5.6 MATRIX TABLE FOR TROUBLE-SHOOTING ACCORDING TO MALFUNCTIONING PHENOMENA

In cases where no malfunction code was detected during the DTC check and no malfunction can be still confirmed during the basic check, perform the trouble-shooting, referring to the following table.

	See page	EF–158	EF–178	EF–181	—	—	EF–145	EF–185	—	Refer to EC section	Refer to AT section	EF–134
	Suspect area / Malfunction phenomena	Starter and starter relay	ECU power source circuit	Fuel pump control circuit	Injector circuit	Fuel filter/Fuel line	Ignition coil (W/Ignitor) circuit	Spark plug	Hose, etc., disconnected	PCV valve	A/T faulty	ISC valve circuit
Poor starting	Engine does not crank (Does not start)	●										
	Engine cranks normally (Difficult to start)			●	●		●	●				●
	No initial combustion takes place		●	●	●		●					
	Although initial combustion takes place, combustion is not complete			●	●		●					
	Hard starting (during cold period)			●	●		●	●				●
	Hard starting (during hot period)			●	●		●	●				●
Poor idling	Fast idle is not effective											●
	Idle revolution speed is too low			●	●							●
	Idle revolution speed is too high		●						●	●		●
	Unstable/Rough idling			●	●	●	●					●
	Hunting during idling		●	●					●	●		●
Engine stalling	Engine stalls when accelerator pedal is depressed					●				●		
	Engine stalls when accelerator pedal is released				●							●
	Engine stalls during idling			●	●	●						●
	Engine stalls when A/C switch is turned on											●
	Engine stalls when shifting from N to D											●
Poor running	Hesitation during acceleration period			●	●	●					●	
	Hunting during running								●	●		
	Lack of output			●	●	●						
	Knocking			●	●							
	Back fire/After fire				●		●	●				

JEF00119-00000

5.7 CHECKING PROCEDURE FOR COMMON ITEMS IN CHART

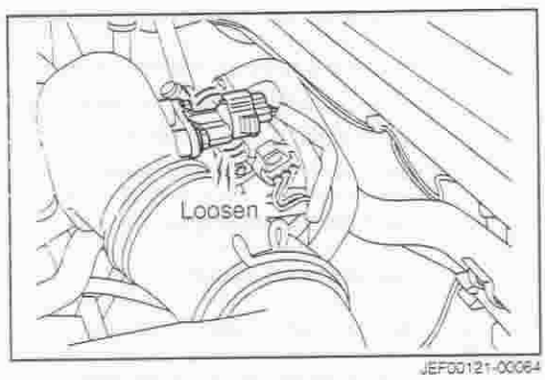
1. For proper trouble-shooting, the detailed checking procedure for each circuit in the chart according t the DTC chart or the chart according to malfunctioning phenomena is provided later on.
2. If the trouble-shooting for all components, wire harnesses and connectors, except for the ECU, reveals that no malfunction is occurring, most likely the ECU is malfunctioning. Therefore, if the diagnosis has been carried out without any malfunction, then the ECU will be checked and eventually replaced even though no malfunction has been found in the ECU. Hence, make sure that any malfunctioning phenomenon is occurring. Or, in cases where no malfunction is occurring, be sure to proceed with the checks, using the malfunction reproduction simulation test method.
3. Each of the procedures "Check of Wire Harnesses and Connectors," "Check of Malfunction which Occurs Intermittently" and "Check and Replacement of ECU" appearing in the checking procedure is an element operation common in each system check (checking procedure) and can apply to various systems. Hence, the checks should be conducted, following these procedures as summarized below.

JEF00120-00000

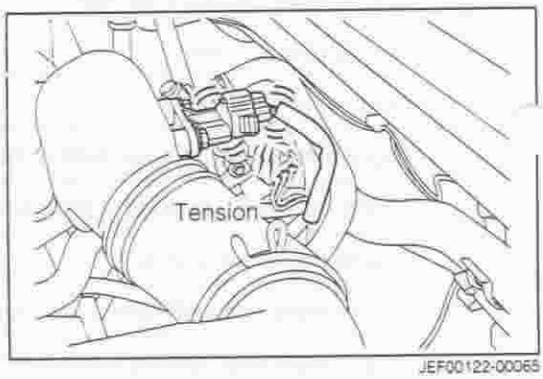
5.7.1 CHECK OF WIRE HARNESSES AND CONNECTORS

Malfunctions of the wire harness and connectors are caused by an open wire or short circuit.

Open Wire: This is caused by detached wire harness, poor contact inside the connector, detached connector terminal, and so forth.



JEF00121-00064

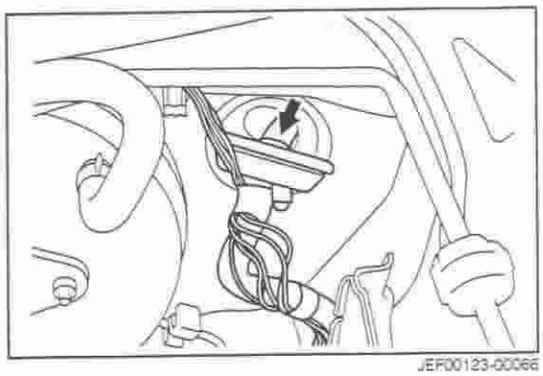


JEF00122-00065

NOTE:

- The wires are rarely cut at the center. In most cases, an open wire occurs at the connectors. Particularly, the connectors of the sensor and actuator should be checked very carefully.
- Poor contact is caused by rust formation at the connector terminal, foreign substances adhered to the terminal, or drop in the contact pressure between the male and female terminals of the connector.
  Simply disconnect the connector once, and then, reconnect it. It may change the contacting condition, thus returning to the normal operation.
  Hence, if no abnormality was found when the wire harness and connector were checked during the trouble-shooting, and if the malfunction ceases to exist after completion of the checks, then the wire harness or connector was most likely causing the malfunction.

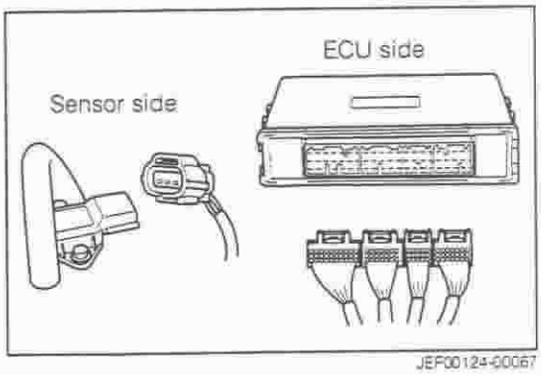
Short Circuit: This is caused by a short circuit between the wire harness and the body ground or by an internal short circuit of the switches, etc.


JEF00123-00066

NOTE:
- If a short circuit is present between the wire harness and the body ground, thoroughly check to see if the wire harness is caught in the body, if the wire is rubbed and the insulator section is ruptured, thus contacting other parts, and if the wire is clamped properly.

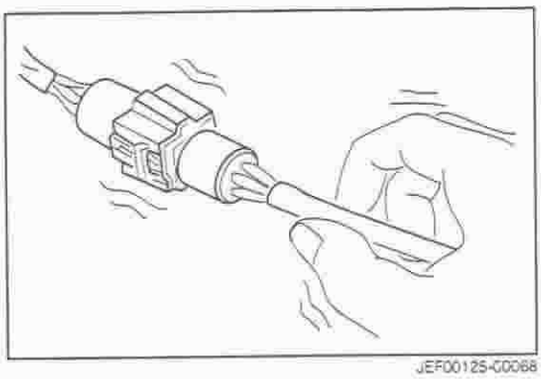
Continuity check (check for open wire)

1. Disconnect the connector on both sides of the ECU and sensor.

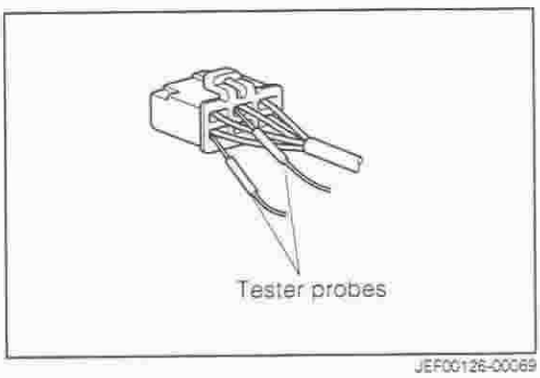


JEF00124-00067

2. Measure the resistance between the relevant terminals of the connector.
   Resistance: 10 Ω or less

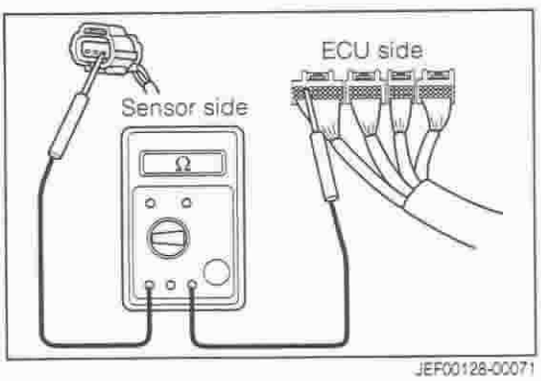

JEF00125-00068

NOTE:
- Lightly shake the wire harness in a longitudinal direction as well as in a horizontal direction when the resistance is measured.
- In the case of non-waterproof connectors, the test probe should be inserted into the connector from each wire harness side.



JEF00126-00069

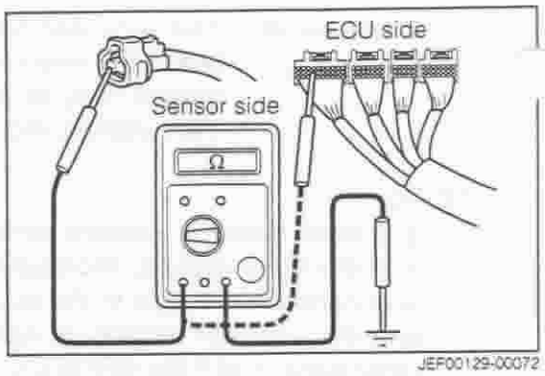
- In cases where the waterproof connector is checked without removing the waterproof rubber, be very careful not to deform the connector terminal when applying the test probes.



JEF00128-00071

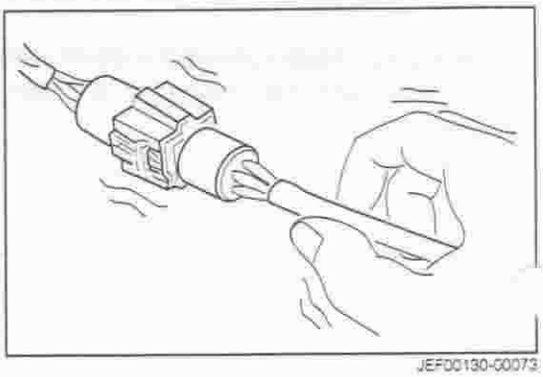
Check of resistance (check for short circuit)

1. Disconnect the connector on both sides.
2. Measure the resistance between the relevant terminal of the connector and the body ground. Moreover, be sure to check for the connectors on both sides.
   Resistance: 1 MΩ or more



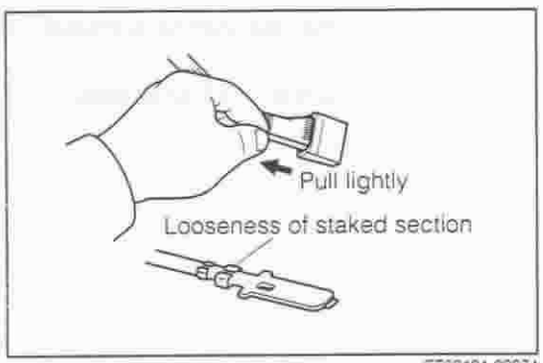
JEF00129-00072

NOTE:
- Lightly shake the wire harness in a longitudinal direction as well as in a horizontal direction when the resistance is measured.


JEF00130-00073

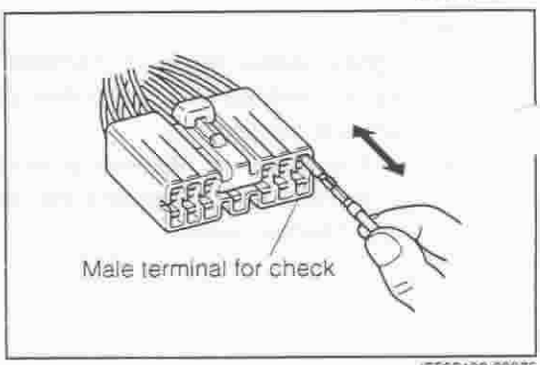
5.7.2 VISUAL INSPECTION AND CONTACT PRESSURE CHECK

1. Disconnect the connectors on both sides of the relevant harness.
2. Visually check that no rust formation is present at the connector terminal section. Also, check that no foreign substance is admitted.
3. Check the staked section for looseness and damage. Moreover, check that the terminal will not be detached by lightly pulling the wire harness from the connector.



JEF00131-00074

4. Prepare the same male terminal as that of the connector terminal. Insert it into the female terminal and check the pulling force.
   The terminal having a smaller pulling force, compared with other terminals, may cause poor contact.
   NOTE:
   - In cases where rust formation is present at the terminal section, foreign substances have been admitted, or the contact pressure has dropped between the male terminal and the female terminal, the contact condition may change by disconnecting and reconnecting the connector once, thus resulting in "No malfunction."
     Therefore, if the check results of the wire harness and connector reveal that there is no malfunction, confirm the malfunctioning phenomenon. At this time, if no malfunctioning phenomena is reproduced, most likely the poor contact between the male terminal and the female terminal was causing the malfunction.



JEF00132-00075

5.7.3 CHECK FOR MALFUNCTION WHICH OCCURS INTERMITTENTLY AND POOR CONTACT

Occasionally the relay or solenoid becomes seized. However, most malfunctions which occur intermittently are temporary open wires caused by a poor connection or wrong wiring inside the circuit.

Therefore, perform the check, observing the following points.

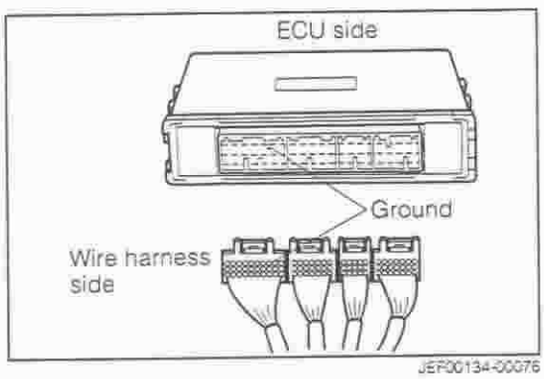
1. Check the connector and terminal.
   Perform the check for the items related to open wire under "Check of Wire Harness and Connector" on page EF-48.
2. Visual Inspection and Contact Pressure Check
   Perform the check, following the items under "Visual Inspection and Contact Pressure Check" on page EF-50.

JEF00133-00000

5.7.4 CHECK AND REPLACEMENT OF ECU

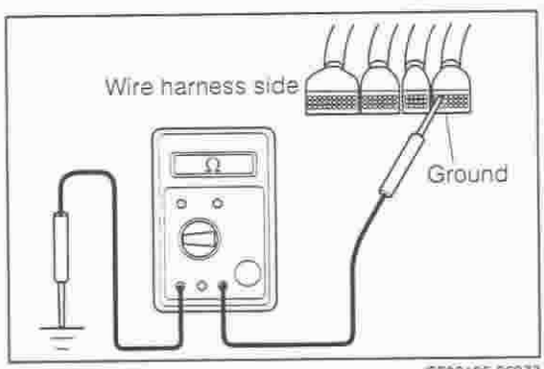
First, check the ground circuit of the ECU. If any malfunction is found, repair the ground circuit. If no malfunction is found, replace the ECU.

1. Disconnect the ECU connector. Check the ground terminals E1 and E2 on the ECU side and wire harness side for bending. Also, check the contact pressure.



JEF00134-00076

2. Measure the resistance between each of the ECU ground terminals E1 and E2 (harness side) and the body ground. Moreover, measure the voltage across the power supply terminal (harness side) and the body ground.
   Resistance: 10 Ω or less
   Voltage: Battery voltage



JEF00135-00077

NOTE:

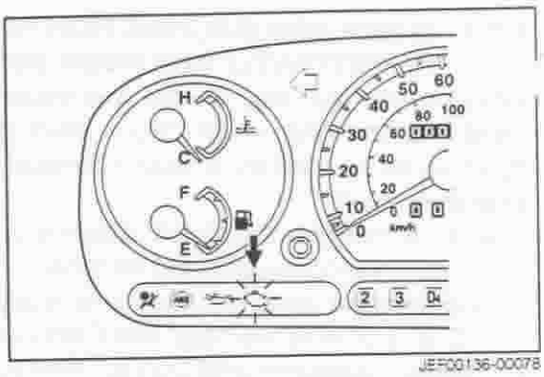
- When the ECU ground circuit is checked, there are cases where the contact condition of the terminal may change by disconnecting and reconnecting the connector, thus resulting in "No malfunction." Therefore, if the check results of the ECU ground circuit reveal that there is "no malfunction," again connect the ECU connector to confirm that the malfunction occurs. Then, you can judge that the ECU unit is faulty.

5.8 CHECKING PROCEDURE FOR DTC

Prior to the check, check the malfunction indicator lamp (MIL), following the procedure given below.

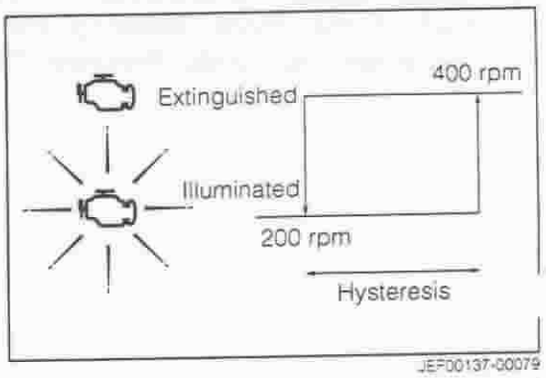
5.8.1 CHECK OF MALFUNCTION INDICATOR LAMP

1. Ensure that the malfunction indicator lamp goes on when the ignition switch is turned ON, but with the engine not running.
   NOTE:
   - If the malfunction indicator lamp (MIL) fails to go on, perform the trouble-shooting for the combination meter.



JEF00136-00078

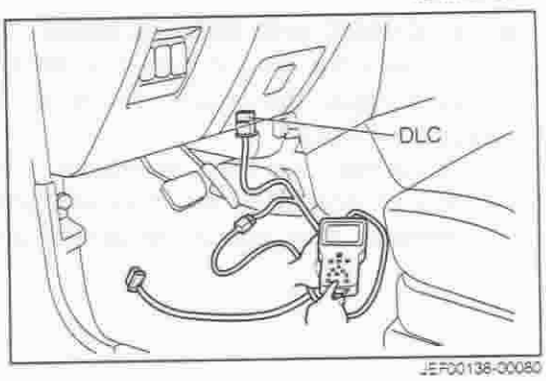
2 Ensure that the malfunction indicator lamp goes out when the engine starts.
   If the lamp remains illuminated or is flashing, the diagnosis system is detecting a malfunction. Therefore, a DTC is memorized in the ECU.
   If no DTC is memorized in the ECU, perform the trouble-shooting for the malfunction indicator lamp circuit.



JEF00137-00079

5.8.2 CHECK OF DTC, USING DS-21 DIAGNOSIS TESTER OR OBD II GENERIC SCAN TOOL

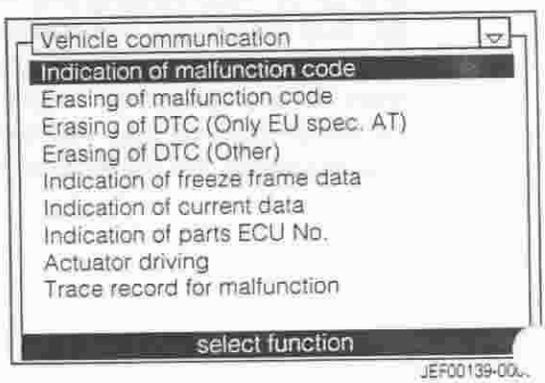
1. Prepare the DS-21 diagnosis tester or OBD II generic scan tool.
2. With the ignition switch turned OFF, connect the DS-21 diagnosis tester or the OBD II generic tester to the data link connector (DLC) located at the lower section of the instrument panel on the driver's seat side. At this time, the DS-21 tester should be connected to the DLC with the following SST interposed, and the OBD II generic tester should be connected directly.
   SST: 09991-87404-000



JEF00138-00080

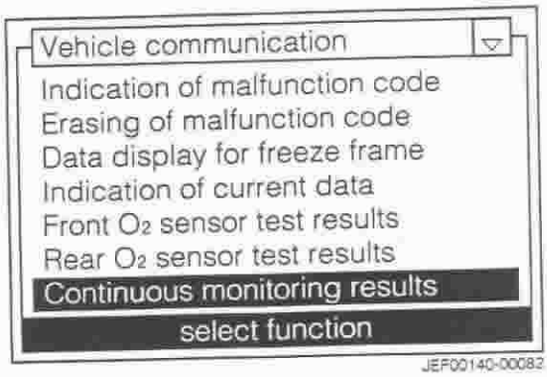
3. Turn ON the ignition switch and turn ON the main switch of the tester.

4. Check the DTC and freeze-frame data. Print them out or write them down.
   (For the operating procedure, refer to the instruction manual of the tester.)
   In cases where the OBD II generic scan tool is used, it is possible to take a reading of only the DTC's provided for in the ISO/SAE. It is, however, impossible to take a reading of the DTC's specified by the DMC.



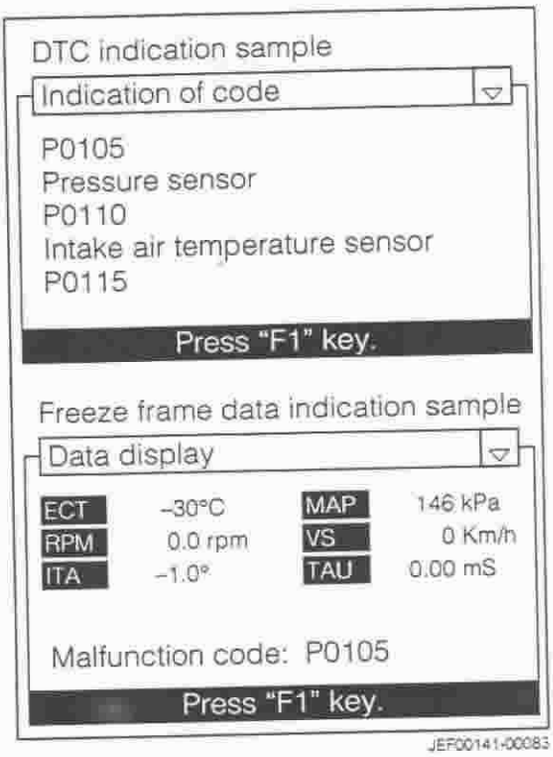
JEF00139-00[illegible]

(1) Furthermore, as regards the check of unidentified two-trip DTC (DTC that has been detected only once), select the "Continuous monitoring results" of the "vehicle communication" in CARB mode and press "F1" key. If any DTC has been detected, it will be indicated.



JEF00140-00082

(2) In this case, too, the OBD II generic scan tool will indicate only the DTC's provided for in the ISO/SAE. It is impossible to take a reading of DTC's specified by the DMC.



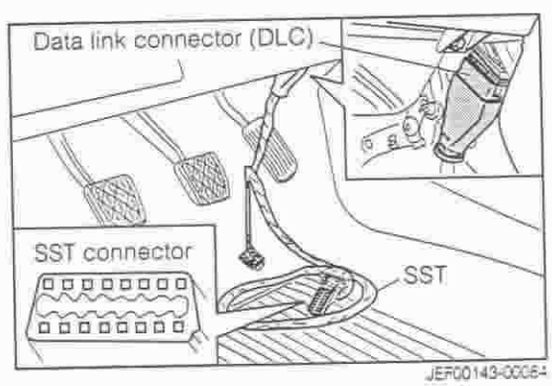
JEF00141-00083

5. After completion of the check, turn OFF the main switch of the tester and ignition switch. Disconnect the SST from the data link connector. Then, disconnect the tester from the SST.

JEF00142-00000

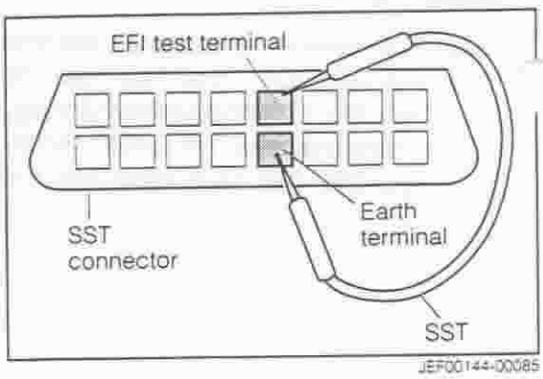
5.8.3 CHECK OF DTC WITHOUT USING DS-21 DIAGNOSIS TESTER OR OBD II GENERIC SCAN TOOL

1. With the ignition switch turned OFF, connect the following SST to the data link connector (DLC) located at the lower section of the instrument panel on the driver's seat side.
   SST: 09991-87404-000



JEF00143-00084

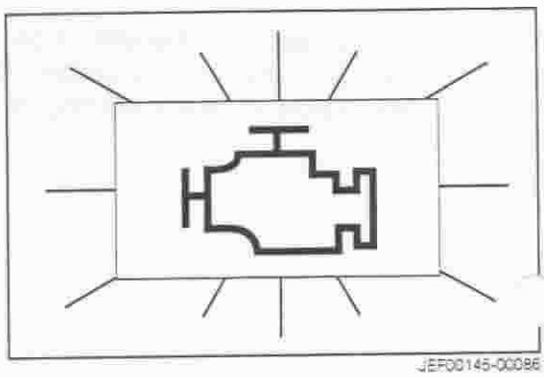
2. Connect the terminal between the EFI test terminal and the earth terminal of the SST connector with a jump wire as indicated in the illustration.
   SST: 09991-87403-000



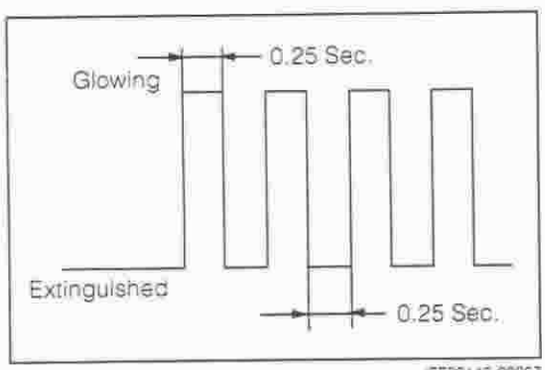
JEF00144-00085

3. Turn the ignition switch to the "ON" position. At this time, Be careful not to start the engine.

4. Read out the diagnostic trouble code (DTC) by observing the flashing number of the malfunction indicator lamp.

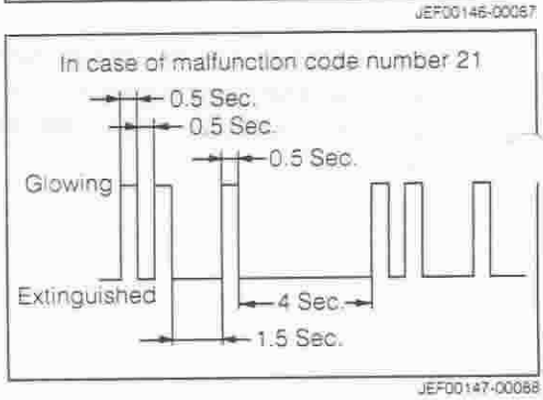

JEF00145-00086

5. The illustration shows an example of the flashing pattern of the normal code.
   The engine check lamp glows for 0.25 second, right after the ignition switch has been turned ON. After a lapse of 0.25 second, the check engine lamp again glows for 0.25 second.
   Then, this pattern will be repeated.



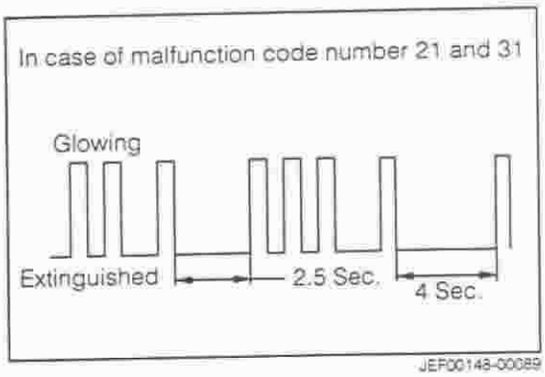
JEF00146-00087

6. The illustration shows an example of the flashing pattern of the code No. 21.
   The diagnosis code is composed of two digits. These two numbers are indicated by blinking of the check engine lamp. Four seconds after the ignition switch has been turned ON, the check lamp indicates first the number of the tens digit of the diagnosis code by glowing the same times as the number. The lamp glows for 0.5 second each time and then it is extinguished for 0.5 second. After a pause of 1.5 seconds, the check lamp indicates the number of the units digit of the diagnosis code by glowing the same times as the number. The lamp glows for 0.5 second each time and then it is extinguished for 0.5 second. Then, this pattern will be repeated after a pause of 4 seconds.



JEF00147-00088

7. The illustration shows an example of the flashing pattern of the codes No. 21 and 31.
   In cases where plural malfunction codes have been detected, the two-digit diagnosis codes are indicated in the sequence of the code number, starting from a smaller number. Each diagnosis code is indicated in the above described pattern. A pause of 2.5 seconds occurs between the outputs of respective diagnosis codes, thus separating one from the others. After all of the plural diagnosis codes that have been detected are indicated, the check engine lamp is extinguished for four seconds. Then, the detected plural diagnosis codes will be indicated again.



JEF00148-00089

8. For the details of malfunctions, refer to the DTC chart.
9. After completion of the check, disconnect the jump wire and turn OFF the ignition switch.
   Then, disconnect the SST from the DLC.
   NOTE:
   - In cases where plural malfunction codes have been detected, the indication will be made progressively, starting from the smaller number to the larger number.
   - In cases where the DS-21 diagnosis tester or the OBD II generic scan tool is not used, it is impossible to take a reading of unidentified two-trip DTC from the SST connector.

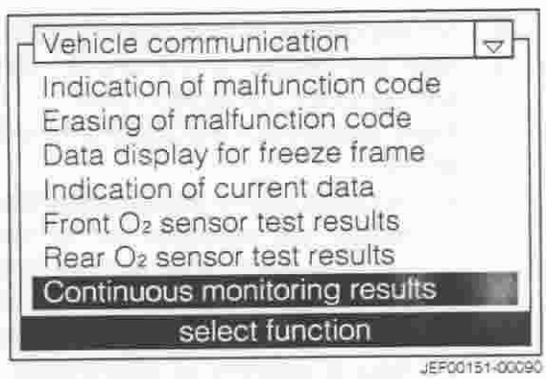
JEF00149-00000

NOTE:
- When malfunctioning phenomena are to be reproduced without using the DS-21 diagnosis tester or OBD II generic scan tool, follow the procedure given below to detect the DTC.

(1) It is assumed that 2 trip detection logic is used for the DTC detection.
(2) Therefore, after a malfunctioning phenomenon is first reproduced, turn OFF the ignition switch.
(3) Then, repeat the same reproduction procedure once again.
(4) When the malfunction is reproduced again, the malfunction indicator lamp goes on and the DTC is memorized in the engine ECU. For reading out of the DTC, refer to page EF-53.

JEF00150-00000

NOTE:
- When malfunctioning phenomena are to be reproduced with the DS-21 diagnosis tester or OBD II generic scan tool connected to the DLC, the "Continuous monitoring results" function can be used. (In the case of the DS-21 diagnosis tester, select the "Continuous monitoring results" of the "Vehicle communication" in CARB mode.) This function makes it possible to indicate the DTC when the malfunctioning phenomenon is first reproduced.
(Request of onboard monitoring test results of ISO 15031-5 Continuous monitoring system)



JEF00151-00090

5.9 ERASING PROCEDURE FOR DTC

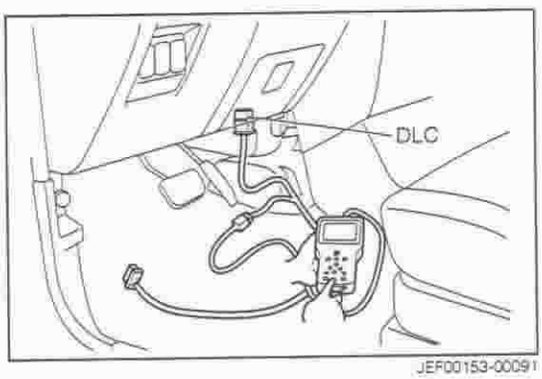
The DTC and freeze-frame data can be erased through the following methods.

1. The DS-21 diagnosis tester or OBD II generic scan tool is used to erase the DTC.
   (For the operating procedure, refer to the instruction manual.)
2. The power supply to the ECU is shut off to erase the DTC without using the DS-21 diagnosis tester or OBD II generic scan tool.
   (Disconnect the negative (–) terminal from the battery or detach the EFI fuse.)

JEF00152-00000

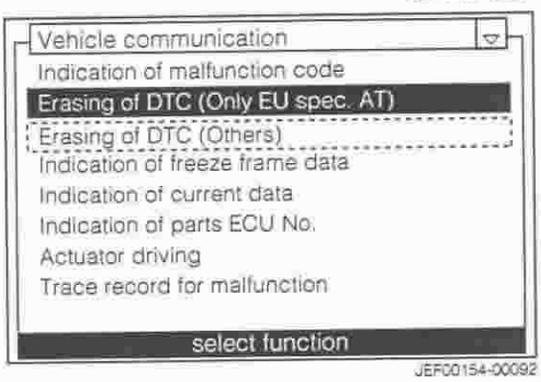
5.9.1 WHEN DS-21 DIAGNOSIS TESTER OR OBD II GENERIC SCAN TOOL IS USED:

1. In the same way as the check of DTC, connect the DS-21 diagnosis tester to the data link connector (DLC) with the following SST interposed. Or, connect the OBD II generic scan tool directly.
   SST: 09991-87404-000



JEF00153-00091

2. Turn ON the ignition switch. Then, turn ON the main switch of the tester.
3. In the case of the DS-21 diagnosis tester, erase the DTC by using the "Erasing of DTC (Only EU spec. AT) (Electronically-controlled A/T vehicles for EU spec. only) or Erasing of DTC (Others) (Except for electronically-controlled A/T vehicles for EU spec.) of the "Vehicle communication" in DAIHATSU mode."
4. After completion of the erasing, turn OFF the main switch of the tester and ignition switch. Disconnect the SST from the data link connector and disconnect the DS-21 diagnosis tester from the SST. Or, disconnect the OBD II generic scan tool.



JEF00154-00092

5.9.2 WHEN DS-21 DIAGNOSIS TESTER OR OBD II GENERIC SCAN TOOL IS NOT USED:

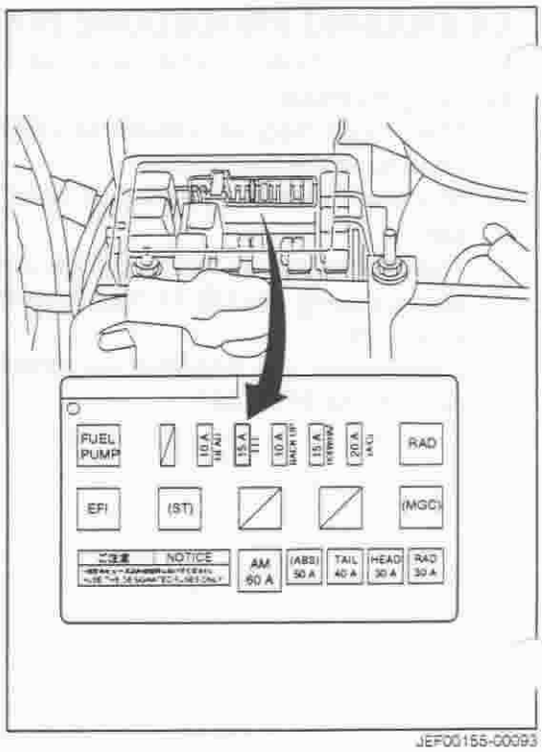
Erasure by disconnecting EFI fuse

To erase the diagnostic trouble codes (DTCs) memorized in the ECU after malfunctions have been repaired, disconnect the EFI fuse from the relay block for at least 30 seconds with the ignition switch turned OFF.

[When ambient temperature is about 20°C.]

NOTE:

- It is possible to complete this erasing for approximately 30 seconds. In some cases, however, it may take longer.
  Furthermore, the erasing can be made by disconnecting the circuit, such as the battery power supply and fusible link. In cases where the battery terminal is to be disconnected, record the radio channels in advance. After completion of the operation, set the radio channels the same as before.
- In cases where the same malfunction (DTC) cannot be detected again during the 40 cycles of the engine warming-up, the DTC and freeze-frame data will be automatically erased from the ECU memory. (Only in the case of vehicles with EU specifications)
- Warming-up cycle
  The warming-up cycle refers to a driving cycle that sufficiently allows the water temperature to rise by at least 22°C above the temperature at the time of engine starting and to reach at least 70°C.
- Driving cycle
  The driving cycle consists of the engine starting and engine stopping.



JEF00155-00093

5.10 BASIC ENGINE CHECK FLOW CHART

When the ECU is detecting no DTC during the reproduction test of malfunctioning phenomena and when no abnormality is found by the visual inspection, it is necessary to progressively perform the trouble-shooting for circuits which are most likely causing the malfunctions.
In many cases, sections causing malfunctions can be narrowed down quickly and effectively by performing the basic engine check indicated in the following flow chart. Therefore, it is very important to perform this check for the engine trouble-shooting.

5.10.1 BASIC ENGINE CHECK (page 1 of 3)

1 Is the battery voltage 11 V or more with the engine in a stopped state?
- NO → Charge the battery or replace it.
- YES ↓

2 Does the engine crank?
- NO → Go to "Matrix Table for Trouble-Shooting According to Malfunctioning Phenomena" on page EF–47.
- YES ↓

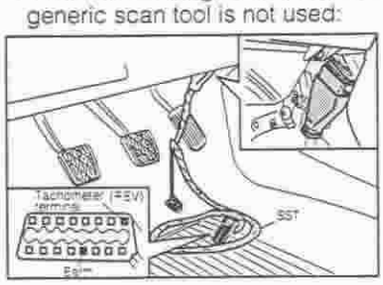
3 Does the engine start?
- NO → Go to Step 6.
- YES ↓

4 Check the engine idle speed

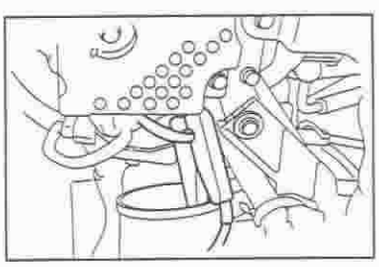
1. Warm up the engine, until the engine coolant temperature reaches 90°C or more.
2. Turn OFF all electric load switches (including A/C switch).
3. In the case of M/T vehicles, set the transmission to neutral. (In the case of A/T vehicles, set the shift lever to the "P" position.)
4. Connect the DS-21 tester to the DLC with the SST interposed, or connect the OBD II generic scan tool to the DLC directly. Then, check the idle speed.
   SST: 09991-87404-000
5. When the DS-21 tester or OBD II generic scan tool is not used, connect a tachometer to the REV terminal.
   Spec.: 650 - 750 rpm (M/T & A/T vehicles)

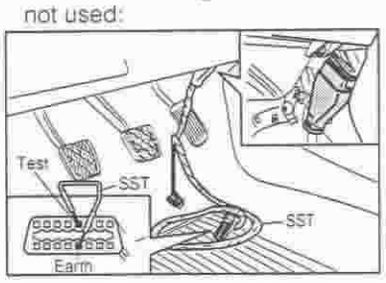
- NO → Go to "Matrix Table for Trouble-Shooting According to Malfunctioning Phenomena" on page EF–47.
- YES ↓

• When DS-21 diagnosis tester or OBD II generic scan tool is not used:



• When DS-21 diagnosis tester is not used:





5 Check the ignition timing

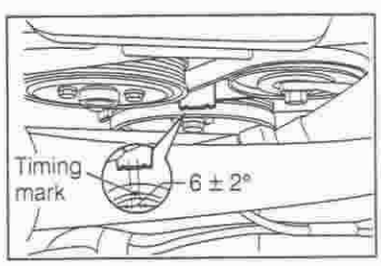
1. When the DS-21 diagnosis tester is not used, connect the terminal T of the SST connector to the earth terminal, using a jump wire.
   SST: 09991-87403-000

   When the DS-21 diagnosis tester is used, select the "T terminal ON" of the actuator driving so as to short the terminal T.
2. Attach the clip of the timing light to the wire harness for timing light connection.
3. Is the timing mark of the crankshaft within a range of the indicator for ignition timing check provided on the timing chain cover?
   Spec.: 6 ± 2° (BTDC)

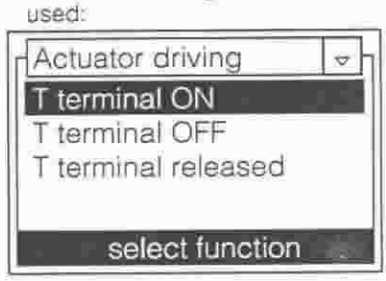
   NOTE:
   • After checking, release the shorting of the terminal T by using the "Actuator driving" function.

- NO → Check the timing chain for wrong assembling. Also, check the plunger protruding amount of the tensioner.
- YES ↓

Go to "Matrix Table for Trouble-Shooting According to Malfunctioning Phenomena" on page EF–47.



• When DS-21 diagnosis tester is used:



JEF00160-00097

BASIC ENGINE CHECK (page 2 of 3)

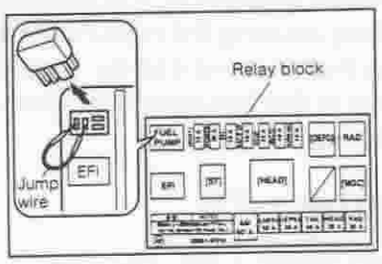
6 Fuel pressure check (simple check)

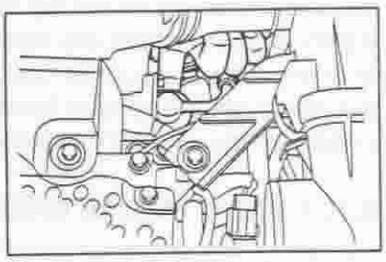
1. Ensure that the fuel tank is filled with sufficient fuel.
2. When DS-21 diagnosis tester is not used:
   (1) Remove the fuel pump relay and connect a jump wire, as indicated in the illustration.
   SST: 09991-87403-000

   (2) Check that the pulsation damper screw rises when the ignition switch is turned ON.
3. When DS-21 diagnosis tester is used:
   (1) Connect the DS-21 diagnosis tester to the DLC with the SST interposed.
   SST: 09991-87404-000

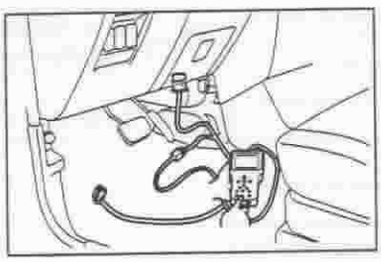
   (2) Turn ON the ignition switch. Then, select the "Fuel pump driving" of the actuator driving among the individual functions so as to drive the fuel pump. Does the pulsation damper screw rise?

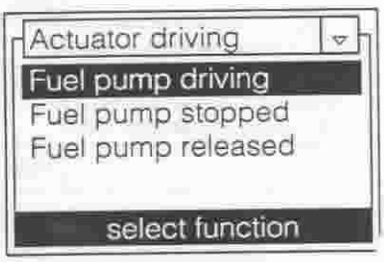
• When DS-21 diagnosis tester is not used:





• When DS-21 diagnosis tester is used:



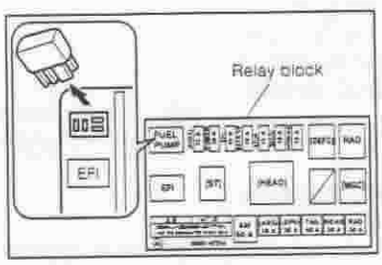


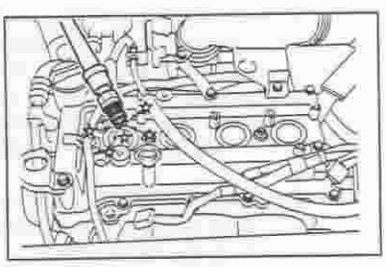
NO → Go to "Check of Fuel Pump and F/P Regulator".

YES

7 Spark check

1. Remove the fuel pump relay from the relay block.
2. Remove the IG coils and spark plugs (all cylinders #1, 2, 3 and 4).
3. Install the spark plug to the IG coil. Connect the IG coil connector to the IG coil.
4. Ground the spark plug.
5. Crank the engine. At this time, check to see if each spark plug sparks.
   Is it in a good condition?



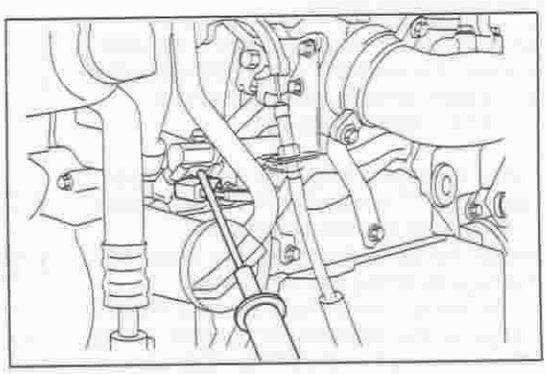


NO → Go to "Check of Ignition System."

YES

8 Confirmation of operation of fuel injector

1. Install the spark plugs, IG coils and fuel pump relay. Connect the connector of the IG coil.
2. Using a sound scope, check each injector for operation sound while the engine is being cranked or idling.
   Can you hear operation sound of all injectors?



NO → Go to "Check of Fuel Injector Circuit".

YES

Go to Step 9.

JEF00161-00098

BASIC ENGINE CHECK (page 3 of 3)

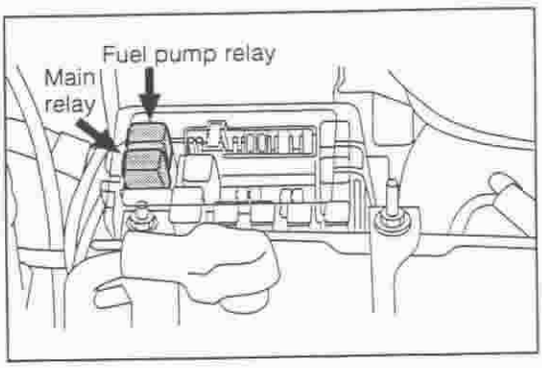
9 Inspection of compression pressure

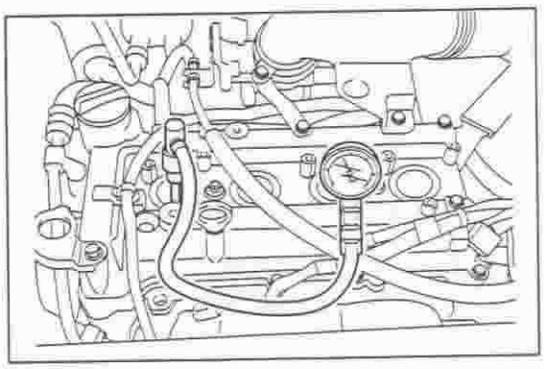
1. Warm up the engine.
2. With the IG switch turned OFF, remove all of the IG coils and spark plugs.
3. Temporarily remove the main relay and fuel pump relay.
4. Insert a compression gauge into the spark plug hole.
5. Depress the accelerator pedal fully.
6. While cranking the engine, measure the compression pressure.
7. Repeat the steps 4, 5 and 6 to perform the measurement for all cylinders.

K3-VE engine
Specified Value: 1471 kPa
Limited Value: 1079 kPa
(330 rpm. difference between cylinders is less than 147 kPa)

K3-VE2 engine
Specified Value: 1285 kPa
Limited Value: 892 kPa
(300 rpm. difference between cylinders is less than 147 kPa)

NOTE:
- Be sure to use a fully-charged battery. Also the measurement should be performed in the shortest possible length of time.





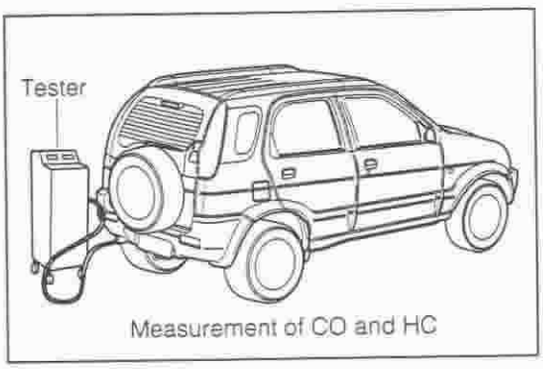
NO → Perform the checks, referring to the section EM.

YES

10 Inspection of idle CO and HC concentrations (only for leaded spec.)

1. Warm up the engine completely.
NOTE:
- Warm up the engine, until the fan motor starts to operate.

2. Measure CO and HC concentrations at idle speed.
Specified Value:
CO concentration: 1 ± 0.5 %
HC concentration:
Not to exceed 700 rpm



Measurement of CO and HC

NO → Perform the checks, referring to the section EM.

YES

Go to "Matrix Table for Trouble-Shooting According to Malfunctioning Phenomena" on page EF-47.

JEF00162-00099

5.11 SCAN TOOL DATA (ECU DATA)

The following data values given below are representative values obtained under the "normal condition" using the scan tool. Please refer to these values.
However, there are cases where the system is functioning normally even if the measured value is different from the values listed here. Therefore, no judgment as to whether any malfunction is occurring or not should be made only on the basis of these data under the "normal condition."

NOTE:

- The data monitor value may vary significantly, depending on slight difference in the measurement, difference in the measurement environment, deterioration due to passage of time in the vehicle, and so forth. Therefore, it is difficult to indicate the definite reference values. Hence, there are cases where malfunctions are occurring even when the measured value is within the reference value.
- With regard to minor phenomenon, such as hesitation and rough idling, it is necessary to make total evaluation, based on all the data monitor items, by sampling the data of the vehicle of the same type under the same conditions and comparing them.
- In the case of the OBD II generic scan tool, it is possible to take a reading of the values with an asterisk mark in the following table.
- When checking the data under a condition where the engine is "idling" or "racing," the shift lever should be placed in the "N" or "P" range, the A/C switch should be turned OFF, and all accessory switches should be turned OFF.

JEF00163-00

5.11.1 SCAN TOOL DATA FOR K3-VE/K3VE2

1. Items specified by CARB

	DS-21 diagnosis tester display	Signal name	Vehicle condition			Reference values under normal condition
☆	FUEL SYSTEM (Fuel system status)	FSYS	At idle speed after warming up			O2 (Closed loop)
☆	CALC LOAD (Calculated load value)	LOAD	At idle speed with no load after warming up	K3-VE2		1.5 - 2.0 %
				K3-VE		1.7 - 2.2 %
			At 2500 r/min. with no load after warming up	K3-VE2		5.0 - 6.3 %
				K3-VE		5.9 - 7.3 %
☆	COOLANT TEMP (Engine coolant temperature)	ECT	Cold start ~ Warming-up running			Value should be rising gradually.
			When engine has warmed up completely			80 - 100°C
			During fail-safe function (At time of starting)			20°C
			During fail-safe function (After starting)			80°C
☆	SHORT FT (Short term fuel trim)	SHRT	At idle speed after warming up			-20 - +20 %
☆	LONG FT (Long term fuel trim)	LONG	At idle speed after warming up			-16 - +16 %
☆	ENGINE SPEED	RPM	When engine is running at a constant speed			There should be no remarkable variation, rpm
			At idle speed with no load after warming-up	M/T	Sirion Terios	650 - 750 rpm
				A/T	All	650 - 750 rpm
☆	VEHICLE SPEED	VS	During running (Compared with speedometer)			There should be no remarkable difference, Km/h
☆	IGN ADVANCE (Ignition timing advance for No. 1 cylinder)	ITA	At idle speed with no load after warming up			-2 - 8°
			When idle switch is OFF			Changes should be made according to running conditions, °
☆	INTAKE AIR TEMP	IAT	When engine is running			Changes should be made according to running conditions, °C
☆	MANI ABS PRESS (Intake manifold absolute pressure)	MAP	When ignition switch is ON (Vacuum hose is released to atmosphere)			Around 100 kPa
			When idling (After warming-up, with no load)	K3-VE2		63 - 72 kPa
				K3-VE		65 - 73 kPa

	DS-21 diagnosis tester display	Signal name	Vehicle condition			Reference values under normal condition
☆	MANI ABS PRESS (Intake manifold absolute pressure)	MAP	During fail-safe function	M/T	K3-VE2	34 - 72 kPa
					K3-VE	35 - 73 kPa
				A/T	K3-VE2	32 - 70 kPa
					K3-VE	33 - 71 kPa
☆	THROTTLE POS (Absolute throttle position)	TP	When accelerator pedal is operated			Changes should be made according to pedal operation. %
☆	OXYGEN SENSOR S1 (Heated oxygen sensor 1)	O_2FP	At idle speed after warming up			-5 - 5 %
		O_2FV				0.05 - 0.95 V
☆	OXYGEN SENSOR S2* (Heated oxygen sensor 2)	O_2RP	When engine is running at 2000 r/min., for 3 min. or longer after warming up.	Sirion, Terios		20 - 77 %
		O_2RV				0.05 - 0.95 V
☆	MIL ON RUN DIST (Distance since actwiation of MIL)	DWM	When there is no DTC			0 Km

JEF00166-00000

2. Items specified by DMC

	DS-21 diagnosis tester display	Signal name	Vehicle condition	Reference values under normal condition
	BATTERY VOLTAGE	BAT	When engine is running at 5000 rpm (25°C)	Approx. 14 V
	ELECTRIC LOAD	DSW	When light, heater blower, defogger or radiator fan switch is ON	"OFF"→"ON"
	AIR CONDITIONING (If equipped)	AC	When air conditioner switch is set to "ECON" or "A/C"	"OFF"→"ON"
	CTP SWITCH (Closed throttle position switch)	IDL	When throttle valve is switched from fully closed state to opened stale	"ON"→"OFF"
	INJ PULSE WIDTH (Fuel injection pulse width)	TAU	Cold start – Warming-up running	Value should be decreasing gradually.
			When idling (After warming-up, with no load)	1 - 3 ms
	ISC DUTY RATIO	ISC	When ignition switch is ON	0 %
			Cold start – Warming-up running	Value should be decreasing gradually
			When idling (After warming-up, with no load)	5 - 15 %
			When air conditioner switch is set to "ON"	18 - 45 %
			When automatic transmission in shifted from N range to D range	9 - 22 %
			When light, heater or defogger switch is ON	7 - 19 %
	ACTUAL DISP ANGLE OF IN CAM (Actual displacement angle of intake cam)	VT	When idling (After warming-up, with no load)	0 - 2 °CA
			During vehicle running	The value changes, depending on the driving conditions. °CA
	TARGET DISP ANGLE OF IN CAM (Target displacement angle of intake cam)	VTT	When idling (After warming-up, with no load)	0 °CA
			During vehicle running	The value changes, depending on the driving conditions. °CA

NOTE:

- The items with an asterisk (*) mark is provided only for the EU specifications. Therefore, in the case of the non-EU specification vehicles, no indication will be made.

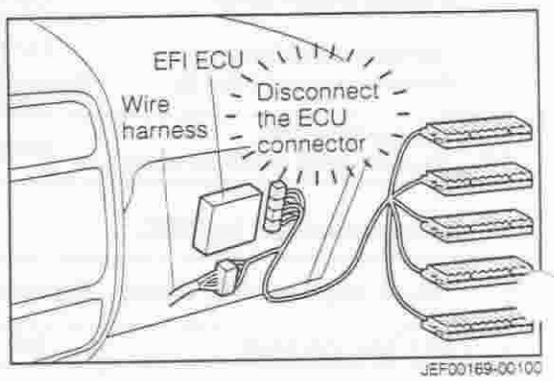
JEF00167-00000

5.12 CHECK OF ECU AND ITS CIRCUIT

The ECU and its circuit can be checked by measuring the voltage and resistance at the ECU connector. In order to narrow down the cause further after the cause has been decided to a certain system, it is imperative to measure the voltage and resistance of the external route of the ECU. The measurement of the voltage and resistance is conducted during the system check, following the procedure given below.

JEF00168-00000

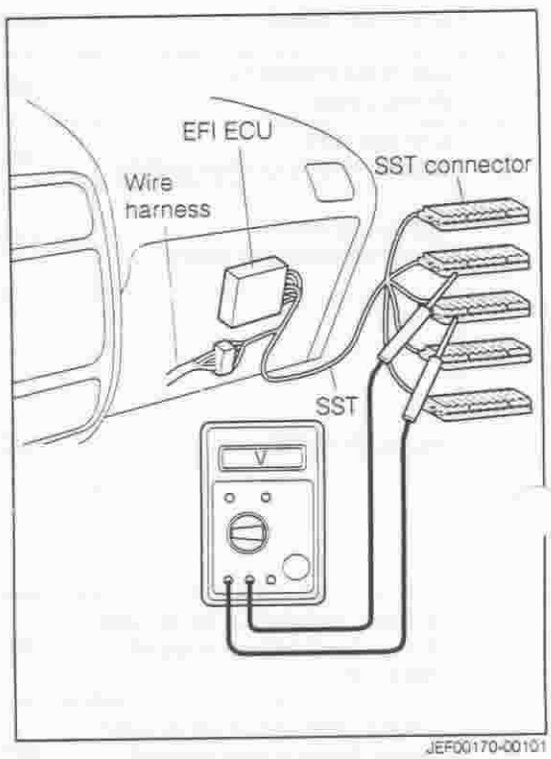
CAUTION:
- The ECU cannot be checked by itself. Never connect a voltmeter or an ohmmeter to the ECU with the connector disconnected from the ECU.
- When conducting the continuity test or measuring the resistance, turn OFF the ignition switch once. Then, disconnect the connector at the ECU.



JEF00169-00100

5.12.1 VOLTAGE CHECK

1. Installation of SST
   First, install the SST between the engine ECU and the vehicle harness.
   For the installation procedure, refer to the section under "Connecting Procedure for SST" on page EF-8.
2. Measure the voltages between the respective terminals of the SST connectors.
3. Check to see if the measured values conform to the specification in accordance with the following table "Characteristics of ECU Output."
   NOTE:
   - Make sure that the battery voltage is 11 V or more with the ignition switch turned ON, for each terminal voltage is affected by the battery voltage.



JEF00170-00101

STANDARD VOLTAGES FOR M101 AND J102

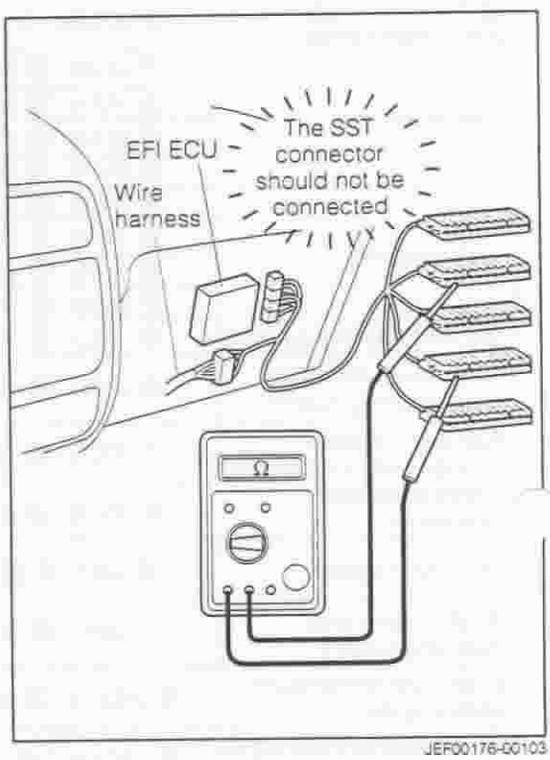
System to be checked	Terminals	Measurement conditions	Reference values
Power supply system	⑦ (+B1) - ㉓ (E1)	When IG is "ON"	Battery voltage
	㊱ (+B2) - ㉓ (E1)	When IG is "ON"	
	① (BAT) - ㉓ (E1)	At all times	
Pressure sensor system	㊻ (VCPM) - ㊼ (E2PM)	When IG is "ON"	4.5 - 5.5 V
	⑮ (PIM) - ㊼ (E2PM)	Sensor released to atmosphere	2.2 - 3.1 V
		After engine starting	Value changes, according to accelerator opening angle
Throttle sensor system	⑯ (VC) - ⑰ (E2)	When IG is "ON"	4.5 - 5.5 V
	㊹ (VTH) - ⑰ (E2)	Throttle valve fully closed	0.4 - 0.8 V
		Throttle valve fully opened	3.2 - 5.0 V
Engine coolant temperature sensor system	㊺ (THW) - ⑰ (E2)	When warming up engine (Water temperature: 60 - 120°C)	0.2 - 1.0 V
Intake air temperature sensor system	㊻ (THA) - ⑰ (E2)	When warming up engine	0.1 - 4.8 V
Vehicle speed sensor system	㊲ (SPD) - ㉓ (E1)	Driving wheels are turned slowly	0 ⇄ 5 V
Knock sensor system	㊸ (KNK) - ㉓ (E1)	When idling, racing	Generation of wave form
Cam angle sensor system	㉒ (N2+) - ㊷ (N2–)	When idling	Generation of wave form
Crank angle sensor system	㉑ (N1+) - ㊶ (N1–)	When idling	Generation of wave form
O_2 sensor system Front	㊺ (OX1) - ⑰ (E2)	After engine speed is held at 3000 rpm for four minutes	0.05 - 0.95 V
O_2 sensor system Rear	㊹ (OX2) - ⑰ (E2)	After engine speed is held at 3000 rpm for four minutes	0.05 - 0.95 V
Ignitor unit system (Ion current sensor)	⑭ (ICMB) - ㊸ (IE)	When idling	Generation of wave form
Injector system	㉗ (#10) - ㉓ (E1)	When IG is "ON"	Battery voltage
	㉖ (#20) - ㉓ (E1)		
	㉕ (#30) - ㉓ (E1)	When cranking	Generation of pulse
	㉔ (#40) - ㉓ (E1)		
Ignition system	㊵ (IG1) - ㉓ (E1)	When IG is "ON"	Battery voltage
	㊴ (IG2) - ㉓ (E1)		
	㊽ (IG3) - ㉓ (E1)	When cranking	Generation of pulse
	㊼ (IG4) - ㉓ (E1)		
ISC driving signal system	㉞ (ISC) - ㉓ (E1)	During idling	Generation of pulse
Oil pressure switch for power steering system	㊽ (PST) - ㉓ (E1)	Oil pressure switch "ON"	0 - 0.5 V
		Oil pressure switch "OFF"	Battery voltage
Fuel pump system Equipped with immobilizer/ Not equipped with immobilizer	② (FC1) - ㉓ (E1)	With fuel pump in a stopped state	Battery voltage
	㉚ (FC2) - ㉓ (E1)	During idling (or when cranking)	2 V or less
VF monitor system	㉞ (VF) - ㉓ (E1)	After engine speed is held at 3000 rpm for four minutes (Terminal T shorted)	0 ⇄ 5 V (Pulse)
P, N range signal detecting system	⑪ (A/T) - ㉓ (E1)	P, N range	0 - 0.5 V
		Other than P, N range	Approx. 10 V
Evaporator temperature sensor system	㉒ (ACEV) - ㉙ (E21)	When air conditioner is "ON"	0.15 - 4.8 V
Air conditioner input signal system	㊳ (ACSW) - ㉓ (E1)	When air conditioner is operating	Battery voltage
		When air conditioner is not operating	0 - 0.5 V
Headlamp system	㉑ (H/L) - ㉓ (E1)	Tail lamp illuminated	Battery voltage
		Tail lamp extinguished	0 - 0.5 V
Defogger system	⑩ (DEF) - ㉓ (E1)	When defogger switch is "ON"	Battery voltage
		When defogger switch is "OFF"	0 - 0.5 V
Blower system	㊴ (BLW) - ㉓ (E1)	When heater blower switch is "ON"	0 - 0.5 V
		When heater blower switch is "OFF"	Battery voltage
Radiator fan control system	⑬ (RFAN) - ㉓ (E1)	When water temperature switch is "ON"	1 V or less
		When water temperature switch is "OFF"	Battery voltage
Stop lamp system	㊵ (STP) - ㉓ (E1)	When stop lamp switch is "ON"	Battery voltage
		When stop lamp switch is "OFF"	0 - 0.5 V

System to be checked	Terminals	Measurement conditions	Reference values
Variable valve timing	㉘ (OCV+) - ㊶ (OCV–)	When idling	4 V or less
Evaporator purge control system	㊾ (PRG) - ㉓ (E1)	When idling	Battery voltage
		When racing (3000 rpm)	Generation of pulse
Magnet clutch control system	⑫ (MGC) - ㉓ (E1)	When air conditioner is operating (Air conditioner switch and heater blower switch are ON.)	1 V or less
		When air conditioner is not operating	Battery voltage
Engine revolution output system	㉛ (REV) - ㉓ (E1)	When idling	Generation of pulse
Communication signal control system	⑧ (SIO1) - ㉓ (E1)	When idling	Generation of pulse
Fuel pump OFF system	㉟ (FPOF) - ㉓ (E1)	When ignition switch is "ON" during normal operation	5 V
		Stopping of driving of fuel pump, when encountered with emergency	Generation of pulse
A/F adjuster	㊷ (VCO) - ㉙ (E21)	When ignition switch is "ON"	4.5 - 5.5 V
	㊸ (OX3) - ㉙ (E21)	When rotor is rotated in R direction and L direction with ignition switch turned "ON"	Voltage should change.

JEF00172-00000

5.12.2 RESISTANCE CHECK

1. Installation of SST
   First, install the SST between the engine ECU and the vehicle harness. However, the SST connector at the ECU side should not be connected.
   For the installation procedure, refer to the section under "Connecting Procedure for SST" on page EF-8.



JEF00176-00103

2. Measure the resistances between the respective terminals.
3. Check to see if the measured resistances conform to the specification in accordance with the following table "Standard Resistances for M101 and J102."
   NOTE:
   - Make sure that the ignition switch is turned OFF during the measurement.
   - The following table shows the resistance at the time when the temperature of parts is 20°C.

JEF00177-C

STANDARD RESISTANCES FOR M101 AND J102

System	Terminals	Circuit	Standard resistance
Front O_2 sensor system	⑳ (OXH1) - ⑦ (+B1)	Front O_2 sensor heater and main relay	11.7 - 14.5 Ω
Rear O_2 sensor system	㊿ (OXH2) - ⑦ (+B1)	Rear O_2 sensor heater and main relay	11.7 - 14.5 Ω
Cam angle sensor system	㉒ (N2+) - ㊷ (N2–)	Camshaft angle sensor	1850 - 2450 Ω
Crank angle sensor system	㉒ (N1+) - ㊶ (N1–)	Crankshaft angle sensor	1850 - 2450 Ω
Injector system	㉗ (#10) - ⑦ (+B1)	No. 1 - 4 Fuel injector	13.4 - 14.2 Ω
	㉖ (#20) - ⑦ (+B1)		
	㉕ (#30) - ⑦ (+B1)		
	㉔ (#40) - ⑦ (+B1)		
Variable valve timing system	㉓ (OCV+) - ㊶ (OCV–)	Oil control valve	6.9 - 7.9 Ω
Purge VSV system	㉙ (PRG) - ⑦ (+B1)	Purge control VSV	30 - 34 Ω
A/F adjuster	㉘ (VCO) - ㉙ (E21)	A/F adjuster	3500 - 6500 Ω
Ground system	㉓ (E1) - Body ground	Ground	10 Ω or less
	⑰ (E2) - Body ground		
	㊼ (E2PM) - Body ground		
	㉙ (E21) - Body ground		

JEF00178-00000

5.13 INSPECTION PROCEDURE FOR FUEL SYSTEM

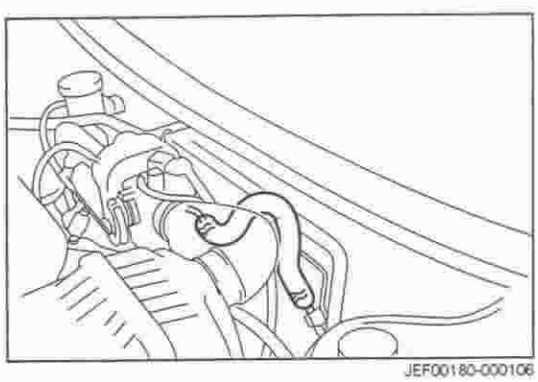
CAUTION:

- Before you start the check, be sure to conduct the fuel pressure eliminating operation according to the "fuel pressure relieving procedure" at page EF–25. Furthermore, after completion of the check operation, ensure that no fuel leakage is present by performing the check according to the "fuel leak check" at page EF–25.

JEF00179-00000

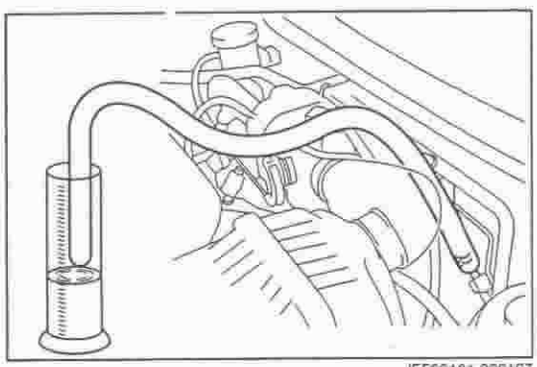
5.13.1 INSPECTION OF FUEL FLOW

1. Loosen the hose band at the fuel pipe. Then remove the fuel hose from the fuel pipe.
2. Connect a suitable fuel hose (about 2 meter long) to the fuel pipe.



JEF00180-000106

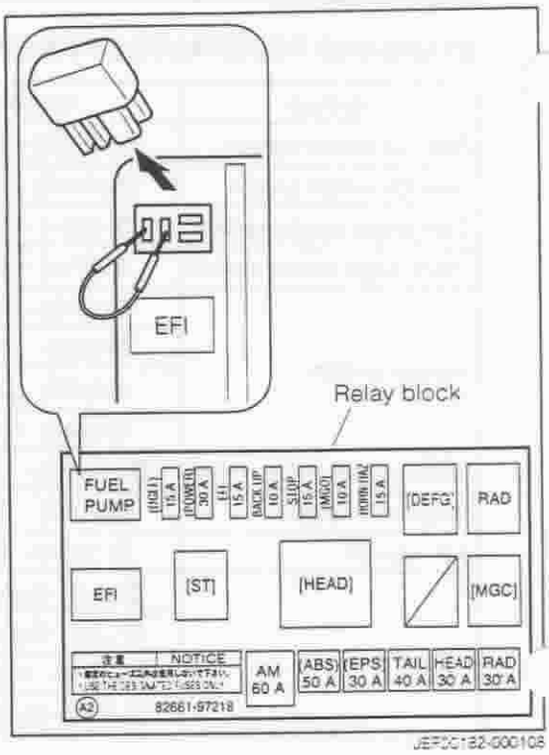
3. Insert one end of the fuel hose in a measuring cylinder.
   CAUTION:
   - Even after the fuel pressure has been released, the fuel line still has a slight residual pressure.
     Hence, be sure to gradually remove the pipe so as to prevent fuel from splashing.
   - Since the fuel will flow out, be certain to place a suitable container or cloth under the fuel pipe so that no fuel may get to the resin or rubber parts of the vehicle.



JEF00181-000107

4. Temporarily remove the fuel pump relay. Then, connect the terminal with a jump wire as illustration.
5. Turn the ignition switch to the "ON" position for 10 seconds. Then, turn off the ignition switch.
6. Measure the amount of fuel collected in the measuring cylinder.
   Specified Amount of Fuel: 190 ml or more

NOTE:
- Check to see if leakage is present at the fuel lines. Also, check the fuel lines for deformation or choking.

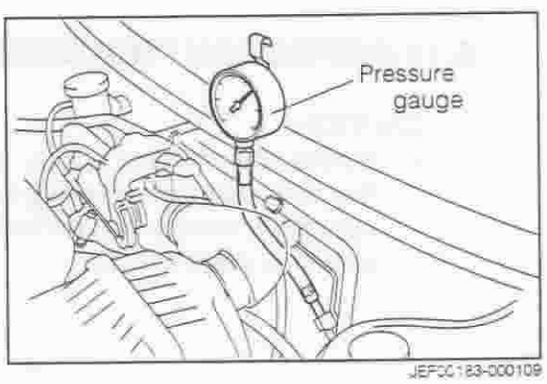


JEF00182-000108

5.13.2 INSPECTION OF FUEL PRESSURE

1. Install a fuel pressure gauge between the delivery pipe and the main pipe.
2. Turn the ignition switch to the "ON" position.
3. Check to see if the fuel pressure conforms to the specified pressure.
   Specified Value: 324 ± 5 kPa

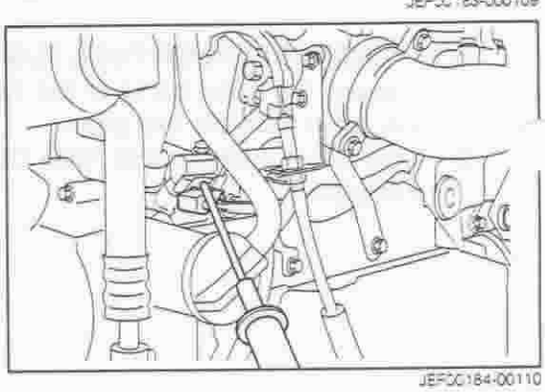
NOTE:
- If the fuel pressure is less than the specification, check the fuel pump.



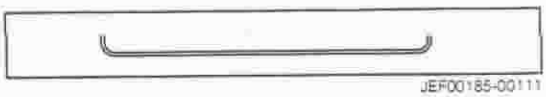
JEF00183-000109

5.13.3 INSPECTION OF FUEL INJECTORS

1. Using a sound scope, check to see if each injector emits an operating sound when the engine is being started or cranked.
   NOTE:
   - If a sound scope is not available, apply a screwdriver or the like to the injector. So you can feel an operating vibration.
   - If the injector emits no operating sound, check the wiring or connectors.Then, perform the following procedure.


JEF00184-000110

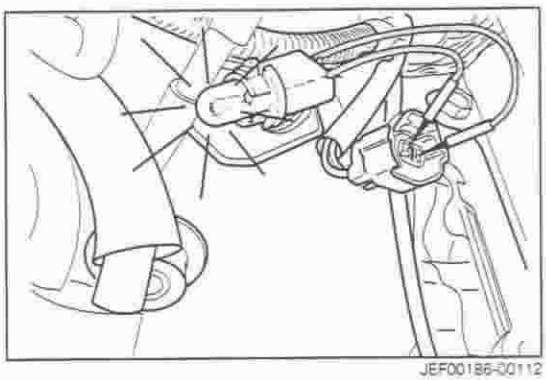
3. Disconnect the injector connector of the engine wire.
jector.
Specified Resistance: 13.4 - 14.2 (at 20°C)


JEF00185-00111

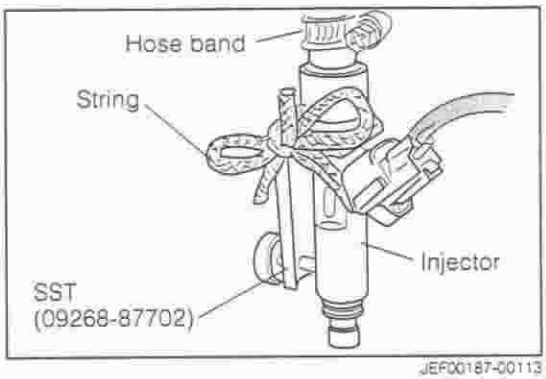
NOTE:
- If the resistance is not within the specification, replace the injector.
- If the resistance will conform to the specification, perform the following procedure.

5. Remove the fuel pump relay.

6. Using a test lamp (12 V 6 W), check to see if the lamp will illuminate as illustration when the engine is being cranked. If not, check the wiring harness and ECU output.
7. Turn the ignition switch to the "OFF" position.

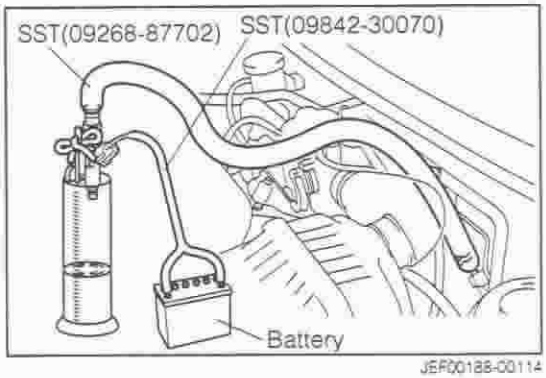

JEF00186-00112

8. Using a suitable string or wire, connect the injector and the fuel delivery pipe, as indicated in the figure.
9. Connect a jump wire across the terminals, as indicated in Step 4 of Paragraph 5.13.1.
10. Insert the injector into the measuring cylinder.
11. Turn the ignition switch to the "ON" position.
12. Connect the SST wire to the battery terminal for 15 seconds.



JEF00187-00113

WARNING:
- Be sure to use hose bands at the joint section between hoses and pipes, etc. so that the hose may not be disconnected unexpectedly.
- Utmost care must be exercised so that no spark may be emitted when connecting the SST to the battery. Furthermore, be sure to place the battery on the windward side and as far away as possible from the measuring cylinder. Moreover, never conduct this operation in a tightly-closed room.

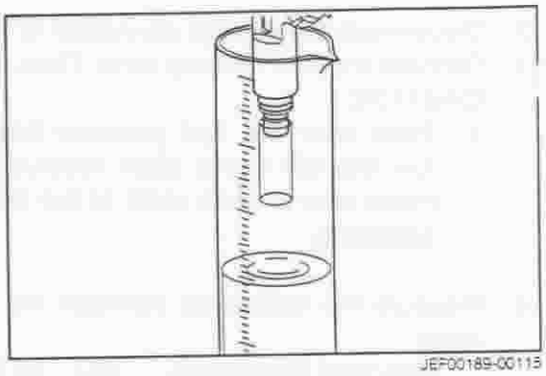


JEF00188-00114

13. Measure the amount of fuel collected in the measuring cylinder.

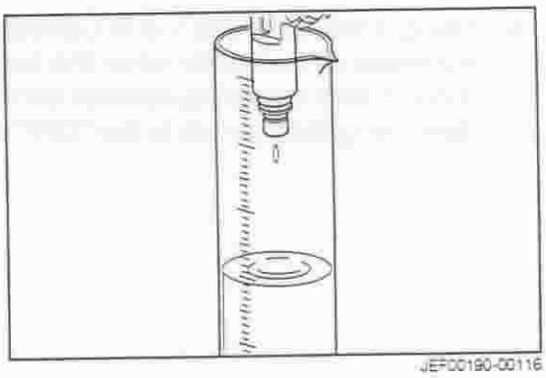
Specified Amount of Fuel	Approx. 40 - 54 ml
Variation Between Injectors	5 ml or less

NOTE:
- Attach a suitable vinyl hose to the tip-end of the injector so as to prevent fuel from splashing.
- Conduct the measurement two or three times for each injector.
- Before the injector is pulled out, make certain to turn off the ignition switch.
- When removing the injector, use a suitable cloth or the like so as to prevent fuel from splashing.
- Prior to the test, perform air bleeding for the fuel hose.


JEF00189-00115

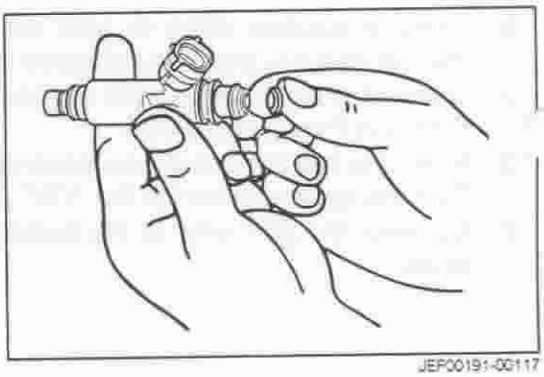
14. Check to see if any fuel leakage is present from the injector nozzle, when the SST wire is removed from the battery terminal.
    Specification: Less than one drop of fuel per minute

NOTE:
- If the leakage exceeds the specified value, replace the injector.


JEF00190-00116

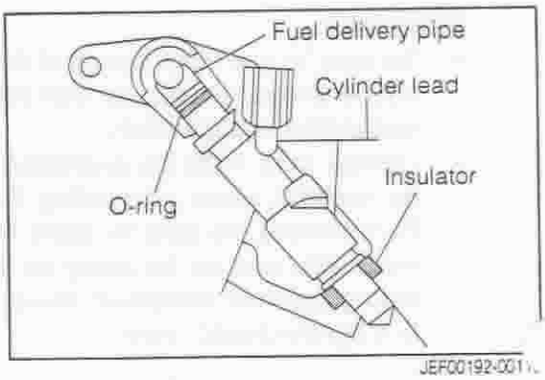
15. Turn OFF the ignition switch.
16. Install the injector grommet and O-ring to the injectors.

NOTE:
- Install a new O-ring to the O-ring seal section.


JEF00191-00117

17. Install the injectors and the fuel delivery pipe.

NOTE:
- After completion of the assembling, ensure that the injector can be turned smoothly by your hand, although there is a slight resistance due to friction.
- Make sure that the connector of the injector is located at the inside of the engine and is directed in a upward direction.

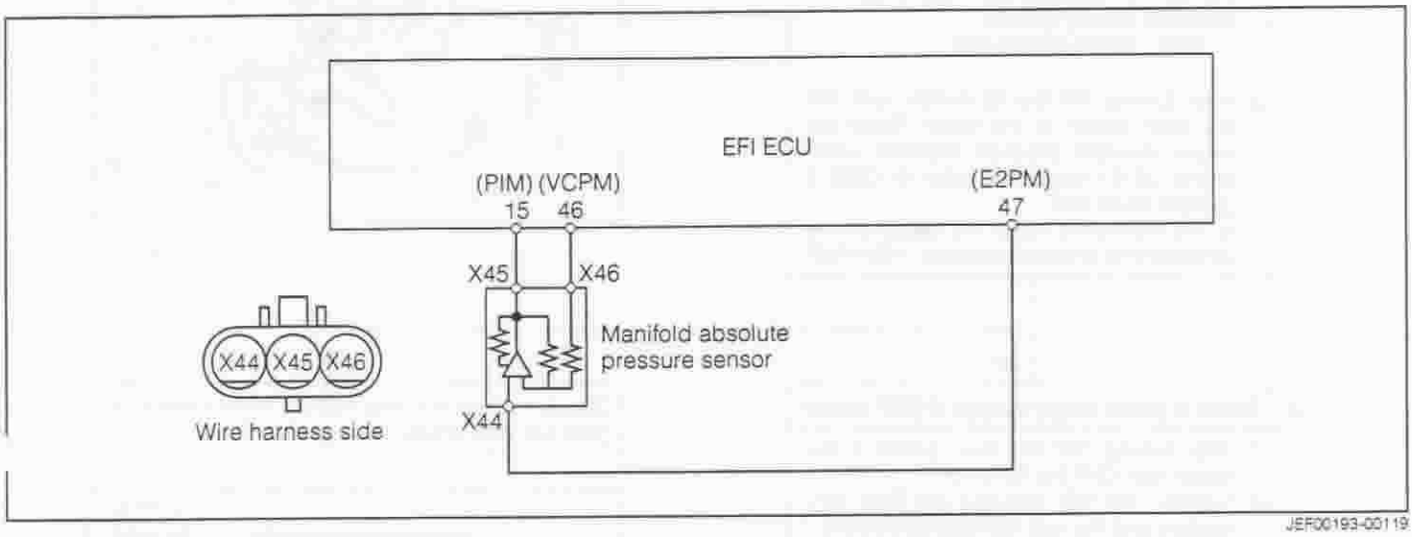


JEF00192-00118

5.14 CIRCUIT INSPECTION

DTC	P0105/31	Manifold Absolute Pressure/Barometric Pressure Circuit Malfunction

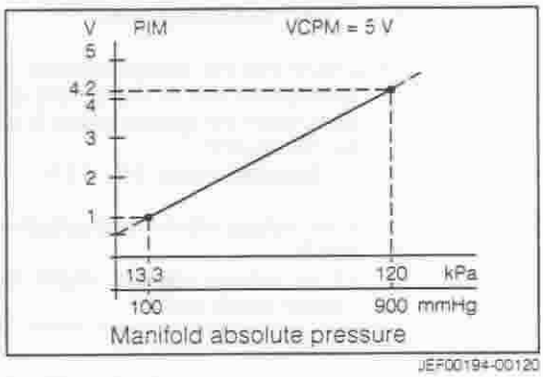
WIRING DIAGRAM



JEF00193-00119

CIRCUIT DESCRIPTION

The manifold absolute pressure sensor detects the intake manifold pressure as a voltage.
Since the manifold absolute pressure sensor does not use the atmospheric pressure as a criterion, but senses the absolute pressure inside the intake manifold (the pressure in proportion to the present absolute vacuum 0), it is not influenced by fluctuations in the atmospheric pressure due to high altitude and other factors. This permits it to control the air-fuel ratio at the proper level under all conditions.



JEF00194-00120

DTC No.	DTC Detecting condition	Trouble area
P0105/31	Open or short manifold absolute pressure sensor circuit	• Open wire or short in manifold absolute pressure sensor circuit • Manifold absolute pressure sensor • Engine ECU

If the ECU detects DTC P0105/31, it operates the fail-safe function, keeping the ignition timing and injection volume constant and making it possible to drive the vehicle.

NOTE:

- After confirming DTC P0105/31, use the OBD II generic scan tool or DS-21 diagnosis tester to confirm the manifold absolute pressure from "CURRENT DATA"

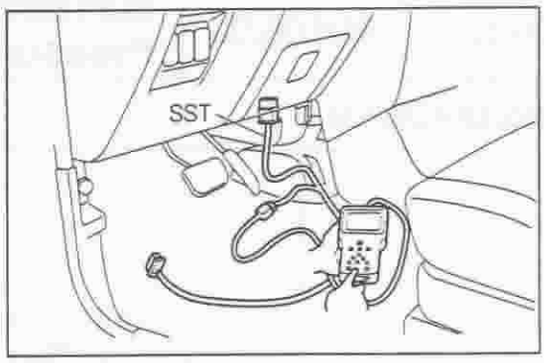
Manifold absolute pressure	Trouble area
0 kPa	PIM circuit short
130 kPa or more	VCPM circuit open or short PIM circuit open E2PM circuit open

INSPECTION PROCEDURE

When using DS-21 diagnosis tester or OBD II generic scan tool:

1 Check of output value of MAP sensor

1. With the IG switch turned OFF, connect the DS-21 diagnosis tester to DLC through the SST or connect the OBD II generic scan tool directly to DLC.
   SST: 09991-87404-000
2. After turning ON the IG switch, turn ON the main switch of the tester. Read the intake manifold absolute pressure value of the DS-21 diagnosis tester or OBD II generic scan tool.
   Is the measured value the same as the atmospheric pressure (approx. 100 kPa)?



NO

YES

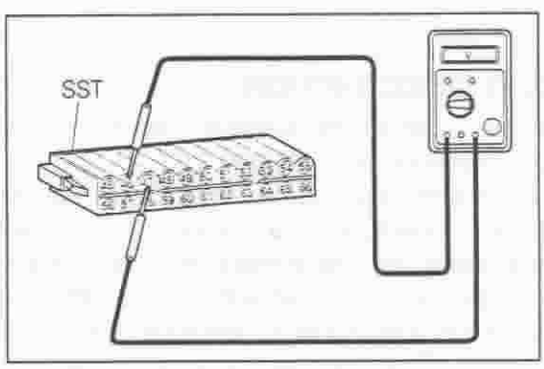
Check malfunction that occurs intermittently or poor contact. (Refer to page EF-51.)

2 Check of power supply voltage of MAP sensor

1. After turning OFF the main switch of the tester, turn OFF the IG switch.
2. Connect the SST between the ECU connectors and the wire harness connectors.
   SST: 09842-97203-000
3. Ensure that the voltage between the SST terminals 46 and 47 is within the specified valve when the ignition switch is turnef to the ON position.
   Specified Value: 4.5 - 5.5 V

   Is the voltage within the specified value?

NOTE:
- If no voltage appears, check the ECU power supply circuit.



YES

NO

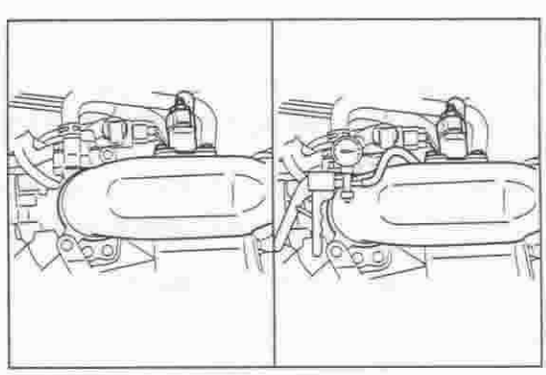
Check or replace the ECU. (Refer to page EF-51.)

3 Check of MAP sensor

1. With the IG switch turned OFF, disconnect the vacuum hose at the surge tank side.
2. After turning ON the IG switch, turn ON the main switch of the tester.
3. Apply a negative pressure to the vacuum hose, using a MityVac.
4. Check the manifold absolute pressure value under following conditions.

Applying Vacuum	Displayed Value on Scan Tool
0	Approx. 100 kPa (Approx. 760 mmHg)
27 kPa (200 mmHg)	Approx. 73 kPa (Approx. 560 mmHg)
67 kPa (500 mmHg)	Approx. 33 kPa (Approx. 260 mmHg)

Is the measured value the same as that shown above?



NO

YES

4	Check of harness between MAP sensor and ECU

1. After turning OFF the main switch of the tester, turn OFF the IG switch.
2. Disconnect the harness from the MAP sensor.
3. Disconnect the SST connectors at the ECU side.
   Connector (X44) at sensor side-Connector ㊼ at ECU side (E2PM).
   Connector (X45) at sensor side-Connector ⑮ at ECU side (PIM).
   Connector (X46) at sensor side-Connector ㊻ at ECU side (VCPM).
   Are the check results for open wire and short OK?

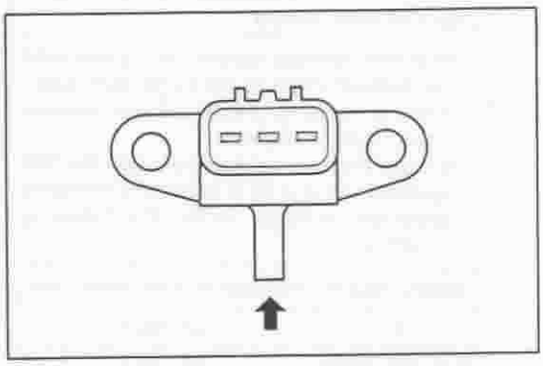
YES

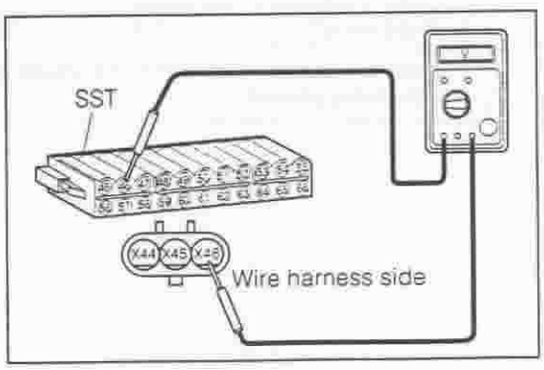
Check and replacement of vacuum hose and MAP sensor
If the vacuum hose has restriction or rapture, replace the vacuum hose. If the vacuum hose does not have it, replace the MAP sensor.

NO

Repair or replace the harness or connector.

Check for intermittent trouble caused by freeze in the vacuum passage, wire harness or connector. (Refer to EF-48.)





JEF00195-00121

When not using DS-21 diagnosis tester or OBD II generic scan tool:

1	Check of ECU input signal PIM

1. Set the SST (sub-harness). (Refer to page EF-8.)
   SST: 09842-97203-000
2. With the IG switch turned ON, measure the voltage between the SST terminals ⑮ and ㊼ (PIM-E2PM).
   Specified Value: 3.3 - 4.0 V

   Is the measured value within the specified value?

YES

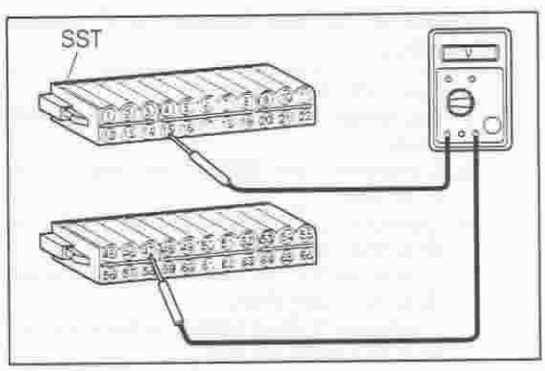
Check malfunction that occurs intermittently or poor contact. (Refer to page EF-51.)

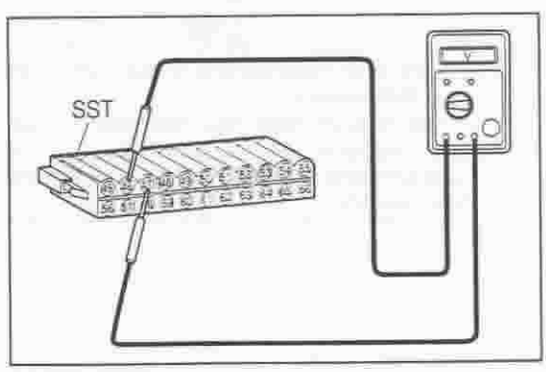
NO

2	Check of power supply voltage of MAP sensor

1. Next, ensure that the voltage between the SST terminals ㊻ and ㊼ is within the specified value.
   Specified Value: 4.5 - 5.5 V

   Is the measured value within the specified value?
   NOTE:
   • If no voltage appears, check the ECU power supply circuit.





NO → Check or replace the ECU. (Refer to page EF-51.)

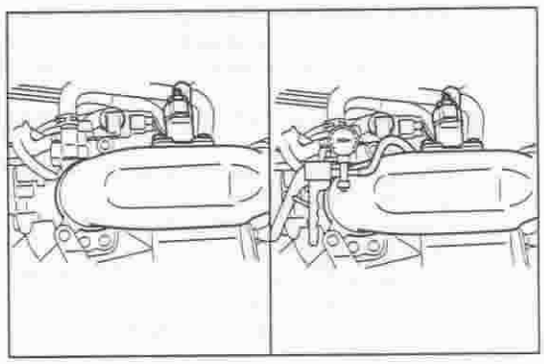
YES

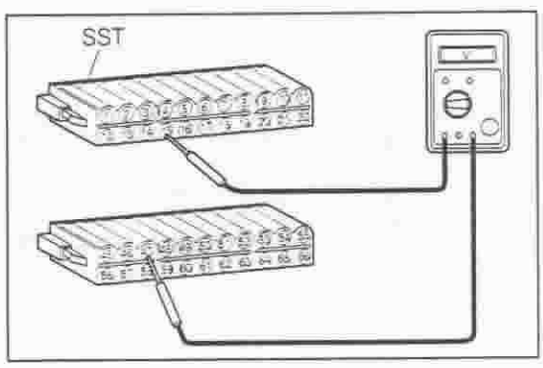
3 Check of MAP sensor

1. With the harness connected, disconnect the vacuum hose at the surge tank side.
2. Apply a negative pressure to the vacuum hose, using a MityVac.
3. Ensure that the voltage between the SST terminals ⑮ and ㊼ is within the following specified voltage under the following conditions.

Applying Vacuum	Displayed Value on voltage meter
0	3.3 - 4.0 V
27 kPa (200 mmHg)	2.6 - 3.1 V
67 kPa (500 mmHg)	1.1 - 1.4 V

Is the measured value within the values in the table above?



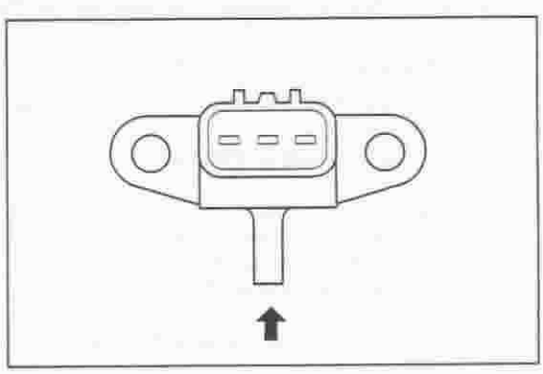


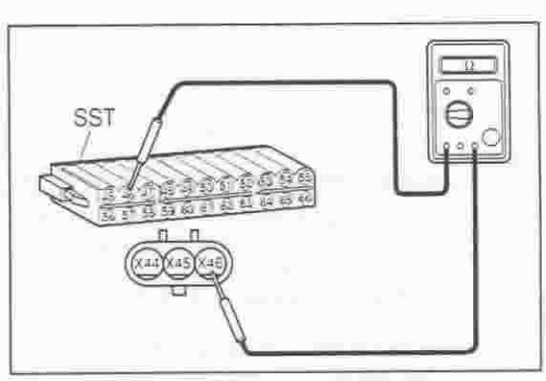
YES → Check for intermittent trouble caused by freeze in vacuum passage, wire harness or connector. (Refer to EF-48.)

NO

4 Check of harness between MAP sensor and ECU

1. Turn OFF the IG switch.
2. Disconnect the harness from the MAP sensor.
3. Disconnect the SST connectors at the ECU side.
4. Connector (X44) at sensor side-Connector ㊼ at ECU side (E2PM).
   Connector (X45) at sensor side-Connector ⑮ at ECU side (PIM).
   Connector (X46) at sensor side-Connector ㊻ at ECU side (VCPM).
   Are the check results for open wire and short OK?





YES

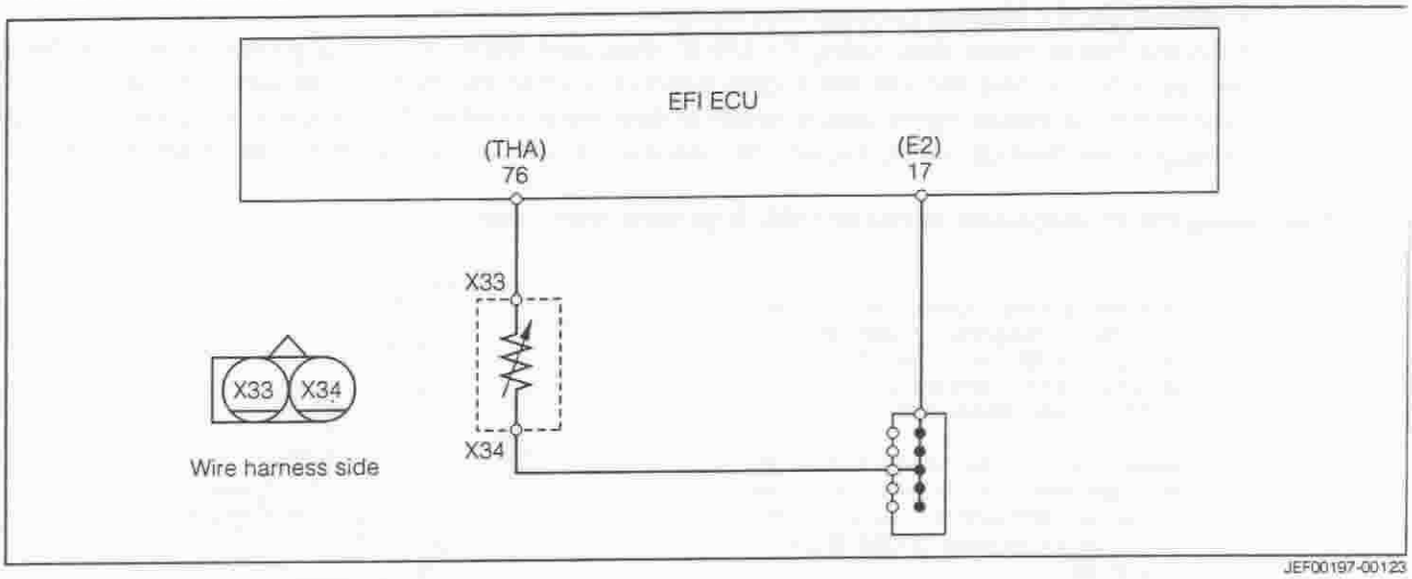
Check and replacement of vacuum hose and MAP sensor
If the vacuum hose has restriction or rapture, replace the vacuum hose. If the vacuum hose does not have it, replace the MAP sensor.

NO → Repair or replace of harness or connector.

JEF00196-00

DTC	P0110/43	Intake Air Temp. Circuit Malfunction

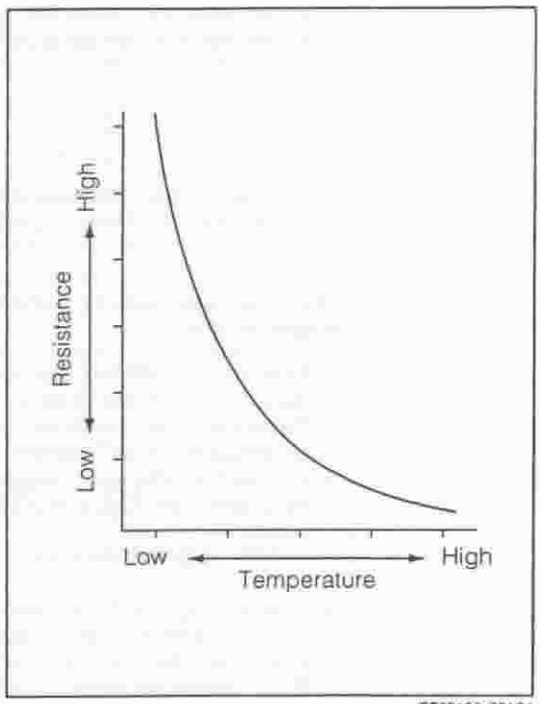
WIRING DIAGRAM



JEF00197-00123

CIRCUIT DESCRIPTION

The intake air temperature sensor, which detects the intake air temperature, is located at the air cleaner.
A thermistor built in the sensor changes the resistance value according to the intake air temperature.
The lower the intake air temperature, the greater the thermistor resistance value, and the higher the intake air temperature, the lower the thermistor resistance value.
When the resistance value of the intake air temp. sensor changes in accordance with changes in the intake air temperature, the potential at terminal THA also changes. Based on this signal, the engine ECU increases the fuel injection volume to improve driveability during cold engine operation.



JEF00198-00124

HINT:

DTC No.	DTC Detecting condition	Trouble area
P0110/43	Open wire or short in intake air temp. sensor circuit	• Open wire or short in intake air temp. sensor circuit • intake air temp. sensor • Engine ECU

After confirming DTC P0110/43, use the DS-21 diagnosis tester or OBD II generic scan tool to confirm the intake air temperature from the CURRENT DATA.

Temperature displayed	Malfunction
–40°C	Open circuit
140°C or more	Short circuit

INSPECTION PROCEDURE

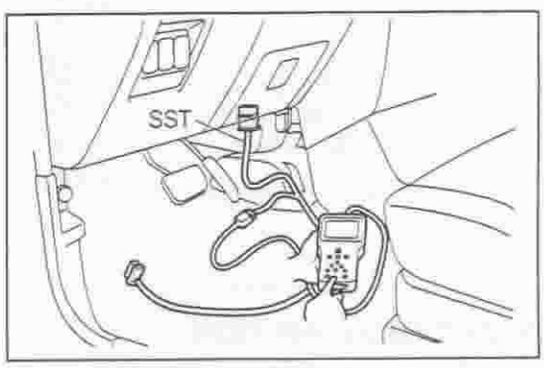
NOTE:

- If DTC P0110/43 (Intake Air Temp. Circuit Malfunction), P0115/42 (Engine Coolant Temp. Circuit Malfunction), are P0120/41 (Throttle/Pedal Position Sensor/Switch "A" Malfunction) are outputted simultaneously, E2 (Sensor Ground) may be open.
- Read the freeze frame data, using the DS-21 diagnosis tester or OBD II generic scan tool. Because the freeze frame data records the engine conditions when the malfunction was detected, when troubleshooting the freeze frame data is useful to determine whether the vehicle was running or stopped, the engine warmed up or not, the air-fuel ratio lean or rich, etc. at the time of the malfunction.

When using DS-21 diagnosis tester or OBD II generic scan tool:

1

1. With the IG switch turned OFF, connect the DS-21 diagnosis tester to DLC through the SST or connect the OBD II generic scan tool directly to DLC.
   SST: 09991-87404-000
2. After turning ON the IG switch, turn ON the main switch of the tester. Read the intake air temperature value of the DS-21 diagnosis tester or OBD II generic scan tool.
   Is the measured value the same as the actual intake air temperature?

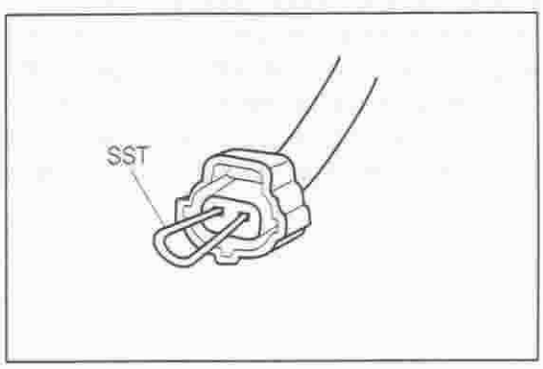


YES → Check malfunction that occurs intermittently or poor contact. (Refer to page EF–51.)

NO →
–40°C ····· Go to Step 2
140°C or more ····· Go to Step 4

2 Check of open wire in harness or inside engine ECU (1)

1. After turning OFF the main switch of the tester, turn OFF the IG switch.
2. Disconnect the connector of the intake air temperature (IAT) sensor.
3. Connect a jump wire between the harness terminals (X33) and (X34) of the IAT sensor.
   SST: 09991-87403-000
4. After turning ON the IG switch, turn ON the main switch of the tester. Read the intake air temperature value of the DS-21 diagnosis tester or OBD II generic scan tool.
   Is the measured value 140°C or above?

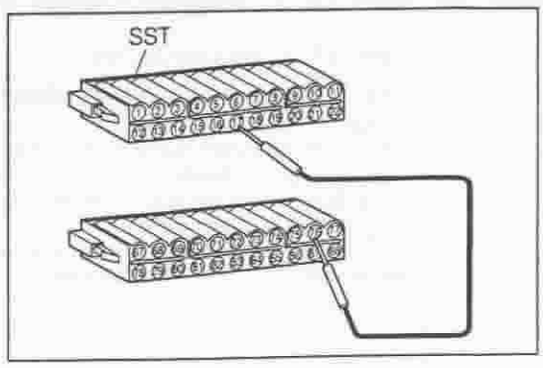


NO → Go to Step 3.

YES → Check the IAT sensor connector or terminal for connecting condition. If they are satisfactory, replace the IAT sensor.

3 Check of open wire in harness or inside engine ECU (2)

1. After turning OFF the main switch of the tester, turn OFF the IG switch.
2. Set the SST (sub-harness). (Refer to page EF-8.)
   SST: 09842-97203-000
3. Disconnect the jump wire from the IAT sensor connector.
4. Next, connect the jump wire between the SST connector terminals ⑯ and ⑰.
5. After turning ON the IG switch, turn ON the main switch of the tester. Read the intake air temperature value of the DS-21 diagnosis tester or OBD II generic scan tool.
   Is the measured value 140°C or above?

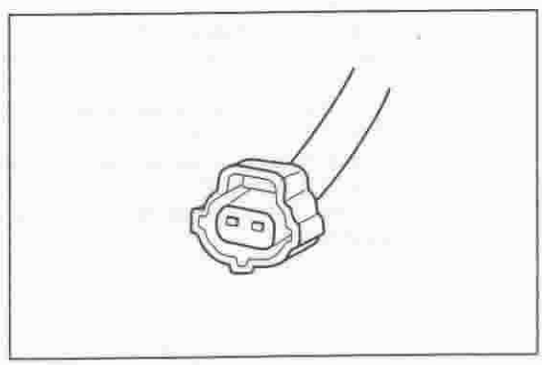


YES → The harness between the IAT sensor and the ECU is open. Repair or replace the harness.

NO → Check the ECU connector or terminal for connecting condition. If they are satisfactory, replace the engine ECU.

4 Check of short in harness or inside engine ECU (1)

1. After turning OFF the main switch of the tester, turn OFF the IG switch.
2. Disconnect the connector of the intake air temperature (IAT) sensor.
3. After turning ON the IG switch, turn ON the main switch of the tester. Read the intake air temperature value of the DS-21 diagnosis tester or OBD II generic scan tool.
   Is the measured value –40°C?

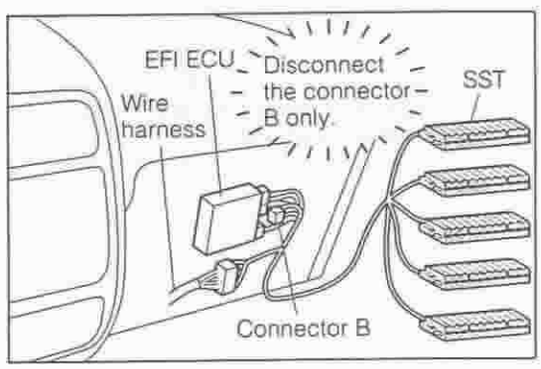


YES → Replace the IAT sensor.

NO →

5 Check of short in harness or inside engine ECU (2)

1. After turning OFF the main switch of the tester, turn OFF the IG switch.
2. Disconnect the connector B of the SST from the ECU connector.
3. After turning ON the IG switch, turn ON the main switch of the tester. Read the intake air temperature value of the DS-21 diagnosis tester or OBD II generic scan tool.
   Is the measured value –40°C?



YES → Repair or replace the harness or connector.

NO → Check or replace the engine ECU. (Refer to page EF-51.)

JEF00199-00125

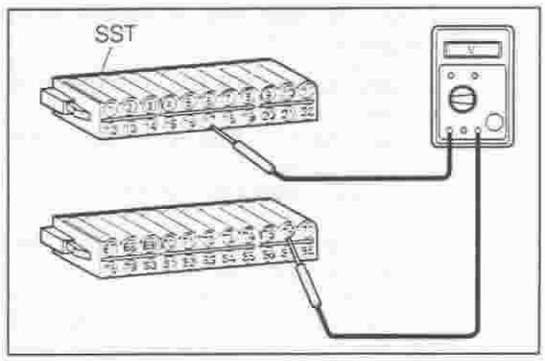
When not using DS-21 diagnosis tester or OBD II generic scan tool:

1 Check of ECU input signal THA

1. Set the SST (sub-harness). (Refer to page EF–8.)
2. With the IG switch turned ON, measure the voltage between the SST connectors ⑯ and ⑰ (THA-E2) under the following condition given below.

Intake air temp. °C	Specified value
20	1.8 - 2.9 V
60	0.6 - 1.2 V

Is the measured value within the specified value?

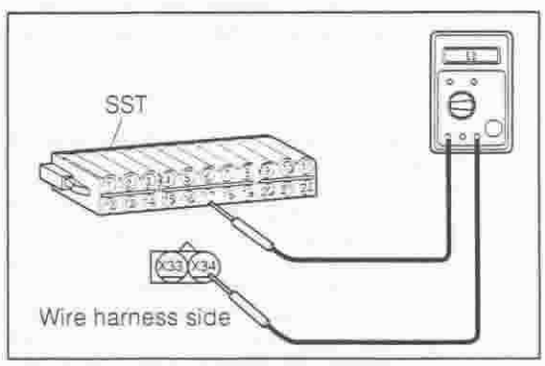


NO

YES → Check malfunction that occurs intermittently or poor contact. (Refer to page EF–51.)

2 Check of harness between IAT sensor and ECU

1. Turn OFF the IG switch.
2. Disconnect the harness from the IAT sensor.
3. Disconnect the SST connectors at the ECU side.
4. Referring to page EF–48, check the harness and connector for open wire or short.
   Connector (X33) at sensor side-Connector ⑯ at ECU side (THA).
   Connector (X34) at sensor side-Connector ⑰ at ECU side (E2).
   Are the check results for open wire and short OK?



YES

NO → Repair or replace the harness or connector.

3 Check of IAT sensor

Unit check of IAT sensor
(Refer to page EF–184.)
Are the unit check results OK?

YES

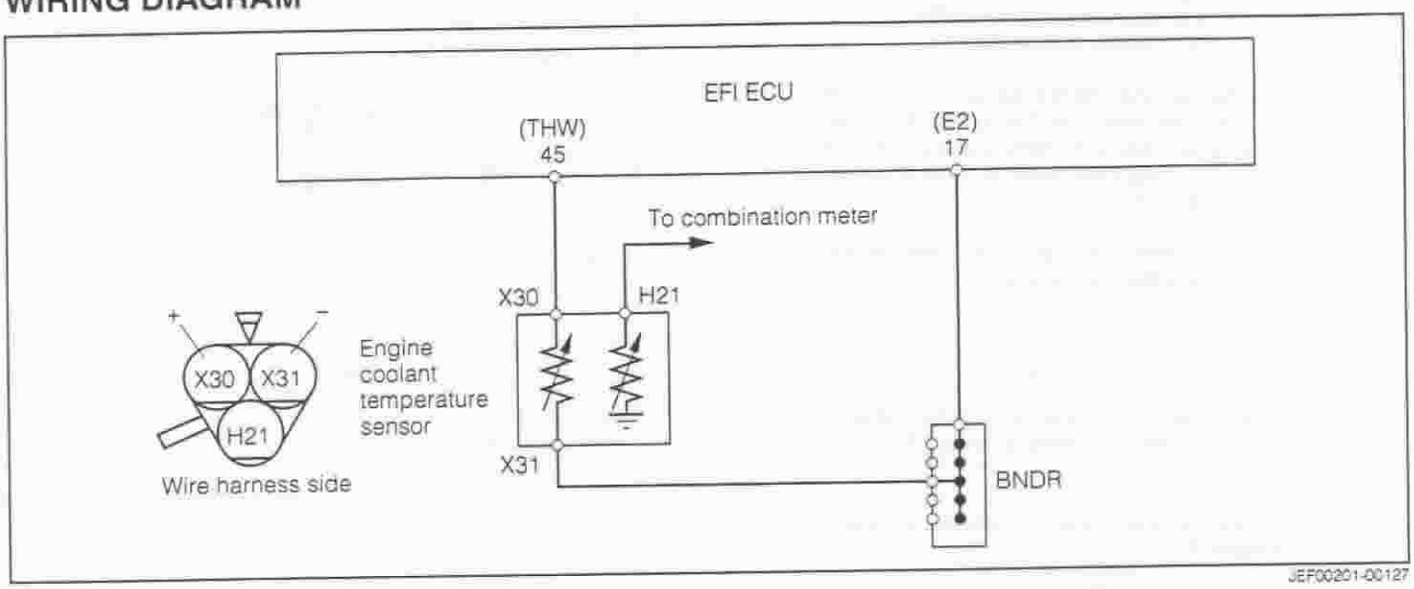
NO → Replace the IAT sensor.

Check or replace the engine ECU.
(Refer to page EF–51.)

JEF00200-00126

DTC	P0115/42	Engine Coolant Temp. Circuit Malfunction

WIRING DIAGRAM



JEF00201-00127

CIRCUIT DESCRIPTION

A thermistor built into the engine coolant temp. sensor changes the resistance valve according to the engine coolant temperature.
The structure of the sensor and connection to the engine ECU is the same as in the DTC P0110/43 (Intake Air Temp. Circuit Malfunction).

DTC No.	DTC Detecting condition	Trouble area
P0115/42	Open wire or short in engine coolant temp. sensor circuit	• Open wire or short in engine coolant temp. sensor circuit • Engine coolant temp. sensor • Engine ECU

NOTE:
- After confirming DTC P0115/42 use the OBD II generic scan tool or DS-21 diagnosis tester to confirm the engine coolant temperature from CURRENT DATA.

Temperature displayed	Malfunction
–40°C	Open circuit
140°C or more	Short circuit

JEF00202-00000

INSPECTION PROCEDURE

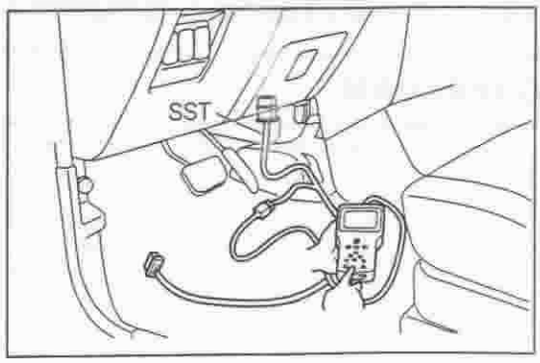
NOTE:
- If DTC P0110/43 (Intake Air Temp. Circuit Malfunction), P0115/42 (Engine Coolant Temp. Circuit Malfunction), P0120/41 (Throttle/Pedal Position Sensor/Switch "A" Malfunction) are output simultaneously, E2 (Sensor Ground) may be open.
- Read freeze frame data using DS-21 diagnosis tester or OBD II generic scan tool.
  Because freeze frame records the engine conditions when the malfunction is detected, when troubleshooting it is useful for determining whether the vehicle was running or stopped, the engine warmed up or not, the air-fuel ratio lean or rich, etc. at the time of the malfunction.

When using DS-21 diagnosis tester or OBD II generic scan tool:

1

1. With the IG switch turned OFF, connect the DS-21 diagnosis tester to DLC through the SST or connect the OBD II generic scan tool directly to DLC.
   SST: 09991-87404-000
2. After turning ON the IG switch, turn ON the main switch of the tester. Read the engine coolant temperature of the DS-21 diagnosis tester or OBD II generic scan tool.

   Is the measured value the same as the actual water temperature?



YES

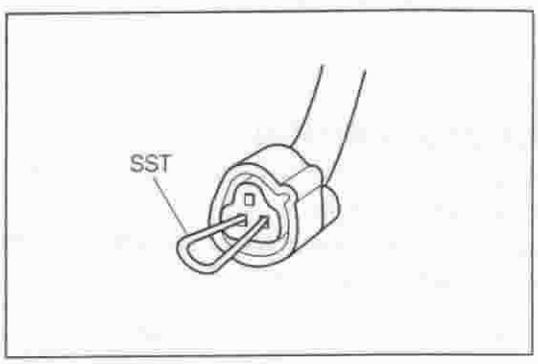
Check malfunction that occurs intermittently or poor contact. (Refer to page EF–51.)

NO

–40°C ····· Go to Step 2
140°C or more ····· Go to Step 4

2 Check of open wire in harness or inside engine ECU (1)

1. After turning OFF the main switch of the tester, turn OFF the IG switch.
2. Disconnect the connector of the engine coolant temperature (ECT) sensor.
3. Connect a jump wire between the harness terminals (X30) and (X31) of the ECT sensor.
   SST: 09991-87403-000
4. After turning ON the IG switch, turn ON the main switch of the tester. Read the engine coolant temperature value of the DS-21 diagnosis tester or OBD II generic scan tool.
   Is the measured value 140°C or above?



NO

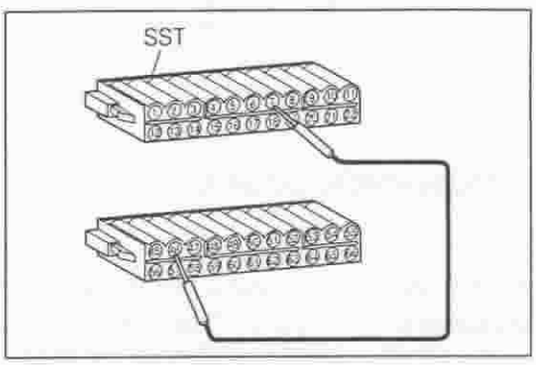
Go to Step 3.

YES

Check the ECT sensor connector or terminal for connecting condition. If they are satisfactory, replace the ECT sensor.

3 Check of open wire in harness or inside engine ECU (2)

1. After turning OFF the main switch of the tester, turn OFF the IG switch.
2. Set the SST (sub-harness). (Refer to page EF–8.)
   SST: 09842-97203-000
3. Disconnect the jump wire from the ECT sensor connector.
4. Next, connect the jump wire between the SST connector terminals ⑯ and ⑦.
5. After turning ON the IG switch, turn ON the main switch of the tester. Read the engine coolant temperature value of the DS-21 diagnosis tester or OBD II generic scan tool.
   Is the measured value 140°C or above?



YES

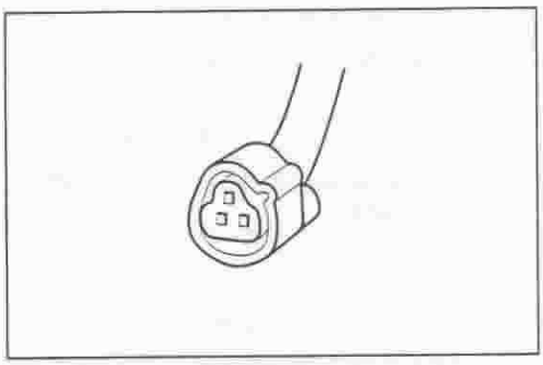
The harness between the ECT sensor and the ECU is open. Repair or replace the harness.

NO

Check the ECU connector and terminal for connecting condition. If they are satisfactory, replace the engine ECU.

4 Check of short in harness or inside engine ECU (1)

1. After turning OFF the main switch of the tester, turn OFF the IG switch.
2. Disconnect the connector of the engine coolant temperature (ECT) sensor.
3. After turning ON the IG switch, turn ON the main switch of the tester. Read the coolant temperature value of the DS-21 diagnosis tester or OBD II generic scan tool.
   Is the measured value –40°C?



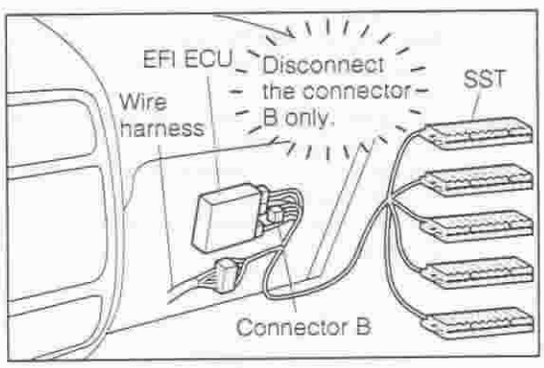
YES

Replace the ECT sensor.

NO

5 Check of short in harness or inside engine ECU (2)

1. After turning OFF the main switch of the tester, turn OFF the IG switch.
2. Disconnect the connector B of the SST from the ECU connector.
3. After turning ON the IG switch, turn ON the main switch of the tester. Read the engine coolant temperature value of the DS-21 diagnosis tester or OBD II generic scan tool.
   Is the measured value –40°C?



NO

Check or replace the engine ECU. (Refer to page EF–51.)

YES

Repair or replace the harness or connector.

JEF00203-00128

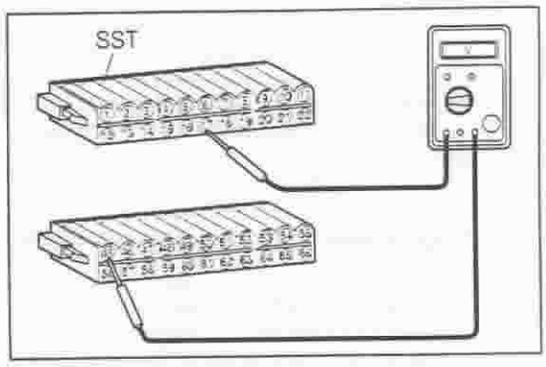
When not using DS-21 diagnosis tester or OBD II generic scan tool:

1 Check of ECU input signal THW

1. Set the SST (sub-harness). (Refer to page EF–8.)
2. With the IG switch turned ON, measure the voltage between the SST terminals ㊺ and ⑰ (THW-E2) under the following condition given below.

Intake air temp. °C	Specified value
20	1.8 - 2.9 V
60	0.5 - 1.2 V

Is the measured value within the specified value?

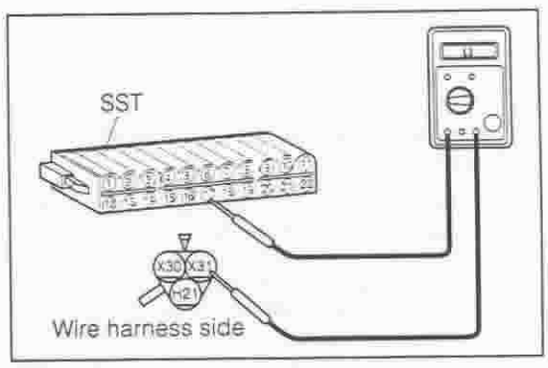


NO

YES → Check malfunction that occurs intermittently or poor contact. (Refer to page EF–51.)

2 Check of harness between ECT sensor and ECU

1. Turn OFF the IG switch.
2. Disconnect the harness from the IAT sensor.
3. Disconnect the SST connectors at the ECU side.
4. Referring to page EF–48, check the harness and connector for open wire or short.
   Connector (X30) at sensor side-Connector ㊺ at ECU side (THW).
   Connector (X31) at sensor side-Connector ⑰ at ECU side (E2).
   Are the check results for open wire and short OK?



YES

NO → Repair or replace the harness or connector.

3 Unit check of ECT sensor

(Refer to page EF–184.)
Are the unit check results OK?

YES

NO → Replace the ECT sensor.

4 Check or replace the engine ECU.

(Refer to page EF–51.)

JEF00204-00129

DTC	P0116/42	Engine Coolant Temp. Circuit Range/ Performance Problem

WIRING DIAGRAM

Refer to Section DTC P0115/42.

JEF00205-00000

CIRCUIT DESCRIPTION

Refer to Engine Coolant Temp. Circuit Malfunction.

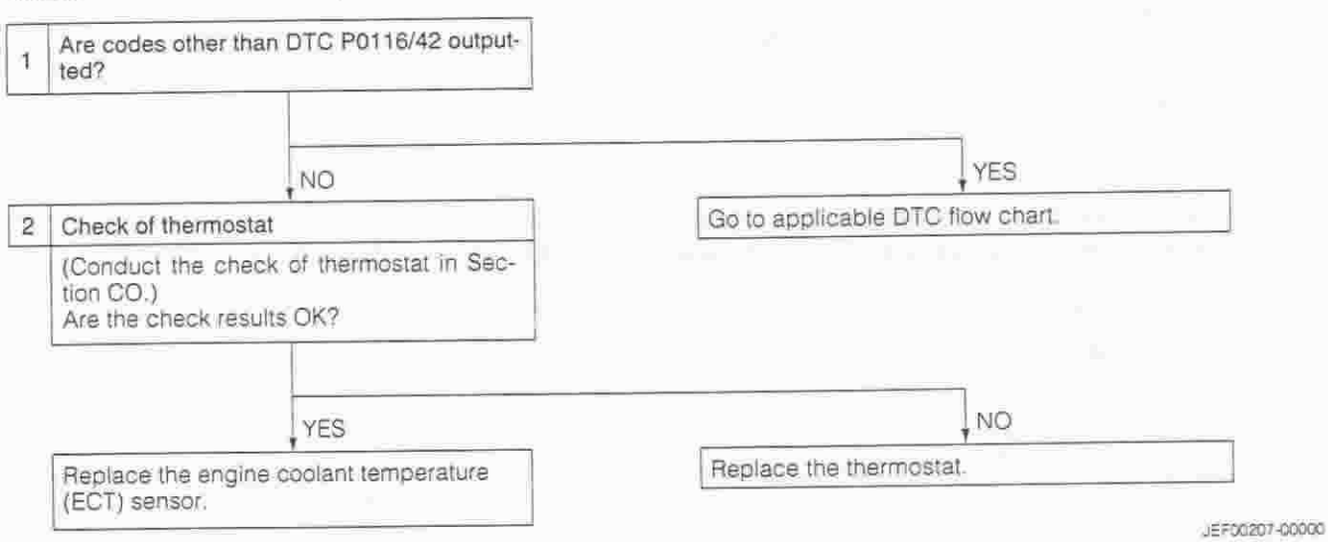
DTC No.	DTC Detecting condition	Trouble area
P0116/42	When the engine starts, the engine coolant temp. is between –7.5°C or more and less than 40°C. And 5 min. or more after the engine starts, engine coolant temp. sensor value is 40°C or less. (2 trip detection logic)	• Engine coolant temp. sensor • Cooling system

JEF00206-00000

INSPECTION PROCEDURE

NOTE:

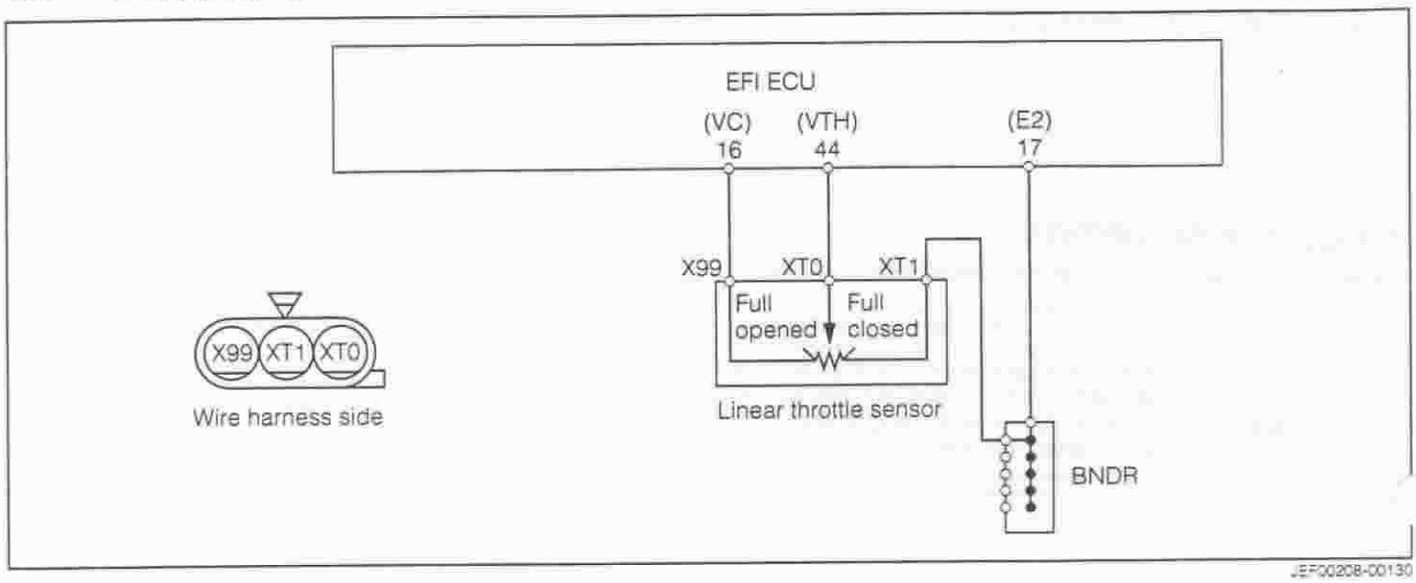
- If DTC "P0115/42" (Engine Coolant Temp. Circuit Malfunction) and "P0116/42" (Engine Coolant Temp. Circuit Range/Performance Problem) are output simultaneously, engine coolant temp. sensor circuit may be open. Perform troubleshooting of DTC P0115/42 first.
- Read the freeze frame data, using the DS-21 diagnosis tester or OBD II generic scan tool. Because the freeze frame data records the engine conditions when the malfunction was detected, when troubleshooting the freeze frame data is useful to determine whether the vehicle was running or stopped, the engine warmed up or not, the air-fuel ratio lean or rich, etc. at the time of the malfunction.
- In the troubleshooting for the water temperature sensor system, only the use of DS-21 diagnosis tester or OBD II generic scan tool will be able to determine whether open wire, short (P0115) or functional malfunction (P0116).



JEF00207-00000

DTC	P0120/41	Throttle/Pedal Position Sensor/Switch "A" Circuit Malfunction

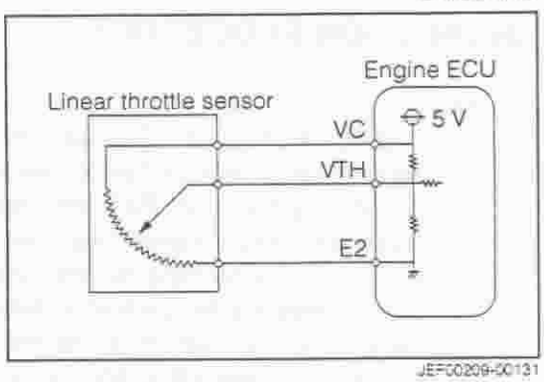
WIRING DIAGRAM



JEF00208-00130

CIRCUIT DESCRIPTION

The linear throttle sensor is mounted in the throttle body and detects the throttle valve opening angle.
When the throttle valve is fully closed, a voltage of approximately 0.4 - 0.8 V is applied to terminal VTH of the engine ECU. The voltage applied to the terminals VTH of the engine ECU increases in proportion to the opening angle of the throttle valve and becomes approximately 3.5 - 5.0 V when the throttle valve is fully opened. The engine ECU judges the vehicle driving conditions from these signals input from terminal VTH, uses them as one of the conditions for deciding the air-fuel ratio correction, power increase correction and fuel-cut control etc.



JEF00209-00131

DTC No.	DTC Detecting condition	Trouble area
P0120/41	Condition (1) or (2) continues with more than 0.6 sec: 1. VTH < 0.2 V 2. VTH ≥ 4.8 V	• Open wire or short in linear throttle sensor circuit • Linear throttle sensor • Engine ECU

NOTE:

- After confirming "DTC P0120/41", use the DS-21 diagnosis tester or OBD Ⅱ generic scan tool to confirm the throttle valve opening percentage and closed throttle position switch condition.

Throttle valve opening position expressed as percentage		Trouble area
Throttle valve fully closed	Throttle valve fully open	
0 %	0 %	VC line open VTH line open wire or short
Approx. 100 %	Approx. 100 %	E2 line open

INSPECTION PROCEDURE

NOTE:

- If DTC P0110/43 (Intake Air Temp. Circuit Malfunction), P0115/42 (Engine Coolant Temp. Circuit Malfunction, P0120/41 (Throttle/Pedal Position Sensor/Switch "A" Malfunction) are output simultaneously, E2 (Sensor Ground) may be open.
- Read the freeze frame data, using the DS-21 diagnosis tester or OBD II generic scan tool. Because the freeze frame data records the engine conditions when the malfunction was detected, when troubleshooting the freeze frame data is useful to determine whether the vehicle was running or stopped, the engine warmed up or not, the air-fuel ratio lean or rich, etc. at the time of the malfunction.

When using DS-21 diagnosis tester or OBD II generic scan tool:

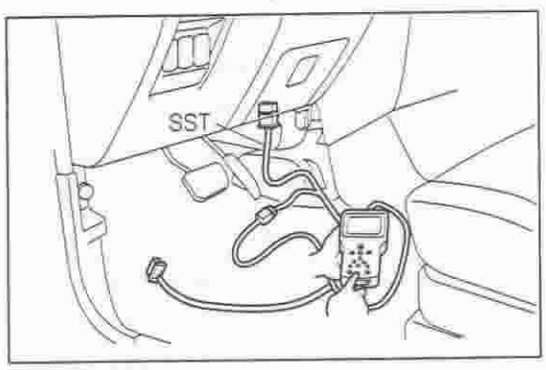
1 Check of output value of liner throttle sensor

1. With the IG switch turned OFF, connect the DS-21 diagnosis tester to DLC through the SST or connect the OBD II generic scan tool directly to DLC.
   SST: 09991-87404-000

2. After turning ON the IG switch, turn ON the main switch of the tester. Read the throttle valve opening value of the DS-21 diagnosis tester or OBD II generic scan tool.

Throttle valve	Throttle valve opening %
Fully closed	0.0
Fully open	100.0

Are the check results OK?



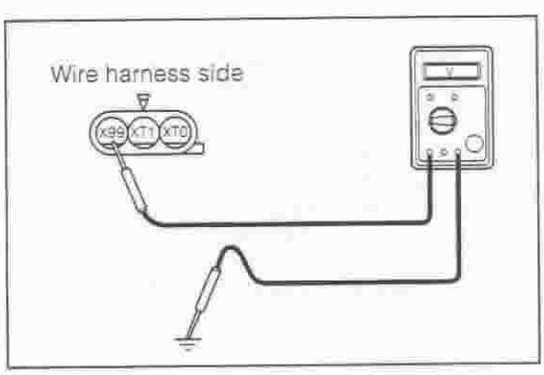
YES → Check malfunction that occurs intermittently or poor contact. (Refer to page EF–51.)

NO ↓

2 Check of power supply voltage at linear throttle sensor harness side

1. After turning OFF the main switch of the tester, turn OFF the IG switch.
2. Disconnect the connector of the linear throttle sensor.
3. Measure the voltage between the terminals (X99) of wire harness connector and body ground when the ignition switch is turned to the ON position.
   Specified Value: 4.5 - 5.5 V

Is the voltage within the specified value?



NO → Go to Step 5.

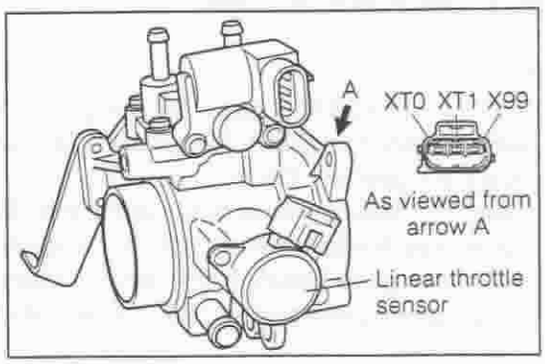
YES ↓

3 Check of linear throttle sensor

1. Turn OFF the IG switch.
2. Measure the resistance between the respective terminals.

Terminal	Condition	Standard value kΩ
X99 - XT1		2.5 - 6.0
XT1 - XT0	Throttle valve fully closed	0.1 - 1.3
XT1 - XT0	Throttle valve fully opened	1.7 - 4.2

Are the check results OK?



NO → Replace the linear throttle sensor.

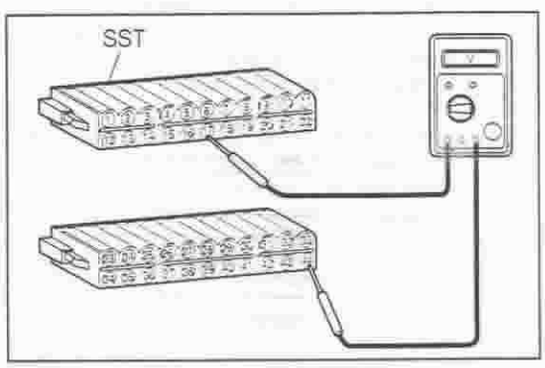
YES

4 Check of ECU input signal VTH

1. Set the SST (sub-harness). (Refer to page EF-8.)
2. With the IG switch turned ON, measure the voltage between the SST connector ㊹ and ⑰ (VTH-E2) under the following condition given below.

Fhrottle value	Specified value
Fully closed	0.4 - 0.8 V
Fully open	3.5 - 5.0 V

Is the measured value within the specified value?



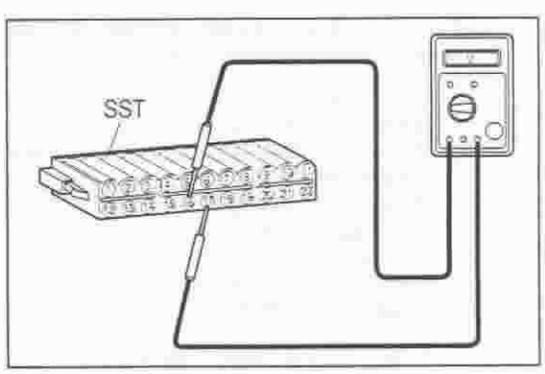
NO → Check the harness and connector between the engine ECU and the linear throttle sensor (VTH line) for open wire or short. (Refer to page EF-48.)

YES → Check or replace the engine ECU. (Refer to page EF-51.)

5 Check of power supply voltage at linear throttle sensor ECU side

1. Turn OFF the IG switch.
2. Set the SST (sub-harness). (Refer to page EF-8.)
3. With the IG switch turned ON, measure the voltage between the SST connectors ⑯ and ⑰ (VTH-E2).
   Specified Value: 4.5 - 5.5 V

Is the measured value within the specified value?
NOTE:
- If no voltage appears, check the ECU power supply circuit.



NO → Check or replace the engine ECU. (Refer to page EF-51.)

YES → Check the harness and connector between the engine ECU and the linear throttle sensor (VC line) for open wire or short. (Refer to page EF-48.)

JEF00210-00

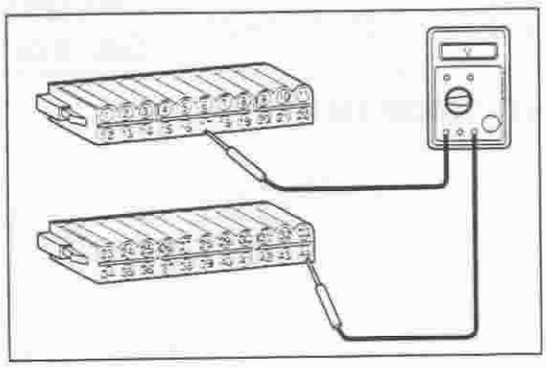
When not using DS-21 diagnosis tester or OBD II generic scan tool:

1 Check of ECU input signal VTH

1. Set the SST (sub-harness). (Refer to page EF-8.)
2. With the IG switch turned ON, measure the voltage between the SST connectors ㊹ and ⑰ (VTH-E2) under the following condition given below.

Throttle valve	Specified value
Fully closed	0.4 - 0.8 V
Fully open	3.5 - 5.0 V

Is the measured value within the specified value?



YES → Check malfunction that occurs intermittently or poor contact. (Refer to page EF-51.)

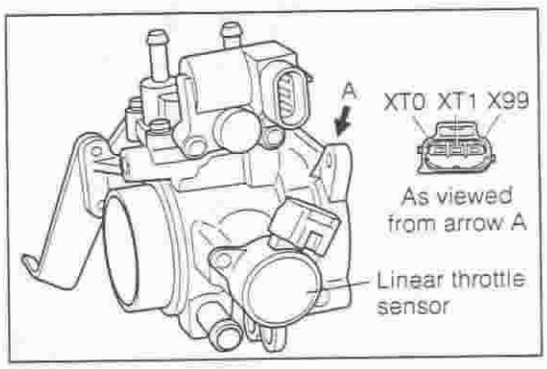
NO ↓

2 Check of linear throttle sensor

1. Turn OFF the IG switch.
2. Disconnect the linear throttle sensor.

Terminal	Condition	Standard value kΩ
X99 - XT1		2.5 - 6.0
XT1 - XT0	Throttle valve fully closed	0.1 - 1.3
XT1 - XT0	Throttle valve fully opened	1.7 - 4.2

Are the check results OK?



NO → Replace the linear throttle sensor.

YES ↓

3 Check the harness and connector between the engine ECU and the linear throttle sensor (VC, VTH, E2 line) for open wire or short. (Refer to page EF-48.)

YES ↓

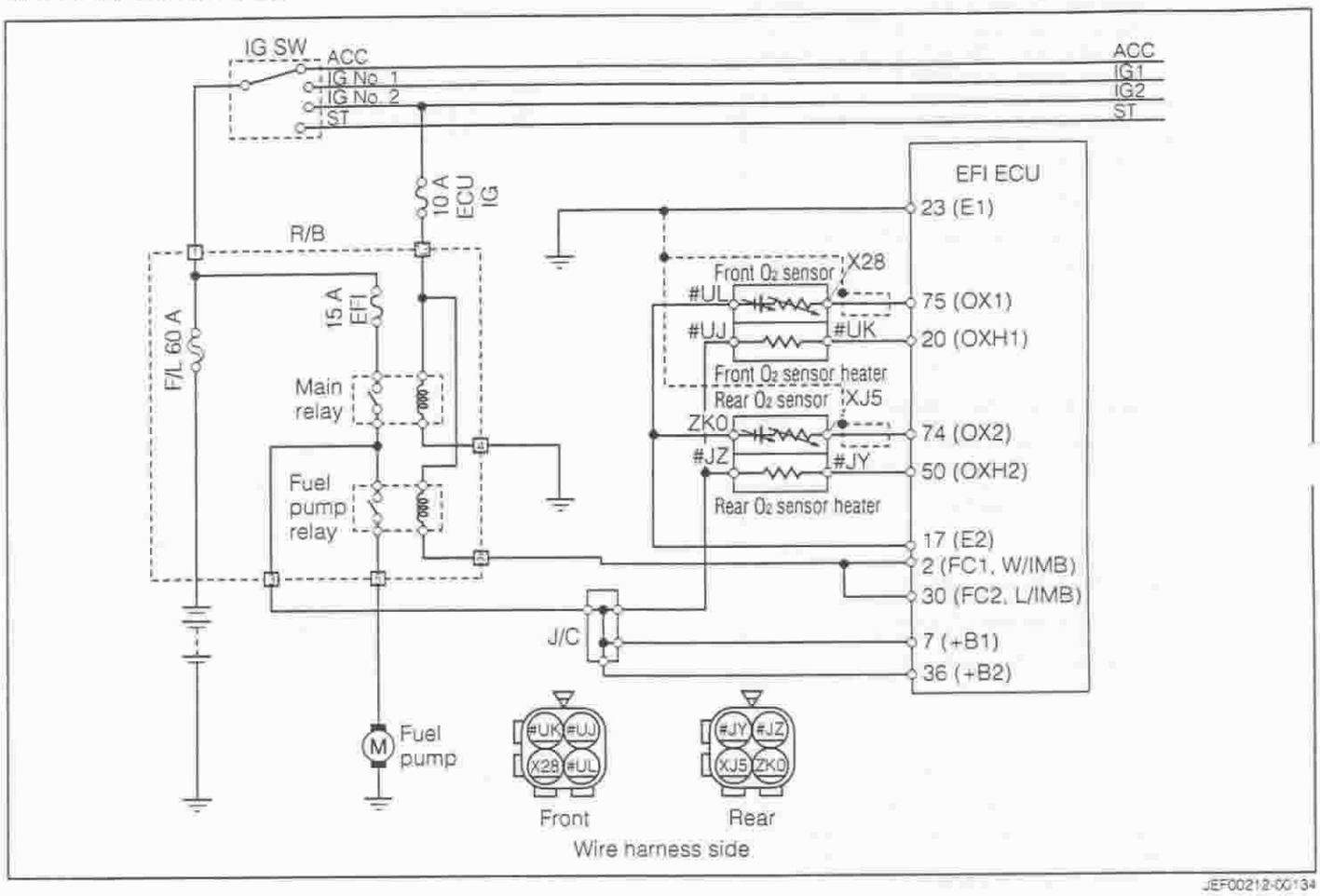
Check or replace the engine ECU. (Refer to page EF-51.)

NO → Repair or replace the harness or connector.

JEF00211-00133

DTC	P0130/21	Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 1)

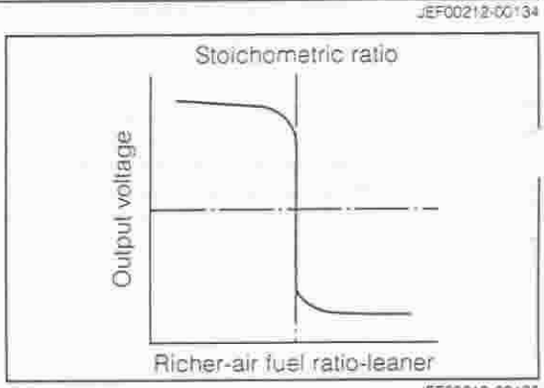
WIRING DIAGRAM



JEF00212-00134

CIRCUIT DESCRIPTION

The front oxygen sensor (bank 1, sensor 1) detects the concentration of oxygen contained in the exhaust gas according to the magnitude of the electromotive force that is being generated in itself. When the air-to-fuel ratio becomes richer than the stoichometric ratio, a greater electromotive force (approx. 1 volt) is applied to the ECU. Conversely, when the ratio becomes leaner than the stoichometric ratio, a smaller electromotive force (approx. 0 volt) is applied to the ECU. In this way, the ECU determines whether the air-to-fuel ratio is rich or lean. Based on this evaluation, the injection time is controlled.

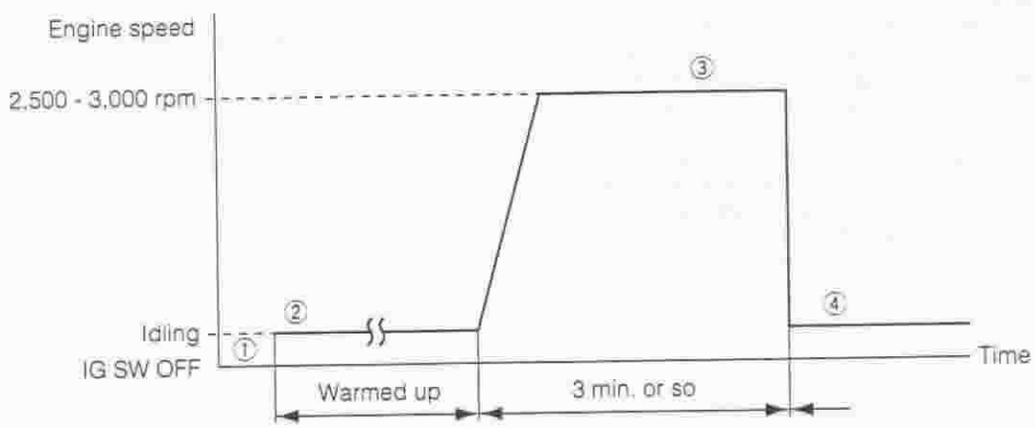


JEF00213-00135

DTC No.	DTC Detecting condition	Trouble area
P0130/21	When the following conditions (a) and (b) continue for more than a certain length of time: (a) After engine warming-up, the signal from the oxygen sensor continuously remains in the non-rich state, not becoming rich even once. (b) Voltage output of oxygen sensor remains at 0.3 V or more, or 0.6 V or less, during idling after engine is warmed up. (2 trip detection logic)	• Air induction system • Fuel pressure • Injector injection • Open or short in heated oxygen sensor circuit • Heated oxygen sensor • Engine ECU

NOTE:
- "Sensor 1" means a sensor which is located near the engine block.
- Using the DS-21 diagnosis tester or OBD II generic scan tool, confirm the output voltage of the oxygen sensor (bank 1, sensor 1) from the current data.
  If the output voltage of the oxygen sensor (bank 1, sensor 1) is 0.1 V or less, most likely the circuit of the oxygen sensor (bank 1, sensor 1) is open or shorted.

CONFIRMATION ENGINE RACING PATTERN



① With the IG switch turned OFF, connect the DS-21 diagnosis tester to DLC through the SST. Turn ON the IG switch and the main switch of the tester. Set the tester to the "Continuos monitoring results" of the CARB mode.
② Start the engine. Keep on warming the engine for more than five minutes until the engine cooling water temperature reaches 90°C or above.
③ Race the engine for about three minutes at 2500 to 3000 rpm.
④ After one minute of idling, press the F1 key of the tester. Check to see if the DTC P0130 is outputted.

JEF00214-00136

CAUTION:
- If the condition in this test is not strictly followed, detection of the malfunction will not be possible.
- If you do not have the DS-21 diagnosis tester, turn the ignition switch OFF after performing steps ② to ④, then perform steps ② to ④ again.

INSPECTION PROCEDURE

NOTE:

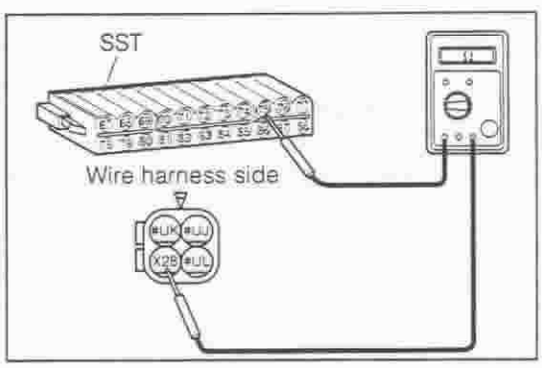
- Read the freeze frame data, using the DS-21 diagnosis tester or OBD II generic scan tool. Because the freeze frame data records the engine conditions when the malfunction was detected, when troubleshooting the freeze frame data is useful to determine whether the vehicle was running or stopped, the engine warmed up or not, the air-fuel ratio lean or rich, etc. at the time of the malfunction.

1 Are other codes (those other than DTC P0130/21) outputted?

- YES → Go to the relative DTC chart.
- NO →

2 Check of harness between oxygen sensor and ECU

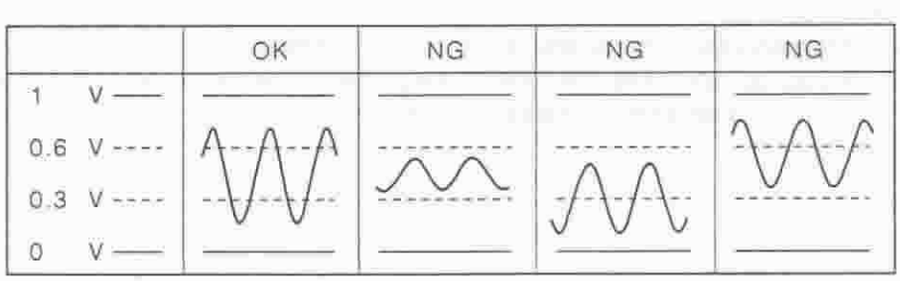
1. With the IG switch turned OFF, set the SST (sub-harness). (Refer to page EF-8.) However, the SST connectors at the ECU side should remain disconnected.
2. Disconnect the oxygen sensor connector.
3. Referring to page EF-48, check the harness and connector for open wire or short.
   Are the check results for open wire and short between the connector (X28) of the oxygen sensor at the harness side and the SST terminal 75 OK?



- YES →
- NO → Repair or replace the harness or connector.

3 Check of output voltage of oxygen sensor during idling

1. Connect the oxygen sensor and SST connectors, respectively.
2. Connect the DS-21 diagnosis tester to DLC through the SST.
   SST: 09991-87404-000
3. Warm up the engine at 2500 rpm for about 90 seconds.
4. Turn ON the main switch of the tester to read the output voltage of oxygen sensor during idling.
   Specified Value:
   The voltage varies repeatedly between a range from a voltage below 0.3 V and to a voltage above 0.6 V. (See the diagram below.)



NO

4 Check of misfire

Check to see if any misfire is occurring by monitoring the DTC and data list.
Are the check results OK?

YES → Go to Step 10.

YES

5 Check of air induction system

Check the following items given below:
- Check of the engine oil level gauge, oil filler cap and PCV hose for disconnection.
- Check of parts of the air induction system between the cylinder head and the throttle body for disconnection, looseness, or cracks.

NO → Perform troubleshooting for misfire. (Go to troubleshooting of DTC P0300/17, P0301-304/17.)

YES

6 Check of fuel pressure

(Refer to page EF-68.)
Are the check results OK?

NO → Repair or replace the induction system.

YES

7 Check of injector injection

(Refer to page EF-68.)
Are the check results OK?

NO → Check and repair fuel pump, fuel pipe line and filter.

YES

8 Check of gas leakage of exhaust system

Are the check results OK?

NO → Replace the injector.

YES

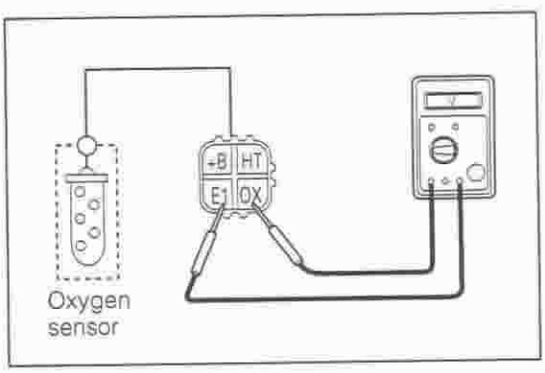
9 Check of output voltage of oxygen sensor unit

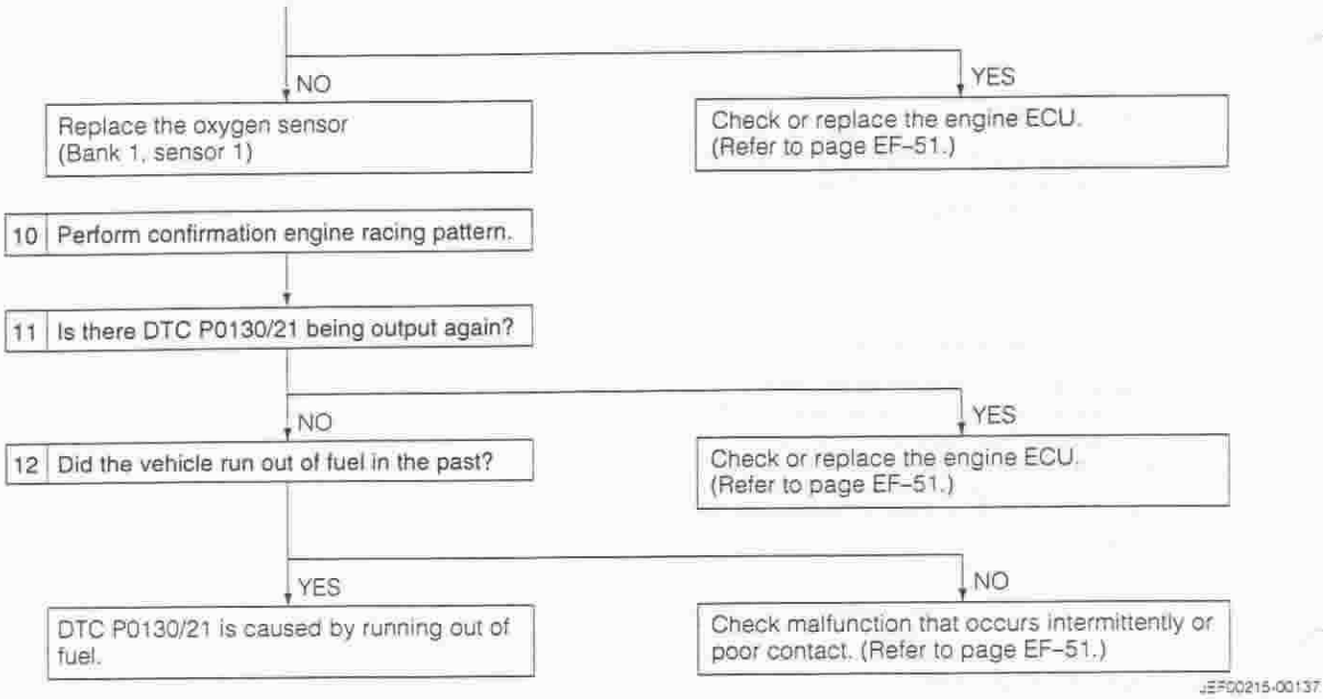
1. Warm up engine completely
2. Disconnect the connector of the oxygen sensor with IG switch OFF
3. Connect a voltmeter to the connector terminal of oxygen sensor
4. Hold the engine racing speed for 3 minutes at 2000 rpm.
   at this time, ensure that the reading of the volt meter is within the specified value.

   Specified Value:
   Does the voltmeter exhibit an output voltage of 0.2 V or more at least one time?

Are the check results OK?

NO → Repair or replace.





JEF00215-00137