

FUEL

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GASOLINE DIRECT INJECTION (GDI)

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GENERAL

OUTLINE OF CHANGE

The engine-ECU <M/T> and engine-A/T-ECU <A/T>, which feature communication port with stability control system, have been introduced. The service procedures for these ECUs are the same as before.

GENERAL INFORMATION

GENERAL SPECIFICATIONS

Items		Specifications
Engine-ECU <M/T>	Identification No.	E2T79275 <LHD> E2T79276 <RHD>
Engine-A/T-ECU <A/T>	Identification No.	E2T76290 <LHD> E2T76291 <RHD>

MITSUBISHI STABILITY CONTROL (MITSUBISHI SC)

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WARNINGS REGARDING SERVICING OF SUPPLEMENTAL RESTRAINT SYSTEM (SRS) EQUIPPED VEHICLES

WARNING!

- (1) Improper service or maintenance of any component of the SRS, or any SRS-related component, can lead to personal injury or death to service personnel (from inadvertent firing of the air bag) or to the driver and passenger (from rendering the SRS inoperative).
- (2) Service or maintenance of any SRS component or SRS-related component must be performed only at an authorized MITSUBISHI dealer.
- (3) MITSUBISHI dealer personnel must thoroughly review this manual, and especially its GROUP 52B – Supplemental Restraint System (SRS) before beginning any service or maintenance of any component of the SRS or any SRS-related component.

NOTE

The SRS includes the following components: front impact sensors, SRS-ECU, SRS warning lamp, air bag module, clock spring and interconnecting wiring. Other SRS-related components (that may have to be removed/installed in connection with SRS service or maintenance) are indicated in the table of contents by an asterisk (*).

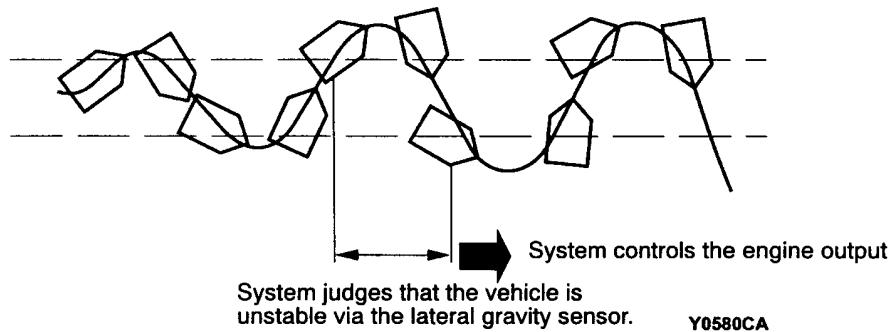
GENERAL INFORMATION

The MITSUBISHI Stability Control (MITSUBISHI SC) system, which compensates for an unsafe driving by controlling the engine output (i.e., traction control), has been introduced.

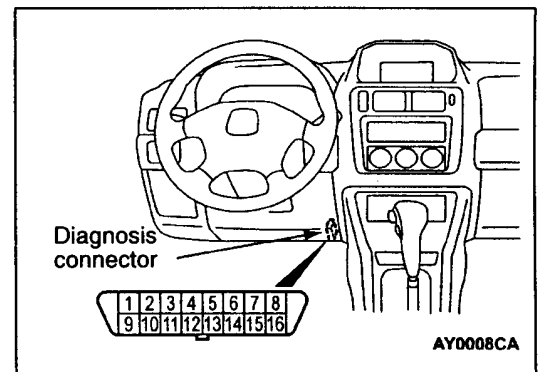
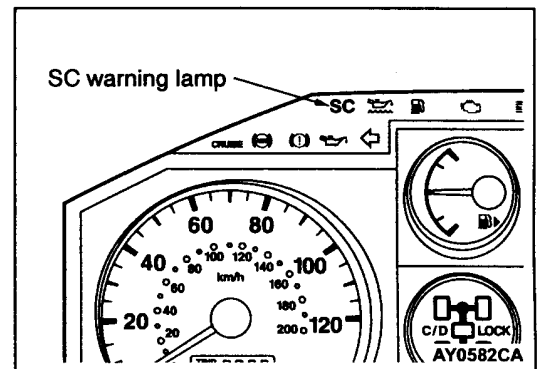
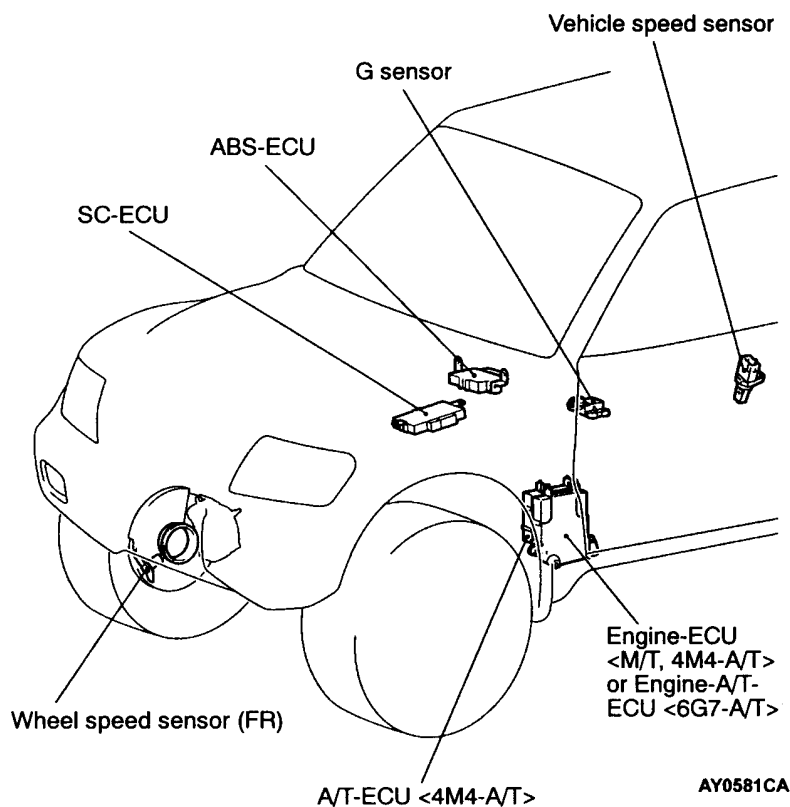
The MITSUBISHI SC judges that the vehicle is unstable via the lateral gravity sensor.

Then the system will control the engine output, based on the vehicle speed and the throttle opening angle.

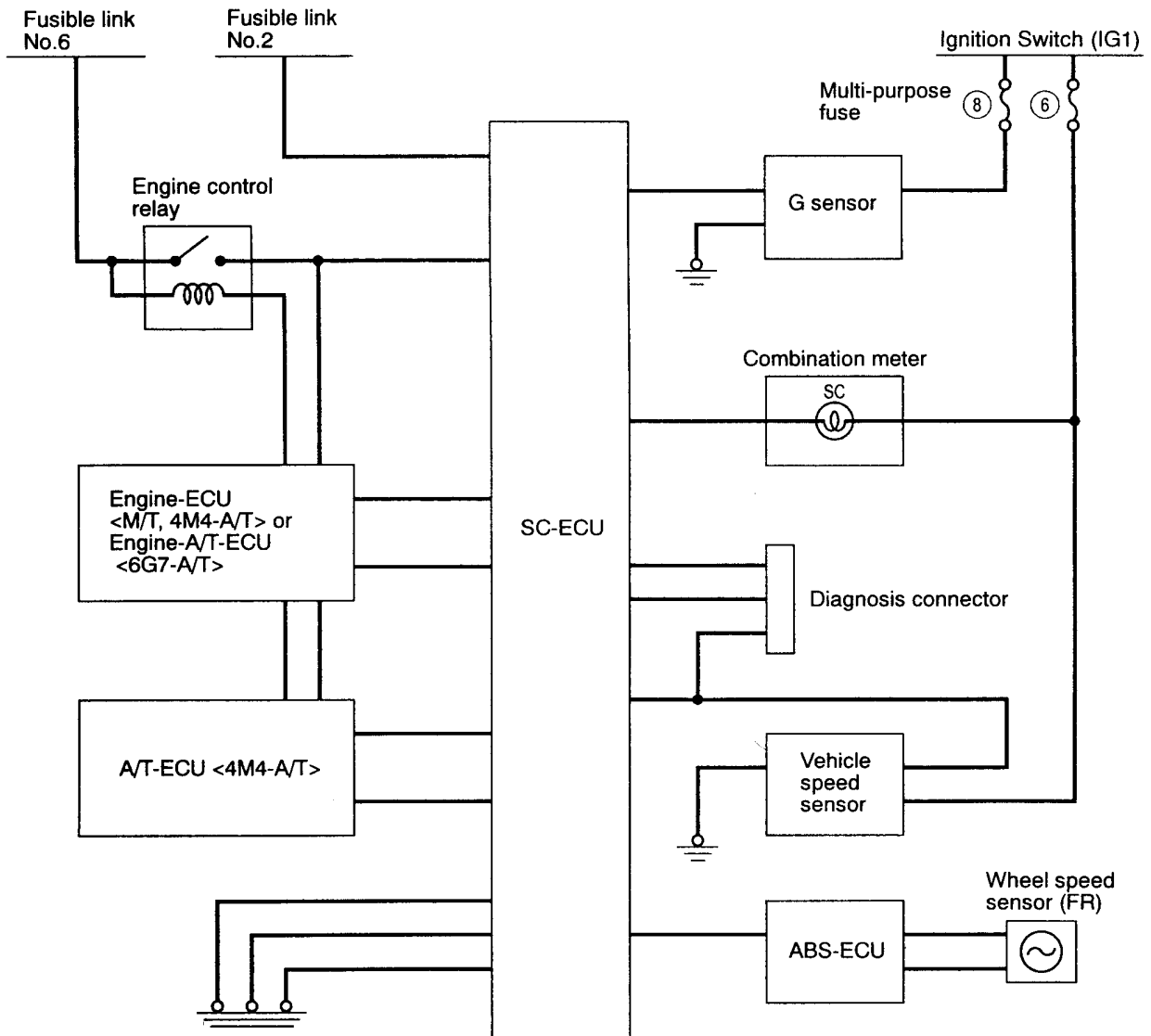
In addition, if the system fails, the SC warning lamp inside the combination meter will illuminate or flash to warn the driver.



System Diagram



System Circuit Diagram



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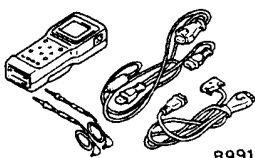
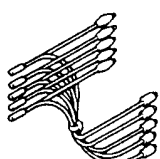
MAJOR COMPONENT REFERENCE TABLE

Components	Functions
SC-ECU	Receives signals from various sensors, and transmits an engine output control signal to the engine-ECU or engine-A/T-ECU, based on the information.
Engine-ECU <M/T, 4M4-A/T>	Transmits the engine information (such as APS signal and engine speed), which is required for control the Mitsubishi SC, to the SC-ECU. Compensate for the engine output according to the current engine condition on request from the SC-ECU.
Engine-A/T-ECU <6G7-A/T>	- Transmits the engine information (such as APS signal and engine speed), which is required for controlling the Mitsubishi SC, to the SC-ECU. - Transmits the transmission information (such as shift position), which is required for controlling the Mitsubishi SC, to the SC-ECU. Compensate for the engine output according to the current engine condition on request from the SC-ECU.
A/T-ECU <4M4-A/T>	Transmits the transmission information (such as shift position), which is required for controlling the Mitsubishi SC, to the SC-ECU.
ABS-ECU	Transmits the wheel speed sensor (FR) signal to the SC-ECU.
G sensor	Measures the vehicle lateral gravity, and transmit the information to the SC-ECU as a voltage signal.
Vehicle speed sensor	Transmits the vehicle speed (transmission output gear speed) signal to the SC-ECU.
SC warning lamp	Illuminates or flashes when the SC-ECU transmits a signal indicating the system error.
Diagnosis connector	When a diagnosis code is set, the MUT-II communicates with the system via this connector.

SERVICE SPECIFICATIONS

Items	Standard value
G sensor output voltage V	When the vehicle is stationary
	When an arrow on the G sensor label is facing down
	2.35 – 2.65
	3.3 – 3.7

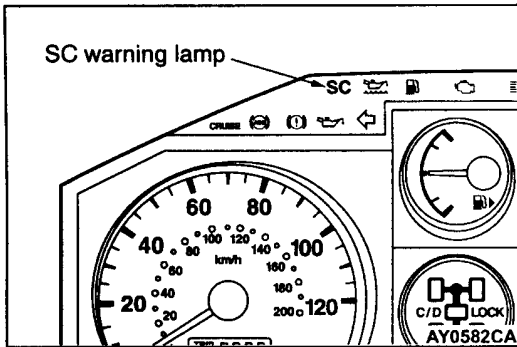
SPECIAL TOOLS

Tools	No.	Name	Application
 8991502	MB991502	MUT-II sub assembly	Checking the MITSUBISHI SC (Diagnosis display using the MUT-II)
 8991348	MB991348	Test harness set	Checking the G sensor

TROUBLESHOOTING

STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING

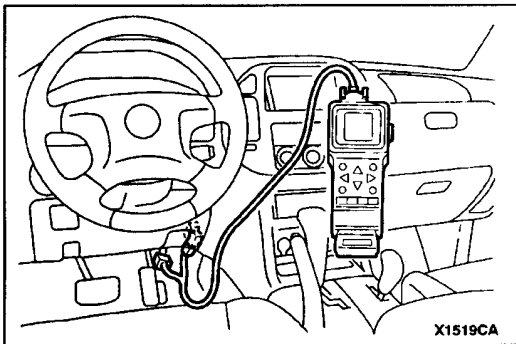
Refer to Basic Manual GROUP 00 – How to Use Troubleshooting/Inspection Service Points.



SC WARNING LAMP INSPECTION

Check that the SC warning lamp illuminates as follows.

1. When the ignition key is turned to "ON", the SC warning lamp will illuminate.
2. When the engine is started, the SC warning lamp will be switched off.
3. If the illumination is other than the above, check the diagnosis codes.



DIAGNOSIS FUNCTION

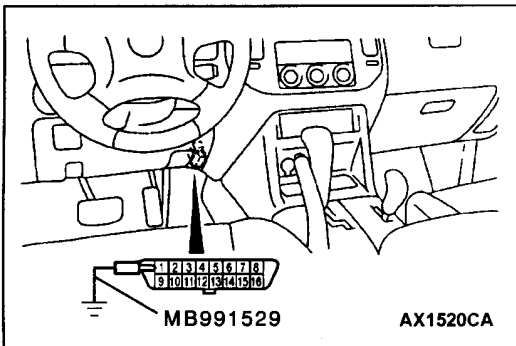
METHOD OF READING DIAGNOSIS CODES

WHEN USING THE MUT-II

Connect the MUT-II to the diagnosis connector and take a reading of the diagnosis codes.

Caution

Turn the ignition switch to "LOCK" (OFF) position before connecting or disconnecting the MUT-II.



WHEN USING THE WARNING LAMP

1. Use the special tool to earth No.1 terminal (diagnosis control terminal) of the diagnosis connector.
2. Turn on the ignition switch.
3. Read out a diagnosis code by observing how the warning lamp flashes.
(Refer to Basic Manual GROUP 00 – How to Use Troubleshooting/Inspection Service Points.)

ERASING DIAGNOSIS CODES

Connect the MUT-II to the diagnosis connector and erase the diagnosis codes.

Caution

Turn the ignition switch to "LOCK" (OFF) position before connecting or disconnecting the MUT-II.

INSPECTION CHART FOR DIAGNOSIS CODES

Diagnosis code No.	Diagnosis item	SC warning lamp	Reference page
27* ¹	SC-ECU power supply system (abnormal voltage drop)	Flashes	13E-6
51* ²	Vehicle speed sensor wheel speed sensor system (output signal abnormality)	Flashes	13E-7
52	Vehicle speed sensor system (open circuit or short-circuit)	Flashes	13E-8
53* ²	Wheel speed sensor system (open circuit or short-circuit)	Flashes	13E-8
55* ²	G sensor system	Flashes	13E-9
71	Communication line between the engine-ECU or engine-A/T-ECU and the system	Flashes	13E-10
72	Engine-ECU or Engine-A/T-ECU system	Illuminates	13E-10
74* ²	Communication line between the A/T-ECU and the system <4M4-A/T>	Flashes	13E-11
81* ¹	The SC-ECU is controlling the system too long	Flashes	13E-11

NOTE

*1: Code No.27 and 81 are erased from the memory if the condition returns to normal.

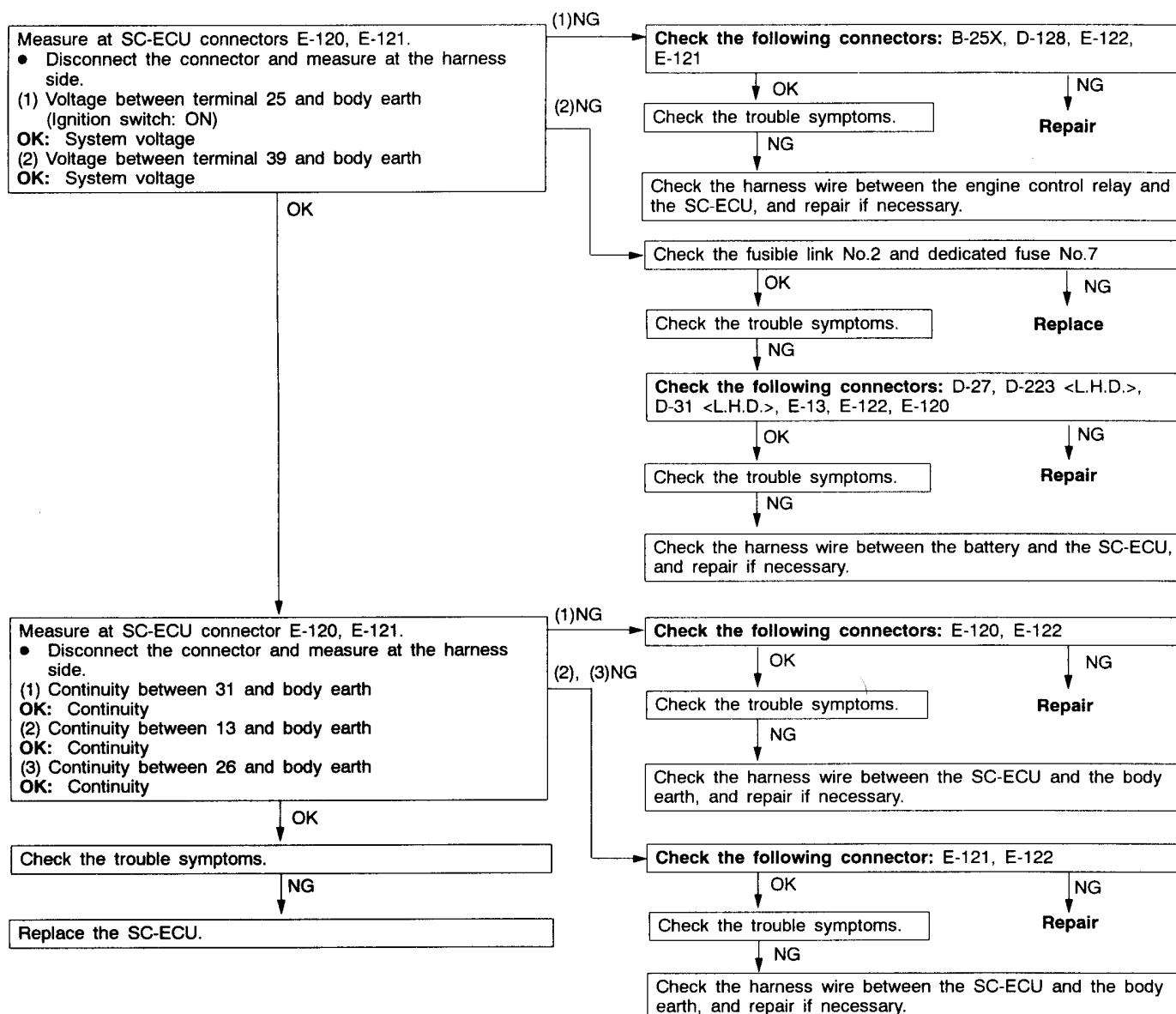
*2: For code Nos.51, 53, 55 and 74, a diagnosis code will be set in ten seconds after a failure is detected..

INSPECTION PROCEDURE FOR DIAGNOSIS CODE

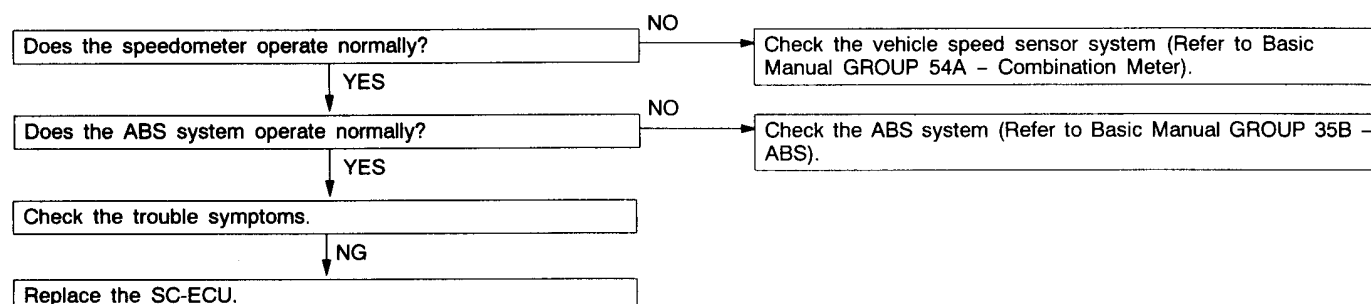
Code No. 27 SC-ECU power supply system (abnormal voltage drop)	Probable cause
This diagnosis code will be set if the SC-ECU power supply voltage drops below a certain level.	● Malfunction of battery ● Malfunction of harness or connector ● Malfunction of the SC-ECU

Caution

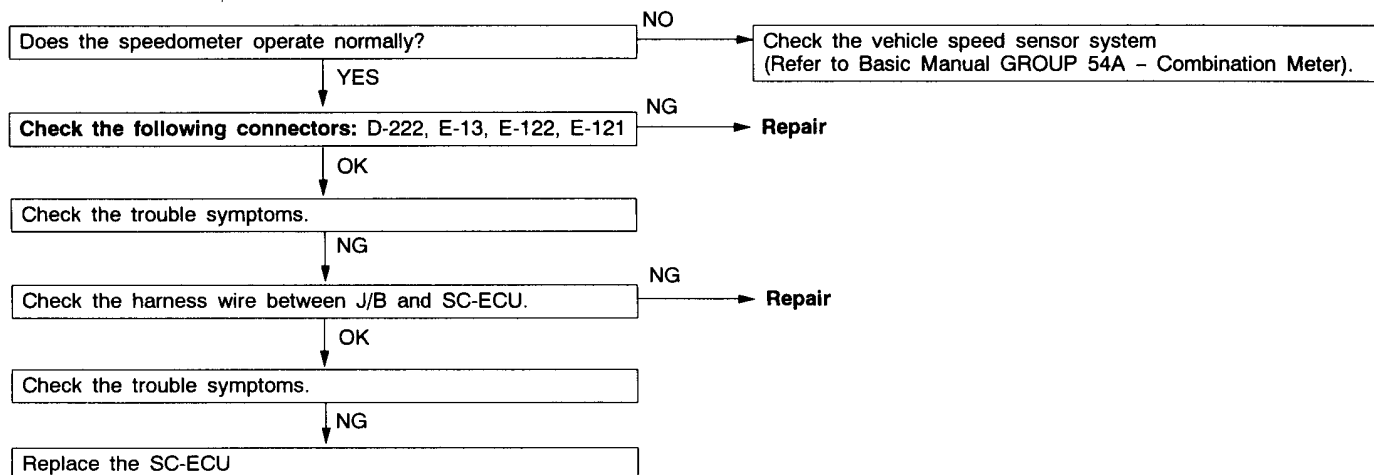
If the system voltage drops during inspection, this code will be output to indicate a current problem. And correct problem diagnosis will not be possible. Before carrying out the following procedure, check the battery and recharge it if necessary.



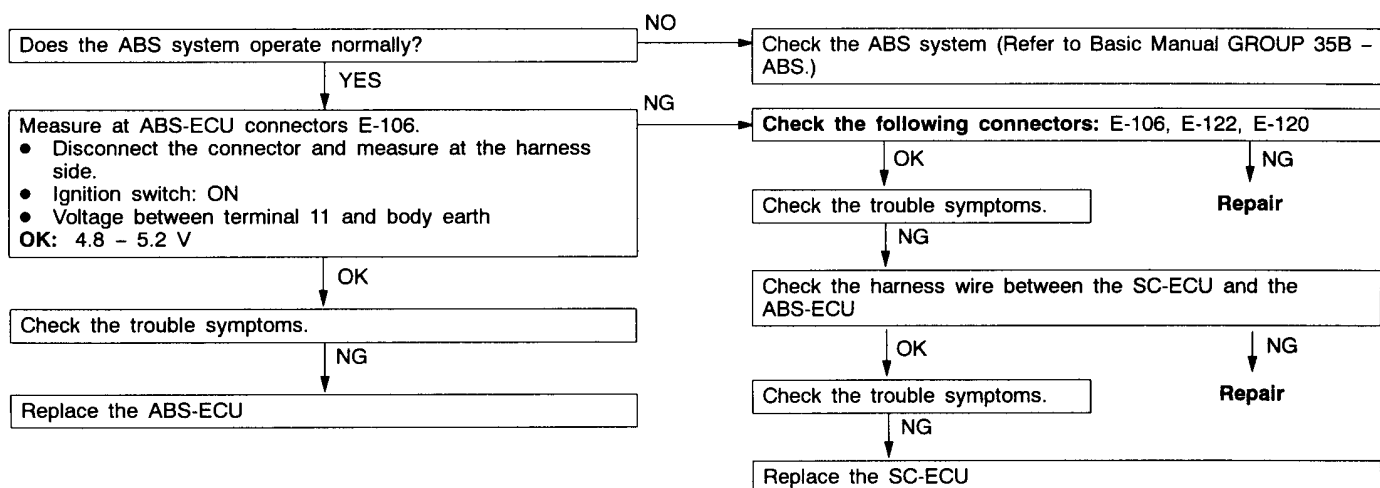
Code No. 51 Vehicle speed sensor system	Probable cause
This diagnosis code will be set when the vehicle speed signal from the vehicle speed sensor is not the same as that from the wheel speed sensor (FR).	- Malfunction of vehicle speed sensor system - Malfunction of wheel speed sensor system - Malfunction of the SC-ECU



Code No. 52 Vehicle speed sensor system (open circuit or short-circuit)	Probable cause
This diagnosis code will be set when the vehicle speed sensor does not send vehicle speed signal to the SC-ECU.	• Malfunction of vehicle speed sensor • Malfunction of harness or connector • Malfunction of the SC-ECU



Code No. 53 Wheel speed sensor system (open circuit or short-circuit)	Probable cause
This code is output when the open circuit or short-circuit detection carried out by the ABS-ECU hardware circuit detects that there is an open circuit or short-circuit in the (+) or (-) wire in one of the four wheel speed sensors and signals are consequently not being input.	• Malfunction of wheel speed sensor • Malfunction of harness or connector • Malfunction of the ABS-ECU



Code No. 55 G sensor system	Probable cause
This code is output at the following cases: - When the G sensor output is lower than 0.5 V or higher than 4.5 V (Open circuit or short-circuit in G sensor circuit) - When there is no variation in the G sensor output voltage (G sensor output seized)	- Malfunction of G sensor - Malfunction of harness or connector - Malfunction of the SC-ECU

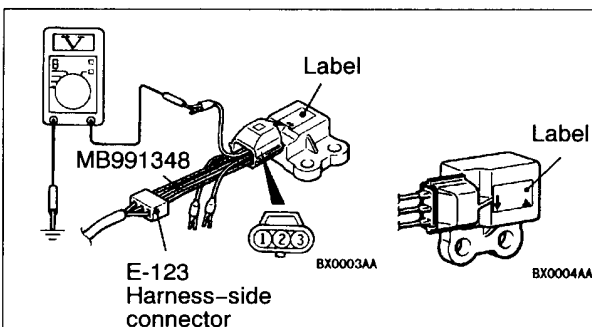
Measure at G sensor connector E-123.

- Disconnect the connector and measure at the harness side.

(1) Voltage between terminal 1 and body earth (Ignition switch: ON)
OK: System voltage

(2) Continuity between terminal 3 and body earth
OK: Continuity

OK



- Remove the G sensor (Refer to P.13E-19).
- Connect the special tool between the G sensor harness-side connector E-123 and the G sensor.
- Ignition switch: ON
- Voltage between terminal 2 and body earth when the G sensor is placed on a level surface
OK: 2.35 – 2.65 V
- Voltage between terminal 2 and body earth when the G sensor is placed so that the label is facing straight up
OK: 3.3 – 3.7 V

OK

Check the following connectors: E-123, E-113, E-122, E-121

OK

Check the trouble symptoms.

NG

Check the harness wire between the G sensor and SC-ECU

OK

Check the trouble symptoms.

NG

Replace the SC-ECU.

(1)NG

Check the following connectors: D-208, D-213, D-32, E-115, E-123

OK

NG

Check the trouble symptoms.

NG

Check the harness wire, and repair if necessary.

- Between ignition switch and G sensor

Repair

Check the following connectors: E-123

OK

NG

Check the trouble symptoms.

NG

Check the harness wire, and repair if necessary.

- Between the G sensor and body earth

Repair

NG

Replace the G sensor.

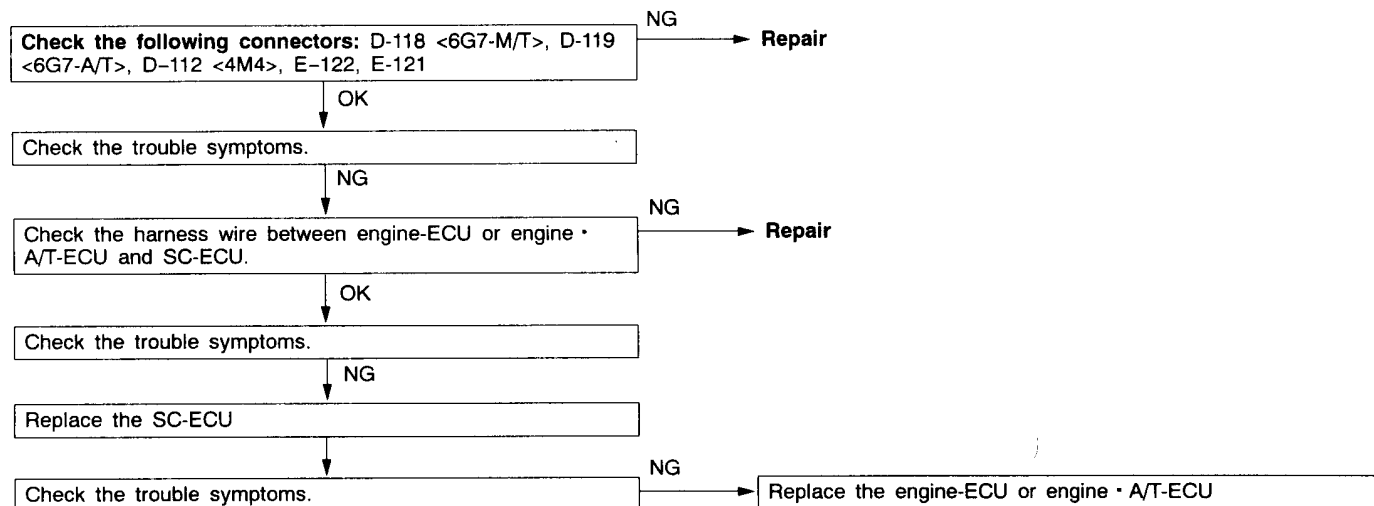
NG

Repair

NG

Repair

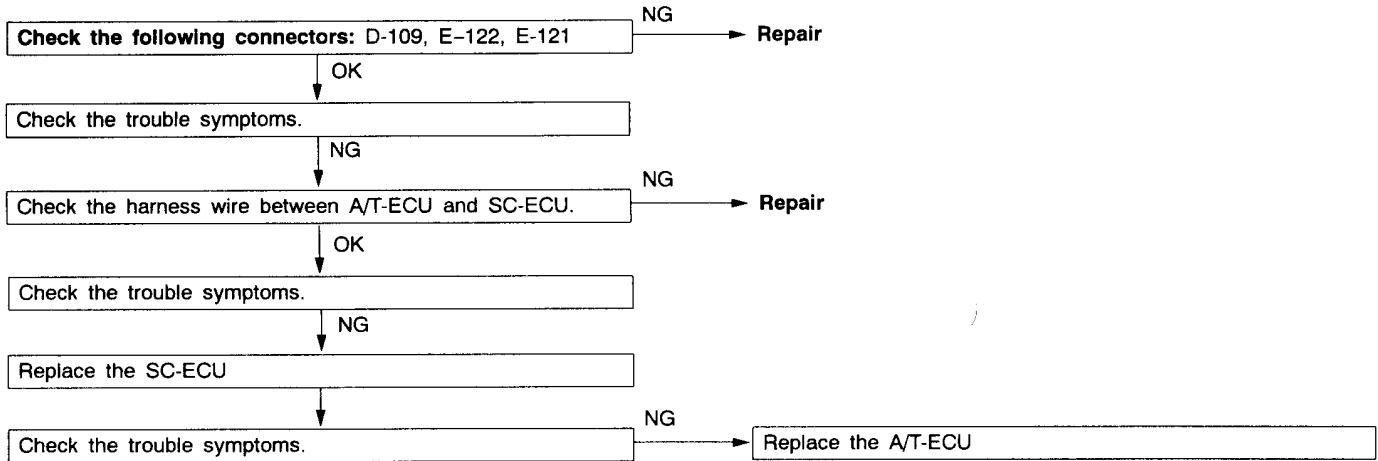
Code No. 71 Communication line between the engine-ECU or engine-A/T-ECU and the system	Probable cause
This diagnosis code will be set when an error takes place due to the open or short circuit in the serial communication line between the SC-ECU and the engine-ECU or engine-A/T-ECU, internal failure in the ECU or improper shield line.	• Malfunction of harness or connector • Malfunction of engine-ECU or engine - A/T-ECU • Malfunction of the SC-ECU



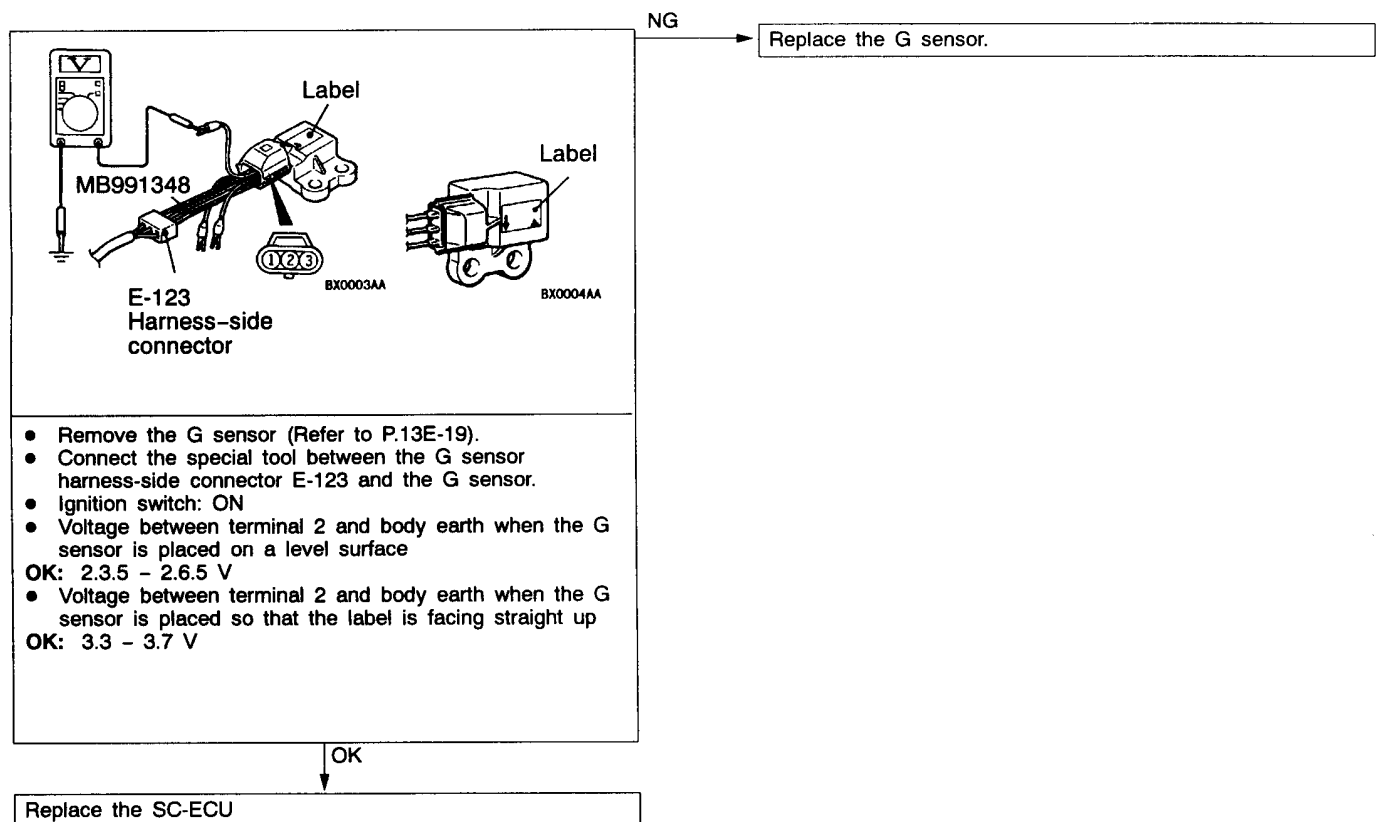
Code No. 72 Engine-ECU or Engine-A/T-ECU system	Probable cause
This diagnosis code will be set when the engine-ECU or engine-A/T-ECU detects a system failure. On the GDI system <6G7> or diesel fuel system <4M4>, the system failure is transmitted from the engine-ECU or engine-A/T-ECU via a serial communication line to the SC-ECU.	• Malfunction of GDI system <6G7> • Malfunction of diesel fuel system <4M4>

- Carry out the troubleshooting regarding the GDI system. <6G7> (Refer to Basic Manual GROUP 13A – Troubleshooting.)
- Carry out the troubleshooting regarding the diesel fuel system. <4M4> (Refer to Basic Manual GROUP 13C – Troubleshooting.)

Code No. 74 Communication line between the A/T-ECU and the system <4M4-A/T>	Probable cause
This diagnosis code will be set when an error takes place due to the open or short circuit in the serial communication line between the SC-ECU and the A/T-ECU, internal failure in the ECU or improper shield line.	• Malfunction of harness or connector • Malfunction of A/T-ECU • Malfunction of the SC-ECU



Code No. 81 The SC-ECU is controlling the system too long	Probable cause
This diagnosis code will be set when the SC-ECU is controlling the system for 20 seconds or more.	• Malfunction of G sensor • Malfunction of SC-ECU



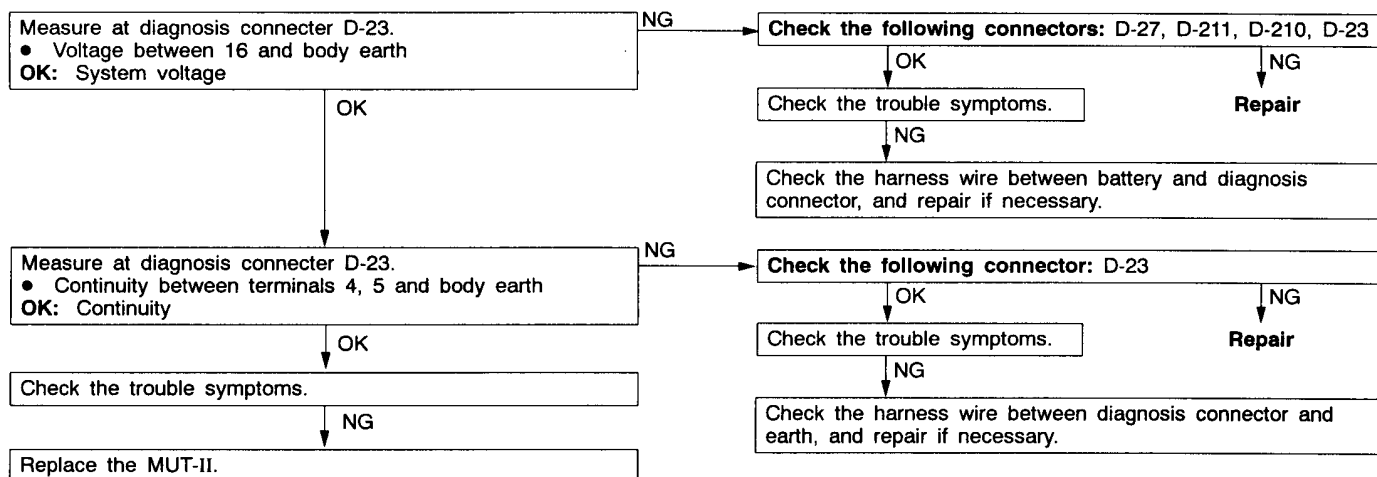
INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble Symptom	Inspection procedure No.	Reference page
Communication with MUT-II is not possible.	1	13E-12
Communication with MUT-II and the SC-ECU is not possible.	2	13E-13
The SC warning lamp does not illuminate when the ignition key is turned to ON (engine stopped).	3	13E-14
The SC warning lamp remains illuminated after the engine has started.	4	13E-14

INSPECTION PROCEDURES FOR TROUBLE SYMPTOMS

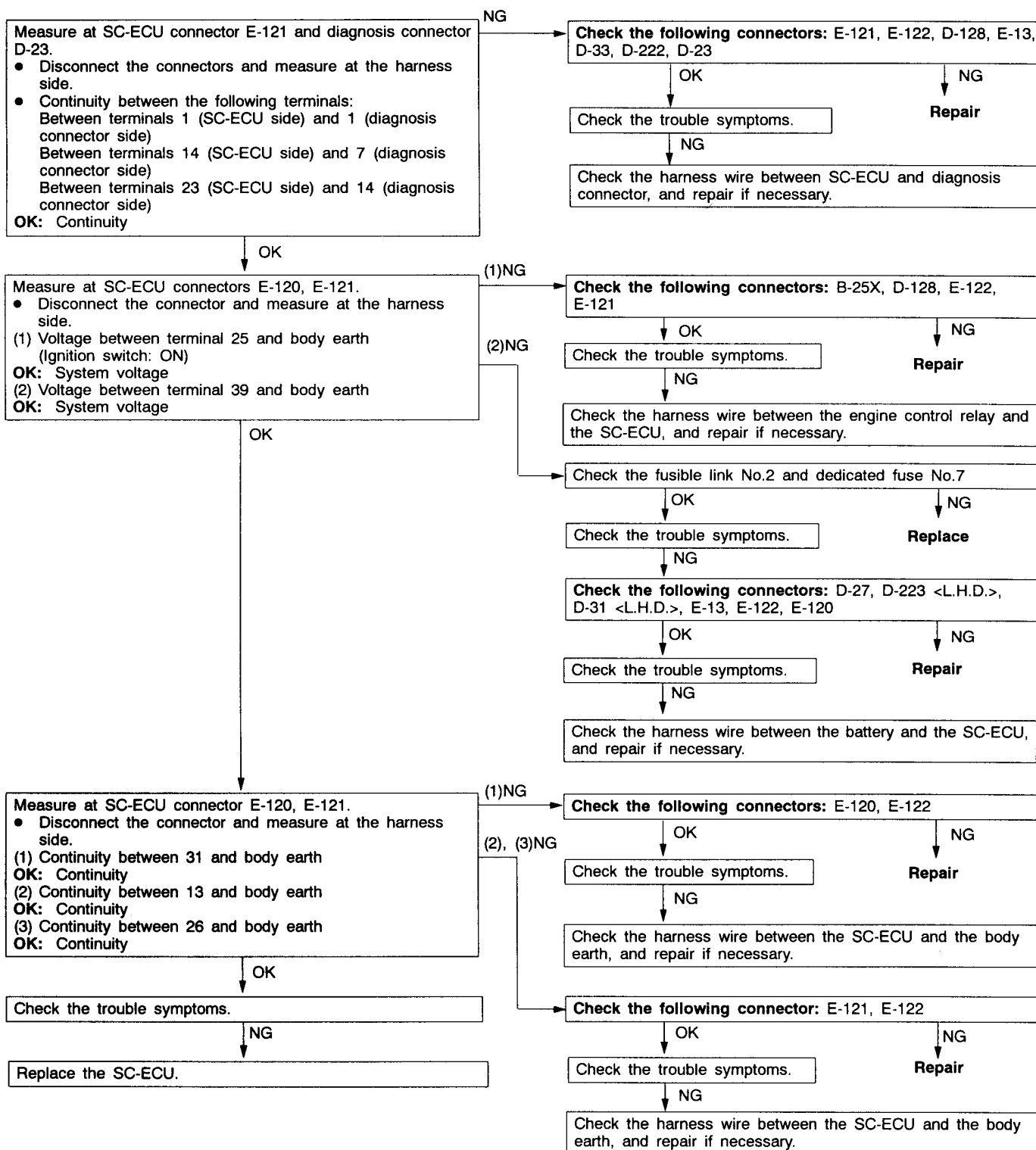
Inspection procedure 1

Communication with MUT-II is not possible.	Probable cause
The cause is probably a malfunction of the diagnosis connector power supply circuit or earth circuit.	- Malfunction of diagnosis connector - Malfunction of harness or connector



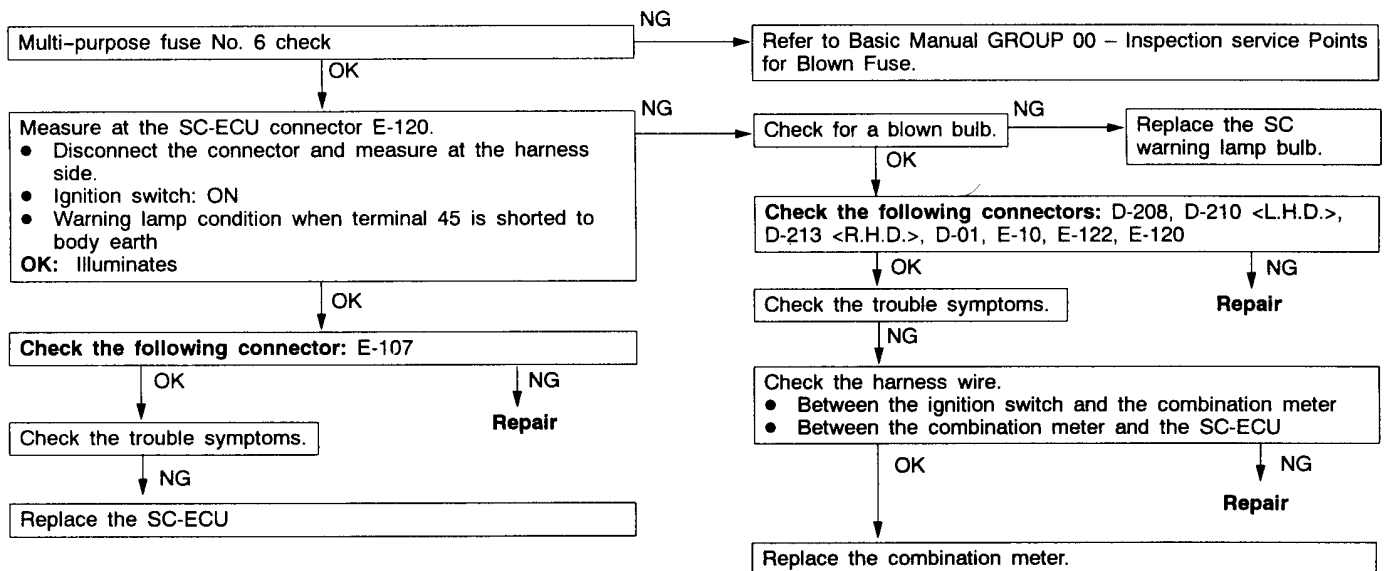
Inspection procedure 2

Communication with MUT-II and the SC-ECU is not possible.	Probable cause
The cause is probably an open circuit in the SC-ECU power supply circuit or an open circuit in the diagnosis output circuit.	• Malfunction of harness or connector • Malfunction of the SC-ECU



Inspection procedure 3

The SC warning lamp does not illuminate when the ignition key is turned to ON (engine stopped).	Probable cause
When the ignition switch is turned on, the SC-ECU starts to communicate with the engine-ECU or engine-A/T-ECU. Then the SC-ECU will illuminate the SC warning lamp if the engine speed is 350 rpm or less. If the SC warning lamp does not illuminate, the case is probably an open circuit in the SC warning lamp power supply circuit, a blown lamp bulb or an open circuit between the SC warning lamp and the SC-ECU.	• Blown fuse • Blown SC warning lamp bulb • Malfunction of harness or connector • Malfunction of combination meter • Malfunction of the SC-ECU

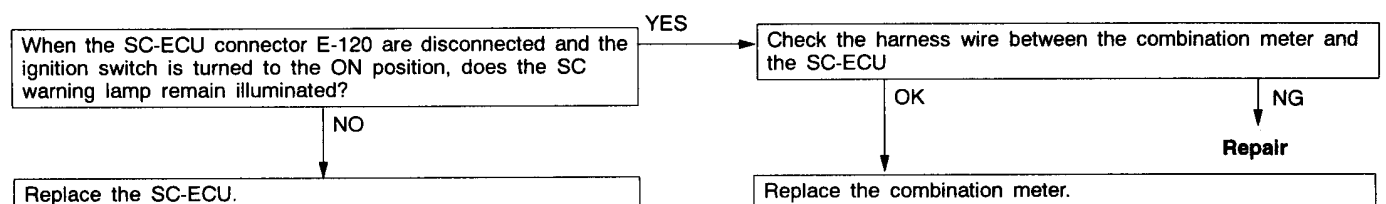


Inspection procedure 4

The SC warning lamp remains illuminated after the engine has started.	Probable cause
The cause is probably a short-circuit in the SC warning lamp illumination circuit.	• Malfunction of combination meter • Malfunction of harness (short-circuit) • Malfunction of the SC-ECU

NOTE

This trouble symptom is limited to cases where communication with the MUT-II is possible(SC-ECU power supply is normal) and the diagnosis code is a normal diagnosis code.



DATA LIST REFERENCE TABLE

The following ECU input data items can be read using the MUT-II.

Item No.	Check item	Inspection conditions		Normal condition
10	Vehicle speed	When vehicle is being driven		Speedometer display and MUT-II display are identical.
11	Accelerator pedal position sensor	Ignition switch: ON	Release the accelerator pedal.	0.9 – 1.1 V
			Depress the accelerator pedal gradually.	Increases in response to pedal depression stroke.
			Depress the accelerator pedal fully	4.0 V or more
18	Power supply voltage	Ignition switch: ON		System voltage
19	Accelerator pedal position switch (Idle switch)	Ignition switch: ON	Release the accelerator pedal	ON
			Depress the accelerator pedal slightly.	OFF
20	Ignition switch	Ignition switch: ON		ON
		Ignition switch: OFF		OFF
22	Front-right wheel speed	When vehicle is being driven		Speedometer display and MUT-II display are identical.
28	Engine type	Vehicles with the 6G74 engine		6G74
		Vehicles with the 4M41 engine		4M41
30	Trace control	SC system control is active		ON
		SC system control is not active		OFF
31	Engine specification 1	Vehicles with the 6G74 engine		DOHC
		Vehicles with the 4M41 engine		–
32	Engine specification 2	Vehicles with the 6G74 engine		N/A
		Vehicles with the 4M41 engine		–
33	Engine specification 3	Vehicles with the 6G74 engine		MIVEC/ETV
		Vehicles with the 4M41 engine		–
35	Destination	–		EC
40	Engine speed	Depress the accelerator pedal gradually.		Tachometer display and MUT-II display are identical.
51	Inhibitor switch	Ignition switch: ON Engine: stopped	Selector lever position: P	P
			Selector lever position: R	R
			Selector lever position: N	N
			Selector lever position: D	D
52	Shift position	Selector lever position: sports mode	Driving at a constant speed of 10 km/h in 1st	1st
			Driving at a constant speed of 30 km/h in 2nd	2nd
			Driving at a constant speed of 50 km/h in 3rd	3rd
			Driving at a constant speed of 50 km/h in 4th	4th
			Driving at a constant speed of 70 km/h in 5th	5th

Item No.	Check item	Inspection conditions	Normal condition
63	G sensor	- Ignition switch: ON - When vehicle is stationary (level)	2.35 – 2.65 V
		When vehicle is being driven	1.0 – 4.0 V

ACTUATOR TEST TABLE

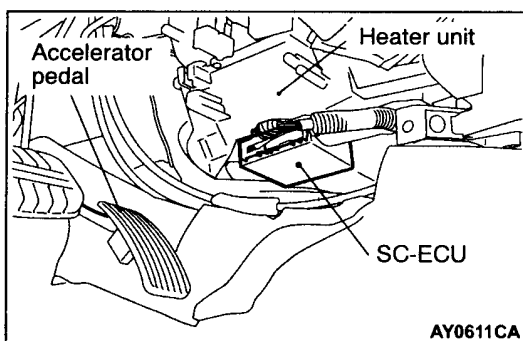
The following actuators can be force-driven using the MUT-II.

NOTE

1. Actuator tests cannot be carried out when the operation of the SC-ECU has been stopped by the fail-safe function.
2. Actuator tests can only be carried out while the vehicle is stopped.

ACTUATOR TEST SPECIFICATIONS

Item No.	Check item	Drive Contents
05	Operation Test of MITSUBISHI SC	Transmits the signal, which requests no torque and wide open throttle, to the engine-ECU or engine-A/T-ECU for three seconds.



SC-ECU side connector

1	2	3	4	5	6	7	8	9	10	11	12	13
14	15	16	17	18	19	20	21	22	23	24	25	26

31	32	33	34	35	36	37	38
39	40	41	42	43	44	45	46

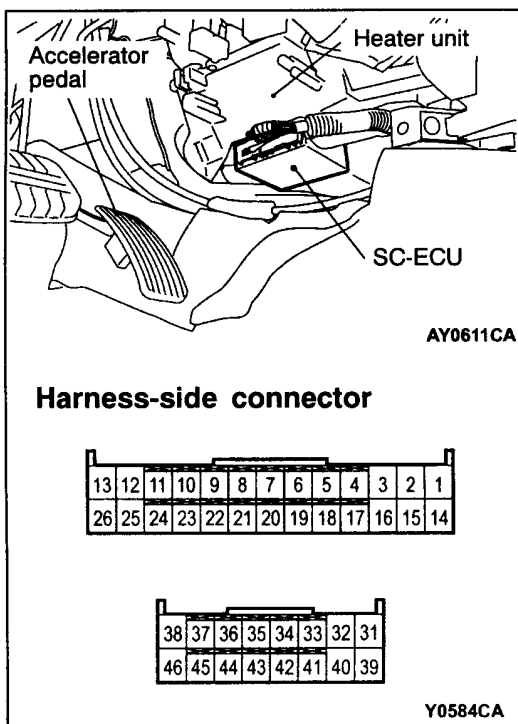
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CHECK AT SC-ECU TERMINAL

TERMINAL VOLTAGE TABLE

1. Measure the voltages between the respective terminal and earth.
2. The terminal layout is shown in the illustration.

Terminal No.	Check item	Inspection conditions		Normal condition
1	Diagnosis select input	When the MUT-II is connected		1 V or less
		When the MUT-II is not connected		Approx. 5 V
14	MUT-II	When the MUT-II is connected		Serial communication with the MUT-II
		When the MUT-II is not connected		1 V or less
15, 16	A/T-ECU <4M41-A/T>	Ignition switch: ON		Serial communication with the SC-ECU
		Ignition switch: OFF		0 V
17, 18	Engine-ECU <M/T, 6G74-M/T> or Engine-A/T-ECU <6G74-A/T>	Ignition switch: ON		Serial communication with the SC-ECU
		Ignition switch: OFF		0 V
19	G sensor input	Ignition switch: ON Vehicle horizontal position		2.4 – 2.6 V
21	ABS-ECU [wheel speed sensor (FR)] input	Ignition switch: ON Move the vehicle slowly forward		0 V and 5 V alternates
23	Vehicle speed sensor input	Ignition switch: ON Move the vehicle slowly forward		0 V and 8 – 12 V alternates
25	SC-ECU power supply	Ignition switch: ON		System voltage
		Ignition switch: OFF		0 V
39	SC-ECU backup power supply	At all time		System voltage
45	SC warning lamp output	Ignition switch: ON	When lamp is switched off	System voltage
			When lamp is illuminated	2 V or less



CHECK CHART FOR RESISTANCE AND CONTINUITY BETWEEN TERMINALS

1. Turn the ignition switch to the LOCK (OFF) position.
2. Check the resistances and continuity with the SC-ECU connector disconnected.
3. Check the resistances and continuity between the terminals listed in the table below.
4. The terminal layout is shown in the illustration.

Terminal No.	Signal name	Normal condition
Between terminal 13 and body earth	Earth	Continuity
Between terminal 26 and body earth	Earth	
Between terminal 31 and body earth	Earth	

ON-VEHICLE SERVICE

OPERATION TEST OF MITSUBISHI SC

1. Connect the MUT-II to the 16-pin diagnosis connector.

Caution

Turn the ignition switch to the LOCK (OFF) position when connecting and disconnecting the MUT-II.

2. Move the shift lever to the neutral <M/T>, or the selector lever to the P range.
3. Start the engine.
4. Use the MUT-II to activate the Actuator Test (item No.05) while depressing the accelerator pedal fully. Check that the engine speed should decrease gradually.

Caution

Activate the Actuator Test for three seconds. Release the accelerator pedal immediately after the Actuator Test is complete, or the engine speed will rise.

NOTE

During the Actuator Test, the SC-ECU transmits the signal, which requests no torque and wide open throttle, to the engine-ECU or engine-A/T-ECU for three seconds.

WHEEL SPEED SENSOR (FR) CHECK

Refer to Basic Manual GROUP 35B – On-vehicle service.

VEHICLE SPEED SENSOR CHECK

Refer to Basic Manual GROUP 54A – Combination Meter.

SC-ECU

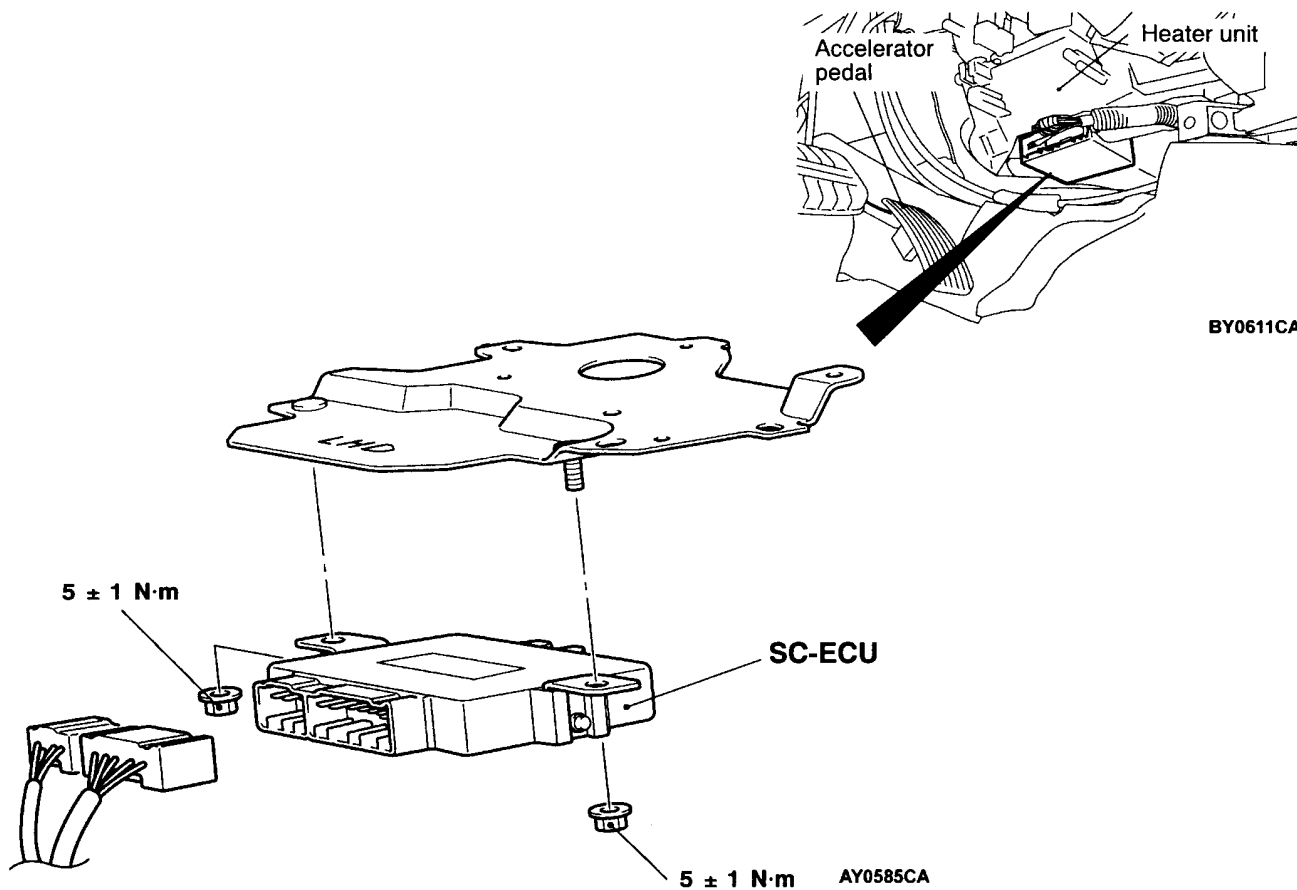
REMOVAL AND INSTALLATION

Caution

When removing and installing the SC-ECU, do not let it bump against the SRS-ECU.

Pre-removal and Post-installation Operations

Front floor console removal and installation
(Refer to Basic Manual GROUP 52A.)



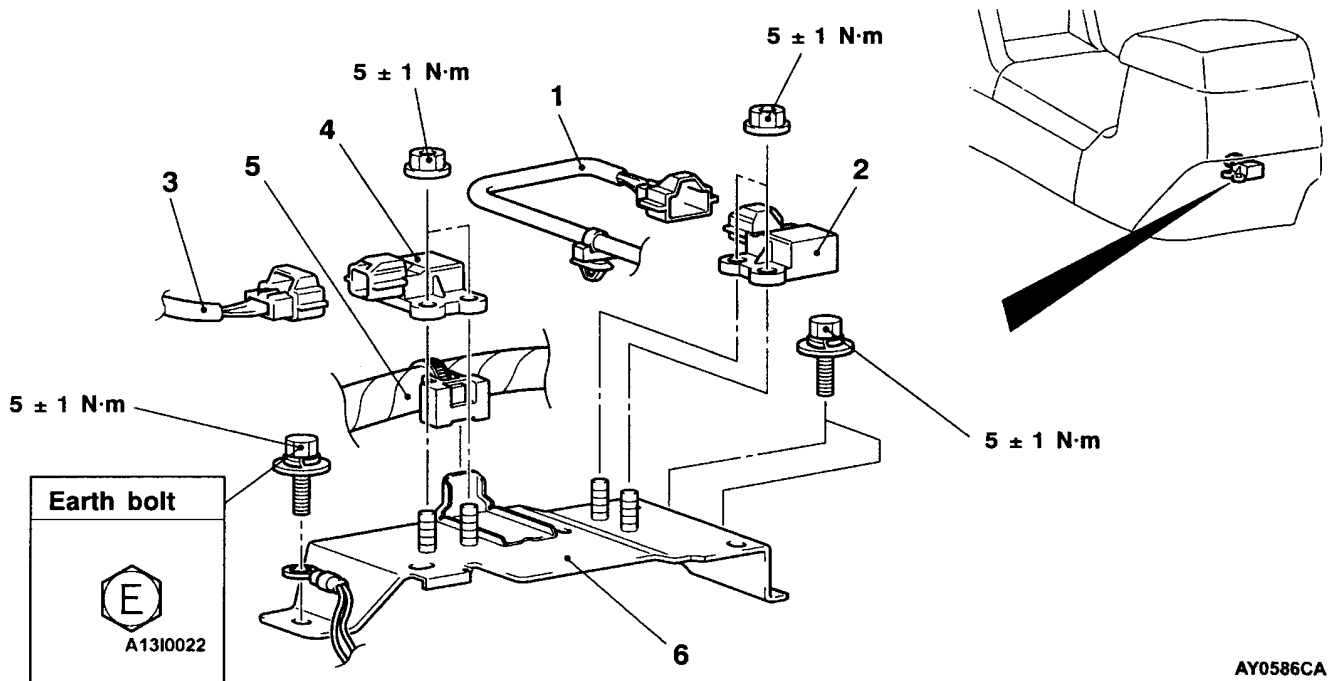
G SENSOR

REMOVAL AND INSTALLATION

Caution

Do not drop the G sensor or subject it to any shocks.

Pre-removal and Post-installation Operations
Rear floor console removal and installation
(Refer to Basic Manual GROUP 52A.)



AY0586CA

Removal steps

1. G sensor (for SC) connector and harness clamp
2. G sensor (for SC)
3. G sensor (for ABS) connector
4. G sensor (for ABS)
5. Harness clamp <L.H.D>
6. G sensor bracket

WHEEL SPEED SENSOR (FR)

Refer to Basic Manual GROUP 35B – Wheel Speed Sensor.

VEHICLE SPEED SENSOR

Refer to Basic Manual GROUP 54A – Combination Meter.