

TO INDEX

EFI SYSTEM (EJ-DE)

APPLICABLE VEHICLE MODEL:

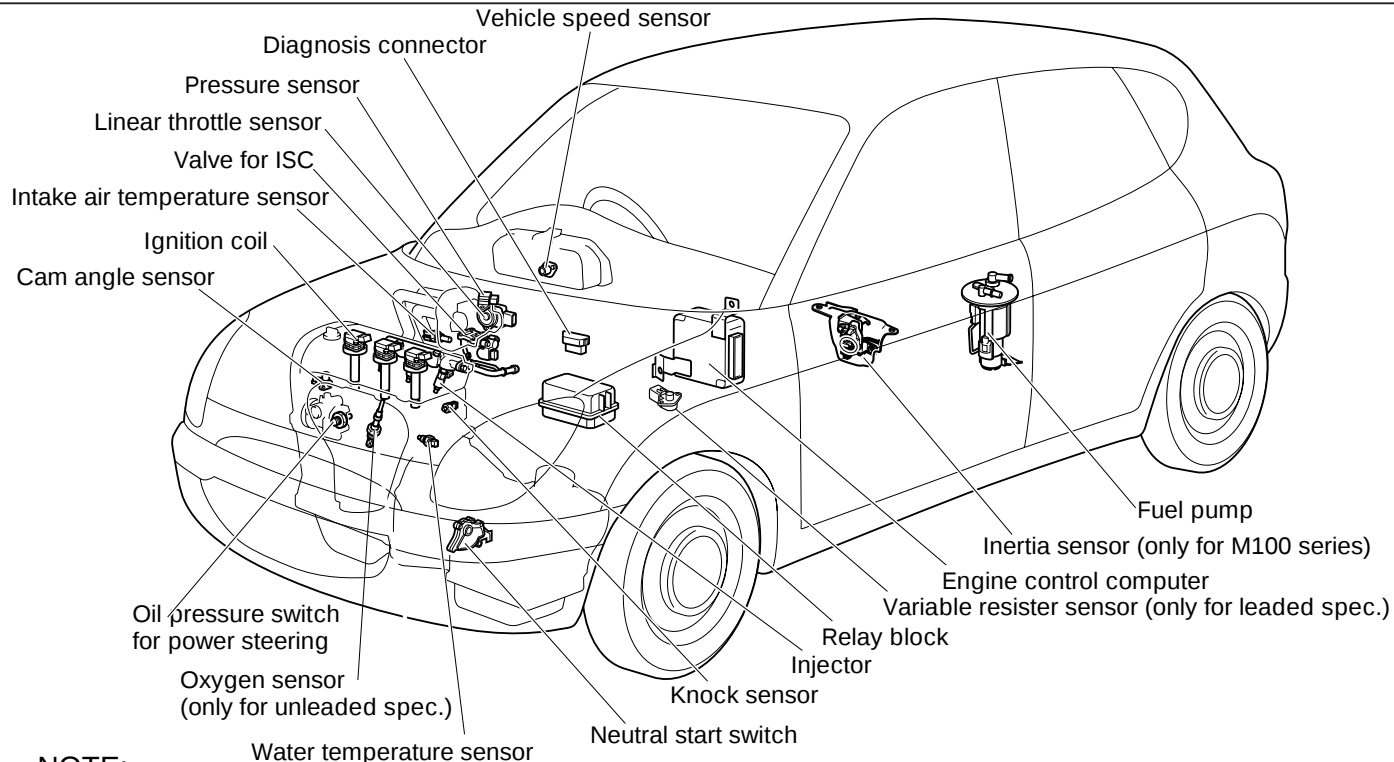
**M100 Series from May 2000 production
L701 Series from Oct. 2000 production
L901 Series from Oct. 2000 production
M200 Series from Sep. 2000 production**

MIG00001-00000

EF

1. SYSTEM DESCRIPTION

1.1 LOCATION OF ELECTRONIC CONTROL PARTS



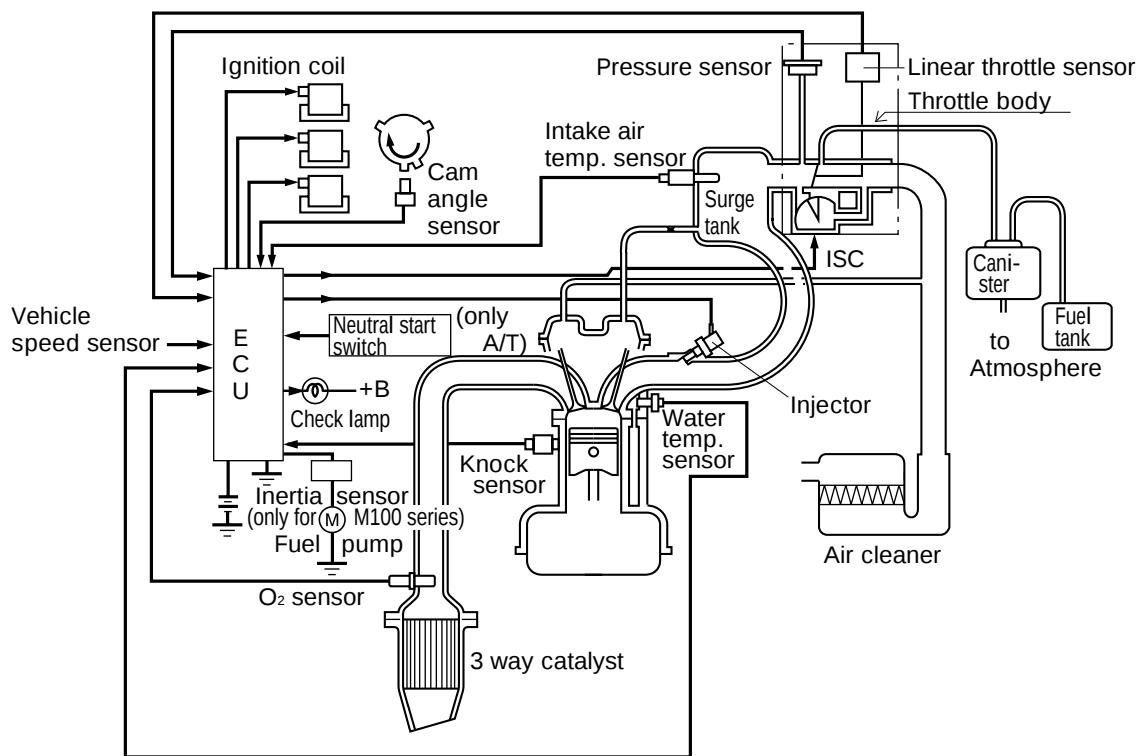
NOTE:

- This figure shows the location for the M100 vehicle. In the case of the L701, L901, M200 vehicle, the location is virtually the same.

mEF00002-00001

1.2 SYSTEMATIC DIAGRAM

1.2.1 SPECIFICATIONS OF SYSTEM FOR UNLEADED GASOLINE



mEF00003-00002

READING OUT OF DIAGNOSIS CODE

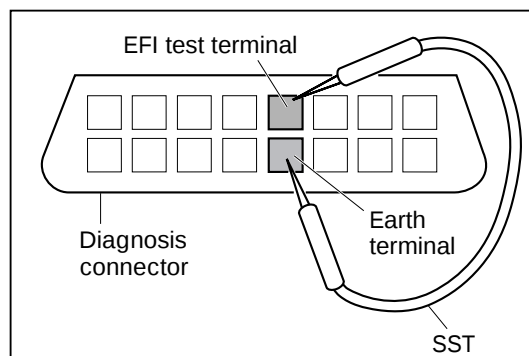
1. Initial conditions.
 - (1) Battery voltage of 11 volts or more.
 - (2) Throttle valve fully closed.
 - (3) All accessory switches turned OFF.
2. Reading out of diagnosis code by check engine lamp.
 - (1) Connect the terminal between the test terminal and the earth terminal with a jump wire as indicated in the illustration.
 - (2) Turn the ignition switch to the "ON" position. At this time, be careful not to start the engine.
 - (3) Read out the diagnosis code by observing the flashing number of the check engine lamp.

NOTE:

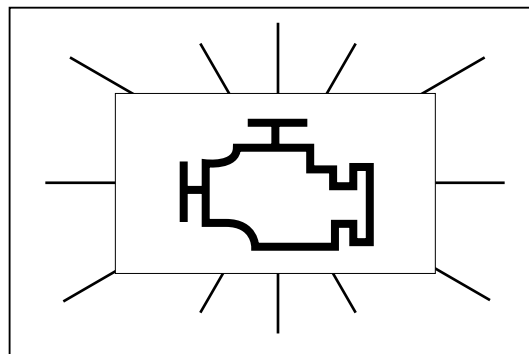
- When system malfunction was detected, go to page EF-21, "TROUBLE SHOOTING ACCORDING TO DIAGNOSIS SYSTEM".
- If the check engine lamp fails to blink, it is likely that the ECU is malfunctioning. Hence, proceed to the inspection of the diagnosis system circuit.

3. Reading out of diagnosis code with diagnosis tester (DS-21)

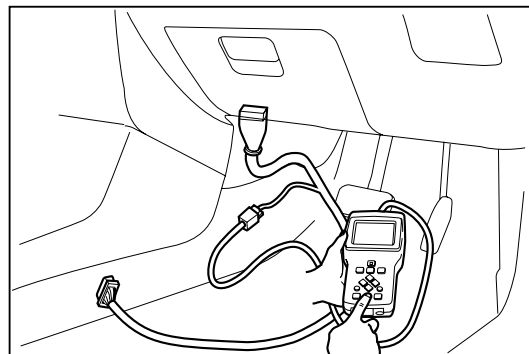
Connect the diagnosis tester (DS-21) to the exclusive connector provided in front of the driver's seat. Have the diagnosis code indicated by means of the "diagnosis check" function.



MEF00144-00085



MEF00008-00007



MEF00009-00008

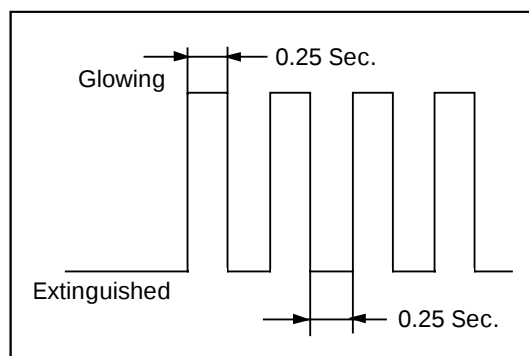
EXPLANATION OF DIAGNOSIS CODES

1. Indication of normal code

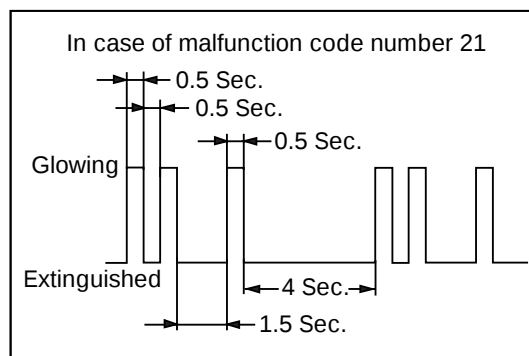
The engine check lamp glows for 0.25 second, right after the ignition switch has been turned ON. After a lapse of 0.25 second, the check engine lamp again glows for 0.25 second.

Then, this pattern will be repeated.
2. Indication of malfunction code
 - (1) When a single malfunction code is indicated:

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.



MEF00010-00009



MEF00011-00010

(2) When plural malfunction codes are indicated:

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.

3. Canceling method of diagnosis code

(1) Erasure by disconnecting EFI fuse.

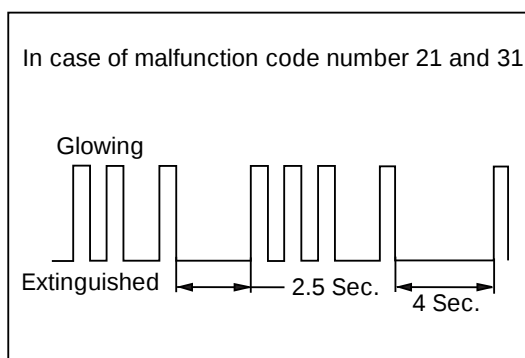
To erase the diagnosis codes memorized in the ECU after malfunctions have been repaired, disconnect the EFI fuse from the relay block for at least 30 seconds with the ignition switch turned OFF.

[When ambient temperature is about 20°C.]

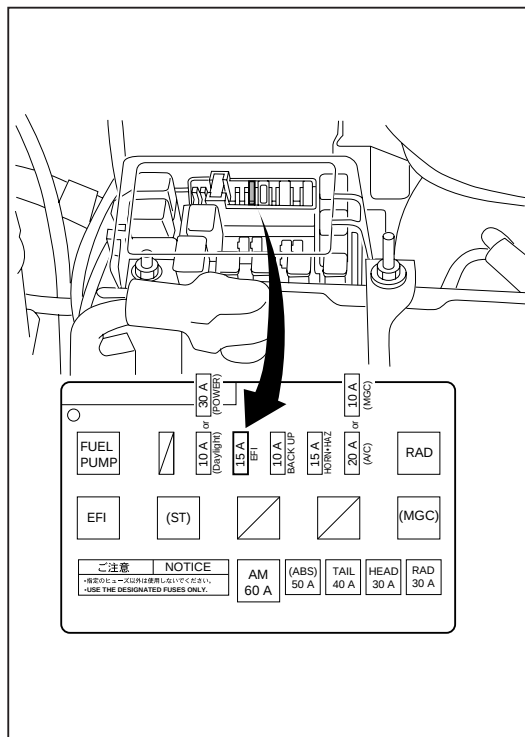
NOTE:

- After the diagnosis codes have been read, remove the SST at the check connector.
- 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.



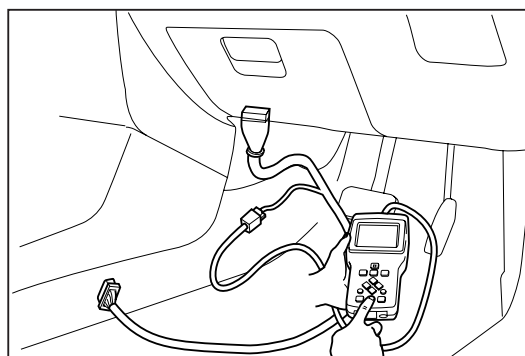
LEF00012-00011



MEF00155-00093

(2) Erasure by diagnosis tester (DS-21)

Connect the diagnosis tester (DS-21) to the exclusive connector provided in front of the driver's seat. Erase the diagnosis codes by the "malfunction code erasing function" of the "individual function."



LEF00014-00013

1.4.2 Diagnosis through inquiries

The diagnosis through inquiries is to collect information from the customer before confirming the malfunction phenomena. The diagnosis through inquiries proves to be very important clues in reproducing malfunction phenomena.

Since the information obtained by the diagnosis through inquiries is referred to during the trouble shooting, it is imperative to make an inquiry of the customer, centering on the items related to the malfunction, instead of simply carrying out the diagnosis through inquiries.

LEF00016-00000

1.4.3 Confirmation, record and erasure of diagnosis code

When the diagnosis abnormality code is indicated, confirm whether the malfunction took place in the system or is taking place now. Also it is necessary to check any relation between the code and the reproduced malfunction. For this purpose, the diagnosis code should be indicated twice; in other words before and after the confirmation of the phenomena.

LEF00017-00000

1.4.4 Confirmation of reproduction of malfunction phenomena

In carrying out the trouble shooting, it is imperative to reproduce the malfunction phenomena by creating conditions and environments similar to the situation where the malfunction took place, based on the information obtained by the diagnosis through inquiries. As for the phenomenon that is hard to be reproduced, it is most important to try to reproduce it patiently by applying external factors, such as vibration (moving wire harnesses or relays by hand), heat (applying hot wind) and water (giving humidity).

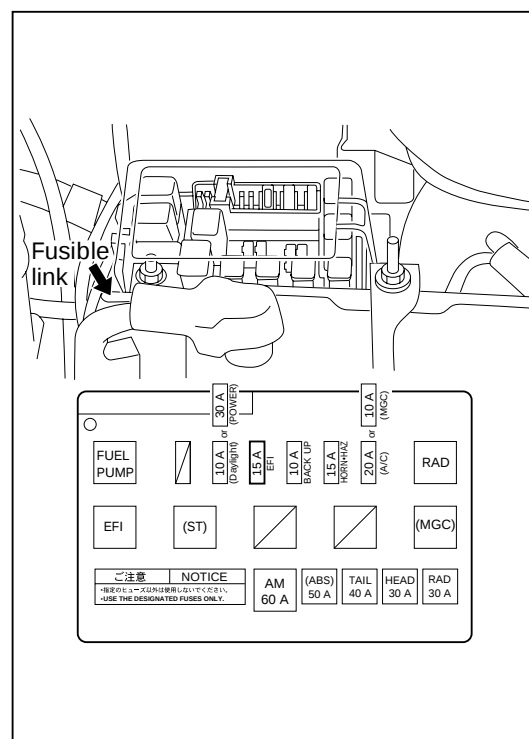
Moreover, if you presume sections (parts) which may have caused the malfunction, connect a tester, etc. to them and check to see if the malfunction takes place, you can evaluate whether the sections (parts) are functioning properly or not, too.

LEF00018-00000

1.4.5 Basic check

A. Hints for basic check

1. In most cases, engine troubles are attributable to systems other than the EFI system.
 - (1) Battery voltage, fuse blown or fusible link blown.
 - (2) Body earth.
 - (3) Fuel leakage, fuel filter clogged or fuel pump malfunctioning.
 - (4) Spark plugs faulty, ignition coil faulty, or ignition timing adjusted improperly.
 - (5) Admission of air.



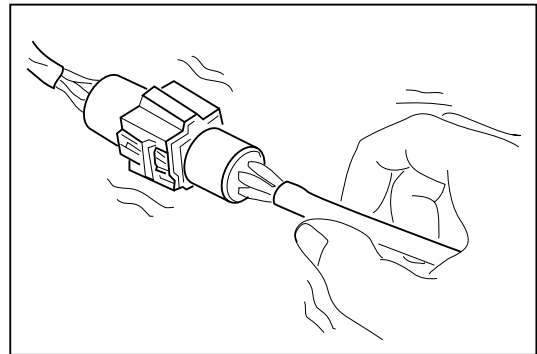
LEF00019-00014

2. Most of troubles related to the EFI system are merely caused by poor wire connections.

Ensure that connectors are connected securely.

Check connectors, being careful as to the following points.

- (1) Visually inspect that terminals are not bent.
- (2) Ensure that connectors are securely connected and locked.
- (3) Check to see if the malfunction phenomenon takes place when applying light vibration to the connector or the wire connected to the connector.



MEF00020-00015

B. Check to see if diagnosis detects malfunction code.

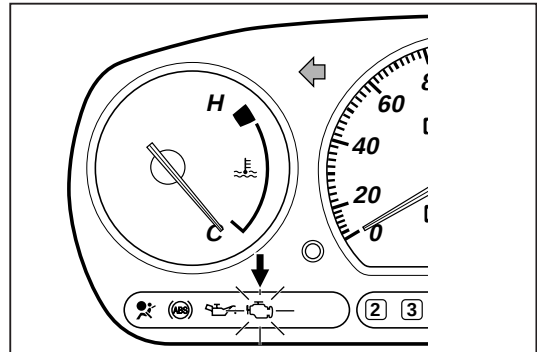
1. Check of diagnosis code.

When the engine starts, the check engine lamp in the combination meter remains illuminated. It indicates that the diagnosis has detected system malfunctions.

2. Read out the diagnosis code.

NOTE:

- See page EF-4.
- When system malfunction has been detected, proceed to page EF-21, "TROUBLE SHOOTING ACCORDING TO DIAGNOSIS SYSTEM".

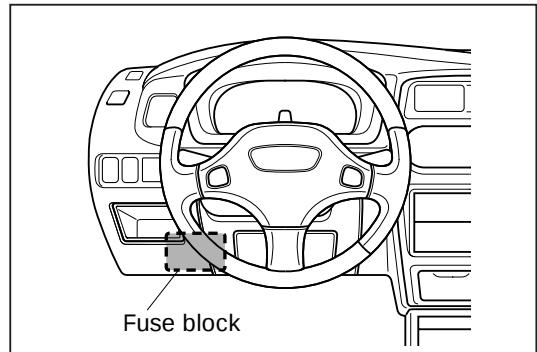


MEF00021-00016

C. Check of power supply circuit

1. Check the fuses and fusible link.

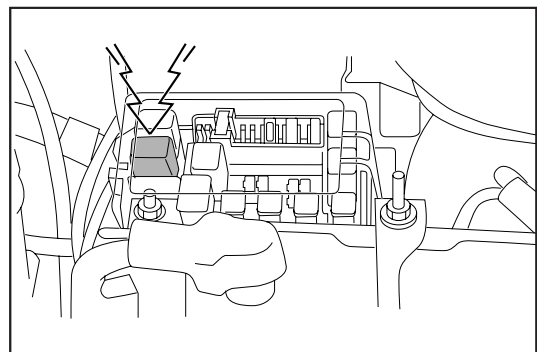
If the fuses are blown out, be sure to perform the trouble shooting.



MEF00022-00017

2. Check the EFI main relay.

- (a) Turn the ignition switch to the "ON" position. Check to see if the relay emits an operating sound.



MEF00023-00018

- (b) Remove the EFI main relay from the relay box. (Only for M100 series)

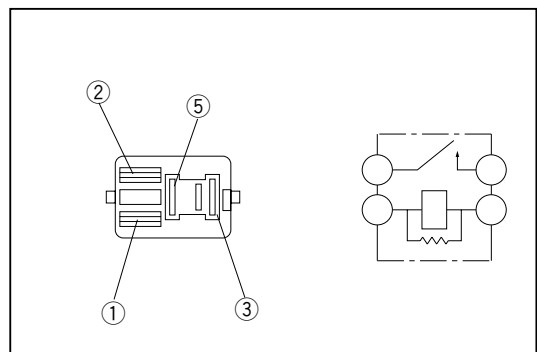
Check that there is continuity between the terminals 1 and 2.

Specified Resistance: 86 - 148 Ω (0 - 40°C)

- (c) Check that there is continuity between the terminals 3 and 5 when a voltage of 12 V is applied across the terminals 1 and 2.

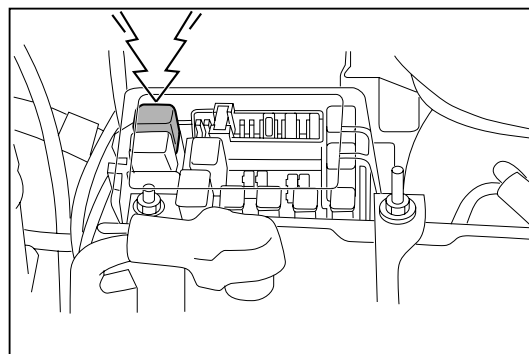
NOTE:

- Even when the trouble has not been solved by repairing the relay, check the wire harness.

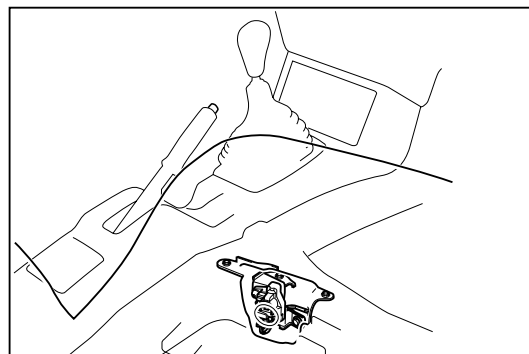


MEF00024-00019

3. Check the fuel pump relay.
 - (a) When the ignition switch is set to the "ON" position, check to see if the relay emits an operating sound.
 - (b) Remove the fuel pump relay from the relay box.
Check that there is continuity between the terminals 1 and 2.
Specified Resistance: 86 - 148 Ω (0 - 40°C)
 - (c) Check that there is continuity between the terminals 3 and 5 when a voltage of 12 V is applied to across the terminals 1 and 2.
4. Check of inertia sensor for fuel cut.
Check that the inertia sensor is functioning.
 - (a) Turn OFF the ignition switch.
 - (b) Slide the front seat (driver's seat) to the front fully.
 - (c) Turn over the cutout section of the carpet under the front seat (driver's seat). Take out the plug hole cover.



LEF00025-00020

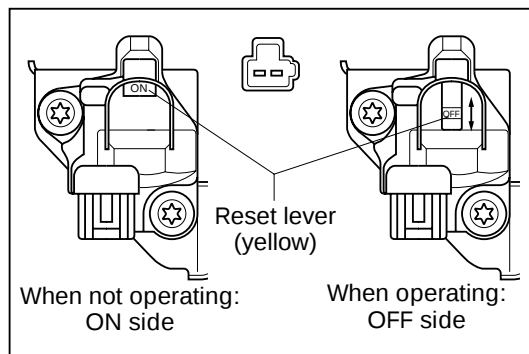


LEF00026-00021

- (d) Check the reset lever (yellow one) for the operating state. Peep through the plug hole and check to see if the embossed letter "OFF" can be seen on the reset lever. If the "OFF" is seen, it means the inertia sensor is functioning. In other words, the power supply circuit is in a cut state.
To restore the power supply circuit, push up the reset lever and keep it in that state for at least one second.

WARNING:

- If there is any possibility of fuel leakage, never operate the reset lever.



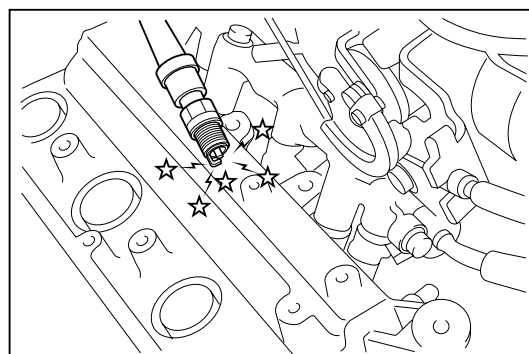
LEF00027-00022

D. Inspection of ignition system

1. Spark check
 - (1) Connect the spark plug and harness to the ignition coil. Ground the plug to the cylinder head cover.
 - (2) Check to see if the spark is emitted at each spark plug while cranking the engine.

WARNING:

- Since there is the possibility that you may have strong shock during the spark check, never allow your body to contact the vehicle body.

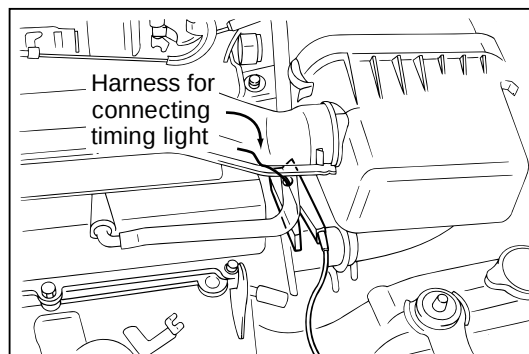


LEF00028-00023

2. After the engine has warmed up, install a timing light, as shown in the right figure.

NOTE:

- Use a timing light which is capable of detecting the primary voltage.



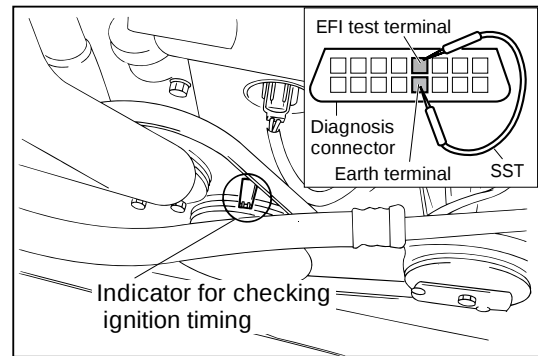
LEF00029-00024

- Confirm that the timing mark of the crankshaft pulley is located within the width of the indicator of the timing belt cover.

Specified Value: $5^{\circ} \pm 2^{\circ}$ BTDC/ idle rpm

NOTE:

- Connect the test terminal and the earth terminal with a jump wire of the diagnosis connector.



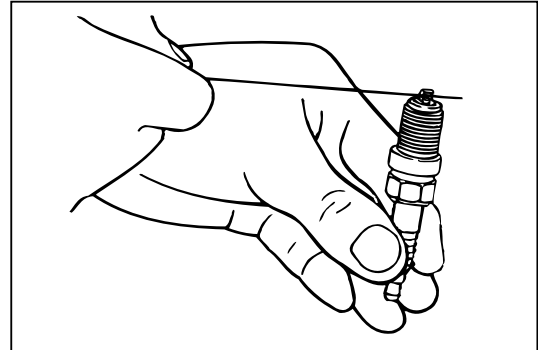
LEF00030-00025

- Remove the ignition coils and the spark plugs.
- Visually inspect the spark plug for electrode wear, thread or insulator damage.
- Measure the electrode gap, using a plug gap gauge.

Specified Value: 1.0 - 1.1 mm

NOTE:

- If the gap fails to conform to the specification, replace the plug.

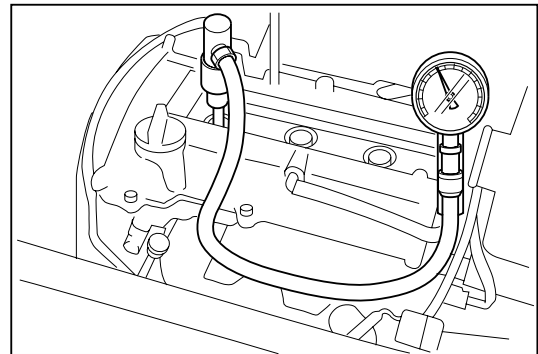


LEF00031-00026

E. Inspection of compression pressure

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

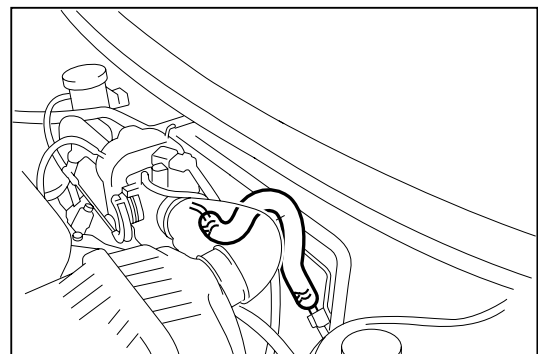
Minimum Value: 1579 - 1755 kPa
(400 rpm. Difference between cylinders is less than 147 kPa.)



LEF00032-00027

NOTE:

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



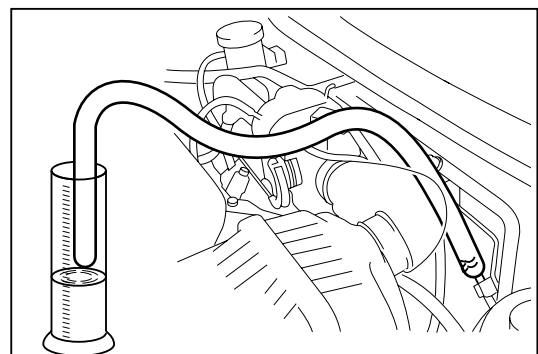
LEF00033-00028

F. Inspection of fuel flow

- Loosen the hose band at the fuel pipe. Then remove the fuel hose from the fuel pipe.
- Connect a suitable fuel hose (about 2 meter long) to the fuel pipe.
- Insert one end of the fuel hose in a measuring cylinder.

CAUTION:

- The fuel pressure of the fuel line is approximately 294 kPa. 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.



LEF00034-00029

- Temporarily remove the fuel pump relay. Then, connect the terminal with a jump wire as illustration.
- Turn the ignition switch to the "ON" position for 10 seconds. Then, turn off the ignition switch.
- Measure the amount of fuel collected in the measuring cylinder.

Specified Amount of Fuel: 110 ml or more

NOTE:

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

G. Inspection of fuel pressure

- Install a fuel pressure gauge between the delivery pipe and the main pipe.
- Turn the ignition switch to the "ON" position.
- Check to see if the fuel pressure conforms to the specified pressure.

Specified Value: 294 ± 5 kPa

NOTE:

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

H. Inspection of fuel injectors

- 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.

- Disconnect the injector connector of the engine wire.
- Remove the fuel delivery pipe. Then, remove the injectors.

NOTE:

- Be sure to place a cloth or the like so as to prevent fuel from splashing.

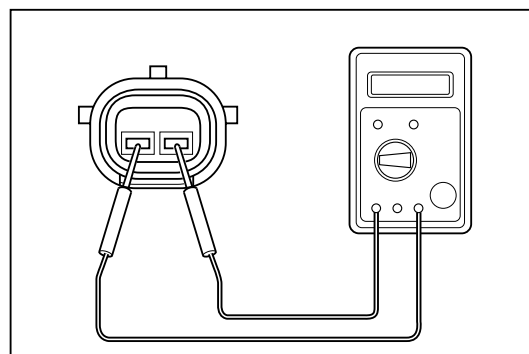
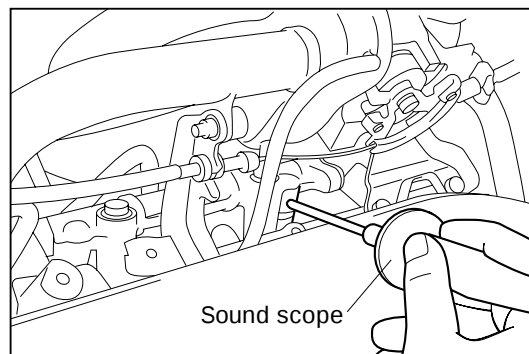
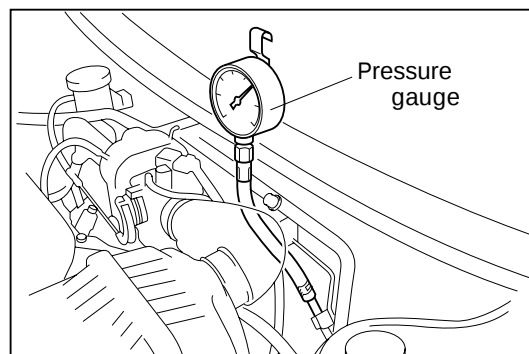
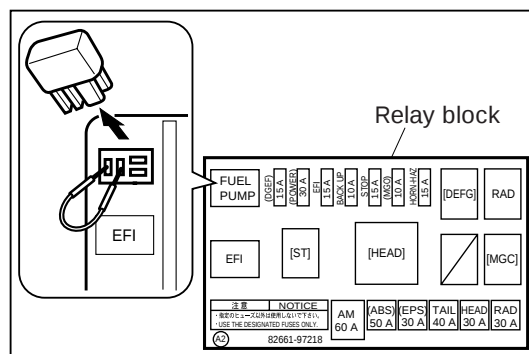
- Measure the resistance between the terminals of each injector.

Specified Resistance: 12.5Ω (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.

- Remove the fuel pump relay.



MEF00037-00032

MEF00038-00033

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.

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 outside of the engine and is directed in a horizontal direction.

I. Inspection of idling revolution

1. Warm up the engine completely.

NOTE:

- Turn off the all electrical accessory switches.
- The transmission control lever should be in the N or P range.

2. Connect a tachometer to the tachometer terminal and the earth terminal at the diagnosis connector.
3. Check to see if the idling revolution conforms to the specification when the engine water temperature is higher than 80°C.

Specified Value:

L701, L901 series	All destinations	—
M100 series	EC, General	AUS, ISRAEL, GCC
M200 series	General	AUS, GCC
M/T	850 ± 50 rpm	900 ± 50 rpm
A/T	850 ± 50 rpm	900 ± 50 rpm

NOTE:

- The engine revolution is given here for your reference during the check. It is not necessary to carry out the adjustment

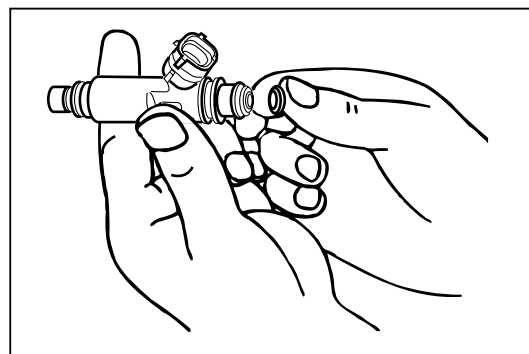
J. Inspection of rotary ISC valve.

1. Connect a tachometer to the terminal of the diagnosis connector.
2. Check to see if the fast idle revolution speed is within the reference value.

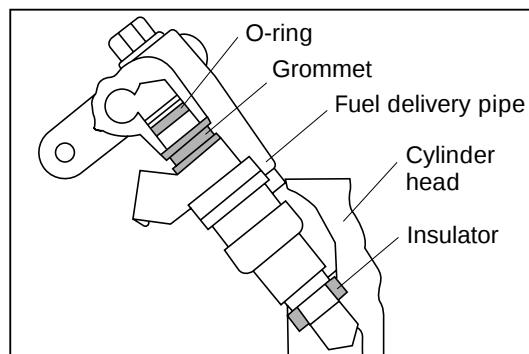
Reference Value: Around 1300 - 1900 rpm/25°C

NOTE:

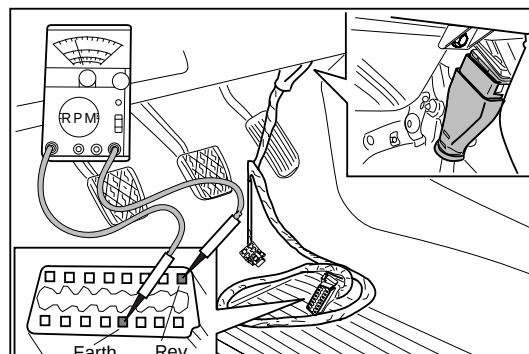
- The fast idle revolution speed can not be adjusted to the specification. If the revolution speed will not conform to the reference value, perform the inspection of the auxiliary air system, following the procedure given below.



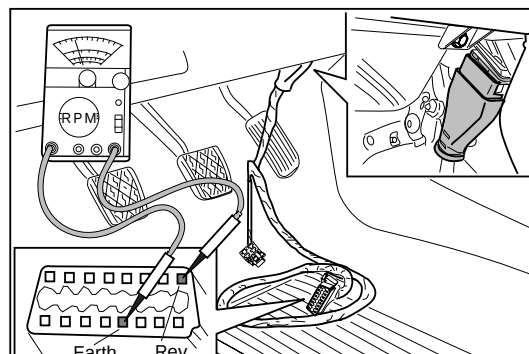
mEF00044-00039



mEF00045-00040



mEF00046-00041



mEF00047-00042

2. PRECAUTIONS

- When resistance or voltage measurement is conducted at the connector section, insert a measuring probe from the back of the connector, being very careful not to damage the harness of terminal connections.

In the case of water-proof type connector, a measurement is conducted at the connector section with the measuring probe put into contact with the terminal at the connection side of the connector. Be very careful not to apply excessive force to the terminal at the connector side.

As an alternative method, insert a male or female terminal into the connector terminal or connect an adequate attachment.

- The fuel line at the high-pressure side is pressurized to a fuel pressure of about 294 kPa. Therefore, a large amount of gasoline flows out when parts of the fuel line are disconnected. Hence, take the following countermeasures.

WARNING

- Be sure to release the inner pressure of the fuel tank by removing the fuel filler cap in advance.

- Tachometer connection.

Connect the tachometer probe to the measuring terminal of the diagnosis connector.

CAUTION:

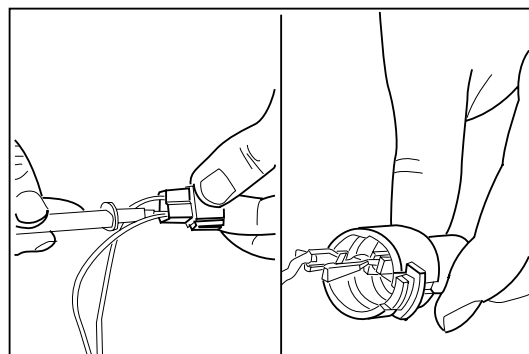
- This does not apply if your tachometer is a pick-up type.
- Never allow the tachometer probe to touch the ground, for it could result in damage to the ignitor and/or ignition coil.
- Some kinds of tachometers may not be suited for the ignition system of the vehicle. Therefore, ensure that your tachometer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

- Precautions during oxygen sensor handling.

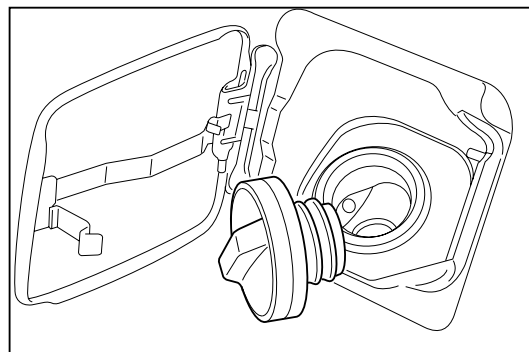
- Do not drop the oxygen sensor or hit it to other objects.
- Do not immerse the sensor in water or do not cool it by water.

- Do not open the cover of the ECU proper.

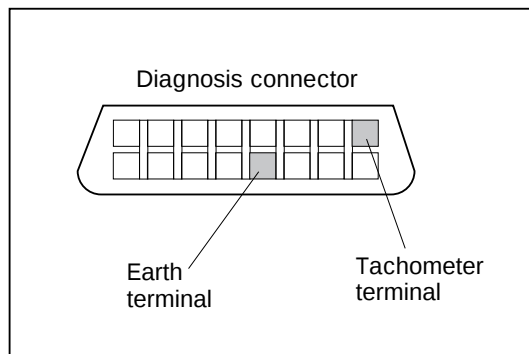
(Failure to observe this caution could cause ECU malfunction.)



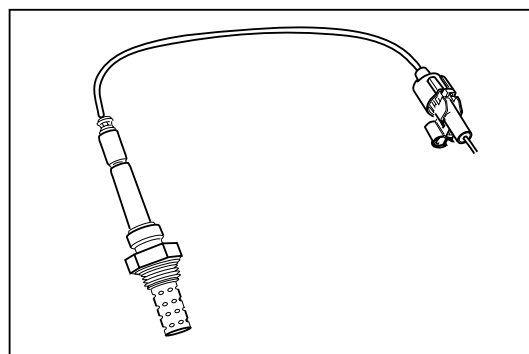
mEF00053-00047



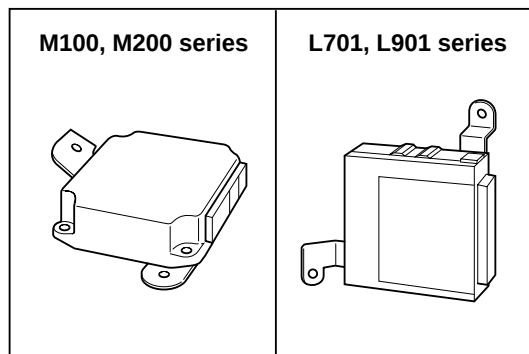
mEF00054-00048



mEF00055-00049

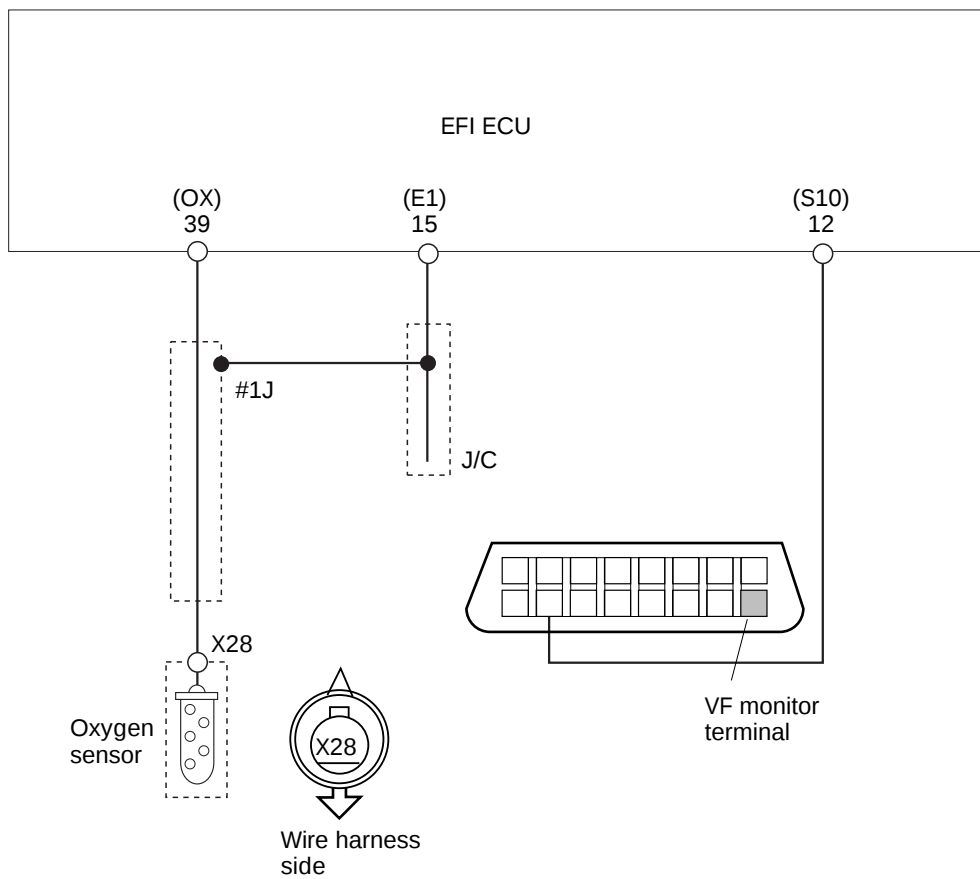


mEF00056-00050



mEF00057-00051

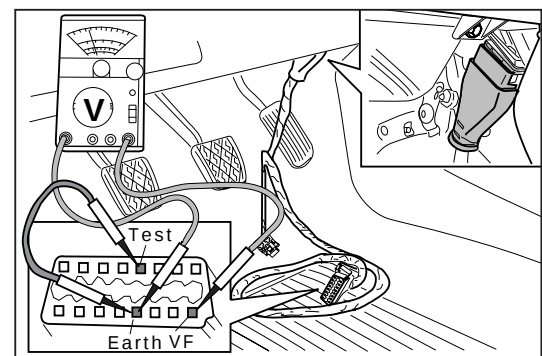
5.5 DIAGNOSIS CODE NO. 21 OXYGEN SENSOR & CIRCUIT



MEF00083-00071

When the signal from the oxygen sensor never becomes rich under a condition where the engine revolution speed has been kept at 3000 rpm or more and the power switch has been turned ON after the engine has warmed up: However, this code is emitted on the assumption that the pressure sensor system and water temperature sensor system are functioning normally. Therefore, when the codes No. 31 and 42 are simultaneously outputted, it is necessary to repair those systems first and, then, let the ECU carry out the diagnosis.

1. Inspection of oxygen sensor circuit
 - (1) Warm up the engine completely.
 - (2) Connect the test terminal and the earth terminal with a jump wire at the diagnosis connector.
 - (3) Keep the engine revolution speed at 3000 rpm for four minutes so as to warm up the oxygen sensor.
 - (4) Measure the voltage between the VF terminal and the earth terminal as illustration while keeping the engine revolution speed at 1200 rpm or more.
- Specified Voltage: 0 $\rightarrow$ 5 V



MEF00084-00072

- (5) While keeping the engine revolution speed at 3000 rpm, count how many times the pointer of the voltmeter swings within 10 seconds.
- 8 times or more: Normal
0 - 7 times: Proceed to the following step.

NOTE:

- There are cases where the measurement can not be conducted with a tester having a low reaction speed.

- (6) Measure the voltage between the VF terminal and the earth terminal while keeping the engine idle revolution when the jump wire is disconnected.

Specified Value: 2.5 ± 0.7 V

REFERENCE

- Prepare an oscilloscope.
- Connect a jump wire to the test terminal and the earth terminal.
- Connect a probe to the VF terminal and the earth terminal.
- Check to see if a signal shown in the graph appears at the terminals while the engine is rotating at 3000 rpm.

NOTE:

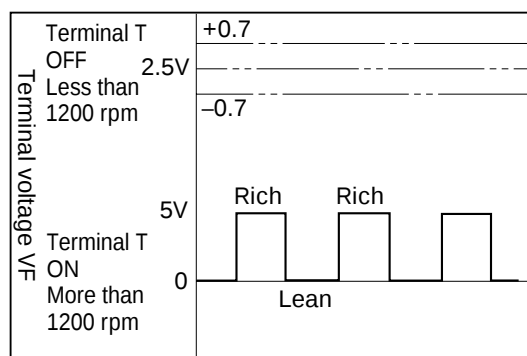
- There are cases where the measurement can not be conducted with a tester having a low reaction speed. Therefore, use a tester having a high reaction speed or oscilloscope.
- If no voltage appears, check the oxygen sensor unit.

2. Check of oxygen sensor

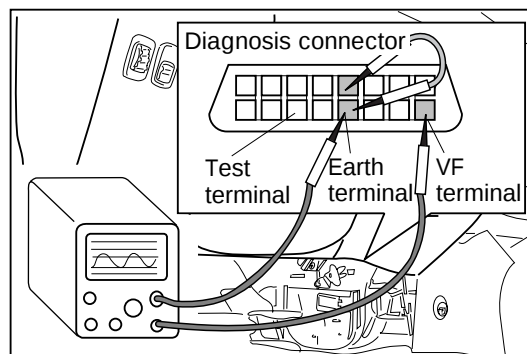
- Warm up the engine completely.
- Disconnect the connector of the oxygen sensor.
- Connect a voltmeter to the connector terminal of the oxygen sensor.
- Hold the engine revolution speed for 2 minutes at about 3000 rpm. At this time, ensure that the reading of the voltmeter registers 0.45 V or more.

NOTE:

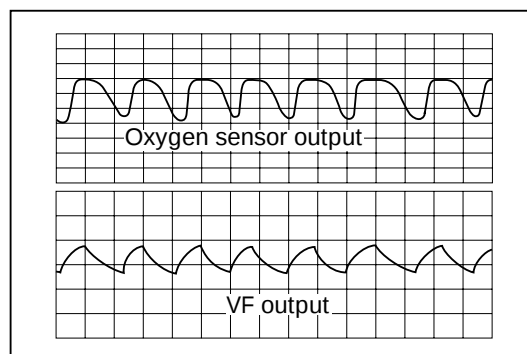
- When the oxygen sensor connector has been disconnected, an air-to-fuel mixture ratio of the engine will become rich. The oxygen sensor therefore generates an electromotive force of about 0.45 volts or more.
- Replace the oxygen sensor with a new part, if the reading will not register 0.45 V or more.
- If the reading conforms to the specification, proceed to the following procedure.



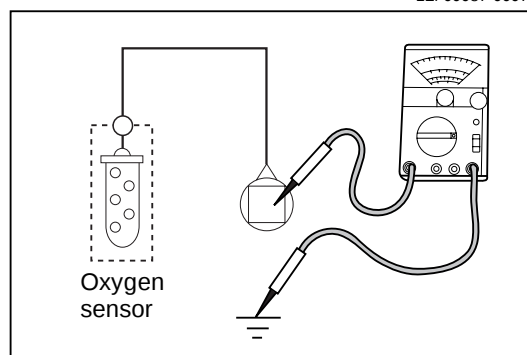
LEF00085-00073



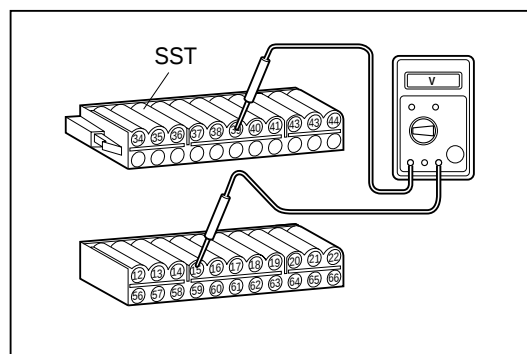
LEF00086-00074



LEF00087-00075

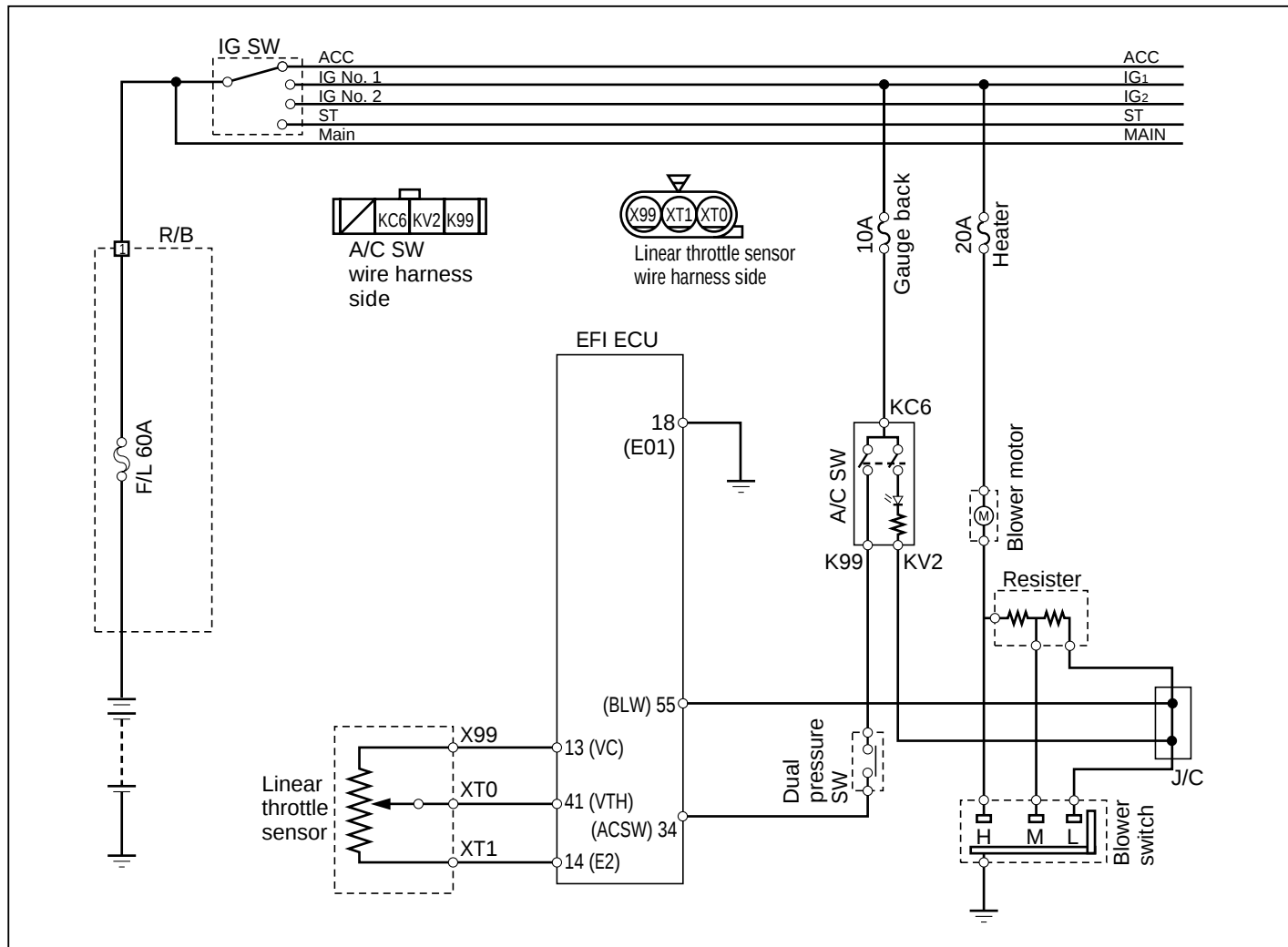


LEF00088-00076



LEF00000-00077

5.12 DIAGNOSIS CODE NO. 51 SWITCHING SIGNAL CIRCUIT



MEF00118-00104

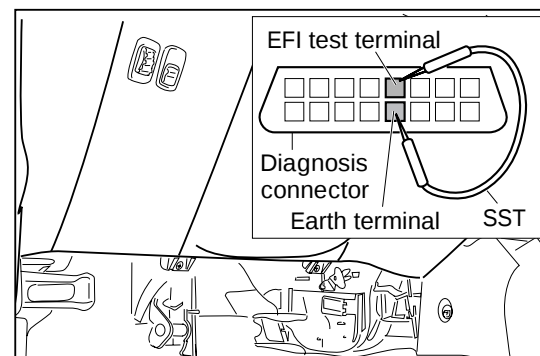
When one of the following conditions is detected when the terminal T is turned ON: IDL SW OFF, A/C SW ON, neutral start SW ON.

1. Check that the following wire connector or switching circuits are connected properly.
 - (1) Linear throttle sensor circuit
 - (2) A/C switch circuit
 - (3) Neutral start switch circuit of the A/T.

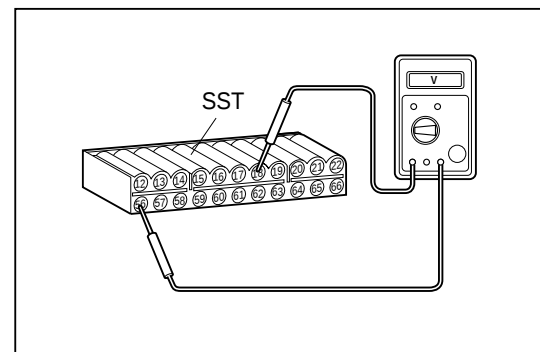
NOTE:

- This code will not be memorized.
- The diagnosis code will be indicated only when the test terminal is connected with the earth terminal as illustration.

2. Check of wire harness and switches.
 - (1) Connector the SST between the ECU connectors and the wire harness connectors.
 - (2) Check the voltage between the SST terminals 56 and 18 when the A/T shift lever is shifted to the P or N position and the ignition switch is turned on.
Specified Value: 1V or less



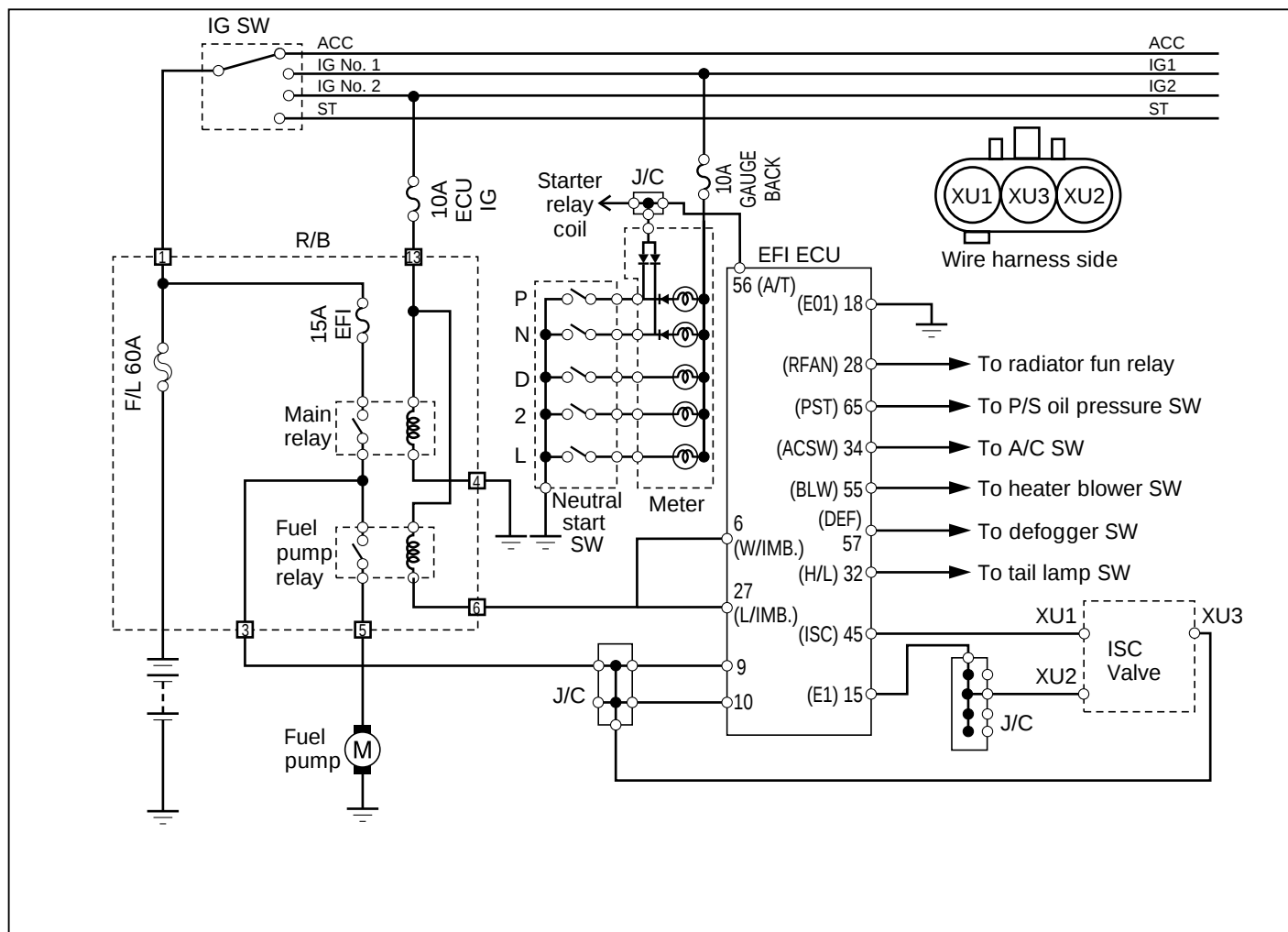
MEF00119-00105



MEF00120-00106

7. INSPECTION OF ROTARY ISC SYSTEM

7.1 WIRING DIAGRAM



mEF00141-00123

7.2 ISC SYSTEM BASIC INSPECTION

1. 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.

Specified Value:

850 rpm (A/T & M/T)... M100 (EC, General spec.)
L701, L901 (All destination)
M200 (General Spec.)

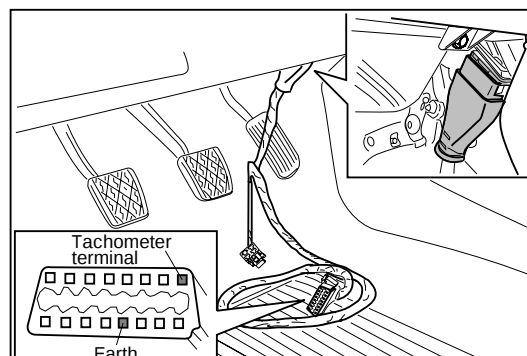
900 rpm (A/T & M/T)... M100 (AUS, ISRAEL and
GCC spec.)
M200 (AUS, GCC Spec.)

2. After the engine has warmed up completely, disconnect the connector of the ISC valve. At this time, ensure that the idle speed rises. (This confirmation should be conducted with no load, such as air conditioner and electric load, applied.)

Specified Value: idle → 1600 rpm

NOTE:

- The above inspection should be conducted only when the engine coolant temperature is above 80°C.

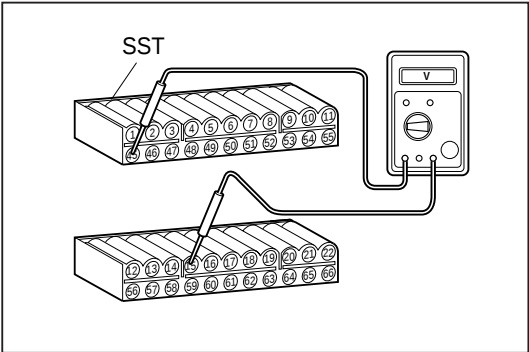


mEF00142-00124

- 3. Turn OFF the ignition switch.
- 4. Connect the SST between the EFI ECU terminals and the wire harness terminals.
- 5. Start the engine.
- 6. Measure the voltage between the SST terminals 45 and 15.

NOTE:

- Ensure that the measured voltage is stabilized at a certain level according to the warming-up state.



7.3 ISC IDLE-UP SYSTEM INSPECTION

- 1. Warm up the engine completely.
- 2. Turn OFF the Ignition switch.
- 3. Connect the SST between the EFI ECU terminals and the wire harness terminals.
- 4. Start the engine.
- 5. Measure the voltage between the SST terminals 34, 55 and 18 and measure the idling speed when the A/C switch is in the following condition while the heater blower is being turned on.

■EC, General spec. for M100 series & All destinations for L701, L901 series.
■General spec. for M200.

A/C switch	Voltage V		Revolution speed rpm	
	OFF	ON	OFF	ON
M/T	0.5 or less	Battery voltage	850	950
A/T	↑	↑	850	900

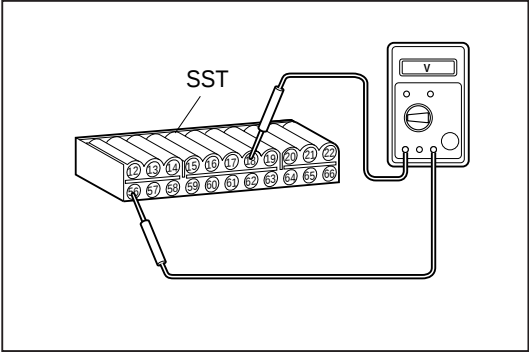
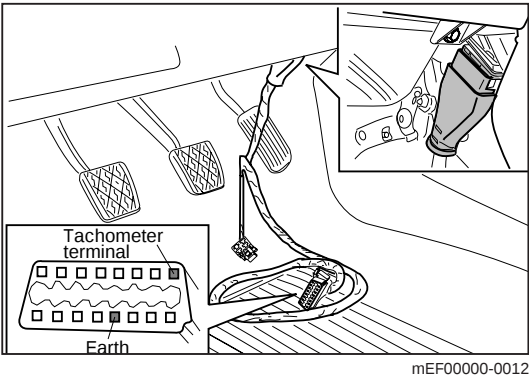
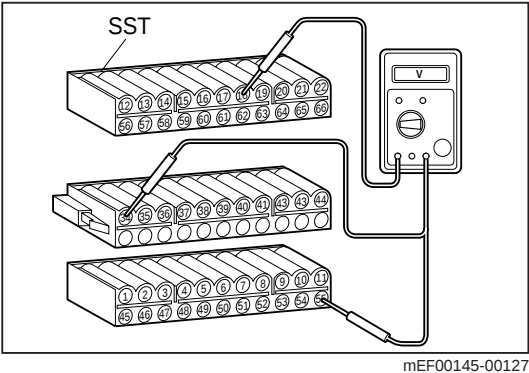
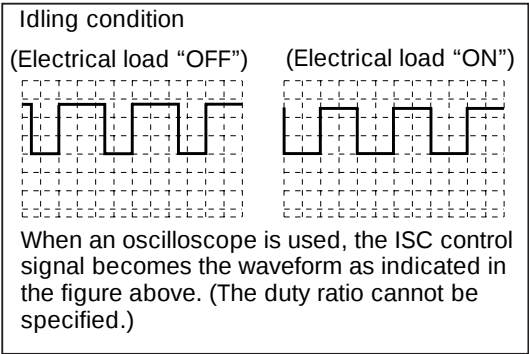
■AUS, ISRAEL, GCC spec. for M100.
■AUS, GCC spec. for M200.

A/C switch	Voltage V		Revolution speed rpm	
	OFF	ON	OFF	ON
M/T	0.5 or less	Battery voltage	900	950
A/T	↑	↑	900	900

- 6. Measure the voltage between the SST terminals 56 and 18 when the neutral start switch is in the following condition.
Specified Value: P or N range 0.5 V or less
Other than P and N ranges Battery voltage

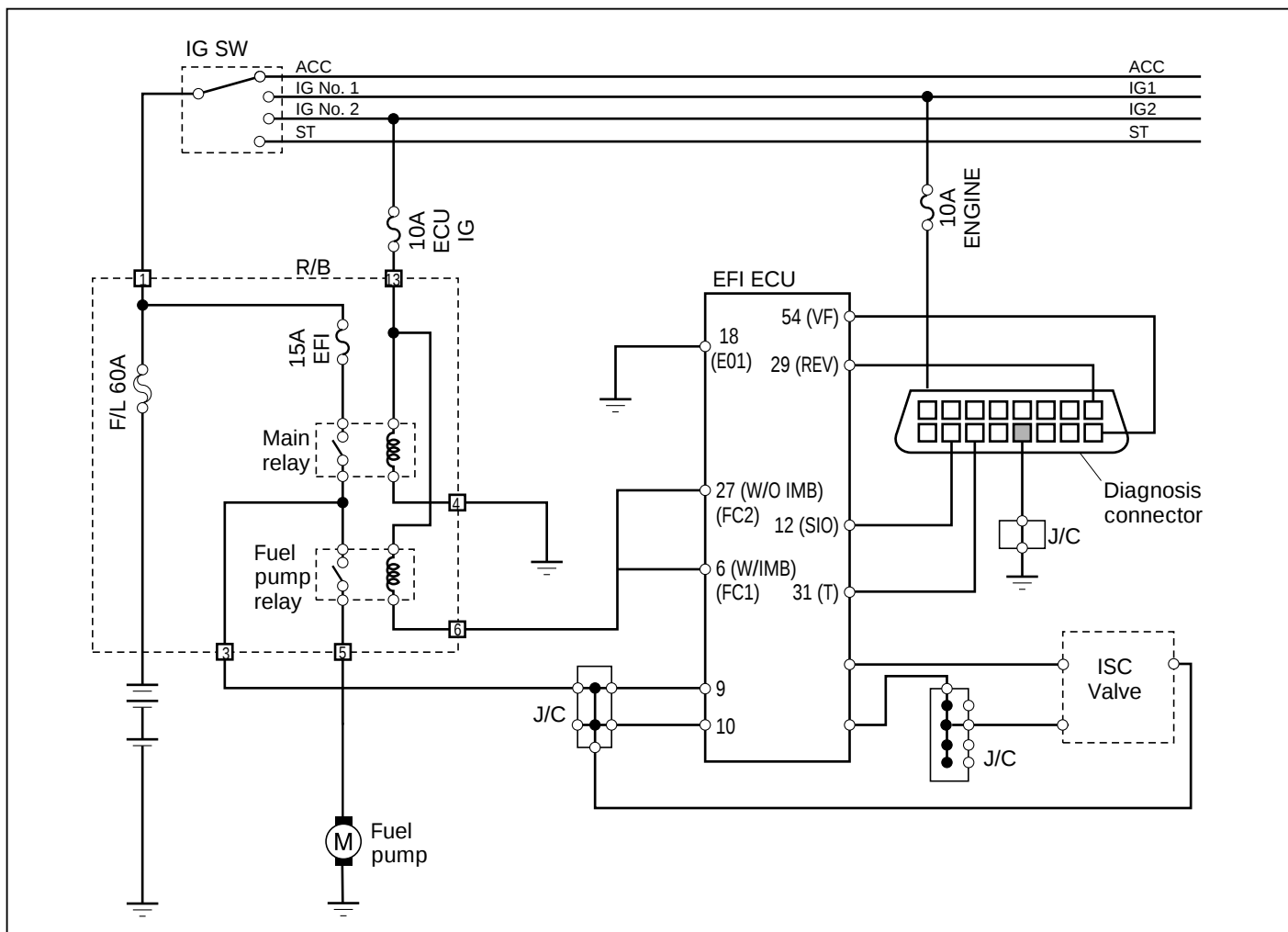
NOTE:

- Make sure that the idle speed will not change when the shift lever is shifted to a position other than the P and N ranges.



8. INSPECTION OF FUEL SYSTEM

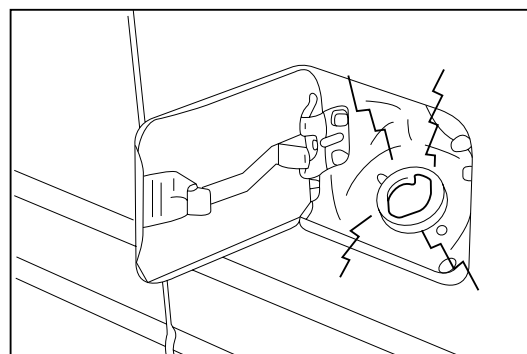
8.1 WIRING DIAGRAM



LEF00152-00135

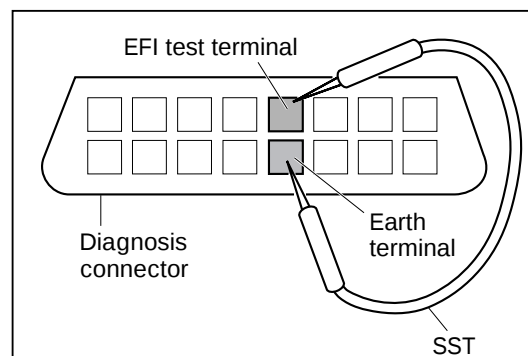
8.2 INSPECTION OF FUEL PUMP OPERATION

1. Check to see if the wire harness connectors are connected properly.
2. Check that you can hear fuel pump operating sound for 8 seconds when the ignition switch is turned on while connecting the terminals with a jump wire as indicated in the illustration.



LEF00153-00136

3. If not, check the wire harness.
 - (1) Turn off the ignition switch.
 - (2) Connect the SST between the ECU connectors and the wire harness connectors.
 - (3) Check that the voltage between the SST terminals 6, 27 and 18 is within the following specified value when the ignition switch is turned to ON position.



LEF00154-00137