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EFI SYSTEM

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1. GENERAL PRECAUTIONARY MEASURES

1.1 INSTRUCTIONS ON USE OF THIS SERVICE MANUAL

This service manual has been compiled in such a way that the manual may be used both in regions where the type certification is implemented based on the EC exhaust emission approval, and other regions. Hence, with regard to the assignment, reading, erasing of trouble codes and those steps of checks, repairs and confirmation, the service manual contains the procedures for both cases; One is a procedure that uses the DS-21 diagnosis tester or the OBD Ⅱ generic scan tool, and the other is a procedure that does not use this tester or tool.

Therefore, the following instructions given below must be observed.

1. About Use of DS-21 Diagnosis Tester or OBD Ⅱ Generic Scan Tool
   - Regions where type certification is implemented based on EC exhaust emission approval
     Make sure to use the DS-21 diagnosis tester or the OBD Ⅱ generic scan tool.
   - Other regions
     You may use or not use the DS-21 diagnosis tester or the OBD Ⅱ generic scan tool.
     You may perform the operation, employing whichever method that will be easier to you.
2. Instructions To Be Followed Concerning Trouble Codes
   Trouble codes, such as P0105/31 (4-digit code/2-digit code) are posted additionally.
   - Regions where type certification is implemented based on EC exhaust emission approval
     Make sure to use only 4-digit trouble codes (e.g. P0105) which have been assigned according to the ISO regulations.
   - Other regions
     You may perform the operation using the 4-digit code, employing the DS-21 diagnosis tester or the OBD Ⅱ generic scan tool. Or you may perform the operation using the 2-digit codes (e.g. 31), without the use of the tester or tool.
     You may perform the operation, employing whichever method that will be easier to you.

NOTE:

- The OBD Ⅱ generic scan tool means a scan tool complying with the ISO 14230 (KWP2000) format.
- In cases where the OBD Ⅱ generic scan tool is employed, not all malfunction codes (4-digit codes) can be read out. It should be noted that only those trouble codes in which “zero” follows after “P”, for example, P0XXX, can be read out.
- The accuracy of the 2-digit codes in diagnosing malfunctioning components is slightly inferior to that of the 4-digit codes.
- Hereinafter, those regions where the type certification is implemented based on the EC exhaust emission approval, is referred to as the “EU specifications.”

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1.2 HANDLING INSTRUCTIONS ON CATALYTIC CONVERTER-EQUIPPED VEHICLES

WARNING:
- When a great amount of unburnt gas is admitted into the catalytic converter, overheating is prone to occur, resulting in a fire hazard.
  To avoid such trouble in advance, be certain to observe the following precautions. Also, be sure to explain such precautions to your customers.

1. Use only unleaded gasoline to catalytic converter-equipped vehicles.
2. Avoid idling the engine for a prolonged length of time.
   Do not run the engine continuously at idle speed for more than 20 minutes.
   WARNING:
   - Immediately check and repair the vehicle if the fast idle speed or idle speed is unstable or the system exhibits malfunction. Failure to observe this warning may result in a fire hazard.
3. Be sure to observe the following points when performing the spark jump tests.
   (1) The spark jump test must be limited to cases where such test is absolutely necessary. Also, be sure to finish the test in the shortest possible time.
   (2) Never race the engine during the test.
   (3) Be sure to shut off the fuel supply when performing the spark jump test in advance.
4. Do not run the engine when the fuel tank becomes nearly empty.
   Failure to observe this caution will cause misfiring. Also, it will apply excessive load to the catalytic converter, even leading to catalyst damage.
5. Be sure to avoid coasting with the ignition switch turned OFF. Moreover, be certain to avoid applying the brake for a prolonged period of time.
6. Do not dispose of the waste catalyst along with parts contaminated with gasoline or oil.

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1.3 ITEMS TO BE OBSERVED WHEN MOBILE COMMUNICATION SYSTEM IS MOUNTED

For those motor vehicles equipped with a mobile communication system, such as a bidirectional wireless telephone and cellular phone, be sure to observe the following precautionary measures.

1. Install the antenna as far away as possible from the ECU and sensors of the electronically-controlled system of the vehicle.
2. The wire of the antenna should be routed at least 30 cm away from the ECU and sensors of the electronically-controlled system of the vehicle. For details concerning the arrangement of the ECU and sensors, refer to the arrangement diagram of the components in the relevant section.
3. Do not wind the antenna feeder line together with other wires. Avoid routing the antenna feeder in parallel with other harnesses whenever possible.
4. The antenna and feeder line should be properly adjusted.
5. Never install a strong mobile communication system.

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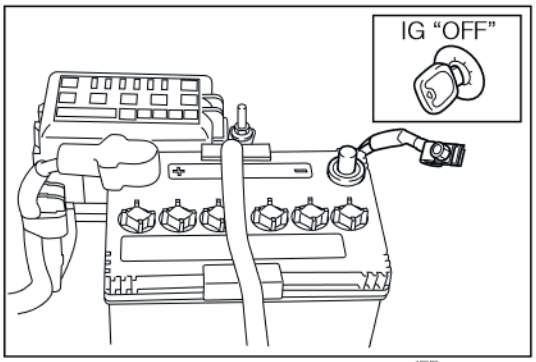
1.4 IMMOBILIZER SYSTEM-EQUIPPED VEHICLES

1. The immobilizer system is formed by communication between the Immobilizer ECU and the EFI ECU by means of the rolling code. The rolling code will be automatically retained both in the immobilizer ECU and in the EFI ECU when the engine is started once with the key of the immobilizer system. The engine will not start if the rolling code in the immobilizer ECU and EFI ECU are not identical. Therefore, the engine will not start when using the EFI ECU which was mounted before on another vehicle with the immobilizer system without resetting the rolling code.
2. When the EFI ECU of a vehicle equipped with the immobilizer system was replaced, based on the results of the trouble shooting, and related troubles have been remedied, it is impossible, due to its construction, to confirm that the malfunction was caused by the former EFI ECU by installing the EFI ECU again. Incidentally, this confirmation is possible in the case of vehicles without the immobilizer system. Therefore, it is not necessary to install the former EFI ECU again to carry out the reconfirmation.
   In the case of vehicles without the immobilizer system, be sure to carry out this re-installation and reconfirmation.
3. In the case of vehicles equipped with the immobilizer system, once the engine is started for the confirmation test, etc. after the malfunction has been remedied, that EFI ECU can not be used for other vehicles with the immobilizer system, unless a measure is taken.
   NOTE:
   - When you would like to use each ECU of the vehicle concerned on vehicles equipped with other immobilizer system, initialize the ECU, using the diagnosis tester (DS-21), before removing the ECU from the vehicle. Then, remove the ECU and install it on another vehicle. If you perform the key registration, using the master key of this vehicle, each ECU can be used separately or as a set.
   - When the EFI ECU is to be replaced with a new one, it is possible to start the engine by using the master key with the terminal T for immobilizer ECU (ECU-T) of the data link connector grounded with a jump wire.
   - Please refer to Section BE of the service manual.

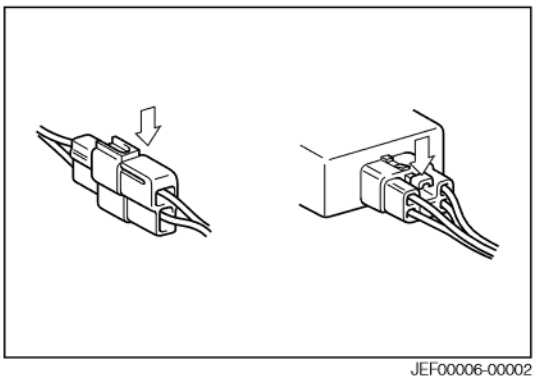
JEF00004-00000

1.5 ITEMS TO BE OBSERVED DURING SYSTEM CIRCUIT CHECK

1. Before connecting and disconnecting the connectors and terminals, be sure to turn OFF the ignition switch or disconnect the negative (–) terminal from the battery. Otherwise, the harness is judged to have an open wire, and the fail-safe function will be applied.
   On the other hand, when the negative (–) terminal of the battery is disconnected, the diagnosis code will be erased. Therefore, if it is necessary to confirm the diagnosis code, be sure to perform the confirmation in advance.
2. When disconnecting the connector, never pull the harness. Rather, hold the connector properly with the connector unlocked and pull it.
   When connecting the connector, be sure to positively insert the connector, until you hear a clicking sound when the lock is engaged.

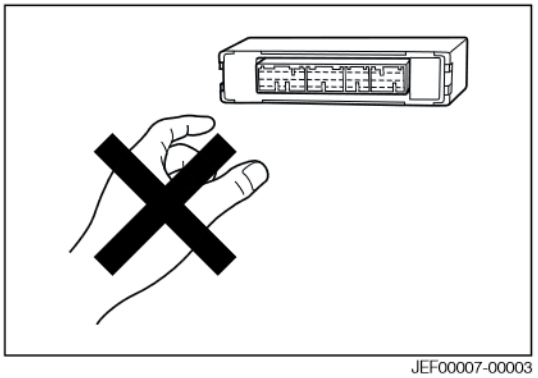


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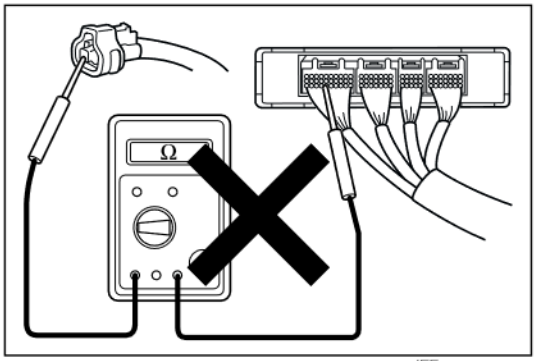
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3. Do not directly touch the terminals of parts which incorporate a microcomputer.
4. When a test probe is applied to the terminal to which a voltage is applied, care must be exercised so that two test probes may not come in contact with each other, so that short circuit may not take place.



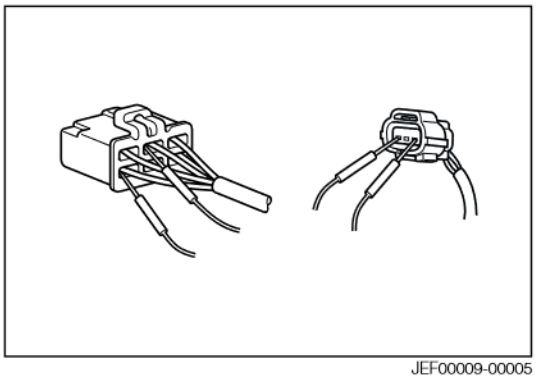
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5. When the connector is connected to the ECU, never connect an ohmmeter between the ECU connector and the sensor or actuator. Failure to observe this caution may damage the ECU or sensor or actuator.



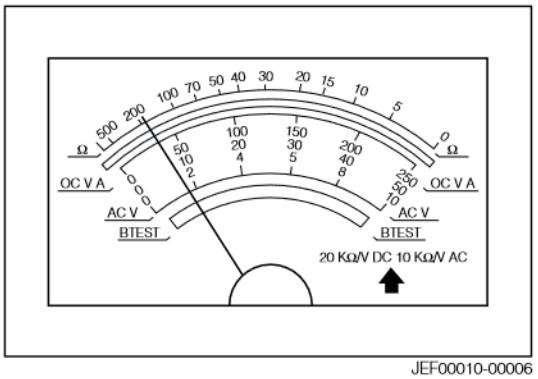
JEF00008-00004

6. When a test probe is applied to the connector, be sure to bring it from the rear side (harness side) of the connector. In the case of connectors where it is impossible to apply a test probe from the rear side, such as water-proof connectors, apply the test probe from the connector side. At this time, be very careful not to bend the male terminal of the connector or open the female terminal.



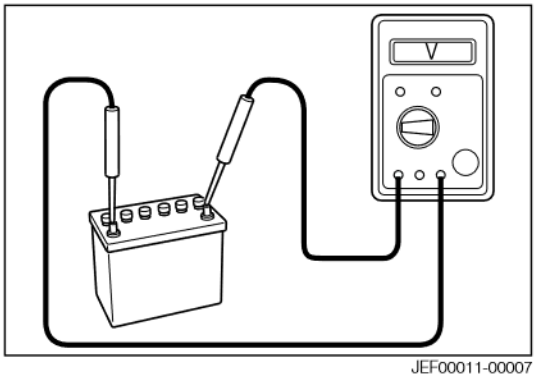
JEF00009-00005

7. Be sure to use a voltmeter/ohmmeter whose internal impedance is at least 10 kΩ/V.
   When a voltmeter/ohmmeter whose internal impedance is less than 10 kΩ/V is used, it may cause the ECU to malfunction or give a wrong evaluation.
8. When checking the terminal for the connecting condition, be sure to check the male terminal for a bend and the female terminal for an excessive opening. Furthermore, check both terminals for locking (looseness), rust formation, dust adhesion, etc.



JEF00010-00006

9. Prior to the measurement of the voltage of each terminal, make sure that the battery voltage is 11 V or more. If the terminal voltage is checked with a low battery voltage, it may lead to a wrong diagnosis.



JEF00011-00007

1.6 ITEMS TO BE OBSERVED WHEN USING OBD Ⅱ GENERIC SCAN TOOL OR DS-21 DIAGNOSIS TESTER

CAUTION:

For enhanced safety, be sure to observe the following points:

- Before using the OBD Ⅱ generic scan tool or the DS-21 diagnosis tester, be sure to thoroughly read the instruction manual of the OBD Ⅱ generic scan tool or the instruction manual of the DS-21 diagnosis tester.
- When driving the vehicle with the OBD Ⅱ generic scan tool or the DS-21 diagnosis tester connected to the vehicle, route the cables in such a way that they may not interfere with the driving. (That is to say, the cables should be routed away from the feet, pedals, steering wheel and shift lever.)
- When performing the test driving, using the OBD Ⅱ generic scan tool or the DS-21 diagnosis tester, two persons are needed. One person drives the vehicle, while the other person operates the OBD Ⅱ generic scan tool or the DS-21 diagnosis tester.

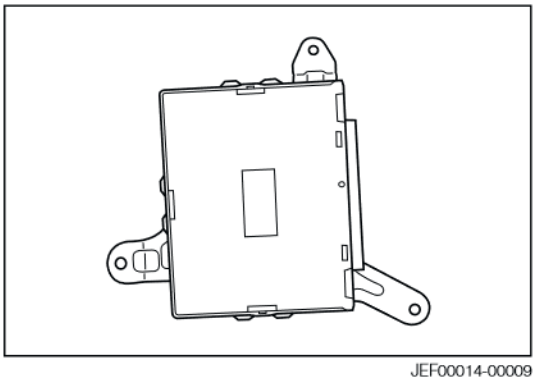
JEF00012-00000

1.7 HANDLING INSTRUCTIONS ON ENGINE CONTROL SYSTEM

1. The ECU, sensors, etc. are precision parts. Be very careful not to give strong impacts to those parts during the installation and removal. Never use those parts to which impacts have been given (for example, in cases where the parts were dropped on the floor).
2. When the test is carried out on a rainy day or the vehicle is washed, care must be exercised so that no water may be admitted and the ECU, connectors, sensors, actuators, etc. may not get wet.
3. Never disconnect the connector from the battery terminal while the engine is running. At the moment when the connector is disconnected from the battery terminal, a great counter electromotive force (approx. 100 V) may be generated, thus damaging the ECU.
4. Never connect the connectors to the wrong terminals of the battery. Failure to observe this caution may break the inside of the battery instantly.

JEF00013-00000

5. Never remove the cover from the ECU proper or the bracket on the ECU proper side. Furthermore, do not touch the attaching screws.



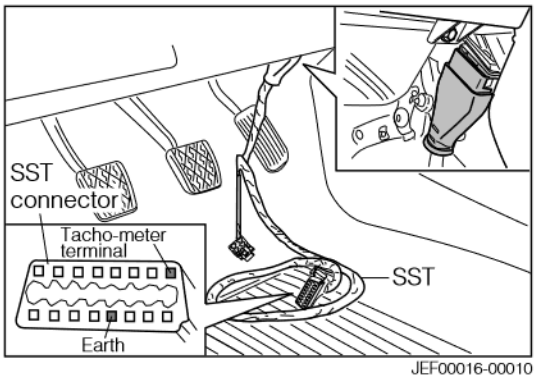
JEF00014-00009

6. In cases where the ECU was judged to be malfunctioning and the vehicle has been remedied by replacing it, install the removed ECU (which has been judged to be malfunctioning) again to confirm that the original malfunction is reproduced. Then, the ECU can be finally judged to have been malfunctioning.

JEF00015-00000

7. Tachometer connection
   Connect the tachometer probe to the measuring terminal of the SST connecter.
   CAUTION:
   - This does not apply if your tachometer is a pick-up type.
   - Never allow the tachometer probe to touch the ground, for it could result in damage to the ignitor and/or ignition coil.
   - Some kinds of tachometers may not be suited for the ignition system of the vehicle. Therefore, ensure that your tachometer is compatible with the ignition system of the vehicle.

     SST: 09991-87404-000



JEF00016-00010

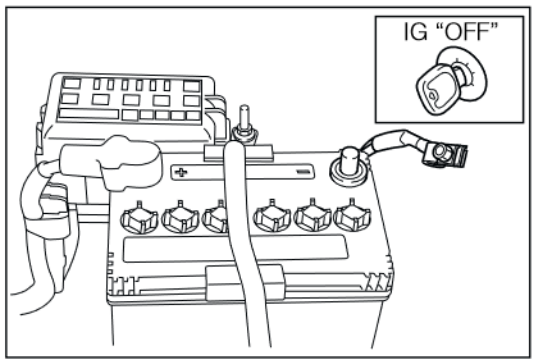
2. CONNECTING PROCEDURE FOR SST (EFI COMPUTER CHECK SUB-HARNESS)

When the ECU terminal voltage is measured with the ECU connector connected to the engine ECU, connect the SST, following the procedure given below.

NOTE:

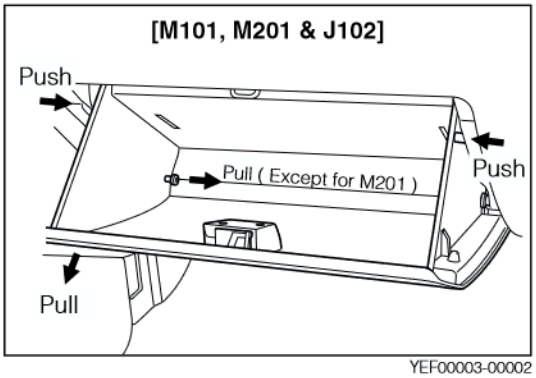
- The terminal number of the SST connector is the same as the ECU connector (page EF–20).

1. Turn OFF the ignition switch. Or, disconnect the battery ground cable from the negative (–) terminal of the battery with the ignition switch turned OFF.
   Disconnect the battery ground cable from the negative (–) terminal of the battery.
   CAUTION:
   - Be sure to memorize the malfunction code before disconnecting the battery cable. Otherwise the malfunction code(s) will be erased by disconnecting the battery cable.

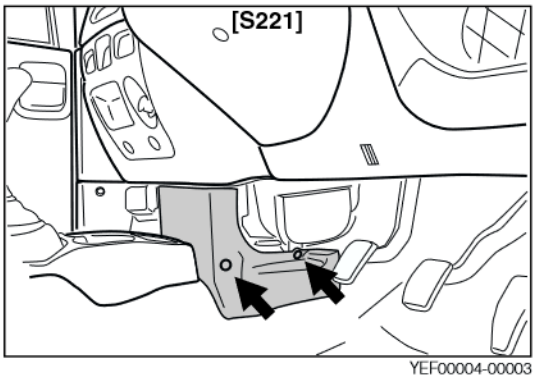


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2. Remove the glove compartment sub assembly. [M101, M201 & J102]
   Remove the EFI-ECU cover [S221]



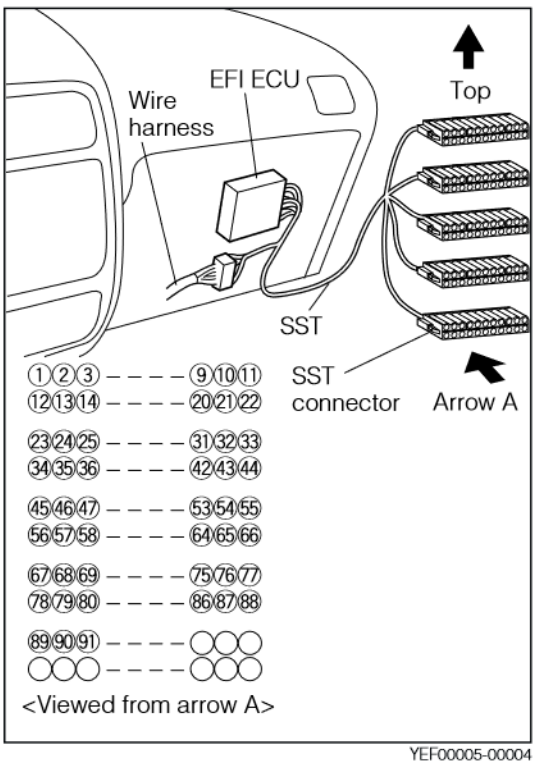
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3. Disconnect the wire harness connectors from the EFI ECU connectors at the cowl side of the passenger seat.
4. Connect the following SST between the wire harness connectors and the EFI ECU connectors.
   SST: 09842-97203-000

5. Reconnect the battery ground cable to the negative (–) terminal of the battery.
   CAUTION:
   - When disconnecting or reconnecting the EFI ECU connectors, be sure to disconnect the battery ground cable from the negative (–) terminal of the battery with the ignition switch and all accessory switches in the off state.
   - When installing a new battery, care must be exercised not to mistake the battery polarity. Failure to observe this caution could cause ECU malfunction.
   - Before using the SST, be sure to check to see if short or open wire exists between the terminals of the SST.

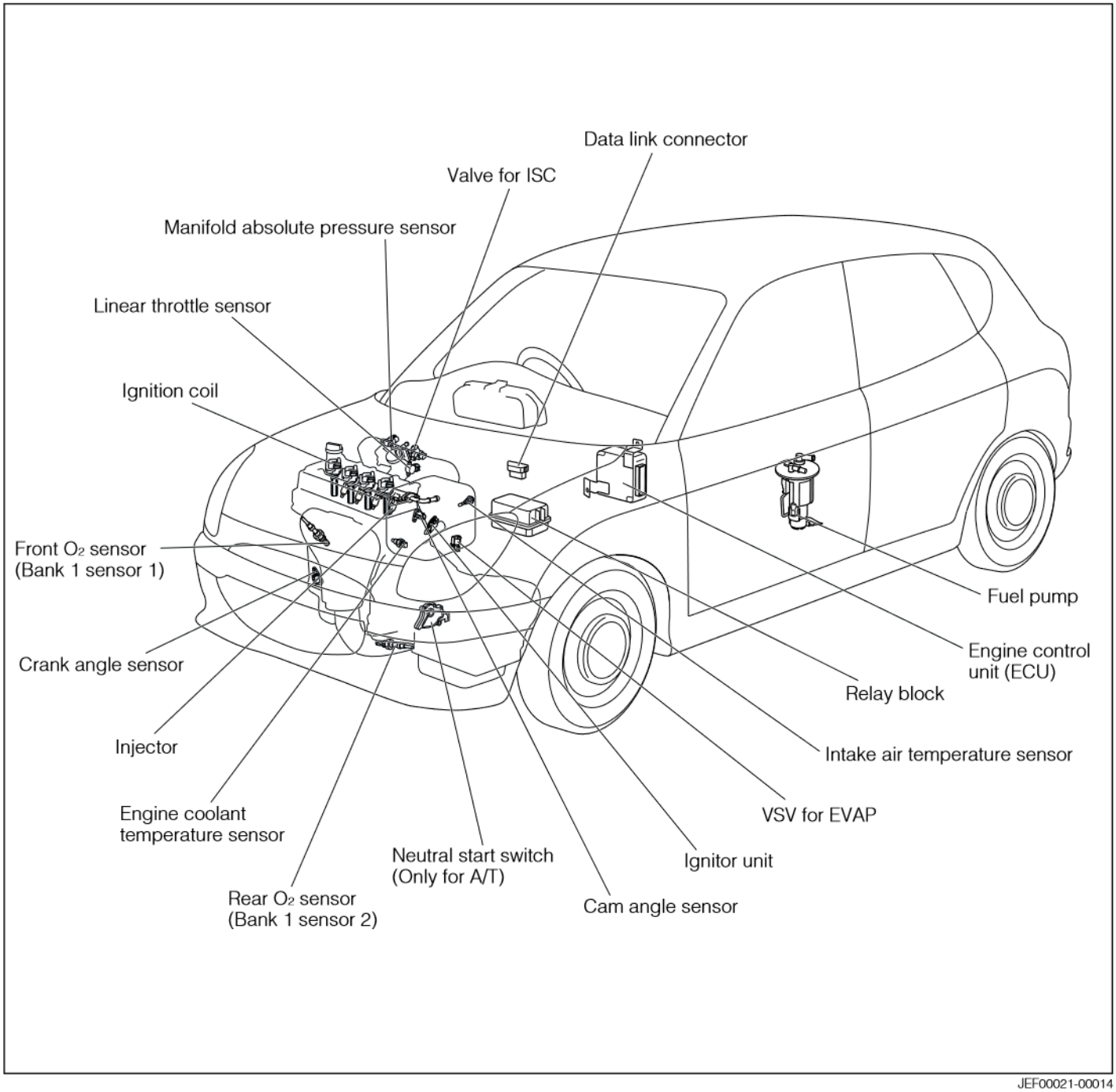


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3. SYSTEM DESCRIPTION

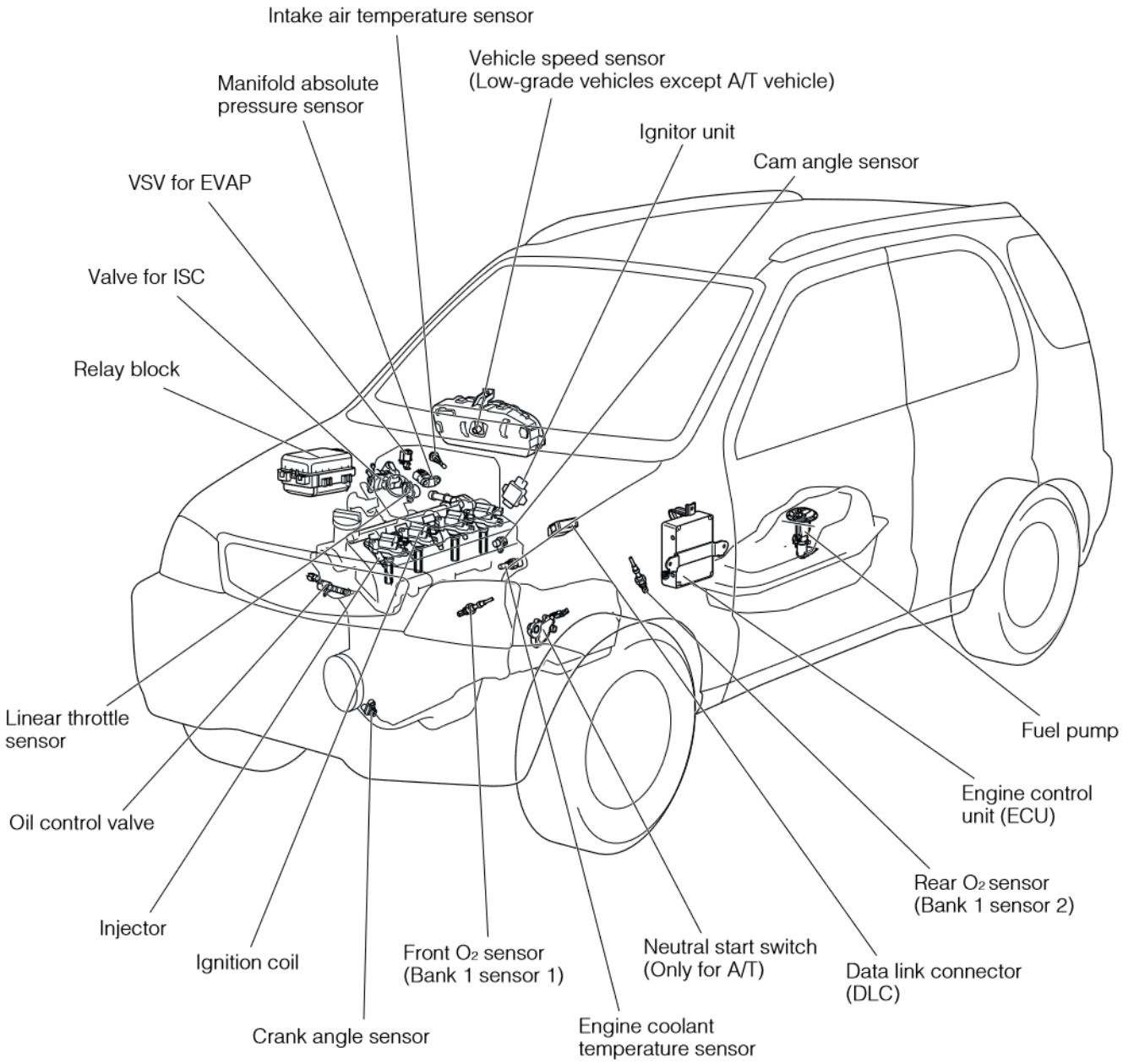
3.1 LOCATION OF ELECTRONIC CONTROL PARTS

3.1.1 FOR EU SPECIFICATIONS OF M101



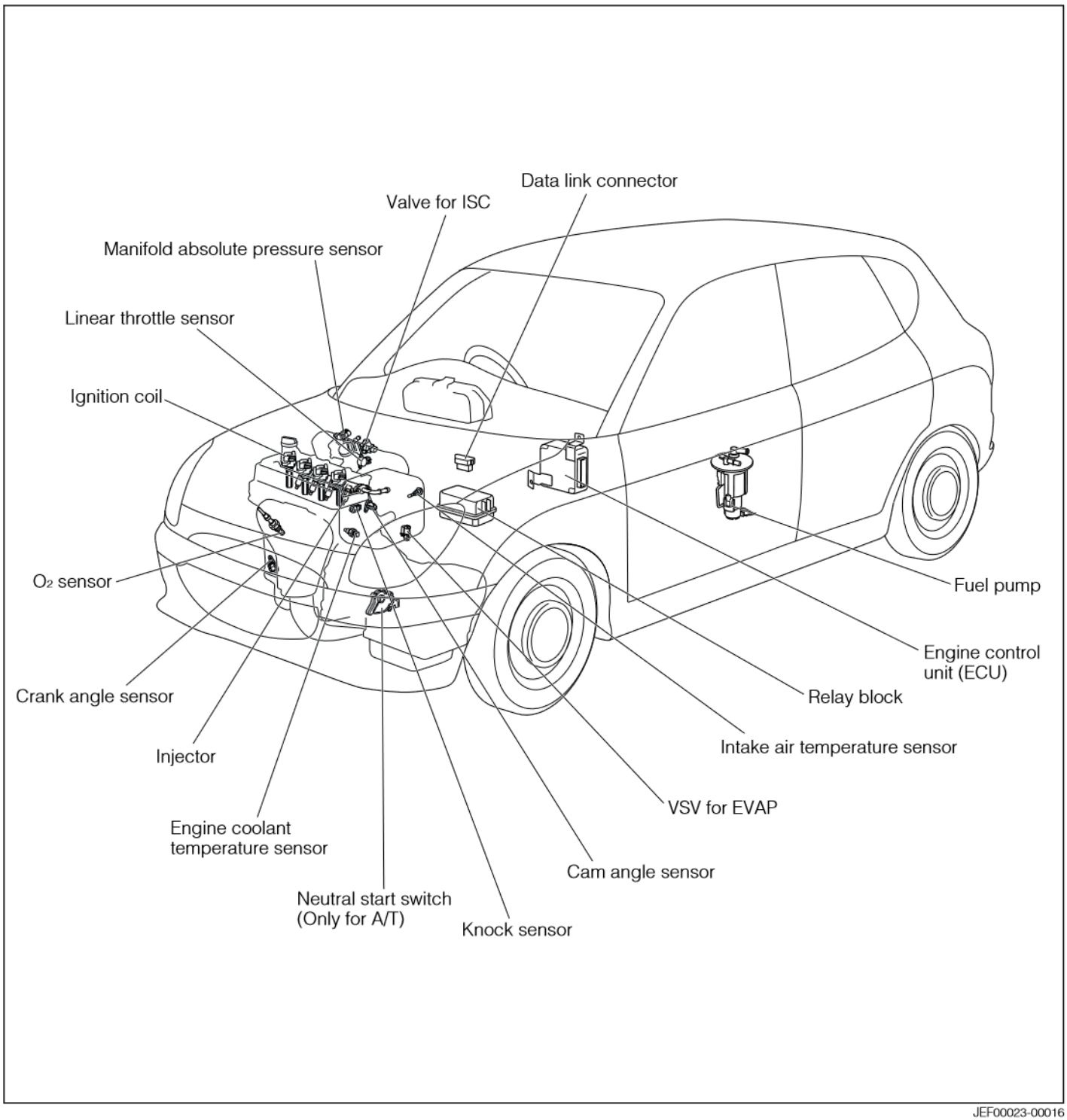
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3.1.2 FOR EU SPECIFICATIONS OF J102



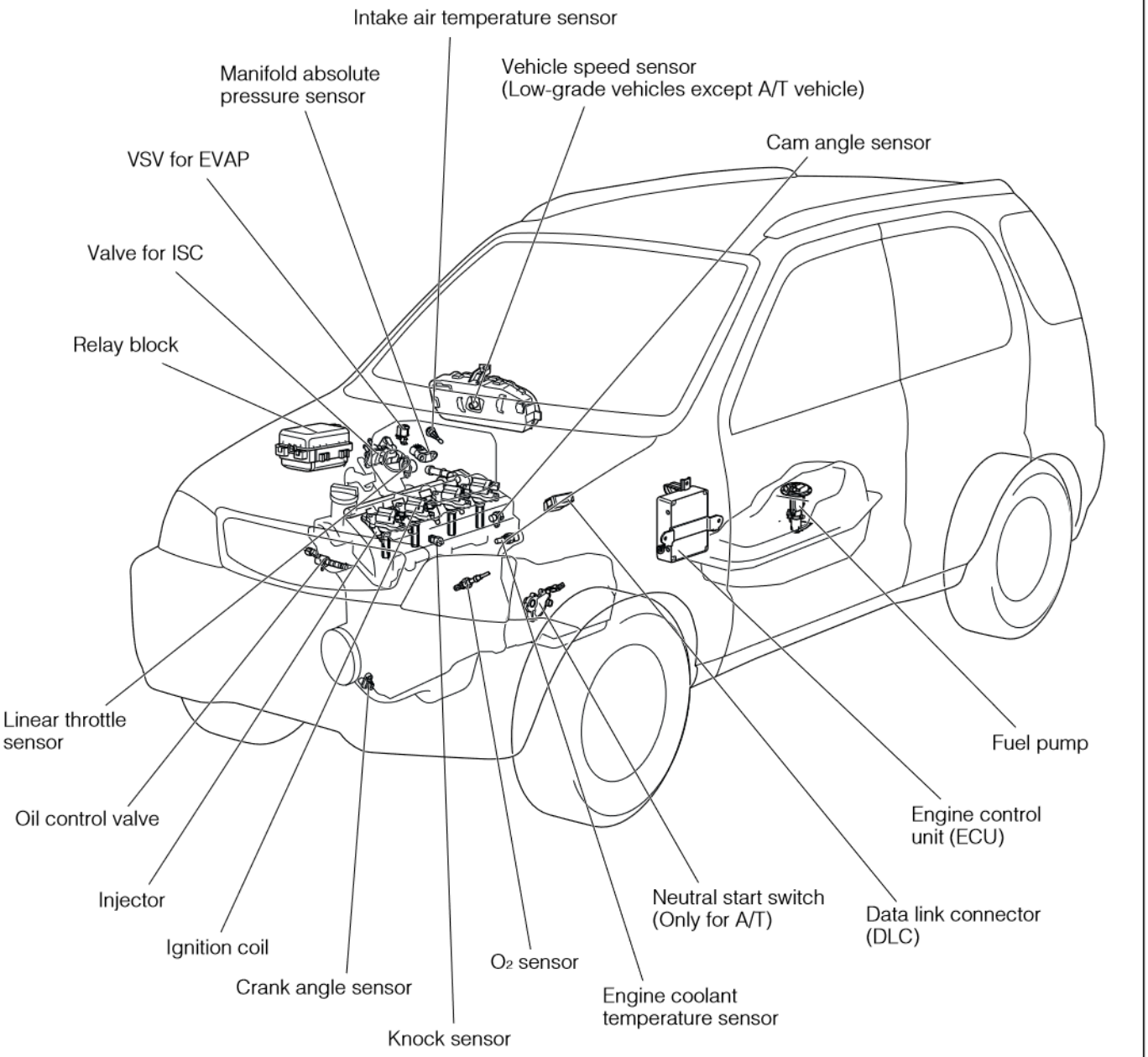
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3.1.3 FOR AUS AND GENERAL SPECIFICATIONS OF M101



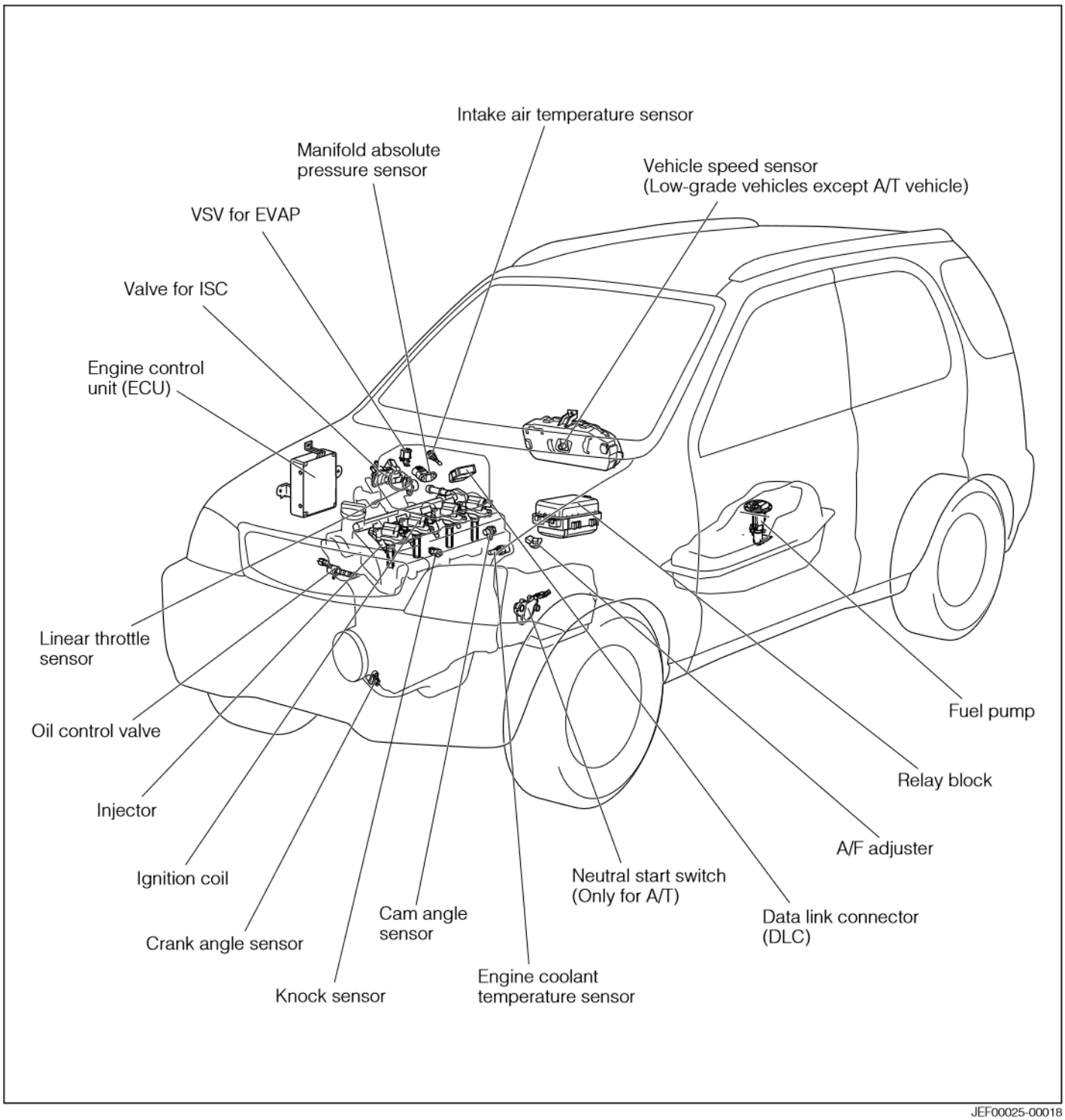
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3.1.4 FOR AUS AND GENERAL SPECIFICATIONS OF J102



JEF00024-00017

3.1.5 FOR LEADED SPECIFICATIONS OF J102

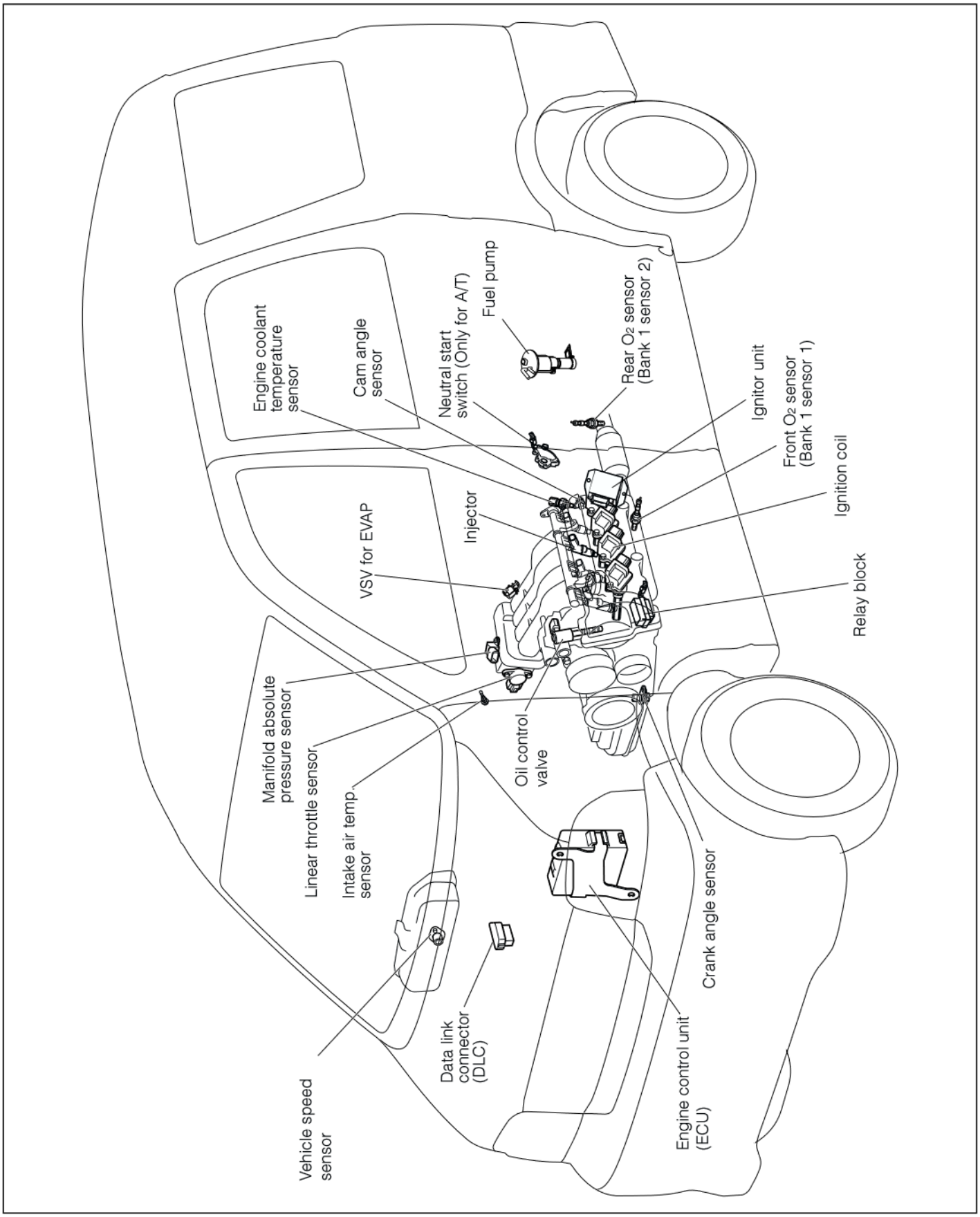


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3. SYSTEM DESCRIPTION (S221)

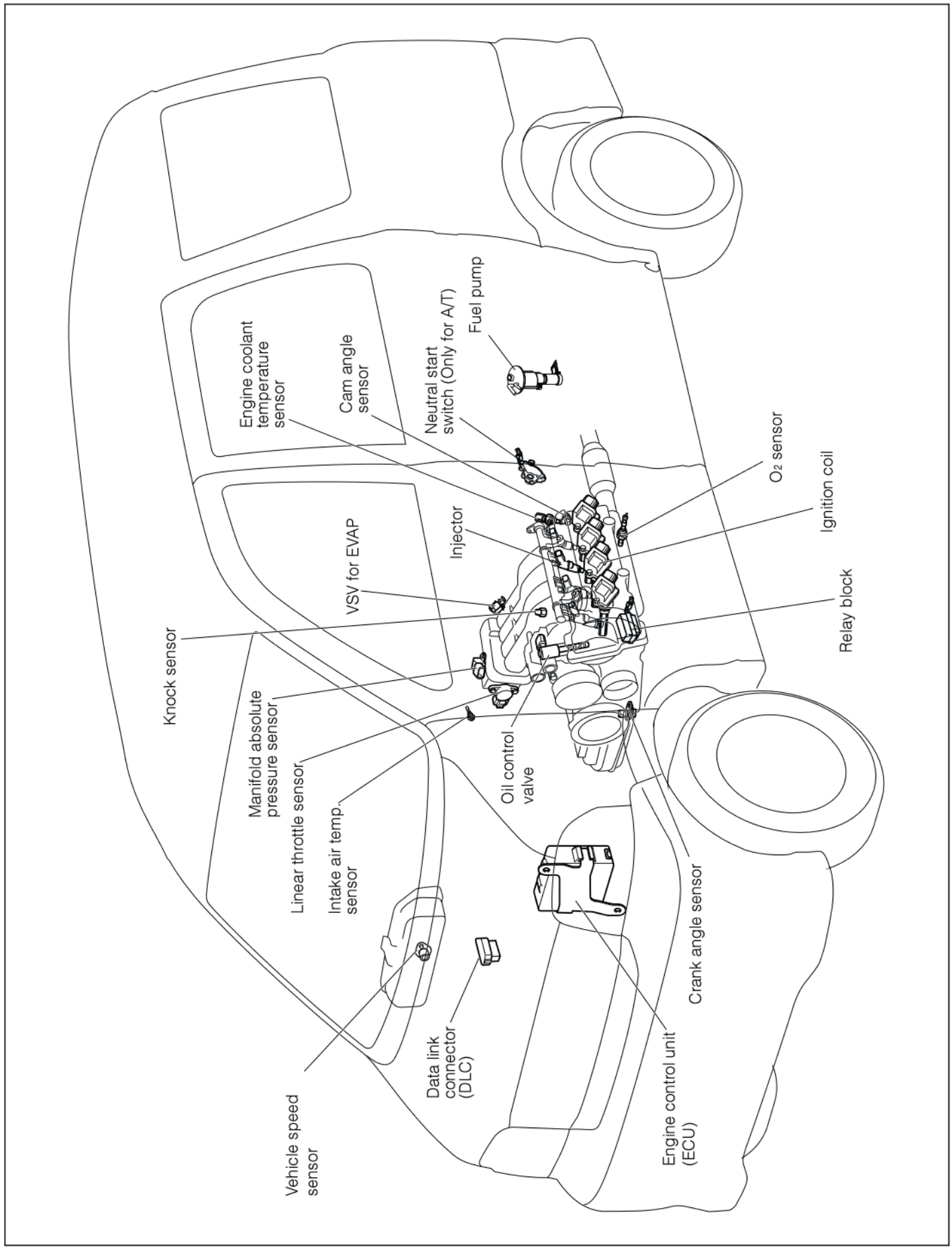
3.1 LOCATION OF ELECTRONIC CONTROL PARTS (S221)

3.1.6 FOR EU SPECIFICATIONS OF S221



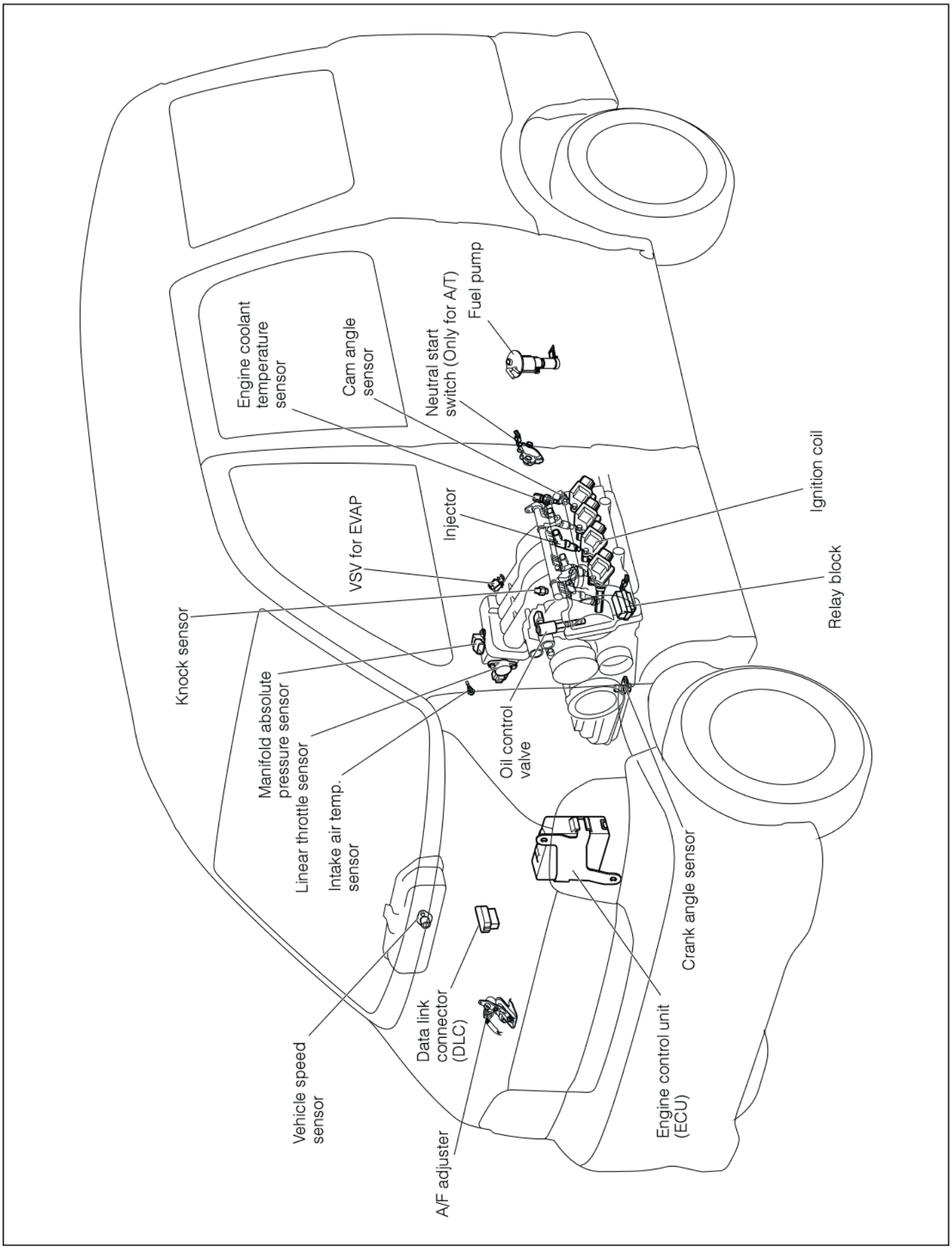
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3.1.7 FOR AUS AND GENERAL SPECIFICATIONS OF S221



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3.1.8 FOR LEADED SPECIFICATIONS OF S221

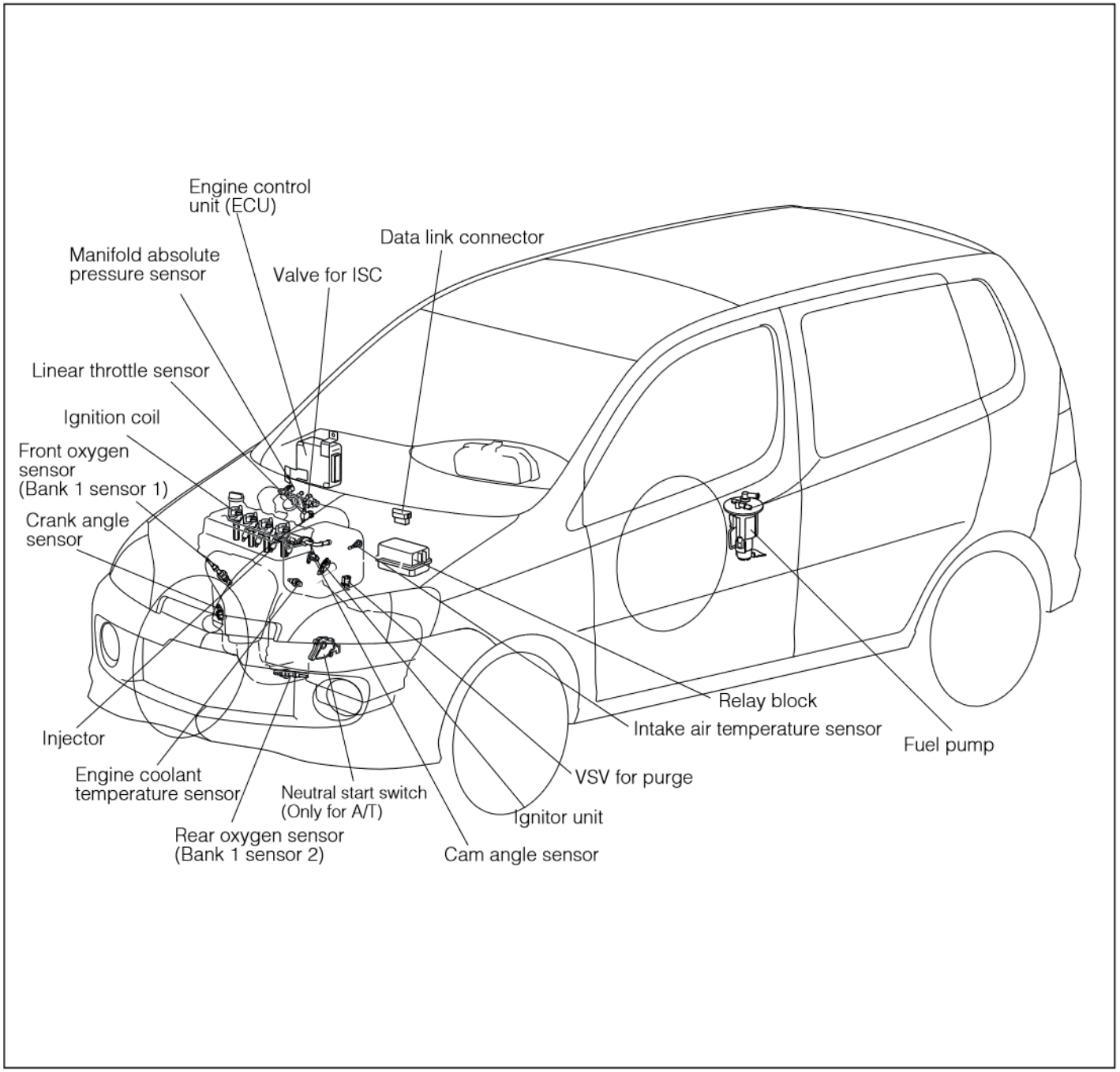


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3. SYSTEM DESCRIPTION (M201)

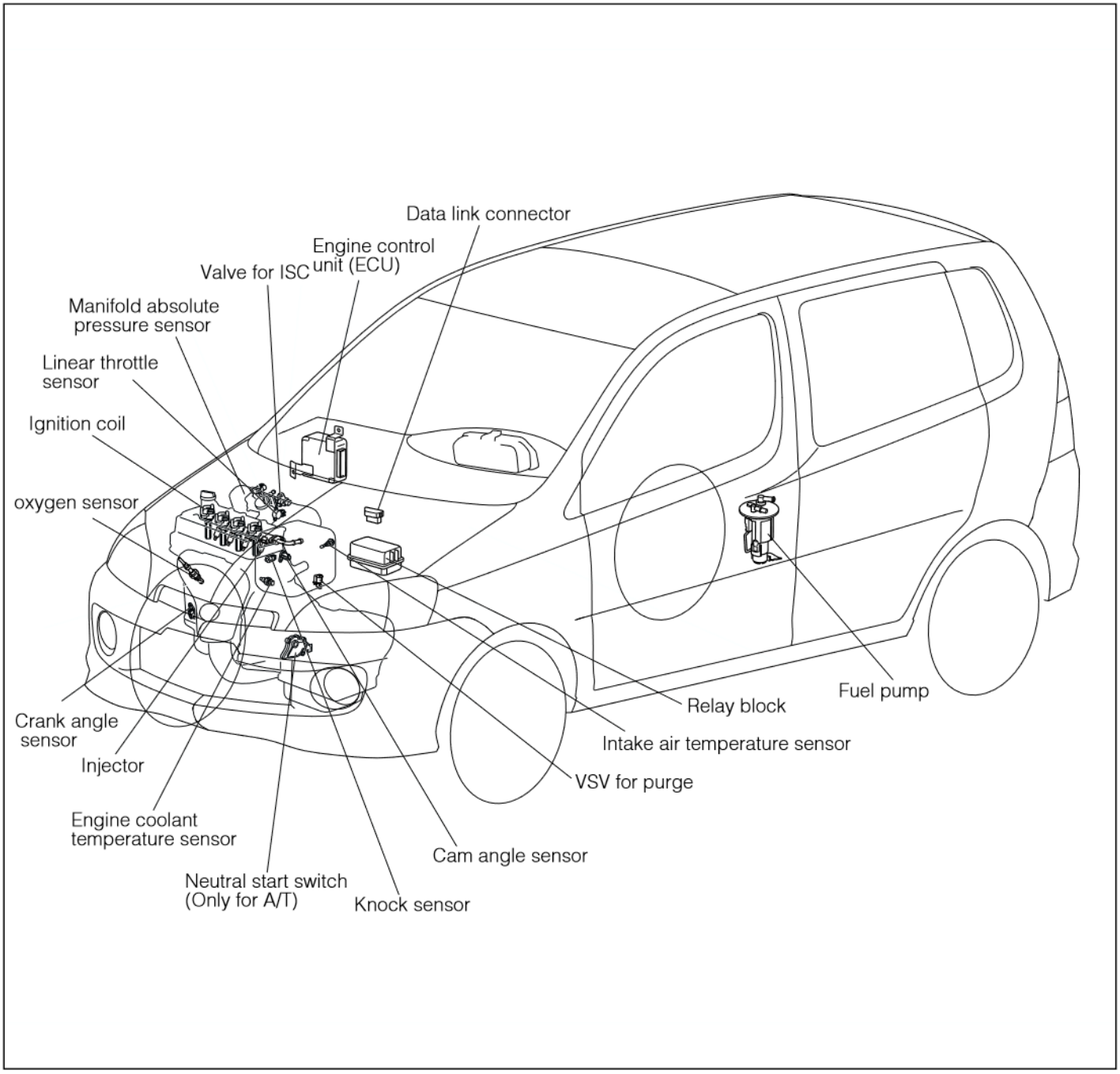
3.1 LOCATION OF ELECTRONIC CONTROL PARTS (M201)

3.1.9 FOR EU SPECIFICATIONS OF M201



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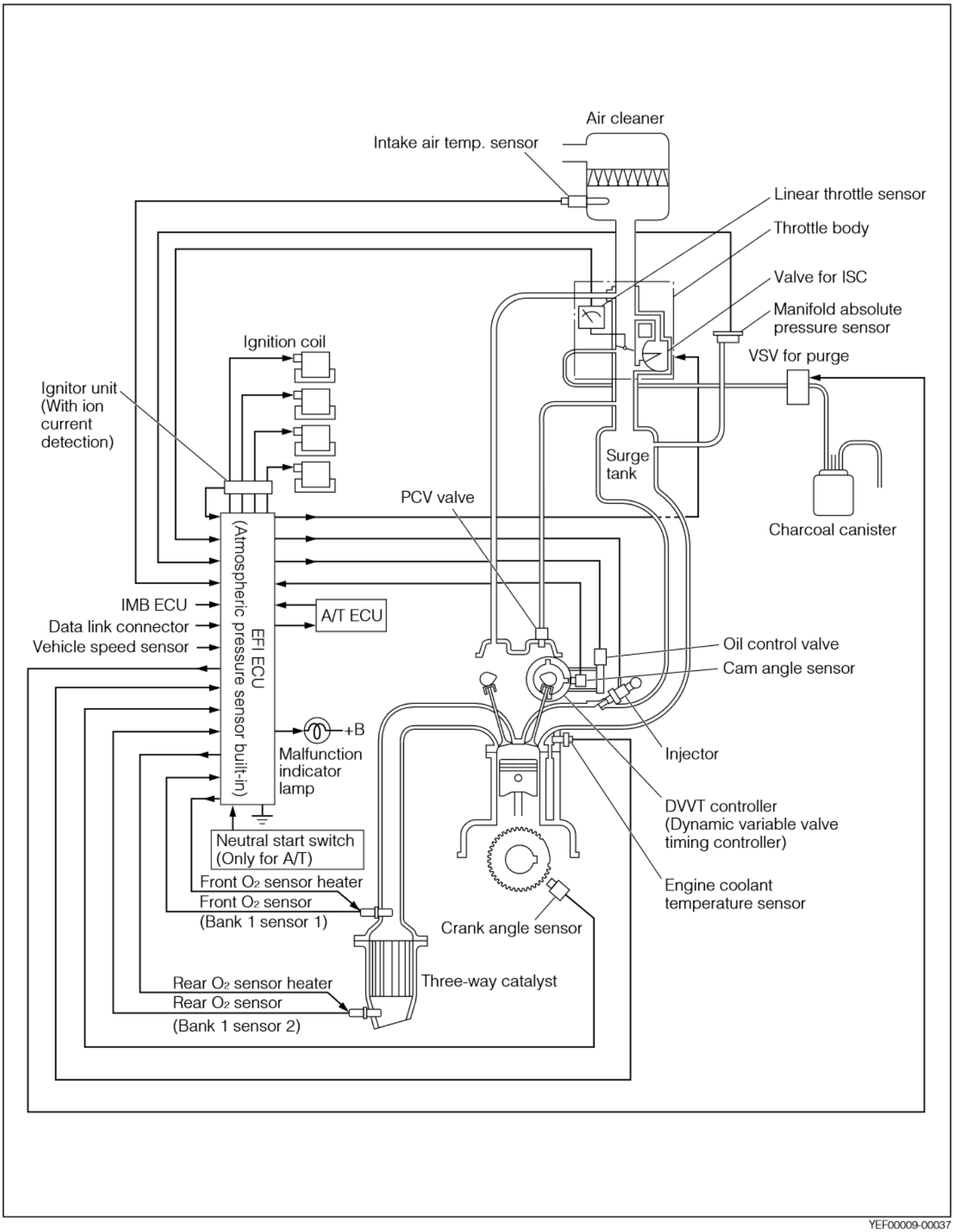
3.1.10 FOR AUS AND GENERAL SPECIFICATIONS OF M201



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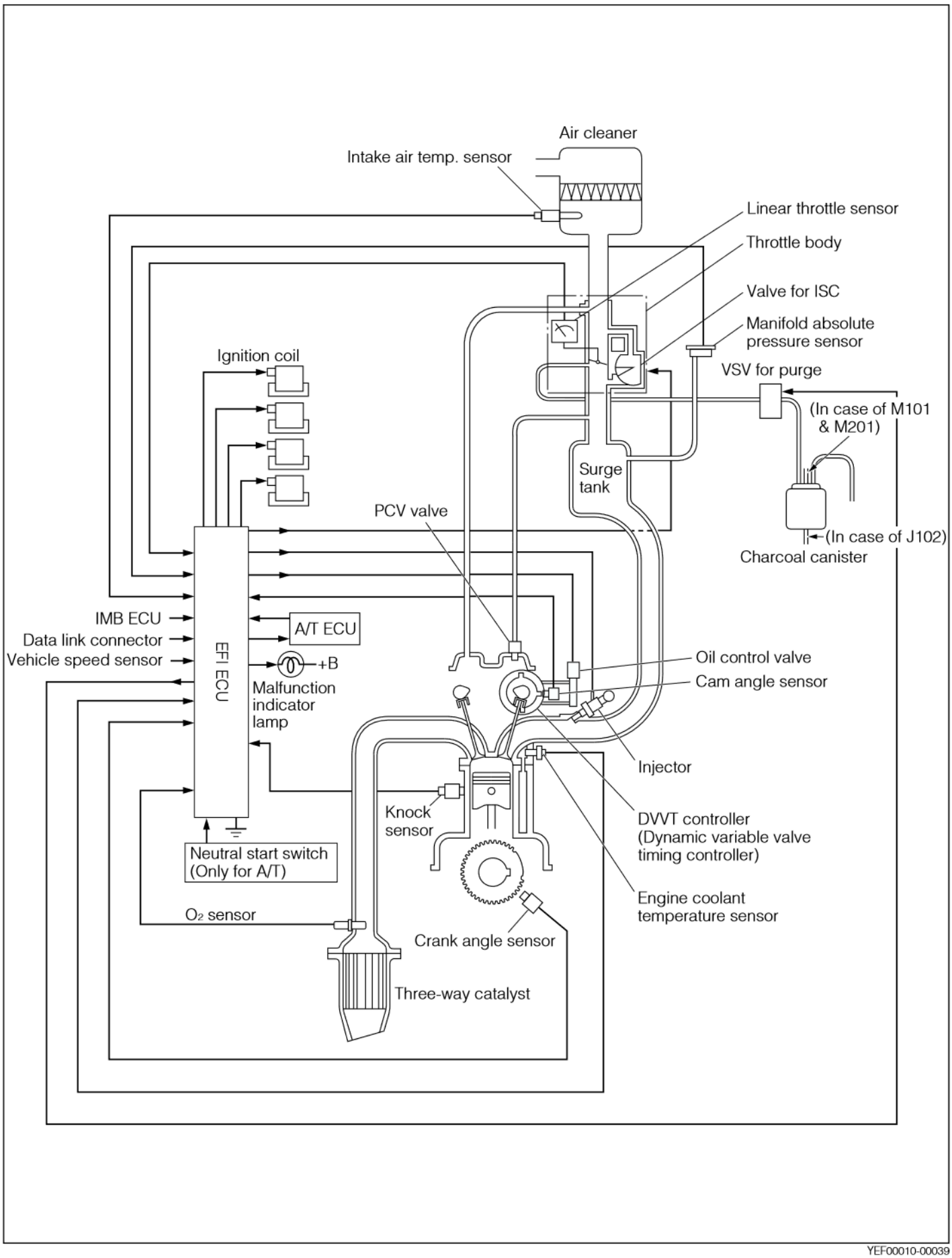
3.2 SYSTEM DIAGRAM

3.2.1 FOR EU SPECIFICATIONS OF M101, M201 and J102



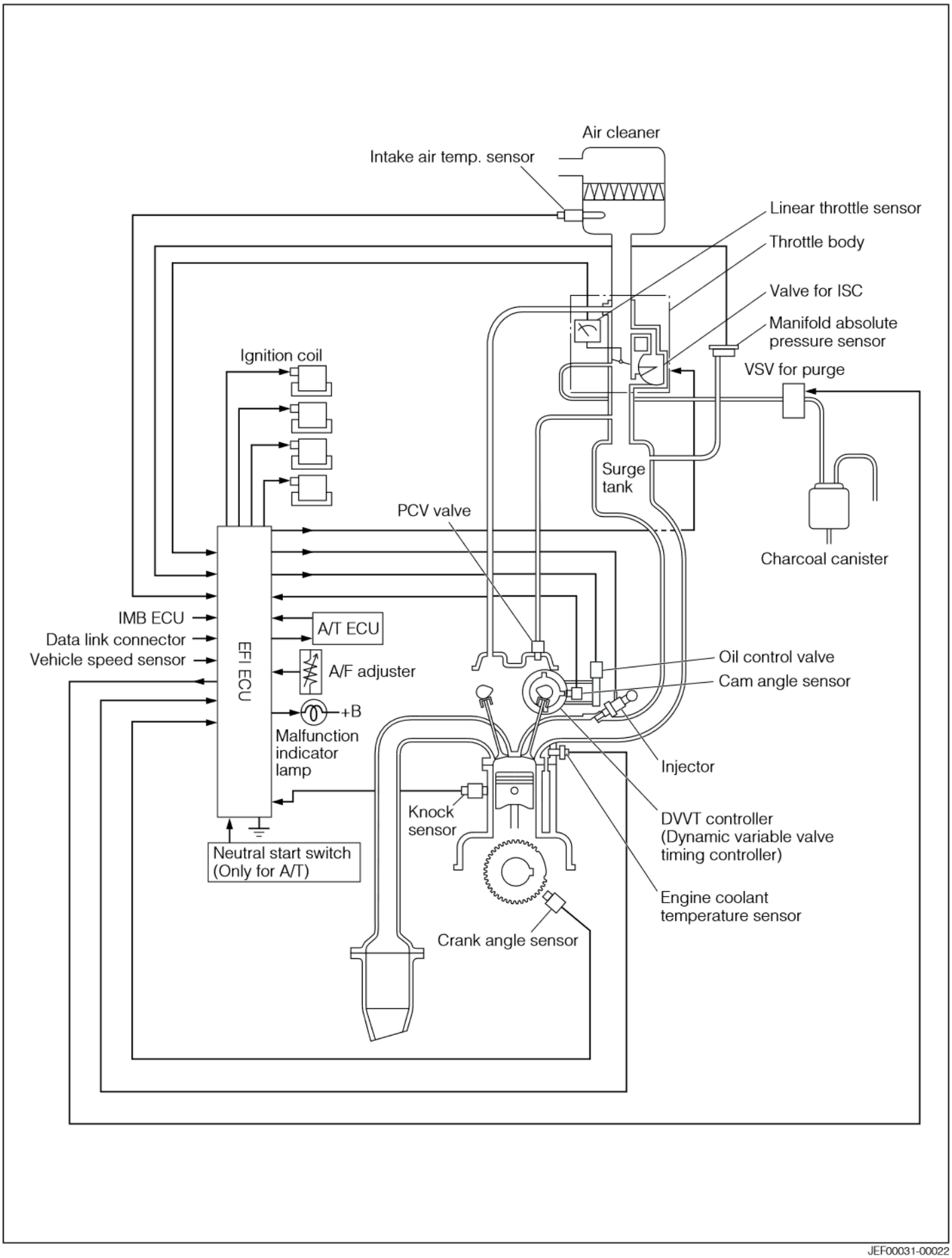
YEF00009-00037

3.2.2 FOR AUS AND GENERAL SPECIFICATIONS OF M101, M201 and J102



YEF00010-00039

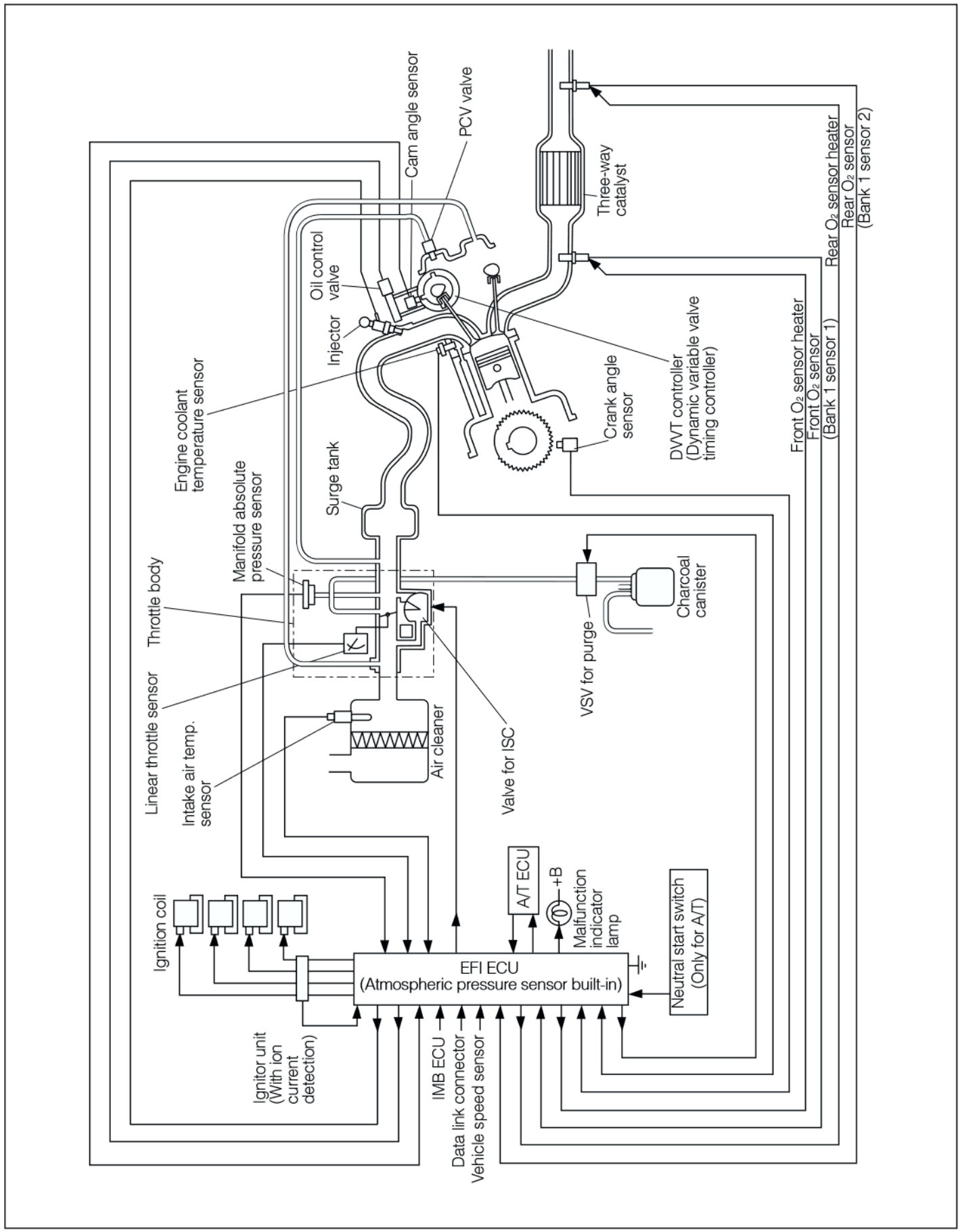
3.2.3 FOR LEADED SPECIFICATIONS OF J102



JEF00031-00022

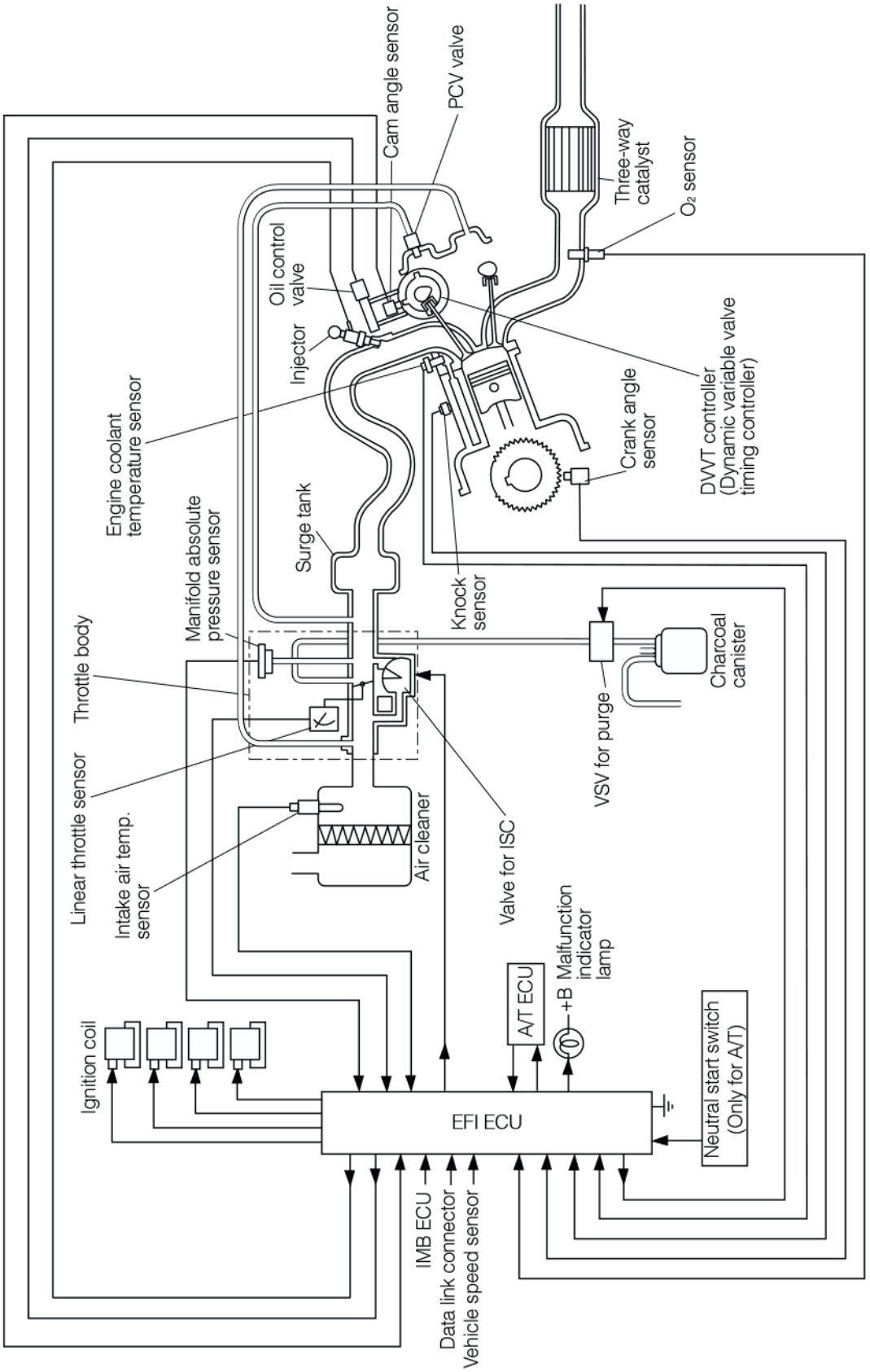
3.2 SYSTEM DIAGRAM (S221)

3.2.4 FOR EU SPECIFICATIONS OF S221

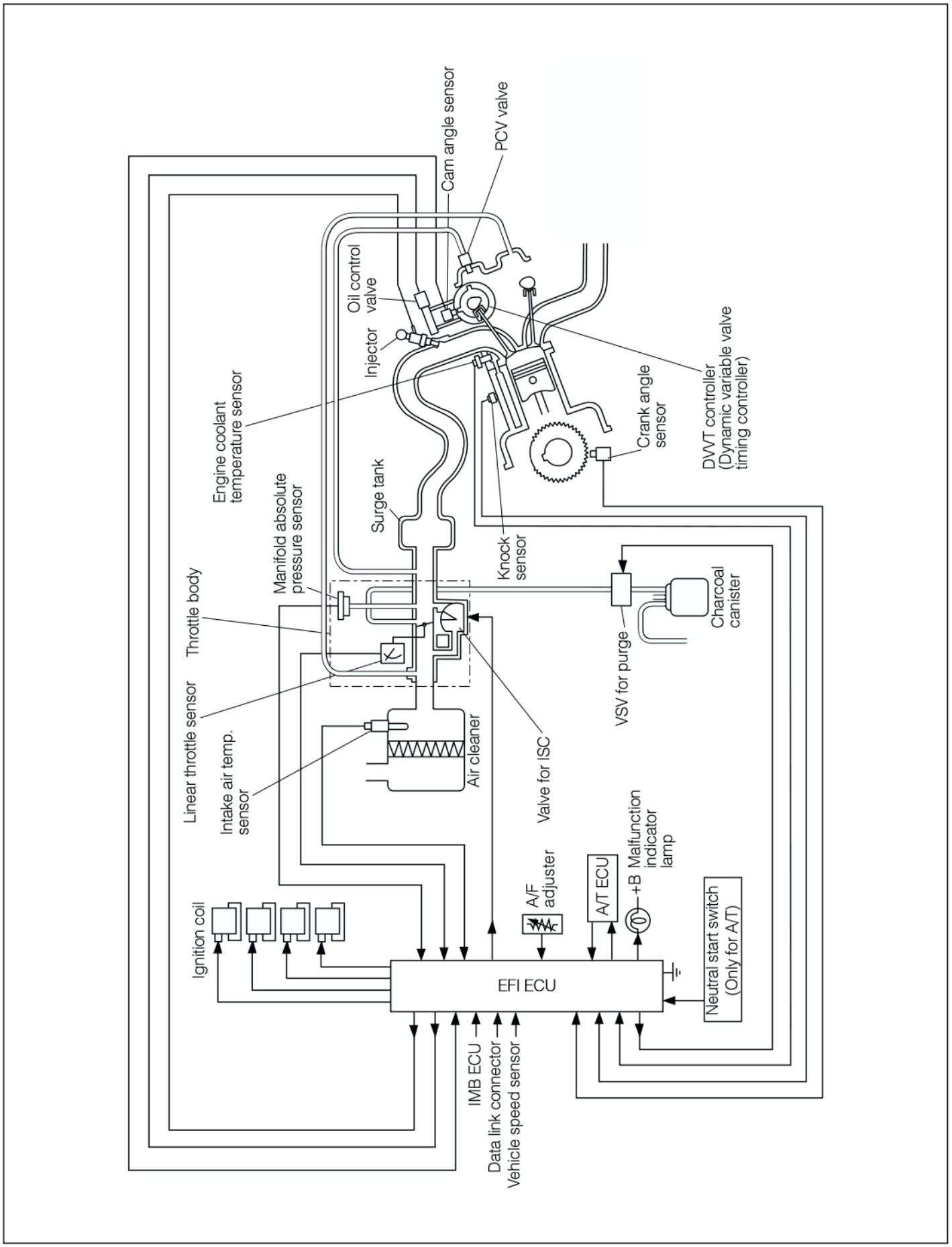


sEF00009-00008

3.2.5 FOR AUS AND GENERAL SPECIFICATIONS OF S221



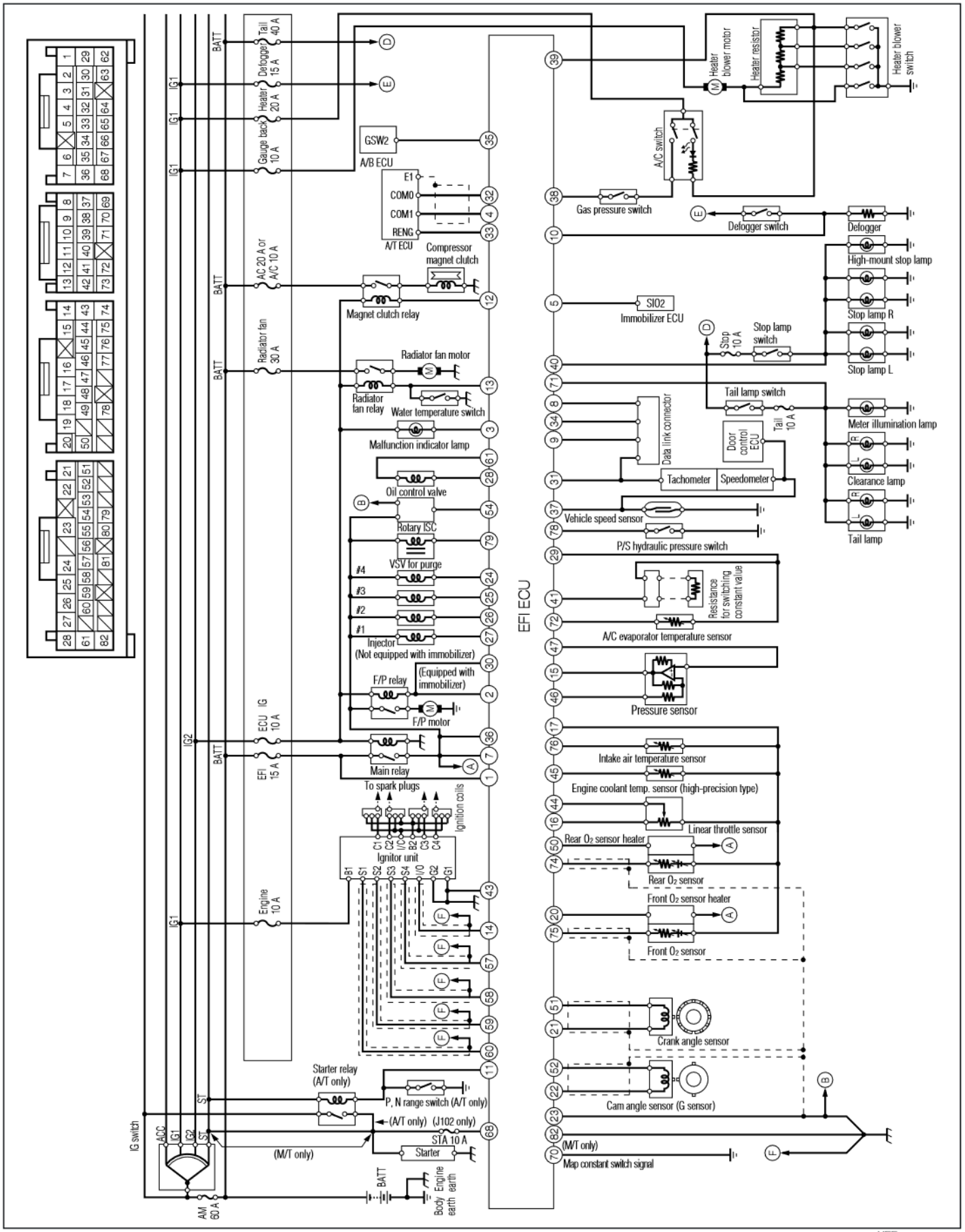
3.2.6 FOR LEADED SPECIFICATIONS OF S221



sEF00011-00010

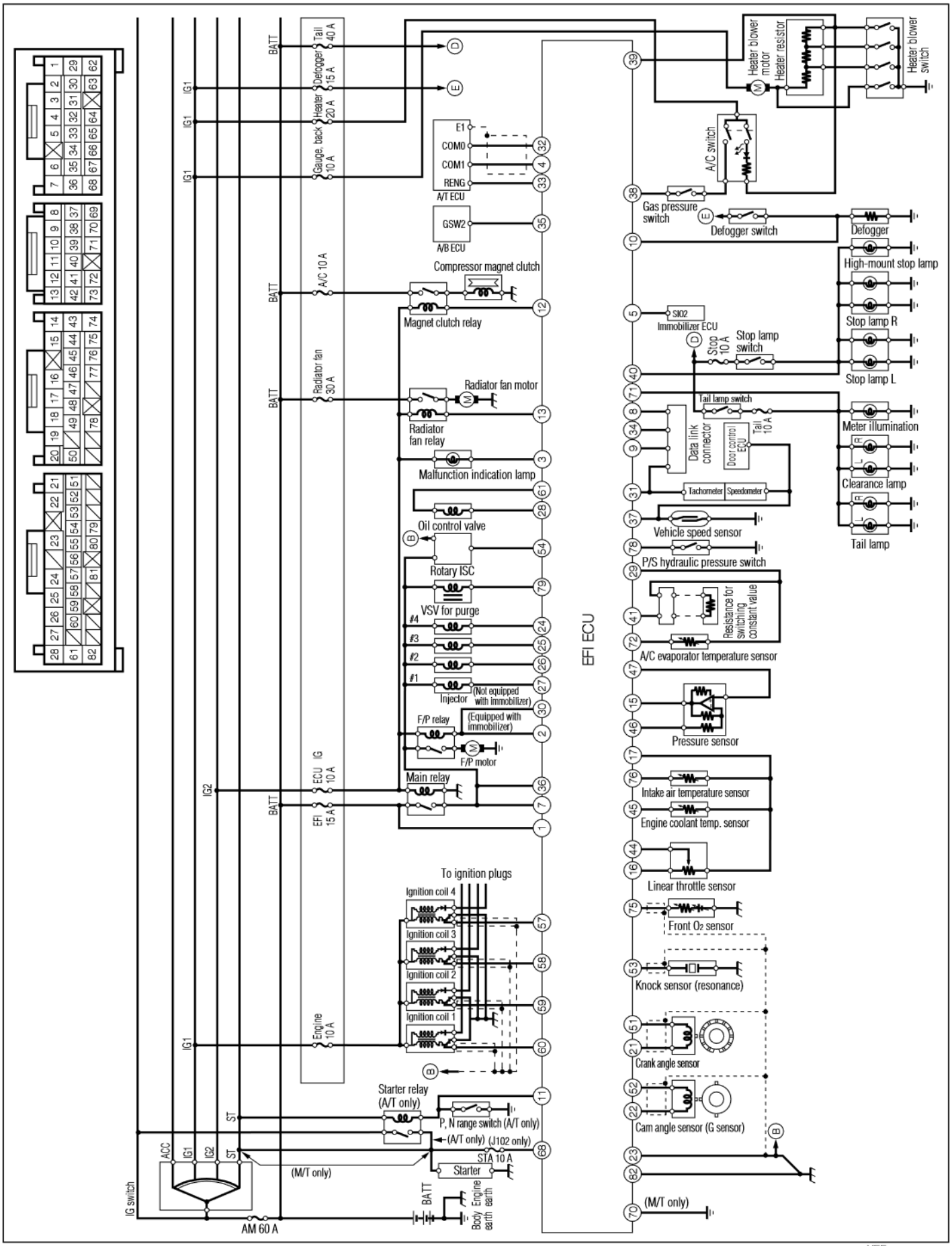
3.3 WIRING DIAGRAM

3.3.1 FOR EU SPECIFICATIONS OF M101, M201, J102 AND S221



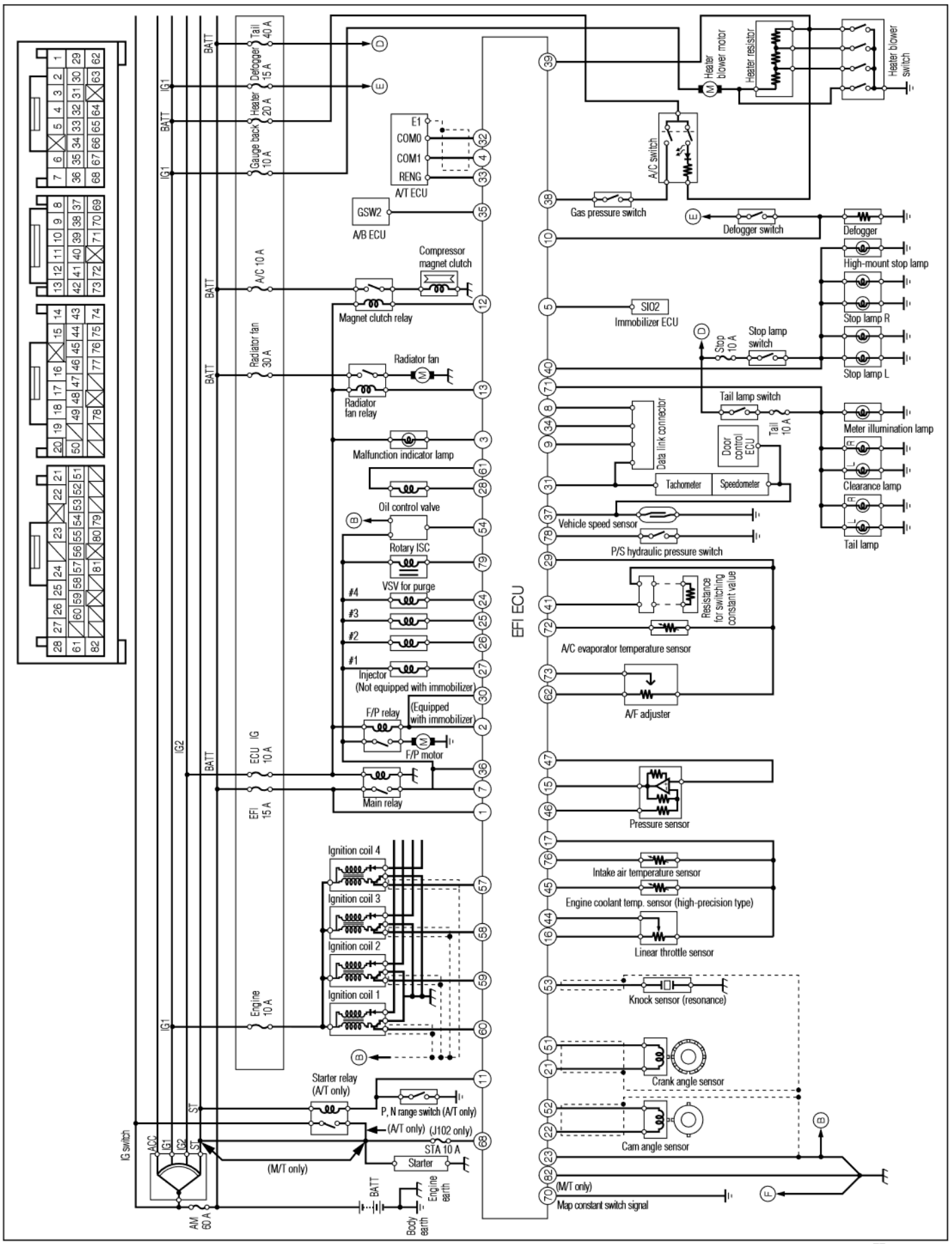
YEF00012-00011

3.3.2 FOR AUS AND GENERAL SPECIFICATIONS OF M101, M201, J102 AND S221



YEF00013-00012

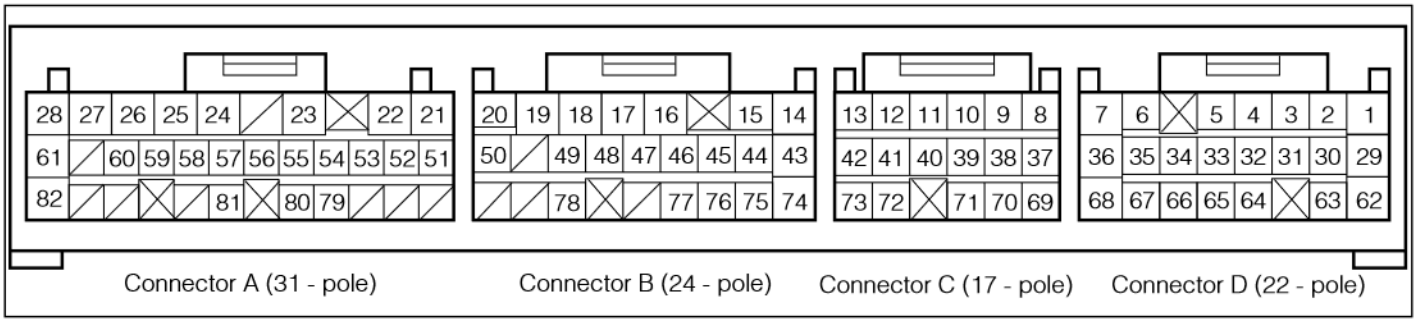
3.3.3 FOR LEADED SPECIFICATIONS OF J102 AND S221



sEF00014-00013

3.4 ARRANGEMENT OF EFI ECU TERMINAL

3.4.1 FOR EU SPECIFICATIONS OF M101, M201, J102 AND S221



YEF00037-00028

CONNECTOR A

No.		Contents of connection	No.		Contents of connection
21	N1+	Crank angle sensor (+)	55	ALTC	—
22	N2+	Cam angle sensor (+)	56	VSV2	—
23	E1	Sensor system ground	57	IG4	Ignition signal (#4 cylinder)
24	#40	Injector (#4 cylinder)	58	IG3	Ignition signal (#3 cylinder)
25	#30	Injector (#3 cylinder)	59	IG2	Ignition signal (#2 cylinder)
26	#20	Injector (#2 cylinder)	60	IG1	Ignition signal (#1 cylinder)
27	#10	Injector (#1 cylinder)	61	OCV–	Oil control valve (–)
28	OCV+	Oil control valve (+)	79	PRG	Purge control VSV
51	N1–	Crank angle sensor (–)	80	VSV1	—
52	N2–	Cam angle sensor (–)	81	ALT	—
53	KNK	—	82	E01	Power supply system ground
54	ISC	Rotary ISC			

YEF00038-00000

CONNECTOR B

No.		Contents of connection	No.		Contents of connection
14	ICMB	Ignitor unit (With ion current detection)	46	VCPM	Pressure sensor power supply
15	PIM	Pressure sensor signal	47	E2PM	Pressure sensor ground
16	VC	Linear throttle sensor power supply	48	ACLK	—
17	E2	Sensor ground	49	ACEN	—
18	FCCP	—	50	OXH2	Rear oxygen sensor heater
19	VFP	—	74	OX2	Rear oxygen sensor
20	OXH1	Front oxygen sensor heater	75	OX1	Front oxygen sensor
43	IE	Ion current sensor ground	76	THA	Intake air temperature sensor
44	VTH	Linear throttle sensor	77	ACVR	—
45	THW	Engine coolant temperature sensor	78	PST	P/S Pressure switch

YEF00039-00000

CONNECTOR C

No.		Contents of connection	No.		Contents of connection
8	SIO1	Diagnosis tester	40	STP	Stop lamp switch
9	T	Test terminal	41	AUX	—
10	DEF	Defogger switch	42	FAN2	—
11	A/T	Neutral start switch (Only for A/T)	69	SEL2	—
12	MGC	A/C Magnet clutch relay	70	SEL1	Map constant switch signal (Only for M/T)
13	FAN1	Radiator fan relay (Without 2-step control)	71	H/L	Tail lamp switch
37	SPD	Vehicle speed sensor	72	ACEV	A/C Evaporator temp. sensor
38	ACSW	A/C Switch	73	OX3	—
39	BLW	Heater blower switch			

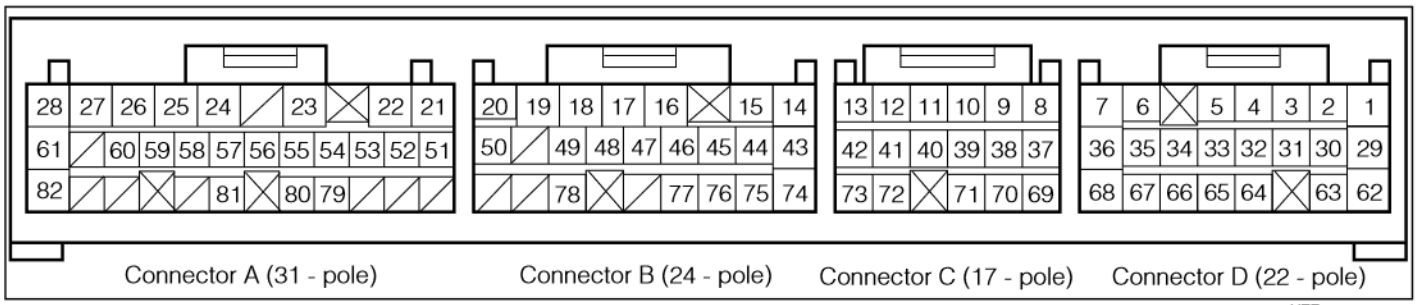
YEF00040-00000

CONNECTOR D

No.		Contents of connection	No.		Contents of connection
1	BAT	Memory back-up supply	33	ATNE	Engine speed signal to A/T ECU
2	FC1	Fuel pump relay (With IMB)	34	VF	VF monitor terminal
3	W	Malfunction indicator lamp	35	FPOF	Fuel pump relay OFF
4	ATTX	Serial data transmission to A/T ECU	36	+B2	Power supply
5	SIO2	Serial port for IMB	62	VCO	—
6	TRRQ	—	63	VTHO	—
7	+B1	Power supply	64	IDLO	—
29	E21	A/C Evaporator temp. sensor ground	65	FCO	—
30	FC2	Fuel pump relay (Without IMB)	66	TRPR	—
31	REV	Engine speed signal	67	ACT	—
32	ATRX	Serial data reception from A/T ECU	68	STA	Starter signal

YEF00041-00000

3.4.2 FOR AUS AND GENERAL SPECIFICATIONS OF M101, M201, J102 AND S221



YEF00042-00029

CONNECTOR A

No.		Contents of connection	No.		Contents of connection
21	N1+	Crank angle sensor (+)	55	ALTC	—
22	N2+	Cam angle sensor (+)	56	VSV2	—
23	E1	Sensor system ground	57	IG4	Ignition signal (#4 cylinder)
24	#40	Injector (#4 cylinder)	58	IG3	Ignition signal (#3 cylinder)
25	#30	Injector (#3 cylinder)	59	IG2	Ignition signal (#2 cylinder)
26	#20	Injector (#2 cylinder)	60	IG1	Ignition signal (#1 cylinder)
27	#10	Injector (#1 cylinder)	61	OCV–	Oil control valve (–)
28	OCV+	Oil control valve (+)	79	PRG	Purge control VSV
51	N1–	Crank angle sensor (–)	80	VSV1	—
52	N2–	Cam angle sensor (–)	81	ALT	—
53	KNK	Knock sensor	82	E01	Power supply system ground
54	ISC	Rotary ISC			

YEF00043-00000

CONNECTOR B

No.		Contents of connection	No.		Contents of connection
14	ICMB	—	46	VCPM	Pressure sensor power supply
15	PIM	Pressure sensor signal	47	E2PM	Pressure sensor ground
16	VC	Linear throttle sensor power supply	48	ACLK	—
17	E2	Sensor ground	49	ACEN	—
18	FCCP	—	50	OXH2	—
19	VFP	—	74	OX2	—
20	OXH1	—	75	OX1	Oxygen sensor
43	IE	—	76	THA	Intake air temperature sensor
44	VTH	Linear throttle sensor	77	ACVR	—
45	THW	Engine coolant temperature sensor	78	PST	P/S Pressure switch

YEF00044-00000

CONNECTOR C

No.		Contents of connection	No.		Contents of connection
8	SIO1	Diagnosis tester	40	STP	Stop lamp switch
9	T	Test terminal	41	AUX	—
10	DEF	Defogger switch	42	FAN2	—
11	A/T	Neutral start switch (Only for A/T)	69	SEL2	—
12	MGC	A/C Magnet clutch relay	70	SEL1	Map constant switch signal (Only for M/T)
13	FAN1	Radiator fan relay (Without 2-step control)	71	H/L	Tail lamp switch
37	SPD	Vehicle speed sensor	72	ACEV	A/C Evaporator temp. sensor
38	ACSW	A/C Switch	73	OX3	—
39	BLW	Heater blower switch			

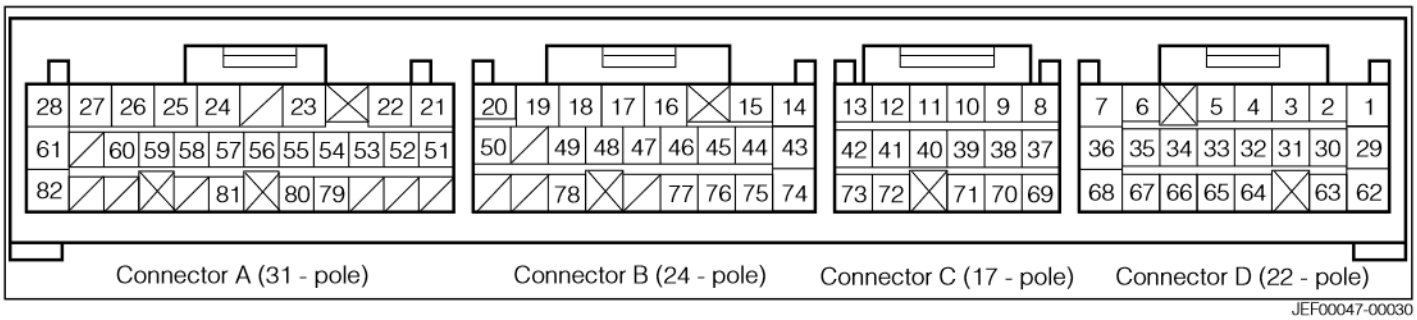
YEF00045-00000

CONNECTOR D

No.		Contents of connection	No.		Contents of connection
1	BAT	Memory back-up supply	33	ATNE	Engine speed signal to A/T ECU
2	FC1	Fuel pump relay (With IMB)	34	VF	VF monitor terminal
3	W	Malfunction indicator lamp	35	FPOF	Fuel pump relay OFF
4	ATTX	Serial data transmission to A/T ECU	36	+B2	Power supply
5	SIO2	Serial port for IMB	62	VCO	—
6	TRRQ	—	63	VTHO	—
7	+B1	Power supply	64	IDLO	—
29	E21	A/C Evaporator temp. sensor ground	65	FCO	—
30	FC2	Fuel pump relay (Without IMB)	66	TRPR	—
31	REV	Engine speed signal	67	ACT	—
32	ATRX	Serial data reception from A/T ECU	68	STA	Starter signal

YEF00046-00000

3.4.3 FOR LEADED SPECIFICATIONS OF J102



JEF00047-00030

CONNECTOR A

No.		Contents of connection	No.		Contents of connection
21	N1+	Crank angle sensor (+)	55	ALTC	—
22	N2+	Cam angle sensor (+)	56	VSV2	—
23	E1	Sensor system ground	57	IG4	Ignition signal (#4 cylinder)
24	#40	Injector (#4 cylinder)	58	IG3	Ignition signal (#3 cylinder)
25	#30	Injector (#3 cylinder)	59	IG2	Ignition signal (#2 cylinder)
26	#20	Injector (#2 cylinder)	60	IG1	Ignition signal (#1 cylinder)
27	#10	Injector (#1 cylinder)	61	OCV–	Oil control valve (–)
28	OCV+	Oil control valve (+)	79	PRG	Purge control VSV
51	N1–	Crank angle sensor (–)	80	VSV1	—
52	N2–	Cam angle sensor (–)	81	ALT	—
53	KNK	Knock sensor	82	E01	Power supply system ground
54	ISC	Rotary ISC			

JEF00048-00000

CONNECTOR B

No.		Contents of connection	No.		Contents of connection
14	ICMB	—	46	VCPM	Pressure sensor power supply
15	PIM	Pressure sensor signal	47	E2PM	Pressure sensor ground
16	VC	Linear throttle sensor power supply	48	ACLK	—
17	E2	Sensor ground	49	ACEN	—
18	FCCP	—	50	OXH2	—
19	VFP	—	74	OX2	—
20	OXH1	—	75	OX1	—
43	IE	—	76	THA	Intake air temperature sensor
44	VTH	Linear throttle sensor	77	ACVR	—
45	THW	Engine coolant temperature sensor	78	PST	P/S Pressure switch

JEF00049-00000

CONNECTOR C

No.		Contents of connection	No.		Contents of connection
8	SIO1	Diagnosis tester	40	STP	Stop lamp switch
9	T	Test terminal	41	AUX	—
10	DEF	Defogger switch	42	FAN2	—
11	A/T	Neutral start switch (Only for A/T)	69	SEL2	—
12	MGC	A/C Magnet clutch relay	70	SEL1	Map constant switch signal (Only for M/T)
13	FAN1	Radiator fan relay (Without 2-step control)	71	H/L	Tail lamp switch
37	SPD	Vehicle speed sensor	72	ACEV	A/C Evaporator temp. sensor
38	ACSW	A/C Switch	73	OX3	A/F adjuster
39	BLW	Heater blower switch			

JEF00050-00000

CONNECTOR D

No.		Contents of connection	No.		Contents of connection
1	BAT	Memory back-up supply	33	ATNE	Engine speed signal to A/T ECU
2	FC1	Fuel pump relay (With IMB)	34	VF	VF monitor terminal
3	W	Malfunction indicator lamp	35	FPOF	Fuel pump relay OFF
4	ATTX	Serial data transmission to A/T ECU	36	+B2	Power supply
5	SIO2	Serial port for IMB	62	VCO	A/F adjuster power supply
6	TRRQ	—	63	VTHO	—
7	+B1	Power supply	64	IDLO	—
29	E21	A/C Evaporator temp. sensor ground	65	FCO	—
30	FC2	Fuel pump relay (Without IMB)	66	TRPR	—
31	REV	Engine speed signal	67	ACT	—
32	ATRX	Serial data reception from A/T ECU	68	STA	Starter signal

JEF00051-00000

4. GENERAL PRECAUTIONARY MEASURES IN ENGINE DIAGNOSIS

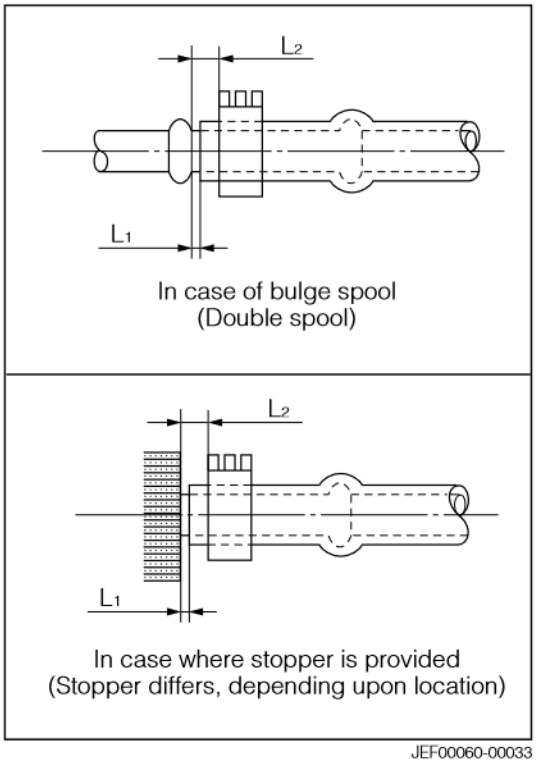
4.1 PRECAUTIONARY MEASURES FOR REPAIRS OF FUEL SYSTEMS

1. Prior to performing operations of the fuel system, remove the cable of the negative (–) terminal from the battery.
   NOTE:
   - When the cable of the negative terminal is removed, the memories concerning the diagnosis codes and radio will be simultaneously erased. Therefore, before removing the cable of the negative terminal from the battery, the diagnosis codes should be outputted and checked. Also, the channels memorized in the radio should be recorded, if necessary.

2. Be sure not to smoke when performing operations of the fuel system. Also never carry out any operations near naked flame.
3. The fuel supply line (between the fuel pump and fuel delivery pipe) is still pressurized even if the engine has been turned off. Therefore, before loosening or removing the fuel supply line, be sure to relieve the fuel pressure, following the "Fuel pressure relieving procedure."
   Even if the fuel pressure has been relieved, a small amount of fuel will spill when the fuel supply line is disconnected. Hence, before removing, cover the portion to be removed with a cloth to prevent the fuel from splashing.

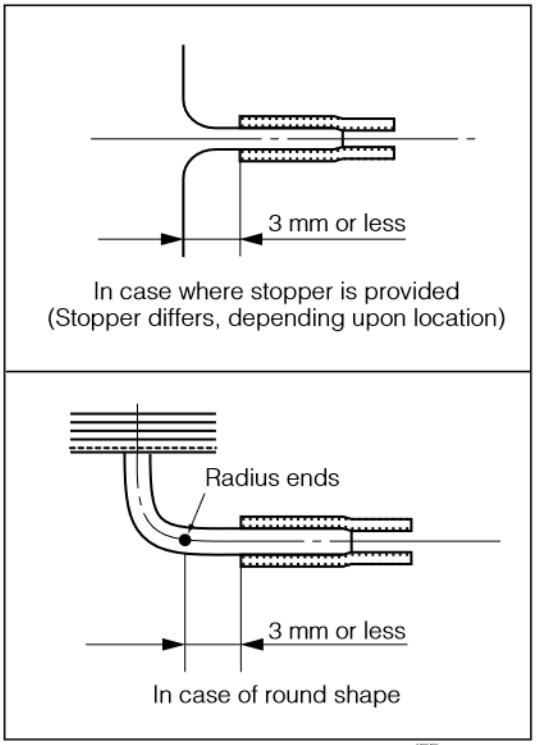
JEF00059-00032

4. The connection method of fuel hoses or evaporative emission hoses differs, depending upon the type of the pipe. When connecting the fuel hoses or evaporative emission hoses again, be sure to correctly connect and clamp them by referring to the figure on the right.
   Ensure that no twist nor fault is present after connecting.
   (1) Fuel hose
      ① Hose insertion length
      Insert the hose in such a way that L_1 becomes 0 - 2 mm.
      ② Clip position
      Clamp the hose in such a way that L_2 becomes 2 - 5 mm. (The clip shall not be placed at the bulge or spool of the pipe. Also the clip shall not go beyond the hose end.)



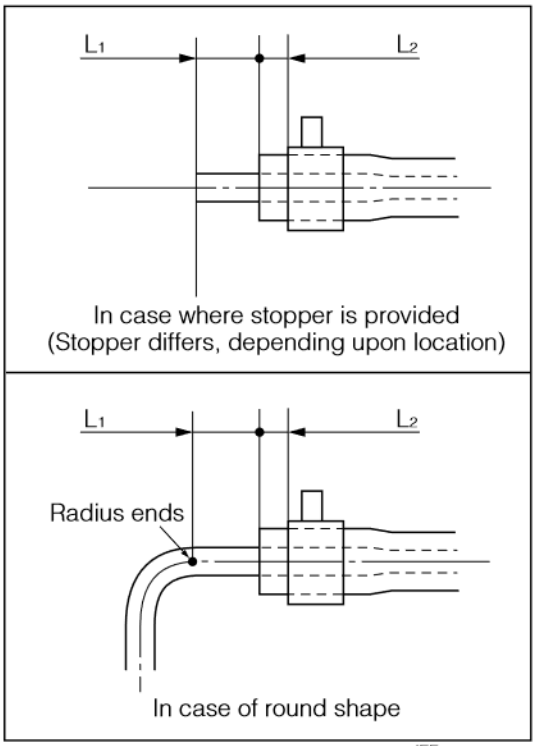
JEF00060-00033

(2) Vacuum hose
① Hose insertion length
Insert the hose in such a way as the figure on the right shows.
② Clip position
The clip end position is about 2 mm away from the hose end.



JEF00061-00034

(3) Purge hose
① Hose insertion length
Insert the hose in such a way that L_1 becomes 0 - 3 mm.
② Clip position
Clamp the hose in such a way that L_2 becomes 2 - 7 mm.



JEF00062-00035

5. When installing the fuel filter union bolt to the fuel filter, use a new gasket and tighten to the specified torque.
6. When installing the injector, fuel supply pipe, fuel pressure regulator or pulsation damper, use a new “O” ring or gasket. Apply gasoline or silicone oil to the “O” ring before assembling.

JEF00063-00000

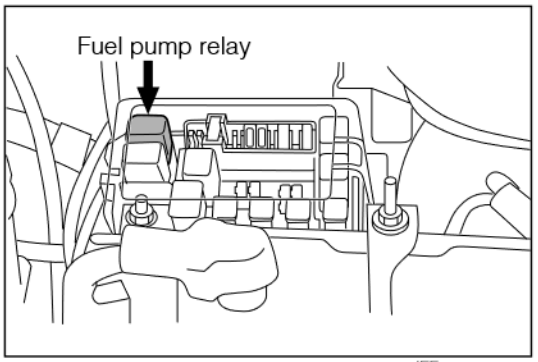
4.2 FUEL PRESSURE RELIEVING PROCEDURE

CAUTION:
- Never perform this operation while the engine is still hot. Failure to observe this caution may damage the catalyst.

After confirming that the engine is cold, relieve the fuel pressure, following the procedure given below.
1. Place the shift lever of the transmission in the “N” position.
   In the case of automatic transmission vehicles, place the shift lever in the “P” position. Apply the parking brake and place chocks at the wheels.

JEF00064-00000

2. Remove the relay block cover.
3. Remove the fuel pump relay from the relay block.
4. Start the engine. Leave the engine running, until it stops due to running-out of the fuel.
5. Install the fuel pump relay. Install the relay block cover.



JEF00065-00036

4.3 FUEL LEAK CHECK

After the fuel system has been repaired, perform the following check in order to ensure that no fuel leakage is present.
1. Turn ON the ignition switch for three seconds. Then turn it OFF. Repeat this operation three or four times so as to apply fuel pressure to the fuel system.
2. Under this state, ensure that the fuel system exhibits no fuel leakage at any point.

JEF00066-00000

4.4 PRECAUTIONARY MEASURES DURING TROUBLE-SHOOTING

1. Before the diagnosis information memorized in the ECU memory is confirmed, never disconnect the connector from the ECU, the battery cable from the battery, the ECU earth wire from the engine, or the main fuse.
2. The diagnosis information memorized in the ECU memory can be erased by using the DS-21 diagnosis tester or the OBD-II generic scan tool in the same way as the check. Therefore, before using the tester, read its instruction manual so as to understand the functions furnished and how to use it.
3. Priority in trouble-shooting
   If the priority in trouble-shooting for a number of diagnosis codes is given in the concerned DTC flow chart, make sure to follow the priority.
   If not given, follow the priority given below and perform the trouble-shooting for each diagnosis trouble code (DTC).
   (1) DTC’s other than DTC P0171/25, DTC P0172/26 (too lean/too rich in fuel system), and DTC 0300/17, DTC P0301-P0304/17, DTC P0314/-(misfire found)
   (2) DTC P0171/25, DTC P0172/26 (too lean/too rich in fuel system)
   (3) DTC 0300/17, DTC P0301-P0304/17, DTC P0314/-(misfire found)
4. Before conducting checks, be sure to read the “Precautionary measures in checking system circuit.” Carry out the diagnosis, while paying utmost attention to those points requiring such attention.

JEF00067-00000

5. ENGINE DIAGNOSIS

5.1 GENERAL INFORMATION

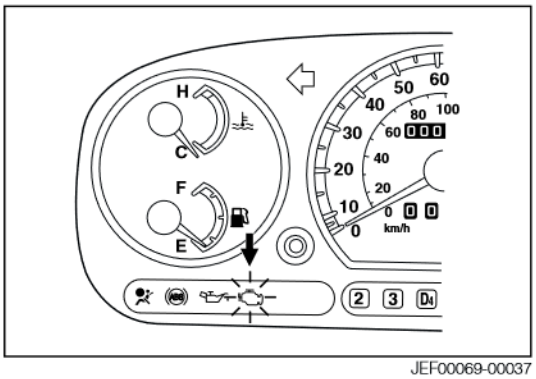
The engine and engine control system of this vehicle are controlled by the ECU. Furthermore, the vehicle is provided with the on-board diagnosis system. Therefore, when any abnormality takes place in the input/output systems (sensors, actuators, harnesses, connectors, etc.) of the engine control system, the ECU memorizes the system concerned and informs the driver by making the malfunction indicator lamp (MIL, warning lamp) illuminate or flash. Also the malfunction is informed to the operator by means of the data link connector (DLC, diagnosis connector).
When trouble-shooting the engine, it is imperative for you to get the general idea of the onboard diagnostic system, and fully understand the precautionary measures in trouble-shooting, the items to be observed and how to use testers. Then, conduct the trouble-shooting, following the flow chart that indicates the correct procedure for the engine trouble-shooting.

JEF00068-00000

5.1.1 ON-BOARD DIAGNOSTIC SYSTEM OF VEHICLES FOR EUROPE

The vehicles for Europe have the following functions that comply with the 1999/102/EC (generally called EURO-OBD) standards.

1. When the ignition switch is turned ON, the malfunction indicator lamp (MIL) goes on. When no malfunction has been detected, the lamp will go out after the engine has started. (Check for a blown bulb)



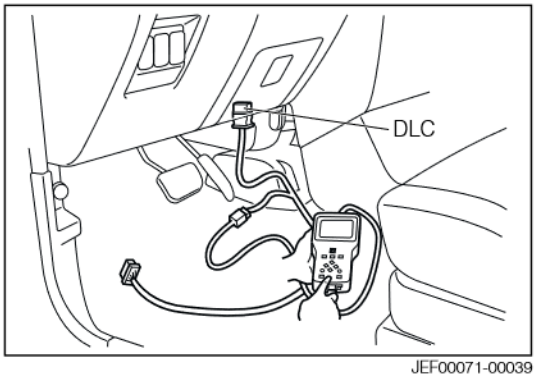
JEF00069-00037

2. While the engine is running, if the ECU detects any malfunction in the emission control system/components that will affect the emissions from the vehicle, or in the power train control components, or if any malfunction is detected in the ECU itself, the ECU illuminates or flashes the MIL (only when misfire is detected which will damage the catalyst). Then, the ECU memorizes the malfunction area (DTC by ISO15031-6/SAEJ2012).
   If that malfunction will not occur in three successive runnings, the MIL is automatically turned off. However, the DTC will be recorded in the ECU memory.
   NOTE:
   - The MIL is illuminated only by the malfunction that affects the emissions from the vehicle. (Only items bearing a circle (“O” mark) in the MIL column on page EF–41)

DTC No.	De	Malfunction evaluation method	MIL
P0105/31	Manifold pressure pressure	1 trip	O
P0110/43	Intake air malfunction	1 trip	O
P0115/42	Engine co malfunction	1 trip	O
P0116/42	Engine coo circuit mance	2 trip	O
P0120/41	Throttle/P switch “A”	1 trip	O

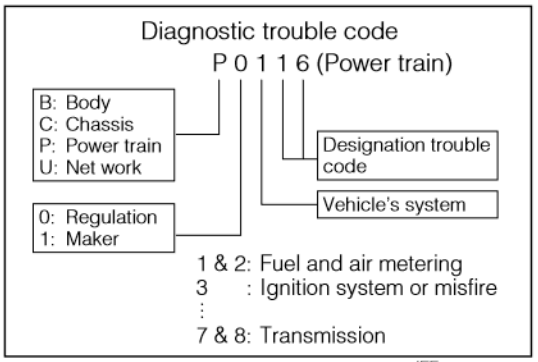
JEF00070-00038

3. It is possible to read out various data from the engine ECU by connecting the OBD Ⅱ generic scan tool which complies with the ISO 14230 format or DS-21 diagnosis tester to the DLC of the vehicle. You can perform trouble-shooting efficiently by checking these data (DTC, freeze-frame data, current data, O_2 sensor monitor data, etc.).



JEF00071-00039

4. The DTC is composed of the ISO standard code (specified by ISO 15031-6) and the manufacturer's designation code. The ISO standard code should be set pursuant to the ISO. On the other hand, the manufacturer's designation code can be freely set forth by the manufacturer within a specified limit.

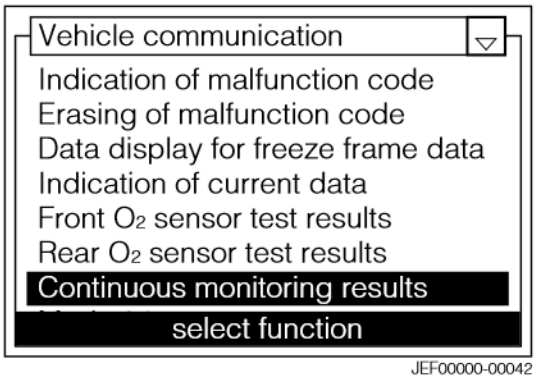


JEF00072-00040

5. Many DTC's have a 2 trip detection logic which assures avoidance of wrong detection and functions only when a malfunction is surely occurring. However, another diagnosis mode is provided, in which only a one-time final confirmation test is necessary for a service mechanic to confirm that the malfunction has been completely remedied after the repair.
   The mode can be switched on with the OBD Ⅱ generic scan tool or the DS-21 diagnosis tester. (In the case of the DS-21 diagnosis tester, the "Continuous monitoring results" of "Vehicle communication in CARB mode" must be selected.

DTC No.	De	Malfunction evaluation method	MIL
P0141/24	Oxygen sens malfunction	2 trip	O
P0171/25	Fuel trim (Air-fuel malfunction	2 trip	O
P0172/26	Fuel trim (Air-fuel malfunction	2 trip	O

JEF00073-00041

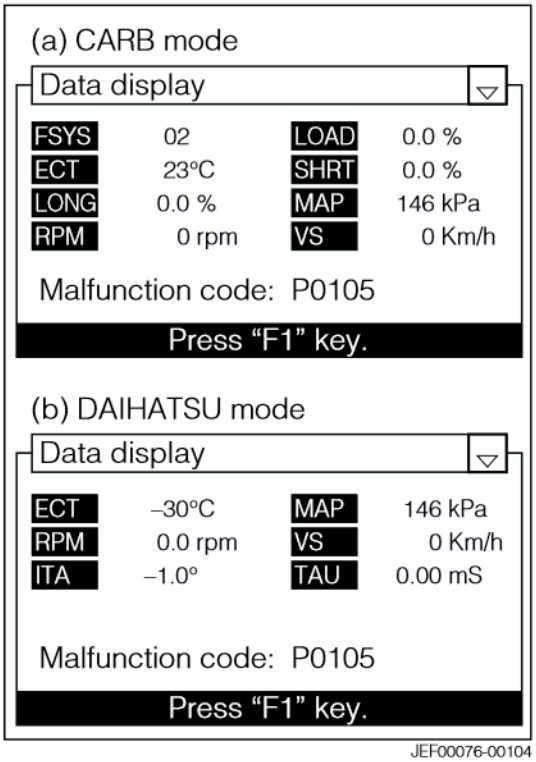


JEF00000-00042

6. When a malfunction is detected, the engine and running conditions at that moment are memorized as a freeze-frame data in the ECU memory.
7. 2 trip detection logic
   When a malfunction is detected for the first time, that malfunction is temporarily memorized in the engine ECU memory. (First running). If the same malfunction is detected again during the second running, the MIL is illuminated and the DTC is determined. (Second running).
   (However, the ignition switch should be turned off between the first running and the second running.)

JEF00075-00043

8. Freeze-frame data
When a malfunction is detected for the first time, the engine and running conditions at that moment are memorized in the memory.
The engine and running conditions are recorded at the moment when the malfunction was found (fuel system, calculated load, engine coolant temperature, fuel trim, engine revolution speed, vehicle speed, etc.). Therefore, the freeze-frame data is useful during the trouble-shooting to determine whether the vehicle was running or stopped, the engine was hot or not, the air-to-fuel ratio was lean or rich when the malfunction occurred.



JEF00076-00104

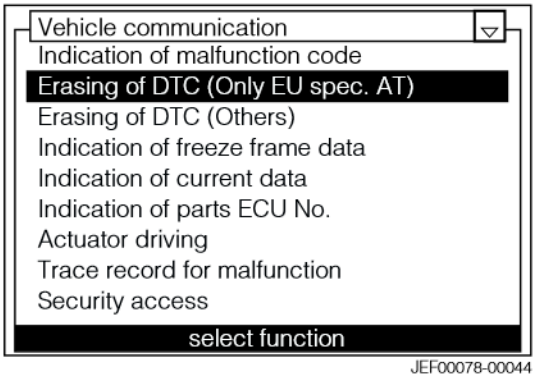
9. Updating freeze-frame data
Since the ECU is able to memorize the freeze-frame data for a single malfunction, the freeze-frame data shown in Item "1" below has priority when data is memorized.
If the freeze-frame data shown in Item "1" below is detected when the freeze-frame data shown in Item "2" below has already been memorized, the freeze-frame data "2" is replaced by the freeze-frame data "1".

PRIORITY	FREEZE FRAME DATA
1	Freeze frame data at initial detection of malfunction among misfire detected (P0300-P0304 and P0314), fuel system too lean (P0171) and fuel system too rich (P0172)
2	Freeze frame data when a malfunction other than those in "1" above is detected

NOTE:
- If the malfunction which occurs later has a lower priority or the same priority as the former one, the data is not updated.

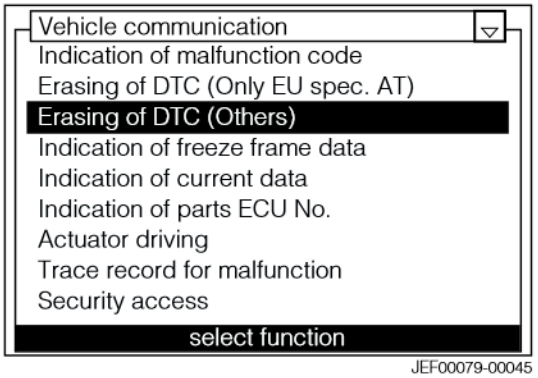
JEF00077-00000

10. Erasing of MIL-related malfunction code (DTC)
In the case of electronically-controlled automatic transmission-equipped vehicles of EU spec. only, selecting "Erasing of DTC (Only EU spec. AT)" will erase all the DTC's on the EFI ECU side, MIL-related DTC's on the A/T ECU side (items with a circle in the MIL column on page EF–41) and freeze-frame data.



JEF00078-00044

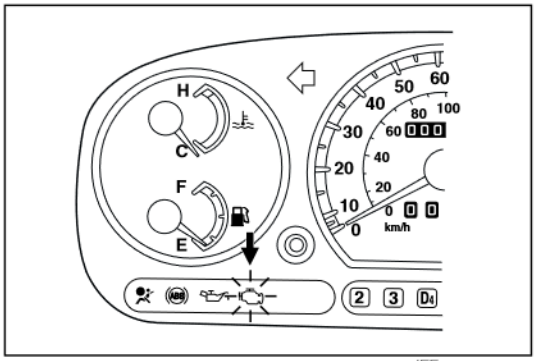
11. Erasing of freeze-frame data
    The freeze-frame data is erased simultaneously when the DTC is erased.
    In the case of except for electrically-controlled automatic transmission-equipped vehicles, the freeze-frame data can be erased simultaneously by erasing the DTC through selection of the “Erasing of DTC (Others)”



JEF00079-00045

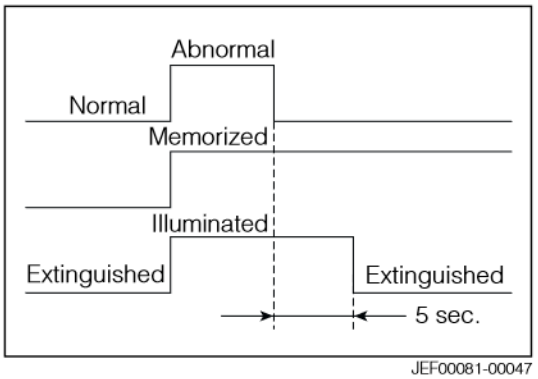
5.1.2 ON-BOARD DIAGNOSTIC SYSTEM OF VEHICLES OTHER THAN THOSE FOR EUROPE

1. When the ignition switch is turned ON, the MIL goes on. When no malfunction has been detected, the lamp will go out after the engine has started. (Check for a blown bulb)



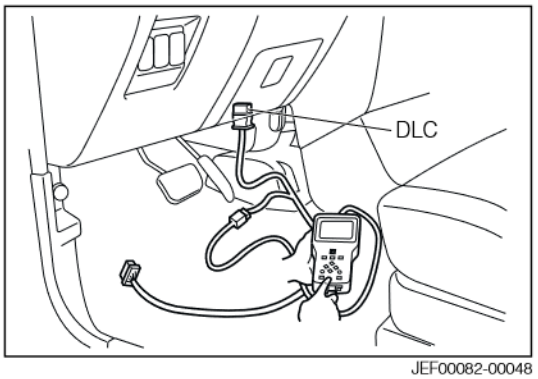
JEF00080-00046

2. While the engine is running, if the ECU detects any malfunction in the engine control system/components, or if any malfunction is detected in the ECU itself, the ECU illuminates the MIL.
   In addition to the illumination of the MIL, the corresponding diagnostic trouble code (DTC) is memorized in the engine ECU memory. When the malfunction has been remedied or the system returns to its normal state, the MIL automatically goes out. However, the DTC remains memorized in the engine ECU memory.



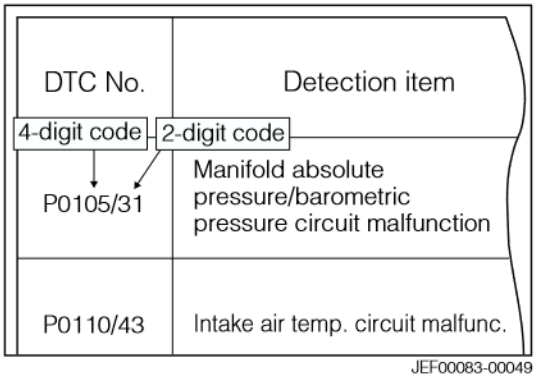
JEF00081-00047

3. It is possible to read out various data from the engine ECU by connecting the DS-21 diagnosis tester to the DLC of the vehicle. You can perform trouble-shooting accurately and efficiently by checking these data (DTC, freeze-frame data, current data, O_2 sensor monitor data, etc.).
   (Only when DS-21 diagnosis tester is used)



JEF00082-00048

4. The DTC (diagnostic trouble code) is set to a four-digit code in accordance with ISO standard. Furthermore, the conventional two-digit code is also provided. The four-digit code can be read out by the DS-21 diagnosis tester. The two-digit code has been set forth by the DMC itself. This code can be read by observing the flashing pattern of the MIL. (For details, see page EF–53.)



JEF00083-00049

5. Some DTC's have a 2 trip detection logic which assures avoidance of wrong detection and functions only when a malfunction is surely taking place.
6. When a malfunction is detected, the engine and running conditions at that moment are memorized as a freeze-frame data in the ECU memory.

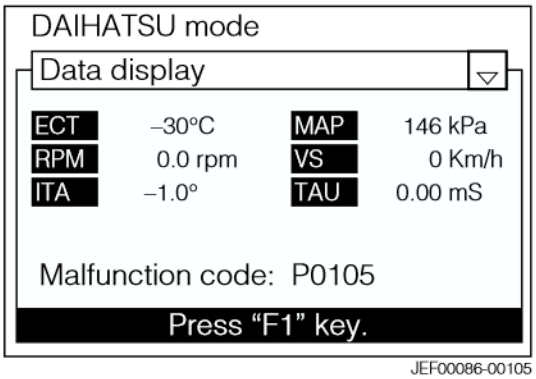
DTC No.	De	Malfunction evaluation method	MIL
P0141/24	Oxygen sens malfunction	2 trip	O
P0171/25	Fuel trim (Air-fuel malfunction	2 trip	O
P0172/26	Fuel trim (Air-fuel malfunction	2 trip	O

JEF00084-00050

7. 2 trip detection logic
   When a malfunction is initially detected, that malfunction is temporarily memorized in the engine ECU memory. (First running) If the same malfunction is detected again during the second running, the MIL is illuminated and the DTC is determined. (Second running)
   (However, the ignition switch should be turned off between the first running and the second running.)

JEF00085-00000

8. Freeze-frame data
   The ECU memorizes the engine and running conditions in its memory at the moment when the ECU detects a malfunction for the first time. (The figure on the right shows an example.)
   Therefore, it is possible to know the engine and running conditions when the malfunction was detected (such as whether the engine was hot or not, the vehicle was running or stopped, the air-to-fuel ratio was lean or rich) by checking the freeze-frame data. By utilizing the freeze-frame data, it is possible to proceed with the trouble-shooting efficiently.
   The freeze-frame data can be read out only by using the DS-21 diagnosis tester.



JEF00086-00105

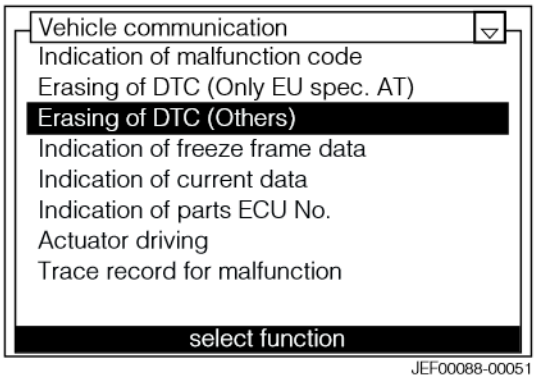
9. Updating freeze-frame data
   Since the ECU is able to memorize the freeze-frame data for a single malfunction, the freeze-frame data shown in Item "1" below has priority when the data is memorized.
   If the freeze-frame data shown in Item "1" below is detected when the freeze-frame data shown in Item "2" below has already been memorized, the freeze-frame data "2" is replaced by the freeze-frame data "1".

PRIORITY	FREEZE FRAME DATA
1	Freeze frame data at initial detection of malfunction among fuel system too lean (P0171) and fuel system too rich (P0172)
2	Freeze frame data when a malfunction other than those in "1" above is detected

NOTE:
- If the malfunction which occurs later has lower priority or the same priority as the former one, the data is not updated.

JEF00087-00000

10. Erasing of freeze-frame data
    The freeze-frame data is erased simultaneously when the DTC is erased.
    (1) When the DS-21 diagnosis tester is used:
    Select "Erasing of DTC (Others)" of the "Vehicle communication." Press the execution key (F1 key).
    (2) When the DS-21 diagnosis tester is not used:
    See page EF–58.

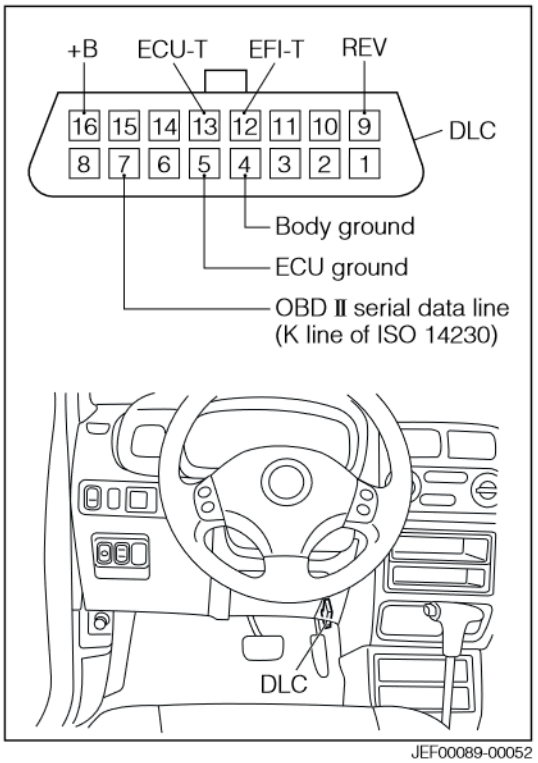


JEF00088-00051

5.1.3 DATA LINK CONNECTOR (DLC, COMMON DESTINATIONS)

The vehicle engine ECU uses the ISO14230 (Euro-OBD) protocol.
As regards the position, connector shape and pin arrangement, the DLC is in accordance with the ISO 15031-3 (SAEJ1962) and has complied with the ISO14230 format.
The OBD Ⅱ serial data line (K line of ISO14230) is used for the OBD Ⅱ generic scan tool or the DS-21 diagnosis tester in order to communicate with the ECU.

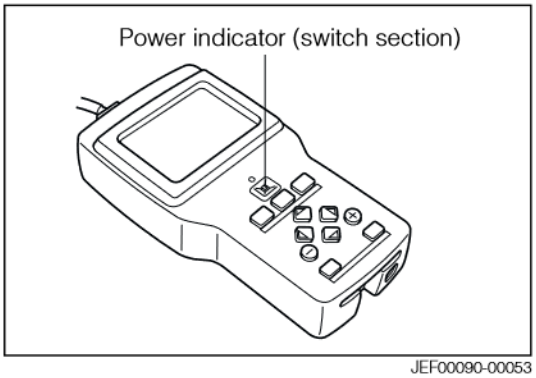
Terminal No.	Connection/voltage or resistance	Condition
7	Bus ⊕ line/pulse generation	During transmission
4	Chassis ground/↔ Body ground 10 Ω or less	Always
16	Battery positive/↔ Body ground 9 - 14 V	Always



JEF00089-00052

NOTE:

- With the cable of the DS-21 diagnosis tester connected to the DLC through the SST, turn ON the ignition switch. If the power indicator of the tester will not go on, conduct the following checks and repair any malfunctioning parts.
  SST: 09991-87404-000



JEF00090-00053

Connect the DS-21 diagnosis tester to another vehicle. Turn ON the ignition switch.

When Power indicator of DS-21 diagnosis tester goes on:	Malfunction on vehicle side Check DLC, +B and earth • Voltage check of BAT terminal • Continuity check between terminal E and body
When Power indicator of DS-21 diagnosis tester will not go on:	Malfunction of DS-21 diagnosis tester proper

JEF00091-00000

5.2 HOW TO PROCEED WITH TROUBLE-SHOOTING

The engine control system is equipped with diagnosis functions which are capable of diagnosing malfunctioning sections. These functions give important clues in trouble-shooting. The flow chart on the next page shows how to proceed with trouble-shooting by using these diagnosis functions.
The flow chart shows how the diagnostic trouble code check can be used effectively. Moreover, when its results are fully reviewed, you can determine whether you are going to do the trouble-shooting according to diagnosis trouble codes or the trouble-shooting according to malfunctioning phenomena.
The diagnosis of this system is equipped with a battery back-up function (a function which supplies power for diagnosis memory even if the ignition switch is turned OFF.)

NOTE:

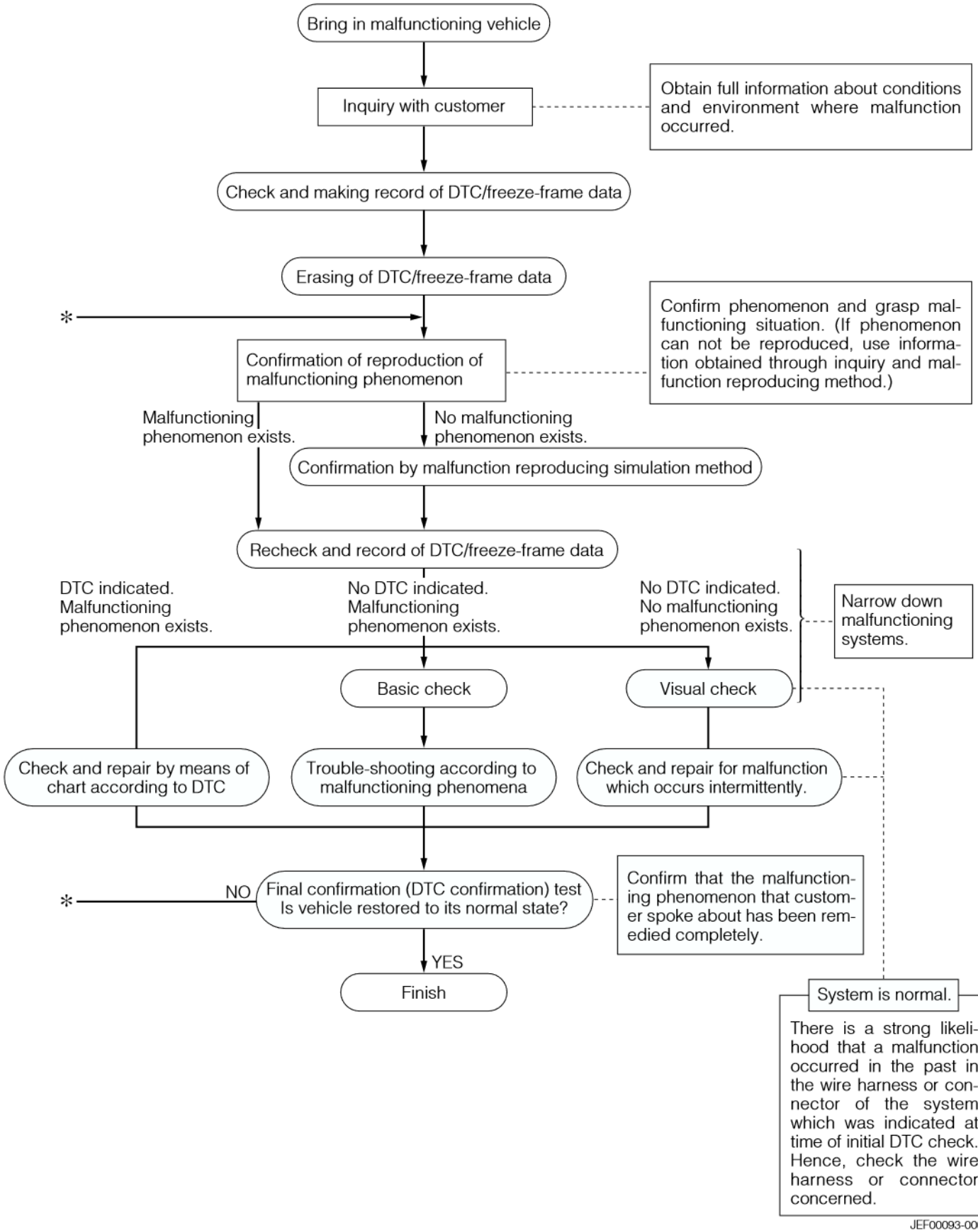
- When no DS-21 diagnosis tester or OBD-II generic scan tool is used, the DTC or freeze-frame data in the flow chart can not be read out.

JEF00092-00000

5.2.1 ENGINE DIAGNOSIS FLOW CHART

NOTE:

- For details of each step, refer to the next page.



JEF00093-00000

5.2.2 INQUIRY WITH CUSTOMER

In your attempt to remove the causes for a malfunction of the vehicle, you will not able to remove the causes unless you actually confirm the malfunctioning phenomenon. No matter how long you continue operations, the vehicle may not resume the normal state unless you confirm the malfunctioning phenomenon. The inquiry with the customer is a vital information collecting activity which is to be conducted previous to the confirmation of malfunctioning phenomenon. This inquiry will provide you with an important clue in an effort to reproduce the malfunctioning phenomenon.

Furthermore, the information obtained by the inquiry can be referred to during the trouble-shooting. Hence, instead of making general questions, it is necessary to focus your questions on the items related to the malfunction.

The following five main points of the inquiry given below are the most important points in analyzing the malfunction. In some cases, the information about malfunctions which took place in the past and about the history of previous repairs, which seem to have nothing to do with the current malfunction, may prove to be helpful in solving the malfunction. Hence, it is important to obtain as much information as possible and keep them accurately in mind as reference information when trouble-shooting the malfunctioning phenomenon.

Main points in analysis of malfunction told by customer

- What? ····· Vehicle model, name of system
- When? ····· Date, time, frequency of occurrence
- Where? ····· Condition of road
- Under what conditions? ··· Running conditions, driving conditions, weather conditions
- What happened? ····· How customer felt about malfunctioning phenomenon

JEF00094-00000

5.2.3 CHECK, RECORD AND ERASING OF DTC/FREEZE-FRAME DATA

When the DTC of the diagnosis is indicated, it is necessary to confirm whether that a system malfunction took place in the past or is still taking place, and confirm how the malfunction is related with the reproduced malfunction. To confirm this, you have to indicate the DTC/freeze-frame data twice. That is to say, you indicate the DTC/freeze-frame data, erase the data, and confirm the malfunctioning phenomenon. Then, you indicate the DTC/freeze-frame data again.

Please check the DTC's (including unidentified DTC's) by referring to the "DTC checking procedure" section. When any DTC's are indicated, print or write down the DTC and freeze-frame data. Then, erase them by referring to the "DTC erasing procedure." If you fail to erase the DTC at this time, you may make a wrong diagnosis, conclude that the normal circuit is malfunctioning, or face difficulty in trouble-shooting.

JEF00095-00000

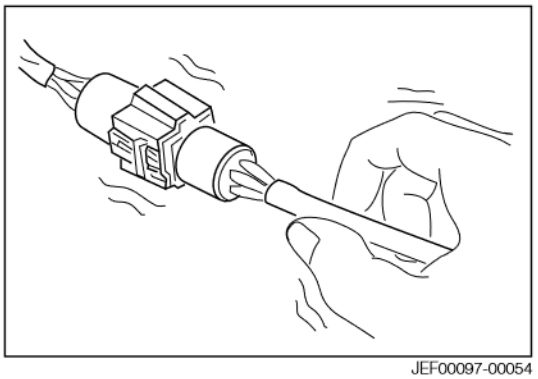
5.2.4 CONFIRMATION OF REPRODUCTION OF MALFUNCTIONING PHENOMENA

In the course of trouble-shooting, the operator can not pinpoint the cause for the malfunction unless he confirms the phenomenon. For this purpose, it is indispensable to reproduce the malfunctioning phenomenon by creating conditions and environments that are similar to those where the malfunction occurred, based on the information obtained through the inquiry with the customer.
As for phenomena which can not be reproduced easily, it is necessary to produce running conditions that are similar to those when the malfunction occurred (road surface condition, weather condition, driving condition). For this end, it is of great importance to try to reproduce the malfunction persistently by applying external factors, such as vibration (moving wire harnesses and relays by hand), heat (applying hot air) and water (applying moisture).
Vibration, heat or moisture can constitute causes for malfunction that are difficult to reproduce. Therefore, with the vehicle in a stationary state, you can perform the following malfunction reproduction simulation tests given below.
Moreover, if you presume a section (part) which can cause a malfunction and connect a tester, etc. to that section so as to confirm the malfunctioning phenomenon, you can also achieve a function evaluation of that section (part).

JEF00096-00000

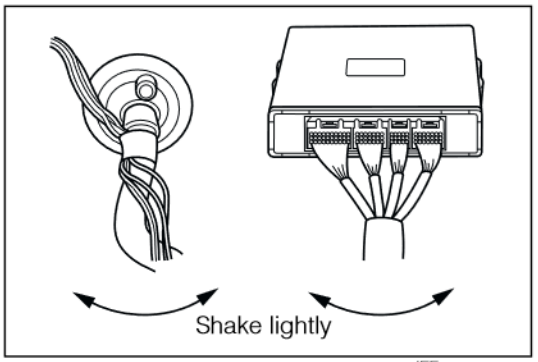
MALFUNCTION REPRODUCTION SIMULATION TEST METHODS

1. Vibration method:
   When vibration is thought to be the main cause
   (1) Connector
   Lightly shake the connector vertically and laterally.



JEF00097-00054

   (2) Wire harness
   Lightly shake the wire harness vertically and laterally.
   The points to be checked are connector joints, the vibrating point and the section where the wire harness is passing through the body.

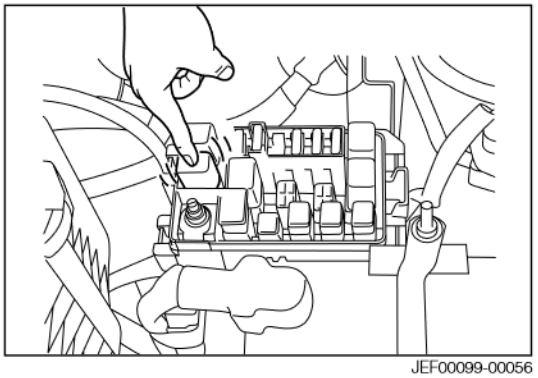


JEF00098-00055

   (3) Parts, sensors
   With your finger, apply light vibrations to a part of the sensor which is presumed to be the cause for the malfunction. Check to see if the malfunction is reproduced.

NOTE:

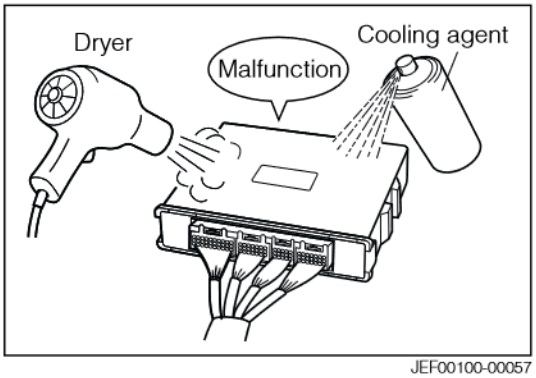
- Be careful not to apply too strong vibration to a relay, for it can cause an open wire in the relay.



JEF00099-00056

2. Cool/hot method:
   When a suspected section is likely causing the malfunction when it is cold or hot
   Heat a component which is presumed to be causing the malfunction by using a dryer or the like. Check to see if the malfunction occurs.

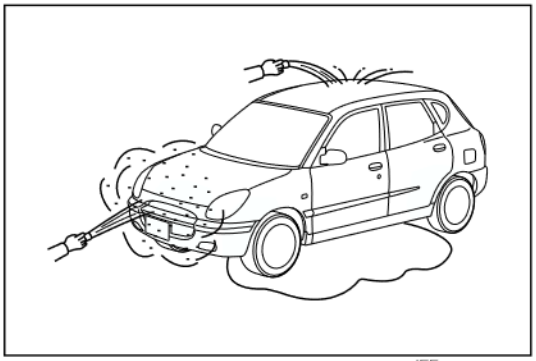
   CAUTION:
   - Do not heat the section beyond 60°C. (Temperature limit to assure that no damage be made to the component.)
   - Do not directly heat the parts inside the ECU.



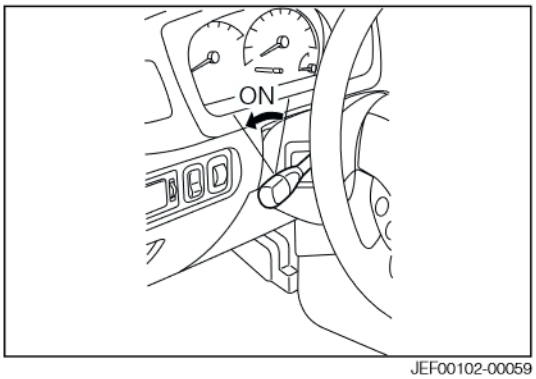
JEF00100-00057

3. Water applying method:
   When the malfunction is believed to occur on rainy days or under humid conditions
   Apply water to the vehicle. Check to see if the malfunction occurs.

   NOTE:
   - Never apply water directly to the engine compartment. By applying water to the front of the radiator, you can indirectly change the temperature and humidity.
   - Never apply water directly to the electronic parts.
   - If rain leaks into the vehicle compartment, rain may get into the inside of the ECU through the wire harnesses. If the vehicle has experienced any rain leakage before, utmost attention must be paid in respect to this point.


JEF00101-00058

4. Others:
   When the malfunction is believed to occur when a heavy electric load is applied
   Turn ON all electric loads, including the heater blower, headlights, rear window defogger, etc. Check to see if the malfunction occurs.



JEF00102-00059

5.2.5 RECHECK AND MAKING RECORD OF DTC/FREEZE-FRAME DATA

By checking the DTC/freeze-frame data after confirming the reproduction of the malfunctioning phenomenon, it is possible to judge whether the system related to the DTC that was indicated before confirmation of the reproduction is now functioning properly or not. Then, you are to proceed to one of the following three steps.

1. When a DTC was indicated at the time of checking the DTC and the same DTC is indicated after the confirmation of reproduction of the malfunction, it indicates that the malfunction is still persisting in the diagnosis circuit. Proceed to the trouble-shooting according codes.
2. When no abnormal code is indicated, although the occurrence of malfunction was observed during the confirmation of reproduction of malfunction, a malfunction other than those related to the diagnosis system is likely taking place. Proceed to the trouble-shooting according to malfunctioning phenomena.
3. When no malfunction is observed during the confirmation of reproduction of malfunction, and the normal code is indicated at the check of the DTC, it is presumed that an abnormality, such as poor contacts at the harnesses and connectors, occurred in the past, but now they are functioning properly. Check the harnesses and connectors of those systems related to the DTC that was indicated before the confirmation of reproduction of the malfunctioning phenomenon.

JEF00103-00000

5.2.6 BASIC CHECK

It is possible to narrow down the malfunctioning sections by performing the basic engine check, following the “basic engine check flow chart.”

JEF00104-00000

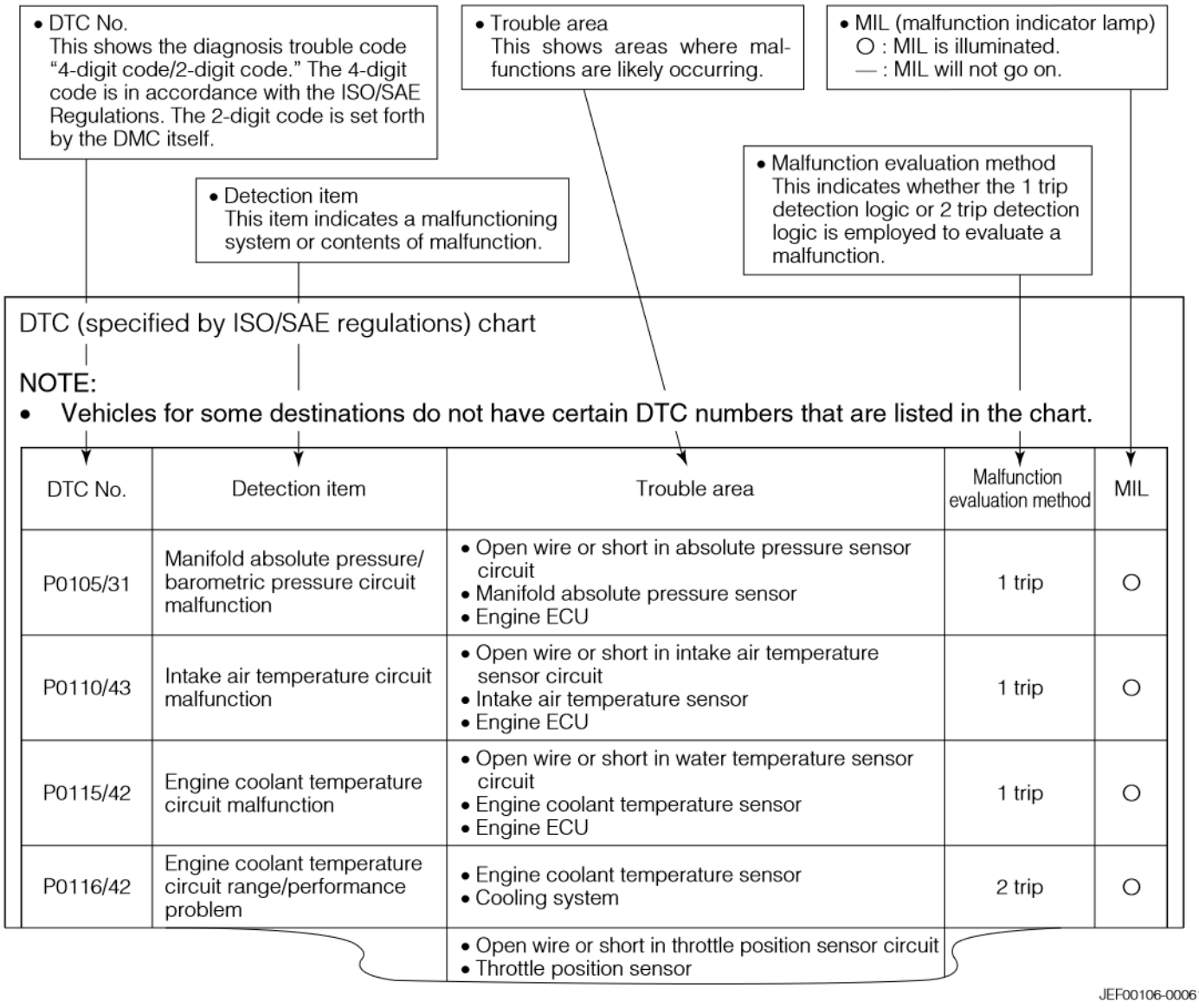
5.2.7 VISUAL INSPECTION

Check the wire harnesses and connectors of the systems that were indicated at the initial DTC check, following the procedure of the “visual and contact pressure checks.”

JEF00105-00000

5.2.8 CHECK AND REPAIR BY CHART ACCORDING TO DTC'S

The following table shows the checking procedure. You can perform efficient and accurate trouble-shooting by utilizing the DTC indicated at the time of rechecking the DTC. Perform the trouble-shooting by following the checking procedure shown in the flow corresponding to each DTC.
The following shows an example of the engine DTC chart.



DTC No.	Detection item	Trouble area	Malfunction evaluation method	MIL
P0105/31	Manifold absolute pressure/ barometric pressure circuit malfunction	• Open wire or short in absolute pressure sensor circuit • Manifold absolute pressure sensor • Engine ECU	1 trip	○
P0110/43	Intake air temperature circuit malfunction	• Open wire or short in intake air temperature sensor circuit • Intake air temperature sensor • Engine ECU	1 trip	○
P0115/42	Engine coolant temperature circuit malfunction	• Open wire or short in water temperature sensor circuit • Engine coolant temperature sensor • Engine ECU	1 trip	○
P0116/42	Engine coolant temperature circuit range/performance problem	• Engine coolant temperature sensor • Cooling system	2 trip	○
		• Open wire or short in throttle position sensor circuit • Throttle position sensor		

JEF00106-00061

5.2.9 CHECK AND REPAIR BY MATRIX TABLE FOR TROUBLESHOOTING ACCORDING TO MALFUNCTIONING PHENOMENA

This table can be used when trouble-shooting a malfunction which persists although the normal code is indicated at time of the DTC recheck. However, before performing trouble-shooting, carry out the basic check to narrow down possible causes for the malfunction. For example, if the spark check of the basic check proves that there is no problem, it can be presumed that the ignition system is normal. Also, you can narrow down further possible causes based on the information obtained through inquiry to the customer.

NOTE:

- If any malfunction can not be detected by the diagnosis system although the malfunctioning phenomenon exists, that malfunction is not covered by the detection range of the diagnosis system or the malfunction exists in a system other than the diagnosis-related systems.

JEF00107-00000

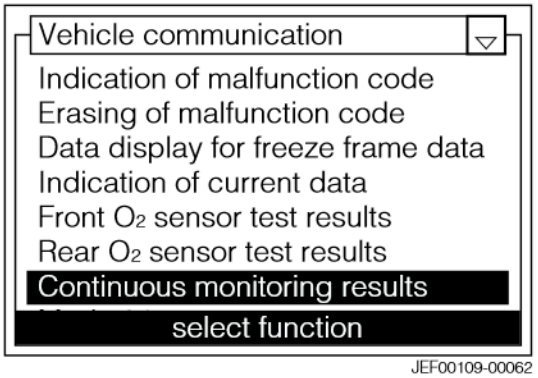
5.2.10 CHECK OF MALFUNCTIONS WHICH OCCUR INTERMITTENTLY

Check parts where malfunctions occur intermittently, such as wire harnesses and connectors, by following the section “Check of malfunctions which occur intermittently and poor contacts.” At that time, focus checks on the circuits related to the systems of the DTC’s that were indicated at the time of initial DTC check.

JEF00108-00000

5.2.11 FINAL CONFIRMATION TEST

Confirm that the malfunctioning phenomenon pinpointed by the customer has been completely eliminated. If the remedied parts are related to the DTC, erase the DTC once and carry out the DTC confirmation test. Ensure that no DTC is indicated. At this time, for improved efficiency of operations, use the “continuous monitoring results” function. (In the case of the DS-21 diagnosis tester, select the “Continuous monitoring results” of the vehicle communication in CARB mode.)



JEF00109-00062

5.3 INQUIRY SHEET

If you make an inquiry sheet in advance, as shown in the example below, you can completely make all necessary inquiries.
The following shows a standard form. This should be altered according to the characteristic of conditions of each market.

[INQUIRY SHEET]

Inquiry sheet					
Name of customer		Vehicle model	Engine - N/A, T/C, S/C, carburetor, EFI, LPG	Transmission - 4M/T, 5M/T, 2WD, 4WD 2A/T, 3A/T, 4A/T	
Details of vehicle	Frame No.	Registration date · ·	Date of malfunction · ·	Running distance km	
	Equipment:				
	[Sex] of customer (driver) Male Female	[Age] Approx.	[Occupation]	[Places where vehicle is mainly used] Urban district/suburb/seacoast/mountain/others	[Parking place] Outdoor/indoor
Symptom	Poor starting	• No initial explosion takes place. • Explosion is incomplete although initial explosion takes place. • Hard starting (cold engine, hot engine, always) • No cranking takes place. • Other ( )			
	Faulty idling	• Fast idling ineffective • Idling speed too low • Idling speed too high • Idling unstable (cold engine, hot engine, always) • Other ( )			
	Poor drive-ability	• Hesitation (during start, during acceleration, during deceleration, during a certain period) • Knocking • Backfire • Lack of power • Poor acceleration • Poor blow • Other ( )			
	Engine stall	• During idling (during warming up, after warming up) • At time of starting • During running ( ) • Immediately after vehicle stops (Re-start possible, Re-start impossible) • Under loaded state (Air conditioner, electric load, power steering) • Other ( )			
From when malfunction has started?		• Since vehicle was purchased as a new car • Recently (since what year/ month)			
Frequency of occurrence		• At all times • Under a certain condition ( ) • Sometimes			
Meteorological conditions	Weather	• At all times • Fine • Cloudy • Rain • Snow • Other ( )			
	Temperature	• Temperature (about °C) (Spring, summer, autumn, winter)			
Engine condition		• When cold • After warming-up • During warming-up (Water temperature about °C)			
Road		• Urban district • Suburb • Highway • Mountainous road (Uphill, downhill)			
Driving conditions		• No relation • During racing under no load • During running (Vehicle speed: km/h, Engine speed: rpm, MT Which gear?) • During turn (right curve, left curve)			
Other situations					

State of malfunction indicator lamp (MIL)	• Illuminated or flashing at all times • Illuminated or flashing sometimes • Will not go on.	
Indication of DTC • Reading out by using OBD Ⅱ generic scan tool or DS-21 diagnosis tester • Reading-out of MIL flashing pattern by shorting terminal T	During checking	• Normal • Malfunction code ( )
	2nd time	• Normal • Malfunction code ( )

JEF00110-00063

5.4 DTC CHART SPECIFICATIONS FOR M101, M201, J102 AND S221

The parameters indicated in the table may vary, depending upon the system types and specifications. This applies to vehicles for all destinations.
For details of the checking of each code, refer to the DTC chart for each code.

YEF00015-00000

5.4.1 DTC CHART SPECIFICATIONS

1. Codes specified by ISO/SAE

DTC No.	Detection item	Trouble area	Malfunction evaluation method	MIL
P0105/31	Manifold absolute pressure/ barometric pressure circuit malfunction	• Open wire or short in manifold absolute pressure sensor circuit • Manifold absolute pressure sensor • Engine ECU	1 trip	○
P0110/43	Intake air temp. circuit malfunction	• Open wire or short in intake air temp. sensor circuit • Intake air temp. sensor • Engine ECU	1 trip	○
P0115/42	Engine coolant temp. circuit malfunction	• Open wire or short in water temp. sensor circuit • Engine coolant temperature sensor • Engine ECU	1 trip	○
P0116/42*1	Engine coolant temp. circuit range/performance problem	• Engine coolant temp. sensor • Cooling system	2 trip	○
P0120/41	Throttle/pedal position sensor/switch “A” circuit malfunction	• Open wire or short in throttle position sensor circuit • Throttle position sensor • Engine ECU	1 trip	○
P0130/21	Oxygen sensor circuit malfunction (Bank 1 sensor 1)	• Air induction system • Fuel pressure • Injector injection • Open wire or short in heated oxygen sensor circuit • Heated oxygen sensor	2 trip	○
P0133/21*1	Oxygen sensor circuit slow response (Bank 1 sensor 1)	• Air induction system • Fuel pressure • Injector injection • Open wire or short in heated oxygen sensor circuit • Heated oxygen sensor • Engine ECU	2 trip	○
P0135/23*1	Oxygen sensor heater circuit malfunction (Bank 1 sensor 1)	• Open wire or short in heater circuit of oxygen sensor • Oxygen sensor heater • Engine ECU	2 trip	○
P0136/22*1	Oxygen sensor circuit malfunction (Bank 1 sensor 2)	• Open wire or short in heater circuit of oxygen sensor • Oxygen sensor • Engine ECU	2 trip	○
P0141/24*1	Oxygen sensor heater circuit malfunction (Bank 1 sensor 2)	• Same as DTC No. P0135/23	2 trip	○
P0171/25	Fuel trim system too lean (Air-fuel ratio lean malfunction, bank 1)	• Air intake (hose loose) • Fuel line pressure • Injector blockage or leakage • Open wire or short in oxygen sensor circuit • Oxygen sensor • Manifold absolute pressure sensor • Engine coolant temperature sensor • Gas leakage on exhaust system • Purge VSV for EVAP • Engine ECU	2 trip	○
P0172/26	Fuel trim system too rich (Air-fuel ratio rich malfunction, bank 1)		2 trip	○

YEF00016-00000

DTC No.	Detection item	Trouble area	Malfunction evaluation method	MIL
P0300/17*1	Random/multiple cylinder misfire detected	• Ignition system • Injector • Fuel pressure • Compression pressure • Valve clearance • Valve timing • Ion current sensor • Engine coolant temperature sensor • Open wire or short in engine wire • Connector connection • Manifold absolute pressure sensor • Engine ECU	2 trip	MIL flashing during misfire detection: ○
P0301/17*1 P0302/17*1 P0303/17*1 P0304/17*1	Misfire detected -Cylinder 1 -Cylinder 2 -Cylinder 3 -Cylinder 4			
P0314/—*1	Single cylinder misfire (Cylinder not specified) (EU regulation)			
P0325/18*4	Knock sensor 1 circuit malfunction	• Open wire or short in knock sensor 1 circuit • Knock sensor 1 (looseness) • Engine ECU	1 trip	○
P0335/13	Crankshaft position sensor “A” circuit malfunction	• Open wire or short in crank angle sensor circuit • Crank angle sensor • Signal rotor • Engine ECU	1 trip	○
P0340/14	Camshaft position sensor circuit malfunction	• Open wire or short in cam angle sensor circuit • Cam angle sensor • Engine ECU	1 trip	○
P0420/27*1	Catalyst system efficiency below threshold	• Three-way catalytic converter • Open wire or short in (heated) oxygen sensor circuit • (Heated) oxyger sensor	2 trip	○
P0443/76	Evaporative emission control system purge control valve circuit malfunction	• Open wire or short in VSV circuit for EVAP • VSV for EVAP • Engine ECU	2 trip	○
P0500/52*6	Vehicle speed sensor malfunction	• Open wire or short in vehicle speed sensor circuit • Combination meter • Vehicle speed sensor • Engine ECU	2 trip	○
P0500/52	Vehicle speed sensor malfunction	• Combination meter • Open wire or short in signal line from A/T ECU or ABS ECU or vehicle speed sensor • Engine ECU or A/T ECU or ABS ECU • Vehicle speed sensor	2 trip	○
P0505/71	Idle control system malfunction	• Open wire or short in ISC valve circuit • Engine ECU	1 trip	○
P0710/38*3	Transmission fluid temperature sensor circuit malfunction	Refer to the AT section	1 trip	○
P0711/38*3	Transmission fluid temperature sensor circuit range/performance		2 trip	○
P0715/37*3	Turbiue speed sensor circuit malfunction		1 trip	○
P0720/42*3	Output speed sensor circuit malfunction		2 trip	○
P0725/86*3	Engine speed input circuit malfunction		2 trip	○
P0753/61*3	Solenoid No. 1		1 trip	○
P0758/62*3	Solenoid No. 2		1 trip	○
P0763/63*3	Solenoid No. 3		1 trip	○
P0768/64*3	Duty solenoid		1 trip	○
P0773/65*3	Lock up solenoid circuit malfunction		1 trip	○

2. Codes specified by DMC

DTC No.	Detection item	Trouble area	Malfunction evaluation method	MIL
P1105/32*1	Barometric pressure sensor circuit malfunction	• Engine ECU	1 trip	○
P1130/29*5	A/F adjuster circuit malfunction	• Open wire or short in A/F adjuster circuit malfunction • A/F adjuster • Engine ECU	1 trip	—
P1300/36*1	Ion system malfunction	• Open wire or short in Ion system circuit • Ignitor unit • Ignition coil (All cylinders) • Spark plug (All cylinders) • Engine ECU	2 trip	○
P1346/75	VVT sensor circuit range/ performance problem	• Mechanical system (Skipping teeth of timing chain, wrong installation of timing chain and chain tensioner) • Engine ECU	2 trip	○
P1349/73	VVT system malfunction	• Valve timing • OCV • VVT controller assembly • Engine ECU	2 trip	○
P1510/54	Starter signal circuit malfunction	• Open wire in starter signal circuit • Engine ECU	2 trip	○
P1520/51	Switch signal circuit malfunction	• Open wire or short in A/C switch circuit • A/C switch • Open wire or short in linear throttle sensor circuit • Linear throttle sensor • Open wire or short in neutral start switch circuit • Neutral start switch	1 trip	—
P1530/44	A/C evaporator temp. sensor circuit malfunction	• Open wire or short in A/C evaporator temp. sensor circuit • A/C evaporator temp. sensor • Engine ECU	1 trip	—
P1560/61	ECU back up power source circuit malfunction	• Open wire in back up power source circuit • Engine ECU	1 trip	○
P1600/83*2	Immobilizer signal malfunction	• Engine ECU	1 trip	—
P1601/81*2	Immobilizer signal circuit malfunction	• Open wire or short in immobiliger signal circuit • Immobilizer ECU • Engine ECU	1 trip	—
P1602/82*3	Serial communication problem between EFI ECU and A/T ECU	• Open wire or short in serial communication circuit • A/T ECU • Engine ECU	1 trip	○
P1656/74	OCV circuit malfunction	• Open wire or short in OCV circuit • OCV • Engine ECU	1 trip	○
P1703/72*3	Lock-up clutch status malfunction	Refer to AT section	2 trip	○
P1780/66*3	Switch solenoid		1 trip	○

sEF00053-00000

NOTE:

- MIL ..... Malfunction indicator lamp.
  However, in the case of A/T vehicles of M101 and M201, the 2-digit codes of DTC No. can be read out through the flashing pattern of the D range lamp.
  In the other hand, in case of A/T vehicles of J102 and S221, the 2-digit codes of DTC No. can be read out through the flashing pattern of the O/D OFF lamp.
- When the “O” mark is shown in the MIL column, the lamp will go on for that DTC No., but when the “—” mark is shown, the lamp will not go on for that DTC No. However, the data other than the switch signal system (P1520/51) are memorized in the backup memory. Therefore, it is possible to read out the DTC No. by using the diagnosis tester DS-21.
- DTC No. with *1 mark ..... Only for European specifications
  But, only in the case of DTC No. P0314, it is possible to read out this DTC No. by means of the “continuos monitoring results” function of the CARB mode.
- DTC No. with *2 mark ..... Only for vehicles with immobilizer
- DTC No. with *3 mark ..... Only for vehicles with electronically-controlled A/T
- DTC No. with *4 mark ..... Not provided only for European specifications
- DTC No. with *5 mark ..... Only for leaded specifications of J102 and S221
- DTC No. with *6 mark ..... Low-grade vehicles of J102 except for A/T vehicle and S221

YEF00017-00000

5.5 FAIL-SAFE FUNCTION FOR M101, M201, J102 AND S221

When any of the following DTC's has been detected, the ECU enters the fail-safe mode in order to make it possible for the vehicle to drive for evacuation and to ensure safety. When the malfunction is remedied to a normal condition, the fail-safe control will be released.
However, the diagnosis results will remain memorized. Hence, it is necessary to determine whether the malfunction still persists or not.

YEF00018-00000

5.5.1 FAIL-SAFE SPECIFICATIONS

DTC No.	Detected item	Fail-safe operation
P0105/31	When the signal from the intake manifold pressure sensor exhibits an open wire or short circuit	• The signal from the intake manifold pressure sensor is set to the value determined from the throttle opening angle, engine revolution speed and ISC opening angle. • The ignition timing is changed to the control based on the pressure determined from the engine revolution speed and the above value. • The fuel will be cut when the throttle opening angle and engine revolution speed exceeds the respective set values.
P0110/43	When the signal from the intake air temperature sensor exhibits an open wire or short circuit	• The signal from the water temperature sensor is set to a constant value.
P0115/42	When the signal from the engine coolant temperature sensor becomes open or shorted.	• The signal from the engine coolant temperature sensor becomes a constant value. • At this time, the radiator fan is turned on. (Except for EU spec.)
P0120/41	When the signal from the throttle position sensor exhibits an open wire or short circuit	• The signal from the throttle position sensor is set to a constant value.
P0136/22*1	When an abnormality is encountered in the signal from the rear O_2 sensor	• The feedback of the rear O_2 sensor is stopped • The correction coefficient of the feedback of the rear O_2 sensor is set to the value determined from the engine revolution speed and pressure.
P0325/18*3	When the signal from the knock sensor becomes open or shorted.	• The ignition timing is retarded.
P1105/32*1	When the signal from the atmospheric pressure sensor exhibits an open wire or short circuit	• The signal from the atmospheric pressure sensor is set to a constant value.
P1300/36*1	When the Ion current signal from the ignitor unit becomes open or shorted.	• The ignition timing is retarded.
P1349/73	When an abnormality is encountered in the valve timing control	• The learning of the most retard timing is prohibited. • The control of air-to-fuel ratio learning is prohibited. • The idle speed control is changed.
P1530/44	When the signal from the evaporator temperature sensor exhibits an open wire or short circuit for more than a certain length of time	• The air conditioner will be cut.
P1600/83*2	When abnormality occurs in writing and reading-out of the rolling codes into/from the E^2 PROM during the immobilizer communication	• The injection and ignition are prohibited. (Only for vehicles with the EU, Israel, AUS and Saudi Arabian specifications)
P1601/81*2	When the rolling codes cannot be exchanged between the EFI ECU and the immobilizer ECU or the rolling codes are not matched	

YEF00019-00000

DTC No.	Detected item	Fail-safe operation
P1602/82	When the signal from A/T ECU or from the EFI ECU becomes open or shorted.	• The signal from the A/T ECU or from the EFI ECU becomes a constant value.
P1656/74	When an abnormality is encountered in the control voltage of the oil control valve for more than a certain length of time	• The continuity control of the oil control valve is prohibited.

NOTE:
- DTC No. with *1 mark ····· Only for vehicles with European specifications
- DTC No. with *2 mark ····· Only for vehicles equipped with immobilizer
- DTC No. with *3 mark ····· Except for vehicles with European specifications

JEF00118-00000

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

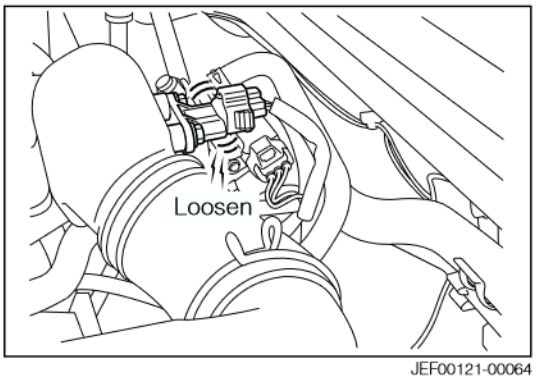
1. For proper trouble-shooting, the detailed checking procedure for each circuit in the chart according to the DTC chart or the chart according to malfunctioning phenomena is provided later on.
2. If the trouble-shooting for all components, wire harnesses and connectors, except for the ECU, reveals that 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

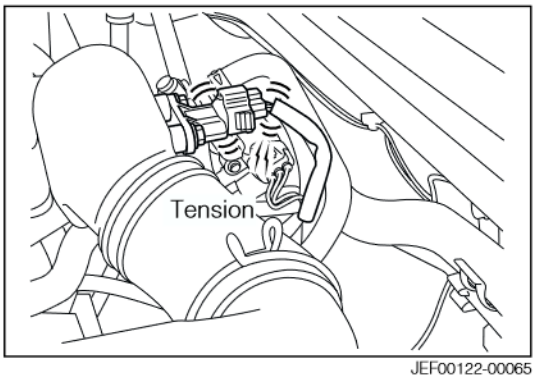
5.7.1 CHECK OF WIRE HARNESSES AND CONNECTORS

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

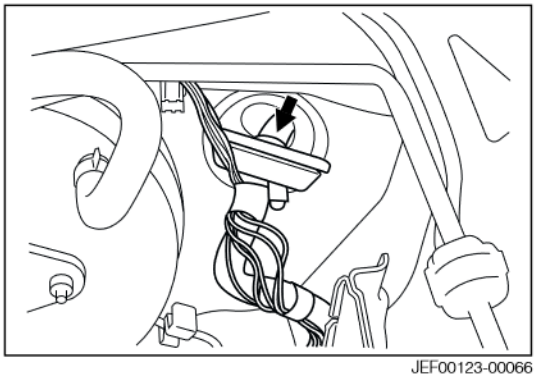


JEF00122-00065

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.

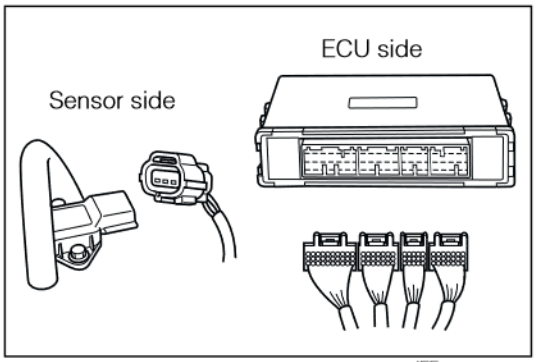
Short Circuit: This is caused by a short circuit between the wire harness and the body ground or by an internal short circuit of the switches, etc.


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.

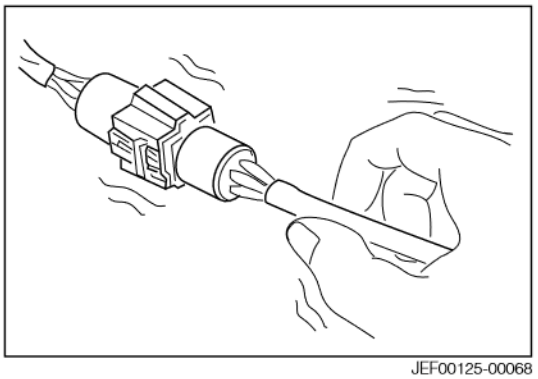
Continuity check (check for open wire)

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

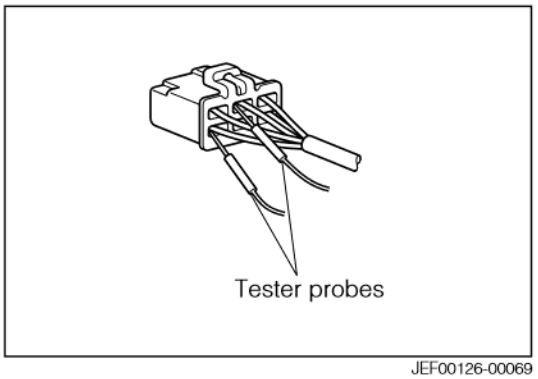


JEF00124-00067

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

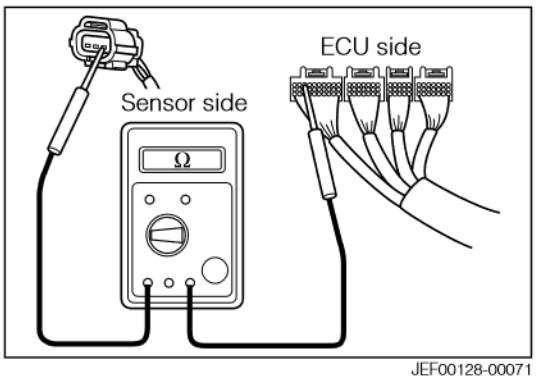

JEF00125-00068

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

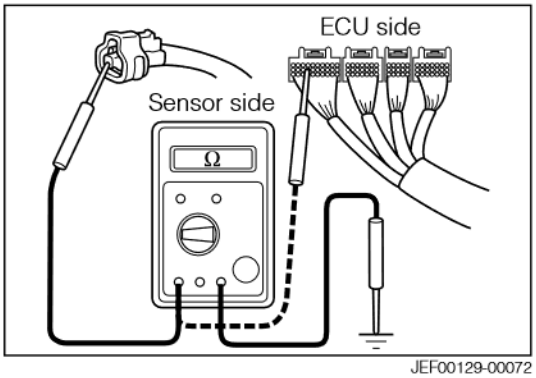
- In cases where the waterproof connector is checked without removing the waterproof rubber, be very careful not to deform the connector terminal when applying the test probes.



JEF00128-00071

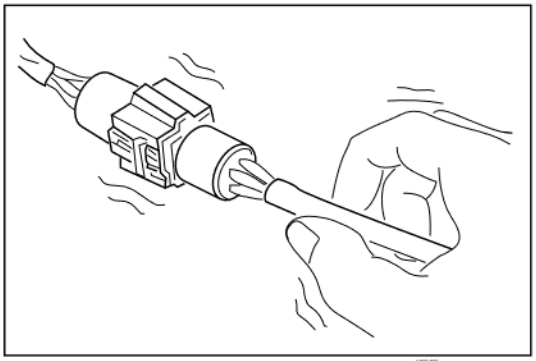
Check of resistance (check for short circuit)

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



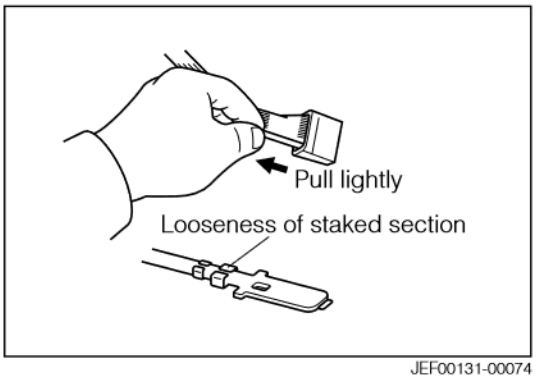
JEF00129-00072

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


JEF00130-00073

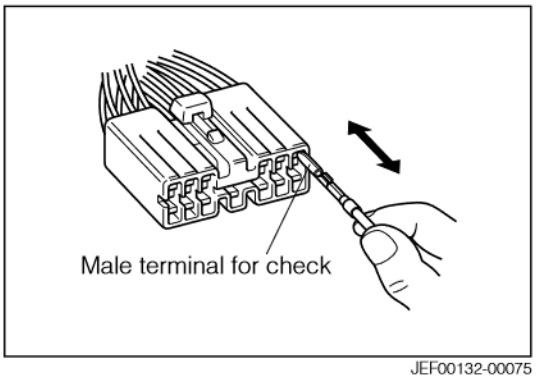
5.7.2 VISUAL INSPECTION AND CONTACT PRESSURE CHECK

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.

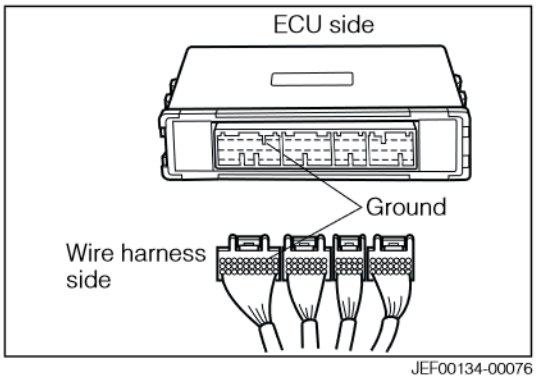
1. Check the connector and terminal.
   Perform the check for the items related to open wire under "Check of Wire Harness and Connector" on page EF–48.
2. Visual Inspection and Contact Pressure Check
   Perform the check, following the items under "Visual Inspection and Contact Pressure Check" on page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

JEF00133-00000

5.7.4 CHECK AND REPLACEMENT OF ECU

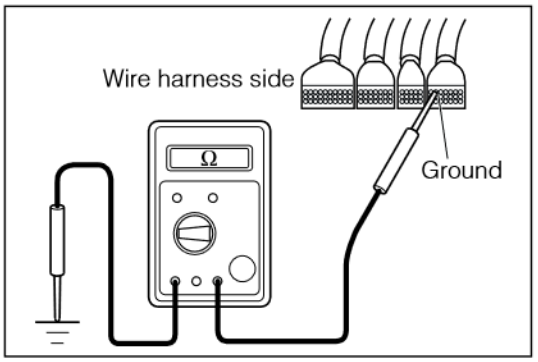
First, check the ground circuit of the ECU. If any malfunction is found, repair the ground circuit. If no malfunction is found, replace the ECU.

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

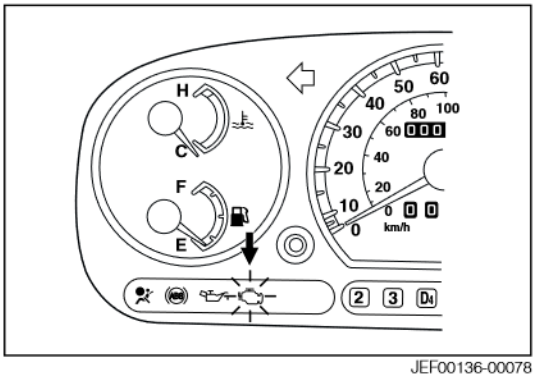
   NOTE:
   - When the ECU ground circuit is checked, there are cases where the contact condition of the terminal may change by disconnecting and reconnecting the connector, thus resulting in "No malfunction." Therefore, if the check results of the ECU ground circuit reveal that there is "no malfunction," 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.

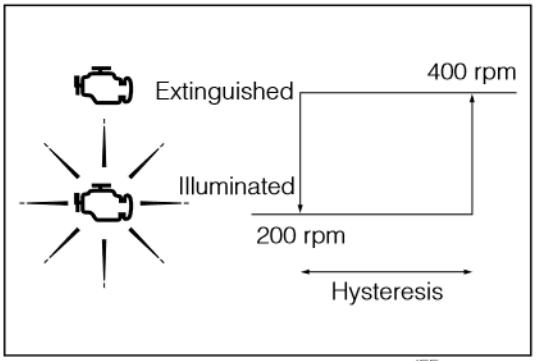
5.8.1 CHECK OF MALFUNCTION INDICATOR LAMP

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

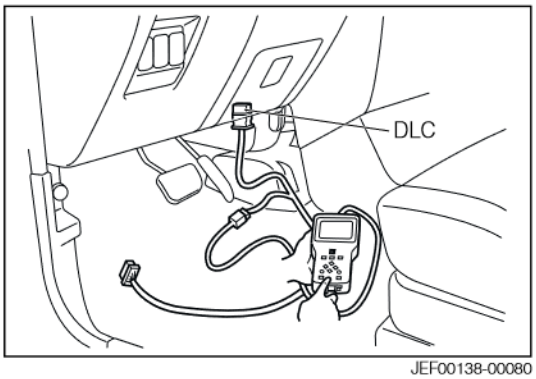
2 Ensure that the malfunction indicator lamp goes out when the engine starts.
   If the lamp remains illuminated or is flashing, the diagnosis system is detecting a malfunction. Therefore, a DTC is memorized in the ECU.
   If no DTC is memorized in the ECU, perform the trouble-shooting for the malfunction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



JEF00137-00079

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

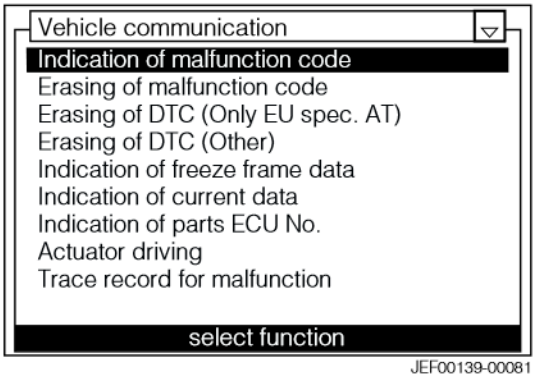
1. Prepare the DS-21 diagnosis tester or OBD Ⅱ generic scan tool.
2. With the ignition switch turned OFF, connect the DS-21 diagnosis tester or the OBD Ⅱ generic tester to the data link connector (DLC) located at the lower section of the instrument panel on the driver's seat side. At this time, the DS-21 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

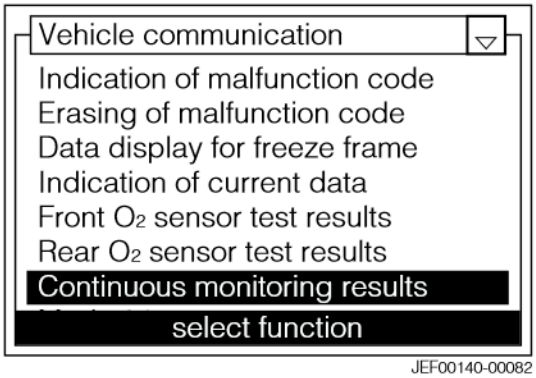
3. Turn ON the ignition switch and turn ON the main switch of the tester.

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.



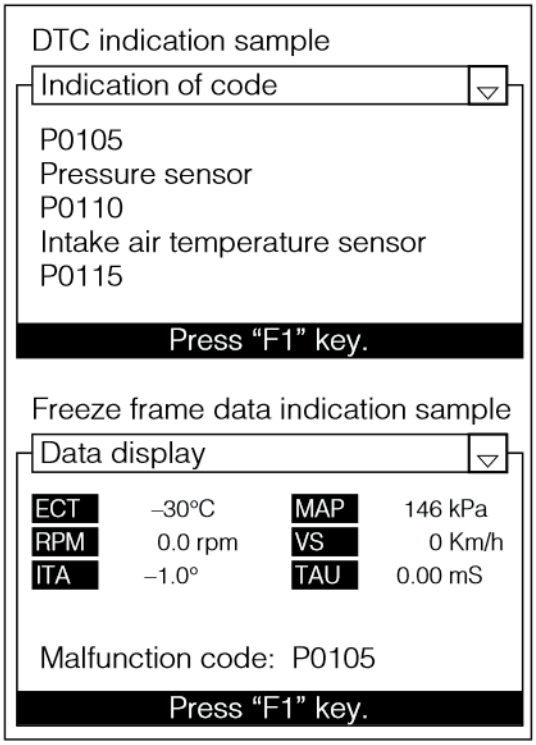
JEF00139-00081

(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.



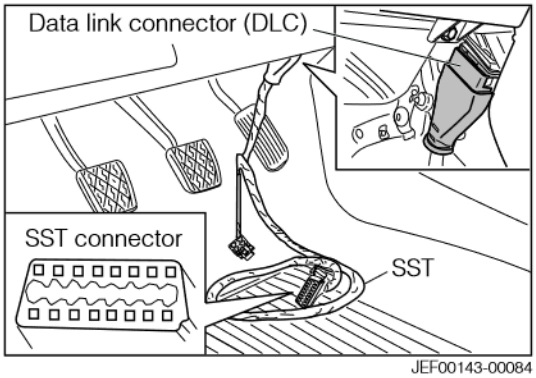
JEF00141-00083

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

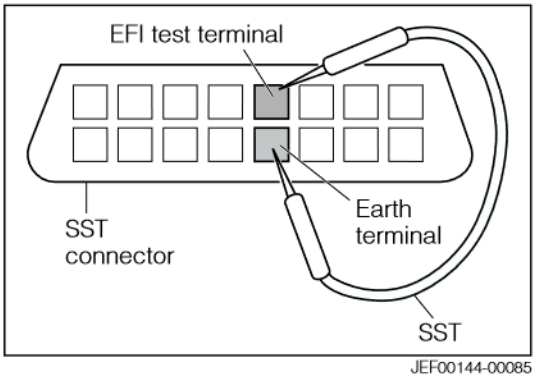
5.8.3 CHECK OF DTC WITHOUT USING DS-21 DIAGNOSIS TESTER OR OBD Ⅱ GENERIC SCAN TOOL

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

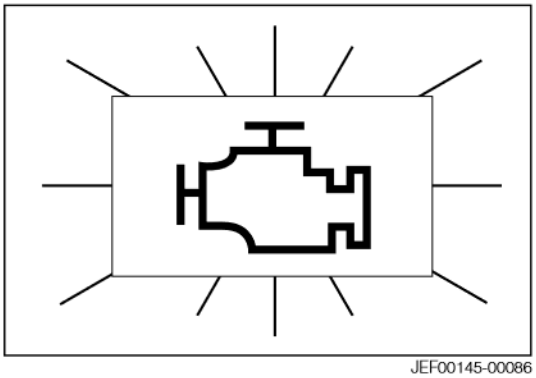
2. Connect the terminal between the EFI test terminal and the earth terminal of the SST connector with a jump wire as indicated in the illustration.
   SST: 09991-87403-000



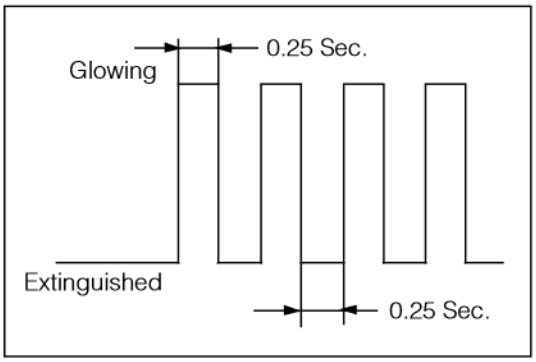
JEF00144-00085

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.

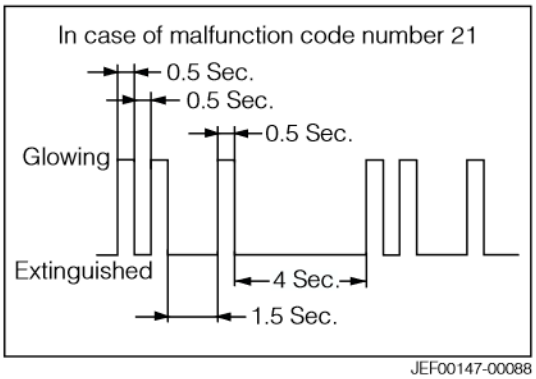

JEF00145-00086

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.



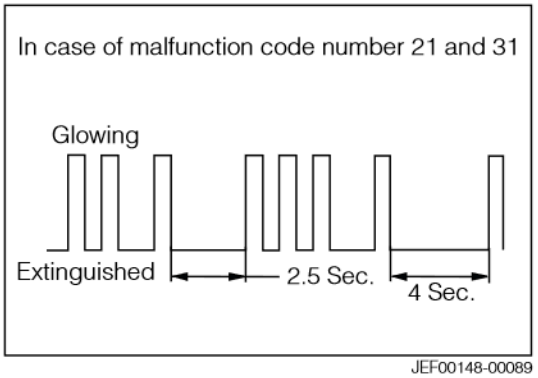
JEF00146-00087

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:

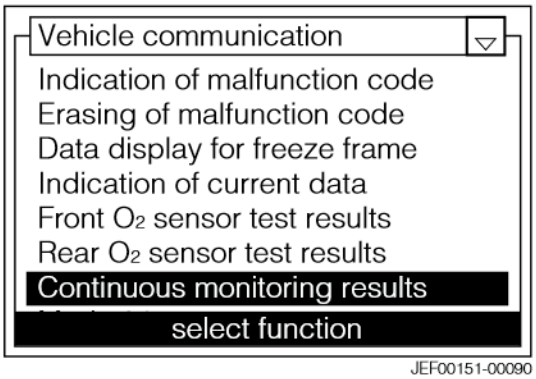
- When malfunctioning phenomena are to be reproduced without using the DS-21 diagnosis tester or OBD Ⅱ generic scan tool, follow the procedure given below to detect the DTC.

  (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

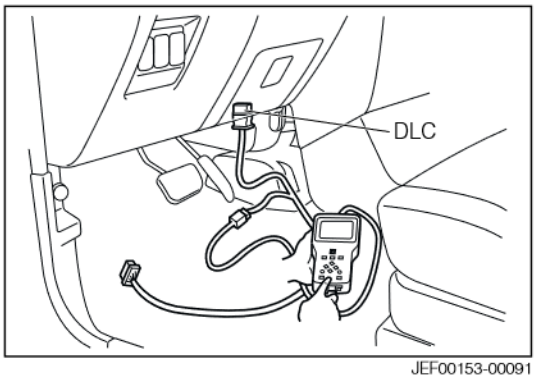
The DTC and freeze-frame data can be erased through the following methods.

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

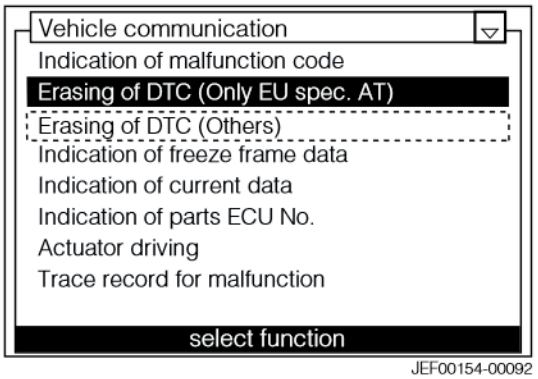
5.9.1 WHEN DS-21 DIAGNOSIS TESTER OR OBD Ⅱ GENERIC SCAN TOOL IS USED:

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:

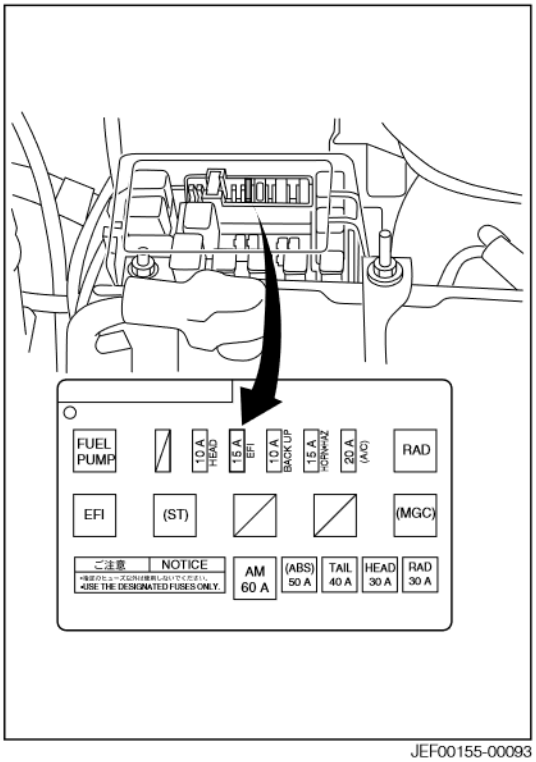
Erasure by disconnecting EFI fuse

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.

YEF00020-00000

5.10.1 BASIC ENGINE CHECK (page 1 of 3) FOR M101, M201 and J102

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

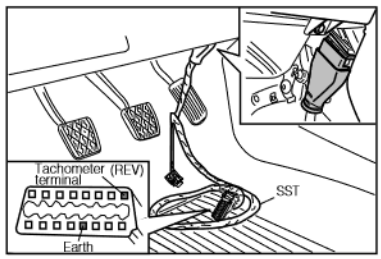
2 Does the engine crank?
- NO → Go to "Matrix Table for Trouble-Shooting According to Malfunctioning Phenomena" on page EF–47.
- YES ↓

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)

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



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

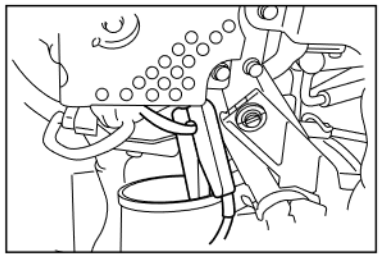
5 Check the ignition timing

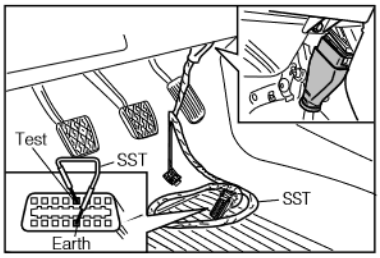
1. When the DS-21 diagnosis tester is not used, connect the terminal T of the SST connector to the earth terminal, using a jump wire.
   SST: 09991-87403-000

   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)

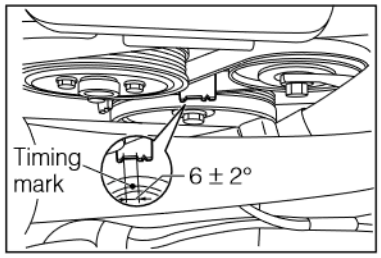
   NOTE:
   - After checking, release the shorting of the terminal T by using the "Actuator driving" function.

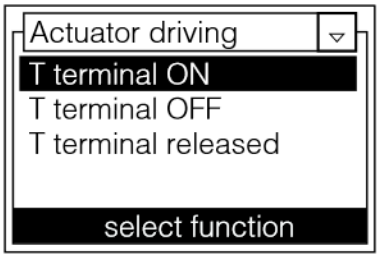
- When DS-21 diagnosis tester is not used:





- When DS-21 diagnosis tester is used:





- 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.

YEF00021-00014

5.10 BASIC ENGINE CHECK FLOW CHART (S221)

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.

sEF00022-00000

5.10.1 BASIC ENGINE CHECK (page 1 of 3) FOR S221

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 ↓

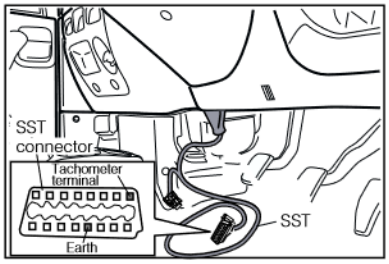
3 Does the engine start?
- NO → Go to Step 6.
- YES ↓

4 Check the engine idle speed

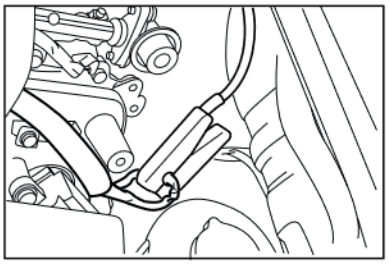
1. Warm up the engine, until the engine coolant temperature reaches 90°C or more.
2. Turn OFF all electric load switches (including A/C switch).
3. In the case of M/T vehicles, set the transmission to neutral. (In the case of A/T vehicles, set the shift lever to the "P" position.)
4. Connect the DS-21 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.: 600 - 700 rpm (M/T)
   650 - 750 rpm (A/T)

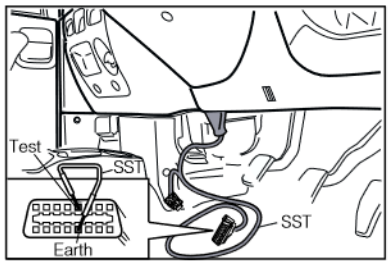
- NO → Go to "Matrix Table for Trouble-Shooting According to Malfunctioning Phenomena" on page EF–47.
- YES ↓

• 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

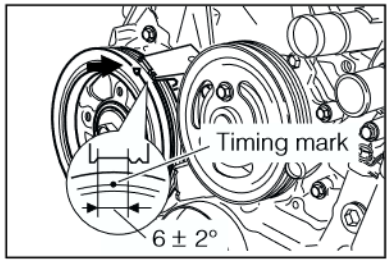
   When the DS-21 diagnosis tester is used, select the "T terminal ON" of the actuator driving so as to short the terminal T.
2. Attach the clip of the timing light to the wire harness for timing light connection.
3. Is the timing mark of the crankshaft within a range of the indicator for ignition timing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

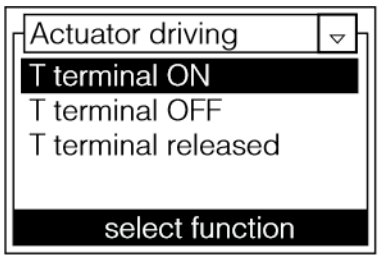
   NOTE:
   • After checking, release the shorting of the terminal T by using the "Actuator driving" function.

- 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:





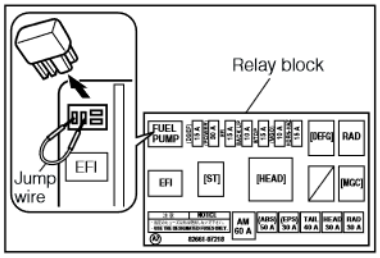
sEF00023-00015

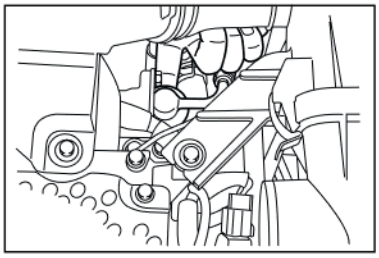
BASIC ENGINE CHECK (page 2 of 3) FOR M101, M201 and J102

6 Fuel pressure check (simple check)

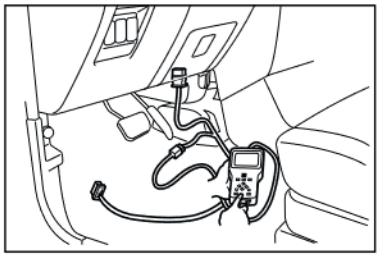
1. Ensure that the fuel tank is filled with sufficient fuel.
2. When DS-21 diagnosis tester is not used:
   (1) Remove the fuel pump relay and connect a jump wire, as indicated in the illustration.
   SST: 09991-87403-000
   (2) Check that the pulsation damper screw rises when the ignition switch is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

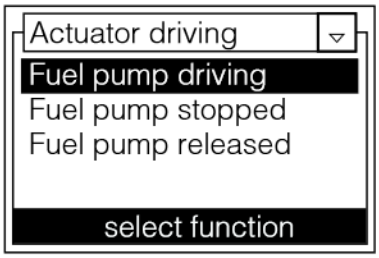
• When DS-21 diagnosis tester is not used:





• When DS-21 diagnosis tester is used:



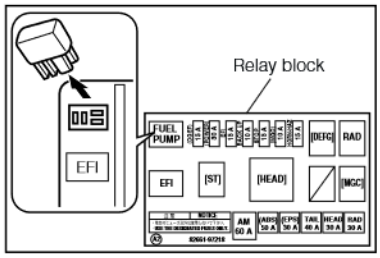


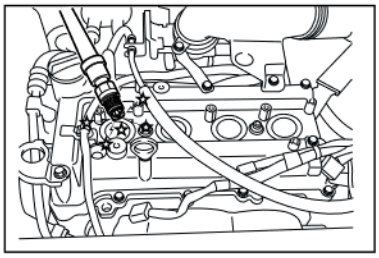
NO → Go to "Check of Fuel Pump and F/P Regulator".

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?



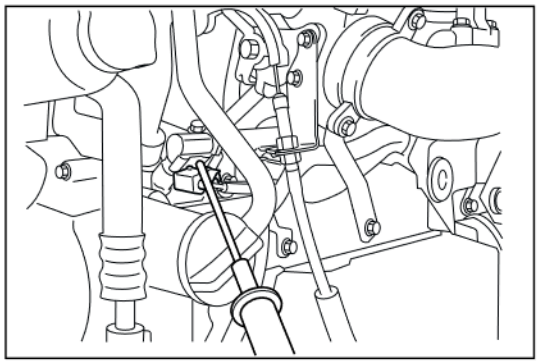


NO → Go to "Check of Ignition System."

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.

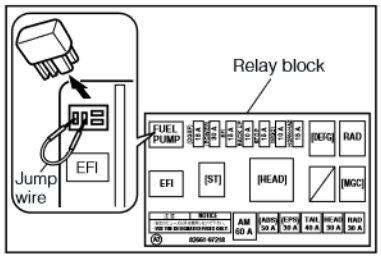
YEF00024-00016

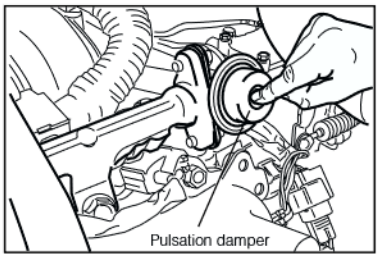
BASIC ENGINE CHECK (page 2 of 3) FOR S221

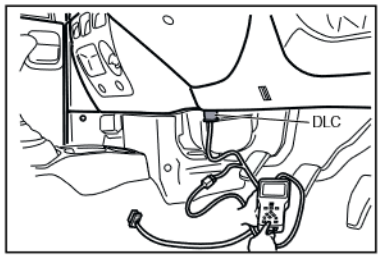
6 Fuel pressure check (simple check)

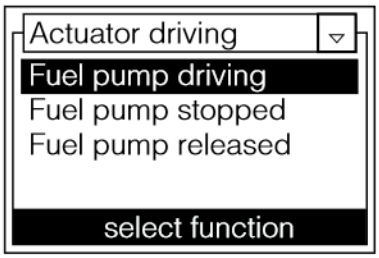
1. Ensure that the fuel tank is filled with sufficient fuel.
2. When DS-21 diagnosis tester is not used:
   (1) Remove the fuel pump relay and connect a jump wire, as indicated in the illustration.
   SST: 09991-87403-000
   (2) Check that the pulsation damper screw rises when the ignition switch is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







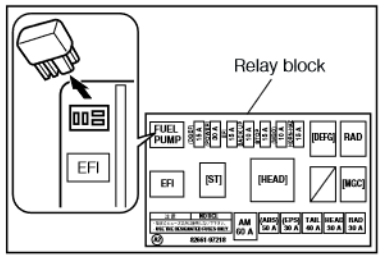


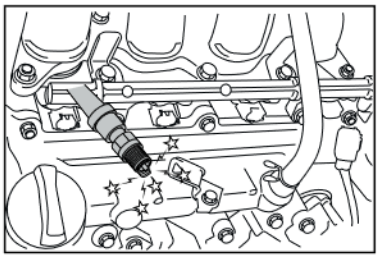
NO → Go to "Check of Fuel Pump and F/P Regulator".

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?



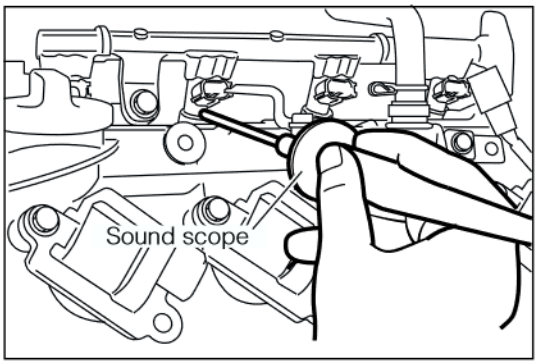


NO → Go to "Check of Ignition System."

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.

BASIC ENGINE CHECK (page 3 of 3) FOR M101, M201 and J102

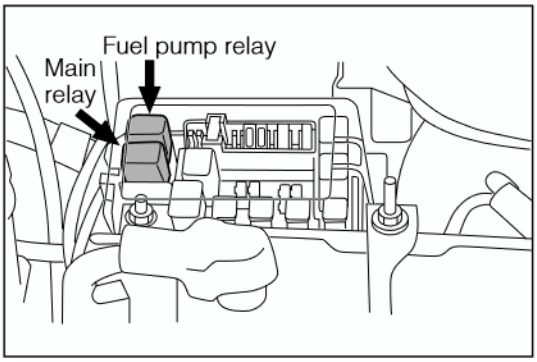
9	Inspection of compression pressure

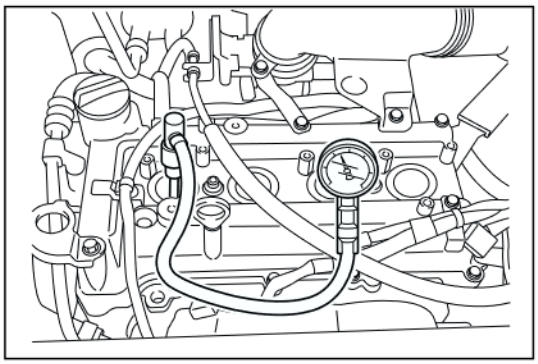
1. Warm up the engine.
2. With the IG switch turned OFF, remove all of the IG coils and spark plugs.
3. Temporarily remove the main relay and fuel pump relay.
4. Insert a compression gauge into the spark plug hole.
5. Depress the accelerator pedal fully.
6. While cranking the engine, measure the compression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





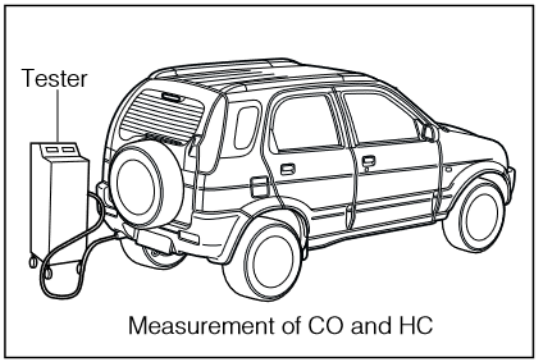
NO → Perform the checks, referring to the section EM.

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.

YEF00026-00018

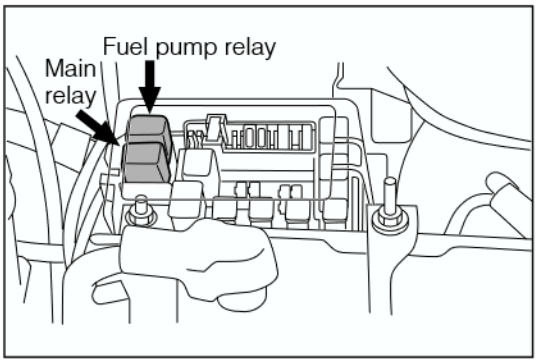
BASIC ENGINE CHECK (page 3 of 3) FOR S221

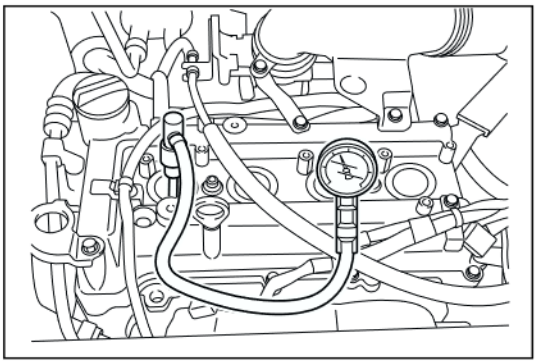
9 Inspection of compression pressure

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)

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





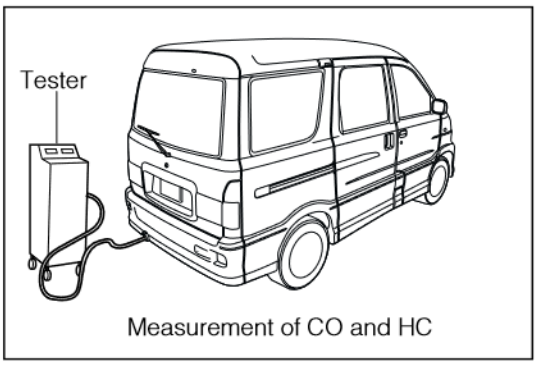
NO → Perform the checks, referring to the section EM.

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.

sEF00027-00019

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.

YEF00028-00000

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	M101 J102	650 - 750 rpm
					S221 M201	600 - 700 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.	M101, J102, M201		20 - 77 %
				S221		25 - 87.5 %
		O_2RV				0.05 - 0.95 V
☆	MIL ON RUN DIST (Distance since actwiation of MIL)	DWM	When there is no DTC			0 Km

YEF00029-00000

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 Ⓝ range to Ⓓ 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.

YEF00030-00000

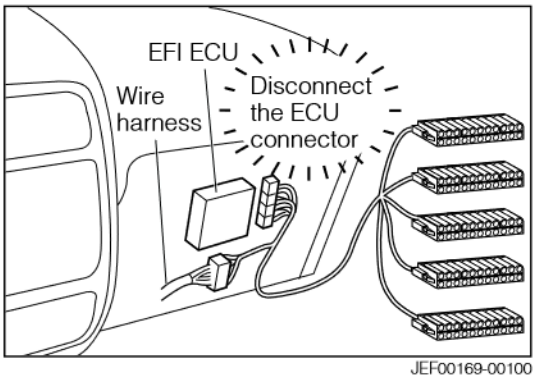
5.12 CHECK OF ECU AND ITS CIRCUIT

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:

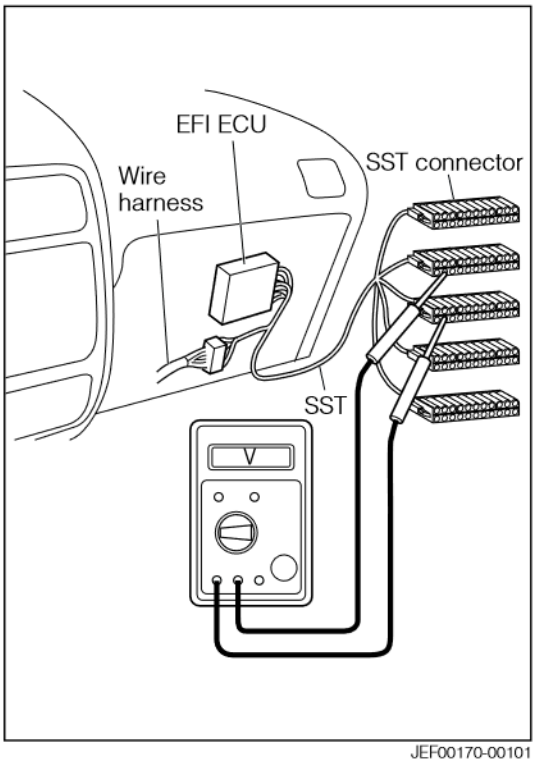
- The ECU cannot be checked by itself. Never connect a voltmeter or an ohmmeter to the ECU with the connector disconnected from the ECU.
- When conducting the continuity test or measuring the resistance, turn OFF the ignition switch once. Then, disconnect the connector at the ECU.



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, M201, J102 AND S221

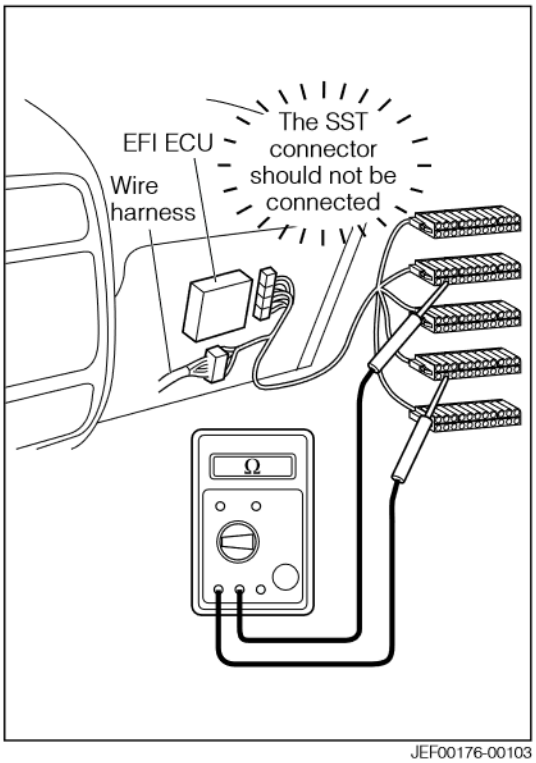
System to be checked		Terminals	Measurement conditions	Reference values
Power supply system		⑦ (+B1) - ㉓ (E1)	When IG is "ON"	Battery voltage
		㊱ (+B2) - ㉓ (E1)	When IG is "ON"	
		① (BAT) - ㉓ (E1)	At all times	
Pressure sensor system		㊻ (VCPM) - ㊼ (E2PM)	When IG is "ON"	4.5 - 5.5 V
		⑮ (PIM) - ㊼ (E2PM)	Sensor released to atmosphere	3.3 - 4.0 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
	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		㊹ (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)
Ⓟ, Ⓝ range signal detecting system		⑪ (A/T) - ㉓ (E1)	Ⓟ, Ⓝ range	0 - 0.5 V
			Other than Ⓟ, Ⓝ 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	㉜ (VCO) - ㉙ (E21)	When ignition switch is “ON”	4.5 - 5.5 V
	㉝ (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.

JEF00177-00000

STANDARD RESISTANCES FOR M101, M201, J102 AND S221

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	㊾ (PRG) - ⑦ (+B1)	Purge control VSV	30 - 34 Ω
A/F adjuster	㊷ (VCO) - ㉙ (E21)	A/F adjuster	3500 - 6500 Ω
Ground system	㉓ (E1) - Body ground	Ground	10 Ω or less
	㉜ (E01) - Body ground		

YEF00032-00000

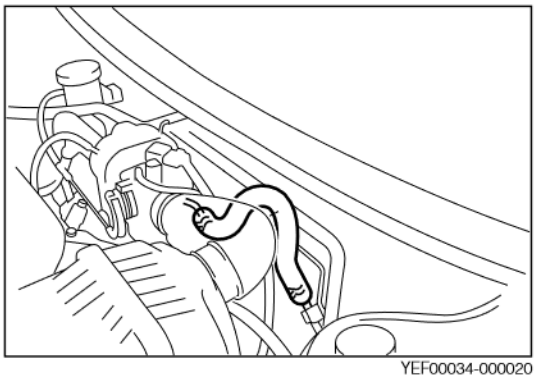
5.13 INSPECTION PROCEDURE FOR FUEL SYSTEM

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.

YEF00033-00000

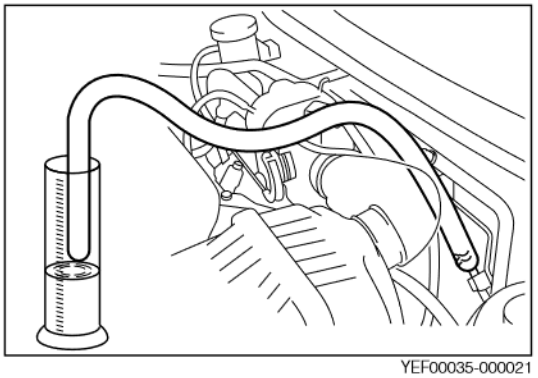
5.13.1 INSPECTION OF FUEL FLOW

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.



YEF00034-000020

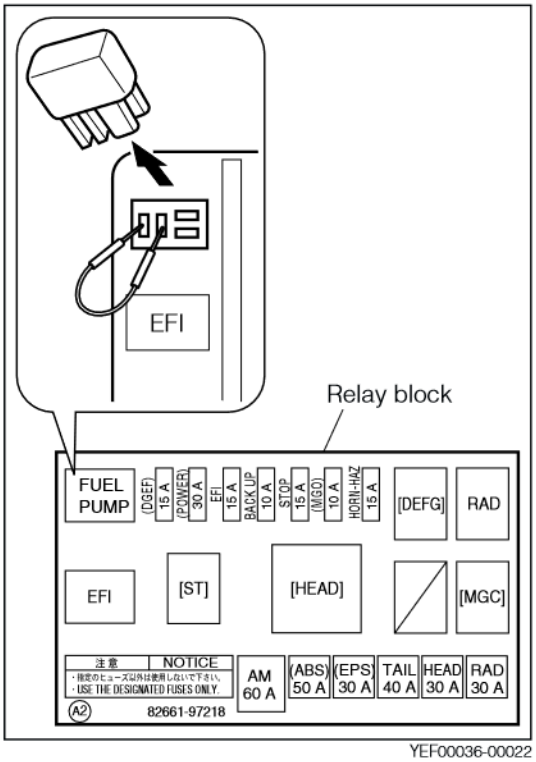
3. Insert one end of the fuel hose in a measuring cylinder.
   CAUTION:
   - Even after the fuel pressure has been released, the fuel line still has a slight residual pressure.
     Hence, be sure to gradually remove the pipe so as to prevent fuel from splashing.
   - Since the fuel will flow out, be 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.



YEF00035-000021

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.

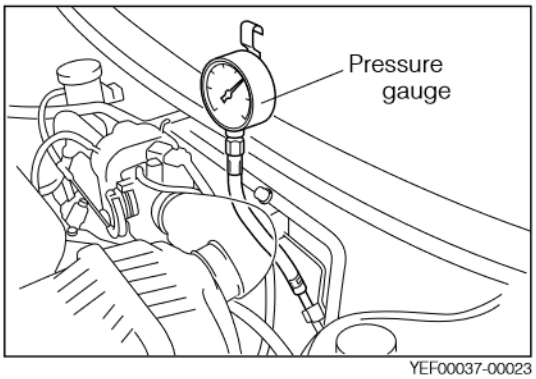


YEF00036-00022

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

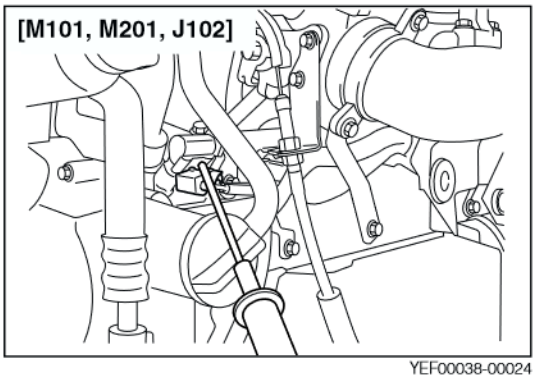
NOTE:
- If the fuel pressure is less than the specification, check the fuel pump.



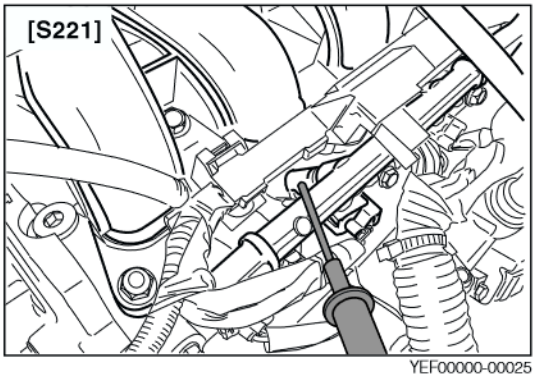
YEF00037-00023

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.



YEF00038-00024



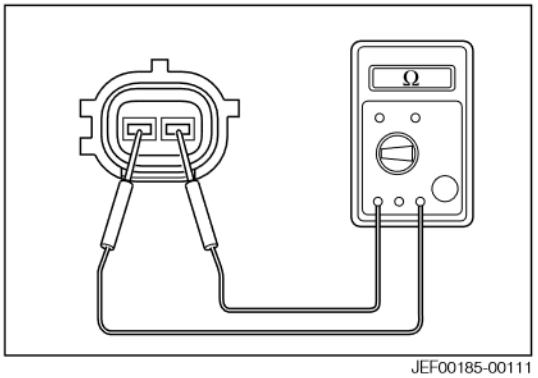
YEF00000-00025

2. Disconnect the injector connector of the engine wire.
3. Remove the fuel delivery pipe. Then, remove the injectors.
   CAUTION:
   - Even after the fuel pressure has been released, the fuel line still has a slight residual pressure. Therefore, make sure to put a cloth or the like to prevent fuel from splashing.

4. Measure the resistance between the terminals of each injector.
   Specified Resistance: 13.4 - 14.2 (at 20°C)

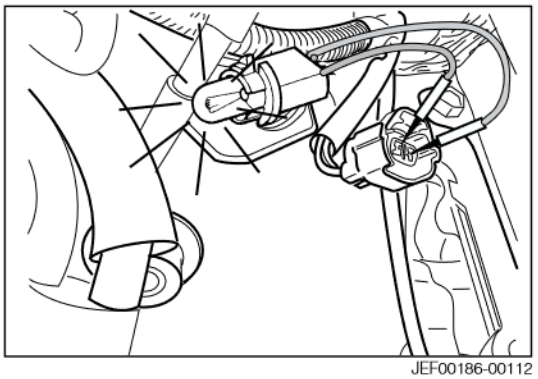
   NOTE:
   - If the resistance is not within the specification, replace the injector.
   - If the resistance will conform to the specification, perform the following procedure.

5. Remove the fuel pump relay.

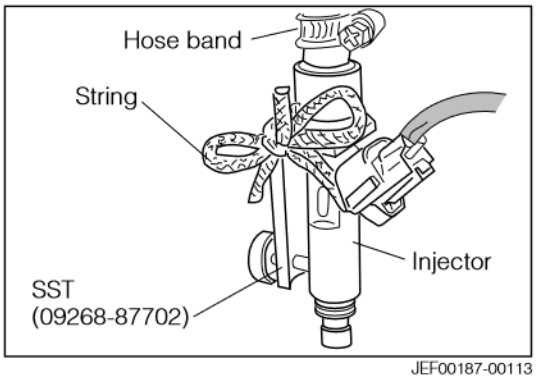


JEF00185-00111

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.

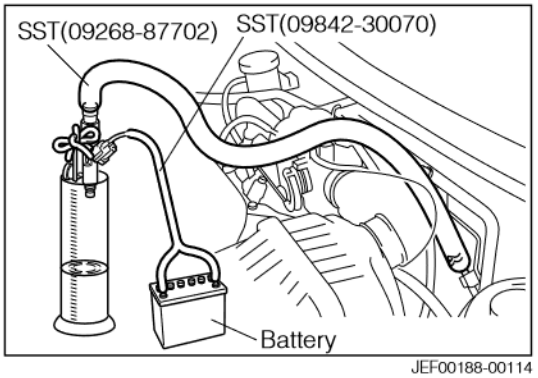

JEF00186-00112

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.

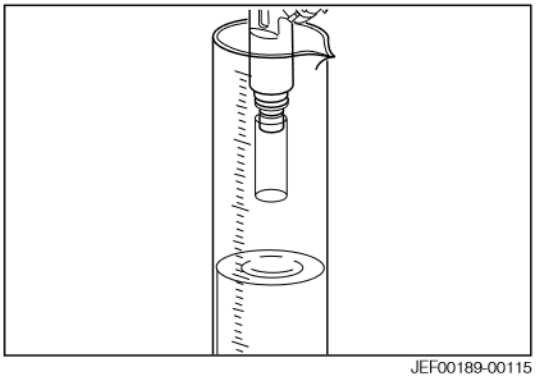


JEF00188-00114

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

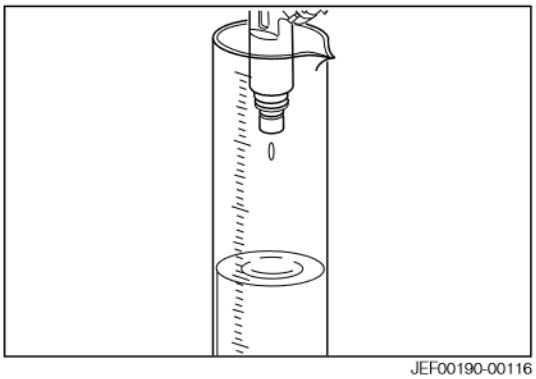
Specified Amount of Fuel	Approx. 40 - 54 ml
Variation Between Injectors	5 ml or less

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.

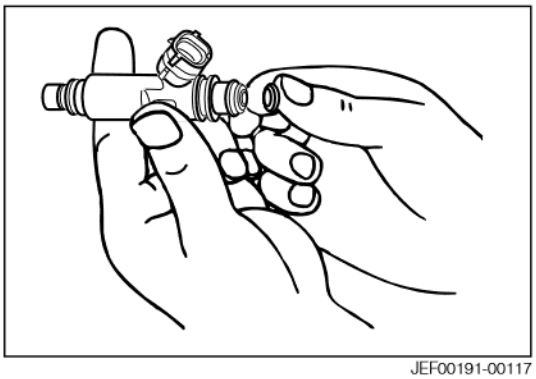

JEF00189-00115

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

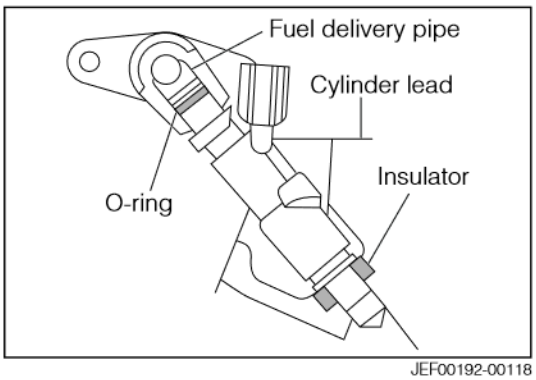
NOTE:
- If the leakage exceeds the specified value, replace the injector.


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.

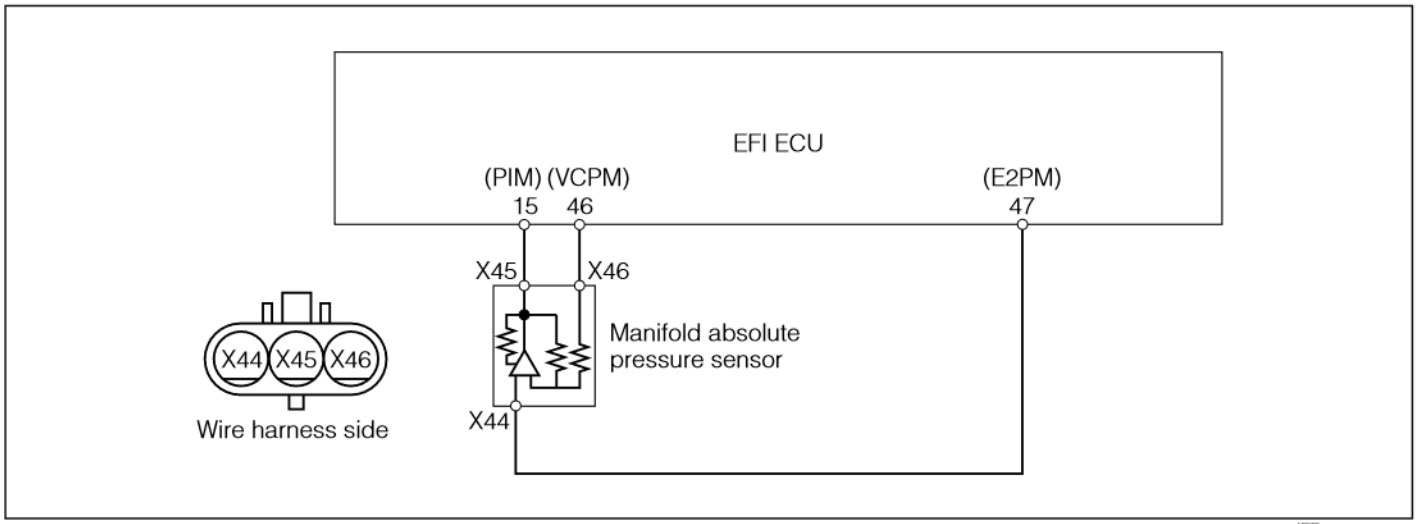


JEF00192-00118

5.14 CIRCUIT INSPECTION

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

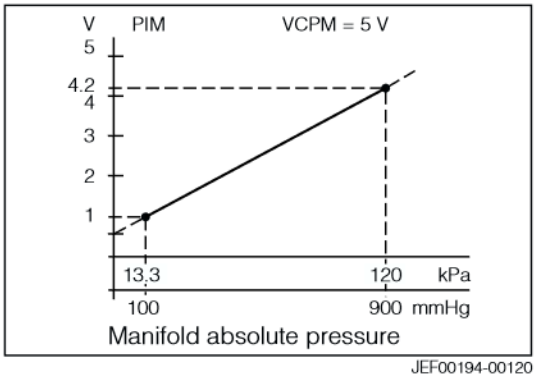
WIRING DIAGRAM



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”

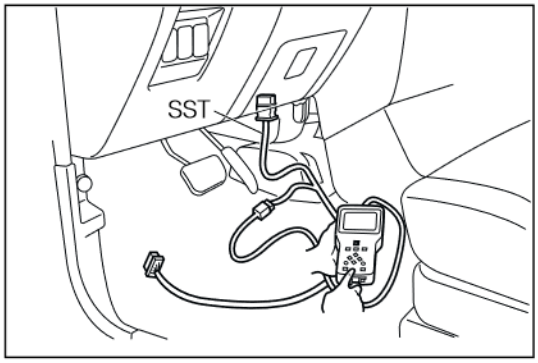
Manifold absolute pressure	Trouble area
0 kPa	PIM circuit short
130 kPa or more	VCPM circuit open or short PIM circuit open E2PM circuit open

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)?



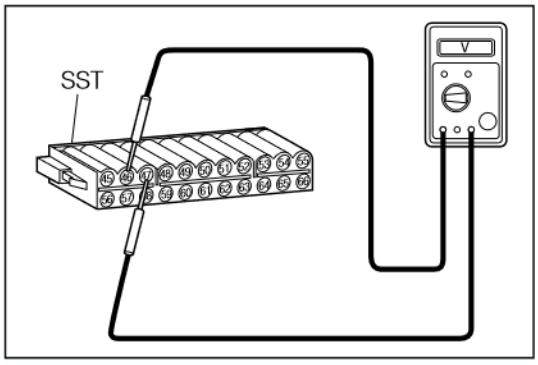
YES → Check malfunction that occurs intermittently or poor contact. (Refer to page EF–51.)

NO ↓

2 Check of power supply voltage of MAP sensor

1. 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.



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

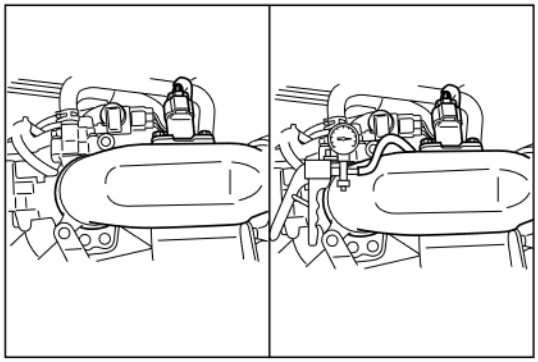
YES ↓

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?

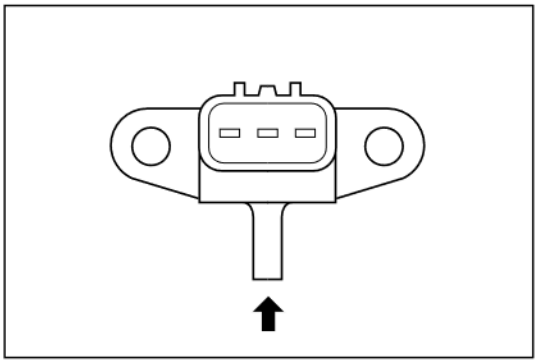
YES

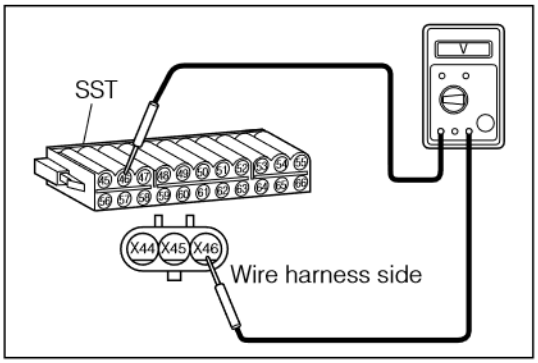
Check and replacement of vacuum hose and MAP sensor
If the vacuum hose has restriction or rapture, replace the vacuum hose. If the vacuum hose does not have it, replace the MAP sensor.

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

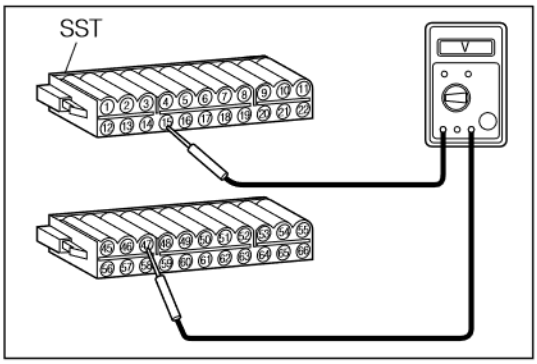
Check malfunction that occurs intermittently or poor contact. (Refer to page EF–51.)

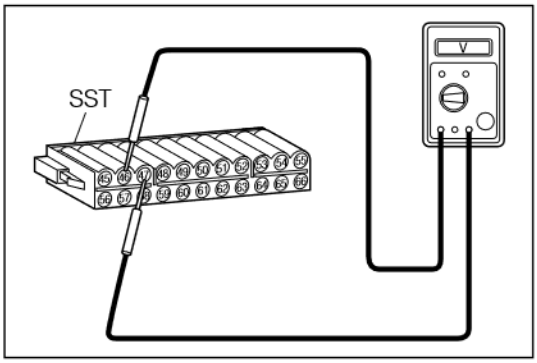
NO

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.)

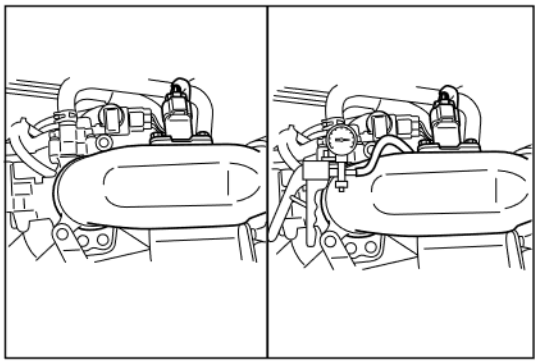
YES

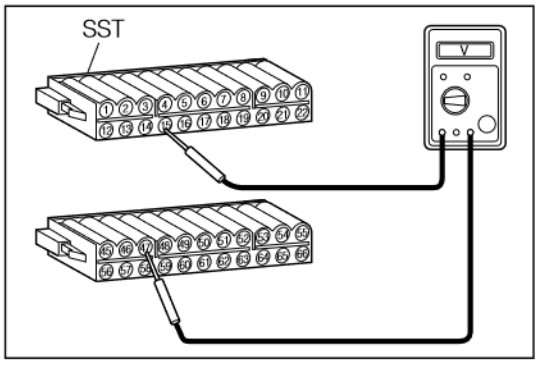
3 Check of MAP sensor

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)	1.5 - 1.8 V

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



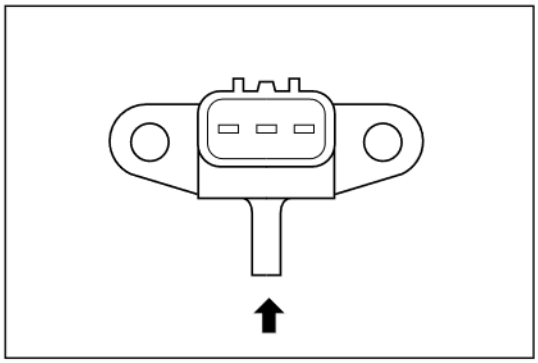


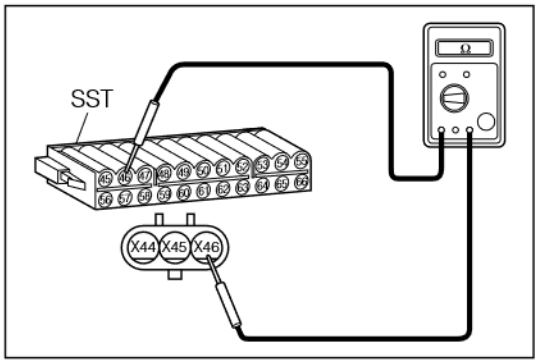
YES → Check for intermittent trouble caused by freeze in vacuum passage, wire harness or connector. (Refer to EF–48.)

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

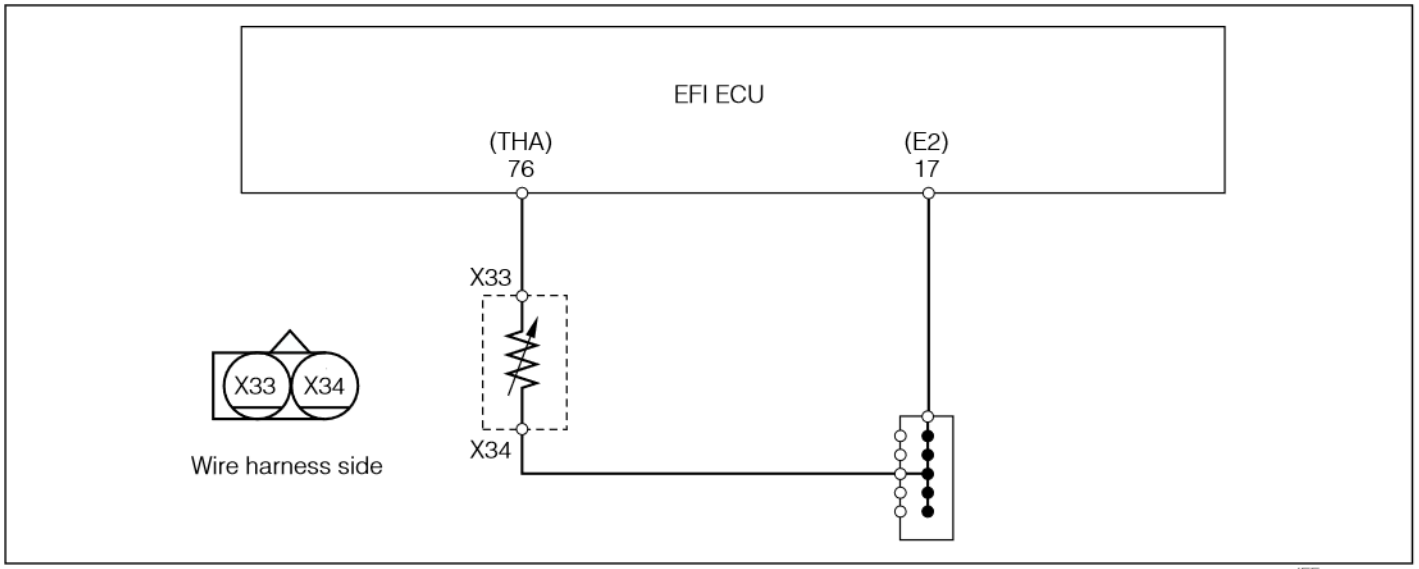
Check and replacement of vacuum hose and MAP sensor
If the vacuum hose has restriction or rapture, replace the vacuum hose. If the vacuum hose does not have it, replace the MAP sensor.

NO → Repair or replace of harness or connector.

JEF00196-00122

DTC	P0110/43	Intake Air Temp. Circuit Malfunction

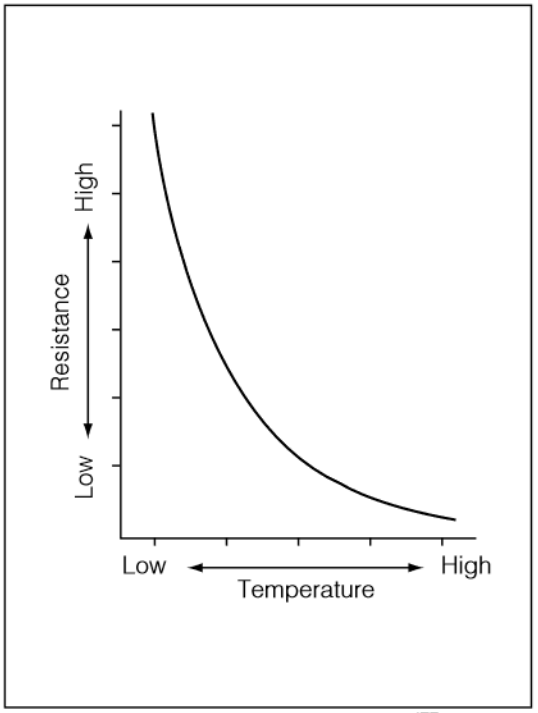
WIRING DIAGRAM



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

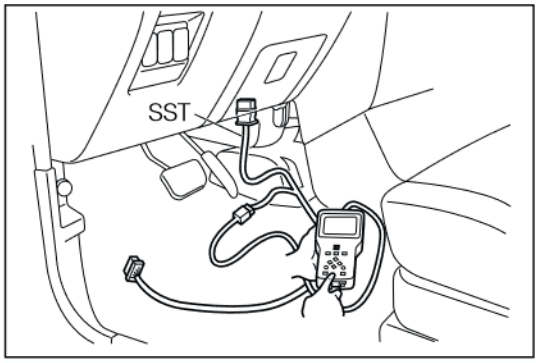
NOTE:

- 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.)

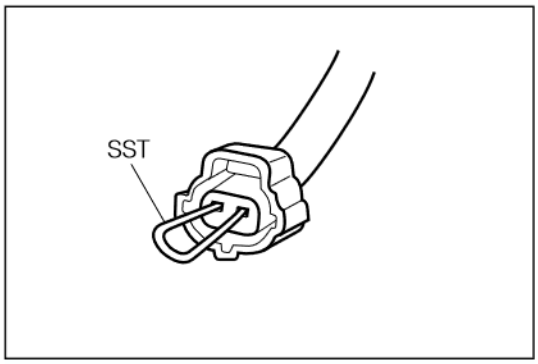
NO

–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

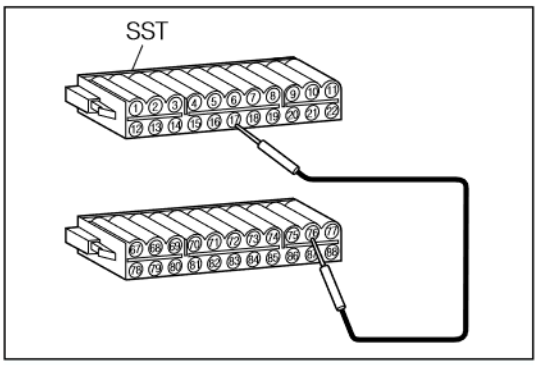
Go to Step 3.

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?

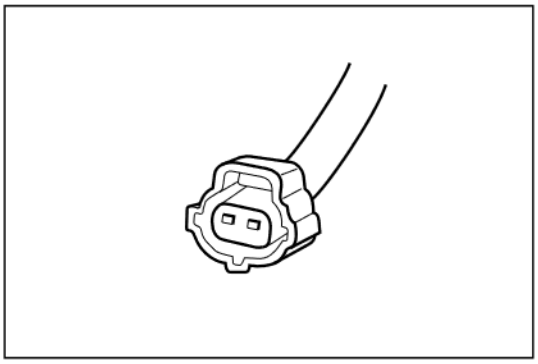


YES → The harness between the IAT sensor and the ECU is open. Repair or replace the harness.

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)**

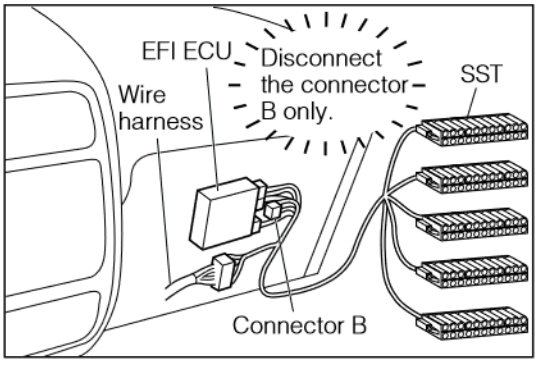
1. After turning OFF the main switch of the tester, turn OFF the IG switch.
2. Disconnect the connector of the intake air temperature (IAT) sensor.
3. After turning ON the IG switch, turn ON the main switch of the tester. Read the intake air temperature value of the DS-21 diagnosis tester or OBD Ⅱ generic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



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 → Replace the IAT sensor.



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

YES → Repair or replace the harness or connector.

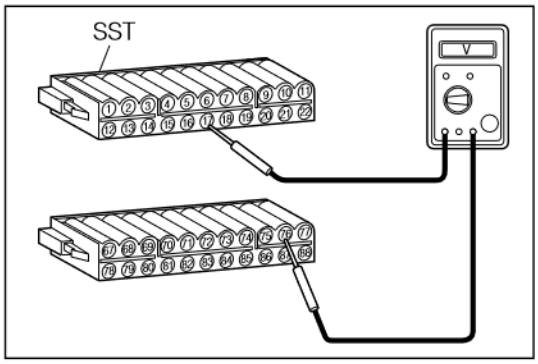
When not using DS-21 diagnosis tester or OBD II generic scan tool:

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?

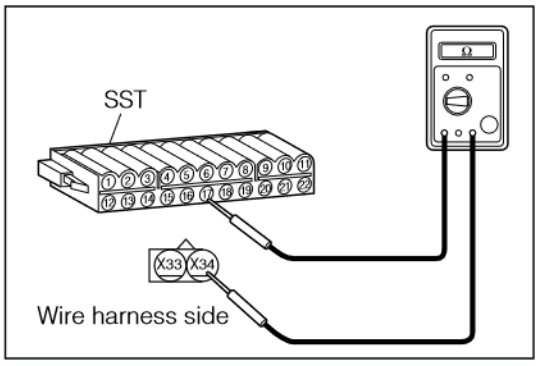


YES → Check malfunction that occurs intermittently or poor contact. (Refer to page EF–51.)

NO ↓

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?



NO → Repair or replace the harness or connector.

YES ↓

3 Check of IAT sensor

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

NO → Replace the IAT sensor.

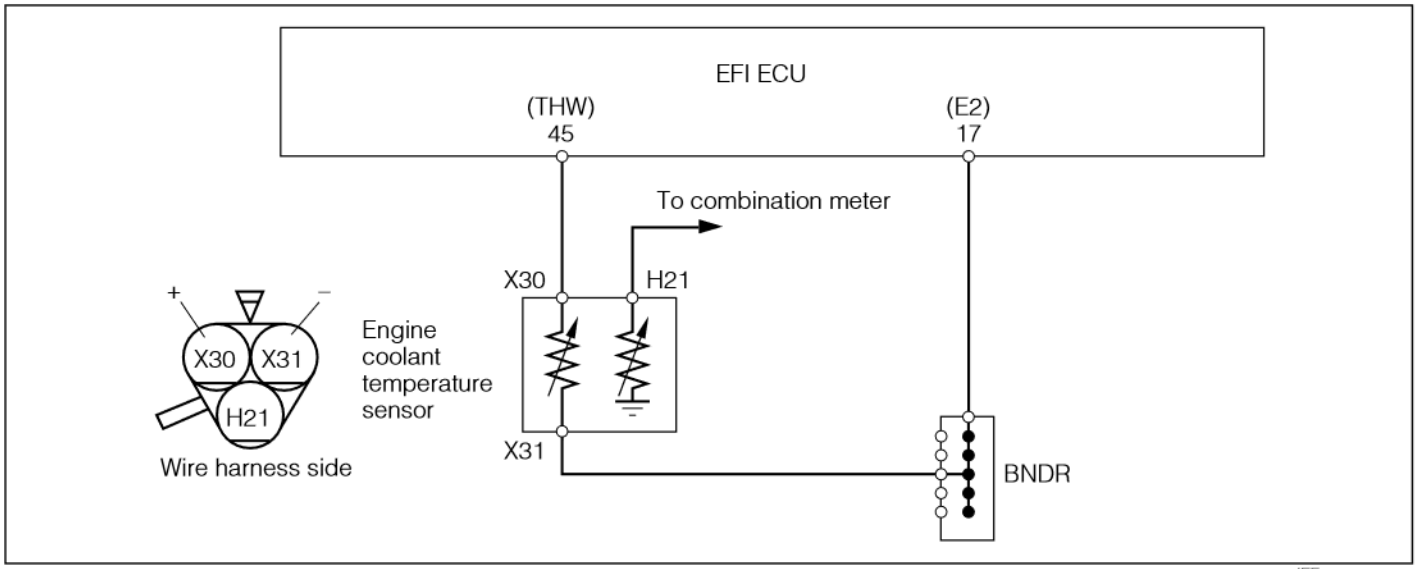
YES ↓

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

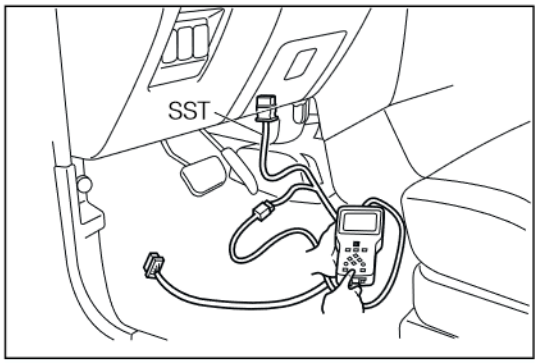
NOTE:
- If DTC P0110/43 (Intake Air Temp. Circuit Malfunction), P0115/42 (Engine Coolant Temp. Circuit Malfunction), P0120/41 (Throttle/Pedal Position Sensor/Switch “A” Malfunction) are output simultaneously, E2 (Sensor Ground) may be open.
- Read freeze frame data using DS-21 diagnosis tester or OBD 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

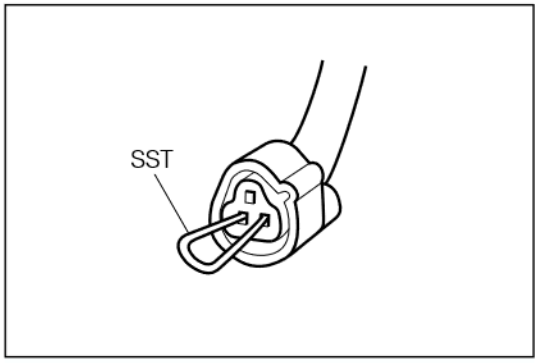
Check malfunction that occurs intermittently or poor contact. (Refer to page EF–51.)

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

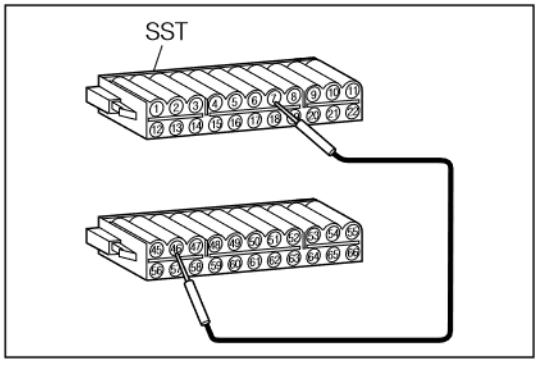
Go to Step 3.

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 ㊻ 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

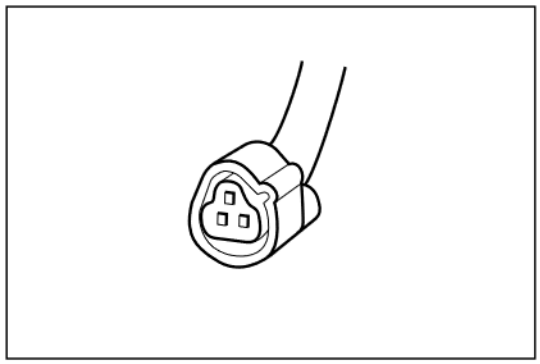
The harness between the ECT sensor and the ECU is open. Repair or replace the harness.

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?



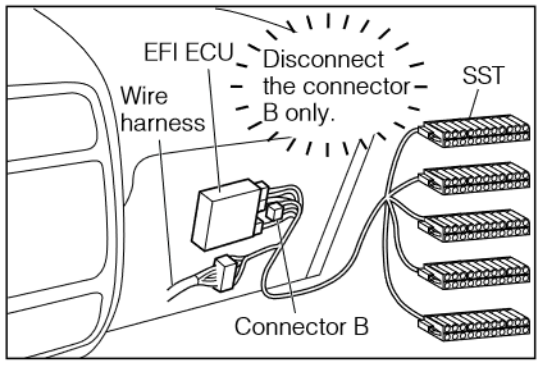
YES

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

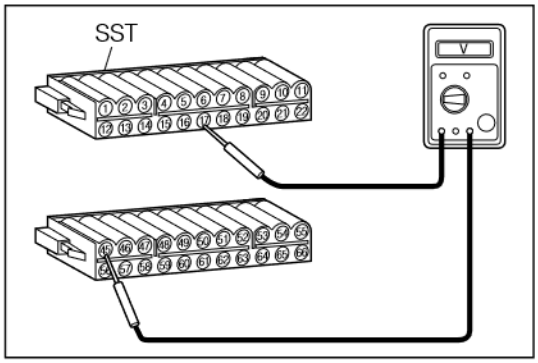
When not using DS-21 diagnosis tester or OBD II generic scan tool:

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?

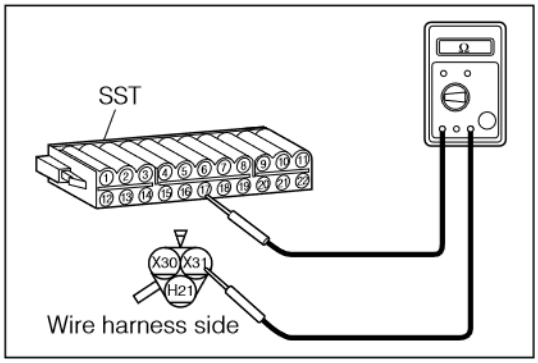


NO

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.

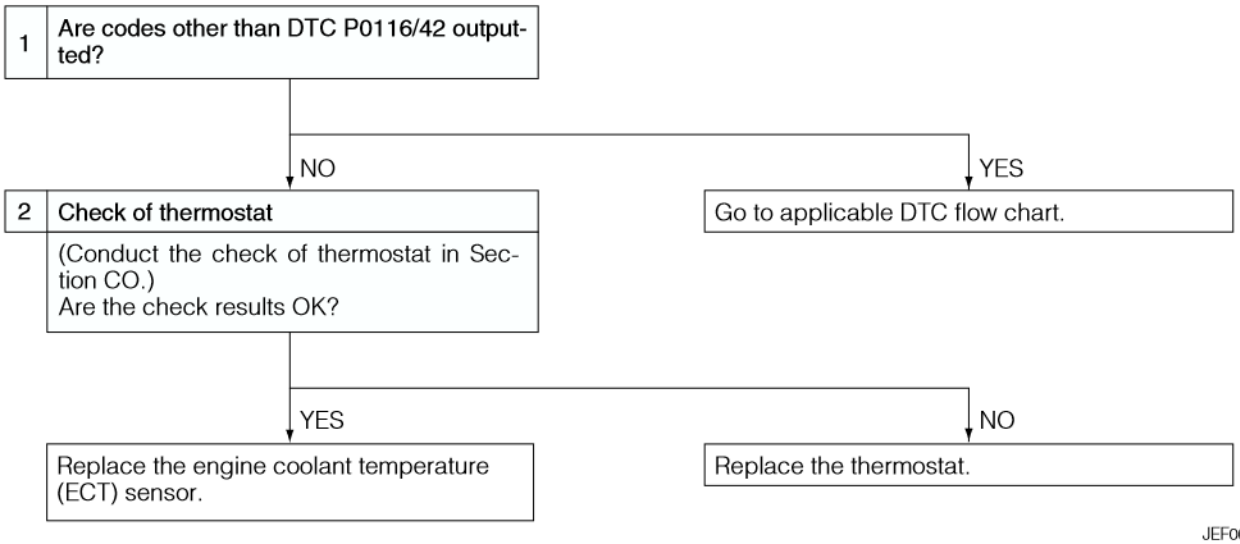
DTC No.	DTC Detecting condition	Trouble area
P0116/42	When the engine starts, the engine coolant temp. is between –7.5°C or more and less than 40°C. And 5 min. or more after the engine starts, engine coolant temp. sensor value is 40°C or less. (2 trip detection logic)	• Engine coolant temp. sensor •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

JEF00206-00000

INSPECTION PROCEDURE

NOTE:

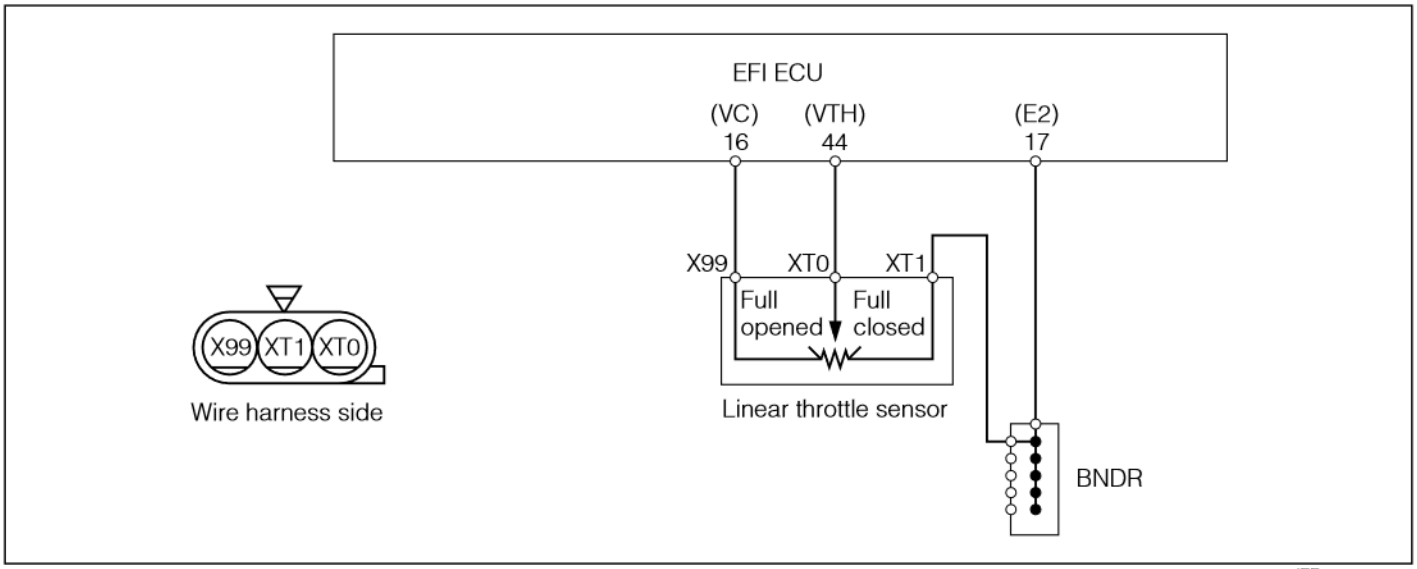
- If DTC "P0115/42" (Engine Coolant Temp. Circuit Malfunction) and "P0116/42" (Engine Coolant Temp. Circuit Range/Performance Problem) are output simultaneously, engine coolant temp. sensor circuit may be open. Perform troubleshooting of DTC P0115/42 first.
- Read the freeze frame data, using the DS-21 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

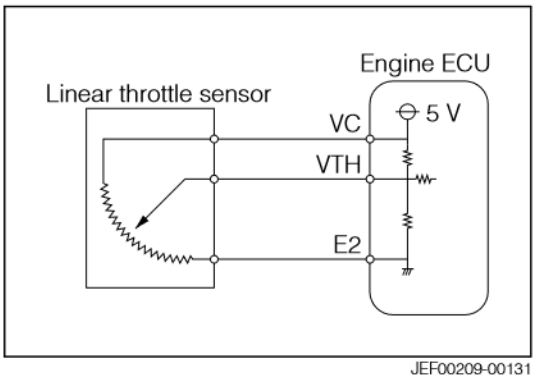
WIRING DIAGRAM



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:

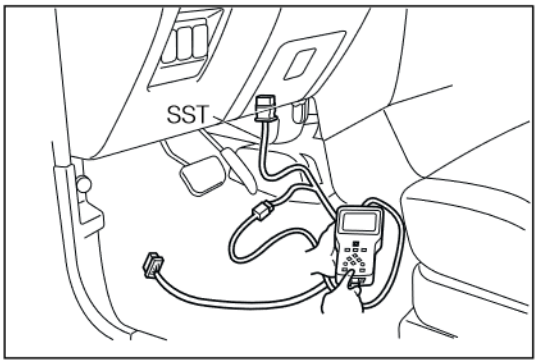
1 Check of output value of liner throttle sensor

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?



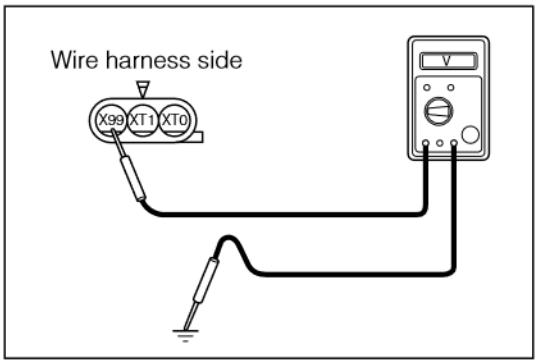
YES → Check malfunction that occurs intermittently or poor contact. (Refer to page EF–51.)

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.

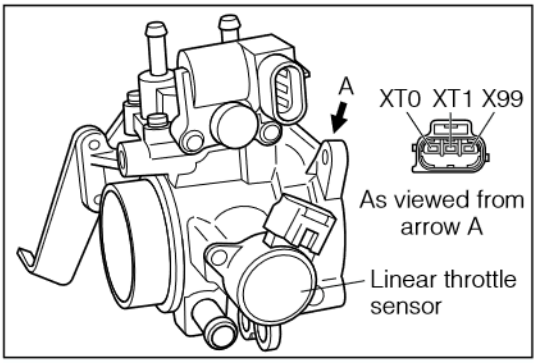
YES ↓

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?



YES

4 Check of ECU input signal VTH

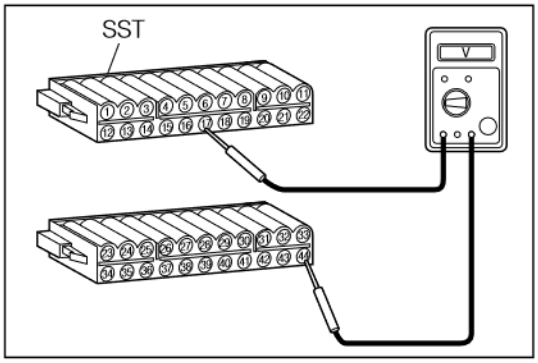
1. Set the SST (sub-harness). (Refer to page EF–8.)
2. With the IG switch turned ON, measure the voltage between the SST connector ㊹ and ⑰ (VTH-E2) under the following condition given below.

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

Replace the linear throttle sensor.



YES

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

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.)

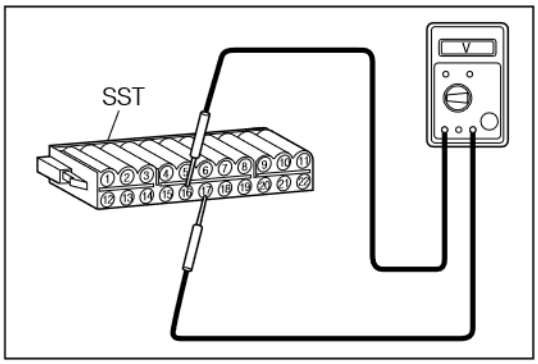
5 Check of power supply voltage at linear throttle sensor ECU side

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.**



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.)

NO

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

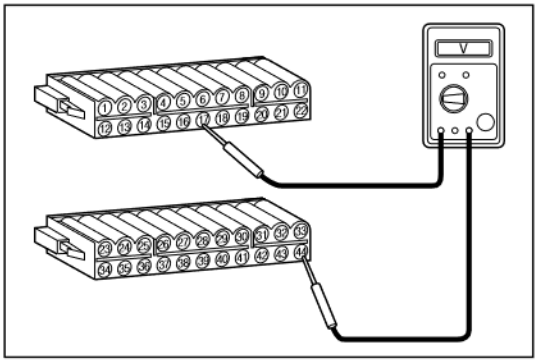
When not using DS-21 diagnosis tester or OBD II generic scan tool:

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.)

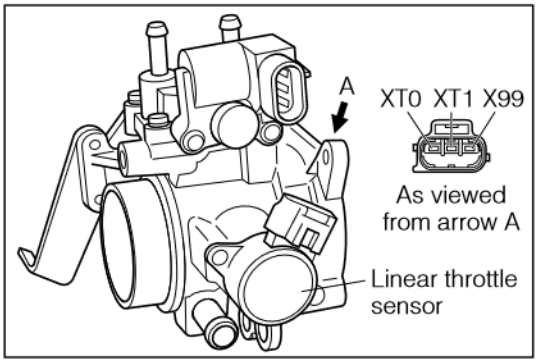
NO ↓

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 ↓

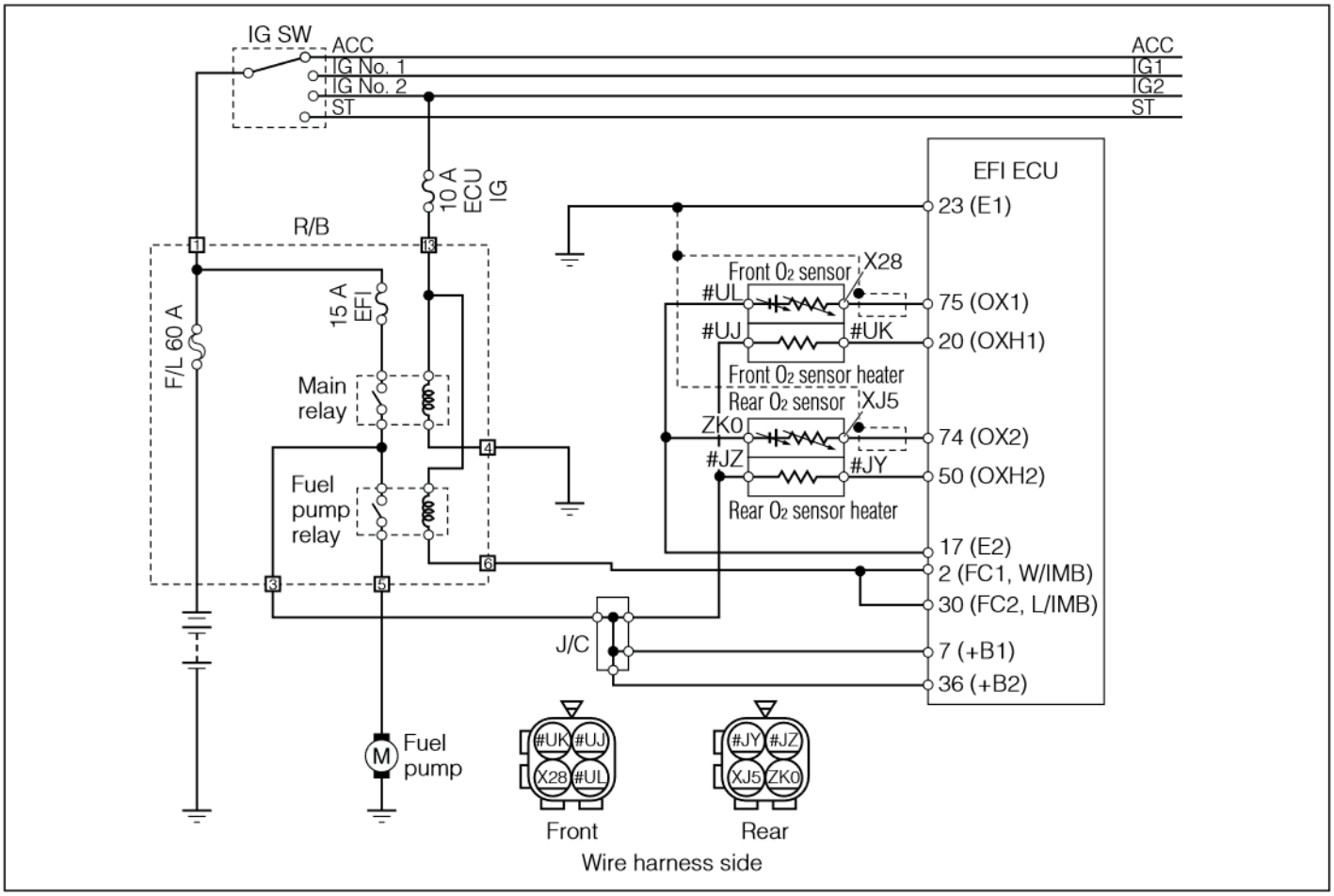
Check or replace the engine ECU. (Refer to page EF–51.)

NO → Repair or replace the harness or connector.

JEF00211-00133

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

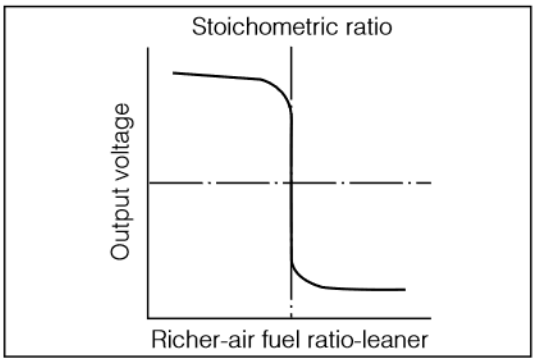
WIRING DIAGRAM



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.

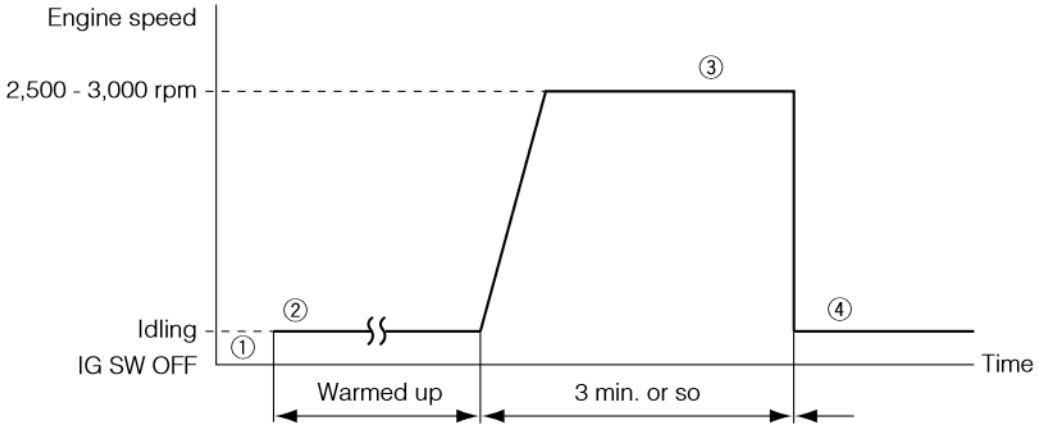


JEF00213-00135

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?

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?

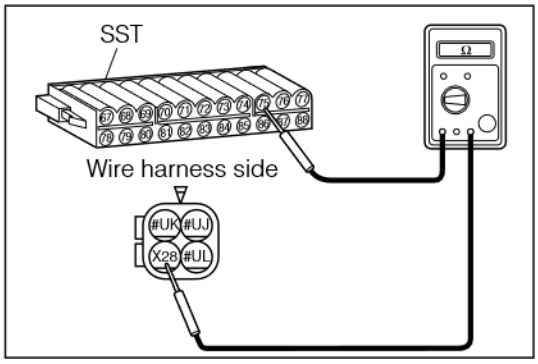
YES

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.)

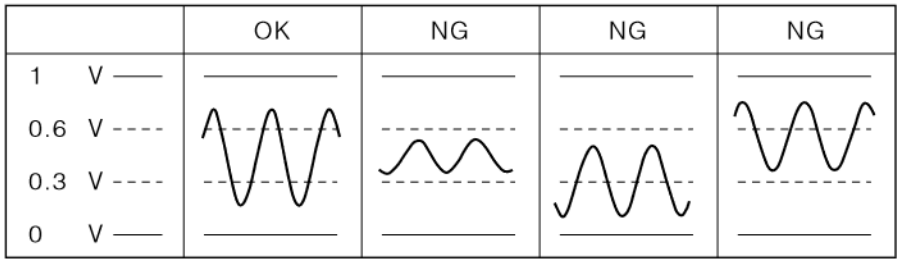
YES

Go to the relative DTC chart.



NO

Repair or replace the harness or connector.



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

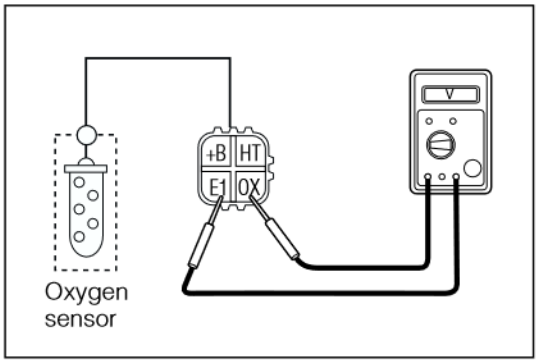
9 Check of output voltage of oxygen sensor unit

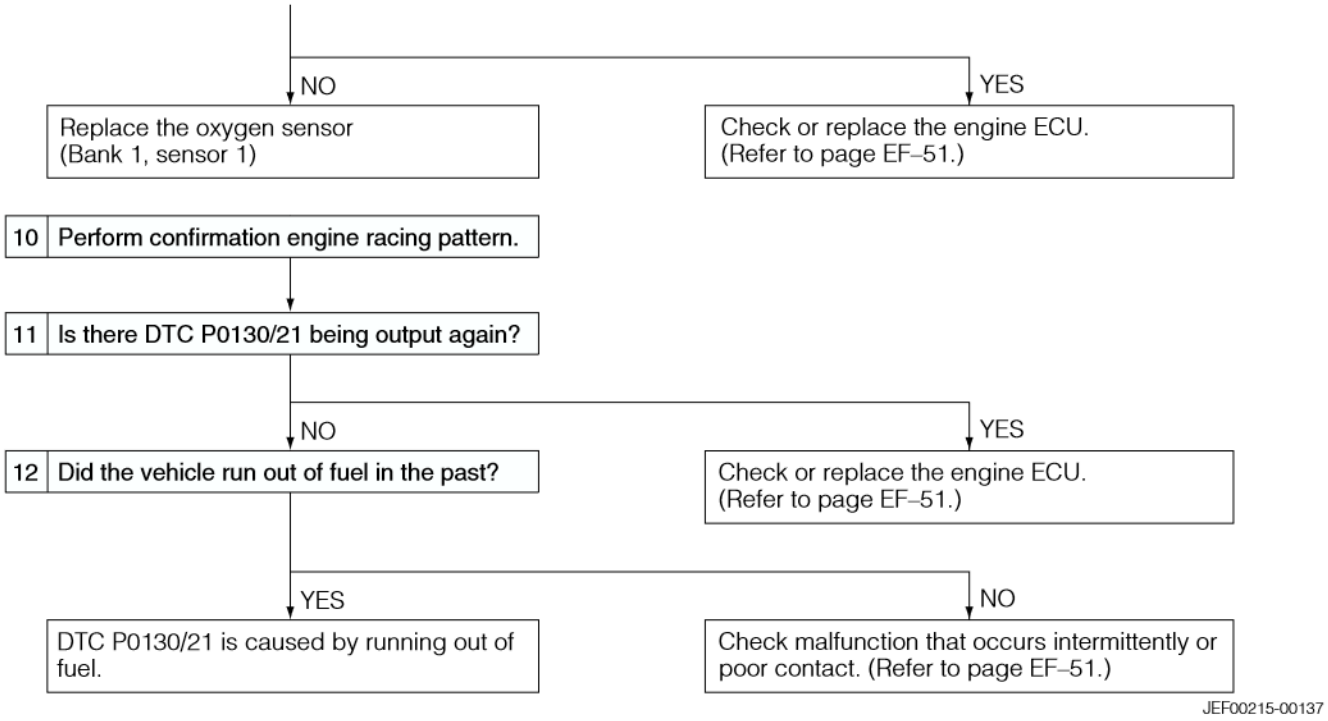
1. Warm up engine completely
2. Disconnect the connector of the oxygen sensor with IG switch OFF
3. Connect a voltmeter to the connector terminal of oxygen sensor
4. Hold the engine racing speed for 3 minutes at 2000 rpm.
   at this time, ensure that the reading of the volt meter is within the specified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

DTC	P0133/21	Oxygen Sensor Circuit Slow Response (Bank 1 Sensor 1)

WIRING DIAGRAM

Refer to DTC P0130/21 (Oxygen sensor circuit malfunction (Bank 1 sensor 1))

JEF00216-00000

CIRCUIT DESCRIPTION

Refer to DTC P0130/21 (Oxygen sensor circuit malfunction (Bank 1 sensor 1))

DTC No.	DTC Detecting condition	Trouble area
P0133/21	Response time for heated oxygen sensor voltage output to change from rich to lean, or form lean to rich, is more than a certain length of time 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 refers to the sensor closer to the engine block.

JEF00217-00000

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?

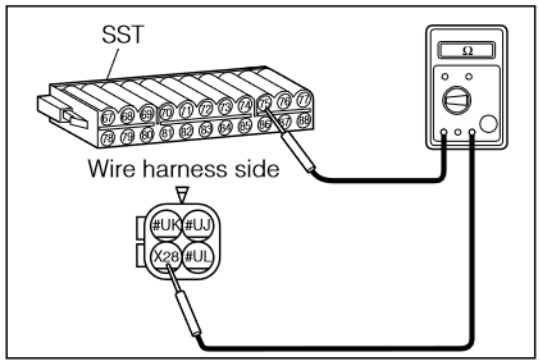
NO

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 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

Go to the relative DTC chart.



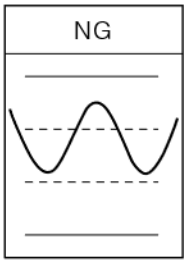
YES

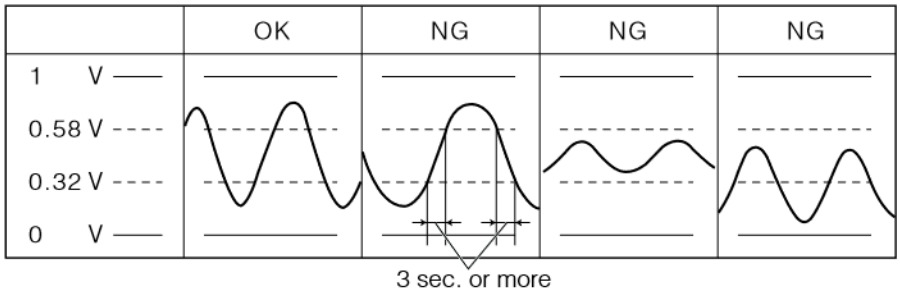
NO

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. Turn OFF all accessory switches. Warm up the engine at 2500 rpm, until the radiator fan makes one turn.
4. Turn ON the main switch of the tester. Read the output voltage of the oxygen sensor when the engine is idling and the radiator fan is not operating.
   Specified Value:
   The voltage varies repeatedly between a range from a voltage below 0.32 V and to a voltage above 0.58 V. (See the diagram below.)

Repair or replace the harness or connector.





NO

YES

4	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.

Go to Step 8.

YES

NO

5	Check of fuel pressure

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

Repair or replace induction system.

YES

NO

6	Check of injector injection

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

Check and repair fuel pump, fuel pipe line and filter.

YES

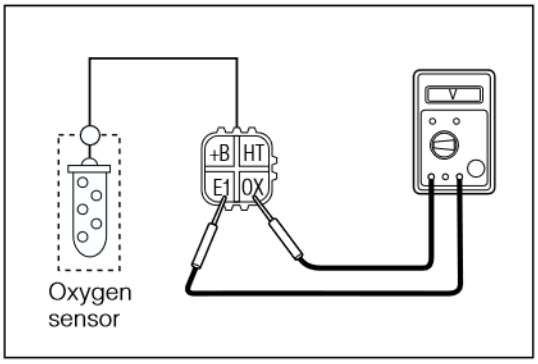
7	Check of output voltage of oxygen sensor unit

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

Replace the injector.



NO

Replace the oxygen sensor. (Bank 1, sensor 1)

YES

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

8	Perform confirmation engine racing pattern.

(Refer to DTC P0130/21 chart)

9	Is there DTC P0133/21 being output again?

YES

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

NO

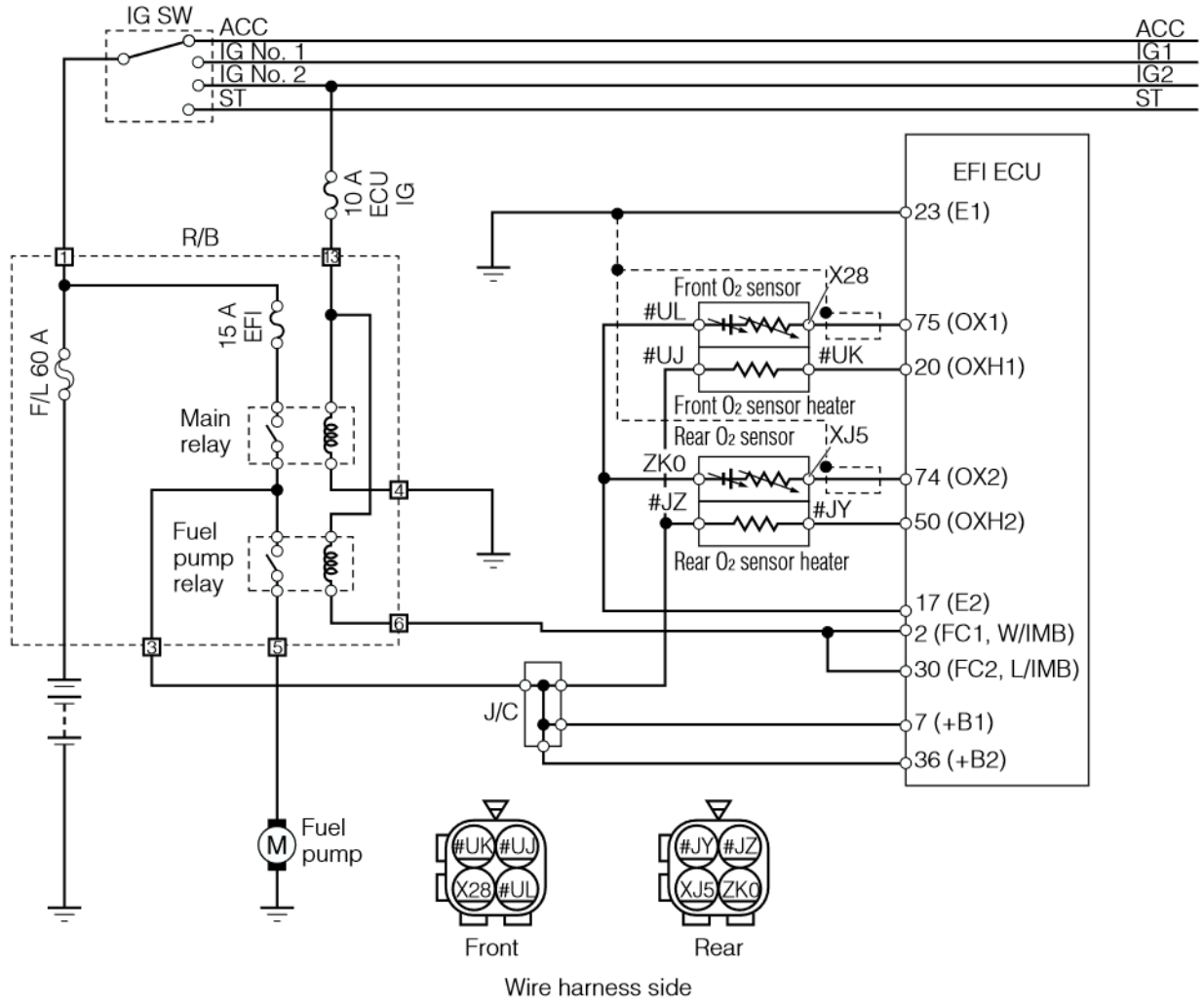
Check malfunction that occurs intermittently or poor contact. (Refer to page EF–51.)

JEF00218-00138

DTC	P0135/23	Oxygen Sensor Heater Circuit Malfunction (Bank 1 Sensor 1)

DTC	P0141/24	Oxygen Sensor Heater Circuit Malfunction (Bank 1 Sensor 2)

WIRING DIAGRAM



JEF00219-00139

CIRCUIT DESCRIPTION

Refer to DTC P0130/21 (Oxygen sensor circuit malfunction (Bank 1 sensor 1))

DTC No.	DTC Detecting condition	Trouble area
P0135/23 P0141/24	When the battery voltage is above 7.5 V and the heater terminal voltage of the ECU is above 1.0 V when the heater is operating or below 7.5 V when the heater is not operating: (2 trip detection logic)	• Open wire or short in heater circuit of oxygen sensor • Oxygen sensor heater • Engine ECU

JEF00220-00000

INSPECTION PROCEDURE

NOTE:

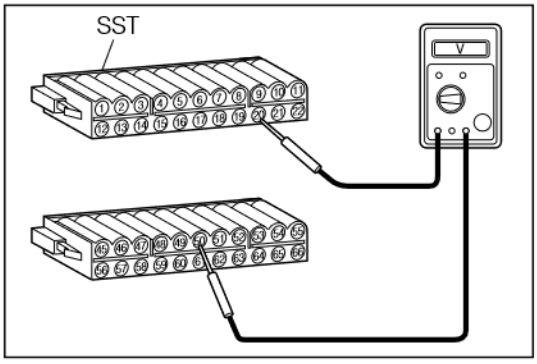
- Read the freeze frame data, using the DS-21 diagnosis tester or OBD Ⅱ generic scan tool. Because the freeze frame data records the engine conditions when the malfunction was detected, when troubleshooting the freeze frame data is useful to determine whether the vehicle was running or stopped, the engine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

1 Check of output voltage of ECU

1. Set the SST (sub-harness). (Refer to page EF–8.)
2. Measure the voltage between the SST connectors ⑳ (OXH1), ㊿ (OXH2) and the body ground under the following conditions given below.

	Measurement conditions	
	IG switch ON	After engine started
Front oxygen sensor	Battery voltage	Below 1.0 V/Immediately after
Rear oxygen sensor	Battery voltage	Below 1.0 V/After more than 3 minutes

Are the check results OK?



NO

2 Unit check of oxygen sensor

Check the resistance of the front and rear oxygen sensor heaters.
(Refer to page EF–188.)
Are the unit check results OK?

YES

Check and repair the harness or connector between the main relay and oxygen sensor and the engine ECU.
(Refer to page EF–48.)

YES

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

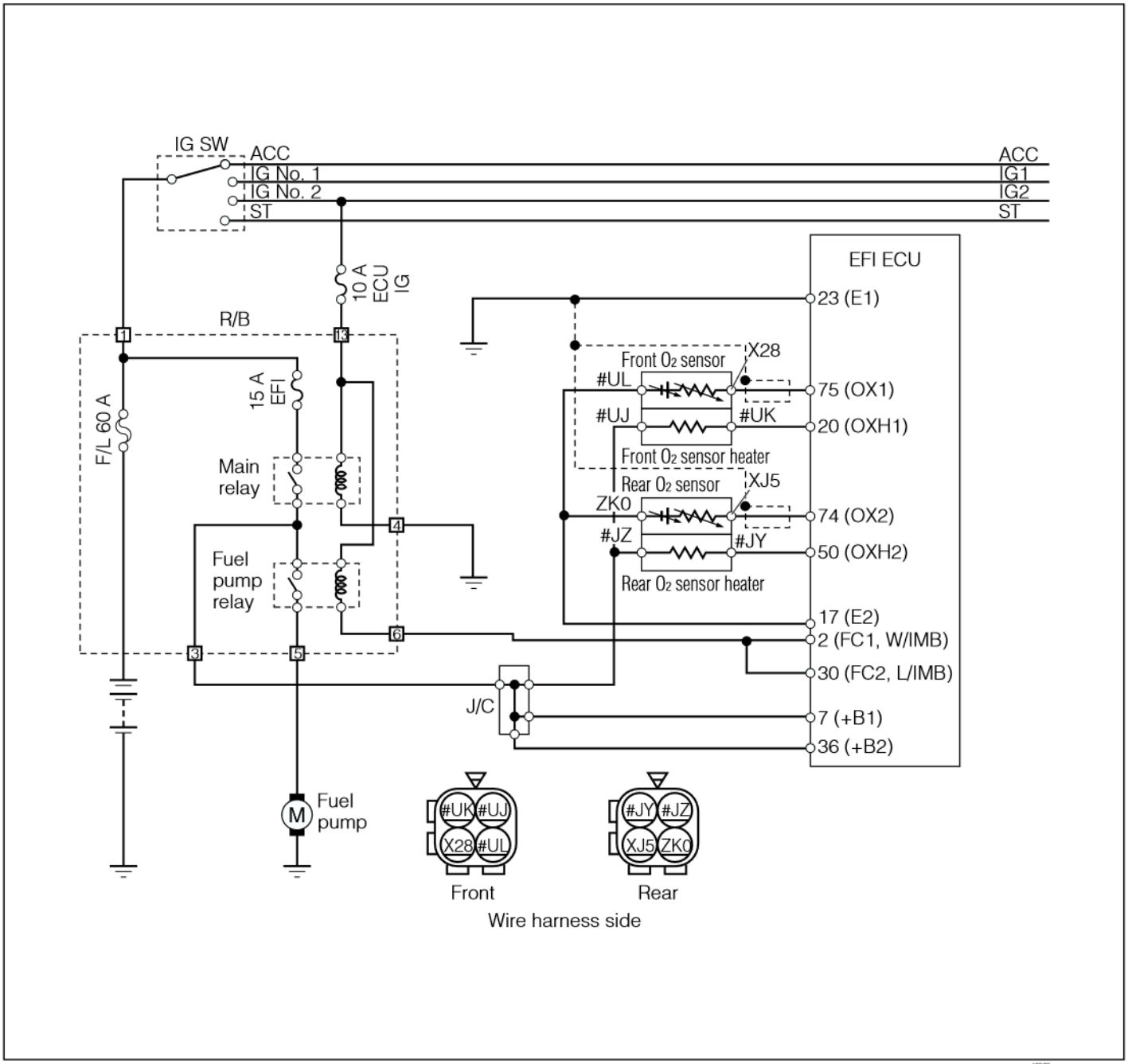
NO

Replace the oxygen sensor.

JEF00221-00140

DTC	P0136/22	Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 2)

WIRING DIAGRAM



JEF00222-00141

CIRCUIT DESCRIPTION

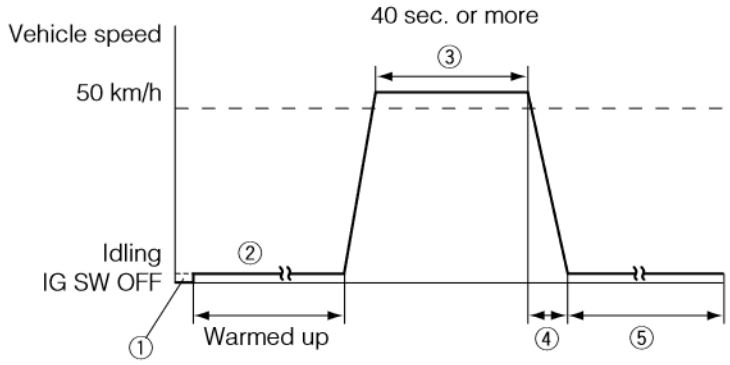
Refer to DTC P0130/21 (Oxygen sensor circuit malfunction (Bank 1 sensor 1))

DTC No.	DTC Detecting condition	Trouble area
P0136/22	Voltage output of heated oxygen sensor remains at 0.4 V or more or 0.5 V or less when vehicle is driven at 100 km/h or more after engine is warmed up (2 trip detection logic)	• Open wire or short in heated oxygen sensor circuit • Oxygen sensor • Engine ECU

HINT:
Sensor 2 refers to the sensor farther away from the engine block.

JEF00223-00000

CONFIRMATION DRIVING 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. With all switch turned OFF, keep on warming the engine until the engine coolant temperature reaches 90°C or above.
③ Accelerate the vehicle until the vehicle speed reaches 50 km/h or more in the 2 range in the case of automatic transmission vehicles; in the 1st → 2nd gear in the case of manual transmission vehicles. Keep on running the vehicle at that speed for at least 40 seconds.
④ Under this condition, release the foot off from the accelerator pedal so as to decelerate the vehicle. Maintain the idling state.
⑤ After one minute of idling, press the F1 key of the tester. Check to see if the DTC P0130 is outputted.

CAUTION:
- If the conditions in this test are not strictly followed, detection of the malfunction will not be possible.
- If you do not have DS-21 diagnosis tester, turn the ignition switch OFF after performing steps ② to ⑤, then perform steps ② to ⑤ again.

WARNING:
- Be sure to conduct the confirmation test, while observing the instructions at page EF–6.

JEF00224-00142

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 P0136/22) outputted?

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 (XJ5) of the oxygen sensor at the harness side and the SST terminal ⑭ OK?

YES

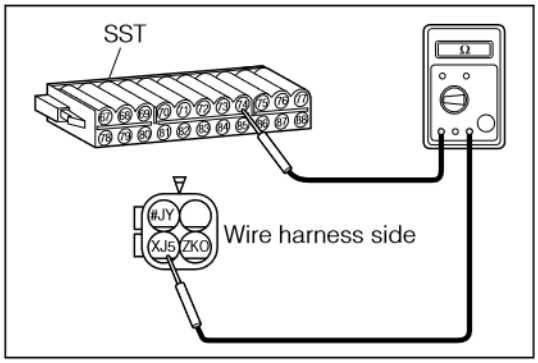
3 Check of output voltage of oxygen sensor during idling

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.
4. Turn ON the main switch of the tester. Race the engine at 4000 rpm for three minutes by depressing the accelerator pedal.
5. Under the condition of Step 4, release the foot off from the accelerator pedal so as to allow the engine to idle.
6. Read the output voltage of the oxygen sensor between Steps 4 to 5.
   Specified Value:
   The voltage should become 0.4 V or below and 0.55 V or more, respectively, at least one time.

Are the check results OK?

YES

Go to the relative DTC chart.



NO

Repair or replace the harness or connector.

NO

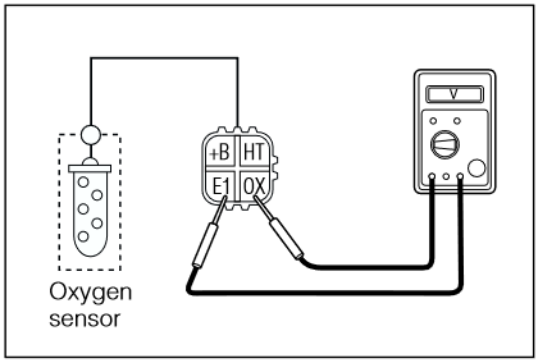
4	Check of output voltage of oxygen sensor unit

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?

YES

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



NO

Replace the oxygen sensor. (Bank 1, sensor 2)

YES

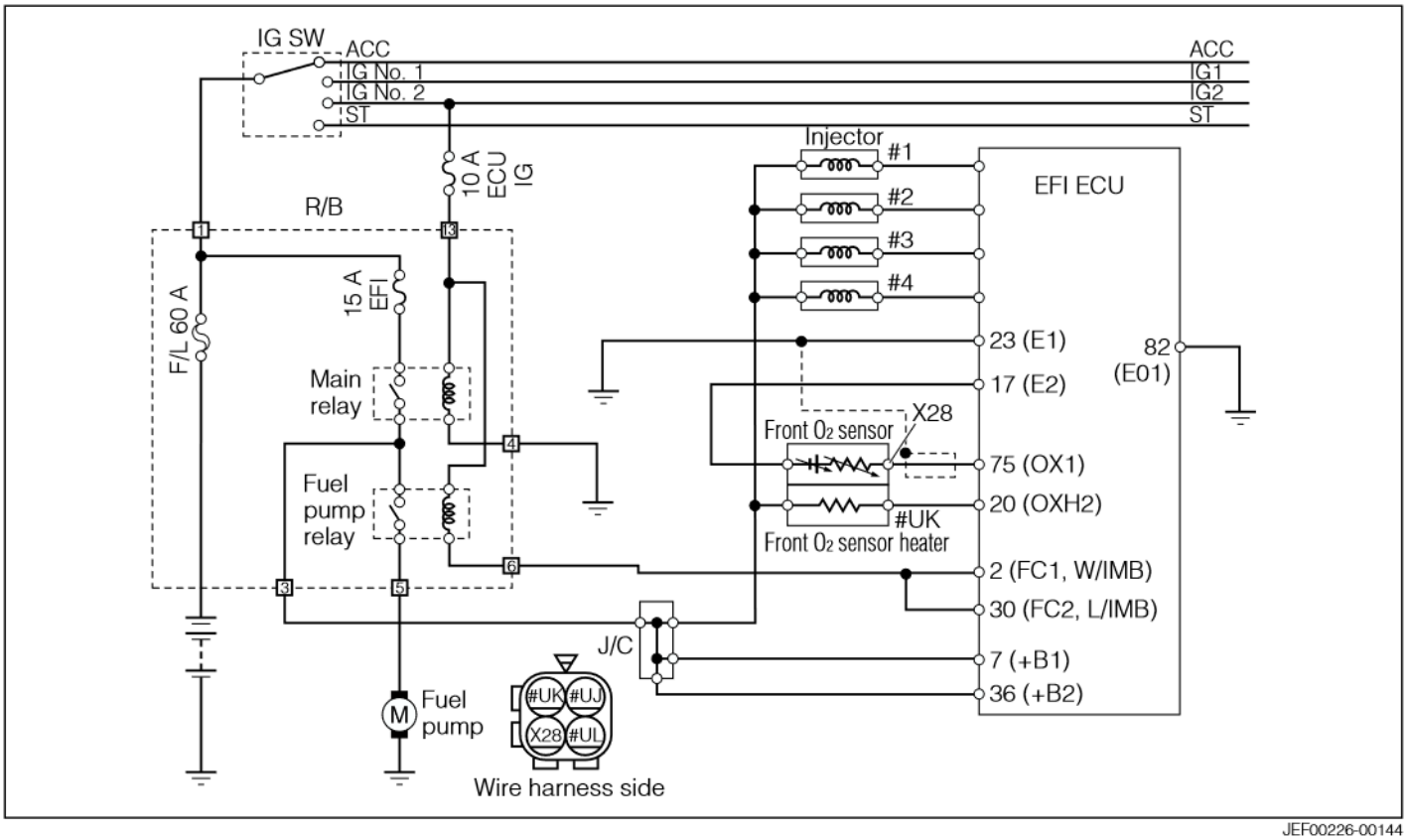
Check or replace the engine ECU.
(Refer to page EF–51.)

JEF00225-00143

DTC	P0171/25	System too Lean (Fuel Trim)

DTC	P0172/26	System too Rich (Fuel Trim)

WIRING DIAGRAM



JEF00226-00144

CIRCUIT DESCRIPTION

The fuel trim means the feedback compensation value that will compensate the basic injection time. The fuel trim comes in two kinds: the short-term fuel trim and the long-term fuel trim.

The short-term fuel trim is a short-term fuel compensation to be carried out to maintain the air-to-fuel ratio at the stoichometric air-to-fuel ratio. The signal from the oxygen sensor indicates whether the current air-to-fuel ratio is rich or lean than the stoichometric air-to-fuel ratio. Hence, if the air-to-fuel ratio is rich, the fuel injection amount will be reduced. Conversely, if the air-to-fuel ratio is lean, the fuel injection amount will be increased.

The long-term fuel trim is overall fuel compensation over a long period of time in order to compensate a continuos deviation of the short-term fuel trim from the central value, which will be caused by the engine's inherent characteristics, the wear due to operation over a long period of time and the change in operational environment.

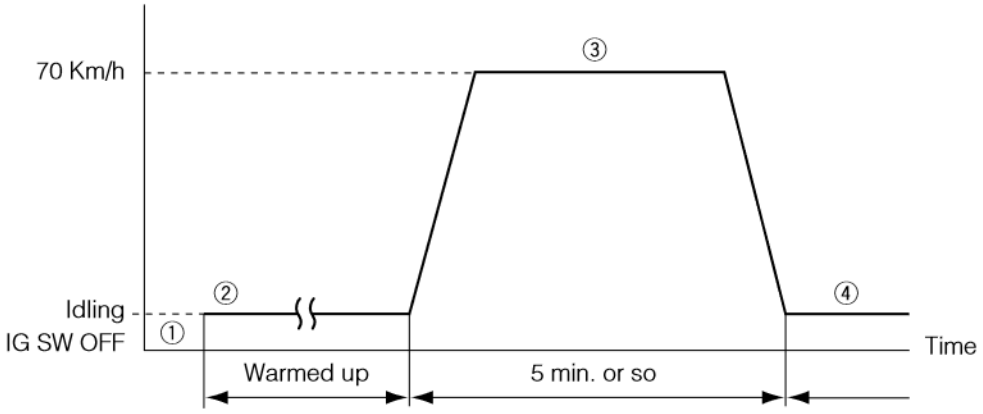
If the sum of the short-term fuel trim and long-term fuel trim exceeds a certain value and proves to be lean or rich, the system will detect it as a malfunction, thereby illuminating the MIL lamp.

DTC No.	DTC Detecting condition	Trouble area
P0171/25 P0172/26	When the following conditions given below occur while the air-to-fuel feedback after the engine warming-up is being executed: • The air-to-fuel is too lean: (The total fuel trim (the sum of the short-term fuel trim and long-term fuel trim) exceeds the set value.) • The air-to-fuel is too rich: (The total fuel trim is less than the set value.) (2 trip detection logic)	• Air intake (hose loose) • Fuel line pressure • Injector blockage or leakage • Open wire or short in oxygen sensor circuit • Oxygen sensor malfunction • Manifold absolute pressure sensor • Engine coolant temp. sensor • Gas leakage on exhaust system • Purge VSV for EVAP • Engine ECU

NOTE:
- If the vehicle has experienced any run out of fuel, the air-to-fuel ratio becomes lean, thus recording the DTC P0171/25.

JEF00227-00000

CONFIRMATION ENGINE DRIVING 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 Run the vehicle for more than five minutes at a speed of 70 km/h with the gear selected to the 5th gear or the D range.
④ After one minute of idling, press the F1 key of the tester. Check to see if the DTC P0171/0172 is detected.

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

WARNING:
- Be sure to conduct the confirmation test, while observing the instructions at page EF–6.

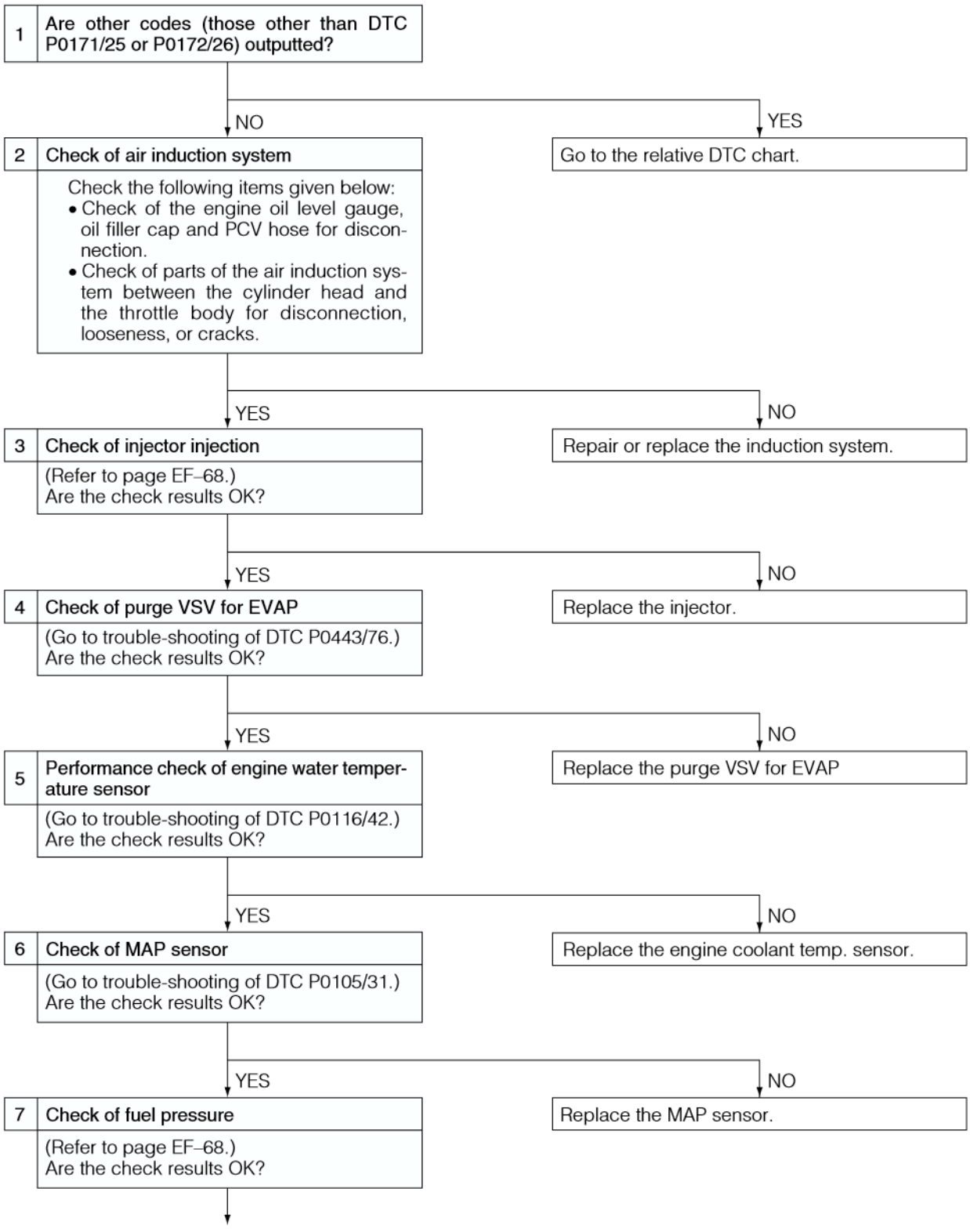
JEF00228-00145

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.

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



YES

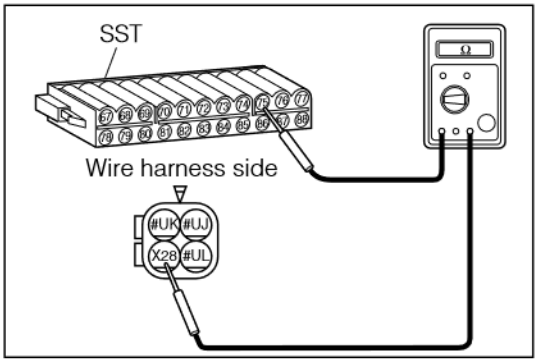
8	Check of gas leakage of exhaust system
	Are the check results OK?

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

YES

9	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 ⑮ OK?

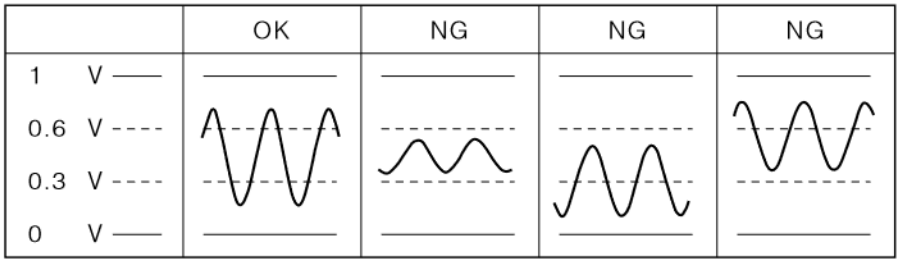
NO → Repair or replate.



YES

10	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 → Repair or replace the harness or connector.



NO

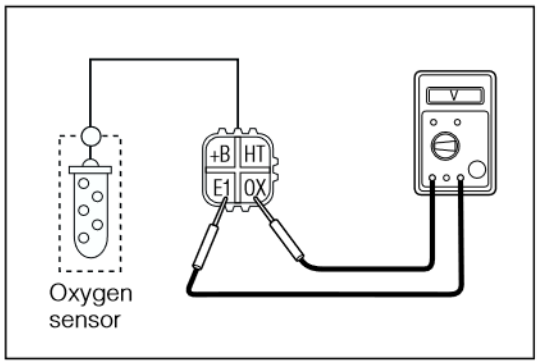
11	Check of output voltage of oxygen sensor unit

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?

YES

Go to Step 12.



NO

Replace the oxygen sensor. (Bank 1, sensor 1)

YES

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

12	Perform confirmation driving pattern.

13	Is there DTC P0171/25 or P0172/26 being output again?

NO

14	Did vehicle run out of fuel in the past?

YES

DTC P0171/25 is caused by running out of fuel.

YES

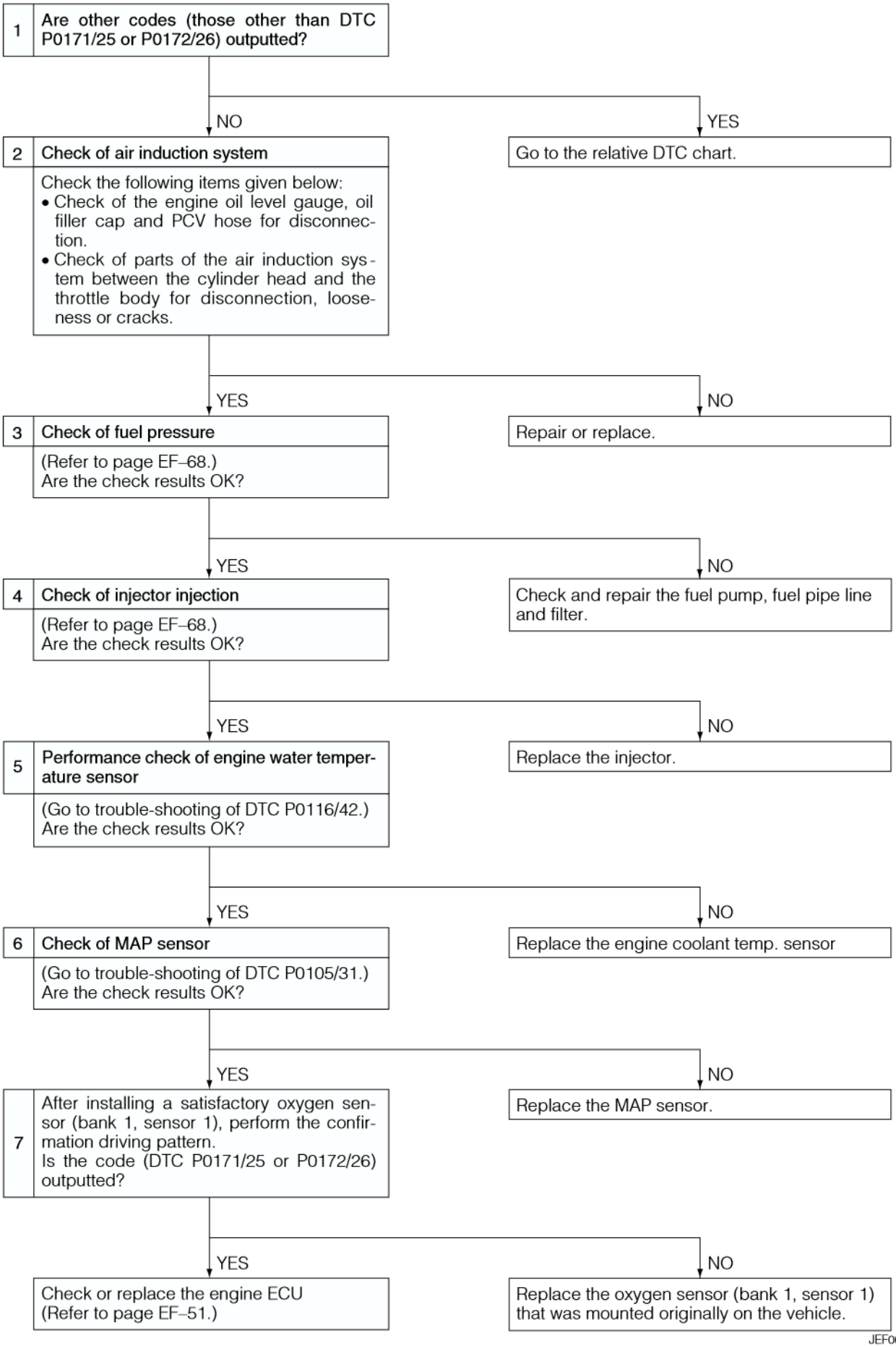
Check or replace the engine ECU
(Refer to page EF–51.)

NO

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

JEF00229-00146

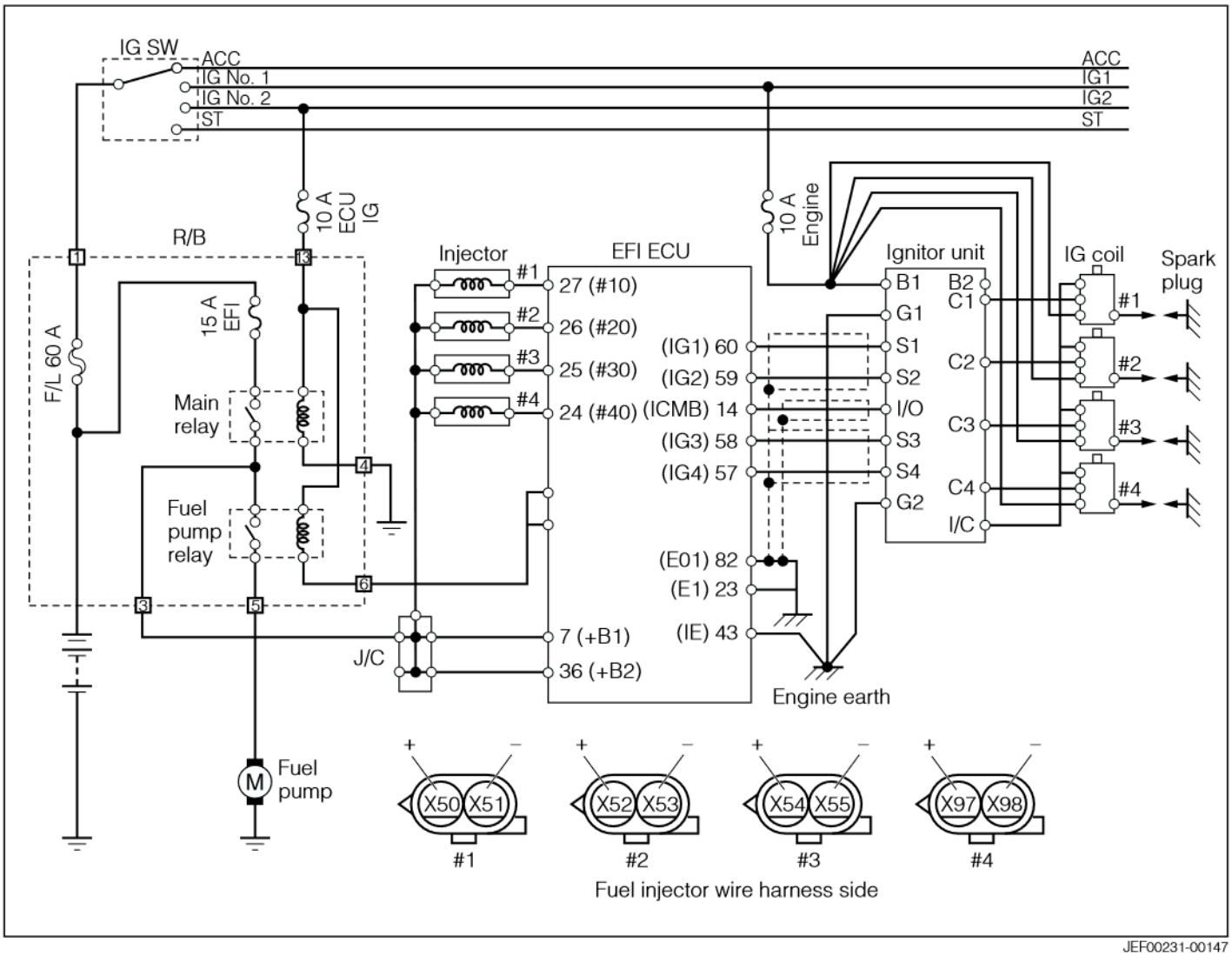
When not using DS-21 diagnosis tester or OBD II generic scan tool:



JEF00230-00000

DTC	P0314/—	Single Cylinder Misfire (Cylinder not Specified)
DTC	P0300/17	Random/Multiple Cylinder Misfire Detected
DTC	P0301/17	Cylinder 1 Misfire Detected
DTC	P0302/17	Cylinder 2 Misfire Detected
DTC	P0303/17	Cylinder 3 Misfire Detected
DTC	P0304/17	Cylinder 4 Misfire Detected

WIRING DIAGRAM



JEF00231-00147

CIRCUIT DESCRIPTION

MISFIRE:

- The ignitor unit detects the ion current that flows in proportion to the combustion pressure. This ion current is converted into a voltage, which will be inputted to the ECU. If the voltage value is below a certain value, the ECU evaluate it as a misfire and counts its occurrence numbers.
  When the misfire rate becomes or exceeds a number that indicates deteriorated engine conditions, this state will cause the malfunction indicator lamp (MIL) to be illuminated.
  If such a misfire is occurring whose misfire rate is high enough that the driving condition will most likely cause the catalyst to be overheated, the malfunction indicator lamp (MIL) will flash.

DTC No.	DTC Detecting condition	Trouble area
P0314/— P0300/17	Misfiring of random/multiple cylinders is detected during any particular 400 or 2,000 ignitions.	• Ignition system (Igniter unit etc.) • Iion system (Igniter unit etc.) • Injector • Fuel pressure • Valve clearance • Valve timing • In Mani abs. pressure sensor • Engine coolant temp. sensor • Open wire or short in engine wire • Connector connection • Compression pressure • Engine ECU
P0301/17 P0302/17 P0303/17 P0304/17	For any particular 400 ignitions for engine, misfiring is detected which can cause catalyst overheating (This causes MIL to blink) (2 trip detection logic)	
	For any particular 2,000 ignitions for engine, misfiring is detected which causes a deterioration in emissions (2 trip detection logic)	

NOTE:

- When the 2 or more codes for a misfiring cylinder are recorded repeatedly but no random/multiply cylinder misfire code is recorded, it indicates that the misfire were detected and recorded at different times.
- When any one or any two or more of P0301 through P0304/17 codes are outputted, the code P0314 is memorized without fail. However, only when the function “Continuos monitoring results” of the CARB mode is used, it is possible to read this code P0314.

JEF00232-00000

CONFIRMATION DRIVING PATTERN

1. Connect the DS-21 diagnosis tester or OBD Ⅱ generic scan tool with IG switch OFF.
2. Record DTC and the freeze frame data with IG switch ON.
3. Erase the DTC.
4. Use the DS-21 diagnosis tester or OBD Ⅱ generic scan tool to set to “Continuous monitoring results” in CARB mode.
5. Drive the vehicle several times with the engine speed, load and its surrounding range shown with ENGINE RPM. CALC LOAD in the freeze frame data or MISFIRE RPM, MISFIRE LOAD in the data list.
   If any malfunction is detected, the code P0314 will be outputted. (When F1 key is pressed:)

If you have no DS-21 diagnosis tester, turn the ignition switch OFF after the symptom is simulated the first time.
Then repeat the simulation process again.

NOTE:

- In order to memorize DTC of misfire, it is necessary to drive around MISFIRE RPM, MISFIRE LOAD in the data list for the following period of time.

Engine speed	Time
Idling	3 minutes 30 seconds or more
1000 rpm	3 minutes or more
2000 rpm	1 minutes 30 seconds or more
3000 rpm	1 minutes or more

6. Check whether there is misfire or not by monitoring DTC and the freeze frame data. After that, record them.
7. Turn ignition switch OFF after least 5 seconds.
   WARNING:
   - Be sure to conduct the confirmation test, while observing the instructions at page EF–6.

JEF00233-00000

INSPECTION PROCEDURE

NOTE:
- If it is the case that any DTC besides misfire is memorized simultaneously, first perform the troubleshooting for them.
- 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 the vehicle is brought to the workshop and the misfire is not occurred, misfire can be confirmed by reproducing the condition of freeze frame data. Also, after finishing the repair, confirm that there is no misfire. (See the confirmation driving pattern)
- When either of SHORT FT, LONG FT in the freeze frame data is besides the range of ±20 %, there is a possibility that the air-fuel ratio is inclining either to RICH (–20 % or less) or LEAN (+20 % or more).
- When COOLANT TEMP in the freeze frame data is less than 80°C (176°F), there is a possibility of misfire only during warning up.
- In the case that misfire cannot be reproduced, the reason may be because of the driving with lack of fuel, the use of improper fuel, a stain of spark plug, and etc.
- If an open wire exists in the ion signal input line between the ignitor unit and the EFI ECU, it may be detected as misfire.

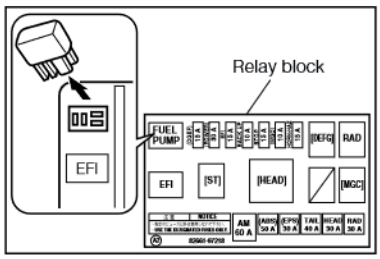
1	Visual check of inside of engine compartment
	• Check the connecting conditions of the wire harnesses and connectors. • Check the vacuum hoses, purge hoses, fuel hoses and pipes for disconnection and breakage. Are the check results OK?

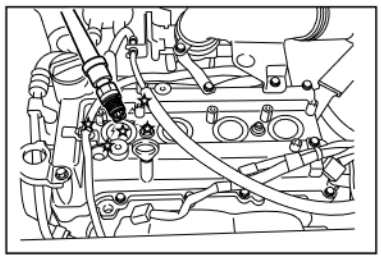
YES

2	Check of spark plug and spark of misfiring cylinder
	1. Remove the fuel pump relay from the relay block. 2. Remove the IG coils and spark plugs (misfire cylinders) 3. Install the spark plug to the IG coil. Connect the IG coil connector to the IG coil. 4. Ground the spark 5. Crank the engine at this time, check to see if the spark plug sparks. 6. If no spark occurs, conduct the check according to the check procedure for spark plug (at page EF–185).

NO

Repair or replace, then confirm that there is no misfire. (See confirmation driving pattern)





YES

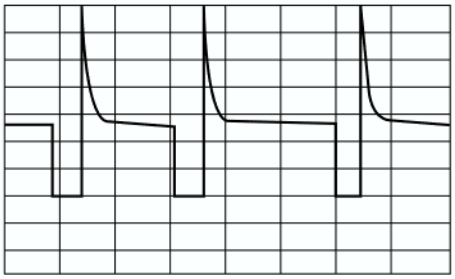
3	Check of ECU output signal of injector of misfiring cylinder

1. With the IG switch twrned OFF, perform
2. restoration.
   Set the SST (sub-harness). (Refer to page EF–8.)
3. With the IG switch turned ON, measure the voltage between the SST connector terminal of an injector in which misfire is taking place among the SST connectors ㉗ through ㉔ and the body ground.
   Specified Value: Battery voltage
4. Observation of injector waveform with oscilloscope (reference)
   Check voltage waveform between the SST connectors ㉗ through ㉔ and ㉜ (E01) while engine is idling.
   Are the check results OK?

NO

Replace the spark plug or check the ignition system and ion system.
(Go to trouble-shooting of DTC P1300/36.)
CAUTION:
- **Do not use any spark plugs other than those designated.**

[Reference]



When an oscilloscope is used, the injector control signal produces such waveforms, as shown in the diagram below. (The frequency or injection time can not be specified.)

NO

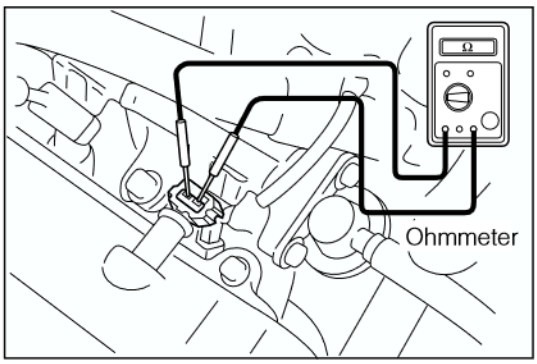
4	Unit check of injector of misfiring cylinder

1. Turn OFF the IG switch.
2. Disconnect the injector connector of the misfiring cylinder.
3. Measure the resistance between the injector terminals.
   Specified Value:
   13.4 to 14.2 Ω at 20°C

   Are the unit check results OK?

YES

Go to Step 6.



YES

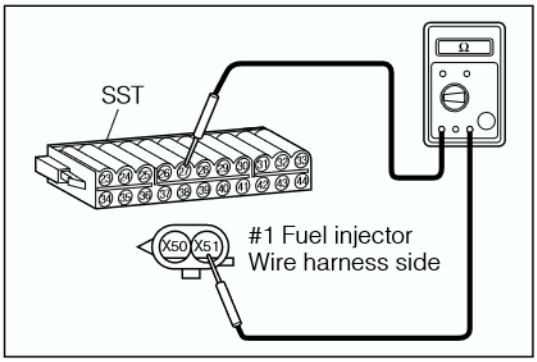
5	Check of harness between injector and ECU

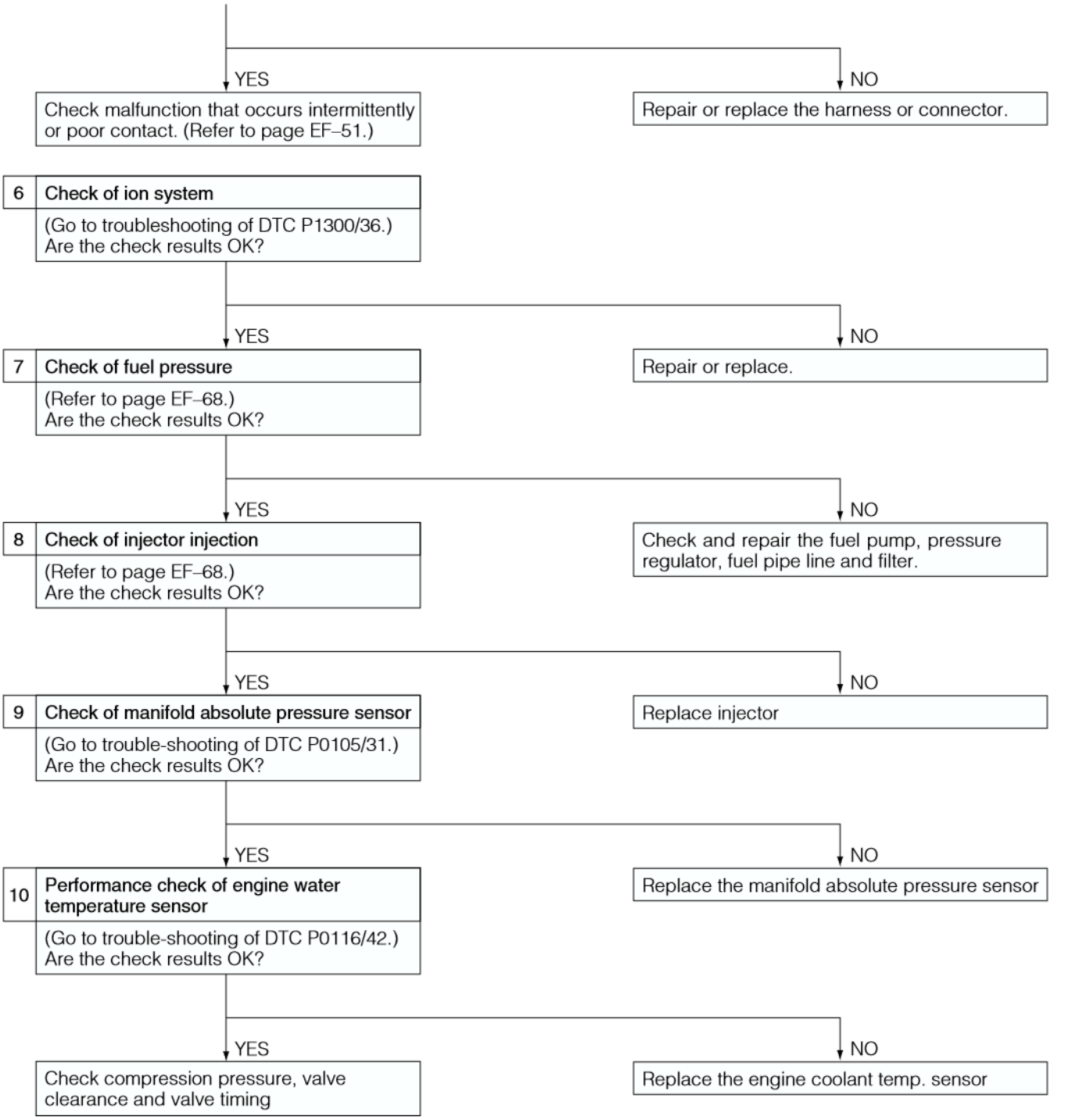
1. Disconnect the SST connectors from the EFI ECU (with the IG switch turned OFF).
2. Referring to page EF–48, check the harness and connector for open wire or short.
- Connector (X51) of #1 injector at harness side - SST connector ㉗
- Connector (X53) of #2 injector at harness side - SST connector ㉖
- Connector (X55) of #3 injector at harness side - SST connector ㉕
- Connector (X98) of #4 injector at harness side - SST connector ㉔

  Are the check results for open wire and short OK?

NO

Replace the injector.

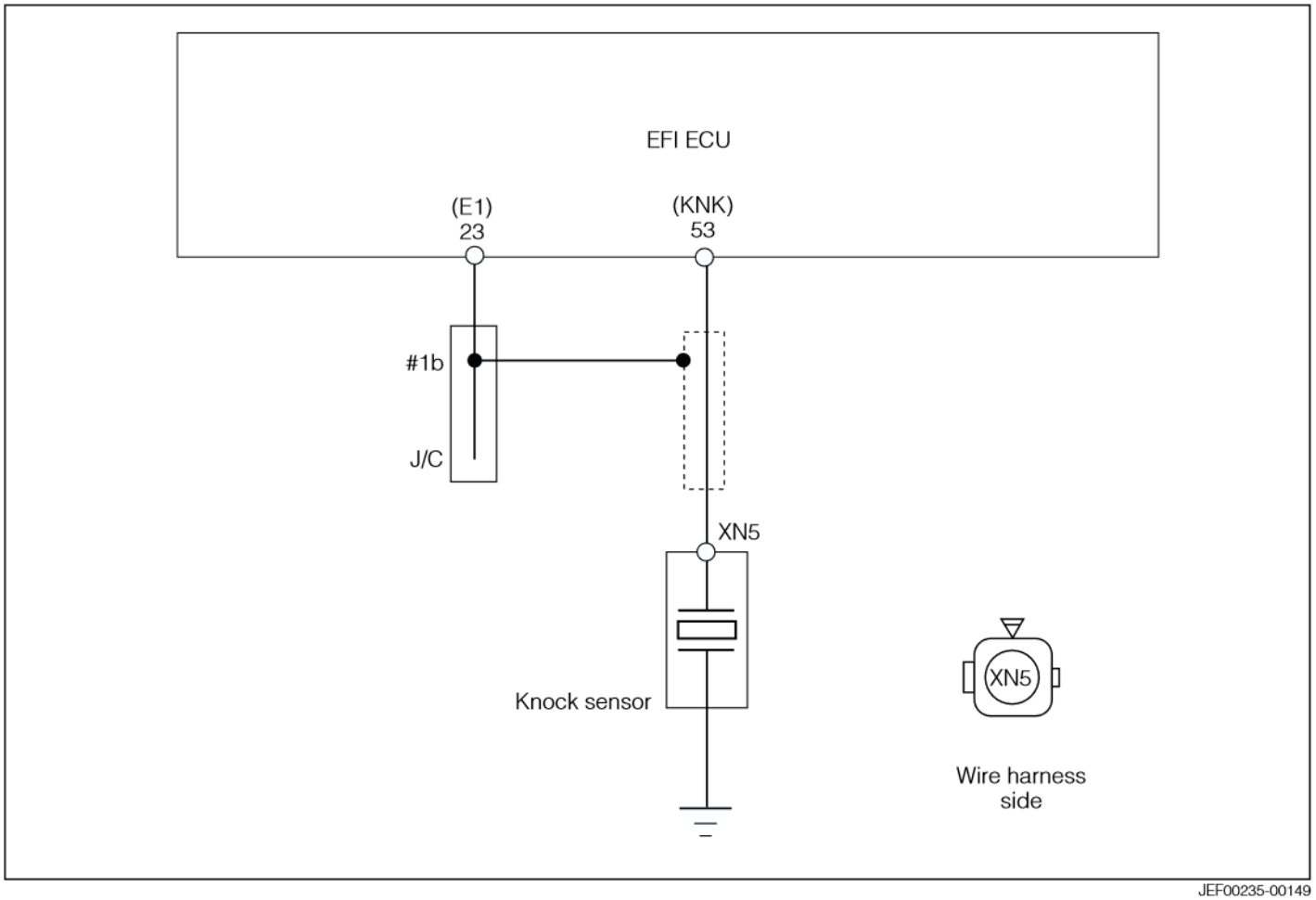




JEF00234-00148

DTC	P0325/18	Knock Sensor 1 Circuit Malfunction

WIRING DIAGRAM



JEF00235-00149

CIRCUIT DESCRIPTION

Knock sensor are fitted to the cylinder block to detect engine knocking. This sensor contains a piezoelectric element which generates a voltage when it becomes deformed, which occurs when the cylinder block vibrates due to knocking. If engine knocking occurs, ignition timing is retarded to suppress it.

DTC No.	DTC Detecting condition	Trouble area
P0325/18	When the signal from the knock sensor exceeds the voltage preset according to the engine revolution speed continuous by for more than a certain length of time while accelerating at a certain engine revolution speed of 2000 rpm or more.	• Open wire or short in knock sensor circuit • Knock sensor (Looseness) • Engine ECU

JEF00236-00000

INSPECTION PROCEDURE

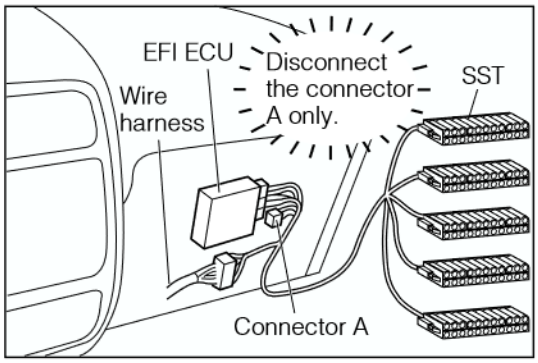
NOTE:

- 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.

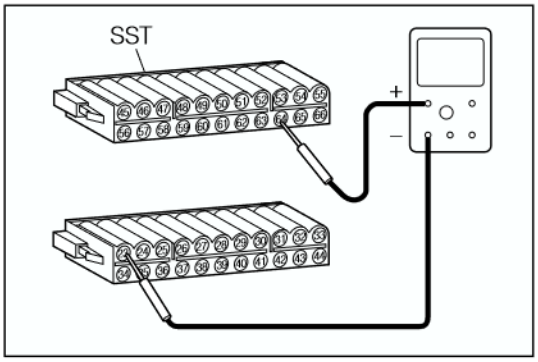
1	Check of continuity of knock sensor circuit

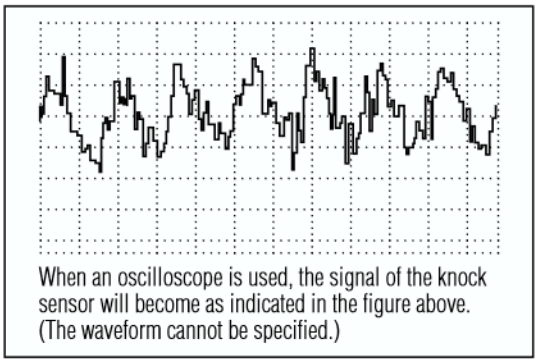
1. Set the SST (sub-harness). (Refer to page EF–8.) However, the SST connector "A" should remain disconnected from the ECU connector.
2. With the IG switch turned OFF, measure the resistance between the SST connector ⑤③ and the body ground.
   Specified Value: 1 MΩ or higher

   Are the unit check results OK?



[Reference]
Check by oscilloscope
1. Connect the SST connector "A" to the ECU.
2. Start the engine and keep it idling.
3. Connect the positive ⊕ and negative ⊖ probes of an oscilloscope to the SST connector terminals ⑥④ and ②③, respectively.
4. When the waveforms as shown in the right figure are observed, the knock sensor circuit is functioning properly.
   (The measurement can be conducted using the oscilloscope function of the DS-21 diagnosis tester.)
   NOTE:
   - **The waveform at the time of racing becomes greater than that at the time of idling.**





When an oscilloscope is used, the signal of the knock sensor will become as indicated in the figure above. (The waveform cannot be specified.)

NO

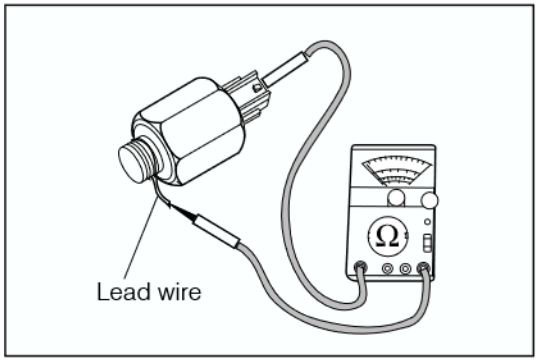
2	Check of knock sensor

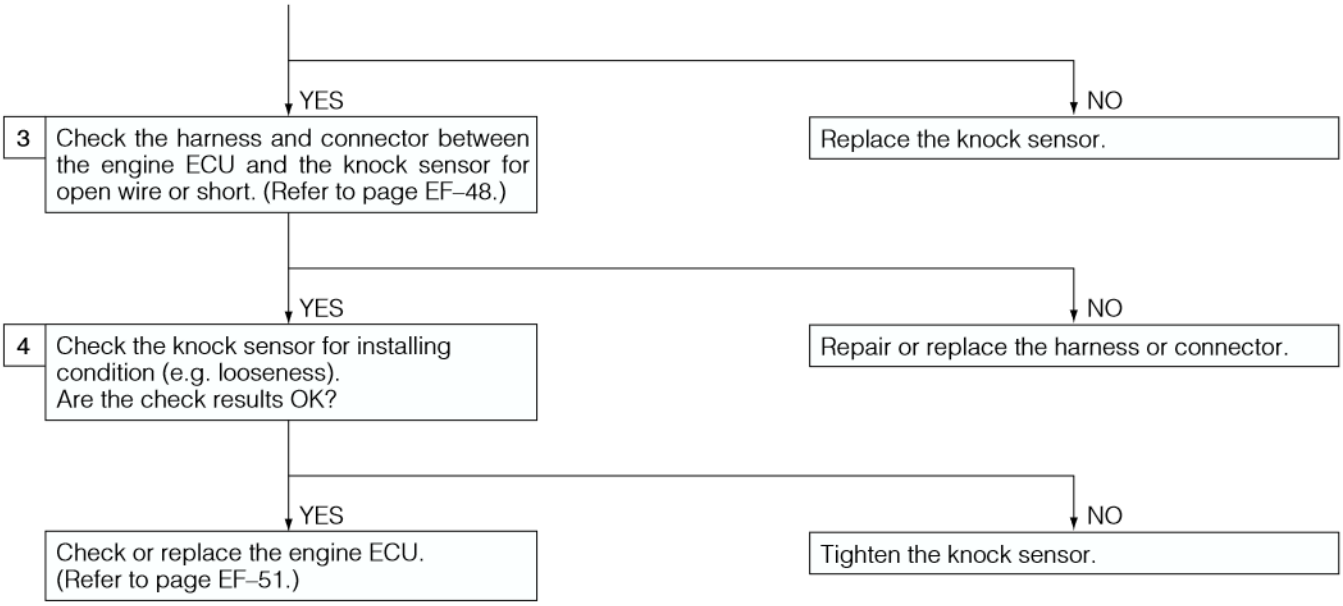
1. Disconnect the connector of the knock sensor with ignition switch OFF
2. Remove the knock sensor from the cylinder block.
3. Using an ohmmeter, check the resistance between the terminal and body.
   Specified Value: 1 MΩ or higher

   Are the check results OK?

YES

Go to Step 3.

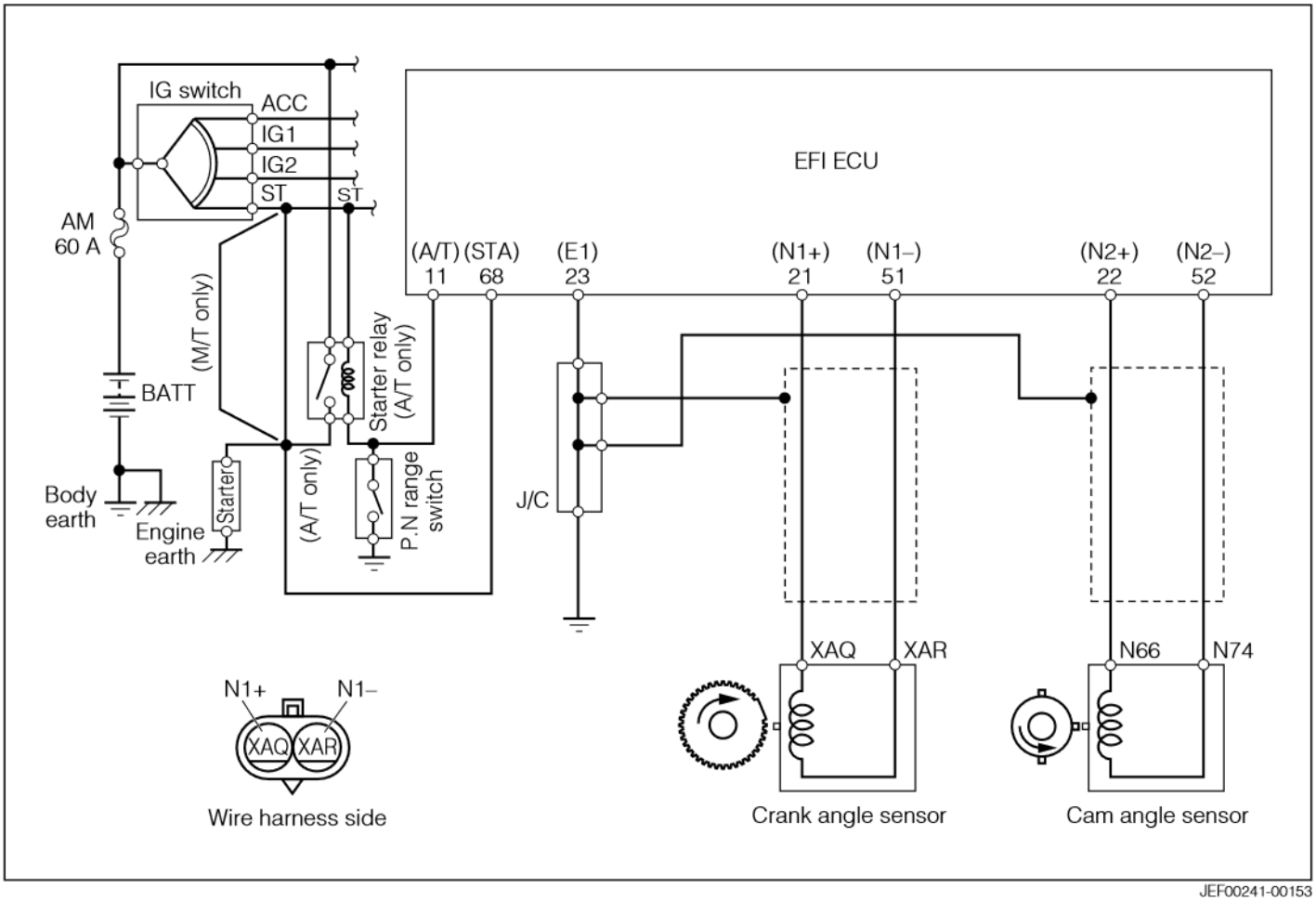




JEF00237-00150

DTC	P0335/13	Crankshaft Position Sensor “A” Circuit Malfunction

WIRING DIAGRAM



JEF00241-00153

CIRCUIT DESCRIPTION

The crankshaft angle sensor (NE signal) consists of a signal rotor and a pickup coil.
The NE signal rotor has 34 teeth and is mounted on the crankshaft. The NE sensor generates 34 signals of every engine revolution. The engine ECU detects the standard crankshaft angle based on the $N2^{+}$ signals, the actual crankshaft angle and the engine speed by the NE signals.

DTC No.	DTC Detecting condition	Trouble area
P0335/13	No crankshaft angle sensor signal to engine ECU during cranking	• Open wire or short in crankshaft angle sensor circuit • Crankshaft angle sensor • Signal rotor • Starter • Engine ECU

JEF00242-00000

INSPECTION PROCEDURE

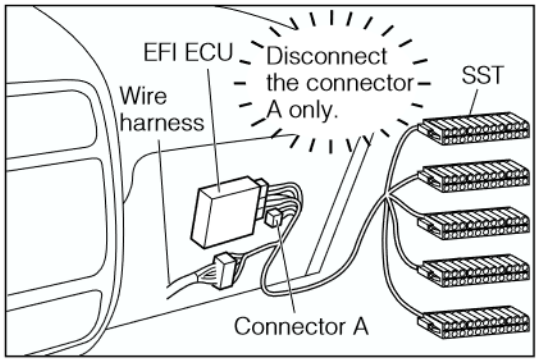
NOTE:

- 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	Check of resistance of crank angle sensor circuit

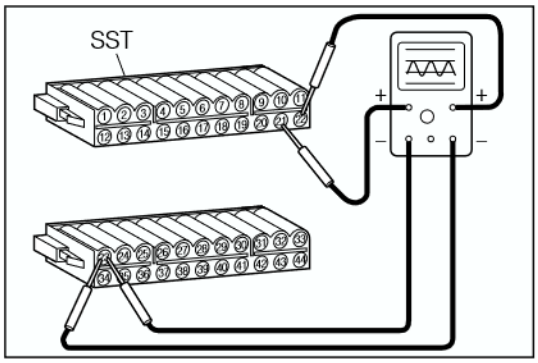
1. Set the SST (sub-harness). (Refer to page EF–8.)
   However, the SST connector "A" should remain disconnected from the ECU connector.
2. With the IG switch turned OFF, measure resistance between the SST terminals ㉑ - ㊿ (N1+ - N1−).
   Specified Value:
   1850 to 2450 Ω at 20°C

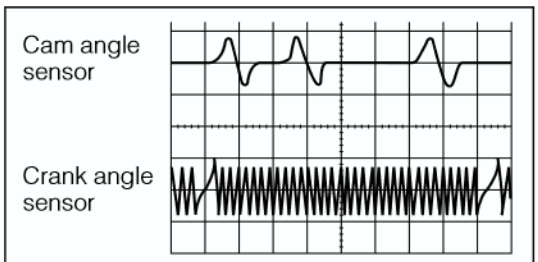
   Are the check results OK?



[Reference]
Check by oscilloscope

1. Connect the SST connector "A" to the ECU.
2. Start the engine and keep it idling.
3. Connect the positive ⊕ and negative ⊖ probes of an oscilloscope to the SST connector terminals between ㉑ and ㉓ and between ㉒ and ㉓, respectively.
4. When the waveforms as shown in the right figure are observed, the crank angle sensor circuit is functioning properly.
   NOTE:
   - **The waveform at the time of racing becomes greater than that at the time of idling.**





When an oscilloscope is used, the signal of the cam/crank angle sensor will become as indicated in the figure above. (The waveform cannot be specified.)

NO

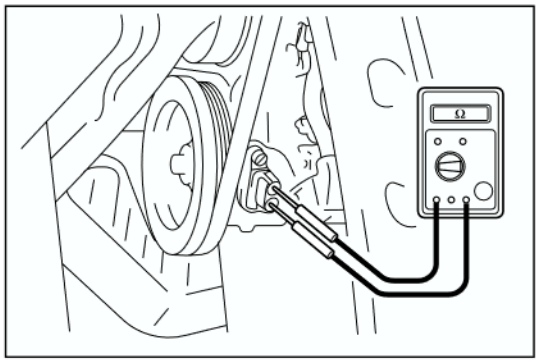
2	Unit check of crank angle sensor

1. Remove the engine under cover RH.
2. While sliding the connector lock, remove the connector.
3. Using an ohmmeter, measure the resistance between the terminals
   Specified Value:
   1850 - 2450 Ω at 20°C

   Are the check results OK?

YES

Go to Step 4.



YES

3 Check the harness and connector between the engine ECU and the crank angle sensor for open wire or short. (Refer to page EF–48.)
Are the check results OK?

NO

Replace the crank angle sensor.

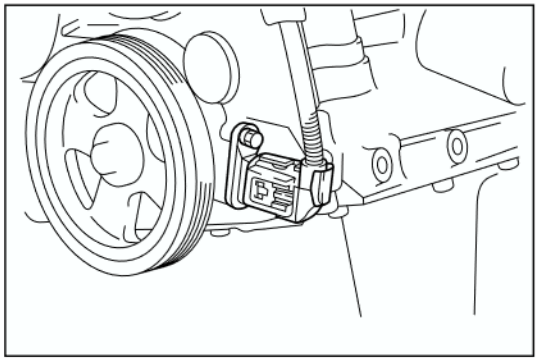
YES

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

NO

Repair or replace the harness or connector.

4 Check the sensor for installing condition and the signal rotor for tooth condition. (Check for the air gap, sensor for looseness, tooth distortion, adhesion of rust, foreign matter, etc. Refer to Section IG.)
Are the check results OK?



YES

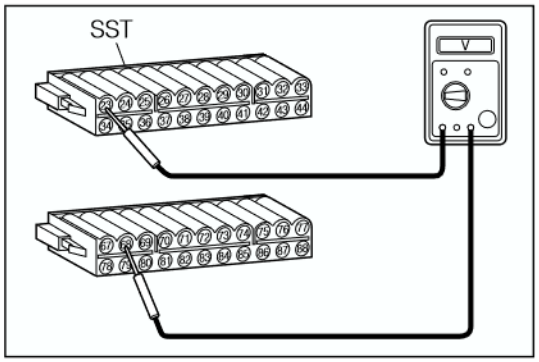
NO

Tighten the sensor. Replace the signal rotor.

5 **Check of starter signal**

1. Connect the SST connector “A” to the ECU.
2. Measure the voltage between the SST connector terminals ⑱ and ㉓ (STA - E1) while the engine is being cranked.
   Specified Value: Battery voltage

   Are the check results OK?



YES

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

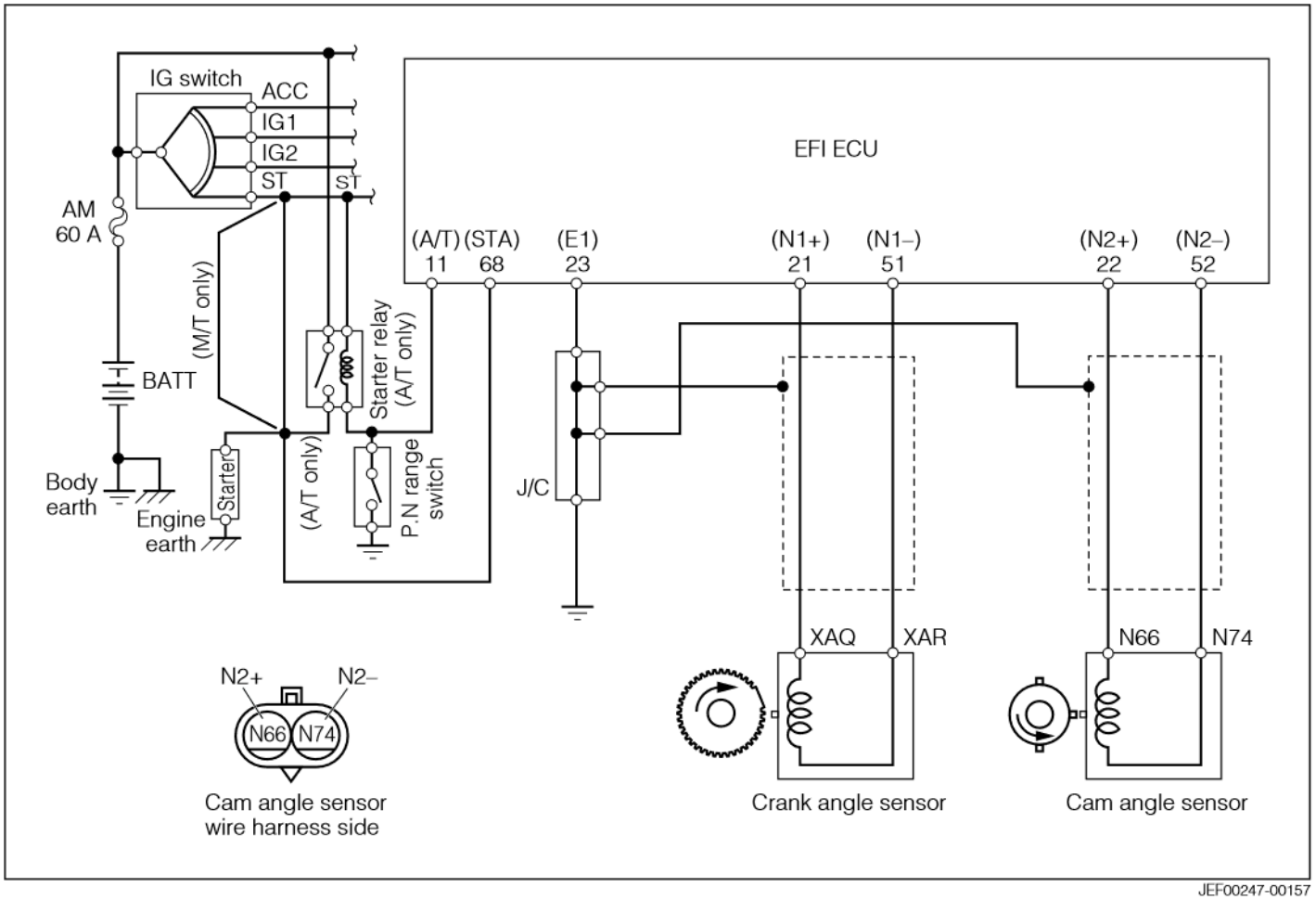
NO

Repair or replace the harness or connector (M/T: between engine ECU - IG switch, A/T: between engine ECU - starter).

JEF00243-00154

DTC	P0340/14	Camshaft Position Sensor Circuit Malfunction

WIRING DIAGRAM



JEF00247-00157

CIRCUIT DESCRIPTION

The camshaft angle sensor ($N2^+$ signal) consists of a signal rotor and a pickup coil.
The $N2^+$ signal rotor has three timing pins on its outer disk surface and is integrated with the intake camshaft. The detection of the actual camshaft position and the discrimination of cylinders are carried out by these three timing pins (360-180-180° CA).

DTC No.	DTC Detecting condition	Trouble area
P0340/14	No camshaft angle sensor signal to engine ECU during cranking	• Open wire or short in camshaft angle sensor circuit • Camshaft angle sensor • Starter • Engine ECU
	Open in N2 circuit	

JEF00248-00000

INSPECTION PROCEDURE

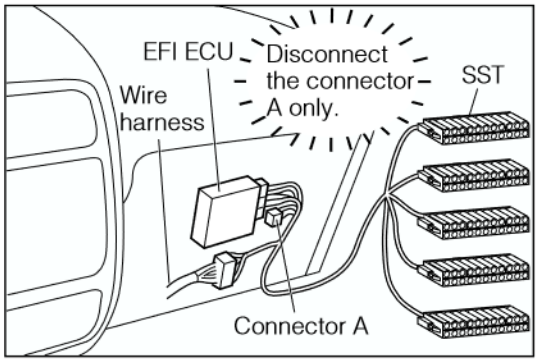
NOTE:

- 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.

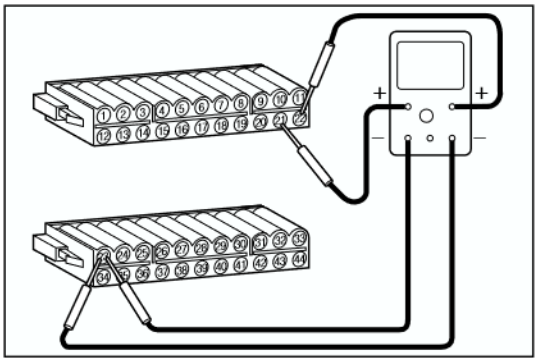
1	Check of resistance of cam angle sensor circuit

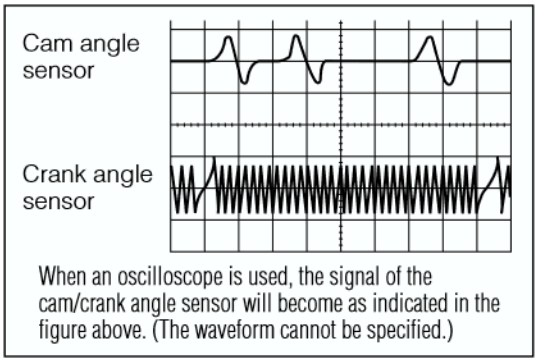
1. Set the SST (sub-harness). (Refer to page EF–8.)
   However, the SST connector "A" should remain disconnected from the ECU connector.
2. With the IG switch turned OFF, measure resistance between the SST terminals ㉒ - ㊷ ($N2^+$ - $N2^-$).
   Specified Value: 1850 to 2450 Ω

   Are the check results OK?



[Reference]
Check by oscilloscope
1. Connect the SST connector "A" to the ECU.
2. Start the engine and keep it idling.
3. Connect the positive ⊕ and negative ⊖ probes of an oscilloscope to the SST connector terminals between ㉒ and ㉓ and between ㉑ and ㉓, respectively.
4. When the waveforms as shown in the right figure are observed, the cam angle sensor circuit is functioning properly.
   NOTE:
   - **The waveform at the time of racing becomes greater than that at the time of idling.**





When an oscilloscope is used, the signal of the cam/crank angle sensor will become as indicated in the figure above. (The waveform cannot be specified.)

NO

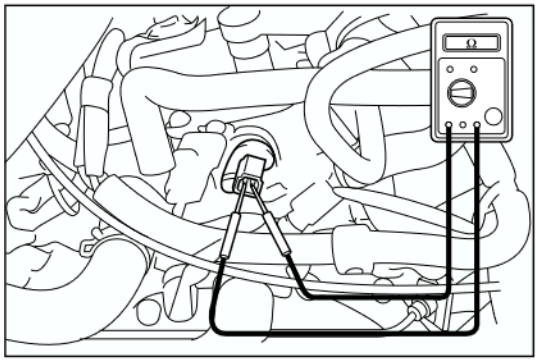
2	Unit check of cam angle sensor

1. Remove the air intake chamber.
2. Dis connect the camshaft angle sensor connector.
3. Using an ohmmeter, measure the resistance between the terminals
   Specified Value:
   1850 - 2450 Ω at 20°C

   Are the check results OK?

YES

Go to Step 4.

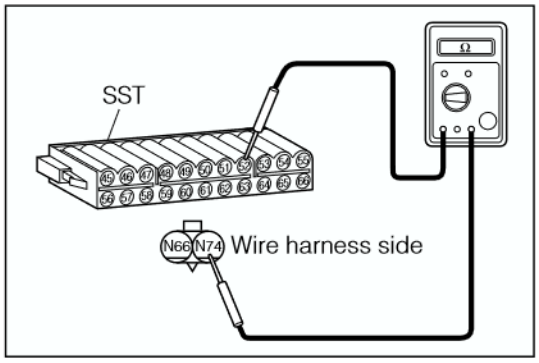


YES

3 Check the harness and connector between the engine ECU and the cam angle sensor for open wire or short. (Refer to page EF–48.)
Are the check results OK?

NO

Replace the cam angle sensor.



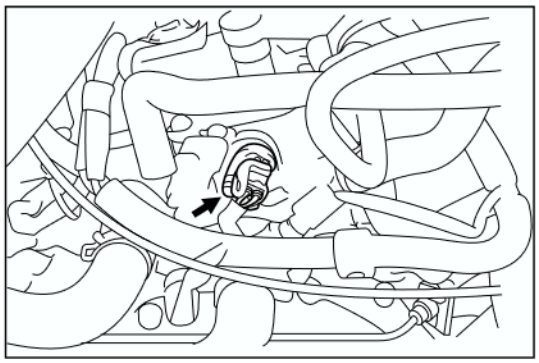
YES

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

NO

Repair or replace the harness or connector.

4 Check the sensor for installing condition and the timing rotor pins for condition. (Check for the air gap, sensor for looseness, pin distortion, adhesion of rust, foreign matter, etc. Refer to Section EM.)
Are the check results OK?



YES

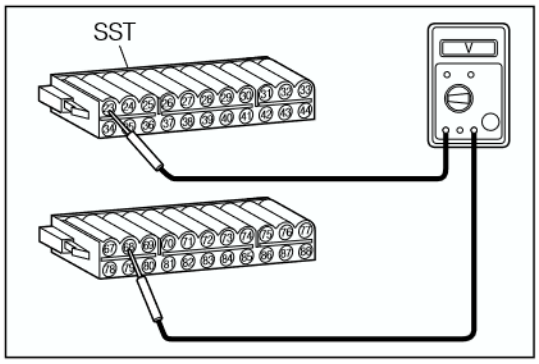
5 **Check of starter signal**

1. Connect the SST connector "A" to the ECU connector.
2. Measure the voltage between the SST connector terminals ⑱ and ㉓ (STA - E1) while the engine is being cranked.
   Specified Value: Battery voltage

   Are the check results OK?

NO

Tighten the sensor. Repair the timing rotor pins.



YES

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

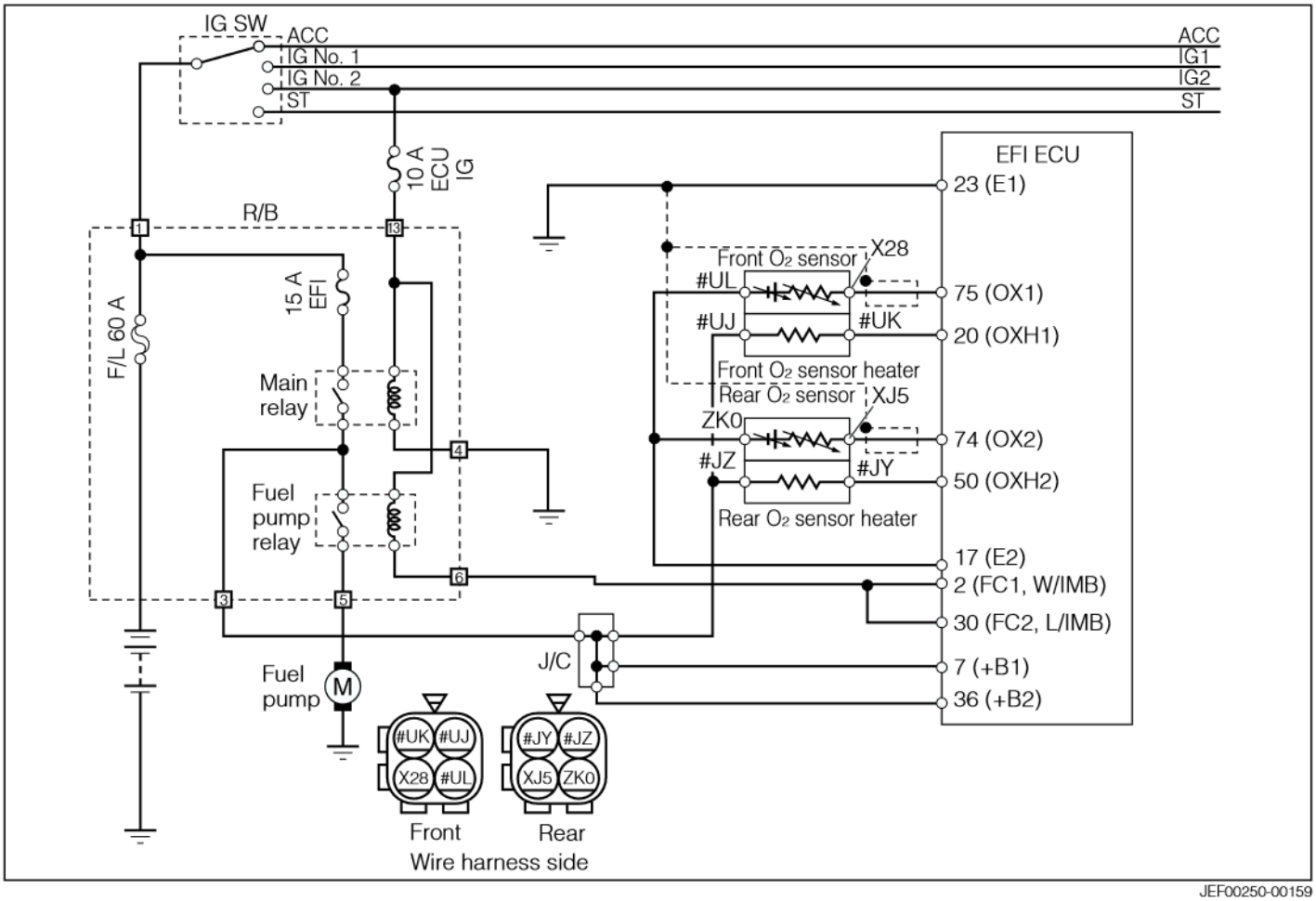
NO

Repair or replace the harness or connector (M/T: between engine ECU - IG switch, A/T: between engine ECU - starter).

JEF00249-00158

DTC	P0420/27	Catalyst System Efficiency Below Threshold

WIRING DIAGRAM



JEF00250-00159

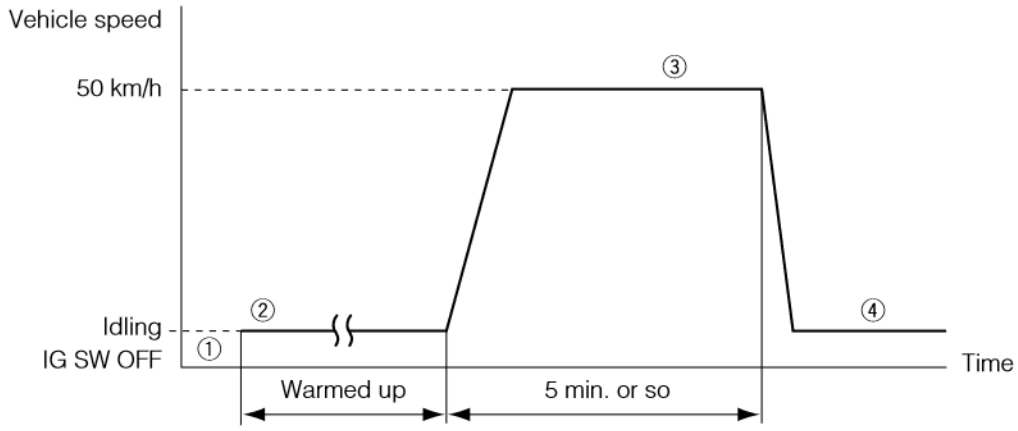
CIRCUIT DESCRIPTION

The ECU monitors the concentration of oxygen in the exhaust gas that is flowing through the three-way catalytic converter, using the rear oxygen sensor. When the catalyst is functioning properly, the varying cycle of the output voltage of the rear oxygen sensor is slower than that of the output voltage of the front oxygen sensor. However, if both the output waveforms of the front and rear sensors are varying at the same rate, it indicates that the catalyst performance has deteriorated.

DTC No.	DTC Detecting condition	Trouble area
P0420/27	When both the waveforms of the front and rear oxygen sensors indicate the same frequency when the vehicle is running at a predetermined speed with the engine revolutional speed within a predetermined range: (2 trip detection logic)	• Three-way catalyst • Open wire or short in oxygen sensor circuit • Oxygen sensor

JEF00251-00000

CONFIRMATION DRIVING 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 "continuous monitoring results" of the CARB mode.
② Start the engine. With all switch turned OFF, keep on warming the engine until the engine coolant temperature reaches 90°C or above.
③ Run at a constant speed of 50 km/h for about five minutes (in the 4th gear in the case of manual transmission vehicles; in D range in the case of automatic transmission vehicles).
④ After one minute of idling, press the F1 key of the tester. Check to see if the DTC P0420 in out putted.

JEF00252-00160

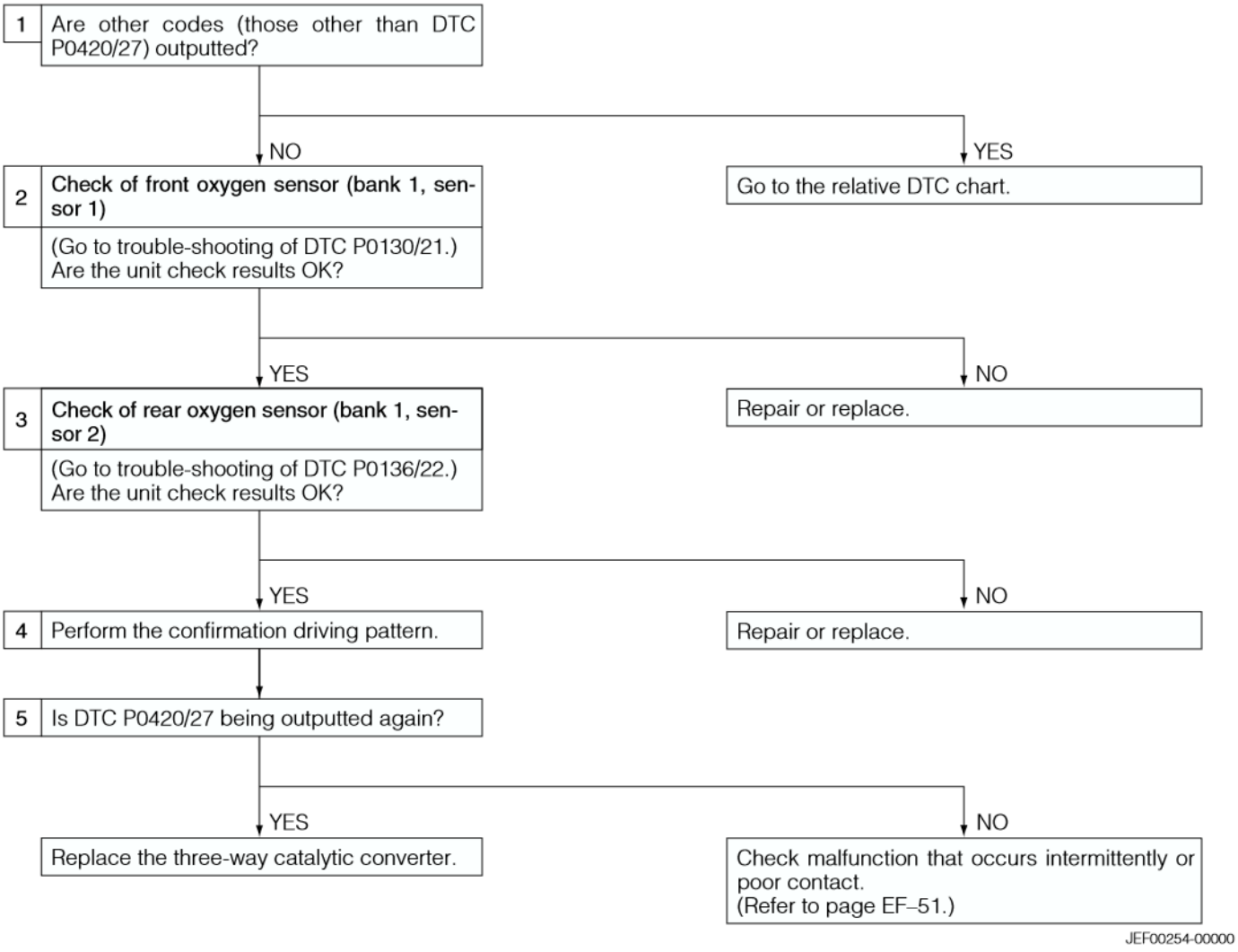
CAUTION
- If the conditions in this test are not strictly followed, detection of the malfunction will not be possible.
- If you do not have DS-21 diagnosis tester, turn the ignition switch OFF after performing steps ② to ④, then perform steps ② to ④ again.

WARNING:
- Be sure to conduct the confirmation test, while observing the instructions at page EF–6.

JEF00253-00161

INSPECTION PROCEDURE

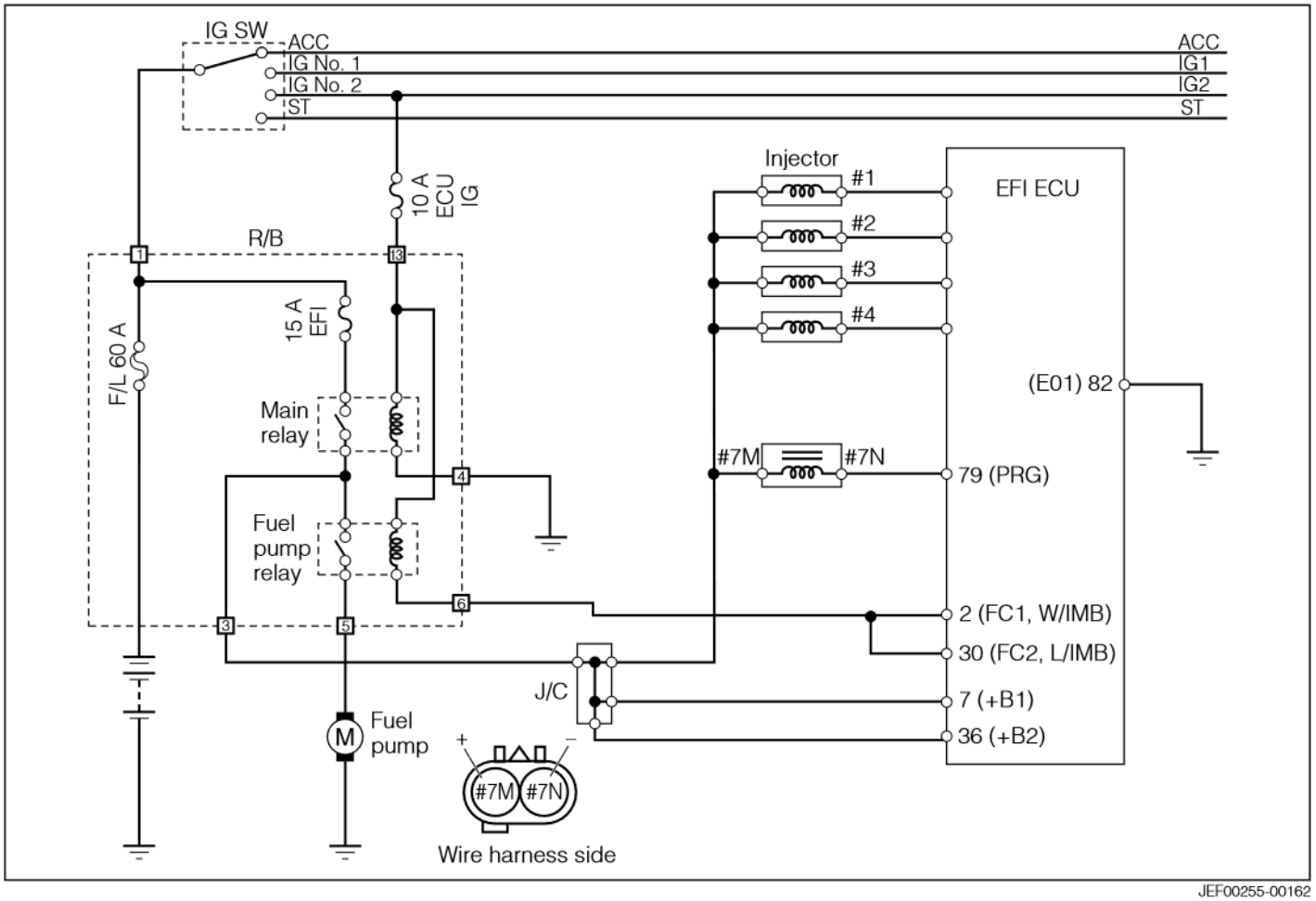
NOTE:
- Read the freeze frame data, using the DS-21 diagnosis tester or OBD II generic scan tool. Because the freeze frame data records the engine conditions when the malfunction was detected, when troubleshooting the freeze frame data is useful to determine whether the vehicle was running or stopped,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



JEF00254-00000

DTC	P0443/76	Evaporative Emission Control System Purge Control Valve Circuit Malfunction

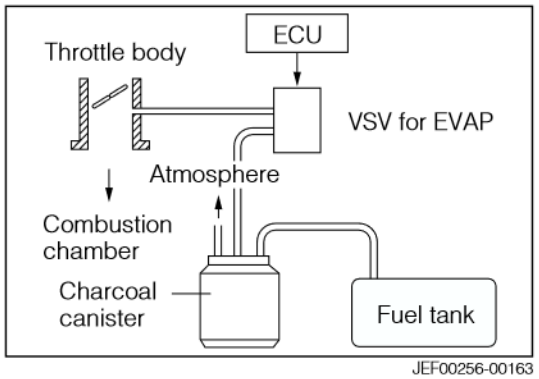
WIRING DIAGRAM



JEF00255-00162

CIRCUIT DESCRIPTION

When the execution conditions for the evaporative emission purging are met, the ECU performs the duty control for the VSV for evaporative emission purging and purges the evaporative emissions into the combustion chamber.



JEF00256-00163

DTC No.	DTC Detecting condition	Trouble area
P0443/76	When open wire or short takes place in VSV circuit for EVAP while the execution conditions for the evaporative emission purging are being met: (2 trip detection logic)	• Open wire or short in VSV circuit for EVAP • VSV for EVAP • Engine ECU

INSPECTION PROCEDURE

NOTE:

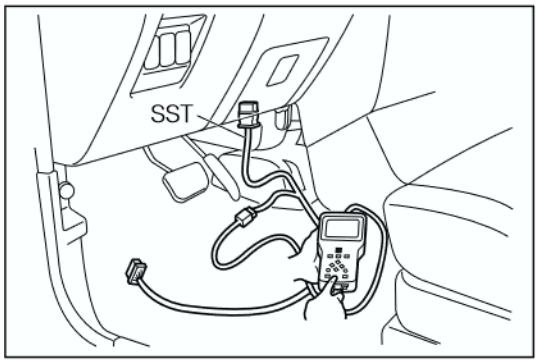
- Read the freeze frame data, using the DS-21 diagnosis tester or OBD Ⅱ generic scan tool. Because the freeze frame data records the engine conditions when the malfunction was detected, when troubleshooting the freeze frame data is useful to determine whether the vehicle was running or stopped, the engine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

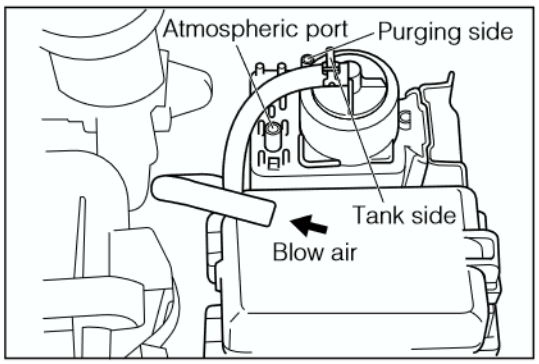
When using DS-21 diagnosis tester:

1 Operation check of EVAP purge control system

1. With the IG switch turned OFF, connect the DS-21 diagnosis tester to the DLC through the SST.
   SST: 09991-87404-000
2. Disconnect the hose going to the VSV from the charcoal canister.
3. Turn ON the IG switch, and turn ON the main switch of the tester. Erase the DTC. Select the "Purge VSV" of the "Actuator driving."
4. When executing "ON" and "OFF", check the operation of the VSV for purging.
   VSV "OFF" ··· No air continuity should exist when air is blown into the hose.
   VSV "ON" ···· Air continuity should exist when air is blown into the hose.

Are the check results OK?





NO

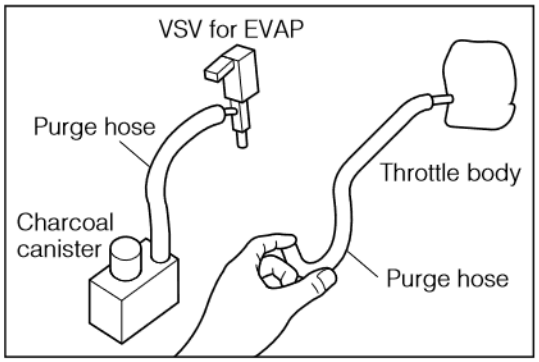
2 Check of purge hose and passage

1. Execute the VSV "Release" so as to return the VSV for purging to the original operating state.
2. Start the engine and keep the engine racing.
3. Disconnect the hose going from the VSV for purging to the intake manifold.
4. Apply your finger to the disconnected hose. Ensure that a negative pressure is applied.
   Specification:
   Negative pressure should be applied.
5. Check the hose for connecting state, leakage, restriction, bending and deterioration.

Are the check results OK?

YES

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



YES

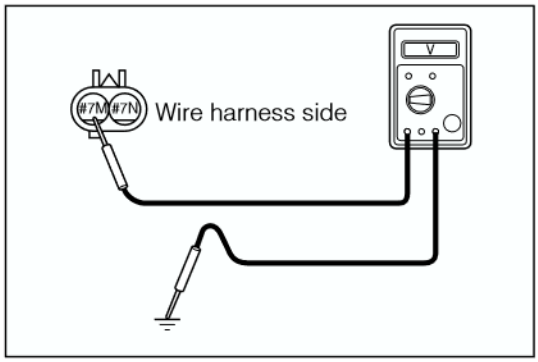
3 **Check of power supply voltage of VSV for purging**

1. Turn OFF the main switch of the tester. Turn OFF the IG switch.
2. Disconnect the VSV connector.
3. With the IG switch turned ON, measure the voltage between the harness side connector (#7M) of VSV and the body earth.
   Specified Value: Battery voltage

   Are the check results OK?

NO

Clean, repair or replace.



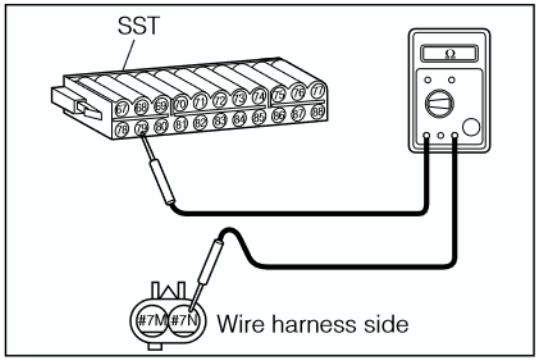
YES

4 **Check of harness between ECU and VSV for purging**

1. With the IG switch turned OFF, connect the SST (sub-harness). (Refer to page EF–8.)
   Do not connect the SST connector to the ECU.
2. Referring to page EF–48, check the harness and connector for open wire or short.
   Connector (#7N) at VSV harness side - connector 79 at ECU side (PRG)
   Are the check results for open wire and short OK?

NO

Check the harness and connector between the VSV for purging and the battery, and the main relay for open wire or short. Repair or replace, as required. (Refer to page EF–48.)



YES

5 **Unit check of VSV for purging**

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

NO

Repair or replace the harness or connector.

YES

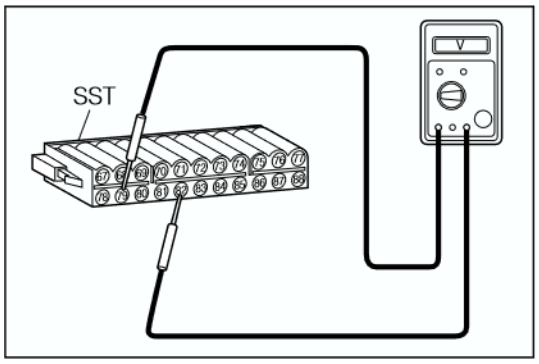
6	Check of ECU output signal

1. Connect the connector to VSV for purging. Connect the SST connector to the EFI ECU. Connect the hoses that have been disconnected to the original places.
2. When the engine is cold, with the engine idling, measure the voltage between the SST connector ⑲ and ㉜ (PRG - E01).
   Specified Value: Battery voltage
3. After warming up the engine (after the radiator fan has operated at least one time), measure the voltage between the SST connectors ⑲ and ㉜ (PRG - E01) for more than two minutes with the accelerator pedal depressed.
   Specified Value:
   The voltage should become 0 to 1 V within the two minutes.

Are the check results OK?

NO

Replace the VSV for purging.



YES

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

NO

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

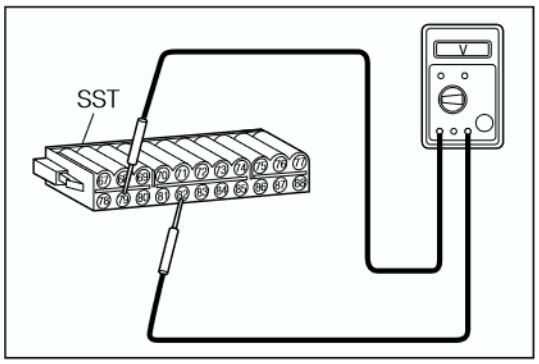
JEF00258-00164

When not using DS-21 diagnosis tester:

1	Check of ECU output signal

1. Set the SST (sub-harness). (Refer to page EF–8.)
2. When the engine is cold, with the engine idling, measure the voltage between the SST connectors ⑲ and ㉜ (PRG - E01).
   Specified Value: Battery voltage
3. After warming up the engine (after the radiator fan has operated at least one time), measure the voltage between the SST connectors ⑲ and ㉜ (PRG - E01) for more than two minutes with the accelerator pedal depressed.
   Specified Value:
   The voltage should become 0 to 1 V within the two minutes.

Are the check results OK?



YES

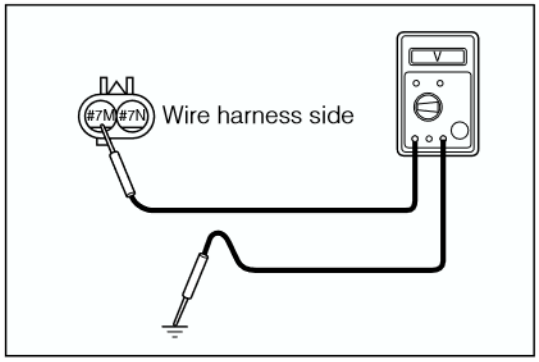
2 **Check of power supply voltage of VSV for purging**

1. Turn OFF the IG switch.
2. Disconnect the VSV connector.
3. With the IG switch turned ON, measure the voltage between the harness side connector (#7M) of VSV and the body earth.
   Specified Value: Battery voltage

   Are the check results OK?

NO

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



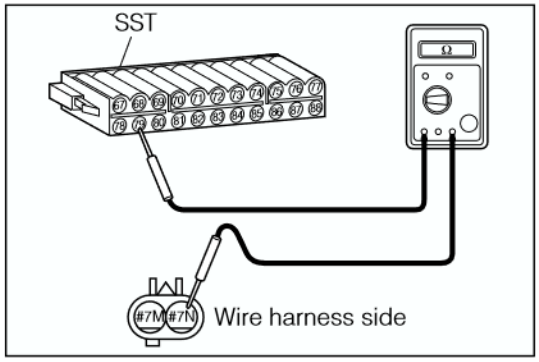
YES

3 **Check of harness between ECU and VSV for purging**

1. With the IG switch turned OFF, connect the SST (sub-harness). (Refer to page EF–8.)
   Do not connect the SST connector to the ECU.
2. Referring to page EF–48, check the harness and connector for open wire or short.
   Connector (#7N) at VSV harness side - connector 79 (PRG) at ECU side
   Are the check results for open wire and short OK?

NO

Check the harness and connector between the VSV for purging and the battery, and the main relay for open wire and short. Repair or replace, as required. (Refer to page EF–48.)



YES

4 **Unit check of VSV for purging**

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

NO

Repair or replace the harness or connector.

YES

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

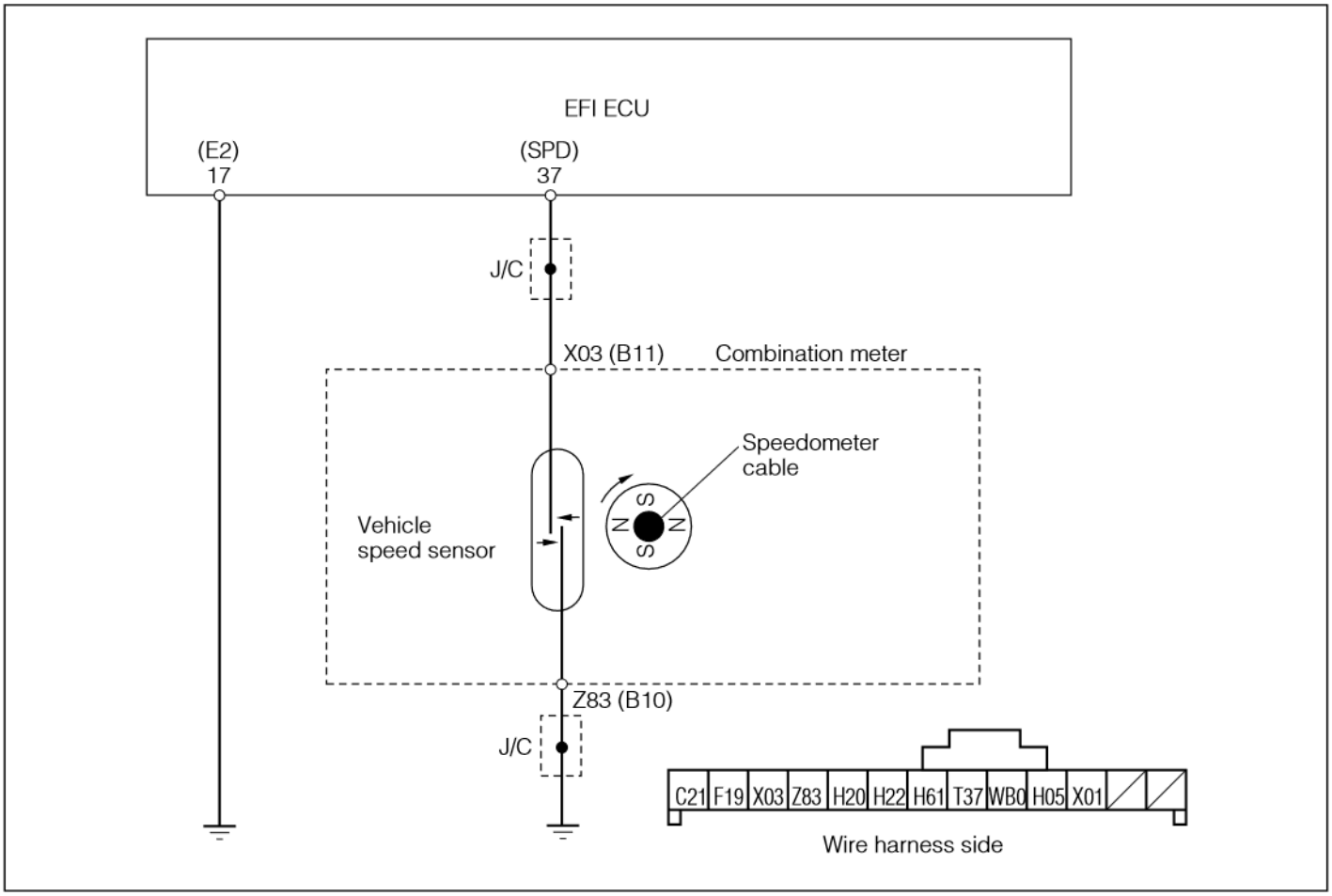
NO

Replace the VSV for purging.

JEF00258-00165

DTC	P0500/52	Vehicle Speed Sensor Malfunction

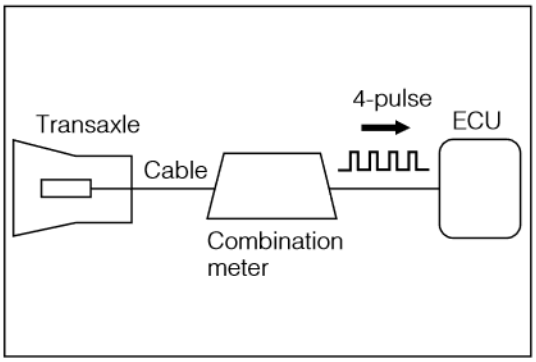
WIRING DIAGRAM



JEF00338-00233

CIRCUIT DESCRIPTION

This sensor is mounted in the combination meter. It contains a magnet which is rotated by the speedometer cable. The reed switch is turned ON and OFF four times for every revolution of the speedometer. It is then transmitted to the ECU. The ECU determines the vehicle speed based on the frequency of these pulse signals.



JEF00339-00234

DTC No.	DTC Detecting condition	Trouble area
P0500/52	No signal is inputted from the speed sensor to the ECU for a certain length of time when the fuel cut operation is performed during deceleration. (2 trip detection logic)	• Combination meter • Open wire or short in vehicle speed sensor circuit • Vehicle speed sensor • Engine ECU

1 Operation check of speedometer

1. Run the vehicle.
   Does the speedometer indicate the vehicle speed correctly?
   NOTE:
   • If the speedometer indication is normal, the speedometer system is functioning normally.

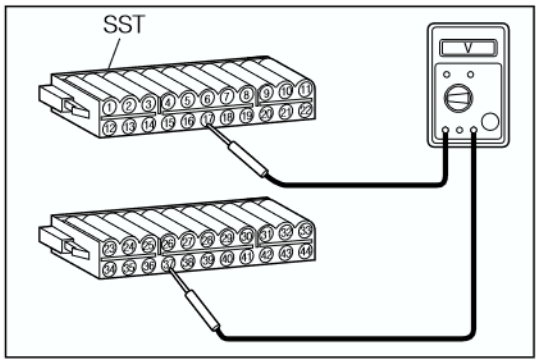
YES ↓

2 Check of input signal of speed sensor to ECU

1. Set the SST (sub-harness) (Refer to page EF–8.)
2. Check that the voltage between the SST terminals ㊲ and ⑰ is within the following specified value when the vehicle is moving with the ignition switch turned ON.
   Specified Value:
   0 ↔ 4.5 to 5.5 V for pulse signal

NO →

Check the speedometer circuit and combination meter (including speedometer gear & meter cable)



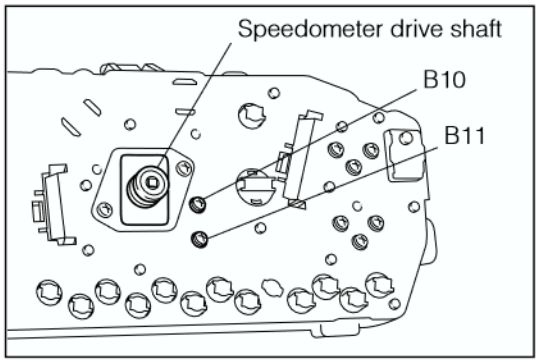
NO ↓

3 Check of speed sensor (reed switch)

1. Turn OFF the IG switch.
2. Remove the combination meter.
3. Ensure that continuity occurs four times at the terminals B10 and B11 of the combination meter while the speedometer drive shaft completes a turn.
   Specification:
   Continuity should occur four times per turn of speedometer drive shaft.

YES →

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



YES ↓

4 Check for open and short in harness and connector between the engine ECU and vehicle speed sensor.
(Refer to page EF–48.)

NO →

Replace the speed sensor (combination meter).

YES ↓

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

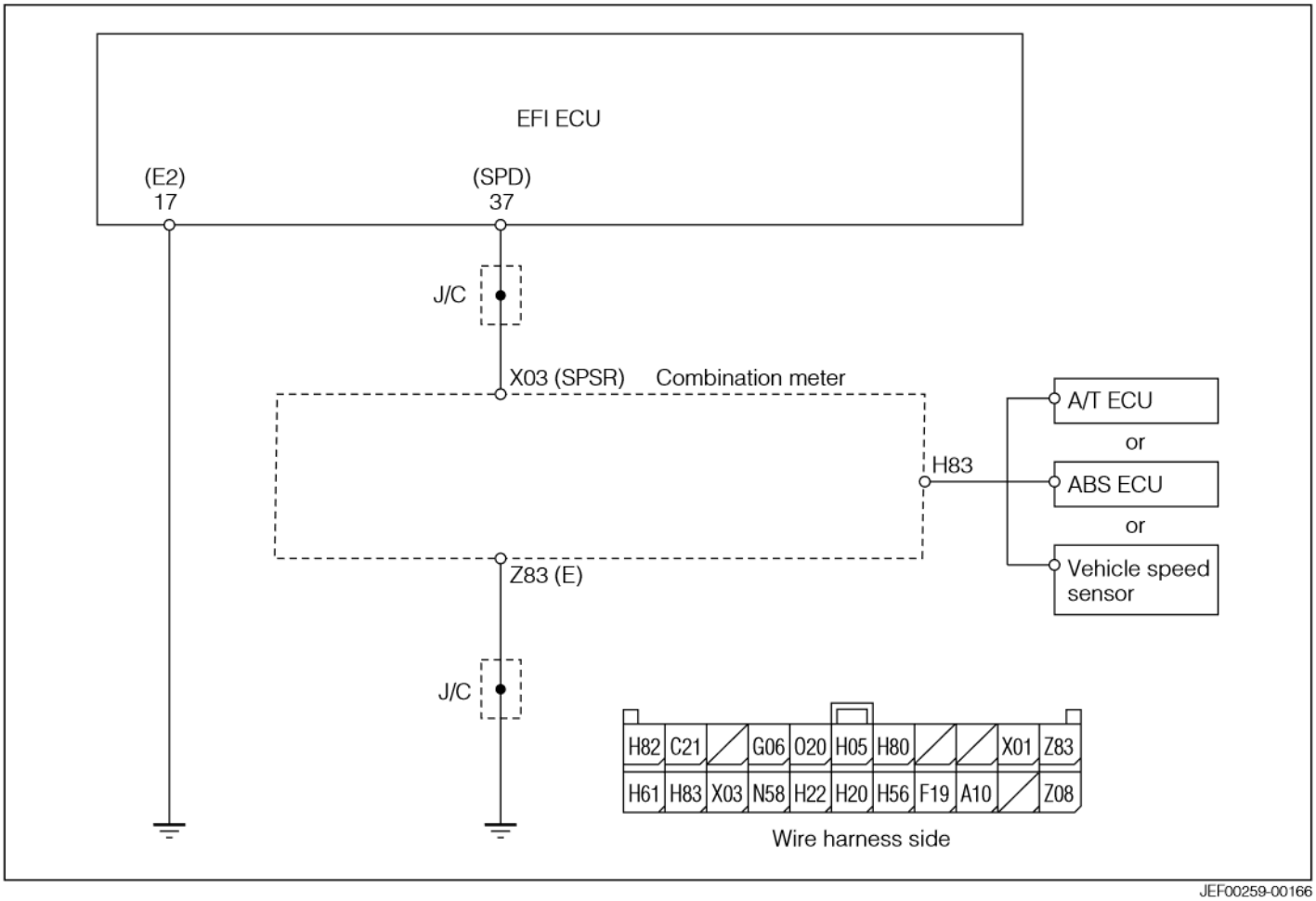
NO →

Repair or replace the harness or connector.

JEF00340-00235

DTC	P0500/52	Vehicle Speed Sensor Malfunction

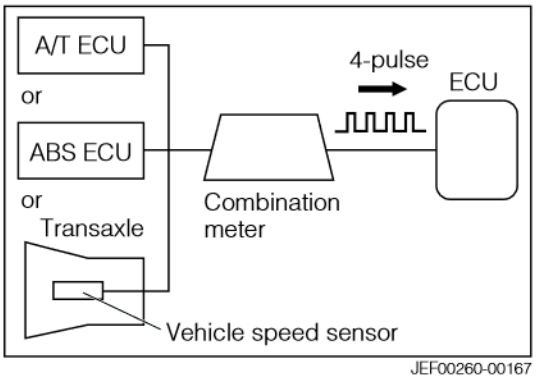
WIRING DIAGRAM



JEF00259-00166

CIRCUIT DESCRIPTION

A vehicle speed sensor driven by a microcomputer is used. Signals driven by the microcomputer in the combination meter are inputted into the EFI ECU, based on the signals from the A/T ECU in the case of automatic transmission vehicles; from ABS ECU in the case of ABS-equipped vehicles; from the vehicle speed sensor mounted on the transaxle in the case of other vehicles.
The EFI ECU determines the vehicle speed based on the frequency of these pulse signals.



JEF00260-00167

DTC No.	DTC Detecting condition	Trouble area
P0500/52	No signal from the speed sensor is inputted into the ECU for a certain length of time during the fuel cut operation at time of deceleration. (2 trip detection logic)	• Combination meter • Open wire or short in signal line from A/T ECU or ABS ECU • Vehicle speed sensor • Engine ECU or A/T ECU or ABS ECU

1 Operation check of speedometer

1. Run the vehicle.
   Does the speedometer indicate the vehicle speed properly?
   NOTE:
   - **If the speedometer indication is normal, the speedometer system is functioning properly.**

YES

2 Check of input signal to EFI ECU

1. Set the SST (sub-harness) (Refer to page EF–8.)
2. Check that the voltage between the SST terminals ㊲ and ⑰ is within the following specified value when the vehicle moves and the ignition switch is turned to the ON position.
   Specified Value:
   0 ↔ 4.5 to 5.5 V for pulse signal

NO

3 Check of harness between EFI ECU and combination meter

1. Turn OFF the IG switch. Disconnect the SST connector at the ECU side.
2. Remove the combination meter.
3. Disconnect the harness from the combination meter.
4. Referring to page EF–48, check the harness and connector for open wire or short.
   - SST connector ㊲ - Harness side connector (X03) of combination meter
   - Harness side connector (Z83) of combination meter - Body ground

   Are the check results for open wire and short OK?

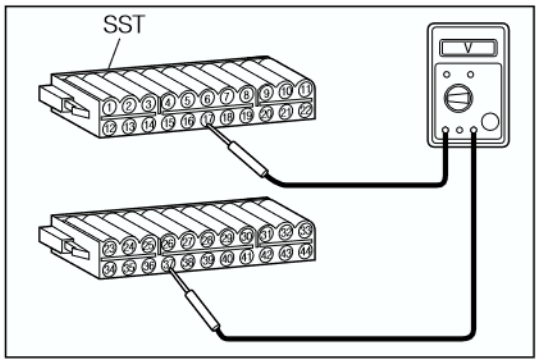
YES

Replace the combination meter.

NO

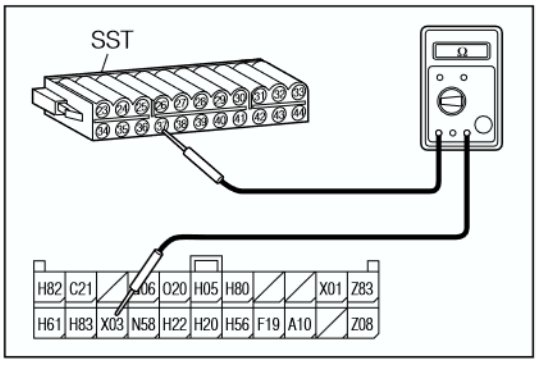
Repair or replace the harness or connector.

Check of A/T ECU, ABS ECU or vehicle speed sensor circuit, and combination meter (Refer to sections A/T, BE and BR.)



YES

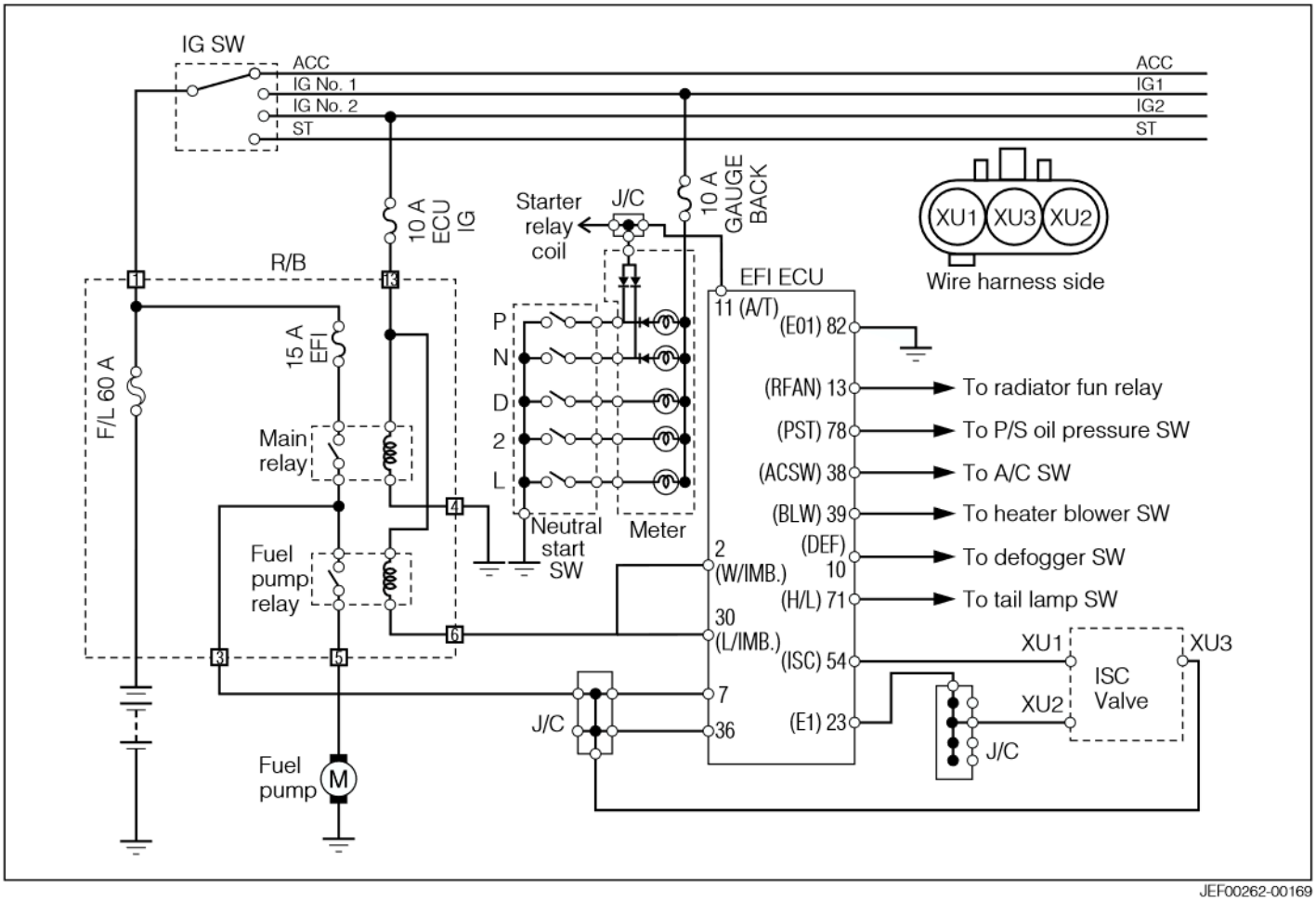
Check or replace the engine ECU. (Refer to page EF–51.)



JEF00261-00168

DTC	P0505/71	Idle Control System Malfunction

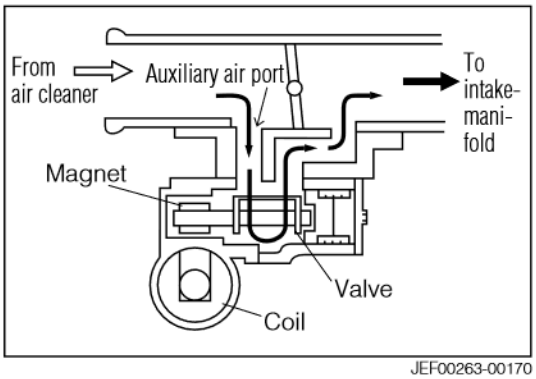
WIRING DIAGRAM



JEF00262-00169

CIRCUIT DESCRIPTION

The rotary solenoid type ISC valve is located in front of the intake manifold and the intake air bypassing the throttle valve is directed to the ISC valve through a passage.
In this way the intake air volume bypassing the throttle valve is regulated, controlling the engine speed.
The engine ECU operates only the ISC valve to perform idle-up and provide feedback for the target idling speed.



JEF00263-00170

DTC No.	DTC Detecting condition	Trouble area
P0505/71	Open wire or short in ISC valve circuit	• Open wire or short in ISC valve circuit • ISC valve • Engine ECU

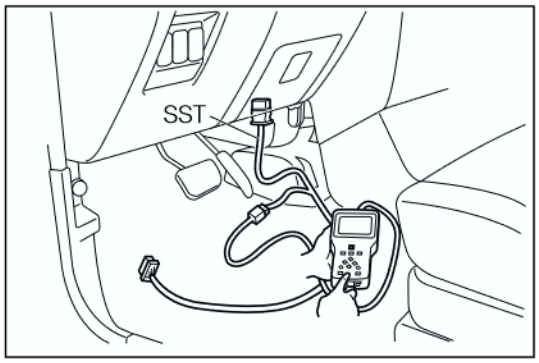
INSPECTION PROCEDURE

NOTE:

- Read the freeze frame data, using the DS-21 diagnosis tester. 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:

1	Operation check of ISC valve
	1. With the IG switch turned OFF, connect the DS-21 diagnosis tester to the DLC through the SST. SST: 09991-87404-000 2. Warm up the engine fully. 3. Turn ON the main switch of the DS-21 diagnosis tester. 4. With the engine idling, select the "ISC" in the "Actuator driving." Execute the "5 % open" and "50 % open", respectively. Does the engine speed increase or decrease in accordance with the change in the ISC duty ratio (5 %, 50 %)?

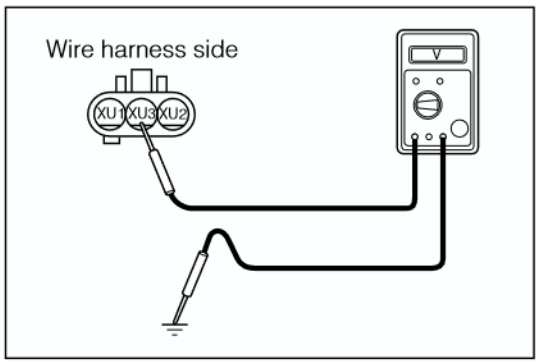


NO

2	Check of power supply voltage of ISC valve
	1. Turn OFF the main switch of the tester. Turn OFF the IG switch. 2. Disconnect the connector of the ISC valve. 3. Measure the voltage between the terminals (XU3) of the wire harness connector and the body ground when the ignition switch is turned to the ON position. Specified Value: Battery voltage Is the measured value the specified value?

YES

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



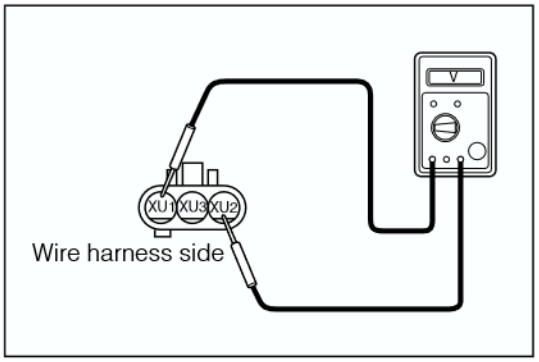
YES

3	Check of input signal of ISC valve

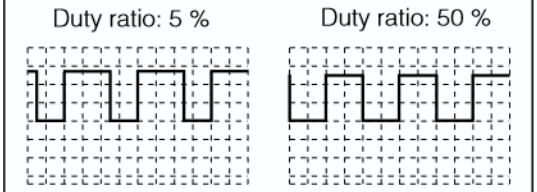
1. After warming up the engine fully, turn ON the main switch of the DS-21 diagnosis tester.
2. With the engine idling, select the "ISC" in the "Actuator driving." Execute the "5 % open" and "50 % open", respectively. Measure the voltage between (XU1) and (XU2).
   Does the voltage increase or decrease in accordance with the change in the ISC duty ratio (5 %, 50 %)?

NO

Check the harness and connector between the ISC valve and the battery, and main relay for open wire and short. (Refer to page EF–48.)



[Reference]
Check by oscilloscope



When an oscilloscope is used, the ISC control signal becomes the waveform as indicated in the figure above.

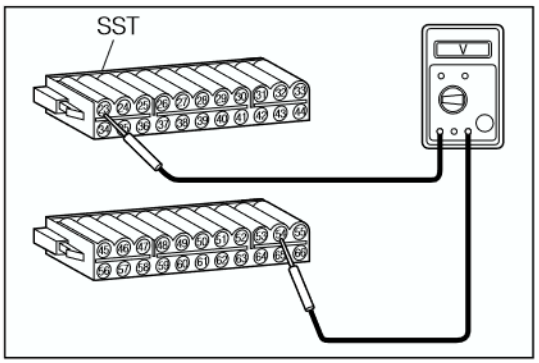
NO

4	Check of output signal of ISC valve of ECU

1. Turn 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. Warm up the engine. With the engine idling, select the "ISC" in the "Actuator driving." Execute the "5 % open" and "50 % open", respectively. Measure the voltage between the SST terminals (54) and (23) (ISC - E1).
   Does the voltage increase or decrease in accordance with the change in the ISC duty ratio (5 %, 50 %)?

YES

Replace the ISC valve.

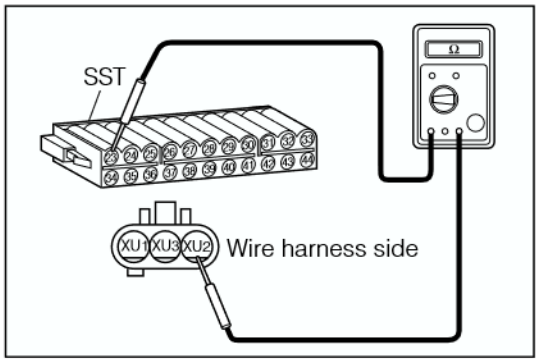


YES

5	Check of harness between ISC valve and ECU
	1. Turn OFF the main switch of the tester. Turn OFF the IG switch. 2. Disconnect the SST connector at the ECU side. 3. Referring to page EF–48, check the harness and connector for open wire or short. • ISC valve connector (XU1) - SST terminal 54 (ISC) • ISC valve connector (XU2) - SST terminal 23 (E1) Are the check results for open wire and short OK?

NO

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



YES

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

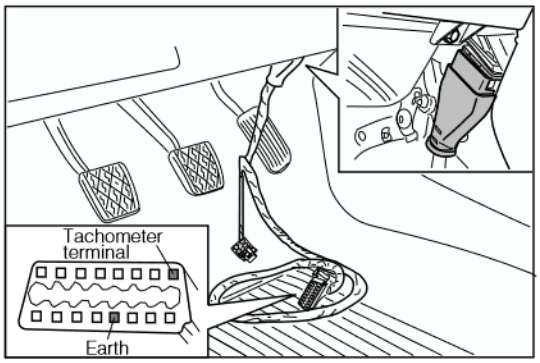
NO

Repair or replace the harness or connector.

JEF00264-00171

When not using DS-21 diagnosis tester:

1	Operation check of ISC valve
	Ensure that the engine revolution speed is high during the cold period. Also, ensure that the engine revolution speed drops as the engine warms up and that the idle speed is maintained. Are the check results OK?



NO

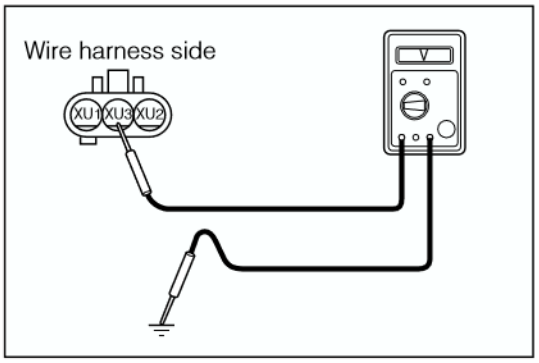
2 Check of power supply voltage of ISC valve

1. Turn OFF the IG switch.
2. Disconnect the connector of the ISC valve.
3. Measure the voltage between the terminals (XU3) of the wire harness connector and the body ground when the ignition switch is turned to the ON position.
   Specified Value: Battery voltage

   Is the measured value the specified value?

YES

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



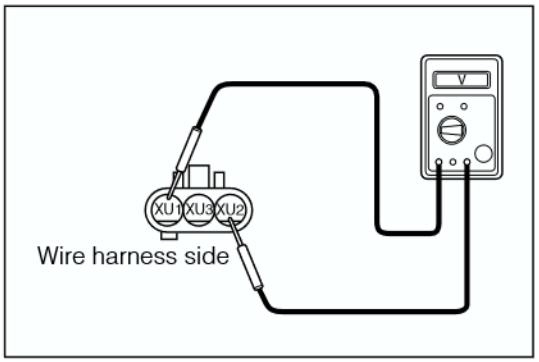
YES

3 Check of input signal of ISC valve

1. Warming up the engine fully.
2. With the engine idling (with the ISC valve connector disconnected), measure the voltage between (XU1) and (XU2) at the harness connector side.
   Specification:
   The voltage should be stable at a constant value. (The value of the voltage can not be specified.)

NO

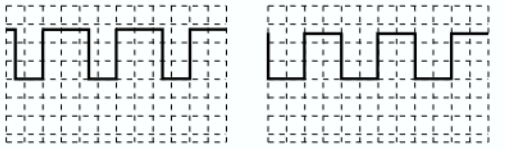
Check the harness and connector between the ISC valve and the battery, and main relay for open wire and short. (Refer to page EF–48.)



[Reference]
Check by oscilloscope

Idling condition

(Electrical load "OFF") (Electrical load "ON")



When an oscilloscope is used, the ISC control signal becomes the waveform as indicated in the figure above. (The duty ratio cannot be specified.)

NO

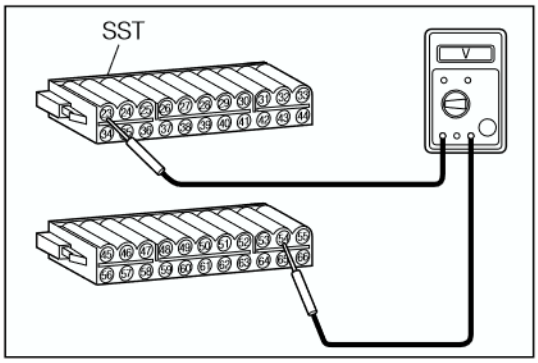
4 Check of output signal of ISC valve of ECU

1. Turn OFF the IG switch.
2. Connect the SST between the ECU connectors and the wire harness connectors.
   SST: 09842-97203-000
3. Warm up the engine. With the engine idling (with the ISC valve connector disconnected), measure the voltage between the SST terminals ⑭ and ㉓ (ISC - E1).
   Specification:
   The voltage should be stable at a constant value. (The value of the voltage can not be specified.)

   Are the check results OK?

YES

Replace the ISC valve.



YES

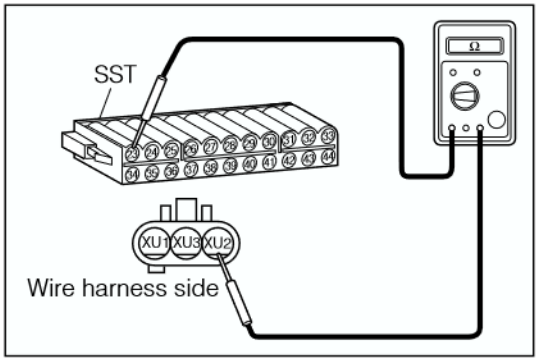
5 Check of harness between ISC valve and ECU

1. Turn OFF the IG switch.
2. Disconnect the SST connector at the ECU side.
3. Referring to page EF–63, check the harness and connector for open wire or short.
   - ISC valve connector (XU1) - SST terminal ⑭ (ISC)
   - ISC valve connector (XU2) - SST terminal ㉓ (E1)

   Are the check results for open wire and short OK?

NO

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



YES

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

NO

Repair or replace the harness or connector.

JEF00265-00172

DTC	P1105/32	Barometric Pressure Sensor Circuit Malfunction

WIRING DIAGRAM/CIRCUIT DESCRIPTION

An atmospheric sensor of the same construction as that of the MAP sensor is mounted in the ECU. Therefore, the wiring diagram for the atmospheric sensor is omitted here.

DTC No.	DTC Detecting condition	Trouble area
P1105/32	When the following conditions 1 and 2 are met for a certain length of time: 1. The AD conversion value of atmospheric sensor is less than 1.6 V. 2. The AD conversion value of atmospheric sensor is 4.7 V or more.	• Engine ECU

JEF00266-00000

INSPECTION PROCEDURE

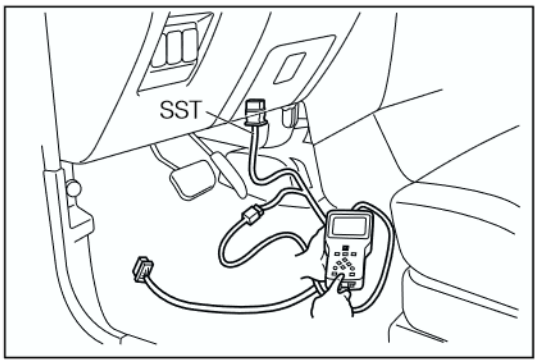
NOTE:

- 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.

When using DS-21 diagnosis tester:

1	Re-confirmation of DTC

1. With the IG switch turned OFF, connect the DS-21 diagnosis tester to the DLC through the SST.
   SST: 09991-87404-000
2. Turn ON the IG switch, and turn ON the main switch of the tester. Erase the DTC.
   (As for the operation, follow the instruction manual of the DS-21 diagnosis tester.)
3. Turn OFF the main switch of the tester. Turn OFF the IG switch.
4. Turn ON the IG switch. Turn ON the main switch of the tester.
5. Check the DTC.
   Is P1105 indicated?



YES → Replace the ECU.

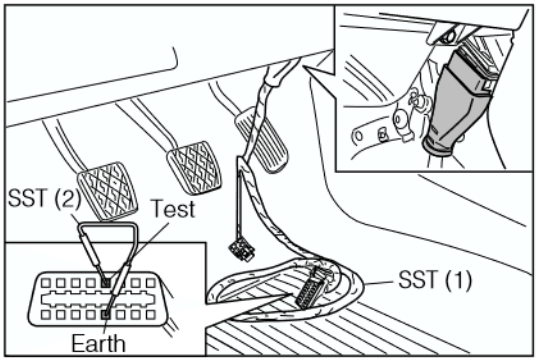
NO → Check or replace the ECU. (Refer to page EF–51.)

JEF00267-00173

When not using DS-21 diagnosis tester:

1	Re-confirmation of DTC

1. With the IG switch turned OFF, connect the DS-21 diagnosis tester to the DLC through the SST.
   SST: 09991-87404-000
2. Connect the terminal T and the earth terminal of the SST connector with a jump wire.
   SST: 09991-87403-000
3. Remove the EFI fuse. Erase the DTC. (As for the erasing method, refer to page EF–58.)
4. Set the EFI fuse to the original position.
5. Turn ON the IG switch.
6. Check the DTC. (Read out the flashing pattern of the MIL.)
   Is "32" indicated?



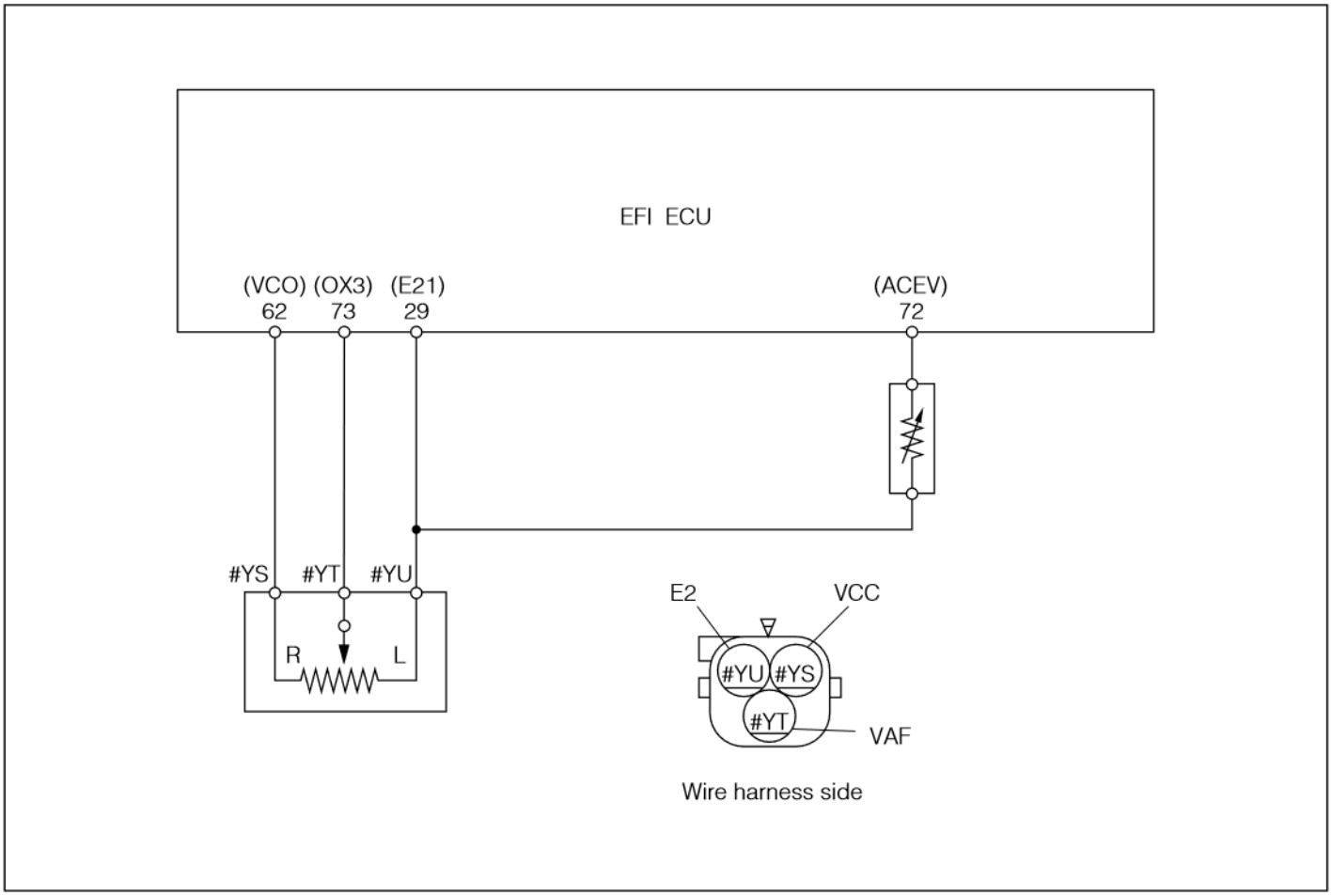
YES → Replace the ECU.

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

JEF00268-00174

DTC	P1130/29	A/F Adjuster Circuit Malfunction

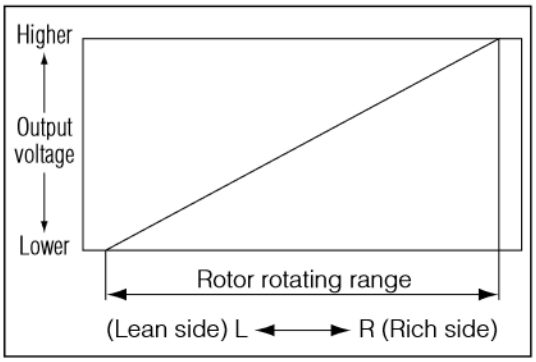
WIRING DIAGRAM



sEF00039-00026

CIRCUIT DESCRIPTION

The variable resistor is mounted at the left side of the engine compartment at the body side.
This is a variable resister to adjust the air-to-fuel ratio while the engine is idling (after the engine has warmed up). The idle CO value is adjusted to the specified value by rotating the rotor.
The letters “R” and “L” are embossed at the root of the connector.



sEF00040-00027

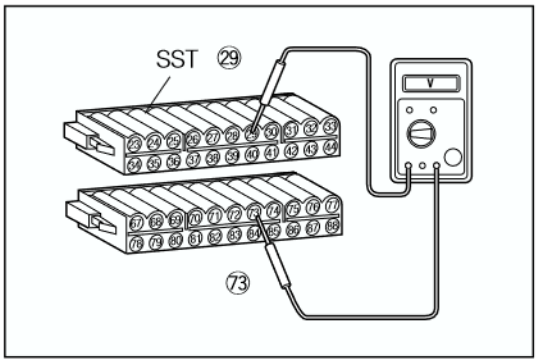
DTC No.	DTC Detecting condition	Trouble area
P1130/29	Condition (1) or (2) continues with more than a certain length of time 1. OX3 < 0.2 V 2. OX3 ≧ 4.8 V	• Open wire or short in A/F adjuster circuit • A/F adjuster • Engine ECU

INSPECTION PROCEDURE

NOTE:

- If DTC P1530/44 (A/C Evaporator Temp. Sensor Malfunction), P1130/29 (A/F Adjuster Circuit Malfunction) are output simultaneously, E21 (Sensor Ground) may be open.
- Read freeze frame data using DS-21 diagnosis tester or OBD Ⅱ generic scan tool. Because freeze frame data records the engine condition 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.

1	Check of input voltage of A/F adjuster to ECU
	1) Set the SST (sub-harness). (Refer to page EF–8.) 2) Turn ON the IG switch. 3) Turn the rotor clockwise and counter-clockwise. Check to see if the voltage measured between the SST connectors ⑦③ and ② (OX3 - E21) varies. **Specified Value: 0.2 V or more, but less than 4.8 V** Are the check results OK?

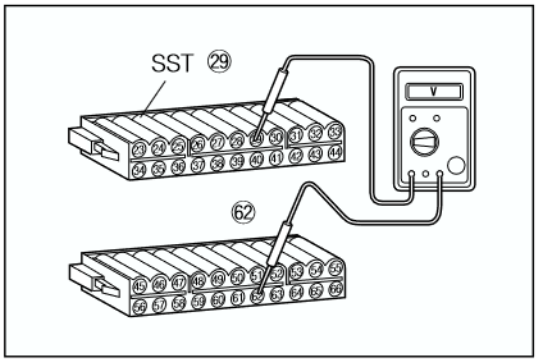


NO

YES

2	Check of power supply voltage of A/F adjuster
	1) Ensure that the voltage between the SST terminals ⑥② (VCO) and ② (E21) is within the specified value when the ignition switch is turned to the ON position. **Specified value: 4.5 - 5.5 V** Are the check results OK?

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



YES

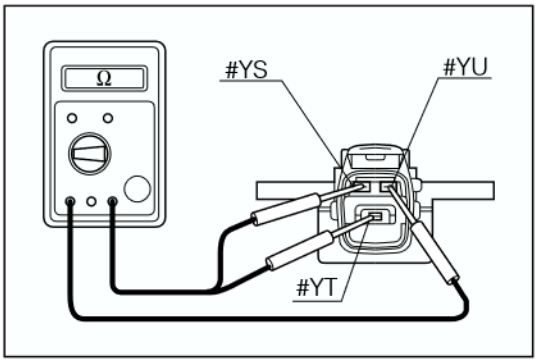
3	Unit check of A/F adjuster

1) Turn off the ignition switch.
2) Disconnect the connector of the A/F adjuster.
3) Check the resistance between the terminals below.
   Specified Value:

Terminal	Resistance kΩ
#YS - #YU	5 ± 1.5 (25°C)
#YT - #YU	The resistance should increase in proportion to the turning of the rotor in a direction from L to R.

NO

Check and replacement of ECU (Refer to page EF–51.)



YES

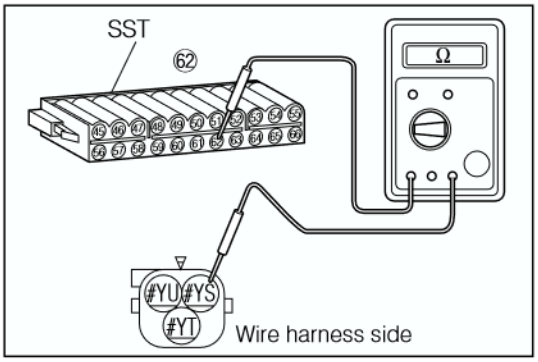
4	Check of harness between A/F adjuster and ECU

1) Turn OFF the IG switch.
2) Disconnect the SST terminals from the EFI ECU.
3) Referring to page EF-48, check the harness and connector for open wire or short, as follows:
   • Connector of A/F adjuster (#YS) at harness side - SST connector (62)
   • Connector of A/F adjuster (#YT) at harness side - SST connector (73)
   • Connector of A/F adjuster (#YU) at harness side - SST connector (29)

   Are the check results for open wire and short OK?

NO

Replace the A/F adjuster.



YES

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

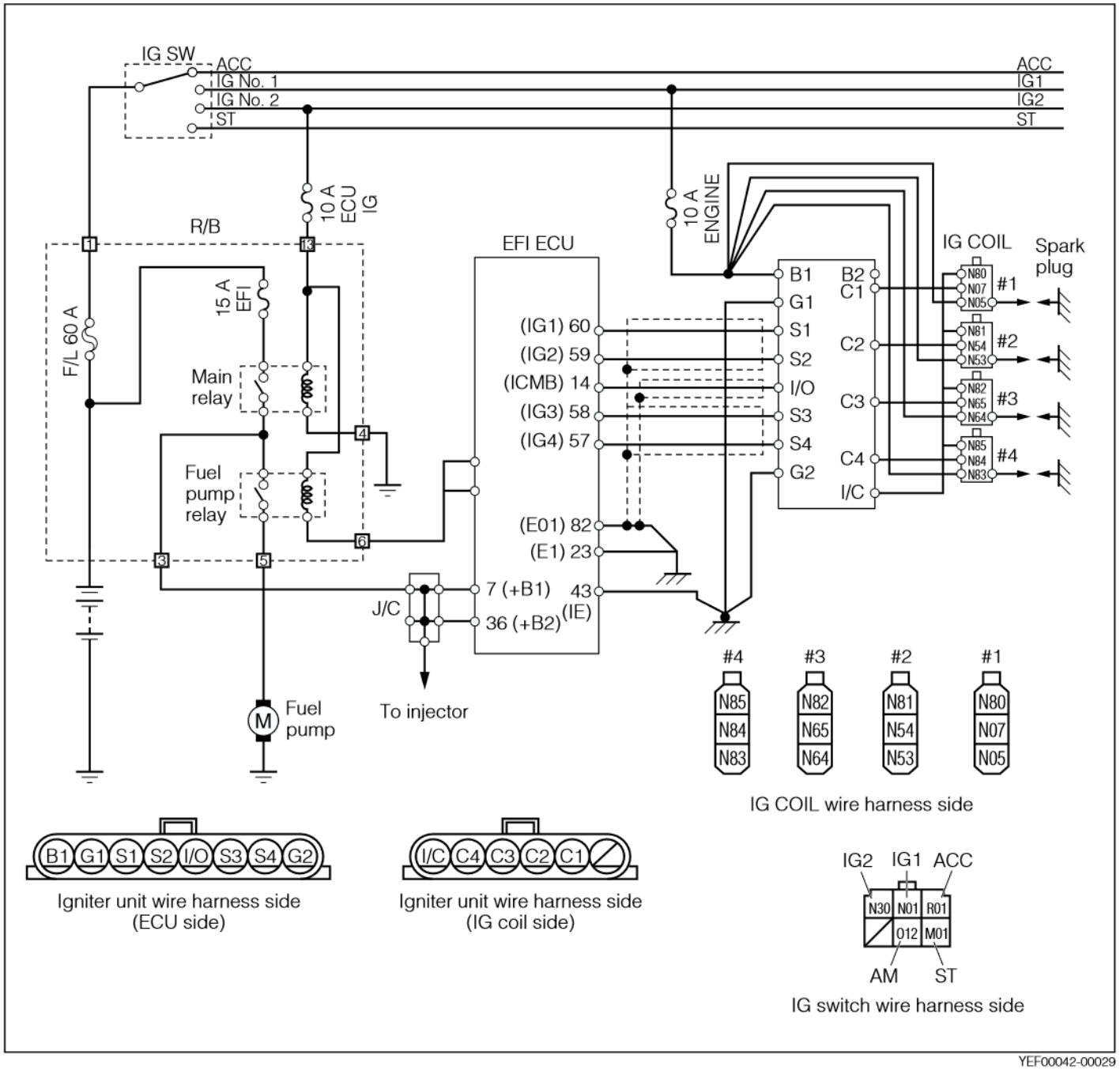
NO

Repair or replace the harness or connector.

sEF00041-00028

DTC	P1300/36	Ion System Malfunction

WIRING DIAGRAM FOR M101, M201 AND J102



YEF00042-00029

CIRCUIT DESCRIPTION

This system detects any misfire of the engine by using an ion current which has the same waveforms as those of the combustion pressure. When any misfire takes place, no ion current is produced. Therefore, if the input voltage at the ECU side is below a certain value, it is judged that a misfire took place. Since the detected ion current is very weak, it is amplified in the ignitor unit. In addition, a vibration waveform appears in the ion current waveform when knocking takes place. Hence, knocking control is also performed by detecting vibration waveforms. This applies only to vehicles mounted with Type K3 engine with EU specifications.

YEF00043-00000

DTC No.	DTC Detecting condition	Trouble area
P1300/36	No ion current signal is inputted to the engine ECU during engine cranking or engine running.	• Open wire or short in Ion system circuit • Ignitor unit • Ignition coil (All cylinders) • Spark plug (All cylinders) • Engine ECU

JEF00270-00000

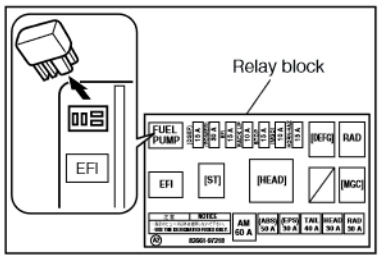
INSPECTION PROCEDURE

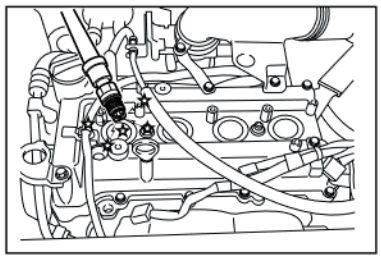
NOTE:

- Read the freeze frame data, using the DS-21 diagnosis tester. 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.
- This diagnostic chart is based on the premise that the engine is being cranked under normal conditions. If the engine does no crank, proceed to the matrix table for troubleshooting according to malfunctioning phenomena on page EF–47.
- When P1300/36 (ion system malfunction) is outputted, both P0300/17 (random/multiple cylinder misfire detected) and P0301/17 - P0304/17 (cylinders 1 to 4 misfire detected) may be outputted simultaneously.

1 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.
   WARNING:
   - **Sparks will take place. Care must be exercised to the surrounding combustible objects.**





- No spark takes place in all cylinders. → **2 Unit check of spark plug**: (Refer to page EF–185.) Are the unit check results OK?
- No spark takes place in some cylinders. → Perform the unit check of the spark plug for the cylinders where no spark takes place. (Refer to page EF–185.) Are the unit check results OK?
- Sparks take place in all cylinders. → Go to Step 5.

NO

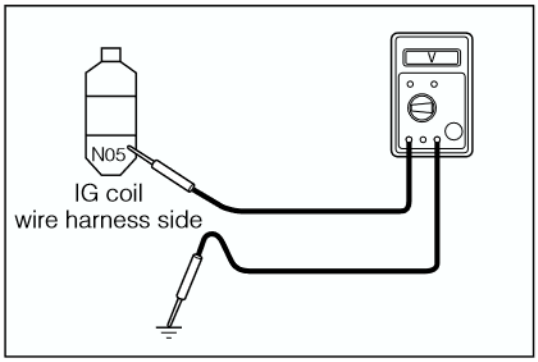
Replace the spark plug. Perform the spark check again.
No spark takes place. ··· Go to Step 3.
Sparks take place. ····· Go to Step 5.
CAUTION:
• Never use spark plugs other than those designated.

YES

3 Check of power supply voltage of IG coil

1. With the IG switch turned OFF, disconnect the connector of the IG coil of each cylinder.
2. With the IG switch turned ON, measure the voltage between the body earth and each of the harness-side connectors (N05), (N53), (N64) and (N83) of each IG coil.
   Specified Value: Battery voltage

   Are the check results OK?



NO

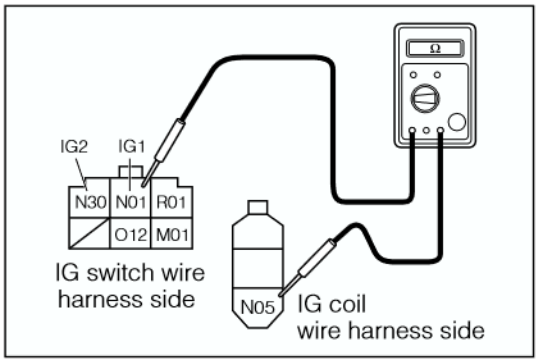
YES

4 Check of power supply voltage of IG coil

Check the harness, connector and fuse for open wire and short by referring to page EF–48.
1. Turn OFF the IG switch.
2. Disconnect the connectors at the ECU side of the IG switch and ignitor unit.
   • Between IG switch and ignitor unit terminal (B1)
   • Between IG switch and each of (N05), (N53), (N64) and (N83) of each IG coil.

   Are the check results for open wire and short OK?

Go to Step 5.



YES

Replace the IG switch.

NO

Repair or replace the harness or connector. Or replace the fuse.

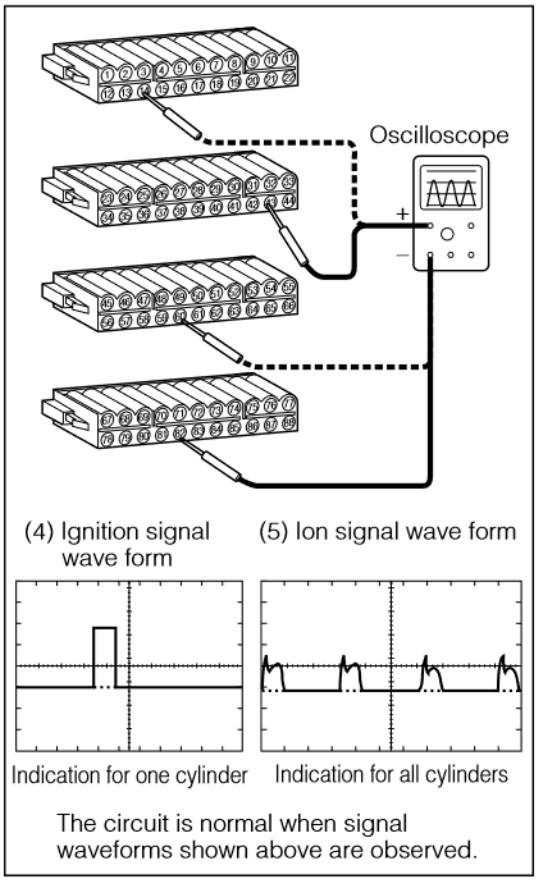
sEF00044-00030

5	Check of ignition signal and ion signal

Check that the ignition signal and ion signal are outputted from the ECU and inputted by using an oscilloscope.

1. With the IG switch turned OFF, perform the restoration.
2. Set the SST (sub-harness). (Refer to page EF–8.)
   SST: 09842-97203-000
3. Warm up the engine. (only when the engine can start)
4. With the engine idling or cranking, connect the probe ⊖ of the oscilloscope to the SST terminal ㉜; the probe ⊕ to each of the SST terminals ㊵, ㊴, ㊳ and ㊲, respectively. Check the ignition signal for all cylinders.
   Specification:
   Pulse waveforms should be confirmed.
5. As has been done in Step 4), connect the probes ⊕ and ⊖ of the oscilloscope to the SST terminals ⑭ (ICMB) and ㊸ (IE), respectively, and check the ion signal.
   Specification:
   Waveforms as shown in the right figure should be observed without any waveform missing.

Are the ignition signal and ion signal observed?



When sparks take place and the ignition signal waveform is observed, is the ion signal waveform observed?

When no spark takes place and the ignition signal waveform is observed, and no ion signal waveform is observed:

Go to Step 10.

When no spark takes place and no ignition signal waveform is observed, and no ion signal waveform is observed:

NO

YES

6	Check of harness between ECU and ignitor unit

1. Turn OFF IG switch.
2. Disconnect the SST connector of the EFI ECU.
3. Disconnect the ECU side connector of the ignitor unit.
4. Referring to page EF–63, check the harness and connector for open wire or short.
   - SST terminal ⑭ - Harness side (I/O) terminal of ignitor unit

Are the check results for open wire and short OK?

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

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

YES

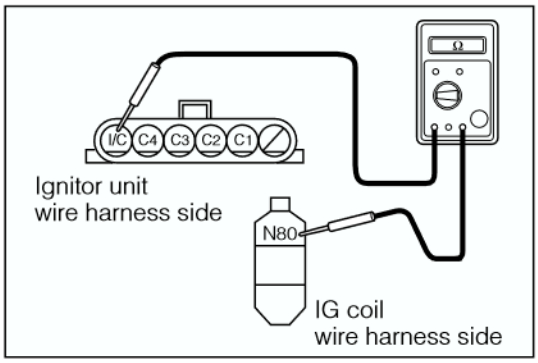
7 **Check of harness between ignitor unit and IG coil**

Referring to page EF–48, check the harness and connector for open wire or short.
1. Disconnect the IG coil side connector of the ignitor unit.
2. Disconnect the connector of each IG coil.
   - Between harness side terminal (I/C) of ignitor unit - Harness side terminals (N80), (N81), (N82) and (N85) of each IG coil

Are the check results for open wire and short OK?

NO

Repair or replace the harness or connector.



YES

8 **Unit check of ignitor unit**

(Refer to page EF–188.)
Are the check results OK?

NO

Repair or replace the harness or connector.

YES

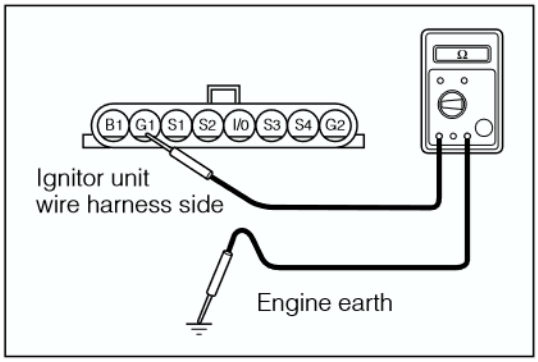
9 **Check of earth circuit of ignitor unit**

1. Measure the continuity between the engine earth and each of harness side terminals (G1) and (G2) of the ignitor unit.
   Specified Value: Continuity exists.

   Are the check results OK?

NO

Replace the ignitor unit.



YES

Replace the IG coil. (All cylinders)

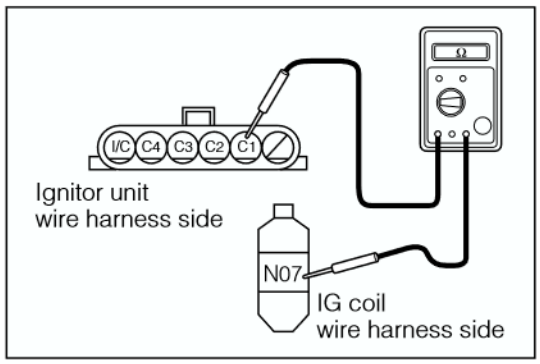
NO

Repair or replace the harness or connector.

10 Check of harness between ignitor unit and IG coil

Referring to page EF–48, check the harness and connector for open wire or short.
1. Turn OFF the IG switch.
2. Disconnect each IG coil and the IG coil side connector of the ignitor unit.
   - Between harness side terminals (N07), (N54), (N65) and (N84) of each IG coil and harness side terminals (C1), (C2), (C3) and (C4) of ignitor unit

   Are the check results for open wire and short OK?



YES

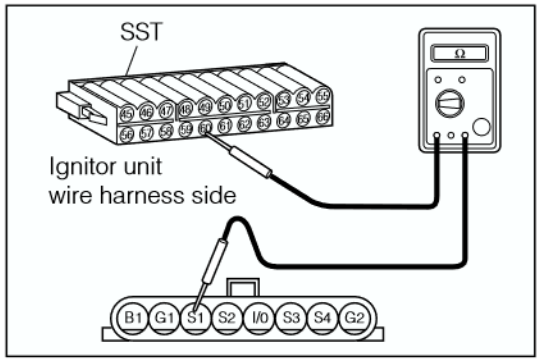
NO → Repair or replace the harness or connector.

11 Check of harness between EFI ECU and ignitor unit

Referring to page EF–48, check the harness and connector for open wire or short.
1. Disconnect the SST connector from the EFI ECU.
2. Disconnect the ECU side connector of the ignitor unit.

   Harness side terminals (S1), (S2), (S3), (S4) and (I/O) of ignitor unit - SST connector terminals 60, 59, 58, 57 and 14

   Are the check results for open wire and short OK?



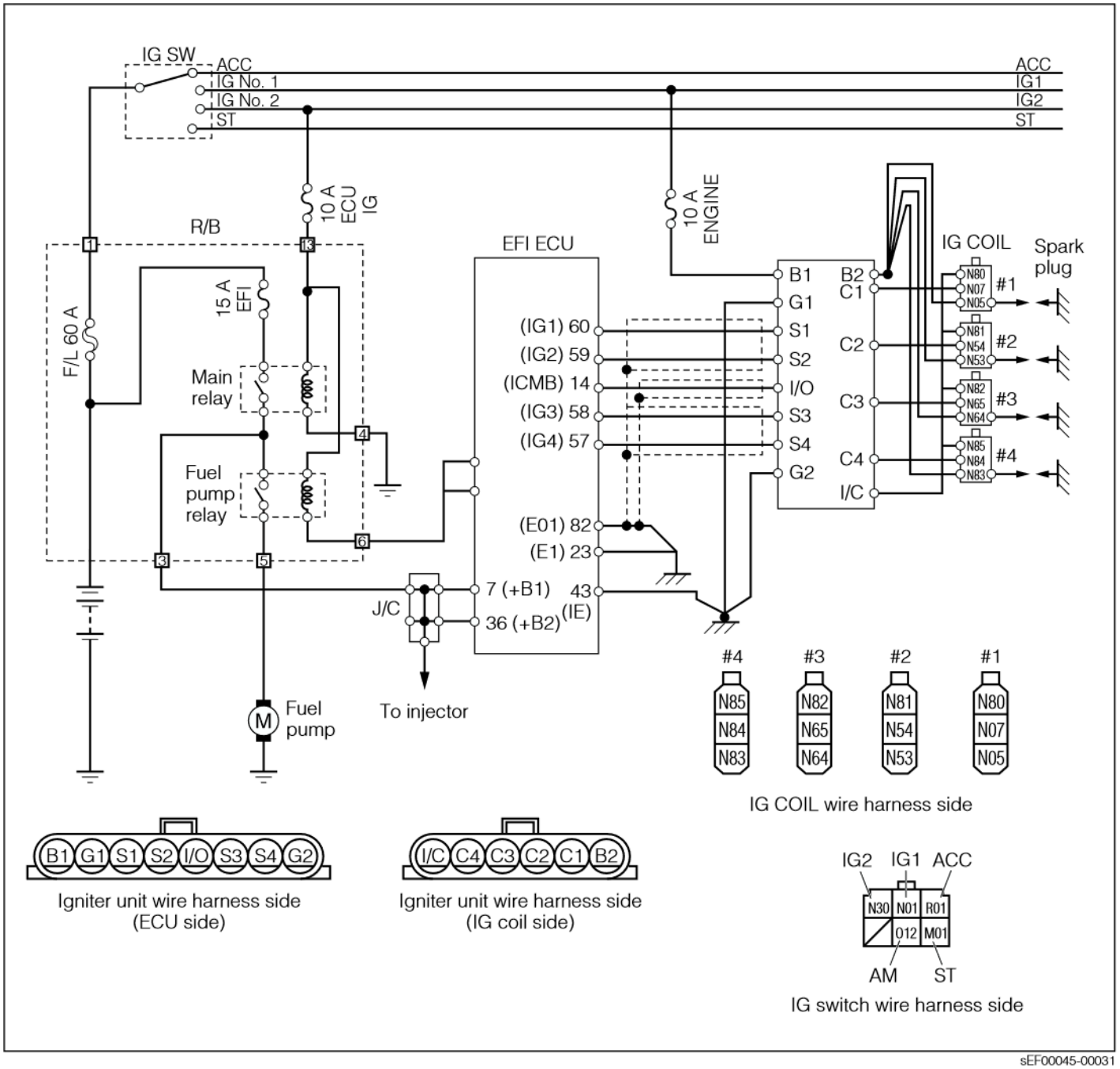
YES → Go to Step 7.

NO → Repair or replace the harness or connector.

JEF00271-00176

DTC	P1300/36	Ion System Malfunction

WIRING DIAGRAM FOR S221



sEF00045-00031

CIRCUIT DESCRIPTION

This system detects any misfire of the engine by using an ion current which has the same waveforms as those of the combustion pressure. When any misfire takes place, no ion current is produced. Therefore, if the input voltage at the ECU side is below a certain value, it is judged that a misfire took place. Since the detected ion current is very weak, it is amplified in the ignitor unit. In addition, a vibration waveform appears in the ion current waveform when knocking takes place. Hence, knocking control is also performed by detecting vibration waveforms. This applies only to vehicles mounted with Type K3 engine with EU specifications.

sEF00046-00000

DTC No.	DTC Detecting condition	Trouble area
P1300/36	No ion current signal is inputted to the engine ECU during engine cranking or engine running.	• Open wire or short in Ion system circuit • Ignitor unit • Ignition coil (All cylinders) • Spark plug (All cylinders) • Engine ECU

sEF00047-00000

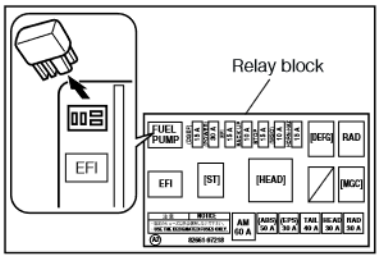
INSPECTION PROCEDURE

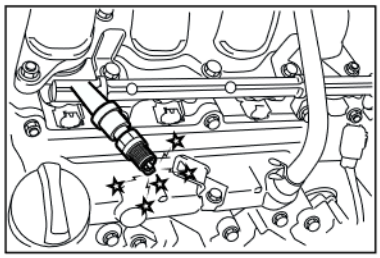
NOTE:

- Read the freeze frame data, using the DS-21 diagnosis tester. 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.
- This diagnostic chart is based on the premise that the engine is being cranked under normal conditions. If the engine does no crank, proceed to the matrix table for troubleshooting according to malfunctioning phenomena on page EF–47.
- When P1300/36 (ion system malfunction) is outputted, both P0300/17 (random/multiple cylinder misfire detected) and P0301/17 - P0304/17 (cylinders 1 to 4 misfire detected) may be outputted simultaneously.

1 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.
   WARNING:
   - **Sparks will take place. Care must be exercised to the surrounding combustible objects.**





- No spark takes place in all cylinders. → **2 Unit check of spark plug**: (Refer to page EF–185.) Are the unit check results OK?
- No spark takes place in some cylinders. → Perform the unit check of the spark plug for the cylinders where no spark takes place. (Refer to page EF–185.) Are the unit check results OK?
- Sparks take place in all cylinders. → Go to Step 5.

NO

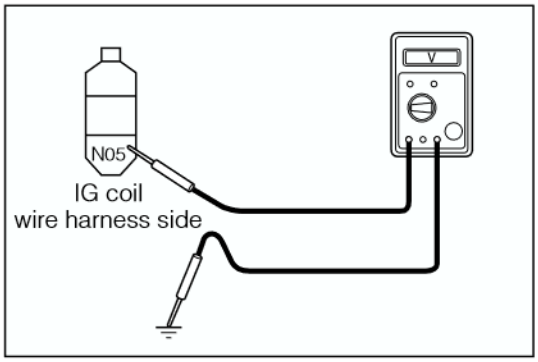
Replace the spark plug. Perform the spark check again.
No spark takes place. ··· Go to Step 3.
Sparks take place. ····· Go to Step 5.
CAUTION:
• Never use spark plugs other than those designated.

YES

3	Check of power supply voltage of IG coil

1. With the IG switch turned OFF, disconnect the connector of the IG coil of each cylinder.
2. With the IG switch turned ON, measure the voltage between the body earth and each of the harness-side connectors (N05), (N53), (N64) and (N83) of each IG coil.
   Specified Value: Battery voltage

   Are the check results OK?



NO

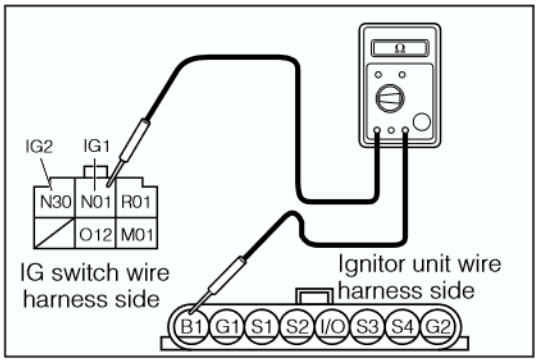
YES

4	Check of power supply voltage of IG coil

Check the harness, connector and fuse for open wire and short by referring to page EF–48.
1. Turn OFF the IG switch.
2. Disconnect the connectors at the ECU side of the IG switch and ignitor unit.
   • Between IG switch and ignitor unit terminal (B1)
   • Between ignitor unit terminal (B2) and each of (N05), (N53), (N64) and (N83) of each IG coil.

   Are the check results for open wire and short OK?

Go to Step 5.



YES

Replace the IG switch.

NO

Repair or replace the harness or connector. Or replace the fuse.

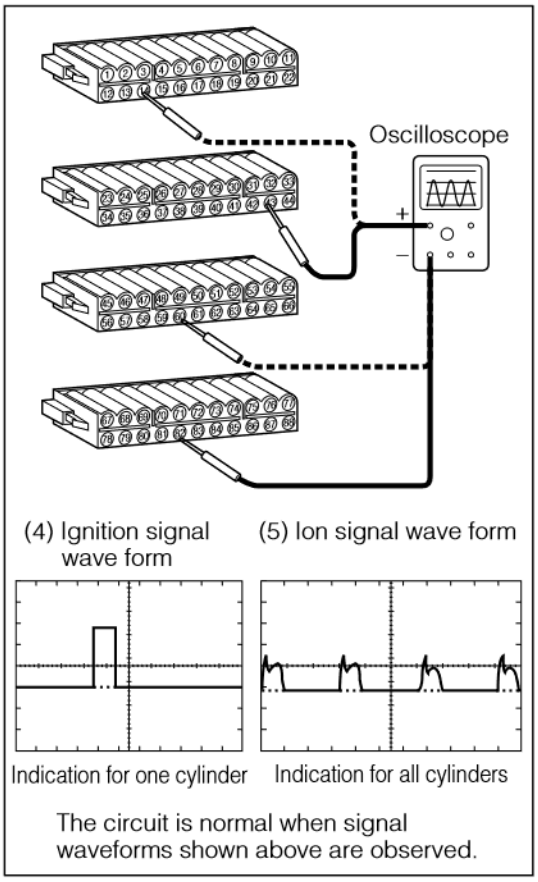
sEF00048-00032

5	Check of ignition signal and ion signal

Check that the ignition signal and ion signal are outputted from the ECU and inputted by using an oscilloscope.

1. With the IG switch turned OFF, perform the restoration.
2. Set the SST (sub-harness). (Refer to page EF–8.)
   SST: 09842-97203-000
3. Warm up the engine. (only when the engine can start)
4. With the engine idling or cranking, connect the probe ⊖ of the oscilloscope to the SST terminal ㉜; the probe ⊕ to each of the SST terminals ㊵, ㊴, ㊳ and ㊲, respectively. Check the ignition signal for all cylinders.
   Specification:
   Pulse waveforms should be confirmed.
5. As has been done in Step 4), connect the probes ⊕ and ⊖ of the oscilloscope to the SST terminals ⑭ (ICMB) and ㊸ (IE), respectively, and check the ion signal.
   Specification:
   Waveforms as shown in the right figure should be observed without any waveform missing.

Are the ignition signal and ion signal observed?



When sparks take place and the ignition signal waveform is observed, is the ion signal waveform observed?

When no spark takes place and the ignition signal waveform is observed, and no ion signal waveform is observed:

Go to Step 10.

When no spark takes place and no ignition signal waveform is observed, and no ion signal waveform is observed:

NO

YES

6	Check of harness between ECU and ignitor unit

1. Turn OFF IG switch.
2. Disconnect the SST connector of the EFI ECU.
3. Disconnect the ECU side connector of the ignitor unit.
4. Referring to page EF–63, check the harness and connector for open wire or short.
   - SST terminal ⑭ - Harness side (I/O) terminal of ignitor unit

Are the check results for open wire and short OK?

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

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

YES

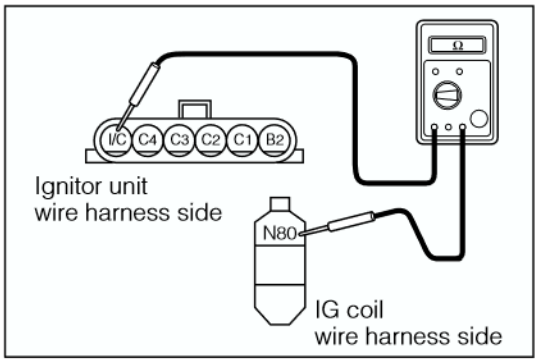
7	Check of harness between ignitor unit and IG coil

Referring to page EF–48, check the harness and connector for open wire or short.
1. Disconnect the IG coil side connector of the ignitor unit.
2. Disconnect the connector of each IG coil.
   - Between harness side terminal (I/C) of ignitor unit - Harness side terminals (N80), (N81), (N82) and (N85) of each IG coil

Are the check results for open wire and short OK?

NO

Repair or replace the harness or connector.



YES

8	Unit check of ignitor unit

(Refer to page EF–188.)
Are the check results OK?

NO

Repair or replace the harness or connector.

YES

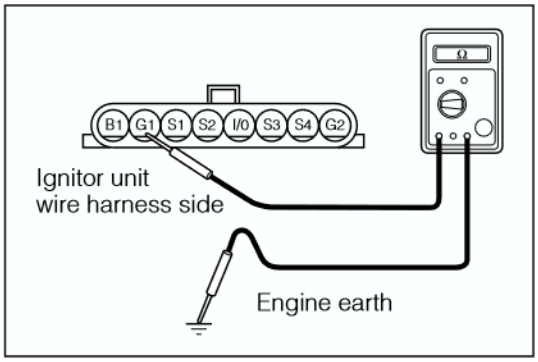
9	Check of earth circuit of ignitor unit

1. Measure the continuity between the engine earth and each of harness side terminals (G1) and (G2) of the ignitor unit.
   Specified Value: Continuity exists.

   Are the check results OK?

NO

Replace the ignitor unit.



YES

Replace the IG coil. (All cylinders)

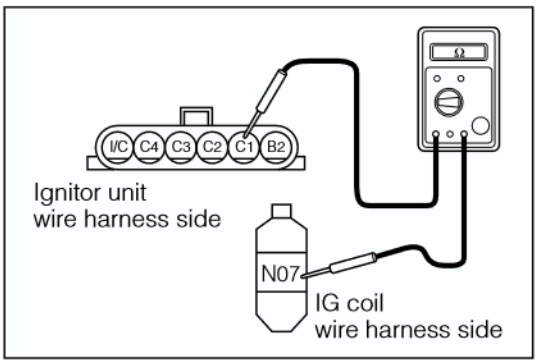
NO

Repair or replace the harness or connector.

sEF00049-00033

10	Check of harness between ignitor unit and IG coil

Referring to page EF–48, check the harness and connector for open wire or short.
1. Turn OFF the IG switch.
2. Disconnect each IG coil and the IG coil side connector of the ignitor unit.
   • Between harness side terminals (N07), (N54), (N65) and (N84) of each IG coil and harness side terminals (C1), (C2), (C3) and (C4) of ignitor unit
   Are the check results for open wire and short OK?

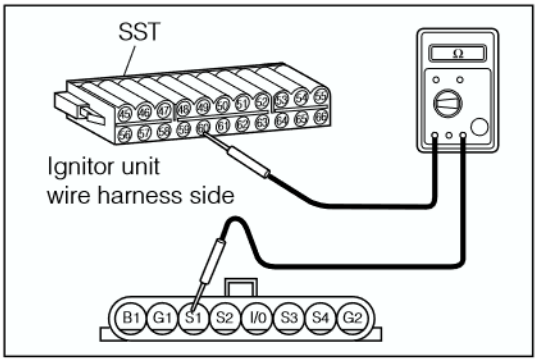


YES

NO → Repair or replace the harness or connector.

11	Check of harness between EFI ECU and ignitor unit

Referring to page EF–48, check the harness and connector for open wire or short.
1. Disconnect the SST connector from the EFI ECU.
2. Disconnect the ECU side connector of the ignitor unit.
   Harness side terminals (S1), (S2), (S3), (S4) and (I/O) of ignitor unit - SST connector terminals 60, 59, 58, 57 and 14
   Are the check results for open wire and short OK?



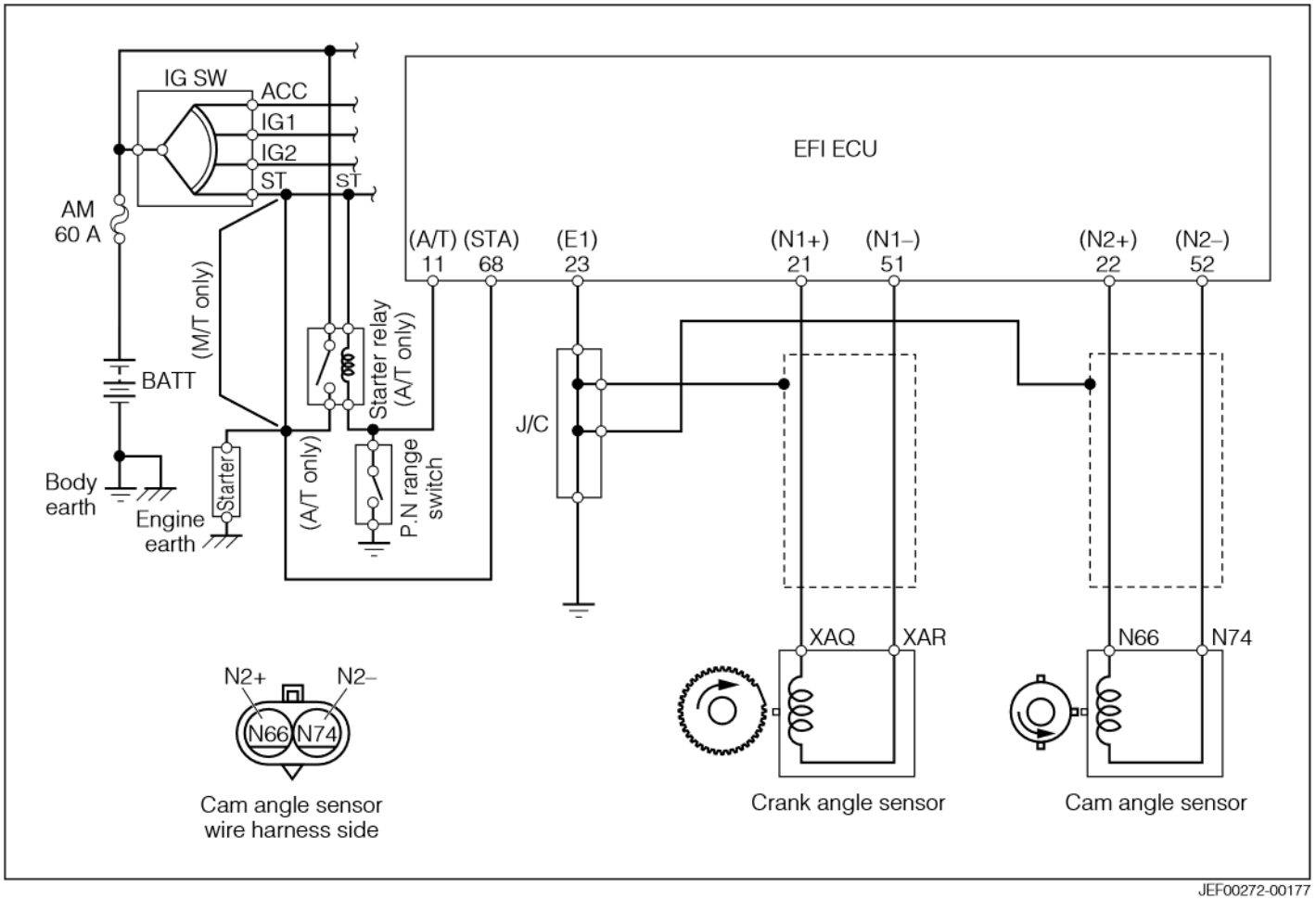
YES → Go to Step 7.

NO → Repair or replace the harness or connector.

sEF00050-00034

DTC	P1346/75	VVT Sensor (Camshaft Position Sensor) Circuit Range/Performance Problem

WIRING DIAGRAM



JEF00272-00177

CIRCUIT DESCRIPTION

The camshaft angle sensor ($N2^+$ signal) consists of a signal rotor and a pickup coil.
The $N2^+$ signal rotor has three timing pins on its outer disk surface and is integrated with the intake camshaft. The detection of the actual camshaft position and the discrimination of cylinders are carried out by these three timing pins (360-180-180° CA).

DTC No.	DTC Detecting condition	Trouble area
P1346/75	Deviation in crankshaft angle sensor signal and cam angle sensor signal (2 trip detection logic)	• Mechanical system malfunction (Skipping teeth of timing chain, chain stretched) • Engine ECU

JEF00273-00000

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	Check of valve timing

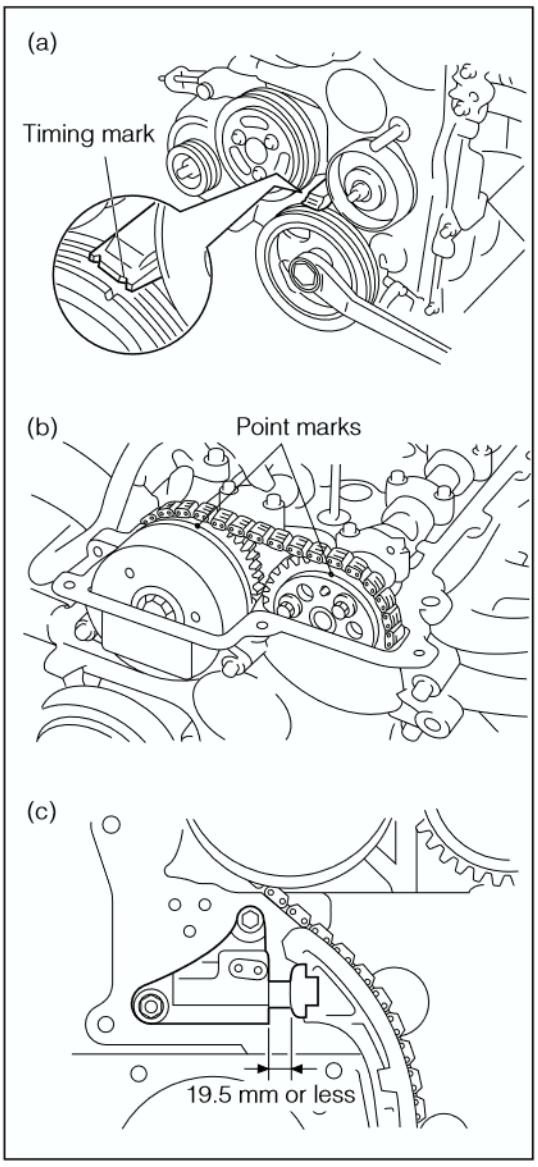
Check the timing belt for looseness and missing teeth. (For details, refer to EM section.)

1. Set the No. 1 cylinder to the top dead center under compression stroke by turning the crankshaft in the normal direction.
   (Align the punch mark of the camshaft timing pulley with the mating mark of the camshaft bearing cap.)
2. Check that the punch mark of the crankshaft timing pulley is aligned with the mating mark of the oil pump as shown in the right illustration. (b)
3. Ensure that the applying load at the time when the timing belt is pushed 5 mm is within the specified value. (c)
   Specified Value:
   19.6 - 29.4 N (2.0 - 3.0 kgf)

Are the check results OK?

NOTE:

- **If the crankshaft was turned in the reverse direction, redo the check.**



YES

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

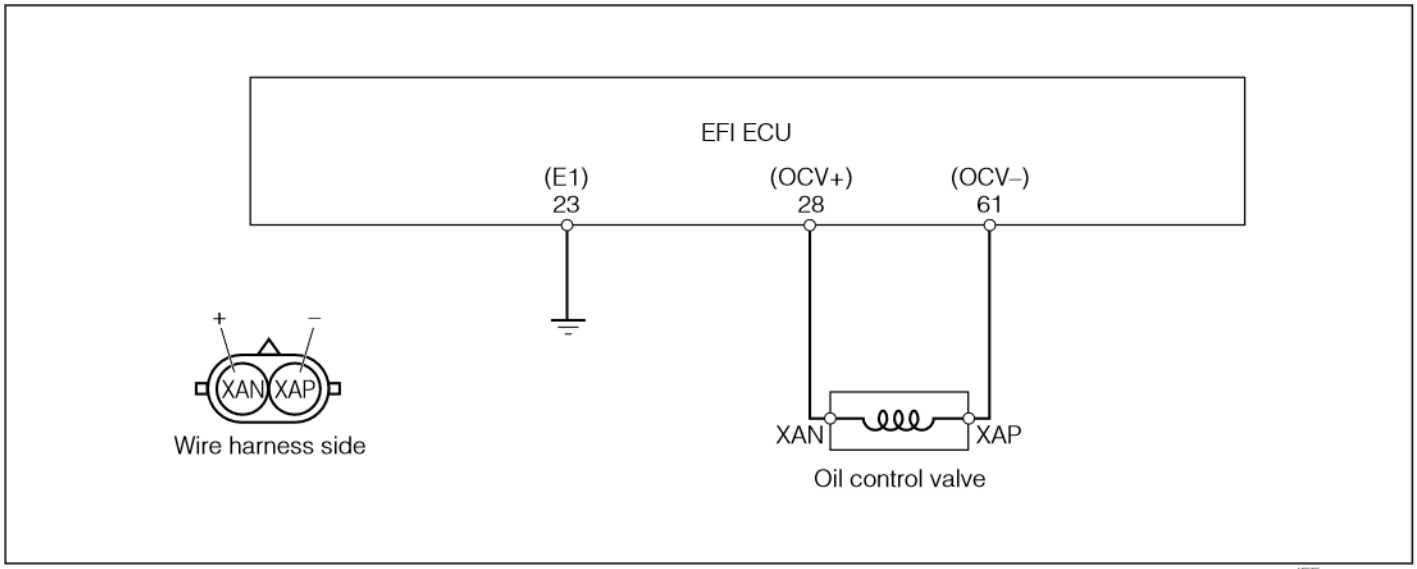
NO

Adjustment of valve timing
(Adjustment or replacement of timing belt or tensioner)
For details, refer to EM section.

JEF00274-00178

DTC	P1349/73	VVT System Malfunction

WIRING DIAGRAM



JEF00275-00179

CIRCUIT DESCRIPTION

The DVVT system controls the intake valve timing to a proper timing in response to the driving conditions. The engine ECU controls the OCV (Oil Control Valve) to make the intake valve timing proper. The oil pressure controlled by the OCV is supplied to the DVVT controller, and then, the DVVT controller changes the relative position between the camshaft and the crankshaft.

DTC No.	DTC Detecting condition	Trouble area
P1349/73	Condition (a) or (b) continues after the engine has warmed up and when the engine speed is 400 to 4000 rpm. (a) Valve timing does not change from the current valve timing. (b) Current valve timing is fixed. (2 trip detection logic)	• Valve timing • Oil control valve • DVVT controller assembly • Engine ECU

JEF00276-00000

INSPECTION PROCEDURE

NOTE:

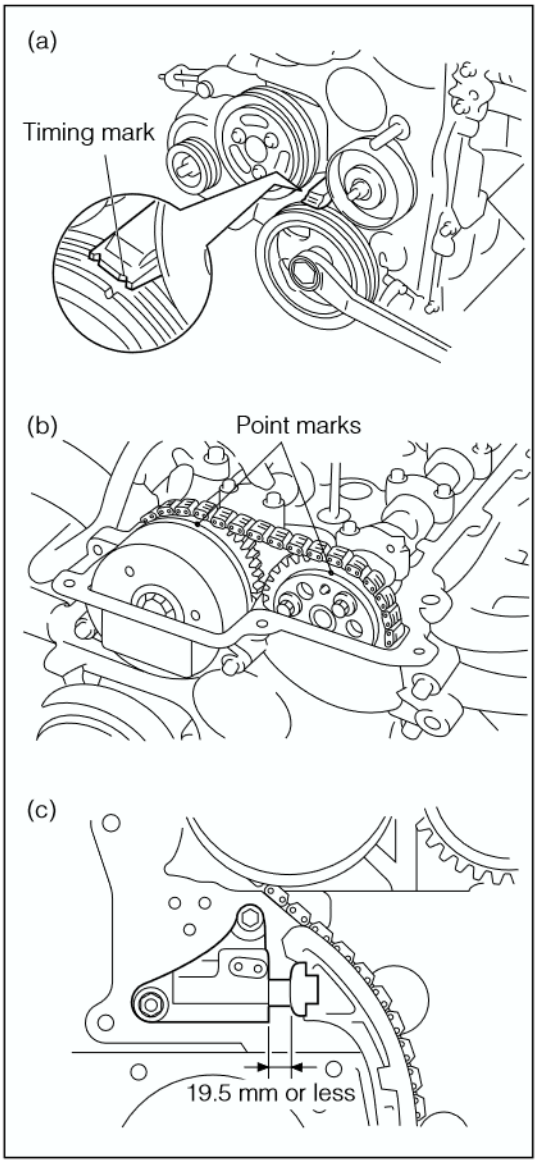
- Read the freeze frame data, using the DS-21 diagnosis tester or OBD Ⅱ generic scan tool. Because the freeze frame data records the engine conditions when the malfunction was detected, when troubleshooting the freeze frame data is useful to determine whether the vehicle was running or stopped, the engine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

1	Check of valve timing

Check the timing chain for looseness and missing teeth. (For details, refer to EM section.)

1. Set the No. 1 cylinder to the top dead center under compression stroke by turning the crankshaft in the normal direction. (a)
   (Align the groove of the crankshaft pulley with the timing mark of the timing chain cover as shown in the illustration.)
2. Check that the point marks of the camshaft timing sprockets are in straight line on the timing chain cover surface as shown in the illustration. (b)
3. Check of protruding amount of chain tensioner (c)
   Specified Value:
   Not to exceed 19.5 mm
4. Check of chain tensioner arm and chain guide for wear
   Specified Value:
   The thickness of arm and guide should be 0.5 mm or more.

Are the check results OK?



YES

NO

2	Operation check of oil control valve (OCV)

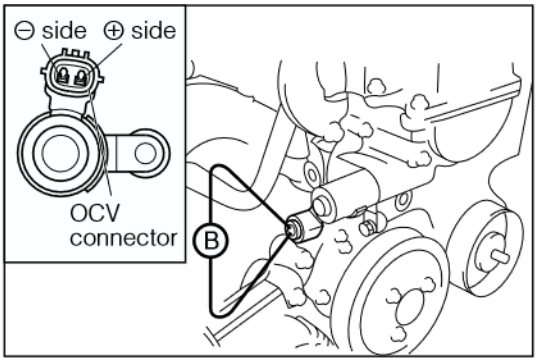
1. Set the SST (sub-harness). (Refer to page EF–8.)
2. Start the engine. Warm it up fully.
3. Disconnect the OCV connector.
4. Apply the battery voltage between the terminals of the OCV connector.
5. Check the engine idling condition.
   Specification:
   Rough idling or engine stall should take place.

Are the check results OK?

NOTE:

- **Be careful not to mistake the polarity.**
- **Pay attention not to make short during operation.**
- **The energizing time should be limited to within one minute.**

Repair and adjustment of valve timing
(Repair or replace the timing chain or tensioner, arm, guide, etc.)
For details, refer to EM section.

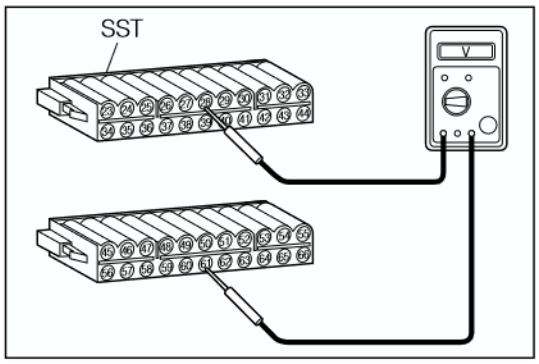


YES

3	Check of output voltage of ECU
	1. With the IG switch turned ON (the engine stopped), measure the voltage between the SST connector terminals ㉘ (OCV+) and ㊶ (OCV–). **Specified Value: 4.0 V or less** Is the measured value the specified value?

NO

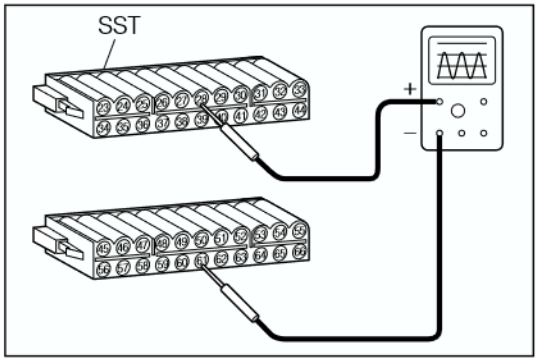
Go to Step 5.



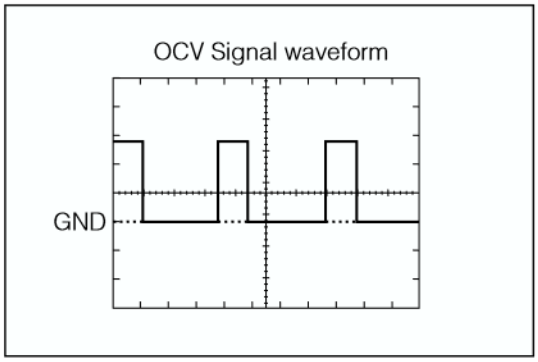
[Reference]

Check by oscilloscope

1. Warm up the engine completely. Keep the engine idling.
2. Connect the ⊕ and ⊖ probes of the oscilloscope to the SST connector terminals ㉘ and ㊶, respectively.



3. If the waveform shown in the right figure is observed, the OCV circuit is functioning normally.

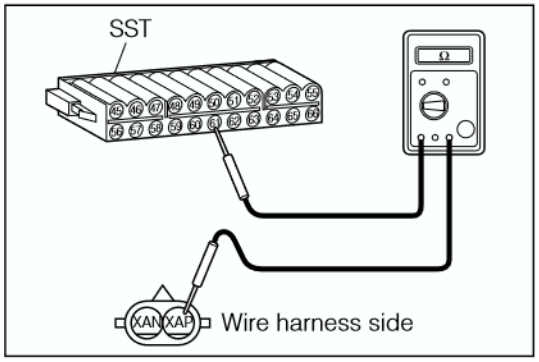


YES

4	Check of harness between OCV and ECU
	1. Turn OFF the IG switch. 2. Disconnect the SST connector from the ECU. 3. Referring to page EF–48, check the harness and connector for open wire or short. • Harness side connector (XAN) of valve - SST connector 28 (OCV+) • Harness side connector (XAP) of valve - SST connector 61 (OCV–) Are the check results for open wire and short OK?

NO

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



YES

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

NO

Repair or replace the harness or connector.

5	Unit check of OCV
	(Refer to page EF–185.)

YES

NO

Replace the OCV and go to Step 6.

6	Unit check of DVVT controller
	(Refer to Section EM.) Are the unit check results OK?

YES

NO

Replace the intake camshaft.

7	Check of oil passage (including OCV)
	(Refer to section EM.) **Specification:** **There should be no restricted passage nor oil leakage.** Are the check results OK?

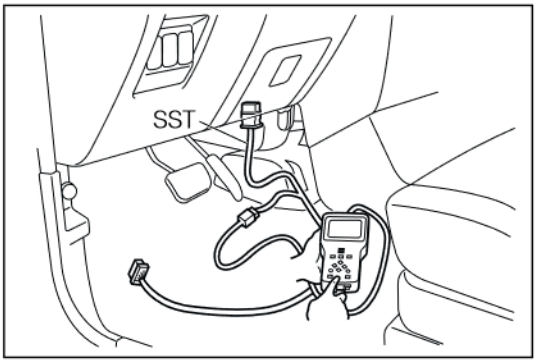
YES

8	Checking whether DTC 1349/73 is memorized or not

1. Restore to the original state.
2. With the IG switch turned OFF, connect the SST.
   SST: 09991-87404-000
3. Erase the DTC. (Refer to page EF–58.)
4. Perform the simulation test.
5. Check to see if DTC 1349/73 is displayed.*1
   Is DTC 1349/73 displayed?

NO

Repair the faulty parts of the oil passage.



NO

The VVT system is functioning properly.*2

YES

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

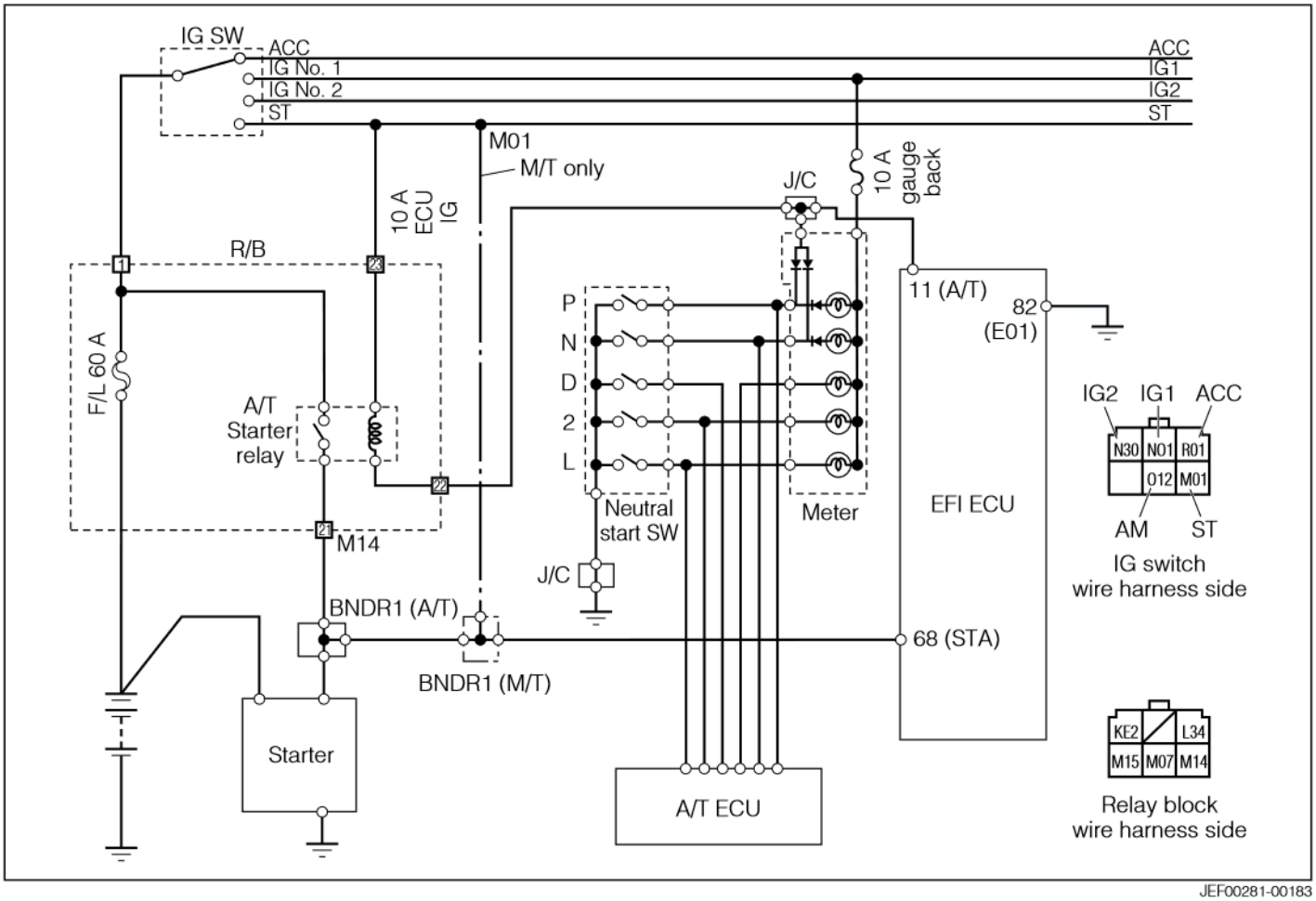
*1: In the case of vehicles with EU specifications, confirmation can be made by one-trip by using the "Continuous monitoring results" function of the CARB mode.
On vehicles other than those with EU specifications, conduct the simulation test twice. At this time, turn OFF the IG switch after the first test. (2 trip)

*2: DTCs P1349/73 are also outputted after foreign objects in the engine oil have been caught in some parts of the system, and the system returns to the normal state in a short time. As the engine ECU controls so that the foreign objects are ejected, there is no problem about the VVT. There is also no problem since the oil filter will get the foreign objects in the engine oil.

JEF00277-00180

DTC	P1510/54	Starter Signal Circuit Malfunction

WIRING DIAGRAM



JEF00281-00183

CIRCUIT DESCRIPTION

When the engine is being cranked, the intake air flow is slow, so fuel vaporization is poor. A rich mixture is therefore necessary in order to achieve good startability. While the engine is being cranked, the battery positive voltage is applied to the terminal STA of the engine ECU. The starter signal is mainly used to increase the fuel injection volume for the starting injection control and after-start injection control.

DTC No.	DTC Detecting condition	Trouble area
P1510/54	Open wire or short in starter signal circuit (2 trip detection logic)	• Open wire or short in starter signal circuit • Engine ECU

JEF00282-00000

INSPECTION PROCEDURE

NOTE:

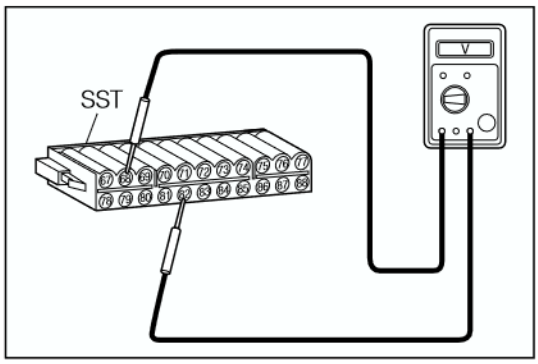
- This diagnostic chart is based on the premise that the engine is being cranked under normal conditions. If the engine does not crank, proceed to the matrix table for troubleshooting according to malfunctioning phenomena on page EF–47.

1	Check of ECU input signal STA

1. Set the SST (sub-harness). (Refer to page EF–8.)
2. Measure the voltage between the SST connectors ⑱ and ⑧② (STA - E01) under the following conditions.

Condition	Specified value
Engine being cranked	6 - 10 V
After engine has started	0 V

Is the measured value the specified value?



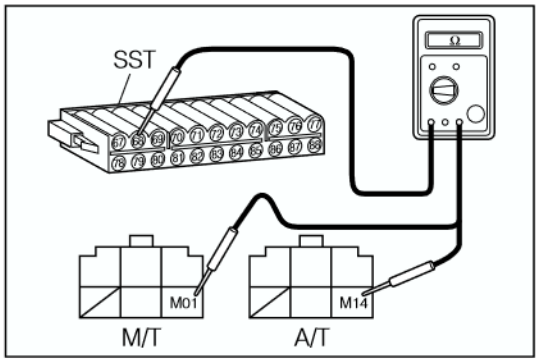
NO

YES

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

2	Check of harnesses between IG switch and ECU (M/T vehicles) and between relay block and ECU (A/T vehicles)

1. Turn OFF the IG switch.
2. Disconnect the connector of the IG switch.
3. Disconnect the SST connector at ECU side.
4. M/T vehicles:
   Connector (M01) at IG switch side - Connector ⑱ (STA) at ECU side
   A/T vehicles:
   Connector (M14) at relay block side - Connector ⑱ (STA) at ECU side
   Are the check results for open wire and short (according to page EF–48) OK?



YES

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

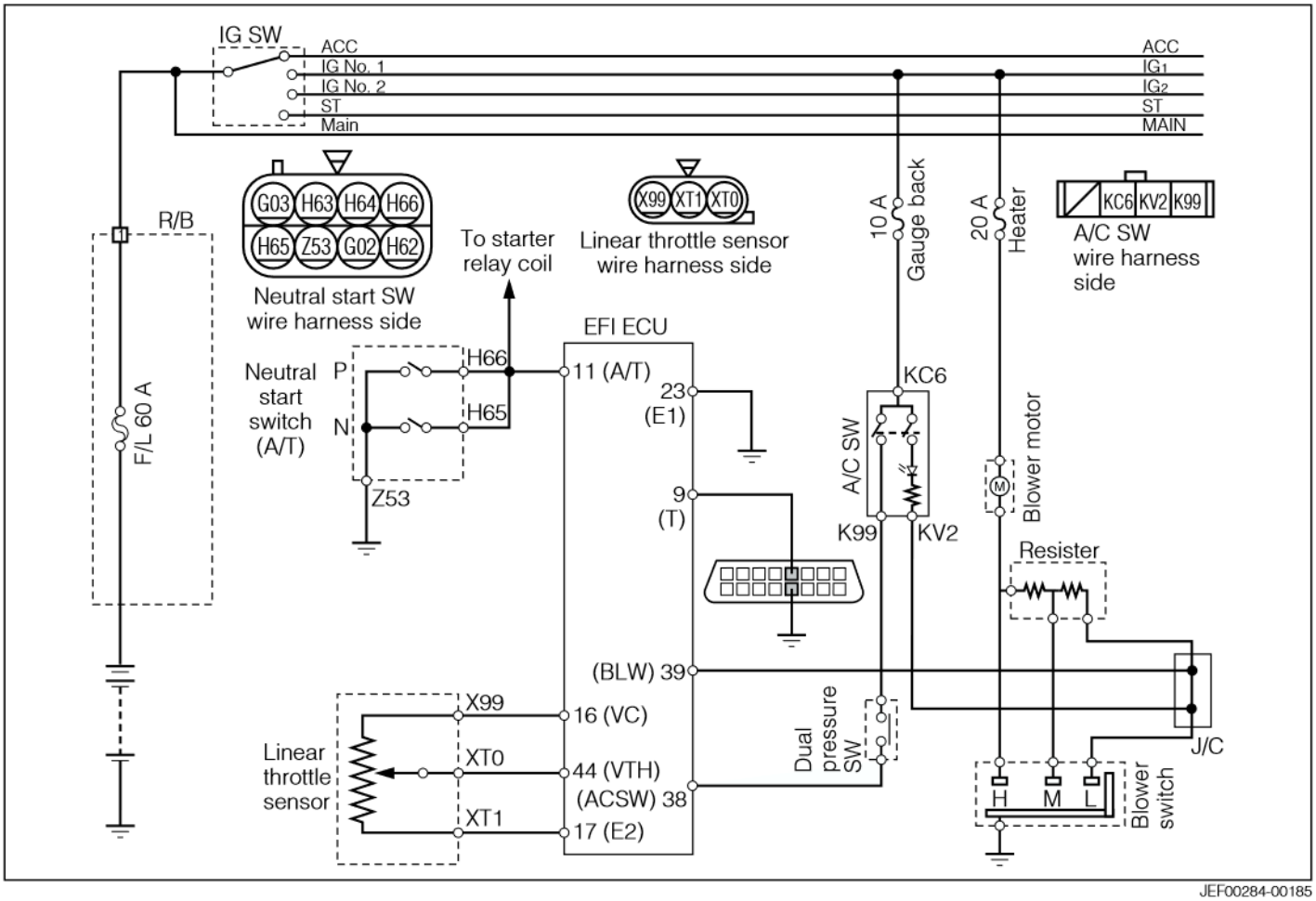
NO

Repair or replace the harness or connector.

JEF00283-00184

DTC	P1520/51	Switch Signal Circuit Malfunction

WIRING DIAGRAM



JEF00284-00185

CIRCUIT DESCRIPTION

This is used as the normal state judging code for the switch system. While the terminal T is "ON", if the idle switch becomes "OFF" or the air conditioner becomes "ON", or the shift lever is placed in [D], [2], [L], or [R] range, the DTC is outputted. However, the DTC is diagnosed only when the terminal T is "ON". No memorization is made.

DTC No.	DTC Detecting condition	Trouble area
P1520/51	When conditions 1 and 2 below are met: 1. Terminal T is "ON". 2. Idle switch "OFF", air conditioner "ON" or neutral start switch "ON"	• Open wire or short in A/C switch circuit • A/C switch • Open wire or short in linear throttle sensor circuit • Linear throttle sensor • Open wire or short in neutral start switch circuit • Neutral start switch • Engine ECU

NOTE:

- When the idle switch becomes "OFF" with the terminal T being "ON", you can check to see if the IDL system of the linear throttle sensor is functioning properly by examining the DTC output.
- With the engine idling, and the terminal T being "ON", when the A/C and heater blower switch are switched on (air conditioner "ON"), you can check to see if the air conditioner switch system is functioning properly by examining the DTC output.
- With the terminal T being "ON", when the shift lever is placed in [D], [2], [L], or [R] range, you can check to see if the neutral start switch system is functioning properly by examining the DTC output.

JEF00285-00000

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 outputted simultaneously, E2 (Sensor Ground) may be open.

When using DS-21 diagnosis tester:

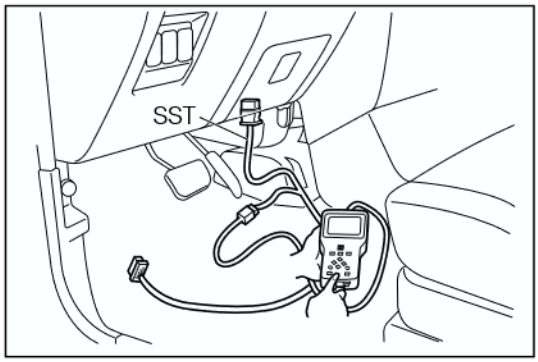
1 Check of input signal by A/C switch and idle switch to ECU

1. Turn OFF the IG switch. Connect the DS-21 diagnosis tester to the DLC through the SST.
   SST: 09991-87404-000
2. Turn ON the IG switch. Turn ON the main switch of the tester. Check the signals of the A/C switch and idle switch.
   (As for the operation, refer to the instruction manual of the DS-21 diagnosis tester.)

A/C switch	A/C signal indication
OFF	OFF
ON	ON

Throttle valve	IDL signal indication
Fully closed	ON
Fully opened	OFF

Are the check results OK?



NO

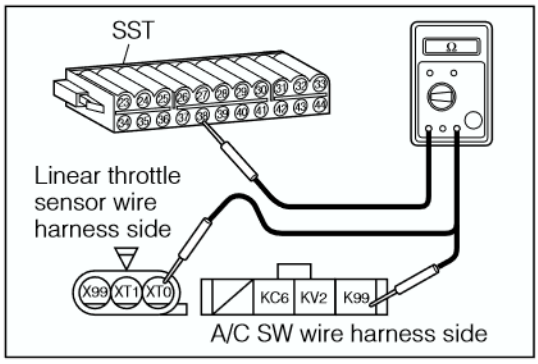
2 Check of harnesses between A/C switch and ECU and between linear throttle sensor and ECU

1. Turn OFF the main switch of the tester. Turn OFF the IG switch.
2. Set the SST (sub-harness). (Refer to page EF–8.)
   Do not connect the SST connector to the ECU.
3. Referring to page EF–48, check the harness and connector for open wire or short.
   - A/C switch
     Switch side connector (K99) - ECU side connector ㊳ (ACSW)
   - Linear throttle sensor
     Sensor side connector (XT1) - ECU side connector ⑰ (E2)
     Sensor side connector (XT0) - ECU side connector ㊹ (VTH)
     Sensor side connector (X99) - ECU side connector ⑯ (VC)

   Are the check results for open wire and short OK?

YES

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



YES

3	Unit check of A/C switch and liner throttle sensor
	(Refer to page EF–186.) Are the unit check results OK?

NO → Repair or replace the harness or connector.

YES

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

NO → Replace the A/C switch or liner throttle sensor.

JEF00286-00186

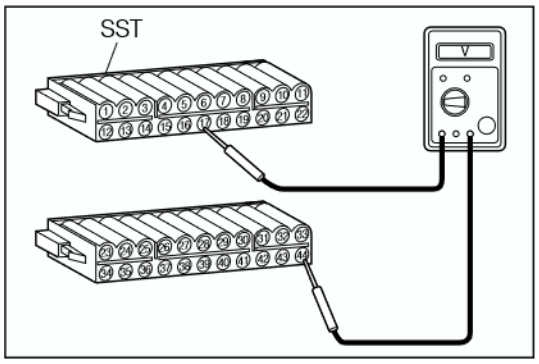
When not using DS-21 diagnosis tester:

1	Check of ECU input signal

1. Set the SST (sub-harness). (Refer to page EF–8.)
2. With the IG switch turned ON, measure the voltage between SST ⑯ and ⑰ (VC and E2), between ㊹ and ⑰ (VTH and E2), between ㊳ and ㉓ (ACSW and E1), and between ⑪ and ㉓ (A/T and E1).

Specified Value:

- ⑯ and ⑰ (VC and E2):
  4.5 - 5.5 V
- ㊹ and ⑰ (VTH and E2):
  When throttle lever is changed from full close state to full open state, voltage should increase proportionally from 0 to 4.8 V.
- ㊳ and ㉓ (ACSW and E1):
  Battery voltage (when A/C switch is ON)
  0 - 0.5 V (When A/C switch is OFF)
- ⑪ and ㉓ (A/T and E1):
  0 - 0.5 V (P or N range)
  Around 10 V (other than ranges above)



NO

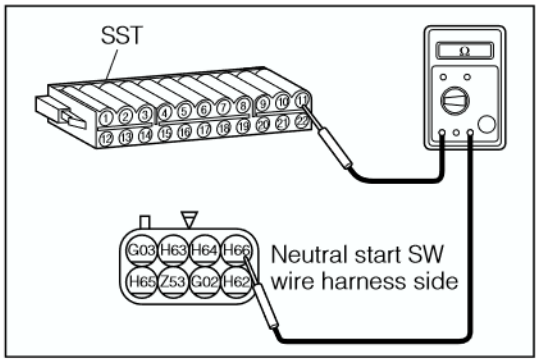
2 **Check of harness between neutral start switch and ECU**

(As for the A/C switch and linear throttle sensor system, go to Step 2 on previous page.)
1. Turn OFF the IG switch. Disconnect the SST connector from the ECU.
2. Referring to page EF–48, check the harness and connector for open wire or short.
   - Switch side connector H66 (P range) - ECU ⑪ (A/T)
   - Switch side connector H65 (N range) - ECU ⑪ (A/T)

   Are the check results for open wire and short OK?

YES

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



YES

3 **Unit check of neutral start switch**

(Refer to page EF–186.)
Are the unit check results OK?

NO

Repair or replace the harness or connector.

YES

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

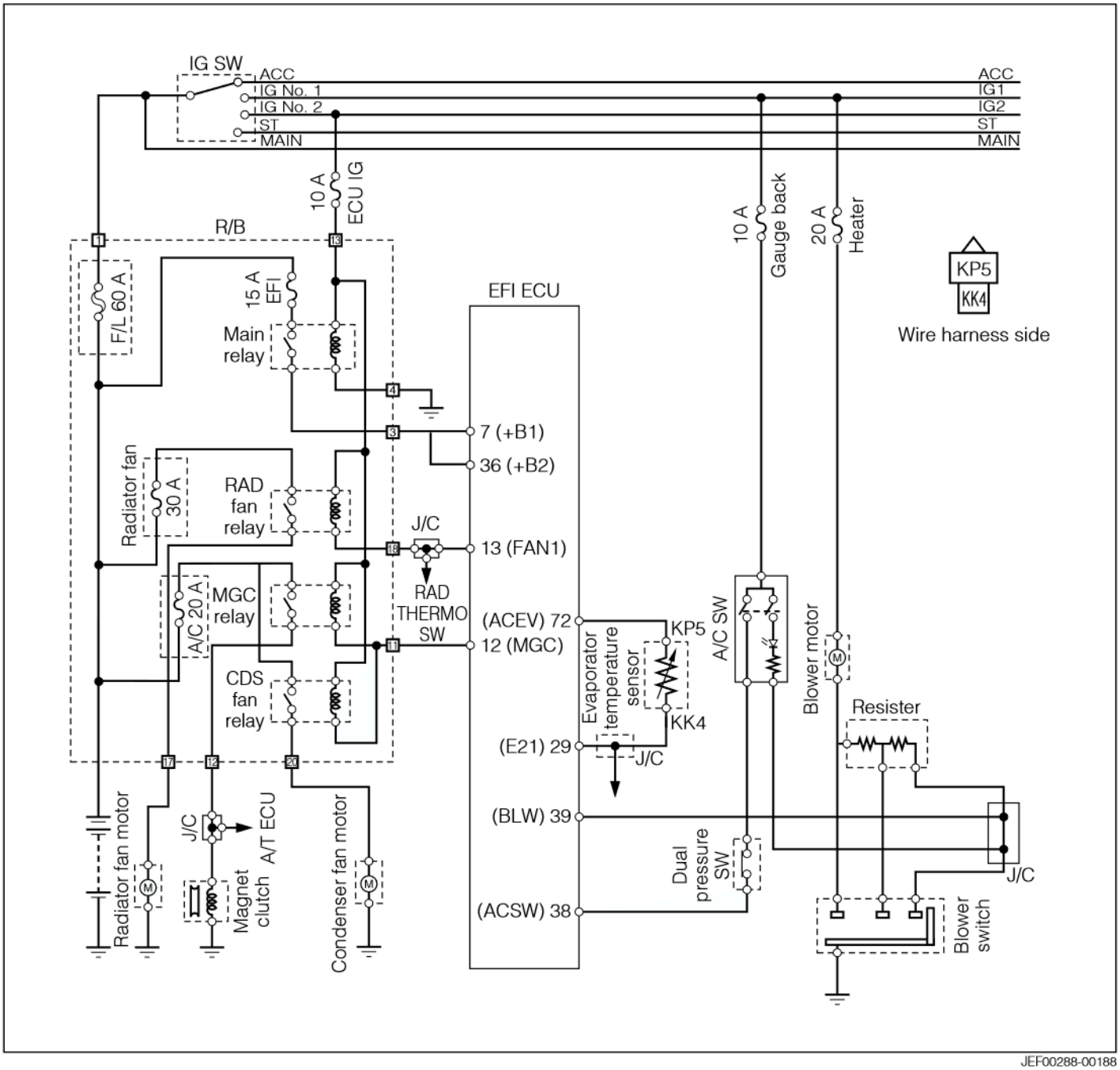
NO

Replace the neutral start switch.

JEF00287-00187

DTC	P1530/44	A/C Evaporator Temp. Sensor Malfunction

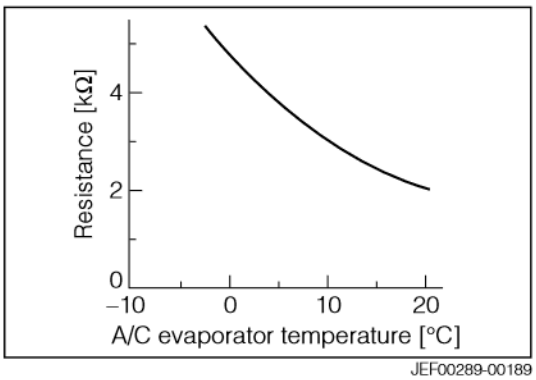
WIRING DIAGRAM



JEF00288-00188

CIRCUIT DESCRIPTION

This circuit, located at the rear of the evaporator of the air conditioner unit, detects the temperature of the air passing through the evaporator. A thermistor is incorporated in the sensor. This thermistor has such characteristics that its resistance decreases as the temperature rises, while the resistance increases as the temperature drops. When the temperature becomes about 0°C, the thermistor disengages the magnet clutch through the MGC relay, thus preventing frosting.



JEF00289-00189

DTC No.	DTC Detecting condition	Trouble area
P1530/44	Open wire or short in evaporator temperature circuit	• Open wire or short in evaporator temp. circuit • Evaporator temperature sensor • Engine ECU

INSPECTION PROCEDURE

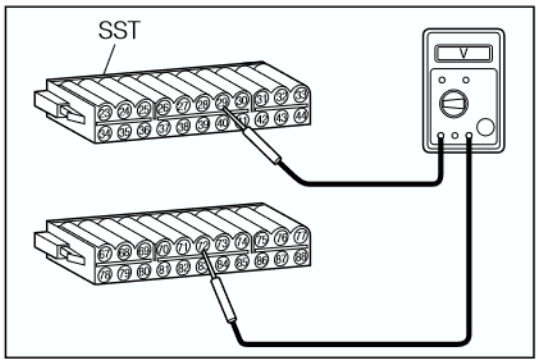
NOTE:

- 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 Check of ECU output voltage

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 ⑫ (ACEV) and ㉙ (E21).
   Specified Value:
   0.1 - 4.8 V (Varies, depending upon the temperature.)
   (Reference: 1.8 - 2.9 V at 20°C)

Are the check results OK?



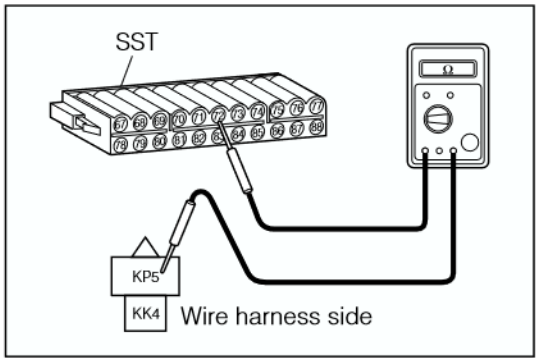
NO

YES → Check malfunction that occurs intermittently and poor contact. (Refer to page EF–61.)

2 Check of harness between evaporator temperature sensor and ECU

1. With the IG switch turned OFF, disconnect the SST connector from the ECU.
2. Referring to page EF–48, check the harness and connector for open wire or short.
   - Harness side connector KP5 of sensor - ECU ⑫ (ACEV)
   - Harness side connector KK4 of sensor - ECU ㉙ (E21)

Are the check results for open wire and short OK?



YES

NO → Repair or replace the harness or connector.

3 Unit check of evaporator temperature sensor

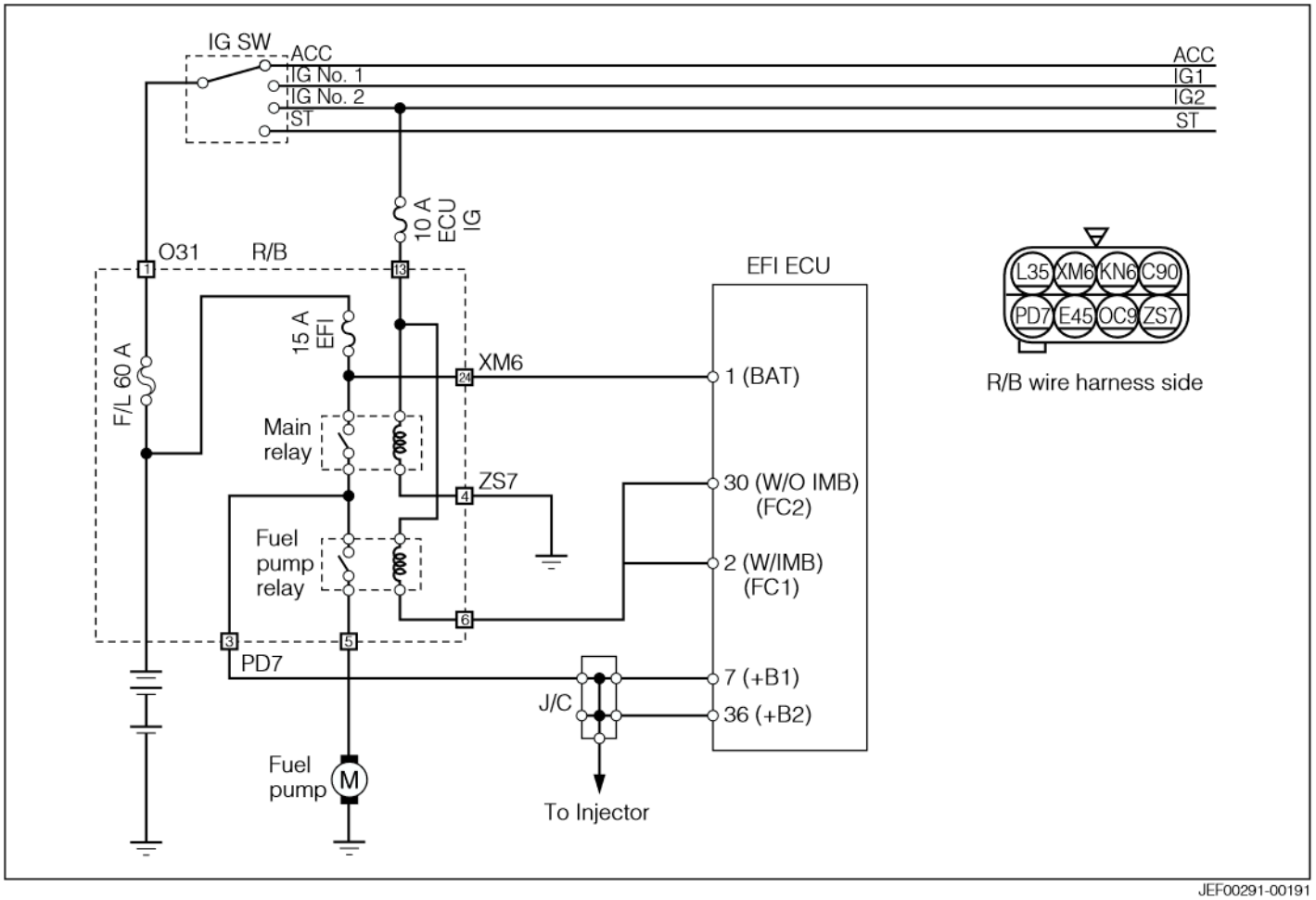
(Refer to page EF–186.)
Are the unit check results OK?



JEF00290-00190

DTC	P1560/61	ECU Back-up Power Source Circuit Malfunction

WIRING DIAGRAM



JEF00291-00191

CIRCUIT DESCRIPTION

The battery positive voltage is supplied to the terminal BAT of the engine ECU even when the ignition switch is OFF for use by the DTC memory and air-fuel ratio adaptive control value memory, etc.

DTC No.	DTC Detecting condition	Trouble area
P1560/61	Open wire in back-up power source circuit	• Open wire in back-up power source circuit • Engine ECU

HINT:
If DTC P1560/61 appears, the engine ECU does not store another DTC.

JEF00292-00000

INSPECTION PROCEDURE

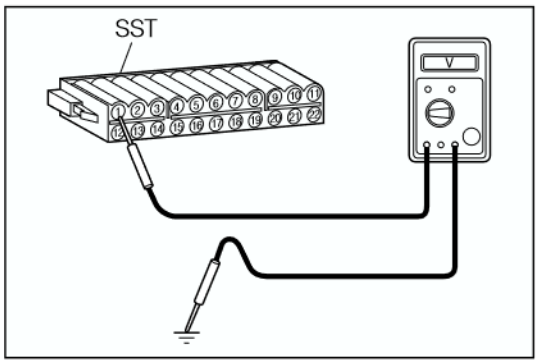
NOTE:

- 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 Check of ECU backup power supply voltage

1. Set the SST (sub-harness). (Refer to page EF–8.)
2. With the IG switch turned OFF, measure the voltage between the SST connector ① (BAT) and the body ground.
   Specified Value: Battery voltage

   Are the check results OK?



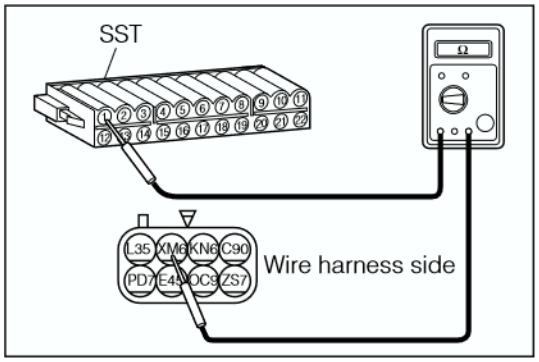
NO

YES

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

2 Check of harness between relay block and ECU

1. With the IG switch turned OFF, disconnect the SST connector from the ECU.
2. Remove the harness from the terminal ⊕ of the battery.
   Referring to page EF–48, check the harness and connector for open wire or short.
   • Harness side connector XM6 of R/B - ECU ① (BAT)
   • Stud bolt of R/B - Battery terminal ⊕
   Are the check results for open wire and short OK?



YES

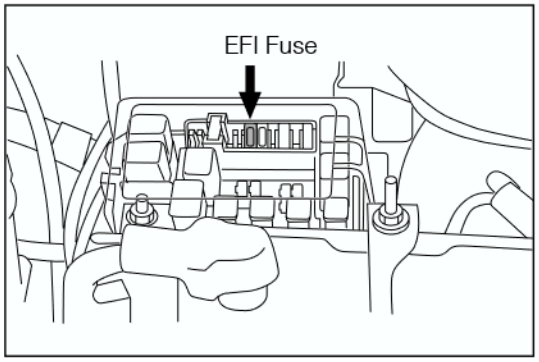
NO

Repair or replace the harness or connector.

3 Unit check of EFI fuse

1. Remove the EFI fuse from the R/B.
2. Check continuity of the EFI fuse.
   Specification:
   Continuity should exist.

   Are the check results OK?



YES

NO

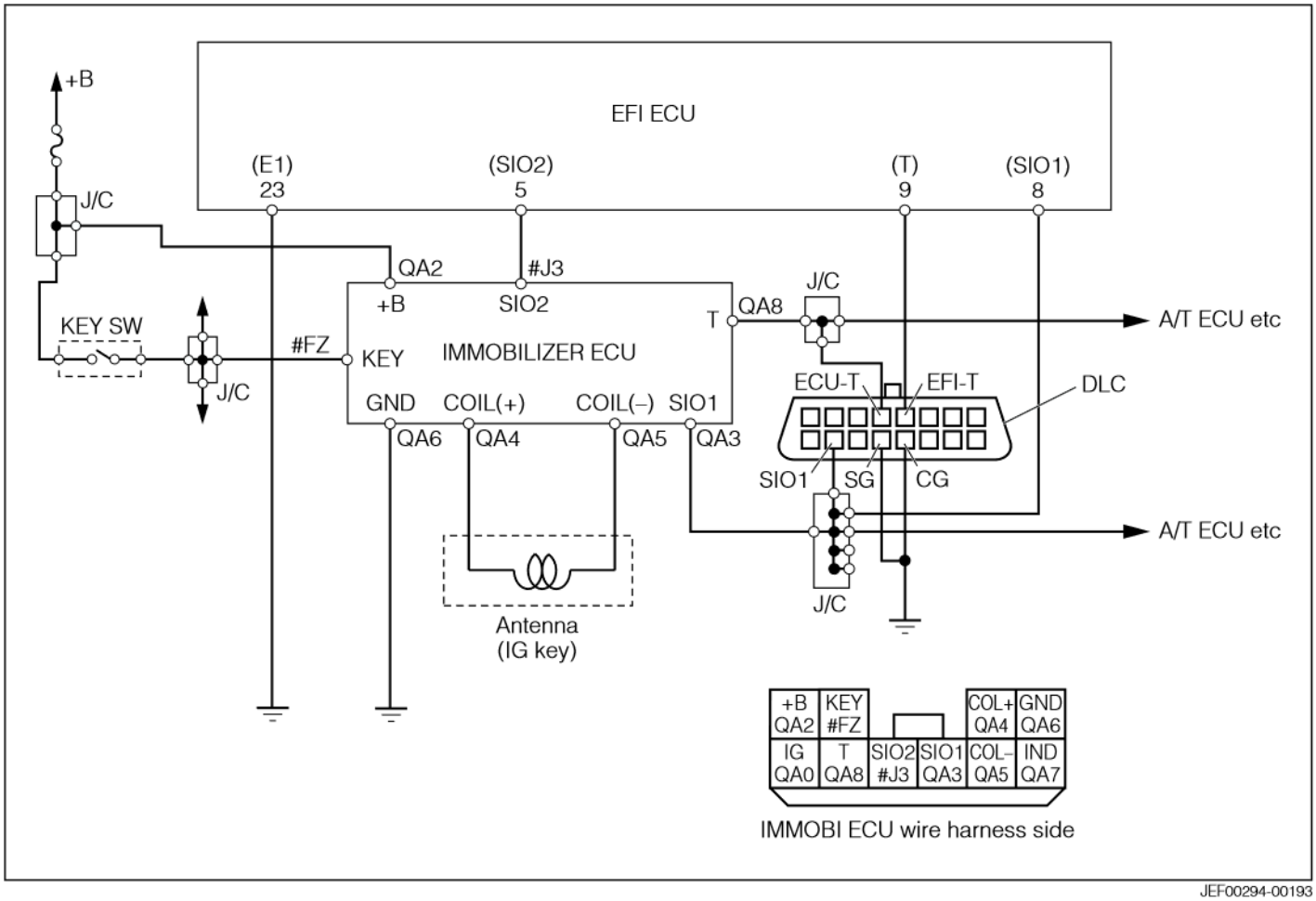
Check or replace the engine ECU. (Refer to page EF–51.)

Replace the EFI fuse.

JEF00293-00192

DTC	P1600/83	Immobilizer Signal Malfunction

WIRING DIAGRAM



JEF00294-00193

CIRCUIT DESCRIPTION

This circuit performs collation and updating of the rolling code in the communication between the immobilizer ECU and the EFI ECU. The engine can start only when the collation and updating of the rolling code can be done. The rolling code is collated and updated by reading out or writing to non volatile memory (E2PROM) of both ECUs.

DTC No.	DTC Detecting condition	Trouble area
P1600/83	In immobilizer communication, • When writing of rolling code to E2PROM is abnormal: or • When reading out rolling code from E2PROM is abnormal:	• Engine ECU

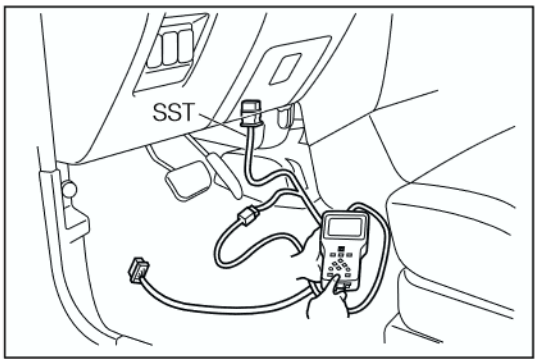
JEF00295-00000

INSPECTION PROCEDURE

When using DS-21 diagnosis tester:

1	Re-confirmation of DTC

1. With the IG switch turned OFF, connect the DS-21 diagnosis tester to the DLC through the SST.
   SST: 09991-87404-000
2. Turn ON the IG switch, and turn ON the main switch of the tester. Erase the DTC.
   (As for the operation, follow the instruction manual of the DS-21 diagnosis tester.)
3. Turn OFF the main switch of the tester. Turn OFF the IG switch.
4. Turn ON the IG switch. Turn ON the main switch of the tester.
5. Check the DTC.
   Is P1600 indicated?



YES → Replace the ECU.

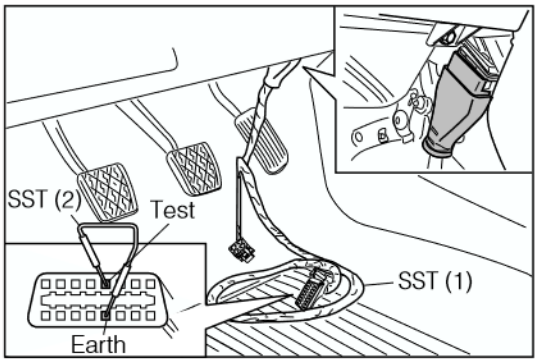
NO → Check or replace the ECU. (Refer to page EF–51.)

JEF00296-00194

When not using DS-21 diagnosis tester:

1	Re-confirmation of DTC

1. With the IG switch turned OFF, connect the DS-21 diagnosis tester to the DLC through the SST.
   SST: 09991-87404-000
2. Connect the terminal T and the earth terminal of the SST connector with a jump wire.
   SST (2): 09991-87403-000
3. Remove the EFI fuse. Erase the DTC.
   (As for the erasing method, refer to page EF–58.)
4. Set the EFI fuse to the original position.
5. Turn ON the IG switch.
6. Check the DTC. (Read out the flashing pattern of the MIL.)
   Is “83” indicated?



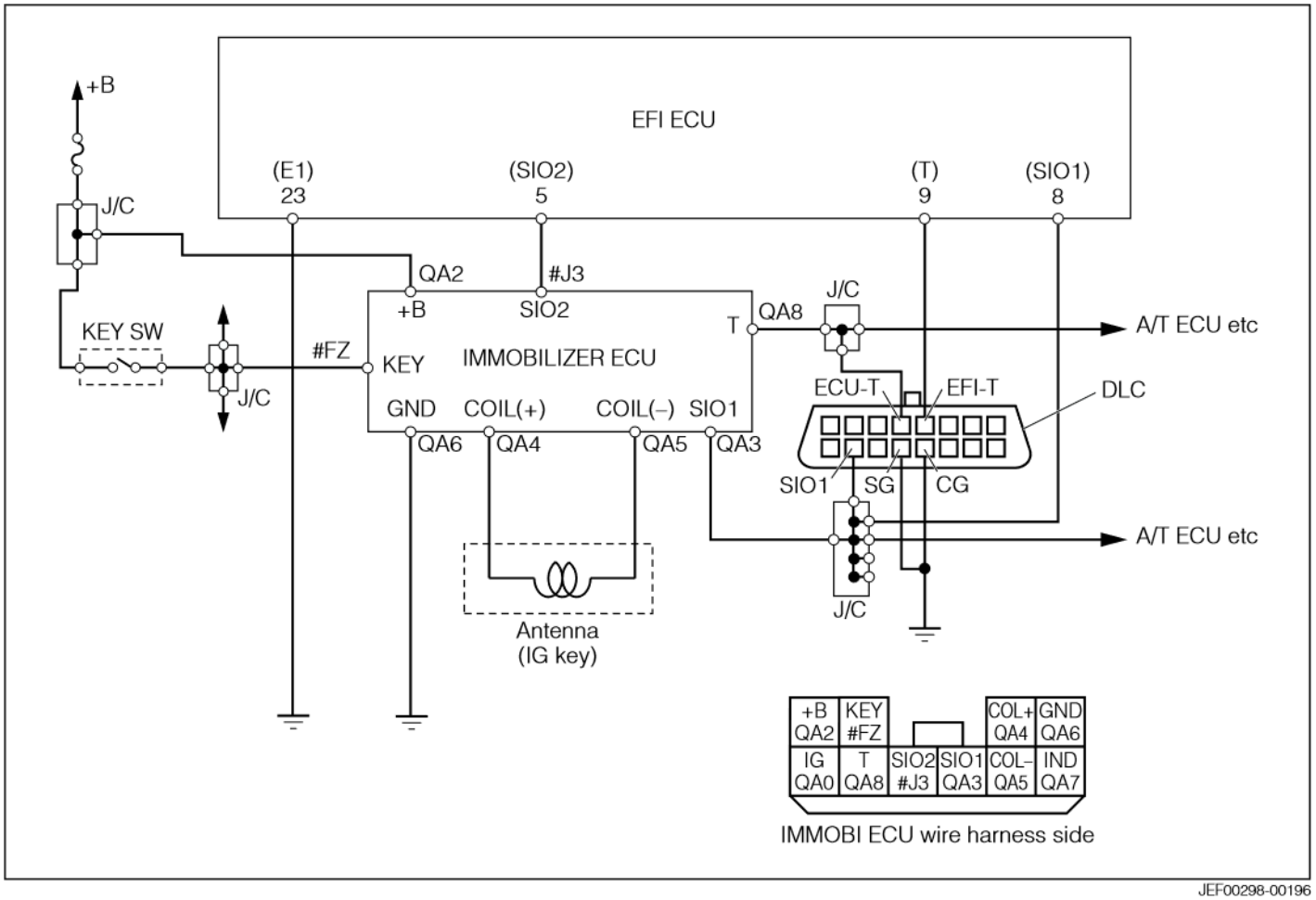
YES → Replace the ECU.

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

JEF00297-00195

DTC	P1601/81	Immobilizer Signal Circuit Malfunction

WIRING DIAGRAM



JEF00298-00196

CIRCUIT DESCRIPTION

When the IG switch is turned ON, communication starts between the immobilizer ECU and the EFI ECU. The engine can start only when the communication between the two ECUs is possible and the rolling codes are matched. In other cases, fuel injection and ignition are prohibited, thus making engine starting impossible.

DTC No.	DTC Detecting condition	Trouble area
P1601/81	When any of the following items takes place in the communication between the immobilizer ECU and EFI ECU, with the IG switch turned ON: • Communication error with immobilizer ECU occurs. • The rolling codes are not matched.	• Open wire or short in immobiliger signal circuit • Immobiliger ECU • Engine ECU

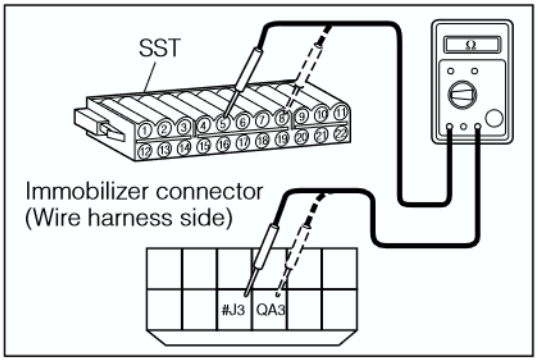
JEF00299-00000

INSPECTION PROCEDURE

1 Check of harness between immobilizer ECU and EFI ECU

1. Set the SST (sub-harness). (Refer to page EF–8.)
   Do not connect the SST connector to the EFI ECU.
2. Disconnect the immobilizer ECU connector.
3. Referring to page EF–48, check the harness and connector for open wire or short, with the IG switch turned OFF.
   - Connector (QA3) at immobilizer ECU harness side- SST terminal ⑧ (SIO1)
   - Connector (#J3) at immobilizer ECU harness side - SST terminal ⑤ (SIO2)

   Are the check results for open wire and short OK?

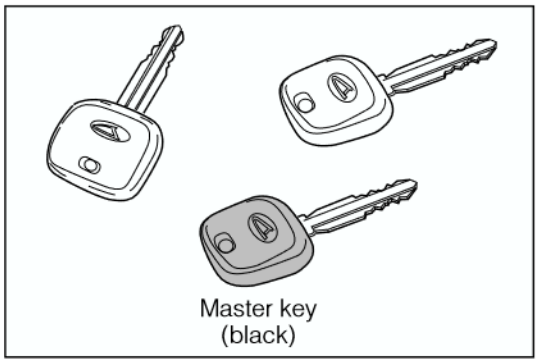


YES

NO → Repair or replace the harness or connector.

2 Check of immobilizer system (1)

1. Connect the connector of the immobilizer ECU.
2. Replace the EFI ECU with a new one. Connect the SST connector to the EFI ECU.
3. Start the engine with the master key. Does the engine start?

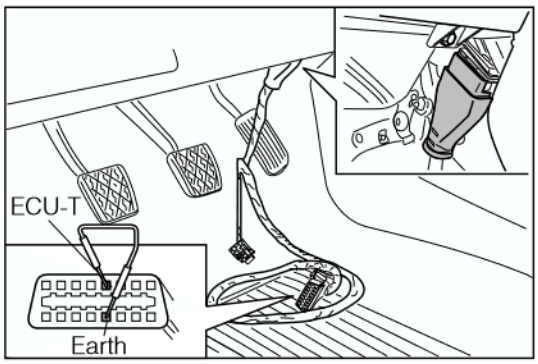


NO

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

3 Check of immobilizer system (2)

1. Replace the immobilizer ECU with a new one, with the IG switch turned OFF.
2. Connect the SST to the DLC.
   SST: 09991-87404-000
3. Connect the ECU-T and the earth terminal of the SST connector with a jump wire.
   SST: 09991-87403-000
4. Start the engine with the master key. Does the engine start?



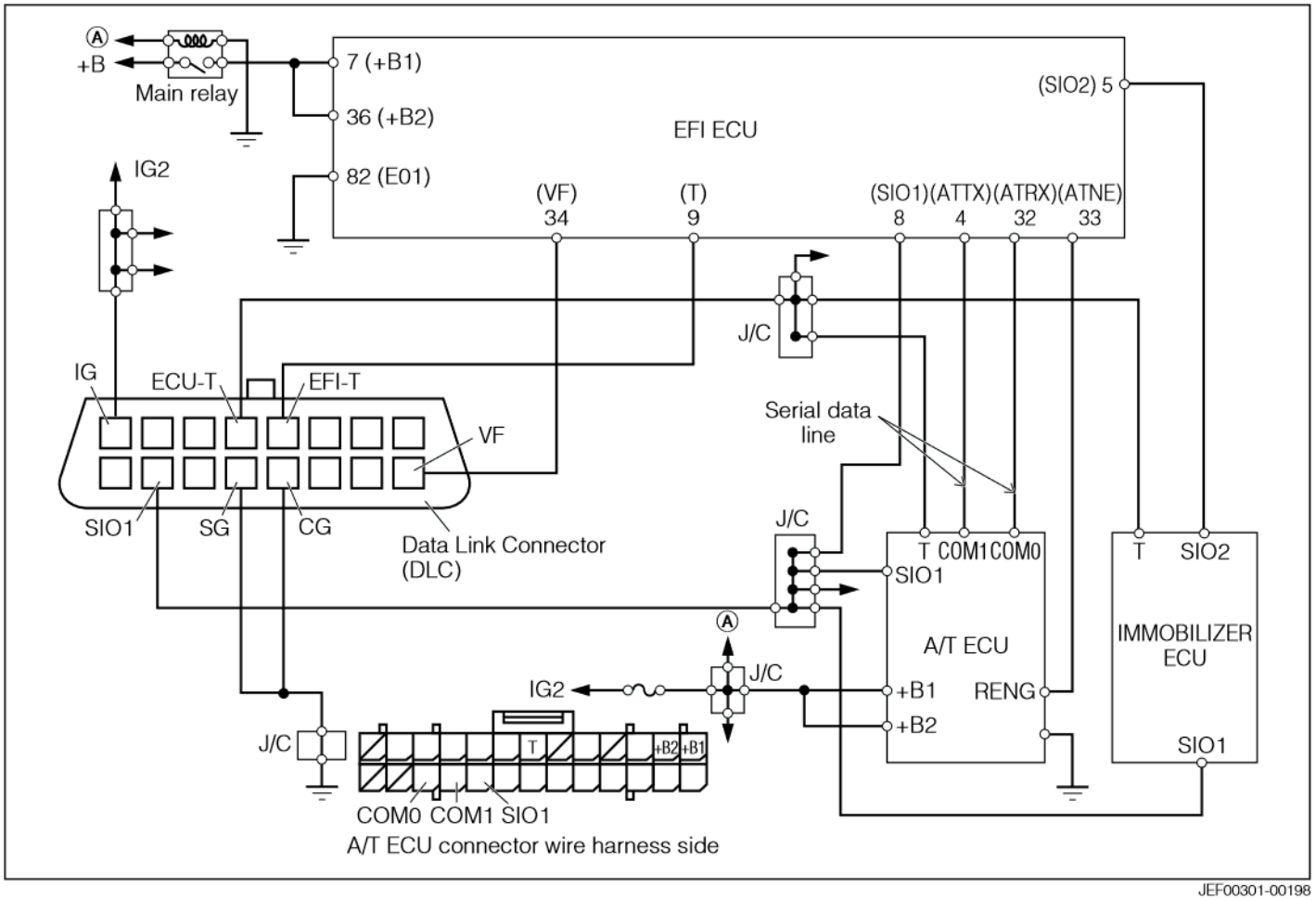
NO → Check the IG key, antenna coil, etc. (Refer to section BE.)

YES → Check or replace the immobilizer ECU. (Refer to section BE.)

JEF00300-00197

DTC	P1602/82	Serial Communication Problem Between EFI and A/T ECU

WIRING DIAGRAM



JEF00301-00198

CIRCUIT DESCRIPTION

The two serial data lines are pulled up to about 12 V by means of the EFI ECU and A/T ECU. Those EFI ECU and A/T ECU send data (to A/T ECU and EFI ECU, respectively) by controlling their grounds.
As long as the IG switch is ON, the A/T ECU keeps sending to the EFI ECU the data concerning whether or not all detectable DTCs have been checked and whether or not any abnormality has been found by the check.

DTC No.	DTC Detecting condition	Trouble area
P1602/82	With IG switch turned ON when any of the followings takes place: • Serial communication is abnormal at receiving side (A/T → EFI) • Serial communication is abnormal at sending side (EFI → A/T)	• Open wire or short in serial communication link circuit • Open wire in power or ground circuit of A/T ECU • A/T ECU • EFI ECU

JEF00302-00000

INSPECTION PROCEDURE

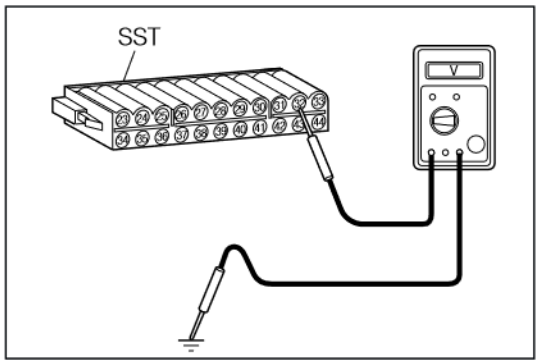
NOTE:

- 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 Check of signal voltage (1)

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 ㉜ (ATRX) and the body ground.
   Specification:
   The voltage should be stable at a constant value. (The value of the voltage can not be specified.)

   Is the voltage stable at a certain value (other than 0 v or 12 V)?



NO

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

About 0 V

2 Check of signal circuit

1. Turn OFF the IG switch. Disconnect the connector of the A/T ECU.
2. Turn ON the IG switch. Measure the voltage between the A/T ECU connector terminal COM0 and the body ground.
   Is the measured voltage about 12 V (battery voltage)?

YES → Check the A/T ECU power supply and check the earth circuit for short.

NO → Check the harness between the EFI and the A/T ECU for short to ground or check the EFI ECU for faulty connectors.
↓
Repair or replace the harness or connector.

Change between about 0 - 12 V

Check of malfunction that occurs intermittently or check of A/T ECU or EFI ECU
Referring to page EF–51, check the malfunction that occurs intermittently and poor contact.
Are the check results OK?

YES → Check or repair the A/T ECU or EFI ECU. (Refer to page EF–51.)

NO → Repair or replace the harness or connector.

About 12 V

1. Turn OFF the IG switch. Disconnect the connector of the A/T ECU.
2. Turn ON the IG switch. Measure the voltage between the A/T ECU connector terminal COM0 and the body ground.
   Is the measured voltage about 0 V?

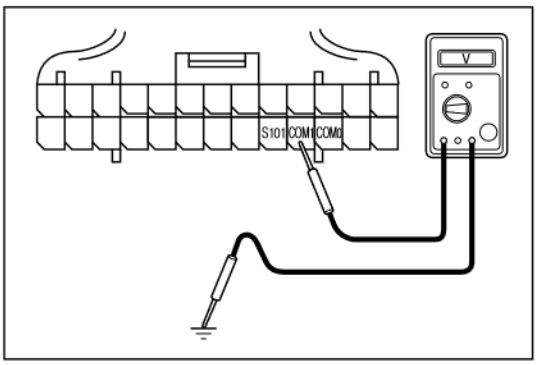
YES → Check the harness between the EFI and the A/T ECU for open wire or check the A/T ECU for faulty connectors.
↓
Repair or replace the harness or connector.

NO → Check or replace A/T ECU.

3 Check of signal voltage (2)

1. Set the SST (sub-harness). (Refer to page EF–8.)
2. With the IG switch turned ON, measure the voltage between the A/T ECU connector (COM1) and the body ground.
   Specification:
   The voltage should be stable at a constant value. (The value of the voltage can not be specified.)

   Is the voltage stable at a certain value (other than 0 V or 12 V)?
   NOTE:
   - **When applying a probe to the terminal (COM1), apply it from the harness side with the connector connected to the A/T ECU.**



NO

YES

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

About 0 V

Change between about 0 - 12 V

About 12 V

4 Check of signal circuit

1. Turn OFF the IG switch. Disconnect the SST connector from the EFI ECU.
2. Turn ON the IG switch. Measure the voltage between the SST connector terminal ④ (ATTX) and the body ground.
   Is the measured voltage about 12 V (battery voltage)?

YES

Check the EFI ECU power supply and check the earth circuit for short.

NO

Check the harness between the EFI and the A/T ECU for short to ground or check the A/T ECU for faulty connectors.

↓

Repair or replace the harness or connector.

Check of malfunction that occurs intermittently or check of A/T ECU or EFI ECU
Referring to page EF–51, check the malfunction that occurs intermittently and poor contact.
Are the check results OK?

YES

Check or repair the EFI ECU or A/T ECU. (Refer to page EF–51.)

NO

Repair or replace the harness or connector.

1. Turn OFF the IG switch. Disconnect the SST connector from the EFI ECU.
2. Turn ON the IG switch. Measure the voltage between the SST connector terminal ④ (ATTX) and the body ground.
   Is the measured voltage about 0 V?

YES

Check the harness between the EFI and the A/T ECU for open wire or check the EFI ECU for faulty connectors.

↓

Repair or replace the harness or connector.

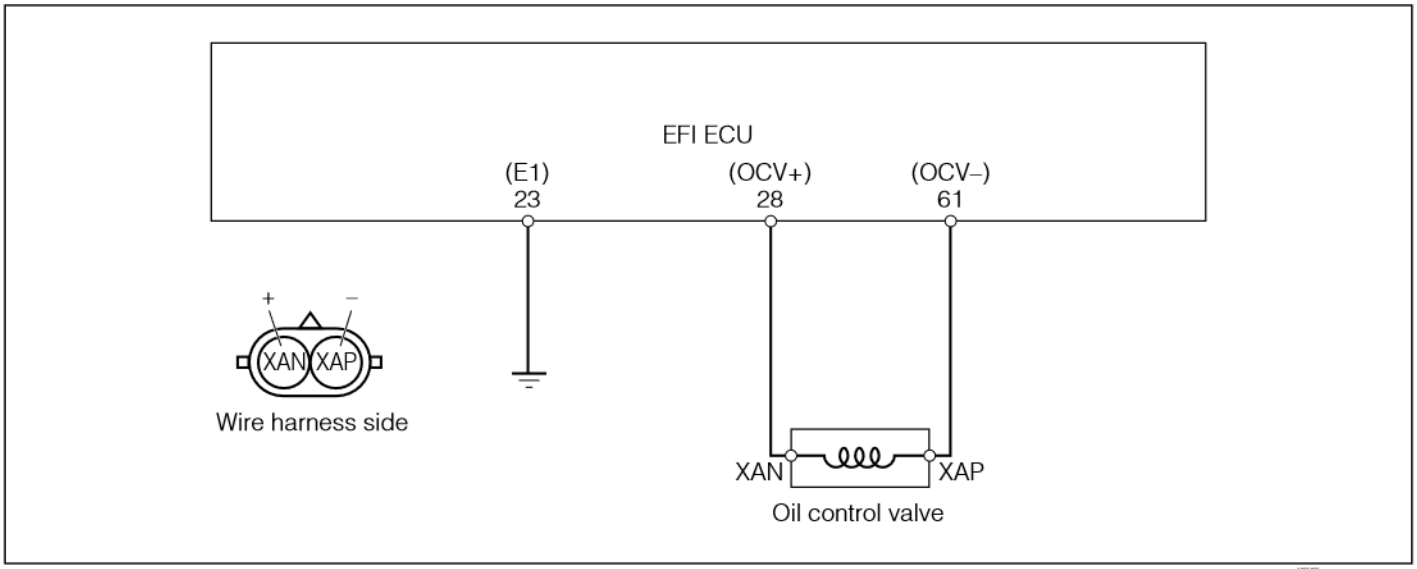
NO

Check or replace EFI ECU.

JEF00303-00199

DTC	P1656/74	OCV Circuit Malfunction

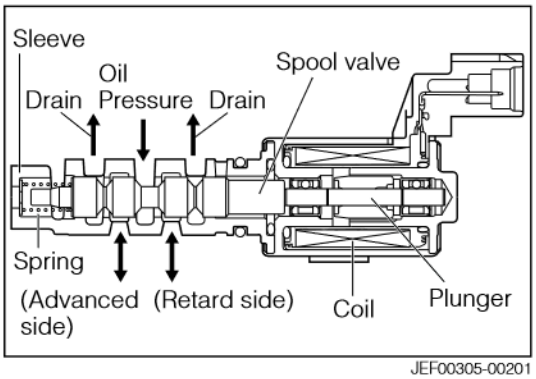
WIRING DIAGRAM



JEF00304-00200

CIRCUIT DESCRIPTION

This circuit operates the spool valve by means of the duty signal from the engine control computer so as to switch the oil passages at the advanced side and retarded side to the DVVT controller. In this way, the valve timing is always controlled at the optimum one.
When the engine is stopped, the camshaft timing oil control valve is set to the most retarded state.



JEF00305-00201

DTC No.	DTC Detecting condition	Trouble area
P1656/74	Open wire or short in oil control valve circuit	• Open wire or short in oil control valve circuit • Oil control valve • Engine ECU

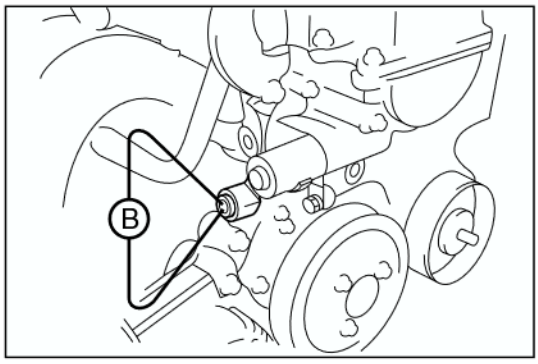
INSPECTION PROCEDURE

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 Operation check of oil control valve

1. Set the SST (sub-harness). (Refer to page EF–8.)
2. Start the engine and fully warm it up.
3. Disconnect the connector of the oil control valve (OCV).
4. Apply the battery voltage to between the terminals of the OCV connector.
5. Check the engine running condition.
   Does rough idling or engine stall take place?



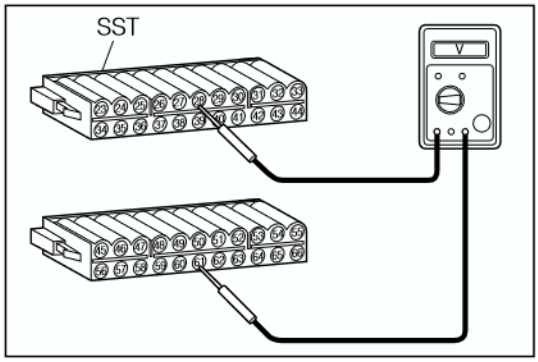
YES

NO → Replace the OCV.

2 Check of ECU output voltage

1. With the engine idling, measure the voltage between the SST connector terminals ㉘ (OCV+) and ㊶ (OCV–).
   Specified Value: 4.0 V or less

   Is the measured value the specified value?



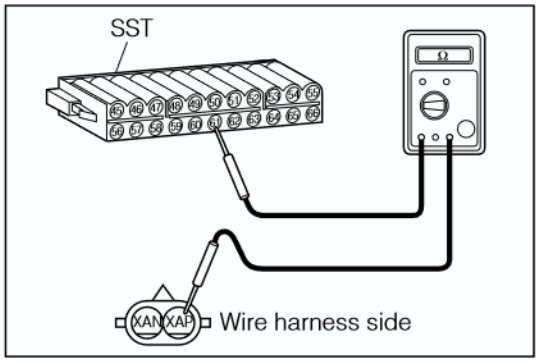
YES

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

3 Check of harness between OCV and ECU

1. Turn OFF the IG switch.
2. Disconnect the SST connector from the ECU.
3. Referring to page EF–48, check the harness and connector for open wire or short.
   - Valve harness side connector (XAN) - SST connector ㉘ (OCV+)
   - Valve harness side connector (XAP) - SST connector ㊶ (OCV–)

   Are the check results for open wire and short OK?



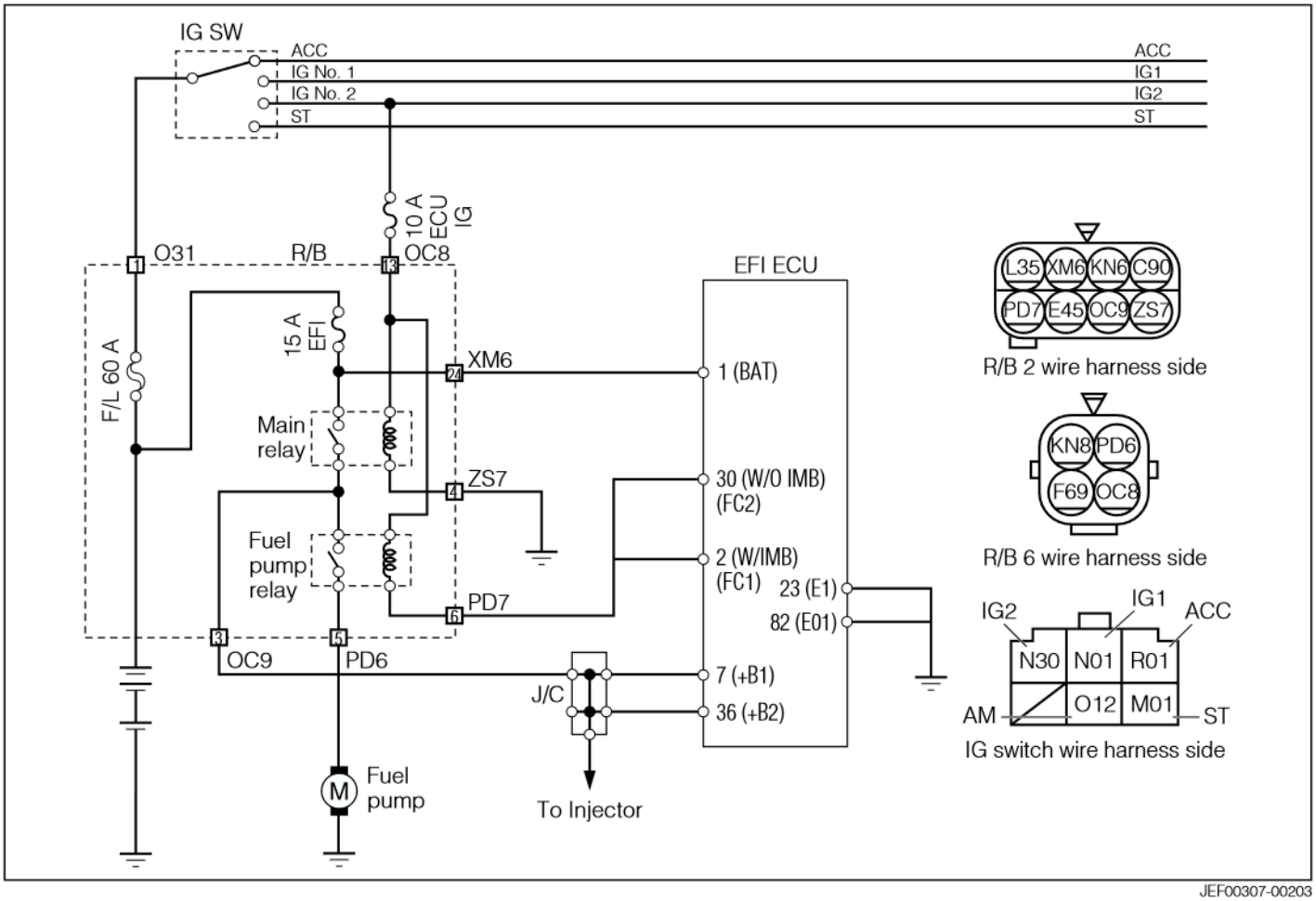
YES → Check malfunction that occurs intermittently and poor contact. (Refer to page EF–51.)

NO → Repair or replace the harness or connector.

JEF00306-00202

ECU Power Source Circuit

WIRING DIAGRAM



JEF00307-00203

CIRCUIT DESCRIPTION

When the ignition switch is turned ON, battery positive voltage is applied to the coil, closing the contacts of the EFI main relay and supplying power to the terminals +B1 and +B2 of the engine ECU.

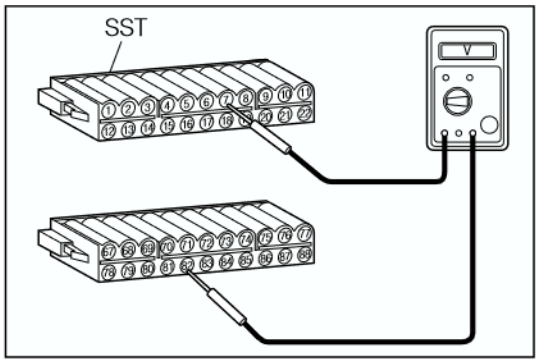
JEF00308-00000

INSPECTION PROCEDURE

1 Check of power supply voltage of ECU

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 ⑦, ㊱ through ㉜ (E01).
   Specified Value: Battery voltage

   Are the check results OK?



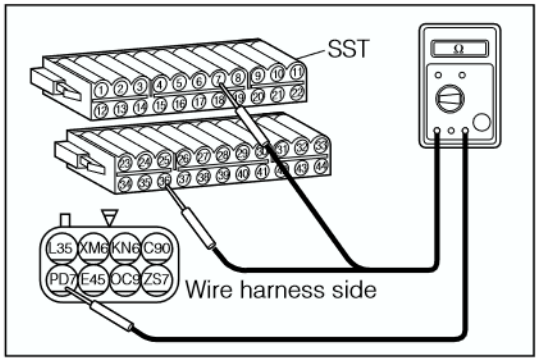
YES → Check malfunction that occurs intermittently or poor contact. (Refer to page EF–51.)

NO ↓

2 Check of harness between relay block and ECU

1. With the IG switch turned OFF, disconnect the SST connector from the ECU.
2. Disconnect the harness from the positive ⊕ terminal of the battery.
3. Referring to page EF–48, check the harness and connector for open wire or short.
   - Connector (PD7) of the relay block at the harness side and the SST terminal ⑦ and ㊱
   - Stand bolt of the relay block and the positive ⊕ terminal of the battery

   Are the check results for open wire and short OK?

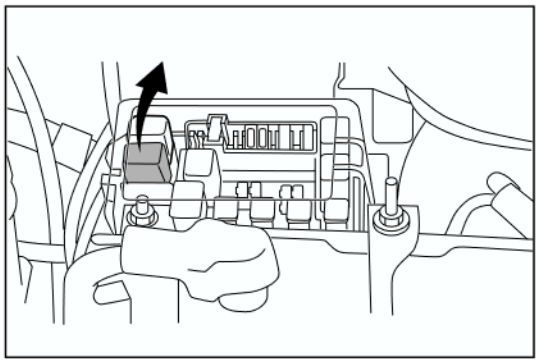


YES ↓

NO → Repair or replace the harness or connector.

3 Unit check of EFI main relay

1. Disconnect the EFI main relay from the relay block.
2. Referring to page EF–187, perform the check.
   Are the check results OK?



YES

4 Unit check of IG switch

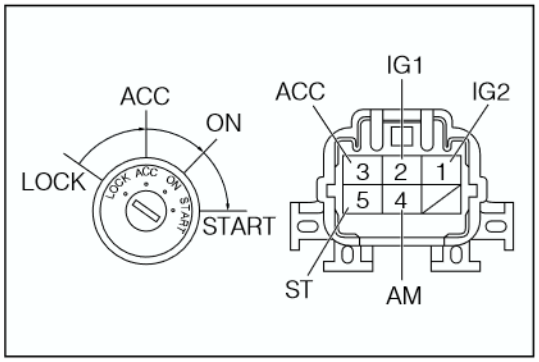
1. Disconnect the connector from the IG switch.
2. With the IG switch disconnected, check continuity between the terminals given below:

Switch position	Terminal No. to continuity
LOCK	—
ACC	3 - 4
ON	1 - 2 - 3 - 4
START	1 - 2 - 4 - 5

Are the check results OK?

NO

Replace the EFI main replay.

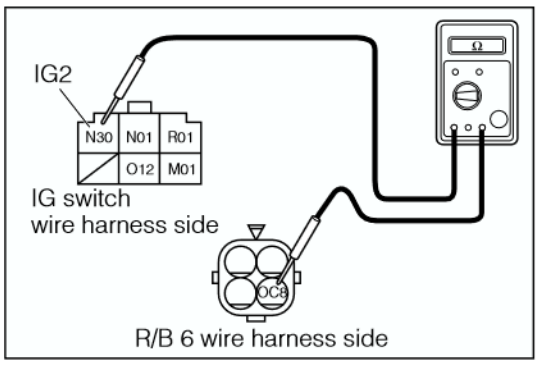


YES

5 Check the harness and connector between the IG switch, relay block and the body ground for open wire or short. (Refer to page EF–48.)

NO

Replace the ignition switch



YES

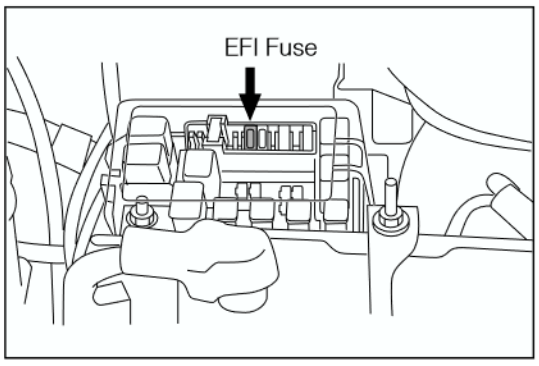
6 Unit check of EFI fuse

1. Disconnect the EFI fuse from the relay block.
2. Check the EFI fuse for continuity.
   Specified Value: Continuity exists.

Are the unit check results OK?

NO

Repair or replace the harness or connector.



YES

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

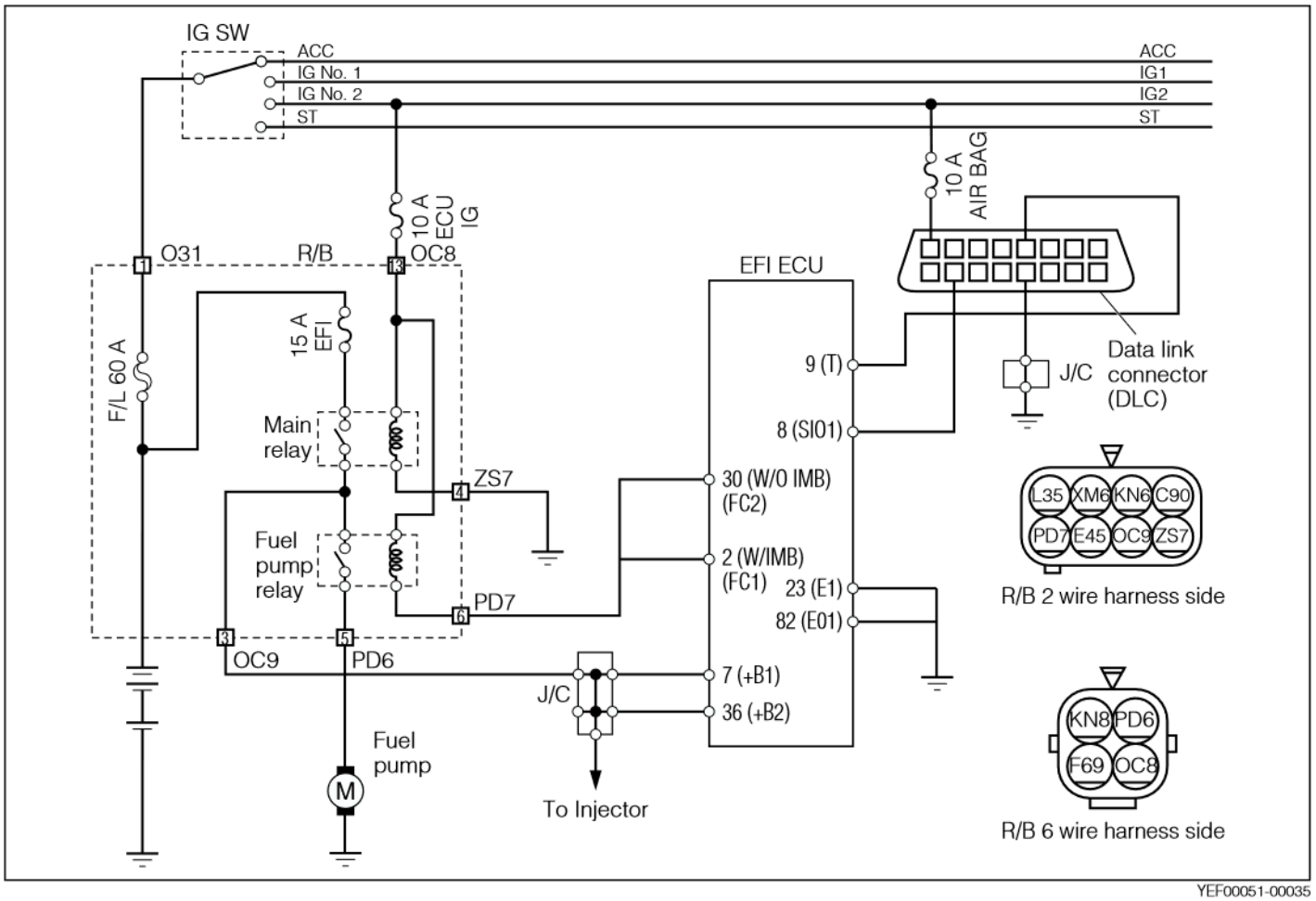
NO

Replace the EFI fuse.

JEF00309-00204

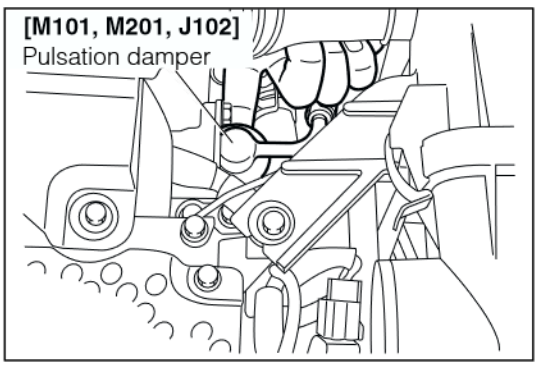
Fuel Pump Control Circuit

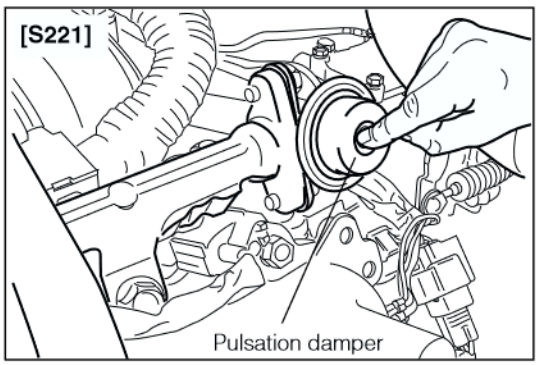
WIRING DIAGRAM



INSPECTION PROCEDURE

1	Operation check of fuel pump
	1. With the IG switch turned OFF, connect the DS-21 diagnosis tester to DLC through the SST. 2. After turning ON the IG switch, turn ON the main switch of the tester. Select the actuator driving. 3. Select the fuel pump ON so as to actuate the fuel pump. If the DS-21 diagnosis tester is not available, connect a jump wire between the terminal T of the DLC and the earth terminal. 4. Ensure that the screw of the pulsation damper rises in Step 3. Are the check results OK?





YES

2	Check of power supply circuit of engine ECU
	Perform the check according to the trouble-shooting of the ECU power source circuit. (Refer to page EF–178.) Are the check results OK?

NO

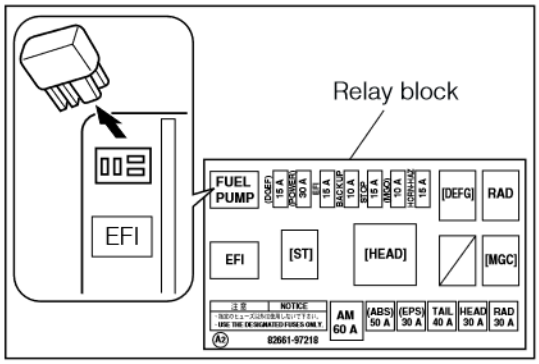
Check malfunction that occurs intermittently or poor contact. (Refer to page EF–51.)

YES

3	Unit check of fuel pump relay
	1. With the IG switch turned OFF, disconnect the fuel pump relay from the relay block. 2. Referring to page EF–187, perform the check. Are the check results OK?

NO

Repair or replace.

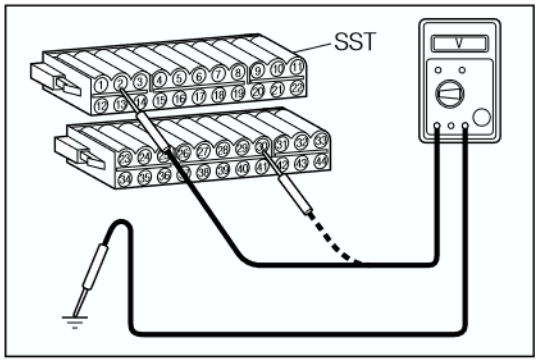


YES

4	Check of voltage at the terminal FC1 or FC2 of engine ECU
	1. Set the SST (sub-harness). (Refer to page EF–8.) 2. Turn ON the IG switch. 3. Measure the voltage between the SST connector ② (W/IMB) or ㉚ (W/O IMB) and the body ground. **Specified Value: Battery voltage** Are the check results OK?

NO

Replace the fuel pump relay.



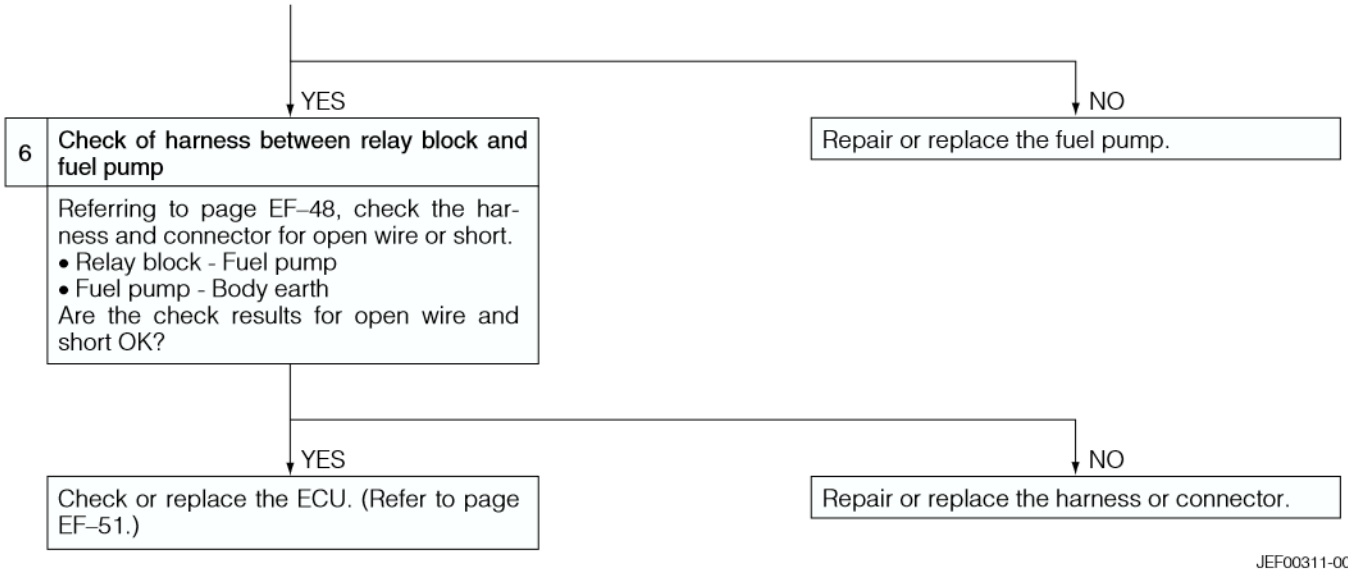
YES

5	Unit check of fuel pump
	(Refer to page EF–187.) Are the check results OK?

NO

Check the harness and connector between the relay block and the engine ECU for open wire or short.

sEF00052-00036



JEF00311-00206

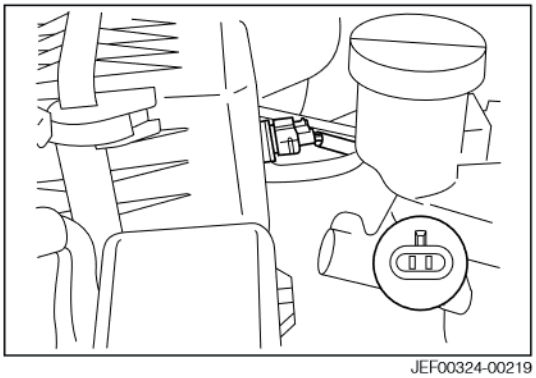
5.15 UNIT CHECK

5.15.1 INTAKE AIR TEMPERATURE SENSOR

1. Measure the resistance between the terminals.

The figures in ( ) denote reference values.

Temperature (°C)	–30	–20	20	80	120
Resistance (kΩ)	(28.6)	(16.2)	2.45	0.33	0.18



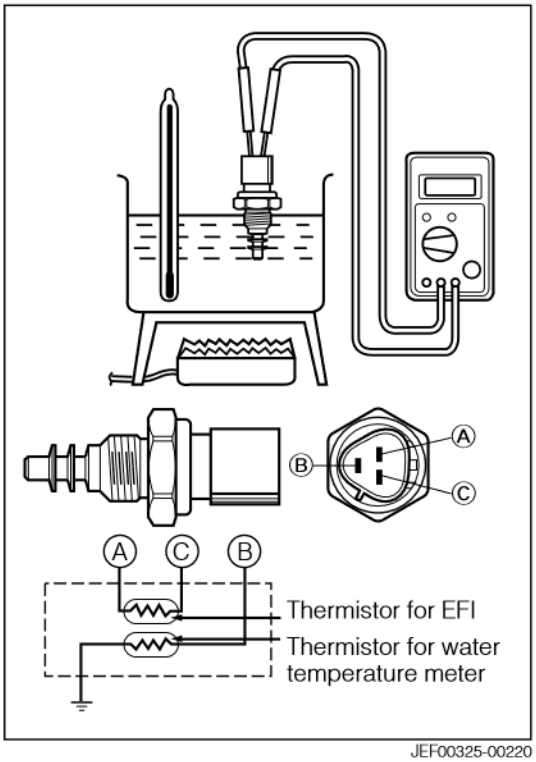
JEF00324-00219

5.15.2 ENGINE COOLANT TEMPERATURE SENSOR

1. Measure the resistance between the terminals.

The figures in ( ) denote reference values.

Temperature (°C)	–20	20	80	110
Resistance (kΩ)	15.06	2.44	0.32	0.14



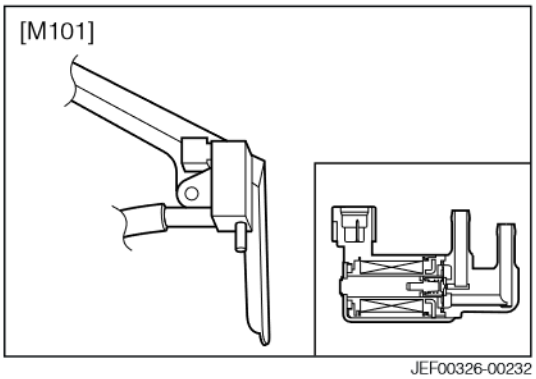
JEF00325-00220

5.15.3 VSV FOR EVAPORATIVE EMISSION PURGING

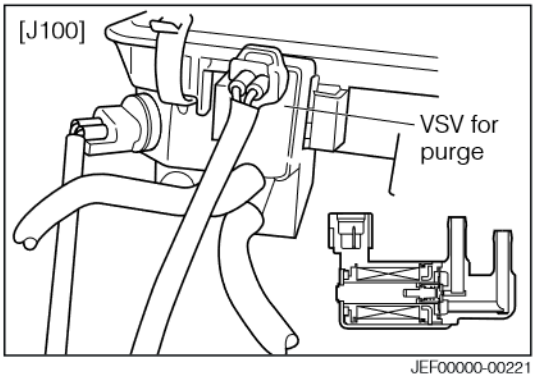
1. Perform continuity check between ports.
   Specification: No continuity should exist.

2. With a voltage applied to the VSV connector terminals, perform continuity check between ports.
   Specification: Continuity should exist.

3. Measure the resistance value between the terminals.
   Specified Value: 30 to 34 Ω at 20°C

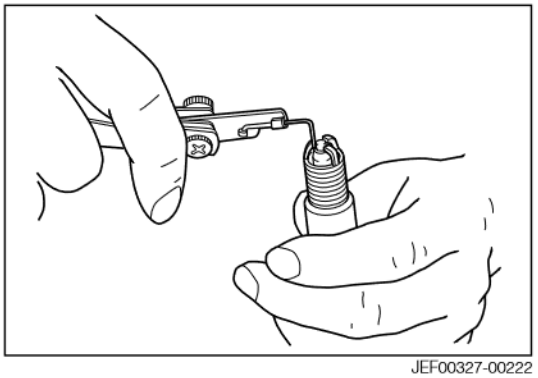


JEF00326-00232



JEF00000-00221

5.15.4 SPARK PLUG


JEF00327-00222

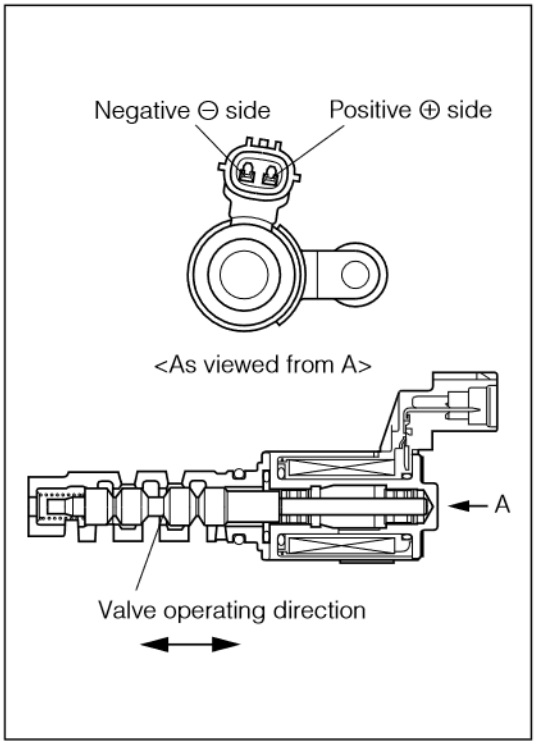
WARNING:
- The spark plug may be still very hot. Special care must be exercised to avoid getting a burn.

1. Check the spark plug for fouling or being too burning.
2. Check the spark plug for plug gap, using a spark plug gauge.
   Specified Value:

	EU spec.	Others
Denso (mm)	0.9 - 1.0	0.7 - 0.8
NGK (mm)	0.9 - 1.0	1.0 - 1.1

3. Check the internal resistance value of the spark plug.
   Specified Value: 3.0 - 7.5 kΩ

5.15.5 OIL CONTROL VALVE (Only for EU specifications)



JEF00328-00223

1. With the battery voltage applied to the oil control valve terminals, visually check the operation of the valve.
   Specification:
   When the battery voltage is applied, the valve should operate.

NOTE:
- The right figure indicates the correct polarity (+ or –) when applying the voltage.
- Never apply the battery voltage in excess of one minute.

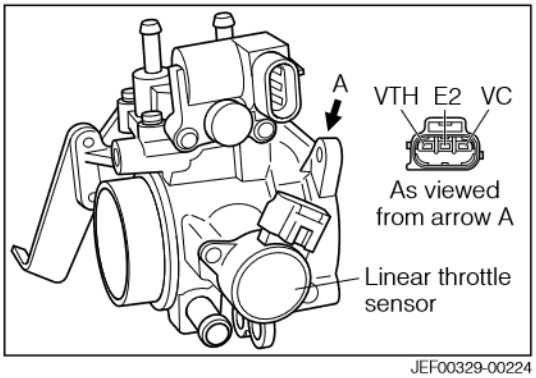
2. Measure the resistance between the terminals.
   Specified Value: 6.9 to 7.5 Ω at 20°C

5.15.6 LINEAR THROTTLE SENSOR

1. Measure the resistance between the VC and the E2.
   Specified Value: 2.5 to 5.0 kΩ

2. Measure the change in resistance between the VTH and the E2.
   Specification:
   The resistance value should increase in proportion to the opening degree of the throttle lever.

REFERENCE:
- When the throttle lever is fully closed, the resistance value should be about 0.4 kΩ.
- When the throttle lever is fully opened, the resistance value should be about 3.4 kΩ.



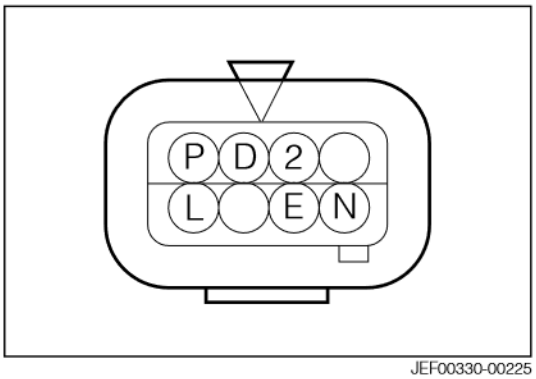
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5.15.7 NEUTRAL START SWITCH

1. Check continuity between terminals given below.

○—○ : Continuity exists.

Position \ Terminal	P	N	D	2	L	E
P	○					○
N		○				○
D			○			○
2				○		○
L					○	○

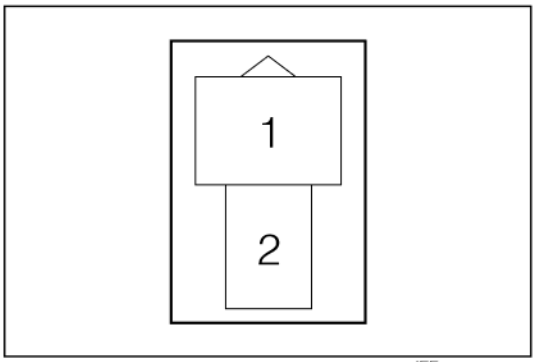


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5.15.8 EVAPORATOR TEMPERATURE SENSOR

1. Measure the resistance between the connector terminals.
2. Connect the connectors. Turn ON the air conditioner and keep on the operation for five minutes.
3. With the air conditioner turned OFF, measure the resistance between the connector terminals.
   Specification:
   The resistance value should vary between times, before and after the operation.

REFERENCE:
- As the temperature drops, the resistance value will rise.



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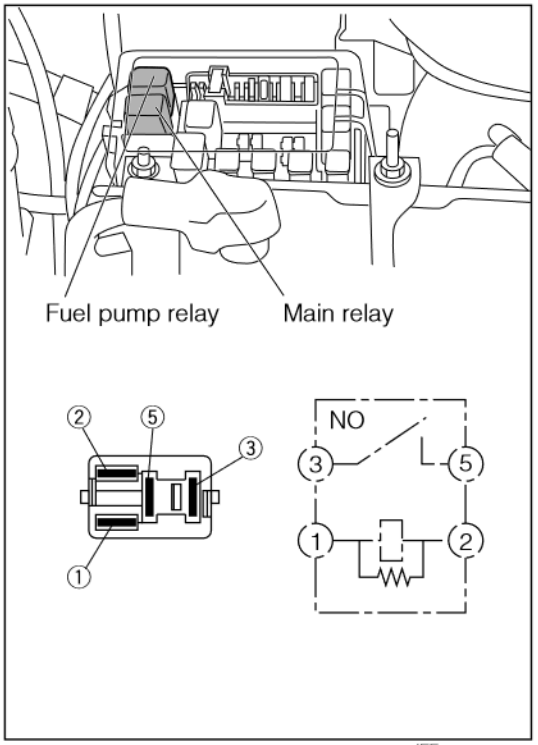
5.15.9 MAIN RELAY & FUEL PUMP RELAY

1. Turn ON the IG switch. Check to see if the relay is functioning through sound and vibration.
   NOTE:
   - The relay may be very hot through its operation. Do not touch it with your hand.

2. Measure the resistance between the terminals ① and ②.
   Specified Value: 86 to 148 Ω

   NOTE:
   - The measurement should be conducted after the relay unit has been soaked at least one hour in an ambient temperature of 40°C.

3. Ensure that no continuity exists except between terminals ① and ②.
4. Apply the battery voltage to between the terminals ① and ②. Ensure that continuity exists between terminals ③ and ⑤.



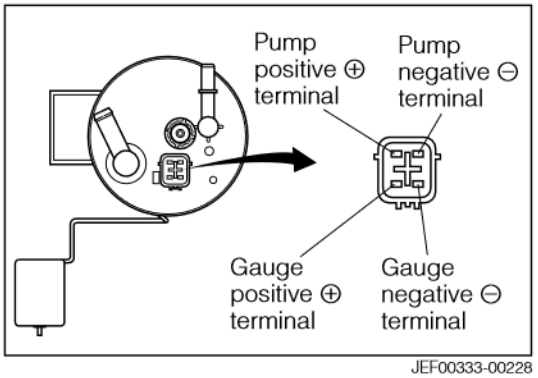
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5.15.10 FUEL PUMP

WARNING:
- Fire is prohibited strictly during the operation.

1. Turn ON the IG switch.
2. Using the SST, short between terminals T and E of the DLC. Check to see if the relay emits an operating sound.
   SST: 09991-87404-000
   09991-87403-000

3. Turn OFF the IG switch.
4. Pull out the connector located at the top of fuel tank. Measure the resistance between the terminals of the fuel pump.
   Specified Value: 0.2 to 3.0 Ω



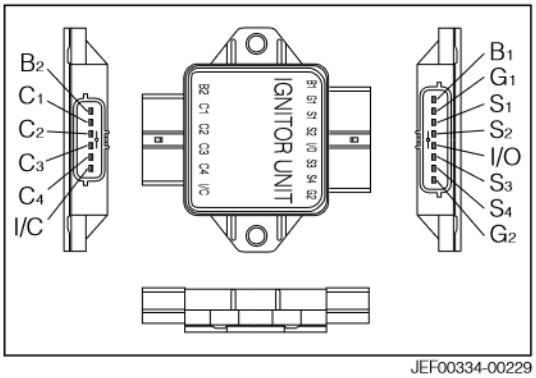
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5.15.11 IGNITOR UNIT (Only for EU specifications)

1. Measure the resistance between the connector terminals given below.
   Specified Value: Refer to the table below.

Between terminals		Resistance value
B_1	G1	∞
B_2	G1	∞
C_1	G1	∞
C_2	G1	∞
C_3	G1	∞
C_4	G1	∞
I/C	G1	∞
S_1	G1	∞
S_2	G1	∞
I/O	G1	1.9 - 2.1 kΩ
S_3	G1	∞
S_4	G1	∞
G_2	G1	∞

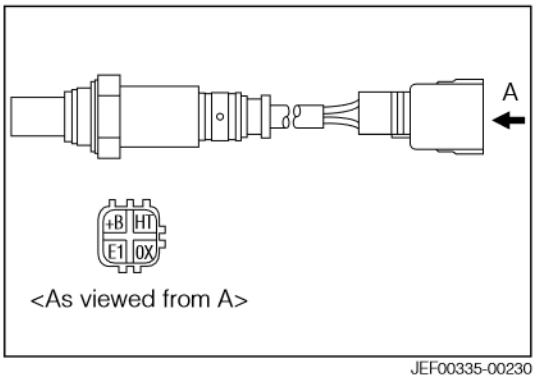
Between terminals		Resistance value
B_1	G2	∞
B_2	G2	∞
C_1	G2	∞
C_2	G2	∞
C_3	G2	∞
C_4	G2	∞
I/C	G2	∞
S_1	G2	3.7 - 4.1 kΩ
S_2	G2	3.7 - 4.1 kΩ
I/O	G2	∞
S_3	G2	3.7 - 4.1 kΩ
S_4	G2	3.7 - 4.1 kΩ
G_1	G2	∞



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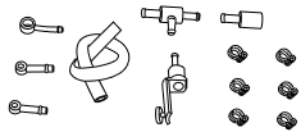
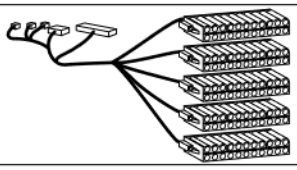
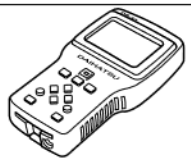
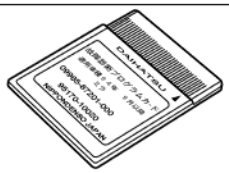
5.15.12 FRONT AND REAR OXYGEN SENSORS WITH HEATER (Only for EU specifications)

1. Measure the resistance between the connector terminals ⊕B and HT.
   Specified Value: 11.7 to 14.5 Ω at 20°C



JEF00335-00230

5.16. SST (Special Service Tools)

Shape	Parts number & Name	Purpose
	09268-87701-000 EFI fuel pressure gauge	Inspection of fuel pressure
	09842-30070-000 EFI inspection wire	Inspection of fuel injector
	09268-87702-000 Inspection measuring tool set	Inspection of fuel pressure Inspection of fuel injector
	09842-97203-000 EFI computer check sub-harness	Inspection of computer input/output voltage
	09991-87404-000 Engine control system inspection wire	Diagnosis code check
	09991-87402-000 Tacho-pluse pick-up wire	Measurement of engine revolution speed
	09991-87403-000 Diagnosis check wire	Shorting terminal T
	09243-87201-000 Idle adjusting wrench	Adjustment and check of variable resister
	09991-87301-000 Diagnosis tester set	Reading of diagnosis codes Erasing of diagnosis codes
	09965-97215-000 (English) 09965-97216-000 (German) 09965-97217-000 (Dutch) 09965-97218-000 (French) Trouble-shooting program card	Reading of diagnosis codes Erasing of diagnosis codes

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