FUEL

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MULTIPOINT FUEL INJECTION (MPI)	

GASOLINE DIRECT INJECTION (GDI) <4G6>

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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 ignition failure sensor has been adopted.
- The engine-ECU has been changed. <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.

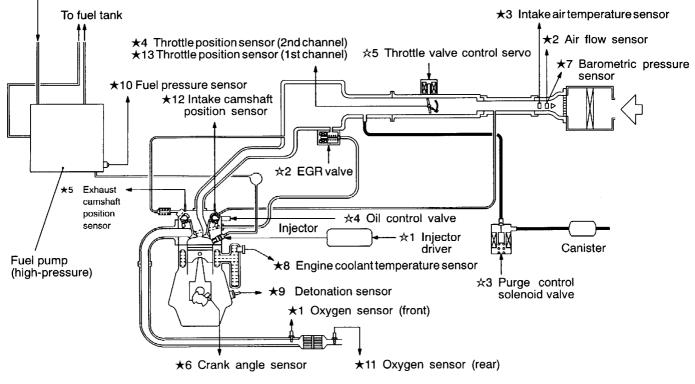
GENERAL SPECIFICATIONS

Items		Specifications
Engine-ECU <m t=""></m>	Identification No.	E2T72590
Engine-A/T-ECU 	Identification No.	E2T77481

GASOLINE DIRECT INJECTION SYSTEM DIAGRAM

 ★1 Oxygen sensor (front) ★2 Air flow sensor ★3 Intake air tempera- ture sensor ★4 Throttle position sensor (2nd chan- nel) ★5 Exhaust camshaft position sensor ★6 Crank angle sensor ★7 Barometric pressure sensor ★8 Engine coolant tem- perature sensor ★9 Detonation sensor ★10 Fuel pressure sen- sor ★11 Oxygen sensor (rear) ★12 Intake camshaft position sensor 	 Power supply Ignition switch-IG Ignition switch-ST Accelerator pedal position sensor (1st channel) Accelerator pedal position switch Vehicle speed sensor www.switch Vehicle speed sensor A/C switch 1 A/C switch 1 A/C switch 2 M/T oil temperature sensor Inhibitor switch Power steering fluid pressure switch Alternator FR terminal Clutch switch Small lamp switch Brake vacuum sensor Injector wire open circuit check signal Throttle valve controller 	C> Engine- ECU <m t=""> or ergine- A/T-ECU </m>	 ☆1 Injector driver (Injector) ☆2 EGR valve (Stepper motor) ☆3 Purge control solenoid valve ☆4 Oil control valve 	 Engine control relay Fuel pump relay Injector driver relay Throttle valve control servo relay A/C relay Ignition coil Fan controller Engine warning lamp GDI ECO indication lamp Diagnosis output Alternator G terminal Auto-cruise control lamp Throttle valve control rotler Tachometer Oxygen sensor heater (front)
★13 Throttle position sensor (1st channel)	 Power supply Ignition switch-IG Accelerator pedal position sensor (2nd channel) Brake switch Main switch Control switch Brake lamp switch Engine-ECU <m t=""></m> Engine-A/T-ECU 	Throttle valve controller	☆5 Throttle valve control servo	 Engine-ECU <m t=""></m> Engine-A/T-ECU

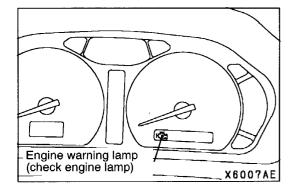
From fuel pump (low-pressure)



Y 6 0 5 1 A E

SERVICE SPECIFICATIONS

Items			Standard value	
Fuel pressure	High-pressure side MI	⊃a	4 - 6.9	
	Low-pressure side kP	a	Approximately 324	
Oxygen sensor out	put voltage (during revving)	V	0.6 – 1.0	
Oxygen sensor hea	ter 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 </m>
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=""></sensor>
P0135	Oxygen sensor heater (front) system <sensor 1=""></sensor>
P0136	Oxygen sensor (rear) system <sensor 2=""></sensor>
P0141	Oxygen sensor heater (rear) system <sensor 2=""></sensor>
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

Code No.	Diagnosis item
P0304	No. 4 cylinder misfire detected
P0335	Crank angle sensor system
P0340	Exhaust camshaft position sensor system
P0403	EGR valve system
P0420	Catalyst malfunction
P0443	Purge control solenoid valve system
P1010	Oil control valve (OCV) system
P1012	Intake camshaft position sensor 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.
- 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 tempe	erature sensor	°C
Engine speed		r/min
Vehicle speed		km/h
Long-term fuel com fuel trim)	pensation (long-term	%
Short-term fuel comp fuel trim)	pensation (short-term	%
Fuel control condi- tion	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 sen- sor		CL-H02S
Calculation load value		%
Diagnosis code durin	g 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	 Suspends lean burn operation. 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)	 Suspends lean burn operation. 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. 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.)
Exhaust camshaft position sen- sor	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	 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. 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	 Suspends lean burn operation. Suspends the exhaust gas recirculation.
Ignition coil (incorporating pow- er transistor)	 Suspends lean burn operation. Cuts off the fuel supply to cylinders with an abnormal ignition signal.
Fuel pressure sensor	 Controls as if the fuel pressure is 5 MPa. (If there is open or short circuit). Turns off the fuel pump relay (If the fuel pressure is excessively high). 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 sen- sor (2nd channel)	 Suspends lean burn operation. 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.) 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 sen- sor (1st channel)	 Suspends lean burn operation. 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.) Also suspends the electronic-controlled throttle valve system when the accelerator pedal position sensor (2nd channel) is defective. 	
Throttle position sensor (1st channel)	 Suspends lean burn operation. 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.) Refrains from controlling the throttle opening angle feedback when throttle position sensor (2nd channel) is also defective. 	
Electronic-controlled throttle valve system	 Suspends the electronic controlled throttle valve system. Suspends lean burn operation. Suspends the idle speed feedback control. 	
Throttle valve position feed- back	 Suspends the electronic controlled throttle valve system. Suspends lean burn operation. Suspends the engine speed feedback control. 	
Communication line between the throttle valve controller and the engine-ECU <m t=""> or engine-A/T-ECU </m>	 Communication error between the throttle valve controller and the engine-ECU <m t=""> or engine-A/T-ECU :</m> Suspends lean burn operation. Cuts the fuel supply when the engine speed reaches 3,000 r/min or more. Suspends the cruise-control. Communication error between the throttle valve controller and the engine-ECU <m t=""> or engine-A/T-ECU :</m> Suspends lean burn operation. Cuts the fuel supply when the engine speed reaches 3,000 r/min or more. 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 valve control servo motor (Motor 1st phase malfunction)	Disables lean-mixture combustion.	
Throttle valve control servo motor (Motor 2nd phase malfunction)	 Disables the electronic-controlled throttle valve system. Disables lean-mixture combustion. Disables idle engine speed feedback control. 	
Misfiring	If the detected misfiring causes damage to the catalyst, the misfiring cylinder will be shut down.	
Intake camshaft position sen- sor	Turns off the oil control valve, and retard the ignition timing to a maximum degree.	

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
P0011	Variable valve timing (V.T.T.) system	13A-14
P0100	Air flow sensor system	13A-15
P0105	Barometric pressure sensor system	13A-17
P0110	Intake air temperature sensor system	13A-19
P0115	Engine coolant temperature sensor system	13A-20
P0120*	Throttle position sensor 1 (1st channel) system	13A-23
P0125	Feedback system	13A-25
P0130	Oxygen sensor (front) system <sensor 1=""></sensor>	13A-27
P0135	Oxygen sensor heater (front) system <sensor 1=""></sensor>	13A-29
P0136	Oxygen sensor (rear) system <sensor 2=""></sensor>	13A-30
P0141	Oxygen sensor heater (rear) system <sensor 2=""></sensor>	13A-32
P0170	Abnormal fuel system	13A-33
P0190★	Abnormal fuel pressure	13A-35
P0201	No. 1 injector system	13A-36
P0202	No. 2 injector system	13A-38
P0203	No. 3 injector system	13A-39
P0204	No. 4 injector system	13A-40
P0220*	Accelerator pedal position sensor (1st channel) system	13A-42
P0225*	Throttle position sensor (2nd channel) system	13A-45
P0300*	Ignition coil (power transistor) system	13A-46
P0301	No. 1 cylinder misfire detected	13A-48
P0302	No. 2 cylinder misfire detected	13A-48
P0303	No. 3 cylinder misfire detected	13A-48
P0304	No. 4 cylinder misfire detected	13A-48
P0325	Detonation sensor system	13A-49
P0335	Crank angle sensor system	13A-49
P0340	Exhasut camshaft position sensor system	13A-51
P0403	EGR valve system	13A-53
P0420	Catalyst malfunction	13A-55
P0443	Purge control solenoid valve system	13A-56
P0500	Vehicle speed sensor system <m t=""></m>	13A-57
P1010	Oil control valve (OCV) system	13A-57

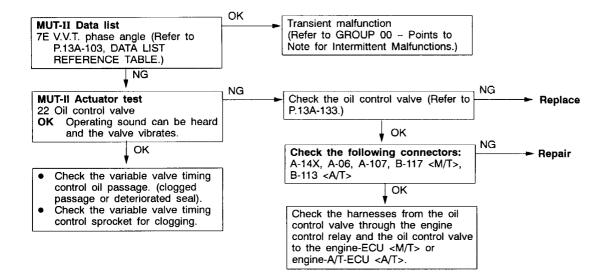
Code No.	Diagnosis item	Reference page
P1012	Intake camshaft position sensor system	13A-58
P1200	Injector driver system	13A-60
P1220★	Electronic-controlled throttle valve system	13A-61
P1221★	Throttle valve position feedback system	13A-62
P1223★	Communication line with throttle valve controller	13A-63
P1224★	Throttle valve control servo motor (motor 1st phase malfunction) system	13A-64
P1225★	Accelerator pedal position sensor (2nd channel) system	13A-65
P1228★	Throttle valve control servo motor (motor 2nd phase malfunction) system	13A-67
P1500	Alternator FR terminal system	13A-68
P1515	Brake vacuum sensor system	13A-69
P1610	Immobilizer system	13A-71

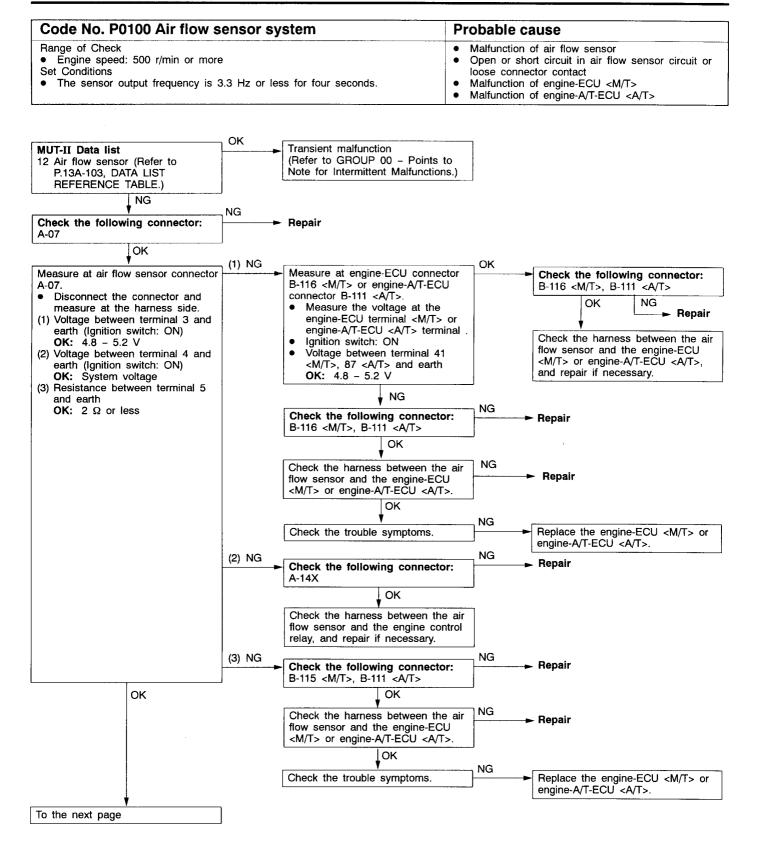
NOTE

- 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.

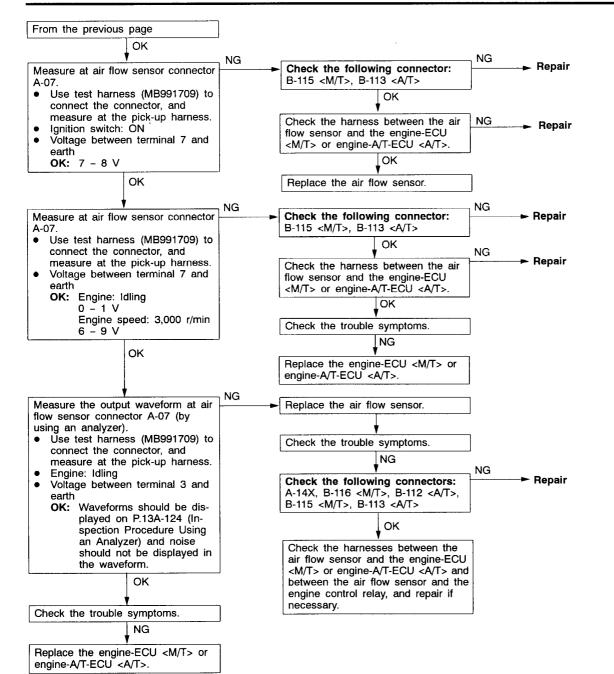
INSPECTION PROCEDURE CLASSIFIED BY DIAGNOSIS CODE

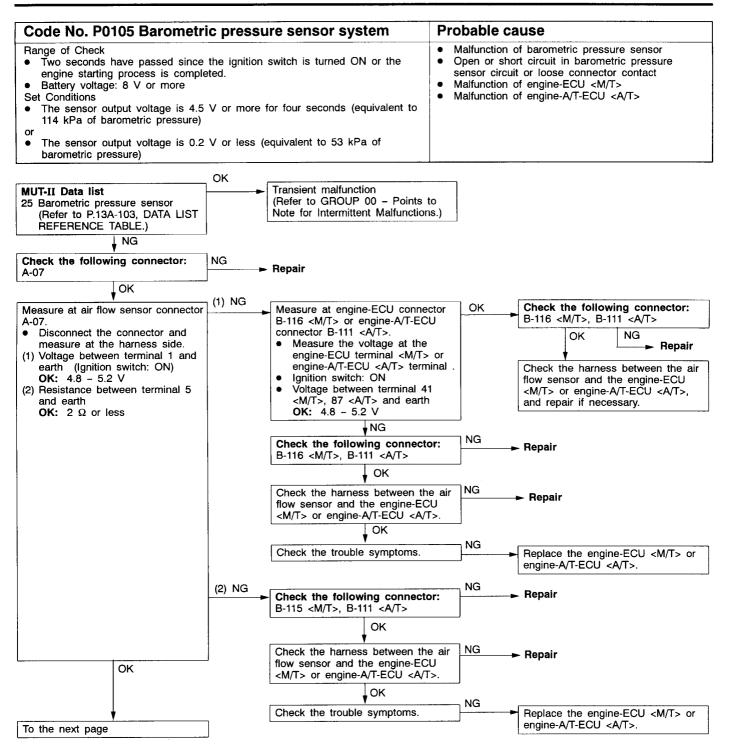
Code No. P0011 Variable valve timing (V.V.T.) system	Probable cause	
 Range of Check Engine is running Oil control valve (OCV): OFF Set Conditions The intake cam phase angle remains approx. 15° or more for 10 seconds. or The intake cam phase angle is approx. 8° or more during the engine idling. 	 Malfunction (eg. sticking or leaks) of oil control valve (OCV) Malfunction (clogging) of variable valve timing (V.V.T.) control oil passage Sticked variable valve timing (V.V.T) sprocket 	

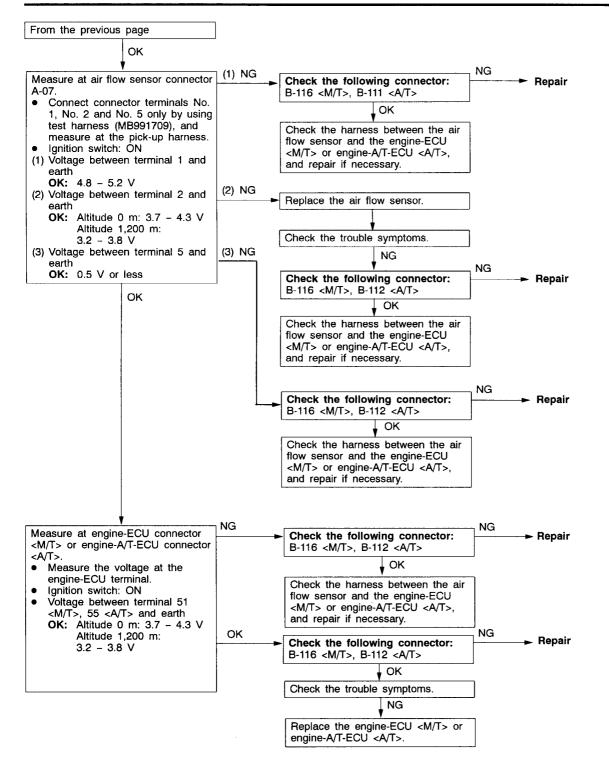


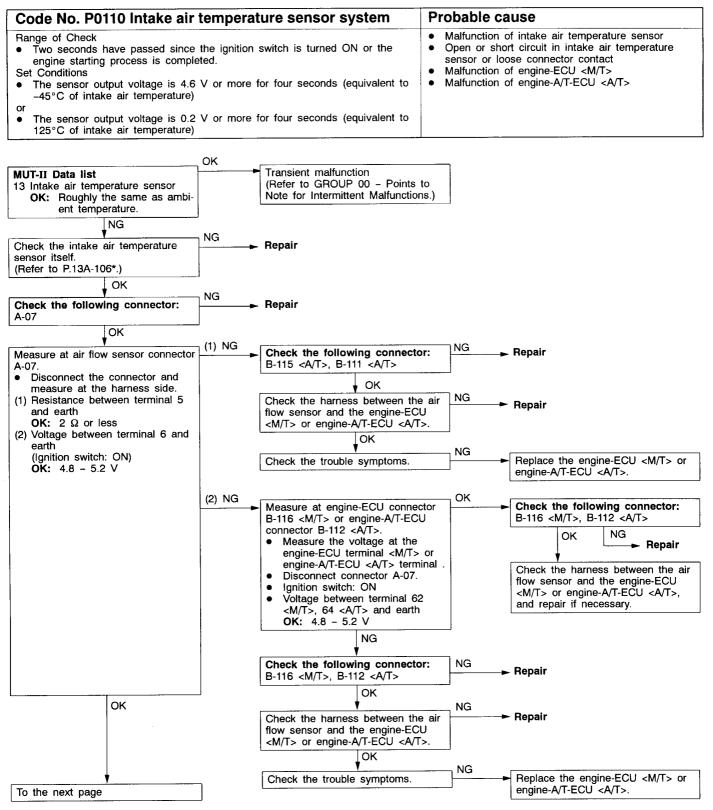


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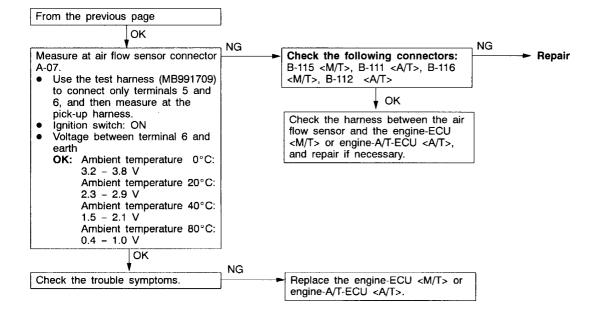




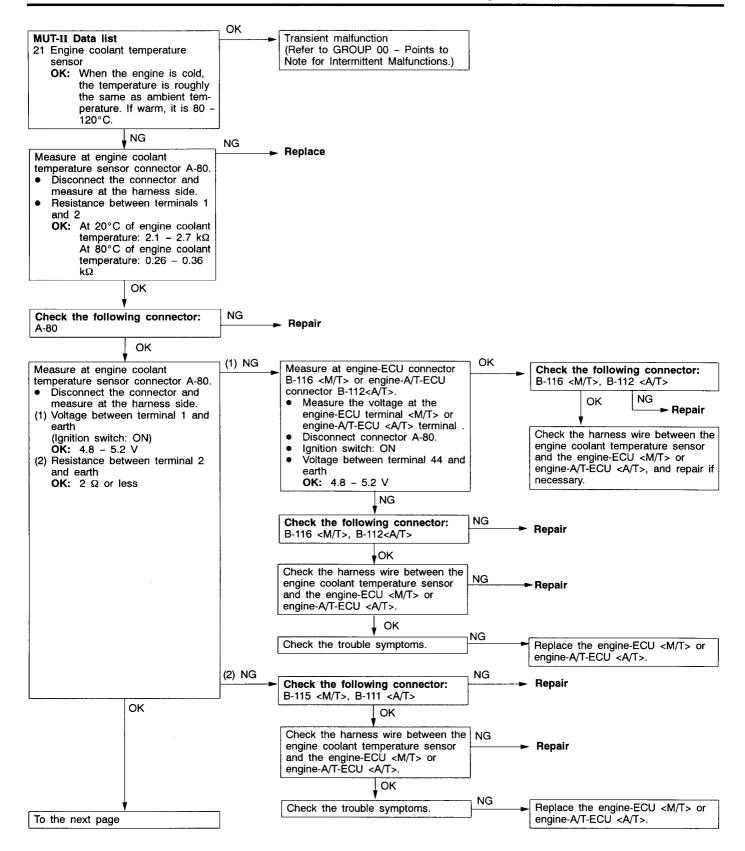


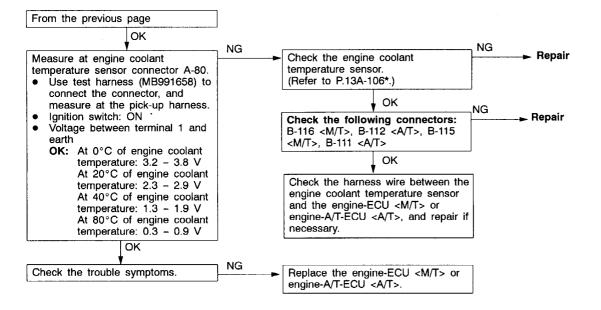


^{*:} Refer to the '99 SPACE RUNNER/SPACE WAGON Workshop Manual (Pub. No. PWDE9803).

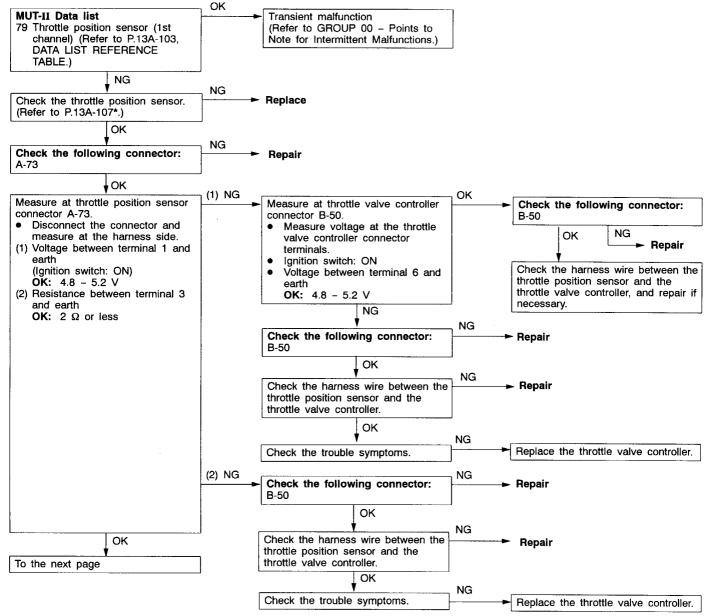


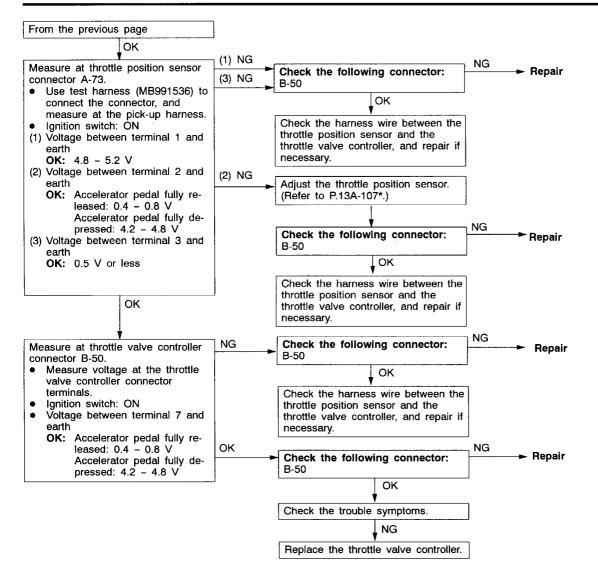
Code No. P0115 Engine coolant temperature sensor system	Probable cause
 Range of Check Engine: Two seconds after the engine has been started Set Conditions The sensor output voltage is 4.6 V or more for four seconds (equivalent to -45°C of engine coolant temperature) or The sensor output voltage is 0.1 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=""></m> Malfunction of engine-A/T-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. 	





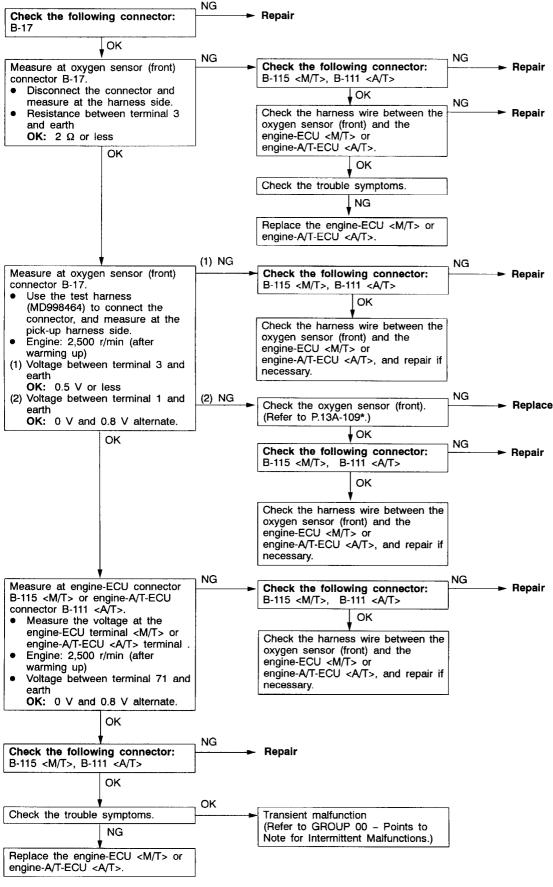
Code No. P0120 Throttle position sensor (1st channel) system	Probable cause
 The throttle valve controller judges a malfunction, and then transmit the result to the engine-ECU. Range of Check Ignition switch: ON Set Conditions The sensor output voltage is 0.2 V or less. The sensor output voltage is 4.85 V or more and the throttle position sensor (2nd channel) output voltage is 2.5 V or more. The throttle position sensor (1st channel) and throttle position sensor (2nd channel) combination output voltage is outside 4 - 6 V. The opening angle of throttle position sensor (1st channel) is different from its target by 1 V or more. The throttle position sensor (1st channel) output changes within 25 mV when the throttle control servo moves one step. 	 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=""></m> Malfunction of engine-A/T-ECU



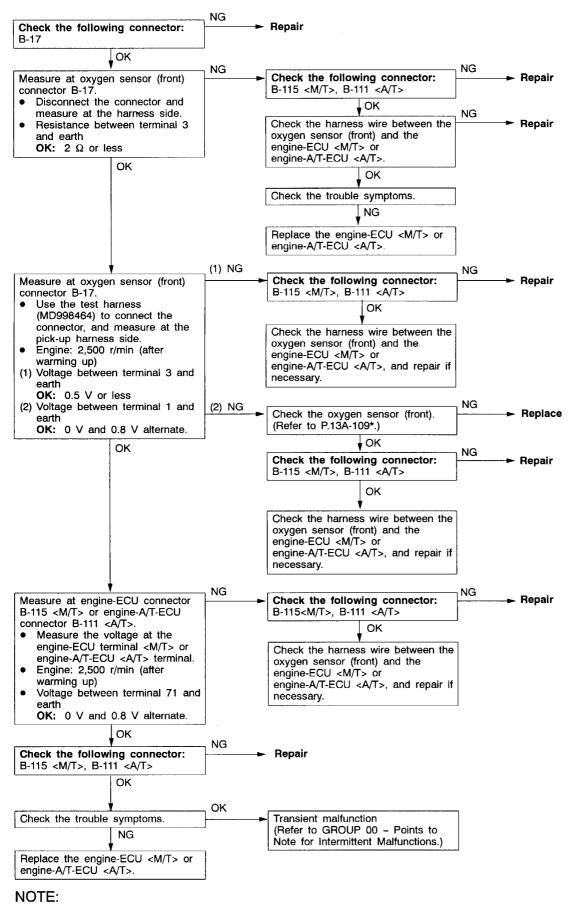


Code No. P0125 Feedback system	Probable cause
 Range of Check The engine coolant temperature is approx. 80°C or more. During stoichiometric feedback control The vehicle is not being decelerated. Set Conditions Oxygen sensor (front) output voltage has been higher or lower than 0.5 V for at least thirty 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=""></m> Malfunction of engine-A/T-ECU

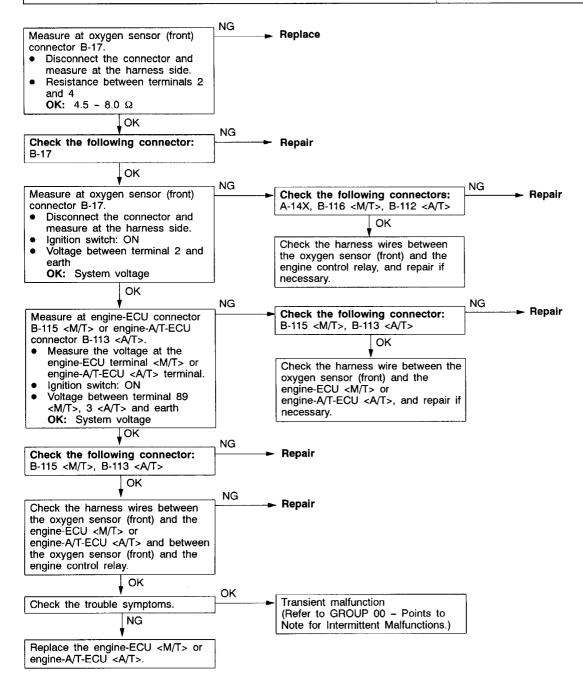
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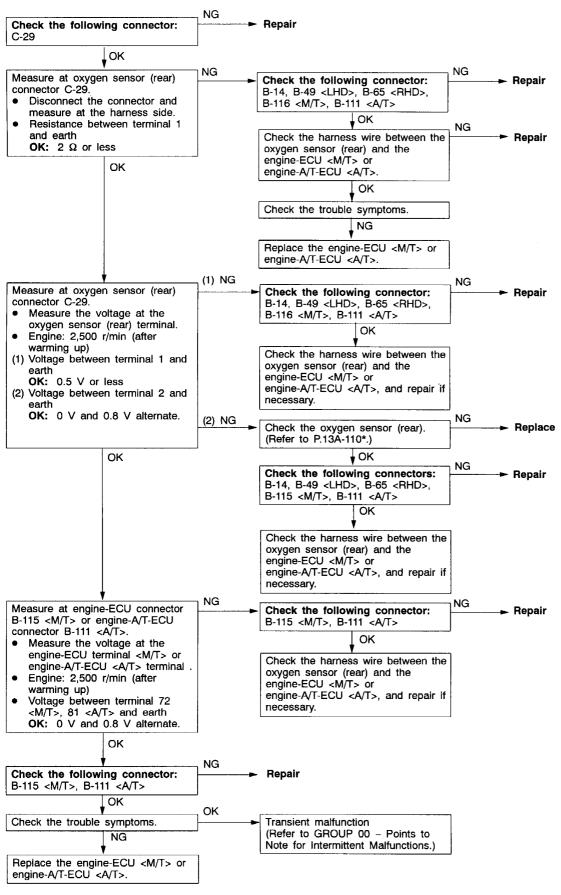
Code No. P0130 Oxygen sensor (front) system <sensor 1=""></sensor>	Probable cause
 Range of Check Three minutes have been passed since the engine has been started. The engine coolant temperature is approx. 80°C or more. Intake air temperature is 20 - 50°C Engine speed is 1,200 r/min or more Driving on 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=""></m> Malfunction of engine-A/T-ECU
 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. 	



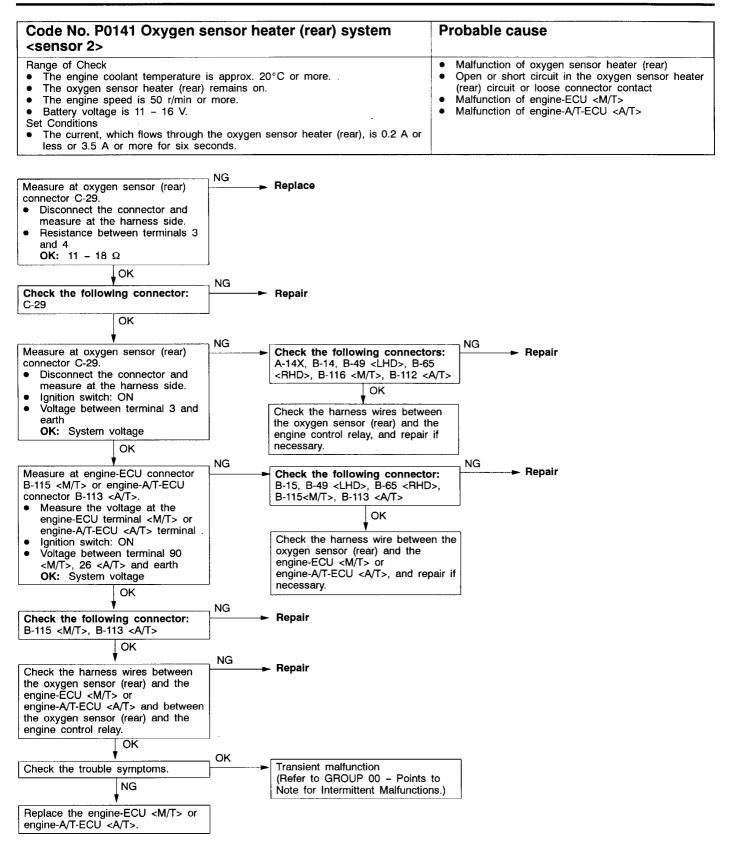
Code No. P0135 Oxygen sensor heater (front) system <sensor 1=""></sensor>	Probable cause
 Range of Check The engine coolant temperature is approx. 20°C or more. The oxygen sensor heater (front) remains on. The engine speed is 50 r/min or more. Battery voltage is 11 - 16 V. Set Conditions The current, 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=""></m> Malfunction of engine-A/T-ECU

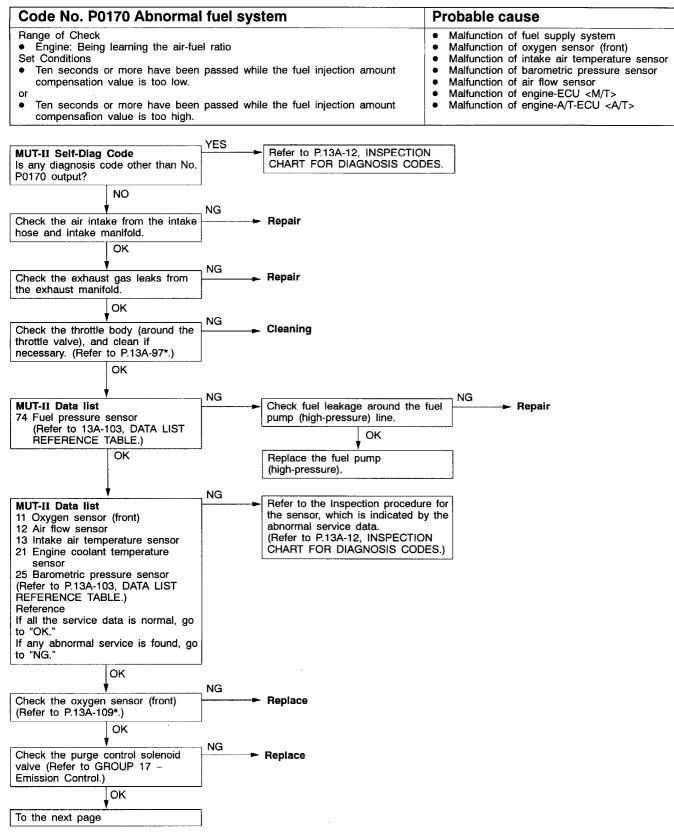


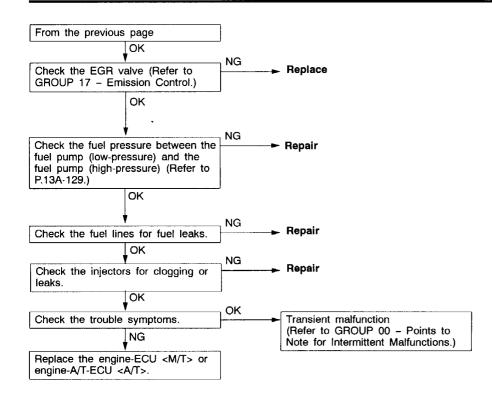
Code No. P0136 Oxygen sensor (rear) system <sensor 2=""></sensor>	Probable cause
 Range of Check Three minutes have been passed since the engine has been started. The engine coolant temperature is approx. 80°C or more. Intake air temperature is 20 - 50°C Engine speed is 1,200 r/min or more Driving on 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=""></m>	 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=""></m> Malfunction of engine-A/T-ECU
 Range of Check Two seconds have passed after the engine-ECU <m t=""> or engine-A/T-ECU detected an open circuit.</m> 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. 	



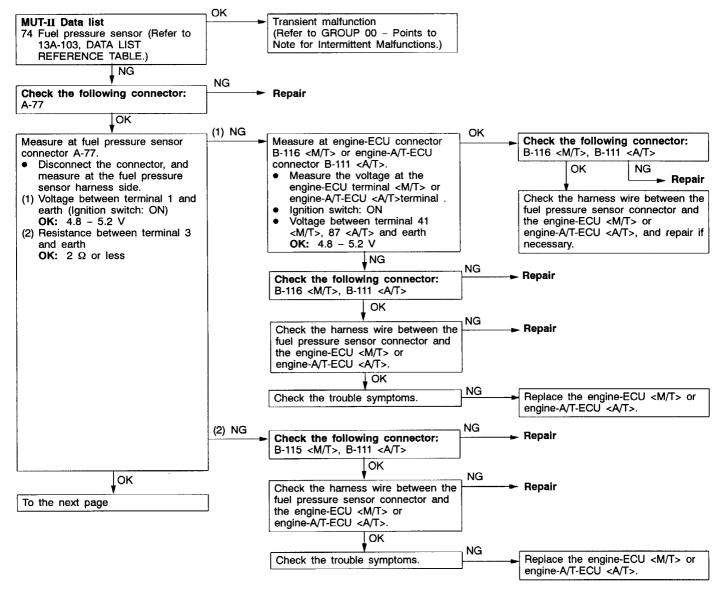
13A-32



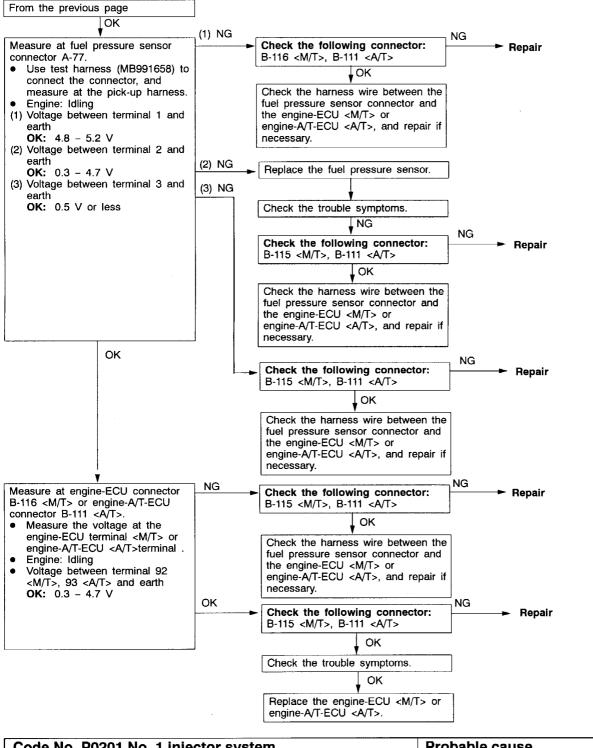




Code No. P0190 Abnormal fuel pressure	 Probable cause Malfunction of fuel pressure sensor Open or short circuit in the fuel pressure sensor circuit or loose connector contact Malfunction of engine-ECU <m t=""></m> Malfunction of engine-A/T-ECU 	
 Range of Check Ignition switch: ON Set Conditions The sensor output voltage is 4.8 V or more, or 0.2 V or less for four seconds. 		
 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	

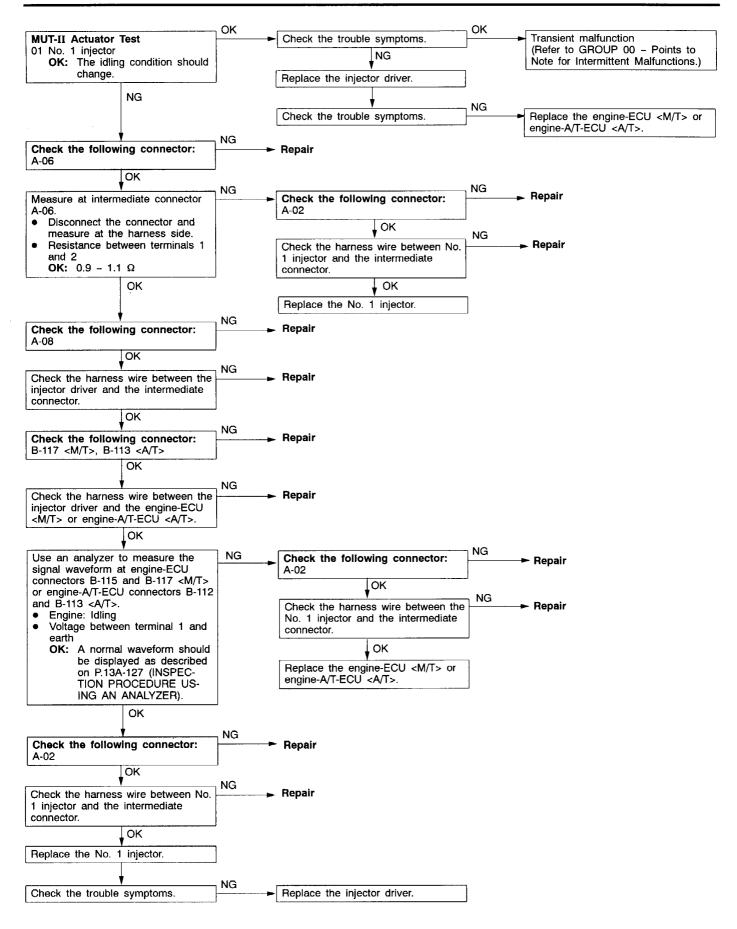


13A-36

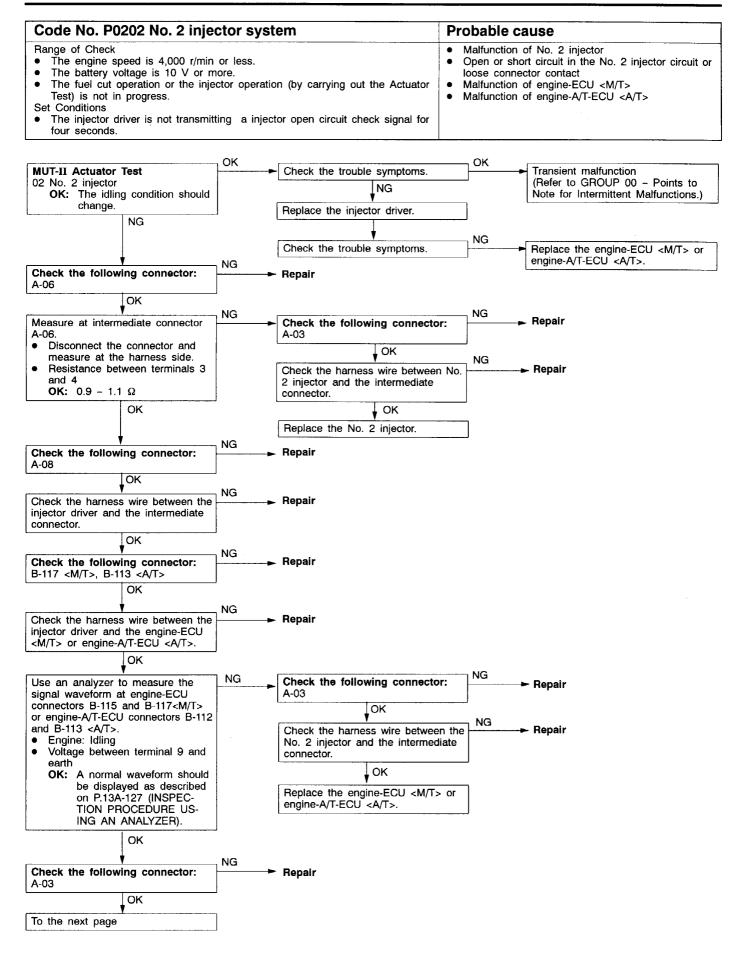


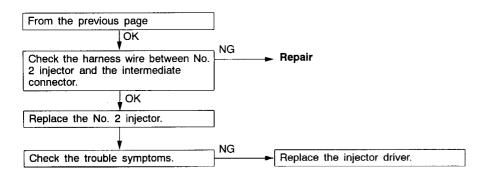
Code No. P0201 No. 1 injector system	Probable cause
 Range of Check The engine speed is 4,000 r/min or less. The battery voltage is 10 V or more. The fuel cut operation or the injector operation (by carrying out the Actuator Test) is not in progress. Set Conditions The injector driver is not transmitting 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=""></m> Malfunction of engine-A/T-ECU

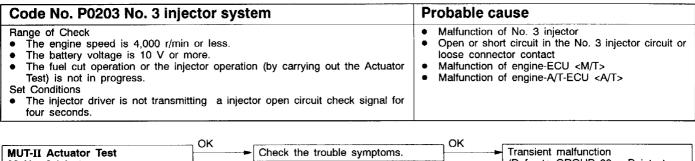


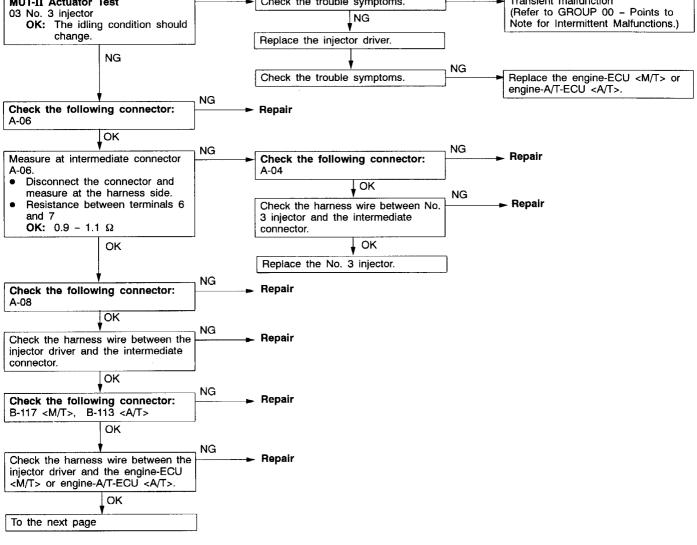


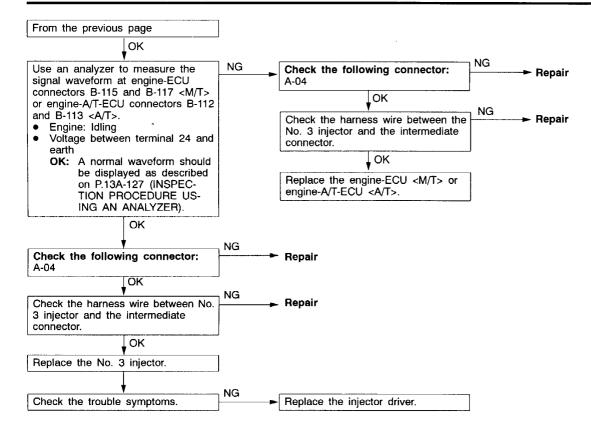
GDI <4G6> - Troubleshooting





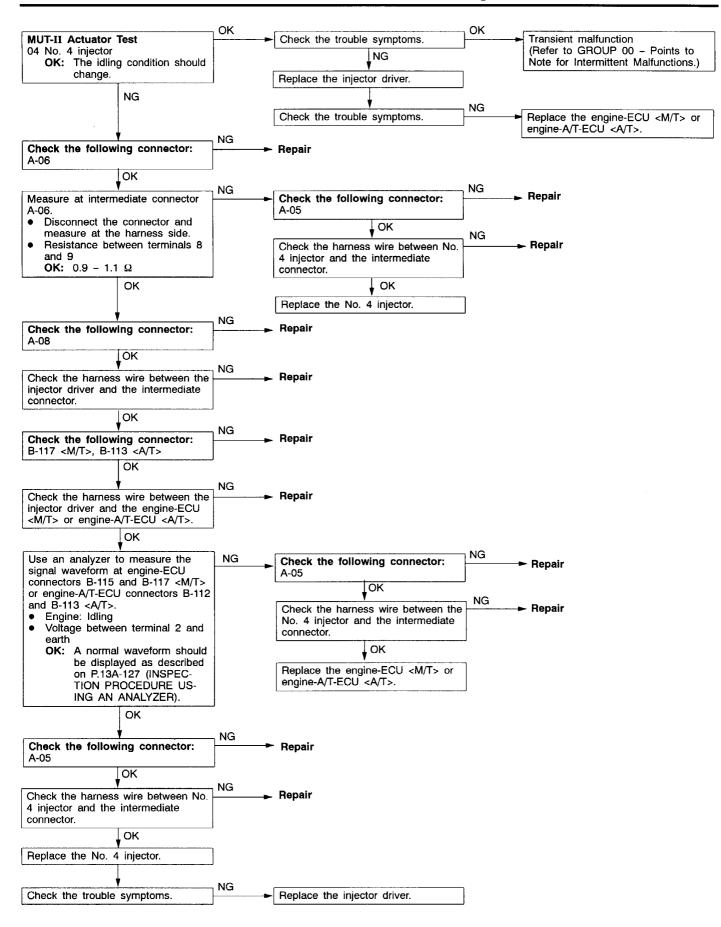




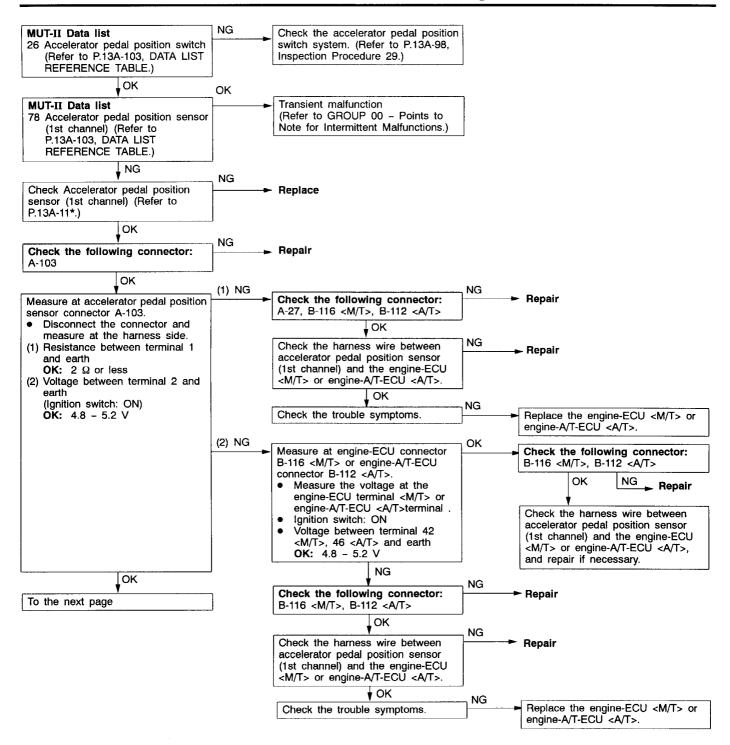


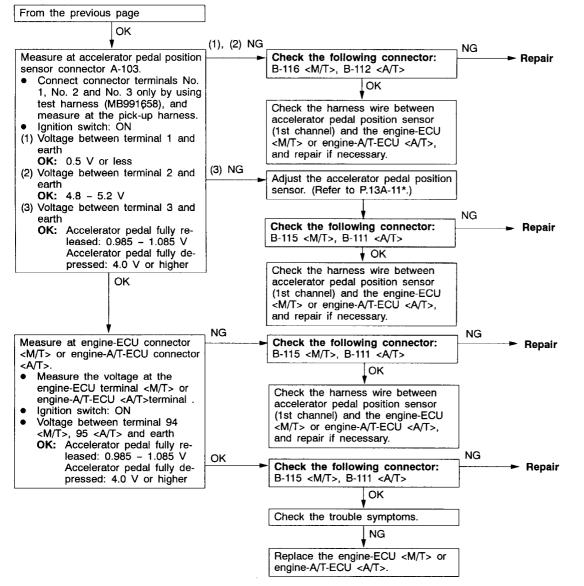
Code No. P0204 No. 4 injector system	Probable cause
 Range of Check The engine speed is 4,000 r/min or less. The battery voltage is 10 V or more. The fuel cut operation or the injector operation (by carrying out the Actuator Test) is not in progress. Set Conditions The injector driver is not transmitting 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=""></m> Malfunction of engine-A/T-ECU

GDI <4G6> – Troubleshooting

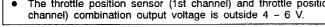


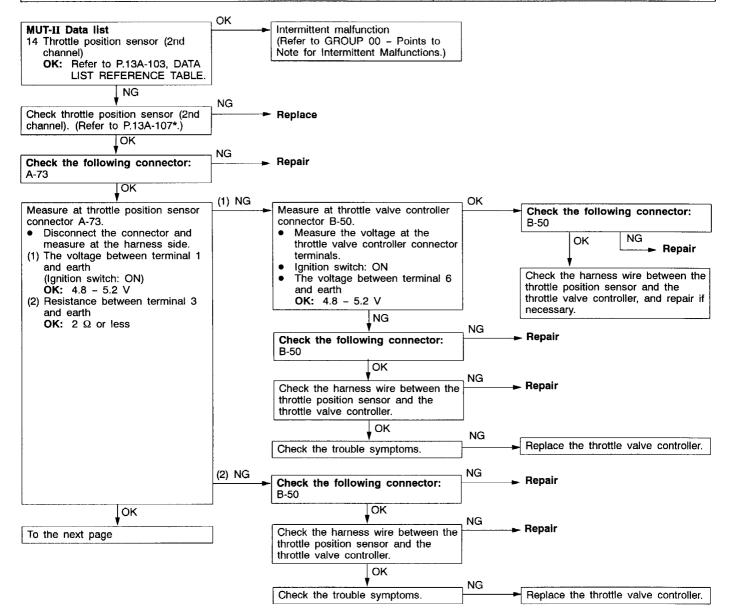
Code No. P0220 Accelerator pedal position sensor (1st channel) system	Probable cause
 Range of Check Accelerator pedal position sensor (2nd channel) is normal. Communication between the engine-ECU <m t=""> or engine-A/T-ECU and the throttle valve controller is normal.</m> Set Conditions The output voltage of accelerator pedal position sensor (1st channel) is 0.2 V or less for one second. 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 The difference between accelerator pedal position sensor (1st channel) and accelerator pedal position sensor (1st channel) and accelerator pedal position sensor (1st channel) and accelerator pedal position sensor (1st channel) or more (i.e. the throttle opening angle changes slightly). 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=""></m> Malfunction of engine-A/T-ECU

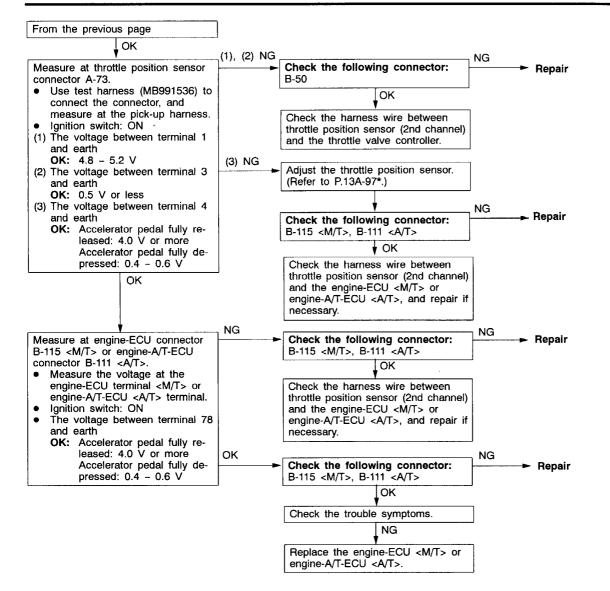




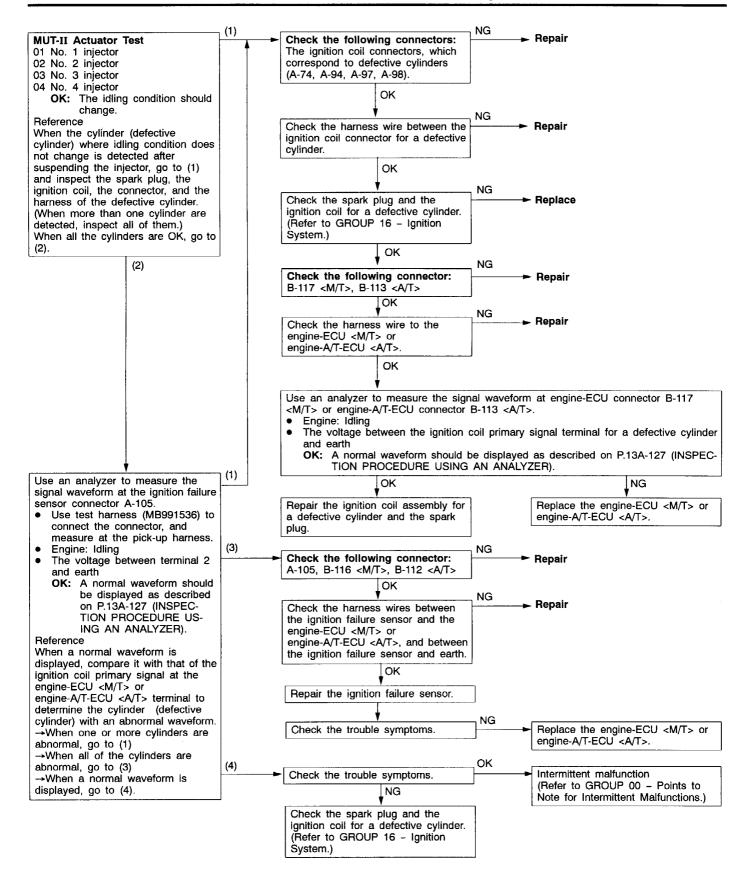
Code No. 0225 Throttle position sensor (2nd channel) system	Probable cause
 The throttle valve controller judges a malfunction, and then transmit the result to the engine-ECU <m t=""> or engine-A/T-ECU .</m> Range of Check Ignition switch: ON The throttle position sensor (1st channel) is normal. Set 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 	 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=""></m> Malfunction of the engine-A/T-ECU

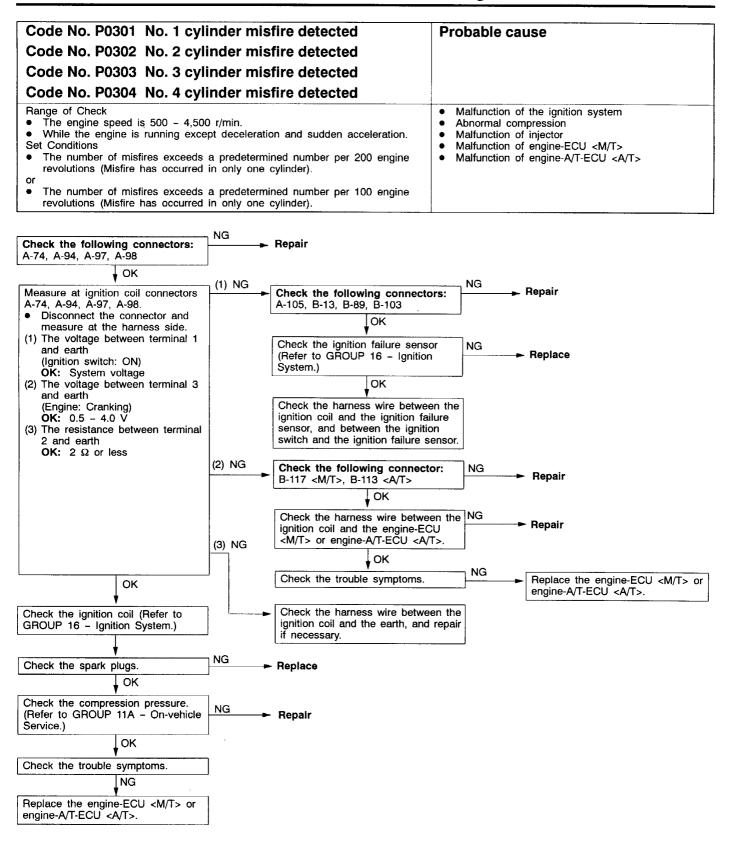






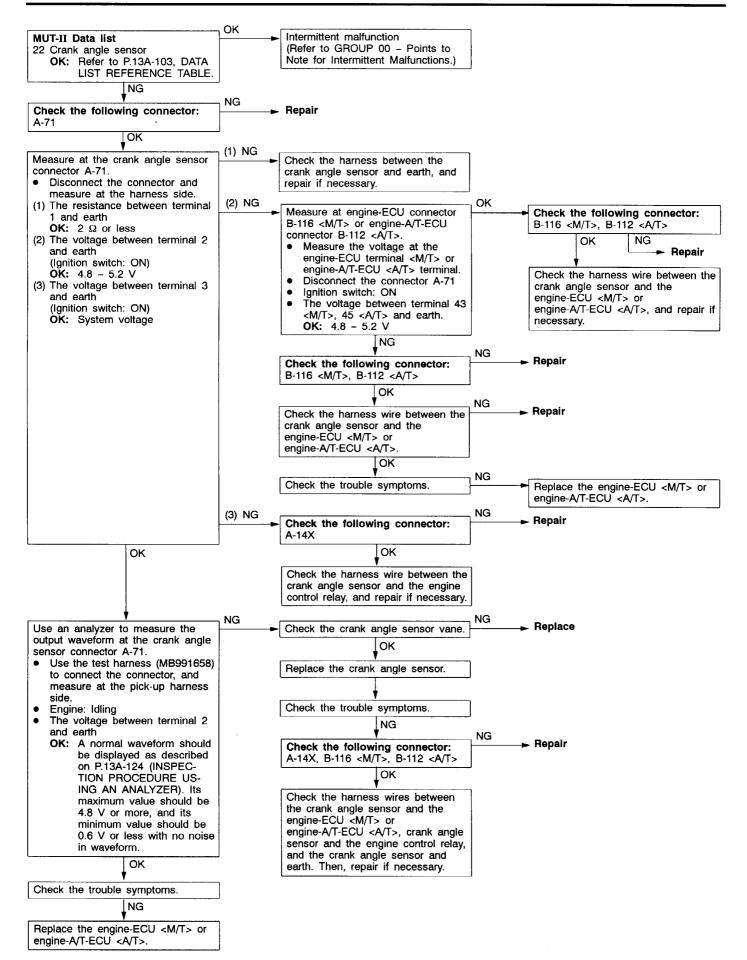
Code No. P0300 Ignition coil (power transistor) system	Probable cause
 Range of Check Engine speed is approx. 50 - 4,000 r/min. Engine is not cranking. Set Conditions The ignition failure sensor does not send a signal about a certain cylinder for four seconds. 	 Malfunction of the ignition coil Malfunction 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=""></m> Malfunction of engine-A/T-ECU



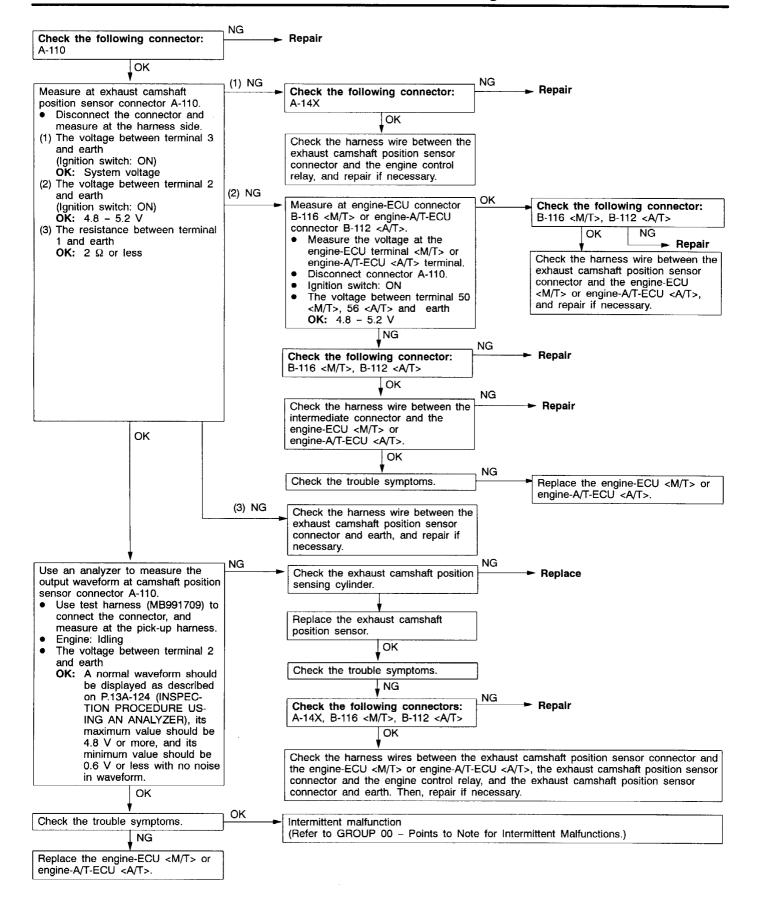


Code No. P0325 Detonation sensor system			Probable cause
 Range of Check Engine: Two seconds after the engine has been started Set Conditions Changes in sensor output voltage (detonation sensor peak crankshaft rotation) in 200 consecutive cycles are 0.08 V 			 Malfunction of the detonation sensor Open or short circuit in the detonation sensor circuit or loose connector contact Malfunction of engine-ECU <m t=""></m> Malfunction of engine-A/T-ECU
Check the following connector: A-79	NG	Repair	
OK			
 Measure at the detonation sensor connector A-79. Disconnect the connector and measure at the harness side. The resistance between terminal 2 and earth OK: 2 Ω or less 	NG		he harness wire between the detonation sensor and nd repair if necessary.
Οκ	1		
Check the following connector: B-115 <m t="">, B-111 </m>	NG	Repair	
	NG	pan	
Check the harness wire between the detonation sensor and the engine-ECU		Repair	
ΟK			
Check the trouble symptoms.	OK F	Intermitt	ent malfunction
NG	J	(Refer to Malfunct	o GROUP 00 – Points to Note for Intermittent tions.)
Replace the detonation sensor.			
Check the trouble symptoms.			
NG	1		
Replace the engine-ECU <m t=""> or engine-A/T-ECU .</m>]		

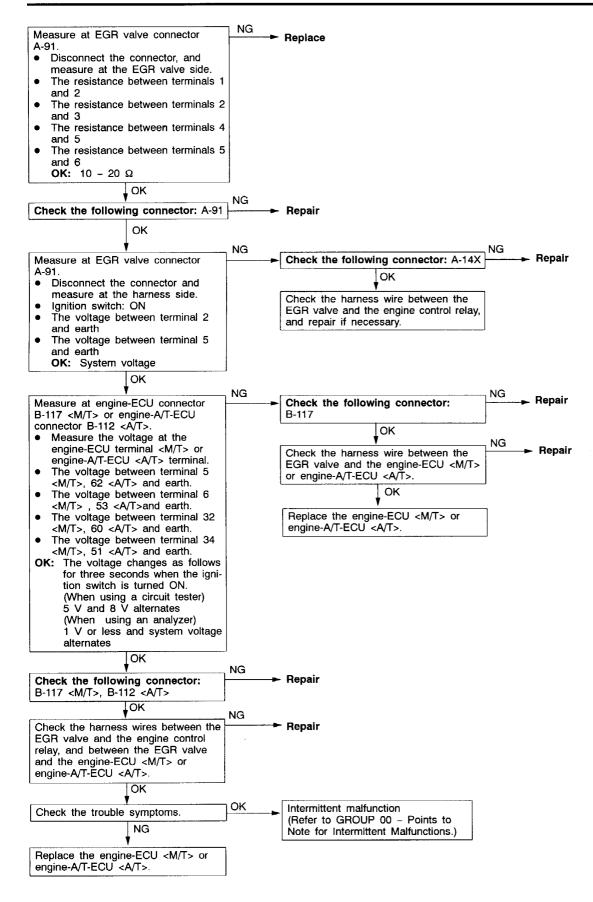
Code No. P0335 Crank angle sensor system	Probable cause
 Range of Check Engine is cranking Set Conditions Sensor output voltage does not change for 4 seconds (no pulse signal input). 	 Malfunction of the crank angle sensor. Open or short circuit in the crank angle sensor circuit or loose connector contact.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



Code No. P0340 Exhaust 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 exhaust camshaft position sensor Open or short circuit in the exhaust camshaft position sensor circuit or loose connector contact. Malfunction of engine-ECU <m t=""></m> Malfunction of engine-A/T-ECU

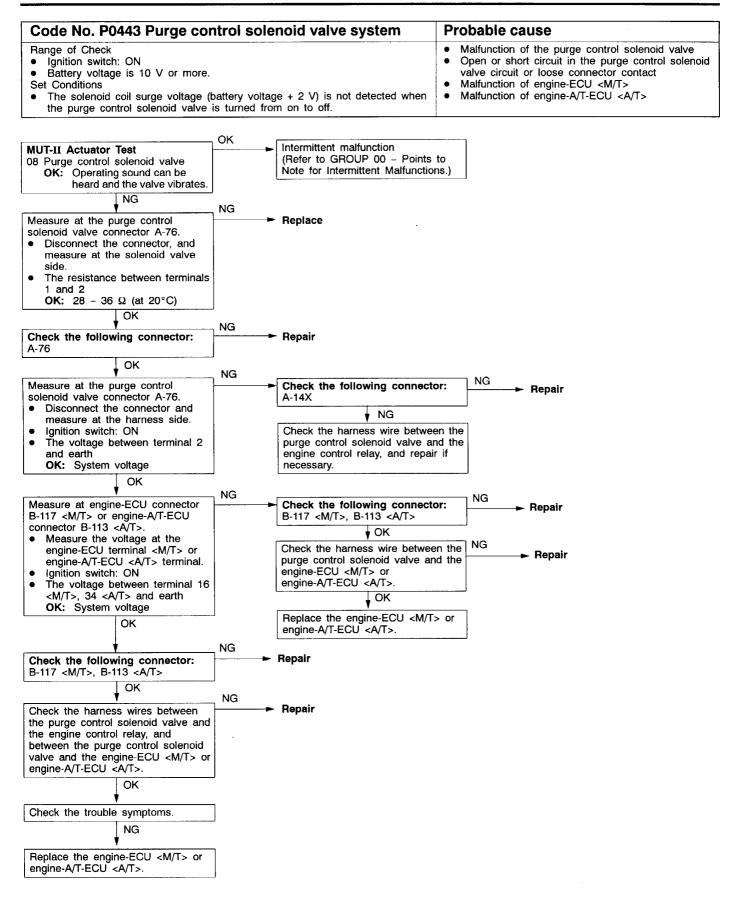


Code No. P0403 EGR valve system	Probable cause
 Range of Check Ignition switch: OFF to ON EGR valve is in operation after the engine starting process is complete. Set Conditions Off-surge voltage is not generated from the motor coil while the EGR valve control motor is running. 	 Malfunction of the EGR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



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 oxyg 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=""></m> Malfunction of engine-A/T-ECU
	n NG	
Check the exhaust manifold. (Are there any cracks?)		Repair
OK	_ NG	
MUT-II Data list		Check the oxygen sensor (rear) system <sensor 2=""></sensor>
59 Oxygen sensor (rear)		(Refer to P.13A-30, INSPECTION PROCEDURE FOR
 Transmission: 2nd gear <m t="">, L range </m> Drive with wide open throttle 		DIAGNOSIS TROUBLE CODE P0136.)
OK: 600 – 1,000 mV		
OK		
MUT-II Data list	NG	Check the encoder (forth) and an encoder
11 Oxygen sensor (front)		Check the oxygen sensor (front) system <sensor 1=""> (Refer to P.13A-27, INSPECTION PROCEDURE FOR</sensor>
OK: 600 - 1,000 mV when racing suddenly		DIAGNOSIS TROUBLE CODE P0130.)
OK	-	
MUT-II Data list	NG	Replace the oxygen sensor (front).
11 Oxygen sensor (front)	-	riepiade the oxygen beneen (nonty).
• Transmission: 2nd gear <m t="">, L range </m>		
OK: Changeover between 0 – 400 mV and 600 – 1,000 mV occur 15 times in 10 seconds.		
ОК		
	7	
Replace the oxygen sensor (rear).]	
*	г	
Check the trouble symptoms.		
NG		
Replace the catalytic converter.]	
↓		
Check the trouble symptoms.]	
NG	_	
Replace the engine-ECU <m t=""> or engine-A/T-ECU .</m>]	

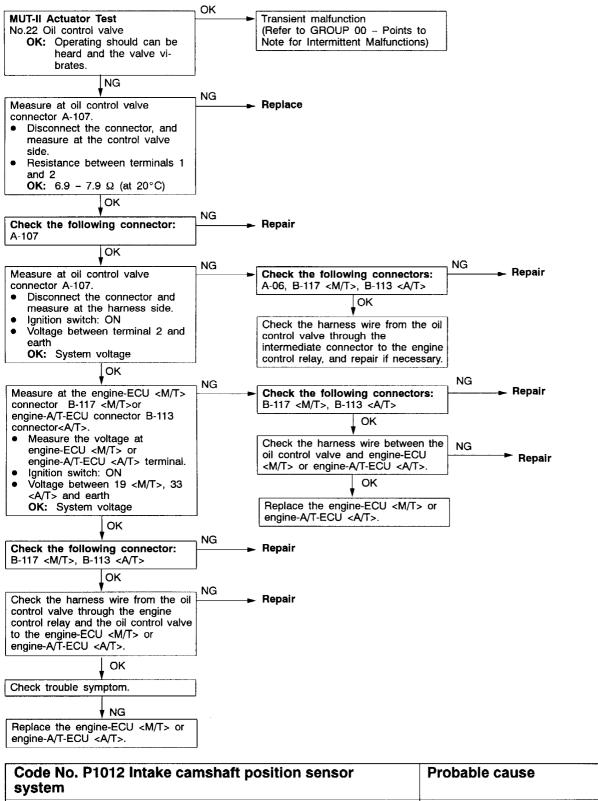
GDI <4G6> - Troubleshooting



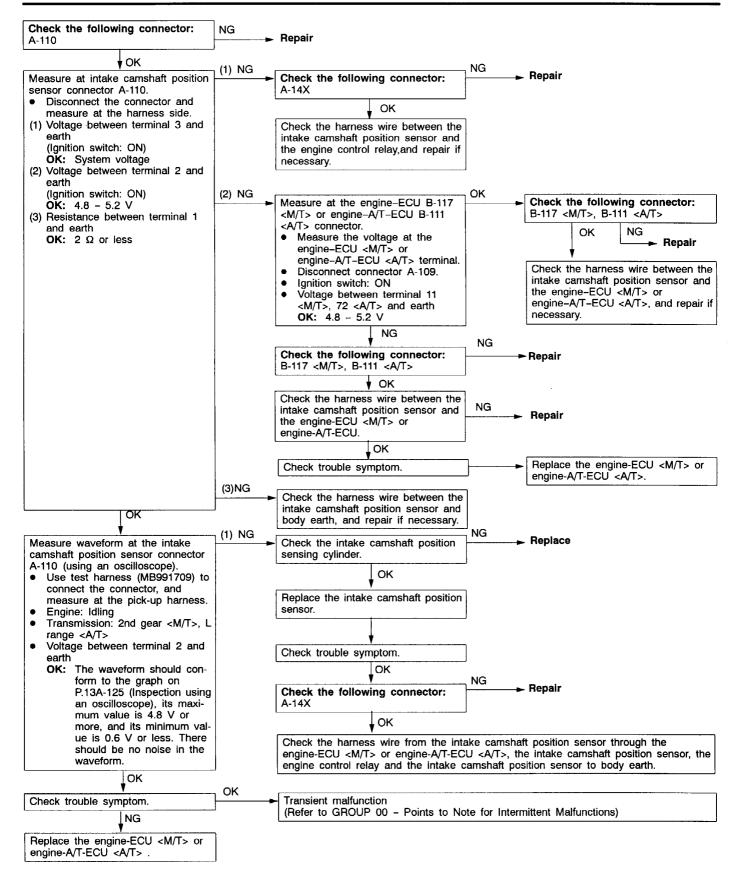
GDI <4G6> - Troubleshooting

Code No. P0500 Vehicle speed sensor syste	m <m t=""></m>	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 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
Does the speedometer operate normally?		k the vehicle speed sensor
YES	NG	r to GROUP 54 - Combination Meter.)
Use an analyzer to measure the output waveform of the vehicle speed sensor at engine-ECU connector B-115.	Chec	k the following connectors: B-14, B-115
 Driving the vehicle The voltage between terminal 80 and earth 		OK NG
 OK: A normal waveform should be displayed as described in OSCILLOSCOPE INSPECTION PROCEDURE, and noise should not be displayed in the waveform. (Refer to GROUP 23 – Troubleshooting.) 		Repair k the harness wire between intermediate connector B-14 he engine-ECU, and repair if necessary.
ОК		
Check the following connector: A-86	NG Repa	ir
ОК	T	
Check the trouble symptoms.]	
NG		
Replace the engine-ECU.]	
Code No. B1010 Oil control volvo system		Probable cause
Code No. P1010 Oil control valve system		
Range of Check	nition switch is on	 The oil control valve is defective. The oil control valve circuit is short or open or

• When the oil control valve is off (for example, when the ignition switch is on or the engine is idling) Set Conditions The oil control valve circuit is short or open, or connector contact is loose
Malfunction of the engine-ECU <M/T>
Malfunction of the engine-A/T-ECU <A/T> • The voltage at the oil control valve activating terminal of the engine-A/T-ECU is abnormal for more than 4 seconds. •



system	
Range of Check	 Malfunction of intake camshaft position sensor
Engine: During cranking and running	 Intake camshaft position sensor circuit short or
Set Conditions	open, or loose connector contact
• The sensor output voltage does not change for 4 seconds (no pulse signal	 Malfunction of the engine-ECU <m t=""></m>
input).	 Malfunction of the engine-A/T-ECU



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 carryin test) are not in progress. During high engine load Set Conditions Injector open circuit check signal is not output from the in 		 Malfunction of the injector driver Open or short circuit, or loose connector contact Malfunction of engine-ECU <m t=""></m> Malfunction of engine-A/T-ECU
Check the following connectors: A-08, B-115 <m t="">, B-112 </m>	NG – Repa	ir
ок		
Check the harness wire between the injector driver and the engine-ECU <m t=""> or engine-A/T-ECU .</m>	NG 🔶 Repai	r
OK	_ NG	
 Use an analyzer to measure the signal waveform at engine-ECU connectors B-117, B-113 <m t=""> or engine-A/T-ECU connectors B-115, B-112 .</m> Engine: Idling The voltage between terminal 96 <m t="">, 63 and earth, terminal 1 and earth</m> OK: A normal waveform should be displayed as described on P.13A-129* (INSPECTION PROCEDURE USING AN ANALYZER). 	Repla	ce the injector driver.
ОК	- . OK	
Check the trouble symptoms.		ittent malfunction to GROUP 00 - Points to Note for Intermittent
NG	Malfur	nctions.)
Replace the engine-ECU <m t=""> or engine-A/T-ECU .</m>	}	

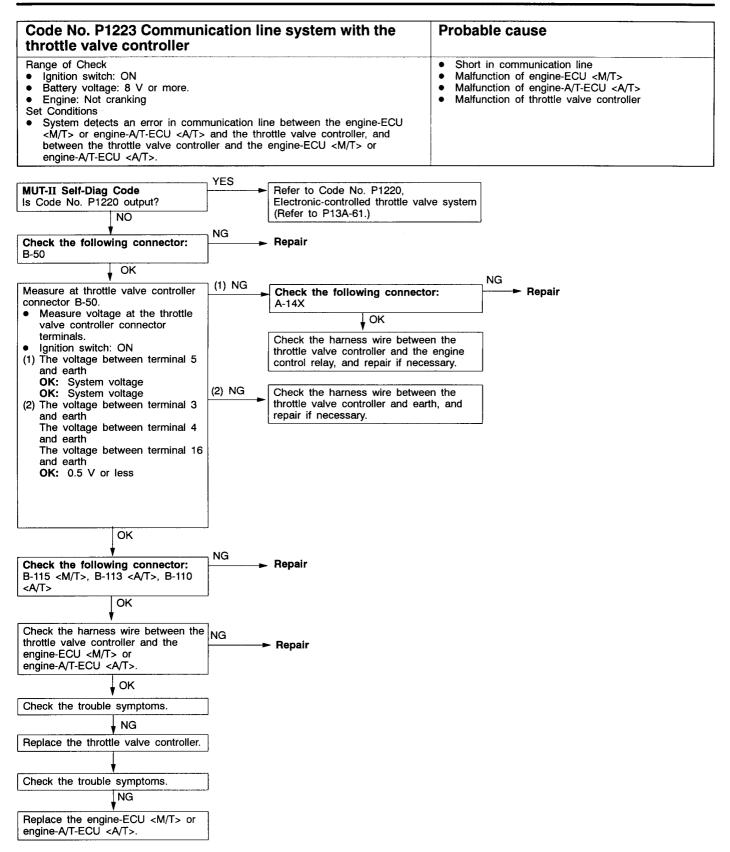
NOTE:

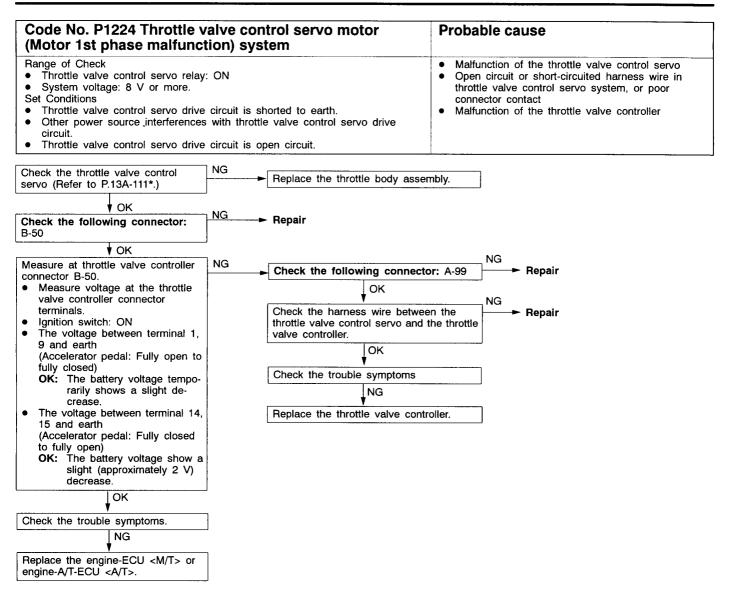
Code No. P1220 Electronic-controlled throttle valve system	Probable cause
 Range of Check Ignition switch: ON Error in communication between the engine-ECU <m t=""> or engine-A/T-ECU and the throttle valve controller</m> Set Conditions Output voltage of throttle position sensor (2nd channel) fluctuates 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 </m> 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 request the throttle valve controller.</m> 	 Short in communication line Malfunction of the engine-ECU <m t=""></m> Malfunction of the engine-A/T-ECU Malfunction of the throttle valve controller

Check the following connectors: B-50, B-115 <m t="">, B-113 </m>	NG Repair
OK Check the harness wire between the throttle valve controller and the engine-ECU <m t=""> or engine-A/T-ECU .</m>	NG Repair
ок	
Check the trouble symptoms.]
NG	
Replace the throttle valve controller.	
Check the trouble symptoms.	
NG	-
Replace the engine-ECU <m t=""> or engine-A/T-ECU .</m>]

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 .</m> 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 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)</m> 	 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

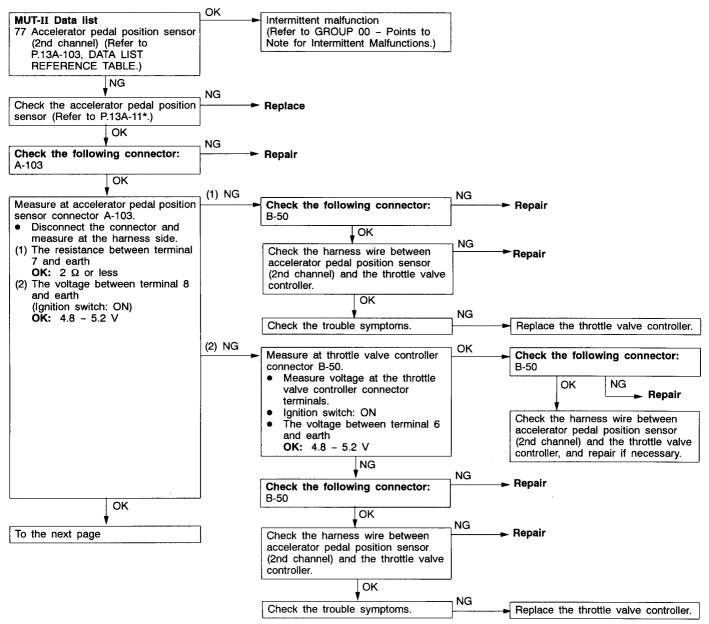
	, YES	
MUT-II Self-Diag Code Is code No. P0120 set?		Refer to Code No. P0120, Throttle position sensor (1st channel) system (Refer to P.13A-23.)
NO		
MUT-II Self-Diag Code Is Code No. P1224 set?		Refer to Code No. P1224, Throttle valve control servo motor (motor 1st phase malfunction) system (Refer to P.13A-64.)
NO		
MUT-II Self-Diag Code Is Code No. P1228 set?		Refer to Code No. P1228, Throttle valve control servo motor (motor 2nd phase malfunction) system (Refer to P.13A-67.)
NO	-	
Adjust the throttle position sensor. (Refer to P.13A-97*.)		
ОК	, NG	
Check the throttle valve control servo. (Refer to P.13A-111*.)	├ ───►	Replace the throttle body assembly.
OK	-	
Check the following connectors: A-73, A-99, B-50	NG	- Repair
NG		
Check the harness wires between the throttle position sensor and the throttle valve controller, and between the throttle valve control servo and the throttle valve controller.		- Repair
ок	-	
Check the trouble symptoms.]	
NG	-	
Replace the throttle valve controller.]	

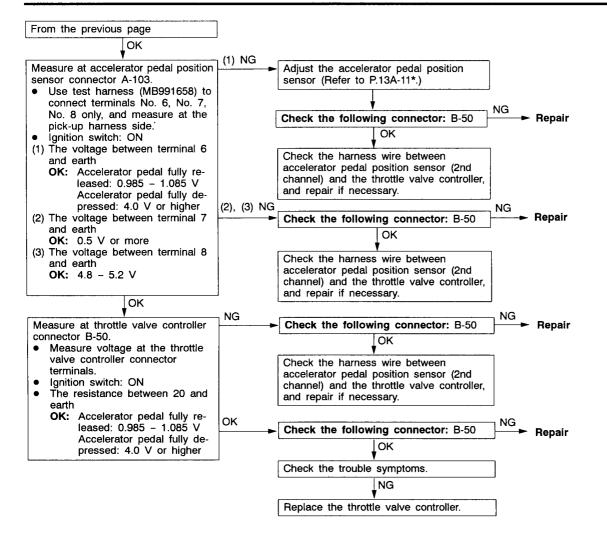




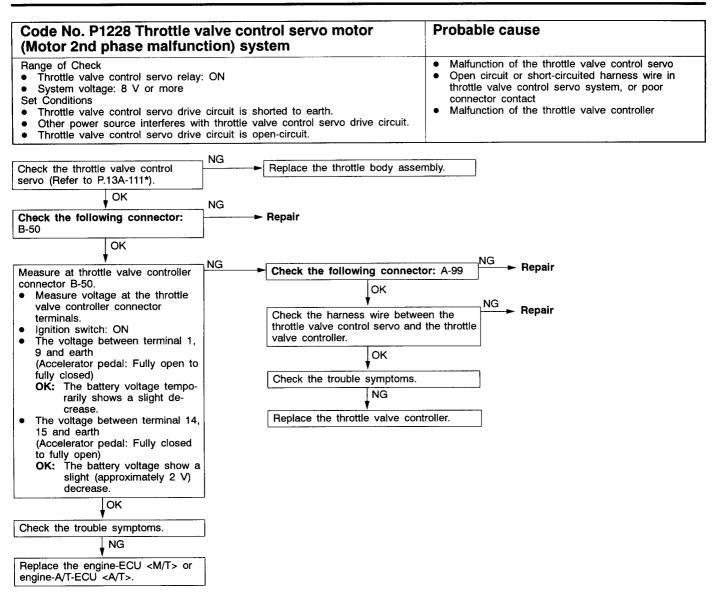
NOTE:

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 A/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 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 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. Oifference 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=""></m> Malfunction of engine-A/T-ECU

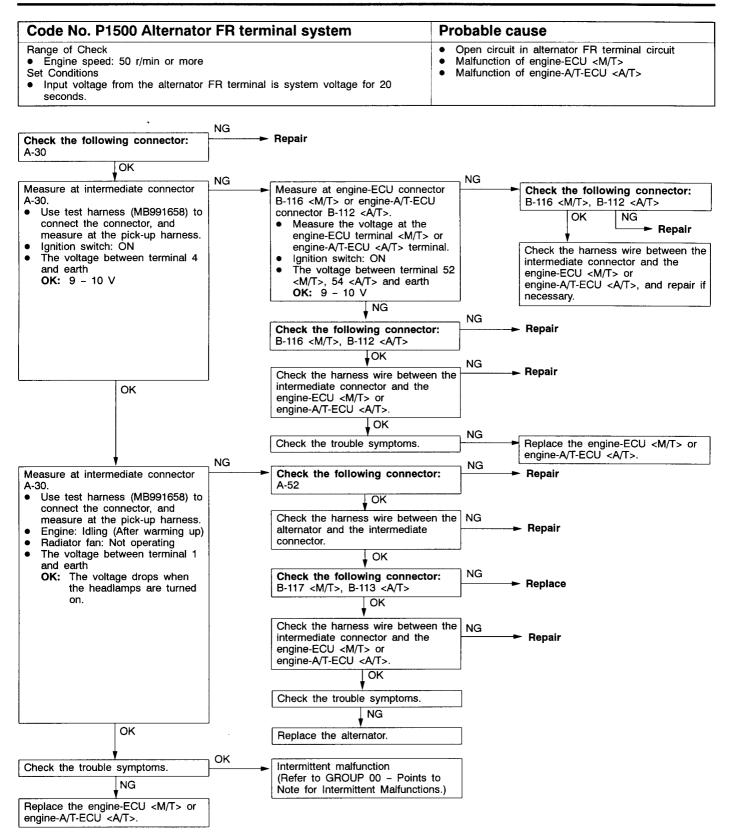


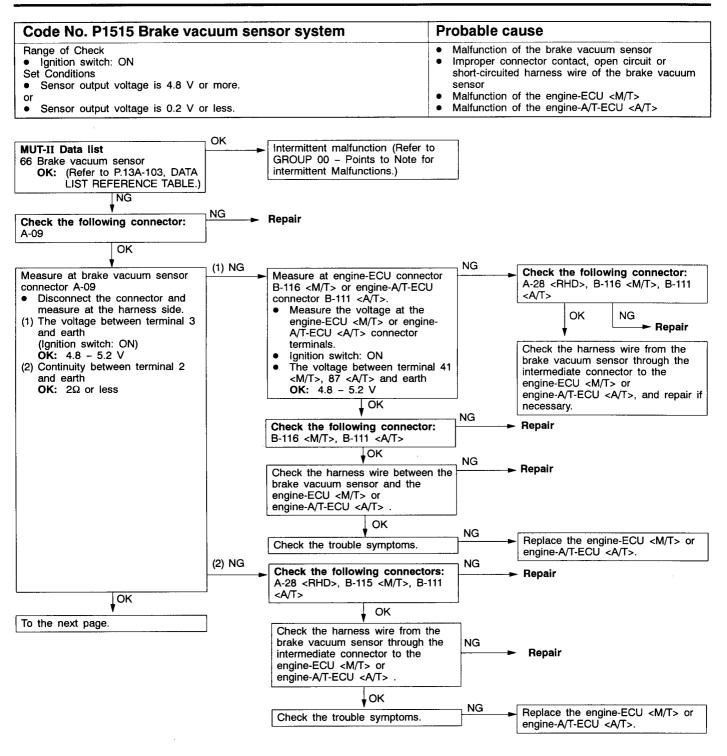


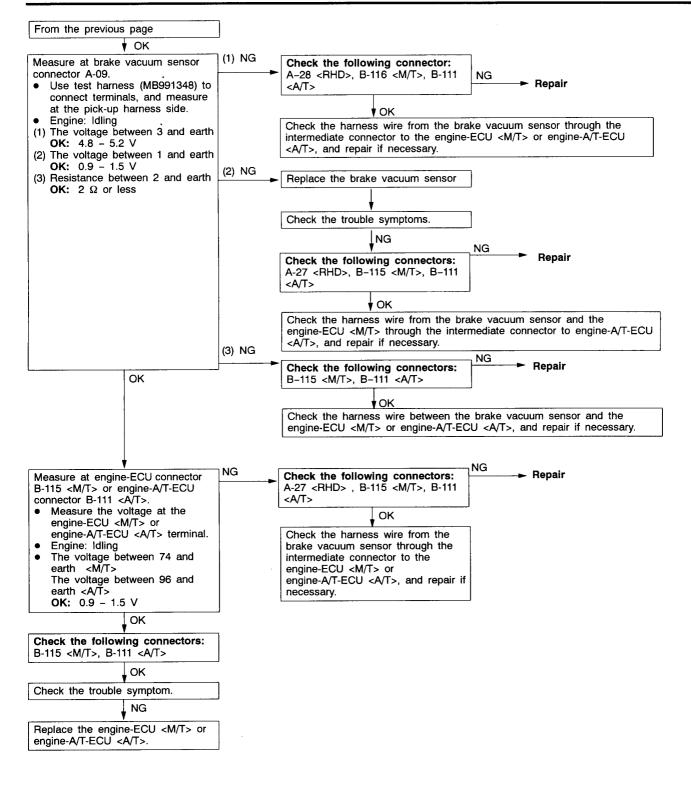
GDI <4G6> - Troubleshooting



NOTE:



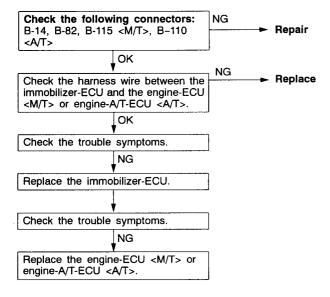




Cord No. P1610 Immobilizer system	Probable cause	
 Range of Check Ignition switch: ON Set Conditions Improper communication between the engine-ECU <m t=""> or engine-A/T-ECU and the immobilizer-ECU</m> 	 Open or short circuit, or loose connector contact Malfunction of the immobilizer-ECU Malfunction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



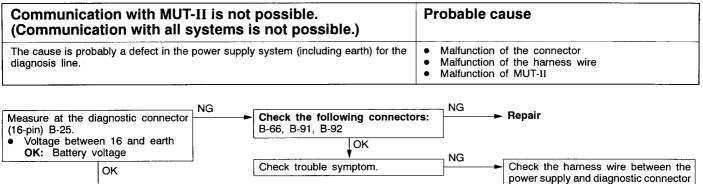
INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom		Inspection procedure No.	Reference page
Communication			13A-73
with MUT-II is impossible.	Communication with engine-ECU only is not possible.	2	13A-73
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-74
	The engine warning lamp remains illuminating and never goes out.	4	13A-74
Starting	No initial combustion (starting impossible)	5	13A-75
	Initial combustion but no complete combustion (starting impossible)	6	13A-77
	Long time to start (improper starting)		
Idling stability	Unstable idling (Rough idling, hunting)	7	13A-78
(Improper idling)	Idling speed is high. (Improper idling speed)	8	13A-80
	Idling speed is low. (Improper idling speed)	-	
Idling stability (Engine stalls)	When the engine is cold, it stalls at idling. (Die out)	9	13A-81
	When the engine is hot, it stalls at idling. (Die out)	10	13A-82
	The engine stalls when starting the car. (Pass out)	11	13A-84
	The engine stalls when decelerating.	12	13A-85
	Hesitation, sag or stumble	13	13A-86
	Poor acceleration	-	
	Surge	-	
	The feeling of impact or vibration when accelerating	14	13A-87
	The feeling of impact or vibration when decelerating	15	13A-88
	Knocking	16	13A-88
Dieseling	L	17	13A-88
Too high CO and HC concentration when idling		18	13A-89
Low alternator output voltage (approx. 12.3 V)		19	13A-90
Engine idle speed is incorrect while the A/C is on.		20	13A-91
Fans (radiator fan, A/C condenser fan) are inoperative		21	13A-91
Clutch switch sys	tem malfunction <m t=""></m>	22	13A-92
GDI ECO indi-	GDI ECO indicator lamp does not illuminate.	23	13A-92
cator lamp sys- tem	GDI ECO indicator lamp remains illuminated and does not go off.	24	13A-93

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

NG

INSPECTION PROCEDURE 1



Check the harness wire between the

diagnostic connector (16-pin) and earth,

and repair if necessary.

INSPECTION PROCEDURE 2

Measure at the diagnostic connector

Continuity between 4 and earth

Continuity between 5 and earth

OK

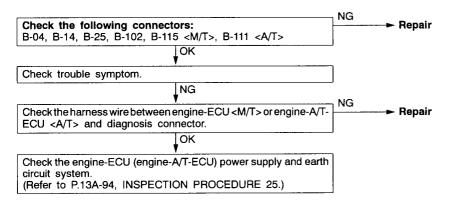
(16-pin) B-25.

OK: Continuity

Replace the MUT-II.

•

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 .</m> Defective earth circuit of engine-ECU <m t=""> or engine-A/T-ECU .</m> Defective engine-ECU <m t=""> or engine-A/T-ECU .</m> Improper communication line between engine-ECU <m t=""> or engine-A/T-ECU .</m> 	 Malfunction of engine-ECU <m t=""> or engine-A/T-ECU power supply circuit</m> Malfunction of engine-ECU <m t=""> or engine-A/T-ECU </m> Open circuit between the engine-ECU <m t=""> or engine-A/T-ECU and diagnosis connector</m>

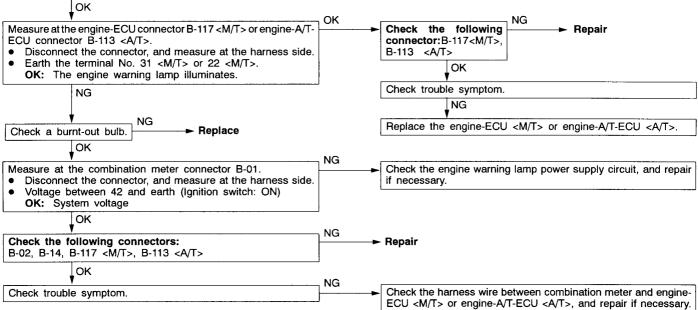


NOTE

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.)

⁽¹⁶⁻pin), and repair if necessary.

Probable cause The engine warning lamp does not illuminate right after the ignition switch is turned to the ON position. Because there is a burnt-out bulb, the engine-ECU <M/T> or engine-A/T-ECU <A/T> Burnt-out bulb . 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 Defective warning lamp circuit . Malfunction of the engine-ECU <M/T> . Malfunction of the engine-A/T-ECU <A/T> after the ignition switch is turned to ON, one of the malfunctions listed at right has . probably occurred. NG Check the engine-ECU (engine-A/T-ECU) power supply and earth **MUT-II** Data list 16 engine-ECU (engine-A/T-ECU) power supply voltage (Refer circuit system. (Refer to P.13A-94, INSPECTION PROCEDURE 25.) to P.13A-104.)



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 is detecting a problem in a sensor or actuator, or that one of the malfunctions listed at right has occurred.</m>			 Short-circuit between the engine warning lamp and engine-ECU Malfunction of the engine-ECU <m t=""></m> Malfunction of the engine-A/T-ECU 	
	Yes	5.		
MUT-II Self-Diag code Are diagnosis codes displayed?	►	Refer CODE	to P.13A-12, INSPECTION CHART FOR DIAGNOSIS S.	
v No	, NG			
 Measure at the combination meter connector B-02. Disconnect the connector, and measure at the harness side. Disconnect the engine-ECU connector <m t=""> or engine-A/T-ECU connector.</m> Continuity between 22 and earth OK: No continuity 			the harness wire between combination meter and engine- <m t=""> or engine-A/T-ECU connector, and repair if sary.</m>	
ok				
Replace the engine-ECU <m t=""> or engine-A/T-ECU .</m>				

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.		proper	 Malfunction of the fuel supply system Malfunction of the ignition system Malfunction of the engine-ECU <m t=""></m> Malfunction of the engine-A/T-ECU
· · · · · · · · · · · · · · · · · · ·	NG		
Check system voltage while the engine is cranking. OK: 8 V or more		Check	the battery. (Refer to GROUP 55 - Battery.)
ОК	Yes		
MUT-II Self-Diag code ls a diagnosis code displayed?		Refer CODE	to P.13A-12, INSPECTION CHART FOR DIAGNOSIS S.
No	NG		
MUT-II Data list 16 System voltage (Refer to P.13A-104.)	<u>}</u>		the engine control relay and ignition switch-IG system. to P.13A-95, INSPECTION PROCEDURE 26.)
OK	No		
Does the camshaft rotate when the engine is cranking?	}	Check	if the timing belt is broken or damaged.
Yes	NG		
MUT-II Actuator test 07 Fuel pump (low pressure) (Refer to P.13A-110.)			the fuel pump (low pressure) system. to P.13A-99, INSPECTION PROCEDURE 30.)
Ток	_ NG	L	
MUT-II Data list 22 Crank angle sensor (Refer to P.13A-104.)			the crank angle sensor system. (Refer to P.13A-49, INSPEC- PROCEDURE FOR DIAGNOSIS CODE P0335.)
ОК	_ NG		
MUT-II Data list 21 Engine coolant temperature sensor (Refer to P.13A-104.)		(Refer	the engine coolant temperature sensor system. toP.13A-20, INSPECTIONPROCEDUREFORDIAGNOSIS P0115.)
ОК	, NG	·	
MUT-II Data list 79 Throttle position sensor (1st channel) (Refer to P.13A-107.) OK		(Refer	the throttle position sensor (1st channel) system. toP.13A-23, INSPECTIONPROCEDUREFORDIAGNOSIS P0120.)
	, ок		around the throttle volue (Defer to D124.07*)
Inspect engine start ability by cranking the engine while the accelerator pedal is slightly depressed.		Clean	around the throttle valve. (Refer to P.13A-97*.)
NG	¬ NG		
 Measure at injector driver connector A-08. Disconnect the connector, and measure at the connector side. Voltage between each of terminals 4, 12, 21 and earth (Ignition switch: ON) OK: System voltage 			the injector driver system. to P.13A-96, INSPECTION PROCEDURE 27.)
ОК			
Check fuel leakage. (Refer to P.13A-132.)	∎	► Repa	ir
ОК	∽ ¬ NG		
Measure low fuel pressure between the fuel pump (low pressure) and fuel pump (high pressure). (Refer to P.13A-131.)		► Repa	ir
↓OK	_		
To the next page			

NOTE:

13A-76

From the previous page	
ОК	NG
 Measure at ignition coil connectors A-74, A-94, A-97, A-98. Connect the connector. Connect a timing light to the No. 1 terminal of each connector in turn. (Engine cranking) OK: The timing light flashes. 	Check the ignition coil (incorporating power transitor) system. (RefertoP.13A-46, INSPECTIONPROCEDURE FOR DIAGNOSIS CODE P0300.)
ок	
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.
ок	
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.	NG Replace the ignition coil.
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.	
ОК	-
 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.
	- <u></u>

Initial combustion takes place, but does (start impossible), too long time to start (po	olete Probable cause	
This may be caused by improper spark plug ignition (poor spark 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=""></m> Malfunction of the engine-A/T-ECU 	
	NG	
Check system voltage while the engine is cranking. OK: 8 V or more		Check the battery. (Refer to GROUP 55 - Battery.)
ОК	- - Yes	
MUT-II Self-Diag code Is a diagnosis code displayed?	 −−− ►	Refer to P.13A-12, INSPECTION CHART FOR DIAGNOSIS CODES.
No		
MUT-II Actuator test 07 Fuel pump (low pressure) (Refer to P.13A-110.)	NG ►	Check the fuel pump (low pressure) system. (Refer to P.13A-99, INSPECTION PROCEDURE 30.)
ок	_ NG	
MUT-II Data list 21 Engine coolant temperature sensor (Refer to P.13A-104.)	 	Check the engine coolant temperature system. (Refer to P.13A-20, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0115.)
OK	_ NG	
MUT-II Data list 18 Cranking signal (Refer to P.13A-104.)	•	Check the ignition switch-ST system. (Refer to P.13A-97, INSPECTION PROCEDURE 28.)
OK		
WUT-II Data list 74 Fuel pressure sensor (Refer to P.13A-107.)	NG	Check an abnormal fuel pressure system. (Refer to P.13A-35, IN- SPECTION PROCEDURE FOR DIAGNOSIS CODE P0190.)
Įοκ	_]	
Check fuel leakage. (Refer to P.13A-132.)	NG	- Repair
↓OK		
Is the engine started normally when it is cranked with the accelerator pedal depressed slightly?	Yes	Clean around the throttle valve. (Refer to P.13A-97*.)
No	 NG	
MUT-II Data list		Check the throttle valve position feedback system. (Referto P.13A-62, INSPECTION PROCEDURE FOR DIAGNOSIS
79 Throttle position sensor (1st channel) (Refer to P.13A-107.) LOK		CODE P1221.)
Check ignition timing when the engine is cranked.	NG	Check that the crank angle sensor and timing belt cover are properly
ОК: арргох. 5° ВТĎС		installed.
VОК	- ¬ 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.		Replace the ignition coil.
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.		
ОК	_	
 Check all the following items: Spark plug Compression pressure Foreign material (such as water or kerosine) entered the fuel lines 		
V OK	NG	
Check trouble symptom.		Replace the injector.

NOTE:

Unstable idling (rough idle, hunting)			Probable cause
This malfunction is probably caused by a faulty ignition system, im a faulty electronic-controlled throttle valve system, improper com etc. As many causes can be suspected, diagnose from easie	pression pres	l ratio, ssure,	 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
	Yes		
Has the battery been disconnected recently?	├		up the engine, and then let it run at idle for approx. ten
No	Yes	minute	5.
MUT-II Self-Diag code Is a diagnosis code displayed?		Refer CODE	to P.13A-12, INSPECTION CHART FOR DIAGNOSIS S.
Νο			
Does the engine idle speed fluctuates excessively (excessive hunt- ing)?	Yes	Clean	around the throttle valve. (Refer to P.13A-97*.)
No			
MUT-II Data list 79 Throttle position sensor (1st channel) (Refer to P.13A-107.)	NG }►	(Refer	the throttle valve position feedback system. toP.13A-62, INSPECTION PROCEDURE FOR DIAGNOSIS P1221.)
OK	NG	0002	
MUT-II Data list 26 Accelerator pedal position switch (Refer to P.13A-105.)			the accelerator pedal position switch system. (Refer to 98, INSPECTION PROCEDURE 29.)
ОК			
MUT-II Data list 13 Intake air temperature sensor (Refer to P.13A-103.)	NG	(Refer	the intake air temperature sensor system. toP.13A-19, INSPECTIONPROCEDURE FORDIAGNOSIS P0110.)
	ר NG		
MUT-II Data list 25 Barometric pressure sensor (Refer to P.13A-105.)			the barometric pressure sensor system. (Refer to P.13A-17, CTION PROCEDURE FOR DIAGNOSIS CODE P0105.)
ок	, NG		
MUT-II Data list 21 Engine coolant temperature sensor (Refer to P.13A-104.)			the engine coolant temperature sensor. (Refer to P.13A-20, CTION PROCEDURE FOR DIAGNOSIS CODE P0115.)
OK	- NG		
MUT-II Actuator test 08 Purge control solenoid valve (Refer to P.13A-110.)			the purge control solenoid valve system. (Refer to P.13A-56, CTION PROCEDURE FOR DIAGNOSIS CODE P0443.)
ок	NG		
MUT-II Data list 59 Oxygen sensor (rear) • Transmission: 2nd gear <m t="">, L range </m>			the oxygen sensor (rear) system. (Refer to P.13A-30, IN- TION PROCEDURE FOR DIAGNOSIS CODE P0136.)
 Driving with throttle widely open OK: 600 - 1,000 mV 			
ок Т	, NG		
MUT-II Data list 11 Oxygen sensor (front) OK: 600 - 1,000 mV when the engine is suddenly raced			the oxygen sensor (front) system. (Refer to P.13A-27, IN- TION PROCEDURE FOR DIAGNOSIS CODE P0130.)
ОК			
To the next page]		
	-		

NOTE:

From the previous page		
ļ ок		
MUT-II Data list 11 Oxygen sensor (front)	NG	Measure fuel high-pressure between the fuel pump (high pressure) and injector. (Refer to P.13A-129.)
OK: 0 – 400 mV and 600 – 1,000 mV alternates when the engine is idling (wait for four minutes after the engine		OK NG
started).		v Repair
OK	1	Check that air is sucked in the air intake system.
		 Broken intake manifold gasket
		Damaged vacuum hose Demaged air intelva hase
•		Damaged air intake hose
MUT-II Data list	NG	Check the power steering fluid pressure switch system. (Refer
27 Power steering fluid pressure switch (Refer to P.13A-105.)		to P.13A-100, INSPECTION PROCEDURE 31.)
ок		
MUT-II Data list	NG	Check the A/C switch and A/C relay system. (Refer to P.13A-100,
28 A/C switch (Refer to P.13A-105.)		INSPECTION PROCEDURE 32.)
та ск	-	
MUT-II Data list	NG	Check the M/T oil temperature sensor system <m t="">. (Refer to</m>
48 M/T oil temperature sensor <m t=""> (Refer to P.13A-106.)</m>		P.13A-101, INSPECTION PROCEDURE 33.)
OK		
MUT-II Data list		Check the stop lamp switch. (Refer to P.13A-102, INSPECTION
67 Stop lamp switch (Refer to P.13A-106.)		PROCEDURE 34.)
OK	-	
MUT-II Data list	NG	Check the small lamp switch system. (Refer to P.13A-102, INSPEC-
31 Small lamp switch (Refer to P.13A-105.)		TION PROCEDURE 35.)
OK	NC	
MUT-II Data list	ר NG רשיי	Check the EGR valve. (Refer to P.13A-53, INSPECTION PROCE-
68 EGR valve (Refer to P.13A-107.)]	DURE FOR DIAGNOSIS CODE P0403.)
OK	NG	
Check ignition timing. (Refer to GROUP 11A - Engine Adjustment.)		Check that the crank angle sensor and timing belt cover are properly
ι οκ		installed.
Clean around the throttle valve. (Refer to P.13A-97*.)	1	
	J	
Check trouble symptom.	7	
NG	_	
	_ NG	
Check ignition coil spark for each cylinder. (1) Remove the ignition coil.		- Replace 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 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:

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.		or too • Malfunction of the electronic-controlled throttle valve system • Malfunction of the throttle body
	Vaa	
MUT-II Self-Diag code Is a diagnosis code displayed?	Yes	(Refer to P.13A-12, INSPECTION CHART FOR DIAGNOSIS CODES.)
No	_ NG	
MUT-II Data list 79 Throttle position sensor (1st channel) (Refer to P.13A-107.) OK		Check the throttle valve position feedback system. (RefertoP.13A-62, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P1221.)
WUT-II Actuator test 08 Purge control solenoid valve (Refer to P.13A-110.)	_ NG	Check the purge control solenoid valve. (Refer to P.13A-56, IN- SPECTION PROCEDURE FOR DIAGNOSIS CODE P0443.)
ОК		
MUT-II Data list 26 Accelerator pedal position switch (Refer to P.13A-105.)		Check the accelerator pedal position switch system. (Refer to P.13A-98, INSPECTION PROCEDURE 29.)
ОК	NG	
MUT-II Data list 21 Engine coolant temperature sensor (Refer to P.13A-104.)		Check the engine coolant temperature sensor. (Refer to P.13A-20, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0115.)
ок		
MUT-II Data list 28 A/C switch (Refer to P.13A-105.)		Check the A/C switch and A/C relay system. (Refer to P.13A-100, INSPECTION PROCEDURE 32.)
ОК	_ NG /	
MUT-II Data list 48 M/T oil temperature sensor <m t=""> (Refer to P.13A-106.)</m>		Check the M/T oil temperature sensor <m t="">. (Refer to P.13A-101, INSPECTION PROCEDURE 33.)</m>
ок	_ NG	
MUT-II Data list 67 Stop lamp switch (Refer to P.13A-106.)		Check the stop lamp switch system. (Refer to P.13A-102, INSPECTION PROCEDURE 34.)
, ok		
MUT-II Data list 7E V.V.T. phase angle (Refer to P.13A-108.)	NG	Check the V.V.T. system. • Malfunction of the oil control valve
ок		 Malfunction of the V.V.T. sprocket Clogged oil passage
 Clean around the throttle valve. (Refer to P.13A-97*.) Adjust the throttle position sensor. (Refer to P.13A-97*.) 		

NOTE:

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.		hen the	 Malfunction of the electronic-control throttle valve system Malfunction of the throttle body
	Vee		
Have the battery terminals been disconnected recently?	_ Yes 		up the engine, and then let it run at idle for approx. ten
No	_ Yes	minute	S
MUT-II Self-Diag code Is a diagnosis code displayed?]	 (Refer CODE 	to P.13A-12, INSPECTION CHART FOR DIAGNOSIS S.)
No	- Voo		
Is the engine idling correct after the engine has been warmed up?	Yes		to "Unstable idling (rough idle, hunting). to P.13A-78, INSPECTION PROCEDURE 7.)
MUT-II Data list 22 Crank angle sensor (Refer to P.13A-104.) Check idling speed when the engine is cold.	NG	(Refer	the throttle valve position feedback system. toP.13A-62, INSPECTIONPROCEDUREFORDIAGNOSIS P1221.)
• ОК	_ NG		
MUT-II Data list 26 Accelerator pedal position switch (Refer to P.13A-105.) OK			the accelerator position switch. to P.13A-98, INSPECTION PROCEDURE 29.)
	NG		
MUT-II Data list 21 Engine coolant temperature sensor (Refer to P.13A-104.) OK]		the engine coolant temperature sensor. (Refer to P.13A-20, CTION PROCEDURE FOR DIAGNOSIS CODE P0115.)
	אק NG	Ohaala	
68 EGR valve (Refer to P.13A-107.)			the EGR valve system. (Refer to P.13A-53, INSPECTION EDURE FOR DIAGNOSIS CODE P0403.)
	ר Yes		
Does the engine stall immediately after the accelerator pedal is released?			around the throttle valve. (Refer to P.13A-97*.)
No	_		
Measure fuel high pressure between the fuel pump (high pressure) and injector. (Refer to P.13A-129.)	NG	► Repair	
ОК	_ NG	<u>_</u>	
Check ignition timing. (Refer to GROUP 11A – Engine Adjustment.)		 Check installe 	that the crank angle sensor and timing belt cover are properly ad.
ОК	, 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.		Replace	e the ignition coil.
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.			
ок	-, OK		
Check all the following items:		Check	trouble symptom.
Spark plugs Compression pressure			NG
Engine oil viscosity		Replac	e the injector.

NOTE:

When the engine is hot, it stalls at idling. (D	Probable cause	
The cause is probably an improper air/fuel ratio, faulty electroni valve system, compression pressure. In addition, if the engine stall possible cause might be a poor connector contact.	c-controlled t s suddenly, ar	 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
	Yes	
Have the battery terminals been disconnected recently?	<u>}</u> ►	 Warm up the engine, and then let it run at idle for approx. ten minutes.
No	Yes	
MUT-II Self-Diag code Is a diagnosis code displayed?	}►	Refer to P.13A-12, INSPECTION CHART FOR DIAGNOSIS CODES.
No	NG	
MUT-II Data list 79 Throttle position sensor (1st channel) (Refer to P.13A-107.) OK		 Check the throttle valve position feedback system. (RefertoP.13A-62, INSPECTIONPROCEDURE FORDIAGNOSIS CODE P1221.)
·	No	
Is it easy to reproduce the engine stall? Yes		 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 </m>
MUT-II Data list	NG	Check the accelerator pedal position switch.
26 Accelerator pedal position switch (Refer to P.13A-105.)	-	(Refer to P.13A-98, INSPECTION PROCEDURE 29.)
ок	, NG	
MUT-II Data list 13 Intake air temperature sensor (Refer to P.13A-103.)		Check the intake air temperature sensor. (Refer to P.13A-19, IN- SPECTION PROCEDURE FOR DIAGNOSIS CODE P0110.)
OK	NG	
MUT-II Data list 25 Barometric pressure sensor (Refer to P.13A-105.)	 	 Check the barometric pressure sensor. (Refer to P.13A-17, IN- SPECTION PROCEDURE FOR DIAGNOSIS CODE P0105.)
ОК	- NG	
MUT-II Data list 21 Engine coolant temperature sensor (Refer to P.13A-104.)		Check the engine coolant temperature sensor. (Refer to P.13A-20, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0115.)
ОК	NG	
MUT-II Data list 59 Oxygen sensor (rear) • Transmission: 2nd gear <m t="">, L range • Driving with throttle widely open OK: 600 - 1,000 mV</m>		Check the oxygen sensor (rear) system. (Refer to P.13A-30, IN- SPECTION PROCEDURE FOR DIAGNOSIS CODE P0136.)
ОК	NG	
MUT-II Data list 11 Oxygen sensor (front) OK: 600 - 1,000 mV when the engine is suddenly raced OK		 Check the oxygen sensor (front) system. (Refer to P.13A-27, IN- SPECTION PROCEDURE FOR DIAGNOSIS CODE P0130.)
I	NG	Moonuro fuel biob procesure between the fuel sume think
MUT-II Data list 11 Oxygen sensor (front)		Measure fuel high-pressure between the fuel pump (high pressure) and injector. (Refer to P.13A-129.)
OK: 0 – 400 mV and 600 – 1,000 mV alternates when the engine is idling (wait for four minutes after the engine started).		OK NG
ок		Check that air is sucked in the air intake system.
To the next page]	 Broken intake manifold gasket Damaged vacuum hose Damaged air intake hose

GDI <4G6> - Troubleshooting

From the previous page		
OK		
MUT-II Data list 27 Power steering fluid pressure switch (Refer to P.13A-105.)	NG	Check the power steering fluid pressure switch system. (Refer to P.13A-100, INSPECTION PROCEDURE 31.)
OK MUT-II Data list	NG	Check the A/C switch and A/C relay system.
28 A/C switch (Refer to P.13A-105.)		(Refer to P.13A-100, INSPECTION PROCEDURE 32.)
MUT-II Data list 31 Small lamp switch (Refer to P.13A-105.)	NG	Check the small lamp switch system. (Refer to P.13A-102, INSPECTION PROCEDURE 35.)
↓ OK	n NG	
MUT-II Data list 34 Air flow sensor reset signal (Refer to P.13A-105.)		Check the airflow sensor system. (Refer to P.13A-15, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0100.)
OK	NG	
MUT-II Data list 68 EGR valve (Refer to P.13A-107.)	 	Check the EGR valve. (Refer to P.13A-53, INSPECTION PROCE- DURE FOR DIAGNOSIS CODE P0403.)
, OK		
MUT-II Data list 7E V.V.T. phase angle (Refer to P.13A-108.)	NG ►	Check the V.V.T. system. Malfunction of the oil control valve
ок		 Malfunction of the V.V.T. sprocket Clogged oil passage
Does the engine stall immediately after the accelerator pedal is released?	Yes	Clean around the throttle valve. (Refer to P.13A-97*.)
No	¬ NG	
Check ignition timing. (Refer to GROUP 11A – Engine Adjustment.)] \u	Check that the crank angle sensor and timing belt cover are properly installed.
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.	NG	Replace the ignition coil.
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.		
ОК		
 Check all the following items: Spark plugs Compression pressure Foreign material (such as water or kerosine) entered the fuel lines 		

NOTE:

The engine stalls when starting the car. (Pas	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? No MUT-II Data list 68 EGR valve (Refer to P.13A-107.) OK		(Refer to P.13A-12, INSPECTION CHART FOR DIAGNOSIS CODES.) Check the EGR valve. (Refer to P.13A-53, INSPECTION PROCE- DURE FOR DIAGNOSIS CODE P0403.)
MUT-II Actuator test 08 Purge control solenoid valve (Refer to P.13A-110.) OK		Check the purge control solenoid valve system. (Refer to P.13A-56, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0443.)
 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. 		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		

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 		
	Yes			
Have the battery terminals been disconnected recently?			up the engine, and then let it run at idle for approx. ten	
No	Vaa	minute	<i>≥S.</i>	
MUT-II Self-Diag code Is a diagnosis code displayed?	Yes (Refe COD		to P.13A-12, INSPECTION CHART FOR DIAGNOSIS S.)	
No				
MUT-II Data list 26 Accelerator pedal position switch (Refer to P.13A-105.)			the accelerator pedal position switch. to P.13A-98, INSPECTION PROCEDURE 29.)	
Jok	」 ¬ NG			
MUT-II Data list 79 Throttle position sensor (1st channel) (Refer to P.13A-107.)			the throttle valve position feedback system. toP.13A-62, INSPECTIONPROCEDURE FORDIAGNOSIS	
	ļ		ODE P1221.)	
MUT-II Data list			the EGR valve system. (Refer to P.13A-53, INSPECTION	
68 EGR valve (Refer to P.13A-107.)			EDURE FOR DIÁGNOSIS CODE P0403.)	
ок	, NG			
Check ignition coil spark for each cylinder.	Rep		ce 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:]			
 Spark plug Clean around the throttle valve (Refer to P.13A-97*.) 				

NOTE:

Hesitation, sag, stumble, poor acceleration or surge		1	Probable cause
The cause is probably a malfunction of the ignition system, electronic-control valve system, compression pressure, etc.		hrottle	system
	Yes		
MUT-II Self-Diag code Is a diagnosis code displayed?	 >	(Refer to CODES.)	P.13A-12, INSPECTION CHART FOR DIAGNOSIS
OK	_ NG		
Check ignition timing. (Refer to GROUP 11A – Engine Adjustment.) OK		Check that installed.	at the crank angle sensor and timing belt cover are properly
	NG		
MUT-II Data list 26 Accelerator pedal position switch (Refer to P.13A-105.) OK			e accelerator pedal position switch. P.13A-98, INSPECTION PROCEDURE 29.)
MUT-II Data list	NG	Check th	e intake air temperature sensor. (Refer to P.13A-19, IN-
13 Intake air temperature sensor (Refer to P.13A-103.)			DN PROCEDURE FOR DIAGNOSIS CODE P0110.)
······	NG	[
MUT-II Data list 25 Barometric pressure sensor (Refer to P.13A-105.)			e barometric pressure sensor. (Refer to P.13A-17, IN- DN PROCEDURE FOR DIAGNOSIS CODE P0105.)
OK	_ NG		
MUT-II Data list 21 Engine coolant temperature sensor (Refer to P.13A-104.)	 	Check the INSPECT	e engine coolant temperature sensor. (Refer to P.13A-20, FION PROCEDURE FOR DIAGNOSIS CODE P0115.)
ок			
MUT-II Data list 79 Throttle position sensor (1st channel) (Refer to P.13A-107.)	NG	Check th (RefertoF	e throttle valve position feedback system. P.13A-62, INSPECTION PROCEDURE FOR DIAGNOSIS
OK	J	CODE P	1221.)
 MUT-II Data list 59 Oxygen sensor (rear) Transmission: 2nd gear <m t="">, L range </m> Driving with throttle widely open OK: 600 - 1,000 mV 	NG	Check the SPECTIC	e oxygen sensor (rear) system. (Refer to P.13A-30, IN- DN PROCEDURE FOR DIAGNOSIS CODE P0136.)
ОК	-		
MUT-II Data list 11 Oxygen sensor (front) OK: 600 - 1,000 mV when the engine is suddenly raced	NG ►	Check th	e oxygen sensor (front) system. (Refer to P.13A-27, IN- DN PROCEDURE FOR DIAGNOSIS CODE P0130.)
	ł		
MUT-II Data list	NG	Mosoure	fuel high-pressure between the fuel pump (high pressure)
OK: 0 – 400 mV and 600 – 1,000 mV alternates when the			stor. (Refer to P.13A-129.)
engine is idling (wait for four minutes after the engine		(↓OK
Started).		 Broke Dama 	at air is sucked in the air intake system. n intake manifold gasket iged vacuum hose iged air intake hose
MUT-II Data list	NG	Check the	EGR valve. (Refer to P.13A-53, INSPECTION PROCE-
68 EGR valve (Refer to P.13A-107.)			OR DIAGNOSIS CODE P0403.)
ОК			
MUT-II Actuator test 08 Purge control solenoid valve (Refer to P.13A-110.)	NG]►		e purge control solenoid valve. (Refer to P.13A-56, IN- DN PROCEDURE FOR DIAGNOSIS CODE P0443.)
ок	-		
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]
From the previous page	
LOK	
	1 NG
Measure high fuel pressure between the fuel pump (high pressure) and injector. (Refer to P.13A-129.)	► Repair
ок	
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.	
ок	
Check all the following items:	OK Check trouble symptom.
Spark plug	
EGR system	↓ NG
Compression pressure	
Clogged fuel filter, fuel line	Replace the injector.

The feeling of impact when accelerating		Probable cause
The cause is probably an ignition leak being generated in line the spark plug request voltage during acceleration.	with an increase	in • Malfunction of the ignition system
MUT-II Self-Diag code Is a diagnosis code displayed?		efer to P.13A-12, INSPECTION CHART FOR DIAGNOSIS
NO MUT-II Data list 79 Throttle position sensor (1st channel) (Refer to P.13A-107.) OK	(Ri CC	eck the throttle valve position feedback system. efertoP.13A-62,INSPECTIONPROCEDUREFORDIAGNOSIS DE P1221.)
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.		eck all the following items: 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 Re	place the ignition coil.
(4) Earth the spark plug electrode securely.(5) Check that the spark plug ignites when the engine is cranked.		

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
MUT-II Self-Diag code Is a diagnosis code displayed?	Yes (Refe	r to P.13A-12, INSPECTION CHART FOR DIAGNOSIS ES.)
No MUT-II Data list 79 Throttle position sensor (1st channel) (Refer to P.13A-107.) OK	(Refe CODE	k the throttle valve position feedback system. rtoP.13A-62, INSPECTIONPROCEDURE FORDIAGNOSIS E P1221.)
MUT-II Data list 26 Accelerator pedal position switch (Refer to P.13A-105.) OK Clean around the throttle valve. (Refer to P.13A-97*.)		K the accelerator pedal position switch system. r to P.13A-105, INSPECTION PROCEDURE 29.)

NOTE:

INSPECTION PROCEDURE 16

Knocking		F	Probable cause
The cause is probably incorrect detonation control or improper spark plugs.	heat range o	f the •	Malfunction of the detonation sensor Improper heat range of the spark plugs
MUT-II Self-Diag code Is a diagnosis code displayed?		(Refer to CODES.)	P.13A-12, INSPECTION CHART FOR DIAGNOSIS
Does knocking occur when the vehicle is driven with the detonation sensor disconnected? (At this time, use the MUT-II to check whether the ignition timing is retarded from when the detonation sensor connector is connected.)	No		e detonation sensor system. (Refer to P.13A-49, INSPEC- OCEDURE FOR DIAGNOSIS CODE P0325.)
Yes			
 Check all the following items: Spark plug Foreign material (such as water or kerosine) entered the fuel lines 			

INSPECTION PROCEDURE 17

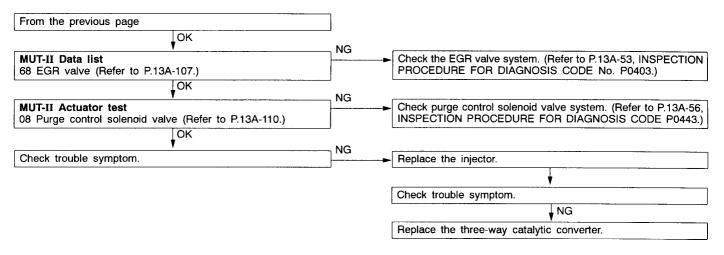
Run-on (dieseling)	Probable cause
The cause is probably fuel leak from injector(s)	Malfunction of the injector

Replace the injector.

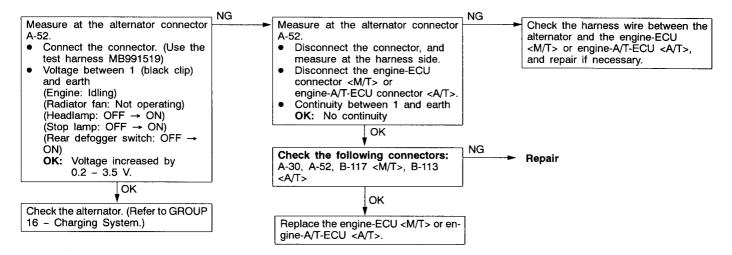
^{*:} Refer to the '99 SPACE RUNNER/SPACE WAGON Workshop Manual (Pub. No. PWDE9803).

Too high CO and HC concentration when idling		Probable cause		
The cause is probably an incorrect air/fuel ratio			 Malfunction of air/fu Deterioration of the 	iel ratio control system catalyst
	Ма а			
MUT-II Self-Diag code Is a diagnosis code displayed?	Yes	 (Refer CODE 		ON CHART FOR DIAGNOSIS
No				
Check ignition timing. (Refer to GROUP 11A – Engine Adjustment.) OK	NG	 Check installe 		r and timing belt cover are properly
MUT-II Data list 21 Engine coolant temperature sensor (Refer to P.13A-104.)	NG	Check	the engine coolant temper CTION PROCEDURE F0	rature sensor. (Refer to P.13A-20, DR DIAGNOSIS CODE P0115.)
LOK]	L		, , , , , , , , , , , , , , , , ,
MUT-II Data list 13 Intake air temperature sensor (Refer to P.13A-103.)	NG			e sensor. (Refer to P.13A-19, IN- R DIAGNOSIS CODE P0110.)
OK		L		······································
MUT-II Data list 25 Barometric pressure sensor (Refer to P.13A-105.)	NG			sensor. (Refer to P.13A-17, IN- DIAGNOSIS CODE P0105.)
ОК	,			
MUT-II Data list 59 Oxygen sensor (rear) • Transmission: 2nd gear <m t="">, L range • Driving with throttle widely open • OK: 600 – 1,000 mV</m>	NG			system. (Refer to P.13A-30, IN- R DIAGNOSIS CODE P0136.)
OK	J			
MUT-II Data list 11 Oxygen sensor (front) OK: 600 – 1,000 mV when the engine is suddenly raced	NG) system. (Refer to P.13A-27, IN- R DIAGNOSIS CODE P0130.)
	J			
MUT-II Data list	ок	Replac	e the oxygen sensor (fr	ont).
 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). 		Check	trouble symptom.	
NG	ļ			NG
Measure fuel high-pressure between the fuel pump (high pressure) and injector. (Refer to P.13A-129.)	NG	🗕 Repai	r	
	J			
 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 i (4) Earth the spark plug electrode securely. (5) Check that the spark plug ignites when the engine is cran 		to the inj	jector, or you are serio	v usly injured.
ок				NG
Check all the following items: • Spark plug • EGR system • Compression pressure • Clogged fuel filter or line OK		Replac	e the ignition coil.	
To the next page	J			

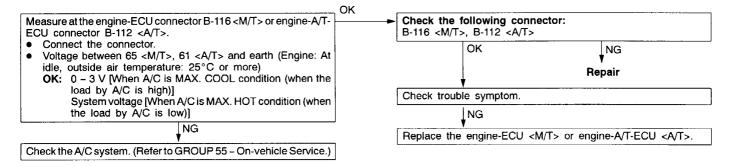
13A-90



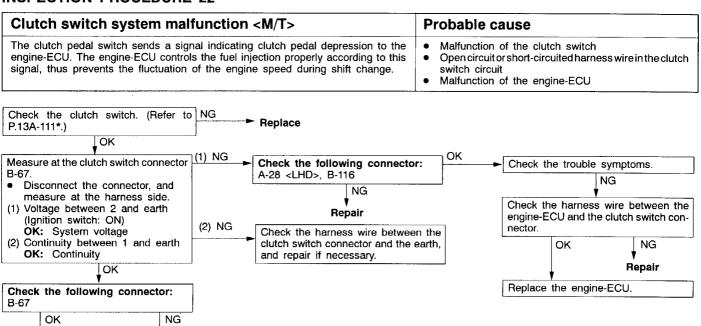
Low alternator output voltage (approx. 12.3 V)	Probable cause
The cause is probably a malfunction of the alternator or one of the problems listed at right.	 Malfunction of the charging system Open circuit between the alternator G terminal and the engine-ECU <m t=""> or engine-A/T-ECU </m> Malfunction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



Idling speed is improper when A/C is operating	Probable cause
If the engine-ECU $$ or engine-A/T-ECU $$ 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 $$ or engine-A/T-ECU $$. Based on this voltage signal, the engine-ECU $$ or engine-A/T-ECU $$ 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=""></m> Malfunction of the engine-A/T-ECU



Fans (radiator fan, A/C condenser fan) are i	noperative.	Probable cause
The engine-ECU <m t=""> or engine-A/T-ECU 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.)</m>		 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=""></m> Malfunction of the engine-A/T-ECU
	_ NG	
Measure at engine-ECU connector B-117 < M/T> or engine-A/T-ECU		cthefollowingconnectors:A-28,B-117 <m t="">,B-113</m>
 connector B-113 . Disconnect the connector, measure at the harness side. 		OK NG
 Voltage between terminal 18 and earth (Ignition switch: ON) 		Repair
OK: 4.8 - 5.2 V (The fan runs at high speed.)	Check	trouble symptom.
Earth terminal 18. (Ignition switch: ON)		LNG
OK: The fan stops.	Check	the harness wire between the engine-ECU <m t=""> or engine-</m>
ОК		CU < A/T > and fan controller.
Check the following connector: B-117 <m t="">, B-113 </m>]	OK NG
		Repair
···· ¥		•
Repair V		(the radiator fan and condenser fan circuit. (Refer to GROUP Troubleshooting.)
Check trouble symptom.]	
NG	-	
MUT-II Data list 21 Engine coolant temperature sensor OK: After the engine has been warmed up, the engine coolant temperature during idling is identical to the MUT-II reading.	P.13A	the engine coolant temperature sensor system. (Refer to -20, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 5.)
ok	NC	
Check the thermostat.	NG ► Repla	ce
ОК	_	
Replace the engine-ECU <m t=""> or engine-A/T-ECU .</m>]	



NOTE:

*: Refer to the '99 SPACE RUNNER/SPACE WAGON Workshop Manual (Pub. No. PWDE9803).

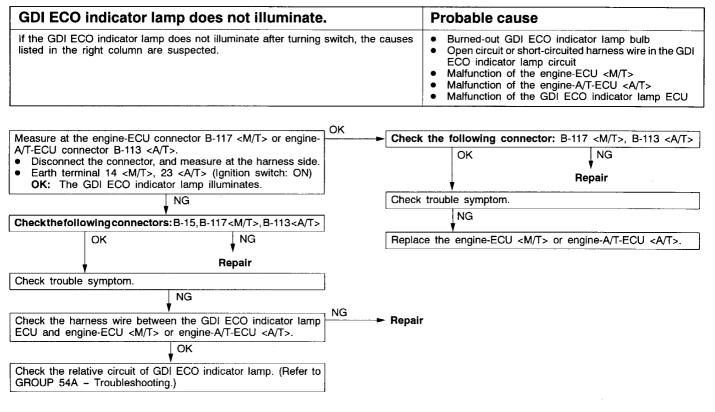
INSPECTION PROCEDURE 23

NG

Check the trouble symptoms.

Replace the engine-ECU

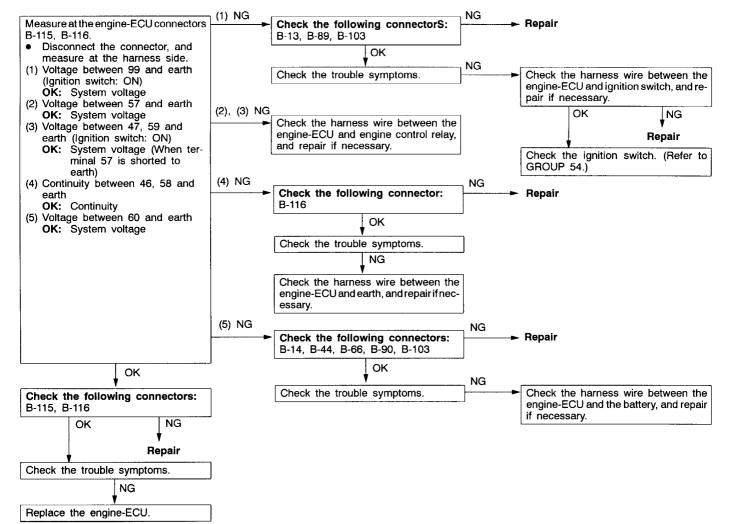
Repair



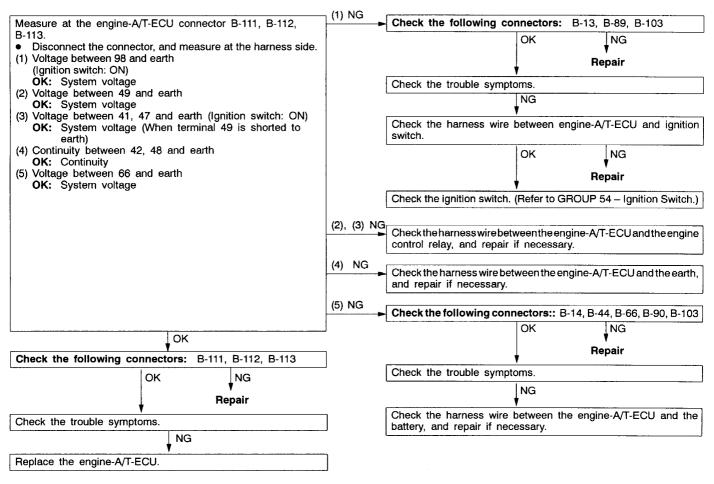
GDI ECO indicator lamp remains illuminated and does not go off.	Probable cause
If the GDI ECO indicator lamp does not go off during high load operation, the causes listed in the right column are suspected.	 Short circuit between the GDI ECO indicator lamp and engine-ECU Malfunction of the engine-ECU <m t=""></m> Malfunction of the engine-A/T-ECU Malfunction of the GDI ECO indicator lamp ECU
Disconnect the connector, and measure at the harness side. ECL	the harness wire between the GDI ECO indicator lamp and engine-ECU <m t=""> or engine-A/T-ECU , and r if necessary.</m>
ок	
Check the relative circuit of GDI ECO indicator lamp. (Refer to GROUP 54A - Troubleshooting.)	
OK ▼	
Replace the engine-ECU <m t=""> or engine-A/T-ECU .</m>	

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

<M/T>

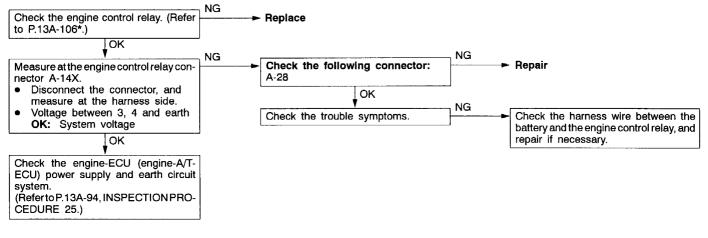


<A/T>



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 , the engine-ECU <m t=""> or engine-A/T-ECU turns on the engine control relay. This causes system voltage to be supplied to the engine-ECU <m t=""> or engine-A/T-ECU and to the sensors and actuators.</m></m></m>	 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=""></m> Malfunction of the engine-A/T-ECU



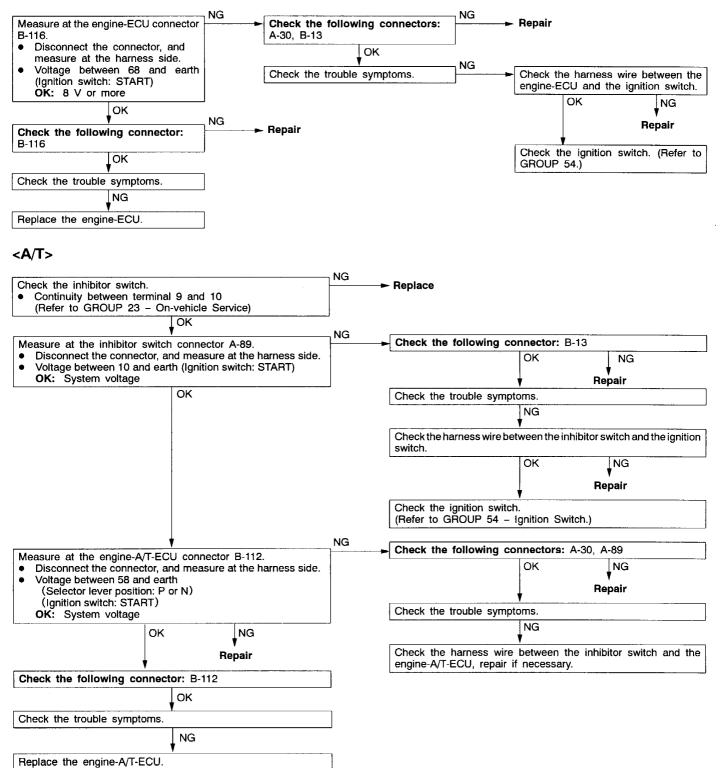
NOTE:

Injector driver relay system			Probable cause
When the ignition switch ON signal is input to the engine-lengine -A/T-ECU , engine-ECU <m t=""> or the engine -, on the injector driver relay. This causes system voltage to be supplied to the injector of</m>	4/T-ECU <a 1<="" td=""><td></td><td> 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 </m> </td>		 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 </m>
	— NG		
Check the injector driver relay. (Refer to P.13A-106*.)		 Replace 	Ce
OK	_		
Measure at the injector driver relay connector A-13X. Disconnect the connector, and measure at the harness side (1) Voltage between 1 and earth OK: System voltage 	(1) NG		the harness wire between the injector driver relay and the , repair if necessary.
(2) Voltage between 3 and earth (Ignition switch: ON) OK: System voltage	(2) NG	Check	the following connectors: B-13, B-89, B-103
ОК			OK ▼NG Repair
		Check	the trouble symptoms.
		L	NG
			the harness wire between the injector driver relay and the switch, repair if necessary.
Measure at the engine-ECU connector B-116 <m t=""> or</m>	NG	- Check	the following connector: A-13X
 engine-A/T-ECU connector B-113 . Disconnect the connector, and measure at the harness side Voltage between 55 < M/T> , 6 and earth 		L	OK NG
(Ignition switch: ON)			Repair
OK: System voltage		Check	the trouble symptoms.
¥		L	NG
Check the following connectors: B-116 <m t="">, B-113 <a t<="" td=""><td>></td><td>Check engine necess</td><td>the harness wire between the injector driver relay and the -ECU <m t=""> or the engine-A/T-ECU , repair if sary.</m></td></m>	>	Check engine necess	the harness wire between the injector driver relay and the -ECU <m t=""> or the engine-A/T-ECU , repair if sary.</m>
Check the trouble symptoms.	NG	Check	the following connector: A-13X
NG			OK NG
Measure at the injector driver connector A-08.	_		t tepair
Connect the connector.			
 Voltage between 4, 12, 21 and earth (Ignition switch: ON) OK: System voltage 		Check	the trouble symptoms.
OK			NG V
Check the injector driver system.		Check injecto	the harness wire between the injector driver relay and the r driver, repair if necessary.
(Refer to P.13A-60, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P1200.)			

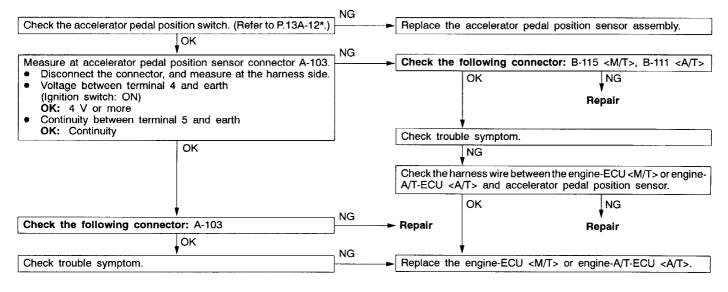
NOTE:

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 while the engine is cranking. The engine-ECU <m t=""> or engine-A/T-ECU uses this signal to carry out functions such as fuel injection control during starting.</m></m>	 Malfunction of the ignition switch <m t=""></m> Malfunction of the inhibitor switch Open circuit or short-circuited harness wire of the ignition switch circuit Malfunction of the engine-ECU <m t=""></m> Malfunction of the engine-A/T-ECU

<M/T>

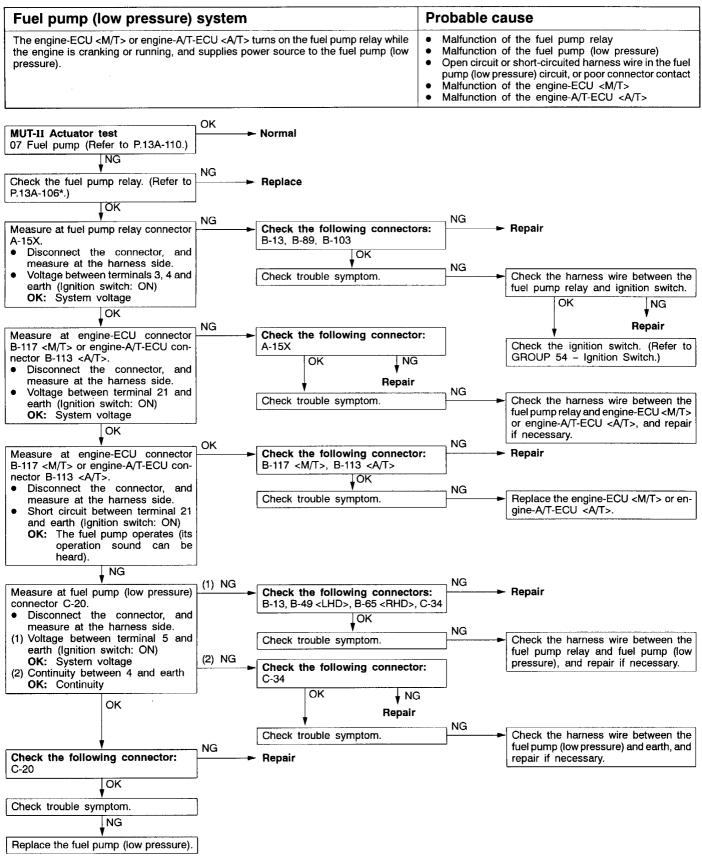


Accelerator pedal position switch system	Probable cause	
The accelerator pedal position switch detects that the accelerator pedal is fully closed, and sends a signal to the engine-ECU M/T> or engine-A/T-ECU A/T>. The engine-ECU M/T> or engine-A/T-ECU A/T> controls idle speed, based on this signal.	 Maladjustment 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=""></m> Malfunction of the engine-A/T-ECU 	



NOTE:

*: Refer to the '00 SPACE RUNNER Workshop Manual (Pub. No. PWDE9803-A).



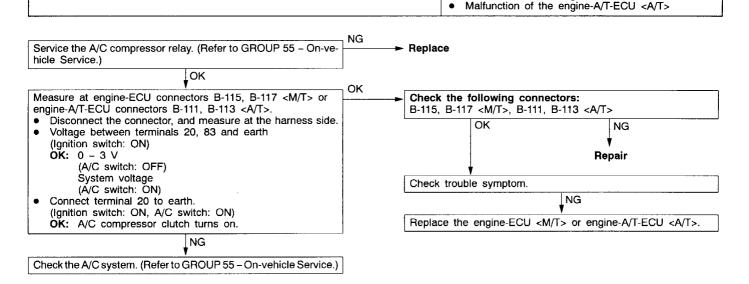
NOTE:

Power st	eering fluid pressu	e switch system	n		Probable ca	ause
The power steering fluid pressure switch sends a signal to the engine-ECU < or engine-A/T-ECU according to power steering load. Based on this signal, the engine-ECU <m t=""> or engine-A/T-ECU control throttle control servo so that idle speed increases when the power steering is in opera</m>			ls the	Open circuit or short-circuited harness wire in the power steering fluid pressure switch circuit, or poor connector		
	wer steering fluid pressure sv hicle Service.)	itch. (Refer to GROUP	NG	Replac	ce	
	ОК					
Measure at p	ower steering fluid pressure	witch connector A-96		Check	the following c	onnector: B-116 <m t="">, B-112 </m>
Disconne	ct the connector, and measu	re at the harness side.	l		OK	NG
(Ignition s	etween terminal 1 and eart switch: ON) tem voltage	1			V	♥ Repair
			J	Check	trouble symptom	•
Check the f	ollowing connector: A-96]			NG
L	ок	NG	J			etween the engine-ECU <m t=""> or engine- wer steering fluid pressure switch.</m>
	Repair				ОК	NG
,		Pan	NG ,		↓	Repair

Replace the engine-ECU <M/T> or engine-A/T-ECU <A/T>.

Check trouble symptom.

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 Malfunction of the A/C control system Malfunction of the A/C switch • and A/C compressor magnetic clutch so that idle speed increases. ٠ . Open circuit or short-circuited harness wire in the A/C switch circuit, or poor connector contact • Malfunction of the engine-ECU <M/T>



.

M/T oil temperature sensor system <m t=""></m>		Probable cause
This sensor inputs the manual transmission oil temperature t The engine-ECU uses this input to control the idle speed co the idle speed is increased when the manual transmission of becomes low.	ntrol servo so that	
Check the M/T oil temperature sensor. (Refer to GROUP 22 – On-vehicle Service.)	NG ► Re	place
Measure at the M/T oil temperature sensor connector A-87.	NG Ch	eck the following connector: B-115
 Disconnect the connector, and measure at the harness side. 		OK NG
 Voltage between 1 and earth (Ignition switch: ON) OK: 4.8 - 5.2 V Continuity between 2 and earth 		Repair
OK: Continuity	Ch	eck ttrouble symptom.
X	7	NG
Check the following connector: A-87		eck the harness wire between the engine-ECU and the M/T temperature sensor.
Repair	i	OK NG
. In the second		Repair
Check the trouble symptoms.	NG ► Re	place the engine-ECU.

Stop lamp switch system		Probable cause
The engine-ECU <m t=""> or engine-A/T-ECU determines while is depressed or not, by means of the stop lamp switch input</m>		 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=""></m> Malfunction of the engine-A/T-ECU
Check the stop lamp switch. (Refer to GROUP 35 – Brake Pedal) NG ► Repla	ace
Measure at stop lamp switch connector B-28.	- Chec	k the following connectors: B-65, B-66
 Disconnect the connector, and measure at the harness side Voltage between terminal 2 and earth OK: System voltage 	9.	OK NG ▼ Repair
ОК	Chec	k trouble symptom.
		NG
		k the harness wire between the battery and stop lamp switch.
Measure at engine-ECU connector B-116 <m t="">or engine-A/T-EC</m>		k the following connectors: B-14, B-65
 connector B-110 . Disconnect the connector, and measure at the harness side 		OK NG
 Voltage between terminal 63 <m t="">, 123 and eart (Ignition switch: ON)</m> 		Repair
OK: 0 – 3 V (when the brake pedal is not depressed) System voltage (when the brake pedal is depressed		k trouble symptom.
OK	<u>"</u>	NG
UK .	A/T-E	k the harness wire between the engine-ECU <m t=""> or engine- CU and stop lamp, and repair if necessary.</m>
Check the following connector: B-116 <m t="">, B-110 </m>	→ NG → ► Repa	ir
ОК		
Check trouble symptom.		
↓NG		
Replace the engine-ECU $$ or engine-A/T-ECU $$.		

Small lamp switch system		Probable cause
The engine-ECU <m t=""> or engine-A/T-ECU determines whether the small lamp switch is on or off. According to that information, the engine-ECU <m t=""> or engine-A/T-ECU controls alternator output current when the vehicle is started.</m></m>		 Improper connector contact, open circuit or short-circuited harness wire in the taillamp circuit Malfunction of the engine-ECU Malfunction of the engine-A/T-ECU
 Measure at the engine-ECU connector B-115 <m t=""> or engine-A/T-ECU connector B-111 .</m> Disconnect the connector, and measure at the harness side. Voltage between 88 <m t="">, 86 and earth (Lighting switch: ON)</m> OK: System voltage 	NG	the taillamp circuit. (Refer to ELECTRICAL WIRING.)

ern ejenninge	
ОК	
Check the following connector: B-115 <m t="">, B-111 </m>	_ NG ┣───► Repair
ОК	-
Check the trouble symptoms.]
NG	-
Replace the engine-ECU <m t=""> or engine-A/T-ECU .</m>]

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 300 500 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.
- *4: Terminal oil temperature is 50°C or more.

NOTE

*: If the battery is removed or the engine-ECU <M/T> or engine-A/T-ECU <A/T> is replaced, start the the engine when the engine coolant temperature is 70°C or less and let it run at a speed of at least 2,000 r/min for a while prior to each check.

ltem No.	Check items	Requirements		Normal condition	Inspection procedure No.	Reference page
11	Oxygen sen-	Engine: After	Idling	200 mV or less*1	Code No.	13A-27
	sor (front)	sor (front) warm-up Sudden racing 600 - 1,000 mV	P0130			
			2,500 r/min	400 mV or less and 600 – 1,000 mV alternates.		
12	Air flow sensor	 Engine coolant temperature: 80 – 95°C 	Idling	17 – 43 Hz	Code No. P0100	13A-15
		 Lamps, electric cooling fan and all accessories: 	2,500 r/min	50 – 90 Hz		
		• Transmission: Neutral (A/T: P range)	Racing	Frequency in- creases in re- sponse to racing.		
13	Intake air tem- perature sen-	Ignition switch: ON	Intake air tempera- ture: -20°C	–20°C	Code No. P0110	13A-19
sor	sor		Intake air tempera- ture: 0°C	0°C		•
			Intake air tempera- ture: 20°C	20°C	-	
			Intake air tempera- ture: 40°C	40°C		
			Intake air tempera- ture: 80°C	80°C	Í	

13A-104

GDI <4G6> - Troubleshooting

ltem No.	Check items	Requirements		Normal condition	Inspection procedure No.	Reference page	
14	Throttle posi- tion sensor	tion sensor	 Engine coolant temperature: 	Release the accel- erator pedal.	4,500 – 5,500 mV	Code No. P0225	13A-45
	(2nd channel)	80 – 95°C ● Ignition switch: ON (Engine stopped)	Depress the accel- erator pedal gradu- ally.	Voltage decreases in response to the pedal depression.			
			Depress the accel- erator pedal fully.	400 600 mV			
16	Power supply voltage	Ignition switch: ON		System voltage	Procedure No. 25	13A-105	
18	Cranking sig- nal (Ignition	Transmission: Neutral	Engine: Stopped	OFF	Procedure No. 28	13A-105	
	switch-ST)	(A/T: P range)	Engine: Cranking	ON	110.20		
21	Engine coolant temperature sensor	Ignition switch: ON	Engine coolant temperature: -20°C	–20°C	Code No. P0115	13A-20	
		Engine	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: Crank- ing Tachometer: Connected 	Compare the engine speed readings on the tachometer and the MUT-II.	Accord	Code No. P0335	13A-49	
	Accelerator temp pedal position -200	Engine coolant temperature: –20°C	1,300 – 1,500 r/min				
		switch: ON	Engine coolant temperature: 0°C	1,200 – 1,400 r/min	-		
			Engine coolant temperature: 20°C	1,050 – 1,250 r/min			
			Engine coolant temperature: 40°C	850 1,050 r/min			
			Engine coolant temperature: 80°C	500 – 700 r/min <m t="">*^{1, *4} 550 – 750 r/min*¹</m>			

GDI <4G6> - Troubleshooting

1	3	A	-1	0	5
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ltem No.	Check items	Requirements		Normal condition	Inspection procedure No.	Reference page
24	Vehicle speed sensor <m t=""></m>	Drive at 40 km/h		Approximately 40 km/h	Code No. P0500	13A-57
25	Barometric pressure sen- sor	Ignition switch: ON	Altitude: 0 m	101 kPa	Code No.	13A-17
			Altitude: 600 m	95 kPa	P0105	
			Altitude: 1,200 m	88 kPa		
			Altitude: 1,800 m	81 kPa		
26	Accelerator pedal position switch	Ignition switch: ON (Depress and re- lease the accelera-	Release the accel- erator pedal.	ON	Procedure No. 29	13A-105
	Switch	tor pedal several times)	Depress the accel- erator pedal slight- ly.	OFF		
27	Power steer- ing fluid pres- sure switch	Engine: Idling	Steering wheel sta- tionary	OFF	Procedure No. 31	13A-105
	Sure Switch		Steering wheel turning	ON		
28 A/C sw	A/C switch	Engine: Idling (The A/C compressor is	A/C switch: OFF	OFF	Procedure No. 32	13A-105
		running when the A/C switch is on.)	A/C switch: ON	ON		
31	Small lamp switch	Engine: Idling	Lighting switch: OFF	OFF	Procedure No. 35	13A-105
			Lighting switch: ON	ON		
34	Air flow sensor reset signal	or Engine: After hav- ing warmed up	Engine is idling	ON	Code No. P0100	13A-19
	reset signal	ing wanned up	3,000 r/min	OFF	FUIDU	
37	Volumetric effi- ciency		Engine is idling	15 – 35 %	-	_
			2,500 r/min	15 – 35 %		
		 OFF Transmission: Neutral (A/T: P range) 	Engine is suddenly raced	Volumetric effi- ciency increases in response to racing		
38	Crank angle sensor	 Engine: Crankin at 2,000 r/min c Tachometer: Co 		Engine speeds displayed on the MUT-II and tachometer are identical.	_	-

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ltem 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 	ldling	0.3 – 0.8 ms* ¹	-	-
			2,500 r/min	0.5 – 1.0 ms		
		 Transmission: Neutral (A/T: P range) 	Sudden racing	Increases		
44	Ignition advance	 Engine: After warm-up 	ldling	15 – 25°BTDC* ¹	Code No. P0300	13A-46
		 Set a timing light. 	2,500 r/min	25 – 35°BTDC		
48	M/T oil temper- ature sensor <m t=""></m>	Drive after the en- gine has warmed up.	Drive for 15 min- utes or more	Gradually increases to 50 – 90°C	Procedure No. 33	13A-105
49	A/C relay	Engine: After warm-up, idling	A/C switch: OFF	OFF (compressor clutch is not oper- ating)	Procedure No. 32	13A-105
			A/C switch: ON	ON (compressor clutch is operating)		
59	Oxygen sen- sor (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-30
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 pres- sure increases.	Code No. P1515	13A-69
67	Stop lamp switch		Brake pedal: De- pressed	OFF	Procedure No. 34	13A-105
			Brake pedal: Re- leased	ON		

GDI <4G6> - Troubleshooting

1	3	A	-1	0	7
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ltem No.	Check items	Requirements		Normal condition	Inspection procedure No.	Reference page
68	EGR valve	 Engine coolant temperature: 80 – 95°C Lamps, electric cooling fan and 	ldling	0 – 15 STEP	Code No. P0403	13A-53
		all accessories: OFF • Transmission: Neutral (A/T: P range)	2,500 r/min	0 – 5 STEP		
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-35
77	Accelerator pedal position sensor (2nd channel)	Ignition switch: ON	Release the accel- erator pedal.	300 – 1,000 mV	Code No. P1225	13A-65
			Depress the accel- erator pedal gradu- ally.	Increases in re- sponse to the ped- al depression stroke.		
			Depress the accel- erator pedal fully.	4,000 mV or more		
78	Accelerator pedal position sensor (1st channel)* ³	al position	Release the accel- erator pedal.	300 – 1,000 mV	Code No. P0220	13A-42
			Depress the accel- erator pedal gradu- ally.	Increases in re- sponse to pedal depression stroke.		
			Depress the accel- erator pedal fully.	4,200 mV or more		
79	Throttle posi- tion sensor (1st channel)	• Engine coolant temperature:	Release the accel- erator pedal.	450 – 800 mV	Code No. P0120	13A-23
		1st channel) 80 – 95°C Ignition switch: ON (Engine stopped)	Depress the accel- erator pedal gradu- ally.	Increases in re- sponse to pedal depression stroke.		
			Depress the accel- erator 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.		
			Selector lever: N → D range	Increases by 0 - 200 mV.		

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ltem No.	Check items	Requirements		Normal condition	Inspection procedure No.	Reference page
7E	V.V.T. phase	Engine: Idling		0°CA	_	-
	angle .	Engine: 2,500 r/min		approx. 25°CA* ⁵		
81	Long-term fuel compensation	Engine: Warm, 2,50 load (during closed lo		-12.5 - 12.5 %	Code No. P0170	13A-33
82	Short-term fuel compensation	Engine: Warm, 2,50 load (during closed lo		-30 - 25 %	Code No. P0170	13A-33
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	Engine: Warm	Engine: Idling	15 – 35 %	_	-
	load value		2,500 r/min	15 – 35 %		
88	Fuel control	Engine: Warm	2,500 r/min	Closed loop	Code No. P0125	13A-25
	condition		When engine is suddenly raced	Open loop – drive condition		
	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 sen- sor (front)		Idling	0 V	Code No. P0130	13A-27
			Sudden racing	0.6 – 1.0 V		
			2,500 r/min	0.4 V or less and 0.6 – 1.0 V alter- nates		
A2	Oxygen sen- sor (rear)	 Transmission: 2nd gear <m t="">, L range </m> Drive with throttle widely open 	3,500 r/min	0.6 – 1.0 V	Code No. P0136	13A-30

GDI <4G6> - Troubleshooting

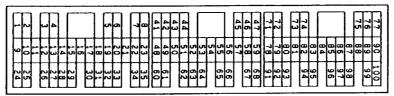
1	3A	-1	09
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ltem No.	Check items	Requirements		Normal condition	Inspection procedure No.	Reference page
8A	Throttle posi- tion sensor	 Engine coolant temperature: 80 – 95°C 	Release the accel- erator pedal.	8 – 16 %	Code No. P0120	13A-23
	(1st channel) (Throttle valve opening angle)	 Ignition switch: ON (Engine: stopped) 	Depress the accel- erator pedal gradu- ally.	Increase in re- sponse to pedal depression stroke.		
			Depress the accel- erator pedal fully.	80 – 100 %		
		Engine: After	No load	8 – 18 %		
		warm-up, idling	A/C switch: OFF → ON	Rises by 2 – 10 %		

ACTUATOR TEST REFERENCE TABLE

ltem 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	Idling condition becomes different	Code No. P0201	13A-36
02	-, 	Cut fuel to No. 2 injector	warmed up/Engine is idling (Cut the fuel supply	(becomes unsta- ble).	Code No. P0202	13A-38
03	-	Cut fuel to No. 3 injector	to each injector in turn and check cylinders which		Code No. P0203	13A-39
04		Cut fuel to No. 4 injector	don't affect idling.)		Code No. P0204	13A-40
07	Fuel pump (low pressure)	Fuel pump operates and fuel is recirculated.	Ignition switch: ON	Sound of opera- tion is heard.	Procedure No. 30	13A-105
08	Purge control solenoid valve	Solenoid valve turns from OFF to ON.	Ignition switch: ON	Sound of opera- tion can be heard when solenoid valve is driven.	Code No. P0443	13A-56
17	Basic ignition timing	Set the engine- ECU <m t=""> or engine-A/T-ECU to ignition timing adjustment mode</m>	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-104
34	Electronic- controlled throttle valve system	Stop the throttle control servo.	Ignition switch: ON	Throttle valve is opened slightly.	Code No. P1220	13A-61

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	Decreases slightly for short
9	No. 2 injector	 the accelerator pedal suddenly from the idle speed. 	time from 9 – 13 V
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	5 – 8 V (fluctuates for
6	EGR valve (C)	turning ON	approx. three seconds)
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
11	Intake camshaft position	Engine: Cranking	0.4 – 3.0 V
	sensor	Engine: Idling	0.5 – 2.0 V
14	GDI ECO indication lamp	Ignition switch: OFF \rightarrow 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	Engine cool- Engine: Stopped	System voltage
	valve	 ant temperature: 80 - 95°C Ignition switch: ON Engine: Start the engine, and then increase engine speed up to 3,500 r/min. 	Voltage decreases

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Terminal No.	Check item	Check requiremer	nts (engine condition)	Normal condition
18	Fan controller	Radiator and concord operating.	lenser fans are not	0 – 0.3 V
		Radiator and concord operating.	lenser fans are	0.7 V or more
19	Oil control valve	Ignition switch: Of	N	System voltage
		Maintain at least 2 checking the idling		4 – 10 V*
20	A/C relay	 Engine: Idling A/C switch: 0 (Compressor) 	g DFF → ON is operating)	System voltage, or changes from momentarily 6 V or more to $0 \rightarrow 3$ V
21	Fuel pump relay	Ignition switch:	Engine: Stopped	System voltage
		ON	Engine: Idling	0 – 3 V
31	Engine warning lamp	Ignition switch: Of	FF → ON	0 – 3 V → System voltage (after several seconds)
41	Sensor power supply	Ignition switch: Of	N	4.5 – 5.5 V
42	Power supply to accelerator pedal position sensor (1st channel)	Ignition switch: Of	٧	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 tempera- ture 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/m	in	0.3 – 3.0 V
47	Power supply	Ignition switch: OI	N	System voltage
59	1			

NOTE

*: If the battery is removed or the engine-ECU is replaced, start the the engine when the engine coolant temperature is 70°C or less and let it run at a speed of at least 2,000 r/min for a while prior to each check.

Terminal No.	Check item	Check requiremen	ts (engine condition)	Normal condition
50	Exhaust camshaft position	Engine: Cranking		0.3 – 3.0 V
	sensor	Engine: Idling		0.5 – 3.5 V
51	Barometric pressure	Ignition switch: ON	Altitude: 0 m	3.7 – 4.3 V
	sensor	UN	Altitude: 1,200 m	3.2 – 3.8 V
52	Alternator FR terminal	 Radiator fan: Headlamp: O Stop lamp: O 		Voltage decreases
53	Oxygen sensor (rear)		2nd gear : 3,500 r/min or more e throttle valve widely	0.6 – 1.0 V
54	Power steering fluid pressure switch	Engine: Warm up, and then	Steering wheel stationary	System voltage
		idling	Steering wheel turning	0 – 3 V
55	Injector driver relay	Ignition switch: OF	F	0 – 0.1 V
		Ignition switch: ON	1	0.5 – 1.0 V
56	Throttle valve control	Ignition switch: OF	F	0 – 0.3 V
	servo relay	Ignition switch: ON	ł	0.5 – 1.0 V
57	Engine control relay	Ignition switch: OF	F	0 – 3 V
		Ignition switch: ON	l	System voltage
60	Back-up power source	Ignition switch: OF	F	System voltage
61	Air flow sensor	Engine: Idling		2.2 – 3.2 V
		Engine: 2,500 r/mi	n	
62	Intake air temperature sensor	Ignition switch: ON	Intake air temper- ature: 0°C	3.2 – 3.8 V
			Intake air temper- ature: 20°C	2.3 – 2.9 V
	·		Intake air temper- ature: 40°C	1.5 – 2.1 V
			Intake air temper- ature: 80°C	0.4 – 1.0 V
63	Stop lamp switch	Depress the brake	pedal.	System voltage
		Release the brake	pedal.	0 – 3 V
66	Clutch switch	Depress the clutch	ı pedal.	0 – 3 V
		Release the clutch	n pedal.	System voltage
68	Ignition switch-ST	Engine: Cranking		8 V or more

Terminal No.	Check item	Check requiremer	nts (engine condition)	Normal condition
71	Oxygen sensor (front)	Engine: Warm up, engine speed at 2 digital voltmeter).	and then hold the ,500 r/min (Use a	$0 \leftrightarrow 0.8 \text{ V}$ alternates.
73	M/T oil temperature	M/T oil temperatu	re: 25°C	2.4 – 2.7 V
	sensor	M/T oil temperatur	re: 80°C	0.5 – 0.8 V
74	Brake vacuum sensor	Engine: Stop the e speed, turn the igr and then depress several times.	nition switch ON,	Voltage increases
76	Air flow sensor reset	Engine: Idling		0 – 1 V
	signal	Engine: 3,000 r/m	in	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 switcMove the vel	h: ON hicle forward.	0 ↔ system voltage alternates.
83	A/C switch	Engine: Idling	A/C switch: OFF	0 – 3 V
			A/C switch: ON (Compressor is operating)	System voltage
88	Small lamp switch	Lighting switch: O	FF	0 – 3 V
		Lighting switch: O	N (Taillamp: ON)	System voltage
89	Oxygen sensor heater	Engine: Idling		0 – 3 V
	(front)	Engine: 3,500 r/m	in	System voltage
90	Oxygen sensor heater	Engine: Idling		0 – 3 V
	(rear)	Engine: 3,500 r/m	in	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 acceler- ator pedal.	0.9 – 1.2 V
			Depress the accelerator pedal fully.	4 V or more

Terminal No.	Check item	Check requirements (engine condition)	Normal condition
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

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



Check item	Standard value, normal condition (check require- ments)
EGR valve (D)	15 – 20 Ω (at 20°C)
EGR valve (C)	
EGR valve (B)	
EGR valve (A)	
Purge control solenoid valve	36 – 44 Ω (at 20°C)
Oil control valve	6.9 – 7.9 Ω (at 20°C)
Engine coolant temperature sensor	5.1 – 6.5 k Ω (when engine coolant temperature is 0°C)
	2.1 – 2.7 k Ω (when engine coolant temperature is 20°C)
	0.9 – $1.3~k\Omega$ (when engine coolant temperature is 40°C)
	0.26 – $0.36~k\Omega$ (when engine coolant temperature is $80^{\circ}C)$
Earth	Continuity (0 Ω)
Intake air temperature sensor	5.3 – 6.7 k Ω (when intake air temperature is 0°C)
	2.3 – 3.0 k Ω (when intake air temperature is 20°C)
	$1.0-1.5~k\Omega$ (when intake air temperature is 40°C)
	$0.30-0.42k\Omega$ (when intake air temperature is 80°C)
Accelerator pedal position switch	Continuity (when the accelerator pedal is released)
	No continuity (when the accelerator pedal is slightly depressed)
Oxygen sensor heater control (front)	4.5 – 8.0 Ω (at 20°C)
Oxygen sensor heater (rear)	11 – 18 Ω (at 20°C)
	EGR valve (D) EGR valve (C) EGR valve (B) EGR valve (A) Purge control solenoid valve Oil control valve Engine coolant temperature sensor Earth Intake air temperature sensor Accelerator pedal position switch

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

TERMINAL VOLTAGE CHECK CHART

Engine-A/T-ECU Connector Terminal Arrangement

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7FU1763

Terminal No.	Check item	Check condition (Engine condition)	Normal condition
1	No. 1 injector	While engine is idling after having warmed up,	From 9 – 13 V, momen-
9	No. 2 injector	suddenly depress the accelerator pedal.	tarily drops slightly
24	No. 3 injector		
2	No. 4 injector		
3	Oxygen sensor heater	Engine: Idling	0 – 3 V
	(front)	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	Ignition switch: OFF	0 – 0.1 V
	relay	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	Engine: Idling	0 – 1 V
	signal	Engine speed: 3,000 r/min	6 – 9 V

13A-118

Terminal No.	Check item	Check condition (Engin	e 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 \rightarrow	ON	0 – 3 V (System voltage after five seconds)
		Rev the engine sudden	ıly.	System voltage
26	Oxygen sensor heater	Engine: Idling		0 – 3 V
	(rear)	Engine: 3,500 r/min		System voltage
33	Oil control valve	Ignition switch: ON		System voltage
		Maintain at least 2,50 idling speed.	0 r/min after checking the	4 – 10 V*
34	Purge control solenoid valve	• Engine coolant temperature:	Engine: Stopped	System voltage
	valve	80 – 95°C Ignition switch: ON	Engine: After starting, in- crease the engine speed up to 3,500 r/min	The voltage drops
41	Power supply	Ignition switch: ON	I	System voltage
47	-			
43	Engine ignition signal	Engine speed: 3,000 r/	min	0.3 – 3.0 V
44	Engine coolant tem- perature sensor	Ignition switch: ON	When engine coolant tem- perature is 0°C	3.2 – 3.8 V
			When engine coolant tem- perature is 20°C	2.3 – 2.9 V
			When engine coolant tem- perature is 40°C	1.3 – 1.9 V
			When engine coolant tem- perature 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

Terminal No.	Check item	Check condition (Engir	ne condition)	Normal condition			
51	EGR valve (A)	Ignition switch: OFF to	ON	5 – 8 V (Repeatedly changes			
53	EGR valve (C)						
60	EGR valve (B)						
62	EGR valve (D)						
52	Power steering fluid pressure switch	Engine: Idling after warming-up	System voltage				
			When steering wheel is turned	0 – 3 V			
55	Barometric pressure	Ignition switch: ON	At an altitude of 0 m	3.7 – 4.3 V			
	sensor		At an altitude of 1,200 m	3.2 – 3.8 V			
56	Exhaust camshaft	Engine: Cranking	· · · · · · · · · · · · · · · · · · ·	0.3 – 3.0 V			
	position sensor	Engine: Idling	0.5 – 3.5 V				
58	Ignition switch-ST	Engine: Cranking		8 V or more			
61	A/C switch 2	Refer to GROUP 55 <m t=""> or engine-A/T-E</m>	at A/C-ECU, engine-ECU				
63	Injector open circuit check signal	Engine: Increases from	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 tempera- ture is 0°C	3.2 - 3.8 V			
			When intake air tempera- ture is 20°C	2.3 – 2.9 V			
			When intake air tempera- ture is 40°C	1.5 – 2.1 V			
			When intake air tempera- ture is 80°C	0.4 – 1.0 V			
65	Air flow sensor	Engine: Idling	<u></u>	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 2,5 (Check by using a digit	500 r/min after warming-up tal voltmeter.)	Voltages of 0 V and 0.8 V alternate			
72	Intake camshaft posi-	Engine: Cranking		0.4 – 3.0 V			
	tion sensor	Engine: Idling		0.5 – 2.0 V			
73	Oxygen sensor (rear)		ange 500 r/min or more hrottle valve widely open	0.6 – 1.0 V			

13A-120

Terminal No.	Check item	Check condition (Engin	ne condition)	Normal condition			
78	Throttle position sen- sor (2nd channel)	Ignition switch: ON	4.0 V or higher				
			Depress the accelerator pedal fully.	0.4 – 0.6 V			
79	Accelerator pedal posi- tion switch	Ignition switch: ON	Release the accelerator pedal.	0 – 1 V			
			4 V or more				
80	Vehicle speed sensor <m t=""></m>	 Ignition switch: O Move the vehicle 		Voltages of 0 and 8 – 12 V alternate (changes repeatedly)			
83	A/C switch 1	Engine: Idling	A/C switch: OFF	0 – 3 V			
			A/C switch: ON (Com- pressor is operating)	System voltage			
86	Small lamp switch	Lighting switch: OFF	demona	0 – 3 V			
		Lighting switch: Tail lig	nt 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 posi- tion sensor (1st chan- nel)	Ignition switch: ON	Release the accelerator pedal.	0.9 – 1.2 V			
	ner		Depress the accelerator pedal fully.	4.0 V or higher			
96	Brake vacuum sensor		he from idle speed, turn the nd then depress the brake	Voltage increases			
98	Ignition switch-IG	Ignition switch: ON		System voltage			
123	Stop lamp switch	Depress the brake ped	System voltage				
		Release the brake ped	0 – 3 V				

NOTE

*: If the battery is removed or the engine-A/T-ECU is replaced, start the the engine when the engine coolant temperature is 70°C or less and let it run at a speed of at least 2,000 r/min for a while prior to each check.

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.

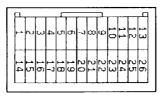
Engine-A/T-ECU Harness Side Connector Terminal Arrangement

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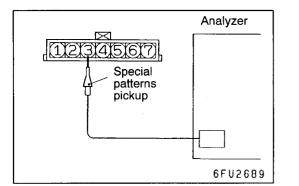
Terminal No.	Check item	Standard value, normal condition (check conditions)						
3 – 41	Oxygen sensor heater (front)	4.5 – 8.0 Ω (at 20°C)						
26 - 41	Oxygen sensor heater (rear)	11 – 18 Ω (at 20°C)						
33 – 41	Oil control valve	6.9 – 7.9 Ω (at 20°C)						
34 – 41	Purge control solenoid valve	28 – 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 k Ω (When coolant temperature is 0°C)						
		2.1 – 2.7 k Ω (When coolant temperature is 20°C)						
		0.9 – 1.3 k Ω (When coolant temperature is 40°C)						
		0.26 – 0.36 k Ω (When coolant temperature is 80°C)						
64 – 81	Intake air temperature sensor	5.3 – 6.7 k Ω (When intake air temperature is 0°C)						
		2.3 – 3.0 k Ω (When intake air temperature is 20°C)						
		$1.0 - 1.5 \text{ k}\Omega$ (When intake air temperature is 40°C)						
		$0.30 - 0.42 \text{ k}\Omega$ (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+)		h: ON edal: Fully opened →	Decreases slightly from system voltage.				
9	Throttle valve control servo (B+)	fully closed						
14	Throttle valve control servo (A-)		h: ON bedal: Fully closed →	Decreases slightly (approx. 2 V) from system voltage.				
15	Throttle valve control servo (B-)	fully opened						
2	Power supply to throttle valve control servo	Ignition switch: O	N	System voltage				
5	Power supply	Ignition switch: O	N	System voltage				
6	Sensor voltage	Ignition switch: O	N	4.5 – 5.5 V				
7	Throttle position sensor (1st channel)	Ignition switch: ON	Release the accelerator pedal.	0.4 – 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.	0.9 – 1.2 V				
			Depress the accelerator pedal fully.	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>

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

<Vehicles with A/T>

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

EXHAUST CAMSHAFT POSITION SENSOR AND CRANK ANGLE SENSOR

Measurement Method

- Disconnect the exhaust camshaft position sensor connector and connect the special tool (test harness: MB991709) in between. (All terminals should be connected.)
- 2. Connect the analyzer special patterns pickup to exhaust 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.

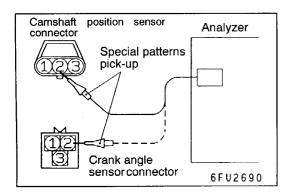
Alternate Method (Test harness not available)

<Vehicles with M/T>

- 1. Connect the analyzer special patterns pickup to engine-ECU terminal 50. (When checking the exhaust 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 exhaust camshaft position sensor signal wave pattern.)
- Connect the analyzer special patterns pickup to engine-A/T-ECU terminal 45. (When checking the crank angle sensor signal wave pattern.)



INTAKE CAMSHAFT POSITION SENSOR AND CRANK ANGLE SENSOR

Measurement Method

- 1. Disconnect the intake 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 intake camshaft position sensor terminal 2.
- 3. Disconnect the crank angle sensor connector and connect the special tool (test harness: MD9988478) in between.
- 4. Connect the analyzer special patterns pickup to crank angle sensor terminal 2.

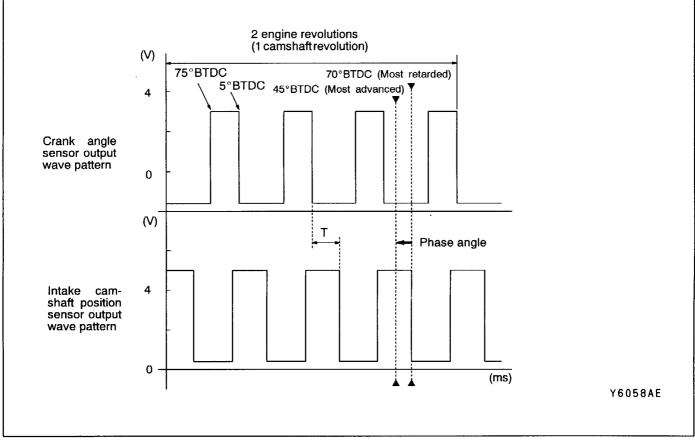
Alternate Method (Test harness not available)

- 1. Connect the analyzer special patterns pickup to engine-ECU <M/T> terminal 11 or engine-A/T-ECU <A/T> terminal 72. (When checking the camshaft position sensor signal wave pattern.)
- 2. Connect the analyzer special patterns pickup to engine-ECU <M/T> terminal 43 or engine-A/T-ECU <A/T> terminal 45. (When checking the crank angle sensor signal wave pattern.)

Standard Wave Pattern Observation conditions

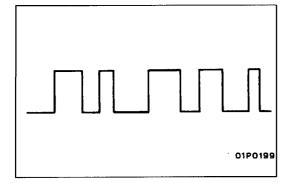
Function	Special patterns
Pattern height	Low
Pattern selector	Display
Engine r/min	Idle speed

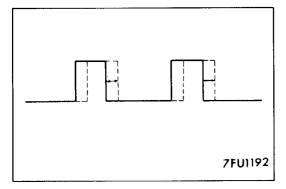
Standard wave pattern



Wave Pattern Observation Points

As the intake camshaft position sensor sends signal for longer time, time duration T should become the shorter. Meanwhile, as the sensor sends signal for shorter time, time duration T should become the longer.





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.

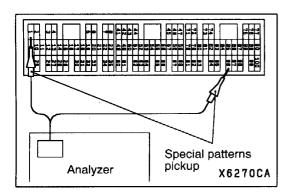
• Example 2

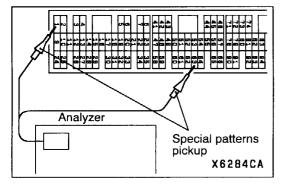
Cause of problem

Loose timing belt Abnormality in sensor disk

Wave pattern characteristics

Wave pattern is displaced to the left or right.





INJECTORS AND INJECTOR OPEN CIRCUIT CHECK SIGNAL

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.
- 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>

1. 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.

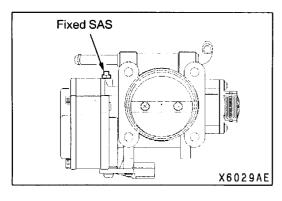
Alternate Method (Test harness not available)

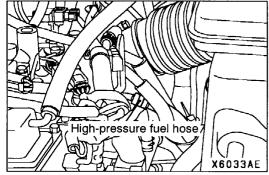
<Vehicles with M/T>

1. 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>

1. 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 to learn a wrong position of the throttle valve.

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.

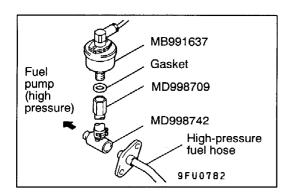
NOTE

Refer to '99 SPACE RUNNER/SPACE WAGON Workshop Manual (Pub. No. PWDE9803) GROUP 13A - On-vehicle Service.

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

Caution

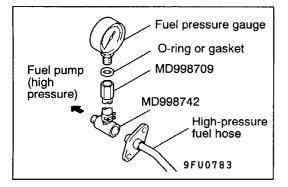
Cover the hose connection with rags to prevent splash of fuel that could be caused by some residual pressure in the fuel pipe line.



- 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>

- 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	Clogged fuel filter	Replace fuel filter			
• Fuel pressure drops after racing	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.

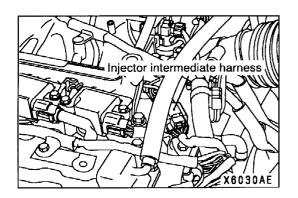
NOTE Refer to '99 SPACE RUNNER/SPACE WAGON Workshop Manual (Pub. No. PWDE9803) GROUP 13A – On-vehicle Service.

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.

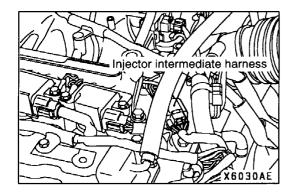
- 7. If the fuel pressure is lower than 1 MPa, it means that there is likely to be a leak in the high-pressure fuel system, so this system should be checked.
- 8. Turn the ignition switch to OFF.
- 9. Connect the injector intermediate harness connector.
- 10. Start the engine and run at idle.
- 11. Measure 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.

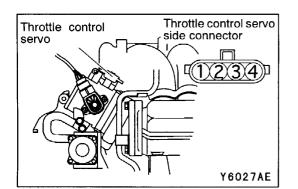
6. Crank the engine, and then measure fuel pressure immediately after 20 seconds.

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.



THROTTLE CONTROL SERVO CHECK

Operation Check

- 1. Remove the air intake hose from the throttle body.
- 2. Turn the ignition switch to the "ON" position.
- 3. Operate the accelerator pedal to confirm that the throttle valve opens and closes.

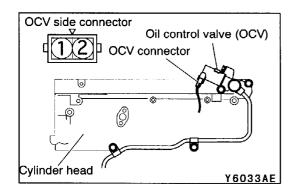
Coil resistance check

- 1. Disconnect the throttle control servo connector.
- 2. Measure the resistance between the throttle control servo connector terminals.

Standard value:

Terminals	Resistance (Ω)
1 – 3	1.35 – 1.65 (at 20°C)
2 - 4	

3. Confirm that there is no continuity between the terminals.



OIL CONTROL VALVE (OCV) CHECK

Operating sound check

- 1. Disconnect the OCV connector.
- 2. When battery voltage is applied to the OCV side connector terminals, operating sound should be heard from the OCV.

Caution

Never apply battery voltage for long time, or the coil may be burned out.

Measuring resistance between terminals

- 1. Disconnect the OCV connector.
- 2. Measure the resistance between the OCV connector terminals.

Standard value:

6.9 - 7.9 Ω (at 20°C)

FUEL PUMP (HIGH PRESSURE)

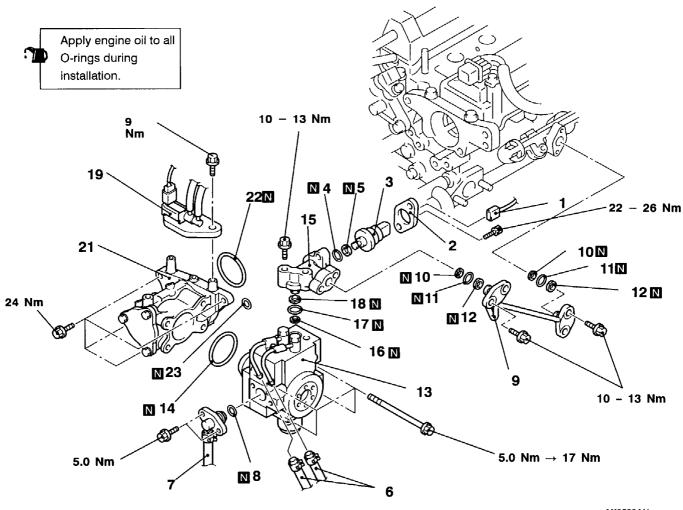
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation

- Prevention of fuel discharge

 before removal only>

 Throttle Body Removal and Installation (P.13A-142.) •
- Fuel Leak Check <after installation only> (Refer to P.13A-132.)



AX0528AU

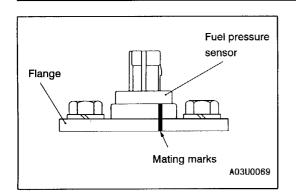
Removal steps

- Air-bleeding high-pressure fuel line
 - Fuel pressure sensor connector 1.

2. Flange

- 3. Fuel pressure sensor ·G 🖌
- 4. O-ring
 - 5. Back-up ring
 - 6. Furl return hose connection
 - 7. Fuel pressure hose connection
 - 8. O-ring
- ►D∢ 9. Fuel pipe
- D 10. Back-up ring A D 11. O-ring

DI 12. Back-up ring B 13. Fuel pump (high pressure) assembly 14. O-ring ►B◀ 15. Fuel fitting B◀ 16. Back-up ring A **B** 17. O-ring B 18. Back-up ring B 19. Purge control solenoid valve assembly 20. Camshaft position sensor ►A 21. Pump camshaft case assembly 22. O-ring 23. O-ring



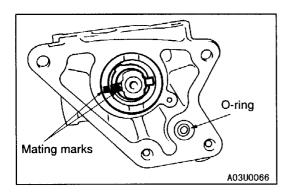
REMOVAL SERVICE POINTS

AP 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.



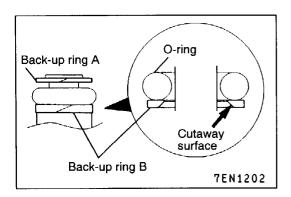
INSTALLATION SERVICE POINTS

►A PUMP CAMSHAFT CASE ASSEMBLY INSTALLATION

- 1. Set the No.1 cylinder to the compression top dead centre position.
- 2. Align the mating mark on the housing of the pump camshaft case assembly with the mating mark on the coupling, and then install the pump camshaft case assembly to the engine.

Caution

Take care not to drop the O-ring.



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

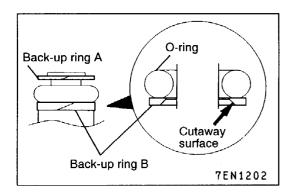
Be careful not to allow the engine oil to enter the fuel pump (high pressure) and the delivery pipe.

3. Insert the fuel fitting into the fuel pump (high pressure) bore squarely and securely while being careful not to twist the fitting. Tighten the mounting bolts to the specified toque.

Tightening torque: 10 - 13 Nm

►C FUEL PUMP (HIGH PRESSURE) INSTALLATION

- 1. Apply fresh engine oil to the O-ring and the fuel pump (high pressure) roller.
- Insert the fuel pump (high pressure) to the pump camshaft case bore squarely, and loosely install the mounting bolts at this stage (a bit tighter than finger-tightening). Tightening the bolts to the specified torque should be carried out at step ▶D◀ below.



►D ■ 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

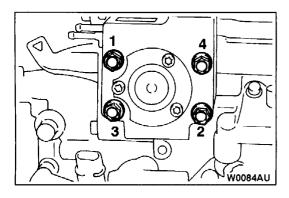
- (1) Install the back-up ring B facing its cutaway surface toward the opposite side of the O-ring as shown in the illustration.
- (2) Confirm the outer diameter of the back-up ring A. Take care not to install the back-up ring for the fuel pressure sensor by mistake. (Outer diameter of the back-up ring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

Caution

Be careful not to allow the engine oil to enter the fuel pump (high pressure) and the delivery pipe.

3. Insert the fuel pipe into the fuel pump (high pressure) and the delivery pipe bores squarely and securely while being careful not to twist the pipe. Tighten the mounting bolts to the specified toque.

Tightening torque: 10 - 13 Nm



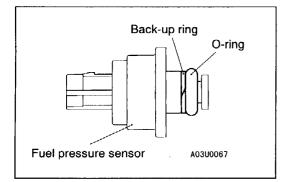
- 4. Tighten the loosely installed fuel pump (high pressure) mounting bolts to 5.0 Nm in the sequence shown as first stage.
- 5. Tighten the mounting bolts to 17 Nm in the sequence shown as second stage. The final tightening torques should not vary more than 2.0 Nm.

►E FUEL PRESSURE HOSE 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 fuel pump (high pressure).

- 2. While being careful not to damage the O-ring, turn the fuel pressure hose to the left and right and connect it to the fuel pump (high pressure). After connecting, check that the hose turns smoothly.
- 3. If the hose does not turn smoothly, the cause may be that the O-ring is getting caught. Disconnect the hose, check the O-ring for damage and re-connect the hose to the fuel pump (high pressure) and then re-check.



►F BACK-UP RING/O-RING INSTALLATION

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

Caution

Take care not to install the back-up ring A for the injector, fuel feed pipe or fuel return pipe by mistake. (Outer diameter of the back-up ring for the fuel pressure sensor: 15.1 mm)

►G FUEL PRESSURE SENSOR/FLANGE

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 fuel pump (high pressure).

2. Install the fuel fitting according to the mating marks made during removal.

Caution

If the fuel pressure sensor is replaced with new one, always replace the sensor and the flange as a set.

►H<IIR-BLEEDING HIGH-PRESSURE FUEL LINE

1. After installing the fuel pump (high pressure), run the engine at 2000 r/min for at least 15 seconds in order to bleed air from the high-pressure fuel line.

NOTE

If air is trapped in the high-pressure fuel line due to the removal of fuel pipe, diagnosis code No.56 will be set as abnormal fuel pressure.

2. Finally confirm diagnosis code by using the MUT-II. If diagnosis code, which indicates defective fuel pressure sensor system, has been set, erase the code.

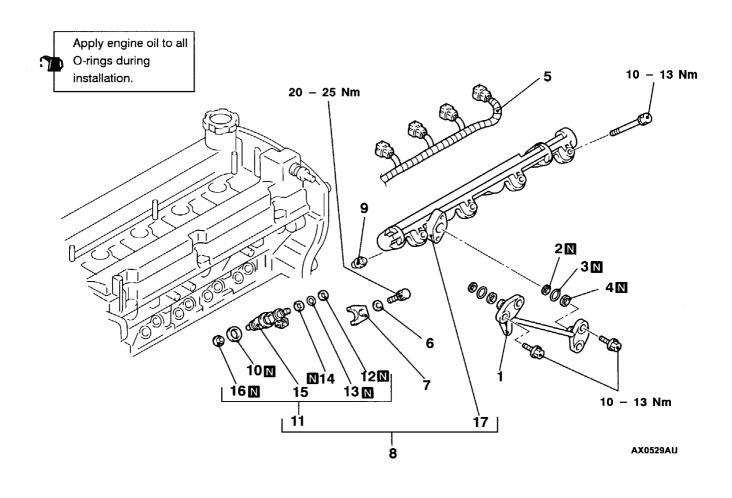
INJECTOR

REMOVAL AND INSTALLATION

- Pre-removal and Post-installation Operation
- Prevention of fuel discharge

 lintake Manifold Removal and Installation

 (Refer to GROUP 15.) .
- Fuel Leak Check <after installation only> (Refer to P.13A-132.)



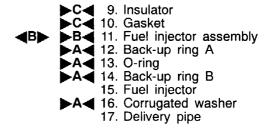
Removal steps

- Air-bleeding high-pressure fuel line
- 1. Fuel pipe 2. Back-up ring A

1BI

- 3. O-ring 4. Back-up ring B 5. Injector harness connector
 - 6. Washer

 - 7. Injector holder
 - 8. Delivery pipe and fuel injector assembly



REMOVAL SERVICE POINTS

A INJECTOR HARNESS CONNECTOR DISCONNECTION

Caution

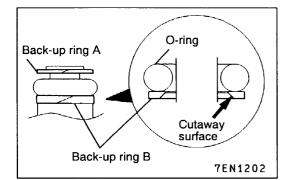
Disconnect the negative battery cable from its terminal before carrying out this operation.

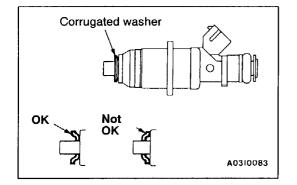
B DELIVERY PIPE AND FUEL INJECTOR ASSEMBLY REMOVAL

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

Caution

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





INSTALLATION SERVICE POINTS

►A CORRUGATED WASHER/BACK-UP RING B/ O-RING/BACK-UP RING A 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 falling off, and install it in the direction shown.

Caution

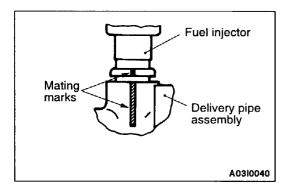
- (1) The corrugated washer should always be replaced with a new part.
- (2) There should be no scratches or foreign particles on the corrugated washer mounting surface of the injector.
- (3) Be careful not to mistake the corrugated washer installation direction.

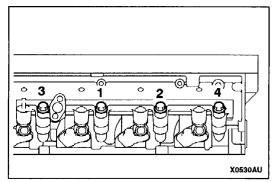
►B FUEL INJECTOR ASSEMBLY INSTALLATION

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 assembly.

- 2. While being careful not to damage the O-ring, turn the fuel injector assembly to the left and right and connect it to the delivery pipe assembly. 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.





C GASKET/INSULATOR/DELIVERY PIPE AND FUEL INJECTOR ASSEMBLY/INJECTOR HOLDER/ WASHER INSTALLATION

- 1. Align the mating marks on the delivery pipe and fuel injector assembly, and then install the delivery pipe assembly with the injector assembly still attached.
- 2. Install the gasket and insulator to the cylinder head.
- 3. Install the delivery pipe and fuel injector assembly to the cylinder head, and loosely install the mounting bolts.
- 4. Instal the injector holder and washer, and tighten the mounting bolts to the specified torque.

Tightening torque: 20 – 25 Nm

5. Tighten the loosely installed delivery pipe and fuel injector assembly mounting bolts to the specified torque in the sequence shown.

Tightening torque: 10 - 13 Nm

►H IIR-BLEEDING HIGH-PRESSURE FUEL LINE

 After installing the fuel pump (high pressure), run the engine at 2000 r/min for at least 15 seconds in order to bleed air from the high-pressure fuel line.

NOTE

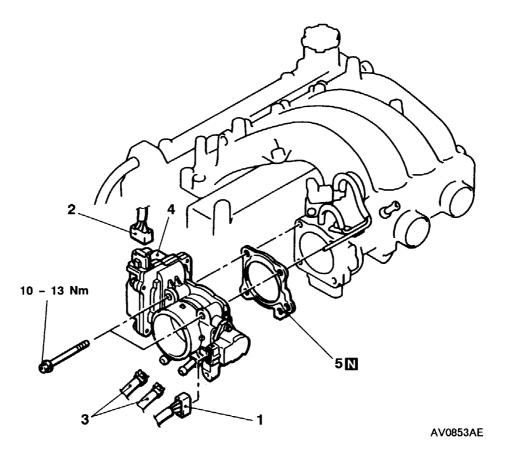
If air is trapped in the high-pressure fuel line due to the removal of fuel pipe, diagnosis code No.56 will be set as abnormal fuel pressure.

2. Finally confirm diagnosis code by using the MUT-II. If diagnosis code, which indicates defective fuel pressure sensor system, has been set, erase the code.

THROTTLE BODY

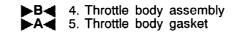
REMOVAL AND INSTALLATION

- Pre-removal and Post-installation Operation
- Engine Coolant Draining and Supplying Air Cleaner Assembly Removal and Installation •

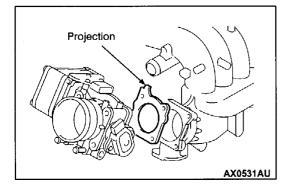


Removal steps

- 1. Throttle position sensor connector
- 2. Throttle control servo connector
- 3. Water hose connection



INSTALLATION SERVICE POINT ►A THROTTLE BODY GASKET INSTALLATION Position the projection as shown in the illustration.



► B THROTTLE BODY INSTALLATION

If the throttle body is replaced, initialize the electronic-controlled throttle valve system.

Initialization

Turn on the ignition switch, and turn off it within one second. Then leave it for at least ten seconds with the ignition switch off.

MULTIPOINT FUEL INJECTION (MPI)

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GENERAL

OUTLINE OF CHANGE

The new 4G6-MPI engine is basically the same as the previous one, which is mounted on the SPACE RUNNER and SPACE WAGON, but some changes have been made as follows:

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.
- The engine-ECU has been changed. <Vehicles with M/T>
- An engine-A/T-ECU has been adopted. <Vehicles with A/T>
- An ignition failure sensor has been adopted.
- The injector has been changed.
- The oxygen sensor has been changed.

GENERAL INFORMATION

The Multipoint Fuel Injection System consists of sensors which detect the engine conditions, the engine-ECU <M/T> or engine-A/T-ECU <A/T> which controls the system based on signals from these sensors, and actuators which operate under the control of the engine-ECU <M/T> or engine-A/T-ECU <A/T>.

FUEL INJECTION CONTROL

The injector drive times and injector timing are controlled so that the optimum air/fuel mixture is supplied to the engine to correspond to the continually-changing engine operation conditions.

A single injector is mounted at the intake port of each cylinder. Fuel is sent under pressure from the fuel tank by the fuel pump, with the pressure being regulated by the fuel pressure regulator. The fuel thus regulated is distributed to each of the injectors.

Fuel injection is normally carried out once for each cylinder for every two rotations of the crankshaft. The firing order is 1-3-4-2. This is called sequential fuel injection. The engine-ECU <M/T> or engine-A/T-ECU <A/T> carries out activities such as fuel injection control, idle speed control and ignition timing control. In addition, the engine-ECU <M/T> or engine-A/T-ECU <A/T> is equipped with several diagnosis modes which simplify troubleshooting when a problem develops.

The engine-ECU <M/T> or engine-A/T-ECU <A/T> provides a richer air/fuel mixture by carrying out "open-loop" control when the engine is cold or operating under high load conditions in order to maintain engine performance. In addition, when the engine is warm or operating under normal conditions, the engine-ECU <M/T> or engine-A/T-ECU <A/T> controls the air/fuel mixture by using the oxygen sensor signal to carry out "closed-loop" control in order to obtain the theoretical air/fuel mixture ratio that provides the maximum cleaning performance from the three way catalyst.

IDLE AIR CONTROL

The idle speed is kept at the optimum speed by controlling the amount of air that bypasses the throttle valve in accordance with changes in idling conditions and engine load during idling. The engine-ECU <M/T> or engine-A/T-ECU <A/T> drives the idle speed control (ISC) motor to keep the engine running at the pre-set idle target speed in accordance with

IGNITION TIMING CONTROL

The power transistor located in the ignition primary circuit turns ON and OFF to control the primary current flow to the ignition coil. This controls the ignition timing in order to provide the optimum ignition timing with respect to the

SELF-DIAGNOSIS FUNCTION

- When an abnormality is detected in one of the sensors or actuators related to emission control, the engine warning lamp (check engine lamp) illuminates as a warning to the driver.
- When an abnormality is detected in one of the sensors or actuators, a diagnosis code corresponding to the abnormality is output.
- The RAM data inside the engine-ECU <M/T> or engine-A/T-ECU <A/T> that is

OTHER CONTROL FUNCTIONS

- 1. Fuel Pump Control Turns the fuel pump relay ON so that current is supplied to the fuel pump while the engine is cranking or running.
- 2. A/C Relay Control Turns the compressor clutch of the A/C ON and OFF.
- 3. Fan Controller The revolutions of the radiator fan and

the engine coolant temperature and air conditioner load. In addition, when the air conditioner switch is turned off and on while the engine is idling, the ISC motor operates to adjust the throttle valve bypass air amount in accordance with the engine load conditions in order to avoid fluctuations in the engine speed.

engine operating conditions. The ignition timing is determined by the engine-ECU <M/T> or engine-A/T-ECU <A/T> from the engine speed, intake air volume, engine coolant temperature and atmospheric pressure.

related to the sensors and actuators can be read by means of the MUT-II. In addition, the actuators can be force-driven under certain circumstances.

 This 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

condenser fan are controlled in response to the engine coolant temperature and vehicle speed.

4. Purge Control Solenoid Valve Control Refer to GROUP 17.

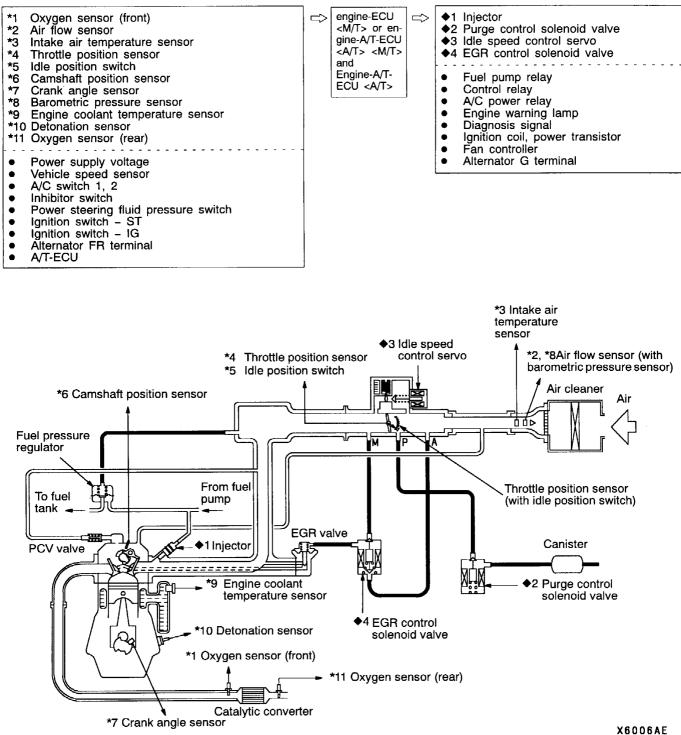
troubleshooting.

5. EGR Control Solenoid Valve Control Refer to GROUP 17.

GENERAL SPECIFICATIONS

Items		Specifications
Throttle body	Throttle bore mm	54
	Throttle position sensor	Variable resistor type
	Idle speed control servo	Stepper motor type (Stepper motor type by-pass air control system with the air volume limiter)
	Idle position switch	Rotary contact type, within throttle position sensor
Engine-ECU	Identification model No.	E2T73678
Engine- A/T-ECU	Identification model No.	E2T76374
Sensors	Air flow sensor	Karman vortex type
	Barometric pressure sensor	Semiconductor type
	Intake air temperature sensor	Thermistor type
	Engine coolant temperature sensor	Thermistor type
	Oxygen sensor	Zirconia type
	Vehicle speed sensor	Magnetic resistive element type
	Inhibitor switch	Contact switch type
	Camshaft position sensor	Hall element type
	Crank angle sensor	Hall element type
	Detonation sensor	Piezoelectric type
	Power steering fluid pressure switch	Contact switch type
Actuators	Control relay type	Contact switch type
	Fuel pump relay type	Contact switch type
	Injector type and number	Electromagnetic type, 4
	Injector identification mark	CDH240
	EGR control solenoid valve	Duty cycle type solenoid valve
	Purge control solenoid valve	ON/OFF type solenoid valve
Fuel pressure regulator	Regulator pressure kPa	329

MULTIPOINT FUEL INJECTION SYSTEM DIAGRAM



SERVICE SPECIFICATIONS

Items		Specifications
Basic idle speed r/min		750±50
Throttle position sensor adjust	ing voltage mV	400 – 1,000
Throttle position sensor resista	ance kΩ	3.5 - 6.5
Idle speed control servo coil re	esistance Ω	28 – 33 (at 20°C)
Intake air temperature sensor	20°C	2.3 - 3.0
resistance kΩ	80°C	0.30 - 0.42
Engine coolant temperature	20°C	2.1 – 2.7
sensor resistance k Ω	80°C	0.26 – 0.36
Oxygen sensor output voltage	(when engine is racing) V	0.6 – 1.0
Oxygen sensor heater coil	Front	4.5 - 8.0
resistance (at 20°C) Ω	Rear	11 – 18
Fuel pressure kPa	Vacuum hose disconnection	324 – 343 at kerb idle
	Vacuum hose connection	Approx. 265 at kerb idle
Injector coil resistance Ω		13 – 16 (at 20°C)

SEALANT

Item	Specified sealant	Remark
Engine coolant temperature sensor threaded portion	3M Nut Locking Part No. 4171 or equivalent	Drying sealant

SPECIAL TOOLS

ТооІ	Number	Name	Use
A B	MB991223 A: MB991219 B: MB991220 C: MB991221 D: MB991222	Harness set A: Test harness B: LED harness C: LED harness adapter D: Probe	 Fuel gauge simple inspection A: Connector pin contact pressure inspection B: Power circuit inspection C: Power circuit inspection D: Commercial tester connection
C C			
D C991223			
B991502	MB991502	MUT-II sub assembly	 Reading diagnosis code MPI system inspection
	MB991348	Test harness set	 Measurement of voltage during trouble- shooting Inspection using an analyzer
ANTEL/O	MB991709	Test harness	
	MB991519	Alternator harness connector	Measurement of voltage during troubleshooting
	MD998463	Test harness (6-pin, square)	 Inspection of idle speed control servo Inspection using an analyzer
	MD998464	Test harness (4-pin, square)	Inspection of oxygen sensor (front)

Tool	Number	Name	Use
J.	MD998478	Test harness (3-pin, triangle)	 Measurement of voltage during trouble- shooting Inspection using an analyzer
C. C	MD998709	Adaptor hose	Measurement of fuel pressure
E	MD998742	Hose adaptor	
	MD998706	Injector test set	Checking the spray condition of injectors
мВ991607	MB991607	Injector test har- ness	
MD998741	MD998741	Injector test adap- tor	
	MB991608	Clip	

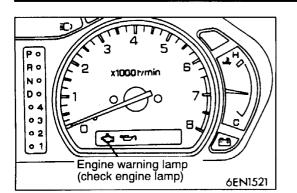
TROUBLESHOOTING

DIAGNOSIS TROUBLESHOOTING FLOW

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

NOTE

If the ECU is replaced, the immobilizer-ECU and ignition key should replaced together with it. Each ECU has an individual information for immobilizer-ECU, and the individual information is registered in the immobilizer-ECU.



DIAGNOSIS FUNCTION

ENGINE WARNING LAMP (CHECK ENGINE LAMP)

If an abnormality occurs in any of the following items related to the MPI 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 </m>
P0100	Air flow sensor system
P0105	Barometric pressure sensor system
P0110	Intake air temperature sensor system
P0115	Engine coolant temperature sensor system
P0120 ★	Throttle position sensor system
P0125	Feedback system
P0130	Oxygen sensor (front) system <sensor 1=""></sensor>
P0135	Oxygen sensor heater (front) system <sensor 1=""></sensor>
P0136	Oxygen sensor (rear) system <sensor 2=""></sensor>
P0141	Oxygen sensor heater (rear) system <sensor 2=""></sensor>
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+	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
P0335	Crank angle sensor system
P0340	Camshaft position sensor system
P0403	EGR valve system

Code No.	Diagnosis item
P0420	Catalyst malfunction
P0443	Purge control solenoid valve system
P0505	Idle speed control system
P0510	Idle position switch system
P0551	Power steering fluid pressure switch system

NOTE

- 1. If the engine warning lamp illuminates because of a malfunction of the engine-ECU <M/T> or engine-A/T-ECU <A/T>, communication between MUT-II and the engine-ECU <M/T> or engine-A/T-ECU <A/T> is impossible. In this case, the diagnosis code cannot be read.
- After the engine-ECU <M/T> or engine-A/T-ĔCU <A/T> 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 </br>
 (1) When the engine-ECU
 (2) when the engine-ECU
 (1) when the engine-ECU
 (2) when the engine-ECU
 (2) when the engine-ECU
 (2) when the engine-ECU
 (3) when the engine-ECU
 (4) when the engine-ECU
 - *: 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 <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 temp	erature sensor	°C
Engine speed		r/min
Vehicle speed		km/h
Long-term fuel com fuel trim)	pensation (long-term	%
Short-term fuel comp fuel trim)	Short-term fuel compensation (short-term fuel trim)	
Fuel control condi-	Open loop	OL
uon	Closed loop	CL
	Open loop owing to drive condition	OL-DRV.
	Open loop owing to system malfunction	
	Closed loop based on one oxygen sen- sor	CL-H02S
Calculation load valu	%	
Diagnosis code durir	-	

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	 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. 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 25°C.
Throttle position sen- sor (TPS)	No increase in fuel injection amount during acceleration due to the throttle position sensor signal.
Engine coolant tem- perature sensor	Controls as if the engine coolant temperature is 80°C.
Camshaft position sensor	Injects fuel to all cylinders simultaneously. (However, after the ignition switch is turned to ON, the No. 1 cylinder top dead centre is not detected at all.)
Barometric pressure sensor	Controls as if the barometric pressure is 101 kPa.
Detonation sensor	Switches the ignition timing from ignition timing for super petrol to ignition timing for standard petrol.
Ignition coil, power transistor	Cuts off the fuel supply to cylinders with an abnormal ignition.
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.
Alternator FR terminal	Does not control the output of the alternator according to an electrical load. (works as a normal alternator)
Misfiring	If the detected misfiring causes damage to the catalyst, the misfiring cylinder will be shut down.

INSPECTION CHART FOR DIAGNOSIS CODES

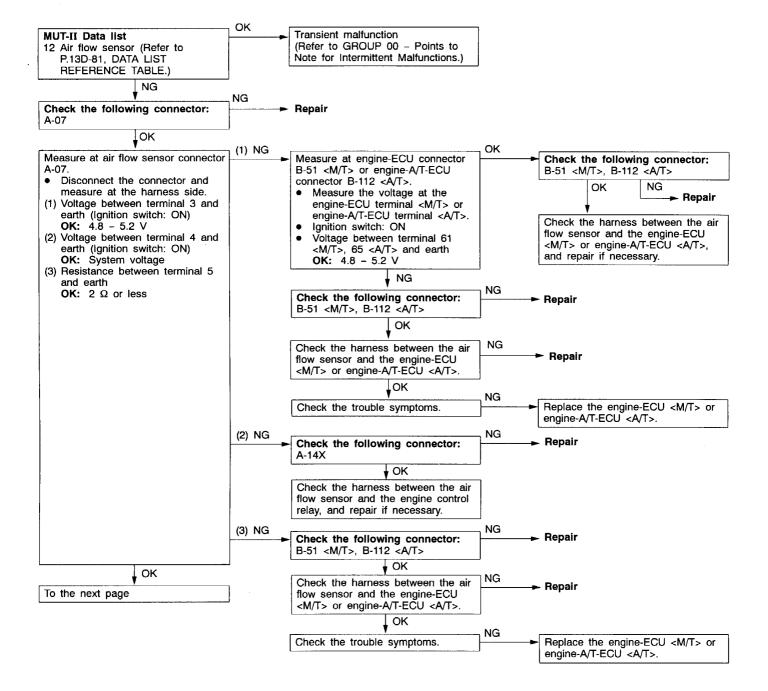
Code No.	Diagnosis item	Reference page
P0100	Air flow sensor system	13D-16
P0105	Barometric pressure sensor system	13D-18
P0110	Intake air temperature sensor system	13D-20
P0115	Engine coolant temperature sensor system	13D-22
P0120 ★	Throttle position sensor 1 system	13D-24
P0125	Feedback system	13D-26
P0130	Oxygen sensor (front) system <sensor 1=""></sensor>	13D-27
P0135	Oxygen sensor heater (front) system <sensor 1=""></sensor>	13D-29
P0136	Oxygen sensor (rear) system <sensor 2=""></sensor>	13D-30
P0141	Oxygen sensor heater (rear) system <sensor 2=""></sensor>	13D-32
P0170	Abnormal fuel system	13D-33
P0201	No. 1 injector system	13D-34
P0202	No. 2 injector system	13D-34
P0203	No. 3 injector system	13D-34
P0204	No. 4 injector system	13D-34
P0300*	Ignition coil (power transistor) system	13D-35
P0301	No. 1 cylinder misfire detected	13D-37
P0302	No. 2 cylinder misfire detected	13D-37
P0303	No. 3 cylinder misfire detected	13D-37
P0304	No. 4 cylinder misfire detected	13D-37
P0325	Detonation sensor system	13D-38
P0335	Crank angle sensor system	13D-38
P0340	Camshaft position sensor system	13D-40
P0403	EGR valve system	13D-42
P0420	Catalyst malfunction	13D-43
P0443	Purge control solenoid valve system	13D-44
P0500	Vehicle speed sensor system	13D-45
P0505	Idle speed control system	13D-45
P0510	Idle position switch system	13D-47
P0551	Power steering fluid pressure switch system	13D-48
P1500	Alternator FR terminal system	13D-49
P1610	Immobilizer system	13D-50

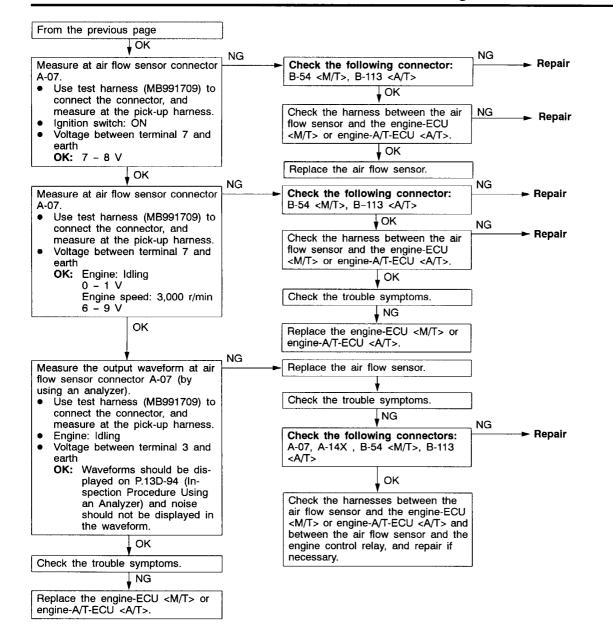
NOTE

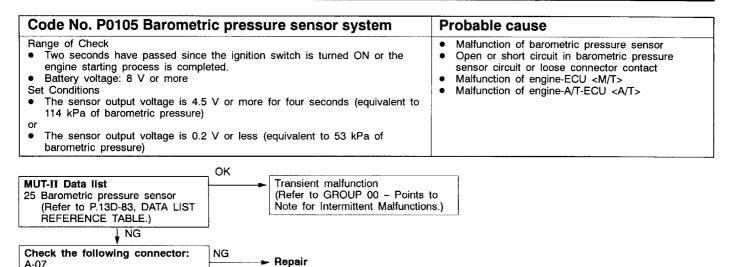
- 1. Do not replace the engine-ECU <M/T> or engine-A/T-ECU <A/T> until a through terminal check reveals there are no short/open circuit.
- 2. Check that the engine-ECU <M/T> or engine-A/T-ECU <A/T> earth circuit is normal before checking for the cause of the problem.
- 3. After the engine-ECU <M/T> or 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.

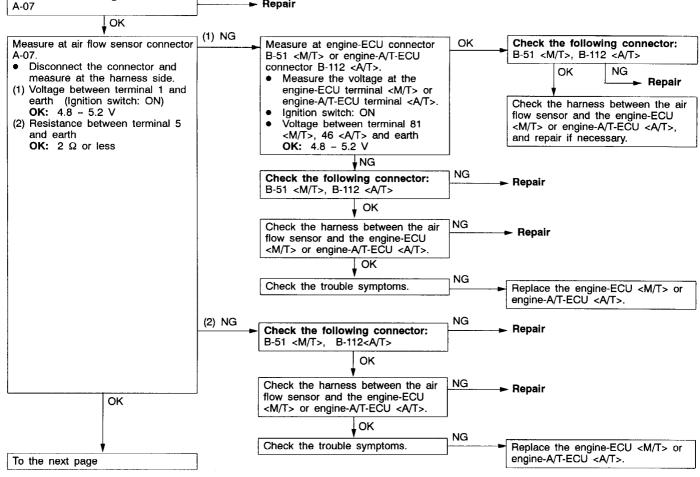
INSPECTION PROCEDURE CLASSIFIED BY DIAGNOSIS CODE

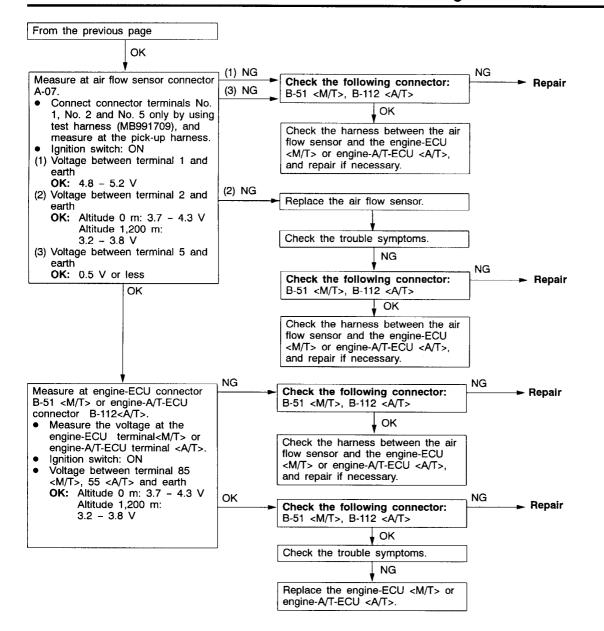
Code No. P0100 Air flow sensor system	Probable cause
 Range of Check Engine speed: 500 r/min or more Set Conditions The sensor output frequency is 3.3 Hz or less for four seconds. 	 Malfunction of air flow sensor Open or short circuit in air flow sensor circuit or loose connector contact Malfunction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

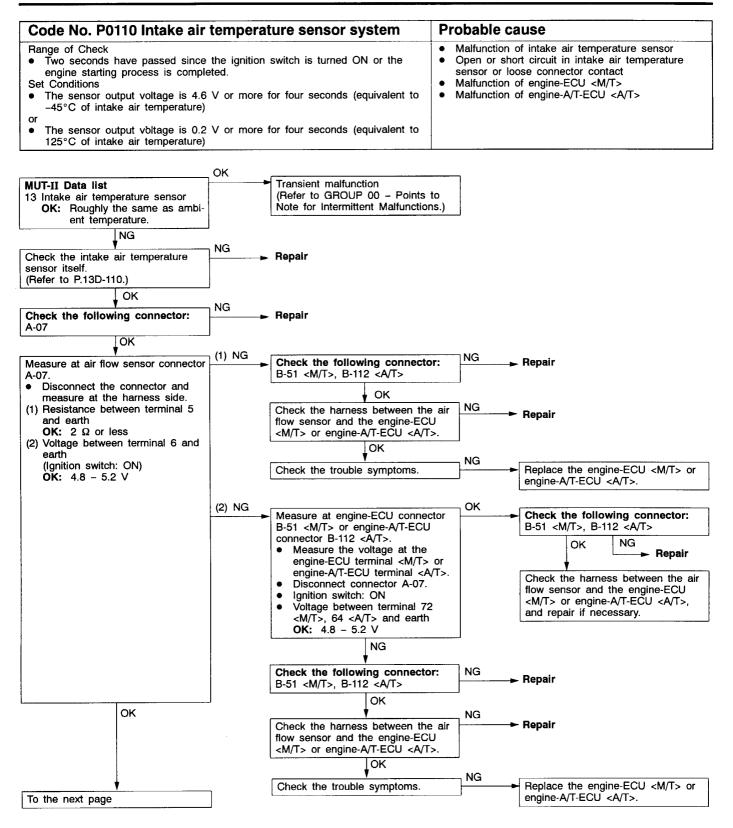


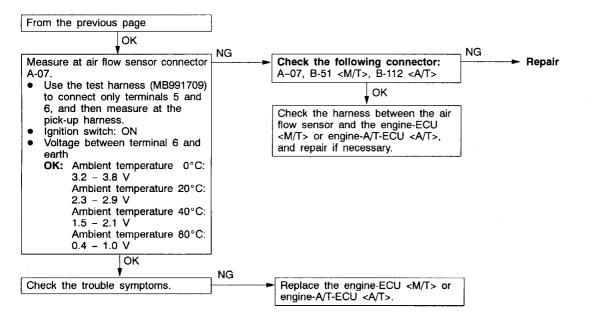




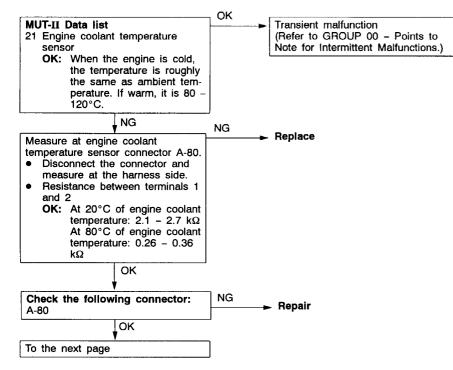


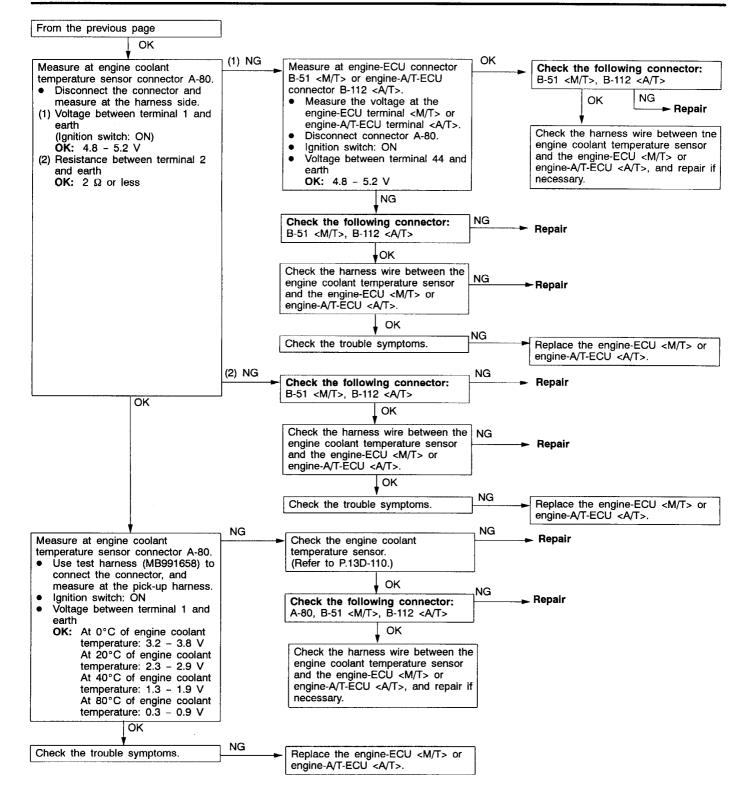


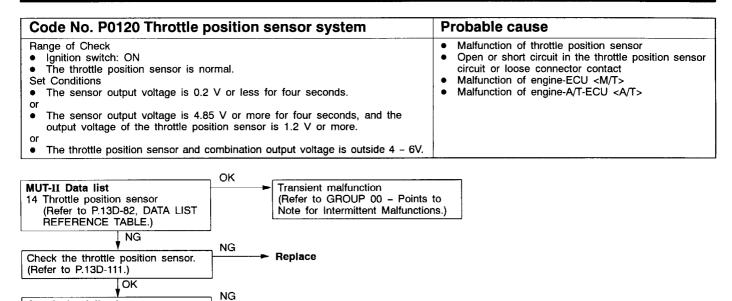


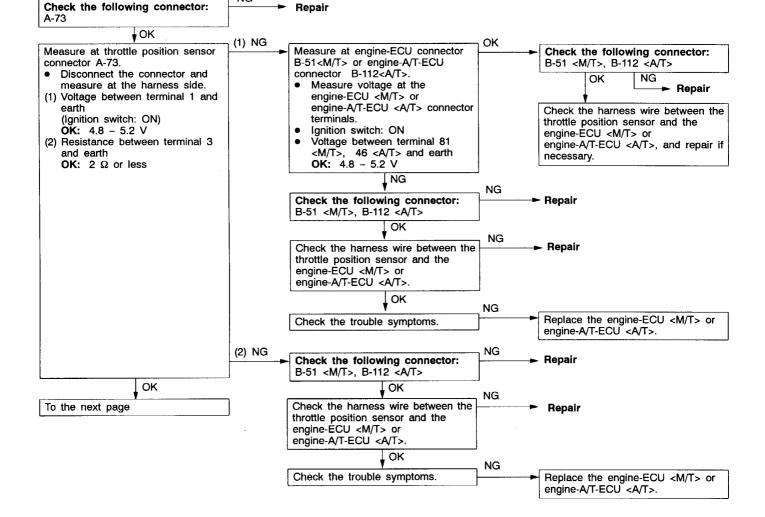


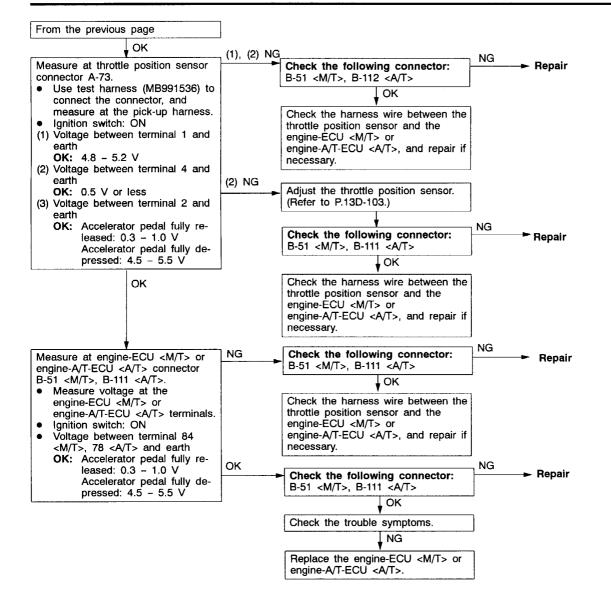
Code No. P0115 Engine coolant temperature sensor system	Probable cause
 Range of Check Engine: Two seconds after the engine has been started Set Conditions The sensor output voltage is 4.6 V or more for four seconds (equivalent to -45°C of engine coolant temperature) or The sensor output voltage is 0.1 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=""></m> Malfunction of engine-A/T-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. 	











Voltage between terminal 76

Check the following connector:

Replace the engine-ECU <M/T> or

OK

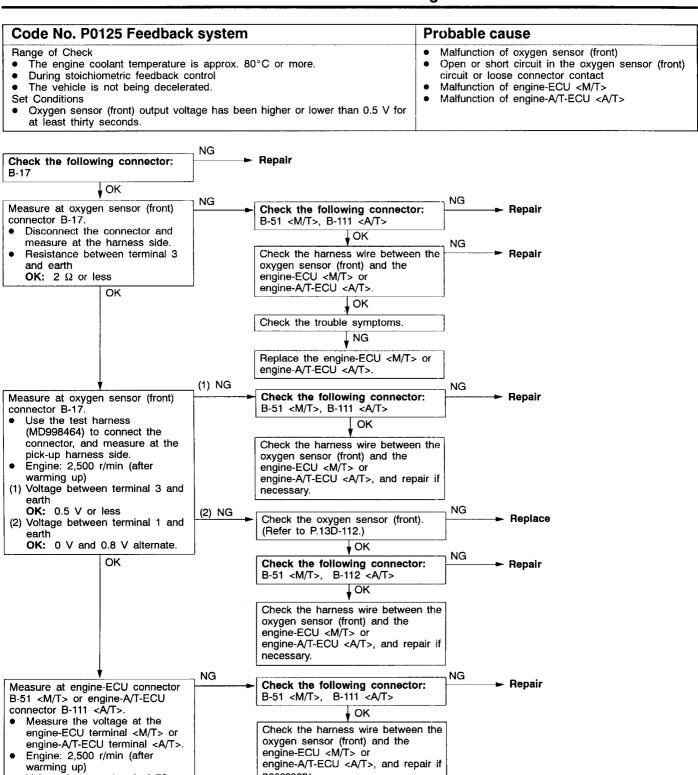
NG

B-51 <M/T>, B-111 <A/T>

engine-A/T-ECU <A/T>.

Check the trouble symptoms.

<M/T>, 71 <A/T> and earth OK: 0 V and 0.8 V alternate. OK



necessary

Repair

Transient malfunction

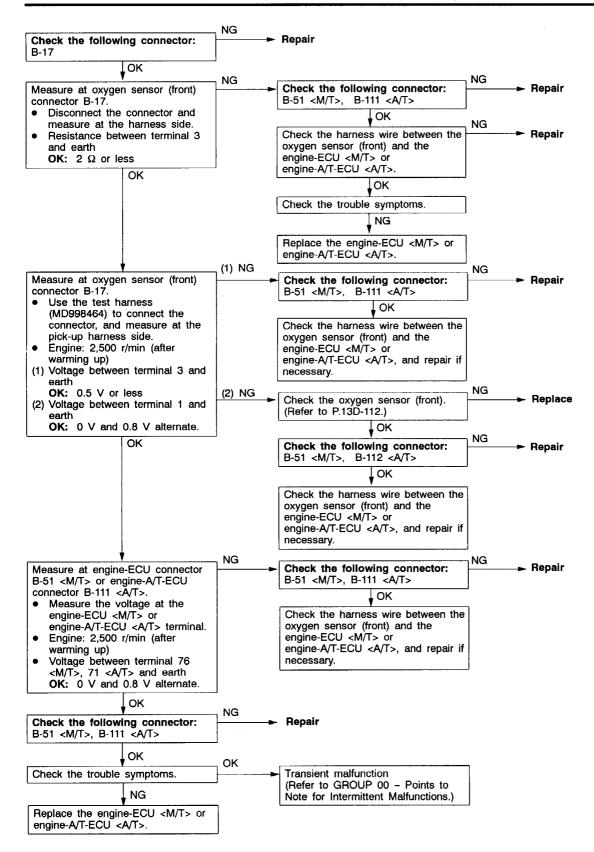
(Refer to GROUP 00 - Points to

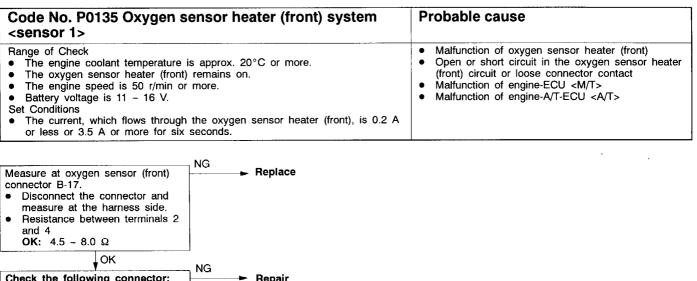
Note for Intermittent Malfunctions.)

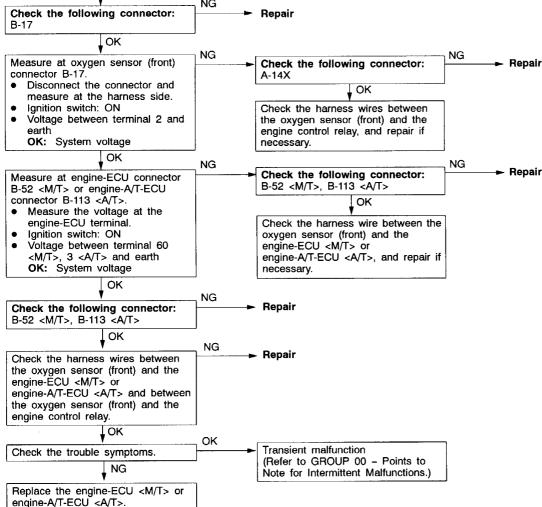
NG

OK

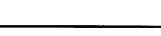
Code No. P0130 Oxygen sensor (front) system <sensor 1=""></sensor>	Probable cause
 Range of Check Three minutes have been passed since the engine has been started. The engine coolant temperature is approx. 80°C or more. Intake air temperature is 20 - 50°C Engine speed is 1,200 r/min or more Driving on 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=""></m> Malfunction of engine-A/T-ECU
 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. 	

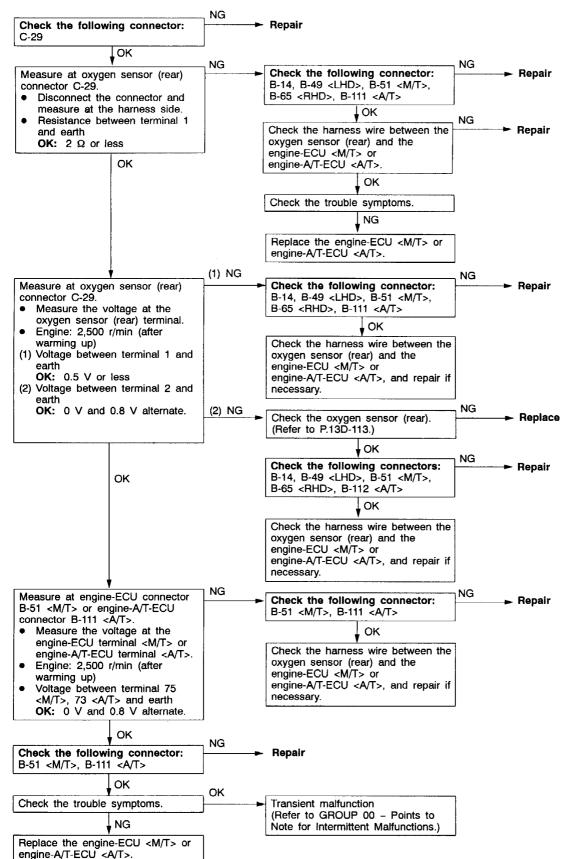


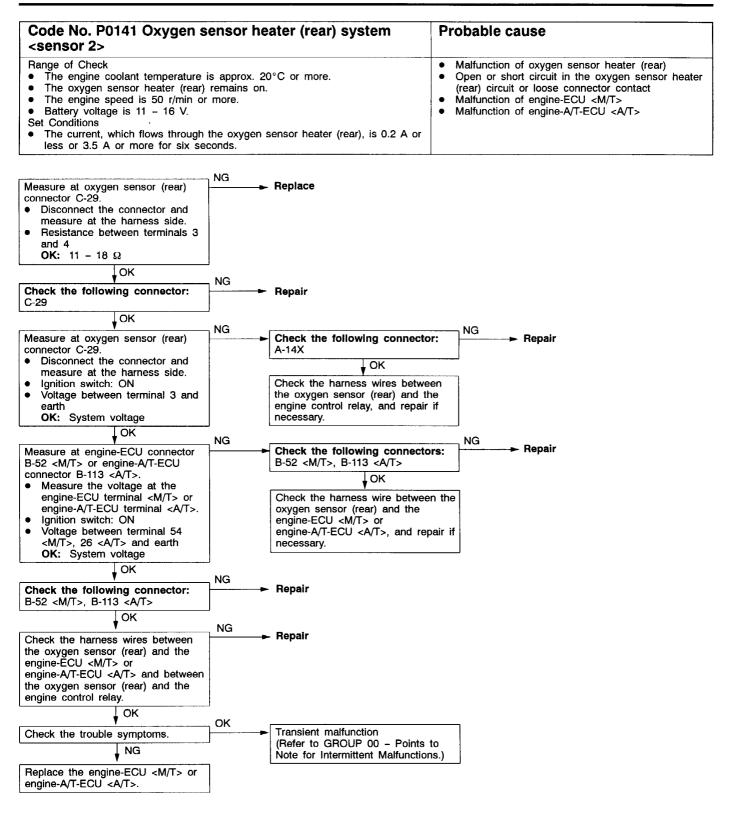




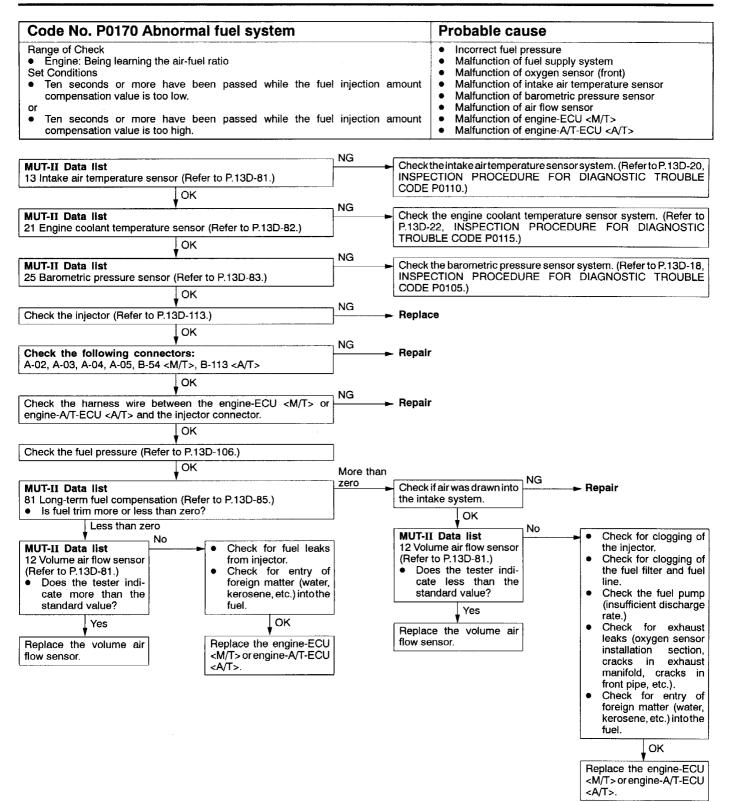
Code No. P0136 Oxygen sensor (rear) system <sensor 2=""></sensor>	Probable cause
 Range of Check Three minutes have been passed since the engine has been started. The engine coolant temperature is approx. 80°C or more. Intake air temperature is 20 - 50°C Engine speed is 1,200 r/min or more Driving on 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=""></m>	 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=""></m> Malfunction of engine-A/T-ECU
 Range of Check Two seconds have passed after the engine-ECU <m t=""> or engine-A/T-ECU detected an open circuit.</m> 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. 	





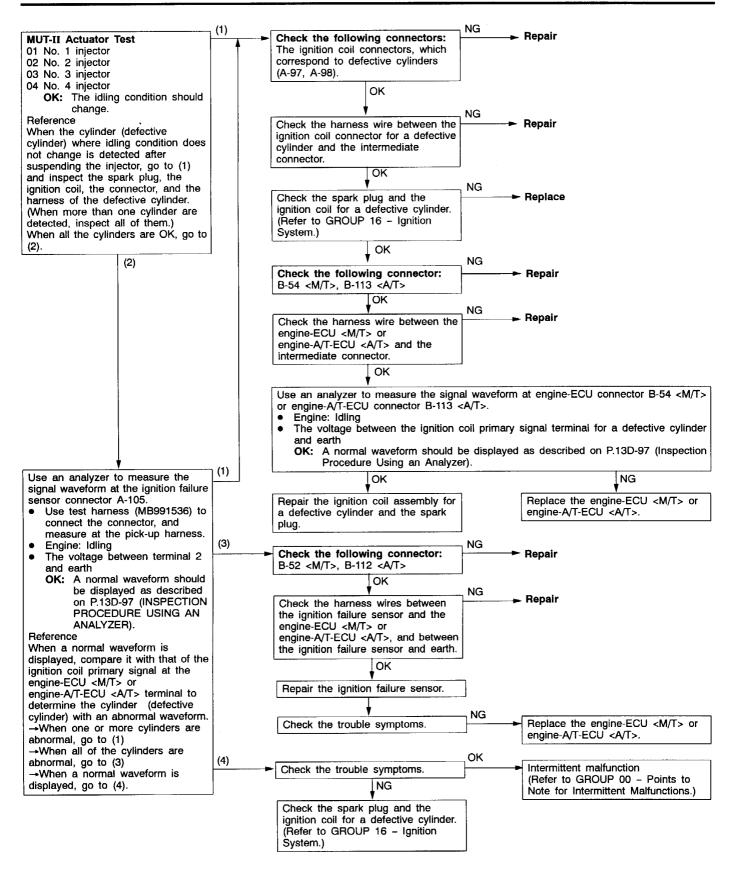


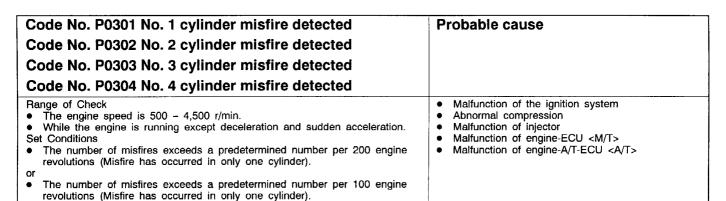
MPI – Troubleshooting

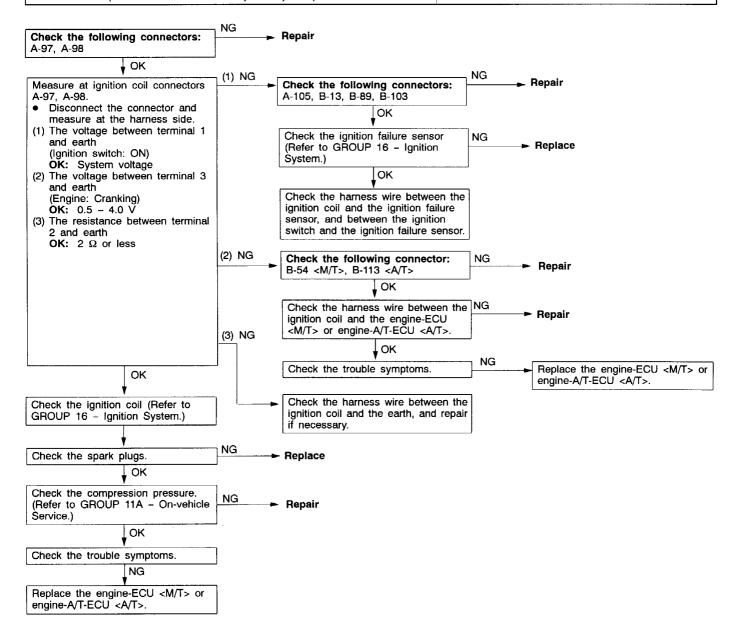


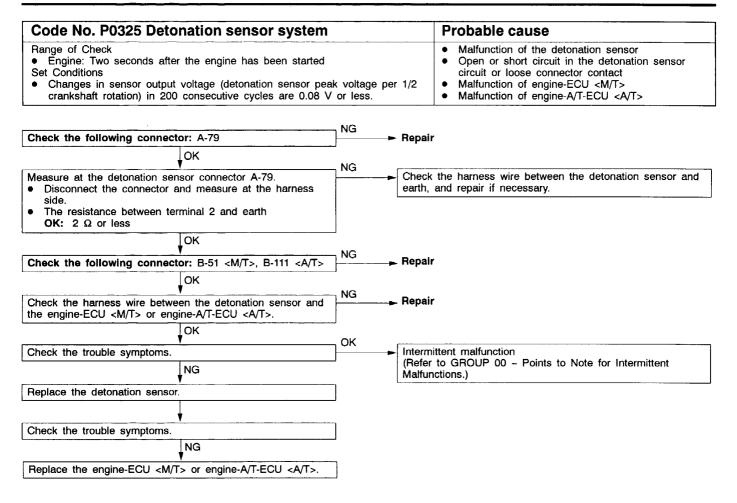
Code No. P0201 No. 1 injector system		Probable cause
Code No. P0202 No. 2 injector system		
Code No. P0203 No. 3 injector system		
Code No. P0204 No. 4 injector system		
 Range of Check Engine speed is approx. 50 – 1,000 r/min The throttle position sensor output voltage is 1.15 V or less. Actuator test by MUT-II is not carried out. Set Conditions Surge voltage of injector coil is not detected for 4 seconds. 		 Malfunction of the injector Improper connector contact, open circuit or short-circuited harness wire of the injector circuit Malfunction of engine-ECU <m t=""></m> Malfunction of engine-A/T-ECU
	¬ ОК	
MUT-II Actuator Test 01 No. 1 injector 02 No. 2 injector 03 No. 3 injector 04 No. 4 injector	Intern	nittent malfunction r to GROUP 00 – Points to Note for Intermittent Malfunctions.)
OK: The idling condition should change		
NG	¬ NG _	
Check the following connectors: A-02, A-03, A-04, A-05	Repa	ir
OK	L	
Check the injector. (Refer to P.13D-113.)	NG Repla	ace
ок	•	
Measure at the injector connectors A-02, A-03, A-04, A-05. Disconnect the connector, and measure at the harness side. Voltage between 1 and earth (Ignition switch: ON) OK: System voltage		k the harness wire between the engine control relay and the or connector, and repair if necessary.
ок		
Check the following connector: B-54 <m t="">, B-113 </m>]	ir
ОК	NG	
 Measure at the engine-ECU connector B-54 <m t=""> or engine-A/T-ECU connector B-113 .</m> Disconnect the connector, and measure at the harness side. Voltage between 1, 2, 14, 15 and earth (Ignition switch: ON) OK: System voltage 	Chec	k the harness wire between the engine-ECU <m t=""> or e-A/T-ECU and the injector connector, and repair if ssary.</m>
ОК	_	
Check trouble symptoms.]	
NG	OK	
 Use an analyzer to measure the signal waveform at injector connector B-54 <m t="">, B-113 .</m> Use a test harness (MB991348) 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.13D-97 (INSPECTION PROCEDURE USING AN ANALYZER). 	Intern	nittent malfunction (Refer to GROUP 00 – Points to Note for nittent Malfunctions.)
NG	-	
Replace the engine-ECU <m t=""> or engine-A/T-ECU .</m>]	

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=""></m> Malfunction of engine-A/T-ECU

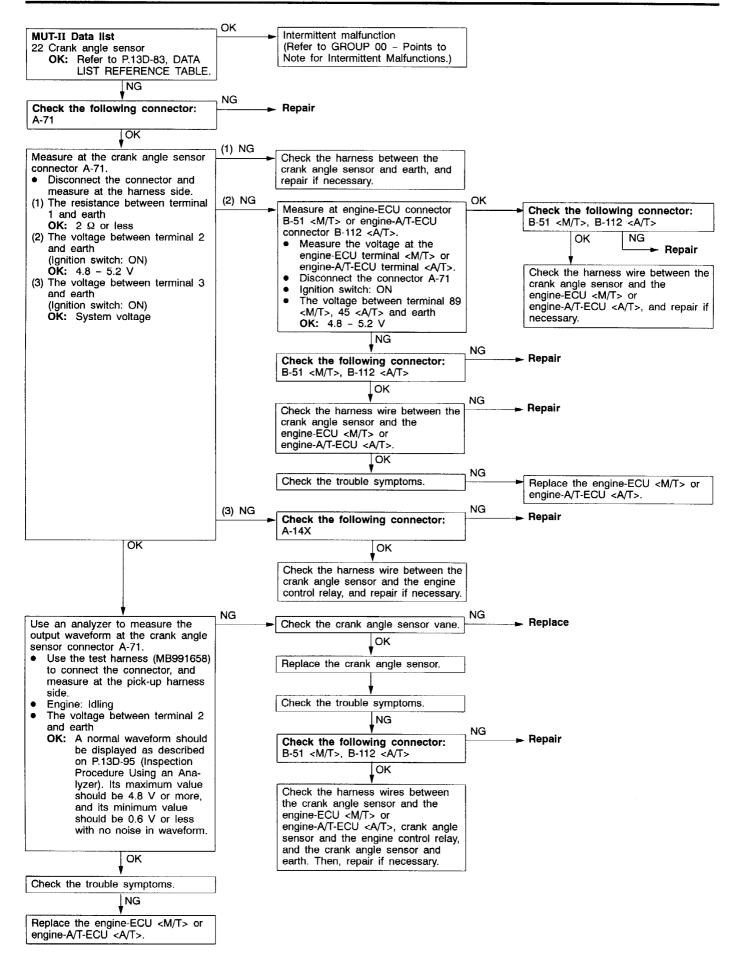






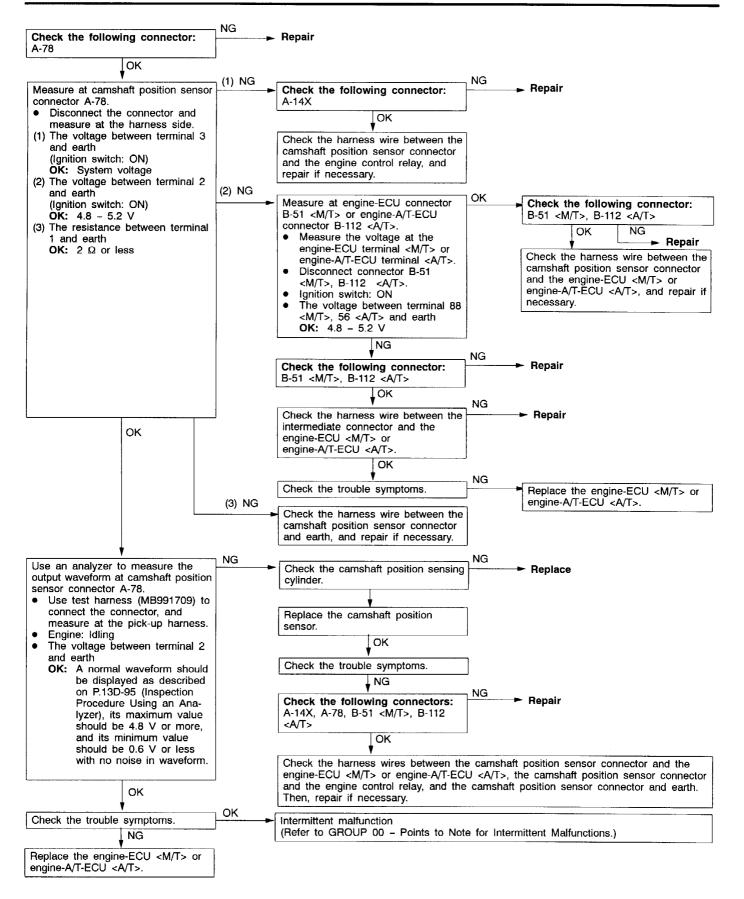


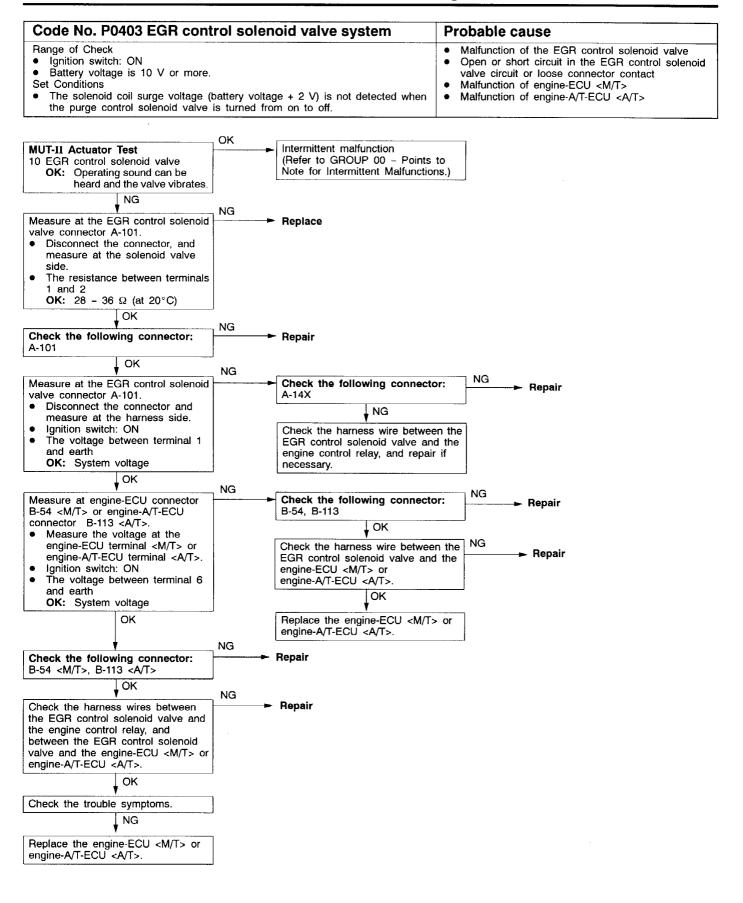
Code No. P0335 Crank angle sensor system	Probable cause
 Range of Check Engine is cranking Set Conditions Sensor output voltage does not change for 4 seconds (no pulse signal input). 	 Malfunction of the crank angle sensor. Open or short circuit in the crank angle sensor circuit or loose connector contact.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



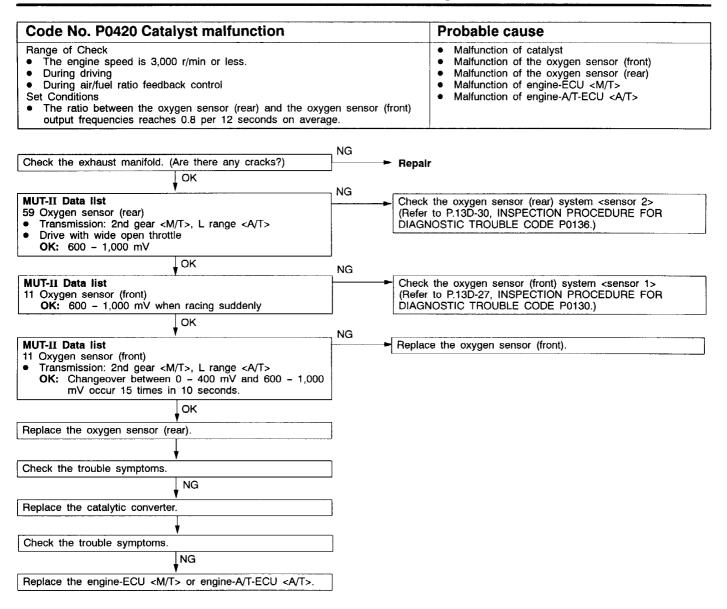
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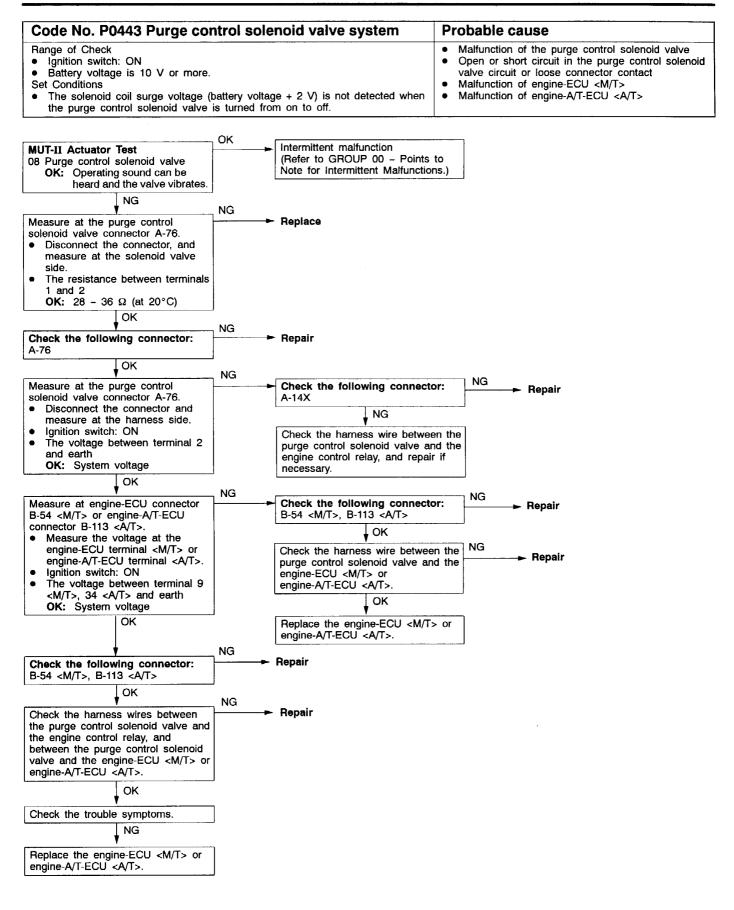
Code No. P0340 Camshaft position sensor system	Probable cause
 Range of Check After the engine was started Set Conditions The sensor output voltage does not change for 4 seconds (no pulse signal input). 	 Malfunction of the camshaft position sensor Open or short circuit in the camshaft position sensor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





MPI – Troubleshooting

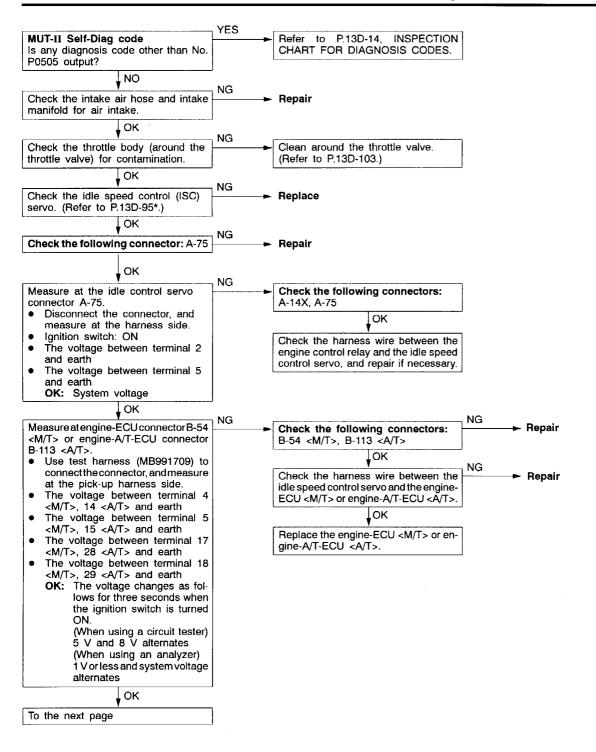


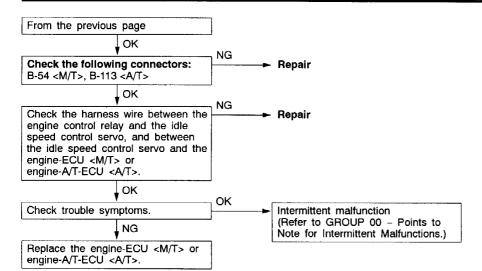


MPI – Troubleshooting

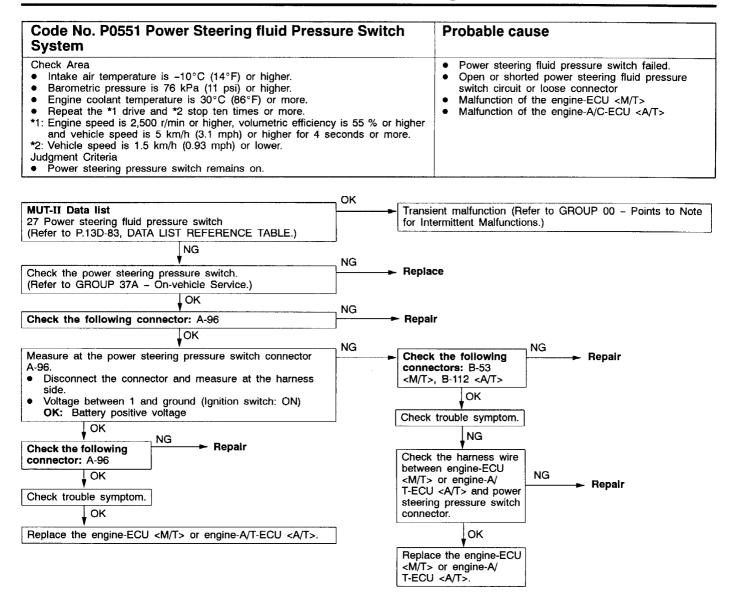
Code No. P0500 Vehicle speed sensor syste	m <m t=""></m>	Probable cause
 Range of Check Engine: Two seconds after the engine was started Idle switch: OFF Engine speed: 2,500 r/min or more During high engine load Set Conditions The sensor output voltage does not change for 4 seconds input). 	s (no pulse signal	 Malfunction of the vehicle speed sensor Open or short circuit in the vehicle speed sensor circuit or loose connector contact Malfunction of engine-ECU
	, NO	
Does the speedometer operate normally?		k the vehicle speed sensor
YES	(Hefe	r to GROUP 54 - Combination Meter.)
¥	NG	
Use an analyzer to measure the output waveform of the		k the following connector:
 vehicle speed sensor at engine-ECU connector B-51. Driving the vehicle 	B-14	<m t="">, B-51 </m>
 Driving the vehicle The voltage between terminal 86 and earth 		OK
OK: A normal waveform should be displayed as described		Repair
in OSCILLOSCOPE INSPECTION PROCEDURE,		V
and noise should not be displayed in the waveform. (Refer to GROUP 23 – Troubleshooting.)		k the harness wire between intermediate connector B-14 the engine-ECU, and repair if necessary.
	·	•
OK	_	
Check the following connector: A-86	NG Repa	ir
ОК	1	
Check the trouble symptoms.		
NG		
Replace the engine-ECU.]	

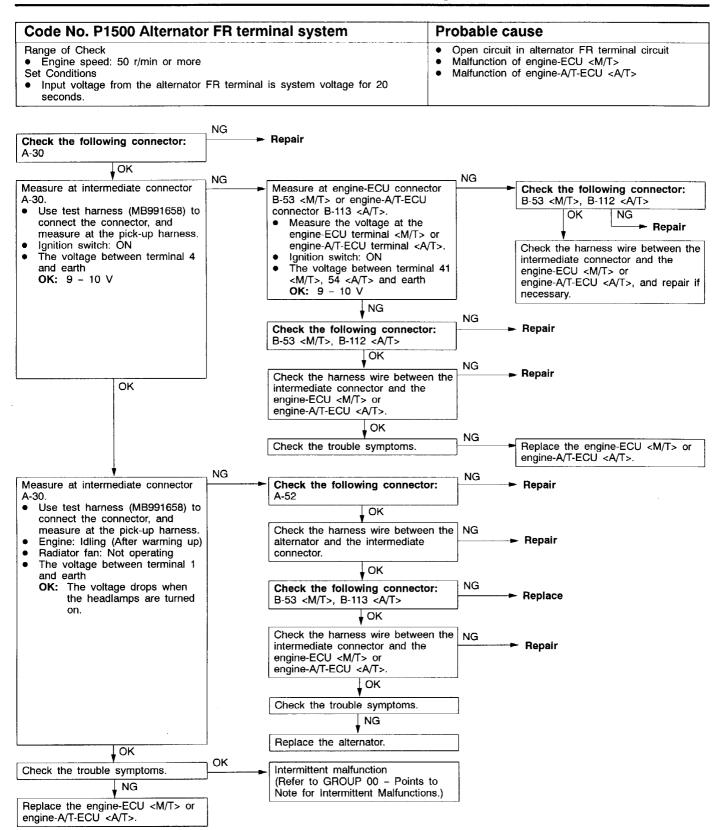
Code No. P0505 Idle speed control (ISC) system	Probable cause
 Check Area Vehicle speed has reached 1.5 km/h at least once. Under the closed loop idle speed control. Judgment Criteria Actual idle speed has continued to be higher than the target idle speed by 300 r/min or more for 10 sec. Check Area Vehicle 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 temperature 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-circuit harness wire Malfunction of engine-ECU <m t=""></m> Malfunction of engine-A/C-ECU





Code No. P0510 Idle Position Switch System	n	Probable cau	ISE
 Check Area Throttle position sensor output voltage is 2.0 V or more. Judgment Criteria Idle position switch has been turned on. Check Area Repeat the *1 drive and *2 stop 15 times. *1 drive: Vehicle speed is more than 30 km/h (19 mph) for more. *2 stop: Vehicle speed is more than 1.5 km/h (0.93 mph). Judgment Criteria Idle position switch remains off. 	two seconds or	 Open or shorte loose connecto Malfunction of 	idle position switch ed idle position switch circuit, or r. engine-ECU <m t=""> engine-A/T-ECU </m>
MUT-II Data list 26 Idle position switch (Refer to P.13D-83, DATA LIST REFERENCE TABLE.)	OK for Ir	ient malfunction (Ref termittent Malfunction	er to GROUP 00 - Points to Note s.)
NG ▼	NC		
Check the idle position switch. (Refer to P.13D-141.)	NG Repla	ace the throttle position	on sensor (TPS).
OK Check the following connector: A-73	NG ► Repa	ir	
 OK Measure at the throttle position sensor connector A-73. Disconnect the connector, and measure at the harness side. Voltage between 3 and ground (Ignition switch: ON) OK: 4 V or higher Continuity between 4 and ground OK: Continuity 	conn B-111 <a t:<="" td=""><td>k the following ectors: B-51, , B-112</td><td>NG ► Repair</td>	k the following ectors: B-51, , B-112	NG ► Repair
OK Check the following connector: A-73 OK Check trouble symptom.	Chec	NG k the harness wire be	etween engine-ECU <m t=""> or d throttle position sensor connector.</m>
Replace the engine-ECU <m t=""> or engine-A/T-ECU .</m>	_ <m t<="" td=""><td>ace the engine-ECU > or engine-A/T- .</td><td>v Repair</td></m>	ace the engine-ECU > or engine-A/T- .	v Repair

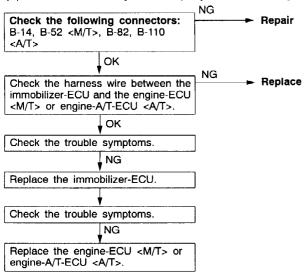




Cord No. P1610 Immobilizer system	Probable cause
 Range of Check Ignition switch: ON Set Conditions Improper communication between the engine-ECU <m t=""> or engine-A/T-ECU and the immobilizer-ECU</m> 	 Open or short circuit, or loose connector contact Malfunction of the immobilizer-ECU Malfunction of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

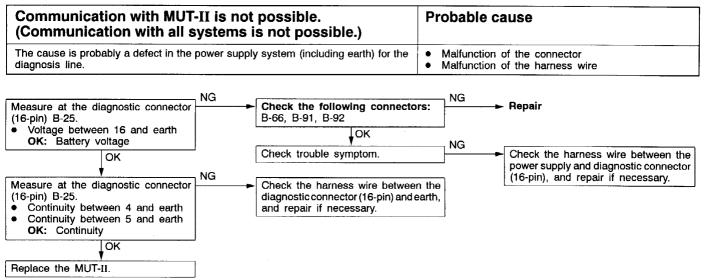


INSPECTION CHART FOR TROUBLE SYMPTOMS

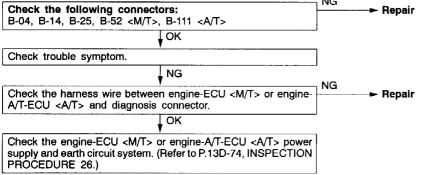
Trouble symptom		Inspection procedure No.	Reference page
Communication with MUT-II is	Communication with all systems is not possible.	1	13D-77
impossible.	Communication with engine-ECU <m t=""> or engine-A/T-ECU only is not possible.</m>	2	13D-77
Engine warning lamp and	The engine warning lamp does not illuminate right after the ignition switch is turned to the ON position.	3	13D-53
related parts	The engine warning lamp remains illuminating and never goes out.	4	13D-53
Starting	No initial combustion (starting impossible)	5	13D-54
	Initial combustion but no complete combustion (starting impossible)	6	13D-45
	Long time to start (improper starting)	7	13D-56
Idling stability	Unstable idling (Rough idling, hunting)	8	13D-57
(Improper idling)	Idling speed is high. (Improper idling speed)	9	13D-82
	Idling speed is low. (Improper idling speed)	10	13D-60
Idling stability (Engine stalls)	When the engine is cold, it stalls at idling. (Die out)	11	13D-61
(Engine stails)	When the engine becomes hot, it stalls at idling. (Die out)	12	13D-86
	The engine stalls when starting the car. (Pass out)	13	13D-64
	The engine stalls when decelerating.	14	13D-64
Driving	Hesitation, sag or stumble	15	13D-65
	The feeling of impact or vibration when accelerating	16	13D-66
	The feeling of impact or vibration when decelerating	17	13D-66
	Poor acceleration	18	13D-67
	Surge	19	13D-69
	Knocking	20	13D-70
Dieseling		21	13D-70
Too high CO and	HC concentration when idling	22	13D-71
Low alternator ou	tput voltage (approx. 12.3 V)	23	13D-72
Idling speed is im	proper when A/C is operating	24	13D-72
Fans (radiator far	n, A/C condensor fan) are inoperative	25	13D-73

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

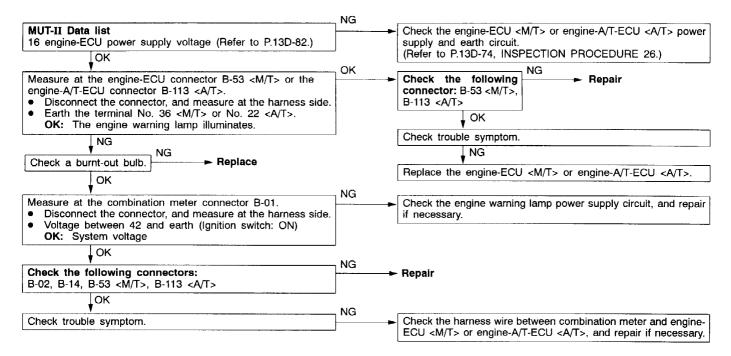
INSPECTION PROCEDURE 1



MUT-II communication with engine-ECU $$ or engine-A/T-ECU $$ 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 .</m> Defective earth circuit of engine-ECU <m t=""> or engine-A/T-ECU .</m> Defective engine-ECU <m t=""> or engine-A/T-ECU .</m> Improper communication line between engine-ECU <m t=""> or engine-A/T-ECU .</m> 	 Malfunction of engine-ECU <m t=""> or engine-A/T-ECU power supply circuit</m> Malfunction of engine-ECU <m t=""> or engine-A/T-ECU </m> Open circuit between the engine-ECU <m t=""> or engine-A/T-ECU and diagnosis connector</m>



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 A/T-> or engine-A/T-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 <m t=""> or engine-A/T-ECU </m>



INSPECTION PROCEDURE 4

Replace the engine-ECU <M/T> or engine-A/T-ECU <A/T>.

The engine warning lamp remains illuminating and never goes out. In cases such as the above, the cause is probably that the engine-ECU <m t=""> or engine-A/T-ECU is detecting a problem in a sensor or actuator, or that one of the malfunctions listed at right has occurred.</m>		Probable cause	
		 Short-circuit between the engine warning lamp and engine-ECU <m t=""> or engine-A/T-ECU </m> Malfunction of the engine-ECU <m t=""> or engine-A/T-ECU </m> 	
MUT-II Self-Diag code Are diagnosis codes displayed?	CODE	to P.13D-14, INSPECTION CHART FOR DIAGNOSIS S.	
 Measure at the combination meter connector B-02. Disconnect the connector, and measure at the harness side. Disconnect the engine-ECU <m t=""> or engine-A/T-ECU connector</m> Continuity between 22 and earth OK: No continuity 		the harness wire between combination meter and engine- M/T> or engine-A/T-ECU connector, and repair it sary.	

No initial combustion (starting impossible)		Probable cause	
In cases such as the above, the cause is probably that a spar or that the supply of fuel to the combustion chamber is defe In addition, foreign materials (water, kerosene, etc.) may be r	ective.	 Malfunction of the fuel pump system 	
Check battery voltage when cranking.	NG	heck the battery. (Refer to GROUP 54 - Battery.)	
OK: 8 V or higher		· · · · · · · · · · · · · · · · · · ·	
· · · · · · · · · · · · · · · · · · ·	Yes	heck the immobilizer.	
Is immobilizer-ECU diagnosis code displayed?		Refer to GROUP 54 – Ignition Key and Immobilizer.)	
MUT-II Data list 16 Power supply voltage (Refer to P.13D-82.)	NG (F	heck the power supply and ignition switch-IG system. Refer to P.13D-75, INSPECTION PROCEDURE 27.)	
Ток			
Does the camshaft rotate at the engine cranking? (When oil filler cap is removed.)		heck timing belt for breakage.	
Yes			
MUT-II Self-Diag code Are diagnosis codes displayed?		efer to P.13D-14, INSPECTION CHART FOR DIAGNOSIS ODES.	
No	No		
MUT-II Data list 22 Crank angle sensor OK: Cranking speed is displayed	C	heck the crank angle sensor system. (Refer to P.13D-38, INSPEC- ION PROCEDURE FOR DIAGNOSIS CODE P0335.)	
OК			
MUT-II Actuator test 07 Fuel pump (Refer to P.13D-86.)		heck the fuel pump system. Refer to P.13D-83, INSPECTION PROCEDURE 28.)	
ОК	NG		
MUT-II Data list 21 Engine coolant temperature sensor (Refer to P.13D-82.)	C	check the engine coolant temperature sensor system. RefertoP.13D-22,INSPECTIONPROCEDUREFORDIAGNOSIS	
ОК	No	ODE P0115.)	
Can any sound be heard from the injectors when cranking?	► C	heck the injector system. (Refer to P.13D-34, INSPECTION PRO- EDURE FOR DIAGNOSIS CODE P0201, P0202, P0203, P0204.)	
Yes	No		
Measure at the ignition coil connectors A-97 and A-98 • Connectors connected • Check by connecting the timing light to terminal (1) of	► C	Check the ignition circuit system. (Refer to P.13D-78, INSPECTION ROCEDURE 31.)	
each connector (Engine: Cranking) OK: The timing light flashes.			
ОК			
Check the following items. • Check the ignition coil, spark plugs, spark plug cables.			

Check iff foreign materials (water, alcohol, etc.) got into fuel. Check the compression pressure. Check the immobilizer system. •

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.		
Check battery voltage when cranking. OK: 8 V or higher	NG ┣━━━━	Check the battery. (Refer to GROUP 54 - Battery.)
OK OK	_Yes _	
MUT-II Self-Diag code Are diagnosis codes displayed?		Referto P.13D-14, INSPECTION CHART FOR DIAGNOSIS CODE.
No MUT-II Actuator test	NG	Check the fuel pump system.
07 Fuel pump (Refer to P.13D-86.)		(Refer to P.13D-75, INSPECTION PROCEDURE 28.)
MUT-II Data list 21 Engine coolant temperature sensor (Refer to P.13D-82.)	NG	Check the engine coolant temperature sensor system. (RefertoP.13D-22, INSPECTIONPROCEDURE FORDIAGNOSIS
OK WUT-II Data list	NG ┣─── ► [CODE P0115.) Check the ignition switch-ST system.
18 Ignition switch-ST (Refer to P.13D-82.)		(Refer to P.13D-75, INSPECTIÓN PROCEDURE 29.)
Can any sound be heard from the injectors when cranking?] <mark>NG</mark>]───►	Check the injector system. (Refer to P.13D-34, INSPECTION PRO- CEDURE FOR DIAGNOSIS CODE P0201, P0202, P0203, P0204.)
Is starting good if the engine is cranked with the accelerator pedal slightly depressed?	} } →	Check ISC servo for op-
No		eration sound. (Refer to P.13D-91.) OK OK CODE P0505.)
		 Clean the throttle valve area. (Refer to P.13D-103.) Check and adjust the fixed SAS. (Refer to P.13D-104.)
Check the ignition timing when cranking. OK: Approx. 5°BTDC	} <mark></mark>	Check that the crank angle sensor is installed properly.
Ток	J	
 Check the following items. Check the ignition coil, spark plugs, spark plug cables. Check if the injectors are clogged. Check the compression pressure. Check fuel lines for clogging. Check if foreign materials (water, alcohol, etc.) got into fuel 	el.	

It takes too long time to start. (Incorrect starting)			Probable cause	
In cases such as the above, the cause is probably that the spark is is difficult, the initial mixture for starting is not appropriate, or suffic pressure is not being obtained.			 Malfunction of the ignition system Malfunction of the injector system Inappropriate gasoline use Poor compression 	
	_ NG			
Check battery voltage when cranking OK: 8 V or higher		Check	the battery. (Refer to GROUP 54 - Battery.)	
ок	_ Yes			
MUT-II Self-Diag code Are diagnosis codes displayed?		Referto	P.13D-14, INSPECTION CHARTFOR DIAGNOSIS CODE.	
No	_ _ NG			
MUT-II Actuator test 07 Fuel pump (Refer to P.13D-86.)	-	 Check the fuel pump system. (Refer to P.13D-75, INSPECTION PROCEDURE 28.) 		
ок	NG			
MUT-II Data list 21 Engine coolant temperature sensor (Refer to P.13D-82.)		(Referto	the engine coolant temperature sensor system. pP.13D-22,INSPECTIONPROCEDUREFORDIAGNOSIS	
ОК	_ NG	CODE		
MUT-II Data list 18 Ignition switch-ST (Refer to P.13D-82.)		Check (Refer 1	the ignition switch-ST system. to P.13D-77, INSPECTION PROCEDURE 29.)	
ок	, NG			
Can any sound be heard from the injectors when cranking?	►	Check the CEDUR	he injector system. (Refer to P.13D-34, INSPECTION PRO- IE FOR DIAGNOSIS CODE P0201, P0202, P0203, P0204.)	
Check the ignition timing when cranking. OK: Approx. 5°BTDC	NG	Check	that the crank angle sensor is installed properly.	
ОК				
 Check the following items. Check the ignition coil, spark plugs, spark plug cables. Check if the injectors are clogged. Check the compression pressure. Check if foreign materials (water, alcohol, etc.) got into fu 	el.			

Unstable idling (Roug	gh idling, hunting)			Probable cause
In cases as the above, the cause is probably that the ignition system, air/fue idle speed control (ISC) or compression pressure is defective. Because the range of possible causes is broad, inspection is narrowed down items.		Э.		 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
		Yes		
Were the battery terminals dis	connected?	►	After w	varming-up, let the engine run at idling for 10 minutes.
	No	, Yes		
MUT-II Self-Diag code Are diagnosis codes displayed	?		Refer CODES	to P.13D-14, INSPECTION CHART FOR DIAGNOSIS S.
	No	_	L	
Does idling speed fluctuate ex	cessively?	Yes	Clean	the throttle body. (Refer to P.13D-103.)
	No	1		
			Check	and adjust the fixed SAS. (Refer to P.13D-104.)
				,,, _,, _
			Check	trouble symptom.
			L	NG
			Bro Bro Bro	t the intake of air into the air intake system oken intake manifold gasket oken air intake hose oken vacuum hose sitive crankcase ventilation valve does not operate.
Check the ISC servo for operat	ion sound. (Refer to P.13D-115.)	NG	Check	the ISC system. (Refer to P.13D-45, INSPECTION PROCE-
	ОК] -	DURE	FOR DIAGNOSIS CODE P0505.)
Check the injector for operatio		NG	Cheeks	the injustory and the Diab of the Diab and the Diab
Check the injector for operatio	OK		CEDUF	the injector system. (Refer to P.13D-34, INSPECTION PRO- RE FOR DIAGNOSIS CODE P0201, P0202, P0203, P0204.)
MUT-II Data list 26 Idle position switch (Refer		NG	Checkt	the idle position switch system. (Refer to P.13D-47, INSPEC- PROCEDURE FOR DIAGNOSIS CODE P0510.)
	lok			
MUT-II Data list 13 Intake air temperature sens	or (Refer to P.13D-81.)	NG	Checkt	the intake air temperature sensor system. (Refer to P. 13D-20, CTION PROCEDURE FOR DIAGNOSIS CODE P0110.)
<u> </u>	ОК	-	L	
MUT-II Data list 25 Barometric pressure sensor	(Refer to P.13D-83.)	NG ►	Check I INSPE	the barometric pressure sensor system. (Refer to P.13D-18, CTION PROCEDURE FOR DIAGNOSIS CODE P0105.)
	ок	, 		
MUT-II Data list 21 Engine coolant temperature	sensor (Refer to P.13D-82.)	NG	(Refert	the engine coolant temperature sensor system. oP.13D-22, INSPECTIONPROCEDUREFORDIAGNOSIS P0115.)
	ок	NG		
MUT-II Actuator test 08 Purge control solenoid valv		-	(Refert	the purge control solenoid valve system oP.13D-44, INSPECTIONPROCEDUREFORDIAGNOSIS P0443.)
1	ОК	, NG		
MUT-II Actuator test 10 EGR control solenoid valve	(Refer to P.13D-86.)			the EGR control solenoid valve system. (Refer to P.13D-42, CTION PROCEDURE FOR DIAGNOSIS CODE P0403.)
To the next page		1		

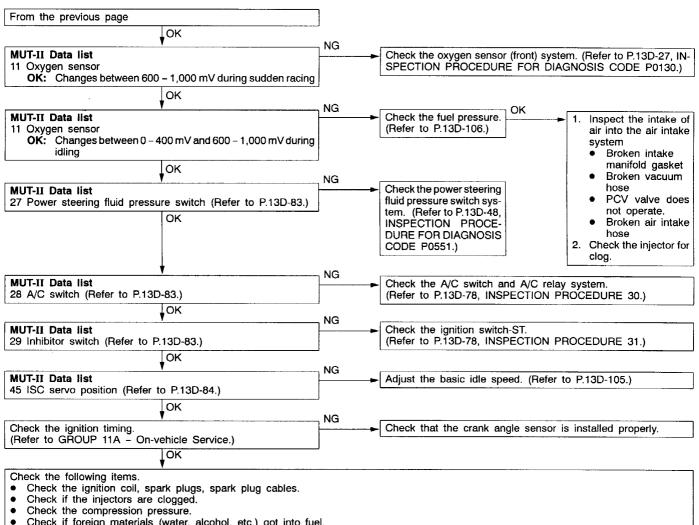
From the previous page]	
OK		
 MUT-II Data list 59 Oxygen sensor (rear) Transmission: 2nd gear <m t="">, L range </m> Driving with throttle widely open OK: 600 - 1,000 mV 	NG	Check the oxygen sensor (rear) system. (Refer to P.13D-30, IN- SPECTION PROCEDURE FOR DIAGNOSIS CODE P0136.)
lok		
MUT-II Data list 11 Oxygen sensor OK: 600 – 1,000 mV during sudden racing	NG ►	Check the oxygen sensor (front) system. (Refer to P.13D-27, IN- SPECTION PROCEDURE FOR DIAGNOSIS CODE P0130.)
ok	NO	ОК
MUT-II Data list 11 Oxygen sensor OK: Changes between 0 - 400 mV and 600 - 1,000 mV during idling	NG ▶	Check the fuel pressure. (Refer to P.13D-106.)
OK	NG	Broken vacuum hose
MUT-II Data list 27 Power steering fluid pressure switch (Refer to P.13D-83.) OK		 Check the power steering fluid pressure switch sys- tem. (Refer to P.13D-48, INSPECTION PROCE- DURE FOR DIAGNOSIS CODE P0551.) PCV valve does not operate. Broken air intake hose Check the injector for clog.
MUT-II Data list	NG	Check the A/C switch and A/C relay system.
28 A/C switch (Refer to P.13D-83.)		(Refer to P.13D-78, INSPECTION PROCEDURE 30.)
ок	NG	
MUT-II Data list 29 Inhibitor switch (Refer to P.13D-83.)		Check the ignition switch-ST. (Refer to P.13D-78, INSPECTION PROCEDURE 31.)
ОК	ר NG	Adjust the basis idle aread (Defer to D12D 105)
MUT-II Data list 45 ISC Servo position (Refer to P.13D-84.)		Adjust the basic idle speed. (Refer to P.13D-105.)
ок		
Check the ignition timing. (Refer to GROUP 11A - On-vehicle Service.)	NG	Check that the crank angle sensor is installed properly.
ОК	-	
 Check the following items. Check the ignition coil, spark plugs, spark plug cables. Check the purge control system. Check the EGR control system. Check the compression pressure. Check if foreign materials (water, alcohol, etc.) got into fue 	el.	

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 servo systemMalfunction of the throttle body
MUT-II Self-Diag code	Yes	Befer	to P.13D-14, INSPECTION CHART FOR DIAGNOSIS
Are diagnosis codes displayed?		CODE	
No Check the ISC servo for operation sound. (Refer to P.13D-91.)	NG	Chock	the ISC system. (Refer to P.13D-45, INSPECTION PROCE-
	F		FOR DIAGNOSIS CODE P0505.)
MUT-II Data list 26 Idle position switch (Refer to P.13D-83.)	NG		the idle position switch system. (Refer to P.13D-47, INSPEC- PROCEDURE FOR DIAGNOSIS CODE P0510.)
OK	_ NG		
MUT-II Data list 21 Engine coolant temperature sensor (Refer to P.13D-82.)		(Refer	the engine coolant temperature sensor system. toP.13D-22, INSPECTION PROCEDURE FOR DIAGNOSIS P0115.)
OK MUT-II Data list 28 A/C switch (Refer to P.13D-83.)	NG		the A/C switch and A/C relay system. to P.13D-78, INSPECTION PROCEDURE 30.)
OK	-		
Basic idle adjustment (Refer to P.13D-105.)			
♦ Check trouble symptom.	NG	Clean	the throttle valve area. (Refer to P.13D-103.)
		Check	and adjust the fixed SAS. (Refer to P.13D-104.)

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 servo system Malfunction of the throttle body 	
MUT-II Self-Diag code Are diagnosis codes displayed?	Yes	Refer CODE	to P.13D-14, INSPECTION CHART FOR DIAGNOSIS S.	
No Check the ISC servo for operation sound. (Refer to P.13D-115.) OK		DURE	the ISC system. (Refer to P.13D-45, INSPECTION PROCE- FOR DIAGNOSIS CODE P0505.) the idle position switch system. (Refer to P.13D-24, INSPEC-	
26 Idle position switch (Refer to P.13D-83.) OK MUT-II Data list	NG	Check	PROCEDURE FOR DIAGNOSIS CODE P0120.) the engine coolant temperature sensor system.	
21 Engine coolant temperature sensor (Refer to P.13D-82.) OK MUT-II Data list 29 Inhibitor switch (Refer to P.13D-83.)	NG ►	CODE	toP.13D-22, INSPECTION PROCEDURE FOR DIAGNOSIS P0115.) the ignition switch ST. to P.13D-78, INSPECTION PROCEDURE 31.)	
OK Basic idle adjustment (Refer to P.13D-105.)	NG			
Check trouble symptom.	>		the throttle valve area. (Refer to P.13D-103.)	

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 in appropriate when the engine is cold, or that the intake air volume is insufficient.			 Malfunction of the ISC servo system Malfunction of the throttle body Malfunction of the injector system Malfunction of the ignition system
	Yes		
Were the battery terminals disconnected?] ►	- After v	warming-up, let the engine run at idling for 10 minutes.
Νο			
MUT-II Self-Diag code Are diagnosis codes displayed?	Yes	Refer CODE	to P.13D-14, INSPECTION CHART FOR DIAGNOSIS S.
No	- Yes		
Does the engine stall right after the accelerator pedal is released?	} ▶		the throttle valve Check and adjust the
No		area. (Refer	to P.13D-103.) fixed SAS. (Refer to P.13D-104.)
Is engine-idling stable after the warming-up?	No	Chack	if the upstable idline (Deuch idline bustles)
Yes		Refer	if the unstable idling (Rough idling, hunting). to P.13D-57, INSPECTION PROCEDURE 8.)
T	ר NG	Chook	the ISC system (Referts B 12D 45 INSPECTION BROOF
Check the ISC servo for operation sound. (Refer to P.13D-115.)	P		the ISC system. (Refer to P.13D-45, INSPECTION PROCE- FOR DIAGNOSIS CODE P0505.)
Check the injector for operation sound.	NG	Chook	the injustry system (Defects D 12D 24 INSPECTION DDD
OK			the injector system. (Refer to P. 13D-34, INSPECTION PRO- RE FOR DIAGNOSIS CODE P0201, P0202, P0203, P0204.)
MUT-II Data list	NG		
26 Idle position switch (Refer to P.13D-83.)		 Check the idle position switch system. (Refer to P.13D-47, INSPEC- TION PROCEDURE FOR DIAGNOSIS CODE P0510.) 	
OK	, 	L	
MUT-II Data list	NG		the engine coolant temperature sensor system.
21 Engine coolant temperature sensor (Refer to P.13D-82.)	J		toP.13D-22, INSPECTION PROCEDURE FOR DIAGNOSIS P0115.)
JOK	, NG		
MUT-II Actuator test 10 EGR control solenoid valve (Refer to P.13D-86.)			the EGR control solenoid valve system. (Refer to P.13D-42, CTION PROCEDURE FOR DIAGNOSIS CODE P0403.)
 L ОК		L	
Check the fuel pressure. (Refer to P.13D-106.)	ן		
 _ок]		
Check the ignition timing.	NG	Check	that the crank angle sensor is installed properly.
(Refer to GROUP 11A – On-vehicle Service.)	J		
<u> </u>			
 Check the following items. Check the ignition coil, spark plugs, spark plug cables. Check the compression pressure. Check the engine oil viscosity. 			

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 systicate speed control (ISC) or compression pressure is defective. In addition, if the engine suddenly stalls, the cause may also be a 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 	
	Yes			
Were the battery terminals disconnected?	 	After v	varming-up, let the engine run at idling for 10 minutes.	
No	Yes			
MUT-II Self-Diag code Are diagnosis codes displayed?		Refer CODE	to P.13D-14, INSPECTION CHART FOR DIAGNOSIS S.	
No	- NG			
Check the ISC servo for operation sound. (Refer to P.13D-115.)]		the ISC system. (Refer to P.13D-45, INSPECTION PROCE- FOR DIAGNOSIS CODE P0505.)	
Check the injector for operation sound.	NG	Chock	the injector system. (Refer to P.13D-34, INSPECTION PRO-	
			RE FOR DIAGNOSIS CODE P0201, P0202, P0203, P0204.)	
Does the engine stall right after the accelerator pedal is released?	Yes	Clean	the throttle valve	
No	-	area. (Refer	to P.13D-103.) fixed SAS. (Refer to P.13D-104.)	
Does the engine stall easily again?	No	While	carrying out an intermittent malfunction simulation test (Refer	
Yes	- NG	● Cra ● Air	udden changes in the signals shown below. rank angle sensor signal Primary and seconda ignition signal Fuel pump drive signa Engine-ECU A/T-ECU power supply voltage 	
MUT-II Data list 26 Idle position switch (Refer to P.13D-83.)			the idle position switch system. (Refer to P.13D-47, INSPEC- PROCEDURE FOR DIAGNOSIS CODE P0510.)	
•ок	, NG			
MUT-II Data list 13 Intake air temperature sensor (Refer to P.13D-81.)] >		theintakeairtemperaturesensorsystem. (Referto P.13D-20, CTION PROCEDURE FOR DIAGNOSIS CODE P0110.)	
ок	_ NG			
MUT-II Data list 25 Barometric pressure sensor (Refer to P.13D-83.)			the barometric pressure sensor system. (Refer to P.13D-18, CTION PROCEDURE FOR DIAGNOSIS CODE P0105.)	
OK	NG			
MUT-II Data list 21 Engine coolant temperature sensor (Refer to P.13D-82.)		(Refer	the engine coolant temperature sensor system. toP.13D-22,INSPECTIONPROCEDUREFORDIAGNOSIS P0115.)	
OK	_ NG			
MUT-II Actuator test 10 EGR control solenoid valve (Refer to P.13D-86.)	 	Check INSPE	the EGR control solenoid valve system. (Refer to P.13D-42, CTION PROCEDURE FOR DIAGNOSIS CODE P0403.)	
ОК				
 MUT-II Data list 59 Oxygen sensor (rear) Transmission: 2nd gear <m t="">, L range </m> Driving with throttle widely open OK: 600 - 1,000 mV 	NG		the oxygen sensor (rear) system. (Refer to P.13D-30, IN- TION PROCEDURE FOR DIAGNOSIS CODE P0136.)	
	-			
To the next page				



Check if foreign materials (water, alcohol, etc.) got into fuel.

The engine stalls when starting the car. (Page 1)	ass 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? No MUT-II Actuator test 10 EGR control solenoid valve (Refer to P.13D-86.) OK	NG Check	to P.13D-14, INSPECTION CHART FOR DIAGNOSIS S. the EGR control solenoid valve system. (Refer to P.13D-42, ECTION PROCEDURE FOR DIAGNOSIS CODE P0403.)
 Check the following items. Check the ignition coil, spark plugs, spark plug cables. 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

	Yes	
Were the battery terminals disconnected?		After warming-up, let the engine run at idling for 10 minutes.
No	_ Yes	
MUT-II Self-Diag code Are diagnosis codes displayed?		Refer to P.13D-14, INSPECTION CHART FOR DIAGNOSIS CODES.
No	NG	
MUT-II Data list 26 Idle position switch (Refer to P.13D-83.)		Check the idle position switch system. (Refer to P.13D-47, INSPEC- TION PROCEDURE FOR DIAGNOSIS CODE P0510.)
ок	n NG	
MUT-II Data list 14 Throttle position sensor (Refer to P.13D-82.)		Check the throttle position sensor system. (Refer to P.13D-24, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0120.)
ок	_ Yes	
 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)? 		- Check the vehicle speed sensor system. (Refer to P.13D-45, IN- SPECTION PROCEDURE FOR DIAGNOSIS CODE P0500.)
No		
MUT-II Actuator test 10 EGR control solenoid valve (Refer to P.13D-86.)	NG	Check the EGR control solenoid valve system. (Refer to P.13D-42, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0403.)
ок	-	
 Check the following items. Check the ignition coil, spark plugs, spark plug cables. Clean the throttle valve area. Check and editest the fixed SAS 		

Check and adjust the fixed SAS.

Hesitation, sag or stumble			Probable cause
In cases such as the above, the cause is probably that ignition system, air/fue or compression pressure is defective.		nixture	 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
	Yes		
MUT-II Self-Diag code Are diagnosis codes displayed?	►	Refer to CODES	0 P.13D-14, INSPECTION CHART FOR DIAGNOSIS
No	- NG		
Check the injectors for operation sound.			ne injector system. (Refer to P.13D-34, INSPECTION PRO- E FOR DIAGNOSIS CODE P0201, P0202, P0203, P0204.)
Check the ignition timing. (Refer to GROUP 11A – On-vehicle Service.)	NG	Check 1	that the crank angle sensor is installed properly.
ОК	NG		
MUT-II Data list 26 Idle position switch (Refer to P.13D-83.)			the idle position switch system. 0P.13D-47, INSPECTIONPROCEDUREFORDIAGNOSIS P0510)
OK T	_ NG	CODE	
MUT-II Data list 13 Intake air temperature sensor (Refer to P.13D-81.)	 	Checkth INSPEC	neintakeairtemperaturesensorsystem. (RefertoP.13D-20, CTION PROCEDURE FOR DIAGNOSIS CODE P0110.)
ок	NG		
MUT-II Data list 25 Barometric pressure sensor (Refer to P.13D-83.)			he barometric pressure sensor system. (Refer to P.13D-18, CTION PROCEDURE FOR DIAGNOSIS CODE P0105.)
ОК	, NG		
MUT-II Data list 21 Engine coolant temperature sensor (Refer to P.13D-82.)	▶		the engine coolant temperature sensor system. pp.13D-22, INSPECTIONPROCEDUREFORDIAGNOSIS P0115.)
ОК	, NG	L	
MUT-II Data list 14 Throttle position sensor (Refer to P.13D-82.)			the throttle position sensor system. (Refer to P.13D-24, CTION PROCEDURE FOR DIAGNOSIS CODE P0120.)
ОК	¬ NG	·	
MUT-II Actuator test 10 EGR control solenoid valve (Refer to P.13D-86.)			the EGR control solenoid valve system. pp.13D-42, INSPECTIONPROCEDUREFORDIAGNOSIS P0403.)
ОК	, NG		
 MUT-II Data list 59 Oxygen sensor (rear) Transmission: 2nd gear <m t="">, L range </m> Driving with throttle widely open OK: 600 - 1,000 mV 			he oxygen sensor (rear) system. (Refer to P.13D-30, IN- ION PROCEDURE FOR DIAGNOSIS CODE P0136.)
ОК	, NG		
MUT-II Data list 11 Oxygen sensor OK: Changes between 600 – 1,000 mV during sudden racing			he oxygen sensor (front) system. (Refer to P.13D-27, IN- ION PROCEDURE FOR DIAGNOSIS CODE P0130.)
r	-		
To the next page			

MPI – Troubleshooting

From the previous page		
OK MUT-II Data list	NG OK	1. Inspect the intake of
11 Oxygen sensor OK: Changes between 0 – 400 mV and 600 – 1,000 mV during idling	(Refer to P.13D-106.)	air into the air intake system ● Broken intake
OK Check the fuel pressure. (Refer to P.13D-106.)]	 manifold gasket Broken vacuum hose DCV uskus doose
ок	-	 PCV valve does not operate. Broken air intake
 Check the following items. Check the ignition coil, spark plugs, spark plug cables. Check the EGR control system. Check the compression pressure. Check the fuel filter or fuel line for clogging. 		 Broken air intake hose Check the injector for clog.

INSPECTION PROCEDURE 16

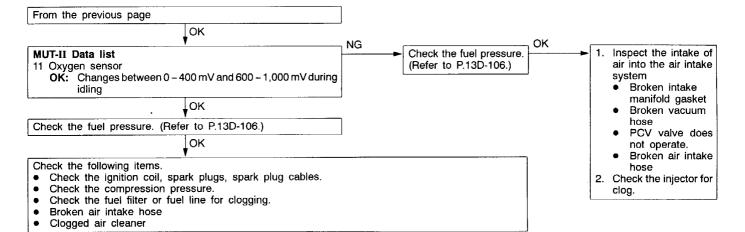
The feeling of impact or vibration when accelerating	Probable cause
In cases such as the above, the cause is probably that there is an ignition leak accompanying the increase in the spark plug demand voltage during acceleration.	Malfunction of the ignition system

MUT-II Self-Diag code Are diagnosis codes displayed?	Yes	Refer to CODES.	P.13D-14,	INSPECTION	CHART	FOR	DIAGNOSIS
No	-						
Check the following items. • Check the ignition coil, spark plugs, spark plug cables. • Check for occurrence of ignition leak.							

INSPECTION PROCEDURE 17

The feeling of impact or vibration when dec	elerating		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.13D-14, INSPECTION CHART FOR DIAGNOSIS
No Check the ISC servo for operation sound. (Refer to P.13D-115.)			the ISC system. (Refer to P.13D-45, INSPECTION PROCE-
ок	NG	DURE	FOR DIÁGNOSIS CODE P0505.)
MUT-II Data list 14 Throttle position sensor (Refer to P.13D-82.)			the throttle position sensor system. (Refer to P.13D-24, ECTION PROCEDURE FOR DIAGNOSIS CODE P0120.)
MUT-II Data list 26 Idle position switch (Refer to P.13D-83.)	NG	(Refer	the idle position switch system. toP.13D-47,INSPECTIONPROCEDUREFORDIAGNOSIS P0510.)
Clean the throttle valve area. (Refer to P.13D-103.)]		

Poor acceleration		Probable cause
Defective ignition system, abnormal air-fuel ratio, poor compres are suspected.	ssion pressur	re, etc. Malfunction of the ignition system Malfunction of air-fuel ratio control system Malfunction of the fuel supply system Poor compression pressure Clogged exhaust system
	Yes	
MUT-II Self-Diag code Are diagnosis codes displayed?	┣►	 Refer to P.13D-14, INSPECTION CHART FOR DIAGNOSIS CODES.
No		
Check the injectors for operation sound.	_ NG }►	Check the injector system. (Refer to P.13D-34, INSPECTION PRO-
ОК		CEDURE FOR DIAGNOSIS CODE P0201, P0202, P0203, P0204.)
Check the ignition timing. (Refer to GROUP 11A - On-vehicle Service.)	- NG ┣───►	- Check that the crank angle sensor is installed properly.
JOK	J	
MUT-11 Data list	NG	- Check the idle position switch system.
26 Idle position switch (Refer to P.13D-83.)		(Referto P.13D-47, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0510.)
ОК	א G	
MUT-II Data list 13 Intake air temperature sensor (Refer to P.13D-81.)	•	Checktheintakeairtemperaturesensorsystem. (Referto P.13D-20, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0110.)
ок	_ NG	
MUT-II Data list 25 Barometric pressure sensor (Refer to P.13D-83.)		 Check the barometric pressure sensor system. (Refer to P.13D-18, INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0105.)
ок	¬ NG	
MUT-II Data list 21 Engine coolant temperature sensor (Refer to P.13D-82.)		 Check the engine coolant temperature sensor system. (RefertoP.13D-22, INSPECTION PROCEDURE FOR DIAGNOSIS)
јок		CODE P0115.)
MUT-II Data list	_NG ►	Check the throttle position sensor system. (Refer to P.13D-24,
14 Throttle position sensor (Refer to P.13D-82.)		INSPECTION PROCEDURE FOR DIAGNOSIS CODE P0120.)
	ר NG	
MUT-II Actuator test 10 EGR control solenoid valve (Refer to P.13D-86.)		 Check the EGR control solenoid valve system. (RefertoP.13D-42, INSPECTIONPROCEDUREFORDIAGNOSIS)
ОК		CODE P0403.)
MUT-II Data list 59 Oxygen sensor (rear) • Transmission: 2nd gear <m t="">, L range • Driving with throttle widely open</m>	NG	Check the oxygen sensor (rear) system. (Refer to P.13D-30, IN- SPECTION PROCEDURE FOR DIAGNOSIS CODE P0136.)
OK: 600 - 1,000 mV	J	
ок	NG	
MUT-II Data list 11 Oxygen sensor OK: Changes between 600–1,000 mV during sudden racing] NG]►	- Check the oxygen sensor (front) system. (Refer to P.13D-27, IN- SPECTION PROCEDURE FOR DIAGNOSIS CODE P0130.)
	7	
To the next page]	



Surge			Probable cause	
Defective ignition system, abnormal air-fuel ratio, etc. are sus	spected.		 Malfunction of the ignition system Malfunction of air-fuel ratio control system Malfunction of the EGR control solenoid 	ystem d valve system
	Yes			
MUT-II Self-Diag code Are diagnosis codes displayed?		Refer CODE	to P.13D-14, INSPECTION CHART FOF S.	R DIAGNOSIS
No		<u></u>		
Check the injectors for operation sound.]		the injector system. (Refer to P.13D-34, INSP RE FOR DIAGNOSIS CODE P0201, P0202, F	
Check the ignition timing. (Refer to GROUP 11A – On-vehicle Service.)	, NG		that the crank angle sensor is installed p	properly.
Į ok				
MUT-II Data list 26 Idle position switch (Refer to P.13D-83.)	NG		the idle position switch system. (Refer to P.13) PROCEDURE FOR DIAGNOSIS CODE F	
OK				
MUT-II Data list 13 Intake air temperature sensor (Refer to P.13D-81.)	NG		theintakeairtemperaturesensorsystem. (Re CTION PROCEDURE FOR DIAGNOSIS (
ок	- NG			
MUT-II Data list 25 Barometric pressure sensor (Refer to P.13D-83.)			the barometric pressure sensor system. (Ref CTION PROCEDURE FOR DIAGNOSIS (
OK	NG			
MUT-II Data list 21 Engine coolant temperature sensor (Refer to P.13D-82.) OK	}	(Refer	the engine coolant temperature sensor s toP.13D-22, INSPECTION PROCEDURE FO P0115.)	ystem. RDIAGNOSIS
<u> </u>	ר NG		· · · · · · · · · · · · · · · · · · ·	
MUT-II Data list 14 Throttle position sensor (Refer to P.13D-82.)			the throttle position sensor system. (Refe CTION PROCEDURE FOR DIAGNOSIS (
ОК	_ NG			
MUT-II Actuator test 10 EGR control solenoid valve (Refer to P.13D-86.)		(Refer	the EGR control solenoid valve system. toP.13D-42, INSPECTIONPROCEDUREFO P0403.)	RDIAGNOSIS
ок	¬ NG			
 MUT-II Data list 59 Oxygen sensor (rear) Transmission: 2nd gear <m t="">, L range </m> Driving with throttle widely open OK: 600 - 1,000 mV 			the oxygen sensor (rear) system. (Refer to TION PROCEDURE FOR DIAGNOSIS CO	
ок	J			
MUT-II Data list 11 Oxygen sensor	NG		the oxygen sensor (front) system. (Refer to TION PROCEDURE FOR DIAGNOSIS CO	
OK: Changes between 600 – 1,000 mV during sudden racing OK				
F	NG		OK	A AL _ 1 - 4 - 1 - 1 - 1
MUT-II Data list 11 Oxygen sensor OK: Changes between 0 – 400 mV and 600 – 1,000 mV during idling			to P.13D-106.) air into system • Bro	t the intake of the air intake when intake nifold gasket
ок			• Bro	ken vacuum
Check the fuel pressure. (Refer to P.13D-106.)]		hos • PC	se V valve does
ОК	-		not • Bro	operate. oken air intake
 Check the following items. Check the ignition coil, spark plugs, spark plug cables. Check the EGR control system. 			2. Check clog.	se the injector for

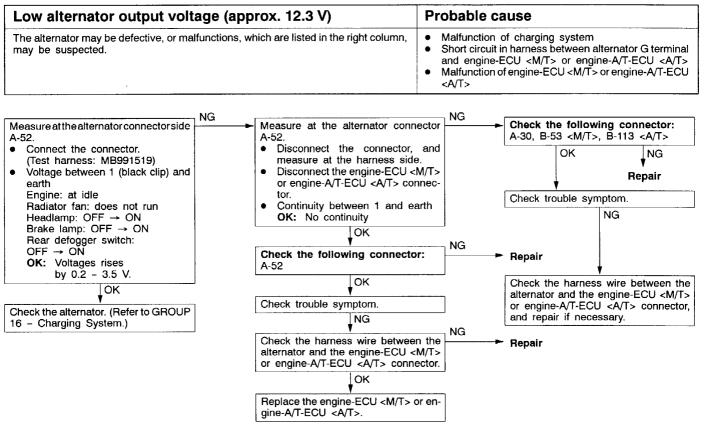
Knocking	Probable cause
In cases as the above, the cause is probably that the detonation control is defective or the heat value of the spark plug is inappropriate.	 Defective detonation sensor Inappropriate heat value of the spark plug
MUT-II Self-Diag code Yes Are diagnosis codes displayed? COD	r to P.13D-14, INSPECTION CHART FOR DIAGNOSIS ES.
	k the detonation sensor system. (Refer to P.13D-38, INSPEC- 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.

Too high CO and HC concentration when id	lling		Probable cause
Abnormal air-fuel ratio is suspected.			 Malfunction of the air-fuel ratio control system Deteriorated catalyst
MUT-II Self-Diag code Are diagnosis codes displayed?	_ Yes ┣───►	Refer CODE	to P.13D-14, INSPECTION CHART FOR DIAGNOSIS S.
No			
Check the ignition timing. (Refer to GROUP 11A - On-vehicle Service.)	NG	Check	that the crank angle sensor is installed properly.
ОК			
MUT-II Data list 21 Engine coolant temperature sensor. (Refer to P.13D-82.)	NG	(Refert	the engine coolant temperature sensor system. toP.13D-22, INSPECTIONPROCEDUREFORDIAGNOSIS P0115.)
OK	– NG		. Forio.j
MUT-II Data list 13 Intake air temperature sensor (Refer to P.13D-81.)			theintakeairtemperaturesensorsystem. (Referto P.13D-20, CTION PROCEDURE FOR DIAGNOSIS CODE P0110.)
↓ok	– NG		
MUT-II Data list 25 Barometric pressure sensor (Refer to P.13D-83.)			the barometric pressure sensor system. (Refer to P.13D-18, CTION PROCEDURE FOR DIAGNOSIS CODE P0105.)
ок	NG		
MUT-II Data list 59 Oxygen sensor (rear) • Transmission: 2nd gear <m t="">, L range • Driving with throttle widely open OK: 600 - 1,000 mV</m>			the oxygen sensor (rear) system. (Refer to P.13D-30, IN- TION PROCEDURE FOR DIAGNOSIS CODE P0136.)
ļοκ			
MUT-II Data list 11 Oxygen sensor OK: 600 – 1,000 mV when racing suddenly.	¬ NG ►	Check SPEC	the oxygen sensor (front) system. (Refer to P.13D-27, IN- TION PROCEDURE FOR DIAGNOSIS CODE P0130.)
ок	_		
MUT-II Data list	_ ОК	Replac	ce the oxygen sensor.
11 Oxygen sensor OK: Repeat 0 – 400 mV and 600 – 1,000 mV alternately when		L	······································
idling.		Check	trouble symptom.
NG			NG
Check the fuel pressure. (Refer to P.13D-106.)			
OK			+
 Check the following items. Check the injectors for operation sound. Check the injectors for fuel leakage. Check the ignition coil, spark plugs, spark plug cables. Check the compression pressure. Check the positive crankcase ventilation system. Check the purge control system. Check the EGR control system. 			
<u> </u>	_		
Check the trouble symptom.			
NG			
Replace the catalytic converter.]		



INSPECTION PROCEDURE 24

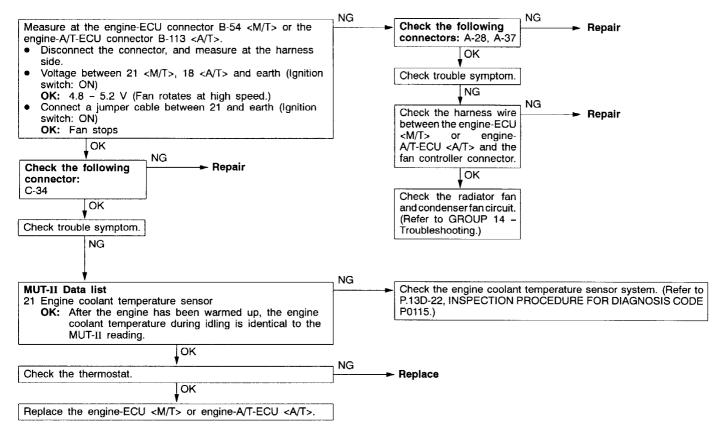
Idling speed is improper when A/C is operating	Probable cause
If the engine-ECU <m t=""> or engine-A/T-ECU detects that the air conditioner is on, it activates the idle speed control (ISC) servo to control idle-up operation. The A/C-ECU judges if the load caused by air conditioner operation is high or 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 . Based on this voltage signal, the engine-ECU <m t=""> or engine-A/T-ECU controls the idle-up speed (for high or low load).</m></m></m>	 Malfunction of the A/C control system Improper connector contact, open circuit or short-circuited harness wire Malfunction of the engine-ECU <m t=""> or engine-A/T-ECU </m>
ок	
	the following connector: <m t="">. B-112 </m>



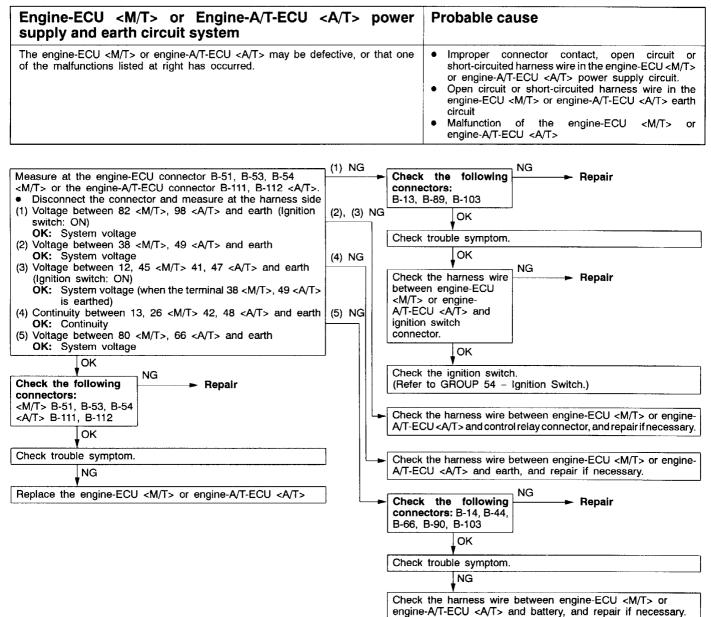
 Voltage between 24 <M/T>, 61 <A/T> and earth (Engine: at idle, outside air temperature: 25°C or more)
 OK: 0 - 3 V [When A/C is MAX. COOL condition (when the load by A/C is high)]
 System voltage [When A/C is MAX. HOT condition (when the load by A/C is low)] OK Repair Check trouble symptom. NG Replace the engine-ECU <M/T> or engine-A/T-ECU <A/T>.

Check the A/C system. (Refer to GROUP 55 - On-vehicle Service.)

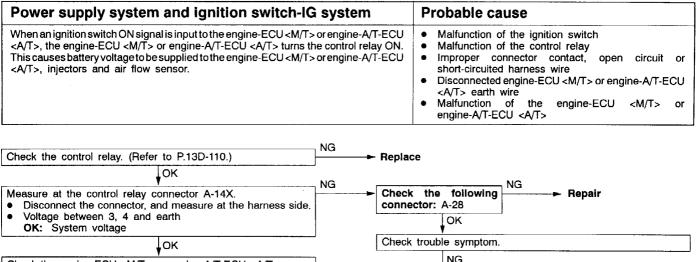
Fans (radiator fan, A/C condenser fan) are inoperative	Probable cause
The engine-ECU $$ or engine-A/T-ECU $$ outputs a duty signal to the fan controller depending on the engine coolant temperature, vehicle speed, and air conditioner switch condition. Based on this signal, the fan controller controls the radiator fan and condenser fan speeds (The more the average voltage at the terminal approaches 5 V, the higher the fan speed become.)	 Malfunction of the fan motor relay Malfunction of the fan motor Malfunction of the fan controller Improper connector contact, open circuit or short-circuited harness wire Malfunction of the engine-ECU <m t=""> or engine-A/T-ECU </m>



INSPECTION PROCEDURE 26



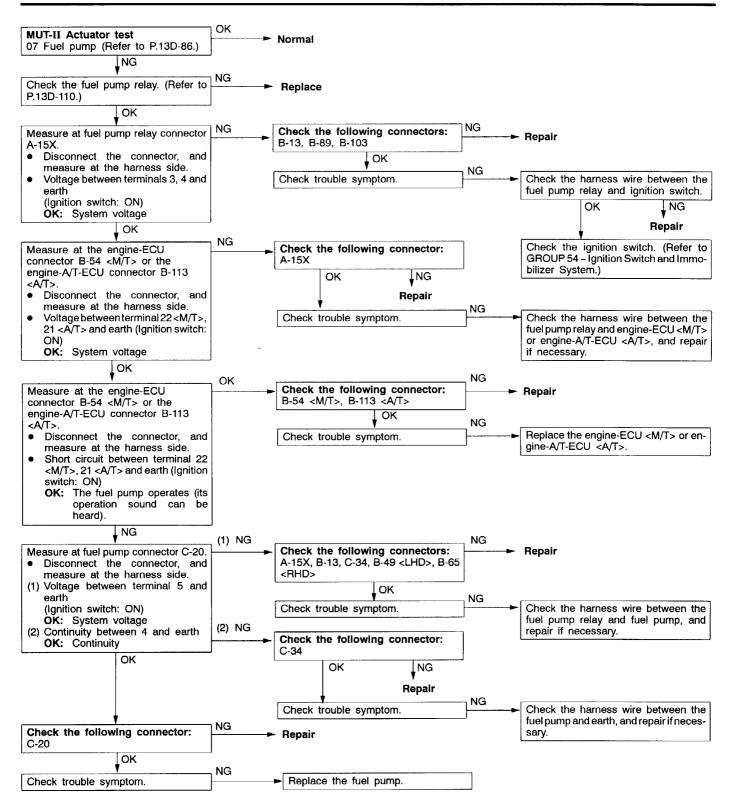
INSPECTION PROCEDURE 27



Check the engine-ECU <M/T> or engine-A/T-ECU <A/T> power supply and earth circuit. (Refer to P.13D-74, INSPECTION PROCEDURE 26.) NG Check the harness wire between battery and control relay connector, and repair if necessary.

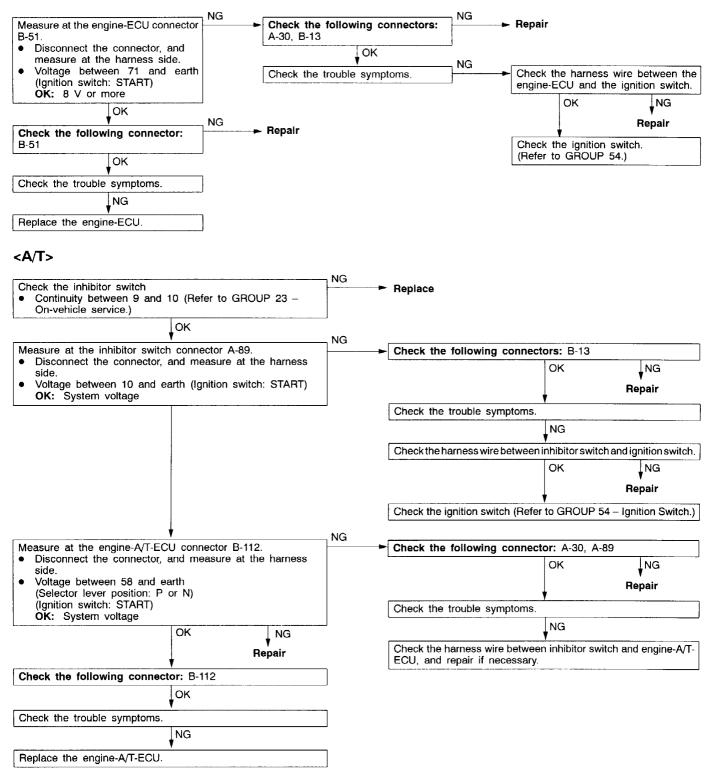
INSPECTION PROCEDURE 28

Fuel pump system	Probable cause
The engine-ECU <m t=""> or engine-A/T-ECU turns the control relay ON when the engine is cranking or running, and this supplies power to drive the fuel pump.</m>	 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 <m t=""> or engine-A/T-ECU </m>



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 while the engine is cranking. The engine-ECU <m t=""> or engine-A/T-ECU uses this signal to carry out functions such as fuel injection control during starting.</m></m>	 Malfunction of the ignition switch Malfunction of the inhibitor switch Open circuit or short-circuited harness wire of the ignition switch circuit Malfunction of the engine-ECU <m t=""></m> Malfunction of the engine-A/T-ECU

<M/T>



INSPECTION PROCEDURE 30

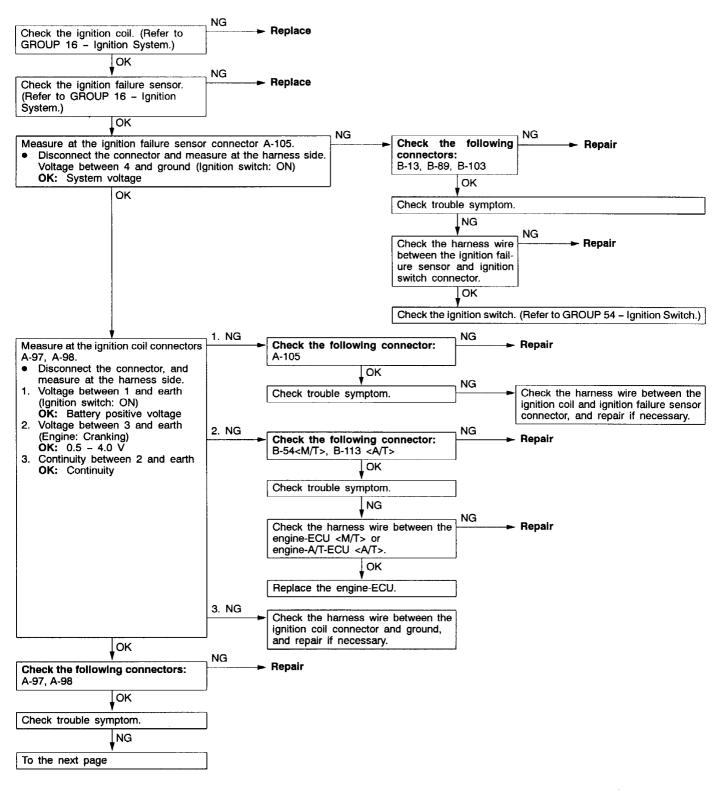
A/C switch and A/C relay system		Probable cause
When an A/C ON signal is input to the engine-ECU $<$ M/T> or engit the engine-ECU $<$ M/T> or engine-A/T-ECU $<$ A/T> carries out cont control (ISC) servo, and also operates the A/C compressor n	rol of the idle speed	 Malfunction of A/C control system Malfunction of A/C switch Improper connector contact, open circuit or short-circuited harness wire Malfunction of the engine-ECU <m t=""> or engine-A/T-ECU </m>
Check the A/C compressor relay. (Refer to GROUP 55 - On-vehicle Service.)	NG ► Replac	;e
¢ОК	, NG	
 Measure at the engine-ECU connector B-53, B-54 <m t=""> or the engine-A/T-ECU connector B-111, B-113 .</m> Disconnect the connector, and measure at the harness side. Voltage between 8 <m t="">, 20 and earth, and 45 <m t="">, 83 and earth (Ignition switch: ON)</m></m> OK: 0 - 3 V (A/C switch: OFF) System voltage (A/C switch: ON) Short circuit between 8 <m t="">, 20 and earth (Ignition switch: ON, A/C switch: ON)</m> OK: A/C compressor clutch turns on. 	OK Check conne <m t=""></m>	OK
	Check	trouble symptom.

Replace the engine-ECU <M/T> or engine-A/T-ECU <A/T>.

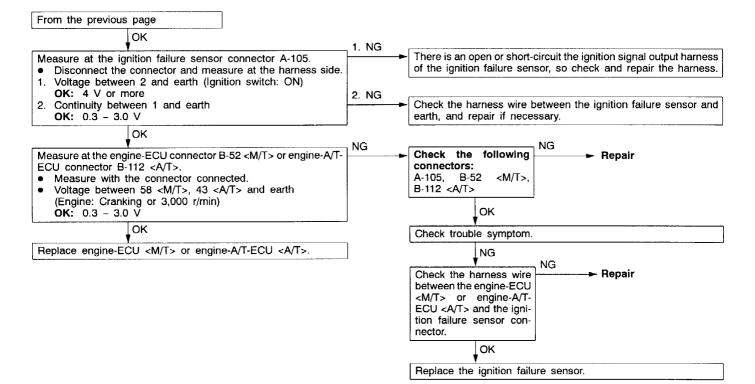
INSPECTION PROCEDURE 31

Ignition circuit system	Probable cause
The engine-ECU <m t=""> or engine-A/T-ECU interrupts the ignition coil primary current by turning the power transistor inside the engine-ECU <m t=""> or engine-A/T-ECU ON and OFF.</m></m>	 Malfunction of ignition coil. Malfunction of ignition failure sensor. Improper connector contact, open circuit or short-circuited harness wire Malfunction of the engine-ECU <m t=""> or engine-A/T-ECU </m>





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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. In a new vehicle [driven approximately 500 km or less], the air flow sensor output frequency is sometimes 10 % higher than the standard frequency.
- *2. The idle position switch normally turns off when the voltage of the throttle position sensor is 50 100 mV higher than the voltage at the idle position. If the throttle position switch turns back on after the throttle position sensor voltage has risen by 100 mV and the throttle valve has opened, the idle position switch and the throttle position sensor need to be adjusted.
- *3. 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.
- *4. In a new vehicle [driven approximately 500 km or less], the injector drive time is sometimes 10 % longer than the standard time.
- *5. 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.

ltem 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	When at 4,000 r/min, engine is suddenly decelerated	200 mV or less	Code No. P0130	13D-27
		made leaner when de- celerating, and is made richer when racing.	When engine is suddenly raced	600 – 1,000 mV		
		Engine: After having warmed up The oxygen sensor signal is used to check	Engine is idling	400 mV or less (Changes) 600 – 1,000 mV		
		the air/fuel mixture ratio, and control condition is also checked by the ECU.	2,500 r/min			
12	Air flow sensor* ¹	 Engine coolant temperature: 	Engine is idling	17 – 43 Hz	-	-
		80 – 95°C ● Lamps, electric	2,500 r/min	70 – 110 Hz		
		 cooling fan and all accessories: OFF Transmission: Neutral (A/T: P range) 	Engine is raced	Frequency increases in response to racing	_	
13	Intake air temperature	Ignition switch: ON or with engine running	When intake air temperature is -20°C	–20°C	Code No. P0110	13D-20
	sensor		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		

13D-82

ltem No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
14	Throttle	Ignition switch: ON	Set to idle position	300 – 1,000 mV	Code No.	13D-24
	position sensor		Gradually open	Increases in proportion to throttle opening angle	- P0120	
			Open fully	4,500 – 5,500 mV]	
16	Power supply voltage	Ignition switch: ON		System voltage	Procedure No. 26	13D-74
18	Cranking signal	Ignition switch: ON	Engine: Stopped	OFF	Procedure No. 29	13D-77
	(ignition switch-ST)		Engine: Cranking	ON		
21	Engine coolant temperature	Ignition switch: ON or with engine running	When engine coolant temperature is -20°C	–20°C	Code No. P0115	13D-16
	sensor		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		

ltem No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
22	Crank angle sensor	 Engine: Cranking Tachometer: Connected 	Compare the engine speed readings on the tachometer and the MUT-II.	Accord	Code No. P0335	13D-38
		 Engine: Idling Idle position switch: ON 	When engine coolant_temperature is –20°C	1,275 – 1,475 rpm		
			When engine coolant temperature is 0°C	1,225 – 1,425 rpm	-	
			When engine coolant temperature is 20°C	1,100 – 1,300 rpm		
			When engine coolant temperature is 40°C	950 – 1,150 rpm		
			When engine coolant temperature is 80°C	650 – 850 rpm	-	
24	Vehicle speed sen- sor <m t=""></m>	Drive at 40 km/h	·	Approximately 40 km/h	Code No. P0500	13D-45
25	Barometric	Ignition switch: ON	At altitude of 0 m	101 kPa	Code No.	13D-18
	pressure sensor		At altitude of 600 m	95 kPa	P0105	
			At altitude of 1,200 m	88 kPa		
			At altitude of 1,800 m	81 kPa		
26	Idle position switch	Ignition switch: ON Check by operating	Throttle valve: Set to idle position	ON	Code No. P0510	13D-47
		accelerator pedal repeatedly	Throttle valve: Slightly open	OFF* ²		
27	Power steering fluid	Engine: Idling	Steering wheel stationary	OFF	Code No. P0551	13D-48
	pressure switch		Steering wheel turning	ON		
28	A/C switch	Engine: Idling (when A/C switch is	A/C switch: OFF	OFF	Procedure No. 30	13D-78
		ON, A/C compressor should be operating.)	A/C switch: ON	ON		
29	Inhibitor switch	Ignition switch: ON	P or N	P or N	Procedure	13D-77
			D, 2, L or R	D, 2, L or R	No. 29	

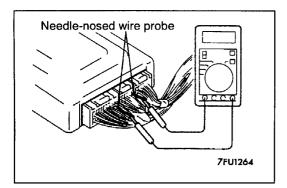
13D-84

ltem No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
41	Injectors* ³	Engine: Cranking	When engine coolant temperature is 0°C (injection is carried out for all cylinders simultaneously)	12 – 19 ms	_	-
			When engine coolant temperature is 20°C	26 – 40 ms		
			When engine coolant temperature is 80°C	6.0 – 9.1 ms		
	Injectors*4	 Engine coolant temperature: 80 – 95°C 	Engine is idling	1.6 – 2.8 ms		
		 Lamps, electric cooling fan and all accessories: OFF 	2,500 r/min	1.4 – 2.6 ms		
		 Transmission: Neutral (A/T: P range) 	When engine is suddenly raced	Increases		
44	Ignition coils and power transistors	 Engine: After having warmed up Timing lamp is set. 	Engine is idling	2 – 18°BTDC	Code No. P0300	13D-35
		(The timing lamp is set in order to check actual ignition timing.)	2,500 r/min	18 – 38°BTDC		
45	ISC (stepper) motor position* ⁵	 Engine coolant temperature: 80 – 95°C Lamps, electric 	A/C switch: OFF	2 – 25 STEP	-	-
	position	 cooling fan and all accessories: OFF Transmission: Neutral (A/T: P range) 	A/C switch: OFF → ON	Increases by 10 – 70 steps		
		 Idle position switch: ON Engine: Idling When A/C switch is ON, A/C compressor should be operating 	range	Increases by 5 – 50 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. 30	13D-78
			A/C switch: ON	ON (Compressor clutch is operating)		

ltem No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
59	Oxygen sensor (rear)	 Transmission: 2nd gear <m t="">, L range </m> Drive with throttle widely open 	3,500 r/min	600 – 1,000 mV	Code No. P0136	13D-30
81	Long-term fuel com- pensation	Engine: Warm, 2,500 r (during closed loop)	/min without any load	-12.5 - 12.5 %	Code No. P0170	13D-33
82	Short-term fuel com- pensation	Engine: Warm, 2,500 r (during closed loop)	/min without any load	-30 - 25 %	Code No. P0170	13D-33
87	Calculation	Engine: Warm	Engine: Idling	15 – 35 %	-	_
	load value		2,500 r/min	15 – 35 %	-	
88	Fuel control	Engine: Warm	2,500 r/min	Closed loop	Code No.	13D-26
	condition		when engine is sud- denly raced	Open loop – drive condition	P0125	
A1	Oxygen	Engine: After warm-up	Idling	0 V	Code No.	13D-27
	sensor (sensor 1)		Sudden racing	0.6 – 1.0 V	P0130	
			2,500 r/min	0.4 V or less and 0.6 – 1.0 V alternates		
A2	Oxygen sensor (sensor 2)	 Transmission: 2nd gear <m t="">, L range </m> Drive with throttle widely open 	3,500 r/min	0.6 – 1.0 V	Code No. P0136	13D-30
8A	Throttle position sensor	 Engine coolant temperature: 80 – 95°C 	Release the accelerator pedal.	6 – 20 %	Code No. P0120	13D-24
	(Throttle valve open- ing angle)	 Ignition switch: ON (Engine: Stopped) 	Depress the accelerator pedal gradually	Increase in response to pedal depression stroke.		
			Depress the accelerator pedal fully.	80 – 100 %		

ACTUATOR TEST REFERENCE TABLE

ltem No.	Inspection item	Drive contents	Inspection conte	ents	Normal condition	Inspection procedure No.	Reference page
01	Injectors	Cut fuel to No. 1 injector	Engine: After ha up/Engine is idli	ng	Idling condition becomes different	Code No. P0201	13D-34
02	-	Cut fuel to No. 2 injector	(Cut the fuel sup injector in turn a cylinders which	nd check	(becomes unsta- ble).	Code No. P0202	13D-34
03	_	Cut fuel to No. 3 injector	idling.)			Code No. P0203	13D-34
04		Cut fuel to No. 4 injector				Code No. P0204	13D-34
07	Fuel pump	Fuel pump operates and fuel is recircu- lated.	 Engine: Cranking Fuel pump: Forced driving Inspect 	Pinch the return hose with fingers to feel the pulse of the fuel being recirculated.	Pulse is felt.	Procedure No. 28	13D-75
			according to both the above conditions.	Listen near the fuel tank for the sound of fuel pump operation.	Sound of opera- tion is heard.		
08	Purge control solenoid valve	Solenoid valve turns from OFF to ON.	Ignition switch: (ON	Sound of opera- tion can be heard when solenoid valve is driven.	Code No. P0443	13D-51
10	EGR control solenoid valve	Solenoid valve turns from OFF to ON.	Ignition switch:	ON	Sound of opera- tion can be heard when solenoid valve is driven.	Code No. P0403	13D-51
17	Basic igni- tion timing	Set to ignition timing adjust- ment mode	Engine: Idling Timing light is so	et	5°BTDC		_
21	Fan controller	Drive the fan motor	Ignition switch:	ON	Radiator fan and condenser fan operate at high speed	Procedure No. 25	13D-73



CHECK AT THE ENGINE-ECU TERMINALS

TERMINAL VOLTAGE CHECK CHART

- 1. Connect a needle-nosed wire probe (test harness: MB991223 or paper clip) to a voltmeter probe.
- 2. Insert the needle-nosed wire probe into each of the engine-ECU <M/T> or engine-A/T-ECU <A/T> connector terminals from the wire side, and measure the voltage while referring to the check chart.

NOTE

- Make the voltage measurement with the engine-ECU <M/T> or engine-A/T-ECU <A/T> connectors connected.
- (2) You may find it convenient to pull out the engine-ECU <M/T> or engine-A/T-ECU <A/T> to make it easier to reach the connector terminals.
- (3) The checks can be carried out off the order given in the chart.

Caution

Short-circuiting the positive (+) probe between a connector terminal and earth could damage the vehicle wiring, the sensor, engine-ECU <M/T> or engine-A/T-ECU <A/T> or all of them. Be careful to prevent this!

- 3. If voltmeter shows any division from standard value, check the corresponding sensor, actuator and related electrical wiring, then repair or replace.
- 4. After repair or replacement, recheck with the voltmeter to confirm that the repair has corrected the problem.

Engine-ECU <M/T> Connector Terminal Arrangement

	Ļ	ω	ļ	5		-	2	-1	a	•	9	10	F	5	5		μ	32	ц Ш	4	5		ķ	30	3	51	52	53	54	55	56		72	13	Ē	c .	6			61	80	10	
14	0	16		4 7	~	-	ò	20	12		22	N G	2	5	20	,	39 9	40	41	42	4	4	4		46	57	58	59	60	61	<u>و</u>	82	83	84	85	96		â	<u>ĝ</u>	90	•	2	

Engine-A/T-ECU <A/T> Connector Terminal Arrangement

446 172 4	104 101 76	107 105
	112 112 111 111 109 109 109 109 109 109 109 109	110 110 110 110
	98 97 97	

9FU0393

Terminal	Terminal	Check item	Check condition (Engine condition)	Normal condition
No. <m t=""></m>	No. 			
1	1	No. 1 injector	While engine is idling after having warmed up, suddenly depress the	From 11 – 14 V, momentarily drops slightly
14	9	No. 2 injector	accelerator pedal.	
2	24	No. 3 injector		
15	2	No. 4 injector		
4	14	Stepper motor coil <a1></a1>	Engine: Soon after the warmed up engine is started	System voltage ↔ 0 V (Changes repeatedly)
17	28	Stepper motor coil <a2></a2>		
5	15	Stepper motor coil <b1></b1>		
18	29	Stepper motor coil <b2></b2>		
6	6	EGR control solenoid valve	Ignition switch: ON	System Voltage
		Solenoid valve	While engine is idling, suddenly depress the accelerator pedal.	From system voltage, momentarily drops
8	20	A/C relay	 Engine: Idle speed A/C switch: OFF → ON (A/C compressor is operating) 	System voltage or momentarily 6V or more → 0 – 3V
9	34	Purge control	Ignition switch: ON	System voltage
		solenoid valve	Running at 3,000r/min while engine is warming up after having been started.	0 – 3V
10	11	Ignition coil – No. 1, No. 4 (power transistor)	Engine r/min: 3,000 r/min	0.3 – 3.0V
23	12	Ignition coil – No. 2, No. 3 (power transistor)		
12	40	Power supply	Ignition switch: ON	System voltage
25	47			

7FU1763

MPI – Troubleshooting

Terminal No. <m t=""></m>	Terminal No. 	Check item	Check condition (En	gine condition)	Normal condition
19	19	Air flow sen-	Engine: Idle speed Engine r/min: 3,000 r/min		0 – 1V
		sor reset signal			6 – 9V
21	18	Fan control- Ier	Radiator fan and cor operating	ndenser fan are not	0 – 0.3 V
			Radiator fan and cor operating	ndenser fan are	0.7 V or more
22	21	Fuel pump	Ignition switch: ON		System voltage
		relay	Engine: Idle speed		0 – 3V
24	61	A/C switch 2	 Engine: Idling Outside air temperature: 25°C or more 	When A/C is MAX. COOL condition (when the load by A/C is high)	0 – 3 V
				(When A/C is MAX. HOT condition (when the load by A/C is low)	System voltage
33	8	Alternator G terminal	 Engine: Warm, idle (radiator fan: OFF) Headlamp: OFF to ON Rear defogger switch: OFF to ON Brake lamp: ON 		Voltage rises by 0.2 – 3.5 V.
41	54	Alternator FR terminal	 Engine: Warm, idle (radiator fan: OFF) Headlamp: OFF to ON Rear defogger switch: OFF to ON Brake lamp: ON 		Voltage drops by 0.2 – 3.5 V.
36	22	Engine warn- ing lamp	Ignition switch: "LOCK" (OFF) position \rightarrow ON		$0 - 3V \rightarrow 9 - 13V$ (After several seconds have elapsed)
37	52	Power steer- ing fluid pressure switch	Engine: Idling after warming up	When steering wheel is stationary	System voltage
				When steering wheel is turned	0 – 3V
38	49	Control relay	Ignition switch: "LOCK" (OFF) position		System voltage
		(Power sup- ply)	Ignition switch: ON		0 – 3V
45	83	A/C switch 1	Engine: Idle speed	Turn the A/C switch OFF	0 – 3V
				Turn the A/C switch ON (A/C compressor is operating)	System voltage
54	26	Oxygen	Engine: Idling after v	varming-up	0 – 3 V
		sensor heat- er (rear)	Engine r/min: 5,000	r/min	System voltage

Terminal No. <m t=""></m>	Terminal No. 	Check item	Check condition (Er	igine condition)	Normal condition
58	43	Tachometer signal	Engine r/min: 3,000 r/min		0.3 – 3.0V
60 3		Oxygen	Engine: Idling after warming up		0 – 3V
		sensor heat- er (front)	Engine r/min: 5,000	/min.	System voltage
71	58	Ignition switch – ST	Engine: Cranking		8V or more
72	64	Intake air temperature sensor	Ignition switch: ON	When intake air temperature is 0°C	3.2 – 3.8V
				When intake air temperature is 20°C	2.3 – 2.9V
				When intake air temperature is 40°C	1.5 – 2.1V
				When intake air temperature is 80°C	0.4 – 1.0V
75	73	Oxygen sen- sor (rear)	 Transmission: 2nd gear <m t="">, L range </m> Engine r/min: 3,500 r/min or more Driving with the throttle valve widely open 		0.6 – 1.0 V
76	71	Oxygen sensor (front)	Engine: Running at 2,500 r/min after warmed up (Check using a digital type voltmeter)		0 ↔ 0.8V (Changes repeatedly)
80	66	Backup pow- er supply	Ignition switch:"LOCK" (OFF) position		System voltage
81	46	Sensor im- pressed voltage	Ignition switch: ON		4.5 – 5.5V
82	98	Ignition switch – IG	Ignition switch: ON		System voltage
83	44	Engine cool- ant temperature	Ignition switch: ON	When engine coolant tempera- ture is 0°C	3.2 – 3.8V
		sensor		When engine coolant tempera- ture is 20°C	2.3 – 2.9V
				When engine coolant tempera- ture is 40°C	1.3 – 1.9V
				When engine coolant tempera- ture is 80°C	0.3 – 0.9V

MPI – Troubleshooting

Terminal No. <m t=""></m>	Terminal No. 	Check item	Check condition (Engine condition)		Normal condition
84	4 78	Throttle position	Ignition switch: ON	Set throttle valve to idle position	0.3 – 1.0V
		sensor		Fully open throttle valve	4.5 – 5.5V
85	55	Barometric pressure	Ignition switch: ON	When altitude is 0m	3.7 – 4.3V
		sensor		When altitude is 1,200m	3.2 – 3.8V
86	-	Vehicle speed sensor	 Ignition switch: ON Move the vehicle slowly forward 		0 ↔ 5V (Changes repeatedly)
87	79	Idle position switch	ion Ignition switch: ON	Set throttle valve to idle position	0 – 1V
				Slightly open throttle valve	4V or more
88	56	Camshaft	Engine: Cranking		0.4 - 3.0V
	position sensor		Engine: Idle speed		0.5 – 2.0V
89	45	Crank angle	Engine: Cranking		0.4 – 4.0V
	sensor		Engine: Idle speed		1.5 – 2.5V
90	65	5 Air flow sen- sor	Engine: Idle speed		2.2 - 3.2V
			Engine r/min: 2,500r/min		~

CHECK CHART FOR RESISTANCE AND CONTINUITY BETWEEN TERMINALS

- 1. Turn the ignition switch to "LOCK" (OFF) position.
- Disconnect the engine-ECU <M/T> or engine-A/T-ECU <A/T> connector.
- 3. Measure the resistance and check for continuity between the terminals of the engine-ECU <M/T> or engine-A/T-ECU <A/T> 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 <M/T> or engine-A/T-ECU <A/T> 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 <M/T> Harness Side Connector Terminal Arrangement

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

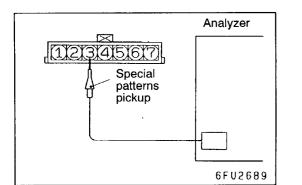
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7FU1764

Terminal No. <m t=""></m>	Terminal No. 	Inspection item	Normal condition (Check condition)
1 – 12	1 – 40	No. 1 injector	13 – 16 Ω (At 20°C)
14 - 12	9 – 40	No. 2 injector	
2 – 12	24 – 40	No. 3 injector	
15 – 12	2 – 40	No. 4 injector	
4 - 12	14 – 40	Stepper motor coil (A1)	28 – 33 Ω (At 20°C)
17 – 12	28 – 40	Stepper motor coil (A2)	
5 – 12	15 – 40	Stepper motor coil (B1)	
18 – 12	29 – 40	Stepper motor coil (B2)	
6 – 12	6 - 40	EGR control solenoid valve	36 – 44 Ω (At 20°C)
9 – 12	34 - 40	Purge control solenoid valve	36 – 44 Ω (At 20°C)
13 – Body earth	42 – Body earth	Engine-ECU <m t=""> or engine-A/T-ECU and earth</m>	Continuity (0Ω)
26 – Body earth	48 – Body earth	Engine-ECU <m t=""> or engine-A/T-ECU and earth</m>	
60 – 12	3 – 41	Oxygen sensor heater (front)	4.5 – 8.0 Ω (At 20°C)
54 – 12	26 – 41	Oxygen sensor heater (rear)	11 – 18 Ω (At 20°C)

9FU0392

Terminal No. <m t=""></m>	Terminal No. 	Inspection item	Normal condition (Check condition)
72 – 92	64 – 57	64 – 57 Intake air temperature sensor	$5.3-6.7~k\Omega~$ (When intake air temperature is 0°C)
			2.3 – $3.0~k\Omega~$ (When intake air temperature is 20°C)
			1.0 – 1.5 k Ω (When intake air temperature is 40°C)
			$0.30-0.42k\Omega$ (When intake air temperature is 80°C)
83 – 92	44 – 57	- 57 Engine coolant temperature sensor	5.1 – 6.5 k Ω (When coolant temperature is 0°C)
			2.1 – 2.7 k Ω (When coolant temperature is 20°C)
			$0.9-1.3~k\Omega~$ (When coolant temperature is 40°C)
			$0.26-0.36k\Omega$ (When coolant temperature is 80°C)
87 – 92	79 – 57	Idle position switch	Continuity (when throttle valve is at idle position)
			No continuity (when throttle valve is slightly open)



MPI – Troubleshooting

INSPECTION PROCEDURE USING AN ANALYZER

AIR FLOW SENSOR (AFS)

Measurement Method

- 1. Disconnect the air flow sensor connector, and connect the special tool (test harness: MB991709) in between. (All terminals should be connected.)
- 2. Connect the analyzer special patterns pickup to air flow sensor connector terminal 3.

Alternate Method (Test harness not available)

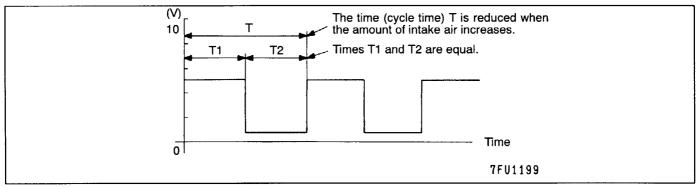
1. Connect the analyzer special patterns pickup to engine-ECU <M/T> terminal 90 or engine-A/T-ECU <A/T> terminal 65.

Standard Wave Pattern

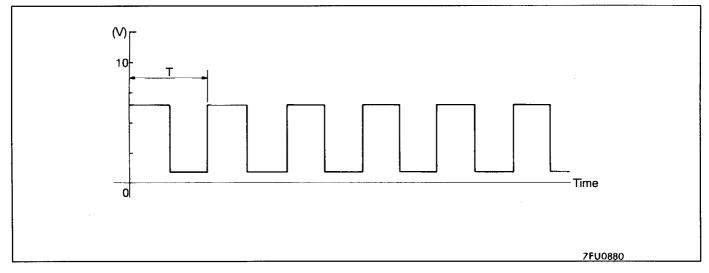
Observation conditions

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

Standard wave pattern

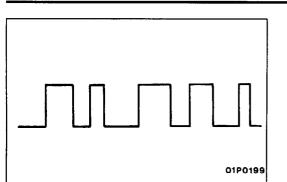


Observation conditions (from conditions above engine speed is increased by racing.)



Wave Pattern Observation Points

Check that cycle time T becomes shorter and the frequency increases when the engine speed is increased.



Examples of Abnormal Wave Patterns

• Example 1

Cause of problem

Sensor interface malfunction

Wave pattern characteristics

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

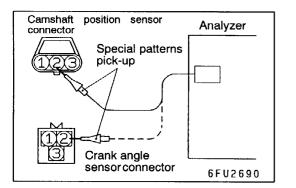
Example 2

Cause of problem

Damaged rectifier or vortex generation column

Wave pattern characteristics

Unstable wave pattern with non-uniform frequency. However, when an ignition leak occurs during acceleration, the wave pattern will be distorted temporarily, even if the air flow sensor is normal.



CAMSHAFT POSITION SENSOR AND CRANK ANGLE SENSOR

Measurement Method

- 1. Disconnect the camshaft position sensor connector and connect the special tool (test harness: MB991223) and jumper wire 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.

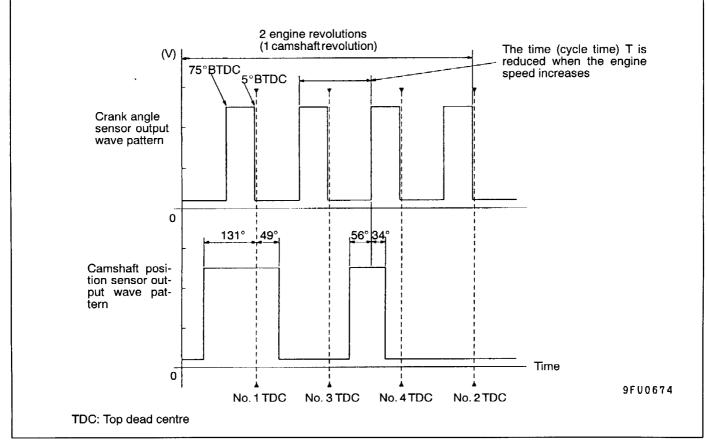
Alternate Method (Test harness not available)

- 1. Connect the analyzer special patterns pickup to engine-ECU <M/T> terminal 88 or engine-A/T-ECU <A/T> terminal 56. (When checking the camshaft position sensor signal wave pattern.)
- Connect the analyzer special patterns pickup to engine-ECU <M/T> terminal 89 or engine-A/T-ECU <A/T> terminal 45. (When checking the crank angle sensor signal wave pattern.)

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

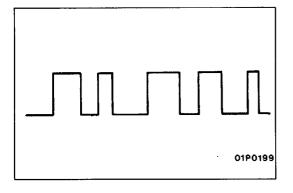
Standard Wave Pattern Observation conditions

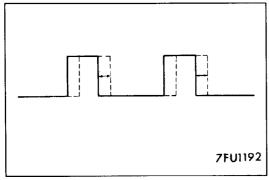
Standard wave pattern



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

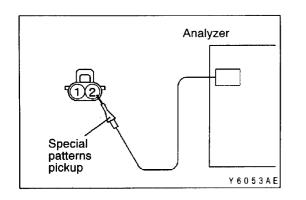
Rectangular wave pattern is output even when the engine is not started.

• Example 2 Cause of problem

Loose timing belt Abnormality in sensor disk

Wave pattern characteristics

Wave pattern is displaced to the left or right.



INJECTOR

Measurement Method

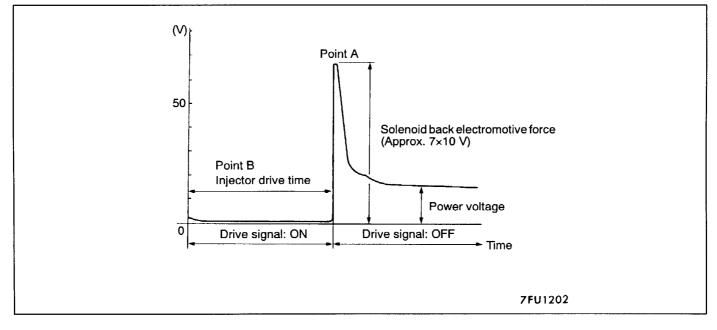
- Disconnect the injector connector, and then connect the special tool (test harness: MB991348) in between. (Both the power supply side and engine-ECU <M/T> or engine-A/T-ECU <A/T> side should be connected.)
- 2. Connect the analyzer special patterns pickup to terminal 2 of the injector connector.

Alternate Method (Test harness not available)

- 1. Connect the analyzer special patterns pickup to engine-ECU <M/T> terminal 1 or engine-A/T-ECU <A/T> terminal 1. (When checking the No. 1 cylinder.)
- Connect the analyzer special patterns pickup to engine-ECU <M/T> terminal 14 or engine-A/T-ECU <A/T> terminal 9. (When checking the No. 2 cylinder.)
- 3. Connect the analyzer special patterns pickup to engine-ECU <M/T> terminal 2 or engine-A/T-ECU <A/T> terminal 24. (When checking the No. 3 cylinder.)
- 4. Connect the analyzer special patterns pickup to engine-ECU <M/T> terminal 15 or engine-A/T-ECU <A/T> terminal 2. (When checking the No. 4 cylinder.)

Standard Wave Pattern Observation conditions

Function	Special patterns
Pattern height	Variable
Variable knob	Adjust while viewing the wave pattern
Pattern selector	Display
Engine r/min	Idle speed



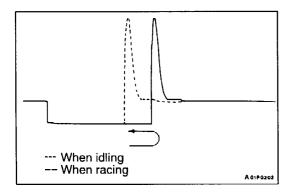
Standard wave pattern

Wave Pattern Observation Points

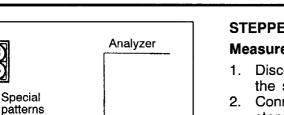
Point A: Height of solenoid back electromotive force

Contrast with standard wave pattern	Probable cause
Solenoid coil back electromotive force is low or doesn't appear at all.	Short in the injector solenoid

Point B: Injector drive time



- The injector drive time will be synchronized with the MUT-II tester display.
- When the engine is suddenly raced, the drive time will be greatly extended at first, but the drive time will soon match the engine speed.



7FU1203

STEPPER MOTOR

Measurement Method

- 1. Disconnect the stepper motor connector, and connect the special tool (test harness: MD998463) in between.
- 2. Connect the analyzer special patterns pickup to the stepper motor-side connector terminal 1 (red clip of special tool), terminal 3 (blue clip), terminal 4 (black clip) and terminal 6 (yellow clip) respectively.

Alternate Method (Test harness not available)

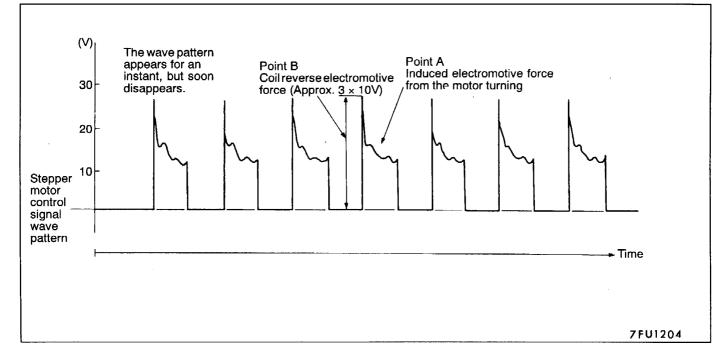
1. Connect the analyzer special patterns pickup to engine-ECU <M/T> terminal 4 or engine-A/T-ECU <A/T> terminal 14, connection terminal 5 <M/T>, 15 <A/T>, connection terminal 17 <M/T>, 28 <A/T>, and connection terminal 18 <M/T>, 29 <A/T> respectively.

Standard Wave Pattern Observation conditions

pickup

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



13D-100

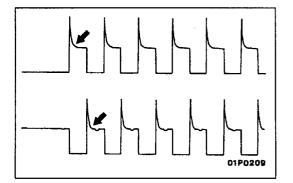
Wave Pattern Observation Points

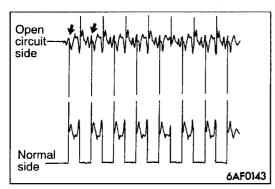
Check that the standard wave pattern appears when the stepper motor is operating. Point A: Presence or absence of induced electromotive force from the motor turning. (Refer to the abnormal wave pattern.)

Contrast with standard wave pattern	Probable cause
Induced electromotive force does not appear or is extremely small.	Motor is malfunctioning

Point B: Height of coil reverse electromotive force

Contrast with standard wave pattern	Probable cause
Coil reverse electromotive force does not appear or is extremely small.	Short in the coil





Examples of Abnormal Wave Pattern

• Example 1

Cause of problem

Motor is malfunctioning. (Motor is not operating.)

Wave pattern characteristics

Induced electromotive force from the motor turning does not appear.

• Example 2

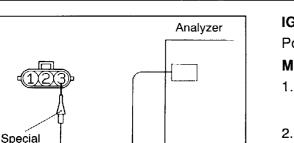
Cause of problem

Open circuit in the line between the stepper motor and the engine-ECU <M/T> or engine-A/T-ECU <A/T>.

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.



6FU2691

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)

 Connect the analyzer special patterns pickup to engine-ECU <M/T> terminal 10 or engine-A/T-ECU <A/T> terminal 11 (No. 1 – No. 4), terminal 23 <M/T>, 12 <A/T> (No. 2 – No. 3) respectively.

Standard Wave Pattern Observation condition

patterns pickup

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

(V) т T: Revolution time corresponding to a crank angle of 180° 5°BTDC Compression top dead center 6 75°BTDC~ 4 Crank angle sensor output 2 wave pattern 0 Ignition period Δ T1 少 10 θ: Spark Power transistor advance control signal angle 2 wave pattern 0 OFF ON **Dwell section** 6FU1681 Time T1: Time computed by the engine-ECU

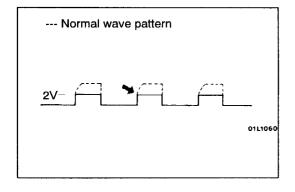
Standard wave pattern

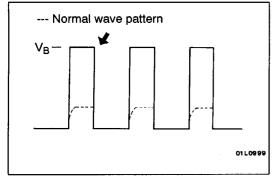
Wave Pattern Observation Points

Point: Condition of wave pattern build-up section and maximum voltage (Refer to abnormal wave pattern examples 1 and 2.)

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

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Examples of Abnormal Wave Patterns

• Example 1 Wave pattern during engine cranking Cause of problem

Open-circuit in ignition primary circuit

Wave pattern characteristics

Top-right part of the build-up section cannot be seen, and voltage value is approximately 2V too low.

Example 2 Wave pattern during engine cranking Cause of problem Malfunction in power transistor Wave pattern characteristics

Power voltage results when the power transistor is ON.

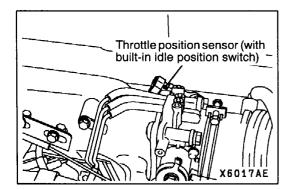
ON-VEHICLE SERVICE

THROTTLE BODY (THROTTLE VALVE AREA) CLEANING

- 1. Start the engine and warm it up until the coolant is heated to 80°C or higher and then stop the engine.
- 2. Remove the air intake hose from the throttle body.
- 3. Plug the bypass passage inlet of the throttle body.
 Caution Do not allow cleaning solvent to enter the bypass passage.
 4. Spray cleaning solvent into the valve through the throttle body intake port and leave it for about 5 minutes.
 - 5. Start the engine, race it several times and idle it for about 1 minute. If the idling speed becomes unstable (or if the engine stalls) due to the bypass passage being plugged, slightly open the throttle valve to keep the engine running.
 - 6. If the throttle valve deposits are not removed, repeat steps 4 and 5.
 - 7. Unplug the bypass passage inlet.
 - 8. Attach the air intake hose.
 - 9. Use the MUT-II to erase the self-diagnosis code.
 - 10. Adjust the basic idle speed. (Refer to P.13D-105.)

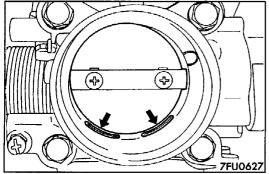
NOTE

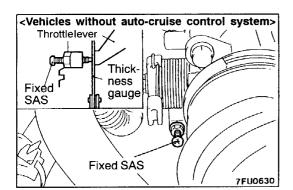
If the engine hunts while idling after adjustment of the basic idle speed, disconnect the negative cable from the battery for 10 seconds or more, and then reconnect it and run the engine at idle for about 10 minutes.

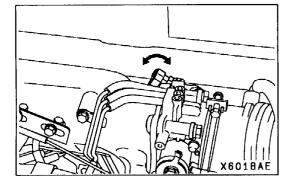


IDLE POSITION SWITCH AND THROTTLE POSITION SENSOR ADJUSTMENT

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





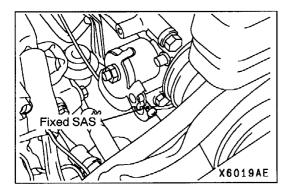


 Insert a thickness gauge as follows: Insert a thickness gauge with a thickness of 0.45 mm between the fixed SAS and the throttle lever.

NOTE

Do not insert the thickness gauge 3 mm or more. If doing that, the throttle lever opening angle becomes larger than the predetermined angle, causing maladjustment.

- 3. Turn the ignition switch to ON (but do not start the engine).
- 4. Loosen the throttle position sensor mounting bolt, and then turn the throttle position sensor anti-clockwise as far as it will go.
- 5. Check that the idle position switch is ON at this position.
- 6. Slowly turn the throttle position sensor clockwise and find the point where the idle position switch turns off. Securely tighten the throttle position sensor mounting bolt at this point.
- Check the throttle position sensor output voltage.
 Standard value: 400 1,000 mV
 - Standard value. 400 1,000 mv
- If there is a deviation from the standard value, check the throttle position sensor and the related harness.
 Demove the thickness gauge
- 9. Remove the thickness gauge.
- 10. Turn the ignition switch to "LOCK" (OFF) position.
- 11. Disconnect the MUT-II.



FIXED SAS ADJUSTMENT

NOTE

- (1) The fixed SAS should not be moved unnecessarily; it has been precisely adjusted by the manufacturer.
- (2) If the adjustment is disturbed for any reason, readjust as follows.
- 1. Loosen the tension of the accelerator cable sufficiently.
- 2. Back out the fixed SAS lock nut.
- 3. Turn the fixed SAS counterclockwise until it is sufficiently backed out, and fully close the throttle valve.
- 4. Tighten the fixed SAS until the point where the throttle lever is touched (i.e., the point at which the throttle valve begins to open) is found.
 - From that point, tighten the fixed SAS 1-1/4 turn.
- 5. While holding the fixed SAS so that it doesn't move, tighten the lock nut securely.
- 6. Adjust the tension of the accelerator cable.
- 7. Adjust the basic idling speed.
- 8. Adjust the idle position switch and the throttle position sensor (P.13D-103).

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). NOTF

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

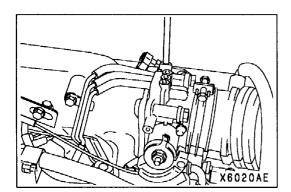
This holds the ISC servo at the basic step to adjust the basic idle speed.

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. (Refer to P.13D-103.)



 If not within the standard value range, turn the speed adjusting screw (SAS) to make the necessary adjustment.
 NOTE

If the idling speed is higher than the standard value range even when the SAS is fully closed, check whether or not there is any indication that the fixed SAS has been moved. If there is an indication that it has been moved, adjust the fixed SAS.

7. Press the 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.

- Switch OFF the ignition switch.
 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.

FUEL PRESSURE TEST

- 1. Release residual pressure from the fuel pipe line to prevent fuel gush out. (Refer to P.13D-108.)
- 2. Disconnect the high-pressure fuel hose at the delivery pipe side.

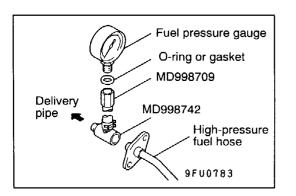
Caution

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.

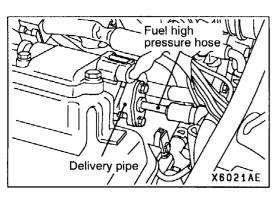
<When using the fuel pressure gauge set (special tool)>

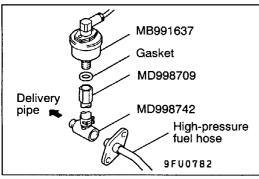
- (1) Install the special tool (for measuring the fuel pressure) between the high-pressure fuel hose and the delivery pipe.
- (2) Install the fuel pressure gauge set (special tool) on the special tool (for measuring the fuel pressure) putting the gasket between them.
- (3) Connect the lead wire of the 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 delivery pipe.
- Connect the MUT-II to the diagnosis connector. 5.
- Turn the ignition switch to ON. (But do not start the engine.) 6.





- 7. Select "Item No.07" from the MUT-II Actuator test to drive the fuel pump.
 - Check that there are no fuel leaks from any parts.
- 8. Finish the actuator test or turn the ignition switch to "LOCK" (OFF) position.
- 9. Start the engine and run at idle.
- 10. Measure fuel pressure while the engine is running at idle.

Standard value: Approx. 265 kPa at kerb idle

11. Disconnect the vacuum hose from the fuel pressure regulator and measure fuel pressure with the hose end closed by a finger.

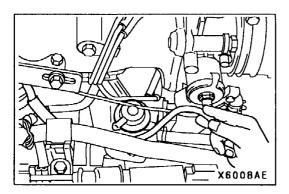
Standard value: 324 - 343 kPa at kerb idle

- 12. Check to see that fuel pressure at idle does not drop even after the engine has been raced several times.
- 13. Racing the engine repeatedly, hold the fuel return hose lightly with fingers to feel that fuel pressure is present in the return hose.
 - NOTE

If the fuel flow rate is low, there will be no fuel pressure in the return hose.

14. If any of fuel pressure measured in steps 10 to 13 is out of specification, troubleshoot and repair according to the table below.

Symptom	Probable cause	Remedy
Fuel pressure too low Fuel pressure draps offer racing	Clogged fuel filter	Replace fuel filter
 Fuel pressure drops after racing No fuel pressure in fuel return hose 	Fuel leaking to return side due to poor fuel regulator valve seating or settled spring	Replace fuel pressure regulator
	Low fuel pump delivery pressure	Replace fuel pump
Fuel pressure too high	Binding valve in fuel pressure regulator	Replace fuel pressure regulator
	Clogged fuel return hose or pipe	Clean or replace hose or pipe
Same fuel pressure when vacuum hose is connected and when disconnected	Damaged vacuum hose or clogged nipple	Replace vacuum hose or clean nipple



15. Stop the engine and check change of fuel pressure gauge reading. Normal if the reading does not drop within 2 minutes. If it does, observe the rate of drop and troubleshoot and repair according to the table below.

Symptom	Probable cause	Remedy	
Fuel pressure drops gradually after	Leaky injector	Replace injector	
engine is stopped	Leaky fuel regulator valve seat	Replace fuel pressure regulator	
Fuel pressure drops sharply immediately after engine is stopped	Check valve in fuel pump is held open	Replace fuel pump	

- 16. Release residual pressure from the fuel pipe line. (Refer to P.13D-108.)
- 17. Remove the fuel pressure gauge and special tool from the delivery pipe.

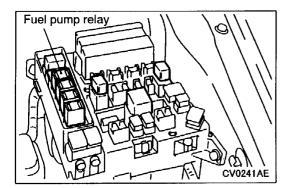
Caution

Cover the hose connection with rags to prevent splash of fuel that could be caused by some residual pressure in the fuel pipe line.

- 18. Replace the O-ring at the end of the fuel high pressure hose with a new one. Furthermore, apply engine oil to the new O-ring before replacement.
- 19. Fit the fuel high pressure hose over the delivery pipe and tighten the bolt to specified torque.

Tightening torque: 5 Nm

- 20. Check for any fuel leaks by following the procedure in step 7.
- 21. Disconnect the MUT-II.



FUEL PUMP CONNECTOR DISCONNECTION (HOW TO REDUCE THE FUEL PRESSURE)

When removing the fuel pipe, hose, etc., since fuel pressure in the fuel pipe line is high, do the following operation so as to release fuel pressure in the line and prevent fuel from running out.

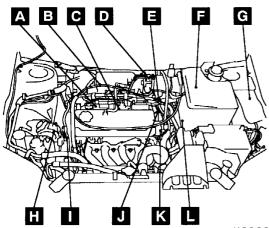
- 1. Remove the fuel filler cap to release pressure in the fuel tank.
- 2. Remove the fuel pump relay.
- 3. After starting the engine and letting it run until it stops naturally, turn the ignition switch to OFF.
- 4. Install the fuel pump relay.

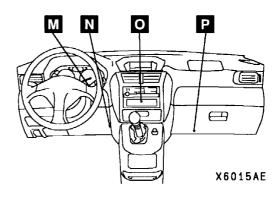
FUEL PUMP OPERATION CHECK

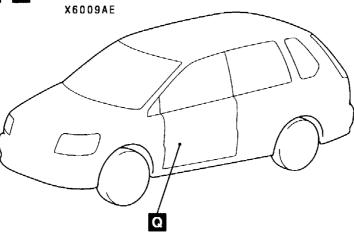
Refer to '99 SPACE RUNNER/SPACE WAGON Workshop Manual (Pub. No. PWDE9803) GROUP 13A – On-vehicle service.

COMPONENT LOCATION

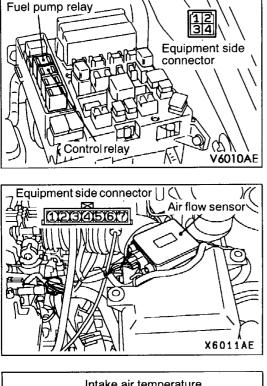
Name	Symbol	Name	Symbol
A/C relay	G	Engine-A/T-ECU 	Р
A/C switch	0	Engine warning lamp (check engine lamp)	М
Air flow sensor (with intake air temperature sensor and barometric pressure sensor)	F	Idle speed control servo	D
Camshaft position sensor	к	Ignition coil	A
Control relay and fuel pump relay	G	Inhibitor switch 	L
Crank angle sensor	1	Injectors	С
Detonation sensor	В	Oxygen sensor (front)	Q
Diagnosis connector	N	Oxygen sensor (rear)	
EGR control solenoid valve	А	Power steering fluid pressure switch	н
EGR valve	E	Purge control solenoid valve	A
Engine coolant temperature sensor	J	Throttle position sensor (with idle position switch)	D
Engine-ECU <m t=""></m>	Р	Vehicle speed sensor <m t=""></m>	L

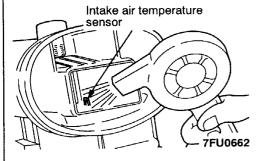


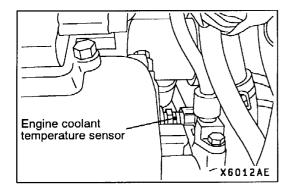


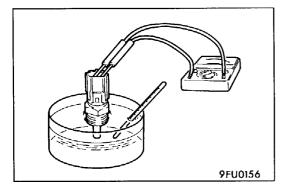


X6016AE









CONTROL RELAY AND FUEL PUMP RELAY CONTINUITY CHECK

Battery voltage	Terminal No.			
	1	2	3	4
Not supplied		0		0
Supplied	0	Θ	0	

INTAKE AIR TEMPERATURE SENSOR CHECK

- 1. Disconnect the air flow sensor connector.
- 2. Measure resistance between terminals 5 and 6.

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

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

Normal condition:

Temperature (°C)	Resistance (kΩ)
Higher	Smaller

4. If the value deviates from the standard value or the resistance remains unchanged, replace the air flow sensor assembly.

ENGINE COOLANT TEMPERATURE SENSOR CHECK

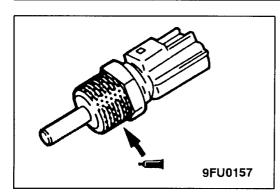
Caution

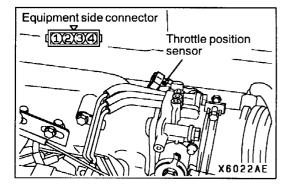
Be careful not to touch the connector (resin section) with the tool when removing and installing.

- 1. Remove the engine coolant temperature sensor.
- 2. With temperature sensing portion of engine coolant temperature sensor immersed in hot water, check resistance.

Standard value: 2.1 – 2.7 kΩ (at 20°C) 0.26 – 0.36 kΩ (at 80°C)

3. If the resistance deviates from the standard value greatly, replace the sensor.





4. Apply sealant to threaded portion. **Specified sealant:**

3M NUT Locking Part No.4171 or equivalent

5. Install the engine coolant temperature sensor and tighten it to the specified torque.

Tightening torque: 29 Nm

THROTTLE POSITION SENSOR CHECK

- 1. Disconnect the throttle position sensor connector.
- 2. Measure the resistance between the throttle position sensor side connector terminal 1 and terminal 4.

Standard value: 3.5 – 6.5 k Ω

3. Measure the resistance between the throttle position sensor side connector terminal 2 and terminal 4.

Normal condition:

Throttle valve slowly open	Changes smoothly in
until fully open from the idle	proportion to the opening
position	angle of the throttle valve

4. If the resistance is outside the standard value, or if it doesn't change smoothly, replace the throttle position sensor.

NOTE

For the throttle position sensor adjustment procedure, refer to P.13D-79.

IDLE POSITION SWITCH CHECK

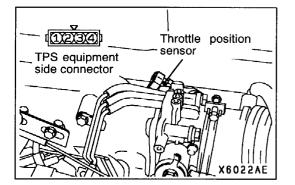
- 1. Disconnect the throttle position sensor connector.
- 2. Check the continuity between the throttle position sensor connector side terminal 3 and terminal 4.

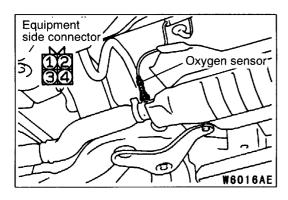
Normal condition:

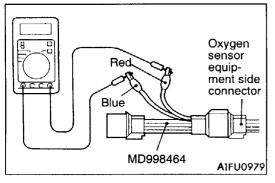
Accelerator pedal	Continuity
Depressed	Non-conductive
Released	Conductive (0 Ω)

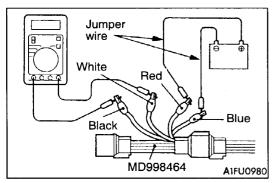
3. If out of specification, replace the throttle position sensor. NOTE

After replacement, the idle position switch and throttle position sensor should be adjusted. (Refer to P.13D-79.)









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.
- Make sure that there is continuity (4.5 8.0 Ω at 20°C) between terminal 2 (red clip of special tool) and terminal 4 (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 2 (red clip) of the oxygen sensor connector to the battery (+) terminal and terminal 4 (blue clip) to the battery (-) terminal. **Caution**

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

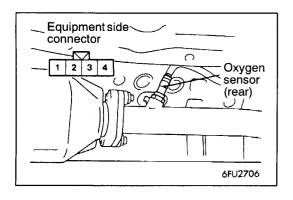
- 6. Connect a digital voltage meter between terminal 1 (black clip) and terminal 3 (white clip).
- 7. While repeatedly racing the engine, measure the oxygen sensor output voltage.

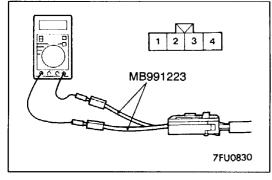
Standard value:

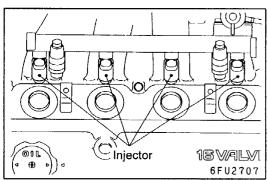
Engine	Oxygen sensor output voltage	Remarks
When racing the engine	0.6 – 1.0 V	If you make the air/fuel ratio rich by racing the engine repeatedly, a normal oxy- gen sensor will output a voltage of 0.6 – 1.0 V.

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 $(11 18 \Omega \text{ at } 20^{\circ}\text{C})$ 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.

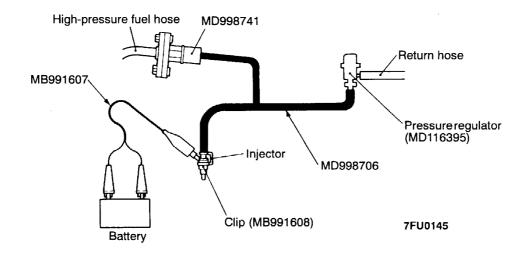
INJECTOR CHECK

Measurement of Resistance between Terminals

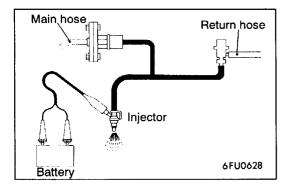
- Remove the injector connector.
 Measure the resistance between terminals.
 - Standard value: 13 16 Ω (at 20°C)
- 3. Install the injector connector.

Checking the Injection Condition

- 1. Following the steps below, bleed out the residual pressure within the fuel pipe line to prevent flow of the fuel. (Refer to P.13D-84.)
- 2. Remove the injector.
- 3. Arrange the special tool (injector test set), adaptor, fuel pressure regulator and clips as shown in the illustration below.



- 4. Connect the MUT-II to the diagnosis connector.
- 5. Turn the ignition switch to ON. (But do not start the engine.)
- 6. Select "Item No.7" from the MUT-II Actuator test to drive the fuel pump.



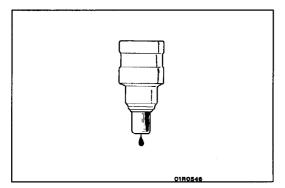
7. Activate the injector and check the atomized spray condition of the fuel. The condition can be considered satisfactory unless it is

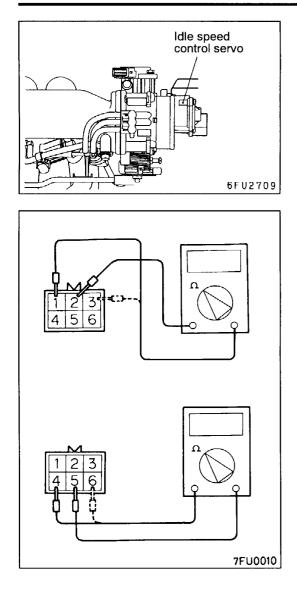
The condition can be considered satisfactory unless it is extremely poor.

8. Stop the actuation of the injector, and check for leakage from the injector's nozzle.

Standard value: 1 drop or less per minute

- 9. Activate the injector without activating the fuel pump; then, when the spray emission of fuel from the injector stops, disconnect the special tool and restore it to its original condition.
- 10. Disconnect the MUT-II.





IDLE SPEED CONTROL (ISC) SERVO (STEPPER MOTOR) CHECK

Checking the Operation Sound

1. Check that the engine coolant temperature is 20° C or below.

NOTE

Disconnecting the engine coolant temperature sensor connector and connecting the harness-side of the connector to another engine coolant temperature sensor that is at 20°C or below is also okay.

- 2. Check that the operation sound of the stepper motor can be heard after the ignition is switched ON. (but without starting the motor.)
- 3. If the operation sound cannot be heard, check the stepper motor's activation circuit.

If the circuit is normal, it is probable that there is a malfunction of the stepper motor or of the engine control unit.

Checking the Coil Resistance

- 1. Disconnect the idle speed control servo connector and connect the special tool (test harness).
- 2. Measure the resistance between terminal 2 (white clip of the special tool) and either terminal 1 (red clip) or terminal 3 (blue clip) of the connector at the idle speed control servo side.

Standard value: 28 – 33 Ω (at 20°C)

3. Measure the resistance between terminal 5 (green clip of the special tool) and either terminal 6 (yellow clip) or terminal 4 (black clip) of the connector at the idle speed control servo side.

Standard value: 28 – 33 Ω (at 20°C)

PURGE CONTROL SOLENOID VALVE CHECK

Refer to GROUP 17 - Emission Control System.

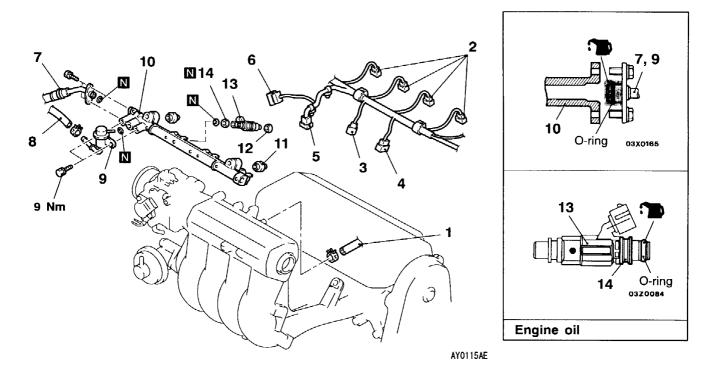
EGR CONTROL SOLENOID VALVE CHECK

Refer to GROUP 17 - Emission Control System.

INJECTOR

REMOVAL AND INSTALLATION

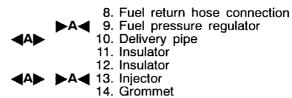
Pre-removal Operation Fuel Discharge Prevention (Refer to P.13D-108.)



Removal steps

- 1. PCV hose connection 2. Injector connector
- 3. Purge control solenoid valve connector
- EGR solenoid valve connector
 Ignition failure sensor connector

- 6. Throttle position sensor
 7. High-pressure fuel hose connection



REMOVAL SERVICE POINT

▲A▶ DELIVERY PIPE/INJECTOR 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 INJECTOR/FUEL PRESSURE REGULATOR/ HIGH-PRESSURE FUEL HOSE INSTALLATION

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

Caution

Be sure not to let engine oil in 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 fuel pressure regulator and then re-insert it into the delivery pipe and check once again.
- 4. Tighten the high-pressure fuel hose to the standard torque, and tighten the fuel pressure regulator to the specified torque.

Tightening torque: 9 Nm (Fuel pressure regulator)

THROTTLE BODY

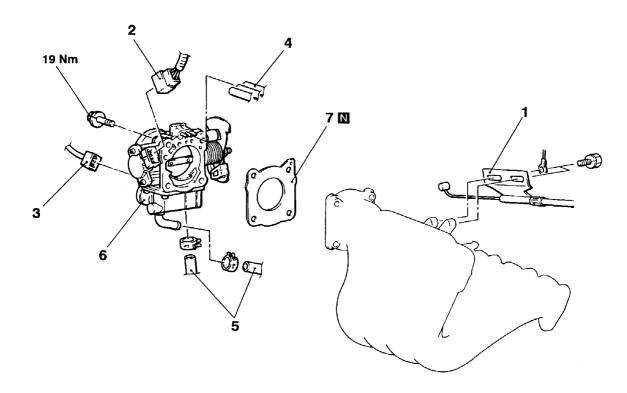
REMOVAL AND INSTALLATION

Pre-removal Operation

- Engine Coolant Draining Air Cleaner Removal

Post-installation Operation

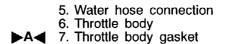
- Air Cleaner Installation •
- Engine Coolant Supplying • •
- Accelerator Cable Adjustment (GROUP 17 On-vehicle Service)

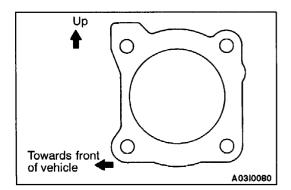


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Removal steps

- 1. Accelerator cable connection
- 2. Throttle position sensor connector
- 3. Idle speed control servo connector
- 4. Vacuum hose connection





INSTALLATION SERVICE POINT ►A THROTTLE BODY GASKET INSTALLATION

Place the gasket so that the projecting part is positioned as shown in the illustration, and then install it between the intake manifold and the throttle body.