FUEL

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MULTIPORT FUEL INJECTION (MFI) <1.5L ENGINE>

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GENERAL INFORMATION

13100010708

The Multiport Fuel Injection System consists of sensors which detect the engine conditions, the ENGINE CONTROL MODULE (ECM) which controls the system based on signals from these sensors, and actuators which operate under the control of the ECM.
The ECM carries out activities such as fuel injection control, idle air control, and ignition timing control. In addition, the ECM is equipped with several diagnostic test modes which simplify troubleshooting when a problem develops.

FUEL INJECTION CONTROL

The injector drive times and injector timing are controlled so that the optimum air/fuel mixture is supplied to the engine to correspond to the continually-changing engine operation conditions.
A single injector is mounted at the intake port of each cylinder. Fuel is sent under pressure from the fuel tank to the fuel injectors by the fuel pump, with the pressure being regulated by the fuel pressure regulator. The regulated fuel 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. Each cylinder has a dedicated fuel injector. This is called multiport. The ECM 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 under normal operating temperature after warming-up, the ECM controls the air/fuel mixture by using the heated oxygen sensor signal to carry out "closed-loop" control. The closed-loop control achieves the theoretical air/fuel mixture ratio where the catalytic converter can obtains the maximum cleaning performance.

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 ECM drives the idle air control (IAC) motor to keep the engine running at the pre-set idle target speed in accordance with the engine coolant temperature and air conditioning load. In addition, when the air conditioning switch is turned off and on while the engine is idling, the IAC motor adjusts the throttle valve bypass air amount according to the engine load conditions to avoid fluctuations in the engine speed.

IGNITION TIMING CONTROL

The ignition 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 to provide the optimum ignition timing with respect to the engine operating conditions. The ignition timing is determined by the ECM from the engine speed, intake air volume, engine coolant temperature, and atmospheric pressure.

DIAGNOSTIC TEST MODE

- When an abnormality is detected in one of the sensors or actuators related to emission control, the SERVICE ENGINE SOON/MALFUNCTION INDICATOR LAMP illuminates to warn the driver.
- When an abnormality is detected in one of the sensors or actuators, a diagnostic trouble code corresponding to the abnormality is stored in the ECM.
- The RAM data inside the ECM that is related to the sensors and actuators can be read with the scan tool.
  In addition, the actuators can be controlled by the Scan tool (MUT-II) under certain circumstances.

OTHER CONTROL FUNCTIONS

1. Fuel Pump Control
   Turns the fuel pump relay ON so that current is supplied to the fuel pump while the engine is cranking or running.
2. A/C Compressor Clutch Relay Control
   Turns the compressor clutch of the A/C ON and OFF.
3. Fan Relay Control
   The radiator fan and condenser fan speeds are controlled in response to the engine coolant temperature and vehicle speed.
4. Evaporative Emission Purge Control
   (Refer to GROUP 17.)
5. EGR Control
   (Refer to GROUP 17.)

GENERAL SPECIFICATIONS

Items		Specifications
Throttle body	Throttle bore mm (in.)	46 (1.81)
	Throttle position sensor	Variable resistor type
	Idle air control motor	Stepper motor (Stepper motor type by-pass air control system with the air volume limiter)
	Closed throttle position switch	Rotary contact type, within throttle position sensor
	Idle air control valve position sensor	Hall element type
Engine control module (ECM)	Identification model No.	E2T69284 <Federal> E2T69283 <California>
Sensors	Manifold absolute pressure sensor	Semiconductor type
	Intake air temperature sensor	Thermistor type
	Engine coolant temperature sensor	Thermistor type
	Heated oxygen sensor	Zirconia type
	Vehicle speed sensor	Electromagnetic resistance element type
	Park/Neutral position switch	Contact switch type
	Camshaft position sensor	Hall element type
	Crankshaft position sensor	Hall element type
	Power steering pressure switch	Contact switch type
Actuators	Multiport fuel injection (MFI) relay	Contact switch type
	Fuel pump relay	Contact switch type
	Injector type and number	Electromagnetic type, 4
	Injector identification mark	CDH166
	EGR solenoid	Duty cycle type solenoid valve
	Evaporative emission purge solenoid	Duty cycle type solenoid valve
Fuel pressure regulator	Regulator pressure kPa (psi)	335 (47.6)

MULTIPORT FUEL INJECTION (MFI) SYSTEM DIAGRAM

<Vehicles for Federal>

SENSE

- ★1 Heated oxygen sensor (front)
- ★2 Intake air temperature sensor
- ★3 Throttle position sensor
- ★4 Closed throttle position switch
- ★5 Camshaft position sensor
- ★6 Crankshaft position sensor
- ★7 Engine coolant temperature sensor
- ★8 Heated oxygen sensor (rear)
- ★9 Manifold absolute pressure sensor
- ★10 Fuel tank differential pressure sensor

- Power supply
- Vehicle speed sensor
- A/C switch
- Park/Neutral position switch
- Power steering pressure switch
- Ignition switch-ST

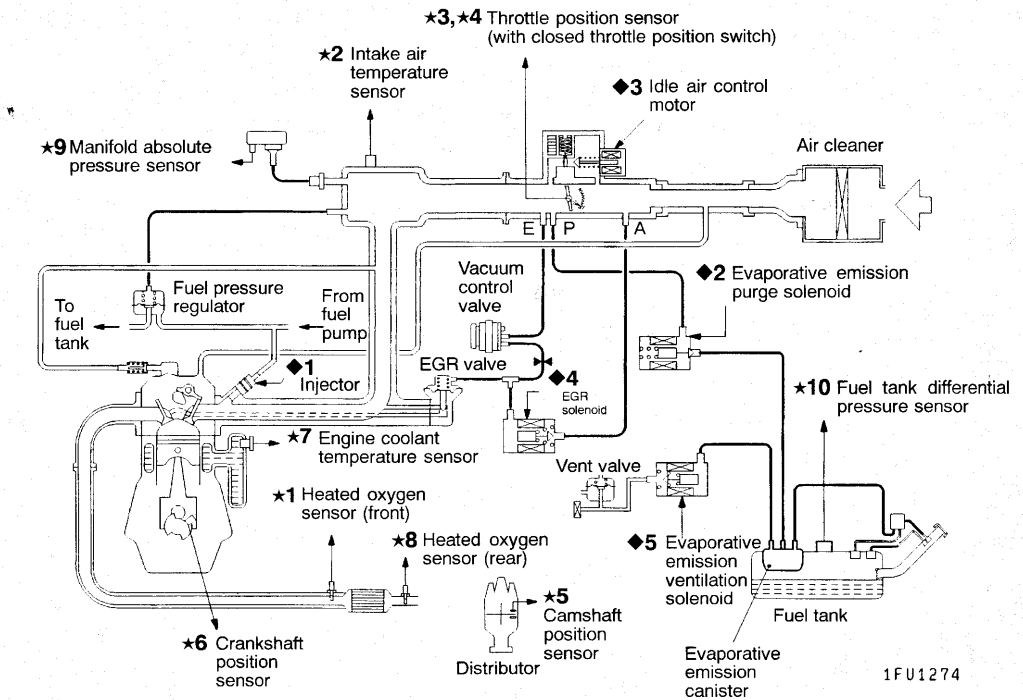
DECIDE

Engine control module

ACT

- ◆1 Injector
- ◆2 Evaporative emission purge solenoid
- ◆3 Idle air control motor
- ◆4 EGR solenoid
- ◆5 Evaporative emission ventilation solenoid

- Fuel pump relay
- Multiport fuel injection (MFI) relay
- A/C compressor clutch relay
- Service Engine Soon/Malfunction Indicator Lamp
- Diagnostic output
- Ignition coil, Ignition power transistor



<Vehicles for California>

SENSE

- ★1 Heated oxygen sensor (front)
- ★2 Intake air temperature sensor
- ★3 Throttle position sensor
- ★4 Closed throttle position switch
- ★5 Camshaft position sensor
- ★6 Crankshaft position sensor
- ★7 Engine coolant temperature sensor
- ★8 Heated oxygen sensor (rear)
- ★9 Manifold absolute pressure sensor
- ★10 Fuel tank differential pressure sensor

- Power supply
- Vehicle speed sensor
- A/C switch
- Park/Neutral position switch
- Power steering pressure switch
- Ignition switch-ST

DECIDE

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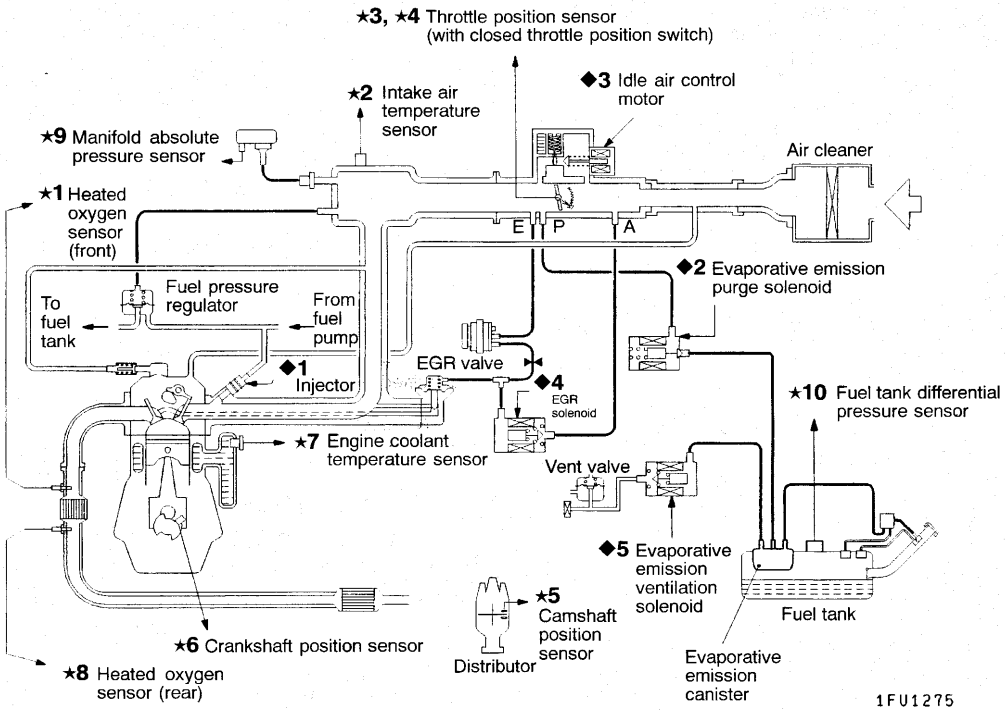


SERVICE SPECIFICATIONS

13100030476

Items			Standard value
Basic ignition timing			5° BTDC ± 3° at curb idle
Curb idle speed r/min			700 ± 100
Idle speed when A/C is ON r/min			850 in Neutral
Basic idle speed r/min			700 ± 50
Throttle position sensor adjusting voltage mV			400-1000
Throttle position sensor resistance kΩ			3.5-6.5
Intake air temperature sensor resistance kΩ		20°C (86°F)	2.3-3.0
		80°C (176°F)	0.30-0.42
Engine coolant temperature sensor resistance kΩ		20°C (68°F)	2.1-2.7
		80°C (176°F)	0.26-0.36
Heated oxygen sensor output voltage V			0.6-1.0
Fuel pressure kPa (psi)	Vacuum hose disconnected		330-350 (47-50) at curb idle
	Vacuum hose connected		Approx. 270 (38) at curb idle
Injector coil resistance Ω			13-16 [at 20°C (68°F)]
Idle air control motor coil resistance Ω			28-33 [at 20°C (68°F)]

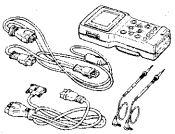
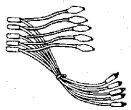
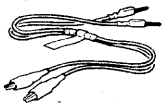
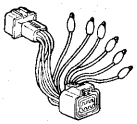
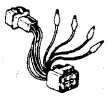
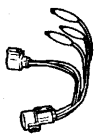
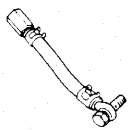
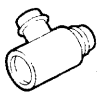
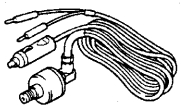
SEALANT

13100050021

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

SPECIAL TOOLS

13100060536

Tool	Tool number and name	Supersession	Application
	MB991502 Scan tool <MUT-II>	MB991496-OD	• Reading diagnostic trouble code • MFI system inspection
	MB991348 Test harness set	MB991348-01	• Adjustment of closed throttle position switch, throttle position sensor • Inspection using an analyzer
	MB991529 Diagnostic trouble code check harness	Tool not necessary if scan tool <MUT-II> is available	Check for diagnostic trouble codes.
	MD998463 Test harness (6 pin, square)	MD998463-01	• Inspection of idle air control motor • Inspection using an analyzer
	MD998464 Test harness (4 pin, square)	MD998464-01	• Inspection of heated oxygen sensor • Inspection using an analyzer
	MD998478 Test harness (3 pin, triangle)	MD998478-01	Inspection using an analyzer
	MD998709 Adaptor hose	MIT210196	Measurement of fuel pressure
	MD998742 Hose adaptor	MD998742-01	Measurement of fuel pressure
 B991637	MB991637 Fuel pressure gauge set	Tool not available	Measurement of fuel pressure

TROUBLESHOOTING

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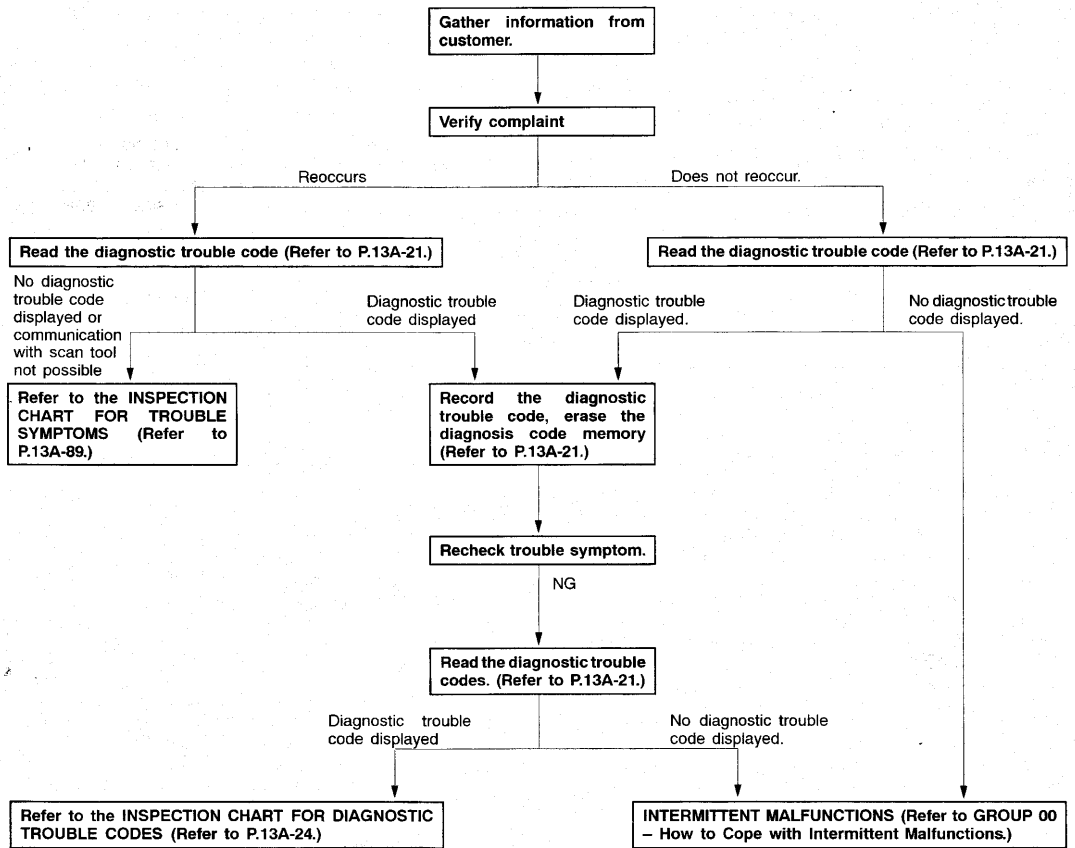
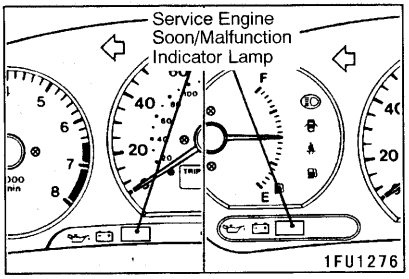
DIAGNOSTIC TROUBLESHOOTING FLOW





DIAGNOSTIC TEST MODE

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SERVICE ENGINE SOON/MALFUNCTION INDICATOR LAMP

Among the on-board diagnostic items, a Service Engine Soon/ Malfunction Indicator Lamp illuminates to notify the driver of an emission control malfunction.
However, when an irregular signal returns to normal and the engine control module judges that it has returned to normal, the Service Engine Soon/Malfunction Indicator Lamp is switched off.
Moreover, when the ignition switch is turned off, the lamp is switched off. Even if the ignition switch is turned on again, the lamp does not illuminate until the malfunction is detected.
Here, immediately after the ignition switch is turned on, the Service Engine Soon/Malfunction Indicator Lamp is lit for 5 seconds to indicate that the Service Engine Soon/Malfunction Indicator Lamp operates normally.

Items Indicated by the Service Engine Soon/Malfunction Indicator Lamp

DTC No.	Items
-	Engine control module (ECM) malfunction
P0105	Manifold absolute pressure circuit malfunction
P0110	Intake air temperature circuit malfunction
P0115	Engine coolant temperature circuit malfunction
P0120	Throttle position circuit malfunction
P0125*	Excessive time to enter closed loop fuel control
P0130	Heated oxygen sensor circuit malfunction (sensor 1)
P0135	Heated oxygen sensor heater circuit malfunction (sensor 1)
P0136	Heated oxygen sensor circuit malfunction (sensor 2)
P0141	Heated oxygen sensor heater circuit malfunction (sensor 2)
P0170	Fuel trim malfunction
P0201	Injector circuit malfunction cylinder-1
P0202	Injector circuit malfunction cylinder-2
P0203	Injector circuit malfunction cylinder-3
P0204	Injector circuit malfunction cylinder-4
P0300*	Random misfire detected
P0301*	Cylinder 1 misfire detected
P0302*	Cylinder 2 misfire detected
P0303*	Cylinder 3 misfire detected
P0304*	Cylinder 4 misfire detected
P0335	Crankshaft position sensor circuit malfunction

DTC No.	Items
P0340	Camshaft position sensor circuit malfunction
P0400	Exhaust gas recirculation flow malfunction
P0403	Exhaust gas recirculation solenoid malfunction
P0420	Catalyst system efficiency below threshold <Federal>
P0421	Warm up catalyst efficiency below threshold <California>
P0442	Evaporative emission control system leak detected
P0443	Evaporative emission control system purge control valve circuit malfunction
P0446	Evaporative emission control system vent control malfunction
P0450	Evaporative emission control system pressure sensor malfunction
P0455	Evaporative emission control system leak detected (Gross leak)
P0505	Idle control system malfunction
P0510	Closed throttle position switch malfunction
P0551	Power steering pressure sensor circuit Range/Performance
P0705	Transmission range sensor circuit malfunction (PRND2L input)
P0710	Transmission fluid temperature sensor circuit malfunction
P0715	Input/turbine speed sensor circuit malfunction
P0720	Output speed sensor circuit malfunction
P0725	Engine speed input circuit malfunction
P0740	Torque converter clutch system malfunction
P0750	Shift solenoid A malfunction
P0755	Shift solenoid B malfunction
P0760	Shift solenoid C malfunction
P0765	Shift solenoid D malfunction
P1600	Serial communication link malfunction
P1751	A/T control relay malfunction
P1795	Throttle position input circuit malfunction

NOTE

1. After the Engine Control Module (ECM) detects a malfunction, the Service Engine Soon/Malfunction Indicator Lamp illuminates when the engine is next turned on and the same malfunction is re-detected.
   However, for items marked with a "*", the Service Engine Soon/Malfunction Indicator Lamp illuminates on the first detection of the malfunction.
2. After the Service Engine Soon/Malfunction Indicator Lamp illuminates, it will be switched off under the following conditions.
   - When the ECM monitored the powertrain malfunction three times* and detected no malfunction.
     *: In this case, "one time" indicates from engine start to stop.
   - For misfiring or a fuel trim malfunction, when driving conditions (engine speed, engine coolant temperature, etc.) are similar to those when the malfunction was first recorded.

Caution

If the Service Engine Soon/Malfunction Indicator Lamp illuminates because of a malfunction of the ECM, transmission between the scan tool and the ECM cannot occur. In this case, the diagnostic trouble code cannot be read.

ON-BOARD DIAGNOSTICS

The engine control module monitors the input/output signals (some signals all the time and others under specified conditions) of the engine control module.
When a malfunction continues for a specified time or longer after the irregular signal is initially monitored, the engine control module judges that a malfunction has occurred.
After the engine control module first detects a malfunction, a diagnostic trouble code is recorded when the engine is restarted and the same malfunction is re-detected. However, for items marked with a "*", a diagnostic trouble code is recorded on the first detection of the malfunction.
There are 48 diagnostic items. The diagnostic results can be read out with a scan tool.
Since memorization of the diagnostic trouble codes is backed up directly by the battery, the diagnostic results are memorized even if the ignition key is turned off. The diagnostic trouble codes will, however, be erased when the battery terminal or the engine control module connector is disconnected.
In addition, the diagnostic trouble code can also be erased by turning the ignition switch to ON and sending the diagnostic trouble code erase signal from the scan tool to the engine control module.

Caution
If the sensor connector is disconnected with the ignition switch turned on, the diagnostic trouble code is memorized. In this case, send the diagnostic trouble code erase signal to the engine control module in order to erase the diagnostic memory.

The 48 diagnostic items are all indicated sequentially from the smallest code number.
The engine control module records the engine operating condition when the diagnostic trouble code is set. This data is called "Freeze-frame" data. This data can be read by using the scan tool, and can then be used in simulation tests for troubleshooting. Data items are as follows.

Data	Unit
Engine coolant temperature	°C or °F
Engine speed	r/min
Vehicle speed	km/h or mph
Long-term fuel compensation (Long-term fuel trim)	%
Short-term fuel compensation (Short-term fuel trim)	%
Fuel control condition	• Open loop • Closed loop • Open loop-drive condition • Open loop-DTC set • Closed loop-O_2 (rear) failed
Calculation load value	%
Diagnostic trouble code during data recording	-

OBD-II DRIVE CYCLE

All kinds of diagnostic trouble codes can be monitored by carrying out a short drive in accordance with the following 6 drive cycle patterns. In other words, doing such a drive allows to regenerate any kind of trouble which involves illuminating the Service Engine Soon/Malfunction Indicator Lamp and to check the repair procedure has eliminated the trouble (the Service Engine Soon/Malfunction Indicator Lamp is no longer illuminated).

Caution
Two mechanics should always get on the vehicle when carrying out a drive test.

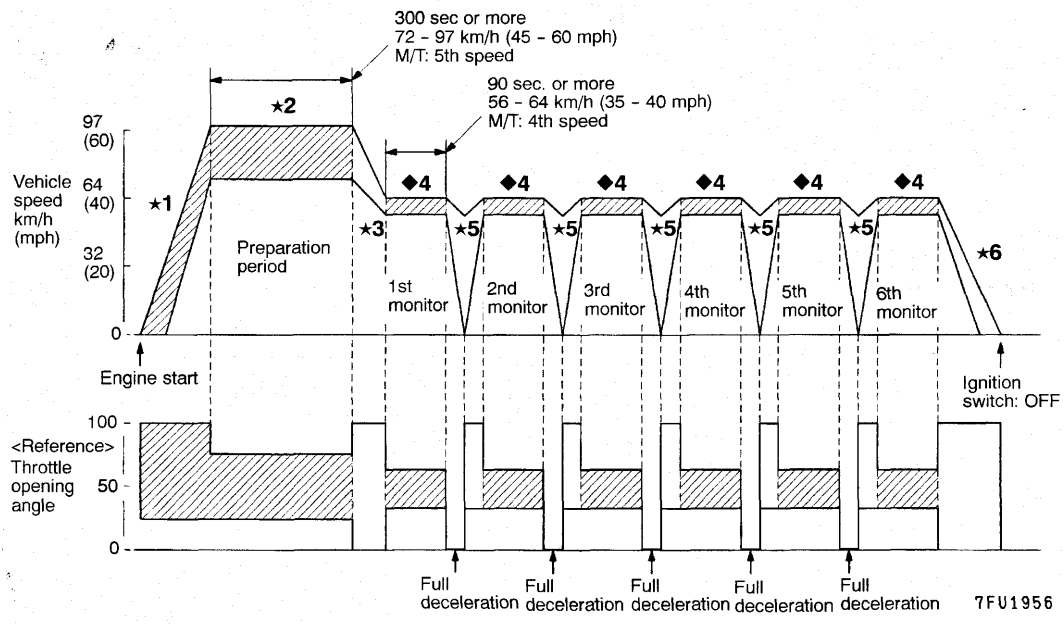
Catalytic converter monitor (P0420, P0421)

Test requirements/procedure

1. All of the following requirements should be met when carrying out a drive test.
   (1) Atmospheric temperature: -10°C (14°F) or more
   (2) Condition of A/T:
   - Selector lever position: D range

   (3) A/C switch: OFF
2. One trip monitor will be completed by driving according to the steps below (from start to switch off). It will take 20 minutes.
   ★1: Start the engine, and accelerate gradually to 72 km/h (45 mph) or more.
   ★2: Preparation period; continue driving between 72 and 97 km/h (45 and 60 mph) for 300 seconds. Brake may be applied for this period if it continues for only a few seconds.
   ★3: Decelerate to 56 - 64 km/h (35 - 40 mph).
   ◆4: Drive between 56 and 64 km/h (35 and 40 mph) at a constant throttle angle (by not moving the throttle pedal as much as possible) for 90 seconds or more during monitor.
   ★5: Decelerate with the throttle valve fully closed (Brake may be applied for this period). After the vehicle is being decelerated for ten seconds, accelerate gradually to 56 - 64 km/h (35 - 40 mph).
   ★6: Decelerate and stop the vehicle. Then turn off the ignition switch.

Drive cycle pattern



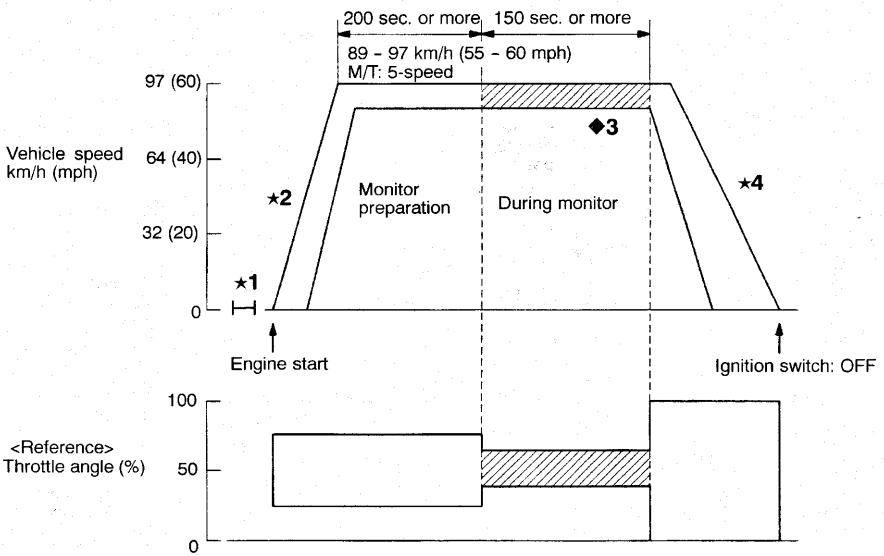
Caution
Vehicle speed and throttle opening angle should be within the shaded rage.

Evaporative emission control system leak monitor (P0442, P0450, P0455)

Test requirements/procedure

1. All of the following requirements should be met when carrying out a drive test.
   (1) Engine coolant temperature: 45°C (113°F) or less (before starting drive test, engine stopped)
   (2) Atmospheric temperature: 5°C (41°F) or more, 45°C (113°F) or less
   (3) Condition of A/T:
   - Selector lever position: D range
   - Overdrive switch: ON
2. One trip monitor will be completed by driving according to the steps below (from start to switch off). (It takes approx. 8 minutes.)
   ★1: Check that both engine coolant temperature and air intake temperature satisfy requirement 1 (engine stopped).
   ★2: Monitor preparation period; Start the engine, and accelerate to 89 - 97 km/h (55 - 60 mph). For this period, acceleration, deceleration, or braking may be carried out.
   Continue driving between 89 and 97 km/h (55 and 60 mph) for 200 seconds or more. For this period, braking or throttle operation may be carried out if vehicle speed is within the specified value.
   ◆3: Drive between 89 and 97 km/h (55 and 60 mph) at a constant throttle angle (by not moving the throttle pedal as much as possible) for 150 seconds or more during monitor. Moreover, do not turn the steering wheel suddenly.
   ★4: Decelerate and stop the vehicle. After stop, turn off the ignition switch.

Drive cycle pattern



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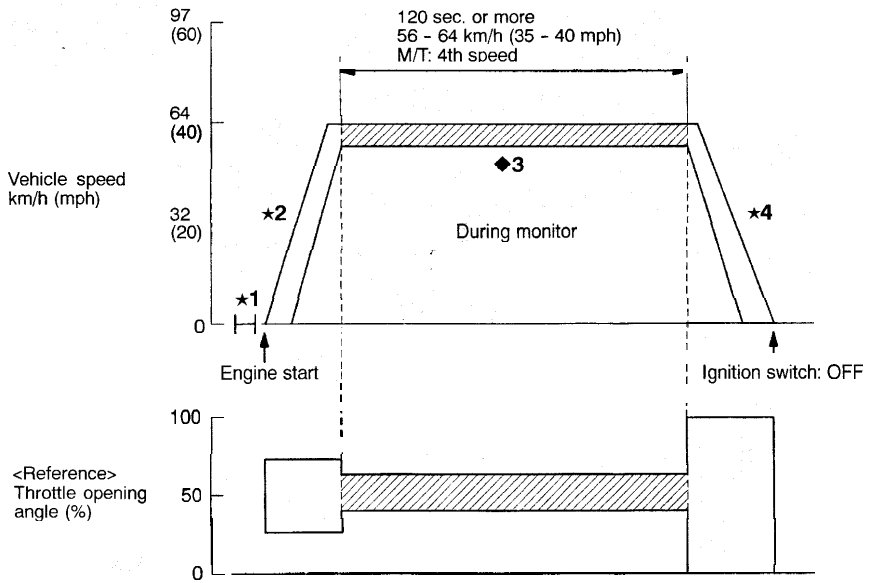
Caution
Drive within the shaded area in the graph above.

Heated oxygen sensor monitor (P0130, P0136)

Test requirements/procedure

1. Test requirements/procedure
   (1) Engine coolant temperature: 80°C (176°F) or more (Engine fully warmed up)
   (2) Atmospheric temperature: -10°C (14°F) or more
   (3) Condition of A/T:
   - Selector lever position: D range
2. One trip monitor will be completed by driving according to the steps below (from start to switch off). It will take 5 minutes.
   ★1: After warming up the engine, turn off the ignition switch.
   ★2: Start the engine, and accelerate to 56 - 64 km/h (35 - 40 mph).
   ◆3: Drive between 56 and 64 km/h (35 and 40 mph) at a constant throttle angle (by not moving the throttle pedal as much as possible) for 120 seconds or more during monitor. Moreover, do not turn the steering wheel suddenly.
   ★4: Decelerate and stop the vehicle. Then turn off the ignition switch.

Drive cycle pattern



7FU1958

Caution
Vehicle speed and throttle opening angle should be within the shaded rage.

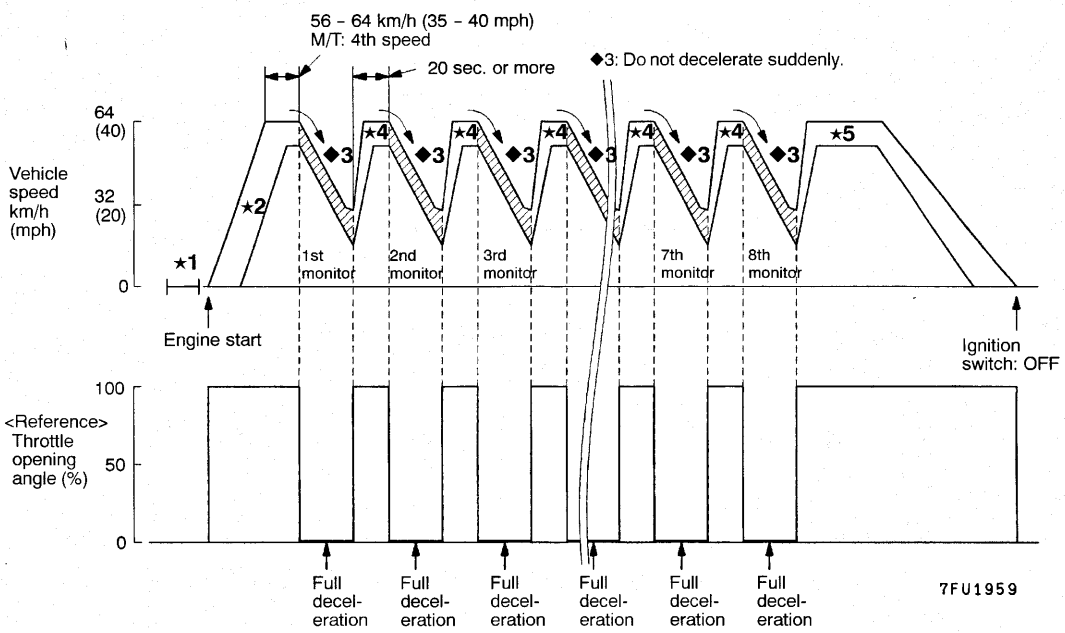
Exhaust gas recirculation (EGR) system monitor (P0400)

Test requirements/procedure

1. All of the following requirements should be met when carrying out a drive test.
   (1) Engine coolant temperature: 80°C (176°F) or more (Engine fully warmed up)
   (2) Atmospheric temperature: 5°C (41°F) or more
   (3) Condition of A/T:
   - Selector lever position: D range

   (4) A/C switch: OFF
2. One trip monitor will be completed by driving according to the steps below (from start to switch off). It will take approx. 10 minutes.
   ★1: After warming up, turn off the ignition switch.
   ★2: Start the engine, and accelerate to 56 - 64 km/h (35 - 40 mph).
   ◆3: Close the throttle fully from 2000 - 3000 r/min with the clutch engaged <M/T>, and then decelerate to 900 r/min without applying brakes. Moreover, do not turn the steering wheel or switch on or off the lights.
   ★4: Accelerate to 56 - 64 km/h (35 - 40 mph), and continue driving for 20 seconds. (After 1st monitor (deceleration), wait for 20 seconds or more until the next monitor (deceleration) starts). Then repeat ◆3 and ★4 steps eight times.
   ★5: Decelerate and stop. Then turn off the ignition switch.

Drive cycle pattern



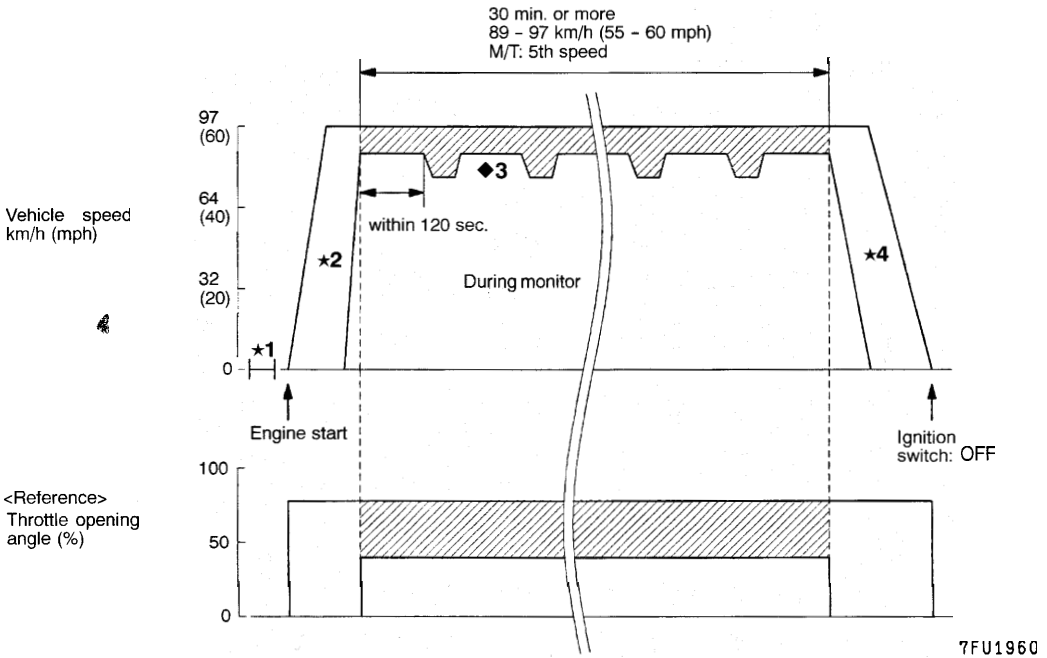
Caution
Vehicle speed should be within the shaded rage.

Fuel trim monitor (P0170)

Test requirements/procedure

1. All of the following requirements should be met when carrying out a drive test.
   (1) Engine coolant temperature: 80°C - 97°C (176 - 207°F) (Engine fully warmed up)
   (2) Atmospheric temperature: -10°C (14°F) or more, 60°C (140°F) or less
   (3) Condition of A/T:
   - Selector lever position: D range
2. One trip monitor will be completed by driving according to the steps below (from start to switch off). It will take 35 minutes.
   ★1: After warming up the engine, turn off the ignition switch.
   ★2: Start the engine, and accelerate to 89 - 97 km/h (55 - 60 mph).
   ◆3: Drive between 89 and 97 km/h (55 and 60 mph) for 30 minutes or more during monitor. Moreover, do not drive the vehicle at the constant speed range for 120 seconds or more. (Accelerate or decelerate lightly within the 120 seconds. Brake may be applied, but avoid decelerating or accelerating suddenly).
   ★4: Decelerate and stop the vehicle. Then turn off the ignition switch.

Drive cycle pattern



Caution
Vehicle speed and throttle opening angle should be within the shaded rage.

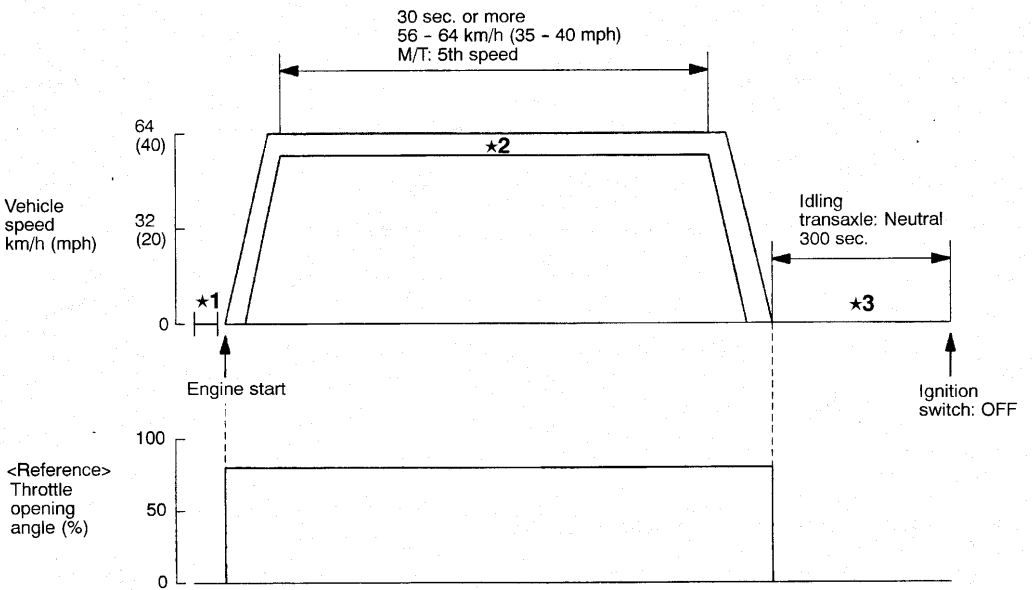
Other monitors

- Misfire (P0300, P0301, P0302, P0303, P0304)
- Evaporative emission control system (P0440)
- Idle air control system (P0505)
- Excessive time to enter closed loop fuel control (P0125)
- Throttle position sensor (P0120)
- Manifold absolute pressure circuit malfunction (P0105)
- Intake air temperature sensor (P0110)
- Serial communication link <A/T> (P1600)
- Crankshaft position sensor (P0335)
- Camshaft position sensor (P0340)
- Engine coolant temperature sensor (P0115)
- Closed throttle position switch (P0510)
- Generator FR terminal circuit (P1500)
- O_2 sensor circuit (P0130, P0136)
- O_2 sensor heater circuit (P0135, P0141)
- EGR solenoid (P0403)
- Evaporative emission purge solenoid (P0443)
- Injector circuit (P0201, P0202, P0203, P0204)
- Evaporative emission ventilation solenoid (P0446)

Test requirements/procedure

1. All of the following requirements should be met when carrying out a drive test.
   (1) Engine coolant temperature: 80°C (176°F) or more (Engine fully warmed up)
   (2) Atmospheric temperature: 5°C (41°F) or more
   (3) Condition of A/T:
   - Selector lever position: D range
2. One trip monitor will be completed by driving according to the steps below (from start to switch off). It will take approx. 10 minutes.
   ★1: After warming up, turn off the ignition switch.
   ★2: Start the engine, accelerate to 56 - 64 km/h (35 - 40 mph), continue driving for 300 seconds or more at that speed range and stop. Moreover, brake or throttle may be applied for this period.
   ★3: After stopping the vehicle, continue idling for 300 seconds or more, and then turn off the ignition switch. Moreover, the vehicle should be set to the following conditions for idling.
   - A/C switch: OFF
   - Lights, electric cooling fan and all accessories: OFF
   - Transaxle: Neutral (A/T for P range)
   - Steering wheel: Straight-forward position

Drive cycle pattern



NOTE
Drive according to the graph above.

READINESS TEST STATUS

The ECM monitors the following main diagnosis items and records whether the evaluation passing or failing in the past. These records can be read with a scan tool. (When using MUT-II, "Complete" will appear to indicate that the evaluation has been completed.)
These records will all be reset if the battery terminal is disconnected or the DTC are erased, etc.
To complete the readiness test status which has been reset, the "OBD-II Drive Cycle" related to a diagnosis item should be carried out.

NOTE
If the vehicle is normal, the readiness test status will be complete by carrying out the "OBD-II Drive Cycle" once. If the ECM detects a malfunction of the vehicle, the readiness test status will be complete by carrying out the "OBD-II Drive Cycle" twice. In addition, after all readiness test status are complete, a DTC should be interrogated. If a DTC is stored, perform repair by referring to the relevant DTC procedures. Then complete the readiness test status by repeating the "OBD-II Drive Cycle". If a DTC is not stored, no further action will be needed.

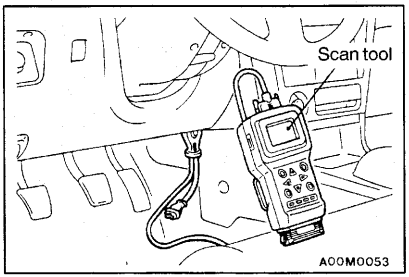
- Catalyst: P0420, P0421
- Evaporative system: P0442, P0455
- Heated oxygen sensor: P0130, P0136
- Heated oxygen sensor heater: P0135, P0141
- EGR system: P0400

HOW TO READ AND ERASE DIAGNOSTIC TROUBLE CODES

Caution

1. **If battery voltage is low, diagnostic trouble codes may not be output. Be sure to check the battery and charging system before continuing.**
2. **If the battery is disconnected or if the engine control module connector is disconnected, the diagnostic trouble code memory will be erased. Do not disconnect the battery or engine control module until after the diagnostic trouble codes are recorded.**
3. **Turn the ignition switch off before connecting or disconnecting the scan tool.**

NOTE
If a DTC is erased, its "freeze frame" data will be also erased and the readiness test status will be reset. If necessary, take a note of the "freeze frame" data before erasing the DTC.



1. Connect the scan tool to the data link connector, and read the diagnostic trouble codes.
2. Repair the malfunction while referring to the INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES.
3. Turn the ignition switch to OFF and then back to ON again.
4. Erase the diagnostic trouble codes using the scan tool.
5. Confirm that the diagnostic trouble code reading is normal.

PROVISIONAL DTCs [MUT-II OBD-II Test Mode - Results (Mode 5)]

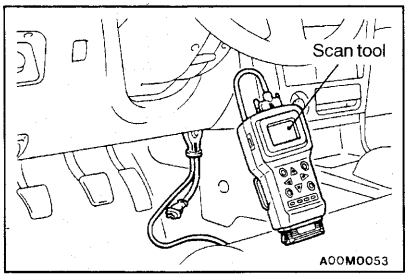
MUT-II will display the Provisional DTCs reported by ECM if the ECM detects some malfunction for "Misfire", "Fuel System" and "Comprehensive" monitoring during a SINGLE Driving Cycle.
The intended use of this data is to assist the technician after a vehicle repair, and after clearing diagnostic information, by reporting test result after a SINGLE Driving Cycle.
Note that the test results reported by this mode do not necessarily indicate a faulty component/system. If test results indicate a failure after ADDITIONAL (consecutive) driving, then the MIL will be illuminated and a DTC will set.

DIAGNOSTIC BY DIAGNOSTIC TEST MODE II (INCREASED SENSITIVITY)

When mode II is selected with MUT-II, the Service Engine Soon/Malfunction Indicator Lamp will light when the ECM first detects the trouble. (Note that this is only for engine related trouble.) At the same time, the relevant diagnostic trouble codes will be registered.
In respect to the comprehensive component electrical faults (opens/shorts), the time for the DTC to be registered after the fault occurrence is shortened (4 sec. → 1 sec.)
With this, the confirmation of the trouble symptom and the confirmation after completing repairs can be reduced.
To return to the normal mode I after mode II has been selected once, the ignition switch must be turned OFF once or mode I must be reselected with the MUT-II. The DTC, readiness test status and freeze frame data, etc., will be erased when mode I is returned to, so record these if necessary.
(1) Using the scan tool, changeover the diagnostic test mode of the engine control module to DIAGNOSTIC TEST MODE II. (INCREASED SENSITIVITY)
(2) Road test the vehicle.

(3) Read the diagnostic trouble code in the same manner as "READ OUT OF DIAGNOSTIC TROUBLE CODE" and repair the malfunctioning part.
(4) Turn OFF the ignition switch to change the ECM from the diagnostic test mode II to the diagnostic test mode I.

NOTE
Turning OFF the ignition switch will cause the ECM to changeover from the diagnostic test mode II to diagnostic test mode I.



INSPECTION USING SCAN TOOL 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 scan tool and check to be sure that the abnormal input and output have returned to normal as a result of the repairs.
3. Erase the diagnostic trouble code(s).
4. Remove the scan tool.
5. Start the engine again and road test to confirm that the problem is eliminated.

NOTE
Refer to P.13A-122 for Data list.
Refer to P.13A-127 for Actuator tests.

FAIL-SAFE/BACKUP FUNCTION TABLE

13100910206

When the main sensor malfunctions are detected by the diagnostic test mode, the vehicle is controlled by means of the following defaults.

Malfunctioning item	Control contents during malfunction
Manifold absolute pressure sensor	1. Uses the throttle position sensor signal and engine speed signal (crankshaft position sensor signal) for basic injector drive time and basic ignition timing from the pre-set mapping. 2. Fixes the IAC motor in the appointed position so idle air control is not performed.
Intake air temperature sensor	Controls as if the intake air temperature is 25°C (77°F).
Throttle position sensor (TPS)	No increase in fuel injection amount during acceleration due to the unreliable throttle position sensor signal.
Engine coolant temperature sensor	Controls as if the engine coolant temperature is 80°C (176°F).
Camshaft position sensor	Injects fuel into the cylinders in the order 1-3-4-2 with irregular timing. (After the ignition switch is turned to ON, the No. 1 cylinder top dead center is not detected at all.)
Heated oxygen sensor <front>	Air/fuel ratio closed loop control is not performed
Heated oxygen sensor <rear>	Performs the closed loop control of the air/fuel ratio by using only the signal of the heated oxygen sensor (front) installed on the front side of the catalytic converter.
Generator FR terminal	No generator output suppression control is performed for the electrical load (to be operated as an ordinary generator).
Misfire detection	The ECM stops supplying fuel to the cylinder with the highest misfiring rate if a misfiring that could damage the catalytic converter is detected.

INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES (FAULT TREE) 13100870740

DTC No.	Diagnostic items	Check items (Remedy)	Memory	Reference page
P0105	Manifold Absolute Pressure Circuit Malfunction	• Harness and connector (If harness and connector are normal, replace manifold absolute pressure sensor assembly.)	Retained	13A-28
P0110	Intake Air Temperature Circuit Malfunction	• Harness and connector • Intake air temperature sensor	Retained	13A-29
P0115	Engine Coolant Temperature Circuit Malfunction	• Harness and connector • Engine coolant temperature sensor	Retained	13A-30
P0120	Throttle Position Circuit Malfunction	• Harness and connector • Throttle position sensor • Closed throttle position switch	Retained	13A-31
P0125	Excessive Time to Enter Closed Loop Fuel Control*	• O_2 sensor (front) • O_2 sensor harness and connector • Injector	Retained	13A-32
P0130	O_2 Sensor Circuit Malfunction (Sensor 1)	• Harness and connector [If harness and connector are normal, replace O_2 sensor (front).]	Retained	13A-33
P0135	O_2 Sensor Heater Circuit Malfunction (Sensor 1)	• Harness and connector • O_2 sensor (front) heater	Retained	13A-34
P0136	O_2 Sensor Circuit Malfunction (Sensor 2)	• Harness and connector • O_2 sensor (rear)	Retained	13A-35
P0141	O_2 Sensor Heater Circuit Malfunction (Sensor 2)	• Harness and connector • O_2 sensor (rear) heater	Retained	13A-36
P0170	Fuel Trim Malfunction	• Injector • Fuel pressure • Intake air leaks • Engine coolant temperature sensor • Intake air temperature sensor • Manifold absolute pressure sensor • O_2 Sensor • Exhaust manifold cracks	Retained	13A-37
P0201	Injector Circuit Malfunction - Cylinder 1	• Harness and connector • Injector	Retained	13A-38
P0202	Injector Circuit Malfunction - Cylinder 2			
P0203	Injector Circuit Malfunction - Cylinder 3			
P0204	Injector Circuit Malfunction - Cylinder 4			

DTC No.	Diagnostic items	Check items (Remedy)	Memory	Reference page
P0300	Random Misfire Detected	• Ignition coil • Ignition power transistor • Spark plug • Ignition circuit • Injector • O_2 Sensor • Compression • Timing belt • Crankshaft position sensor • Air intake • Fuel pressure • Crankshaft position sensor circuit and connector	Retained	13A-39
P0301	Cylinder 1 Misfire Detected	• Ignition coil • Ignition power transistor • Spark plug • Ignition circuit • Injector • O_2 Sensor • Compression • Timing belt • Crankshaft position sensor • Air intake • Fuel pressure • Crankshaft position sensor circuit and connector	Retained	13A-40
P0302	Cylinder 2 Misfire Detected			
P0303	Cylinder 3 Misfire Detected			
P0304	Cylinder 4 Misfire Detected			
P0335	Crankshaft Position Sensor Circuit Malfunction	• Harness and connector (If harness and connector are normal, replace crankshaft position sensor.)	Retained	13A-41
P0340	Camshaft Position Sensor Circuit Malfunction	• Harness and connector (If harness and connector are normal, replace camshaft position sensor.)	Retained	13A-42
P0400	Exhaust Gas Recirculation Flow Malfunction	• Harness and connector • EGR valve • EGR solenoid • EGR valve control vacuum • Manifold absolute pressure sensor	Retained	13A-43
P0403	Exhaust Gas Recirculation Solenoid Malfunction	• Harness and connector • EGR solenoid	Retained	13A-44
P0420	Catalyst Efficiency Below Threshold <Federal>	• Exhaust manifold (Replace the catalytic converter if there is no cracks, etc.)	Retained	13A-45
P0421	Warm Up Catalyst Efficiency Below Threshold <California>	• Exhaust manifold (Replace the catalytic converter if there is no cracks, etc.)	Retained	13A-46
P0442	Evaporative Emission Control System Leak Detected	• Harness and connector • Evaporative emission purge solenoid • Evaporative emission ventilation solenoid • Vacuum hoses routing	Retained	13A-47

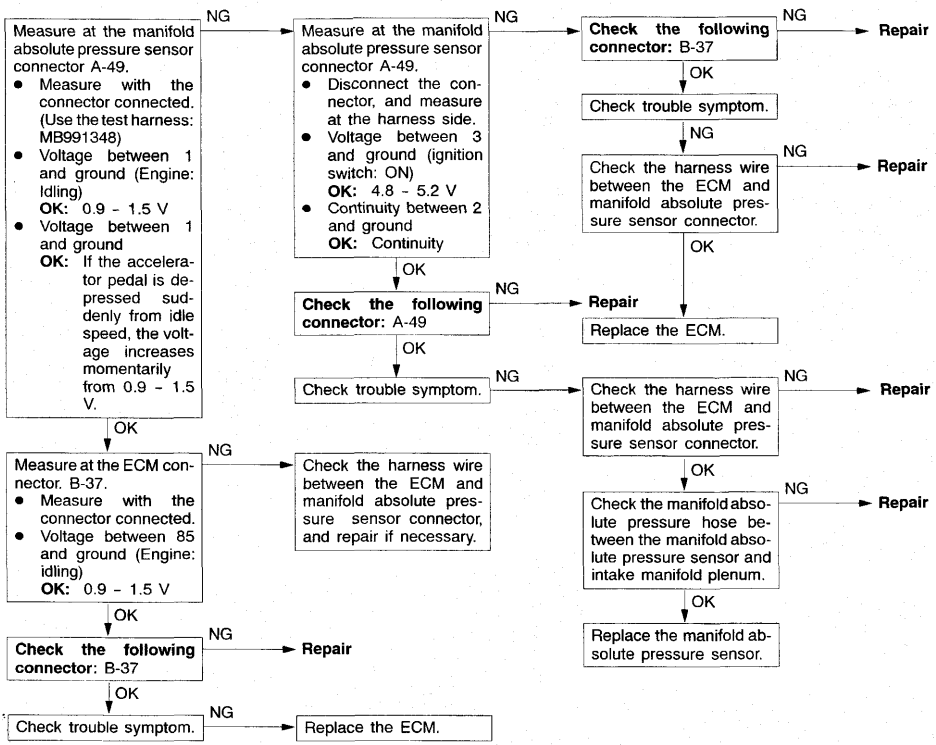
DTC No.	Diagnostic items	Check items (Remedy)	Memory	Reference page
P0443	Evaporative Emission Control System Purge Control Valve Circuit Malfunction	• Harness and connector • Evaporative emission purge solenoid	Retained	13A-57
P0446	Evaporative Emission Control System Vent Control Malfunction	• Harness and connector • Evaporative emission ventilation solenoid	Retained	13A-58
P0450	Evaporative Emission Control System Pressure Sensor Malfunction	• Harness and connector • Fuel tank differential pressure sensor	Retained	13A-59
P0455	Evaporative Emission Control System Leak Detected (Gross Leak)	• Harness and connector • Evaporative emission ventilation solenoid	Retained	13A-71
P0500	Vehicle Speed Sensor Malfunction	• Harness and connector • Vehicle speed sensor	Retained	13A-81
P0505	Idle Control System Malfunction	• Harness connector • Idle air control motor	Retained	13A-82
P0510	Closed Throttle Position Switch Malfunction	• Harness and connector • Closed throttle position switch	Retained	13A-83
P0551	Power Steering Pressure Sensor Circuit Range/Performance	• Harness and connector • Power steering pressure switch	Retained	13A-84
P0705	Transmission Range Sensor Circuit Malfunction (PRND2L Input)	• Harness and connector • Park/Neutral position switch	Retained	13A-84
P0710	Transmission Fluid Temperature Sensor Circuit Malfunction	• Harness and connector • Transaxle fluid temperature sensor	Retained	13A-84
P0715	Input/turbine Speed Sensor Circuit Malfunction	• Harness and connector • Pulse generator	Retained	13A-85
P0720	Output Speed Sensor Circuit Malfunction	• Harness and connector • Pulse generator	Retained	13A-85
P0725	Engine Speed Input Circuit Malfunction	• Harness and connector	Retained	13A-85
P0740	Torque Converter Clutch System Malfunction	• Harness and connector • Torque converter clutch solenoid	Retained	13A-85
P0750	Shift Solenoid A Malfunction	• Harness and connector • Low-reverse solenoid	Retained	13A-85
P0755	Shift Solenoid B Malfunction	• Harness and connector • Underdrive solenoid	Retained	13A-86
P0760	Shift Solenoid C Malfunction	• Harness and connector • Second solenoid	Retained	13A-86
P0765	Shift Solenoid D Malfunction	• Harness and connector • Overdrive solenoid	Retained	13A-86
P1500	Generator FR Terminal Circuit Malfunction	• Harness and connector	Retained	13A-87
P1600	Serial communication link malfunction	• Harness and connector	Retained	13A-88
P1720	Vehicle Speed Sensor Signal Line Malfunction	• Harness and connector	Retained	13A-88
P1751	A/T Control Relay Malfunction	• Harness and connector • A/T control relay	Retained	13A-88

DTC No.	Diagnostic items	Check items (Remedy)	Memory	Reference page
P1795	Throttle Position Input Circuit Malfunction	• Harness and connector	Retained	13A-88

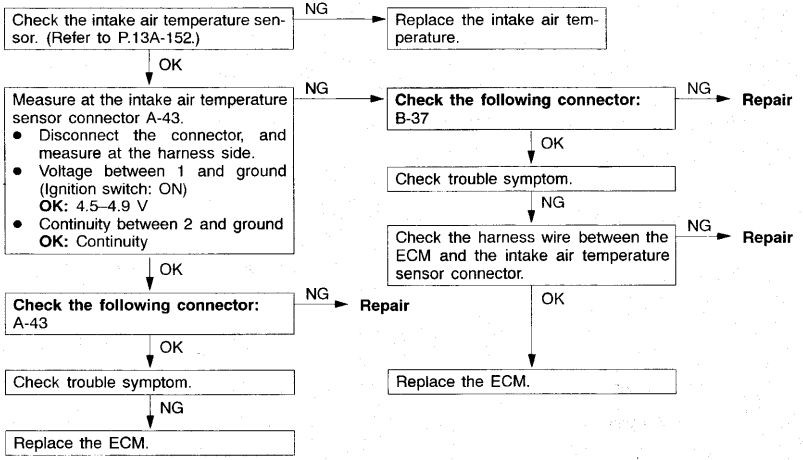
NOTE
1. Do not replace the engine control module (ECM) until a thorough terminal check reveals there are no short/open circuits.
2. After the ECM detects a malfunction, a diagnostic trouble code is recorded the next time the engine started and the same malfunction is re-detected. However, for items marked with a "★", the diagnostic trouble code is recorded on the first detection of the malfunction.
3. O_2 : Heated oxygen sensor
4. Sensor 1 : indicates sensors which are mounted closest to the engine.
5. Sensor 2 : indicates sensors which are mounted next-closest to the engine.

INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES

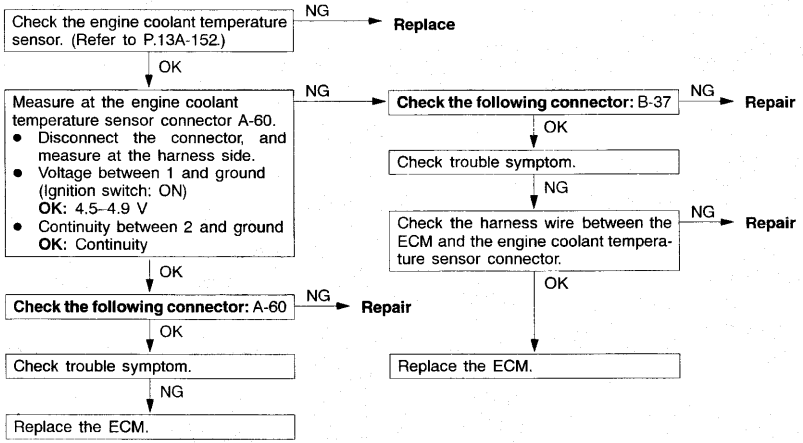
Code No.P0105 Manifold Absolute Pressure Circuit Malfunction	Probable cause
Background • The manifold absolute pressure sensor outputs a voltage which corresponds to the intake manifold plenum pressure. • The engine control module checks whether this voltage is within a specified range. Check Area • Ignition Switch: ON Judgment Criteria • Sensor output voltage has continued to be 4.5 V or higher [corresponding to an absolute pressure of 115 kPa (17 psi) or higher] or higher for 2 sec. Check Area • Throttle position sensor voltage is not lower than 1.25 V, or • Engine speed is not higher than 4000 r/min. Judgment Criteria • Sensor output voltage has continued to be 0.2 V or lower [corresponding to an absolute pressure of 4.9 kPa (0.7 psi) or lower] for 2 sec. Check Area • Throttle position sensor voltage is 0.8 V or lower. • Engine speed is not higher than 2000 r/min. Judgment Criteria • Sensor output voltage is 4 V or more for 2 seconds. Check Area • Throttle position sensor voltage is 3.5 V or more. • Engine speed is 2000 r/min or more. Judgment Criteria • Sensor output voltage is 1.1 V or less for 2 seconds.	• Manifold absolute pressure sensor failed. • Open or shorted manifold absolute pressure sensor circuit, or loose connector. • Engine control module failed.



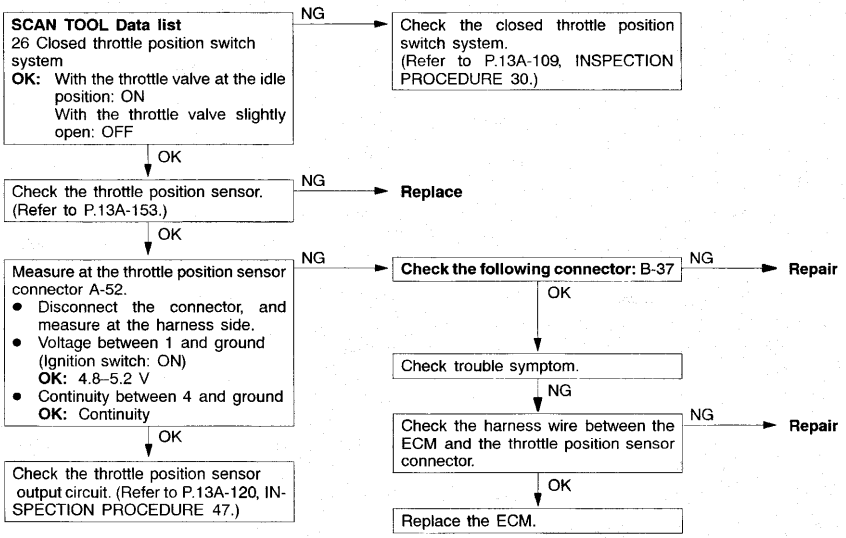
Code No. P0110 Intake Air Temperature Circuit Malfunction	Probable cause
Background • The intake air temperature sensor converts the intake air temperature to a voltage and outputs it. • The engine control module checks whether the voltage is within a specified range. Check Area • 2 sec or more have passed since the starting sequence was completed. Judgment Criteria • Sensor output voltage has continued to be 4.6 V or higher [corresponding to an intake air temperature of -45°C (-49°F) or lower] for 2 sec, or • Sensor output voltage has continued to be 0.2 V or lower [corresponding to an intake air temperature of 125°C (257°F) or higher] for 2 sec.	• Intake air temperature sensor failed • Open or shorted intake air temperature sensor circuit, or loose connector • Engine control module failed



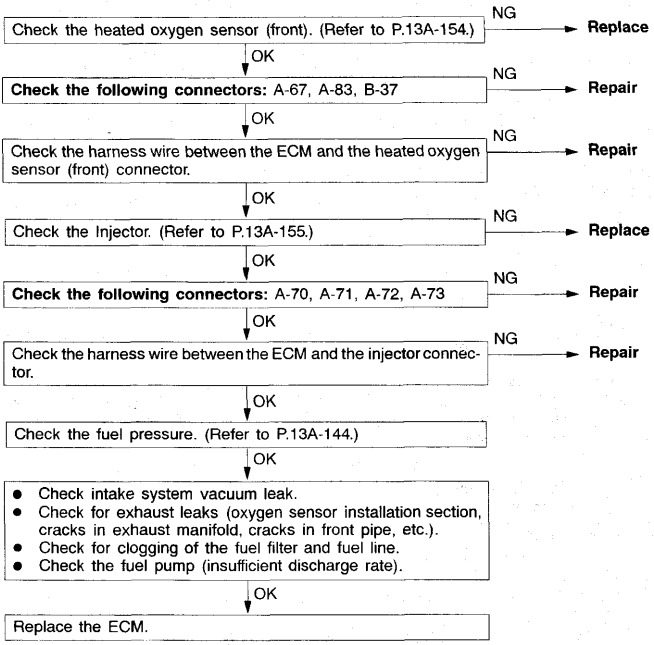
Code No. P0115 Engine Coolant Temperature Circuit Malfunction	Probable cause
Background • The engine coolant temperature sensor converts the engine coolant temperature to a voltage and outputs it. • The engine control module checks whether the voltage is within a specified range. In addition, it checks that the engine coolant temperature (signal) does not drop while the engine is warming up. Check Area At least 2 seconds have passed since the ignition switch was turned on or the starting sequence was completed. Judgment Criteria • Sensor output voltage has continued to be 4.6 V or higher [corresponding to a coolant temperature of -45°C (-49°F) or lower] for 2 sec, or • Sensor output voltage has continued to be 0.1 V or lower [corresponding to a coolant temperature of 140°C (284°F) or higher] for 2 sec. Check Area Judgment Criteria • Sensor output voltage increased from a value lower than 1.6 V to a value higher than 1.6 V [Coolant temperature decreases from a higher than 40°C (104°F) temperature to a lower than 40°C (104°F) temperature.]. • then the sensor output voltage has continued to be 1.6 V or higher for 5 min. Check Area Judgment Criteria • About 60 - 300 sec have passed for the engine coolant temperature to rise to about 40°C (104°F) after starting sequence was completed. • However, time is not counted when fuel is shut off. Check Area • Engine coolant temperature was 20°C (68°F) <Federal> or 7°C (44.6°F) <California> or more immediately before the engine was stopped at the last drive. • Engine coolant temperature is 20°C (68°F) <Federal> or 7°C (44.6°F) <California> or more when the engine is started. Judgement Criteria • Engine coolant temperature fluctuates within 1°C (1.8°F) after 5 minutes have passed since the engine was started. • However, time is not counted in any of the following conditions: (1) Intake air temperature is 60°C (140°F) or higher. (2) Engine speed is 1,500 r/min or higher. (3) Intake manifold pressure is 40 kPa (5.8 psi) or lower. (4) During fuel shut-off operation. • Monitored only once per trip.	• Engine coolant temperature sensor failed • Open or shorted engine coolant temperature sensor circuit, or loose connector • Engine control module failed



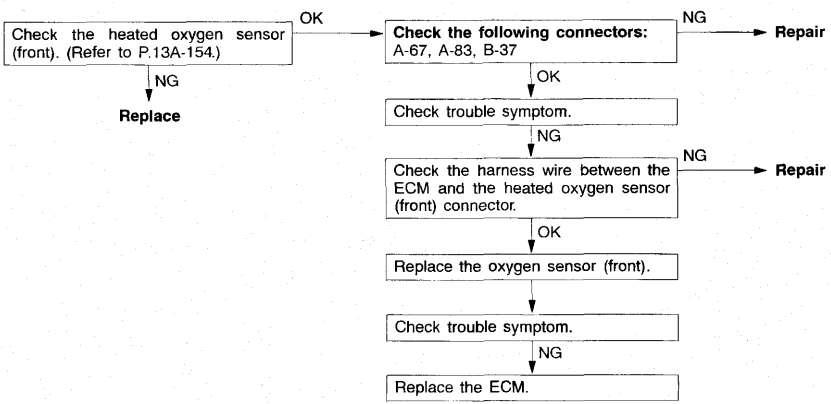
Code No. P0120 Throttle Position Circuit Malfunction	Probable cause
Background • The throttle position sensor outputs a voltage which is proportional to the throttle valve opening angle. • The engine control module checks whether the voltage output by the throttle position sensor is within a specified range. In addition, it checks that the voltage output does not become too large while the engine is idling. Check Area • At least 2 seconds have passed since the engine was started. Judgment Criteria • With the close throttle position switch set to ON, the sensor output voltage has continued to be 2 V or higher for 2 sec, or • Sensor output voltage has continued to be 0.2 V or lower for 2 sec. Check Area • At least 2 seconds have passed since the engine was started. • Engine speed is 3000 r/min or less. • Intake air pipe pressure is 48 kPa (7.0 psi) or less. Judgment Criteria • Sensor output voltage has continued to be 4.6 V or higher for 2 sec. Check Area • At least 2 seconds have passed since the engine was started. • Engine speed is 2000 r/min or more. • Intake air pipe pressure is 53 kPa (7.7 psi) or more. Judgment Criteria • Sensor output voltage is 0.8 V or less for 2 seconds.	• Throttle position sensor failed or misadjusted • Open or shorted throttle position sensor circuit, or loose connector • Closed throttle position switch malfunction • Closed throttle position switch signal wire shorted • Engine control module failed



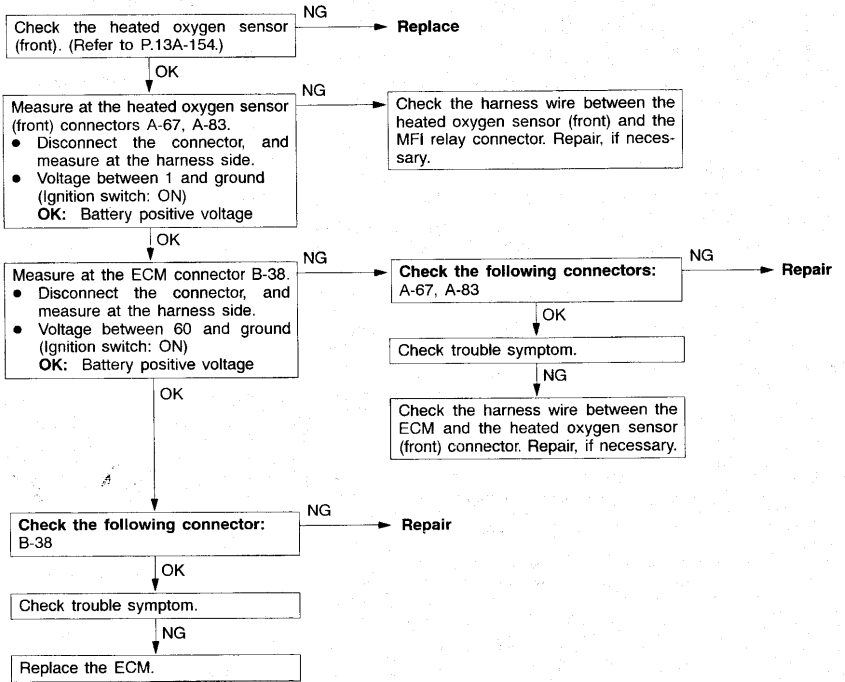
Code No. P0125 Excessive Time to Enter Closed Loop Fuel Control	Probable cause
Background • The MFI system reduces exhaust emissions by means of closed-loop fuel control. • The engine control module checks the time taken until closed-loop fuel control commences. Check Area • At least 2 seconds have passed since the engine was started. • Engine coolant temperature is higher than 80°C (176°F). • Engine speed is at between about 1,800 and 4,000 r/min. • Intake air pipe pressure is 24 kPa (3.5 psi) - 77 kPa (11 psi). • Engine operating within the air-fuel ratio feedback zone. • Monitoring time: 30 sec Judgment Criteria • Multiport fuel injection system doesn't enter the closed loop control within about 30 sec. • Monitored only once per trip.	• Heated oxygen sensor failed • Injector failed • Fuel pressure regulator failed • Fuel pump failed • Fuel filter is clogged • Intake system vacuum leak • Exhaust leak • Engine control module failed



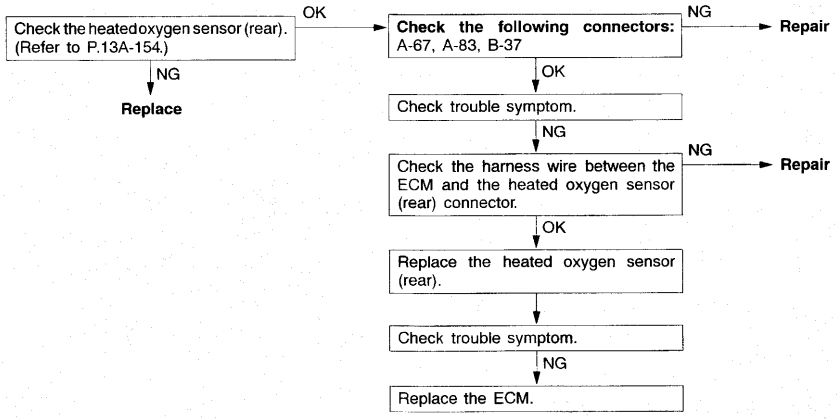
Code No. P0130 Heated Oxygen Sensor Circuit Malfunction (Sensor 1)	Probable cause
Background • When the heated oxygen sensor begins to deteriorate, the oxygen sensor signal response becomes poor. • The engine control module forcibly varies the air/fuel mixture to make it leaner and richer and checks the response speed of the heated oxygen sensor. In addition, the engine control module also checks for an open circuit in the heated oxygen sensor output line. Check Area • Coolant temperature sensor: normal • Heated oxygen sensor signal voltage has continued to be 0.2 V or lower for 3 min or more after the starting sequence was completed. • Engine coolant temperature is higher than 80°C (176°F). • Engine speed is higher than 1200 r/min. • Intake air pressure is not lower than 40 kPa (5.8 psi). • Monitoring time: 7 seconds • Volumetric efficiency is not lower than 25%. Judgment Criteria • Input voltage supplied to the engine control module interface circuit is not lower than 4.5 V when 5 V is applied to the heated oxygen sensor output line via a resistor. • Monitored only once per trip. Check Area • Engine coolant temperature is not lower than 50°C (122°F). • Engine speed is between 1600 and 3000 r/min <M/T> or 1400 and 3200 r/min <A/T>. • Intake air pipe pressure is 27 kPa (3.9 psi) - 67 kPa (9.8 psi). • Intake air temperature is -10°C (14°F) or more • Under the closed loop air-fuel control. • Vehicle speed is 30 km/h (18.7 mph) or higher. • Throttle valve opening angle (TPS output voltage) fluctuates within 0.117 V every 250 milliseconds. • Monitoring Time: 5 - 20 sec Judgment Criteria • When the air-fuel ratio is forcibly changed (lean to rich and rich to lean), the heated oxygen sensor signal doesn't provide response within 1.2 sec. or • The heated oxygen sensor sends "lean" and "rich" signals alternately nine times or less for ten seconds. • Monitored only three times per trip. NOTE: If the sensor switch time is longer than the Judgment Criteria due to the MUT-II OBD-II test Mode - H02S Test Results, it is assumed that the heated oxygen sensor has deteriorated. If it is short, it is assumed that the harness wire is broken or has a short circuit. If the heated oxygen sensor signal voltage has not changed even once (lean/rich) after the DTC was erased, the sensor switch time will display as 0 seconds.	• Heated oxygen sensor deteriorated • Open circuit in heated oxygen sensor output line • Engine control module failed



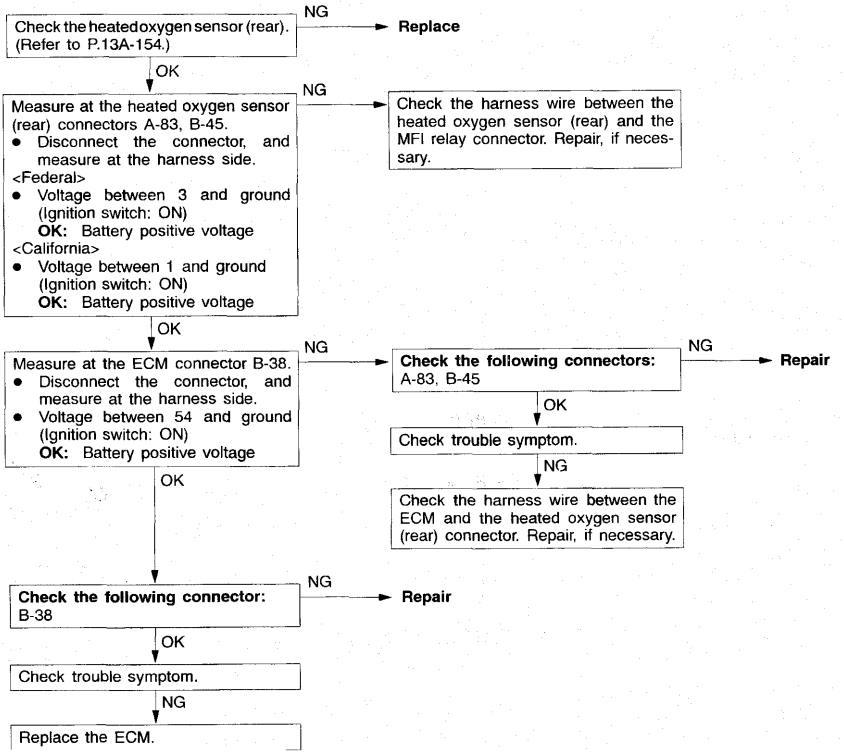
Code No. P0135 Heated Oxygen Sensor Heater Circuit Malfunction (Sensor 1)	Probable cause
Background • The engine control module checks whether the heater current is within a specified range when the heater is energized. Check Area • Engine coolant temperature is 20°C (68°F) or higher. • The heated oxygen sensor heater is on. • Battery voltage is between 11 and 16 V. Judgment Criteria • Heater current of the front heated oxygen sensor heater (Sensor 1) has continued to be lower than 0.2 A or higher than 3.5 A for 6 sec. • Monitored only once per trip.	• Open or shorted oxygen sensor heater circuit • Open circuit in oxygen sensor heater • Engine control module failed



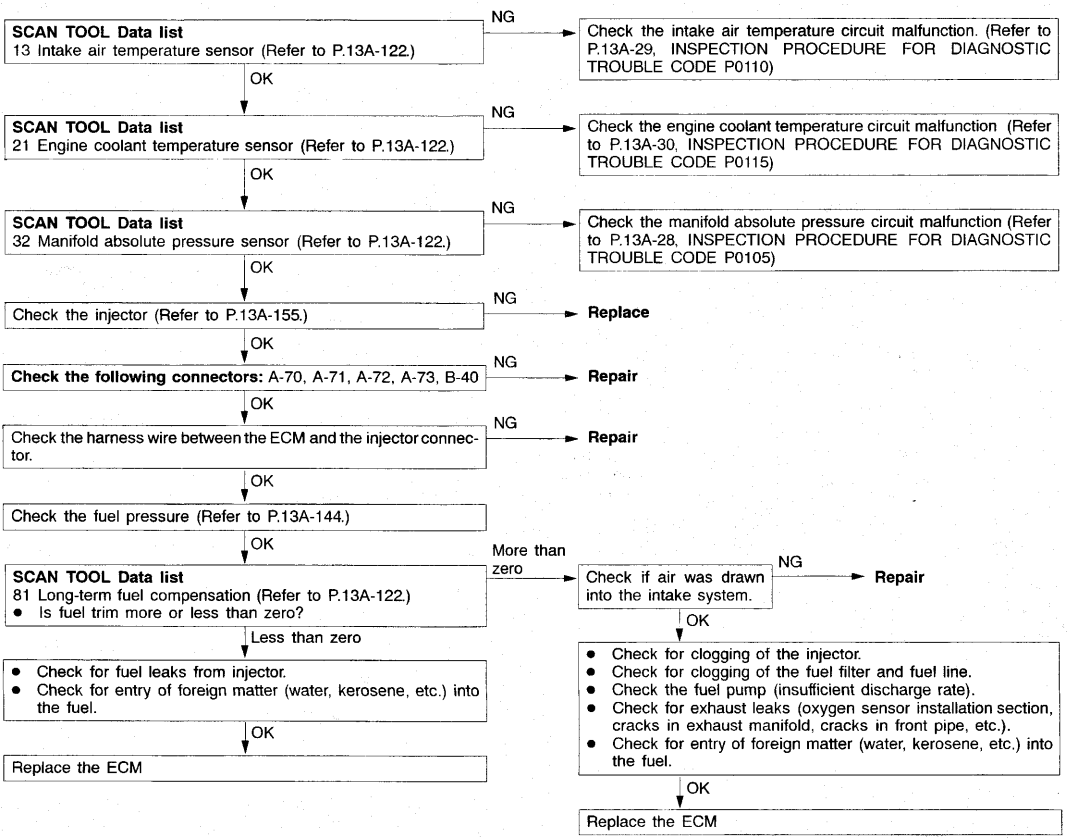
Code No. P0136 Heated Oxygen Sensor Circuit Malfunction (Sensor 2)	Probable cause
Background • The engine controls module checks for an open circuit in the heated oxygen sensor output line. Check Area • Coolant temperature sensor: normal • Heated oxygen sensor signal voltage has continued to be 0.1 V or lower for 3 min or more after the starting sequence was completed. • Engine coolant temperature is not lower than 80°C (176°F). • Engine speed is higher than 1200 r/min. • Intake air pressure is not lower than -40 kPa (-5.8 psi). • Monitoring time: 7 sec. Judgment Criteria • Input voltage supplied to the engine control module interface circuit is not lower than 4.5 V when 5 V is applied to the heated oxygen sensor output line via a resistor. • Monitored only once per trip Check Area • Oxygen sensor signal voltage has been 0.1 V or less for 3 minutes after the engine was started. • Engine coolant temperature is about 80°C (176°F) or higher. • Engine speed is about 1,200 rpm or higher. • Intake manifold pressure is 40 kPa (5.8 psi) or higher. • At least 20 seconds have passed since fuel shut-off control was released. • Oxygen sensor (front) output voltage is 0.5 V or higher. • Monitoring time: 10 seconds Judgement Criteria • Making the air-fuel ratio 15% richer doesn't result in raising the heated oxygen sensor output voltage beyond 0.1 V. • Monitored once per trip. Check Area • Engine coolant temperature is about 80°C (176°F) or more. • The heated oxygen sensor (front) is operating. • The engine runs for at least ten seconds when air-fuel ratio is rich. • The heated oxygen sensor (rear) output voltage is 0.4 V or higher before fuel shut-off commences. • While fuel is being shut off. Judgment Criteria • At least 1 second has passed before heated oxygen sensor (rear) output voltage falls to 0.15 - 0.40 V. or • At least 3 seconds have passed before the heated oxygen sensor (rear) output voltage falls to 0.15 V or less.	• Heated oxygen sensor failed • Open circuit in heated oxygen sensor output line • Engine control module failed



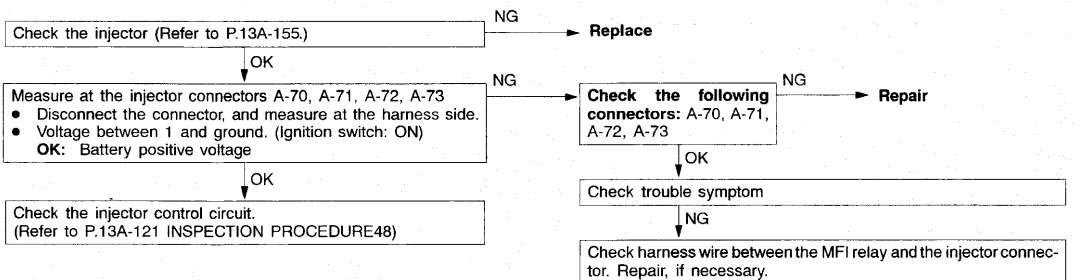
Code No. P0141 Heated Oxygen Sensor Heater Circuit Malfunction (Sensor 2)	Probable cause
Background • The engine control module checks whether the heater current is within a specified range when the heater is energized. Check Area • Engine coolant temperature is 20°C (68°F) or more. • The heated oxygen sensor heater is on. • Battery voltage is between 11 and 16 V. Judgment Criteria • Heater current of the front heated oxygen sensor heater (Sensor 2) has continued to be lower than 0.2 A or higher than 3.5 A for 6 sec. • Monitored only once per trip.	• Open or shorted oxygen sensor heater circuit • Open circuit in oxygen sensor heater • Engine control module failed



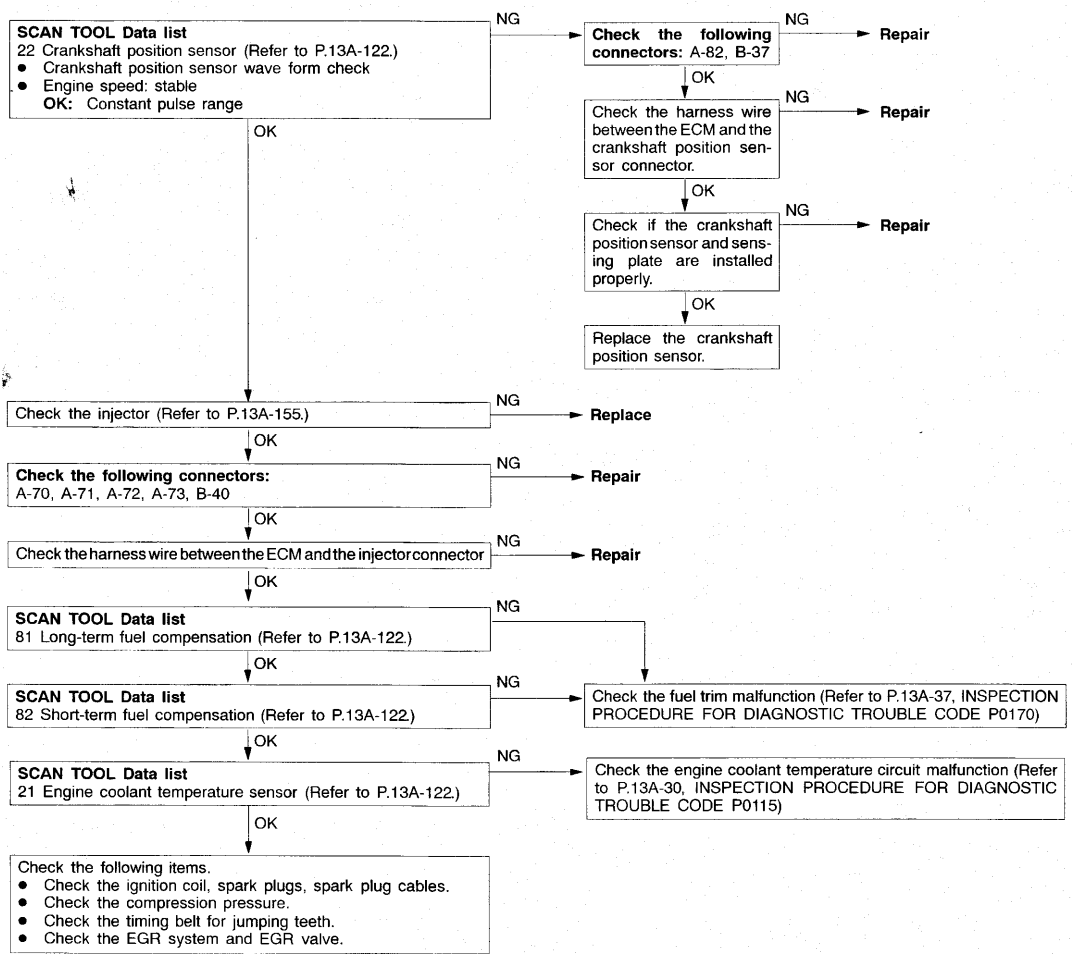
Code No. P0170 Fuel Trim Malfunction	Probable cause
Background • If a malfunction occurs in the fuel system, the fuel trim value becomes too large or too small. • The engine control module checks whether the fuel trim value is within a specified range. Check Area • Under the closed loop air-fuel ratio control. • Engine coolant temperature is −10°C (14°F) or higher. • Intake air temperature −10°C (14°F) or more • Intake manifold pressure is 48 kPa (7.0 psi) or higher. Judgment Criteria • Long-range fuel correction has continued to be higher than +12.5% or lower than −12.5% for 5 sec. • Short-range fuel correction has continued to be higher than +10% or lower than −10% for 5 sec.	• Injector failed • Incorrect fuel pressure • Air drawn in from gaps in gasket seals, etc. • Heated oxygen sensor failed • Engine coolant temperature sensor failed • Intake air temperature sensor failed • Manifold absolute pressure sensor failed • Exhaust leak • Use of incorrect fuel • Engine control module failed



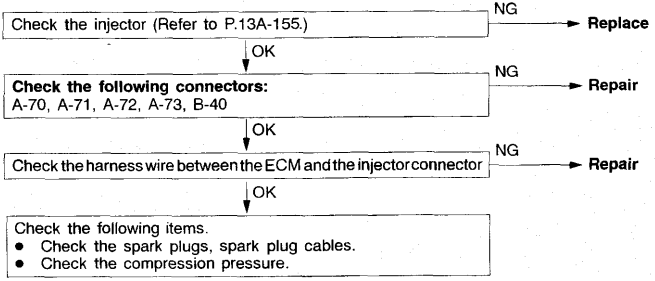
Code No. P0201, P0202, P0203, P0204 Injector Circuit Malfunction (Cylinder-1, Cylinder-2, Cylinder-3, Cylinder-4)	Probable cause
Background • A surge voltage is generated when the injectors are driven and the current flowing to the injector coil is shut off. • The engine control module checks this surge voltage. Check Area • Engine speed is between 50 and 1000 r/min. • Throttle position sensor output voltage is lower than 1.0 V. Judgment Criteria • Injector coil surge voltage (more than system voltege +2 V) has not been detected for 2 sec.	• Injector failed • Open or shorted injector circuit, or loose connector • Engine control module failed



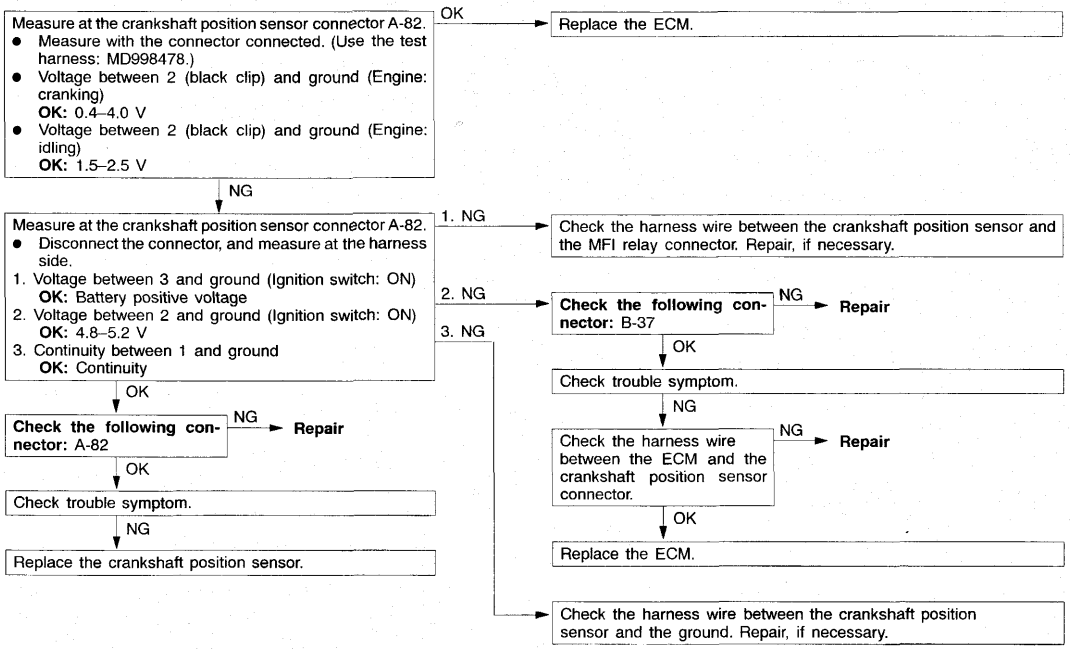
Code No. P0300 Random Misfire Detected	Probable cause
Background • If a misfiring occurs while the engine is running, the engine speed suddenly changes. • The engine control module checks for changes in the engine speed. Check Area • 5 sec or more have passed after the engine was started. • Engine speed is between 500 and 6500 r/min. • Engine coolant temperature is -10°C (14°F) or more. • Intake air temperature -10°C (14°F) or more. • Adaptive learning is complete for the vane which generates a crankshaft position signal. • While the engine is running, excluding gear shifting, deceleration, sudden acceleration/deceleration and A/C compressor switching. Judgment Criteria (change in the angular acceleration of the crankshaft is used for misfire detection.) • Misfire has occurred in the engine more than allowed (1.8%) per 200 revolutions. [when the catalyst temperature is higher than 950°C (1742°F)]. or • Misfire has occurred in the engine more than allowed (1.8%) per 1,000 revolutions. (Misfire exceeding 1.5 times the limit of emission standard.)	• Ignition system related part(s) failed • Poor crankshaft position sensor signal • Incorrect air/fuel ratio • Low compression pressure • Engine coolant temperature sensor failed • Timing belt teeth jumped • Injector failed • EGR valve failed • Engine control module failed



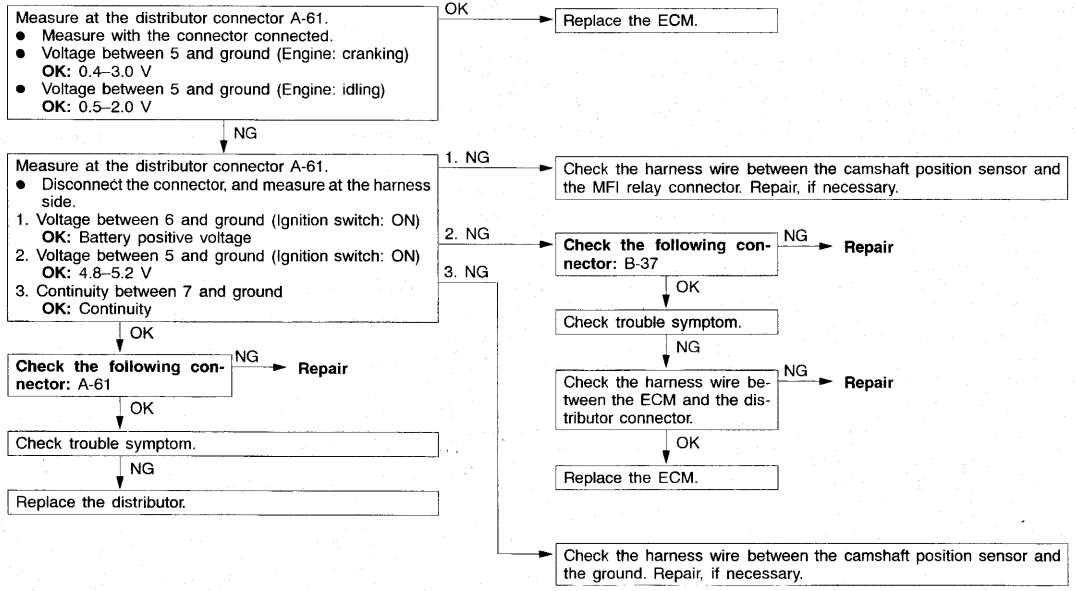
Code No. P0301, P0302, P0303, P0304, Misfire Detected (Cylinder-1, Cylinder-2, Cylinder-3, Cylinder-4)	Probable cause
Background • If a misfiring occurs while the engine is running, the engine speed suddenly changes. • The engine control module checks for changes in the engine speed. Check Area • 5 sec or more have passed after the engine was started. • Engine speed is between 500 and 6500 r/min. • Engine coolant temperature is -10°C (14°F) or more. • Intake air temperature -10°C (14°F) or more. • Adaptive learning is complete for the vane which generates a crankshaft position signal. • While the engine is running, excluding gear shifting, deceleration, sudden acceleration/deceleration and A/C compressor switching. Judgment Criteria (change in the augular acceleration of the crankshaft is used for misfire detection.) • Misfire has occurred in the engine more than allowed (1.8%) per 200 revolutions. [when the catalyst temperature is higher than 950°C (1742°F)]. or • Misfire has occurred in the engine more than allowed (1.8%) per 1,000 revolutions. (Misfire exceeding 1.5 times the limit of emission standard.)	• Ignition system related part(s) failed • Low compression pressure • Injector failed • Engine control module failed



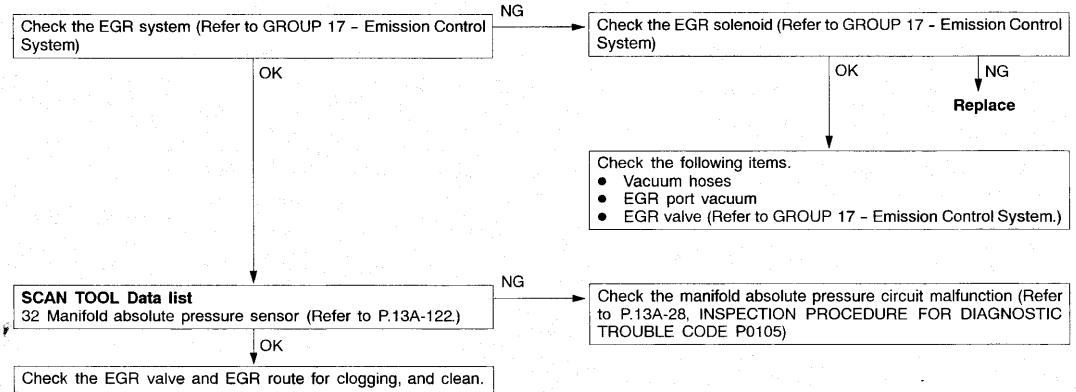
Code No. P0335 Crankshaft Position Sensor Circuit Malfunction	Probable cause
Background • When the engine is running, the crankshaft position sensor outputs a pulse signal. • The engine control module checks whether the pulse signal is input while the engine is cranking. Check Area • Engine is being cranked. Judgment Criteria • Sensor output voltage has not changed (no pulse signal is input) for 2 sec. Check Area Judgment Criteria • Normal signal pattern has not been input for cylinder identification from the crankshaft position sensor signal and camshaft position sensor signal for 2 sec.	• Crankshaft position sensor failed • Open or shorted crankshaft position sensor circuit, or loose connector • Engine control module failed



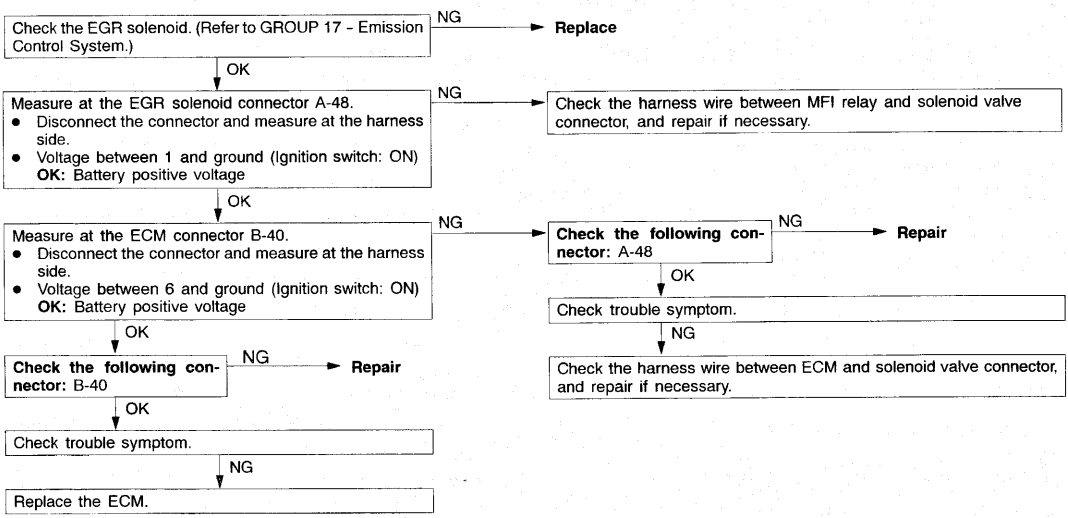
Code No. P0340 Camshaft Position Sensor Circuit Malfunction	Probable cause
Background • When the engine is running, the camshaft position sensor outputs a pulse signal. • The engine control module checks whether the pulse signal is input. Check Area • Engine speed is 50 r/min or higher. Judgment Criteria • Sensor output voltage has not changed (no pulse signal is input) for 2 sec. Check Area • Engine speed is 50 r/min or higher. Judgment Criteria • Normal signal pattern has not been input for cylinder identification from the crankshaft position sensor and camshaft position sensor signal for 2 sec.	• Camshaft position sensor malfunction • Open or shorted camshaft position sensor circuit or loose connector • Engine control module failed



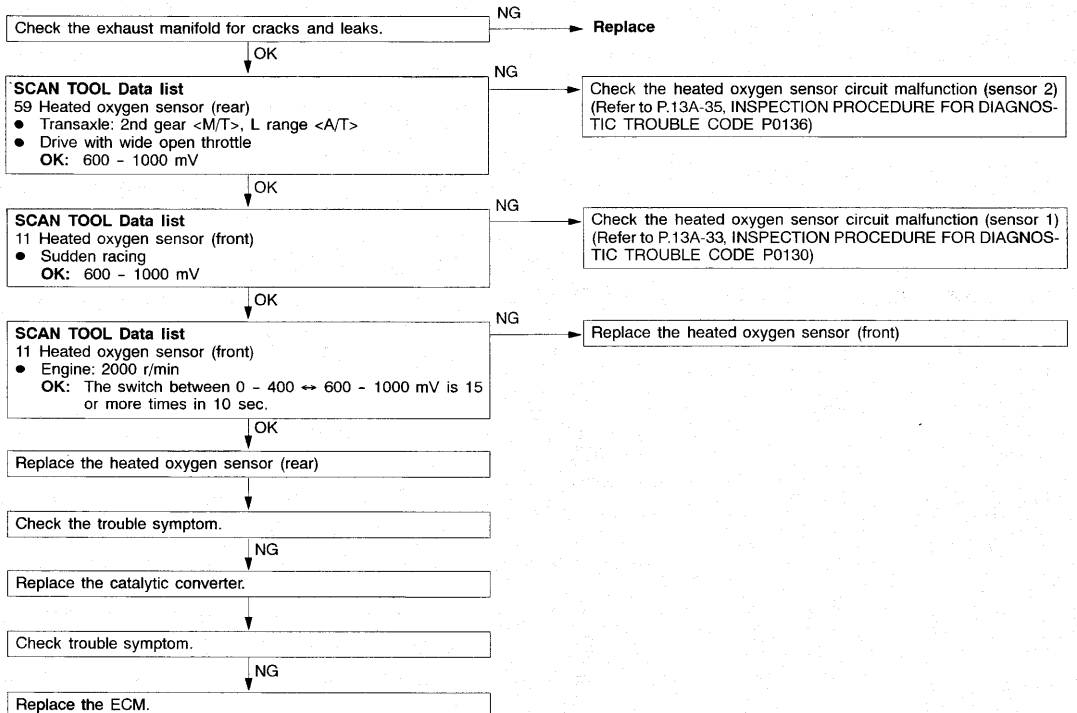
Code No. P0400 Exhaust Gas Recirculation Flow Malfunction	Probable cause
Background • When the EGR solenoid switches from OFF to ON while the engine is running, EGR gas flows. • The engine control module checks how the EGR gas flow signal changes. Check Area • After at least 20 seconds have passed since the last monitor finished. • Engine coolant temperature is higher than 80°C (176°F). • Engine speed is between 1500 and 2000 r/min <M/T> or 1000 and 2000 r/min <A/T>. • Intake air temperature is 5°C (41°F) or more. • Vehicle speed is 30 km/h (18.7 mph) or higher. • At least 90 seconds have passed since manifold differential pressure sensor output voltage fluctuated 1.5 V or higher. • Closed throttle position switch: ON • Intake air pipe pressure is 35 kPa (5.0 psi) or less <M/T>, or 47 kPa (6.8 psi) or less <A/T>. • While fuel is being shut off <M/T>. • Monitoring Time: 2 sec Judgment Criteria • The fluctuation in the intake system is low when the EGR solenoid is turned ON. • Monitored only three times per trip.	• EGR valve does not open • EGR control vacuum is too low • EGR solenoid failed • Open or shorted EGR solenoid circuit, or loose connector • Manifold absolute pressure sensor failed • Engine control module failed



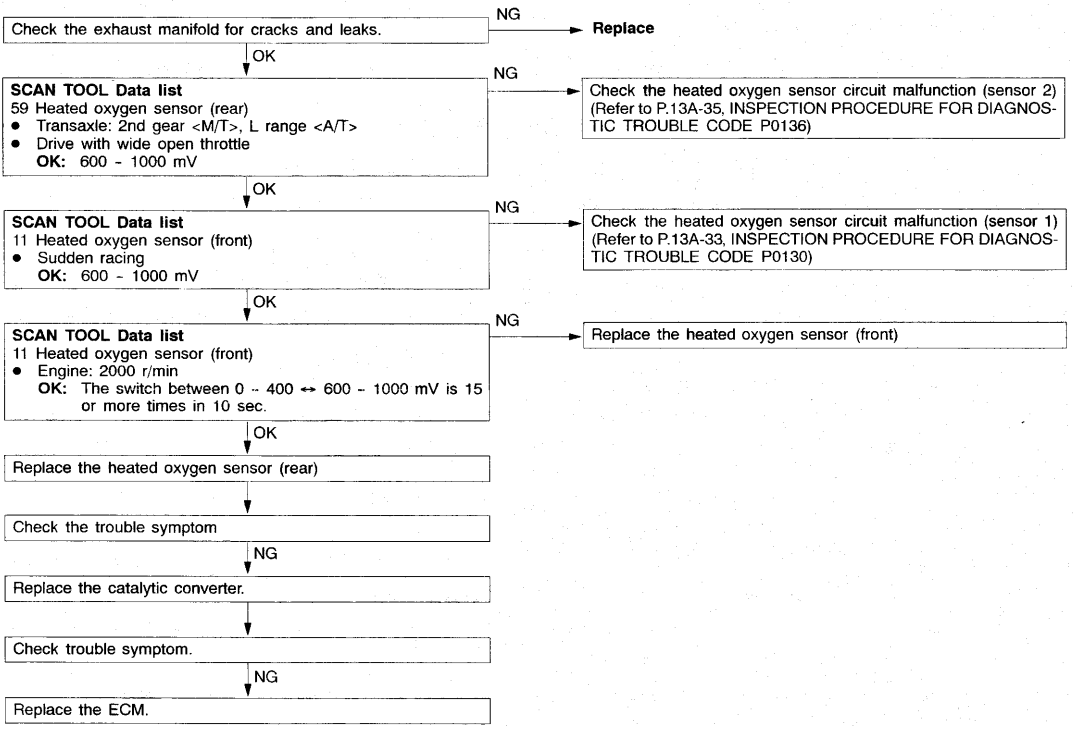
Code No. P0403 Exhaust Gas Recirculation solenoid Malfunction	Probable cause
Background • The engine control module checks current flows in the EGR solenoid drive circuit when the solenoid is ON and OFF. Check Area • Battery voltage is not lower than 10 V. Judgment Criteria • Solenoid coil surge voltage (more than system voltage +2V) is not detected when the EGR solenoid is turned on/off. • Monitored only once per trip.	• EGR solenoid failed. • Open or shorted evaporative EGR solenoid circuit, or loose connector. • Engine control module failed.



Code No. P0420 Catalyst System Efficiency Below Threshold	Probable cause
Background • The signal from the heated oxygen sensor which follows the catalytic converter differs from that which precedes the catalytic converter. That is because the catalytic converter purifies exhaust gas. When the catalytic converter has deteriorated, the signal from the heated oxygen sensor which follows the catalytic converter becomes similar to that which precedes the catalytic converter. • The engine control module checks the outputs of the heated oxygen sensor signals. Check Area • Engine speed is not higher than 2,600 r/min. • Intake air temperature is -10°C (14°F) or more. • Intake air pressure is between 20 and 63 kPa (2.9 and 9.2 psi) <M/T> or between 24 and 63 kPa (3.5 and 9.2 psi) <A/T>. • Closed throttle position switch: OFF • Under the closed loop air-fuel ratio control. • Vehicle speed is 1.5 km/h (0.93 mph) or higher. • Monitoring time: 140 sec Judgment Criteria • Fault in the oxygen sensor (rear) signal and oxygen sensor (front) signal.	• Catalytic converter deteriorated • Heated oxygen sensor failed • Engine control module failed

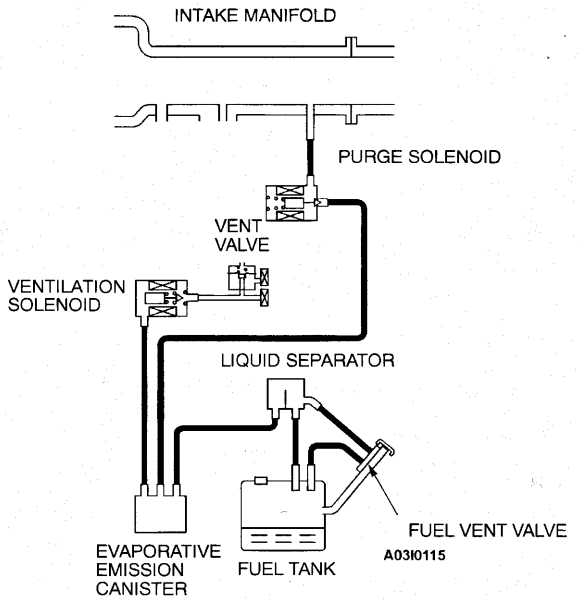


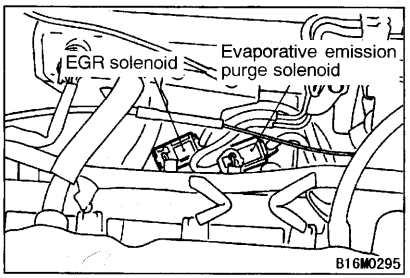
Code No. P0421 Warm Up Catalyst Efficiency Below Threshold	Probable cause
Background • The signal from the heated oxygen sensor which follows the catalytic converter differs from that which precedes the catalytic converter. That is because the catalytic converter purifies exhaust gas. When the catalytic converter has deteriorated, the signal from the heated oxygen sensor which follows the catalytic converter becomes similar to that which precedes the catalytic converter. • The engine control module checks the outputs of the heated oxygen sensor signals. Check Area • Engine speed is not higher than 2250 r/min. • Intake air temperature is -10°C (14°F) or more. • Intake air pressure is between 20 and 63 kPa (2.9 and 9.2 psi) <M/T> or between 24 and 63 kPa (3.5 and 9.2 psi) <A/T>. • Closed throttle position switch: OFF • Under the closed loop air-fuel ratio control. • Vehicle speed is 1.5 km/h (0.93 mph) or higher. • Monitoring time: 140 sec Judgment Criteria • Fault in the oxygen sensor (rear) signal and oxygen sensor (front) signal.	• Catalytic converter deteriorated • Heated oxygen sensor failed • Engine control module failed

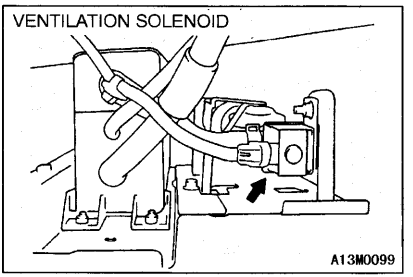


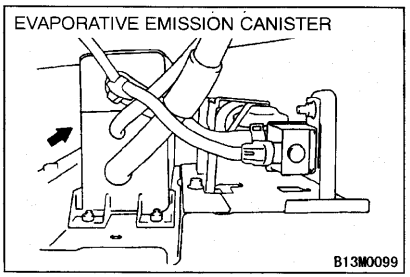
Code No. P0442	Evaporative Emission Control System Leak Detected

System Diagram









TECHNICAL DESCRIPTION

- The ECM turns on the evaporative emission ventilation solenoid which shuts off the evaporative emission canister outlet port. Then the evaporative emission purge solenoid is driven. As a result, the fuel system will be set into a negative pressure.
  When the fuel system reaches negative pressure, the evaporative emission purge solenoid is turned "off," and the fuel system are sealed. As the fuel pressure inside the fuel tank changes, the ECM judges if there is a leak in the fuel system.

DTC SET CONDITIONS

Check Area

- At least sixteen minutes have passed since the starting sequence was completed.
- Engine coolant temperature higher than 60°C (140°F).
- Engine speed is 1,600 r/min or more.
- Power steering pressure switch: "OFF."
- Barometric pressure is higher than 76 kPa (11 psi).
- Volumetric efficiency is at between 20 and 80 percent.
- The engine coolant temperature is 30°C (86°F) or less when the engine is started.
- Intake air temperature is higher than 5°C (41°F).
- The pressure rise when the evaporative emission purge solenoid and evaporative emission ventilation solenoid are closed is less than 451 Pa (0.065 psi).
- The pressure fluctuation width is less than 647 Pa (0.094 psi).
- At least twenty seconds have passed since pressure fluctuation detection commenced.
- Fuel tank differential pressure sensor output voltage is 1 - 4 volts.
- Intake air temperature is 30°C (86°F) or less when the engine started.
- Vehicle speed is 30 km/h (18.7 mph) or more.
- Monitoring time: 75 - 125 seconds

Judgment Criteria

- Internal pressure of the fuel tank has changed more than 843 Pa (0.122 psi) in 20 seconds after the tank and vapor line were closed.

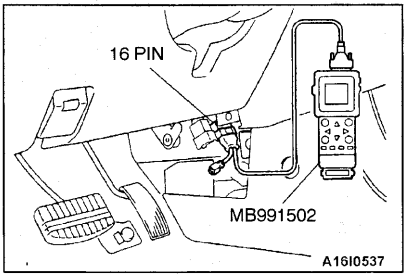
TROUBLESHOOTING HINTS

The most likely causes for this code to be set are:

- Loose fuel cap.
- Fuel cap relief pressure is incorrect.
- Evaporative emission canister seal is faulty.
- Evaporative emission canister is clogged.
- Fuel vent valve failed.
- Purge line or vapor line is clogged.
- Fuel tank, purge line or vapor line seal failed.
- Evaporative emission purge solenoid failed.
- Evaporative emission ventilation solenoid failed.
- Fuel tank differential pressure sensor failed.
- Engine coolant temperature sensor failed.
- Intake air temperature sensor failed.
- Power steering pressure switch failed.
- Use of incorrect fuel.

OVERVIEW OF TROUBLESHOOTING

- To determine the cause of DTC P0442, a performance test is needed. The performance test uses a mechanical vacuum gauge and scan tool MB991502 set on the fuel tank differential pressure sensor (TANK PRS SNSR 73). The mechanical gauge reading is used to verify scan tool MB991502 reading. A comparison of the mechanical gauge to scan tool MB991502 determines the problem in the system.
- Prior to doing the performance test, several simple inspections are needed to exclude some possibilities of the symptom.



DIAGNOSIS

Required Special Tool:
MB991502: Scan Tool (MUT-II)

Caution
To prevent damage to scan tool MB991502, turn the ignition switch off before connecting or disconnecting scan tool MB991502.

In this procedure, scan tool MB991502 should be used in the metric mode (showing the value in kPa). If not, set scan tool MB991502 by selecting the "System Setup" at the main menu.

STEP 1. Check for other DTCs.

If any other DTCs are set, please check those DTCs first then follow the steps below.

STEP 2. Evaporative Emission System Leak Monitor Test using scan tool MB991502.

NOTE: This monitor is carried out at an engine speed of 1,600 r/min or more, transmission is in "N" or "R" position. The engine speed has to be automatically adjusted.

(1) Erase the DTCs using scan tool MB991502. Ensure that the fuel cap is securely tightened.
(2) Select "System Test" and press "YES" key.
(3) Select "Evap Leak Mon" and press "YES" key.
(4) If "Evap Leak Mon" is selected before starting the engine, "Engine must be running." is displayed. In this case, start the engine and then select "Evap Leak Mon" again.
(5) If "Keep the TPS in idle position. during the test." is displayed, the ECM adjusts engine speed automatically. A manual adjustment for engine speed is not needed.
(6) Keep the idling position during the monitor.

NOTE: If the engine speed does not reach 2,000 r/min during the monitor test, adjustment of the Speed Adjusting Screw may be needed. Refer to P.13A-143 for the adjustment procedure.

(7) Item "In Progress" is displayed during the monitor. Keep the engine speed and load within the defined range. Scan tool MB991502 shows these items on the screen. Item "In Progress" will be change from "NO" to "YES" by keeping engine conditions.
(8) Message "Evap Leak Mon. Completed. Test Passed." is displayed when the test has been completed without malfunction. Evaporative emission system is working property at this time. Please explain to customer that improperly tightened fuel cap can cause to MIL turn on. No further steps are needed.
(9) Message "Evap Leak Mon. Completed. Test Failed & DTCs Set." is displayed when a malfunction has been detected during the test. Go to Step 3.

(10) Message "Evap Leak Mon. discontinued. Retest again from the first" is displayed when the monitor was discontinued by a certain reason (input vehicle speed, engine speed and engine load was put of the specified range). Turn the ignition switch off once and start monitoring from the beginning.

NOTE: Monitoring will not start unless turning off the ignition switch is turned off once and the engine restarted.

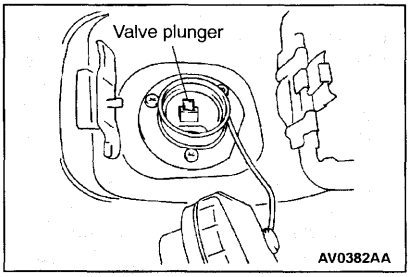
STEP 3. Using scan tool MB991502, check "Fuel tank differential pressure sensor (date list 73)" output.

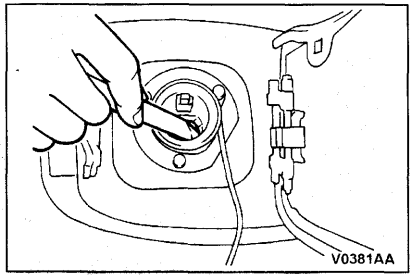
In this step, the fuel tank differential pressure sensor reading is checked to determine if the fuel tank differential pressure sensor output is within the normal range.

(1) Check the MFI data list item: TANK PRS SNSR 73
(2) Watch the sensor reading. This value varies depending on pressure inside the fuel tank.
(3) Remove the fuel cap.

NOTE: If the fuel cap is not securely tightened, it might have the cause of a leak in the EVAP system and set the DTC P0442.

(4) After the fuel cap has been removed, the pressure sensor reading should be between -0.5 kPa (-0.07 psi) and 0.5 kPa (0.07 psi).
- If the reading is between -0.5 kPa (-0.07 psi) and 0.5 kPa (0.07 psi), the fuel tank differential pressure sensor circuit is OK. Therefore, go to Step 4.
- If the reading is not between -0.5 kPa (-0.07 psi) and 0.5 kPa (0.07 psi), the fuel tank differential pressure sensor is not working properly. Replace the fuel tank differential pressure sensor.





STEP 4. Check the fuel vent valve plunger and flapper door operation.

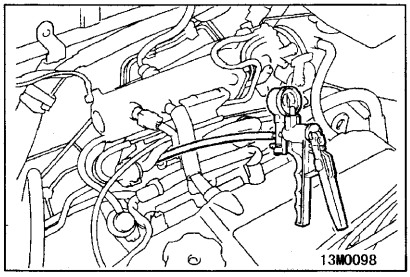
NOTE: When a fuel nozzle is inserted to the fuel tank filler tube and the flapper door is opened, the fuel vent valve is closed (plunger moves towards the top of the neck). When the fuel cap is closed, the fuel cap pushes the plunger back in, which then opens the vent valve. If the flapper door or plunger does not operate properly, the vent valve stays closed even after the fuel cap is closed. This may block the vapor passage. A faulty vent valve plunger may also cause the fuel cap not to seat properly. Either of these conditions can set DTC P0442.

(1) Remove the fuel cap.
(2) Push the flapper in to operate the valve.

NOTE: When the flapper is pushed in, the plunger of the valve should move towards the top.

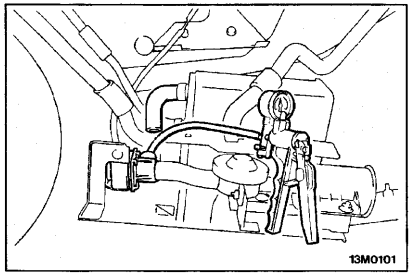
(3) Reinstall and tighten the fuel cap until three clicks are heard.
(4) Remove the cap again and check the protrusion of the plunger to verify if it is pushed back.

(5) Distance between the tip of vent valve plunger and that of fuel tank filler tube should be 28 mm (1.1 inches) or more.
- If the plunger does not return, replace the fuel tank filler tube and securely tighten the cap.
- If the operation is OK, install and securely tighten the fuel cap.



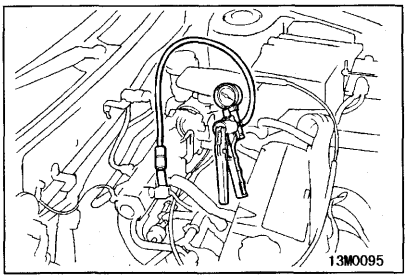
STEP 5. Using scan tool MB991502, actuator test item 08 : Evaporative Emission Purge Solenoid.

(1) Disconnect the hose connected to the evaporative emission canister from the purge solenoid.
(2) Connect a hand vacuum pump to the nipple where the hose is disconnected at the previous step.
(3) The vacuum should be maintained when vacuum is applied and vacuum should leak when the purge solenoid is activated by the actuator test of scan tool MB991502.
- If correct, go to Step 6.
- If not, refer to DTC P0443 (Evaporative Emission Control System Purge Control Valve Circuit Malfunction) on P.13A-57.



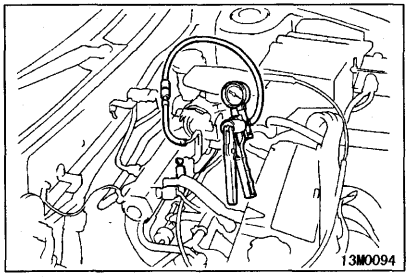
STEP 6. Using scan tool MB991502, actuator test item 29 : evaporative Emission Ventilation Solenoid.

(1) Disconnect the hose connected to the vent solenoid valve from the evaporative emission canister.
(2) Connect a hand vacuum pump to the hose that is disconnected in the previous step.
(3) The vacuum should leak when vacuum is applied, and the vacuum should be maintained when the purge solenoid is activated by the actuator test of scan tool MB991502.
- If correct, go to Step 7.
- If not, refer to DTC P0446 (Evaporative Emission Control System Vent Control Malfunction) on P.13A-58.



STEP 7. Check the purge solenoid-to-air intake plenum hose for blockage.

(1) Disconnect the purge solenoid-to-air intake plenum hose at the purge solenoid side.
(2) Connect a hand vacuum pump to the disconnected hose end.
(3) Apply vacuum, and check if the vacuum is not maintained.
- If not maintained, go to STEP 8.
- If maintained, replace the hose or intake plenum. Then go to STEP 9.



STEP 8. Check the purge solenoid-to-air intake plenum hose for vacuum leakage.

(1) Plug the purge solenoid-to-air intake plenum hose at the purge solenoid side.
(2) Disconnect the purge solenoid-to-air intake plenum hose at the air intake plenum side.
(3) Connect a hand vacuum pump to disconnected hose end.
(4) Apply vacuum, and check if the vacuum is maintained.
- If maintained, go to STEP 9.
- If not maintained, replace the hose. Then go to STEP 9.

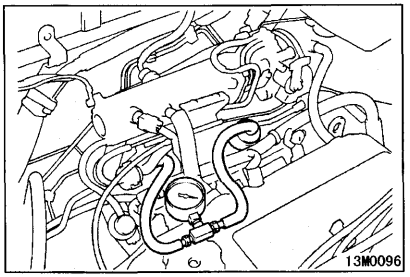
STEP 9. Performance test.

NOTE: Fuel temperature should be lower than 40°C (104°F) during the performance test.

In this step, verify if the EVAP system works properly, or determine which area of the evaporative emission system has a failure.

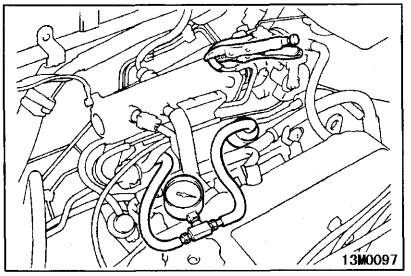
Caution
As a 0 - 6.2 kPa (0 - 0.90 psi) range vacuum gauge is used, the gauge may be broken if excessive vacuum pressure is applied. Do not apply a vacuum of more than 2.9 kPa (0.42 psi).

To achieve the performance test efficiently, a mechanical vacuum gauge [0 - 6.2 kPa (0 - 0.90 psi) range] and scan tool MB991502 should be used, and the engine to generate vacuum.

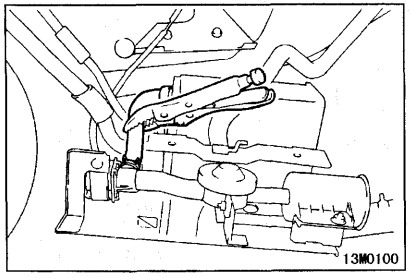


(1) Install a mechanical vacuum gauge [0 - 6.2 kPa (0 - 0.90 psi) range] between the EVAP purge solenoid valve and the purge hose that comes from the evaporative emission canister.
(2) Before starting the performance test, set the vehicle in the following condition.
- Engine coolant temperature: 80 - 90°C (176 - 203°F)
- Lights and all accessories: OFF
- Transmission: "N" or "P" position

(3) Select the item TANK PRS SNSR (data list 73) on scan tool MB991502 to see the differential pressure sensor output.
(4) Run the engine at idle.



(5) Using locking pliers, pinch the hose between the purge solenoid and the intake plenum to close the purge flow, as a preparation of the performance test.



(6) Using another locking pliers, pinch the vent hose between the evaporative emission canister and the vent solenoid. Momentary, remove the locking pliers at the purge hose; this will cause the vacuum build up in the EVAP system.
(7) The engine vacuum comes from the purge port through the purge solenoid.

NOTE: During this operation, the purge solenoid may turn off but will resume operation in about 20 seconds. Operation of the purge solenoid can be checked by needle fluctuation of the mechanical vacuum gauge.

(8) Watch the vacuum reading on the mechanical vacuum gauge and scan tool MB991502.
(9) When the vacuum reading reaches 2.9 kPa (0.42 psi) on the mechanical vacuum gauge and -2.9 kPa (-0.42 psi) on scan tool MB991502, pinch the hose between the purge solenoid and the intake manifold plenum using another locking pliers; this stops the application of vacuum and seals the EVAP system for the leak test.

NOTE: If there is a system failure, either of both vacuum readings may not reach to the above specifications. In this case, it is not necessary to pinch off the purge hose as shown. Refer to the performance test results table below for further steps.

(10) After an elapsed time of 20 seconds, check the fuel tank differential pressure reading on scan tool MB991502.

OK: Change in pressure reading is 0.4 kPa (0.06 psi) or less [holding -2.5 kPa (-0.36 psi) or more vacuum].

Performance test result table:

MECHANICAL VACUUM GAUGE READING	SCAN TOOL MB991502 READING	RESULT	GO TO
Reaches 2.9 kPa (0.42 psi).	Reaches -2.9 kPa (-0.42 psi) and vacuum drops not more than 0.4 kPa (0.06 psi) in 20 seconds.	Satisfactory. No leak nor blockage detected.	Step 10
Reaches 2.9 kPa (0.42 psi).	Does not reach -2.9 kPa (-0.42 psi).*	Blockage in the system or bad differential sensor.	Step 11
Does not reach 2.9 kPa (0.42 psi).	Does not reach -2.9 kPa (-0.42 psi).	Large leak in EVAP system.	Step 13
Reaches 2.9 kPa (0.42 psi).	Reaches -2.9 kPa (-0.42 psi) but vacuum drops more than 0.4 kPa (0.06 psi) in 20 seconds.	Small leak in EVAP system.	Step 14

NOTE
*: If there is a blockage, scan tool MB991502 reading can be a positive value (positive pressure) due to the heat of return fuel from the engine.

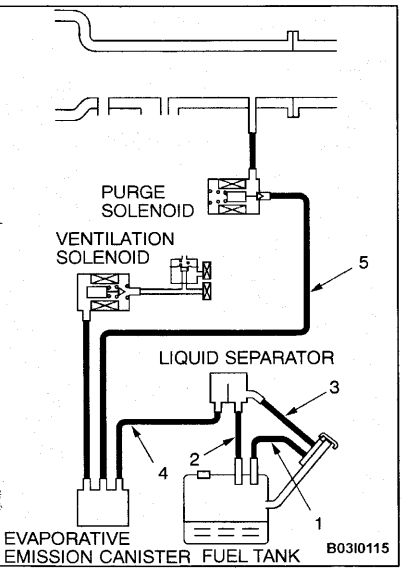
STEP 10. Vacuum reading on both the mechanical gauge and scan tool MB991502 reaches the specifications and satisfy the specifications after 20 seconds:

EVAP system is properly working at the moment. The cause of DTC might have been a loose fuel cap and the customer may have already tightened fuel cap causing the MIL to turn on. No further steps are needed.

STEP 11. Vacuum reading on the mechanical gauge reaches 2.9 kPa (0.42 psi) but scan tool MB991502 does not reach -2.9 kPa (-0.42 psi) :

(1) If the vacuum reading on the gauge reaches 2.9 kPa (0.42 psi) but the reading on scan tool MB991502 does not reach -2.9 kPa (-0.42 psi), either a system blockage or a bad differential pressure sensor may be the cause.
(2) To determine if there is a blockage in the system, remove the fuel cap.

- If the vacuum reading on the vacuum gauge [at this point 2.9 kPa (0.42 psi)] remains the same, there is a blockage in the system. Go to Step 12.
- If the reading drops to about 0 kPa (0 psi), there is no blockage in the EVAP system. The fuel tank differential pressure sensor needs to be replaced. After replacing the differential pressure sensor, go to Step 15.

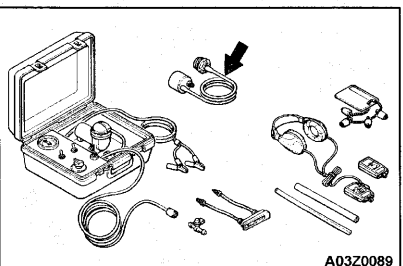


STEP 12. System blockage inspection.

(1) Disconnect the number 1 and 2 hoses shown in the illustration, check the mechanical vacuum gauge reading. If the vacuum reading does not drop, then the blockage is not in the fuel tank.
(2) Disconnect one portion of the EVAP system at a time working towards the front of the vehicle until blockage is found (number 1 to 5 hoses in the illustration).
(3) Repair the location of the blockage and go to Step 15.

STEP 13. Vacuum readings on both the mechanical gauge and scan tool MB991502 do not reach the specifications [2.9 kPa (0.42 psi) and -2.9 kPa (-0.42 psi)]:

This condition shows that there is a significant leakage in the system. The inspection procedure for the large system leakage is the same as the small leakage test in Step 14.

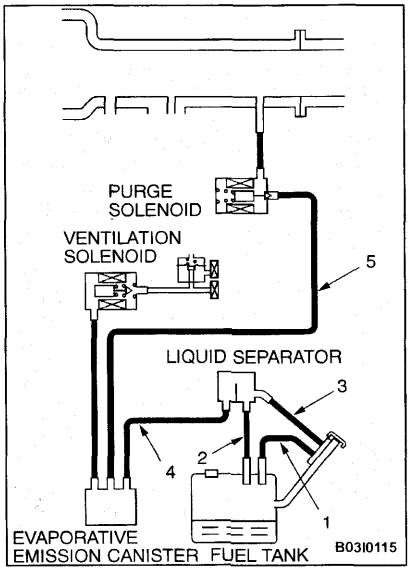


STEP 14. Vacuum readings on both the mechanical gauge and scan tool MB991502 do not reach the specification [2.9 kPa (0.42 psi) and -2.9 kPa (-0.42 psi)] but do not maintain the vacuum.

This condition shows that there is a slight leakage in the system. Follow the procedure below to locate the source of the leak.

(1) The fuel cap relief valve inspection.

a. Remove the fuel cap and install the fuel tank filler tube adapter in the emission system tester kit in place of the fuel cap.
b. Plug the nipple on the fuel tank filler tube adapter.
c. Repeat the performance test. If the EVAP system holds the vacuum, then the fuel cap is faulty. Replace the fuel cap, and go to Step 15.



(2) To find the vacuum leakage in the system, clamp the number 1 and 2 hoses shown in the illustration. Repeat the performance test. This will determine if the vacuum leak is either in the fuel tank area or in the rest of the system.

NOTE: In this case, as we clamped off the vacuum hose connecting to the fuel tank, scan tool MB991502 reading will not change. Please use the mechanical gauge reading.

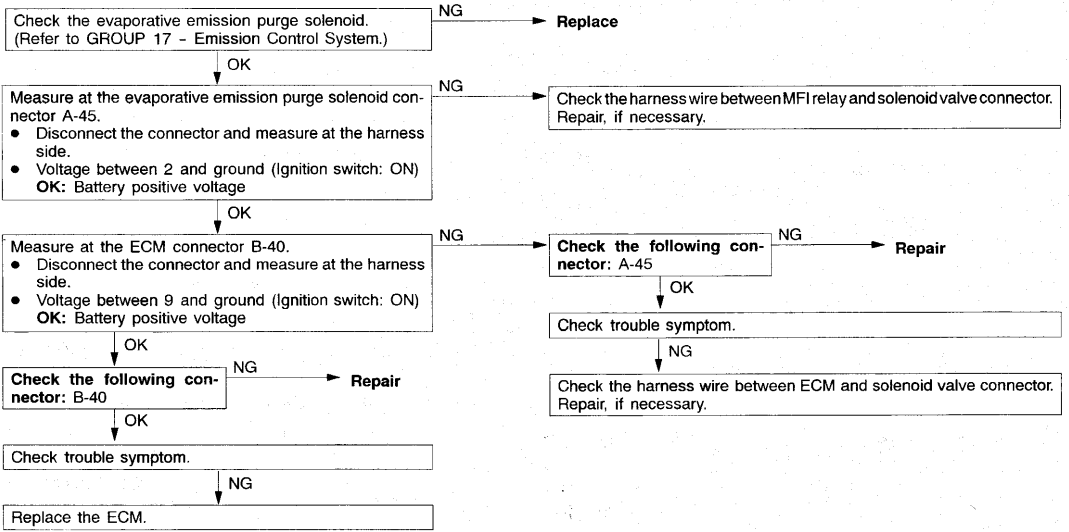
- If the EVAP system hold the vacuum leak is in the fuel tank area. To locate the leakage, pressurize the EVAP system to 3.4 kPa (0.49 psi) and look for leaky area using the ultrasonic leak detector in the Evaporative Emission System Tester. After repairing the leakage, go to Step 15.
- If the vacuum leak still exists, the leak is at other than fuel tank area.

(3) Clamp off the vacuum hose one component at a time working towards the front of the vehicle until leakage is found (number 1 to 5 hoses shown in the illustration).
(4) Repair the leakage at that location and go to Step 15.

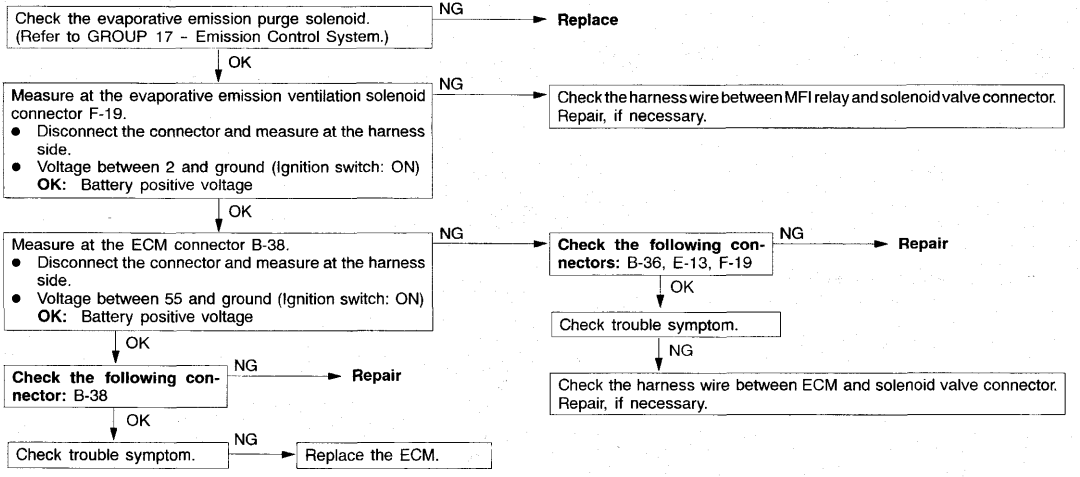
STEP 15. Confirmation test.

After system failures are repaired, repeat the Evaporative Emission System Leak Monitor test (Step 2) to check that the EVAP system operates correctly.

Code No. P0443 Evaporative Emission Control System Purge Control Valve Circuit Malfunction	Probable cause
Background • The engine control module checks current flows in the evaporative emission purge solenoid (No.1) drive circuit when the solenoid is ON and OFF. Check Area • Battery voltage is not lower than 10 V. Judgment Criteria • Solenoid coil surge voltage (more than system voltage +2 V) is not detected when the EVAP purge solenoid is turned on/off. • Monitored only once per trip.	• Evaporative emission purge solenoid failed • Open or shorted evaporative emission purge solenoid circuit, or loose connector • Engine control module failed

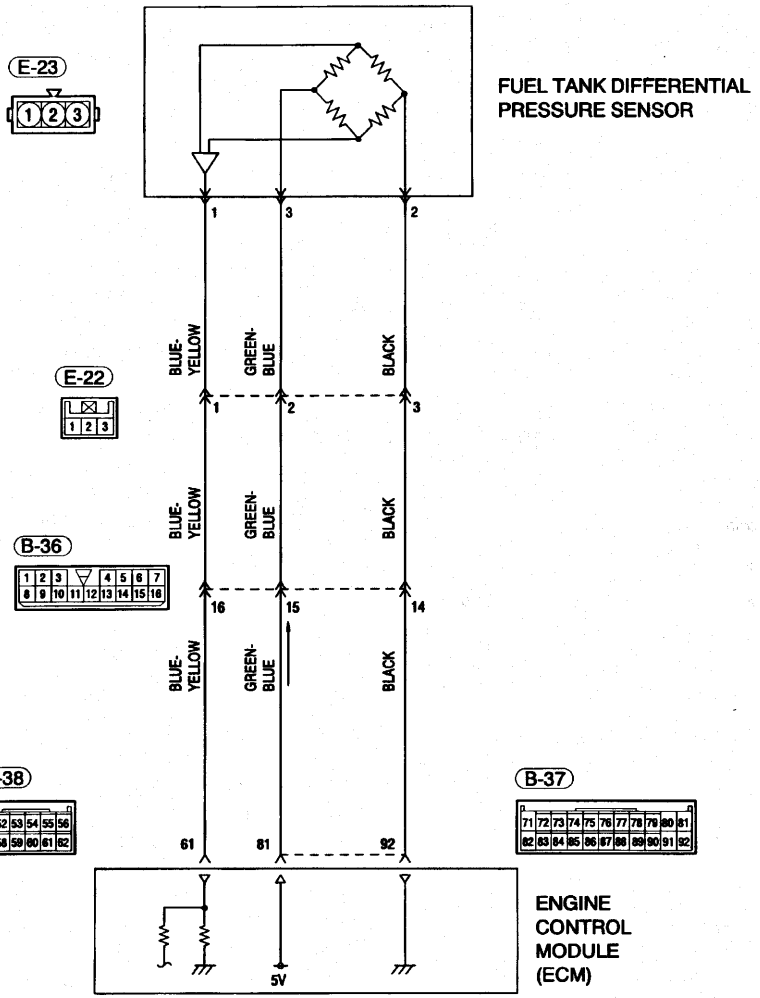


Code No. P0446 Evaporative Emission Control System Vent Control Malfunction	Probable cause
[Comment] Background • The engine control module checks current flows in the evaporative emission ventilation solenoid drive circuit when the solenoid is ON and OFF. Check Area • Battery voltage is 10 V or higher. Judgment Criteria • Solenoid coil surge voltage (system voltage +2 V) is not detected when the EVAP emission vent solenoid is turned on/off. • Monitored only once per trip.	• Evaporative emission ventilation solenoid failed. • Open or shorted evaporative emission ventilation solenoid circuit, or loose connector. • Engine control module failed.

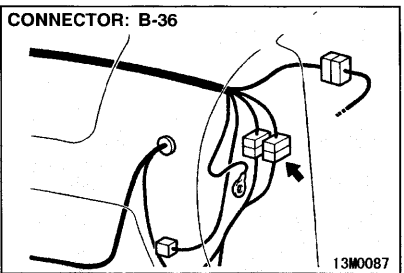


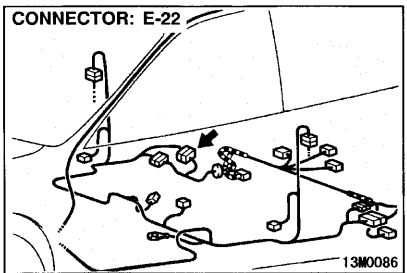
Code No.	Evaporative Emission Control System Pressure Sensor Malfunction
P0450	

Fuel Tank Differential Pressure Sensor Circuit

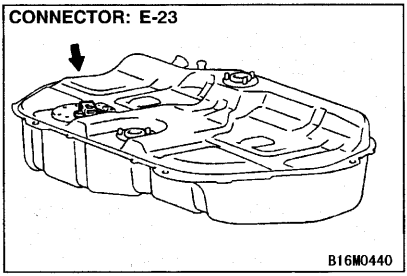


13M0085



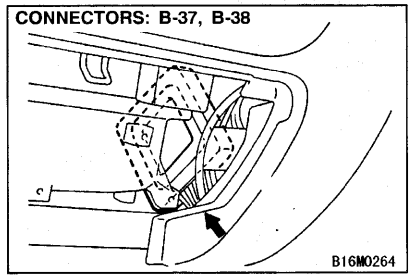


CONNECTOR: E-23



B16M0440

CONNECTORS: B-37, B-38



B16M0264

CIRCUIT OPERATION

- A 5-volt voltage is supplied to the power terminal of the fuel tank differential pressure sensor (terminal 3) from the ECM (terminal 81). The ground terminal (terminal 2) is grounded with the ECM (terminal 92).
- A voltage proportional to the pressure in the fuel tank is sent from the output terminal of the fuel tank differential pressure sensor (terminal 1) to the ECM (terminal 61).

TECHNICAL DESCRIPTION

- The fuel tank differential pressure sensor outputs the voltage in proportion to the pressure in the fuel tank (differential pressure against the barometric pressure).
- The ECM checks whether the output voltage of the fuel tank differential pressure sensor is with in the specified range.

DTC SET CONDITIONS

Check Area

- Intake air temperature is higher than 5°C (41°F).
- Engine speed is higher than 1,600 r/min.
- Volumetric efficiency is between 20 and 80 percent.

Judgement Criteria

- The sensor output voltage is more than 4 volts for 10 seconds even if the evaporative emission purge solenoid is driven at a 100 percent duty when the intake air temperature is between 5 and 45°C (41 - 113°F).

or

- The sensor output voltage is less than 1 volt for 10 seconds even if the evaporative emission purge solenoid is not driven when the intake air temperature is 5°C (41°F) or more.

Check Area

- The throttle valve is closed.
- Engine speed is 840 r/min or less.
- Vehicle speed is 1.5 km/h (0.93 mph) or less.

Judgement Criteria

- The events are counted 20 times or more that sudden pressure fluctuation of at least 0.2 volts is detected for 25 milliseconds or more.
- The above events are detected continuous eight times during normal driving condition.

NOTE: If the number of the pressure fluctuation does not reach 20 during one engine idling, the count number will be reset to zero. In addition, the count number will be also reset to zero if the ignition switch is turned off.

NOTE: The engine control module determines that the engine has deflected from the idle operation if all of the following conditions are met.

- Engine speed is higher than 2,500 r/min.
- Vehicle speed is 15 km/h (9.3 mph) or more.
- Volumetric efficiency is 55 percent or more.

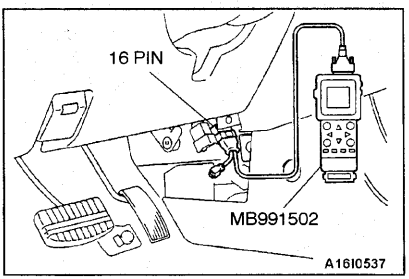
TROUBLESHOOTING HINTS

The most likely causes for this code to be set are:

- Fuel tank differential pressure sensor failed.
- Open or shorted fuel tank differential pressure sensor circuit, or loose connector.
- ECM failed.

OVERVIEW OF TROUBLESHOOTING

- DTC P0450 can be set if either of the following conditions occur:
  1. Faulty fuel tank differential pressure sensor, related circuit, or ECM.
  2. Faulty fuel tank filler tube vent valve or blocked vapor line.
- If the fuel tank filler tube vent valve is faulty and stays closed or the vapor line is blocked, the pressure inside the fuel tank is increased as the evaporative fuel is not purged especially at hot ambient temperatures. Once the pressure inside the fuel tank reaches 6 kPa, the sensor output voltage also reaches and remains 4.5 volts. This will set DTC P0450.
- To check a system blockage, do a performance test which uses a mechanical vacuum gauge and scan tool MB991502 (MUT-II) set on the fuel tank differential pressure sensor (TANK PRS SNSR 73). The mechanical gauge reading is used to verify scan tool MB991502 reading. A comparison of the mechanical gauge to scan tool MB991502 determines the problem in the system.



DIAGNOSIS

Required Special Tool:
MB991502: Scan Tool (MUT-II)

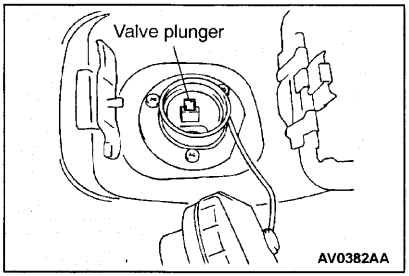
Caution
To prevent damage to scan tool MB991502, turn the ignition switch off before connecting or disconnecting scan tool MB991502.

In this procedure, scan tool MB991502 should be used in the metric mode (showing the value in kPa). If not, set scan tool MB991502 by selecting the "System Setup" at the main menu.

STEP 1. Using scan tool MB991502, check "Fuel tank differential pressure sensor (date list 73)" output.

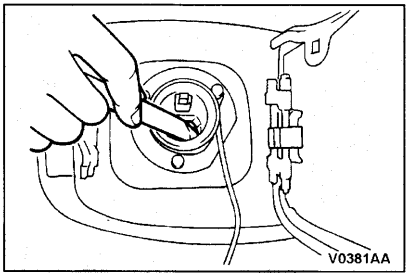
In this step, check the fuel tank differential pressure sensor reading to determine if the fuel tank differential pressure sensor is operating correctly.

(1) Check the MFI data list item: TANK PRS SNSR 73
(2) Watch the sensor reading. This value varies depending on pressure inside the fuel tank.
(3) Remove the fuel cap.
(4) After the fuel cap has been removed, the pressure sensor reading should be between -0.5 kPa (-0.07 psi) and 0.5 kPa (0.07 psi).
    - If the reading is between -0.5 kPa (-0.07 psi) and 0.5 kPa (0.07 psi), the DTC could be caused by an intermittent electrical malfunction, or by a blockage in the EVAP system. Go to step 2.
    - If the reading is not between -0.5 kPa (-0.07 psi) and 0.5 kPa (0.07 psi), there is an electrical malfunction. Go to step 9.



STEP 2. Check the fuel vent valve plunger and flapper door operation.

NOTE: When a fuel nozzle is inserted to the fuel tank filler tube and the flapper door is opened, the fuel vent valve is closed (plunger moves towards the top of the neck). When the fuel cap is closed, the fuel cap pushes the plunger back in, which then opens the vent valve. If the flapper door or plunger does not operate properly, the vent valve stays closed even after the fuel cap is closed. This may block the vapor passage and set the DTC P0450.



(1) Remove the fuel cap.
(2) Push the flapper in to operate the valve.

NOTE: When the flapper is pushed in, the plunger of the valve should move towards the top.

(3) Reinstall and tighten the fuel cap until three clicks are heard.
(4) Remove the cap again and check the protrusion of the plunger to verify if it is pushed back.
(5) The distance between the tip of vent valve plunger and that of fuel tank filler tube should be 28 mm (1.1 inches) or more.
- If the plunger does not return, replace the fuel tank filler tube and securely tighten the cap.
- If the operation is OK, install and securely tighten the fuel cap.

Go to Step 3.

STEP 3. Evaporative Emission System Leak Monitor Test using scan tool MB991502.

NOTE: This monitor is carried out at an engine speed of 1,600 r/min or more, transmission is in "N" or "R" position. The engine speed has to be automatically adjusted.

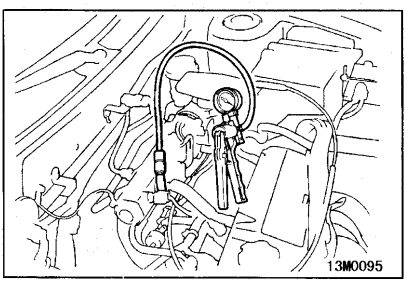
(1) Erase the DTCs using scan tool MB991502. Ensure that the fuel cap is securely tightened.
(2) Select "System Test" and press "YES" key.
(3) Select "Evap Leak Mon" and press "YES" key.
(4) If "Evap Leak Mon" is selected before starting the engine, "Engine must be running." is displayed. In this case, start the engine and then select "Evap Leak Mon" again.
(5) If "Keep the TPS in idle position. during the test." is displayed, the ECM or PCM adjusts engine speed automatically. A manual adjustment for engine speed is not needed.

(6) Keep the idling position during the monitor.

NOTE: If the engine speed does not reach 2,000 r/min during the monitor test, adjustment of the Speed Adjusting Screw may be needed. Refer to P.13A-143 for the adjustment procedure.

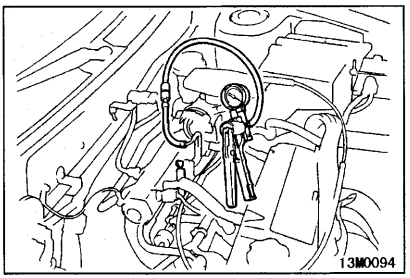
(7) Item "In Progress" is displayed during the monitor. Keep the engine speed and load within the defined range. Scan tool MB991502 shows these items on the screen. Item "In Progress" will be change from "NO" to "YES" by keeping engine conditions.
(8) Message "Evap Leak Mon. Completed. Test Passed." is displayed when the test has been completed without malfunction. Evaporative emission system is working property at the moment. Please explain to customer that improperly tightened fuel cap can cause to turn MIL on. No further steps are needed.
(9) Message "Evap Leak Mon. Completed. Test Failed & DTCs Set." is displayed when a malfunction has been detected during the test. Go to Step 4.
(10) Message "Evap Leak Mon. discontinued. Retest again from the first" is displayed when the monitor was discontinued by a certain reason (input vehicle speed, engine speed and engine load was put of the specified range). Turn the ignition switch off once and start the monitor from the beginning.

NOTE: The monitor will not start unless turning off the ignition switch once and restart the engine.



STEP 4. Check the purge solenoid-to-air intake plenum hose for blockage.

(1) Disconnect the purge solenoid-to-air intake plenum hose at the purge solenoid side.
(2) Connect a hand vacuum pump to the disconnected hose end.
(3) Apply vacuum, and check if the vacuum is not maintained.
- If not maintained, go to STEP 5.
- If maintained, replace the hose or intake plenum. Then go to STEP 6.



STEP 5. Check the purge solenoid-to-air intake plenum hose for vacuum leakage.

(1) Plug the purge solenoid-to-air intake plenum hose at the purge solenoid side.
(2) Disconnect the purge solenoid-to-air intake plenum hose at the air intake plenum side.
(3) Connect a hand vacuum pump to disconnected hose end.
(4) Apply vacuum, and check if the vacuum is maintained.
- If maintained, go to STEP 6.
- If not maintained, replace the hose. Then go to STEP 6.

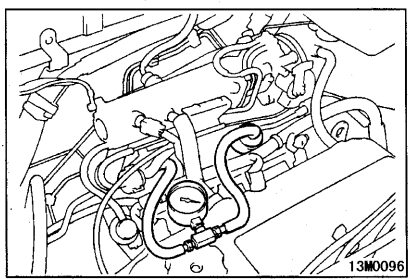
STEP 6. Performance test.

NOTE: Fuel temperature should be lower than 40°C (104°F) during the performance test.

In this step, verify if the EVAP system works properly, or determine which area of the evaporative emission system has a failure.

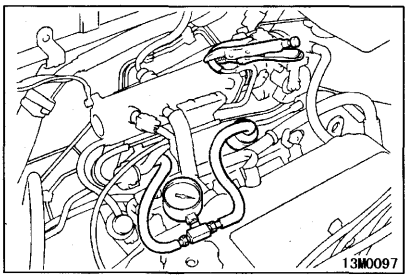
Caution
As a 0 - 6.2 kPa (0 - 0.90 psi) range vacuum gauge is used, the gauge may be broken if excessive vacuum pressure is applied. Do not apply a vacuum of more than 2.9 kPa (0.42 psi).

To achieve the performance test efficiently, a mechanical vacuum gauge [0 - 6.2 kPa (0 - 0.90 psi) range] and scan tool MB991502 should be used, and the engine to generate vacuum.

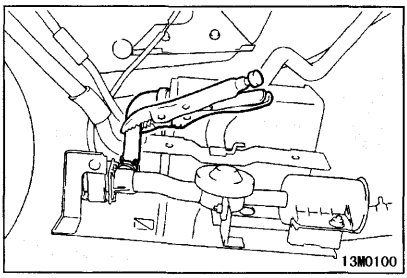


(1) Install a mechanical vacuum gauge [0 - 6.2 kPa (0 - 0.90 psi) range] between the EVAP purge solenoid valve and the purge hose that comes from the evaporative emission canister.
(2) Before starting the performance test, set the vehicle in the following condition.
- Engine coolant temperature: 80 - 90°C (176 - 203°F)
- Lights and all accessories: OFF
- Transmission: "N" or "P" position

(3) Select the item TANK PRS SNSR (data list 73) on scan tool MB991502 to see the fuel tank differential pressure sensor output.
(4) Run the engine at idle.



(5) Using locking pliers, pinch the hose between the purge solenoid and the intake plenum to close the purge flow, as a preparation of the performance test.



(6) Using another locking pliers, pinch the vent hose between the evaporative emission canister and the vent solenoid. Momentary, remove the locking pliers at the purge hose; this will cause the vacuum build up in the EVAP system.
(7) The engine vacuum comes from the purge port through the purge solenoid.

NOTE: During this operation, the purge solenoid may turn off but will resume in operation in about 20 seconds. Operation of the purge solenoid can be checked by needle fluctuation of the mechanical vacuum gauge.

(8) Watch the vacuum reading on the mechanical vacuum gauge and scan tool MB991502.
(9) When the vacuum reading reaches 2.9 kPa (0.42 psi) on the mechanical vacuum gauge and -2.9 kPa (-0.42 psi) on scan tool MB991502, pinch the hose between the purge solenoid and the intake manifold plenum using another locking pliers; this stops the application of vacuum and seals the EVAP system for the leak test.

NOTE: If there is a system failure, either of both vacuum readings may not reach to the above specifications. In this case, it is not necessary to pinch off the purge hose as shown. Refer to the performance test results table below for further steps.

(10) After an elapsed time of 20 seconds, check the fuel tank differential pressure reading on scan tool MB991502.

OK: Change in pressure reading is 0.4 kPa (0.06 psi) or less [holding -2.5 kPa (-0.36 psi) or more vacuum].

Performance test result table:

MECHANICAL VACUUM GAUGE READING	SCAN TOOL MB991502 READING	RESULT	GO TO
Reaches 2.9 kPa (0.42 psi).	Reaches -2.9 kPa (-0.42 psi) and vacuum drops not more than 0.4 kPa (0.06 psi) in 20 seconds.	Satisfactory. No leak nor blockage detected.	Step 7
Reaches 2.9 kPa (0.42 psi).	Does not reach -2.9 kPa (-0.42 psi).*	Blockage in the system or bad differential pressure sensor.	Step 8
Does not reach 2.9 kPa (0.42 psi).	Does not reach -2.9 kPa (-0.42 psi).	Large leak in EVAP system.	Step 11
Reaches 2.9 kPa (0.42 psi).	Reaches -2.9 kPa (-0.42 psi) but vacuum drops more than 0.4 kPa (0.06 psi) in 20 seconds.	Small leak in EVAP system.	Step 12

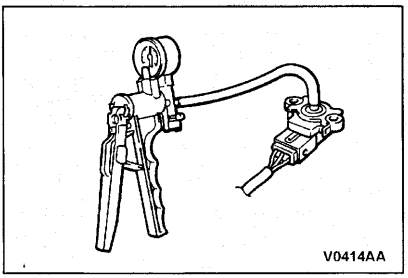
NOTE
*: If there is a blockage, scan tool MB991502 reading can be positive value (positive pressure) due to heat of return fuel from the engine.

STEP 7. Vacuum reading on both the mechanical gauge and scan tool MB991502 reaches the specifications and satisfy the specifications after 20 seconds:

EVAP system is properly working at the moment. The cause is an intermittent electrical wiring problem. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points.

STEP 8. Vacuum reading on the mechanical gauge reaches 2.9 kPa (0.42 psi) but scan tool MB991502 does not reach -2.9 kPa (-0.42 psi) :

(1) If the vacuum reading on the gauge reaches 2.9 kPa (0.42 psi) but the reading on scan tool MB991502 does not reach -2.9 kPa (-0.42 psi), either a system blockage or a bad differential pressure sensor may be the cause.
(2) To determine if there is a blockage in the system, remove the fuel cap.
- If the vacuum reading on the vacuum gauge [at this point 2.9 kPa (0.42 psi)] remain the same, there is a blockage in the system, and go to Step 8.
- If the reading drops to about 0 kPa (0 psi), there is no blockage in the EVAP system. Then the fuel tank differential pressure sensor need to be tested. Go to Step 9.



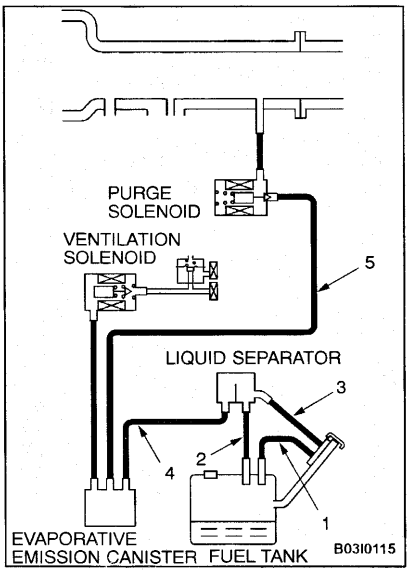
STEP 9. Check the fuel tank differential pressure sensor.

(1) Remove the floor carpet and floor cover.
(2) Remove the fuel tank differential pressure sensor. Do not disconnect the connector at this point.
(3) Connect the fuel tank differential pressure sensor to a hand vacuum pump and mechanical vacuum gauge [0 - 6.2 kPa (0 - 0.90 psi) range].
(4) Turn the ignition switch "ON."
(5) Using the scan tool, check MFI data list item 73: TANK PRS SNSR while applying vacuum.

Applying vacuum (at the gauge)	Scan tool reading	Output voltage (V)
5.0 kPa (0.72 psi)	-5 kPa	1 ± 0.1
No vacuum applied	0 kPa	2.5 ± 0.1

If not correct, go to Step 13.

If correct, it can be assumed that this malfunction is caused by an intermittent electrical wiring problem. Refer to GROUP 00. How to Use Troubleshooting/Inspection Service Points.

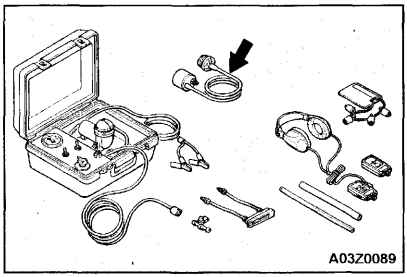


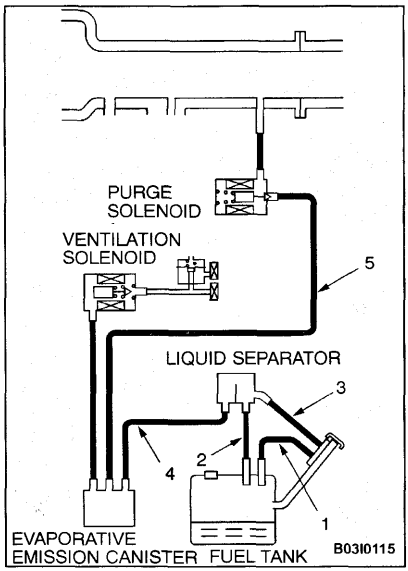
STEP 10. System blockage inspection.

(1) Disconnect the number 1 and 2 hoses shown in the illustration, check the mechanical vacuum gauge reading. If the vacuum reading does not drop, then the blockage is not in the fuel tank.
(2) Disconnect one portion of the EVAP system at a time working towards the front of the vehicle until blockage is found (number 1 to 5 hoses in the illustration).
(3) Repair the location of the blockage and go to Step 12.

STEP 11. Vacuum readings on both the mechanical gauge and scan tool MB991502 do not reach the specifications [2.9 kPa (0.42 psi) and -2.9 kPa (-0.42 psi)]:

This condition shows that there is a significant leakage in the system. The inspection procedure for the large system leakage is the same as the small leakage test in Step 12.





STEP 12. Vacuum readings on both the mechanical gauge and scan tool MB991502 do not reach the specification [2.9 kPa (0.42 psi) and -2.9 kPa (-0.42 psi)] but do not maintain the vacuum.

This condition shows that there is a slight leakage in the system. Follow the procedure below to locate the source of the leak.

(1) The fuel cap relief valve inspection.
   a. Remove the fuel cap and install the fuel tank filler tube adapter in the emission system tester kit in place of the fuel cap.
   b. Plug the nipple on the fuel tank filler tube adapter.
   c. Repeat the performance test. If the EVAP system holds the vacuum, then the fuel cap is faulty. Replace the fuel cap, and go to Step 18.

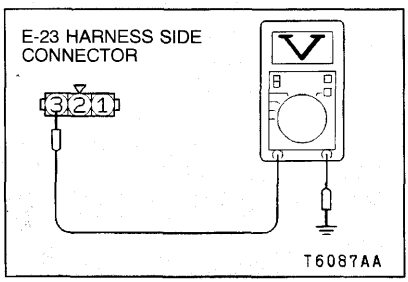
(2) To find the vacuum leakage in the system, clamp the number 1 and 2 hoses shown in the illustration. Repeat the performance test. This will determine if the vacuum leak is either in the fuel tank area or in the rest of the system.

   NOTE: In this case, as we clamped off the vacuum hose connecting to the fuel tank, scan tool MB991502 reading will not change. Please use the mechanical gauge reading.

   - If the EVAP system hold the vacuum leak is in the fuel tank area. To locate the leakage, pressurize the EVAP system to 3.4 kPa (0.49 psi) and look for leaky area using the ultrasonic leak detector in the Evaporative Emission System Tester. After repairing the leakage, go to Step 18.
   - If the vacuum leak still exists, the leak is at other than fuel tank area.

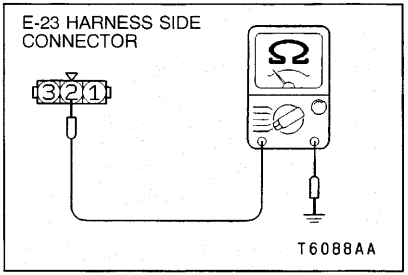
(3) Clamp off the vacuum hose one component at a time working towards the front of the vehicle until leakage is found (number 1 to 5 hoses shown in the illustration).

(4) Repair the location of the leakage and go to Step 18.



STEP 13. Check the circuits at fuel tank differential pressure sensor connector E-23.

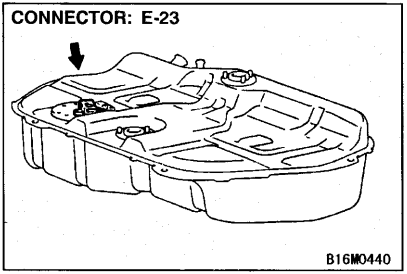
(1) Disconnect connector E-23 and measure at the harness side.
(2) Turn the ignition switch "ON."
(3) Measure voltage between terminal 3 and ground.
   - Voltage should be between 4.8 and 5.2 volts.
(4) Turn the ignition switch "OFF."



(5) Check for continuity between terminal 2 and ground.
- There should be continuity (0 Ω).

If all checks above meet the specifications, go to Step 14.

If any check above do not meet the specifications, go to Step 16.

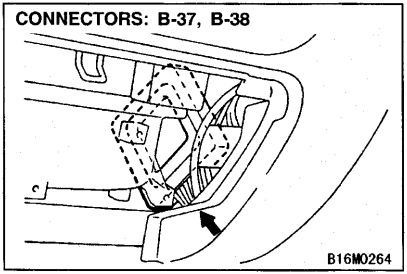


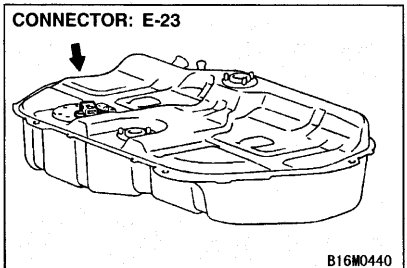
STEP 14. Check the harness wire between fuel tank differential pressure sensor connector E-23 (terminal 1) and ECM connector B-38 (terminal 61).

NOTE: Check the wire after checking intermediate connectors B-36 and E-22. If intermediate connectors B-36 and E-22 are faulty, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection. Then go to Step 18.

If the wire between fuel tank differential pressure sensor connector E-23 (terminal 1) and ECM connector B-38 (terminal 61) is not damaged, go to Step 15.

If the wire between fuel tank differential pressure sensor connector E-23 (terminal 1) and ECM connector B-38 (terminal 61) is damaged, repair it. Then go to Step 18.

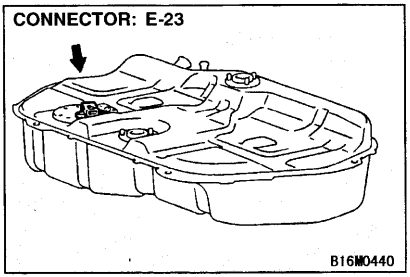




STEP 15. Check harness connector E-23 at the fuel tank differential pressure sensor for damage.

If harness connector E-23 is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection.

If harness connector E-23 is not damaged, check ECM connectors B-37 and B-38, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection. If ECM connectors B-37 and B-38 are in good condition, replace the ECM. Then go to Step 18.

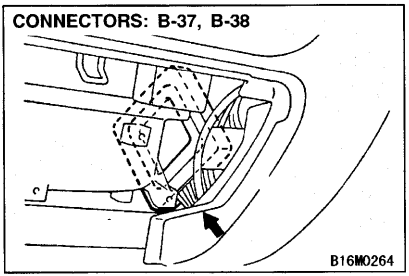


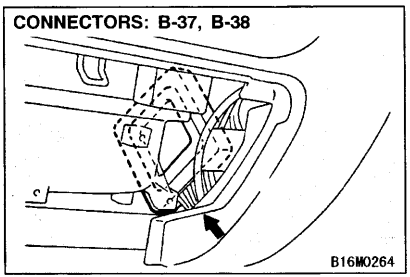
STEP 16. Check the harness wire between fuel tank differential pressure sensor connector E-23 and ECM connectors B-37 and B-38.

NOTE: Check the wire after checking the intermediate connectors B-36 and E-22. If the intermediate connectors B-36 and E-22 are faulty, repair or replace them. Refer to GROUP 00E. Harness Connector Inspection. Then go to Step 18.

If the wire between fuel tank differential pressure sensor connector E-23 and ECM connectors B-37 and B-38 are not damaged, go to Step 17.

If the wire between fuel tank differential pressure sensor connector E-23 and ECM connectors B-37 and B-38 are damaged, repair it. Then go to Step 18.





STEP 17. Check harness connectors B-37 and B-38 at the ECM.

If harness connectors B-37 and B-38 are damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection.

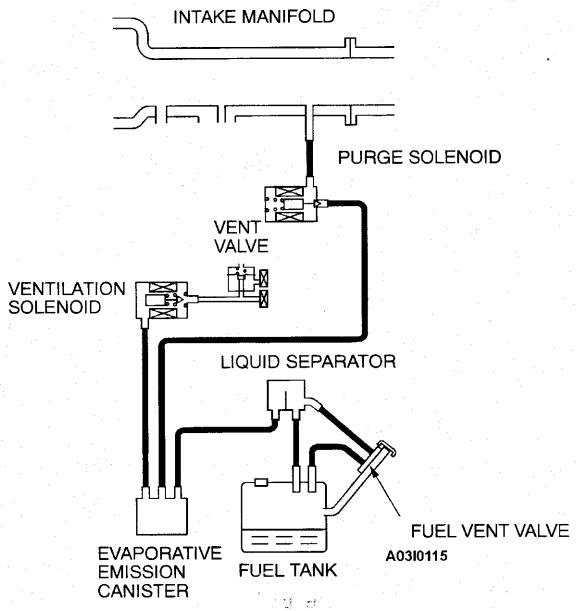
If harness connectors B-37 and B-38 are not damaged, replace the ECM. Then go to Step 18.

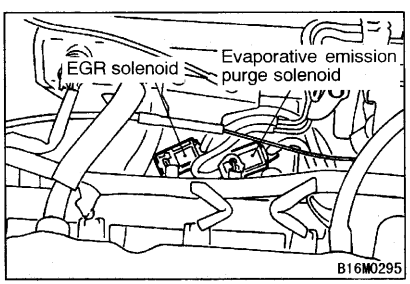
STEP 18. Confirmation test.

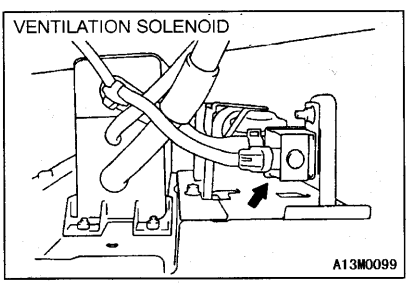
After system failures are repaired, repeat the Evaporative Emission System Leak Monitor test (Step 3) to check that the EVAP system operates correctly.

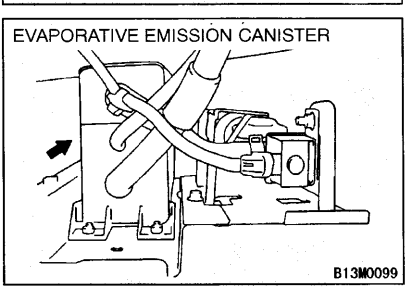
Code No.	Evaporative Emission Control System Leak Detected (Gross Leak)
P0455	

System Diagram









TECHNICAL DESCRIPTION

- The ECM turns on the evaporative emission ventilation solenoid which shuts off the evaporative emission canister outlet port. Then the evaporative emission purge solenoid is driven. As a result, the fuel system will be set into a negative pressure.
  When the fuel system reaches negative pressure, the evaporative emission purge solenoid is turned "off," and the fuel system are sealed. As the fuel pressure inside the fuel tank changes, the ECM judges if there is a leak in the fuel system.

DTC SET CONDITIONS

Check Area

- At least sixteen minutes have passed since the starting sequence was completed.
- Engine coolant temperature higher than 60°C (140°F).
- Engine speed is 1,600 r/min or more.
- Power steering pressure switch: "OFF."
- Barometric pressure is higher than 76 kPa (11 psi).
- Volumetric efficiency is at between 20 and 80 percent.
- The engine coolant temperature is 30°C (86°F) or less when the engine is started.
- Intake air temperature is higher than 5°C (41°F).
- The pressure rise when the evaporative emission purge solenoid and evaporative emission ventilation solenoid are closed is less than 451 Pa (0.065 psi).
- The pressure fluctuation width is less than 647 Pa (0.094 psi).
- At least twenty seconds have passed since pressure fluctuation detection commenced.
- Fuel tank differential pressure sensor output voltage is 1 - 4 volts.
- Intake air temperature is 30°C (86°F) or less when the engine started.
- Vehicle speed is 30 km/h (18.7 mph) or more.
- Monitoring time: 75 - 125 seconds

Judgment Criteria

- Internal pressure of the fuel tank has changed more than 843 Pa (0.122 psi) in 20 seconds after the tank and vapor line were closed.

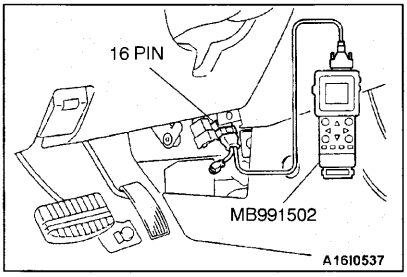
TROUBLESHOOTING HINTS

The most likely causes for this code to be set are:

- Loose fuel cap.
- Fuel cap relief pressure is incorrect.
- Evaporative emission canister seal is faulty.
- Evaporative emission canister is clogged.
- Fuel vent valve failed.
- Purge line or vapor line is clogged.
- Fuel tank, purge line or vapor line seal failed.
- Evaporative emission purge solenoid failed.
- Evaporative emission ventilation solenoid failed.
- Fuel tank differential pressure sensor failed.
- Engine coolant temperature sensor failed.
- Intake air temperature sensor failed.
- Power steering pressure switch failed.
- Use of incorrect fuel.

OVERVIEW OF TROUBLESHOOTING

- To determine the cause of DTC P0442, a performance test is needed. The performance test uses a mechanical vacuum gauge and scan tool MB991502 set on the fuel tank differential pressure sensor (TANK PRS SNSR 73). The mechanical gauge reading is used to verify scan tool MB991502 reading. A comparison of the mechanical gauge to scan tool MB991502 determines the problem in the system.
- Prior to doing the performance test, several simple inspections are needed to exclude some possibilities of the symptom.



DIAGNOSIS

Required Special Tool:
MB991502: Scan Tool (MUT-II)

Caution
To prevent damage to scan tool MB991502, turn the ignition switch off before connecting or disconnecting scan tool MB991502.

In this procedure, scan tool MB991502 should be used in the metric mode (showing the value in kPa). If not, set scan tool MB991502 by selecting the "System Setup" at the main menu.

STEP 1. Check for other DTCs.

If any other DTCs are set, please check those DTCs first then follow the steps below.

STEP 2. Evaporative Emission System Leak Monitor Test using scan tool MB991502.

NOTE: This monitor is carried out at an engine speed of 1,600 r/min or more, transmission is in "N" or "R" position. The engine speed has to be automatically adjusted.

(1) Erase the DTCs using scan tool MB991502. Ensure that the fuel cap is securely tightened.
(2) Select "System Test" and press "YES" key.
(3) Select "Evap Leak Mon" and press "YES" key.
(4) If "Evap Leak Mon" is selected before starting the engine, "Engine must be running." is displayed. In this case, start the engine and then select "Evap Leak Mon" again.
(5) If "Keep the TPS in idle position. during the test." is displayed, the ECM adjusts engine speed automatically. A manual adjustment for engine speed is not needed.
(6) Keep the idling position during the monitor.

NOTE: If the engine speed does not reach 2,000 r/min during the monitor test, adjustment of the Speed Adjusting Screw may be needed. Refer to P.13A-143 for the adjustment procedure.

(7) Item "In Progress" is displayed during the monitor. Keep the engine speed and load within the defined range. Scan tool MB991502 shows these items on the screen. Item "In Progress" will be change from "NO" to "YES" by keeping engine conditions.
(8) Message "Evap Leak Mon. Completed. Test Passed." is displayed when the test has been completed without malfunction. Evaporative emission system is working property at this time. Please explain to customer that improperly tightened fuel cap can cause to MIL turn on. No further steps are needed.
(9) Message "Evap Leak Mon. Completed. Test Failed & DTCs Set." is displayed when a malfunction has been detected during the test. Go to Step 3.

(10) Message "Evap Leak Mon. discontinued. Retest again from the first" is displayed when the monitor was discontinued by a certain reason (input vehicle speed, engine speed and engine load was put of the specified range). Turn the ignition switch off once and start monitoring from the beginning.

NOTE: Monitoring will not start unless turning off the ignition switch is turned off once and the engine restarted.

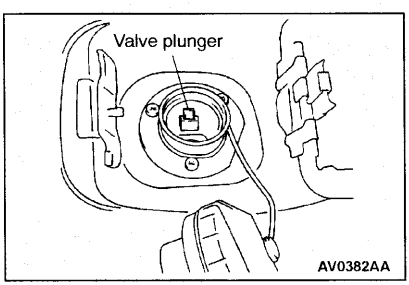
STEP 3. Using scan tool MB991502, check "Fuel tank differential pressure sensor (date list 73)" output.

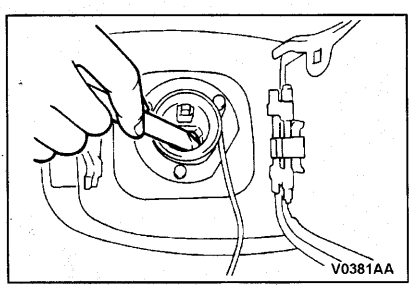
In this step, the fuel tank differential pressure sensor reading is checked to determine if the fuel tank differential pressure sensor output is within the normal range.

(1) Check the MFI data list item: TANK PRS SNSR 73
(2) Watch the sensor reading. This value varies depending on pressure inside the fuel tank.
(3) Remove the fuel cap.

NOTE: If the fuel cap is not securely tightened, it might have the cause of a leak in the EVAP system and set the DTC P0442.

(4) After the fuel cap has been removed, the pressure sensor reading should be between -0.5 kPa (-0.07 psi) and 0.5 kPa (0.07 psi).
- If the reading is between -0.5 kPa (-0.07 psi) and 0.5 kPa (0.07 psi), the fuel tank differential pressure sensor circuit is OK. Therefore, go to Step 4.
- If the reading is not between -0.5 kPa (-0.07 psi) and 0.5 kPa (0.07 psi), the fuel tank differential pressure sensor is not working properly. Replace the fuel tank differential pressure sensor.





STEP 4. Check the fuel vent valve plunger and flapper door operation.

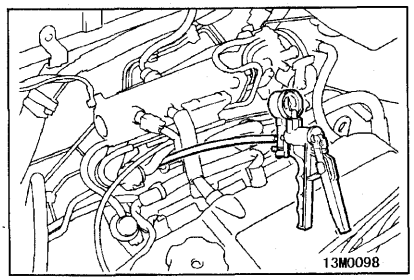
NOTE: When a fuel nozzle is inserted to the fuel tank filler tube and the flapper door is opened, the fuel vent valve is closed (plunger moves towards the top of the neck). When the fuel cap is closed, the fuel cap pushes the plunger back in, which then opens the vent valve. If the flapper door or plunger does not operate properly, the vent valve stays closed even after the fuel cap is closed. This may block the vapor passage. A faulty vent valve plunger may also cause the fuel cap not to seat properly. Either of these conditions can set DTC P0442.

(1) Remove the fuel cap.
(2) Push the flapper in to operate the valve.

NOTE: When the flapper is pushed in, the plunger of the valve should move towards the top.

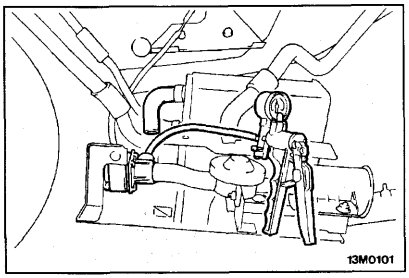
(3) Reinstall and tighten the fuel cap until three clicks are heard.
(4) Remove the cap again and check the protrusion of the plunger to verify if it is pushed back.

(5) Distance between the tip of vent valve plunger and that of fuel tank filler tube should be 28 mm (1.1 inches) or more.
- If the plunger does not return, replace the fuel tank filler tube and securely tighten the cap.
- If the operation is OK, install and securely tighten the fuel cap.



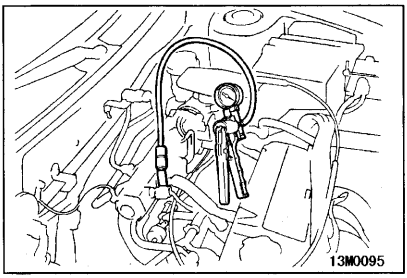
STEP 5. Using scan tool MB991502, actuator test item 08 : Evaporative Emission Purge Solenoid.

(1) Disconnect the hose connected to the evaporative emission canister from the purge solenoid.
(2) Connect a hand vacuum pump to the nipple where the hose is disconnected at the previous step.
(3) The vacuum should be maintained when vacuum is applied and vacuum should leak when the purge solenoid is activated by the actuator test of scan tool MB991502.
- If correct, go to Step 6.
- If not, refer to DTC P0443 (Evaporative Emission Control System Purge Control Valve Circuit Malfunction) on P.13A-57.



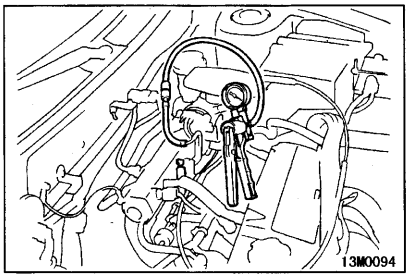
STEP 6. Using scan tool MB991502, actuator test item 29 : evaporative Emission Ventilation Solenoid.

(1) Disconnect the hose connected to the vent solenoid valve from the vent solenoid valve.
(2) Connect a hand vacuum pump to the nipple that is disconnected in the previous step.
(3) The vacuum should leak when vacuum is applied, and the vacuum should be maintained when the purge solenoid is activated by the actuator test of scan tool MB991502.
- If correct, go to Step 7.
- If not, refer to DTC P0446 (Evaporative Emission Control System Vent Control Malfunction) on P.13A-58.



STEP 7. Check the purge solenoid-to-air intake plenum hose for blockage.

(1) Disconnect the purge solenoid-to-air intake plenum hose at the purge solenoid side.
(2) Connect a hand vacuum pump to the disconnected hose end.
(3) Apply vacuum, and check if the vacuum is not maintained.
- If not maintained, go to STEP 8.
- If maintained, replace the hose or intake plenum. Then go to STEP 9.



STEP 8. Check the purge solenoid-to-air intake plenum hose for vacuum leakage.

(1) Plug the purge solenoid-to-air intake plenum hose at the purge solenoid side.
(2) Disconnect the purge solenoid-to-air intake plenum hose at the air intake plenum side.
(3) Connect a hand vacuum pump to disconnected hose end.
(4) Apply vacuum, and check if the vacuum is maintained.
- If maintained, go to STEP 9.
- If not maintained, replace the hose. Then go to STEP 9.

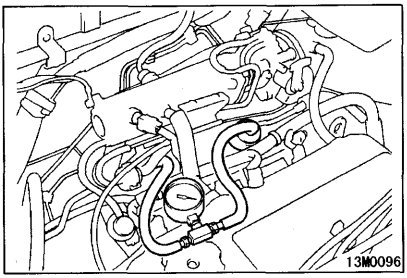
STEP 9. Performance test.

NOTE: Fuel temperature should be lower than 40°C (104°F) during the performance test.

In this step, verify if the EVAP system works properly, or determine which area of the evaporative emission system has a failure.

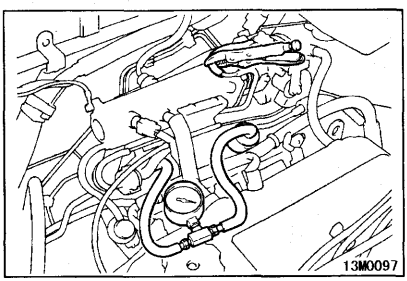
Caution
As a 0 - 6.2 kPa (0 - 0.90 psi) range vacuum gauge is used, the gauge may be broken if excessive vacuum pressure is applied. Do not apply a vacuum of more than 2.9 kPa (0.42 psi).

To achieve the performance test efficiently, a mechanical vacuum gauge [0 - 6.2 kPa (0 - 0.90 psi) range] and scan tool MB991502 should be used, and the engine to generate vacuum.

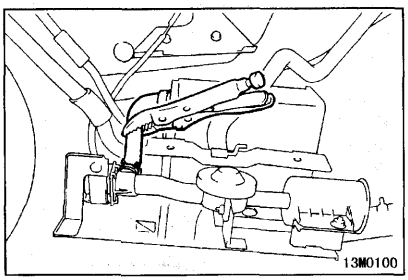


(1) Install a mechanical vacuum gauge [0 - 6.2 kPa (0 - 0.90 psi) range] between the EVAP purge solenoid valve and the purge hose that comes from the evaporative emission canister.
(2) Before starting the performance test, set the vehicle in the following condition.
- Engine coolant temperature: 80 - 90°C (176 - 203°F)
- Lights and all accessories: OFF
- Transmission: "N" or "P" position

(3) Select the item TANK PRS SNSR (data list 73) on scan tool MB991502 to see the differential pressure sensor output.
(4) Run the engine at idle.



(5) Using locking pliers, pinch the hose between the purge solenoid and the intake plenum to close the purge flow, as a preparation of the performance test.



(6) Using another locking pliers, pinch the vent hose between the evaporative emission canister and the vent solenoid. Momentary, remove the locking pliers at the purge hose; this will cause the vacuum build up in the EVAP system.
(7) The engine vacuum comes from the purge port through the purge solenoid.

NOTE: During this operation, the purge solenoid may turn off but will resume operation in about 20 seconds. Operation of the purge solenoid can be checked by needle fluctuation of the mechanical vacuum gauge.

(8) Watch the vacuum reading on the mechanical vacuum gauge and scan tool MB991502.
(9) When the vacuum reading reaches 2.9 kPa (0.42 psi) on the mechanical vacuum gauge and -2.9 kPa (-0.42 psi) on scan tool MB991502, pinch the hose between the purge solenoid and the intake manifold plenum using another locking pliers; this stops the application of vacuum and seals the EVAP system for the leak test.

NOTE: If there is a system failure, either of both vacuum readings may not reach to the above specifications. In this case, it is not necessary to pinch off the purge hose as shown. Refer to the performance test results table below for further steps.

(10) After an elapsed time of 20 seconds, check the fuel tank differential pressure reading on scan tool MB991502.

OK: Change in pressure reading is 0.4 kPa (0.06 psi) or less [holding -2.5 kPa (-0.36 psi) or more vacuum].

Performance test result table:

MECHANICAL VACUUM GAUGE READING	SCAN TOOL MB991502 READING	RESULT	GO TO
Reaches 2.9 kPa (0.42 psi).	Reaches -2.9 kPa (-0.42 psi) and vacuum drops not more than 0.4 kPa (0.06 psi) in 20 seconds.	Satisfactory. No leak nor blockage detected.	Step 10
Reaches 2.9 kPa (0.42 psi).	Does not reach -2.9 kPa (-0.42 psi).*	Blockage in the system or bad differential sensor.	Step 11
Does not reach 2.9 kPa (0.42 psi).	Does not reach -2.9 kPa (-0.42 psi).	Large leak in EVAP system.	Step 13
Reaches 2.9 kPa (0.42 psi).	Reaches -2.9 kPa (-0.42 psi) but vacuum drops more than 0.4 kPa (0.06 psi) in 20 seconds.	Small leak in EVAP system.	Step 14

NOTE
*: If there is a blockage, scan tool MB991502 reading can be a positive value (positive pressure) due to the heat of return fuel from the engine.

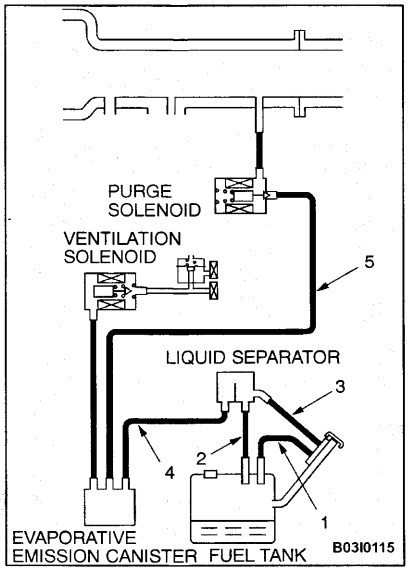
STEP 10. Vacuum reading on both the mechanical gauge and scan tool MB991502 reaches the specifications and satisfy the specifications after 20 seconds:

EVAP system is properly working at the moment. The cause of DTC might have been a loose fuel cap and the customer may have already tightened fuel cap causing the MIL to turn on. No further steps are needed.

STEP 11. Vacuum reading on the mechanical gauge reaches 2.9 kPa (0.42 psi) but scan tool MB991502 does not reach -2.9 kPa (-0.42 psi) :

(1) If the vacuum reading on the gauge reaches 2.9 kPa (0.42 psi) but the reading on scan tool MB991502 does not reach -2.9 kPa (-0.42 psi), either a system blockage or a bad differential pressure sensor may be the cause.
(2) To determine if there is a blockage in the system, remove the fuel cap.

- If the vacuum reading on the vacuum gauge [at this point 2.9 kPa (0.42 psi)] remains the same, there is a blockage in the system. Go to Step 12.
- If the reading drops to about 0 kPa (0 psi), there is no blockage in the EVAP system. The fuel tank differential pressure sensor needs to be replaced. After replacing the differential pressure sensor, go to Step 15.

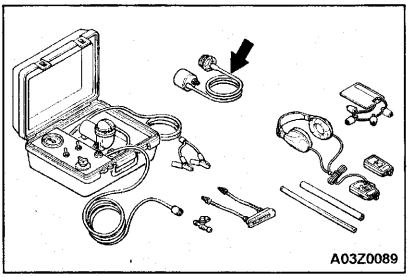


STEP 12. System blockage inspection.

(1) Disconnect the number 1 and 2 hoses shown in the illustration, check the mechanical vacuum gauge reading. If the vacuum reading does not drop, then the blockage is not in the fuel tank.
(2) Disconnect one portion of the EVAP system at a time working towards the front of the vehicle until blockage is found (number 1 to 5 hoses in the illustration).
(3) Repair the location of the blockage and go to Step 15.

STEP 13. Vacuum readings on both the mechanical gauge and scan tool MB991502 do not reach the specifications [2.9 kPa (0.42 psi) and -2.9 kPa (-0.42 psi)]:

This condition shows that there is a significant leakage in the system. The inspection procedure for the large system leakage is the same as the small leakage test in Step 14.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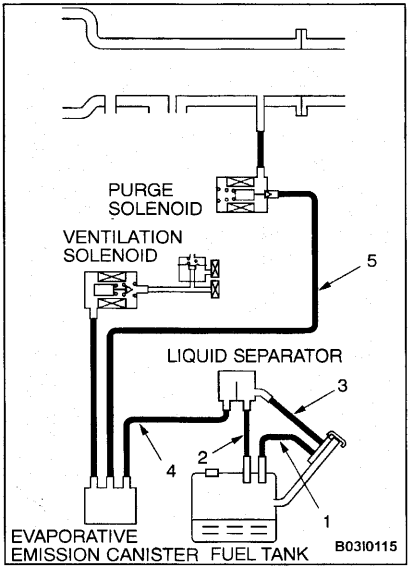


STEP 14. Vacuum readings on both the mechanical gauge and scan tool MB991502 do not reach the specification [2.9 kPa (0.42 psi) and -2.9 kPa (-0.42 psi)] but do not maintain the vacuum.

This condition shows that there is a slight leakage in the system. Follow the procedure below to locate the source of the leak.

(1) The fuel cap relief valve inspection.
   a. Remove the fuel cap and install the fuel tank filler tube adapter in the emission system tester kit in place of the fuel cap.
   b. Plug the nipple on the fuel tank filler tube adapter.
   c. Repeat the performance test. If the EVAP system holds the vacuum, then the fuel cap is faulty. Replace the fuel cap, and go to Step 15.

(2) To find the vacuum leakage in the system, clamp the number 1 and 2 hoses shown in the illustration. Repeat the performance test. This will determine if the vacuum leak is either in the fuel tank area or in the rest of the system.

   NOTE: In this case, as we clamped off the vacuum hose connecting to the fuel tank, scan tool MB991502 reading will not change. Please use the mechanical gauge reading.

   - If the EVAP system hold the vacuum leak is in the fuel tank area. To locate the leakage, pressurize the EVAP system to 3.4 kPa (0.49 psi) and look for leaky area using the ultrasonic leak detector in the Evaporative Emission System Tester. After repairing the leakage, go to Step 15.
   - If the vacuum leak still exists, the leak is at other than fuel tank area.

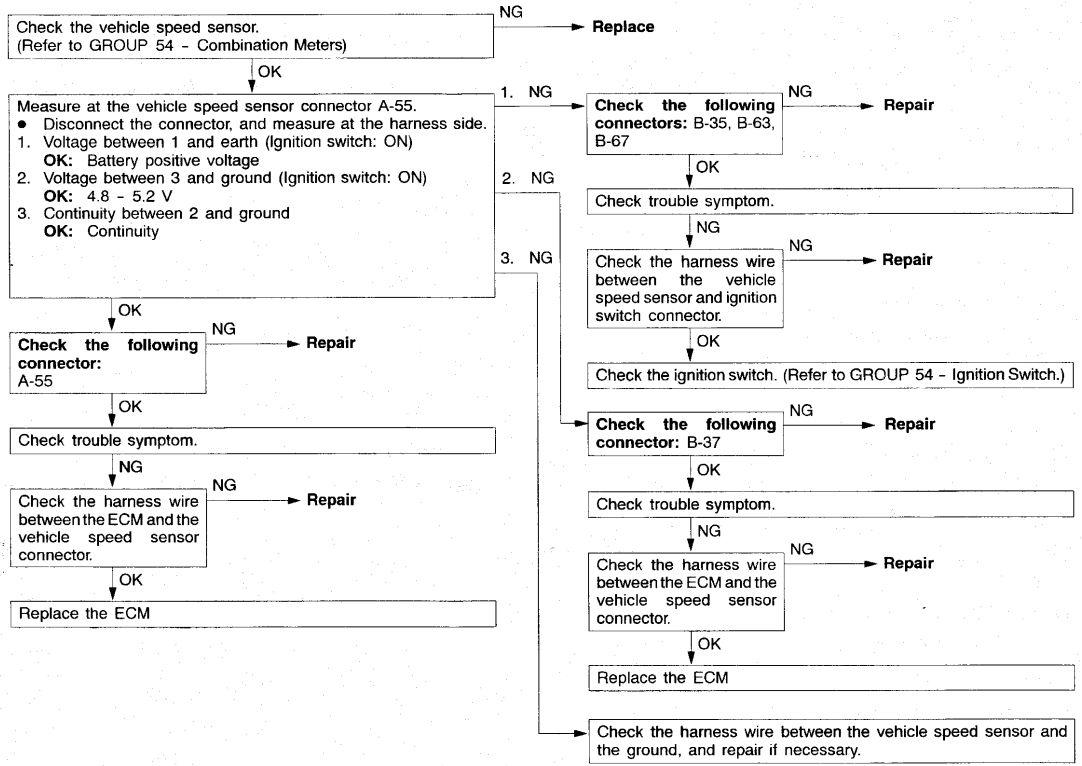
(3) Clamp off the vacuum hose one component at a time working towards the front of the vehicle until leakage is found (number 1 to 5 hoses shown in the illustration).

(4) Repair the leakage at that location and go to Step 15.

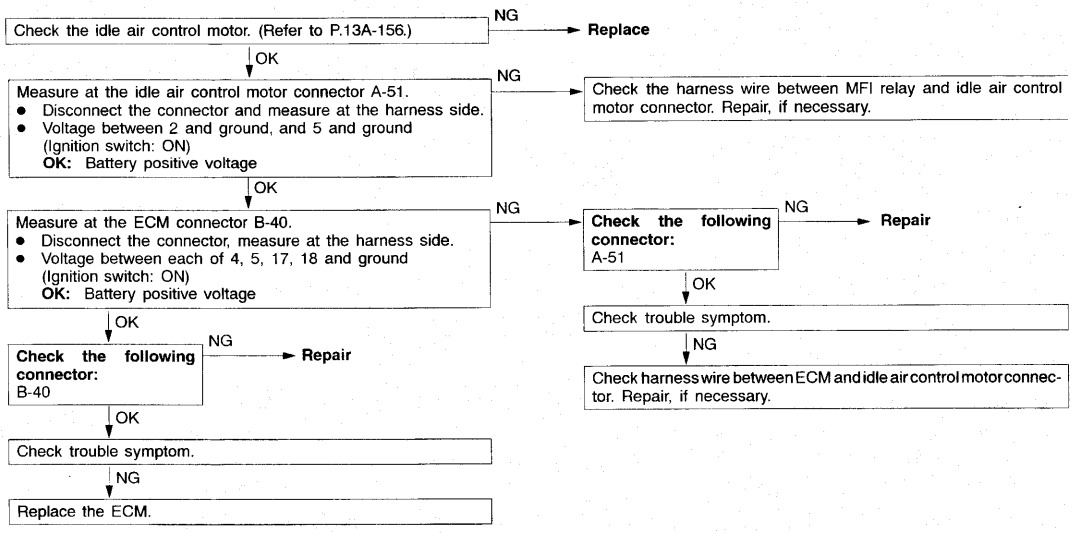
STEP 15. Confirmation test.

After system failures are repaired, repeat the Evaporative Emission System Leak Monitor test (Step 2) to check that the EVAP system operates correctly.

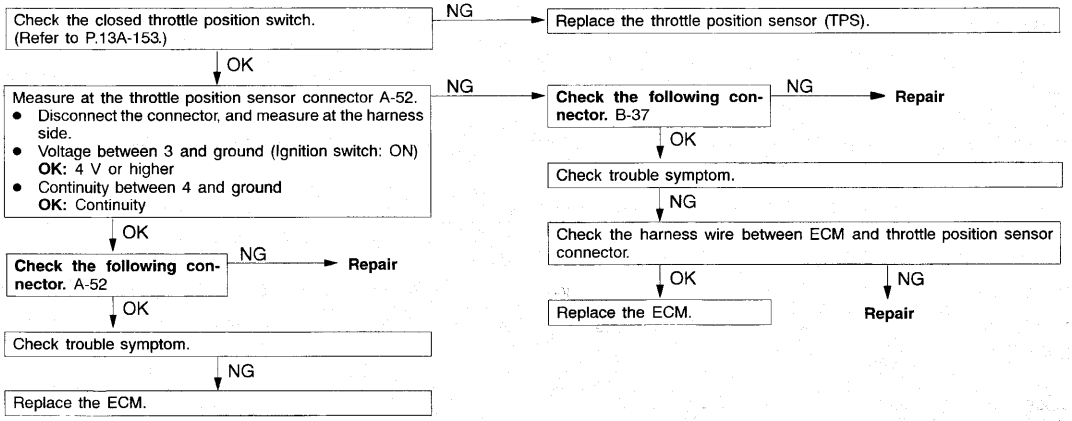
Code No. P0500 Vehicle Speed Sensor Malfunction	Probable cause
Background • The vehicle speed sensor outputs a pulse signal while the vehicle is driven. • The engine control module checks whether the pulse signal is output. Check Area • At least 2 seconds have passed since the engine was started. • Closed throttle position switch: OFF • Engine speed is not lower than 3000 r/min. • Intake air pipe pressure is 83 kPa (12 psi) or more. Judgment Criteria • Sensor output voltage has not changed (no pulse signal is input) for 2 sec.	• Vehicle speed sensor failed • Open or shorted vehicle-speed sensor circuit, or loose connector • Engine control module failed



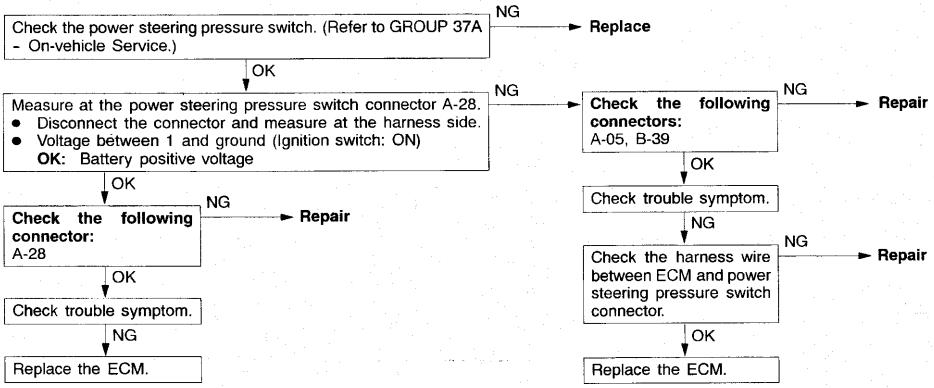
Code No. P0505 Idle Control System Malfunction	Probable cause
Background • If there is a malfunction of the IAC system, the actual engine speed will not be identical to the target engine speed. • The engine control module checks the difference between the actual engine speed and the target engine speed. Check Area • Vehicle speed has reached 1.5 km/h (0.93 mph) 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 (0.93 mph) at least once. • During idle speed closed loop control • The highest temperature at the last drive is 45°C (113°F) or less. • Engine coolant temperature is approx. 80°C (176°F) 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 (176°F) or higher. • Battery voltage is 10 V or higher. • Power steering switch is off. • Intake air pipe pressure is 53 kPa (7.7 psi) or less. • Intake air temperature is -10°C (14°F) or more. Judgment Criteria • Actual idle speed has been minimum 100 r/min higher than the target idle speed for ten seconds.	• Idle air control motor failed • Open or shorted idle air control motor circuit, or loose connector. • Engine control module failed.



Code No. P0510 Closed Throttle Position Switch Malfunction	Probable cause
Background • While the engine is idling without depressing the accelerator pedal, "ON" signal can be input from the closed throttle position switch to the engine control module. • The engine control module is used for checking the input signal while the engine is idling or the accelerator pedal is depressed slightly. Check Area • Throttle position sensor output voltage is 2.0 V or more. Judgment Criteria • Closed throttle position switch has been turned on. Check Area • Repeat the *1 drive and *2 stop 15 times. *1 drive: Engine speed is 1500 r/min or more, intake air pipe pressure is 40 kPa (5.8 psi) or more for two seconds or more. *2 stop: Vehicle speed is 1.5 km/h (0.93 mph) or lower. Judgment Criteria • Closed throttle position switch remains off.	• Closed throttle position switch failed. • Open or shorted closed throttle position switch circuit, or loose connector. • Engine control module failed.



Code No.P0551 Power Steering Pressure Sensor Circuit Range/Performance	Probable cause
Background • The steering wheel will be set to the straight-ahead position for a while during driving. At that time the power steering pressure switch will be turned off. • The engine control module checks whether the power steering pressure switch is turned off during drive. Check Area • Intake air temperature is -10°C (14°F) or higher. • Barometric pressure is 76 kPa (11 psi) or higher. • Engine coolant temperature is 30°C (86°F) or more. • Repeat *1 drive and *2 stop ten times or more. *1: Engine speed is 2,500 r/min or higher, intake air pipe pressure is 75 kPa (10.8 psi) and vehicle speed is 5 km/h (3.1 mph) or higher for at least 4 seconds. *2: Vehicle speed is 1.5 km/h (0.93 mph) or lower. Judgment Criteria • Power steering pressure switch remains on.	• Power steering pressure switch failed. • Open or shorted power steering pressure switch circuit, or loose connector • Engine control module failed.



Code No. P0705 Transmission Range Sensor Circuit Malfunction (RPNDL Input)	Probable cause
Background • When a malfunction of the park/neutral position switch is detected, the transaxle control module outputs a malfunction signal to the engine control module. Range of Check, Set Conditions • A park/neutral position switch malfunction signal is input to the engine control module from the transaxle control module.	• Park/neutral position switch failed. • Open or shorted Park/neutral position switch circuit, or loose connector. • Engine control module failed.

Check the automatic transaxle diagnostic trouble codes. (Refer to GROUP 23A - Troubleshooting)

Code No. P0710 Transmission Fluid Temperature Sensor Circuit Malfunction	Probable cause
Background • When a malfunction of the fluid temperature sensor is detected, the transaxle control module outputs a malfunction signal to the engine control module. Check Area Judgment Criteria • The signal which indicates the failure of the oil temperature sensor is input from the transaxle control module to the engine control module.	• Oil temperature sensor failed. • Open or shorted oil temperature sensor circuit, or loose connector • Engine control module failed.

Check the automatic transaxle diagnostic trouble codes. (Refer to GROUP 23A - Troubleshooting)

Code No. P0715 Input/Turbine Speed Sensor Circuit Malfunction	Probable cause
Background • When a malfunction of the input shaft speed sensor is detected, the transaxle control module outputs a malfunction signal to the engine control module. Check Area, Judgment Criteria • Input shaft speed sensor failure signal is input to the engine control module from the transaxle control module.	• Input shaft speed sensor failed. • Open or shorted Input shaft speed sensor circuit, or loose connector • Engine control module failed.

Check the automatic transaxle diagnostic trouble codes.
(Refer to GROUP 23A - Troubleshooting.)

Code No. P0720 Output Speed Sensor Circuit Malfunction	Probable cause
Background • When a malfunction of the output shaft speed sensor is detected, the transaxle control module outputs a malfunction signal to the engine control module. Check Area, Judgment Criteria • Output shaft speed sensor failure signal is input to the engine control module from the transaxle control module.	• Output shaft speed sensor failed. • Open or shorted output shaft speed sensor circuit, or loose connector • Engine control module failed.

Check the automatic transaxle diagnostic trouble codes.
(Refer to GROUP 23A - Troubleshooting.)

Code No. P0725 Engine Speed Input Circuit Malfunction	Probable cause
Background • When a malfunction of the crankshaft position sensor is detected, the transaxle control module outputs a malfunction signal to the engine control module. Check Area, Judgment Criteria • Crankshaft position sensor failure signal is input to the engine control module from the transaxle control module.	• Crankshaft position sensor failed. • Open or shorted input shaft speed sensor circuit, or loose connector • Engine control module failed.

Check the automatic transaxle diagnostic trouble codes.
(Refer to GROUP 23A - Troubleshooting.)

Code No. P0740 Torque Converter Clutch System Malfunction	Probable cause
Background • When a malfunction of the torque converter clutch or its related system is detected, the transaxle control module outputs a malfunction signal to the engine control module. Check Area, Judgment Criteria • Failure signal of the torque converter clutch or its related system is input to the engine control module form the transaxle control module.	• Torque converter clutch or its related system failed. • Open or shorted torque converter clutch or its related system circuit, or loose connector • Engine control module failed.

Check the automatic transaxle diagnostic trouble codes.
(Refer to GROUP 23A - Troubleshooting.)

Code No. P0750 Shift Solenoid A Malfunction	Probable cause
Background • When a malfunction of the shift solenoid A (Low-reverse solenoid) is detected, the transaxle control module outputs a malfunction signal to the engine control module. Check Area, Judgment Criteria • Low-reverse solenoid failure signal is input to the engine control module from the transaxle control module.	• Low-reverse solenoid failed. • Open or shorted low-reverse solenoid circuit, or loose connector. • Engine control module failed.

Check the automatic transaxle diagnostic trouble codes.
(Refer to GROUP 23A - Troubleshooting.)

Code No. P0755 Shift Solenoid B Malfunction	Probable cause
Background • When a malfunction of the shift solenoid B (Underdrive solenoid) is detected, the transaxle control module outputs a malfunction signal to the engine control module. Check Area, Judgment Criteria • Underdrive solenoid failure signal is input to the engine control module from the transaxle control module.	• Underdrive solenoid failed. • Open or shorted underdrive solenoid circuit, or loose connector. • Engine control module failed.

Check the automatic transaxle diagnostic trouble codes.
(Refer to GROUP 23A - Troubleshooting.)

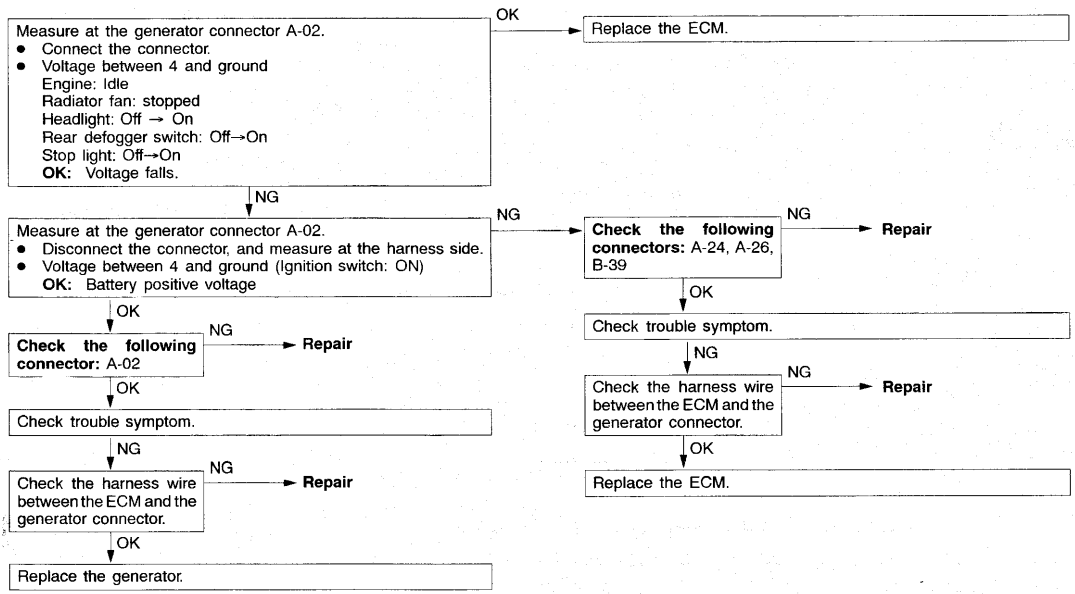
Code No. P0760 Shift Solenoid C Malfunction	Probable cause
Background • When a malfunction of the shift solenoid C (Second solenoid) is detected, the transaxle control module outputs a malfunction signal to the engine control module. Check Area, Judgment Criteria • Second solenoid failure signal is input to the engine control module form the transaxle control module.	• Second solenoid failed. • Open or shorted second solenoid circuit, or loose connector • Engine control module failed.

Check the automatic transaxle diagnostic trouble codes.
(Refer to GROUP 23A - Troubleshooting.)

Code No. P0765 Shift Solenoid D Malfunction	Probable cause
Background • When a malfunction of the shift solenoid D (Overdrive solenoid) is detected, the transaxle control module outputs a malfunction signal to the engine control module. Check Area, Judgment Criteria • Overdrive solenoid failure signal is input to the engine control module from the transaxle control module.	• Overdrive solenoid failed. • Open or shorted overdrive solenoid circuit, or loose connector • Engine control module failed.

Check the automatic transaxle diagnostic trouble codes.
(Refer to GROUP 23A - Troubleshooting.)

Code No. P1500 Generator FR Terminal Circuit Malfunction	Probable cause
Background • When the generator field coils is controlled, the generator FR terminal inputs a signal to the engine control module. • The engine control module detects the generator output with the input signal, and controls the idle air control motor according to the generator output. Check Area • Engine speed is higher than 50 r/min. Judgment Criteria • Input voltage from the generator FR terminal has been equal to battery positive voltage for 20 seconds.	• Open circuit in generator FR terminal circuit • Engine control module failed



Code No. P1600 Serial Communication Link Malfunction	Probable cause
Background • The engine control module receives various messages from the transaxle control module via communication line. • The engine control module monitors an abnormal message signal due to open circuit in communication line and transaxle control module failure. Check Area • Two seconds or more have passed immediately after the engine started. Judgment Criteria • Abnormal communication line (TCM to ECM) with the transaxle control module (TCM) • Transaxle control module (TCM) failed.	• Automatic transaxle control system failed. • Open or short circuit, or loose connector in communication line between engine control module and transaxle control module • Transaxle control module failed. • Engine control module failed.

Check the following connectors:
B-38, B-40
NG → **Repair**
OK ↓
Check trouble symptom.
NG ↓
Check the harness wire between the ECM and the transaxle control module connector.
NG → **Repair**
OK ↓
Automatic transaxle control system may be defective. Follow the automatic transaxle troubleshooting. (Refer to GROUP 23A - Troubleshooting.)
OK ↓
Replace the ECM.

Code No. P1720 Vehicle Speed Sensor Signal Line Malfunction	Probable cause
Background • When a malfunction of the vehicle speed sensor is detected, the transaxle control module outputs a malfunction signal to the engine control module. Check Area, Judgment Criteria • Vehicle speed sensor failure signal is input to the engine control module from the transaxle control module.	• Vehicle speed sensor failed. • Open or shorted output vehicle speed sensor circuit, or loose connector • Engine control module failed.

Check the automatic transaxle diagnostic trouble codes. (Refer to GROUP 23A - Troubleshooting.)

Code No. P1751 A/T Control Relay Malfunction	Probable cause
Background • When a malfunction of the A/T control relay is detected, the transaxle control module outputs a malfunction signal to the engine control module. Check Area, Judgment Criteria • A/T control relay failure signal is input to the engine control module from the transaxle control module.	• A/T control relay failed. • Open or shorted output A/T control relay circuit, or loose connector • Engine control module failed.

Check the automatic transaxle diagnostic trouble codes. (Refer to GROUP 23A - Troubleshooting.)

Code No. P1795 Throttle Position Input Circuit Malfunction	Probable cause
Background • When a malfunction of the throttle position sensor is detected, the transaxle control module outputs a malfunction signal to the engine control module. Check Area, Judgment Criteria • Throttle position sensor failure signal is input to the engine control module from the transaxle control module.	• Throttle position sensor failed. • Open or shorted input shaft speed sensor circuit, or loose connector • Engine control module failed.

Check the automatic transaxle diagnostic trouble codes. (Refer to GROUP 23A - Troubleshooting.)

INSPECTION CHART FOR TROUBLE SYMPTOMS

13100880644

Trouble symptom		Inspection procedure No.	Reference Page
Communication with scan tool is impossible.	Communication with all systems is not possible.	1	13A-91
	Communication with ECM only is not possible.	2	13A-91
Service Engine Soon/ Malfunction Indicator Lamp and related parts	The Service Engine Soon/Malfunction Indicator Lamp does not illuminate right after the ignition switch is turned to the ON position.	3	13A-92
	The Service Engine Soon/Malfunction Indicator Lamp remains illuminated and never goes out.	4	13A-93
Starting	Cranks, won't start	5	13A-93
	Fires up and dies	6	13A-94
	Hard starting	7	13A-95
Idling stability (Improper idling)	Unstable idle. (Rough idle, hunting)	8	13A-96
	Idle speed is high. (Improper idle speed)	9	13A-97
	Idle speed is low. (Improper idle speed)	10	13A-98
Idling stability (Engine stalles)	When the engine is cold, it stalls at idle (Die out)	11	13A-99
	When the engine becomes hot, it stalls at idle. (Die out)	12	13A-100
	The engine stalls when accelerating. (Pass out)	13	13A-101
	The engine stalls when decelerating.	14	13A-101
Driving	Hesitation, sag or stumble	15	13A-102
	Acceleration shock	16	13A-102
	Deceleration shock	17	13A-103
	Poor acceleration	18	13A-103
	Surge	19	13A-104
	Knocking	20	13A-104
Dieseling		21	13A-104
Too high CO and HC concentration when idling		22	13A-105
Generator output voltage is low (approx. 12.3V)		23	13A-106
Fans (radiator fan, A/C condenser fan) are inoperative		24	13A-106
IM240 test failure	Transient, mass emission tailpipe test	25	13A-107
	Purge flow test of the evaporative canister	26	13A-108
	Pressure test of the evaporative system	27	13A-108

PROBLEM SYMPTOMS TABLE (FOR YOUR INFORMATION)

Items		Symptom
Starting Idling stability	Won't start	The starter is used to crank the engine, but there is no combustion within the cylinders, and the engine won't start.
	Fires up and dies	There is combustion within the cylinders, but then the engine soon stalls.
	Hard starting	Engine starts after cranking a while.
Starting Idling stability	Hunting	Engine speed doesn't remain constant; changes at idle.
	Rough idle	Usually, a judgement can be based upon the movement of the tachometer pointer, and the vibration transmitted to the steering wheel, shift lever, body, etc. This is called rough idle.
	Incorrect idle speed	The engine doesn't idle at the usual correct speed.
	Engine stall (Die out)	The engine stalls when the foot is taken from the accelerator pedal, regardless of whether the vehicle is moving or not.
	Engine stall (Pass out)	The engine stalls when the accelerator pedal is depressed or while it is being used.
Driving	Hesitation Sag	"Hesitation" is the delay in response of the vehicle speed (engine speed) that occurs when the accelerator is depressed in order to accelerate from the speed at which the vehicle is now traveling, or a temporary drop in vehicle speed (engine speed) during such acceleration. Serious hesitation is called "sag". (Refer to Fig. 1)
	Poor acceleration	Poor acceleration is inability to obtain an acceleration corresponding to the degree of throttle opening, even though acceleration is smooth, or the inability to reach maximum speed.
	Stumble	Engine speed increase is delayed when the accelerator pedal is initially depressed for acceleration. (Refer to Fig. 2)
	Shock	The feeling of a comparatively large impact or vibration when the engine is accelerated or decelerated.
	Surge	This is slight acceleration and deceleration feel usually felt during steady, light throttle cruise. Most notable under light loads.
	Knocking	A sharp sound like a hammer striking the cylinder walls during driving and which adversely affects driving.
Stopping	Run on ("Dieseling")	The condition in which the engine continues to run after the ignition switch is turned to OFF. Also called "Dieseling".

Fig. 1

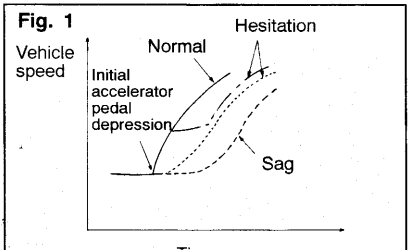
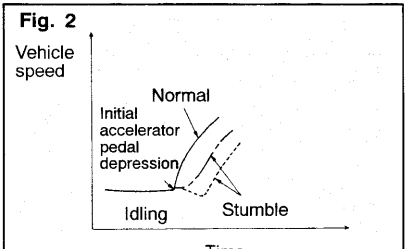


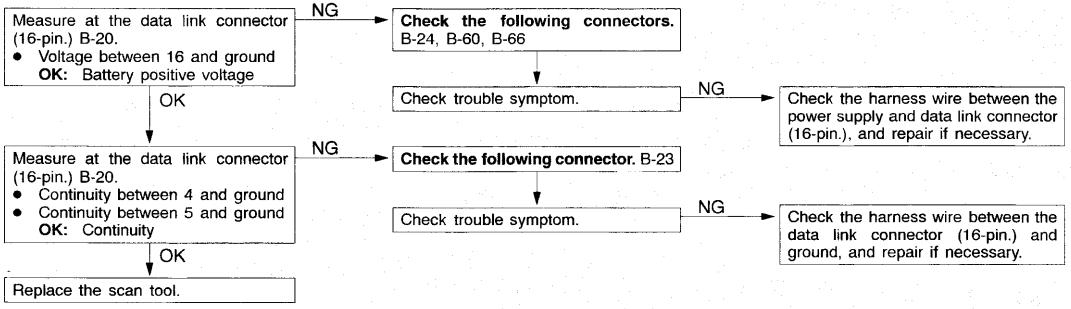
Fig. 2



INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

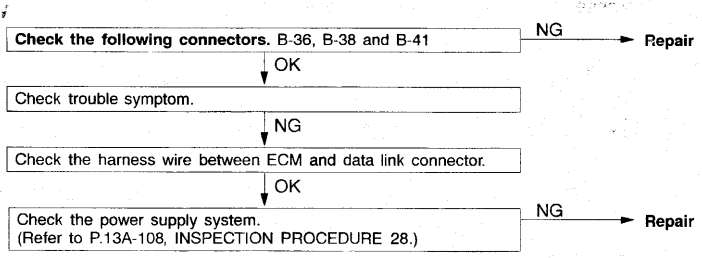
INSPECTION PROCEDURE 1

Communication with scan tool is not possible. (Communication with all systems is not possible.)	Probable cause
The cause is probably a defect in the power supply system (including ground) for the on-board diagnostic test mode line.	• Malfunction of the connector • Malfunction of the harness wire



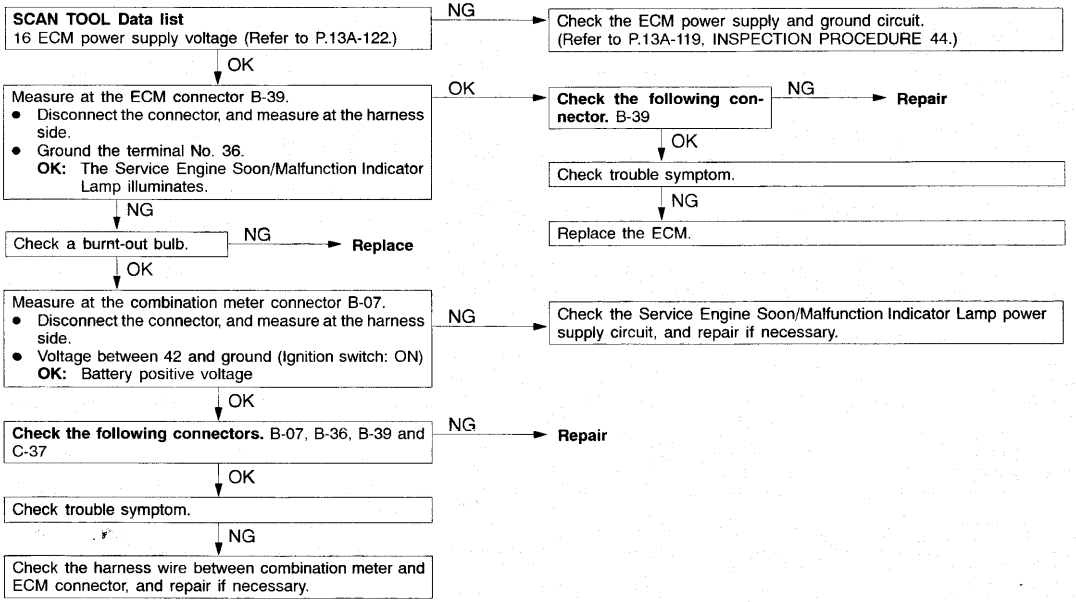
INSPECTION PROCEDURE 2

Scan tool communication with ECM is not possible.	Probable cause
One of the following causes may be suspected. • No power supply to ECM • Defective ground circuit of ECM • Defective ECM • Improper communication line between ECM and scan tool	• Malfunction of ECM power supply circuit • Malfunction of the ECM • Open circuit between ECM and data link connector



INSPECTION PROCEDURE 3

The Service Engine Soon/Malfunction Indicator Lamp does not illuminate right after the ignition switch is turned to the ON position.	Probable cause
The ECM causes the Service Engine Soon/MalfunctionIndicator Lamp to illuminate for five seconds immediately after the ignition switch is turned to ON. If the Service Engine Soon/Malfunction Indicator 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 Service Engine Soon/Malfunction Indicator Lamp circuit • Malfunction of the ECM



INSPECTION PROCEDURE 4

The Service Engine Soon/Malfunction Indicator Lamp remains illuminated and never goes out.	Probable cause
In cases such as the above, the cause is probably that the ECM is detecting a problem in a sensor or actuator, or that one of the malfunctions listed at right has occurred.	• Short-circuit between the Service Engine Soon/Malfunction Indicator Lamp and ECM • Malfunction of the ECM

SCAN TOOL DTC
Are diagnostic trouble codes output?
- YES → Refer to P.13A-24, INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES
- NO ↓

Measure at the combination meter connector B-07.
- Disconnect the connector, and measure at the harness side.
- Disconnect the ECM connector.
- Continuity between 53 and ground
  OK: No continuity

- NG → Check the harness wire between combination meter and ECM connector, and repair if necessary.
- OK ↓

Replace the ECM.

INSPECTION PROCEDURE 5

Cranks, won't start	Probable cause
In cases such as the above, the cause is probably no spark, or fuel delivery or fuel quality problems. In addition, foreign materials (water, kerosene, etc.) may be mixed with the fuel.	• Malfunction of the ignition system • Malfunction of the fuel pump system • Malfunction of the injectors • Malfunction of the ECM • Foreign materials in fuel

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

Scan tool: Inspection of no initial combustion. (Refer to P.13A-113, INSPECTION PROCEDURE 36.)
- OK ↓

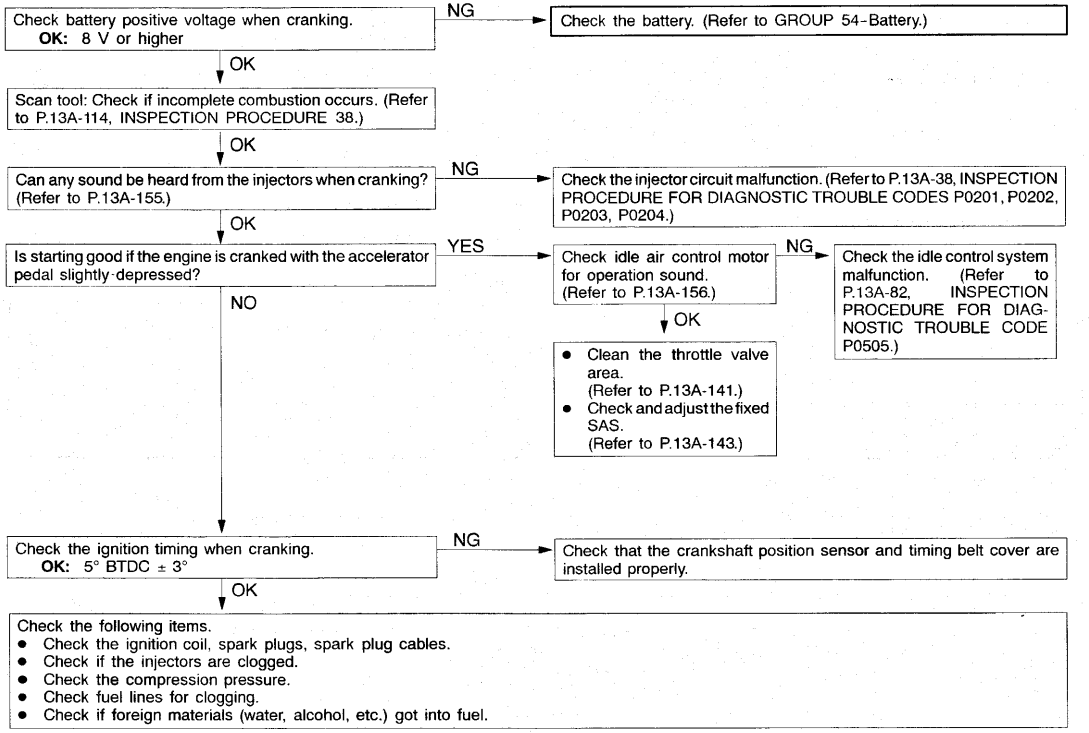
Can any sound be heard from the injectors when cranking? (Refer to P.13A-155.)
- NG → Check the injector circuit malfunction. (Refer to P.13A-38, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES P0201, P0202. P0203, P0204.)
- OK ↓

Ignition system: Inspection of no initial combustion. (Refer to P.13A-114, INSPECTION PROCEDURE 37.)
- OK ↓

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables.
- Check if the injectors are clogged.
- Check if foreign materials (water, alcohol, etc.) got into fuel.
- Check the compression pressure.

INSPECTION PROCEDURE 6

Fires up and dies.	Probable cause
In such cases as the above, the cause is usually improper air/fuel mixture. It is possible, though less likely, that the spark plugs are generating sparks but the sparks are weak.	• Malfunction of the ignition system • Malfunction of the injector system • Foreign materials in fuel • Poor compression • Malfunction of the ECM



INSPECTION PROCEDURE 7

Hard starting	Probable cause
In cases such as the above, the cause is probably that the spark is weak and ignition is difficult, the initial mixture for starting is not appropriate, or sufficient compression pressure is not being obtained.	• Malfunction of the ignition system • Malfunction of the injector system • Inappropriate fuel quality • Poor compression

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

Scan tool: Check if incomplete combustion occurs. (Refer to P.13A-114, INSPECTION PROCEDURE 38.)
OK ↓

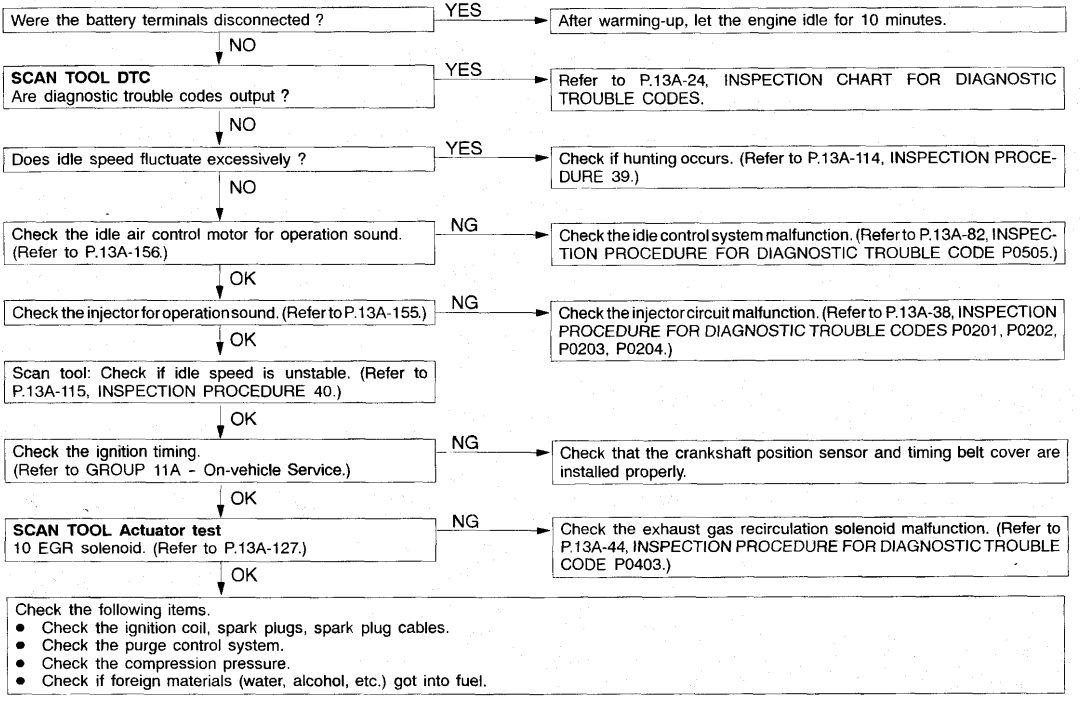
Can any sound be heard from the injectors when cranking? (Refer to P.13A-155.)
NG → Check the injector circuit malfunction. (Refer to P.13A-38, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0201, P0202, P0203, P0204.)
OK ↓

Check the ignition timing when cranking.
OK: 5° BTDC ± 3°
NG → Check that the crankshaft position sensor and timing belt cover are installed properly.
OK ↓

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 fuel.

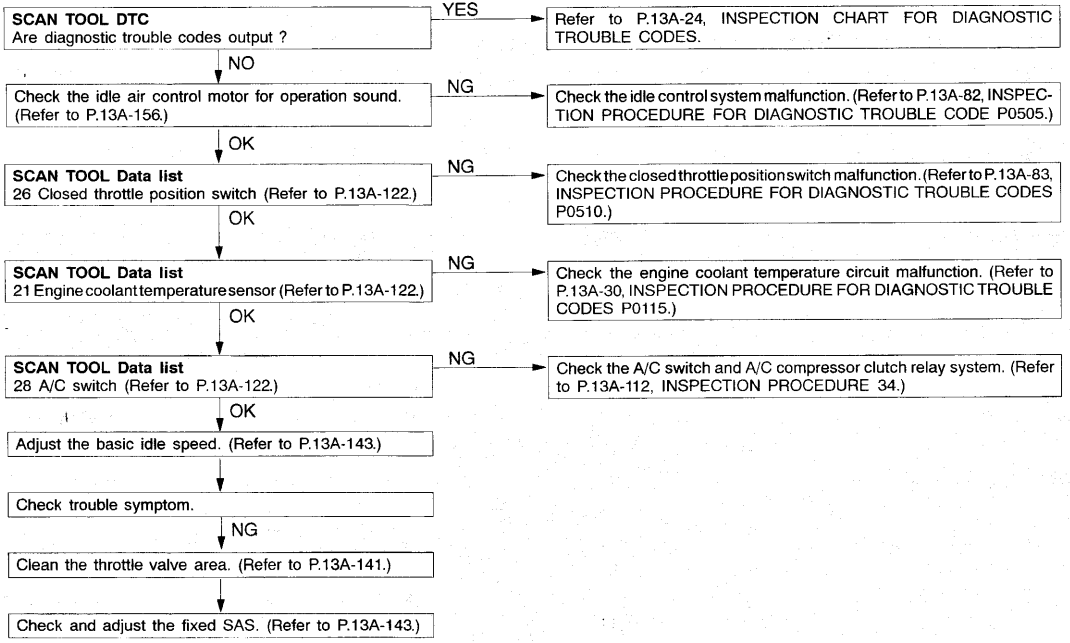
INSPECTION PROCEDURE 8

Unstable idle (Rough idle, hunting)	Probable cause
In cases such as the above, the cause is probably that the ignition system, air/fuel mixture, idle air control motor or compression pressure is defective. Because the range of possible causes is broad, inspection is narrowed down to simple items.	• Malfunction of the ignition system • Malfunction of air-fuel ratio control system • Malfunction of the IAC system • Malfunction of the evaporative emission purge solenoid system • Poor compression • Vacuum leak • Malfunction of the EGR solenoid system



INSPECTION PROCEDURE 9

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



INSPECTION PROCEDURE 10

Idle speed is low. (Improper idle 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 idle air control motor system • Malfunction of the throttle body

SCAN TOOL DTC
Are diagnostic trouble codes output ?
YES → Refer to P.13A-24, INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES.
NO ↓

Check the idle air control motor for operation sound. (Refer to P.13A-156.)
NG → Check the idle control system malfunction. (Refer to P.13A-82, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0505.)
OK ↓

SCAN TOOL Data list
26 Closed throttle position switch (Refer to P.13A-122.)
NG → Check the closed throttle position switch malfunction. (Refer to P.13A-83, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES P0510.)
OK ↓

SCAN TOOL Data list
21 Engine coolant temperature sensor (Refer to P.13A-122.)
NG → Check the engine coolant temperature circuit malfunction. (Refer to P.13A-30, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES P0115.)
OK ↓

SCAN TOOL Data list
29 Park/neutral position switch (Refer to P.13A-122.)
NG → Check the ignition switch-ST and park/neutral position switch system. (Refer to P.13A-111, INSPECTION PROCEDURE 32.)
OK ↓

Adjust the basic idle speed. (Refer to P.13A-143.)
↓

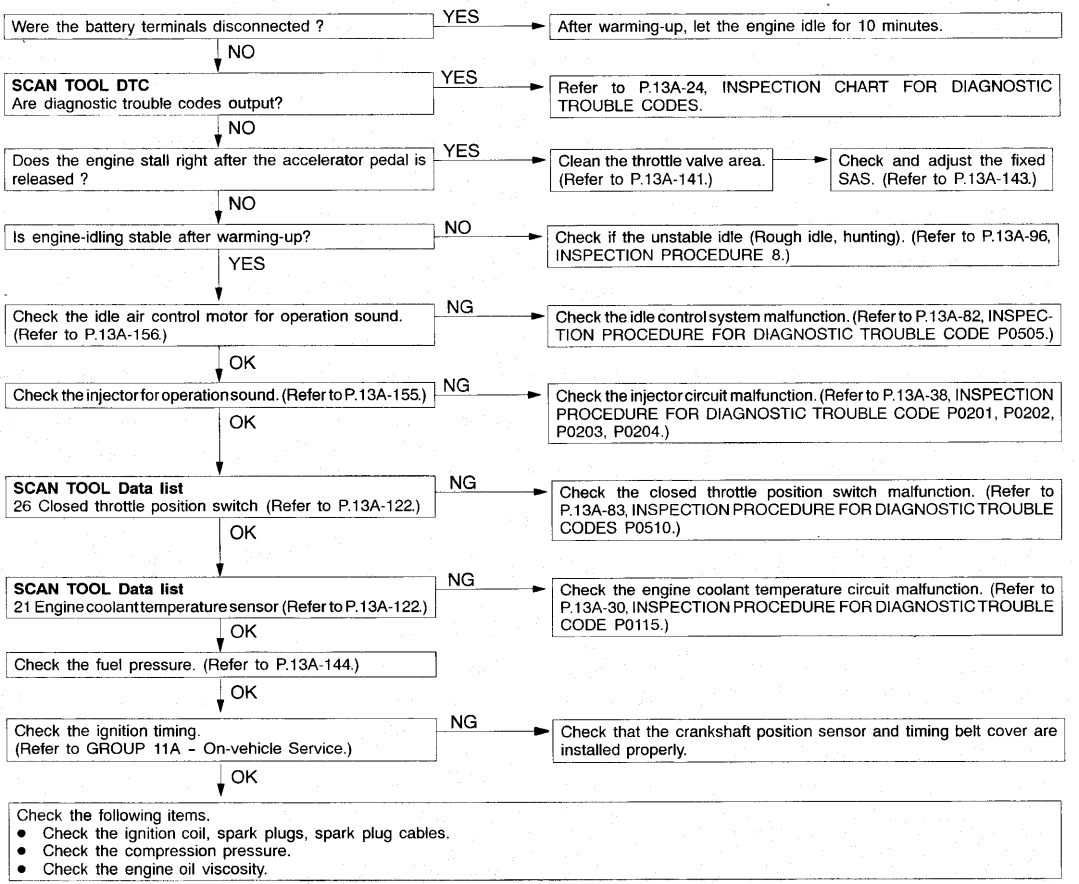
Check trouble symptom.
NG ↓

Clean the throttle valve area. (Refer to P.13A-141.)
↓

Check and adjust the fixed SAS. (Refer to P.13A-143.)

INSPECTION PROCEDURE 11

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



INSPECTION PROCEDURE 12

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

Were the battery terminals disconnected ?
- YES → After warming-up, let the engine idle for 10 minutes.
- NO ↓

SCAN TOOL DTC
Are diagnostic trouble codes output?
- YES → Refer to P.13A-24, INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES.
- NO ↓

Check the idle air control motor for operation sound. (Refer to P.13A-156.)
- NG → Check the idle control system malfunction. (Refer to P.13A-82, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0505.)
- OK ↓

Check the injector for operation sound. (Refer to P.13A-155.)
- NG → Check the injector circuit malfunction. (Refer to P.13A-38, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0201, P0202, P0203, P0204.)
- OK ↓

Does the engine stall right after the accelerator pedal is released ?
- YES → Clean the throttle valve area. (Refer to P.13A-141.) → Check and adjust the fixed SAS. (Refer to P.13A-143.)
- NO ↓

Does the engine stall easily again ?
- NO → While carrying out an intermittent malfunction simulation test (Refer to GROUP 00 – How to Cope with Intermittent Malfunctions.), check for sudden changes in the signals shown below.
  - Crankshaft position sensor signal
  - Injector drive signal
  - Primary and secondary ignition signal
  - Fuel pump drive signal
  - ECM power supply voltage
- YES ↓

Scan tool: Engine stalling inspection when the engine is warm and idling (Refer to P.13A-116, INSPECTION PROCEDURE 41.)
- OK ↓

Check the ignition timing. (Refer to GROUP 11A - On-vehicle Service.)
- NG → Check that the crankshaft position sensor and timing belt cover are installed properly.
- OK ↓

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 fuel.

INSPECTION PROCEDURE 13

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

SCAN TOOL DTC
Are diagnostic trouble codes output?
YES → Refer to P.13A-24, INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES.
NO ↓

SCAN TOOL Actuator test
10 EGR solenoid (Refer to P.13A-127.)
NG → Exhaust gas recirculation solenoid malfunction (Refer to P.13A-44, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0403.)
OK ↓

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 air control motor system.	• Malfunction of the IAC system

Were the battery terminals disconnected ?
YES → After warming-up, let the engine idle for 10 minutes.
NO ↓

SCAN TOOL DTC
Are diagnostic trouble codes output?
YES → Refer to P.13A-24, INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES.
NO ↓

SCAN TOOL Data list
26 Closed throttle position switch (Refer to P.13A-122.)
NG → Check the closed throttle position switch malfunction. (Refer to P.13A-83, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES P0510.)
OK ↓

SCAN TOOL Data list
14 Throttle position sensor (Refer to P.13A-122.)
NG → Check the throttle position circuit malfunction. (Refer to P.13A-31, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0120.)
OK ↓

SCAN TOOL Data list
55 Idle air control valve position sensor
- Is the idle speed control motor position dropped to 0-2 steps when decelerating (engine rpm more than 1,000)?

YES → Check the vehicle speed sensor malfunction (Refer to P.13A-81, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0500.)
NO ↓

SCAN TOOL Actuator test
10 EGR solenoid (Refer to P.13A-127.)
NG → Exhaust gas recirculation solenoid malfunction (Refer to P.13A-44, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0403.)
OK ↓

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables.
- Clean the throttle valve area.
- Check and adjust the fixed SAS.

INSPECTION PROCEDURE 15

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

SCAN TOOL DTC
Are diagnostic trouble codes output ?
YES → Refer to P.13A-24, INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES.
NO ↓

Check the injectors for operation sound. (Refer to P.13A-155.)
NG → Check the injector circuit malfunction. (Refer to P.13A-38, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0201, P0202, P0203, P0204.)
OK ↓

Check the ignition timing.
(Refer to GROUP 11A - On-vehicle Service.)
NG → Check that the crankshaft position sensor and timing belt cover are installed properly.
OK ↓

Scan Tool: Check if hesitation, sag, stumble or poor acceleration occur. (Refer to P.13A-117, INSPECTION PROCEDURE 42.)
OK ↓

Check the fuel pressure. (Refer to P.13A-144.)
OK ↓

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables.
- Check the EGR system.
- Check the compression pressure.
- Check the fuel filter or fuel line for clogging.

INSPECTION PROCEDURE 16

Acceleration shock	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

SCAN TOOL DTC
Are diagnostic trouble codes output ?
YES → Refer to P.13A-24, INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES.
NO ↓

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables.
- Check for occurrence of ignition leak.

INSPECTION PROCEDURE 17

Deceleration shock	Probable cause
Malfunction of the IAC system is suspected.	• Malfunction of the IAC system

SCAN TOOL DTC
Are diagnostic trouble codes output?
- YES → Refer to P.13A-24, INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES.
- NO ↓

Check the idle air control motor for operation sound. (Refer to P.13A-156.)
- NG → Check the idle control system malfunction. (Refer to P.13A-82, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0505.)
- OK ↓

SCAN TOOL Data list
14 Throttle position sensor (Refer to P.13A-122.)
- NG → Check the throttle position circuit malfunction. (Refer to P.13A-31, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0120.)
- OK ↓

SCAN TOOL Data list
26 Closed throttle position switch (Refer to P.13A-122.)
- NG → Check the closed throttle position switch malfunction. (Refer to P.13A-83, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES P0510.)
- OK ↓

Clean the throttle valve area. (Refer to P.13A-141.)

INSPECTION PROCEDURE 18

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

SCAN TOOL DTC
Are diagnostic trouble codes output ?
- YES → Refer to P.13A-24, INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES.
- NO ↓

Check the injectors for operation sound. (Refer to P.13A-155.)
- NG → Check the injector circuit malfunction. (Refer to P.13A-38, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES P0201, P0202, P0203, P0204.)
- OK ↓

Check the ignition timing. (Refer to GROUP 11A - On-vehicle Service.)
- NG → Check that the crankshaft position sensor and timing belt cover are installed properly.
- OK ↓

Scan tool: Check if hesitation, sag, stumble, or poor acceleration occur. (Refer to P.13A-117, INSPECTION PROCEDURE 42.)
- OK ↓

Check the fuel pressure. (Refer to P.13A-144.)
- OK ↓

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables.
- Check the compression pressure.
- Check the fuel filter or fuel line for clogging.
- Broken air intake hose
- Clogged air cleaner
- Clogged exhaust system

INSPECTION PROCEDURE 19

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

SCAN TOOL DTC
Are diagnostic trouble codes output ?
YES → Refer to P.13A-24, INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES.
NO ↓

Check the injectors for operation sound. (Refer to P.13A-155.)
NG → Check the injector circuit malfunction. (Refer to P.13A-38, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0201, P0202, P0203, P0204.)
OK ↓

Check the ignition timing.
(Refer to GROUP 11A - On-vehicle Service.)
NG → Check that the crankshaft position sensor and timing belt cover are installed properly.
OK ↓

Scan Tool: Check if surge occurs.(Refer to P.13A-118, INSPECTION PROCEDURE 43.)
OK ↓

Check the fuel pressure. (Refer to P.13A-144.)
OK ↓

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables.
- Check the EGR system.

INSPECTION PROCEDURE 20

Knocking	Probable cause
In cases such as the above, the cause is probably that the heat value of the spark plug is inappropriate or low fuel quality.	• Inappropriate heat value of the spark plug

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

INSPECTION PROCEDURE 21

Dieseling	Probable cause
Fuel leakage from injectors is suspected, or carbon build up.	• Fuel leakage from injectors

Check the injectors for fuel leakage.

INSPECTION PROCEDURE 22

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

SCAN TOOL DTC
Are diagnostic trouble codes output?
YES → Refer to P.13A-24, INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES.
NO ↓

Check the ignition timing.
(Refer to GROUP 11A - On-vehicle Service.)
NG → Check that the crankshaft position sensor and timing belt cover are installed properly.
OK ↓

SCAN TOOL Data list
21 Engine coolant temperature sensor.
(Refer to P.13A-122.)
NG → Check the engine coolant temperature circuit malfunction. (Refer to P.13A-30, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0115.)
OK ↓

SCAN TOOL Data list
13 Intake air temperature sensor (Refer to P.13A-122.)
NG → Check the intake air temperature circuit malfunction. (Refer to P.13A-29, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0110.)
OK ↓

SCAN TOOL Data list
59 Heated oxygen sensor (rear) (Refer to P.13A-122.)
- Transaxle : 2nd gear <M/T>, L range <A/T>
- Driving with the throttle wide open
  OK: 600 - 1,000 mV

NG → Check the oxygen sensor circuit malfunction (sensor 2). (Refer to P.13A-35, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0136.)
OK ↓

SCAN TOOL Data list
11 Heated oxygen sensor (front) (Refer to P.13A-122.)
OK: 600 - 1,000 mV when racing suddenly
NG → Check the oxygen sensor circuit malfunction (sensor 1). (Refer to P.13A-33, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0130.)
OK ↓

SCAN TOOL Data list
11 Heated oxygen sensor (front) (Refer to P.13A-122.)
OK: Repeat 0 - 400 mV and 600 - 1,000 mV alternately when idling.
OK → Replace the heated oxygen sensor (front).
↓
Check trouble symptom.
NG ↓

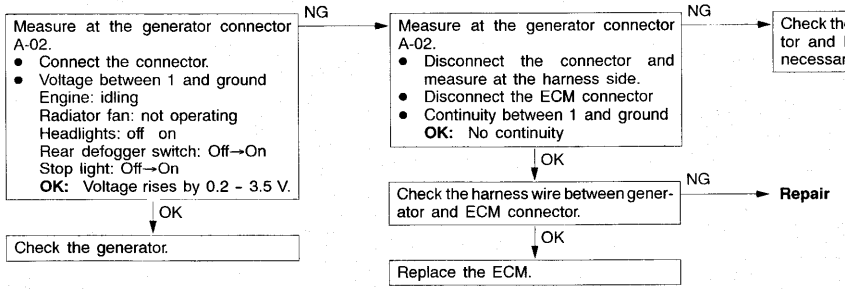
Check the fuel pressure. (Refer to P.13A-144.)
OK ↓

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 evaporative emission control system.
- Check the EGR system.

↓
Check trouble symptom.
NG ↓
Replace the three-way catalytic converter.

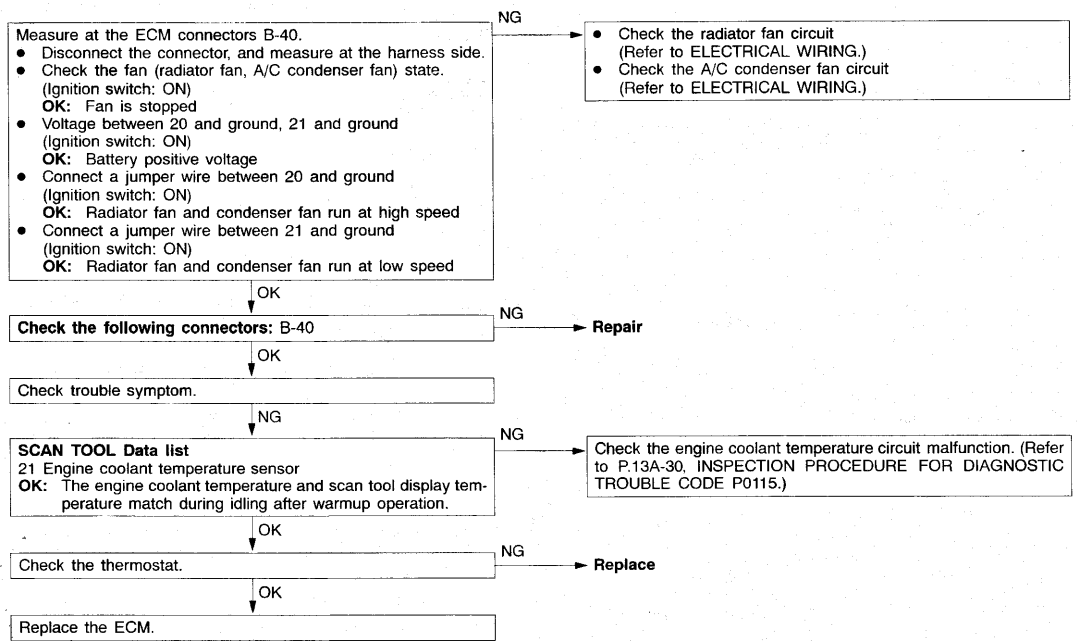
INSPECTION PROCEDURE 23

Low generator output voltage (approx. 12.3 V)	Probable cause
The cause may be a malfunction of the generator or one of the problems listed at right.	• Malfunction of charging system • Short-circuit in harness between Generator G terminal and engine control module • Malfunction of ECM



INSPECTION PROCEDURE 24

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



INSPECTION PROCEDURE 25

Transient, mass emission tailpipe test failure	Probable cause
The test is failed when the air-fuel ratio is not controlled to the ideal air-fuel ratio due to the feedback control by oxygen sensor signals, or when the EGR flow rate is insufficient, or the catalyst has deteriorated.	• Malfunction of the air-fuel ratio control system • Malfunction of the EGR system • Deteriorated catalyst

NOTE
If the three-way catalyst temperature is low when checking the exhaust gas, the three-way catalyst cannot sufficiently perform for cleaning the emission. Warm up the engine sufficiently before checking the exhaust, and check immediately.

Has the engine been warmed up sufficiently before checking the exhaust gas? (Confirm with owner)
NO → Sufficiently warm up the engine, and then check the exhaust.
Yes ↓

- Check all vacuum hoses and connectors.
- Check electrical wires and connectors for obvious problems.
- Check the exhaust system for missing or damage parts

NG → **Repair**
OK ↓

Does the vehicle have poor driveability?
YES → Refer to P.13A-89, INSPECTION CHART FOR TROUBLE SYMPTOMS.
NO ↓

SCAN TOOL DTC
Are diagnostic trouble code(s) output?
YES → Refer to P.13A-24, INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODE.
NO ↓

Check the ignition timing.
(Refer to GROUP 11A - On-vehicle Service.)
NG → Check that the crankshaft position sensor and timing belt cover are installed properly.
OK ↓

SCAN TOOL Data list
21 Engine coolant temperature sensor (Refer to P.13A-122.)
NG → Check the engine coolant temperature sensor circuit malfunction. (Refer to P.13A-30, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0115)
OK ↓

SCAN TOOL Data list
13 Intake air temperature sensor (Refer to P.13A-122.)
NG → Check the intake air temperature sensor circuit malfunction. (Refer to P.13A-29, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0110)
OK ↓

SCAN TOOL Data list
59 Heated oxygen sensor (rear)
- Transaxle: 2nd gear <M/T>, L range <A/T>
- Drive with wide open throttle

OK: 600 - 1000 mV
NG → Check the oxygen sensor circuit malfunction (sensor 2). (Refer to P.13A-35, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0136.)
OK ↓

SCAN TOOL Data list
11 Heated oxygen sensor (front)
OK: 600 - 1000 mV when racing suddenly
NG → Check the oxygen sensor circuit malfunction (sensor 1). (Refer to P.13A-33, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0130.)
OK ↓

SCAN TOOL Data list
11 Heated oxygen sensor (front)
OK: 0 - 400 mV ↔ 600 - 1000 mV alternately when idling and 2500 r/min
OK → Check the EGR system. (Refer to GROUP 17 - Emission Control System.)
OK ↓
NG ↓

Measure the CO concentration during idling.
OK: 0.5% or less
NG → Replace the heated oxygen sensor (front)
OK ↓

Check the fuel pressure. (Refer to P.13A-144.)
NG ↓
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 evaporative emission control system.

OK → Check trouble symptom.
NG ↓
Replace the three-way catalytic converter.

INSPECTION PROCEDURE 26

Evaporative canister purge flow test failure	Probable cause
The test fails when the purge line or purge port is clogged or if the evaporative emission purge solenoid fails.	• Purge line or purge port is clogged • Malfunction of evaporative emission purge solenoid • Evaporative emission canister is clogged

SCAN TOOL DTC
Are diagnostic trouble code output?
YES → Refer to P.13A-24, INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODE.
NO ↓
Check the evaporative emission purge system. (Refer to GROUP 17 - Emission Control System.)

INSPECTION PROCEDURE 27

Evaporative system pressure test failure	Probable cause
The test fails if there is a leak from the fuel tank or vapor line.	• Improper tightening of fuel tank filler tube cap clamp • Broken seal in fuel tank, vapor line evaporative emission canister

Check the evaporative emission purge solenoid (Refer to GROUP 17 - Emission Control System.)
NG → **Replace**
OK ↓
Check the evaporative emission ventilation solenoid (Refer to GROUP 17 - Emission Control System.)
NG → **Replace**
OK ↓
Check the following items.
- Check for leaks from the vapor line or evaporative emission canister.
- Check for leaks from the fuel tank.

INSPECTION PROCEDURE 28

Power supply system	Probable cause
While the ignition switch is ON, battery power is supplied to ECM, injectors, volume air flow sensor, etc. through MFI relay.	• Malfunction of the MFI relay • Improper connector contact, open circuit or short-circuited harness wire • Disconnected ECM ground wire • Malfunction of the ECM

Check the MFI relay. (Refer to P.13A-152.)
NG → **Replace**
OK ↓
Measure at the MFI relay connector B-32.
- Disconnect the connector, and measure at the harness side.

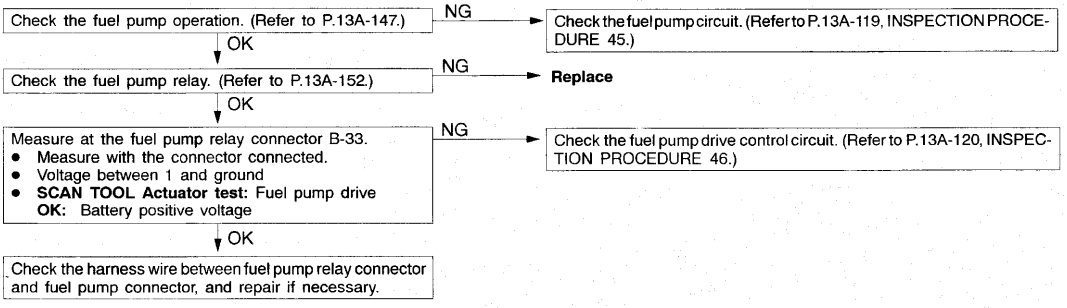
1. Voltage between 4 and ground
   OK: Battery positive voltage
2. Voltage between 3 and ground (Ignition switch: ON)
   OK: Battery positive voltage

1. NG → Check the harness wire between battery and MFI relay connector, and repair if necessary.
2. NG → **Check the following connector.** A-05
   NG → **Repair**
   OK ↓
   Check trouble symptom.
   NG ↓
   Check the harness wire between ignition switch and MFI relay connector.
   NG → **Repair**
   OK ↓
   Check the ignition switch (Refer to GROUP 54 – Ignition Switch.)

OK ↓
Check the ECM power supply and ground circuit. (Refer to P.13A-119, INSPECTION PROCEDURE 44.)

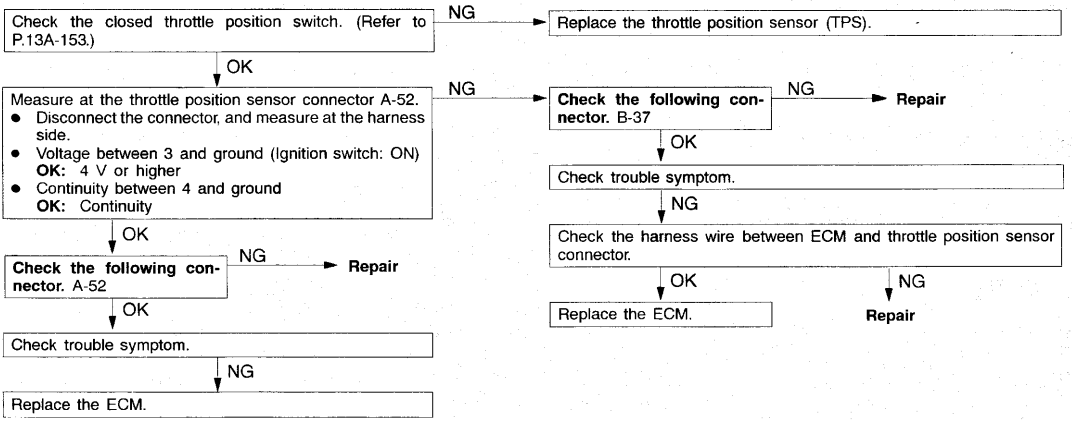
INSPECTION PROCEDURE 29

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



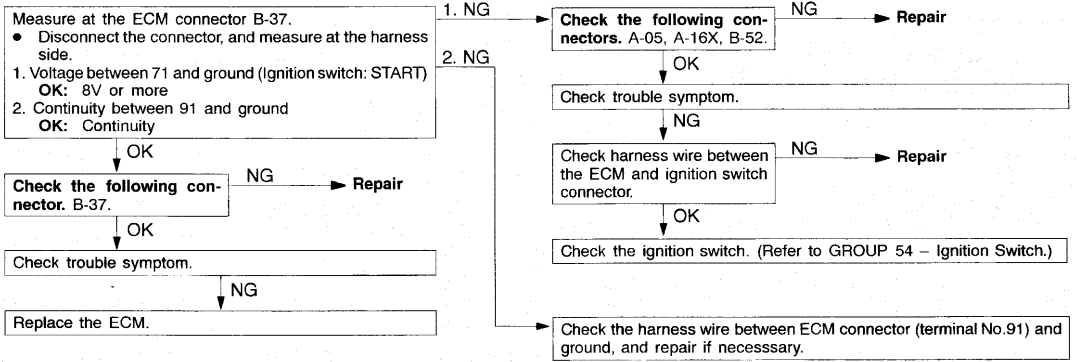
INSPECTION PROCEDURE 30

Closed throttle position switch system	Probable cause
The closed throttle position switch inputs the condition of the accelerator pedal, i.e. whether it is depressed or released (HIGH/LOW), to the ECM. The ECM controls the idle air control motor based on this input.	• Misadjustment of the accelerator pedal • Misadjustment of the fixed SAS • Misadjustment of the closed throttle position switch and throttle position sensor • Improper connector contact, open circuit or short-circuited harness wire • Malfunction of the ECM



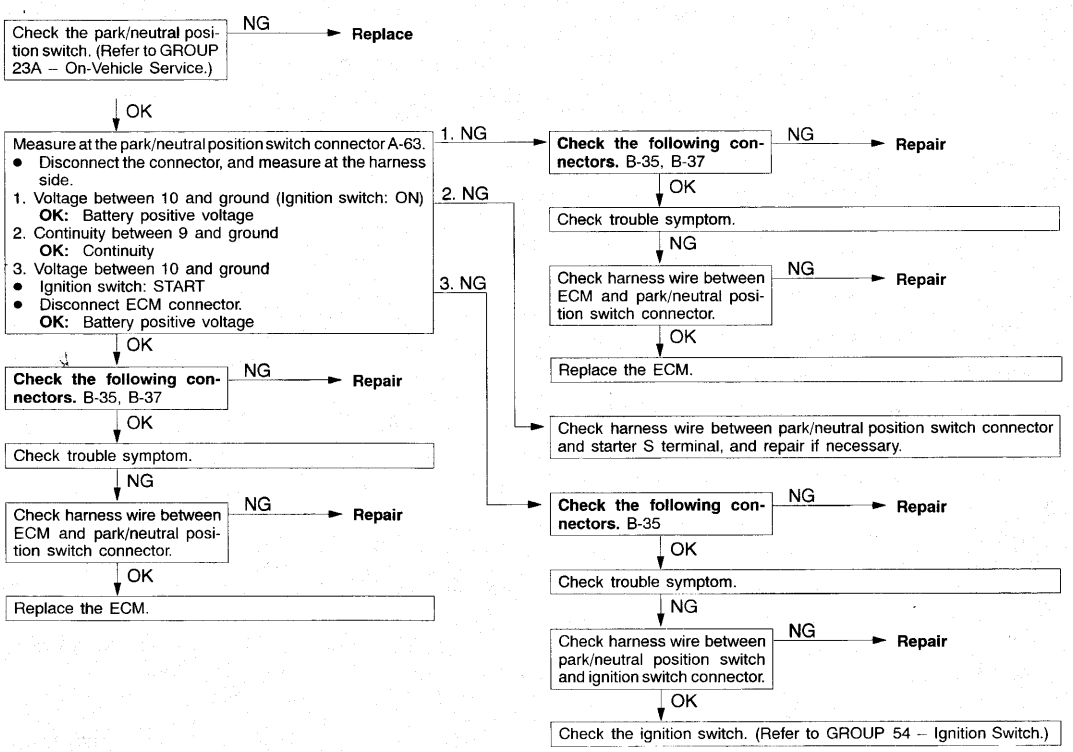
INSPECTION PROCEDURE 31

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



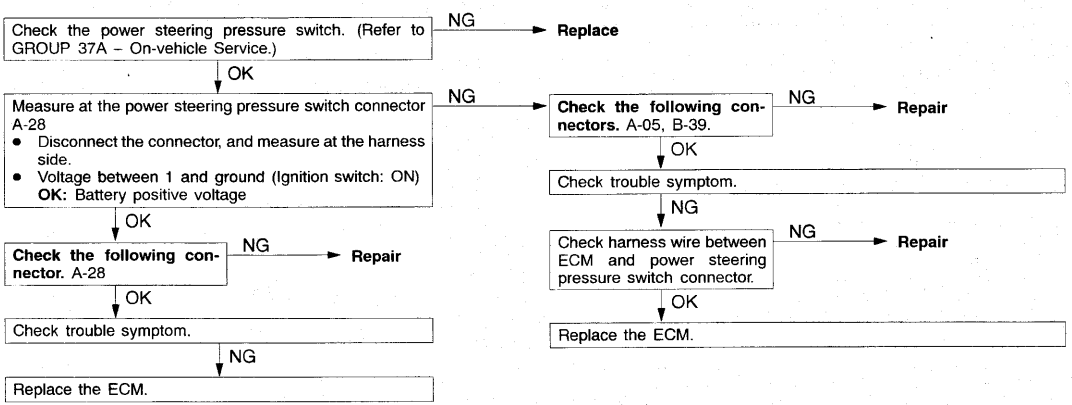
INSPECTION PROCEDURE 32

Ignition switch-ST and park/neutral position switch system <A/T>	Probable cause
• The ignition switch – ST inputs a HIGH signal to the ECM while the engine is cranking. The ECM controls fuel injection, etc. during starting based on this input. • The park/neutral position switch inputs the condition of the select lever, i.e. whether it is in P or N range or in some other range, to the ECM. The ECM controls the idle air control motor using this input.	• Malfunction of ignition switch • Malfunction of park/neutral position switch • Improper connector contact, open circuit or short-circuited harness wire • Malfunction of the ECM.



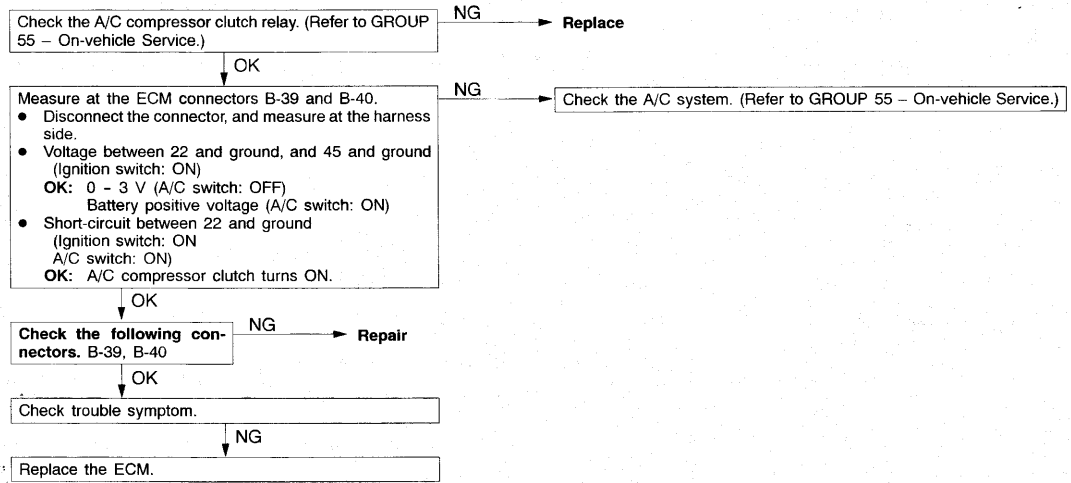
INSPECTION PROCEDURE 33

Power steering pressure switch system	Probable cause
The presence or absence of power steering load is input to the ECM. The ECM controls the idle air control motor using this input.	• Malfunction of power steering pressure switch • Improper connector contact, open circuit or short-circuited harness wire • Malfunction of the ECM



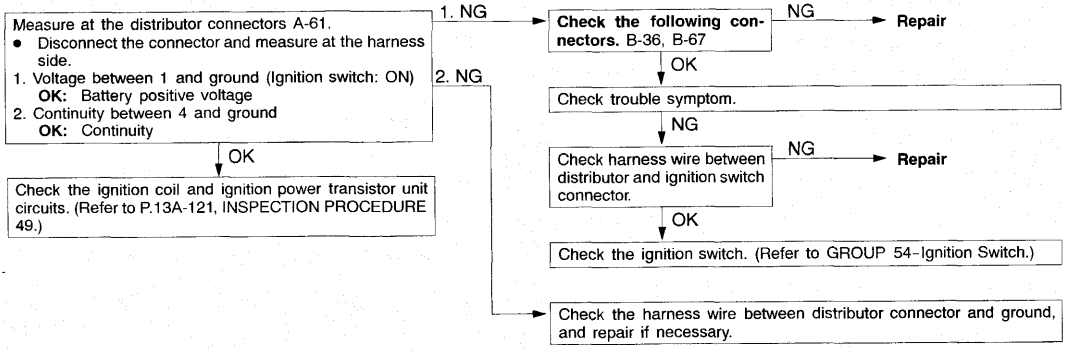
INSPECTION PROCEDURE 34

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



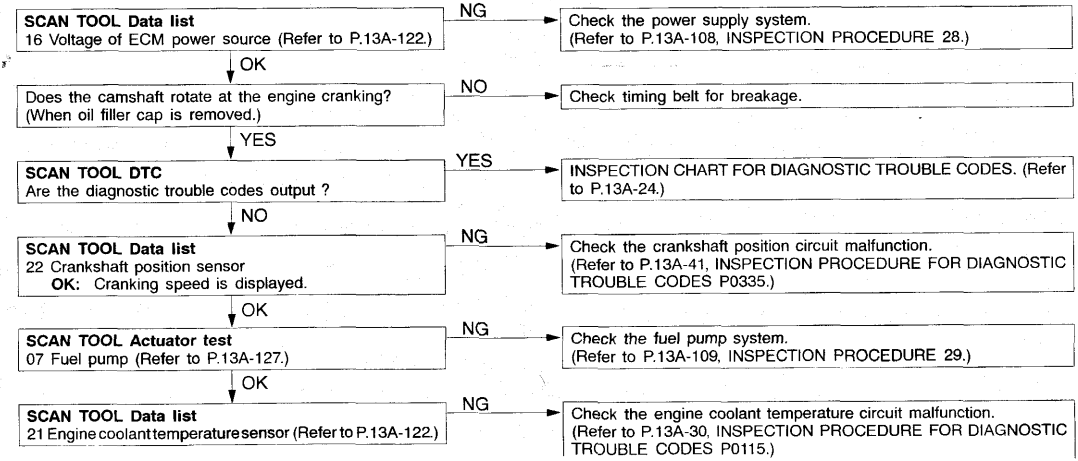
INSPECTION PROCEDURE 35

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



INSPECTION PROCEDURE 36

Scan tool: Inspection of no initial combustion



INSPECTION PROCEDURE 37

Ignition system: Inspection of no initial combustion

Does the engine tachometer display the cranking speed?
- Connect tachometer to ignition coil negative terminal.

NG → Check the ignition circuit system (Refer to P.13A-113, INSPECTION PROCEDURE 35.)

OK ↓

Check the ignition timing when cranking.
OK: 5° BTDC ± 3°

NG → Check for the correct installation condition of crankshaft position sensor and timing belt cover.

INSPECTION PROCEDURE 38

Scan tool: Check if incomplete combustion occurs.

SCAN TOOL DTC
Are diagnostic trouble code output ?

YES → INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODE (Refer to P.13A-24.)

NO ↓

SCAN TOOL Actuator test
07 Fuel pump (Refer to P.13A-127.)

NG → Check the fuel pump system. (Refer to P.13A-109, INSPECTION PROCEDURE 29.)

OK ↓

SCAN TOOL Data list
21 Engine coolant temperature sensor (Refer to P.13A-122.)

NG → Check the engine coolant temperature circuit malfunction. (Refer to P.13A-30, INSPECTION PROCEDURES FOR DIAGNOSTIC TROUBLE CODE P0115.)

OK ↓

SCAN TOOL Data list
18 Ignition switch-ST (Refer to P.13A-122.)

NG → Check the ignition switch-ST system<M/T>. (Refer to P.13A-110, INSPECTION PROCEDURE 31.)
Check the ignition switch-ST and park/neutral position switch system<A/T> (Refer to P.13A-111, INSPECTION PROCEDURE 32.)

INSPECTION PROCEDURE 39

Check if hunting occurs.

Clean the throttle body. (Refer to P.13A-141.)

↓

Check and adjust the fixed SAS (Refer to P.13A-143.)

↓

Check trouble symptom.

NG ↓

Inspect for vacuum leak
- Broken intake manifold gasket
- Broken air intake hose
- Broken vacuum hose
- Positive crankcase ventilation valve does not operate

INSPECTION PROCEDURE 40

Scan tool: Check if idle speed is unstable.

SCAN TOOL Data list
26 Closed throttle position switch (Refer to P.13A-122.)
NG → Check the closed throttle position switch malfunction. (Refer to P.13A-83, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0510.)
OK ↓

SCAN TOOL Data list
13 Intake air temperature sensor (Refer to P.13A-122.)
NG → Check the intake air temperature circuit malfunction. (Refer to P.13A-29, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0110.)
OK ↓

SCAN TOOL Data list
21 Engine coolant temperature sensor (Refer to P.13A-122.)
NG → Check the engine coolant temperature circuit malfunction. (Refer to P.13A-30, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0115.)
OK ↓

SCAN TOOL Actuator test
08 Evaporative emission purge solenoid (Refer to P.13A-127.)
NG → Check the evaporative emission control system purge control valve circuit malfunction (Refer to P.13A-57, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0443.)
OK ↓

SCAN TOOL Actuator test
10 EGR solenoid (Refer to P.13A-127.)
NG → Exhaust gas recirculation solenoid malfunction (Refer to P.13A-44, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0403.)
OK ↓

SCAN TOOL Data list
59 Heated oxygen sensor (rear) (Refer to P.13A-122.)
- Transaxle : 2nd gear <M/T>, L range <A/T>
- Drive with wide open throttle
  OK: 600–1,000 mV

NG → Check the O_2 sensor circuit malfunction (Sensor 2). (Refer to P.13A-35, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0136.)
OK ↓

SCAN TOOL Data list
11 Heated oxygen sensor (front) (Refer to P.13A-122.)
OK: 600–1,000 mV during sudden racing

NG → Check the O_2 sensor circuit malfunction (Sensor 1). (Refer to P.13A-33, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0130.)
OK ↓

SCAN TOOL Data list
11 Heated oxygen sensor (front) (Refer to P.13A-122.)
OK: Changes between 0–400 mV and 600–1,000 mV during idling

NG → Check the fuel pressure. (Refer to P.13A-144.)
OK → 1. Inspect for vacuum leak.
- Broken intake manifold gasket
- Broken vacuum hose
- PCV valve does not operate.
- Broken air intake hose

2. Check the injector for clog.

OK ↓

SCAN TOOL Data list
27 Power steering pressure switch (Refer to P.13A-122.)
NG → Check the power steering pressure switch system. (Refer to P.13A-112, INSPECTION PROCEDURE 33.)
OK ↓

SCAN TOOL Data list
28 A/C switch (Refer to P.13A-122.)
NG → Check the A/C switch and A/C relay system. (Refer to P.13A-112, INSPECTION PROCEDURE 34.)
OK ↓

SCAN TOOL Data list
29 Park/neutral position switch (Refer to P.13A-122.)
NG → Check the ignition switch-ST and park/neutral position switch system. (Refer to P.13A-111, INSPECTION PROCEDURE 32.)
OK ↓

SCAN TOOL Data list
55 Idle air control valve position sensor (Refer to P.13A-122.)
NG → Adjust the basic idle speed. (Refer to P.13A-143.)

INSPECTION PROCEDURE 41

Scan tool: Engine stalling inspection when the engine is warm and idling.

SCAN TOOL Data list
26 Closed throttle position switch (Refer to P.13A-122.)
NG → Check the closed throttle position switch malfunction. (Refer to P.13A-83, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0510.)
OK ↓

SCAN TOOL Data list
13 Intake air temperature sensor (Refer to P.13A-122.)
NG → Check the intake air temperature circuit malfunction. (Refer to P.13A-29, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0110.)
OK ↓

SCAN TOOL Data list
21 Engine coolant temperature sensor (Refer to P.13A-122.)
NG → Check the engine coolant temperature circuit malfunction. (Refer to P.13A-30, INSPECTION PROCEDURE FOR DIAGNOSTIC CODE P0115.)
OK ↓

SCAN TOOL Actuator test
10 EGR solenoid (Refer to P.13A-127.)
NG → Exhaust gas recirculation solenoid malfunction (Refer to P.13A-44, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0403.)
OK ↓

SCAN TOOL Data list
59 Heated oxygen sensor (rear) (Refer to P.13A-122.)
- Transaxle :
  2nd gear <M/T>,
  L range <A/T>
- Drive with wide open throttle

OK: 600-1,000 mV
NG → Check the O_2 sensor circuit malfunction (Sensor 2) (Refer to P.13A-35, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0136.)
OK ↓

SCAN TOOL Data list
11 Heated oxygen sensor (front) (Refer to P.13A-122.)
OK: Changes between 600-1,000 mV during sudden racing
NG → Check the O_2 sensor circuit malfunction (Sensor 1). (Refer to P.13A-33, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0130.)
OK ↓

SCAN TOOL Data list
11 Heated oxygen sensor (front) (Refer to P.13A-122.)
OK: Changes between 0-400 mV and 600-1,000 mV during idling
NG → Check the fuel pressure. (Refer to P.13A-144.)
OK →
1. Inspect for vacuum leak
   - Broken intake manifold gasket
   - Broken vacuum hose
   - PCV valve does not operate.
   - Broken air intake hose
2. Check the injector for clog.

OK ↓

SCAN TOOL Data list
27 Power steering pressure switch (Refer to P.13A-122.)
NG → Check the power steering pressure switch system. (Refer to P.13A-112, INSPECTION PROCEDURE 33.)
OK ↓

SCAN TOOL Data list
28 A/C switch (Refer to P.13A-122.)
NG → Check the A/C switch and A/C compressor clutch relay system. (Refer to P.13A-112, INSPECTION PROCEDURE 34.)
OK ↓

SCAN TOOL Data list
29 Park/neutral position switch (Refer to P.13A-122.)
NG → Check the ignition switch-ST and park/neutral position switch system. (Refer to P.13A-111, INSPECTION PROCEDURE 32.)
OK ↓

SCAN TOOL Data list
55 Idle air control valve position sensor (Refer to P.13A-122.)
NG → Adjust the basic idle speed. (Refer to P.13A-143.)

INSPECTION PROCEDURE 42

Scan tool: Check if hesitation, sag, stumble or poor acceleration occurs.

SCAN TOOL Data list
26 Closed throttle position switch (Refer to P.13A-122.)
NG → Check the closed throttle position switch malfunction. (Refer to P.13A-83, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0510.)
OK ↓

SCAN TOOL Data list
13 Intake air temperature sensor (Refer to P.13A-122.)
NG → Check the intake air temperature circuit malfunction. (Refer to P.13A-29, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0110.)
OK ↓

SCAN TOOL Data list
21 Engine coolant temperature sensor (Refer to P.13A-122.)
NG → Check the engine coolant temperature circuit malfunction. (Refer to P.13A-30, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0115.)
OK ↓

SCAN TOOL Data list
14 Throttle position sensor (Refer to P.13A-122.)
NG → Check the throttle position circuit malfunction. (Refer to P.13A-31, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0120.)
OK ↓

SCAN TOOL Actuator test
10 EGR solenoid (Refer to P.13A-127.)
NG → Exhaust gas recirculation solenoid malfunction. (Refer to P.13A-44, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0403.)
OK ↓

SCAN TOOL Data list
59 Heated oxygen sensor (rear) (Refer to P.13A-122.)
- Transaxle : 2nd gear <M/T>, L range <A/T>
- Drive with wide open throttle
  OK: 600–1,000 mV

NG → Check the O_2 sensor circuit malfunction (Sensor 2). (Refer to P.13A-35, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0136.)
OK ↓

SCAN TOOL Data list
11 Heated oxygen sensor (front) (Refer to P.13A-122.)
OK: Changes between 600–1,000 mV during sudden racing

NG → Check the O_2 sensor circuit malfunction (Sensor 1). (Refer to P.13A-33, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0130.)
OK ↓

SCAN TOOL Data list
11 Heated oxygen sensor (front) (Refer to P.13A-122.)
OK: Changes between 0–400 mV and 600–1,000 mV during idling

NG → Check the fuel pressure. (Refer to P.13A-144.)
OK → 1. Inspect for vacuum leak
- Broken intake manifold gasket
- Broken vacuum hose
- PCV valve does not operate
- Broken air intake hose

2. Check the injector for clog.

INSPECTION PROCEDURE 43

Scan tool: Check if surge occurs.

SCAN TOOL Data list
26 Closed throttle position switch (Refer to P.13A-122.)
NG → Check the closed throttle position switch malfunction. (Refer to P.13A-83, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0510.)
OK ↓

SCAN TOOL Data list
13 Intake air temperature sensor (Refer to P.13A-122.)
NG → Check the intake air temperature circuit malfunction. (Refer to P.13A-29, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0110.)
OK ↓

SCAN TOOL Data list
21 Engine coolant temperature sensor (Refer to P.13A-122.)
NG → Check the engine coolant temperature circuit malfunction. (Refer to P.13A-30, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0115.)
OK ↓

SCAN TOOL Data list
14 Throttle position sensor (Refer to P.13A-122.)
NG → Check the throttle position circuit malfunction. (Refer to P.13A-31, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0120.)
OK ↓

SCAN TOOL Actuator test
10 EGR solenoid (Refer to P.13A-127.)
NG → Exhaust gas recirculation solenoid malfunction. (Refer to P.13A-44, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0403.)
OK ↓

SCAN TOOL Data list
59 Heated oxygen sensor (rear) (Refer to P.13A-122.)
- Transaxle : 2nd gear <M/T>, L range <A/T>
- Drive with wide open throttle
  OK: 600-1,000 mV

NG → Check the O_2 sensor circuit malfunction (Sensor 2). (Refer to P.13A-35, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0136.)
OK ↓

SCAN TOOL Data list
11 Heated oxygen sensor (front) (Refer to P.13A-122.)
OK: Changes between 600-1,000 mV during sudden racing

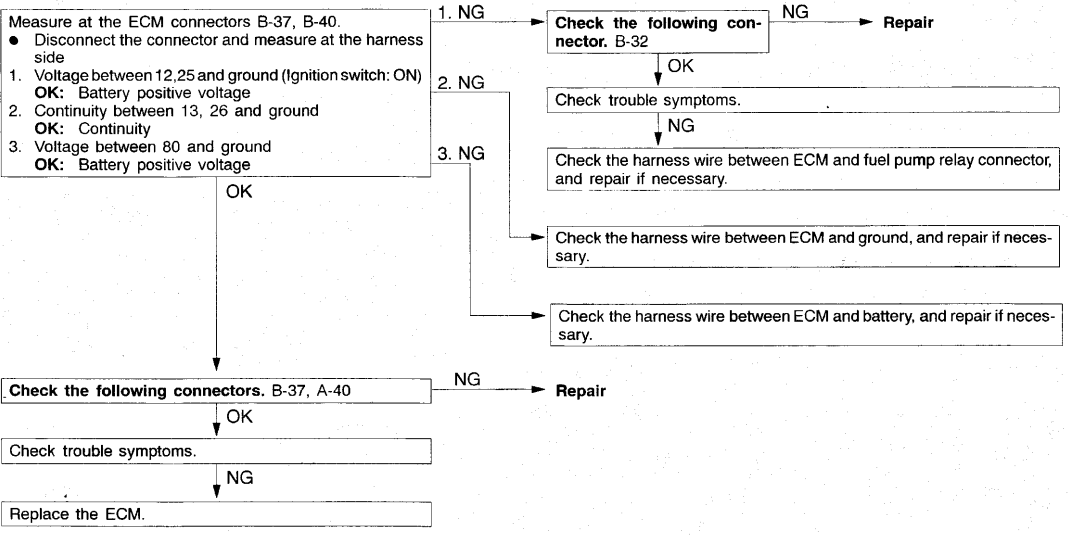
NG → Check the O_2 sensor circuit malfunction (Sensor 1). (Refer to P.13A-33, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE P0130.)
OK ↓

SCAN TOOL Data list
11 Heated oxygen sensor (front) (Refer to P.13A-122.)
OK: Changes between 0-400 mV and 600-1,000 mV during idling

NG → Check the fuel pressure. (Refer to P.13A-144.)
OK →
1. Inspect for vacuum leak
   - Broken intake manifold gasket
   - Broken vacuum hose
   - PCV valve does not operate
   - Broken air intake hose
2. Check the injector for clog.

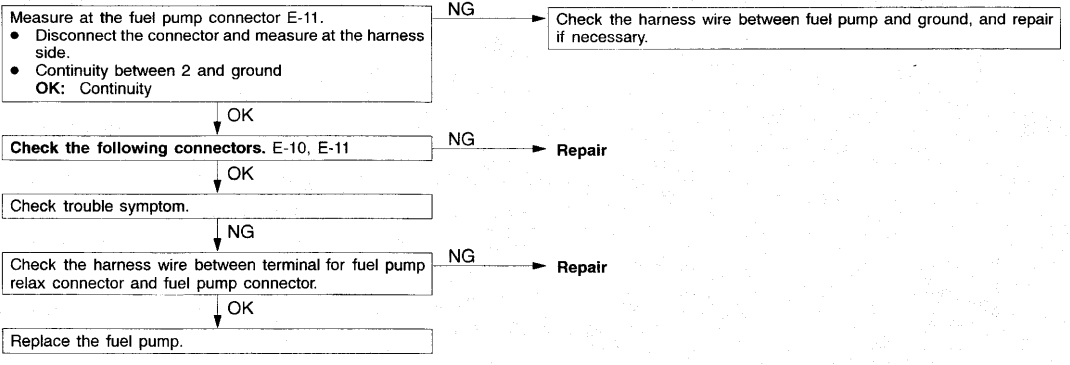
INSPECTION PROCEDURE 44

Check the ECM power supply and ground circuit.



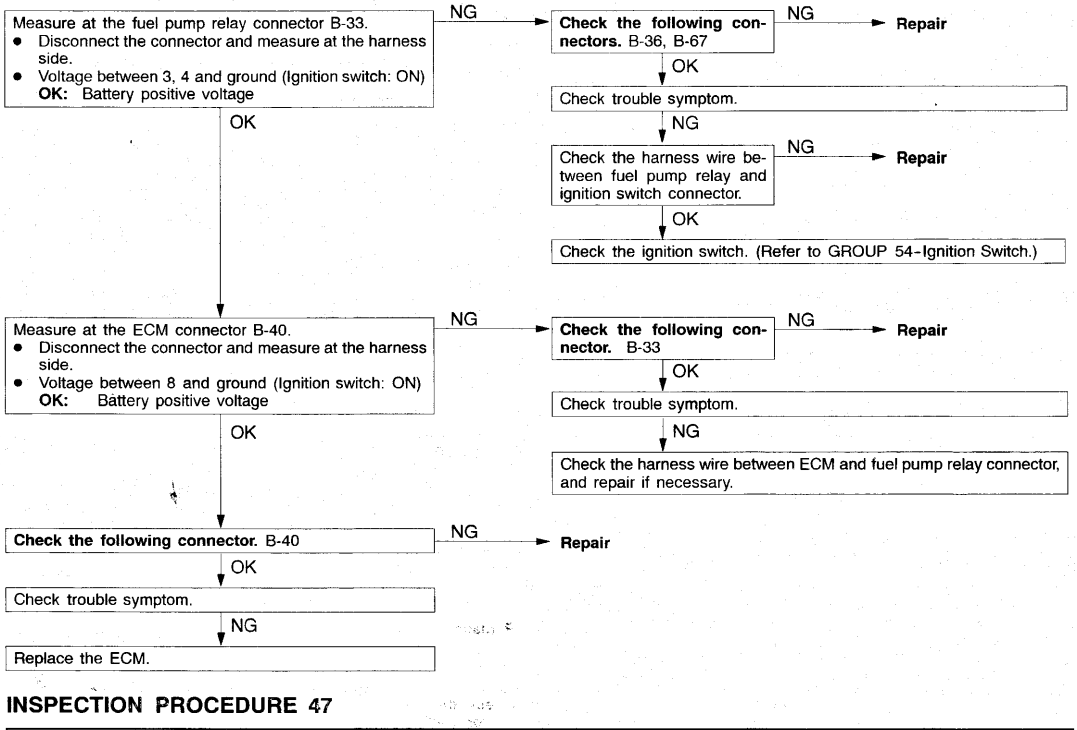
INSPECTION PROCEDURE 45

Check fuel pump circuit.



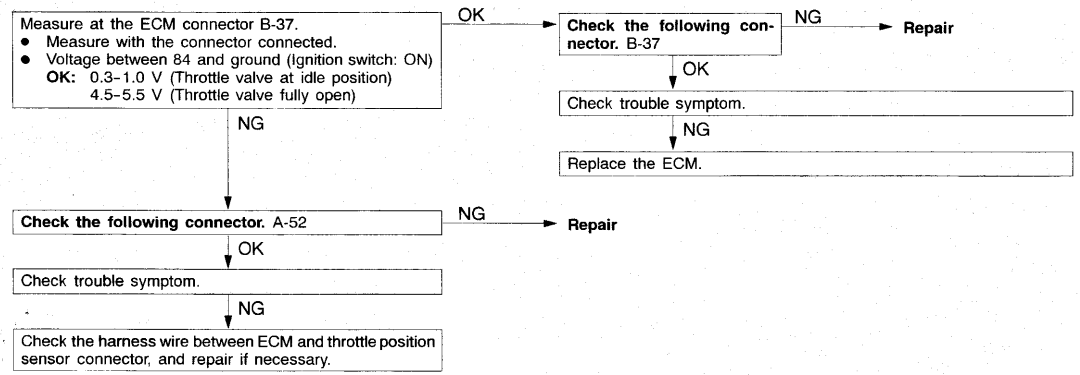
INSPECTION PROCEDURE 46

Check the fuel pump drive control circuit.



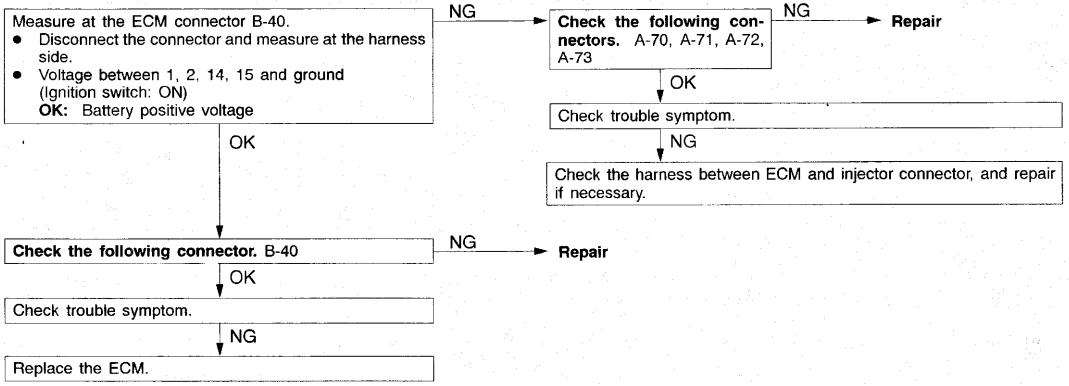
INSPECTION PROCEDURE 47

Check throttle position sensor (TPS) output circuit.



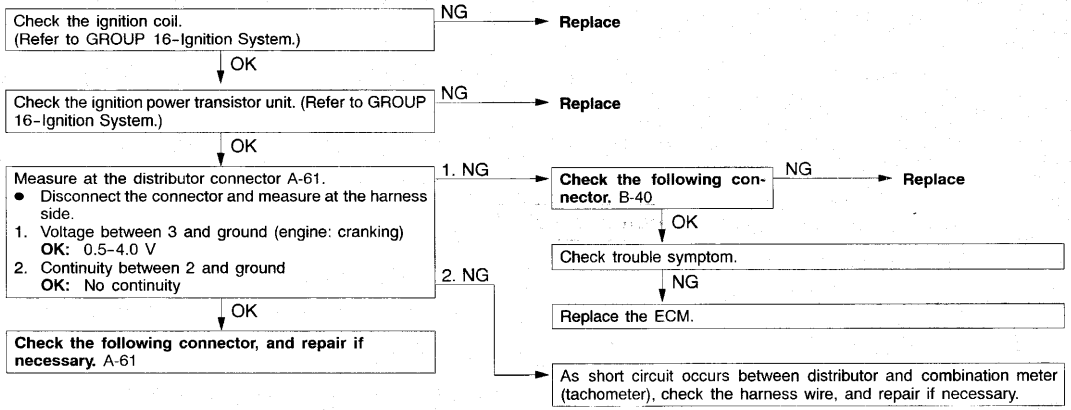
INSPECTION PROCEDURE 48

Check injector control circuit



INSPECTION PROCEDURE 49

Check ignition coil and ignition power transistor unit circuit.



DATA LIST REFERENCE TABLE

13100890548

The scan tool (MUT-II) has two operation modes: the general scan mode and the scan tool (MUT-II) mode.
The data list which can be read in either mode is shown in the table below.

Item No.	Inspection item	General scan tool model	Scan tool (MUT-II) mode
11	Heated oxygen sensor (Front)	×	×
13	Intake air temperature sensor	×	×
14	Throttle position sensor	×	×
16	Power supply voltage	-	×
18	Cranking signal (Ignition switch-ST)	-	×
21	Engine coolant temperature sensor	×	×
22	Crankshaft position sensor	×	×
24	Vehicle speed sensor	×	-
26	Closed throttle position switch	-	×
27	Power steering pressure switch	-	×
28	A/C switch	-	×
29	Park/Neutral position switch <A/T>	-	×
32	Manifold absolute pressure sensor	×	×
41	Injectors	-	×
44	Ignition coils and ignition power transistor	-	×
45	Idle air control position	-	×
49	A/C compressor clutch relay	-	×
59	Heated oxygen sensor (Rear)	×	×
73	Fuel tank differential pressure sensor	×	×
81	Long-term fuel compensation	×	-
82	Short-term fuel compensation	×	-
87	Calculation load	×	-
88	Fuel control condition	×	-

Caution

1. **When shifting the select lever to D range, the brakes should be applied so that the vehicle does not move forward.**
2. **Driving tests always require another person.**

NOTES FOR DATA LIST ITEMS BELOW

*1: When idling to warm up from an engine coolant temperature of approx. -20°C (-4°F), if the idling speed is lower than the standard value even when the IAC motor is fully opened, the air volume limiter built in the throttle body could be defective.

*2: The closed throttle position switch normally turns off when the voltage of the throttle position sensor is 50 - 100mV higher than the voltage at the idle position. If the closed throttle position switch turns back on after the throttle position sensor voltage has risen by 100mV and the throttle valve has opened, the closed throttle position switch and the throttle position sensor need to be adjusted.

*3: In a new vehicle [driven approximately 500 km (300 mile) or less], the volume air flow sensor output frequency is sometimes 10% higher than the standard frequency.

*4: 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.

*5: In a new vehicle [driven approximately 500 km (300 mile) or less], the injector drive time is sometimes 10% longer than the standard time.

*6: In a new vehicle [driven approximately 500 km (300 mile) or less], the servo valve position is sometimes 20 steps greater than the standard value.

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
11	Heated oxygen sensor (front)	Engine: Warm (Air/fuel mixture is made leaner when decelerating, and is made richer when racing.)	When at 4,000 r/min, engine is suddenly decelerated	200 mV or less	Code No. P0130	P.13A-33
			When engine is suddenly raced	600-1,000 mV		
		Engine: Warm (The heated oxygen sensor signal is used to check the air/fuel mixture ratio, and control condition is also checked by the ECM.)	Engine is idling	400 mV or less ↔ 600-1,000 mV (Changes)		
			2,500 r/min			
13	Intake air temperature sensor	Ignition switch: ON or with engine running	When intake air temperature is -20°C (-4°F)	-20°C (-4°F)	Code No. P0110	P.13A-29
			When intake air temperature is 0°C (32°F)	0°C (32°F)		
			When intake air temperature is 20°C (68°F)	20°C (68°F)		
			When intake air temperature is 40°C (104°F)	40°C (104°F)		
			When intake air temperature is 80°C(176°F)	80°C (176°F)		
14	Throttle position sensor	Ignition switch: ON	Set to idle position	300-1,000 mV (6 - 20%)	Code No. P0120	P.13A-31
			Gradually open	Increases in proportion to throttle opening angle		
			Open fully	4,500-5,500 mV (80 - 100%)		
16	Power supply voltage	Ignition switch: ON		Battery positive voltage	Procedure No. 28	P.13A-108

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
18	Cranking signal (ignition switch-ST)	Ignition switch: ON	Engine: Stopped	OFF	Procedure No. 31 <M/T> Procedure No. 32 <A/T>	P.13A-110 <M/T> P.13A-111 <A/T>
			Engine: Cranking	ON		
21	Engine coolant temperature sensor	Ignition switch: ON or with engine running	When engine coolant temperature is -20°C (-4°F)	-20°C (-4°F)	Code No. 0115	P.13A-30
			When engine coolant temperature is 0°C (32°F)	0°C (32°F)		
			When engine coolant temperature is 20°C (68°F)	20°C (68°F)		
			When engine coolant temperature is 40°C (104°F)	40°C (104°F)		
			When engine coolant temperature is 80°C (176°F)	80°C (176°F)		
22	Crankshaft position sensor*1	• Engine: Cranking • Tachometer: Connected	Compare the rpm of the tachometer with the one of the scan tool.	Identical	Code N0. P0335	P.13A-41
		• Engine: Idling • Closed throttle position switch: ON	When engine coolant temperature is -20°C (-4°F)	1,400 - 1,600 r/min		
			When engine coolant temperature is 0°C (32°F)	1,300 - 1,500 r/min		
			When engine coolant temperature is 20°C (68°F)	1,200 - 1,400 r/min		
			When engine coolant temperature is 40°C (104°F)	1,000 - 1,200 r/min		
			When engine coolant temperature is 80°C (176°F)	600 - 800 r/min		
24	Vehicle speed sensor	Drive at 40 km/h (25 miles/h)		Approx. 40 km/h	Code No. P0500	P.13A-81
26	Closed throttle position switch	Ignition switch: ON Check by operating accelerator pedal repeatedly	Throttle valve: Set to idle position	ON	Code N0. P0510	P.13A-83
			Throttle valve: Slightly open	OFF*2		
27	Power steering pressure switch	Engine: Idling	Steering wheel stationary	OFF	Code N0. P0551	P.13A-84
			Steering wheel turning	ON		

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
28	A/C switch	Engine: Idling (When A/C switch is ON, A/C compressor should be operating.)	A/C switch: OFF	OFF	Procedure No. 34	P.13A-112
			A/C switch: ON	ON		
29	Park/Neutral positon switch <A/T>	Ignition switch: ON	P or N	P or N	Procedure No. 32	P.13A-111
			D, 2, L or R	D, 2, L or R		
32	Manifold absolute pressure sensor*3	• Engine coolant temperature: 80 - 95°C (176 - 203°F) • Lights, electric cooling fan and all accessories: OFF • Transaxle: Neutral (A/T: P range) • Ignition switch: ON	Engine stopped [At altitude of 0 m (0 ft.)]	101 kPa	Code No. P0105	P.13A-28
			Engine stopped [At altitude of 600 m (1,969 ft.)]	95 kPa		
			Engine stopped [At altitude of 1,200 m (3,937 ft.)]	88 kPa		
			Engine stopped [At altitude of 1,800 m (5,906 ft.)]	81 kPa		
			Engine: Idling	25.3 - 38.7 kPa		
			When engine is suddenly raced	Increases		
41	Injectors *4	Engine: Cranking	When engine coolant temperature is 0°C (32°F) (injection is carried out for all cylinders simultaneously)	15 - 23 ms	-	-
			When engine coolant temperature is 20°C (68°F)	32 - 48 ms	-	-
			When engine coolant temperature is 80°C (176°F)	7.5 - 11.3 ms		
	Injectors *5	• Engine coolant temperature: 80–95°C (176-203°F) • Lights, electric cooling fan and all accessories: OFF • Transaxle: Neutral (A/T : P range)	Engine is idling	1.7 - 2.9 ms		
			2,500 r/min	1.4 - 2.6 ms		
			When engine is suddenly raced	Increases		
44	Ignition coils and ignition power transistors	• Engine: After having warmed up • Timing light is set. (The timing light is set in order to check actual ignition timing.)	Engine is idling	2 - 18 °BTDC	-	-
			2,500 r/min	29 - 49 °BTDC <Federal> 30 - 50 °BTDC <California>		

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
45	Idle air control (stepper) position sensor*6	• Engine coolant temperature: 80 – 95° (176-203°F) • Lights, electric cooling fan and all accessories: OFF • Transaxle: Neutral (A/T : P range) • Closed throttle position switch: ON • Engine: Idling (When A/C switch is ON, A/C compressor should be operating)	A/C switch: OFF	Increases by 2 - 25 steps	-	-
			A/C switch: OFF → ON	Increases by 10 - 70 steps		
			• A/C switch: OFF • Select lever: N range → D range	Increases by 5 - 50 steps		
49	A/C compressor clutch relay	Engine: After having warmed up /Engine is idling	A/C switch: OFF	OFF (Compressor clutch is not operating)	Procedure No. 34	P.13A-112
			A/C switch: ON	ON (Compressor clutch is operating)		
59	Heated oxygen sensor (rear)	• Transaxle: 2nd gear <M/T> L range <A/T> • Drive with wide open throttle	3,500 r/min	600- 1,000 mV	Code No. P0136	P.13A-35
73	Fuel tank differential pressure sensor	• Ignition switch: ON • Fuel tank filler tube cap removal		-3.3 - 3.3 kPa	-	-
81	Long-term fuel compensation	Engine: Warm, 2,500 r/min without any load (during closed loop)		-12.5 - 12.5 %	Code No. P0170	P.13A-37
82	Short-term fuel compensation	Engine: Warm, 2,500 r/min without any load (during closed loop)		-17 - 17 %	Code No. P0170	P.13A-37
87	Calculation load value	Engine: Warm	Engine is idling	20 - 33 %	-	-
			2,500 r/min	20 - 33 %		
88	Fuel control condition	Engine: Warm	2,500 r/min	Closed loop	Code No. P0125	P.13A-32
			When engine is suddenly raced	Open loop - drive condition		

ACTUATOR TEST REFERENCE TABLE

13100900623

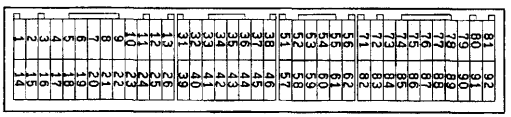
Item No.	Drive contents	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
01	Injectors	Cut fuel to No. 1 injector	Engine: Warm, idle (Cut the fuel supply to each injector in turn and check cylinders which don't affect idling.)		Idle speed drops equally for each injector	Code No. P0201, P0202, P0203, P0204,	P.13A-38
02		Cut fuel to No. 2 injector					
03		Cut fuel to No. 3 injector					
04		Cut fuel to No. 4 injector					
07	Fuel pump	Fuel pump operates and fuel is recirculated.	• Engine: Cranking • Fuel pump: Activated Inspect according to both the above conditions.	Pinch the return hose with fingers to feel the pulse of the fuel being recircu-lated.	Pulse is felt.	Procedure No. 29	P.13A-109
				Listen near the fuel tank for the sound of fuel pump operation.	Typical electric fuel pump whine.		
08	Evaporative emission purge solenoid	Solenoid valve turns from OFF to ON.	Ignition switch: ON		Clicks when solenoid valve is driven.	Code No. P0443	P.13A-57
10	EGR solenoid	Solenoid valve turns from OFF to ON.	Ignition switch: ON		Clicks when solenoid valve is driven.	Code No. P0403	P.13A-44
17	Basic ignition timing	Set to ignition timing adjustment mode	Engine: Idle Timing light is set		5°BTDC	-	-
20	Radiator fan (Hi) Condenser fan (Hi)	Drive the fan motors (radiator and condenser).	Ignition switch: ON A/C switch: ON		Fan motor operates at high speed.	Procedure No. 24	P.13A-106
21	Radiator fan (Hi) Condenser fan (Low)	Drive the fan motors (radiator and condenser).	Ignition switch: ON A/C switch: ON		Fan motor operates at low speed.	Procedure No. 24	P.13A-106
29	Evapora-tive emis-sion ven-tilation so-lenoid	Solenoid valve turns from OFF to ON.	Ignition switch: ON		Clicks when solenoid valve is driven.	Code No. P0446	P.13A-58

CHECK AT THE ENGINE CONTROL MODULE (ECM)

13100920551

TERMINAL VOLTAGE CHECK CHART

Engine Control Module (ECM) Connector Terminal Arrangement



9FU0393

Terminal No.	Check item	Check condition (Engine condition)	Normal condition
1	No. 1 injector	While engine is idling after having warmed up, suddenly depress the accelerator pedal.	From 11 - 14 V, momentarily drops slightly
14	No. 2 injector		
2	No. 3 injector		
15	No. 4 injector		
4	Stepper motor coil <A1>	Engine: Soon after the warmed up engine is started	B+ ↔ 0 V (Changes repeatedly)
17	Stepper motor coil <A2>		
5	Stepper motor coil <B1>		
18	Stepper motor coil <B2>		
6	EGR solenoid	Ignition switch: ON	B+
		While engine is idling, suddenly depress the accelerator pedal.	From B+, momentarily drops
8	Fuel pump relay	Ignition switch: ON	B+
		Engine: Idle speed	0 - 3 V
9	Evaporative emission purge solenoid	Ignition switch: ON	B+
		Running at 3,000 r/min while engine is warming up after having been started.	0 - 3 V
10	Ignition power transistor	Engine r/min: 3,000 r/min	0.3 - 3.0 V
12	Power supply	Ignition switch: ON	B+
25			
20	Condenser fan motor relay	Condenser fan is not operating [Engine coolant temperature is 90°C (194°F) or less]	B+
		Condenser fan is operating [Engine coolant temperature is 105°C (221°F) or more]	0 - 3 V

Terminal No.	Check item	Check condition (Engine condition)		Normal condition
21	Radiator fan motor relay	Radiator fan is not operating [Engine coolant temperature is 90°C (194°F) or less)]		B+
		Radiator fan is operating [Engine coolant temperature is 90 - 105°C (194 - 221°F)]		0 - 3 V
22	A/C relay	• Engine: Idle speed • A/C switch: OFF → ON (A/C compressor is operating)		B+ or momentarily 6V or more → 0 - 3 V
31	Engine ignition signal	Engine r/min: 3,000 r/min		0.3 - 3.0 V
33	Generator G terminal	• Engine: Warm, idle (radiator fan: OFF) • Headlamp: OFF to ON • Rear defogger switch: OFF to ON • Stop light: OFF to ON		Voltage rises by 0.2 - 3.5 V.
41	Generator FR terminal	• Engine: Warm, idle (radiator fan: OFF) • Headlamp: OFF to ON • Rear defogger switch: OFF to ON • Stop light: OFF to ON		Voltage falls
36	Service Engine Soon/ Malfunction Indicator Lamp	Ignition switch: OFF → ON		0 - 3 V → 9 - 13 V (After several seconds have elapsed)
37	Power steering pressure switch	Engine: Idling after warming up	When steering wheel is stationary	B+
			When steering wheel is turned	0 - 3 V
38	MFI relay (Power supply)	Ignition switch: OFF		B+
		Ignition switch: ON		0 - 3 V
45	A/C switch	Engine: Idle speed	Turn the A/C switch OFF	0 - 3 V
			Turn the A/C switch ON (A/C compressor is operating)	B+
54	Heated oxygen sensor heater (Rear)	Engine: Idling after warming up		0 - 3 V
		Engine r/min: 5,000 r/min.		B+
55	Evaporative emission ventilation solenoid	Ignition switch: ON		B+
		After the engine has warmed up, drive the vehicle at a constant speed 88 km/h (55 mph) (OBD-II monitoring conditions).		Momentarily 0 - 3 V
60	Heated oxygen sensor heater (Front)	Engine: Idling after warming up		0 - 3 V
		Engine r/min: 5,000r/min.		B+
61	Fuel tank differential pressure sensor	Engine: Idle		1.2 - 3.8 V
71	Ignition switch - ST	Engine: Cranking		8 V or more

Terminal No.	Check item	Check condition (Engine condition)		Normal condition
72	Intake air temperature sensor	Ignition switch: ON	When intake air temperature is 0°C (32°F)	3.2 - 3.8 V
			When intake air temperature is 20°C (68°F)	2.3 - 2.9 V
			When intake air temperature is 40°C (104°F)	1.5 - 2.1 V
			When intake air temperature is 80°C (176°F)	0.4 - 1.0 V
75	Heated oxygen sensor (Rear)	• Transaxle: 2nd <M/T>, L range <A/T> • Driving with the throttle widely open • Engine: 3,500 r/min or more		0.6 - 1.0 V
76	Heated oxygen sensor (Front)	Engine: Running at 2,500 r/min after warmed up (Check using a digital type voltmeter)		0 ↔ 0.8 V (Changes repeatedly)
80	Backup power supply	Ignition switch: OFF		B+
81	Sensor impressed voltage	Ignition switch: ON		4.5 - 5.5 V
82	Ignition switch - IG	Ignition switch: ON		B+
83	Engine coolant temperature sensor	Ignition switch: ON	When engine coolant temperature is 0°C (32°F)	3.2 - 3.8 V
			When engine coolant temperature is 20°C (68°F)	2.3 - 2.9 V
			When engine coolant temperature is 40°CB (104°F)	1.3 - 1.9 V
			When engine coolant temperature is 80°C (176°F)	0.3 - 0.9 V
84	Throttle position sensor	Ignition switch: ON	Set throttle valve to idle position	0.3 - 1.0 V
			Fully open throttle valve	4.5 - 5.5 V
85	Manifold absolute pressure sensor	Ignition switch: ON [when altitude is 0 m (0 ft.)]		3.7 - 4.3 V
		Ignition switch: ON [when altitude is 1,200 m (3,937 ft.)]		3.2 - 3.8 V
		Engine: Idle speed		0.9 - 1.5 V
		While engine is idling after having warmed up, suddenly depress the accelerator pedal		From 0.9 - 1.5 V, momentarily increases

Terminal No.	Check item	Check condition (Engine condition)		Normal condition
86	Vehicle speed sensor	• Ignition switch: ON • Move the vehicle slowly forward		0 ↔ 5 V (Changes repeatedly)
87	Closed throttle position switch	Ignition switch: ON	Set throttle valve to idle position	0 - 1 V
			Slightly open throttle valve	4 V or more
88	Camshaft position sensor	Engine: Cranking		0.4 - 3.0 V
		Engine: Idle speed		0.5 - 2.0 V
89	Crankshaft position sensor	Engine: Cranking		0.4 - 4.0 V
		Engine: Idle speed		1.5 - 2.5 V
91	Park/Neutral position switch <A/T>	Ignition switch: ON	Set selector lever to P or N	0 - 3 V
			Set selector lever to R, D, 2, or L	8 - 14 V

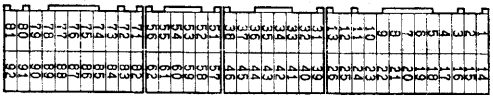
TERMINAL RESISTANCE AND CONTINUITY CHECK

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

   NOTE
   1. When measuring resistance and checking continuity, use a harness for checking contact pin pressure instead of inserting a test probe.
   2. Checks do not have to be carried out in the order given in this chart.

   Caution
   If resistance or continuity checks are performed on the wrong terminals, damage to the vehicle wiring, sensors, ECM, and/or ohmmeter may occur. Use care to prevent this!
4. If the ohmmeter shows any deviation from the normal condition, 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.

ECM Harness Side Connector Terminal Arrangement



9FU0392

Terminal No.	Inspection item	Normal condition (Check condition)
1 - 12	No. 1 injector	13-16 Ω [At 20°C (68°F)]
14 - 12	No. 2 injector	
2 - 12	No. 3 injector	
15 - 12	No. 4 injector	
4 - 12	Stepper motor coil (A1)	28-33 Ω [At 20°C (68°F)]
17 - 12	Stepper motor coil (A2)	
5 - 2	Stepper motor coil (B1)	
18 - 12	Stepper motor coil (B2)	
6 - 12	EGR solenoid	36-44 Ω [At 20°C (68°F)]
9 - 12	Evaporative emission purge solenoid	36-44 Ω [At 20°C (68°F)]
13 - Body ground	ECM ground	Continuity (0Ω)
26 - Body ground	ECM ground	

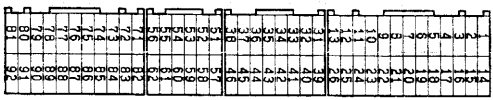
TERMINAL RESISTANCE AND CONTINUITY CHECK

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

   NOTE
   1. When measuring resistance and checking continuity, use a harness for checking contact pin pressure instead of inserting a test probe.
   2. Checks do not have to be carried out in the order given in this chart.

   Caution
   If resistance or continuity checks are performed on the wrong terminals, damage to the vehicle wiring, sensors, ECM, and/or ohmmeter may occur. Use care to prevent this!
4. If the ohmmeter shows any deviation from the normal condition, 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.

ECM Harness Side Connector Terminal Arrangement

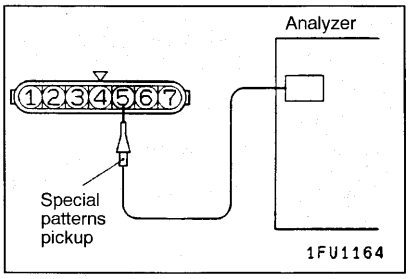


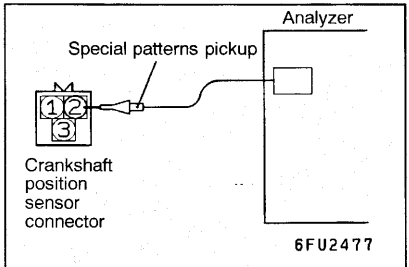
9FU0392

Terminal No.	Inspection item	Normal condition (Check condition)
1 - 12	No. 1 injector	13-16 Ω [At 20°C (68°F)]
14 - 12	No. 2 injector	
2 - 12	No. 3 injector	
15 - 12	No. 4 injector	
4 - 12	Stepper motor coil (A1)	28-33 Ω [At 20°C (68°F)]
17 - 12	Stepper motor coil (A2)	
5 - 2	Stepper motor coil (B1)	
18 - 12	Stepper motor coil (B2)	
6 - 12	EGR solenoid	36-44 Ω [At 20°C (68°F)]
9 - 12	Evaporative emission purge solenoid	36-44 Ω [At 20°C (68°F)]
13 - Body ground	ECM ground	Continuity (0Ω)
26 - Body ground	ECM ground	

Terminal No.	Check item	Check condition (Engine condition)		Normal condition
86	Vehicle speed sensor	• Ignition switch: ON • Move the vehicle slowly forward		0 ↔ 5 V (Changes repeatedly)
87	Closed throttle position switch	Ignition switch: ON	Set throttle valve to idle position	0 - 1 V
			Slightly open throttle valve	4 V or more
88	Camshaft position sensor	Engine: Cranking		0.4 - 3.0 V
		Engine: Idle speed		0.5 - 2.0 V
89	Crankshaft position sensor	Engine: Cranking		0.4 - 4.0 V
		Engine: Idle speed		1.5 - 2.5 V
91	Park/Neutral position switch <A/T>	Ignition switch: ON	Set selector lever to P or N	0 - 3 V
			Set selector lever to R, D, 2, or L	8 - 14 V

Terminal No.	Inspection item	Normal condition (Check condition)
54 - 12	Heated oxygen sensor heater (Rear)	4.5 - 8.0 Ω [At 20°C (68°F)]
55 - 12	Evaporative emission ventilation solenoid	36 - 44 Ω [At 20°C (68°F)]
60 - 12	Heated oxygen sensor heater (Front)	4.5 - 8.0 Ω [At 20°C (68°F)]
72 - 92	Intake air temperature sensor	5.3 - 6.7 kΩ [When intake air temperature is 0°C (32°F)]
		2.3 - 3.0 kΩ [When intake air temperature is 20°C (68°F)]
		1.0 - 1.5 kΩ [When intake air temperature is 40°C (104°F)]
		0.30 - 0.42 kΩ [When intake air temperature is 80°C (176°F)]
83 - 92	Engine coolant temperature sensor	5.1 - 6.5 kΩ [When coolant temperature is 0°C (32°F)]
		2.1 - 2.7 kΩ [When coolant temperature is 20°C (68°F)]
		0.9 - 1.3 kΩ [When coolant temperature is 40°C (104°F)]
		0.26 - 0.36 kΩ [When coolant temperature is 80°C (176°F)]
87 - 92	Closed throttle position switch	Continuity (when throttle valve is at idle position)
		No continuity (when throttle valve is slightly open)
91 - Body ground	Park/Neutral position switch <A/T>	Continuity (when select lever is at P or N)
		No continuity (when select lever is at D, 2, L or R)





INSPECTION PROCEDURE USING AN ANALYZER

13100930134

CAMSHAFT POSITION SENSOR AND CRANKSHAFT POSITION SENSOR

Measurement Method

1. Disconnect the distributor (camshaft position sensor) connector and connect the special tool (test harness: MB991348) in between. (All terminals should be connected.)
2. Connect the analyzer special patterns pickup to distributor connector terminal 5.
3. Disconnect the crankshaft position sensor connector and connect the special tool (test harness: MD998478) in between.
4. Connect the analyzer special patterns pickup to crankshaft position sensor connector terminal 2.

Alternate method (Test harness not available)

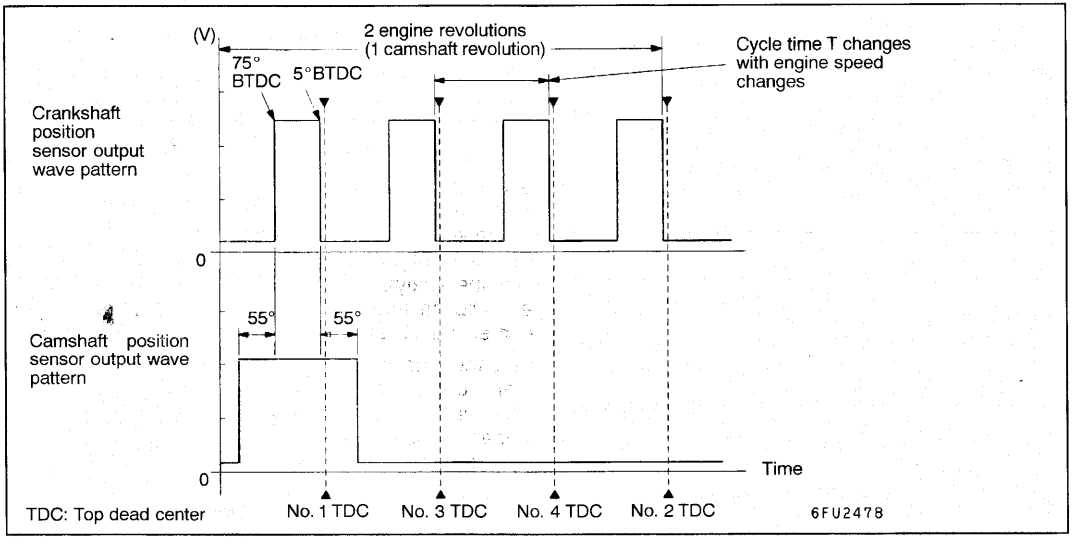
1. Connect the analyzer special patterns pickup to ECM terminal 88. (When checking the camshaft position sensor signal wave pattern)
2. Connect the analyzer special patterns pickup to ECM terminal 89. (When checking the crankshaft position sensor signal wave pattern)

Standard Wave Pattern

Observation conditions

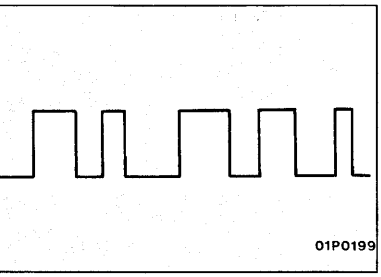
Function	Special patterns
Pattern height	Low
Pattern selector	Display
Engine r/min	Idle

Standard wave pattern



Wave Pattern Observation Points

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



Examples of Abnormal Wave Patterns

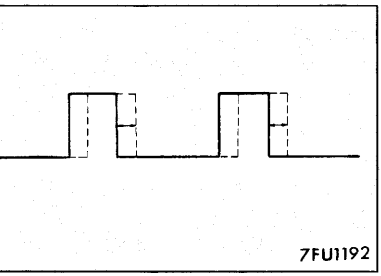
- Example 1

  CAUSE OF PROBLEM

  Sensor interface malfunction

  WAVE PATTERN CHARACTERISTICS

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



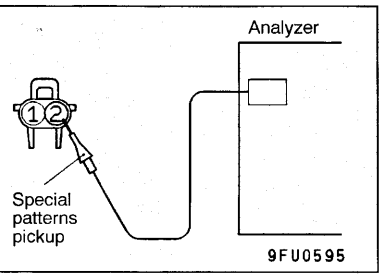
- Example 2

  CAUSE OF PROBLEM

  Loose timing belt
  Abnormality in sensor disk

  WAVE PATTERN CHARACTERISTICS

  Wave pattern jumps to the left or right.



INJECTOR

Measurement Method

1. Disconnect the injector connector and connect the special tool (test harness: MB991348) in between. (Both the terminal on the engine control module side and the terminal on the power supply side should be connected.)
2. Connect the analyzer special patterns pickup to the test harness clip on the engine control module side.

Alternate method (Test harness not available)

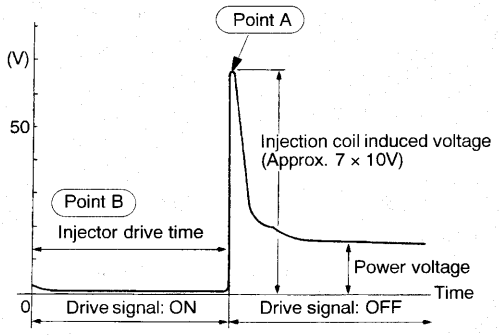
1. Connect the analyzer special patterns pickup to ECM terminal 1 to analyze the No.1 cylinder, connection terminal 2 to analyze the No.3 cylinder, connection terminal 14 to analyze the No.2 cylinder and connection terminal 15 to analyze the No.4 respectively.

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

Standard wave pattern

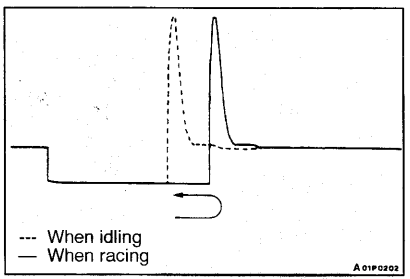


Wave Pattern Observation Points

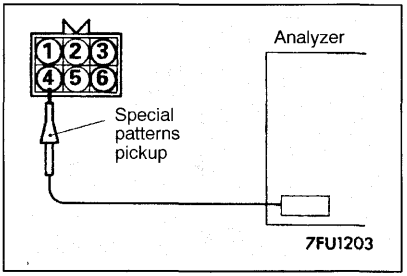
Point A: Height of injector coil induced voltage

Contrast with standard wave pattern	Probable cause
Injector coil induced voltage 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 scan tool tester display.
- When the engine is suddenly raced, the drive time will be greatly extended at first, but the drive time will soon match the engine speed.



IDLE AIR CONTROL (STEPPER) MOTOR

Measurement Method

1. Disconnect the IAC motor connector, and connect the special tool (test harness: MD998463) in between.
2. Connect the analyzer special patterns pickup to the IAC 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)

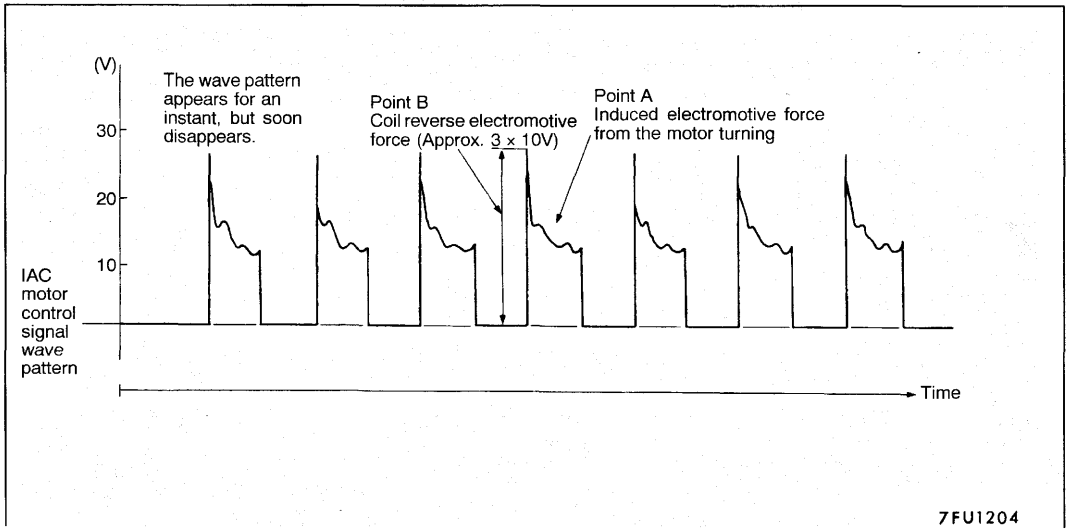
1. Connect the analyzer special patterns pickup to ECM terminal 4, connection terminal 5, connection terminal 17, and connection terminal 18 respectively.

Standard Wave Pattern

Observation conditions

Function	Special patterns
Pattern height	High
Pattern selector	Display
Engine condition	When the engine coolant temperature is 20°C or below, turn the ignition switch from OFF to ON (without starting the engine).
	While the engine is idling, turn the A/C switch to ON.
	Immediately after starting the warm engine

Standard wave pattern



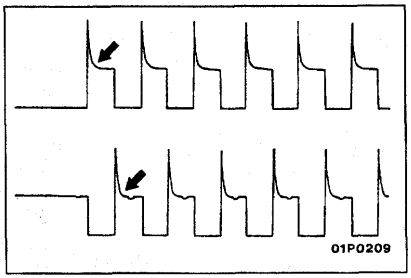
Wave Pattern Observation Points

Check that the standard wave pattern appears when the IAC 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

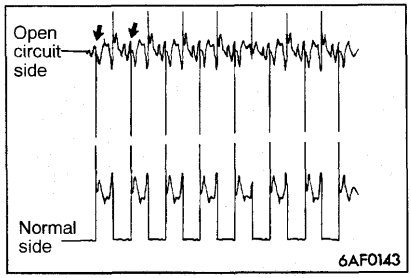
- Example 1

  Cause of problem

  Motor is malfunctioning. (Motor is not operating.)

  Wave pattern characteristics

  Induced electromotive force from the motor turning does not appear.



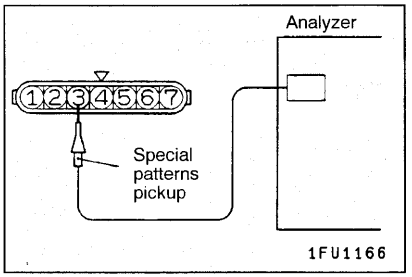
- Example 2

  Cause of problem

  Open circuit in the line between the IAC motor and the ECM.

  Wave pattern characteristics

  Current is not supplied to the motor coil on the open circuit side. (Voltage does not drop to 0 V.)
  Furthermore, the induced electromotive force waveform at the normal side is slightly different from the normal waveform.



IGNITION COIL AND IGNITION POWER TRANSISTOR

- Ignition coil primary signal
  Refer to GROUP 16 - Ignition System
- Ignition power transistor control signal

Measurement Method

1. Disconnect the distributor (ignition power transistor) connector, and connect the special tool (test harness: MB991348) in between. (All terminals should be connected.)
2. Connect the analyzer special patterns pickup to distributor connector terminal 3.

Alternate method (Test harness not available)

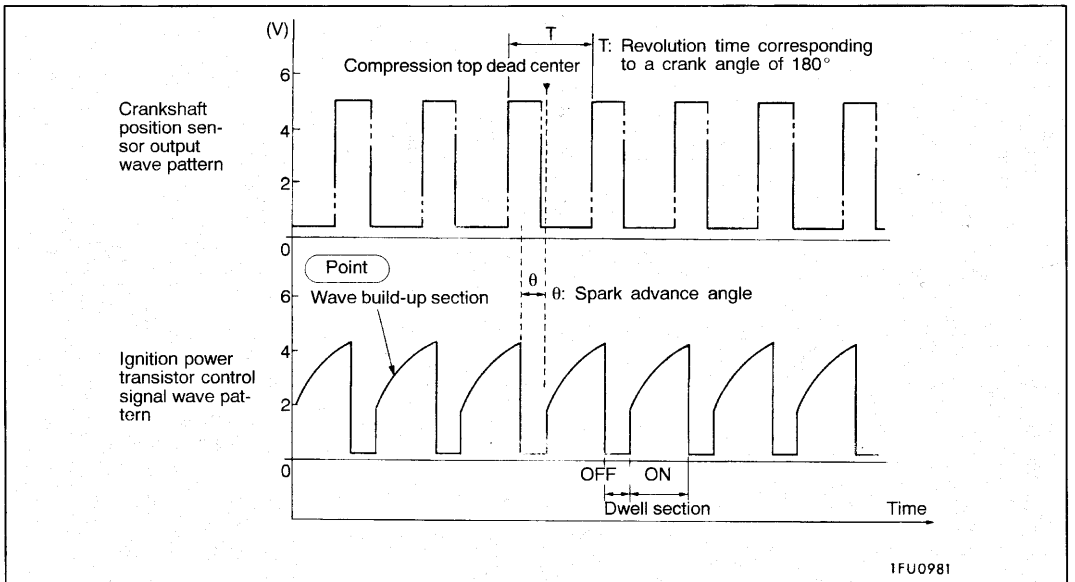
1. Connect the analyzer special patterns pickup to ECM terminal 10.

Standard Wave Pattern

Observation conditions

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

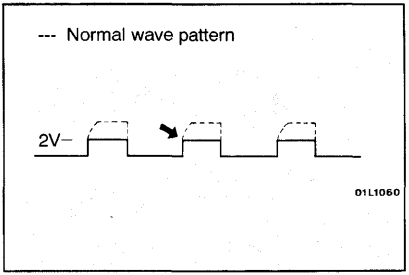
Standard wave pattern



Wave Pattern Observation Points

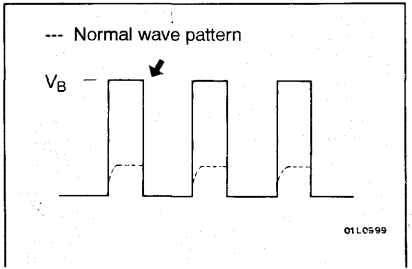
Point: Condition of wave pattern build-up section and maximum voltage (Refer to abnormal wave pattern examples 1 and 2.)

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	Ignition power transistor malfunction



Examples of Abnormal Wave Patterns

- Example 1
  Wave pattern during engine cranking
  CAUSE OF PROBLEM
  Open-circuit in ignition primary circuit
  WAVE PATTERN CHARACTERISTICS
  Top-right part of the build-up section cannot be seen, and voltage value is too low approximately 2V.



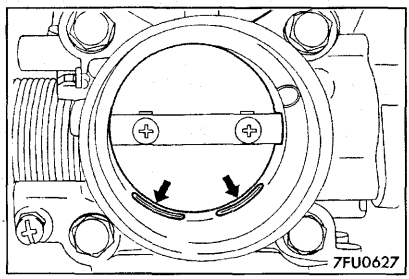
- Example 2
  Wave pattern during engine cranking
  CAUSE OF PROBLEM
  Malfunction in ignition power transistor
  WAVE PATTERN CHARACTERISTICS
  Power voltage results when the ignition power transistor is ON.

ON-VEHICLE SERVICE

13100100474

THROTTLE BODY (THROTTLE VALVE AREA) CLEANING

1. Start the engine and warm it up until the coolant is heated to 80°C (176°F) or higher and then stop the engine.
2. Remove the air intake hose from the throttle body.



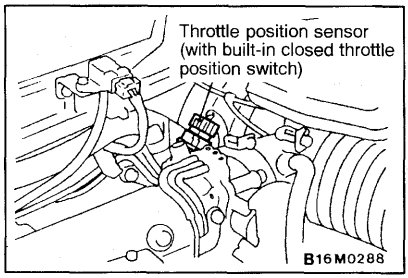
3. Plug the bypass passage inlet (arrow) of the throttle body.

   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 scan tool to erase the diagnostic trouble code.
10. Adjust the basic idle speed. (Refer to P.13A-143.)

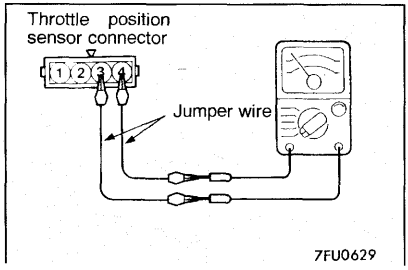
    NOTE
    If the engine hunts while idling after adjustment of the basic idle speed, disconnect the (–) cable from the battery for 10 seconds or more, and then reconnect it and run the engine at idle for about 10 minutes.

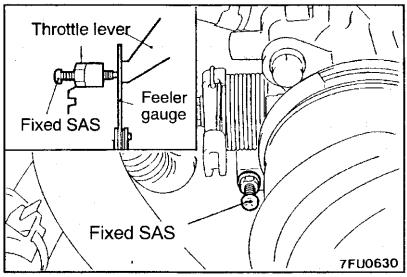
CLOSED THROTTLE POSITION SWITCH AND THROTTLE POSITION SENSOR ADJUSTMENT

13100130190

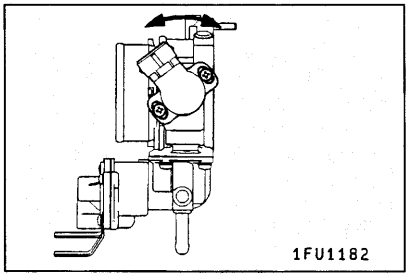


1. Connect the scan tool to the data link connector. When not using the scan tool, proceed as follows.
   (1) Disconnect the connector of the throttle position sensor.
   (2) Connect an ohmmeter between terminal 3 (closed throttle position switch) and 4 (sensor ground) by using jumper wires.



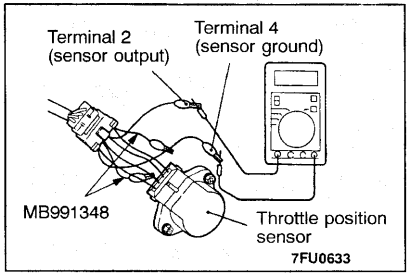


2. Insert a feeler gauge with a thickness of 0.45 mm (0.177 in.) between the fixed SAS and the throttle lever.
3. When using the scan tool, turn the ignition switch ON. (Do not start engine.) Observe operation of the closed throttle position switch.



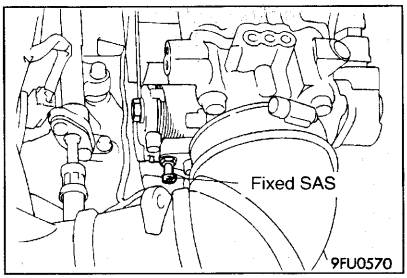
4. Loosen the throttle position sensor mounting bolt; then turn the throttle position sensor body fully counter clockwise.
5. In this condition, make sure that the closed throttle position switch is ON.

6. Slowly turn the throttle position sensor clockwise until the point at which the closed throttle position switch is turned OFF is found.
   Tighten the throttle position sensor installation bolt at that position. Proceed to Step 8.



7. When not using the scan tool, proceed as follows:
   (1) Connect the special tool (test harness set) between the throttle position sensor connectors which have been disconnected. (Connect all terminals taking care not to mistake the terminal No.)
   (2) Connect a digital voltmeter between the throttle position sensor terminal 2 (sensor output) and terminal 4 (sensor ground.)
   (3) Turn the ignition switch ON (but do not start the engine).

8. Check the throttle position sensor output voltage.
   Standard value: 400-1,000 mV
9. If there is a deviation from the standard value, check the throttle position sensor and the related harness.
10. Remove the feeler gauge.
11. Switch OFF the ignition switch.



FIXED SAS ADJUSTMENT

13100150431

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. Turn the fixed SAS clockwise until the throttle lever is touched (i.e., the point at which the throttle valve begins to open).
   From that point, turn the fixed SAS clockwise another 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 idle speed.
8. Adjust the closed throttle position switch and the throttle position sensor. (Refer to P.13A-141.)

BASIC IDLE SPEED ADJUSTMENT

13100180539

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 air control motor, the compression pressure, etc., are all normal.

1. The vehicle should be prepared as follows before the inspection and adjustment.
   - Engine coolant temperature: 80 - 95°C (176 - 203°F)
   - Lights, cooling fan and accessories: OFF
   - Transaxle: Neutral (A/T for P range)
2. Connect the scan tool to the data link connector (16-pin).

   NOTE
   When the scan tool is connected, the diagnostic test mode control terminal should be grounded.

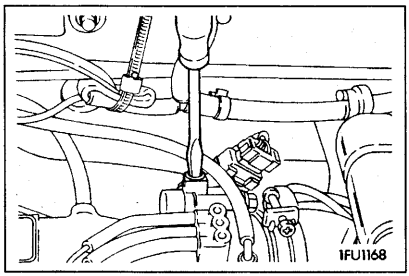
3. Start the engine and run at idle.
4. Select the item No.30 of the scan tool Actuator test.

   NOTE
   This holds the IAC motor at the basic step to adjust the basic idle speed.

5. Check the idle speed.

   Standard value: 700 ± 50 r/min

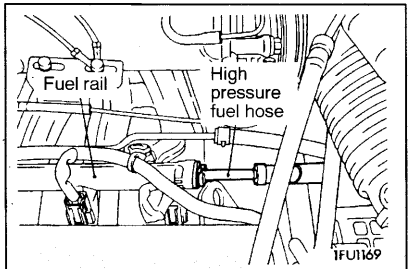
   NOTE
   1. The engine speed may be 20 to 100 r/min lower than indicated above for a new vehicle [driven approximately 500 km (300 mile) or less], but no adjustment is necessary.
   2. If the engine stalls or the engine speed is low even though the vehicle has been driven approximately 500 km (300 mile) or more, it is probable that deposits are adhered to the throttle valve, so clean it. (Refer to P.13A-141.)



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

   NOTE
   If the idling speed is higher than the standard value range even when the SAS is fully closed, check whether or not there is any indication that the fixed SAS has been moved. If there is an indication that it has been moved, adjust the fixed SAS.
7. Press the scan tool clear key, and release the IAC motor Actuator test mode.

   NOTE
   Unless the IAC motor is released, the Actuator test mode will continue 27 minutes.
8. Switch OFF the ignition switch.
9. Disconnect the scan tool.
10. Start the engine again and let it run at idle speed for about 10 minutes; check that the idling condition is normal.



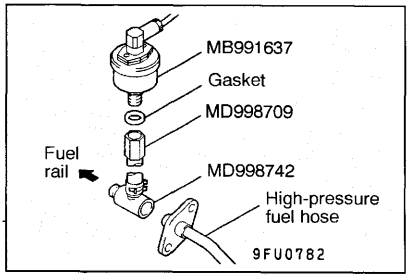
FUEL PRESSURE TEST

13100190488

1. Release residual pressure from the fuel line to prevent fuel spray. (Refer to P.13A-147.)
2. Disconnect the high pressure fuel hose at the fuel rail 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.

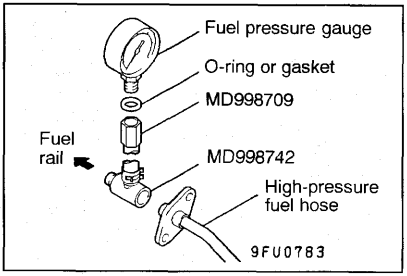
3. Remove the union joint and bolt from the special tool (adapter hose MD998709) and instead attach the special tool (hose adapter MD998742) to the adapter hose.



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 MB991637)>

(1) Install the special tool (for measuring the fuel pressure) between the high-pressure fuel hose and the fuel rail.
(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 scan tool.

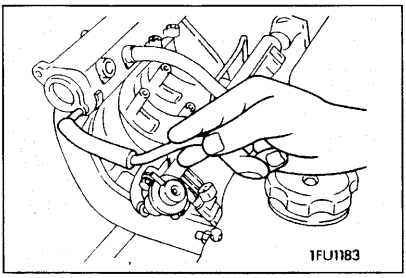


<When using the fuel pressure gauge>

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

5. Connect the scan tool to the data link connector.
6. Turn the ignition switch to ON. (But do not start the engine.)
7. Use the scan tool to operate the fuel pump. 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:
Approx. 270 kpa (38 psi) at curb 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:
    330-350 kPa (47-50 psi) at curb 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 drops after racing • No fuel pressure in fuel return hose	Clogged fuel filter	Replace fuel filter
	Fuel leaking to return side due to poor fuel regulator valve seating or settled spring	Replace fuel pressure regulator
	Low fuel pump delivery pressure	Replace fuel pump
Fuel pressure too high	Binding valve in fuel pressure regulator	Replace fuel pressure regulator
	Clogged fuel return hose or pipe	Clean or replace hose or pipe
Same fuel pressure when vacuum hose is connected and when disconnected	Damaged vacuum hose or clogged nipple	Replace vacuum hose or clean nipple

15. Stop the engine and observe 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.
    (1) Squeeze closed the fuel return line to confirm leak-down occurs from defective fuel pressure requlator.
    (2) Squeeze closed the fuel supply line to confirm leak-down occurs from defective fuel pump check valve.
    (3) If pressure continues to drop with both fuel lines squeezed closed, injector(s) are leaking.

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

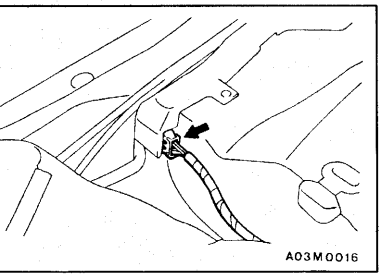
16. Release residual pressure from the fuel pipe line. (Refer to P.13A-147.)
17. Remove the fuel pressure gauge and special tool from the fuel rail.

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 high pressure fuel hose with a new one.
19. Fit the high pressure fuel hose into the fuel rail and tighten the bolts to specified torque.

Tightening torque: 5 Nm (3.6 ft.lbs.)

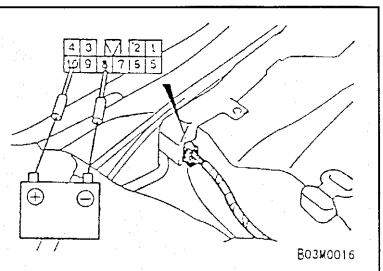
20. Check for fuel leaks.
    (1) Use the scan tool to operate the fuel pump.
    (2) Check the fuel line for leaks, repair as needed.
21. Disconnect the scan tool.



FUEL PUMP CONNECTOR DISCONNECTION (HOW TO REDUCE PRESSURIZED FUEL LINES) 13100090146

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) Raise the rear seat cushion.
(2) Disconnect the body wiring harness and fuel wiring harness under the floor carpet.
(3) After starting the engine and letting it run until it stops naturally, turn the ignition switch to OFF.
(4) Connect the fuel wiring harness and body wiring harness.
(5) Install the rear seat cushion.



FUEL PUMP OPERATION CHECK 13100200334

1. Check the operation of the fuel pump by using the scan tool to force-drive the fuel pump.
2. If the fuel pump will not operate, check by using the following procedure, and if it is normal, check the drive circuit.
   (1) Turn the ignition switch to OFF.
   (2) Raise the rear seat cushion.
   (3) Disconnect the body wiring harness and fuel wiring harness under the floor carpet.

(4) Connect the battery (+) terminal to terminal No.10 of the fuel pump side directly, and battery (-) terminal to terminal No.8. Then, confirm that operation sound is heard from the pump.

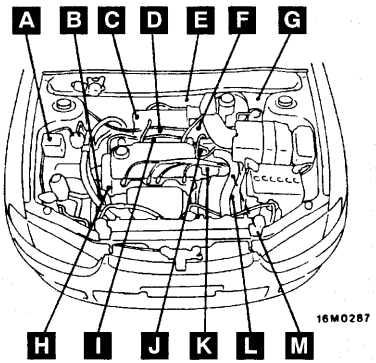
NOTE
As the fuel pump is an in-tank type, the fuel pump sound is hard to hear, so remove the fuel filler cap and check from the tank inlet.

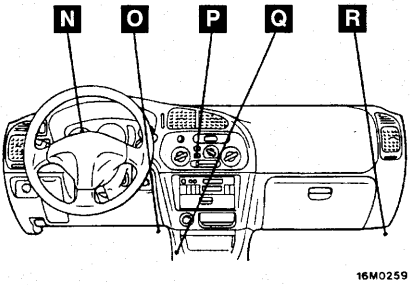
(5) Check the fuel pressure by pinching the fuel hose with the fingertips.
(6) Connect the body wiring harness and fuel wiring harness.
(7) Install the rear seat cushion.

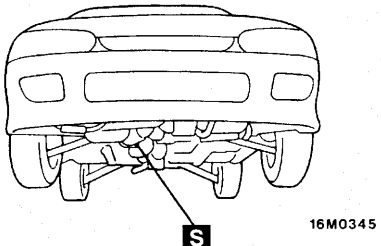
COMPONENT LOCATION

13100210627

Name		Symbol	Name	Symbol
Air conditioning compressor clutch relay		A	Idle air control motor	F
Air conditioning switch		P	Ignition coil/Ignition power transistor	K
Camshaft position sensor		K	Injector	I
Crankshaft position sensor		H	Intake air temperature sensor	C
Data link connector		O	Manifold absolute pressure sensor	E
EGR Solenoid		D	Multiport fuel injection (MFI) relay/Fuel pump relay	Q
Engine control module		R		
Engine coolant temperature sensor		J	Park/Neutral position switch	L
Evaporative emission purge solenoid		D	Power steering pressure switch	B
Fuel pump check connector		G	Service Engine Soon/Malfunction Indicator Lamp	N
Heated oxygen sensor <California>	Front	S		
	Rear	S	Throttle position sensor (with built-in closed throttle position switch)	F
Heated oxygen sensor <Federal>	Front	S		
	Rear	S	Vehicle speed sensor	M







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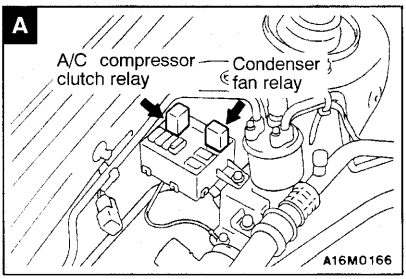
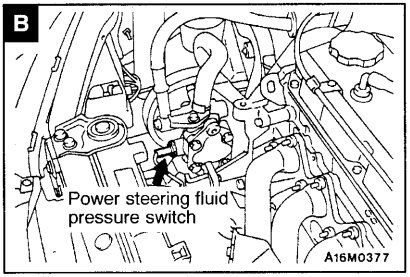
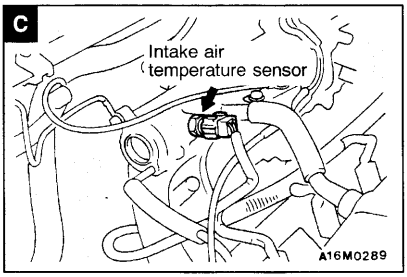

A/C compressor clutch relay
Condenser fan relay
A16M0166

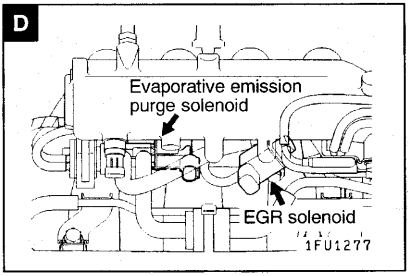
B


Power steering fluid pressure switch
A16M0377

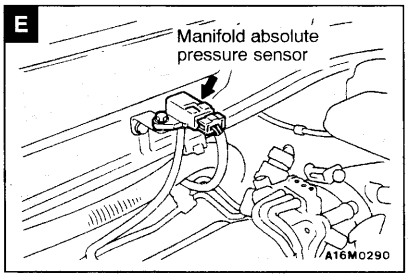
C


Intake air temperature sensor
A16M0289

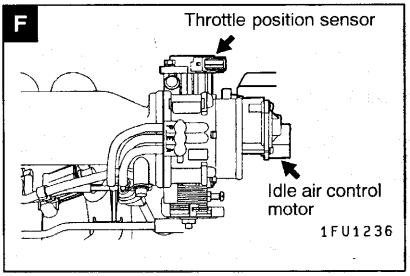
D


Evaporative emission purge solenoid
EGR solenoid
1FU1277

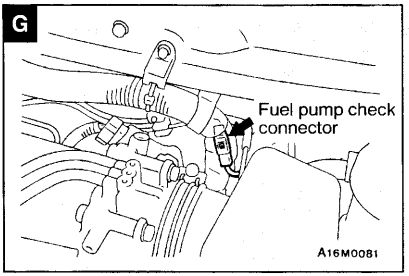
E


Manifold absolute pressure sensor
A16M0290

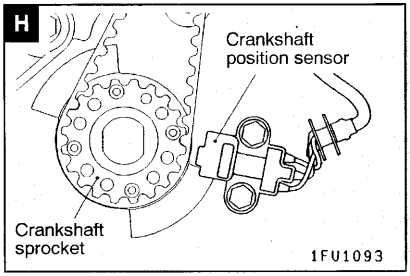
F


Throttle position sensor
Idle air control motor
1FU1236

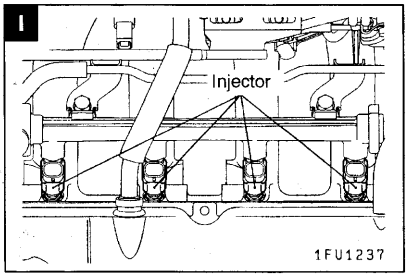
G


Fuel pump check connector
A16M0081

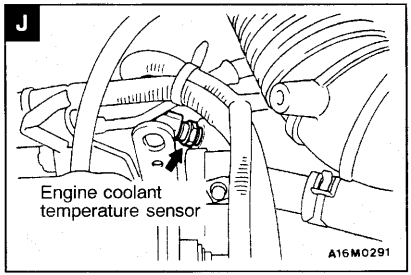
H


Crankshaft position sensor
Crankshaft sprocket
1FU1093

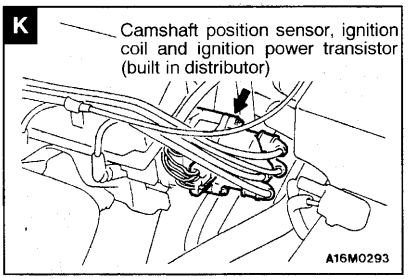
I


Injector
1FU1237

J


Engine coolant temperature sensor
A16M0291

K



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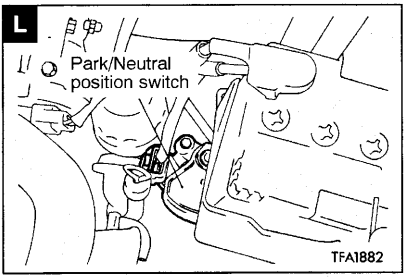

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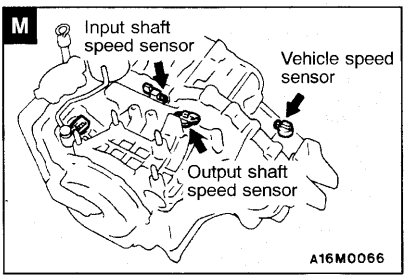

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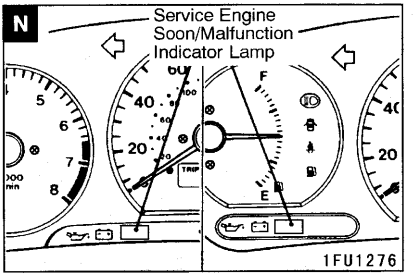

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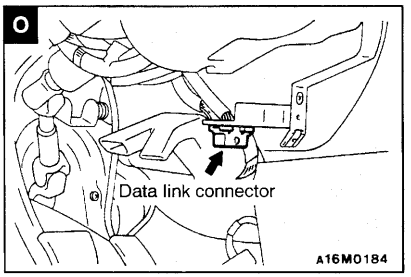

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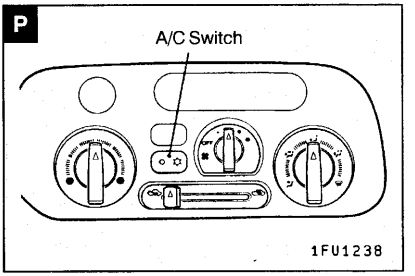

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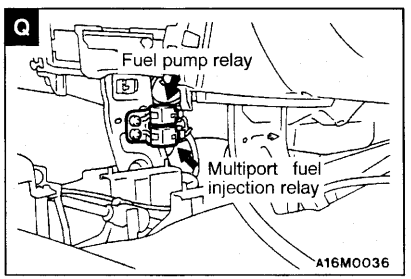

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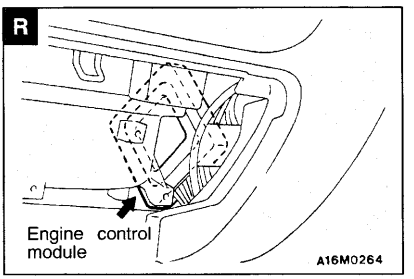
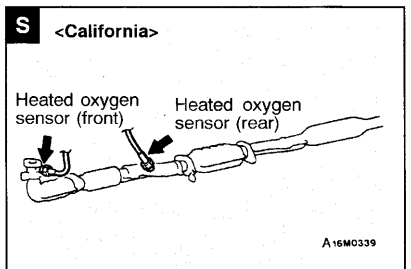
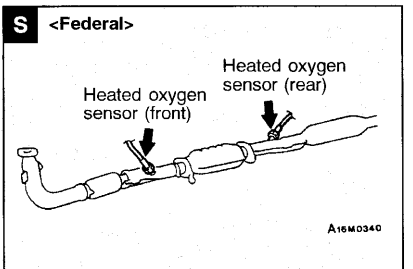
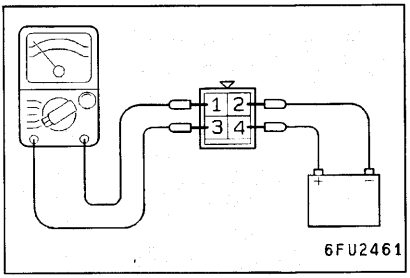


S <California>



S <Federal>

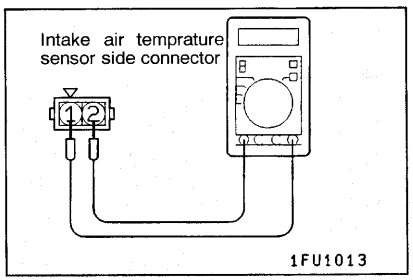




MULTIPORT FUEL INJECTION (MFI) RELAY AND FUEL PUMP RELAY CONTINUITY CHECK

13100990033

BATTERY VOLTAGE	TERMINAL NO.			
	1	2	3	4
Not supplied		○		○
Supplied	○		○	
		⊖		⊕

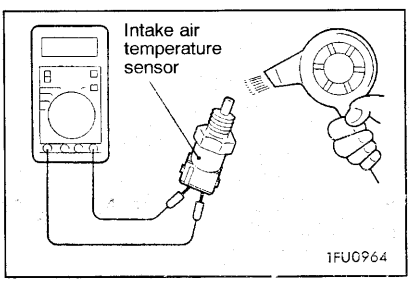


INTAKE AIR TEMPERATURE SENSOR CHECK

13100280154

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

   Standard value:
   2.3 - 3.0 kΩ [at 20°C (68°F)]
   0.30 - 0.42 kΩ [at 80°C (176°F)]
3. Remove the intake air temperature sensor.



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

   Normal condition:

Temperature	Resistance (kΩ)
Higher	Smaller

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

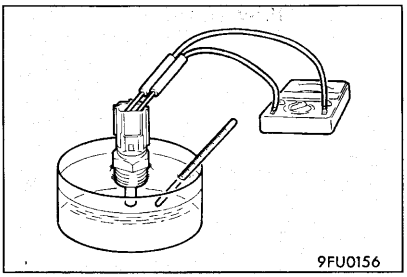
   Tightening torque: 12 - 15 Nm (9 - 11 ft.lbs.)

ENGINE COOLANT TEMPERATURE SENSOR CHECK

13100310167

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

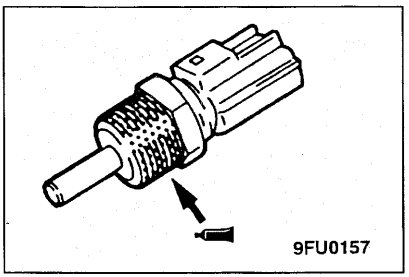
1. Remove the engine coolant temperature sensor.



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 (68°F)]
   0.26 - 0.36 kΩ [at 80°C (176°F)]

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

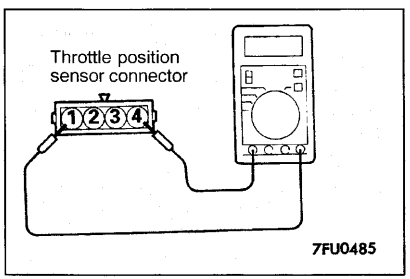


4. Apply sealant to threaded portion.

   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 (22 ft.lbs.)



THROTTLE POSITION SENSOR CHECK 13100320436

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 kΩ

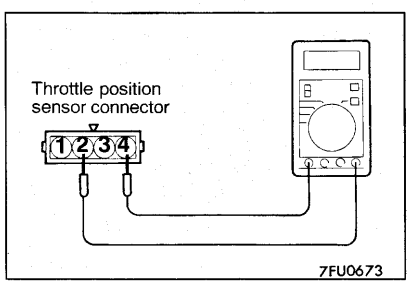
3. Measure the resistance between the throttle position sensor side connector terminal 2 and terminal 4.

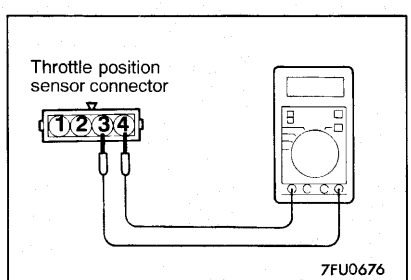
   Normal condition:

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

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

   NOTE
   For the throttle position sensor adjustment procedure, refer to P.13A-141.





CLOSED THROTTLE POSITION SWITCH CHECK 13100330415

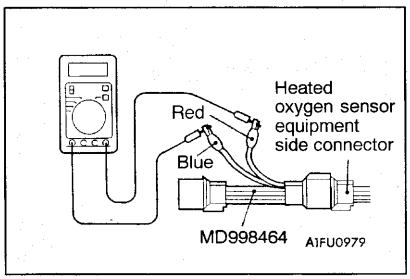
1. Disconnect the throttle position sensor connector.
2. Check the continuity between the throttle position sensor connector side terminal 3 and terminal 4.

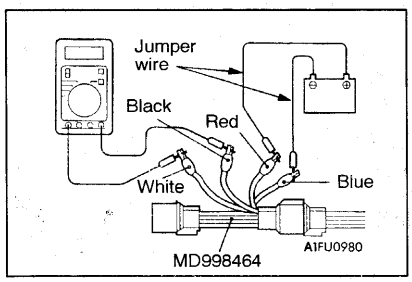
   Normal condition:

Accelerator pedal	Continuity
Depressed	Non-conductive
Released	Conductive

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

NOTE
After replacement, the closed throttle position switch and throttle position sensor should be adjusted. (Refer to P.13A-141.)





HEATED OXYGEN SENSOR CHECK 13100500199

<Heated oxygen sensor (front)>

When using Scan tool, observe HO_2S reading. If values are unsatisfactory, or if Scan tool is not available, use the following procedure:

1. Disconnect the heated oxygen sensor connector and connect the special tool (test harness) to the connector on the heated oxygen sensor side.
2. Make sure that there is continuity [4.5 - 8.0 Ω at 20°C (68°F)] between terminal 1 (red clip of special tool) and terminal 3 (blue clip of special tool) on the heated oxygen sensor connector.
3. If there is no continuity, replace the heated oxygen sensor.
4. Warm up the engine until engine coolant is 80°C (176°F) or higher.
5. Use the jumper wires to connect terminal 1 (red clip) of the heated oxygen sensor connector to the battery (+) terminal and terminal 3 (blue clip) to the battery (–) terminal.

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

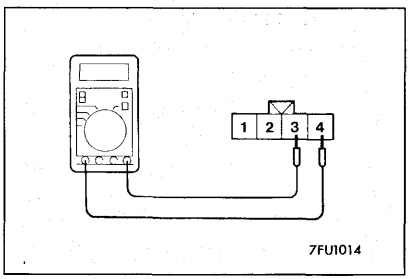
6. Connect a digital voltage meter between terminal 2 (black clip) and terminal 4 (white clip).
7. While repeatedly racing the engine, measure the heated oxygen sensor output voltage.

Standard value:

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

8. If the sensor is defective, replace the heated oxygen sensor.

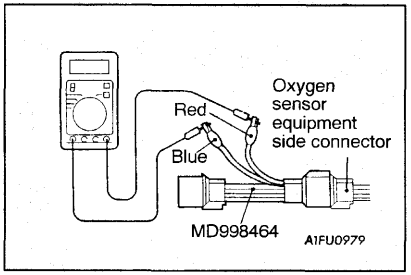
NOTE
For removal and installation of the heated oxygen sensor, refer to GROUP 15 - Exhaust Pipe and Main Muffler.



<Heated oxygen sensor (rear): Vehicles for Federal>

1. Disconnect the heated oxygen sensor connector.
2. Make sure that there is continuity [4.5 - 8.0 Ω at 20°C (68°F)] between terminal 3 and terminal 4 on the heated oxygen sensor connector.
3. If there is no continuity, replace the heated oxygen sensor.

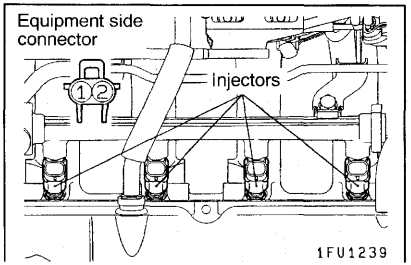
NOTE
1. If the scan tool does not display the standard value although no abnormality is found by the above mentioned continuity test and harness check, replace the heated oxygen sensor (rear).
2. For removal and installation of the oxygen sensor, refer to GROUP 15 - Exhaust Pipe and Main Muffler.



<Heated oxygen sensor (rear): Vehicles for California>

1. Disconnect the heated oxygen sensor connector and connect the special tool (test harness) to the connector on the heated oxygen sensor side.
2. Make sure that there is continuity [4.5 - 8.0 Ω at 20°C (68°F)] between terminal 1 (red clip of special tool) and terminal 3 (blue clip of special tool) on the heated oxygen sensor connector.
3. If there is no continuity, replace the heated oxygen sensor.

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



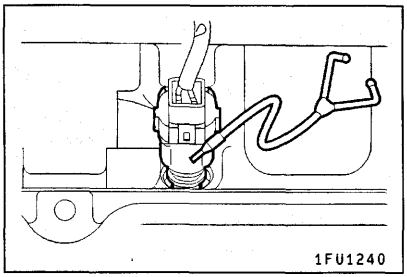
INJECTOR CHECK

13100520188

Measurement of Resistance between Terminals

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

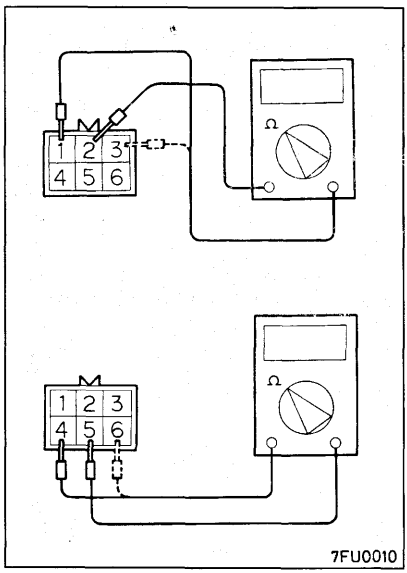
   Standard value: 13-16 Ω [at 20°C (68°F)]
3. Install the injector connector



Checking operation sound

Using a stethoscope or long blade screwdriver, check the operation sound ("tick-tick-tick") of injectors during idling or during cranking.
Check that as the engine speed increases, the frequency of the operating sound also increases.

(1) If the injector you are checking is not operating, you will hear the operating sound of the other injectors.
(2) If no operating sound is heard from the injector that is being checked, check the injector drive circuit. If there is nothing wrong with the circuit, a defective injector or engine control module is suspected.



IDLE AIR CONTROL MOTOR (STEPPER MOTOR) CHECK

13100540184

Checking the Operation Sound

1. Check that the engine coolant temperature is 20°C (68°F) 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 (68°F) or below is okay for this test.

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 module.

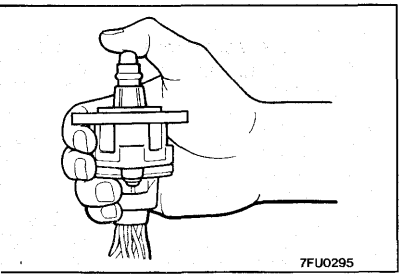
Checking the Coil Resistance

1. Disconnect the idle air control motor 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 air control motor side.

   Standard value: 28-33 Ω [at 20°C (68°F)]

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 air control motor side.

   Standard value: 28-33 Ω [at 20°C (68°F)]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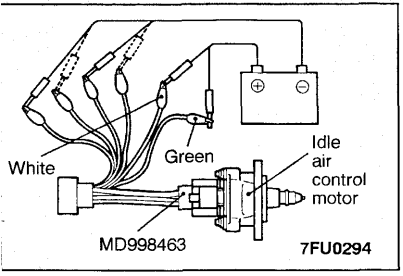
Operation Check

1. Remove the throttle body.
2. Remove the stepper motor.
3. Connect the special tool (test harness) to the idle air control motor connector.



4. Connect the positive (+) terminal of a power supply (approx. 6 V) to the white clip and the green clip.
5. With the idle air control motor as shown in the illustration, connect the negative (-) terminal of the power supply to each clip as described in the following steps, and check whether or not a very slight vibration of the stepper motor is generated as a result of the activation of the stepper motor.
   (1) Connect the negative (-) terminal of the power supply to the red and black clip.
   (2) Connect the negative (-) terminal of the power supply to the blue and black clip.
   (3) Connect the negative (-) terminal of the power supply to the blue and yellow clip.
   (4) Connect the negative (-) terminal of the power supply to the red and yellow clip.
   (5) Connect the negative (-) terminal of the power supply to the red and black clip.
   (6) Repeat the tests in sequence from (5) to (1) to test opposite movement of the IAC.
6. If, as a result of these tests, vibration is detected, the stepper motor can be considered to be normal.

EVAPORATIVE EMISSION PURGE SOLENOID CHECK

13100560272

Refer to GROUP 17 - Emission Control System.

EGR SOLENOID CHECK

13100570138

Refer to GROUP 17 - Emission Control System.

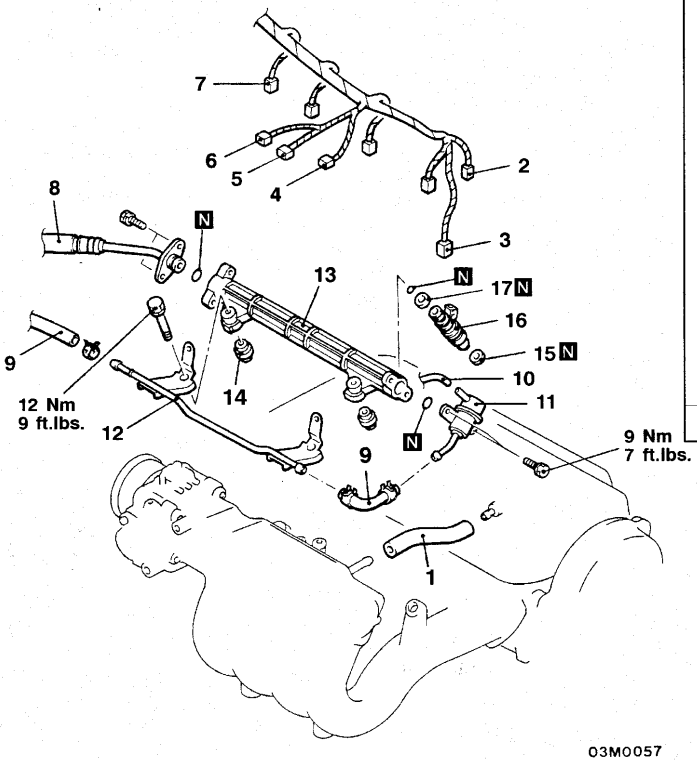
INJECTOR

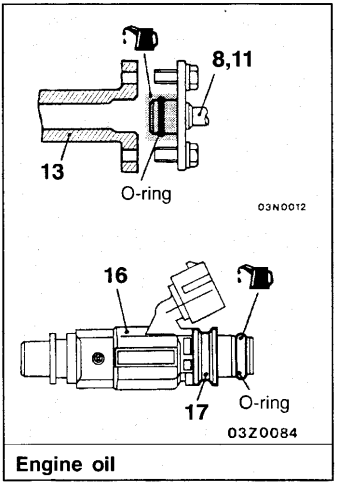
13100710189

REMOVAL AND INSTALLATION

Pre-removal Operation
(1) Fuel Discharge Prevention (Refer to P.13A-147.)
(2) Air Cleaner Removal

Post-installation Operation
(1) Air Cleaner Installation
(2) Fuel Leakage Checking





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Removal steps

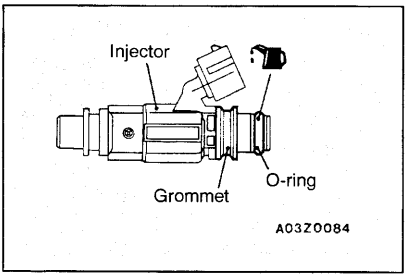
1. PCV hose
2. Crank angle sensor connector
3. Heated oxygen sensor connector
4. Intake air temperature sensor connector
5. Evaporative emission purge solenoid connector
6. EGR solenoid connector
7. Injector connector
▶A◀ 8. Fuel high-pressure hose connection
9. Fuel return hose connection
10. Vacuum hose connection
▶A◀ 11. Fuel pressure regulator
12. Fuel return pipe
◀A▶ 13. Fuel rail
14. Insulators
15. Insulators
◀A▶ ▶A◀ 16. Injectors
17. Grommets

REMOVAL SERVICE POINT

◀A▶ FUEL RAIL/INJECTOR REMOVAL

Remove the fuel rail (with the injectors attached to it).

Caution
Care must be taken, when removing the fuel rail, not to drop the injector.



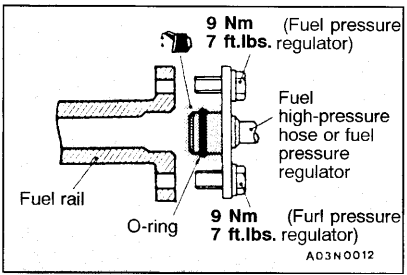
INSTALLATION SERVICE POINT

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

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

   Caution
   Be sure not to let engine oil enter the fuel rail.

2. While turning the injector, fuel high-pressure hose and fuel pressure regulator to the right and left, install the fuel rail. Be careful not to damage the O-ring.
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 fuel rail and check once again.



4. Tighten the fuel high-pressure hose to the standard torque, and tighten the fuel pressure regulator to the specified torque.

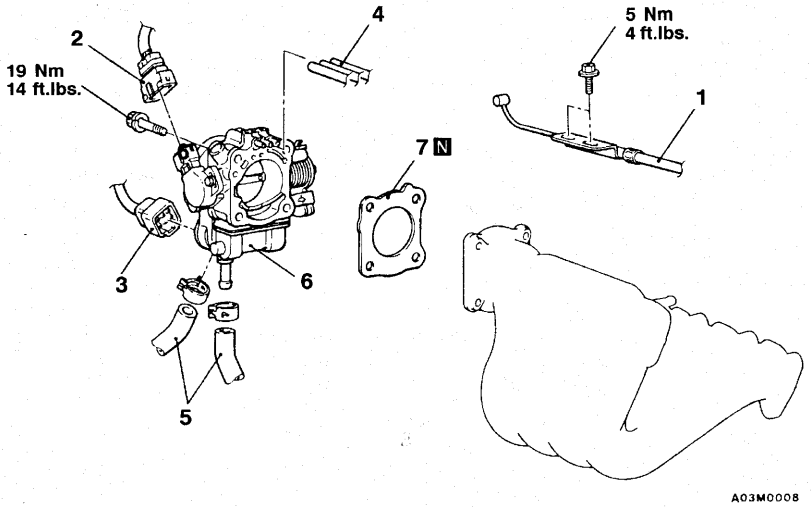
THROTTLE BODY

13100770378

REMOVAL AND INSTALLATION

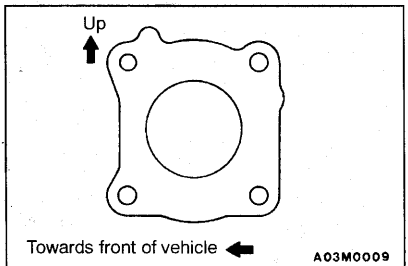
Pre-removal Operation
(1) Engine Coolant Draining (Refer to GROUP 00 - Maintenance Service.)
(2) Air Cleaner Removal

Post-installation Operation
(1) Air Cleaner Installation
(2) Engine Coolant Supplying (Refer to GROUP 00 - Maintenance Service.)
(3) Accelerator Cable Adjustment (Refer to GROUP 17 - On-vehicle Service.)



Removal steps

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



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.

DISASSEMBLY AND REASSEMBLY

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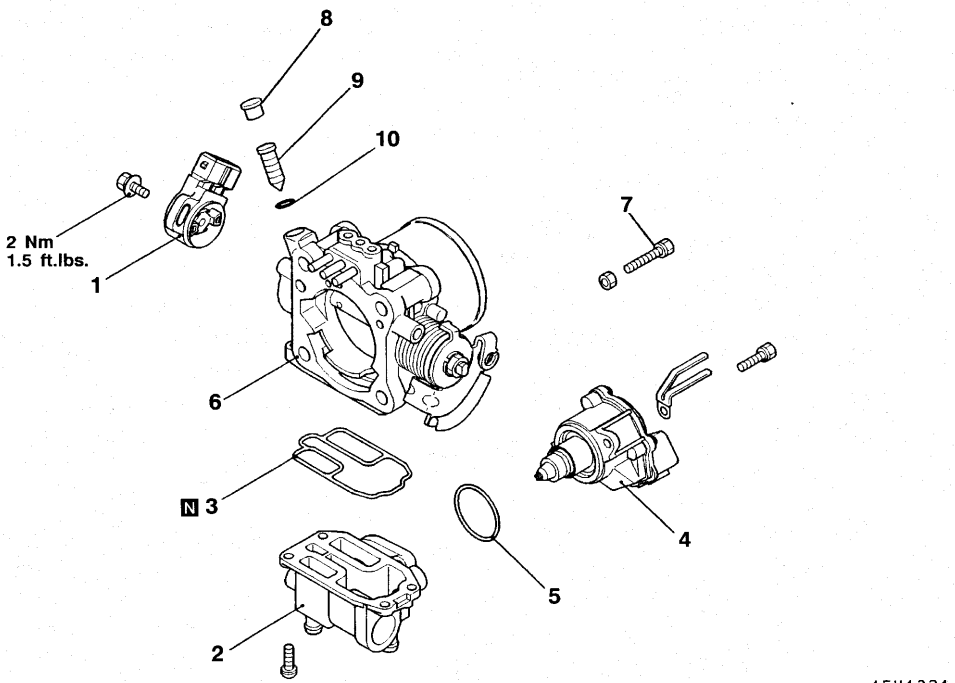
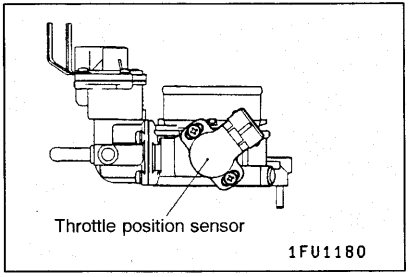
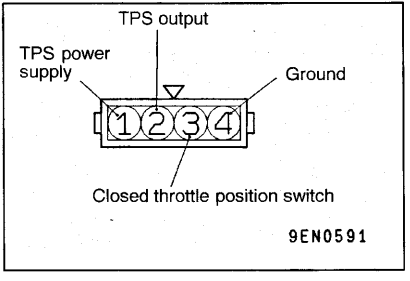


Disassembly steps

▶A◀ 1. Throttle position sensor
2. Idle speed control body assembly
3. O-ring
4. Idle speed control servo
5. O-ring
6. Throttle body
7. Fixed SAS
8. Cap
9. Speed adjusting screw
10. O-ring

NOTE
1. The fixed SAS is correctly adjusted at the factory and should not be removed.
2. If the fixed SAS should happen to have been removed, carry out fixed SAS adjustment. (Refer to page 13A-143.)
3. If the speed adjusting screw should happen to have been removed, carry out speed adjusting screw adjustment. (Refer to page 13A-143.)





REASSEMBLY SERVICE POINT

▶A◀ THROTTLE POSITION SENSOR (TPS) INSTALLATION

1. Install the TPS so that it faces as shown in the illustration, and then tighten it with the screw.
2. Connect a multimeter between terminal (1) (TPS power supply) and terminal (2) (TPS output) of the TPS connector, and check that the resistance increases gradually as the throttle valve is opened slowly to the fully-open position.
3. Check the continuity between terminal (3) (closed throttle position switch) and terminal (4) (ground) of the TPS connector when the throttle valve is fully closed and fully open.

Normal condition:

Throttle valve condition	Continuity
Fully closed	Continuity
Fully open	No continuity

If there is no continuity when the throttle valve is fully closed, turn the TPS body counter-clockwise and then check again.

4. If there is an abnormality, replace the TPS.