FUEL

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GASOLINE DIRECT INJECTION (GDI)

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GENERAL

OUTLINE OF CHANGES

Due to the changes shown below, the service procedures regarding the different description from the previous version have been established.

- On-board Diagnostics System has been adopted to expand the diagnostic items and to change diagnosis code numbering system.
- Fuel pressure regulator (high-pressure) incorporate fuel pump (high-pressure) has been adopted.
- An oxygen sensor (rear) has been added.
- A ignition failure sensor has been added.
- Lead cables of the crank angle sensor have been contained in the timing belt cover.
- An accelerator pedal position sensor attached to the accelerator pedal has been adopted.
- An engine-ECU has been changed.(Change of terminal layout) <Vehicles with M/T>
- An engine-A/T-ECU has been adopted. <Vehicles with A/T>

GENERAL INFORMATION

SELF-DIAGNOSIS FUNCTION

Following functions have been added.

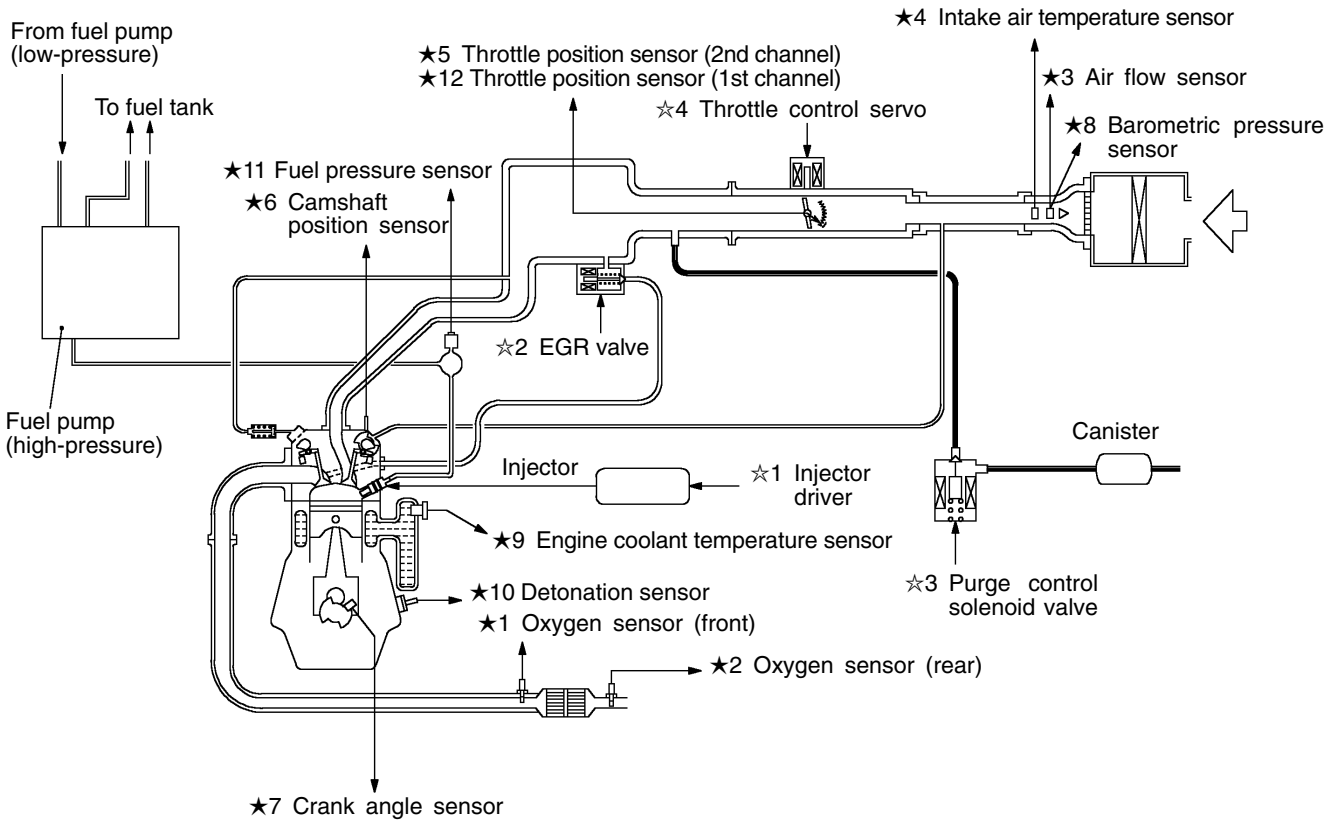
- The engine-ECU records the engine operating condition when the diagnosis code is set.
  This data is called “freeze frame” data.
  This data can be read by using the MUT-II, are can then be used in simulation tests for troubleshooting.

GENERAL SPECIFICATIONS

Items		Specifications
Engine-ECU <M/T>	Identification No.	E2T72675
Engine-A/T-ECU <A/T>	Identification No.	E2T77572

GASOLINE DIRECT INJECTION SYSTEM DIAGRAM

★1 Oxygen sensor (front) ★2 Oxygen sensor (rear) ★3 Air flow sensor ★4 Intake air temperature sensor ★5 Throttle position sensor (2nd channel) ★6 Camshaft position sensor ★7 Crank angle sensor ★8 Barometric pressure sensor ★9 Engine coolant temperature sensor ★10 Detonation sensor ★11 Fuel pressure sensor	• Power supply • Ignition switch-IG • Ignition switch-ST • Accelerator pedal position sensor (1st channel) • Accelerator pedal position switch • Vehicle speed sensor • A/C switch 1 • A/C switch 2 • M/T oil temperature sensor <M/T> • Inhibitor switch <A/T> • Power steering fluid pressure switch • Alternator FR signal • Stop lamp switch • Small lamp switch • Clutch switch <M/T> • Brake vacuum sensor • Injector open circuit check signal • Throttle valve controller	⇨ Engine-ECU <M/T> or engine-A/T-ECU <A/T> ⇨	☆1 Injector driver (injector) ☆2 EGR valve (stepper motor) ☆3 Purge control solenoid valve	• Engine control relay • Fuel pump relay • Injector driver relay • Throttle control servo relay • A/C relay • Ignition coil • Fan controller • Engine warning lamp • GDI ECO indicator lamp • Diagnosis output • Alternator G terminal • Throttle valve controller • Oxygen sensor heater
★12 Throttle position sensor (1st channel)	• Power supply • Ignition switch-IG • Accelerator pedal position sensor (2nd channel) • Engine-ECU <M/T> • Engine-A/T-ECU <A/T>	⇨ Throttle valve controller ⇨	☆4 Throttle valve control servo	• Engine-ECU<M/T> • Engine-A/T-ECU <A/T>	



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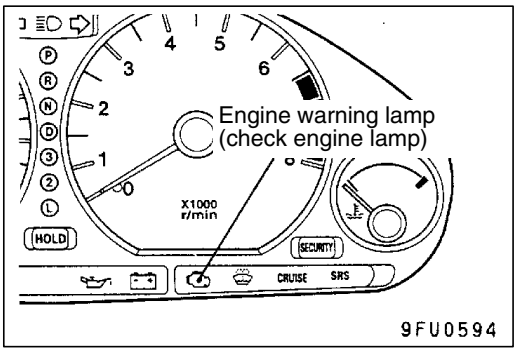
SERVICE SPECIFICATIONS

Items			Standard value
Adjustment voltage of accelerator pedal position sensor (1st and 2nd channel) V			0.985 – 1.085
Resistance of accelerator pedal position sensor (1st and 2nd channel) kΩ			3.5 – 6.5
Fuel pressure	High-pressure side MPa		4 – 6.9
	Low-pressure side kPa		Approximately 329
Oxygen sensor output voltage (during revving) V			0.6 – 1.0
Oxygen sensor heater resistance (at 20°C) Ω		Front	4.5 – 8.0
		Rear	11 – 18



TROUBLESHOOTING

DIAGNOSIS FUNCTION

ENGINE WARNING LAMP (CHECK ENGINE LAMP)

If an abnormality occurs in any of the following items related to the GDI system, the engine warning lamp will illuminate or flash. If the lamp remains illuminated or if the lamp illuminates while the engine is running, check the diagnosis code output. However, the warning lamp will illuminate as bulb check for five seconds whenever the ignition switch is turned to the ON position.

Engine warning lamp inspection items

Code No.	Diagnosis item
–	Engine-ECU <M/T> or engine-A/T-ECU <A/T>
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 (1st channel) system
P0125	Feedback system
P0130	Oxygen sensor (front) system <sensor 1>
P0135	Oxygen sensor heater (front) system <sensor 1>
P0136	Oxygen sensor (rear) system <sensor 2>
P0141	Oxygen sensor heater (rear) system <sensor 2>
P0170	Abnormal fuel system
P0190★	Abnormal fuel pressure
P0201	No. 1 injector system
P0202	No. 2 injector system
P0203	No. 3 injector system
P0204	No. 4 injector system
P0220★	Accelerator pedal position sensor (1st channel) system
P0225★	Throttle position sensor (2nd channel) system
P0300★	Ignition coil (power transistor) system
P0301	No. 1 cylinder misfire detected
P0302	No. 2 cylinder misfire detected
P0303	No. 3 cylinder misfire detected
P0304	No. 4 cylinder misfire detected

Code No.	Diagnosis item
P0335	Crank angle sensor system
P0340	Camshaft position sensor system
P0403	EGR valve system
P0420	Catalyst malfunction
P0443	Purge control solenoid valve system
P1200	Injector driver system
P1220★	Electronic-controlled throttle valve system
P1221★	Throttle valve position feedback system
P1223★	Communication line with throttle valve controller
P1224★	Throttle valve control servo motor (motor 1st phase malfunction) system
P1225★	Accelerator pedal position sensor (2nd channel) system
P1228★	Throttle valve control servo motor (motor 2nd phase malfunction) system
P1515	Brake vacuum sensor system

NOTE
1. If the engine warning lamp illuminates because of a malfunction of the engine-ECU (engine-A/T-ECU), communication between MUT-II and the engine-ECU (engine-A/T-ECU) is impossible. In this case, the diagnosis code cannot be read.
2. After the engine-ECU (engine-A/T-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.
   As for P1220, P1221, P1223, P1224, and P1228, the engine warning lamp flashes. If malfunctions are detected at the throttle position sensor (1st channel) and the throttle position sensor (2nd channel) at the same time, or malfunctions are detected at the accelerator pedal position sensor (1st channel) and the accelerator pedal position sensor (2nd channel) at the same time, the engine warning lamp will flash.
3. After the engine warning lamp illuminates, it will be switched off under the following conditions.
   (1) When the engine-ECU (engine-A/T-ECU) monitored the power train malfunction three times* and met set condition requirements, it detected no malfunction.
      *: In this case, "one time" indicates from engine start to stop.
   (2) For misfiring malfunction, when driving conditions (engine speed, engine coolant temperature, etc.) are similar to those when the malfunction was first recorded.
4. 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 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 MUT-II.
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 OFF and then back to ON again.

   NOTE
   By turning the ignition switch to OFF, the engine-ECU <M/T> or engine-A/T-ECU <A/T> will switch the diagnosis mode from DIAGNOSIS 2 mode to DIAGNOSIS 1 mode.

5. Erase the diagnosis codes.

INSPECTION USING MUT-II 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 harnesses and components.
2. After repairing, re-check using the MUT-II 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 MUT-II, 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 <M/T> or engine-A/T-ECU <A/T> 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 MUT-II, an effective troubleshooting can be performed.

The display items of freeze frame data are shown below.
Display item list

Data item		Unit
Engine coolant temperature sensor		°C
Engine speed		r/min
Vehicle speed		km/h
Long-term fuel compensation (long-term fuel trim)		%
Short-term fuel compensation (short-term fuel trim)		%
Fuel control condition	Open loop	OL
	Closed loop	CL
	Open loop owing to drive condition	OL-DRV.
	Open loop owing to system malfunction	OL-SYS.
	Closed loop based on one oxygen sensor	CL-H02S
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.

READINESS TEST STATUS

The engine-ECU <M/T> or engine-A/T-ECU <A/T> 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 MUT-II. (If the ECU has judged a item before, the MUT-II 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: P0420
- 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. Suspends lean burn operation. 2. 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.
Intake air temperature sensor	Controls as if the intake air temperature is 25°C.
Throttle position sensor (2nd channel)	1. Suspends lean burn operation. 2. Controls the throttle opening angle feedback (half as much as the opening rate in the normal condition) by using signals from the throttle position sensor (1st channel). However, this controlling system is not applied if the throttle position sensor (1st channel) and throttle position sensor (2nd channel) combination output voltage is outside 4 – 6 V. 3. Refrains from controlling the throttle opening angle feedback if the throttle position sensor (1st channel) is also defective.
Engine coolant temperature sensor	Controls as if the engine coolant temperature is 80°C. (Moreover, the control system is working until the ignition switch is turned OFF if the sensor signal returns to normal.)
Camshaft position sensor	Controls maintaining the condition before determined as failure. Fuel will be cut-off 4 seconds after a malfunction is detected. (However, only if No. 1 cylinder TDC has never been detected after the ignition switch is turned to the ON position)
Vehicle speed sensor	1. Suspends lean burn operation. However, the control is cancelled as a certain time passes by with the engine speed of 1,500 r/min or more. 2. Suspends lean burn operation during the engine idling.
Barometric pressure sensor	Controls as if the barometric pressure is 101 kPa.
Detonation sensor	Fixes the ignition timing as that for standard petrol.
Injector	1. Suspends lean burn operation. 2. Suspends the exhaust gas recirculation.
Ignition coil (incorporating power transistor)	1. Suspends lean burn operation. 2. Cuts off the fuel supply to cylinders with an abnormal ignition signal.
Fuel pressure sensor	1. Controls as if the fuel pressure is 5 MPa. (In case of open/short circuit) 2. Turns the fuel pump relay off. (In case of abnomality in high pressure) 3. Suspends fuel injection. (when the low pressure is detected and the engine speed is more than 3,000 r/min)
Alternator FR terminal	Refrains from controlling to suppress the alternator output to electrical load. (Operated as a normal alternator)
Accelerator pedal position sensor (2nd channel)	1. Suspends lean burn operation. 2. Controls the throttle valve position by using signals from the accelerator pedal position sensor (1st channel). (However, the control system is not applicable if the difference from the accelerator pedal position sensor (1st channel) output voltage is 1.0 V or higher.) 3. Suspends the electronic controlled throttle valve system if accelerator pedal position sensor (1st channel) is also defective.

Malfunctioning item	Control contents during malfunction
Accelerator pedal position sensor (1st channel)	1. Suspends lean burn operation. 2. Controls the throttle valve position by using signals from the accelerator pedal position sensor (2nd channel). (However, this control is not applicable if the voltage difference between the accelerator pedal position sensor (1st channel) and accelerator pedal position sensor (2nd channel) is 1.0 V or higher.) 3. Also suspends the electronic-controlled throttle valve system when the accelerator pedal position sensor (2nd channel) is defective.
Throttle position sensor (1st channel)	1. Suspends lean burn operation. 2. Controls throttle opening angle feedback by using signals from throttle position sensor (2nd channel). (However, the controlling system is not applied when the throttle position sensor (1st channel) and throttle position sensor (2nd channel) combination output voltage is outside 4 – 6 V.) 3. Refrains from controlling the throttle opening angle feedback when throttle position sensor (2nd channel) is also defective.
Electronic-controlled throttle valve system	1. Suspends the electronic controlled throttle valve system. 2. Suspends lean burn operation. 3. Suspends the idle speed feedback control.
Throttle valve position feedback	1. Suspends the electronic controlled throttle valve system. 2. Suspends lean burn operation. 3. Suspends the engine speed feedback control.
Communication line between the throttle valve controller and the engine-ECU <M/T> or engine-A/T-ECU <A/T>	1. Communication error between the throttle valve controller and the engine-ECU <M/T> or engine-A/T-ECU <A/T>: ● Suspends lean burn operation. ● Cuts the fuel supply when the engine speed reaches 3,000 r/min or more. ● Suspends the cruise-control. 2. Communication error between the throttle valve controller and the engine-ECU <M/T> or engine-A/T-ECU <A/T>: ● Suspends lean burn operation. ● Cuts the fuel supply when the engine speed reaches 3,000 r/min or more. ● Suspends the cruise-control. ● The throttle valve controller controls the throttle valve opening angle by using signals from accelerator pedal position sensor (2nd channel).
Throttle control servo motor 1st phase malfunction	Bans lean burn operation.
Throttle control servo motor 2nd phase malfunction	1. Suspends electronic control throttle valve system. 2. Bans lean burn operation. 3. Bans engine speed feed back control.
Misfiring	If the detected misfiring causes damage to the catalyst, the misfiring cylinder will be shut down.

NOTE
If the electronic-controlled throttle valve system is suspended, the engine warning lamp will illuminate.

INSPECTION CHART FOR DIAGNOSIS CODES

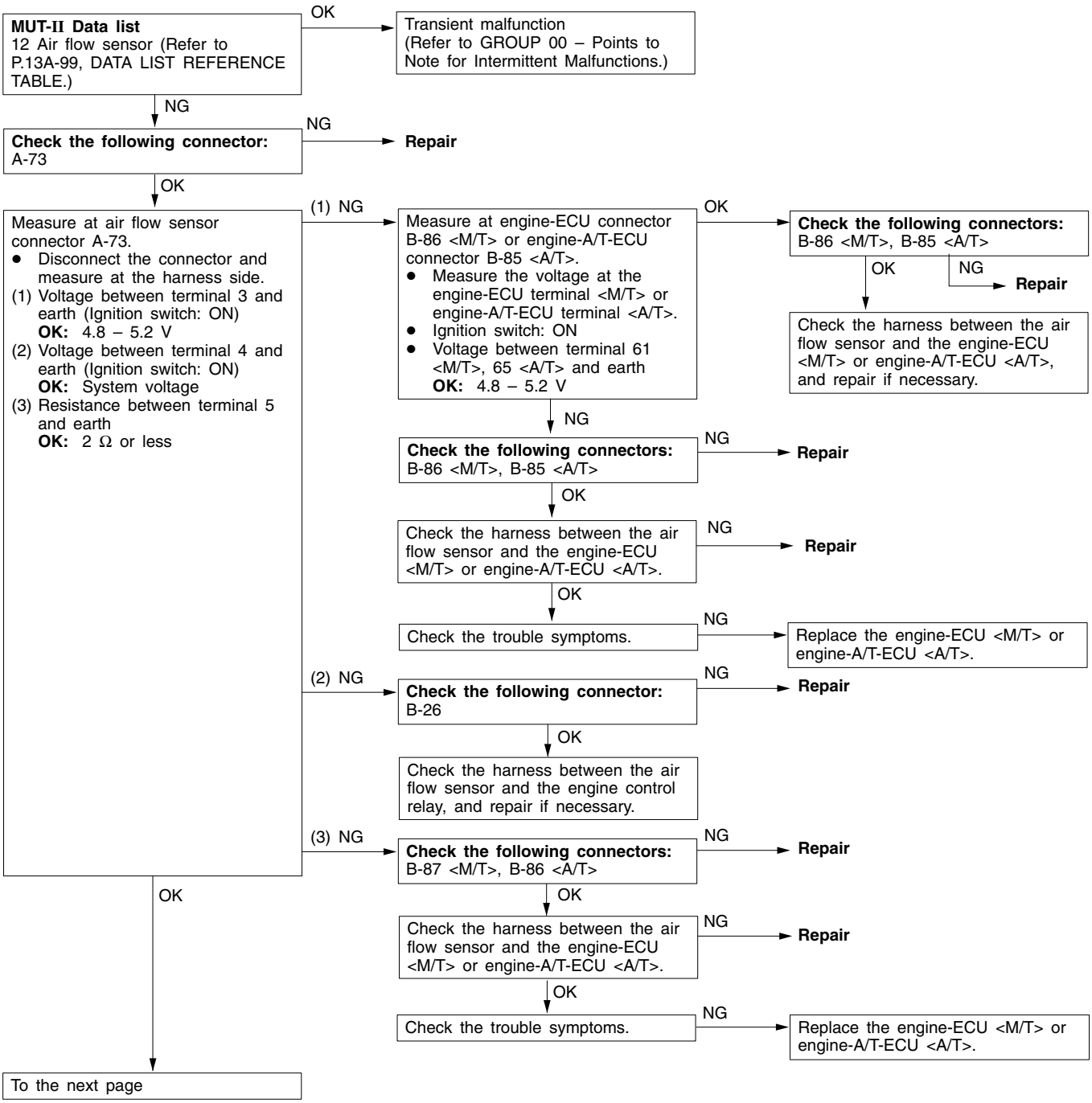
Code No.	Diagnosis item	Reference page
P0100	Air flow sensor system	13A-14
P0105	Barometric pressure sensor system	13A-16
P0110	Intake air temperature sensor system	13A-18
P0115	Engine coolant temperature sensor system	13A-19
P0120★	Throttle position sensor 1 (1st channel) system	13A-22
P0125	Feedback system	13A-24
P0130	Oxygen sensor (front) system <sensor 1>	13A-26
P0135	Oxygen sensor heater (front) system <sensor 1>	13A-28
P0136	Oxygen sensor (rear) system <sensor 2>	13A-29
P0141	Oxygen sensor heater (rear) system <sensor 2>	13A-31
P0170	Abnormal fuel system	13A-32
P0190★	Abnormal fuel pressure	13A-34
P0201	No. 1 injector system	13A-35
P0202	No. 2 injector system	13A-37
P0203	No. 3 injector system	13A-38
P0204	No. 4 injector system	13A-39
P0220★	Accelerator pedal position sensor (1st channel) system	13A-41
P0225★	Throttle position sensor (2nd channel) system	13A-44
P0300★	Ignition coil (power transistor) system	13A-45
P0301	No. 1 cylinder misfire detected	13A-47
P0302	No. 2 cylinder misfire detected	13A-47
P0303	No. 3 cylinder misfire detected	13A-47
P0304	No. 4 cylinder misfire detected	13A-47
P0325	Detonation sensor system	13A-48
P0335	Crank angle sensor system	13A-48
P0340	Camshaft position sensor system	13A-50
P0403	EGR valve system	13A-52
P0420	Catalyst malfunction	13A-54
P0443	Purge control solenoid valve system	13A-55
P0500	Vehicle speed sensor system	13A-56
P1200	Injector driver system	13A-56
P1220★	Electronic-controlled throttle valve system	13A-57

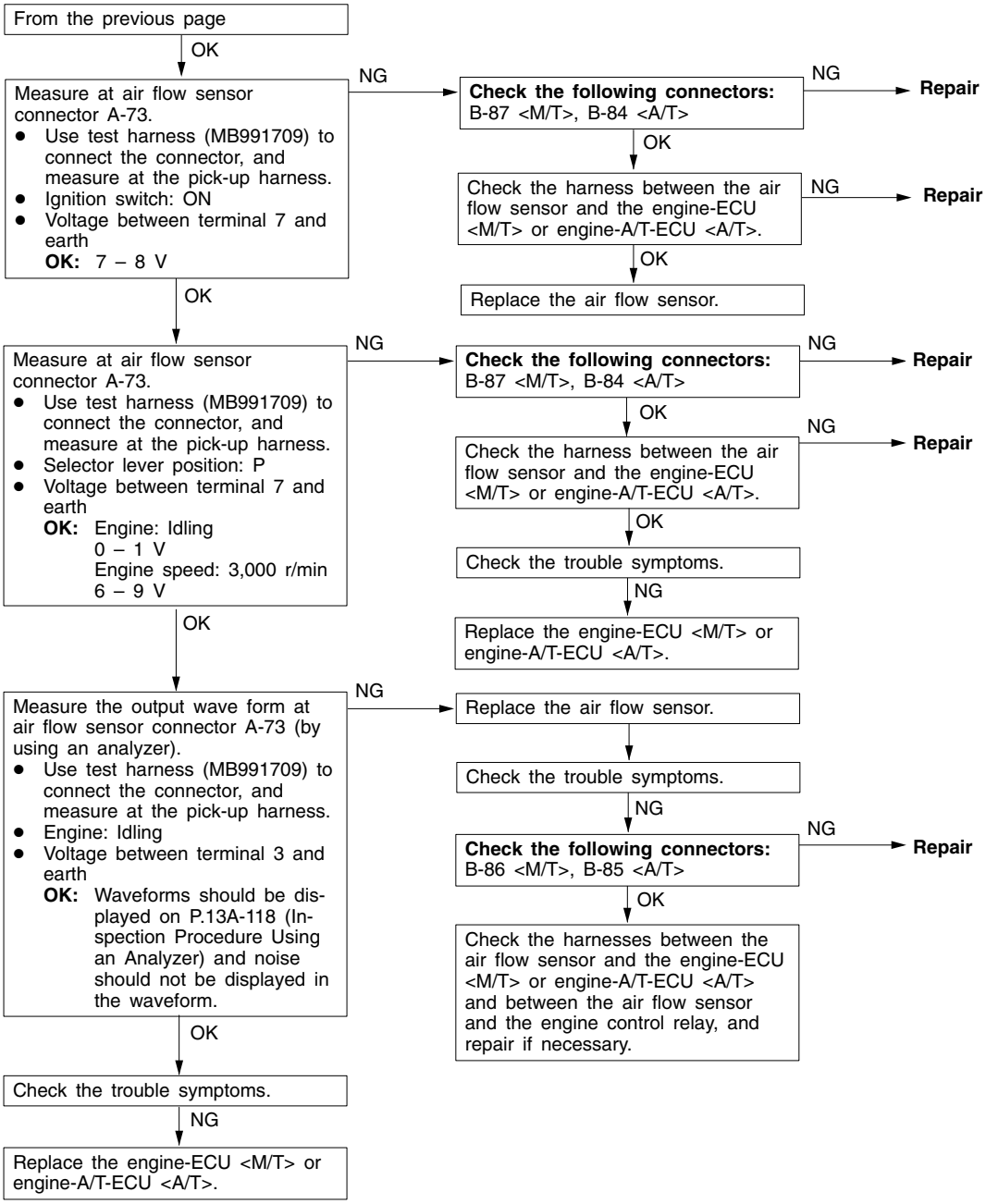
Code No.	Diagnosis item	Reference page
P1221★	Throttle valve position feedback system	13A-58
P1223★	Communication line with throttle valve controller	13A-59
P1224★	Throttle valve control servo motor (motor 1st phase malfunction) system	13A-60
P1225★	Accelerator pedal position sensor (2nd channel) system	13A-61
P1228★	Throttle valve control servo motor (motor 2nd phase malfunction) system	13A-63
P1500	Alternator FR terminal system	13A-64
P1515	Brake vacuum sensor system	13A-65
P1610	Immobilizer system	13A-67

NOTE
1. Do not replace the engine-ECU <M/T> or engine-A/T-ECU <A/T> until a through terminal check reveals there are no short/open circuit.
2. Check that the engine-ECU <M/T> or engine-A/T-ECU <A/T> earth circuit is normal before checking for the cause of the problem.
3. After the engine-ECU <M/T> or engine-A/T-ECU <A/T> 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 a "★", the diagnosis code is recorded on the first detection of the malfunction.
4. 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 CLASSIFIED BY DIAGNOSIS CODE

Code No. P0100 Air flow sensor system	Probable cause
Range of Check • Engine speed: 500 r/min or more Set Conditions • The sensor output frequency is 3.3 Hz or less for four seconds.	• Malfunction of air flow sensor • Open or short circuit in air flow sensor circuit or loose connector contact • Malfunction of engine-ECU <M/T> • Malfunction of engine-A/T-ECU <A/T>

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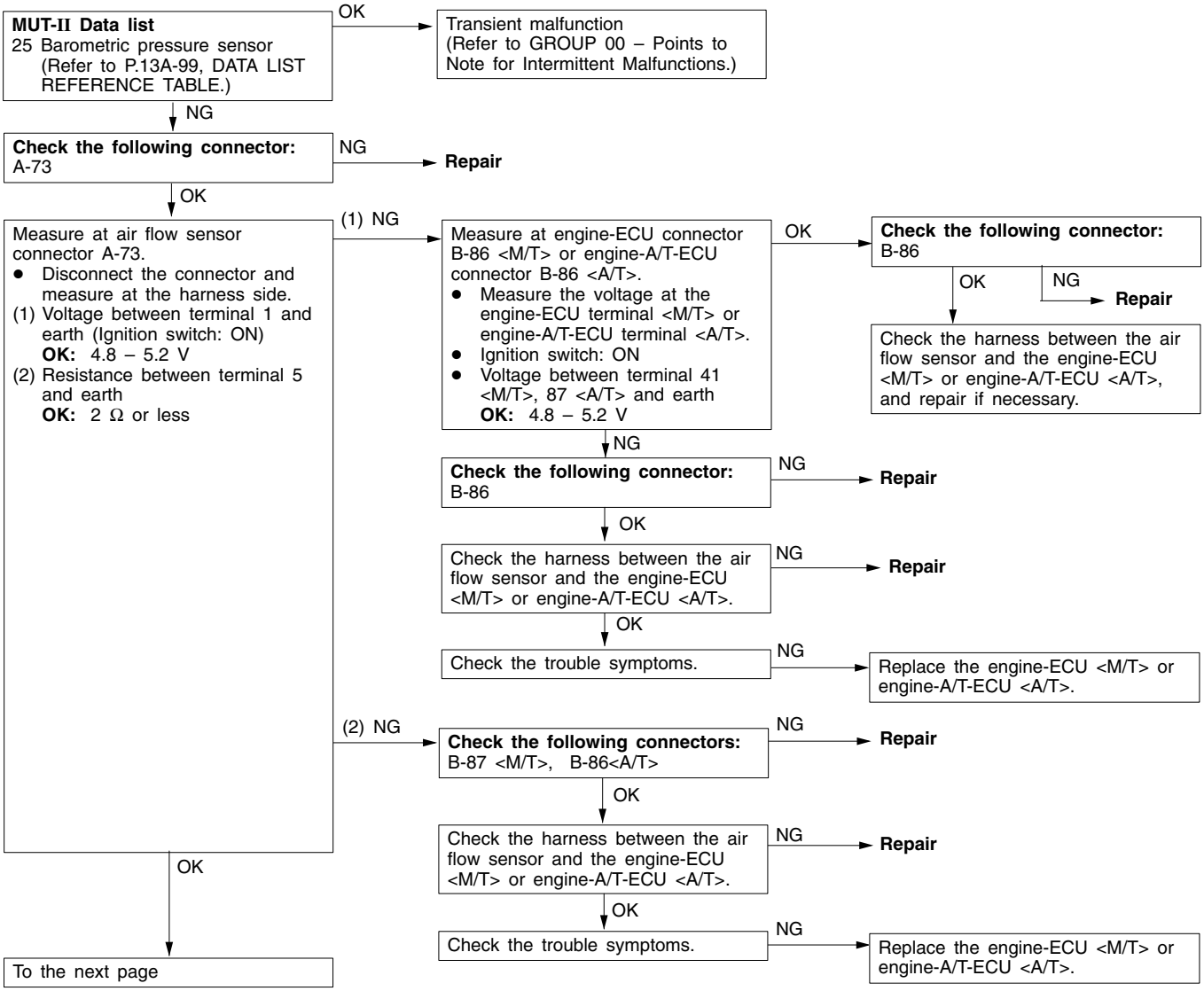
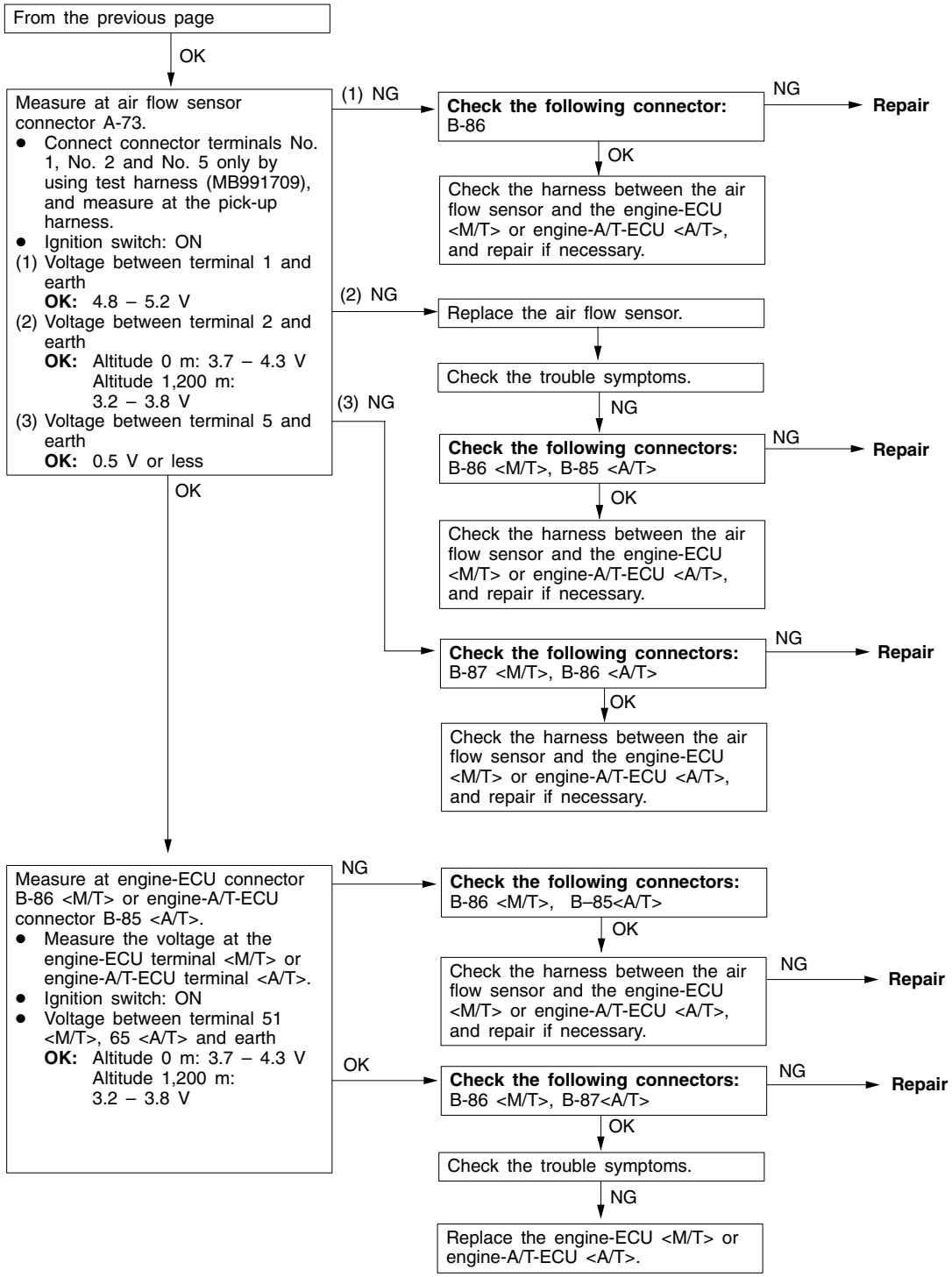
OK
Measure at air flow sensor connector A-73.
• Use test harness (MB991709) to connect the connector, and measure at the pick-up harness.
• Ignition switch: ON
• Voltage between terminal 7 and earth
OK: 7 – 8 V
NG
Check the following connectors: B-87 <M/T>, B-84 <A/T>
NG
Repair
OK
Check the harness between the air flow sensor and the engine-ECU <M/T> or engine-A/T-ECU <A/T>.
NG
Repair
OK
Replace the air flow sensor.
OK
Measure at air flow sensor connector A-73.
• Use test harness (MB991709) to connect the connector, and measure at the pick-up harness.
• Selector lever position: P
• Voltage between terminal 7 and earth
OK: Engine: Idling
0 – 1 V
Engine speed: 3,000 r/min
6 – 9 V
NG
Check the following connectors: B-87 <M/T>, B-84 <A/T>
NG
Repair
OK
Check the harness between the air flow sensor and the engine-ECU <M/T> or engine-A/T-ECU <A/T>.
NG
Repair
OK
Check the trouble symptoms.
NG
Replace the engine-ECU <M/T> or engine-A/T-ECU <A/T>.
OK
Measure the output wave form at air flow sensor connector A-73 (by using an analyzer).
• Use test harness (MB991709) to connect the connector, and measure at the pick-up harness.
• Engine: Idling
• Voltage between terminal 3 and earth
OK: Waveforms should be displayed on P.13A-118 (Inspection Procedure Using an Analyzer) and noise should not be displayed in the waveform.
NG
Replace the air flow sensor.
Check the trouble symptoms.
NG
Check the following connectors: B-86 <M/T>, B-85 <A/T>
NG
Repair
OK
Check the harnesses between the air flow sensor and the engine-ECU <M/T> or engine-A/T-ECU <A/T> and between the air flow sensor and the engine control relay, and repair if necessary.
OK
Check the trouble symptoms.
NG
Replace the engine-ECU <M/T> or engine-A/T-ECU <A/T>.

Code No. P0105 Barometric pressure sensor system	Probable cause
Range of Check • Two seconds have passed since the ignition switch is turned ON or the engine starting process is completed. • Battery voltage: 8 V or more Set Conditions • The sensor output voltage is 4.5 V or more for four seconds (equivalent to 114 kPa of barometric pressure) or • The sensor output voltage is 0.2 V or less (equivalent to 53 kPa of barometric pressure)	• Malfunction of barometric pressure sensor • Open or short circuit in barometric pressure sensor circuit or loose connector contact • Malfunction of engine-ECU <M/T> • Malfunction of engine-A/T-ECU <A/T>

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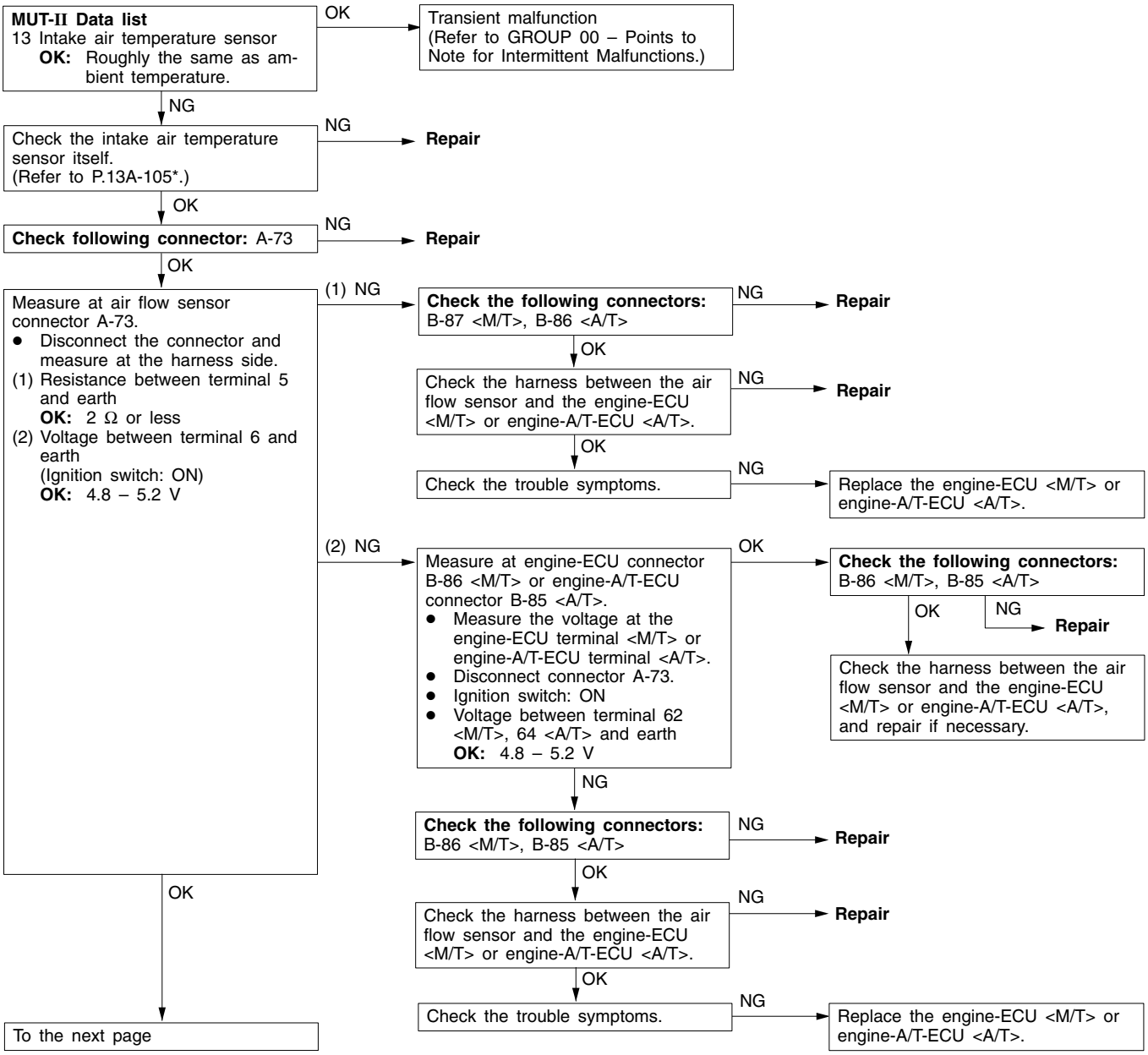
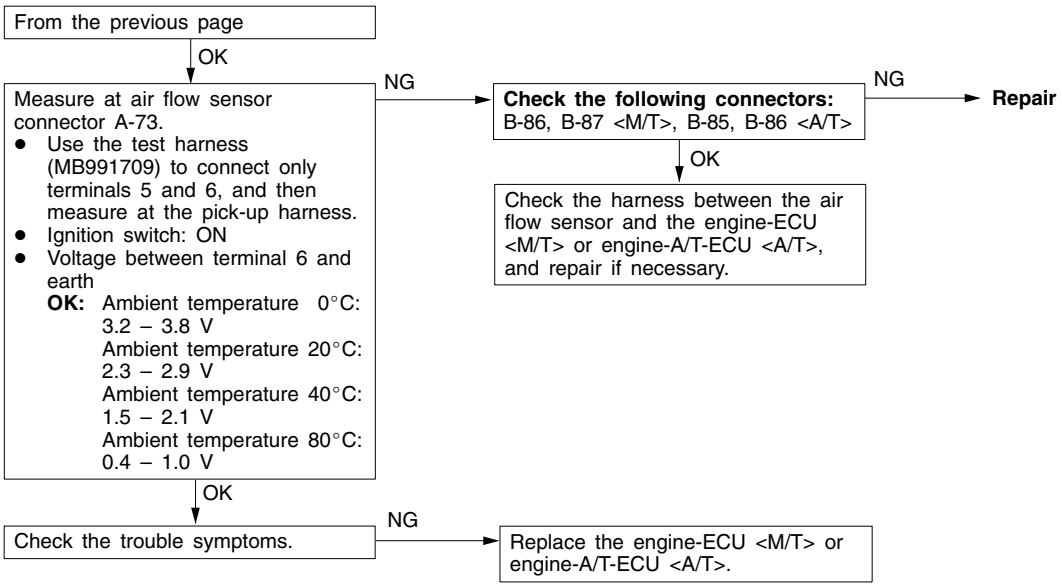
OK
Measure at air flow sensor connector A-73.
● Connect connector terminals No. 1, No. 2 and No. 5 only by using test harness (MB991709), and measure at the pick-up harness.
● Ignition switch: ON
(1) Voltage between terminal 1 and earth
OK: 4.8 – 5.2 V
(2) Voltage between terminal 2 and earth
OK: Altitude 0 m: 3.7 – 4.3 V
Altitude 1,200 m: 3.2 – 3.8 V
(3) Voltage between terminal 5 and earth
OK: 0.5 V or less
(1) NG
Check the following connector: B-86
NG
Repair
OK
Check the harness between the air flow sensor and the engine-ECU <M/T> or engine-A/T-ECU <A/T>, and repair if necessary.
(2) NG
Replace the air flow sensor.
Check the trouble symptoms.
NG
(3) NG
Check the following connectors: B-86 <M/T>, B-85 <A/T>
NG
Repair
OK
Check the harness between the air flow sensor and the engine-ECU <M/T> or engine-A/T-ECU <A/T>, and repair if necessary.
Check the following connectors: B-87 <M/T>, B-86 <A/T>
NG
Repair
OK
Check the harness between the air flow sensor and the engine-ECU <M/T> or engine-A/T-ECU <A/T>, and repair if necessary.
Measure at engine-ECU connector B-86 <M/T> or engine-A/T-ECU connector B-85 <A/T>.
● Measure the voltage at the engine-ECU terminal <M/T> or engine-A/T-ECU terminal <A/T>.
● Ignition switch: ON
● Voltage between terminal 51 <M/T>, 65 <A/T> and earth
OK: Altitude 0 m: 3.7 – 4.3 V
Altitude 1,200 m: 3.2 – 3.8 V
NG
Check the following connectors: B-86 <M/T>, B–85<A/T>
OK
Check the harness between the air flow sensor and the engine-ECU <M/T> or engine-A/T-ECU <A/T>, and repair if necessary.
NG
Repair
OK
Check the following connectors: B-86 <M/T>, B-87<A/T>
NG
Repair
OK
Check the trouble symptoms.
NG
Replace the engine-ECU <M/T> or engine-A/T-ECU <A/T>.

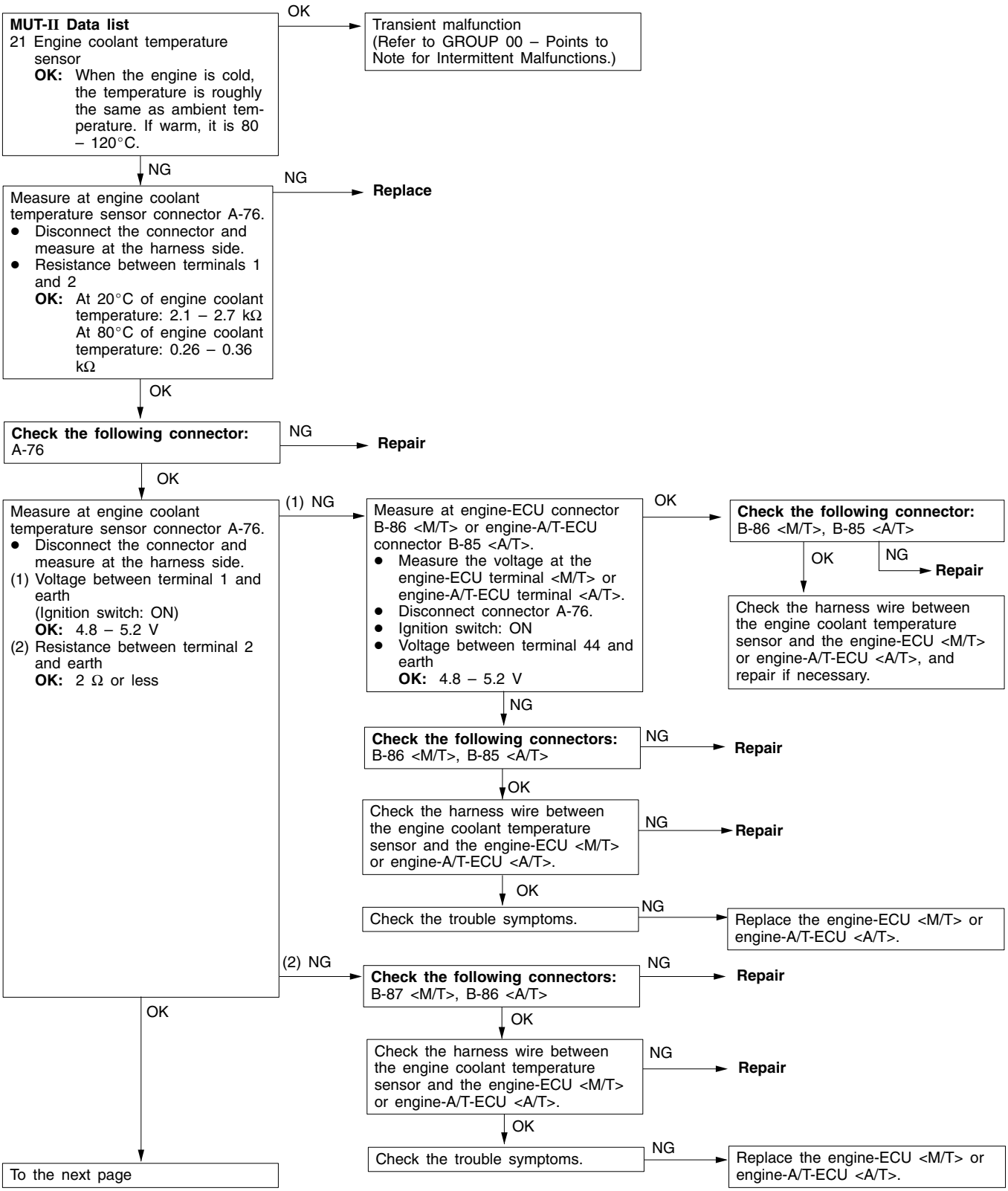
Code No. P0110 Intake air temperature sensor system	Probable cause
Range of Check • Two seconds have passed since the ignition switch is turned ON or the engine starting process is completed. Set Conditions • The sensor output voltage is 4.6 V or more for four seconds (equivalent to –45°C of intake air temperature) or • The sensor output voltage is 0.2 V or more for four seconds (equivalent to 125°C of intake air temperature)	• Malfunction of intake air temperature sensor • Open or short circuit in intake air temperature sensor or loose connector contact • Malfunction of engine-ECU <M/T> • Malfunction of engine-A/T-ECU <A/T>

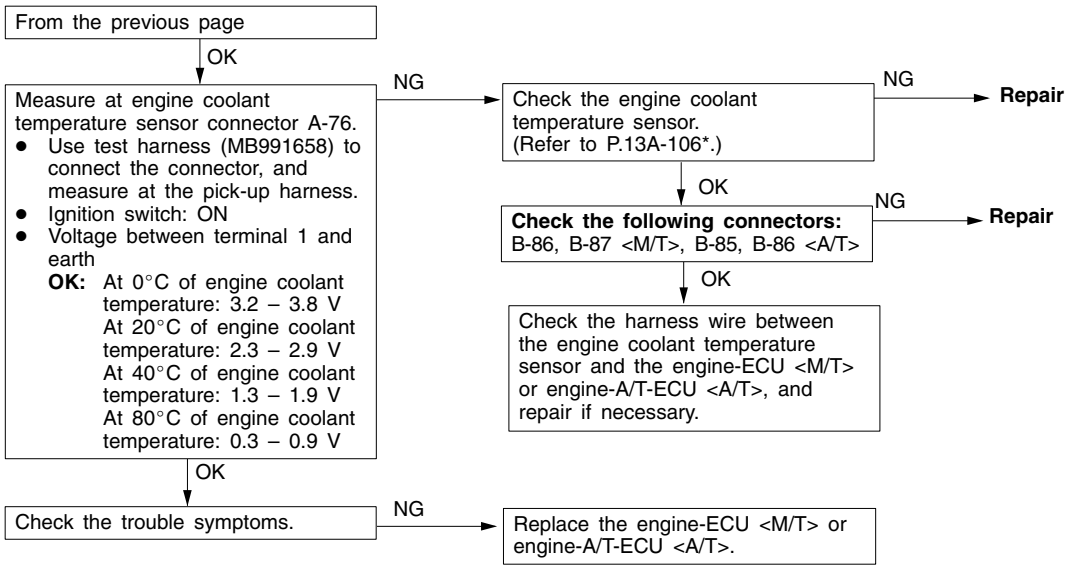


NOTE
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1).



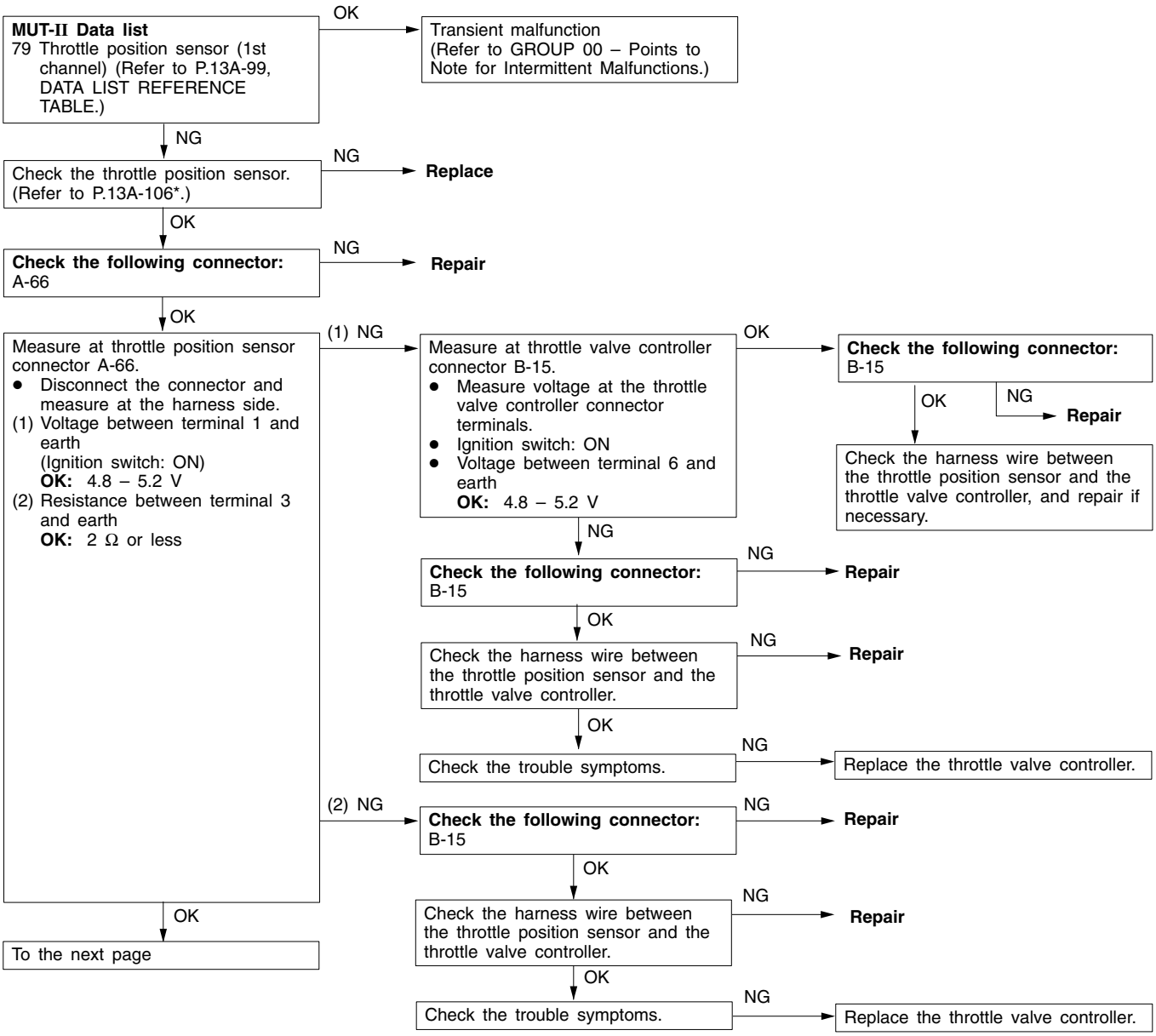
Code No. P0115 Engine coolant temperature sensor system	Probable cause
Range of Check ● Engine: Two seconds after the engine has been started Set Conditions ● The sensor output voltage is 4.6 V or more for four seconds (equivalent to –45°C of engine coolant temperature) or ● The sensor output voltage is 0.1 V or less for four seconds (equivalent to 140°C of engine coolant temperature)	● Malfunction of engine coolant temperature sensor ● Open or short circuit in the engine coolant temperature sensor circuit or loose connector contact ● Malfunction of engine-ECU <M/T> ● Malfunction of engine-A/T-ECU <A/T>
Range of Check ● Engine: After starting Set Conditions ● The engine coolant temperature has reduced from over 40°C to less than 40°C, and that condition has lasted for five minutes or more.	


MUT-II Data list
21 Engine coolant temperature sensor
OK: When the engine is cold, the temperature is roughly the same as ambient temperature. If warm, it is 80 – 120°C.
OK
Transient malfunction (Refer to GROUP 00 – Points to Note for Intermittent Malfunctions.)
NG
Measure at engine coolant temperature sensor connector A-76.
• Disconnect the connector and measure at the harness side.
• Resistance between terminals 1 and 2
OK: At 20°C of engine coolant temperature: 2.1 – 2.7 kΩ
At 80°C of engine coolant temperature: 0.26 – 0.36 kΩ
NG
Replace
OK
Check the following connector: A-76
NG
Repair
OK
Measure at engine coolant temperature sensor connector A-76.
• Disconnect the connector and measure at the harness side.
(1) Voltage between terminal 1 and earth (Ignition switch: ON)
OK: 4.8 – 5.2 V
(2) Resistance between terminal 2 and earth
OK: 2 Ω or less
(1) NG
Measure at engine-ECU connector B-86 <M/T> or engine-A/T-ECU connector B-85 <A/T>.
• Measure the voltage at the engine-ECU terminal <M/T> or engine-A/T-ECU terminal <A/T>.
• Disconnect connector A-76.
• Ignition switch: ON
• Voltage between terminal 44 and earth
OK: 4.8 – 5.2 V
OK
Check the following connector: B-86 <M/T>, B-85 <A/T>
OK
NG
Repair
Check the harness wire between the engine coolant temperature sensor and the engine-ECU <M/T> or engine-A/T-ECU <A/T>, and repair if necessary.
NG
Check the following connectors: B-86 <M/T>, B-85 <A/T>
NG
Repair
OK
Check the harness wire between the engine coolant temperature sensor and the engine-ECU <M/T> or engine-A/T-ECU <A/T>.
NG
Repair
OK
Check the trouble symptoms.
NG
Replace the engine-ECU <M/T> or engine-A/T-ECU <A/T>.
(2) NG
Check the following connectors: B-87 <M/T>, B-86 <A/T>
NG
Repair
OK
Check the harness wire between the engine coolant temperature sensor and the engine-ECU <M/T> or engine-A/T-ECU <A/T>.
NG
Repair
OK
Check the trouble symptoms.
NG
Replace the engine-ECU <M/T> or engine-A/T-ECU <A/T>.
OK
To the next page

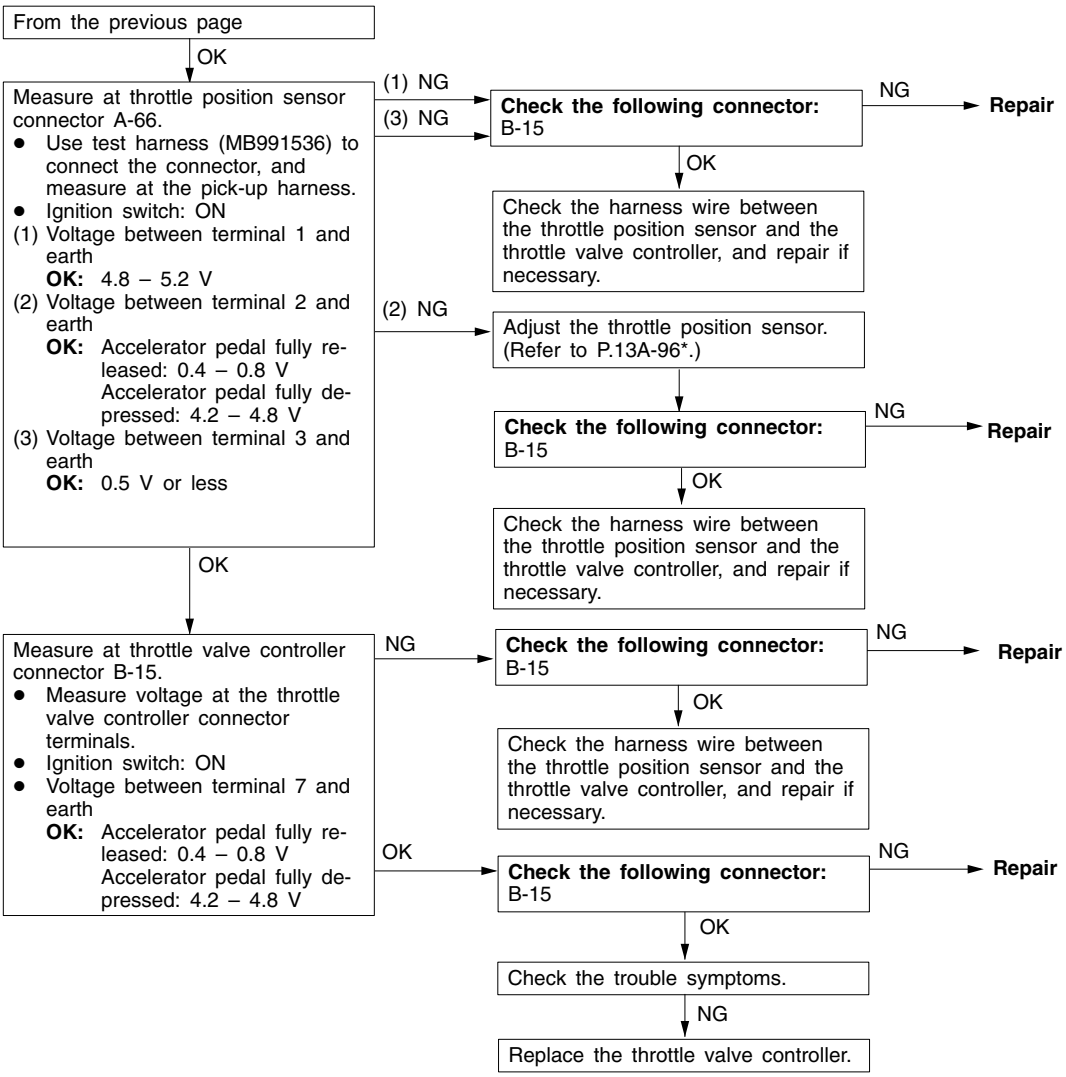


NOTE
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1).

Code No. P0120 Throttle position sensor (1st channel) system	Probable cause
The throttle valve controller judges a malfunction, and then transmit the result to the engine-ECU <M/T> or engine-A/T-ECU <A/T>. Range of Check • Ignition switch: ON Set Conditions • The sensor output voltage is 0.2 V or less. or • The sensor output voltage is 4.9 V or more. or • The throttle position sensor (1st channel) and throttle position sensor (2nd channel) combination output voltage is outside 4 – 6 V. or • The output voltage of the throttle position sensor (1st channel) is significantly different (approx. 1V) from the throttle valve opening angle (voltage), whitch the engine-ECU <M/T> or engine-A/T-ECU <A/T> request the throttle valve controller.	• Malfunction of throttle position sensor • Open or short circuit in the throttle position sensor (1st channel) circuit or loose connector contact • Malfunction of throttle valve controller • Malfunction of engine-ECU <M/T> • Malfunction of engine-A/T-ECU <A/T>



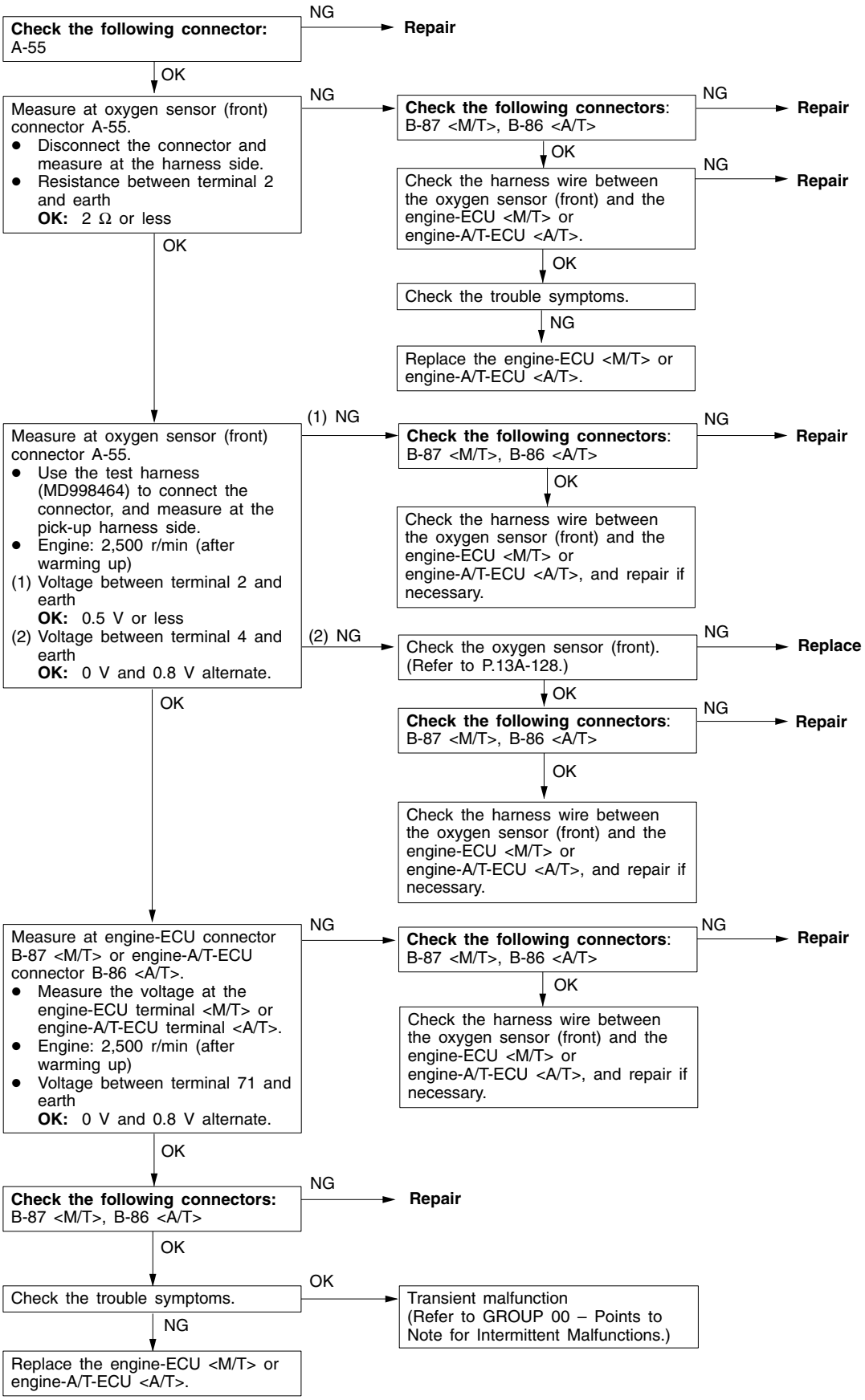
NOTE
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)



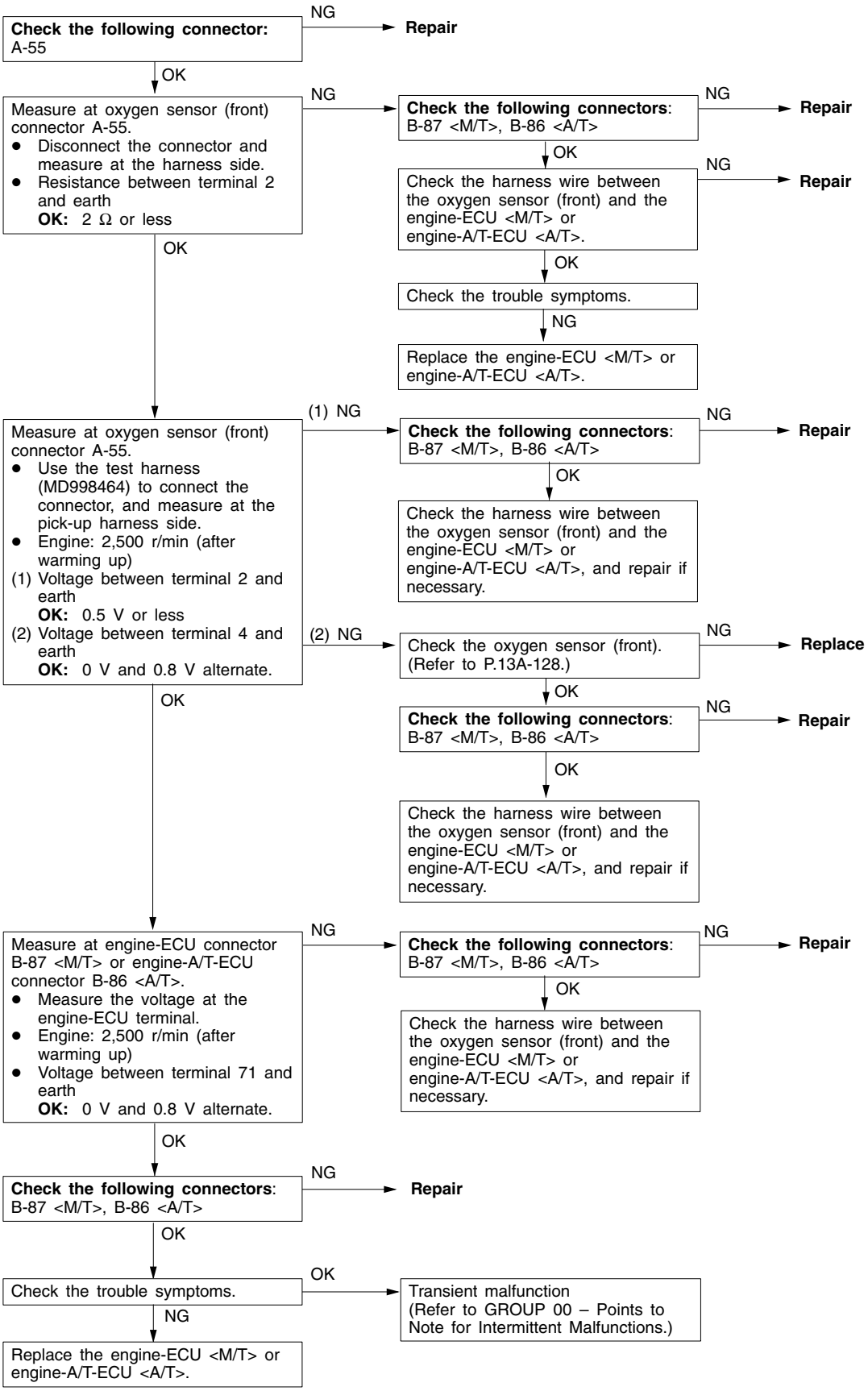
NOTE

*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

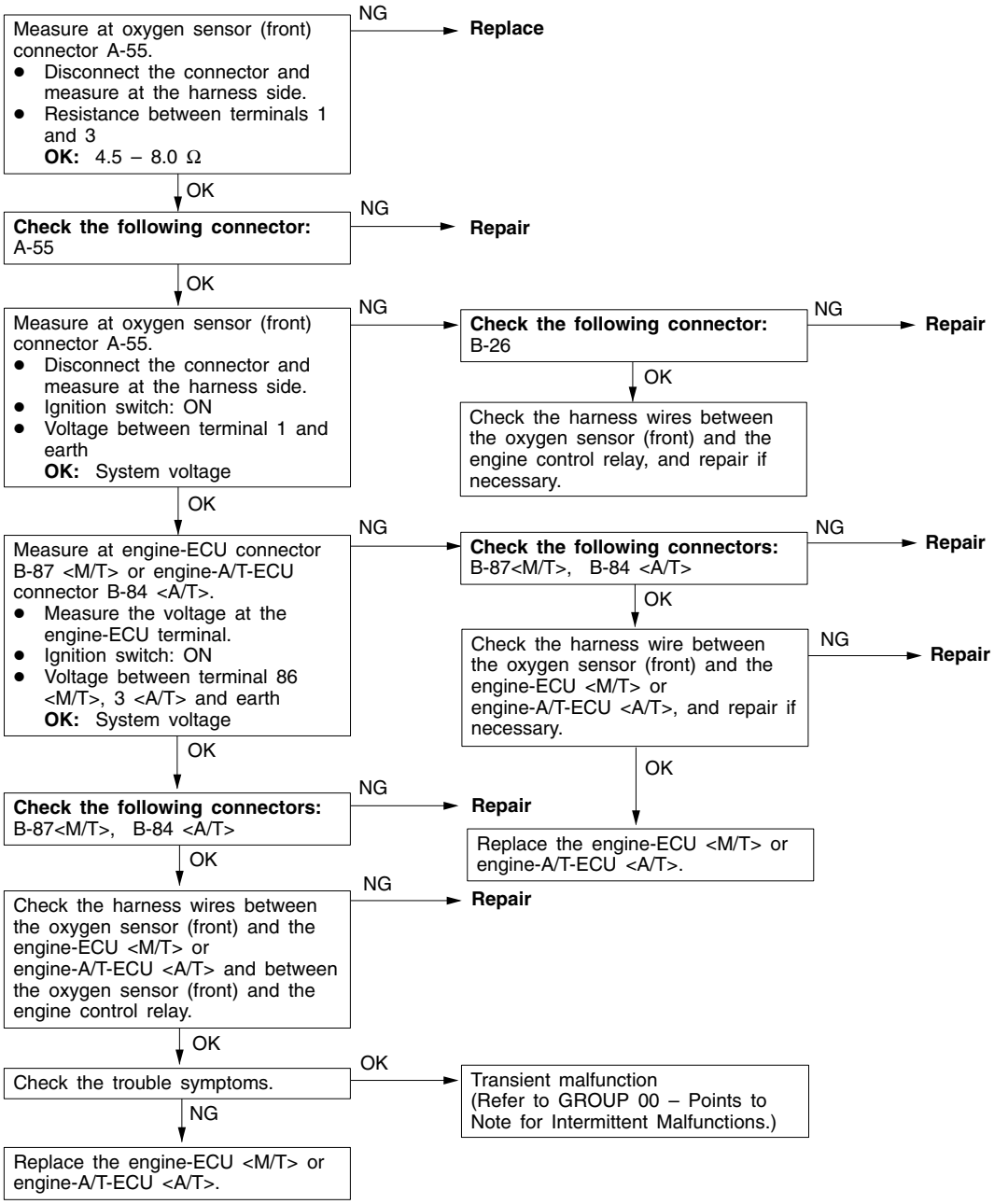
Code No. P0125 Feedback system	Probable cause
Range of Check ● The engine coolant temperature is approx. 80°C or more. ● During stoichiometric feedback control ● The vehicle is not being decelerated. Set Conditions ● Oxygen sensor (front) output voltage has been higher or lower than 0.5 V for at least thirty seconds.	● Malfunction of oxygen sensor (front) ● Open or short circuit in the oxygen sensor (front) circuit or loose connector contact ● Malfunction of engine-ECU <M/T> ● Malfunction of engine-A/T-ECU <A/T>


Check the following connector: A-55
NG
Repair
OK
Measure at oxygen sensor (front) connector A-55.
• Disconnect the connector and measure at the harness side.
• Resistance between terminal 2 and earth
OK: 2 Ω or less
NG
Check the following connectors: B-87 <M/T>, B-86 <A/T>
NG
Repair
OK
Check the harness wire between the oxygen sensor (front) and the engine-ECU <M/T> or engine-A/T-ECU <A/T>.
NG
Repair
OK
Check the trouble symptoms.
NG
Replace the engine-ECU <M/T> or engine-A/T-ECU <A/T>.
OK
Measure at oxygen sensor (front) connector A-55.
• Use the test harness (MD998464) to connect the connector, and measure at the pick-up harness side.
• Engine: 2,500 r/min (after warming up)
(1) Voltage between terminal 2 and earth
OK: 0.5 V or less
(2) Voltage between terminal 4 and earth
OK: 0 V and 0.8 V alternate.
(1) NG
Check the following connectors: B-87 <M/T>, B-86 <A/T>
NG
Repair
OK
Check the harness wire between the oxygen sensor (front) and the engine-ECU <M/T> or engine-A/T-ECU <A/T>, and repair if necessary.
(2) NG
Check the oxygen sensor (front). (Refer to P.13A-128.)
NG
Replace
OK
Check the following connectors: B-87 <M/T>, B-86 <A/T>
NG
Repair
OK
Check the harness wire between the oxygen sensor (front) and the engine-ECU <M/T> or engine-A/T-ECU <A/T>, and repair if necessary.
OK
Measure at engine-ECU connector B-87 <M/T> or engine-A/T-ECU connector B-86 <A/T>.
• Measure the voltage at the engine-ECU terminal <M/T> or engine-A/T-ECU terminal <A/T>.
• Engine: 2,500 r/min (after warming up)
• Voltage between terminal 71 and earth
OK: 0 V and 0.8 V alternate.
NG
Check the following connectors: B-87 <M/T>, B-86 <A/T>
NG
Repair
OK
Check the harness wire between the oxygen sensor (front) and the engine-ECU <M/T> or engine-A/T-ECU <A/T>, and repair if necessary.
OK
Check the following connectors: B-87 <M/T>, B-86 <A/T>
NG
Repair
OK
Check the trouble symptoms.
OK
Transient malfunction (Refer to GROUP 00 – Points to Note for Intermittent Malfunctions.)
NG
Replace the engine-ECU <M/T> or engine-A/T-ECU <A/T>.

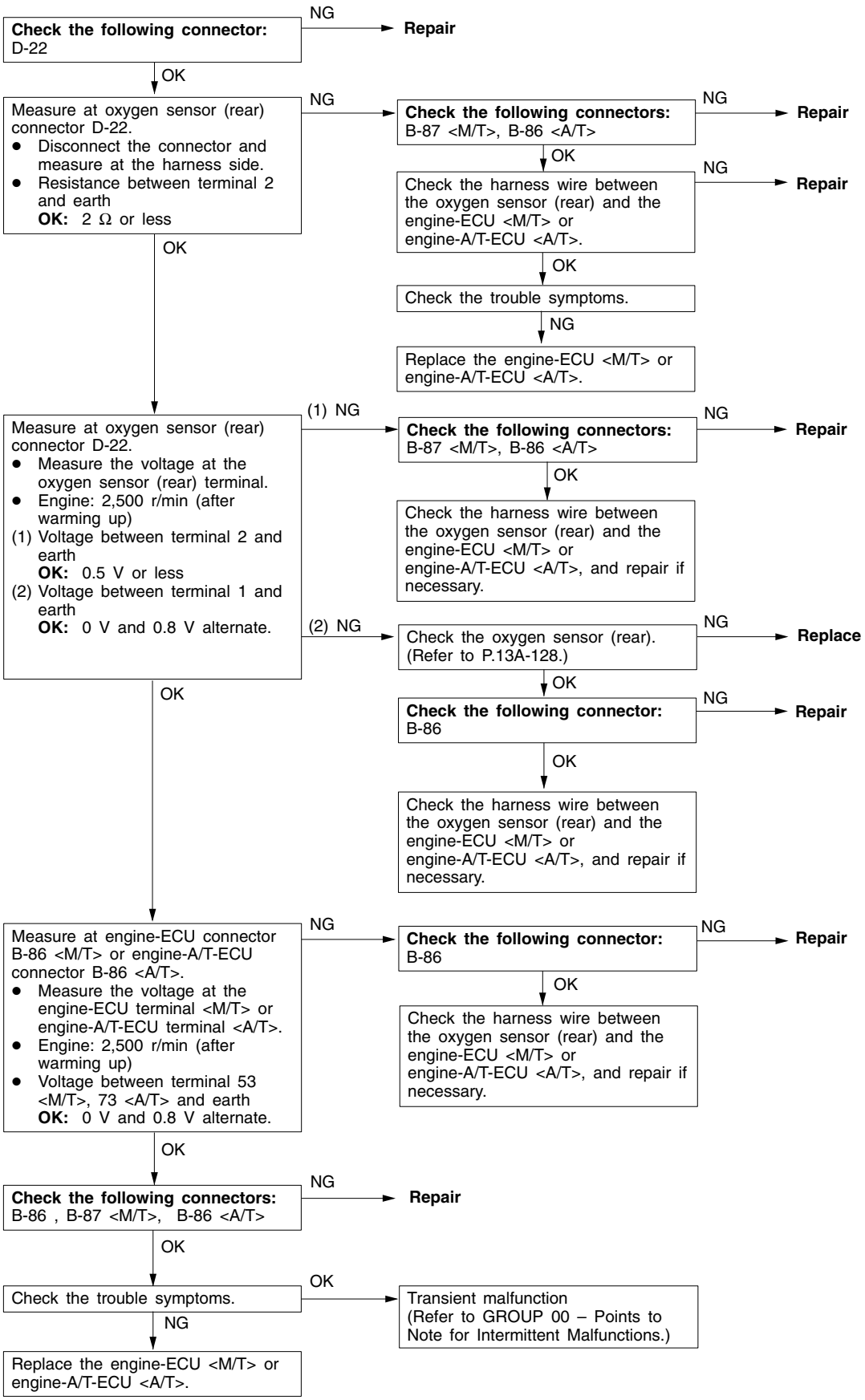
Code No. P0130 Oxygen sensor (front) system <sensor 1>	Probable cause
Range of Check ● Three minutes have been passed since the engine has been started. ● The engine coolant temperature is approx. 80°C or more. ● Intake air temperature is 20 – 50°C ● Engine speed is 1,200 r/min or more ● Driving on a level surface at constant speed. Set Conditions ● The oxygen sensor (front) output voltage is 4.5 V or more when the sensor output voltage is 0.2 V or less and a voltage of 5 V is applied to the oxygen sensor (front) inside the engine-ECU.	● Malfunction of oxygen sensor (front) ● Open or short circuit in the oxygen sensor (front) circuit or loose connector contact ● Malfunction of engine-ECU <M/T> ● Malfunction of engine-A/T-ECU <A/T>
Range of Check ● Engine speed is 3,000 r/min or less ● During driving ● During air/fuel ratio feedback control Set Conditions ● The oxygen sensor (front) output frequency is five or less per 12 seconds on average.	


Check the following connector: A-55
NG
Repair
OK
Measure at oxygen sensor (front) connector A-55.
• Disconnect the connector and measure at the harness side.
• Resistance between terminal 2 and earth
OK: 2 Ω or less
NG
Check the following connectors: B-87 <M/T>, B-86 <A/T>
NG
Repair
OK
Check the harness wire between the oxygen sensor (front) and the engine-ECU <M/T> or engine-A/T-ECU <A/T>.
NG
Repair
OK
Check the trouble symptoms.
NG
Replace the engine-ECU <M/T> or engine-A/T-ECU <A/T>.
OK
Measure at oxygen sensor (front) connector A-55.
• Use the test harness (MD998464) to connect the connector, and measure at the pick-up harness side.
• Engine: 2,500 r/min (after warming up)
(1) Voltage between terminal 2 and earth
OK: 0.5 V or less
(2) Voltage between terminal 4 and earth
OK: 0 V and 0.8 V alternate.
(1) NG
Check the following connectors: B-87 <M/T>, B-86 <A/T>
NG
Repair
OK
Check the harness wire between the oxygen sensor (front) and the engine-ECU <M/T> or engine-A/T-ECU <A/T>, and repair if necessary.
(2) NG
Check the oxygen sensor (front). (Refer to P.13A-128.)
NG
Replace
OK
Check the following connectors: B-87 <M/T>, B-86 <A/T>
NG
Repair
OK
Check the harness wire between the oxygen sensor (front) and the engine-ECU <M/T> or engine-A/T-ECU <A/T>, and repair if necessary.
OK
Measure at engine-ECU connector B-87 <M/T> or engine-A/T-ECU connector B-86 <A/T>.
• Measure the voltage at the engine-ECU terminal.
• Engine: 2,500 r/min (after warming up)
• Voltage between terminal 71 and earth
OK: 0 V and 0.8 V alternate.
NG
Check the following connectors: B-87 <M/T>, B-86 <A/T>
NG
Repair
OK
Check the harness wire between the oxygen sensor (front) and the engine-ECU <M/T> or engine-A/T-ECU <A/T>, and repair if necessary.
OK
Check the following connectors: B-87 <M/T>, B-86 <A/T>
NG
Repair
OK
Check the trouble symptoms.
OK
Transient malfunction (Refer to GROUP 00 – Points to Note for Intermittent Malfunctions.)
NG
Replace the engine-ECU <M/T> or engine-A/T-ECU <A/T>.

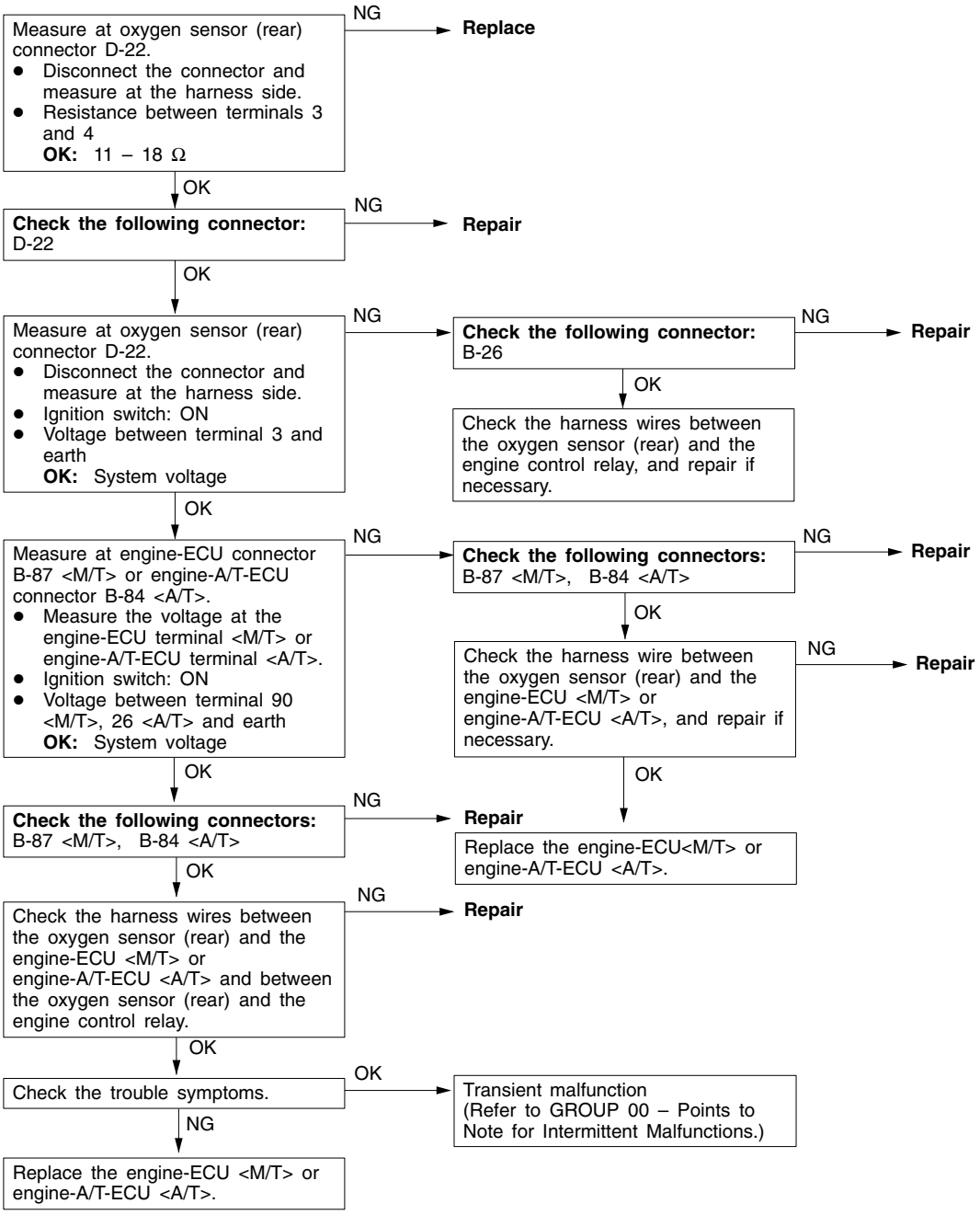
Code No. P0135 Oxygen sensor heater (front) system <sensor 1>	Probable cause
Range of Check • The engine coolant temperature is approx. 20°C or more. • The oxygen sensor heater (front) remains on. • The engine speed is 50 r/min or more. • Battery voltage is 11 – 16 V. Set Conditions • The current, which flows through the oxygen sensor heater (front), is 0.2 A or less or 3.5 A or more for six seconds.	• Malfunction of oxygen sensor heater (front) • Open or short circuit in the oxygen sensor heater (front) circuit or loose connector contact • Malfunction of engine-ECU <M/T> • Malfunction of engine-A/T-ECU <A/T>



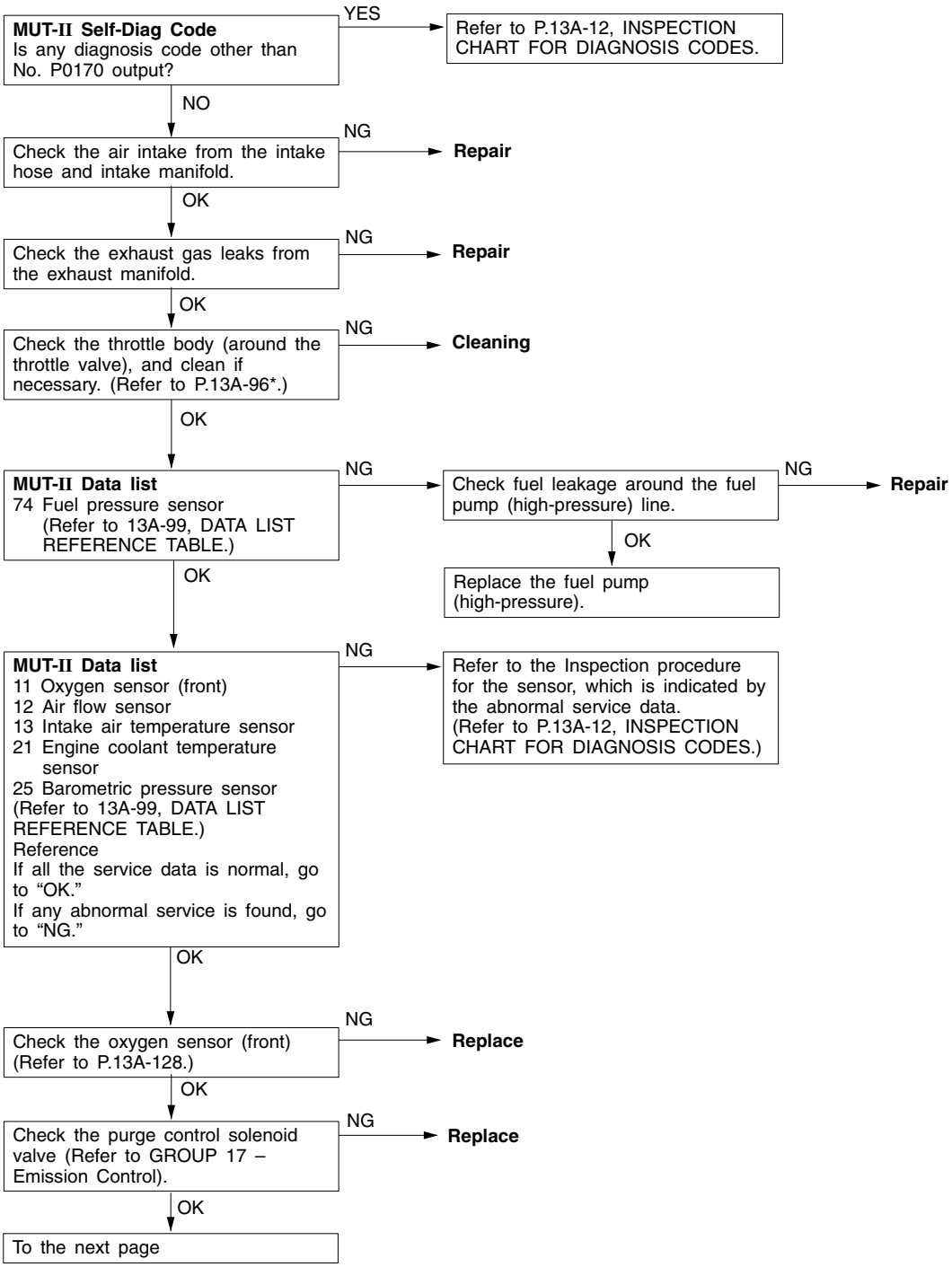
Code No. P0136 Oxygen sensor (rear) system <sensor 2>	Probable cause
Range of Check ● Three minutes have been passed since the engine has been started. ● The engine coolant temperature is approx. 80°C or more. ● Intake air temperature is 20 – 50°C ● Engine speed is 1,200 r/min or more ● Driving on a level surface at constant speed. Set Conditions ● The oxygen sensor (rear) output voltage is 4.5 V or more when the sensor output voltage is 0.2 V or less and a voltage of 5 V is applied to the oxygen sensor (rear) inside the engine-ECU <M/T> or engine-A/T-ECU <A/T>.	● Malfunction of oxygen sensor (rear) ● Open or short circuit in the oxygen sensor (rear) circuit or loose connector contact ● Malfunction of engine-ECU <M/T> ● Malfunction of engine-A/T-ECU <A/T>
Range of Check ● Two seconds have passed after the engine-ECU <M/T> or engine-A/T-ECU <A/T> detected an open circuit. ● When the oxygen sensor (front) is in good condition. Set Conditions ● When the air/fuel ratio is rich, the oxygen sensor (front) output voltage is 0.5 V or more, the oxygen sensor (rear) output voltage is less than 0.1 V, and the oxygen sensor (rear) output voltage fluctuates within 0.078 V.	


Check the following connector: D-22
NG
Repair
OK
Measure at oxygen sensor (rear) connector D-22.
• Disconnect the connector and measure at the harness side.
• Resistance between terminal 2 and earth
OK: 2 Ω or less
NG
Check the following connectors: B-87 <M/T>, B-86 <A/T>
NG
Repair
OK
Check the harness wire between the oxygen sensor (rear) and the engine-ECU <M/T> or engine-A/T-ECU <A/T>.
NG
Repair
OK
Check the trouble symptoms.
NG
Replace the engine-ECU <M/T> or engine-A/T-ECU <A/T>.
OK
Measure at oxygen sensor (rear) connector D-22.
• Measure the voltage at the oxygen sensor (rear) terminal.
• Engine: 2,500 r/min (after warming up)
(1) Voltage between terminal 2 and earth
OK: 0.5 V or less
(2) Voltage between terminal 1 and earth
OK: 0 V and 0.8 V alternate.
(1) NG
Check the following connectors: B-87 <M/T>, B-86 <A/T>
NG
Repair
OK
Check the harness wire between the oxygen sensor (rear) and the engine-ECU <M/T> or engine-A/T-ECU <A/T>, and repair if necessary.
(2) NG
Check the oxygen sensor (rear). (Refer to P.13A-128.)
NG
Replace
OK
Check the following connector: B-86
NG
Repair
OK
Check the harness wire between the oxygen sensor (rear) and the engine-ECU <M/T> or engine-A/T-ECU <A/T>, and repair if necessary.
OK
Measure at engine-ECU connector B-86 <M/T> or engine-A/T-ECU connector B-86 <A/T>.
• Measure the voltage at the engine-ECU terminal <M/T> or engine-A/T-ECU terminal <A/T>.
• Engine: 2,500 r/min (after warming up)
• Voltage between terminal 53 <M/T>, 73 <A/T> and earth
OK: 0 V and 0.8 V alternate.
NG
Check the following connector: B-86
NG
Repair
OK
Check the harness wire between the oxygen sensor (rear) and the engine-ECU <M/T> or engine-A/T-ECU <A/T>, and repair if necessary.
OK
Check the following connectors: B-86 , B-87 <M/T>, B-86 <A/T>
NG
Repair
OK
Check the trouble symptoms.
OK
Transient malfunction (Refer to GROUP 00 – Points to Note for Intermittent Malfunctions.)
NG
Replace the engine-ECU <M/T> or engine-A/T-ECU <A/T>.

Code No. P0141 Oxygen sensor heater (rear) system <sensor 2>	Probable cause
Range of Check • The engine coolant temperature is approx. 20°C or more. • The oxygen sensor heater (rear) remains on. • The engine speed is 50 r/min or more. • Battery voltage is 11 – 16 V. Set Conditions • The current, which flows through the oxygen sensor heater (rear), is 0.2 A or less or 3.5 A or more for six seconds.	• Malfunction of oxygen sensor heater (rear) • Open or short circuit in the oxygen sensor heater (rear) circuit or loose connector contact • Malfunction of engine-ECU <M/T> • Malfunction of engine-A/T-ECU <A/T>

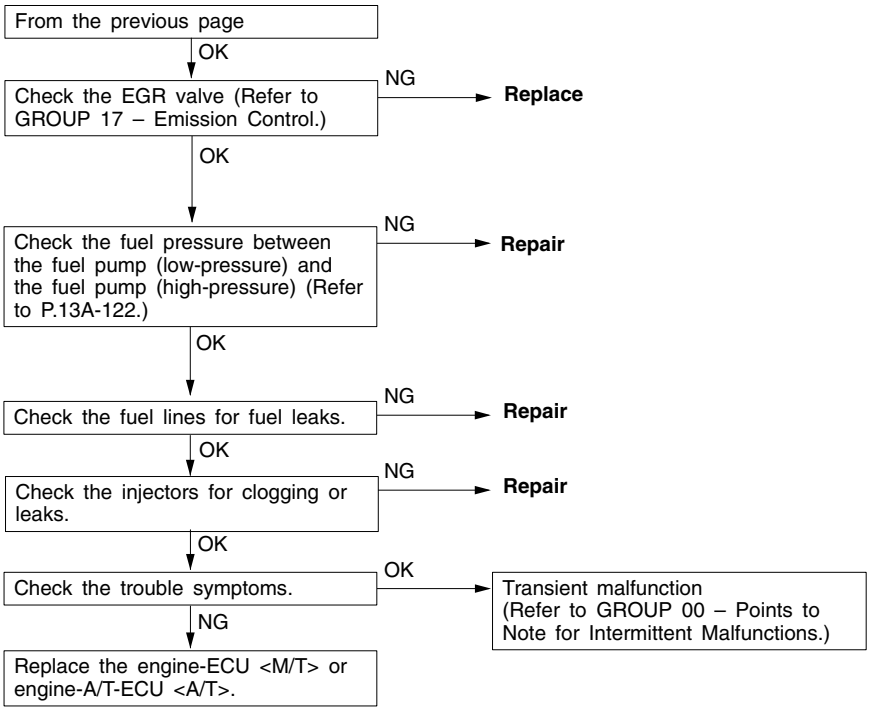


Code No. P0170 Abnormal fuel system	Probable cause
Range of Check • Engine: Being learning the air-fuel ratio Set Conditions • Ten seconds or more have been passed while the fuel injection amount compensation value is too low. or • Ten seconds or more have been passed while the fuel injection amount compensation value is too high.	• Malfunction of fuel supply system • Malfunction of oxygen sensor (front) • Malfunction of intake air temperature sensor • Malfunction of barometric pressure sensor • Malfunction of air flow sensor • Malfunction of engine-ECU <M/T> • Malfunction of engine-A/T-ECU <A/T>

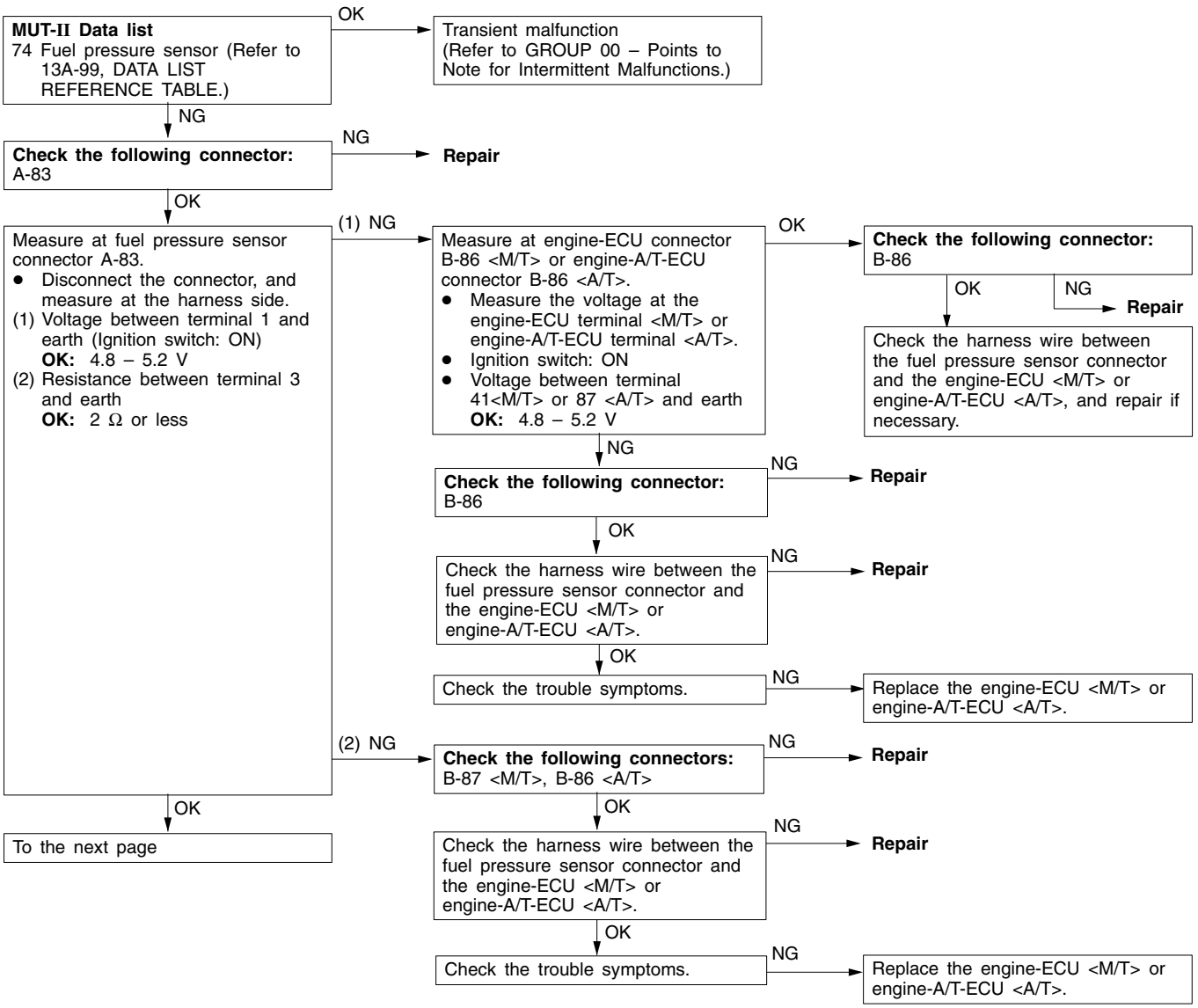


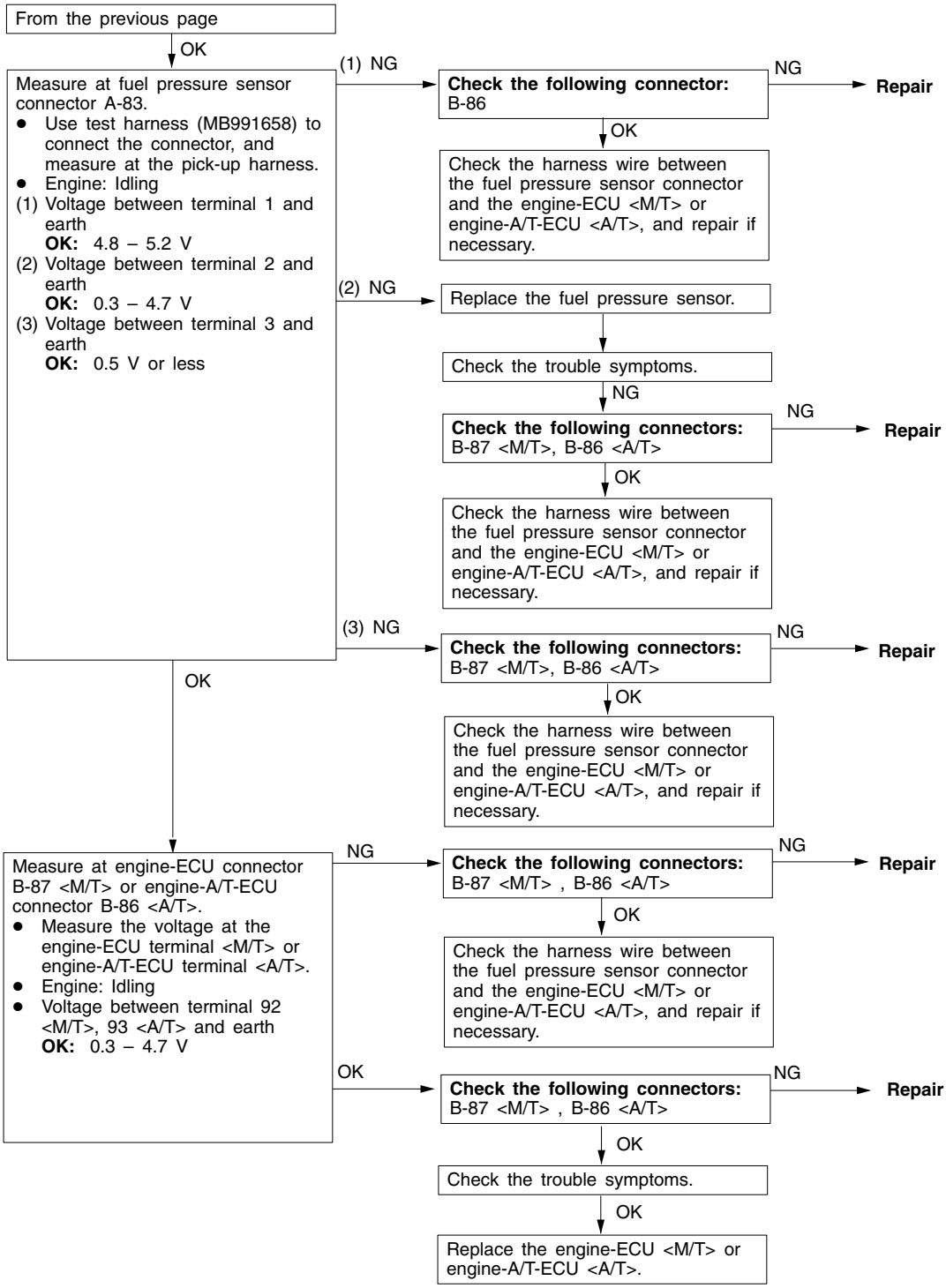
NOTE

*: Refer to the ’99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

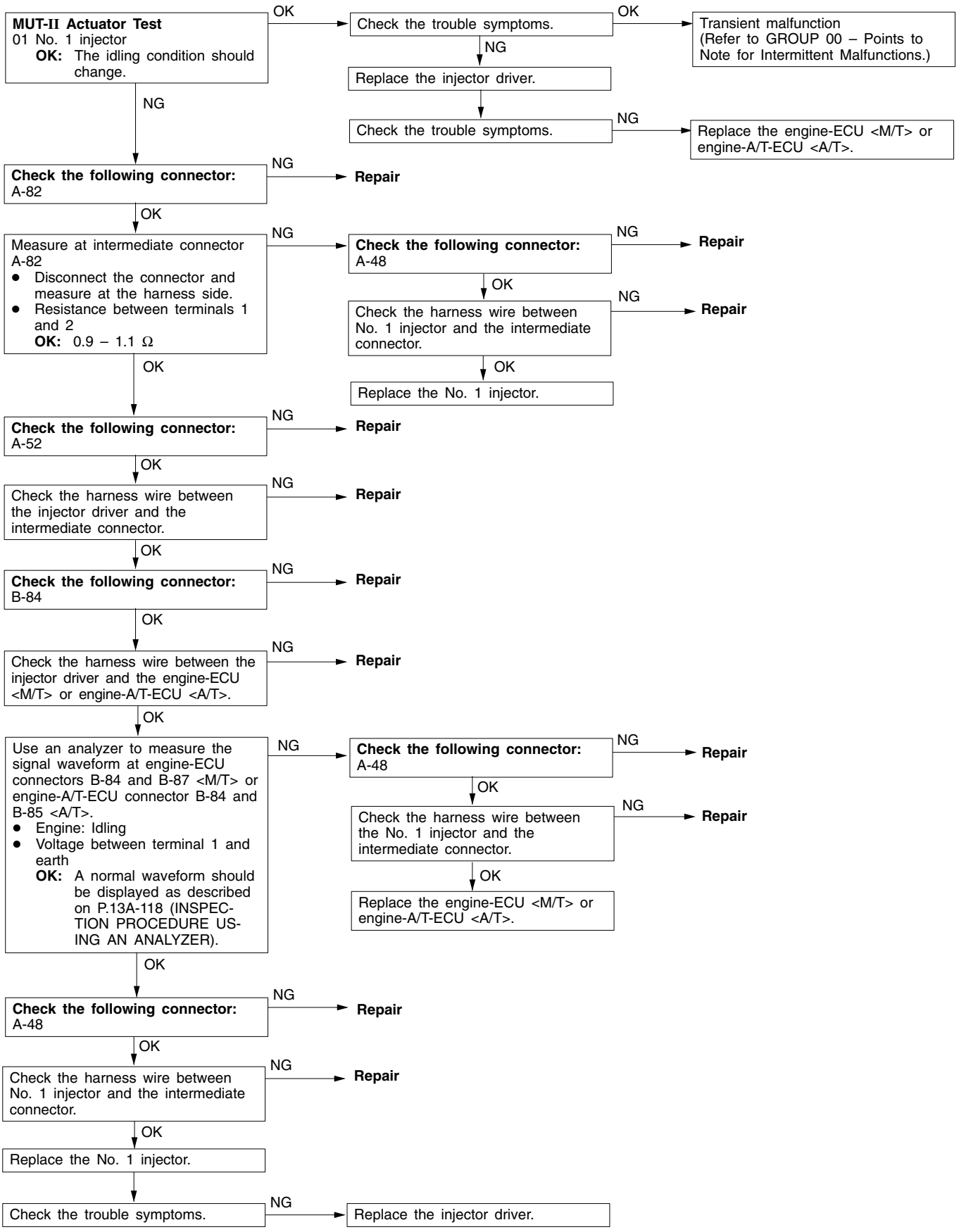

From the previous page
OK
Check the EGR valve (Refer to GROUP 17 – Emission Control.)
NG
Replace
OK
Check the fuel pressure between the fuel pump (low-pressure) and the fuel pump (high-pressure) (Refer to P.13A-122.)
NG
Repair
OK
Check the fuel lines for fuel leaks.
NG
Repair
OK
Check the injectors for clogging or leaks.
NG
Repair
OK
Check the trouble symptoms.
OK
Transient malfunction (Refer to GROUP 00 – Points to Note for Intermittent Malfunctions.)
NG
Replace the engine-ECU <M/T> or engine-A/T-ECU <A/T>.

Code No. P0190 Abnormal fuel pressure	Probable cause
Range of Check ● Ignition switch: ON Set Conditions ● The sensor output voltage is 4.8 V or more, or 0.2 V or less for four seconds.	● Malfunction of of fuel pressure sensor ● Open or short circuit in the fuel pressure sensor circuit or loose connector contact ● Malfunction of engine-ECU <M/T> ● Malfunction of engine-A/T-ECU <A/T>
Range of Check ● The following conditions are detected temporarily after the engine has been started. (1) Engine speed: 1,000 r/min or more (2) Fuel pressure: 2 MPa or more ● Engine running Set Conditions ● The fuel pressure is 6.9 MPa or more, or 2 MPa or less for four seconds.	● Malfunction of high-pressure fuel pump ● Clogging of high-pressure fuel lines
This diagnosis code will also be output when air is trapped into the high-pressure fuel lines (such as poor fuel level). In that case, the air can be evacuated by operating the engine for at least 15 seconds at 2,000 r/min. After the repair, use the MUT-II to erase the diagnosis code.	● Air trapped due to poor fuel level

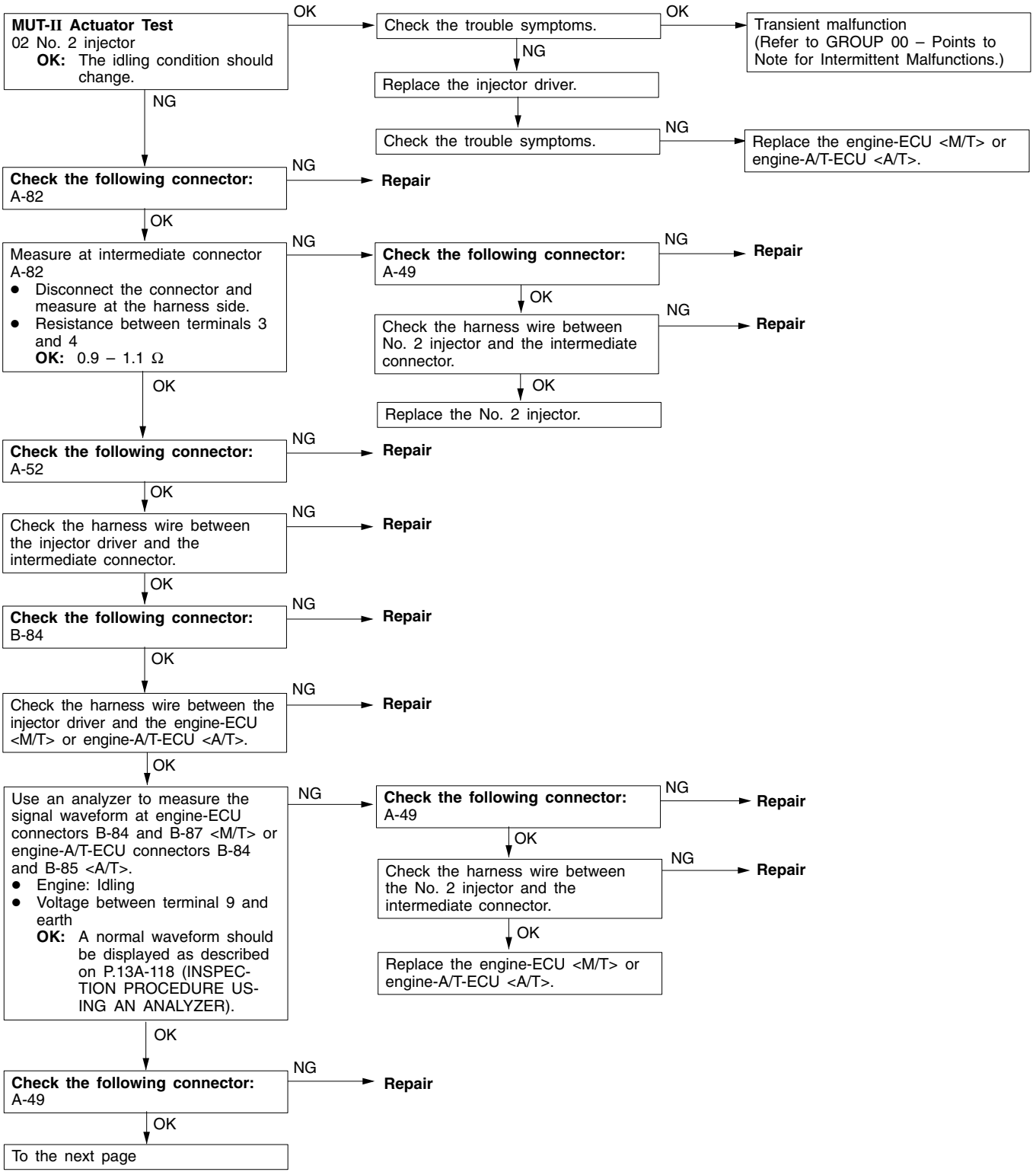


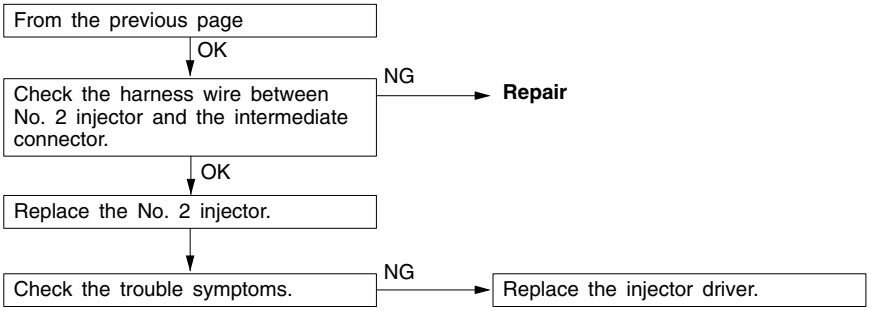


Code No. P0201 No. 1 injector system	Probable cause
Range of Check ● The engine speed is 4,000 r/min or less. ● The battery voltage is 10 V or more. ● The fuel cut operation or the injector operation (by carrying out the Actuator Test) is not in progress. Set Conditions ● The injector driver is not transmitting a injector open circuit check signal for four seconds.	● Malfunction of No. 1 injector ● Open or short circuit in the No. 1 injector circuit or loose connector contact ● Malfunction of engine-ECU <M/T> ● Malfunction of engine-A/T-ECU <A/T>

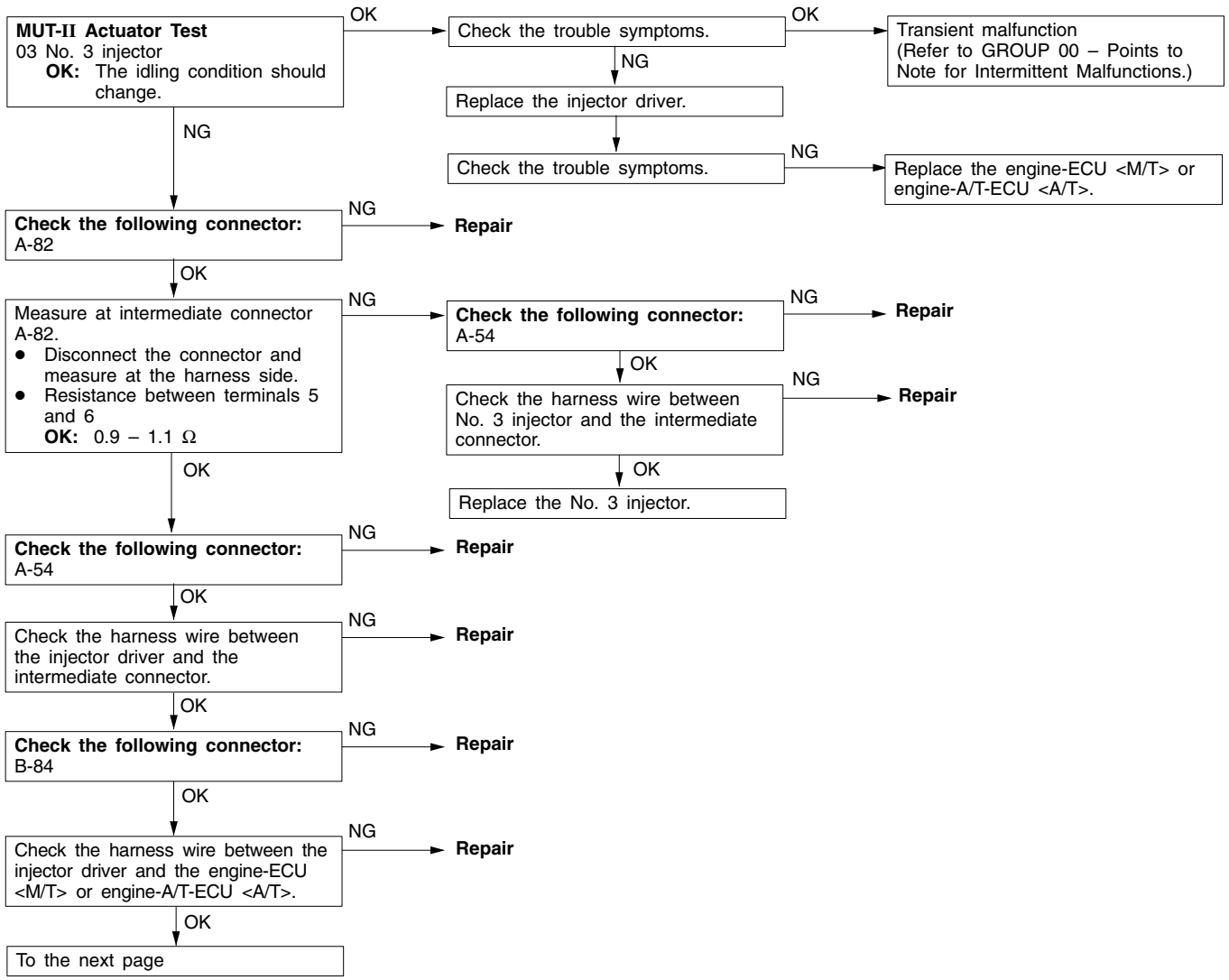

MUT-II Actuator Test
01 No. 1 injector
OK: The idling condition should change.
OK
Check the trouble symptoms.
OK
Transient malfunction
(Refer to GROUP 00 – Points to Note for Intermittent Malfunctions.)
NG
Replace the injector driver.
Check the trouble symptoms.
NG
Replace the engine-ECU <M/T> or engine-A/T-ECU <A/T>.
NG
Check the following connector:
A-82
NG
Repair
OK
Measure at intermediate connector A-82
• Disconnect the connector and measure at the harness side.
• Resistance between terminals 1 and 2
OK: 0.9 – 1.1 Ω
NG
Check the following connector:
A-48
NG
Repair
OK
Check the harness wire between No. 1 injector and the intermediate connector.
NG
Repair
OK
Replace the No. 1 injector.
OK
Check the following connector:
A-52
NG
Repair
OK
Check the harness wire between the injector driver and the intermediate connector.
NG
Repair
OK
Check the following connector:
B-84
NG
Repair
OK
Check the harness wire between the injector driver and the engine-ECU <M/T> or engine-A/T-ECU <A/T>.
NG
Repair
OK
Use an analyzer to measure the signal waveform at engine-ECU connectors B-84 and B-87 <M/T> or engine-A/T-ECU connector B-84 and B-85 <A/T>.
• Engine: Idling
• Voltage between terminal 1 and earth
OK: A normal waveform should be displayed as described on P.13A-118 (INSPECTION PROCEDURE USING AN ANALYZER).
NG
Check the following connector:
A-48
NG
Repair
OK
Check the harness wire between the No. 1 injector and the intermediate connector.
NG
Repair
OK
Replace the engine-ECU <M/T> or engine-A/T-ECU <A/T>.
OK
Check the following connector:
A-48
NG
Repair
OK
Check the harness wire between No. 1 injector and the intermediate connector.
NG
Repair
OK
Replace the No. 1 injector.
Check the trouble symptoms.
NG
Replace the injector driver.

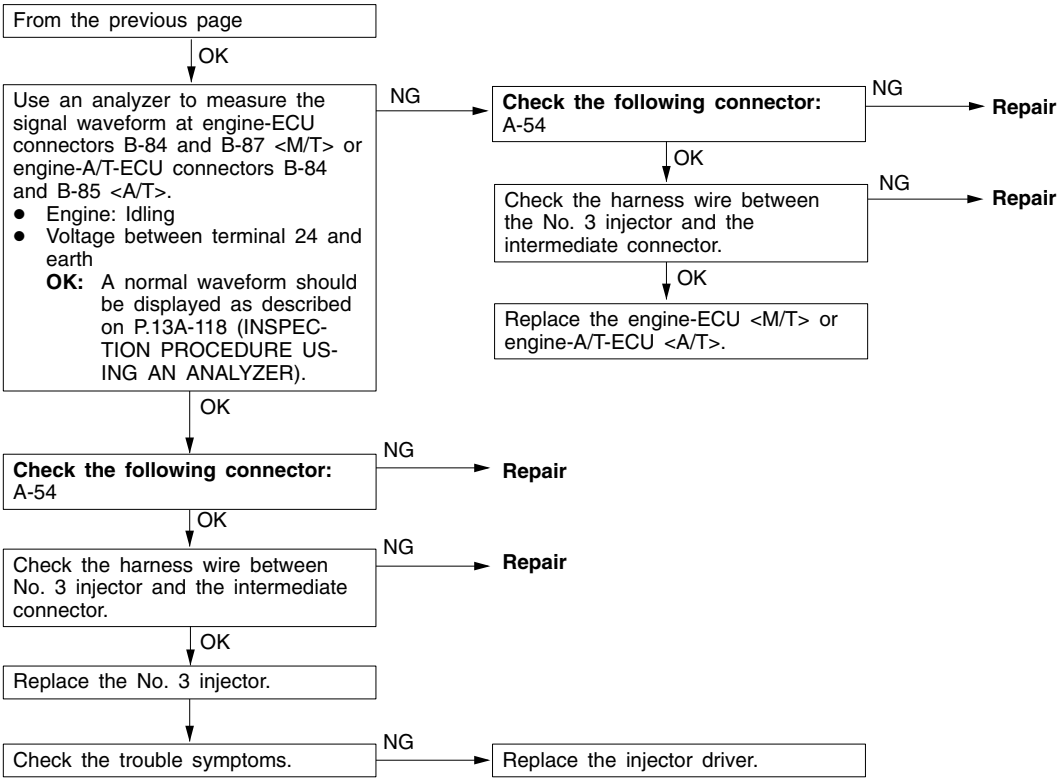
Code No. P0202 No. 2 injector system	Probable cause
Range of Check • The engine speed is 4,000 r/min or less. • The battery voltage is 10 V or more. • The fuel cut operation or the injector operation (by carrying out the Actuator Test) is not in progress. Set Conditions • The injector driver is not transmitting a injector open circuit check signal for four seconds.	• Malfunction of No. 2 injector • Open or short circuit in the No. 2 injector circuit or loose connector contact • Malfunction of engine-ECU <M/T> • Malfunction of engine-A/T-ECU <A/T>



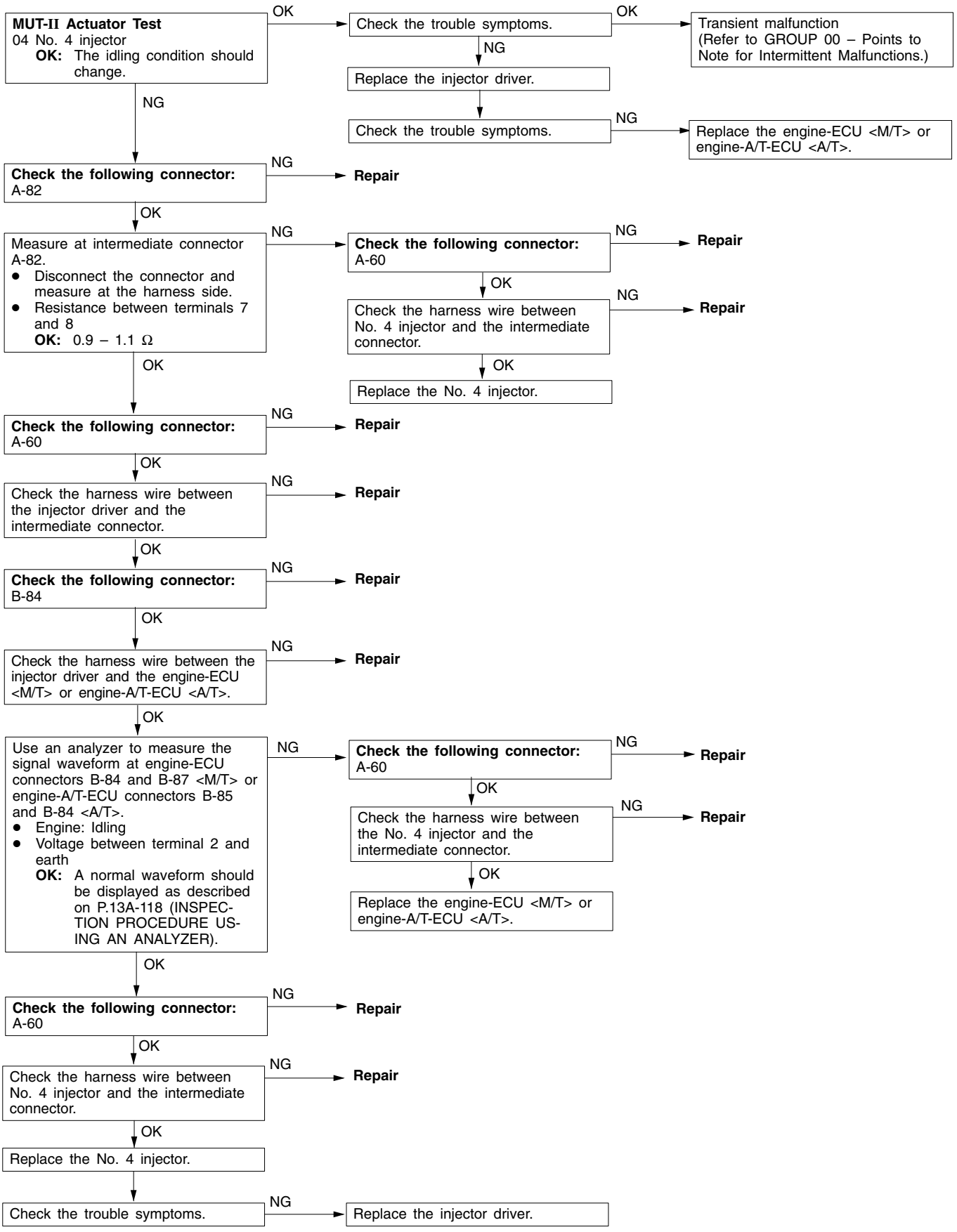


Code No. P0203 No. 3 injector system	Probable cause
Range of Check • The engine speed is 4,000 r/min or less. • The battery voltage is 10 V or more. • The fuel cut operation or the injector operation (by carrying out the Actuator Test) is not in progress. Set Conditions • The injector driver is not transmitting a injector open circuit check signal for four seconds.	• Malfunction of No. 3 injector • Open or short circuit in the No. 3 injector circuit or loose connector contact • Malfunction of engine-ECU <M/T> • Malfunction of engine-A/T-ECU <A/T>

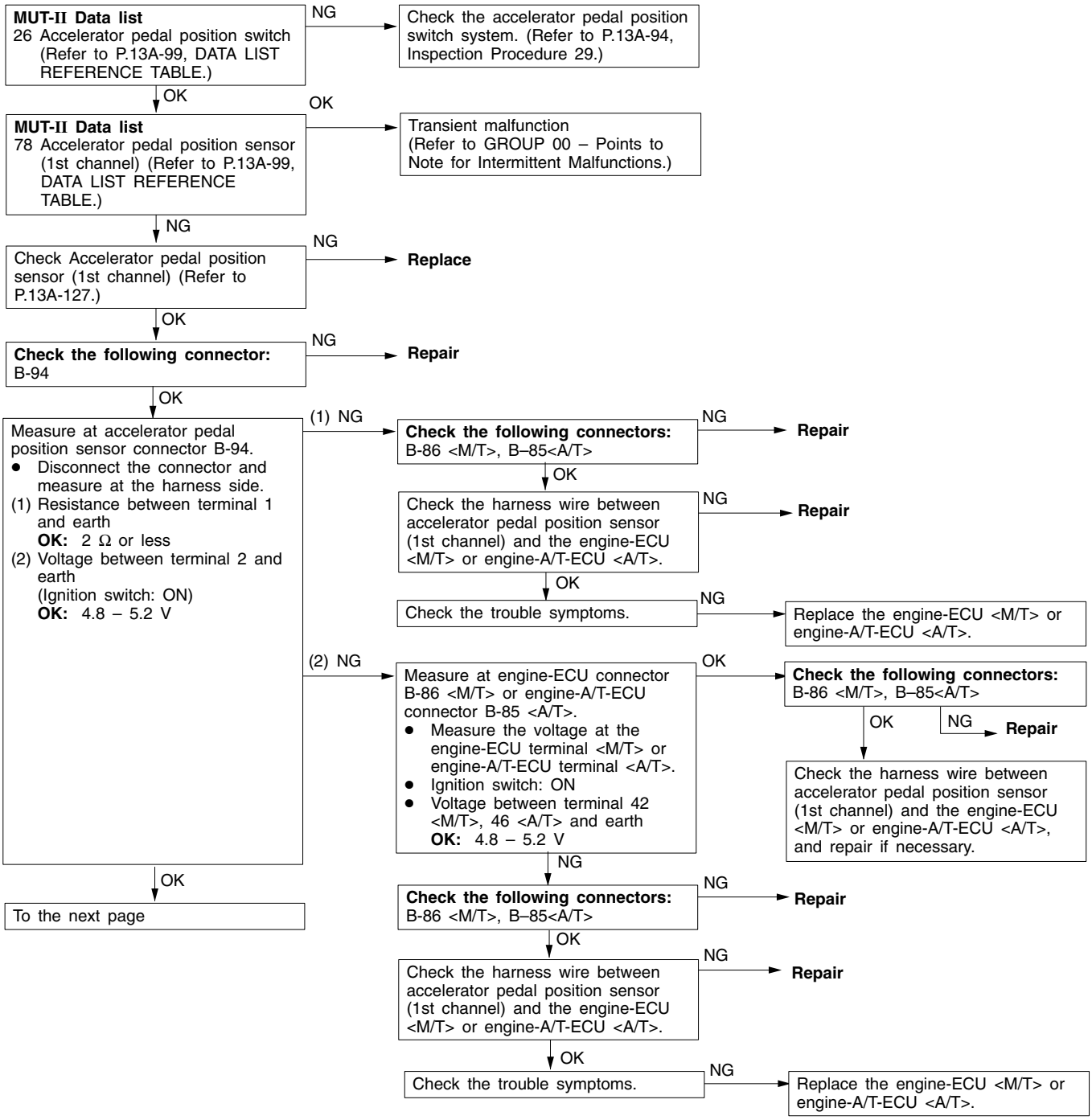


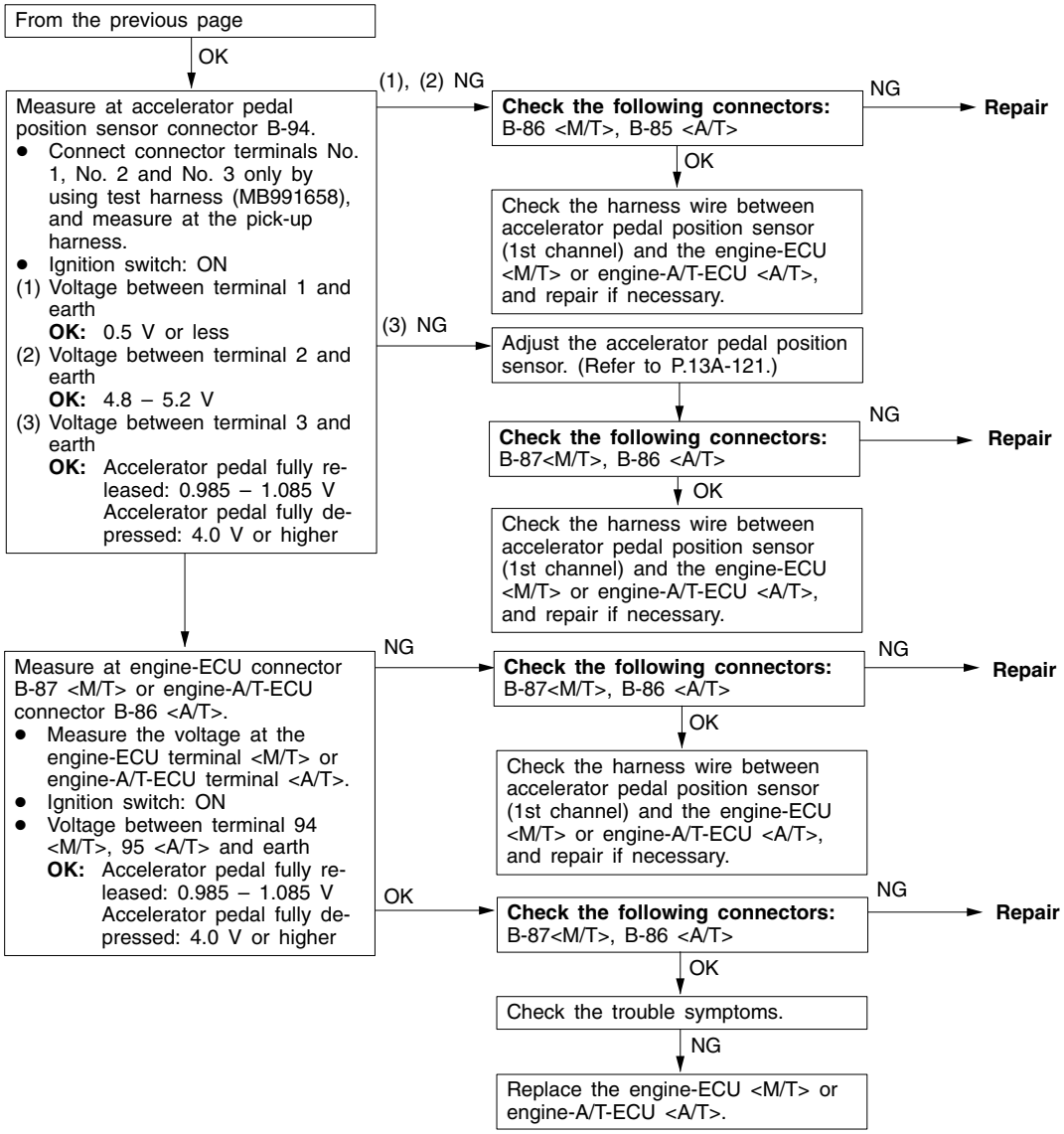


Code No. P0204 No. 4 injector system	Probable cause
Range of Check ● The engine speed is 4,000 r/min or less. ● The battery voltage is 10 V or more. ● The fuel cut operation or the injector operation (by carrying out the Actuator Test) is not in progress. Set Conditions ● The injector driver is not transmitting a injector open circuit check signal for four seconds.	● Malfunction of No. 4 injector ● Open or short circuit in the No. 4 injector circuit or loose connector contact ● Malfunction of engine-ECU <M/T> ● Malfunction of engine-A/T-ECU <A/T>

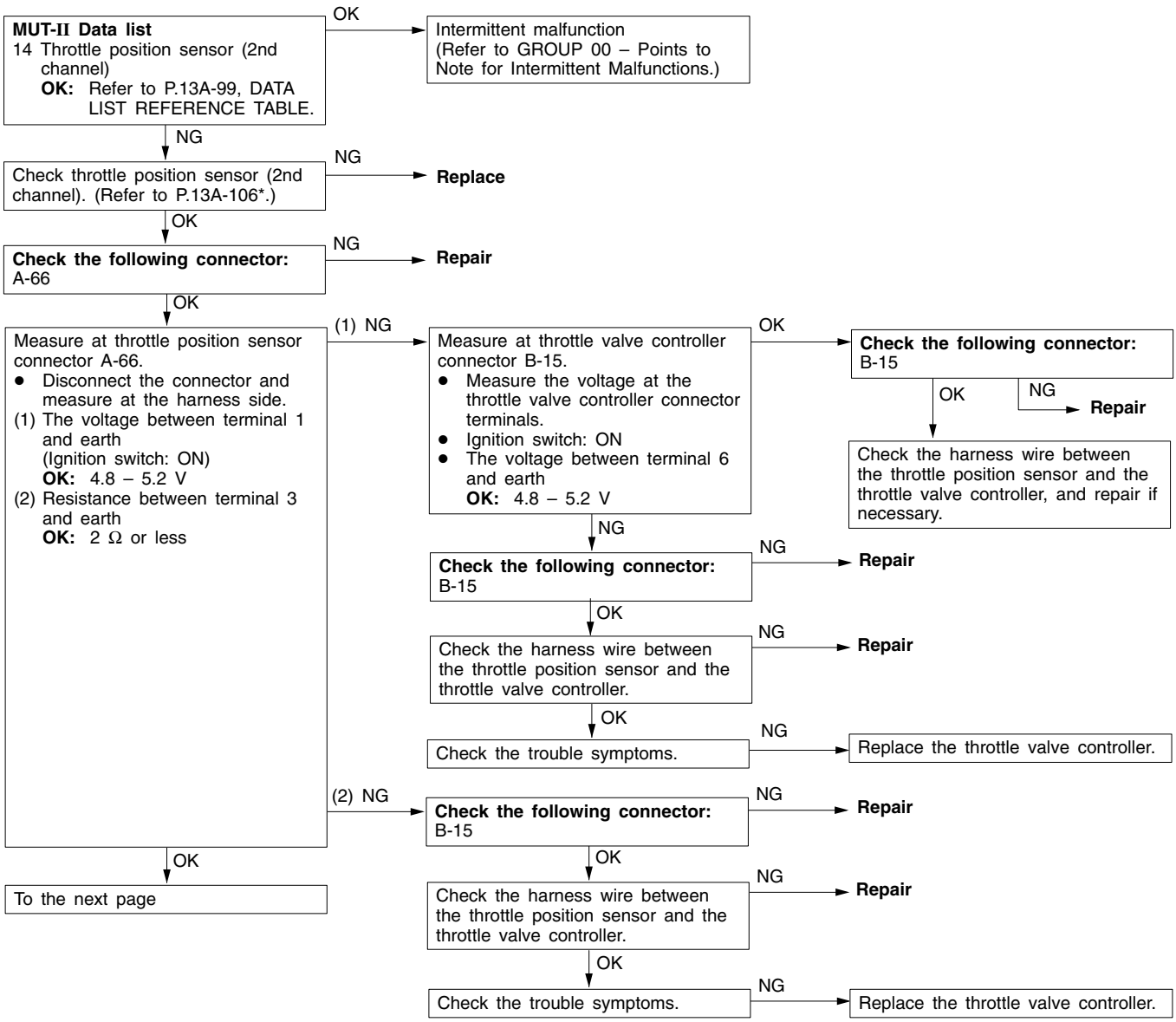

MUT-II Actuator Test
04 No. 4 injector
OK: The idling condition should change.
OK
Check the trouble symptoms.
OK
Transient malfunction
(Refer to GROUP 00 – Points to Note for Intermittent Malfunctions.)
NG
Replace the injector driver.
Check the trouble symptoms.
NG
Replace the engine-ECU <M/T> or engine-A/T-ECU <A/T>.
NG
Check the following connector:
A-82
NG
Repair
OK
Measure at intermediate connector A-82.
• Disconnect the connector and measure at the harness side.
• Resistance between terminals 7 and 8
OK: 0.9 – 1.1 Ω
NG
Check the following connector:
A-60
NG
Repair
OK
Check the harness wire between No. 4 injector and the intermediate connector.
NG
Repair
OK
Replace the No. 4 injector.
OK
Check the following connector:
A-60
NG
Repair
OK
Check the harness wire between the injector driver and the intermediate connector.
NG
Repair
OK
Check the following connector:
B-84
NG
Repair
OK
Check the harness wire between the injector driver and the engine-ECU <M/T> or engine-A/T-ECU <A/T>.
NG
Repair
OK
Use an analyzer to measure the signal waveform at engine-ECU connectors B-84 and B-87 <M/T> or engine-A/T-ECU connectors B-85 and B-84 <A/T>.
• Engine: Idling
• Voltage between terminal 2 and earth
OK: A normal waveform should be displayed as described on P.13A-118 (INSPECTION PROCEDURE USING AN ANALYZER).
NG
Check the following connector:
A-60
NG
Repair
OK
Check the harness wire between the No. 4 injector and the intermediate connector.
NG
Repair
OK
Replace the engine-ECU <M/T> or engine-A/T-ECU <A/T>.
OK
Check the following connector:
A-60
NG
Repair
OK
Check the harness wire between No. 4 injector and the intermediate connector.
NG
Repair
OK
Replace the No. 4 injector.
Check the trouble symptoms.
NG
Replace the injector driver.

Code No. P0220 Accelerator pedal position sensor (1st channel) system	Probable cause
Range of Check ● Accelerator pedal position sensor (2nd channel) is normal. ● Communication between the engine-ECU <M/T> or engine-A/T-ECU <A/T> and the throttle valve controller is normal. Set Conditions ● The output voltage of accelerator pedal position sensor (1st channel) is 0.2 V or less for one second. or ● The output voltage of accelerator pedal position sensor (2nd channel) is 2.5 V or less, and that of accelerator pedal position sensor (1st channel) is 4.5 V or more for one second or ● The difference between accelerator pedal position sensor (1st channel) and accelerator pedal position sensor (2nd channel) output voltages is 1.0 V or more (i.e. the throttle opening angle changes slightly). or ● The output voltage of accelerator pedal position sensor (1st channel) is 1.875 V or more for one second when the accelerator pedal position switch is turned on.	● Malfunction of accelerator pedal position sensor (1st channel) ● Open or short circuit in the accelerator pedal position sensor (1st channel) circuit or loose connector contact ● Accelerator pedal position switch seized ON ● Malfunction of throttle valve controller ● Malfunction of engine-ECU <M/T> ● Malfunction of engine-A/T-ECU <A/T>

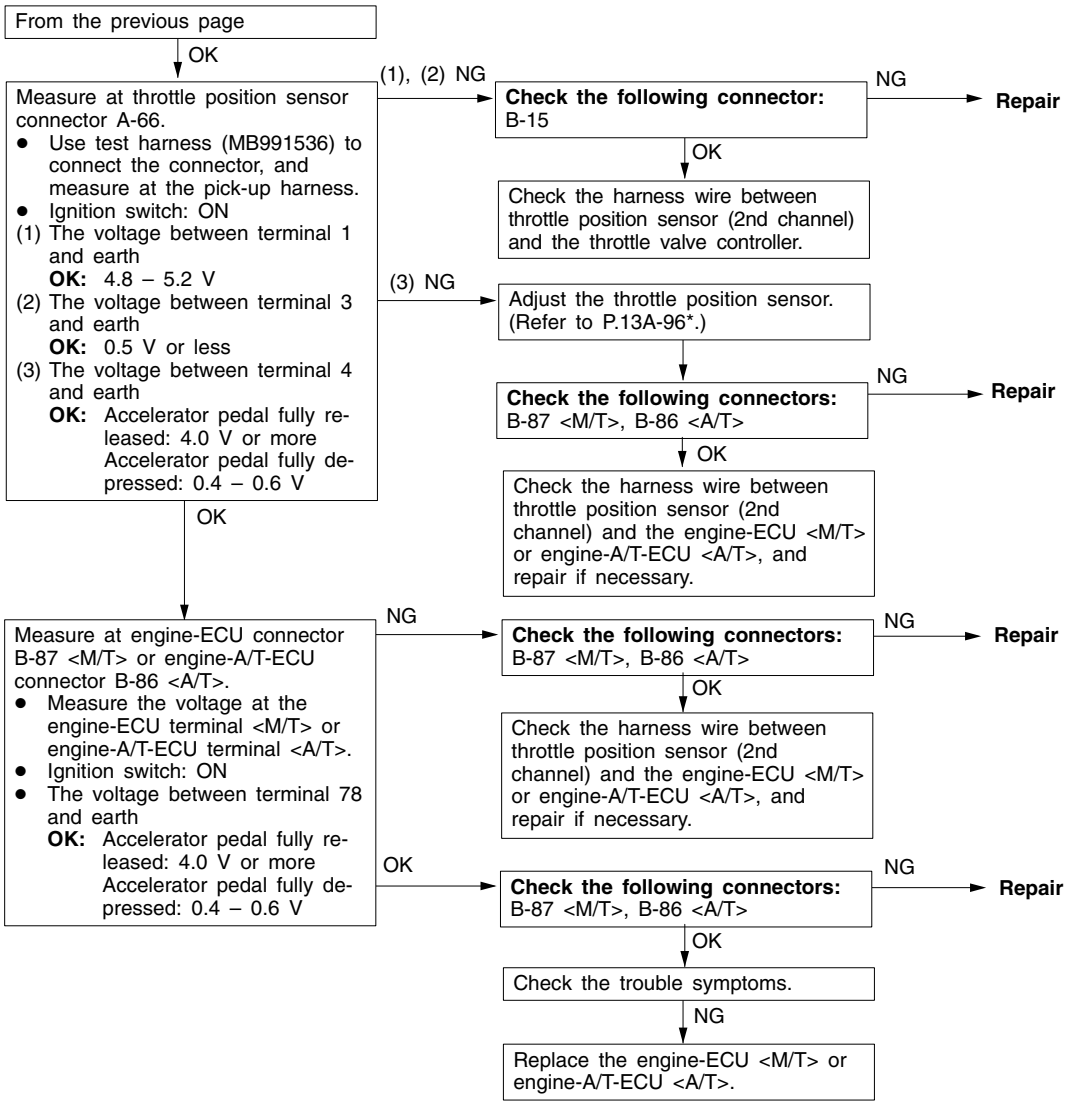

MUT-II Data list
26 Accelerator pedal position switch (Refer to P.13A-99, DATA LIST REFERENCE TABLE.)
NG
Check the accelerator pedal position switch system. (Refer to P.13A-94, Inspection Procedure 29.)
OK
MUT-II Data list
78 Accelerator pedal position sensor (1st channel) (Refer to P.13A-99, DATA LIST REFERENCE TABLE.)
OK
Transient malfunction (Refer to GROUP 00 – Points to Note for Intermittent Malfunctions.)
NG
Check Accelerator pedal position sensor (1st channel) (Refer to P.13A-127.)
NG
Replace
OK
Check the following connector: B-94
NG
Repair
OK
Measure at accelerator pedal position sensor connector B-94.
● Disconnect the connector and measure at the harness side.
(1) Resistance between terminal 1 and earth
OK: 2 Ω or less
(2) Voltage between terminal 2 and earth
(Ignition switch: ON)
OK: 4.8 – 5.2 V
(1) NG
Check the following connectors: B-86 <M/T>, B–85<A/T>
NG
Repair
OK
Check the harness wire between accelerator pedal position sensor (1st channel) and the engine-ECU <M/T> or engine-A/T-ECU <A/T>.
NG
Repair
OK
Check the trouble symptoms.
NG
Replace the engine-ECU <M/T> or engine-A/T-ECU <A/T>.
(2) NG
Measure at engine-ECU connector B-86 <M/T> or engine-A/T-ECU connector B-85 <A/T>.
● Measure the voltage at the engine-ECU terminal <M/T> or engine-A/T-ECU terminal <A/T>.
● Ignition switch: ON
● Voltage between terminal 42 <M/T>, 46 <A/T> and earth
OK: 4.8 – 5.2 V
OK
Check the following connectors: B-86 <M/T>, B–85<A/T>
OK
NG
Repair
Check the harness wire between accelerator pedal position sensor (1st channel) and the engine-ECU <M/T> or engine-A/T-ECU <A/T>, and repair if necessary.
NG
Check the following connectors: B-86 <M/T>, B–85<A/T>
NG
Repair
OK
Check the harness wire between accelerator pedal position sensor (1st channel) and the engine-ECU <M/T> or engine-A/T-ECU <A/T>.
NG
Repair
OK
Check the trouble symptoms.
NG
Replace the engine-ECU <M/T> or engine-A/T-ECU <A/T>.
OK
To the next page


From the previous page
OK
Measure at accelerator pedal position sensor connector B-94.
● Connect connector terminals No. 1, No. 2 and No. 3 only by using test harness (MB991658), and measure at the pick-up harness.
● Ignition switch: ON
(1) Voltage between terminal 1 and earth
OK: 0.5 V or less
(2) Voltage between terminal 2 and earth
OK: 4.8 – 5.2 V
(3) Voltage between terminal 3 and earth
OK: Accelerator pedal fully released: 0.985 – 1.085 V
Accelerator pedal fully depressed: 4.0 V or higher
(1), (2) NG
Check the following connectors:
B-86 <M/T>, B-85 <A/T>
NG
Repair
OK
Check the harness wire between accelerator pedal position sensor (1st channel) and the engine-ECU <M/T> or engine-A/T-ECU <A/T>, and repair if necessary.
(3) NG
Adjust the accelerator pedal position sensor. (Refer to P.13A-121.)
Check the following connectors:
B-87<M/T>, B-86 <A/T>
NG
Repair
OK
Check the harness wire between accelerator pedal position sensor (1st channel) and the engine-ECU <M/T> or engine-A/T-ECU <A/T>, and repair if necessary.
Measure at engine-ECU connector B-87 <M/T> or engine-A/T-ECU connector B-86 <A/T>.
● Measure the voltage at the engine-ECU terminal <M/T> or engine-A/T-ECU terminal <A/T>.
● Ignition switch: ON
● Voltage between terminal 94 <M/T>, 95 <A/T> and earth
OK: Accelerator pedal fully released: 0.985 – 1.085 V
Accelerator pedal fully depressed: 4.0 V or higher
NG
Check the following connectors:
B-87<M/T>, B-86 <A/T>
NG
Repair
OK
Check the harness wire between accelerator pedal position sensor (1st channel) and the engine-ECU <M/T> or engine-A/T-ECU <A/T>, and repair if necessary.
OK
Check the following connectors:
B-87<M/T>, B-86 <A/T>
NG
Repair
OK
Check the trouble symptoms.
NG
Replace the engine-ECU <M/T> or engine-A/T-ECU <A/T>.

Code No. 0225 Throttle position sensor (2nd channel) system	Probable cause
The throttle valve controller judges a malfunction, and then transmit the result to the engine-ECU <M/T> or engine-A/T-ECU <A/T>. Range of Check ● Ignition switch: ON ● The throttle position sensor (1st channel) is normal. Set Conditions ● The sensor output voltage is 0.2 V or less for four seconds. or ● The sensor output voltage is 4.85 V or more for four seconds, and the output voltage of the throttle position sensor (1st channel) is 1.2 V or more. or ● The throttle position sensor (1st channel) and throttle position sensor (2nd channel) combination output voltage is outside 4 – 6 V.	● Malfunction of throttle position sensor (2nd channel) ● Open or short circuit in the throttle position sensor (2nd channel) circuit or loose connector contact ● Malfunction of the throttle valve controller ● Malfunction of the engine-ECU <M/T> ● Malfunction of the engine-A/T-ECU <A/T>

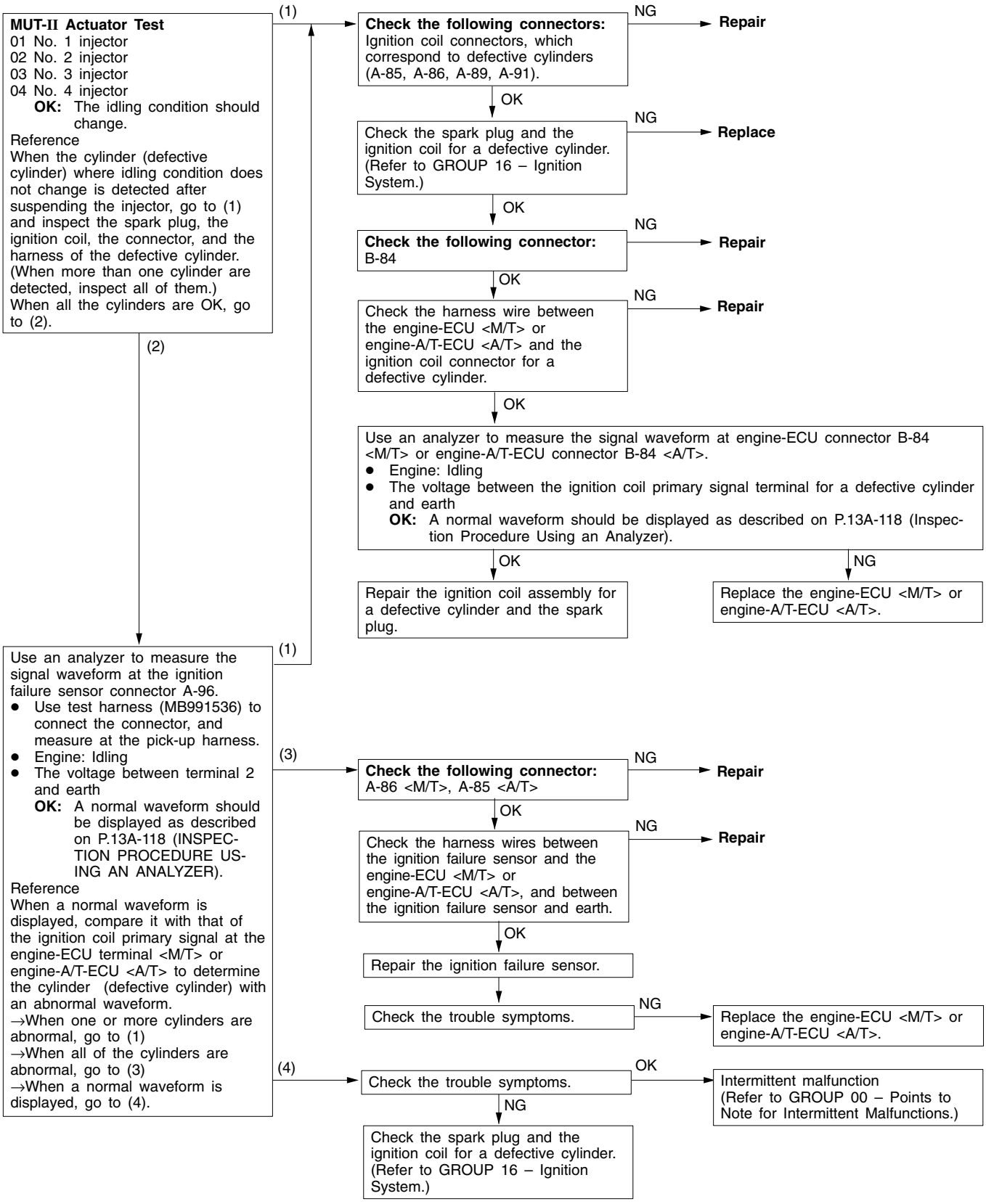


NOTE
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

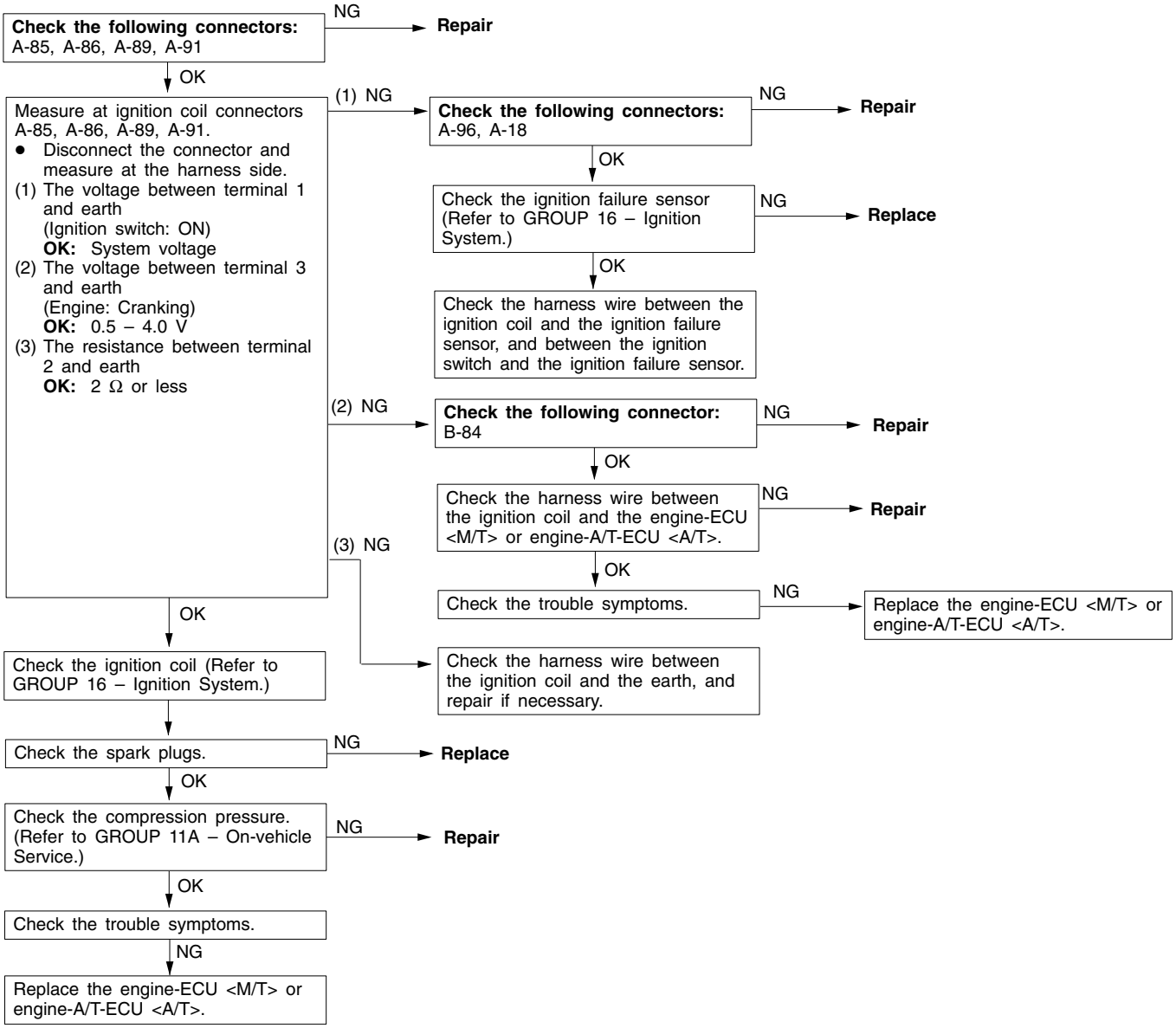


NOTE
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

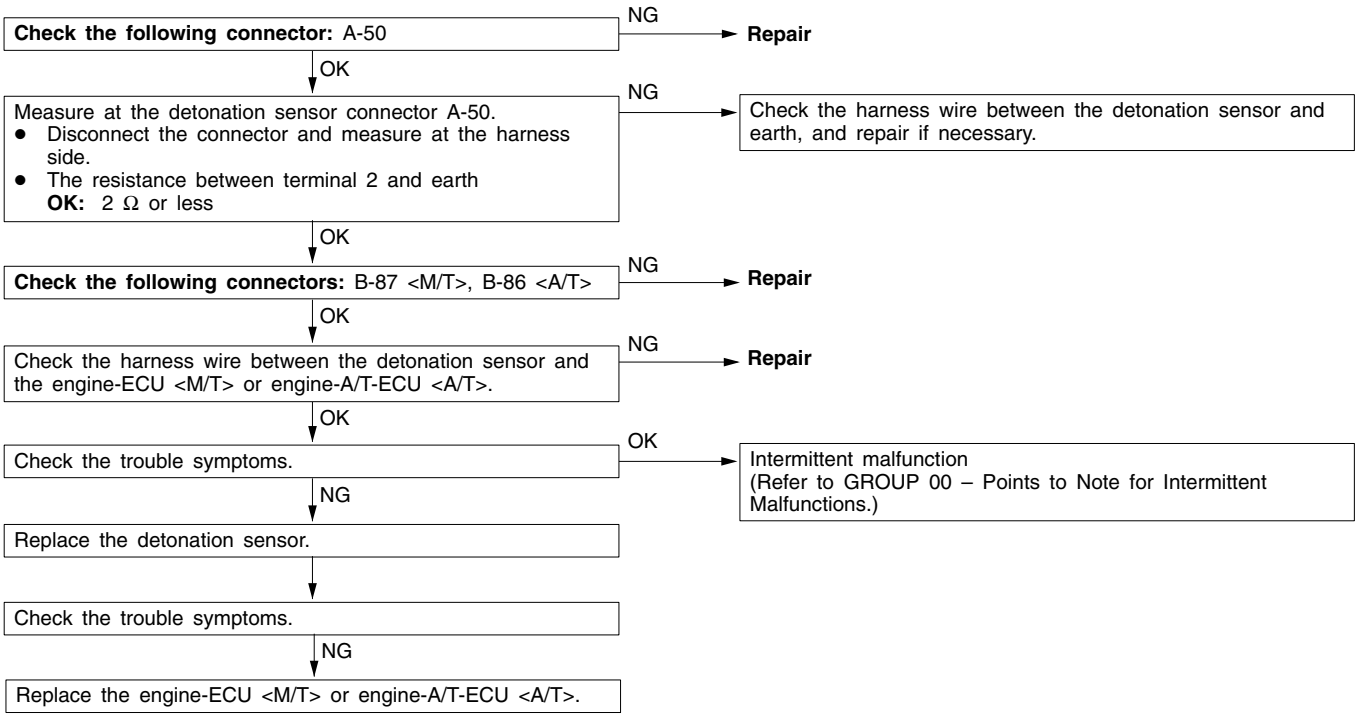
Code No. P0300 Ignition coil (power transistor) system	Probable cause
Range of Check ● Engine speed is approx. 50 – 4,000 r/min. ● Engine is not cranking. Set Conditions ● The ignition failure sensor does not send a signal about a certain cylinder for four seconds.	● Malfunction of the ignition coil ● Malfunction of the ignition failure sensor ● Malfunction of spark plug ● Open or short circuit in the primary ignition circuit or loose connector contact ● Malfunction of engine-ECU <M/T> ● Malfunction of engine-A/T-ECU <A/T>


MUT-II Actuator Test
01 No. 1 injector
02 No. 2 injector
03 No. 3 injector
04 No. 4 injector
OK: The idling condition should change.
Reference
When the cylinder (defective cylinder) where idling condition does not change is detected after suspending the injector, go to (1) and inspect the spark plug, the ignition coil, the connector, and the harness of the defective cylinder. (When more than one cylinder are detected, inspect all of them.)
When all the cylinders are OK, go to (2).
(1)
Check the following connectors: Ignition coil connectors, which correspond to defective cylinders (A-85, A-86, A-89, A-91).
NG
Repair
OK
Check the spark plug and the ignition coil for a defective cylinder. (Refer to GROUP 16 – Ignition System.)
NG
Replace
OK
Check the following connector: B-84
NG
Repair
OK
Check the harness wire between the engine-ECU <M/T> or engine-A/T-ECU <A/T> and the ignition coil connector for a defective cylinder.
NG
Repair
OK
Use an analyzer to measure the signal waveform at engine-ECU connector B-84 <M/T> or engine-A/T-ECU connector B-84 <A/T>.
Engine: Idling
The voltage between the ignition coil primary signal terminal for a defective cylinder and earth
OK: A normal waveform should be displayed as described on P.13A-118 (Inspection Procedure Using an Analyzer).
OK
NG
Repair the ignition coil assembly for a defective cylinder and the spark plug.
Replace the engine-ECU <M/T> or engine-A/T-ECU <A/T>.
(2)
Use an analyzer to measure the signal waveform at the ignition failure sensor connector A-96.
Use test harness (MB991536) to connect the connector, and measure at the pick-up harness.
Engine: Idling
The voltage between terminal 2 and earth
OK: A normal waveform should be displayed as described on P.13A-118 (INSPECTION PROCEDURE USING AN ANALYZER).
Reference
When a normal waveform is displayed, compare it with that of the ignition coil primary signal at the engine-ECU terminal <M/T> or engine-A/T-ECU <A/T> to determine the cylinder (defective cylinder) with an abnormal waveform.
→When one or more cylinders are abnormal, go to (1)
→When all of the cylinders are abnormal, go to (3)
→When a normal waveform is displayed, go to (4).
(1)
(3)
Check the following connector: A-86 <M/T>, A-85 <A/T>
NG
Repair
OK
Check the harness wires between the ignition failure sensor and the engine-ECU <M/T> or engine-A/T-ECU <A/T>, and between the ignition failure sensor and earth.
NG
Repair
OK
Repair the ignition failure sensor.
Check the trouble symptoms.
NG
Replace the engine-ECU <M/T> or engine-A/T-ECU <A/T>.
(4)
Check the trouble symptoms.
OK
Intermittent malfunction (Refer to GROUP 00 – Points to Note for Intermittent Malfunctions.)
NG
Check the spark plug and the ignition coil for a defective cylinder. (Refer to GROUP 16 – Ignition System.)

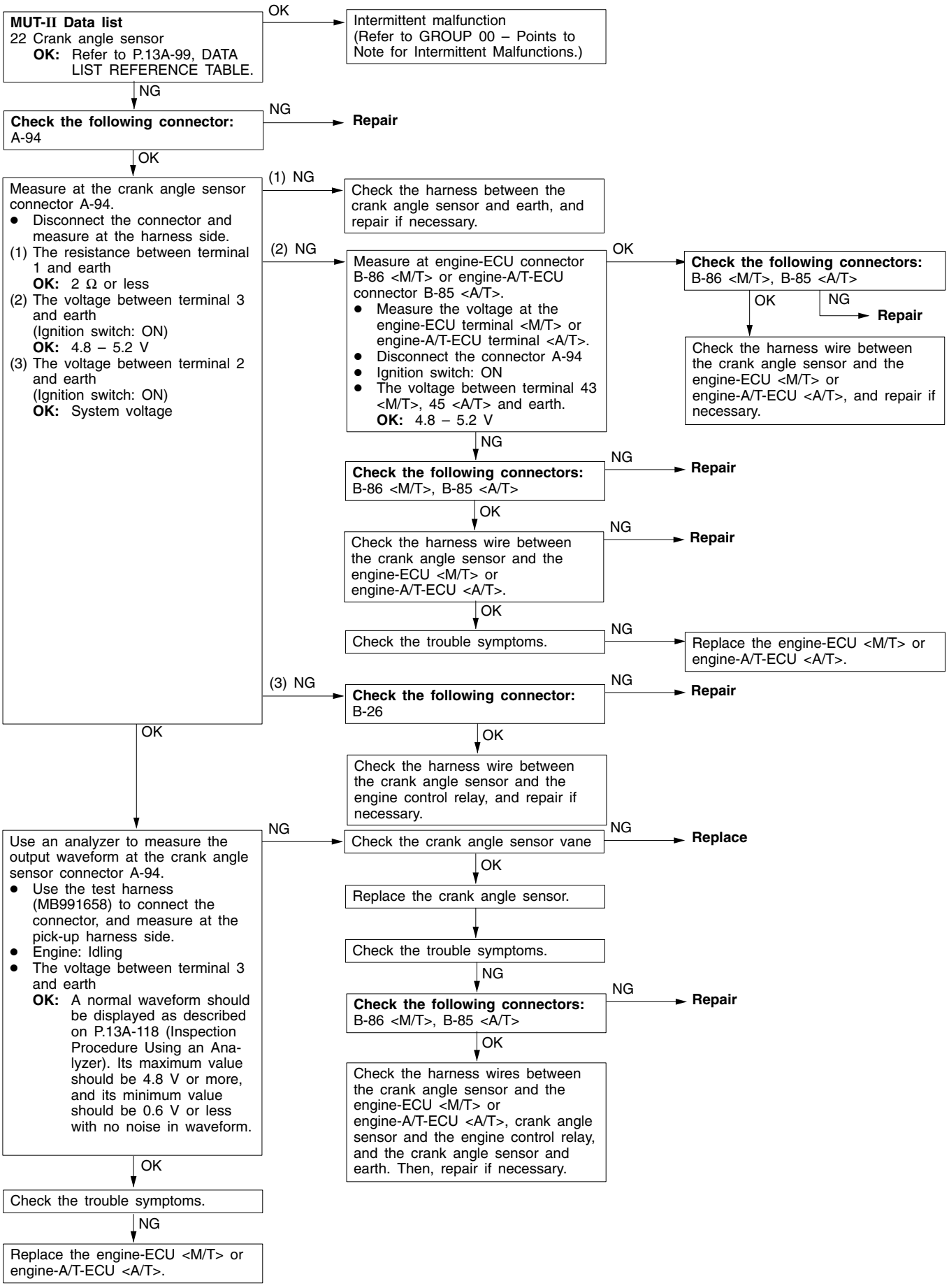
Code No. P0301 No. 1 cylinder misfire detected **Code No. P0302 No. 2 cylinder misfire detected** **Code No. P0303 No. 3 cylinder misfire detected** **Code No. P0304 No. 4 cylinder misfire detected**	**Probable cause**
Range of Check • The engine speed is 500 – 4,500 r/min. • While the engine is running except deceleration and sudden acceleration. Set Conditions • The number of misfires exceeds a predetermined number per 200 engine revolutions (Misfire has occurred in only one cylinder). or • The number of misfires exceeds a predetermined number per 100 engine revolutions (Misfire has occurred in only one cylinder).	• Malfunction of the ignition system • Abnormal compression • Malfunction of injector • Malfunction of engine-ECU <M/T> • Malfunction of engine-A/T-ECU <A/T>



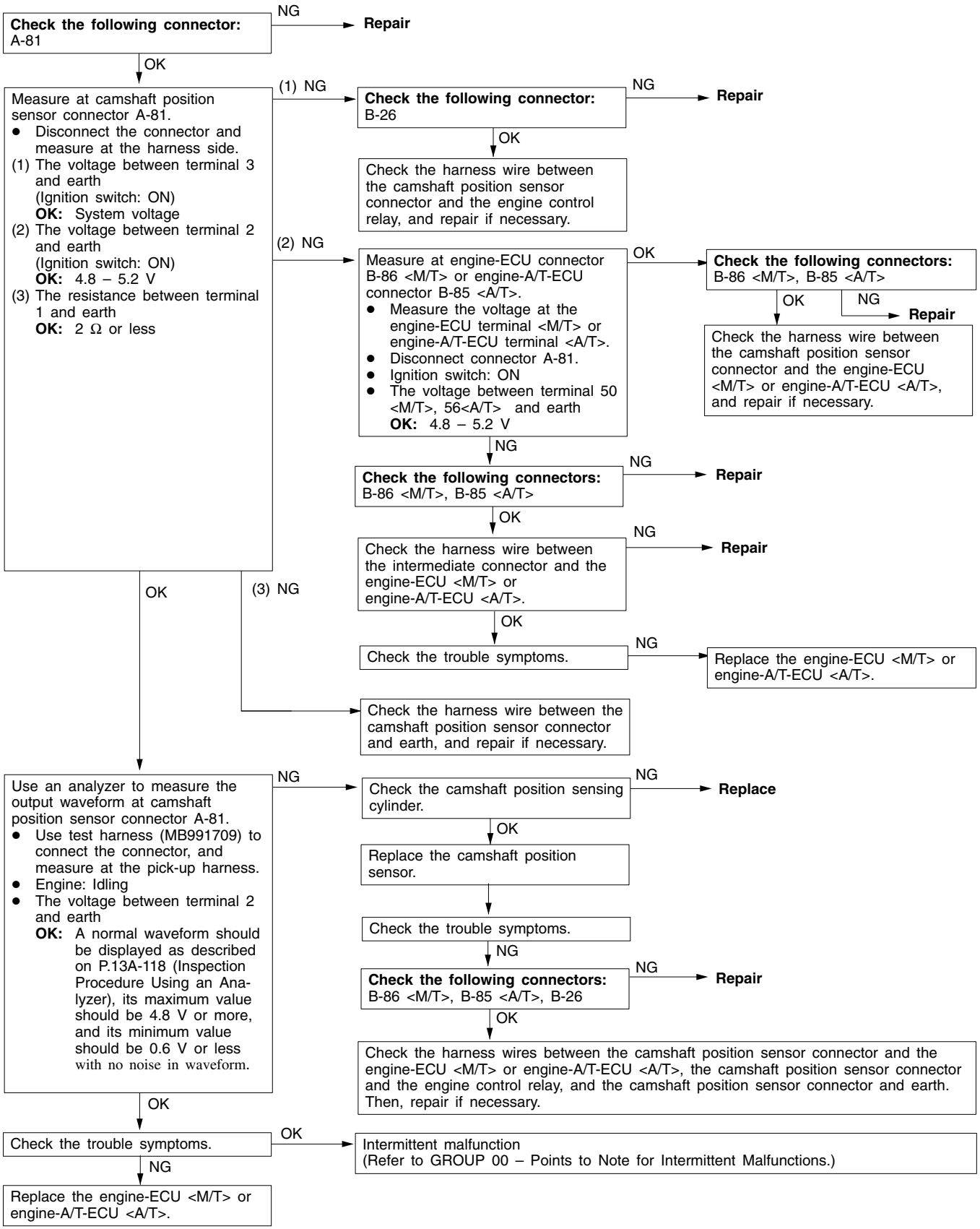
Code No. P0325 Detonation sensor system	Probable cause
Range of Check ● Engine: Two seconds after the engine has been started Set Conditions ● Changes in sensor output voltage (detonation sensor peak voltage per 1/3 crankshaft rotation) in 200 consecutive cycles are 0.08 V or less.	● Malfunction of the detonation sensor ● Open or short circuit in the detonation sensor circuit or loose connector contact ● Malfunction of engine-ECU <M/T> ● Malfunction of engine-A/T-ECU <A/T>



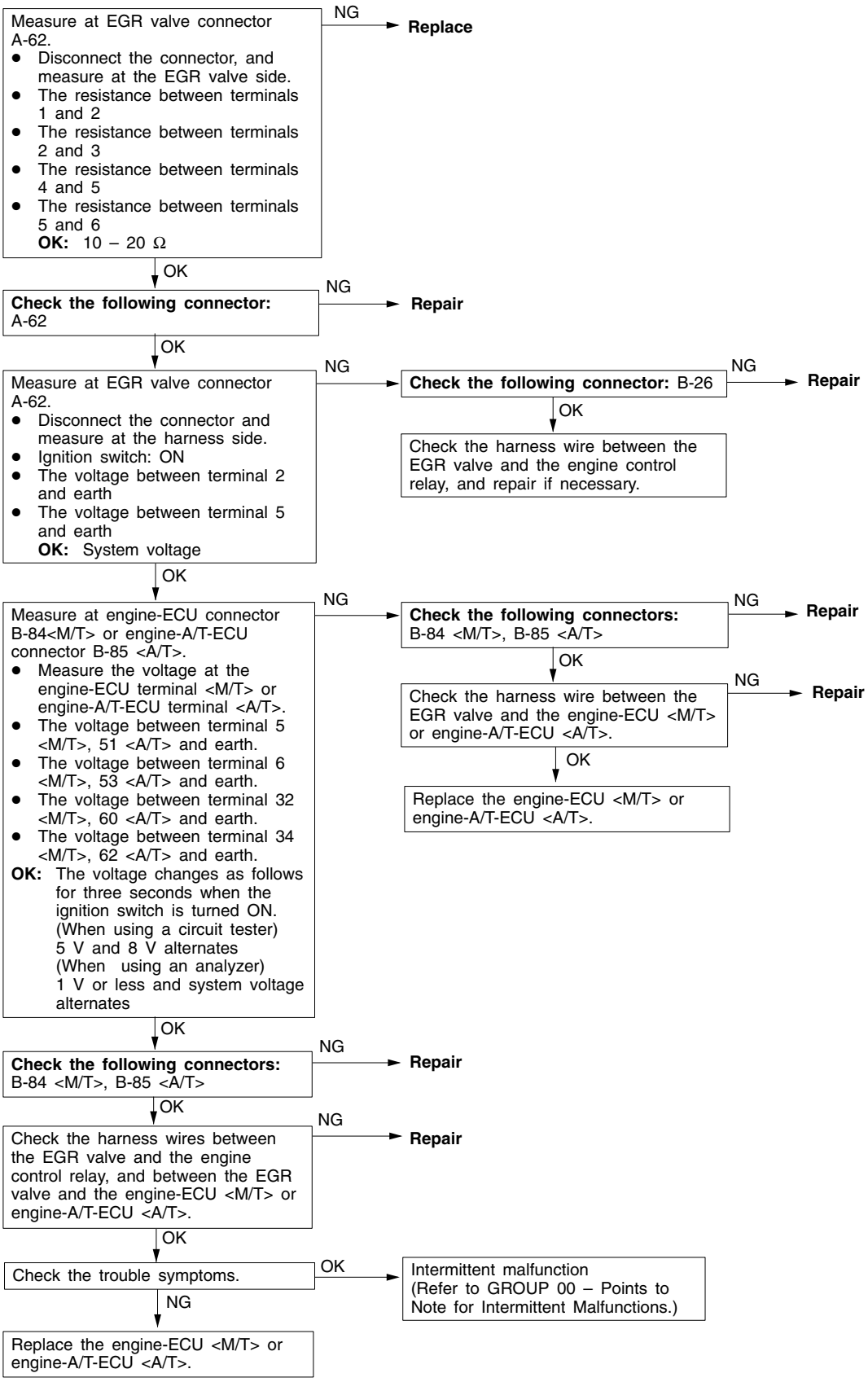
Code No. P0335 Crank angle sensor system	Probable cause
Range of Check ● Engine is cranking Set Conditions ● Sensor output voltage does not change for 4 seconds (no pulse signal input).	● Malfunction of the crank angle sensor. ● Open or short circuit in the crank angle sensor circuit or loose connector contact. ● Malfunction of engine-ECU <M/T> ● Malfunction of engine-A/T-ECU <A/T>


MUT-II Data list
22 Crank angle sensor
OK: Refer to P.13A-99, DATA LIST REFERENCE TABLE.
OK
Intermittent malfunction (Refer to GROUP 00 – Points to Note for Intermittent Malfunctions.)
NG
Check the following connector: A-94
NG
Repair
OK
Measure at the crank angle sensor connector A-94.
● Disconnect the connector and measure at the harness side.
(1) The resistance between terminal 1 and earth
OK: 2 Ω or less
(2) The voltage between terminal 3 and earth
(Ignition switch: ON)
OK: 4.8 – 5.2 V
(3) The voltage between terminal 2 and earth
(Ignition switch: ON)
OK: System voltage
(1) NG
Check the harness between the crank angle sensor and earth, and repair if necessary.
(2) NG
Measure at engine-ECU connector B-86 <M/T> or engine-A/T-ECU connector B-85 <A/T>.
● Measure the voltage at the engine-ECU terminal <M/T> or engine-A/T-ECU terminal <A/T>.
● Disconnect the connector A-94
● Ignition switch: ON
● The voltage between terminal 43 <M/T>, 45 <A/T> and earth.
OK: 4.8 – 5.2 V
OK
Check the following connectors: B-86 <M/T>, B-85 <A/T>
OK
NG
Repair
Check the harness wire between the crank angle sensor and the engine-ECU <M/T> or engine-A/T-ECU <A/T>, and repair if necessary.
NG
Check the following connectors: B-86 <M/T>, B-85 <A/T>
NG
Repair
OK
Check the harness wire between the crank angle sensor and the engine-ECU <M/T> or engine-A/T-ECU <A/T>.
NG
Repair
OK
Check the trouble symptoms.
NG
Replace the engine-ECU <M/T> or engine-A/T-ECU <A/T>.
(3) NG
Check the following connector: B-26
NG
Repair
OK
Check the harness wire between the crank angle sensor and the engine control relay, and repair if necessary.
OK
Use an analyzer to measure the output waveform at the crank angle sensor connector A-94.
● Use the test harness (MB991658) to connect the connector, and measure at the pick-up harness side.
● Engine: Idling
● The voltage between terminal 3 and earth
OK: A normal waveform should be displayed as described on P.13A-118 (Inspection Procedure Using an Analyzer). 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.
NG
Check the crank angle sensor vane
NG
Replace
OK
Replace the crank angle sensor.
Check the trouble symptoms.
NG
Check the following connectors: B-86 <M/T>, B-85 <A/T>
NG
Repair
OK
Check the harness wires between the crank angle sensor and the engine-ECU <M/T> or engine-A/T-ECU <A/T>, crank angle sensor and the engine control relay, and the crank angle sensor and earth. Then, repair if necessary.
OK
Check the trouble symptoms.
NG
Replace the engine-ECU <M/T> or engine-A/T-ECU <A/T>.

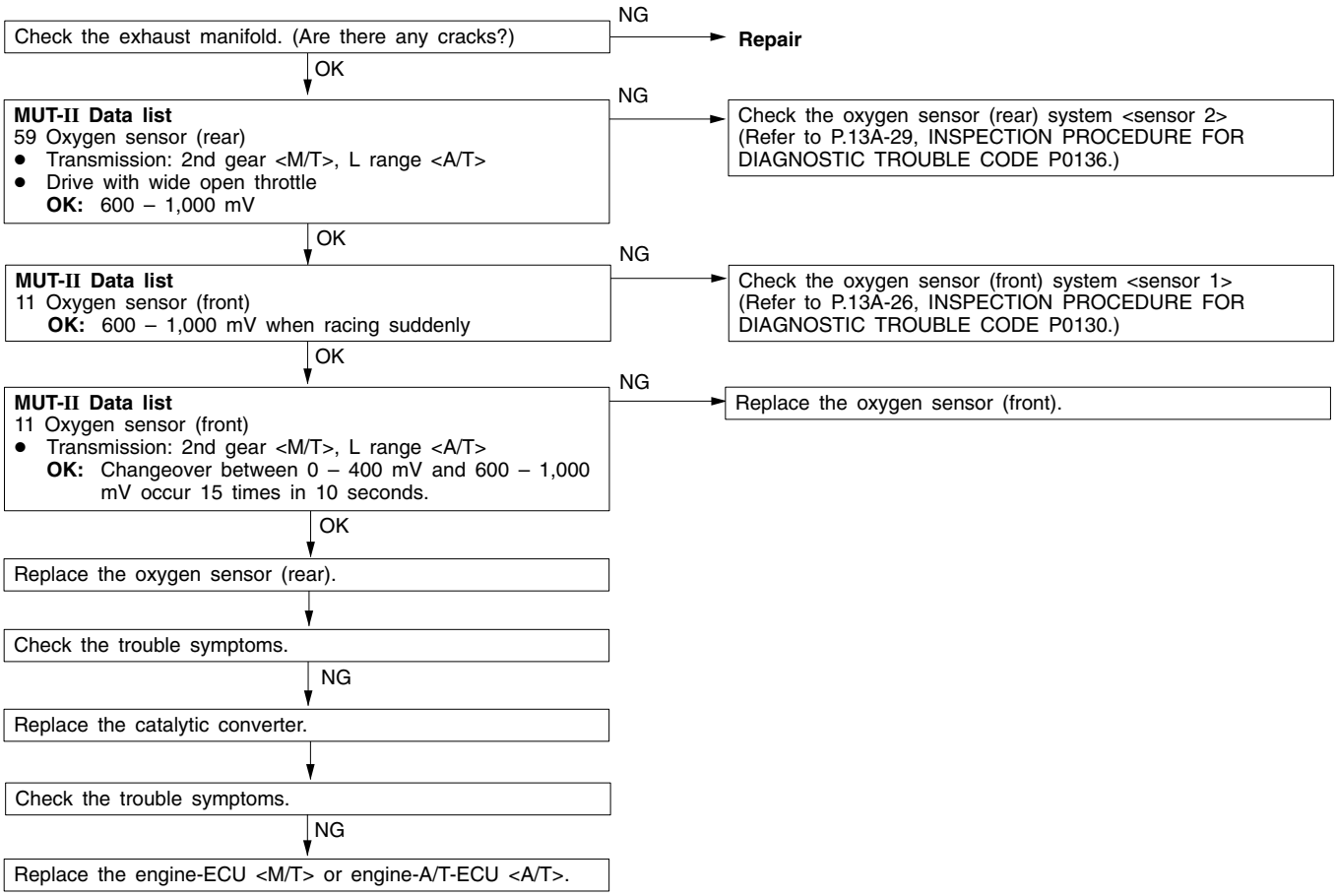
Code No. P0340 Camshaft position sensor system	Probable cause
Range of Check ● After the engine was started Set Conditions ● The sensor output voltage does not change for 4 seconds (no pulse signal input).	● Malfunction of the camshaft position sensor ● Open or short circuit in the camshaft position sensor circuit or loose connector contact. ● Malfunction of engine-ECU <M/T> ● Malfunction of engine-A/T-ECU <A/T>


Check the following connector: A-81
NG
Repair
OK
Measure at camshaft position sensor connector A-81.
● Disconnect the connector and measure at the harness side.
(1) The voltage between terminal 3 and earth (Ignition switch: ON)
OK: System voltage
(2) The voltage between terminal 2 and earth (Ignition switch: ON)
OK: 4.8 – 5.2 V
(3) The resistance between terminal 1 and earth
OK: 2 Ω or less
(1) NG
Check the following connector: B-26
NG
Repair
OK
Check the harness wire between the camshaft position sensor connector and the engine control relay, and repair if necessary.
(2) NG
Measure at engine-ECU connector B-86 <M/T> or engine-A/T-ECU connector B-85 <A/T>.
● Measure the voltage at the engine-ECU terminal <M/T> or engine-A/T-ECU terminal <A/T>.
● Disconnect connector A-81.
● Ignition switch: ON
● The voltage between terminal 50 <M/T>, 56<A/T> and earth
OK: 4.8 – 5.2 V
OK
Check the following connectors: B-86 <M/T>, B-85 <A/T>
OK
NG
Repair
Check the harness wire between the camshaft position sensor connector and the engine-ECU <M/T> or engine-A/T-ECU <A/T>, and repair if necessary.
NG
Check the following connectors: B-86 <M/T>, B-85 <A/T>
NG
Repair
OK
Check the harness wire between the intermediate connector and the engine-ECU <M/T> or engine-A/T-ECU <A/T>.
NG
Repair
OK
Check the trouble symptoms.
NG
Replace the engine-ECU <M/T> or engine-A/T-ECU <A/T>.
OK
(3) NG
Check the harness wire between the camshaft position sensor connector and earth, and repair if necessary.
Use an analyzer to measure the output waveform at camshaft position sensor connector A-81.
● Use test harness (MB991709) to connect the connector, and measure at the pick-up harness.
● Engine: Idling
● The voltage between terminal 2 and earth
OK: A normal waveform should be displayed as described on P.13A-118 (Inspection Procedure Using an Analyzer), 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.
NG
Check the camshaft position sensing cylinder.
NG
Replace
OK
Replace the camshaft position sensor.
Check the trouble symptoms.
NG
Check the following connectors: B-86 <M/T>, B-85 <A/T>, B-26
NG
Repair
OK
Check the harness wires between the camshaft position sensor connector and the engine-ECU <M/T> or engine-A/T-ECU <A/T>, the camshaft position sensor connector and the engine control relay, and the camshaft position sensor connector and earth. Then, repair if necessary.
OK
Check the trouble symptoms.
OK
Intermittent malfunction
(Refer to GROUP 00 – Points to Note for Intermittent Malfunctions.)
NG
Replace the engine-ECU <M/T> or engine-A/T-ECU <A/T>.

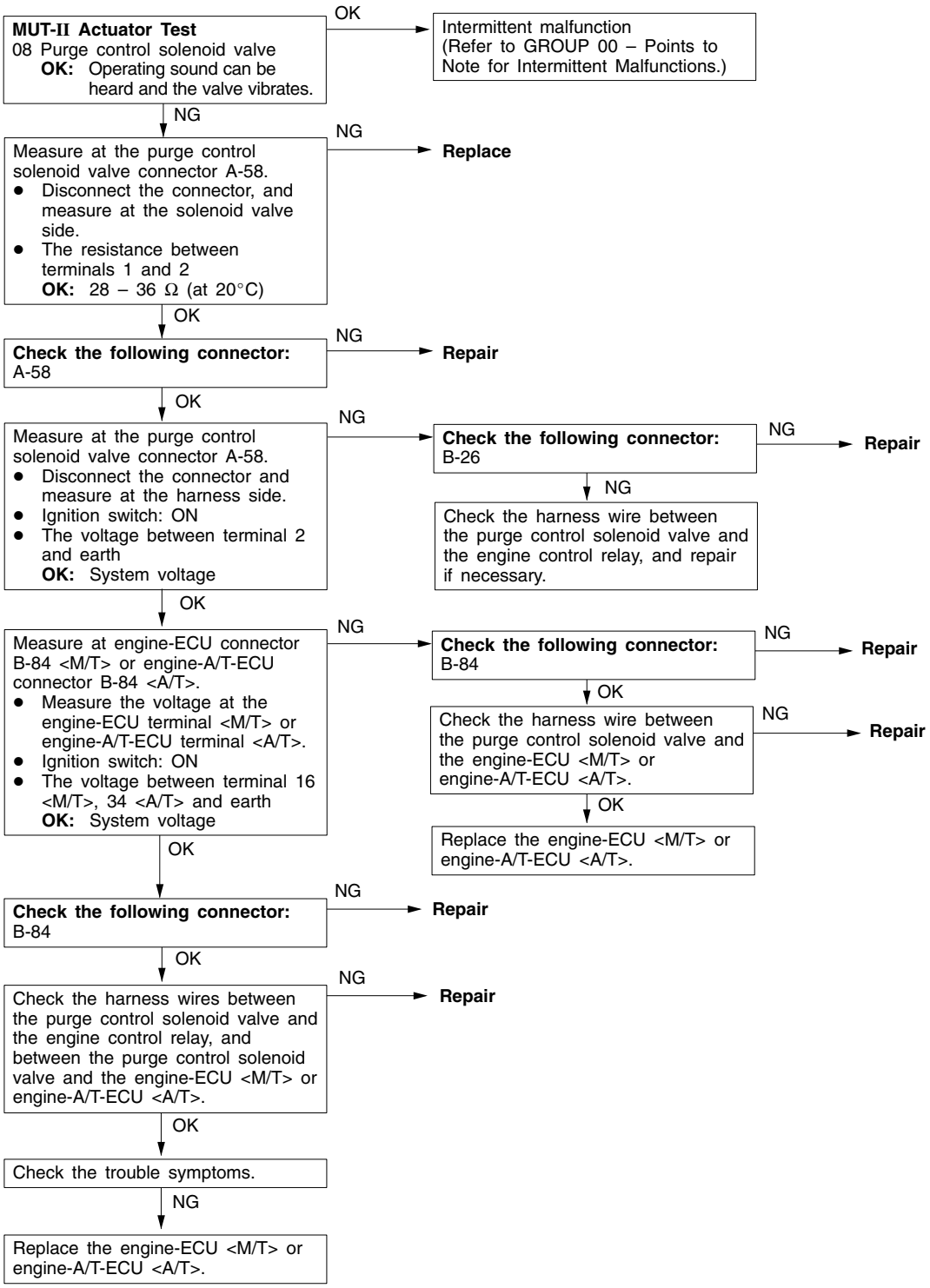
Code No. P0403 EGR valve system	Probable cause
Range of Check ● Ignition switch: OFF to ON ● EGR valve is in operation after the engine starting process is complete. Set Conditions ● Off–surge voltage is not generated from the motor coil while the EGR valve control motor is running.	● Malfunction of the EGR valve ● Open or short circuit in the EGR valve circuit or loose connector contact ● Malfunction of engine-ECU <M/T> ● Malfunction of engine-A/T-ECU <A/T>


Measure at EGR valve connector A-62.
• Disconnect the connector, and measure at the EGR valve side.
• The resistance between terminals 1 and 2
• The resistance between terminals 2 and 3
• The resistance between terminals 4 and 5
• The resistance between terminals 5 and 6
OK: 10 – 20 Ω
NG
Replace
OK
Check the following connector: A-62
NG
Repair
OK
Measure at EGR valve connector A-62.
• Disconnect the connector and measure at the harness side.
• Ignition switch: ON
• The voltage between terminal 2 and earth
• The voltage between terminal 5 and earth
OK: System voltage
NG
Check the following connector: B-26
NG
Repair
OK
Check the harness wire between the EGR valve and the engine control relay, and repair if necessary.
OK
Measure at engine-ECU connector B-84<M/T> or engine-A/T-ECU connector B-85 <A/T>.
• Measure the voltage at the engine-ECU terminal <M/T> or engine-A/T-ECU terminal <A/T>.
• The voltage between terminal 5 <M/T>, 51 <A/T> and earth.
• The voltage between terminal 6 <M/T>, 53 <A/T> and earth.
• The voltage between terminal 32 <M/T>, 60 <A/T> and earth.
• The voltage between terminal 34 <M/T>, 62 <A/T> and earth.
OK: The voltage changes as follows for three seconds when the ignition switch is turned ON.
(When using a circuit tester)
5 V and 8 V alternates
(When using an analyzer)
1 V or less and system voltage alternates
NG
Check the following connectors: B-84 <M/T>, B-85 <A/T>
NG
Repair
OK
Check the harness wire between the EGR valve and the engine-ECU <M/T> or engine-A/T-ECU <A/T>.
NG
Repair
OK
Replace the engine-ECU <M/T> or engine-A/T-ECU <A/T>.
OK
Check the following connectors: B-84 <M/T>, B-85 <A/T>
NG
Repair
OK
Check the harness wires between the EGR valve and the engine control relay, and between the EGR valve and the engine-ECU <M/T> or engine-A/T-ECU <A/T>.
NG
Repair
OK
Check the trouble symptoms.
OK
Intermittent malfunction
(Refer to GROUP 00 – Points to Note for Intermittent Malfunctions.)
NG
Replace the engine-ECU <M/T> or engine-A/T-ECU <A/T>.

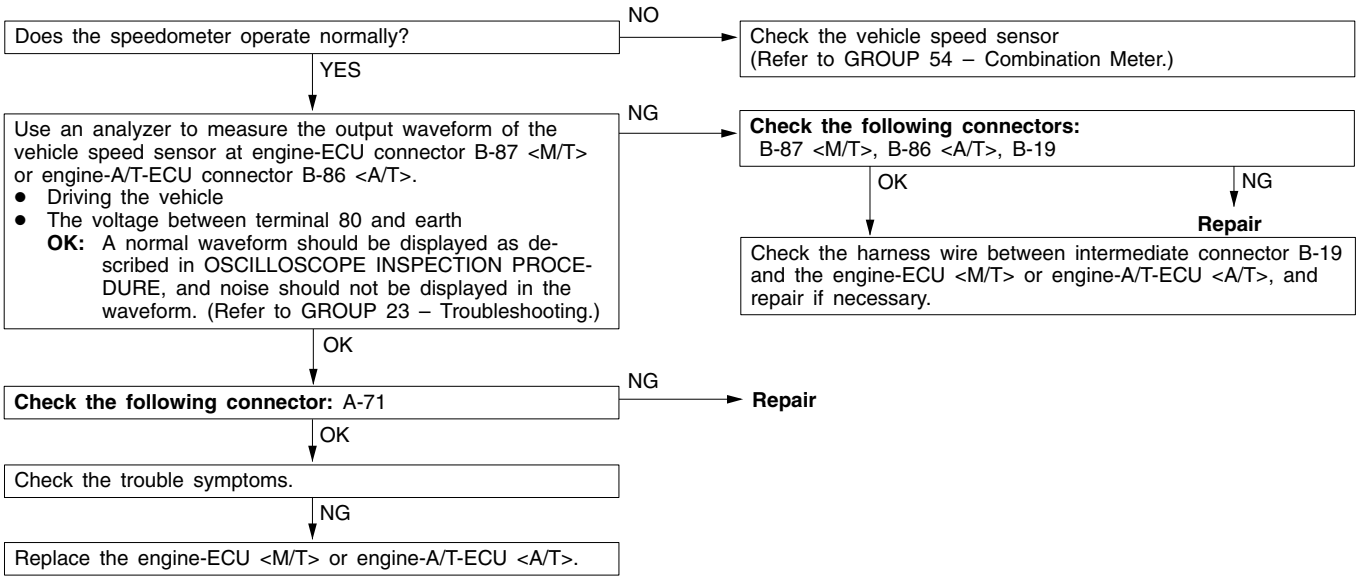
Code No. P0420 Catalyst malfunction	Probable cause
Range of Check ● The engine speed is 3,000 r/min or less. ● During driving ● During air/fuel ratio feedback control Set Conditions ● The ratio between the oxygen sensor (rear) and the oxygen sensor (front) output frequencies reaches 0.8 per 12 seconds on average.	● Malfunction of catalyst ● Malfunction of the oxygen sensor (front) ● Malfunction of the oxygen sensor (rear) ● Malfunction of engine-ECU <M/T> ● Malfunction of engine-A/T-ECU <A/T>



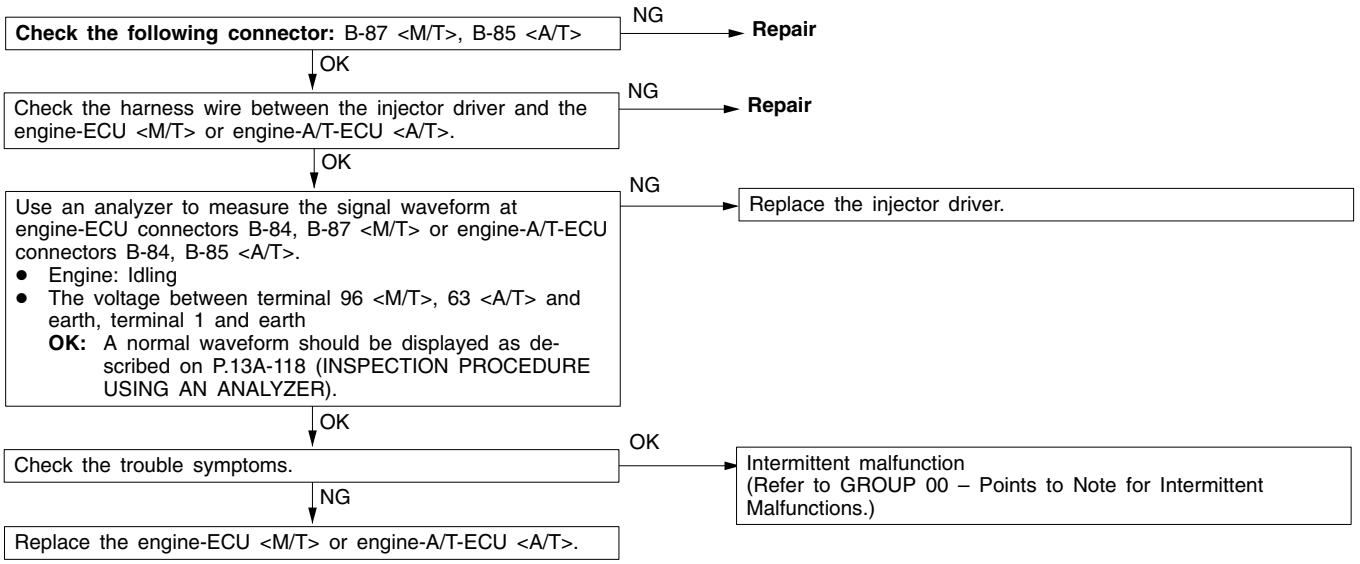
Code No. P0443 Purge control solenoid valve system	Probable cause
Range of Check • Ignition switch: ON • Battery voltage is 10 V or more. Set Conditions • The solenoid coil surge voltage (battery voltage + 2 V) is not detected when the purge control solenoid valve is turned from on to off.	• Malfunction of the purge control solenoid valve • Open or short circuit in the purge control solenoid valve circuit or loose connector contact • Malfunction of engine-ECU <M/T> • Malfunction of engine-A/T-ECU <A/T>



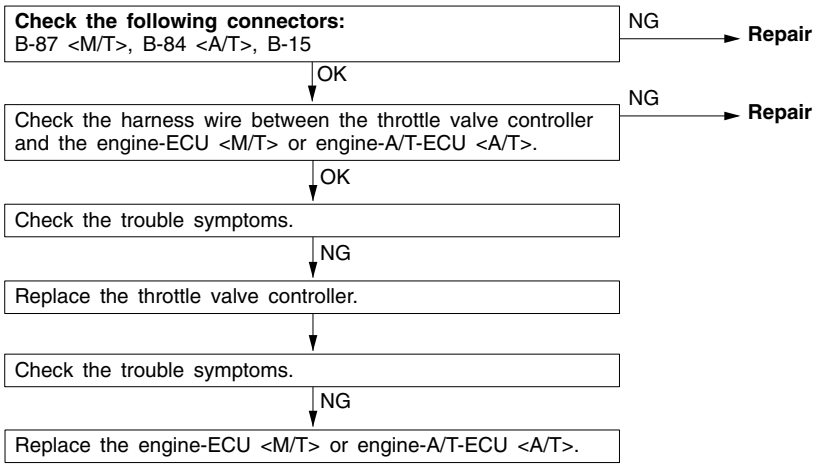
Code No. P0500 Vehicle speed sensor system	Probable cause
Range of Check • Engine: Two seconds after the engine was started • Idle switch: OFF • Engine speed: 2,500 r/min or more • During high engine load Set Conditions • The sensor output voltage does not change for 4 seconds (no pulse signal input).	• Malfunction of the vehicle speed sensor • Open or short circuit in the vehicle speed sensor circuit or loose connector contact • Malfunction of engine-ECU <M/T> • Malfunction of engine-A/T-ECU <A/T>



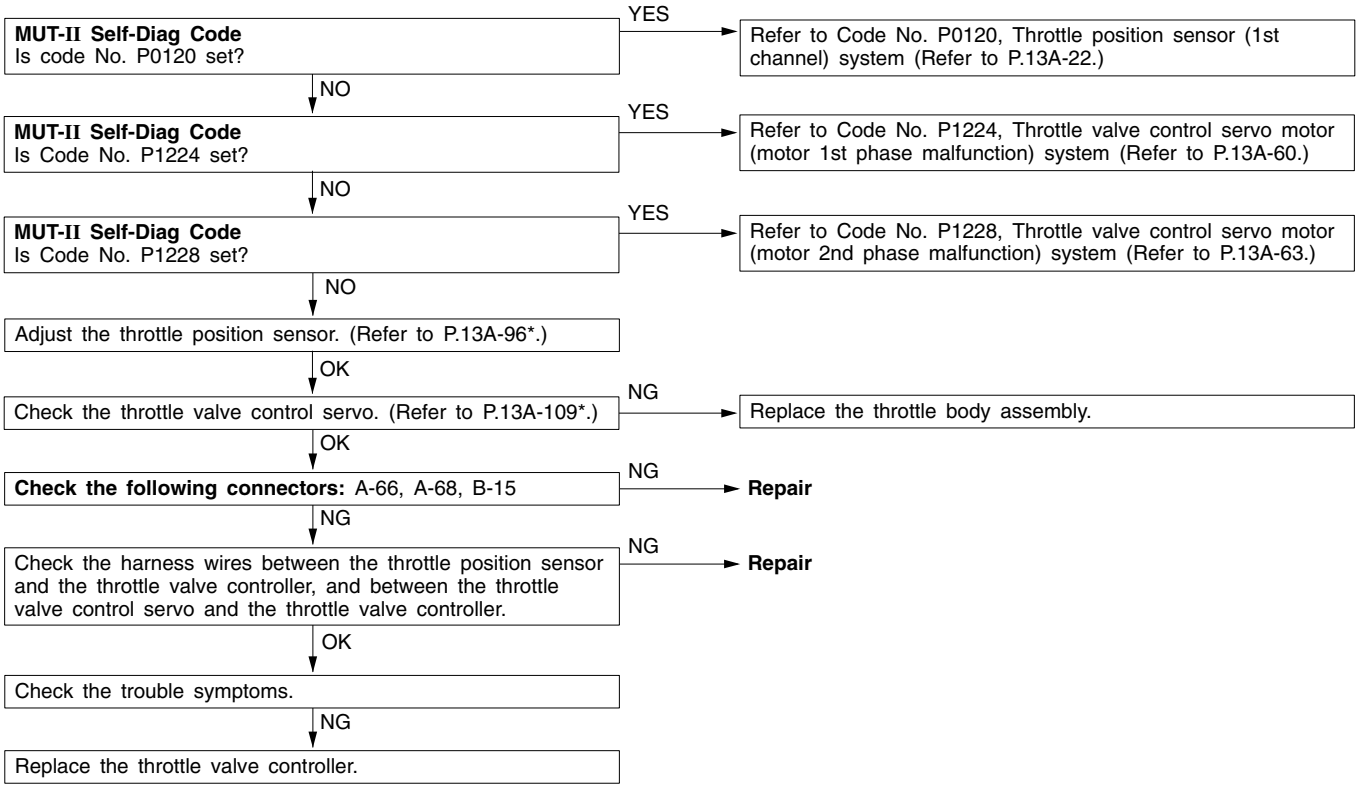
Code No. P1200 Injector driver system	Probable cause
Range of Check • Engine speed: 4,000 r/m or less • Battery voltage: 10 V or more • The fuel cut operation and the injector operation (by carrying out the Actuator test) are not in progress. • During high engine load Set Conditions • Injector open circuit check signal is not output from the injector driver.	• Malfunction of the injector driver • Open or short circuit, or loose connector contact • Malfunction of engine-ECU <M/T> • Malfunction of engine-A/T-ECU <A/T>



Code No. P1220 Electronic-controlled throttle valve system	Probable cause
Range of Check • Ignition switch: ON • Error in communication between the engine-ECU <M/T> or engine-A/T-ECU <A/T> and the throttle valve controller Set Conditions • Output voltage of throttle position sensor (2nd channel) fluctuates significantly (approx. 1 V or more) from an expected value, based on that of the accelerator pedal position sensor (2nd channel). Range of Check • Ignition switch: ON • Error in communication between the throttle valve controller and the engine-ECU <M/T> or engine-A/T-ECU <A/T> Set Conditions • The output voltage of the throttle position sensor (2nd channel) is significantly different (approx. 1 V) from the throttle valve opening angle (voltage), which the engine-ECU <M/T> or engine-A/T-ECU <A/T> request the throttle valve controller.	• Short in communication line • Malfunction of the engine-ECU <M/T> • Malfunction of the engine-A/T-ECU <A/T> • Malfunction of the throttle valve controller

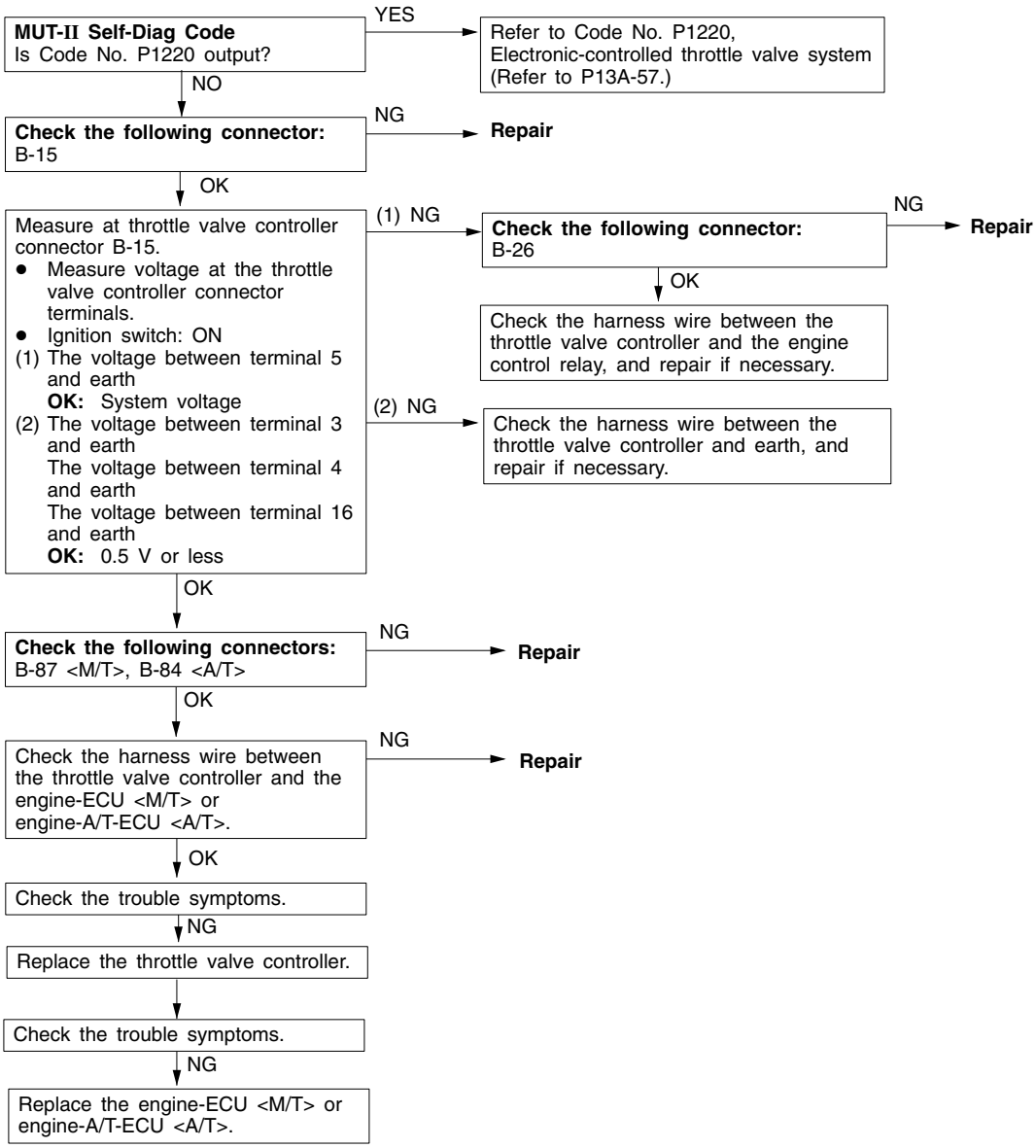


Code No. P1221 Throttle valve position feedback system	Probable cause
The throttle valve controller judges a malfunction, and then transmit the result to the engine-ECU <M/T> or engine-A/T-ECU <A/T>. Range of Check • Ignition switch: ON • Battery voltage: 10 V or more Set Conditions • Failure in the motor position feedback (The engine-ECU <M/T> or engine-A/T-ECU <A/T> detects that the current in the motor is excessive and the opening angle difference between the target value of throttle position sensor (1st channel) and the actual value of throttle position sensor (1st channel) is 1.0 V or more)	• Malfunction of throttle position sensor (1st channel) • Open or short circuit in the throttle position sensor (1st channel) circuit or loose connector contact • Malfunction of the throttle valve controller

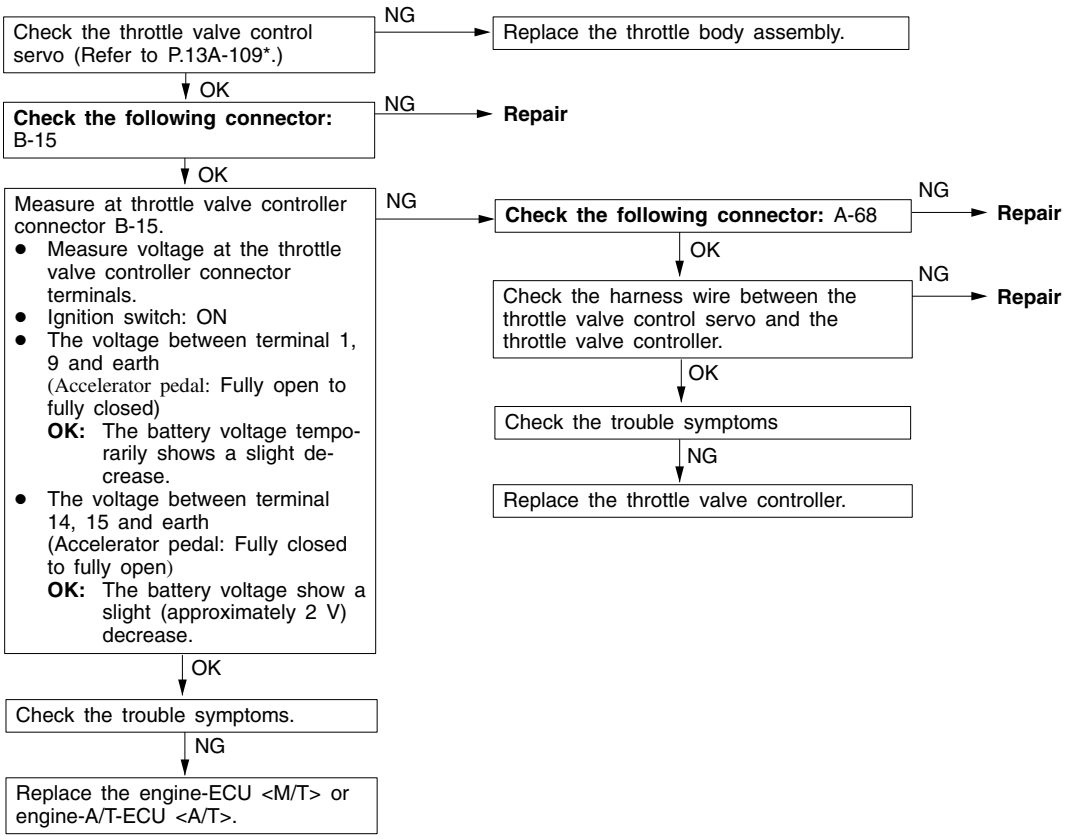


NOTE
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

Code No. P1223 Communication line system with the throttle valve controller	Probable cause
Range of Check • Ignition switch: ON • Battery voltage: 8 V or more. • Engine: Not cranking Set Conditions • System detects an error in communication line between the engine-ECU <M/T> or engine-A/T-ECU <A/T> and the throttle valve controller, and between the throttle valve controller and the engine-ECU <M/T> or engine-A/T-ECU <A/T>.	• Short in communication line • Malfunction of engine-ECU <M/T> • Malfunction of engine-A/T-ECU <A/T> • Malfunction of throttle valve controller

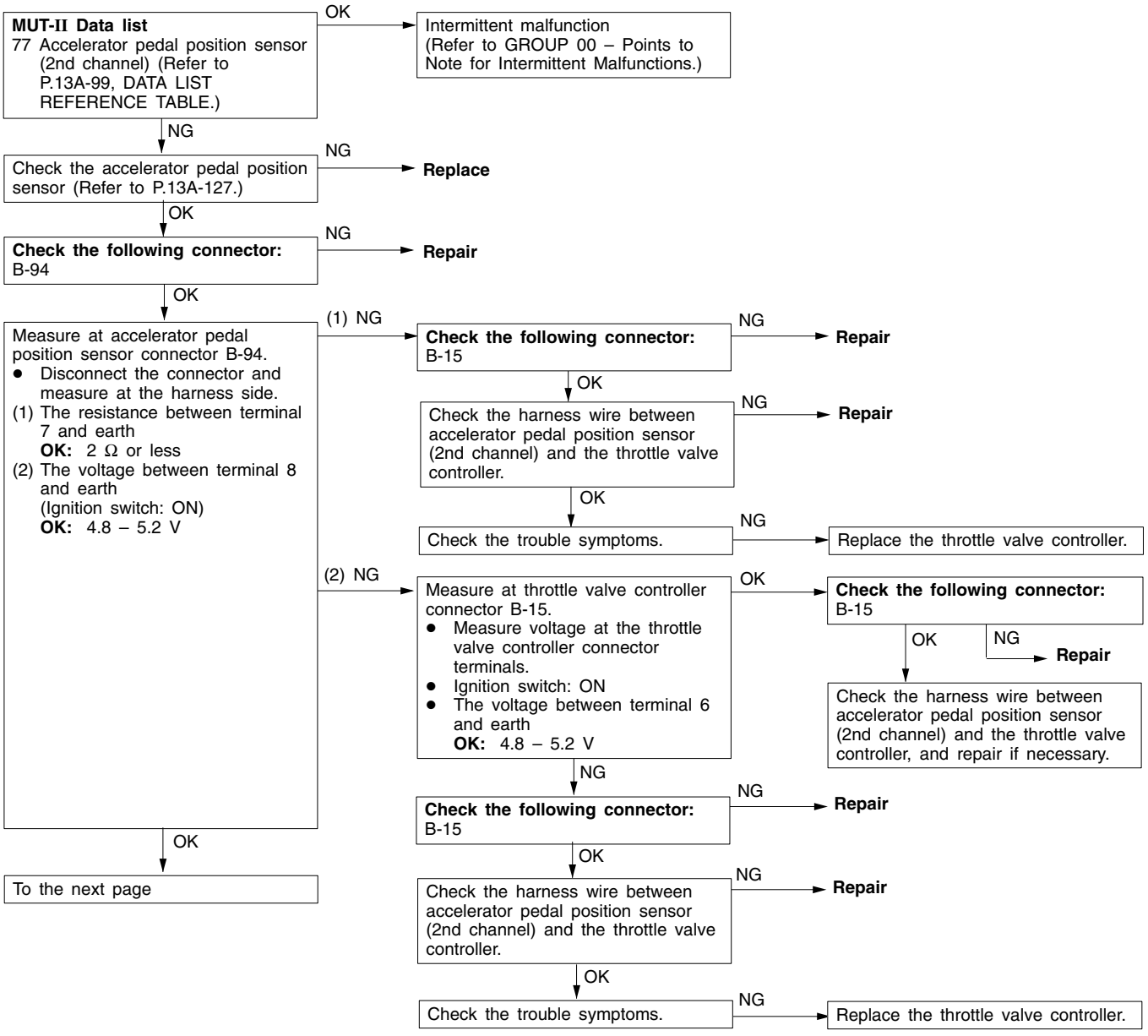


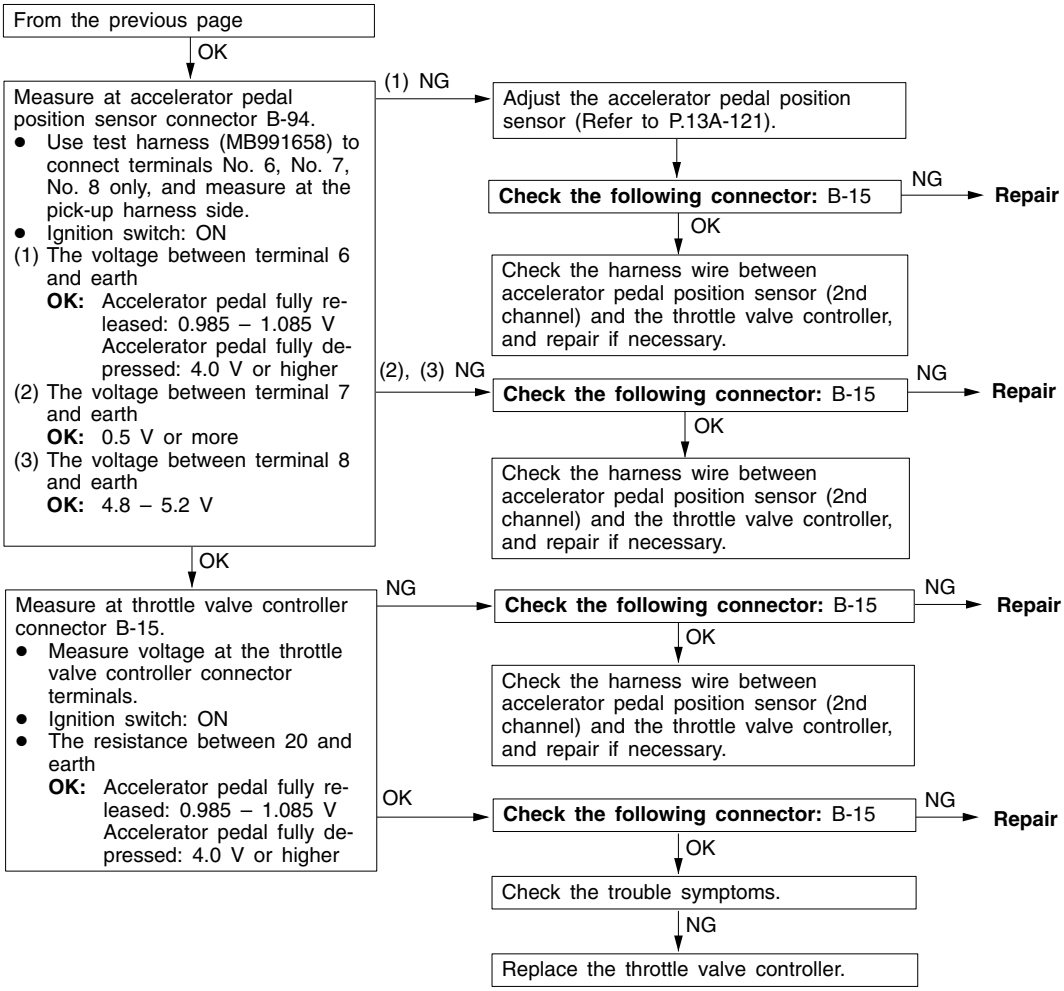
Code No. P1224 Throttle valve control servo motor (Motor 1st phase malfunction) system	Probable cause
Range of Check ● Throttle valve control servo relay: ON ● System voltage: 8 V or more. Set Conditions ● Throttle valve control servo drive circuit is shorted to earth. ● Other power source interferences with throttle valve control servo drive circuit. ● Throttle valve control servo drive circuit is open circuit.	● Malfunction of the throttle valve control servo ● Open circuit or short-circuited harness wire in throttle valve control servo system, or poor connector contact ● Malfunction of the throttle valve controller



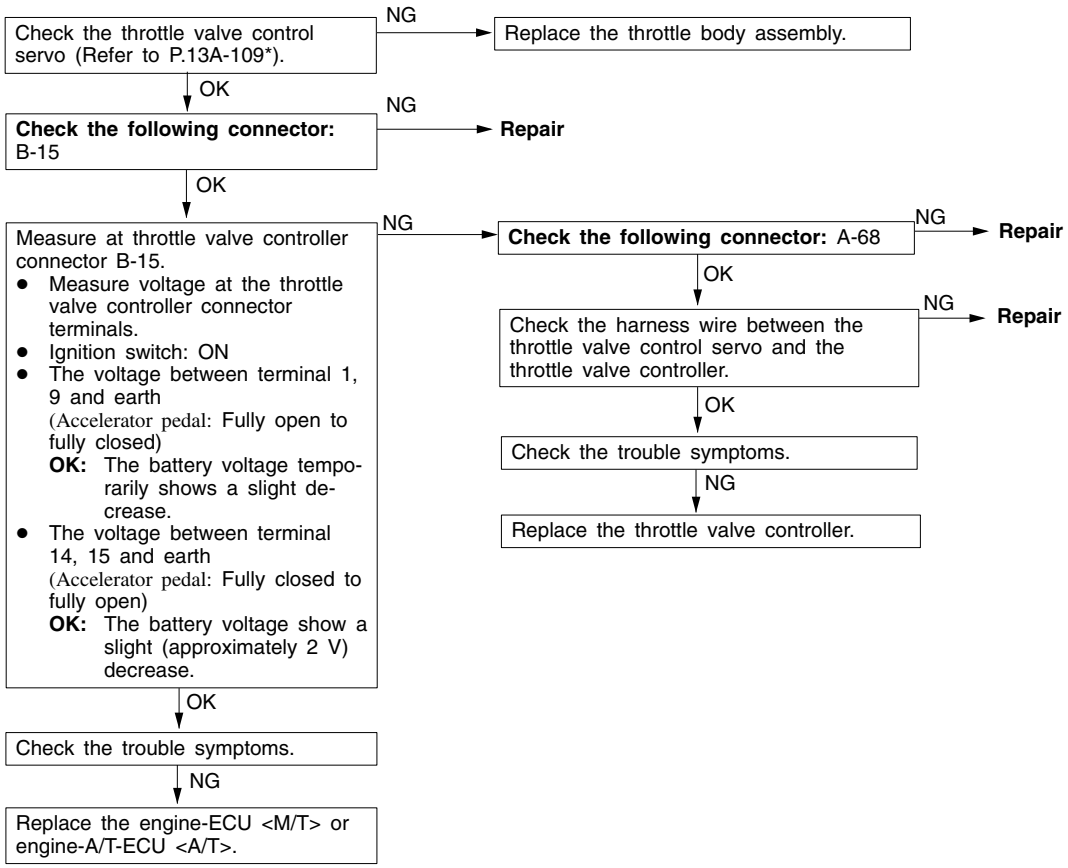
NOTE
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

Code No. P1225 Accelerator pedal position sensor (2nd channel) system	Probable cause
Range of Check • Accelerator pedal position sensor (2nd channel) is normal. • Communication between the engine-ECU <M/T> or engine-A/T-ECU <A/T> and the throttle valve controller is normal. Set Conditions • Output voltage of the accelerator pedal position sensor (2nd channel) is 0.2 V or less for one second or • Output voltage of the accelerator pedal position sensor (1st channel) is 2.5 V or less, and output voltage of the accelerator pedal position sensor (2nd channel) is 4.5 V or more for one second. or • Difference between the accelerator pedal position sensor (1st and 2nd channels) output voltages exceeds 1.0 V (i.e. when the throttle valve opening angle changes slightly).	• Malfunction of accelerator pedal position sensor (2nd channel) • Open or short circuit in accelerator pedal position sensor (2nd channel) circuit or loose connector contact • Malfunction of the throttle valve controller • Malfunction of engine-ECU <M/T> • Malfunction of engine-A/T-ECU <A/T>



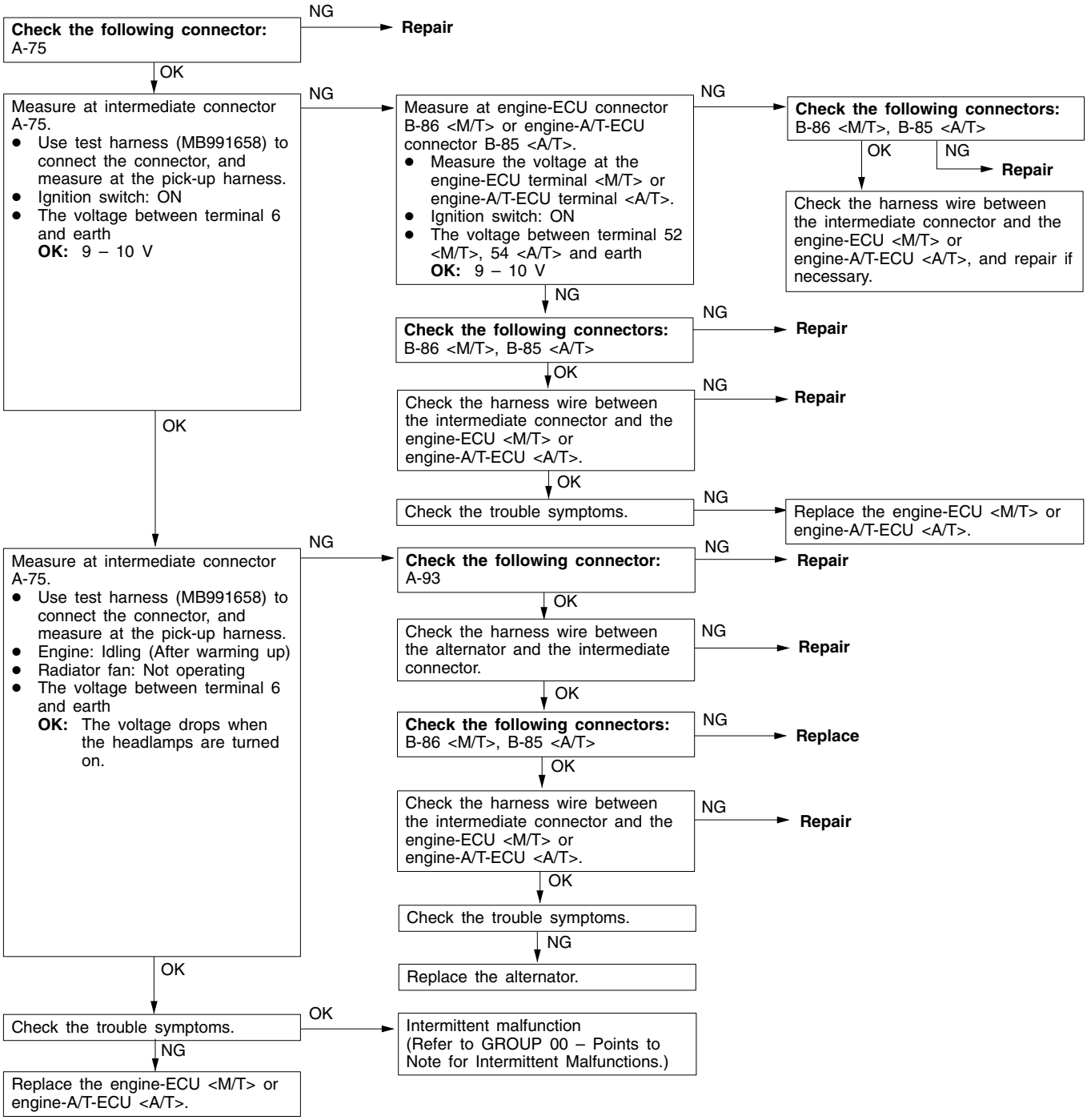

From the previous page
OK
Measure at accelerator pedal position sensor connector B-94.
● Use test harness (MB991658) to connect terminals No. 6, No. 7, No. 8 only, and measure at the pick-up harness side.
● Ignition switch: ON
(1) The voltage between terminal 6 and earth
OK: Accelerator pedal fully released: 0.985 – 1.085 V
Accelerator pedal fully depressed: 4.0 V or higher
(2) The voltage between terminal 7 and earth
OK: 0.5 V or more
(3) The voltage between terminal 8 and earth
OK: 4.8 – 5.2 V
(1) NG
Adjust the accelerator pedal position sensor (Refer to P.13A-121).
Check the following connector: B-15
NG
Repair
OK
Check the harness wire between accelerator pedal position sensor (2nd channel) and the throttle valve controller, and repair if necessary.
(2), (3) NG
Check the following connector: B-15
NG
Repair
OK
Check the harness wire between accelerator pedal position sensor (2nd channel) and the throttle valve controller, and repair if necessary.
OK
Measure at throttle valve controller connector B-15.
● Measure voltage at the throttle valve controller connector terminals.
● Ignition switch: ON
● The resistance between 20 and earth
OK: Accelerator pedal fully released: 0.985 – 1.085 V
Accelerator pedal fully depressed: 4.0 V or higher
NG
Check the following connector: B-15
NG
Repair
OK
Check the harness wire between accelerator pedal position sensor (2nd channel) and the throttle valve controller, and repair if necessary.
OK
Check the following connector: B-15
NG
Repair
OK
Check the trouble symptoms.
NG
Replace the throttle valve controller.

Code No. P1228 Throttle valve control servo motor (Motor 2nd phase malfunction) system	Probable cause
Range of Check ● Throttle valve control servo relay: ON ● System voltage: 8 V or more Set Conditions ● Throttle valve control servo drive circuit is shorted to earth. ● Other power source interferes with throttle valve control servo drive circuit. ● Throttle valve control servo drive circuit is open-circuit.	● Malfunction of the throttle valve control servo ● Open circuit or short-circuited harness wire in throttle valve control servo system, or poor connector contact ● Malfunction of the throttle valve controller

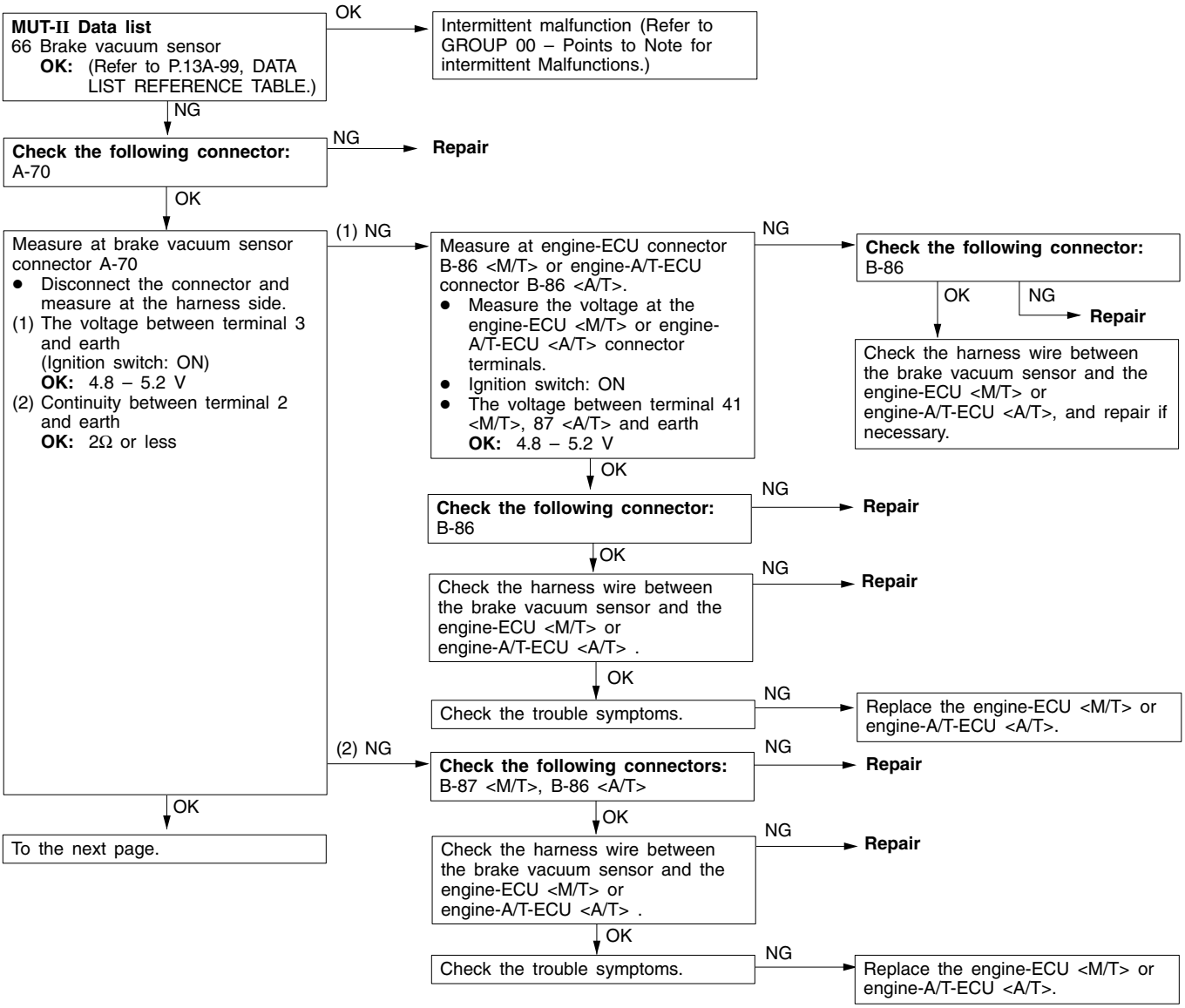


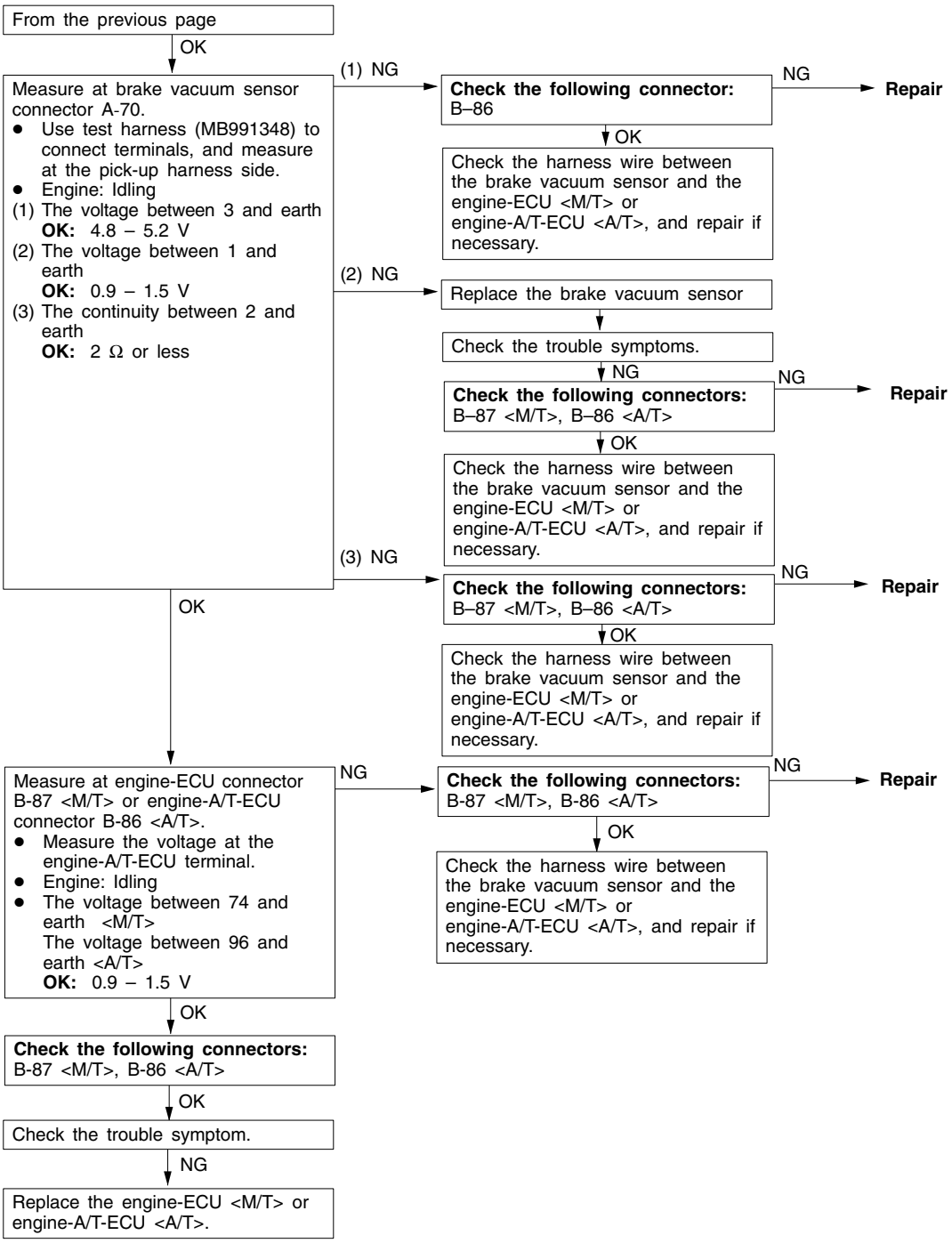
NOTE
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

Code No. P1500 Alternator FR terminal system	Probable cause
Range of Check • Engine speed: 50 r/min or more Set Conditions • Input voltage from the alternator FR terminal is system voltage for 20 seconds.	• Open circuit in alternator FR terminal circuit • Malfunction of engine-ECU <M/T> • Malfunction of engine-A/T-ECU <A/T>



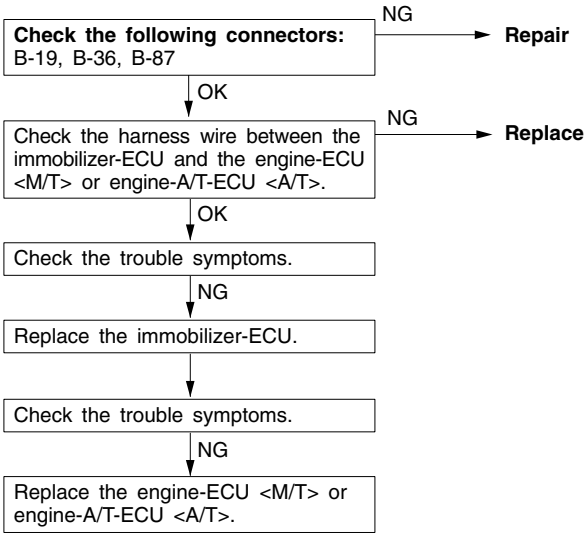
Code No. P1515 Brake vacuum sensor system	Probable cause
Range of Check • Ignition switch: ON Set Conditions • Sensor output voltage is 4.8 V or more. or • Sensor output voltage is 0.2 V or less.	• Malfunction of the brake vacuum sensor • Improper connector contact, open circuit or short-circuited harness wire of the brake vacuum sensor • Malfunction of the engine-ECU <M/T> • Malfunction of the engine-A/T-ECU <A/T>




From the previous page
OK
Measure at brake vacuum sensor connector A-70.
• Use test harness (MB991348) to connect terminals, and measure at the pick-up harness side.
• Engine: Idling
(1) The voltage between 3 and earth
OK: 4.8 – 5.2 V
(2) The voltage between 1 and earth
OK: 0.9 – 1.5 V
(3) The continuity between 2 and earth
OK: 2 Ω or less
(1) NG
Check the following connector: B–86
NG
Repair
OK
Check the harness wire between the brake vacuum sensor and the engine-ECU <M/T> or engine-A/T-ECU <A/T>, and repair if necessary.
(2) NG
Replace the brake vacuum sensor
Check the trouble symptoms.
NG
Check the following connectors: B–87 <M/T>, B–86 <A/T>
NG
Repair
OK
Check the harness wire between the brake vacuum sensor and the engine-ECU <M/T> or engine-A/T-ECU <A/T>, and repair if necessary.
(3) NG
Check the following connectors: B–87 <M/T>, B–86 <A/T>
NG
Repair
OK
Check the harness wire between the brake vacuum sensor and the engine-ECU <M/T> or engine-A/T-ECU <A/T>, and repair if necessary.
OK
Measure at engine-ECU connector B-87 <M/T> or engine-A/T-ECU connector B-86 <A/T>.
• Measure the voltage at the engine-A/T-ECU terminal.
• Engine: Idling
• The voltage between 74 and earth <M/T>
The voltage between 96 and earth <A/T>
OK: 0.9 – 1.5 V
NG
Check the following connectors: B-87 <M/T>, B-86 <A/T>
NG
Repair
OK
Check the harness wire between the brake vacuum sensor and the engine-ECU <M/T> or engine-A/T-ECU <A/T>, and repair if necessary.
OK
Check the following connectors: B-87 <M/T>, B-86 <A/T>
OK
Check the trouble symptom.
NG
Replace the engine-ECU <M/T> or engine-A/T-ECU <A/T>.

Cord No. P1610 Immobilizer system	Probable cause
Range of Check • Ignition switch: ON Set Conditions • Improper communication between the engine-ECU <M/T> or engine-A/T-ECU <A/T> and the immobilizer-ECU	• Open or short circuit, or loose connector contact • Malfunction of the immobilizer-ECU • Malfunction of the engine-ECU <M/T> • Malfunction of the engine-A/T-ECU <A/T>

NOTE
(1) If the registered ignition keys are close each other when starting the engine, radio interference may cause this code to be displayed.
(2) This code may be displayed when registering the key ID code.



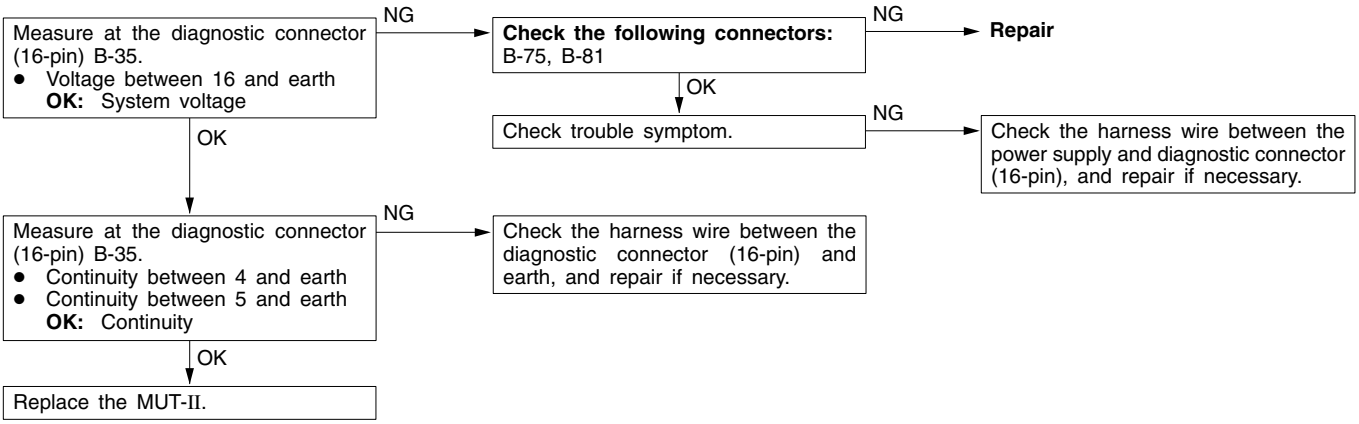
INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom		Inspection procedure No.	Reference page
Communication with MUT-II is impossible.	Communication with all systems is not possible.	1	13A-69
	Communication with engine-ECU only is not possible.	2	13A-71
Engine warning lamp and related parts	The engine warning lamp does not illuminate right after the ignition switch is turned to the ON position.	3	13A-70
	The engine warning lamp remains illuminating and never goes out.	4	13A-70
Starting	No initial combustion (starting impossible)	5	13A-71
	Initial combustion but no complete combustion (starting impossible)	6	13A-73
	Long time to start (improper starting)		
Idling stability (Improper idling)	Unstable idling (Rough idling, hunting)	7	13A-74
	Idling speed is high. (Improper idling speed)	8	13A-76
	Idling speed is low. (Improper idling speed)		
Idling stability (Engine stalls)	When the engine is cold, it stalls at idling. (Die out)	9	13A-77
	When the engine is hot, it stalls at idling. (Die out)	10	13A-78
	The engine stalls when starting the car. (Pass out)	11	13A-80
	The engine stalls when decelerating.	12	13A-81
Driving	Hesitation, sag or stumble	13	13A-82
	Poor acceleration		
	Surge		
	The feeling of impact or vibration when accelerating	14	13A-83
	The feeling of impact or vibration when decelerating	15	13A-84
	Knocking	16	13A-84
Dieseling		17	13A-84
Too high CO and HC concentration when idling		18	13A-85
Low alternator output voltage (approx. 12.3 V)		19	13A-86
Engine idle speed is incorrect while the A/C is on.		20	13A-87
Fans (radiator fan, A/C condenser fan) are inoperative		21	13A-87
Clutch switch system malfunction <M/T>		22	13A-88
GDI ECO indicator lamp system	GDI ECO indicator lamp does not illuminate.	23	13A-88
	GDI ECO indicator lamp remains illuminated and does not go off.	24	13A-89

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

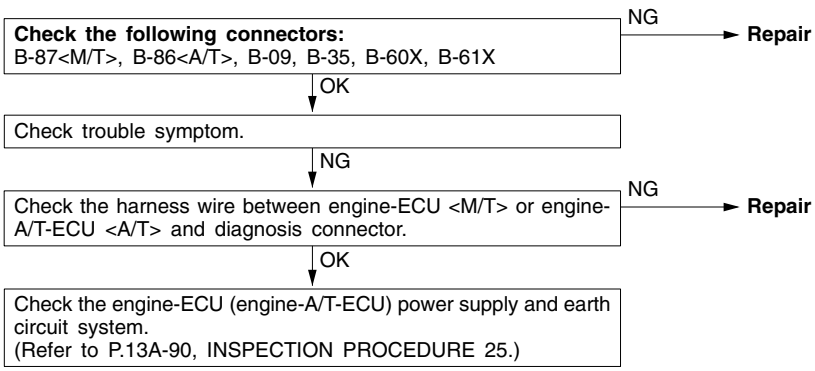
INSPECTION PROCEDURE 1

Communication with MUT-II is not possible. (Communication with all systems is not possible.)	**Probable cause**
The cause is probably a defect in the power supply system (including earth) for the diagnosis line.	• Malfunction of the connector • Malfunction of the harness wire • Malfunction of MUT-II



INSPECTION PROCEDURE 2

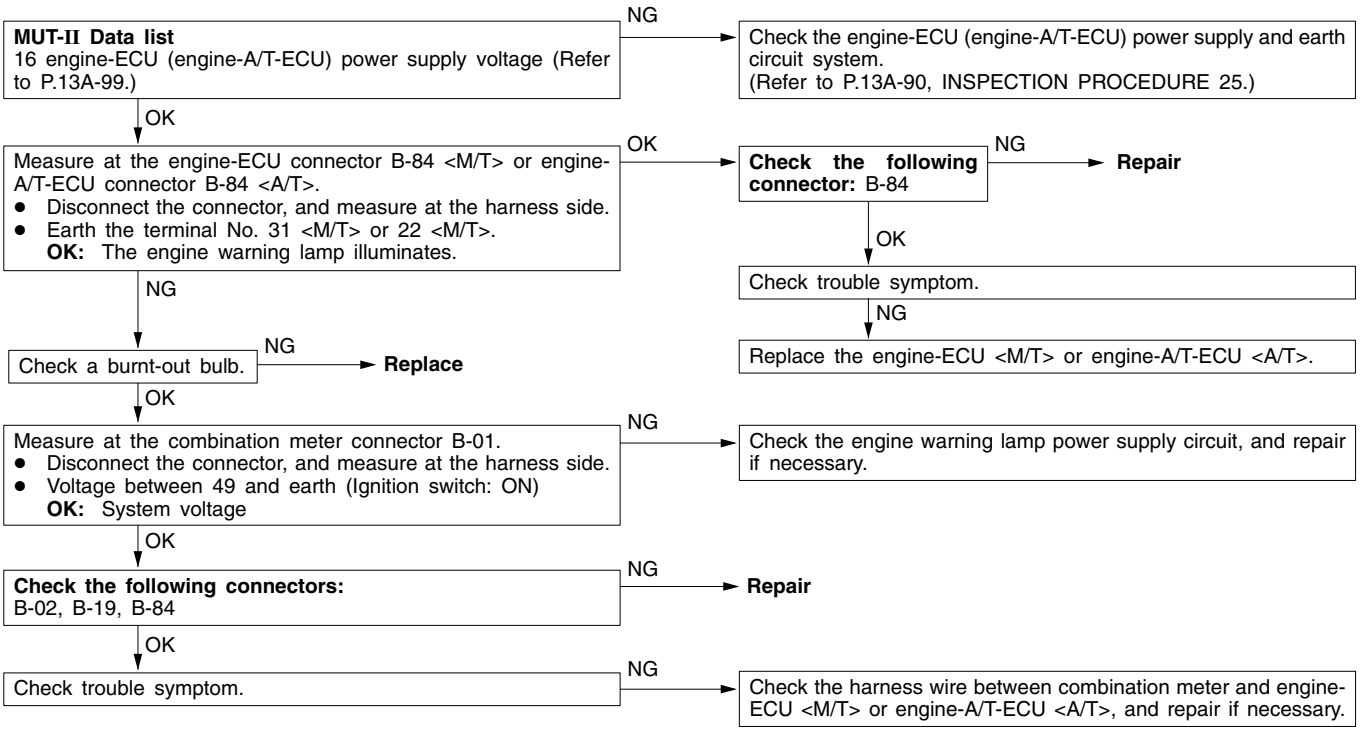
MUT-II communication with engine-ECU (engine-A/T-ECU) is impossible.	**Probable cause**
One of the following causes may be suspected. • No power supply to engine-ECU <M/T> or engine-A/T-ECU <A/T>. • Defective earth circuit of engine-ECU <M/T> or engine-A/T-ECU <A/T>. • Defective engine-ECU <M/T> or engine-A/T-ECU <A/T>. • Improper communication line between engine-ECU <M/T> or engine-A/T-ECU <A/T> and MUT-II	• Malfunction of engine-ECU <M/T> or engine-A/T-ECU <A/T> power supply circuit • Malfunction of engine-ECU <M/T> or engine-A/T-ECU <A/T> • Open circuit between the engine-ECU <M/T> or engine-A/T-ECU <A/T> and diagnosis connector



NOTE
On vehicles with multi center display, if a malfunction cannot be resolved after the procedure above, check the multi center display and replace if necessary. (Refer to GROUP 54 – Multi Center display.)

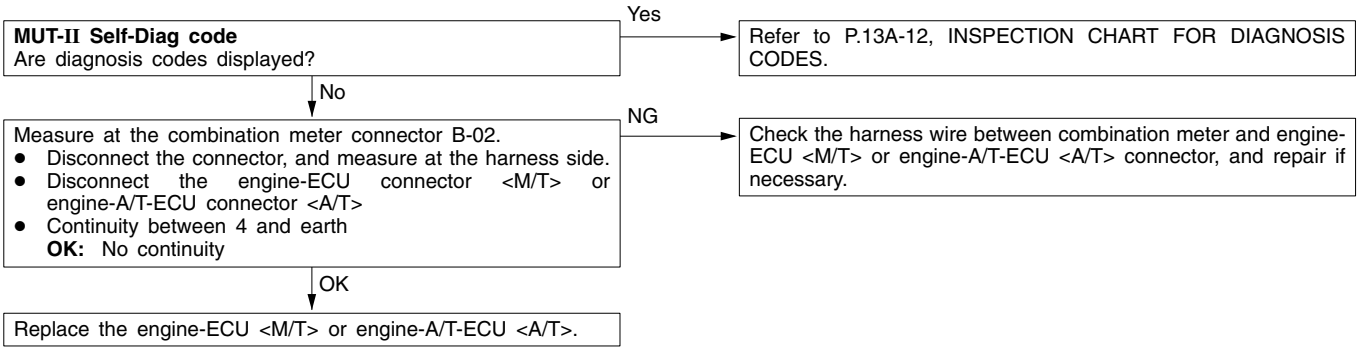
INSPECTION PROCEDURE 3

The engine warning lamp does not illuminate right after the ignition switch is turned to the ON position.	Probable cause
Because there is a burnt-out bulb, the engine-ECU <M/T> or engine-A/T-ECU <A/T> causes the engine warning lamp to illuminate for five seconds immediately after the ignition switch is turned to ON. If the engine warning lamp does not illuminate immediately after the ignition switch is turned to ON, one of the malfunctions listed at right has probably occurred.	• Burnt-out bulb • Defective warning lamp circuit • Malfunction of the engine-ECU <M/T> • Malfunction of the engine-A/T-ECU <A/T>



INSPECTION PROCEDURE 4

The engine warning lamp remains illuminating and never goes out.	Probable cause
In cases such as the above, the cause is probably that the engine-ECU <M/T> or engine-A/T-ECU <A/T> is detecting a problem in a sensor or actuator, or that one of the malfunctions listed at right has occurred.	• Short-circuit between the engine warning lamp and engine-ECU • Malfunction of the engine-ECU <M/T> • Malfunction of the engine-A/T-ECU <A/T>



INSPECTION PROCEDURE 5

No initial combustion (starting impossible)	Probable cause
This is caused by incorrect fuel supply into the combustion chamber, and improper ignition circuit. Besides that, foreign material may be contaminated in fuel.	• Malfunction of the fuel supply system • Malfunction of the ignition system • Malfunction of the engine-ECU <M/T> • Malfunction of the engine-A/T-ECU <A/T>

Check system voltage while the engine is cranking.
OK: 8 V or more
NG → Check the battery. (Refer to GROUP 55 – Battery.)
OK ↓

MUT-II Self-Diag code
Is a diagnosis code displayed?
Yes → Refer to P.13A-12, INSPECTION CHART FOR DIAGNOSIS CODES.
No ↓

MUT-II Data list
16 System voltage (Refer to P.13A-99.)
NG → Check the engine control relay and ignition switch-IG system. (Refer to P.13A-91, INSPECTION PROCEDURE 26.)
OK ↓

Does the camshaft rotate when the engine is cranking?
No → Check if the timing belt is broken or damaged.
Yes ↓

MUT-II Actuator test
07 Fuel pump (low pressure) (Refer to P.13A-105.)
NG → Check the fuel pump (low pressure) system. (Refer to P.13A-95, INSPECTION PROCEDURE 30.)
OK ↓

MUT-II Data list
22 Crank angle sensor (Refer to P.13A-99.)
NG → Check the crank angle sensor system. (Refer to P.13A-48, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0335.)
OK ↓

MUT-II Data list
21 Engine coolant temperature sensor (Refer to P.13A-99.)
NG → Check the engine coolant temperature sensor system. (Refer to P.13A-19, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0115.)
OK ↓

MUT-II Data list
79 Throttle position sensor (1st channel) (Refer to P.13A-99.)
NG → Check the throttle position sensor (1st channel) system. (Refer to P.13A-22, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0120.)
OK ↓

Inspect engine start ability by cranking the engine while the accelerator pedal is slightly depressed.
OK → Clean around the throttle valve. (Refer to P.13A-96*.)
NG ↓

Measure at injector driver connector A-52.
- Disconnect the connector, and measure at the connector side.
- Voltage between each of terminals 12, 21 and earth (Ignition switch: ON)
  OK: System voltage

NG → Check the injector driver system. (Refer to P.13A-92, INSPECTION PROCEDURE 27.)
OK ↓

Check fuel leakage. (Refer to P.13A-125.)
NG → **Repair**
OK ↓

Measure low fuel pressure between the fuel pump (low pressure) and fuel pump (high pressure). (Refer to P.13A-122.)
NG → **Repair**
OK ↓

Measure at ignition coil connectors A-85, A-86, A-89, A-91.
- Connect the connector.
- Connect a timing light to the No. 1 terminal of each connector in turn. (Engine cranking)
  OK: The timing light flashes.

NG → Check the ignition coil (incorporating power transitor) system. (Refer to P.13A-45, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0300.)
OK ↓

Check ignition timing while the engine is cranking.
OK: Approx. 5° BTDC
NG → Check that the crank angle sensor and timing belt cover are properly installed.
OK ↓

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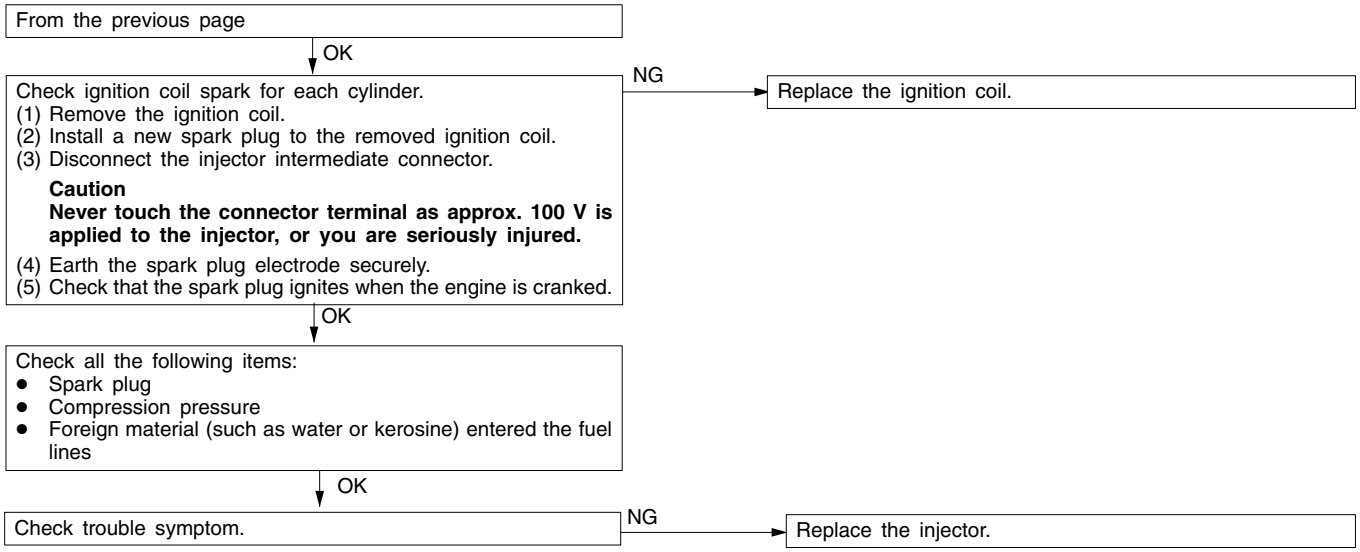
NOTE
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)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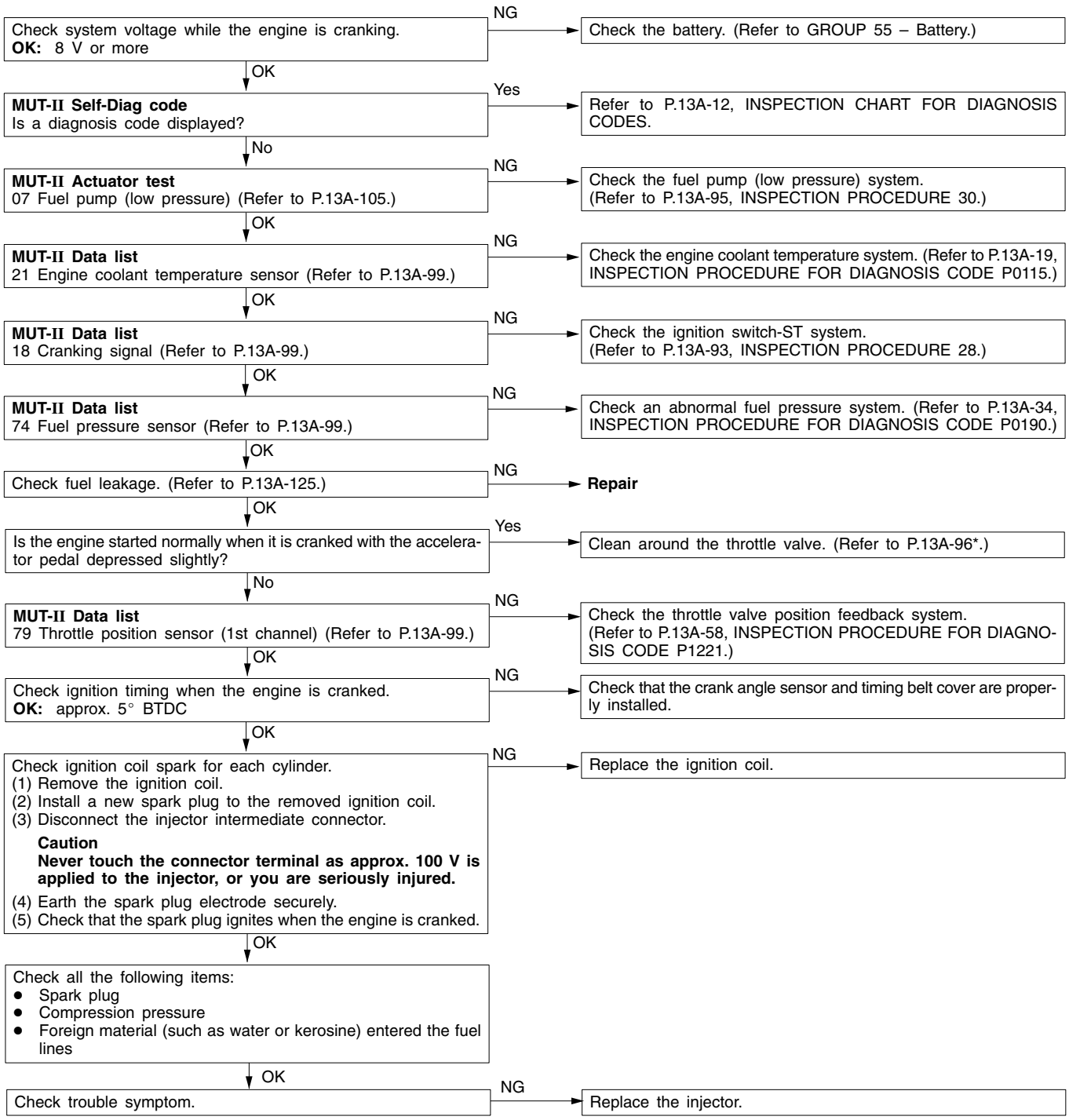
OK
Check ignition coil spark for each cylinder.
(1) Remove the ignition coil.
(2) Install a new spark plug to the removed ignition coil.
(3) Disconnect the injector intermediate connector.
Caution
Never touch the connector terminal as approx. 100 V is applied to the injector, or you are seriously injured.
(4) Earth the spark plug electrode securely.
(5) Check that the spark plug ignites when the engine is cranked.
NG
Replace the ignition coil.
OK
Check all the following items:
• Spark plug
• Compression pressure
• Foreign material (such as water or kerosine) entered the fuel lines
OK
Check trouble symptom.
NG
Replace the injector.

INSPECTION PROCEDURE 6

Initial combustion takes place, but does not complete (start impossible), too long time to start (poor start)	Probable cause
This may be caused by improper spark plug ignition (poor spark), improper mixture during engine cranking, improper fuel pressure.	• Malfunction of the fuel supply system • Malfunction of the fuel pressure sensor • Malfunction of the ignition system • Malfunction of the electronic-controlled throttle valve system • Malfunction of the engine-ECU <M/T> • Malfunction of the engine-A/T-ECU <A/T>

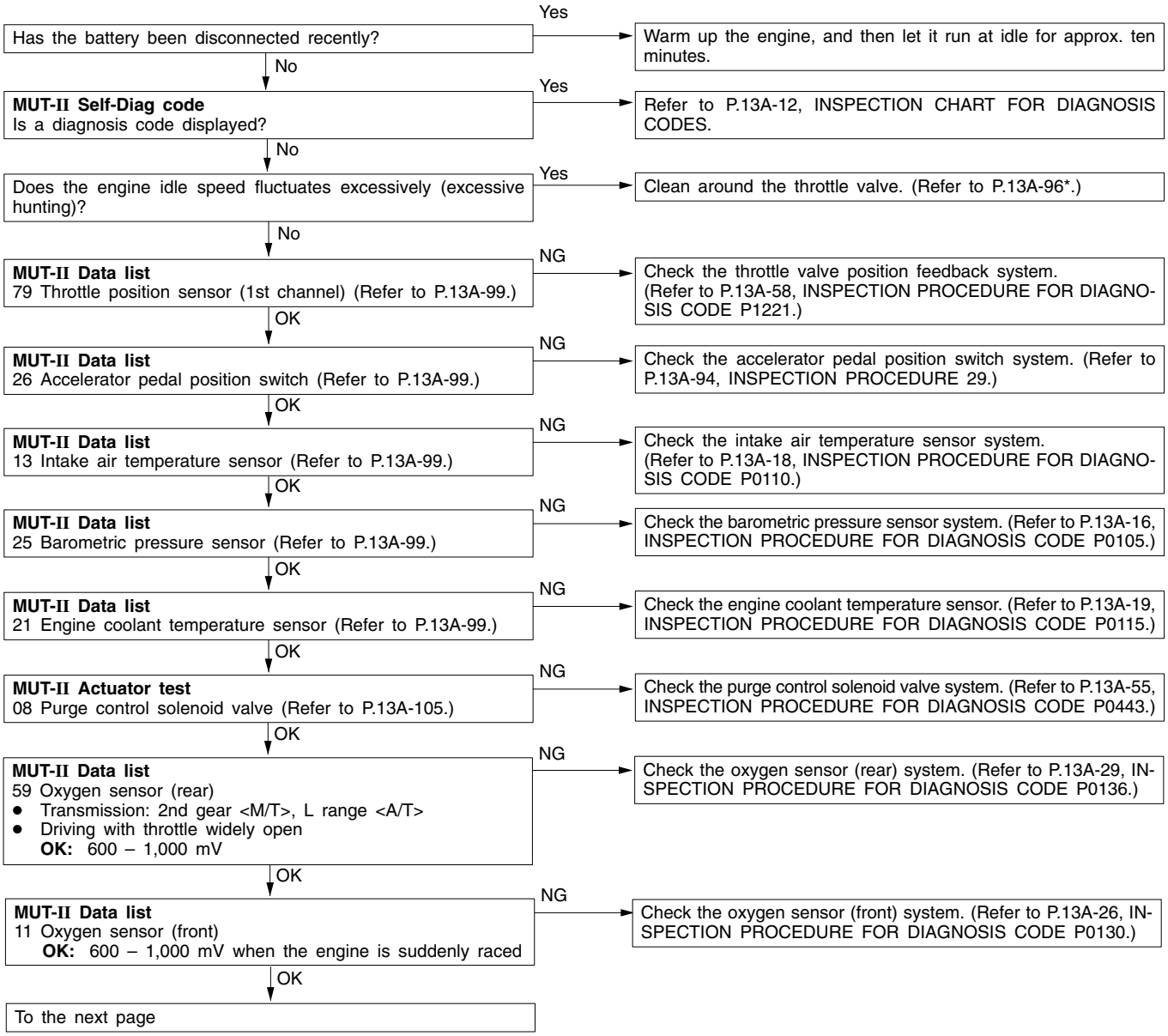


NOTE

*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

INSPECTION PROCEDURE 7

Unstable idling (rough idle, hunting)	Probable cause
This malfunction is probably caused by a faulty ignition system, improper air/fuel ratio, a faulty electronic-controlled throttle valve system, improper compression pressure, etc. As many causes can be suspected, diagnose from easier items.	• Malfunction of the ignition system • Malfunction of the air/fuel ratio control system • Malfunction of the electronic-control throttle valve system • Improper compression pressure • Air sucking into the air intake system



NOTE
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

From the previous page

OK

MUT-II Data list
11 Oxygen sensor (front)
OK: 0 – 400 mV and 600 – 1,000 mV alternates when the engine is idling (wait for four minutes after the engine started).

NG → Measure fuel high-pressure between the fuel pump (high pressure) and injector. (Refer to P.13A-124.)

OK → Check that air is sucked in the air intake system.
- Broken intake manifold gasket
- Damaged vacuum hose
- Damaged air intake hose

NG → **Repair**

OK

MUT-II Data list
27 Power steering fluid pressure switch (Refer to P.13A-99.)

NG → Check the power steering fluid pressure switch system. (Refer to P.13A-96, INSPECTION PROCEDURE 31.)

OK

MUT-II Data list
28 A/C switch (Refer to P.13A-99.)

NG → Check the A/C switch and A/C relay system. (Refer to P.13A-96, INSPECTION PROCEDURE 32.)

OK

MUT-II Data list
48 M/T oil temperature sensor (Refer to P.13A-99.)

NG → Check the M/T oil temperature sensor system. (Refer to P.13A-97, INSPECTION PROCEDURE 33.)

OK

MUT-II Data list
67 Stop lamp switch (Refer to P.13A-99.)

NG → Check the stop lamp switch. (Refer to P.13A-98, INSPECTION PROCEDURE 34.)

OK

MUT-II Data list
31 Small lamp switch (Refer to P.13A-99.)

NG → Check the small lamp switch system. (Refer to P.13A-98, INSPECTION PROCEDURE 35.)

OK

MUT-II Data list
68 EGR valve (Refer to P.13A-99.)

NG → Check the EGR valve. (Refer to P.13A-52, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0403.)

OK

Check ignition timing. (Refer to GROUP 11A – Engine Adjustment.)

NG → Check that the crank angle sensor and timing belt cover are properly installed.

OK

Clean around the throttle valve. (Refer to P.13A-96*.)

Check trouble symptom.

NG

Check ignition coil spark for each cylinder.
(1) Remove the ignition coil.
(2) Install a new spark plug to the removed ignition coil.
(3) Disconnect the injector intermediate connector.

Caution
Never touch the connector terminal as approx. 100 V is applied to the injector, or you are seriously injured.

(4) Earth the spark plug electrode securely.
(5) Check that the spark plug ignites when the engine is cranked.

NG → Replace the ignition coil.

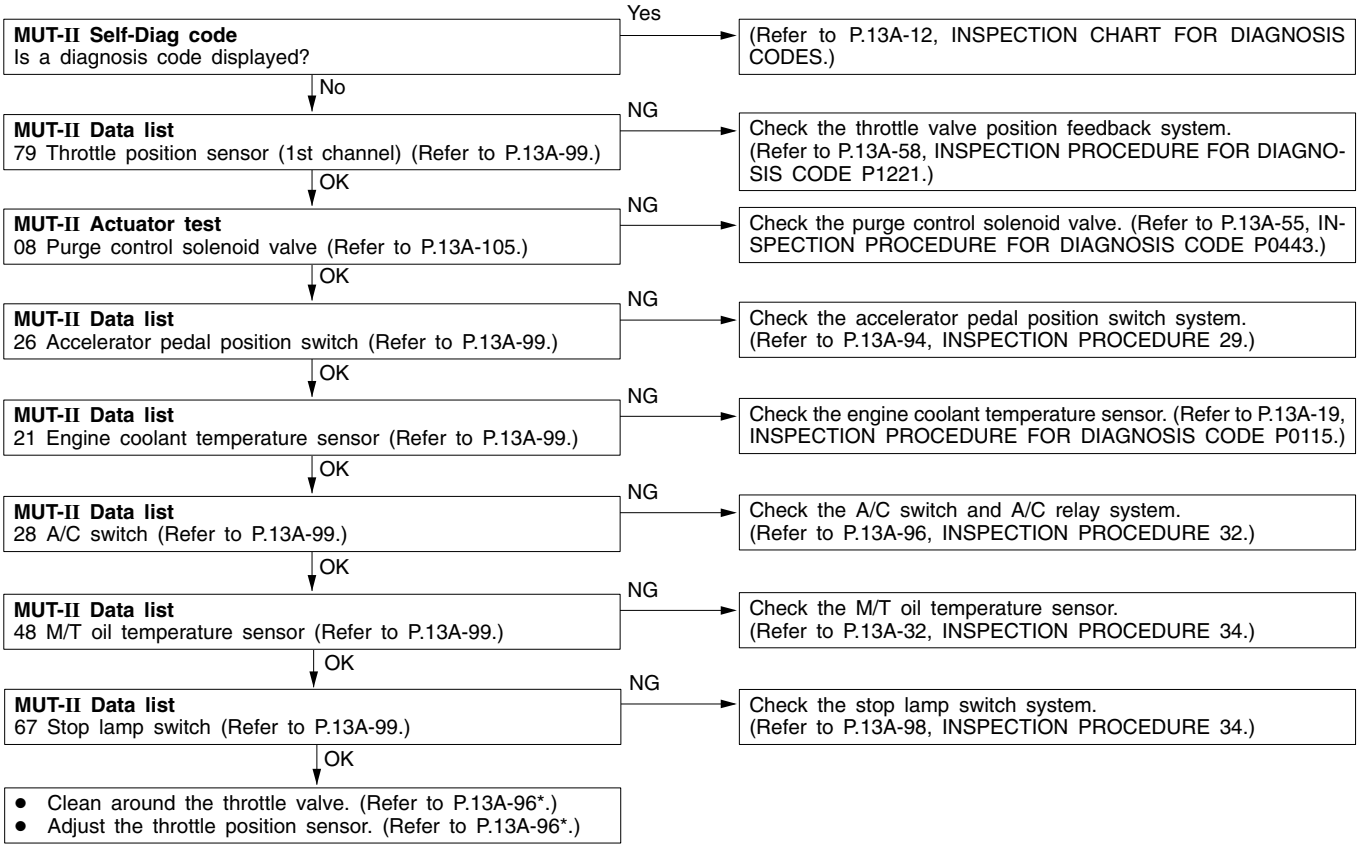
OK

Check all the following items in that order.
(1) Spark plugs
(2) Exhaust gas emission control system
(3) EGR system
(4) Compression pressure
(5) Foreign material (such as water or kerosine) entered the fuel line.
(6) Air is sucked in the air intake system, or EGR gas leaks.
- Damaged intake manifold gasket
- Damaged air intake hose
- Damaged vacuum hose
- Faulty EGR valve seat

NOTE
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

INSPECTION PROCEDURE 8

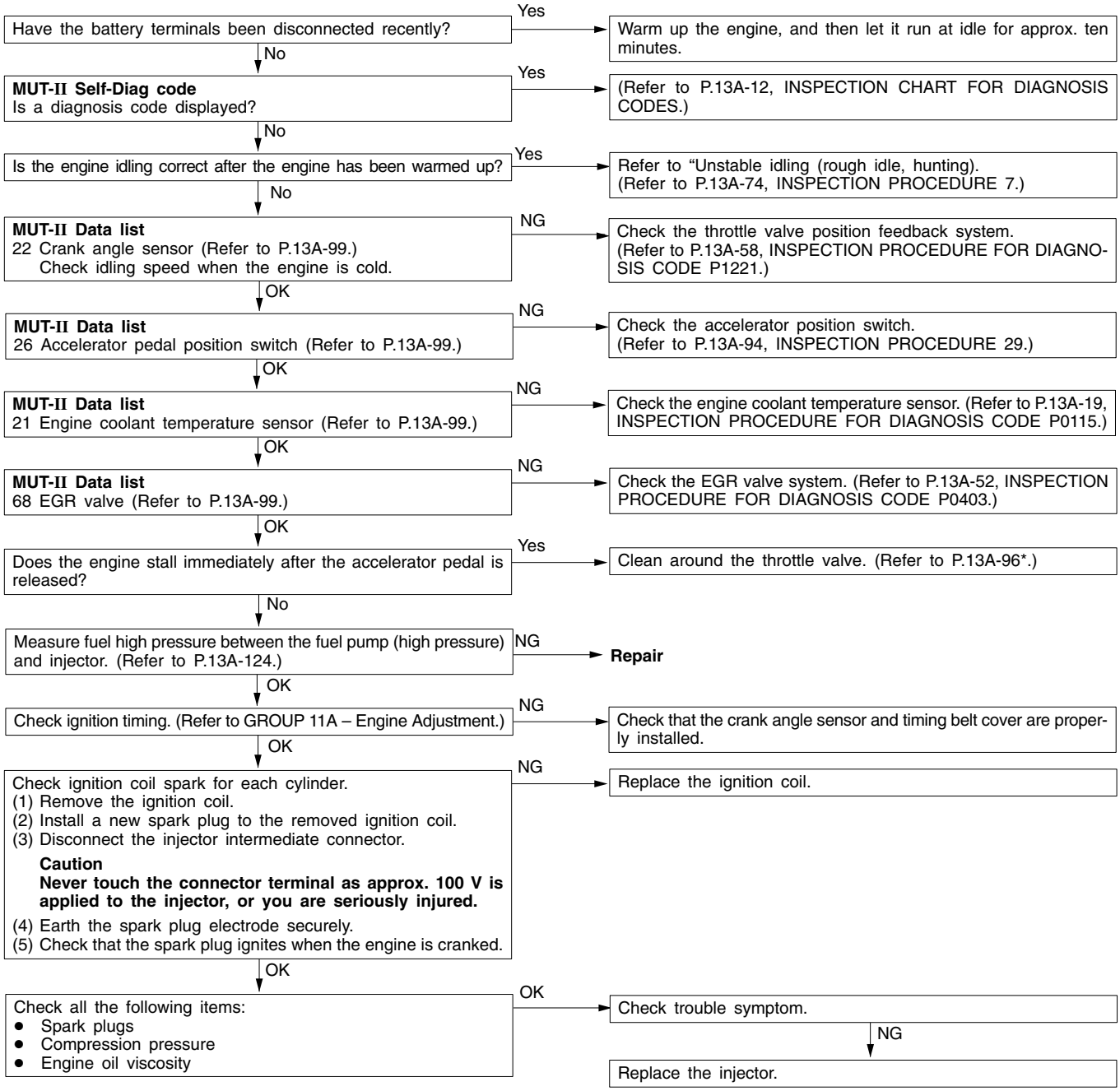
Idle speed is high or low (Improper idling)	Probable cause
The cause is probably that the intake air amount during idling is too great or too small.	• Malfunction of the electronic-controlled throttle valve system • Malfunction of the throttle body



NOTE
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

INSPECTION PROCEDURE 9

When the engine is cold, it stalls at idling. (Die out)	Probable cause
The cause is probably an incorrect air/fuel ratio or poor intake air amount when the engine is cold.	• Malfunction of the electronic-control throttle valve system • Malfunction of the throttle body



NOTE
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

INSPECTION PROCEDURE 10

When the engine is hot, it stalls at idling. (Die out)	Probable cause
The cause is probably an improper air/fuel ratio, faulty electronic-controlled throttle valve system, compression pressure. In addition, if the engine stalls suddenly, another possible cause might be a poor connector contact.	• Malfunction of the ignition system • Malfunction of air/fuel ratio control system • Malfunction of electronic-controlled throttle valve system • Malfunction of the throttle body • Poor connector contact • Improper compression pressure • Air stuck in the air intake system

Have the battery terminals been disconnected recently?
- Yes → Warm up the engine, and then let it run at idle for approx. ten minutes.
- No ↓

MUT-II Self-Diag code
Is a diagnosis code displayed?
- Yes → Refer to P.13A-12, INSPECTION CHART FOR DIAGNOSIS CODES.
- No ↓

MUT-II Data list
79 Throttle position sensor (1st channel) (Refer to P.13A-99.)
- NG → Check the throttle valve position feedback system. (Refer to P.13A-58, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P1221.)
- OK ↓

Is it easy to reproduce the engine stall?
- No → While carrying out an intermittent malfunction simulation test. (Refer to GROUP 00 – Points to Note for Intermittent Malfunction.), check for sudden changes in the following signals.
  - Crank angle sensor signal
  - Injector drive signal
  - Fuel pump (low pressure) drive signal
  - Air flow sensor
  - Primary ignition signal
  - Power supply to the engine-ECU <M/T> or engine-A/T-ECU <A/T>
- Yes ↓

MUT-II Data list
26 Accelerator pedal position switch (Refer to P.13A-99.)
- NG → Check the accelerator pedal position switch. (Refer to P.13A-94, INSPECTION PROCEDURE 29.)
- OK ↓

MUT-II Data list
13 Intake air temperature sensor (Refer to P.13A-99.)
- NG → Check the intake air temperature sensor. (Refer to P.13A-18, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0110.)
- OK ↓

MUT-II Data list
25 Barometric pressure sensor (Refer to P.13A-99.)
- NG → Check the barometric pressure sensor. (Refer to P.13A-16, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0105.)
- OK ↓

MUT-II Data list
21 Engine coolant temperature sensor (Refer to P.13A-99.)
- NG → Check the engine coolant temperature sensor. (Refer to P.13A-19, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0115.)
- OK ↓

MUT-II Data list
59 Oxygen sensor (rear)
- Transmission: 2nd gear <M/T>, L range <A/T>
- Driving with throttle widely open

OK: 600 – 1,000 mV
- NG → Check the oxygen sensor (rear) system. (Refer to P.13A-29, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0136.)
- OK ↓

MUT-II Data list
11 Oxygen sensor (front)
OK: 600 – 1,000 mV when the engine is suddenly raced
- NG → Check the oxygen sensor (front) system. (Refer to P.13A-26, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0130.)
- OK ↓

MUT-II Data list
11 Oxygen sensor (front)
OK: 0 – 400 mV and 600 – 1,000 mV alternates when the engine is idling (wait for four minutes after the engine started).
- NG → Measure fuel high-pressure between the fuel pump (high pressure) and injector. (Refer to P.13A-124.)
  - OK → Check that air is sucked in the air intake system.
    - Broken intake manifold gasket
    - Damaged vacuum hose
    - Damaged air intake hose
  - NG → **Repair**
- OK ↓

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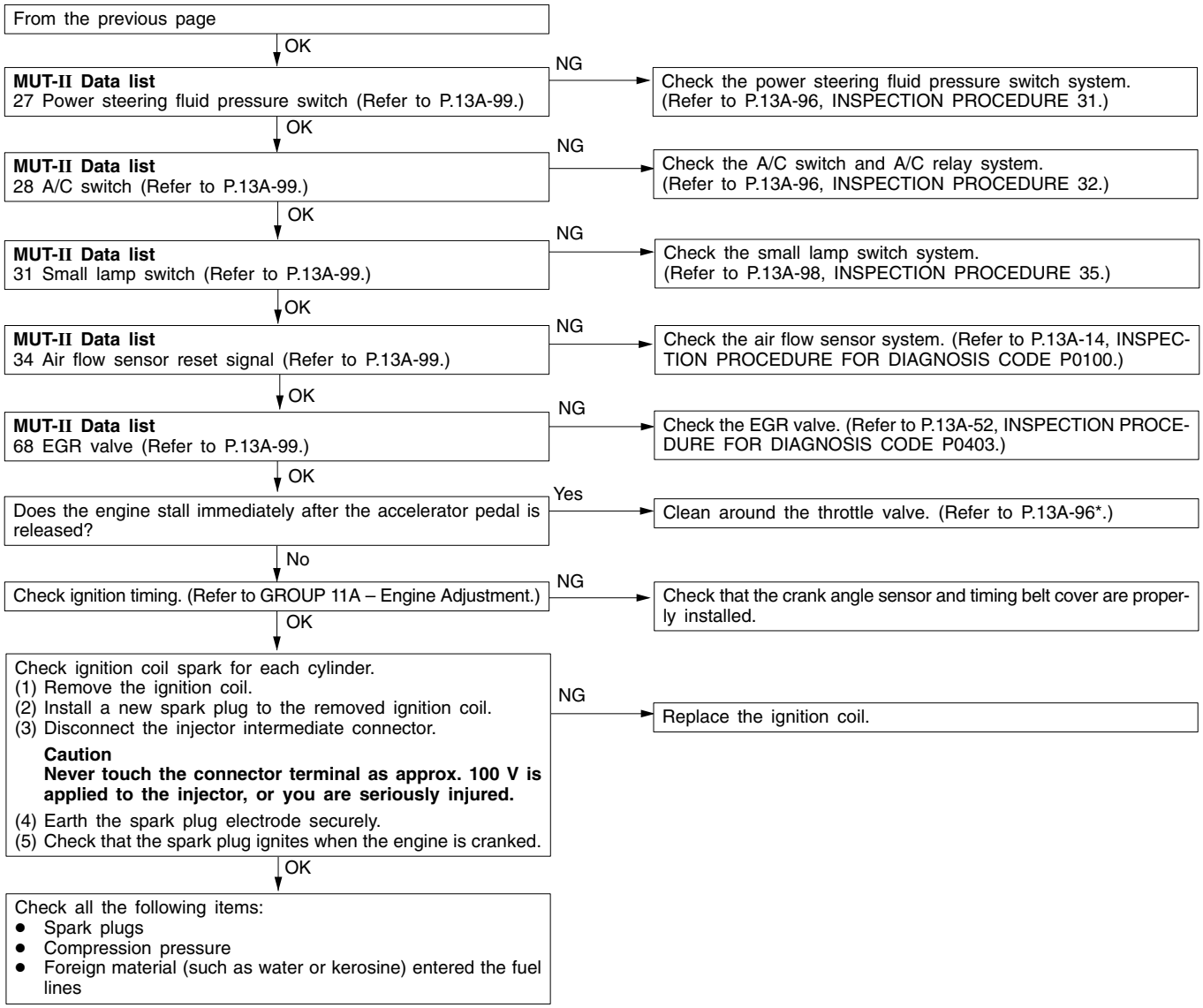


NOTE

*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

INSPECTION PROCEDURE 11

The engine stalls when starting the car. (Pass out)	Probable cause
The cause is probably poor ignition due to a malfunctioning spark plug (weak spark), or an incorrect air/fuel ratio when the accelerator is depressed.	• Malfunction of the ignition system • Malfunction of the EGR valve • Air stuck in the air intake system

MUT-II Self-Diag code
Is a diagnosis code displayed?
- Yes → (Refer to P.13A-12, INSPECTION CHART FOR DIAGNOSIS CODES.)
- No ↓

MUT-II Data list
68 EGR valve (Refer to P.13A-99.)
- NG → Check the EGR valve. (Refer to P.13A-52, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0403.)
- OK ↓

MUT-II Actuator test
08 Purge control solenoid valve (Refer to P.13A-105.)
- NG → Check the purge control solenoid valve system. (Refer to P.13A-55, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0443.)
- OK ↓

Check ignition coil spark for each cylinder.
(1) Remove the ignition coil.
(2) Install a new spark plug to the removed ignition coil.
(3) Disconnect the injector intermediate connector.

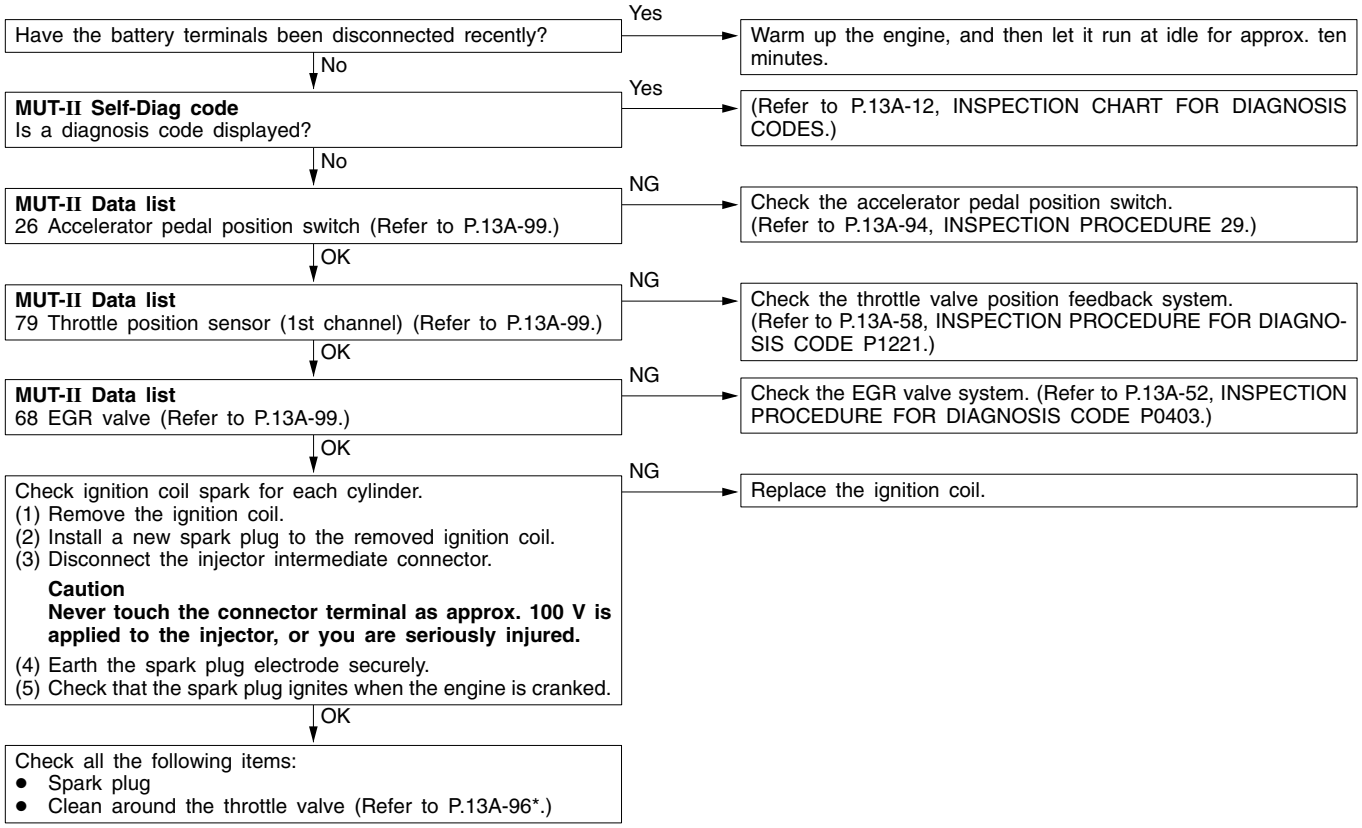
Caution
Never touch the connector terminal as approx. 100 V is applied to the injector, or you are seriously injured.

(4) Earth the spark plug electrode securely.
(5) Check that the spark plug ignites when the engine is cranked.
- NG → Replace the ignition coil.
- OK ↓

Check all the following items:
(1) Spark plug
(2) Check if air is stuck in the air intake system.
- Damage intake manifold gasket
- Damaged or disconnected vacuum hose
- Damaged air intake hose

INSPECTION PROCEDURE 12

The engine stalls when decelerating.	Probable cause
The cause is probably an improper air/fuel ratio due to a faulty EGR system, or poor intake air volume due to a faulty electronic-controlled throttle valve system.	• Malfunction of the electronic-controlled throttle valve system • Malfunction of the EGR valve



NOTE
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

INSPECTION PROCEDURE 13

Hesitation, sag, stumble, poor acceleration or surge	Probable cause
The cause is probably a malfunction of the ignition system, electronic-controlled throttle valve system, compression pressure, etc.	• Malfunction of the ignition system • Malfunction of the air/fuel ratio control system • Malfunction of the electronic-controlled throttle valve system • Improper compression pressure • Air stuck in the air intake system

MUT-II Self-Diag code
Is a diagnosis code displayed?
- Yes → (Refer to P.13A-12, INSPECTION CHART FOR DIAGNOSIS CODES.)
- No ↓

Check ignition timing. (Refer to GROUP 11A – Engine Adjustment.)
- NG → Check that the crank angle sensor and timing belt cover are properly installed.
- OK ↓

MUT-II Data list
26 Accelerator pedal position switch (Refer to P.13A-99.)
- NG → Check the accelerator pedal position switch. (Refer to P.13A-94, INSPECTION PROCEDURE 29.)
- OK ↓

MUT-II Data list
13 Intake air temperature sensor (Refer to P.13A-99.)
- NG → Check the intake air temperature sensor. (Refer to P.13A-18, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0110.)
- OK ↓

MUT-II Data list
25 Barometric pressure sensor (Refer to P.13A-99.)
- NG → Check the barometric pressure sensor. (Refer to P.13A-16, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0105.)
- OK ↓

MUT-II Data list
21 Engine coolant temperature sensor (Refer to P.13A-99.)
- NG → Check the engine coolant temperature sensor. (Refer to P.13A-19, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0115.)
- OK ↓

MUT-II Data list
79 Throttle position sensor (1st channel) (Refer to P.13A-99.)
- NG → Check the throttle valve position feedback system. (Refer to P.13A-58, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P1221.)
- OK ↓

MUT-II Data list
59 Oxygen sensor (rear)
- Transmission: 2nd gear <M/T>, L range <A/T>
- Driving with throttle widely open

OK: 600 – 1,000 mV
- NG → Check the oxygen sensor (rear) system. (Refer to P.13A-29, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0136.)
- OK ↓

MUT-II Data list
11 Oxygen sensor (front)
OK: 600 – 1,000 mV when the engine is suddenly raced
- NG → Check the oxygen sensor (front) system. (Refer to P.13A-26, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0130.)
- OK ↓

MUT-II Data list
11 Oxygen sensor (front)
OK: 0 – 400 mV and 600 – 1,000 mV alternates when the engine is idling (wait for four minutes after the engine started).
- NG → Measure fuel high-pressure between the fuel pump (high pressure) and injector. (Refer to P.13A-124.)
  - OK ↓

Check that air is sucked in the air intake system.
- Broken intake manifold gasket
- Damaged vacuum hose
- Damaged air intake hose

OK ↓

MUT-II Data list
68 EGR valve (Refer to P.13A-99.)
- NG → Check the EGR valve. (Refer to P.13A-52, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0403.)
- OK ↓

MUT-II Actuator test
08 Purge control solenoid valve (Refer to P.13A-105.)
- NG → Check the purge control solenoid valve. (Refer to P.13A-55, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0443.)
- OK ↓

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OK

Measure high fuel pressure between the fuel pump (high pressure) and injector. (Refer to P.13A-124.) — NG → **Repair**

OK

Check ignition coil spark for each cylinder. — NG → Replace the ignition coil.
(1) Remove the ignition coil.
(2) Install a new spark plug to the removed ignition coil.
(3) Disconnect the injector intermediate connector.

Caution
Never touch the connector terminal as approx. 100 V is applied to the injector, or you are seriously injured.

(4) Earth the spark plug electrode securely.
(5) Check that the spark plug ignites when the engine is cranked.

OK

Check all the following items: — OK → Check trouble symptom. — NG → Replace the injector.
- Spark plug
- EGR system
- Compression pressure
- Clogged fuel filter, fuel line

INSPECTION PROCEDURE 14

The feeling of impact when accelerating	Probable cause
The cause is probably an ignition leak being generated in line with an increase in the spark plug request voltage during acceleration.	• Malfunction of the ignition system

MUT-II Self-Diag code
Is a diagnosis code displayed? — Yes → (Refer to P.13A-12, INSPECTION CHART FOR DIAGNOSIS CODES.)

No

MUT-II Data list
79 Throttle position sensor (1st channel) (Refer to P.13A-99.) — NG → Check the throttle valve position feedback system. (Refer to P.13A-58, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P1221.)

OK

Check ignition coil spark for each cylinder. — OK → Check all the following items:
(1) Remove the ignition coil.
(2) Install a new spark plug to the removed ignition coil.
(3) Disconnect the injector intermediate connector.

- Spark plug
- Ignition current leak

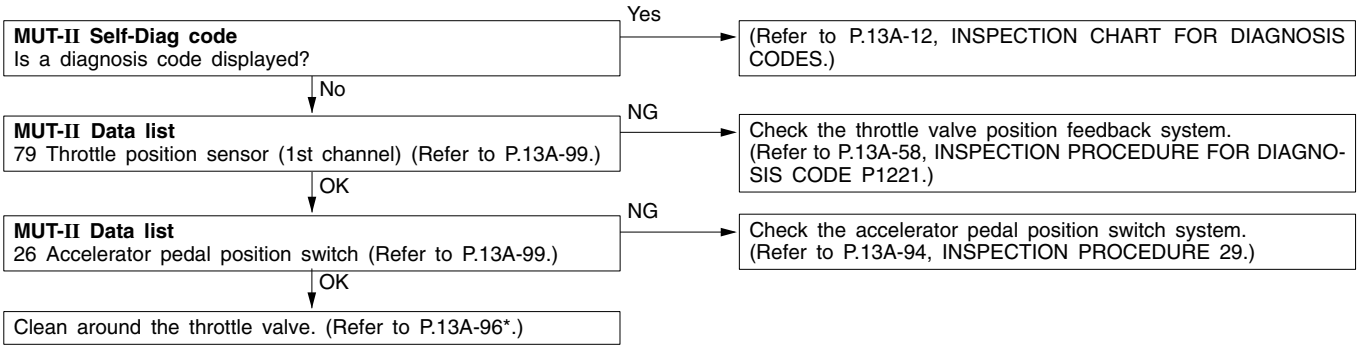
Caution
Never touch the connector terminal as approx. 100 V is applied to the injector, or you are seriously injured.

NG → Replace the ignition coil.

(4) Earth the spark plug electrode securely.
(5) Check that the spark plug ignites when the engine is cranked.

INSPECTION PROCEDURE 15

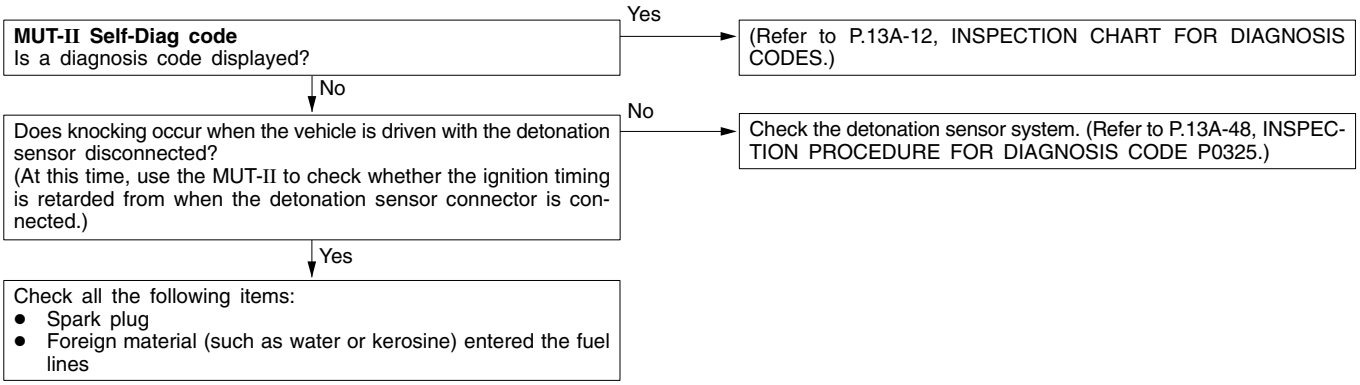
The feeling of impact when decelerating	Probable cause
The cause is probably insufficient intake air due to a faulty electronic-controlled throttle valve system.	• Malfunction of the electronic-controlled throttle valve system



NOTE
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

INSPECTION PROCEDURE 16

Knocking	Probable cause
The cause is probably incorrect detonation control or improper heat range of the spark plugs.	• Malfunction of the detonation sensor • Improper heat range of the spark plugs



INSPECTION PROCEDURE 17

Run-on (dieseling)	Probable cause
The cause is probably fuel leak from injector(s)	• Malfunction of the injector

Replace the injector.

INSPECTION PROCEDURE 18

Too high CO and HC concentration when idling	Probable cause
The cause is probably an incorrect air/fuel ratio	• Malfunction of air/fuel ratio control system • Deterioration of the catalyst

MUT-II Self-Diag code
Is a diagnosis code displayed?
Yes → (Refer to P.13A-12, INSPECTION CHART FOR DIAGNOSIS CODES.)
No ↓

Check ignition timing. (Refer to GROUP 11A – Engine Adjustment.)
NG → Check that the crank angle sensor and timing belt cover are properly installed.
OK ↓

MUT-II Data list
21 Engine coolant temperature sensor (Refer to P.13A-99.)
NG → Check the engine coolant temperature sensor. (Refer to P.13A-19, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0115.)
OK ↓

MUT-II Data list
13 Intake air temperature sensor (Refer to P.13A-99.)
NG → Check the intake air temperature sensor. (Refer to P.13A-18, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0110.)
OK ↓

MUT-II Data list
25 Barometric pressure sensor (Refer to P.13A-99.)
NG → Check the barometric pressure sensor. (Refer to P.13A-16, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0105.)
OK ↓

MUT-II Data list
59 Oxygen sensor (rear)
- Transmission: 2nd gear <M/T>, L range <A/T>
- Driving with throttle widely open

OK: 600 – 1,000 mV
NG → Check the oxygen sensor (rear) system. (Refer to P.13A-29, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0136.)
OK ↓

MUT-II Data list
11 Oxygen sensor (front)
OK: 600 – 1,000 mV when the engine is suddenly raced
NG → Check the oxygen sensor (front) system. (Refer to P.13A-26, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0130.)
OK ↓

MUT-II Data list
11 Oxygen sensor (front)
OK: 0 – 400 mV and 600 – 1,000 mV alternates when the engine is idling (wait for four minutes after the engine started).
OK → Replace the oxygen sensor (front).
↓
Check trouble symptom.
NG ↓
NG ↓

Measure fuel high-pressure between the fuel pump (high pressure) and injector. (Refer to P.13A-124.)
NG → **Repair**
OK ↓

Check ignition coil spark for each cylinder.
(1) Remove the ignition coil.
(2) Install a new spark plug to the removed ignition coil.
(3) Disconnect the injector intermediate connector.

Caution
Never touch the connector terminal as approx. 100 V is applied to the injector, or you are seriously injured.

(4) Earth the spark plug electrode securely.
(5) Check that the spark plug ignites when the engine is cranked.

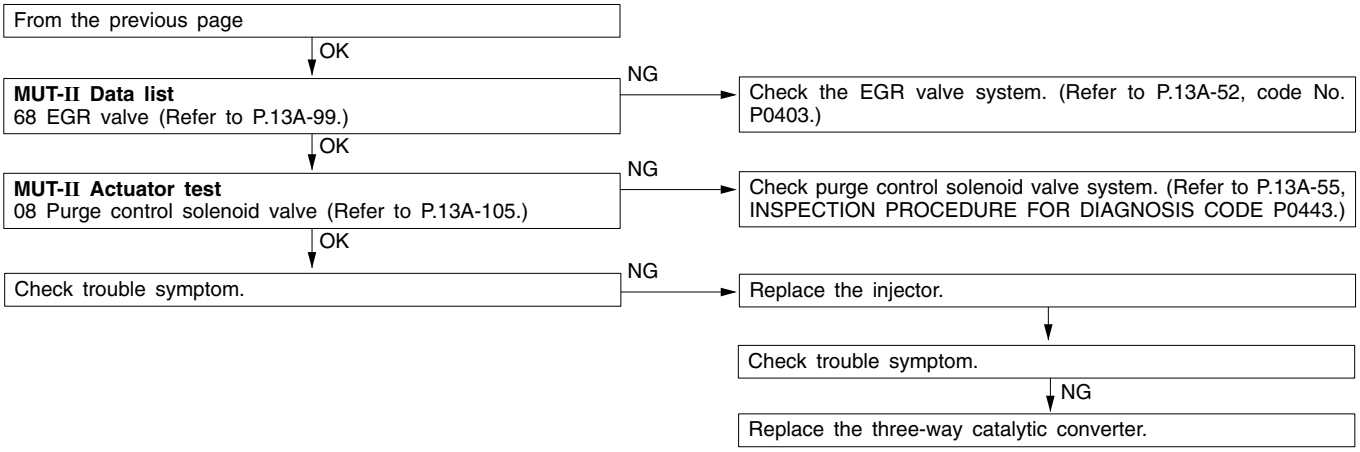
OK ↓
NG ↓

Check all the following items:
- Spark plug
- EGR system
- Compression pressure
- Clogged fuel filter or line

Replace the ignition coil.

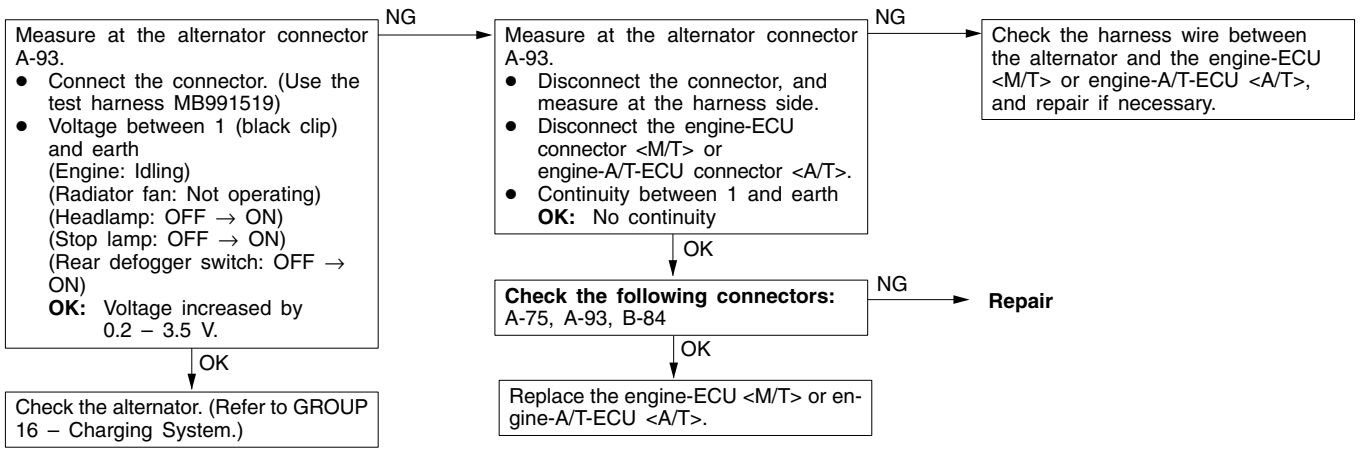
OK ↓

To the next page



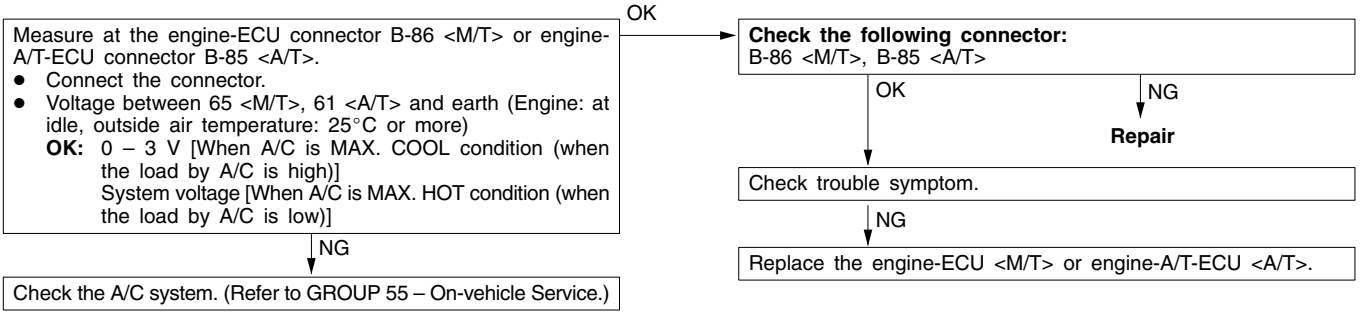
INSPECTION PROCEDURE 19

Low alternator output voltage (approx. 12.3 V)	Probable cause
The cause is probably a malfunction of the alternator or one of the problems listed at right.	• Malfunction of the charging system • Open circuit between the alternator G terminal and the engine-ECU <M/T> or engine-A/T-ECU <A/T> • Malfunction of the engine-ECU <M/T> • Malfunction of the engine-A/T-ECU <A/T>



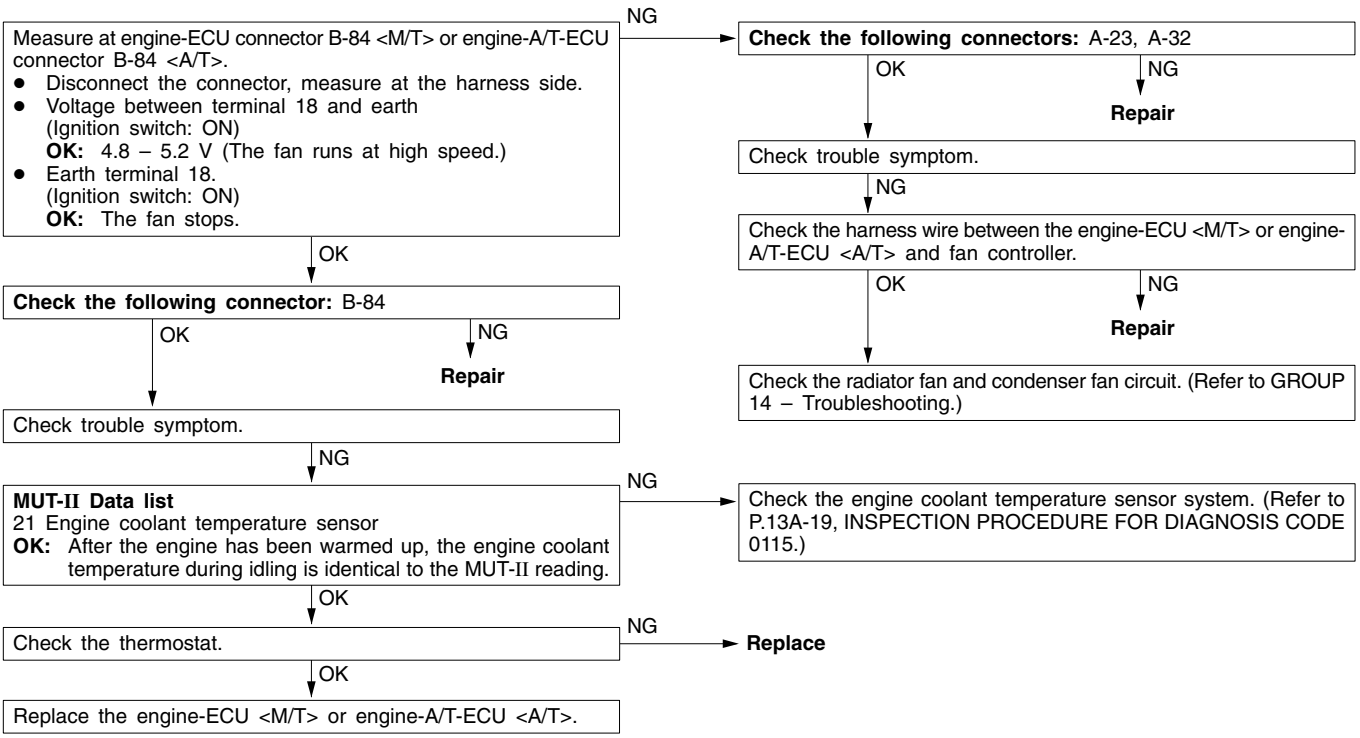
INSPECTION PROCEDURE 20

Idling speed is improper when A/C is operating	Probable cause
If the engine-ECU <M/T> or engine-A/T-ECU <A/T> detects that the air conditioner is on, it activates the throttle control servo to control idle-up operation. The A/C-ECU judges if the load caused by air conditioner operation is high or low, and converts it to voltage signal (high or low voltage) and inputs the signal to the engine-ECU <M/T> or engine-A/T-ECU <A/T>. Based on this voltage signal, the engine-ECU <M/T> or engine-A/T-ECU <A/T> controls the idle-up speed (for high or low load).	• Malfunction of the A/C control system • Improper connector contact, open circuit or short-circuited harness wire • Malfunction of the engine-ECU <M/T> • Malfunction of the engine-A/T-ECU <A/T>



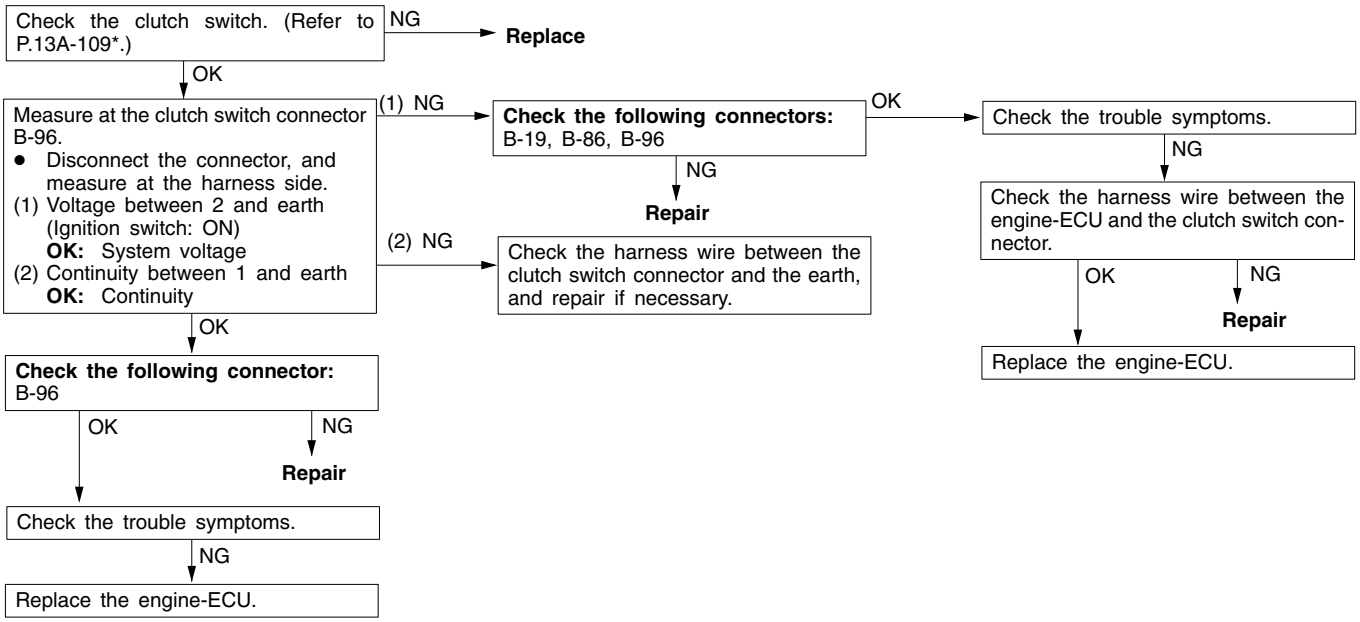
INSPECTION PROCEDURE 21

Fans (radiator fan, A/C condenser fan) are inoperative.	Probable cause
The engine-ECU <M/T> or engine-A/T-ECU <A/T> sends a duty signal to the fan controller according to engine coolant temperature, vehicle speed, or A/C switch load. The fan controller controls radiator fan and condenser fan speeds, based on this signal. (The closer the terminal voltage comes to 5 V, the higher the fan speed becomes.)	• Malfunction of the fan motor relay • Malfunction of the fan motor • Malfunction of the fan controller • Open or short circuit, or poor connector contact • Malfunction of the engine-ECU <M/T> • Malfunction of the engine-A/T-ECU <A/T>



INSPECTION PROCEDURE 22

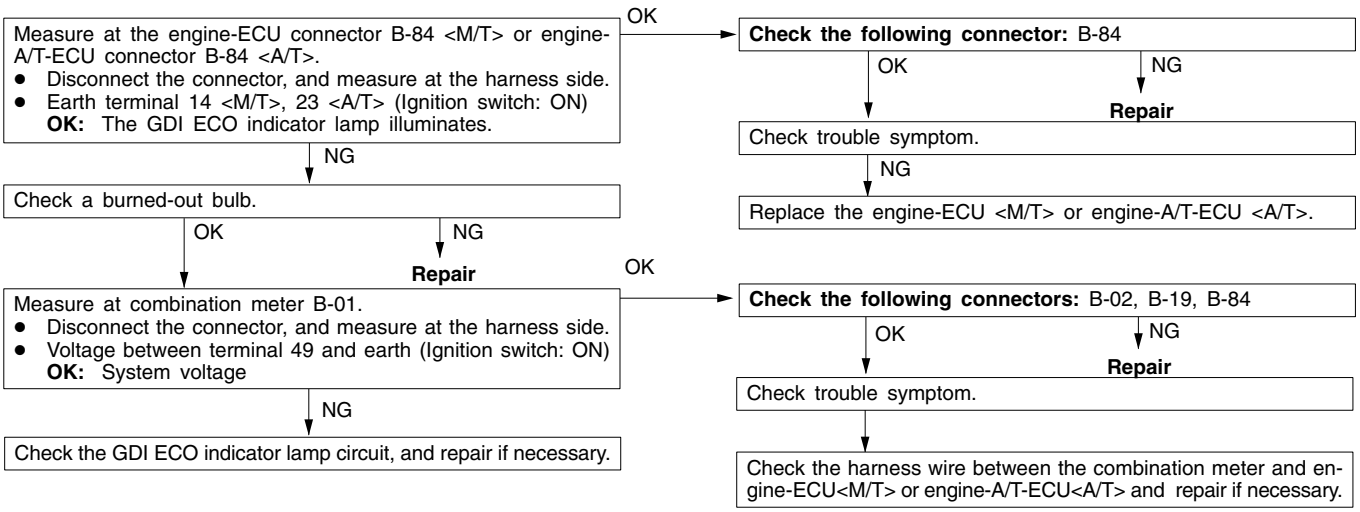
Clutch switch system malfunction <M/T>	Probable cause
The clutch pedal switch sends a signal indicating clutch pedal depression to the engine-ECU. The engine-ECU controls the fuel injection properly according to this signal, thus prevents the fluctuation of the engine speed during shift change.	• Malfunction of the clutch switch • Open circuit or short-circuited harness wire in the clutch switch circuit • Malfunction of the engine-ECU



NOTE
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

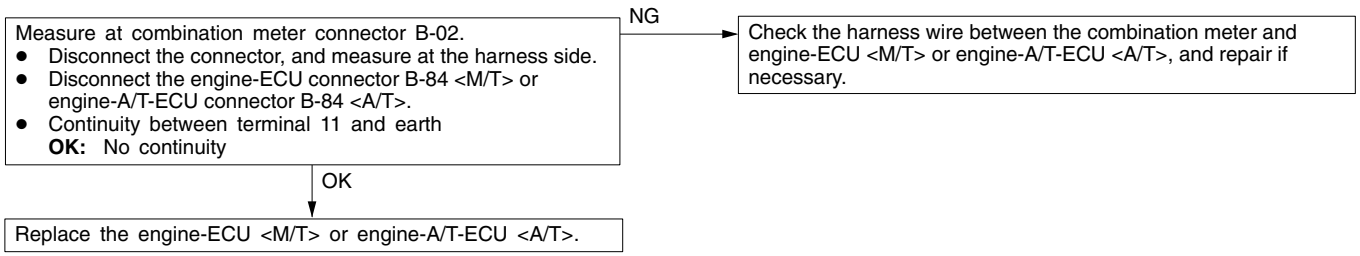
INSPECTION PROCEDURE 23

GDI ECO indicator lamp does not illuminate.	Probable cause
If the GDI ECO indicator lamp does not illuminate after turning switch, the causes listed in the right column are suspected.	• Burned-out GDI ECO indicator lamp bulb • Open circuit or short-circuited harness wire in the GDI ECO indicator lamp circuit • Malfunction of the engine-ECU <M/T> • Malfunction of the engine-A/T-ECU <A/T>



INSPECTION PROCEDURE 24

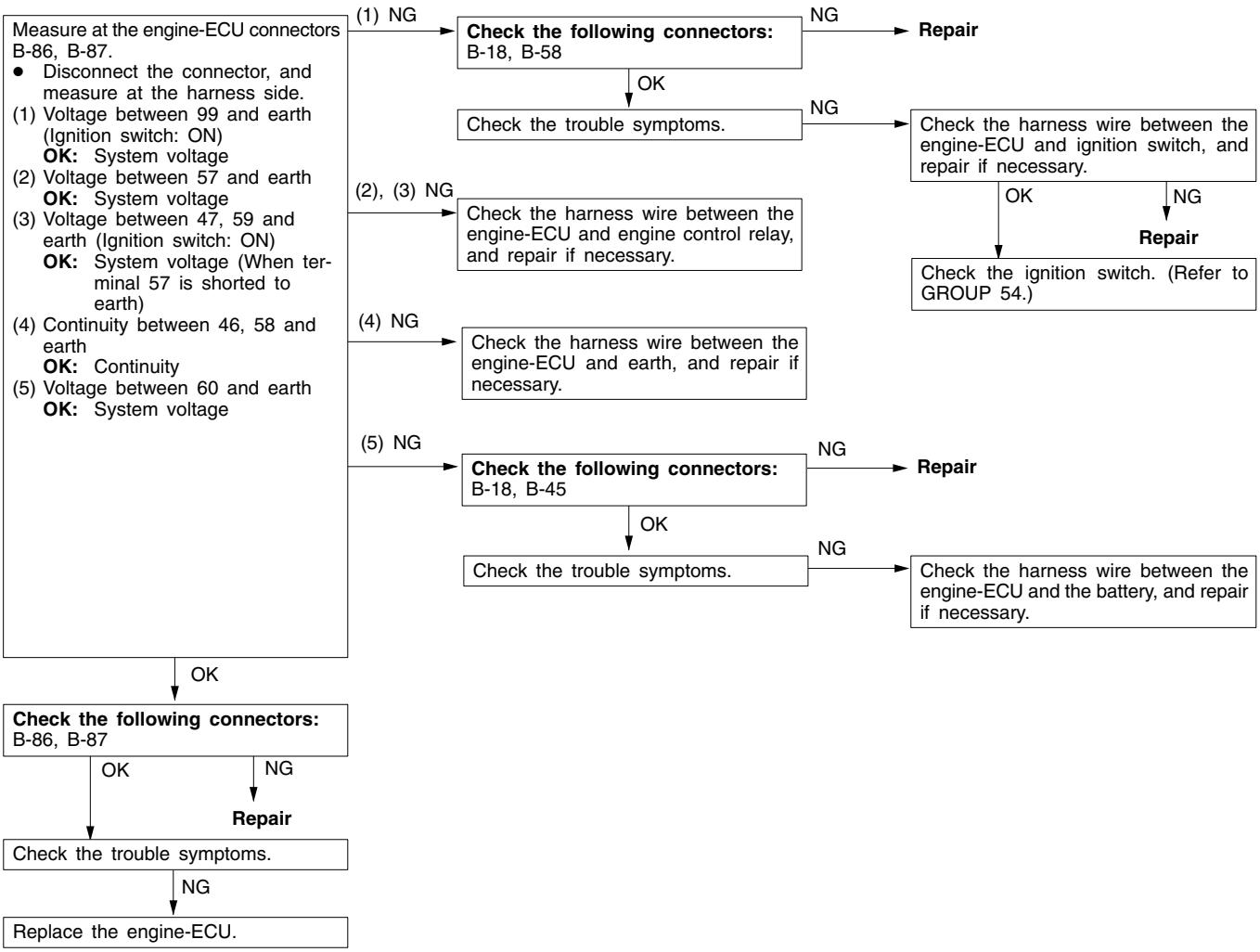
GDI ECO indicator lamp remains illuminated and does not go off.	Probable cause
If the GDI ECO indicator lamp does not go off during high load operation, the causes listed in the right column are suspected.	• Short circuit between the GDI ECO indicator lamp and engine-ECU • Malfunction of the engine-ECU <M/T> • Malfunction of the engine-A/T-ECU <A/T>



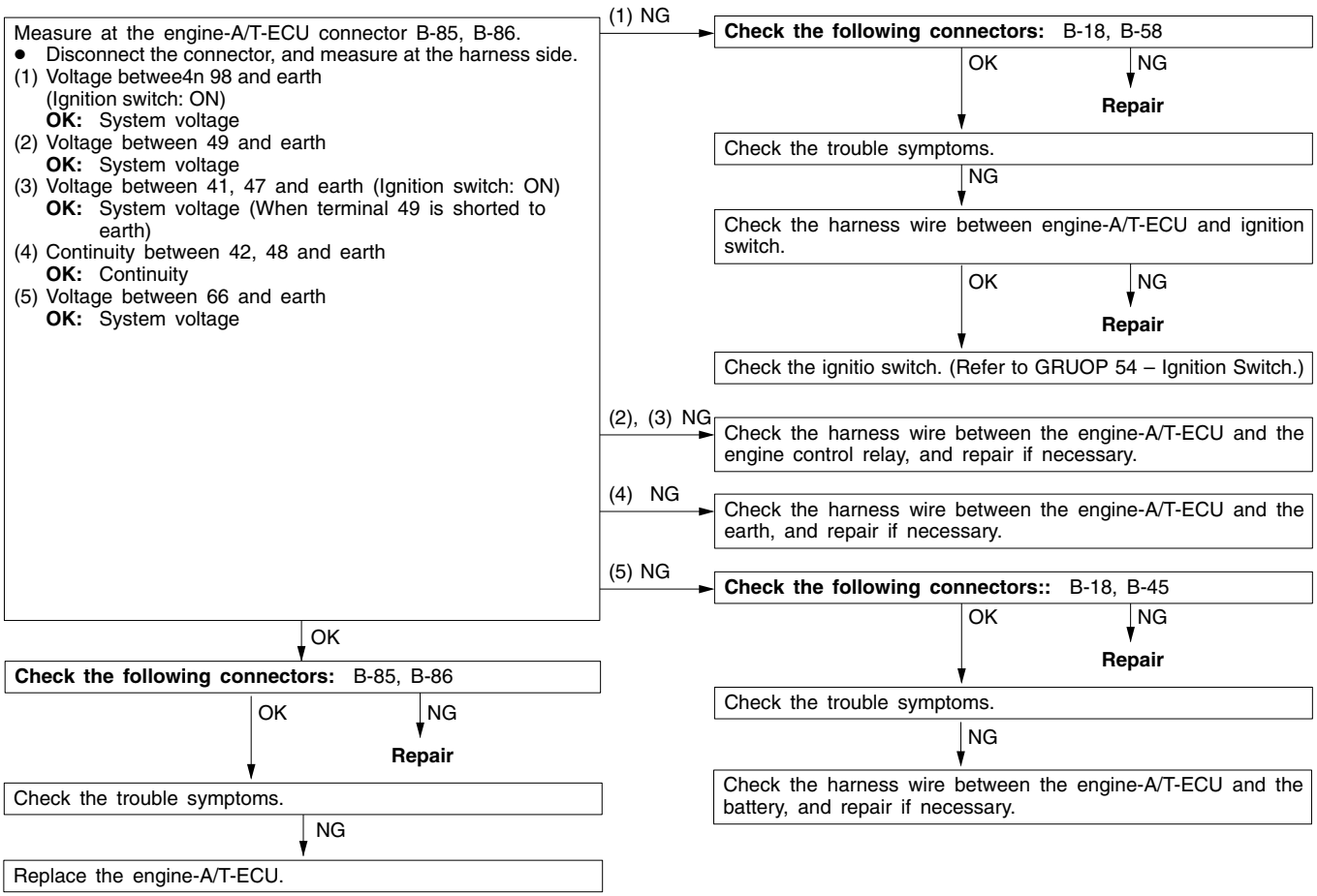
INSPECTION PROCEDURE 25

Engine-ECU (engine-A/T-ECU) power supply and earth circuit system	Probable cause
The cause is probably a malfunction of the engine-ECU <M/T> or engine-A/T-ECU <A/T> or one of the problems listed at right.	• Open circuit or short-circuited harness wire in the engine-ECU <M/T>or engine-A/T-ECU <A/T> power supply circuit • Open circuit or short-circuited harness wire in the engine-ECU <M/T> or engine-A/T-ECU <A/T> earth circuit • Malfunction of the engine-ECU <M/T> • Malfunction of the engine-A/T-ECU <A/T>

<M/T>

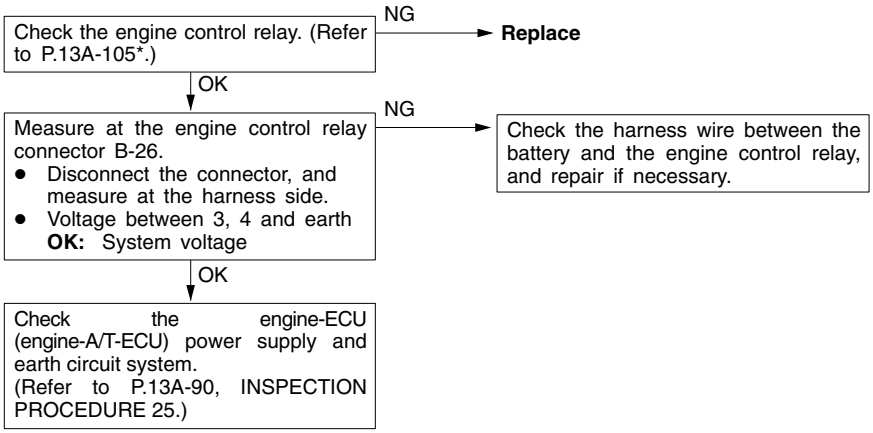


<A/T>



INSPECTION PROCEDURE 26

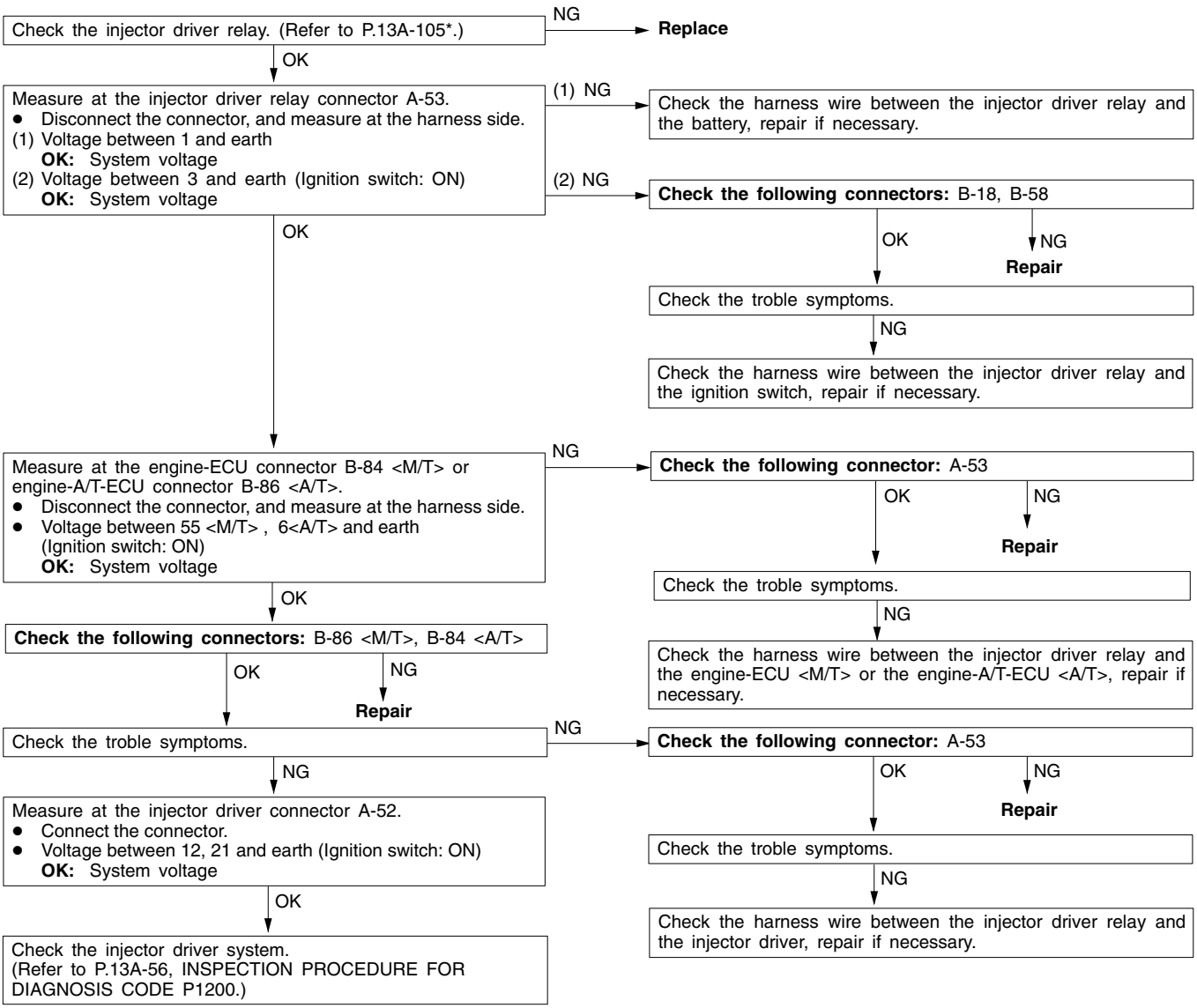
Engine control relay and ignition switch-IG system	Probable cause
When the ignition switch ON signal is input to the engine-ECU <M/T> or engine-A/T-ECU <A/T>, the engine-ECU <M/T> or engine-A/T-ECU <A/T> turns on the engine control relay. This causes system voltage to be supplied to the engine-ECU <M/T> or engine-A/T-ECU <A/T> and to the sensors and actuators.	● Malfunction of the ignition switch ● Malfunction of the engine control relay ● Open circuit or short-circuited harness wire of the engine control relay circuit ● Malfunction of the engine-ECU <M/T> ● Malfunction of the engine-A/T-ECU <A/T>



NOTE
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

INSPECTION PROCEDURE 27

Injector driver relay system	Probable cause
When the ignition switch ON signal is input to the engine-ECU <M/T> or the engine -A/T-ECU <A/T>, engine-ECU <M/T> or the engine -A/T-ECU <A/T> turns on the injector driver relay. This causes system voltage to be supplied to the injector driver.	• Malfunction of the injector driver relay • Improper connector contact, open circuit or short-circuited harness wire • Malfunction of the engine-ECU <M/T> or engine-A/T-ECU <A/T>



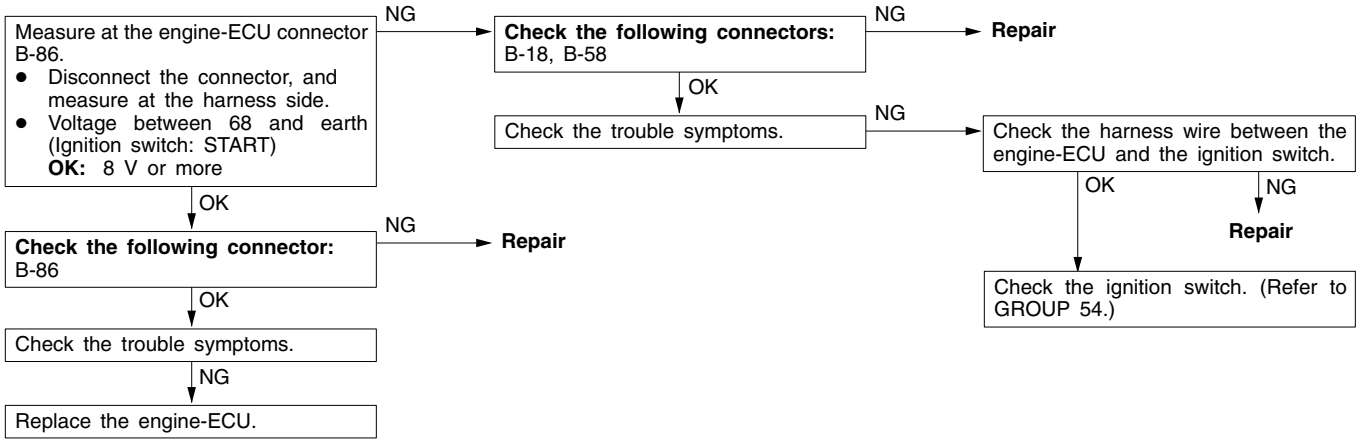
NOTE

*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

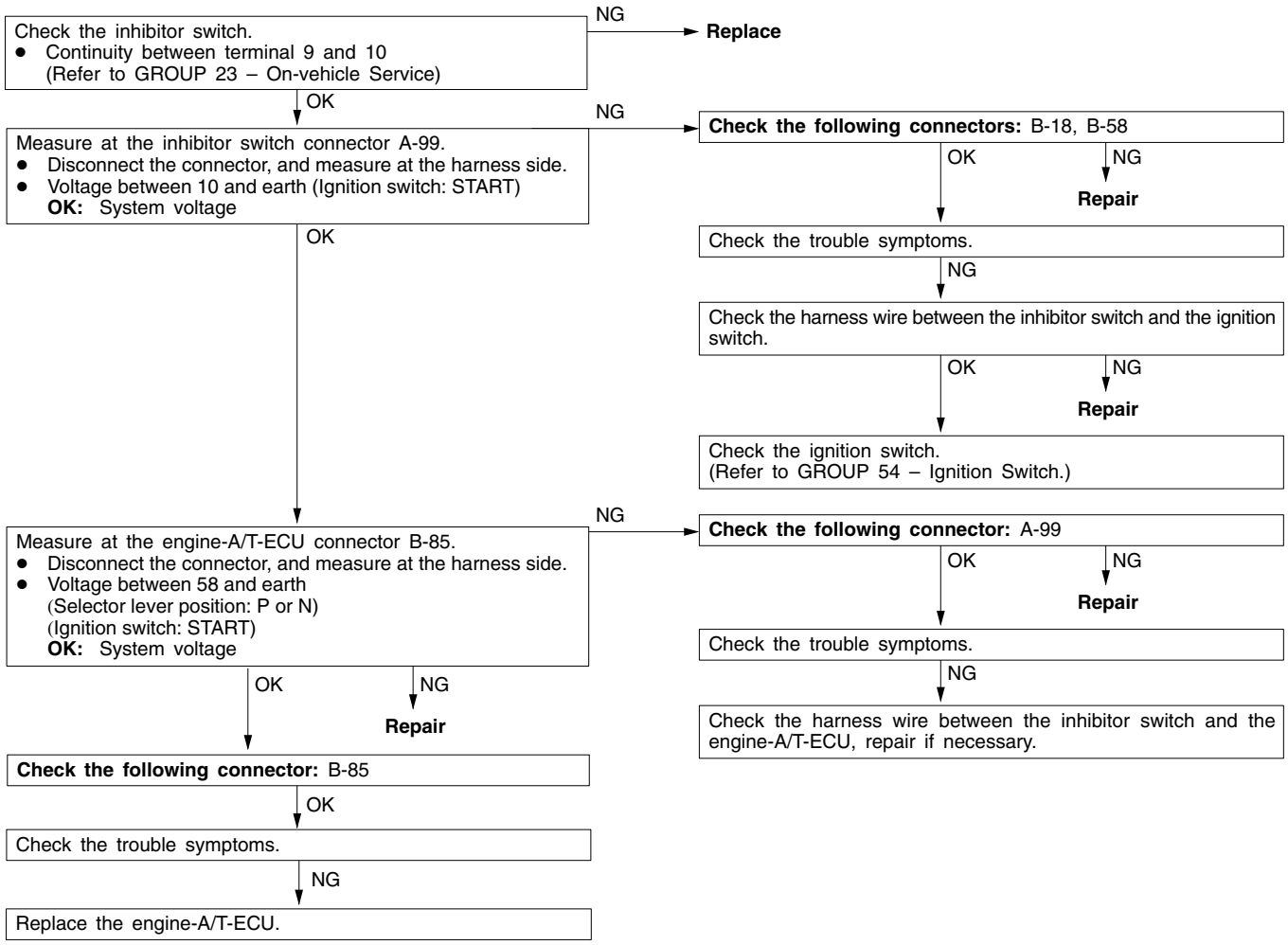
INSPECTION PROCEDURE 28

Ignition switch-ST system	Probable cause
The ignition switch-ST outputs a HIGH signal to the engine-ECU <M/T> or engine-A/T-ECU <A/T> while the engine is cranking. The engine-ECU <M/T> or engine-A/T-ECU <A/T> uses this signal to carry out functions such as fuel injection control during starting.	• Malfunction of the ignition switch • Malfunction of the inhibitor switch <A/T> • Open circuit or short-circuited harness wire of the ignition switch circuit • Malfunction of the engine-ECU <M/T> • Malfunction of the engine-A/T-ECU <A/T>

<M/T>

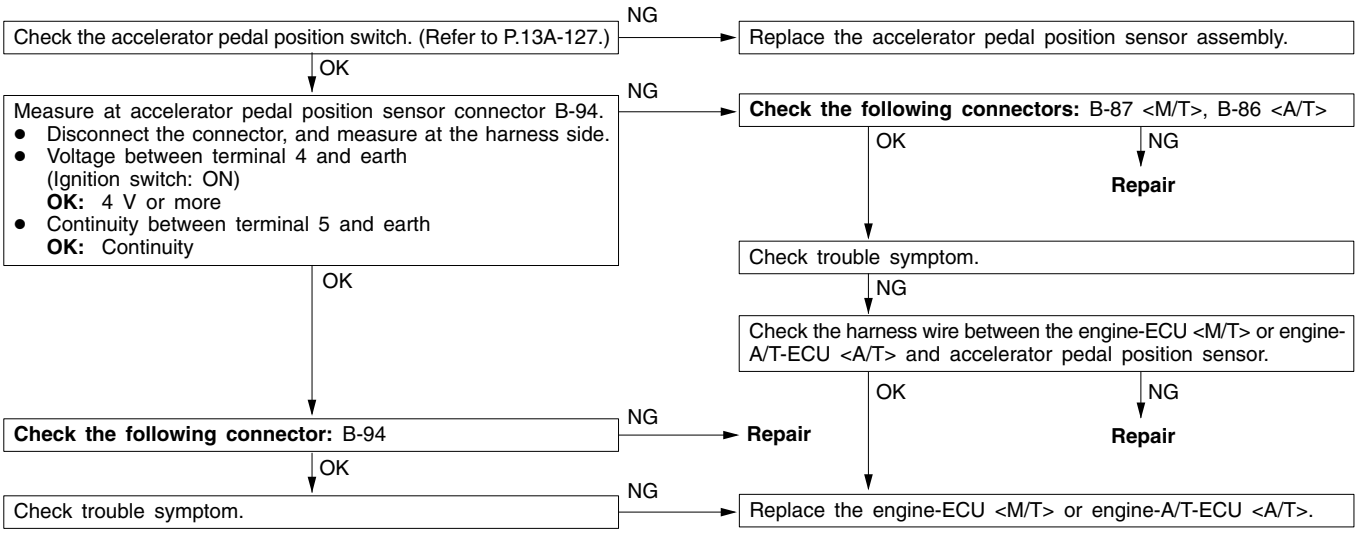


<A/T>



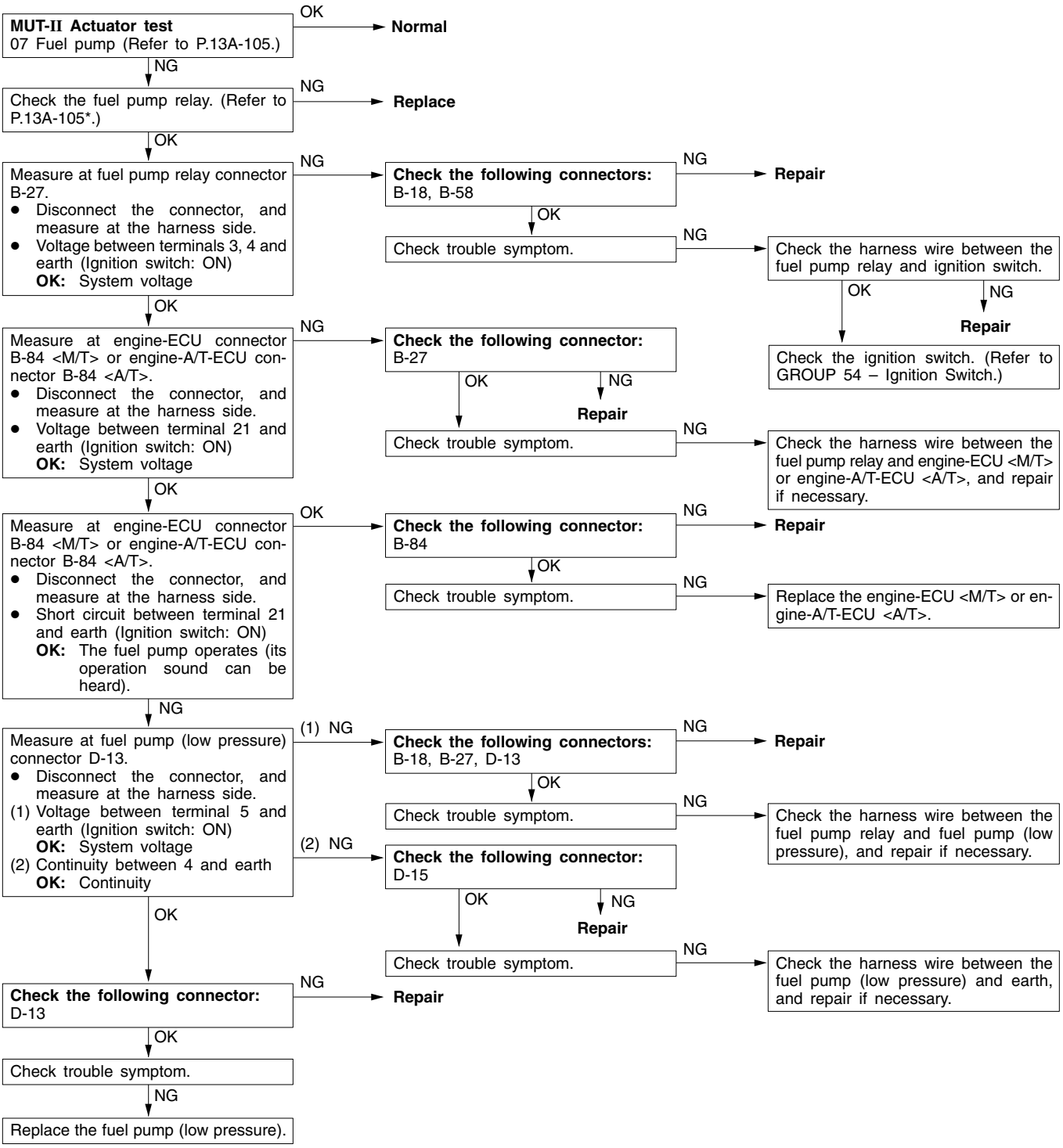
INSPECTION PROCEDURE 29

Accelerator pedal position switch system	Probable cause
The accelerator pedal position switch detects that the accelerator pedal is fully closed, and sends a signal to the engine-ECU <M/T> or engine-A/T-ECU <A/T>. The engine-ECU <M/T> or engine-A/T-ECU <A/T> controls idle speed, based on this signal.	• Maladjustment of the accelerator cable • Maladjustment of the accelerator pedal position switch • Open circuit or short-circuited harness wire in the accelerator pedal position switch system, or poor connector contact • Malfunction of the engine-ECU <M/T> • Malfunction of the engine-A/T-ECU <A/T>



INSPECTION PROCEDURE 30

Fuel pump (low pressure) system	Probable cause
The engine-ECU <M/T> or engine-A/T-ECU <A/T> turns on the fuel pump relay while the engine is cranking or running, and supplies power source to the fuel pump (low pressure).	• Malfunction of the fuel pump relay • Malfunction of the fuel pump (low pressure) • Open circuit or short-circuited harness wire in the fuel pump (low pressure) circuit, or poor connector contact • Malfunction of the engine-ECU <M/T> • Malfunction of the engine-A/T-ECU <A/T>

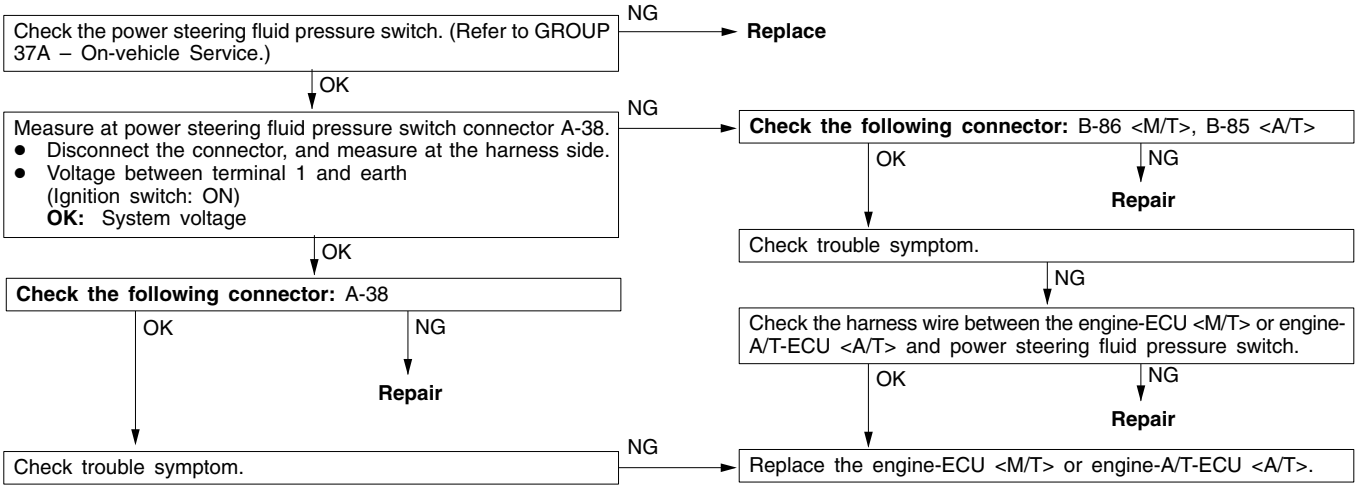


NOTE

*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

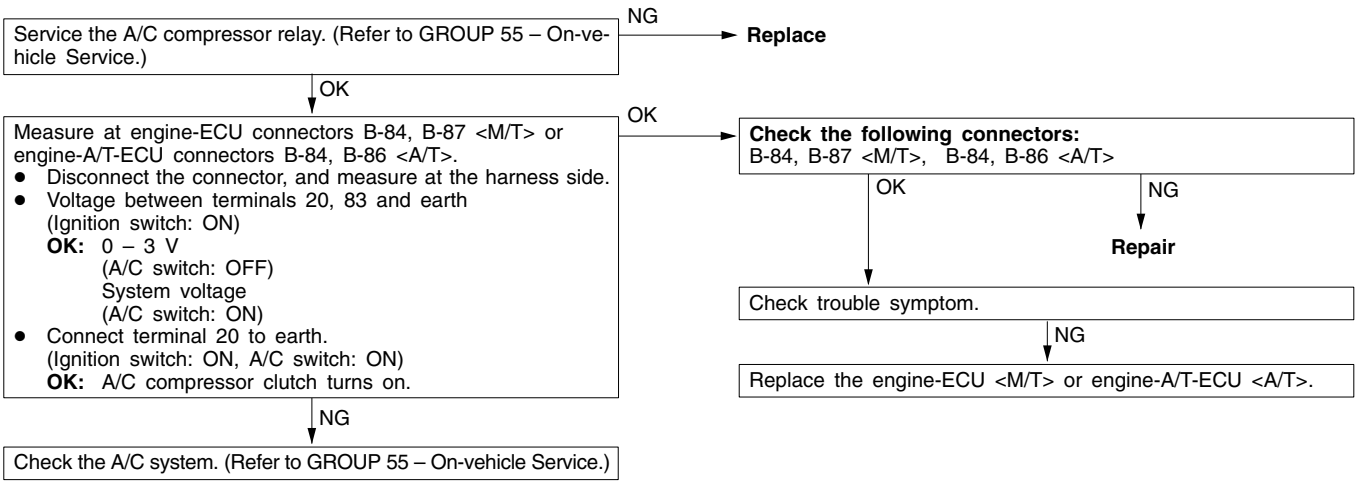
INSPECTION PROCEDURE 31

Power steering fluid pressure switch system	Probable cause
The power steering fluid pressure switch sends a signal to the engine-ECU <M/T> or engine-A/T-ECU <A/T> according to power steering load. Based on this signal, the engine-ECU <M/T> or engine-A/T-ECU <A/T> controls the throttle control servo so that idle speed increases when the power steering is in operation.	• Malfunction of the power steering fluid pressure switch • Open circuit or short-circuited harness wire in the power steering fluid pressure switch circuit, or poor connector contact • Malfunction of the engine-ECU <M/T> • Malfunction of the engine-A/T-ECU <A/T>



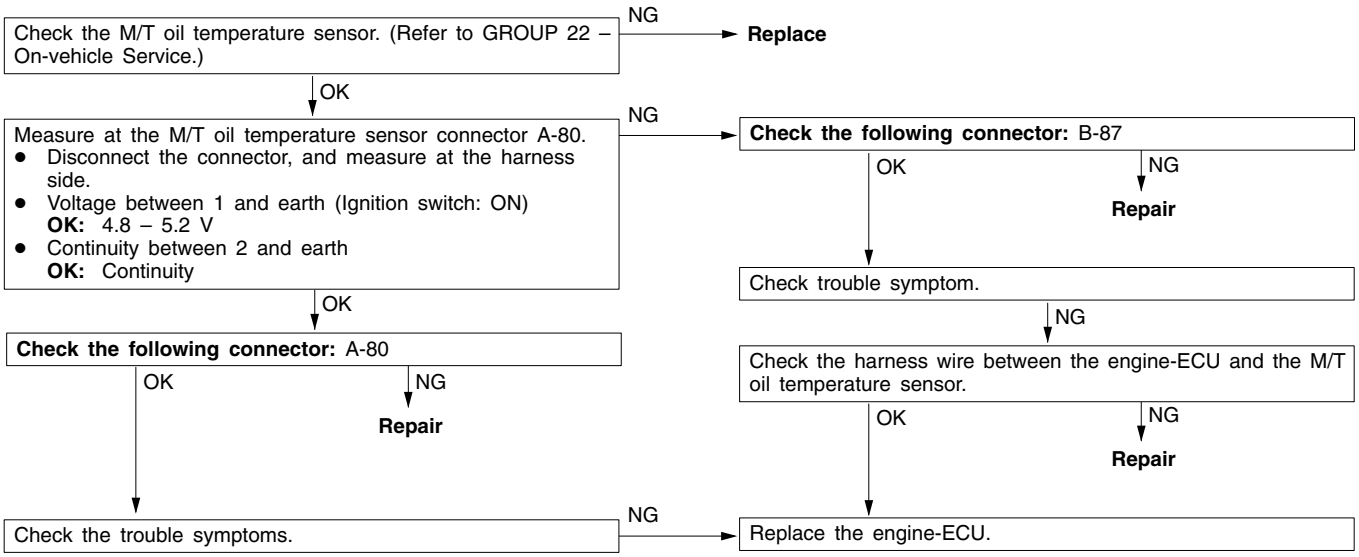
INSPECTION PROCEDURE 32

A/C switch and A/C relay system	Probable cause
If the engine-ECU receives a 'A/C on' signal, it operates the throttle control servo and A/C compressor magnetic clutch so that idle speed increases.	• Malfunction of the A/C control system • Malfunction of the A/C switch • Open circuit or short-circuited harness wire in the A/C switch circuit, or poor connector contact • Malfunction of the engine-ECU <M/T> • Malfunction of the engine-A/T-ECU <A/T>



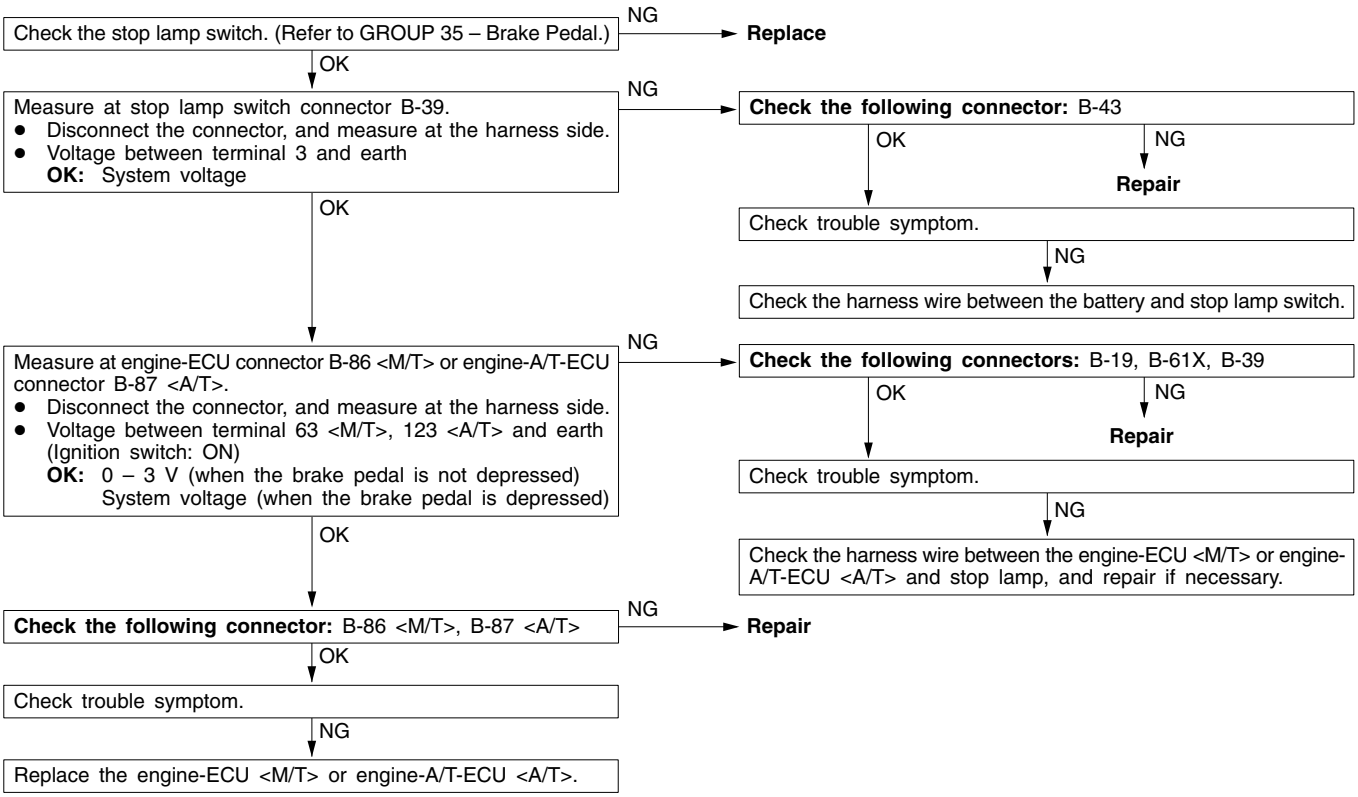
INSPECTION PROCEDURE 33

M/T oil temperature sensor system	Probable cause
This sensor inputs the manual transmission oil temperature to the engine-ECU. The engine-ECU uses this input to control the idle speed control servo so that the idle speed is increased when the manual transmission oil temperature becomes low.	• Malfunction of the M/T oil temperature sensor • Open circuit or short-circuited harness wire in the M/T oil temperature sensor circuit • Malfunction of the engine-ECU



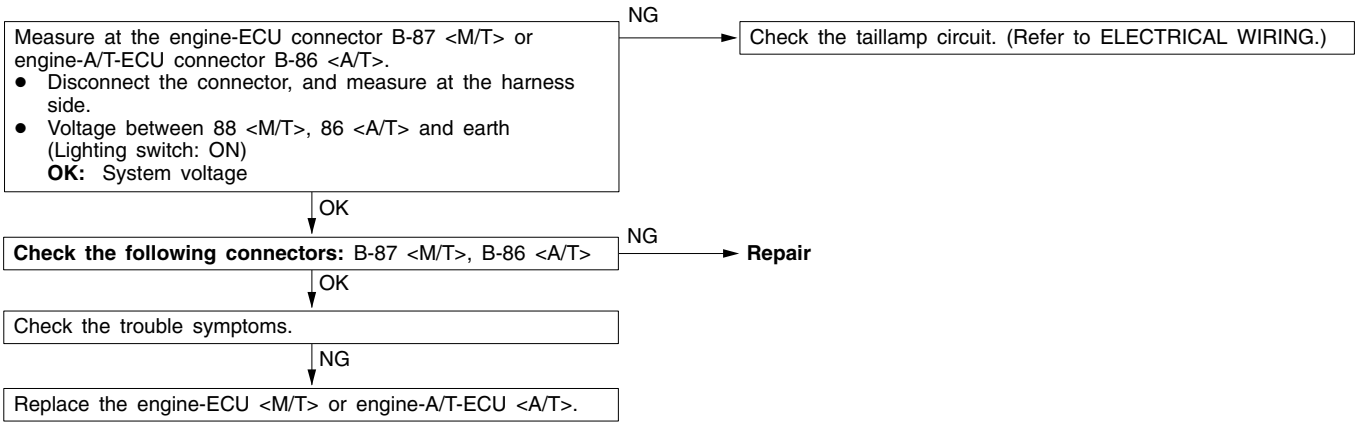
INSPECTION PROCEDURE 34

Stop lamp switch system	Probable cause
The engine-ECU <M/T> or engine-A/T-ECU <A/T> determines whether the brake pedal is depressed or not, by means of the stop lamp switch input signal.	• Malfunction of the stop lamp switch • Open circuit or short-circuited harness wire in the stop lamp circuit, or poor connector contact • Malfunction of the engine-ECU <M/T> • Malfunction of the engine-A/T-ECU <A/T>



INSPECTION PROCEDURE 35

Small lamp switch system	Probable cause
The engine-ECU <M/T> or engine-A/T-ECU <A/T> determines whether the small lamp switch is on or off. According to that information, the engine-ECU <M/T> or engine-A/T-ECU <A/T> controls alternator output current when the vehicle is started.	• Improper connector contact, open circuit or short-circuited harness wire in the taillamp circuit • Malfunction of the engine-ECU <M/T> • Malfunction of the engine-A/T-ECU <A/T>



DATA LIST REFERENCE TABLE

Caution
When shifting the select lever to D range, the brakes should be applied so that the vehicle does not move forward.

NOTE
*1: Within four minutes after starting the engine
*2: In a new vehicle [driven approximately 500 km or less], the injector drive time is sometimes 10 % longer than the standard time.
*3: The accelerator pedal position switch normally turns off when the voltage of the accelerator pedal position sensor (1st channel) is 200 – 600 mV higher than the voltage at the idle position. If the accelerator pedal position switch turns back on after the accelerator pedal position sensor voltage has risen by 100 mV and the throttle valve has opened, the accelerator pedal position switch and the accelerator pedal position sensor (1st channel) need to be adjusted.

Item No.	Check items	Requirements		Normal condition	Inspection procedure No.	Reference page
11	Oxygen sensor (front)	Engine: After warm-up	Idling	200 mV or less*1	Code No. P0130	13A-26
			Sudden racing	600 – 1,000 mV		
			2,500 r/min	400 mV or less and 600 – 1,000 mV alternates.		
12	Air flow sensor	• Engine coolant temperature: 80 – 95°C • Lamps, electric cooling fan and all accessories: OFF • Transmission: Neutral (A/T: P range)	Idling	27 – 53 Hz	Code No. P0100	13A-14
			2,500 r/min	55 – 95 Hz		
			Racing	Frequency increases in response to racing.		
13	Intake air temperature sensor	Ignition switch: ON	Intake air temperature: –20°C	–20°C	Code No. P0110	13A-18
			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		

Item No.	Check items	Requirements		Normal condition	Inspection procedure No.	Reference page
14	Throttle position sensor (2nd channel)	• Engine coolant temperature: 80 – 95°C • Ignition switch: ON (Engine stopped)	Release the accelerator pedal.	4,500 – 5,500	Code No. P0225	13A-44
			Depress the accelerator pedal gradually.	Voltage decreases in response to the pedal depression.		
			Depress the accelerator pedal fully.	400 – 600 mV		
16	Power supply voltage	Ignition switch: ON		System voltage	Procedure No. 25	13A-90
18	Cranking signal (Ignition switch – ST)	Transmission: Neutral (A/T: P range)	Engine: Stopped	OFF	Procedure No. 28	13A-93
			Engine: Cranking	ON		
21	Engine coolant temperature sensor	Ignition switch: ON	Engine coolant temperature: –20°C	–20°C	Code No. P0115	13A-19
			Engine coolant temperature: 0°C	0°C		
			Engine coolant temperature: 20°C	20°C		
			Engine coolant temperature: 40°C	40°C		
			Engine coolant temperature: 80°C	80°C		
22	Crank angle sensor	• Engine: Cranking • Tachometer: Connected	Compare the engine speed readings on the tachometer and the MUT-II.	Accord	Code No. P0335	13A-48
		• Engine: Idling • Accelerator pedal position switch: ON	Engine coolant temperature: –20°C	1,200 – 1,400 r/min		
			Engine coolant temperature: 0°C	1,100 – 1,300 r/min		
			Engine coolant temperature: 20°C	1,000 – 1,200 r/min		
			Engine coolant temperature: 40°C	800 – 1,000 r/min		
			Engine coolant temperature: 80°C	550 – 650 <M/T> r/min*1 600 – 700 <A/T> r/min*1		
24	Vehicle speed sensor	Drive at 40 km/h		Approximately 40 km/h	Code No. P0500	13A-56

Item No.	Check items	Requirements		Normal condition	Inspection procedure No.	Reference page
25	Barometric pressure sensor	Ignition switch: ON	Altitude: 0 m	101 kPa	Code No. P0105	13A-16
			Altitude: 600 m	95 kPa		
			Altitude: 1,200 m	88 kPa		
			Altitude: 1,800 m	81 kPa		
26	Accelerator pedal position switch	Ignition switch: ON (Depress and release the accelerator pedal several times)	Release the accelerator pedal.	ON	Procedure No. 29	13A-94
			Depress the accelerator pedal slightly.	OFF		
27	Power steering fluid pressure switch	Engine: Idling	Steering wheel stationary	OFF	Procedure No. 31	13A-96
			Steering wheel turning	ON		
28	A/C switch	Engine: Idling (The A/C compressor is running when the A/C switch is on.)	A/C switch: OFF	OFF	Procedure No. 32	13A-96
			A/C switch: ON	ON		
31	Small lamp switch	Engine: Idling	Lighting switch: OFF	OFF	Procedure No. 35	13A-98
			Lighting switch: ON	ON		
34	Air flow sensor reset signal	Engine: After having warmed up	Engine is idling	ON	Code No. P0100	13A-14
			3,000 r/min	OFF		
37	Volumetric efficiency	• Engine coolant temperature: 80 – 95°C • Lamps, electric cooling fan and all accessories: OFF • Transmission: Neutral (A/T: P range)	Engine is idling	15 – 35 %	–	–
			2,500 r/min	15 – 35 %		
			Engine is suddenly raced	Volumetric efficiency increases in response to racing		
38	Crank angle sensor	• Engine: Cranking [reading is possible at 2,000 r/min or less] • Tachometer: Connected		Engine speeds displayed on the MUT-II and tachometer are identical.	–	–

Item No.	Check items	Requirements		Normal condition	Inspection procedure No.	Reference page
41	Injector drive time*2	• Engine coolant temperature: 80 – 95°C • Lamps, electric cooling fan and all accessories: OFF • Transmission: Neutral (A/T: P range)	Idling	0.5 – 0.7 ms*1	–	–
			2,500 r/min	0.6 – 0.8 ms		
			Sudden racing	Increases		
44	Ignition advance	• Engine: After warm-up • Set a timing light.	Idling	12 – 20°BTDC*1	Code No. P0300	13A-45
			2,500 r/min	20 – 40°BTDC		
48	M/T oil temperature sensor	Drive after the engine has warmed up.	Drive for 15 minutes or more	Gradually increases to 50 – 90°C	Procedure No. 33	13A-97
49	A/C relay	Engine: After warm-up, idling	A/C switch: OFF	OFF (compressor clutch is not operating)	Procedure No. 32	13A-96
			A/C switch: ON	ON (compressor clutch is operating)		
59	Oxygen sensor (rear)	• Transmission: 2nd gear (A/T: L range) • Drive with throttle widely open	3,500 r/min	600 – 1,000 mV	Code No. P0136	13A-29
66	Brake vacuum sensor	• Engine coolant temperature: 80 – 95°C • Lamps, electric cooling fan and all accessories: OFF • Transmission: Neutral (A/T: P range)	Stop the engine from idling speed, and then depress the brake pedal several times with the ignition switch on.	Displayed pressure increases.	Code No. P1515	13A-65
67	Stop lamp switch	Ignition switch: ON	Brake pedal: Depressed	OFF	Procedure No. 34	13A-98
			Brake pedal: Released	ON		
68	EGR valve	• Engine coolant temperature: 80 – 95°C • Lamps, electric cooling fan and all accessories: OFF • Transmission: Neutral (A/T: P range)	Idling	2 – 20 STEP	Code No. P0403	13A-52
			2,500 r/min	0 – 10 STEP		

Item No.	Check items	Requirements		Normal condition	Inspection procedure No.	Reference page
74	Fuel pressure sensor	• Engine coolant temperature: 80 – 95°C • Lamps, electric cooling fan and all accessories: OFF • Transmission: Neutral (A/T: P range)	Engine: Idling	4 – 6.9 MPa	Code No. P0190	13A-34
77	Accelerator pedal position sensor (2nd channel)*3	Ignition switch: ON	Release the accelerator pedal.	985 – 1,085 mV	Code No. P1225	13A-61
			Depress the accelerator pedal gradually.	Increases in response to the pedal depression stroke.		
			Depress the accelerator pedal fully.	4,000 mV or more		
78	Accelerator pedal position sensor (1st channel)*3	Ignition switch: ON	Release the accelerator pedal.	985 – 1,085 mV	Code No. P0220	13A-41
			Depress the accelerator pedal gradually.	Increases in response to pedal depression stroke.		
			Depress the accelerator pedal fully.	4,000 mV or more		
79	Throttle position sensor (1st channel)	• Engine coolant temperature: 80 – 95°C • Ignition switch: ON (Engine stopped)	Release the accelerator pedal.	450 – 800 mV	Code No. P0120	13A-22
			Depress the accelerator pedal gradually.	Increases in response to pedal depression stroke.		
			Depress the accelerator pedal fully.	4,200 – 4,900 mV		
		Engine: After warm-up, idling	No load	450 – 1,000 mV		
			A/C switch: OFF → ON	Increases by 100 – 600 mV.		
81	Long-term fuel compensation	Engine: Warm, 2,500 r/min without any load (during closed loop)		–12.5 – 12.5 %	Code No. P0170	13A-32
82	Short-term fuel compensation	Engine: Warm, 2,500 r/min without any load (during closed loop)		–30 – 25 %	Code No. P0170	13A-32

Item No.	Check items	Requirements		Normal condition	Inspection procedure No.	Reference page
85	Fuel pressure sensor	• Engine coolant temperature: 80 – 95°C • Lamps, electric cooling fan and all accessories: OFF • Transmission: Neutral (A/T: P range)	Engine: Idling	4,000 – 6,900 kPa	–	–
87	Calculation load value	Engine: Warm	Engine: Idling	15 – 35 %	–	–
			2,500 r/min	15 – 35 %		
88	Fuel control condition	Engine: Warm	2,500 r/min	Closed loop	Code No. P0125	13A-24
			When engine is suddenly raced	Open loop – drive condition		
99	Fuel injection mode	Engine: After warm up	Idling (after four minutes or more have passed since engine start)	Lean compression	–	–
			2,500 r/min	Stoichiometric metric feedback		
			Sudden racing after idle position	Open loop		
A1	Oxygen sensor (front)	Engine: After warm-up	Idling	0 V	Code No. P0130	13A-26
			Sudden racing	0.6 – 1.0 V		
			2,500 r/min	0.4 V or less and 0.6 – 1.0 V alternates		
A2	Oxygen sensor (rear)	• Transmission: 2nd gear <M/T>, L range <A/T> • Drive with throttle widely open	3,500 r/min	0.6 – 1.0 V	Code No. P0136	13A-29
8A	Throttle position sensor (1st channel) (Throttle valve opening angle)	• Engine coolant temperature: 80 – 95°C • Ignition switch: ON (Engine: stopped)	Release the accelerator pedal.	8 – 16 %	Code No. P0120	13A-22
			Depress the accelerator pedal gradually.	Increase in response to pedal depression stroke.		
			Depress the accelerator pedal fully.	80 – 100 %		
		Engine: After warm-up, idling	No load	8 – 18 %		
			A/C switch: OFF → ON	Rises by 2 – 10 %		

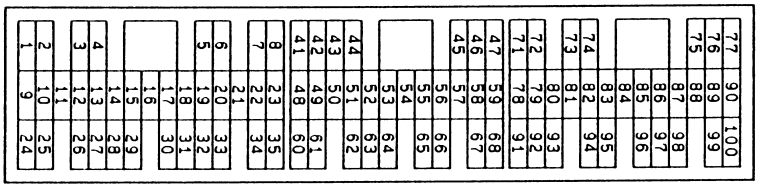
ACTUATOR TEST REFERENCE TABLE

Item No.	Inspection item	Drive contents	Inspection contents	Normal condition	Inspection procedure No.	Reference page
01	Injectors	Cut fuel to No. 1 injector	Engine: After having warmed up/Engine is idling (Cut the fuel supply to each injector in turn and check cylinders which don't affect idling.)	Idling condition becomes different (becomes unstable).	Code No. P0201	13A-35
02		Cut fuel to No. 2 injector			Code No. P0202	13A-37
03		Cut fuel to No. 3 injector			Code No. P0203	13A-38
04		Cut fuel to No. 4 injector			Code No. P0204	13A-39
07	Fuel pump (low pressure)	Fuel pump operates and fuel is recirculated.	Ignition switch: ON	Sound of operation is heard.	Procedure No. 30	13A-95
08	Purge control solenoid valve	Solenoid valve turns from OFF to ON.	Ignition switch: ON	Sound of operation can be heard when solenoid valve is driven.	Code No. P0443	13A-55
17	Basic ignition timing	Set the engine-ECU <M/T> or engine-A/T-ECU <A/T> to ignition timing adjustment mode	Idling after engine warm up	5°BTDC	–	–
21	Fan controller	Drive the fan motor	Ignition switch: ON	The fan motor operates	Procedure No. 21	13A-87
34	Electronic-controlled throttle valve system	Stop the throttle control servo.	Ignition switch: ON	Throttle valve is opened slightly.	Code No. P1220	13A-57

CHECK AT THE ENGINE-ECU TERMINALS <M/T>

TERMINAL VOLTAGE CHECK CHART

Engine-ECU Connector Terminal Arrangement



7FU2119

Terminal No.	Check item	Check requirements (engine condition)		Normal condition
1	No. 1 injector	Engine: Warm up, and then depress the accelerator pedal suddenly from the idle speed.		Decreases slightly for short time from 9 – 13 V
9	No. 2 injector			
24	No. 3 injector			
2	No. 4 injector			
3	No. 1 ignition coil	Engine: 3,000 r/min		0.3 – 3.0 V
13	No. 2 ignition coil			
12	No. 3 ignition coil			
4	No. 4 ignition coil			
5	EGR valve (D)	Ignition switch: Immediately after turning ON		5 – 8 V (fluctuates for approx. three seconds)
6	EGR valve (C)			
32	EGR valve (B)			
34	EGR valve (A)			
8	Alternator G terminal	• Engine: Warm up, and then idling • Radiator fan: Not operating • Headlamp: OFF → ON • Stop lamp: OFF → ON • Rear defogger switch: OFF → ON		Voltage increases by 0.2 – 3.5 V
14	GDI ECO indication lamp	Ignition switch: OFF → ON		0 – 3 V (System voltage after five seconds)
		Engine: When the accelerator pedal is suddenly depressed while the engine is idling		System voltage
16	Purge control solenoid valve	• Engine coolant temperature: 80 – 95°C • Ignition switch: ON	Engine: Stopped	System voltage
			Engine: Start the engine, and then increase engine speed up to 3,500 r/min.	Voltage decreases

Terminal No.	Check item	Check requirements (engine condition)		Normal condition
18	Fan controller	Radiator and condenser fans are not operating.		0 – 0.3 V
		Radiator and condenser fans are operating.		0.7 V or more
20	A/C relay	• Engine: Idling • A/C switch: OFF → ON (Compressor is operating)		System voltage, or changes from momentarily 6 V or more to 0 → 3 V
21	Fuel pump relay	Ignition switch: ON	Engine: Stopped	System voltage
			Engine: Idling	0 – 3 V
31	Engine warning lamp	Ignition switch: OFF → ON		0 – 3 V → System voltage (after several seconds)
41	Sensor power supply	Ignition switch: ON		4.5 – 5.5 V
42	Power supply to accelerator pedal position sensor (1st channel)	Ignition switch: ON		4.5 – 5.5 V
43	Crank angle sensor	Engine: Cranking		0.4 – 4.0 V
		Engine: Idling		1.5 – 2.5 V
44	Engine coolant temperature sensor	Ignition switch: ON	Engine coolant temperature: 0°C	3.2 – 3.5 V
			Engine coolant temperature: 20°C	2.3 – 2.9 V
			Engine coolant temperature: 40°C	1.5 – 2.1 V
			Engine coolant temperature: 80°C	0.4 – 1.0 V
45	Engine ignition signal	Engine: 3,000 r/min		0.3 – 3.0 V
47	Power supply	Ignition switch: ON		System voltage
59				
50	Camshaft position sensor	Engine: Cranking		0.4 – 3.0 V
		Engine: Idling		0.5 – 2.0 V
51	Barometric pressure sensor	Ignition switch: ON	Altitude: 0 m	3.7 – 4.3 V
			Altitude: 1,200 m	3.2 – 3.8 V
52	Alternator FR terminal	• Engine: Warm up, and then idling • Radiator fan: Not operating • Headlamp: OFF → ON • Stop lamp: OFF → ON • Rear defogger: OFF → ON		Voltage decreases

Terminal No.	Check item	Check requirements (engine condition)		Normal condition
53	Oxygen sensor (rear)	• Transmission: 2nd gear • Engine speed: 3,500 r/min or more • Driving with the throttle valve widely open		0.6 – 1.0 V
54	Power steering fluid pressure switch	Engine: Warm up, and then idling	Steering wheel stationary	System voltage
			Steering wheel turning	0 – 3 V
55	Injector driver relay	Ignition switch: OFF		0 – 0.1 V
		Ignition switch: ON		0.5 – 1.0 V
56	Throttle valve control servo relay	Ignition switch: OFF		0 – 0.3 V
		Ignition switch: ON		0.5 – 1.0 V
57	Engine control relay	Ignition switch: OFF		0 – 3 V
		Ignition switch: ON		System voltage
60	Back-up power source	Ignition switch: OFF		System voltage
61	Air flow sensor	Engine: Idling		2.2 – 3.2 V
		Engine: 2,500 r/min		
62	Intake air temperature sensor	Ignition switch: ON	Intake air temperature: 0°C	3.2 – 3.8 V
			Intake air temperature: 20°C	2.3 – 2.9 V
			Intake air temperature: 40°C	1.5 – 2.1 V
			Intake air temperature: 80°C	0.4 – 1.0 V
63	Stop lamp switch	Depress the brake pedal.		System voltage
		Release the brake pedal.		0 – 3 V
65	A/C switch (2nd channel)	Refer to GROUP 55 – Troubleshooting “Check at the A/C-ECU terminal, engine-ECU output terminals.”		
66	Clutch switch	Depress the clutch pedal.		0 – 3 V
		Release the clutch pedal.		System voltage
68	Ignition switch-ST	Engine: Cranking		8 V or more
71	Oxygen sensor (front)	Engine: Warm up, and then hold the engine speed at 2,500 r/min (Use a digital voltmeter).		0 ↔ 0.8 V alternates.
73	M/T oil temperature sensor	M/T oil temperature: 25°C		2.4 – 2.7 V
		M/T oil temperature: 80°C		0.5 – 0.8 V

Terminal No.	Check item	Check requirements (engine condition)		Normal condition
74	Brake vacuum sensor	Engine: Stop the engine from idle speed, turn the ignition switch ON, and then depress the brake pedal several times.		Voltage increases
76	Air flow sensor reset signal	Engine: Idling		0 – 1 V
		Engine: 3,000 r/min		6 – 9 V
78	Throttle position sensor (2nd channel)	Ignition switch: ON	Release the accelerator pedal.	4.5 – 5.5 V
			Depress the accelerator pedal fully.	0.4 – 0.6 V
79	Accelerator pedal position switch	Ignition switch: ON	Release the accelerator pedal.	0 – 1 V
			Depress the accelerator pedal fully.	4 V or more
80	Vehicle speed sensor	• Ignition switch: ON • Move the vehicle forward.		0 ↔ system voltage alternates.
83	A/C switch (1st channel)	Engine: Idling	A/C switch: OFF	0 – 3 V
			A/C switch: ON (Compressor is operating)	System voltage
88	Small lamp switch	Lighting switch: OFF		0 – 3 V
		Lighting switch: ON (Taillamp: ON)		System voltage
89	Oxygen sensor heater (front)	Engine: Idling		0 – 3 V
		Engine: 3,500 r/min		System voltage
90	Oxygen sensor heater (rear)	Engine: Idling		0 – 3 V
		Engine: 3,500 r/min		System voltage
92	Fuel pressure sensor	Engine: Idling		0.3 – 4.7 V
94	Accelerator pedal position sensor (1st channel)	Ignition switch: ON	Release the accelerator pedal.	0.985 – 1.085 V*1
			Depress the accelerator pedal fully.	4 V or more*2
96	Injector open circuit check signal	Engine: Increase engine speed from idle speed to 4,000 r/min.		Decreases slightly (approx. 0.7 V) from 4.5 V – 5.0 V.
99	Ignition switch-IG	Ignition switch: ON		System voltage

NOTE
Check if the difference in output between *1 and *2 is 4 V or more.

CHECK CHART FOR RESISTANCE AND CONTINUITY BETWEEN TERMINALS

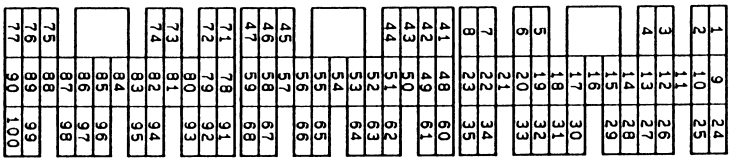
1. Turn the ignition switch to OFF.
2. Disconnect the engine-ECU connector.
3. Measure the resistance and check for continuity between the terminals of the engine-ECU harness-side connector while referring to the check chart.

   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 then 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

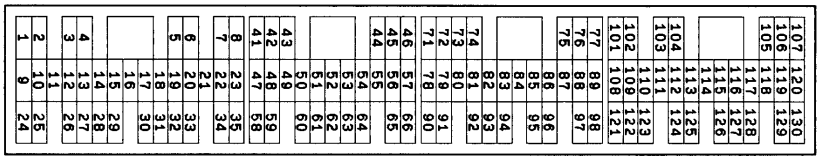


Terminal No.	Check item	Standard value, normal condition (check requirements)
5 – 47	EGR valve (D)	15 – 20 Ω (at 20°C)
6 – 47	EGR valve (C)	
32 – 47	EGR valve (B)	
34 – 47	EGR valve (A)	
16 – 47	Purge control solenoid valve	36 – 44 Ω (at 20°C)
44 – 72	Engine coolant temperature sensor	5.1 – 6.5 kΩ (when engine coolant temperature is 0°C)
		2.1 – 2.7 kΩ (when engine coolant temperature is 20°C)
		0.9 – 1.3 kΩ (when engine coolant temperature is 40°C)
		0.26 – 0.36 kΩ (when engine coolant temperature is 80°C)
46 – Body earth	Earth	Continuity (0 Ω)
58 – Body earth		
62 – 72	Intake air temperature sensor	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)
		0.30 – 0.42 kΩ (when intake air temperature is 80°C)
79 – 49	Accelerator pedal position switch	Continuity (when the accelerator pedal is released)
		No continuity (when the accelerator pedal is slightly depressed)
89 – 47	Oxygen sensor heater control (front)	4.5 – 8.0 Ω (at 20°C)
90 – 47	Oxygen sensor heater (rear)	11 – 18 Ω (at 20°C)

CHECK AT THE ENGINE-A/T-ECU TERMINALS <A/T>

TERMINAL VOLTAGE CHECK CHART

Engine-A/T-ECU Connector Terminal Arrangement



7FU1763

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 9 – 13 V, momentarily drops slightly
9	No. 2 injector		
24	No. 3 injector		
2	No. 4 injector		
3	Oxygen sensor heater (front)	Engine: Idling	0 – 3 V
		Engine: 3,500 r/min	System voltage
6	Injector driver relay	Ignition switch: OFF	0 – 0.1 V
		Ignition switch: ON	0.5 – 1.0 V
8	Alternator G terminal	• Engine: Idling after warming-up • Radiator fan: Not operating • Headlamp: OFF to ON • Stop lamp: OFF to ON • Defogger switch: OFF to ON	The voltage increases by 0.2 – 3.5 V
54	Alternator FR terminal	• Engine: Idling after warming-up • Radiator fan: Not operating • Headlamp: OFF to ON • Stop lamp: OFF to ON • Defogger switch: OFF to ON	The voltage drops
11	No. 1 ignition coil	Engine speed: 3,000 r/min	0.3 – 3.0 V
12	No. 2 ignition coil		
31	No. 3 ignition coil		
30	No. 4 ignition coil		
14	Throttle control servo relay	Ignition switch: OFF	0 – 0.1 V
		Ignition switch: ON	0.5 – 1.0 V
18	Fan controller	Condenser fan not operating	System voltage
		Condenser fan operating	0 – 3 V or more
19	Air flow sensor reset signal	Engine: Idling	0 – 1 V
		Engine speed: 3,000 r/min	6 – 9 V

Terminal No.	Check item	Check condition (Engine condition)		Normal condition
20	A/C relay	• Engine: Idling • A/C switch: OFF to ON (Compressor operating)		System voltage or changes momentarily 6 V or more to 0 – 3 V
21	Fuel pump relay	Ignition switch: ON		System voltage
		Engine: Idling		0 – 3 V
22	Engine warning lamp	Ignition switch: OFF to ON		System voltage
23	GDI ECO indication lamp	Ignition switch: OFF → ON		0 – 3 V (System voltage after five seconds)
		Rev the engine suddenly.		System voltage
26	Oxygen sensor heater (rear)	Engine: Idling		0 – 3 V
		Engine: 3,500 r/min		System voltage
34	Purge control solenoid valve	• Engine coolant temperature: 80 – 95°C • Ignition switch: ON	Engine: Stopped	System voltage
			Engine: After starting, increase the engine speed up to 3,500 r/min	The voltage drops
41	Power supply	Ignition switch: ON		System voltage
47				
43	Engine ignition signal	Engine speed: 3,000 r/min		0.3 – 3.0 V
44	Engine coolant temperature sensor	Ignition switch: ON	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 80°C	0.3 – 0.9 V
45	Crank angle sensor	Engine: Cranking		0.4 – 4.0 V
		Engine: Idling		1.5 – 2.5 V
46	Power supply voltage applied to accelerator pedal position sensor (1st channel)	Ignition switch: ON		4.5 – 5.5 V
49	Engine control relay	Ignition switch: OFF		0 – 3 V
		Ignition switch: ON		System voltage
51	EGR valve (A)	Ignition switch: OFF to ON		5 – 8 V (Repeatedly changes for approx. 3 seconds)
53	EGR valve (C)			
60	EGR valve (B)			
62	EGR valve (D)			

Terminal No.	Check item	Check condition (Engine condition)		Normal condition
52	Power steering fluid pressure switch	Engine: Idling after warming-up	When steering wheel is stationary	System voltage
			When steering wheel is turned	0 – 3 V
55	Barometric pressure sensor	Ignition switch: ON	At an altitude of 0 m	3.7 – 4.3 V
			At an altitude of 1,200 m	3.2 – 3.8 V
56	Camshaft position sensor	Engine: Cranking		0.4 – 3.0 V
		Engine: Idling		0.5 – 2.0 V
58	Ignition switch-ST	Engine: Cranking		8 V or more
61	A/C switch 2	Refer to GROUP 55 – Troubleshooting (Check at A/C-ECU or Engine-ECU Terminal).		
63	Injector open circuit check signal	Engine: Increases from idling up to 4,000 r/min		The voltage decreases slightly (approx. 0.7 V) from 4.5 – 5.0 V.
64	Intake air temperature sensor	Ignition switch: ON	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 80°C	0.4 – 1.0 V
65	Air flow sensor	Engine: Idling		2.2 – 3.2 V
		Engine speed: 2,500 r/min		
66	Backup power supply	Ignition switch: OFF		System voltage
71	Oxygen sensor (front)	Engine: Running at 2,500 r/min after warming-up (Check by using a digital voltmeter.)		Voltages of 0 V and 0.8 V alternate
73	Oxygen sensor (rear)	• Transmission: L range • Engine speed: 3,500 r/min or more • Driving with the throttle valve widely open		0.6 – 1.0 V
78	Throttle position sensor (2nd channel)	Ignition switch: ON	Release the accelerator pedal.	4.5 – 5.5 V
			Depress the accelerator pedal fully.	0.4 – 0.6 V
79	Accelerator pedal position switch	Ignition switch: ON	Release the accelerator pedal.	0 – 1 V
			Depress the accelerator pedal slightly.	4 V or more
80	Vehicle speed sensor	• Ignition switch: ON • Move the vehicle slowly forward		Voltages of 0 and 8 –12 V alternate (changes repeatedly)

Terminal No.	Check item	Check condition (Engine condition)		Normal condition
83	A/C switch 1	Engine: Idling	A/C switch: OFF	0 – 3 V
			A/C switch: ON (Compressor is operating)	System voltage
86	Small lamp switch	Lighting switch: OFF		0 – 3 V
		Lighting switch: Tail light position		System voltage
87	Sensor applied voltage	Ignition switch: ON		4.5 – 5.5 V
93	Fuel pressure sensor	Engine: Idling		0.3 – 4.7 V
95	Accelerator pedal position sensor (1st channel)	Ignition switch: ON	Release the accelerator pedal.	0.985 – 1.085 V
			Depress the accelerator pedal fully.	4.0 V or higher
96	Brake vacuum sensor	Engine: Stop the engine from idle speed, turn the ignition switch ON, and then depress the brake pedal several times.		Voltage increases
98	Ignition switch-IG	Ignition switch: ON		System voltage
123	Stop lamp switch	Depress the brake pedal.		System voltage
		Release the brake pedal.		0 – 3 V

CHECK CHART FOR RESISTANCE AND CONTINUITY BETWEEN TERMINALS

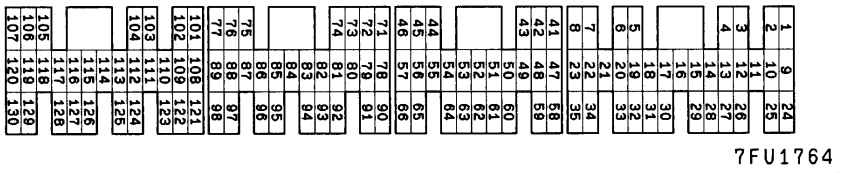
1. Turn the ignition switch to OFF.
2. Disconnect the engine-A/T-ECU connector.
3. Measure the resistance and check for continuity between the terminals of the engine-A/T-ECU harness-side connector while referring to the check chart.

   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-A/T-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 then repair or replace.
5. After repair or replacement, recheck with the ohmmeter to confirm that the repair or replacement has corrected the problem.

Engine-A/T-ECU Harness Side Connector Terminal Arrangement

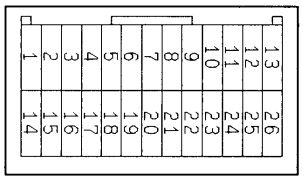


Terminal No.	Check item	Standard value, normal condition (check conditions)
3 – 41	Oxygen sensor heater (front)	4.5 – 8.0 Ω (at 20°C)
26 – 41	Oxygen sensor heater (rear)	11 – 18 Ω (at 20°C)
34 – 41	Purge control solenoid valve	28 – 36 Ω (at 20°C)
Between terminal 42 and body earth	Earth	Continuity (0 Ω)
Between terminal 48 and body earth		
51 – 41	EGR valve (A)	15 – 20 Ω (at 20°C)
53 – 41	EGR valve (C)	
60 – 41	EGR valve (B)	
62 – 41	EGR valve (D)	
44 – 81	Engine coolant temperature sensor	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)
		0.26 – 0.36 kΩ (When coolant temperature is 80°C)
64 – 81	Intake air temperature sensor	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)
		0.30 – 0.42 kΩ (When intake air temperature is 80°C)
79 – 81	Accelerator pedal position switch	Continuity (when the accelerator pedal is released)
		No continuity (when the accelerator pedal is depressed slightly)

CHECK AT THE THROTTLE VALVE CONTROLLER TERMINALS

TERMINAL VOLTAGE CHECK CHART

Throttle Valve Controller Terminal Arrangement



7FU2121

Terminal No.	Check items	Requirements		Normal value
1	Throttle valve control servo (A+)	• Ignition switch: ON • Accelerator pedal: Fully opened → fully closed		Decreases slightly from system voltage.
9	Throttle valve control servo (B+)			
14	Throttle valve control servo (A–)	• Ignition switch: ON • Accelerator pedal: Fully closed → fully opened		Decreases slightly (approx. 2 V) from system voltage.
15	Throttle valve control servo (B–)			
2	Power supply to throttle valve control servo	Ignition switch: ON		System voltage
19				
5	Power supply	Ignition switch: ON		System voltage
6	Sensor voltage	Ignition switch: ON		4.5 – 5.5 V
7	Throttle position sensor (1st channel)	Ignition switch: ON	Release the accelerator pedal.	0.45 – 0.8 V
			Depress the accelerator pedal fully.	4.2 – 4.9 V
20	Accelerator pedal position sensor (2nd channel)	Ignition switch: ON	Release the accelerator pedal.	0.985 – 1.085 V*1
			Depress the accelerator pedal fully.	4 V or more*1

NOTE:
Check that the voltage difference between *1 and *2 is 4 V or more.

INSPECTION PROCEDURE USING AN ANALYZER

AIR FLOW SENSOR (AFS)

The followings have been changed from the previous description.

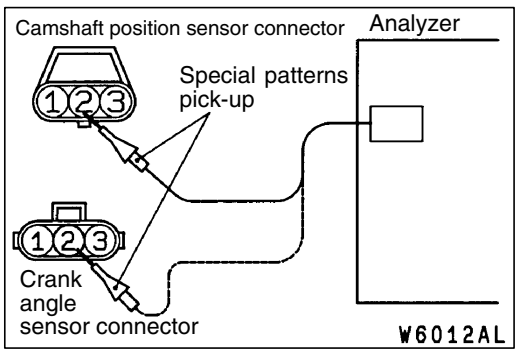
Alternate Method (Test harness not available)

<Vehicles with M/T>

Connect the analyzer special patterns pickup to engine-ECU terminal 61.

<Vehicles with A/T>

Connect the analyzer special patterns pickup to engine-A/T-ECU terminal 65.



CAMSHAFT POSITION SENSOR AND CRANK ANGLE SENSOR

The measurement method has been changed from the previous description.

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 analyzer special patterns pickup to camshaft position sensor terminal 2.
3. Disconnect the crank angle sensor connector and connect the special tool (test harness: MD998478) in between.
4. Connect the analyzer special patterns pickup to crank angle sensor terminal 2.

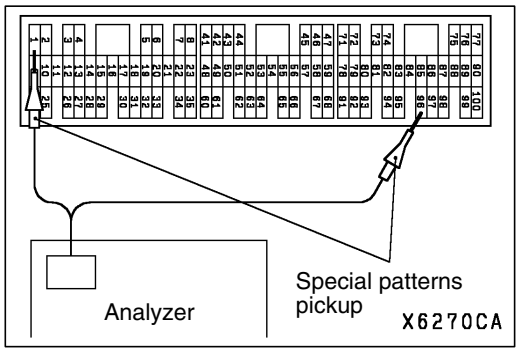
Alternate Method (Test harness not available)

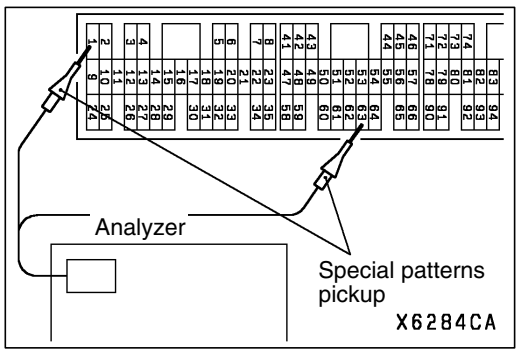
<Vehicles with M/T>

1. Connect the analyzer special patterns pickup to engine-ECU terminal 50. (When checking the camshaft position sensor signal wave pattern.)
2. Connect the analyzer special patterns pickup to engine-ECU terminal 43. (When checking the crank angle sensor signal wave pattern.)

<Vehicles with A/T>

1. Connect the analyzer special patterns pickup to engine-A/T-ECU terminal 56. (When checking the camshaft position sensor signal wave pattern.)
2. Connect the analyzer special patterns pickup to engine-A/T-ECU terminal 45. (When checking the crank angle sensor signal wave pattern.)





INJECTORS AND INJECTOR OPEN CIRCUIT CHECK SIGNAL

The measurement method has been changed from the previous description.

Measurement Method

<Vehicles with M/T>

1. Connect the analyzer special patterns pickup to terminal 1 (No. 1 injector) of the engine-ECU connector.
2. Connect the analyzer special patterns pickup to terminal 96 (injector open circuit check signal) of the engine-ECU connector.
3. After checking terminal 1, check terminal 9 (No. 2 injector), terminal 24 (No. 3 injector) and terminal 2 (No. 4 injector).

<Vehicles with A/T>

1. Connect the analyzer special patterns pickup to terminal 1 (No. 1 injector) of the engine-A/T-ECU connector.
2. Connect the analyzer special patterns pickup to terminal 63 (injector open circuit check signal) of the engine-A/T-ECU connector.
3. After checking terminal 1, check terminal 9 (No. 2 injector), terminal 24 (No. 3 injector) and terminal 2 (No. 4 injector).

IGNITION COIL AND POWER TRANSISTOR (Power transistor control signal)

The followings have been changed from the previous description.

Alternate Method (Test harness not available)

<Vehicles with M/T>

Connect the analyzer special patterns pickup to engine-ECU terminal 3 (No. 1 ignition coil), terminal 13 (No. 2 ignition coil), terminal 12 (No. 3 ignition coil) and terminal 4 (No. 4 ignition coil) respectively.

<Vehicles with A/T>

Connect the analyzer special patterns pickup to engine-A/T-ECU terminal 11 (No. 1 ignition coil), terminal 12 (No. 2 ignition coil), terminal 31 (No. 3 ignition coil) and terminal 30 (No. 4 ignition coil) respectively.

EGR VALVE (STEPPER MOTOR)

The followings have been changed from the previous description.

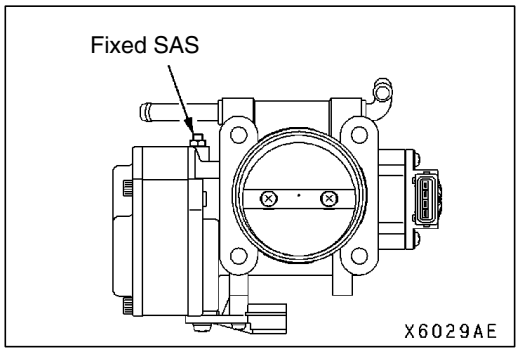
Alternate Method (Test harness not available)

<Vehicles with M/T>

Connect the analyzer special patterns pickup to engine-ECU terminal 34, connection terminal 32, connection terminal 6, and connection terminal 5 respectively.

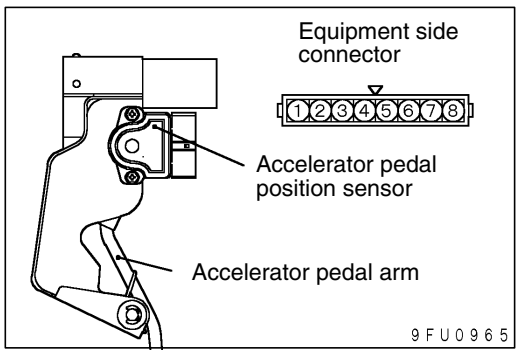
<Vehicles with A/T>

Connect the analyzer special patterns pickup to engine-A/T-ECU terminal 51, connection terminal 60, connection terminal 53, and connection terminal 62 respectively.



ON-VEHICLE SERVICE

Caution
(1) Never attempt to tamper the fixed SAS. The fixed SAS is precisely adjusted at factory.
(2) Should it be tampered, the full closed position of the throttle valve will be changed. This causes the engine-ECU <M/T> or engine-A/T-ECU <A/T> to learn a wrong position of the throttle valve.



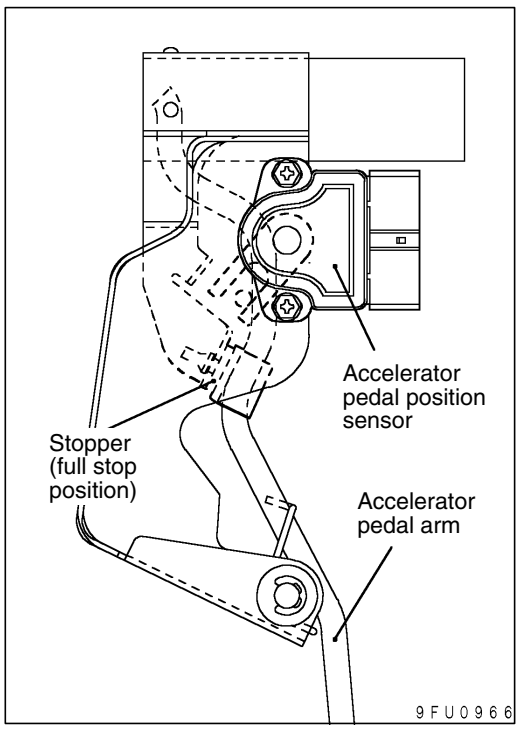
ACCELERATOR PEDAL POSITION SENSOR ADJUSTMENT

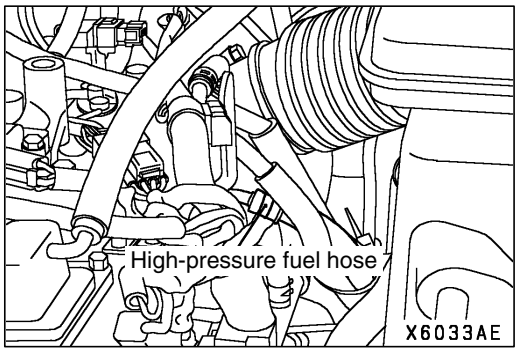
Caution
(1) Never attempt to tamper the accelerator pedal position sensor. The sensor position is precisely adjusted at factory.
(2) Should it be tampered, follow the procedure below:

1. Remove the accelerator pedal complete.
2. Connect the MUT-II to the diagnosis connector.
3. Loosen the accelerator pedal position sensor attaching bolts to allow it to be loosely fitted.
4. Ensure that the accelerator pedal arm contacts the full-stop position stopper.
5. Turn the ignition switch to the ON position (but do not start the engine).
6. Rotate the accelerator pedal position sensor to adjust sensor output voltage to the standard value.

   Standard value: 0.985 – 1.085 V

7. Tighten the sensor mounting bolts securely.
8. Install the accelerator pedal complete.





FUEL PRESSURE TEST

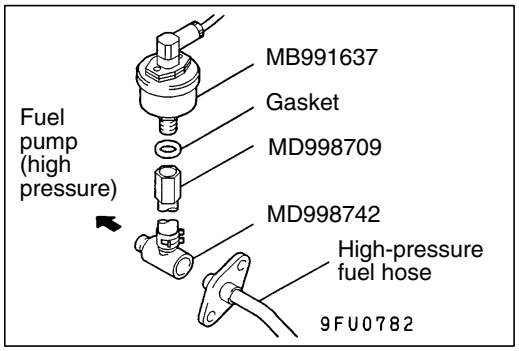
MEASUREMENT OF FUEL LOW PRESSURE BETWEEN FUEL PUMP (LOW PRESSURE) AND FUEL PUMP (HIGH PRESSURE)

1. Release residual pressure from the fuel pipe line to prevent fuel gush out.

   NOTE
   Refer to SPACE STAR '99 Workshop Manual (Pub. No. CMXE99E1) GROUP 13A – On-vehicle Service.

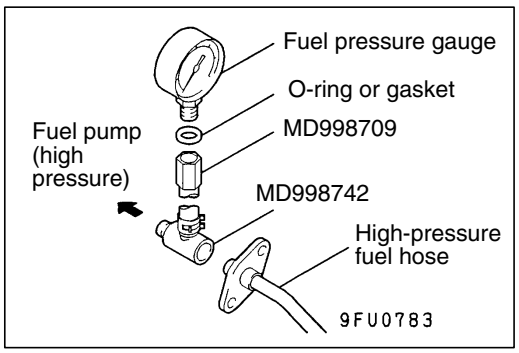
2. Disconnect the high-pressure fuel hose at the fuel pump (high pressure) side.

   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.



3. Remove the union joint and bolt from the special tool (adapter hose) and instead attach the special tool (hose adapter) to the adapter hose.
4. Install the special tool (for measuring the fuel pressure) that was set up in step 3.

   <When using the fuel pressure gauge set (special tool)>
   (1) Install the special tool (for measuring the fuel pressure) between the high-pressure fuel hose and the fuel pump (high pressure).
   (2) Install the fuel pressure gauge set (special tool) on the special tool (for measuring the fuel pressure) putting the gasket between them.
   (3) Connect the lead wire of the fuel pressure gauge set (special tool) to the power supply (cigarette lighter socket) and to the MUT-II.



<When using the fuel pressure gauge>
(1) Install the fuel pressure gauge on the special tool (for measuring the fuel pressure) putting a suitable O-ring or gasket between them.
(2) Install the special tool which was set up in step (1) between the high-pressure fuel hose and the fuel pump (high pressure).

5. Connect the MUT-II to the diagnosis connector.

   Caution
   Turn off the ignition switch before disconnecting or connecting the MUT-II.

6. Turn the ignition switch to ON. (But do not start the engine.)
7. Select "Item No. 07" from the MUT-II Actuator test to drive the fuel pump (low pressure) at the fuel tank side. Check that there are no fuel leaks from any parts.
8. Finish the actuator test or turn the ignition switch to OFF.
9. Start the engine and run at idle.
10. Measure fuel pressure while the engine is running at idle.

    Standard value: approximately 324 kPa

11. Check to see that fuel pressure at idle does not drop even after the engine has been raced several times.
12. If fuel pressure is out of the standard value, troubleshoot and repair according to the table below.

Symptom	Probable cause	Remedy
• Fuel pressure too low • Fuel pressure drops after racing	Clogged fuel filter	Replace fuel filter
	Fuel leaking to return side due to poor fuel pressure regulator (low pressure) valve seating or settled spring	Replace fuel pressure regulator (low pressure)
	Low fuel pump (low pressure) delivery pressure	Replace the fuel pump (low pressure)
Fuel pressure too high	Binding valve in fuel pressure regulator (low pressure)	Replace fuel pressure regulator (low pressure)
	Clogged fuel return hose or pipe	Clean or replace hose or pipe

13. 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 fuel pressure regulator (low pressure) valve seat	Replace fuel pressure regulator (low pressure)
Fuel pressure drops sharply immediately after engine is stopped	Check valve in fuel pump (low pressure) is held open	Replace the fuel pump (low pressure)

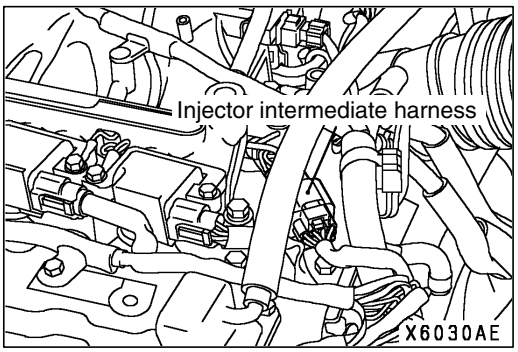
14. Release residual pressure from the fuel pipe line.

    NOTE
    Refer to SPACE STAR '99 Workshop Manual (Pub. No. CMXE99E1) GROUP 13A – On-vehicle Service.

15. Remove the fuel pressure gauge and special tools from the fuel pump (high pressure).

    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.

16. Replace the O-ring at the end of the high-pressure fuel hose with a new one. Furthermore, apply engine oil to the new O-ring before replacement.
17. Fit the high-pressure fuel hose to the fuel pump (high pressure) and tighten the mounting bolt to specified torque.
18. Check for any fuel leaks by following the procedure in step 7.
19. Disconnect the MUT-II.



MEASUREMENT OF FUEL HIGH PRESSURE BETWEEN FUEL PUMP (HIGH PRESSURE) AND INJECTORS

NOTE
Measurement of the fuel pressure between the fuel pump (high pressure) and the injectors should be carried out after checking that the fuel pressure between the fuel pump (low pressure) and the fuel pump (high pressure) is normal.

1. Connect the MUT-II to the diagnosis connector.
2. Disconnect the injector intermediate harness connector.
3. Turn the ignition switch to ON.
4. Select “Item No. 74” from the MUT-II Data list.
5. Crank the engine continuously for 2 seconds or more, and visually check that there are no fuel leaks from any parts.

    Caution
    If any fuel leaks appear, stop cranking immediately and repair the source of the leak.

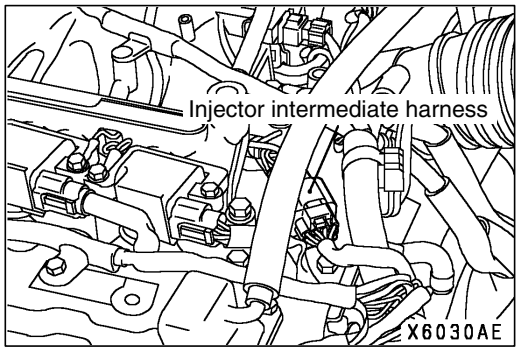
6. Check if the fuel pressure is more than 1 MPa immediately after 20 seconds have passed since cranking was finished.
7. If the fuel pressure is lower than 1 MPa, it means that there is likely to be a leak in the high-pressure fuel system, so this system should be checked.
8. Turn the ignition switch to OFF.
9. Connect the injector intermediate harness connector.
10. Start the engine and run at idle.
11. Measure fuel pressure while the engine is running at idle.

    Standard value: 4 – 6.9 MPa

12. Check to see that fuel pressure at idle does not drop even after the engine has been raced several times.
13. If fuel pressure is out of the standard value, troubleshoot and repair according to the table below.

Symptom	Probable cause	Remedy
• Fuel pressure too low • Fuel pressure drops after racing	Fuel leaking to return side due to poor fuel pressure regulator valve seating or settled spring in the fuel pump (high pressure).	Replace fuel pump (high pressure)
	Low fuel pump (high pressure) delivery pressure	Replace the fuel pump (high pressure)
Fuel pressure too high	Clogged fuel pressure regulator valve in the fuel pump (high pressure)	Replace fuel pump (high pressure)
	Clogged fuel return hose or pipe	Clean or replace hose or pipe

14. Stop the engine and turn the ignition switch to OFF.
15. Disconnect the MUT-II.



FUEL LEAK CHECK

1. Connect the MUT-II to the diagnosis connector.
2. Disconnect the injector intermediate harness connector.
3. Turn the ignition switch to ON.
4. Select “Item No. 74” from the MUT-II Data list.
5. Crank the engine continuously for two seconds or more, and visually check that there are no fuel leaks from any parts.

   Caution
   If any fuel leaks appear, stop cranking immediately and repair the source of the leak.

6. Crank the engine, and then measure fuel pressure immediately after 20 seconds.

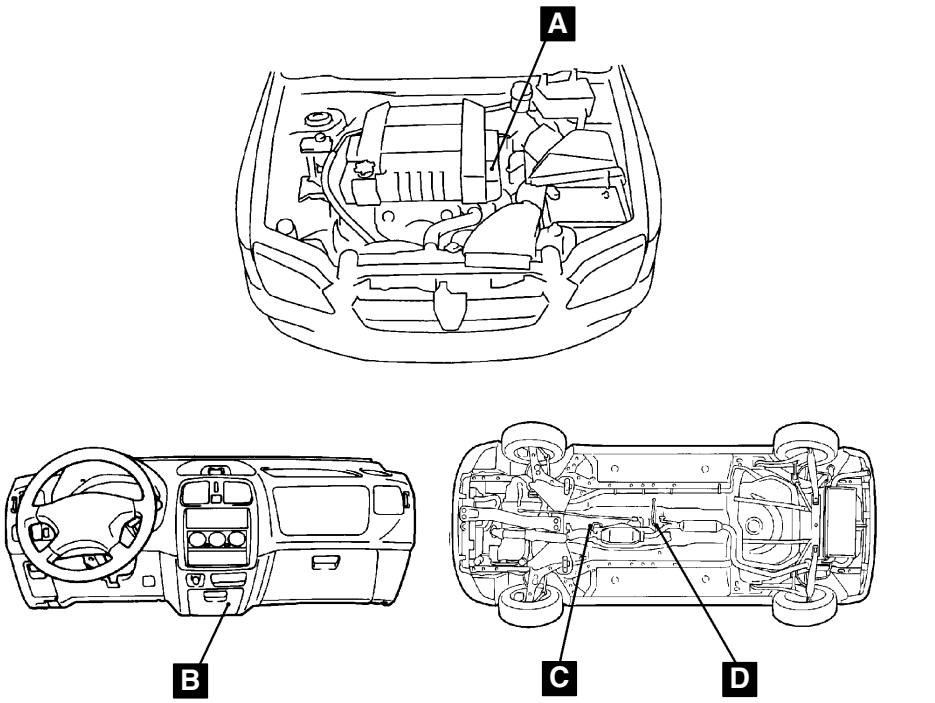
   Limit: Minimum 1 MPa

   Caution
   If the fuel pressure is less than 1 MPa, there may be a partial fuel leak in the high-pressure fuel system.

7. Turn off the ignition switch.
8. Reconnect the injector intermediate connector.
9. Remove the MUT-II.

COMPONENT LOCATION

Name	Symbol	Name	Symbol
Engine-A/T-ECU <A/T>	B	Oxygen sensor (front)	C
Ignition failure sensor	A	Oxygen sensor (rear)	D



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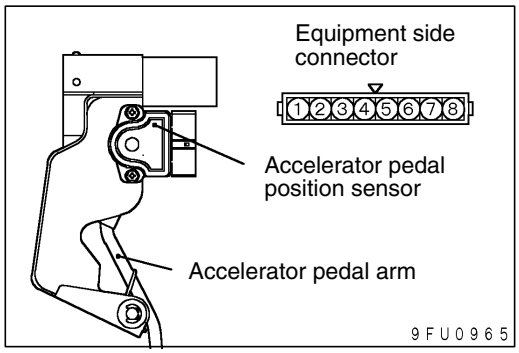


ACCELERATOR PEDAL POSITION SENSOR (1ST AND 2ND CHANNELS) CHECK

1. Disconnect the accelerator pedal position sensor connector.
2. Measure resistance between terminal Nos. 2 (1st channel power supply) and 1 (1st channel earth) as well as between terminal Nos. 8 (2nd channel power supply) and terminal No. 7 (2nd channel earth) of the sensor connector.

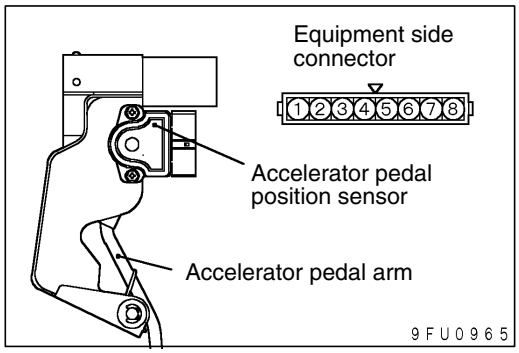
   Standard value: 3.5 – 6.5 kΩ
3. Measure resistance between terminal Nos. 2 (1st channel power supply) and 3 (1st channel output) as well as between terminal Nos. 8 (2nd channel power supply) and terminal No. 6 (2nd channel output) of the sensor connector.

   Normal condition:

Depress the accelerator pedal slowly.	Resistance value changes in accordance with the accelerator pedal depression smoothly.

4. If not within the standard value, or resistance value does not change smoothly, replace the accelerator pedal position sensor.

   NOTE
   After replacement, adjust the accelerator pedal position sensor. (Refer to P.13A-121.)



ACCELERATOR PEDAL POSITION SWITCH CHECK

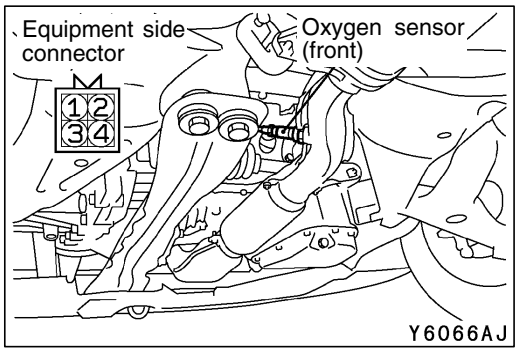
1. Disconnect the accelerator pedal position sensor connector.
2. Check continuity between terminal Nos. 4 (accelerator pedal position switch) and 5 (earth) of the connector.

   Normal condition:

Accelerator pedal	Continuity
Depressed	No continuity
Released	Continuity (0 Ω)

3. If defective, replace the accelerator pedal position sensor.

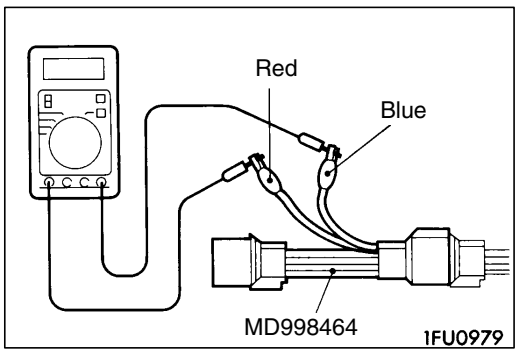
   NOTE
   After replacement, adjust the accelerator pedal position sensor. (Refer to P.13A-121.)



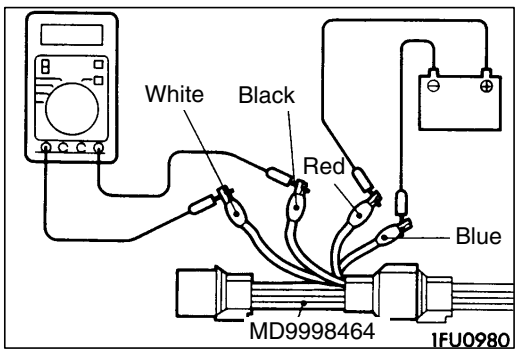
OXYGEN SENSOR CHECK

<Oxygen sensor (front)>

1. Disconnect the oxygen sensor connector and connect the special tool (test harness) 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 1 (red clip of special tool) and terminal 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. Use a jumper wire to connect terminal 1 (red clip) of the oxygen sensor connector to the battery (+) terminal and terminal 3 (blue clip) to the battery (–) terminal.

   Caution
   Be very careful when connecting the jumper wire; incorrect connection can damage the oxygen sensor.

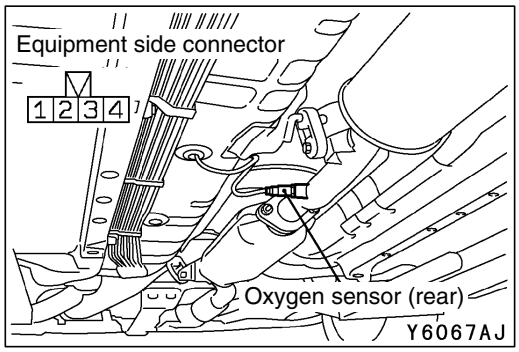
6. Connect a digital voltage meter between terminal 2 (black clip) and terminal 4 (white clip).
7. While repeatedly racing the engine, measure the oxygen sensor output voltage.

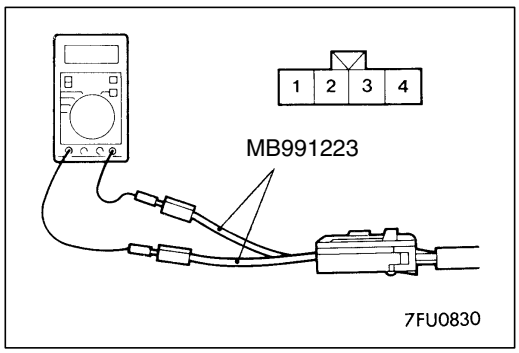
   Standard value:

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.

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.





<Oxygen sensor (rear)>

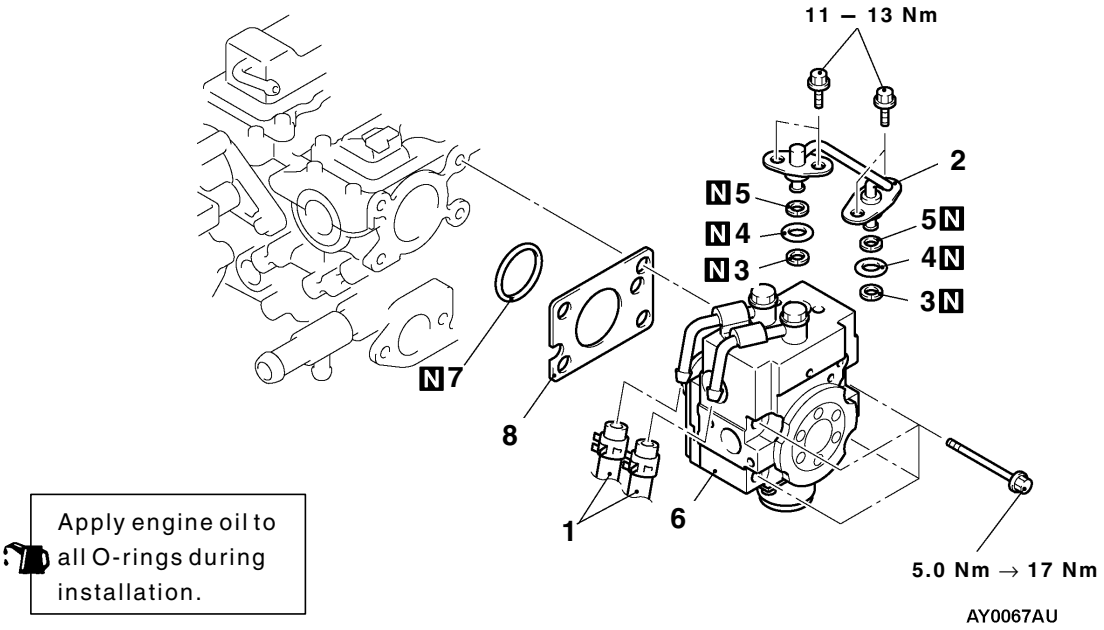
1. Disconnect the oxygen sensor connector and connect the special tool (test harness set) to the connector on the oxygen sensor side.
2. Make sure that there is continuity (11 – 18 Ω at 20°C) between terminal 3 and terminal 4 on the oxygen sensor connector.
3. If there is no continuity, replace the oxygen sensor.

   NOTE
   (1) If the MUT-II does not display the standard value although no abnormality is found by the above mentioned continuity test and harness check, replace the oxygen sensor (rear).
   (2) For removal and installation of the oxygen sensor, refer to GROUP 15 – Exhaust Pipe and Main Muffler.

FUEL PUMP (HIGH PRESSURE)

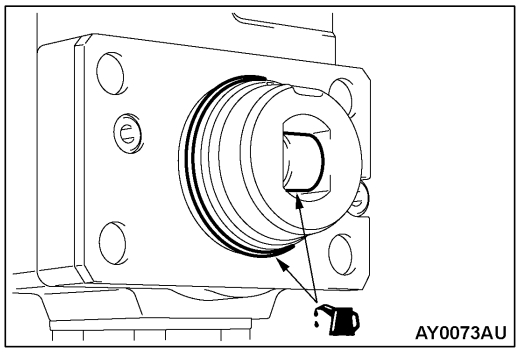
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Engine Cover Removal and Installation (Refer to GROUP 11A – Camshaft, Camshaft Oil Seal.)
- Prevention of Fuel Discharge <before removal only>
- Fuel Leak Check <after installation only>
- Air Cleaner Assembly Removal and Installation
- Throttle Body Remove and Installation (Refer to P.13A-137.)
- Intake Manifold Removal and Installation (Refer to GROUP 15.)



Removal steps

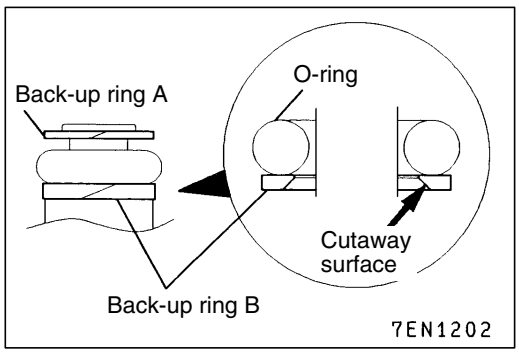
▶D◀ • Air bleeding the high-pressure fuel path
▶C◀ 1. Fuel return hoses connection
▶B◀ 2. Fuel pipe
▶B◀ 3. Back-up ring A
▶B◀ 4. O-ring
▶B◀ 5. Back-up ring B
▶A◀ 6. Fuel pump (high pressure)
7. O-ring
8. Insulator



INSTALLATION SERVICE POINTS

▶A◀ FUEL PUMP (HIGH PRESSURE) INSTALLATION

1. Apply a small amount of fresh engine oil to the fuel pump (high pressure) roller and O-ring.
2. Insert the fuel pump (high pressure) to the cylinder head ports squarely, and the tighten the mounting bolts temporarily (a little more tightly than finger-tightening). Tightening them to the specified torque should be carried out in later step **▶B◀**.

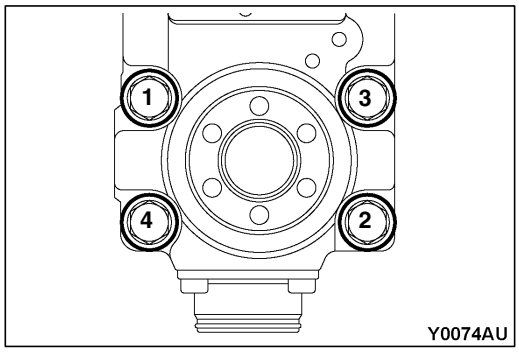


▶B◀ BACK-UP RING B/O-RING/BACK-UP RING A/FUEL PIPE INSTALLATION

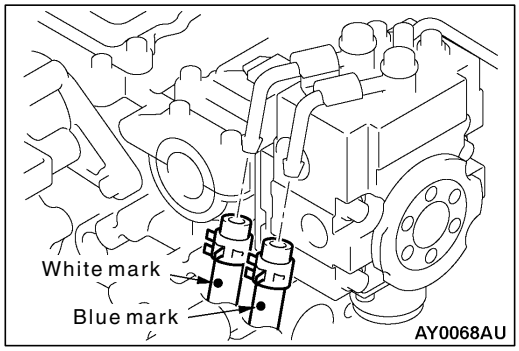
1. Install the back-up rings and the O-ring as shown in the illustration.
   Caution
   (1) Install the back-up ring B facing its cutaway surface toward the opposite side of the O-ring as shown in the illustration.
   (2) Confirm the outer diameter of the back-up ring A. Take care not to install the back-up ring for the fuel pressure sensor by mistake. (Outer diameter of the back-up ring A: 14.8 mm)
2. Apply a small amount of fresh engine oil to the O-ring.

   Caution
   Take care not to let any of the engine oil get inside the fuel pump (high-pressure) or the delivery pipe assembly.
3. Install the fuel pipe into the fuel pump (high pressure) and the delivery pipe ports squarely. Insert the pipe securely, being careful not to twisting it, and then tighten the mounting bolts to the specified torque.

   Tightening torque: 11 – 13 Nm



4. Tighten the temporarily tightened mounting bolts of the fuel pump (high pressure) in shown odder to 5.0 Nm.
5. Tighten the bolts to 17 Nm in the order shown in the illustration. The overall difference in tightening torque between the four bolts should be within 2 Nm.



▶C◀ FUEL RETURN HOSES INSTALLATION

Install the fuel return hoses so that the identification mark of fuel return hoses comes to the illustrated position.

▶D◀ AIR BLEEDING THE HIGH-PRESSURE FUEL PATH

1. Air-bleed the high-pressure fuel path with the engine running at 2000 r/min for 15 seconds or more.

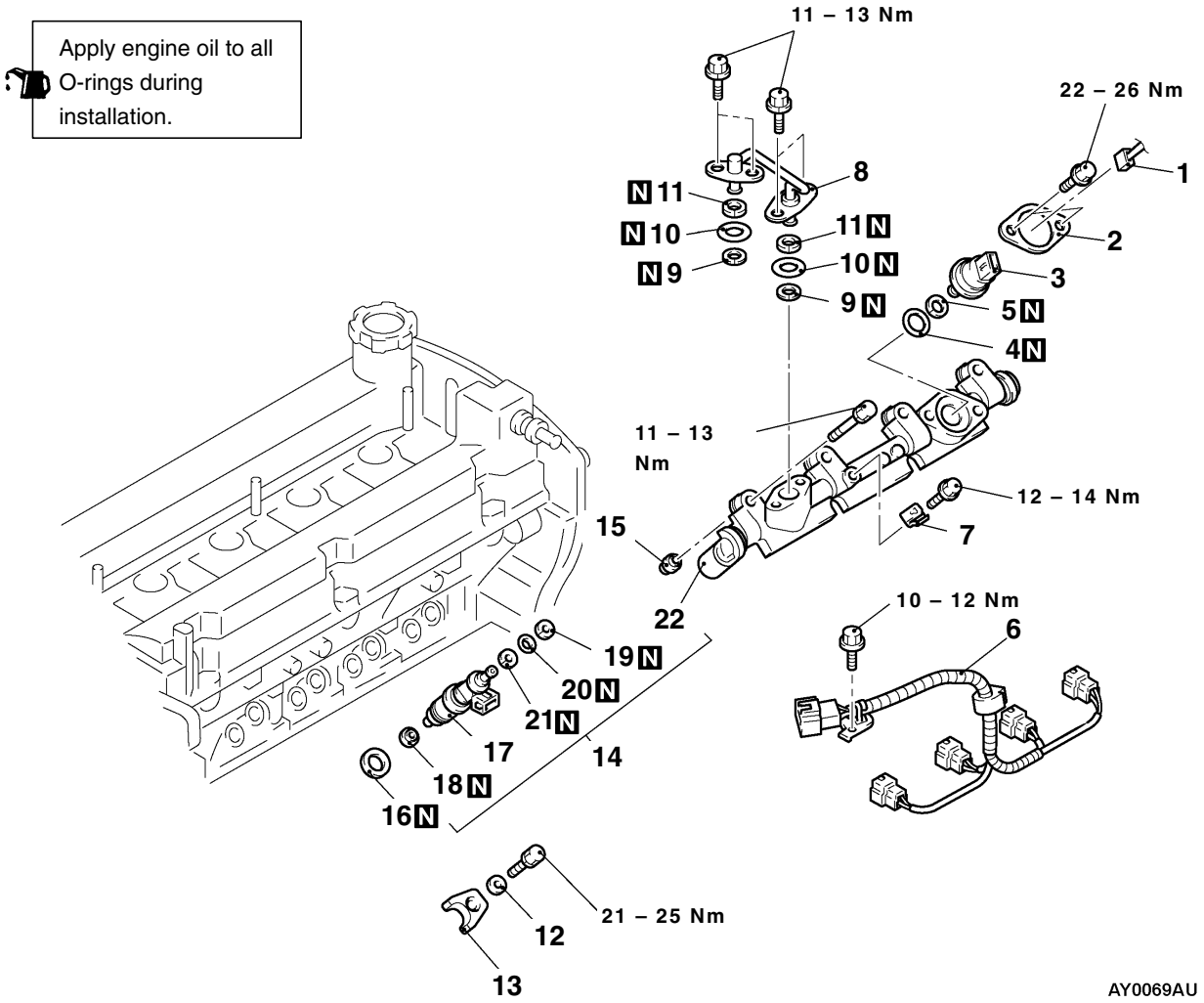
   NOTE

   When the air is trapped into the high-pressure fuel path due to the fuel pipe removal, an abnormality in the fuel pressure causes the output of diagnosis code No. 56.
2. If diagnosis code No. 56 at the fuel pressure sensor system is output after the diagnosis code is confirmed by MUT-II, the code will be erased.

FUEL INJECTOR

REMOVAL AND INSTALLATION

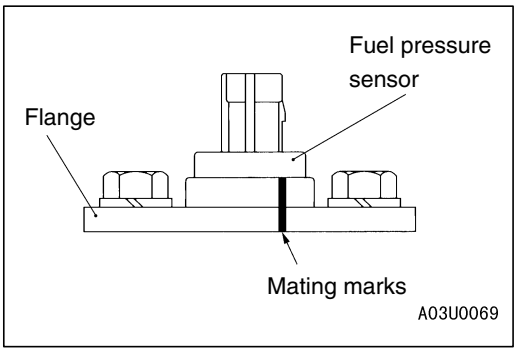
Pre-removal and Post-installation Operation
- Engine Cover Removal and Installation (Refer to GROUP 11A – Camshaft, Camshaft Oil Seal.)
- Prevention of Fuel Discharge <before removal only>
- Fuel Leak Check <after installation only>
- Air bleeding the high-pressure fuel path <after installation only>



Fuel pressure sensor removal steps
1. Fuel pressure sensor connector
◀A▶ ▶E◀ 2. Flange
▶E◀ 3. Fuel pressure sensor
▶D◀ 4. O-ring
▶D◀ 5. Back-up ring

Fuel injector removal steps
- Air cleaner
- Throttle body (Refer to P.13A-137.)
- Intake manifold (Refer to GROUP 15.)

6. Injector harness
7. Injector harness support bracket
▶C◀ 8. Fuel pipe
▶C◀ 9. Back-up ring A
▶C◀ 10. O-ring
▶C◀ 11. Back-up ring B
▶B◀ 12. Injector washer
▶B◀ 13. Injector holder
◀B▶ ▶B◀ 14. Delivery pipe and fuel injector assembly
▶B◀ 15. Insulator
▶B◀ 16. Injector gasket
▶B◀ 17. Fuel injector
▶A◀ 18. Corrugated washer
▶A◀ 19. Back-up ring A
▶A◀ 20. O-ring
▶A◀ 21. Back-up ring B
22. Delivery pipe



REMOVAL SERVICE POINTS

◀A▶ FLANGE REMOVAL

If the fuel pressure sensor is reused, make mating marks on the sensor and the flange.

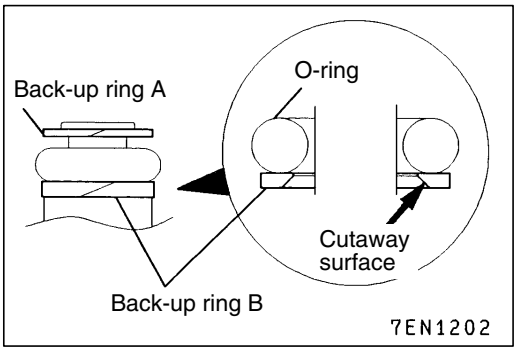
NOTE

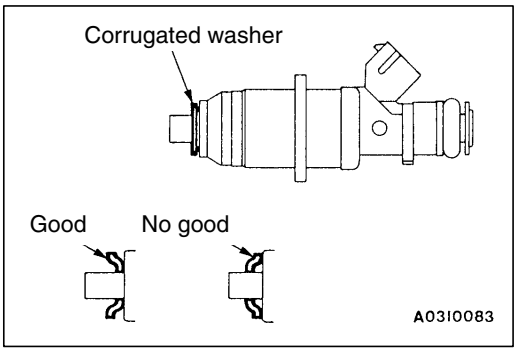
The flange secures sealing performance of fuel pressure sensor and installation rigidity by bending to deform the shape at installation. Therefore, make mating marks to install the flange with the right phase and side. In addition, If the fuel pressure sensor is replaced with a new one, replace it together with the flange as a set.

◀B▶ DELIVERY PIPE AND FUEL INJECTOR ASSEMBLY REMOVAL

Remove the delivery pipe with the fuel injector assembly still attached.

Caution
Be careful not to drop the fuel injector assembly when removing the delivery pipe.





INSTALLATION SERVICE POINTS

▶A◀ BACK-UP RING B/O-RING/BACK-UP RING A/CORRUGATED WASHER INSTALLATION

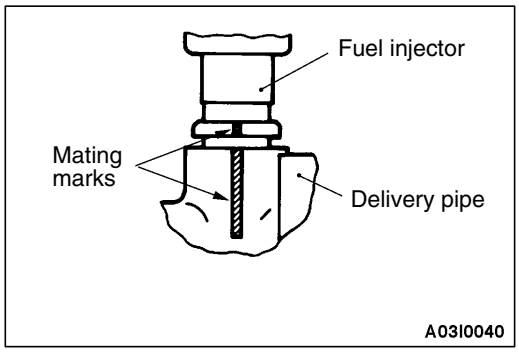
1. Install the back-up rings and the O-ring as shown in the illustration.
   Caution
   (1) Install the back-up ring B facing its cutaway surface toward the opposite side of the O-ring as shown in the illustration.
   (2) Confirm the outer diameter of the back-up ring A. Take care not to install the back-up ring for the fuel pressure sensor by mistake. (Outer diameter of the back-up ring A: 14.8 mm)
2. Apply petroleum jelly to the corrugated washer to prevent it from dropping, and then install it to the direction shown.

   Caution
   The corrugated washer should always be replace with a new part.

▶B◀ FUEL INJECTOR/INJECTOR GASKET/INSULATOR/DELIVERY PIPE AND FUEL INJECTOR ASSEMBLY/INJECTOR HOLDER/INJECTOR WASHER INSTALLATION

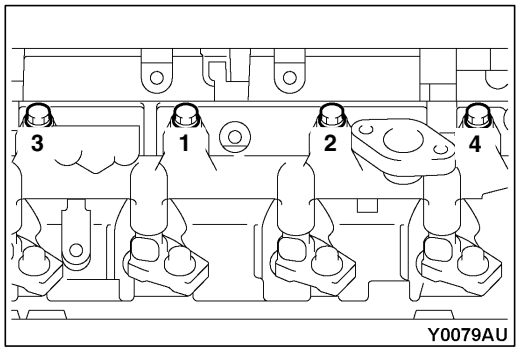
1. Apply a small amount of fresh engine oil to the O-ring.

   Caution
   Take care not to let any of the engine oil get inside the delivery pipe.



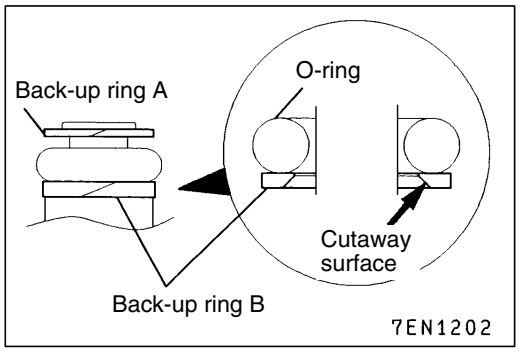
2. While being careful not to damage the O-ring, turn the fuel injector to the left and right and connect it to the delivery pipe. After connecting, check that the fuel injector turns smoothly.
3. If the fuel injector does not turn smoothly, the cause may be that the O-ring is getting caught. Remove the fuel injector, check the O-ring for damage and re-connect the fuel injector to the delivery pipe assembly and then re-check.
4. Align the Fuel injector mating mark with the delivery pipe mating mark.
5. Install the injector gasket and insulator to the cylinder head.
6. Install the delivery pipe and fuel injector assembly to the cylinder head, and then temporarily tighten mounting bolts.
7. Install the injector holder and the injector washer then tighten mounting bolts to the specified torque.

Tightening torque: 21 – 25 Nm



8. Tighten the mounting bolts to temporarily tighten the delivery pipe and the fuel injector assembly according to the illustrated sequence to the specified torque.

Tightening torque: 11 – 13 Nm

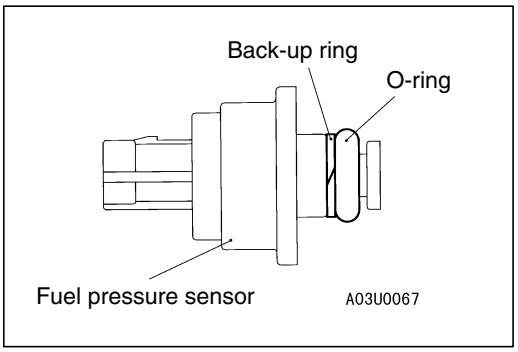


▶C◀ BACK-UP RING B/O-RING/BACK-UP RING A/FUEL PIPE INSTALLATION

1. Install the back-up rings and the O-ring as shown in the illustration.
   Caution
   (1) Install the back-up ring B facing its cutaway surface toward the opposite side of the O-ring as shown in the illustration.
   (2) Confirm the outer diameter of the back-up ring A. Take care not to install the back-up ring for the fuel pressure sensor by mistake. (Outer diameter of the back-up ring A: 14.8 mm)
2. Apply a small amount of fresh engine oil to the O-ring.

   Caution
   Take care not to let any of the engine oil get inside the fuel pump (high pressure) or the delivery pipe.
3. Insert the fuel pipe into the fuel pump (high pressure) and the delivery pipe ports squarely. Insert the pipe securely, being careful not to twisting it, and then tighten the mounting bolts to the specified torque.

Tightening torque: 11 – 13 Nm



▶D◀ BACK-UP RING/O-RING INSTALLATION

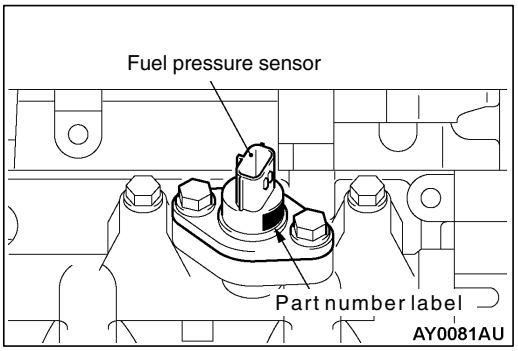
Install the back-up ring and the O-ring as shown in the illustration.

Caution
Be careful not to confuse this back-up ring with the back-up ring A for the fuel injector or back-up ring A for the fuel pipe. (External diameter of the back-up ring: 15.1 mm)

▶E◀ FUEL PRESSURE SENSOR/FLANGE INSTALLATION

1. Apply a small amount of fresh engine oil to the O-ring.

   Caution
   Take care not to let any of the engine oil get inside the delivery pipe.



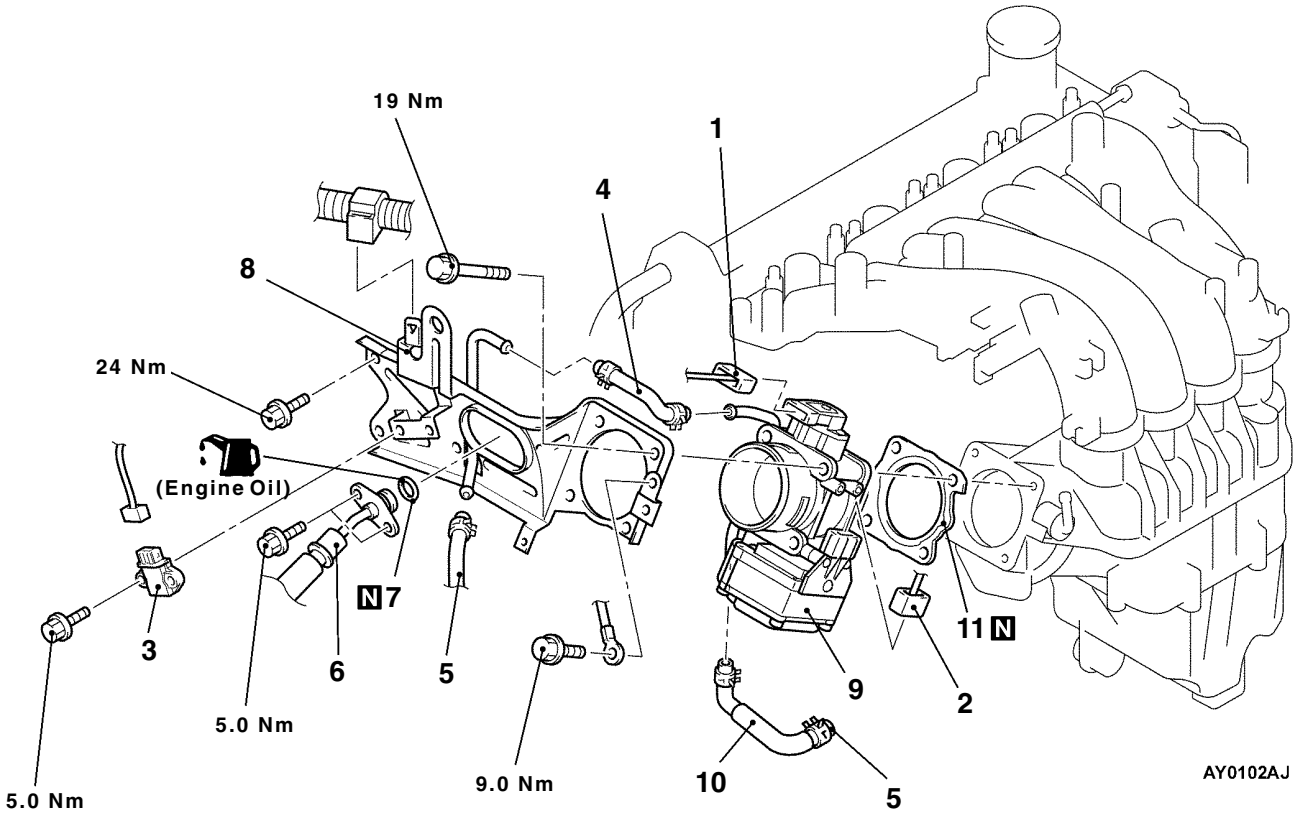
2. Install the fuel pressure sensor so that the part number label comes to the same direction shown in the illustration. If the old fuel pressure sensor is reused, Install the sensor to the delivery pipe using the mating mark made during its removal.

   Caution
   If the fuel pressure sensor is replaced with a new one, replace it together with the flange as a set.

THROTTLE BODY

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Engine Cover Removal and Installation (Refer to GROUP 11A – Camshaft, Camshaft Oil Seal.)
- Prevention of Fuel Discharge <before removal only>
- Fuel Leak Check <after installation only>
- Engine Coolant Draining and Supplying
- Air Cleaner Removal and Installation



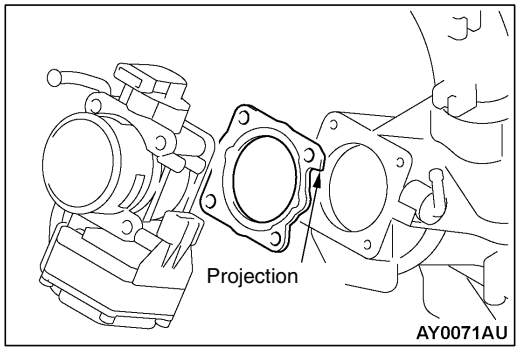
Removal steps

1. Throttle position sensor connector
2. Idle speed control servo connector
3. Ignition failure sensor
4. Water hose
5. Water hose connection

▶B◀ 6. High-pressure fuel hose connection

▶B◀ 7. O-ring
8. Throttle body stay
9. Throttle body
10. Water hose

▶A◀ 11. Throttle body gasket



INSTALLATION SERVICE POINTS

▶A◀ THROTTLE BODY GASKET INSTALLATION

Install the throttle body gasket so that the projection comes to the illustrated position.

▶B◀ O-RING/HIGH-PRESSURE FUEL HOSE INSTALLATION

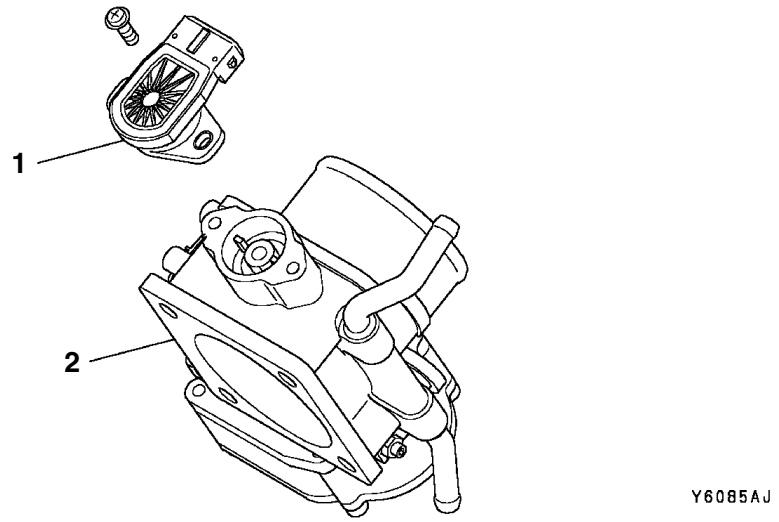
1. Apply a small amount of new engine oil to the O-ring.

   Caution
   Do not let any engine oil get into the delivery pipe.

2. While turning the high-pressure fuel hose to the right and left, install the delivery pipe, while being careful not to damage the O-ring. After installing, check that the hose turns smoothly.
3. If the hose does not turn smoothly, the O-ring is probably being clamped. Disconnect the high-pressure fuel hose and check the O-ring for damage. After this, re-insert the delivery pipe and check that the hose turns smoothly.
4. Tighten to the specified torque.

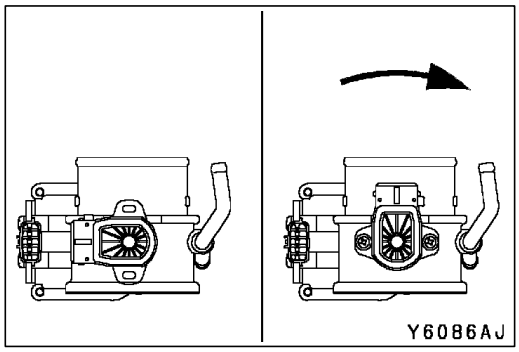
   Tightening torque: 5.0 Nm

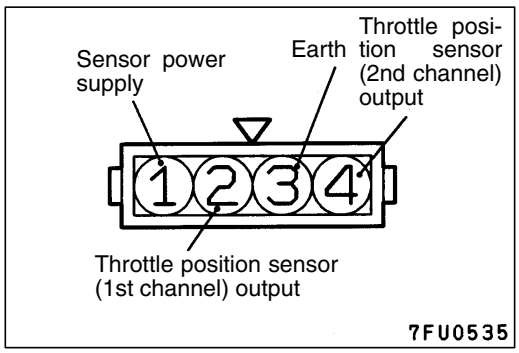
DISASSEMBLY AND REASSEMBLY



Disassembly steps

▶A◀ 1. Throttle position sensor
2. Throttle body





REASSEMBLY SERVICE POINTS

▶A◀ THROTTLE POSITION SENSOR

1. Position the throttle position sensor on the throttle body along the dotted line as shown in the illustration.
2. Rotate the throttle position sensor anticlockwise as shown in the illustration, and then tighten the screws.
3. Measure resistance value between terminal Nos. 1 (sensor power supply) and 2 (throttle position sensor 1st-channel output) as well as 1 (sensor power supply) and 4 (throttle position sensor 2nd-channel output).

Normal condition

Open the throttle valve slowly from the idle position to full-open position.	Resistance value changes smoothly in response to throttle valve opening angle.

4. If the resistance value does not change smoothly, replace the throttle position sensor.

NOTES

MULTIPOINT FUEL INJECTION (MPI)

CONTENTS

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TROUBLESHOOTING 5
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Component Location 79
Intake Air Temperature Sensor Check 80
Oxygen Sensor Check 80
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GENERAL

OUTLINE OF CHANGES

The service procedures have been established to describe revised sections due to the changed items shown below.

- On-board Diagnostics System has been adopted, diagnostic items have been expanded, and diagnostic code numbering system has been changed.
- Non-distributor two-coiled ignition system has been adopted.
- Crank angle sensor attached to the crank shaft has been adopted.
- Camshaft position sensor has been added.
- Ignition failure sensor has been added.
- Intake air temperature sensor built in the vacuum sensor (manifold absolute pressure sensor) has been adopted.
- Oxygen sensor (front, rear) has been changed.
- Ignition timing adjustment terminal has been abolished.

GENERAL INFORMATION

SELF-DIAGNOSIS FUNCTION

The following functions have been added.

- The engine-ECU records the engine operating condition when the diagnosis code is set.
  This data is called “freeze frame” data.
  This data can be read by using the MUT-II, are can then be used in simulation tests for troubleshooting.

GENERAL SPECIFICATIONS

Item		Specifications
Engine-ECU	Identification No.	E2T71279

MULTI-POINT FUEL INJECTION SYSTEM DIAGRAM

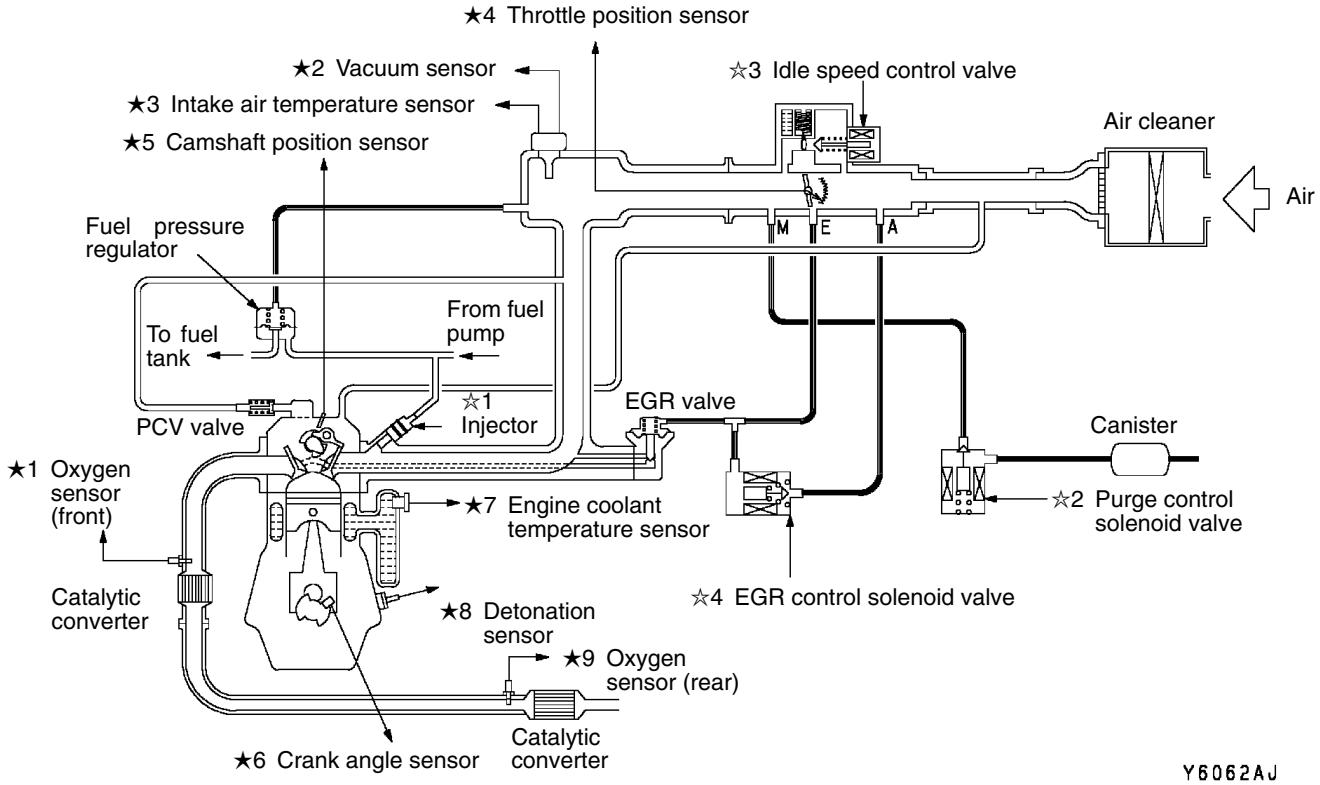
★1 Oxygen sensor (front)
★2 Vacuum sensor
★3 Intake air temperature sensor
★4 Throttle position sensor
★5 Camshaft position sensor
★6 Crank angle sensor
★7 Engine coolant temperature sensor
★8 Detonation sensor
★9 Oxygen sensor (rear)

- Power supply voltage
- Vehicle speed sensor
- A/C switch
- Power steering fluid pressure switch
- Vehicle speed sensor
- Ignition switch – ST
- Ignition switch – IG

⇨ Engine-ECU ⇨

☆1 Injector
☆2 Purge control solenoid valve
☆3 Idle speed control valve
☆4 EGR control servo valve

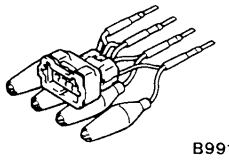
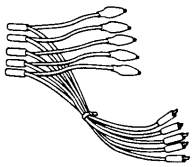
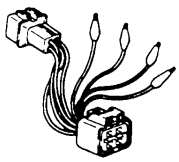
- Fuel pump relay
- Engine control relay
- A/C power relay
- Engine warning lamp
- Diagnosis signal
- Ignition coil (power transistor)
- Fan controller

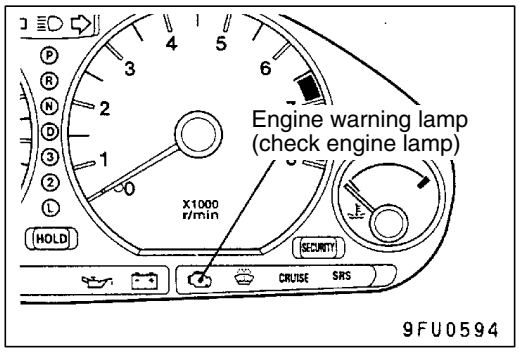


SERVICE SPECIFICATIONS

Items		Standard value
Intake air temperature sensor resistance kΩ	20°C	2.3 – 3.0
	80°C	0.30 – 0.42
Oxygen sensor output voltage (during revving) V		0.6 – 1.0
Oxygen sensor heater resistance (at 20°C) Ω	Front	4.5 – 8.0
	Rear	11 – 18

SPECIAL TOOLS

Tool	Number	Name	Use
 B991536	MB991536	Throttle position sensor adjustment harness	• Measurement of voltage during trouble-shooting
	MB991658	Test harness set	• Measurement of voltage during trouble-shooting
	MD998464	Test harness (4-pin, square)	• Measurement of voltage during trouble-shooting • Inspection of oxygen sensor (front)
	MD998478	Test harness (3-pin, triangle)	• Measurement of voltage during trouble-shooting • Inspection using an analyzer



TROUBLESHOOTING

DIAGNOSIS FUNCTION

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.
However, the warning lamp will illuminate as bulb check for five seconds whenever the ignition switch is turned to the ON position.

Engine warning lamp inspection items

Code No.	Diagnosis item
–	Engine-ECU
P0105	Vacuum sensor system
P0110	Intake air temperature sensor system
P0115	Engine coolant temperature sensor system
P0120	Throttle position sensor system
P0125	Feedback system
P0130	Oxygen sensor (front) system <sensor 1>
P0135	Oxygen sensor heater (front) system <sensor 1>
P0136	Oxygen sensor (rear) system <sensor 2>
P0141	Oxygen sensor heater (rear) system <sensor 2>
P0170	Abnormal fuel system
P0201	No. 1 injector system
P0202	No. 2 injector system
P0203	No. 3 injector system
P0204	No. 4 injector system
P0300★	Random cylinder misfire detected
P0301	No. 1 cylinder misfire detected
P0302	No. 2 cylinder misfire detected
P0303	No. 3 cylinder misfire detected
P0304	No. 4 cylinder misfire detected
P0335	Crank angle sensor system
P0340	Camshaft position sensor system
P0403	EGR control solenoid valve system
P0420	Catalyst malfunction
P0443	Purge control solenoid valve system
P0505	Idle speed control system

NOTE
1. If the engine warning lamp illuminates because of a malfunction of the engine-ECU, communication between MUT-II and the engine-ECU is impossible. In this case, the diagnosis code cannot be read.
2. 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.
3. After the engine warning lamp illuminates, it will be switched off under the following conditions.
   (1) When the engine-ECU monitored the power train malfunction three times* and met set condition requirements, it detected no malfunction.
   *: In this case, "one time" indicates from engine start to stop.
   (2) For misfiring malfunction, when driving conditions (engine speed, engine coolant temperature, etc.) are similar to those when the malfunction was first recorded.
4. 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 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 MUT-II.
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 OFF and then back to ON again.

NOTE
By turning the ignition switch to OFF, the engine-ECU will switch the diagnosis mode from DIAGNOSIS 2 mode to DIAGNOSIS 1 mode.

5. Erase the diagnosis codes.

INSPECTION USING MUT-II 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 harnesses and components.
2. After repairing, re-check using the MUT-II 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 MUT-II, 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 MUT-II, an effective troubleshooting can be performed.

Displayed items of freeze frame data are shown in the following:

DISPLAYED ITEM LIST

Data item		Unit
Engine coolant temperature sensor		°C
Engine speed		r/min
Vehicle speed		km/h
Long-term fuel compensation (long-term fuel trim)		%
Short-term fuel compensation (short-term fuel trim)		%
Fuel control condition	Open loop	OL
	Closed loop	CL
	Open loop owing to drive condition	OL-DRV.
	Open loop owing to system malfunction	OL-SYS.
	Closed loop based on one oxygen sensor	CL-H02S
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.

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 MUT-II. (If the ECU has judged a item before, the MUT-II 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
Vacuum 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 ISC servo in the appointed position so idle control is not performed.
Intake air temperature sensor	Controls as if the intake air temperature is 45°C.
Throttle position sensor (TPS)	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.
Camshaft position sensor	Injects fuel into the cylinders in the order 1-3-4-2 with irregular timing. (After the ignition switch is turned to ON, the No. 1 cylinder top dead centre is not detected at all.)
Detonation sensor	Switches the ignition timing from ignition timing for super petrol to ignition timing for standard petrol.
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 sensor (front) installed on the front of the catalytic converter.
Misfire detection	The engine-ECU stops supplying fuel to the cylinder with the highest misfiring rate if a misfiring that could damage the catalytic converter is detected.

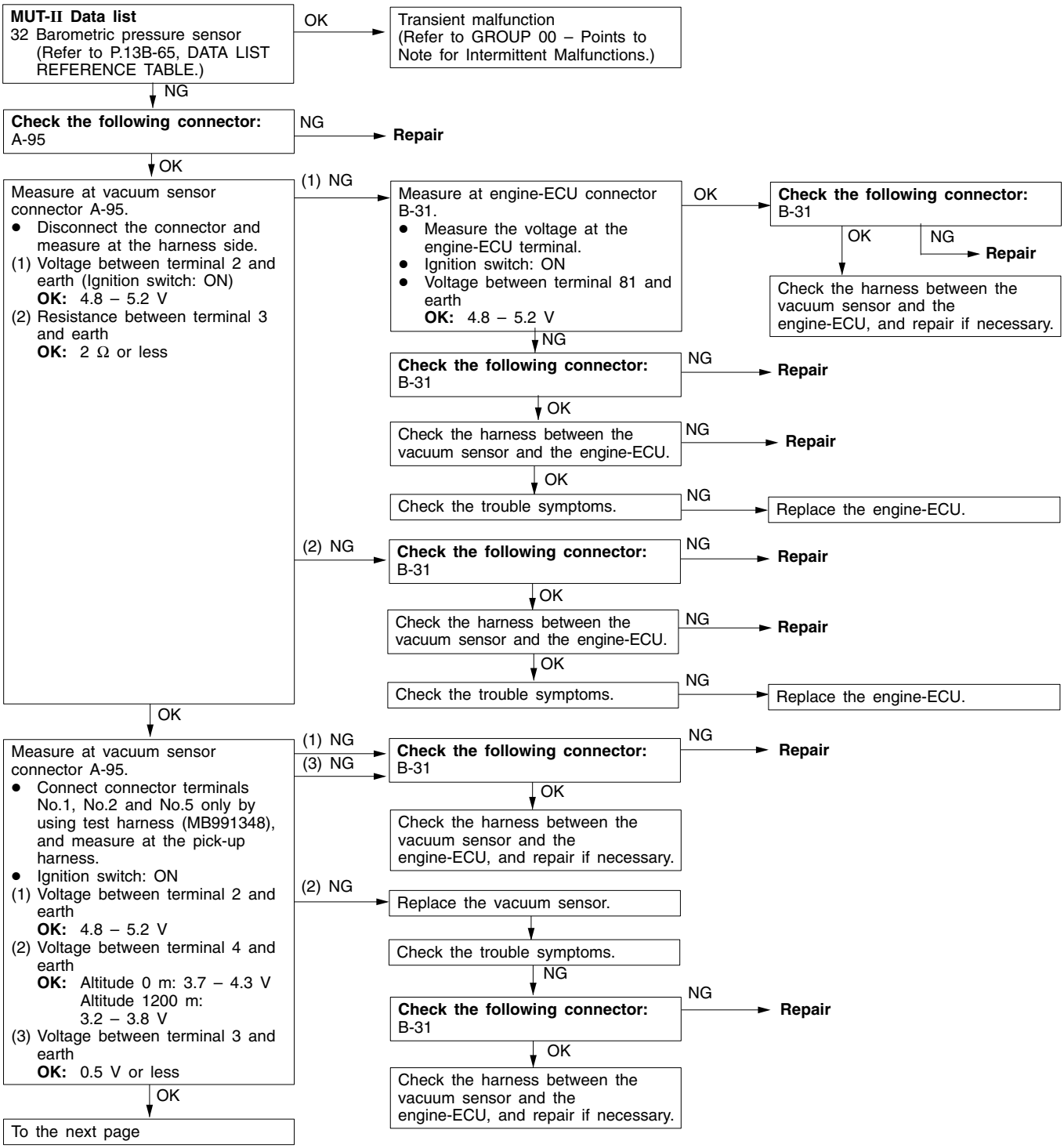
INSPECTION CHART FOR DIAGNOSIS CODES

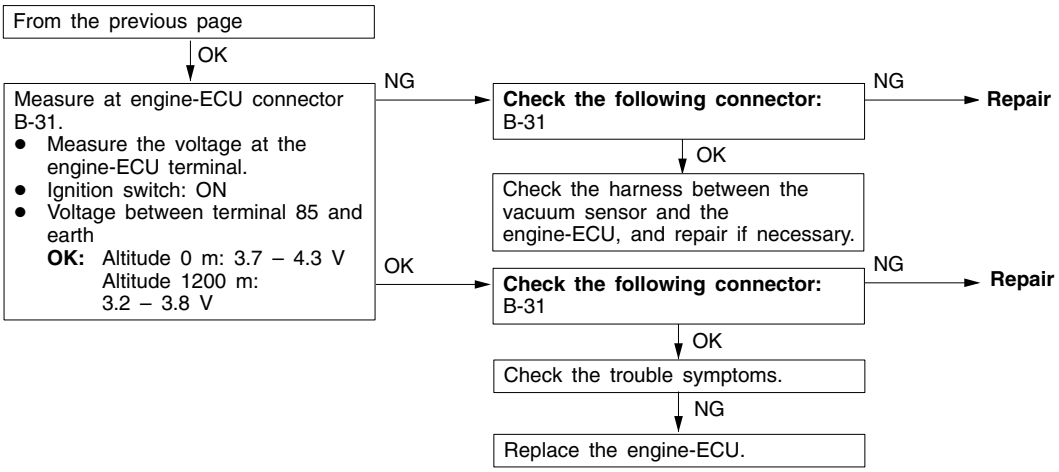
Code No.	Diagnosis item	Reference page
P0105	Vacuum sensor system	13B-10
P0110	Intake air temperature sensor system	13B-12
P0115	Engine coolant temperature sensor system	13B-13
P0120	Throttle position sensor system	13B-16
P0125	Feedback system	13B-18
P0130	Oxygen sensor (front) system <sensor 1>	13B-19
P0135	Oxygen sensor heater (front) system <sensor 1>	13B-21
P0136	Oxygen sensor (rear) system <sensor 2>	13B-22
P0141	Oxygen sensor heater (rear) system <sensor 2>	13B-24
P0170	Abnormal fuel system	13B-25
P0201	No. 1 injector system	13B-26
P0202	No. 2 injector system	13B-26
P0203	No. 3 injector system	13B-26
P0204	No. 4 injector system	13B-26
P0300★	Random cylinder misfire detected	13B-27
P0301	No. 1 cylinder misfire detected	13B-28
P0302	No. 2 cylinder misfire detected	13B-28
P0303	No. 3 cylinder misfire detected	13B-28
P0304	No. 4 cylinder misfire detected	13B-28
P0325	Detonation sensor system	13B-29
P0335	Crank angle sensor system	13B-25
P0340	Camshaft position sensor system	13B-31
P0403	EGR control solenoid valve system	13B-32
P0421	Catalyst malfunction	13B-33
P0443	Purge control solenoid valve system	13B-34
P0500	Vehicle speed sensor system	13B-35
P0505	Idle speed control system	13B-36
P1610	Immobilizer system	13B-38

NOTE
1. Do not replace the engine-ECU until a through terminal check reveals there are no short/open circuit.
2. Check that the engine-ECU earth circuit is normal before checking for the cause of the problem.
3. 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 a "★", the diagnosis code is recorded on the first detection of the malfunction.
4. 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.

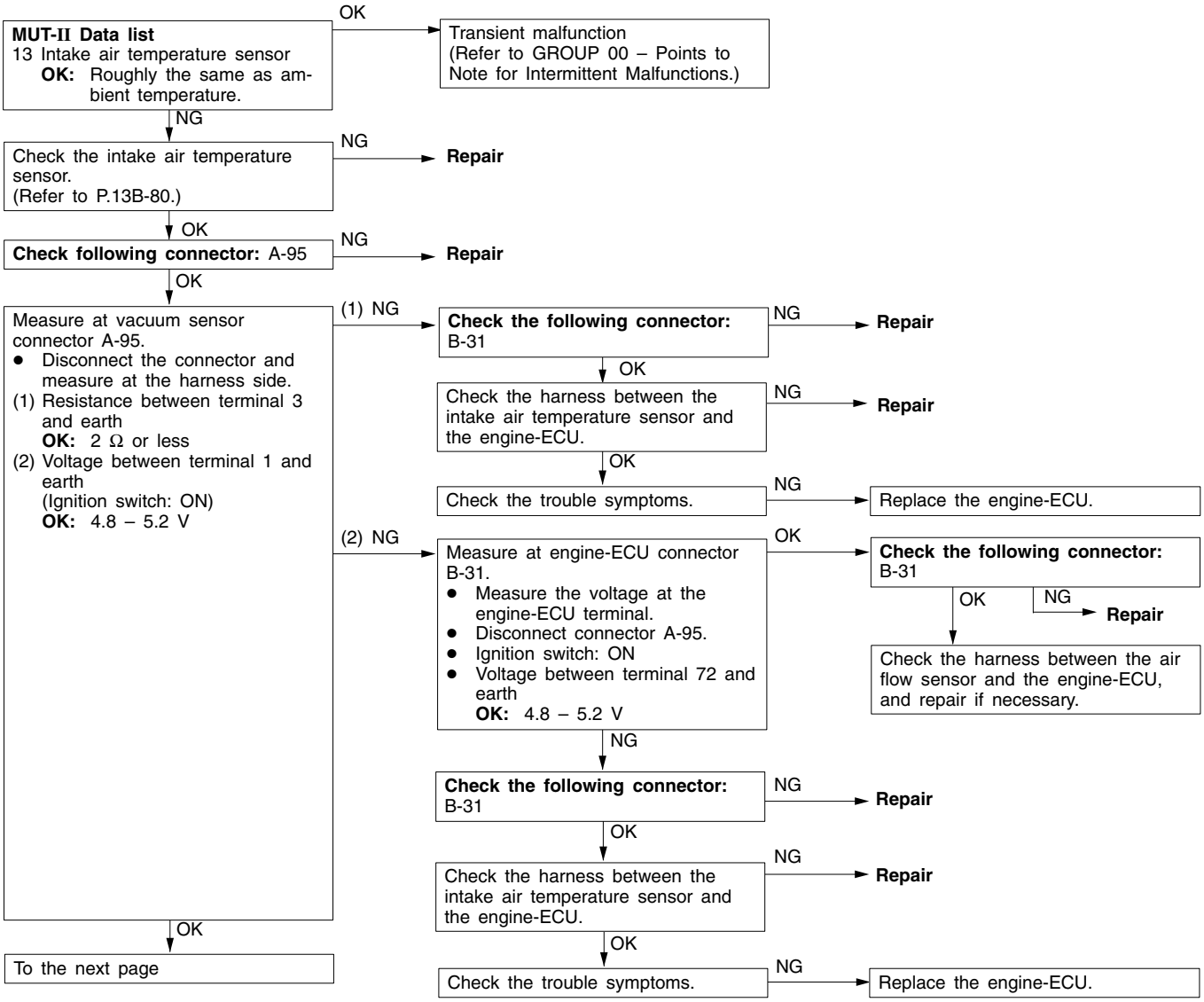
INSPECTION PROCEDURE CLASSIFIED BY DIAGNOSIS CODE

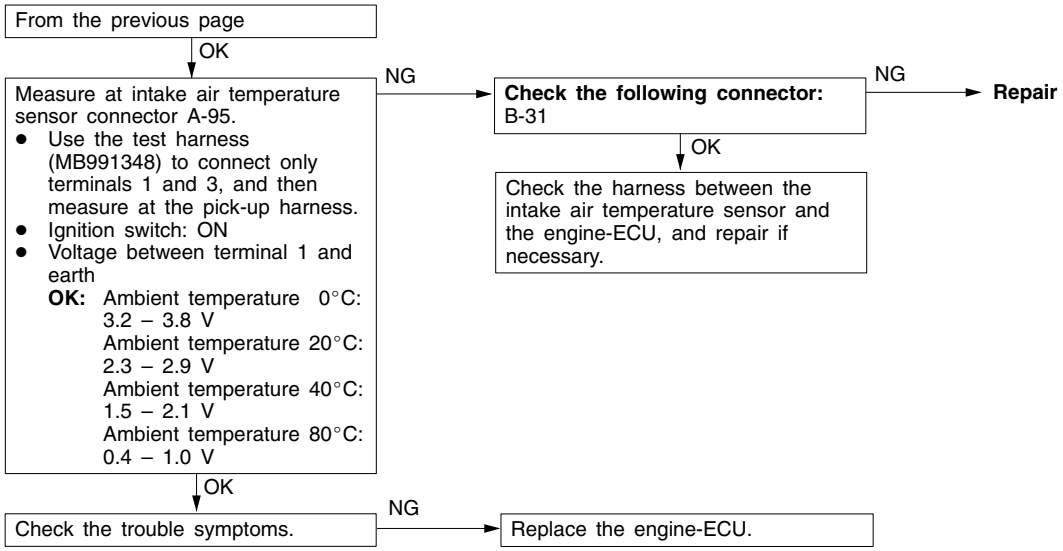
Code No. P0105 Vacuum sensor system	Range of Check
Range of Check ● Ignition switch: ON Set Conditions ● The output voltage of the vacuum sensor is 4.5 V or more for 2 seconds. (This corresponds to the absolute manifold pressure of 115 kPa or more.)	● Malfunction of the vacuum sensor ● Improper connector contact, open circuit or short-circuited harness ● Malfunction of the engine-ECU
Range of Check ● The output voltage of the throttle position sensor is 1.25 V or more. or ● The vehicle is stationary. Set Conditions ● The output voltage of the vacuum sensor is 0.2 V or less for 2 seconds. (This corresponds to the absolute manifold pressure of 4.9 kPa or less.)	



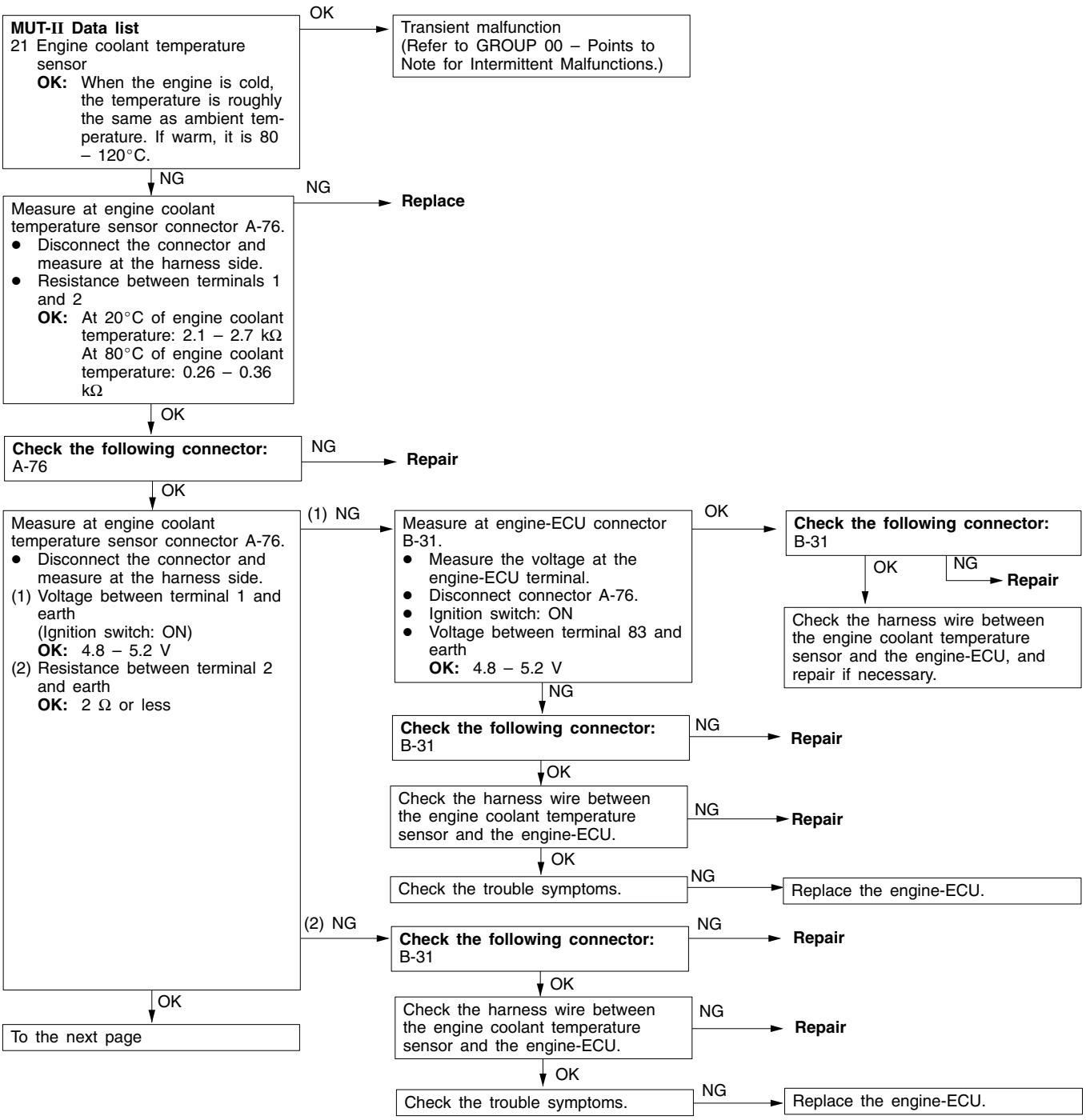

From the previous page
OK
Measure at engine-ECU connector B-31.
● Measure the voltage at the engine-ECU terminal.
● Ignition switch: ON
● Voltage between terminal 85 and earth
OK: Altitude 0 m: 3.7 – 4.3 V
Altitude 1200 m: 3.2 – 3.8 V
NG
Check the following connector: B-31
NG
Repair
OK
Check the harness between the vacuum sensor and the engine-ECU, and repair if necessary.
OK
Check the following connector: B-31
NG
Repair
OK
Check the trouble symptoms.
NG
Replace the engine-ECU.

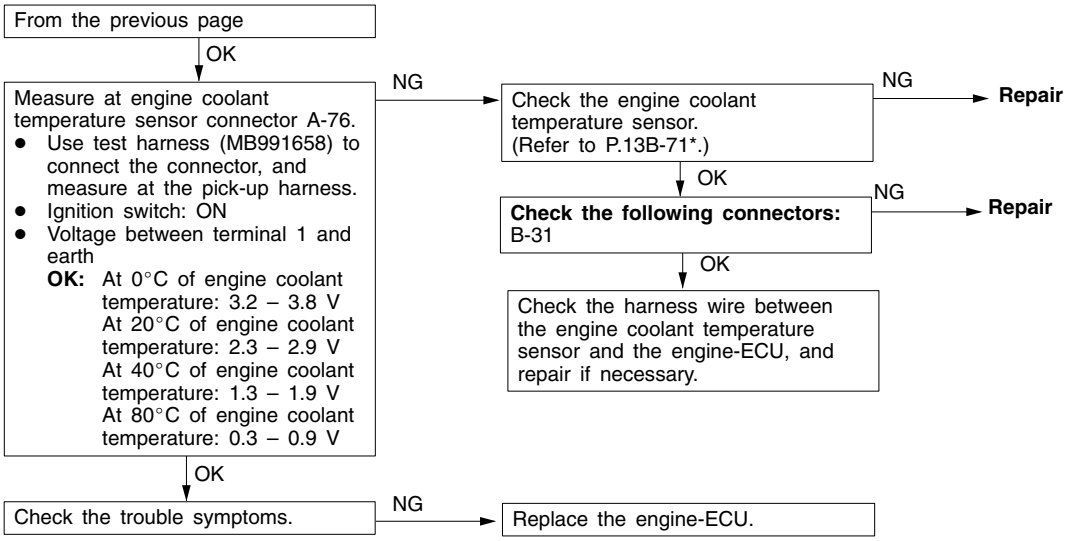
Code No. P0110 Intake air temperature sensor system	Probable cause
Range of Check ● Two seconds have passed since the ignition switch is turned ON or the engine starting process is completed. Set Conditions ● The sensor output voltage is 4.6 V or more for two seconds (equivalent to –45°C of intake air temperature) or ● The sensor output voltage is 0.2 V or more for two seconds (equivalent to 125°C of intake air temperature)	● Malfunction of intake air temperature sensor ● Open or short circuit in intake air temperature sensor or loose connector contact ● Malfunction of engine-ECU





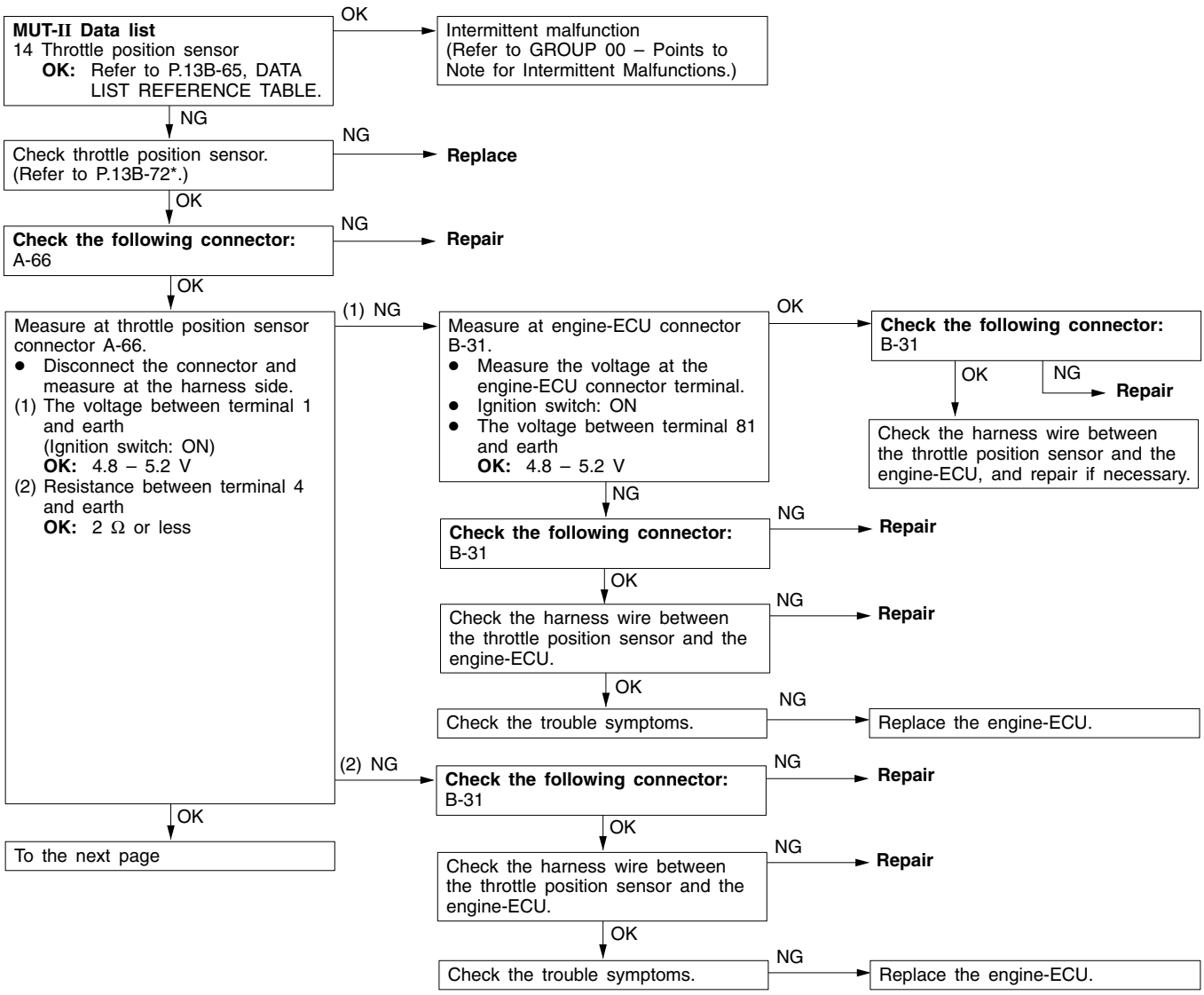
Code No. P0115 Engine coolant temperature sensor system	Probable cause
Range of Check ● Engine: Two seconds after the engine has been started Set Conditions ● The sensor output voltage is 4.6 V or more for two seconds (equivalent to –45°C of engine coolant temperature) or ● The sensor output voltage is 0.1 V or less for two seconds (equivalent to 140°C of engine coolant temperature)	● Malfunction of engine coolant temperature sensor ● Open or short circuit in the engine coolant temperature sensor circuit or loose connector contact ● Malfunction of engine-ECU
Range of Check ● Engine: After starting Set Conditions ● The engine coolant temperature has reduced from over 40°C to less than 40°C, and that condition has lasted for five minutes or more.	


MUT-II Data list
21 Engine coolant temperature sensor
OK: When the engine is cold, the temperature is roughly the same as ambient temperature. If warm, it is 80 – 120°C.
OK
Transient malfunction (Refer to GROUP 00 – Points to Note for Intermittent Malfunctions.)
NG
Measure at engine coolant temperature sensor connector A-76.
• Disconnect the connector and measure at the harness side.
• Resistance between terminals 1 and 2
OK: At 20°C of engine coolant temperature: 2.1 – 2.7 kΩ
At 80°C of engine coolant temperature: 0.26 – 0.36 kΩ
NG
Replace
OK
Check the following connector: A-76
NG
Repair
OK
Measure at engine coolant temperature sensor connector A-76.
• Disconnect the connector and measure at the harness side.
(1) Voltage between terminal 1 and earth
(Ignition switch: ON)
OK: 4.8 – 5.2 V
(2) Resistance between terminal 2 and earth
OK: 2 Ω or less
(1) NG
Measure at engine-ECU connector B-31.
• Measure the voltage at the engine-ECU terminal.
• Disconnect connector A-76.
• Ignition switch: ON
• Voltage between terminal 83 and earth
OK: 4.8 – 5.2 V
OK
Check the following connector: B-31
OK
NG
Repair
Check the harness wire between the engine coolant temperature sensor and the engine-ECU, and repair if necessary.
NG
Check the following connector: B-31
NG
Repair
OK
Check the harness wire between the engine coolant temperature sensor and the engine-ECU.
NG
Repair
OK
Check the trouble symptoms.
NG
Replace the engine-ECU.
(2) NG
Check the following connector: B-31
NG
Repair
OK
Check the harness wire between the engine coolant temperature sensor and the engine-ECU.
NG
Repair
OK
Check the trouble symptoms.
NG
Replace the engine-ECU.
OK
To the next page

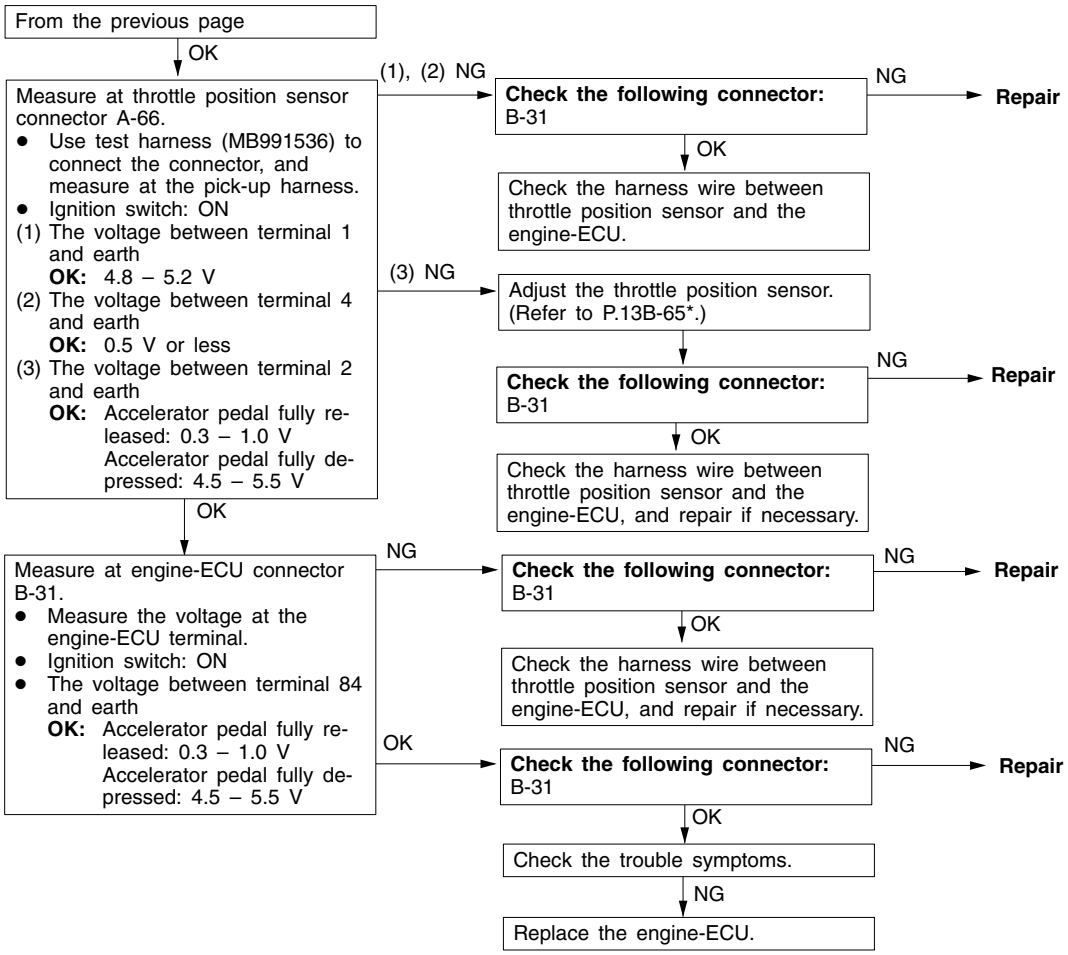


NOTE:
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

Code No. 0120 Throttle position sensor system	Probable cause
Range of Check • Ignition switch: ON • Excluding 2 seconds after the ignition switch is turned to ON or immediately after the engine starts. Set Conditions • Engine speed is 1,000 r/min or less, and intake air pressure is 48kPa or less, TPS output voltage is 4.6 V or more for 2 seconds. or • The sensor output voltage is 0.2 V or less for 2 seconds.	• Malfunction of throttle position sensor • Open or short circuit in the throttle position sensor circuit or loose connector contact • Malfunction of the engine-ECU

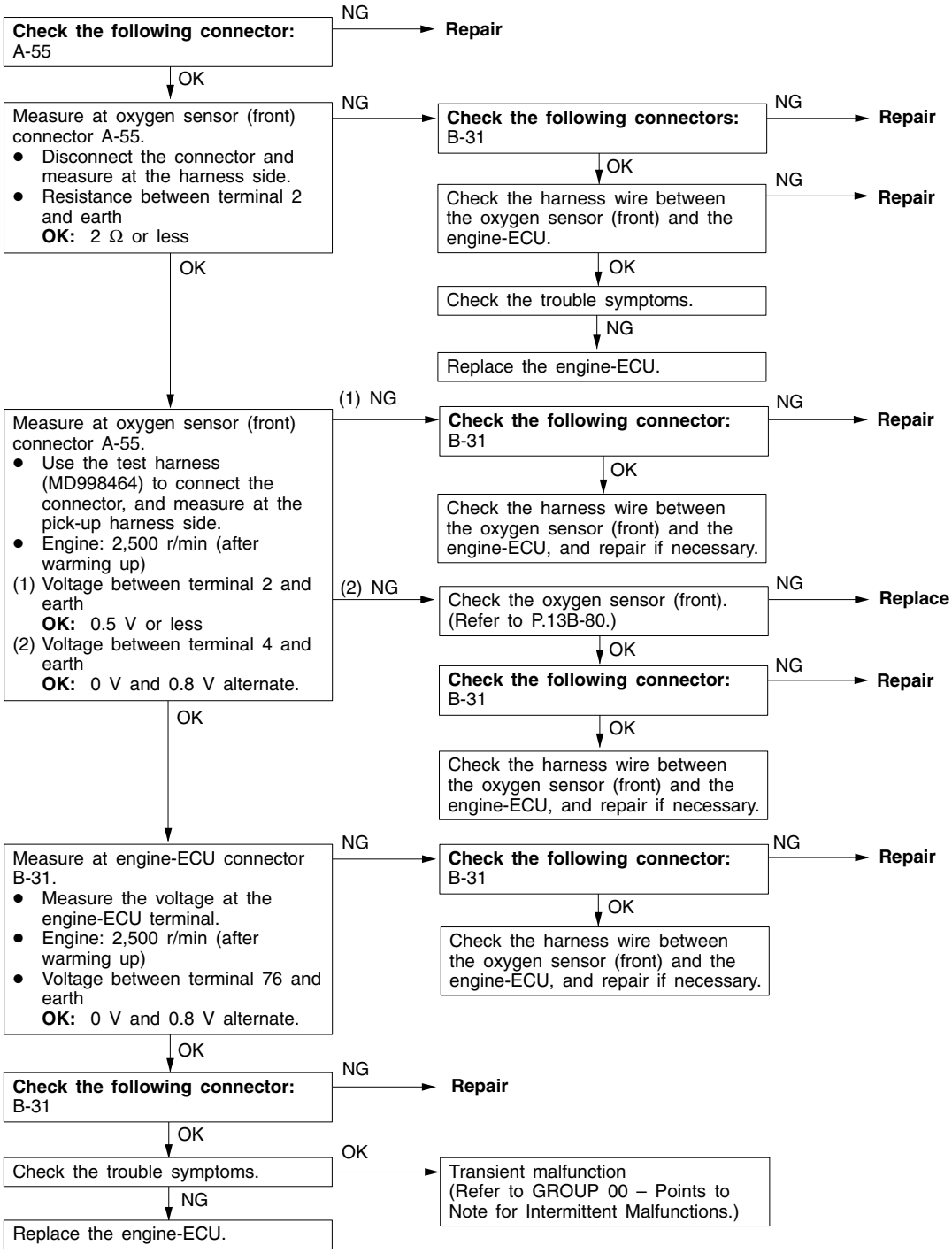


NOTE:
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

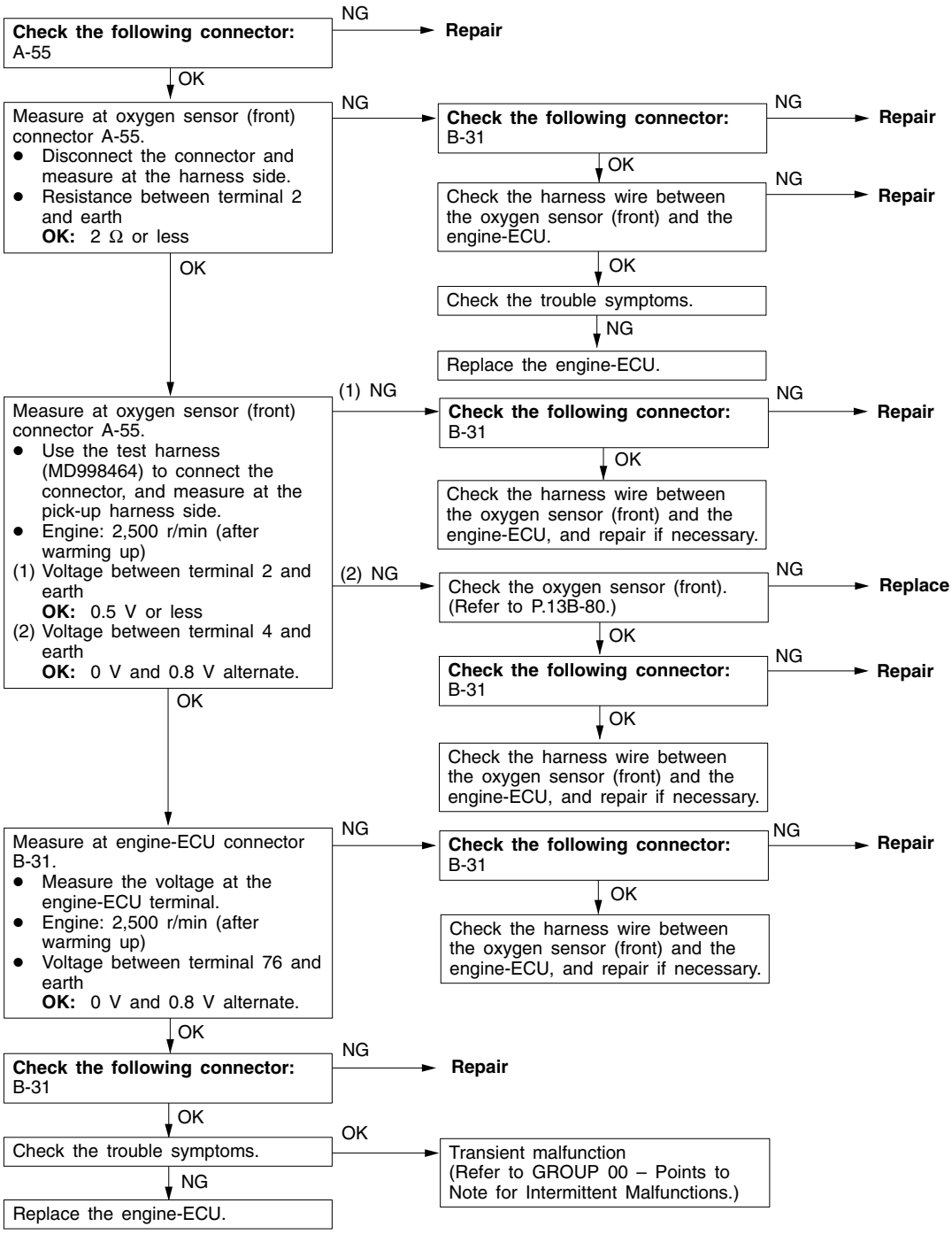


NOTE:
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

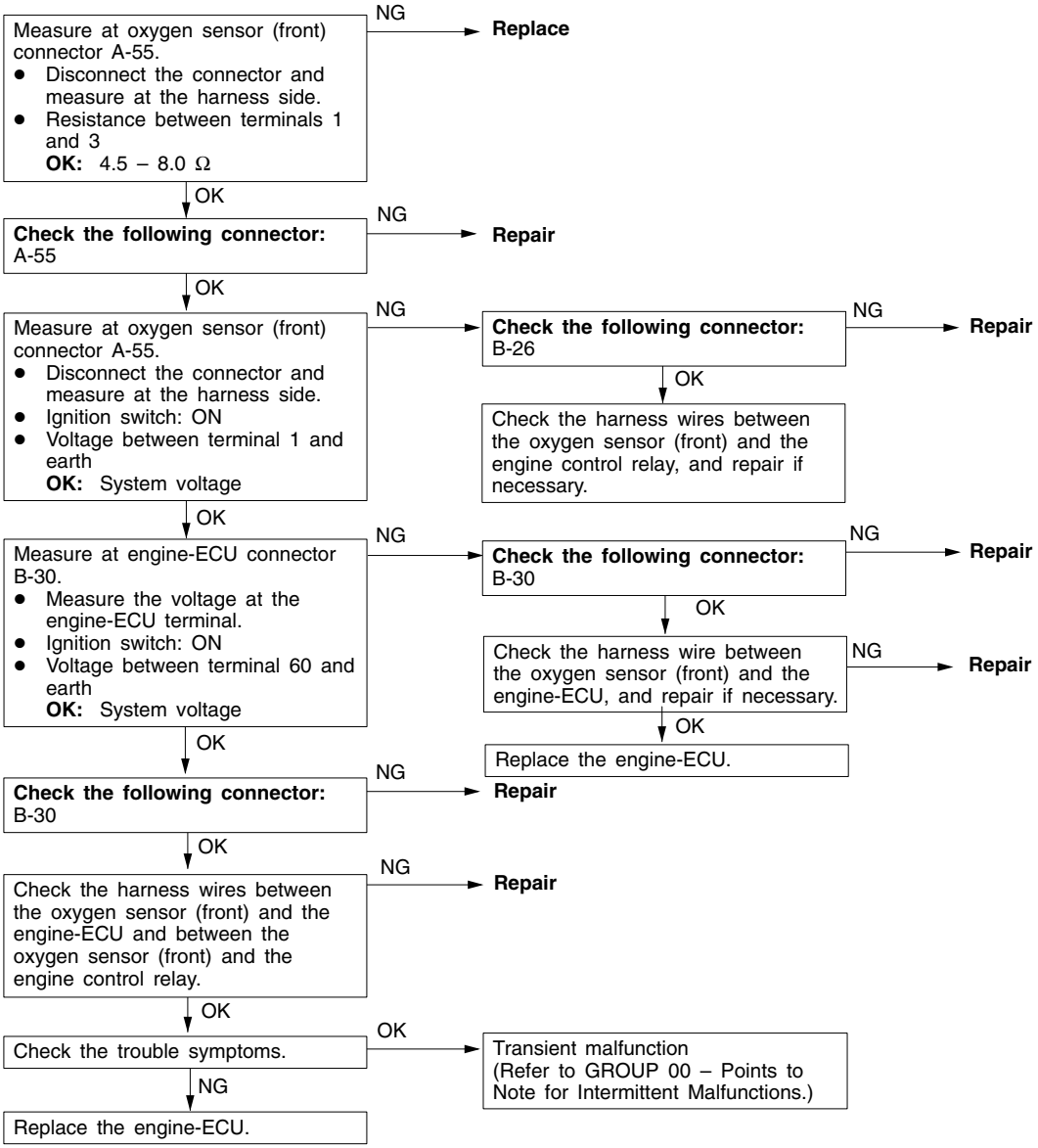
Code No. P0125 Feedback system	Probable cause
Range of Check • The engine coolant temperature is approx. 80°C or more. • During stoichiometric feedback control • The vehicle is not being decelerated. Set Conditions • Oxygen sensor (front) output voltage has been higher or lower than 0.5 V for at least thirty seconds.	• Malfunction of oxygen sensor (front) • Open or short circuit in the oxygen sensor (front) circuit or loose connector contact • Malfunction of engine-ECU



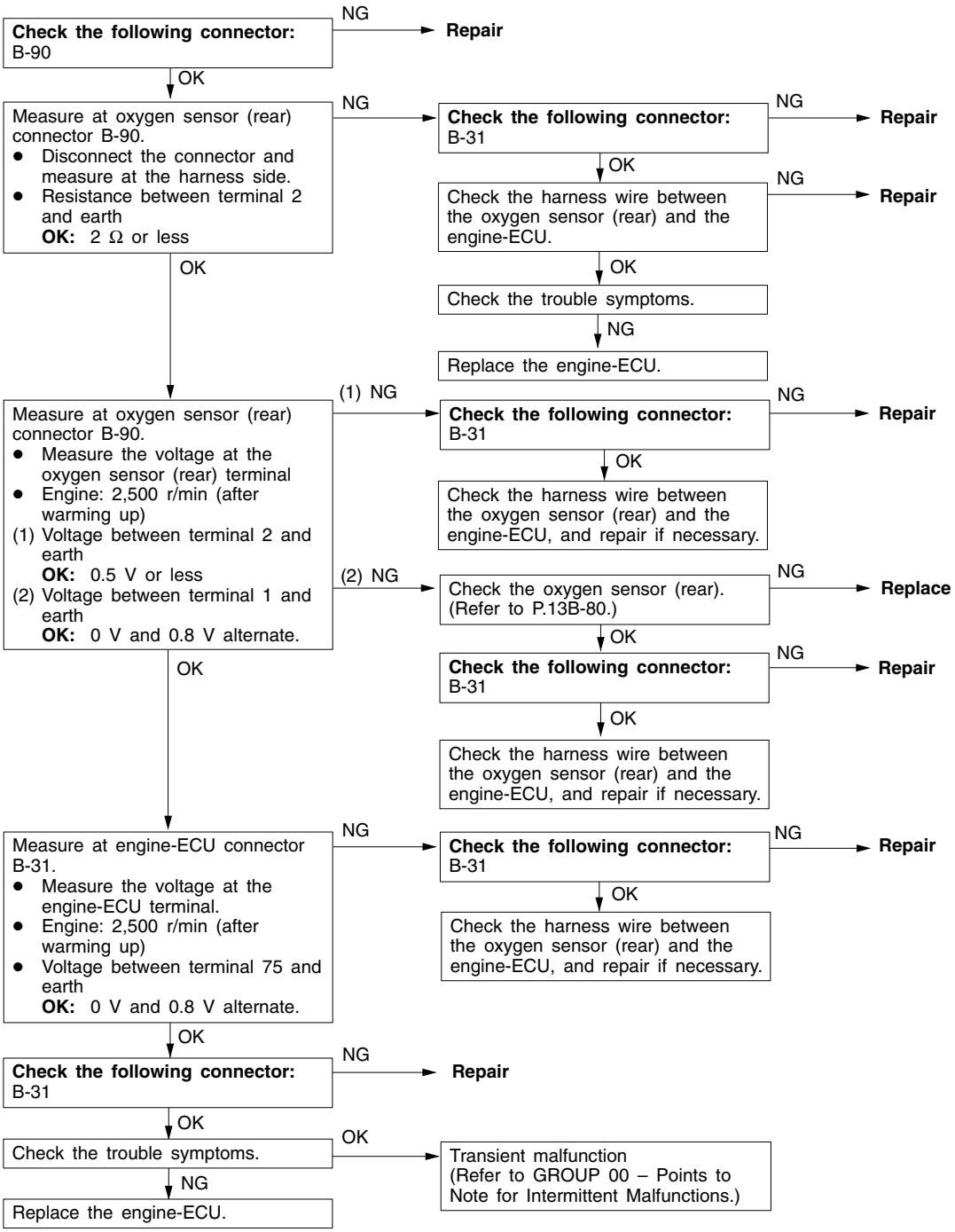
Code No. P0130 Oxygen sensor (front) system <sensor 1>	Probable cause
Range of Check ● Three minutes have been passed since the engine has been started. ● The engine coolant temperature is approx. 80°C or more. ● Intake air temperature is 20 – 50°C ● Engine speed is 1,200 r/min or more ● Driving on a level surface at constant speed. Set Conditions ● The oxygen sensor (front) output voltage is 4.5 V or more when the sensor output voltage is 0.2 V or less and a voltage of 5 V is applied to the oxygen sensor (front) inside the engine-ECU.	● Malfunction of oxygen sensor (front) ● Open or short circuit in the oxygen sensor (front) circuit or loose connector contact ● Malfunction of engine-ECU
Range of Check ● Engine speed is 2,800 r/min or less ● During driving ● During air/fuel ratio feedback control Set Conditions ● The oxygen sensor (front) output frequency is six or less per 10 seconds on average.	


Check the following connector: A-55
NG
Repair
OK
Measure at oxygen sensor (front) connector A-55.
• Disconnect the connector and measure at the harness side.
• Resistance between terminal 2 and earth
OK: 2 Ω or less
NG
Check the following connector: B-31
NG
Repair
OK
Check the harness wire between the oxygen sensor (front) and the engine-ECU.
NG
Repair
OK
Check the trouble symptoms.
NG
Replace the engine-ECU.
OK
Measure at oxygen sensor (front) connector A-55.
• Use the test harness (MD998464) to connect the connector, and measure at the pick-up harness side.
• Engine: 2,500 r/min (after warming up)
(1) Voltage between terminal 2 and earth
OK: 0.5 V or less
(2) Voltage between terminal 4 and earth
OK: 0 V and 0.8 V alternate.
(1) NG
Check the following connector: B-31
NG
Repair
OK
Check the harness wire between the oxygen sensor (front) and the engine-ECU, and repair if necessary.
(2) NG
Check the oxygen sensor (front). (Refer to P.13B-80.)
NG
Replace
OK
Check the following connector: B-31
NG
Repair
OK
Check the harness wire between the oxygen sensor (front) and the engine-ECU, and repair if necessary.
OK
Measure at engine-ECU connector B-31.
• Measure the voltage at the engine-ECU terminal.
• Engine: 2,500 r/min (after warming up)
• Voltage between terminal 76 and earth
OK: 0 V and 0.8 V alternate.
NG
Check the following connector: B-31
NG
Repair
OK
Check the harness wire between the oxygen sensor (front) and the engine-ECU, and repair if necessary.
OK
Check the following connector: B-31
NG
Repair
OK
Check the trouble symptoms.
OK
Transient malfunction (Refer to GROUP 00 – Points to Note for Intermittent Malfunctions.)
NG
Replace the engine-ECU.

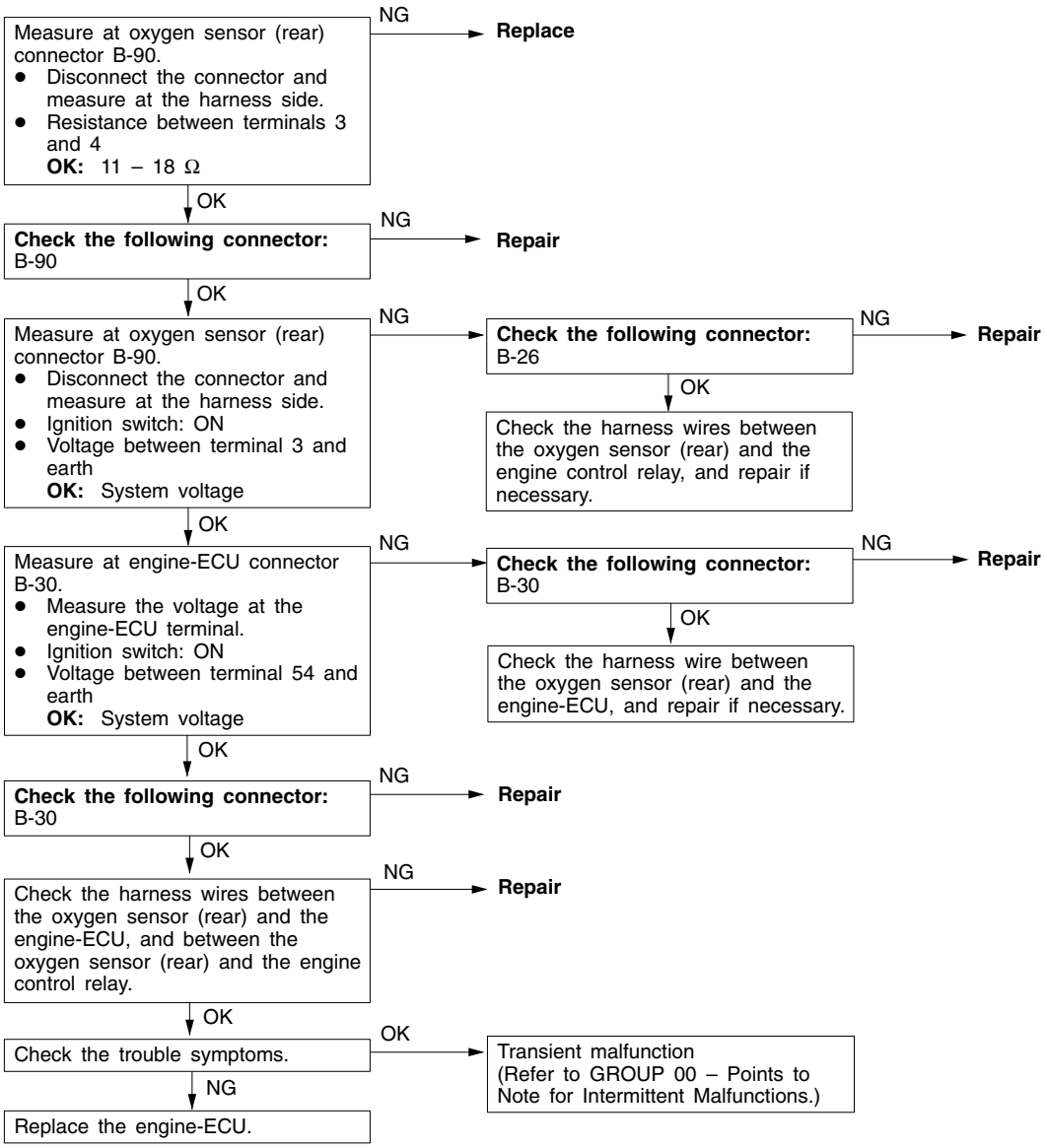
Code No. P0135 Oxygen sensor heater (front) system <sensor 1>	Probable cause
Range of Check • The engine coolant temperature is approx. 20°C or more. • The oxygen sensor heater (front) remains on. • The engine speed is 50 r/min or more. • Battery voltage is 11 – 16 V. Set Conditions • The current, which flows through the oxygen sensor heater (front), is 0.2 A or less or 3.5 A or more for six seconds.	• Malfunction of oxygen sensor heater (front) • Open or short circuit in the oxygen sensor heater (front) circuit or loose connector contact • Malfunction of engine-ECU



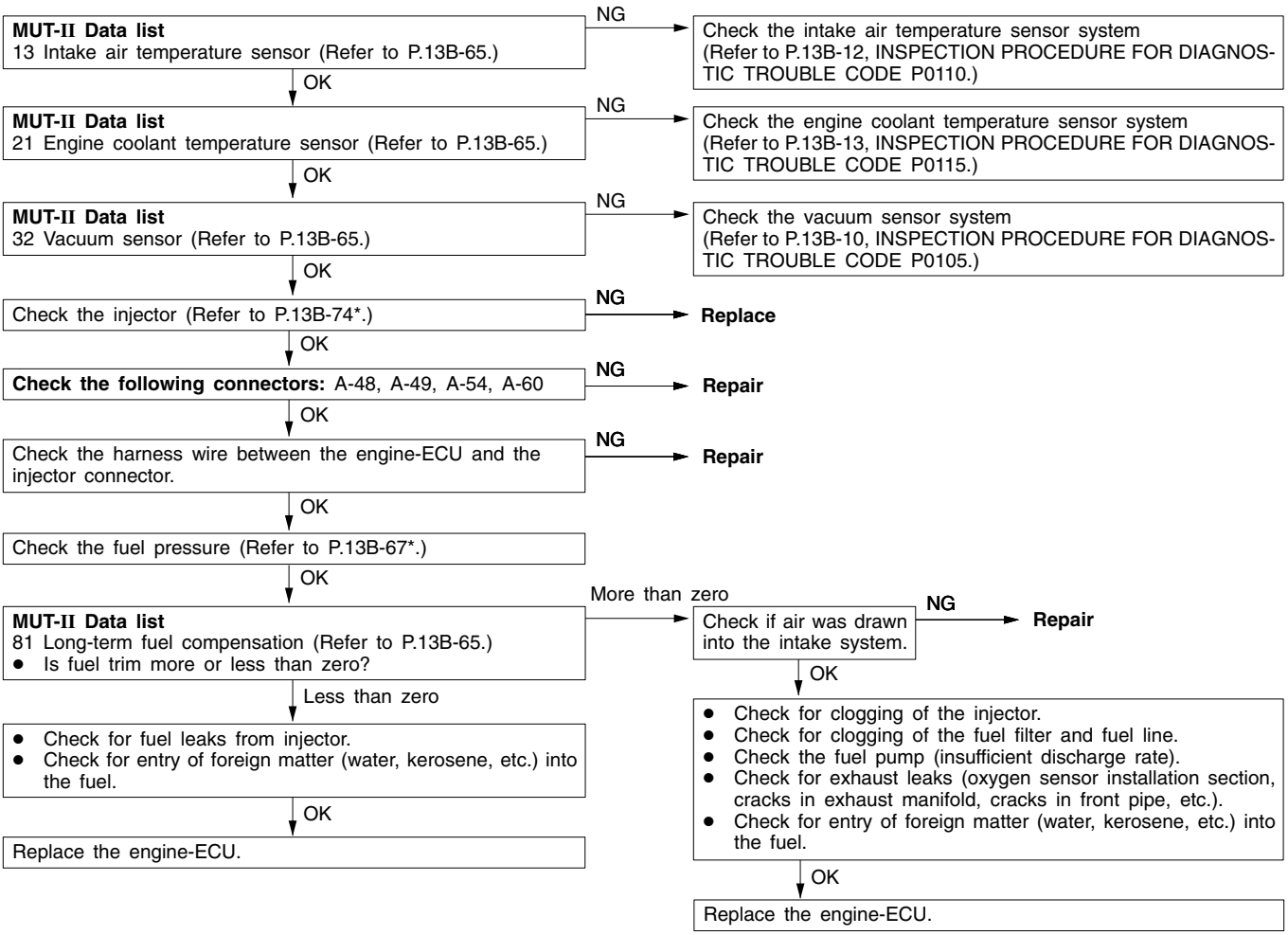
Code No. P0136 Oxygen sensor (rear) system <sensor 2>	Probable cause
Range of Check ● Three minutes have been passed since the engine has been started. ● The engine coolant temperature is approx. 80°C or more. ● Intake air temperature is 20 – 50°C ● Engine speed is 1,200 r/min or more ● Driving on a level surface at constant speed. Set Conditions ● The oxygen sensor (rear) output voltage is 4.5 V or more when the sensor output voltage is 0.2 V or less and a voltage of 5 V is applied to the oxygen sensor (rear) inside the engine-ECU.	● Malfunction of oxygen sensor (rear) ● Open or short circuit in the oxygen sensor (rear) circuit or loose connector contact ● Malfunction of engine-ECU
Range of Check ● Two seconds have passed after the ECU detected an open circuit. ● When the oxygen sensor (front) is in good condition. Set Conditions ● When the air/fuel ratio is rich, the oxygen sensor (front) output voltage is 0.5 V or more, the oxygen sensor (rear) output voltage is less than 0.1 V, and the oxygen sensor (rear) output voltage fluctuates within 0.078 V.	


Check the following connector: B-90
NG
Repair
OK
Measure at oxygen sensor (rear) connector B-90.
• Disconnect the connector and measure at the harness side.
• Resistance between terminal 2 and earth
OK: 2 Ω or less
NG
Check the following connector: B-31
NG
Repair
OK
Check the harness wire between the oxygen sensor (rear) and the engine-ECU.
NG
Repair
OK
Check the trouble symptoms.
NG
Replace the engine-ECU.
OK
Measure at oxygen sensor (rear) connector B-90.
• Measure the voltage at the oxygen sensor (rear) terminal
• Engine: 2,500 r/min (after warming up)
(1) Voltage between terminal 2 and earth
OK: 0.5 V or less
(2) Voltage between terminal 1 and earth
OK: 0 V and 0.8 V alternate.
(1) NG
Check the following connector: B-31
NG
Repair
OK
Check the harness wire between the oxygen sensor (rear) and the engine-ECU, and repair if necessary.
(2) NG
Check the oxygen sensor (rear). (Refer to P.13B-80.)
NG
Replace
OK
Check the following connector: B-31
NG
Repair
OK
Check the harness wire between the oxygen sensor (rear) and the engine-ECU, and repair if necessary.
OK
Measure at engine-ECU connector B-31.
• Measure the voltage at the engine-ECU terminal.
• Engine: 2,500 r/min (after warming up)
• Voltage between terminal 75 and earth
OK: 0 V and 0.8 V alternate.
NG
Check the following connector: B-31
NG
Repair
OK
Check the harness wire between the oxygen sensor (rear) and the engine-ECU, and repair if necessary.
OK
Check the following connector: B-31
NG
Repair
OK
Check the trouble symptoms.
OK
Transient malfunction (Refer to GROUP 00 – Points to Note for Intermittent Malfunctions.)
NG
Replace the engine-ECU.

Code No. P0141 Oxygen sensor heater (rear) system <sensor 2>	Probable cause
Range of Check • The engine coolant temperature is approx. 20°C or more. • The oxygen sensor heater (rear) remains on. • The engine speed is 50 r/min or more. • Battery voltage is 11 – 16 V. Set Conditions • The current, which flows through the oxygen sensor heater (rear), is 0.2 A or less or 3.5 A or more for six seconds.	• Malfunction of oxygen sensor heater (rear) • Open or short circuit in the oxygen sensor heater (rear) circuit or loose connector contact • Malfunction of engine-ECU

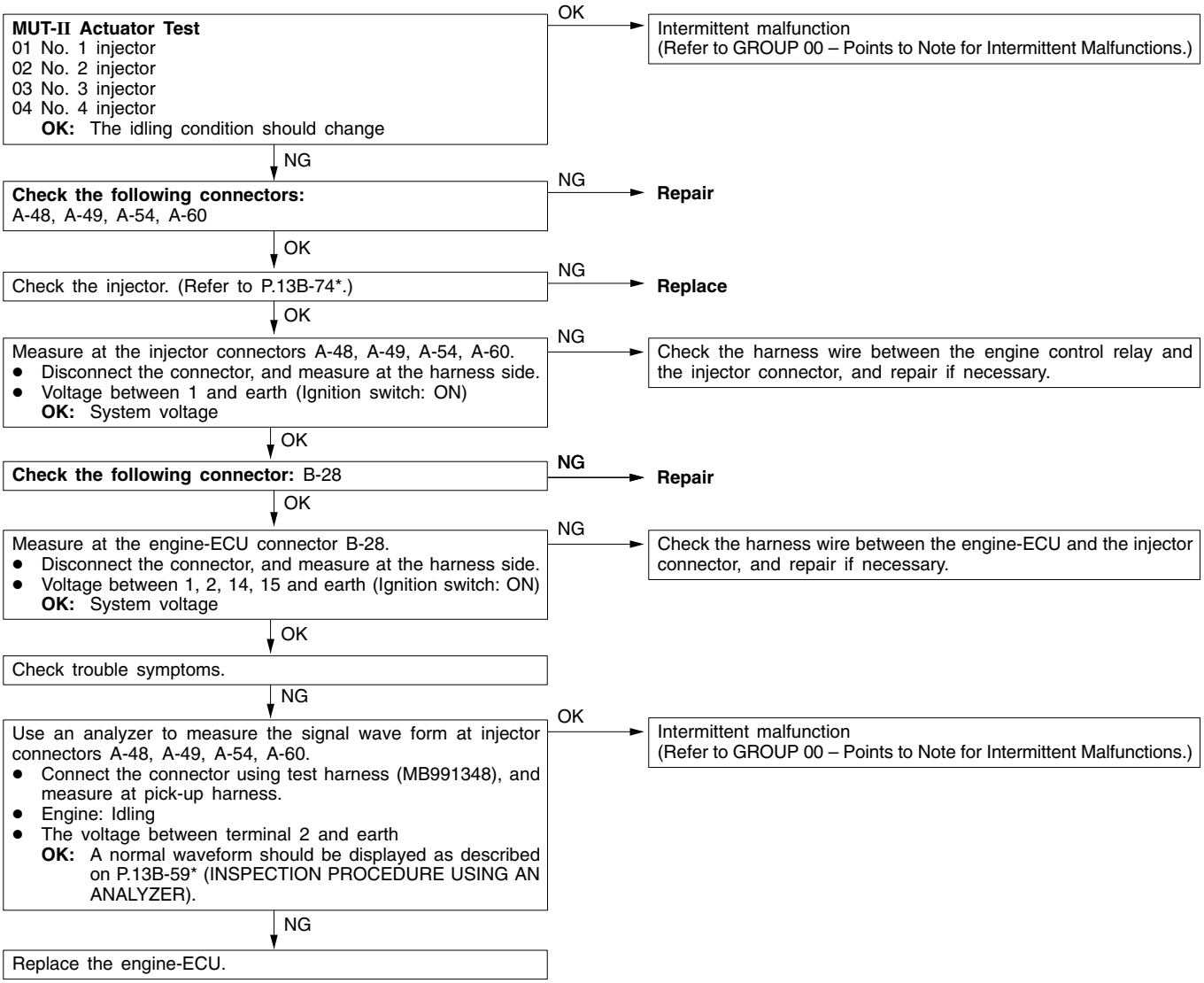


Code No. P0170 Abnormal fuel system	Probable cause
Range of Check • Engine: Being learning the air-fuel ratio Set Conditions • Two seconds or more have been passed while the fuel injection amount compensation value is too low. or • Two seconds or more have been passed while the fuel injection amount compensation value is too high.	• Incorrect fuel pressure • Malfunction of injector • Malfunction of oxygen sensor (front) • Malfunction of intake air temperature sensor • Malfunction of vacuum sensor • Malfunction of engine-ECU



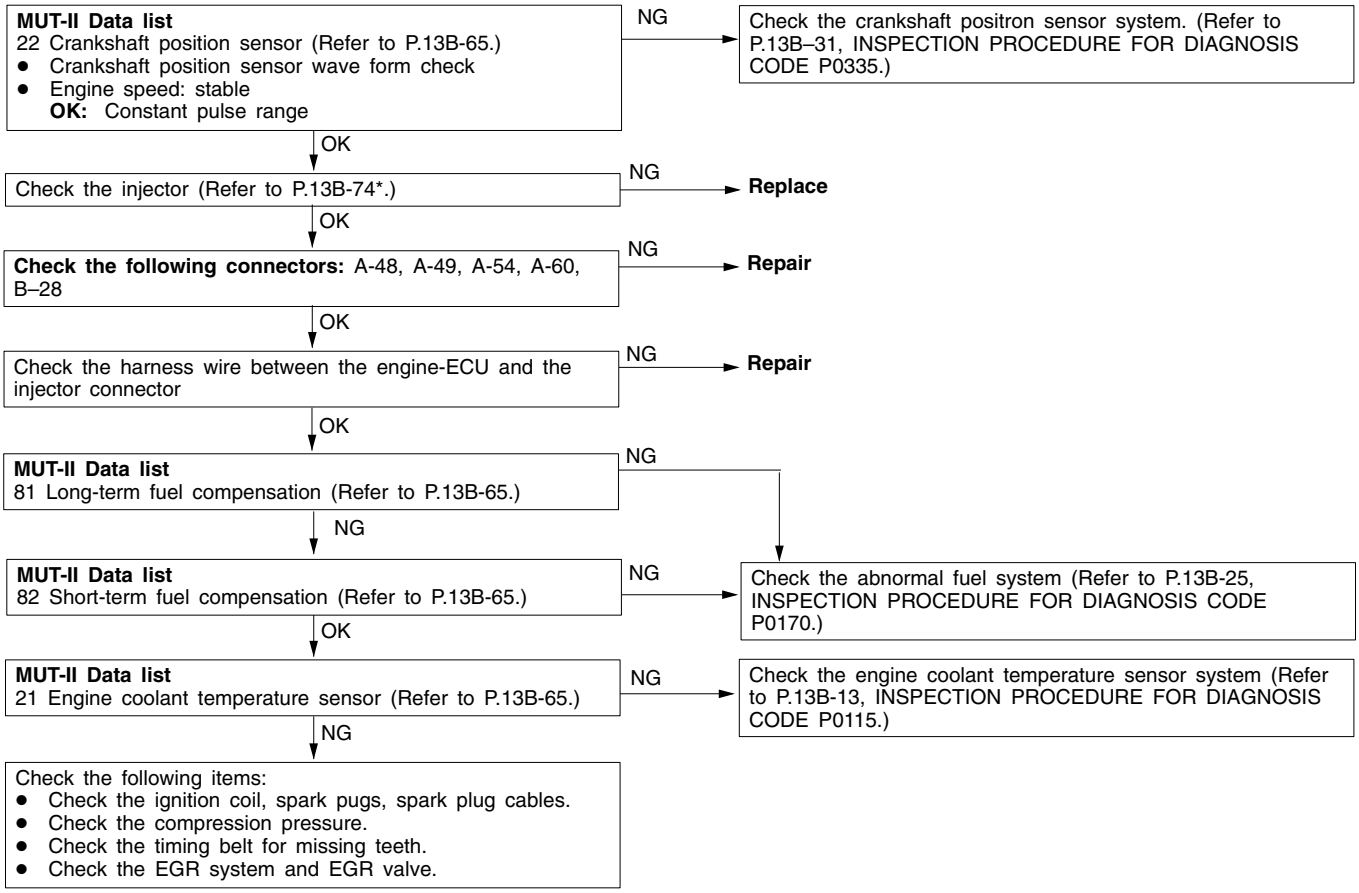
NOTE:
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

Code No. P0201 No. 1 injector system Code No. P0202 No. 2 injector system Code No. P0203 No. 3 injector system Code No. P0204 No. 4 injector system	Probable cause
Range of Check • Engine speed is approx. 50 – 1,000 r/min • The throttle position sensor output voltage is 1.15 V or less. • Actuator test by MUT-II is not carried out. Set Conditions • Surge voltage of injector coil is not detected for 2 seconds.	• Malfunction of the injector • Improper connector contact, open circuit or short-circuited harness wire of the injector circuit • Malfunction of the engine-ECU



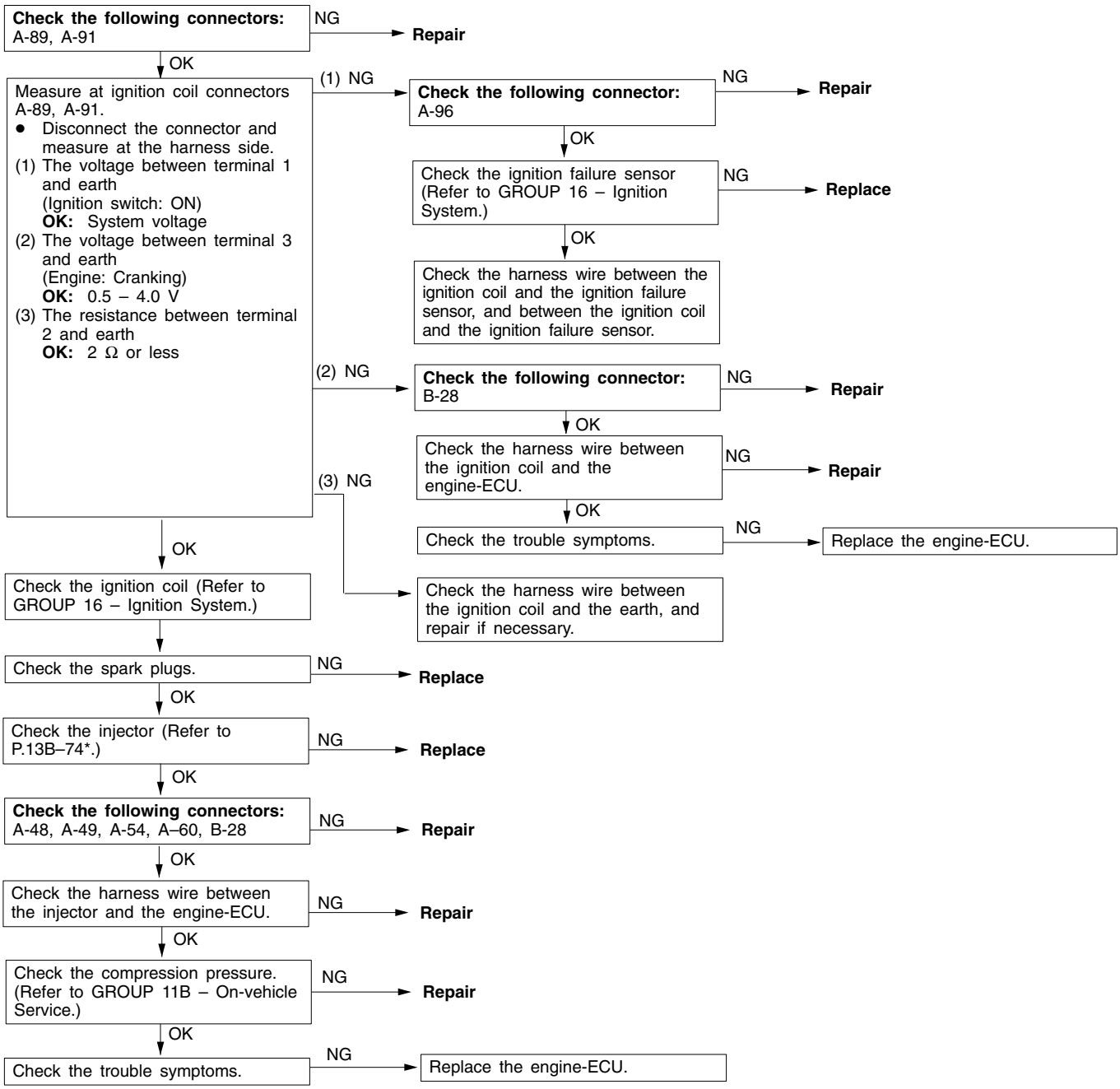
NOTE:
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

Code No. P0300 Random cylinder misfire detected	Probable cause
Range of Check ● Engine speed is approx. 50 – 4,500 r/min. ● When the engine is running except deceleration and sudden acceleration Set Conditions ● The number of misfire exceeds a predetermined number per 200 engine revolutions. ● The number of misfire exceeds a predetermined number per 1,000 engine revolutions.	● Malfunction of the ignition system ● Abnormal compression ● Malfunction of injector ● Abnormal signal from the crank angle sensor ● Malfunction of the lambda control system ● Malfunction of the engine coolant temperature sensor ● Missing timing belt teeth ● Malfunction of the EGR valve ● Malfunction of engine-ECU



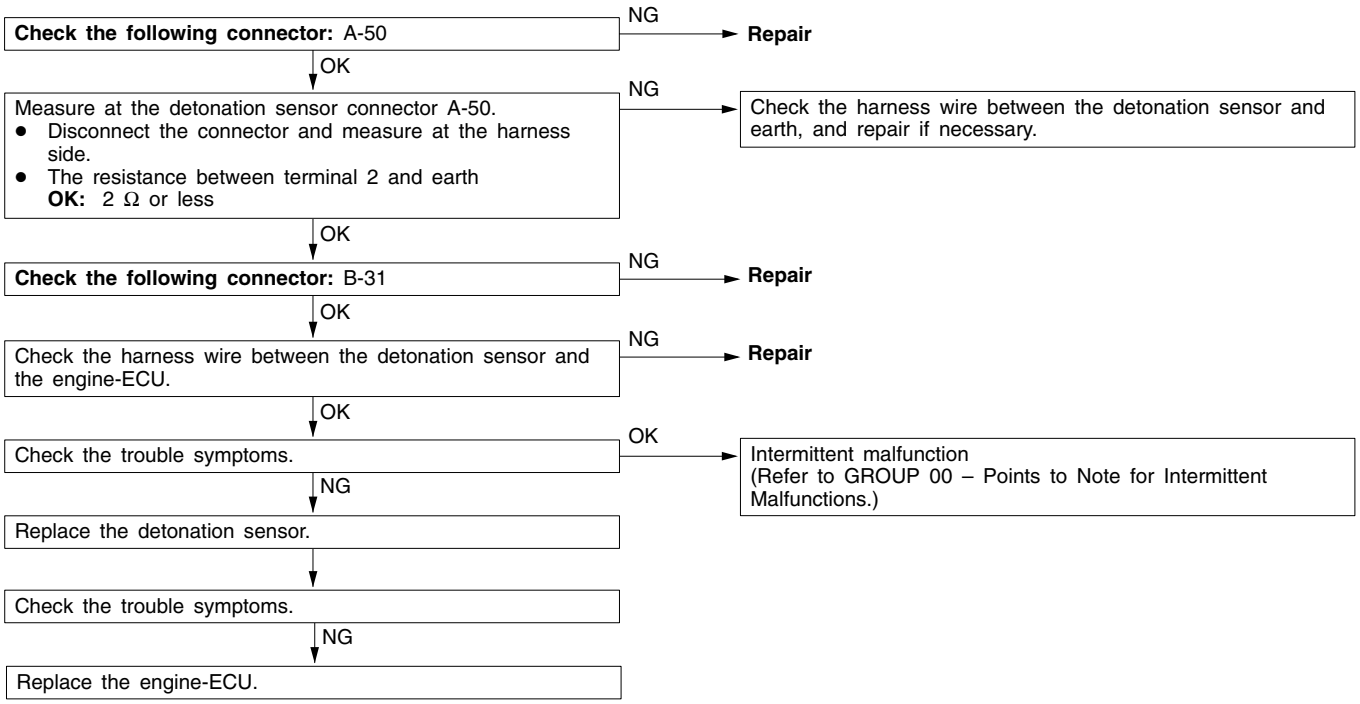
NOTE:
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

Code No. P0301 No. 1 cylinder misfire detected Code No. P0302 No. 2 cylinder misfire detected Code No. P0303 No. 3 cylinder misfire detected Code No. P0304 No. 4 cylinder misfire detected	Probable cause
Range of Check • The engine speed is 500 – 4,500 r/min. • While the engine is running except deceleration and sudden acceleration. Set Conditions • The number of misfires exceeds a predetermined number per 200 engine revolutions (Misfire has occurred in only one cylinder). or • The number of misfires exceeds a predetermined number per 1,000 engine revolutions (Misfire has occurred in only one cylinder).	• Malfunction of the ignition system • Abnormal compression • Malfunction of injector • Malfunction of engine-ECU

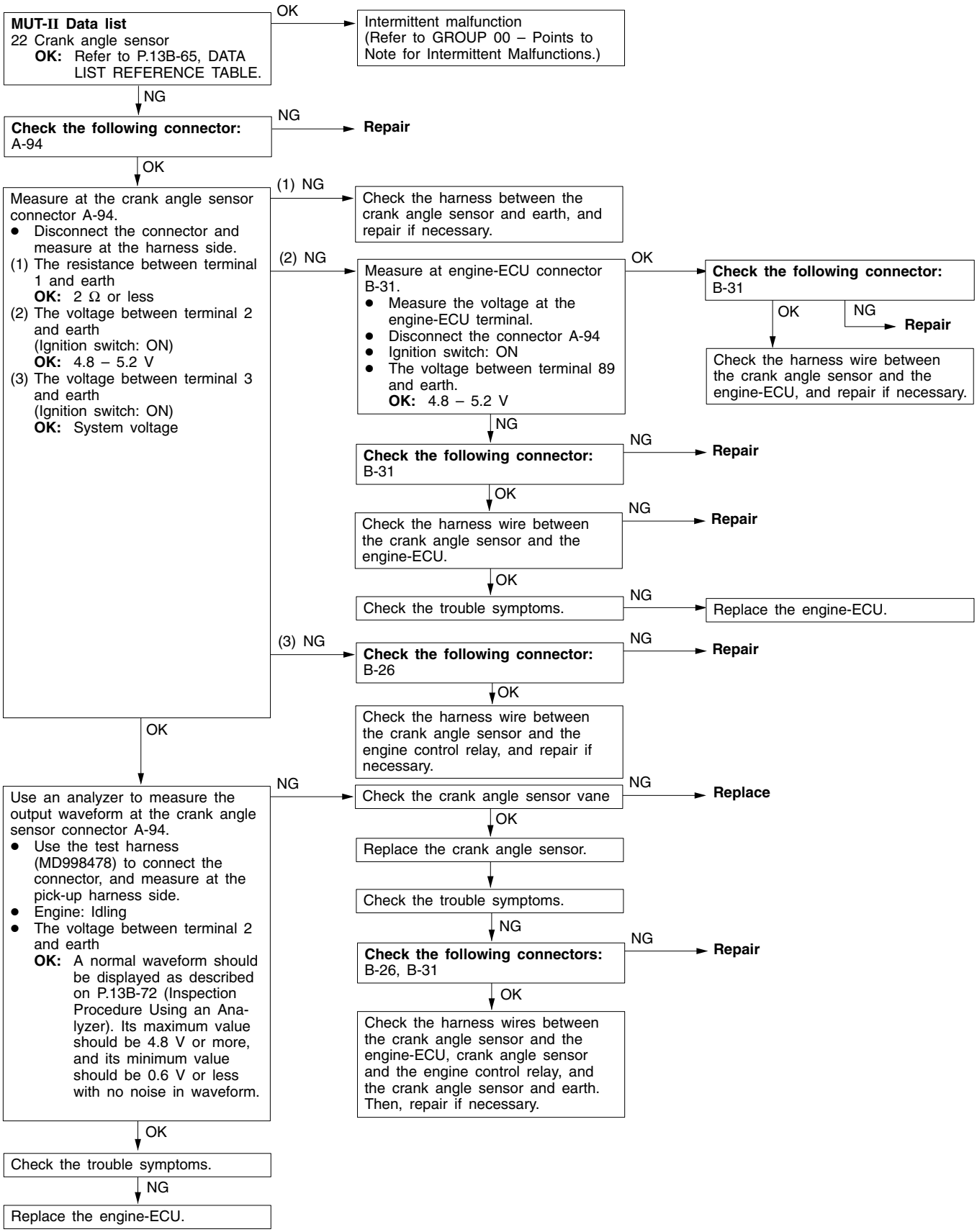


NOTE:
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

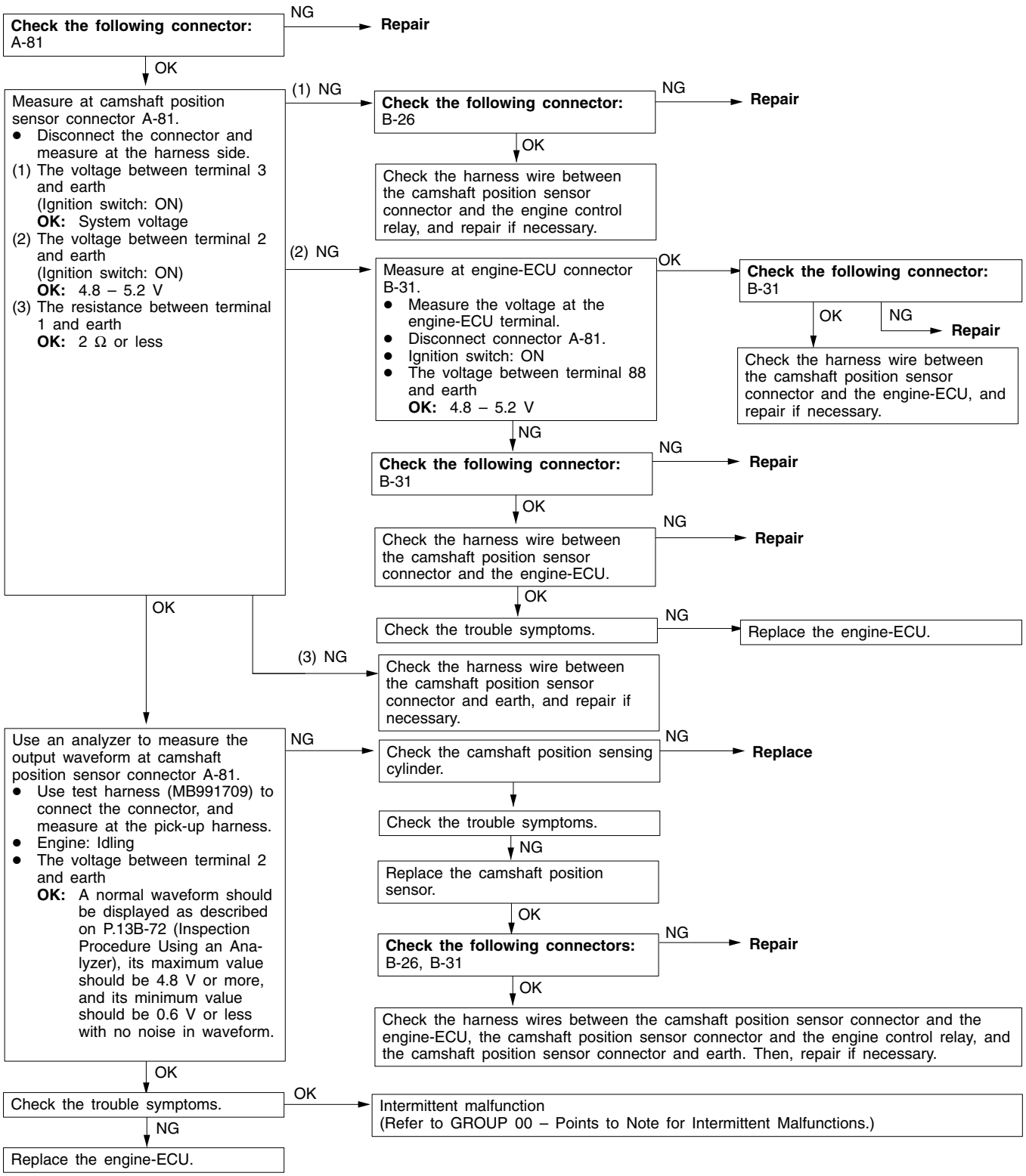
Code No. P0325 Detonation sensor system	Probable cause
Range of Check ● Engine: Two seconds after the engine has been started Set Conditions ● Changes in sensor output voltage (detonation sensor peak voltage per 1/2 crankshaft rotation) in 200 consecutive cycles are 0.06 V or less.	● Malfunction of the detonation sensor ● Open or short circuit in the detonation sensor circuit or loose connector contact ● Malfunction of engine-ECU



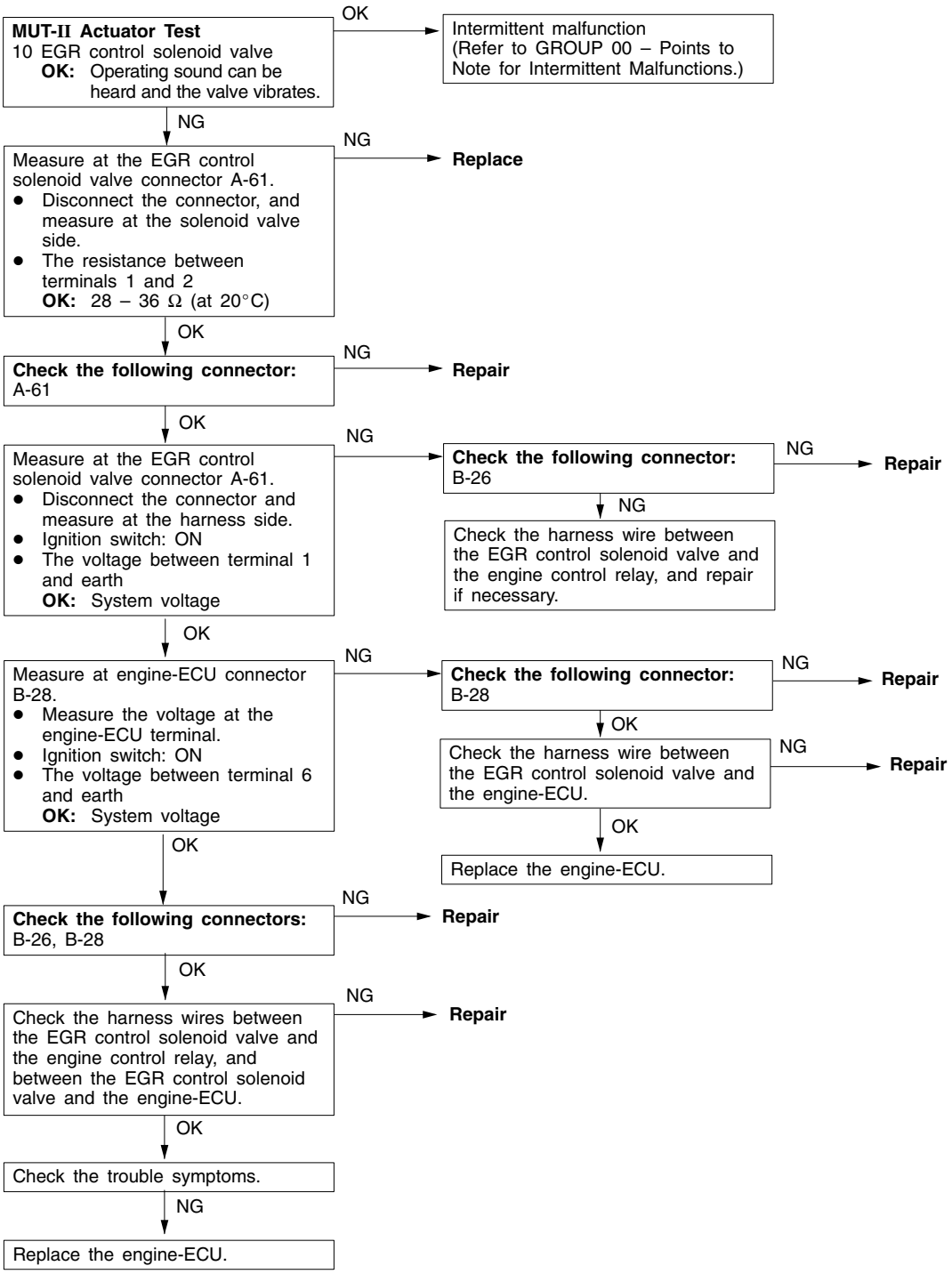
Code No. P0335 Crank angle sensor system	Probable cause
Range of Check ● Engine is cranking Set Conditions ● Sensor output voltage does not change for 2 seconds (no pulse signal input).	● Malfunction of the crank angle sensor. ● Open or short circuit in the crank angle sensor circuit or loose connector contact. ● Malfunction of engine-ECU


MUT-II Data list
22 Crank angle sensor
OK: Refer to P.13B-65, DATA LIST REFERENCE TABLE.
OK
Intermittent malfunction (Refer to GROUP 00 – Points to Note for Intermittent Malfunctions.)
NG
Check the following connector: A-94
NG
Repair
OK
Measure at the crank angle sensor connector A-94.
• Disconnect the connector and measure at the harness side.
(1) The resistance between terminal 1 and earth
OK: 2 Ω or less
(2) The voltage between terminal 2 and earth
(Ignition switch: ON)
OK: 4.8 – 5.2 V
(3) The voltage between terminal 3 and earth
(Ignition switch: ON)
OK: System voltage
(1) NG
Check the harness between the crank angle sensor and earth, and repair if necessary.
(2) NG
Measure at engine-ECU connector B-31.
• Measure the voltage at the engine-ECU terminal.
• Disconnect the connector A-94
• Ignition switch: ON
• The voltage between terminal 89 and earth.
OK: 4.8 – 5.2 V
OK
Check the following connector: B-31
OK
NG
Repair
Check the harness wire between the crank angle sensor and the engine-ECU, and repair if necessary.
NG
Check the following connector: B-31
NG
Repair
OK
Check the harness wire between the crank angle sensor and the engine-ECU.
NG
Repair
OK
Check the trouble symptoms.
NG
Replace the engine-ECU.
(3) NG
Check the following connector: B-26
NG
Repair
OK
Check the harness wire between the crank angle sensor and the engine control relay, and repair if necessary.
OK
Use an analyzer to measure the output waveform at the crank angle sensor connector A-94.
• Use the test harness (MD998478) to connect the connector, and measure at the pick-up harness side.
• Engine: Idling
• The voltage between terminal 2 and earth
OK: A normal waveform should be displayed as described on P.13B-72 (Inspection Procedure Using an Analyzer). 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.
NG
Check the crank angle sensor vane
NG
Replace
OK
Replace the crank angle sensor.
Check the trouble symptoms.
NG
Check the following connectors: B-26, B-31
NG
Repair
OK
Check the harness wires between the crank angle sensor and the engine-ECU, crank angle sensor and the engine control relay, and the crank angle sensor and earth. Then, repair if necessary.
OK
Check the trouble symptoms.
NG
Replace the engine-ECU.

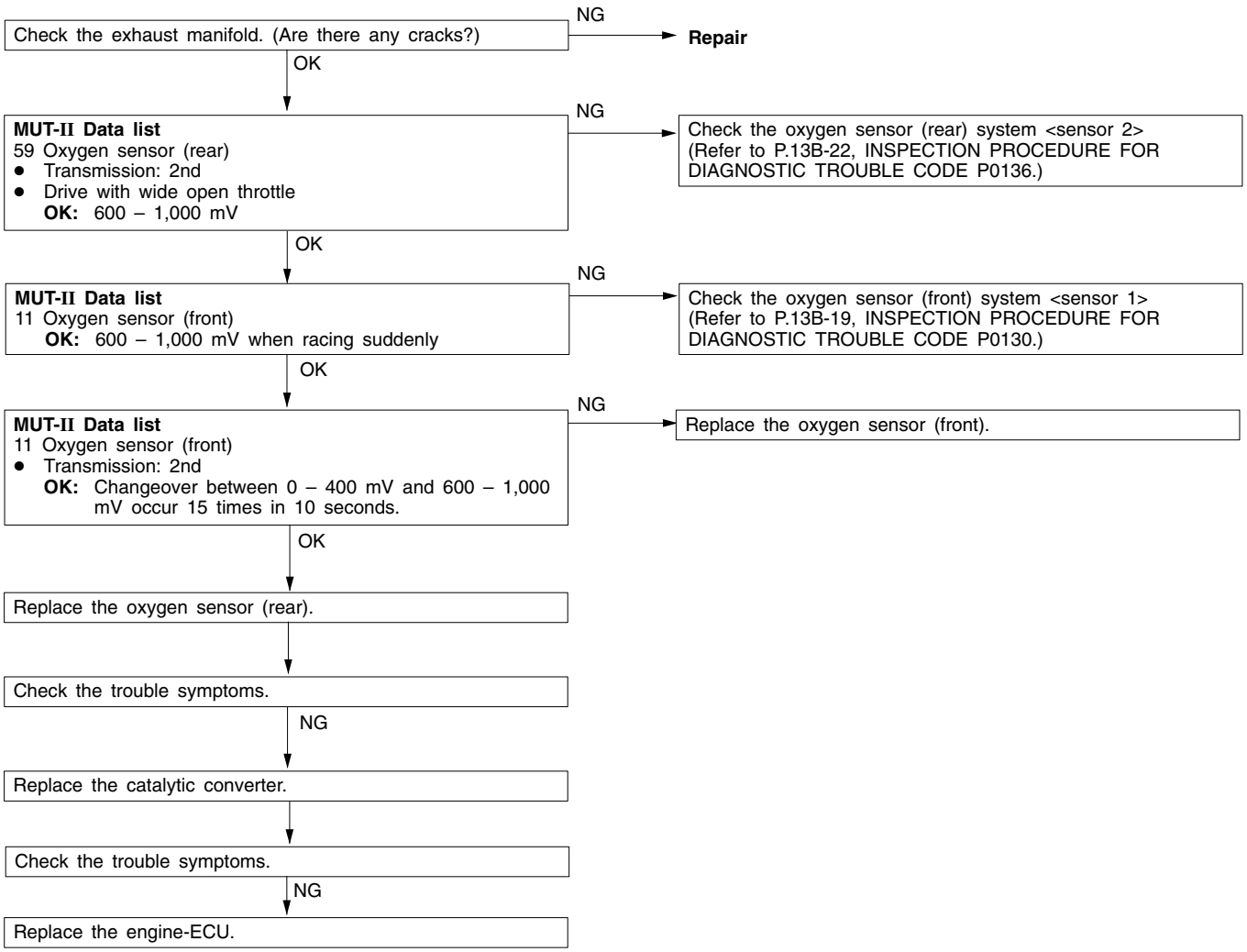
Code No. P0340 Camshaft position sensor system	Probable cause
Range of Check ● After the engine was started Set Conditions ● The sensor output voltage does not change for 2 seconds (no pulse signal input).	● Malfunction of the camshaft position sensor ● Open or short circuit in the camshaft position sensor circuit or loose connector contact. ● Malfunction of engine-ECU



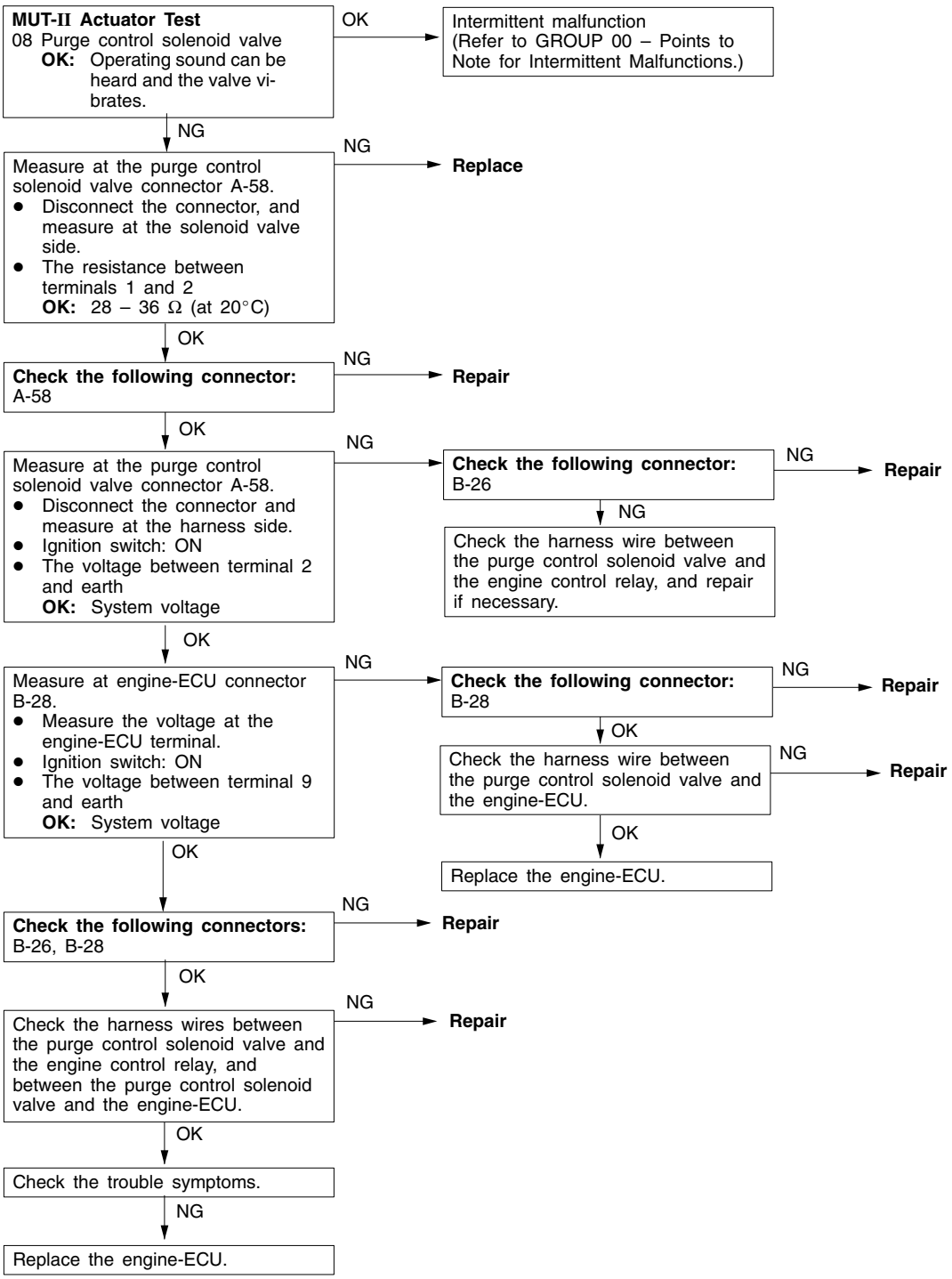
Code No. P0403 EGR control solenoid valve system	Probable cause
Range of Check • Ignition switch: ON • Battery voltage is 10 V or more. Set Conditions • The solenoid coil surge voltage (battery voltage + 2 V) is not detected when the EGR control solenoid valve is turned from on to off.	• Malfunction of the EGR control solenoid valve • Open or short circuit in the EGR control solenoid valve circuit or loose connector contact • Malfunction of engine-ECU



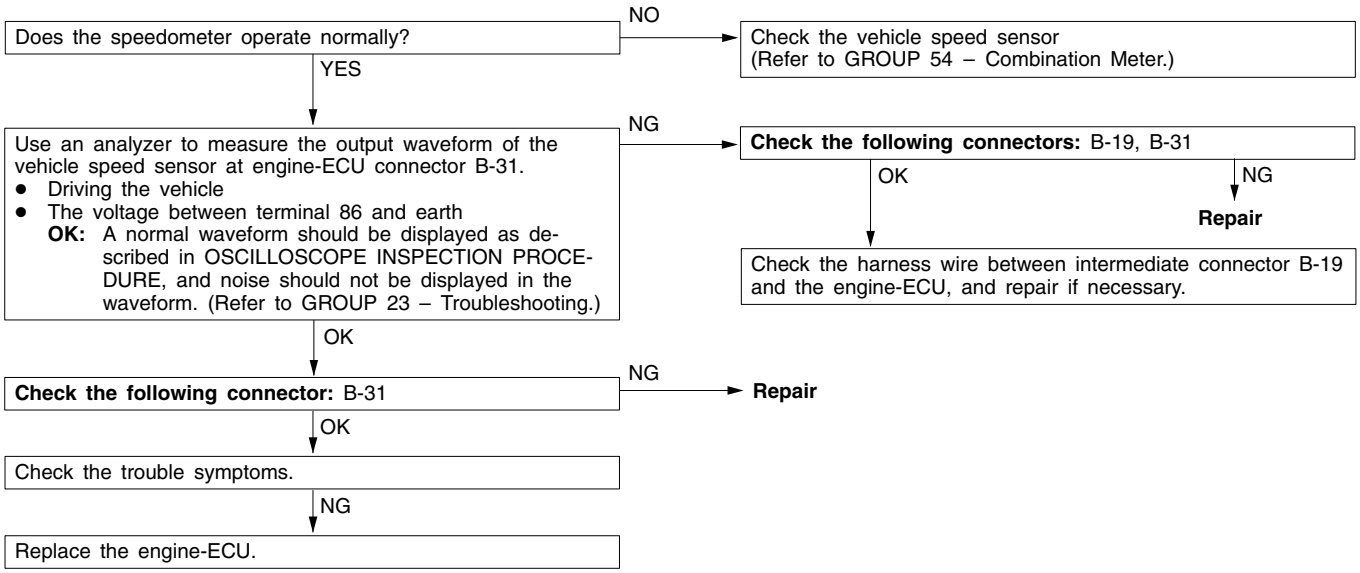
Code No. P0421 Catalyst malfunction	Probable cause
Range of Check • The engine speed is 4,000 r/min or less. • During driving • During air/fuel ratio feedback control Set Conditions • The ratio between the oxygen sensor (rear) and the oxygen sensor (front) output frequencies reaches 0.8 per 10 seconds on average.	• Malfunction of catalyst • Malfunction of the oxygen sensor (front) • Malfunction of the oxygen sensor (rear) • Malfunction of engine-ECU



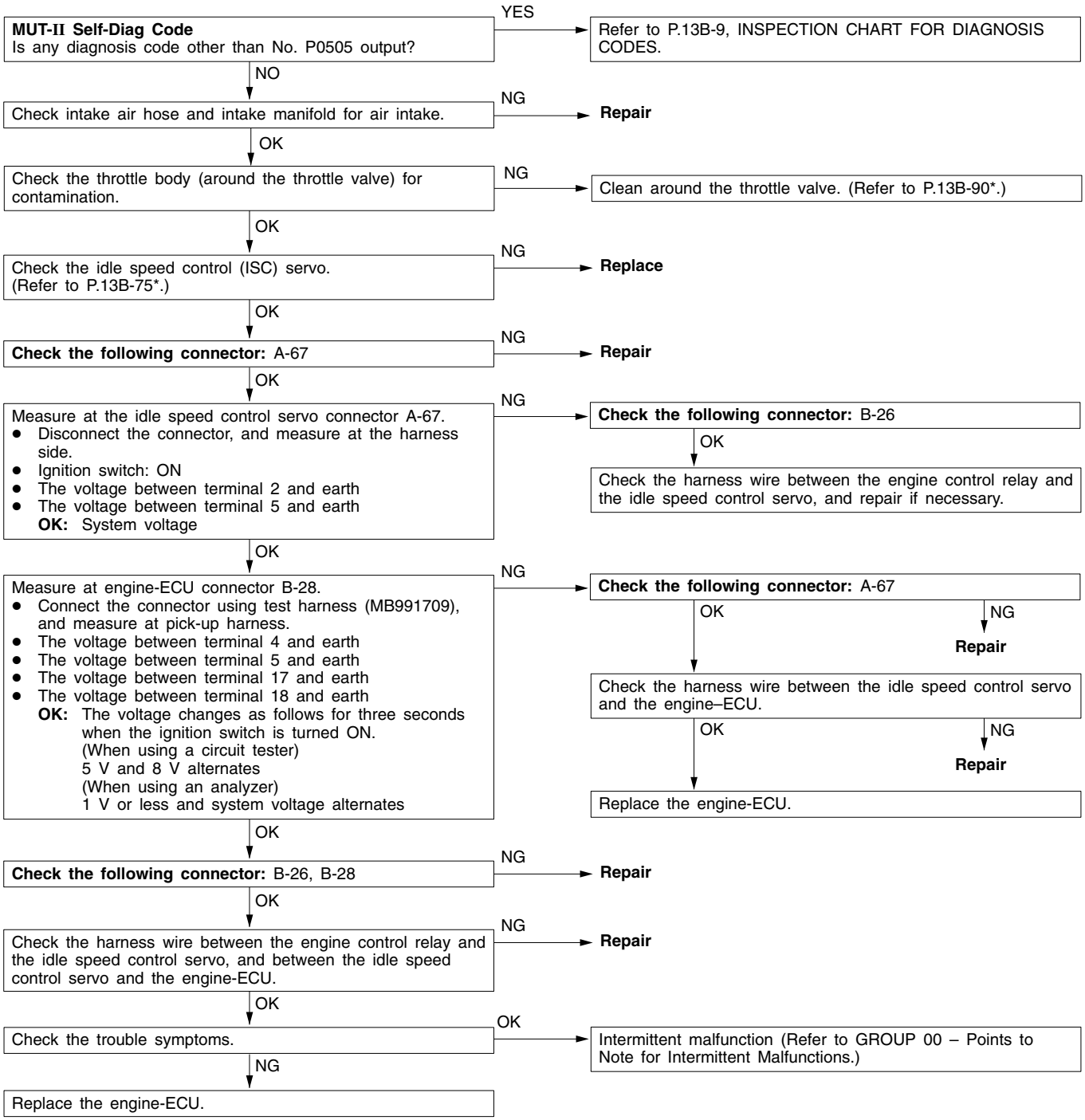
Code No. P0443 Purge control solenoid valve system	Probable cause
Range of Check ● Ignition switch: ON ● Battery voltage is 10 V or more. Set Conditions ● The solenoid coil surge voltage (battery voltage + 2 V) is not detected when the purge control solenoid valve is turned from on to off.	● Malfunction of the purge control solenoid valve ● Open or short circuit in the purge control solenoid valve circuit or loose connector contact ● Malfunction of engine-ECU



Code No. P0500 Vehicle speed sensor system	Probable cause
Range of Check ● Engine: Two seconds after the engine was started ● Idle switch: OFF ● Engine speed: 2,500 r/min or more ● During high engine load Set Conditions ● The sensor output voltage does not change for 2 seconds (no pulse signal input).	● Malfunction of the vehicle speed sensor ● Open or short circuit in the vehicle speed sensor circuit or loose connector contact ● Malfunction of engine-ECU



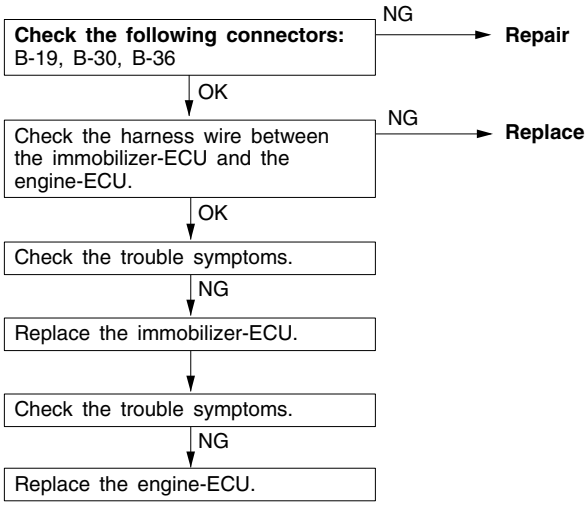
Code No. P0505 Idle speed control (ISC) system	Probable cause
Check Area ● Vehicle speed has reached 1.5 km/h at least once. ● Under the closed loop idle speed control. Judgment Criteria ● Actual idle speed has continued to be higher than the target idle speed by 300 r/min or more for 10 sec. Check Area ● 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 approx. 80°C or more. ● Battery voltage is 10 V or more. ● Intake air temperature is –10°C (14°F) or more. Judgment Criteria ● Actual idle speed has been minimum 200 r/min higher than the target idle speed for ten seconds. Check Area ● During idle speed closed loop control. ● Engine coolant temperature is about 80°C or higher. ● Battery voltage is 10 V or higher. ● Power steering switch is off. ● Intake air pipe pressure is 53 kPa or less. ● Intake air temperature is –10°C or more. Judgment Criteria ● Actual idle speed has been minimum 100 r/min higher than the target idle speed for ten seconds.	● Malfunction of idle speed control (ISC) servo ● Improper connector contact, open circuit or short-circuited harness wire ● Malfunction of the engine-ECU



NOTE:
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

Cord No. P1610 Immobilizer system	Probable cause
Range of Check • Ignition switch: ON Set Conditions • Improper communication between the engine-ECU and the immobilizer-ECU	• Open or short circuit, or loose connector contact • Malfunction of the immobilizer-ECU • Malfunction of the engine-ECU

NOTE
(1) If the registered ignition keys are close each other when starting the engine, radio interference may cause this code to be displayed.
(2) This code may be displayed when registering the key ID code.



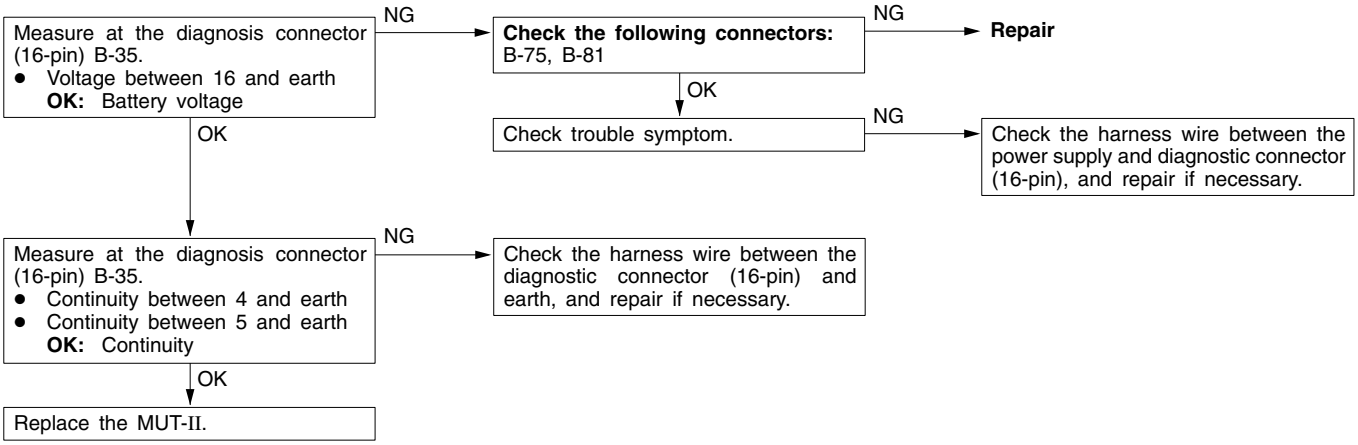
INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom		Inspection procedure No.	Reference page
Communication with MUT-II is impossible.	Communication with all systems is not possible.	1	13B-40
	Communication with engine-ECU only is not possible.	2	13B-40
Engine warning lamp and related parts	The engine warning lamp does not illuminate right after the ignition switch is turned to the ON position.	3	13B-41
	The engine warning lamp remains illuminating and never goes out.	4	13B-41
Starting	No initial combustion (starting impossible)	5	13B-42
	Initial combustion but no complete combustion (starting impossible)	6	13B-43
	Long time to start (improper starting)	7	13B-44
Idling stability (Improper idling)	Unstable idling (Rough idling, hunting)	8	13B-45
	Idling speed is high. (Improper idling speed)	9	13B-47
	Idling speed is low. (Improper idling speed)	10	13B-47
Idling stability (Engine stalls)	When the engine is cold, it stalls at idling. (Die out)	11	13B-48
	When the engine becomes hot, it stalls at idling. (Die out)	12	13B-49
	The engine stalls when starting the car. (Pass out)	13	13B-51
	The engine stalls when decelerating.	14	13B-51
Driving	Hesitation, sag or stumble	15	13B-52
	The feeling of impact or vibration when accelerating	16	13B-53
	The feeling of impact or vibration when decelerating	17	13B-53
	Poor acceleration	18	13B-54
	Surge	19	13B-55
	Knocking	20	13B-56
Dieseling		21	13B-56
Too high CO and HC concentration when idling		22	13B-57
Fans (radiator fan, A/C condenser fan) are inoperative		23	13B-58

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

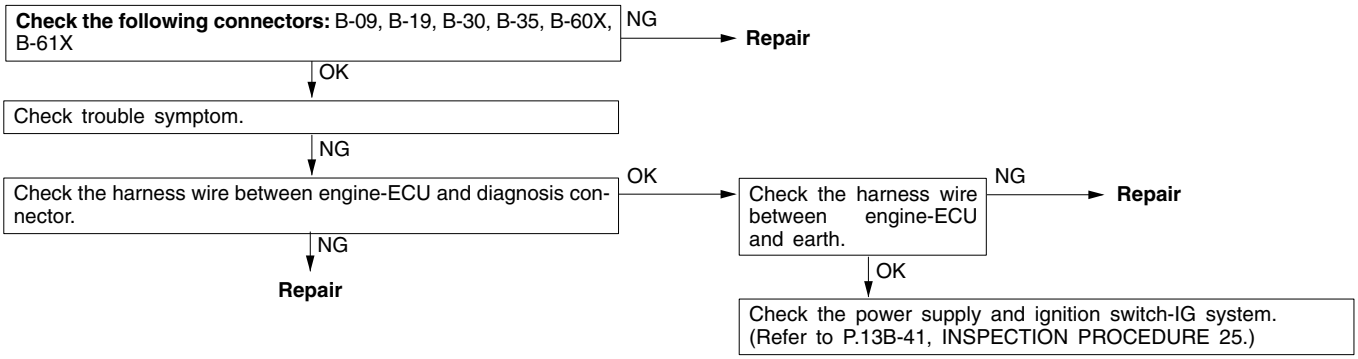
INSPECTION PROCEDURE 1

Communication with MUT-II is not possible. (Communication with all systems is not possible.)	Probable cause
The cause is probably a defect in the power supply system (including earth) for the diagnosis line.	• Malfunction of the connector • Malfunction of the harness wire



INSPECTION PROCEDURE 2

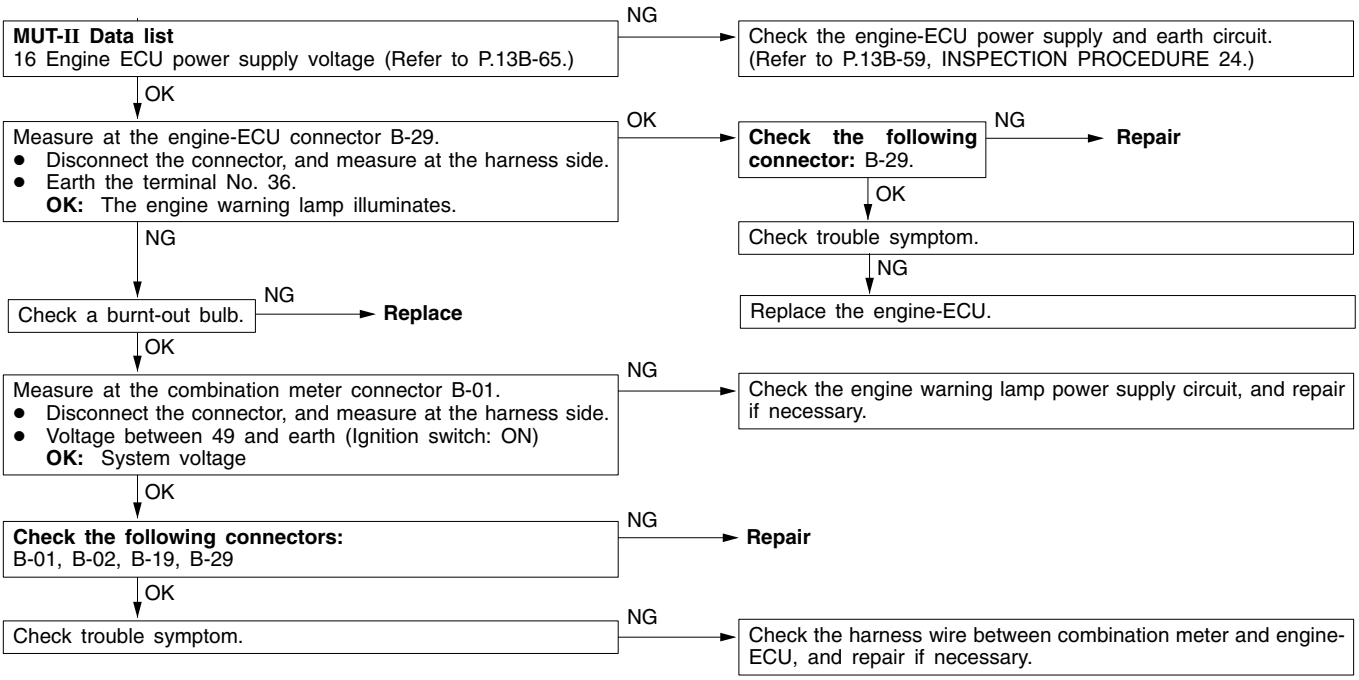
MUT-II communication with engine-ECU is impossible.	Probable cause
One of the following causes may be suspected: • No power supply to engine-ECU. • Defective earth circuit of engine-ECU. • Defective engine-ECU. • Improper communication line between engine-ECU and MUT-II	• Malfunction of engine-ECU power supply circuit • Malfunction of engine-ECU • Open circuit between engine-ECU and diagnosis connector



NOTE
Though the above inspection has been performed, if trouble symptom does not disappear, check the multi center display, and replace it if necessary.

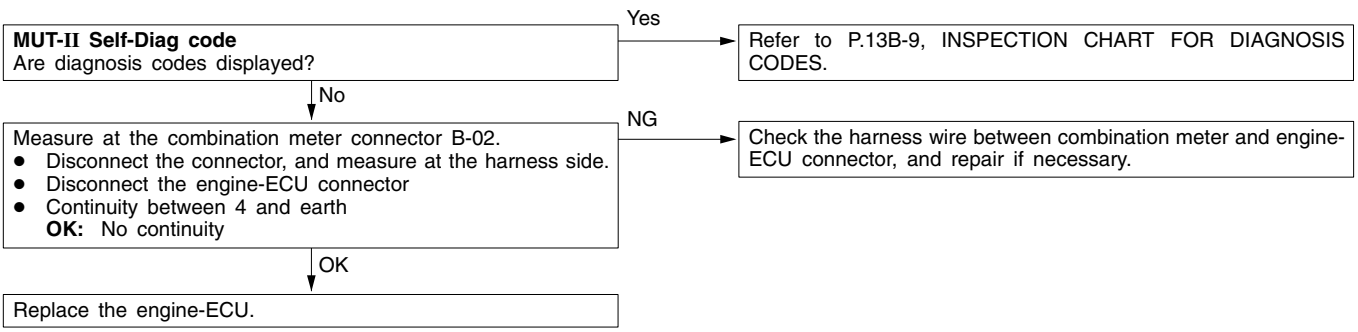
INSPECTION PROCEDURE 3

The engine warning lamp does not illuminate right after the ignition switch is turned to the ON position.	Probable cause
Because there is a burnt-out bulb, the engine-ECU causes the engine warning lamp to illuminate for five seconds immediately after the ignition switch is turned to ON. If the engine warning lamp does not illuminate immediately after the ignition switch is turned to ON, one of the malfunctions listed at right has probably occurred.	• Burnt-out bulb • Defective warning lamp circuit • Malfunction of the engine-ECU



INSPECTION PROCEDURE 4

The engine warning lamp remains illuminating and never goes out.	Probable cause
In cases such as the above, the cause is probably that the engine-ECU is detecting a problem in a sensor or actuator, or that one of the malfunctions listed at right has occurred.	• Short-circuit between the engine warning lamp and engine-ECU • Malfunction of the engine-ECU



INSPECTION PROCEDURE 5

No initial combustion (starting impossible)	Probable cause
In cases such as the above, the cause is probably that a spark plug is defective, or that the supply of fuel to the combustion chamber is defective. In addition, foreign materials (water, kerosene, etc.) may be mixed with the fuel.	• Malfunction of the ignition system • Malfunction of the fuel pump system • Malfunction of the injectors • Malfunction of the engine-ECU • Malfunction of the immobilizer system • Foreign materials in fuel

Check battery voltage when cranking.
OK: 8 V or higher
NG → Check the battery. (Refer to GROUP 54 – Battery.)
OK ↓

Is an immobilizer-ECU diagnosis code displayed?
Yes → Check the immobilizer. (Refer to GROUP 54 – Ignition Key and Immobilizer.)
No ↓

MUT-II Data list
16 Voltage of engine-ECU power source (Refer to P.13B-65.)
NG → Check the power supply and ignition switch-IG system. (Refer to P.13B-59, INSPECTION PROCEDURE 25.)
OK ↓

Does the camshaft rotate at the engine cranking? (When oil filler cap is removed.)
No → Check timing belt for breakage.
Yes ↓

MUT-II Self-Diag code
Are diagnosis codes displayed?
Yes → Refer to P.13B-9, INSPECTION CHART FOR DIAGNOSIS CODES.
No ↓

MUT-II Data list
22 Crank angle sensor
OK: Cranking speed is displayed.
No → Check the crank angle sensor system. (Refer to P.13B-25, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0335.)
OK ↓

MUT-II Actuator test
07 Fuel pump (Refer to P.13B-70.)
NG → Check the fuel pump system. (Refer to P.13B-60, INSPECTION PROCEDURE 26.)
OK ↓

MUT-II Data list
21 Engine coolant temperature sensor (Refer to P.13B-65.)
NG → Check the engine coolant temperature sensor system. (Refer to P.13B-13, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0115.)
OK ↓

Can any sound be heard from the injectors when cranking?
NG → Check the injector system. (Refer to P.13B-26, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0201, P0202, P0203, P0204.)
OK ↓

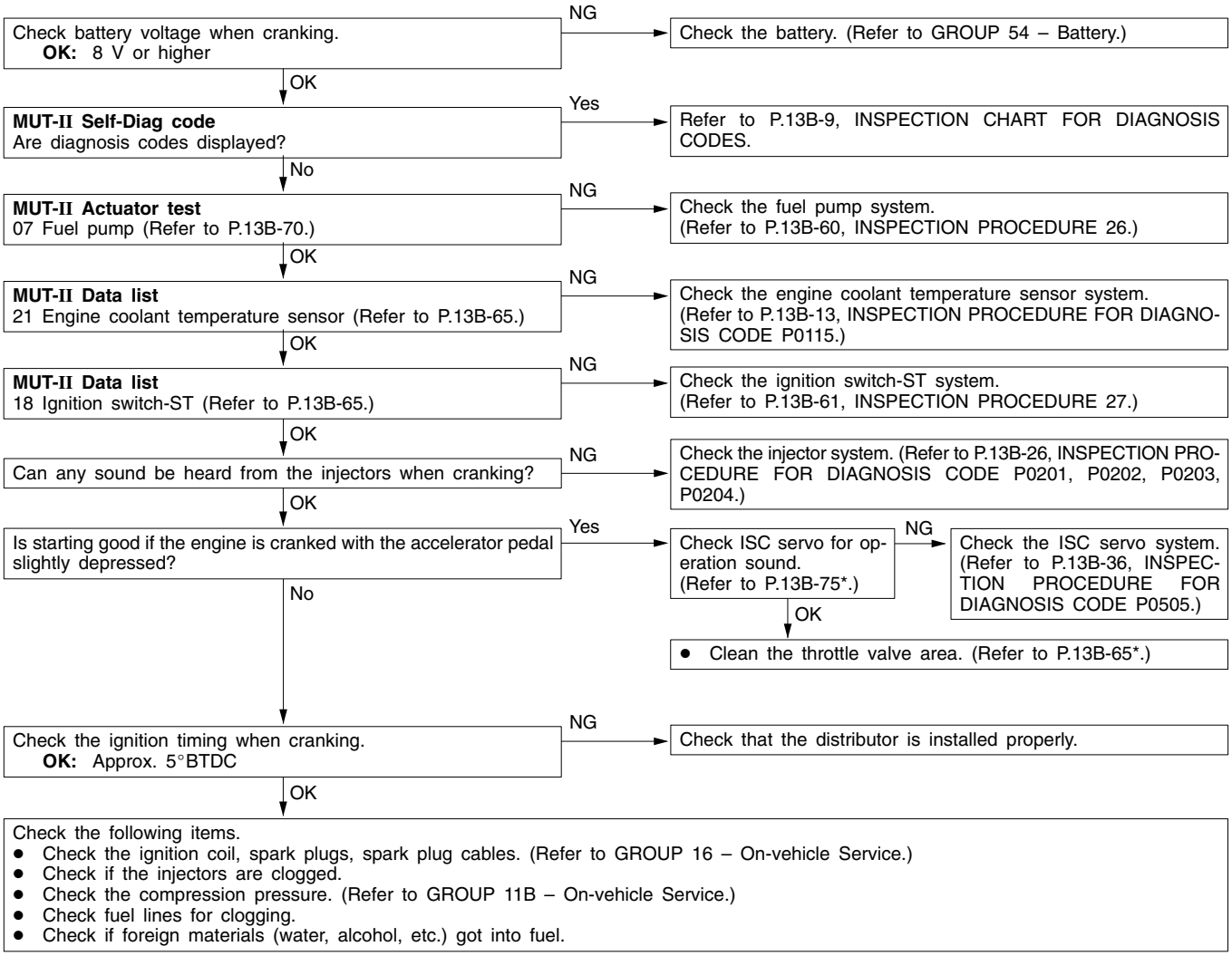
Does the engine tachometer display the cranking speed?
• Set the tachometer of primary voltage detection type.
NG → Check the ignition circuit system. (Refer to P.13B-63, INSPECTION PROCEDURE 31.)
OK ↓

Check the ignition timing when cranking.
OK: Approx. 5° BTDC
NG → Check that the distributor is installed properly.
OK ↓

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 16 – On-vehicle service.)
- Check if the injectors are clogged.
- Check if foreign materials (water, alcohol, etc.) got into fuel.
- Check the compression pressure.
- Check the immobilizer system. (Refer to GROUP 54 – Ignition Key and Immobilizer.)

INSPECTION PROCEDURE 6

Initial combustion but no complete combustion (starting impossible)	Probable cause
In such cases as the above, the cause is probably that the spark plugs are generating sparks but the sparks are weak, or the initial mixture for starting is not appropriate.	• Malfunction of the ignition system • Malfunction of the injector system • Foreign materials in fuel • Poor compression • Malfunction of the engine-ECU



NOTE:
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

INSPECTION PROCEDURE 7

In takes too long time to start. (Incorrect starting)	Probable cause
In cases such as the above, the cause is probably that the spark is weak and ignition is difficult, the initial mixture for starting is not appropriate, or sufficient compression pressure is not being obtained.	• Malfunction of the ignition system • Malfunction of the injector system • Inappropriate gasoline use • Poor compression

Check battery voltage when cranking
OK: 8 V or higher
NG → Check the battery. (Refer to GROUP 54 – Battery.)
OK ↓

MUT-II Self-Diag code
Are diagnosis codes displayed?
Yes → Refer to P.13B-9, INSPECTION CHART FOR DIAGNOSIS CODES.
No ↓

MUT-II Actuator test
07 Fuel pump (Refer to P.13B-70.)
NG → Check the fuel pump system. (Refer to P.13B-60, INSPECTION PROCEDURE 26.)
OK ↓

MUT-II Data list
21 Engine coolant temperature sensor (Refer to P.13B-65.)
NG → Check the engine coolant temperature sensor system. (Refer to P.13B-13, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0115.)
OK ↓

MUT-II Data list
18 Ignition switch-ST (Refer to P.13B-65.)
NG → Check the ignition switch-ST system. (Refer to P.13B-61, INSPECTION PROCEDURE 27.)
OK ↓

Can any sound be heard from the injectors when cranking?
NG → Check the injector system. (Refer to P.13B-26, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0201, P0202, P0203, P0204.)
OK ↓

Check the ignition timing when cranking.
OK: Approx. 5°BTDC
NG → Check that the distributor is installed properly.
OK ↓

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 16 – On-vehicle Service.)
- Check if the injectors are clogged.
- Check the compression pressure. (Refer to GROUP 11B – On-vehicle Service.)
- Check if foreign materials (water, alcohol, etc.) got into fuel.

INSPECTION PROCEDURE 8

Unstable idling (Rough idling, hunting)	Probable cause
In cases as the above, the cause is probably that the ignition system, air/fuel mixture, idle speed control (ISC) or compression pressure is defective. Because the range of possible causes is broad, inspection is narrowed down to simple items.	• Malfunction of the ignition system • Malfunction of air-fuel ratio control system • Malfunction of the ISC system • Malfunction of the purge control solenoid valve system • Malfunction of the EGR solenoid valve system • Poor compression • Drawing air into exhaust system

Were the battery terminals disconnected?
- Yes → After warming-up, let the engine run at idling for 10 minutes.
- No ↓

MUT-II Self-Diag code
Are diagnosis codes displayed?
- Yes → Refer to P.13B-9, INSPECTION CHART FOR DIAGNOSIS CODES.
- No ↓

Does idling speed fluctuate excessively?
- Yes → Check the throttle body. (Refer to P.13B-65*.)
  - Check trouble symptom.
    - NG → Inspect the intake of air into the air intake system.
      - Broken intake manifold gasket
      - Broken air intake hose
      - Broken vacuum hose
      - Positive crankcase ventilation valve does not operate.
- No ↓

Check the ISC servo for operation sound. (Refer to P.13B-75*.)
- NG → Check the ISC system. (Refer to P.13B-36, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0505.)
- OK ↓

Check the injector for operation sound.
- NG → Check the injector system. (Refer to P.13B-26, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0201, P0202, P0203, P0204.)
- OK ↓

MUT-II Data list
14 Throttle position sensor (Refer to P.13B-65.)
- NG → Check the throttle position sensor system. (Refer to P.13B-16, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0120.)
- OK ↓

MUT-II Data list
13 Intake air temperature sensor (Refer to P.13B-65.)
- NG → Check the intake air temperature sensor system. (Refer to P.13B-12, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0110.)
- OK ↓

MUT-II Data list
21 Engine coolant temperature sensor (Refer to P.13B-65.)
- NG → Check the engine coolant temperature sensor system. (Refer to P.13B-13, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0115.)
- OK ↓

MUT-II Actuator test
08 Purge control solenoid valve (Refer to P.13B-70.)
- NG → Check the purge control solenoid valve system. (Refer to P.13B-34, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0443.)
- OK ↓

MUT-II Actuator test
10 EGR control solenoid valve (Refer to P.13B-70.)
- NG → Check the EGR control solenoid valve system. (Refer to P.13B-32, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0403.)
- OK ↓

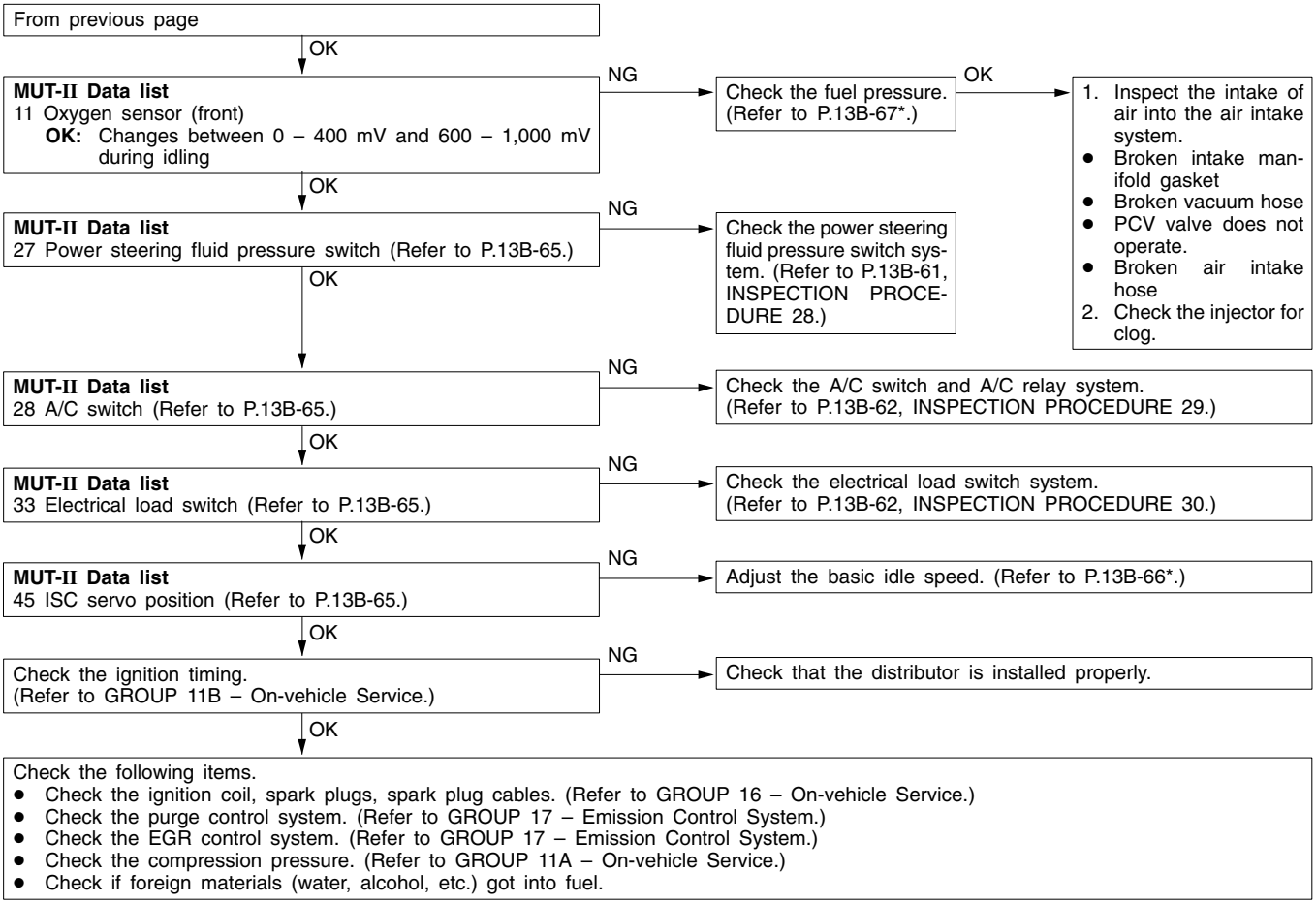
MUT-II Data list
59 Oxygen sensor (rear)
- Transmission: 2nd gear
- Driving with throttle widely open

OK: 600 – 1,000 mV
- NG → Check the oxygen sensor (rear) system. (Refer to P.13B-22, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0136.)
- OK ↓

MUT-II Data list
11 Oxygen sensor (front)

OK: 600 – 1,000 mV during sudden racing
- NG → Check the oxygen sensor (front) system. (Refer to P.13B-19, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0130.)
- OK → To next page

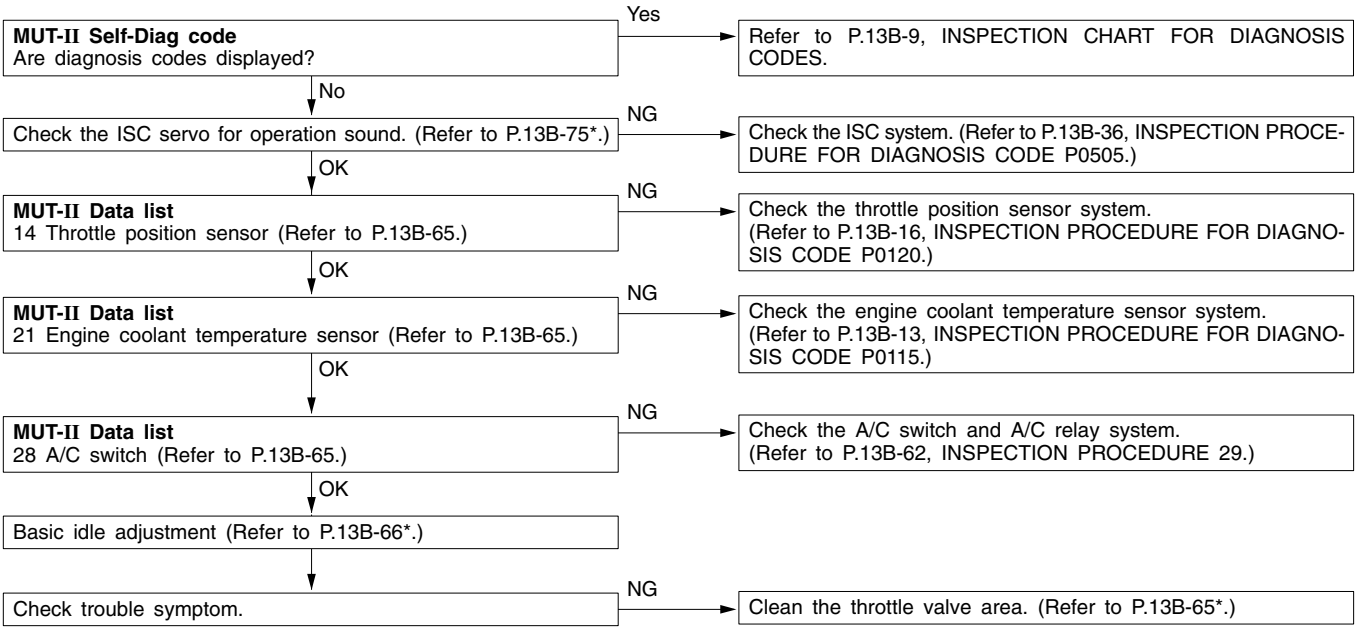
NOTE:
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)



NOTE:
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

INSPECTION PROCEDURE 9

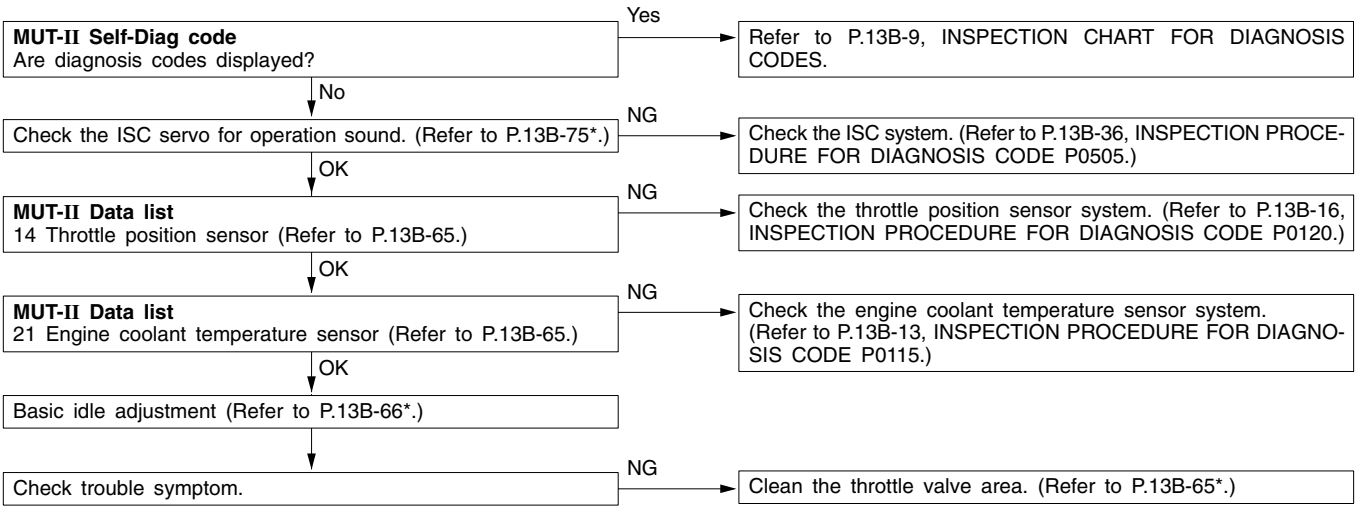
Idling speed is high. (Improper idling speed)	Probable cause
In such cases as the above, the cause is probably that the intake air volume during idling is too great.	• Malfunction of the ISC system • Malfunction of the throttle body



NOTE:
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

INSPECTION PROCEDURE 10

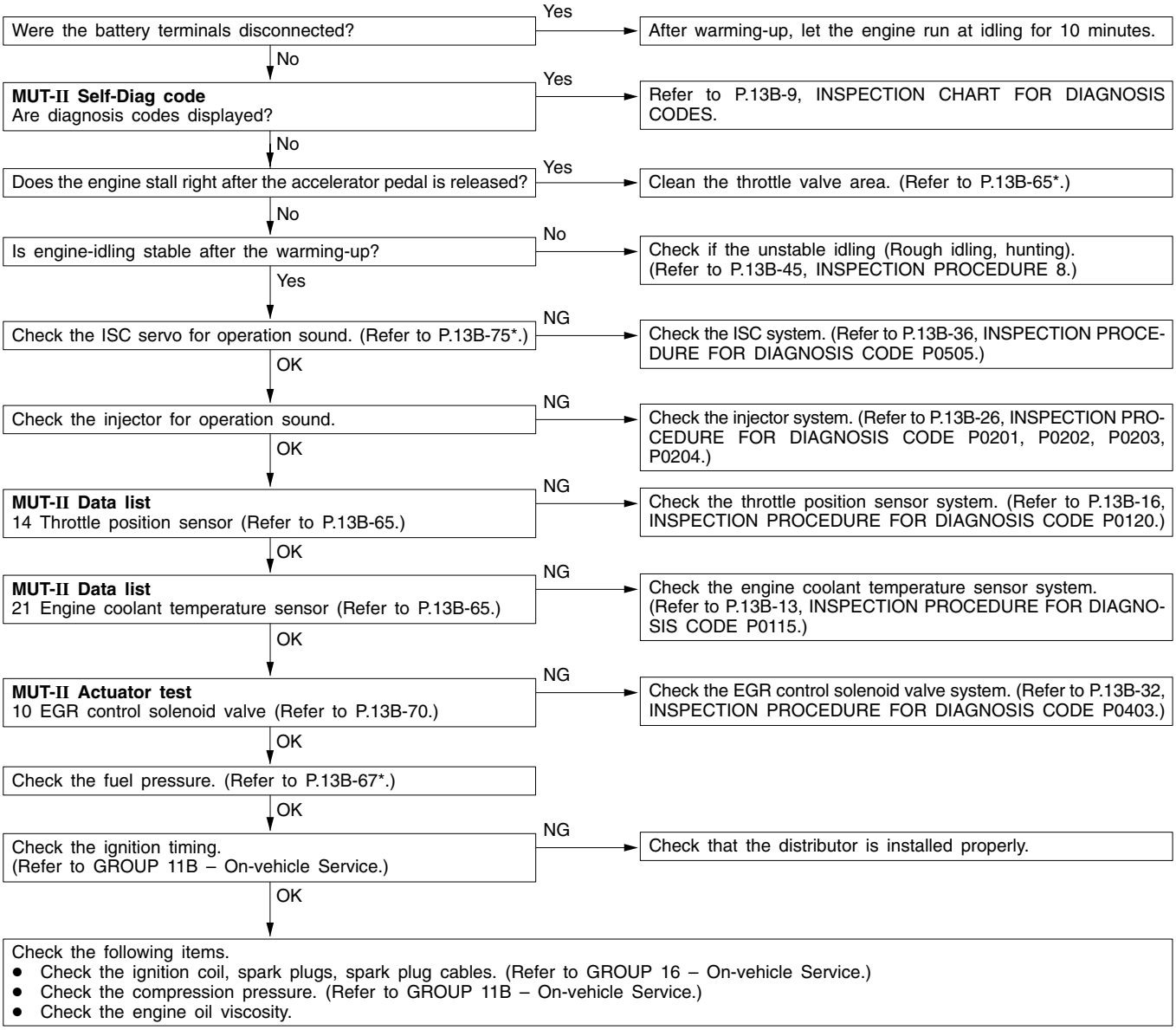
Idling speed is low. (Improper idling speed)	Probable cause
In cases such as the above, the cause is probably that the intake air volume during idling is too small.	• Malfunction of the ISC system • Malfunction of the throttle body



NOTE:
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

INSPECTION PROCEDURE 11

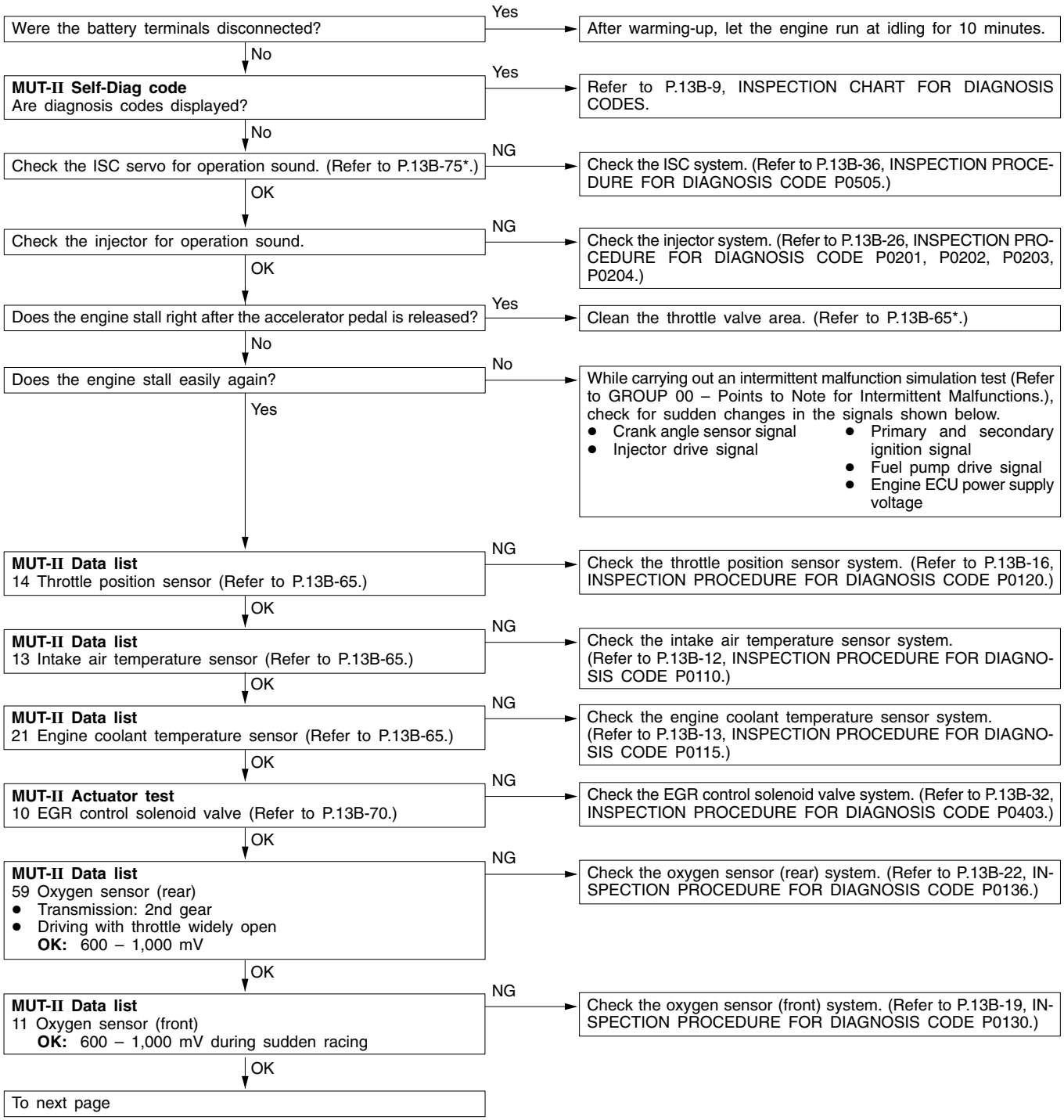
When the engine is cold, it stalls at idling. (Die out)	Probable cause
In such cases as the above, the cause is probably that the air/fuel mixture is inappropriate when the engine is cold, or that the intake air volume is insufficient.	• Malfunction of the ISC system • Malfunction of the throttle body • Malfunction of the injector system • Malfunction of the ignition system

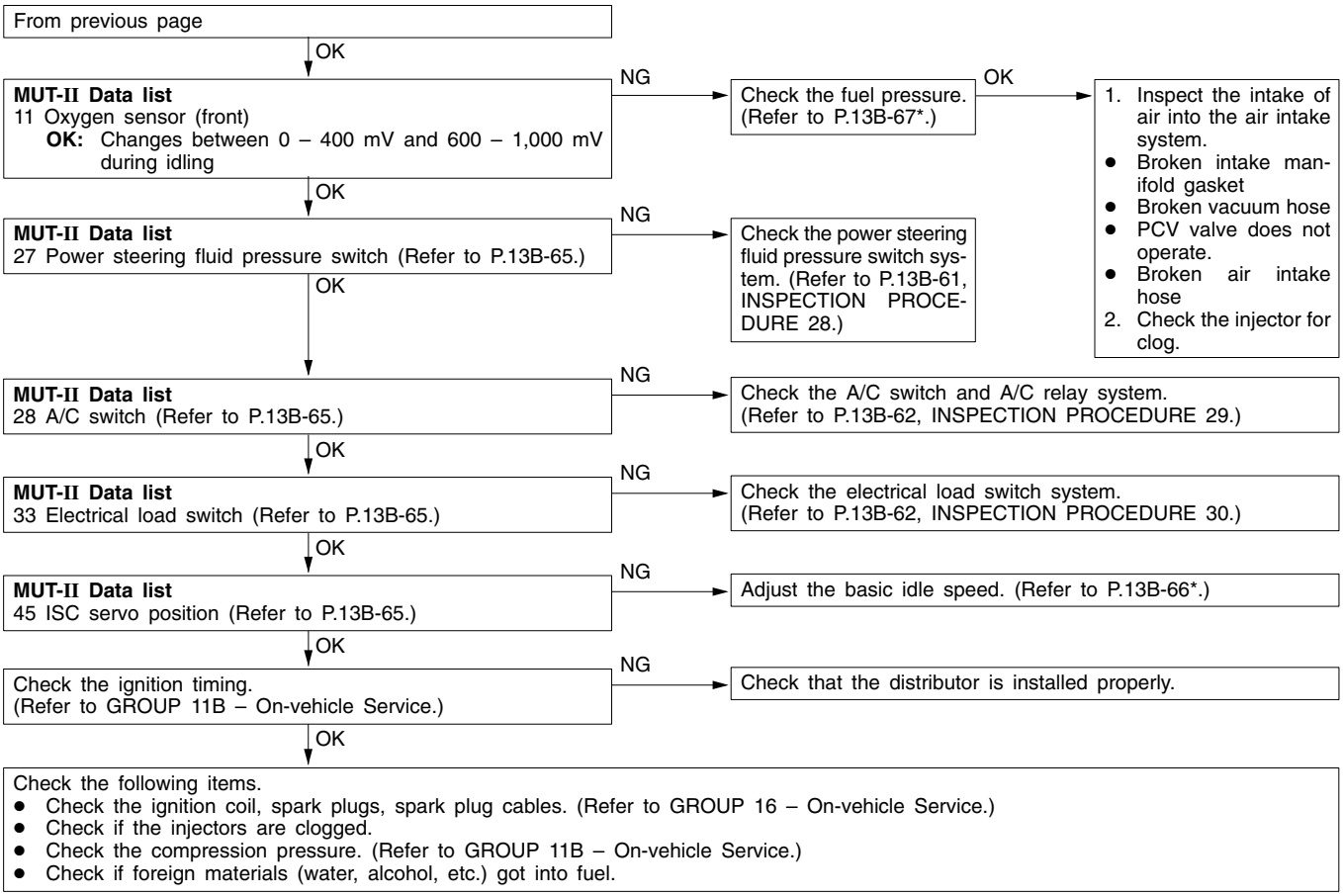


NOTE:
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

INSPECTION PROCEDURE 12

When the engine is hot, it stalls at idling. (Die out)	Probable cause
In such cases as the above, the cause is probably that ignition system, air/fuel mixture, idle speed control (ISC) or compression pressure is defective. In addition, if the engine suddenly stalls, the cause may also be a defective connector contact.	• Malfunction of the ignition system • Malfunction of air-fuel ratio control system • Malfunction of the ISC system • Drawing air into intake system • Improper connector contact





NOTE:
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

INSPECTION PROCEDURE 13

The engine stalls when starting the car. (Pass out)	Probable cause
In cases such as the above, the cause is probably misfiring due to a weak spark, or an inappropriate air/fuel mixture when the accelerator pedal is depressed.	• Drawing air into intake system • Malfunction of the ignition system

MUT-II Self-Diag code
Are diagnosis codes displayed?
Yes → Refer to P.13B-9, INSPECTION CHART FOR DIAGNOSIS CODES.
No ↓

MUT-II Actuator test
10 EGR control solenoid valve (Refer to P.13B-70.)
NG → Check the EGR control solenoid valve system. (Refer to P.13B-32, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0403.)
OK ↓

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 16 – On-vehicle Service.)
- Check if air was drawn into the intake system.
  - Broken intake manifold gasket
  - Broken or disconnected vacuum hose
  - Improper operation of the PCV valve
  - Broken air intake hose

INSPECTION PROCEDURE 14

The engine stalls when decelerating.	Probable cause
In cases such as the above, the cause is probably that the intake air volume is insufficient due to a defective idle speed control (ISC) servo system.	• Malfunction of the ISC system

Were the battery terminals disconnected?
Yes → After warming-up, let the engine run at idling for 10 minutes.
No ↓

MUT-II Self-Diag code
Are diagnosis codes displayed?
Yes → Refer to P.13B-9, INSPECTION CHART FOR DIAGNOSIS CODES.
No ↓

MUT-II Data list
14 Throttle position sensor (Refer to P.13B-65.)
NG → Check the throttle position sensor system. (Refer to P.13B-16, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0120.)
OK ↓

MUT-II Data list
45 ISC servo position
- Is the idle speed control (ISC) servo position drops to 0–2 steps when decelerating (engine r/min less than 1,000)?

Yes → Check the vehicle speed sensor system. (Refer to P.13B-35, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0500.)
No ↓

MUT-II Actuator test
10 EGR control solenoid valve (Refer to P.13B-70.)
NG → Check the EGR control solenoid valve system. (Refer to P.13B-32, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0403.)
OK ↓

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 16 – On-vehicle Service.)
- Clean the throttle valve area.

INSPECTION PROCEDURE 15

Hesitation, sag or stumble	Probable cause
In cases such as the above, the cause is probably that ignition system, air/fuel mixture or compression pressure is defective.	• Malfunction of the ignition system • Malfunction of air-fuel ratio control system • Malfunction of the fuel supply system • Malfunction of the EGR control solenoid valve system • Poor compression

MUT-II Self-Diag code
Are diagnosis codes displayed?
Yes → Refer to P.13B-9, INSPECTION CHART FOR DIAGNOSIS CODES.
No ↓

Check the injectors for operation sound.
NG → Check the injector system. (Refer to P.13B-26, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0201, P0202, P0203, P0204.)
OK ↓

Check the ignition timing.
(Refer to GROUP 11B – On-vehicle Service.)
NG → Check that the distributor is installed properly.
OK ↓

MUT-II Data list
13 Intake air temperature sensor (Refer to P.13B-65.)
NG → Check the intake air temperature sensor system. (Refer to P.13B-12, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0110.)
OK ↓

MUT-II Data list
21 Engine coolant temperature sensor (Refer to P.13B-65.)
NG → Check the engine coolant temperature sensor system. (Refer to P.13B-13, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0115.)
OK ↓

MUT-II Data list
14 Throttle position sensor (Refer to P.13B-65.)
NG → Check the throttle position sensor system. (Refer to P.13B-16, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0120.)
OK ↓

MUT-II Actuator test
10 EGR control solenoid valve (Refer to P.13B-70.)
NG → Check the EGR control solenoid valve system. (Refer to P.13B-32, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0403.)
OK ↓

MUT-II Data list
59 Oxygen sensor (rear)
- Transmission: 2nd gear
- Driving with throttle widely open

OK: 600 – 1,000 mV
NG → Check the oxygen sensor (rear) system. (Refer to P.13B-22, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0136.)
OK ↓

MUT-II Data list
11 Oxygen sensor (front)
OK: 600 – 1,000 mV during sudden racing
NG → Check the oxygen sensor (front) system. (Refer to P.13B-19, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0130.)
OK ↓

MUT-II Data list
11 Oxygen sensor (front)
OK: Changes between 0 – 400 mV and 600 – 1,000 mV during idling
NG → Check the fuel pressure. (Refer to P.13B-67*.)
OK → 1. Inspect the intake of air into the air intake system.
- Broken intake manifold gasket
- Broken vacuum hose
- PCV valve does not operate.
- Broken air intake hose

2. Check the injector for clog.

OK ↓

Check the fuel pressure. (Refer to P.13B-67*.)
OK ↓

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 16 – On-vehicle Service.)
- Check the EGR control system. (Refer to GROUP 17 – Emission Control System.)
- Check the compression pressure. (Refer to GROUP 11B – On-vehicle Service.)
- Check the fuel filter or fuel line for clogging.

NOTE:
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

INSPECTION PROCEDURE 16

The feeling of impact or vibration when accelerating	Probable cause
In cases such as the above, the cause is probably that there is an ignition leak accompanying the increase in the spark plug demand voltage during acceleration.	• Malfunction of the ignition system

MUT-II Self-Diag code
Are diagnosis codes displayed?
Yes → Refer to P.13B-9, INSPECTION CHART FOR DIAGNOSIS CODES.
No ↓

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 16 – On-vehicle Service.)
- Check for occurrence of ignition leak.

INSPECTION PROCEDURE 17

The feeling of impact or vibration when decelerating.	Probable cause
Malfunction of the ISC system is suspected.	• Malfunction of the ISC system

MUT-II Self-Diag code
Are diagnosis codes displayed?
Yes → Refer to P.13B-9, INSPECTION CHART FOR DIAGNOSIS CODES.
No ↓

Check the ISC servo for operation sound. (Refer to P.13B-75*.)
NG → Check the ISC system. (Refer to P.13B-36, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0505.)
OK ↓

MUT-II Data list
14 Throttle position sensor (Refer to P.13B-65.)
NG → Check the throttle position sensor system. (Refer to P.13B-16, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0120.)
OK ↓

Clean the throttle valve area. (Refer to P.13B-65*.)

NOTE:
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

INSPECTION PROCEDURE 18

Poor acceleration	Probable cause
Defective ignition system, abnormal air-fuel ratio, poor compression pressure, etc. are suspected.	• Malfunction of the ignition system • Malfunction of air-fuel ratio control system • Malfunction of the fuel supply system • Poor compression pressure • Clogged exhaust system

MUT-II Self-Diag code
Are diagnosis codes displayed?
Yes → Refer to P.13B-9, INSPECTION CHART FOR DIAGNOSIS CODES.
No ↓

Check the injectors for operation sound.
NG → Check the injector system. (Refer to P.13B-26, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0201, P0202, P0203, P0204.)
OK ↓

Check the ignition timing.
(Refer to GROUP 11B – On-vehicle Service.)
NG → Check that the distributor is installed properly.
OK ↓

MUT-II Data list
13 Intake air temperature sensor (Refer to P.13B-65.)
NG → Check the intake air temperature sensor system. (Refer to P.13B-12, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0110.)
OK ↓

MUT-II Data list
21 Engine coolant temperature sensor (Refer to P.13B-65.)
NG → Check the engine coolant temperature sensor system. (Refer to P.13B-13, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0115.)
OK ↓

MUT-II Data list
14 Throttle position sensor (Refer to P.13B-65.)
NG → Check the throttle position sensor system. (Refer to P.13B-16, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0120.)
OK ↓

MUT-II Actuator test
10 EGR control solenoid valve (Refer to P.13B-70.)
NG → Check the EGR control solenoid valve system. (Refer to P.13B-32, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0403.)
OK ↓

MUT-II Data list
59 Oxygen sensor (rear)
- Transmission: 2nd gear
- Driving with throttle widely open

OK: 600 – 1,000 mV
NG → Check the oxygen sensor (rear) system. (Refer to P.13B-22, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0136.)
OK ↓

MUT-II Data list
11 Oxygen sensor (front)
OK: 600 – 1,000 mV during sudden racing
NG → Check the oxygen sensor (front) system. (Refer to P.13B-19, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0130.)
OK ↓

MUT-II Data list
11 Oxygen sensor (front)
OK: Changes between 0 – 400 mV and 600 – 1,000 mV during idling
NG → Check the fuel pressure. (Refer to P.13B-67*.)
OK → 1. Inspect the intake of air into the air intake system.
- Broken intake manifold gasket
- Broken vacuum hose
- PCV valve does not operate.
- Broken air intake hose

2. Check the injector for clog.

OK ↓

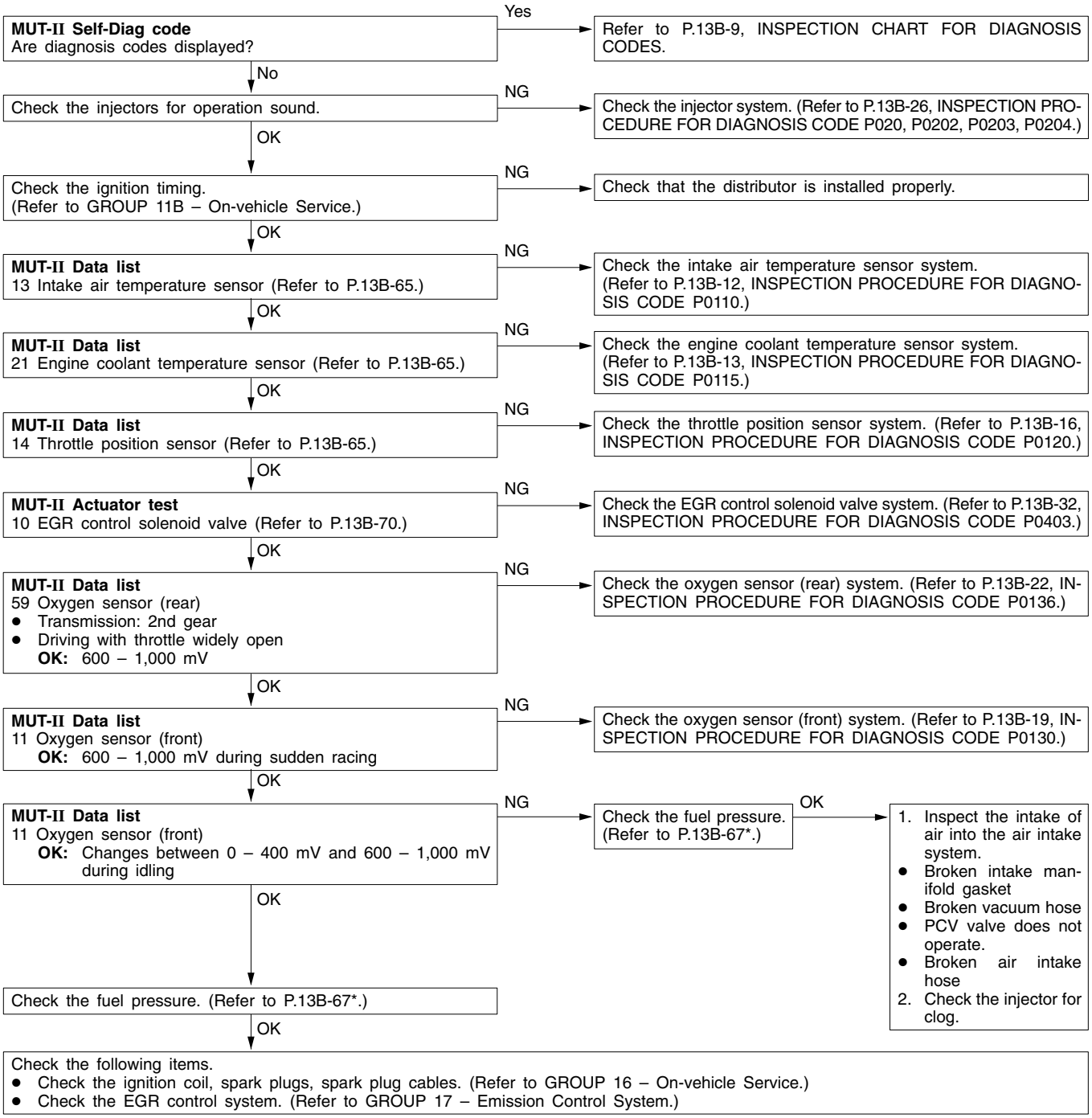
Check the fuel pressure. (Refer to P.13B-67*.)
OK ↓

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 16 – On-vehicle Service.)
- Check the compression pressure. (Refer to GROUP 11B – On-vehicle Service.)
- Check the fuel filter or fuel line for clogging.
- Broken air intake hose
- Clogged air cleaner

NOTE:
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

INSPECTION PROCEDURE 19

Surge	Probable cause
Defective ignition system, abnormal air-fuel ratio, etc. are suspected.	• Malfunction of the ignition system • Malfunction of air-fuel ratio control system • Malfunction of the EGR control solenoid valve system



NOTE:
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

INSPECTION PROCEDURE 20

Knocking	Probable cause
In cases as the above, the cause is probably that the detonation control is defective or the heat value of the spark plug is inappropriate.	• Defective detonation sensor • Inappropriate heat value of the spark plug

MUT-II Self-Diag code
Are diagnosis codes displayed?
Yes → Refer to P.13B-9, INSPECTION CHART FOR DIAGNOSIS CODES.
No ↓

Does knocking occur when driving with the detonation sensor connector disconnected? At this time, use the MUT-II to check if the timing is retarded compared to when the detonation sensor connector is disconnected.
No → Check the detonation sensor system. (Refer to P.13B-29, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0325.)
Yes ↓

Check the following items.
- Spark plugs
- Check if foreign materials (water, alcohol, etc.) got into fuel.

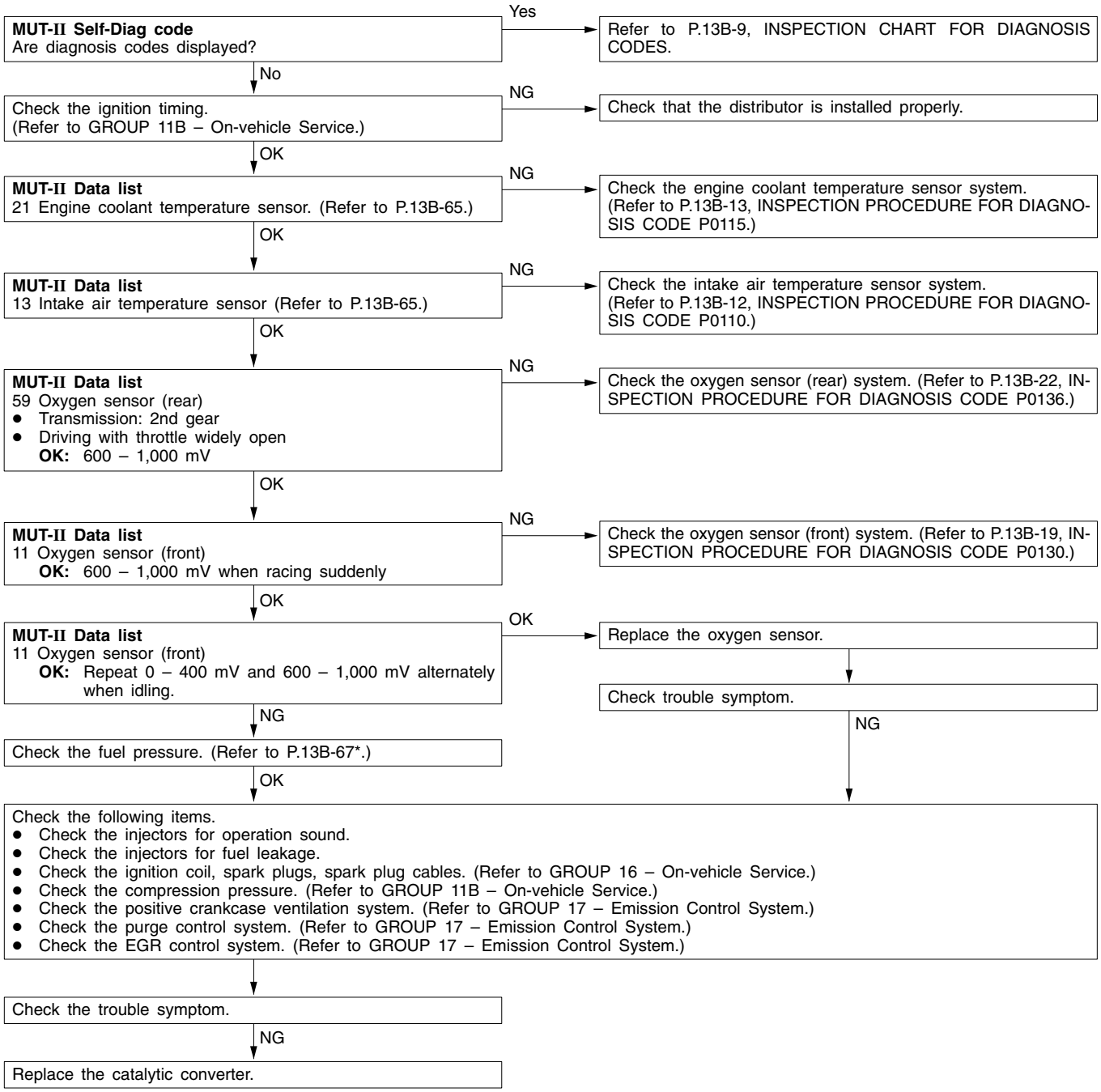
INSPECTION PROCEDURE 21

Dieseling	Probable cause
Fuel leakage from injectors is suspected.	• Fuel leakage from injectors

Check the injectors for fuel leakage.

INSPECTION PROCEDURE 22

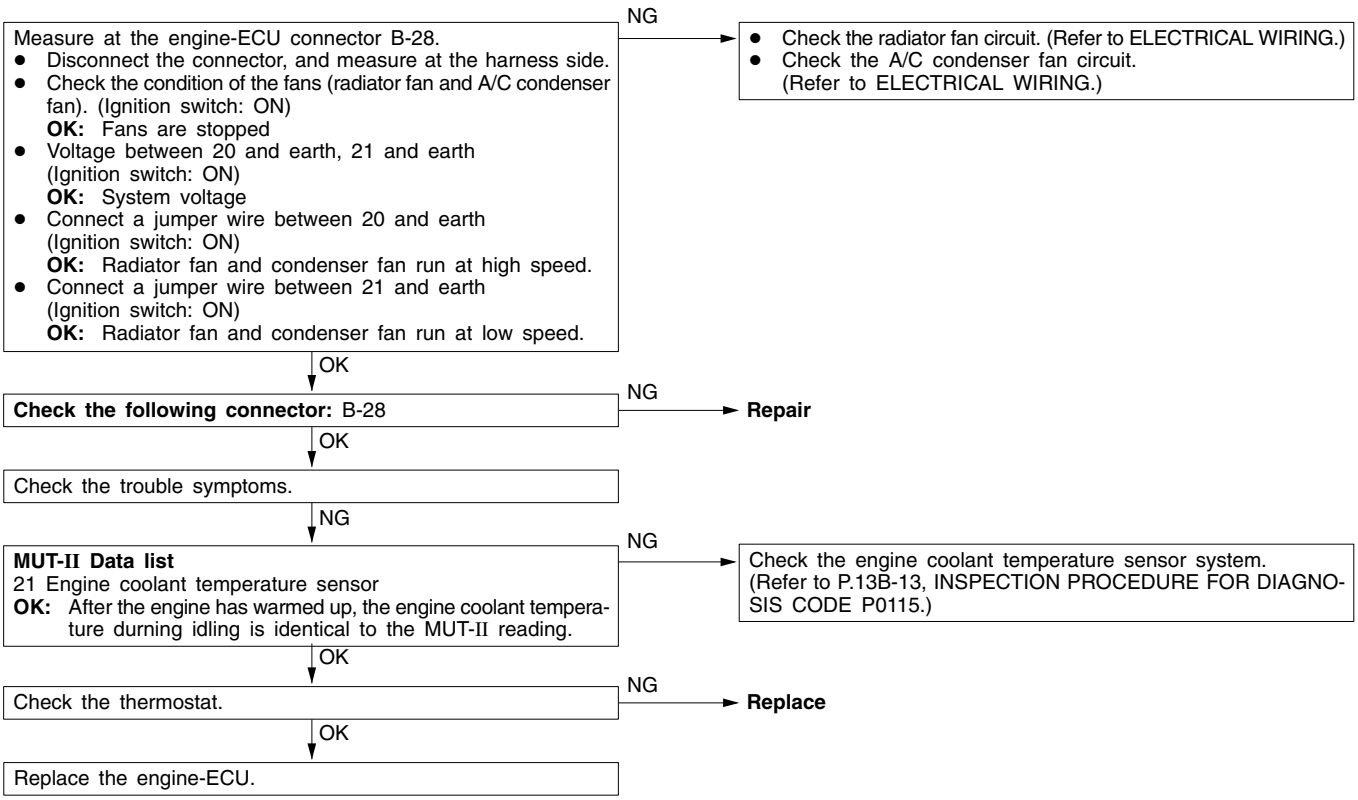
Too high CO and HC concentration when idling	Probable cause
Abnormal air-fuel ratio is suspected.	• Malfunction of the air-fuel ratio control system • Deteriorated catalyst



NOTE:
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

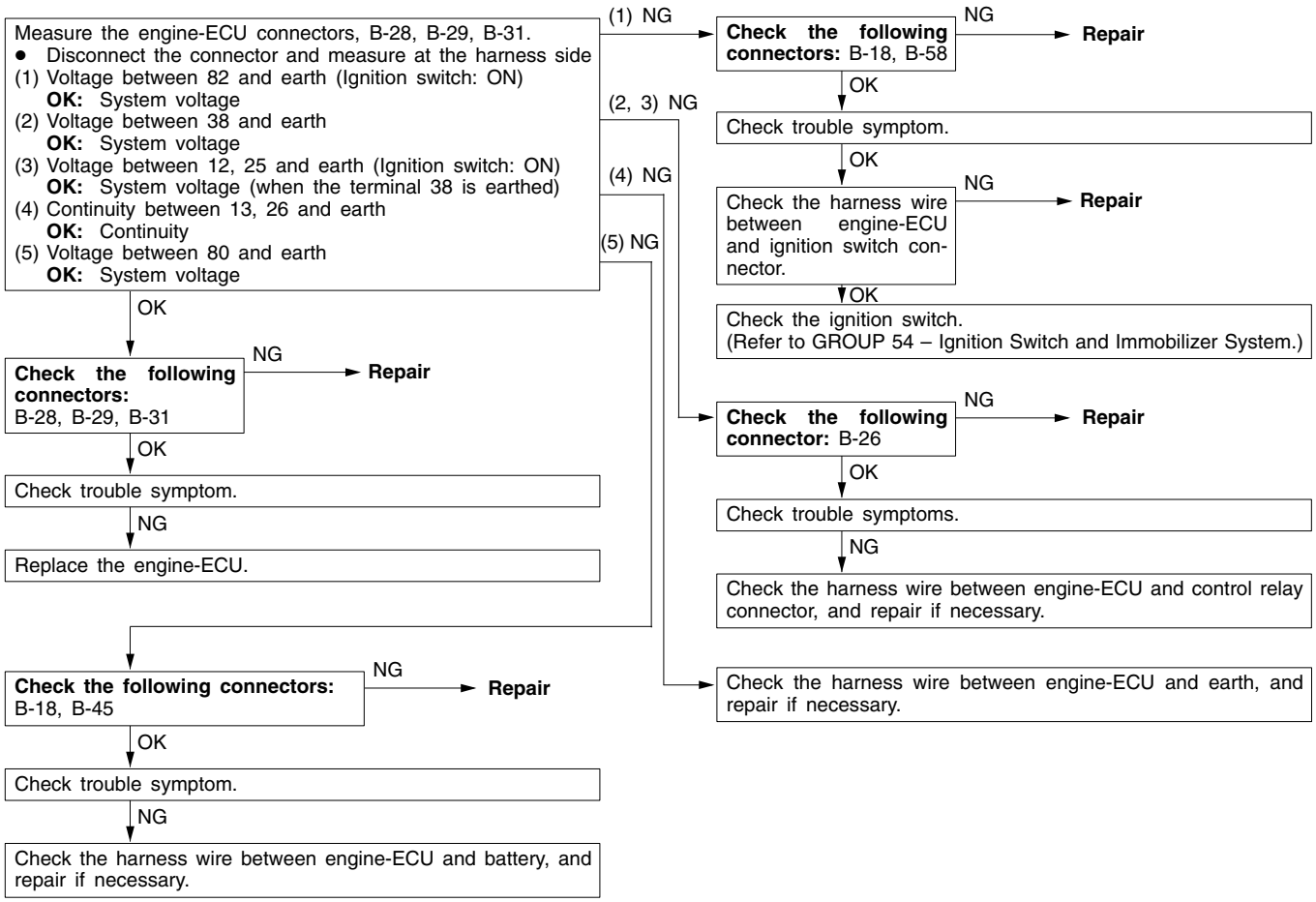
INSPECTION PROCEDURE 23

Fans (radiator fan, A/C condenser fan) are inoperative.	Probable cause
The fan motor relay is controlled by the power transistor inside the engine-ECU turning ON and OFF.	• Malfunction of the fan motor relay • Malfunction of the fan motor • Malfunction of the thermostat • Improper connector contact, open circuit or short-circuited harness wire • Malfunction of the engine-ECU



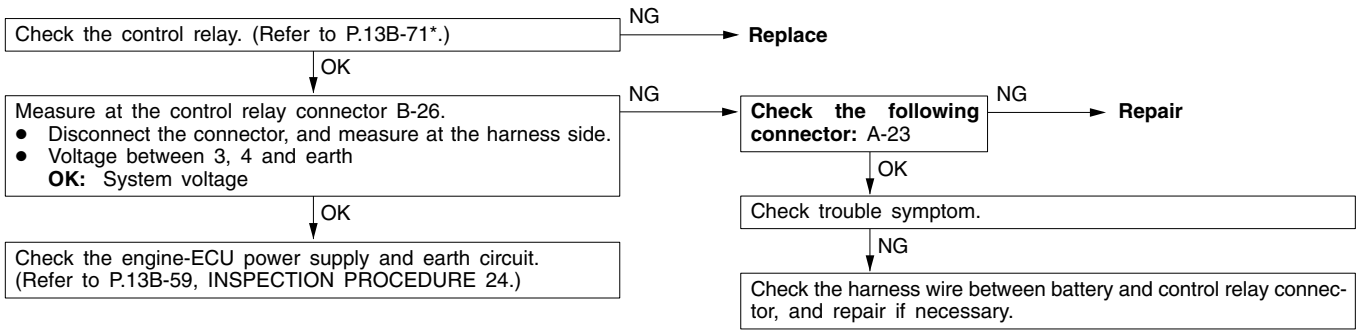
INSPECTION PROCEDURE 24

Check the engine-ECU power supply and earth circuit.



INSPECTION PROCEDURE 25

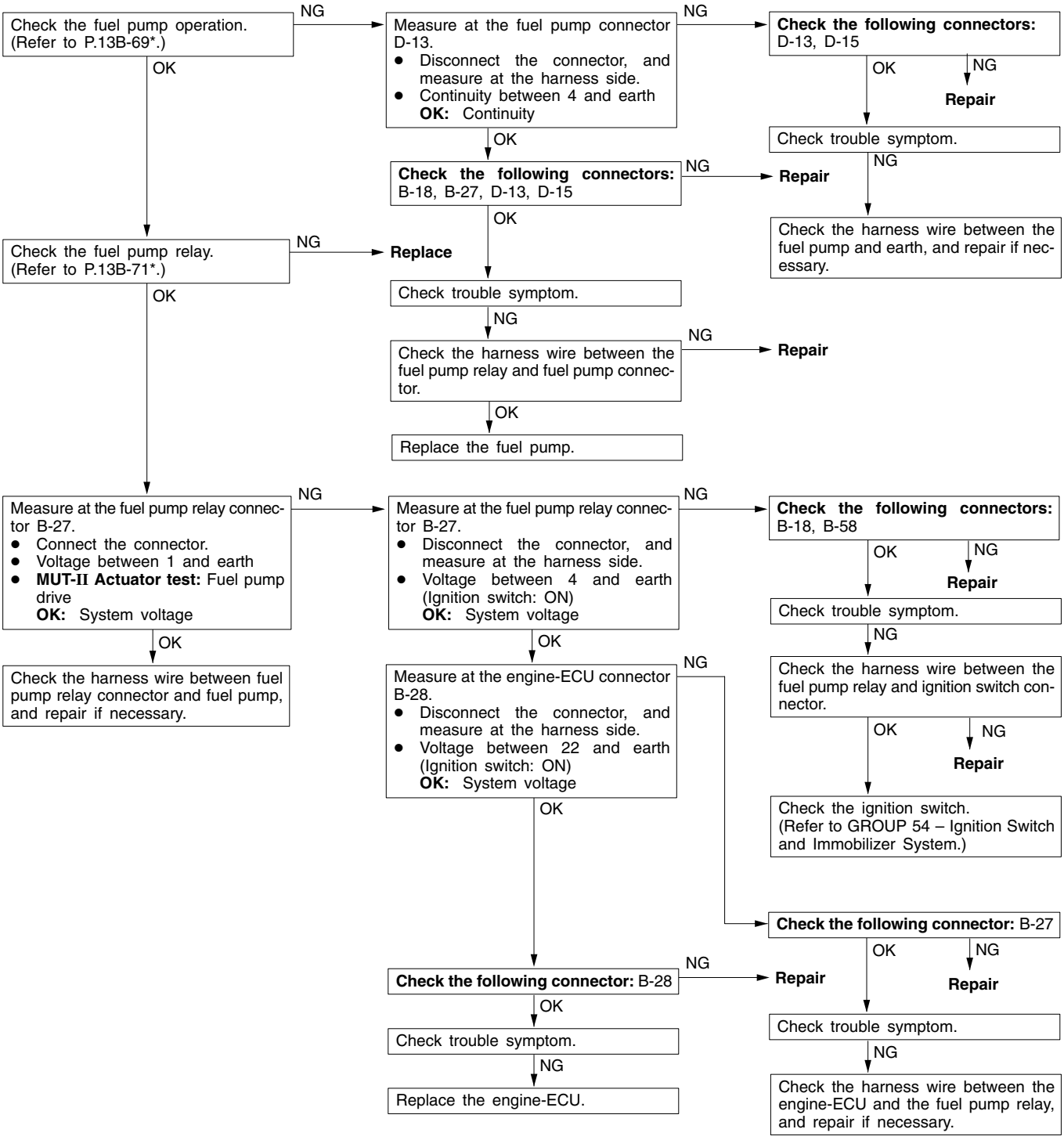
Power supply system and ignition switch-IG system	Probable cause
When an ignition switch ON signal is input to the engine-ECU, the engine-ECU turns the control relay ON. This causes battery voltage to be supplied to the engine-ECU, injectors and air flow sensor.	● Malfunction of the ignition switch ● Malfunction of the control relay ● Improper connector contact, open circuit or short-circuited harness wire ● Disconnected engine-ECU earth wire ● Malfunction of the engine-ECU



NOTE:
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

INSPECTION PROCEDURE 26

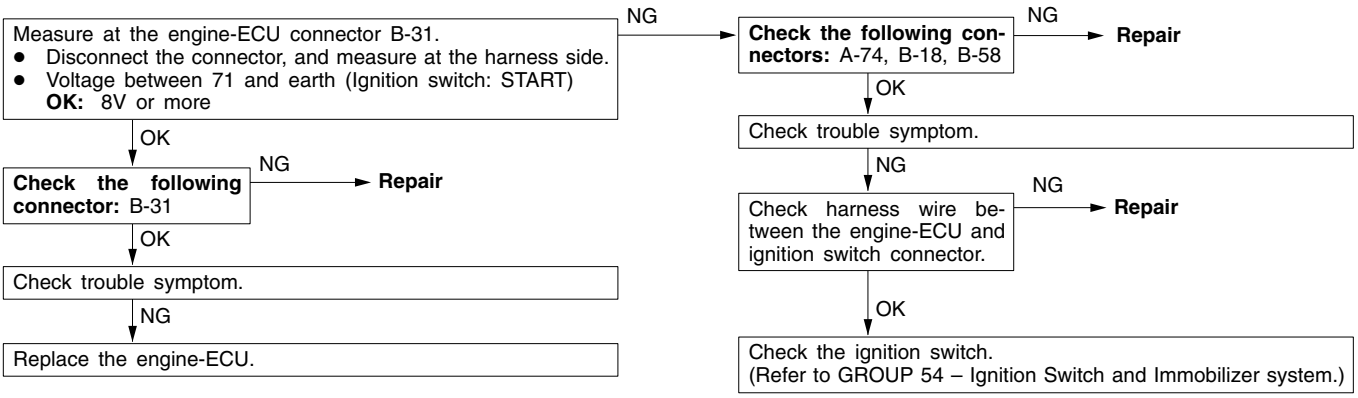
Fuel pump system	Probable cause
The engine-ECU turns the fuel pump relay ON when the engine is cranking or running, and this supplies power to drive the fuel pump.	• Malfunction of the fuel pump relay • Malfunction of the fuel pump • Improper connector contact, open circuit or short-circuited harness wire • Malfunction of the engine-ECU



NOTE:
*: Refer to the '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

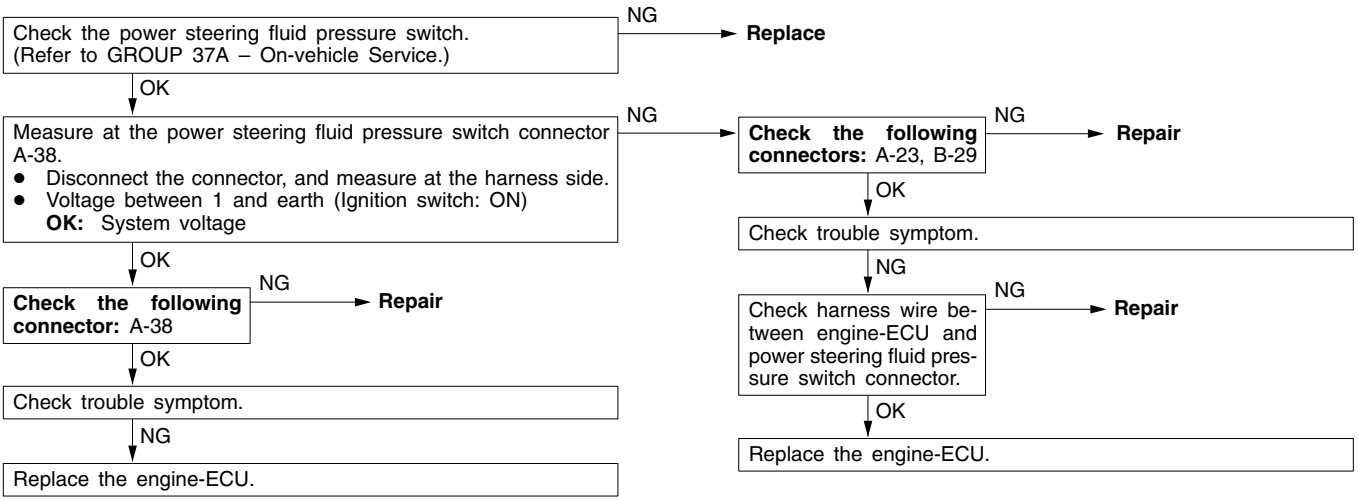
INSPECTION PROCEDURE 27

Ignition switch-ST system	Probable cause
The ignition switch-ST inputs a HIGH signal to the engine-ECU while the engine is cranking. The engine-ECU controls fuel injection, etc. during starting based on this input.	• Malfunction of ignition switch • Improper connector contact, open circuit or short-circuited harness wire • Malfunction of the engine-ECU



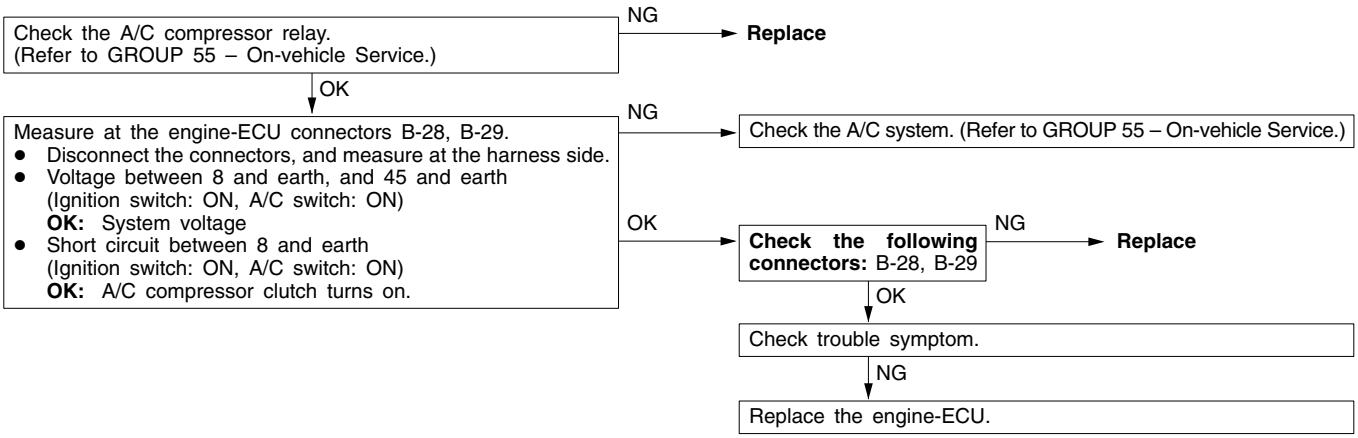
INSPECTION PROCEDURE 28

Power steering fluid pressure switch system	Probable cause
The presence or absence of power steering load is input to the engine-ECU. The engine-ECU controls the idle speed control (ISC) servo based on this input.	• Malfunction of power steering fluid pressure switch • Improper connector contact, open circuit or short-circuited harness wire • Malfunction of the engine-ECU



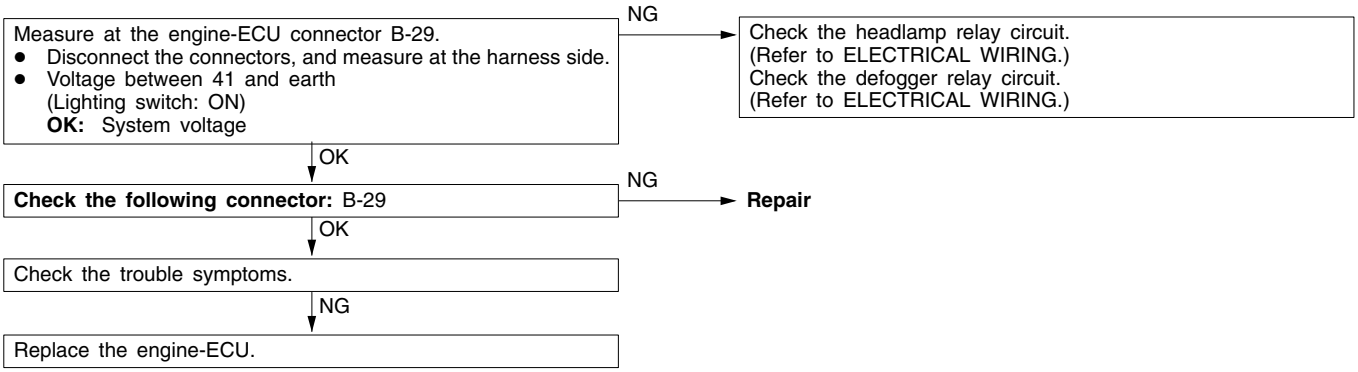
INSPECTION PROCEDURE 29

A/C switch and A/C relay system	Probable cause
When an A/C ON signal is input to the engine-ECU, the engine-ECU carries out control of the idle speed control (ISC) servo, and also operates the A/C compressor magnetic clutch.	• Malfunction of A/C control system • Malfunction of A/C switch • Improper connector contact, open circuit or short-circuited harness wire • Malfunction of the engine-ECU



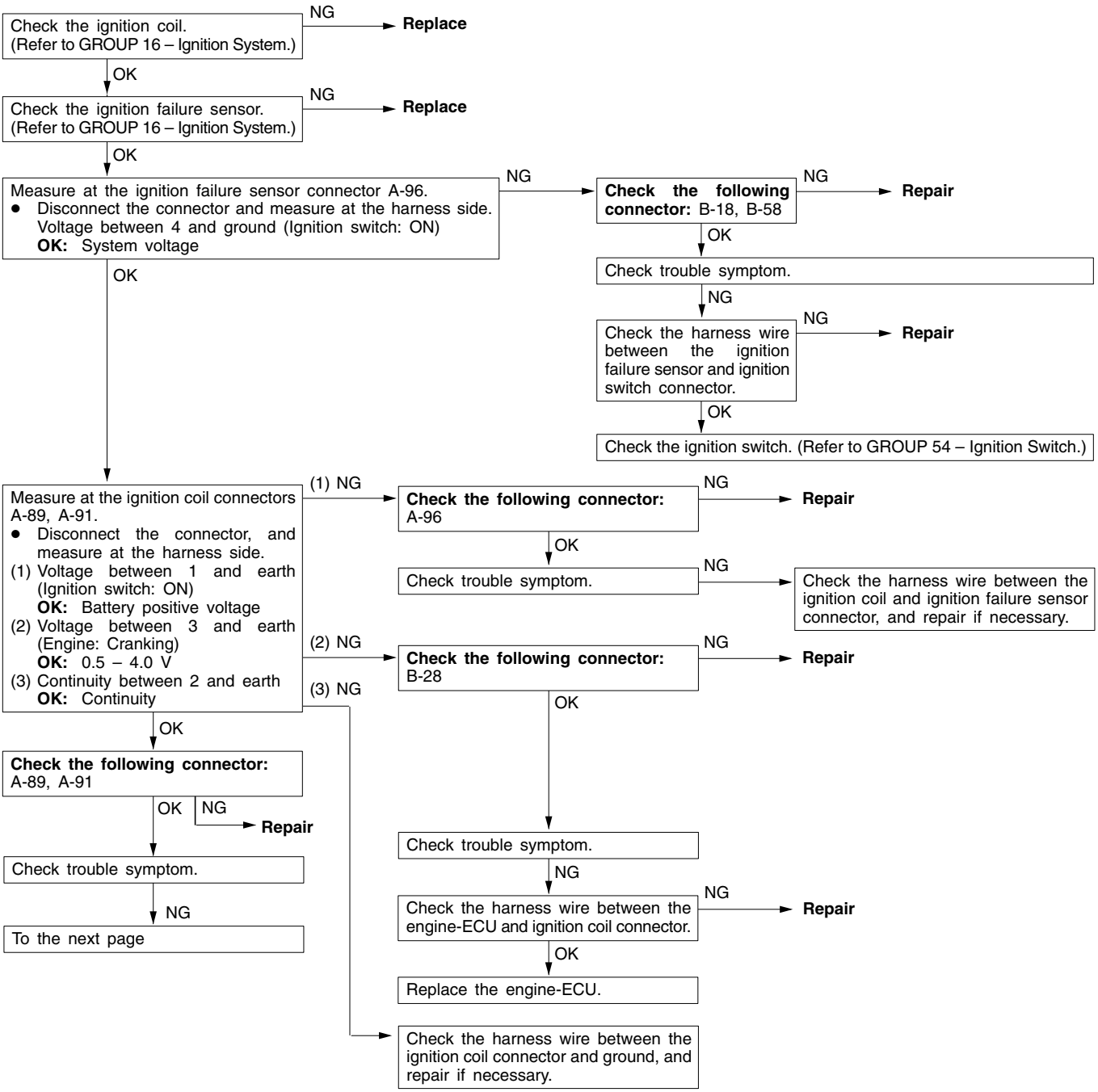
INSPECTION PROCEDURE 30

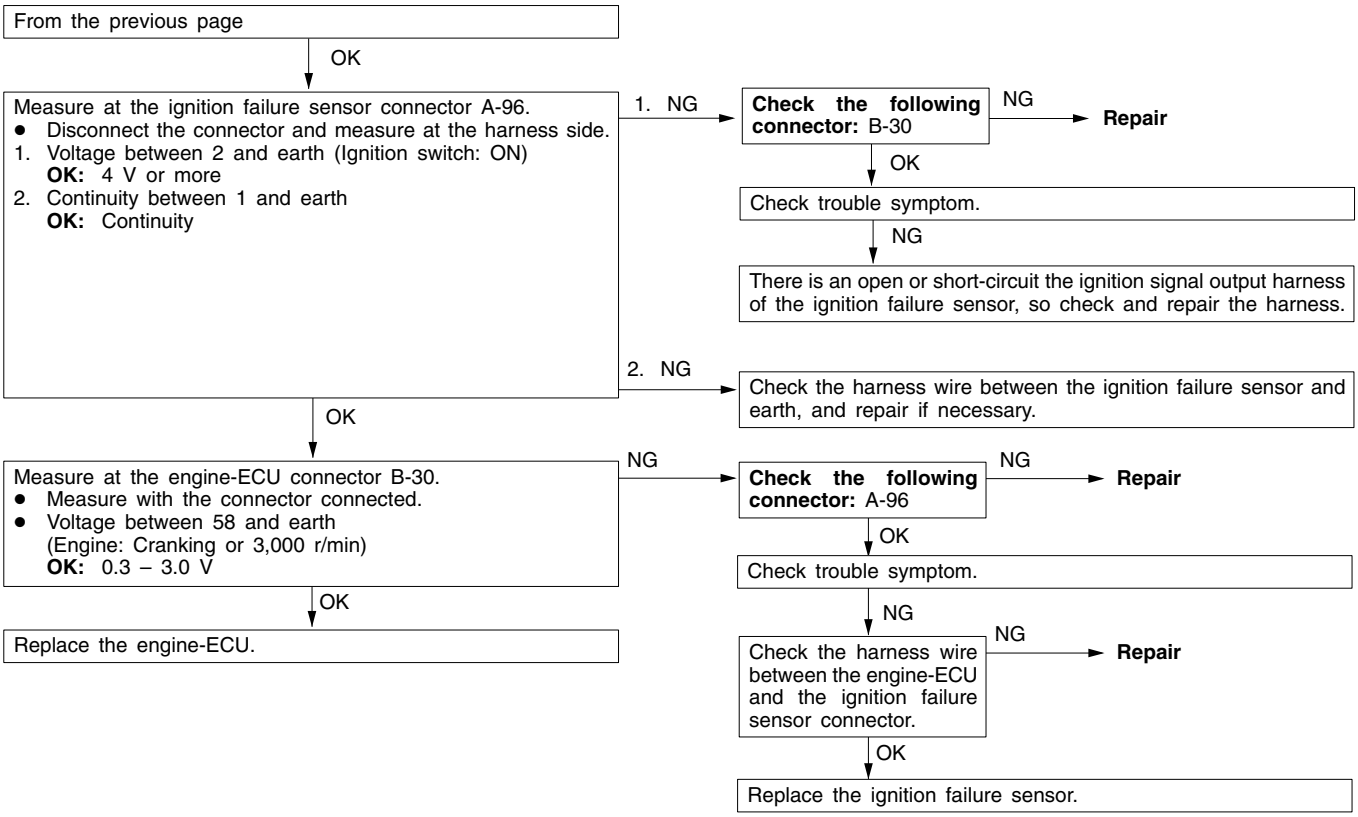
Electrical load switch	Probable cause
During idling, the ON/OFF condition of switches is equipment which have a large electrical load is input to the engine-ECU. The engine-ECU controls the idle speed control servo on this input.	• Improper connector contact, open circuit or short-circuited harness wire in the headlamp relay circuit • Improper connector contact, open circuit or short-circuited harness wire in the defogger relay circuit. • Malfunction of the engine-ECU



INSPECTION PROCEDURE 31

Ignition circuit system	Probable cause
The engine-ECU interrupts the ignition coil primary current by turning the power transistor inside the engine-ECU ON and OFF.	• Malfunction of ignition coil • Malfunction of ignition failure sensor • Improper connector contact, open circuit or short-circuited harness wire • Malfunction of the engine-ECU




From the previous page
OK
Measure at the ignition failure sensor connector A-96.
● Disconnect the connector and measure at the harness side.
1. Voltage between 2 and earth (Ignition switch: ON)
OK: 4 V or more
2. Continuity between 1 and earth
OK: Continuity
1. NG
Check the following connector: B-30
NG
Repair
OK
Check trouble symptom.
NG
There is an open or short-circuit the ignition signal output harness of the ignition failure sensor, so check and repair the harness.
2. NG
Check the harness wire between the ignition failure sensor and earth, and repair if necessary.
OK
Measure at the engine-ECU connector B-30.
● Measure with the connector connected.
● Voltage between 58 and earth
(Engine: Cranking or 3,000 r/min)
OK: 0.3 – 3.0 V
NG
Check the following connector: A-96
NG
Repair
OK
Check trouble symptom.
NG
Check the harness wire between the engine-ECU and the ignition failure sensor connector.
NG
Repair
OK
Replace the ignition failure sensor.
OK
Replace the engine-ECU.

DATA LIST REFERENCE TABLE

NOTE
*1: In a new vehicle [driven approximately 500 km or less], the air intake plenum pressure is sometimes 10 % higher than the standard pressure.
*2: The injector drive time represents the time when the cranking speed is at 250 r/min or below when the power supply voltage is 11 V.
*3: In a new vehicle [driven approximately 500 km or less], the injector drive time is sometimes 10 % longer than the standard time.
*4: In a new vehicle [driven approximately 500 km or less], the step of the stepper motor is sometimes 30 steps greater than the standard value.

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
11	Oxygen sensor (front)	Engine: After having warmed up Air/fuel mixture is made leaner when decelerating, and is made richer when racing.	When at 4,000 r/min, engine is suddenly decelerated	200 mV or less	Code No. P0130	13B-19
			When engine is suddenly raced	600 – 1,000 mV		
		Engine: After having warmed up The oxygen sensor signal is used to check the air/fuel mixture ratio, and control condition is also checked by the ECU.	Engine is idling	400 mV or less (Changes) 600 – 1,000 mV		
			2,500 r/min			
13	Intake air temperature sensor	Ignition switch: ON or with engine running	When intake air temperature is –20°C	–20°C	Code No. P0110	13B-12
			When intake air temperature is 0°C	0°C		
			When intake air temperature is 20°C	20°C		
			When intake air temperature is 40°C	40°C		
			When intake air temperature is 80°C	80°C		
14	Throttle position sensor	Ignition switch: ON	Set to idle position	300 – 1,000 mV	Code No. P0120	13B-16
			Gradually open	Increases in proportion to throttle opening angle		
			Open fully	4,500 – 5,500 mV		

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
16	Power supply voltage	Ignition switch: ON		System voltage	Procedure No. 25	13B-59
18	Cranking signal (ignition switch-ST)	Ignition switch: ON	Engine: Stopped	OFF	Procedure No. 27	13B-61
			Engine: Cranking	ON		
21	Engine coolant temperature sensor	Ignition switch: ON or with engine running	When engine coolant temperature is –20°C	–20°C	Code No. P0115	13B-13
			When engine coolant temperature is 0°C	0°C		
			When engine coolant temperature is 20°C	20°C		
			When engine coolant temperature is 40°C	40°C		
			When engine coolant temperature is 80°C	80°C		
22	Crank angle sensor	• Engine: Cranking • Tachometer: Connected	Compare the engine speed readings on the tachometer and the MUT-II.	Accord	Code No. P0335	13B-25
		• Engine: Idling • Idle position switch: ON	When engine coolant temperature is –20°C	1,475 – 1,675 r/min		
			When engine coolant temperature is 0°C	1,345 – 1,545 r/min		
			When engine coolant temperature is 20°C	1,200 – 1,400 r/min		
			When engine coolant temperature is 40°C	1,160 – 1,225 r/min		
			When engine coolant temperature is 80°C	650 – 850 r/min		
24	Vehicle speed sensor	Drive at 40 km/h		Approximately 40 km/h	Code No. P0500	13B-35

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
27	Power steering fluid pressure switch	Engine: Idling	Steering wheel stationary	OFF	Procedure No. 28	13B-61
			Steering wheel turning	ON		
28	A/C switch	Engine: Idling (when A/C switch is ON, A/C compressor should be operating.)	A/C switch: OFF	OFF	Procedure No. 29	13B-62
			A/C switch: ON	ON		
32	Vacuum sensor*1	• Engine coolant temperature: 80 – 95°C • Lamps, electric cooling fan and all accessories: OFF • Transmission: Neutral • Ignition switch: ON	Engine: Stopped (At altitude of 0 m)	101 kPa	Code No. P0105	13B-10
			Engine: Stopped (At altitude of 600 m)	95 kPa		
			Engine: Stopped (At altitude of 1,200 m)	88 kPa		
			Engine: Stopped (At altitude of 1,800 m)	81 kPa		
			Engine: Idling	24.3 – 37.7 kPa		
			When engine is suddenly raced	Increases		
33	Electrical load switch	All accessories: OFF	Lighting switch only: OFF → ON	OFF → ON	Procedure No. 30	13B-62
41	Injectors*2	Engine: Cranking	When engine coolant temperature is 0°C (injection is carried out for all cylinders simultaneously)	13 – 23 ms	–	–
			When engine coolant temperature is 20°C	26 – 46 ms		
			When engine coolant temperature is 80°C	8 – 12 ms		

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
41	Injectors*3	• Engine coolant temperature: 80 – 95°C • Lamps, electric cooling fan and all accessories: OFF • Transmission: Neutral	Engine is idling	1.7 – 2.9 ms	–	–
			2,500 r/min	1.4 – 2.6 ms		
			When engine is suddenly raced	Increases		
44	Ignition coils and power transistors	• Engine: After having warmed up • Timing lamp is set. (The timing lamp is set in order to check actual ignition timing.)	Engine is idling	0 – 20 °BTDC	–	–
			2,500 r/min	19 – 39 °BTDC		
45	ISC (stepper) motor position*4	• Engine coolant temperature: 80 – 95°C • Lamps, electric cooling fan and all accessories: OFF • Transmission: Neutral • Engine: Idling • When A/C switch is ON, A/C compressor should be operating	A/C switch: OFF	2 – 25 STEP	–	–
			A/C switch: OFF → ON	Increases by 10 – 70 steps		
49	A/C relay	Engine: After having warmed up/Engine is idling	A/C switch: OFF	OFF (Compressor clutch is not operating)	Procedure No. 29	13B-62
			A/C switch: ON	ON (Compressor clutch is operating)		
59	Oxygen sensor (rear)	• Transmission: 2nd gear • Drive with throttle widely open	3,500 r/min	600 – 1,000 mV	Code No. P0136	13B-22

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
81	Long-term fuel compensation	Engine: Warm, 2,500 r/min without any load (during closed loop)		–12.5 – 12.5 %	Code No. P0170	13B-25
82	Short-term fuel compensation	Engine: Warm, 2,500 r/min without any load (during closed loop)		–17 – 17 %	Code No. P0170	13B-25
87	Calculation load value	Engine: Warm	Engine: Idling	20 – 33 %	–	–
			2,500 r/min	20 – 33 %		
88	Fuel control condition	Engine: Warm	2,500 r/min	Closed loop	Code No. P0125	13B-18
			When engine is suddenly raced	Open loop – drive condition		
A1	Oxygen sensor (front)	Engine: After having warmed up Air/fuel mixture is made leaner when decelerating, and is made richer when racing.	When at 4,000 r/min, engine is suddenly decelerated	0.2 V or less	Code No. P0130	13B-19
			When engine is sudden racing	0.6 – 1.0 V		
		Engine: After having warmed up The oxygen sensor signal is used to check the air/fuel mixture ratio, and control condition is also checked by the engine-ECU.	Engine is idling	0.4 V or less (Changes) 0.6 – 1.0 V		
			2,500 r/min			
A2	Oxygen sensor (rear)	• Transmission: 2nd gear • Drive with throttle widely open	3,500 r/min	0.6 – 1.0 V	Code No. P0136	13B-22
8A	Throttle position sensor (Throttle opening angle)	• Ignition switch: ON	Set to idle position	6 – 20 %	Code No. P0120	13B-16
			Gradually open	Increase in proportion to throttle opening angle		
			Open fully	80 – 100 %		

ACTUATOR TEST REFERENCE TABLE

Item No.	Inspection item	Drive contents	Inspection contents		Normal condition	Inspection procedure No.	Reference page
01	Injectors	Cut fuel to No. 1 injector	Engine: After having warmed up/Engine is idling (Cut the fuel supply to each injector in turn and check cylinders which don't affect idling.)		Idling condition becomes different (becomes unstable).	Code No. P0201	13B-26
02		Cut fuel to No. 2 injector				Code No. P0202	
03		Cut fuel to No. 3 injector				Code No. P0203	
04		Cut fuel to No. 4 injector				Code No. P0204	
07	Fuel pump	Fuel pump operates and fuel is recirculated.	• Engine: Cranking • Fuel pump: Forced driving Inspect according to both the above conditions.	Pinch the return hose with fingers to feel the pulse of the fuel being recirculated.	Pulse is felt.	Procedure No. 26	13B-60
				Listen near the fuel tank for the sound of fuel pump operation.	Sound of operation is heard.		
08	Purge control solenoid valve	Solenoid valve turns from OFF to ON.	Ignition switch: ON		Sound of operation can be heard when solenoid valve is driven.	Code No. P0443	13B-34
10	EGR control solenoid valve	Solenoid valve turns from OFF to ON.	Ignition switch: ON		Sound of operation can be heard when solenoid valve is driven.	Code No. P0403	13B-32
20	Condenser fan	Drive the fan motors (condenser)	• Ignition switch: ON • A/C switch: ON		Fan motor runs	Procedure No. 23	13B-23
21	Radiator fan	Drive the fan motors (radiator)	• Ignition switch: ON		Fan motor runs	Procedure No. 23	13B-23

CHECK AT THE ENGINE-ECU TERMINALS

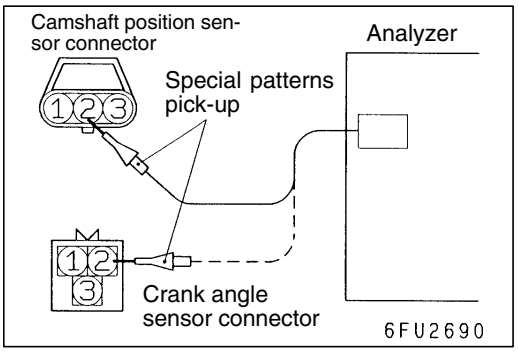
TERMINAL VOLTAGE CHECK CHART

The following items have been added. The ignition timing adjustment terminal (terminal No. 52) has been discontinued.

Terminal No.	Check item	Check condition	Normal condition
10	Ignition coil – No. 1, No. 4 (Ignition power transistor)	Engine r/min: 3,000 r/min	0.3 – 3.0 V
23	Ignition coil – No. 2, No. 3 (Ignition power transistor)	Engine r/min: 3,000 r/min	0.3 – 3.0 V
58	Engine ignition signal	Engine r/min: 3,000 r/min	0.3 – 3.0 V
88	Camshaft position sensor	Engine: Cranking	0.4 – 3.0 V
		Engine: Idling	0.5 – 2.0 V

CHECK CHART FOR RESISTANCE AND CONTINUITY BETWEEN TERMINALS

Terminal No.	Check item	Normal condition (check condition)
54 – 12	Oxygen sensor heater (rear)	4.5 – 8.0 Ω (at 20°C)
60 – 12	Oxygen sensor heater (front)	11 – 18 Ω (at 20°C)



INSPECTION PROCEDURE USING AN ANALYZER

CAMSHAFT POSITION SENSOR AND CRANK ANGLE 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 analyzer special patterns pickup to camshaft position sensor terminal 2.
3. Disconnect the crank angle sensor connector and connect the special tool (test harness: MD998478) in between.
4. Connect the analyzer special patterns pickup to crank angle sensor terminal 2.

Alternate Method (Test harness not available)

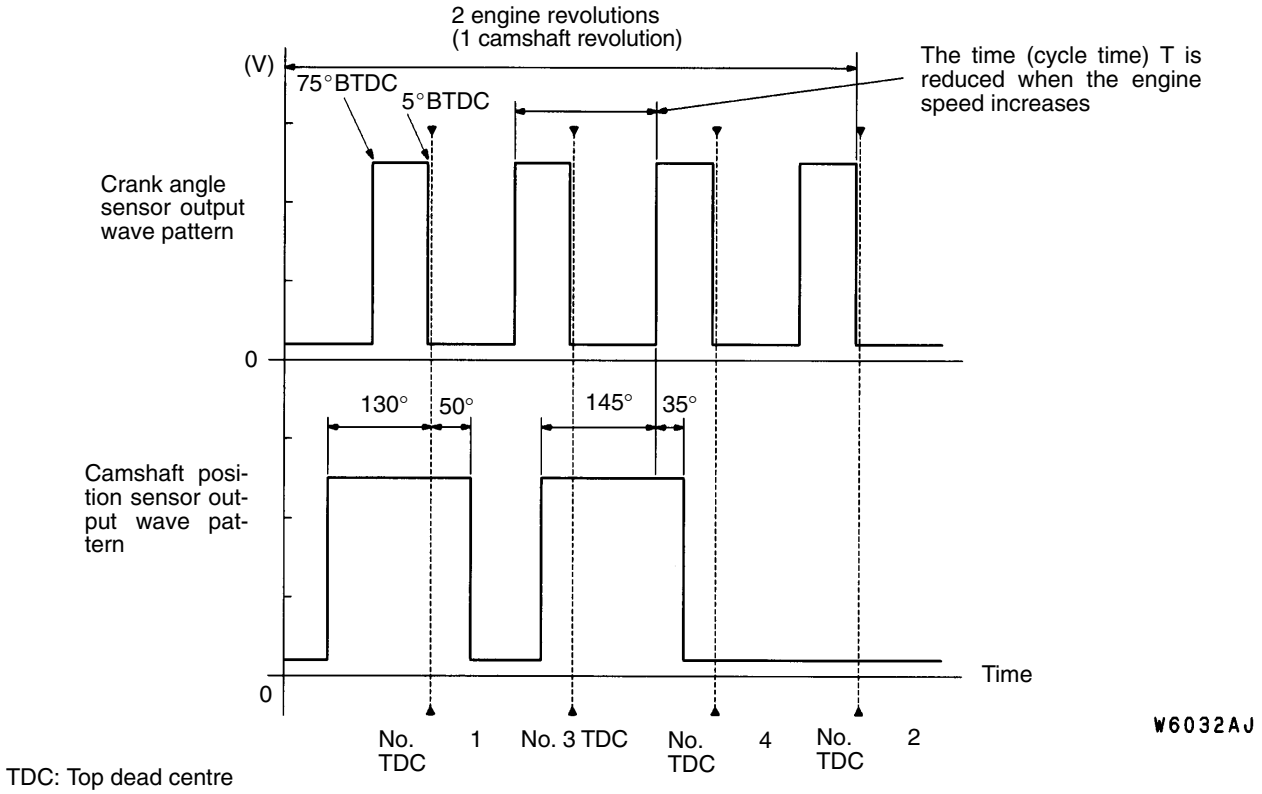
1. Connect the analyzer special patterns pickup to engine-ECU terminal 88. (When checking the camshaft position sensor signal wave pattern.)
2. Connect the analyzer special patterns pickup to engine-ECU terminal 89. (When checking the crank angle sensor signal wave pattern.)

Standard Wave Pattern

Observation conditions

Function	Special patterns
Pattern height	Low
Pattern selector	Display
Engine r/min	Idle speed

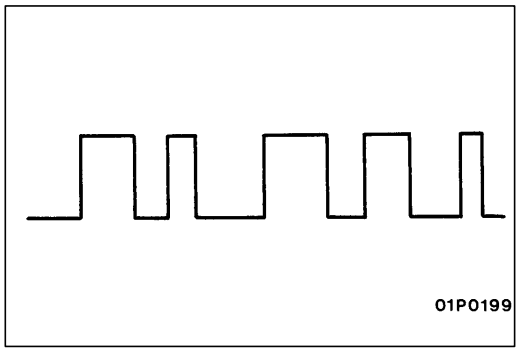
Standard wave pattern



TDC: Top dead centre

Wave Pattern Observation Points

Check that cycle time T becomes shorter when the engine speed increases.



Examples of Abnormal Wave Patterns

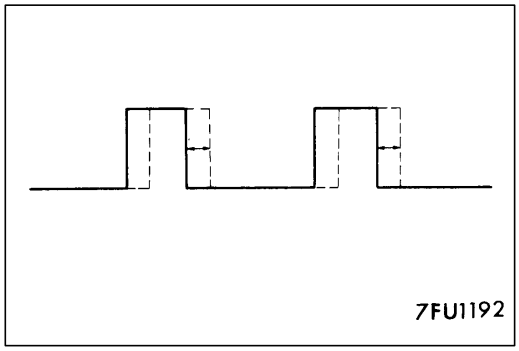
- Example 1

  Cause of problem

  Sensor interface malfunction

  Wave pattern characteristics

  Rectangular wave pattern is output even when the engine is not started.



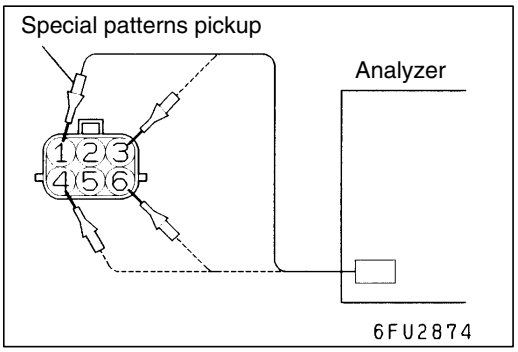
- Example 2

  Cause of problem

  Loose timing belt
  Abnormality in sensor disk

  Wave pattern characteristics

  Wave pattern is displaced to the left or right.



IDLE SPEED CONTROL (ISC) SERVO (STEPPER MOTOR)

Measurement Method

1. Disconnect the ISC servo connector, and connect the special tool (test harness: MB991709) in between. (All terminals should be connected.)
2. Connect the analyzer special patterns pickup to the ISC servo-side connector terminal 1, terminal 3, terminal 4 and terminal 6 respectively.

Alternate Method (Test harness not available)

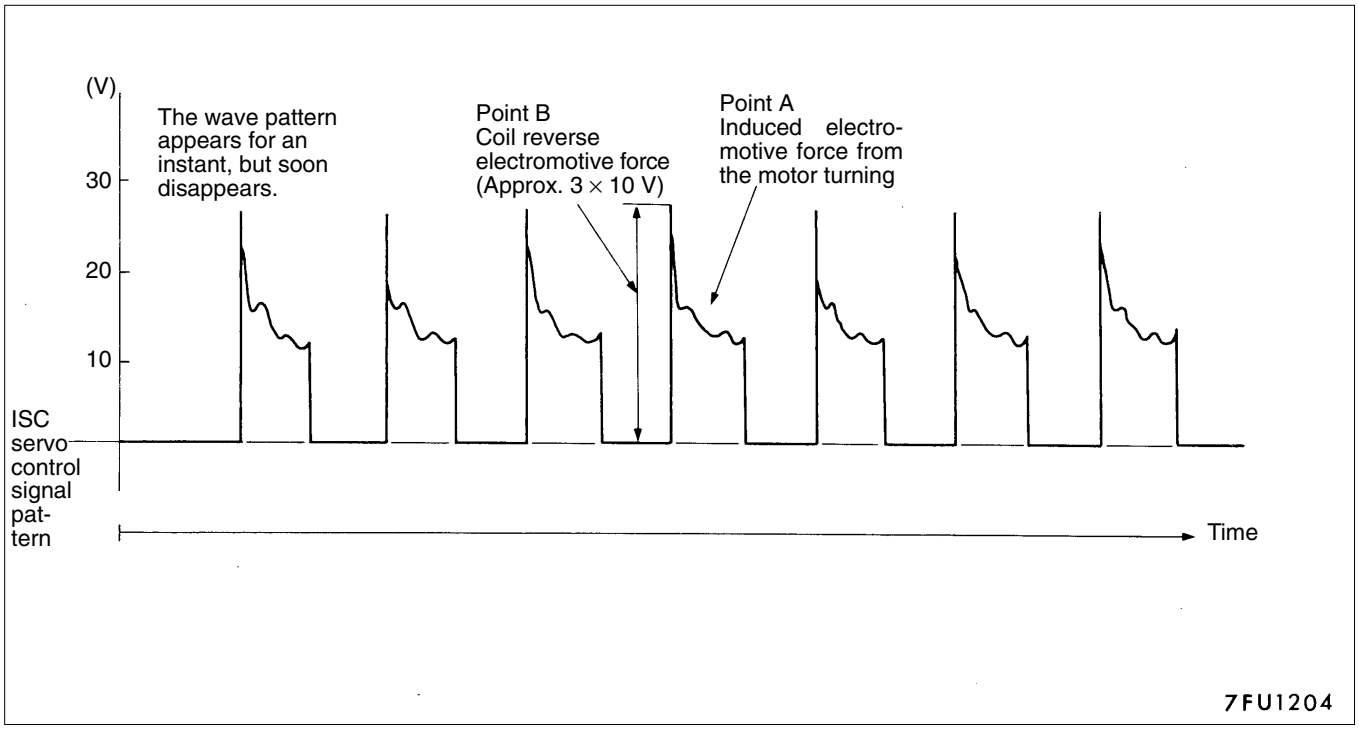
1. Connect the analyzer special patterns pickup to engine-ECU terminal 4, connection terminal 5, connection terminal 17, and connection terminal 18 respectively.

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 OFF 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



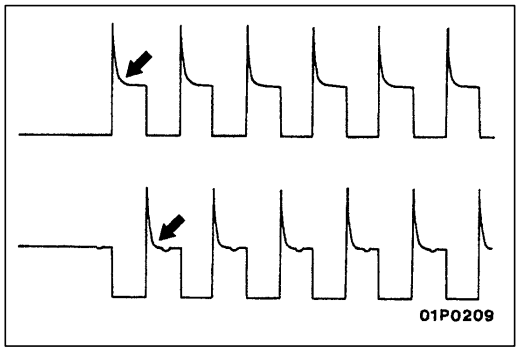
Wave Pattern Observation Points

Check that the standard wave pattern appears when the ISC servo 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 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

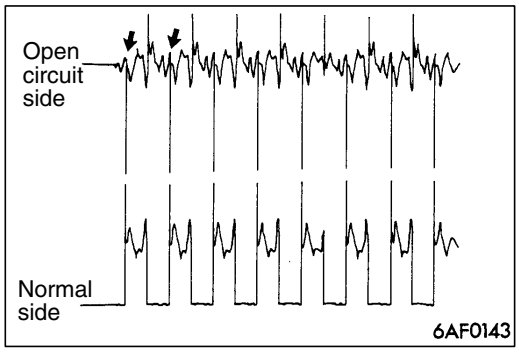
- Example 1

  Cause of problem

  Motor is malfunctioning. (Motor is not operating.)

  Wave pattern characteristics

  Induced electromotive force from the motor turning does not appear.



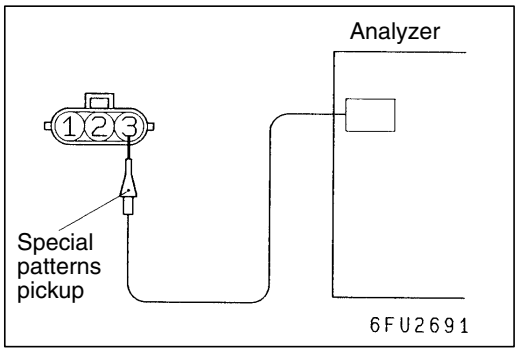
- Example 2

  Cause of problem

  Open circuit in the line between the ISC servo 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

Power transistor control signal

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 analyzer special patterns pickup to terminal 3 of each ignition coil connector in turn.

Alternate Method (Test harness not available)

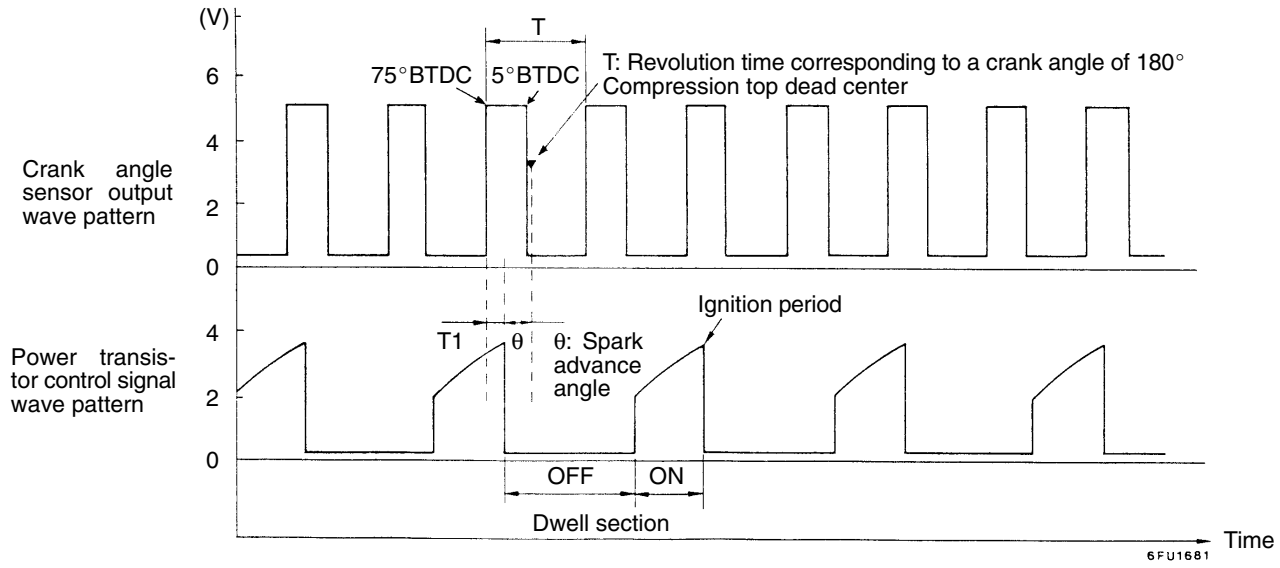
1. Connect the analyzer special patterns pickup to engine-ECU terminal 10 (No. 1 – No. 4), terminal 23 (No. 2 – No. 3) respectively.

Standard Wave Pattern

Observation condition

Function	Special patterns
Pattern height	Low
Pattern selector	Display
Engine r/min	Approx. 1,200 r/min

Standard wave pattern

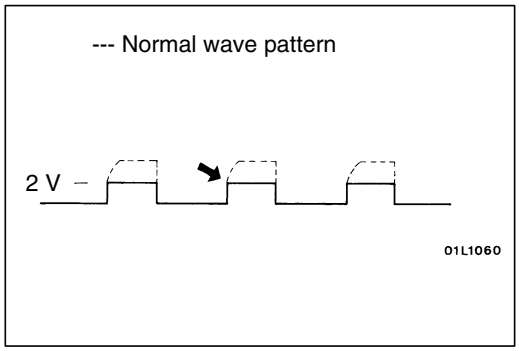


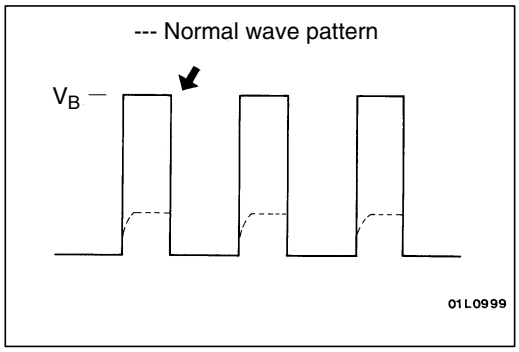
T1: Time computed by the engine-ECU

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 wave pattern build-up section and maximum voltage	Probable cause
Rises from approx. 2 V to approx. 4.5 V at the top-right	Normal
2V rectangular wave	Open-circuit in ignition primary circuit
Rectangular wave at power voltage	Power transistor malfunction





Examples of Abnormal Wave Pattern

- 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

BASIC IDLE SPEED ADJUSTMENT

NOTE
(1) 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.
(2) 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.
(3) 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 MUT-II to the diagnosis connector (16-pin).

   NOTE
   When the MUT-II is connected, the diagnosis control terminal should be earthed.

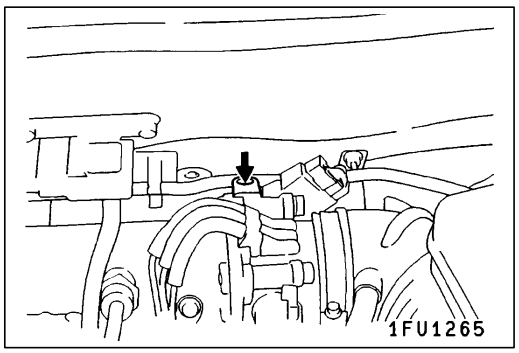
3. Start the engine and run at idle.
4. Select the item No. 30 of the MUT-II Actuator test.

   NOTE
   This holds the ISC servo at the basic step to adjust the basic idle speed.

5. Check the idle speed.

   Standard value: 750 ± 50 r/min

   NOTE
   (1) 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.
   (2) 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.



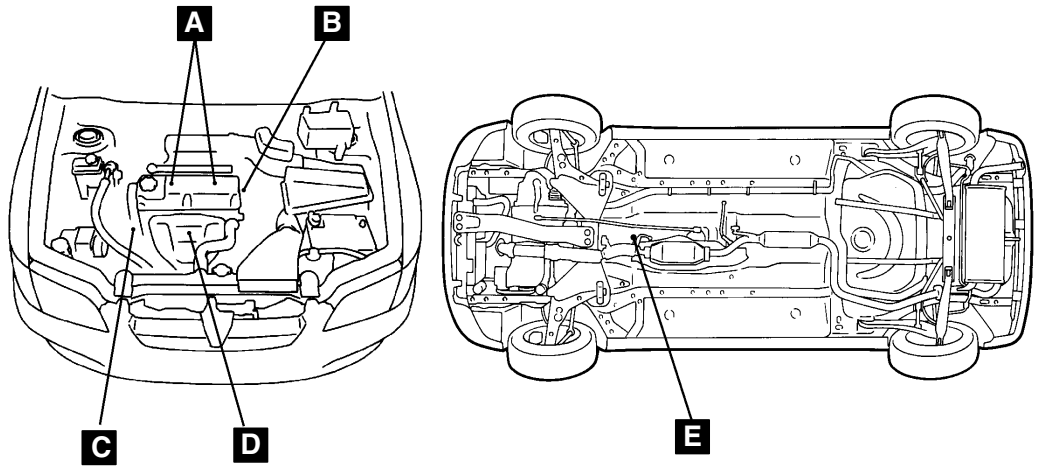
6. If not within the standard value range, turn the speed adjusting screw (SAS) to make the necessary adjustment.
7. Press the MUT-II clear key, and release the ISC servo from the Actuator test mode.

NOTE
Unless the ISC servo is released, the Actuator test mode will continue 27 minutes.

8. Switch OFF the ignition switch.
9. Disconnect the MUT-II.
10. Start the engine again and let it run at idle speed for about 10 minutes; check that the idling condition is normal.

COMPONENT LOCATION

Name	Symbol	Name	Symbol
Camshaft position sensor	B	Ignition failure sensor	B
Crank angle sensor	C	Oxygen sensor (front)	D
Ignition coil	A	Oxygen sensor (rear)	E



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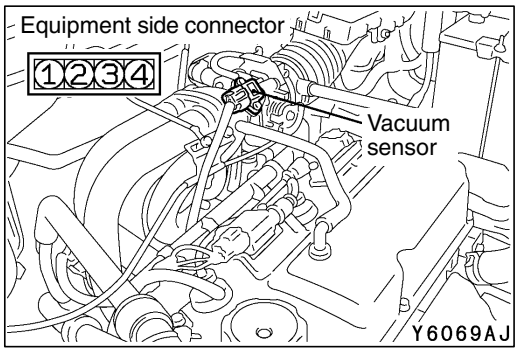
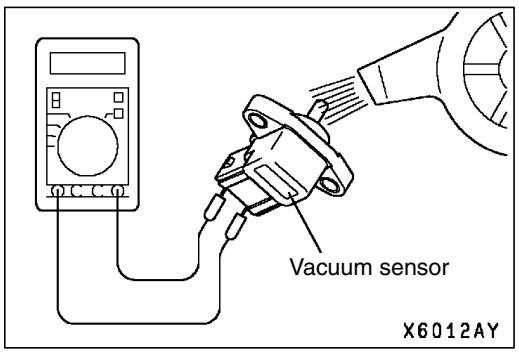


INTAKE AIR TEMPERATURE SENSOR CHECK

1. Disconnect the vacuum sensor connector.
2. Measure resistance between terminals 1 and 3.

   Standard value:
   2.3 – 3.0 kΩ (at 20°C)
   0.30 – 0.42 kΩ (at 80°C)

3. Remove the vacuum sensor.



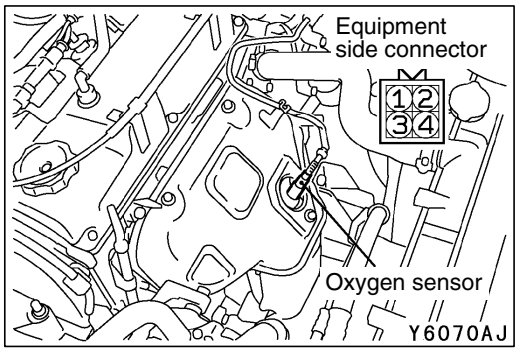
4. Measure resistance while heating the sensor using a hair drier.

   Normal condition:

Temperature (°C)	Resistance (kΩ)
Higher	Smaller

5. If the value deviates from the standard value or the resistance remains unchanged, replace the vacuum sensor.
6. Install the vacuum sensor and tighten it to the specified torque.

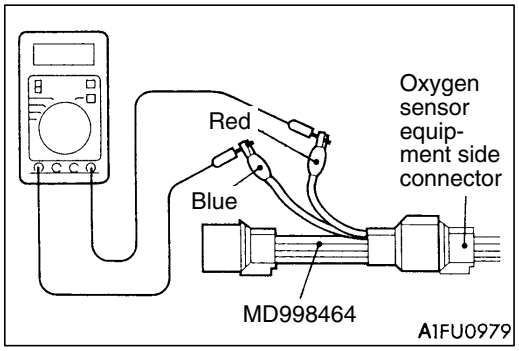
   Tightening torque: 13 – 15 Nm



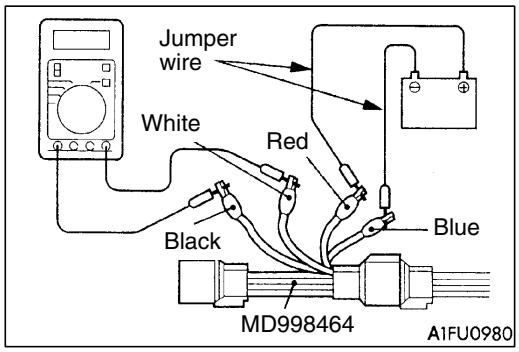
OXYGEN SENSOR CHECK

<Oxygen sensor (front)>

1. Disconnect the oxygen sensor connector and connect the special tool (test harness) 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 1 (red clip of special tool) and terminal 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. Use a jumper wire to connect terminal 1 (red clip) of the oxygen sensor connector to the battery (+) terminal and terminal 3 (blue clip) to the battery (–) terminal.

   Caution
   Be very careful when connecting the jumper wire; incorrect connection can damage the oxygen sensor.

6. Connect a digital voltage meter between terminal 2 (black clip) and terminal 4 (white clip).

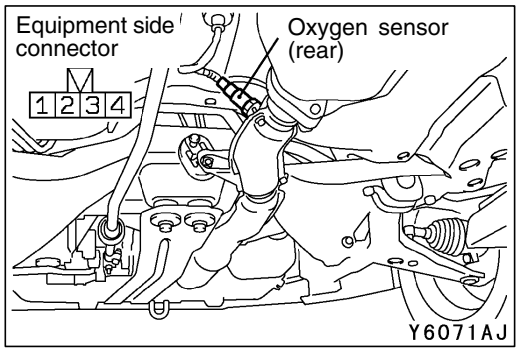
7. While repeatedly racing the engine, measure the oxygen sensor output voltage.

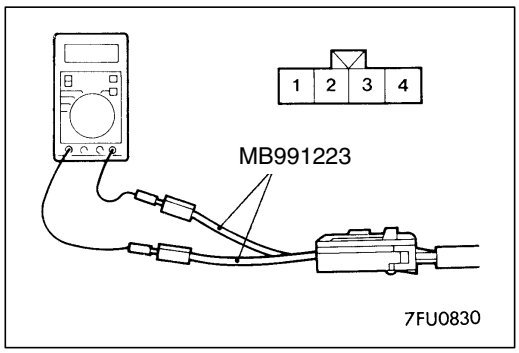
   Standard value:

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.

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.





<Oxygen sensor (rear)>

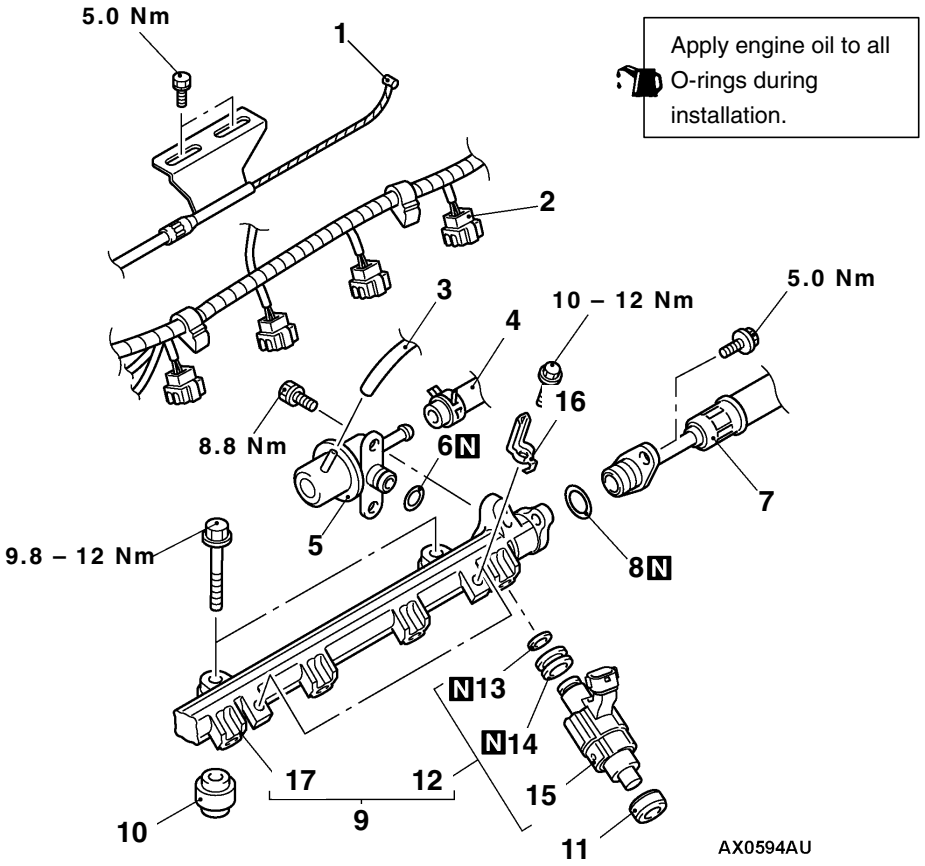
1. Disconnect the oxygen sensor connector and connect the special tool (test harness set) to the connector on the oxygen sensor side.
2. Make sure that there is continuity (11 – 18 Ω at 20°C) between terminal 3 and terminal 4 on the oxygen sensor connector.
3. If there is no continuity, replace the oxygen sensor.

   NOTE
   (1) If the MUT-II does not display the standard value although no abnormality is found by the above mentioned continuity test and harness check, replace the oxygen sensor (rear).
   (2) For removal and installation of the oxygen sensor, refer to GROUP 15 – Exhaust Pipe and Main Muffler.

FUEL INJECTOR

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Prevention of Fuel Discharge <before removal only>
- Fuel Leak Check <after installation only>
- Accelerator Cable Adjustment



Removal steps

1. Accelerator cable connection
2. Fuel injector connector
3. Vacuum hose connection
4. Fuel return hose connection
▶A◀ 5. Fuel pressure regulator
▶A◀ 6. O-ring
▶A◀ 7. High-pressure fuel hose connection
▶A◀ 8. O-ring
◀A▶ 9. Delivery pipe and fuel injector assembly
▶A◀ 10. Insulator
11. Insulator
▶A◀ 12. Fuel injector assembly
▶A◀ 13. O-ring
14. Grommet
15. Fuel injector
16. Harness bracket
17. Delivery pipe

REMOVAL SERVICE POINT

◀A▶ DELIVERY PIPE AND FUEL INJECTOR ASSEMBLY REMOVAL

Remove the delivery pipe (with the injectors attached to it).

Caution
Care must be taken, when removing the delivery pipe, not to drop the injector.

INSTALLATION SERVICE POINT

▶A◀ O-RING/FUEL INJECTOR ASSEMBLY/ HIGH-PRESSURE FUEL HOSE/FUEL PRESSURE REGULATOR INSTALLATION

1. Apply a drop of new engine oil to the O-ring.

   Caution
   Be sure not to let engine oil enter the delivery pipe.

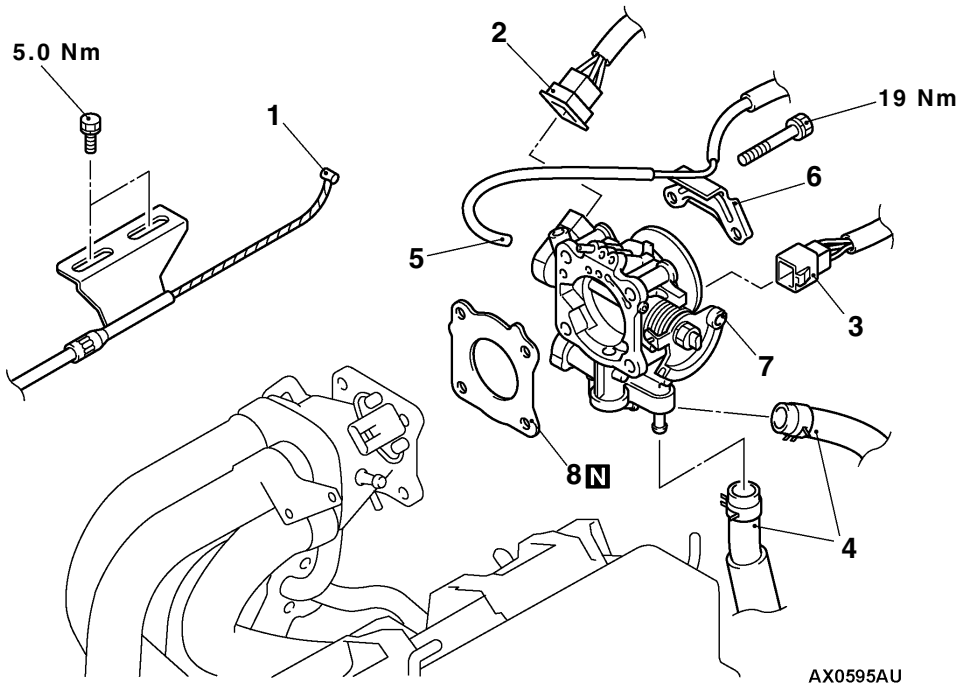
2. While turning the injector, high-pressure fuel hose and fuel pressure regulator to the right and left, install the delivery pipe, while being careful not to damage the O-ring. After installing, check that the hose turns smoothly.
3. If it does not turn smoothly, the O-ring may be trapped, remove the injector, high-pressure fuel hose or fuel pressure regulator and then re-insert it into the delivery pipe and check once again.
4. Tighten the high-pressure fuel hose and fuel pressure regulator to the specified torque.

   Tightening torque:
   5.0 Nm (High-pressure fuel hose)
   8.8 Nm (Fuel pressure regulator)

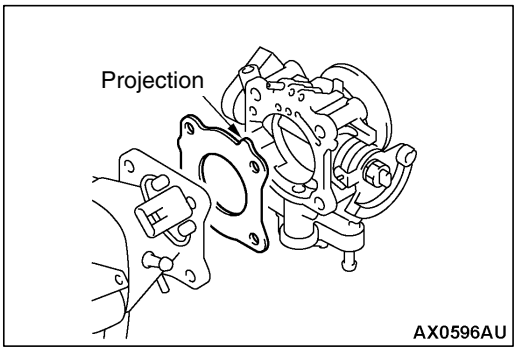
THROTTLE BODY

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Engine Coolant Draining
- Air Intake Hose Removal and Installation
- Accelerator Cable Adjustment <after installation>



Removal steps
1. Accelerator cable connection
2. Throttle position sensor connector
3. Idle speed control servo connector
4. Water hose connection
5. Vacuum hose connection
6. Vacuum pipe and hose assembly
7. Throttle body
▶A◀ 8. Throttle body gasket



INSTALLATION SERVICE POINT

▶A◀ THROTTLE BODY GASKET INSTALLATION

Install the throttle body gasket with its projection facing as shown in the illustration.

FUEL SUPPLY

CONTENTS

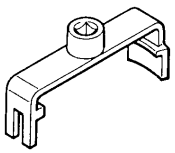
GENERAL **2**
Outline of Change 2
SPECIAL TOOL **2**
FUEL TANK <F9QT> **3**

GENERAL

OUTLINE OF CHANGE

The following service procedures have been established to correspond to the addition of the F9QT diesel engine. Other service procedures are the same as before.

SPECIAL TOOL

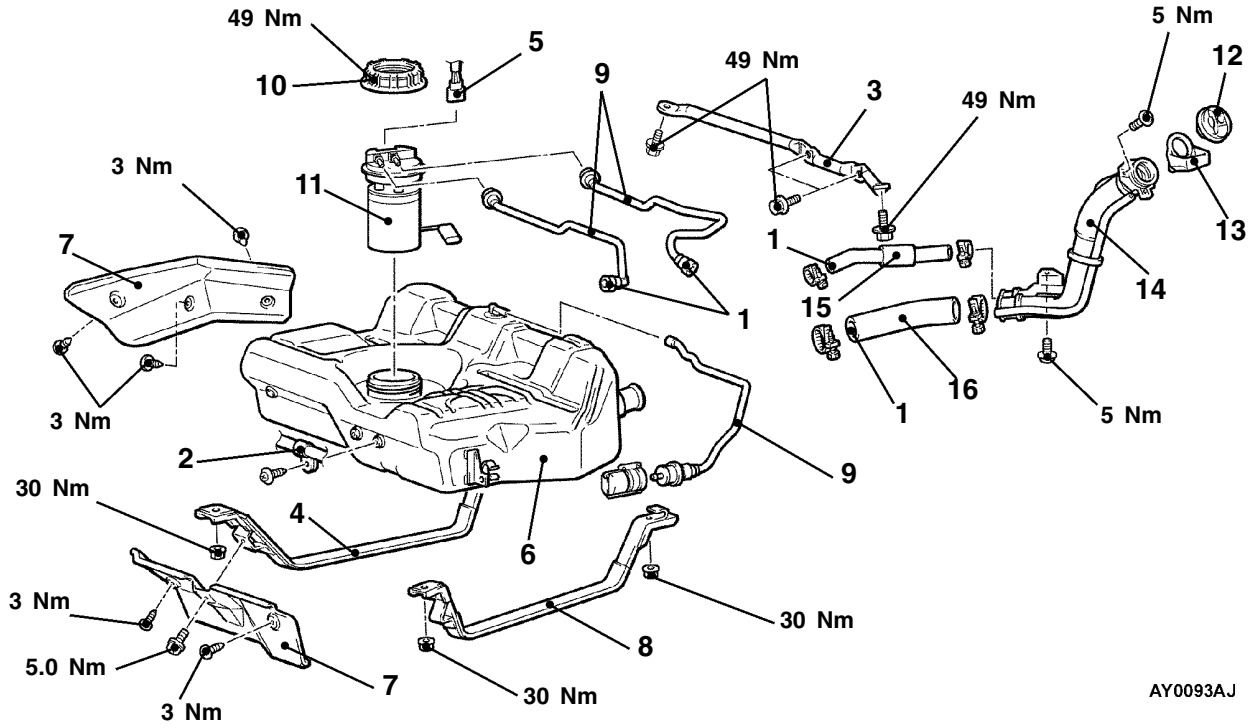
Tool	Number	Name	Use
	MB996009	Tank cap wrench	Installation of tank cap

FUEL TANK <F9QT>

REMOVAL AND INSTALLATION

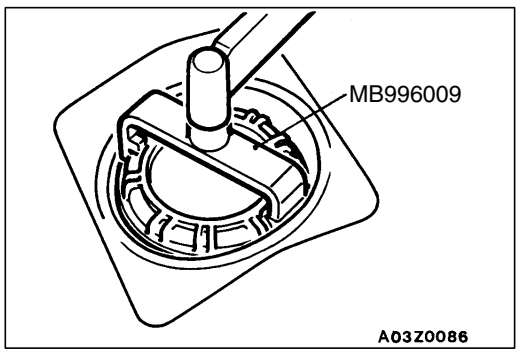
Pre-removal Operation
- Draining the Fuel

Post-installation Operation
- Refilling the Fuel
- Checking for Fuel Leaks



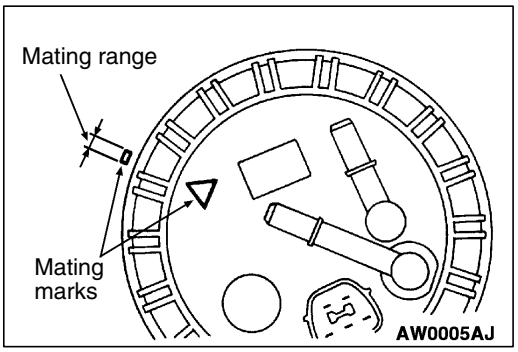
Removal steps

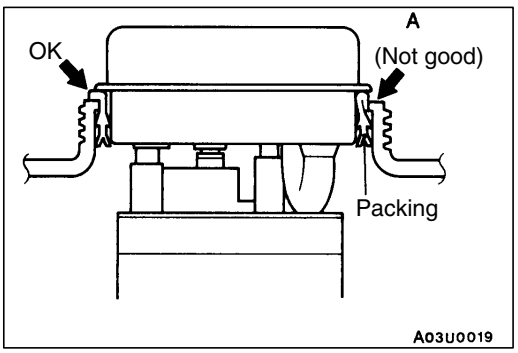
1. Fuel hoses connection
2. Harness clamp
3. Toe control link support bar
4. Band (RH)
5. Fuel pump module connector
6. Fuel tank assembly
7. Heat protector
8. Band (LH)
9. Fuel hoses
- ◀A▶ ▶B◀ 10. Cap
- ▶A◀ 11. Fuel pump module
12. Fuel filler cap
13. Fuel rubber drain
14. Filler neck assembly
15. Leveling hose
16. Filler hose

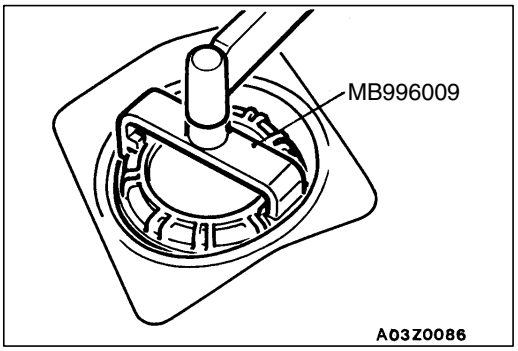


REMOVAL SERVICE POINT

◀A▶ CAP REMOVAL







INSTALLATION SERVICE POINTS

▶A◀ FUEL PUMP MODULE INSTALLATION

1. Check to be sure that the fuel tank packing is not damaged or deformed, and then securely install the packing to the fuel tank.

   Caution
   If the packing is installed to the fuel pump module, packing lip will be damaged when installing the fuel pump module to the fuel tank and the fuel leak will result.

   NOTE
   If the packing is damaged or deformed, replace the defective packing with a new packing.

2. Apply soapy water to the inside of the packing. Align the mating marks on the fuel tank and fuel pump module as shown in the illustration, and then install the fuel pump module to the fuel tank.

   Caution
   (1) Do not tilt the fuel pump module when installing.
   (2) The packing should not be folded over as shown by (A) in the illustration.

▶B◀ CAP INSTALLATION

Apply soapy water to the cap thread, and the use the special tool as the same manner as for removal to tighten the cap to the specified torque.

Tightening torque: 49 Nm

Caution
Prevent the fuel pump module from turning with the cap when tightening the cap.

DIESEL FUEL

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GENERAL

OUTLINE OF CHANGE

The following maintenance service points have been established to correspond to the adoption of the F9Q1 engine.

GENERAL INFORMATION

The common rail fuel injection system consists of sensors which detect the condition of the diesel engine, an engine-ECU which controls the system based on signals from these sensors, and actuators which operate according to control commands from the engine-ECU. The engine-ECU carries out activities such as fuel injection control and idle speed control. In addition, the engine-ECU is equipped with several self-diagnosis functions which make trouble-shooting easier in the event that a problem develops.

FUEL INJECTION CONTROL

The injector drive time and the timing are controlled so that the appropriate quantities of fuel are supplied to the engine in response to engine conditions which can change frequently. A single injector is mounted at each cylinder. The fuel is sent from the fuel tank by the electronic fuel pump to the high pressure pump. The high pressure pump increases the fuel pressure to the pressure which is required for high-pressure injection, and then send the fuel to each injector.

SELF-DIAGNOSIS FUNCTION

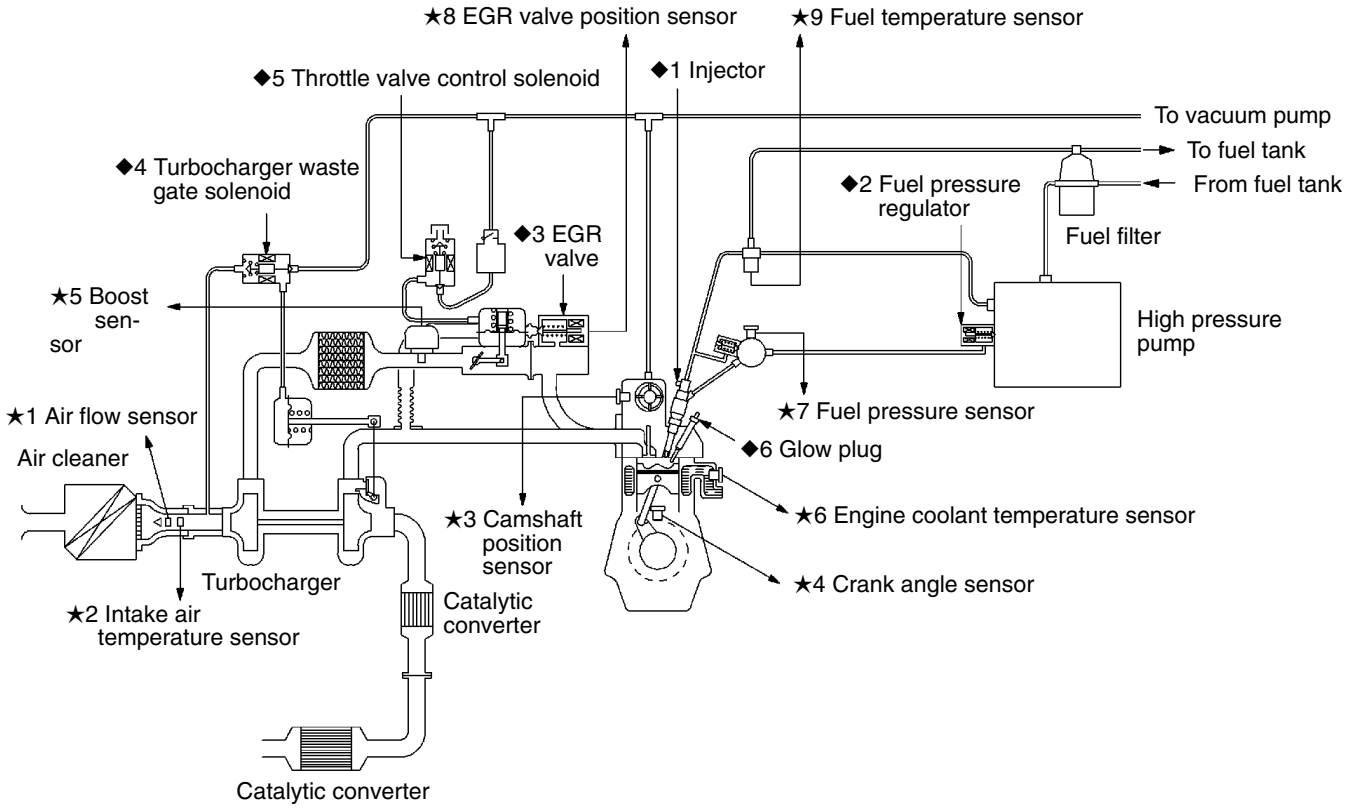
- When an abnormality is detected in any of the sensors or actuators, the engine warning lamp illuminates to warn the driver.
- When an abnormality is detected in any of the sensors or actuators, a diagnosis code number corresponding to the problem which occurred is output.
- The RAM data relating to the sensors and actuators which is stored in the engine-ECU can be read using the MUT-II. In addition, the actuators can be force-driven under certain conditions.

OTHER CONTROL FUNCTIONS

1. A/C Relay Control
   Turn the compressor clutch of the A/C ON and OFF.
2. Glow Control
   Refer to GROUP 16.
3. Fan Control
   The revolutions of the radiator fan and condenser fan are controlled in response to the engine coolant temperature and vehicle speed.
4. EGR Control
   Refer to GROUP 17.
5. Throttle Valve Control
   The throttle valve control solenoid controls vacuum pressure to the throttle actuator to open and close the throttle valve.
6. Boost Pressure Control
   Turbocharger waste gate solenoid controls vacuum pressure to the waste gate actuator to control boost pressure.
7. Additional Heater Control
   Refer to GROUP 55.

FUEL INJECTION SYSTEM DIAGRAM

★1 Air flow sensor ★2 Intake air temperature sensor ★3 Camshaft position sensor ★4 Crank angle sensor ★5 Boost sensor ★6 Engine coolant temperature sensor ★7 Fuel pressure sensor ★8 EGR valve position sensor ★9 Fuel temperature sensor	• Power supply • Ignition switch – IG • Accelerator pedal position sensor (1st channel) • Accelerator pedal position sensor (2nd channel) • Vehicle speed sensor • A/C switch • Stop lamp switch • Clutch pedal switch • Diagnostic control terminal	⇨	Engine-ECU	⇨	◆1 Injector ◆2 Fuel pressure regulator ◆3 EGR valve ◆4 Turbocharger waste gate ◆5 Throttle valve control solenoid ◆6 Glow plug	• Main relay • Glow relay box • A/C relay • Additional heater relay • Fan motor relay • Engine warning lamp • Glow indicator lamp • Overheat indicator lamp • Diagnostic output terminal

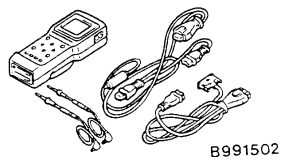
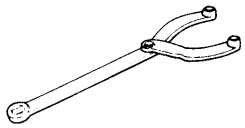
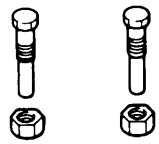


Y6030AJ

SERVICE SPECIFICATIONS

Items		Specifications
Intake air temperature sensor resistance kΩ	at –30°C	24.0 – 27.2
	at 20°C	2.35 – 2.55
	at 100°C	0.180 – 0.186
Engine coolant temperature sensor resistance kΩ	at 25°C	2.14 – 2.36
	at 80°C	0.27 – 0.29
Accelerator pedal position sensor (1st channel) Resistance between terminals (3) and (5) Ω		Approx. 1,200
Accelerator pedal position sensor (2nd channel) Resistance between terminals (2) and (6) Ω		Approx. 1,700
Injector coil resistance Ω (at 20°C)		Approx. 0.33
Fuel temperature sensor resistance kΩ (at 25°C)		2.05
Fuel pressure regulator Ω (at 20°C)		Approx. 5
Crank angle sensor resistance Ω		720 – 880
Throttle valve control solenoid coil resistance Ω (at 25°C)		43 – 49

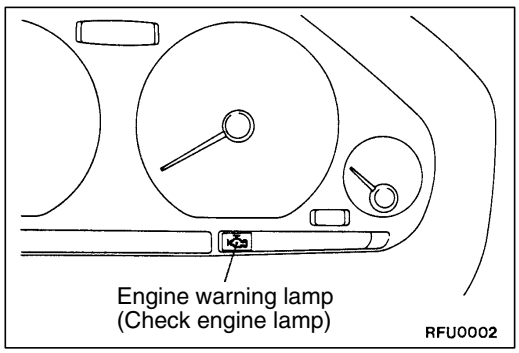
SPECIAL TOOLS

Tool	Number	Name	Use
 B991502	MB991502	MUT-II sub assembly	• Reading diagnosis code • Checking the fuel injection system
	MB990767	End yoke holder	Holding the fuel high pressure pump sprocket
	MD998719	Crankshaft pulley holder pin	

TROUBLESHOOTING

DIAGNOSIS TROUBLESHOOTING FLOW

Refer to '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1), GROUP 00 – How to Use Troubleshooting/Inspection Service Points.



DIAGNOSIS FUNCTION

ENGINE WARNING LAMP (CHECK ENGINE LAMP)

If an abnormality occurs in any of the items related to the electronic controlled injection 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.

NOTE
When the ignition switch is ON, the engine warning lamp illuminates as checking of the engine warning lamp circuit and the bulb, and then the warning lamp is extinguished after a few seconds.

METHOD OF READING AND ERASING DIAGNOSIS CODES

Refer to '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1), GROUP 00 – How to Use Troubleshooting/Inspection Service Points.

INSPECTION USING MUT-II 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 harnesses and components.
2. After repairing, re-check using the MUT-II 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 MUT-II.
5. Start the engine again and carry out a road test to confirm that the problem has disappeared.

FAIL-SAFE FUNCTION REFERENCE TABLE

Malfunctioning item	Control contents during malfunction
Crank angle sensor system	Engine cut-off
Camshaft position sensor system	Engine cut-off
Fuel pressure sensor system	Engine cut-off
Boost sensor system	● Turbocharger waste gate control is stopped ● EGR control is stopped
Air flow sensor system	EGR control is stopped
Engine coolant temperature sensor system	● The coolant temperature is regulated as specified ● The radiator fan is driven
Intake air temperature sensor system	Thermoplunger control is stopped
EGR valve position sensor system	EGR control is stopped
Immobilizer system	The engine is immobilized. However, the engine is not cut-off while the engine is running
EGR valve system	● Turbocharger waste gate control is stopped ● EGR control is stopped
Turbocharger waste gate solenoid system	● Turbocharger waste gate control is stopped ● EGR control is stopped
Fuel pressure regulator system	Engine cut-off
Fuel pressure system	Engine cut-off
Engine-ECU	Engine cut-off
Additional heater relay system	Thermoplunger control is stopped

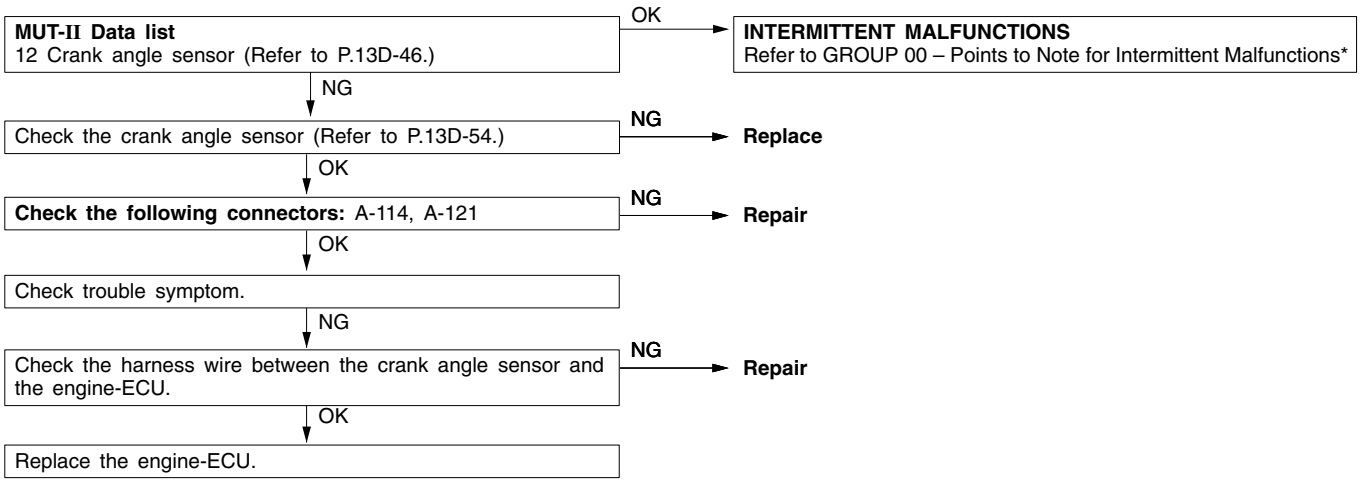
INSPECTION CHART FOR DIAGNOSIS CODES

Caution
Check that the engine-ECU earth circuit is normal before checking for the cause of the problem.

Code No.	Diagnosis item	Reference page
11	Crank angle sensor system	13D-8
12	Camshaft position sensor system	13D-9
13	Accelerator pedal position sensor (1st channel) system	13D-10
14	Accelerator pedal position sensor (2nd channel) system	13D-11
15	Fuel pressure sensor system	13D-12
16	Boost sensor system	13D-13
17	Barometric pressure sensor system	13D-14
18	Air flow sensor system	13D-15
19	Engine coolant temperature sensor system	13D-16
21	Fuel temperature sensor system	13D-17
22	Intake air temperature sensor system	13D-18
23	EGR valve position sensor system	13D-19
24	Glow relay box system	13D-20
25	Immobilizer system	13D-21
26	EGR valve system	13D-22
27	Turbocharger waste gate solenoid system	13D-23
28	Fuel pressure regulator system	13D-24
29	No. 1 injector system	13D-25
31	No. 2 injector system	13D-25
32	No. 3 injector system	13D-26
33	No. 4 injector system	13D-26
34	Glow plug system	13D-27
35	Vehicle speed sensor system	13D-27
36	Fuel pressure system	13D-28
37	Throttle valve control solenoid system	13D-29
38	Engine-ECU	13D-30
40	Additional heater relay system	13D-30
41	Fan control relay (low) system	13D-31
42	Stop lamp switch system	13D-31
43	Clutch pedal switch system	13D-32
44	Power latch system	13D-32
45	Main relay system	13D-33
46	Power supply system	13D-34
47	ECU alimentation	13D-34

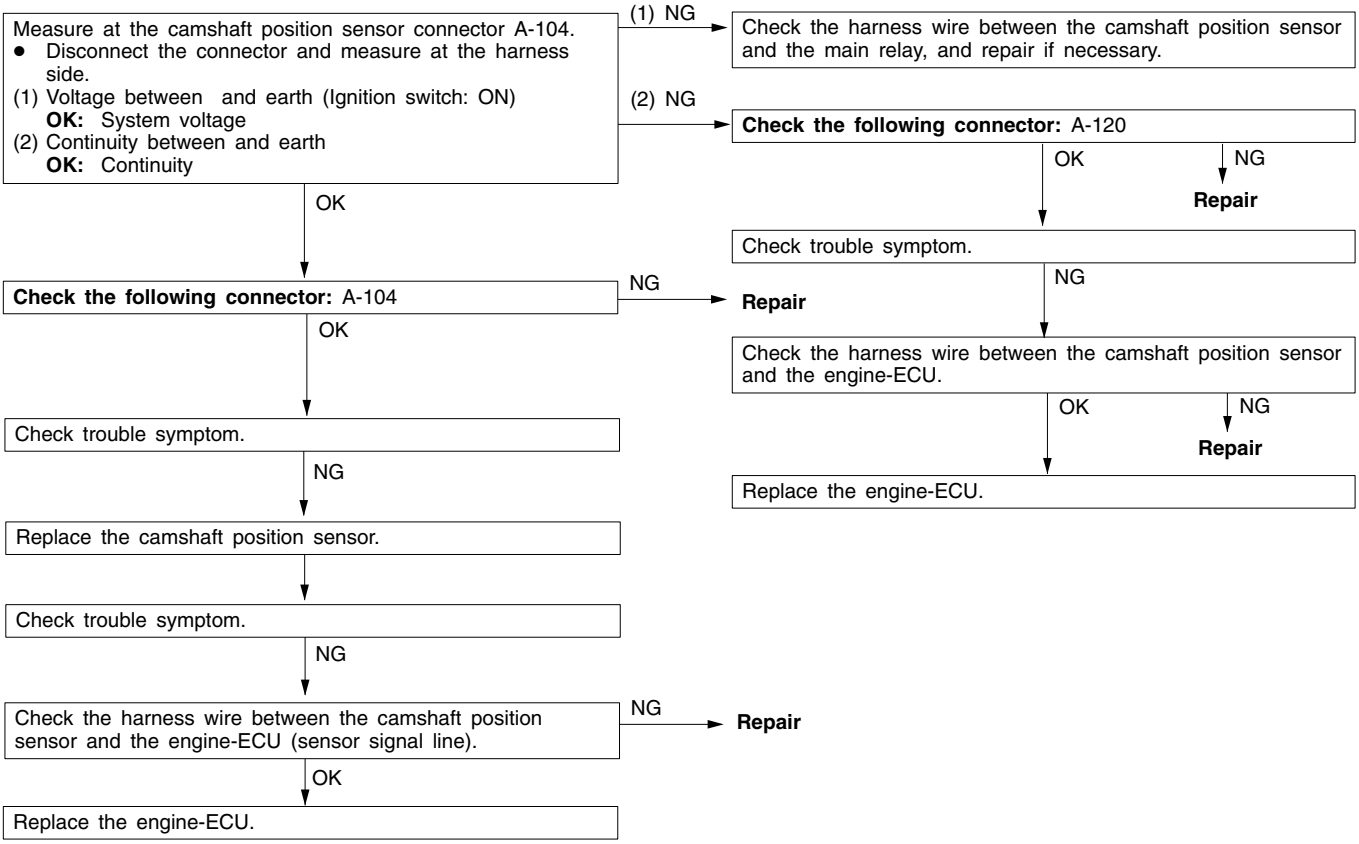
INSPECTION PROCEDURE FOR DIAGNOSIS CODES

Code No. 11 Crank angle sensor system	Probable cause
Range of Check ● During engine running **Set Conditions** ● Sensor output voltage does not change (no pulse signal input) or ● Sensor output value is 5,000 r/min or more for 1 second	● Malfunction of the crank angle sensor ● Improper connector contact, open circuit or short-circuited harness wire of the crank angle sensor circuit ● Malfunction of the engine-ECU

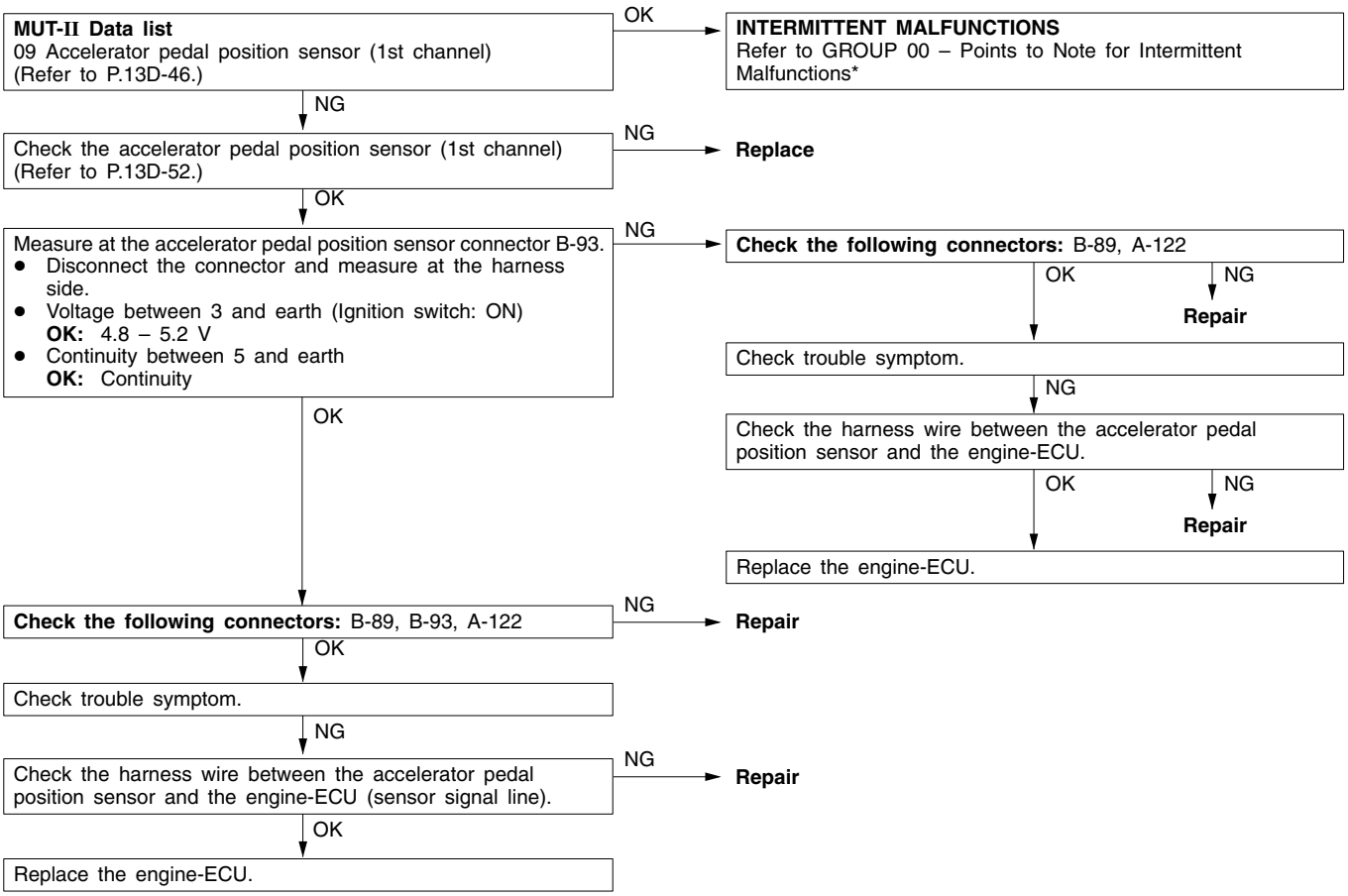


*: Refer to '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

Code No. 12 Camshaft position sensor system	Probable cause
Range of Check ● During engine running **Set Conditions** ● Sensor output voltage does not change for 0.5 second (no pulse signal input) **Range of Check** ● During engine running ● Pulse signal detected two or more times **Set Conditions** ● Not synchronized with crank angle sensor output or ● Crank angle sensor output voltage does not change for 0.5 second (no pulse signal input)	● Malfunction of the camshaft position sensor ● Improper connector contact, open circuit or short-circuited harness wire of the camshaft position sensor circuit ● Malfunction of the engine-ECU

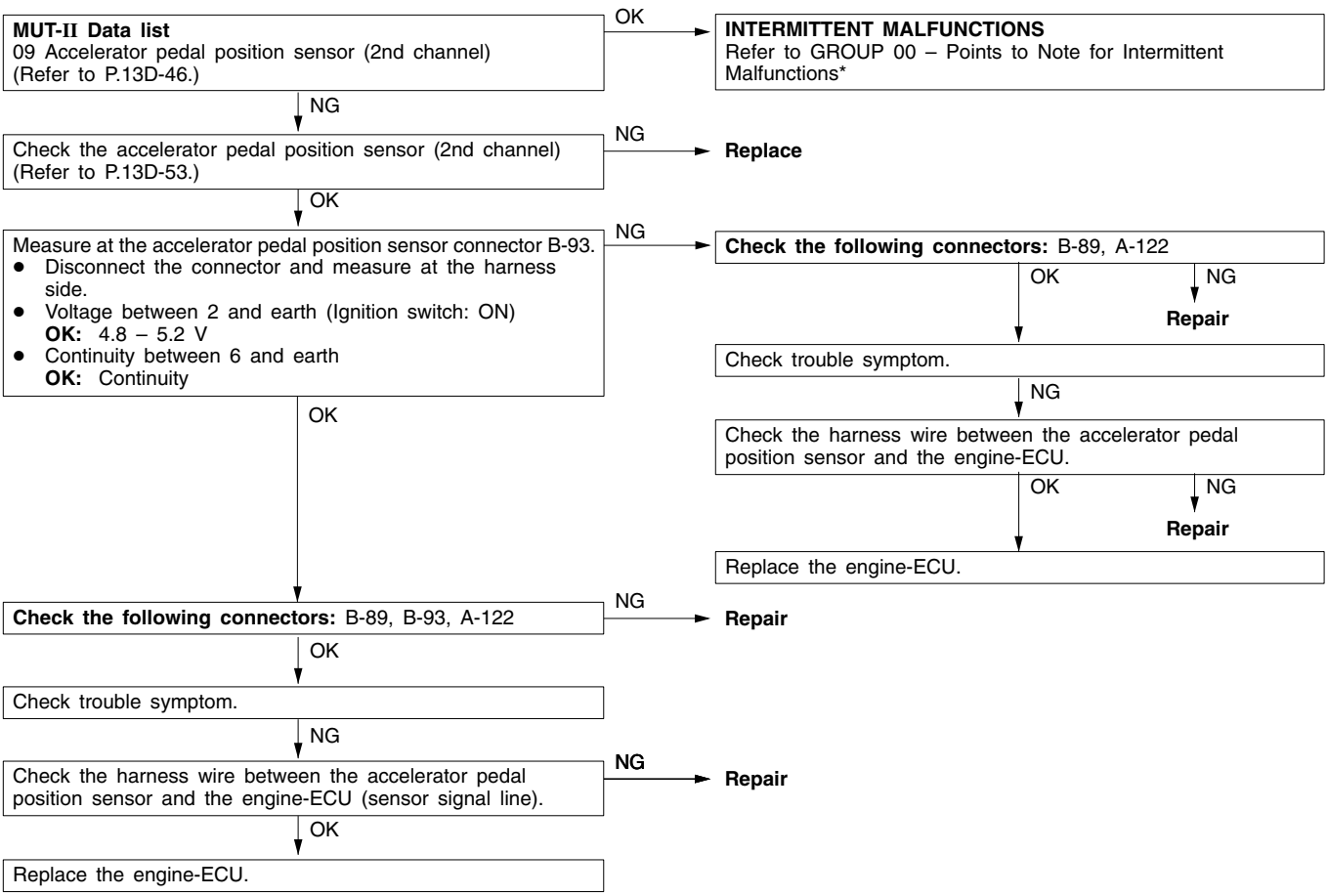


Code No. 13 Accelerator pedal position sensor (1st channel) system	Probable cause
Range of Check • Ignition switch: ON **Set Conditions** • Sensor output voltage is 200 mV or less or • Sensor output voltage is 4,750 mV or more	• Malfunction of the accelerator pedal position sensor (1st channel) • Improper connector contact, open circuit or short-circuited harness wire of the accelerator pedal position sensor (1st channel) circuit • Malfunction of the engine-ECU



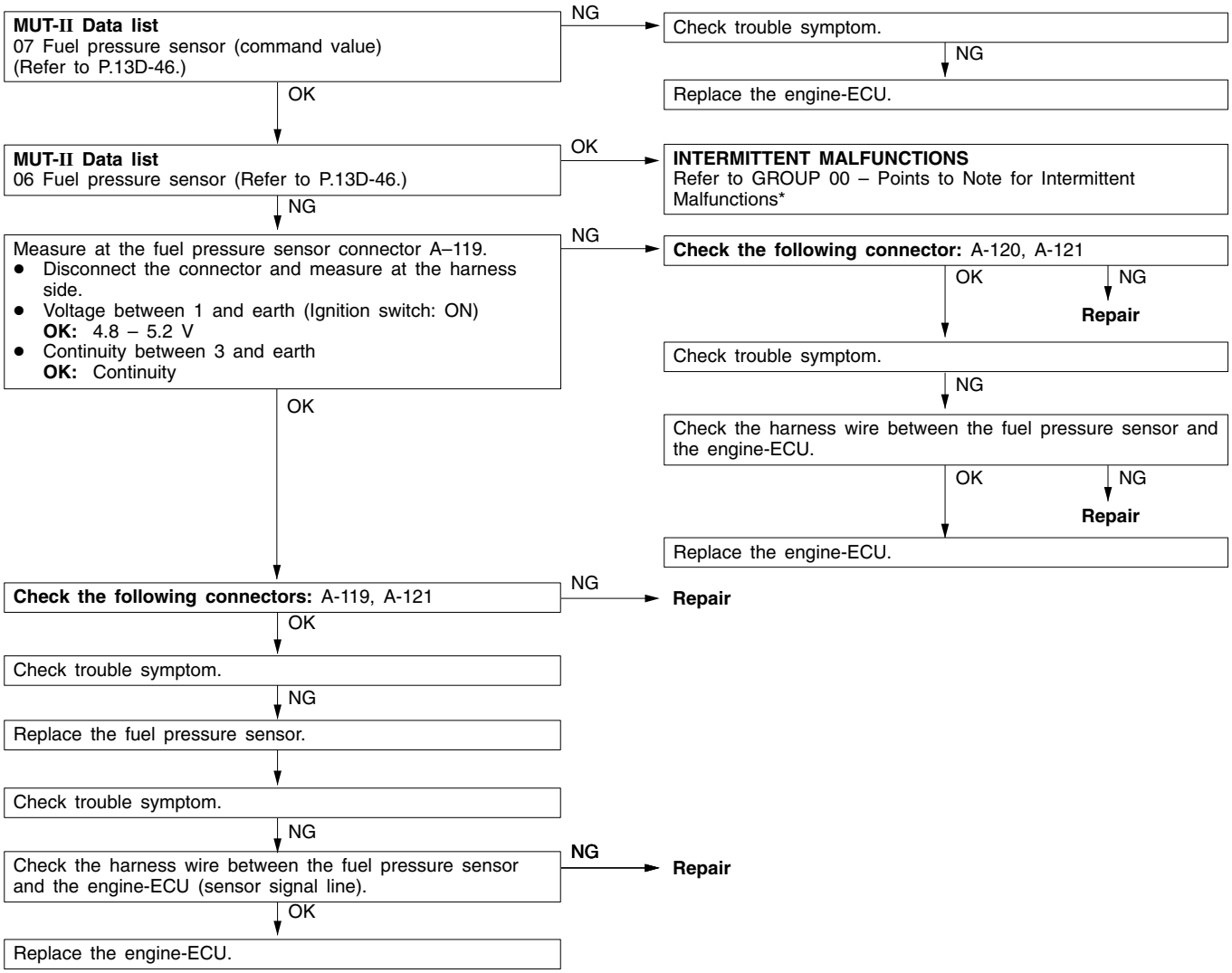
*: Refer to '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

Code No. 14 Accelerator pedal position sensor (2nd channel) system	Probable cause
Range of Check ● Ignition switch: ON **Set Conditions** ● Sensor output voltage is 200 mV or less or ● Sensor output voltage is 2,500 mV or more **Range of Check** ● Ignition switch: ON **Set Conditions** ● Output difference compared to accelerator pedal position sensor (1st channel) is 6 % or more	● Malfunction of the accelerator pedal position sensor (2nd channel) ● Improper connector contact, open circuit or short-circuited harness wire of the accelerator pedal position sensor (2nd channel) circuit ● Malfunction of the engine-ECU



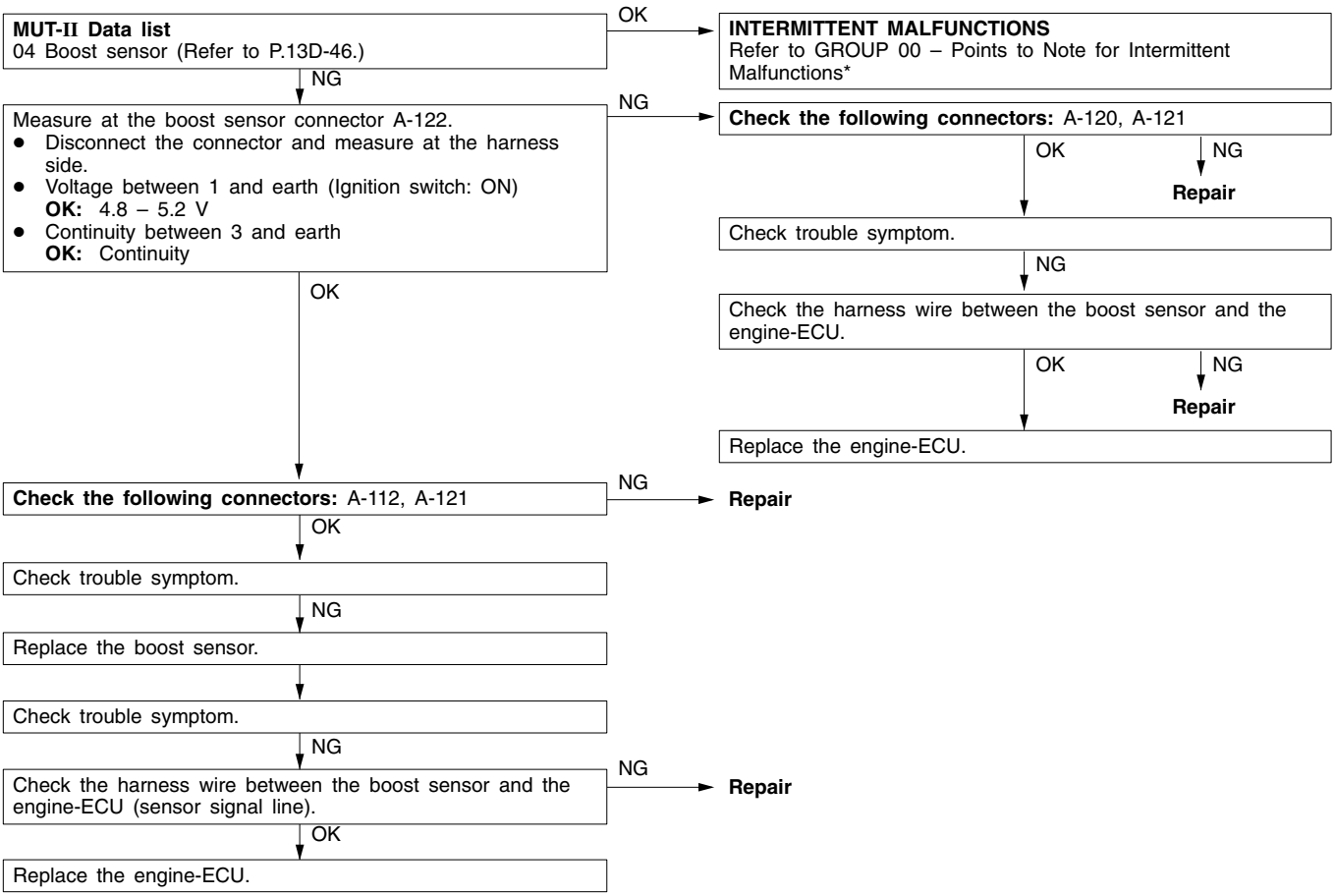
*: Refer to '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

Code No. 15 Fuel pressure sensor system	Probable cause
Range of Check • Ignition switch: ON **Set Conditions** • Sensor output voltage is 250 mV or less or • Sensor output voltage is 4,750 mV or more **Range of Check** • During engine running **Set Conditions** • Fuel pressure varies greatly from command value	• Malfunction of the fuel pressure sensor • Improper connector contact, open circuit or short-circuited harness wire of the fuel pressure sensor circuit • Malfunction of the engine-ECU



*: Refer to '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

Code No. 16 Boost sensor system	Probable cause
Range of Check ● Ignition switch: ON **Set Conditions** ● Sensor output voltage is 100 mV or less for 1 second or ● Sensor output voltage is 4,900 mV or more for 1 second **Range of Check** ● Engine speed: 900 r/min or less **Set Conditions** ● Variation from barometric pressure sensor output signal is 15 kPa or more for 4.6 seconds	● Malfunction of the boost sensor ● Improper connector contact, open circuit or short-circuited harness wire of the boost sensor circuit ● Malfunction of the engine-ECU



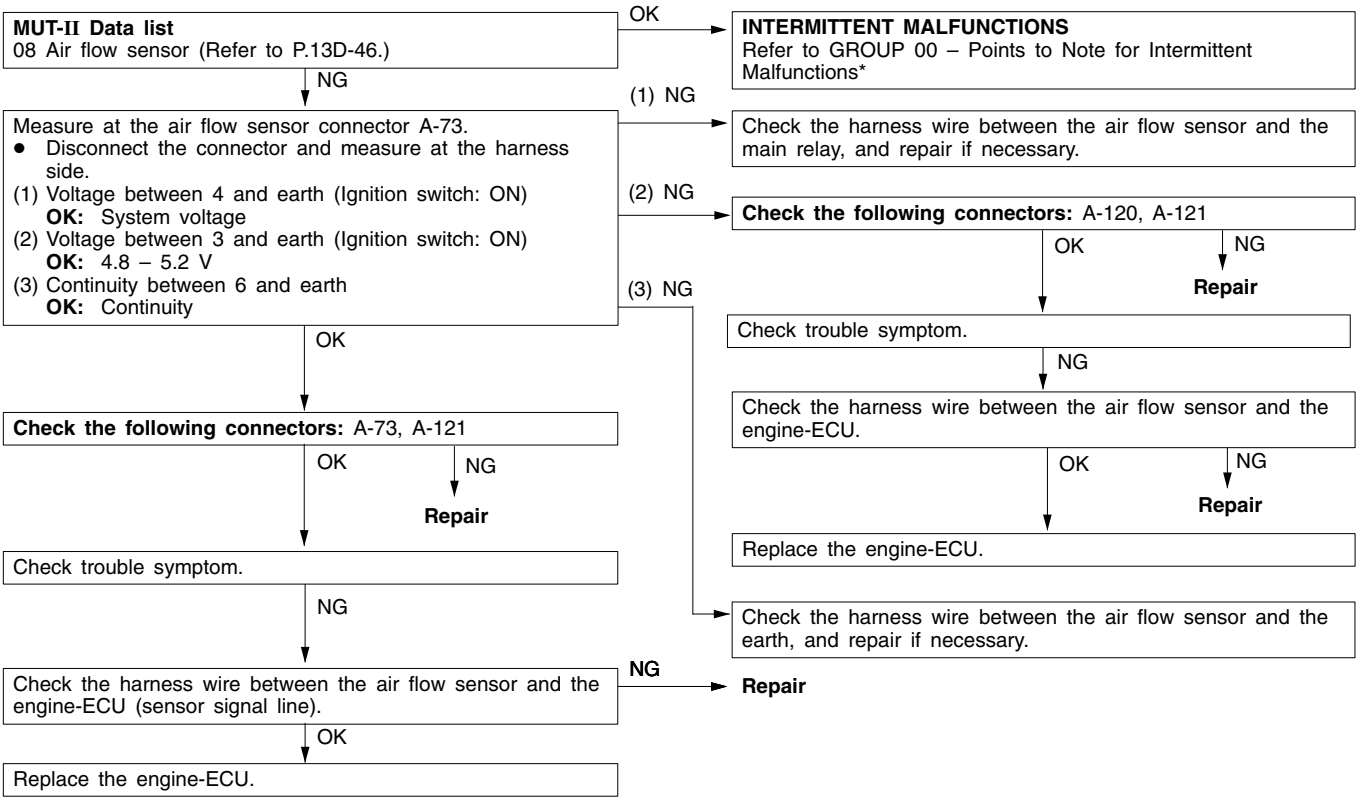
*: Refer to '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

Code No. 17 Barometric pressure sensor system	Probable cause
Range of Check ● Ignition switch: ON **Set Conditions** ● Sensor output voltage is 200 mV or less for 1 second or ● Sensor output voltage is 4,950 mV or more for 1 second	● Malfunction of the barometric pressure sensor ● Malfunction of the engine-ECU

MUT-II Data list
05 Barometric pressure sensor (Refer to P.13D-46.)
→ OK → **INTERMITTENT MALFUNCTIONS** Refer to GROUP 00 – Points to Note for Intermittent Malfunctions*
↓ NG
Check trouble symptom.
↓ NG
Replace the engine-ECU.

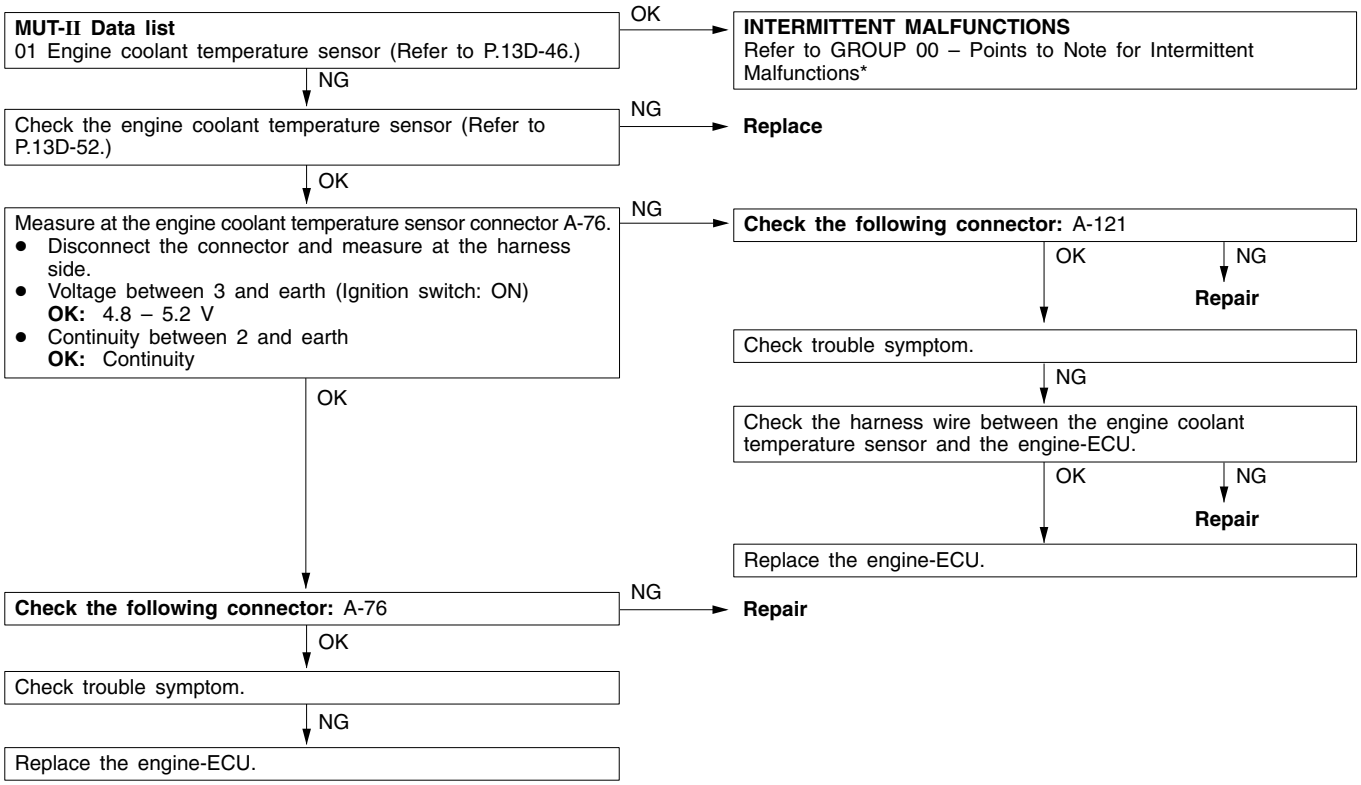
*: Refer to '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

Code No. 18 Air flow sensor system	Probable cause
Range of Check ● Ignition switch: ON **Set Conditions** ● Sensor output voltage is 100 mV or less for 1.5 seconds or ● Sensor output voltage is 1,200 mV or more for 1.5 seconds **Range of Check** ● Engine speed : 700 r/min or more **Set Conditions** ● Sensor output is 10 kg/h or less for 1 second	● Malfunction of the air flow sensor ● Improper connector contact, open circuit or short-circuited harness wire of the air flow sensor circuit ● Malfunction of the engine-ECU



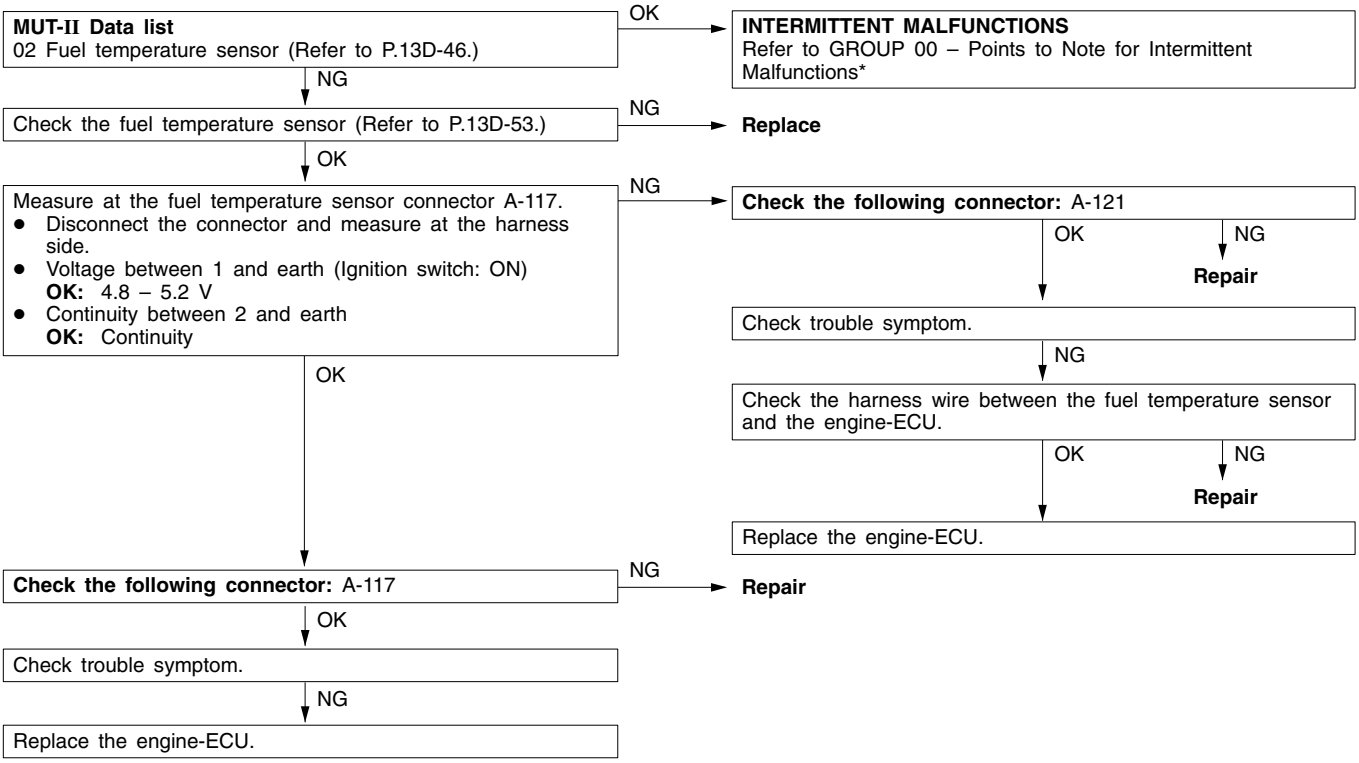
*: Refer to '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

Code No. 19 Engine coolant temperature sensor system	Probable cause
Range of Check ● Ignition switch: ON **Set Conditions** ● Sensor output voltage is 100 mV or less for 1 second or ● Sensor output voltage is 4,900 mV or more for 1 second	● Malfunction of the engine coolant temperature sensor ● Improper connector contact, open circuit or short-circuited harness wire of the engine coolant temperature sensor circuit ● Malfunction of the engine-ECU



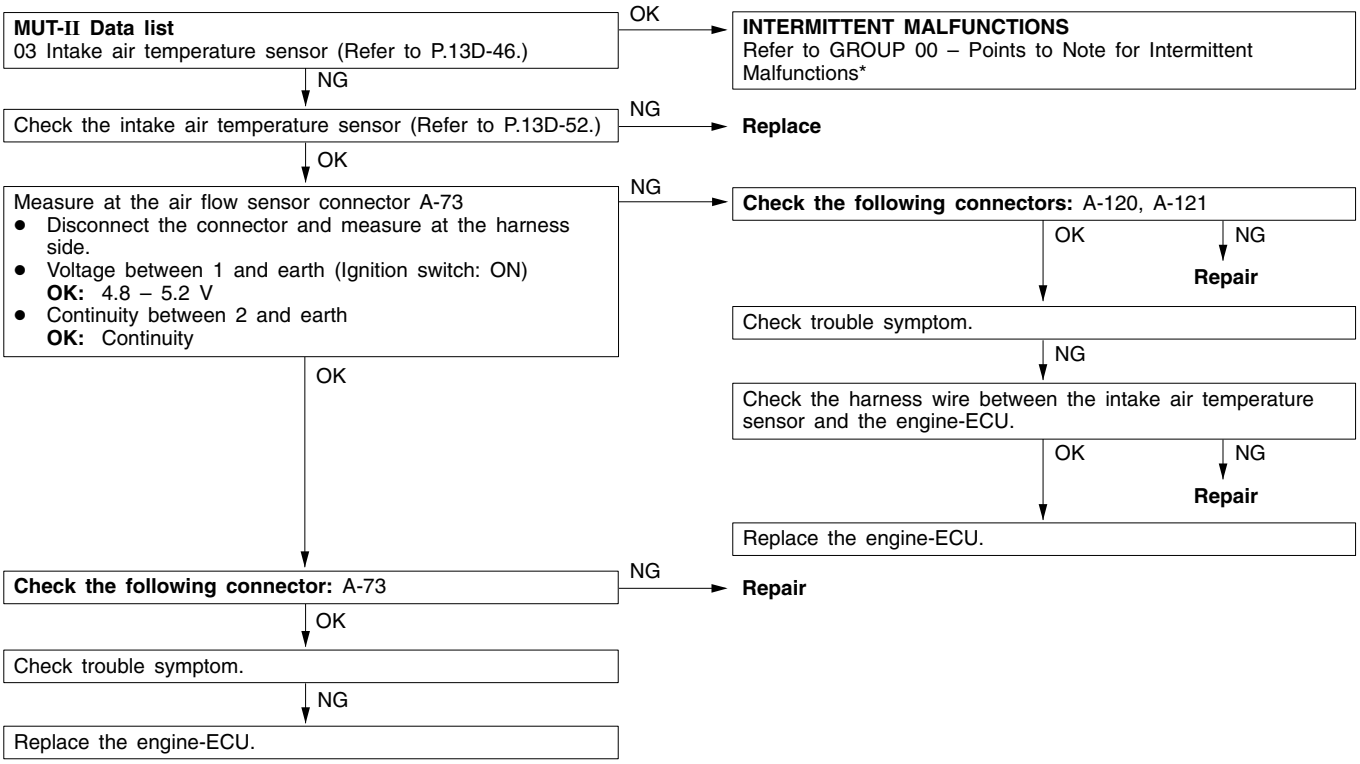
*: Refer to '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

Code No. 21 Fuel temperature sensor system	Probable cause
Range of Check • Ignition switch: ON **Set Conditions** • Sensor output voltage is 100 mV or less for 1 second or • Sensor output voltage is 4,900 mV or more for 1 second	• Malfunction of the fuel temperature sensor • Improper connector contact, open circuit or short-circuited harness wire of the fuel temperature sensor circuit • Malfunction of the engine-ECU



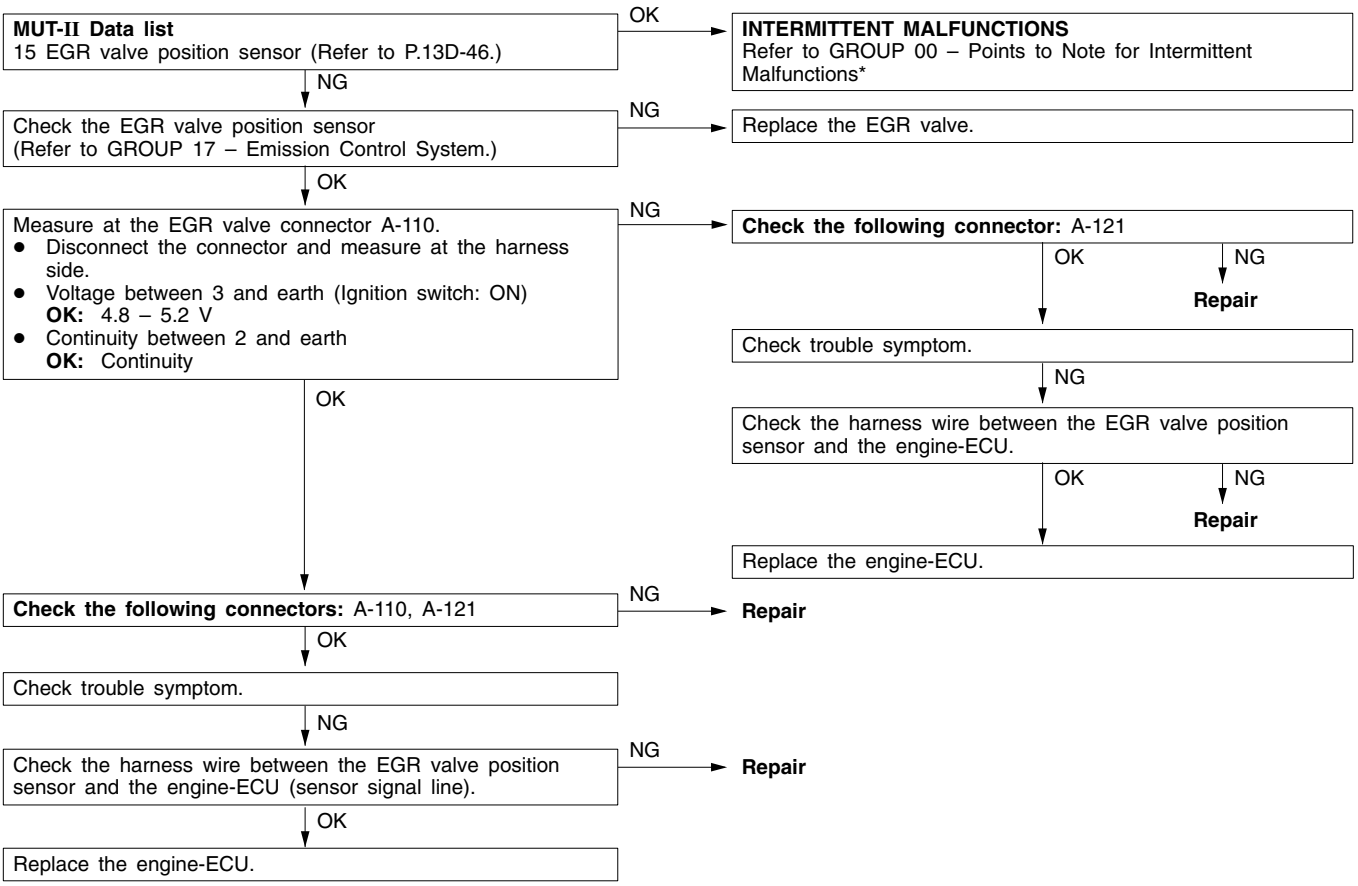
*: Refer to '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

Code No. 22 Intake air temperature sensor system	Probable cause
Range of Check • Ignition switch: ON **Set Conditions** • Sensor output voltage is 100 mV or less for 1 second or • Sensor output voltage is 4,850 mV or more for 1 second	• Malfunction of the intake air temperature sensor • Improper connector contact, open circuit or short-circuited harness wire of the intake air temperature sensor circuit • Malfunction of the engine-ECU



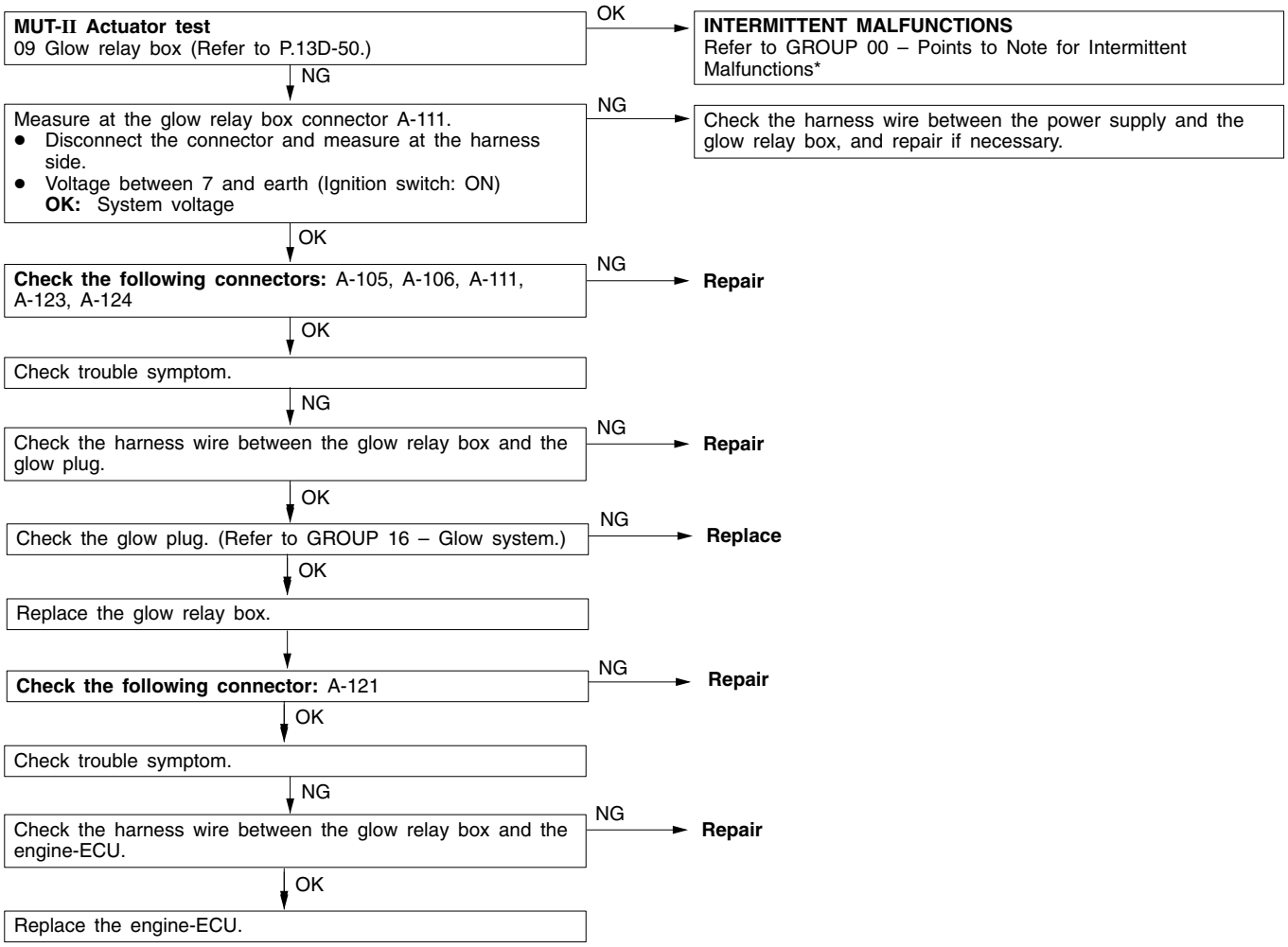
*: Refer to '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

Code No. 23 EGR valve position sensor system	Probable cause
Range of Check • Ignition switch: ON **Set Conditions** • Sensor output voltage is 250 mV or less for 1 second or • Sensor output voltage is 4,700 mV or more for 1 second **Range of Check** • Ignition switch: OFF → ON **Set Conditions** • Sensor output voltage is 1,500 mV or more for 1 second	• Malfunction of the EGR valve position sensor • Improper connector contact, open circuit or short-circuited harness wire of the EGR valve position sensor circuit • Malfunction of the engine-ECU



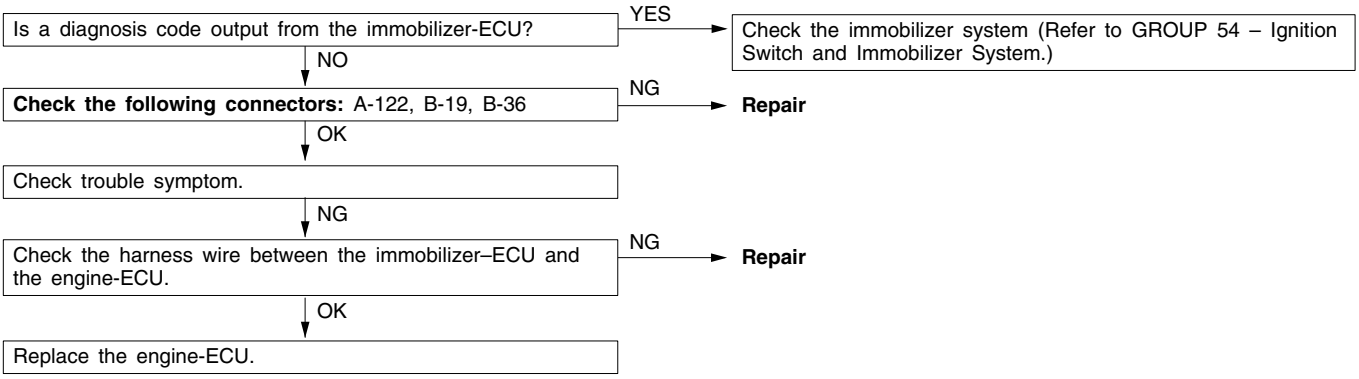
*: Refer to '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

Code No. 24 Glow relay box system	Probable cause
Range of Check • Ignition switch: OFF→ON **Set Conditions** • Trouble signal input from the glow relay box	• Malfunction of the glow relay box • Improper connector contact, open circuit or short-circuited harness wire of the glow relay box circuit • Malfunction of the engine-ECU



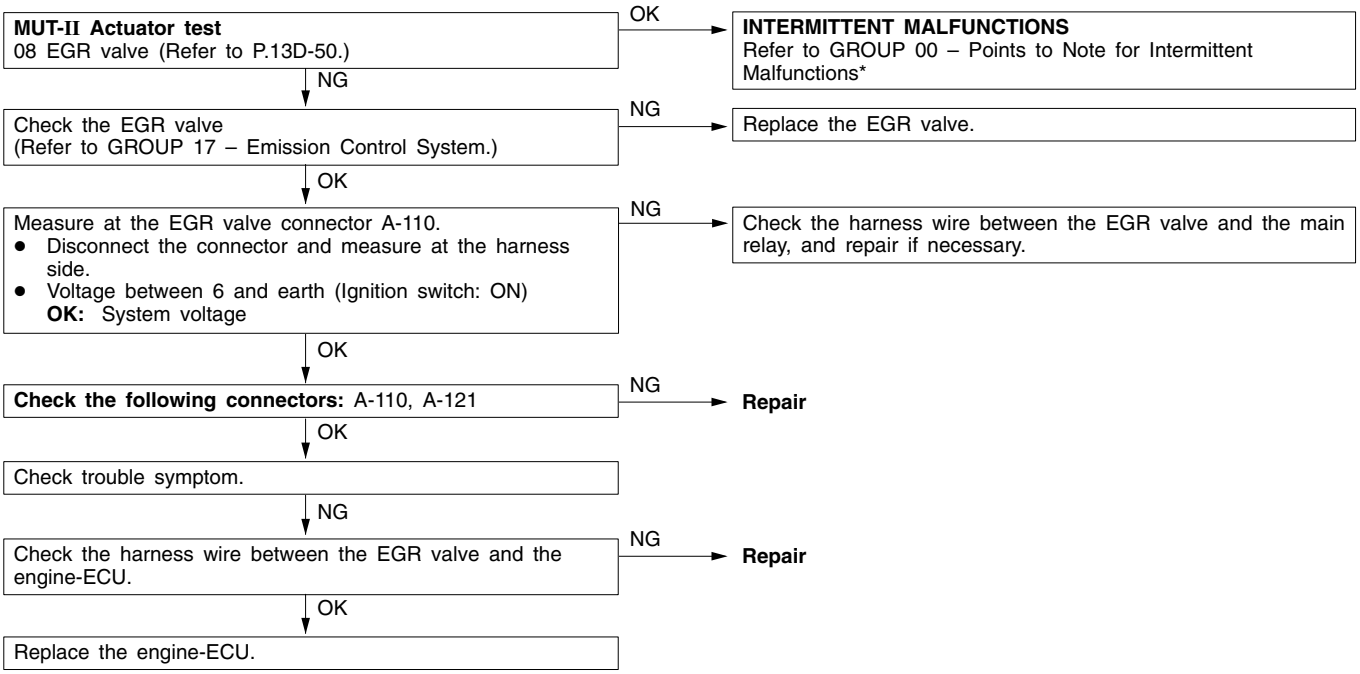
*: Refer to '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

Code No. 25 Immobilizer system	Probable cause
Range of Check • Ignition switch: ON **Set Conditions** • Improper communication between the engine-ECU and Immobilizer-ECU	• Malfunction of the immobilizer-ECU • Improper connector contact, open circuit or short-circuited harness wire • Malfunction of the engine-ECU



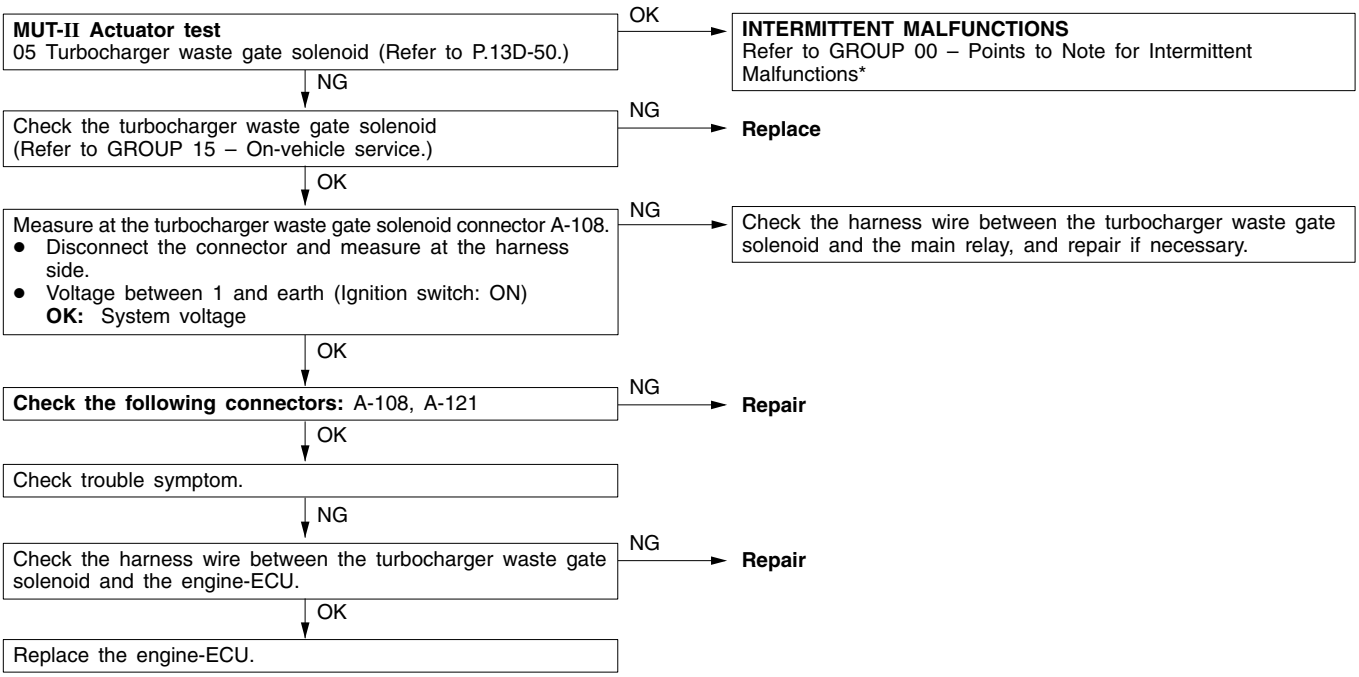
NOTE
If the engine-ECU is replaced, the immobilizer-ECU and ignition key should be replaced together with it.

Code No. 26 EGR valve system	Probable cause
	• Malfunction of the EGR valve • Improper connector contact, open circuit or short-circuited harness wire of the EGR valve circuit • Malfunction of the engine-ECU



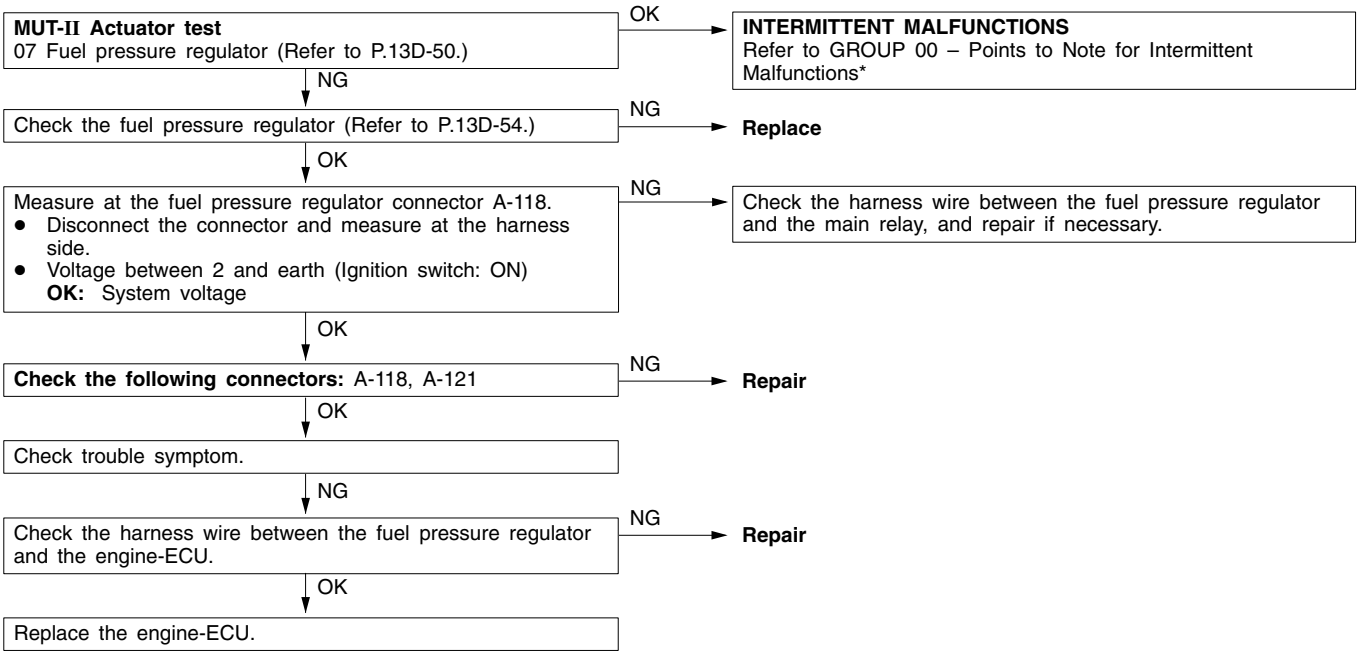
*: Refer to '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

Code No. 27 Turbocharger waste gate solenoid system	Probable cause
	• Malfunction of the turbocharger waste gate solenoid • Improper connector contact, open circuit or short-circuited harness wire of the turbocharger waste gate solenoid circuit • Malfunction of the engine-ECU



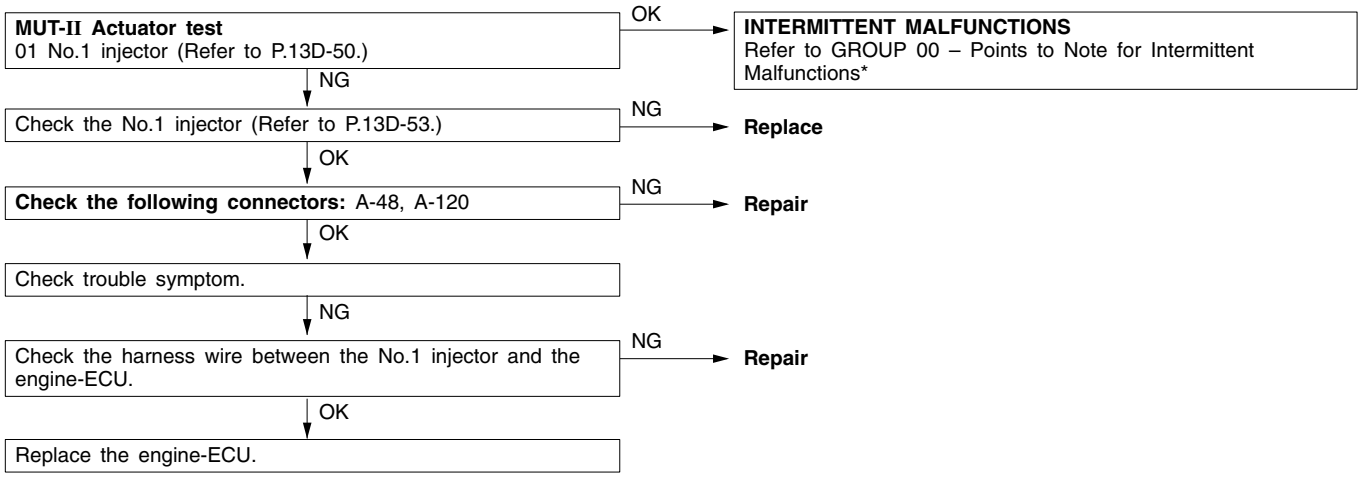
*: Refer to '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

Code No. 28 Fuel pressure regulator system	Probable cause
	• Malfunction of the fuel pressure regulator • Improper connector contact, open circuit or short-circuited harness wire of the fuel pressure regulator circuit • Malfunction of the engine-ECU



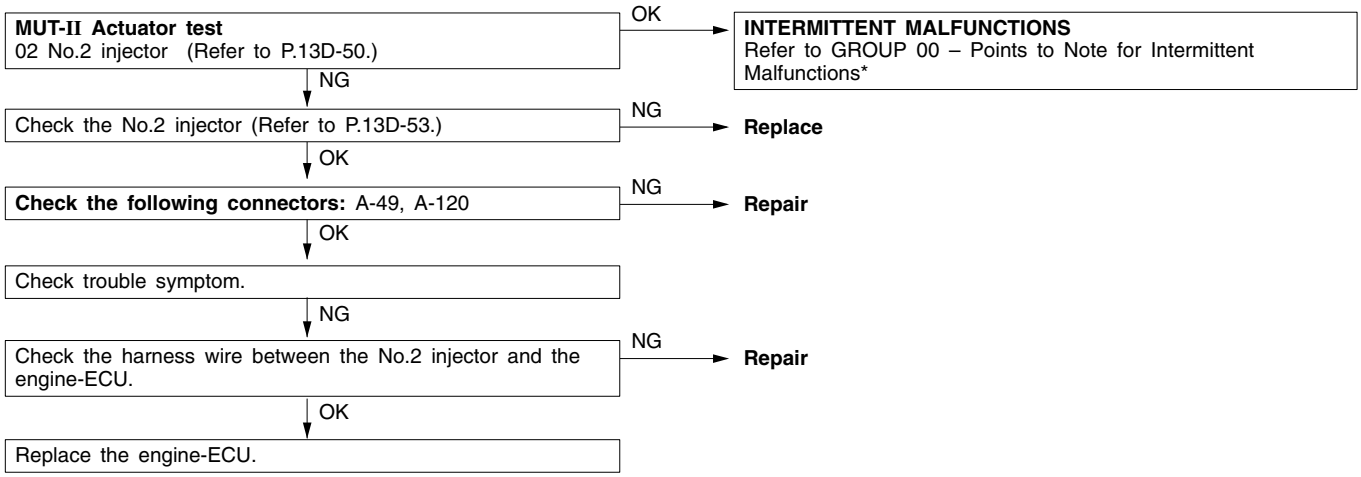
*: Refer to '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

Code No. 29 No.1 injector system	Probable cause
	• Malfunction of the No.1 injector • Improper connector contact, open circuit or short-circuited harness wire of the No.1 injector circuit • Malfunction of the engine-ECU



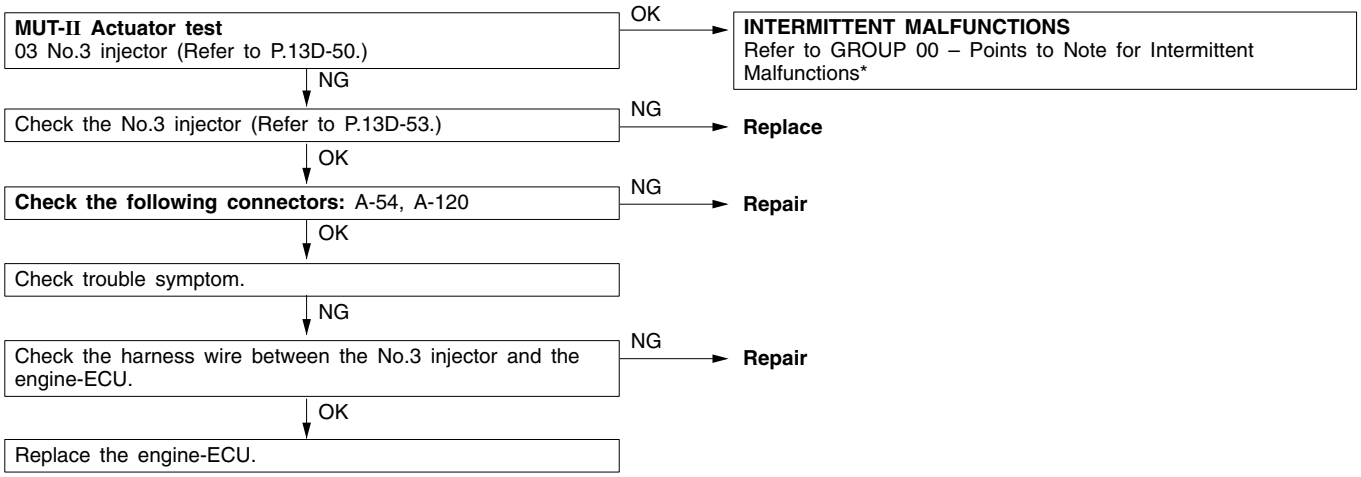
*: Refer to '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

Code No. 31 No.2 injector system	Probable cause
	• Malfunction of the No.2 injector • Improper connector contact, open circuit or short-circuited harness wire of the No.2 injector circuit • Malfunction of the engine-ECU



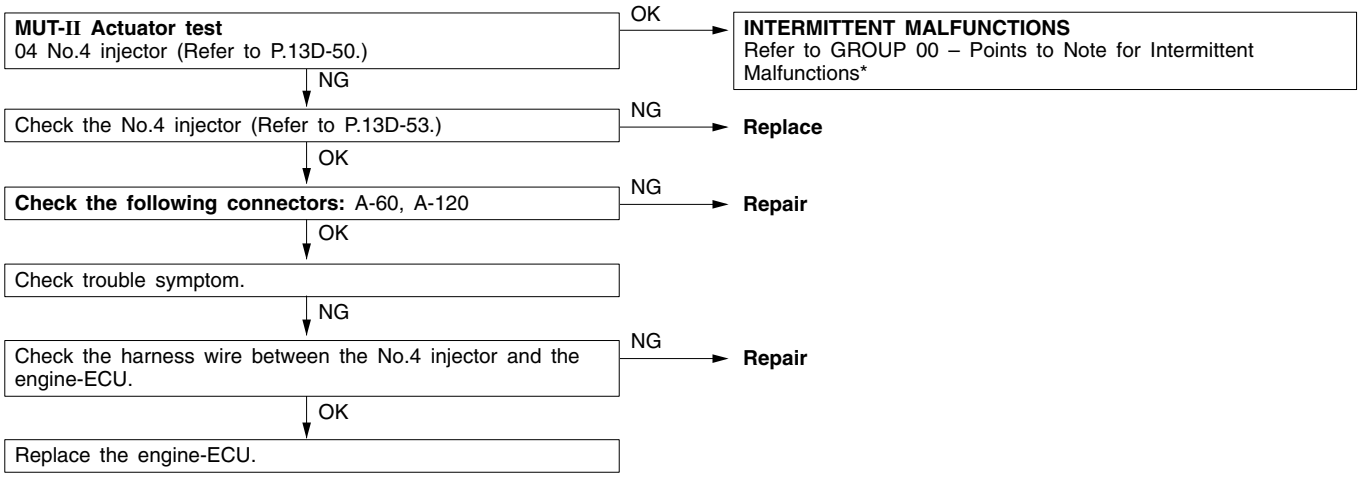
*: Refer to '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

Code No. 32 No.3 injector system	Probable cause
	• Malfunction of the No.3 injector • Improper connector contact, open circuit or short-circuited harness wire of the No.3 injector circuit • Malfunction of the engine-ECU



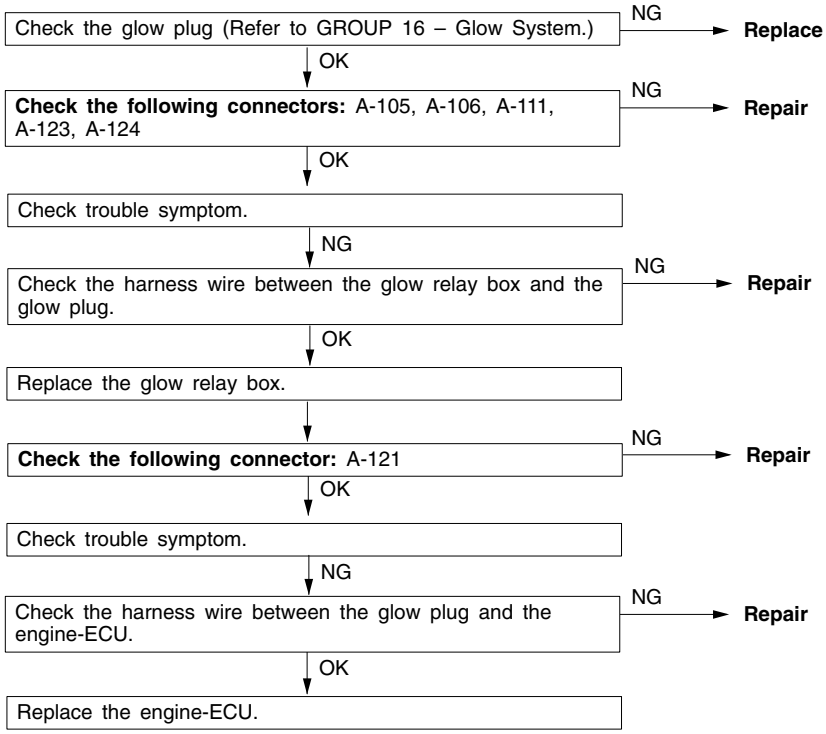
*: Refer to '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

Code No. 33 No.4 injector system	Probable cause
	• Malfunction of the No.4 injector • Improper connector contact, open circuit or short-circuited harness wire of the No.4 injector circuit • Malfunction of the engine-ECU



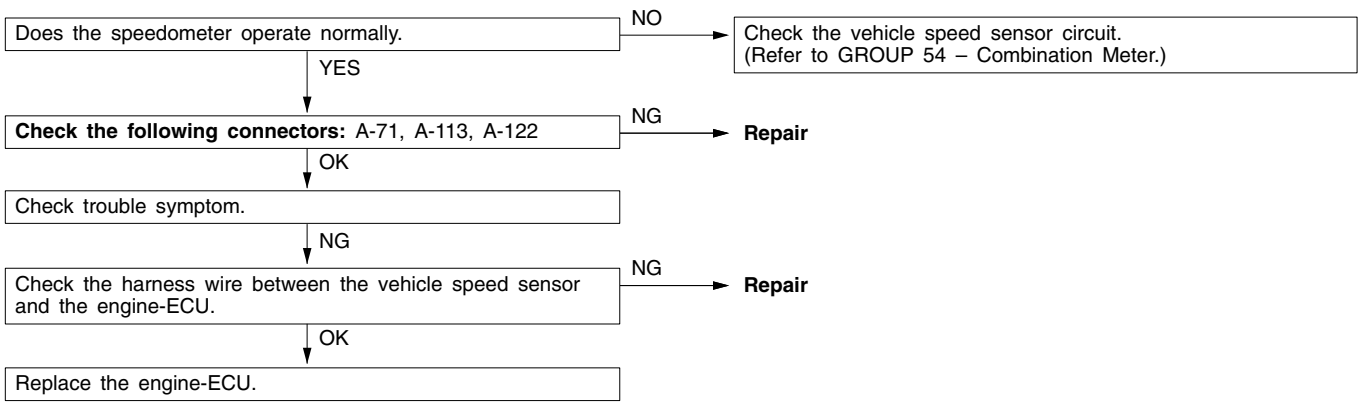
*: Refer to '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

Code No. 34 Glow plug system	Probable cause
	• Malfunction of the glow plug • Improper connector contact, open circuit or short-circuited harness wire of the glow plug circuit • Malfunction of the engine-ECU

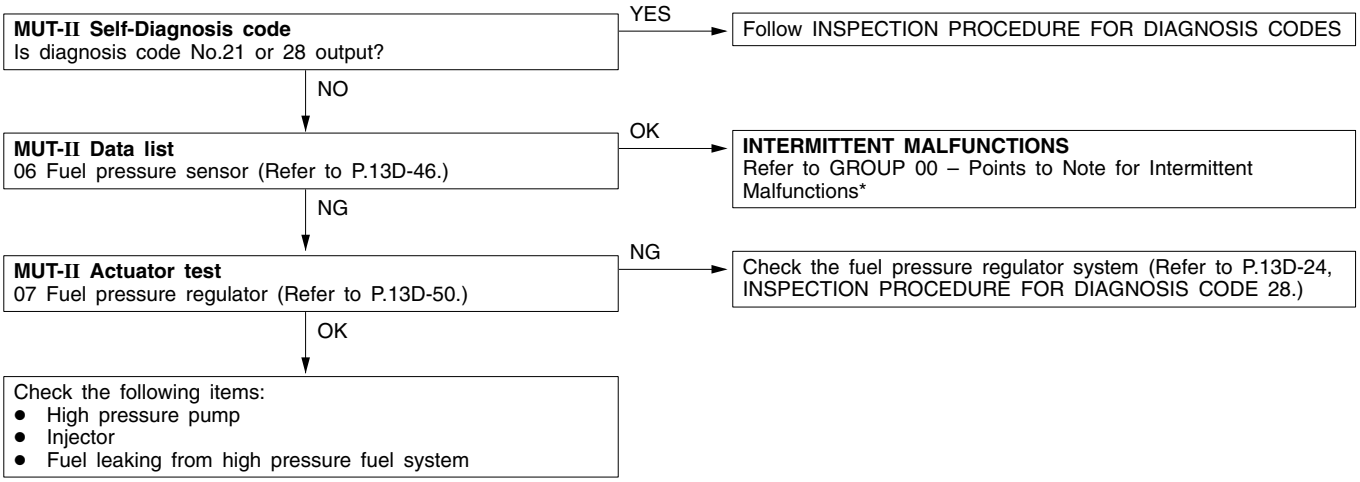


*: Refer to '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

Code No. 35 Vehicle speed sensor system	Probable cause
Range of Check • Ignition switch: ON or • During engine running **Set Conditions** • Sensor output voltage corresponds to a speed of 250 km/h or more for 1 second	• Malfunction of the vehicle speed sensor • Improper connector contact, open circuit or short-circuited harness wire of the vehicle speed sensor circuit • Malfunction of the engine-ECU

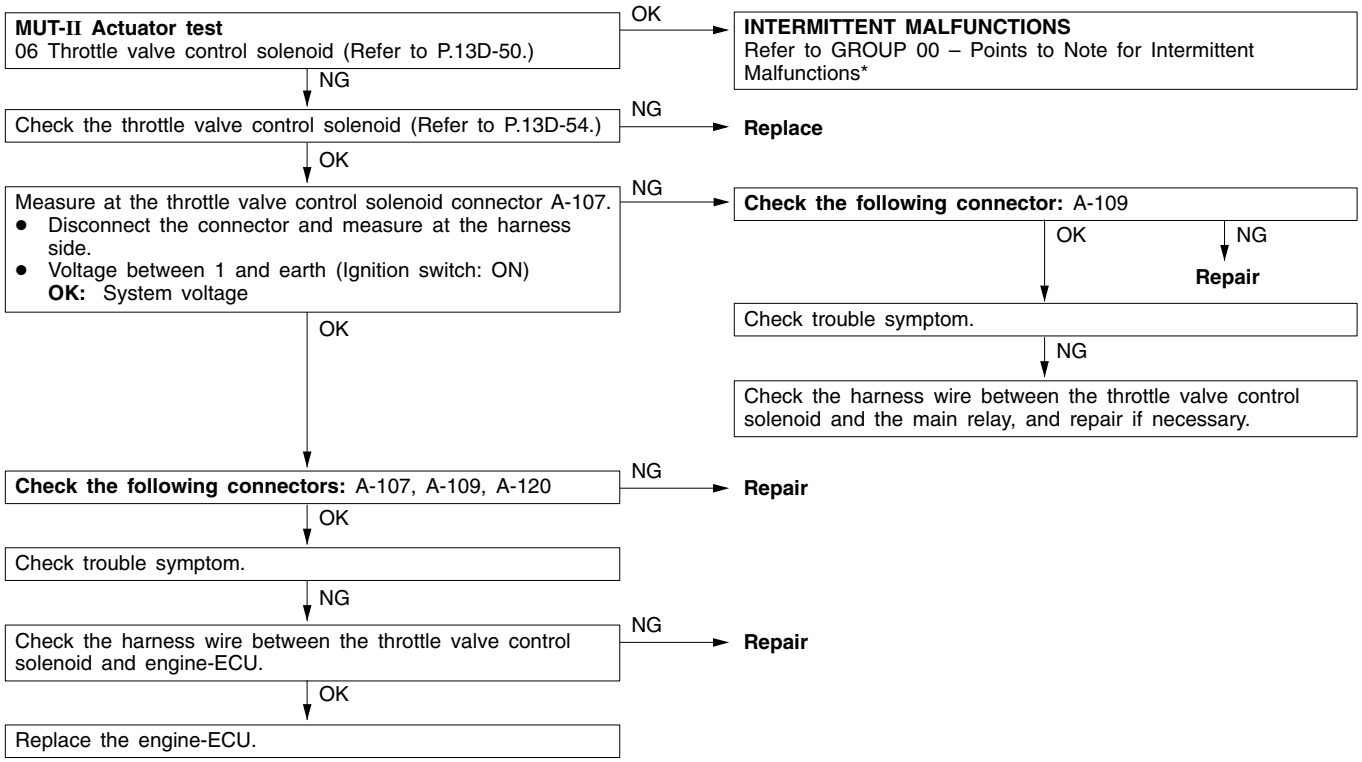


Code No. 36 Fuel pressure system	Probable cause
	• Malfunction of the high pressure pump • Malfunction of the injector • Seized fuel pressure regulator • Fuel leaking from high pressure fuel system



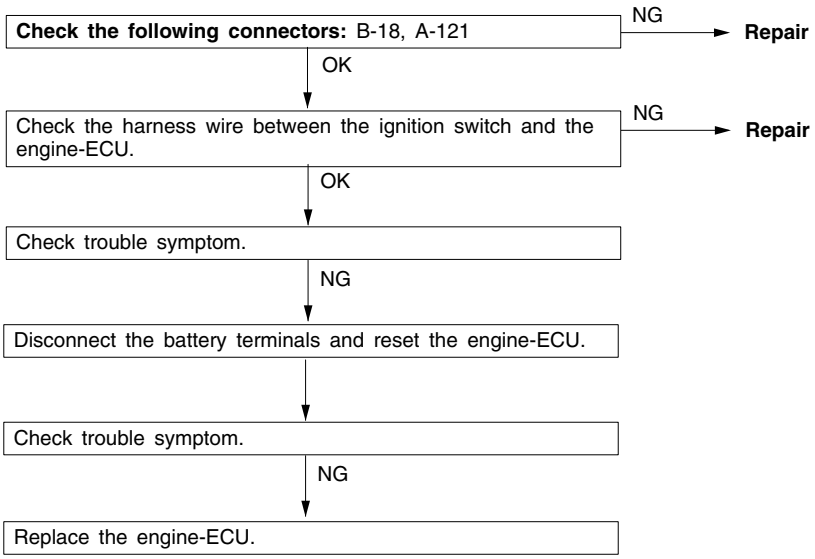
*: Refer to '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

Code No. 37 Throttle valve control solenoid system	Probable cause
	• Malfunction of the throttle valve control solenoid • Improper connector contact, open circuit or short-circuited harness wire of the throttle valve control solenoid circuit • Malfunction of the engine-ECU

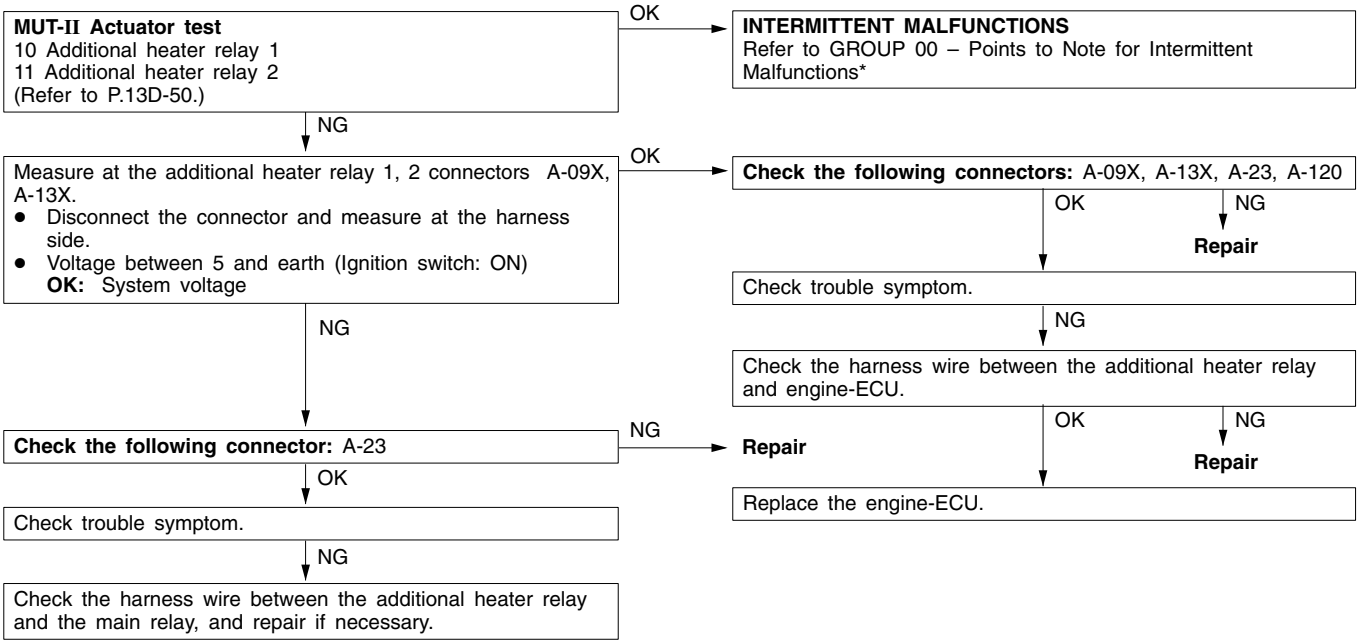


*: Refer to '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

Code No. 38 Engine-ECU	Probable cause
	• Malfunction of the engine-ECU

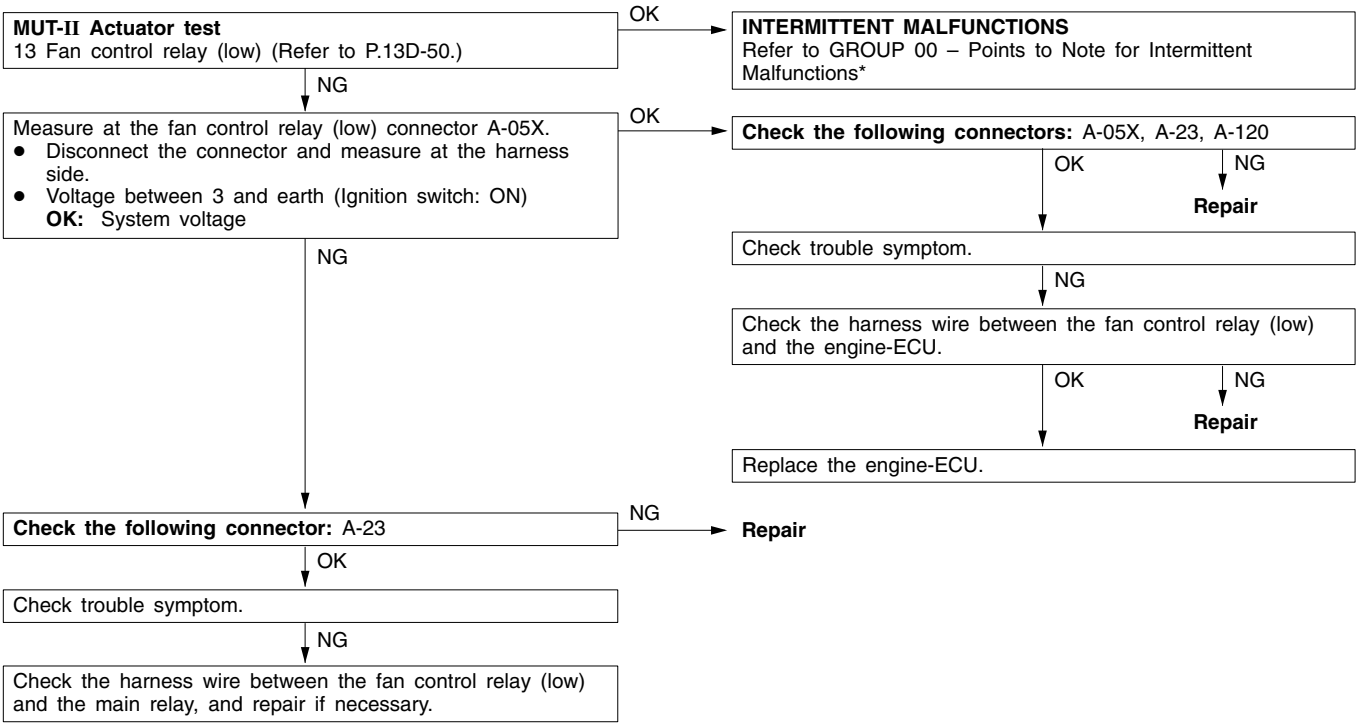


Code No. 40 Additional heater relay system	Probable cause
	• Malfunction of the additional heater relay 1, 2 • Improper connector contact, open circuit or short-circuited harness wire of the additional heater relay circuit • Malfunction of the engine-ECU



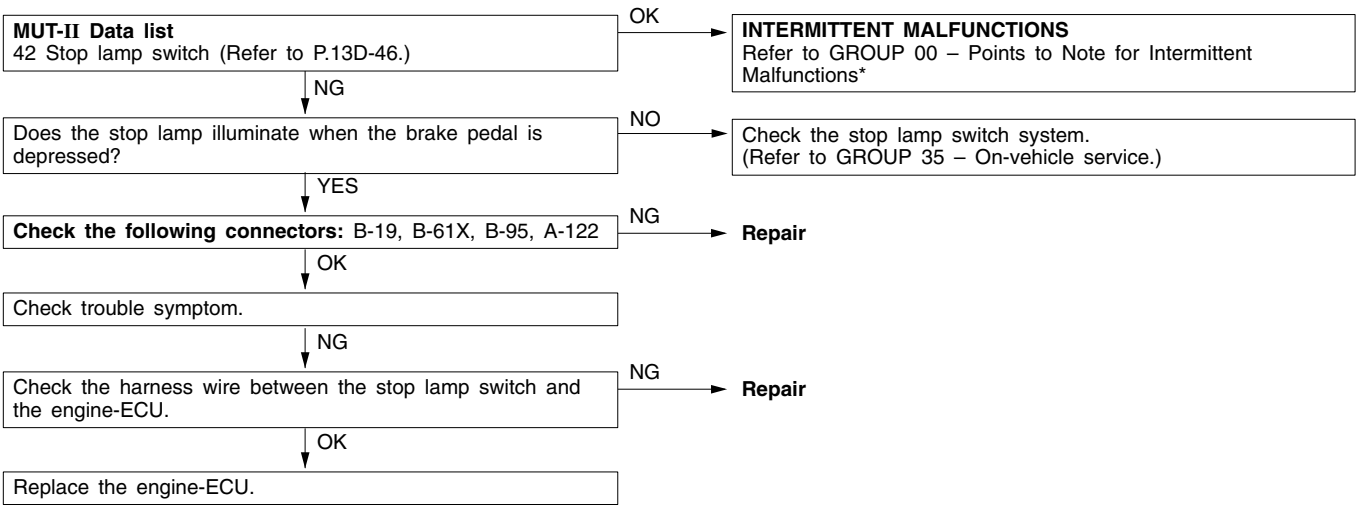
*: Refer to '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

Code No. 41 Fan control relay (low) system	Probable cause
	• Malfunction of the fan control relay • Improper connector contact, open circuit or short-circuited harness wire of the fan control relay circuit • Malfunction of the engine-ECU



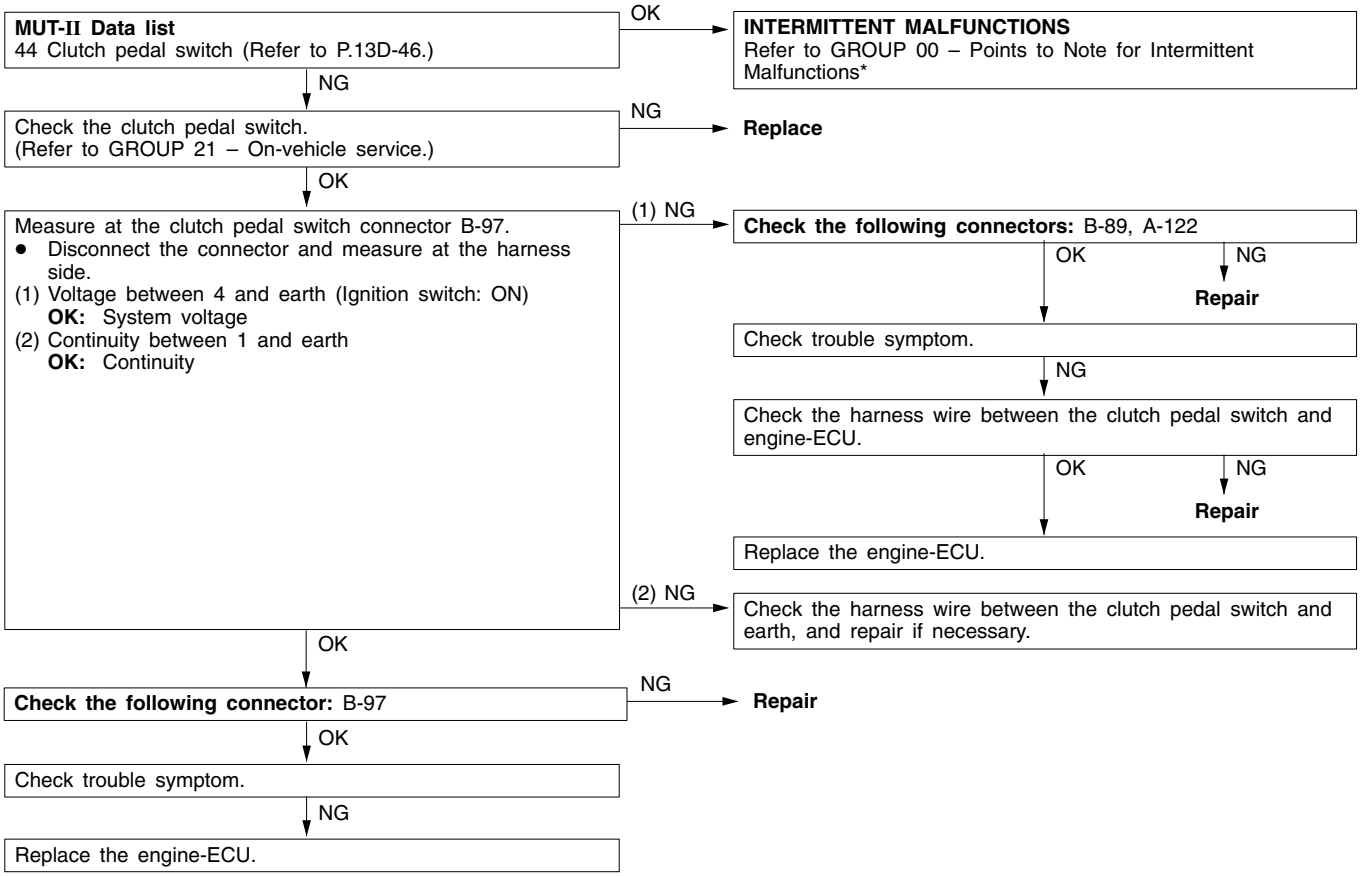
*: Refer to '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

Code No. 42 Stop lamp switch system	Probable cause
Range of Check • Ignition switch: ON **Set Conditions** • Outputs for stop lamp switches 1 and 2 are different	• Malfunction of the stop lamp switch • Improper connector contact, open circuit or short-circuited harness wire of the stop lamp switch circuit • Malfunction of the engine-ECU



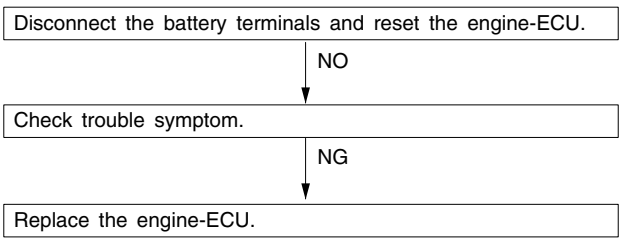
*: Refer to '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

Code No. 43 Clutch pedal switch system	Probable cause
Range of Check • Vehicle speed: 100 km/h or more **Set Conditions** • Clutch pedal switch remains off for 1 second	• Malfunction of the clutch pedal switch • Improper connector contact, open circuit or short-circuited harness wire of the clutch pedal switch circuit • Malfunction of the engine-ECU

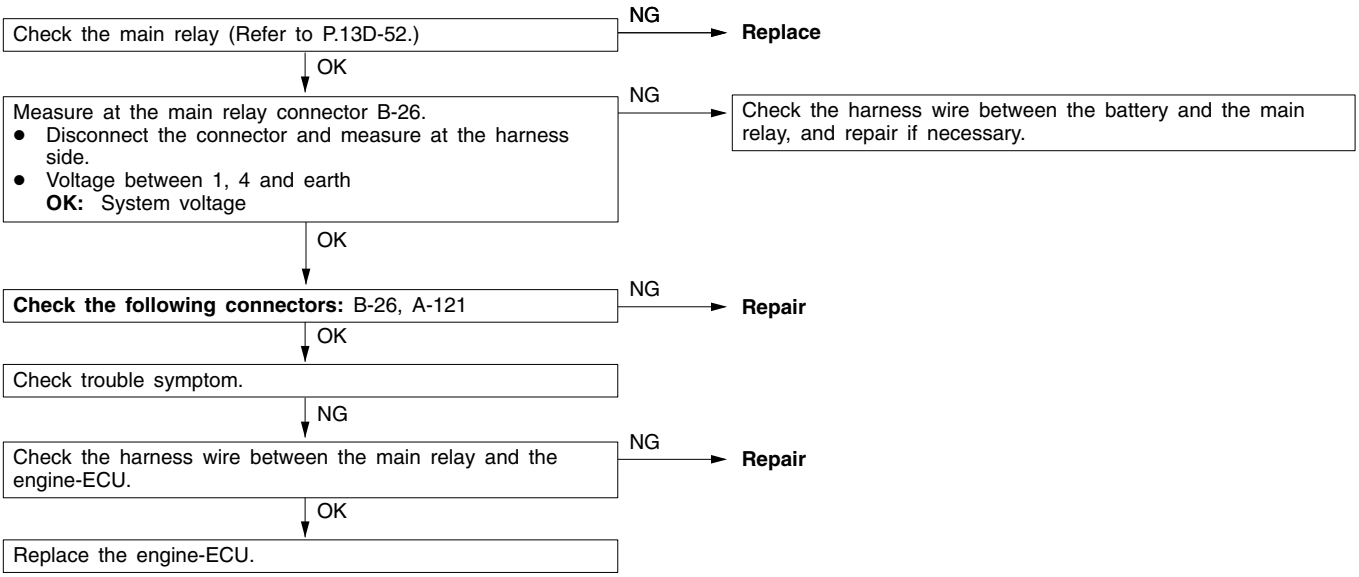


*: Refer to '99 SPACE STAR Workshop Manual (Pub. No. CMXE99E1)

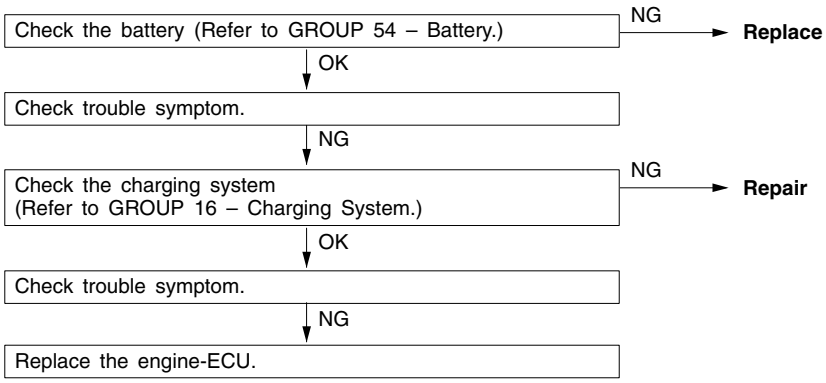
Code No. 44 Power latch system	Probable cause
	• Malfunction of the engine-ECU



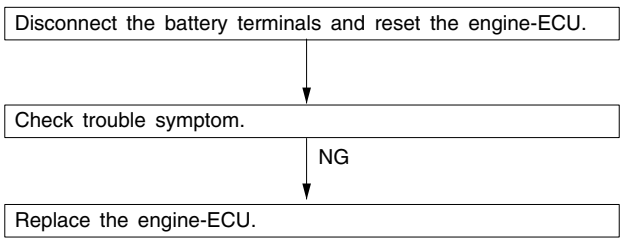
Code No. 45 Main relay system	Probable cause
Range of Check ● Ignition switch: ON **Set Conditions** ● Power is not supplied **Range of Check** ● Ignition switch: OFF → ON **Set Conditions** ● Power latch time is short or long	● Malfunction of the main relay ● Improper connector contact, open circuit or short-circuited harness wire of the main relay circuit ● Malfunction of the engine-ECU



Code No. 46 Power supply system	Probable cause
Range of Check ● Ignition switch: ON **Set Conditions** ● Power supply voltage is 6.5 V or less, or 16.5 V or more	● Malfunction of the engine-ECU



Code No. 47 ECU alimentation	Probable cause
	● Malfunction of the engine-ECU



INSPECTION CHART FOR TROUBLE SYMPTOMS

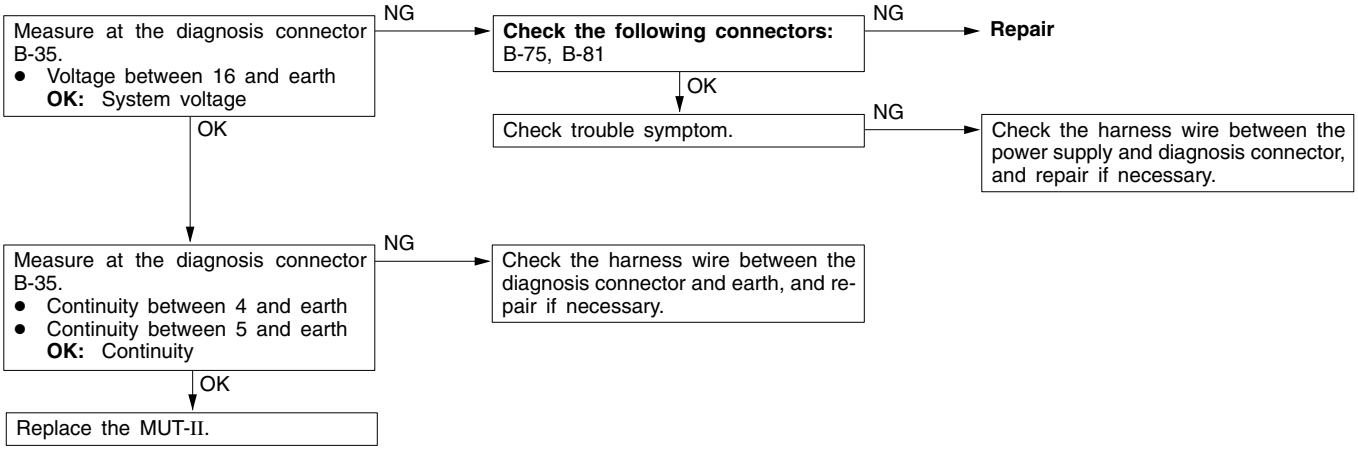
Caution
Check that the engine-ECU earth circuit is normal before checking for the cause of the problem.

Trouble symptoms		Inspection procedure No.	Reference page
Communication with MUT-II is impossible	Communication with all systems is not possible.	1	13D-36
	Communication with engine-ECU only is not possible.	2	13D-36
Engine warning lamp and related parts	The engine warning lamp does not illuminate right after the ignition switch is turned to the ON position	3	13D-37
	The engine warning lamp remains illuminating and never goes out.	4	13D-38
Starting	No initial combustion (Starting not possible)	5	13D-38
	Poor startability when engine is cold (Poor starting)	6	13D-39
	Poor startability when engine is cold or warm (Poor starting)	7	13D-39
Idling stability (Improper idling)	Idle speed is low when engine is cold (Improper idling speed)	8	13D-40
	Idling speed is high (Improper idling speed)	9	13D-40
	Idling speed is low (Improper idling speed)	10	13D-41
	Idle speed is unstable (Rough idling, hunting)	11	13D-41
Idling stability (Engine stalls)	Engine stops soon after starting	12	13D-42
	Engine stops during idling	13	13D-42
Driving	Engine output is too low	14	13D-43
	Abnormal engine knocking occurs	15	13D-43
	Abnormally black smoke	16	13D-44
	Abnormally white smoke	17	13D-44
	Hunting occurs while driving	18	13D-45

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

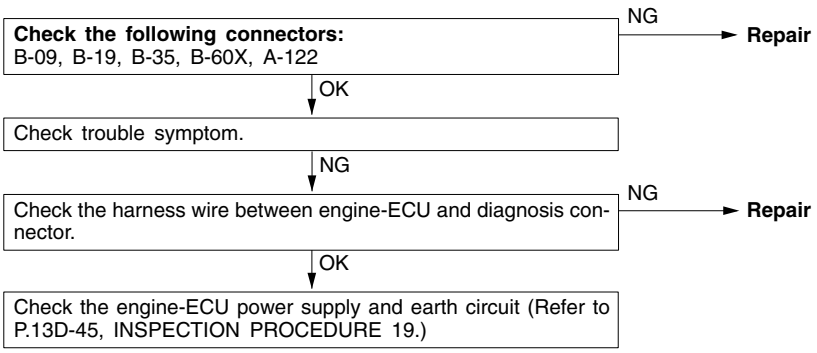
INSPECTION PROCEDURE 1

Communication with MUT-II is not possible (Communication with all systems is not possible)	Probable cause
The cause is probably a defect in the power supply system (including earth) for the diagnosis line.	• Malfunction of the connector • Malfunction of the harness wire



INSPECTION PROCEDURE 2

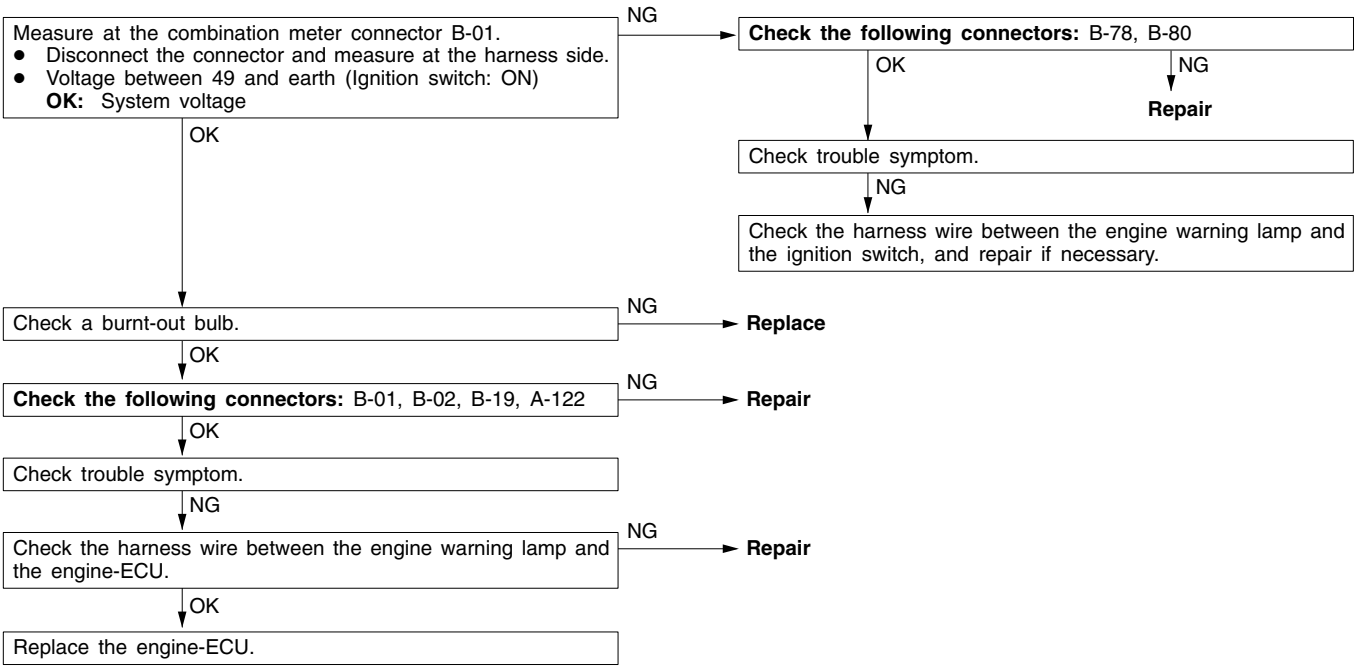
MUT-II communication with engine-ECU is impossible.	Probable cause
One of the following causes may be suspected. • No power supply to engine-ECU • Defective earth circuit of engine-ECU • Defective engine-ECU • Improper communication line between engine-ECU and MUT-II	• Malfunction of engine-ECU power supply circuit • Malfunction of the engine-ECU • Open circuit between engine-ECU and diagnosis connector



NOTE
On vehicles with the multi-center display, if a malfunction cannot be resolved after the procedure above, check the multi-center display and replace if necessary. (Refer to GROUP 54 – Multi-center Display.)

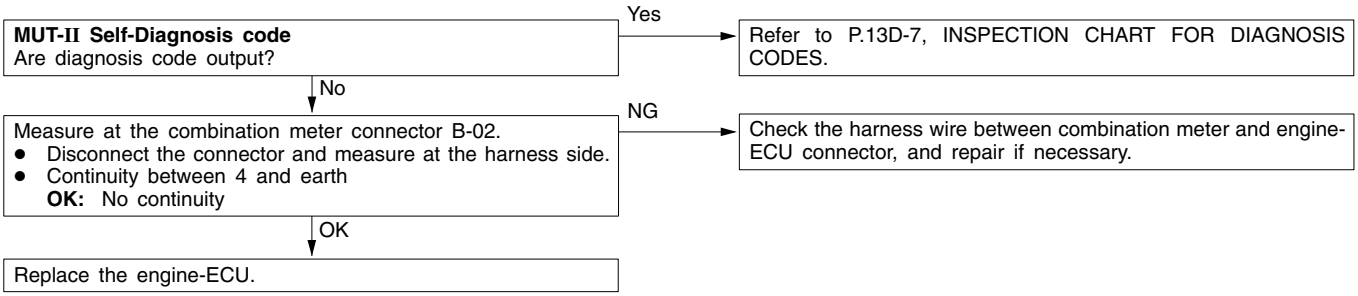
INSPECTION PROCEDURE 3

The engine warning lamp does not illuminate right after the ignition switch is turned to the ON position	Probable cause
Because there is a burnt-out bulb, the engine-ECU causes the engine warning lamp to illuminate immediately after the ignition switch is turned to ON. If the engine warning lamp does not illuminate immediately after the ignition switch is turned to ON, one of the malfunctions listed at right has probably occurred.	• Burnt-out bulb • Defective warning lamp circuit • Malfunction of the engine-ECU



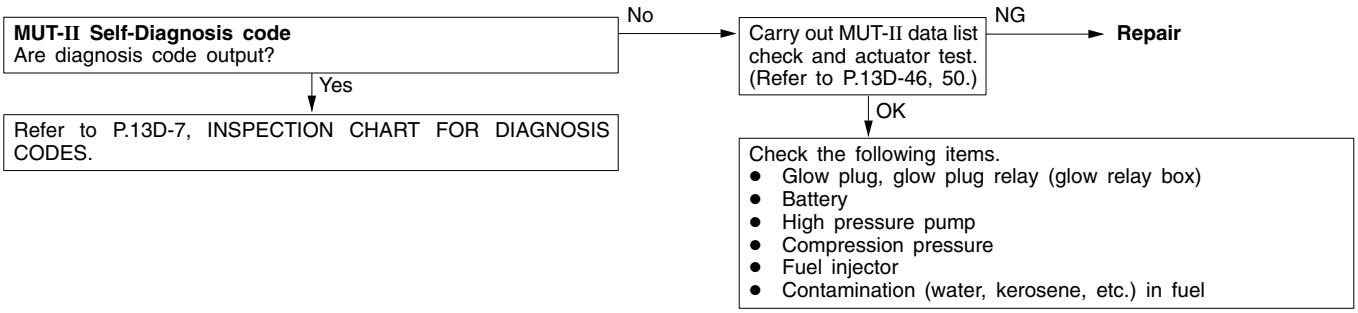
INSPECTION PROCEDURE 4

The engine warning lamp remains illuminating and never goes out	Probable cause
In cases such as the above, the cause is probably that the engine-ECU is detecting a problem in a sensor or actuator, or that one of the malfunctions listed at right has occurred.	• Short-circuit between the engine warning lamp and engine-ECU • Malfunction of the engine-ECU



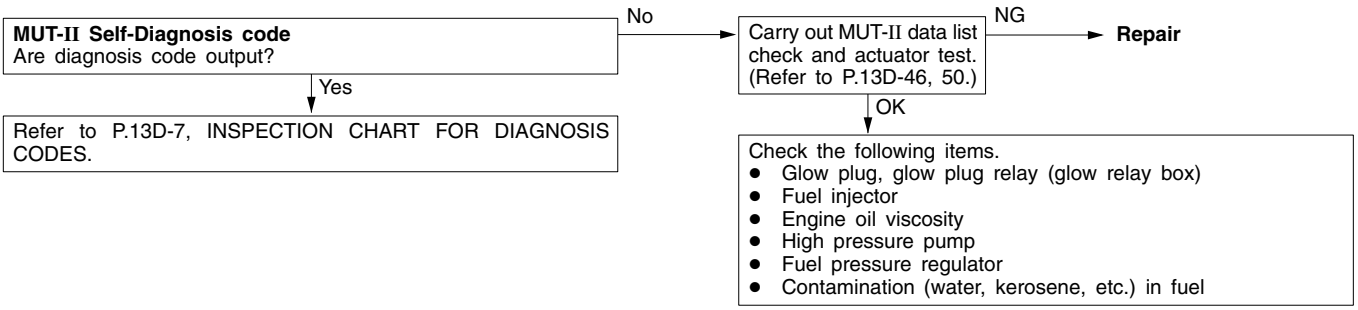
INSPECTION PROCEDURE 5

No initial combustion (Starting not possible)	Probable cause
The cause is probably a malfunction of the control system, high pressure pump, glow system or power supply.	• Malfunction of the control system • Malfunction of the high pressure pump • Malfunction of the glow system • Malfunction of the immobilizer system • Malfunction of the engine-ECU



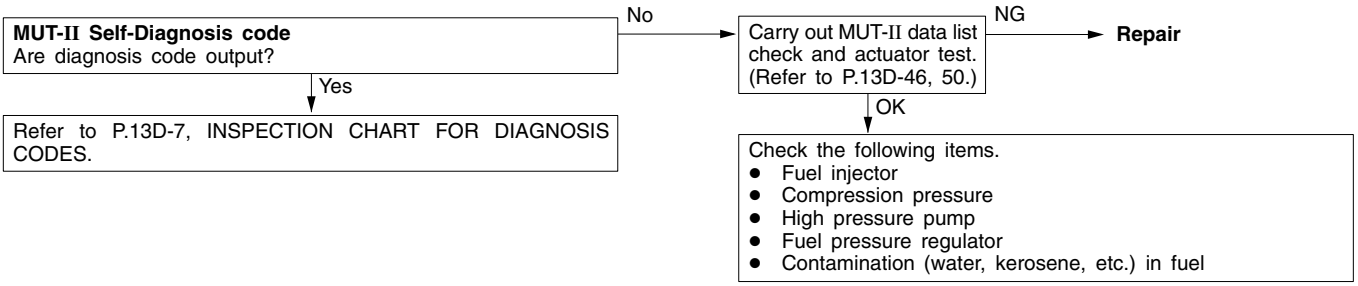
INSPECTION PROCEDURE 6

Poor startability when engine is cold (Poor starting)	Probable cause
The cause is probably a malfunction of the control system, high pressure pump, fuel system or glow system.	• Malfunction of the control system • Malfunction of the high pressure pump • Malfunction of the fuel system • Malfunction of the glow system • Malfunction of the engine-ECU



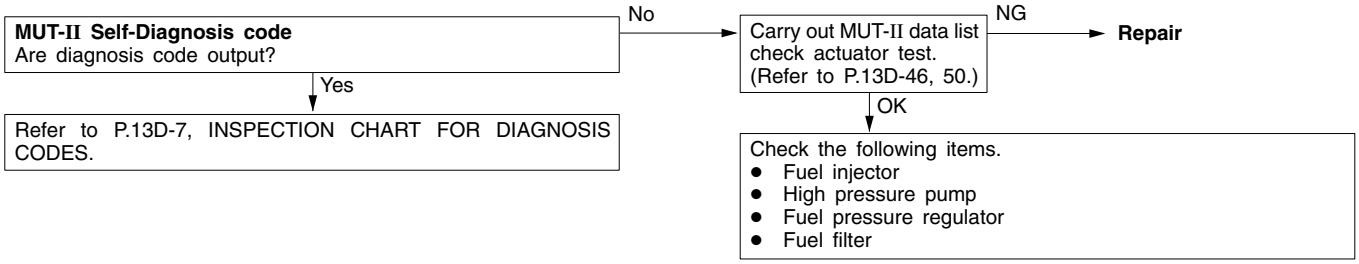
INSPECTION PROCEDURE 7

Poor startability when engine is both cold and warm (Poor starting)	Probable cause
The cause is probably a malfunction of the control system, high pressure pump or fuel system.	• Malfunction of the control system • Malfunction of the high pressure pump • Malfunction of the fuel system • Malfunction of the engine-ECU



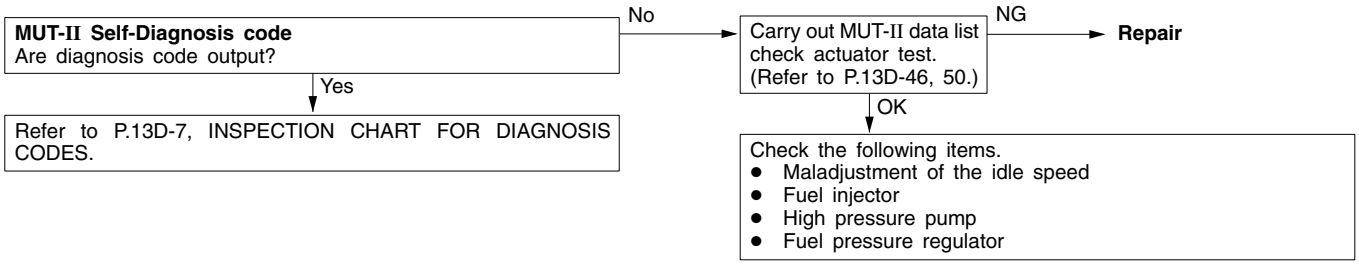
INSPECTION PROCEDURE 8

Idle speed is low when engine is cold (Improper idling speed)	Probable cause
The cause is probably a malfunction of the control system, high pressure pump or fuel system.	• Malfunction of the control system • Malfunction of the high pressure pump • Malfunction of the fuel system • Malfunction of the engine-ECU



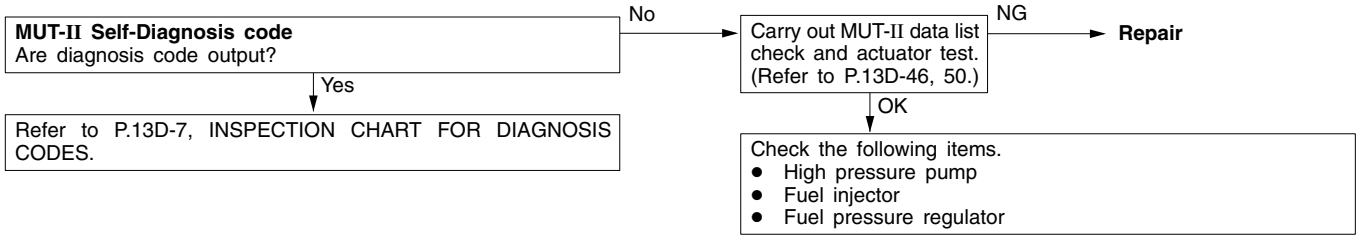
INSPECTION PROCEDURE 9

Idle speed is high (Improper idling speed)	Probable cause
The cause is probably a malfunction of the control system, fuel injector or high pressure pump.	• Malfunction of the control system • Malfunction of the fuel injector • Malfunction of the high pressure pump • Malfunction of the engine-ECU



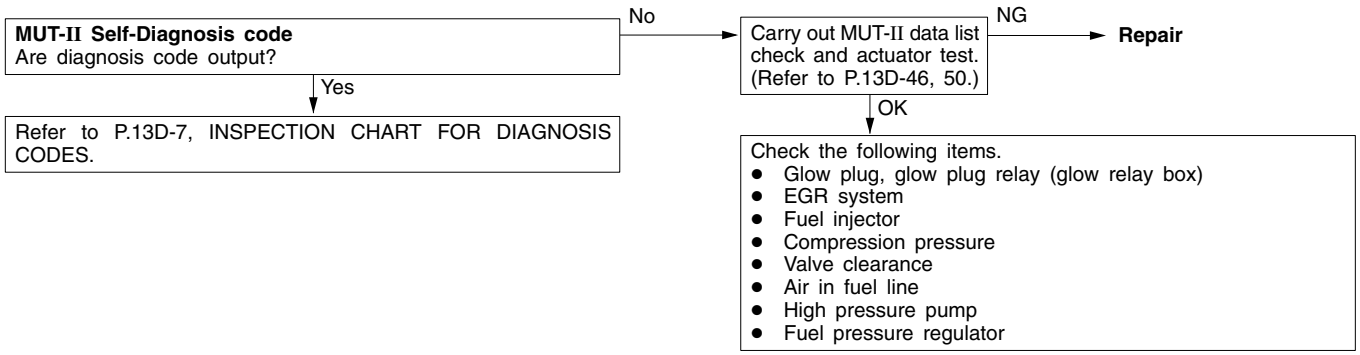
INSPECTION PROCEDURE 10

Idle speed is low (Improper idling speed)	Probable cause
The cause is probably a malfunction of the control system, high pressure pump or fuel system.	• Malfunction of the control system • Malfunction of the high pressure pump • Malfunction of the fuel system • Malfunction of the engine-ECU



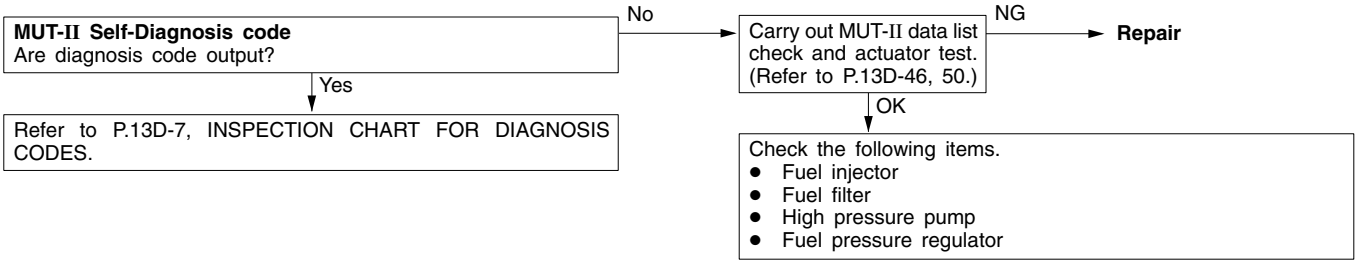
INSPECTION PROCEDURE 11

Idle speed is unstable (Rough idling, hunting)	Probable cause
The cause is probably a malfunction of the control system, high pressure pump, fuel system or glow system.	• Malfunction of the control system • Malfunction of the high pressure pump • Malfunction of the fuel system • Malfunction of the glow system • Malfunction of the EGR system • Malfunction of the engine-ECU



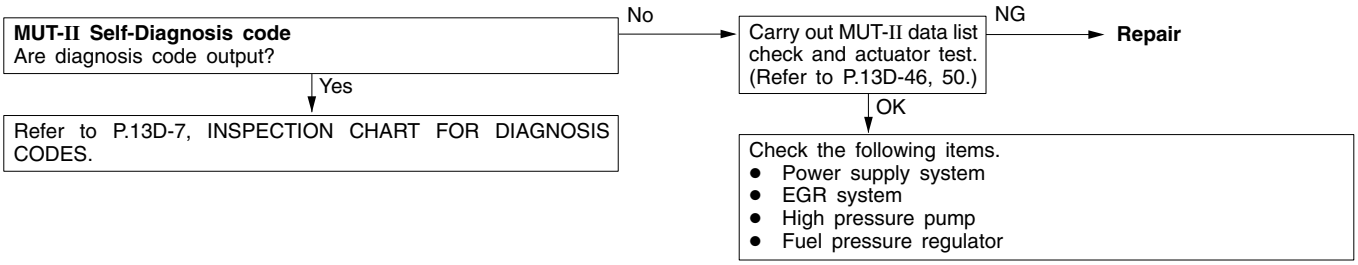
INSPECTION PROCEDURE 12

Engine stops soon after starting	Probable cause
The cause is probably a malfunction of the control system, high pressure pump or fuel system.	• Malfunction of the control system • Malfunction of the high pressure pump • Malfunction of the fuel system • Malfunction of the engine-ECU



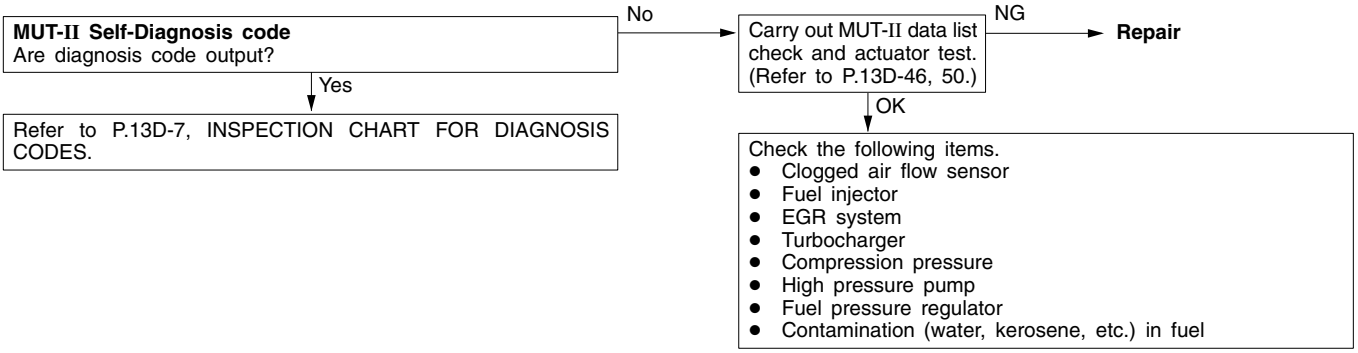
INSPECTION PROCEDURE 13

Engine stops during idling	Probable cause
The cause is probably a malfunction of the control system, high pressure pump or power supply system.	• Malfunction of the control system • Malfunction of the high pressure pump • Malfunction of the EGR system • Malfunction of the engine-ECU



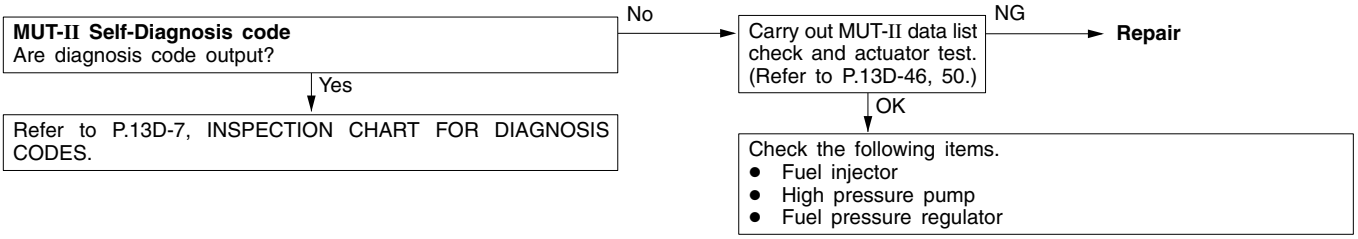
INSPECTION PROCEDURE 14

Engine output is too low	Probable cause
The cause is probably a malfunction of the control system, high pressure pump, fuel system or EGR system.	• Malfunction of the control system • Malfunction of the high pressure pump • Malfunction of the fuel system • Malfunction of the EGR system • Clogged air flow sensor • Malfunction of the engine-ECU



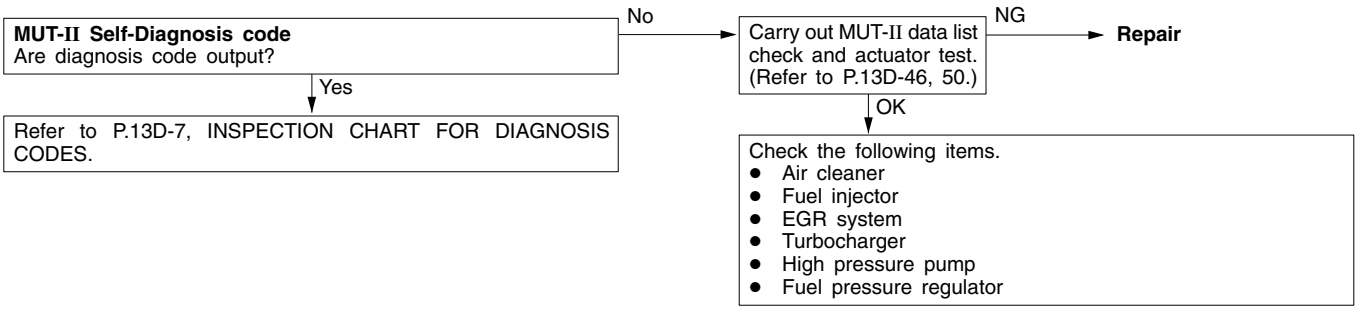
INSPECTION PROCEDURE 15

Abnormal engine knocking occurs	Probable cause
The cause is probably a malfunction of the control system, high pressure pump or fuel system.	• Malfunction of the control system • Malfunction of the high pressure pump • Malfunction of the fuel system • Malfunction of the engine-ECU



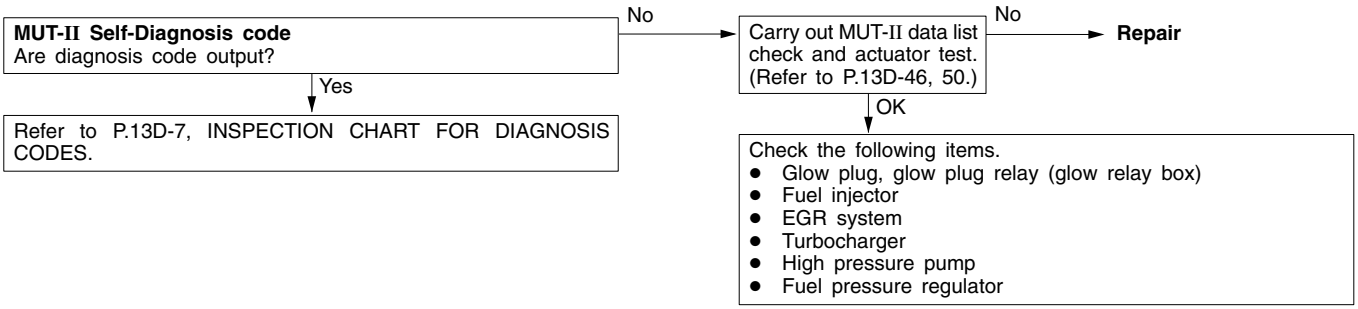
INSPECTION PROCEDURE 16

Abnormally black smoke	Probable cause
The cause is probably a malfunction of the control system, high pressure pump, fuel system or EGR system.	• Malfunction of the control system • Malfunction of the high pressure pump • Malfunction of the fuel system • Malfunction of the EGR system • Malfunction of the engine-ECU



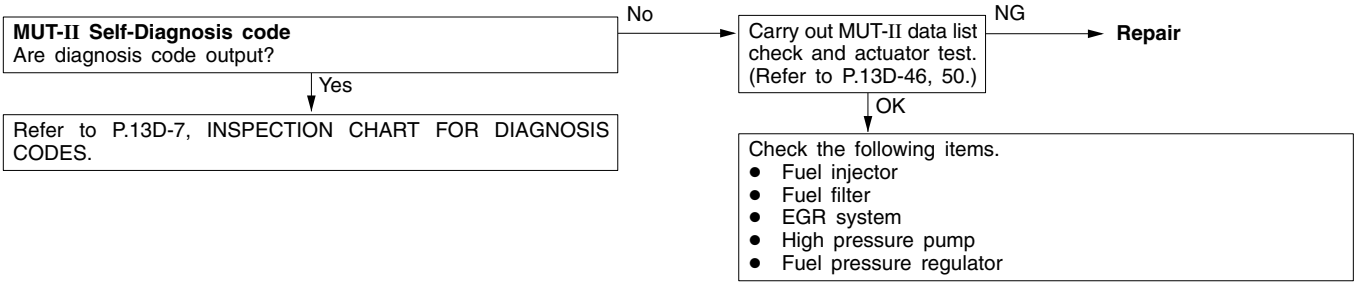
INSPECTION PROCEDURE 17

Abnormally white smoke	Probable cause
The cause is probably a malfunction of the control system, high pressure pump, fuel system, EGR system or glow system.	• Malfunction of the control system • Malfunction of the high pressure pump • Malfunction of the fuel system • Malfunction of the EGR system • Malfunction of the glow system • Malfunction of the engine-ECU



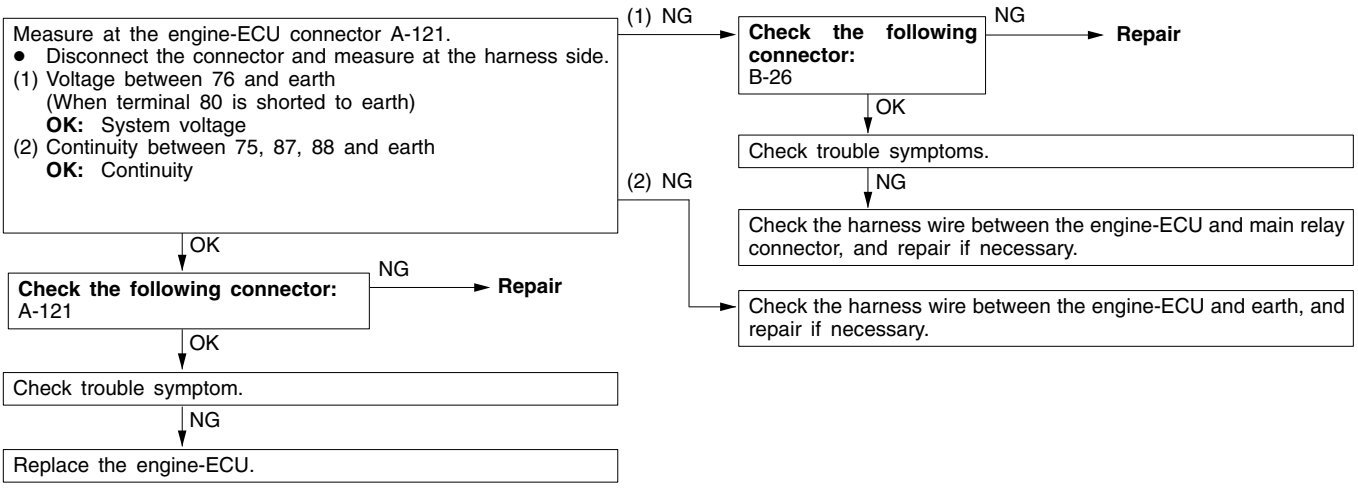
INSPECTION PROCEDURE 18

Hunting occurs while driving	Probable cause
The cause is probably a malfunction of the control system, high pressure pump or fuel system.	• Malfunction of the control system • Malfunction of the high pressure pump • Malfunction of the fuel system • Malfunction of the engine-ECU



INSPECTION PROCEDURE 19

Check the engine-ECU power supply and earth circuit



DATA LIST REFERENCE TABLE

Caution
Driving tests always need another personnel.

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
01	Engine coolant temperature sensor	Ignition switch: ON	Engine coolant temperature is –20°C	–20°C	Code No. 19	13D-16
			Engine coolant temperature is 0°C	0°C		
			Engine coolant temperature is 20°C	20°C		
			Engine coolant temperature is 40°C	40°C		
			Engine coolant temperature is 80°C	80°C		
02	Fuel temperature sensor	• In cooled state • Ignition switch: ON		Approx. the same as the outdoor temperature	Code No. 21	13D-17
03	Intake air temperature sensor	Ignition switch: ON	Intake air temperature is –20°C	–20°C	Code No. 22	13D-18
			Intake air temperature is 0°C	0°C		
			Intake air temperature is 20°C	20°C		
			Intake air temperature is 40°C	40°C		
			Intake air temperature is 80°C	80°C		
04	Boost sensor	Ignition switch: ON		950 – 1040 hPa	Code No. 16	13D-13
		• Engine coolant temperature: 80 – 95°C • Lamp, electric cooling fan and all accessories: OFF	When engine is suddenly raced	Pressure increases		
05	Barometric pressure sensor	Ignition switch: ON	At altitude of 0 m	950 – 1040 hPa	Code No. 17	13D-14
06	Fuel pressure sensor	Engine: After warm-up	When engine is suddenly raced	Pressure increases	Code No. 15	13D-12
07	Fuel pressure sensor (command value)	Engine: After warm-up	When engine is suddenly raced	Pressure increases	–	–

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
08	Air flow sensor	● Engine coolant temperature: 80 – 95°C ● Lamp, electric cooling fan and all accessories: OFF	When engine is suddenly raced	Increases	–	–
09	Accelerator pedal position sensor (1st channel)	Ignition switch: ON	Release the accelerator pedal	700 – 800 mV	Code No. 13	13D-10
			Depress the accelerator pedal gradually	Increases in response to the pedal depression stroke		
			Depress the accelerator pedal fully	3,270 – 4,700 mV		
10	Accelerator pedal position sensor (1st channel)	Ignition switch: ON	Release the accelerator pedal	375 mV	Code No. 14	13D-11
			Depress the accelerator pedal gradually	Increases in response to the pedal depression stroke		
			Depress the accelerator pedal fully	1,635 – 2,500 mV		
11	Accelerator pedal position sensor	Ignition switch: ON	Release the accelerator pedal	0 %	–	–
			Depress the accelerator pedal gradually	Increases in response to the pedal depression stroke		
			Depress the accelerator pedal fully	100 %		
12	Crank angle sensor	● Engine: Cranking ● Tachometer: Connected	Compare the engine speed readings on the tachometer and the MUT-II	Accord	Code No. 11	13D-8
14	Fuel injection amount	● Engine coolant temperature: 80 – 95°C ● Lamp, electric cooling fan and all accessories: OFF	Engine is Idling	4 – 9 mm^3	–	–

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
15	EGR valve position sensor	• Engine coolant temperature: 80 – 95°C • Lamp, electric cooling fan and all accessories: OFF	When engine is suddenly raced	Increases	Code No. 23	13D-19
16	EGR valve	• Engine coolant temperature: 80 – 95°C • Lamp, electric cooling fan and all accessories: OFF	Engine is Idling	5 – 10 %	Code No. 26	13D-22
			When engine is suddenly raced	Increases		
17	Turbocharger waste gate solenoid	Ignition switch: ON	When engine is suddenly raced	Increases	Code No. 27	13D-23
18	Fuel pressure regulator	Engine: After warm-up	When engine is suddenly raced	Voltage increases	Code No. 28	13D-24
20	Crank angle sensor (2,000 r/min or less)	• Engine: Cranking [reading is possible at 2,000 r/min or less] • Tachometer: Connected		Engine speeds displayed on the MUT-II and tachometer are identical	–	–
21	Vehicle speed sensor	When vehicle is moving	Compare the speeds displayed on the speedometer and the MUT-II	Accord	Code No. 35	13D-27
41	Ignition switch – IG	Ignition switch: ON		ON	–	–
42	Stop lamp switch	Ignition switch: ON	Brake pedal: Depressed	ON	Code No. 42	13D-31
			Brake pedal: Released	OFF		
44	Clutch pedal switch	Ignition switch: ON	Clutch pedal: Depressed	ON	Code No. 43	13D-32
			Clutch pedal: Released	OFF		
45	Overheat indicator lamp	Ignition switch: ON	Several seconds pass after ignition switch is turned to ON	ON → OFF	–	–
46	Glow indicator lamp	Ignition switch: ON	From 0.5 – 16 seconds after ignition switch is turned to ON	ON → OFF	–	–
47	Throttle valve control solenoid	Engine: Idle		OFF	Code No. 37	13D-29
		Engine: Idle → stopped		ON		
48	Glow relay box	Ignition switch: ON	From 0.5 – 16 seconds after ignition switch is turned to ON	ON → OFF	Code No. 24	13D-20

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
50	A/C relay	Engine: After warm-up, idle	A/C switch: OFF	OFF (Compressor clutch is not operating)	–	–
			A/C switch: ON	ON (Compressor clutch is operating)		
51	A/C switch	Engine: After warm-up, idle	A/C switch: OFF	OFF	–	–
			A/C switch: ON	ON		
52	Additional heater relay 1	● Engine coolant temperature: 75°C or lower ● Intake air temperature: 10°C or lower ● Post-heating complete ● All accessories: OFF		ON	Code No. 40	13D-30
		Engine: After warm-up		OFF		
53	Additional heater relay 2	● Engine coolant temperature: 75°C or lower ● Intake air temperature: 10°C or lower ● Post-heating complete ● All accessories: OFF		ON	Code No. 40	13D-30
		Engine: After warm-up		OFF		
54	Fan control relay (high)	Engine coolant temperature: 96°C or lower		OFF	–	–
		Engine coolant temperature: 102°C or higher		ON		
55	Fan control relay (low)	Engine coolant temperature: 99°C or lower		OFF	–	–
		Engine coolant temperature: 99 – 102°C		ON		

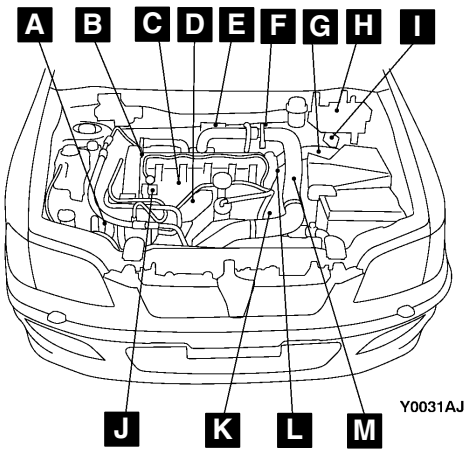
ACTUATOR TEST REFERENCE TABLE

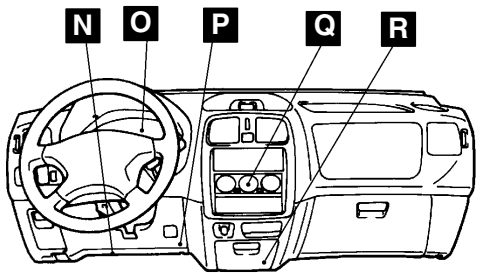
Item No.	Inspection item	Drive contents	Inspection contents	Normal condition	Inspection procedure No.	Reference page
01	Injector	Cut fuel to No. 1 injector	Engine: After warm-up, idle (Cut the fuel supply to each injector in turn and check cylinders which don't affect idling)	Idling condition becomes different (becomes unstable)	Code No. 29	13D-25
02		Cut fuel to No. 2 injector			Code No. 31	13D-25
03		Cut fuel to No. 3 injector			Code No. 32	13D-26
04		Cut fuel to No. 4 injector			Code No. 33	13D-26
05	Turbocharger waste gate solenoid	Solenoid valve turns from OFF to ON	Ignition switch: ON	Sound of operation can be heard when solenoid valve is driven	Code No. 27	13D-23
06	Throttle valve control solenoid	Solenoid valve turns from OFF to ON	Ignition switch: ON	Sound of operation can be heard when solenoid valve is driven	Code No. 37	13D-29
07	Fuel pressure regulator	Solenoid valve turns from OFF to ON	Ignition switch: ON	Sound of operation can be heard when solenoid valve is driven	Code No. 28	13D-24
08	EGR valve	Solenoid valve turns from OFF to ON	Ignition switch: ON	Sound of operation can be heard when solenoid valve is driven	Code No. 26	13D-22
09	Glow relay box	Relay turns from OFF to ON	• Ignition switch: ON • Check operating condition on data list	OFF → ON	Code No. 24	13D-20
10	Additional heater relay 1	Relay turns from OFF to ON	Ignition switch: ON	Sound of operation can be heard when relay is driven	Code No. 40	13D-30
11	Additional heater relay 2	Relay turns from OFF to ON	Ignition switch: ON	Sound of operation can be heard when relay is driven	Code No. 40	13D-30
12	Fan control relay (high)	Relay turns from OFF to ON	Ignition switch: ON	Fan motor operates at high speed	–	–
13	Fan control relay (low)	Relay turns from OFF to ON	Ignition switch: ON	Fan motor operates at low speed	–	–
14	Engine warning lamp	Causes engine warning lamp to illuminate	Engine: Idle	Engine warning lamp illuminates	–	–
15	Glow indicator lamp	Causes glow indicator lamp to illuminate	Engine: Idle	Glow indicator lamp illuminates	–	–
16	Overheat indicator lamp	Causes overheat indicator lamp to illuminate	Engine: Idle	Glow overheat lamp illuminates	–	–

ON-VEHICLE SERVICE

COMPONENT LOCATION

Name	Symbol	Name	Symbol
A/C relay	H	Engine-ECU (with barometric pressure sensor)	A
A/C switch	Q	Fuel pressure regulator	J
Accelerator pedal position sensor (1st and 2nd channel)	P	Fuel pressure sensor	D
Air flow sensor (with intake air temperature sensor)	G	Fuel temperature sensor	D
Boost sensor	M	Glow relay box	I
Camshaft position sensor	B	Injector	C
Clutch pedal switch	N	Main relay	R
Crank angle sensor	K	Stop lamp switch	N
Diagnosis connector	R	Throttle valve control solenoid	E
EGR valve	F	Turbocharger waste gate solenoid	E
EGR valve position sensor	F	Vehicle speed sensor	K
Engine coolant temperature sensor	L		





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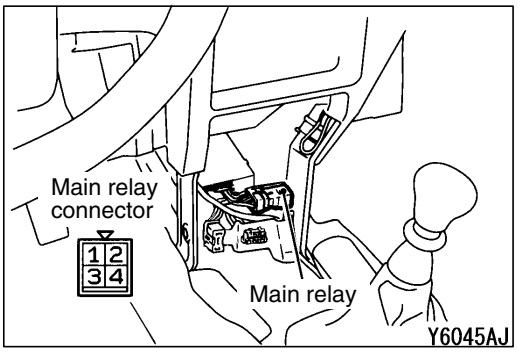
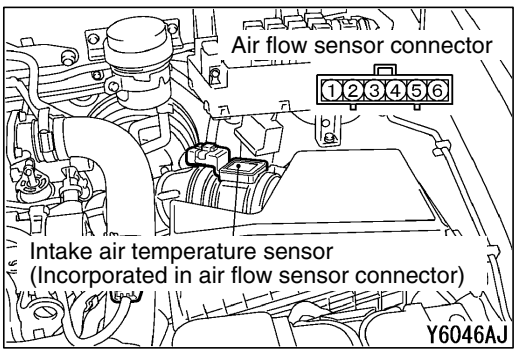


MAIN RELAY CONTINUITY CHECK

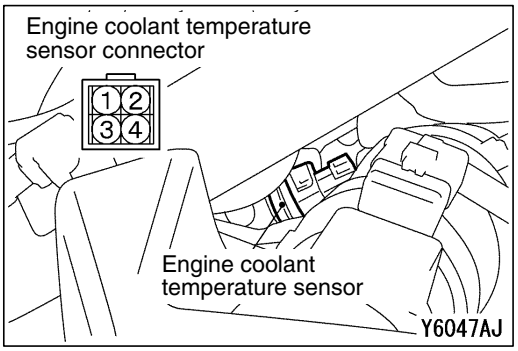
Battery voltage	Terminal No.			
	1	2	3	4
Not supplied	○		○	
Supplied	○	⊖	○	⊕



INTAKE AIR TEMPERATURE SENSOR CHECK

1. Disconnect the air flow sensor connector.
2. Measure the resistance between terminals 1 and 2.

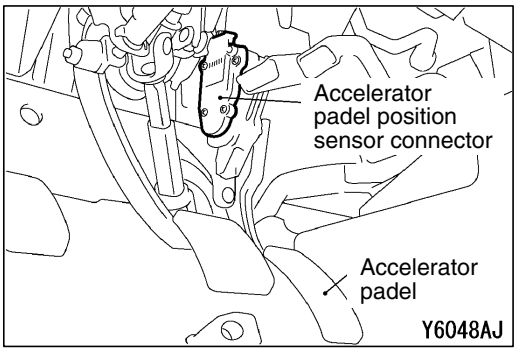
Standard value:
24.0 – 27.2 kΩ (at –30°C)
2.35 – 2.55 kΩ (at 20°C)
0.180 – 0.186 kΩ (at 100°C)



ENGINE COOLANT TEMPERATURE SENSOR CHECK

1. Disconnect the engine coolant temperature sensor connector.
2. Measure the resistance between terminals 2 and 3.

Standard value: 2.14 – 2.36 kΩ (at 25°C)
0.27 – 0.29 kΩ (at 80°C)



ACCELERATOR PEDAL POSITION SENSOR (1st channel) CHECK

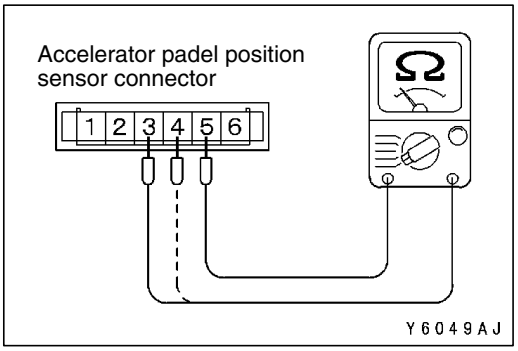
1. Disconnect the accelerator pedal position sensor connector.
2. Measure the resistance between terminals 3 and 5.

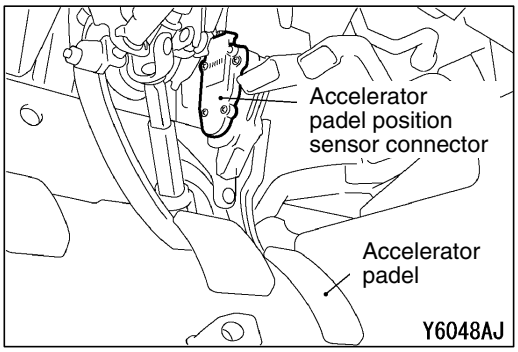
Standard value: Approx. 1200 Ω

3. Measure the resistance between terminals 4 and 5.

Normal condition:

Depress the accelerator pedal slowly	Resistance value changes in accordance with the accelerator pedal depression smoothly





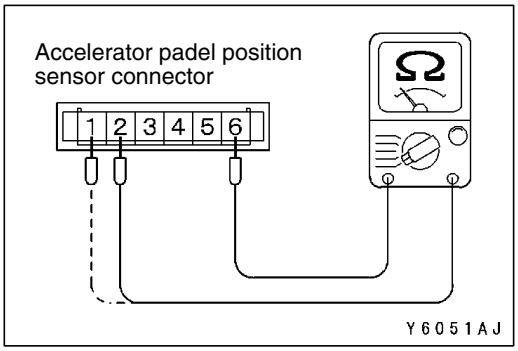
ACCELERATOR PEDAL POSITION SENSOR (2nd channel) CHECK

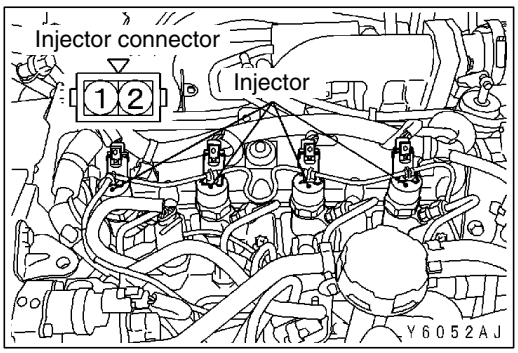
1. Disconnect the accelerator pedal position sensor connector.
2. Measure the resistance between terminals 2 and 6.

   Standard value: Approx. 1,700 Ω
3. Measure the resistance between terminals 1 and 6.

   Normal condition:

Depress the accelerator pedal slowly	Resistance value changes in accordance with the accelerator pedal depression smoothly

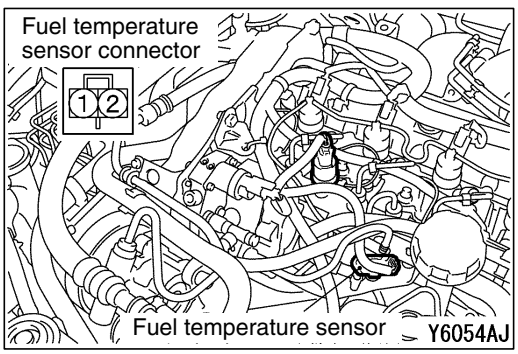




INJECTOR CHECK

1. Disconnect the injector connector.
2. Measure the resistance between terminals.

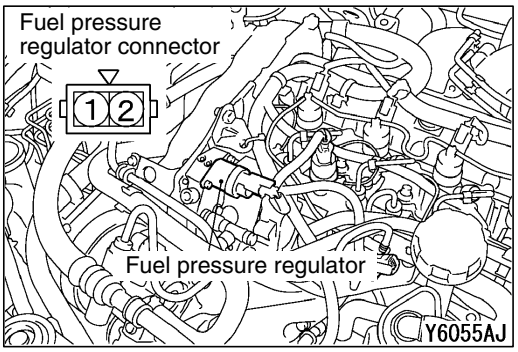
   Standard value: Approx. 0.33 Ω (at 20°C)



FUEL TEMPERATURE SENSOR CHECK

1. Disconnect the fuel temperature sensor connector.
2. Measure the resistance between terminals.

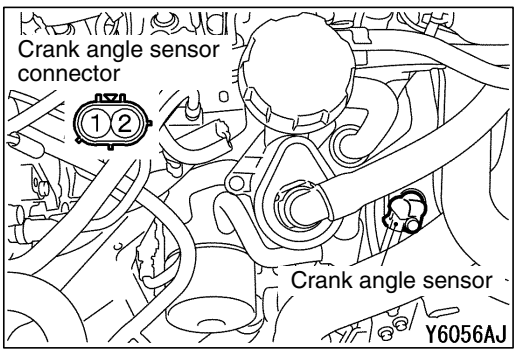
   Standard value: 2.05 kΩ (at 25°C)



FUEL PRESSURE REGULATOR CHECK

1. Disconnect the fuel pressure regulator connector.
2. Measure the resistance between terminals.

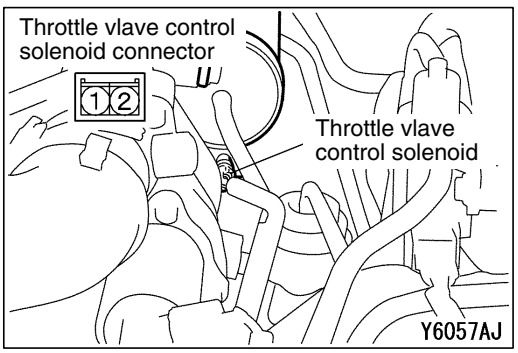
Standard value: Approx. 5 Ω (at 20°C)



CRANK ANGLE SENSOR CHECK

1. Disconnect the crank angle sensor connector.
2. Measure the resistance between terminals.

Standard value: 720 – 880 Ω



THROTTLE VALVE CONTROL SOLENOID CHECK

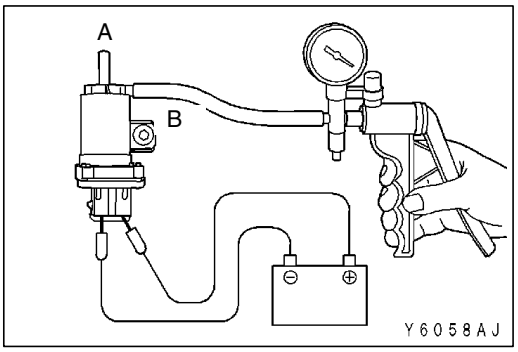
NOTE
When disconnecting the vacuum hose, always make a mark so that it can be reconnected at original position.

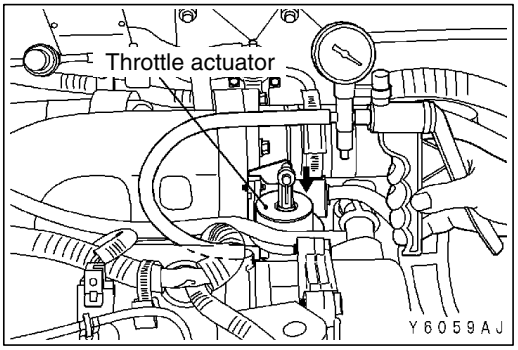
1. Disconnect the vacuum hose from the solenoid.
2. Disconnect the solenoid connector.
3. Connect a hand vacuum pump to the nipple (B) of the solenoid (refer to the illustration at left).
4. Check the airtightness by applying a vacuum with voltage applied directly from the battery to the solenoid and without applying voltage.

Battery voltage	Nipple A condition	Normal condition
Applied	Open	Vacuum leaks
	Close	Vacuum maintained
Not applied	Open	Vacuum leaks

5. Measure the resistance between the terminals.

Standard value: 43 – 49 Ω (at 25°C)



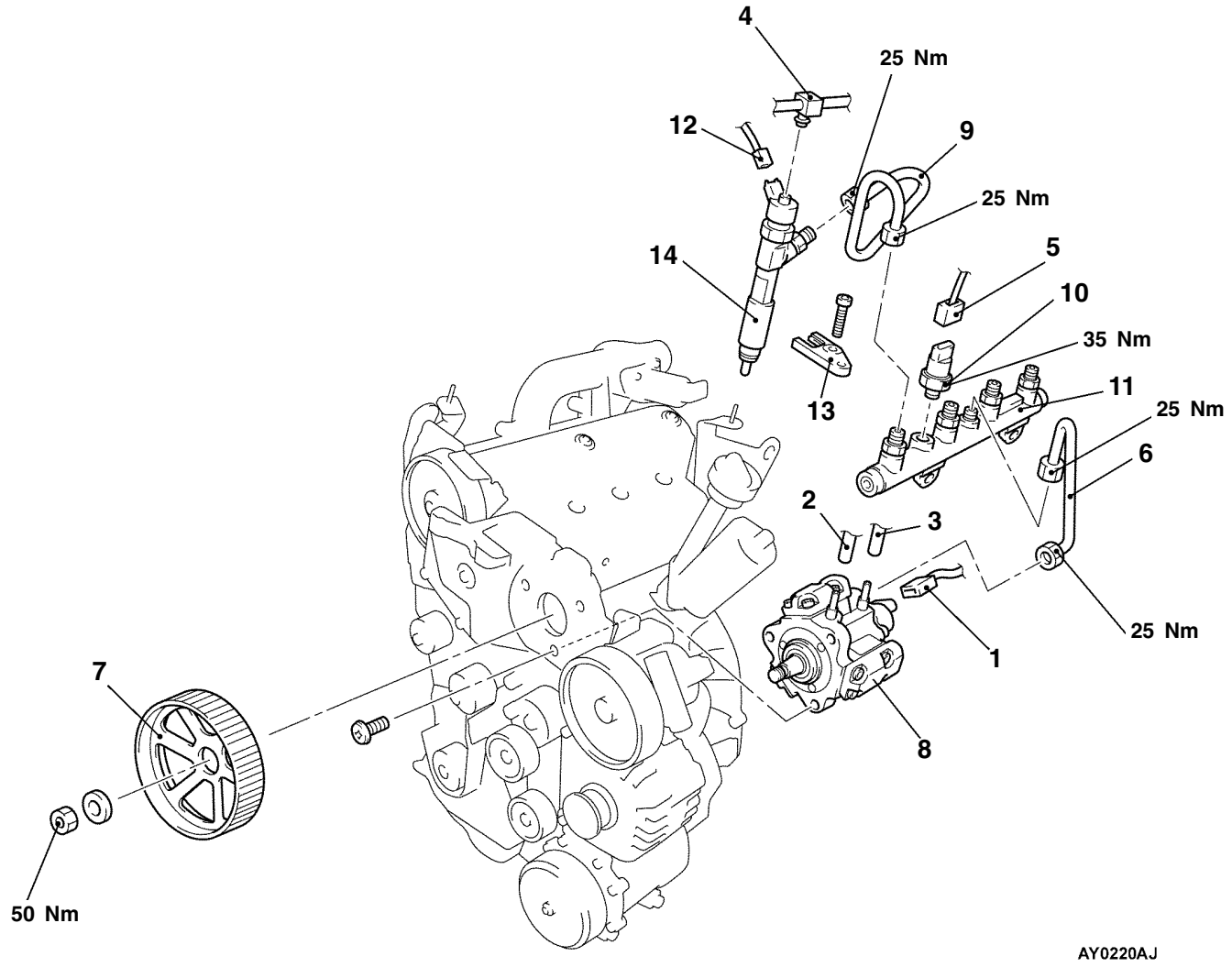


THROTTLE ACTUATOR CHECK

1. Disconnect the vacuum hose from the throttle actuator and connect a hand vacuum pump to the throttle actuator nipple.
2. Check that the actuator rod moves smoothly when applying vacuum gradually.

FUEL HIGH PRESSURE PUMP AND FUEL INJECTOR

REMOVAL AND INSTALLATION



Fuel high pressure pump removal steps

- Timing belt (Refer to GROUP 11C.)

1. Fuel high pressure pump connector
2. ◀A▶ Fuel supply hose connection
3. ◀A▶ Fuel return hose connection
6. ◀A▶ Fuel pump pipe
7. ◀B▶ Fuel high pressure pump sprocket
8. Fuel high pressure pump

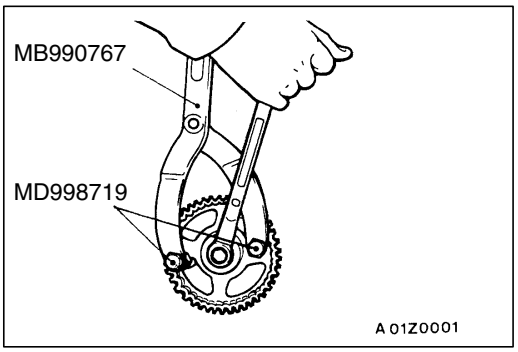
Fuel injector removal steps

4. ◀A▶ Fuel return tube
5. Fuel pressure sensor connector
6. ◀A▶ Fuel pump pipe
9. ◀A▶ Fuel injector pipe
10. ◀A▶ Fuen pressure sensor
11. Common rail
12. Fuel injector connector
13. Fuel injector holder
14. Fuel injector

REMOVAL SERVICE POINTS

◀B▶ FUEL HOSE CONNECTION/FUEL PIPE/FUEL RETURN TUBE/FUEL PRESSURE SENSOR REMOVAL

Disconnect the fuel hose, fuel pipe, fuel return tube and the fuel pressure sensor. Then, plug them to prevent dust from entering the fuel line, common rail and the fuel high pressure pump.



◀B▶ FUEL HIGH PRESSURE PUMP SPROCKET REMOVAL

INSTALLATION SERVICE POINT

▶A◀ FUEL HIGH PRESSURE PUMP SPROCKET INSTALLATION

Use the special tool to secure the fuel high pressure pump sprocket in the same way as during removal, and then tighten the bolt to the specified torque.