DAIHATSU

F300

EFI SYSTEM

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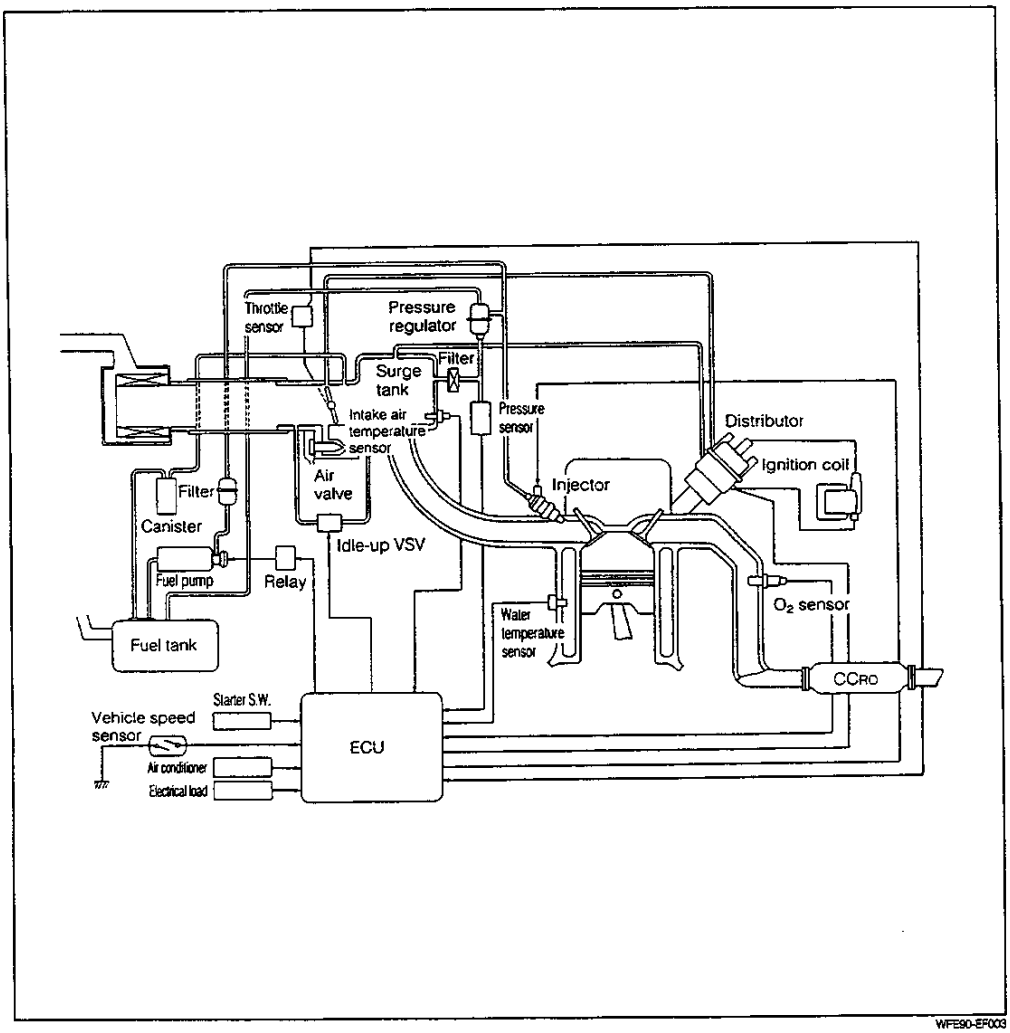
WFE90-EF001

INTRODUCTION (General Specification)

The EFI system consists of the flowing three systems; fuel system, intake system and control system. The electronic control system unit (ECU) incorporating a microcomputer controls the EFI system, based on signals inputted from the varues sensors.
Besides this function, the ECU controls various functions such as the fuel pump control, idle up VSV control, injector control, self diagnosis function and fail-safe function.

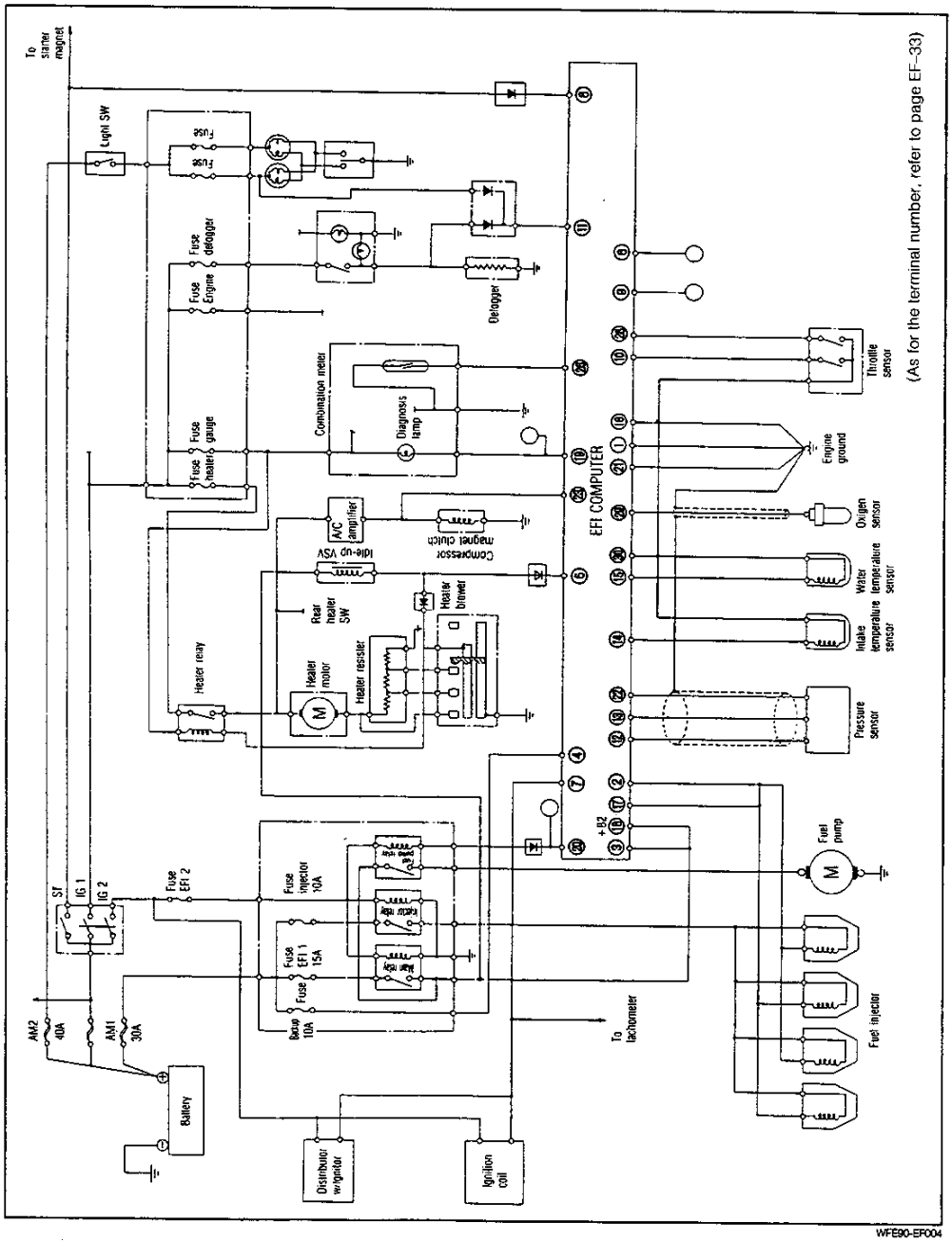
WFE90-EF002

SCHEMATIC DIAGRAM



WFE90-EF003

SYSTEM CIRCUIT



WFE90-EF004

FUEL SYSTEM

The fuel system is a system which supplies the injectors with fuel necessary for combustion. This system is composed of the fuel pump, fuel pipes, fuel filter, pressure regulator, fuel delivery pipe and injectors.
Fuel sucked up from the fuel tank by means of the fuel pump is sent under a pressurized condition to the fuel delivery pipe through the fuel filter. The pressure regulator mounted at the delivery pipe keeps the fuel pressure at a value about 250 kPa (2.55 kgf/cm^2) higher than the intake manifold inner pressure. Such difference between the intake manifold inner pressure and the fuel line inner pressure prevents any variation in the fuel injection rate of each injector.
Any excess fuel returns to the fuel tank through the pressure regulator. This makes it possible for the fuel at a comparatively low temperature in the fuel tank to be supplied into the fuel line, thus preventing percolation.
The fuel pump is driven by the ECU.

WFE90-EF005

INTAKE SYSTEM

The intake system is a system which supplies air necessary for combustion with each cylinder.
Air sucked from the cool air intake of a comparatively low temperature is sucked into the surge tank through the air cleaner, and air chamber depending upon the opening degree of the throttle valve.
Then, the air goes through the intake manifold into each cylinder.

WFE90-EF006

CONTROL SYSTEM

The control system is a system which controls the fuel amount, using the ECU, by detecting the engine conditions and vehicle running conditions, based on signals inputted from the various sensors to the ECU.

Fuel pump control (FC)
This system controls the fuel pump operation. This system drives the fuel pump for two seconds when the ignition key switch is turned ON and/or the ignition signal is inputted. It also drives the fuel pump when the starter switch is turned ON.

Idle-up VSV control
This is a system which actuates the idle-up VSV when the engine is cold (i.e. the cooling water temperature is below 70°C) or when heavy electric loads (e.g. heater blower, defogger, headlamps) are applied, thus maintaining a proper engine revolutional speed.

WFE90-EF007

SELF DIAGNOSIS FUNCTION

If signals inputted from main sensor systems to the ECU do not conform to the specified values memorized in the ECU, this malfunction is memorized.
(There are some items which are not memorized.)
Since the memorized malfunction code is retained by the back-up power supply from the battery, the code remains memorized when the ignition key switch is turned OFF.
The memorized malfunction code can be reset by cutting off the power supply to the ECU.
When any malfunction concerned with the important items occurs, the check engine lamp provided inside the combination meter is turned ON, thereby warning the driver of such malfunction. The check engine lamp remains illuminated as long as the malfunction concerned with the important item persists. However, if the encountered malfunction takes place temporarily and the normal state is restored, the check engine lamp goes out. In this case, however, the malfunction that has once occurred is memorized to the ECU, using the pertinent code number.
To indicate the malfunction code during the inspection, short the test terminal of the check connector located at the fender panel right side of the engine compartment with the ground terminal. The check engine lamp inside the combination meter flashes as many times as the number of the corresponding malfunction code. With the aid of the diagnosis code, the checking operator can perform trouble shooting efficiently.

WFE90-EF008

FAIL-SAFE FUNCTION

In the event that any abnormality takes place in the signals inputted from the important sensors to the ECU and the control can no longer be continued based on the inputted data, an evacuation running is made possible using the data memorized in the ECU in advance. This function is called "fail-safe function."
Moreover, in the event that any abnormality occurs in the microcomputer in the ECU, the backup circuit makes it possible for the vehicle to perform an evacuation running, based on the data memorized in the ECU in advance.
In either case, it is not possible to expect normal running performance under such evacuation running.

WFE90-EF009

PRECAUTION

1. The engine control system has self diagnosis function. The ECU memorizes all malfunction codes which have occurred in the past and/or are occurring at present.
   The memorized malfunction codes are erased when the battery ground cable is disconnected from the battery terminal. Hence, prior to starting any repairs, be sure to check to see if any malfunction code has been memorized.
2. When performing operations on the fuel system or its related operation, never smoke and keep away any fire.
3. Before disconnecting the fuel line, be sure to disconnect the battery ground cable from the negative terminal of the battery.
4. The fuel line is pressurized to a pressure about 250.1 kPa (2.55 kgf/cm^2) higher than the pressure inside the surge tank. Therefore, when disconnecting the fuel line, be sure to loose the fuel line slowly and prevent the fuel from splashing with a cloth or the like.
5. Do not allow gasoline to get to any parts made of rubber, leather and resin and/or to the electric parts.
6. When cleaning the engine compartment with water, make sure that no water gets to the electrical system.
7. Ensure that the battery voltage should be 11 volts or more, before performing the inspection.

WFE90-EF010

INSPECTION PRECAUTIONS

Maintenance precautions

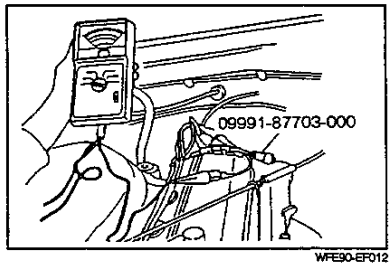
1. Ensure that the engine is correctly tuned up.

WFE90-EF011

2. Precautions during gauge connection
   (1) To connect the tachometer, connect the following SST between the distributor connector and the distributor connector of the engine wire.
   SST: 09991-87703-000

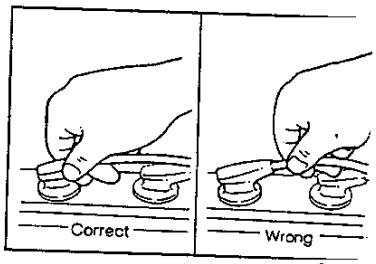
   (2) Connect the measuring terminal of the tachometer to the measuring terminal of the SST.
   NOTE:
   - **This does not apply if your tachometer is a pick-up type.**

   (3) Use the battery as power source for a timing light, tachometer and so forth.
   (4) Never allow the tachometer terminal to touch the ground, for it could result in damage to the ignitor and/or ignition coil.
   (5) 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.



WFE90-EF012

3. If engine misfire takes place, the following measures should be taken.
   (1) Ensure that the battery terminals and so forth are connected properly.
   (2) Ensure that spark plug wires are connected properly while handle the spark plug wires carefully.
   (3) After completion of repairs, ensure that the ignition coil terminals and other ignition system wire are reconnected securely.



WFE90-EF01

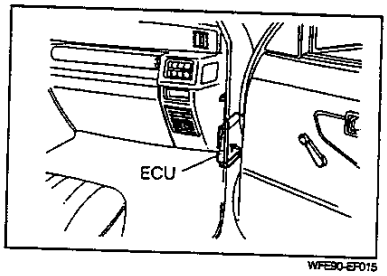
4. Precautions during oxygen sensor handling
   (1) Do not drop the oxygen sensor allow it to hit other objects.
   (2) Do not immerse the sensor in water or do not cool it by water.
5. Do not open the cover of the ECU proper.
   (Failure to observe this caution could cause ECU malfunction.)
6. Do not touch the screws of the bracket installed on the ECU proper.
   (Failure to observe this caution could cause ECU malfunction.)

WFE90-EF014

When the vehicle is equipped with wireless installation (HAM, CB, etc.)

The ECU has been so designed that it is resistant to external influence.

However, if a vehicle is equipped with a CB wireless installation and so forth (even if its output is only 10 W), it may affect the ECU adversely. Therefore, observe the following precautions.

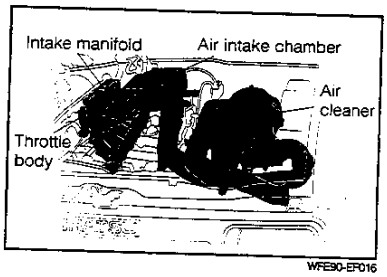


WFE90-EF015

1 Install an antenna at a place as far away as possible from the ECU.
   The ECU is installed at the cowl side panel in front of the passenger's seat. Therefore, the antenna should be installed at the rear of the vehicle.
2. The antenna cord should be kept at least 20 cm away form the engine wire. Never wind the antenna with the engine wire with tapes.
3. Adjust the antenna output correctly.
4. Never install a wireless installation with a high output on the vehicle.

Air induction system

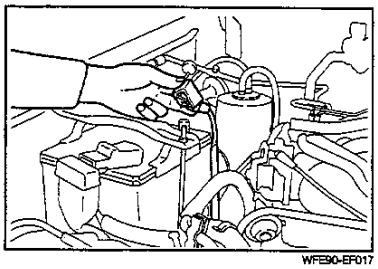
1. Unless all of the oil level gauge, oil filler cap, PCV hose and so forth are installed securely, the engine tune-up can not be performed properly.
2. If air leakage (air admission) is present between the throttle body and the cylinder head, the engine revolution speed can not be adjusted.



WFE90-EF016

Electronic control system

1. Before disconnecting or reconnecting the connector of the sensor system of the EFI system, be sure to turn OFF the ignition switch and all accessory switches. Also, disconnect the battery ground cable from the battery negative terminal. Failure to observe this caution could cause ECU malfunction.

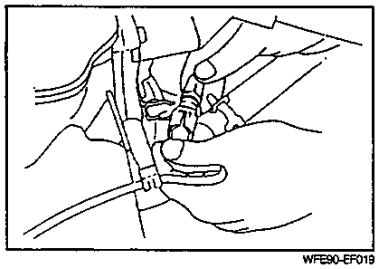


WFE90-EF017

2. Before disconnecting or reconnecting the connector of the ECU proper of the EFI system, be sure to turn OFF the ignition switch and all accessory switches. Also, disconnect the battery ground cable from the battery negative terminal.
   Failure to observe this caution could cause ECU malfunction.
3. Be sure to keep the number of disconnection/reconnection of the connector of the EFI system at a minimum level.
4. When installing the battery, care must be exercised not to mistake the battery polarity.
5. Never apply strong impacts to the EFI parts. Pay utmost attention during the installation/removal. Especially, special caution must be exercised as to the handling of the ECU.
6. When the voltage or resistance of the ECU is measured during the check, never touch terminals other than the specified terminals. Failure to observe this caution could cause ECU malfunction.
7. Never open the cover of the ECU proper.
8. When the system is checked on a rainy day, be very careful not to allow water to get into connectors and/or terminals.
   Also, when the engine compartment is washed, prevent water from being splashed to the EFI-related parts and wiring connectors.
9. EFI parts should be replaced as an assembly.

WFE90-EF018

10. When disconnecting or reconnecting the wiring connector, care must be exercised as to the following points.
    (1) Carefully observe the shape of the lock prior to the disconnecting/connection.
    (2) Release the lock. Disconnect the connector.
    NOTE:
    - **When disconnecting the connector, be sure to hold the connector body, do not to pull the wire.**

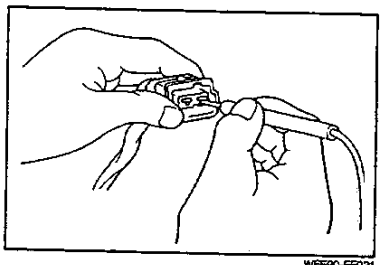


WFE90-EF019

    (3) Insert the connector, until the lock is engaged completely.
    (4) Be sure to keep the number of disconnection/reconnection of the connector at a minimum level.

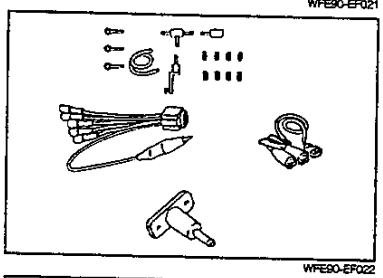
WFE90-EF020

11. When checks are performed at the connector-side terminals, using a circuit tester, care must be exercised as to the following point.
    Never apply such a force to the connector terminal that can deform the terminal.



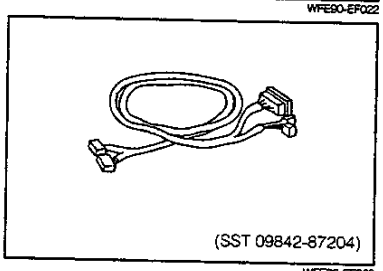
WFE90-EF021

12. When checking the fuel system, such as the injectors, pressure regulator and fuel pressures, use the following SSTs.
    SSTs: 09268-87702-000
    09283-87703-000
    09991-87702-000
    09268-87701-000
    09842-30070-000



WFE90-EF022

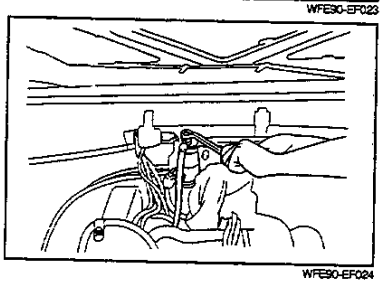
13. When measuring the voltage or resistance of each system, use the following SST.
    SST: 09842-87204-000



WFE90-EF023

Fuel system

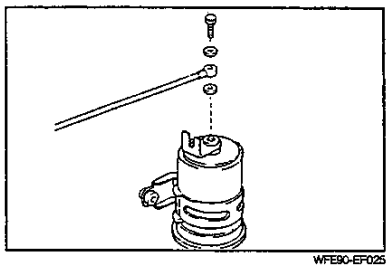
1. The fuel line at the high-pressure side is pressurized to a fuel pressure of about 250 kPa (2.55 kgf/cm^2). Therefore, a large amount of gasoline flows out when parts of the fuel line is disconnected. Hence, take the following counter-measures.
   (1) Place a suitable container, close or the like under the disconnecting connection.
   (2) Loosen the connection slowly, while preventing the fuel from splashing, using a suitable cloth or the like.
   (3) Disconnect the connection.
   (4) Plug the disconnected connection with a rubber plug or the like so that no dust may enter into the fuel line.



WFE90-EF024

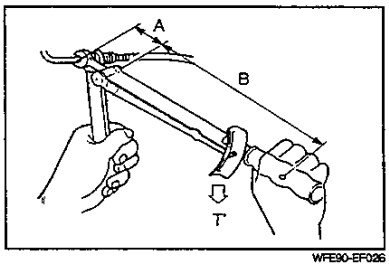
2. When connecting the flare nut or union bolt of the high-pressure pipe, observe the following instructions.

   [Union bolt type at the fuel filter]
   (1) Always use new gaskets.
   (2) First, tighten the union bolt with your fingers.
   (3) Next, tighten the union bolt to the specified torque.
   Tightening Torque: 34.3 - 44.1 N·m (3.5 - 4.5 kgf-m)


WFE90-EF025

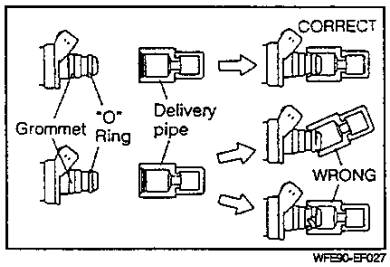
   [Flare nut type at the fuel line]
   (1) Coat the flare nut with a thin film of engine oil. Tighten the flare nut fully with your fingers.
   (2) Tighten the flare nut to the specified torque.
   Tightening Torque T:
   34.3 - 44.1 N·m (3.5 - 4.5 kgf-m)

$$T' = \frac{B}{A+B} \times T$$



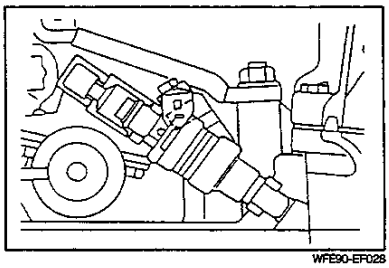
WFE90-EF026

3. When removing/installing the injector, observe the following instructions.
   (1) Do not reuse the "O" ring.
   (2) When installing the "O" ring to the injector, be careful not to damage the "O" ring.
   (3) When connecting the injector to the delivery pipe, apply silicon oil to the "O" ring of the injector in advance. (Never use engine oil, gear oil and so forth.)
   (4) When connecting the injector to the delivery pipe, be very careful not to damage the "O" ring of the injector.



WFE90-EF027

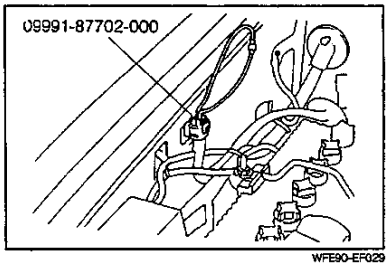
4. Install the injector to the delivery pipe and cylinder head, as shown in the figure.


WFE90-EF028

5. After completion of checks or repairs of the fuel system, be sure that no fuel leakage is present in the fuel system, following the procedure given below.
   (1) Detach the check terminal cap.
   (2) Short the fuel pump terminal (white/black) with the ground terminal (black) of the check connector, using the following SST.
   SST: 09991-87702-000

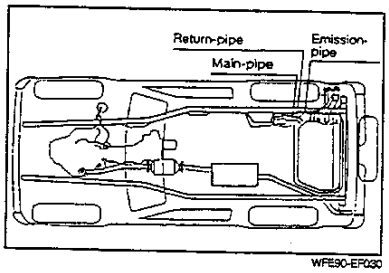
   NOTE:
   - **The check connector is located at the right side fender panel of the engine compartment.**

   CAUTION:
   - **As for the terminals other than those specified, never allow them to be connected or shorted.**



WFE90-EF029

(3) Turn ON the ignition switch. (with the engine in a stopped state)
At this time, a fuel pressure of 250 kPa (2.55 kgf/cm^2) is being applied to the fuel line.
Under this conditions, check the fuel line system for evidence of leakage.
If any leakage is present at the fuel line system, repair leaky points. Recheck the system for leakage.
(4) Stop the engine.
(5) Remove the SST from the check terminal.
(6) Connect the check terminal cap to the check terminal.



WFE90-EF030

TROUBLE SHOOTING

TROUBLE SHOOTING HINTS

1. In most cases, engine troubles are attributable to systems other than the EFI system.
   Prior to starting the trouble shooting for the EFI system, check other systems.
   (1) Power supply
   - Battery voltage
   - Fuse blown
   - Fusible link blown

   (2) Body ground
   (3) Fuel supply
   - Fuel leakage
   - Fuel filter clogged
   - Fuel pump malfunctioning

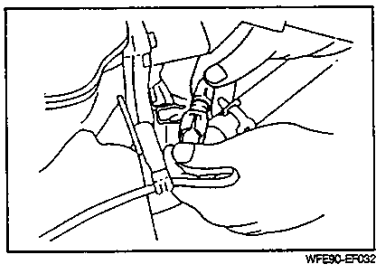
   (4) Ignition system
   - Spark plugs faulty
   - Spark plug wires faulty
   - Distributor and ignitor faulty
   - Ignition coil faulty

   (5) Air induction system
   - Air leakage

   (6) Others
   - Ignition timing adjusted improperly
   - Idle speed adjusted improperly
   - Idle-up VSV malfunctioning

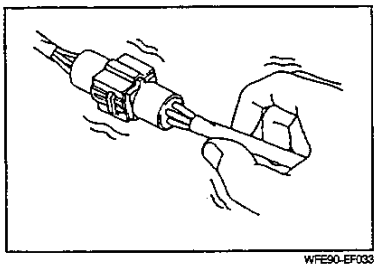
WFE90-EF031

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.



WFE90-EF032

   (3) Check to see if the malfunction phenomenon takes place when applying light vibration to the connector or the wire connected to the connector.

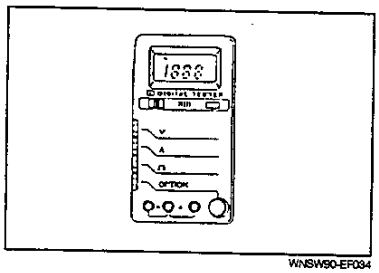


WFE90-EF033

3. Prior to replacing the ECU, thoroughly perform the trouble shooting for possible items other than the ECU. The ECU is a reliable, but an expensive part.
   Even when the ECU has been replaced according to the check results of the trouble shooting and the relevant malfunction has been remedied, be sure to reinstall the old ECU so as to confirm that the malfunction was obviously caused by the faulty ECU.

WFE90-EF034

4. For the trouble shooting, use a volt/ohmmeter whose internal resistance is 10 kΩ/V or more.
   Use of a volt/ohmmeter whose internal resistance is less than 10 kΩ/V may cause an ECU malfunction or wrong diagnosis.
   Furthermore, be sure to employ a meter whose resolution is 0.1V or more, 0.5Ω or more and whose accuracy is ±2% or more.



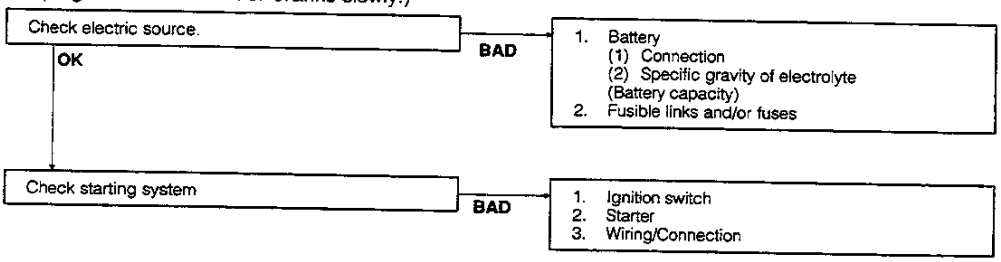
WNSW90-EF034

5. In this trouble shooting, no consideration has been made to any displacement of timing belt teeth. Hence, if the trouble persists even after the trouble shooting has been carried out, check to see if the timing belt has skipped a tooth.

WFE90-EF035

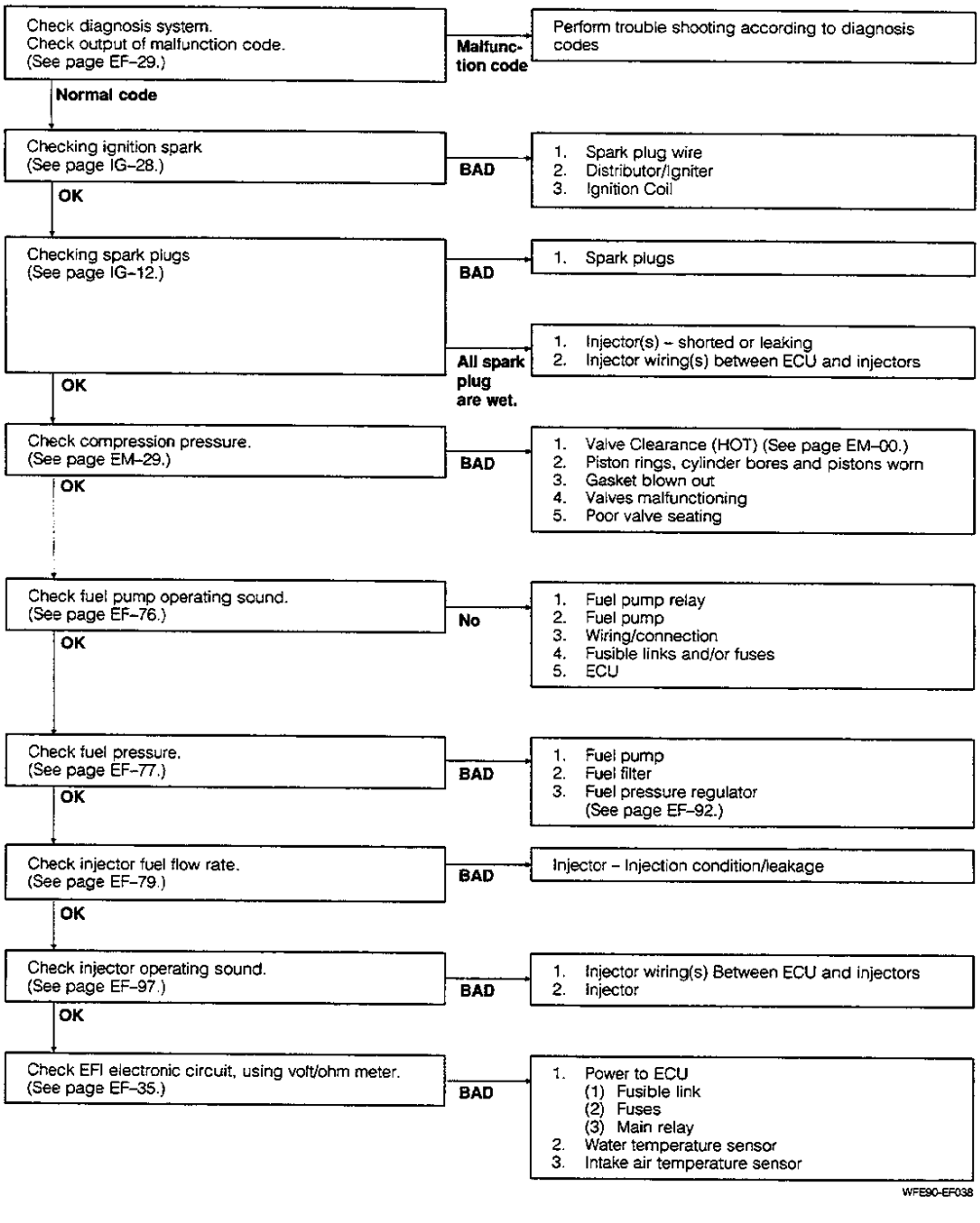
TROUBLE SHOOTING PROCEDURE

1 Symptom .... Engine will not start.
(Engine will not crank or cranks slowly.)

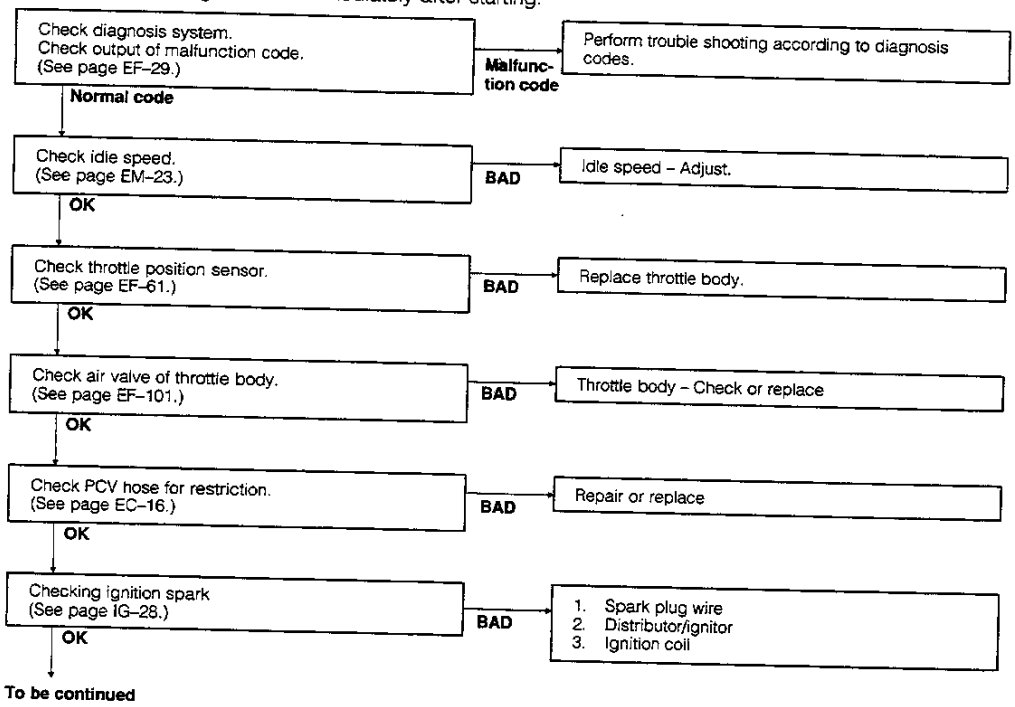


WFE90-EF036

2 Symptom .... Engine will not start.
(Engine cranks normally.)



3 Symptom .... Engine stalls immediately after starting.



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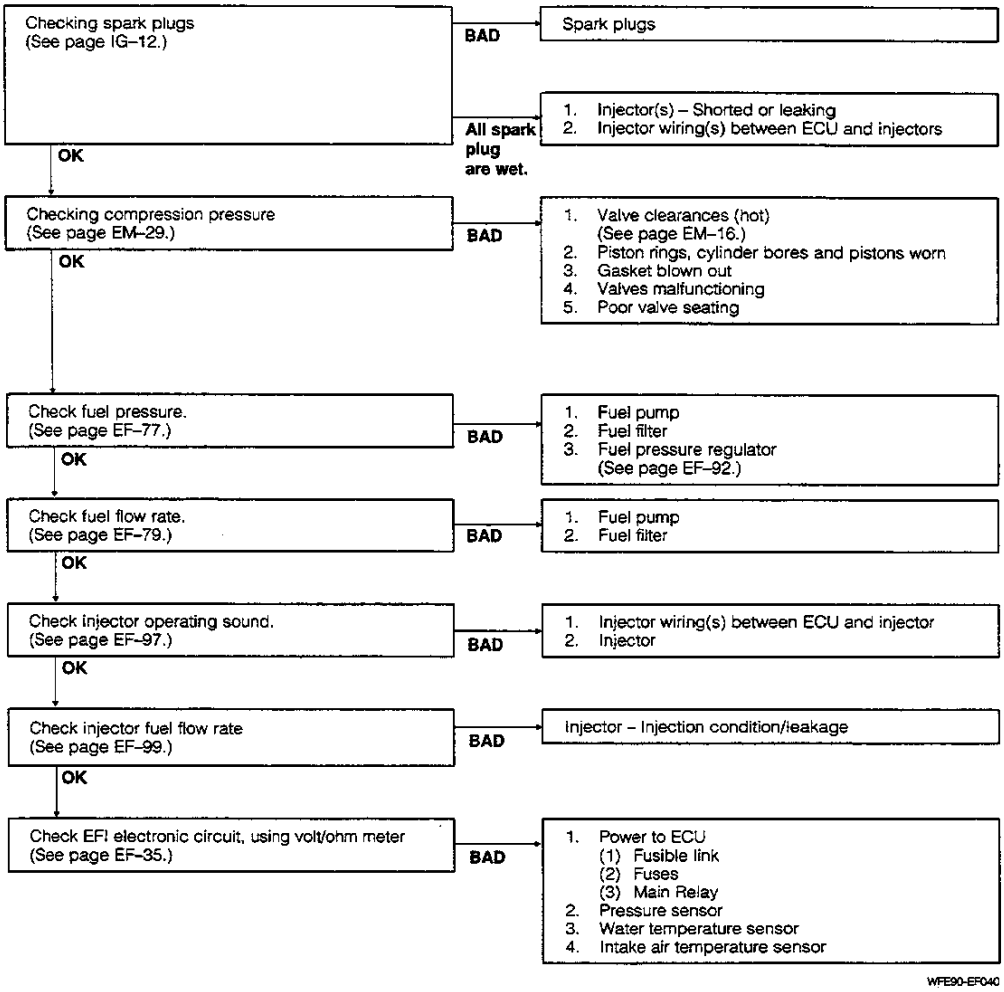
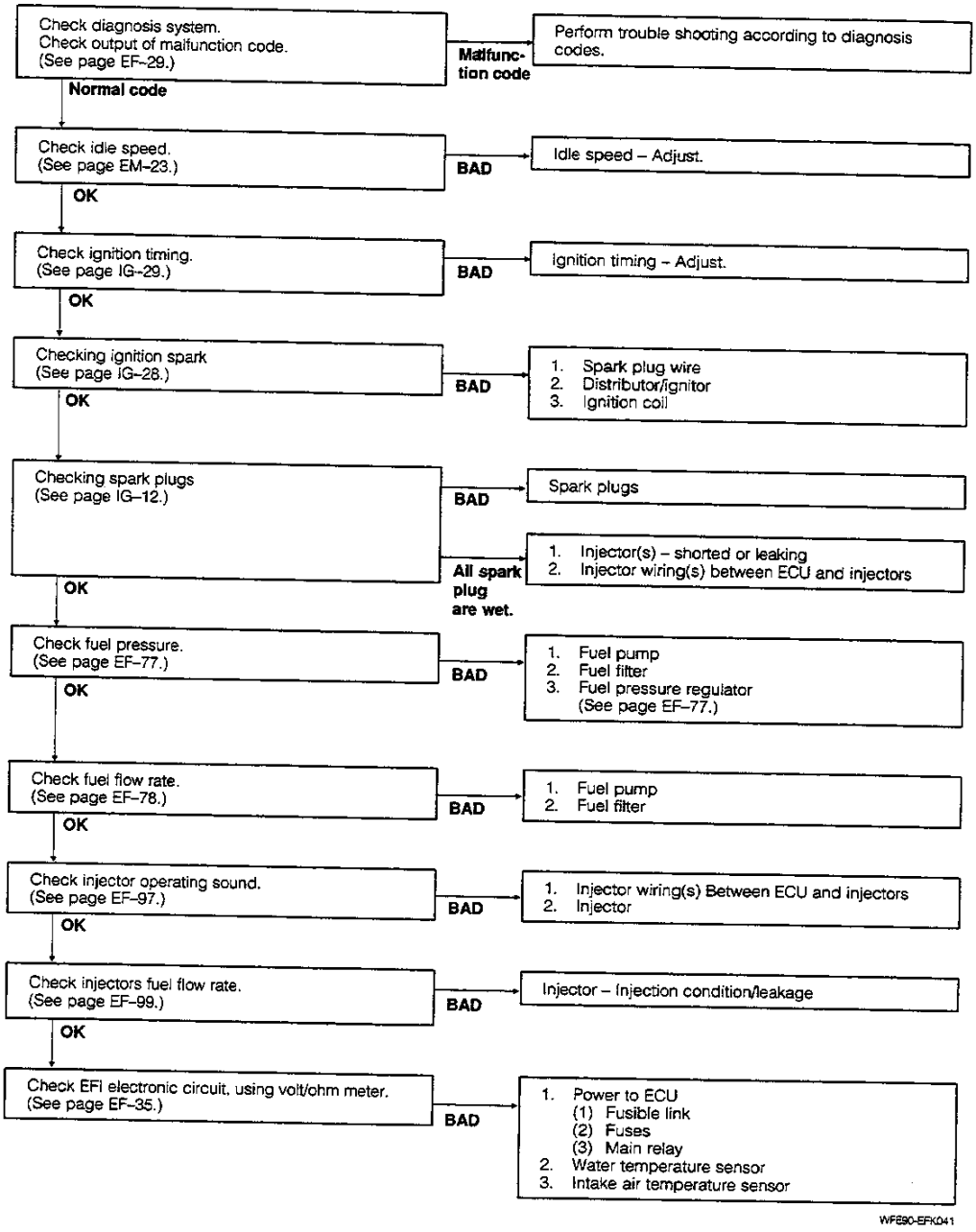
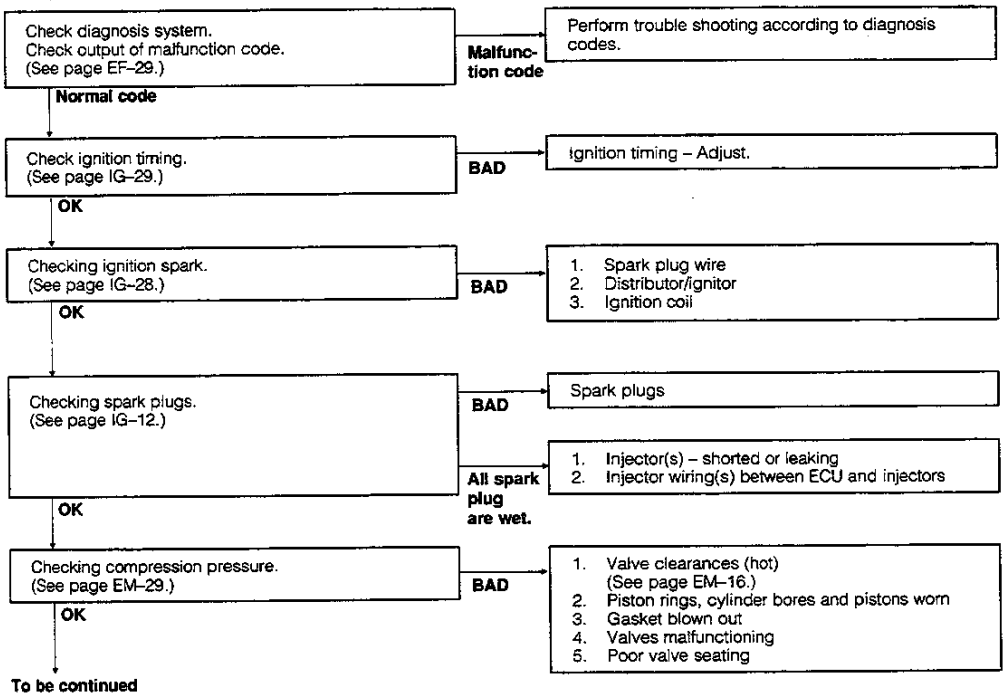

Checking spark plugs
(See page IG–12.)
BAD
Spark plugs
All spark plug are wet.
1. Injector(s) – Shorted or leaking
2. Injector wiring(s) between ECU and injectors
OK
Checking compression pressure
(See page EM–29.)
BAD
1. Valve clearances (hot)
(See page EM–16.)
2. Piston rings, cylinder bores and pistons worn
3. Gasket blown out
4. Valves malfunctioning
5. Poor valve seating
OK
Check fuel pressure.
(See page EF–77.)
BAD
1. Fuel pump
2. Fuel filter
3. Fuel pressure regulator
(See page EF–92.)
OK
Check fuel flow rate.
(See page EF–79.)
BAD
1. Fuel pump
2. Fuel filter
OK
Check injector operating sound.
(See page EF–97.)
BAD
1. Injector wiring(s) between ECU and injector
2. Injector
OK
Check injector fuel flow rate
(See page EF–99.)
BAD
Injector – Injection condition/leakage
OK
Check EFI electronic circuit, using volt/ohm meter
(See page EF–35.)
BAD
1. Power to ECU
(1) Fusible link
(2) Fuses
(3) Main Relay
2. Pressure sensor
3. Water temperature sensor
4. Intake air temperature sensor
WFE90-EF040

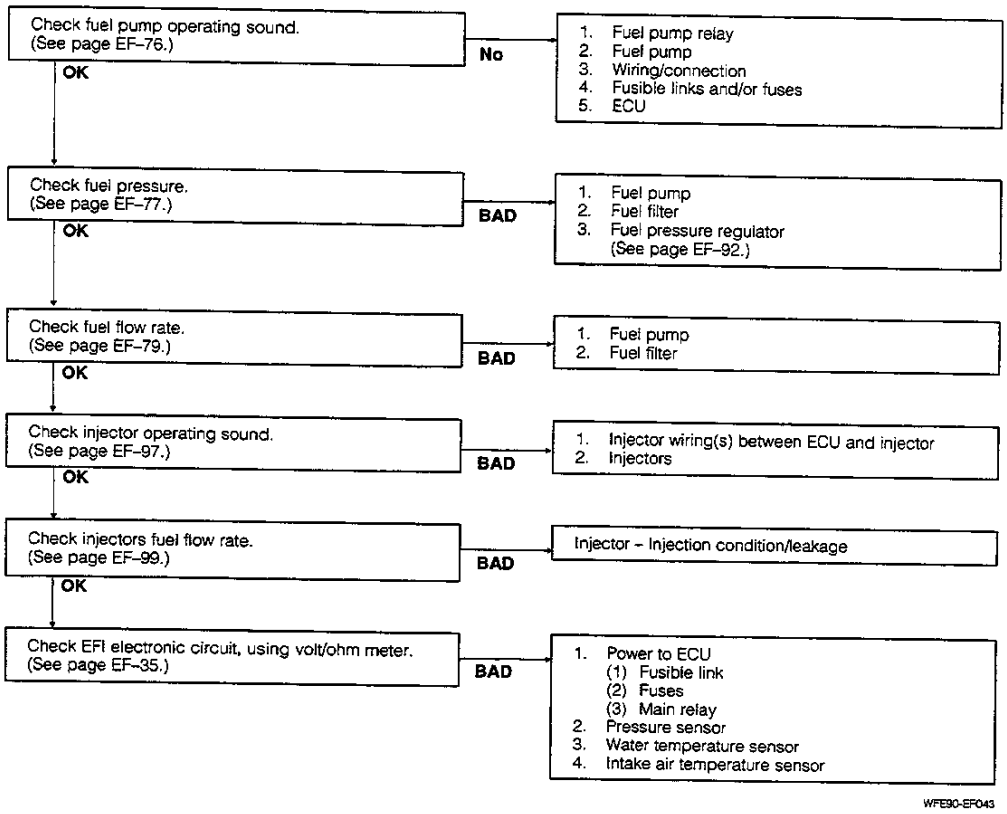
4 Symptom .... Engine often stalls.



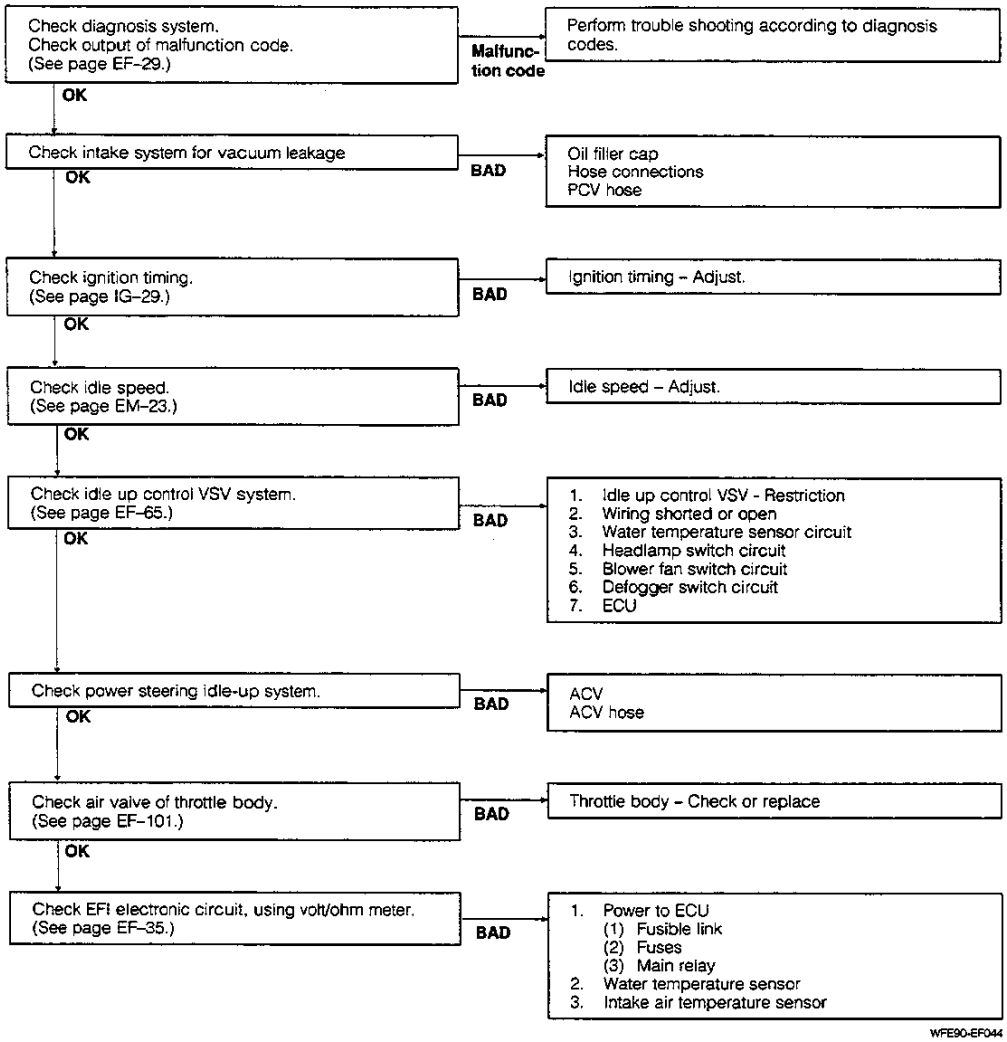
5 Symptom .... Hard starting



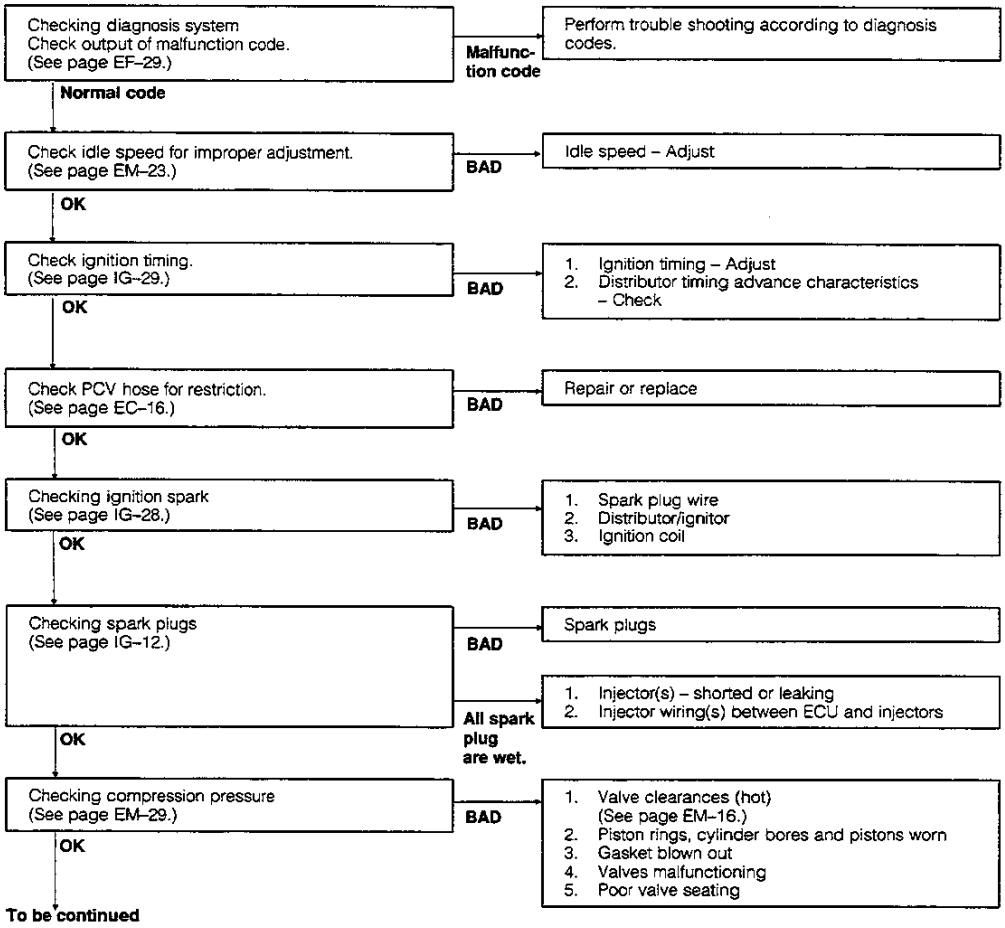
(Cont'd)


Check fuel pump operating sound.
(See page EF-76.)
No
1. Fuel pump relay
2. Fuel pump
3. Wiring/connection
4. Fusible links and/or fuses
5. ECU
OK
Check fuel pressure.
(See page EF-77.)
BAD
1. Fuel pump
2. Fuel filter
3. Fuel pressure regulator
(See page EF-92.)
OK
Check fuel flow rate.
(See page EF-79.)
BAD
1. Fuel pump
2. Fuel filter
OK
Check injector operating sound.
(See page EF-97.)
BAD
1. Injector wiring(s) between ECU and injector
2. Injectors
OK
Check injectors fuel flow rate.
(See page EF-99.)
BAD
Injector - Injection condition/leakage
OK
Check EFI electronic circuit, using volt/ohm meter.
(See page EF-35.)
BAD
1. Power to ECU
(1) Fusible link
(2) Fuses
(3) Main relay
2. Pressure sensor
3. Water temperature sensor
4. Intake air temperature sensor
WFE90-EF043

6 Symptom .... Engine idle speed too high



7 Symptom .... Engine idle speed too low and/or rough idling



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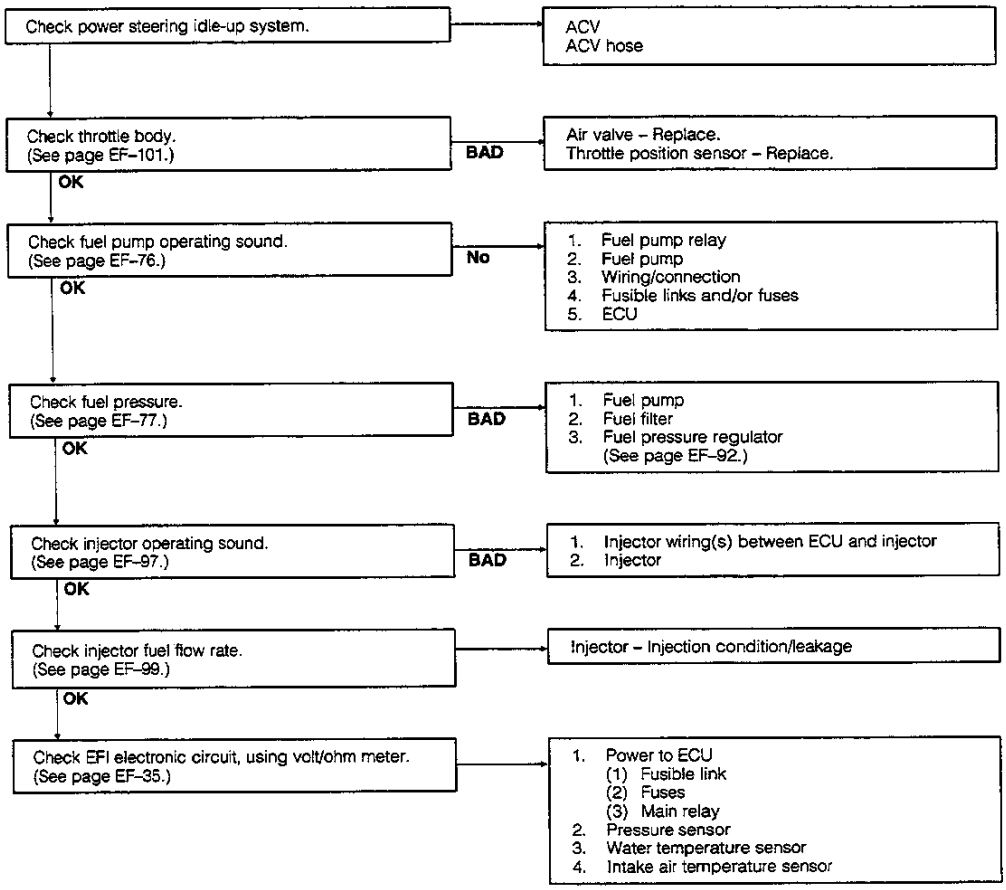
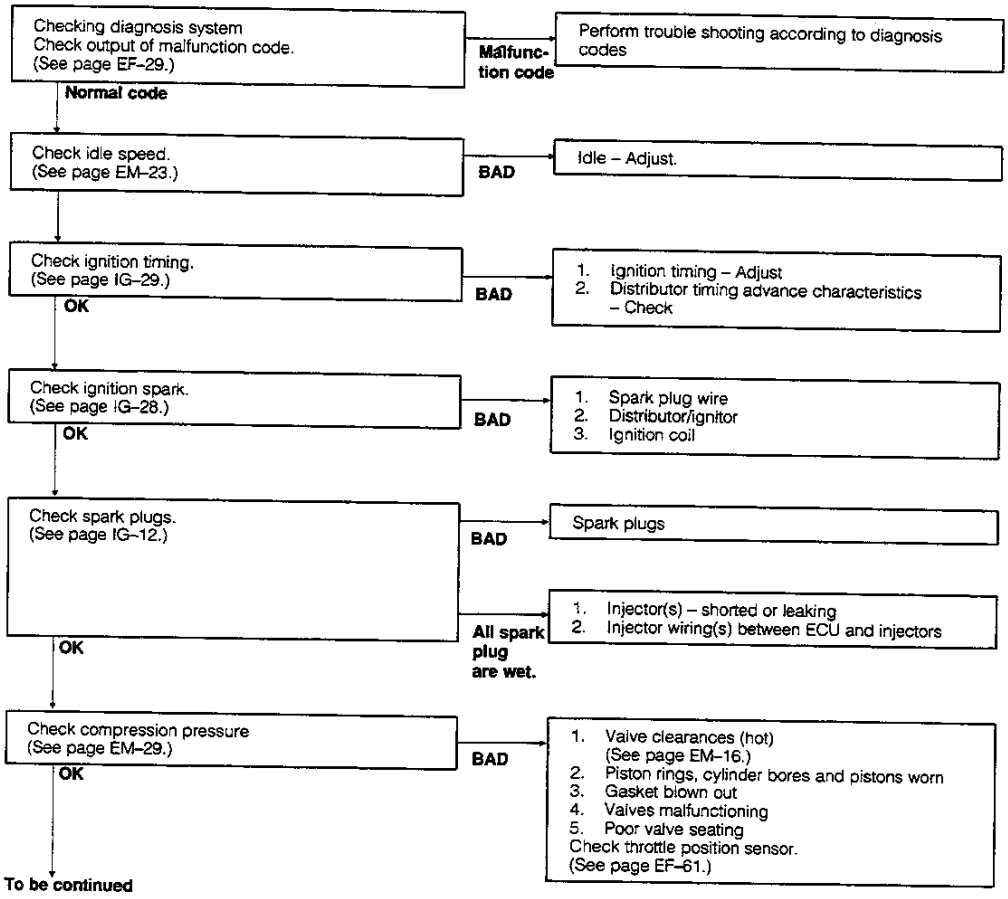
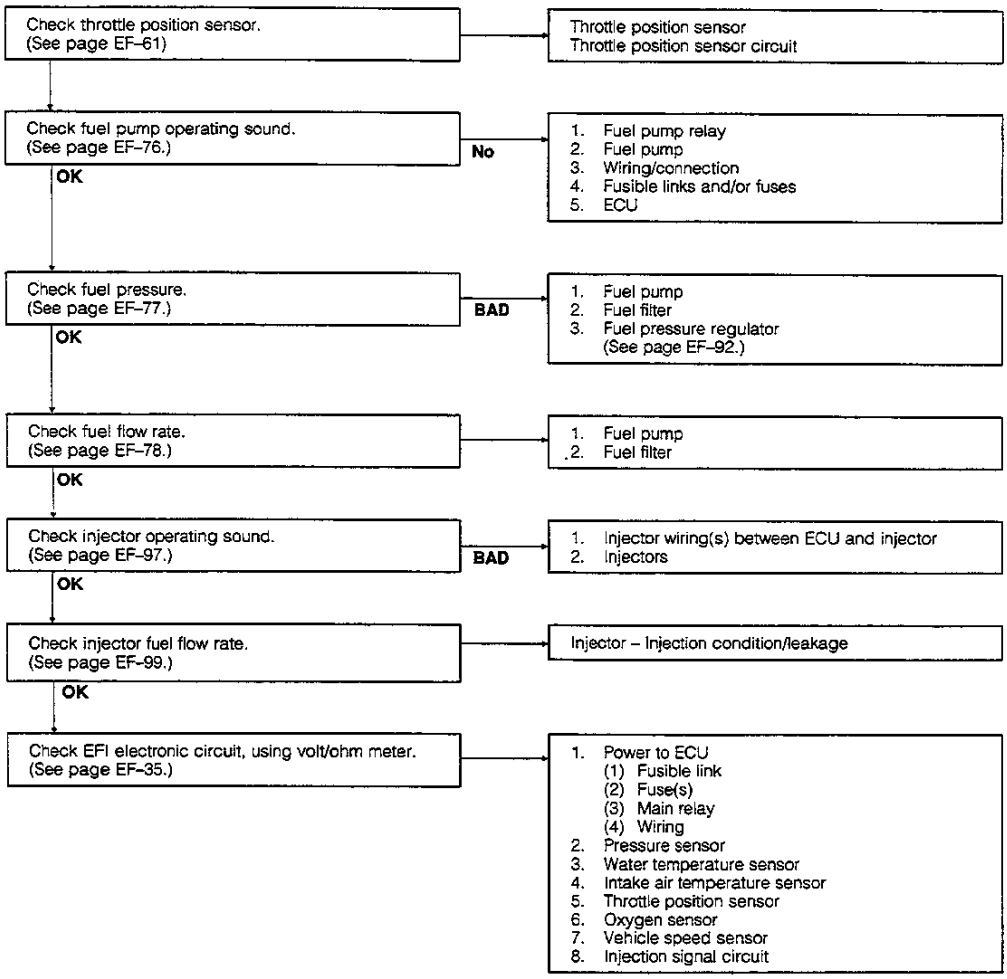

Check power steering idle-up system.
ACV
ACV hose
Check throttle body.
(See page EF-101.)
BAD
Air valve – Replace.
Throttle position sensor – Replace.
OK
Check fuel pump operating sound.
(See page EF-76.)
No
1. Fuel pump relay
2. Fuel pump
3. Wiring/connection
4. Fusible links and/or fuses
5. ECU
OK
Check fuel pressure.
(See page EF-77.)
BAD
1. Fuel pump
2. Fuel filter
3. Fuel pressure regulator
(See page EF-92.)
OK
Check injector operating sound.
(See page EF-97.)
BAD
1. Injector wiring(s) between ECU and injector
2. Injector
OK
Check injector fuel flow rate.
(See page EF-99.)
Injector – Injection condition/leakage
OK
Check EFI electronic circuit, using volt/ohm meter.
(See page EF-35.)
1. Power to ECU
(1) Fusible link
(2) Fuses
(3) Main relay
2. Pressure sensor
3. Water temperature sensor
4. Intake air temperature sensor
WFE90-EF046

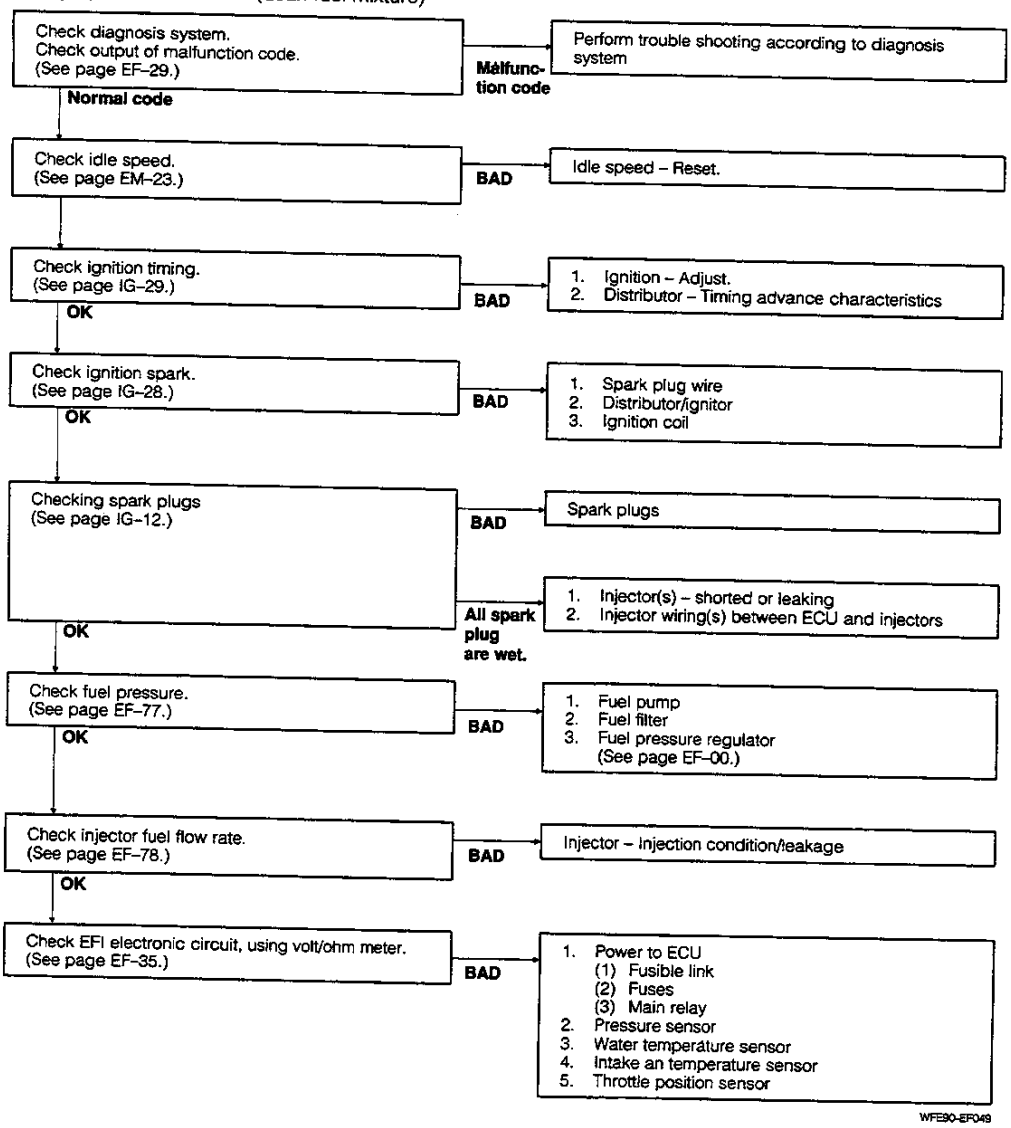
8 Symptom .... Poor driveability



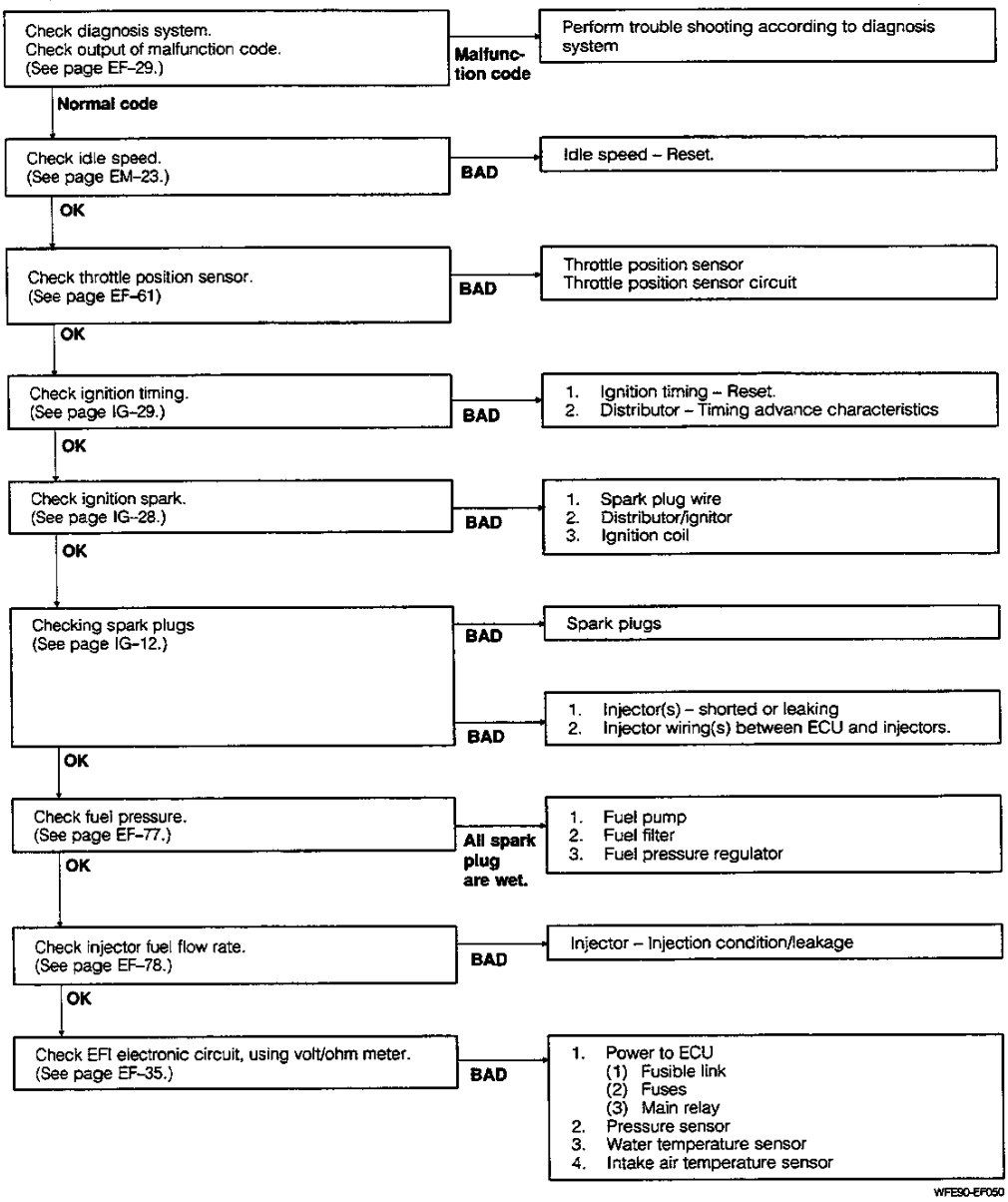
(Cont'd)


Check throttle position sensor.
(See page EF-61)
Throttle position sensor
Throttle position sensor circuit
Check fuel pump operating sound.
(See page EF-76.)
No
1. Fuel pump relay
2. Fuel pump
3. Wiring/connection
4. Fusible links and/or fuses
5. ECU
OK
Check fuel pressure.
(See page EF-77.)
BAD
1. Fuel pump
2. Fuel filter
3. Fuel pressure regulator
(See page EF-92.)
OK
Check fuel flow rate.
(See page EF-78.)
1. Fuel pump
2. Fuel filter
OK
Check injector operating sound.
(See page EF-97.)
BAD
1. Injector wiring(s) between ECU and injector
2. Injectors
OK
Check injector fuel flow rate.
(See page EF-99.)
Injector – Injection condition/leakage
OK
Check EFI electronic circuit, using volt/ohm meter.
(See page EF-35.)
1. Power to ECU
(1) Fusible link
(2) Fuse(s)
(3) Main relay
(4) Wiring
2. Pressure sensor
3. Water temperature sensor
4. Intake air temperature sensor
5. Throttle position sensor
6. Oxygen sensor
7. Vehicle speed sensor
8. Injection signal circuit
WFE90-EF048

9 Symptom .... Backfire (Lean fuel mixture)



19 Symptom .... Afterfire (Rich mixture – Misfire)



DIAGNOSIS SYSTEM

DESCRIPTION

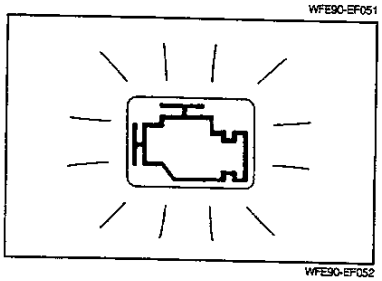
A self-diagnosis system is built in the ECU. If any abnormality should occur in the signal systems of various sensors, the self-diagnosis system memorizes the malfunction code number in the ECU. In respect to important abnormalities, the check engine lamp at the instrument panel goes on, thus warning the driver of the abnormality.
When the abnormality is cleared, the check engine lamp goes out.
When the Test terminal of the check terminal is shorted with the ground terminal, the malfunction code number that has been memorized in the ECU will be indicated in a form of flashing of the check engine lamp in the instrument panel.
This memorized malfunction code number is erased when the battery ground cable is disconnected from the negative (–) terminal of the battery, or when the back-up fuse in the relay block assembly is disconnected with the ignition key switch turned OFF.

Check of "CHECK ENGINE" warning light

1. When the ignition switch is turned ON, the check engine lamp goes on.
   (Engine is under a stopped state.)
   If not, see page EF–31.
2. When the engine starts, the check engine lamp goes off.

If the check engine lamp remains illuminated, it indicates that the diagnosis system has detected system malfunctions.

WFE90-EF051



WFE90-EF052

Output of diagnosis codes

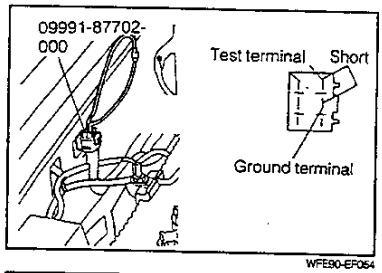
1. Initial conditions
   (1) Battery voltage of 11 volts or more
   (2) Throttle valve fully closed
   (3) All accessory switches turned OFF

WFE90-EF053

2. Short the Test terminal of the check terminal with the ground terminal, using the following SST.
   SST: 09991-87702-000

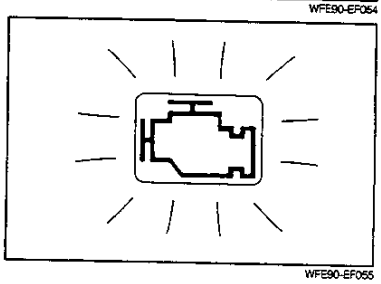
   NOTE:
   - The check terminal is located at the right side fender panel of the engine compartment for LHD vehicles and left side fender panel of the engine compartment for RHD vehicles.

   CAUTION:
   - Care must be exercised to ensure that no connection is made on terminals except for those specified.



WFE90-EF054

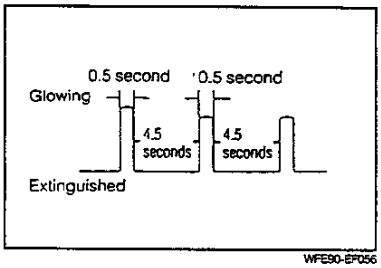
3. Set the ignition switch to ON position. At this time, be careful not to start the engine.
4. Read the diagnosis code by observing the flashing number of the check engine lamp.
   NOTE:
   - If the check engine lamp fails to flash, it is likely that the ECU is malfunctioning. Hence, proceed to inspection of diagnosis system circuit.



WFE90-EF055

Output form of diagnosis code

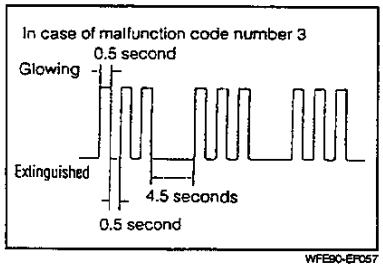
(1) Indication of normal code number
(Code number 1 – normal function)
The check engine lamp glows for 0.5 second, 4.5 seconds later after the ignition key switch has been turned ON. After a lapse of 4.5 seconds, the check engine lamp again glows for 0.5 second. Then, this pattern will be repeated.



WFE90-EF056

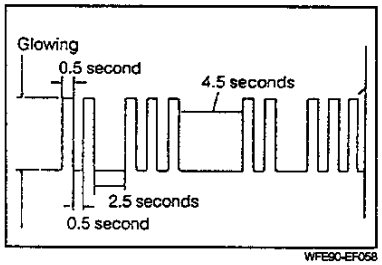
(2) Indication of malfunction code number

- When a single malfunction code is indicated:
The check engine lamp repeats glowing the same times as the number of the malfunction code at intervals of 0.5 second, 4.5 seconds later after the ignition key switch is turned ON. After a lapse of 4.5 seconds, the check engine lamp again repeats glowing the same times as the number of the malfunction code at intervals of 0.5 second. Then, this pattern will be repeated.



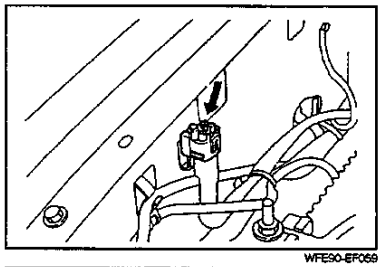
WFE90-EF057

- When plural malfunction code numbers are indicated:
The check engine lamp repeats glowing the same times as the number of the first malfunction code at intervals of 0.5 second, 4.5 seconds later after the ignition key switch is turned ON. After a lapse of 2.5 seconds, the check engine lamp repeats glowing the same times as the number of the next malfunction code at intervals of 0.5 second.
The memorized code numbers are indicated in the sequence of code number, starting from a smaller number.
The indication of the malfunction codes is repeated 4.5 seconds later after the memorized code numbers have been indicated.



WFE90-EF058

5. After the diagnosis codes have been read, remove the SST from the check terminal.
6. Install the cap on the check terminal.

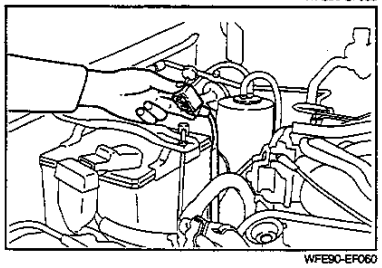

WFE90-EF059

Cancelling diagnosis code

To erase the diagnosis codes memorized in the ECU after malfunctions have been repaired, disconnect the battery ground cable from the negative (–) terminal of the battery. For at least 10 seconds with the ignition switch turned OFF. [When ambient temperature is about 20°C.]

NOTE:

- **When disconnecting the fuse, be sure to use a fuse puller. The fuse puller is located at the upper section of the block in the vehicle interior.**

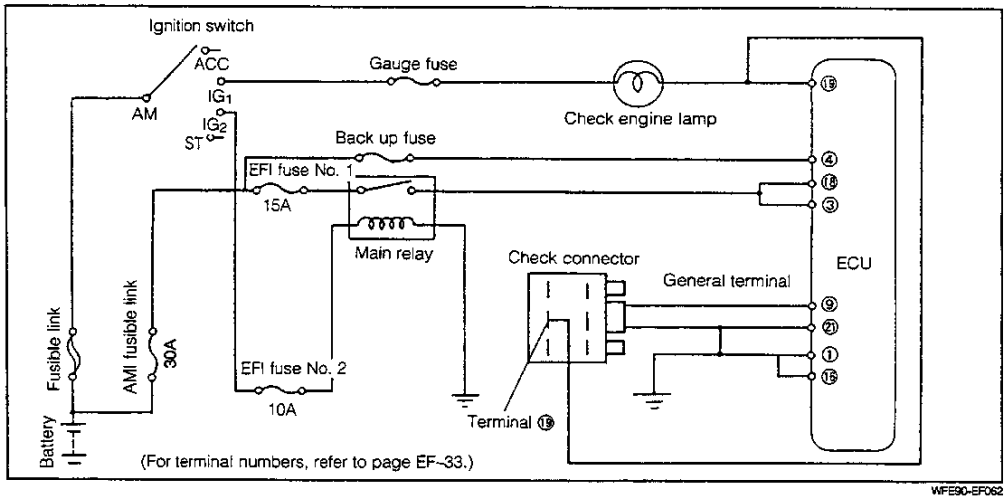

WFE90-EF060

DIAGNOSIS CODE

Code No.	Number of glowing of check engine lamp	Diagnosis item	Diagnosis contents	Trouble area
1		Normal	—	—
2		Pressure sensor	When the input signal from the pressure sensor deviates from the specified value:	• Pressure sensor • Pressure sensor circuit • ECU
3		Ignition signal	When the ignition signal fails to be inputted:	• Distributor • Ignitor • Ignition coil • Ignition system circuit • ECU
4		Water temperature sensor	When the input signal from the water temperature sensor deviates from the specified value:	• Water temperature sensor • Water temperature sensor circuit • ECU
5		Oxygen sensor signal	When the input signal from the oxygen sensor fails to be inputted under the certain conditions:	• Oxygen sensor • Oxygen sensor circuit • ECU
7		Throttle position sensor	When both idle switch and power switch enter "ON" conditions:	• Throttle position sensor • Throttle position sensor circuit • ECU
8		Intake air temperature sensor	When the input signal from the intake air temperature sensor deviates from the specified value:	• Intake air temperature sensor • Intake air temperature sensor circuit • ECU
9		Vehicle speed sensor	When the input signal from the vehicle speed sensor fails to be inputted under the certain conditions:	• Vehicle speed sensor • Vehicle speed sensor circuit • ECU
10		Starter signal	When the input signal from the starter fails to be inputted, until the certain conditions are satisfied: However, it should be noted that this code may be memorized when vehicle is started by being pushed.	• Starter • Starter circuit • ECU
11		Switch signal	When even if one of the following conditions is satisfied with the test terminal shorted with the ground terminal: • when idle switch is turned OFF.	• Throttle position sensor • Throttle position sensor circuit • ECU • Air conditioner switch circuit

WFE90-EF061

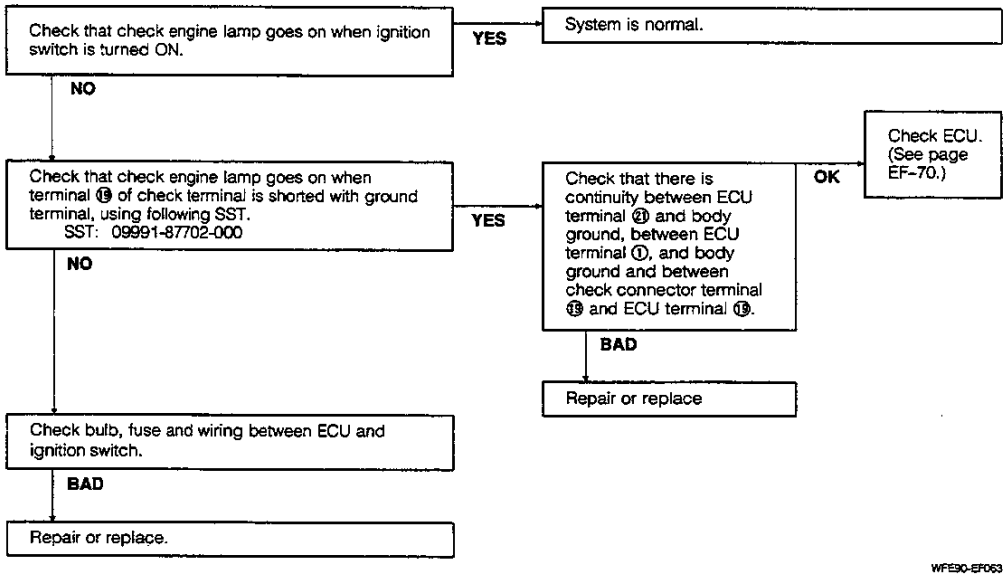
Inspection of diagnosis system circuit



WFE90-EF062

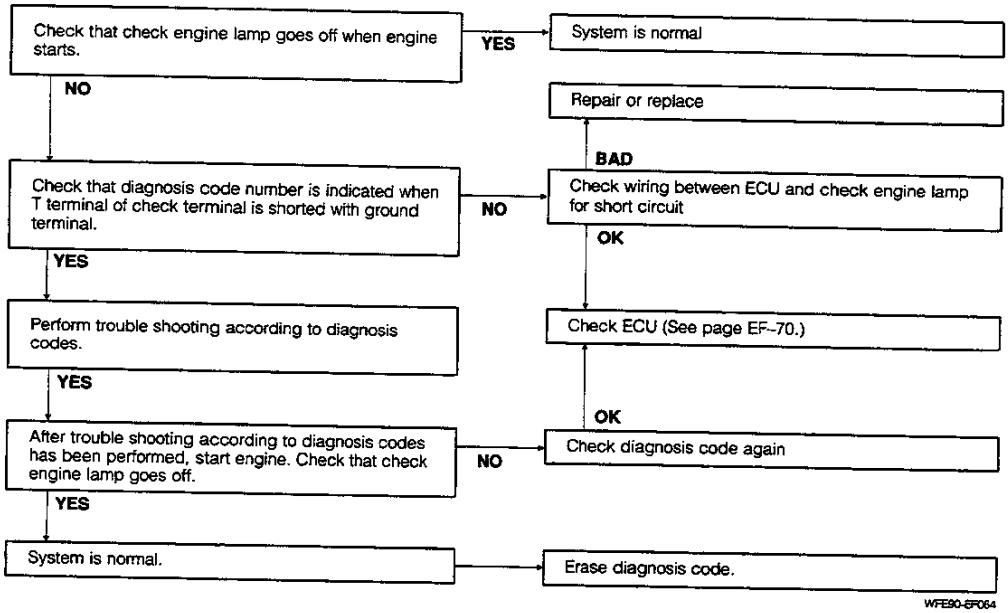
If the SST (09842-87204-000) has not been installed yet, install the SST, referring to the section under "Preparation of Trouble-shooting" at page EF–32.

1st step

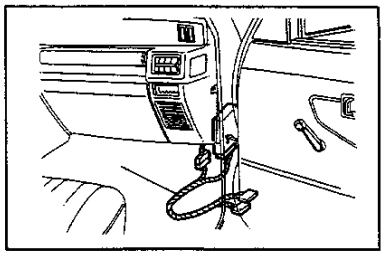


WFE90-EF063

2nd step


Check that check engine lamp goes off when engine starts.
YES
System is normal
NO
Repair or replace
BAD
Check that diagnosis code number is indicated when T terminal of check terminal is shorted with ground terminal.
NO
Check wiring between ECU and check engine lamp for short circuit
OK
YES
Perform trouble shooting according to diagnosis codes.
Check ECU (See page EF-70.)
YES
OK
After trouble shooting according to diagnosis codes has been performed, start engine. Check that check engine lamp goes off.
NO
Check diagnosis code again
YES
System is normal.
Erase diagnosis code.
WFE90-EF064

TROUBLE SHOOTING WITH VOLT/ OHMMETER



PREPARATION OF TROUBLE SHOOTING

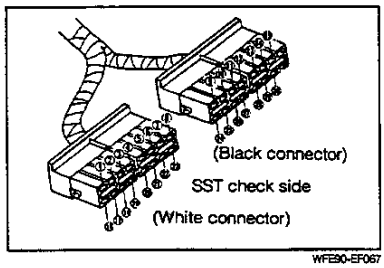
1. Disconnect the battery ground cable from the negative (–) terminal of the battery.
2. Remove the ECU cover.
3. Disconnect the engine harness from ECU.
4. Connect the following SST between the engine wire and the ECU.
   SST: 09842-87204-000
5. Reconnect the battery ground cable to the negative (–) terminal of the battery.
   CAUTION:
   - After completion of the inspection, before the SST is removed, be sure to disconnect the battery ground cable from the negative (–) terminal of the battery.
   - After the engine harness has been connected to the ECU, reconnect the battery ground cable to the negative (–) terminal of the battery.
   - Before using the SST, be sure to check to see if short or open wire exists between the terminals.

WFE90-EF065

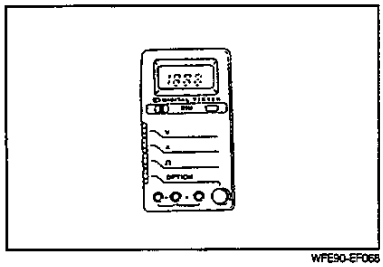
CHECK PROCEDURE FOR EFI SYSTEM

NOTE:
1. The EFI circuit can be checked by measuring the resistance and voltage at the SST terminals.
2. The voltage check should be conducted under a condition where all connectors are connected.
3. Prior to the check, ensure that the battery voltage is 11V or more when the ignition switch is turned ON.
4. If any problem is encountered during this check, see the section under "Trouble Shooting for EFI Electronic Circuit with Volt/Ohmmeter."

CAUTION:
- For the trouble shooting, use a volt/ohmmeter whose internal impedance is more than 10 kΩ/V.
  Use of a volt/ohmmeter whose internal resistance is 10 kΩ/V or less may cause ECU malfunction and/or misjudgment.
- No terminal except for the specified terminal should be connected. Failure to observe this caution may cause ECU malfunction.



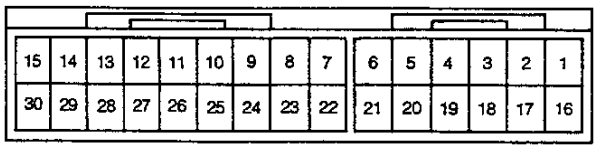
WFE90-EF067



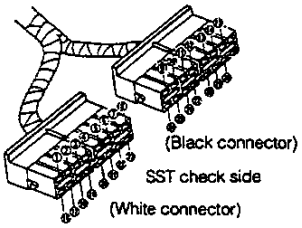
WFE90-EF068

ECU CONNECTORS

No.	Contents of connection	No.	Contents of connection
1	Power ground	15	Cooling water temperature sensor
2	Injector	16	Power ground
3	Battery +B (Main relay)	17	Injector
4	Battery +B (Back-up)	18	Battery +B (Main relay)
5	Idle-up VSV	19	Check engine lamp
6	Feedback check terminal	20	Fuel pump relay
7	Ignition coil (negative)	21	Engine ground
8	Starter switch	22	Pressure sensor ground
9	Test terminal	23	Air conditioner magnet clutch
10	Idle switch	26	Vehicle speed sensor
11	Electric load signal	28	Power switch
12	Sensor power supply	29	Oxygen sensor
13	Pressure sensor	30	Sensor ground
14	Intake air temperature sensor		



ECU side



WFE90-EF069

Voltage at ECU wiring connectors

No.	Terminal code (SST terminal)	STD voltage (V)	Conditions		See page
1	④ - ㉑ Negative	Approx battery voltage	All time		EF–36
	③ - ㉑		Ignition switch ON		EF–37
	⑱ - ㉑		Ignition switch ON		EF–37
2	⑫ - ㉒	4.5 - 5.5	Ignition switch ON		EF–38
	⑬ - ㉒	3.2 - 4.0	Ignition switch ON	When atmospheric pressure is 101.3 kPa (760 mmHg)	EF–38
3	⑦ - ㉑	Approx battery voltage	Ignition switch ON		EF–40
4	⑮ - ㉚	0.40 - 0.65	Ignition switch ON	After engine has fully warmed up Cooling water temperature: 80 - 90°C	EF–41
5	㉙ - ㉑	Voltage changes more than 8 times within 10 seconds	Ignition switch ON	When engine speed is held at for two minutes after engine has fully warmed up:	EF–42
7	㉕ - ㉑	Approx battery voltage	Ignition switch ON	Throttle valve fully closed	EF–43
		Less than 1V	Ignition switch ON	Throttle valve fully opened	
	⑩ - ㉑	Less than 1V	Ignition switch ON	Throttle valve fully closed	
		Approx battery voltage	Ignition switch ON	Throttle valve fully opened	
8	⑭ - ㉚	0.9 - 3.0	Ignition switch ON	Air temperature inside surge tank: 20°C	EF–46
9	㉖ - ㉑	0 - Approx battery voltage	Ignition switch ON	When vehicle is moved: (Voltage changes 4 times while vehicle moves 1.5m)	EF–47
10	⑧ - ㉑	6 - 15	When ignition switch is set to ST position:		EF–48
11	㉓ - ㉑	Approx battery voltage	Ignition switch ON	When engine rotating, air conditioner switch turned ON and compressor operating:	EF–49
	⑩ - ㉚	Less than 1.0V	Ignition switch ON	Throttle valve fully closed	EF–49
		Approx battery voltage	Ignition switch ON	Throttle valve fully opened	EF–49

WFE90-EF070

TROUBLE SHOOTING EFI ELECTRONIC CIRCUIT WITH VOLT/OHMMERTER

NOTE:

The trouble shooting procedures described in this section are ones designed for the inspection for each system. Hence, they may differ from actual trouble shooting procedure.

However, it is advisable that the basic approach to trouble shooting is based on the procedure described in this manual.

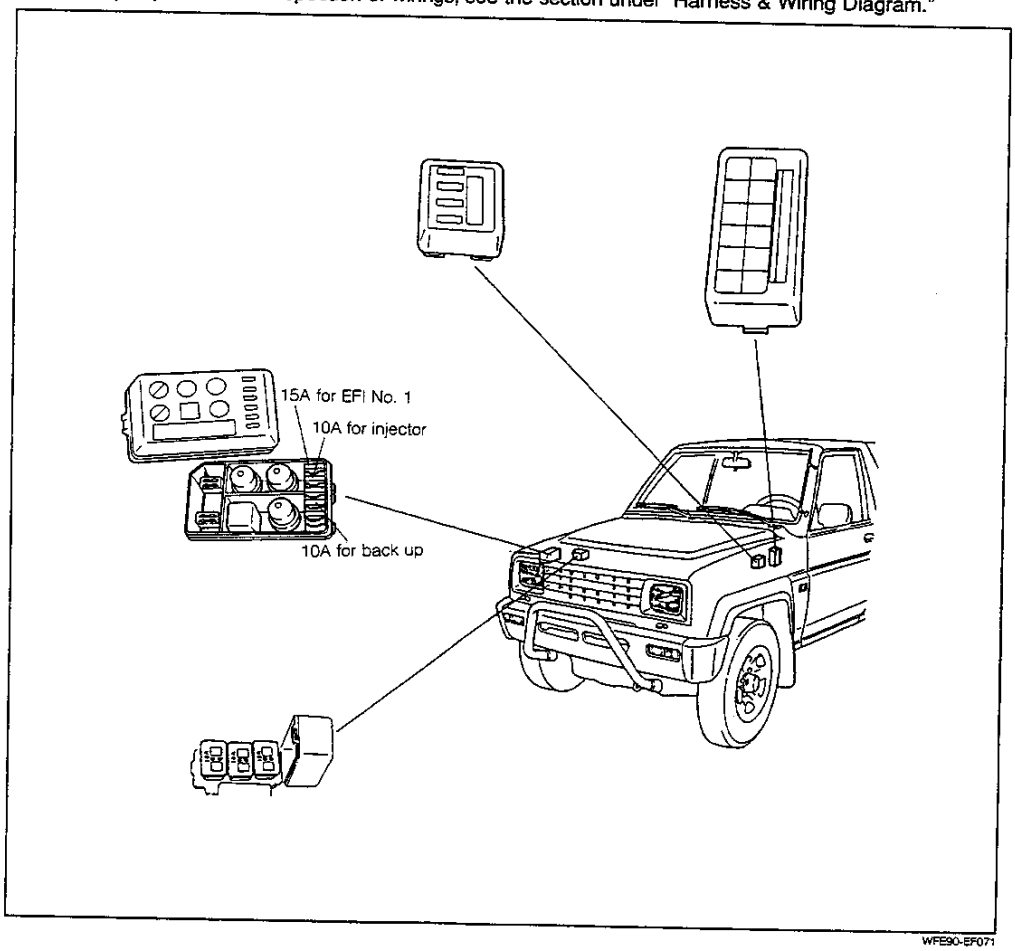
Before you start the inspection, it is a best practice to first make simple checks of the fuses, fusible links and conditions of the connectors.

The following trouble shooting procedure has been prepared on the assumption that troubles are caused by short circuits or open circuits of external components of the computer or short circuits inside the computer.

If engine malfunctions persist even when the terminal voltages of the ECU connectors are normal, the ECU may be faulty. Try the trouble shooting using a new ECU.

However, even when the trouble is solved after the ECU has been replaced, it is imperative to confirm that the trouble was actually attributed to the old ECU by installing the old ECU again.

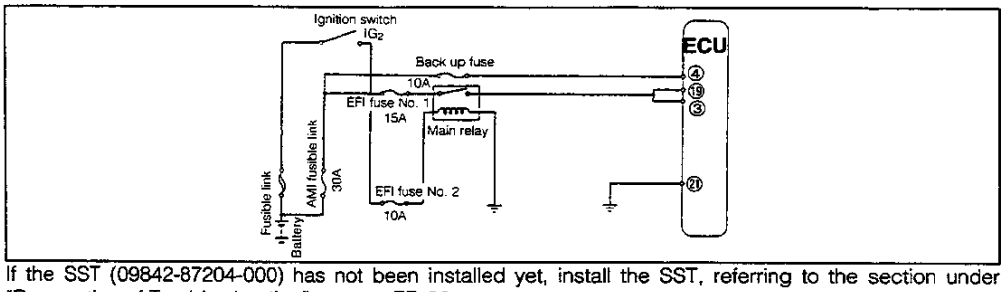
When you perform the inspection of wirings, see the section under "Harness & Wiring Diagram."



WFE90-EF071

No.	Terminals	Trouble	Conditions	STD voltage
1	④ - ㉑	No specified voltage	At all times (But, voltage drops during engine starting period.)	Approx battery voltage
	③ - ㉑	No specified voltage	Ignition switch ON	Approx battery voltage
	⑲ - ㉑			

WFE90-EF072



If the SST (09842-87204-000) has not been installed yet, install the SST, referring to the section under "Preparation of Trouble-shooting" at page EF–32.

WFE90-EF073

- ④ - ㉑

① There is no voltage between SST terminals ④ and ㉑.

↓

② Check that there is voltage between SST terminal ④ and body ground.

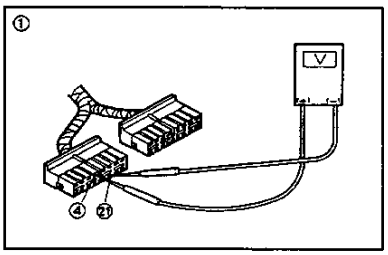
NO → Check fuses, fusible link and wiring harness.

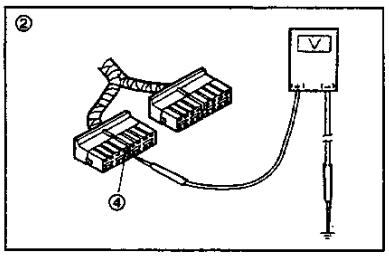
OK → ③ Check wiring between SST terminal ㉑ and body ground.

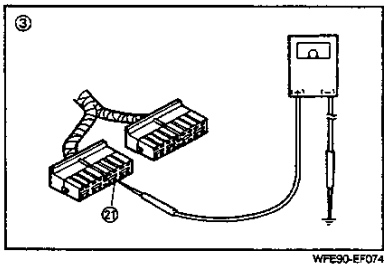
- **OK** → Repair or replace.
- **BAD** → Check ECU (See page EF–70.)

Check fuses, fusible link and wiring harness.

BAD → Repair or replace.







WFE90-EF074

- ③ or ⑱ - ㉑

① There is no voltage between SST terminal ③ or ⑱ and ㉑.

↓

② Check that there is voltage between SST terminal ③ or ⑱ and body ground when ignition switch is turned ON.

- NO → Check fuses, fusible links and wiring harness.
- OK ↓

③ Check wiring between ECU terminal ㉑ and body ground.

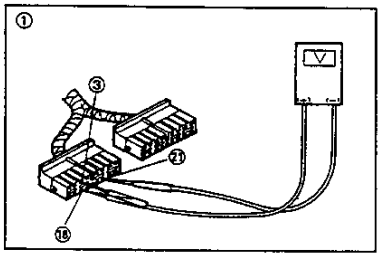
- BAD → Repair or replace.
- OK → Check ECU (See page EF-70.)

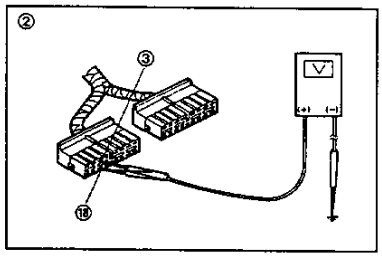
Check fuses, fusible links and wiring harness.

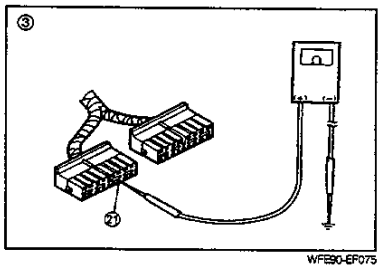
- OK ↓
- BAD → Repair or replace.

Check EFI main relay. (See page EF-52.)

- BAD → Replace.



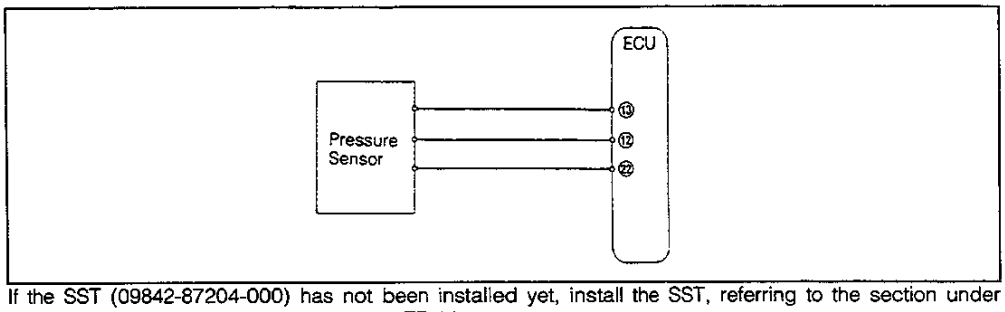




WFE90-EF075

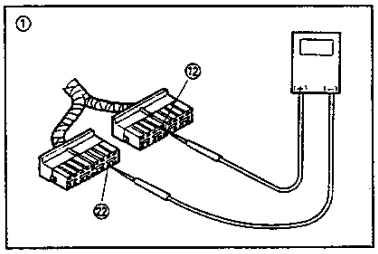
No.	Terminals	Trouble	Conditions	STD voltage
2	⑫ - ㉒	No specified voltage	Ignition switch ON	4.5 - 5.5
	⑬ - ㉒		Ignition switch ON At time of atmospheric pressure of 101.3 kPa (760 mmHg)	3.2 - 4.0

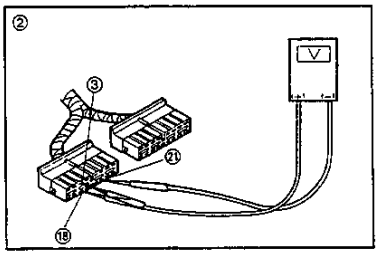
WFE90-EF076



If the SST (09842-87204-000) has not been installed yet, install the SST, referring to the section under "Preparation of Trouble-shooting" at page EF–32.

WFE90-EF077





- ⑫ - ㉒

① There is no voltage between SST terminals ⑫ and ㉒.

↓

② Check that there is voltage between SST terminals ③ or ⑱ and ㉑.

- **NO** → Check wiring between ECU and pressure sensor.
- **BAD** → Refer to "Trouble shooting, No. 1 ③ - ㉑." (See page EF–37.)
  - **BAD** → Repair or replace.

Check wiring between ECU and pressure sensor.

- **BAD** → Repair or replace.
- **OK** → Check pressure sensor. (Refer to page EF–62.)
  - **OK** → Check ECU. (See page EF–70.)

WFE90-EF078

- ⑬ - ㉒

① There is no voltage between SST terminal ⑬ and ㉒.

② Check that there is voltage between SST terminal ⑫ and ㉒.

OK → Check wiring between ECU and pressure sensor.

BAD → ③ Refer to "Trouble shooting, No. 2 ⑫ - ㉒." (See page EF-38.)

BAD → Repair.

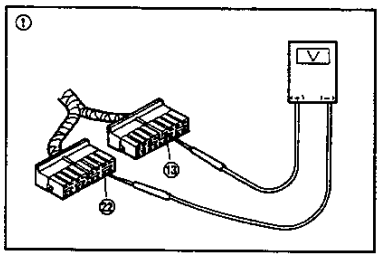
Check wiring between ECU and pressure sensor.

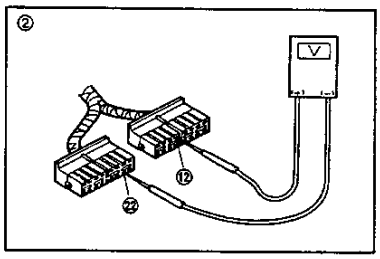
OK → Check pressure sensor. (See page EF-62.)

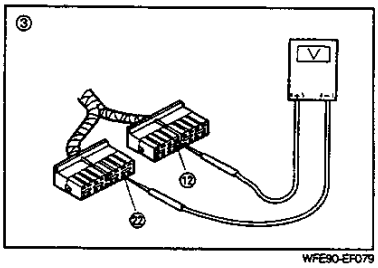
BAD → Repair or replace.

Check pressure sensor. (See page EF-62.)

OK → Check ECU (See page EF-70.)



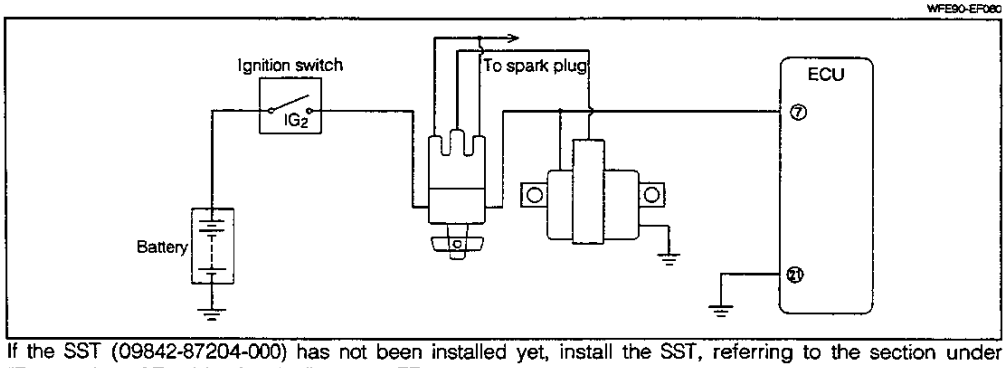




WFE90-EF079

No.	Terminals	Trouble	Conditions	STD voltage
3	⑦ - ㉑ Ground	No specified voltage	Ignition switch ON	Approx battery voltage

WFE90-EF080



If the SST (09842-87204-000) has not been installed yet, install the SST, referring to the section under "Preparation of Trouble-shooting" at page EF–32.

WFE90-EF081

① There is no voltage between SST terminal ⑦ and ㉑.

↓

② Check wiring between SST terminal IG ⑦ and body ground.

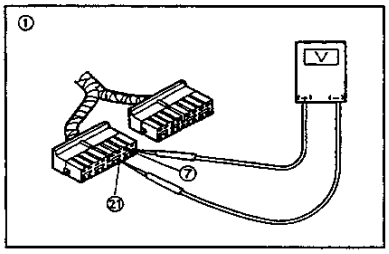
OK ↓ / BAD → Repair or replace.

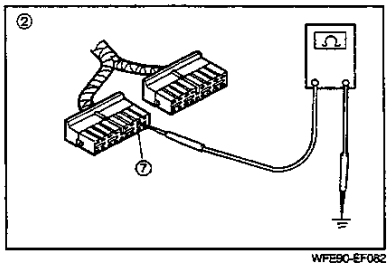
↓

Check ignition system. → BAD → Repair or replace.

OK ↓

Check ECU. (See page EF–70.)

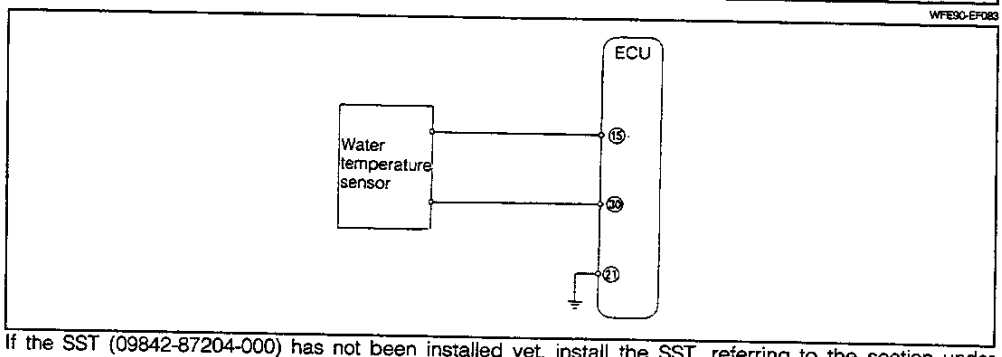




WFE90-EF082

No.	Terminals	Trouble	Conditions		STD voltage
4	⑮ - ⑳	No specified voltage	Ignition switch ON	Coolant temperature 80 - 90°C	0.40 - 0.65

WFE90-EF083



If the SST (09842-87204-000) has not been installed yet, install the SST, referring to the section under "Preparation of Trouble-shooting" at page EF–32.

WFE90-EF084

① There is no specified voltage between SST terminals ⑮ and ⑳

② Check that there is voltage between SST terminals ③ or ⑱ and ㉑.

OK → Check water temperature sensor. (See page EF–56.)

BAD → Refer to "Trouble Shooting, No.1 ③ - ㉑." (See page EF–37.)

Check water temperature sensor. (See page EF–56.)

OK → Check wiring between ECU and water temperature sensor.

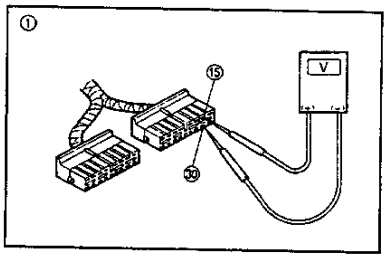
BAD → Replace water temperature sensor.

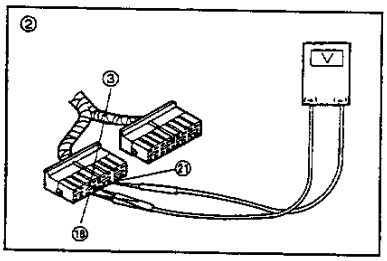
Check wiring between ECU and water temperature sensor.

OK → Check ECU. (See page EF–70.)

BAD → Repair or replace.

Check ECU. (See page EF–70.)

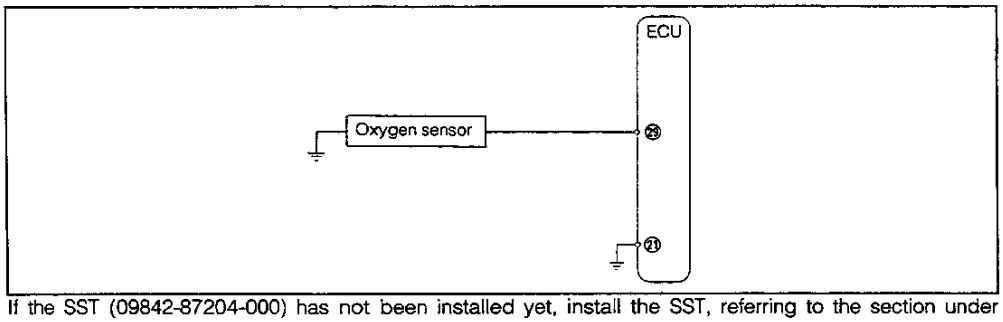




WFE90-EF085

No.	Terminals	Trouble	Conditions		STD voltage
5	㉙ - ㉑	No voltage changes	Ignition switch ON	When engine speed is held at 3000 rpm for two minutes after engine has been fully warmed up:	Voltage changes more than 8 times within 10 seconds.

WFE90-EF086



If the SST (09842-87204-000) has not been installed yet, install the SST, referring to the section under "Preparation of Trouble-shooting" at page EF–32.

WFE90-EF087

① There is no change in voltage between SST terminals ㉙ and ㉑ when engine speed is held at 3000 rpm for two minutes after engine has been fully warmed up:

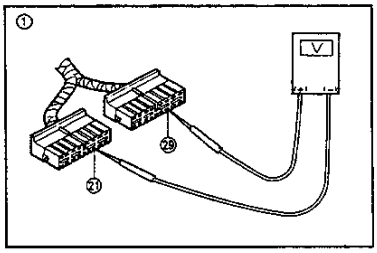
↓

Check wiring between ECU and oxygen sensor.

- **OK** → Check oxygen sensor. (See page EF–68.)
- **BAD** → Repair or replace. → Check oxygen sensor. (See page EF–68.)

Check oxygen sensor. (See page EF–68.)

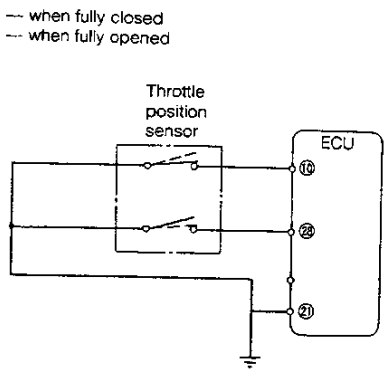
- **OK** → Check ECU. (See page EF–70.)



WFE90-EF088

No.	Terminals	Trouble	Condition		STD voltage
7	⑩ — ㉑ Ground	More than 5 V	Ignition switch ON	Throttle valve fully closed	Less than 0.5 V
		No specified voltage	Ignition switch ON	Throttle valve fully opened	Approx. battery voltage
	㉘ — ㉑ Ground	No specified voltage	Ignition switch ON	Throttle valve fully closed	Approx. battery voltage
		More than 5 V	Ignition switch ON	Throttle valve fully opened	Less than 0.5 V

WFE9C-EF089



If the SST (09842-87204-000) has not been installed yet, install the SST, referring to the section under "Preparation of Trouble-shooting" at page EF–32.

WFE9C-EF090

- ㉘ - ㉑

① There is no specified voltage between SST terminals ㉘ and ㉑.

② Check that there is voltage between SST terminals ③ or aH and ㉑.

OK → Check throttle position sensor. (See page EF-61.)

BAD → Refer to "Trouble Shooting, No. 1 ③ - ㉑." (See page EF-37.)

Check throttle position sensor. (See page EF-61.)

OK → Check wiring between ECU and throttle position sensor.

BAD → Replace.

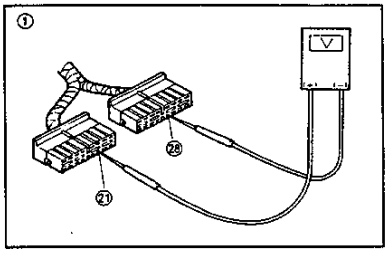
Check wiring between ECU and throttle position sensor.

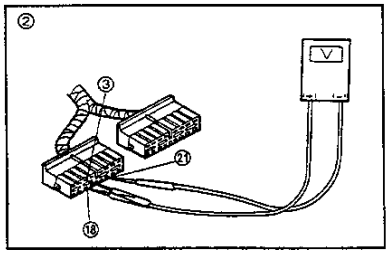
OK → Check wiring between throttle position sensor and body ground.

BAD → Repair or replace.

Check wiring between throttle position sensor and body ground.

OK → Check ECU. (See page EF-70.)





WFE90-EF091

- ⑩ - ㉑

① There is no specified voltage between SST terminals ⑩ and ㉑.

↓

② Check that there is voltage between SST terminals ③ or ⑱ and ㉑.

OK → Check throttle position sensor. (See page EF-61.)

BAD → Refer to "Trouble Shooting, No. 1 ③ - ㉑." (See page EF-37.)

Check throttle position sensor. (See page EF-61.)

OK → Check wiring between ECU and throttle position sensor.

BAD → Replace.

Check wiring between ECU and throttle position sensor.

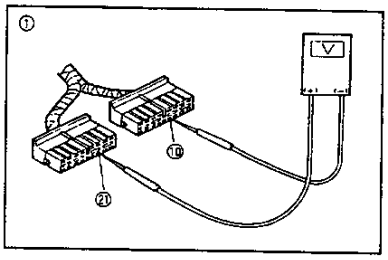
OK → Check wiring between throttle position sensor and body ground.

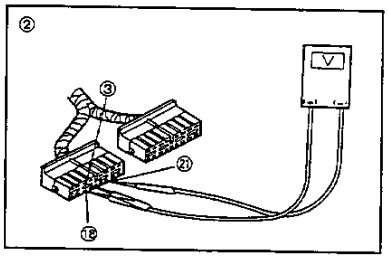
BAD → Repair or replace.

Check wiring between throttle position sensor and body ground.

OK → Check ECU. (See page EF-70.)

Check ECU. (See page EF-70.)

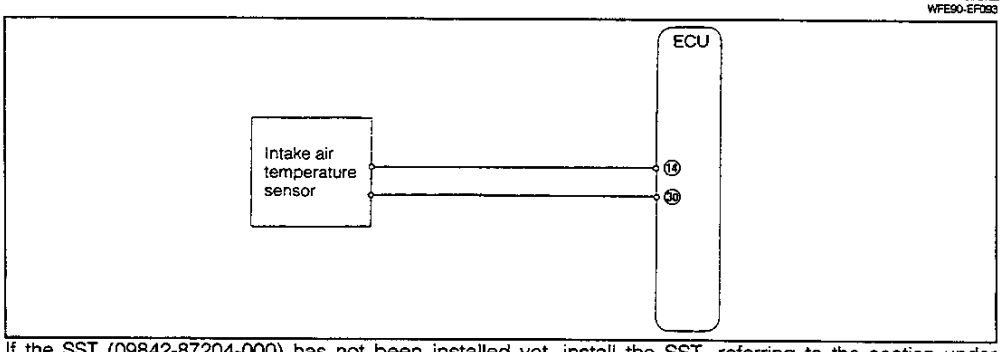




WFE90-EF092

No.	Terminals	Trouble	Conditions		STD voltage
8	⑭ - ㉚	No specified voltage	Ignition switch ON	Air temperature inside surge tank 20°C	1.5 - 3.0

WFE90-EF093



If the SST (09842-87204-000) has not been installed yet, install the SST, referring to the section under "Preparation of Trouble-shooting" at page EF-32.

WFE90-EF094

① There is no specified voltage between SST terminals ⑭ and ㉚ when ignition switch is turned ON.

② Check that there is voltage between SST terminals ③ or ⑱ and ㉑.

OK → Check intake air temperature sensor. (See page EF-59.)

No → Refer to yTrouble Shooting, No. 1 ③ - ㉑." (See page EF-37.)

Check intake air temperature sensor. (See page EF-59.)

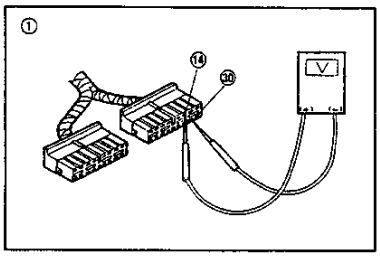
OK → Check wiring between ECU and intake air temperature sensor.

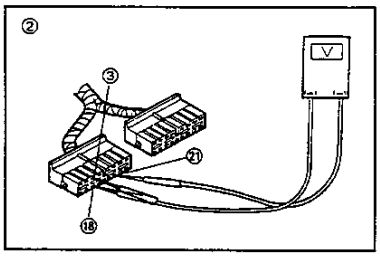
BAD → Replace intake air temperature sensor.

Check wiring between ECU and intake air temperature sensor.

OK → Check ECU. (See page EF-70.)

BAD → Repair or replace.

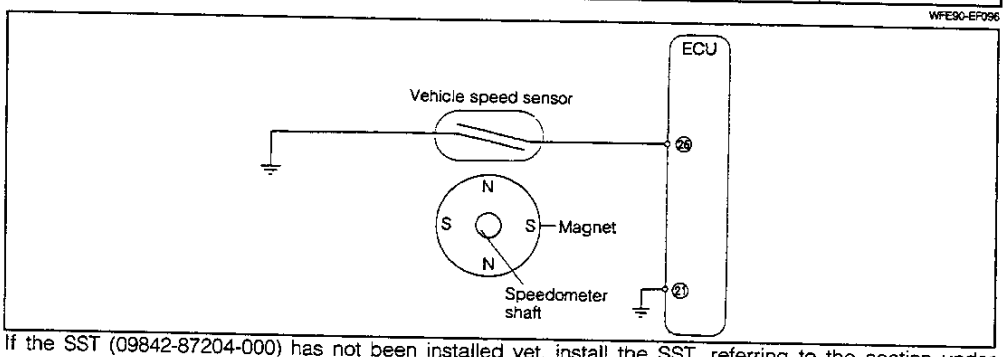




WFE90-EF095

No.	Terminals	Trouble	Conditions		STD voltage
9	㉖ - ㉑	No voltage changes	Ignition switch ON	When vehicle is moved slowly:	0 – Approx battery voltage

WFE90-EF096



If the SST (09842-87204-000) has not been installed yet, install the SST, referring to the section under "Preparation of Trouble-shooting" at page EF–32.

WFE90-EF097

① No change in voltage occurs between SST terminals ㉖ and ㉑ when vehicle is moved slowly with ignition switch turned ON.

② Check that there is voltage between SST terminal ③ or ⑱ and ㉑.

No → Refer to "Trouble shooting, No. 1 ③ - ㉑." (See page EF–37.)

Check wiring between ECU and vehicle speed sensor.

OK → Check wiring between vehicle speed sensor and body ground.

BAD → Repair or replace.

Check wiring between vehicle speed sensor and body ground.

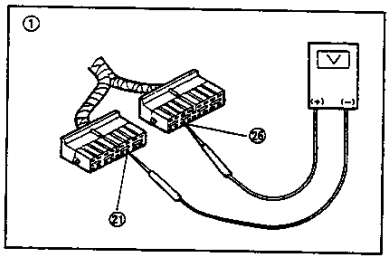
OK → Check vehicle speed sensor.

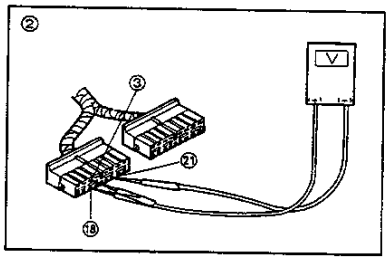
BAD → Repair or replace.

Check vehicle speed sensor.

OK → Check ECU. (See page EF–70.)

BAD → Replace vehicle speed sensor.

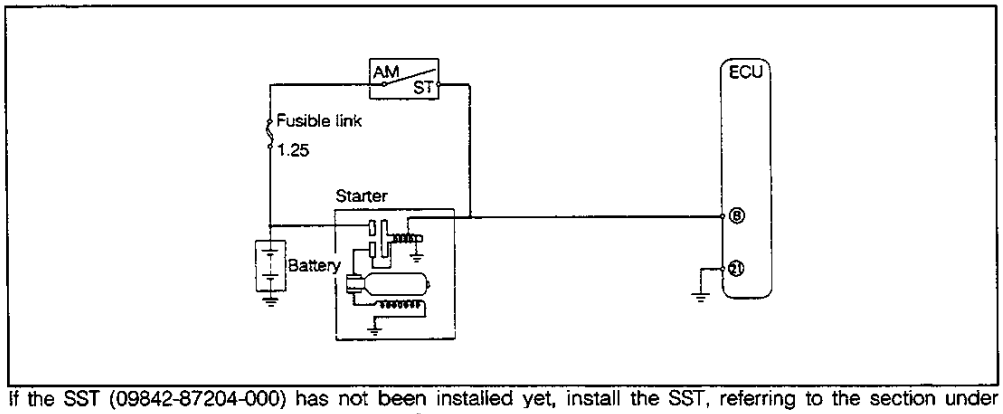




WFE90-EF098

No.	Terminals	Trouble	Conditions	STD voltage
10	⑧ - ㉑	No specified voltage	Ignition switch ST position	More than 6V

WFE90-EF099



If the SST (09842-87204-000) has not been installed yet, install the SST, referring to the section under "Preparation of Trouble-shooting" at page EF-32.

WFE90-EF100

① There is no voltage between SST terminals H and U when ignition switch is set to ST position.

Check starter operation.

BAD → Check battery, fusible link, ignition switch and starter.

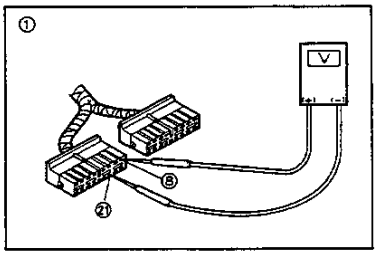
OK → Check wiring between ECU and starter terminal.

OK → Check and repair wiring between ECU terminal ㉑ and body

BAD → Repair or replace.

Check battery, fusible link, ignition switch and starter.

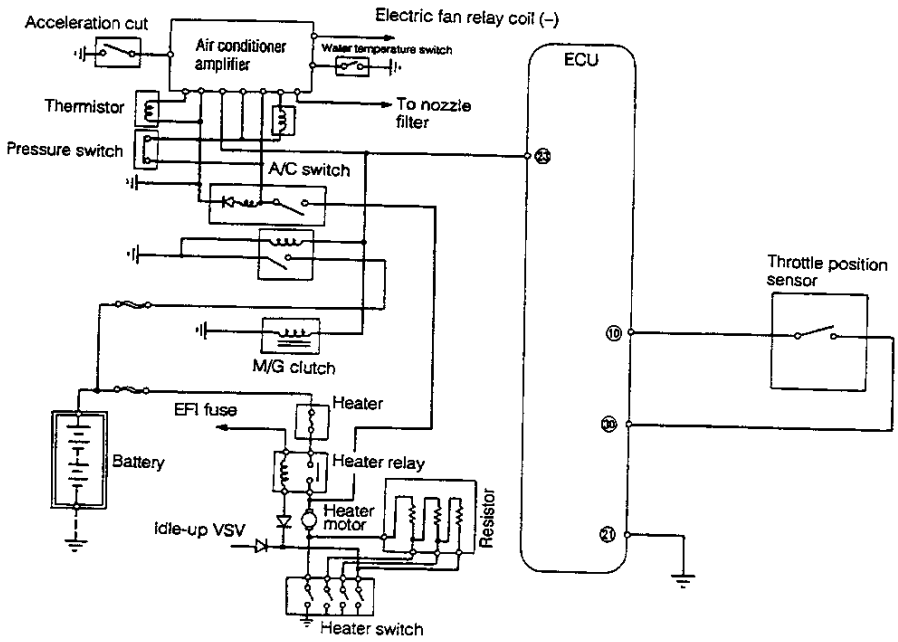
BAD → Repair or replace.



WFE90-EF101

No.	Terminals	Trouble	Conditions		STD voltage
11	㉓ - ㉑	No specified voltage	Ignition switch ON	With engine rotating, air conditioner switch turned ON and magnet clutch turned ON:	Approx battery voltage
	⑩ - ㉚	No specified voltage	Ignition switch ON	Throttle valve fully closed	Less than 0.5 V
			Ignition switch ON	Throttle valve fully opened	Approx battery voltage

WFE90-EF102



If the SST (09842-87204-000) has not been installed yet, install the SST, referring to the section under "Preparation of Trouble-shooting" at page EF–32.

WFE90-EF103

- ㉓ - ㉑

① There is no voltage at SST terminals ㉓ and ㉑ when compressor of air conditioner is operated.

↓

② Check that there is voltage between SST terminal ㉓ and body ground.

- **No** → Check magnet clutch operation.
- **OK** → Check wiring between ECU terminal ㉑ and body ground.

Check magnet clutch operation.

- **BAD** → Check air conditioner system.
- **OK** → Check and repair wiring between ECU terminal ㉓ and amplifier.

Check air conditioner system.

- ⑩ - ㉚

① There is no voltage between SST terminals ⑩ and ㉚ when ignition switch is turned ON. (Throttle valve opened)

↓

② Check that there is voltage between SST terminal ③ or ⑱ and ㉑.

- **OK** → Check throttle position sensor. (See page EF-61.)
- **No** → Refer to "Trouble shooting, No. 1 ③ - ㉑." (See page EF-37.)

Check throttle position sensor. (See page EF-61.)

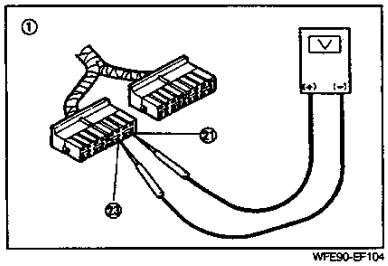
- **OK** → Check wiring between ECU and throttle position sensor.
- **BAD** → Replace throttle position sensor.

Check wiring between ECU and throttle position sensor.

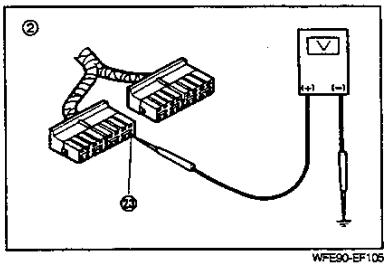
- **OK** → Check wiring between throttle position sensor and body ground.
- **BAD** → Repair or replace.

Check wiring between throttle position sensor and body ground.

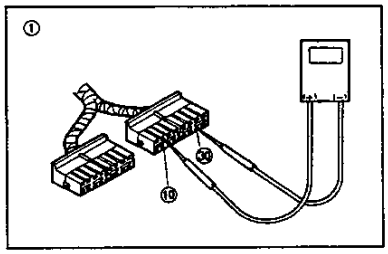
- **OK** → Check ECU. (See page EF-70.)

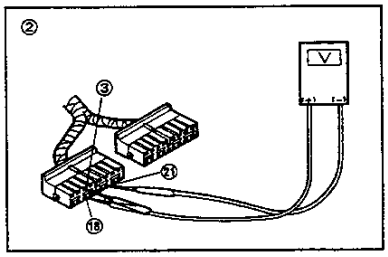


WFE90-EF104



WFE90-EF105

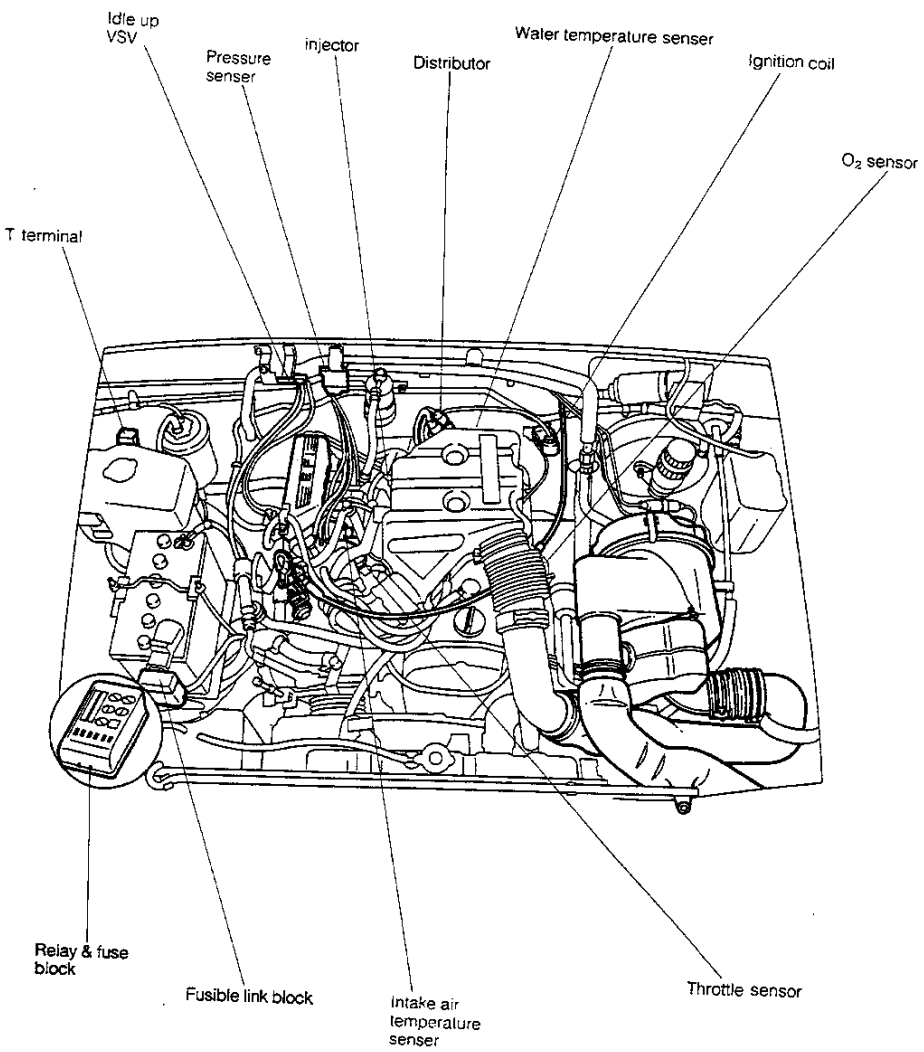




WFE90-EF106

ELECTRONIC CONTROL SYSTEM

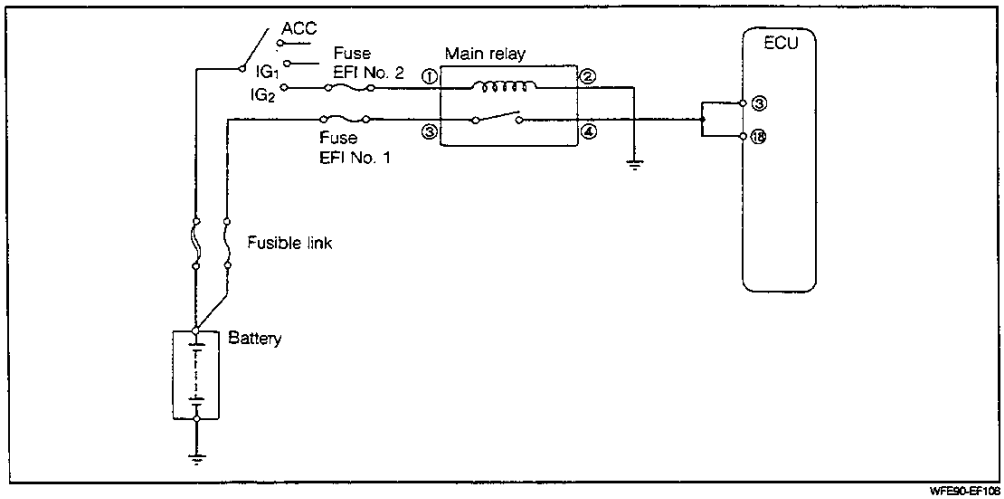
LOCATION OF ELECTRONIC CONTROL PARTS



L.H.D. vehicle

WFE90-EF107

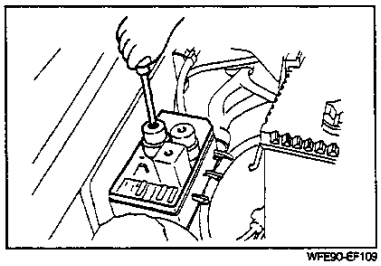
MAIN RELAY



WFE90-EF108

Inspection of EFI main relay

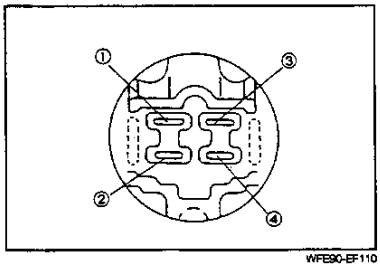
1. Check of main relay operation
   Turn ON the ignition switch. Check to see if you can hear a relay operating sound or if you can feel operating vibrations when a screwdriver or the like is brought into contact with the relay.
   CAUTION:
   - **The relay may become very hot during the operation. Hence, do not touch the relay by your hand.**



WFE90-EF109

2. Inspection of relay continuity
   (1) Remove the main relay from relay box.
   (2) Check that there is continuity between the terminals ① and ②.
   (3) Check that there is no continuity between the terminals ③ and ④.
   (4) Check that there is no continuity between the terminals ① and ③ and also between the terminals ① and ④.
   (5) Check that there is no continuity between the terminals ② and ③ and also between the terminals ② and ④.

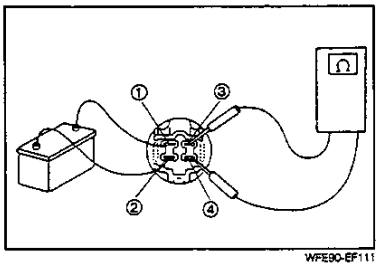
   If the continuity test results do not conform to specifications, replace the relay.



WFE90-EF110

3. Inspection of relay operation
   (1) Apply the battery voltage across the terminals ① and ②.
   (2) Check that there is continuity between the terminals ③ and ④.

   If the operation test results do not conform to specifications, replace the relay.

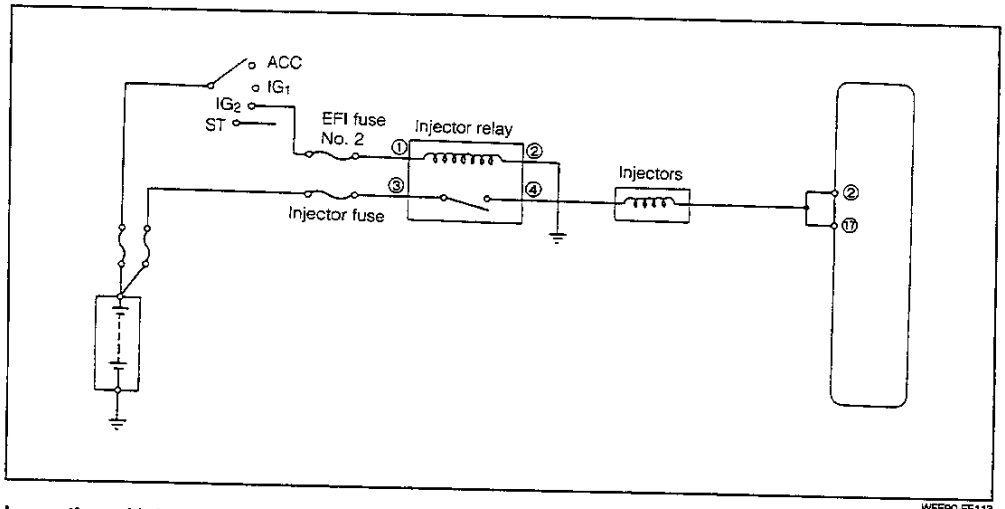


WFE90-EF111

4. If the main relay persists to be inoperative after the checks 1 through 3 have been performed satisfactorily, check the following items.
   (1) Fusible links
   (2) Ignition switch
   (3) Fuses
   (4) Wiring and wiring connector
5. Install the main relay to the relay box. Attach the cover.

INJECTOR RELAY

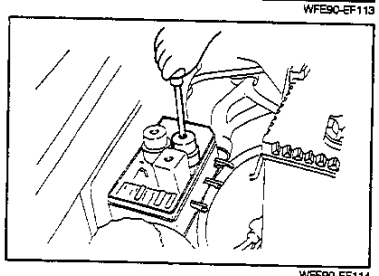
WFE90-EF112



WFE90-EF113

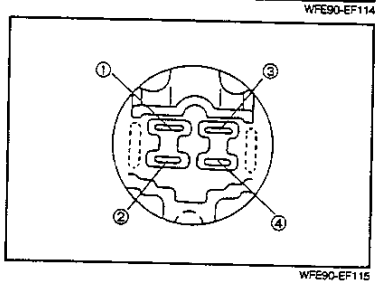
Inspection of injector relay

1. Check of injector relay operation
   Turn ON the ignition switch. Check to see if you can hear a relay operating sound or if you can feel operating vibrations when a screwdriver or the like is brought into contact with the relay.
   CAUTION:
   - **The relay may become very hot during the operation. Hence, do not touch the relay by your hand.**



WFE90-EF114

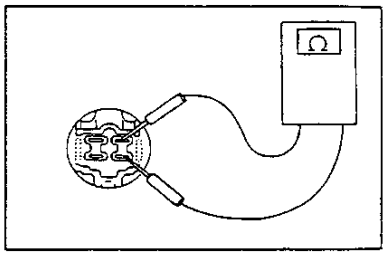
2. Inspection of relay continuity
   (1) Remove the injector relay from the relay box.
   Check that there is continuity between the terminals ① and ②.



WFE90-EF115

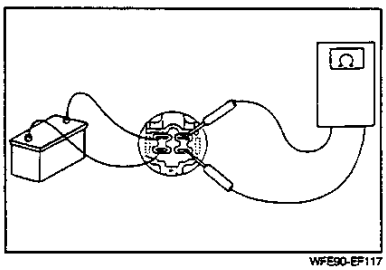
Check that there is no continuity between the terminals ③ and ④.
Check that there is no continuity between the terminals ① and ③ and also between the terminals ① and ④.
Check that there is no continuity between the terminals ② and ③ and also between the terminals ② and ④.

If the continuity test results do not conform to specifications, replace the relay.


WFE90-EF116

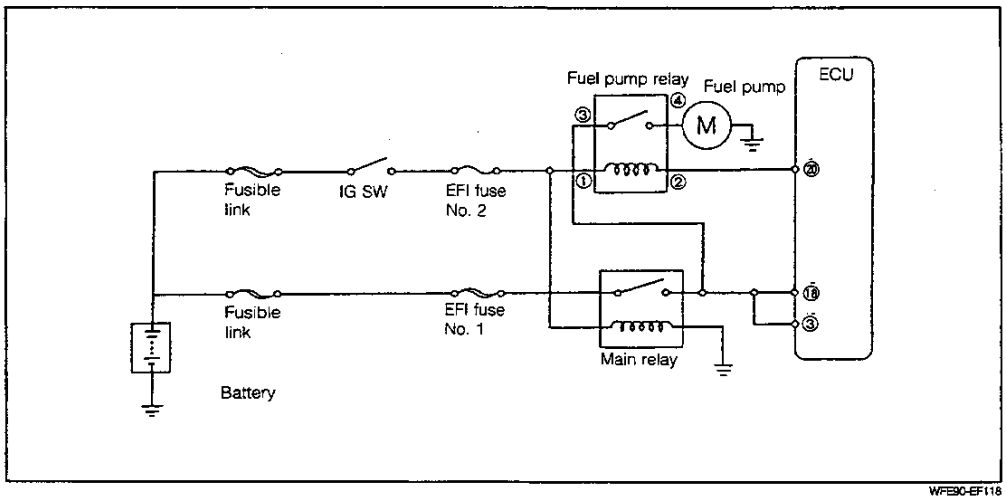
3. Inspection of relay operation
   (1) Apply the battery voltage across the terminals ① and ②.
   (2) Check that there is continuity between the terminals ③ and ④.

   If the operation test results do not conform to specifications, replace the relay.


WFE90-EF117

4. If the injector relay persists to be inoperative after the checks 1 through 3 have been performed satisfactorily, check the following items.
   (1) Fusible links
   (2) Fuses
   (3) Ignition switch
   (4) Wiring and wiring connector
5. Install the injector relay to the relay box. Attach the cover.

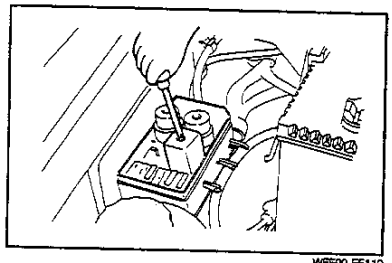
FUEL PUMP RELAY



WFE90-EF118

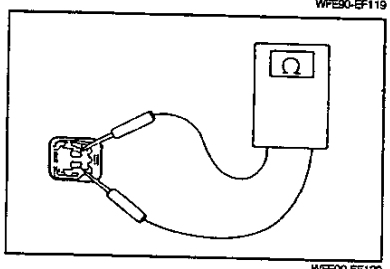
Inspection of fuel pump relay

1. Check of fuel pump relay operation
   When the ignition switch is set to the ON position, check to see if the relay emits an operating sound. Or check to see if you will feel an operating vibration with a screwdriver or the like placed on the relay.
   CAUTION:
   - **The relay may become very hot during the operation. Hence, do not touch the relay by your hand.**



WFE90-EF119

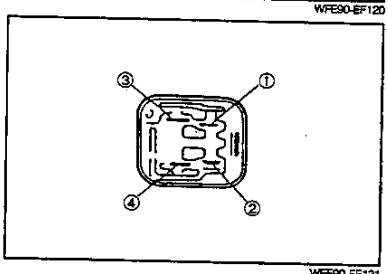
2. Inspection of relay continuity
   (1) Check that there is continuity between the terminals ① and ②.
   (2) Check that there is no continuity between the terminals ③ and ④.



WFE90-EF120

   (3) Check that there is no continuity between the terminals ① and ③ and also between the terminals ① and ④.
   (4) Check that there is no continuity between the terminals ② and ③ and also between the terminals ② and ④.

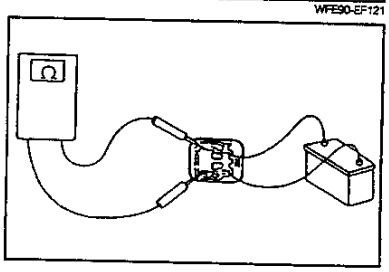
   If the continuity test results do not conform to specifications, replace the relay.



WFE90-EF121

3. Inspection of relay operation
   (1) Apply the battery voltage across the terminals ① and ②.
   (2) Check that there is continuity between the terminals ③ and ④.

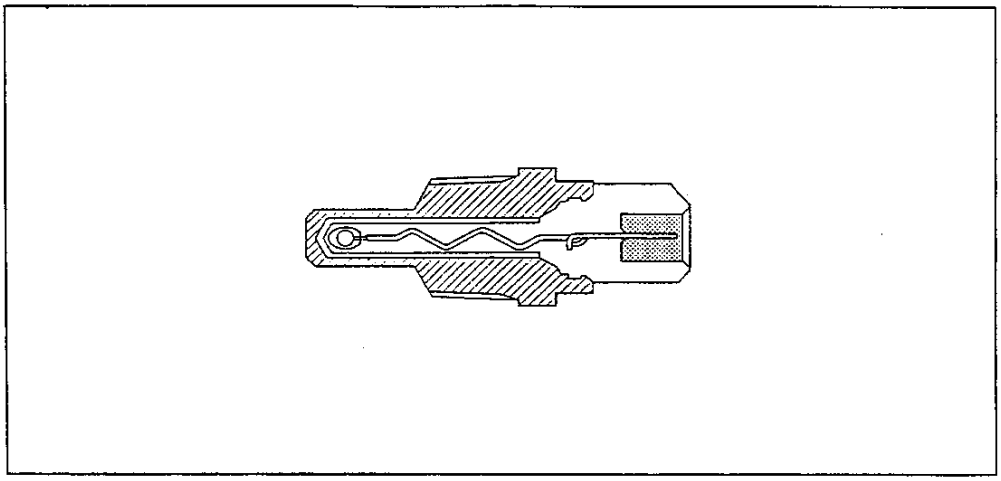
   If the operation test results do not conform to specifications, replace the relay.



4. If the fuel pump relay persists to be inoperative after the checks 1 through 3 have been performed satisfactorily, check the following items.
   (1) Fusible links
   (2) Ignition switch
   (3) Fuses
   (4) Main relay
   (5) Wiring and wiring connector
   (6) ECU

WFE90-EF122

WATER TEMPERATURE SENSOR

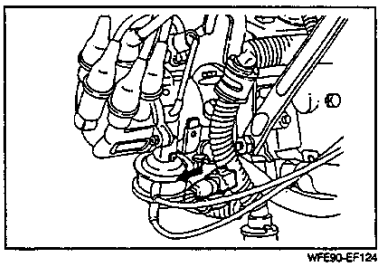


WFE90-EF123

INSPECTION OF WATER TEMPERATURE SENSOR

Measurement of resistance of water temperature sensor

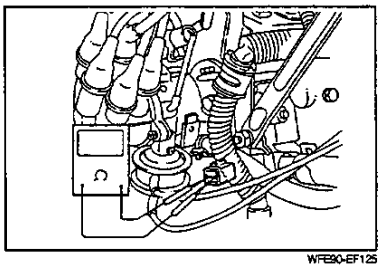
1. Disconnect the connector.
   NOTE:
   - Be sure to un-lock the lock of connector, when disconnect or connect the connector.



WFE90-EF124

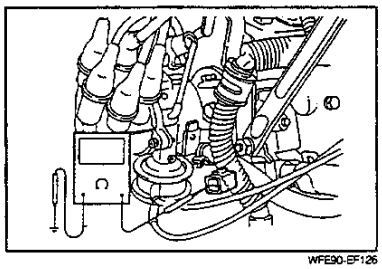
2. Start the engine. Read the resistance at the time when the engine is wormed up fully.
   Resistance: 0.32 ± 0.1 kΩ at 80°C

   If the measured resistance will not conform to the specification, remove the water temperature sensor and perform the unit inspection.



WFE90-EF125

3. Check that there is no continuity between each terminal of the water temperature sensor and the body.
   If there is continuity, replace the water temperature sensor.
   NOTE:
   - Before the water temperature sensor is removed, drain the coolant.
   - After completion of the sensor replacement, refill the coolant.



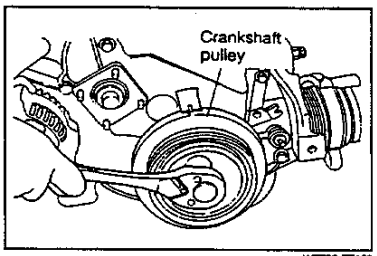
WFE90-EF126

Water temperature sensor removal and unit test

1. Disconnect the ground cable terminal from the negative (–) terminal of the battery.
2. Drain the cooling water.

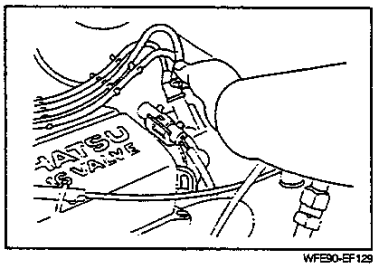
WFE90-EF127

3. Distributor removal
   (1) Turn the crankshaft, until the mark on the crankshaft timing belt pulley is aligned with the indicator mark on the timing belt cover. Ensure that the rocker arms of the cylinder No.1 at the timing belt side are in a free state. If the rocker arms are not in a free state, turn the crankshaft one more complete turn 360°.



WFE90-EF128

   (2) Remove the spark plug wires from the distributor cap.
   NOTE:
   - **Be sure to remove the spark plug wire by holding the rubber grommet. Never pull out the cord section.**

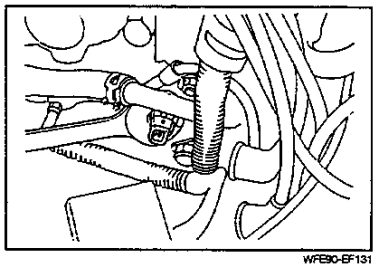


WFE90-EF129

   (3) Disconnect the distributor connector.
   (4) Disconnect the vacuum hoses from the vacuum advancer.
   (5) Remove the distributor by removing the distributor set bolts.
   NOTE:
   - **Since the oil flows out during the removal, place a suitable cloth underneath the distributor.**

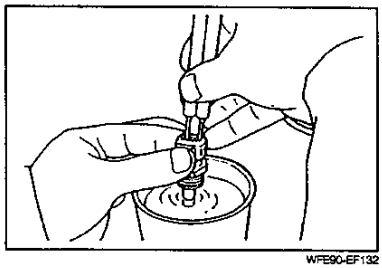
WFE90-EF130

4. Removal of water temperature sensor
   (1) Remove the water temperature sensor connector.
   (2) Remove the water temperature sensor.



WFE90-EF131

5. Unit check
   (1) Immerse the heat sensing section of the water temperature sensor in water. Raise the water temperature gradually. Check to see if the resistance varies within the specified values in accordance with the table below.

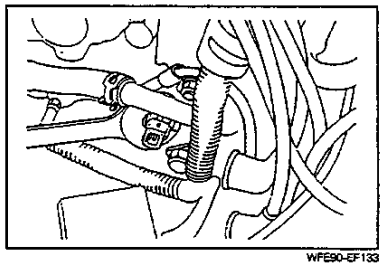

WFE90-EF132

Specifications

Water temperature °C	Resistance (kΩ)
80	0.322 ± 0.1
60	0.584 ± 0.2
40	1.140 ± 0.3
20	2.450 ± 0.5

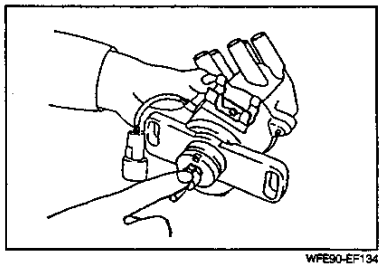
   If the resistance will not conform to the specifications, replace the ter temperature sensor.
   (2) Check that there is no continuity between each terminal of the water temperature sensor and sensor body.
   If there is continuity, replace the intake air temperature sensor.

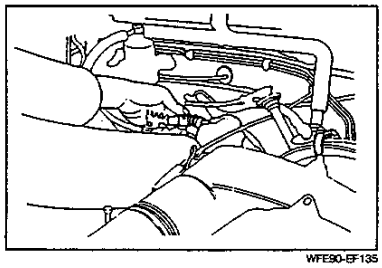
6. Installation of water temperature sensor
   (1) Wind sealing tape to the water temperature sensor switch and install it to the cylinder. Connect the connector.
   Tightening Torque: 24.5 - 34.3 N·m (2.5 - 3.5 kgf-m)


WFE90-EF133

NOTE:
- **The new sensor is coated with sealer. Hence,when the sensor is replaced with a new one, first remove the sealer thoroughly. Then, wind the seal tape. Also, be sure to clean the threaded holes at the cylinder head side.**

   (2) Distributor installation
   ① Replace the distributor "O" ring with a new part.
   ② With the coupling cut-out section of the distributor aligned with the cut-out section of the distributor body, insert the distributor into the cylinder head. At this time, ensure that the distributor attaching bolt hole of the cylinder head comes at the center of the elongated hole for the distributor bolt. Then, torque the distributor set bolt.
   ③ Connect the vacuum hoses to the vacuum advancer.
   ④ Connect the distributor connector. Install the connector to the clamp.
   ⑤ Connect the high-tension cords to the distributor cap.

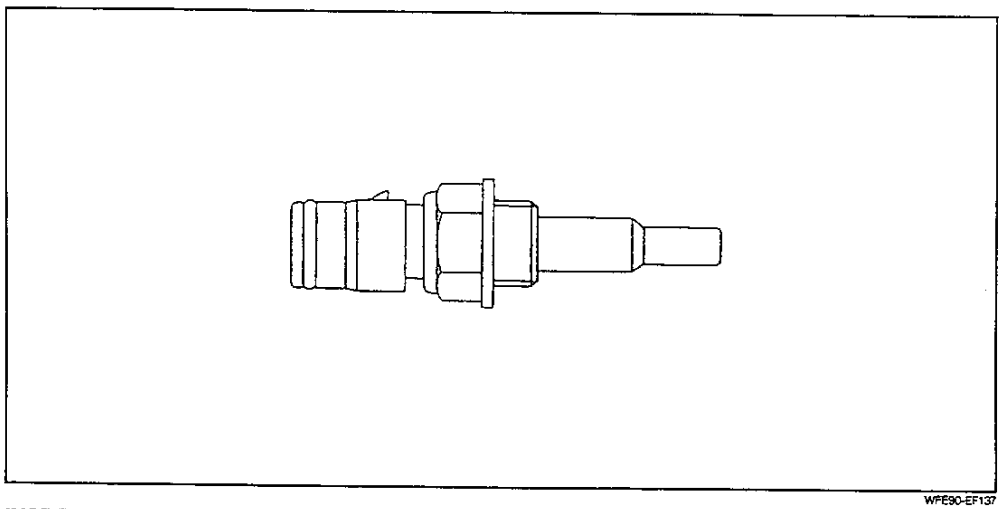

WFE90-EF134


WFE90-EF135

(3) Connect the ground cable terminal to the battery negative (–) terminal.
(4) Fill cooling water.
(5) Adjust the ignition timing.
(6) Start the engine. Ensure that no water or oil leakage is present.
(7) Check the oil level.

WFE90-EF136

INTAKE AIR TEMPERATURE SENSOR

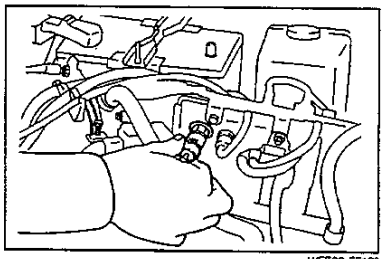


WFE90-EF137

INSPECTION OF INTAKE AIR TEMPERATURE SENSOR

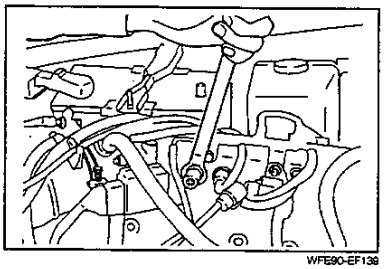
Measurement of resistance of intake air temperature sensor

1. Disconnect the connector.
   NOTE:
   - Do not pull out the lead wire. While holding the connector section, unlock the lock and pull out the connector.



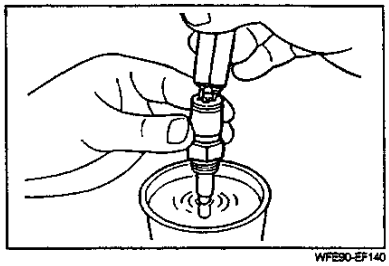
WFE90-EF138

2. Remove the intake air temperature sensor.



WFE90-EF139

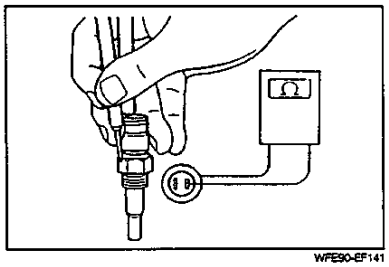
3. Immerse the heat sensing section of the intake air temperature sensor in water. Raise the water temperature gradually. Check to see if the resistance varies within the specified values in accordance with the table.
   If the measured resistance will not conform to the specifications, replace the intake air temperature sensor.


WFE90-EF140

Specifications

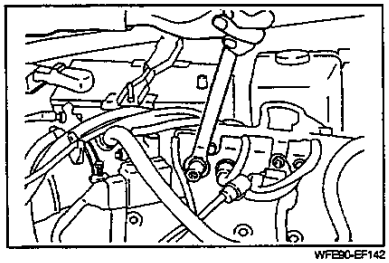
Water temperature °C	Resistance (kΩ)
60	0.584 ± 0.2
40	1.140 ± 0.3
20	2.450 ± 0.5

4. Check that there is no continuity between each terminal of the intake air temperature sensor and the sensor body.
   If there is continuity, replace the intake air temperature sensor.

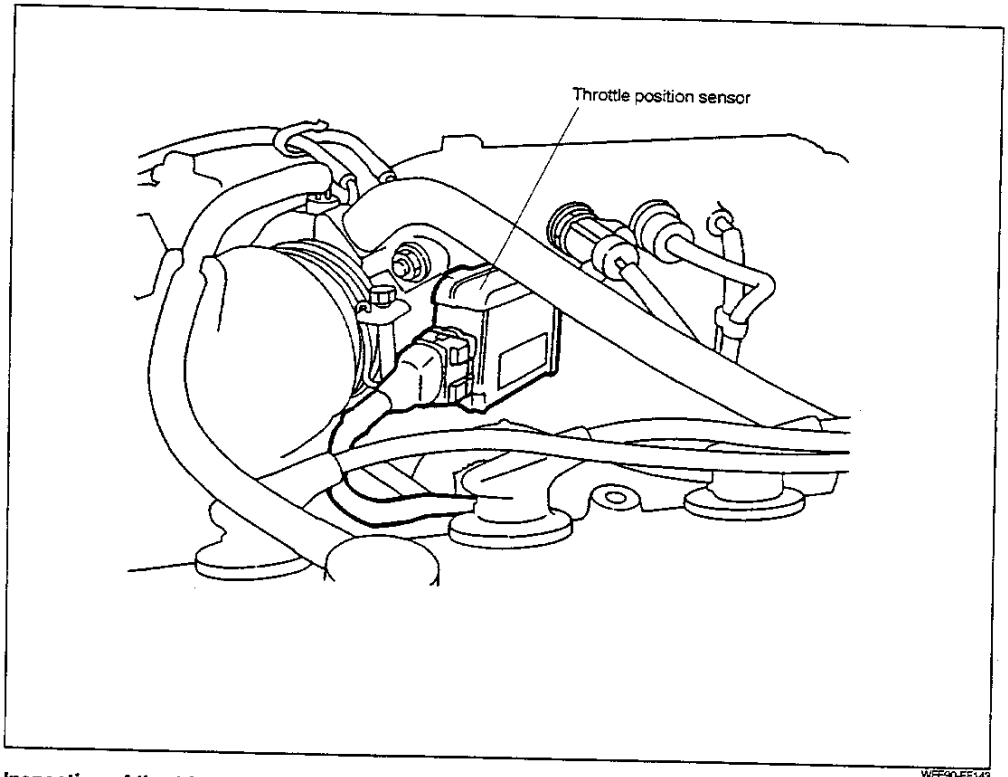

WFE90-EF141

5. Install the intake air temperature sensor to the surge tank with a new gasket interposed.
   Tightening Torque: 29.4 - 39.2 N·m (3.0 - 4.0 kgf-m)

6. Connect the intake air temperature sensor connector.


WFE90-EF142

THROTTLE POSITION SENSOR



WFE90-EF143

Inspection of throttle position sensor

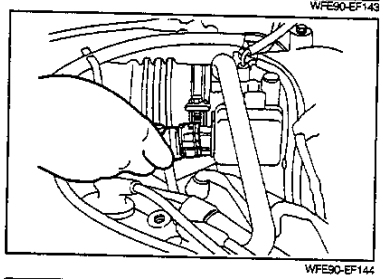
1. Remove the air chamber (See page EM–17.)

2. Unlock the throttle position sensor connector and disconnect it.
   CAUTION:
   - When disconnecting the connector, care must be exercised to ensure that no excessive load is applied to the throttle position sensor.

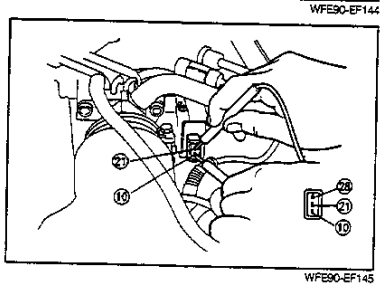
3. Measure the resistance between the terminals of the throttle position sensor.
   (1) Measure the resistance between ⑩ and ㉑ under the following conditions.

Throttle valve closed fully	29 kΩ or less at 20°C
Throttle valve opened fully	1000 kΩ or more

If the measured resistance does not conform to the specification, replace the throttle body.
CAUTION:
- Be very careful not to damage the terminal.



WFE90-EF144

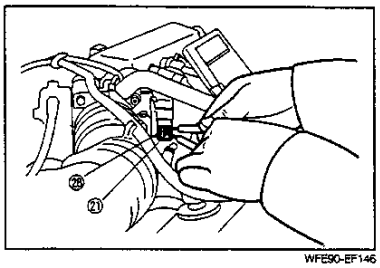


WFE90-EF145

(2) Measure the resistance between ㉘ and ㉑ under the following conditions.

Throttle valve closed fully	1000 kΩ or more
Throttle valve opened fully	29 kΩ or less

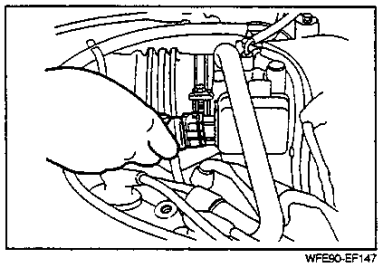
If the measured resistance does not conform to the specification, replace the throttle body.
CAUTION:
- **Be very careful not to damage the terminal.**



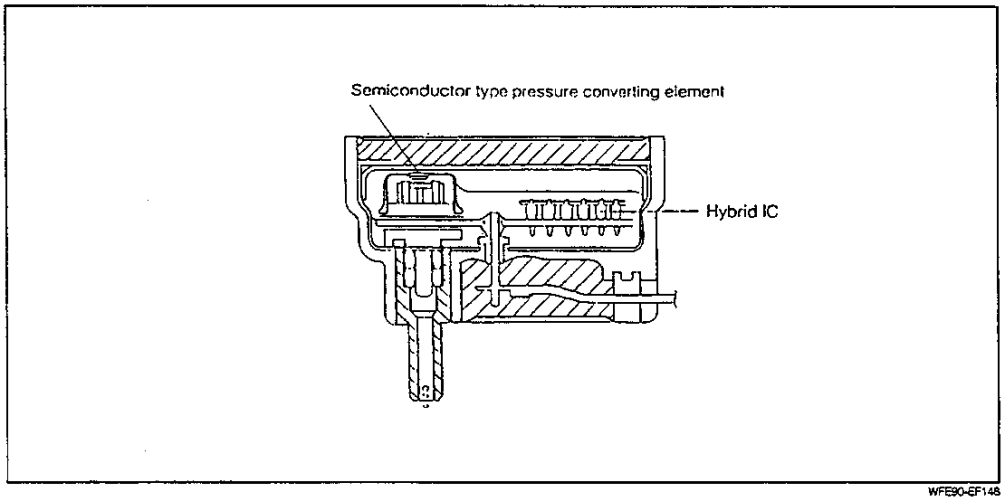
WFE90-EF146

4. Connect the throttle position sensor connector.
   CAUTION:
   - **When connecting the connector, care must be exercised to ensure that no excessive load is applied to the throttle position sensor.**

5. Install the air chamber (See page EM–22.)


WFE90-EF147

PRESSURE SENSOR

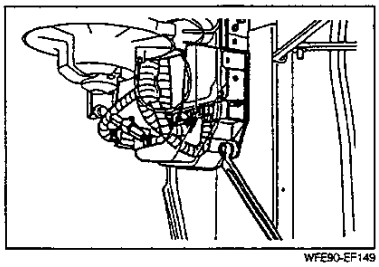


WFE90-EF148

INSPECTION OF PRESSURE SENSOR

Measurement of output voltage of pressure sensor

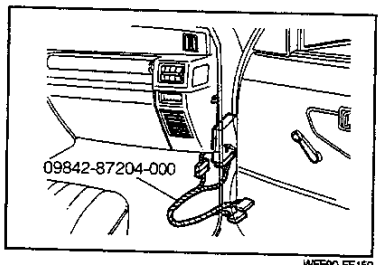
1. Connection of SST
   (1) Disconnect the ground cable terminal from the negative (–) terminal of the battery.
   (2) Remove the ECU cover.


WFE90-EF149

(3) Connect the following SST between the ECU and the engine wire.
SST: 09842-87204-000

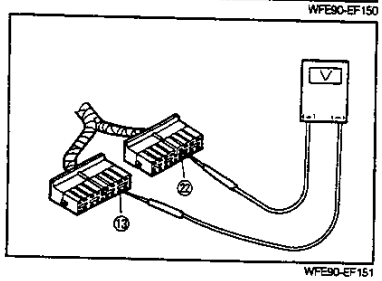
NOTE:
- **Before the SST is installed, be sure to perform continuity and short tests between the SST terminals.**

(4) Reconnect the ground cable terminal to the negative (–) terminal of the battery.



WFE90-EF150

2. Check of output of pressure sensor
(1) Measure the voltage between the SST terminals ⑬ and ㉒ when the ignition switch is turned ON.



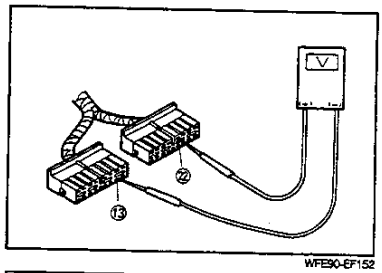
WFE90-EF151

Specified Value

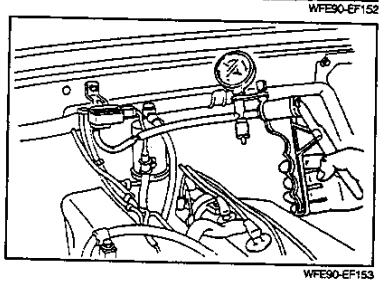
Measuring point	Atmospheric pressure kPa (mmHg)	Voltage V
Altitude (height above sea level) m		
0	101.3 (760)	3.2 - 4.0
500	95.5 (716)	3.1 - 3.8
1000	89.9 (674)	3.0 - 3.6

If the measured voltage does not conform to the specification, measure the voltage between the SST terminals ⑬ and ㉒. Ensure that the measured voltage is within a range of 4.5 to 5.5 volts. Then, proceed to replace the pressure sensor.
When the pressure sensor is replaced, it is necessary to replace the gas filter, too.
If the measured voltage between the SST terminals ⑬ and ㉒ does not conform to the specification, check the wiring between the ECU and the pressure sensor. If there is no trouble with the wiring, check the ECU.

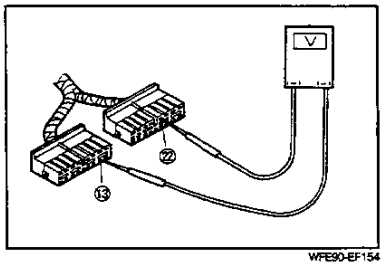
(2) Disconnect the rubber hose connected to the pressure sensor. Apply a negative pressure of 26.7 kPa (200 mmHg) to the pressure sensor, using a MityVac. Check that the measured voltage between the SST terminals ⑬ and ㉒ drops by 0.65 - 0.95, compared with the voltage measured in the step (1).



WFE90-EF152


WFE90-EF153

If the measured voltage fails to drop by the specified value, replace the pressure sensor.
When the pressure sensor is replaced, it is necessary to replace the gas filter, too.



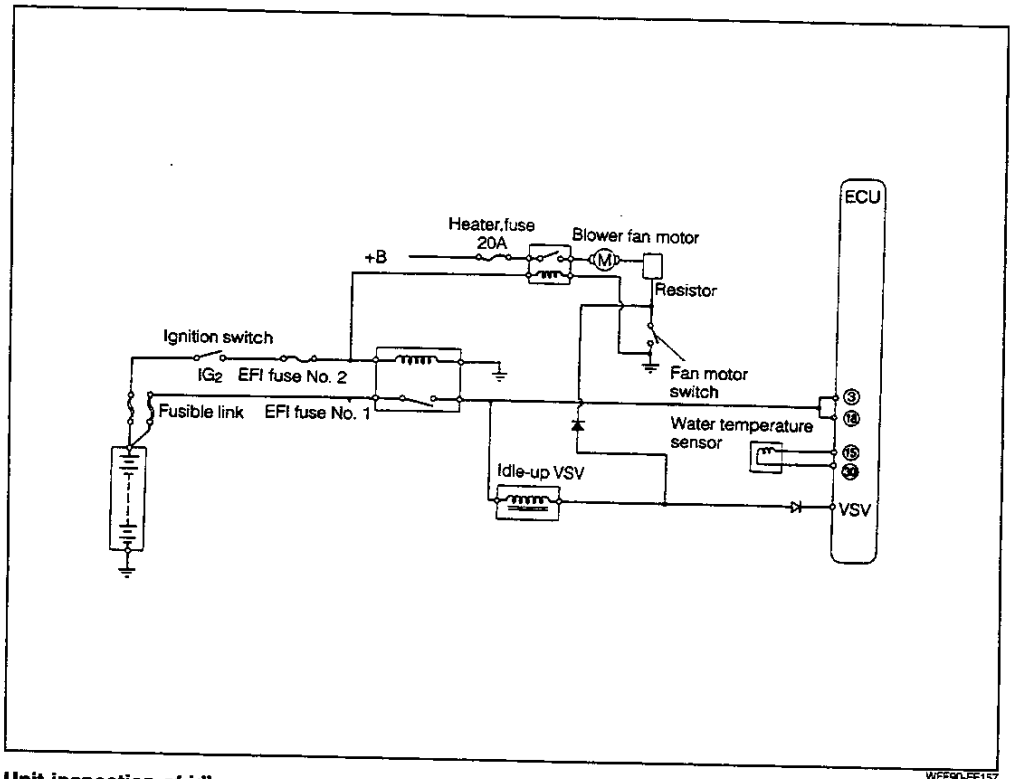
WFE90-EF154

(3) Remove the MityVac from the pressure sensor.
(4) Connect the rubber hose disconnected in the step (2) to the pressure sensor.

3. SST removal
   (1) Disconnect the ground cable terminal from the negative (–) terminal of the battery.
   (2) Remove the SST by disconnecting the ECU and engine wire connectors of the SST.
   (3) Connect the engine wire to the ECU.
   (4) Install the glove compartment box to the instrument panel.
   (5) Reconnect the ground cable terminal to the negative (–) terminal of the battery.

WFE90-EF155

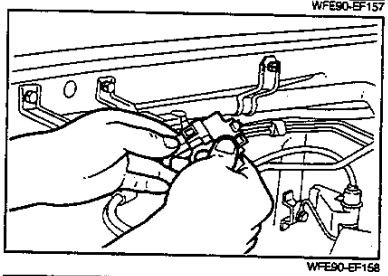
IDLE-UP VSV



WFE90-EF157

Unit inspection of idle-up vsv

1. Detach the idle-up VSV assembly from the bracket. Disconnect the idle-up VSV connector.

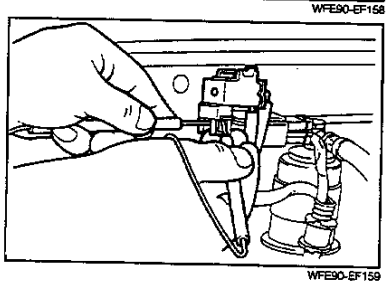


WFE90-EF158

2. Measure the resistance between the idle-up VSV terminals.

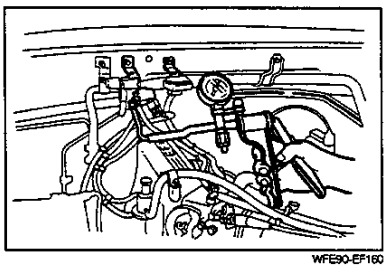
Specified value	30 - 50Ω at 20°C

If the resistance will not conform to the specification, replace the idle-up VSV.

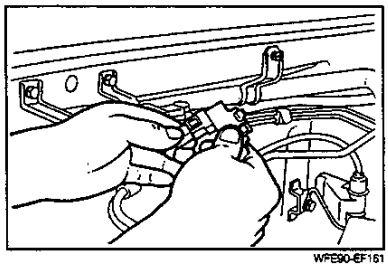


WFE90-EF159

3. Disconnect the rubber hose connected to the idle-up VSV and connect a MityVac or a vacuum pump. Apply a negative pressure of 13.3 kPa (100 mmHg).
   If no negative pressure is applied, replace the idle-up VSV.

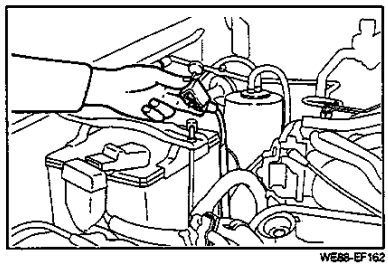

WFE90-EF160

4. Connect the idle-up VSV connector and turn ON the ignition key switch. Check to see if the negative pressure applied in the step 3 becomes zero.
   During this check, a voltage should be applied to the connector side.
5. Connect the disconnected rubber hose to the idle-up VSV. Attach the idle-up VSV to the bracket.

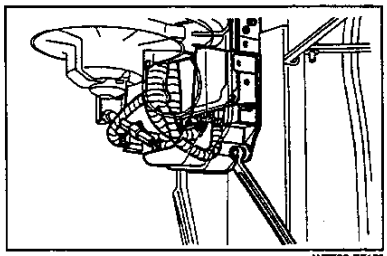

WFE90-EF161

Check of idle-up vsv control

1. Disconnect the ground cable terminal from the negative (–) terminal of the battery.

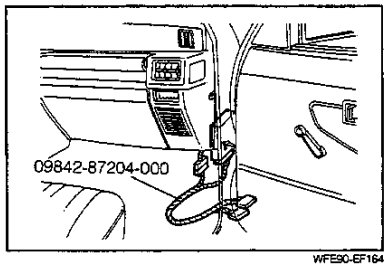

WE68-EF162

2. Remove the ECU cover.


WFE90-EF163

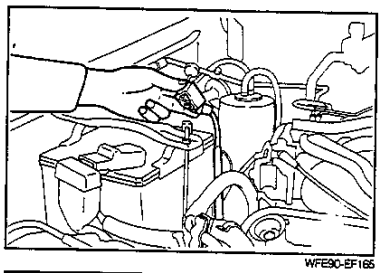
3. Connect the following SST between the ECU and the engine wire.
   SST: 09842-87204-000

   NOTE:
   - **Before the SST is installed, be sure to perform continuity and short tests between SST terminals.**



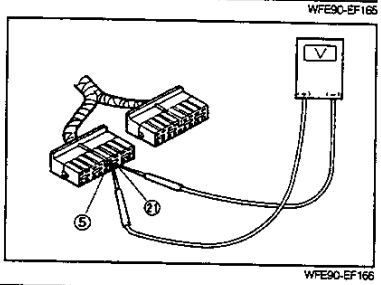
WFE90-EF164

4. Reconnect the ground cable terminal to the negative (–) terminal of the battery.



WFE90-EF165

5. With the engine running, measure the voltage across the SST terminals ⑤ and ㉑.



WFE90-EF166

No.	Condition	Measured voltage
1	Engine has warmed up fully after starting.	Less than 3V
2	Defogger ON	
3	Headlamps ON	
4	Blower fan motor operating	

The measurement should not be performed when plural conditions of those described above are met concurrently.
If the check results will not conform to the requirements given in the table above, check and repair the following sections.

WFE90-EF167

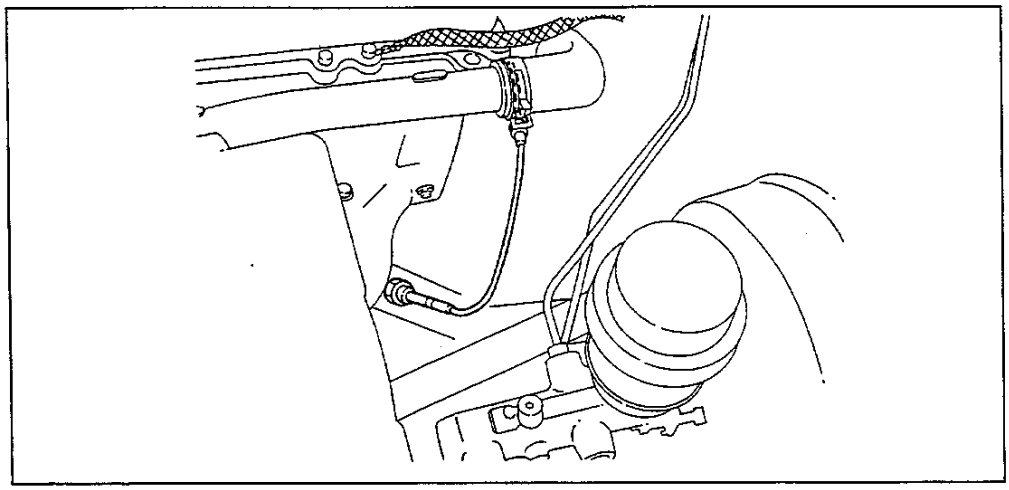
No.	Check item
1	Check water temperature sensor-related parts. (See page EF–56.) Check ECU. (See page EF–70.)
2, 3	Check to see if battery voltage is applied to between SST terminals ⑪ and ㉑ when defogger switch and/or headlamp switch is turned ON. If battery voltage is applied, check ECU. If no battery voltage is applied, check wiring from ECU ⑪ terminal to defogger switch and/or headlamp switch.
4	Check and repair wiring between blower fan motor switch and idle-up VSV.

WFE90-EF168

6. SST removal
   (1) Disconnect the ground cable terminal from the negative (–) terminal of the battery.
   (2) Remove the SST by disconnecting the ECU and engine wire connectors of the SST.
   (3) Connect the engine wire to the ECU.
   (4) Install the ECU cover.
   (5) Reconnect the ground cable terminal to the negative (–) terminal of the battery.

WFE90-EF169

OXYGEN SENSOR



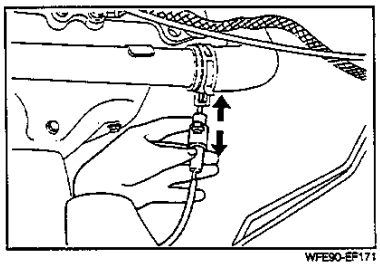
WFE90-EF170

Inspection of oxygen sensor

1. Unit inspection of oxygen sensor

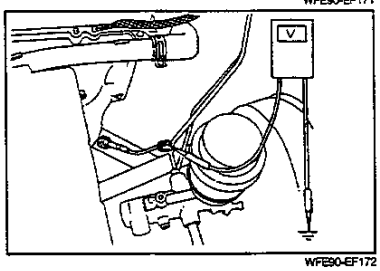
WARNING:
- Do not attempt this operation unless the engine has been cooled.

(1) Disconnect the oxygen sensor connector.



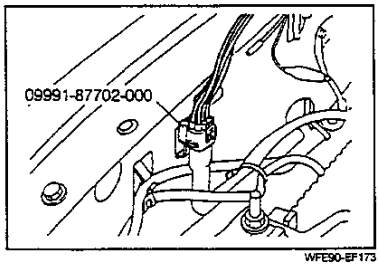
WFE90-EF171

(2) Start and warm up the engine completely.
(3) Connect a voltmeter to the connector of the oxygen sensor.
(4) Depress the accelerator pedal. At this time, ensure that the reading of the voltmeter is 0.45 V or more.
Replace the oxygen sensor with a new part if the reading is not 0.45 V or more.
(5) Remove the voltmeter from the oxygen sensor connector. Reconnect the connector. Install the connector to the clamp.



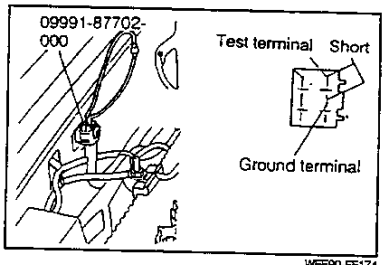
WFE90-EF172

2. System inspection of oxygen sensor
(1) Remove the cap of the check connector. Connect the following SST to the check connector.
SST: 09991-87702-000



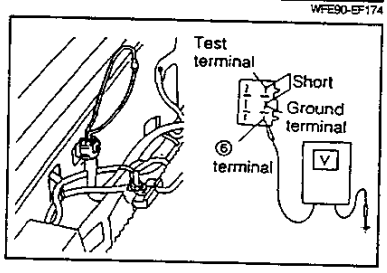
WFE90-EF173

(2) Start and warm up the engine completely.
(3) Connect the test terminal (brown) of the SST to the ground terminal (black).



WFE90-EF174

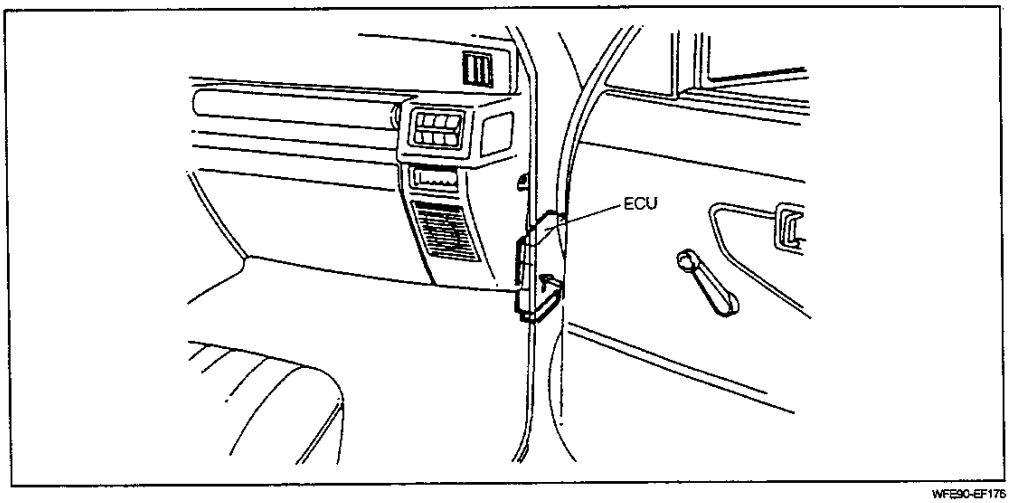
(4) Connect a voltmeter to the output terminal (green) of the SST.



(5) Hold the engine speed at 3000 rpm.
(6) After a lapse of 2 minutes, ensure that the reading of the voltmeter connected in the step (4) changes eight times or more for 10 seconds.
If the change in voltage fails to occur eight times or more, check the diagnosis code. Replace the oxygen sensor if no malfunction code is memorized.
(7) Stop the engine.
(8) Remove the SST which was connected to the check connector. Attach the cap to the check connector.

WFE90-EF175

ELECTRONIC CONTROL UNIT (ECU)



WFE90-EF176

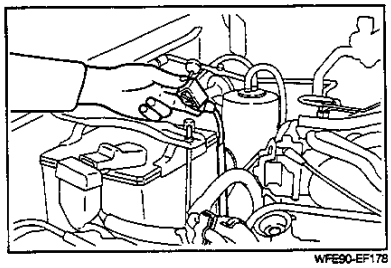
Inspection of ECU

1. Measurement of ECU input/output voltage

   NOTE:
   - The wiring circuit of the EFI can be checked by measuring the voltage and resistance at the ECU connector terminals.
   - The measurement of voltage should be conducted while all of the connectors are connected.
   - Make sure that the battery voltage is 11 V or more when the ignition switch is turned ON.

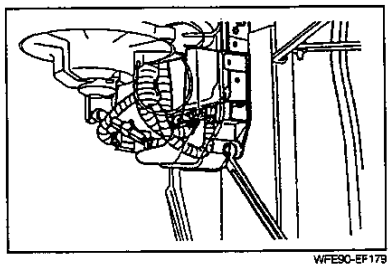
   (1) Disconnect the battery ground cable from the negative terminal (–) of the battery.

WFE90-EF177



WFE90-EF178

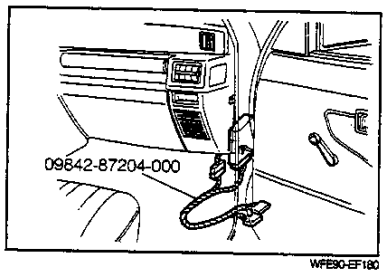
   (2) Remove the ECU cover.



WFE90-EF179

(3) Connect the following SST between the ECU and the engine wire.
SST: 09842-87204-000

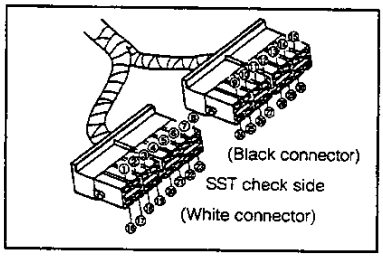
NOTE:
- **Before the SST is connected, make sure that no open wire and/or no short exists between the SST terminals.**



WFE90-EF180

(4) Connect the battery ground cable to the negative (–) terminal of the battery.
(5) Measure the voltage between the terminals under each condition shown in the table below.
Replace the ECU if the engine shows abnormality despite the fact that all measured results are normal.
If the measured results are abnormal, check the malfunctioning system. Repair or replace the malfunctioning part.
Replace the ECU if no abnormality exists in the wiring system.

NOTE:
- **The measurement should be carried out at the measuring terminals of the SST.**



WFE90-EF181

Voltage or resistance at ECU wiring connectors

Terminals	STD voltage or resistance	Conditions	Remedies
① - ㉑	Less than 1Ω	Ignition switch OFF	Proceed to flow chart ②.
② - ㉑	Less than 1V	Ignition switch OFF (after more than one minute)	Check power supply.
	Approx battery voltage	Ignition switch ON	
③ - ㉑	Less than 0.1V	Ignition switch OFF (after more than ten seconds)	Check power supply.
	Approx battery voltage	Ignition switch ON	
④ - ㉑	Approx battery voltage	At all times (Measured voltage is lower than specified voltage only at during starting period.)	Check power supply.
⑤ - ㉑	Approx battery voltage	Engine fully warmed up. All accessory switches turned OFF.	Check power supply.
	Less than 3V	Idle-up VSV ON	Check idle-up VSV control.
⑥ - ㉑	4.5 - 5.5V	Ignition switch ON. Terminal T shorted with ground terminal. Throttle valve fully closed.	Proceed to flow chart ②.
	Less than 1V		Check diagnosis code.
	0 - 4.5 to 5.5V (Measured voltage varies.)	Ignition switch ON. Terminal T shorted with ground terminal. Engine revolution speed held at 3000 rpm after it has fully warmed up.	Oxygen sensor system
⑦ - ㉑	Less than 0.1V	Ignition switch OFF	Check power supply.
	Approx battery voltage	Ignition switch ON	
⑧ - ㉑	Less than 0.1V	Ignition switch OFF	Check power supply.
	More than 6v	When ignition switch is set to ST position	
⑨ - ㉑	Less than 0.1V	Ignition switch OFF	Check T-terminal wiring.
	Approx battery voltage	Ignition switch ON	
⑩ - ㉑	Less than 0.5V	Ignition switch ON. Throttle valve fully closed.	Throttle position sensor system.
	Approx battery voltage	Ignition switch ON. Throttle valve fully opened.	
⑪ - ㉑	Less than 0.1V	Ignition switch ON. Headlamp switch and/or defogger switch OFF.	Check idle-up VSV control.
	Approx battery voltage	Ignition switch ON. Headlamp switch and/or defogger switch ON.	
⑫ - ㉑	Less than 0.1V	Ignition switch OFF	Check VCC wiring.
	4.5 - 5.5V	Ignition switch ON	
⑬ - ㉑	3.2 - 4.0V	Ignition switch ON. Atmospheric pressure is 101.3 kPa (760 mmHg).	Check pressure sensor.
⑭ - ㉚	1.5 - 3.0V	Ignition switch ON. Air temperature inside surge tank: 20°C	Check intake air temperature sensor.
⑮ - ㉚	0.4 - 0.65V	Ignition switch ON. After engine has been warmed up fully. (Cooling water temperature: 80 - 90°C)	Check cooling water temperature sensor.

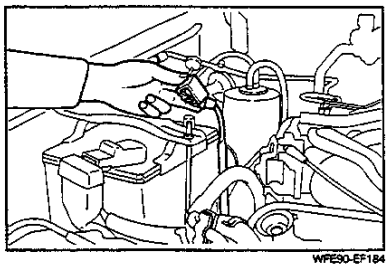
WFE90-EF182

Terminals	STD voltage or resistance	Conditions	Remedies
⑯ - ①	Less than 1Ω	Ignition switch OFF	Proceed to flow chart ②.
⑰ - ㉑	Less than 1V	Ignition switch OFF (after more than one minute)	Check/repair injector power supply.
	Approx battery voltage	Ignition switch ON	
⑱ - ㉑	Less than 0.1V	Ignition switch OFF	Check and repair ECU power supply.
	Approx battery voltage	Ignition switch ON	
⑲ - ㉑	Less than 3V	Ignition switch ON (Check engine lamp illuminated.)	Check power supply for check engine lamp.
	Approx battery voltage	Engine is rotating. (Check engine lamp not illuminated.)	
⑳ - ㉑	Less than 1V	Ignition switch ON. Fuel pump is operating.	Check/repair fuel pump power supply.
	Approx battery voltage	Ignition switch ON. Fuel pump is stopped.	
㉑ - Engine ground	Less than 0.2Ω	Ignition switch OFF	Check ground wiring.
㉒ - ㉑	Less than 0.2Ω	Ignition switch OFF	Replace ECU.
㉓ - ㉑	Approx battery voltage	Engine is rotating. Air conditioner compressor is rotating. (Genuine air conditioner-equipped vehicle)	Check air conditioner wiring.
㉕ - ㉑	0-Approx battery voltage	Ignition switch ON When vehicle is moved. (Measured voltage changes four times for movement of 1.5m.)	Check speed sensor.
㉖ - ㉑	4.5 - 5.5V	Ignition switch ON. Throttle valve fully closed.	Check throttle position sensor.
	Less than 0.5V	Ignition switch ON. Throttle valve fully opened.	
㉙ - ㉑	Less than 0.1V	Ignition switch ON (after more than 60 seconds)	Check oxygen sensor.
	Voltage varies within 0 - 1.0V	After engine has warmed up fully. When engine revolution is held at 3000 rpm for more than two minutes:	Check fuel system.
㉚ - ㉑	Less than 1Ω	Ignition switch ON	Proceed to flow chart ②.

WFE90-EF183

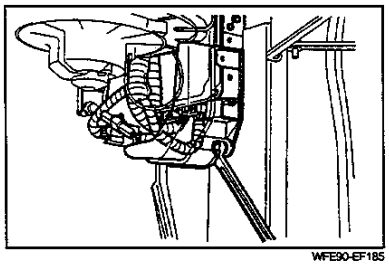
ECU replacement

1. Disconnect the ground cable terminal from the negative (–) terminal of the battery.



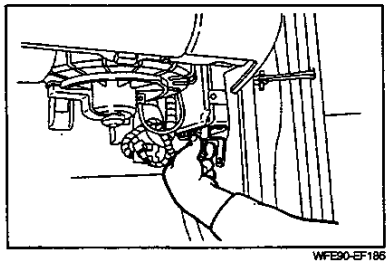
WFE90-EF184

2. Remove the ECU cover.



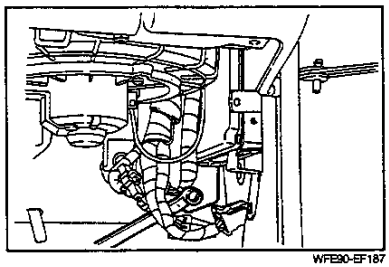
WFE90-EF185

3. Disconnect the engine wire connector from the ECU.



WFE90-EF186

4. Remove the ECU from the cowl panel by removing the attaching screws.
5. Install a new ECU to the cowl panel.
   CAUTION:
   - **Do not touch with the bracket screws mounted on the ECU proper. This tampering will cause an ECU malfunction.**



WFE90-EF187

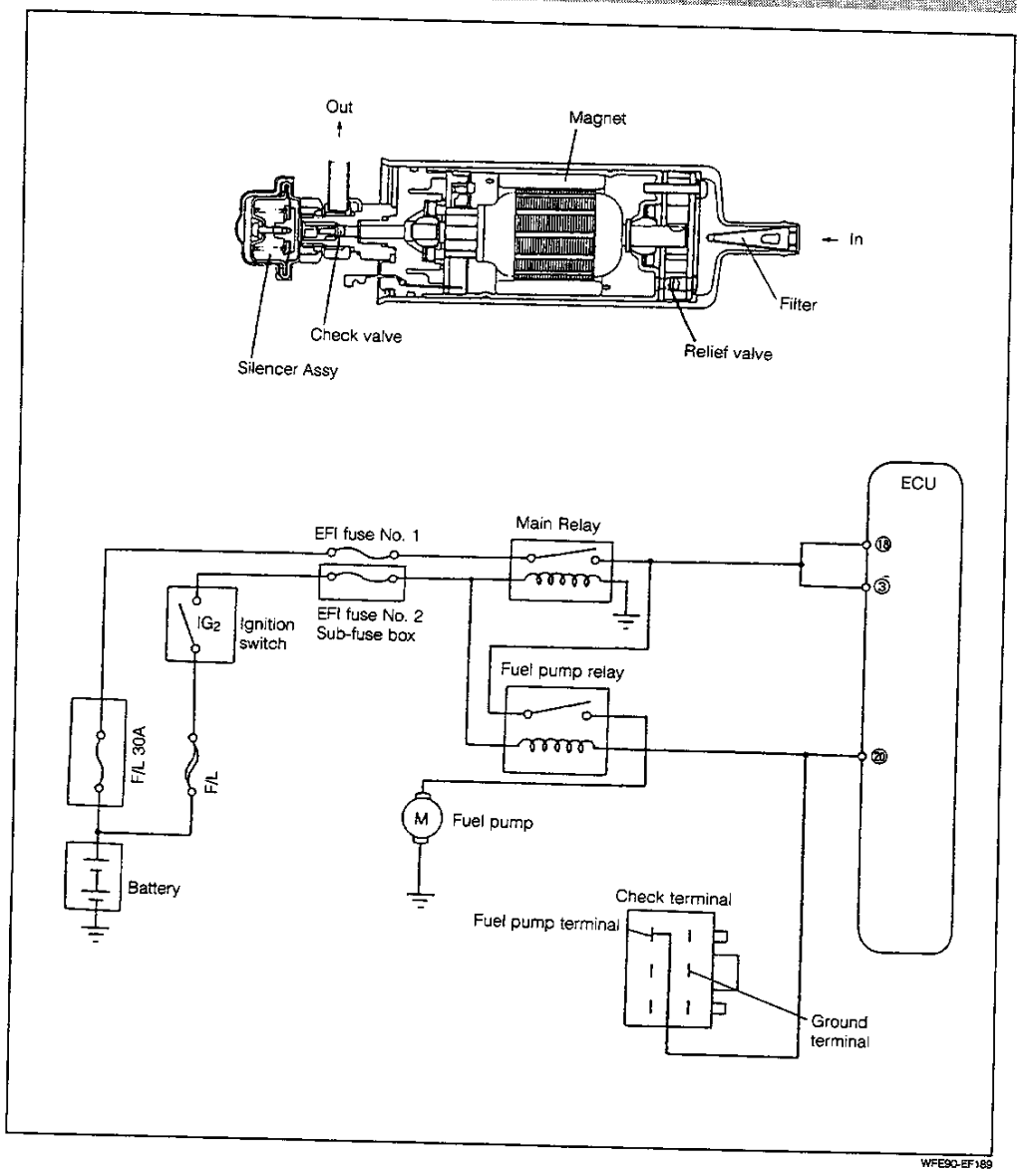
6. Connect the engine wire connector to the ECU.
7. Install the ECU cover on the cowl panel.
8. Connect the ground cable terminal to the negative (–) terminal of the battery.

WFE90-EF188

FUEL SYSTEM

FUEL PUMP

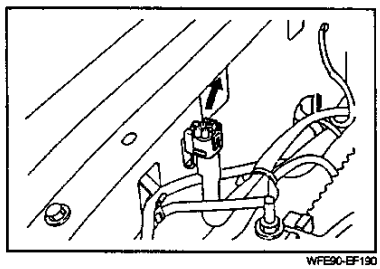
WARNING:
When working on the fuel system, never smoke nor allow any open flame to be brought near the working site



IN-VEHICLE INSPECTION

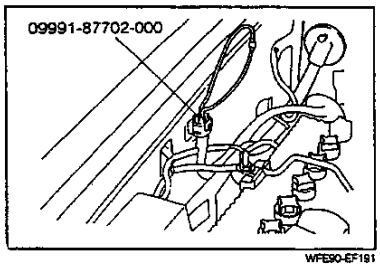
Check of fuel pump operation

1. Connection of SST (09991-87702-000)
   (1) Detach the check connector cap.



WFE90-EF190

   (2) Connect the SST to the check connector. Connect the SST terminal F (white/black) to the ground terminal (black).

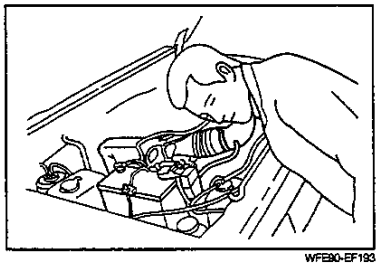


WFE90-EF191

2. Check of fuel flowing sound
   (1) Turn ON the ignition key switch.

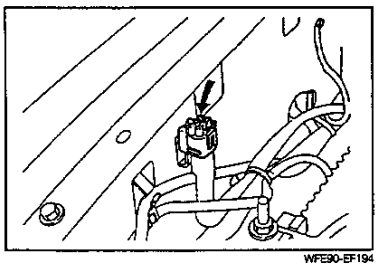
WFE90-EF192

   (2) Check to see if you can hear fuel flowing sound around the pressure regulator.
   (3) If you can hear no fuel flowing sound, check the following parts. Repair them, as required.
   - Fusible links
   - Fuses
   - Main relay
   - Fuel pump
   - Wiring and wiring connections



WFE90-EF193

3. SST Removal
   (1) Turn OFF the ignition switch.
   (2) Remove the SST from the check connector.
   (3) Attach the cap on the check connector.



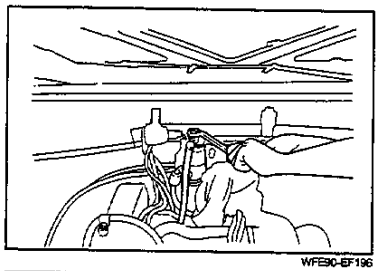
WFE90-EF194

Check of fuel pressure

1. Ensure that the battery voltage is 12 volts or more.
2. Disconnect the ground cable terminal from the negative (–) terminal of the battery.
3. Place a suitable container or cloth, etc. under the fuel filter.

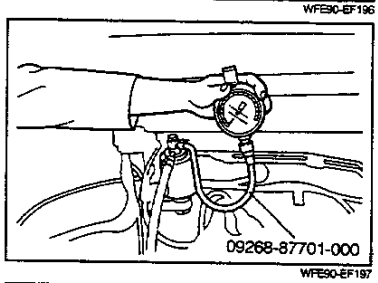
WFE90-EF195

4. Loosen the union bolt gradually.
   CAUTION:
   - The fuel pressure at the inside of the fuel line is approximately 250 kPa (2.55 kgf/cm²) higher than the atmospheric pressure. Hence, be sure to gradually loosen the union bolt so as to prevent fuel from splashing. Since the fuel will flow out, be certain to place a suitable container or cloth, etc. under the fuel filter so that no fuel may get to the resin or rubber parts of the vehicle.



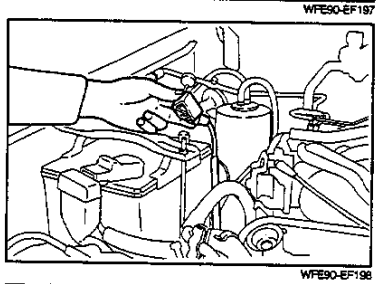
WFE90-EF196

5. Install the SST (fuel pressure gauge) between the fuel hose No. 1 and the fuel filter by means of the union bolt with a new gasket interposed.
   SST: 09268-87701-000
   Tightening Torque: 34.3 - 44.1 N·m (3.5 - 4.5 kgf-m)



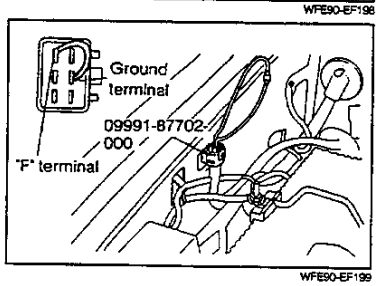
WFE90-EF197

6. Reconnect the ground cable terminal to the negative (–) terminal of the battery.



WFE90-EF198

7. Connection of SST (09991-87702-000)
   (1) Remove the cap on the check terminal.
   (2) Connect the SST to the check connector.
   (3) Connect the SST terminal fuel pump (white/black) to the ground terminal (black).
8. Turn ON the ignition switch.

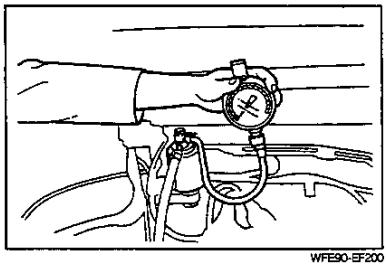


WFE90-EF199

9. Check to see if the fuel pressure conforms to the specified pressure.
   Specified Fuel Pressure:
   225.6 - 274.6 kPa (2.3 - 2.8 kgf/cm²)

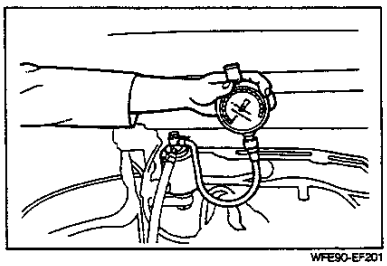
   If the fuel pressure is higher than the specified pressure, check and/or repair the following items.
   (1) Fuel return hose and/or pipe for restriction or damage.
   (2) Rubber hose connected between pressure regulator and surge tank for restriction.
   (3) If the check results of (1) and (2) are satisfactory, replace the pressure regulator.

   If the fuel pressure is lower than the specified pressure, check and/or repair the following items.
   (1) Fuel hose and/or pipe for restriction or damage or leakage.
   (2) Fuel filter for restriction.
   (3) Check fuel flow rate.
   (4) Pressure regulator.


WFE90-EF200

10. Turn OFF the ignition switch. After a lapse of three minutes, check to see if the fuel pressure is the specified pressure or more.
    Specified Fuel Pressure:
    176.5 kPa (1.8 kgf/cm²) or more

    If the fuel pressure is lower than the specified pressure, check and/or repair the following items.
    (1) Injector
    (2) Pressure regulator
    (3) Fuel hose and/or pipe for damage or leakage.

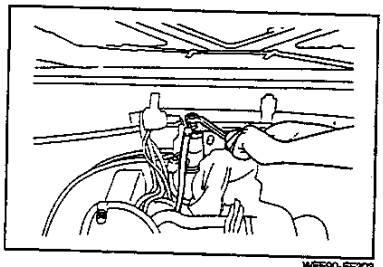

WFE90-EF201

11. SST removal
    (1) Turn OFF the ignition key switch.
    (2) Disconnect the ground cable terminal from the negative terminal (–) of the battery.
    (3) Loosen the fuel filter union bolt gradually.
    CAUTION:
    - **The fuel pressure at the inside of the fuel line is approximately 255.8 kPa (2.5 atm). higher than the atmospheric pressure. Hence, be sure to gradually loosen the union bolt so as to prevent fuel from splashing.**
      Since the fuel will flow out, be certain to place a suitable container or cloth, etc. under the fuel filter so that no fuel may get to the resin or rubber parts of the vehicle.

    (4) Remove the SST (fuel pressure gauge).
    SST: 09268-87701-000

WFE90-EF202

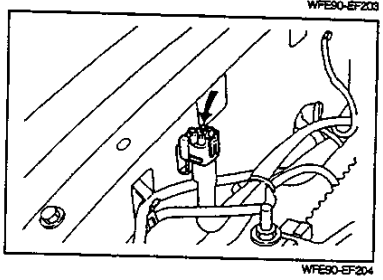
(5) Install the fuel hose No. 1 to the fuel filter by means of the union bolt with a new gasket interposed.
Tightening Torque: 34.3 - 44.1 N·m (3.5 - 4.5 kgf-m)



WFE90-EF203

(6) Remove the SST from the check connector.
SST: 09991-87702-000

(7) Attach the cap on the check connector.
(8) Reconnect the ground cable terminal to the negative (–) terminal of the battery.



WFE90-EF204

12. Check of fuel leakage
Start the engine. Check to see if any fuel leakage is present.
Repair any defective part if the fuel leakage exists.

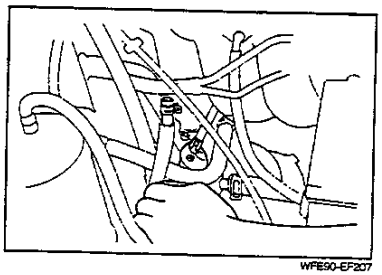
WFE90-EF205

Check of fuel flow rate

1. Ensure that the battery voltage is 12 volts or more.
2. Disconnect the ground cable terminal from the negative (–) terminal of the battery.
3. Place a suitable container or cloth, etc. under the pressure regulator.

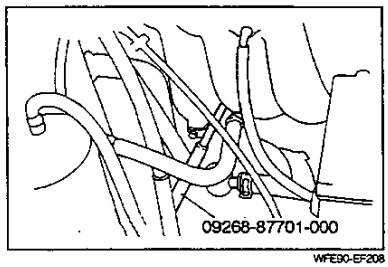
WFE90-EF206

4. Disconnect the fuel return hose connected to the pressure regulator.
CAUTION:
- **Since the fuel will flow out, be certain to place a suitable container or cloth, etc. under the pressure regulator so that no fuel may get to the alternator.**
- **Release the inner pressure of the fuel tank by removing the fuel filler cap in advance.**



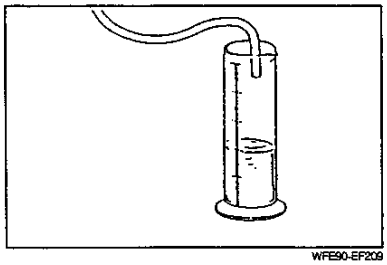
WFE90-EF207

5. Connect a suitable fuel hose (about 2 meter long) to the pressure regulator.
   Reference:
   - This fuel hose is included in the SST (09268-87702-000).

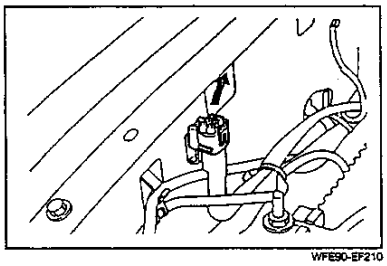


WFE90-EF208

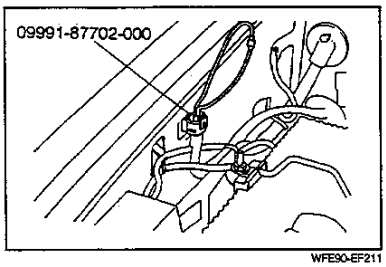
6. Insert one end of the fuel hose in a measuring cylinder.


WFE90-EF209

7. Detach the check connector cap.


WFE90-EF210

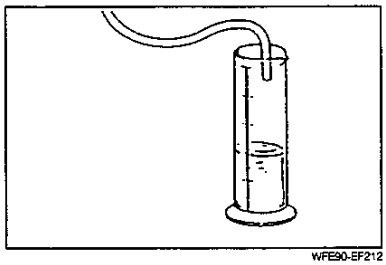
8. Connect the SST (09991-87702-000) to the check connector. Connect the SST terminal F (White/Black) to the ground terminal (Black).
9. Connect the ground cable terminal to the negative (–) terminal of the battery.
10. Turn ON the ignition switch for 15 seconds. Then, turn OFF the switch.



WFE90-EF211

11. Measure the amount of fuel collected in the measuring cylinder.
    Specified Amount of Fuel: 235 cm³ or more

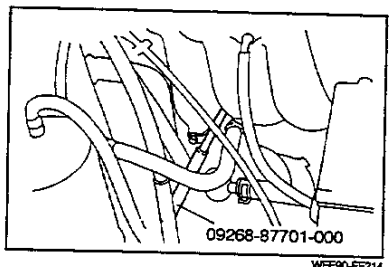
    If the fuel amount is less than the specified amount, check the fuel filter.
12. Disconnect the ground cable terminal from the negative (–) terminal of the battery.


WFE90-EF212

13. Remove the SST (09991-87702-000) from the check connector.
14. Attach the cap on the check connector.

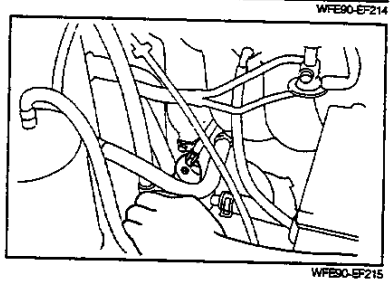
WFE90-EF213

15. Disconnect the fuel hose connected to the pressure regulator.



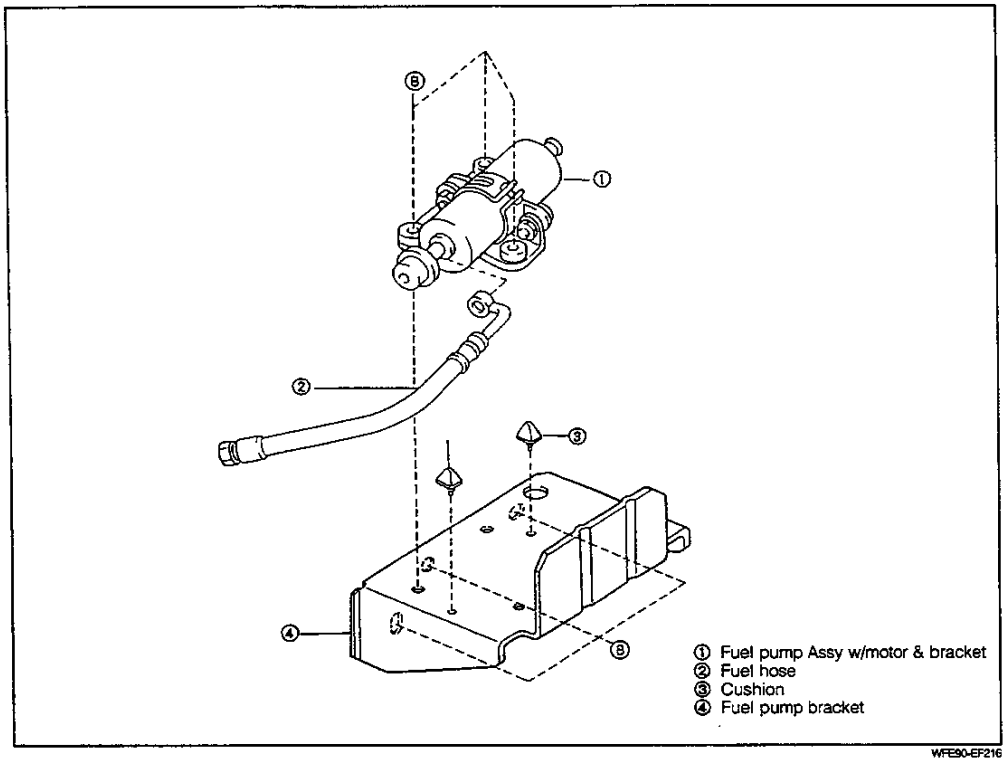
WFE90-EF214

16. Connect the fuel return hose to the pressure regulator. Attach the new clips.
17. Reconnect the ground cable terminal to the negative (–) terminal of the battery.
18. Start the engine. Check to see if any fuel leakage is present. Repair any defective part if fuel leakage exists.



WFE90-EF215

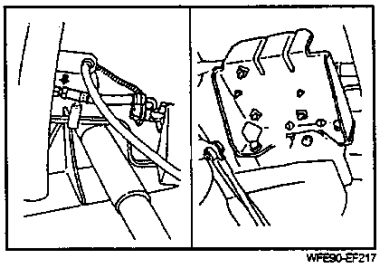
REMOVAL OF FUEL PUMP



WFE90-EF216

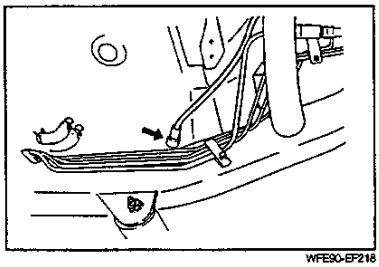
WARNING:
- When working on the fuel system, never smoke nor allow any open flame to be brought near the working site.

1. Disconnect the fuel hose front side from the fuel pump.
   CAUTION:
   - Since the fuel will flow out, be certain to place a suitable container or cloth, etc. under the fuel pump.



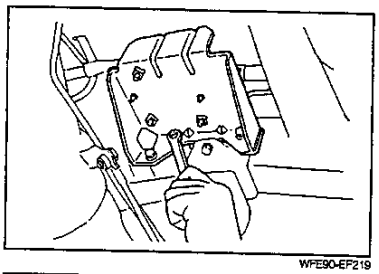
WFE90-EF217

2. Disconnect the fuel pump coupler.



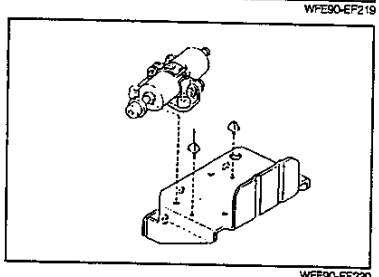
WFE90-EF218

3. Detach the fuel pump bracket by removing the three bolts.
4. Detach the fuel pump bracket from fuel pump by removing the three bolts.
5. Remove the fuel pump by disconnecting the fuel hose rear side.


WFE90-EF219

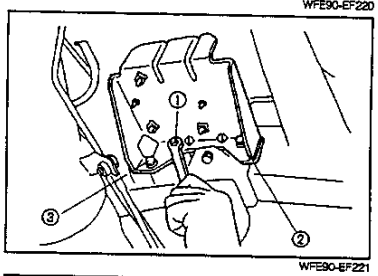
INSTALLATION OF FUEL PUMP

1. Connect the fuel hose rear side to the fuel pump.
   NOTE:
   - **Ensure that the fuel filter is installed at the fuel pump unlit port.**
   - **Ensure that the hose clamp is securely installed**


WFE90-EF220

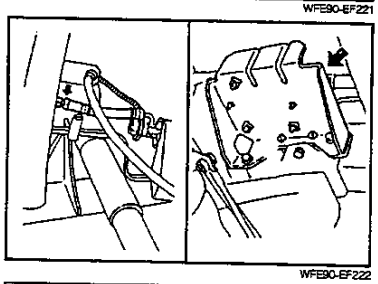
2. Install the fuel pump bracket to the fuel pump by tighten the three bolts.
   NOTE:
   - **Ensure that the two cushions are installed as correct position.**

3. Installation of bracket
   (1) Temporarily tighten bolt No. ①.
   (2) Tighten the bolt No. ② and No. ③.
   (3) Securely tighten the bolt No. ①.

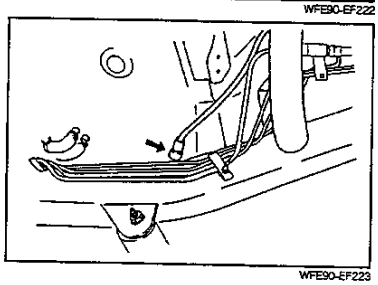


WFE90-EF221

4. Connect the fuel hose front and rear side to the fuel pump.
   Tightening Torque: 34.3 - 44.1 N·m (3.5 - 4.5 kgf-m)

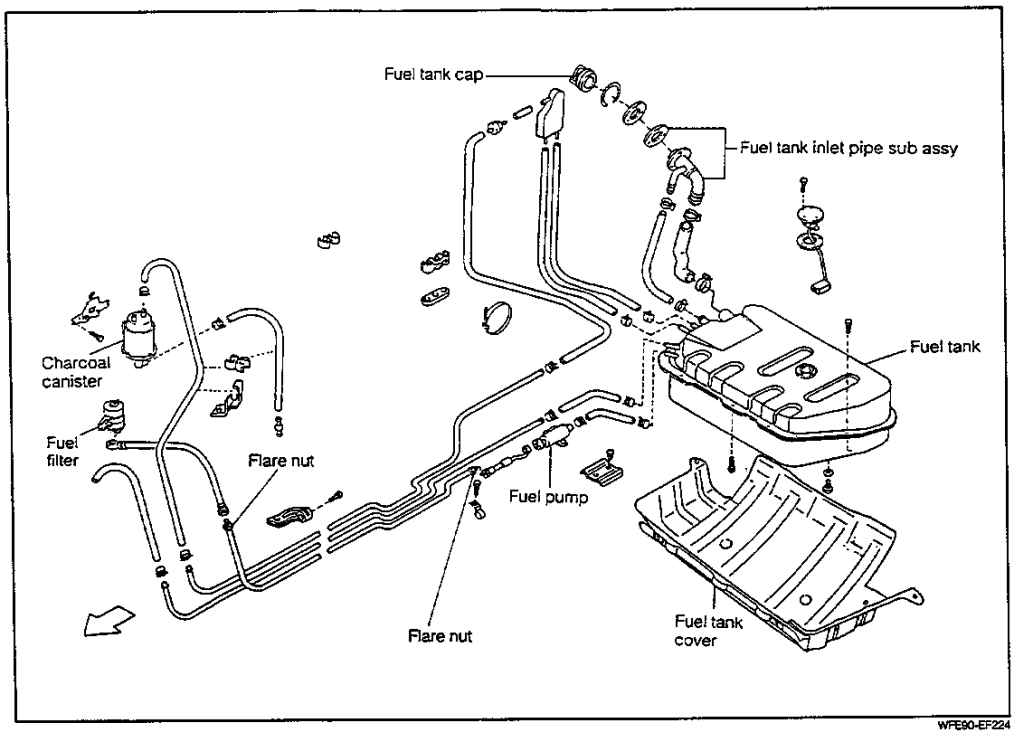

WFE90-EF222

5. Connect the fuel pump coupler.
   NOTE:
   - **Ensure that the lead wire is clamped at two position.**


WFE90-EF223

FUEL TANK AND LINE

COMPONENTS



WFE90-EF224

PRECAUTIONS

1. Always use a new gasket and hose band (clip) when replacing the fuel tank or components.
2. Each part should be tightened securely to the specified torque.

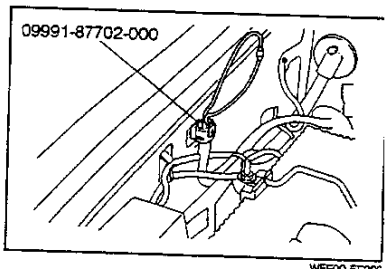
WARNING:

- Always keep fire away from the working site.

WFE90-EF225

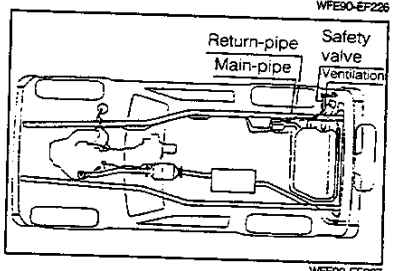
INSPECTION OF FUEL LINES AND CONNECTIONS

1. Connect the following SST to the check connector. Short the terminal F (White/Black) to the ground terminal (Black).
   SST: 09991-87702-000



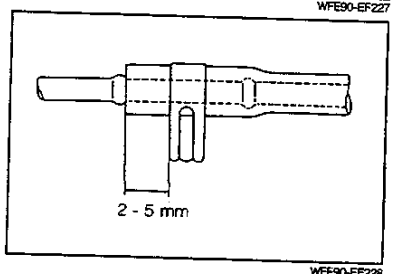
WFE90-EF226

2. Turn ON the ignition switch.
3. Check the fuel lines and connections for cracks, leakage or deformation.
   If any crack, leakage or deformation is present, replace or repair the part concerned.
4. Turn OFF the ignition switch. Remove the SST from the check terminal. Attach the cap to the check terminal.
5. Check the fuel tank for deformation, cracks or fuel leakage.
   If the fuel tank exhibits any defect, repair or replace the fuel tank.



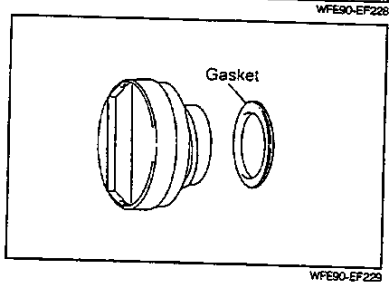
WFE90-EF227

6. Check the filler neck for damage or fuel leakage.
   If the filler neck exhibits any defect, repair or replace the filler neck.
7. Check to see if the hose and tube connections are installed as shown in the right figure.
   If any problem is found, repair or replace the parts, as required.



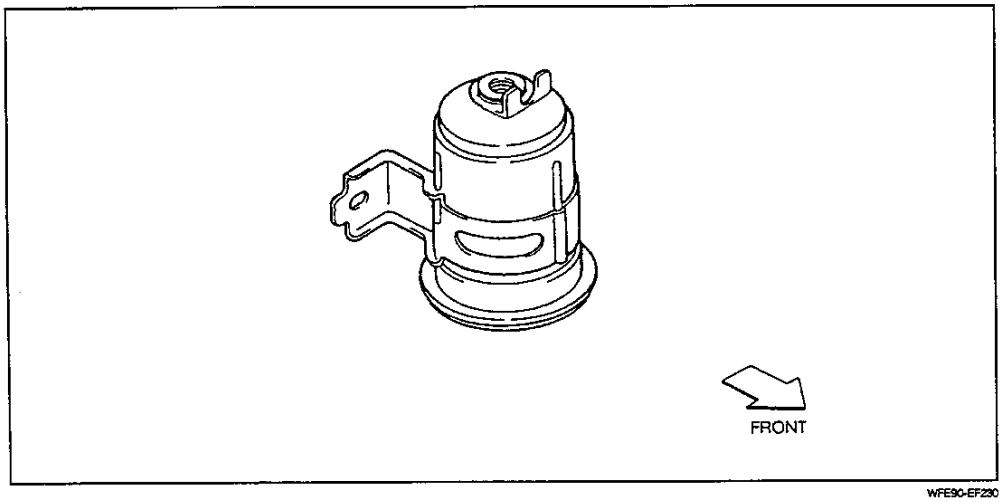
WFE90-EF228

8. Check to see if the fuel tank cap and gasket exhibits damage.
   Replace the gasket if it is damaged. Also, replace the fuel tank cap if it exhibits damage.



WFE90-EF229

FUEL FILTER ELEMENT



WFE90-EF230

CHECK OF FUEL FILTER ELEMENT

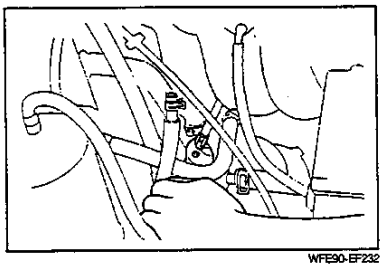
1. Disconnect the ground cable terminal from the negative (–) terminal of the battery.

WFE90-EF231

2. Disconnect the fuel return hose connected to the pressure regulator. Connect a suitable fuel hose (about 2 meter long) to the pressure regulator.
   REFERENCE:
   - This fuel hose is included in the SST (09268-87702-000).

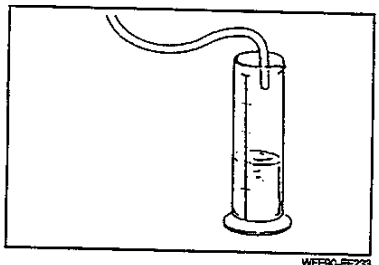
   NOTE:
   - Before the fuel return hose is disconnected, be sure to release the inner pressure of the fuel tank by detaching the fuel filler cap.

   CAUTION:
   - Since the fuel will flow out, be certain to place a suitable container or cloth, etc. under the pressure regulator so as to prevent fuel splashing.



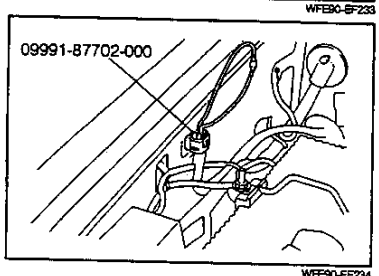
WFE90-EF232

3. Insert one end of the fuel hose in a measuring cylinder.



WFE90-EF233

4. Connection of SST (09991-87702-000)
   (1) Detach the cap from the check connector.
   (2) Connect the SST to the check connector.
   (3) Short the SST terminal F (White/Black) to the ground terminal (Black).
5. Connect the ground cable terminal to the negative (–) terminal of the battery.
6. Turn ON the ignition switch for 15 seconds. Then, turn OFF the switch.

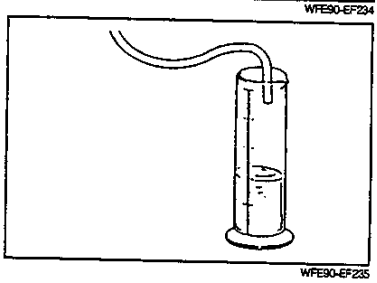


WFE90-EF234

7. Measure the amount of fuel collected in the measuring cylinder. Check to see if the measured amount conforms to the specification.
   Specified Amount of Fuel: 235 cm^3 or more

   NOTE:
   - **If it becomes necessary to bleed air, be sure to conduct the measurement at least twice.**

   If the fuel amount conforms to the specification, perform the operation, starting from the step 18 onward.
   If the fuel amount is less than the specified amount, perform the operation, starting from the step 8 onward.

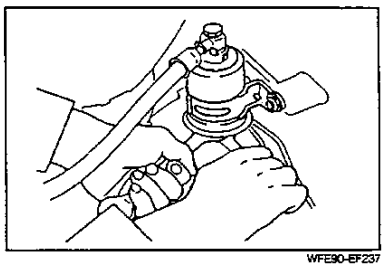


WFE90-EF235

8. Disconnect the ground cable terminal from the negative (–) terminal of the battery.

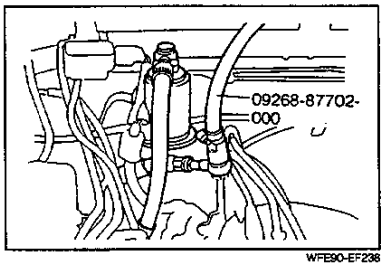
WFE90-EF236

9. Loosen the union bolt gradually.
   CAUTION:
   - The fuel pressure at the inside of the fuel line is approximately 250 kPa (2.55 kgf/cm^2) higher than the atmospheric pressure. Hence, be sure to gradually loosen the flare nut and use a cloth, etc. so as to prevent fuel from splashing.
     Since the fuel will flow out, be certain to place a suitable container or cloth, etc. under the fuel filter so that no fuel may get to the resin or rubber parts or electrical parts of the vehicle.



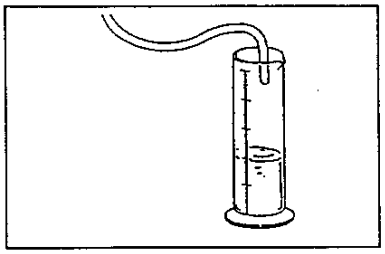
WFE90-EF237

10. Connect a suitable fuel hose (about 2 meter long) to the fuel pipe.
    REFERENCE:
    - This fuel hose is included in the SST (09268-87702-000).



WFE90-EF238

11. Insert one end of the fuel hose in a measuring cylinder.

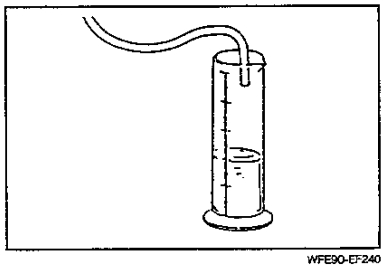


12. Reconnect the ground cable terminal to the negative (–) terminal of the battery.
13. Turn ON the ignition switch for 15 seconds. Then, turn OFF the switch.

WFE90-EF239

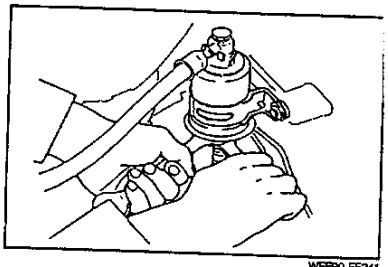
14. Measure the amount of fuel collected in the measuring cylinder.
    Specified Amount of Fuel: 235 cm^3 or more

    If the fuel amount conforms to the specification, replace the fuel filter.
    If the fuel amount is less than the specified amount, check the fuel pump filter for restriction. Then, replace the fuel pump as required.
15. Disconnect the ground cable terminal from the negative (–) terminal of the battery.



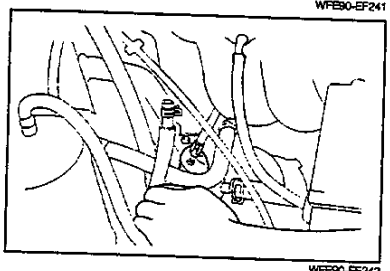
WFE90-EF240

16. Install the fuel hose to fuel filter by means of the union bolt with a new gasket interposed.
    Tightening Torque: 34.3 - 44.1 N·m (3.5 - 4.5 kgf-m)



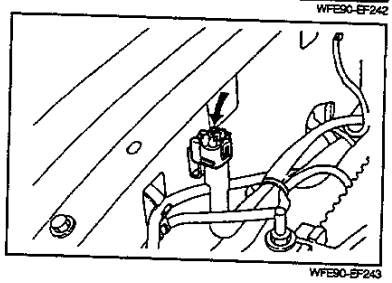
WFE90-EF241

17. Disconnect the fuel hose connected to the pressure regulator.
18. Connection of fuel hose to fuel pipe No. 2.
    (1) Insert the fuel return hose to the fuel pipe No. 2 untill second spool of fuel pipe.
    (2) Securely clamp the fuel hose at 2 - 5 mm from fuel return hose end with new clip.
    NOTE:
    - **Install the fuel return hose in parallel with chassis frame.**



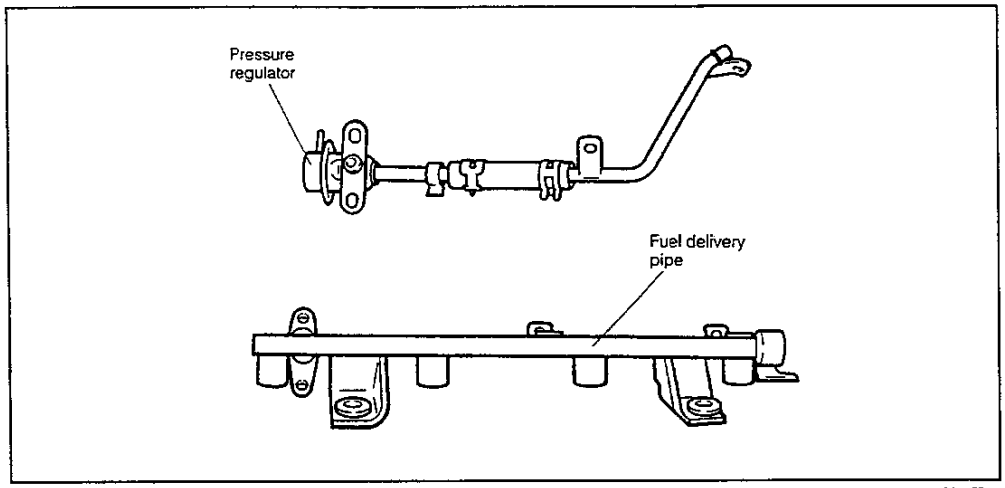
WFE90-EF242

19. Remove the SST from the check connector.
20. Attach the cap on the check connector.
21. Reconnect the ground cable terminal to the negative (–) terminal of the battery.
22. Start the engine. Check to see if any fuel leakage is present. Repair any defective part if fuel leakage exists.



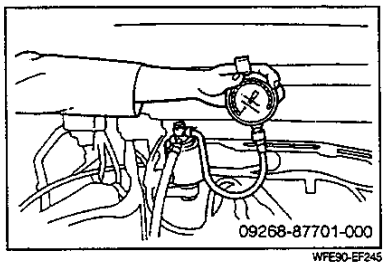
WFE90-EF243

PRESSURE REGULATOR



WFE90-EF244

IN-VEHICLE INSPECTION
Check the fuel pressure.



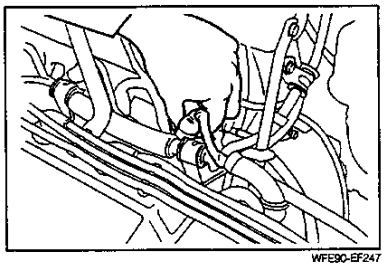
WFE90-EF245

REMOVAL OF PRESSURE REGULATOR

1. Disconnect the ground cable terminal from the negative (–) terminal of the battery.
2. Remove the air chamber assembly (See page EM–17.)

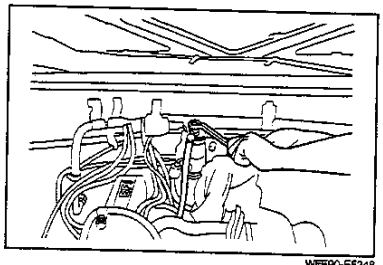
WFE90-EF246

3. Disconnect the injector connector from each injector.



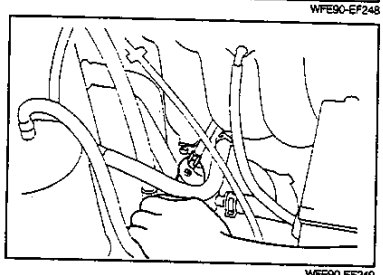
WFE90-EF247

4. Disconnect the fuel hose No. 1 at the delivery pipe side.
   CAUTION:
   - The fuel pressure at the inside of the fuel line is approximately 250 kPa (2.55 kg/cm^2) higher than the atmospheric pressure. Hence, be sure to gradually loosen the union bolt so as to prevent fuel from splashing. Since the fuel will flow out, be certain to place a suitable container or cloth, etc. under the fuel filter so that no fuel may get to the resin or rubber parts of the vehicle.

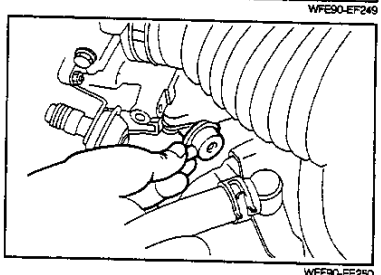

WFE90-EF248

5. Disconnect the fuel return hose from the pressure regulator.
   CAUTION:
   - Since the fuel will flow out, be certain to place a suitable container or cloth, etc. under the connection so as to prevent fuel from splashing.

   NOTE:
   - Before the fuel return hose is disconnected, be sure to release the inner pressure of the fuel tank by detaching the fuel filler cap.

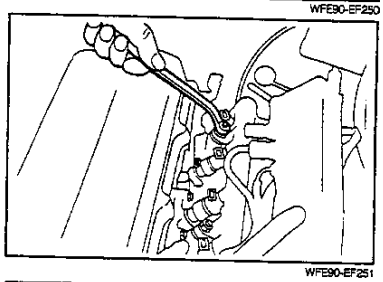

WFE90-EF249

6. Disconnect the vacuum hose from the vacuum pipe.

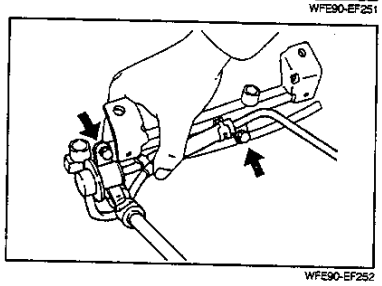

WFE90-EF250

7. Remove the delivery pipe by removing the delivery pipe attaching nuts.
   CAUTION:
   - Be certain to place a suitable cloth, etc. under the delivery pipe so that no fuel gets to the the electrical equipment, such as the alternator and starter, wiring and rubber and plastic parts.
   - Be very careful not to drop the injectors.

   NOTE:
   - Leave the injector at the intake manifold side.


WFE90-EF251

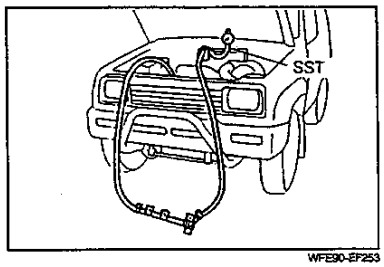
8. Disconnect the vacuum hose from the pressure regulator.
9. Remove the pressure regulator from the delivery pipe.


WFE90-EF252

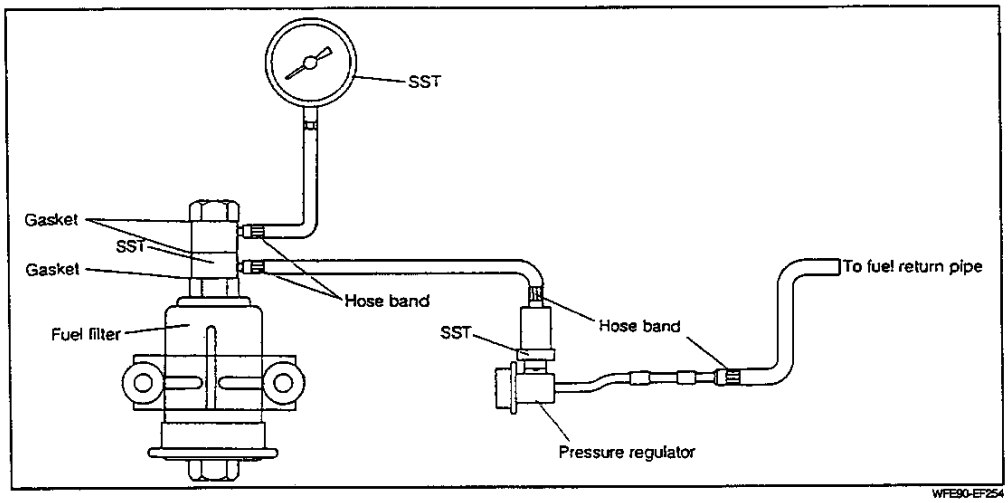
Inspection of Pressure Regulator

1. Using the following SSTs, connect the pressure regulator, as indicated in the figure.
   SSTs: 09268-87701-000
   09268-87702-000
   09283-87703-000

   NOTE:
   - **When connecting the pressure regulator, install a new gasket to the union bolt connection and a new "O" ring to the "O" ring seal section. Also, attach hose bands to the hose connections.**

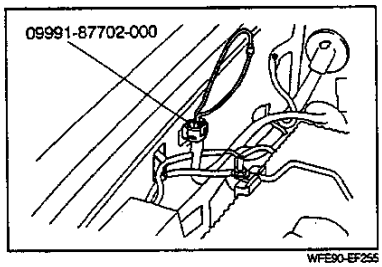


WFE90-EF253



WFE90-EF254

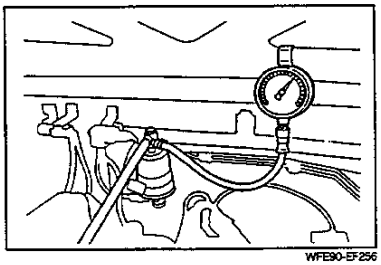
2. Connect the ground cable terminal to the negative (–) terminal of the battery.
3. Connection of SST (09991-87702-000)
   (1) Detach the cap from the check connector.
   (2) Connect the SST to the check connector.
   (3) Connect the fuel pump terminal (White/Black) with the ground terminal (Black).
4. Turn ON the ignition switch.



WFE90-EF255

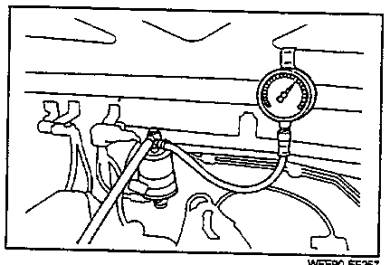
5. Check to see if the fuel pressure conforms to the specification.
   Specified Fuel Pressure:
   225.6 - 274.6 kPa (2.3 - 2.8 kgf/cm²)

   If the fuel pressure fails to conform to the specification, replace the pressure regulator.
   NOTE:
   - **At this stage, ensure that the fuel pump complies with the fuel flow rate requirements.**


WFE90-EF256

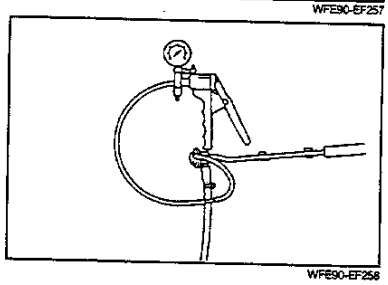
6. Turn OFF the ignition switch. After a lapse of three minutes, check to see if the fuel pressure is the specified pressure or more.
   Specified Fuel Pressure:
   176.5 kPa (1.8 kgf/cm²) or more

   If the fuel pressure fails to conform to the specification, again perform the operations described in the step 17 afterward.



WFE90-EF257

7. Connect a suitable hose to the vacuum hose pipe of the pressure regulator. Connect a MityVac to the other end of the hose.



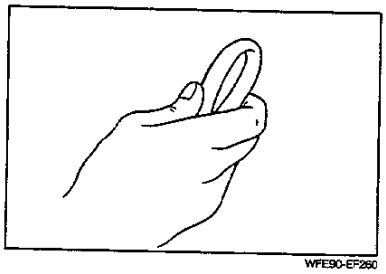
WFE90-EF258

8. Turn ON the ignition switch.
9. While observing the fuel pressure, apply a negative pressure, using the MityVac. At this time, ensure that the fuel pressure drops corresponding to the applied negative pressure.
   Replace the pressure regulator if the fuel pressure will not decrease.

10. Turn OFF the ignition switch.
11. Remove the MityVac and hose from the pressure regulator.
12. Disconnect the ground cable terminal to the negative (–) terminal of the battery.
13. Remove the SSTs from the respective parts.
14. Install the cap to the check connector.
    Proceed to assembly of the pressure regulator.

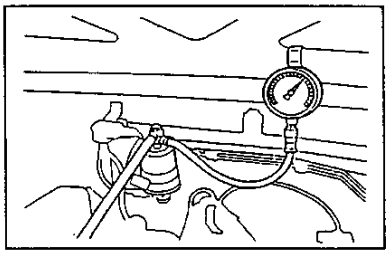
WFE90-EF259

15. Turn OFF the ignition switch after turning ON the ignition switch temporarily.
16. Immediately after the operation described in the step 15, stop the flowing of the fuel by bending the fuel hose between the fuel filter and the pressure regulator. Read the fuel pressure under this condition.



WFE90-EF260

17. After holding the fuel hose in a bent state for 3 minutes, check that the pressure has dropped compared with that measured in the step 6.
    Replace the fuel pump if the pressure has dropped.
    Replace the pressure regulator if the pressure will not drop.

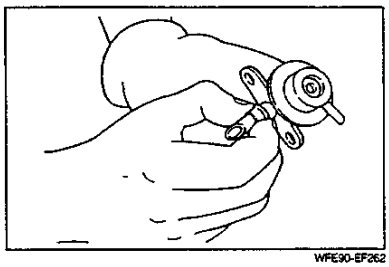


18. Disconnect the ground cable terminal from the negative (–) terminal of the battery.
19. Remove the SSTs from the respective parts.
20. Install the cap to the check connector.

WFE90-EF261

ASSEMBLY OF PRESSURE REGULATOR

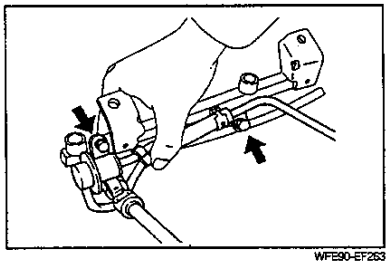
1. Replace the pressure regulator "O" ring with a new part.



WFE90-EF262

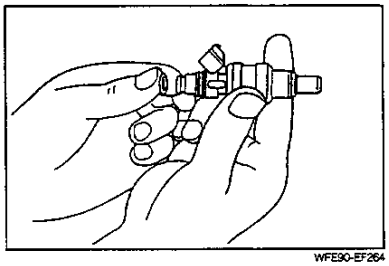
2. Apply silicon oil to the "O" ring of the pressure regulator. Install the "O" ring to the delivery pipe and tighten the attaching bolts.
   Tightening Torque: 14.7 - 21.6 N·m (1.5 - 2.2 kgf-m)

   CAUTION:
   - Be very careful not to damage the "O" ring. Failure to observe this caution may cause fuel leakage.



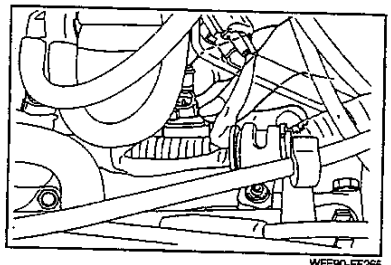
WFE90-EF263

3. Replace the injector "O" ring with a new part.
   NOTE:
   - Visually inspect the grommets and insulators of the injectors for any evidence of damage. Replace any defective parts if they exhibit damage before replacing the "O" ring.
   - Be very careful to avoid damaging the "O" ring.

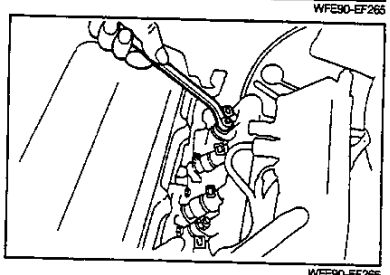


WFE90-EF264

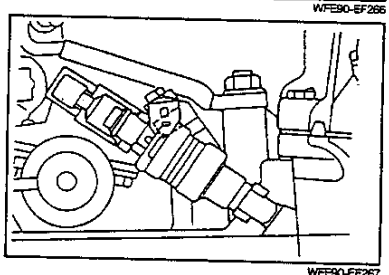
4. Install the injector to the intake manifold.


WFE90-EF265

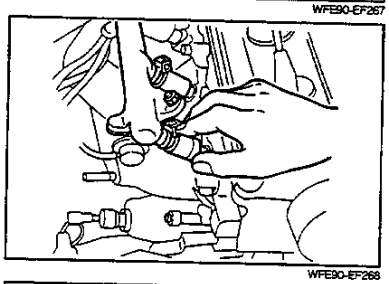
5. Apply silicon oil to the "O" ring of the injector. Install the delivery pipe.
   Tightening Torque: 14.7 - 21.6 N·m (1.5 - 2.2 kgf-m)


WFE90-EF266

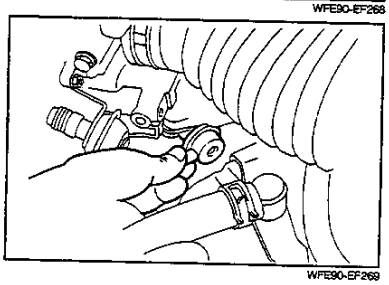
NOTE:
- **Be very careful not to damage the injector "O" ring during the installation.**
- **When connecting the delivery pipe and injector, make sure that they are installed straight, not in a tilted state.**


WFE90-EF267

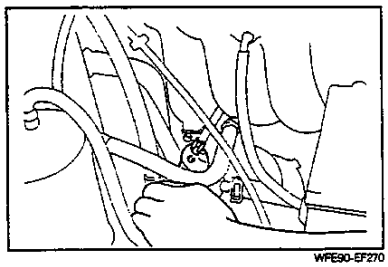
6. Ensure that the injector can rotate by your hand.
   If the injector can not be rotated smoothly, most likely the injector is installed in a tilted state. It is, therefore, necessary to reassemble the injector using a new injector "O" rings.
   CAUTION:
   - **Never push the injector toward the insulator side or the grommet side. Failure to observe this caution will cause fuel leakage.**


WFE90-EF268

7. Connect the rubber hose to the vacuum pipe.

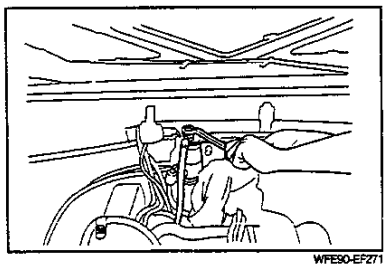

WFE90-EF269

8. Connect the fuel return hose to the pressure regulator. Attach new hose clamps.



WFE90-EF270

9. Install the fuel hose No.1 to the delivery pipe with a new gasket interposed.
   Tightening Torque: 34.3 - 44.1 N·m (3.5 - 4.5 kgf-m)

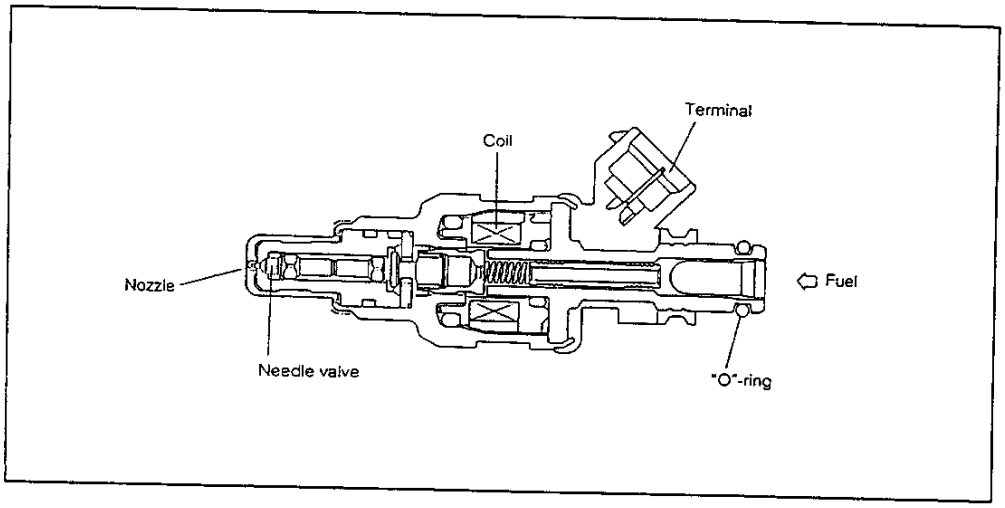


WFE90-EF271

10. Connect the injector wiring connectors to the injector.
11. Connect the ground cable terminal to the negative (–) terminal of the battery.
12. Turn ON and OFF the ignition switch at intervals of 2 or 3 seconds, until air is expelled from the pressure regulator section.
    NOTE:
    - **If air remains inside the piping, you will hear a different sound from the fuel flowing sound.**
    - **Usually the air bleeding can be performed by repeating turning ON/OFF the ignition switch four or five times.**
13. Ensure that no fuel leakage exists.
    Repair the leaky point if fuel leakage is present.
14. Start the engine. Again, check for fuel leakage.
    Repair the leaky point if fuel leakage is present.
15. Install the air chamber assembly (See page EM–22.)

WFE90-EF272

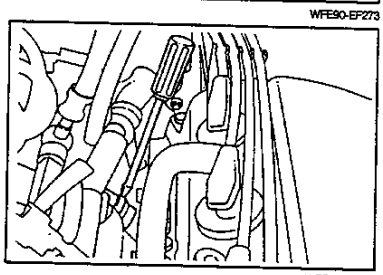
INJECTORS

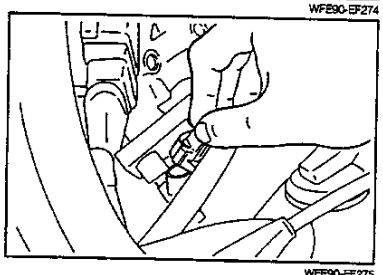


IN-VEHICLE INSPECTION

1. Remove the air chamber assembly. (See page EM–17.)
2. Check of injector operation
   (1) Using a sound scope, check to see if each injector emits an operating sound when the engine is being started or cranked.
   (2) If a sound scope is not available, apply a screwdriver or the like to the injector and check to see if you can feel an operating vibration.

   If the injector emits no operating sound or emits an abnormal sound, check the wiring, wiring connector or injector.


WFE90-EF273

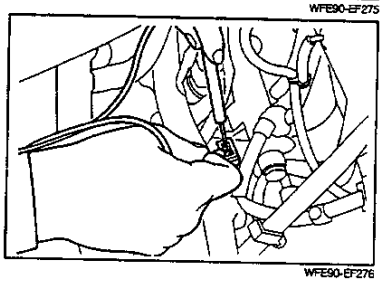

WFE90-EF274

3. Measurement of resistance of injector
   (1) Disconnect the injector connector of the engine wire.

   (2) Measure the resistance between the terminals of each injector.
   Specified Resistance: 11 - 17Ω

   If the resistance between the terminals is not within the specification, replace the injector.

   (3) Connect the injector connector of the engine wire to the injector.


WFE90-EF275

WFE90-EF276

REMOVAL OF INJECTOR

1. Remove the pressure regulator.
2. Remove the injector.
   NOTE:
   - Do not remove the injector cover.

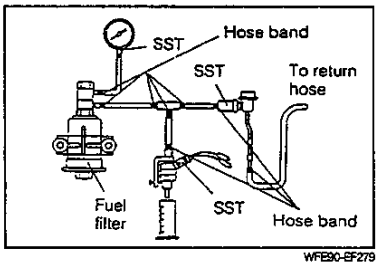
WFE90-EF277

INSPECTION OF INJECTOR

1. Using the following SSTs, connect the injector, as indicated in the figure. Insert the injector in the measuring cylinder.
   SST: (1) 09268-87701-000
   (2) 09283-87703-000
   (3) 09268-87702-000
   (4) 09842-30070-000

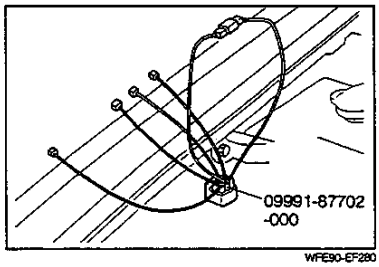
WFE90-EF278

NOTE:
- Install a new gasket to the union bolt connection.
- Install a new "O" ring to the "O" ring seal section.
- Attach the hose bands to the rubber hose connections.
- Attach a suitable vinyl hose to the tip-end of the injector so as to prevent fuel from splashing.
- Remove the injector grommet. Check to see if the injector grommet exhibits any damage.



WFE90-EF279

2. Remove the check connector cap.
3. Connect the SST to the check connector.
   SST: 09991-87702-000
4. Connect the terminal F (white/black) of the check connector to the ground terminal (black).

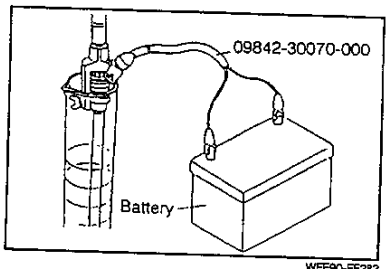


WFE90-EF280

5. Connect the ground cable terminal to the negative (–) terminal of the battery.
6. Turn ON the ignition switch.

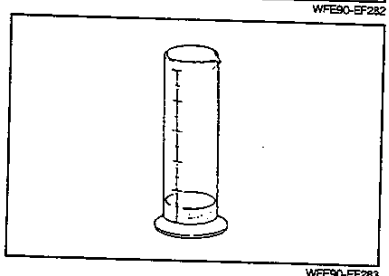
WFE90-EF281

7. Perform energizing for 15 seconds by means of the SST (09842-30070-000).
8. Measure the amount of fuel collected in the measuring cylinder.
   specified pressure.
   Specified Amount of Fuel: Approx. 45 ±5 cm^3
   Variation between Each Injector: 5 cm^3 or less



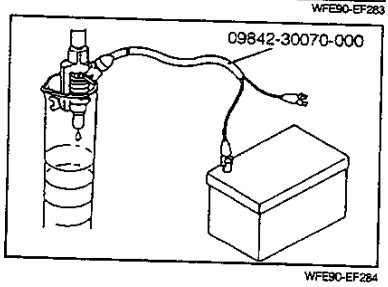
WFE90-EF282

NOTE:
- **Conduct the measurement two or three times for each injector.**
- **Before the injector is pulled out, make certain to turn OFF the ignition key.**
- **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.**


WFE90-EF283

If the amount of fuel fails to conform to the specification, replace the injector.

9. Leakage check
   With the SST (09842-30070-000) in not energized state, turn ON the ignition key switch. Check any fuel leakage from the injector nozzle.
   Fuel Leakage:
   Less Than One Drop of Fuel per Minute



WFE90-EF284

If the leakage exceeds the specified value, replace the injector.
NOTE:
- **Prior to the test, remove the vinyl hose that was attached on the injector.**

10. Turn OFF the ignition key.
11. Disconnect the ground cable terminal from the negative (–) terminal of the battery.
12. Disconnect the SST.
    NOTE:
    - **Care must be exercised as to fuel splashing and fuel flowing.**

WFE90-EF285

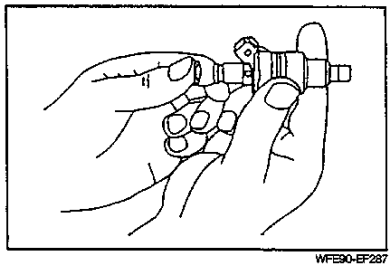
INSTALLATION OF INJECTOR

1. Check the insulator and grommet of each injector for damage.
   Replace the insulator and/or grommet if damage exists.
2. Install the insulator on the manifold section.

WFE90-EF286

3. Install the grommet on the injection.
4. Replace the injector "O" ring with a new part.
   NOTE:
   - **Be very careful to avoid damaging the "O" ring.**

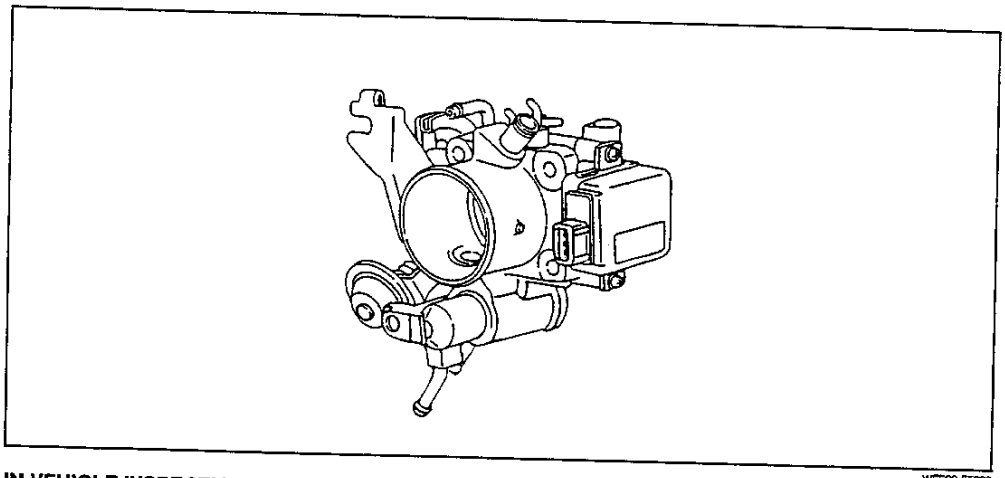
5. Insert the injector into the insulator.
6. Install the delivery pipe.
7. Install the air chamber assembly (See page EM–22.)



WFE90-EF287

AIR INDUCTION SYSTEM

THROTTLE BODY

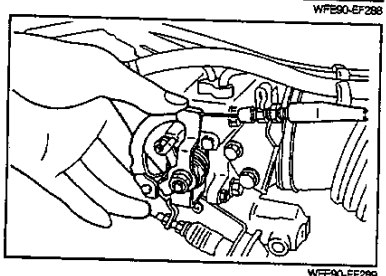


WFE90-EF288

IN-VEHICLE INSPECTION

Check of throttle body

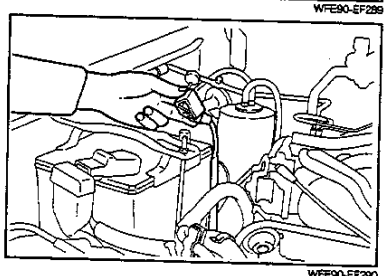
1. Ensure that the throttle linkage operates smoothly. Replace the throttle body if the throttle lever fails to operate smoothly.
2. Check the throttle positioner sensor.
3. Check the throttle positioner.



WFE90-EF289

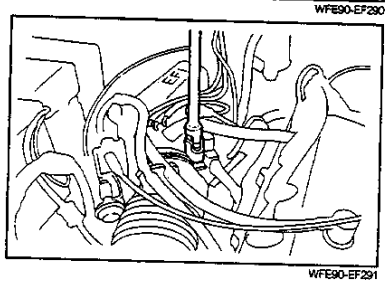
Removal of throttle body

1. Disconnect the ground cable terminal from the negative (–) terminal of the battery.
2. Drain the coolant. (See page CO–12.)
3. Disconnect the hose for air conditioner and power steering idle-up from the air chamber.



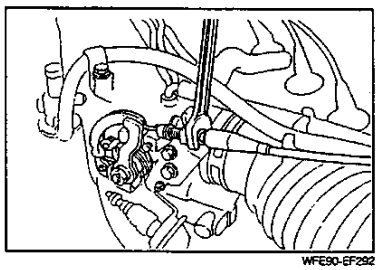
WFE90-EF290

4. Disconnect the air cleaner hose from the throttle body.



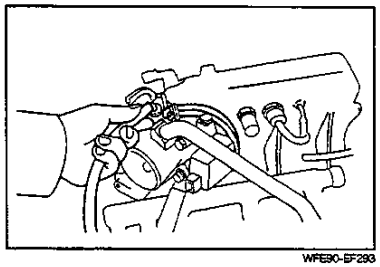
WFE90-EF291

5. Disconnect the accelerator cable.

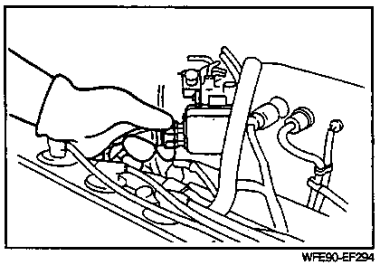


WFE90-EF292

6. Disconnect the vacuum hoses from the throttle body.
   NOTE:
   - Prior to the disconnection, put a tag on each vacuum hose so that the original installation position may be known readily during the installation.

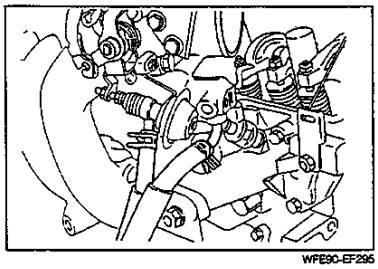


WFE90-EF293



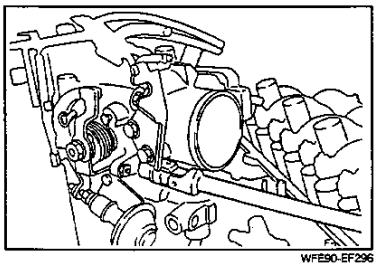
WFE90-EF294

7. Disconnect the water hoses from the throttle body.
   NOTE:
   - Using a suitable cloth, take a precautionary measure so that no water gets to the electrical equipment of the vehicle.
   - Be sure to plug the disconnected water hoses by suitable plug to prevent the water from flowing out.



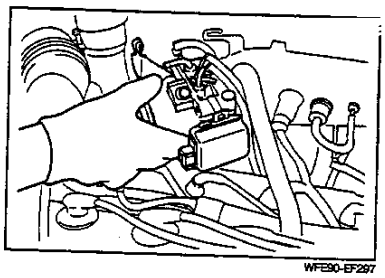
WFE90-EF295

8. Removal of throttle body
   (1) Remove the attaching bolts and nuts of the surge tank stay No. 1.



WFE90-EF296

(2) Remove the attaching bolts and nuts of the throttle body.
(3) Remove the throttle body.

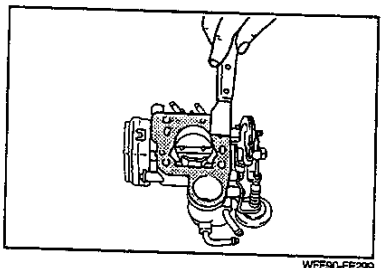

WFE90-EF297

Inspection of throttle body

1. Cleaning of throttle body prior to inspection
   (1) Clean the cast part with a soft brush, a wet cloth or the like.

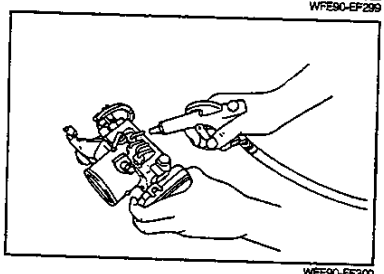
WFE90-EF298

(2) Remove the gasket material from the surge tank attaching surface of the throttle body.

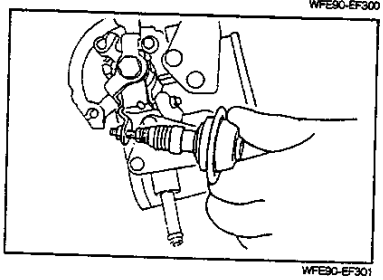

WFE90-EF299

(3) Clean all passages by blowing compressed air.

WARNING:
- Be sure to protect your eyes, wearing goggles.


WFE90-EF300

2. Check of throttle valve
   (1) Check that the throttle lever is in full contact with the dashpot.
   (2) When the throttle lever is opened, check to see if the dashpot lever comes out.

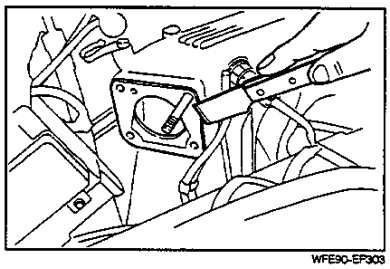

WFE90-EF301

(3) Check the throttle position sensor.
Replace the throttle body if it exhibits any defect.

WFE90-EF302

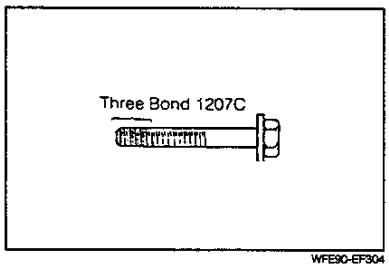
Installation of throttle body

1. Remove any gasket material from the throttle body attaching surface of the surge tank.



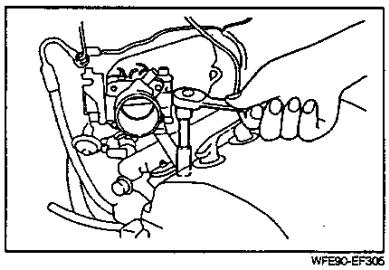
WFE90-EF303

2. Install the throttle body on the surge tank with a new gasket interposed. Attach the surge tank stay No. 1.
3. Apply a seal bond (Three Bond 1207C) to the threaded portions of the throttle body tightening bolts.



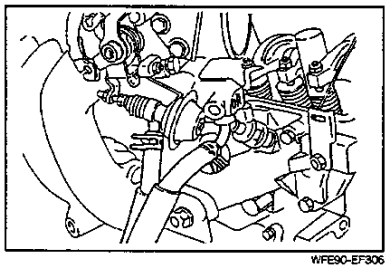
WFE90-EF304

4. Tighten the attaching bolts and nuts of the throttle body and surge tank stay No. 1.
   Tightening Torque: 14.7 - 21.6 N·m (1.5 - 2.2 kgf-m)



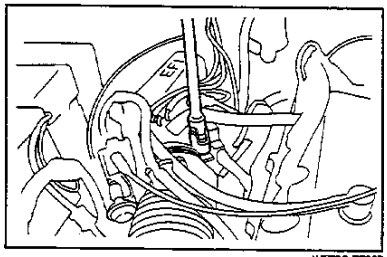
WFE90-EF305

5. Connect the water hoses to the throttle body. Attach the hose clips.



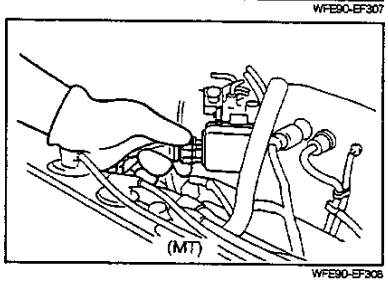
WFE90-EF306

6. Connect the air cleaner hose to the throttle body.



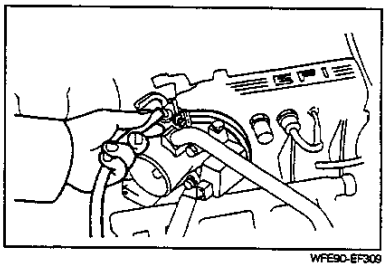
WFE90-EF307

7. Connect the throttle position sensor connector.



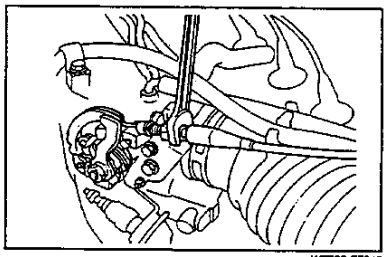
WFE90-EF308

8. Connect the vacuum hoses to the throttle body.



WFE90-EF309

9. Connect the air chamber hose to the throttle body and air chamber.
   NOTE:
   - Be sure to align the mating marks between the throttle body and air chamber hose, and the air chamber hose and the air chamber.
   - Be sure to clamp the air chamber hose bands.

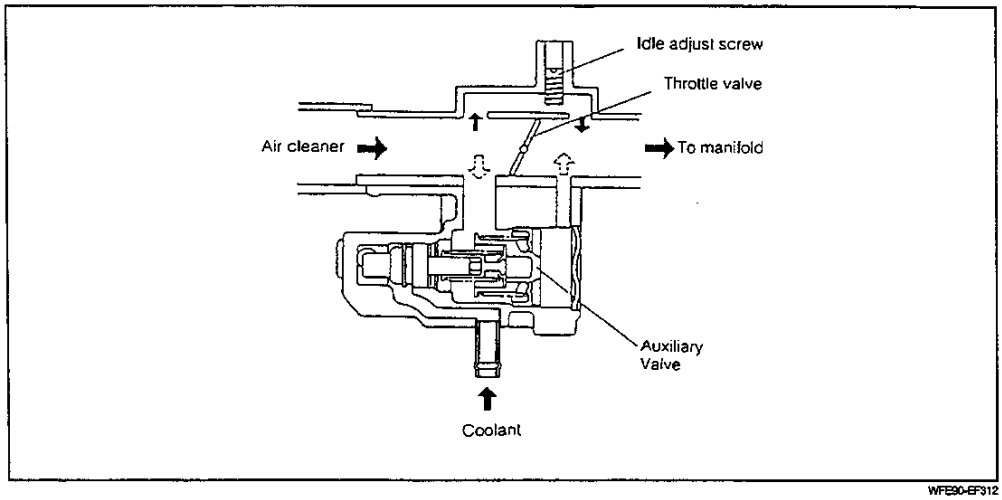


WFE90-EF310

10. Fill coolant.
11. Connect the ground cable terminal to the negative (–) terminal of the battery.
12. Start the engine. Recheck the engine for water leakage. Repair the leaky point if water leakage exists.

WFE90-EF311

AUXILIARY AIR VALVE

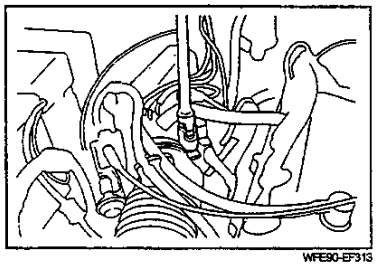


WFE90-EF312

IN-VEHICLE INSPECTION

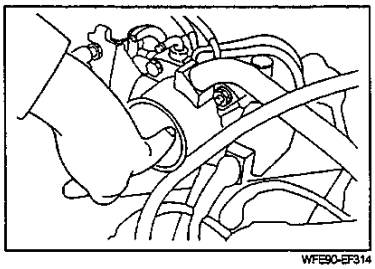
Check operation

1. Disconnect the air chamber hose from the throttle body.



WFE90-EF313

2. Start the engine. Check that there is air continuity at the auxiliary air valve port under the following conditions. Perform the check, following the procedures given below.
   When the cooling water temperature is below 40°C, apply your finger to the auxiliary air valve port. Ensure that the engine speed drops.
   When the cooling water teperature is above 70°C, apply your finger to the auxiliary air valve port. Ensure that the engine speed does not change.
   If the auxiliary air valve exhibits any malfunction, replace the throttle body.



WFE90-EF314

Removal of auxiliary air valve

Remove the throttle body.
(See page EF–101.)

WFE90-EF315

Installation of auxiliary air valve

Installation of throttle body
(See page EF–104.)

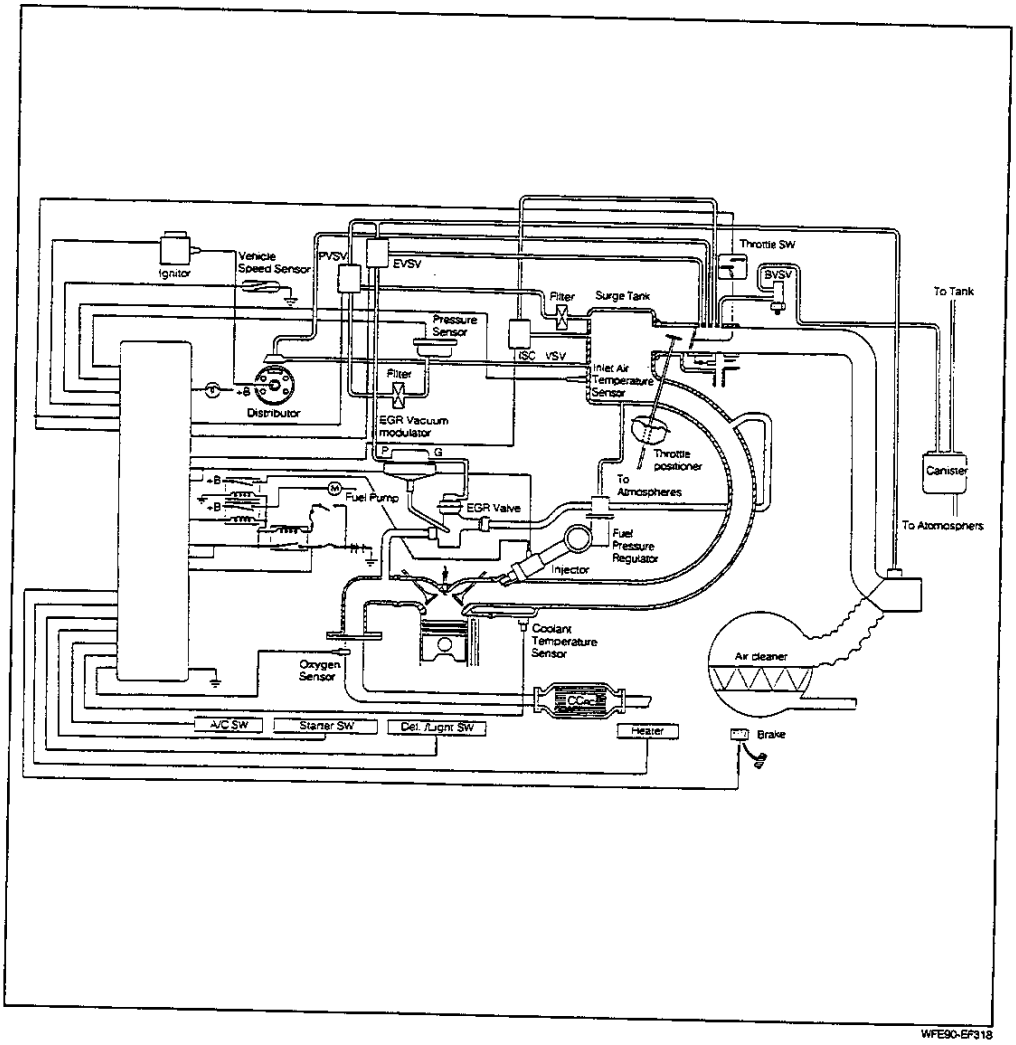
WFE90-EF316

INTRODUCTION (US. Specification)

The EFI system consists of the following three systems; fuel system, intake system and control system. The electronic control unit (ECU) incorporating a microcomputer controls the EFI system, based on signals inputted from the various sensors.
Besides this function, the ECU controls various functions such as the fuel pump control, idle speed VSV control (ISC), exhaust gas recirculating (EGR) VSV control, barometric VSV (PVSV) control, self diagnosis function and fail-safe function.

WNU89-EF317

SYSTEMATIC DIAGRAM



WFE90-EF318

FUEL SYSTEM

The fuel system is a system which supplies the injectors with fuel necessary for combustion. This system is composed of the fuel pump, fuel pipes, fuel filter, pressure regulator, fuel delivery pipe and injectors.
Fuel sucked up from the fuel tank by means of the fuel pump is sent under a pressurized condition to the fuel delivery pipe through the fuel filter. The pressure regulator mounted at the delivery pipe keeps the fuel pressure at a value about 250 kPa (2.55 kgf/cm^2) higher than the intake manifold inner pressure. Such difference between the intake manifold inner pressure and the fuel line inner pressure prevents any variation in the fuel injection rate of each injector.
Any excess fuel returns to the fuel tank through the pressure regulator. This makes it possible for the fuel at a comparatively low temperature in the fuel tank to be supplied into the fuel line, thus preventing percolation.
The fuel pump is driven by the ECU.

WFE90-EF319

INTAKE SYSTEM

The intake system is a system which supplies air necessary for combustion with each cylinder.
Air sucked from the cool air intake of a comparatively low temperature is sucked into the surge tank through the air cleaner and air chamber, depending upon the opening degree of the throttle valve.
Then, the air goes through the intake manifold into each cylinder.

WFE90-EF320

CONTROL SYSTEM

The control system is a system which controls the fuel amount, using the ECU, by detecting the engine conditions and vehicle running conditions, based on signals inputted from the various sensors to the ECU.

Fuel pump control (FC)
This system controls the fuel pump operation. This system drives the fuel pump for two seconds when the ignition key switch is turned ON and/or the ignition signal is inputted. It also drives the fuel pump when the starter switch is turned ON.

Idle speed control (ISC)
For stabilized idle speed, this system regulates the air flow rate to the engine in such a way that the idle speed may become the target idle speed that has been memorized in the ECU in advance.

Exhaust gas recirculation (EGR) VSV control
When the cooling water temperature exceeds the specified level, this system makes the EGR in an operable condition by turning ON the EGR VSV.

Barometric VSV (PVSV) control
This system controls the PVSV whereby the pressure being applied to the pressure sensor is switched temporarily from the intake manifold inner pressure to the atmospheric pressure.

WFE90-EF321

SELF DIAGNOSIS FUNCTION

If signals inputted from main sensor systems to the ECU do not conform to the specified values memorized in the ECU, this malfunction is memorized.
(There are some items which are not memorized.)
Since the memorized malfunction code is retained by the back-up power supply from the battery, the code remains memorized when the ignition key switch is turned OFF.
The memorized malfunction code can be reset by cutting off the power supply to the ECU.
When any malfunction concerned with the important items occurs, the check engine lamp provided inside the combination meter is turned ON, thereby warning the driver of such malfunction. The check engine lamp remains illuminated as long as the malfunction concerned with the important item persists. However, if the encountered malfunction takes place temporarily and the normal state is restored, the check engine lamp goes out. In this case, however, the malfunction that has once occurred is memorized to the ECU, using the pertinent code number.
There are thirteen malfunction codes including the item showing the normal state.
To indicate the malfunction code during the inspection, short the test terminal of the check connector located at the fender panel right side of the engine compartment with the ground terminal. The check engine lamp inside the combination meter flashes as many times as the number of the corresponding malfunction code. With the aid of the diagnosis code, the checking operator can perform trouble shooting efficiently.

WFE90EF322

FAIL-SAFE FUNCTION

In the event that any abnormality takes place in the signals inputted from the important sensors to the ECU and the control can no longer be continued based on the inputted data, an evacuation running is made possible using the data memorized in the ECU in advance. This function is called "fail-safe function."
Moreover, in the event that any abnormality occurs in the microcomputer in the ECU, the backup circuit makes it possible for the vehicle to perform an evacuation running, based on the data memorized in the ECU in advance.
In either case, it is not possible to expect normal running performance under such evacuation running.

WFE90-EF323

PRECAUTION

1. The engine control system has self diagnosis function. The ECU memorizes all malfunction codes which have occurred in the past and/or are occurring at present.
   The memorized malfunction codes are erased when the battery ground cable is disconnected from the battery terminal. Hence, prior to starting any repairs, be sure to check to see if any malfunction code has been memorized.
   (See page EF–136.)
2. When performing operations on the fuel system or its related operation, never smoke and keep away any fire.
3. Before disconnecting the fuel line, be sure to disconnect the battery ground cable from the negative terminal of the battery.
4. The fuel line is pressurized to a pressure about 250 kPa (2.55 kgf/cm^2) higher than the pressure inside the surge tank. Therefore, when disconnecting the fuel line, be sure to loose the fuel line slowly and prevent the fuel from splashing with a cloth or the like.
5. Do not allow gasoline to get to any parts made of rubber, leather and resin and/or to the electric parts.
6. When cleaning the engine compartment with water, make sure that no water gets to the electrical system.
7. Ensure that the battery voltage should be 11 volts or more, before performing the inspection.

WFE90-EF500

INSPECTION PRECAUTIONS

Maintenance precautions

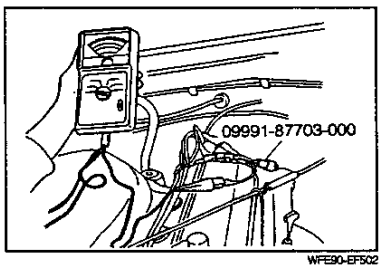
1. Ensure that the engine is correctly tuned up.

WFE90-EF501

2. Precautions during gauge connection
   (1) To connect the tachometer, connect the following SST between the distributor connector and the distributor connector of the engine wire.
   SST: 09991-87703-000

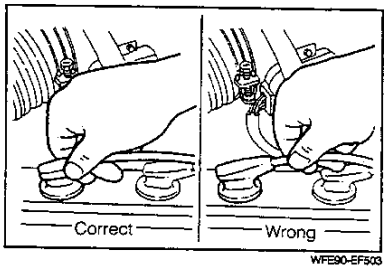
   (2) Connect the measuring terminal of the tachometer to the measuring terminal of the SST.
   NOTE:
   - This does not apply if your tachometer is a pick-up type.

   (3) Use the battery as power source for a timing light, tachometer and so forth.
   (4) Never allow the tachometer terminal to touch the ground, for it could result in damage to the ignitor and/or ignition coil.
   (5) 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.



WFE90-EF502

3. If engine misfire takes place, the following measures should be taken.
   (1) Ensure that the battery terminals and so forth are connected properly
   (2) Ensure that the spark plug wires are connected properly while handle the spark plug wires carefully.
   (3) After completion of repairs, ensure that the ignition coil terminals and other ignition system wire are reconnected securely.



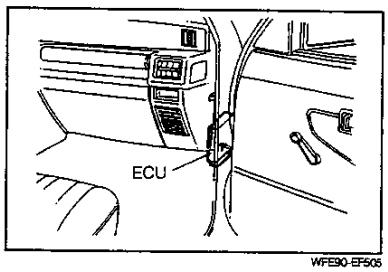
WFE90-EF503

4. Precautions during oxygen sensor handling
   (1) Do not drop the oxygen sensor or allow it to hit other objects.
   (2) Do not immerse the sensor in water or do not cool it by water.
5. Do not open the cover of the ECU proper.
   (Failure to observe this caution could cause ECU malfunction.)
6. Do not touch the screws of the bracket installed on the ECU proper.
   (Failure to observe this caution could cause ECU malfunction.)

WFE90-EF504

When the vehicle is equipped with wireless installation (HAM, CB, etc.)

The ECU has been so designed that it is resistant to external influence.
However, if a vehicle is equipped with a CB wireless installation and so forth (even if its output is only 10 W), it may affect the ECU adversely. Therefore, observe the following precautions.

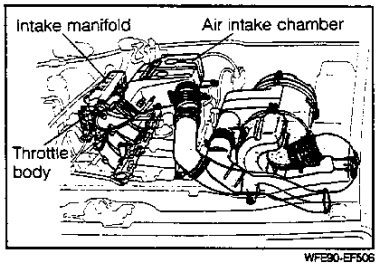


WFE90-EF505

1. Install an antenna at a place as far away as possible from the ECU.
   The ECU is installed at the cowl side panel in front of the passenger's seat. Therefore, the antenna should be installed at the rear of the vehicle.
2. The antenna cord should be kept at least 20 cm away form the engine wire. Never wind the antenna with the engine wire with tapes.
3. Adjust the antenna output correctly.
4. Never install a wireless installation with a high output on the vehicle.

Air induction system

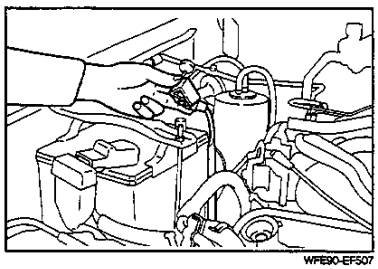
1. Unless all of the oil level gauge, oil filler cap, PCV hose and so forth are installed securely, the engine tune-up can not be performed properly.
2. If air leakage (air admission) is present between the throttle body and the cylinder head, the engine revolution speed can not be adjusted.



WFE90-EF506

Electronic control system

1. Before disconnecting or reconnecting the connector of the sensor system of the EFI system, be sure to turn OFF the ignition switch and all accessory switches. Also, disconnect the battery ground cable from the battery negative terminal. Failure to observe this caution could cause ECU malfunction.

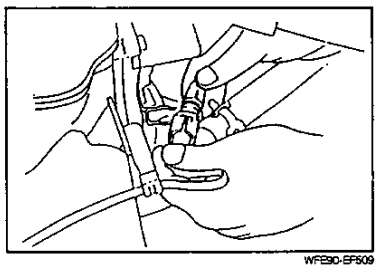


WFE90-EF507

2. Before disconnecting or reconnecting the connector of the ECU proper of the EFI system, be sure to turn OFF the ignition switch and all accessory switches. Also, disconnect the battery ground cable from the battery negative terminal.
   Failure to observe this caution could cause ECU malfunction.
3. Be sure to keep the number of disconnection/reconnection of the connector of the EFI system at a minimum level.
4. When installing the battery, care must be exercised not to mistake the battery polarity.
5. Never apply strong impacts to the EFI parts. Pay utmost attention during the installation/removal. Especially, special caution must be exercised as to the handling of the ECU.
6. When the voltage or resistance of the ECU is measured during the check, never touch terminals other than the specified terminals. Failure to observe this caution could cause ECU malfunction.
7. Never open the cover of the ECU proper.
8. When the system is checked on a rainy day, be very careful not to allow water to get into connectors and/or terminals.
   Also, when the engine compartment is washed, prevent water from being splashed to the EFI-related parts and wiring connectors.
9. EFI parts should be replaced as an assembly.

WFE90-EF508

10. When disconnecting or reconnecting the wiring connector, care must be exercised as to the following points.
    (1) Carefully observe the shape of the lock prior to the disconnecting/connection.
    (2) Release the lock. Disconnect the connector.
    NOTE:
    - **When disconnecting the connector, be sure to hold the connector body, do not to pull the wire.**

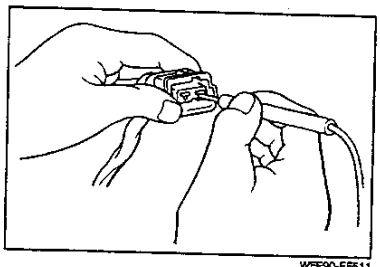


WFE90-EF509

(3) Insert the connector, until the lock is engaged completely.
(4) Be sure to keep the number of disconnection/reconnection of the connector at a minimum level.

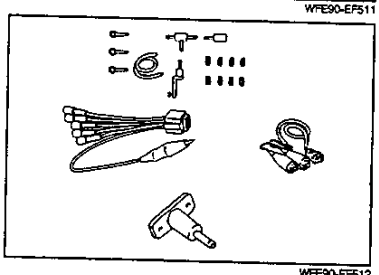
WFE90-EF510

11. When checks are performed at the connector-side terminals, using a circuit tester, care must be exercised as to the following point.
Never apply such a force to the connector terminal that can deform the terminal.



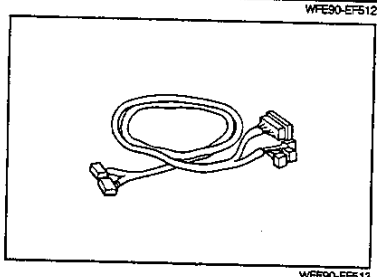
WFE90-EF511

12. When checking the fuel system, such as the injectors, pressure regulator and fuel pressures, use the following SSTs.
SSTs: 09268-87702-000
09283-87703-000
09991-87702-000
09268-87701-000
09842-30070-000



WFE90-EF512

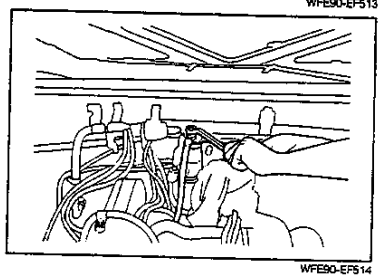
13. When measuring the voltage or resistance of each system, use the following SST.
SST: 09842-87704-000



WFE90-EF513

Fuel system

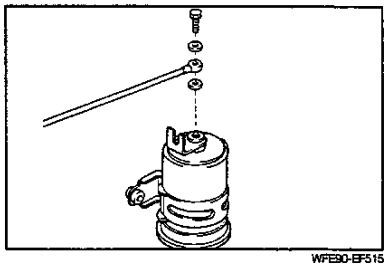
1. The fuel line at the high-pressure side is pressurized to a fuel pressure of about 250 kPa (2.55 kgf/cm^2). Therefore, a large amount of gasoline flows out when parts of the fuel line is disconnected. Hence, take the following countermeasures.
(1) Place a suitable container, close or the like under the disconnecting connection.
(2) Loosen the connection slowly, while preventing the fuel from splashing, using a suitable cloth or the like.
(3) Disconnect the connection.
(4) Plug the disconnected connection with a rubber plug or the like so that no dust may enter into the fuel line.



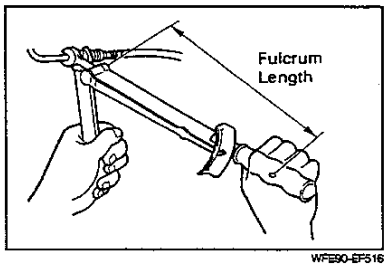
WFE90-EF514

2. When connecting the flare nut or union bolt of the high-pressure pipe, observe the following instructions.

   [Union bolt type]
   (1) Always use new gaskets.
   (2) First, tighten the union bolt with your fingers.
   (3) Next, tighten the union bolt to the specified torque.
   Tightening Torque:
   34.3 - 44.1 N·m (3.5 - 4.5 kgf-m)

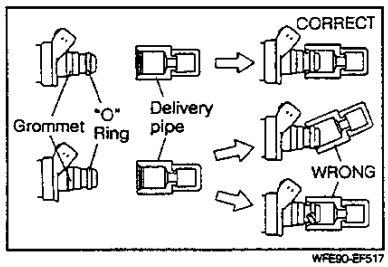

WFE90-EF515

   [Flare nut type]
   (1) Coat the flare nut with a thin film of engine oil. Tighten the flare nut fully with your fingers.
   (2) Tighten the flare nut to the specified torque.
   Tightening Torque:
   34.3 - 44.1 N·m (3.5 - 4.5 kgf-m)



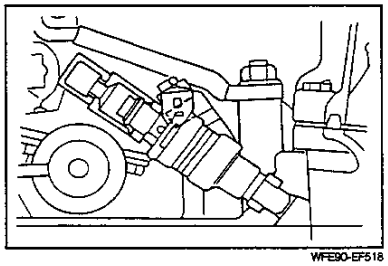
WFE90-EF516

3. When removing/installing the injector, observe the following instructions.
   (1) Do not reuse the "O" ring.
   (2) When installing the "O" ring to the injector, be careful not to damage the "O" ring.
   (3) When connecting the injector to the delivery pipe, apply silicon oil to the "O" ring of the injector in advance. (Never use engine oil, gear oil and so forth.)
   (4) When connecting the injector to the delivery pipe, be very careful not to damage the "O" ring of the injector.



WFE90-EF517

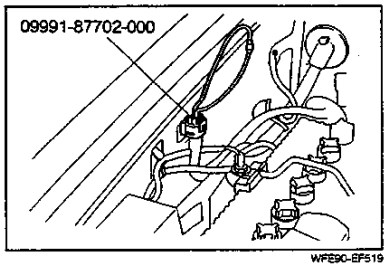
4. Install the injector to the delivery pipe and cylinder head, as shown in the figure.


WFE90-EF518

5. After completion of checks or repairs of the fuel system, be sure that no fuel leakage is present in the fuel system, following the procedure given below.
   (1) Detach the check terminal cap.
   (2) Short the fuel pump terminal (white/black) with the ground terminal (black) of the check connector, using the following SST.
   SST: 09991-87702-000

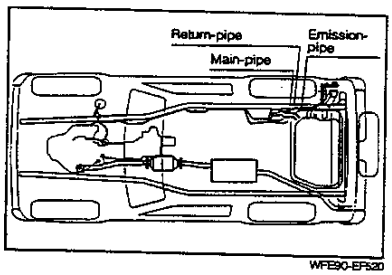
   NOTE:
   - **The check connector is located at the right side fender panel of the engine compartment.**

   CAUTION:
   - **As for the terminals other than those specified, never allow them to be connected or shorted.**



WFE90-EF519

(3) Turn ON the ignition switch. (with the engine in a stopped state)
At this time, a fuel pressure of 250 kPa (2.55 kgf-m) is being applied to the fuel line.
Under this conditions, check the fuel line system for evidence of leakage.
If any leakage is present at the fuel line system, repair leaky points. Recheck the system for leakage.
(4) Stop the engine.
(5) Remove the SST from the check terminal.
(6) Connect the check terminal cap to the check terminal.



TROUBLE SHOOTING

TROUBLE SHOOTING HINTS

1. In most cases, engine troubles are attributable to systems other than the EFI system. Prior to starting the trouble shooting for the EFI system, check other systems.
   (1) Power supply
   - Battery voltage
   - Fuse blown
   - Fusible link blown

   (2) Body ground
   (3) Fuel supply
   - Fuel leakage
   - Fuel filter clogged
   - Fuel pump malfunctioning

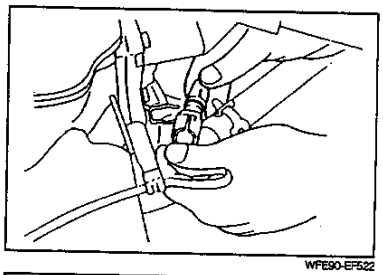
   (4) Ignition system
   - Spark plugs faulty
   - Spark plug wires faulty
   - Distributor and ignitor faulty
   - Ignition coil faulty

   (5) Air induction system
   - Air leakage

   (6) Others
   - Ignition timing adjusted improperly
   - Idle speed adjusted improperly
   - Idle speed control VSV malfunctioning
   - EGR valve malfunctioning
   - etc.

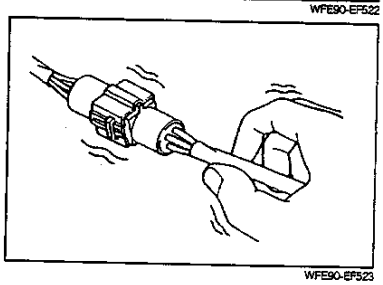
WFE90-EF521

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.



WFE90-EF522

   (3) Check to see if the malfunction phenomenon takes place when applying light vibration to the connector or the wire connected to the connector.

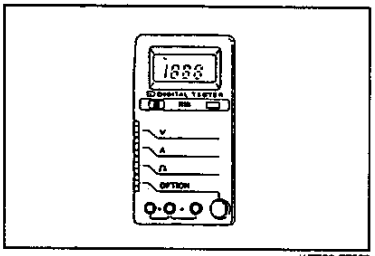


WFE90-EF523

3. Prior to replacing the ECU, thoroughly perform the trouble shooting for possible items other than the ECU. The ECU is a reliable, but an expensive part.
   Even when the ECU has been replaced according to the check results of the trouble shooting and the relevant malfunction has been remedied, be sure to reinstall the old ECU so as to confirm that the malfunction was obviously caused by the faulty ECU.

WFE90-EF524

4. For the trouble shooting, use a volt/ohmmeter whose internal resistance is 10 kΩ/V or more.
   Use of a volt/ohmmeter whose internal resistance is less than 10 kΩ/V may cause an ECU malfunction or wrong diagnosis.
   Furthermore, be sure to employ a meter whose resolution is 0.1V or more, 0.5Ω or more and whose accuracy is ±2% or more.



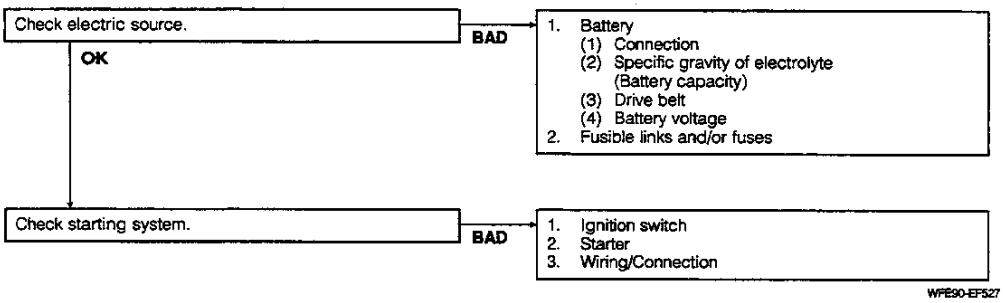
WFE90-EF525

5. In this trouble shooting, no consideration has been made to any displacement of timing belt teeth. Hence, if the trouble persists even after the trouble shooting has been carried out, check to see if the timing belt has skipped a tooth.

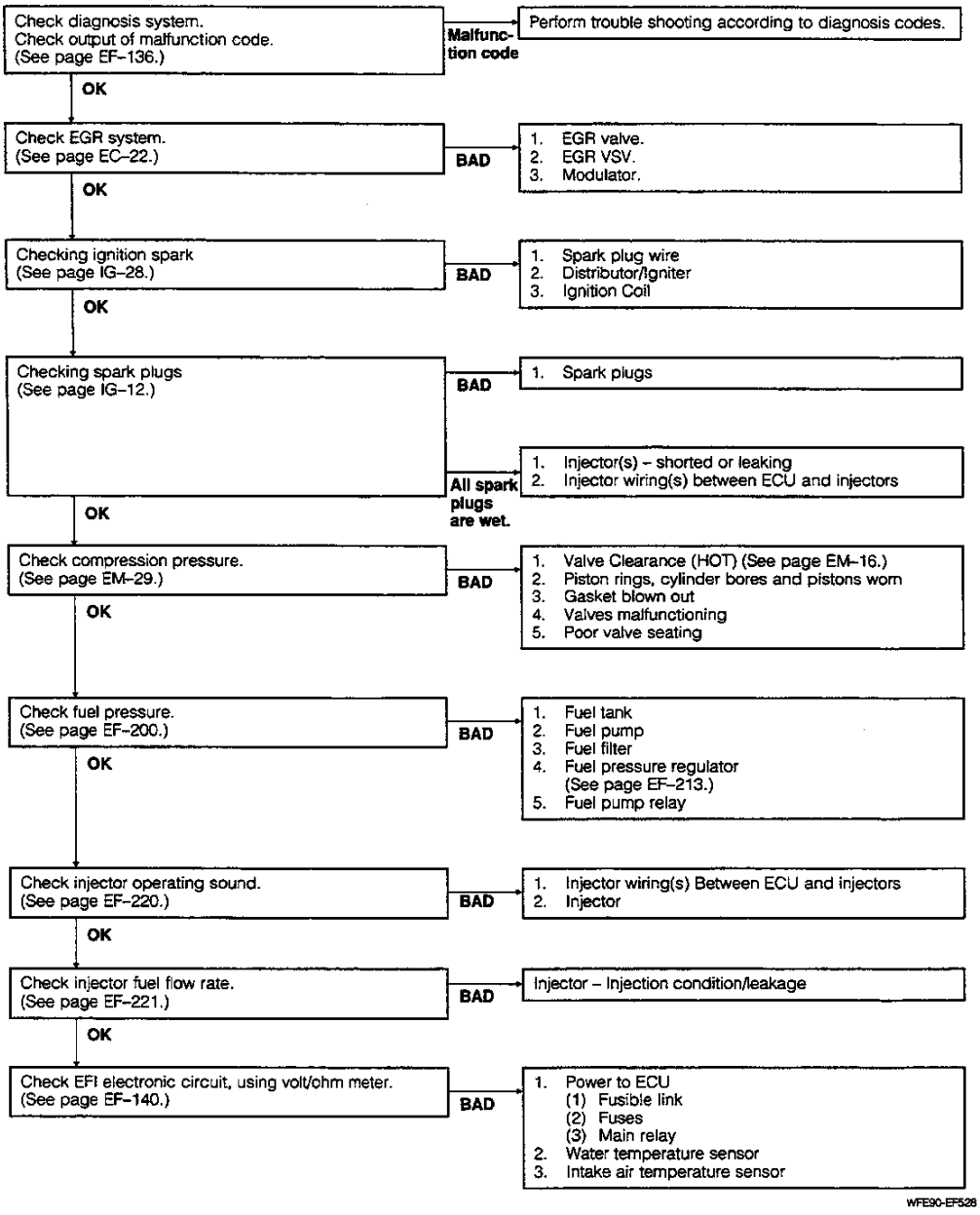
WFE90-EF526

TROUBLE SHOOTING PROCEDURE

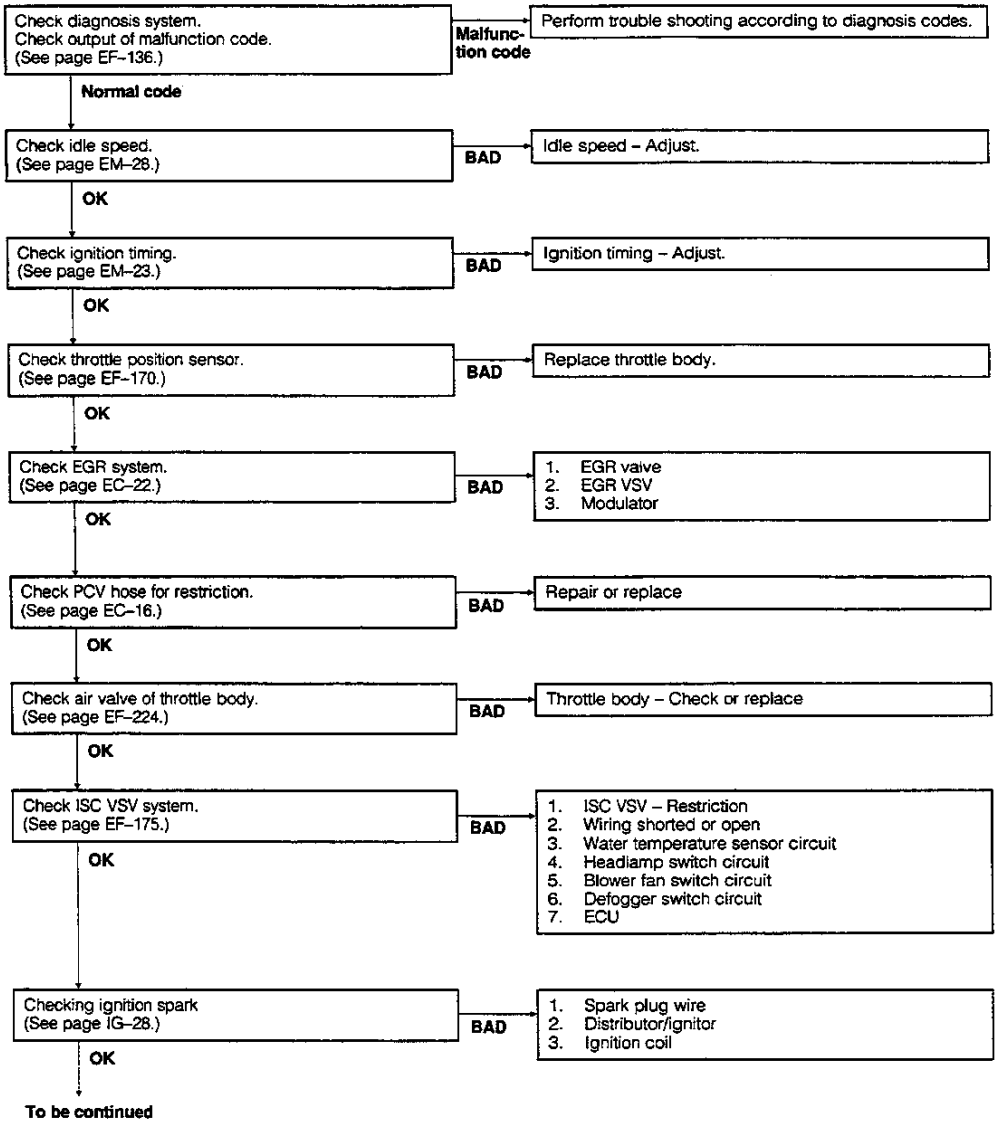
1 Symptom .... Engine will not start. (Engine will not crank or cranks slowly.)



2 Symptom .... Engine will not start. (Engine cranks normally.)



3 Symptom .... Engine stalls immediately after starting.



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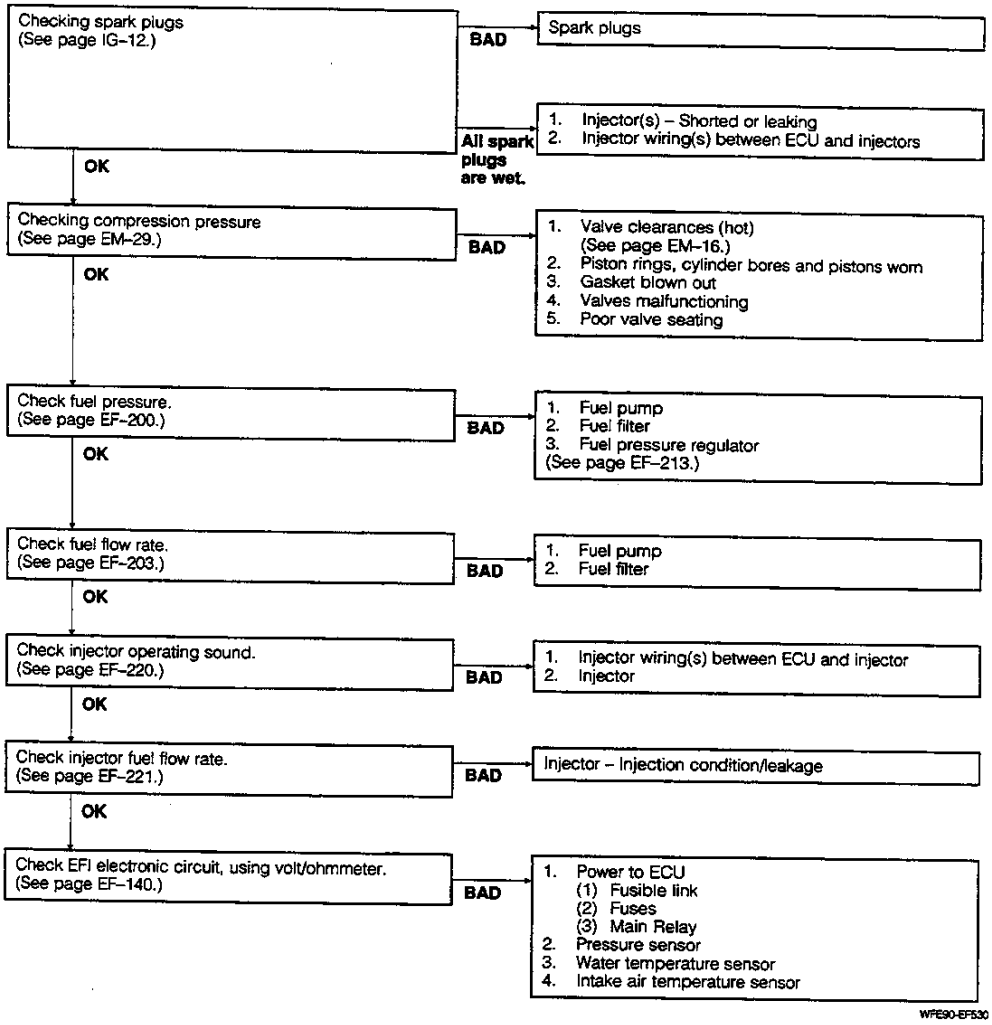
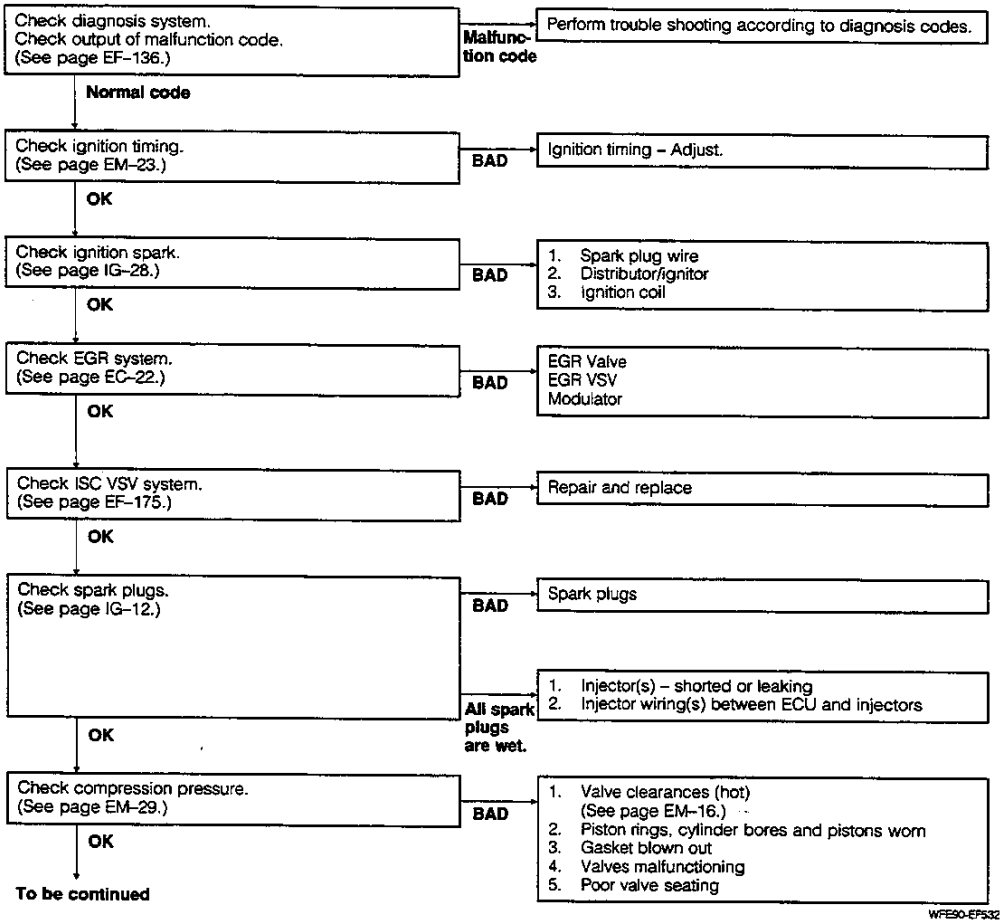

Checking spark plugs
(See page IG-12.)
BAD
Spark plugs
All spark plugs are wet.
1. Injector(s) – Shorted or leaking
2. Injector wiring(s) between ECU and injectors
OK
Checking compression pressure
(See page EM-29.)
BAD
1. Valve clearances (hot)
(See page EM-16.)
2. Piston rings, cylinder bores and pistons worn
3. Gasket blown out
4. Valves malfunctioning
5. Poor valve seating
OK
Check fuel pressure.
(See page EF-200.)
BAD
1. Fuel pump
2. Fuel filter
3. Fuel pressure regulator
(See page EF-213.)
OK
Check fuel flow rate.
(See page EF-203.)
BAD
1. Fuel pump
2. Fuel filter
OK
Check injector operating sound.
(See page EF-220.)
BAD
1. Injector wiring(s) between ECU and injector
2. Injector
OK
Check injector fuel flow rate.
(See page EF-221.)
BAD
Injector – Injection condition/leakage
OK
Check EFI electronic circuit, using volt/ohmmeter.
(See page EF-140.)
BAD
1. Power to ECU
(1) Fusible link
(2) Fuses
(3) Main Relay
2. Pressure sensor
3. Water temperature sensor
4. Intake air temperature sensor
WFE90-EF530

5 Symptom .... Hard starting



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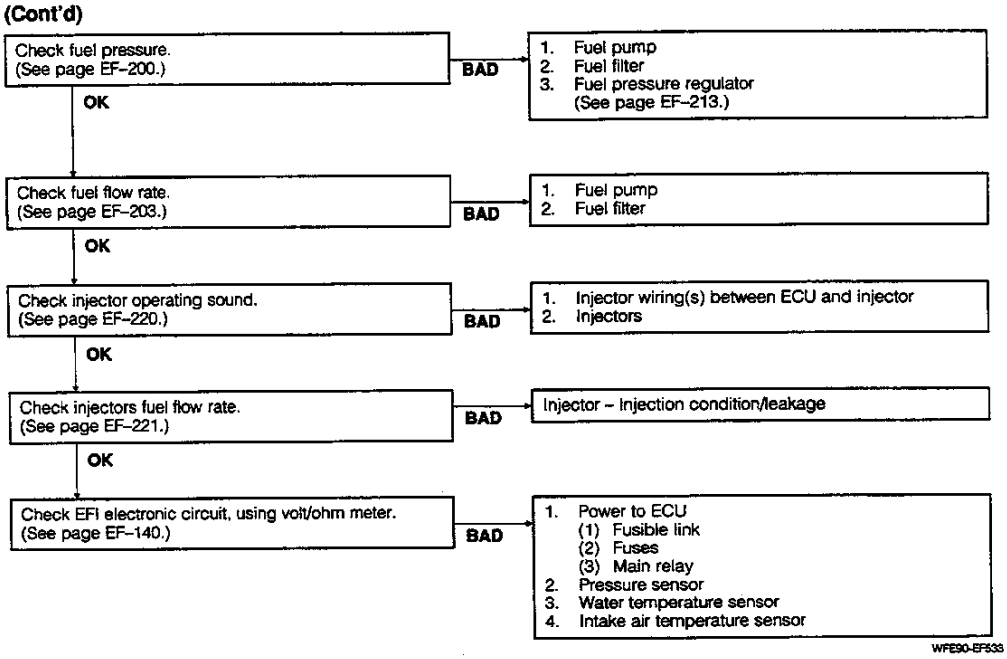
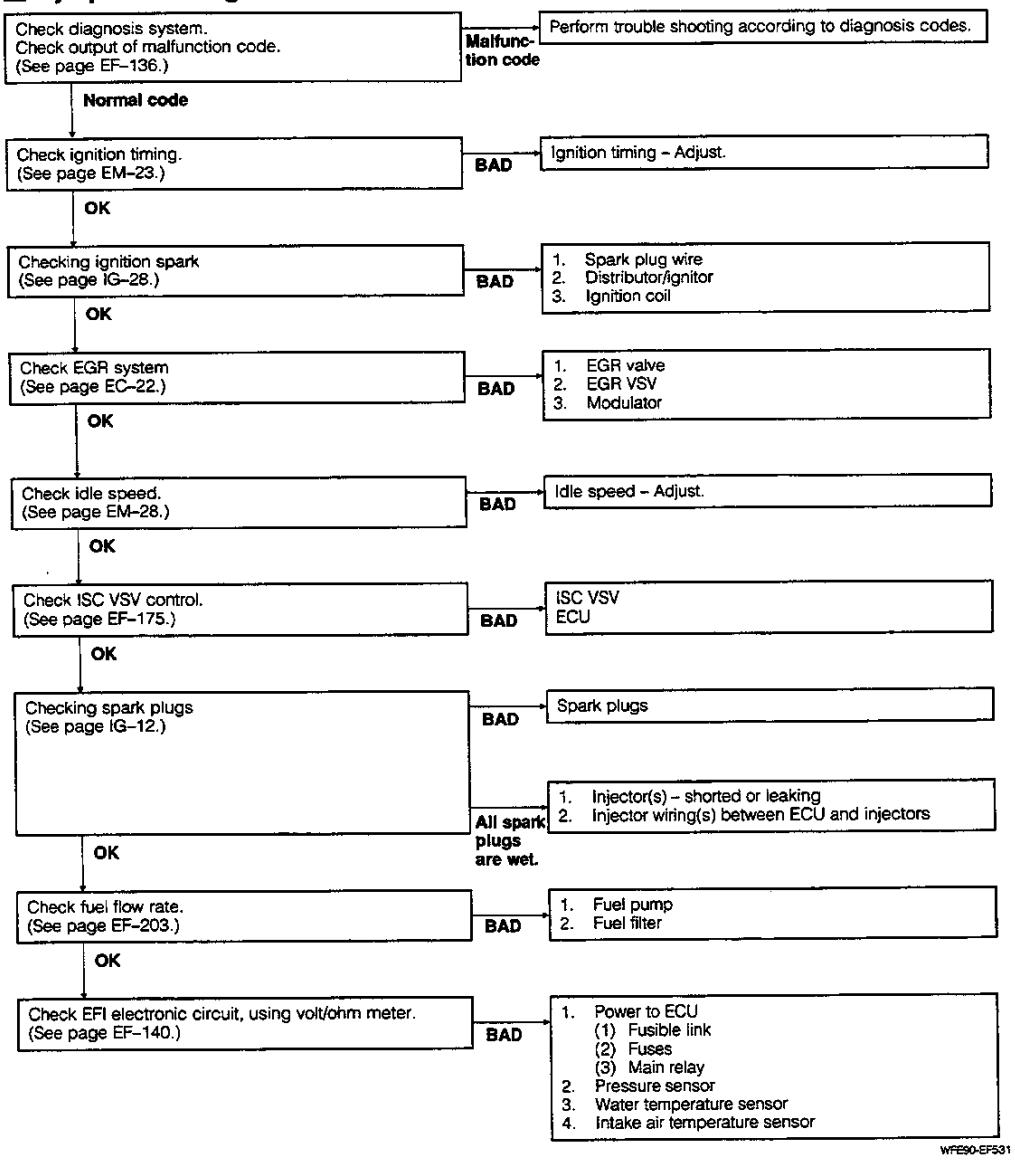
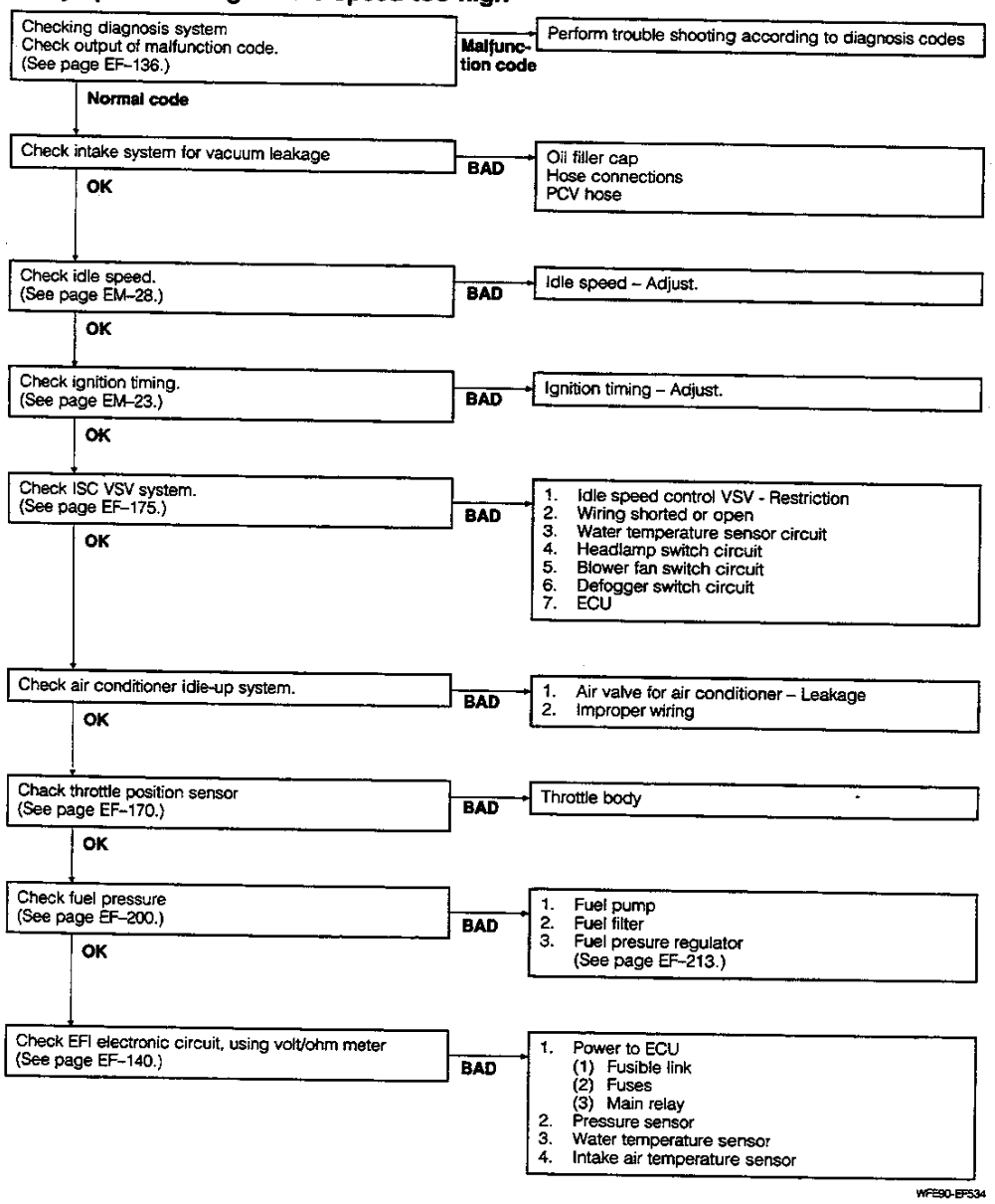

Check fuel pressure.
(See page EF-200.)
BAD
1. Fuel pump
2. Fuel filter
3. Fuel pressure regulator
(See page EF-213.)
OK
Check fuel flow rate.
(See page EF-203.)
BAD
1. Fuel pump
2. Fuel filter
OK
Check injector operating sound.
(See page EF-220.)
BAD
1. Injector wiring(s) between ECU and injector
2. Injectors
OK
Check injectors fuel flow rate.
(See page EF-221.)
BAD
Injector – Injection condition/leakage
OK
Check EFI electronic circuit, using volt/ohm meter.
(See page EF-140.)
BAD
1. Power to ECU
(1) Fusible link
(2) Fuses
(3) Main relay
2. Pressure sensor
3. Water temperature sensor
4. Intake air temperature sensor
WFE90-EF533

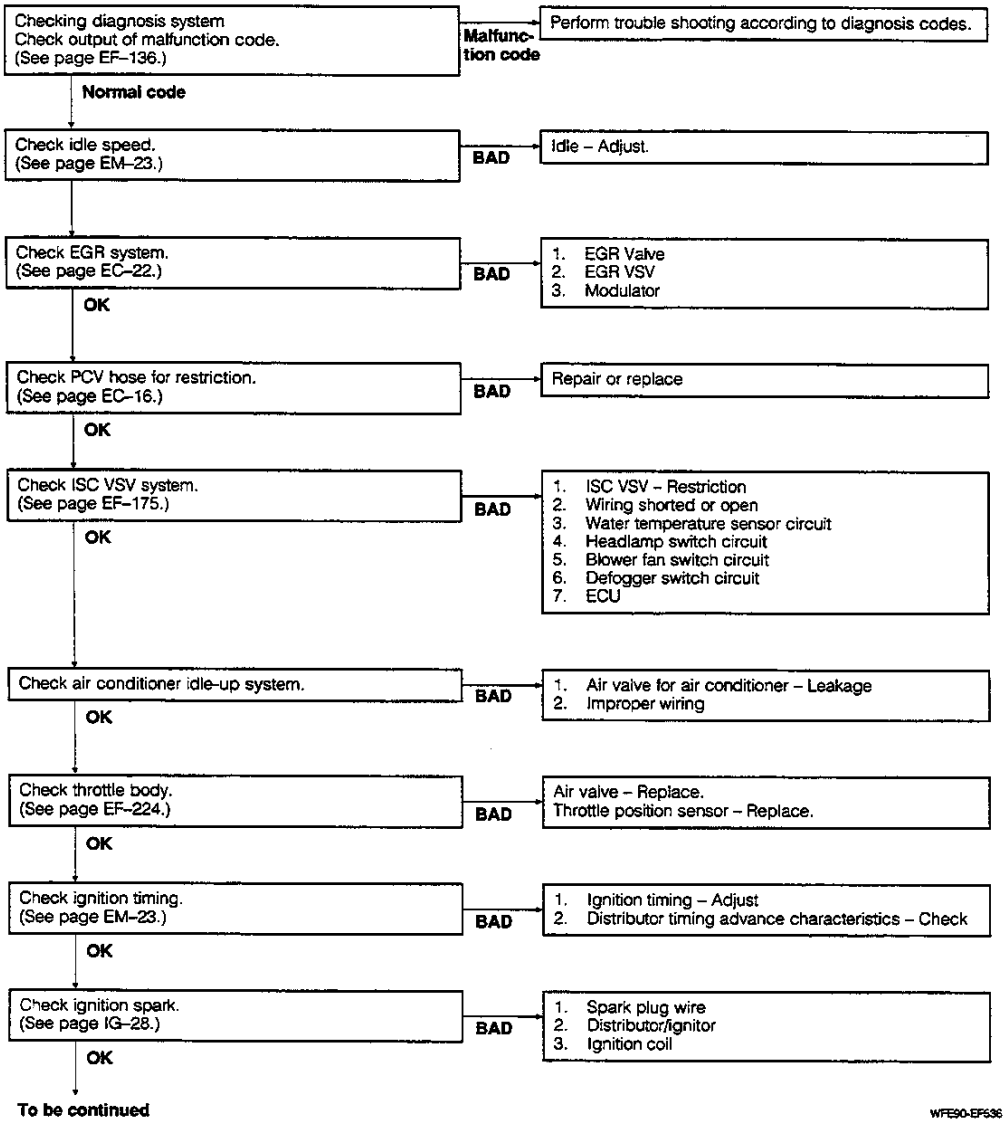
4 Symptom .... Engine often stalls.



6 Symptom .... Engine idle speed too high



7 Symptom .... Engine idle speed too low and/or rough idling



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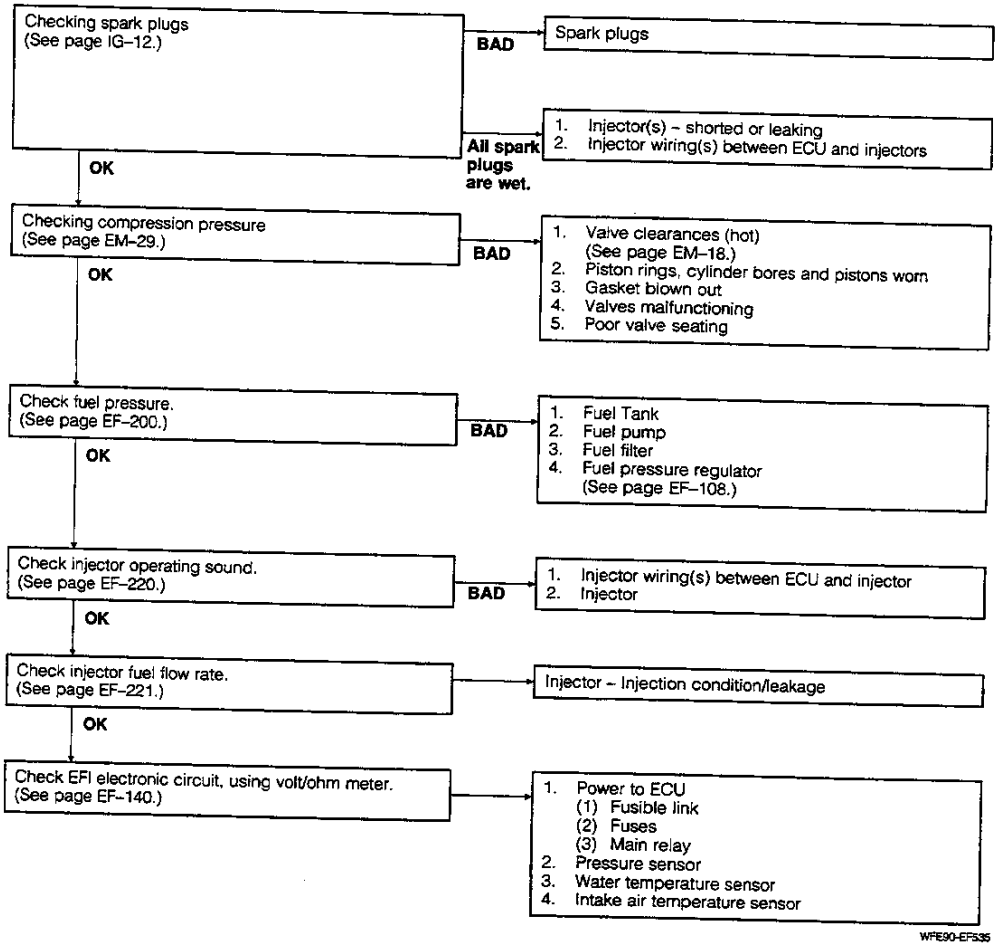
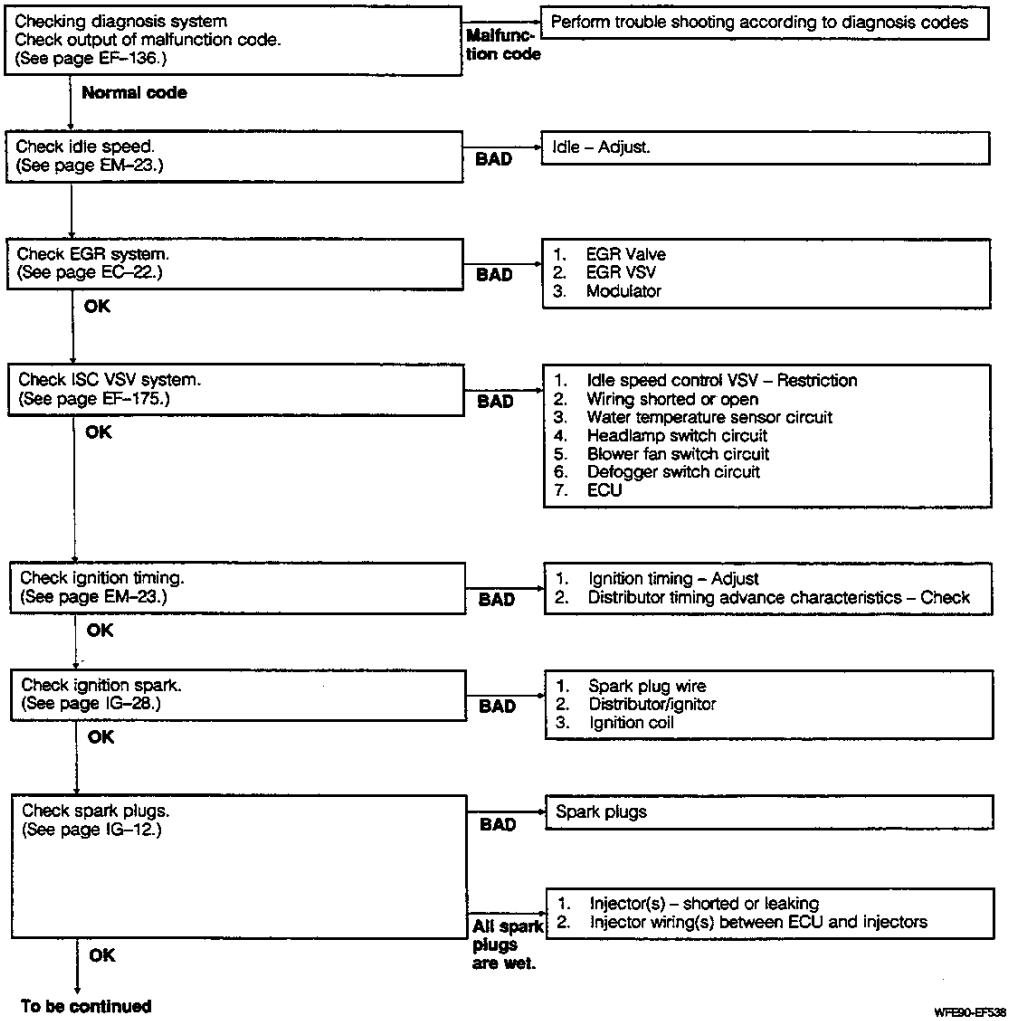

Checking spark plugs
(See page IG–12.)
BAD
Spark plugs
All spark plugs are wet.
1. Injector(s) – shorted or leaking
2. Injector wiring(s) between ECU and injectors
OK
Checking compression pressure
(See page EM–29.)
BAD
1. Valve clearances (hot)
(See page EM–18.)
2. Piston rings, cylinder bores and pistons worn
3. Gasket blown out
4. Valves malfunctioning
5. Poor valve seating
OK
Check fuel pressure.
(See page EF–200.)
BAD
1. Fuel Tank
2. Fuel pump
3. Fuel filter
4. Fuel pressure regulator
(See page EF–108.)
OK
Check injector operating sound.
(See page EF–220.)
BAD
1. Injector wiring(s) between ECU and injector
2. Injector
OK
Check injector fuel flow rate.
(See page EF–221.)
Injector – Injection condition/leakage
OK
Check EFI electronic circuit, using volt/ohm meter.
(See page EF–140.)
1. Power to ECU
(1) Fusible link
(2) Fuses
(3) Main relay
2. Pressure sensor
3. Water temperature sensor
4. Intake air temperature sensor
WFE90-EF535

8 Symptom .... Poor driveability



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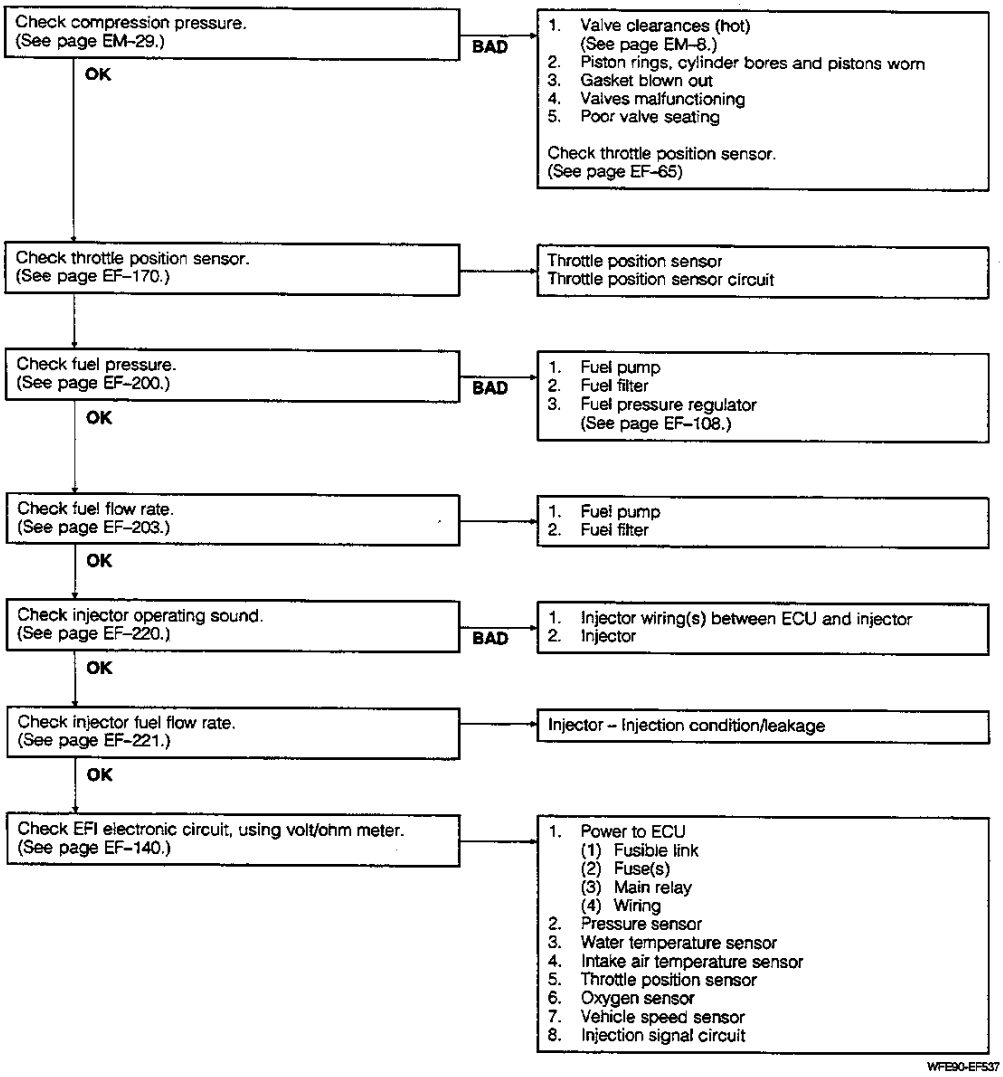
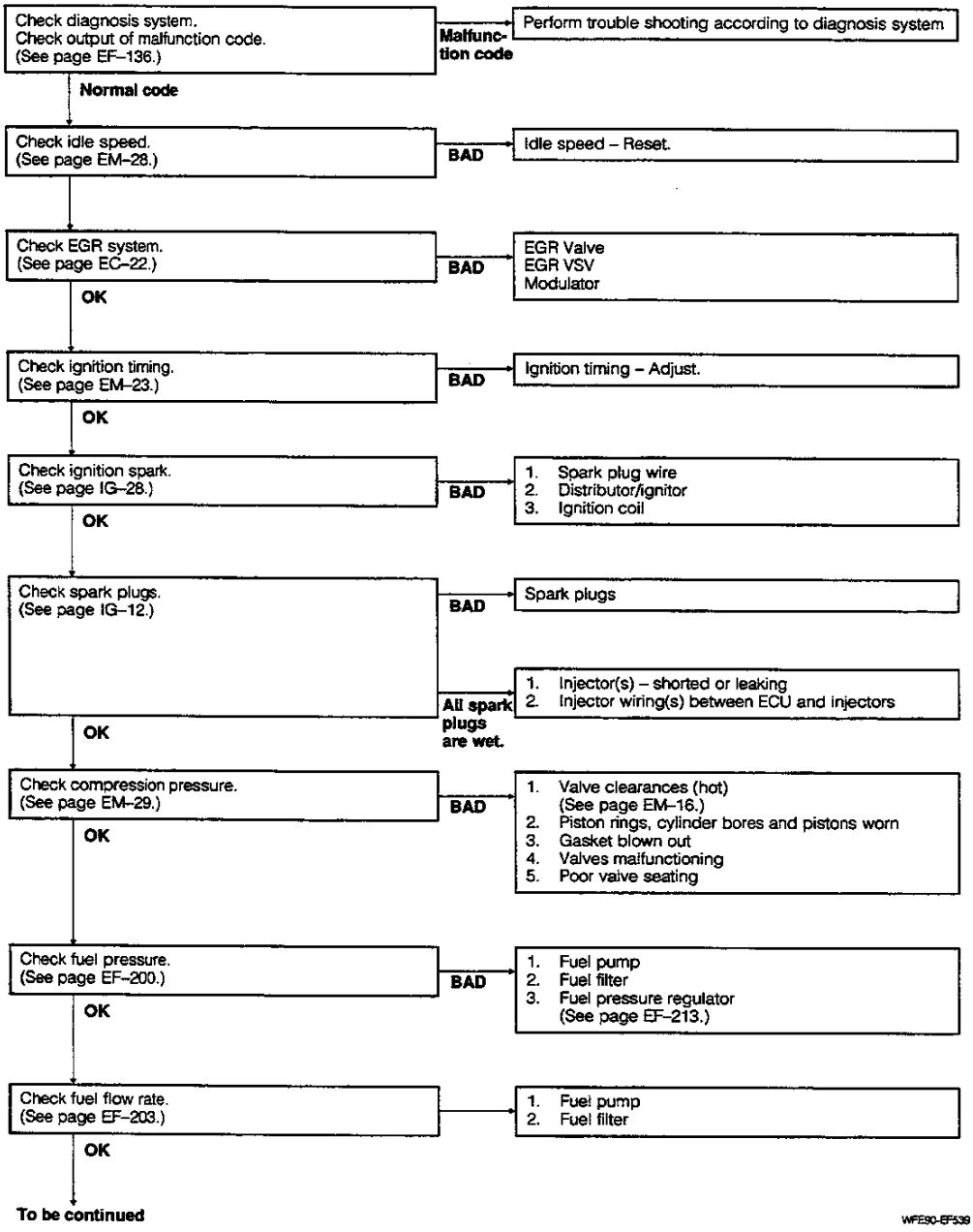

Check compression pressure.
(See page EM-29.)
BAD
1. Valve clearances (hot)
(See page EM-8.)
2. Piston rings, cylinder bores and pistons worn
3. Gasket blown out
4. Valves malfunctioning
5. Poor valve seating
Check throttle position sensor.
(See page EF-65)
OK
Check throttle position sensor.
(See page EF-170.)
Throttle position sensor
Throttle position sensor circuit
Check fuel pressure.
(See page EF-200.)
BAD
1. Fuel pump
2. Fuel filter
3. Fuel pressure regulator
(See page EF-108.)
OK
Check fuel flow rate.
(See page EF-203.)
1. Fuel pump
2. Fuel filter
OK
Check injector operating sound.
(See page EF-220.)
BAD
1. Injector wiring(s) between ECU and injector
2. Injector
OK
Check injector fuel flow rate.
(See page EF-221.)
Injector – Injection condition/leakage
OK
Check EFI electronic circuit, using volt/ohm meter.
(See page EF-140.)
1. Power to ECU
(1) Fusible link
(2) Fuse(s)
(3) Main relay
(4) Wiring
2. Pressure sensor
3. Water temperature sensor
4. Intake air temperature sensor
5. Throttle position sensor
6. Oxygen sensor
7. Vehicle speed sensor
8. Injection signal circuit
WFE90-EF537

9 Symptom .... Backfire (Lean fuel mixture)



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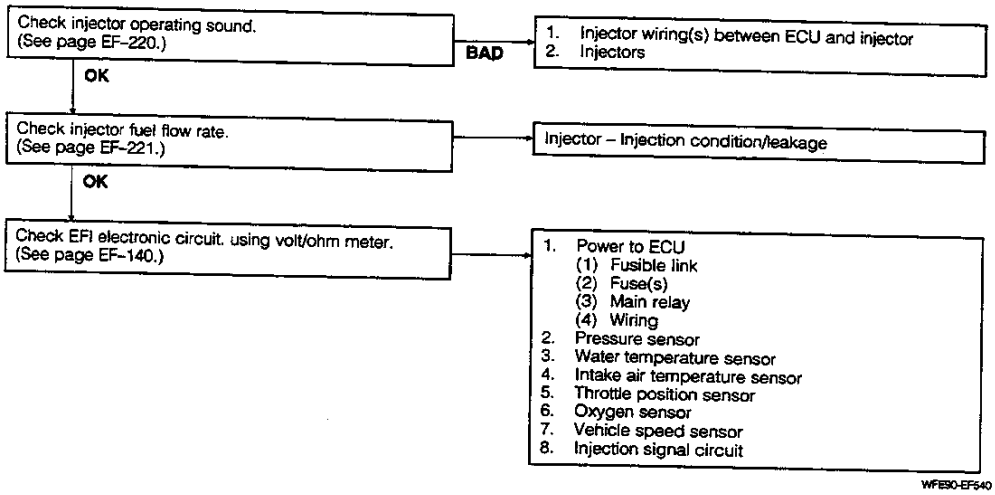
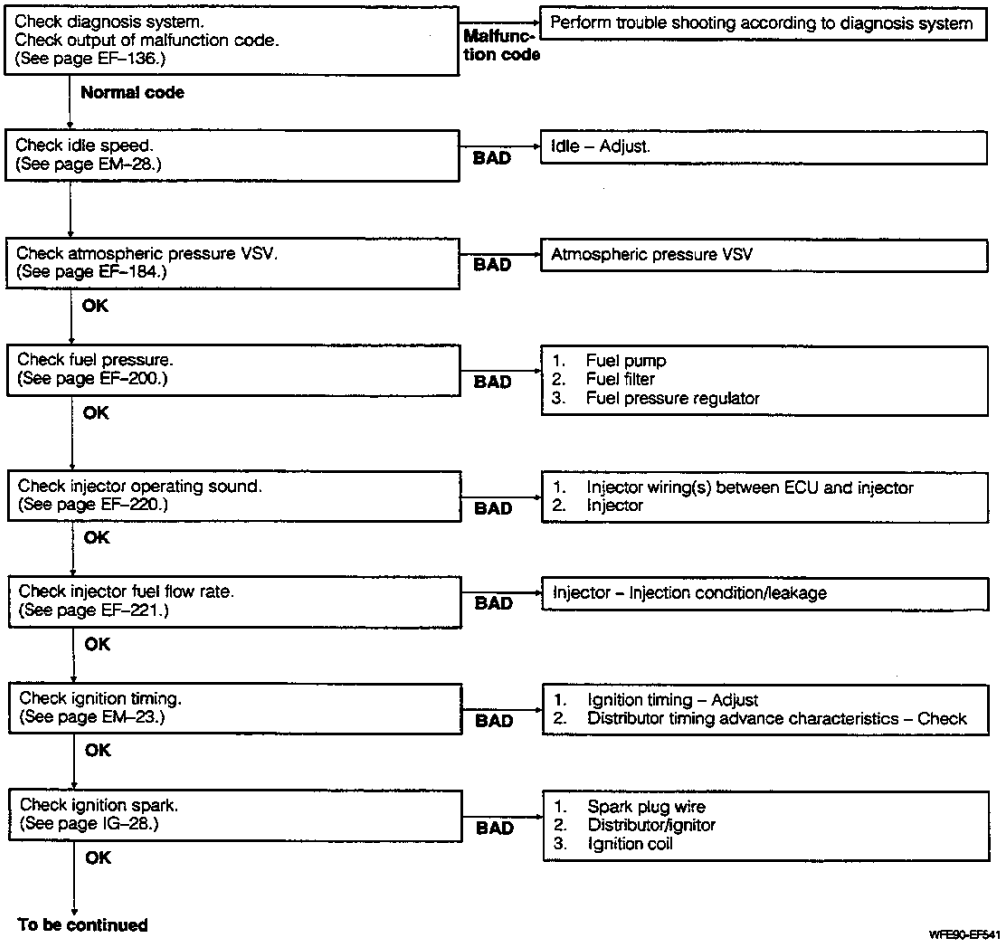

Check injector operating sound.
(See page EF-220.)
BAD
1. Injector wiring(s) between ECU and injector
2. Injectors
OK
Check injector fuel flow rate.
(See page EF-221.)
Injector – Injection condition/leakage
OK
Check EFI electronic circuit, using volt/ohm meter.
(See page EF-140.)
1. Power to ECU
(1) Fusible link
(2) Fuse(s)
(3) Main relay
(4) Wiring
2. Pressure sensor
3. Water temperature sensor
4. Intake air temperature sensor
5. Throttle position sensor
6. Oxygen sensor
7. Vehicle speed sensor
8. Injection signal circuit
WFE90-EF540

10 Symptom .... Afterfire (Rich mixture - Misfire)



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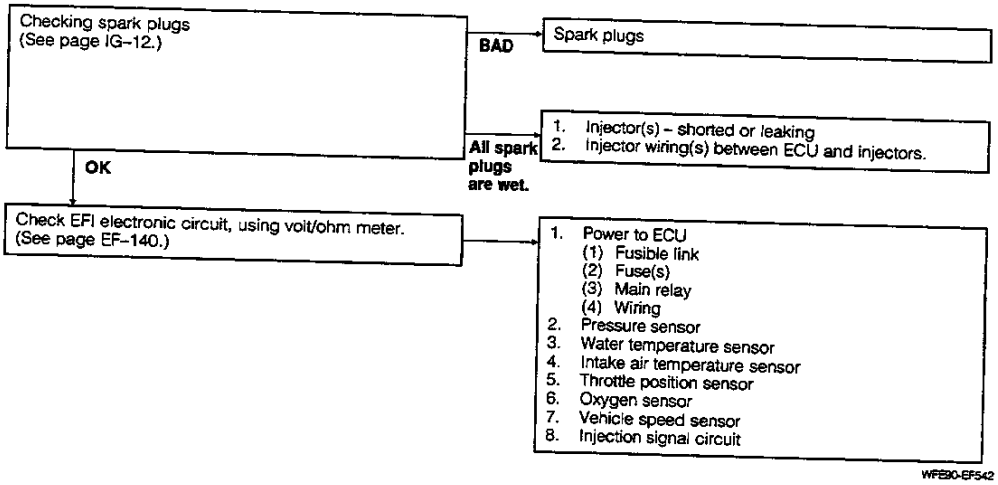
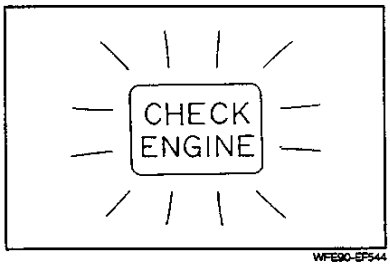

Checking spark plugs
(See page IG-12.)
BAD
Spark plugs
All spark plugs are wet.
1. Injector(s) - shorted or leaking
2. Injector wiring(s) between ECU and injectors.
OK
Check EFI electronic circuit, using volt/ohm meter.
(See page EF-140.)
1. Power to ECU
(1) Fusible link
(2) Fuse(s)
(3) Main relay
(4) Wiring
2. Pressure sensor
3. Water temperature sensor
4. Intake air temperature sensor
5. Throttle position sensor
6. Oxygen sensor
7. Vehicle speed sensor
8. Injection signal circuit
WPE90-EF542

DIAGNOSIS SYSTEM

DESCRIPTION

A self-diagnosis system is built in the ECU. If any abnormality should occur in the signal systems of various sensors, the self-diagnosis system memorizes the malfunction code number in the ECU. In respect to important abnormalities, the check engine lamp at the instrument panel goes on, thus warning the driver of the abnormality.
When the abnormality is cleared, the check engine lamp goes out.
When the Test terminal of the check terminal is shorted with the ground terminal, the malfunction code number that has been memorized in the ECU will be indicated in a form of flashing of the check engine lamp in the instrument panel.
This memorized malfunction code number is erased when the battery ground cable is disconnected from the negative (–) terminal of the battery, or when the back-up fuse in the relay block assembly is disconnected with the ignition key switch turned OFF.

WFE90-EF543



WFE90-EF544

Check of "Check Engine" Warning Light

1. When the ignition switch is turned ON, the check engine lamp goes on.
   (Engine is under a stopped state.)
   If not, see page EF–138.
2. When the engine starts, the check engine lamp goes off.

If the check engine lamp remains illuminated, it indicates that the diagnosis system has detected system malfunctions.

Output of Diagnosis Codes

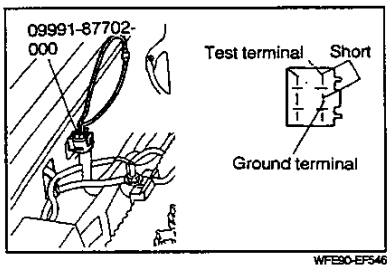
1. Initial conditions
   (1) Battery voltage of 11 volts or more
   (2) Throttle valve fully closed
   (3) All accessory switches turned OFF

WFE90-EF545

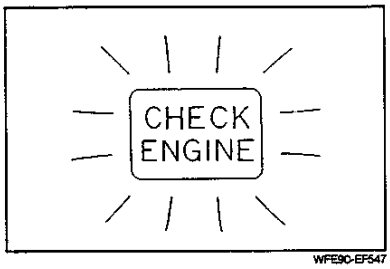
2. Short the Test terminal of the check terminal with the ground terminal, using the following SST.
   SST: 09991-87702-000

   NOTE:
   - **The check terminal is located at the right side fender panel of the engine compartment.**

   CAUTION:
   - **Care must be exercised to ensure that no connection is made on terminals except for those specified.**
3. Set the ignition switch to ON position. At this time, be careful not to start the engine.
4. Read the diagnosis code by observing the flashing number of the check engine lamp.
   NOTE:
   - **If the check engine lamp fails to flash, it is likely that the ECU is malfunctioning. Hence, proceed to inspection of diagnosis system circuit.**



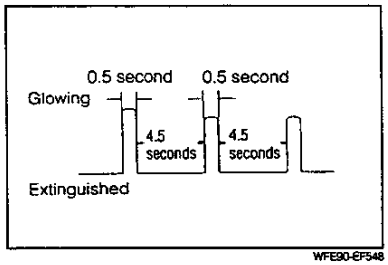
WFE90-EF546



WFE90-EF547

Output form of diagnosis code

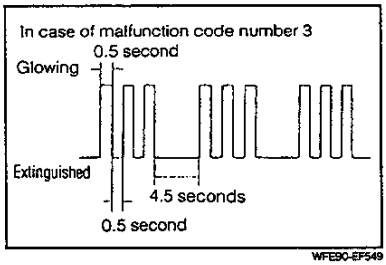
(1) Indication of normal code number
(Code number 1 – normal function)
The check engine lamp glows for 0.5 second, 4.5 seconds later after the ignition key switch has been turned ON. After a lapse of 4.5 seconds, the check engine lamp again glows for 0.5 second. Then, this pattern will be repeated.



WFE90-EF548

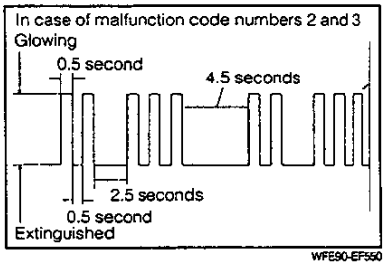
(2) Indication of malfunction code number

- When a single malfunction code is indicated:
  The check engine lamp repeats glowing the same times as the number of the malfunction code at intervals of 0.5 second, 4.5 seconds later after the ignition key switch is turned ON. After a lapse of 4.5 seconds, the check engine lamp again repeats glowing the same times as the number of the malfunction code at intervals of 0.5 second. Then, this pattern will be repeated.



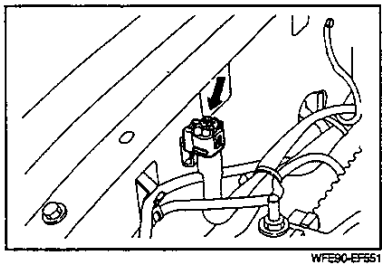
WFE90-EF549

- When plural malfunction code numbers are indicated:
  The check engine lamp repeats glowing the same times as the number of the first malfunction code at intervals of 0.5 second, 4.5 seconds later after the ignition key switch is turned ON. After a lapse of 2.5 seconds, the check engine lamp repeats glowing the same times as the number of the next malfunction code at intervals of 0.5 second.
  The memorized code numbers are indicated in the sequence of code number, starting from a smaller number.
  The indication of the malfunction codes is repeated 4.5 seconds later after the memorized code numbers have been indicated.



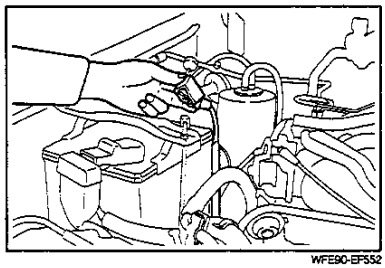
WFE90-EF550

5. After the diagnosis codes have been read, remove the SST from the check terminal.
6. Install the cap on the check terminal.


WFE90-EF551

Cancelling Diagnosis Code

To erase the diagnosis codes memorized in the ECU after malfunctions have been repaired, disconnect the battery ground cable from the negative (–) terminal of the battery. For at least 10 seconds with the ignition switch turned OFF. [When ambient temperature is about 20°C.]


WFE90-EF552

DIAGNOSIS CODE

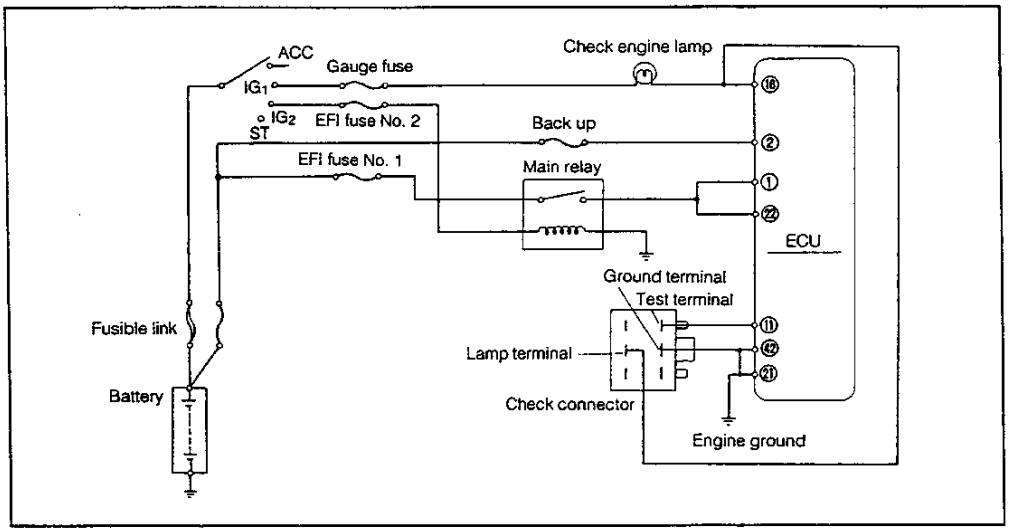
Code No.	Number of glowing of check engine lamp	Diagnosis item	Diagnosis contents	Trouble area	Reference page
1		Normal	—	—	—
2		Pressure sensor	When the input signal from the pressure sensor deviates from the specified value:	• Pressure sensor • Pressure sensor circuit • ECU	EF–172 EF–147
3		Ignition signal	When the ignition signal fails to be inputted:	• Distributor • Ignitor • Ignition coil • Ignition system circuit • ECU	IG– 15 IG– 3 EF–149
4		Water temperature sensor	When the input signal from the water temperature sensor deviates from the specified value:	• Water temperature sensor • Water temperature sensor circuit • ECU	EF–165 EF–150
5		Oxygen sensor signal	When the input signal from the oxygen sensor fails to be inputted under the certain conditions:	• Oxygen sensor • Oxygen sensor circuit • ECU	EF–187 EF–151
7		Throttle position sensor	When both idle switch and power switch enter "ON" conditions:	• Throttle position sensor • Throttle position sensor circuit • ECU	EF–170 EF–152
8		Intake air temperature sensor	When the input signal from the intake air temperature sensor deviates from the specified value:	• Intake air temperature sensor • Intake air temperature sensor circuit • ECU	EF–168 EF–155
9		Vehicle speed sensor	When the input signal from the vehicle speed sensor fails to be inputted under the certain conditions:	• Vehicle speed sensor • Vehicle speed sensor circuit • ECU	EF–156
10		Starter signal	When the input signal from the starter fails to be inputted, until the certain conditions are satisfied: However, it should be noted that this code may be memorized when vehicle is started by being pushed.	• Starter • Starter circuit • ECU	EF–157
11		Switch signal	When even one of the following conditions is satisfied with the test terminal shorted with the ground terminal: • when the air conditioner is functioning. • when idle switch is turned OFF.	• Air conditioner system • Throttle position sensor • Throttle position sensor circuit • ECU	EF–170 EF–158
12		EGR control system	When it is judged that the EGR control system is not functioning normally under the certain conditions:	• EGR valve • Modulator • EGR VSV • Water temperature sensor	EF–181 EF–165

WFE90-EF553

Code No.	Number of glowing of check engine lamp	Diagnosis item	Diagnosis contents	Trouble area	Reference page
15		Air-to-fuel ratio (rich fail)	When the feedback function performs reduction compensation beyond the specified level:	• Injector circuit • Injector • Fuel pressure • Pressure regulator • Pressure sensor • Water temperature sensor • Water temperature sensor circuit • Intake air temperature sensor • Intake air temperature sensor circuit	 EF–220 EF–231 EF–172 EF–165 EF–150 EF–168 EF–155
16		Air-to-fuel ratio (lean fail)	When the feedback function performs increase compensation below the specified level:	• Injector circuit • Injector • ECU • Fuel pressure • Pressure regulator • Pressure sensor • Water temperature sensor • Water temperature sensor circuit • Intake air temperature sensor • Intake air temperature	 EF–220 EF–189 EF–231 EF–165 EF–150 EF–168 EF–155

WFE90-EF554

INSPECTION OF DIAGNOSIS SYSTEM CIRCUIT

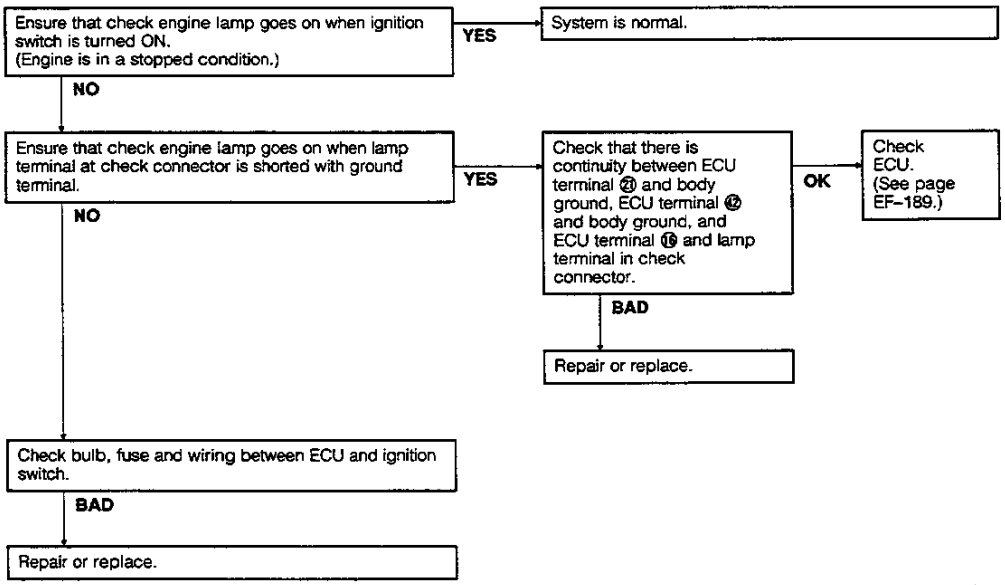


NOTE:

- When checking continuity between terminals, first install the SST (09842-87704-000). Then, check continuity between the SST terminals. (See page EF–141.)

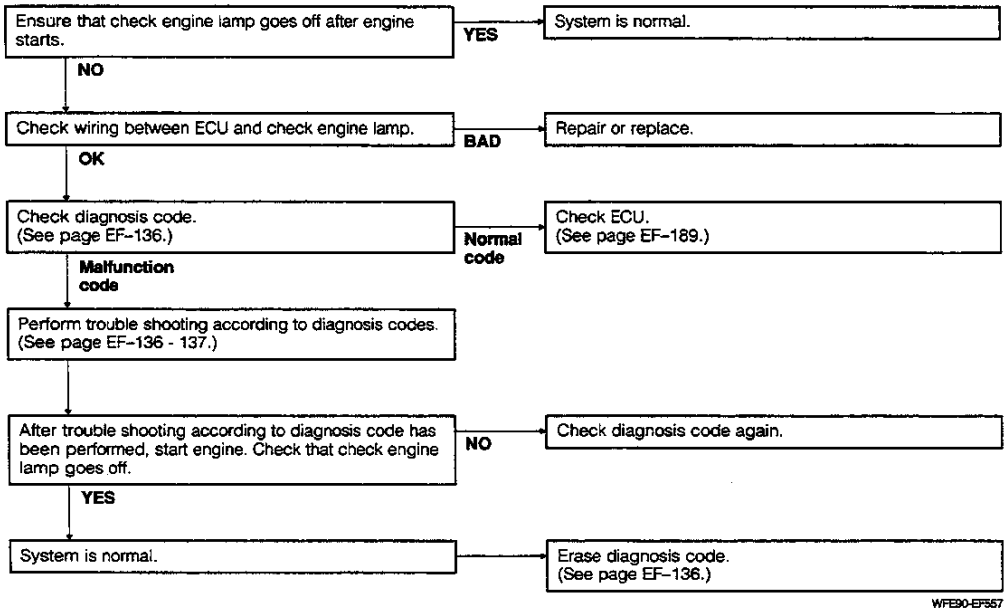
WFE90-EF555

1st step



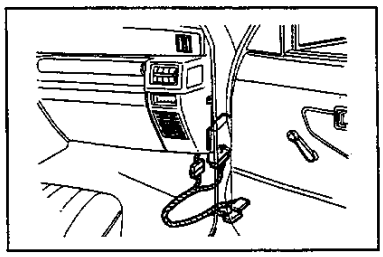
WFE90-EF556

2nd step


Ensure that check engine lamp goes off after engine starts.
YES
System is normal.
NO
Check wiring between ECU and check engine lamp.
BAD
Repair or replace.
OK
Check diagnosis code.
(See page EF-136.)
Normal code
Check ECU.
(See page EF-189.)
Malfunction code
Perform trouble shooting according to diagnosis codes.
(See page EF-136 - 137.)
After trouble shooting according to diagnosis code has been performed, start engine. Check that check engine lamp goes off.
NO
Check diagnosis code again.
YES
System is normal.
Erase diagnosis code.
(See page EF-136.)
WFE90-EF557

TROUBLE SHOOTING WITH VOLT/ OHMMETER

PREPARATION OF TROUBLE SHOOTING

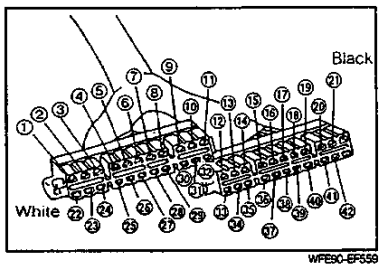


1. Disconnect the battery ground cable from the negative (–) terminal of the battery.
2. Remove the ECU cover.
3. Disconnect the engine harness from ECU.
4. Connect the following SST between the engine wire and the ECU.
   SST: 09842-87704-000
5. Reconnect the battery ground cable to the negative (–) terminal of the battery.
   CAUTION:
   - After completion of the inspection, before the SST is removed, be sure to disconnect the battery ground cable from the negative (–) terminal of the battery.
   - After the engine harness has been connected to the ECU, reconnect the battery ground cable to the negative (–) terminal of the battery.
   - Before using the SST, be sure to check to see if short or open wire exists between the terminals.

WFE90-EF558

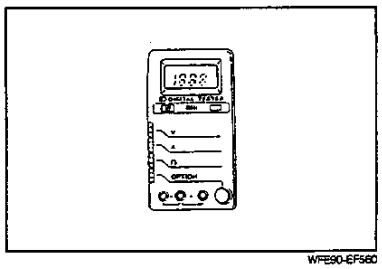
CHECK PROCEDURE FOR EFI SYSTEM

NOTE:
1. The EFI circuit can be checked by measuring the resistance and voltage at the SST terminals.
2. The voltage check should be conducted under a condition where all connectors are connected.
3. Prior to the check, ensure that the battery voltage is 11V or more when the ignition switch is turned ON.
4. If any problem is encountered during this check, see the section under "Trouble Shooting for EFI Electronic Circuit with Volt/Ohmmeter."



WFE90-EF559

CAUTION:
- For the trouble shooting, use a volt/ohmmeter whose internal impedance is more than 10 kΩ/V.
  Use of a volt/ohmmeter whose internal resistance is 10 kΩ/V or less may cause ECU malfunction and/or misjudgment.
- No terminal except for the specified terminal should be connected. Failure to observe this caution may cause ECU malfunction.



WFE90-EF560

ECU CONNECTORS

The figure below shows the arrangement of the ECU connector terminals.

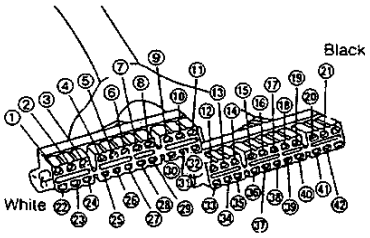
ECU side

21	20		18	
42	41	40	39	38

16	15		13	12	11		9	8
37	36		34	33	32		30	29

7	6	5		3	2	1
	27	26				22

SST side



WFE90-EF561

Table Showing ECU Connections

Terminal code	Contents of connection	Terminal code	Contents of connection
1	Main relay (Power supply)	22	Main relay (Power supply)
2	Battery (Backup power supply)	23	
3	Ignition coil primary voltage	24	
4		25	
5	Pressure sensor power supply	26	Oxygen sensor
6	Pressure sensor	27	Intake air temperature sensor
7	Cooling water temperature sensor	28	
8	Vehicle speed sensor	29	Operation system ground (Engine)
9	Electrical load (Headlamp and defogger)	30	Electrical load (Blower fan)
10		31	
11	Check connector (Test terminal)	32	Throttle position switch (Power switch)
12	Throttle position switch (Idle switch)	33	Stop lamp
13	Starter	34	Air conditioner magnet switch
14		35	
15	Oxygen sensor feedback check terminal	36	Operation system ground
16	Check engine lamp	37	Fuel pump relay
17		38	Pressure VSV
18	EGR VSV	39	System ground
19		40	Idle speed control VSV
20	Injector	41	Injector
21	Actuator drive ground (Engine)	42	Actuator drive ground (Engine)

WFE90-EF562

Voltage at ECU wiring connectors

Measure voltage between SST terminals shown in the table below.

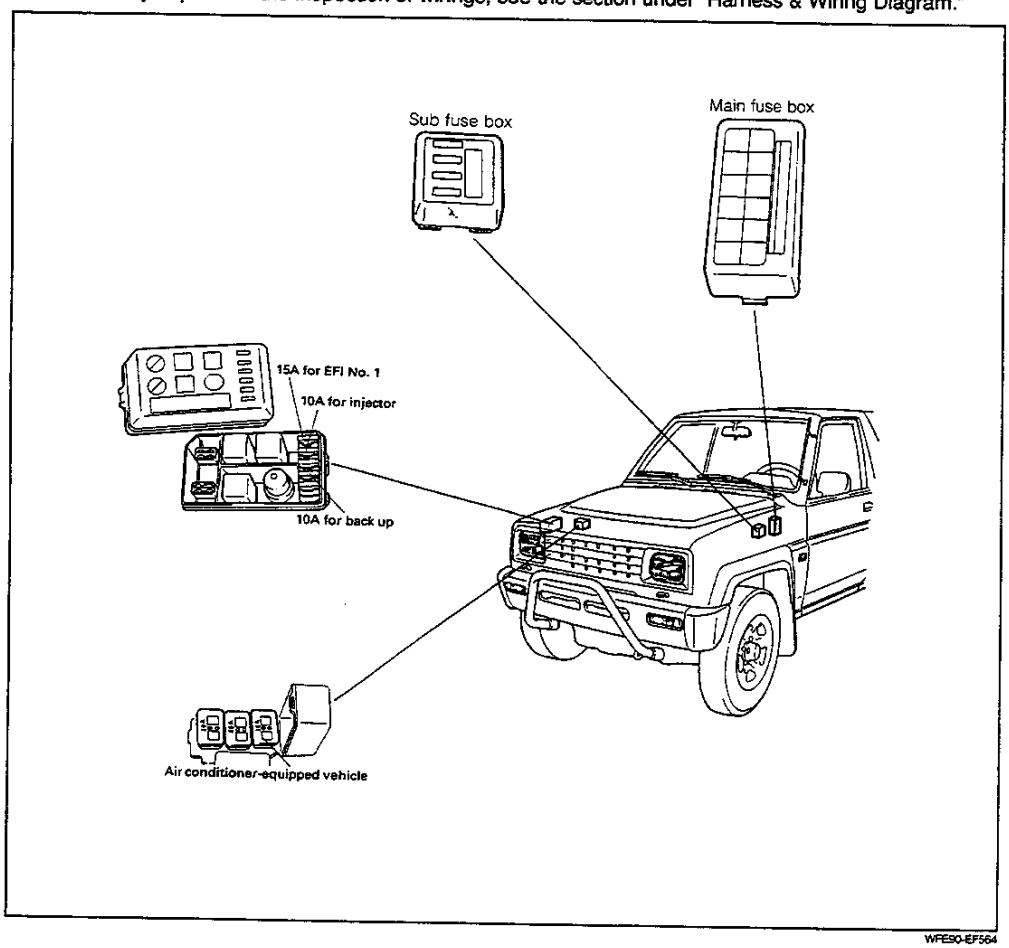
No.	Terminals	STD voltage	Condition		See page
1	① — ㉛ Ground ㉒ — ㉛ Ground	Approx. battery voltage	Ignition switch ON		EF–144
	② — ㉛ Ground		At all time		
2	⑤ — ㉛ Ground	4.5 - 5.5 V	Ignition switch ON		EF–147
	⑥ — ㉛ Ground	3.2 - 4.0 V	Ignition switch ON	Atmospheric pressure 101.3 kPa (760 mmHg)	
3	③ — ㉛ Ground	Approx. battery voltage	Ignition switch ON	Engine at stopped state	EF–149
4	⑦ — ㉛ Ground	0.4 - 0.65 V	Ignition switch ON	When cooling water temperature is 80°C	EF–150
5	㉖ — ㉛ Ground	Voltage changes more than 8 times within 10 seconds.	Ignition switch ON	When engine speed is held at 3000 rpm for two minutes after engine has been fully warmed up:	EF–151
7	⑫ — ㉛ Ground	Less than 5V	Ignition switch ON	Throttle valve fully closed	EF–152
		Approx battery voltage	Ignition switch ON	Throttle valve fully opened	
	㉜ — ㉛ Ground	Approxbattery voltage	Ignition switch ON	Throttle valve fully opened	
		Less than 5 V	Ignition switch ON	Throttle valve fully closed	
8	㉗ — ㉛ Ground	1.5 - 3.0 V	Ignition switch ON	When air temperature inside intake manifold is 20°C	EF–155
9	⑧ — ㉛ Ground	0 - Approx battery voltage	Ignition switch ON	Voltages chang takes place 4 times when vehicle is moved 1.5 m	EF–156
10	⑬ — ㉛ Ground	More than 6 V	When ignition switch is set to ST position:		EF–157
11	㉔ — ㉛ Ground	Approx. battery voltage	When engine is operating and compressor magnet clutch of air condition is energized:		EF–158
	⑫ — ㉛ Ground	Less than 5V	Ignition switch ON	Throttle valve fully closed	
		Approx. battery voltage		Throttle valve fully opened	
12	⑯ — ㉛	Approx. battery voltage	Ignition switch ON	When engine is operating and cooling water temperature is 40°C or below:	
		Less than 3V	Ignition switch ON	When engine is operating and cooling water temperature is 40°C or more:	

WFE90-EF563

TROUBLE SHOOTING EFI ELECTRONIC CIRCUIT WITH VOLT/OHM MERTER

NOTE:

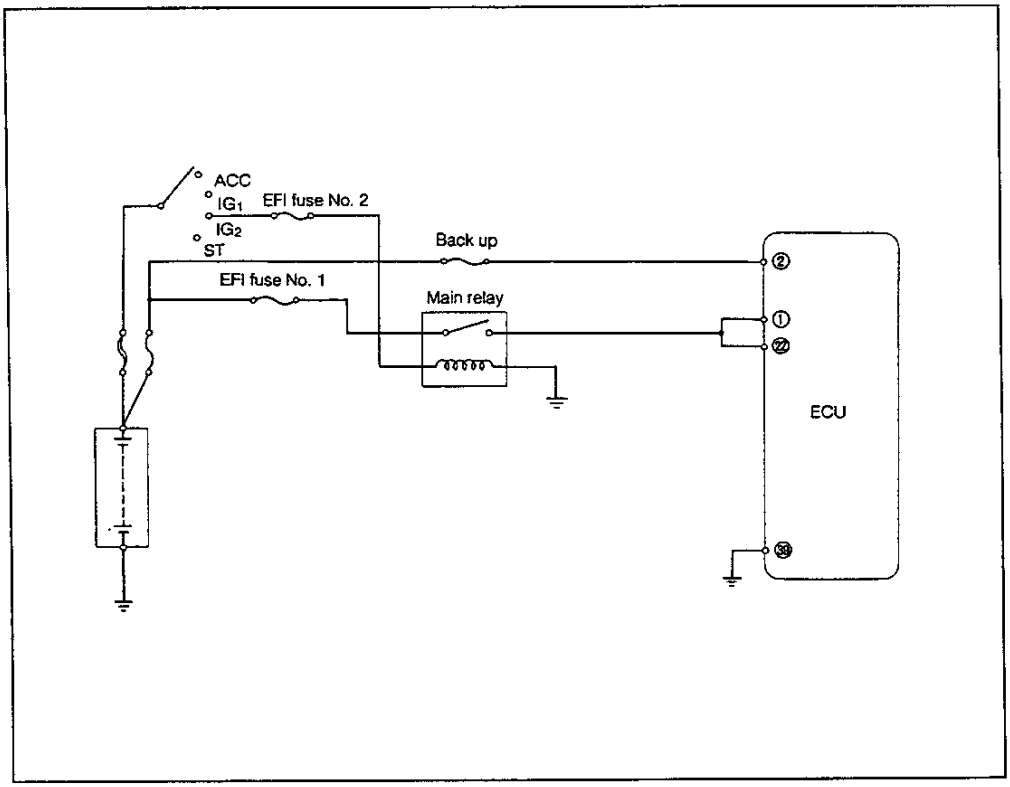
- The trouble shooting procedures described in this section are ones designed for the inspection for each system. Hence, they may differ from actual trouble shooting procedure.
- However, it is advisable that the basic approach to trouble shooting is based on the procedure described in this manual.
- Before you start the inspection, it is a best practice to first make simple checks of the fuses, fusible links and conditions of the connectors.
- The following trouble shooting procedure has been prepared on the assumption that troubles are caused by short circuits or open circuits of external components of the computer or short circuits inside the computer.
- If engine malfunctions persist even when the terminal voltages of the ECU connectors are normal, the ECU may be faulty. Try the trouble shooting using a new ECU.
- However, even when the trouble is solved after the ECU has been replaced, it is imperative to confirm that the trouble was actually attributed to the old ECU by installing the old ECU again.
- When you perform the inspection of wirings, see the section under "Harness & Wiring Diagram."



WFE90-EF564

No.	Terminals	Trouble	Condition	STD voltage
1	① — ㊳ Ground ㉒ — ㊳ Ground	No standard voltage	Ignition switch ON	Approx. battery voltage
	② — ㊳ Ground		At all time (But, voltage drops during engine starting period)	

WFE90-EF565



If the SST (09842-87704-000) has not been installed yet, install the SST, referring to the section under "Preparation of Trouble-shooting" at page EF–141.

WFE90-EF566

① or ㉒ — ㊴

[1] There is no specified voltage between SST terminals ① or ㉒ and ㊴.

[2] Check that there is specified voltage between SST terminal ① or ㉒ and body ground when ignition switch is turned ON.

NO → Check fuses, fusible link and wiring harness.

YES → Check between ECU terminal ㊴ and body ground.

YES → Repair or replace.

Check fuses, fusible link and wiring harness.

OK → Check ignition switch.

BAD → Repair or replace.

Check ignition switch.

OK → Check EFI main relay. (See page EF-161.)

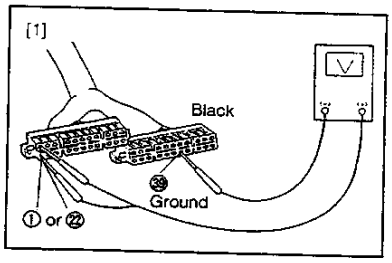
BAD → Repair or replace.

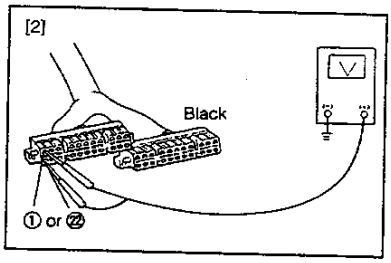
Check EFI main relay. (See page EF-161.)

OK → Check ECU. (See page EF-189.)

BAD → Repair or replace.

Check ECU. (See page EF-189.)





WFE90-EF567

② — ㊳

[1] There is no specified voltage between SST terminals ② and ㊳.

↓

[2] Check that there is specified voltage between terminal ② and body ground.

NO → Check fuses, fusible link and wiring harness.

YES → [3] Check wiring between SST terminal ㊳ and body ground.

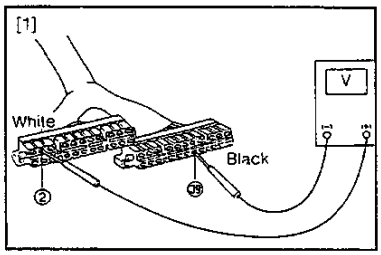
BAD → Repair or replace.

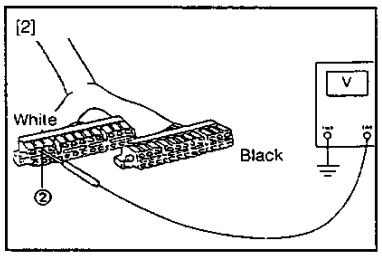
Check fuses, fusible link and wiring harness.

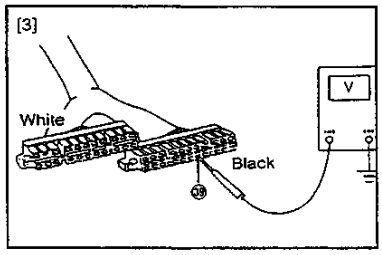
OK → Check ECU. (See page EF-189.)

BAD → Repair or replace.

Check ECU. (See page EF-189.)



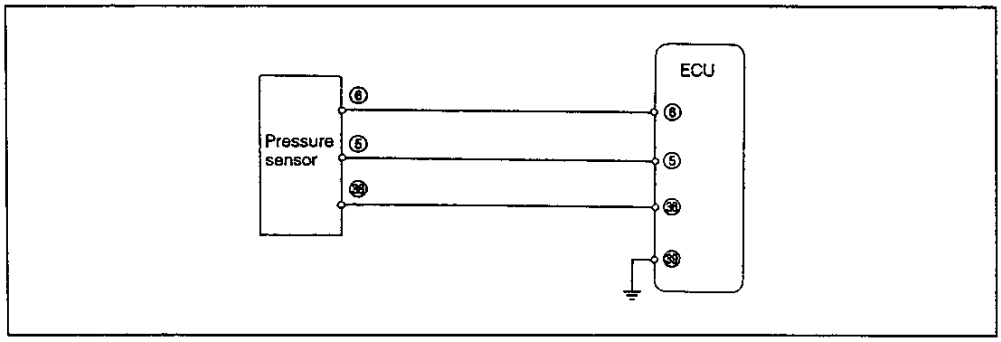




WFE90-EF568

No.	Terminals	Trouble	Condition		STD voltage
2	⑤ — ㊱ Ground	No voltage	Ignition switch ON		4.5 - 5.5 V
	⑥ — ㊱ Ground	No standard voltage	Ignition switch ON	When atmospheric pressure of 101.3 kPa (760 mmHg) exists:	3.2 - 4.0 V

WFE90-EF569



If the SST (09842-87704-000) has not been installed yet, install the SST, referring to the section under "Preparation of Trouble-shooting" at page EF–141.

WFE90-EF570

⑤ — ㊱

[1] There is no specified voltage between SST terminals ⑤ and ㊱.

[2] Check that there is specified voltage between SST terminals ① or ㉒ and ㊱.

OK → Check wiring between ECU and pressure sensor.

BAD → Refer to trouble shooting No. 1. (See page EF–138.)

BAD → Repair or replace.

Check wiring between ECU and pressure sensor.

OK → Check pressure sensor. (See page EF–172.)

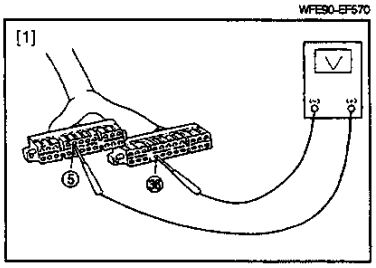
BAD → Repair or replace.

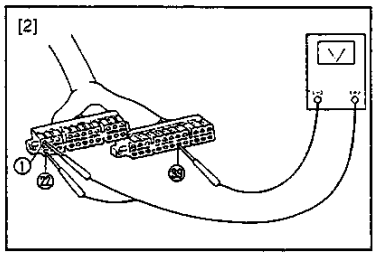
Check pressure sensor. (See page EF–172.)

OK → Check ECU. (See page EF–189.)

BAD → Repair or replace.

Check ECU. (See page EF–189.)





WFE90-EF571

⑥ — ㊴

[1] There is no specified voltage between SST terminals ⑥ — ㊴.

[2] Check that there is specified voltage between SST terminals ⑤ and ㊳.

OK → Check wiring between ECU and pressure sensor.

BAD → Refer to ⑤ — ㊳ trouble section. (See page EF-147.)

BAD → Repair or replace.

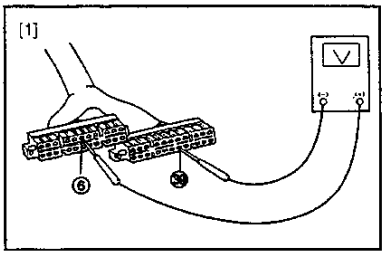
Check wiring between ECU and pressure sensor.

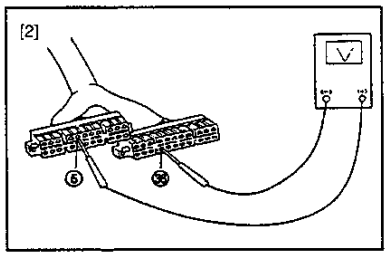
OK → Check pressure sensor. (See page EF-172.)

BAD → Repair or replace.

Check pressure sensor. (See page EF-172.)

OK → Check ECU. (See page EF-189.)

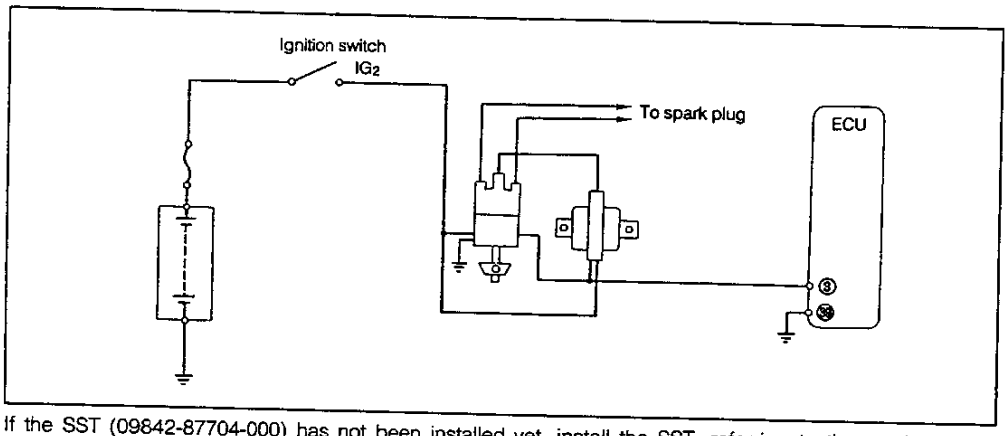




WFE90-EF572

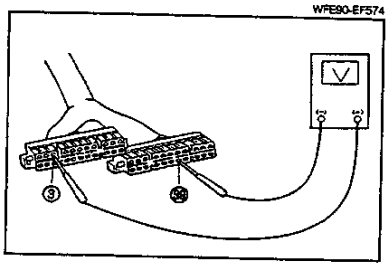
No.	Terminals	Trouble	Condition	STD voltage
3	③ — ㊴	No voltage	Ignition switch ON (Engine stopped state)	Approx. battery voltage

WFE90-EF573



If the SST (09842-87704-000) has not been installed yet, install the SST, referring to the section under "Preparation of Trouble-shooting" at page EF–141.

③ — ㊴



WFE90-EF574

There is no voltage between SST terminals ③ and ㊴

↓

Check wiring between distributor connector positive terminals (+) and SST terminal ③. (Disconnect the IG coil connector)

OK → ↓ | BAD → Repair or replace.

↓

Check ignition system. (See page IG–3.)

OK → ↓ | BAD → Repair or replace.

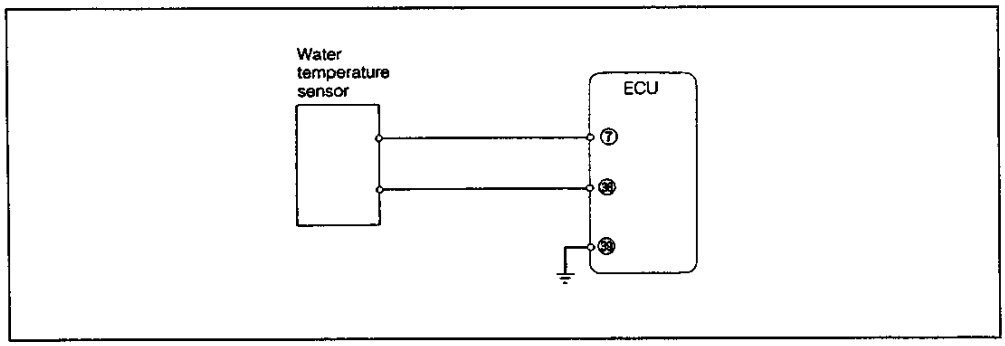
↓

Check ECU. (See page EF–189.)

WFE90-EF575

No.	Terminals	Trouble	Condition		STD voltage
4	⑦ — ㊴ Ground	No specified voltage	Ignition switch ON	When cooling water temperature is 80°C	0.4 - 0.65 V

WFE90-EF576



If the SST (09842-87704-000) has not been installed yet, install the SST, referring to the section under "Preparation of Trouble-shooting" at page EF–141.

WFE90-EF577

[1] There is no specified voltage between SST terminals ⑦ and ㊴.

[2] Check that there is voltage between SST terminals ① or ㉒ and ㊳ when ignition switch is turned ON.

OK → Check wiring between ECU and water temperature sensor.

BAD → Refer to (① or ㉒ — ㊳ trouble section No. 1. (See page EF–145.)

Check wiring between ECU and water temperature sensor.

OK → Check water temperature sensor. (See page EF–165.)

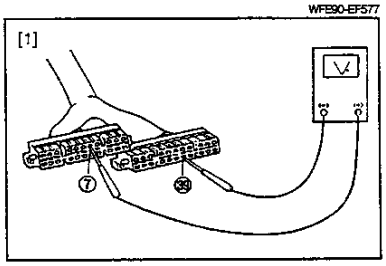
BAD → Repair or replace.

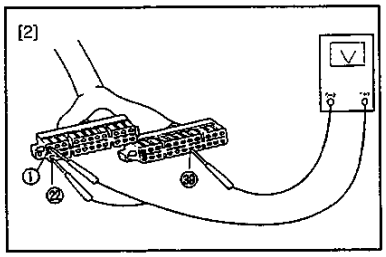
Check water temperature sensor. (See page EF–165.)

OK → Check ECU. (See page EF–189.)

BAD → Replace water temperature sensor.

Check ECU. (See page EF–189.)

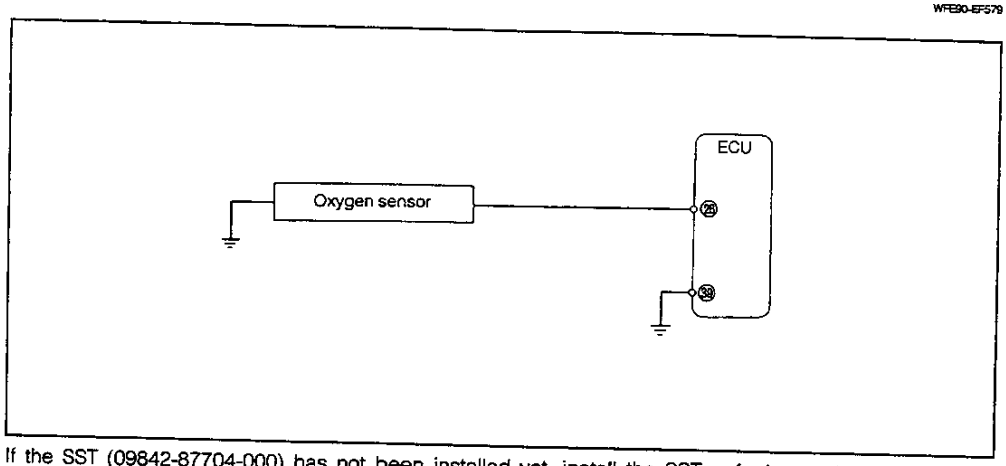




WFE90-EF578

No.	Terminals	Trouble	Condition		STD voltage
5	㉘ — ㊴ Ground	No voltage change	Ignition switch ON	When engine revolution speed is held at 3000 rpm after having warmed up engine fully:	Voltage changes more than 8 times within 10 seconds.

WFE90-EF579



If the SST (09842-87704-000) has not been installed yet, install the SST, referring to the section under "Preparation of Trouble-shooting" at page EF–141.

There is no change in voltage between SST terminals ㉘ and ㊴.

↓

Check wiring between ECU and oxygen sensor.

- **OK** → ↓
- **BAD** → Repair or replace.

↓

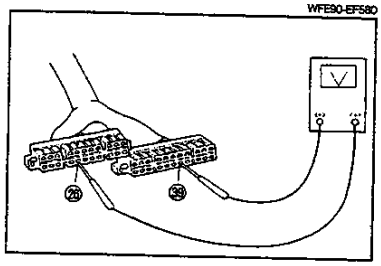
Check oxygen sensor. (See page EF–187.)

- **OK** → ↓

↓

Check ECU. (See page EF–189.)

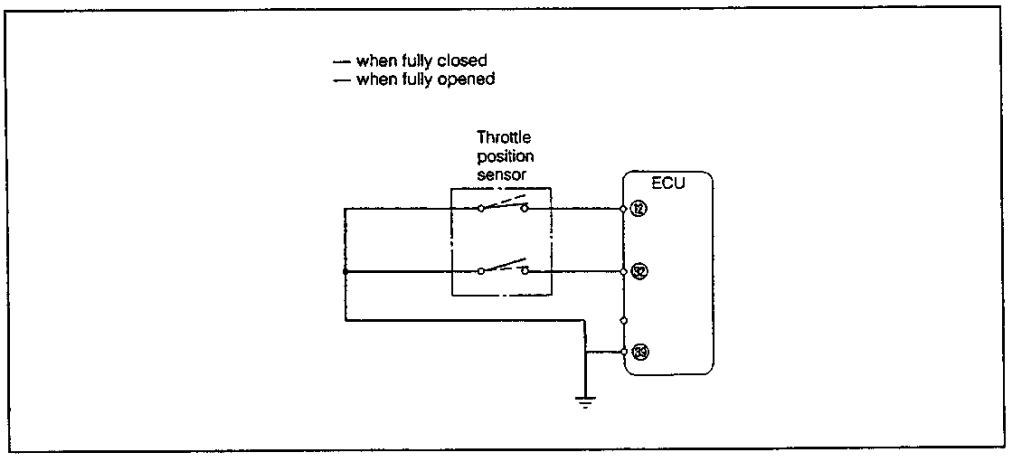
WFE90-EF580



WFE90-EF581

No.	Terminals	Trouble	Condition		STD voltage
7	⑫ — ㉝ Ground	More than 5 V	Ignition switch ON	Throttle valve fully closed	Less than 5 V
		No voltage	Ignition switch ON	Throttle valve fully opened	Approx. battery voltage
	㉜ — ㉝ Ground	No voltage	Ignition switch ON	Throttle valve fully closed	Approx. battery voltage
		More than 5 V	Ignition switch ON	Throttle valve fully opened	Less than 5 V

WFE90-EF582



If the SST (09842-87704-000) has not been installed yet, install the SST, referring to the section under "Preparation of Trouble-shooting" at page EF–141.

WFE90-EF583

⑫ — ㊴

[1] There is no specified voltage between SST terminals ⑫ and ㊴.

↓

[2] Check that there is voltage between SST terminals ① or ㉒ and ㊴ when ignition switch is turned ON.

OK → ↓ **BAD** → Refer to ① or ㉒ and ㊴ trouble section No. 1. (See page EF–145.)

↓

Check throttle position sensor. (See page EF–170.)

OK → ↓ **BAD** → Replace.

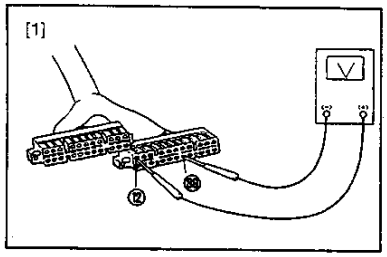
↓

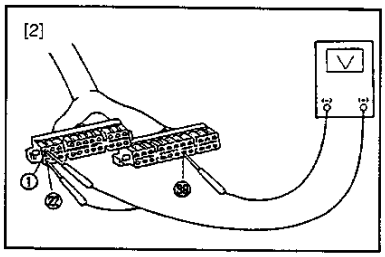
Check wiring between ECU and throttle position sensor.

OK → ↓ **BAD** → Repair or replace.

↓

Check ECU (See page EF–189.)





WFE90-EF584

㉜ — ㊴

[1] There is no specified voltage between SST terminals ㉜ and ㊴.

[2] Check that there is voltage between SST terminals ① or ㉒ and ㊴ when ignition switch is turned ON.

OK → Check throttle position sensor. (See page EF–170.)

BAD → Refer to ① or ㉒ and ㊴ trouble section No. 1. (See page EF–145.)

Check throttle position sensor. (See page EF–170.)

OK → Check wiring between ECU and throttle position sensor.

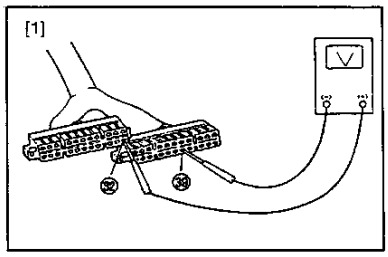
BAD → Replace.

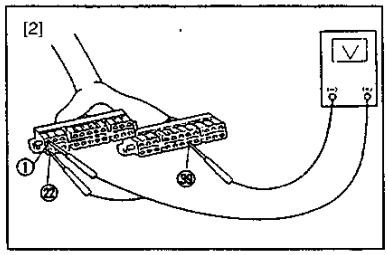
Check wiring between ECU and throttle position sensor.

OK → Check ECU. (See page EF–189.)

BAD → Repair or replace.

Check ECU. (See page EF–189.)

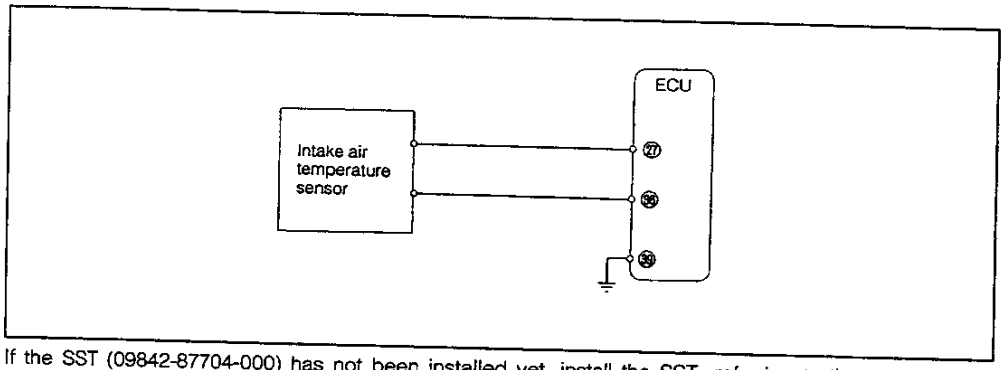




WFE90-EF585

No.	Terminals	Trouble	Condition		STD voltage
8	㉗ — ㊴ Ground	No specified voltage	Ignition switch ON	When air temperature inside intake manifold is 20°C	1.5 - 3.0 V

WFE90-EF586



If the SST (09842-87704-000) has not been installed yet, install the SST, referring to the section under "Preparation of Trouble-shooting" at page EF–141.

[1] There is no specified voltage between SST terminals ㉗ and ㊴.

[2] Check that there is voltage between SST terminals ① or ㉒ and ㊴ when ignition switch is turned ON.

OK → Check intake air temperature sensor. (See page EF–168.)

BAD → Refer to ① or ㉒ and ㊴ trouble section No. 1. (See page EF–145.)

Check intake air temperature sensor. (See page EF–168.)

OK → Check wiring between ECU and intake air temperature sensor.

BAD → Replace intake air temperature sensor.

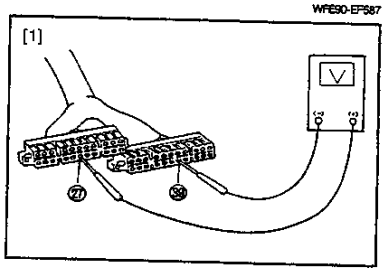
Check wiring between ECU and intake air temperature sensor.

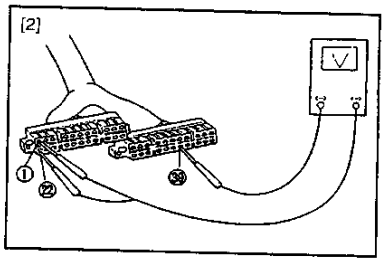
OK → Check ECU. (See page EF–189.)

BAD → Repair or replace.

Check ECU. (See page EF–189.)

WFE90-EF587

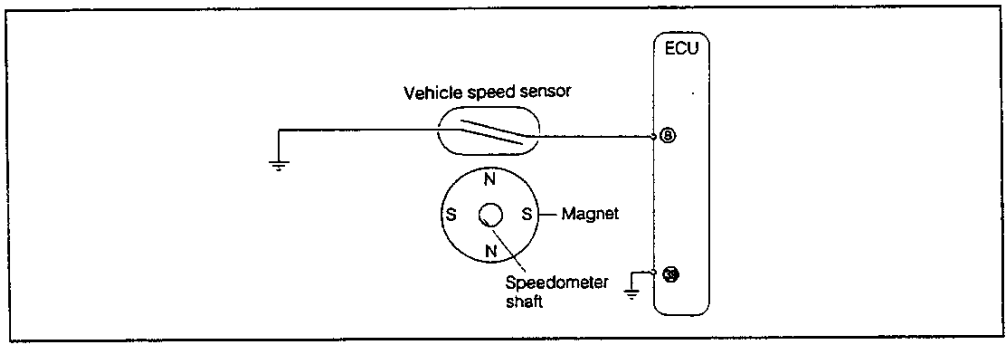




WFE90-EF598

No.	Terminals	Trouble	Condition		STD voltage
9	⑧ — ㉚ Ground	No voltage changes	Ignition switch ON	When vehicle is moved slowly:	0 - Approx. battery voltage

WFE90-EF589



If the SST (09842-87704-000) has not been installed yet, install the SST, referring to the section under "Preparation of Trouble-shooting" at page EF–141.

WFE90-EF590

[1] No change in voltage occurs between SST terminals ⑧ and ㉚ when vehicle is moved slowly with ignition switch turned ON.

↓

[2] Check that there is voltage between SST terminals ① or ㉒ and ㉚ when ignition switch is turned ON.

OK → Check wiring between ECU and vehicle speed sensor.

BAD → Refer to ① or ㉒ and ㉚ trouble section No. 1. (See page EF–145.)

Check wiring between ECU and vehicle speed sensor.

OK → Check wiring between vehicle speed sensor and body ground.

BAD → Repair or replace.

Check wiring between vehicle speed sensor and body ground.

OK → Check vehicle speed sensor.

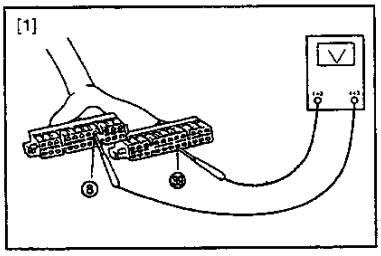
BAD → Repair or replace.

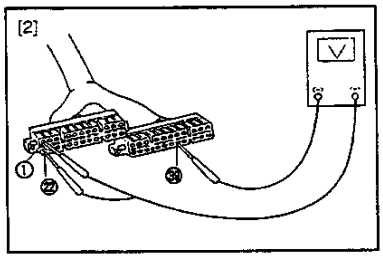
Check vehicle speed sensor.

OK → Check ECU. (See page EF–189.)

BAD → Replace.

Check ECU. (See page EF–189.)

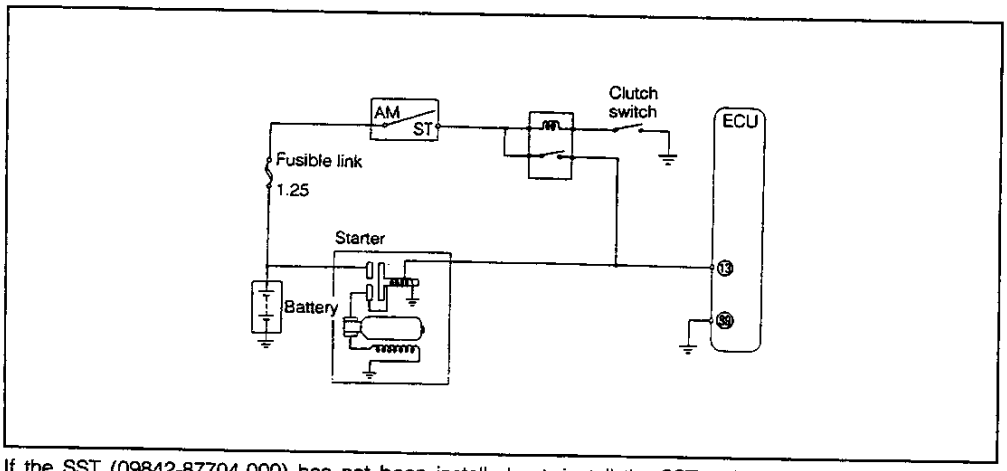




WFE90-EF591

No.	Terminals	Trouble	Condition	STD voltage
10	⑬ — ㊴ Ground	No voltage	Ignition switch set to ST position	More than 6 V

WFE90-EF592



If the SST (09842-87704-000) has not been installed yet, install the SST, referring to the section under "Preparation of Trouble-shooting" at page EF–141.

There is no voltage between SST terminals ⑬ and ㊴ when ignition switch is set to ST position.

↓

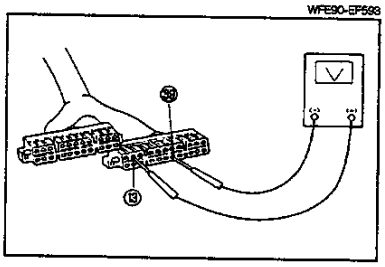
Check starter operation.

- **BAD** → Check battery, fusible link ignition switch, starter, starter relay and shift position switch or clutch switch.
- **OK** → Check wiring between ECU and starter terminals.
  - **BAD** → Repair or replace.

Check battery, fusible link ignition switch, starter, starter relay and shift position switch or clutch switch.

- **OK** → Check ECU. (See page EF–189.)
- **BAD** → Repair or replace.

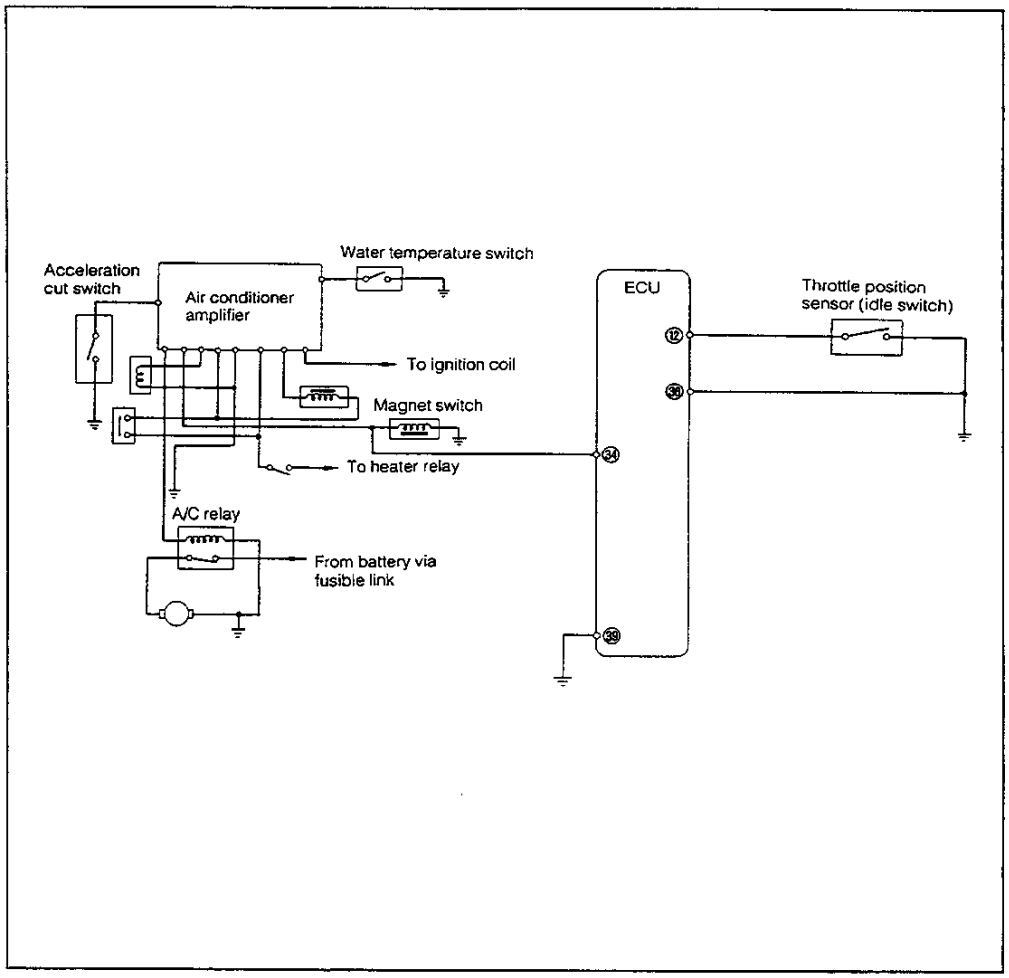
WFE90-EF593



WFE90-EF594

No.	Terminals	Trouble	Condition		STD voltage
11	㉞ — ㊴ Ground	No voltage	When engine is operating and compressor magnet clutch of air conditioner is energized:		Approx. battery voltage
	⑫ — ㊴ Ground	More than 5 V	Ignition switch ON	Throttle valve fully closed	Less than 5 V
		No voltage		Throttle valve fully opened	Approx. battery voltage

WFE90-EF595



If the SST (09842-87704-000) has not been installed yet, install the SST, referring to the section under "Preparation of Trouble-shooting" at page EF-141.

WFE90-EF596

㉞—㊴

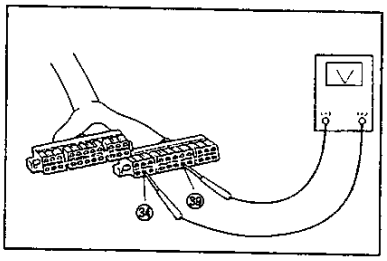
There is no specified voltage between SST terminals ㉞ and ㊴ when magnet clutch is operated.

Check magnet clutch operation.

- BAD → Check air conditioner system.
- OK → Check wiring between ECU terminal ㉞ and air conditioner amplifier terminal.
  - BAD → Repair or replace.
  - OK → Check air conditioner system.

Check air conditioner system.

- OK → Check ECU. (See page EF-189.)
- BAD → Repair.



WFE90-EF597

㉒—㊴

[1] There is no specified voltage between SST terminals ㉒ and ㊴.

[2] Check that there is voltage between SST terminals ① or ㉒ and ㊴ when ignition switch is turned ON.

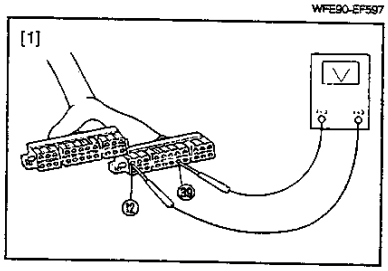
- OK → Check throttle position sensor. (See page EF-170.)
- BAD → Refer to ① or ㉒ and ㊴ trouble section No. 1. (See page EF-145.)

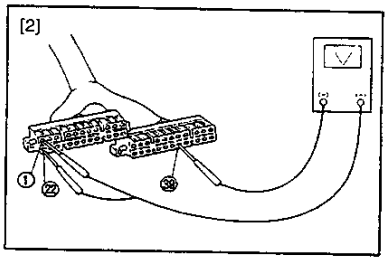
Check throttle position sensor. (See page EF-170.)

- OK → Check wiring between throttle position sensor and body ground.
- BAD → Replace throttle position sensor.

Check wiring between throttle position sensor and body ground.

- OK → Check ECU. (See page EF-189.)
- BAD → Repair or replace.

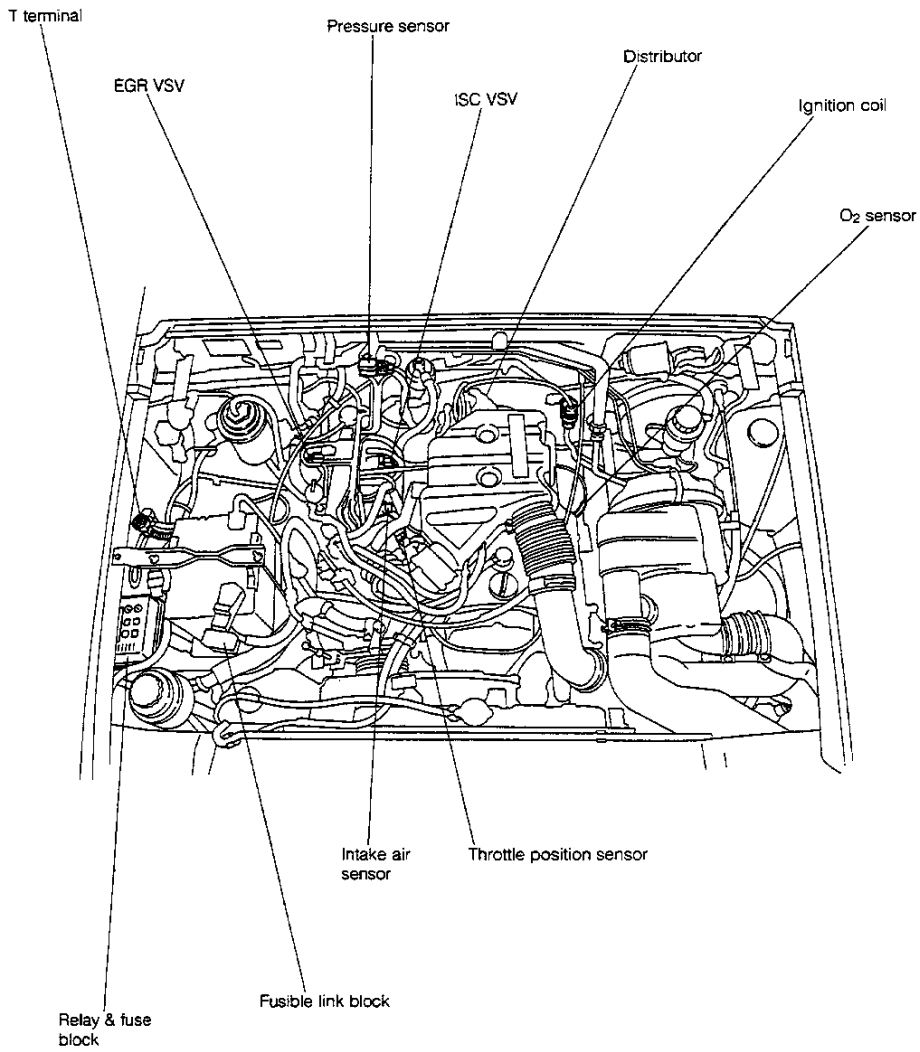




WFE90-EF598

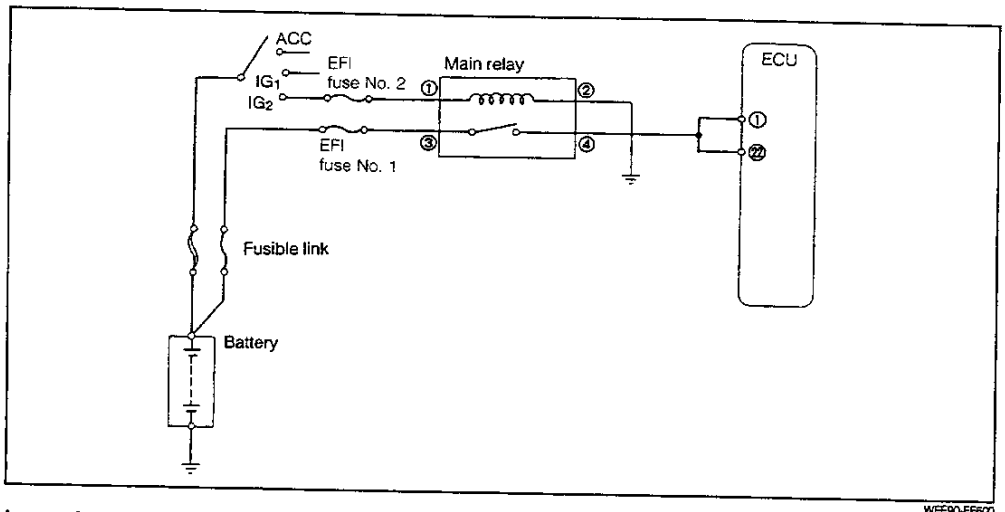
ELECTRONIC CONTROL SYSTEM

LOCATION OF ELECTRONIC CONTROL PARTS



WFE90-EF599

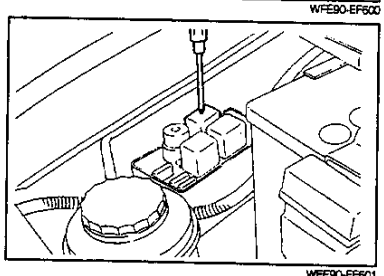
MAIN RELAY



WFE90-EF600

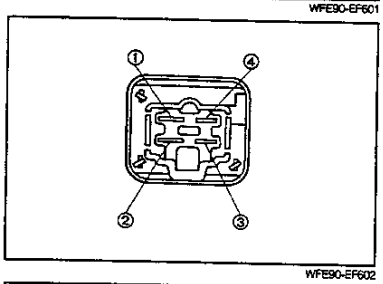
Inspection of EFI main relay

1. Check of main relay operation
   Turn ON the ignition switch. Check to see if you can hear a relay operating sound or if you can feel operating vibrations when a screwdriver or the like is brought into contact with the relay.
   CAUTION:
   - **The relay may become very hot during the operation. Hence, do not touch the relay by your hand.**



WFE90-EF601

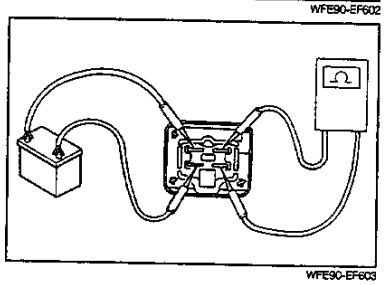
2. Inspection of relay continuity
   (1) Remove the main relay from relay box.
   (2) Check that there is continuity between the terminals ① and ②.
   (3) Check that there is no continuity between the terminals ③ and ④.
   (4) Check that there is no continuity between the terminals ① and ③ and also between the terminals ① and ④.
   (5) Check that there is no continuity between the terminals ② and ③ and also between the terminals ② and ④.



WFE90-EF602

If the continuity test results do not conform to specifications, replace the relay.

3. Inspection of relay operation
   (1) Apply the battery voltage across the terminals ① and ②.
   (2) Check that there is continuity between the terminals ③ and ④.



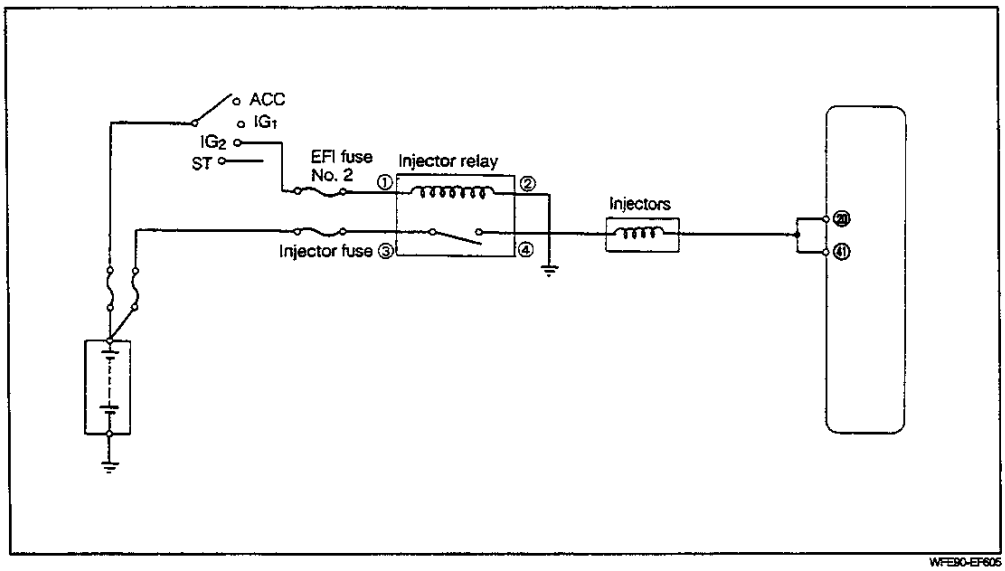
WFE90-EF603

If the operation test results do not conform to specifications, replace the relay.

4. If the main relay persists to be inoperative after the checks 1 through 3 have been performed satisfactorily, check the following items.
   (1) Fusible links
   (2) Ignition switch
   (3) Fuses
   (4) Wiring and wiring connector
5. Install the main relay to the relay box. Attach the cover.

WFE90-EF604

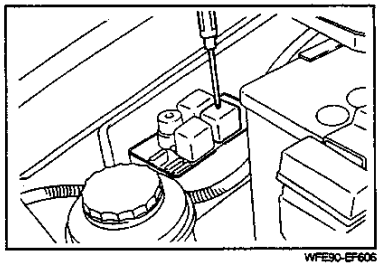
INJECTOR RELAY



WFE90-EF605

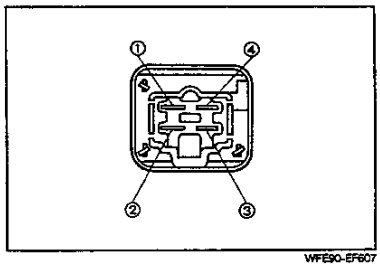
Inspection of injector relay

1. Check of injector relay operation
   Turn ON the ignition switch. Check to see if you can hear a relay operating sound or if you can feel operating vibrations when a screwdriver or the like is brought into contact with the relay.
   CAUTION:
   - **The relay may become very hot during the operation. Hence, do not touch the relay by your hand.**



WFE90-EF606

2. Inspection of relay continuity
   (1) Remove the injector relay from the relay box.
   Check that there is continuity between the terminals ① and ②.



WFE90-EF607

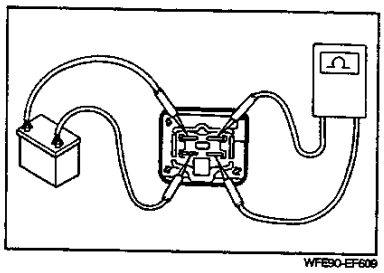
Check that there is no continuity between the terminals ③ and ④.
Check that there is no continuity between the terminals ① and ③ and also between the terminals ① and ④.
Check that there is no continuity between the terminals ② and ③ and also between the terminals ② and ④.

If the continuity test results do not conform to specifications, replace the relay.

WFE90-EF608

3. Inspection of relay operation
   (1) Apply the battery voltage across the terminals ① and ②.
   (2) Check that there is continuity between the terminals ③ and ④.

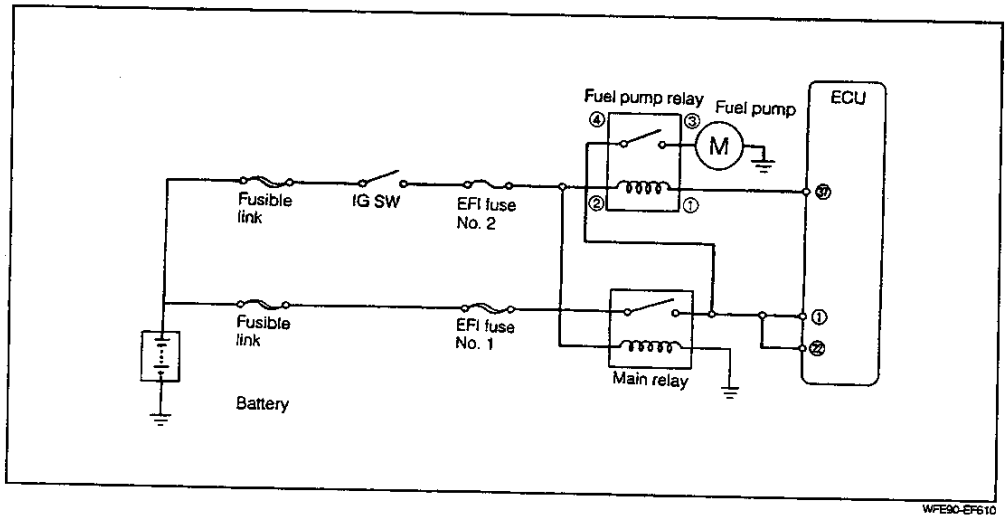
   If the operation test results do not conform to specifications, replace the relay.



WFE90-EF609

4. If the injector relay persists to be inoperative after the checks 1 through 3 have been performed satisfactorily, check the following items.
   (1) Fusible links
   (2) Fuses
   (3) Ignition switch
   (4) Wiring and wiring connector
5. Install the injector relay to the relay box. Attach the cover.

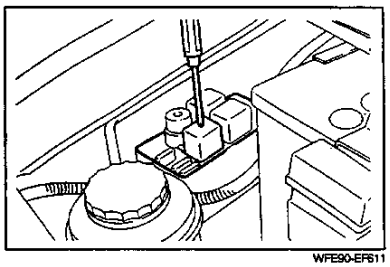
FUEL PUMP RELAY



WFE90-EF610

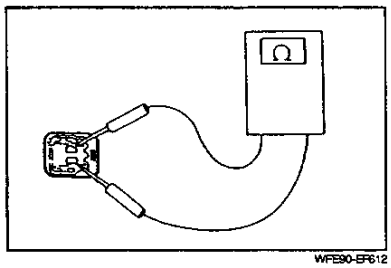
Inspection of Fuel Pump Relay

1. Check of fuel pump relay operation
   When the ignition switch is set to the ON position, check to see if the relay emits an operating sound. Or check to see if you will feel an operating vibration with a screwdriver or the like placed on the relay.
   CAUTION:
   - **The relay may become very hot during the operation. Hence, do not touch the relay by your hand.**



WFE90-EF611

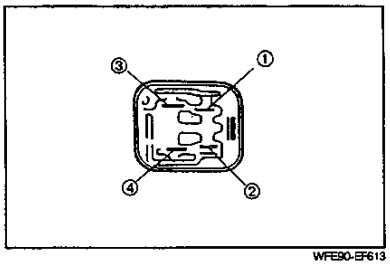
2. Inspection of relay continuity
   (1) Check that there is continuity between the terminals ① and ②.
   (2) Check that there is no continuity between the terminals ③ and ④.



WFE90-EF612

   (3) Check that there is no continuity between the terminals ① and ③ and also between the terminals ① and ④.
   (4) Check that there is no continuity between the terminals ② and ③ and also between the terminals ② and ④.

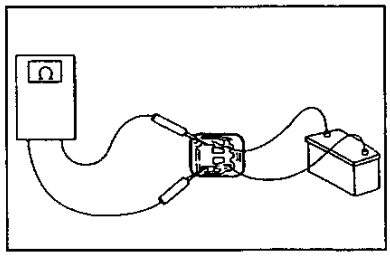
If the continuity test results do not conform to specifications, replace the relay.



WFE90-EF613

3. Inspection of relay operation
   (1) Apply the battery voltage across the terminals ① and ②.
   (2) Check that there is continuity between the terminals ③ and ④.

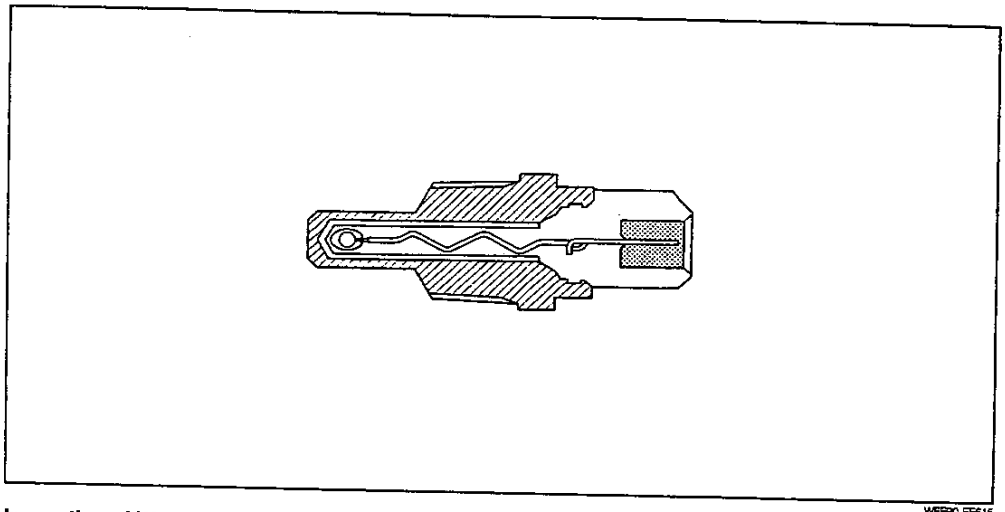
If the operation test results do not conform to specifications, replace the relay.



4. If the fuel pump relay persists to be inoperative after the checks 1 through 3 have been performed satisfactorily, check the following items.
   (1) Fusible links
   (2) Ignition switch
   (3) Fuses
   (4) Main relay (See page EF–161.)
   (5) Wiring and wiring connector
   (6) ECU (See page EF–189.)

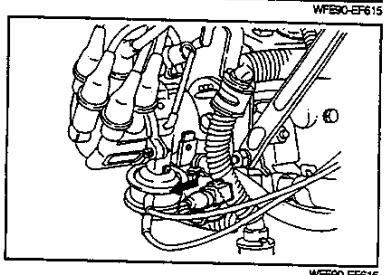
WFE90-EF614

WATER TEMPERATURE SENSOR



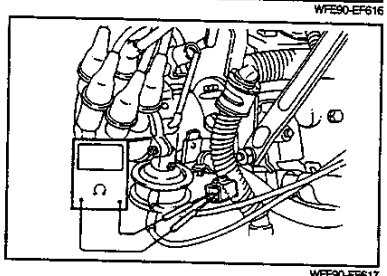
Inspection of Water Temperature Sensor
Measurement of resistance of water temperature sensor

1. Disconnect the connector.
   NOTE:
   - Be sure to un-lock the lock of connector, when disconnect or connect the connector.

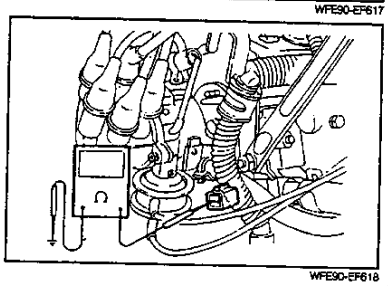

WFE90-EF615

2. Start the engine. Read the resistance at the time when the engine is wormed up fully.
   Resistance: 0.32 ± 0.1 kΩ

   If the measured resistance will not conform to the specification, remove the water temperature sensor and perform the unit inspection.


WFE90-EF616

3. Check that there is no continuity between each terminal of the water temperature sensor and the body.
   If there is continuity, replace the water temperature sensor.
   NOTE:
   - Before the water temperature sensor is removed, drain the coolant. (See page CO–12.)
   - After completion of the sensor replacement, refill the coolant. (See page CO–13.)


WFE90-EF617

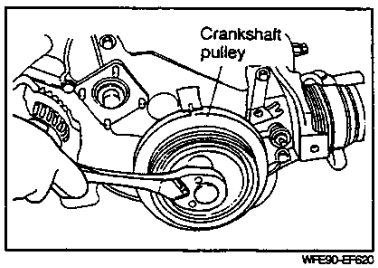
WFE90-EF618

Water temperature sensor removal and unit test

1. Disconnect the ground cable terminal from the negative (–) terminal of the battery.
2. Drain the cooling water. (See page CO–12.)

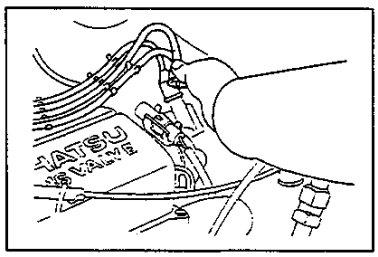
WFE90-EF619

3. Distributor removal
   (1) Turn the crankshaft, until the mark on the crankshaft timing belt pulley is aligned with the indicator mark on the timing belt cover. Ensure that the rocker arms of the cylinder No.1 at the timing belt side are in a free state. If the rocker arms are not in a free state, turn the crankshaft one more complete turn 360°.



WFE90-EF620

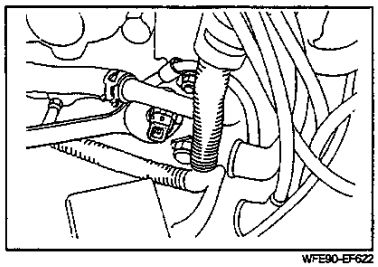
   (2) Remove the spark plug wires from the distributor cap.
   NOTE:
   - **Be sure to remove the spark plug wire by holding the rubber grommet. Never pull out the cord section.**



   (3) Disconnect the distributor connector.
   (4) Disconnect the vacuum hoses from the vacuum advancer.
   (5) Remove the distributor by removing the distributor set bolts.
   NOTE:
   - **Since the oil flows out during the removal, place a suitable cloth underneath the distributor.**

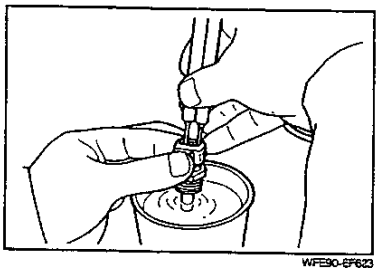
WFE90-EF621

4. Removal of water temperature sensor
   (1) Remove the water temperature sensor connector.
   (2) Remove the water temperature sensor.



WFE90-EF622

5. Unit check
   (1) Immerse the heat sensing section of the water temperature sensor in water. Raise the water temperature gradually. Check to see if the resistance varies within the specified values in accordance with the table below.


WFE90-EF623

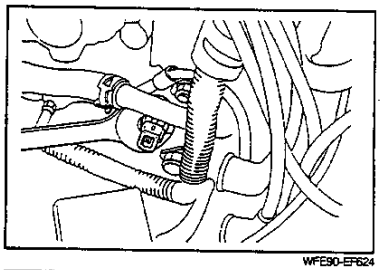
Specifications

Water temperature °C	Resistance (kΩ)
80	0.322 ± 0.1
60	0.584 ± 0.2
40	1.140 ± 0.3
20	2.450 ± 0.5
0	5.88 ± 1.5
–20	16.2 ± 3.2

If the resistance will not conform to the specifications, replace the water temperature sensor.

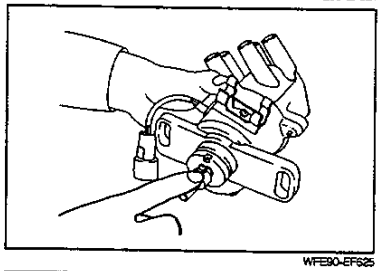
   (2) Check that there is no continuity between each terminal of the water temperature sensor and sensor body.
   If there is continuity, replace the intake air temperature sensor.

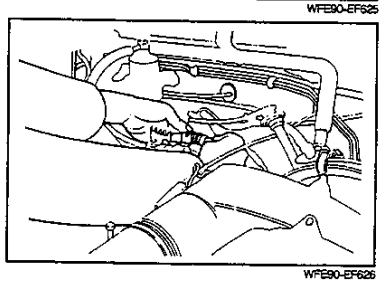
6. Installation of water temperature sensor
   (1) Wind sealing tape to the water temperature sensor switch and install it to the cylinder. Connect the connector.
   Tightening Torque: 24.4 - 34.3 N·m (2.5 - 3.5 kgf-m)


WFE90-EF624

NOTE:
- **The new sensor is coated with sealer. Hence,when the sensor is replaced with a new one, first remove the sealer thoroughly. Then, wind the seal tape. Also, be sure to clean the threaded holes at the cylinder head side.**

   (2) Distributor installation (See page IG–27.)
   ① Replace the distributor "O" ring with a new part.
   ② With the coupling cut-out section of the distributor aligned with the cut-out section of the distributor body, insert the distributor into the cylinder head. At this time, ensure that the distributor attaching bolt hole of the cylinder head comes at the center of the elongated hole for the distributor bolt. Then, torque the distributor set bolt.
   ③ Connect the vacuum hoses to the vacuum advancer.
   ④ Connect the distributor connector. Install the connector to the clamp.
   ⑤ Connect the high-tension cords to the distributor cap.

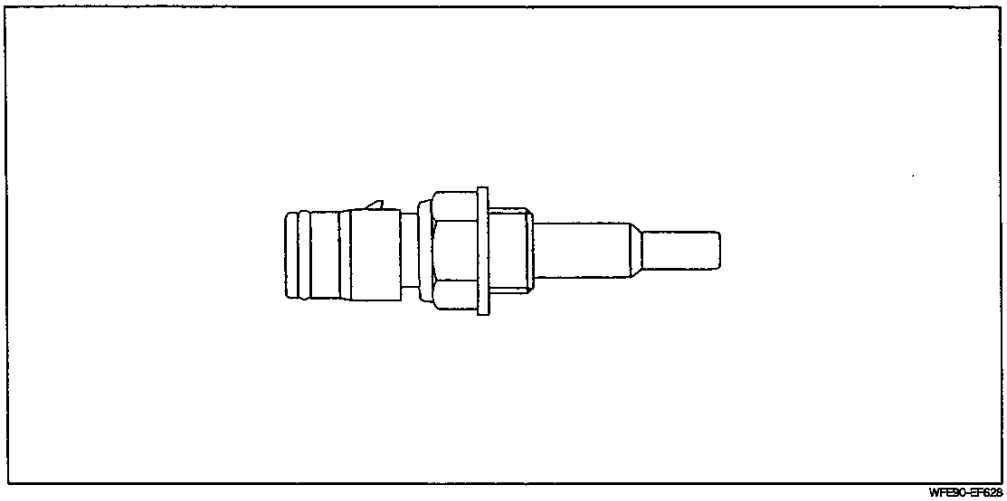

WFE90-EF625


WFE90-EF626

(3) Connect the ground cable terminal to the battery negative (–) terminal.
(4) Fill cooling water. (See page CO–13.)
(5) Adjust the ignition timing. (See page EM–23.)
(6) Start the engine. Ensure that no water or oil leakage is present.
(7) Check the oil level. (See page LU–9.)

WFE90-EF627

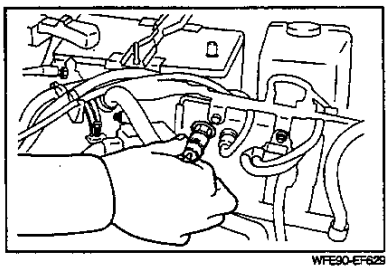
INTAKE AIR TEMPERATURE SENSOR



WFE90-EF628

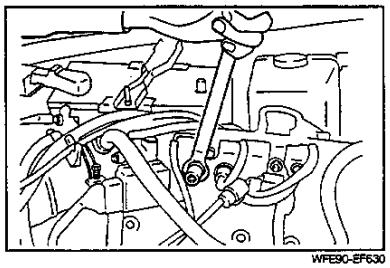
Inspection of Intake Air Temperature Sensor
Measurement of resistance of intake air temperature sensor

1. Disconnect the connector.
   NOTE:
   - Do not pull out the lead wire. While holding the connector section, unlock the lock and pull out the connector.



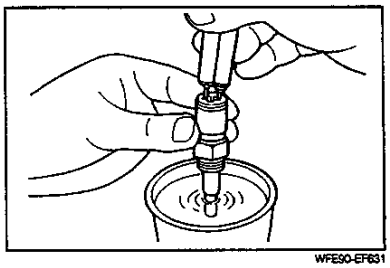
WFE90-EF629

2. Remove the intake air temperature sensor.



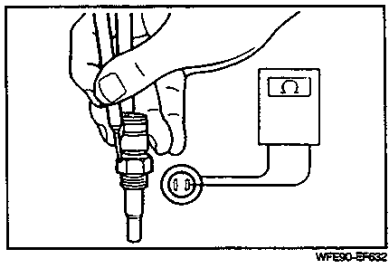
WFE90-EF630

3. Immerse the heat sensing section of the intake air temperature sensor in water. Raise the water temperature gradually. Check to see if the resistance varies within the specified values in accordance with the table in the preceding page. If the measured resistance will not conform to the specifications, replace the intake air temperature sensor.



WFE90-EF631

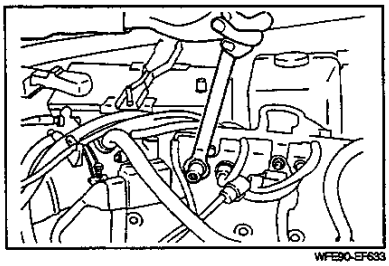
4. Check that there is no continuity between each terminal of the intake air temperature sensor and the sensor body. If there is continuity, replace the intake air temperature sensor.



WFE90-EF632

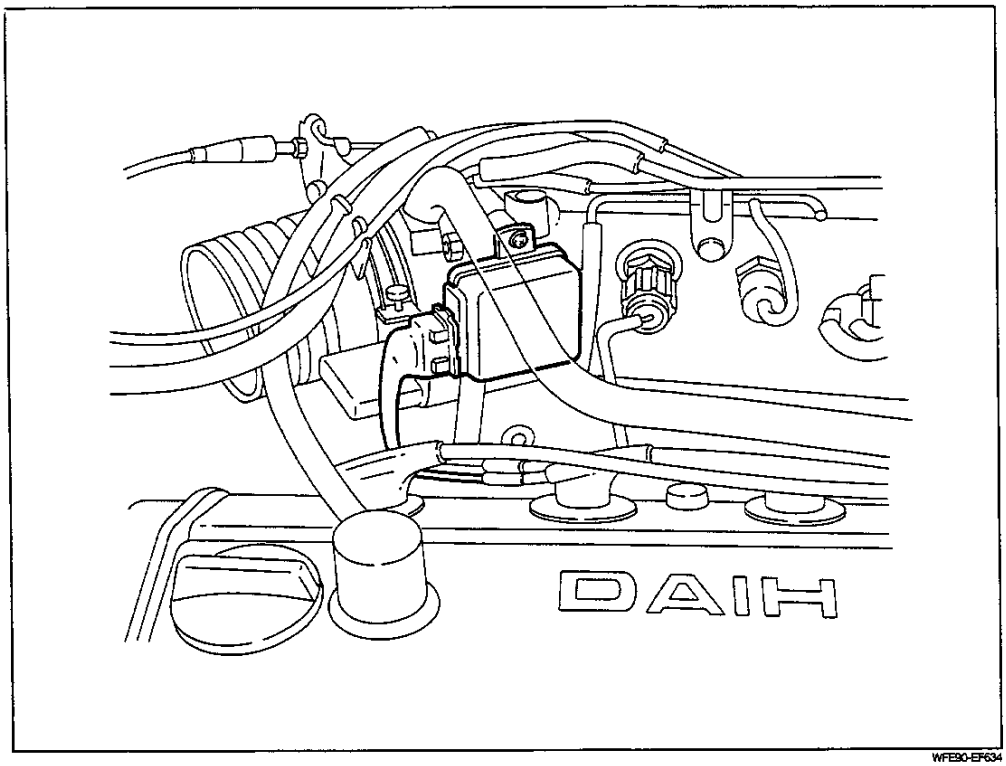
5. Install the intake air temperature sensor to the surge tank with a new gasket interposed.
   Tightening Torque: 29.4 - 39.2 N·m (3.0 - 4.0 kgf-m)

6. Connect the intake air temperature sensor connector.



WFE90-EF633

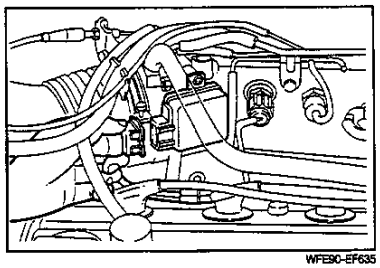
THROTTLE POSITION SENSOR



WFE90-EF634

Inspection of throttle position sensor

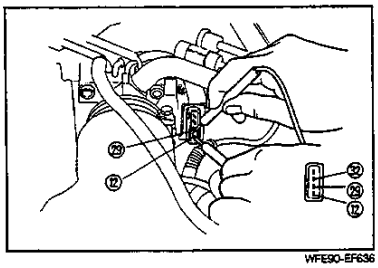
1. Remove the air chamber. (See page EM-17.)
2. Unlock the throttle position sensor connector and disconnect it.
   CAUTION:
   - **When disconnecting the connector, care must be exercised to ensure that no excessive load is applied to the throttle position sensor.**



WFE90-EF635

3. Measure the resistance between the terminals of the throttle position sensor.
   (1) Measure the resistance between ⑫ and ㉙ under the following conditions.

Throttle valve closed fully	29 kΩ or less at 20°C
Throttle valve opened fully	1000 kΩ or more



WFE90-EF636

If the measured resistance does not conform to the specification, replace the throttle body. (See page EF-224.)

CAUTION:

- **Be very careful not to damage the terminal.**

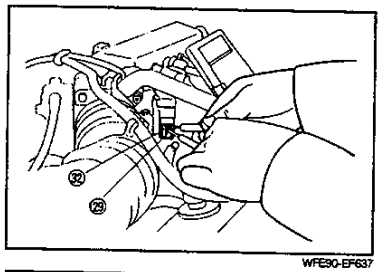
(2) Measure the resistance between ㉜ and ㉙ under the following conditions.

Throttle valve closed fully	1000 kΩ or more
Throttle valve opened fully	29 kΩ or less

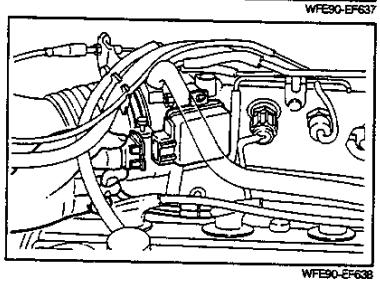
If the measured resistance does not conform to the specification, replace the throttle body. (See page EF–224.)
CAUTION:
- **Be very careful not to damage the terminal.**

4. Connect the throttle position sensor connector.
CAUTION:
- **When connecting the connector, care must be exercised to ensure that no excessive load is applied to the throttle position sensor.**

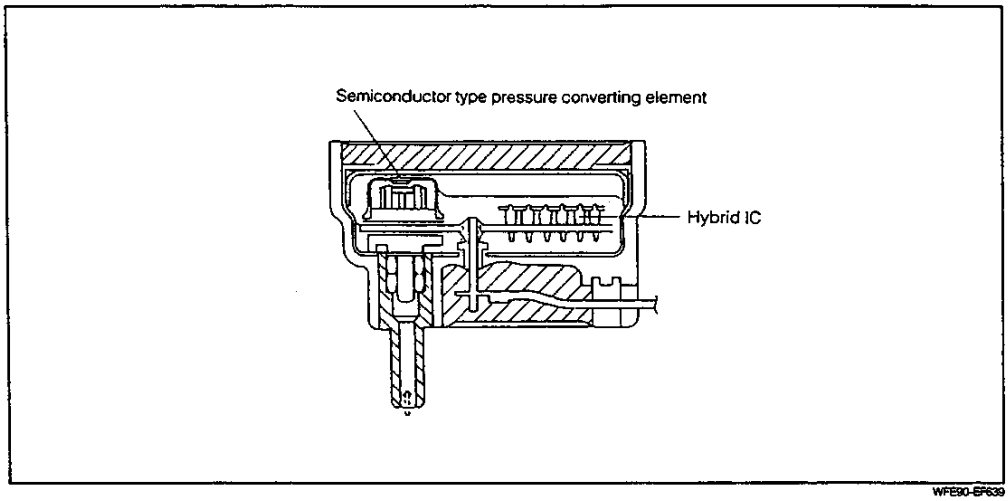
5. Install the air chamber. (See page EM–22.)



WFE90-EF637


WFE90-EF638

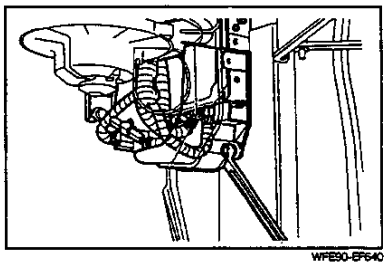
PRESSURE SENSOR



WFE90-EF639

Inspection of Pressure Sensor
Measurement of output voltage of pressure sensor

1. Connection of SST
   (1) Disconnect the ground cable terminal from the negative (–) terminal of the battery.
   (2) Remove the ECU cover.

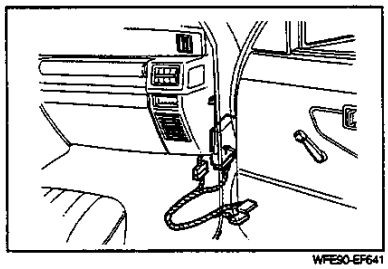


WFE90-EF640

   (3) Connect the following SST between the ECU and the engine wire.
   SST: 09842-87704-000

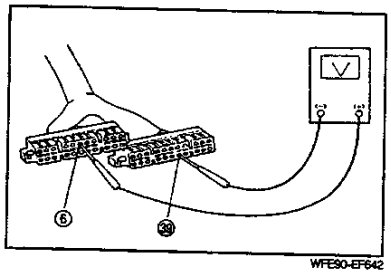
   NOTE:
   - **Before the SST is installed, be sure to perform continuity and short tests between the SST terminals.**

   (4) Reconnect the ground cable terminal to the negative (–) terminal of the battery.



WFE90-EF641

2. Check of output of pressure sensor
   (1) Measure the voltage between the SST terminals ⑥ and ㊴ when the ignition switch is turned ON.

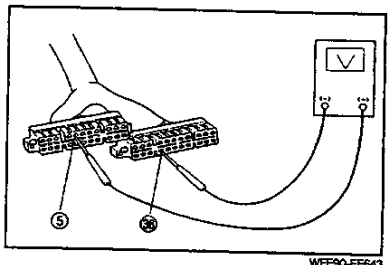


WFE90-EF642

Specified Value

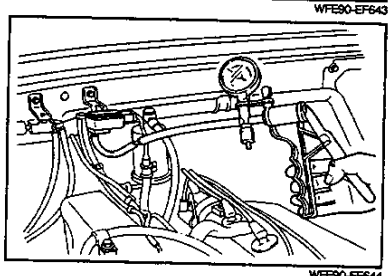
Measuring point	Atmospheric pressure kPa (mmHg)	Voltage V
Altitude (height above sea level) m		
0	101.3 kPa (760 mmHg)	3.2 - 4.0
500	95.5 kPa (716 mmHg)	3.1 - 3.8
1000	89.9 kPa (674 mmHg)	3.0 - 3.6

If the measured voltage does not conform to the specification, measure the voltage between the SST terminals ⑤ and ㊱. Ensure that the measured voltage is within a range of 4.5 to 5.5 volts. Then, proceed to replace the pressure sensor.
When the pressure sensor is replaced, it is necessary to replace the gas filter, too.
If the measured voltage between the SST terminals ⑤ and ㊱ does not conform to the specification, check the wiring between the ECU and the pressure sensor. If there is no trouble with the wiring, check the ECU. (See page EF–189.)

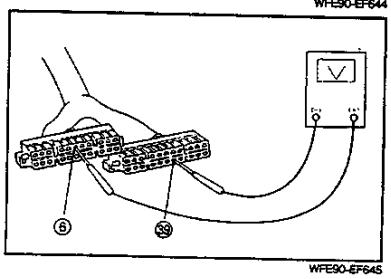


WFE90-EF643

(2) Disconnect the rubber hose connected to the pressure sensor. Apply a negative pressure of 26.7 kPa (200 mmHg) to the pressure sensor, using a MityVac. Check that the measured voltage between the SST terminals ⑥ and ㊴ drops by 0.65 - 0.95, compared with the voltage measured in the step (1).


WFE90-EF644

If the measured voltage fails to drop by the specified value, replace the pressure sensor.
When the pressure sensor is replaced, it is necessary to replace the gas filter, too.



WFE90-EF645

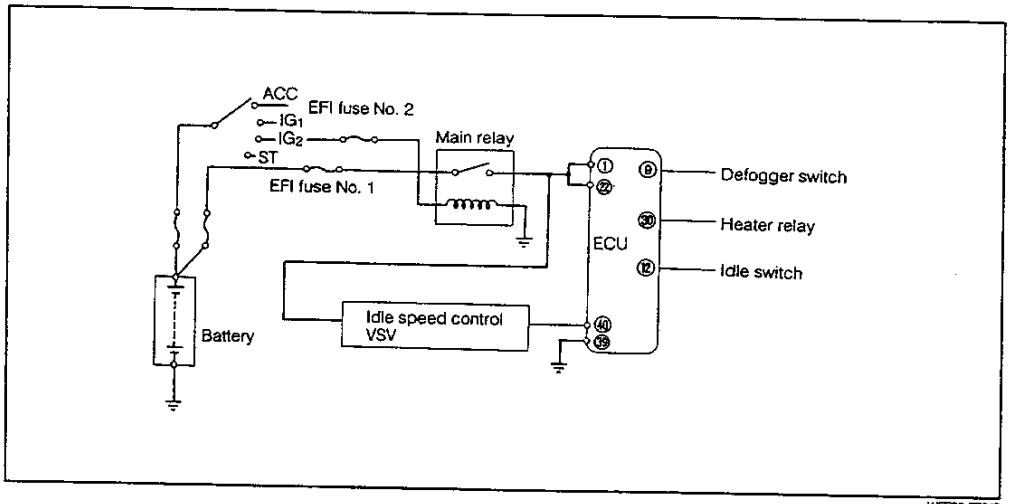
(3) Remove the MityVac from the pressure sensor.
(4) Connect the rubber hose disconnected in the step (2) to the pressure sensor.

WFE90-EF646

3. SST removal
(1) Disconnect the ground cable terminal from the negative (–) terminal of the battery.
(2) Remove the SST by disconnecting the ECU and engine wire connectors of the SST.
(3) Connect the engine wire to the ECU.
(4) Install the glove compartment box to the instrument panel.
(5) Reconnect the ground cable terminal to the negative (–) terminal of the battery.

WFE90-EF647

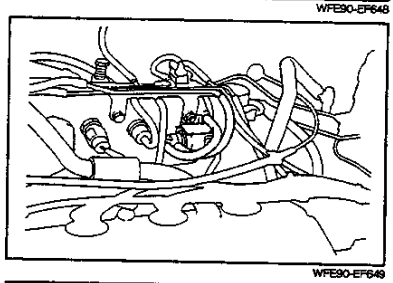
IDLE SPEED CONTROL VSV



WFE90-EF648

Inspection of idle speed control VSV

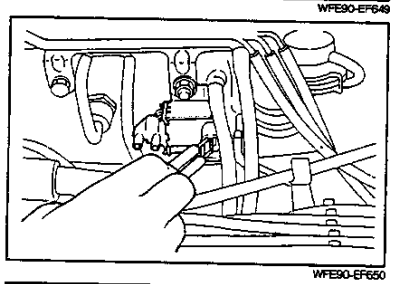
1. Unit inspection of idle speed control VSV
   (1) With the ignition switch turned OFF, disconnect the connector and vacuum hoses which are connected to the idle speed control VSV.



WFE90-EF649

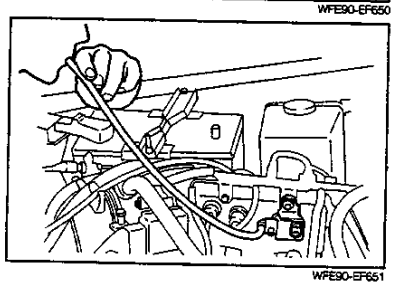
   (2) Check that the resistance between the terminals of the VSV conforms to the specification.
   Specified Resistance: 10 - 50 Ω

   Replace the VSV with a new part if the resistance does not conform to the specification.



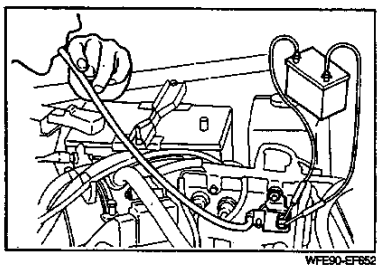
WFE90-EF650

   (3) Connect a suitable rubber hose to the VSV. Ensure that you feel resistance while blowing your breath.
   Replace the VSV with a new part if you feel no resistance while blowing your breath.

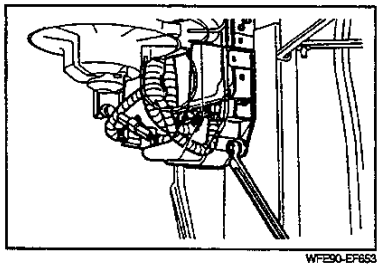


WFE90-EF651

(4) Apply the battery voltage to the idle speed control VSV as shown in the right figure.
(5) Connect a suitable rubber hose to the idle speed control VSV. Ensure that air continuity exists.
Replace the VSV with a new part if no air continuity exists.
(6) Remove the battery voltage from the VSV.
(7) Connect the disconnected vacuum hoses and connector to the VSV.

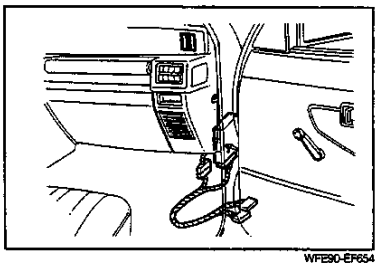

WFE90-EF652

2. Measurement of operation voltage of idle speed control VSV
(1) Disconnect the battery ground cable from the negative (–) terminal of the battery.
(2) Remove the ECU cover.


WFE90-EF653

(3) Connect the following SST between the ECU and the engine wire.
SST: 09842-87704-000

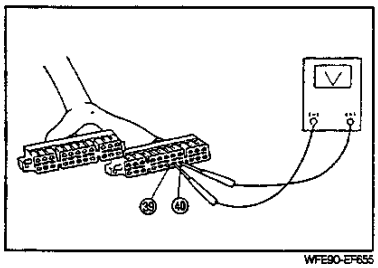
NOTE:
- **Before connecting the SST, ensure that no open wire or short exists between the terminals.**


WFE90-EF654

(4) Reconnect the battery ground cable to the negative (–) terminal of the battery.
(5) Turn ON the ignition switch.

(6) Ensure that the voltage between the SST terminals ㊵ and ㊴ (negative) is less than the specified voltage.
Specified Voltage: 3 V or less

Check the ECU if the measured voltage exceeds the specified voltage. (See page EF–189.)

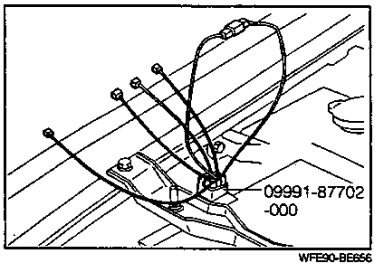


WFE90-EF655

(7) Remove the cap of the check connector. Connect the following SST.
SST: 09991-87702-000

NOTE:
- **Before connecting the SST, ensure that no open wire or short exists in each wiring.**

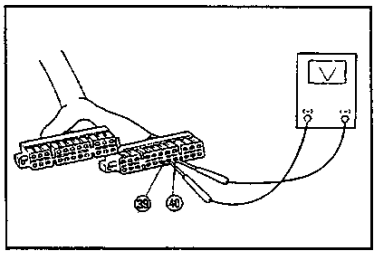
(8) Connect the test terminal (Brown) with the ground terminal (Black).



WFE90-BE656

(9) Ensure that the voltage between the SST terminals ㊵ and ㊴ (negative) is approximately the battery voltage.
Specified Voltage: Approximately battery voltage

Check the wiring from the battery to the ECU terminal ㊵ if the measured voltage is less than the specified voltage.
If no abnormality exists in the wiring, check the ECU. (See page EF–189.)



(10) Turn OFF the ignition switch.
(11) Remove the SST from the check connector.
(12) Attach the cap to the check connector.
(13) Disconnect the battery ground cable from the negative (–) terminal of the battery.
(14) Remove the SST by disconnecting the ECU and engine wire connectors of the SST.
(15) Reconnect the engine wire to the ECU.
(16) Install the ECU cover to the cowl panel.
(17) Reconnect the ground cable terminal to the negative (–) terminal of the battery.

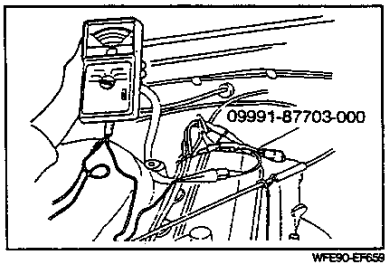
WFE90-EF657

System inspection of idle speed control VSV

1. Setting conditions prior to check
   (1) Start and warm up the engine.
   (2) Turn OFF all accessory switches.
   (3) Move the shift lever to the neutral position.
   (4) On the vehicle equipped with power steering, set the steering wheel to the straight-ahead condition.
   (5) Ensure that the intake or exhaust system exhibits no air and/or gas leakage.
   (6) Ensure that the air cleaner filter element is installed.
   (7) Ensure that all vacuum hoses and pipes are connected correctly.

WFE90-EF658

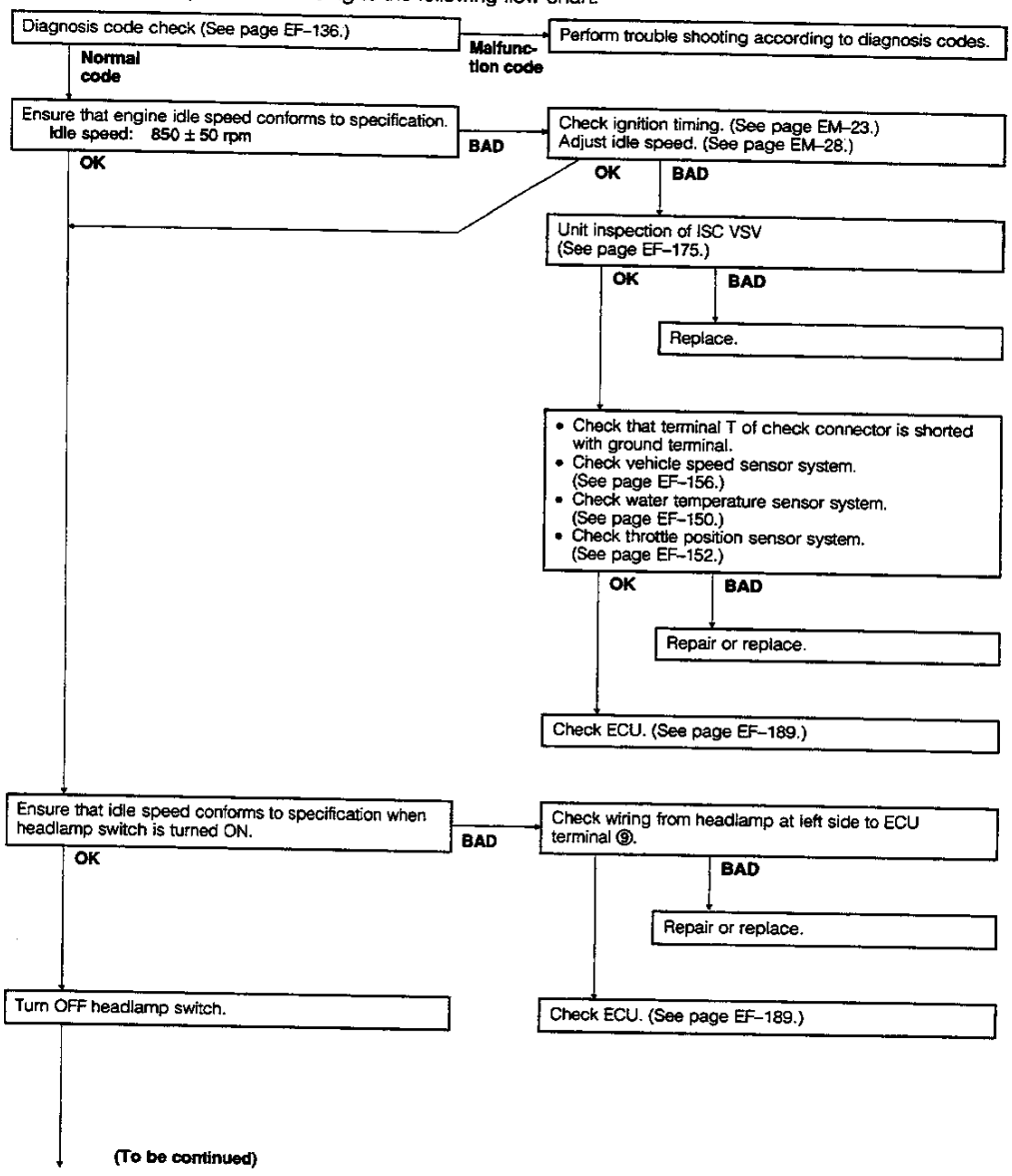
2. Connecting tachometer to engine
   Connect the measuring terminal of a tachometer to the engine.
   NOTE:
   - In case where your tachometer is to be connected to the negative (–) terminal of the ignition coil, connect the following SST, which is to be connected to the distributor connector, between the distributor and the engine wire. Then, connect the tachometer as shown in the right figure.
     SST: 09991-87703-000

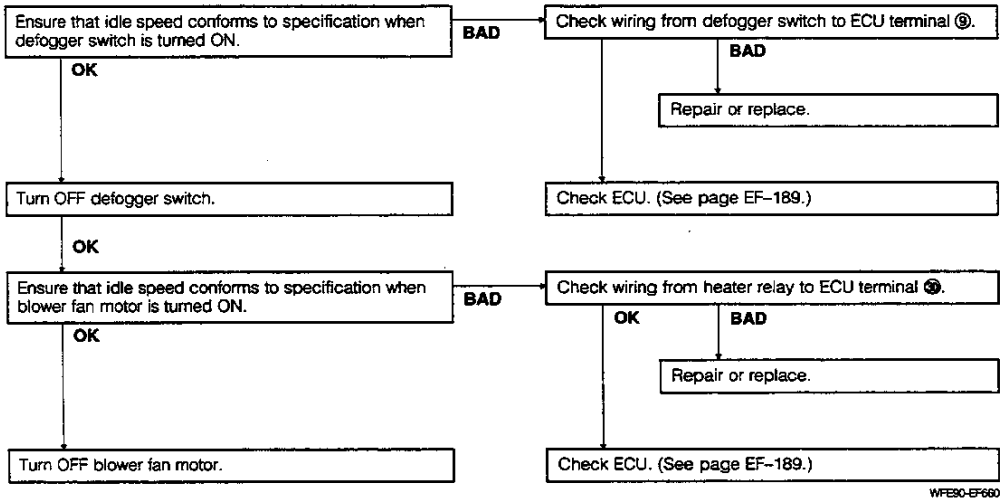


WFE90-EF659

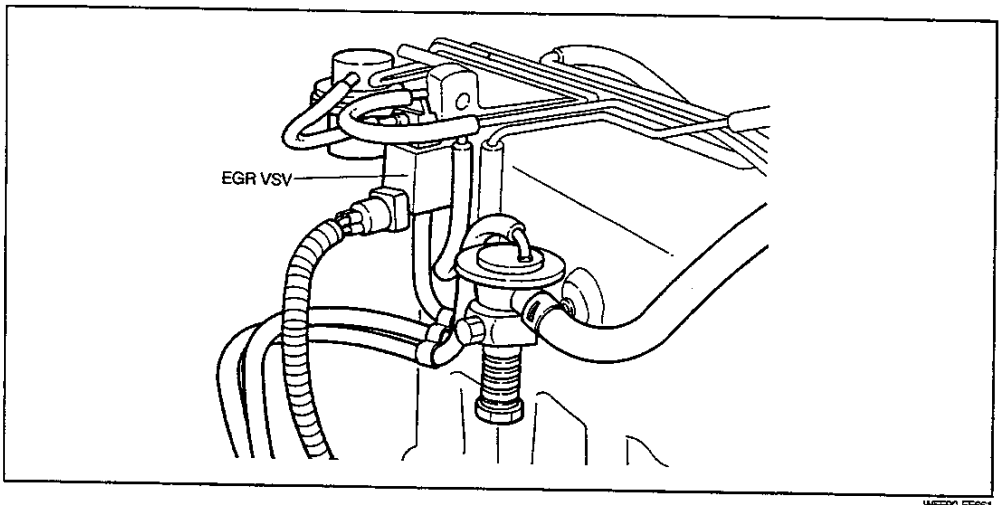
   CAUTION:
   - Never allow the tachometer terminal to touch the ground terminal as it could result in damage of the ignitor and/or the ignition coil.
   - As some tachometers are not compatible with this ignition system, it is imperative to confirm the compatibility of your meter before it is used.

3. Perform the inspection according to the following flow chart.




Ensure that idle speed conforms to specification when defogger switch is turned ON.
BAD
Check wiring from defogger switch to ECU terminal ⑨.
BAD
Repair or replace.
OK
Turn OFF defogger switch.
Check ECU. (See page EF-189.)
OK
Ensure that idle speed conforms to specification when blower fan motor is turned ON.
BAD
Check wiring from heater relay to ECU terminal ㉚.
OK
BAD
Repair or replace.
OK
Turn OFF blower fan motor.
Check ECU. (See page EF-189.)
WFE90-EF660

EGR VSV

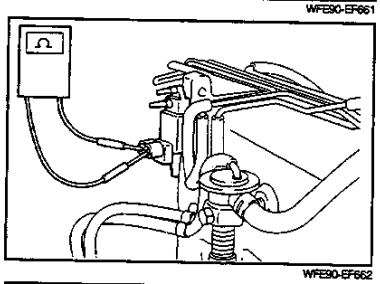


WFE90-EF661

Inspection of EGR VSV

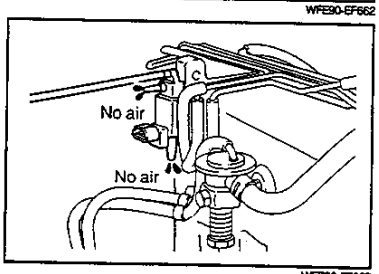
1. Unit inspection of EGR VSV
   (1) With the ignition switch turned OFF, disconnect the connector and vacuum hoses which have been connected to the EGR VSV.
   (2) Check that the resistance between the terminals of the VSV conforms to the specification.
   Specified Resistance: 20 - 60 Ω

   Replace the VSV with a new part if the resistance does not conform to the specification.



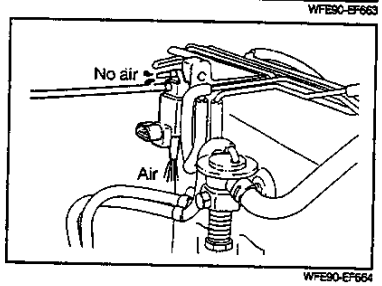
WFE90-EF662

   (3) Connect a suitable rubber hose to the VSV as shown in the right figure. Ensure that no air continuity exists. Replace the VSV with a new part if air continuity exists.



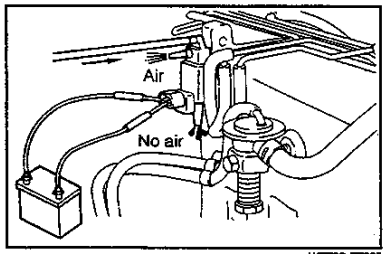
WFE90-EF663

   (4) Connect a suitable rubber hose to the VSV as shown in the right figure. Ensure that air continuity exists. Replace the VSV with a new part if no air continuity exists.



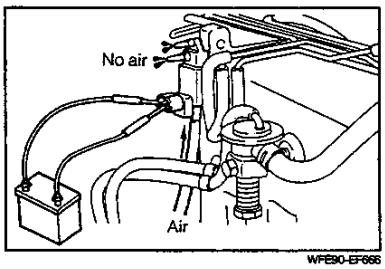
WFE90-EF664

(5) Apply the battery voltage to the EGR VSV as shown in the right figure.
(6) Connect a suitable rubber hose to the EGR VSV as shown in the right figure. Ensure that air continuity exists.
Replace the VSV with a new part if no air continuity exists.



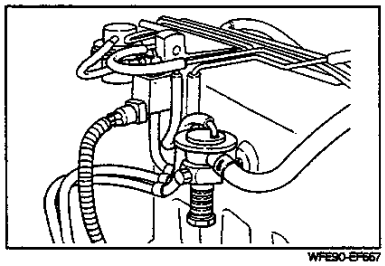
WFE90-EF665

(7) Connect a suitable rubber hose to the EGR VSV as shown in the right figure. Ensure that no air continuity exists.
Replace the VSV with a new part if air continuity exists.

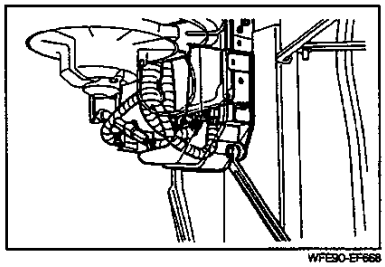


WFE90-EF666

(8) Disconnect the battery voltage from the VSV.
(9) Connect the disconnected vacuum hoses and connector to the VSV.


WFE90-EF667

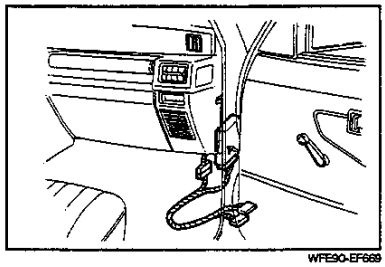
2. Measurement of operation voltage of EGR VSV
(1) Disconnect the battery ground cable from the negative (–) terminal of the battery.
(2) Remove the ECU cover.


WFE90-EF668

(3) Connect the following SST between the ECU and the engine wire.
SST: 09842-87704-000

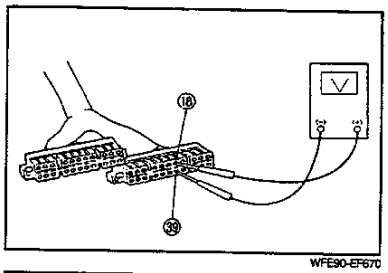
NOTE:
- Before connecting the SST, ensure that no open wire or short exists between the terminals.

(4) Reconnect the battery ground cable to the negative (–) terminal of the battery.


WFE90-EF669

(5) Start the engine. Ensure that the specified voltage is applied between the SST terminals ⑱ and ㊴ (negative) when the cooling water temperature is below 40 °C.
Specified Voltage: About battery voltage

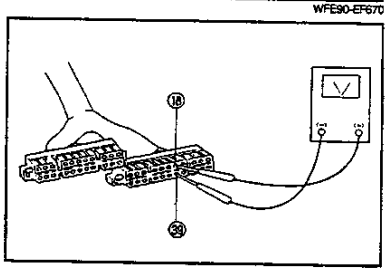
Check the wiring from the battery to the ECU terminal ㊴ if the measured value is less than the specified voltage.
If no abnormality exists in the wiring, proceed to the ECU check. (See page EF–189.)



WFE90-EF670

(6) Warm up the engine until the cooling water temperature becomes above 40 °C.
(7) Ensure that the specified voltage is applied between the SST terminals ⑱ and ㊴ (negative).
Specified Voltage: 3 V or less

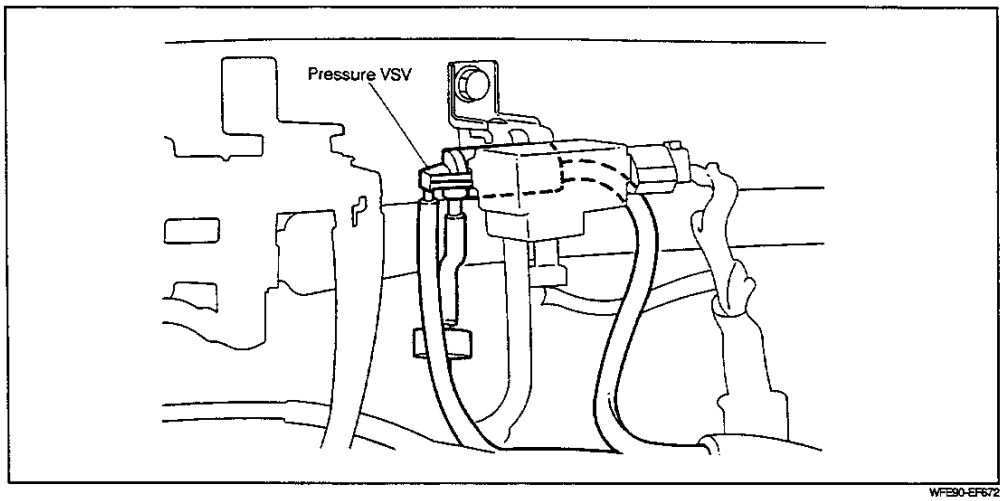
If the measured value exceeds the specified voltage, Proceed to the ECU check. (See page EF–189.)



(8) Turn OFF the ignition switch.
(9) Disconnect the battery ground cable from the negative (–) terminal of the battery.
(10) Remove the SST by disconnecting the ECU and engine wire connectors of the SST.
(11) Connect the engine wire to the ECU.
(12) Install the ECU cover to the coul panel.
(13) Reconnect the ground cable terminal to the negative (–) terminal of the battery.

WFE90-EF671

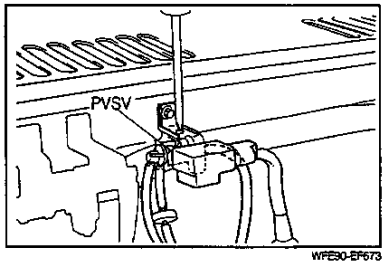
PRESSURE VSV



WFE90-EF672

INSPECTION OF PRESSURE VSV

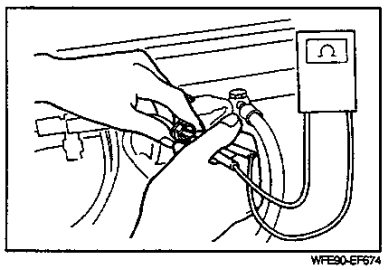
1. Unit inspection of pressure VSV
   (1) Detach the pressure VSV from the bracket, disconnect the connector and vacuum hoses that have been connected to the pressure VSV.



WFE90-EF673

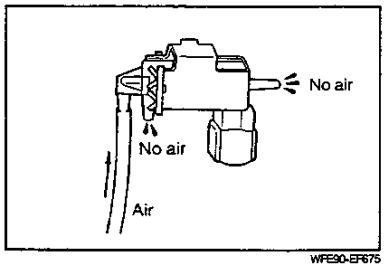
   (2) Check that the resistance between the terminals of the VSV conforms to the specification.
   Specified Resistance: 20 - 60 Ω

   Replace the VSV with a new part if the resistance does not conform to the specification.



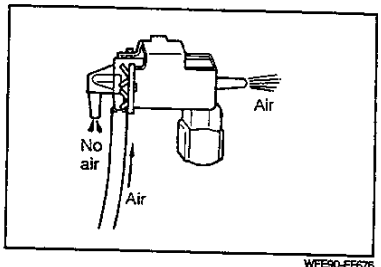
WFE90-EF674

   (3) Connect a suitable rubber hose to the VSV as shown in the right figure. Ensure that no air continuity exists. Replace the VSV with a new part if air continuity exists.



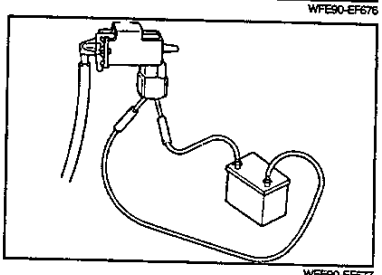
WFE90-EF675

(4) Connect a suitable rubber hose to the VSV as shown in the right figure. Ensure that air continuity exists.
Replace the VSV with a new part if no air continuity exists.

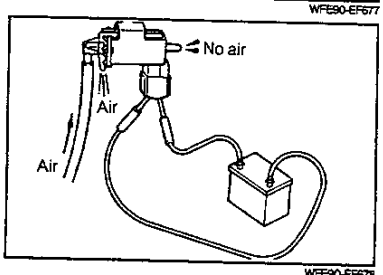


WFE90-EF676

(5) Apply the battery voltage to the pressure VSV as shown in the right figure.

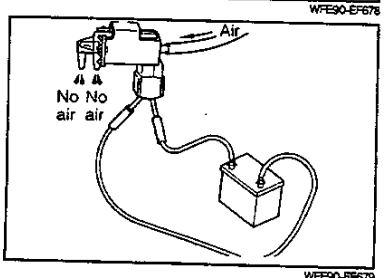

WFE90-EF677

(6) Connect a suitable rubber hose to the pressure VSV as shown in the right figure. Ensure that air continuity exists.
Replace the VSV with a new part if no air continuity exists.



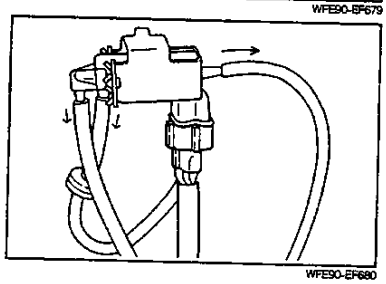
WFE90-EF678

(7) Connect a suitable rubber hose to the pressure VSV as shown in the right figure. Ensure that no air continuity exists.
Replace the VSV with a new part if air continuity exists.
(8) Remove the battery voltage being applied to the VSV.
(9) Connect the disconnected vacuum hoses and connector.

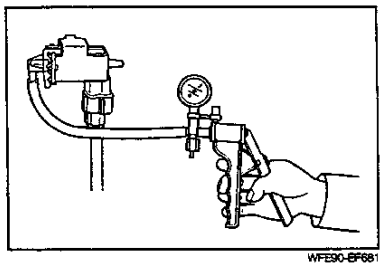


WFE90-EF679

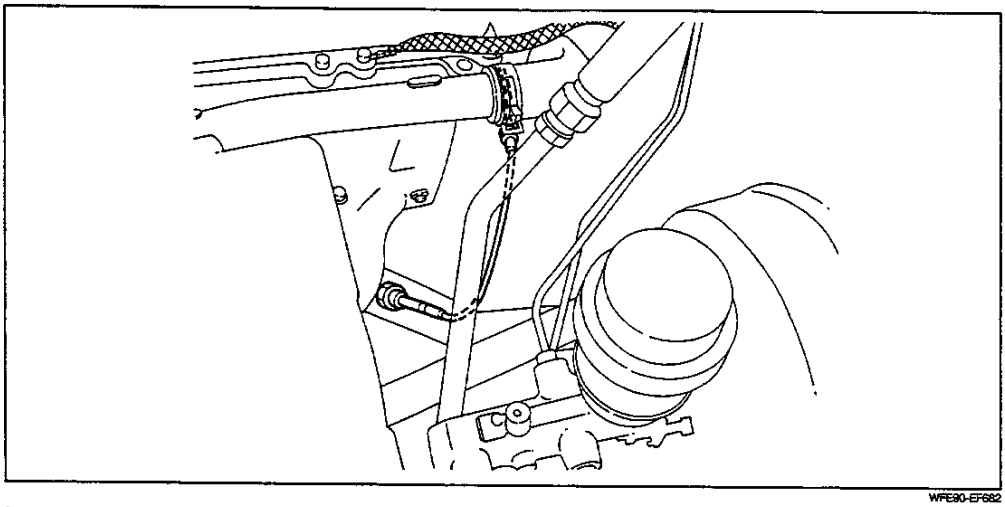
2. Inspection of pressure VSV system
(1) With the ignition switch turned OFF, disconnect the vacuum hoses which have been connected to the pressure VSV.


WFE90-EF680

(2) Connect a MityVac as shown in the right figure.
Apply a negative pressure of 26.7 kPa (200 mmHg).
(3) Ensure that the negative pressure which was applied in the step (2) becomes zero when the ignition switch turned ON.
Check the wiring from the battery to the ECU terminal ㉘ if the negative pressure does not become zero.
If no abnormality exists in the wiring, proceed to the ECU check. (See page EF–189.)
(4) Remove the MityVac. Connect the vacuum hose to the pressure VSV.



OXYGEN SENSOR

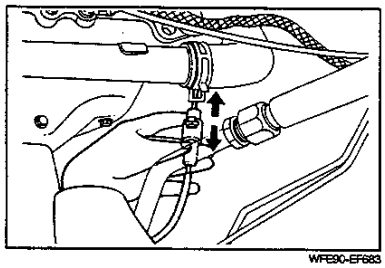


WFE90-EF682

Inspection of oxygen sensor

1. Unit inspection of oxygen sensor
   (1) Disconnect the oxygen sensor connector.

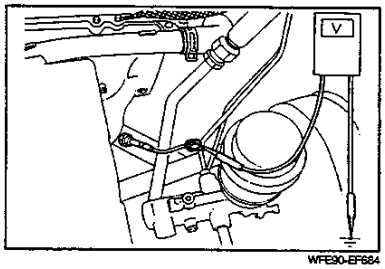
   WARNING:
   - Do not attempt this operation unless the engine has been cooled.



WFE90-EF683

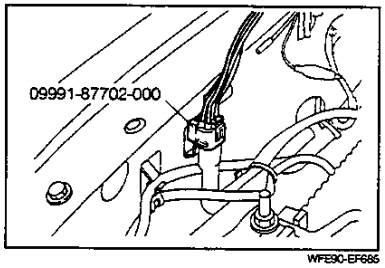
   (2) Start and warm up the engine completely.
   (3) Connect a voltmeter to the connector of the oxygen sensor.
   (4) Depress the accelerator pedal. At this time, ensure that the reading of the voltmeter is 0.45 V or more.
   Replace the oxygen sensor with a new part if the reading is not 0.45 V or more.
   (5) Remove the voltmeter from the oxygen sensor connector. Reconnect the connector. Install the connector to the clamp.

   WARNING:
   - Be careful not to scold your hand.



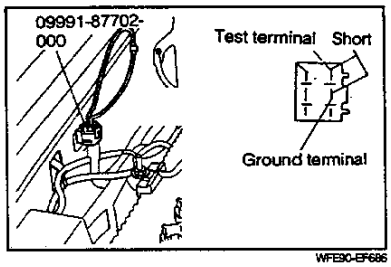
WFE90-EF684

2. System inspection of oxygen sensor
   (1) Remove the cap of the check connector. Connect the following SST to the check connector.
   SST: 09991-87702-000



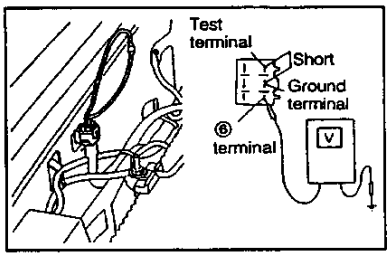
WFE90-EF685

(2) Start and warm up the engine completely.
(3) Connect the test terminal (brown) of the SST to the ground terminal (black).



WFE90-EF686

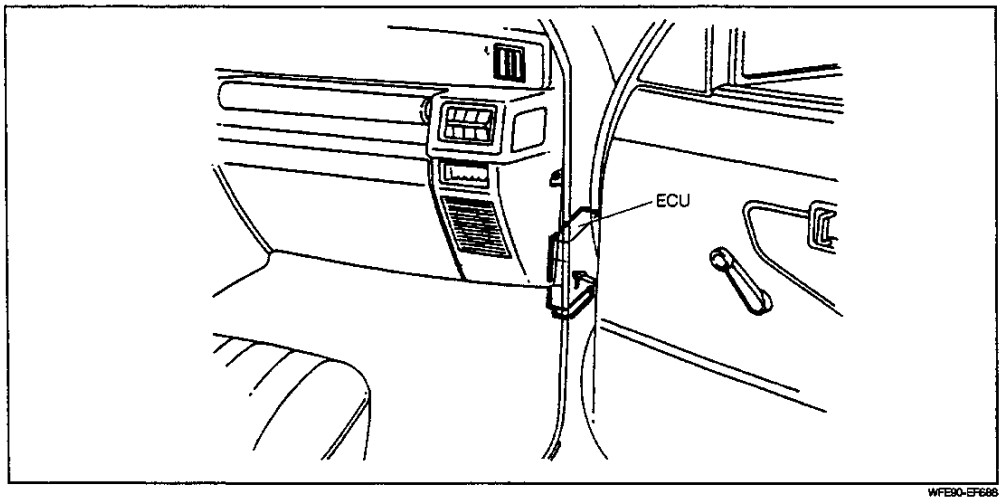
(4) Connect a voltmeter to the output terminal (green) of the SST.



(5) Hold the engine speed at 3000 rpm.
(6) After a lapse of 2 minutes, ensure that the reading of the voltmeter connected in the step (4) changes eight times or more for 10 seconds.
If the change in voltage fails to occur eight times or more, check the diagnosis code. Replace the oxygen sensor if no malfunction code is memorized.
(7) Stop the engine.
(8) Remove the SST which was connected to the check connector. Attach the cap to the check connector.

WFE90-EF687

ELECTRONIC CONTROL UNIT (ECU)



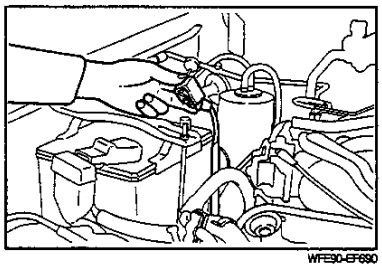
WFE90-EF688

INSPECTION OF ECU

1. Measurement of ECU input/output voltage
   NOTE:
   - The wiring circuit of the EFI can be checked by measuring the voltage and resistance at the ECU connector terminals.
   - The measurement of voltage should be conducted while all of the connectors are connected.
   - Make sure that the battery voltage is 11 V or more when the ignition switch is turned ON.

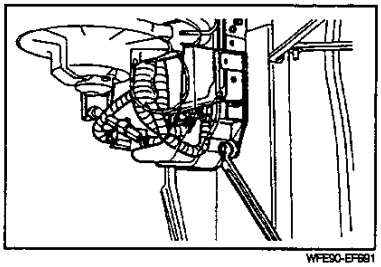
   (1) Disconnect the battery ground cable from the negative terminal (–) of the battery.

WFE90-EF689



WFE90-EF690

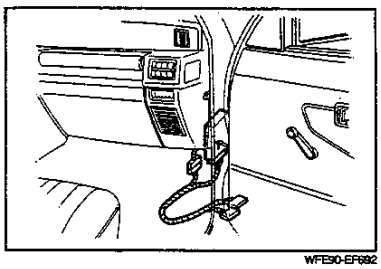
   (2) Remove the ECU cover.



WFE90-EF691

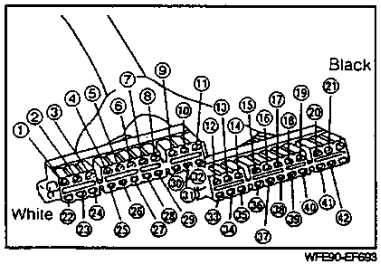
(3) Connect the following SST between the ECU and the engine wire.
SST: 09842-87704-000

NOTE:
- Before the SST is connected, make sure that no open wire and/or no short exists between the SST terminals.


WFE90-EF692

(4) Connect the battery ground cable to the negative (–) terminal of the battery.
(5) Measure the voltage between the terminals under each condition shown in the table below.
Replace the ECU if the engine shows abnormality despite the fact that all measured results are normal.
If the measured results are abnormal, check the malfunctioning system. Repair or replace the malfunctioning part.
Replace the ECU if no abnormality exists in the wiring system.

NOTE:
- The measurement should be carried out at the measuring terminals of the SST.

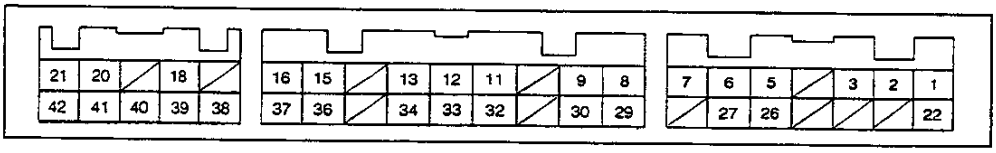


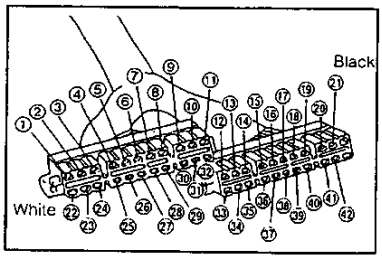
WFE90-EF693

Table Showing ECU Connections

Terminal code	Contents of connection	Terminal code	Contents of connection
1	Main relay (Power supply)	22	Main relay (Power supply)
2	Battery (Backup power supply)	23	
3	Ignition coil primary voltage	24	
4		25	
5	Pressure sensor power supply	26	Oxygen sensor
6	Pressure sensor	27	Intake air temperature sensor
7	Cooling water temperature sensor	28	
8	Vehicle speed sensor	29	Operation system ground (Engine)
9	Electrical load (Headlamp and defogger)	30	Electrical load (Blower fan)
10		31	
11	Check connector (Test terminal)	32	Throttle position switch (Power switch)
12	Throttle position switch (Idle switch)	33	Stop lamp
13	Starter	34	Air conditioner magnet switch
14		35	
15	Oxygen sensor feedback check terminal	36	Operation system ground
16	Check engine lamp	37	Fuel pump relay
17		38	Pressure VSV
18	EGR VSV	39	System ground
19		40	Idle speed control VSV
20	Injector	41	Injector
21	Actuator drive ground (Engine)	42	Actuator drive ground (Engine)

WFE90-EF694





Voltages at ECU connectors

Terminals	STD Voltage	Condition		See page
① — ㉘	Approx. battery voltage	Ignition switch ON		EF–145
② — ㉘	Approx. battery voltage	At all time		EF–146
③ — ㉘	Approx. battery voltage	Ignition switch ON	When engine is stopped:	EF–149
⑤ — ㉘	4.5 - 5.5 V	Ignition switch ON		EF–147
⑥ — ㉘	3.2 - 4.0 V	Ignition switch ON	When atmospheric pressure of 101.3 kPa (760 mmHg) exists.	EF–148
⑦ — ㉘	0.4 - 0.65 V	Ignition switch ON	When cooling water temperature is 80°C:	EF–150
⑧ — ㉘	0 - Approx. battery voltage	Ignition switch ON	Measured voltage changes when vehicle is moved 1.5 m.	EF–156
⑨ — ㉘	Less than 5.0 V	Ignition switch ON	When defogger and headlamp switches are turned OFF:	—
	Approx. battery voltage	Ignition switch ON	When defogger and/or headlamp switches are turned ON:	
⑪ — ㉘	Approx. battery voltage	Ignition switch ON	When test terminal of check connector is not connected with ground terminal:	—
	Less than 1.0 V	Ignition switch ON	When test terminal of check connector is connected with ground terminal:	—
⑫ — ㉘	Less than 5.0 V	Ignition switch ON	Throttle valve fully closed	EF–153
	Approx. battery voltage	Ignition switch ON	Throttle valve fully opened	
⑬ — ㉘	0 V	Ignition switch ON		EF–157
	More than 6 V	When ignition switch is set to ST position:		
⑮ — ㉘	Measured voltage changes at a point between 0 - 5.0 V.	After warming up engine completely, connect test terminal of check connector with ground terminal. Hold engine revolution speed at 3000 rpm for two minutes.		EF–187
⑯ — ㉘	Less than 3.0 V	Ignition switch ON	• Engine is stopped. • When check engine lamp is illuminated:	—
	Approx. battery voltage	Ignition switch ON	• After engine starts: • When check engine lamp is extinguished:	

WFE90-EF695

Terminals	STD Voltage	Condition		See page
⑱ — ㉝	Approx. battery voltage	Ignition switch ON	• After engine starts: • Cooling water temperature is below 40°C.	EF–181
	Less than 3.0 V	Ignition switch ON	• After engine starts: • Cooling water temperature is above 41°C.	
⑳ — ㉝	Less than 1.0 V	At least 30 seconds have elapsed after turning OFF ignition switch.		EF–220
	Approx. battery voltage	Ignition switch ON	• Engine is stopped.	
㉑ — ㉝	Less than 0.01 V	Ignition switch ON		—
㉒ — ㉝	Approx. battery voltage	Ignition switch ON		EF–145
㉕ — ㉝	Change in output voltage	Ignition switch ON	After warming up engine completely, hold engine revolution speed at 3000 rpm for two minutes.	EF–151
㉗ — ㉝	1.5 - 3.0 V	Ignition switch ON	Air temperature inside intake manifold is 20°C:	EF–155
㉙ — ㉝	Less than 0.1 V	Ignition switch ON		—
㉚ — ㉝	Approx. battery voltage	Ignition switch ON	• Blower fan switch turned OFF	—
	Less than 2.0 V	Ignition switch ON	When blower fan switch turned ON:	
㉜ — ㉝	Approx. battery voltage	Ignition switch ON	Throttle valve fully closed	EF–154
	Less than 5.0 V	Ignition switch ON	Throttle valve fully opened	
㉝ — ㉞	Less than 1 V	Ignition switch ON	When brake pedal is not depressed:	—
	Approx. battery voltage	At all time	When brake pedal is depressed:	—

WFE90-EF696

Terminals	STD Voltage	Condition		See page
㉞ — ㉚	Less than 1 V	Ignition switch ON	When compressor magnet switch of air conditioner is turned OFF:	EF–159
	Approx. battery voltage	Ignition switch ON	When compressor magnet switch of air conditioner is turned ON:	
㉟ — ㉚	Less than 0.1 V	Ignition switch ON		—
㊲ — ㉚	Approx. battery voltage	Ignition switch ON	When fuel pump is stopped:	EF–163
	Less than 2.0 V	Ignition switch ON	When fuel pump is operating:	
㊳ — ㉚	Approx. battery voltage	Ignition switch ON	When pressure VSV is turned OFF:	EF–184
	Less than 3.0 V	Ignition switch ON	For 0.5 second immediately after engine starts	
㊴ — Engine ground	Less than 0.1 V	Ignition switch ON		—
㊵ — ㉚	Less than 3.0 V	Ignition switch ON	Engine is stopped.	EF–175
	Approx. battery voltage	Ignition switch ON	When test terminal of check connector is connected with ground terminal:	
㊶ — ㉚	Less than 1.0 V	At least 30 seconds have elapsed after turning OFF ignition switch.		EF–220
	Approx. battery voltage	Ignition switch ON	Engine is stopped.	
㊷ — ㉚	Less than 0.1 V	Ignition switch ON		—

(6) Turn OFF the ignition switch.
(7) Disconnect the battery ground cable from the negative (–) terminal of the battery.
(8) Remove the SST by disconnecting the ECU and engine wire connectors of the SST.
(9) Reconnect the engine wire to the ECU.
(10) Install the ECU cover to the cowl panel.
(11) Reconnect the ground cable terminal to the negative (–) terminal of the battery.

WFE90-EF697

2. Measurement of resistance of sensor circuits
   CAUTION:
   - Be sure to conduct the voltage measurement at the SST terminals.
   - The resistance measurement should be conducted with the connector of the ECU disconnected.

   (1) Disconnect the battery ground cable from the negative (–) terminal of the battery.
   (2) Remove the ECU cover.
   (3) Disconnect the engine wire connectors of the ECU.
   (4) Connect the following SST to the engine wire connectors.
   SST: 09842-87704-000

   NOTE:
   - Do not connect the SST to the ECU side.

   (5) Measure the resistance between the terminals shown in the table under each condition.
   Replace the ECU if the engine is abnormal despite the fact that the measurement results are normal.
   If the measurement results are abnormal, check the malfunctioning system. Repair or replace the malfunctioning part.
   NOTE:
   - As for the ECU terminal connection table, refer to page EF–141.

WFE90-EF698

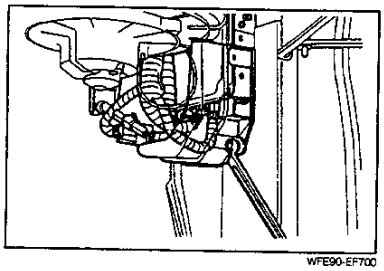
Terminals	STD Resistance kΩ	Condition	See page
⑦ — ㉙	0.322 ± 0.1	When cooling water temperature is 80°C:	EF–165
⑫ — ㊳	Less than 29	Throttle valve fully closed	EF–170
	More than 1000	Throttle valve fully opened	
㉗ — ㉙	2.45 ± 0.5	When air temperature inside intake manifold is 20°C:	EF–168
㉜ — ㊳	More than 1000	Throttle valve fully closed	EF–170
	Less than 29	Throttle valve fully opened	

   (6) Disconnect the SST connectors from the engine wire.
   (7) Connect the engine wire connectors to the ECU.
   (8) Install the ECU cover to cowl panel.
   (9) Reconnect the ground cable terminal to the negative (–) terminal of the battery.

WFE90-EF699

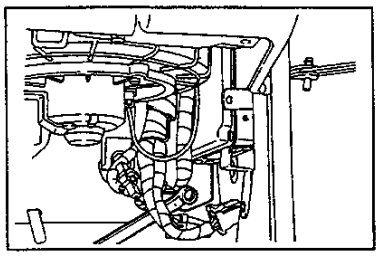
REMOVAL/INSTALLATION OF ECU

1. Disconnect the battery ground cable from the negative (–) terminal of the battery.
2. Remove the ECU cover.
3. Disconnect the engine wire connectors from the ECU.



WFE90-EF700

4. Remove the ECU from the instrument panel by removing the attaching screws.
5. Install a new ECU to the instrument panel.
   CAUTION:
   - **Do not touch the braket screws mounted on the ECU proper.**
     This tampering will cause an ECU malfunction.



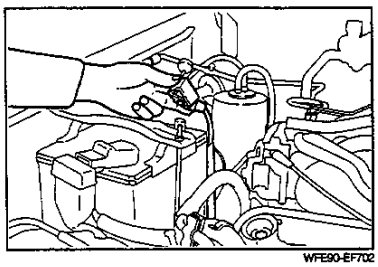
6. Connect the engine wire connectors to the ECU.
7. Install the ECU cover to the cowl panel.
8. Connect the ground cable terminal to the negative (–) terminal of the battery.

WFE90-EF701

FUEL CUT RPM

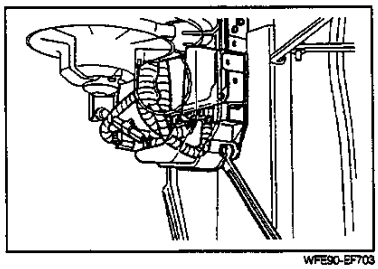
INSPECTION OF FUEL CUT RPM

1. Disconnect the battery ground cable from the negative (–) terminal of the battery.



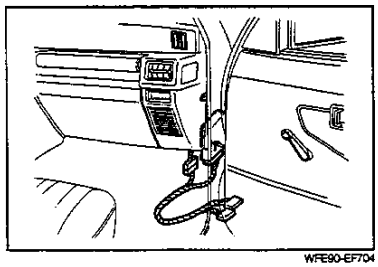
WFE90-EF702

2. Remove the ECU cover.



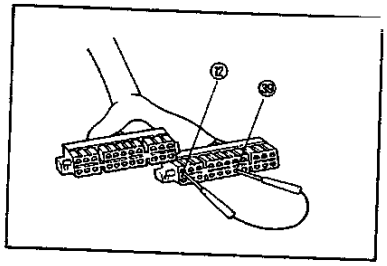
WFE90-EF703

3. Connect the following SST between the ECU and the engine harness.
   SST: 09842-87704-000



WFE90-EF704

4. Connect the SST terminals ⑫ and ㊴.



5. Connect the battery ground cable to the negative (–) terminal of the battery.
6. Start and warm up the engine fully.

WFE90-EF705

7. After the engine has been warmed up completely, increase the engine revolution speed gradually. Ensure that the change in the engine revolution speed occurs between the fuel cut revolution speed and the fuel return revolution speed.

Fuel cut revolution speed (rpm)	AC OFF	1650
	AC ON	2300
Fuel return revolution speed (rpm)	AC OFF	1300
	AC ON	1600

WFE90-EF706

8. Turn OFF the ignition switch.
9. Disconnect the battery ground cable from the negative (–) terminal of the battery.
10. Remove the SST by disconnecting the ECU and engine wire connectors of the SST.
11. Reconnect the engine wire to the ECU.
12. Install the ECU cover to the cowl panel.
13. Reconnect the ground cable terminal to the negative (–) terminal of the battery.

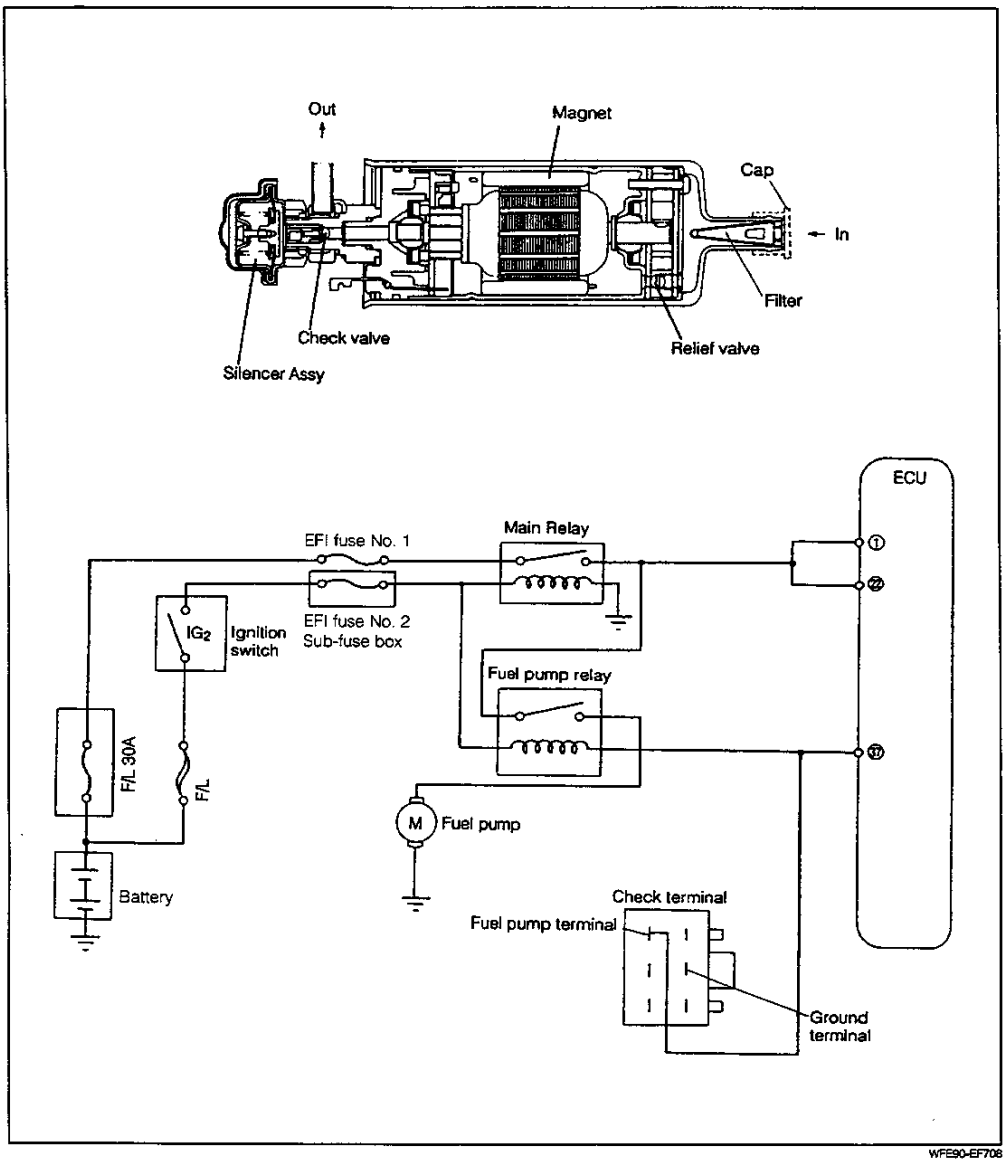
WFE90-EF707

FUEL SYSTEM

FUEL PUMP

WARNING:

- When working on the fuel system, never smoke nor allow any open flame to be brought near the working site.

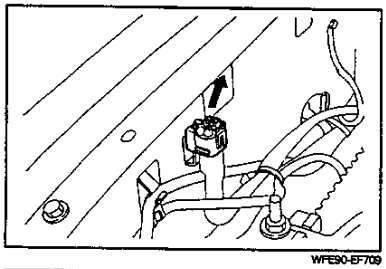


WFE90-EF708

IN-VEHICLE INSPECTION

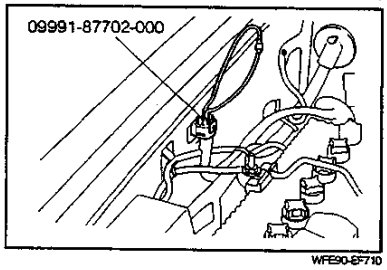
Check of fuel pump operation

1. Connection of SST (09991-87702-000)
   (1) Detach the check connector cap.



WFE90-EF709

   (2) Connect the SST to the check connector. Connect the SST terminal F (white/black) to the ground terminal (black).

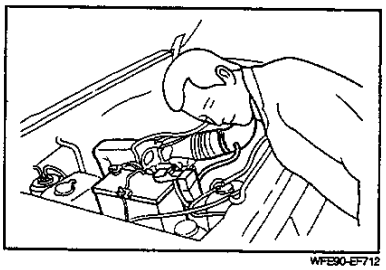


WFE90-EF710

2. Check of fuel flowing sound
   (1) Turn ON the ignition key switch.

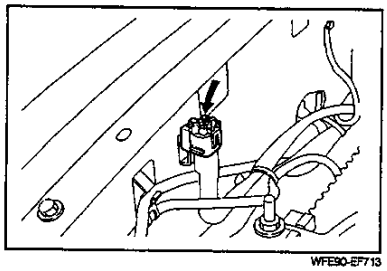
WFE90-EF711

   (2) Check to see if you can hear fuel flowing sound around the pressure regulator.
   (3) If you can hear no fuel flowing sound, check the following parts. Repair them, as required.
   - Fusible links
   - Fuses
   - Main relay
   - Fuel pump
   - Wiring and wiring connections



WFE90-EF712

3. SST Removal
   (1) Turn OFF the ignition switch.
   (2) Remove the SST from the check connector.
   (3) Attach the cap on the check connector.



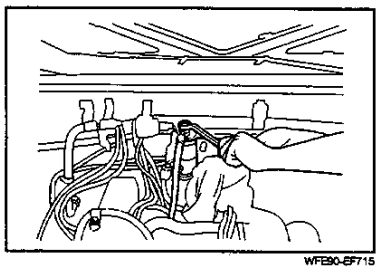
WFE90-EF713

Check of fuel pressure

1. Ensure that the battery voltage is 12 volts or more.
2. Disconnect the ground cable terminal from the negative (–) terminal of the battery.
3. Place a suitable container or cloth, etc. under the fuel filter.

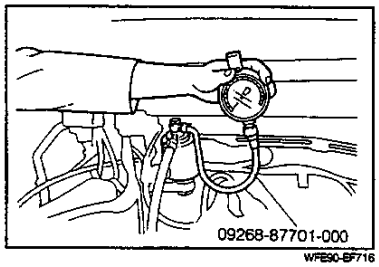
WFE90-EF714

4. Loosen the union bolt gradually.
   CAUTION:
   - **The fuel pressure at the inside of the fuel line is approximately 250 kPa (2.55 kgf/cm²) higher than the atmospheric pressure. Hence, be sure to gradually loosen the union bolt so as to prevent fuel from splashing. Since the fuel will flow out, be certain to place a suitable container or cloth, etc. under the fuel filter so that no fuel may get to the resin or rubber parts of the vehicle.**



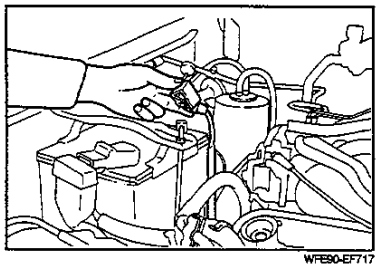
WFE90-EF715

5. Install the SST (fuel pressure gauge) between the fuel hose No. 1 and the fuel filter by means of the union bolt with a new gasket interposed.
   SST: 09268-87701-000
   Tightening Torque: 34.3 - 44.1 N·m (3.5 - 4.5 kgf-m)



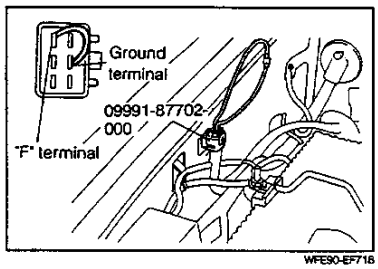
WFE90-EF716

6. Reconnect the ground cable terminal to the negative (–) terminal of the battery.



WFE90-EF717

7. Connection of SST (09991-87702-000)
   (1) Remove the cap on the check terminal.
   (2) Connect the SST to the check connector.
   (3) Connect the SST terminal fuel pump (white/black) to the ground terminal (black).
8. Turn ON the ignition switch.

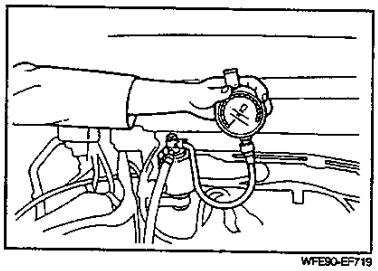


WFE90-EF718

9. Check to see if the fuel pressure conforms to the specified pressure.
   Specified Fuel Pressure:
   225.6 - 274.6 kPa (2.3 - 2.8 kgf/cm²)

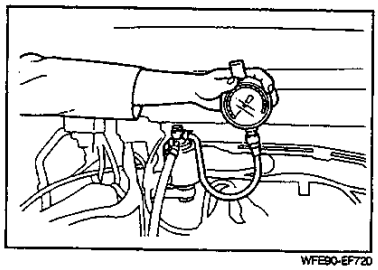
   If the fuel pressure is higher than the specified pressure, check and/or repair the following items.
   (1) Fuel return hose and/or pipe for restriction or damage.
   (2) Rubber hose connected between pressure regulator and surge tank for restriction.
   (3) If the check results of (1) and (2) are satisfactory, replace the pressure regulator. (See page EF–213.)

   If the fuel pressure is lower than the specified pressure, check and/or repair the following items.
   (1) Fuel hose and/or pipe for restriction or damage or leakage.
   (2) Fuel filter for restriction. (See page EF–209.)
   (3) Check fuel flow rate. (See page EF–203.)
   (4) Pressure regulator. (See page EF–213.)


WFE90-EF719

10. Turn OFF the ignition switch. After a lapse of three minutes, check to see if the fuel pressure is the specified pressure or more.
    Specified Fuel Pressure: 176.5 kPa (1.8 kgf/cm²)

    If the fuel pressure is lower than the specified pressure, check and/or repair the following items.
    (1) Injector (See page EF–220.)
    (2) Pressure regulator (See page EF–213.)
    (3) Fuel hose and/or pipe for damage or leakage.

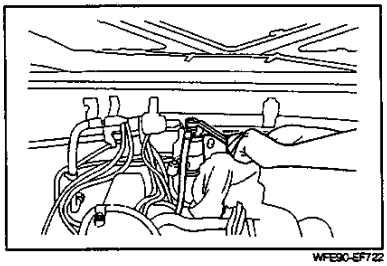

WFE90-EF720

11. SST removal
    (1) Turn OFF the ignition key switch.
    (2) Disconnect the ground cable terminal from the negative terminal (–) of the battery.
    (3) Loosen the fuel filter union bolt gradually.
    CAUTION:
    - **The fuel pressure at the inside of the fuel line is approximately 253 kPa (2.5 atm) higher than the atmospheric pressure. Hence, be sure to gradually loosen the union bolt so as to prevent fuel from splashing.**
      Since the fuel will flow out, be certain to place a suitable container or cloth, etc. under the fuel filter so that no fuel may get to the resin or rubber parts of the vehicle.

    (4) Remove the SST (fuel pressure gauge).
    SST: 09268-87701-000

WFE90-EF721

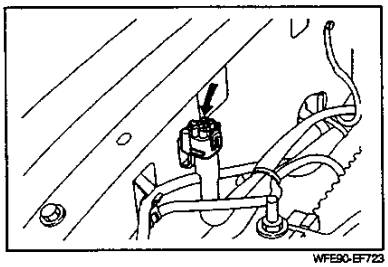
(5) Install the fuel hose No. 1 to the fuel filter by means of the union bolt with a new gasket interposed.
Tightening Torque: 34.3 - 44.1 N·m (3.5 - 4.5 kgf-m)



WFE90-EF722

(6) Remove the SST from the check connector.
SST: 09991-87702-000

(7) Attach the cap on the check connector.
(8) Reconnect the ground cable terminal to the negative (–) terminal of the battery.



WFE90-EF723

12. Check of fuel leakage
Start the engine. Check to see if any fuel leakage is present. Repair any defective part if the fuel leakage exists.

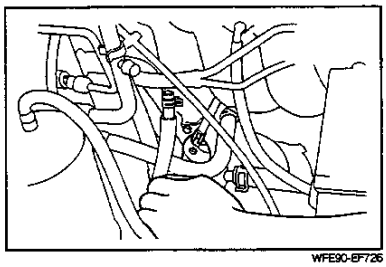
WFE90-EF724

Check of fuel flow rate

1. Ensure that the battery voltage is 12 volts or more.
2. Disconnect the ground cable terminal from the negative (–) terminal of the battery.
3. Place a suitable container or cloth, etc. under the pressure regulator.

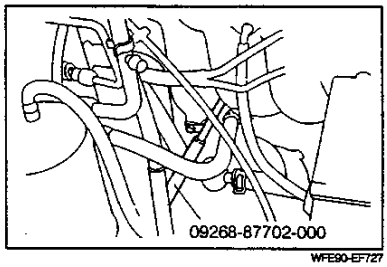
WFE90-EF725

4. Disconnect the fuel return hose connected to the pressure regulator.
CAUTION:
   - **Since the fuel will flow out, be certain to place a suitable container or cloth, etc. under the pressure regulator so that no fuel may get to the alternator.**
   - **Release the inner pressure of the fuel tank by removing the fuel filler cap in advance.**



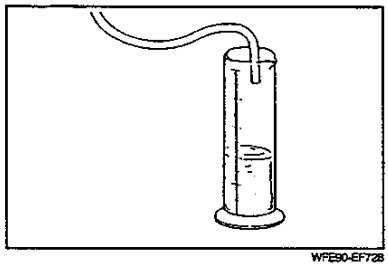
WFE90-EF726

5. Connect a suitable fuel hose (about 2 meter long) to the pressure regulator.
   REFERENCE:
   - **This fuel hose is included in the SST (09268-87702-000).**

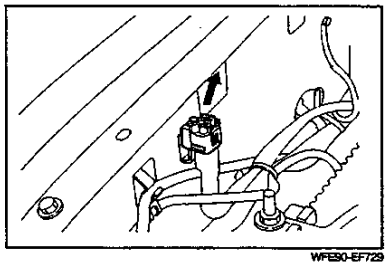


WFE90-EF727

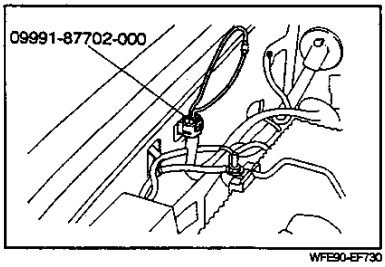
6. Insert one end of the fuel hose in a measuring cylinder.


WFE90-EF728

7. Detach the check connector cap.


WFE90-EF729

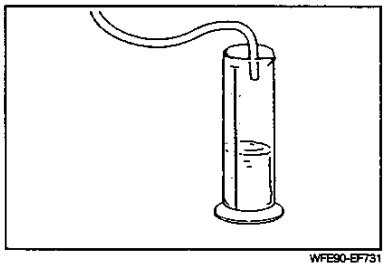
8. Connect the SST (09991-87702-000) to the check connector. Connect th SST terminal F (White/Black) to the ground terminal (Black).
9. Connect the ground cable terminal to the negative (–) terminal of the battery.
10. Turn ON the ignition switch for 15 seconds. Then, turn OFF the switch.



WFE90-EF730

11. Measure the amount of fuel collected in the measuring cylinder.
    Specified Amount of Fuel: 235 cm^3 or more

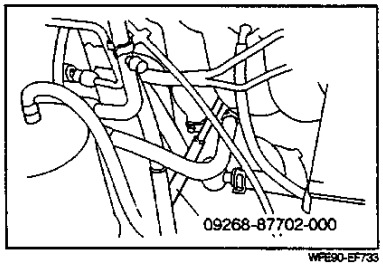
    If the fuel amount is less than the specified amount, check the fuel filter.
12. Disconnect the ground cable terminal from the negative (–) terminal of the battery.


WFE90-EF731

13. Remove the SST (09991-87702-000) from the check connector.
14. Attach the cap on the check connector.

WFE90-EF732

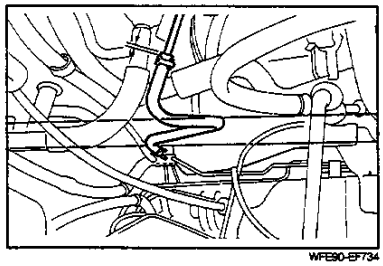
15. Disconnect the fuel hose connected to the pressure regulator.



WFE90-EF733

16. Connection of fuel return hose to the fuel pipe No. 2.
    (1) Insert the fuel return hose to the fuel pipe No. 2 until second spool of fuel pipe.
    (2) Securely clamp the fuel hose at 2 - 5 mm from fuel return hose end, with new clip.

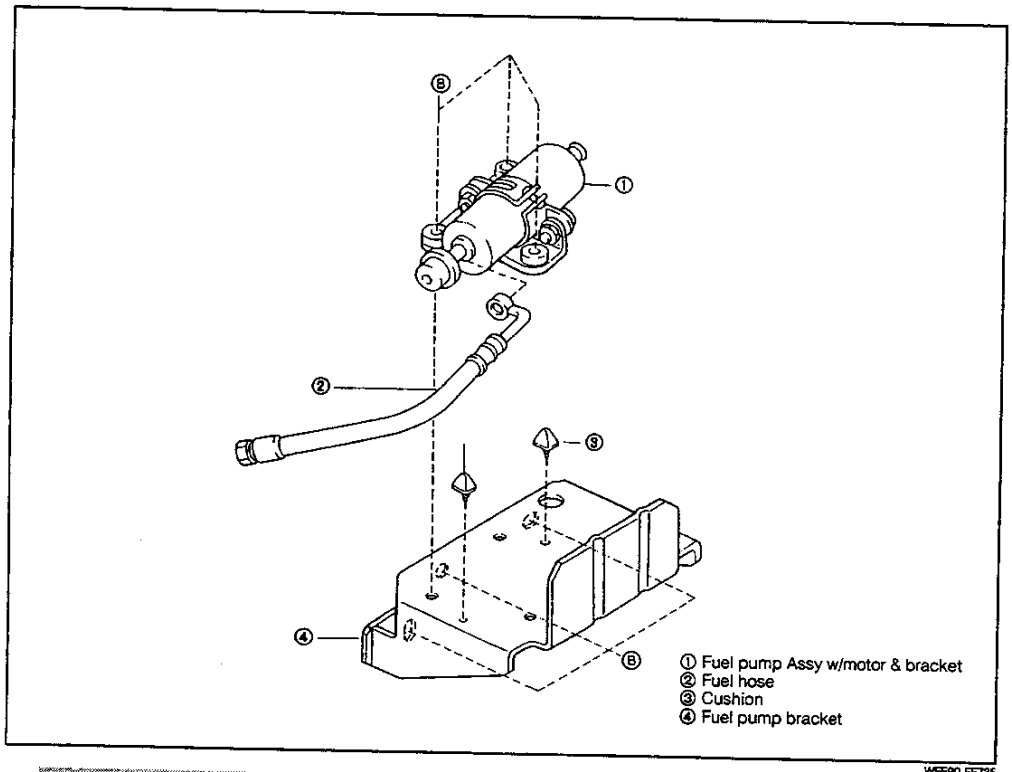
    NOTE:
    - **Install the fuel return hose in parallel with chassis frame.**



WFE90-EF734

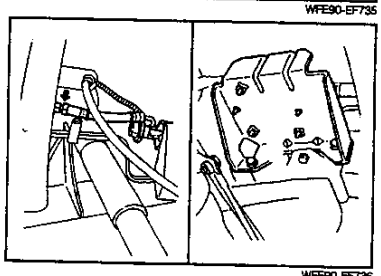
17. Reconnect the ground cable terminal to the negative (–) terminal of the battery.
18. Start the engine. Check to see if any fuel leakage is present. Repair any defective part if fuel leakage exists.

REMOVAL OF FUEL PUMP



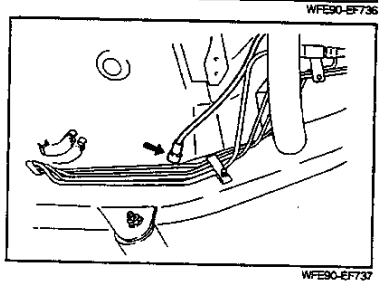
WFE90-EF735

WARNING:
- When working on the fuel system, never smoke nor allow any open flame to be brought near the working site.



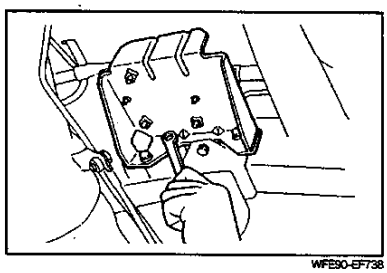
WFE90-EF736

1. Disconnect the fuel hose front side from the fuel pump.
   CAUTION:
   - **Since the fuel will flow out, be certain to place a suitable container or cloth, etc. under the fuel pump.**
2. Disconnect the fuel pump coupler.



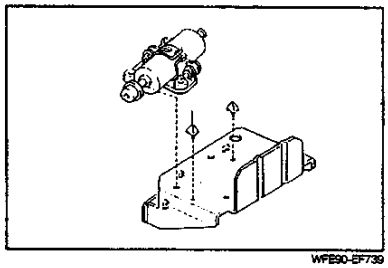
WFE90-EF737

3. Detach the fuel pump bracket by removing the three bolts.
4. Detach the fuel pump bracket from fuel pump by removing the three bolts.
5. Remove the fuel pump by disconnecting the fuel hose rear side.


WFE90-EF738

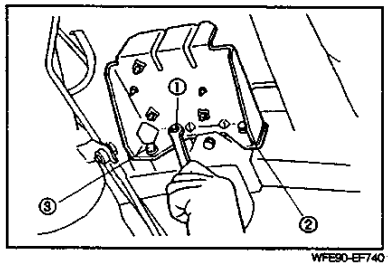
INSTALLATION OF FUEL PUMP

1. Connect the fuel hose rear side to the fuel pump.
   NOTE:
   - Ensure that the filter is installed at the fuel pump inlet port.
   - Ensure that the hose clamp is securely installed.


WFE90-EF739

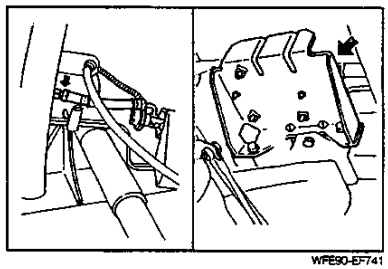
2. Install the fuel pump bracket to the fuel pump by tighten the three bolts.
   NOTE:
   - Ensure that the two cushions are installed as correct position.

3. Installation of bracket
   (1) Temporarily tighten bolt No. 1.
   (2) Tighten the bolt No. ② and No. ③.
   (3) Securely tighten the bolt No. 1.

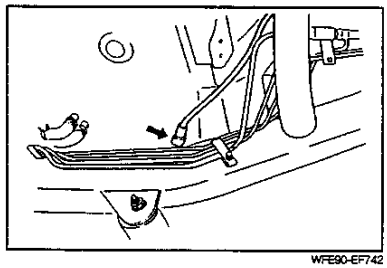


WFE90-EF740

4. Connect the fuel hose front side to the fuel pump.
   Tightening Torque: 34.3 - 44.1 N·m (3.5 - 4.5 kgf-m)

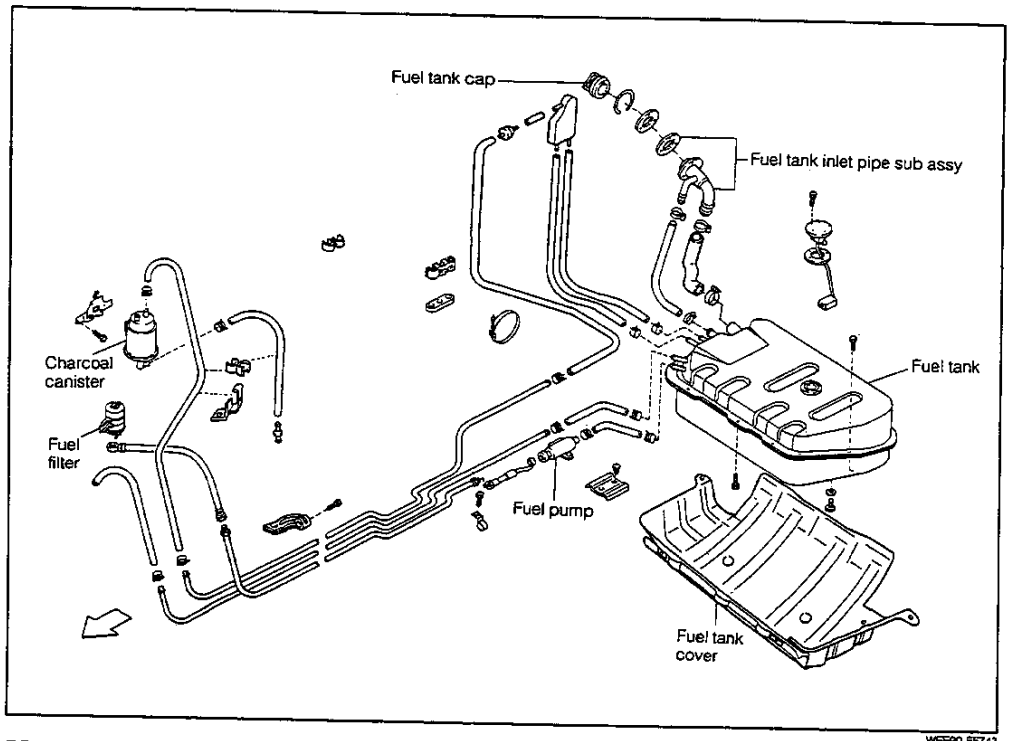

WFE90-EF741

5. Connect the fuel pump coupler.
   NOTE:
   - Ensure that the lead wire is clamped at two position.


WFE90-EF742

FUEL TANK AND LINE

COMPONENTS



WFE90-EF743

PRECAUTIONS

1. Always use a new gasket and hose band (clip) when replacing the fuel tank or components.
2. Each part should be tightened securely to the specified torque.

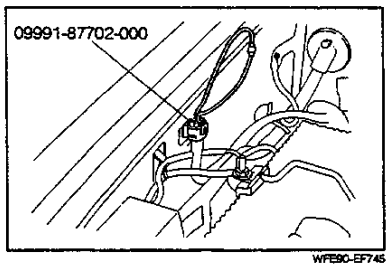
WARNING:

- Always keep fire away from the working site.

WFE90-EF744

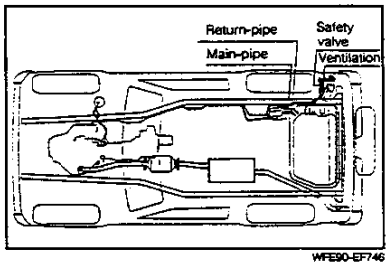
INSPECTION OF FUEL LINES AND CONNECTIONS

1. Connect the following SST to the check connector. Short the terminal F (White/Black) to the ground terminal (Black).
   SST: 09991-87702-000



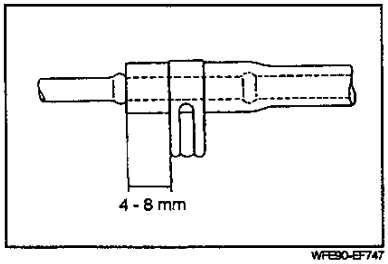
WFE90-EF745

2. Turn ON the ignition switch.
3. Check the fuel lines and connections for cracks, leakage or deformation.
   If any crack, leakage or deformation is present, replace or repair the part concerned.
4. Turn OFF the ignition switch. Remove the SST from the check terminal. Attach the cap to the check terminal.
5. Check the fuel tank for deformation, cracks or fuel leakage.
   If the fuel tank exhibits any defect, repair or replace the fuel tank.



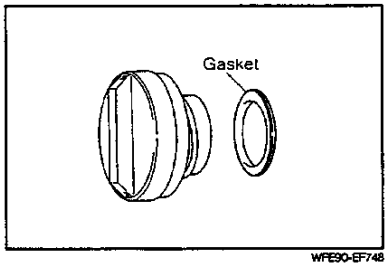
WFE90-EF746

6. Check the filler neck for damage or fuel leakage.
   If the filler neck exhibits any defect, repair or replace the filler neck.
7. Check to see if the hose and tube connections are installed as shown in the right figure.
   If any problem is found, repair or replace the parts, as required.



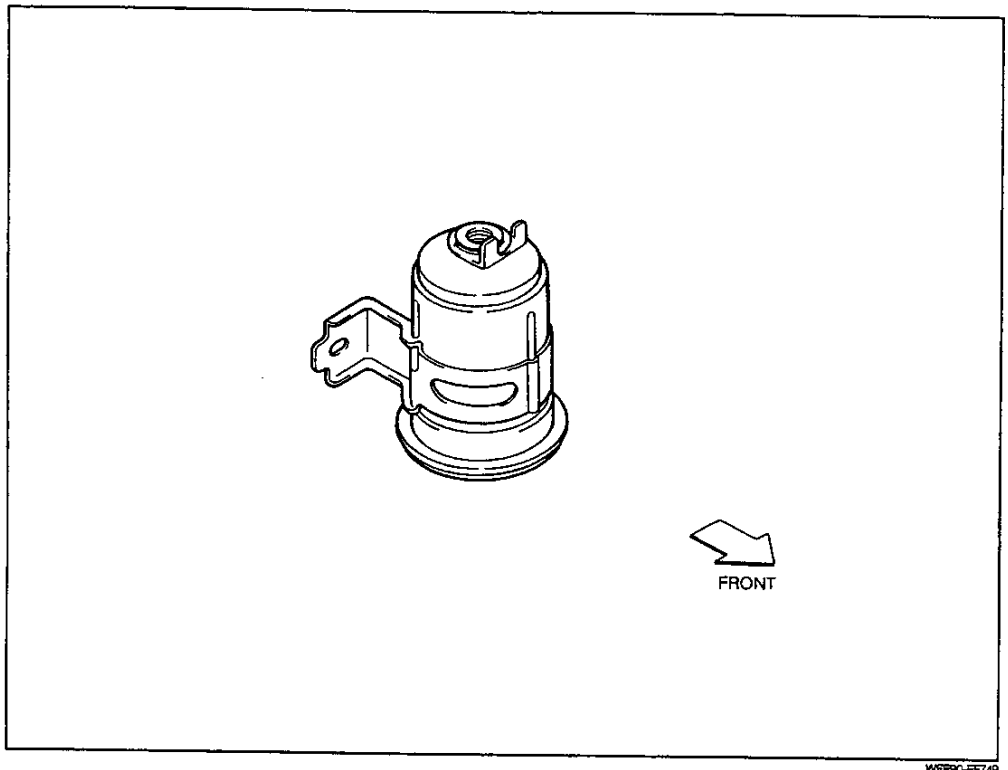
WFE90-EF747

8. Check to see if the fuel tank cap and gasket exhibits damage.
   Replace the gasket if it is damaged. Also, replace the fuel tank cap if it exhibits damage.



WFE90-EF748

FUEL FILTER ELEMENT



WFE90-EF749

CHECK OF FUEL FILTER ELEMENT

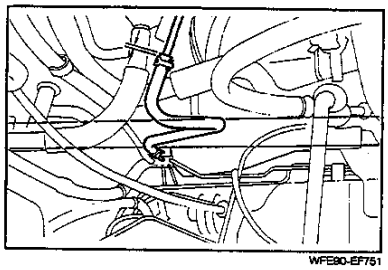
1. Disconnect the ground cable terminal from the negative (–) terminal of the battery.

WFE90-EF750

2. Disconnect the fuel return hose connected to the pressure regulator. Connect a suitable fuel hose (about 2 meter long) to the pressure regulator.
   REFERENCE:
   - This fuel hose is included in the SST (09268-87702-000).

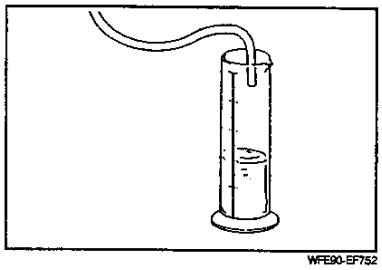
   NOTE:
   - Before the fuel return hose is disconnected, be sure to release the inner pressure of the fuel tank by detaching the fuel filler cap.

   CAUTION:
   - Since the fuel will flow out, be certain to place a suitable container or cloth, etc. under the pressure regulator so as to prevent fuel splashing.



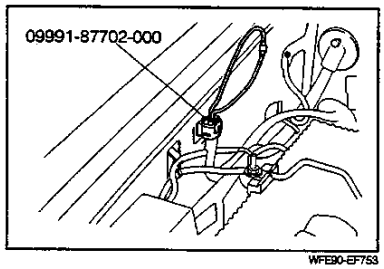
WFE90-EF751

3. Insert one end of the fuel hose in a measuring cylinder.



WFE90-EF752

4. Connection of SST (09991-87702-000)
   (1) Detach the cap from the check connector.
   (2) Connect the SST to the check connector.
   (3) Short the SST terminal F (White/Black) to the ground terminal (Black).
5. Connect the ground cable terminal to the negative (–) terminal of the battery.
6. Turn ON the ignition switch for 15 seconds. Then, turn OFF the switch.

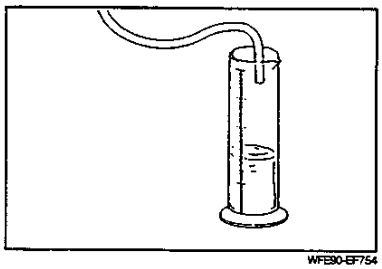


WFE90-EF753

7. Measure the amount of fuel collected in the measuring cylinder. Check to see if the measured amount conforms to the specification.
   Specified Amount of Fuel: 235 cm^3 or more

   NOTE:
   - **If it becomes necessary to bleed air, be sure to conduct the measurement at least twice.**

   If the fuel amount conforms to the specification, perform the operation, starting from the step 18 onward.
   If the fuel amount is less than the specified amount, perform the operation, starting from the step 8 onward.

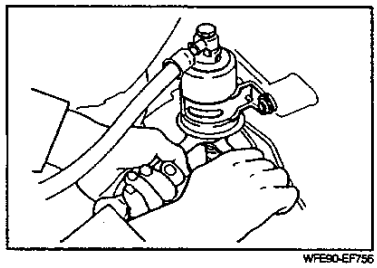


WFE90-EF754

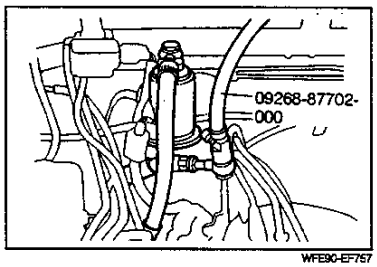
8. Disconnect the ground cable terminal from the negative (–) terminal of the battery.

WFE90-EF755

9. Loosen the union bolt gradually.
   CAUTION:
   - The fuel pressure at the inside of the fuel line is approximately 250 kPa (2.55 kgf/cm^2) higher than the atmospheric pressure. Hence, be sure to gradually loosen the flare nut and use a cloth, etc. so as to prevent fuel from splashing.
     Since the fuel will flow out, be certain to place a suitable container or cloth, etc. under the fuel filter so that no fuel may get to the resin or rubber parts or electrical parts of the vehicle.

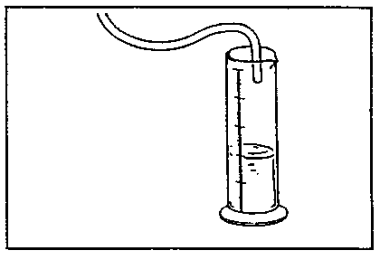

WFE90-EF756

10. Connect a suitable fuel hose (about 2 meter long) to the fuel pipe.
    Reference:
    - This fuel hose is included in the SST (09268-87702-000).



WFE90-EF757

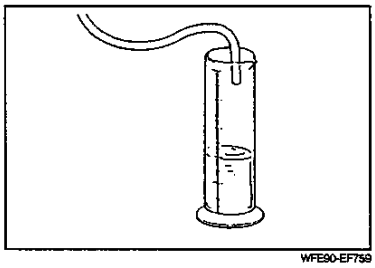
11. Insert one end of the fuel hose in a measuring cylinder.


WFE90-EF758

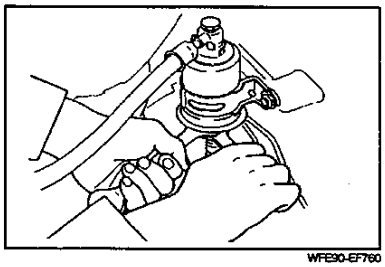
12. Reconnect the ground cable terminal to the negative (–) terminal of the battery.
13. Turn ON the ignition switch for 15 seconds. Then, turn OFF the switch.

14. Measure the amount of fuel collected in the measuring cylinder.
    Specified Amount of Fuel: 235 cm^3 or more

    If the fuel amount conforms to the specification, replace the fuel filter.
    If the fuel amount is less than the specified amount, check the fuel pump filter for restriction. Then, replace the fuel pump as required. (See page EF–210.)
15. Disconnect the ground cable terminal from the negative (–) terminal of the battery.

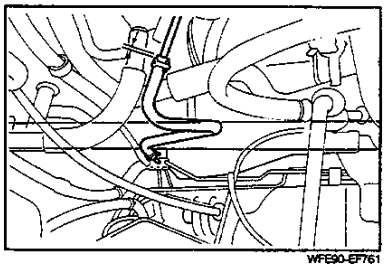

WFE90-EF759

16. Coat the flare nut with a thin film of engine oil. Screw in the flare nut into the fuel filter fully by your hand.
17. Tighten the union bolt.
    Tightening Torque: 34.3 - 44.1 N·m (3.5 - 4.5 kgf-m)



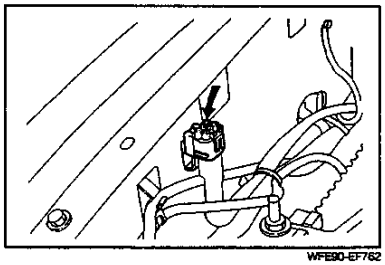
WFE90-EF760

18. Disconnect the fuel hose connected to the pressure regulator.
19. Connection of fuel return hose to fuel pipe No. 2.
    (1) Insert the fuel return hose to the full pipe No. 2 until second spool of fuel pipe.
    (2) Securely clamp the fuel hose at 2 - 5 mm from fuel return hose end, with new clip.
    NOTE:
    - **Install the fuel return hose in parallel with chassis frame.**



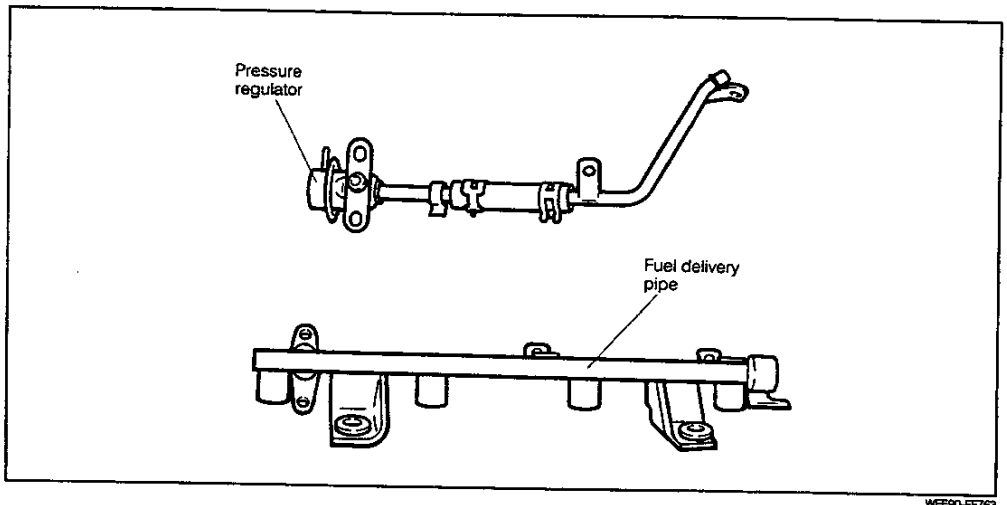
WFE90-EF761

20. Remove the SST from the check connector.
21. Attach the cap on the check connector.
22. Reconnect the ground cable terminal to the negative (-) terminal of the battery.
23. Start the engine. Check to see if any fuel leakage is present. Repair any defective part if fuel leakage exists.



WFE90-EF762

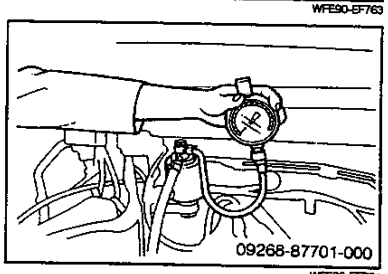
PRESSURE REGULATOR



WFE90-EF763

IN-VEHICLE INSPECTION

Check the fuel pressure. (See page EF–200.)



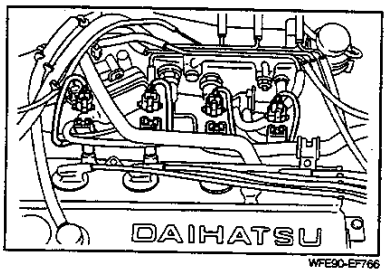
WFE90-EF764

REMOVAL OF PRESSURE REGULATOR

1. Disconnect the ground cable terminal from the negative (–) terminal of the battery.
2. Remove the air chamber assembly. (See page EM–17.)

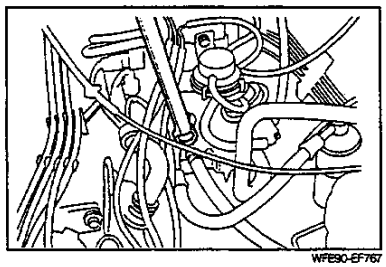
WFE90-EF765

3. Disconnect the injector connector from each injector.



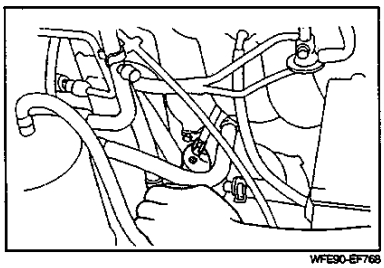
WFE90-EF766

4. Disconnect the fuel hose No. 1 at the delivery pipe side.
   CAUTION:
   - The fuel pressure at the inside of the fuel line is approximately 250 kPa (2.55 kgf/cm^2) higher than the atmospheric pressure. Hence, be sure to gradually loosen the union bolt so as to prevent fuel from splashing. Since the fuel will flow out, be certain to place a suitable container or cloth, etc. under the fuel filter so that no fuel may get to the resin or rubber parts of the vehicle.

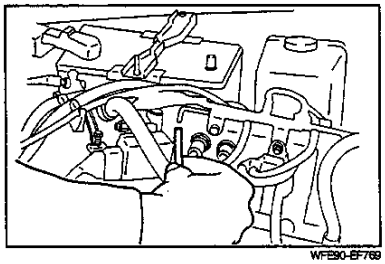

WFE90-EF767

5. Disconnect the fuel return hose from the pressure regulator.
   CAUTION:
   - Since the fuel will flow out, be certain to place a suitable container or cloth, etc. under the connection so as to prevent fuel from splashing.

   NOTE:
   - Before the fuel return hose is disconnected, be sure to release the inner pressure of the fuel tank by detaching the fuel filler cap.

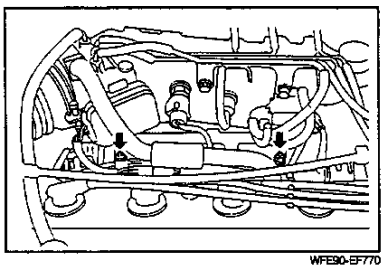

WFE90-EF768

6. Disconnect the vacuum hose from the vacuum pipe.

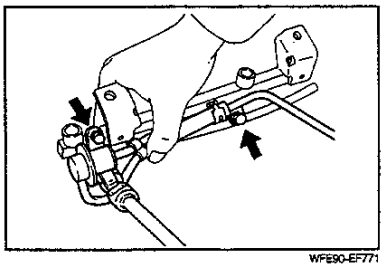

WFE90-EF769

7. Remove the delivery pipe by removing the delivery pipe attaching nuts.
   CAUTION:
   - Be certain to place a suitable cloth, etc. under the delivery pipe so that no fuel gets to the the electrical equipment, such as the alternator and starter, wiring and rubber and plastic parts.
   - Be very careful not to drop the injectors.

   NOTE:
   - Leave the injector at the intake manifold side.


WFE90-EF770

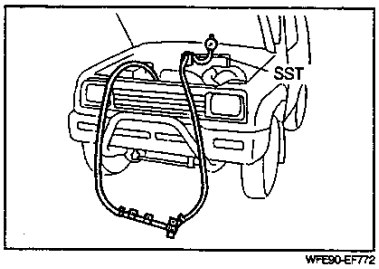
8. Disconnect the vacuum hose from the pressure regulator.
9. Remove the pressure regulator from the delivery pipe.


WFE90-EF771

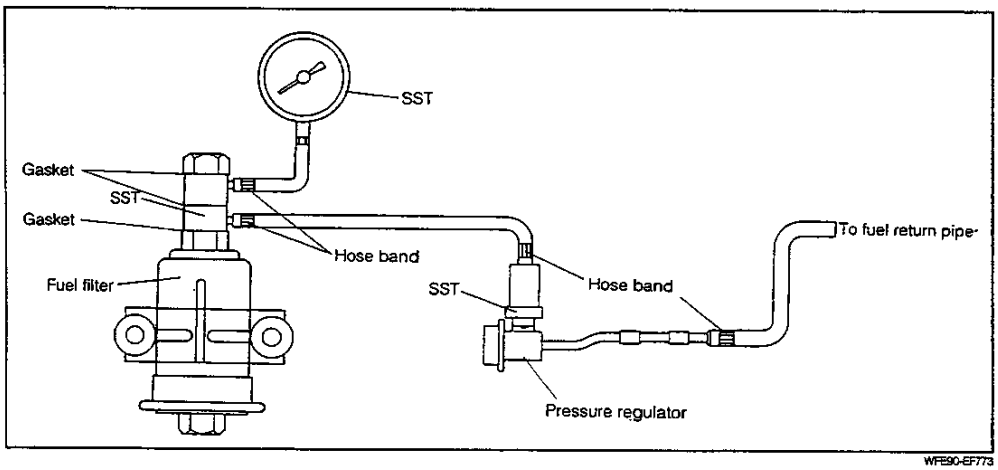
Inspection of Pressure Regulator

1. Using the following SSTs, connect the pressure regulator, as indicated in the figure.
   SSTs: 09268-87701-000
   09268-87702-000
   09283-87703-000

   NOTE:
   - When connecting the pressure regulator, install a new gasket to the union bolt connection and a new "O" ring to the "O" ring seal section. Also, attach hose bands to the hose connections.

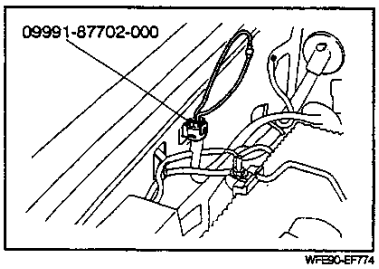


WFE90-EF772



WFE90-EF773

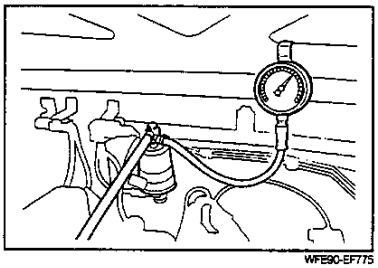
2. Connect the ground cable terminal to the negative (–) terminal of the battery.
3. Connection of SST (09991-87702-000)
   (1) Detach the cap from the check connector.
   (2) Connect the SST to the check connector.
   (3) Connect the fuel pump terminal (White/Black) with the ground terminal (Black).
4. Turn ON the ignition switch.



WFE90-EF774

5. Check to see if the fuel pressure conforms to the specification.
   Specified Fuel Pressure:
   225.6 - 274.6 kPa (2.3 - 2.8 kgf/cm^2)

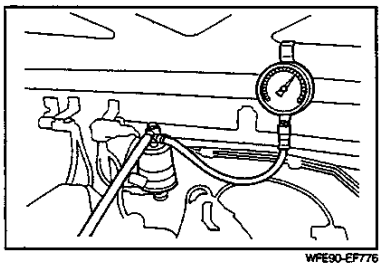
   If the fuel pressure fails to conform to the specification, replace the pressure regulator.
   NOTE:
   - At this stage, ensure that the fuel pump complies with the fuel flow rate requirements.



WFE90-EF775

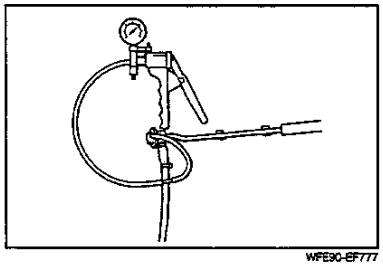
6. Turn OFF the ignition switch. After a lapse of three minutes, check to see if the fuel pressure is the specified pressure or more.
   Specified Fuel Pressure:
   176.5 kPa (1.8 kgf/cm²) or more

   If the fuel pressure failes to comform to the specification, perform the operations described in the step 16 afterward.



WFE90-EF776

7. Connect a suitable hose to the vacuum hose pipe of the pressure regulator. Connect a MityVac to the other end of the hose.



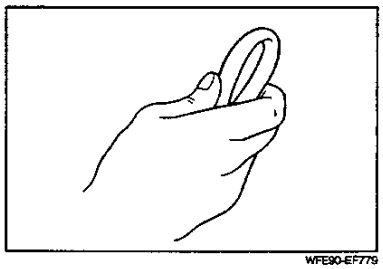
WFE90-EF777

8. Turn ON the ignition switch.
9. While observing the fuel pressure, apply a negative pressure, using the MityVac. At this time, ensure that the fuel pressure drops corresponding to the applied negative pressure.
   Replace the pressure regulator if the fuel pressure will not decrease.

10. Turn OFF the ignition switch.
11. Remove the MityVac and hose from the pressure regulator.
12. Disconnect the ground cable terminal to the negative (–) terminal of the battery.
13. Remove the SSTs from the respective parts.
14. Install the cap to the check connector.
    Proceed to assembly of the pressure regulator.

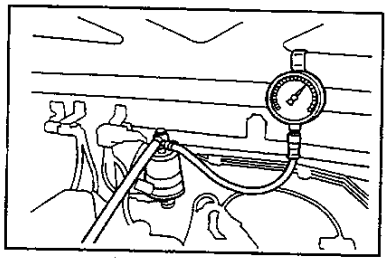
WFE90-EF778

15. Turn OFF the ignition switch after turning ON the ignition switch temporarily.
16. Immediately after the operation described in the step 15, stop the flowing of the fuel by bending the fuel hose between the fuel filter and the pressure regulator. Read the fuel pressure under this condition.



WFE90-EF779

17. After holding the fuel hose in a bent state for 3 minutes, check that the pressure has dropped compared with that measured in the step 6.
    Replace the fuel pump if the pressure has dropped.
    Replace the pressure regulator if the pressure will not drop.

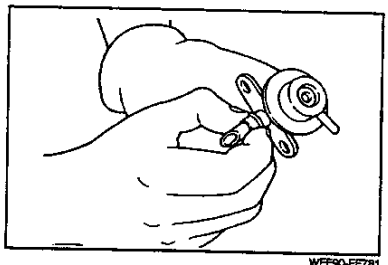


18. Disconnect the ground cable terminal from the negative terminal of the battery.
19. Remove the SSTs from the respective parts.
20. Install the cap to the check connector.

WFE90-EF780

ASSEMBLY OF PRESSURE REGULATOR

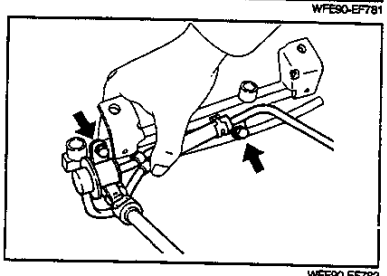
1. Replace the pressure regulator "O" ring with a new part.



WFE90-EF781

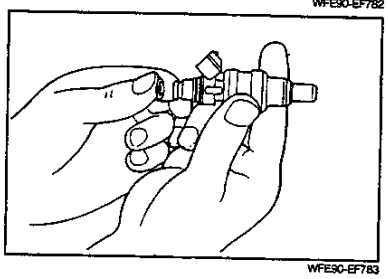
2. Apply silicon oil to the "O" ring of the pressure regulator. Install the "O" ring to the delivery pipe and tighten the attaching bolts.
   Tightening Torque: 14.7 - 21.6 N·m (1.5 - 2.2 kgf-m)

   CAUTION:
   - Be very careful not to damage the "O" ring. Failure to observe this caution may cause fuel leakage.



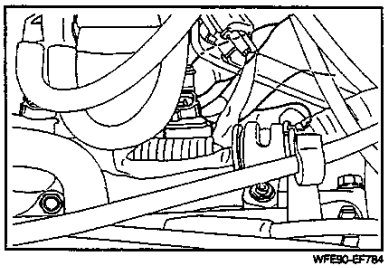
WFE90-EF782

3. Replace the injector "O" ring with a new part.
   NOTE:
   - Visually inspect the grommets and insulators of the injectors for any evidence of damage. Replace any defective parts if they exhibit damage before replacing the "O" ring.
   - Be very careful to avoid damaging the "O" ring.

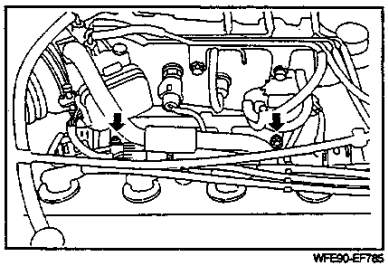


WFE90-EF783

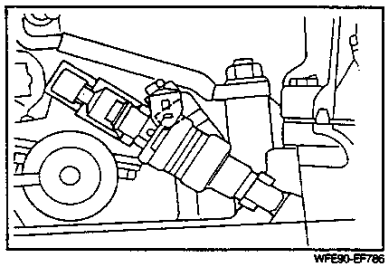
4. Install the injector to the intake manifold.


WFE90-EF784

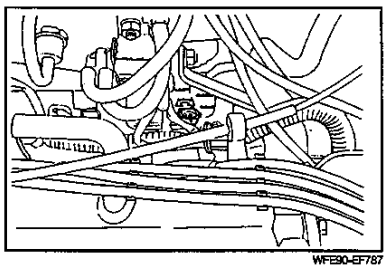
5. Apply silicon oil to the "O" ring of the injector. Install the delivery pipe.
   Tightening Torque: 14.7 - 21.6 N·m (1.5 - 2.2 kgf-m)


WFE90-EF785

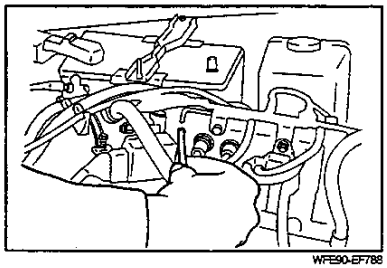
NOTE:
- **Be very careful not to damage the injector "O" ring during the installation.**
- **When connecting the delivery pipe and injector, make sure that they are installed straight, not in a tilted state.**


WFE90-EF786

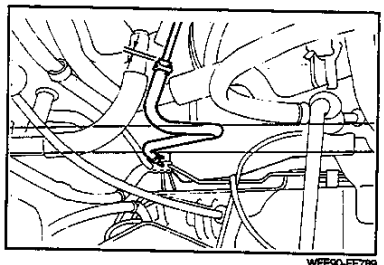
6. Ensure that the injector can rotate by your hand.
   If the injector can not be rotated smoothly, most likely the injector is installed in a tilted state. It is, therefore, necessary to reassemble the injector using a new injector "O" rings.
   CAUTION:
   - **Never push the injector toward the insulator side or the grommet side. Failure to observe this caution will cause fuel leakage.**


WFE90-EF787

7. Connect the rubber hose to the vacuum pipe.

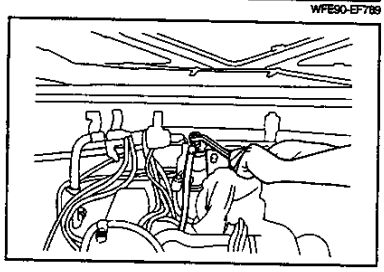

WFE90-EF788

8. Connection of fuel return hose to fuel pipe No. 2.
   (1) Install the fuel return hose to the fuel pipe No. 2 until second spool of fuel pipe.
   (2) Securely clamp the fuel hose at 2 - 5 mm from full return hose end, with new clamp.
   NOTE:
   - **Install the fuel return hose in parallel with chassis frame.**



WFE90-EF789

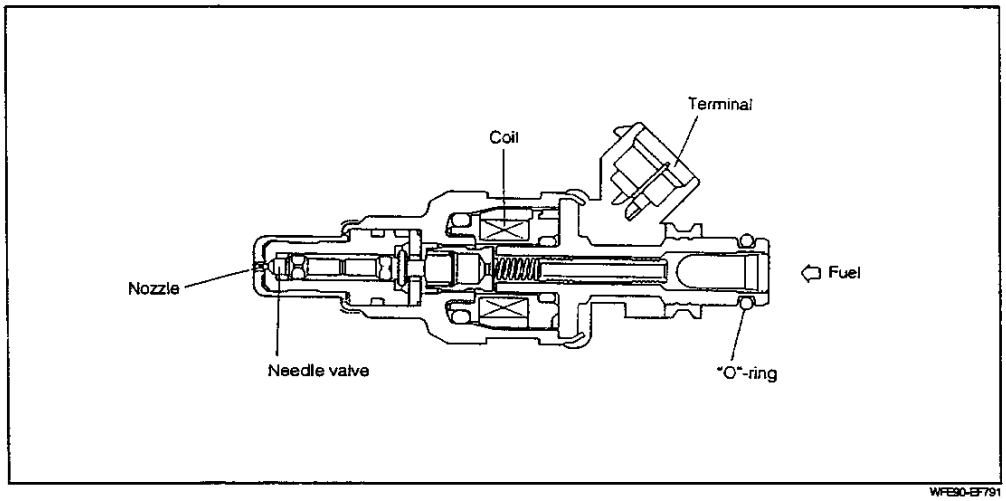
9. Install the fuel hose No.1 to the delivery pipe with a new gasket interposed.
   Tightening Torque: 34.3 - 44.1 N·m (3.5 - 4.5 kgf-m)



10. Connect the injector wiring connectors to the injector.
11. Connect the ground cable terminal to the negative (–) terminal of the battery.
12. Turn ON and OFF the ignition switch at intervals of 2 or 3 seconds, until air is expelled from the pressure regulator section.
    NOTE:
    - **If air remains inside the piping, you will hear a different sound from the fuel flowing sound.**
    - **Usually the air bleeding can be performed by repeating turning ON/OFF the ignition switch four or five times.**
13. Ensure that no fuel leakage exists.
    Repair the leaky point if fuel leakage is present.
14. Start the engine. Again, check for fuel leakage.
    Repair the leaky point if fuel leakage is present.
15. Install the air chamber assembly. (See page EM–22.)

WFE90-EF790

INJECTORS

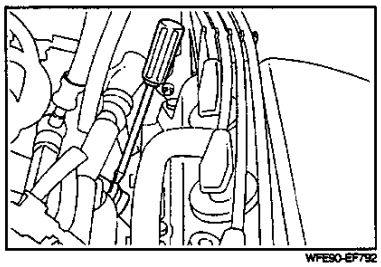


WFE90-EF791

IN-VEHICLE INSPECTION

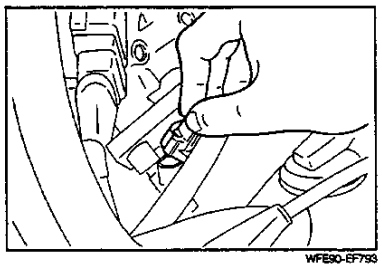
1. Remove the air chamber assembly.
   (See page EM–17.)
2. Check of injector operation
   (1) Using a sound scope, check to see if each injector emits an operating sound when the engine is being started or cranked.
   (2) If a sound scope is not available, apply a screwdriver or the like to the injector and check to see if you can feel an operating vibration.

   If the injector emits no operating sound or emits an abnormal sound, check the wiring, wiring connector or injector.



WFE90-EF792

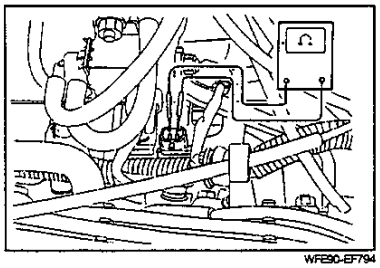
3. Measurement of resistance of injector
   (1) Disconnect the injector connector of the engine wire.



WFE90-EF793

   (2) Measure the resistance between the terminals of each injector.
   Specified Resistance: 11 - 17 Ω

   If the resistance between the terminals is not within the specification, replace the injector.
   (3) Connect the injector connector of the engine wire to the injector.



WFE90-EF794

REMOVAL OF INJECTOR

1. Remove the pressure regulator. (See page EF-215.)
2. Remove the injector.
   NOTE:
   - Do not remove the injector cover.

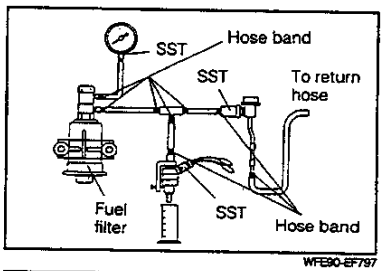
WFE90-EF795

INSPECTION OF INJECTOR

1. Using the following SSTs, connect the injector, as indicated in the figure. Insert the injector in the measuring cylinder.
   SSTs: (1) 09268-87701-000
   (2) 09283-87703-000
   (3) 09268-87702-000
   (4) 09842-30070-000

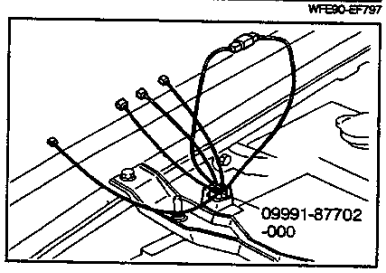
WFE90-EF796

NOTE:
- Install a new gasket to the union bolt connection.
- Install a new "O" ring to the "O" ring seal section.
- Attach the hose bands to the rubber hose connections.
- Attach a suitable vinyl hose to the tip-end of the injector so as to prevent fuel from splashing.
- Remove the injector grommet. Check to see if the injector grommet exhibits any damage.



WFE90-EF797

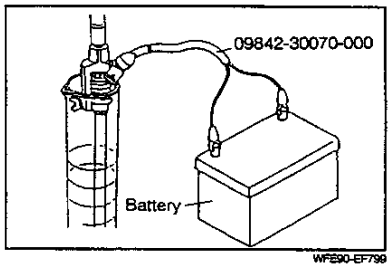
2. Remove the check connector cap.
3. Connect the SST to the check connector.
   SST: 09991-87702-000
4. Connect the terminal F (white/black) of the check connector to the ground terminal (black).



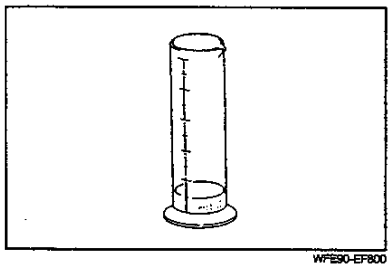
5. Connect the ground cable terminal to the negative (–) terminal of the battery.
6. Turn ON the ignition switch.

WFE90-EF798

7. Perform energizing for 15 seconds by means of the SST (09842-30070-000).
8. Measure the amount of fuel collected in the measuring cylinder.
   specified pressure.
   Specified Amount of Fuel: Approx. 45 ± 5 cm^3
   Variation between Each Injector: 5 cm^3 or less



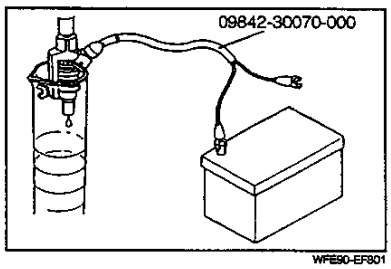
WFE90-EF799


WFE90-EF800

NOTE:
- **Conduct the measurement two or three times for each injector.**
- **Before the injector is pulled out, make certain to turn OFF the ignition key.**
- **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.**

If the amount of fuel fails to conform to the specification, replace the injector.

9. Leakage check
   With the SST (09842-30070-000) in not energized state, turn ON the ignition key switch. Check any fuel leakage from the injector nozzle.
   Fuel Leakage:
   Less Than One Drop of Fuel per Minute



WFE90-EF801

If the leakage exceeds the specified value, replace the injector.
NOTE:
- **Prior to the test, remove the vinyl hose that was attached on the injector.**

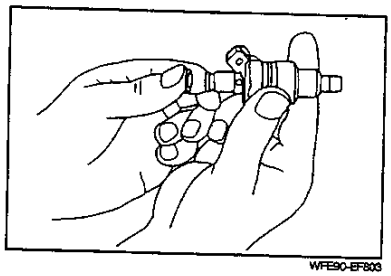
10. Turn OFF the ignition key.
11. Disconnect the ground cable terminal from the negative (–) terminal of the battery.
12. Disconnect the SST.
    NOTE:
    - **Care must be exercised as to fuel splashing and fuel flowing.**

INSTALLATION OF INJECTOR

1. Check the insulator and grommet of each injector for damage.
   Replace the insulator and/or grommet if damage exists.
2. Install the insulator on the manifold section.

WFE90-EF802

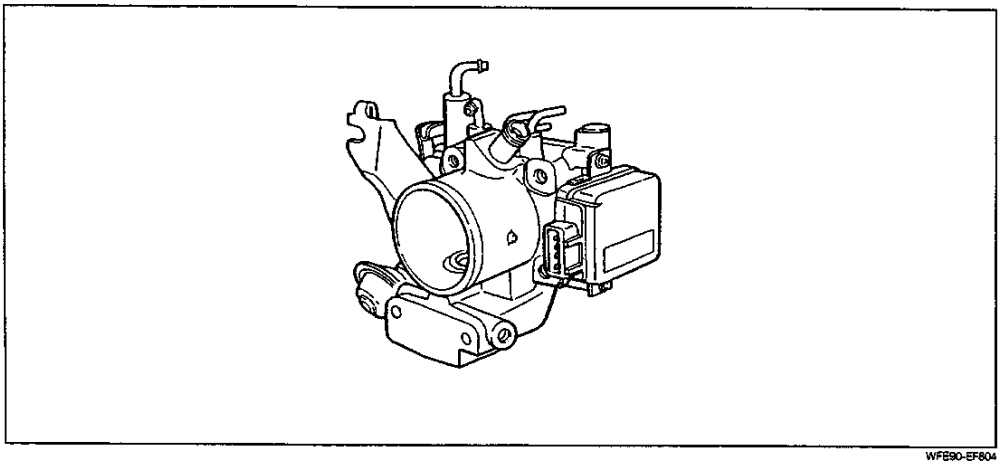
3. Install the grommet on the injection.
4. Replace the injector "O" ring with a new part.
   NOTE:
   - **Be very careful to avoid damaging the "O" ring.**
5. Insert the injector into the insulator.
6. Install the delivery pipe. (See page EF-217.)
7. Install the air chamber assembly. (See page EM-22.)



WFE90-EF803

AIR INDUCTION SYSTEM

THROTTLE BODY

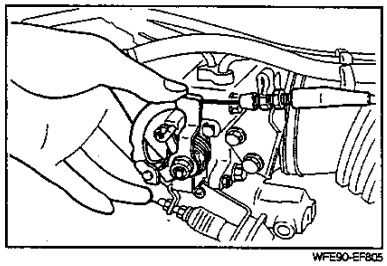


WFE90-EF804

IN-VEHICLE INSPECTION

Check of throttle body

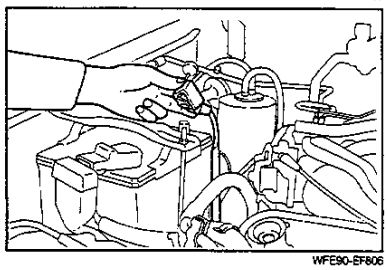
1. Ensure that the throttle linkage operates smoothly. Replace the throttle body if the throttle lever fails to operate smoothly.
2. Check the throttle position sensor. (See page EF–170.)
3. Check the throttle positioner. (See page EC–21.)



WFE90-EF805

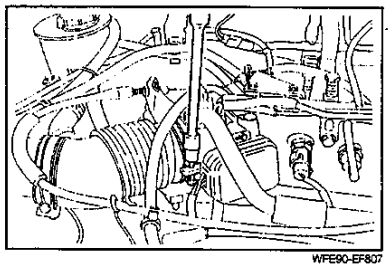
Removal of throttle body

1. Disconnect the ground cable terminal from the negative (–) terminal of the battery.
2. Drain the coolant. (See page CO–12.)
3. Disconnect the hose for air conditioner and power steering idle-up from the air chamber.



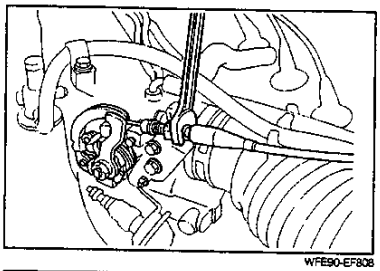
WFE90-EF806

4. Disconnect the air chamber hose from the throttle body.



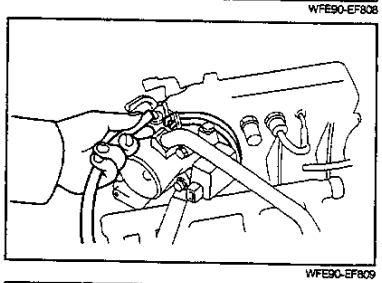
WFE90-EF807

5. Disconnect the accelerator cable.



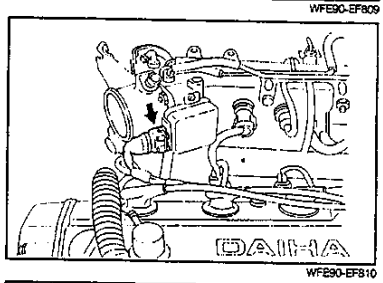
WFE90-EF808

6. Disconnect the vacuum hoses from the throttle body.
   NOTE:
   - Prior to the disconnection, put a tag on each vacuum hose so that the original installation position may be known readily during the installation.



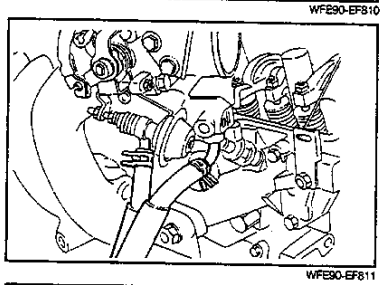
WFE90-EF809

7. Disconnect the connector of the throttle position sensor.



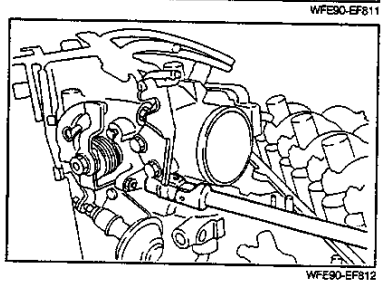
WFE90-EF810

8. Disconnect the water hoses from the throttle body.
   NOTE:
   - Using a suitable cloth, take a precautionary measure so that no water gets to the electrical equipment of the vehicle.
   - Be sure to plug the disconnected water hoses by suitable plug to prevent the water from flowing out.



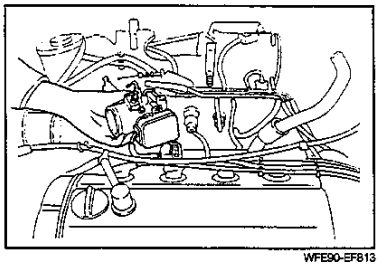
WFE90-EF811

9. Removal of throttle body
   (1) Remove the attaching bolts and nuts of the surge tank stay No. 1.



WFE90-EF812

(2) Remove the attaching bolts and nuts of the throttle body.
(3) Remove the throttle body.

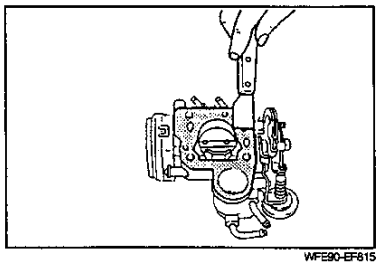

WFE90-EF813

Inspection of throttle body

1. Cleaning of throttle body prior to inspection
   (1) Clean the cast part with a soft brush, a wet cloth or the like.

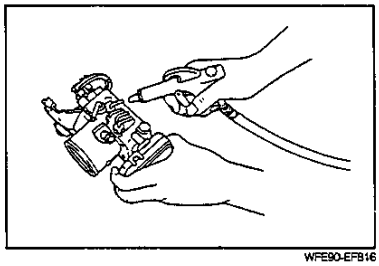
WFE90-EF814

(2) Remove the gasket material from the surge tank attaching surface of the throttle body.

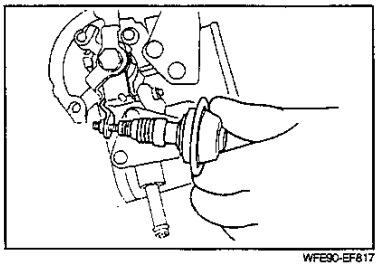

WFE90-EF815

(3) Clean all passages by blowing compressed air.

WARNING:
- Be sure to protect your eyes, wearing goggles.


WFE90-EF816

2. Check of throttle valve
   (1) Check that the throttle lever is in full contact with the dashpot.
   (2) When the throttle lever is opened, check to see if the dashpot lever comes out.

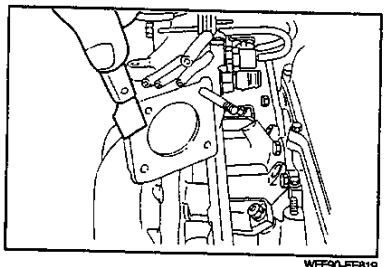

WFE90-EF817

(3) Check the throttle position sensor
(See page EF–170.)
Replace the throttle body if it exhibits any defect.

WFE90-EF818

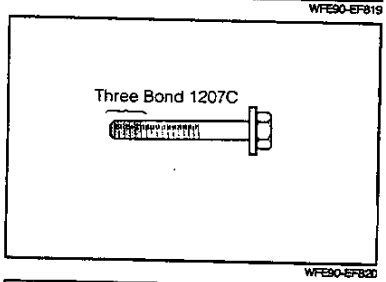
Installation of throttle body

1. Remove any gasket material from the throttle body attaching surface of the surge tank.



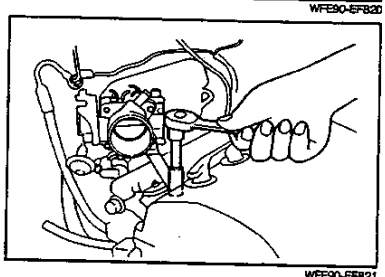
WFE90-EF819

2. Install the throttle body on the surge tank with a new gasket interposed. Attach the surge tank stay No. 1.
3. Apply a seal bond (Three Bond 1207C) to the threaded portions of the throttle body tightening bolts.



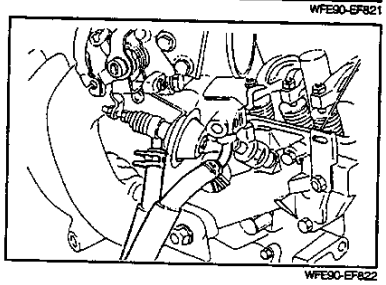
WFE90-EF820

4. Tighten the attaching bolts and nuts of the throttle body and surge tank stay No. 1.
   Tightening Torque: 14.7 - 21.6 N·m (1.5 - 2.2 kgf-m)



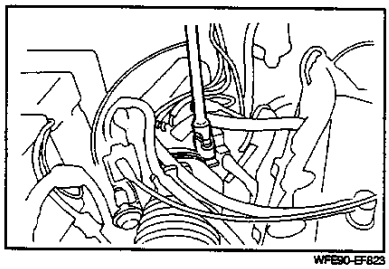
WFE90-EF821

5. Connect the water hoses to the throttle body. Attach the hose clips.



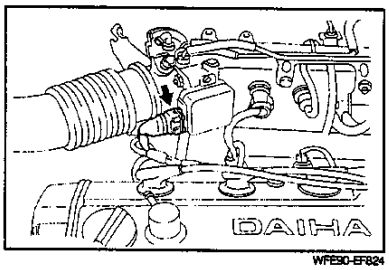
WFE90-EF822

6. Connect the vacuum hose to the throttle body.



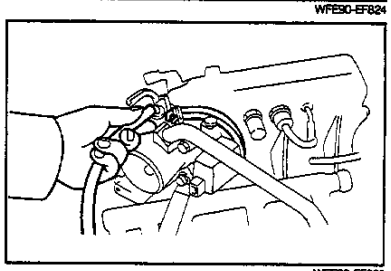
WFE90-EF823

7. Connect the throttle position sensor connector.



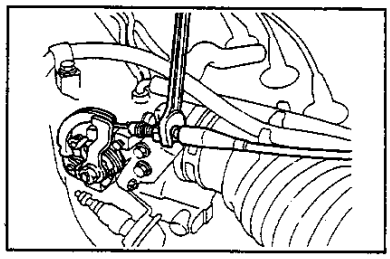
WFE90-EF824

8. Connect the vacuum hoses to the throttle body.



WFE90-EF825

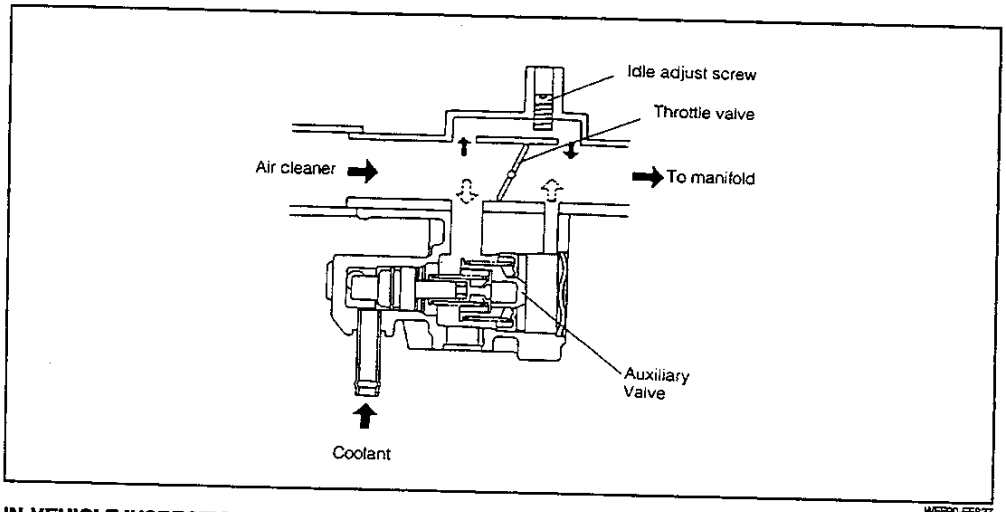
9. Connect the accelerator cable to the throttle body. Perform the adjustment so that the play in the axial direction may become 3 to 8 mm.
10. Connect the air chamber hose to the throttle body and the air chamber.
    NOTE:
    - **Be sure to align the mating marks between the throttle body and air chamber hose, and the air chamber hose and air chamber.**
    - **Be sure to clamp the air chamber hose bands.**



WFE90-EF826

11. Fill coolant.
    (See page CO-13.)
12. Connect the ground cable terminal to the negative (–) terminal of the battery.
13. Start the engine. Recheck the engine for water leakage. Repair the leaky point if water leakage exists.

AUXILIARY AIR VALVE

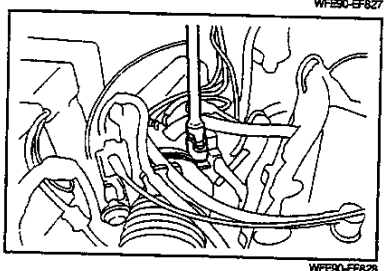


WFE90-EF827

IN-VEHICLE INSPECTION

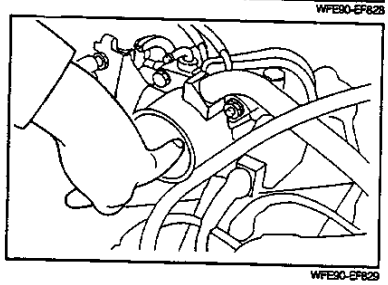
Check operation

1. Disconnect the air chamber hose from the throttle body.



WFE90-EF828

2. Start the engine. Check that there is air continuity at the auxiliary air valve port under the following conditions. Perform the check, following the procedures given below.
   When the cooling water temperature is below 40°C, apply your finger to the auxiliary air valve port. Ensure that the engine speed drops.
   When the cooling water temperature is above 70°C, apply your finger to the auxiliary air valve port. Ensure that the engine speed does not change.
   If the auxiliary air valve exhibits any malfunction, replace the throttle body.



WFE90-EF829

Removal of auxiliary air valve

Remove the throttle body.
(See page EF–224.)

WFE90-EF830

Installation of auxiliary air valve

Installation of throttle body
(See page EF–227.)

WFE90-EF831

SSTs

Shape	Part No. and Name	Purpose	Remarks
	09991-87702-000 Engine control system inspection sub harness	Shorting terminal T Actuating fuel pump, etc.	
	09842-87204-000 EFC-II computer check sub harness	Inspection of computer input/output voltage	General specification
	09842-87704-000 EFC computer check sub harness	Inspection of computer input/output voltage	US specification
	09842-30070-000 EFI inspection wire F	Inspection of fuel injectors	
	09268-87701-000 EFI fuel pressure gauge	Inspection of fuel pressure	
	09283-87703-000 Pressure regulator adopter	Inspection of injectors Inspection of pressure regulator Inspection of fuel pressure	
	09268-87702-000 Injection measuring tool set	Inspection of injectors Inspection of pressure regulator Inspection of fuel pressure	
	09268-87703-000 Plug wrench	Removal and installation of spark plugs	
	09991-87703-000 Tacho pulse pick-up wire	Connecting engine tachometer	

WFE90-EF832

TIGHTENING TORQUE

Tightening component	Tightening torque			Remarks
	N·m	kgf-m	ft-lb	
Cylinder head × Spark plug	14.7 - 21.6	1.5 - 2.2	10.8 - 15.9	
× Water temperature sensor	24.5 - 34.3	2.5 - 3.5	18.1 - 25.3	
× Distributor attach bolt	14.5 - 21.6	1.5 - 2.2	10.8 - 15.9	
Surge tank × Intake air temperature sensor	29.4 - 39.2	3.0 - 4.0	21.7 - 28.9	
× Gas filter	11.8 - 19.6	1.2 - 2.0	8.7 - 14.5	
× Throttle body	14.7 - 21.6	1.5 - 2.2	10.8 - 15.9	
Surge tank × Stay No. 1	14.7 - 21.6	1.5 - 2.2	10.8 - 15.9	
No. 2	29.4 - 44.1	3.0 - 4.5	21.7 - 32.5	
No. 3	14.7 - 21.6	1.5 - 2.2	10.8 - 15.9	
Fuel filter × Fuel hose No. 1	34.3 - 44.1	3.5 - 4.5	25.3 - 32.5	
× Fuel pipe	34.3 - 44.1	3.5 - 4.5	25.3 - 32.5	
Delivery pipe × Fuel pipe No. 1	34.3 - 44.1	3.5 - 4.5	25.3 - 32.5	
× Intake manifold	14.7 - 21.6	1.5 - 2.2	10.8 - 15.9	

WFE90-EF833

EFI SYSTEM

Fuel pressure regulator	Fuel pressure at No. vacuum	225 - 275 kPa (2.3 - 2.8 kgf/cm²)
Injector	Resistance at 20°C (approx.) Injection amount (approx.) Difference between each injector Fuel leakage	11.0 - 15.0 Ω 152 - 168 cm³/60 seconds at 20°C 5 cm³ or less Less than one drop of fuel per minute
EFI main relay Injector relay	Between terminals ① - ② ③ - ④	60 - 85 Ω Infinity
Fuel pump relay	Between terminals ① - ② ③ - ④	70 - 90 Ω Infinity
Idle-up VSV	Resistance	30 - 50 Ω at 20°C
Throttle position sensor	Resistance Between terminals ⑩ - ㉑ (General) ⑫ - ㉘ (US) Throttle valve closed fully Throttle valve opened fully Between terminals ㉘ - ㉑ (General) ㉜ - ㉘ (US) Throttle valve closed fully Throttle valve opened fully	 0.2 Ω or less at 20°C 10 kΩ or more at 20°C 10 kΩ or more at 20°C 5 Ω or less at 20°
Fuel pump	Fuel flow amount	235 cm³ or more/15 seconds
Water temperature sensor Intake air temperature sensor	Cooling water temperature	Resistance
	80°C	0.322 ± 0.1 kΩ
	60°C	0.584 ± 0.2 kΩ
	40°C	1.14 ± 0.3 kΩ
	20°C	2.45 ± 0.5 kΩ
	0°C	5.88 ± 1.5 kΩ
	−20°C	16.2 ± 3.2 kΩ

Pressure sensor
Output between SST terminals ⑬ - ㉒ (ground) (When engine is stopped.)

Measuring point Altitude (height above sea level) m	Atmospheric pressure kPa (mmHg)	Voltage V
0	101.3 (760)	3.3 - 3.9
500	95.5 (716)	3.2 - 3.8
1000	89.9 (674)	3.0 - 3.6

WFE30-EF834

VOLTAGES AT ECU CONNECTORS (General specification)

Terminals	STD voltage or resistance	Conditions	Remedies
(1) - (21)	Less than 1 Ω	Ignition switch OFF.	Proceed to flow chart (2).
(2) - (21)	Less than 1 V	Ignition switch OFF (after more than one minute).	Check power supply.
	Approx. battery voltage	Ignition switch ON.	
(3) - (21)	Less than 0.1 V	Ignition switch OFF (after more than ten seconds).	Check power supply.
	Approx. battery voltage	Ignition switch ON.	
(4) - (21)	Approx. battery voltage	At all times. (Measured voltage is lower than specified voltage only at during starting period.)	Check power supply.
(5) - (21)	Approx. battery voltage	Engine fully warmed up. All accessary switches turned OFF.	Check power supply.
	Less than 3 V	Idle-up VSV ON.	Check idle-up VSV control.
(6) - (21)	4.5 - 5.5 V	Ignition switch ON. T-terminal shorted with ground terminal. Throttle valve fully closed.	Proceed to flow chart (2).
	Less than 1 V		Check diagnosis code.
	0 - 4.5 to 5.5 V (Measured voltage varies)	Ignition switch ON. T-terminal shorted with ground terminal. Engine revolution speed build at 3000 rpm after it has fully warmed up.	Oxygen sensor system.
(7) - (21)	Less than 0.1 V	Ignition switch OFF.	Check power supply.
	Approx. battery voltage	Ignition switch ON.	
(8) - (21)	Less than 0.1 V	Ignition switch OFF.	Check power supply.
	More than 6 V	When ignition switch is set to ST position.	
(9) - (21)	Less than 0.1 V	Ignition switch OFF.	Check T-terminal wiring.
	Approx. battery voltage	Ignition switch ON.	
(10) - (21)	Less than 0.5 V	Ignition switch ON. Throttle valve fully closed.	Throttle position sensor system.
	Approx. battery voltage	Ignition switch ON. Throttle valve fully opened.	
(11) - (21)	Less than 0.1 V	Ignition switch ON. Headlamp switch and/or defogger switch OFF.	Check idle-up VSV control.
	More than 9 V	Ignition switch ON. Headlamp switch and/or defogger switch ON.	
(12) - (22)	Less than 0.1 V	Ignition switch OFF.	Check VCC wiring.
	4.5 - 5.5 V	Ignition switch ON.	
(13) - (22)	3.2 - 4.0 V	Ignition switch ON. Atmospheric pressure is 101.3 kPa (760 mmHg)	Check pressure sensor.
(14) - (30)	1.5 - 3.0 V	Ignition switch ON. Air temperature inside surge tank: 20°C.	Check intake air temperature sensor.
(15) - (30)	0.40 - 0.65 V	Ignition switch ON. After engine has been warmed up fully. Cooling water temperature: 80 - 90°C.	Check cooling water tempera-ture sensor.
(16) - (1)	Less than 1 Ω	Ignition switch OFF.	Proceed to flow chart (2).
(17) - (21)	Less than 1 V	Ignition switch OFF (after more than one minute).	Check/repair injector power supply.
	Approx. battery voltage	Ignition switch ON.	

WFE90-EF835

Terminals	STD voltage or resistance	Conditions	Remedies
(18) - (21)	Less than 0.1 V	Ignition switch OFF.	Check/repair ECU power supply.
	Approx. battery voltage	Ignition switch ON.	
(19) - (21)	Less than 3 V	Ignition switch ON. (Check engine lamp illuminated.)	Check power supply for check engine lamp.
	Approx. battery voltage	Engine is rotating. (Check engine lamp not illuminated.)	
(20) - (21)	Less than 1 V	Ignition switch ON. Fuel pump is operating.	Check/repair fuel pump power supply.
	Approx. battery voltage	Ignition switch ON. Fuel pump is stopped.	
(21) - Engine ground	Less than 0.2 Ω	Ignition switch OFF.	Check ground wiring.
(22) - (21)	Less than 0.5 Ω	Ignition switch OFF.	Replace ECU.
(23) - (21)	Approx. battery voltage	Engine is rotating. Air conditioner compressor is rotating. (Genuine air conditioner-equipped vehicle.)	Check air conditioner wiring.
(26) - (21)	0 to Approx. battery voltage	Ignition switch ON. When vehicle is moved. (Measured voltage changes four times for movement of 1.5 m.)	Check speed sensor
(28) - (21)	Approx. battery voltage	Ignition switch ON. Throttle valve fully closed.	Check throttle position sensor.
	Less than 0.5 V	Ignition switch ON. Throttle valve fully opened.	
(29) - (21)	Less than 0.1 V	Ignition switch ON. (after more than 60 seconds.)	Check oxygen sensor.
	Voltage varies within 0 - 1.0 V	After engine has warmed up fully. When engine revolution is held as 3000 rpm for more than two minutes:	Check fuel system.
(30) - (21)	Less than 1 Ω	Ignition switch ON.	Proceed to flow chart (2).

WFE90-EF836

VOLTAGES AT ECU CONNECTORS (US specification)

Terminals	STD Voltage	Condition		See page
① — ㊴	Approx. battery voltage	Ignition switch ON		EF–145
② — ㊳	Approx. battery voltage	At all time		EF–146
③ — ㊳	Approx. battery voltage	Ignition switch ON	When engine is stopped:	EF–149
⑤ — ㊳	4.5 - 5.5 V	Ignition switch ON		EF–147
⑥ — ㊳	3.2 - 4.0 V	Ignition switch ON	When atmospheric pressure of 101.3 kPa (760 mmHg) exists.	EF–148
⑦ — ㊳	0.4 - 0.65 V	Ignition switch ON	When cooling water temperature is 80°C:	EF–150
⑧ — ㊳	0 - Approx. battery voltage	Ignition switch ON	Measured voltage changes when vehicle is moved 1.5 m.	EF–156
⑨ — ㊳	Less than 5.0 V	Ignition switch ON	When defogger and headlamp switches are turned OFF:	—
	Approx. battery voltage	Ignition switch ON	When defogger and/or headlamp switches are turned ON:	
⑪ — ㊳	Approx. battery voltage	Ignition switch ON	When test terminal of check connector is not connected with ground terminal:	—
	Less than 1.0 V	Ignition switch ON	When test terminal of check connector is connected with ground terminal:	—
⑫ — ㊳	Less than 5.0 V	Ignition switch ON	Throttle valve fully closed	EF–153
	Approx. battery voltage	Ignition switch ON	Throttle valve fully opened	
⑬ — ㊳	0 V	Ignition switch ON		EF–157
	More than 6 V	When ignition switch is set to ST position:		
⑮ — ㊳	Measured voltage changes at a point between 0 - 5.0 V.	After warming up engine completely, connect test terminal of check connector with ground terminal. Hold engine revolution speed at 3000 rpm for two minutes.		EF–187
⑯ — ㊳	Less than 3.0 V	Ignition switch ON	• Engine is stopped. • When check engine lamp is illuminated:	—
	Approx. battery voltage	Ignition switch ON	• After engine starts: • When check engine lamp is extinguished:	
⑭ — ㊳	Approx. battery voltage	Ignition switch ON	• After engine starts: • Cooling water temperature is below 40°C.	EF–181
	Less than 3.0 V	Ignition switch ON	• After engine starts: • Cooling water temperature is above 41°C.	
⑳ — ㊳	Less than 1.0 V	At least 30 seconds have elapsed after turning OFF ignition switch.		EF–220
	Approx. battery voltage	Ignition switch ON	• Engine is stopped.	
㉑ — ㊴	Less than 0.01 V	Ignition switch ON		—
㉒ — ㊴	Approx. battery voltage	Ignition switch ON		EF–145

Terminals	STD Voltage	Condition		See page
㉖ — ㉚	Change in output voltage	Ignition switch ON	After warming up engine completely, hold engine revolution speed at 3000 rpm for two minutes.	EF–151
㉗ — ㉚	1.5 - 3.0 V	Ignition switch ON	Air temperature inside intake manifold is 20°C:	EF–155
㉘ — ㉚	Less than 0.1 V	Ignition switch ON		—
㉙ — ㉚	Approx. battery voltage	Ignition switch ON	• Blower fan switch turned OFF	—
	Less than 2.0 V	Ignition switch ON	When blower fan switch turned ON:	
㉜ — ㉚	Approx. battery voltage	Ignition switch ON	Throttle valve fully closed	EF–154
	Less than 5.0 V	Ignition switch ON	Throttle valve fully opened	
㉝ — ㉚	Less than 1 V	Ignition switch ON	When brake pedal is not depressed:	—
	Approx. battery voltage	At all time	When brake pedal is depressed:	—
㉞ — ㉚	Less than 1 V	Ignition switch ON	When compressor magnet switch of air conditioner is turned OFF:	EF–159
	Approx. battery voltage	Ignition ON	When compressor magnet switch of air conditioner is turned ON:	
㉟ — ㉚	Less than 0.1 V	Ignition switch ON		—
㊲ — ㉚	Approx. battery voltage	Ignition switch ON	When fuel pump is stopped:	EF–163
	Less than 2.0 V	Ignition switch ON	When fuel pump is operating:	
㊳ — ㉚	Approx. battery voltage	Ignition switch ON	When pressure VSV is turned OFF:	EF–184
	Less than 3.0 V	Ignition switch ON	For 0.5 second immediately after engine starts	
㊴ — Engine ground	Less than 0.1 V	Ignition switch ON		—
㊵ — ㉚	Less than 3.0 V	Ignition switch ON	Engine is stopped.	EF–175
	Approx. battery voltage	Ignition switch ON	When test terminal of check connector is connected with ground terminal:	
㊶ — ㉚	Less than 1.0 V	At least 30 seconds have elapsed after turning OFF ignition switch.		EF–220
	Approx. battery voltage	Ignition switch ON	Engine is stopped.	
㊷ — ㉚	Less than 0.1 V	Ignition switch ON		—

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