaken, or if connector terminals are not correctly shorted to earth, damage may be caused to the vehicle wiring, sensors, engine-ECU and/or ohmmeter. Be careful to prevent this!

4. If the ohmmeter shows any deviation from the standard value, check the corresponding sensor, actuator and related electrical wiring, and the repair or replace.
5. After repair or replacement, recheck with the ohmmeter to confirm that the repair or replacement has corrected the problem.

Engine-ECU Harness Side Connector Terminal Arrangement

Terminal No.	Inspection item	Normal condition (Check condition)
1 – 47	No. 1 injector	2 – 3 Ω (At 20°C)
9 – 47	No. 2 injector	
24 – 47	No. 3 injector	
2 – 47	No. 4 injector	
47 – 48	Fuel pressure control solenoid valve	28 – 36 Ω (At 20°C)
14 – 47	Stepper motor coil (A1)	26 – 33 Ω (At 20°C)
28 – 47	Stepper motor coil (A2)	
15 – 47	Stepper motor coil (B1)	
29 – 47	Stepper motor coil (B2)	
6 – 47	EGR control solenoid valve	29 – 35 Ω (At 20°C)
16 – 47	Purge control solenoid valve	30 – 34 Ω (At 20°C)
41 – 47	Waste gate solenoid valve	29 – 35 Ω (At 20°C)
3 – 47	Oxygen sensor heater (rear)	11 – 18 Ω (At 20°C)
26 – 47	Oxygen sensor heater (front)	4.5 – 8.0 Ω (At 20°C)
33 – 47	Oil feeder control valve	6.9 – 7.9 Ω (At 20°C)
46 – Body earth	ECU earth	Continuity (2 Ω or less)
58 – Body earth		
42 – 62	Intake air temperature sensor	13 – 17 kΩ (When intake air temperature is –20°C)
		5.3 – 6.7 kΩ (When intake air temperature is 0°C)
		2.3 – 3.0 kΩ (When intake air temperature is 20°C)
		1.0 – 1.5 kΩ (When intake air temperature is 40°C)
		0.56 – 0.76 kΩ (When intake air temperature is 60°C)
		0.30 – 0.42 kΩ (When intake air temperature is 80°C)
42 – 44	Engine coolant temperature sensor	14 – 17 kΩ (When coolant temperature is –20°C)
		5.1 – 6.5 kΩ (When coolant temperature is 0°C)
		2.1 – 2.7 kΩ (When coolant temperature is 20°C)
		0.9 – 1.3 kΩ (When coolant temperature is 40°C)
		0.48 – 0.68 kΩ (When coolant temperature is 60°C)
		0.26 – 0.36 kΩ (When coolant temperature is 80°C)

Terminal No.	Inspection item	Normal condition (Check condition)
42 – 96	Transmission oil temperature sensor	14 – 17 kΩ (When transmission oil temperature is –20°C)
		5.1 – 6.5 kΩ (When transmission oil temperature is 0°C)
		2.1 – 2.7 kΩ (When transmission oil temperature is 20°C)
		0.9 – 1.3 kΩ (When transmission oil temperature is 40°C)
		0.48 – 0.68 kΩ (When transmission oil temperature is 60°C)
		0.26 – 0.36 kΩ (When transmission oil temperature is 80°C)

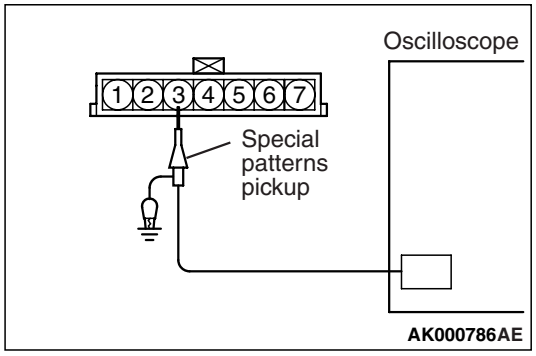
INSPECTION PROCEDURE USING OSCILLOSCOPE

M1131154501483

The output signals of the sensors and the conditions of the actuation signals of the actuators can be inspected visually by observing the waveforms on the oscilloscope.

AIR FLOW SENSOR (AFS)

Measurement Method



1. Disconnect the air flow sensor connector, and connect the special tool test harness (MB991709) in between (All terminals should be connected).
2. Connect the oscilloscope special patterns pickup to air flow sensor connector terminal No. 3.

Alternate Method (Test harness not available)

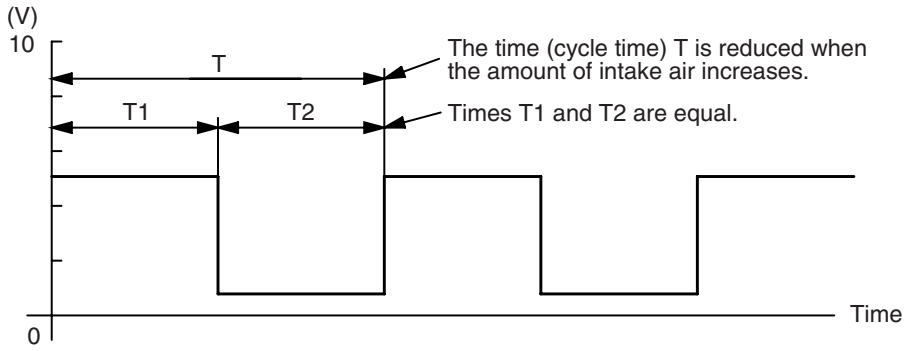
1. Connect the oscilloscope special patterns pickup to engine-ECU terminal No. 61.

Standard Wave Pattern

Observation conditions

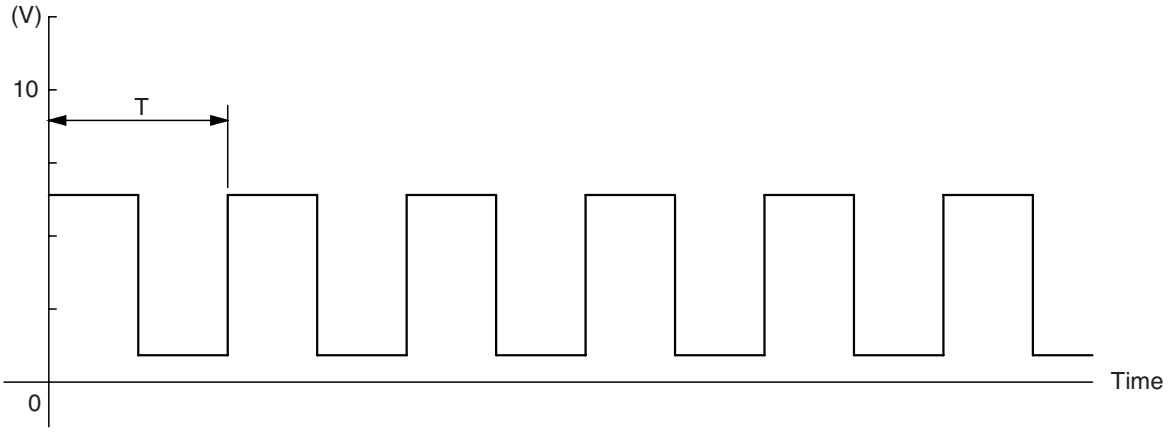
Function	Special patterns
Pattern height	Low
Pattern selector	Display
Engine speed	Idle

Standard wave pattern



AK202334AC

Observation conditions (from conditions above engine is increased by racing.)

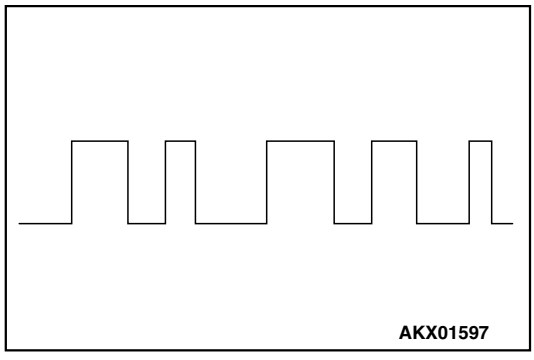


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Wave Pattern Observation Points

Check that cycle time T becomes shorter and the frequency increases when the engine speed is increased.

Examples of Abnormal Wave Patterns



- Example 1

  Cause of problem
  Sensor interface malfunction

  Wave pattern characteristics
  Rectangular wave pattern is output even when the engine is not started.

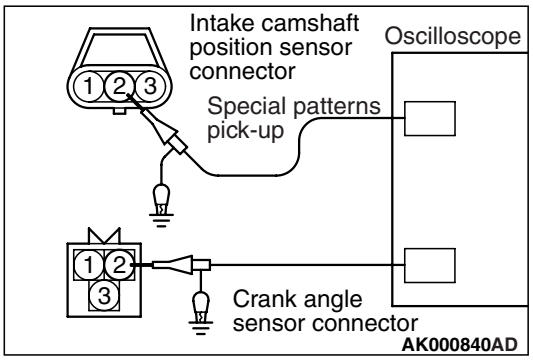
- Example 2

  Cause of problem
  Damaged rectifier or vortex generation column

  Wave pattern characteristics
  Unstable wave pattern with non-uniform frequency. However, when an ignition leak occurs during acceleration, the wave pattern will be distorted temporarily, even if the air flow sensor is normal.

INTAKE CAMSHAFT POSITION SENSOR

Measurement Method



1. Disconnect the camshaft position sensor connector and connect the special tool test harness (MB991709) in between (All terminals should be connected).
2. Connect the oscilloscope special pattern pickup to camshaft position sensor terminal No. 2.
3. To check the state of the intake camshaft position sensor output signal, observe its synchronicity with the crankshaft position sensor output signal.

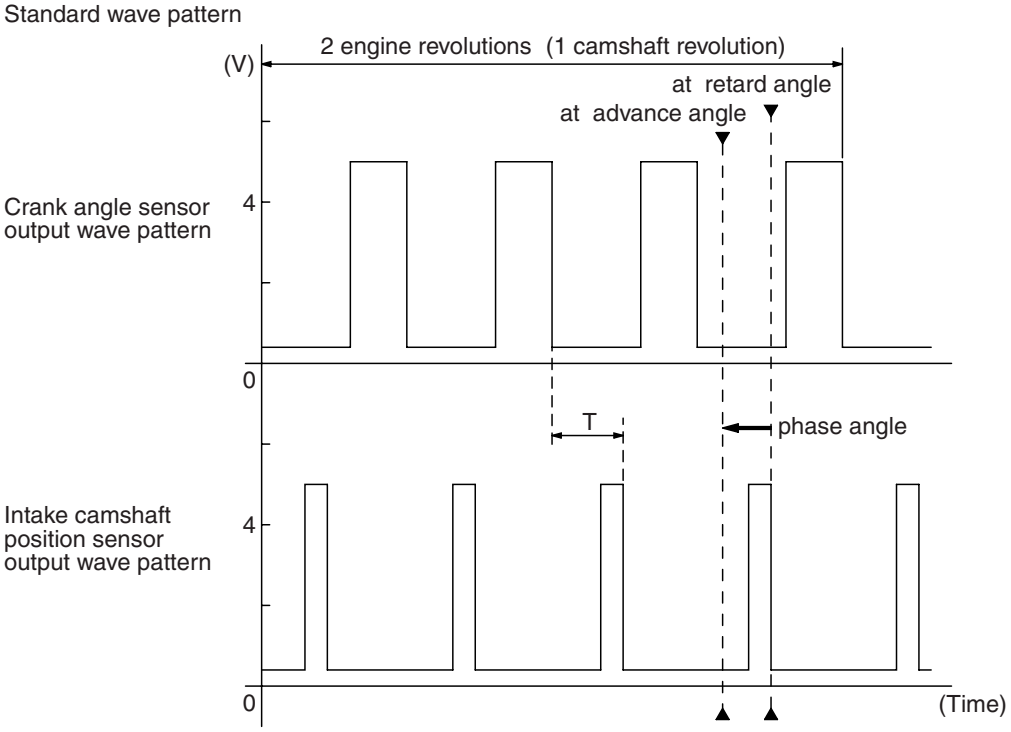
Alternate Method (Test harness not available)

1. Connect the oscilloscope special patterns pickup to engine-ECU terminal No. 53 (When checking the camshaft position sensor signal wave pattern).

Standard Wave Pattern

Observation condition

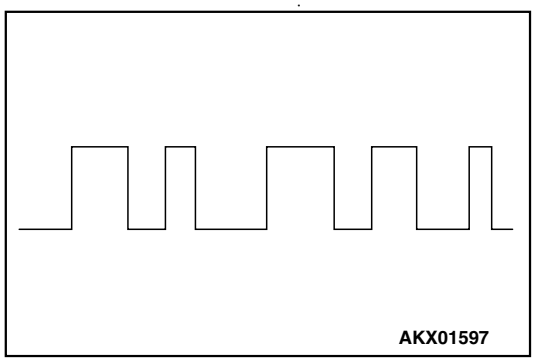
Function	Special patterns
Pattern height	Low
Pattern selector	Display
Engine speed	Idle



Wave Pattern Observation Points

For the engine at 2,500 r/min, make sure that the time difference "T", between the output waveform of the crank angle sensor and that of the intake camshaft position sensor, is shorter on the rising edge.

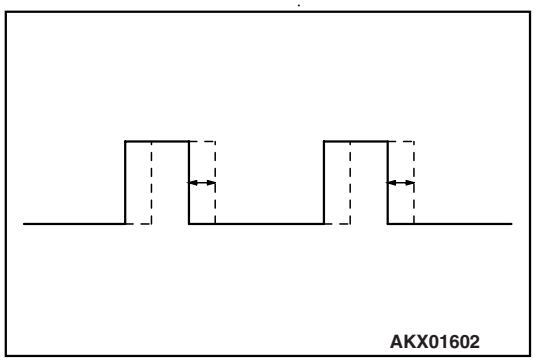
Examples of Abnormal Wave Patterns



Example 1

Cause of problem
Sensor interface malfunction

Wave pattern characteristics
Rectangular wave pattern is output even when the engine is not started.



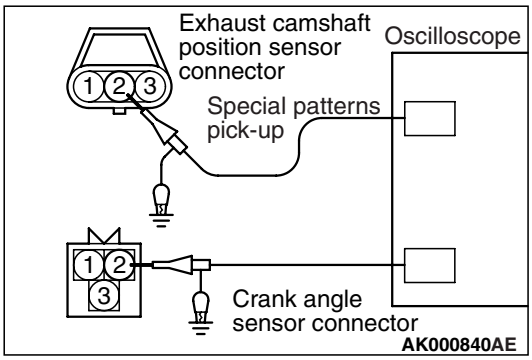
Example 2

Cause of problem
Loose timing belt
Failure of the fuel pump camshaft

Wave pattern characteristics
Wave pattern is displaced to the left or right.

EXHAUST CAMSHAFT POSITION SENSOR AND CRANK ANGLE SENSOR

Measurement Method



1. Disconnect the exhaust camshaft position sensor connector and connect the special tool test harness (MB991709) in between (All terminals should be connected).
2. Connect the oscilloscope special pattern pickup to exhaust camshaft position sensor terminal No. 2.
3. Disconnect the crank angle sensor connector and connect the special tool test harness (MD998478) in between.
4. Connect the oscilloscope special patterns pickup to crank angle sensor terminal No. 2.

Alternate Method (Test harness not available)

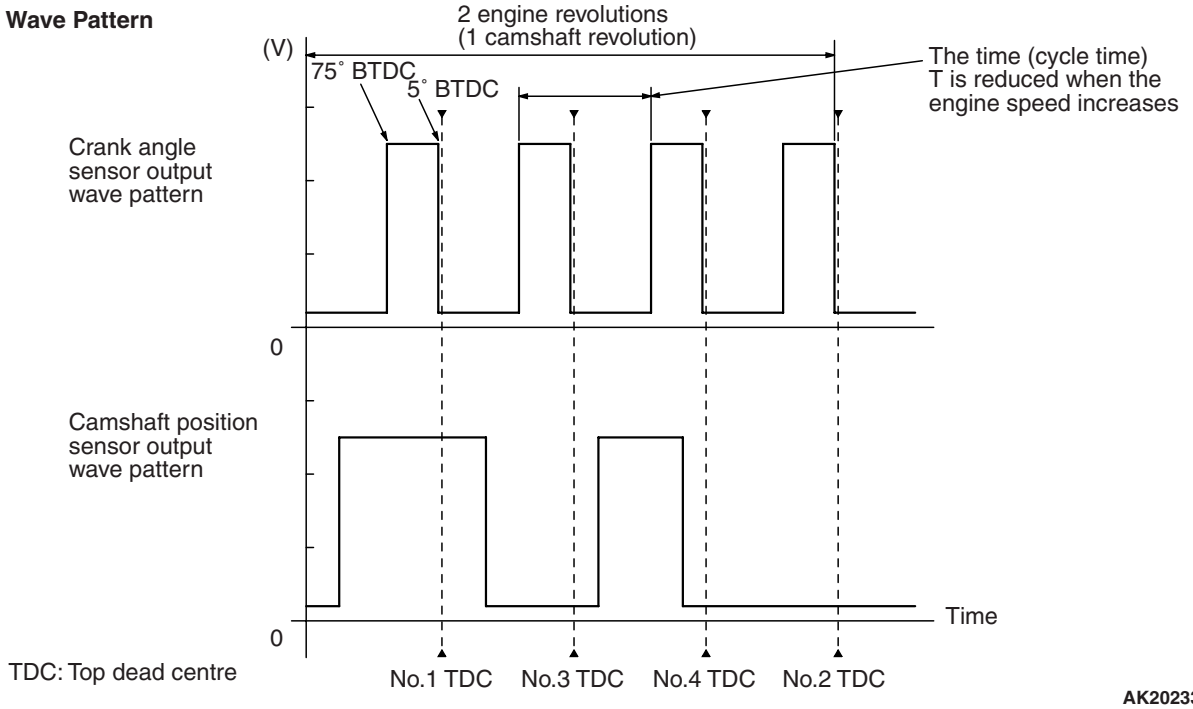
1. Connect the oscilloscope special patterns pickup to engine-ECU terminal No. 50 (When checking the exhaust camshaft position sensor signal wave pattern).
2. Connect the oscilloscope special patterns pickup to engine-ECU terminal No. 42 (When checking the crank angle sensor signal wave pattern).

Standard Wave Pattern

Observation condition

Function	Special patterns
Pattern height	Low
Pattern selector	Display
Engine speed	Idle

Standard Wave Pattern

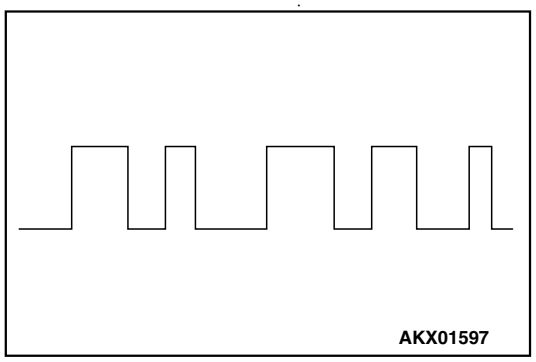


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Wave Pattern Observation Points

Check that cycle time T becomes shorter and the frequency increases when the engine speed is increased.

Examples of Abnormal Wave Patterns



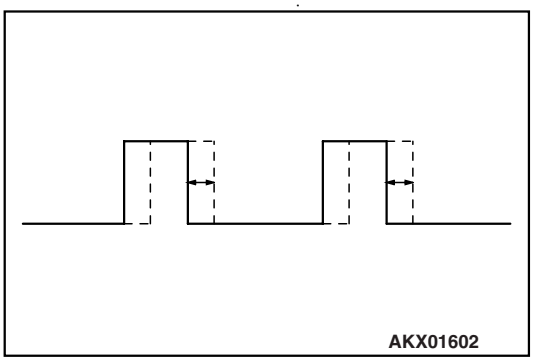
Example 1

Cause of problem

Sensor interface malfunction

Wave pattern characteristics

Rectangular wave pattern is output even when the engine is not started.



Example 2

Cause of problem

Loose timing belt

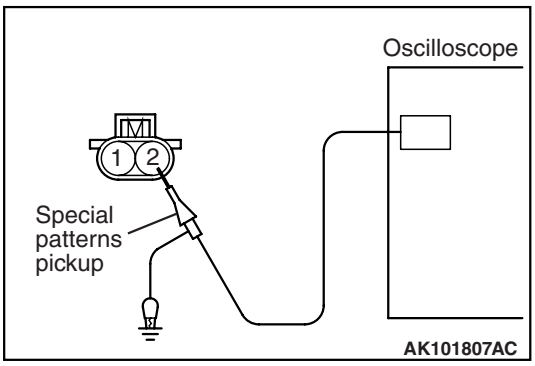
Abnormality in sensor disk

Wave pattern characteristics

Wave pattern is displaced to the left or right.

INJECTOR

Measurement Method



1. Disconnect the injector connector, and then connect the special tool test harness (MB991348) in between (All terminals should be connected).
2. Connect the oscilloscope special patterns pickup to terminal No. 2 of the injector connector.

Alternate Method (Test harness not available)

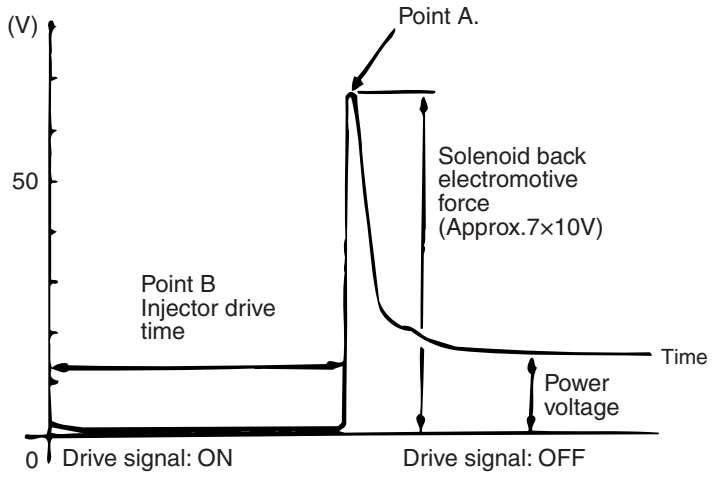
1. Connect the oscilloscope special patterns pickup to engine-ECU terminal No. 1 (When checking the No. 1 cylinder).
2. Connect the oscilloscope special patterns pickup to engine-ECU terminal No. 9 (When checking the No. 2 cylinder).
3. Connect the oscilloscope special patterns pickup to engine-ECU terminal No. 24 (When checking the No. 3 cylinder).
4. Connect the oscilloscope special patterns pickup to engine-ECU terminal No. 2 (When checking the No. 4 cylinder).

Standard Wave Pattern

Observation conditions

Function	Special patterns
Pattern height	Variable
Variable knob	Adjust while viewing the wave pattern
Pattern selector	Display
Engine speed	Idle

Standard wave pattern



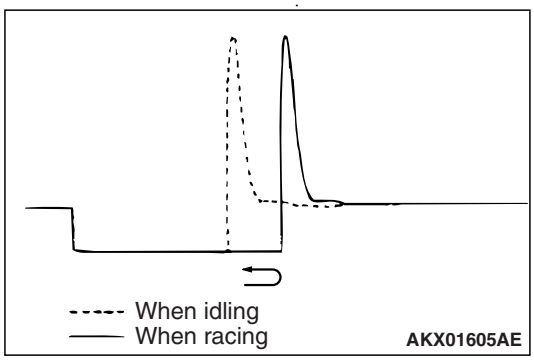
AK202347AB

Wave Pattern Observation Points

Point A: Height of solenoid back electromotive force

Contrast with standard wave pattern	Probable cause
Solenoid coil back electromotive force is low or doesn't appear at all.	Short in the injector solenoid

Point B: Injector drive time

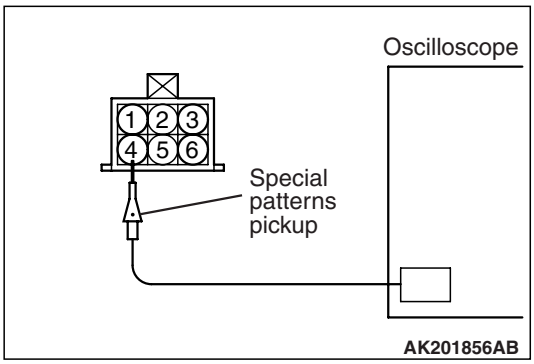


The injector drive time will be synchronized with the M.U.T.-II/III tester display.

- When the engine is suddenly raced, the drive time will be greatly extended at first, but the drive time will soon match the engine speed.

IDLE SPEED CONTROL (ISC) SERVO (STEPPER MOTOR)

Measurement Method



1. Disconnect the idle speed control servo connector, and connect the special tool test harness (MB991709) in between.
2. Connect the oscilloscope special patterns pickup to the idle speed control servoside connector terminal No. 1, No. 3, No. 4 and No. 6 respectively.

Alternate Method (Test harness not available)

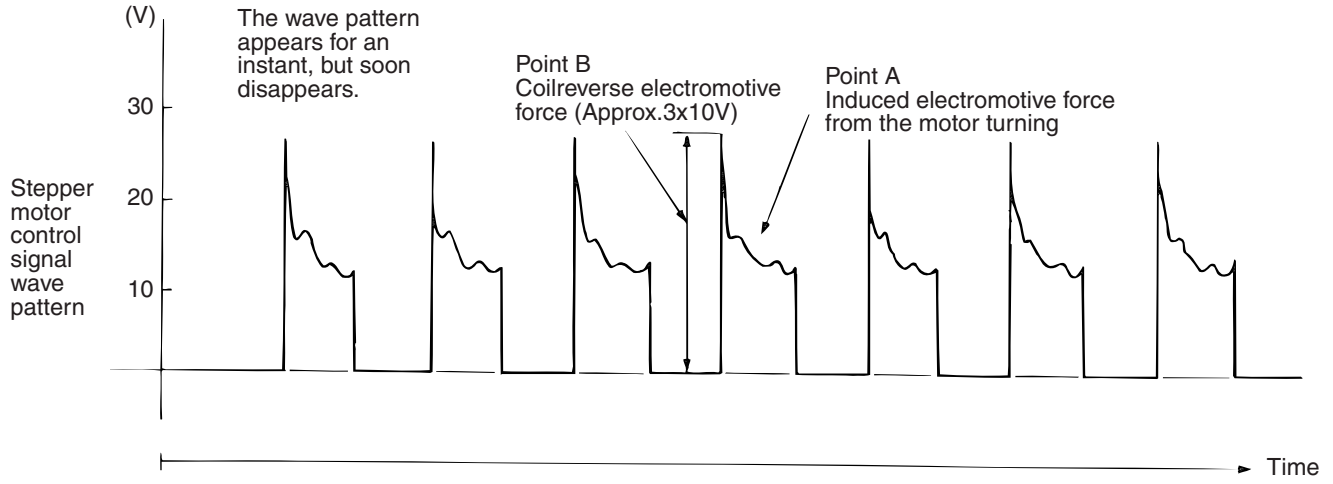
1. Connect the oscilloscope special patterns pickup to engine-ECU terminal No. 14, connection terminal No. 28, connection terminal No. 15, and connection terminal No. 29 respectively.

Standard Wave Pattern

Observation conditions

Function	Special patterns
Pattern height	High
Pattern selector	Display
Engine condition	When the engine coolant temperature is 20°C or below, turn the ignition switch from "LOCK" (OFF) position to ON (without starting the engine).
	While the engine is idling, turn the A/C switch to ON.
	Immediately after starting the warm engine.

Standard wave pattern



AK201857AB

Wave pattern Observation Points

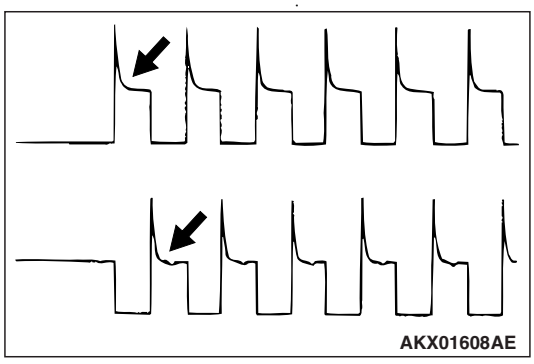
Check that the standard wave pattern appears when the stepper motor is operating.
Point A: Presence or absence of induced electromotive force from the motor turning (Refer to the abnormal wave pattern).

Contrast with standard wave pattern	Probable cause
Induced electromotive force does not appear or is extremely small.	Motor is malfunctioning

Point B: Height of coil reverse electromotive force

Contrast with standard wave pattern	Probable cause
Coil reverse electromotive force does not appear or is extremely small.	Short in the coil

Examples of Abnormal Wave Pattern



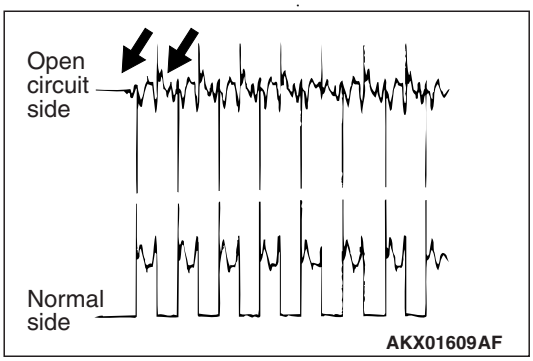
Example 1

Cause of problem

Motor is malfunctioning. (Motor is not operating.)

Wave pattern characteristics

Induced electromotive force from the motor turning does not appear.



Example 2

Cause of problem

Open circuit in the line between the stepper motor and the engine-ECU.

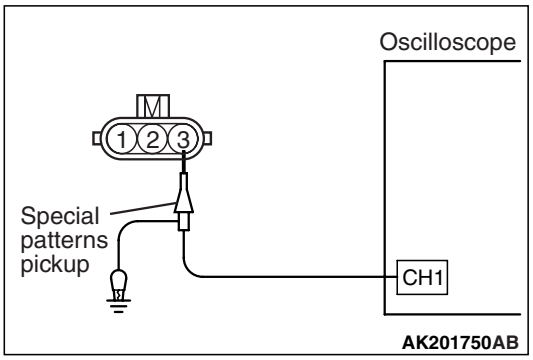
Wave pattern characteristics

Current is not supplied to the motor coil on the open circuit side (Voltage does not drop to 0 V).

Furthermore, the induced electromotive force waveform at the normal side is slightly different from the normal waveform.

IGNITION COIL AND POWER TRANSISTOR

Measurement Method



1. Disconnect the ignition coil connector, and connect the special tool test harness (MB991348) in between (All terminals should be connected).
2. Connect the oscilloscope special patterns pickup to terminal No. 3 of each ignition coil connector in turn.

Alternate Method (Test harness not available)

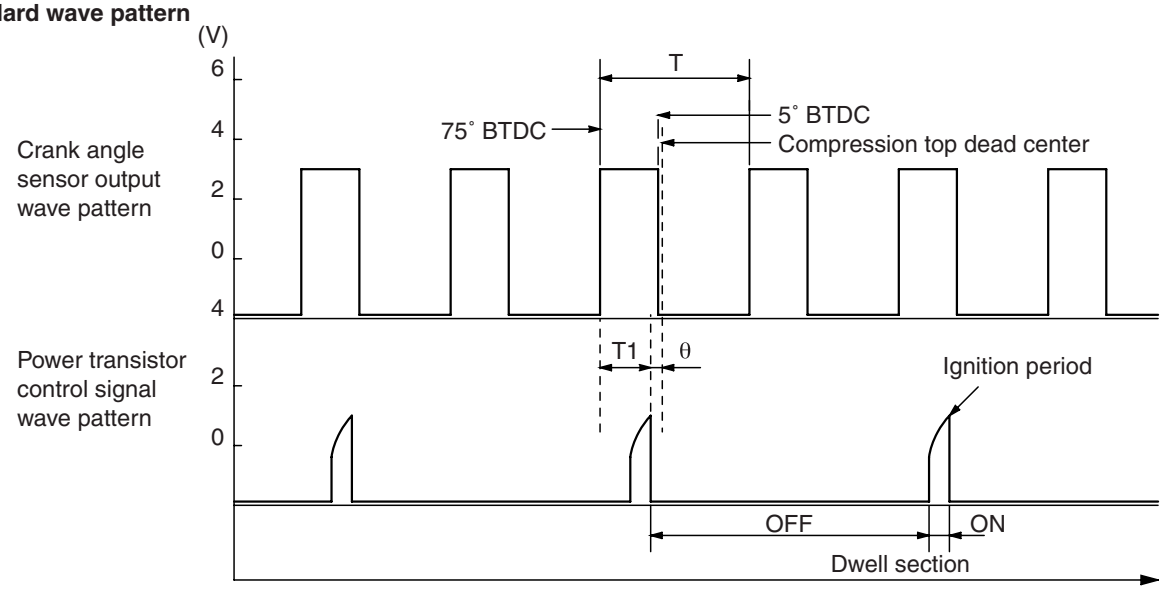
1. Connect the oscilloscope special patterns pickup to engine-ECU terminal No. 11 (No. 1 – No. 4), connection terminal No. 12 (No. 2 – No.3) respectively.

Standard Wave Pattern

Observation condition

Function	Special patterns
Pattern height	Low
Pattern selector	Display
Engine r/min	Approximately 1,200 r/min

Standard wave pattern



T : Revolution time corresponding to a crank angle of 180˚
T1 : Time computed by the engine-ECU
θ : Spark advance angle

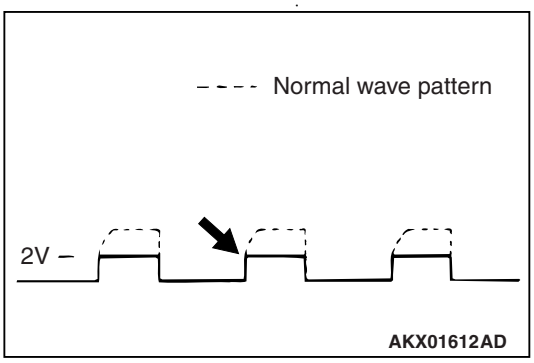
AK204435AC

Wave Pattern Observation Points

Point: Condition of wave pattern build-up section and maximum voltage (Refer to abnormal wave pattern examples 1 and 2).

Condition of wave pattern build-up section and maximum voltage	Probable cause
Rises from approximately 2 V to approximately 4.5 V at the top-right	Normal
2 V rectangular wave	Open-circuit in ignition primary circuit
Rectangular wave at power voltage	Power transistor malfunction

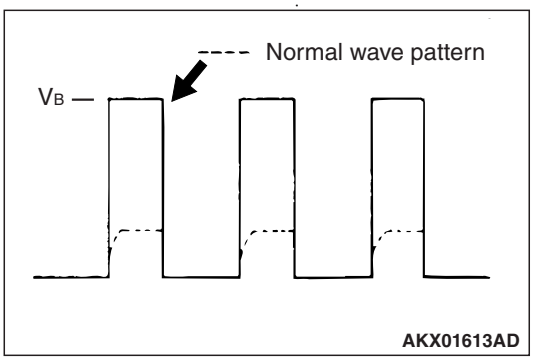
Examples of Abnormal Wave Patterns



Example 1
Wave pattern during engine cranking

Cause of problem
Open-circuit in ignition primary circuit

Wave pattern characteristics
Top-right part of the build-up section cannot be seen, and voltage value is approximately 2 V too low.



Example 2
Wave pattern during engine cranking

Cause of problem
Malfunction in power transistor

Wave pattern characteristics
Power voltage results when the power transistor is ON.

ON-VEHICLE SERVICE

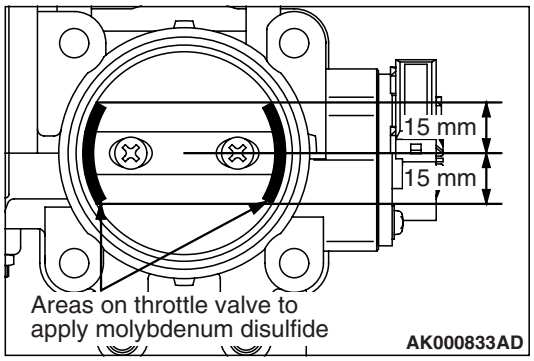
THROTTLE BODY (THROTTLE VALVE AREA) CLEANING

M1131001000990

1. Remove the air intake hose from the throttle body.
2. Spray cleaning fluid on a clean cloth.

⚠ CAUTION

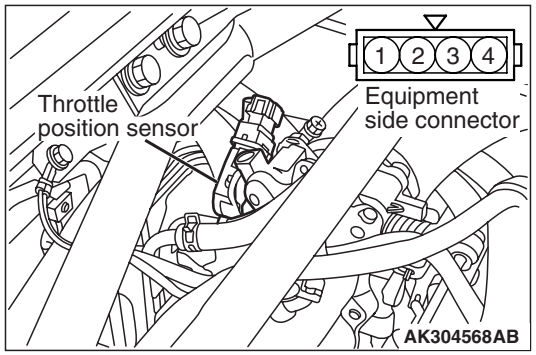
- **Do not spray the cleaning fluid directly to the throttle valve.**
- **Make sure the cleaning fluid does not enter the motor from the bypass line. Also make sure it does not enter the sensor through the shaft.**
- **Be careful not to rub off the molybden applied around the throttle valve shaft.**



3. Wipe off the dirt around the throttle valve with the cloth sprayed with cleaning fluid.
4. Attach the air intake hose.
5. Adjust the basic idle speed (Refer to P.13A-396).

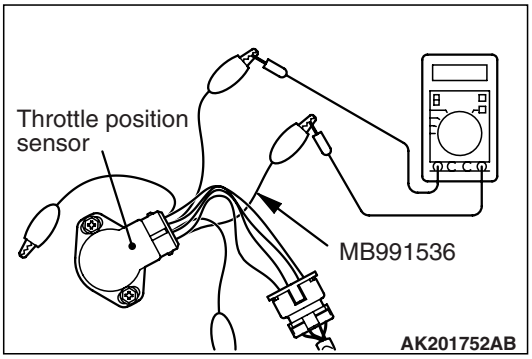
THROTTLE POSITION SENSOR ADJUSTMENT

M1131001100801



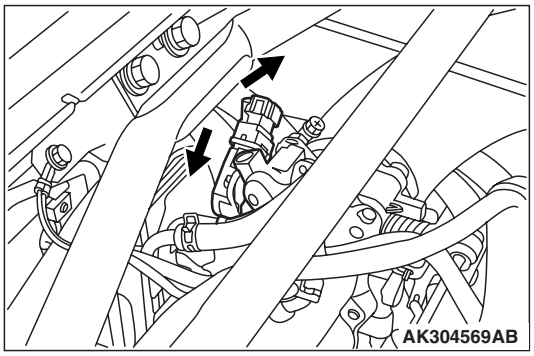
1. Connect the M.U.T.-II/III to the diagnosis connector.

   When not using the M.U.T.-II/III, proceed as follows.



   (1) Disconnect the throttle position sensor connector and connect the special tool test harness (MB991536) between the disconnected connector taking care not to confuse the terminal to be connected.
   (2) Connect digital voltmeter between the terminal No. 2 (special tool's yellow clip on the sensor output) and the terminal No. 4 (special tool's red clip on the sensor earth) of the throttle position sensor connector.
2. Turn the ignition switch to "ON" position (but do not start the engine).
3. Check the output voltage of the throttle position sensor.

   Standard value: 535 – 735 mV



4. If not within the standard value, loosen the throttle position sensor mounting bolts. Then rotate the sensor body to adjust.
5. Turn the ignition switch to "LOCK" (OFF) position.
6. Remove the M.U.T.-II/III. If the M.U.T.-II/III is not used, remove the special tool, and then connect the throttle position sensor connector.
7. If a diagnosis code is displayed, erase the diagnosis code by using the M.U.T.-II/III or disconnect the negative battery cable from the battery terminal and then leave it for at least 10 seconds. After that, reconnect the battery cable, and then let the engine run at idle for approximately 10 minutes.

BASIC IDLE SPEED ADJUSTMENT

M1131001800888

⚠ CAUTION

- **The standard idling speed has been adjusted by the speed adjusting screw (SAS) by the manufacturer, and there should usually be no need for readjustment.**
- **If the adjustment has been changed by mistake, the idle speed may become too high or the idle speed may drop too low when loads from components such as the A/C are placed on the engine. If this occurs, adjust by the following procedure.**
- **The adjustment, if made, should be made after first confirming that the spark plugs, the injectors, the idle speed control servo, the compression pressure, etc., are all normal.**

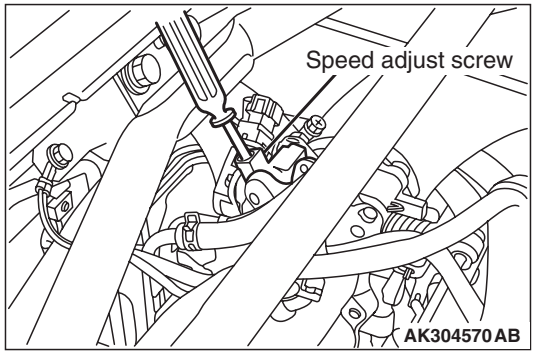
1. Before inspection and adjustment, set the vehicle to the pre-inspection condition.
2. Connect the M.U.T.-II/III to the diagnosis connector (16-pin).

   NOTE: When the M.U.T.-II/III is connected, the diagnosis control terminal should be earthed.
3. Start the engine and run at idle.
4. Select the item No. 30 of the M.U.T.-II/III Actuator test.

   NOTE: This holds the idle speed control servo at the basic step to adjust the basic idle speed.
5. Check the idle speed.

   Standard value:
   800 ± 50 r/min

   NOTE:
   - *The engine speed may be 20 to 100 r/min lower than indicated above for a new vehicle [driven approximately 500 km or less], but no adjustment is necessary.*
   - *If the engine stalls or the engine speed is low even though the vehicle has been driven approximately 500 km or more, it is probable that deposits are adhered to the throttle valve, so clean it (Refer to P.13A-395).*



6. If not within the standard value range, turn the speed adjusting screw (SAS) to make the necessary adjustment.

   NOTE: If the idling speed is higher than the standard value range even when the SAS is fully closed, check whether or not there is any indication that the fixed SAS has been moved. If there is an indication that it has been moved, adjust the fixed SAS.
7. Press the M.U.T.-II/III clear key, and release the idle speed control servo from the Actuator test mode.

   NOTE: Unless the idle speed control servo is released, the Actuator test mode will continue 27 minutes.
8. Turn the ignition switch to "LOCK" (OFF) position.
9. Disconnect the M.U.T.-II/III.
10. Start the engine again and let it run at idle speed for about 10 minutes; check that the idling condition is normal.

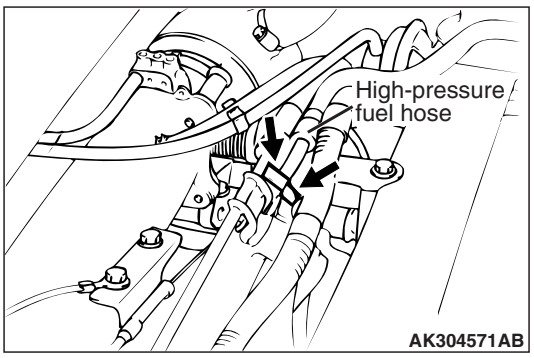
FUEL PRESSURE TEST

M1131001901286

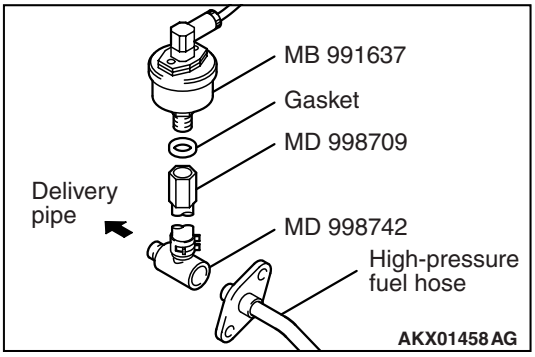
1. Release residual pressure from the fuel pipe line to prevent fuel gush out (Refer to P.13A-398).

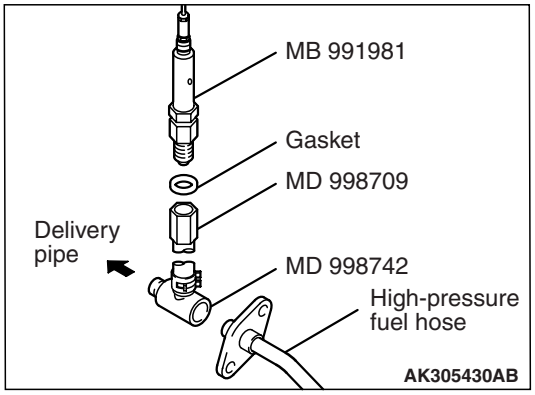
⚠ CAUTION

Cover the hose connection with rags to prevent splash of fuel that could be caused by some residual pressure in the fuel pipe line.



2. Disconnect the high-pressure fuel hose at the delivery pipe side.





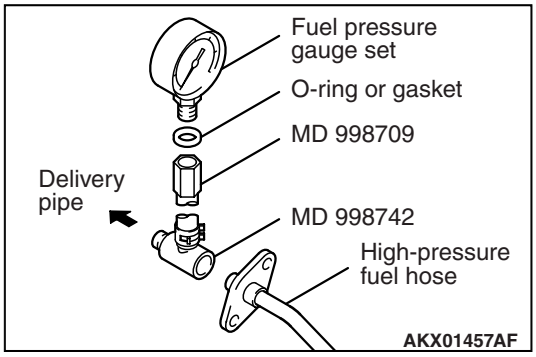
3. Assemble the fuel pressure measurement tools as follows.

<When using the fuel pressure gauge set (special tool)>

a. Remove the union joint and bolt from the special tool adaptor hose (MD998709) and attach the special tool hose adaptor (MD998742) to the adaptor hose.
b. Via a gasket, install the special tool fuel pressure gauge set (MB991637 or MB991981) into the special tool that has already assembled as described in (a) above.

<When using the fuel pressure gauge>

a. Remove the union joint and bolt from special tool adaptor hose (MD998709) and attach the special tool hose adaptor (MD998742) to the adaptor hose.
b. Via a suitable O-ring or gasket, install the fuel pressure gauge to the special tool that has already assembled as described in (a) above.



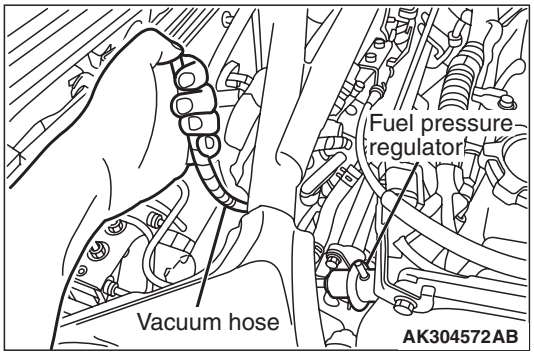
4. Install the assembled fuel pressure measurement tools between the fuel rail and fuel high-pressure hose.

⚠ CAUTION

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

5. Connect the M.U.T.-II/III to the diagnosis connector.
6. Turn the ignition switch to "ON" position (But do not start the engine).
7. Select "Item No. 07" from the M.U.T.-II/III Actuator test to drive the fuel pump. Check that there are no fuel leaks from any parts.
8. Finish the actuator test or turn the ignition switch to "LOCK" (OFF) position.
9. Start the engine and run at idle.
10. Measure fuel pressure while the engine is running at idle.

Standard value: Approximately 230 kPa



11. Disconnect the vacuum hose from the fuel pressure regulator and measure fuel pressure with the hose end closed by a finger.

Standard value: 289 – 309 kPa

12. Check to see that fuel pressure at idle does not drop even after the engine has been raced several times.

13.Racing the engine repeatedly, hold the fuel return hose lightly with fingers to feel that fuel pressure is present in the return hose.

NOTE: If the fuel flow rate is low, there will be no fuel pressure in the return hose.

14.If any of fuel pressure measured in steps 10 to 13 is out of specification, troubleshoot and repair according to the table below.

Symptom	Probable cause	Remedy
• Fuel pressure too low • Fuel pressure drops after racing • No fuel pressure in fuel return hose	Clogged fuel filter	Replace fuel filter
	Fuel leaking to return side due to poor fuel regulator valve seating or settled spring	Replace fuel pressure regulator
	Low fuel pump delivery pressure	Replace fuel pump
Fuel pressure too high	Binding valve in fuel pressure regulator	Replace fuel pressure regulator
	Clogged fuel return hose or pipe	Clean or replace hose or pipe
Same fuel pressure when vacuum hose is connected and when disconnected	Damaged vacuum hose or Clogged nipple	Replace vacuum hose or clean nipple

15.Stop the engine and check change of fuel pressure gauge reading. Normal if the reading does not drop within 2 minutes. If it does, observe the rate of drop and troubleshoot and repair according to the table below.

Symptom	Probable cause	Remedy
Fuel pressure drops gradually after engine is stopped	Leaky injector	Replace injector
	Leaky fuel regulator valve seat	Replace fuel pressure regulator
Fuel pressure drops sharply immediately after engine is stopped	Check valve in fuel pump is held open	Replace fuel pump

16.Release residual pressure from the fuel pipe line (Refer to P.13A-398).

⚠ CAUTION

Cover the hose connection with rags to prevent splash of fuel that could be caused by some residual pressure in the fuel pipe line.

17.Remove the fuel pressure gauge and special tool from the delivery pipe.

18.Replace the O-ring at the end of the fuel high pressure hose with a new one. Furthermore, apply engine oil to the new O-ring before replacement.

19.Fit the fuel high pressure hose over the delivery pipe and tighten the bolt to specified toque.

Tightening torque: 5.0 ± 1.0 N·m

20.Check for any fuel leaks by following the procedure in step 7.

21.Disconnect the M.U.T.-II/III.

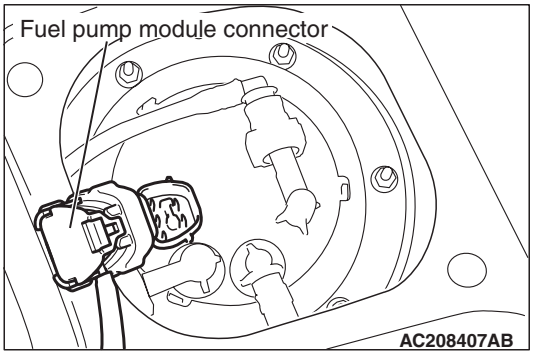
FUEL PUMP CONNECTOR DISCONNECTION (HOW TO REDUCE PRESSURIZED FUEL LINES)

M1131000900718

⚠ WARNING

When removing the fuel pipe, etc., release fuel pressure to prevent fuel spray.

1. Remove the rear seat assembly (Refer to GROUP 52A – Rear Seat Assembly P.52A-20).
2. Remove the protector.



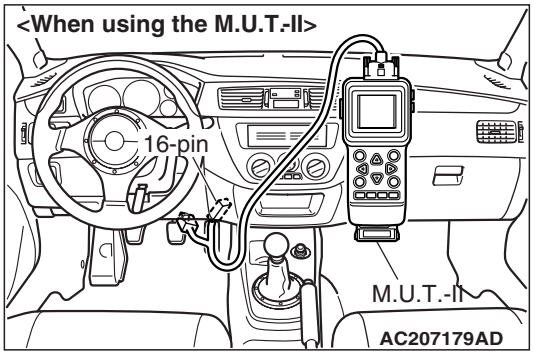
3. Disconnect the fuel pump module connector.

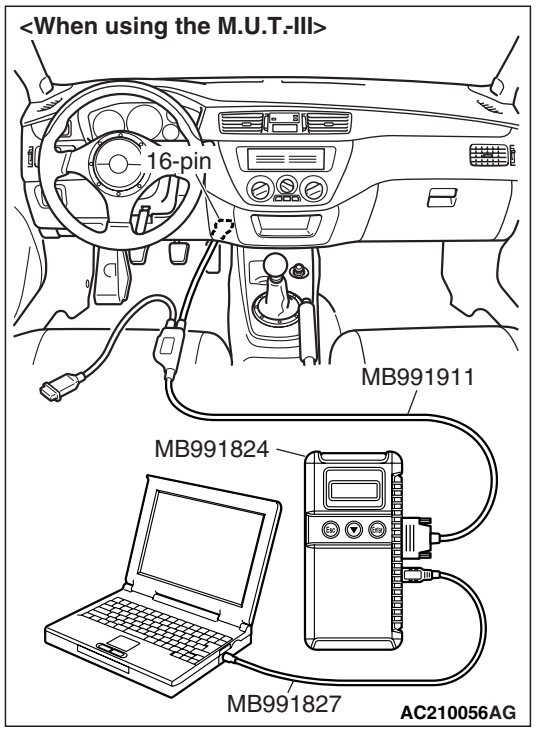
4. After starting the engine and letting it run until it stops naturally, turn the ignition switch to the "LOCK" (OFF) position.
5. Connect the fuel pump module connector.
6. Install the protector and rear seat assembly (Refer to GROUP 52A – Rear Seat Assembly P.52A-20).

FUEL PUMP OPERATION CHECK

M1131002000818

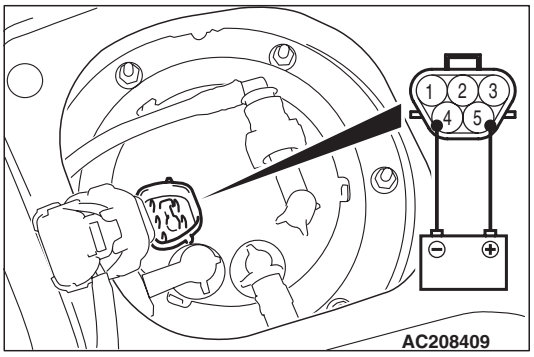
⚠ CAUTION





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

1. Check the operating of the fuel pump by using the M.U.T.-II/III to force-drive the fuel pump.



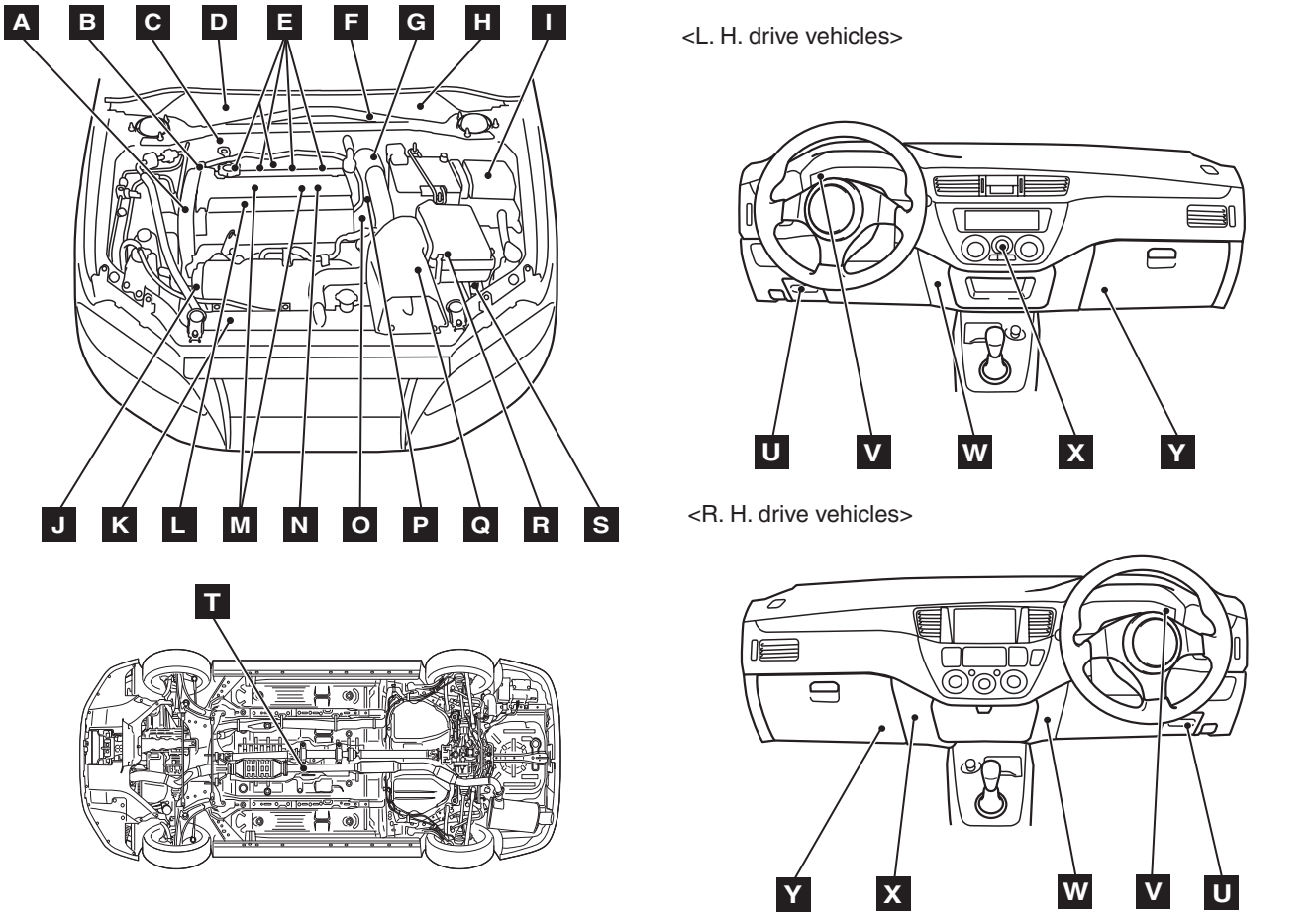
2. If the fuel pump will not operate, check by using the following procedure. If normal, check the fuel pump drive circuit.
   (1) Turn the ignition switch to the "LOCK" (OFF) position.
   (2) Remove the rear seat assembly (Refer to GROUP 52A – Rear Seat Assembly P.52A-20).
   (3) Remove the protector.
   (4) Disconnect the fuel pump module connector.
   (5) When the fuel pump drive connector is attached directly to the battery, check if the sound of the fuel pump operation can be heard.

   NOTE: As the fuel pump is an in-tank type, the fuel pump sound is hard to hear. Remove the fuel tank filler tube cap and check from the tank inlet.
   (6) Check for fuel pressure by pinching the fuel hose with fingertips.
   (7) Connect the fuel pump module connector.
   (8) Install the protector and rear seat assembly (Refer to GROUP 52A – Rear Seat Assembly P.52A-20).

COMPONENT LOCATION

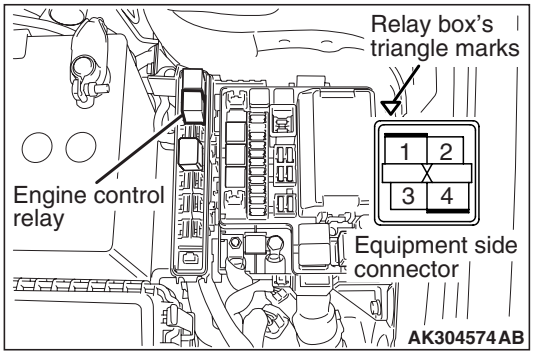
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Name		Symbol	Name		Symbol
A/C relay		I	Fuel pump resistor	<L.H. drive vehicles>	D
				<R.H. drive vehicles>	H
A/C switch		X	Idle speed control servo (stepper motor)		F
Air flow sensor (with intake air temperature sensor and barometric pressure sensor)		R	Ignition coil (integrated power transister)		M
Crank angle sensor		A	Ignition coil relay <R.H. drive vehicles>		I
			Injector		E
Detonation sensor		N	Oil feeder control solenoid valve		B
Diagnosis connector		W	Oxygen sensor (front)		K
EGR control solenoid valve		L	Oxygen sensor (rear)		T
Engine control relay		I	Power steering fluid pressure switch		J
Engine coolant temperature sensor		O	Purge control solenoid valve		G
Engine-ECU		Y	Injector resistor	<L.H. drive vehicles>	D
				<R.H. drive vehicles>	H
Engine warming lamp (check engine lamp)		V	Intake camshaft position sensor		N
Exhaust camshaft position sensor		N	Throttle position sensor		F
Fan control relay		I	Transmission oil temperature sensor		Q
Fuel pressure control solenoid valve		C	Vehicle speed sensor		P
Fuel pump relay (1) and (2)		U	Waste gate solenoid valve		S
Fuel pump relay (3)	<L.H. drive vehicles>	D			
	<R.H. drive vehicles>	H			



ENGINE CONTROL RELAY CONTINUITY CHECK

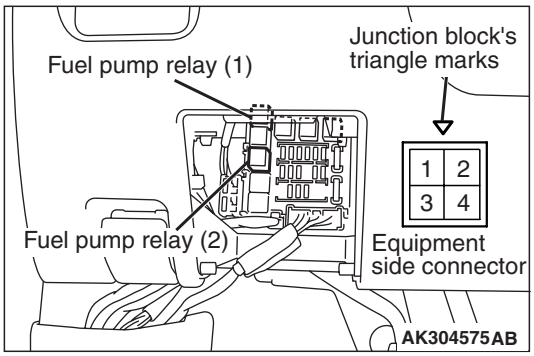
M1131050000754



Tester Connection Terminal	Battery Voltage	Normal State
2 – 3	No Voltage	Continuity
1 – 4	No Voltage	No continuity
	Voltage (Connect positive (+) terminal of battery to terminal No. 2 and negative (–) terminal of battery to terminal No. 3.)	Continuity

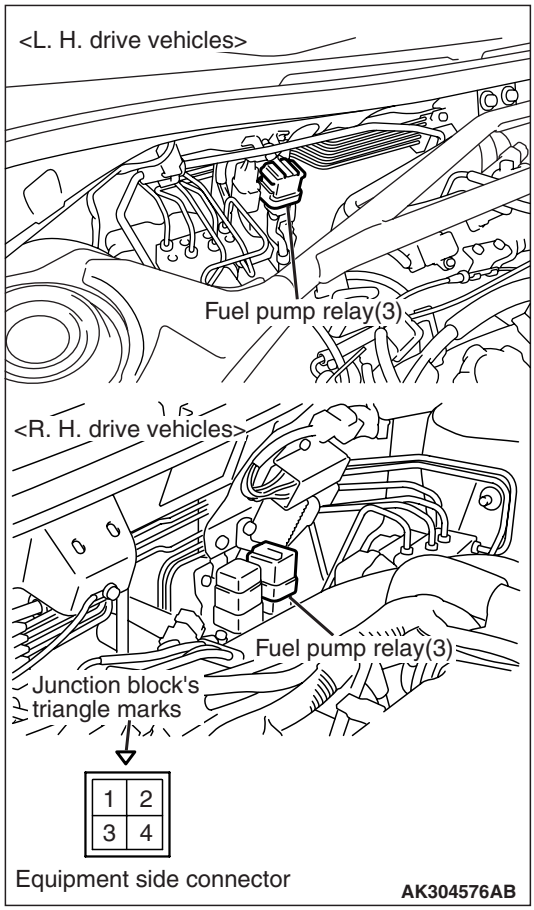
FUEL PUMP RELAY CONTINUITY CHECK

M1131033000762



Fuel pump relay (1) and (2)

Tester Connection Terminal	Battery Voltage	Normal State
1 – 4	No Voltage	Continuity
2 – 3	No Voltage	No continuity
	Voltage (Connect positive (+) terminal of battery to terminal No. 1 and negative (–) terminal of battery to terminal No. 4.)	Continuity

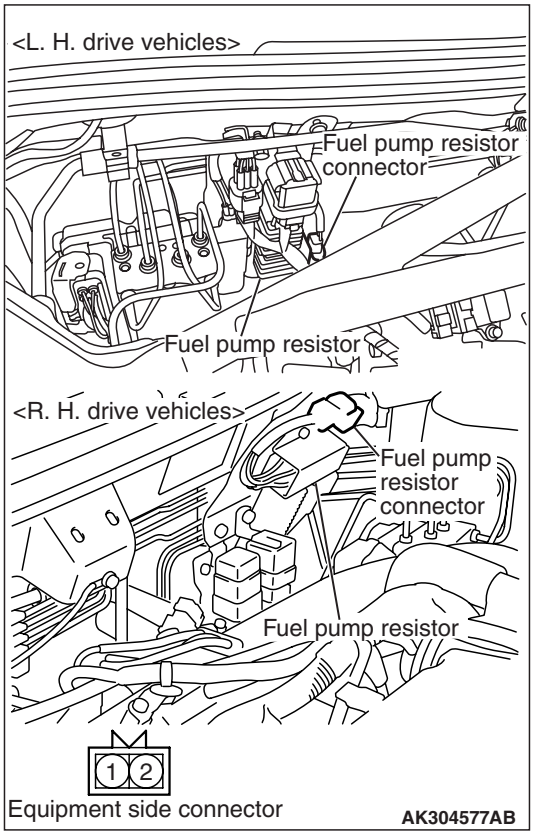


Fuel pump relay (3)

Tester Connection Terminal	Battery Voltage	Normal State
3 – 4	No Voltage	Continuity
1 – 2	No Voltage	No continuity
	Voltage (Connect positive (+) terminal of battery to terminal No. 2 and negative (–) terminal of battery to terminal No. 1.)	Continuity

FUEL PUMP RESISTOR CHECK

M1131052700049



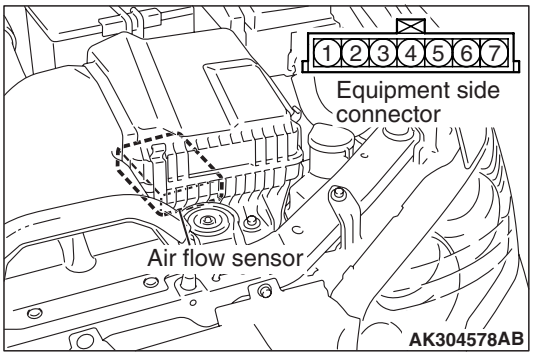
1. Disconnect the fuel pump resistor connector.
2. Measure the resistance between terminals.

   Standard value: 0.45 – 0.65 Ω

3. If the resistance is out of specification, replace the fuel pump resistor.

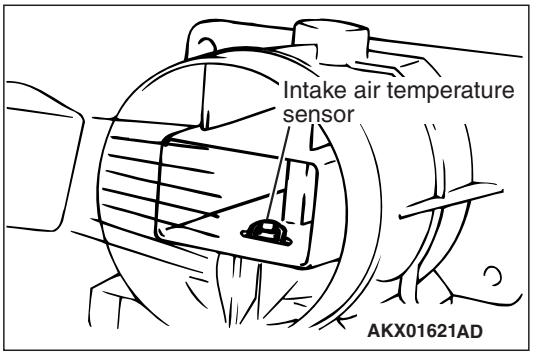
INTAKE AIR TEMPERATURE SENSOR CHECK

M1131002801118



1. Disconnect the air flow sensor connector.
2. Measure resistance between terminals No. 5 and No. 6.

   Standard value:
   13 – 17 kΩ (at –20°C)
   5.3 – 6.7 kΩ (at 0°C)
   2.3 – 3.0 kΩ (at 20°C)
   1.0 – 1.5 kΩ (at 40°C)
   0.56 – 0.76 kΩ (at 60°C)
   0.30 – 0.42 kΩ (at 80°C)



3. Measure resistance while heating the sensor using a hair drier.

   Normal condition:

Temperature (°C)	Resistance (kΩ)
Higher	Smaller

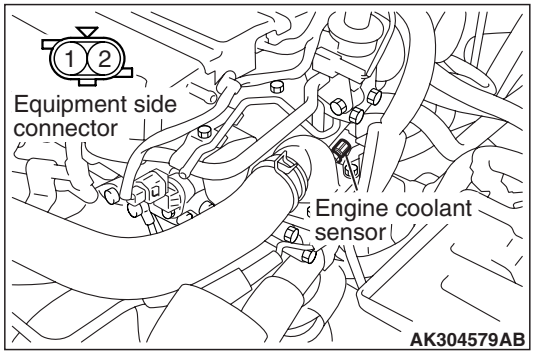
4. If the value deviates from the standard value or the resistance remains unchanged, replace the air flow sensor assembly.

ENGINE COOLANT TEMPERATURE SENSOR CHECK

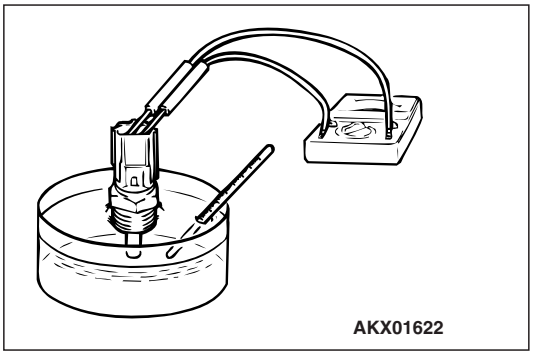
M1131003101060

⚠ CAUTION

Be careful not to touch the connector (resin section) with the tool when removing and installing.



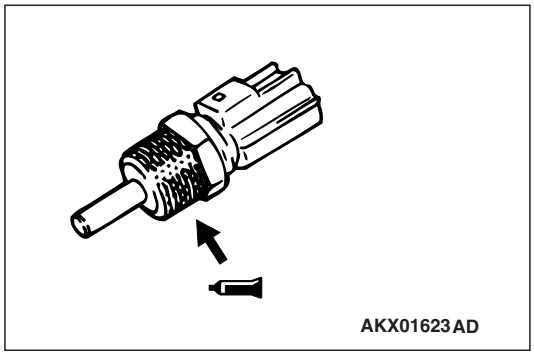
1. Remove the engine coolant temperature sensor.



2. With temperature sensing portion of engine coolant temperature sensor immersed in hot water, check resistance.

   Standard value:
   14 – 17 kΩ (at –20°C)
   5.1 – 6.5 kΩ (at 0°C)
   2.1 – 2.7 kΩ (at 20°C)
   0.9 – 1.3 kΩ (at 40°C)
   0.48 – 0.68 kΩ (at 60°C)
   0.26 – 0.36 kΩ (at 80°C)

3. If the resistance deviates from the standard value greatly, replace the sensor.



4. Apply sealant to threaded portion.

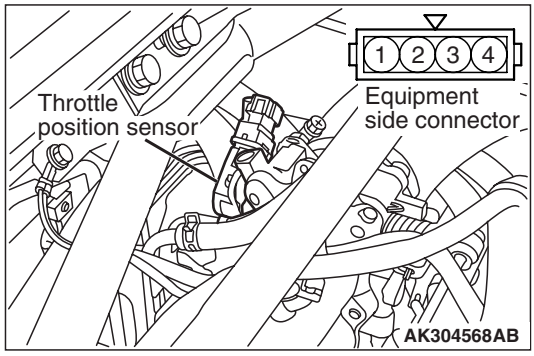
   Specified sealant:
   3M NUT Locking Part No. 4171 or equivalent

5. Install the engine coolant temperature sensor and tighten it to the specified torque.

   Tightening torque: 29 ± 10 N·m

THROTTLE POSITION SENSOR CHECK

M1131003200796



1. Disconnect the throttle position sensor connector.
2. Measure the resistance between the throttle position sensor side connector terminal No. 1 and terminal No. 4.

   Standard value: 3.5 – 6.5 kΩ

3. Measure the resistance between the throttle position sensor side connector terminal No. 2 and terminal No. 4.

   Normal condition:

Throttle valve slowly open until fully open from the idle position	Changes smoothly in proportion to the opening angle of the throttle valve

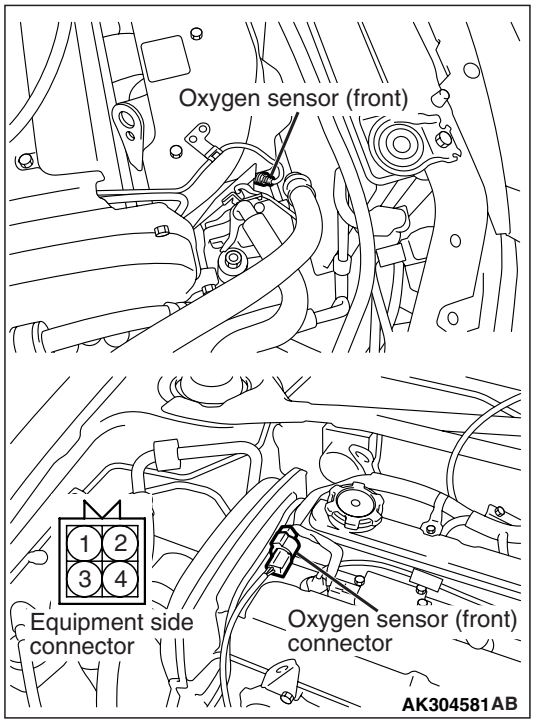
4. If the resistance is outside the standard value, or if it doesn't change smoothly, replace the throttle position sensor.

   NOTE: For the throttle position sensor adjustment procedure, refer to P.13A-395.

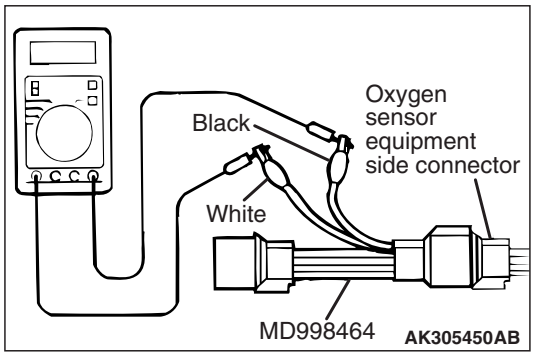
OXYGEN SENSOR CHECK

M1131005001434

Oxygen sensor (front)



1. Disconnect the oxygen sensor connector and connect the special tool test harness (MD998464) to the connector on the oxygen sensor side.
2. Make sure that there is continuity (4.5 – 8.0 Ω at 20°C) between terminal No. 1 (red clip of special tool) and No. 3 (blue clip of special tool) on the oxygen sensor connector.
3. If there is no continuity, replace the oxygen sensor.
4. Warm up the engine until engine coolant is 80°C or higher.
5. Perform a tracing for 5 minutes or more with the engine speed of 4,500 r/min.



6. Connect a digital voltage meter between terminal No. 2 (black clip of special tool) and No. 4 (white clip of special tool).
7. While repeatedly racing the engine, measure the oxygen sensor output voltage.

Standard value:

Engine	Oxygen sensor output voltage	Remarks
When racing the engine	0.6 – 1.0 V	If you make the air-fuel ratio rich by racing the engine repeatedly, a normal oxygen sensor will output a voltage of 0.6 – 1.0 V.

⚠ CAUTION

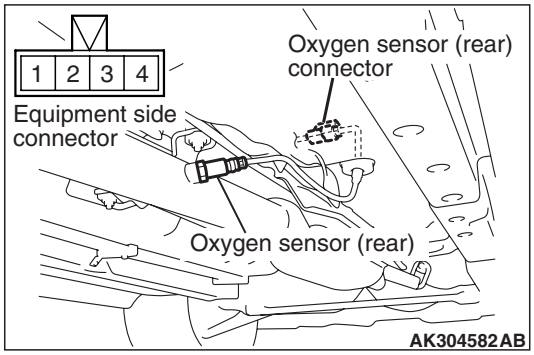
- **Be very careful when connecting the jumper wire; incorrect connection can damage the oxygen sensor.**
- **Be careful the heater is broken when voltage of beyond 8 V is applied to the oxygen sensor heater.**

NOTE: If the sufficiently high temperature (of approximate 400°C or more) is not reached although the oxygen sensor is normal, the output voltage would be possibly low although the rich air-fuel ratio. Therefore, if the output voltage is low, use a jumper wire to connect the terminal No. 1 (red clip of special tool) and the terminal No. 3 (blue clip of special tool) of the oxygen sensor with a (+) terminal and (–) terminal of 8 V power supply respectively, then check again.

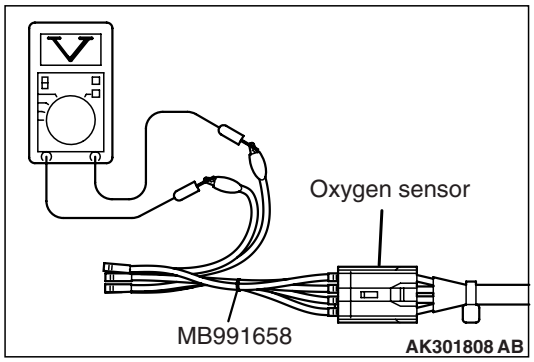
8. If the sensor is defective, replace the oxygen sensor.

NOTE: For removal and installation of the oxygen sensor, refer to GROUP 15 – Exhaust Manifold and turbocharger. P.15-10.

Oxygen sensor (rear)



1. Disconnect the oxygen sensor connector and connect the special tool test harness (MB991658) to the connector on the oxygen sensor side.
2. Make sure that there is continuity (11 – 18 Ω at 20°C) between terminal No. 3 and No. 4 on the oxygen sensor connector.
3. If there is no continuity, replace the oxygen sensor.
4. Warm up the engine until engine coolant is 80°C or higher.
5. Perform a tracing for 5 minutes or more with the engine speed of 4,500 r/min.



6. Connect a digital voltage meter between terminal No. 1 and No. 2.
7. While repeatedly racing the engine, measure the oxygen sensor output voltage.

Standard value:

Engine	Oxygen sensor output voltage	Remarks
When racing the engine	0.6 – 1.0 V	If you make the air-fuel ratio rich by racing the engine repeatedly, a normal oxygen sensor will output a voltage of 0.6 – 1.0 V.

⚠ CAUTION

- **Be very careful when connecting the jumper wire; incorrect connection can damage the oxygen sensor.**
- **Be careful the heater is broken when voltage of beyond 12 V is applied to the oxygen sensor heater.**

NOTE: If the sufficiently high temperature (of approximately 400°C or more) is not reached although the oxygen sensor is normal, the output voltage would be possibly low although the rich air-fuel ratio. Therefore, if the output voltage is low, use a jumper wire to connect the terminal No. 3 and the terminal No. 4 of the oxygen sensor with a (+) terminal and (–) terminal of 12 V power supply respectively, then check again.

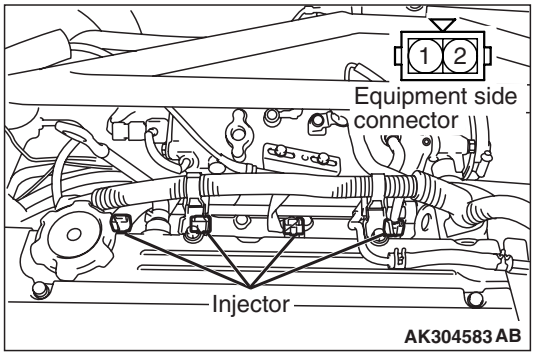
8. If the sensor is defective, replace the oxygen sensor.

NOTE: For removal and installation of the oxygen sensor, refer to GROUP 15 – Exhaust Pipe and Main Muffler P.15-13.

INJECTOR CHECK

M1131005201267

Check the Operation Sound



1. Use a stethoscope to listen to the operation sound (clicking) of the injectors while the engine is idling or cranking.

⚠ CAUTION

Beware that the operation sounds of other injectors can be heard even if the injector that is being inspected might not be operating.

2. Verify that the operation sound increases with the engine speed.

NOTE: If the operating sound cannot be heard, inspect the injector actuation circuit.

Measurement of Resistance between Terminals

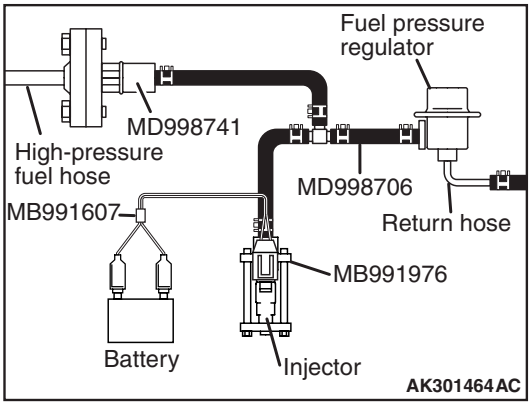
1. Disconnect the injector connector.
2. Measure the resistance between terminals.

Standard value: 2 – 3 Ω (at 20°C)

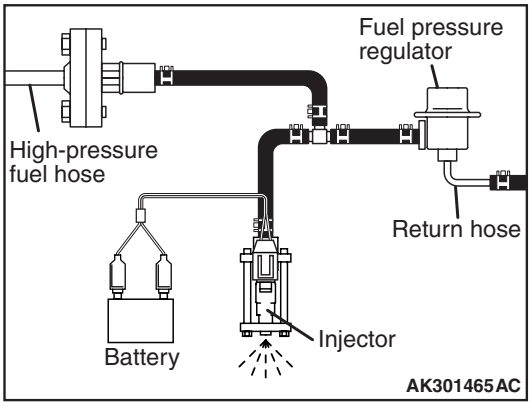
3. Connect the injector connector.

Check the Injection Condition

1. Following the steps below, bleed out the residual pressure within the fuel pipe line to prevent flow of the fuel (Refer to P.13A-398).
2. Remove the injector.



3. Assemble the following special tools as shown in Fig.
   - Injector test set (MD998706)
   - Injector test harness (MB991607)
   - Injector test adaptor (MD998741)
   - Injector test holder assembly (MB991976)
4. Connect the M.U.T.-II/III to the diagnosis connector.
5. Turn the ignition switch to "ON" position (But do not start the engine).
6. Select "Item No. 07" from the M.U.T.-II/III actuator test to drive the fuel pump.



7. Activate the injector and check the atomized spray condition of the fuel.

The condition can be considered satisfactory unless it is extremely poor.

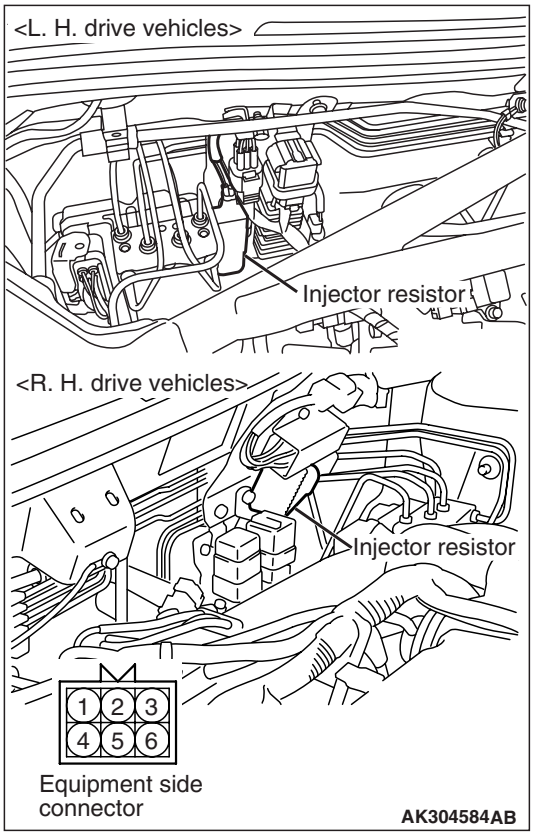
8. Stop the actuation of the injector, and check for leakage from the injector's nozzle.

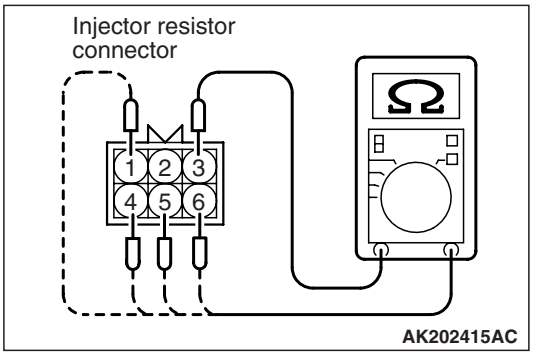
   Standard value: 1 drop or less per minute

9. Without the fuel pump operation, operate the injector to draw the fuel out.
10. If the spraying is extremely poor or the fuel leakage from the injector nozzle deviates from the standard value, replace the injector.
11. Disconnect the M.U.T.-II/III.

INJECTOR RESISTOR CHECK

M1131052800046





1. Disconnect the injector resistor connector.

2. Measure the resistance between terminals.

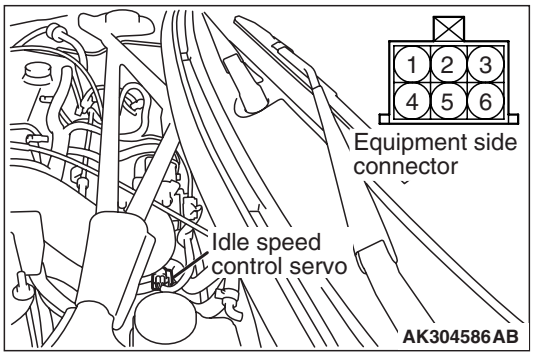
Measurement terminals	Resistance
1 – 3 4 – 3 5 – 3 6 – 3	5.8 – 6.2 Ω (At 20°C)

3. If the resistance is out of specification, replace the injector resistor.

IDLE SPEED CONTROL SERVO (STEPPER MOTOR) CHECK

M1131005400804

Check the Operation Sound



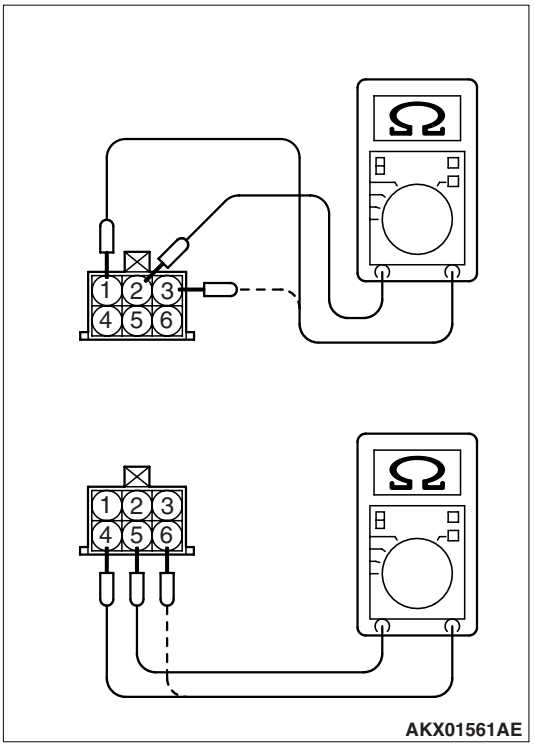
1. Check that the engine coolant temperature is 20°C or below.

   NOTE: Disconnecting the engine coolant temperature sensor connector and connecting the harness-side of the connector to another engine coolant temperature sensor that is at 20°C or below is also okay.

2. Check that the operation sound of the stepper motor can be heard after the ignition is switched "ON" position (but without starting the engine).
3. If the operation sound cannot be heard, check the stepper motor's activation circuit.

   If the circuit is normal, it is probable that there is a malfunction of the stepper motor or of the engine-ECU.

Check the Coil resistance



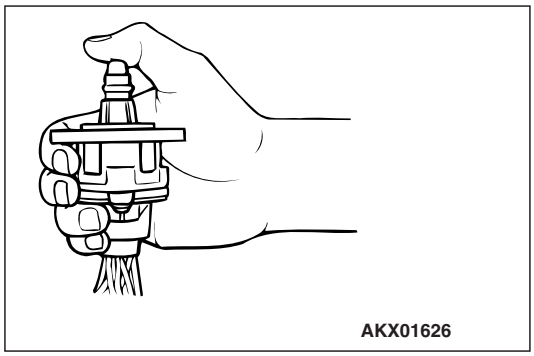
1. Disconnect the idle speed control servo connector.
2. Measure the resistance between terminal No. 2 and either terminal No. 1 or terminal No. 3 of the connector at the idle speed control servo side.

   Standard value: 28 – 33 Ω (at 20°C)

3. Measure the resistance between terminal No. 5 and either terminal No. 6 or terminal No. 4 of the connector at the idle speed control servo side.

   Standard value: 28 – 33 Ω (at 20°C)

Operation Check

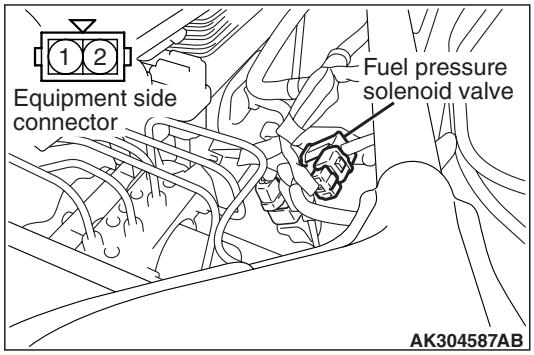


1. Remove the throttle body.
2. Remove the stepper motor.
3. Connect the special tool Test harness (MB991709) to the idle speed control servo connector.
4. Connect the positive (+) terminal of a power supply (approximately 6 V) to the terminals No. 2 and No. 5.
5. With the idle speed control servo as shown in the illustration, connect the negative (–) terminal of the power supply to each clip as described in the following steps, and check whether or not a vibrating feeling (a feeling of very slight vibration of the stepper motor) is generated as a result of the activation of the stepper motor.
   (1) Connect the negative (–) terminal of the power supply to the red and black clip.
   (2) Connect the negative (–) terminal of the power supply to the blue and black clip.
   (3) Connect the negative (–) terminal of the power supply to the blue and yellow clip.
   (4) Connect the negative (–) terminal of the power supply to the red and yellow clip.
   (5) Connect the negative (–) terminal of the power supply to the red and black clip.
   (6) Repeat the tests in sequence from (5) to (1).
6. If, as a result of these tests, vibration is detected, the stepper motor can be considered to be normal.

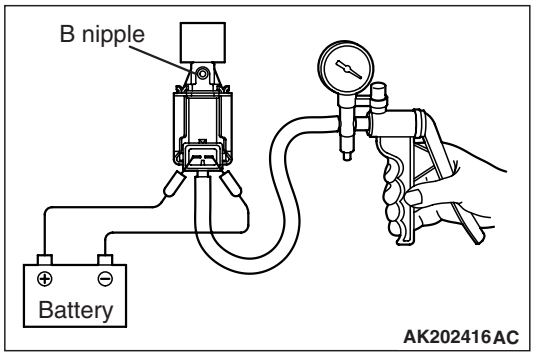
FUEL PRESSURE SOLENOID VALVE CHECK

M1131005800114

OPERATION CHECK



1. Remove the vacuum hose from the solenoid valve.
2. Disconnect the harness connector.

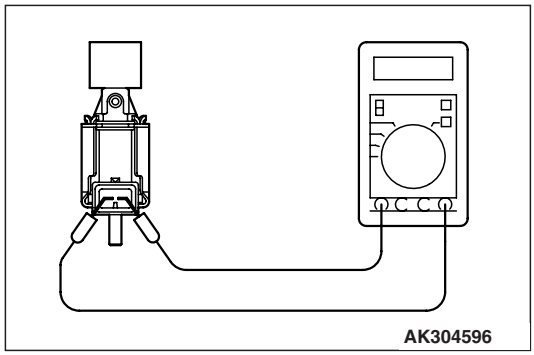


3. Connect a hand vacuum pump to the solenoid valve's A nipple.
4. Connect the solenoid valve terminal and battery terminal with a jumper wire.
5. Disconnect the jumper wire between the battery's (–) terminals, apply a negative pressure, and inspect the tightness.

Standard valve:

Battery voltage	B nipple	Normal condition
No applied	Open	Vacuum leak
	Close	Vacuum maintained
Applied	Open	Vacuum maintained

COIL RESISTANCE CHECK



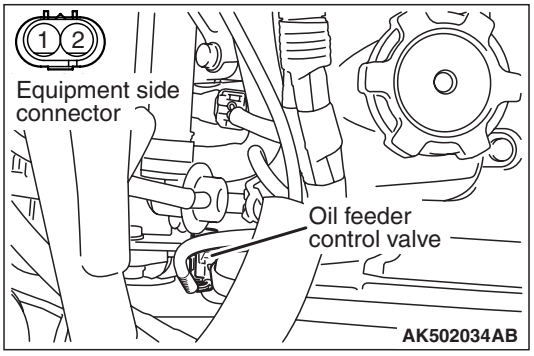
1. Measure the resistance between the terminals of the solenoid valve.

Standard value: 28 – 36 Ω (at 20°C)

OIL FEEDER CONTROL VALVE CHECK

M1131053800072

OPERATION CHECK



1. Disconnect the oil feeder control valve connector.

⚠ CAUTION

To prevent the coil from burning, keep the duration of the voltage application as short as possible.

2. Apply battery voltage to the terminals of the connector at the oil feeder control valve, and make sure the oil feeder control valve makes a clicking sound.

MEASUREMENT OF RESISTANCE BETWEEN TERMINALS

1. Disconnect the oil feeder control valve connector.
2. Measure the resistance between the terminals of the connector at the oil feeder control valve.

Standard value: 6.9 – 7.9 Ω (at 20°C)

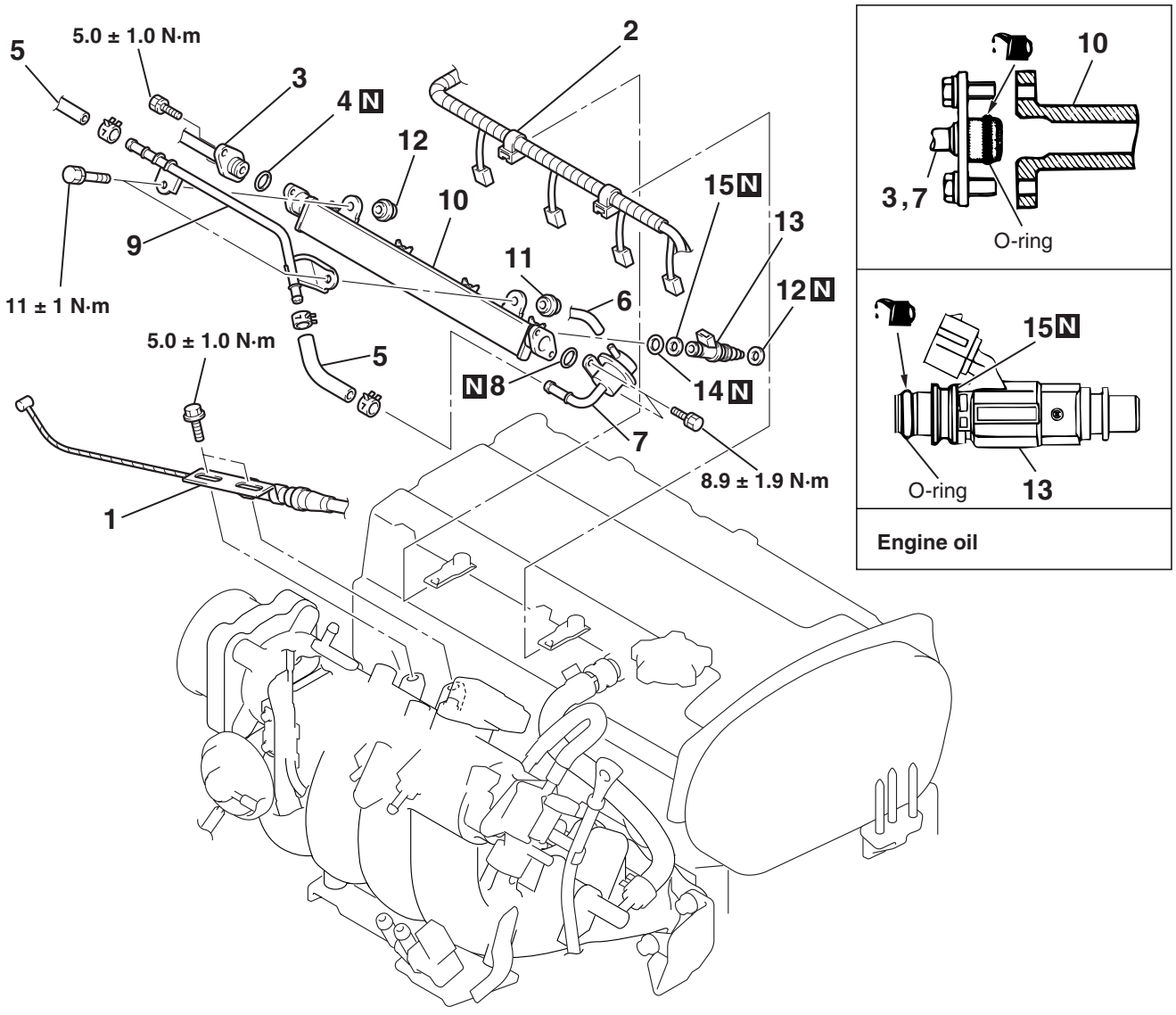
3. If resistance is outside the standard value, replace the oil feeder control valve.

INJECTOR

REMOVAL AND INSTALLATION

M1131007100854

Pre-removal Operation	Post-installation Operation
• Fuel Discharge Prevention (Refer to P.13A-398). • Strut Tower Bar Removal (Refer to GROUP 42, Strut Tower Bar P.42-9). • Air Hose E, Air By-pass Hose, Air Pipe C Removal (Refer to GROUP 15, Intercooler P.15-6).	• Air Hose E, Air By-pass Hose, Air Pipe C Installation (Refer to GROUP 15, Intercooler P.15-6). • Strut Tower Bar Installation (Refer to GROUP 42, Strut Tower Bar P.42-9). • Fuel Leakage Check



AC210060AD

Removal steps

1. Accelerator cable assembly connection (Throttle body side)
2. Control wiring harness connection
>>**A**<< 3. Fuel high-pressure hose connection
4. O-ring
5. Fuel return hoses connection
6. Vacuum hose connection
>>**A**<< 7. Fuel pressure regulator

Removal steps (Continued)

8. O-ring
9. Fuel return pipe
<<**A**>> 10. Delivery pipe
11. Insulators
12. Insulators
<<**A**>> >>**A**<< 13 Injectors
14. O-ring
15. Grommets

REMOVAL SERVICE POINT

<<A>> DELIVERY PIPE/INJECTORS REMOVAL

⚠ CAUTION

Do not drop the injector.

Remove the delivery pipe with the injectors attached to it.

INSTALLATION SERVICE POINT

>>A<< INJECTORS/FUEL PRESSURE REGULATOR/FUEL HIGH-PRESSURE HOSE INSTALLATION

⚠ CAUTION

Do not let the engine oil get into the delivery pipe will be damaged.

1. Apply a drop of new engine oil to the O-ring.
2. Turn the injector to the right and left to install to the delivery pipe. Repeat for fuel pressure regulator and fuel high-pressure hose. Be careful not to damage the O-ring. After installing, check that the item turns smoothly.
3. If it does not turn smoothly, the O-ring may be pinched, remove the item, re-install it into the delivery pipe and check again.
4. Tighten the fuel pressure regulator and fuel high-pressure hose to the specified torque.

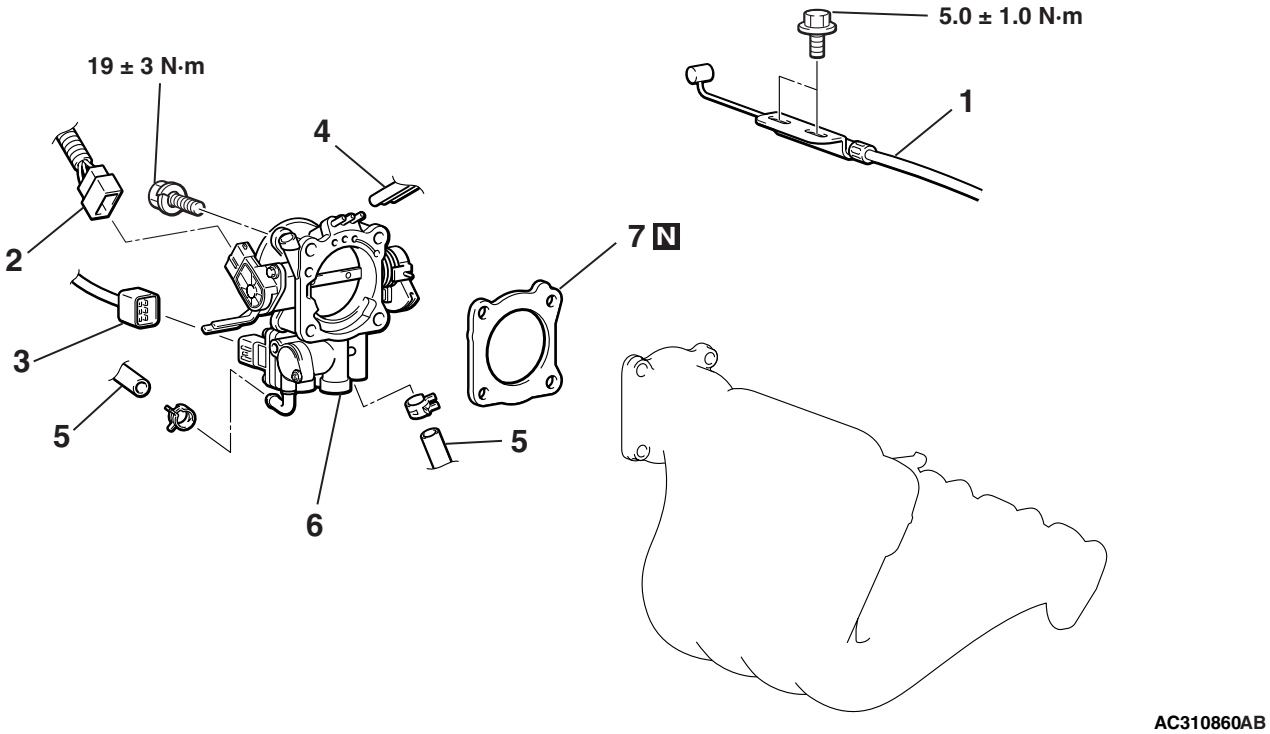
   Tightening torque:
   8.9 ± 1.9 N·m <Fuel pressure regulator>
   5.0 ± 1.0 N·m <Fuel high-pressure hose>

THROTTLE BODY ASSEMBLY

REMOVAL AND INSTALLATION

M1131007700759

Pre-removal Operation	Post-installation Operation
• Under Cover Removal (Refer to GROUP 51, Front Bumper P.51-2). • Engine Coolant Draining (Refer to GROUP 14, On-vehicle Service – Engine Coolant Replacement P.14-15). • Strut Tower Bar Removal (Refer to GROUP 42, Strut Tower Bar P.42-9). • Air Hose E, Air By-pass Hose, Air Pipe C Removal (Refer to GROUP 15, Intercooler P.15-6).	• Air Hose E, Air By-pass Hose, Air Pipe C Installation (Refer to GROUP 15, Intercooler P.15-6). • Strut Tower Bar Installation Refer to GROUP 42, Strut Tower Bar P.42-9). • Engine Coolant Refilling (Refer to GROUP 14, On-vehicle Service – Engine Coolant Replacement P.14-15). • Under Cover Installation (Refer to GROUP 51, Front Bumper P.51-2). • Accelerator Cable Adjustment (Refer to GROUP 17, On-vehicle Service – Accelerator Cable Check and Adjustment P.17-2).



AC310860AB

Removal steps
1. Accelerator cable connection
2. Throttle position sensor connector
3. Idle speed control servo connector
4. Vacuum hoses connection

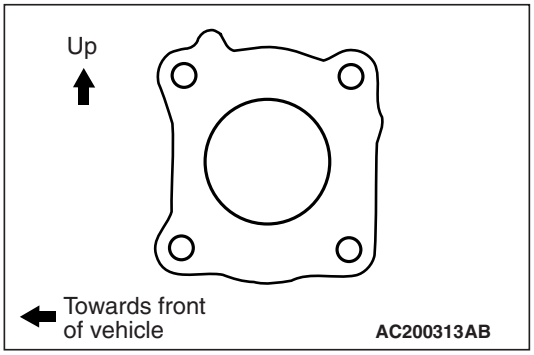
Removal steps (Continued)
5. Water hoses connection
6. Throttle body
>>A<< 7. Throttle body gasket

INSTALLATION SERVICE POINT

>>A<<THROTTLE BODY GASKET INSTALLATION

⚠ CAUTION

Poor idling etc. may result if the throttle body gasket is installed incorrectly.



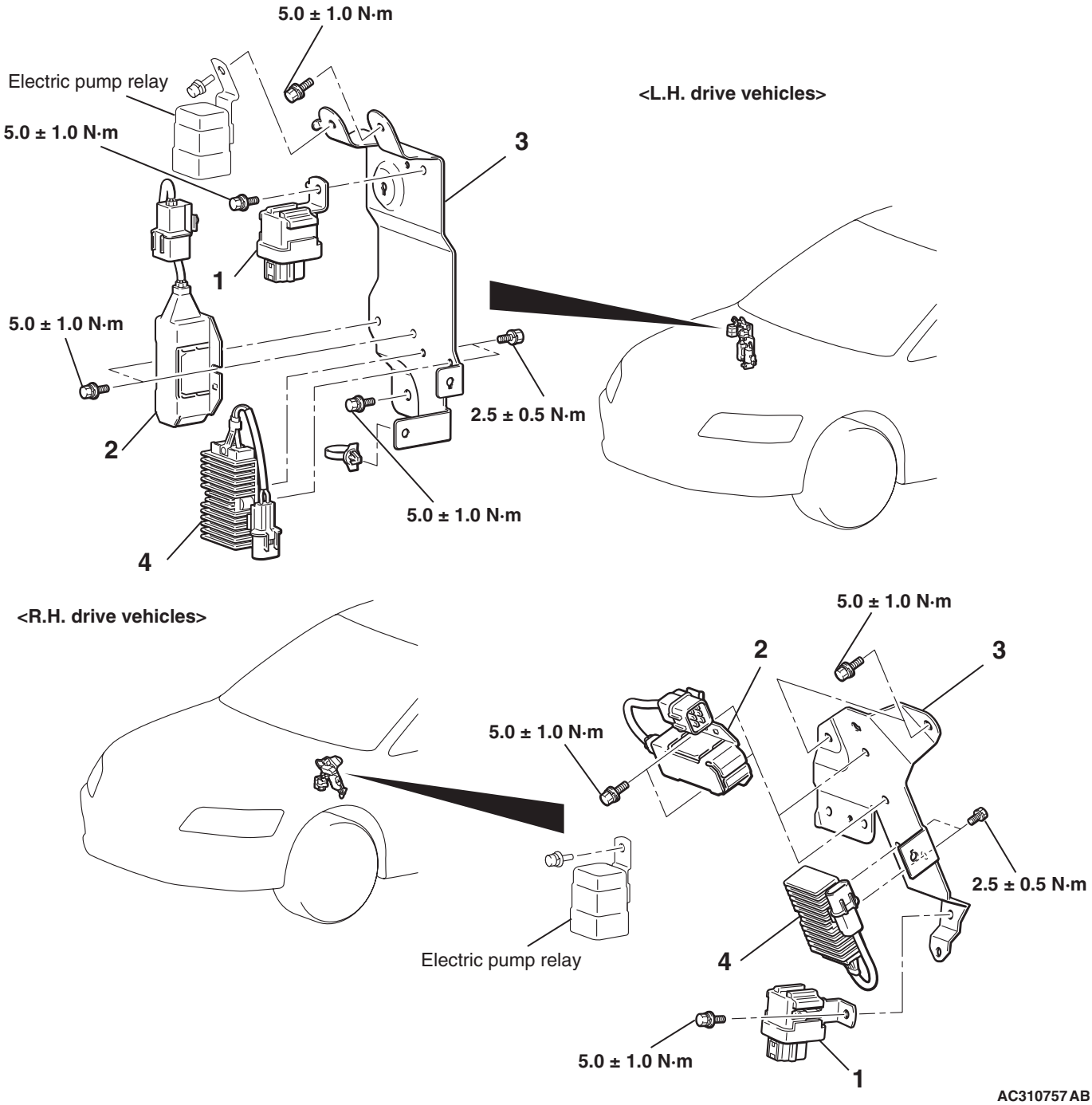
Install the throttle body gasket as shown in the illustration.

ENGINE CONTROL RESISTOR, RELAY

REMOVAL AND INSTALLATION

M1131034600024

Pre-removal Operation	Post-installation Operation
• Strut Tower Bar Removal (Refer to GROUP 42, Strut Tower Bar P.42-9). • Harness Connector Disconnection	• Harness Connector Connection • Strut Tower Bar Installation (Refer to GROUP 42, Strut Tower Bar P.42-9).



Removal steps

- Electric pump relay (Refer to GROUP 22A, Sensor, Switch and Relay P.22A-168).

1. Fuel pump relay

Removal steps (Continued)

2. Injector resistor
3. Bracket
4. Fuel pump resistor

ENGINE-ECU

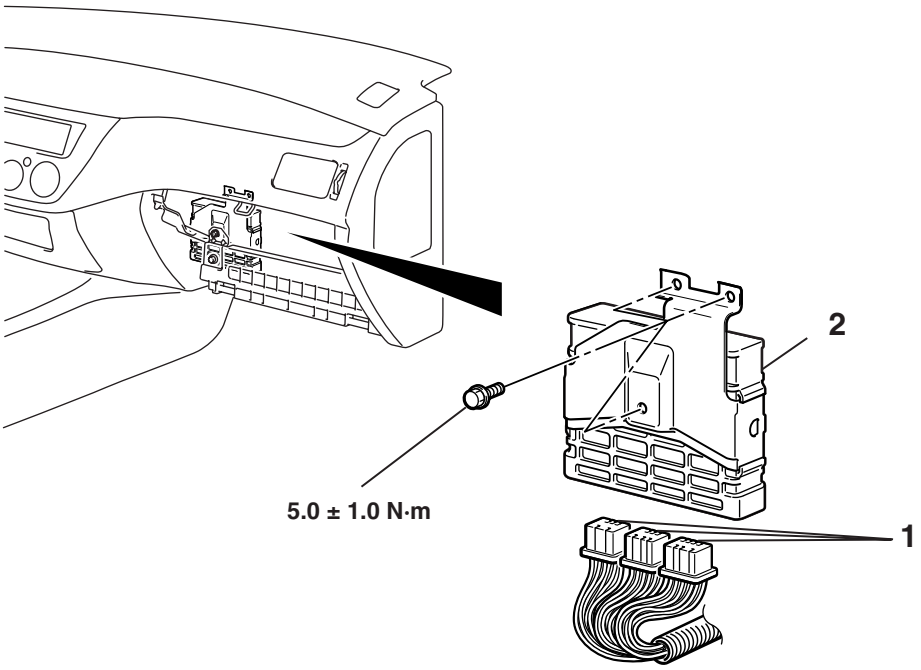
REMOVAL AND INSTALLATION

M1131033800230

⚠ CAUTION

When the engine-ECU is replaced, always refer to GROUP 54A, General Information – Immobilizer System – Encrypted Code Registration Criteria Table P.54A-6.

Pre-removal and Post-installation Operation
- Glove Box Assembly Removal and Installation (Refer to GROUP 52A, Instrument Panel P.52A-2).
- Harness Cover Removal and Installation (Refer to GROUP 52A, Instrument Panel P.52A-2).



AC505253AB

Removal steps
1. Engine-ECU connectors
2. Engine-ECU