ENGINE FUEL & EMISSION CONTROL SYSTEM

SECTION EF & EC

GI MA EM LC EF & EC FE CL MT AT TF PD FA RA BR ST BF HA EL IDX

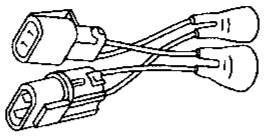
CONTENTS

CONTENTS (Cont'd.)

When you read wiring diagrams:
- **Read GI section, "HOW TO READ WIRING DIAGRAMS".**
- **See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.**

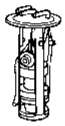
When you perform trouble diagnoses, read GI section, "HOW TO FOLLOW FLOW CHART IN TROUBLE DIAGNOSES".

Special Service Tool

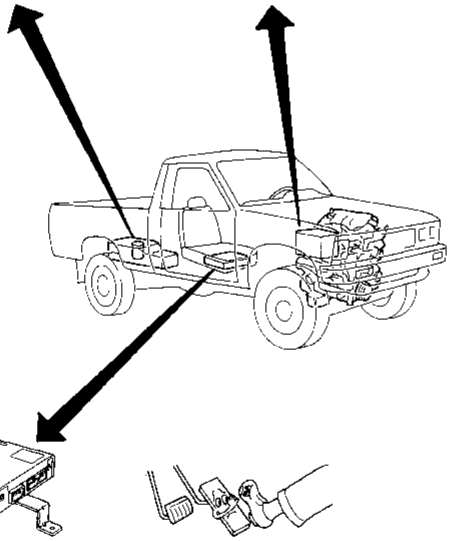
Tool number (Kent-Moore No.) Tool name	Description	Engine application	
		VG30E	KA24E
EG11160000 (—) Adapter harness	 Measuring engine speed NT056	X	X

Precautions

FUEL PUMP
- Do not operate fuel pump when there is no fuel in lines.
- Tighten fuel hose clamps to the specified torque.



BATTERY
- Always use a 12 volt battery as power source.
- Do not attempt to disconnect battery cables while engine is running.



ECM
- Do not disassemble ECCS control module (ECM).
- Do not turn diagnosis mode selector forcibly.
- If a battery terminal is disconnected, the memory will return to the ECM value.
  The ECCS will now start to self-control at its initial value. Engine operation can vary slightly when the terminal is disconnected. However, this is not an indication of a problem. Do not replace parts because of a slight variation.

WHEN STARTING
- Do not depress accelerator pedal when starting.
- Immediately after starting, do not rev up engine unnecessarily.
- Do not rev up engine just prior to shutdown.

WIRELESS EQUIPMENT
- When installing CB ham radio or a mobile phone, be sure to observe the following as it may adversely affect electronic control systems depending on its installation location.

1) Keep the antenna as far as possible away from the electronic control units.
2) Keep the antenna feeder line more than 20 cm (7.9 in) away from the harness of electronic controls.
   Do not let them run parallel for a long distance.
3) Adjust the antenna and feeder line so that the standing-wave ratio can be kept smaller.
4) Be sure to ground the radio to vehicle body.

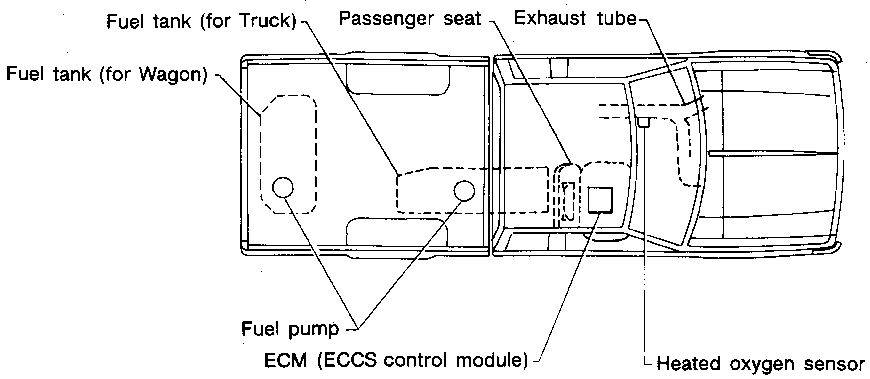
INJECTOR
- Do not disconnect injector harness connectors with engine running.
- Do not apply battery power directly to injectors.

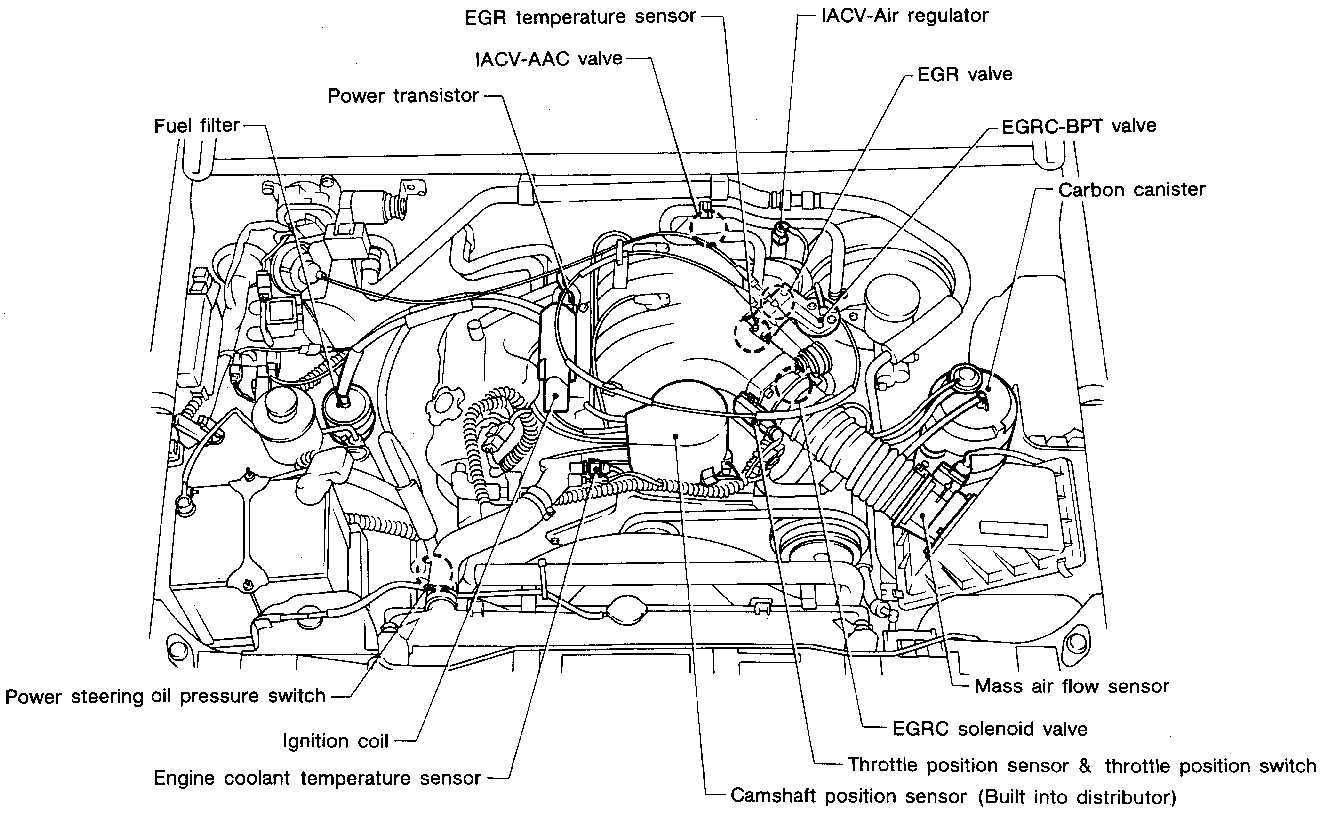
ECCS PARTS HANDLING
- Handle mass air flow sensor carefully to avoid damage.
- Do not disassemble mass air flow sensor.
- Do not clean mass air flow sensor with any type of detergent.
- Do not disassemble IACV-AAC valve.
- Even a slight leak in the air intake system can cause serious problems.
- Do not shock or jar the camshaft position sensor.

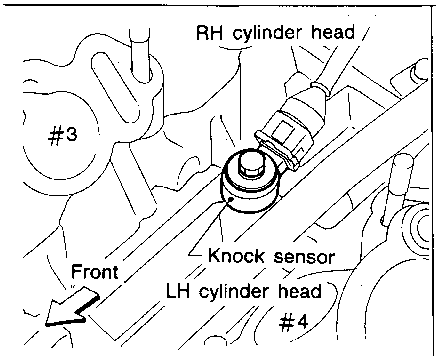
ECCS HARNESS HANDLING
- Securely connect ECCS harness connectors.
  A poor connection can cause an extremely high (surge) voltage to develop in coil and condenser, thus resulting in damage to ICs.
- Keep ECCS harness at least 10 cm (3.9 in) away from adjacent harnesses, to prevent an ECCS system malfunction due to receiving external noise.

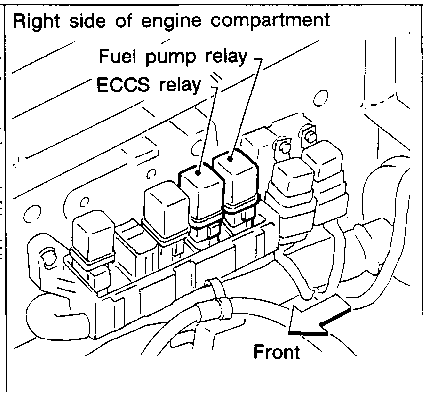
SEF903MA

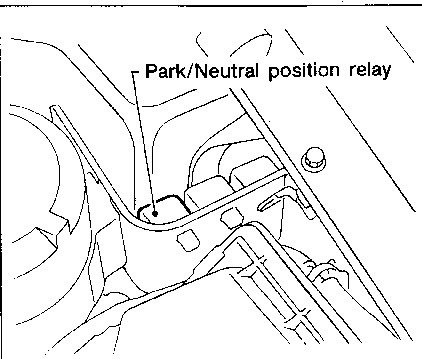
ECCS Component Parts Location





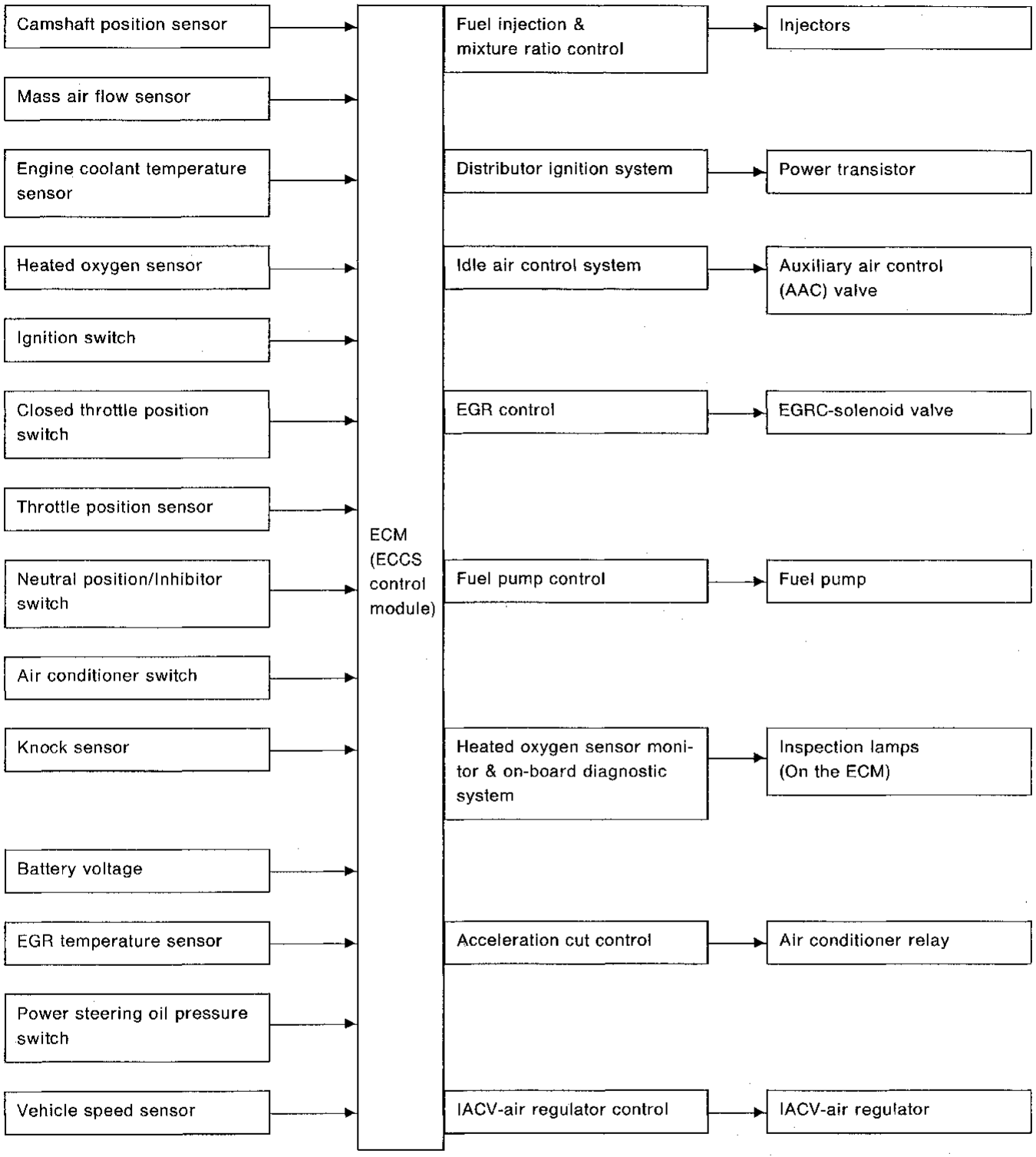




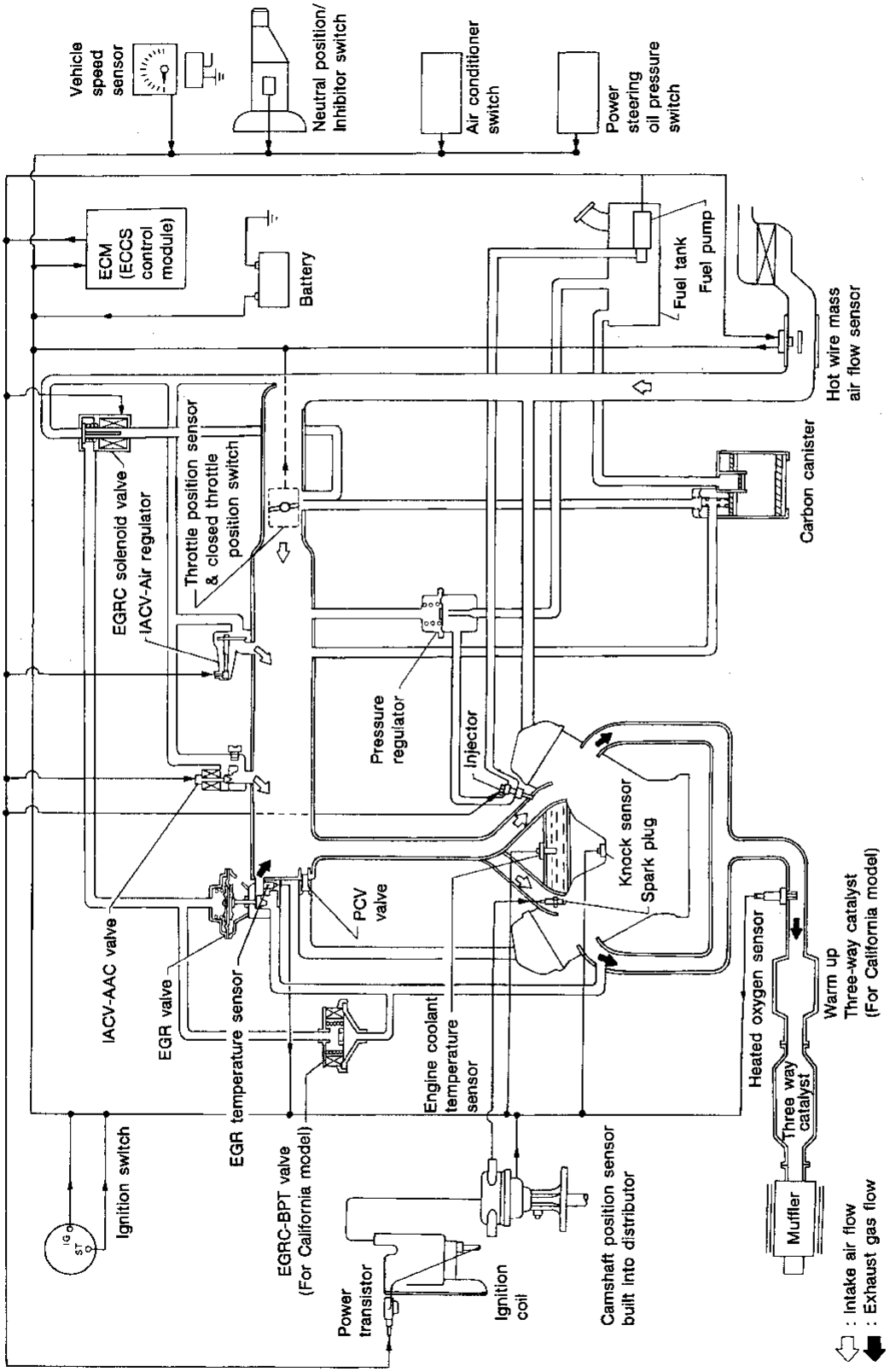


SEF516N

System Chart

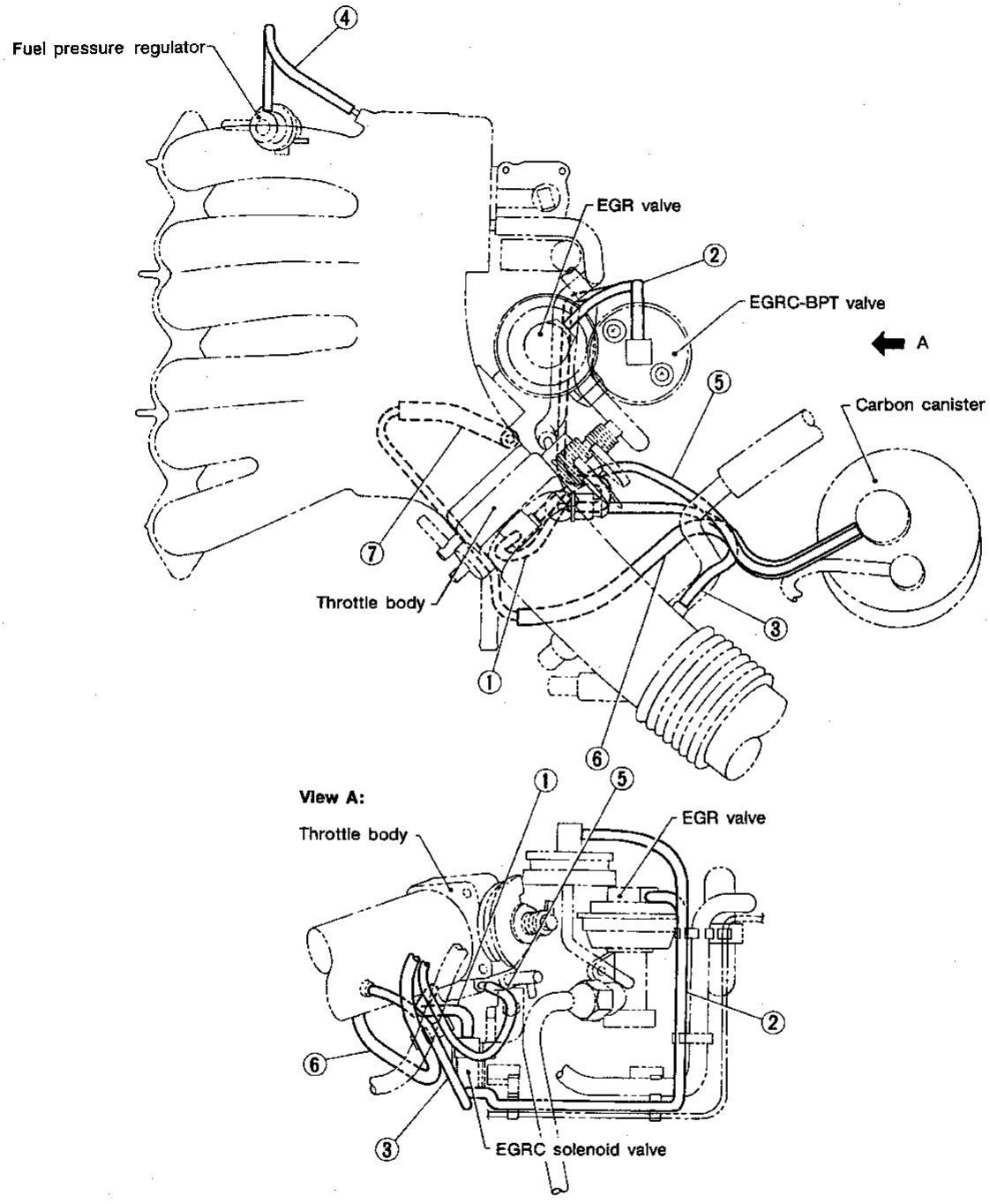


System Diagram



SEF515N

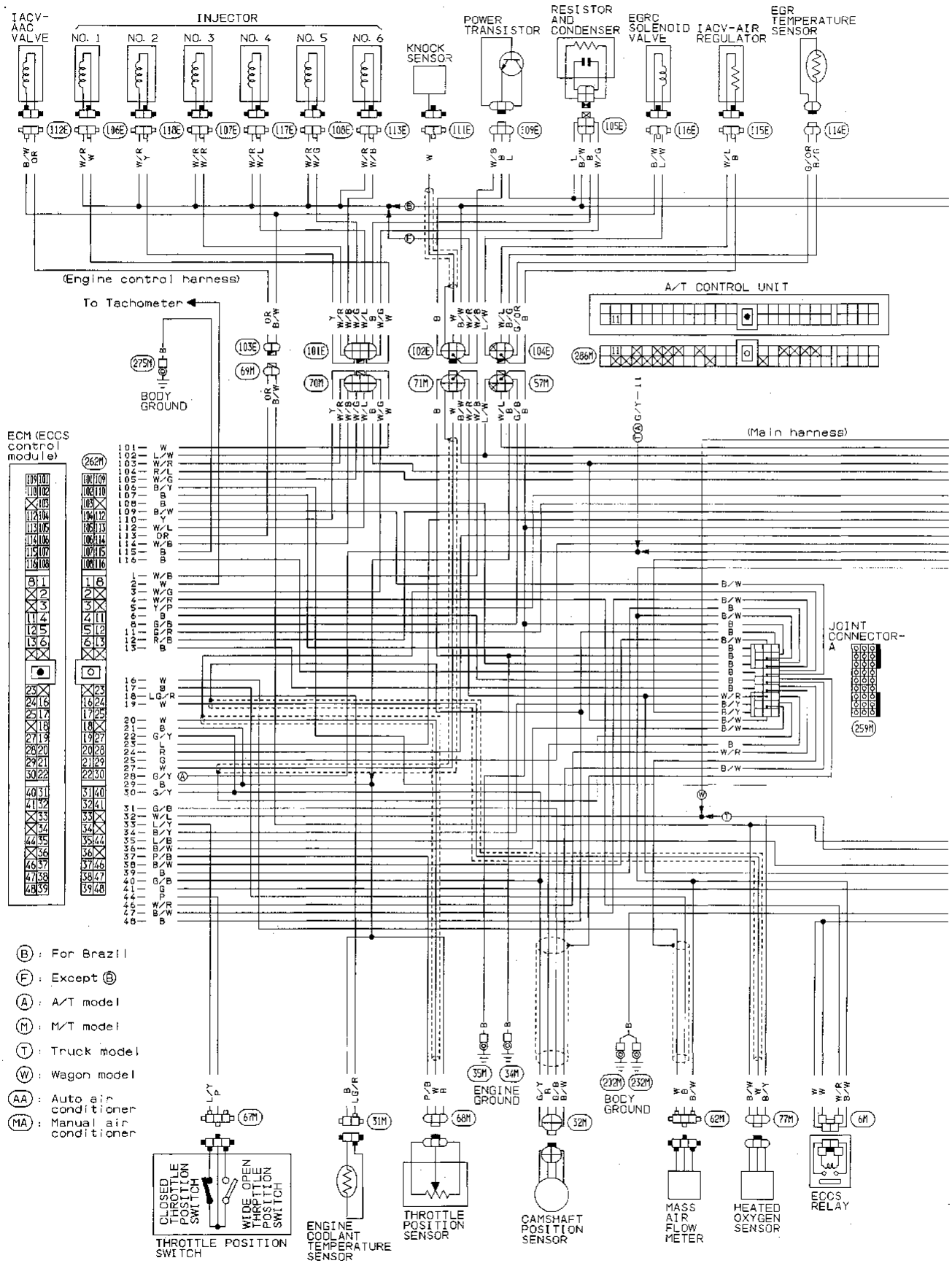
Vacuum Hose Drawing



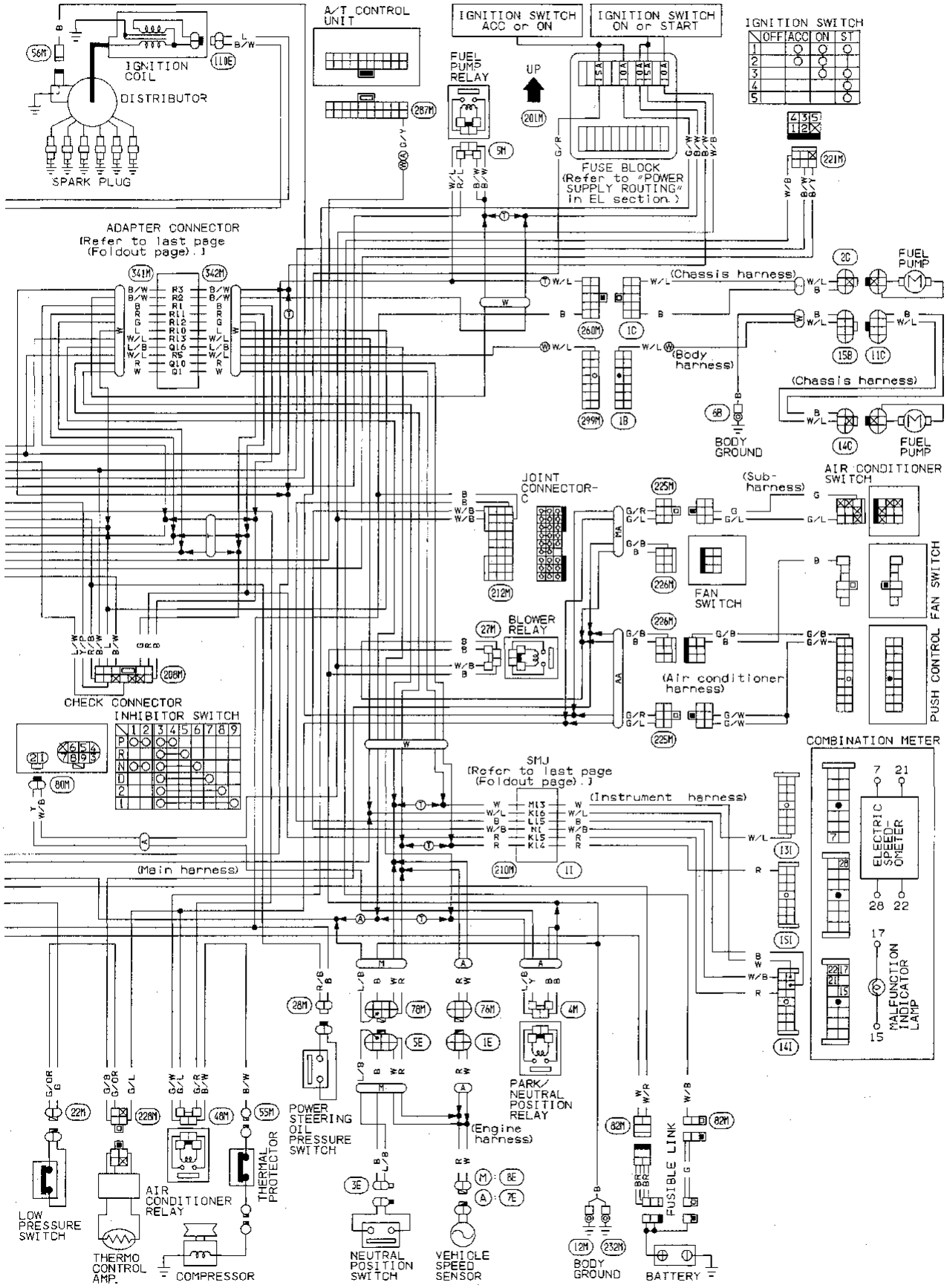
① EGRC solenoid valve to Throttle body
② EGRC solenoid valve to EGR valve
③ EGRC solenoid valve to Air duct
④ Fuel pressure regulator to Intake manifold collector
⑤ Carbon canister vacuum port to Throttle body
⑥ Carbon canister purge port to Vapor purge tube
⑦ Vapor purge tube to Throttle body

SEF506N

Wiring Diagram

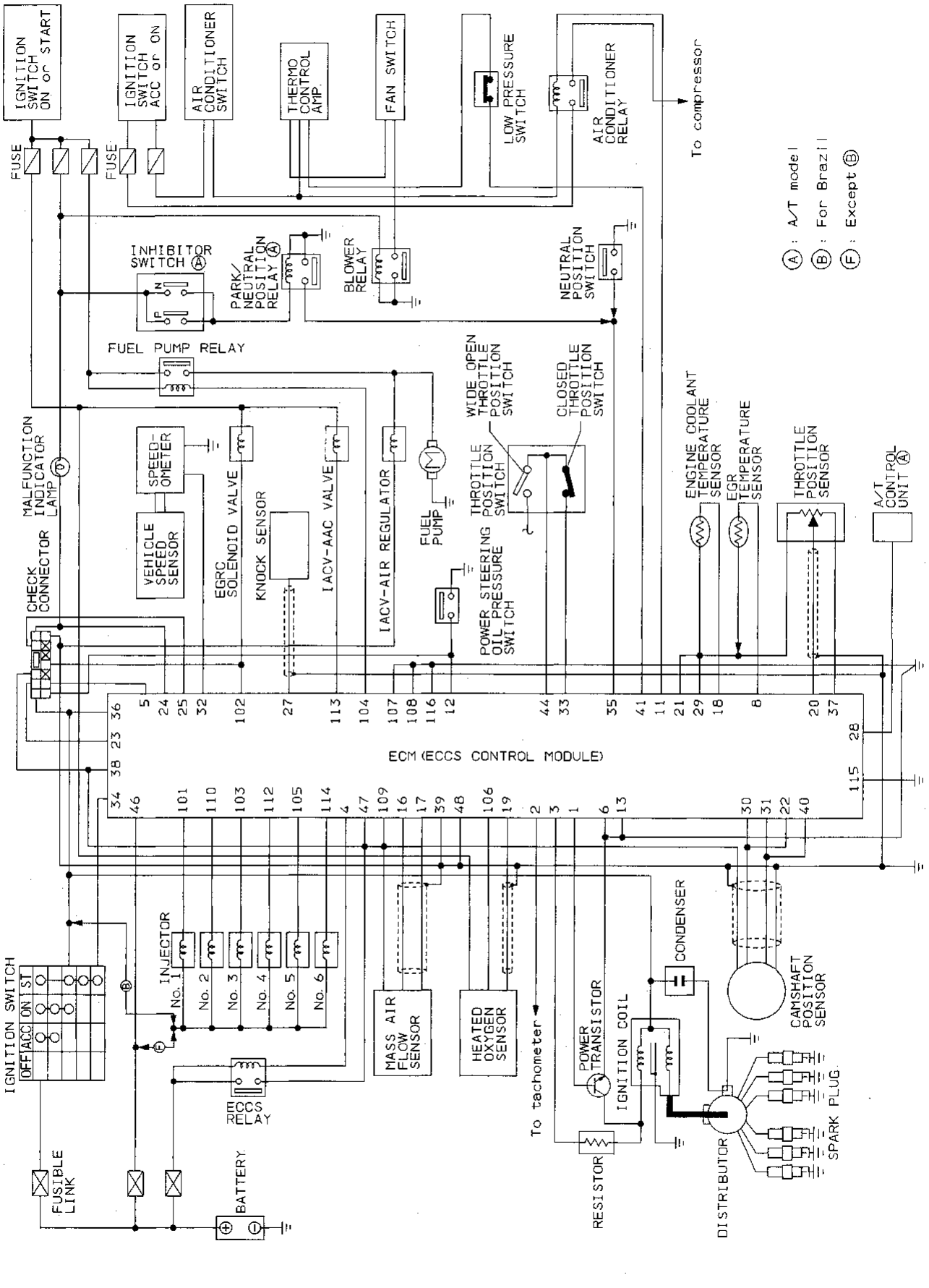


Wiring Diagram (Cont'd)

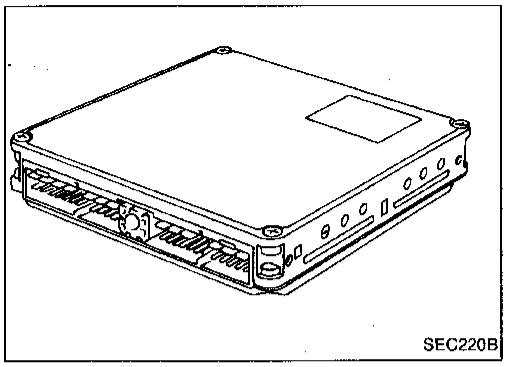


SEF770N

Circuit Diagram

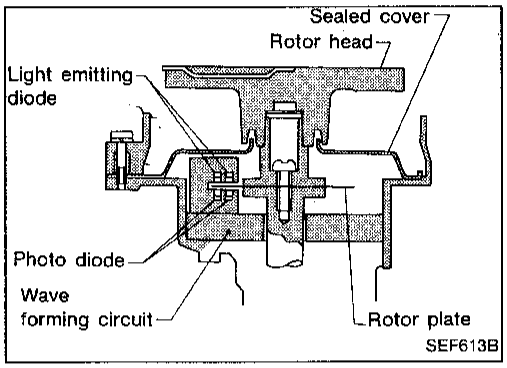


SEF771N


SEC220B

Engine Control Module (ECM)-ECCS Control Module

The ECM consists of a microcomputer, inspection lamps, a diagnostic test mode selector, and connectors for signal input and output and for power supply. The unit controls the engine.

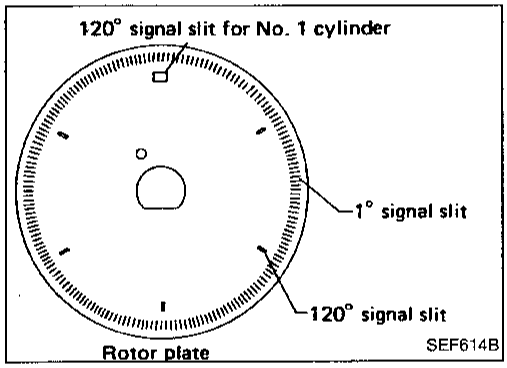


SEF613B

Camshaft Position Sensor (CMPS)

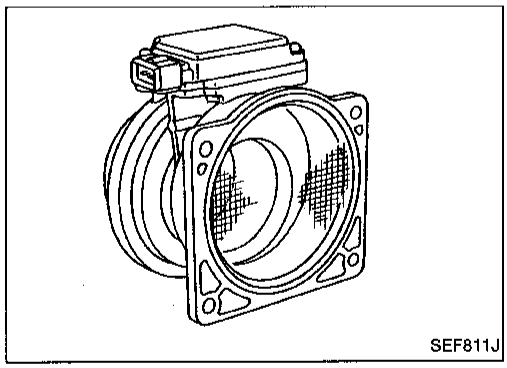
The camshaft position sensor is a basic component of the entire ECCS. It monitors engine speed and piston position, and sends signals to the ECM to control fuel injection, ignition timing and other functions.

The camshaft position sensor has a rotor plate and a wave-forming circuit. The rotor plate has 360 slits for 1° signal and 6 slits for 120° signal. Light Emitting Diodes (LED) and photo diodes are built in the wave-forming circuit.



SEF614B

When the rotor plate passes between the LED and the photo diode, the slits in the rotor plate continually cut the light being transmitted to the photo diode from the LED. This generates rough-shaped pulses which are converted into on-off pulses by the wave-forming circuit, which are sent to the ECM.

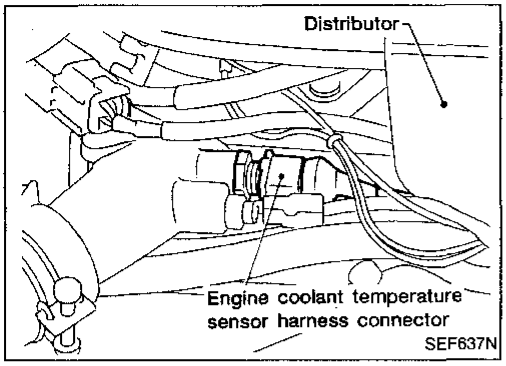

SEF811J

Mass Air Flow Sensor (MAFS)

The mass air flow sensor measures the intake air flow rate by taking a part of the entire flow. Measurements are made in such a manner that the ECM receives electrical output signals varied by the amount of heat emitting from the hot wire placed in the stream of the intake air.

When intake air flows into the intake manifold through a route around the hot wire, the heat generated from the hot wire is taken away by the air. The amount of heat depends on the air flow. On the other hand, the temperature of the hot wire is automatically controlled to a certain number of degrees.

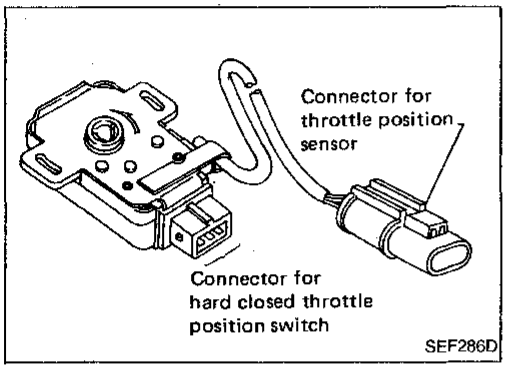
Therefore, it is necessary to supply the hot wire with more electric current in order to maintain the temperature of the hot wire. The ECM knows the air flow by means of the electric change.



Engine Coolant Temperature Sensor (ECTS)

The engine coolant temperature sensor, located on the water outlet housing, detects engine coolant temperature and transmits a signal to the ECM.

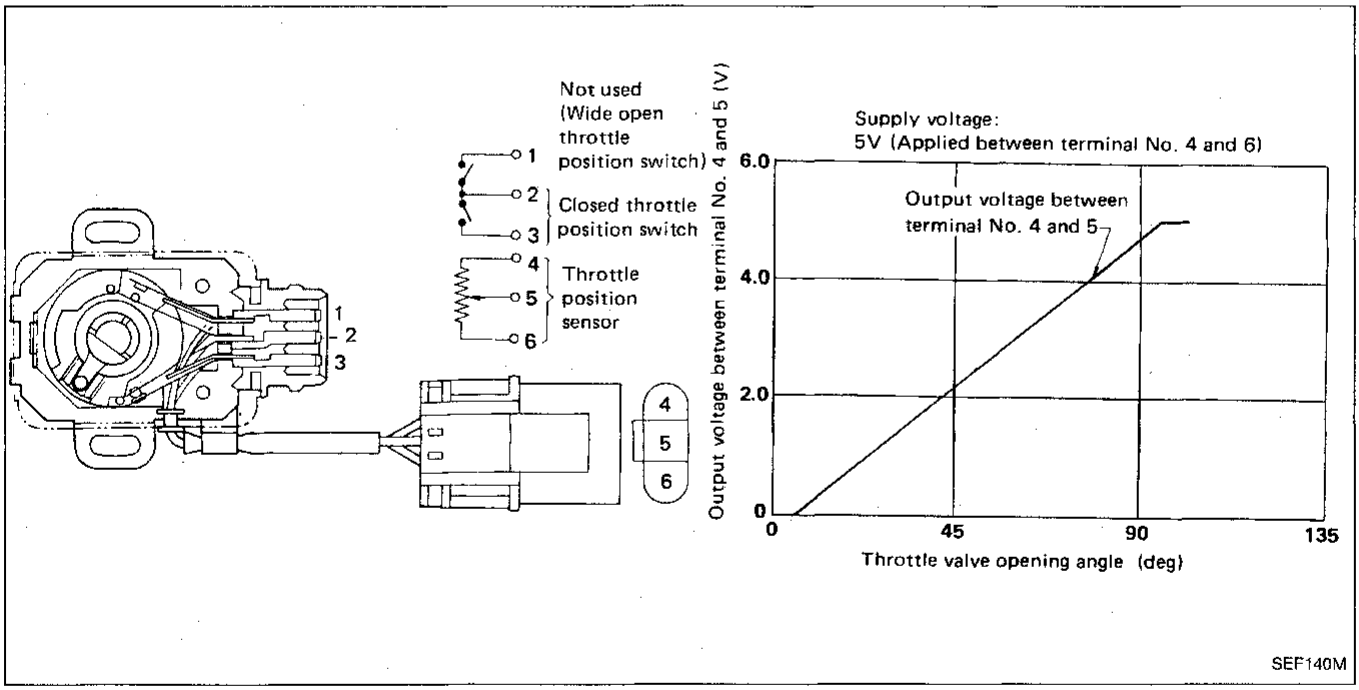
The temperature sensing unit employs a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the temperature rise.

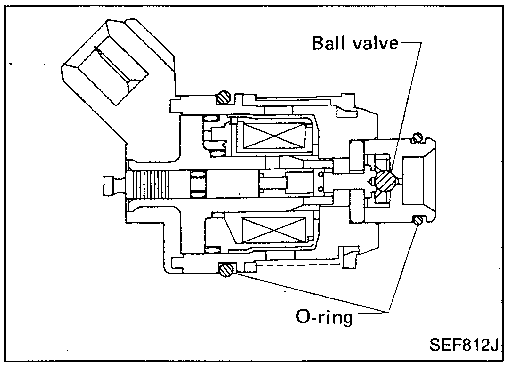


Throttle Position Sensor (TPS) & Soft/Hard Closed Throttle Position (CTP) Switch

The throttle position sensor responds to the accelerator pedal movement. This sensor is a kind of potentiometer which transforms the throttle position into output voltage, and emits the voltage signal to the ECM. In addition, the sensor detects the opening and closing speed of the throttle valve and feeds the voltage signal to the ECM.

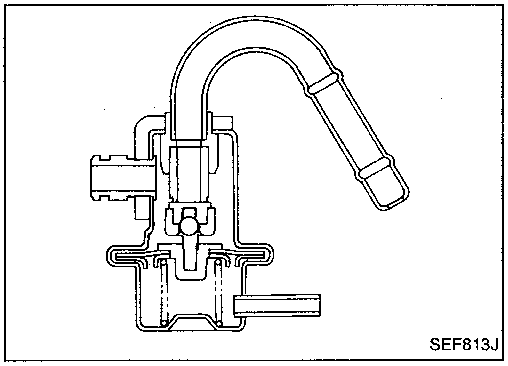
Idle position of the throttle valve is determined by the ECM receiving the signal from the throttle position sensor. This system is called "soft closed throttle position switch". This one controls engine operation such as fuel cut. On the other hand, "hard closed throttle position switch", which is built in the throttle position sensor unit, is used not for engine control but for on-board diagnostic system.





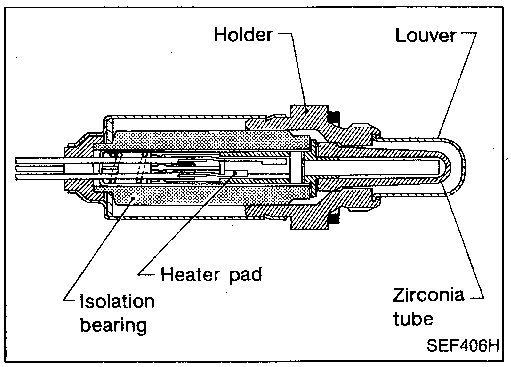
Fuel Injector

The fuel injector is a small, elaborate solenoid valve. As the ECM sends injection signals to the injector, the coil in the injector pulls the ball valve back and fuel is released into the intake manifold through the nozzle. The injected fuel is controlled by the ECM in terms of injection pulse duration.



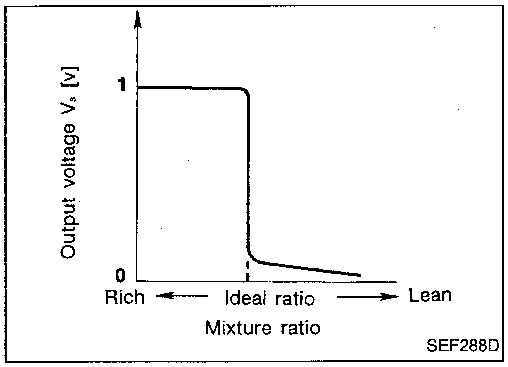
Pressure Regulator

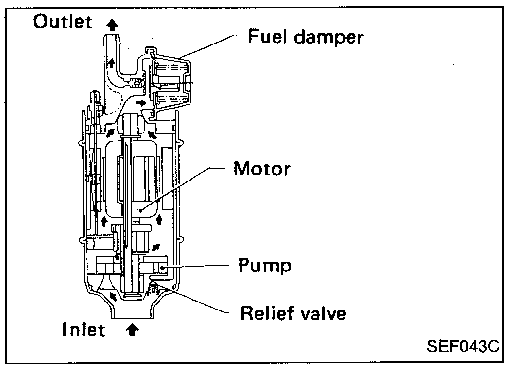
The pressure regulator maintains the fuel pressure at approximately 294 kPa (3.0 kg/cm^2, 43 psi). Since the injected fuel amount depends on injection pulse duration, it is necessary to maintain the pressure at the above value.



Heated Oxygen Sensor (HO2S)

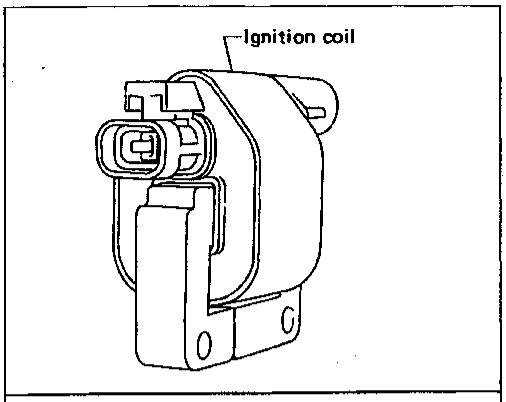
The heated oxygen sensor, which is placed into the exhaust outlet, monitors the amount of oxygen in the exhaust gas.
The sensor has a closed-end tube made of ceramic zirconia. The outer surface of the tube is exposed to exhaust gas, and the inner surface to atmosphere. The zirconia of the tube compares the oxygen density of exhaust gas with that of atmosphere, and generates electricity. In order to improve generating power of the zirconia, its tube is coated with platinum. The voltage is approximately 1V in a richer condition of the mixture ratio than the ideal air-fuel ratio, while approximately 0V in leaner conditions. The radical change from 1V to 0V occurs at around the ideal mixture ratio. In this way, the heated oxygen sensor detects the amount of oxygen in the exhaust gas and sends the signal of approximately 1V or 0V to the ECM. A heater is used to activate the sensor.





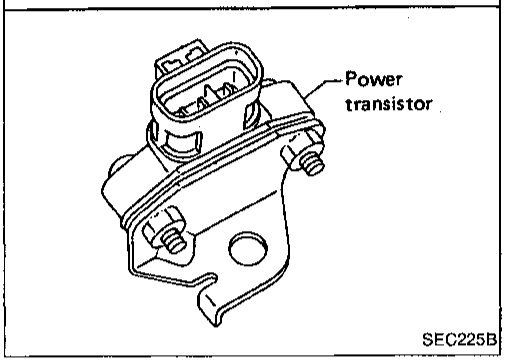
Fuel Pump

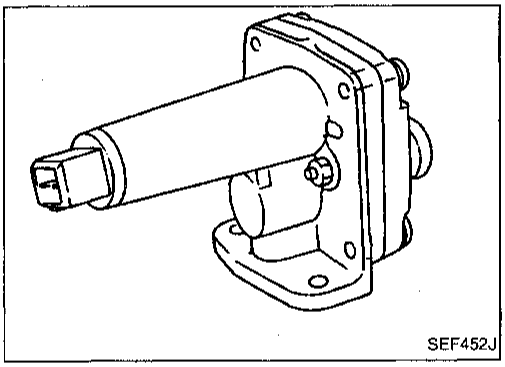
The fuel pump with a fuel damper is an in-tank type, that is the pump and damper are located in the fuel tank.
The vane rollers are directly coupled to a motor which is cooled by the fuel.



Power Transistor & Ignition Coil

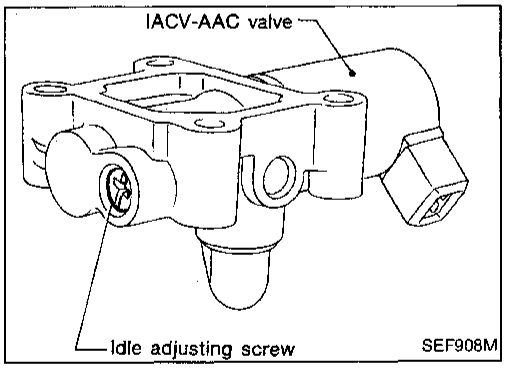
The ignition signal from the ECM is amplified by the power transistor, which turns the ignition coil primary circuit on and off, inducing the proper high voltage in the secondary circuit. The ignition coil is a small, molded type.





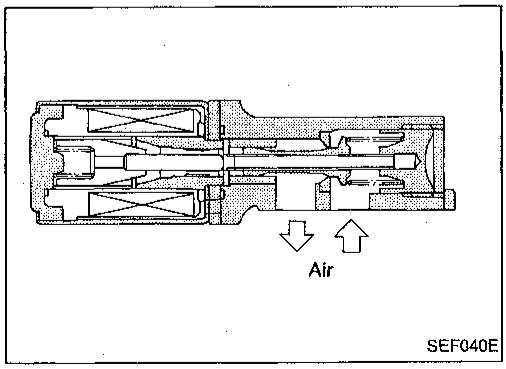
Idle Air Control Valve (IACV)-Air Regulator

The IACV-air regulator provides an air by-pass when the engine is cold for a fast idle during warm-up.
A bimetal, heater and rotary shutter are built into the IACV-air regulator. When the bimetal temperature is low, the air by-pass port opens. As the engine starts and electric current flows through a heater, the bimetal begins to turn the shutter to close the by-pass port. The air passage remains closed until the engine stops and the bimetal temperature drops.



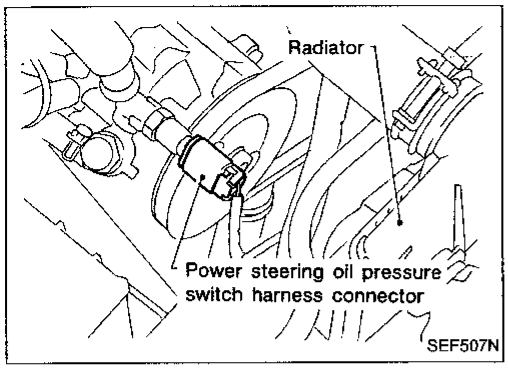
Idle Air Adjusting (IAA) Unit

The IAA unit is made up of the IACV-AAC valve and idle adjusting screw. It receives the signal from the ECM and controls the idle speed at the preset value.



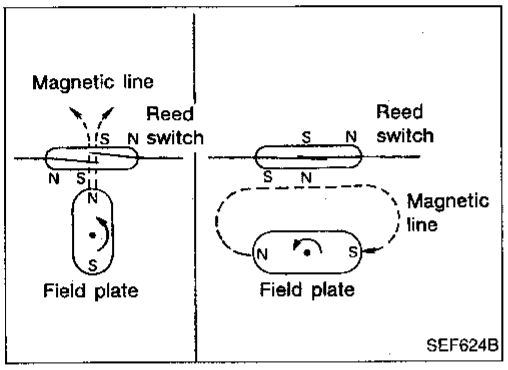
Idle Air Control Valve (IACV)-Auxiliary Air Control (AAC) Valve

The ECM actuates the IACV-AAC valve by an ON/OFF pulse. The longer that ON duty is left on, the larger the amount of air that will flow through the IACV-AAC valve.



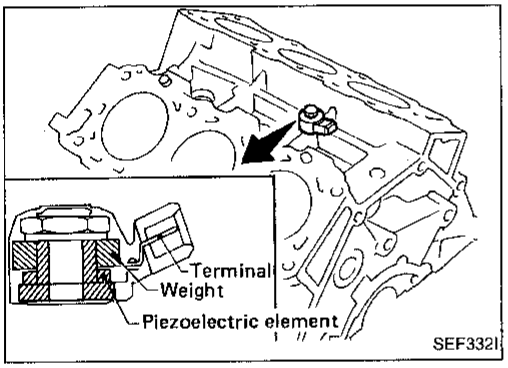
Power Steering Oil Pressure Switch

The power steering oil pressure switch is attached to the power steering high-pressure tube and detects the power steering load, sending the load signal to the ECM. The ECM then sends the idle-up signal to the IACV-AAC valve.



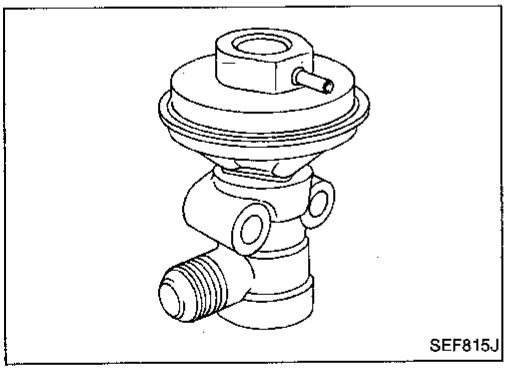
Vehicle Speed Sensor (VSS)

The vehicle speed sensor provides a vehicle speed signal to the ECM.
The speed sensor consists of a reed switch, which is installed in the speedometer unit and transforms vehicle speed into a pulse signal.



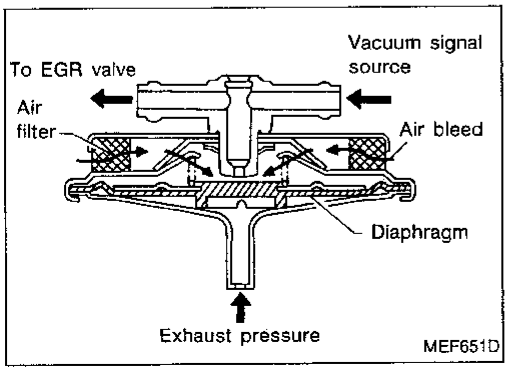
Knock Sensor (KS)

The knock sensor is attached to the cylinder block and senses engine knocking conditions.
A knocking vibration from the cylinder block is applied as pressure to the piezoelectric element. This vibrational pressure is then converted into a voltage signal which is sent to the ECM.



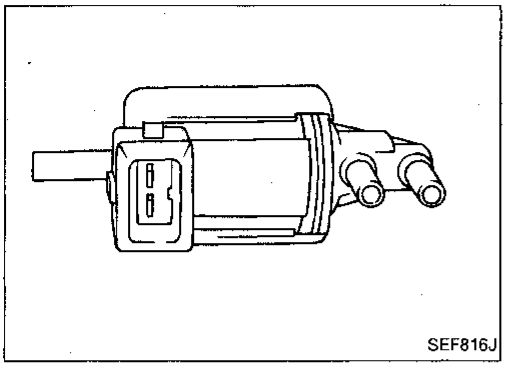
Exhaust Gas Recirculation (EGR) Valve

The EGR valve controls the quantity of exhaust gas to be led to the intake manifold through vertical movement of the taper valve connected to the diaphragm, to which vacuum is applied in response to the opening of the throttle valve.



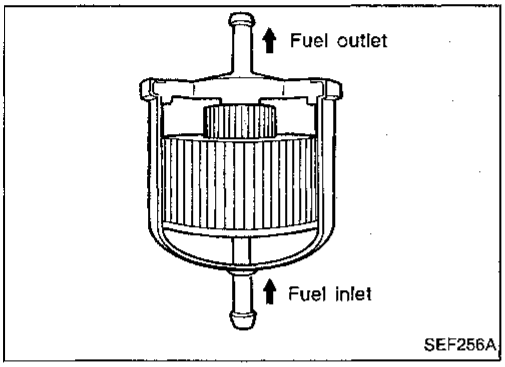
EGR Control (EGRC)-BPT Valve

The EGRC-BPT valve monitors exhaust pressure to activate the diaphragm, controlling throttle body vacuum applied to the EGR valve. In other words, recirculated exhaust gas is controlled in response to positioning of the EGR valve or to engine operation.


SEF816J

EGR Control (EGRC)-Solenoid Valve

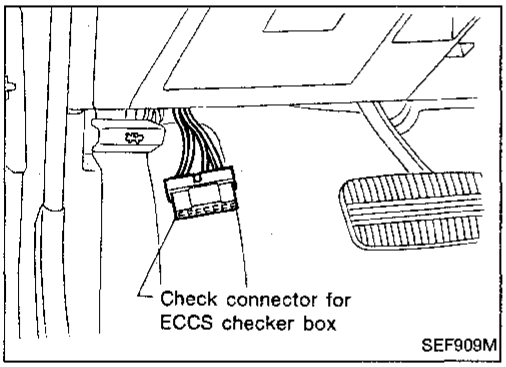
The EGR system is controlled only by the ECM. At both low- and high-speed revolutions of engine, the solenoid valve turns on and accordingly the EGR valve cuts the exhaust gas leading to the intake manifold.



SEF256A

Fuel Filter

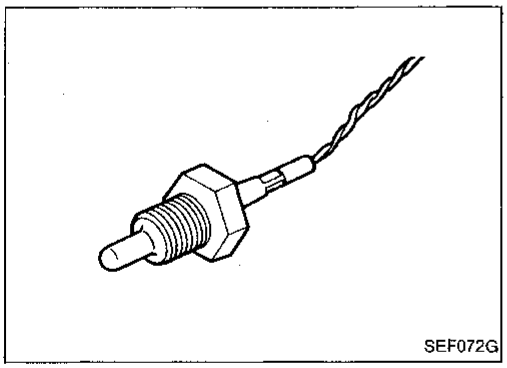
The specially designed fuel filter has a metal case in order to withstand high fuel pressure.



SEF909M

Check Connector for ECCS Checker Box

The check connector for ECCS checker box is located in the instrument panel to the rear of the hood opener.

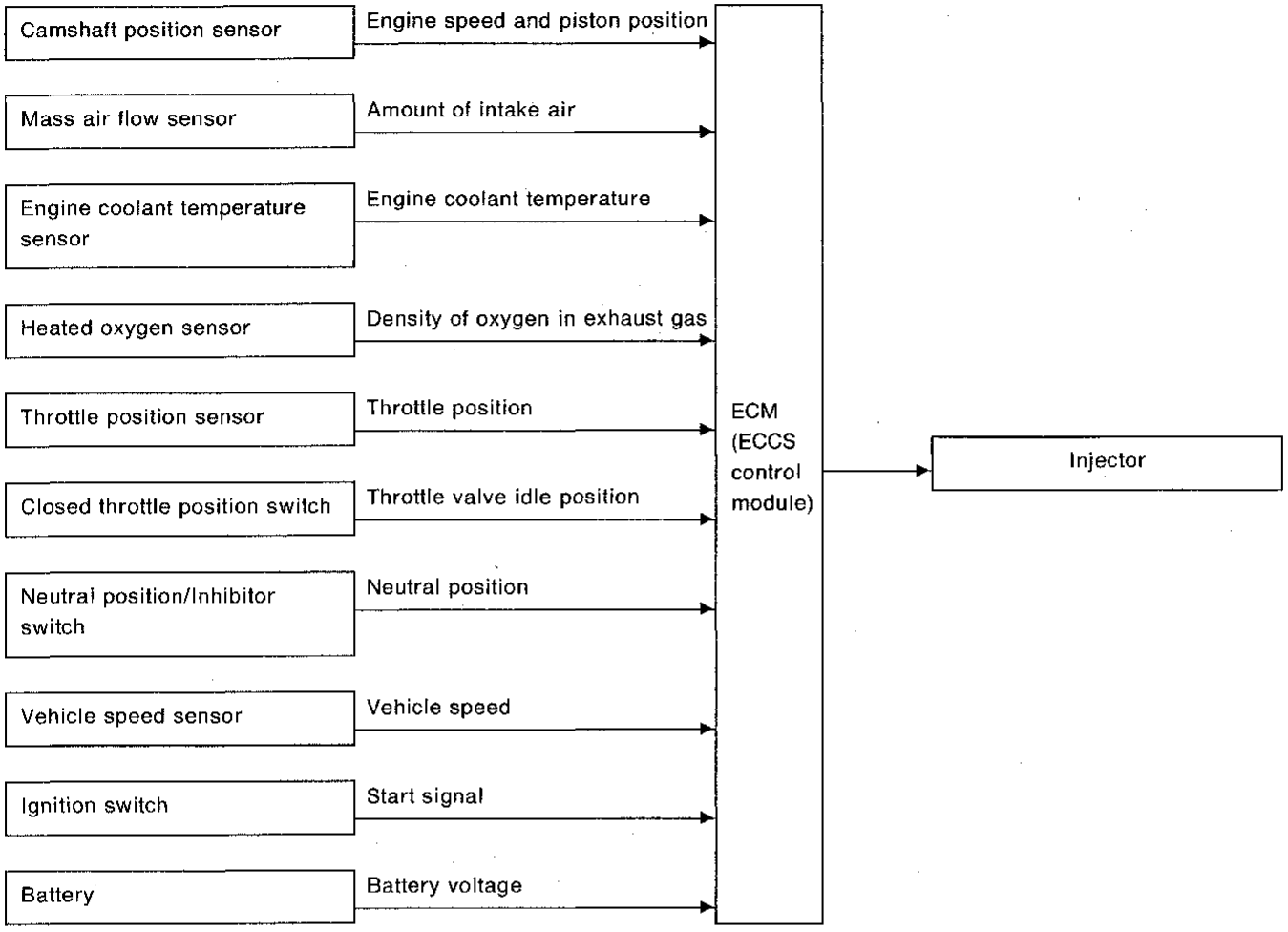

SEF072G

EGR Temperature Sensor

The EGR temperature sensor monitors in exhaust gas temperature and transmits a signal to the ECM. The temperature sensing unit employs a thermistor which is sensitive to the change in temperature. Electric resistance of the thermistor decreases in response to the temperature rise.

Multiport Fuel Injection (MFI) System

INPUT/OUTPUT SIGNAL LINE



BASIC MULTIPORT FUEL INJECTION SYSTEM

The amount of fuel injected from the fuel injector, or the length of time the valve remains open, is determined by the ECM. The basic amount of fuel injected is a program value mapped in the ECM memory. In other words, the program value is preset by engine operating conditions determined by input signals (for engine speed and air intake) from both the camshaft position sensor and the mass air flow sensor.

VARIOUS FUEL INJECTION INCREASE/DECREASE COMPENSATION

In addition, the amount of fuel injection is compensated for to improve engine performance under various operating conditions as listed below.

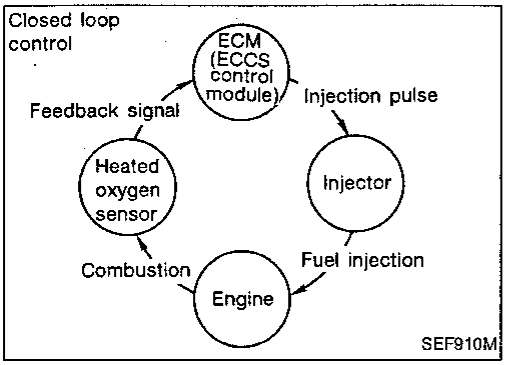
<Fuel increase>

1) During warm-up
2) When starting the engine
3) During acceleration
4) Hot-engine operation

<Fuel decrease>

1) During deceleration

Multiport Fuel Injection (MFI) System (Cont'd)



MIXTURE RATIO FEEDBACK CONTROL

Mixture ratio feedback system is designed to precisely control the mixture ratio to the stoichiometric point so that the three-way three way catalyst can reduce CO, HC and NOx emissions. This system uses an heated oxygen sensor in the exhaust manifold to check the air-fuel ratio. The ECM adjusts the injection pulse width according to the sensor voltage so the mixture ratio will be within the range of the stoichiometric air-fuel ratio.

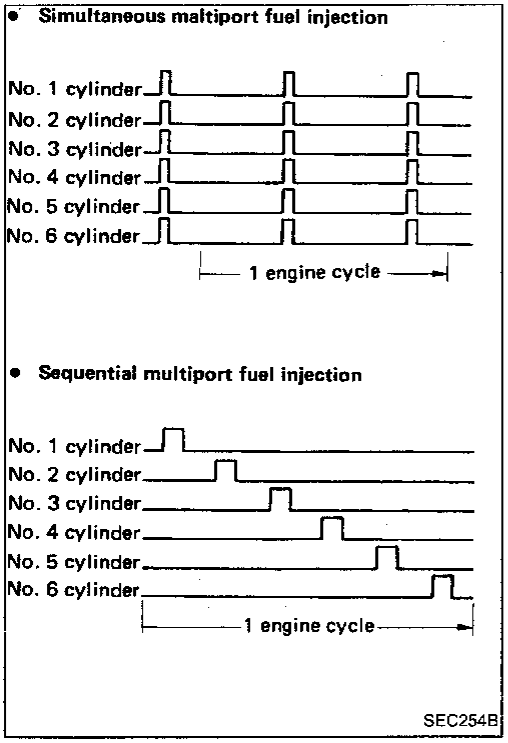
This stage refers to the closed loop control condition. The open-loop control condition refers to that under which the ECM detects any of the following conditions and feedback control stops in order to maintain stabilized fuel combustion.

1) Deceleration
2) High-load, high-speed operation
3) Engine idling
4) Malfunction of heated oxygen sensor or its circuit
5) Insufficient activation of heated oxygen sensor at low engine coolant temperature
6) Engine starting

MIXTURE RATIO SELF-LEARNING CONTROL

The mixture ratio feedback control system monitors the mixture ratio signal transmitted from the heated oxygen sensor. This feedback signal is then sent to the ECM to control the amount of fuel injection to provide a basic mixture ratio as close to the theoretical mixture ratio as possible. However, the basic mixture ratio is not necessarily controlled as originally designed. This is due to manufacturing errors (e.g., mass air flow sensor hot wire) and changes during operation (injector clogging, etc.) of ECCS parts which directly affect the mixture ratio.

Accordingly, a difference between the basic and theoretical mixture ratios is quantitatively monitored in this system. It is then computed in terms of "fuel injection duration" to automatically compensate for the difference between the two ratios.



FUEL INJECTION TIMING

Two types of fuel injection systems are used — simultaneous multiport fuel injection system and sequential multiport fuel injection system. In the former, fuel is injected into all six cylinders simultaneously twice each engine cycle.

In other words, pulse signals of the same width are simultaneously transmitted from the ECM to the six injectors two times for each engine cycle.

In the sequential multiport fuel injection system system, fuel is injected into each cylinder during each engine cycle according to the firing order.

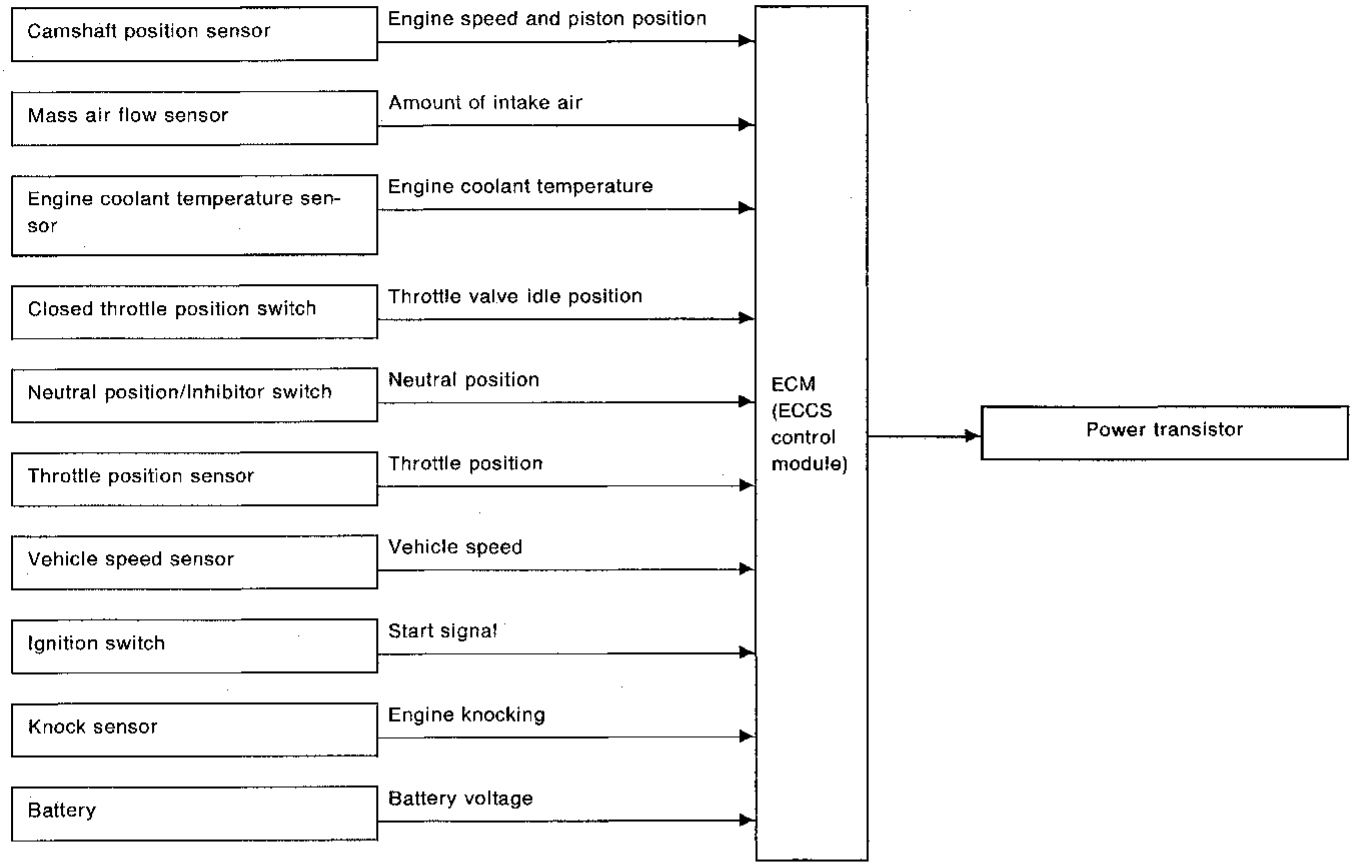
When engine is starting, fuel is injected into all six cylinders simultaneously twice a cycle.

FUEL SHUT-OFF

Fuel to each cylinder is cut off during deceleration or high-speed operation.

Distributor Ignition (DI) System

INPUT/OUTPUT SIGNAL LINE



SYSTEM DESCRIPTION

The ignition timing is controlled by the ECM in order to maintain the best air-fuel ratio in response to every running condition of the engine.

The ignition timing data is stored in the ECM located in the ECM, in the form of the map shown below.

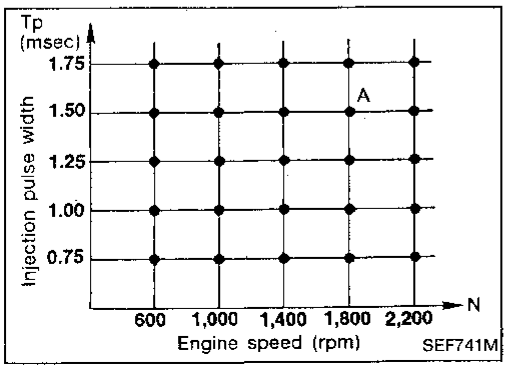
The ECM detects information such as the injection pulse width and camshaft position sensor signal which varies every moment. Then responding to this information, ignition signals are transmitted to the power transistor.

e.g. N: 1,800 rpm, Tp: 1.50 msec
A °BTDC

In addition to this,

1) At starting
2) During warm-up
3) At idle
4) At low battery voltage

the ignition timing is revised by the ECM according to the other data stored in the ECM.

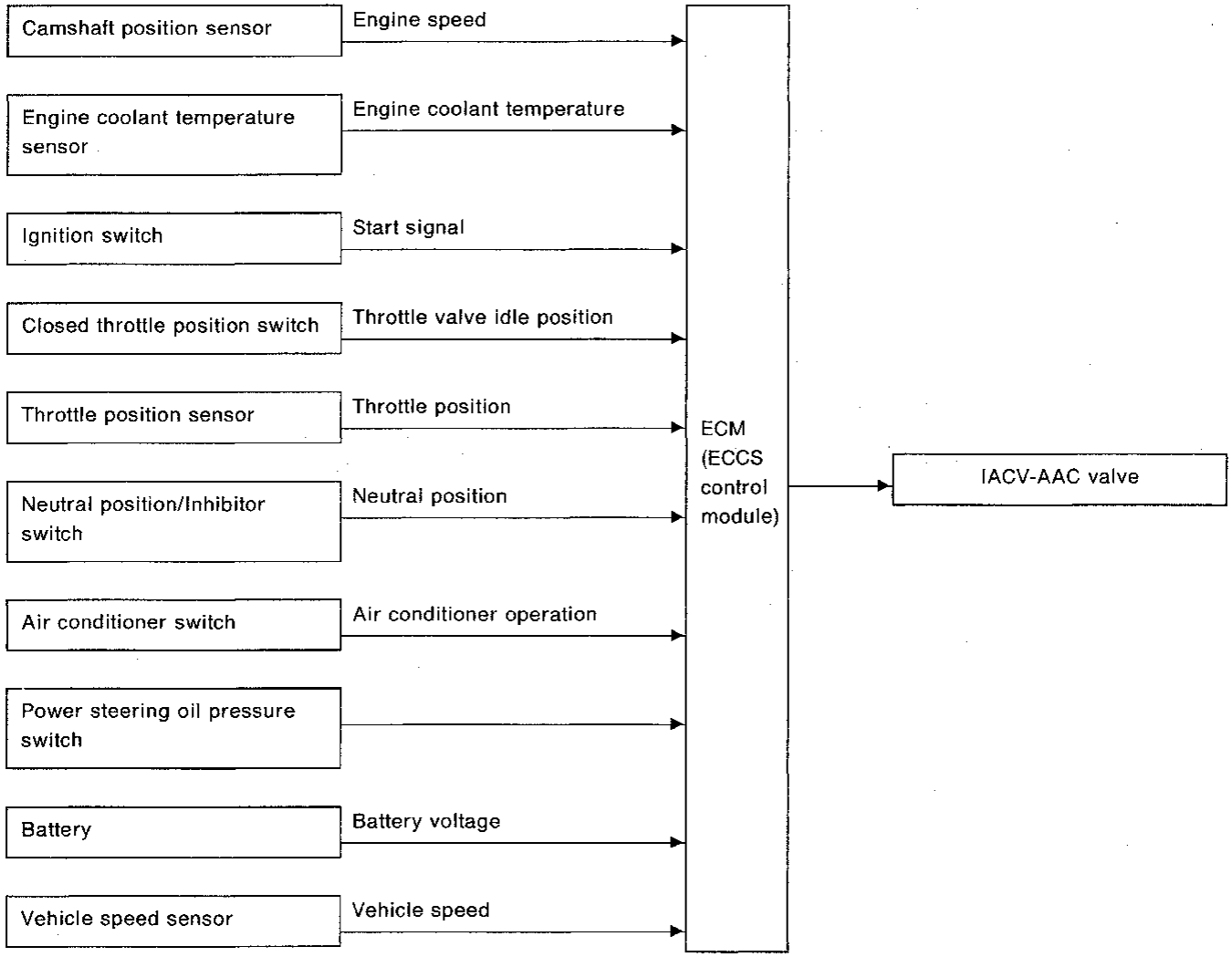


The retard system by knock sensor is designed only for emergencies. The basic ignition timing is pre-programmed within the anti-knocking zone, even if recommended fuel is used under dry conditions. Consequently, the retard system does not operate under normal driving conditions.

However, if engine knocking occurs, the knock sensor monitors the condition and the signal is transmitted to the ECM (ECCS control module). After receiving it, the ECM retards the ignition timing to avoid the knocking condition.

Idle Air Control (IAC) System

INPUT/OUTPUT SIGNAL LINE

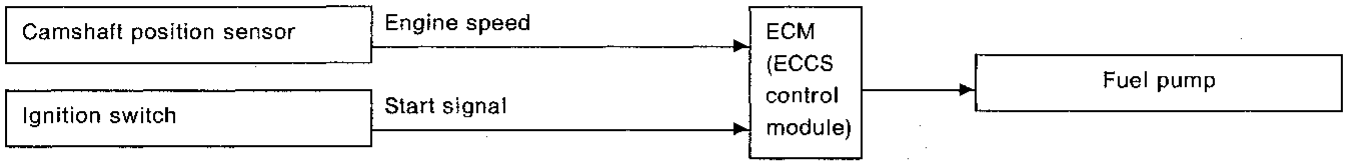


SYSTEM DESCRIPTION

This system automatically controls engine idle speed to a specified level. Idle speed is controlled through fine adjustment of the amount of air which by-passes the throttle valve via IACV-AAC valve. The IACV-AAC valve changes the opening of the air by-pass passage to control the amount of auxiliary air. The opening of the valve is varied to allow for optimum control of the engine idling speed. The camshaft position sensor detects the actual engine speed and sends a signal to the ECM. The ECM then controls the ON/OFF time of the IACV-AAC valve so that engine speed coincides with the target value memorized in ECM. The target engine speed is the lowest speed at which the engine can operate steadily. The optimum value stored in the ECM is determined by taking into consideration various engine conditions, such as warming up and during deceleration, fuel consumption, and engine load (air conditioner, electrical load).

Fuel Pump Control

INPUT/OUTPUT SIGNAL LINE



SYSTEM DESCRIPTION

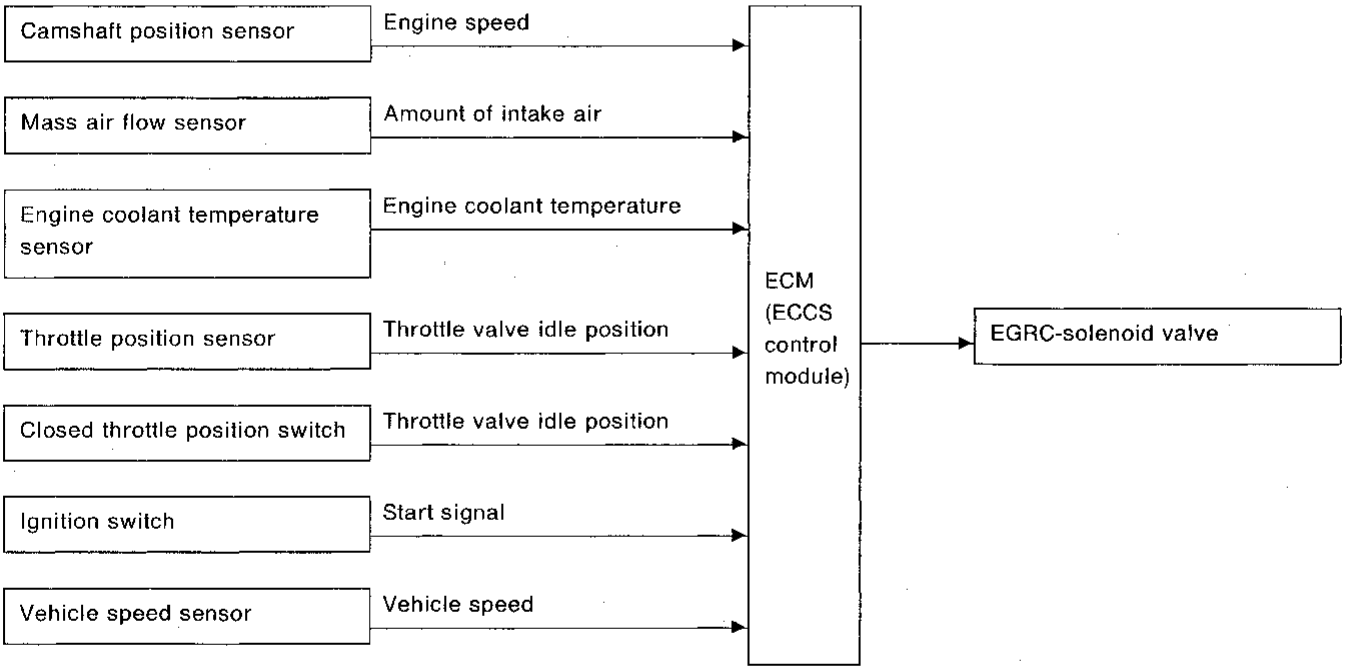
To reduce power consumption, fuel pump relay ON-OFF operation controls the fuel pump as follows:

Fuel pump ON-OFF control

Ignition switch position	Engine condition	Fuel pump relay	Fuel pump operation
ON	Stopped	ON → OFF	Operates for a few seconds after ignition switch turns to "ON"
	Starting	ON	Operates
	Running	ON	Operates

Exhaust Gas Recirculation (EGR) System

INPUT/OUTPUT SIGNAL LINE



SYSTEM DESCRIPTION

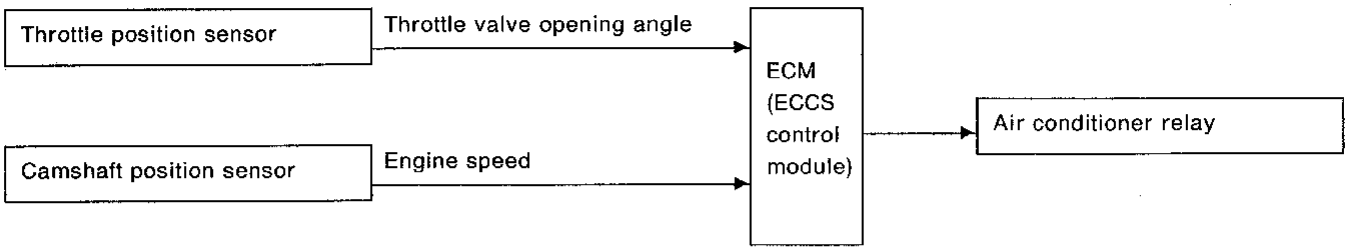
In addition, a system is provided which precisely cuts and controls port vacuum applied to the EGR valve to suit engine operating conditions. This cut-and-control operation is accomplished through the ECM. When the ECM detects any of the following conditions, current flows through the solenoid valve in the EGR control vacuum line.

This causes the port vacuum to be discharged into the atmosphere so that the EGR valve remains closed.

1) Low engine coolant temperature
2) Engine starting
3) High-speed engine operation
4) Engine idling
5) Excessively high engine coolant temperature
6) CPU malfunction of ECM and camshaft position sensor malfunction

Acceleration Cut Control

INPUT/OUTPUT SIGNAL LINE



SYSTEM DESCRIPTION

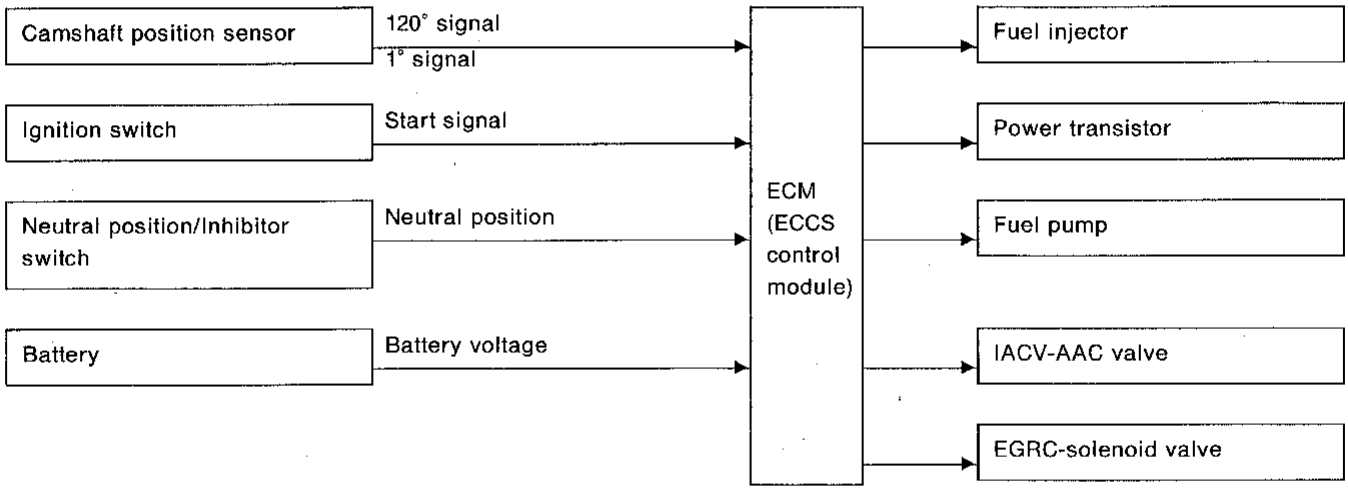
Air conditioner is turned off for a few seconds during accelerating condition.

This system improves acceleration when air conditioner is used.

Fail-safe System

CPU MALFUNCTION OF ECM AND CAMSHAFT POSITION SENSOR MALFUNCTION

Input/output signal line



Outline

The fail-safe system makes engine starting possible if there is something malfunctioning in the ECM's CPU circuit, or if there is a disconnection or short/open circuit in the camshaft position sensor circuit.
In former models, engine starting was difficult under the conditions mentioned above. But with the provisions provided in this fail-safe system, it is possible to start the engine.

Fail-safe system activating condition when camshaft position sensor is malfunctioning

The fail-safe mode operation starts immediately after all of the following conditions have been satisfied for several seconds.

(1) No pulse of 120° signal (reference signal) detected for several seconds, or 1° signal (position signal) is equivalent to 0 rpm.
(2) Ignition switch in START
(3) Battery voltage is greater than 10 volts with ignition switch ON.
(4) The neutral position switch is ON, or the inhibitor switch is in the "P" or "N" position.
(5) When ignition switch is in START, battery voltage is at least 1 volt lower than when ignition switch is ON.

Fail-safe system activating condition when ECM is malfunctioning

The computing function of the ECM was judged to be malfunctioning.
When the fail-safe system activates, i.e. if the ECM detects a malfunction condition in the CPU of ECM or camshaft position sensor circuit, the MALFUNCTION INDICATOR LAMP on the instrument panel lights to warn the driver.

Fail-safe System (Cont'd)

Engine control, with fail-safe system, operates when ECM or camshaft position sensor is malfunctioning

When the fail-safe system is operating, fuel injection, ignition timing, fuel pump operation, engine idle speed, and EGR operation, are controlled under certain limitations.

Cancellation of fail-safe system when ECM or camshaft position sensor is malfunctioning

Activation of the fail-safe system is canceled each time the ignition switch is turned OFF. The system is reactivated if all of the above-mentioned activating conditions are satisfied after turning the ignition switch from OFF to ON.

MASS AIR FLOW SENSOR MALFUNCTION

If the mass air flow sensor output voltage is above or below the specified value, the ECM senses an mass air flow sensor malfunction. In case of a malfunction, the throttle position sensor substitutes for the mass air flow sensor.
Though mass air flow sensor is malfunctioning, it is possible to drive the vehicle and start the engine. But engine speed will not rise more than 3,000 rpm in order to inform the driver of fail-safe system operation while driving.

Operation

Engine condition	Starter switch	Fail-safe system	Fail-safe functioning
Stopped	ANY	Does not operate	—
Cranking	ON	Operates	Engine will be started by a predetermined injection pulse on ECM
Running	OFF		Engine speed will not rise above 3,000 rpm

ENGINE COOLANT TEMPERATURE SENSOR MALFUNCTION

When engine coolant temperature sensor output voltage is below or above the specified value, water temperature is fixed at the preset value as follows:

Operation

Condition	Engine coolant temperature decided
Just as ignition switch is turned ON or Start	20°C (68°F)
More than 6 minutes after ignition ON or Start	80°C (176°F)
Except as shown above	20 - 80°C (68 - 176°F) (Depends on the time)

KNOCK SENSOR MALFUNCTION

When the output signal of the knock sensor is abnormal, the ECM judges it to be malfunctioning. When knock sensor is malfunctioning, ignition timing will retard according to operating conditions.

THROTTLE POSITION SENSOR MALFUNCTION

When throttle position sensor output voltage is below or above the specified value, throttle position sensor output is fixed at the preset value.

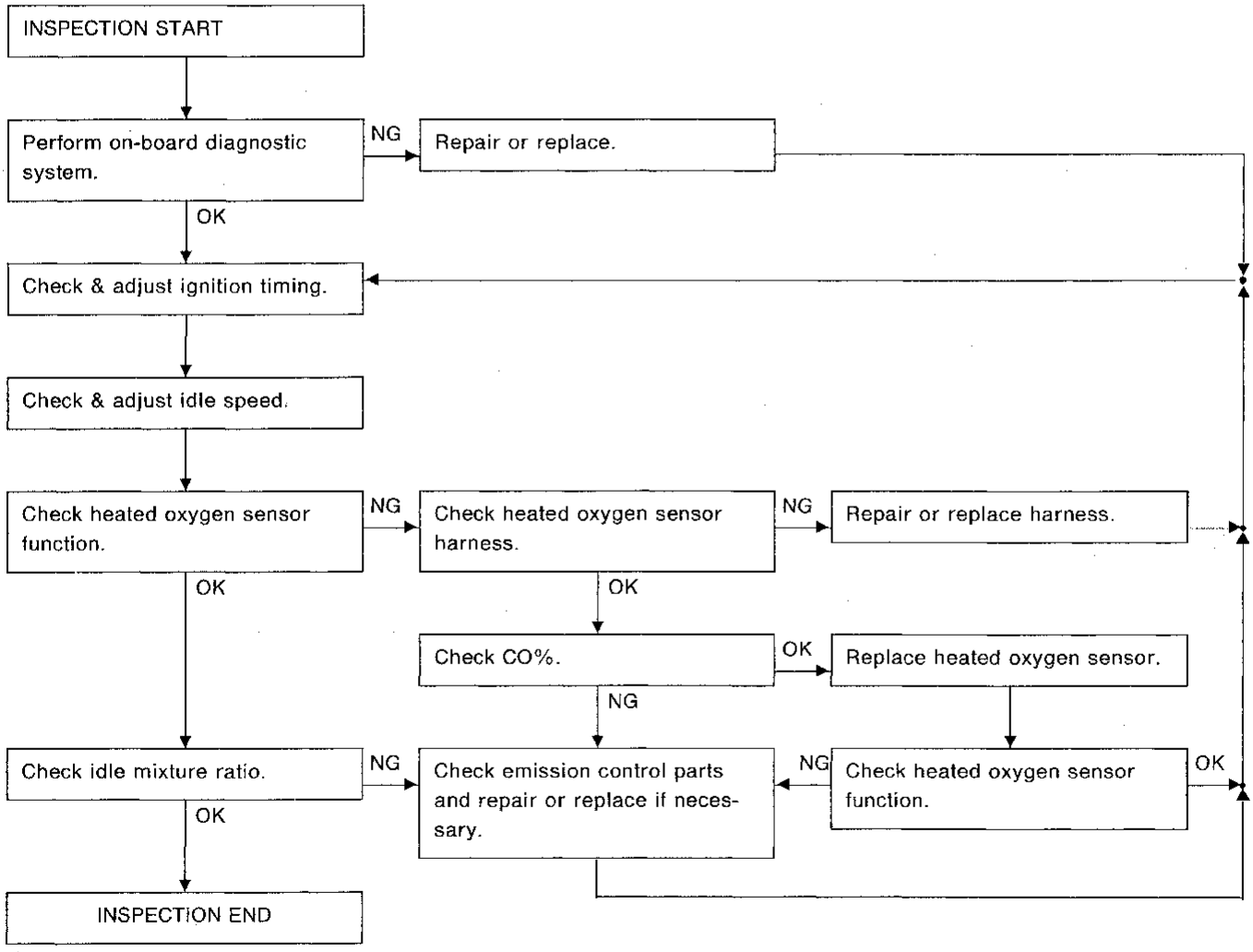
PREPARATION

1. Make sure that the following parts are in good order.
- Battery
- Ignition system
- Engine oil and coolant levels
- Fuses
- ECM SMJ harness connector
- Vacuum hoses
- Air intake system
  (Oil filler cap, oil level gauge, etc.)
- Fuel pressure
- Engine compression
- EGR valve operation
- Throttle valve

2. On air conditioner equipped models, checks should be carried out while the air conditioner is "OFF".
3. On automatic transmission equipped models, when checking idle rpm, ignition timing and mixture ratio, checks should be carried out while shift lever is in "N" position.
4. When measuring "CO" percentage, insert probe more than 40 cm (15.7 in) into tail pipe.
5. Turn off headlamps, heater blower, rear defogger.
6. Keep front wheels pointed straight ahead.
7. Make the check after the cooling fan has stopped.

WARNING:
Apply parking brake and block both front and rear wheels with chocks.

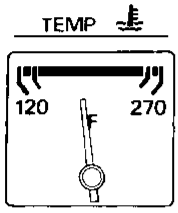
Overall inspection sequence



Idle check and set procedure

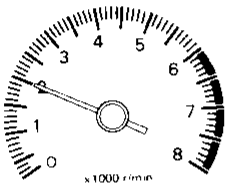
INSPECTION START

Visually check the following:
- Air cleaner clogging
- Hoses and ducts for leaks
- EGR valve operation
- Electrical connectors
- Gaskets
- Closed throttle position switch operation

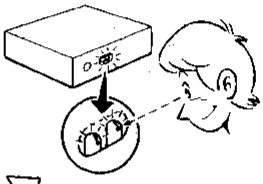


SEF246F

Start engine and warm it up until water temperature indicator points to the middle of gauge.


SEF247F

Open engine hood and run engine at about 2,000 rpm for about 2 minutes under no-load.


SEF292H

Perform ECCS on-board diagnostic system (Diagnostic Test Mode III, IV, V).

OK

NG

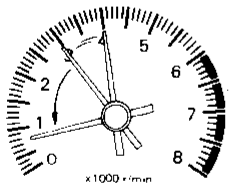
Repair or replace components as necessary.

Does engine run smoothly?

Yes

No

Clean injectors.


SEF248F

Race engine two or three times under no-load and run engine for about one minute at idle speed.

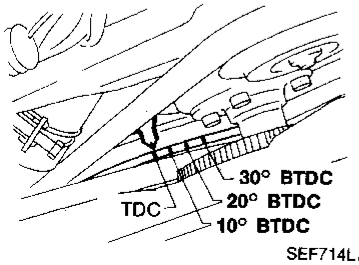
Check ignition timing.

A/T: **15° ± 2° BTDC (A/T: in "N" position)**
M/T:

OK

NG

Adjust ignition timing by turning distributor after loosening bolt which secures distributor.



SEF714LA

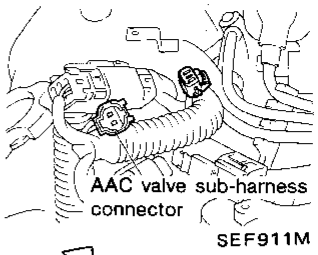
Ⓐ

Check idle speed (A/T: in "N" position).

A/T: **750±50 rpm**
M/T:

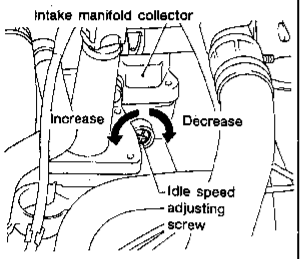
OK

NG



SEF911M

Disconnect IACV-AAC valve sub-harness connector.



SEF508N

Adjust engine speed by turning idle speed adjusting screw (A/T: in "N" position).

A/T: **700 rpm**
M/T:

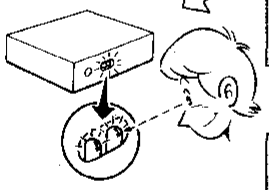
Reconnect IACV-AAC valve sub-harness connector.

Run engine at about 2,000 rpm for about 2 minutes under no-load.

SEF247F

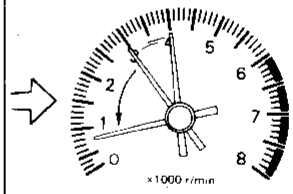
Keep engine speed at 2,000 rpm and make sure that green inspection lamp on ECM goes ON and OFF more than 5 times during 10 seconds.

NG


SEF292H

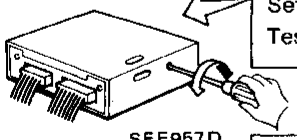
OK

Race engine two or three times under no-load, then run engine at idle speed.



SEF248F

Set the diagnosis mode selector on ECM to Diagnostic Test Mode II.

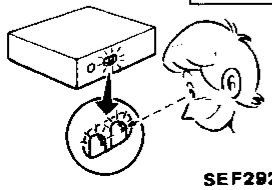

SEF957D

Make sure that inspection lamps (red and green) go on and off more than 5 times simultaneously during 10 seconds at 2,000 rpm under no-load.

OK

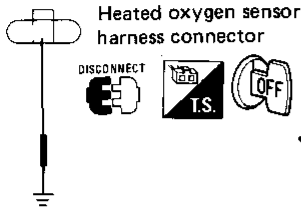
INSPECTION END

Ⓒ


SEF292H

Ⓓ

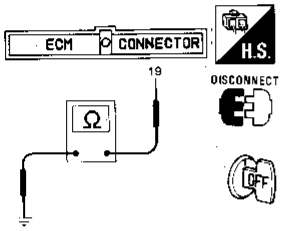
Ⓑ



SEF142M

Check heated oxygen sensor harness:
1) Turn off engine and disconnect battery ground cable.
2) Disconnect ECM SMJ harness connector from ECM.
3) Disconnect heated oxygen sensor harness connector and connect main harness side terminal for heated oxygen sensor to ground with a jumper wire. As for the location of heated oxygen sensor harness connector, refer to page EF & EC-96.
4) Check for continuity between terminal No. 19 of ECM SMJ harness connector and body ground.

Continuity exists ..... **OK**
Continuity does not exist ..... **NG**



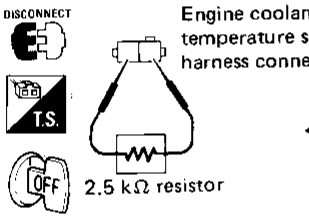
SEC241B

OK

NG

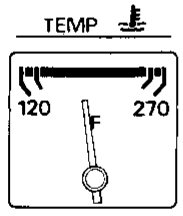
Repair or replace harness.

Connect SMJ harness connector to ECM.



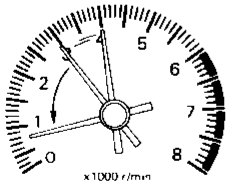
SEF143M

1) Disconnect engine coolant temperature sensor harness connector.
2) Connect a resistor (2.5 kΩ) between terminals of engine coolant temperature sensor harness connector.
3) Disconnect a jumper wire connected to heated oxygen sensor harness connector (main harness side).



SEF246F

Connect battery ground cable, start engine and warm it up until water temperature indicator points to middle of gauge.



SEF248F

Race engine two or three times under no-load, then run engine at idle.

Ⓒ

Ⓔ

Check CO%.

Idle CO: 0.2 - 8.0%

After checking CO%,
1) Disconnect the resistor from terminals of engine coolant temperature sensor harness connector.
2) Connect engine coolant temperature sensor harness connector to engine coolant temperature sensor.

NG

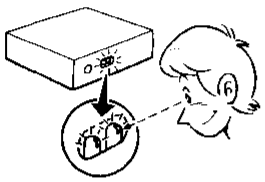
OK

Replace heated oxygen sensor.

Run engine at 2,000 rpm and make sure that green inspection lamp on ECM goes ON and OFF more than 5 times during 10 seconds.

OK

NG



SEF292H

Connect heated oxygen sensor harness connector to heated oxygen sensor.

Check fuel pressure regulator.
(See page EF & EC-139.)

Check mass air flow sensor and its circuit.
(See page EF & EC-83.)

Check injector and its circuit.
(See page EF & EC-108.)
Clean or replace if necessary.

Check engine coolant temperature sensor and its circuit.
(See page EF & EC-86.)

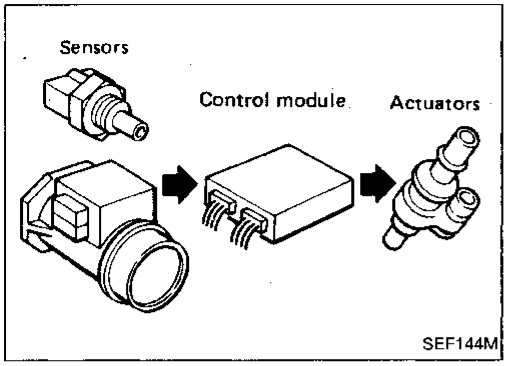
Check ECM function* by substituting another known good ECM.

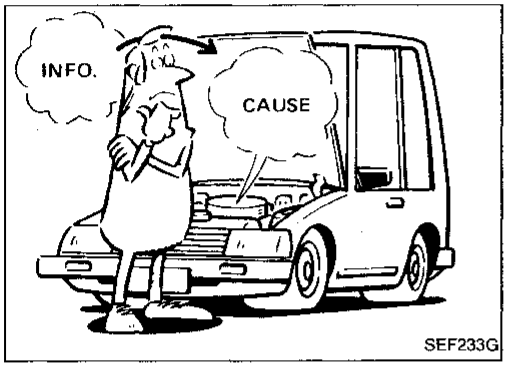
Ⓑ

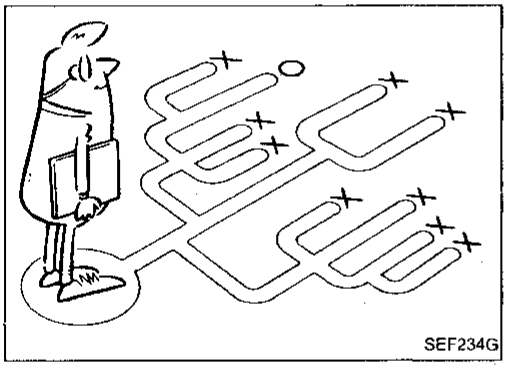
*: ECM may be the cause of a problem, but this is rarely the case.

Contents

Contents (Cont'd)







How to Perform Trouble Diagnoses for Quick and Accurate Repair

INTRODUCTION

The engine has an ECM to control major systems such as fuel control, ignition control, idle air control system, etc. The ECM accepts input signals from sensors and instantly drives actuators. It is essential that both kinds of signals are proper and stable. At the same time, it is important that there are no conventional problems such as vacuum leaks, fouled spark plugs, or other problems with the engine.

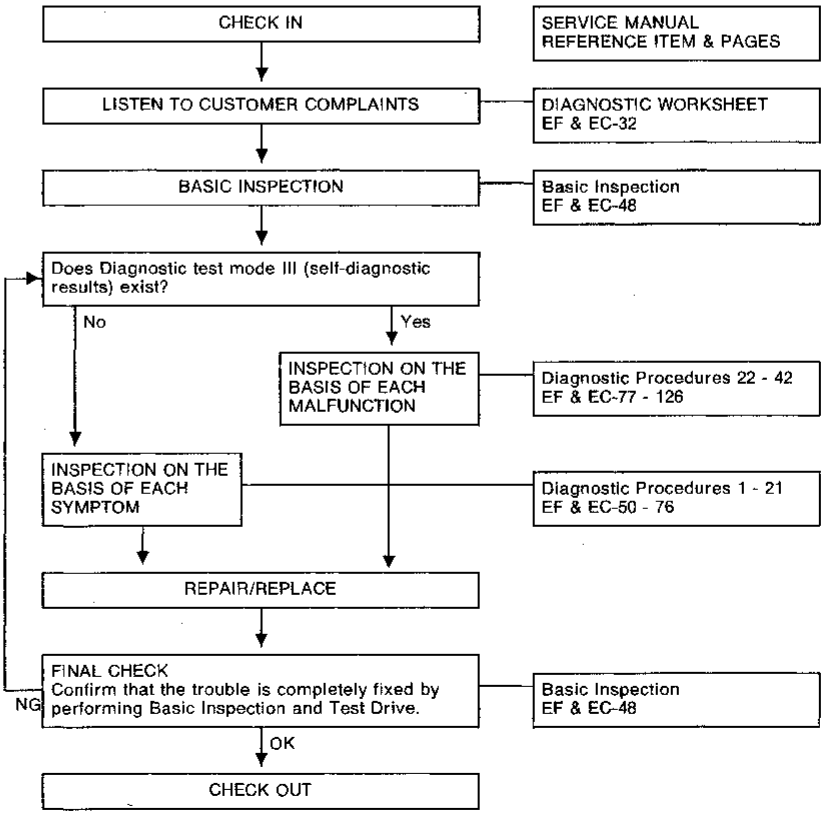
It is much more difficult to diagnose a problem that occurs intermittently rather than continuously. Most intermittent problems are caused by poor electric connections or improper wiring. In this case, careful checking of suspected circuits may help prevent the replacement of good parts.

A visual check only may not find the cause of the problems, so a road test with a circuit tester connected to a suspected circuit should be performed.

Before undertaking actual checks, take just a few minutes to talk with a customer who approaches with a driveability complaint. The customer is a very good supplier of information on such problems, especially intermittent ones. Through interaction with the customer, find out what symptoms are present and under what conditions they occur.

Start your diagnosis by looking for "conventional" problems first. This is one of the best ways to troubleshoot driveability problems on an electronically controlled engine vehicle.

WORK FLOW



How to Perform Trouble Diagnoses for Quick and Accurate Repair (Cont'd)

KEY POINTS

WHAT ..... Vehicle & engine model
WHEN ..... Date, Frequencies
WHERE..... Road conditions
HOW ..... Operating conditions, Weather conditions, Symptoms

SEF907L

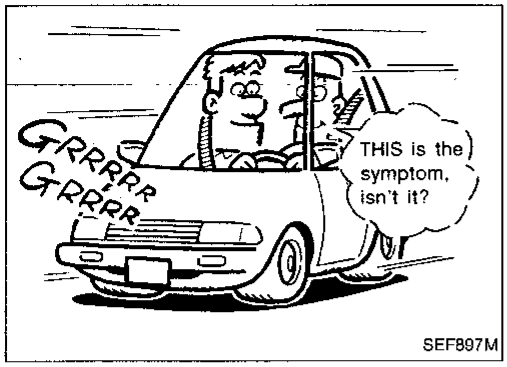
DIAGNOSTIC WORKSHEET

There are many kinds of operating conditions that lead to malfunctions on engine components.
A good grasp of such conditions can make trouble-shooting faster and more accurate.
In general, feelings for a problem depend on each customer. It is important to fully understand the symptoms or under what conditions a customer complains.
Make good use of a diagnostic worksheet such as the one shown below in order to utilize all the complaints for trouble-shooting.

Worksheet sample

Customer name MR/MS	Model & Year	VIN
Engine #	Trans.	Mileage
Incident Date	Manuf. Date	In Service Date

Symptoms	☐ Startability	☐ Impossible to start ☐ No combustion ☐ Partial combustion ☐ Partial combustion affected by throttle position ☐ Partial combustion NOT affected by throttle position ☐ Possible but hard to start ☐ Others [ ]
	☐ Idling	☐ No fast idle ☐ Unstable ☐ High idle ☐ Low idle ☐ Others [ ]
	☐ Driveability	☐ Stumble ☐ Surge ☐ Knock ☐ Lack of power ☐ Intake backfire ☐ Exhaust backfire ☐ Others [ ]
	☐ Engine stall	☐ At the time of start ☐ While idling ☐ While accelerating ☐ While decelerating ☐ Just after stopping ☐ While loading
Incident occurrence		☐ Just after delivery ☐ Recently ☐ In the morning ☐ At night ☐ In the daytime
Frequency		☐ All the time ☐ Under certain conditions ☐ Sometimes
Weather conditions		☐ Not affected
	Weather	☐ Fine ☐ Raining ☐ Snowing ☐ Others [ ]
	Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold ☐ Humid °F
Engine conditions		☐ Cold ☐ During warm-up ☐ After warm-up Engine speed 0 2,000 4,000 6,000 8,000 rpm
Road conditions		☐ In town ☐ In suburbs ☐ Highway ☐ Off road (up/down)
Driving conditions		☐ Not affected ☐ At starting ☐ While idling ☐ At racing ☐ While accelerating ☐ While cruising ☐ While decelerating ☐ While turning (RH/LH) Vehicle speed 0 10 20 30 40 50 60 MPH
Malfunction indicator lamp		☐ Turned on ☐ Not turned on

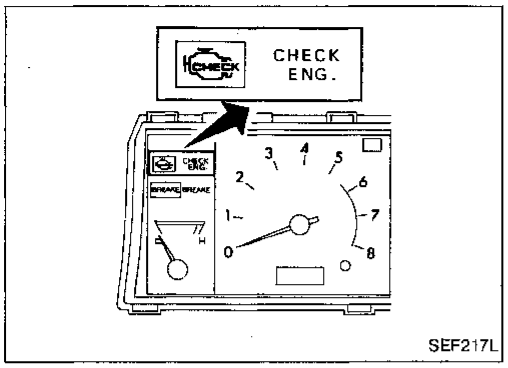


How to Perform Trouble Diagnoses for Quick and Accurate Repair (Cont'd)

INTERMITTENT PROBLEM SIMULATION

In order to duplicate an intermittent problem, it is effective to create similar conditions for component parts, under which the problem might occur.
Perform the activity listed under Service procedure and note the result.

	Variable factor	Influential part	Target condition	Service procedure
1	Mixture ratio	Pressure regulator	Made lean	Remove vacuum hose and apply vacuum.
			Made rich	Remove vacuum hose and apply pressure.
2	Ignition timing	Camshaft position sensor	Advanced	Rotate distributor counterclockwise.
			Retarded	Rotate distributor clockwise.
3	Mixture ratio feedback control	Heated oxygen sensor	Suspended	Disconnect heated oxygen sensor harness connector.
		ECM	Operation check	Perform on-board diagnostic system (Diagnostic Test Mode I/II) at 2,000 rpm.
4	Idle speed	IACV-AAC valve	Raised	Turn idle adjusting screw counterclockwise.
			Lowered	Turn idle adjusting screw clockwise.
5	Electrical connection (Electric continuity)	Harness connectors and wires	Poor electrical connection or improper wiring	Tap or wiggle.
				Race engine rapidly. See if the torque reaction of the engine unit causes electric breaks.
6	Temperature	ECM	Cooled	Cool with an icing spray or similar device.
			Warmed	Heat with a hair drier. **[WARNING: Do not overheat the unit.]**
7	Moisture	Electric parts	Damp	Wet. **[WARNING: Do not directly pour water on components. Use a mist sprayer.]**
8	Electric loads	Load switches	Loaded	Turn on head lights, air conditioner, rear defogger, etc.
9	Closed throttle position switch condition	ECM	ON-OFF switching	Rotate throttle position sensor body.
10	Ignition spark position	Timing light	Spark power check	Try to flash timing light for each cylinder using ignition coil adapter (SST).



SEF217L

On-board Diagnostic System

MALFUNCTION INDICATOR LAMP

A malfunction indicator lamp has been adopted. This light blinks under the following conditions:

	California model	Non-California model
Condition	Light illuminates when any one of conditions 1), 2), 3) and 4) is satisfied.	Light illuminates when any one of conditions 1), 2) and 4) is satisfied.

1) When ignition switch is turned "ON" (for bulb check).
2) When systems related to emission performance malfunction in Diagnostic Test Mode I (with engine running).
- **This malfunction indicator lamp always illuminates and is synchronous with red LED.**

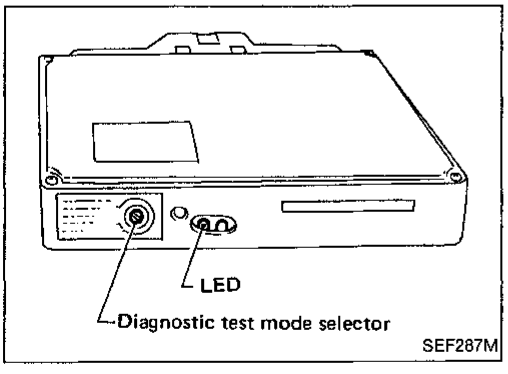
3) When a malfunction is detected regarding the following self-diagnostic items.

Malfunction	On-board diagnostic system diagnostic trouble code No.
Mass air flow sensor circuit	12
Engine coolant temperature sensor circuit	13
Vehicle speed sensor circuit	14
ECM (ECCS control module)	31
EGR function	32

Malfunction	On-board diagnostic system diagnostic trouble code No.
Heated oxygen sensor circuit	33
EGR temperature sensor circuit	35
Throttle position sensor circuit	43
Injector leak	45
Injector circuit	51

- The malfunction indicator lamp will turn off when normal operation is resumed. Diagnostic Test Mode III memory must be cleared as the contents remain stored.

4) When camshaft position sensor or CPU of ECM malfunctions and fail-safe system operates during engine rotation.



SEF287M

ECM LED

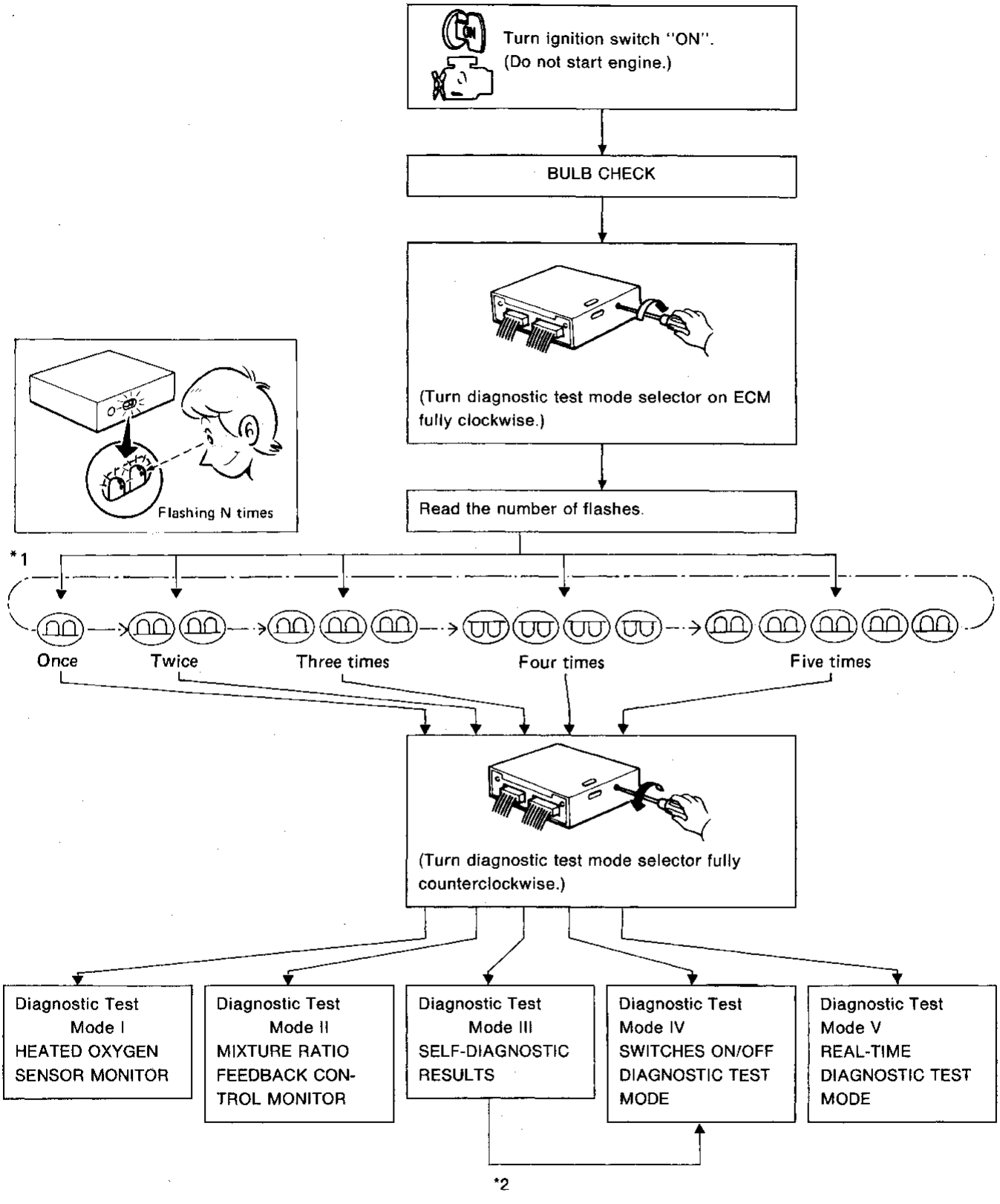
In the ECM, the Green and Red LED's have been adopted to monitor the self-diagnostic functions.

SELF-DIAGNOSTIC FUNCTION

Diagnostic Test Mode	Function
Diagnostic Test Mode I	HEATED OXYGEN SENSOR MONITOR
Diagnostic Test Mode II	MIXTURE RATIO FEEDBACK CONTROL MONITOR
Diagnostic Test Mode III	SELF-DIAGNOSTIC RESULTS
Diagnostic Test Mode IV	SWITCHES ON/OFF DIAGNOSTIC TEST MODE
Diagnostic Test Mode V	REAL-TIME DIAGNOSTIC TEST MODE

On-board Diagnostic System (Cont'd)

HOW TO SWITCH DIAGNOSTIC TEST MODES



***1 While the diagnostic test mode selector is kept turned fully clockwise, it will continue to change in the order of Diagnostic Test Mode I → II → III → IV → V → I ...**

***2 The diagnostic trouble code is erased from the backup memory of the ECM.**

- **Return the diagnostic test mode selector to the original position so as not to disturb the idle speed.**

On-board Diagnostic System — Diagnostic Test Mode I
Heated oxygen sensor monitor

This mode checks the heated oxygen sensor for proper functioning. The operation of the ECM LED in this mode differs with mixture ratio control conditions as follows:

Diagnostic Test Mode	LED	Engine stopped (Ignition switch "ON")	Engine running	
			Open loop condition	Closed loop condition
Diagnostic Test Mode I	Green	ON	*Remains ON or OFF	Blinks
	Red	ON	• ON: a. when the MALFUNCTION INDICATOR LAMP ITEMS are stored in the ECM (California model only) b. when fail-safe system is operating • OFF: except for the above conditions	

*: Maintains conditions just before switching to open loop

HEATED OXYGEN SENSOR FUNCTION CHECK

If the number of LED blinks is less than that specified, replace the heated oxygen sensor.
If the LED does not blink, check heated oxygen sensor circuit.

HEATED OXYGEN SENSOR CIRCUIT CHECK

See page EF & EC-96.

On-board Diagnostic System — Diagnostic Test Mode II
Mixture ratio feedback control monitor

This mode checks, through the ECM LED, optimum control of the mixture ratio. The operation of the LED, as shown below, differs with the control conditions of the mixture ratio (for example, richer or leaner mixture ratios, etc., which are controlled by the ECM).

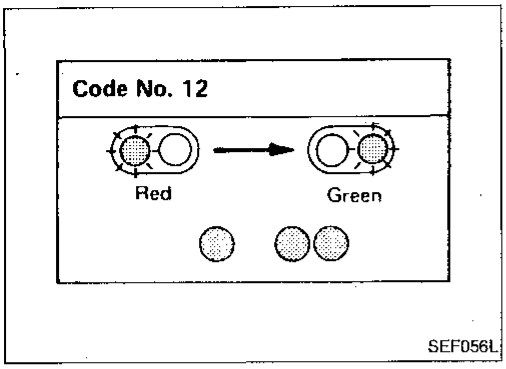
Diagnostic Test Mode	LED	Engine stopped (Ignition switch "ON")	Engine running			
			Open loop condition	Closed loop condition		
Diagnostic Test Mode II	Green	ON	*Remains ON or OFF	Blinks		
	Red	OFF	*Remains ON or OFF	Compensating mixture ratio		
				More than 5% rich	Between 5% lean and 5% rich	More
				OFF	Synchronized with green LED	Remains ON

*: Maintains conditions just before switching to open loop

If the red LED remains ON or OFF during the closed loop operation, the mixture ratio may not be controlled properly. Using the following procedures, check the related components or adjust the mixture ratio.

COMPONENT CHECK OR MIXTURE RATIO ADJUSTMENT

See page EF & EC-24.



On-board Diagnostic System — Diagnostic Test Mode III

Self-diagnostic Results

The ECM constantly monitors the function of these sensors and actuators, regardless of ignition key position. If a malfunction occurs, the information is stored in the ECM and can be retrieved from the memory by turning on the diagnostic test mode selector, located on the side of the ECM. When activated, the malfunction is indicated by flashing a red and a green LED (Light Emitting Diode), also located on the ECM. Since all the self-diagnostic results are stored in the ECM's memory even intermittent malfunctions can be diagnosed.

A malfunction is indicated by the number of both red and green flashing LEDs. First, the red LED flashes and the green flashes follow. The red LED corresponds to units of ten and the green LED corresponds to units of one. For example, when the red LED flashes once and the green LED flashes twice, this signifies the number "12", showing that the mass air flow sensor signal is malfunctioning. All problems are classified by diagnostic trouble code numbers in this way.

- **When the engine fails to start, crank it two or more seconds before beginning on-board diagnostic system.**
- **Read out self-diagnostic results first and then erase the malfunction records which are stored in ECM memory. If it is erased, the on-board diagnostic system function for intermittent malfunctions will be lost.**

DISPLAY DIAGNOSTIC TROUBLE CODE TABLE

Diagnostic trouble code No.	Detected items	
11	Camshaft position sensor circuit	X
12	Mass air flow sensor circuit	X
13	Engine coolant temperature sensor circuit	X
14	Vehicle speed sensor circuit	X
21	Ignition signal missing in primary coil	X
31	Engine control module (ECM)	X
32	EGR function	X
33	Heated oxygen sensor circuit	X
34	Knock sensor circuit	X
35	EGR temperature sensor circuit	X
43	Throttle position sensor circuit	X
45	Injector leak	X
51	Injector circuit	X
55	No malfunction in the above circuit	X

X: Available

HOW TO ERASE SELF-DIAGNOSTIC RESULTS

The diagnostic trouble code is erased from the backup memory of the ECM by the following:

- **When the battery terminal is disconnected, the diagnostic trouble code will be lost from the backup memory within 24 hours.**
- **When Diagnostic Test Mode IV is selected after selecting Diagnostic Test Mode III.**

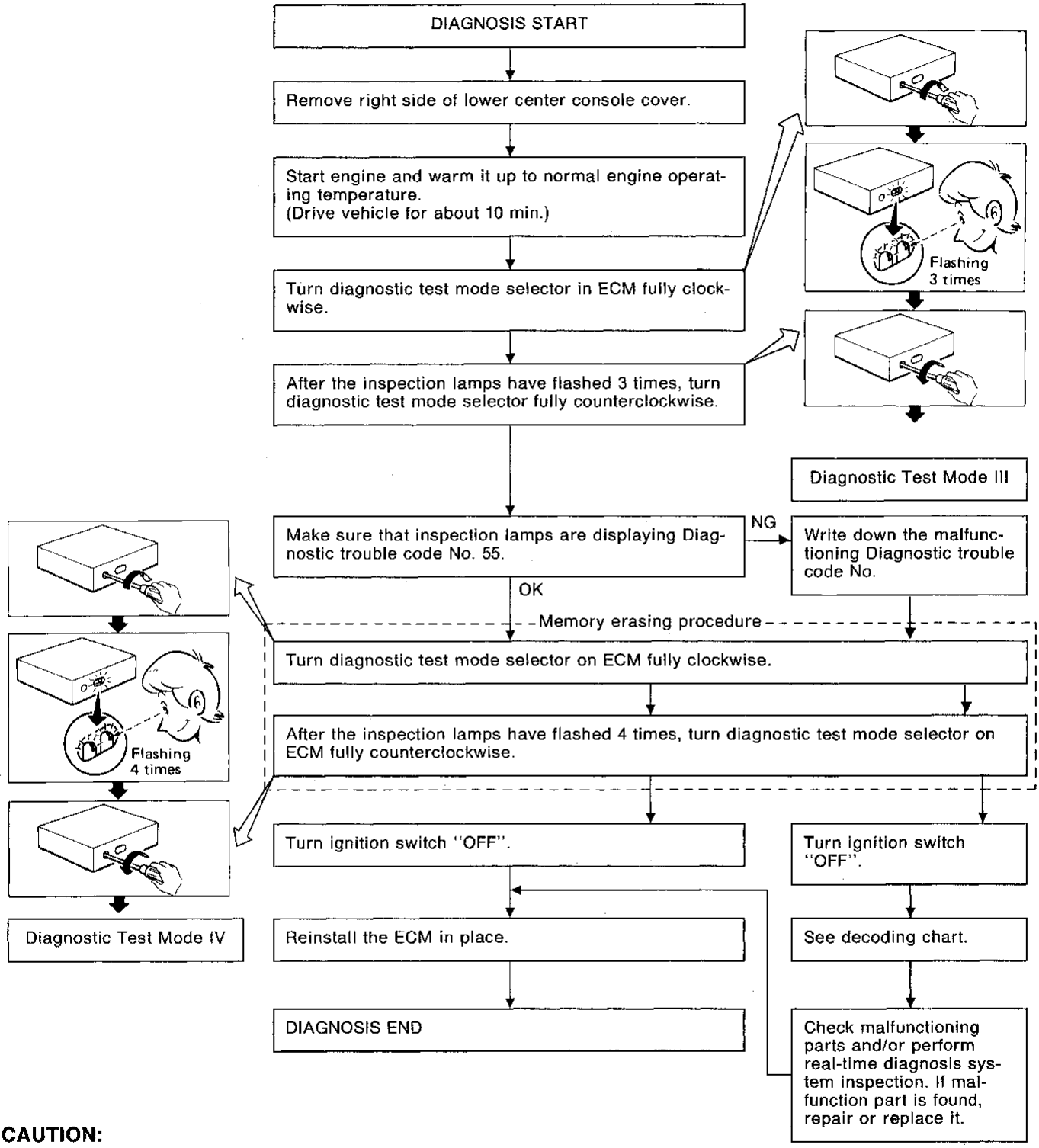
On-board Diagnostic System — Diagnostic Test Mode III
Self-diagnostic Results (Cont'd)

Diagnostic trouble code No.	Detected items	Malfunction is detected when ...	Check item (remedy)
*11	Camshaft position sensor circuit	• Either 1° or 120° signal is not entered for the first few seconds during engine cranking. • Either 1° or 120° signal is not input often enough while the engine speed is higher than the specified rpm.	• Harness and connector (If harness and connector are normal, replace camshaft position sensor.)
12	Mass air flow sensor circuit	• The mass air flow sensor circuit is open or shorted. (An abnormally high or low voltage is entered.)	• Harness and connector (If harness and connector are normal, replace mass air flow sensor.)
13	Engine coolant temperature sensor circuit	• The engine coolant temperature sensor circuit is open or shorted. (An abnormally high or low output voltage is entered.)	• Harness and connector • Engine coolant temperature sensor
14	Vehicle speed sensor circuit	• The vehicle speed sensor circuit is open or shorted.	• Harness and connector • Vehicle speed sensor (reed switch)
*21	Ignition signal circuit	• The ignition signal in the primary circuit is not entered during engine cranking or running.	• Harness and connector • Power transistor unit
31	ECM	• ECM calculation function is malfunctioning.	[Replace ECM (ECCS control module).]
32	EGR function	• EGR valve does not operate. (EGR valve spring does not lift.)	• EGR valve • EGRC-solenoid valve
33	Heated oxygen sensor circuit	• The heated oxygen sensor circuit is open or shorted. (An abnormally high or low output voltage is entered.)	• Harness and connector • Heated oxygen sensor • Fuel pressure • Injectors • Intake air leaks
34	Knock sensor circuit	• The knock sensor circuit is open or shorted. (An abnormally high or low voltage is entered.)	• Harness and connector • Knock sensor
35	EGR temperature sensor circuit	• The EGR temperature sensor circuit is open or shorted. (An abnormally high or low voltage is entered.)	• Harness and connector • EGR temperature sensor
43	Throttle position sensor circuit	• The throttle position sensor circuit is open or shorted. (An abnormally high or low voltage is entered.)	• Harness and connector • Throttle position sensor
45	Injector leak	• Fuel leaks from injector.	• Injector
51	Injector circuit	• The injector circuit is open.	• Harness and connector • Injector

*: Check items causing a malfunction of camshaft position sensor circuit first, if both diagnostic trouble code No. 11 and 21 are displayed at the same time.

On-board Diagnostic System — Diagnostic Test Mode III
Self-diagnostic Results (Cont'd)

PROCEDURE



CAUTION:

- **During display of a Diagnostic trouble code No. in on-board diagnostic system mode (Diagnostic Test Mode III), if another diagnostic test mode is to be performed, be sure to note the malfunction Diagnostic trouble code No. before turning diagnostic test mode selector on ECM fully clockwise. When selecting an alternative, select the diagnosis mode after turning switch "OFF". Otherwise, on-board diagnostic system information in the ECM memory will be lost.**

On-board Diagnostic System — Diagnostic Test Mode IV

Switches ON/OFF diagnostic test mode

In switches ON/OFF diagnostic system, ON/OFF operation of the following switches can be detected continuously.

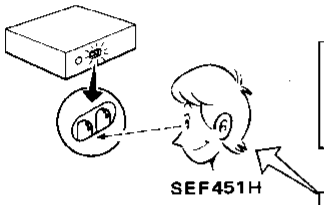
- Soft closed throttle position switch
- Starter switch
- Vehicle speed sensor

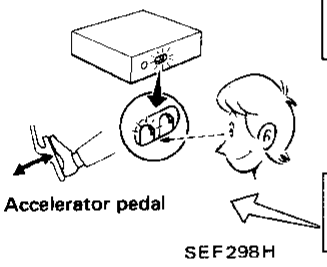
(1) Closed throttle position switch & Starter switch
The switches ON/OFF status in Diagnostic Test Mode IV is stored in ECM memory. When either switch is turned from "ON" to "OFF" or "OFF" to "ON", the red LED on ECM alternately comes on and goes off each time switching is performed.

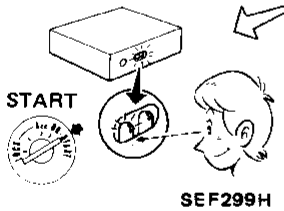
(2) Vehicle speed sensor
The switches ON/OFF status in Diagnostic Test Mode IV is selected is stored in ECM memory. The green LED on ECM remains off when vehicle speed is 20 km/h (12 MPH) or below, and comes ON at higher speeds.

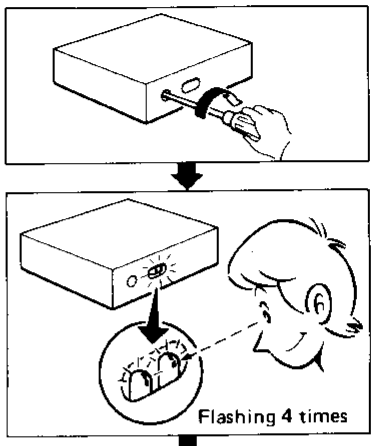
On-board Diagnostic System — Diagnostic Test Mode IV
Switches ON/OFF diagnostic test mode (Cont'd)

PROCEDURE









DIAGNOSIS START

Remove passenger seat.

Turn ignition switch "ON".

Turn diagnostic test mode selector on ECM fully clockwise.

After the inspection lamps have flashed 4 times, turn diagnostic test mode selector fully counterclockwise.

Make sure that a red inspection lamp goes "OFF".

Diagnostic Test Mode IV

Make sure that a red inspection lamp goes "ON" when depressing accelerator pedal.

NG → Check throttle position sensor circuit.

OK

Make sure that a red inspection lamp goes "ON" during turning ignition switch "START".

NG → Check starter signal circuit.

OK

Lift the rear of the vehicle.

Drive vehicle (in 2WD for 4WD models). Make sure that a green inspection lamp goes "ON" when vehicle speed is 20 km/h (12 MPH) or faster.

NG → Check vehicle speed sensor circuit.

OK

Turn ignition switch "OFF".

Reinstall passenger seat.

DIAGNOSIS END

CAUTION:

- **For safety, do not drive rear wheels at higher speed than required.**

On-board Diagnostic System — Diagnostic Test Mode V

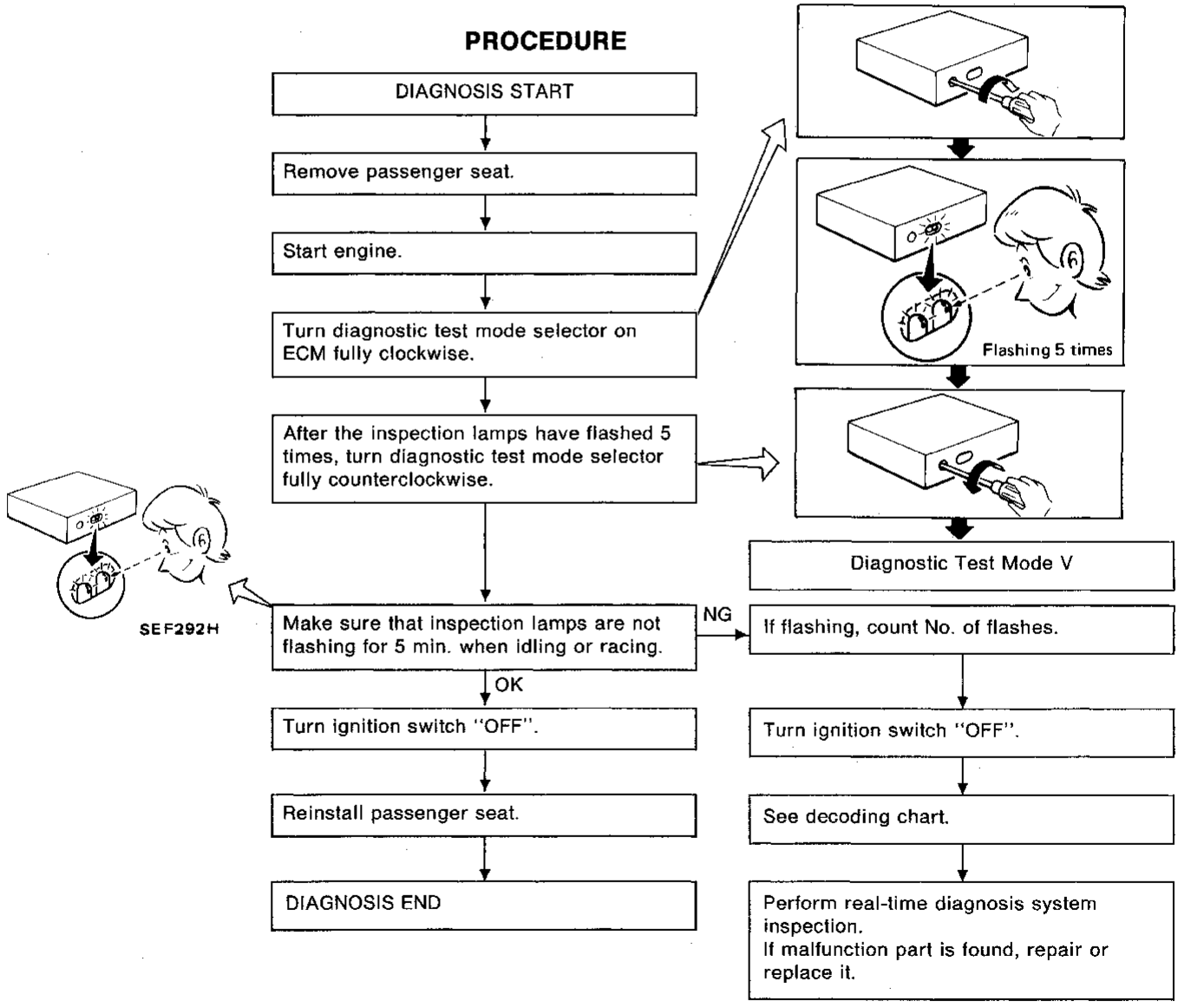
Real-time diagnostic test mode

In real-time diagnosis, if the following items are judged to be working incorrectly, a malfunction will be indicated immediately.

- Camshaft position sensor (120° signal & 1° signal) output signal
- Ignition signal
- Mass air flow sensor output signal

Consequently, this diagnosis very effectively determines whether the above systems cause the malfunction, during driving test. Compared with on-board diagnostic system, real-time diagnosis is very sensitive and can detect malfunctions instantly. However, items regarded as malfunctions in this diagnosis are not stored in ECM memory.

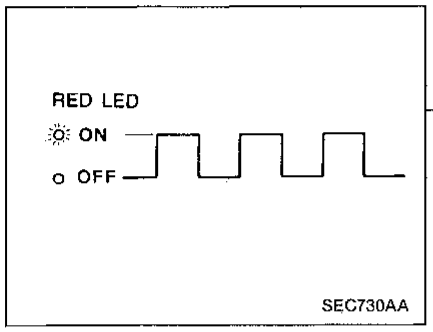
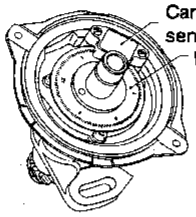
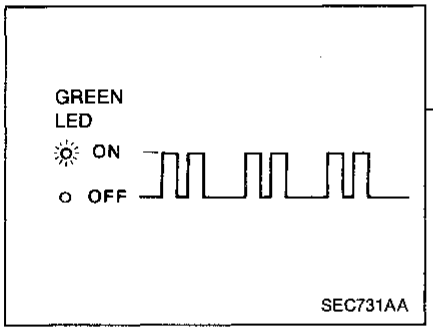
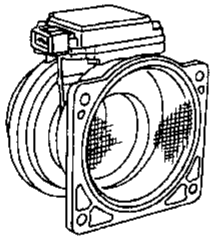
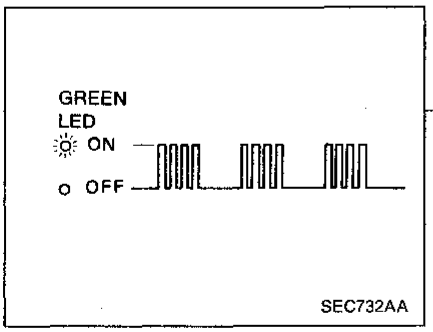
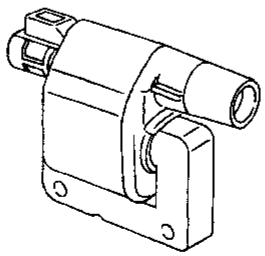
PROCEDURE



CAUTION:
In real-time diagnosis, pay attention to inspection lamp flashing. ECM displays the diagnostic trouble code only once and does not memorize the inspection.

On-board Diagnostic System — Diagnostic Test Mode V
Real-time diagnostic test mode (Cont'd)

DECODING CHART

Display presentation	Malfunction circuit or parts	ECM shows a malfunction signal when the following conditions are detected. (Compare with On-board diagnostic system — Diagnostic Test Mode III.)
CAMSHAFT POSITION SENSOR 	Camshaft position sensor circuit is malfunctioning.  MEF251DA	The 1° or 120° signal is momentarily missing, or, multiple, momentary noise signals enter. REAL TIME DIAGNOSTIC INSPECTION See page EF & EC-44.
MASS AIR FLOW SENSOR 	Mass air flow sensor circuit is malfunctioning.  SEF848J	Abnormal, momentary increase in mass air flow sensor output signal. REAL TIME DIAGNOSTIC INSPECTION See page EF & EC-45.
IGNITION SIGNAL 	Ignition signal is malfunctioning.  SEF736I	Signal from the primary ignition coil momentarily drops off. REAL TIME DIAGNOSTIC INSPECTION See page EF & EC-46.

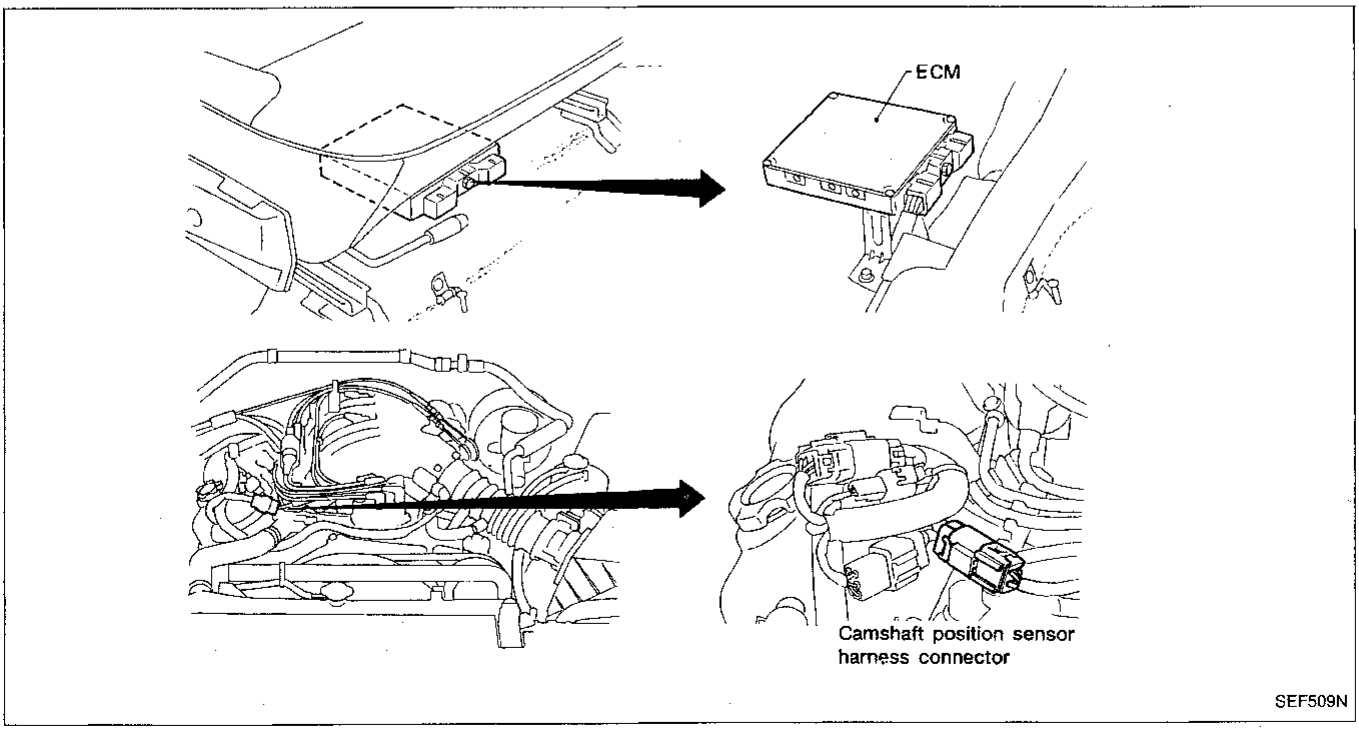
On-board Diagnostic System — Diagnostic Test Mode V
Real-time diagnostic test mode (Cont'd)

REAL-TIME DIAGNOSTIC INSPECTION

Camshaft Position Sensor

X : Available
—: Not available

Check sequence	Check items	Check conditions	Check parts			If malfunction, perform the following items.
			Camshaft position sensor harness connector	Sensor & actuator	ECM SMJ harness connector	
1	Tap and wiggle harness connector or component during real-time diagnosis.	During real-time diagnosis	X	X	X	Go to check item 2.
2	Check harness continuity at connector.	Engine stopped	X	—	—	Go to check item 3.
3	Disconnect harness connector, and then check dust adhesion to harness connector.	Engine stopped	X	—	X	Clean terminal surface.
4	Check pin terminal bend.	Engine stopped	—	—	X	Take out bend.
5	Reconnect harness connector and then recheck harness continuity at connector.	Engine stopped	X	—	—	Replace terminal.
6	Tap and wiggle harness connector or component during real-time diagnosis.	During real-time diagnosis	X	X	X	If diagnostic trouble codes are displayed during real-time diagnosis, replace terminal.

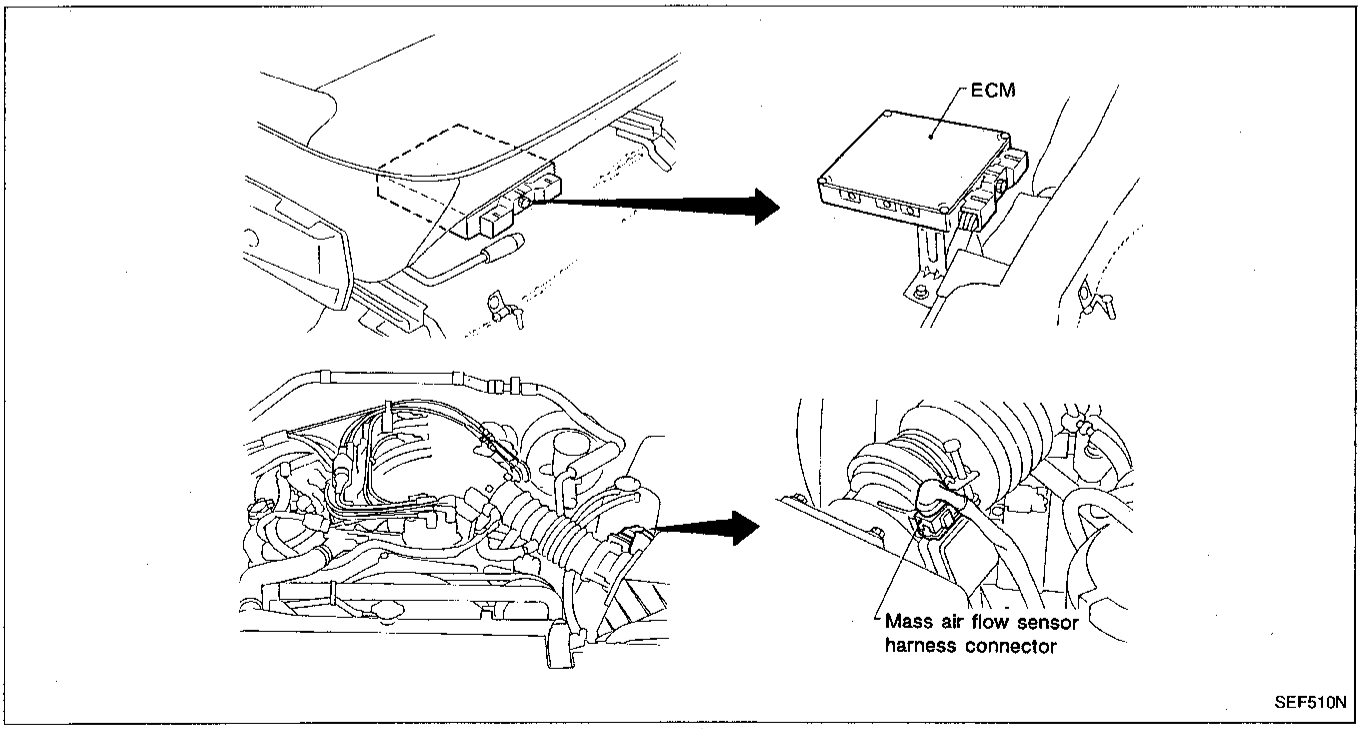


On-board Diagnostic System — Diagnostic Test Mode V
Real-time diagnostic test mode (Cont'd)

Mass Air Flow Sensor

X: Available
—: Not available

Check sequence	Check items	Check conditions	Check parts			If malfunction, perform the following items.
			Mass air flow sensor harness connector	Sensor & actuator	ECM SMJ harness connector	
1	Tap and wiggle harness connector or component during real-time diagnosis.	During real-time diagnosis	X	X	X	Go to check item 2.
2	Check harness continuity at connector.	Engine stopped	X	—	—	Go to check item 3.
3	Disconnect harness connector, and then check dust adhesion to harness connector.	Engine stopped	X	—	X	Clean terminal surface.
4	Check pin terminal bend.	Engine stopped	—	—	X	Take out bend.
5	Reconnect harness connector and then recheck harness continuity at connector.	Engine stopped	X	—	—	Replace terminal.
6	Tap and wiggle harness connector or component during real-time diagnosis.	During real-time diagnosis	X	X	X	If diagnostic trouble codes are displayed during real-time diagnosis, replace terminal.

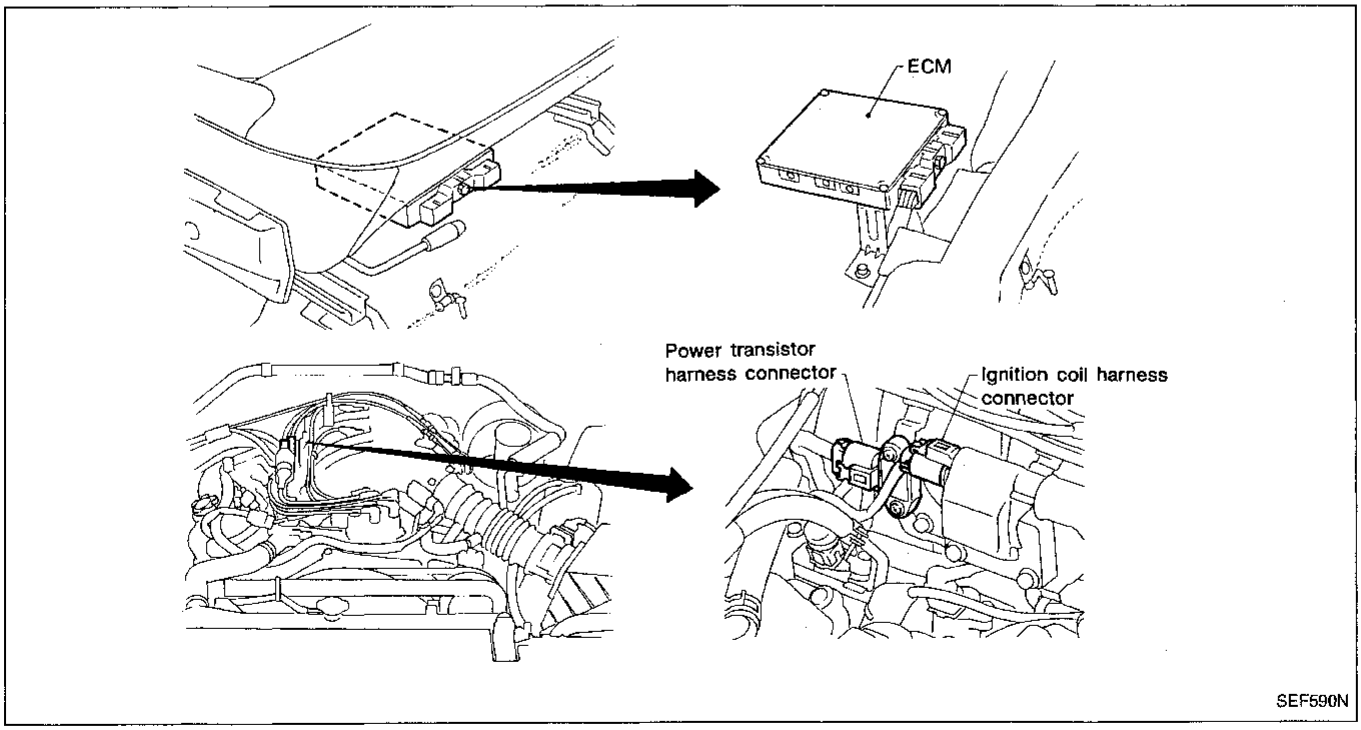


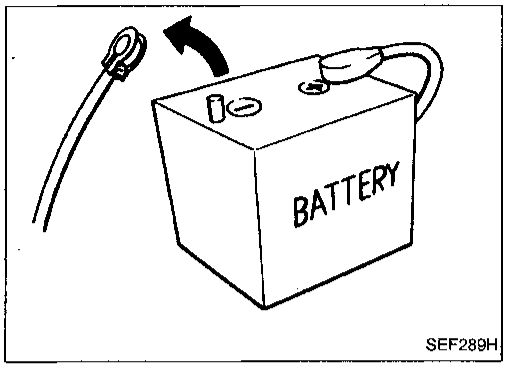
On-board Diagnostic System — Diagnostic Test Mode V
Real-time diagnostic test mode (Cont'd)

Ignition Signal

X: Available
—: Not available

Check sequence	Check items	Check conditions	Check parts			If malfunction, perform the following items.
			Ignition signal harness connector	Sensor & actuator	ECM SMJ harness connector	
1	Tap and wiggle harness connector or component during real-time diagnosis.	During real-time diagnosis	X	X	X	Go to check item 2.
2	Check harness continuity at connector.	Engine stopped	X	—	—	Go to check item 3.
3	Disconnect harness connector, and then check dust adhesion to harness connector.	Engine stopped	X	—	X	Clean terminal surface.
4	Check pin terminal bend.	Engine stopped	—	—	X	Take out bend.
5	Reconnect harness connector and then recheck harness continuity at connector.	Engine stopped	X	—	—	Replace terminal.
6	Tap and wiggle harness connector or component during real-time diagnosis.	During real-time diagnosis	X	X	X	If diagnostic trouble codes are displayed during real-time diagnosis, replace terminal.



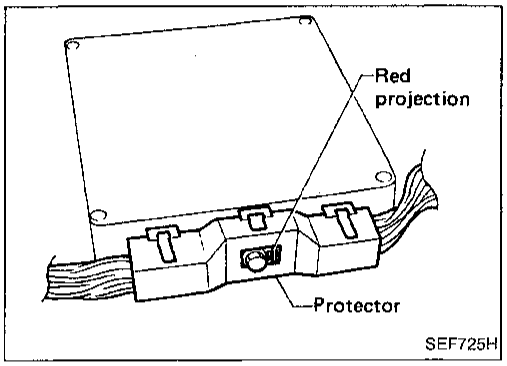


SEF289H

Diagnostic Procedure

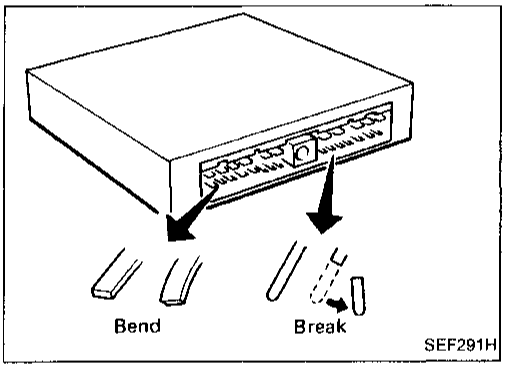
CAUTION:

1. **Before connecting or disconnecting the ECM harness connector to or from any ECM, be sure to turn the ignition switch to the "OFF" position and disconnect the negative battery terminal in order not to damage ECM as battery voltage is applied to ECM even if ignition switch is turned off. Failure to do so may damage the ECM.**



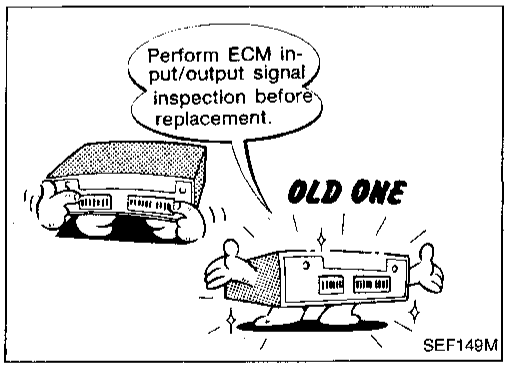
SEF725H

2. When connecting ECM harness connector, tighten securing bolt until red projection is in line with connector face.



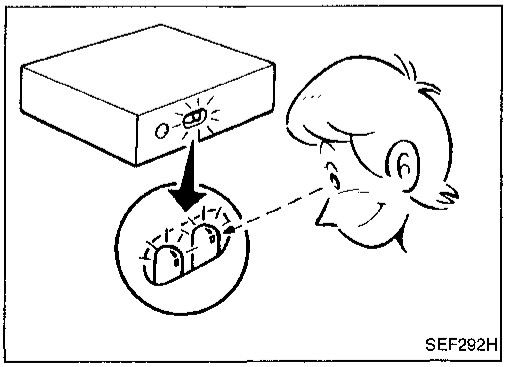
SEF291H

3. **When connecting or disconnecting pin connectors into or from ECM, take care not to damage pin terminals (bend or break).**
4. **Make sure that there are not any bends or breaks on ECM pin terminal, when connecting pin connectors.**



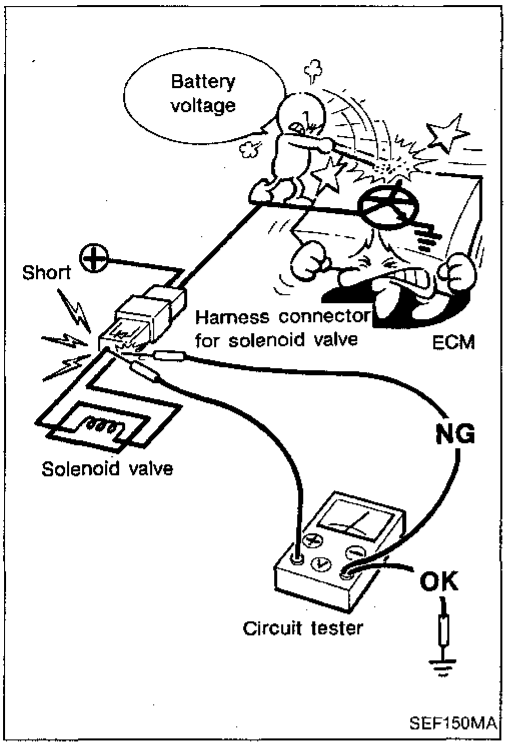
SEF149M

5. **Before replacing ECM, perform ECM input/output signal inspection and make sure whether ECM functions properly or not. (See page EF & EC-127.)**

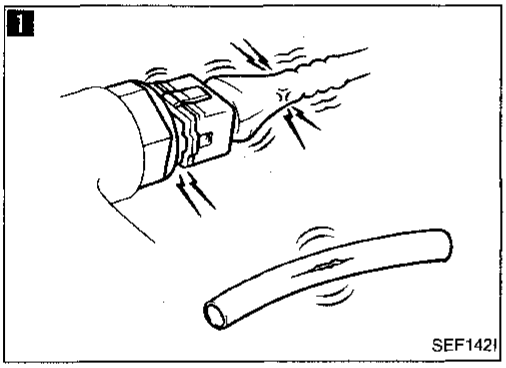

SEF292H

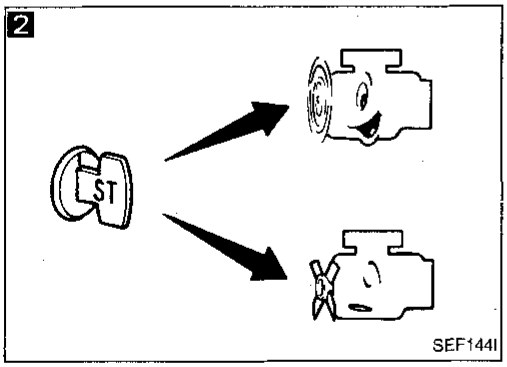
6. **After performing this "Diagnostic Procedure", perform ECCS on-board diagnostic system and driving test.**

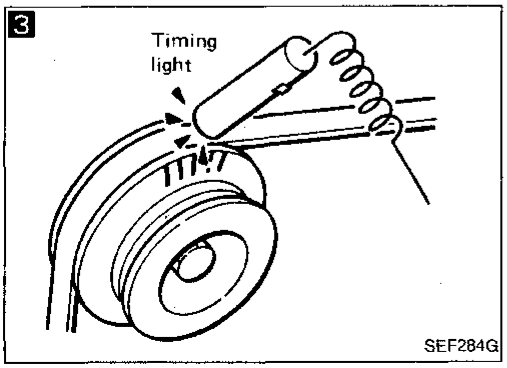
Diagnostic Procedure (Cont'd)



7. When measuring ECM controlled components supply voltage with a circuit tester, separate one tester probe from the other.
If the two tester probes accidentally make contact with each other during measurement, the circuit will be shorted, resulting in damage to the ECM power transistor.







Basic Inspection

1

BEFORE STARTING
1. Check service records for any recent repairs that may indicate a related problem, or the current need for scheduled maintenance.
2. Open engine hood and check the following:
- Harness connectors for proper connections
- Vacuum hoses for splits, kinks, and proper connections
- Wiring for proper connections, pinches, and cuts

2

DOES ENGINE START? — No → Go to **5** .

Yes

3

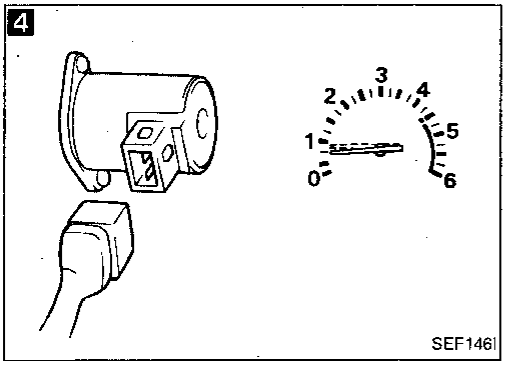
CHECK IGNITION TIMING.
Warm up engine sufficiently and check ignition timing at idle using timing light. (Refer to page EF & EC-24.)
Ignition timing:
15° ± 2° BTDC

NG → Adjust ignition timing by turning camshaft position sensor.

OK

Ⓐ

Basic Inspection (Cont'd)

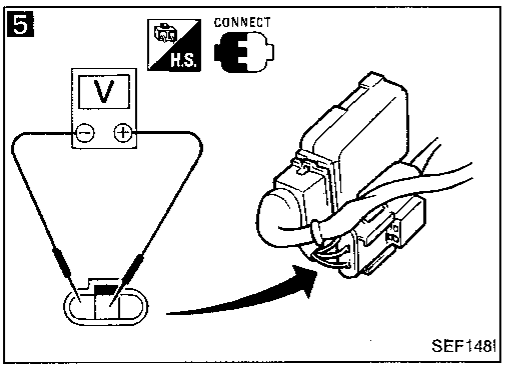


Ⓐ

4 **CHECK IDLE ADJ. SCREW INITIAL SET RPM.**
When disconnecting IACV-AAC valve harness connector, does engine speed fall to;
700 ± 50 rpm
[in "N" position]?

No → Adjust engine speed by turning idle adjusting screw.

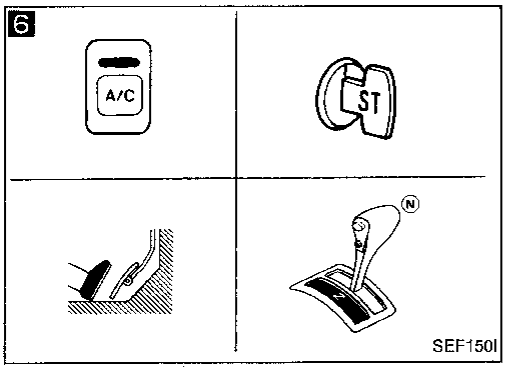
Yes ↓



5 **CHECK THROTTLE POSITION SENSOR IDLE POSITION.**
Measure output voltage of throttle position sensor using voltmeter, and check that it is approximately 0.5V. (Throttle valve fully closed.)

NG → 1. Adjust output voltage by rotating throttle position sensor body.
2. Disconnect throttle position sensor harness connector for a few seconds and then reconnect it.
3. Confirm that "IDLE POSITION" stays "ON".

OK ↓

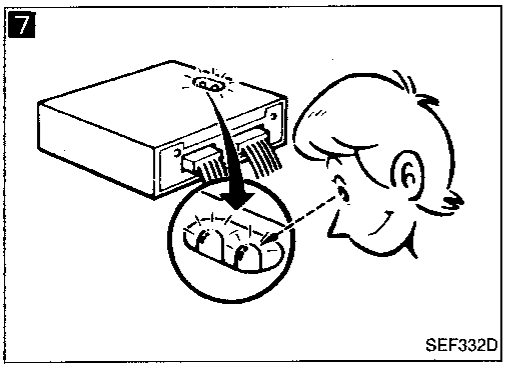


6 **CHECK SWITCH INPUT SIGNAL.**
Remove ECM and check the switches' ON-OFF operation using voltmeter at each ECM terminal.

NG → Repair or replace the malfunctioning switch or its circuit.

Switch	Condition	Voltage (V)
Start signal	IGN ON → IGN START	0 → Battery voltage
Throttle position switch	Idle position	Battery voltage
A/C signal	A/C OFF → A/C ON (Engine running)	Battery voltage → 0.5 - 0.7
Neutral (Parking) position switch	Selector lever is "N" or "P" position → Except "N" and "P"	0 → 8.0 - 9.0

OK ↓

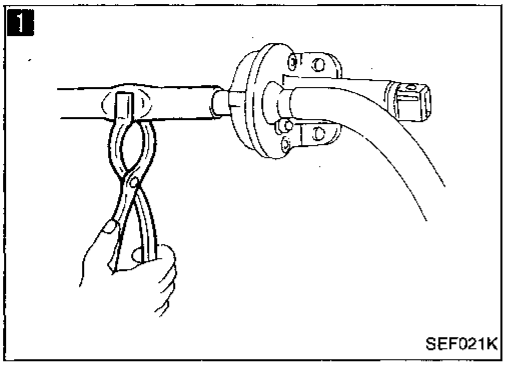


7 **READ SELF-DIAGNOSTIC RESULTS.**
1. Set "Self-diagnostic function" in Diagnostic Test Mode III. (Refer to page EF & EC-37.)
2. Count the number of LED flashes and read out the diagnostic trouble codes.
3. Are the diagnostic trouble codes being output?

Yes → Go to the relevant inspection procedure.

No ↓

INSPECTION END



Diagnostic Procedure 1 — High Idling after Warm-up

1

CHECK IACV-AIR REGULATOR.
When pinching the IACV-air regulator hose, does the engine speed drop?

Yes → Check IACV-air regulator and circuit.

No ↓

2

CHECK INTAKE AIR LEAK.
1. Disconnect heated oxygen sensor harness connector.
2. After racing engine at 1,500 rpm under no load for about 30 seconds, does the engine speed drop?

Yes → Discover air leak location and repair.

No ↓

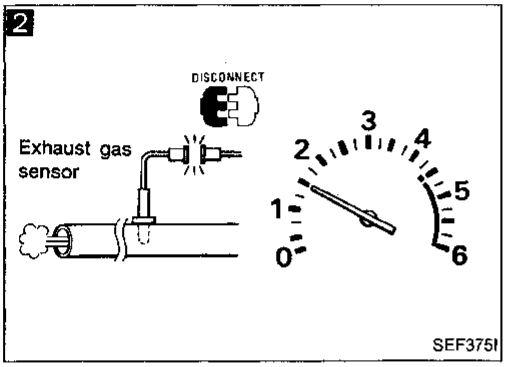
3

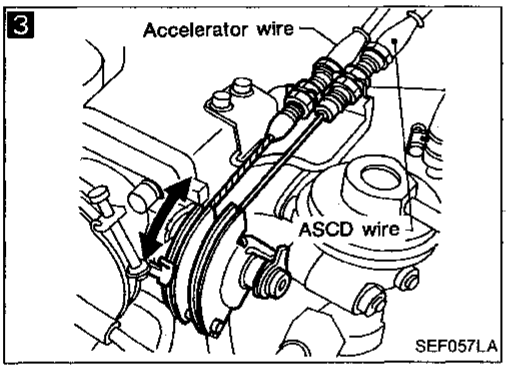
CHECK THROTTLE LINKAGE.
1. Check that throttle linkage moves smoothly.
2. Confirm that throttle valve both fully opens and fully closes.

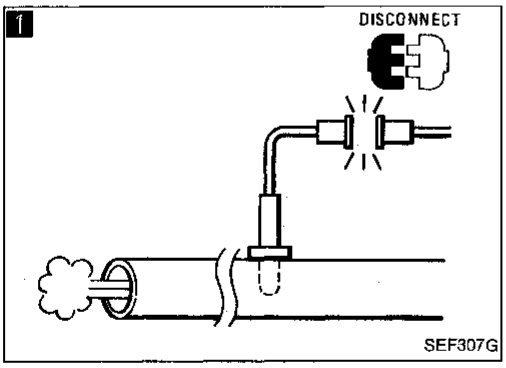
NG → Repair throttle linkage or sticking of throttle valve.

OK ↓

INSPECTION END







Diagnostic Procedure 2 — Hunting

1

CHECK HEATED OXYGEN SENSORS.
When disconnecting heated oxygen sensor harness connector, is the hunting fixed?

Yes → Check heated oxygen sensor. (See page EF & EC-96.)

No ↓

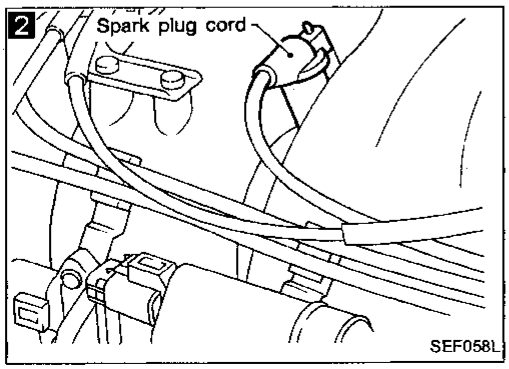
2

PERFORM POWER BALANCE TEST.
When disconnecting each spark plug cord one at a time, is there any cylinder which does not produce a momentary engine speed drop?

No → Go to 4 .

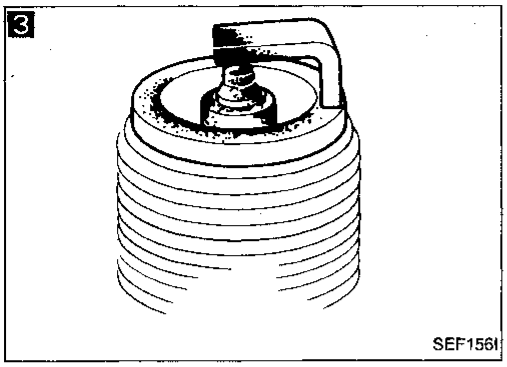
Yes ↓

Ⓐ



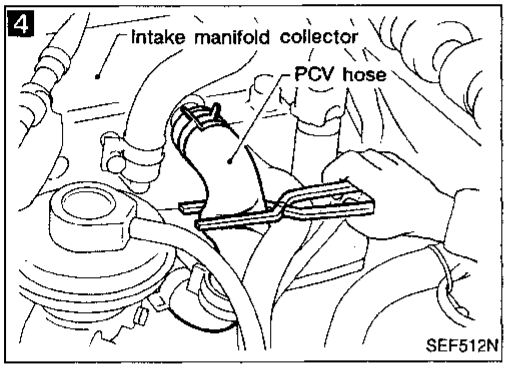
Diagnostic Procedure 2 — Hunting (Cont'd)

3



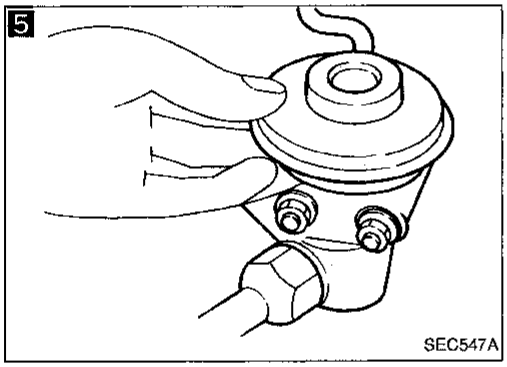
SEF156I

4



SEF512N

5



SEC547A

Ⓐ

3

CHECK SPARK PLUGS.
Remove the spark plugs and check for fouling, etc.

NG → Repair or replace spark plug(s).

OK

4

CHECK FOR INTAKE AIR LEAK.
When pinching blow-by hose (lowering the blow-by air supply), does the engine speed rise?

Yes → Discover air leak location and repair.

No

5

CHECK EGR VALVE.
Check EGR valve for sticking.

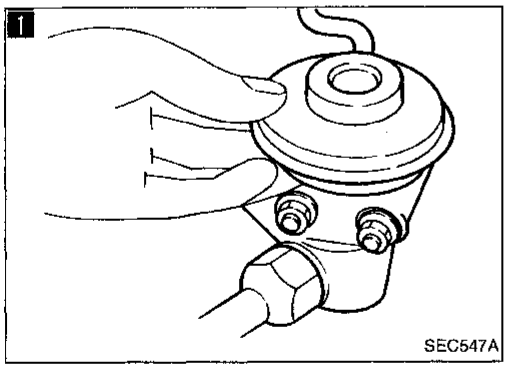
NG → Repair or replace.

OK

INSPECTION END

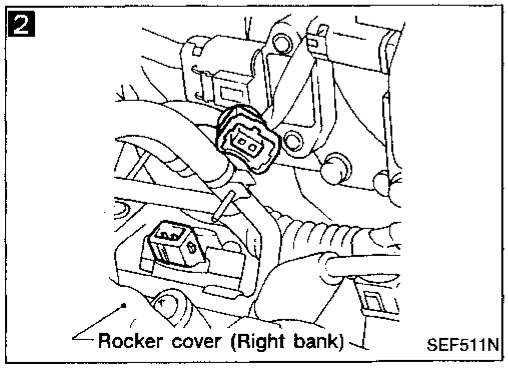
Diagnostic Procedure 3 — Unstable Idle

1



SEC547A

2



SEF511N

1

CHECK EGR VALVE.
Check EGR valve for sticking.

NG → Repair or replace.

OK

2

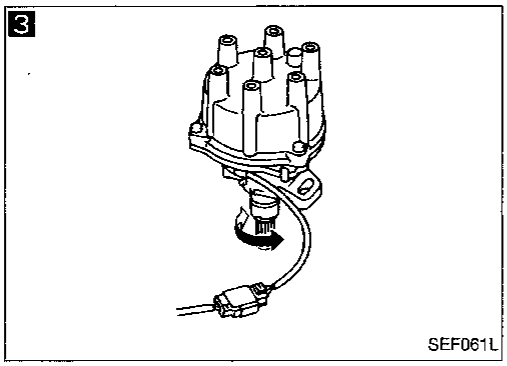
PERFORM POWER BALANCE TEST.
When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

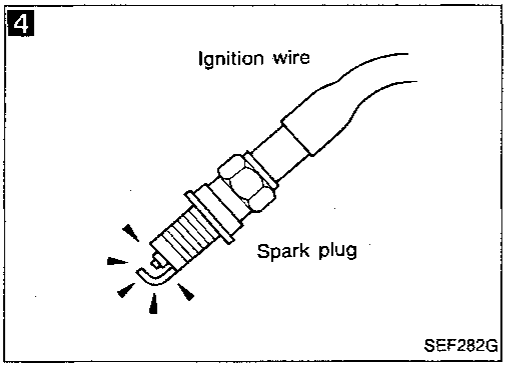
No → Go to **6** .

Yes

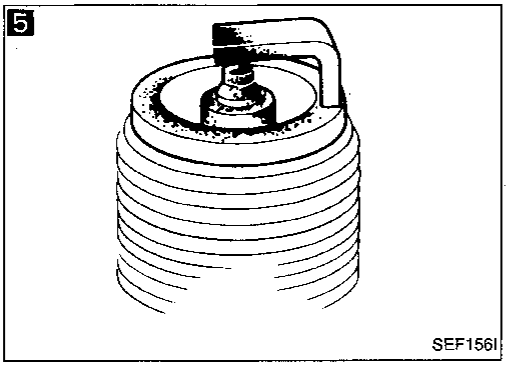
Ⓐ

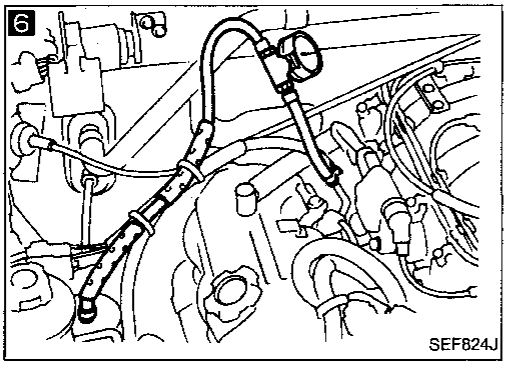
Diagnostic Procedure 3 — Unstable Idle (Cont'd)

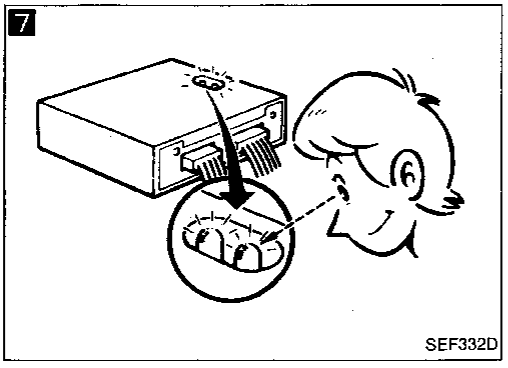

SEF061L



SEF282G


SEF156I


SEF624J


SEF332D

Ⓐ

3 **CHECK INJECTOR.**
1. Remove camshaft position sensor from engine. (Harness connector should remain connected.)
2. Turn ignition switch ON. (Do not start engine.)
3. When rotating camshaft position sensor shaft, does each injector make an operating sound?

No → Check injector(s) and circuit(s).

Yes ↓

4 **CHECK IGNITION SPARK.**
1. Disconnect spark plug cord.
2. Connect a known good spark plug to the spark plug cord.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

NG → Check ignition coil, ignition wire, power transistor unit and their circuits. (See page EF & EC-90.)

OK ↓

5 **CHECK SPARK PLUGS.**
Remove the spark plugs and check for fouling, etc.

NG → Repair or replace spark plug(s).

OK ↓

6 **CHECK FUEL PRESSURE.**
1. Release fuel pressure to zero. (Refer to page EF & EC-139.)
2. Install fuel pressure gauge and check fuel pressure.

At idle:
Approx. 235 kPa
(2.4 kg/cm^2, 34 psi)

NG → Check fuel pump and circuit.

OK ↓

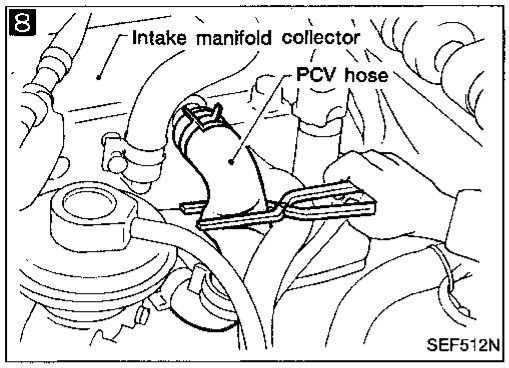
7 **CHECK HEATED OXYGEN SENSOR.**
1. Set "Self-diagnostic function" in Diagnostic Test Mode I. (See page EF & EC-36.)
2. Maintaining engine at 2,000 rpm under no-load, check to see that GREEN LED on the ECM goes ON and OFF more than 5 times during 10 seconds.

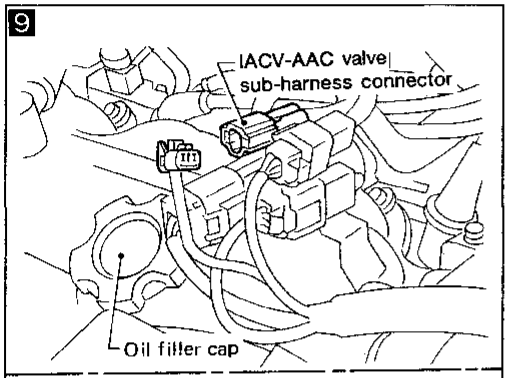
NG → Replace heated oxygen sensor.

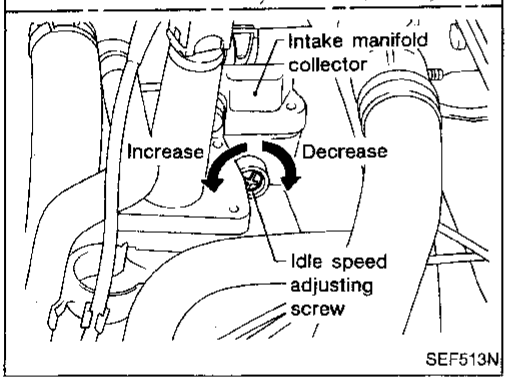
OK ↓

Ⓐ

Diagnostic Procedure 3 — Unstable Idle (Cont'd)







Ⓐ

8

CHECK FOR INTAKE AIR LEAK.
When pinching blow-by hose (lowering the blow-by air supply), does the engine speed rise?

Yes → Discover air leak location and repair.

No ↓

9

CHECK IDLE ADJ. SCREW CLOGGING.
1. Disconnect IACV-AAC valve harness connector.
2. Can you set engine speed as follows by turning idle adjusting screw?
   700±50 rpm
   [in "N" position]

No → Check for IACV-AAC valve clogging or throttle valve clogging.

Yes ↓

CHECK COMPRESSION PRESSURE.
- Check compression pressure.
  Standard: kPa (kg/cm², psi)/300 rpm
  1,196 (12.2, 173)
  Minimum: kPa (kg/cm², psi)/300 rpm
  883 (9.0, 128)
  Difference between each cylinder: kPa (kg/cm², psi)/300 rpm
  98 (1.0, 14)

NG → Check pistons, piston rings, valves, valve seats and cylinder head gaskets.

OK ↓

CHECK ECM HARNESS CONNECTOR.
Check the ECM pin terminals for damage or poor connection of ECM harness connector.

NG → Repair or replace.

OK ↓

Reconnect ECM harness connector and retest.

Trouble is not fixed. ↓

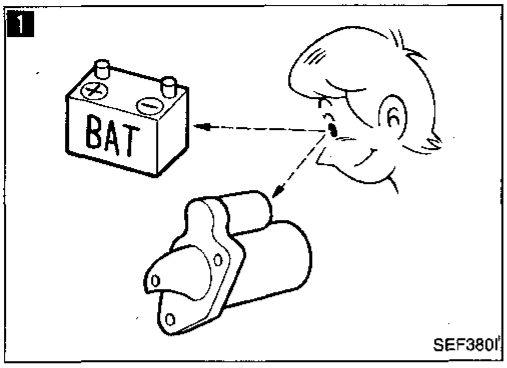
TRY A KNOWN GOOD ECM.*

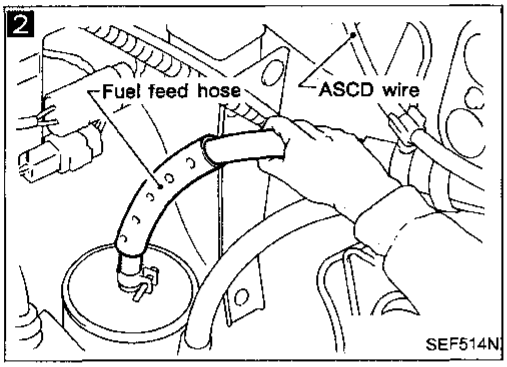
OK ↓

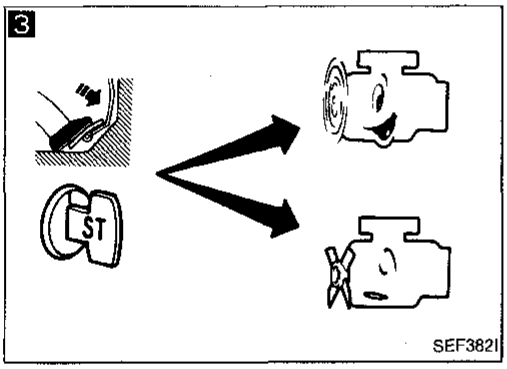
INSPECTION END

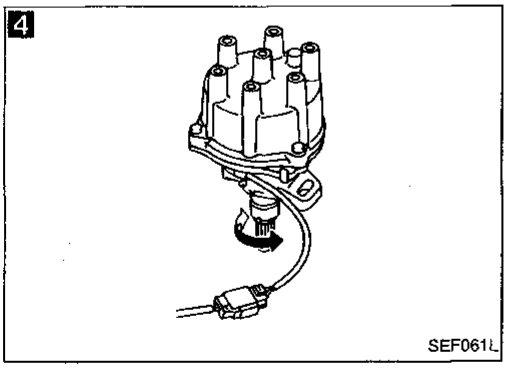
*: ECM may be the cause of a problem, but this is rarely the case.

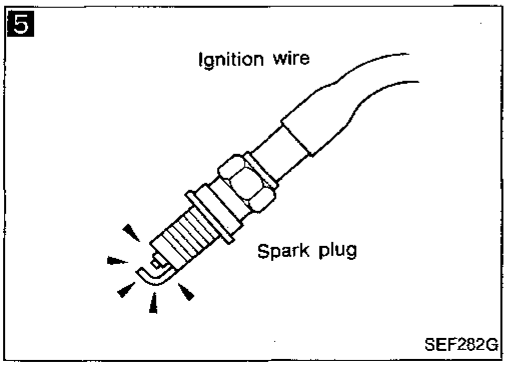
Diagnostic Procedure 4 — Hard to Start or Impossible to Start when the Engine is Cold











1

CHECK BATTERY AND STARTER.
Check battery and starter condition. (Refer to EL section.)

NG → Repair or replace.

OK ↓

2

CHECK FUEL PRESSURE.
1. Pinch fuel feed hose with fingers.
2. When cranking the engine, is there any pressure on the fuel feed hose?

No → Check fuel pump and circuit. (See page EF & EC-115.)

Yes ↓

3

CHECK IACV-AIR REGULATOR AND IACV-AAC VALVE.
When pressing accelerator pedal fully, can you start the engine.

Yes → Check IACV-AAC valve, IACV-air regulator and circuits. (See pages EF & EC-117, 119.)

No ↓

4

CHECK INJECTOR.
1. Remove camshaft position sensor from engine. (Harness connector should remain connected.)
2. Turn ignition switch ON. (Do not start engine.)
3. When rotating camshaft position sensor shaft, does each injector make an operating sound?

No → Check injector(s) and circuit(s).

Yes ↓

5

CHECK IGNITION SPARK.
1. Disconnect spark plug cord.
2. Connect a known good spark plug to the spark plug cord.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

NG → Check ignition coil, ignition wire, power transistor unit and their circuits. (See page EF & EC-90.)

OK ↓

6

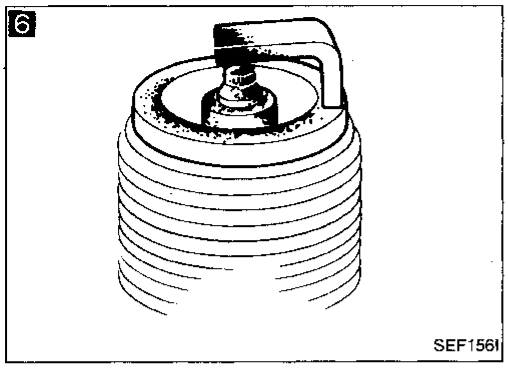
CHECK SPARK PLUGS.
Remove the spark plugs and check for fouling, etc.

NG → Repair or replace spark plug(s).

OK ↓

Ⓐ

Diagnostic Procedure 4 — Hard to Start or Impossible to Start when the Engine is Cold (Cont'd)



Ⓐ

CHECK ECM HARNESS CONNECTOR.
Check the ECM pin terminals for damage or poor connection of ECM harness connector.

NG → Repair or replace.

OK ↓

Reconnect ECM harness connector and retest.

Trouble is not fixed. ↓

CHECK ECM POWER SUPPLY AND GROUND CIRCUIT.
Refer to page EF & EC-77.

NG → Repair or replace.

OK ↓

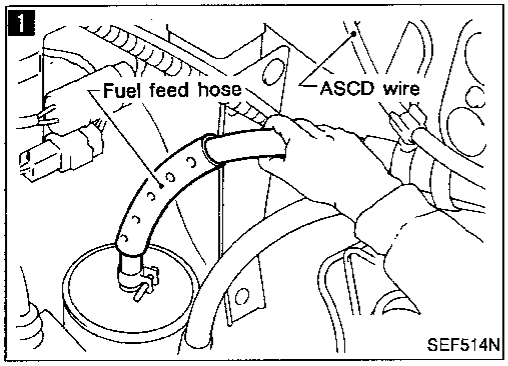
TRY A KNOWN GOOD ECM.*

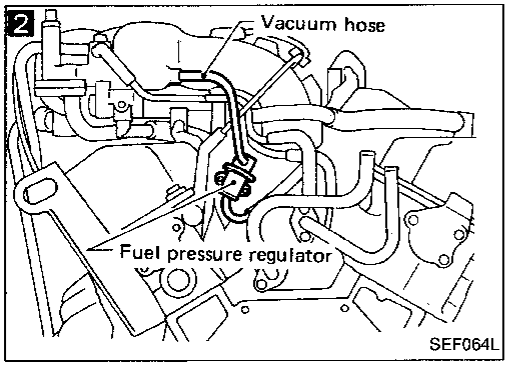
↓

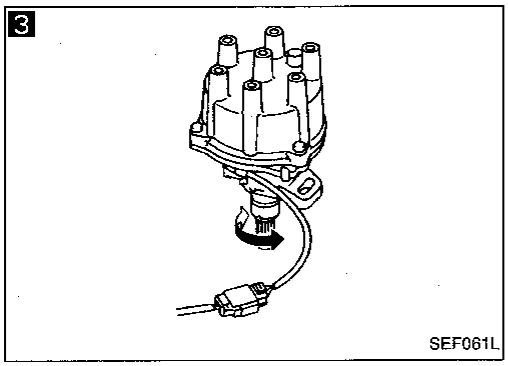
INSPECTION END

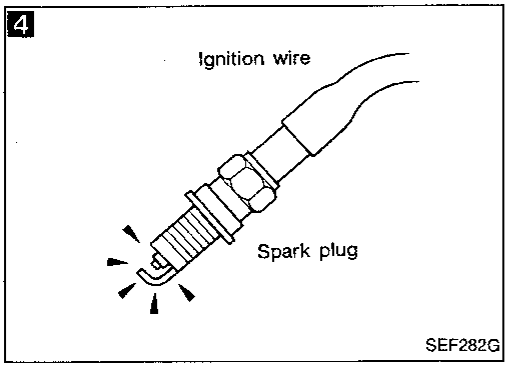
*: ECM may be the cause of a problem, but this is rarely the case.

Diagnostic Procedure 5 — Hard to Start or Impossible to Start when the Engine is Hot









1

CHECK FUEL PRESSURE.
1. Pinch fuel feed hose with fingers.
2. When cranking the engine, is there any pressure on the fuel feed hose?

No → Check fuel pump and circuit. (See page EF & EC-115.)

Yes ↓

2

CHECK FUEL VAPOR.
1. Disconnect fuel pressure regulator vacuum hose and plug hose.
2. Can you start engine?

Yes → Check fuel properties.

No ↓

3

CHECK INJECTOR.
1. Remove camshaft position sensor from engine. (Harness connector should remain connected.)
2. Turn ignition switch ON. (Do not start engine.)
3. When rotating camshaft position sensor shaft, does each injector make an operating sound?

No → Check injector(s) and circuit(s).

Yes ↓

4

CHECK IGNITION SPARK.
1. Disconnect spark plug cord.
2. Connect a known good spark plug to the spark plug cord.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

NG → Check ignition coil, ignition wire, power transistor unit and circuits. (See page EF & EC-90.)

OK ↓

CHECK ECM HARNESS CONNECTOR.
Check the ECM pin terminals for damage or poor connection of ECM harness connector.

NG → Repair or replace.

OK ↓

Reconnect ECM harness connector and retest.

Trouble is not fixed. ↓

CHECK ECM POWER SUPPLY AND GROUND CIRCUIT.
Refer to page EF & EC-77.

NG → Repair or replace.

OK ↓

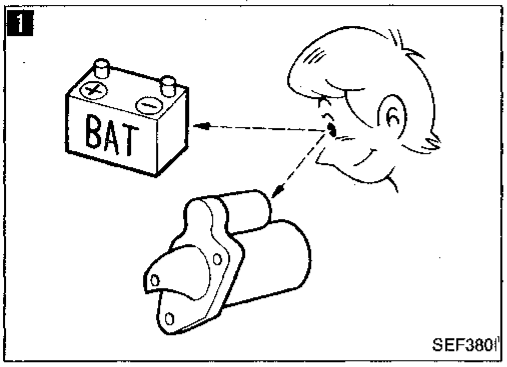
TRY A KNOWN GOOD ECM*.

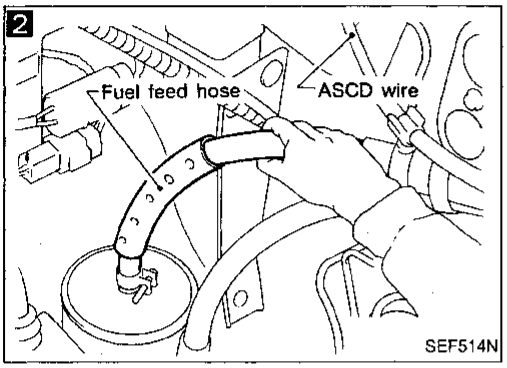
↓

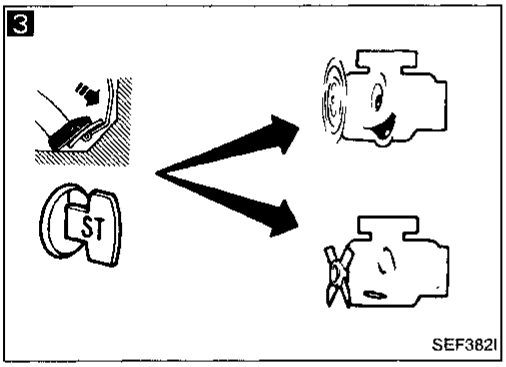
INSPECTION END

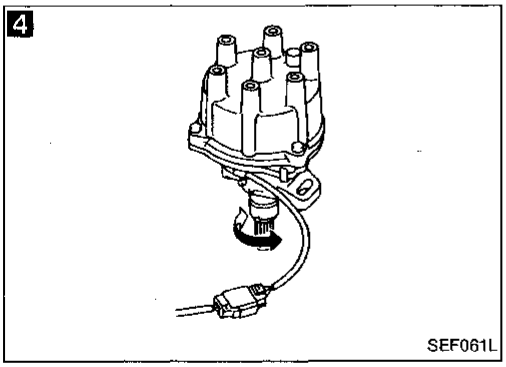
*: ECM may be the cause of a problem, but this is rarely the case.

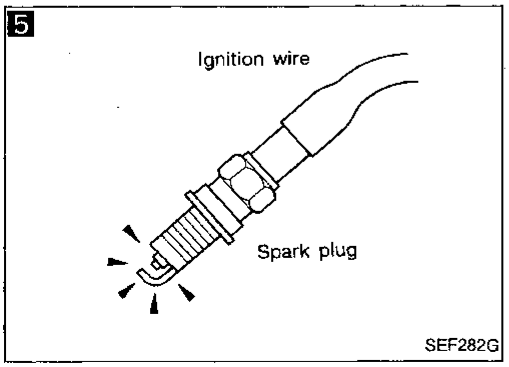
Diagnostic Procedure 6 — Hard to Start or Impossible to Start under Normal Conditions











1 **CHECK BATTERY AND STARTER.**
Check battery and starter operation. (Refer to EL section.)
NG → Repair or replace.
OK ↓

2 **CHECK FUEL PRESSURE.**
1. Pinch fuel feed hose with fingers.
2. When cranking the engine, is there any pressure on the fuel feed hose?

No → Check fuel pump and circuit. (See page EF & EC-115.)
Yes ↓

3 **CHECK INJECTOR FOR LEAKAGE.**
When pressing accelerator pedal fully, can you start the engine.
Yes → Check injector(s) for leakage.
No ↓

4 **CHECK INJECTOR.**
1. Remove camshaft position sensor from engine. (Harness connector should remain connected.)
2. Turn ignition switch ON. (Do not start engine.)
3. When rotating camshaft position sensor shaft, does each injector make an operating sound?

No → Check injectors and circuits.
Yes ↓

5 **CHECK IGNITION SPARK.**
1. Disconnect spark plug cord.
2. Connect a known good spark plug to the spark plug cord.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

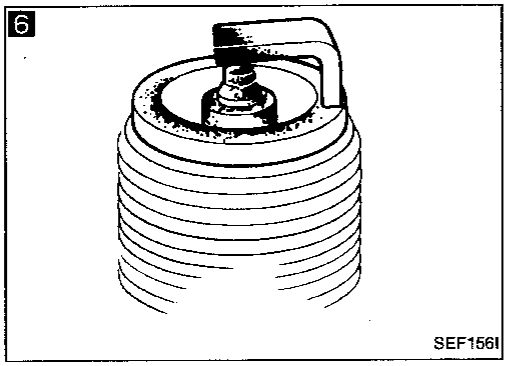
NG → Check ignition coil, ignition wire, power transistor unit and circuits. (See page EF & EC-90.)
OK ↓

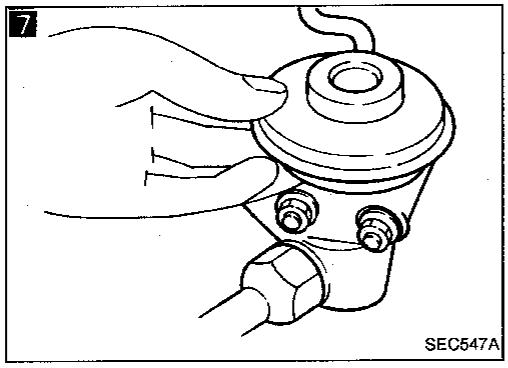
6 **CHECK SPARK PLUGS.**
Remove the spark plugs and check for fouling, etc.
NG → Repair or replace spark plug(s).
OK ↓

7 **CHECK EGR VALVE.**
Check EGR valve for sticking.
NG → Repair or replace.
OK ↓

Ⓐ

Diagnostic Procedure 6 — Hard to Start or Impossible to Start under Normal Conditions (Cont'd)





Ⓐ

CHECK ECM HARNESS CONNECTOR.
Check the ECM pin terminals for damage or poor connection of ECM harness connector.
NG → Repair or replace.

OK ↓

Reconnect ECM harness connector and retest.

Trouble is not fixed. ↓

CHECK ECM POWER SUPPLY AND GROUND CIRCUIT.
Refer to page EF & EC-77.
NG → Repair or replace.

OK ↓

TRY A KNOWN GOOD ECM*.

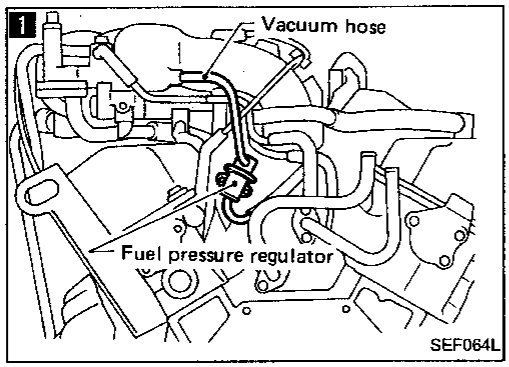
CHECK TIMING BELT FOR PROPER INSTALLATION.
NG → Replace timing belt.

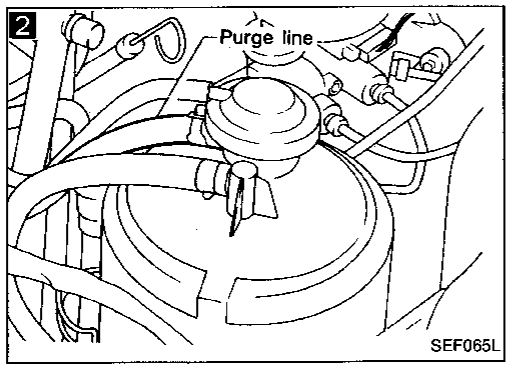
OK ↓

INSPECTION END

*: ECM may be the cause of a problem, but this is rarely the case.

Diagnostic Procedure 7 — Hesitation when the Engine is Hot





1

CHECK FUEL VAPOR.
1. Disconnect fuel pressure regulator vacuum hose and plug hose.
2. Perform cruise test.
3. Does the hesitation disappear?

Yes → Check fuel properties.

No ↓

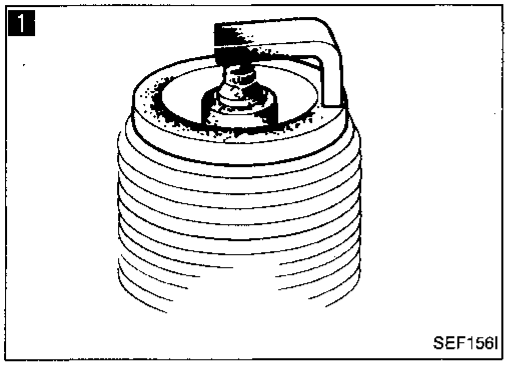
2

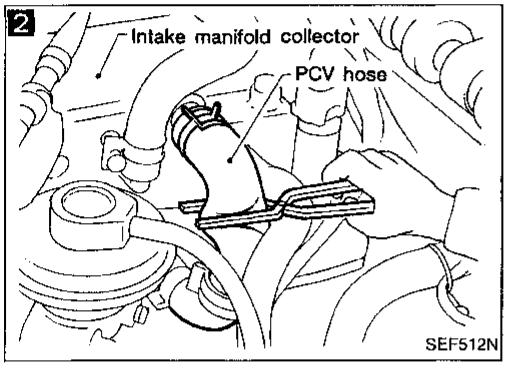
CHECK CANISTER PURGE.
1. Disconnect canister purge line hose and plug hose.
2. Perform cruise test.
3. Does the hesitation disappear?

Yes → Check purge and vacuum lines.

No ↓

INSPECTION END





Diagnostic Procedure 8 — Hesitation when the Engine is Cold

1

CHECK SPARK PLUGS.
Remove spark plugs and check for fouling, etc.

NG → Repair or replace spark plug(s).

OK ↓

2

CHECK FOR INTAKE AIR LEAK.
When pinching blow-by hose (lowering the blow-by air supply), does the engine speed rise?

Yes → Discover air leak location and repair.

No ↓

TRY A KNOWN GOOD MASS AIR FLOW SENSOR.

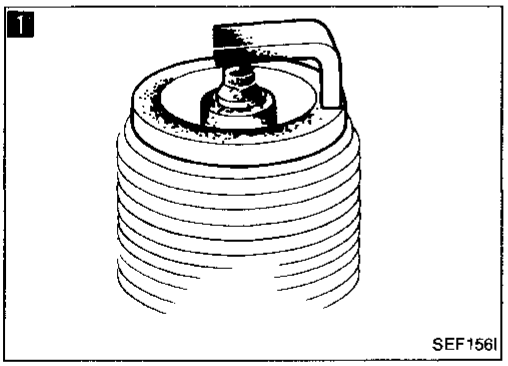
Trouble is fixed. → Replace mass air flow sensor.

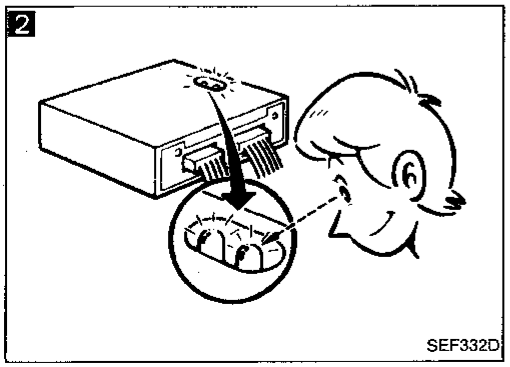
Trouble is not fixed. ↓

CHECK FOR INTAKE VALVE DEPOSITS.
If there are deposits on intake valves, remove them.

↓

INSPECTION END





Diagnostic Procedure 9 — Hesitation under Normal Conditions

1

CHECK SPARK PLUGS.
Remove spark plugs and check for fouling, etc.

NG → Repair or replace spark plug(s).

OK ↓

2

CHECK HEATED OXYGEN SENSOR.
1. Set in Diagnostic Test Mode I. (See page EF & EC-36.)
2. Maintaining engine at 2,000 rpm under no load, check to see that GREEN LED on the ECM goes ON and OFF more than 5 times during 10 seconds.

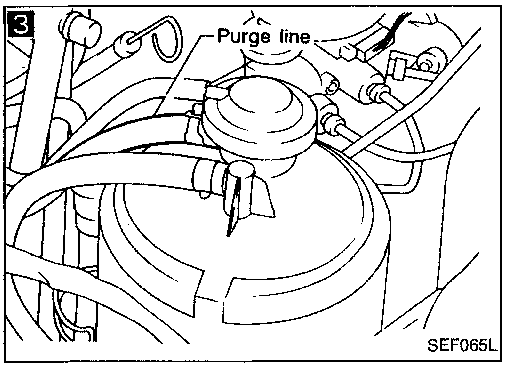
Yes → Replace heated oxygen sensor(s).

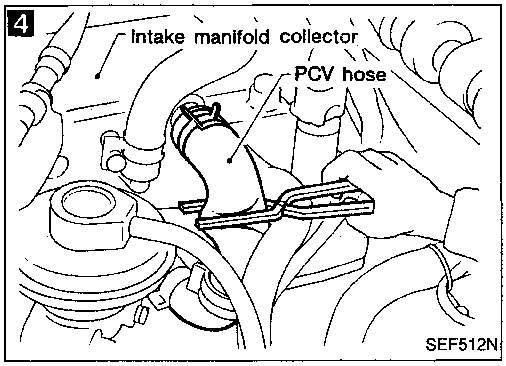
No ↓

Ⓐ

GI MA EM LC EF & EC FE CL MT AT TF PD FA RA BR ST BF HA EL IDX

Diagnostic Procedure 9 — Hesitation under Normal Conditions (Cont'd)





Ⓐ

3 **CHECK CANISTER PURGE.**
1. Disconnect canister purge line hose and plug hose.
2. Perform cruise test.
3. Does the hesitation disappear?

Yes → Check purge and vacuum lines.

No

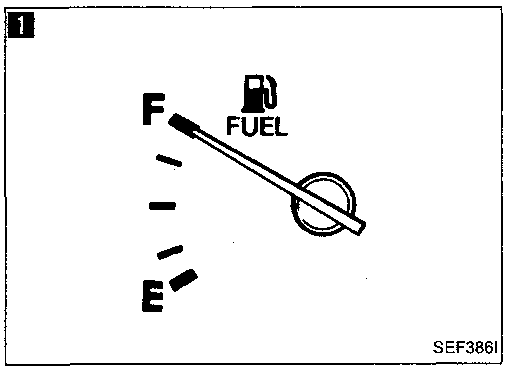
4 **CHECK FOR INTAKE AIR LEAK.**
When pinching blow-by hose (lowering the blow-by air supply), does the engine speed rise?

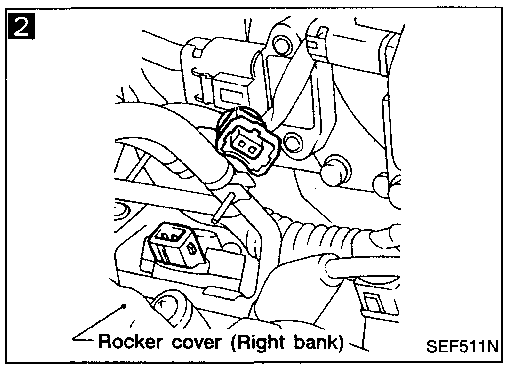
Yes → Discover air leak location and repair.

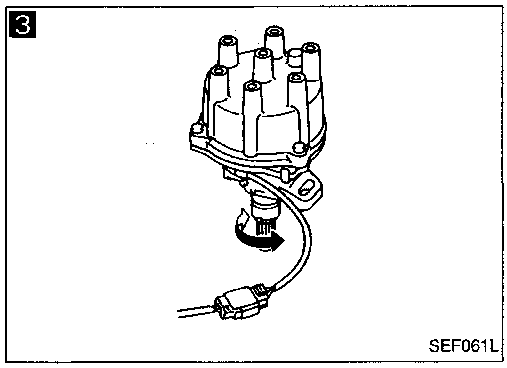
No

INSPECTION END

Diagnostic Procedure 10 — Engine Stalls when Turning







1 **CHECK FUEL LEVEL.**
Check to see that there is enough fuel in tank.

NG → Fill fuel tank with fuel.

OK

2 **PERFORM POWER BALANCE TEST.**
When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

No → Go to **5** .

Yes

3 **CHECK INJECTOR.**
1. Remove camshaft position sensor from engine. (Harness connector should remain connected.)
2. Turn ignition switch ON. (Do not start engine.)
3. When rotating camshaft position sensor shaft, does each injector make an operating sound?

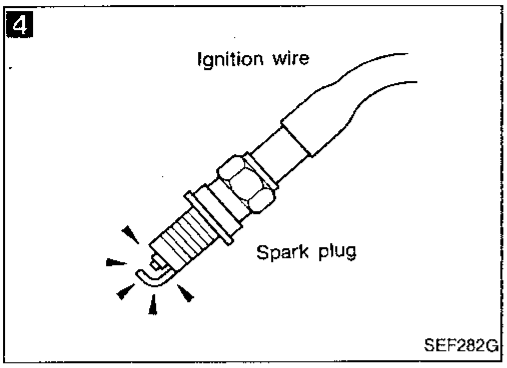
No → Check injector(s) and circuit(s).

Yes

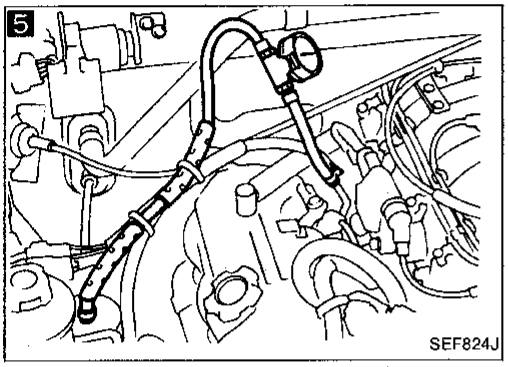
Ⓐ

Diagnostic Procedure 10 — Engine Stalls when Turning (Cont'd)

4



5



Ⓐ

4

CHECK IGNITION SPARK.
1. Disconnect spark plug cord.
2. Connect a known good spark plug to the spark plug cord.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

NG → Check ignition coil, ignition wire, power transistor unit and circuits. (See page EF & EC-90.)

OK ↓

5

CHECK FUEL PRESSURE.
1. Release fuel pressure to zero. (Refer to page EF & EC-139.)
2. Install fuel pressure gauge and check fuel pressure.

At idle:
Approx. 235 kPa
(2.4 kg/cm², 34 psi)
The moment throttle valve is fully open:
Approx. 294 kPa
(3.0 kg/cm², 43 psi)

NG → Check fuel pressure regulator diaphragm.

OK ↓

CHECK ECM HARNESS CONNECTOR.
Check the ECM pin terminals for damage or poor connection of ECM harness connector.

NG → Repair or replace.

OK ↓

Reconnect ECM harness connector and retest.

Trouble is not fixed. ↓

CHECK ECM POWER SUPPLY AND GROUND CIRCUIT.
Refer to page EF & EC-77.

NG → Repair or replace.

OK ↓

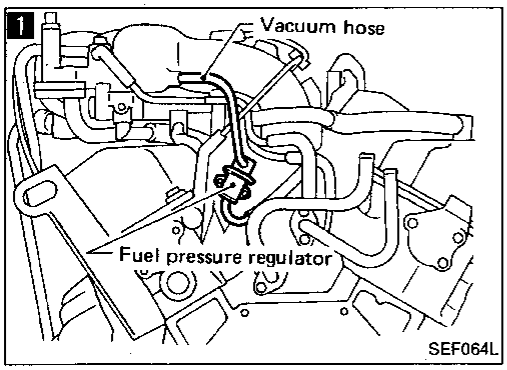
TRY A KNOWN GOOD ECM*.

INSPECTION END

*: ECM may be the cause of a problem, but this is rarely the case.

Diagnostic Procedure 11 — Engine Stalls when the Engine is Hot

1



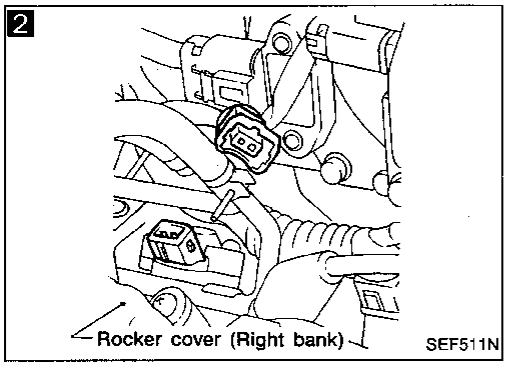
SEF064L

CHECK FUEL VAPOR.
1. Disconnect fuel pressure regulator vacuum hose and plug hose.
2. Perform cruise test.
3. Does the engine stall disappear?

Yes → Check fuel properties.

No ↓

2



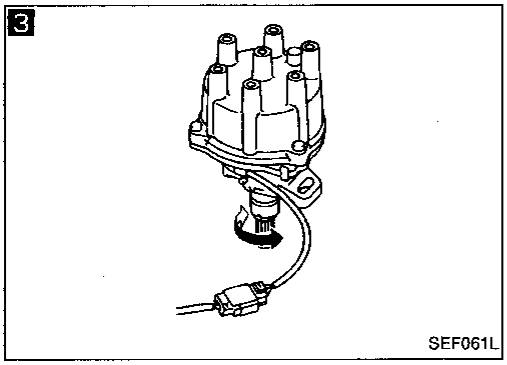
SEF511N

PERFORM POWER BALANCE TEST.
When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

No → Go to 5 .

Yes ↓

3

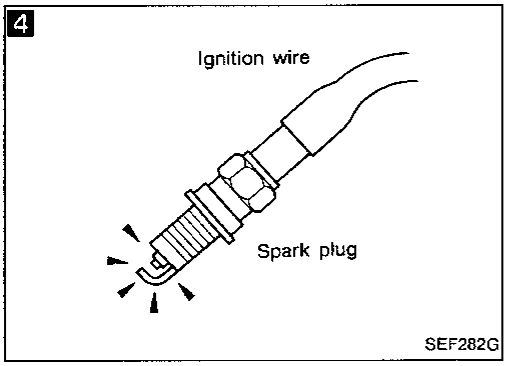

SEF061L

CHECK INJECTOR.
1. Remove camshaft position sensor from engine. (Harness connector should remain connected.)
2. Turn ignition switch ON. (Do not start engine.)
3. When rotating camshaft position sensor shaft, does each injector make an operating sound?

No → Check injector(s) and circuit(s).

Yes ↓

4



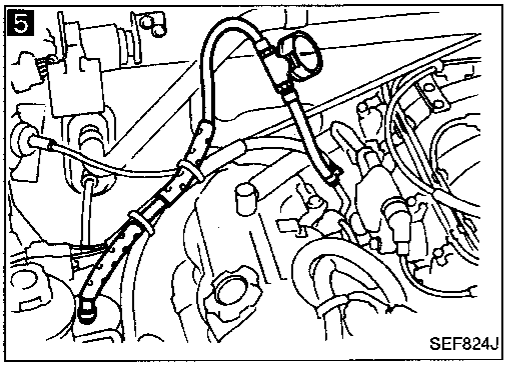
SEF282G

CHECK IGNITION SPARK.
1. Disconnect spark plug cord.
2. Connect a known good spark plug to the spark plug cord.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

NG → Check ignition coil, ignition wire, power transistor unit and their circuits. (See page EF & EC-90.)

OK ↓

5


SEF824J

CHECK FUEL PRESSURE.
1. Release fuel pressure to zero. (Refer to page EF & EC-139.)
2. Install fuel pressure gauge and check fuel pressure.

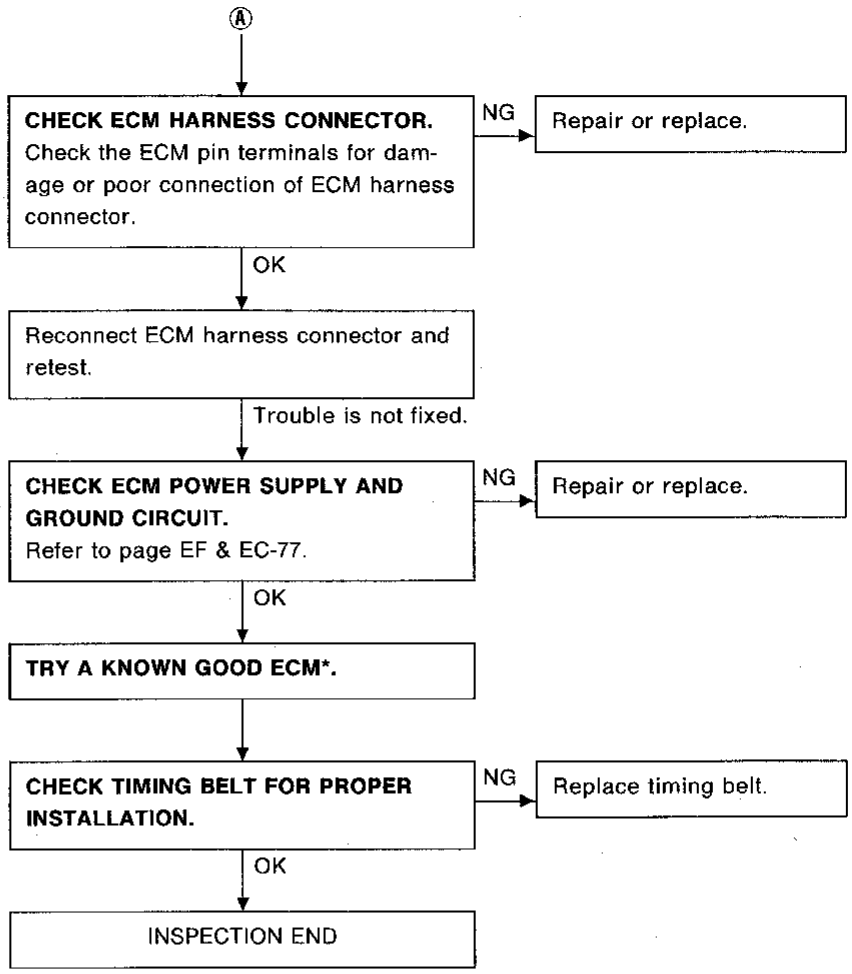
At idle:
Approx. 235 kPa
(2.4 kg/cm², 34 psi)
The moment throttle valve is fully open:
Approx. 294 kPa
(3.0 kg/cm², 43 psi)

NG → Check fuel pressure regulator diaphragm.

OK ↓

Ⓐ

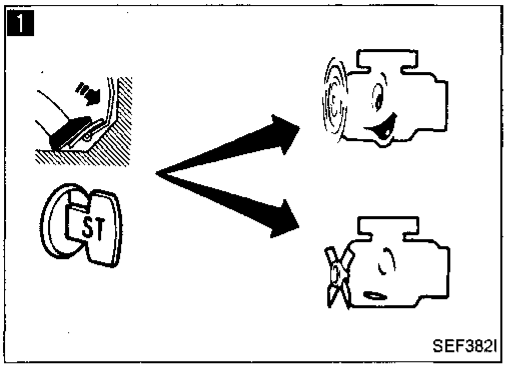
Diagnostic Procedure 11 — Engine Stalls when the Engine is Hot (Cont'd)



*: ECM may be the cause of a problem, but this is rarely the case.

Diagnostic Procedure 12 — Engine Stalls when the Engine is Cold

1



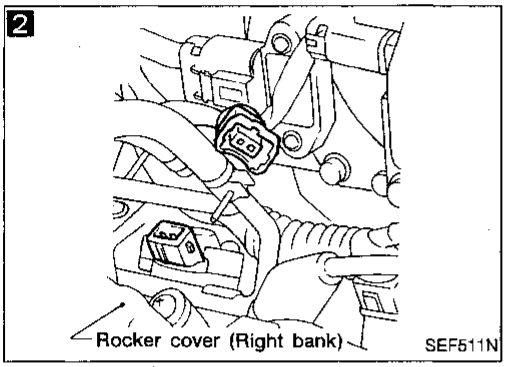
SEF382I

CHECK IACV-AIR REGULATOR AND IACV-AAC VALVE.
When the engine is cold, can you start the engine when pressing accelerator pedal fully?

NG → Check IACV-AAC valve, IACV-air regulator and circuits. (See pages EF & EC-117, 119.)

OK ↓

2



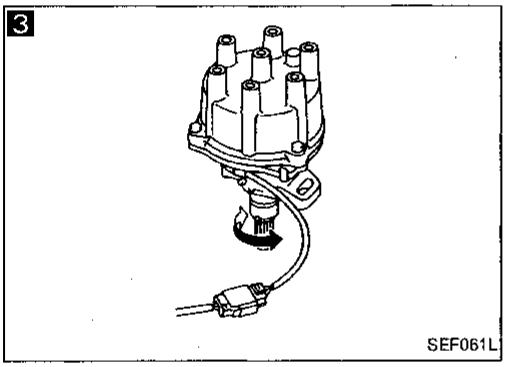
SEF511N

PERFORM POWER BALANCE TEST.
When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

NG → Go to 6 .

OK ↓

3

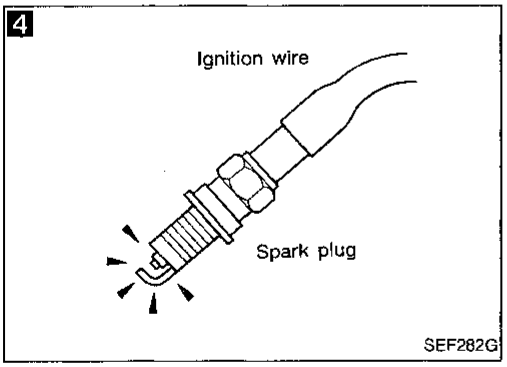

SEF061L

CHECK INJECTOR.
1. Remove camshaft position sensor from engine. (Harness connector should remain connected.)
2. Turn ignition switch ON. (Do not start engine.)
3. When rotating camshaft position sensor shaft, does each injector make an operating sound?

NG → Check injector(s) and circuit(s).

OK ↓

4



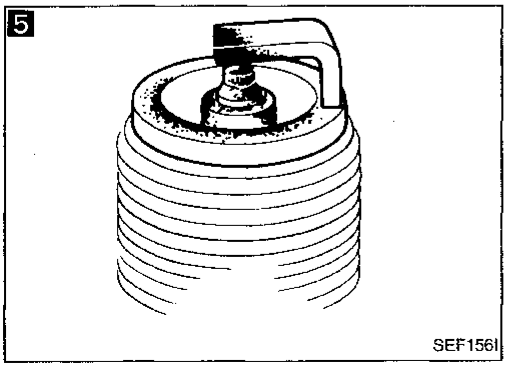
SEF282G

CHECK IGNITION SPARK.
1. Disconnect spark plug cord.
2. Connect a known good spark plug to the spark plug cord.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

NG → Check ignition coil, ignition wire, power transistor unit and circuits. (See page EF & EC-90.)

OK ↓

5


SEF156I

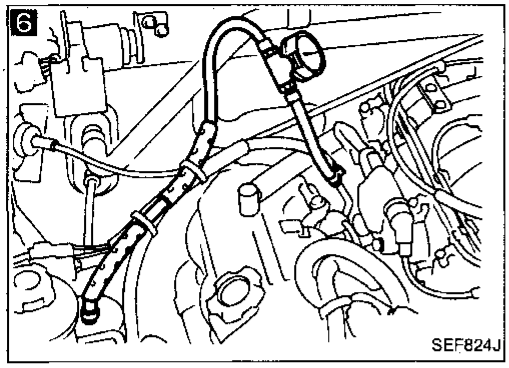
CHECK SPARK PLUGS.
Remove the spark plugs and check for fouling, etc.

NG → Repair or replace spark plug(s).

OK ↓

Ⓐ

Diagnostic Procedure 12 — Engine Stalls when the Engine is Cold (Cont'd)



Ⓐ

6

CHECK FUEL PRESSURE.
1. Release fuel pressure to zero. (Refer to page EF & EC-139.)
2. Install fuel pressure gauge and check fuel pressure.

At idle:
Approx. 235 kPa
(2.4 kg/cm², 34 psi)
The moment throttle valve is fully open:
Approx. 294 kPa
(3.0 kg/cm², 43 psi)

NG → Check fuel pressure regulator diaphragm.

OK ↓

CHECK ECM HARNESS CONNECTOR.
Check the ECM pin terminals for damage or poor connection of ECM harness connector.

NG → Repair or replace.

OK ↓

Reconnect ECM harness connector and retest.

Trouble is not fixed. ↓

CHECK ECM POWER SUPPLY AND GROUND CIRCUIT.
Refer to page EF & EC-77.

NG → Repair or replace.

OK ↓

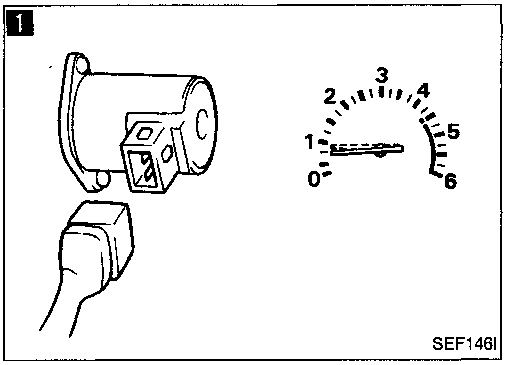
TRY A KNOWN GOOD ECM*.

INSPECTION END

*: ECM may be the cause of a problem, but this is rarely the case.

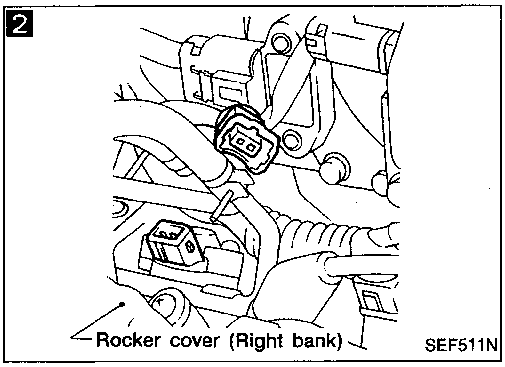
Diagnostic Procedure 13 — Engine Stalls when Stepping on the Accelerator Momentarily

1



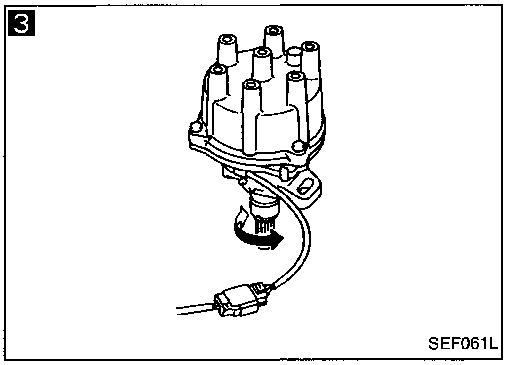
SEF146I

2

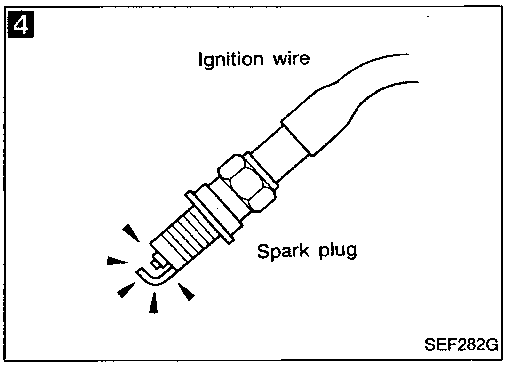


SEF511N

3

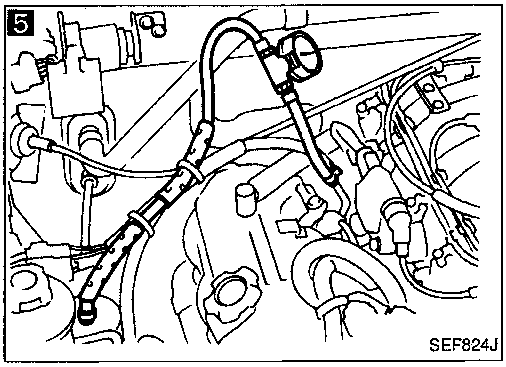

SEF061L

4



SEF282G

5


SEF824J

1

CHECK IACV-AAC VALVE.
When disconnecting IACV-AAC valve harness connector, does the engine speed drop?

No → Check IACV-AAC valve and circuit. (See page EF & EC-119.)

Yes ↓

2

PERFORM POWER BALANCE TEST.
When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

No → Go to **5** .

Yes ↓

3

CHECK INJECTOR.
1. Remove camshaft position sensor from engine. (Harness connector should remain connected.)
2. Turn ignition switch ON. (Do not start engine.)
3. When rotating camshaft position sensor shaft, does each injector make an operating sound?

No → Check injector(s) and their circuit(s).

Yes ↓

4

CHECK IGNITION SPARK.
1. Disconnect spark plug cord.
2. Connect a known good spark plug to the spark plug cord.
3. Place end of spark plug against an earth point with engine cranking.
4. Check for spark.

NG → Check ignition coil, ignition wire, power transistor unit and their circuits. (See page EF & EC-90.)

OK ↓

5

CHECK FUEL PRESSURE.
1. Release fuel pressure to zero. (Refer to page EF & EC-139.)
2. Install fuel pressure gauge and check fuel pressure.

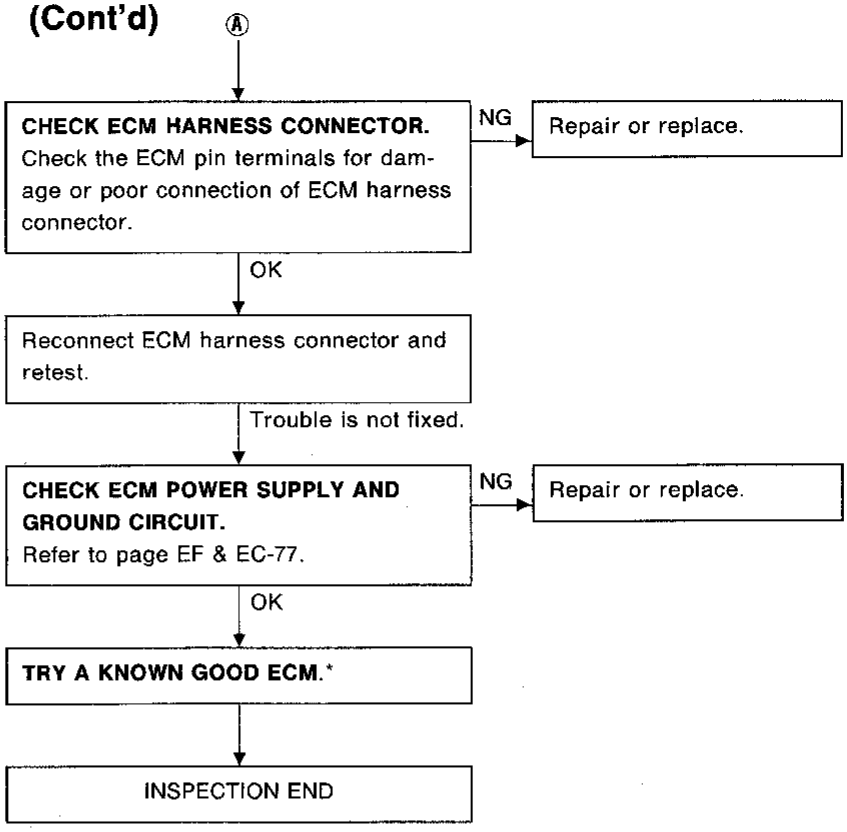
At idle:
Approx. 235 kPa
(2.4 kg/cm², 34 psi)
The moment throttle valve is fully open:
Approx. 294 kPa
(3.0 kg/cm², 43 psi)

NG → Check fuel pressure regulator diaphragm.

OK ↓

Ⓐ

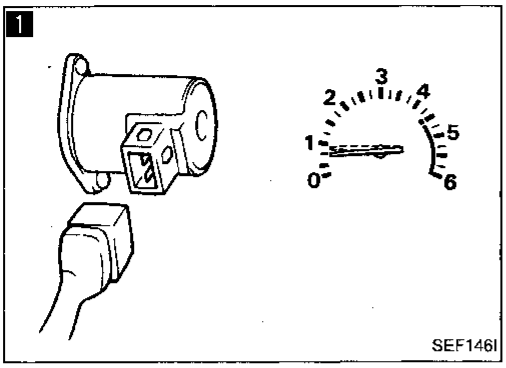
Diagnostic Procedure 13 — Engine Stalls when Stepping on the Accelerator Momentarily (Cont'd)



*: ECM may be the cause of a problem, but this is rarely the case.

Diagnostic Procedure 14 — Engine Stalls after Decelerating

1



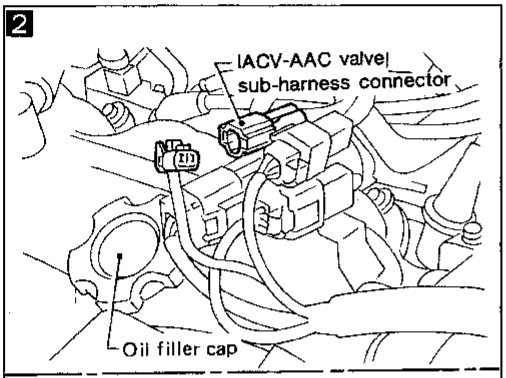
SEF146I

CHECK IACV-AAC VALVE.
When disconnecting IACV-AAC valve harness connector, does the engine speed drop?

No → Check IACV-AAC valve and circuit. (See page EF & EC-119.)

Yes ↓

2

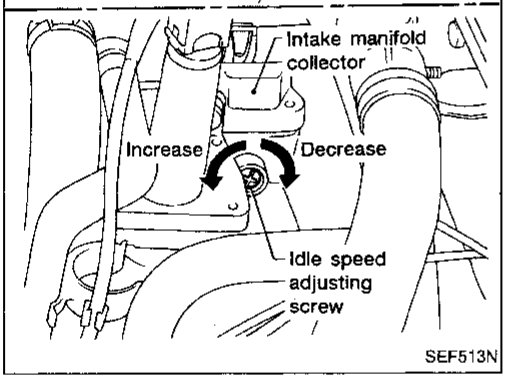


CHECK IDLE ADJ. SCREW CLOGGING.
1. Disconnect IACV-AAC valve harness connector.
2. Can you set engine speed as follows by turning idle adjusting screw?
   700±50 rpm
   [in "N" position]

No → Check for IACV-AAC valve clogging or throttle body clogging.

Yes ↓

3



SEF513N

PERFORM POWER BALANCE TEST.
When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

No → Go to 6 .

Yes ↓

4

CHECK INJECTOR.
1. Remove camshaft position sensor from engine. (Harness connector should remain connected.)
2. Turn ignition switch ON. (Do not start engine.)
3. When rotating camshaft position sensor shaft, does each injector make an operating sound?

No → Check injector(s) and circuit(s).

Yes ↓

5

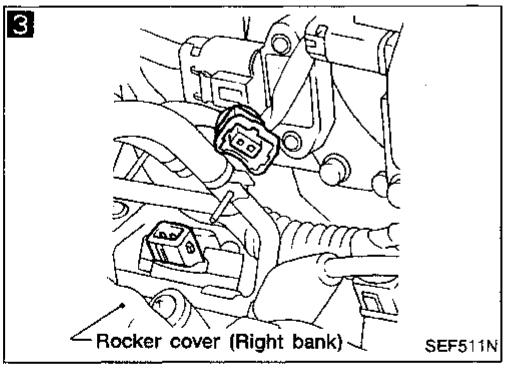
CHECK IGNITION SPARK.
1. Disconnect spark plug cord.
2. Connect a known good spark plug to the spark plug cord.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

NG → Check ignition coil, ignition wire, power transistor unit and circuits. (See page EF & EC-90.)

OK ↓

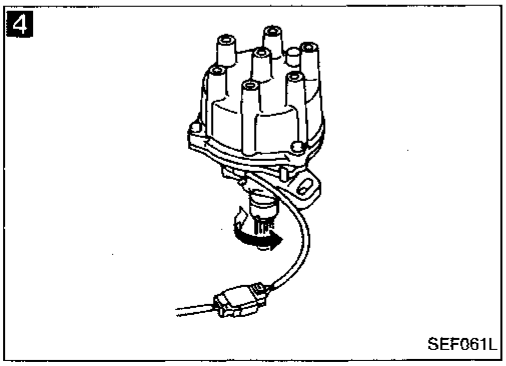
Ⓐ

3



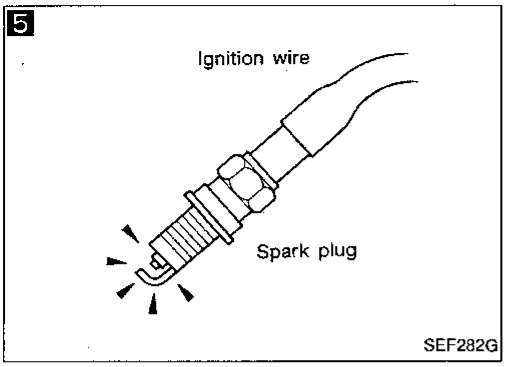
SEF511N

4

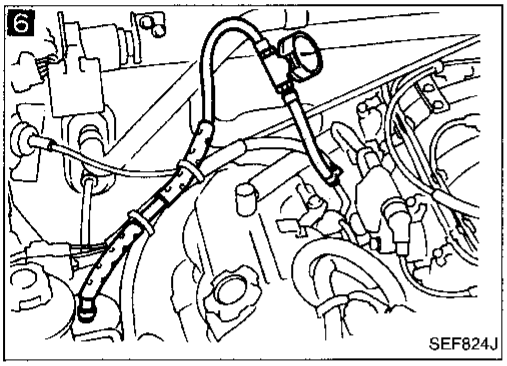

SEF061L

Diagnostic Procedure 14 — Engine Stalls after Decelerating (Cont'd)

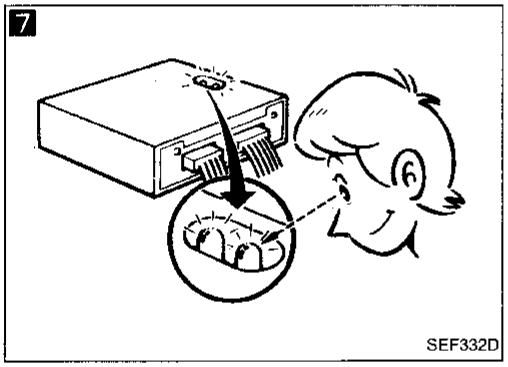
5



6



7



Ⓐ

6

CHECK FUEL PRESSURE.
1. Release fuel pressure to zero. (Refer to page EF & EC-139.)
2. Install fuel pressure gauge and check fuel pressure.

At idle:
Approx. 235 kPa (2.4 kg/cm², 34 psi)
The moment throttle valve is fully open:
Approx. 294 kPa (3.0 kg/cm², 43 psi)

NG → Check fuel pressure regulator diaphragm.

OK ↓

7

CHECK HEATED OXYGEN SENSOR.
1. Set "Self-diagnostic function" in Diagnostic Test Mode I. (See page EF & EC-36.)
2. Maintaining engine at 2,000 rpm under no load, check to see that GREEN LED on the ECM goes ON and OFF more than 5 times during 10 seconds.

NG → Replace heated oxygen sensor.

OK ↓

CHECK ECM HARNESS CONNECTOR.
Check the ECM pin terminals for damage or poor connection of ECM harness connector.

NG → Repair or replace.

OK ↓

Reconnect ECM harness connector and retest.

Trouble is not fixed. ↓

CHECK ECM POWER SUPPLY AND GROUND CIRCUIT.
Refer to page EF & EC-77.

NG → Repair or replace.

OK ↓

TRY A KNOWN GOOD ECM.*

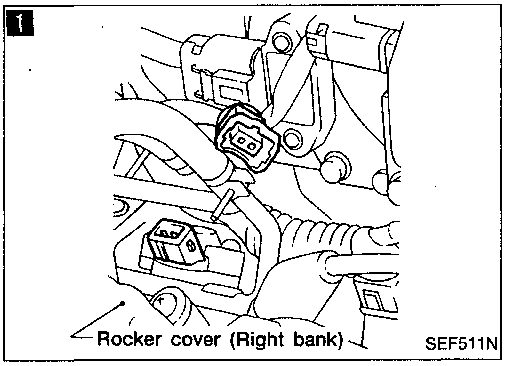
↓

INSPECTION END

*: ECM may be the cause of a problem, but this is rarely the case.

Diagnostic Procedure 15 — Engine Stalls when Accelerating or Cruising

1

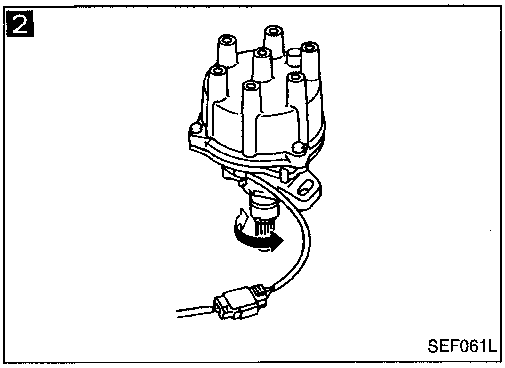


PERFORM POWER BALANCE TEST.
When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

No → Go to 4 .

Yes ↓

2

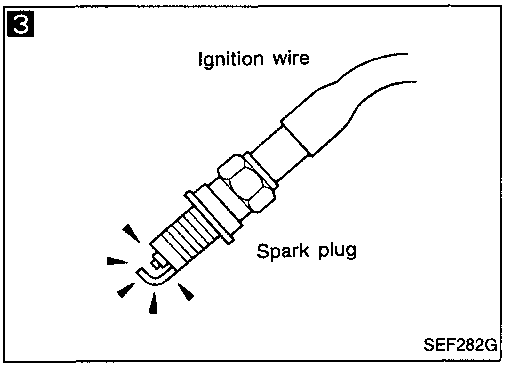


CHECK INJECTOR.
1. Remove camshaft position sensor from engine. (Harness connector should remain connected.)
2. Turn ignition switch ON. (Do not start engine.)
3. When rotating camshaft position sensor shaft, does each injector make an operating sound?

No → Check injector(s) and circuit(s).

Yes ↓

3

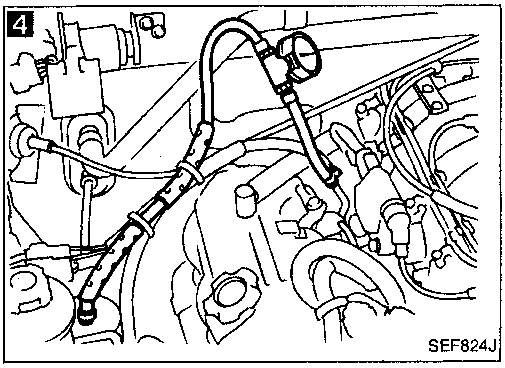


CHECK IGNITION SPARK.
1. Disconnect spark plug cord.
2. Connect a known good spark plug to the spark plug cord.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

NG → Check ignition coil, ignition wire, power transistor unit and circuits. (See page EF & EC-90.)

OK ↓

4



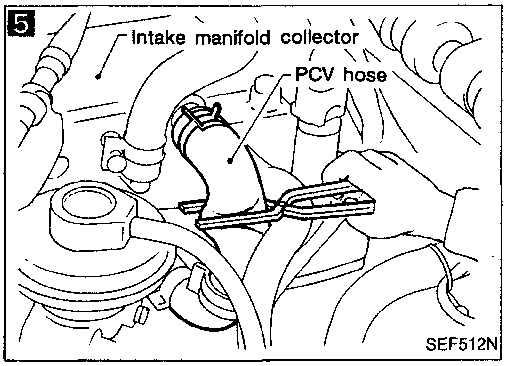
CHECK FUEL PRESSURE.
1. Release fuel pressure to zero. (Refer to page EF & EC-139.)
2. Install fuel pressure gauge and check fuel pressure.

At idle:
Approx. 235 kPa
(2.4 kg/cm², 34 psi)
The moment throttle valve is fully open:
Approx. 294 kPa
(3.0 kg/cm², 43 psi)

NG → Check fuel pump, circuit and fuel pressure regulator.

OK ↓

5



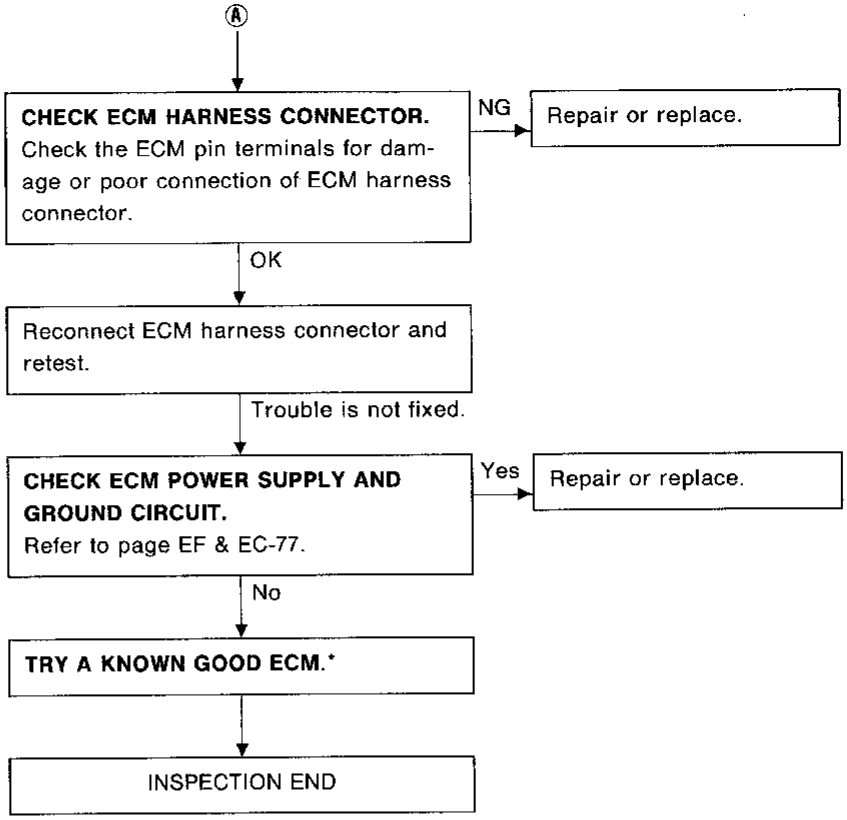
CHECK FOR INTAKE AIR LEAK.
When pinching blow-by hose (lowering the blow-by air supply), does the engine speed rise?

Yes → Discover air leak location and repair.

No ↓

Ⓐ

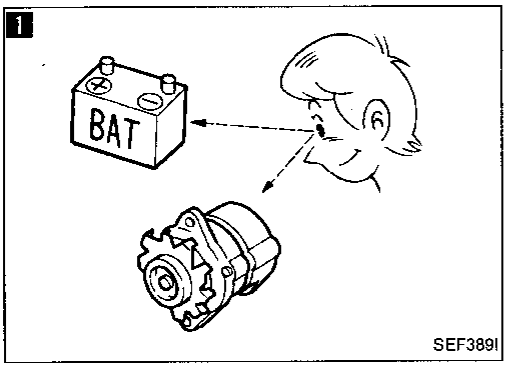
Diagnostic Procedure 15 — Engine Stalls when Accelerating or Cruising (Cont'd)



*: ECM may be the cause of a problem, but this is rarely the case.

Diagnostic Procedure 16 — Engine Stalls when the Electrical Load is Heavy

1



SEF389I

CHECK BATTERY AND ALTERNATOR.
Check battery and alternator condition. (Refer to EL section.)

NG → Repair or replace.

OK ↓

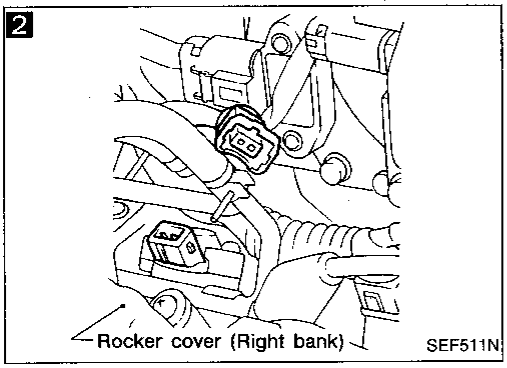
2

PERFORM POWER BALANCE TEST.
When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

No → Go to 5 .

Yes ↓

2



SEF511N

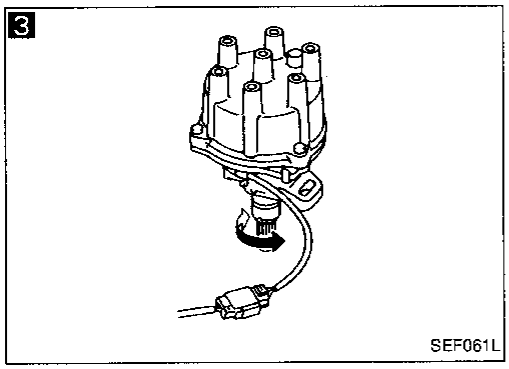
3

CHECK INJECTOR.
1. Remove camshaft position sensor from engine. (Harness connector should remain connected.)
2. Turn ignition switch ON. (Do not start engine.)
3. When rotating camshaft position sensor shaft, does each injector make an operating sound?

No → Check injector(s) and circuit(s).

Yes ↓

3


SEF061L

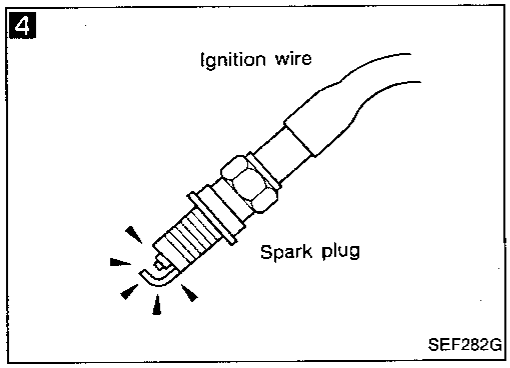
4

CHECK IGNITION SPARK.
1. Disconnect spark plug cord.
2. Connect a known good spark plug to the spark plug cord.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

NG → Check ignition coil, ignition wire, power transistor unit and circuits. (See page EF & EC-90.)

OK ↓

4



SEF282G

5

CHECK FUEL PRESSURE.
1. Release fuel pressure to zero. (Refer to page EF & EC-139.)
2. Install fuel pressure gauge and check fuel pressure.

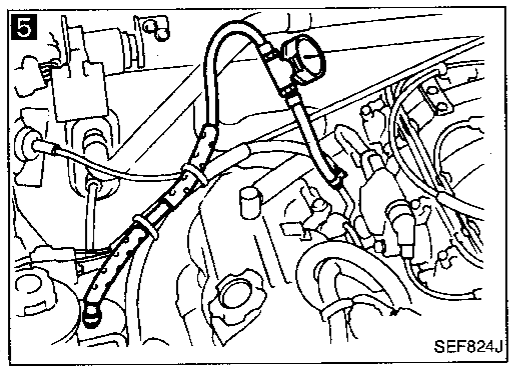
At idle:
Approx. 235 kPa
(2.4 kg/cm², 34 psi)
The moment throttle valve is fully open:
Approx. 294 kPa
(3.0 kg/cm², 43 psi)

NG → Check fuel pressure regulator diaphragm.

OK ↓

Ⓐ

5


SEF824J

Diagnostic Procedure 16 — Engine Stalls when the Electrical Load is Heavy (Cont'd)

Ⓐ

CHECK ECM HARNESS CONNECTOR.
Check the ECM pin terminals for damage or poor connection of ECM harness connector.
NG → Repair or replace.

OK

Reconnect ECM harness connector and retest.

Trouble is not fixed.

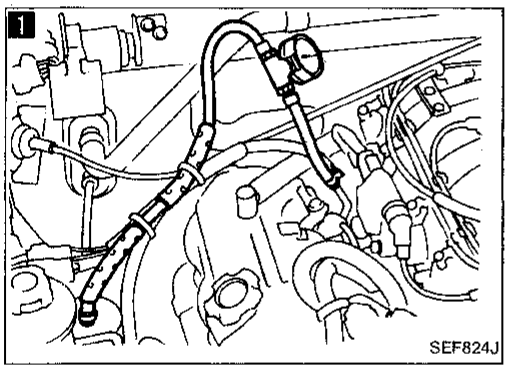
CHECK ECM POWER SUPPLY AND GROUND CIRCUIT.
Refer to page EF & EC-77.
NG → Repair or replace.

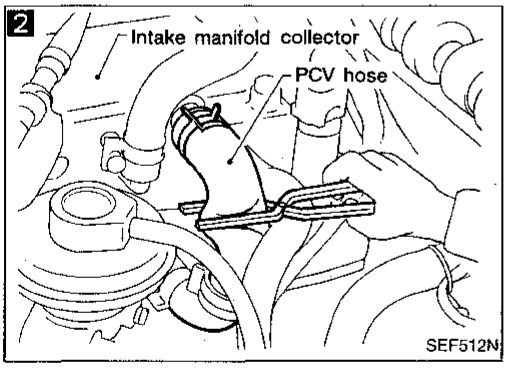
OK

TRY A KNOWN GOOD ECM.*

INSPECTION END

*: ECM may be the cause of a problem, but this is rarely the case.





Diagnostic Procedure 17 — Lack of Power and Stumble

1

CHECK FUEL PRESSURE.
1. Release fuel pressure to zero. (Refer to page EF & EC-139.)
2. Install fuel pressure gauge and check fuel pressure.

At idle:
Approx. 235 kPa (2.4 kg/cm², 34 psi)
The moment throttle valve is fully open:
Approx. 294 kPa (3.0 kg/cm², 43 psi)

NG → Check fuel pressure regulator diaphragm.

OK

2

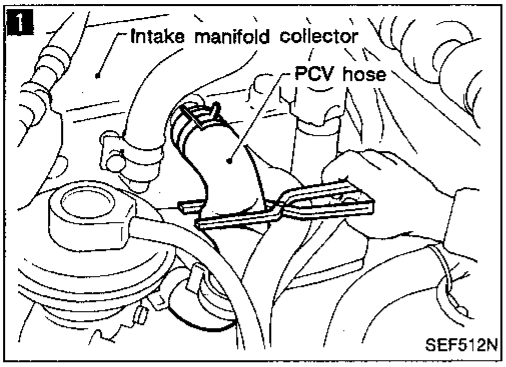
CHECK FOR INTAKE AIR LEAK.
When pinching blow-by hose (lowering the blow-by air supply), does the engine speed rise?
Yes → Discover air leak location and repair.

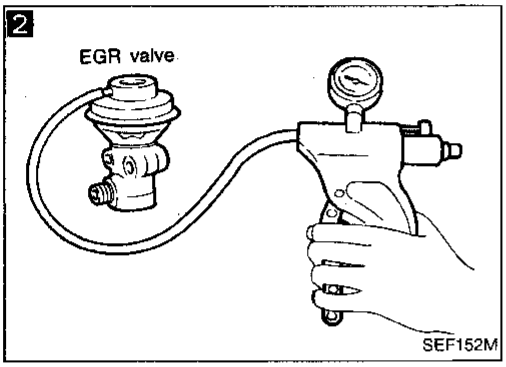
No

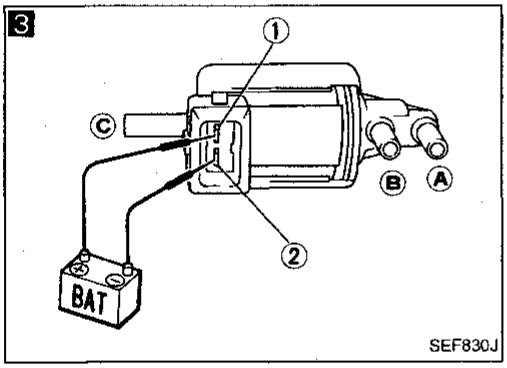
CHECK TIMING BELT FOR PROPER INSTALLATION.
NG → Replace timing belt.

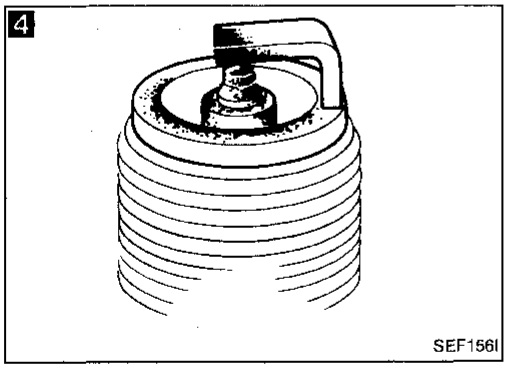
OK

INSPECTION END









Diagnostic Procedure 18 — Knock

1

CHECK FOR INTAKE AIR LEAK.
When pinching blow-by hose (lowering the blow-by air supply), does the engine speed rise?

Yes → Discover air leak location and repair.

No ↓

2

CHECK EGR OPERATION.
1. Apply vacuum directly to the EGR valve using a handy vacuum pump.
2. Check to see that the engine runs rough or dies.

No → Check EGR valve for sticking.

Yes ↓

3

CHECK EGRC-SOLENOID VALVE.
1. Disconnect EGRC-solenoid valve harness connector.
2. Supply EGRC-solenoid valve terminals with battery current and check operating sound.

NG → Check solenoid valve and circuit.

OK ↓

4

CHECK VACUUM HOSES.
Check the following vacuum hoses for clogging, cracks and poor connection.
a) Vacuum hose between EGR valve and EGRC-solenoid valve.
b) Vacuum hose between EGRC-solenoid valve and throttle body port.
c) Vacuum hose between EGRC-solenoid valve and air duct.

NG → Repair or replace.

OK ↓

CHECK FOR OIL LEAK TO COMBUSTION CHAMBER.
Remove spark plugs and check for fouling with oil.

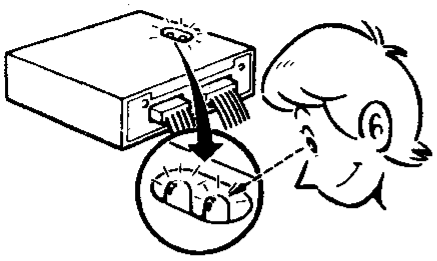
Yes → Check pistons, piston rings, valves, valve seats, valve oil seal, engine oil level, etc.

No ↓

INSPECTION END

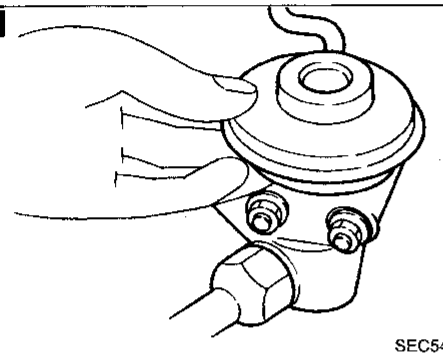
Diagnostic Procedure 19 — Surge

1



SEF332D

2



SEC547A

1

CHECK HEATED OXYGEN SENSOR.
1. Set "On-board diagnostic system function" in Diagnostic Test Mode I. (See page EF & EC-36.)
2. Maintaining engine at 2,000 rpm under no load, check to see that GREEN LED on the ECM goes ON and OFF more than 5 times during 10 seconds.

NG → Replace heated oxygen sensor.

OK ↓

2

CHECK EGR VALVE.
Check EGR valve for sticking.

NG → Repair or replace.

OK ↓

CHECK ECM HARNESS CONNECTOR.
Check the ECM pin terminals for damage or poor connection of ECM harness connector.

OK ↓

Reconnect ECM harness connector and retest.

Trouble is not fixed. ↓

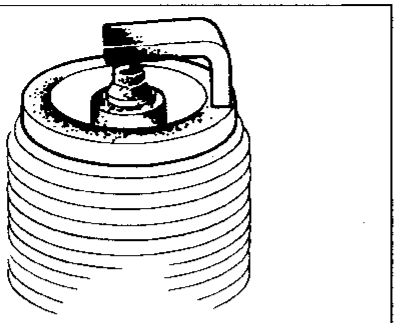
TRY A KNOWN GOOD ECM.*

OK ↓

INSPECTION END

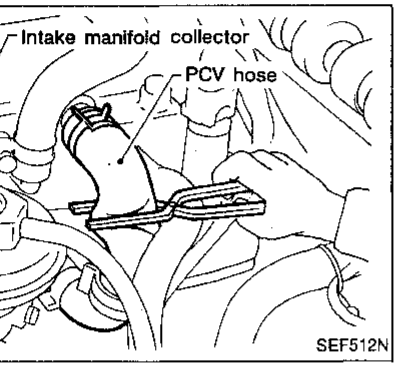
*: ECM may be the cause of a problem, but this is rarely the case.

1



SEF156I

2



SEF512N

Diagnostic Procedure 20 — Backfire through the Intake

1

CHECK SPARK PLUGS.
Remove the spark plugs and check for fouling, etc.

NG → Repair or replace spark plug(s).

OK ↓

2

CHECK INTAKE AIR LEAK.
When pinching blow-by hose (lowering the blow-by air supply), does the engine speed rise?

Yes → Discover air leak location and repair.

No ↓

CHECK FOR INTAKE VALVE DEPOSITS.
If there are deposits on intake valves, remove them.

↓

INSPECTION END

Diagnostic Procedure 21 — Backfire through the Exhaust

CHECK ENGINE COOLANT TEMPERATURE SENSOR.
Check engine coolant temperature sensor and its circuit. (See page EF & EC-86.)

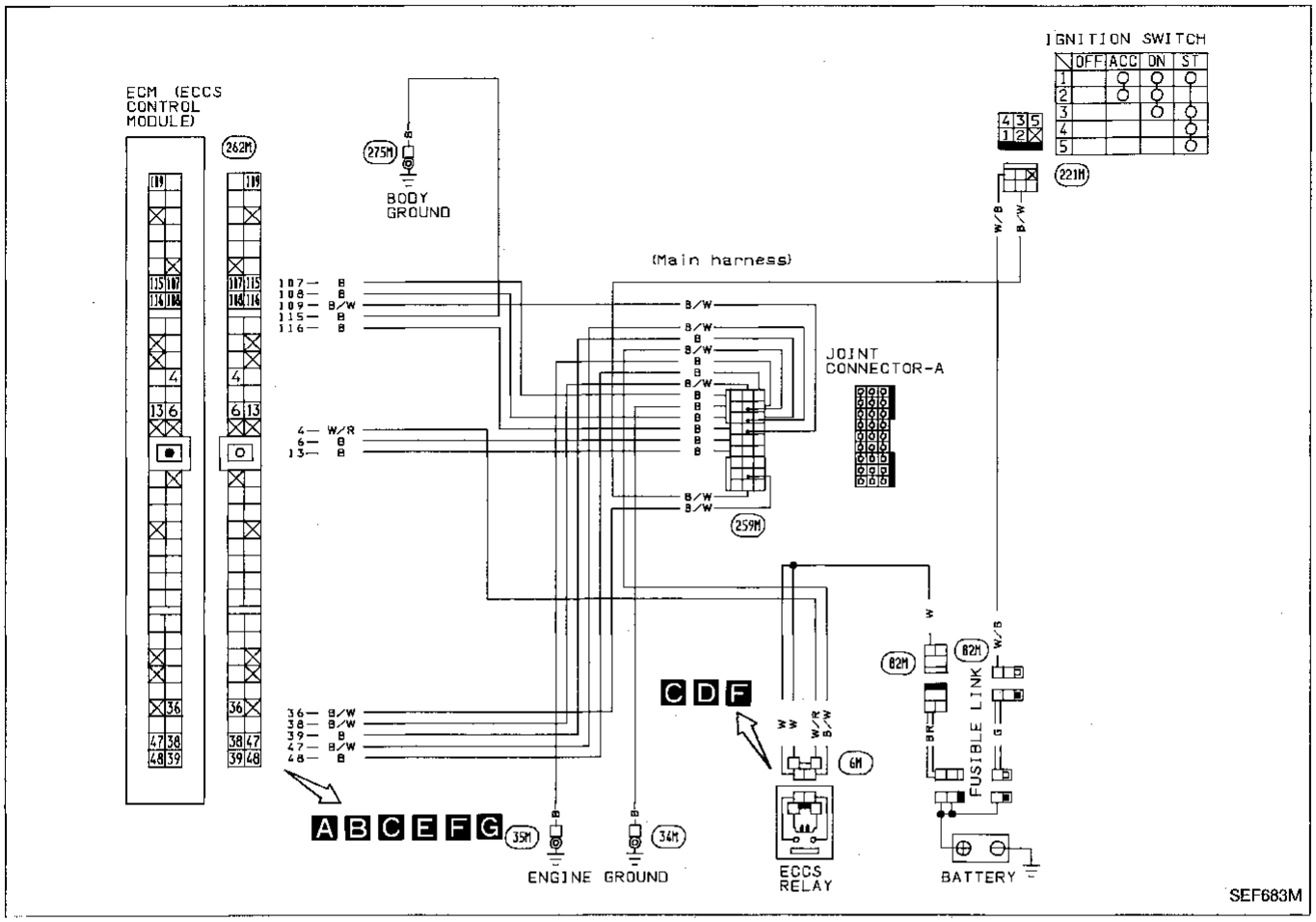
NG → Replace or repair.

OK ↓

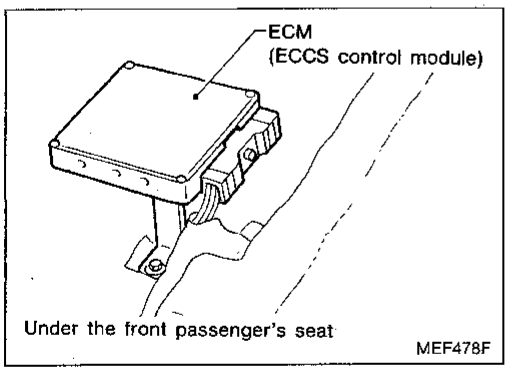
INSPECTION END

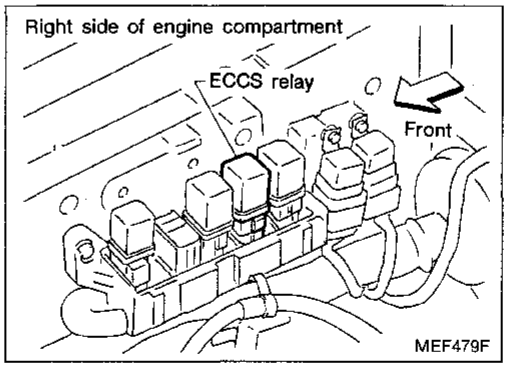
Diagnostic Procedure 22

MAIN POWER SUPPLY AND GROUND CIRCUIT (Not self-diagnostic item)



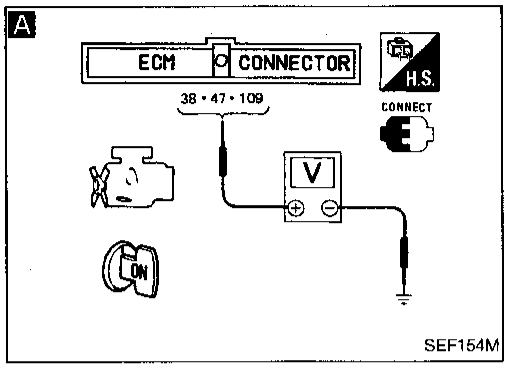
Harness layout



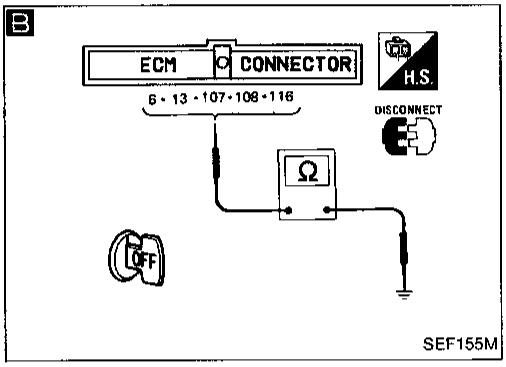


Diagnostic Procedure 22 (Cont'd)

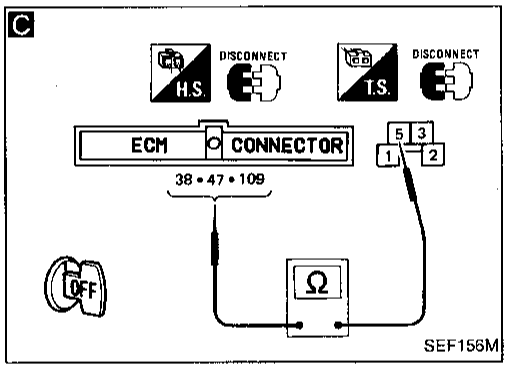
A



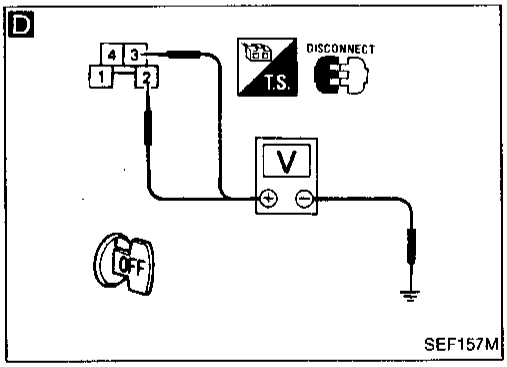
B



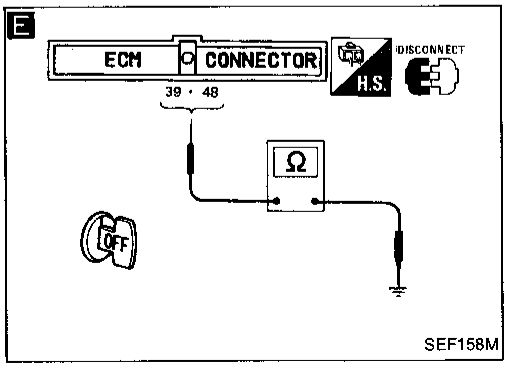
C



D



E



INSPECTION START

A

CHECK POWER SUPPLY.
1) Turn ignition switch "ON".
2) Check voltage between ECM terminals ㊳, ㊼, ㉙ and ground.
Voltage: Battery voltage

OK → **B**

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect ECM harness connector.
3) Check harness continuity between ECM terminals ⑥, ⑬, ㉗, ㉘, ㉜ and ground.
Continuity should exist.
If NG, repair harness or connectors.

OK → Check ECM pin terminals for damage or the connection of ECM harness connector.

NG

C

CHECK HARNESS CONTINUITY BETWEEN ECCS RELAY AND ECM.
1) Turn ignition switch "OFF".
2) Disconnect ECM harness connector.
3) Disconnect ECCS relay.
4) Check harness continuity between ECM terminals ㊳, ㊼, ㉙ and terminal ⑤.
Continuity should exist.

NG → Check the following.
- Joint connector-A (259M)
- Harness continuity between ECM and ECCS relay

If NG, repair harness or connectors.

OK

D

CHECK VOLTAGE BETWEEN ECCS RELAY AND GROUND.
1) Check voltage between terminals ②, ③ and ground.
Voltage: Battery voltage

NG → Check the following.
- "BR" fusible link
- Harness continuity between ECCS relay and battery

If NG, repair harness or connectors.

OK

E

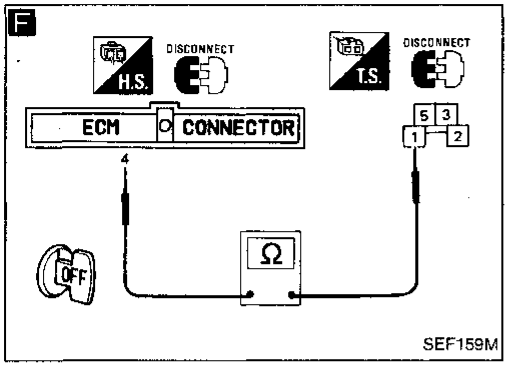
CHECK GROUND CIRCUIT.
1) Check harness continuity between ECM terminals ㊴, ㊽ and engine ground.
Continuity should exist.

NG → Repair harness or connectors.

OK → Ⓐ

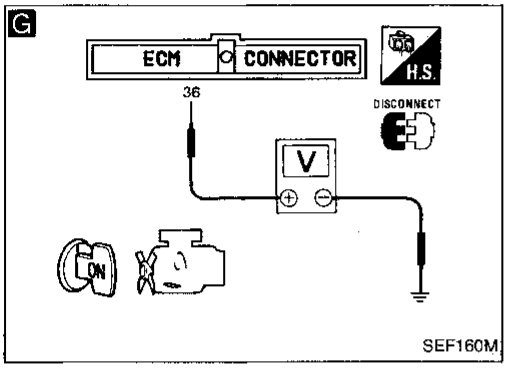
Diagnostic Procedure 22 (Cont'd)

F



SEF159M

G



SEF160M

Ⓐ

F

CHECK OUTPUT SIGNAL CIRCUIT.
1) Check harness continuity between ECM terminal ④ and terminal ①.
Continuity should exist.

NG → Repair harness or connectors.

OK

G

CHECK INPUT SIGNAL CIRCUIT.
1) Turn ignition switch "ON".
2) Check voltage between ECM terminal ㊱ and ground.
Voltage: Battery voltage

NG → Check the following.
- Joint connector-A (259M)
- Harness continuity between ignition switch and ECM

If NG, repair harness or connectors.

OK

CHECK COMPONENT (ECCS relay).
Refer to "Electrical Components Inspection". (See page EF & EC-138.)

NG → Replace ECCS relay.

OK

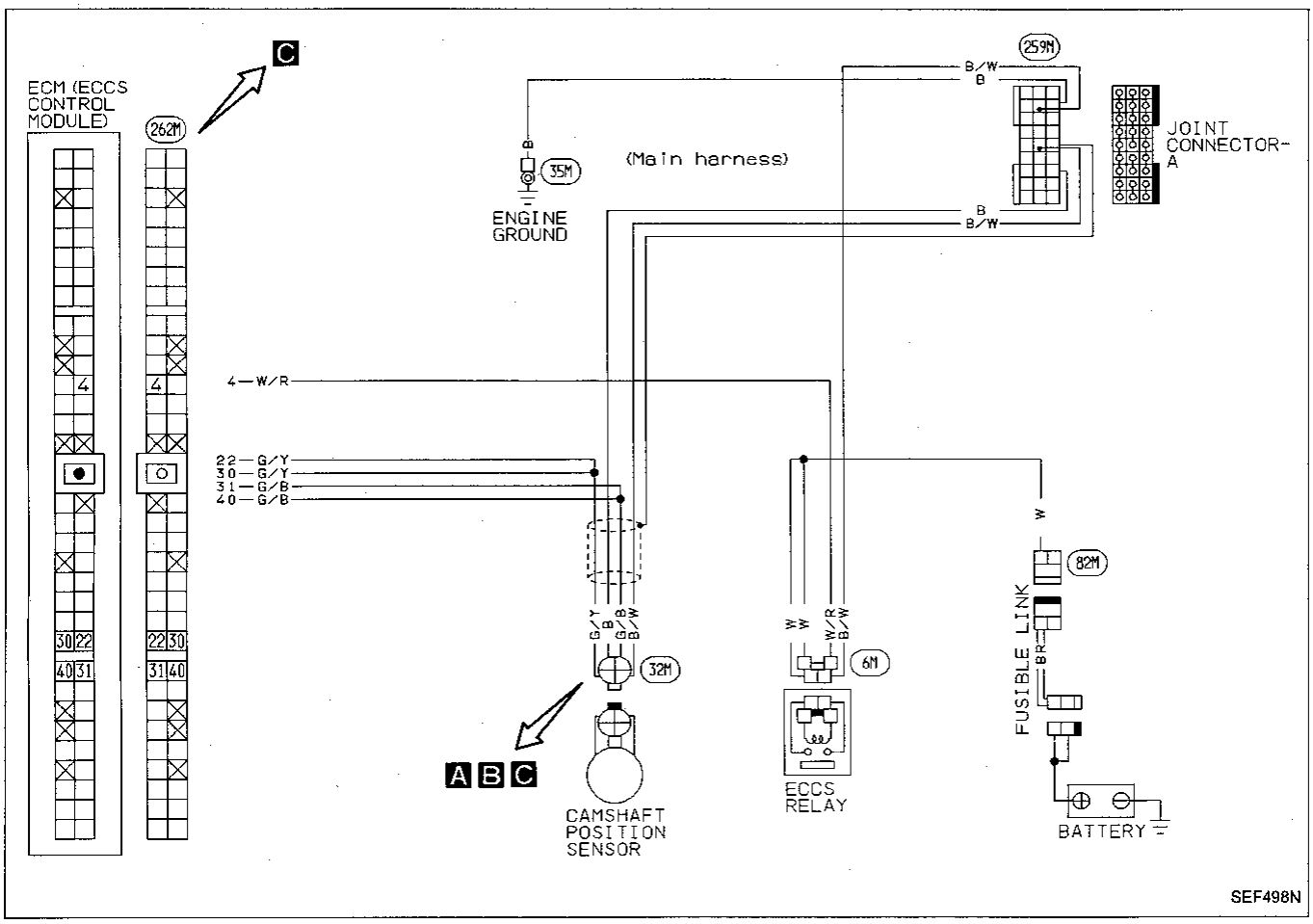
Disconnect and reconnect harness connectors in the circuit, and retest.

Trouble is not fixed.

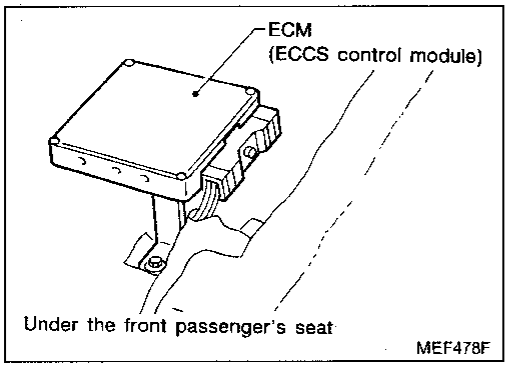
Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

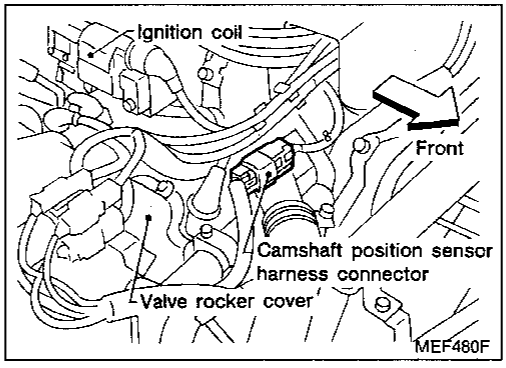
Diagnostic Procedure 23

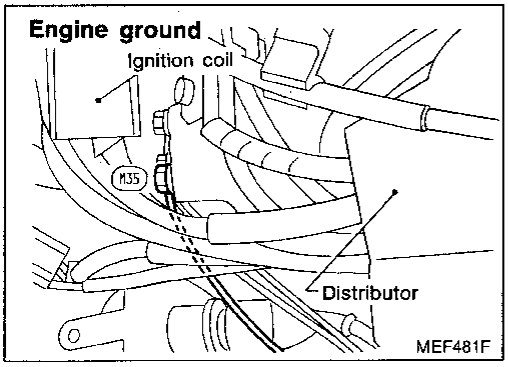
CAMSHAFT POSITION SENSOR (Diagnostic trouble code No. 11)



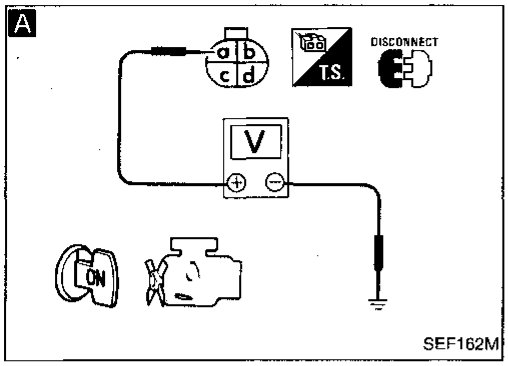
Harness layout

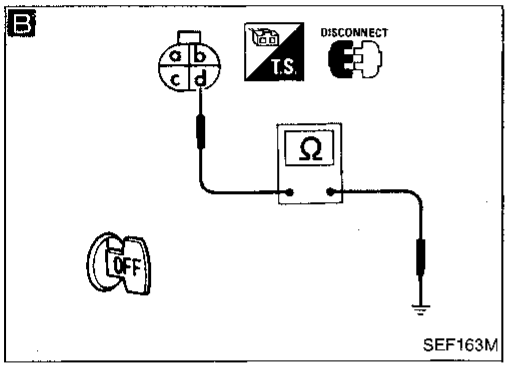


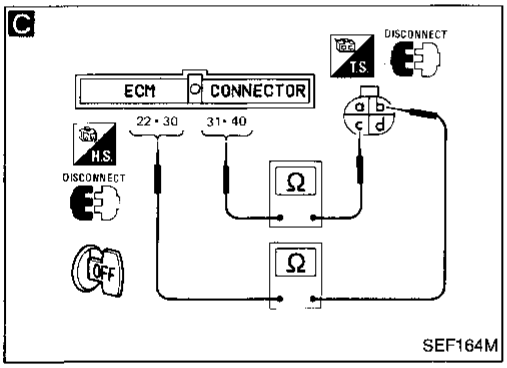




Diagnostic Procedure 23 (Cont'd)







INSPECTION START

A

CHECK POWER SUPPLY.
1) Disconnect camshaft position sensor harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓐ and ground.
Voltage: Battery voltage

NG → Check the following.
- Joint connector-A (259M)
- Harness continuity between camshaft position sensor and ECCS relay

If NG, repair harness or connectors.

OK ↓

B

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Loosen and retighten ground screw.
3) Check harness continuity between terminal ⓓ and engine ground.
Continuity should exist.

NG → Check the following.
- Joint connector-A (259M)
- Harness continuity between camshaft position sensor and ground

If NG, repair harness or connectors.

OK ↓

C

CHECK INPUT SIGNAL CIRCUIT.
1) Disconnect ECM harness connector.
2) Check harness continuity between terminal ⓒ and ECM terminals ㉛, ㊵ (1° signal), terminal ⓑ and ECM terminals ㉒, ㉚ (120° signal).
Continuity should exist.

NG → Repair harness or connectors.

OK ↓

CHECK COMPONENT
(Camshaft position sensor).
Refer to "Electrical Components Inspection".
(See page EF & EC-133.)

NG → Replace camshaft position sensor.

OK ↓

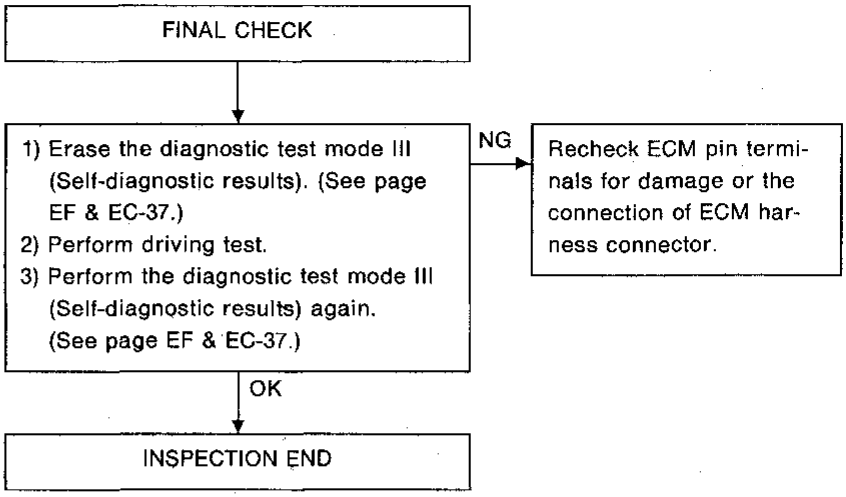
Disconnect and reconnect harness connectors in the circuit, and retest.

Trouble is not fixed. ↓

Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

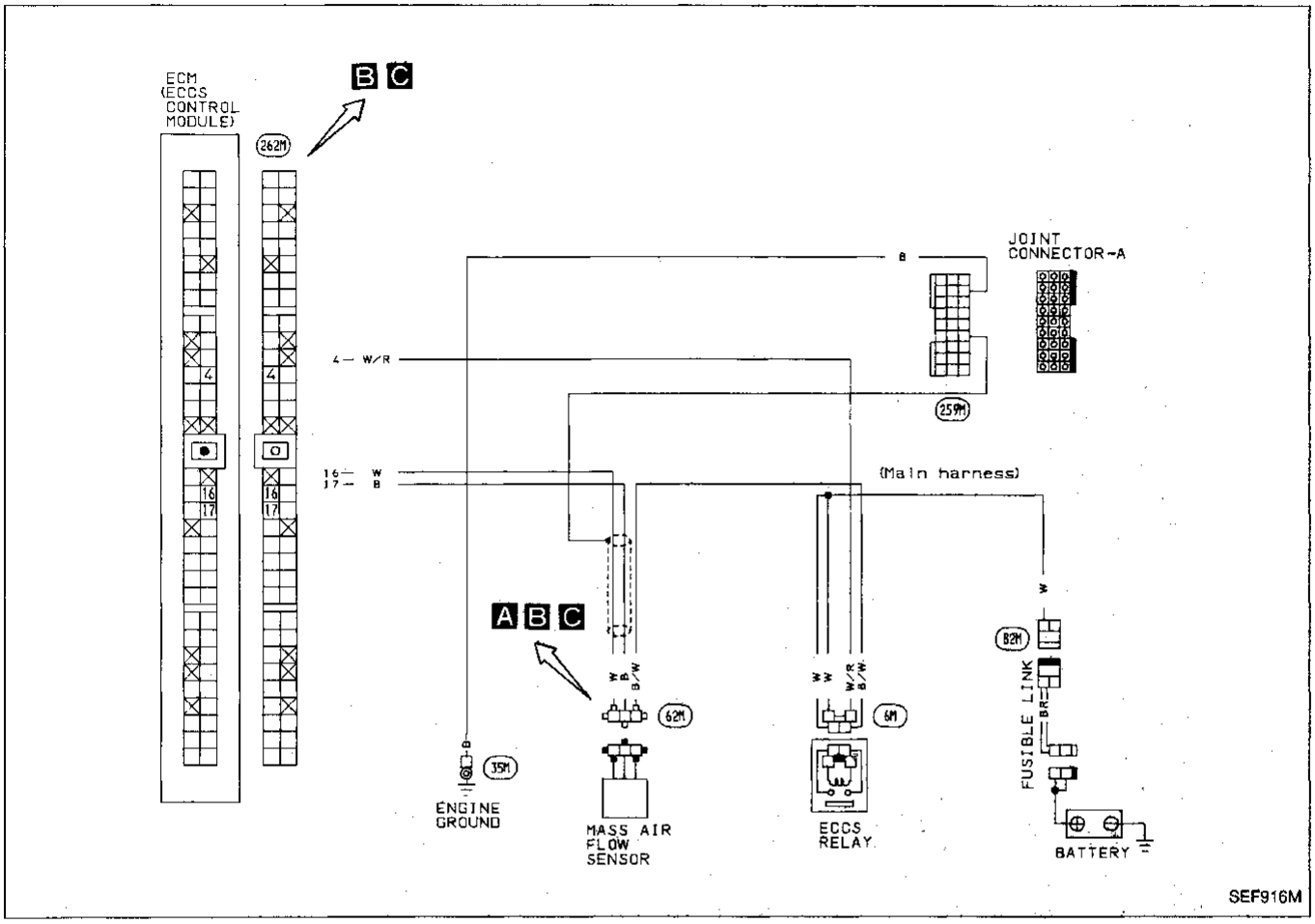
Diagnostic Procedure 23 (Cont'd)

Perform FINAL CHECK by the following procedure after repair is completed.

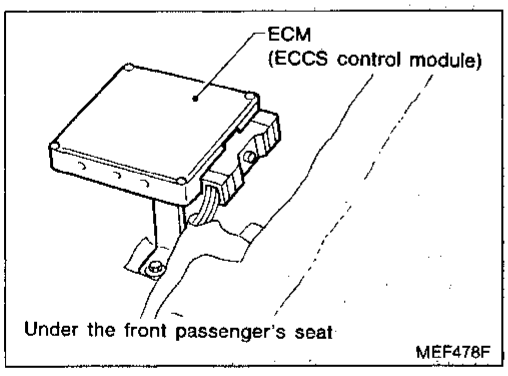


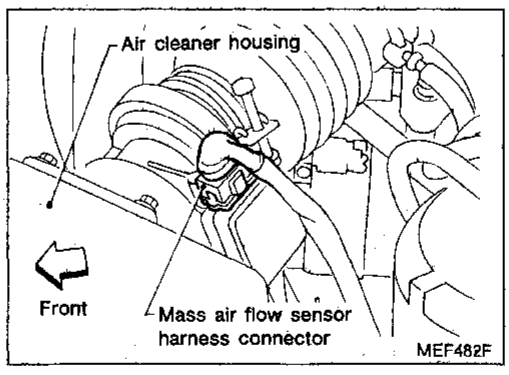
Diagnostic Procedure 24

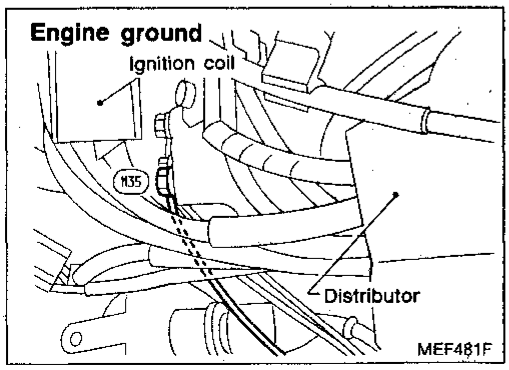
MASS AIR FLOW SENSOR (Diagnostic trouble code No. 12) CHECK (MALFUNCTION INDICATOR LAMP ITEM)



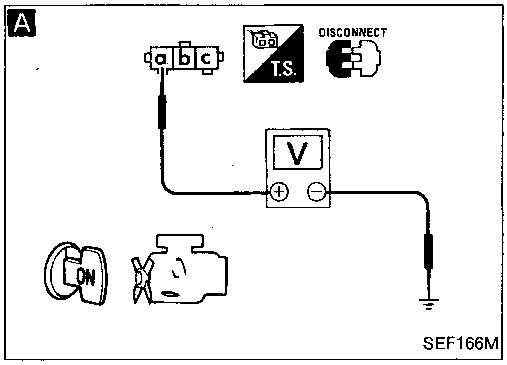
Harness layout

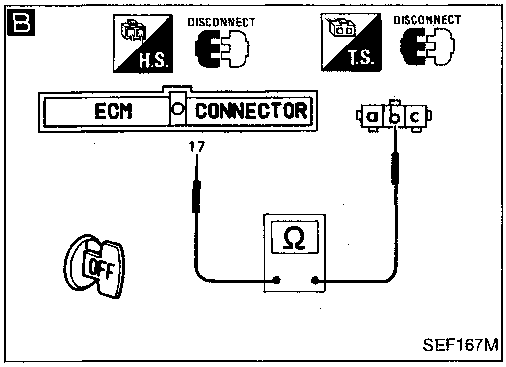


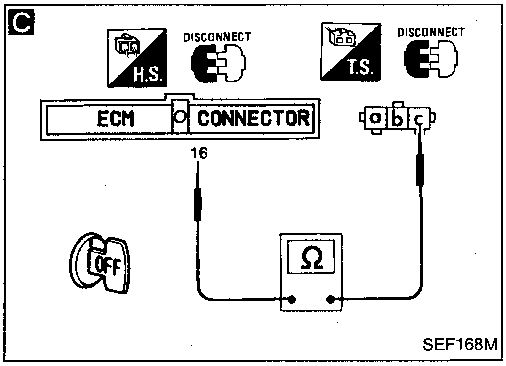




Diagnostic Procedure 24 (Cont'd)







INSPECTION START

A

CHECK POWER SUPPLY.
1) Disconnect mass air flow sensor harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓐ and ground.
Voltage: Battery voltage

NG → Repair harness or connectors.

OK ↓

Loosen and retighten ground screw.

B

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect ECM harness connector.
3) Check harness continuity between terminal ⓑ and ECM terminal ⑰.
Continuity should exist.

NG → Repair harness or connectors.

OK ↓

C

CHECK INPUT SIGNAL CIRCUIT.
1) Check harness continuity between terminal ⓒ and ECM terminal ⑯.
Continuity should exist.

NG → Repair harness or connectors.

OK ↓

CHECK COMPONENT
(Mass air flow sensor).
Refer to "Electrical Components Inspection".
(See page EF & EC-133.)

NG → Replace mass air flow sensor.

OK ↓

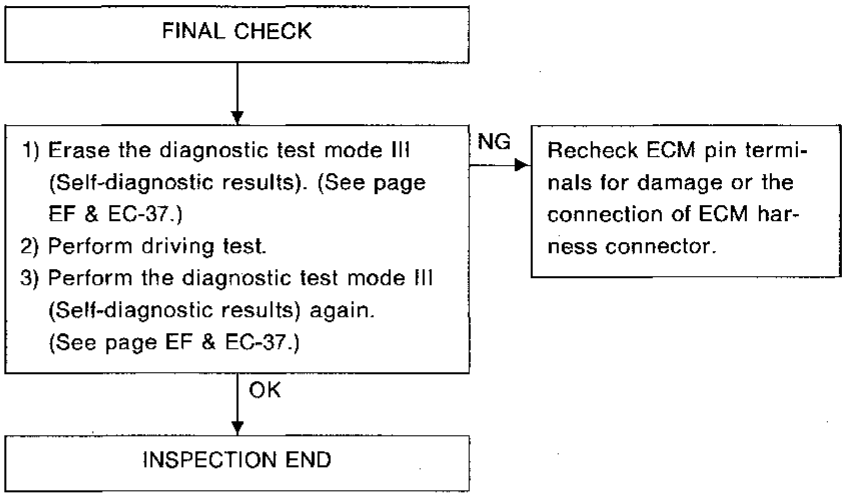
Disconnect and reconnect harness connectors in the circuit, and retest.

Trouble is not fixed. ↓

Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

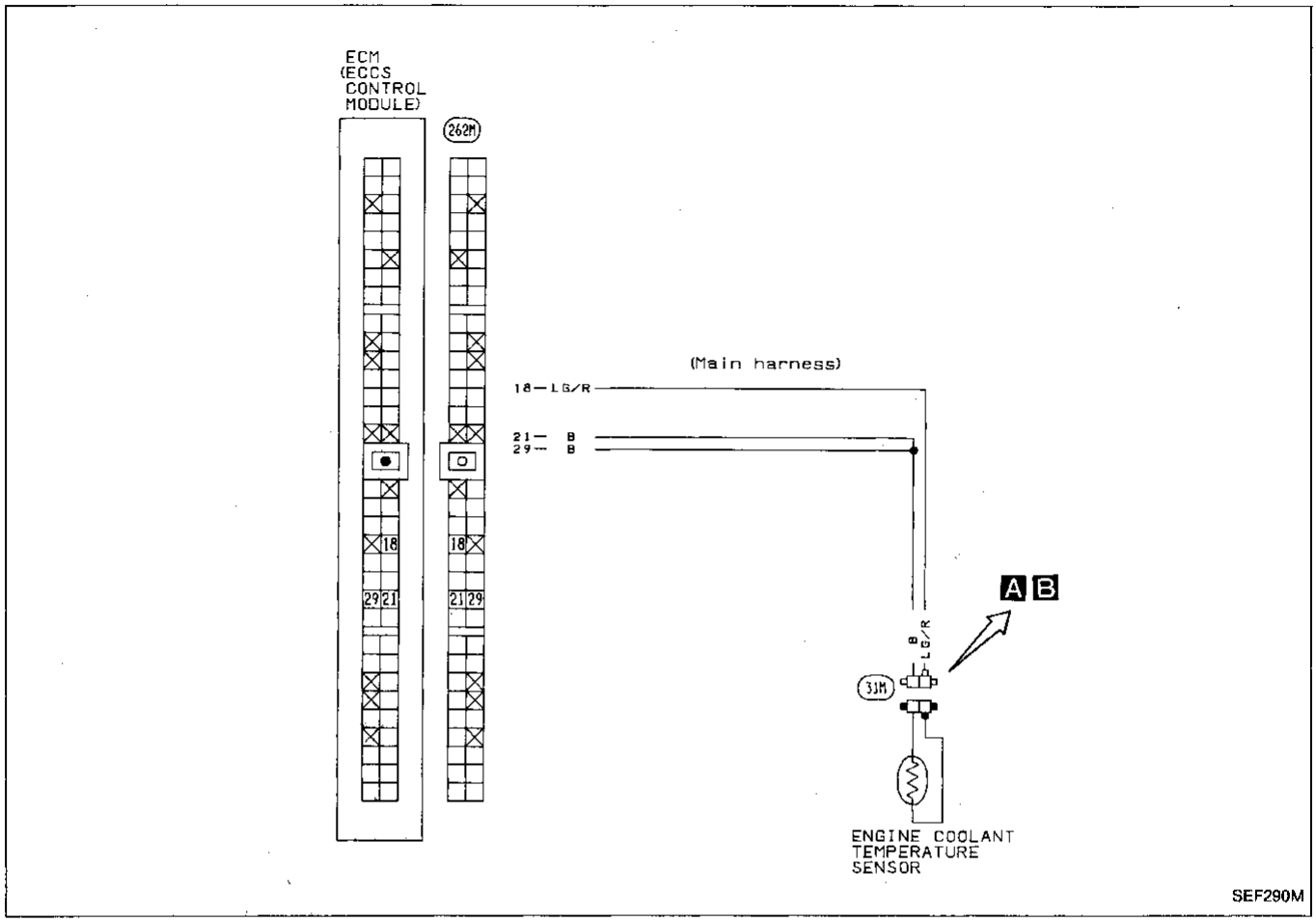
Diagnostic Procedure 24 (Cont'd)

Perform FINAL CHECK by the following procedure after repair is completed.

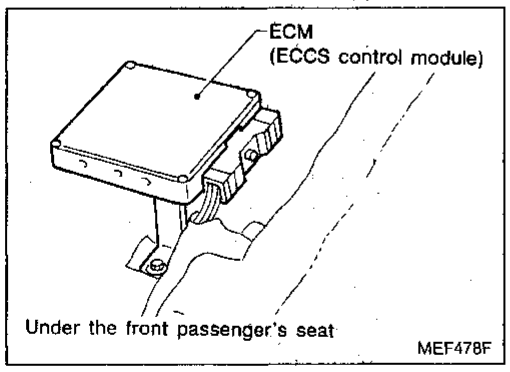


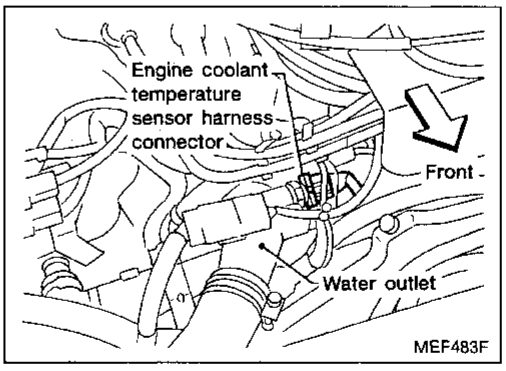
Diagnostic Procedure 25

ENGINE COOLANT TEMPERATURE SENSOR (Diagnostic trouble code No. 13)
(CHECK) (MALFUNCTION INDICATOR LAMP ITEM)

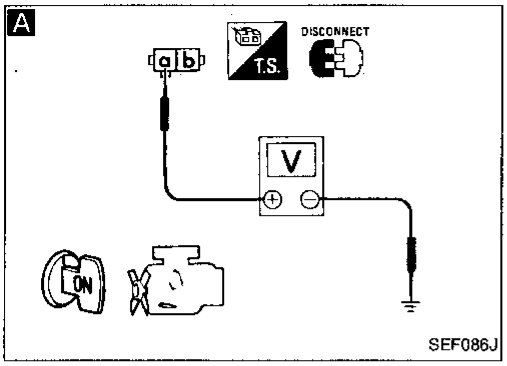


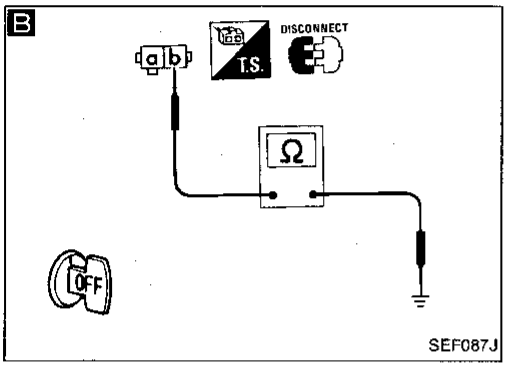
Harness layout





Diagnostic Procedure 25 (Cont'd)





INSPECTION START

A

CHECK POWER SUPPLY.
1) Disconnect engine coolant temperature sensor harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓐ and ground.
Voltage: Approximately 5V

NG → Repair harness or connectors.

OK

B

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Check harness continuity between terminal ⓑ and engine ground.
Continuity should exist.

NG → Repair harness or connectors.

OK

CHECK COMPONENT
(Engine coolant temperature sensor).
Refer to "Electrical Components Inspection".
(See page EF & EC-133.)

NG → Replace engine coolant temperature sensor.

OK

Disconnect and reconnect harness connectors in the circuit, and retest.

Trouble is not fixed.

Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

Perform FINAL CHECK by the following procedure after repair is completed.

FINAL CHECK

1) Erase the diagnostic test mode III (Self-diagnostic results). (See page EF & EC-37.)
2) Perform driving test.
3) Perform the diagnostic test mode III (Self-diagnostic results) again. (See page EF & EC-37.)

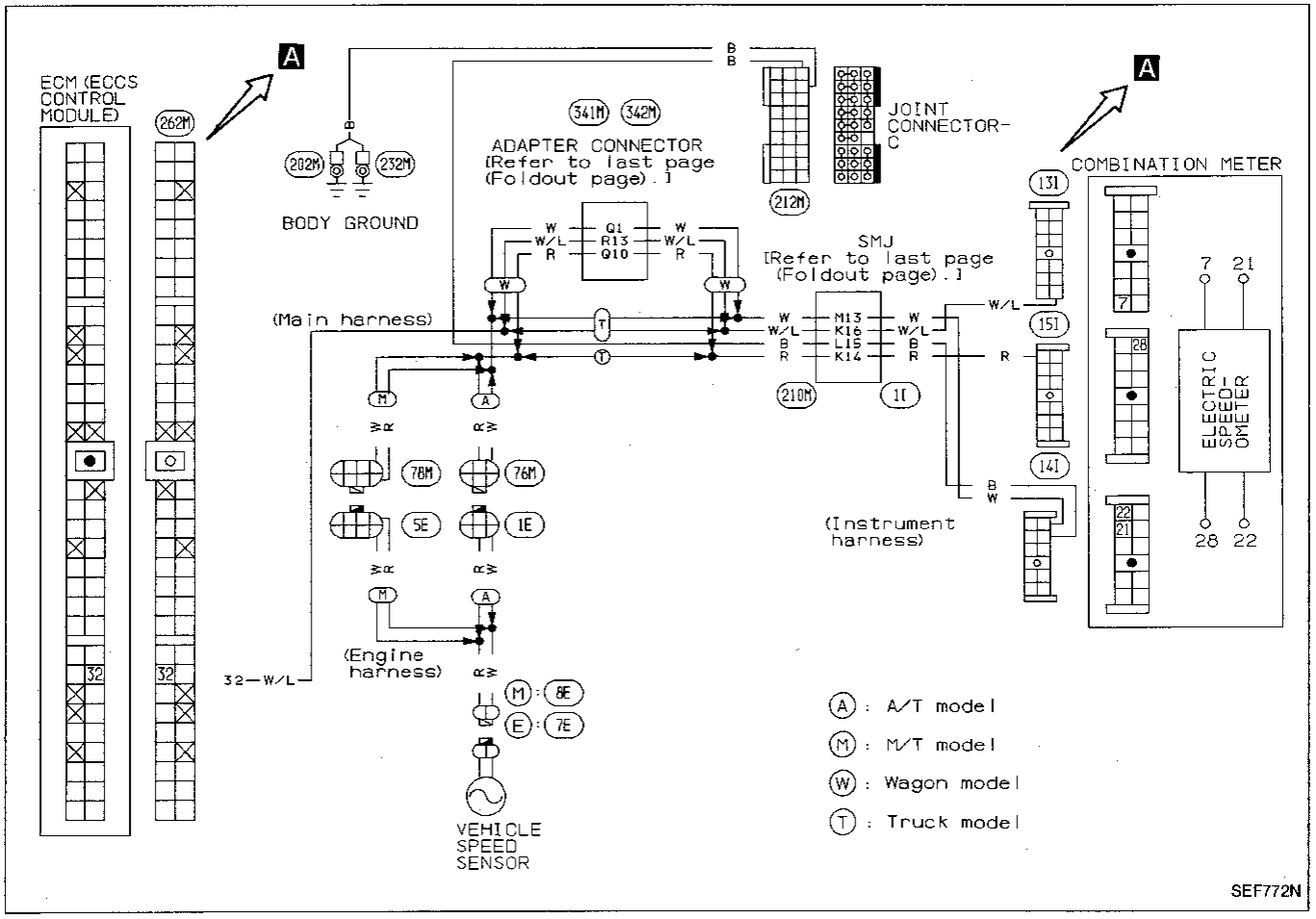
NG → Recheck ECM pin terminals for damage or the connection of ECM harness connector.

OK

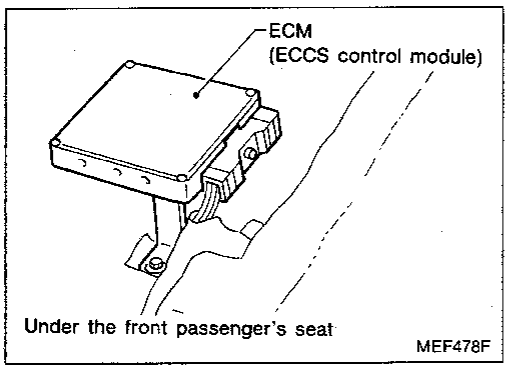
INSPECTION END

Diagnostic Procedure 26

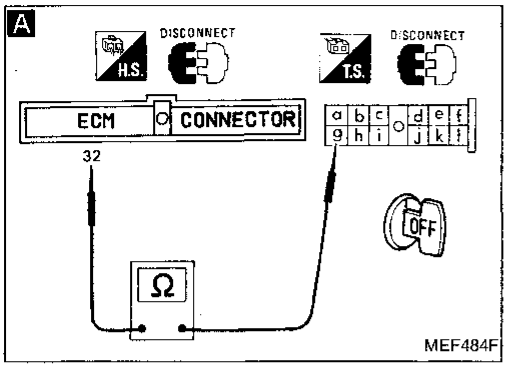
VEHICLE SPEED SENSOR (Diagnostic trouble code No. 14) (Switch ON/OFF diagnostic item) (MALFUNCTION INDICATOR LAMP ITEM)



Harness layout



Diagnostic Procedure 26 (Cont'd)



INSPECTION START

CHECK SPEEDOMETER FUNCTION.
Make sure that speedometer functions properly.

NG → Check vehicle speed sensor and its circuit. (Refer to EL section.)

OK

A

CHECK INPUT SIGNAL CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect ECM harness connector.
3) Disconnect combination meter harness connector
4) Check harness continuity between ECM terminal ㉜ and terminal ⓖ.
Continuity should exist.

NG → Check the following.
- Harness connectors (210M) , (11)
- Harness continuity between ECM and combination meter

If NG, repair harness or connectors.

OK

Disconnect and reconnect harness connectors in the circuit, and retest.

Trouble is not fixed.

Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

Perform FINAL CHECK by the following procedure after repair is completed.

FINAL CHECK

1) Start engine.
2) Perform switch ON/OFF diagnosis. (See page EF & EC-40.)

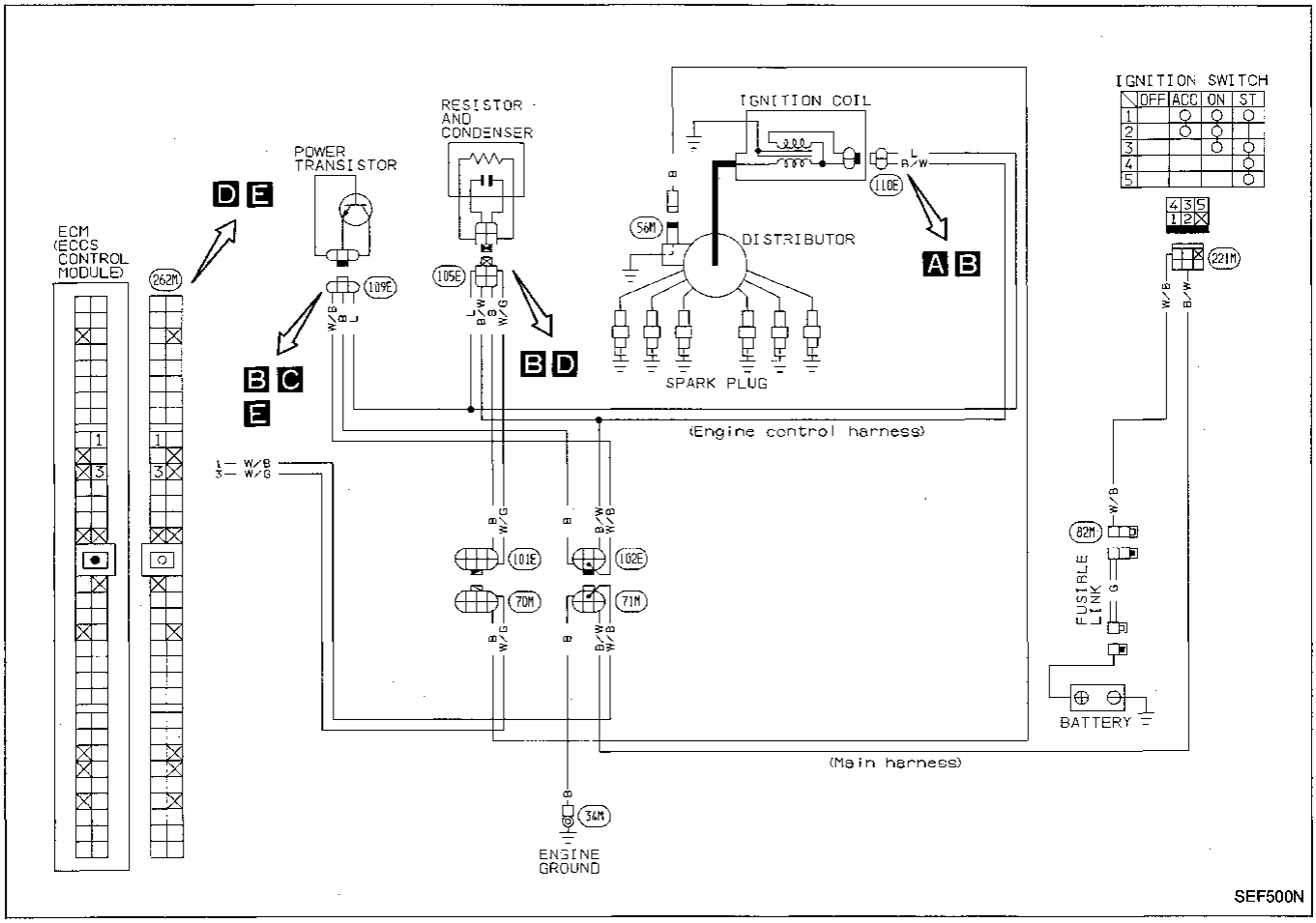
NG → Recheck ECM pin terminals for damage or the connection of ECM harness connector.

OK

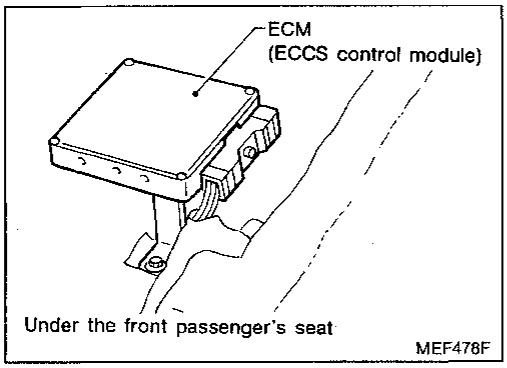
INSPECTION END

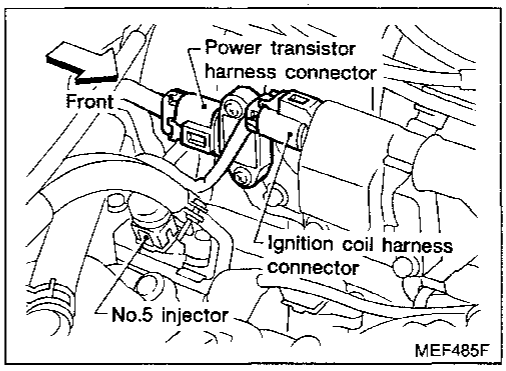
Diagnostic Procedure 27

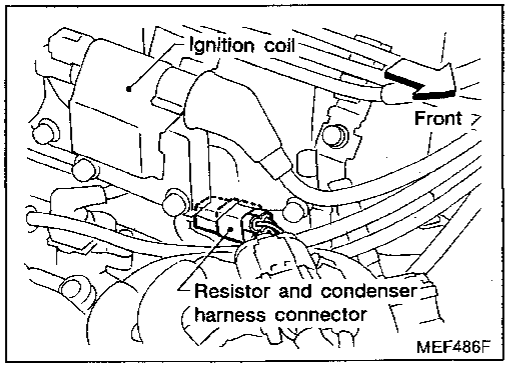
IGNITION SIGNAL (Diagnostic trouble code No. 21)



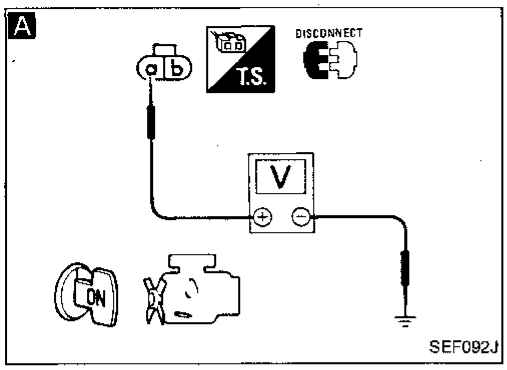
Harness layout

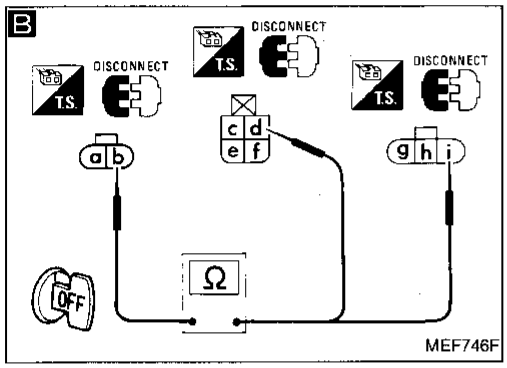


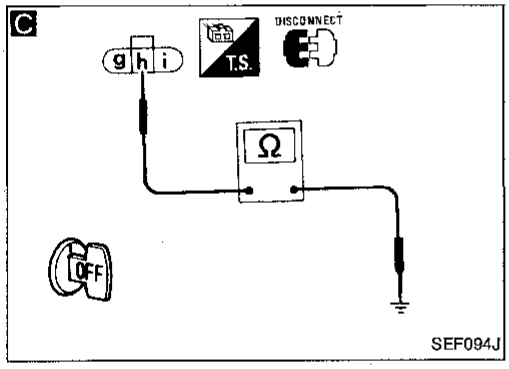


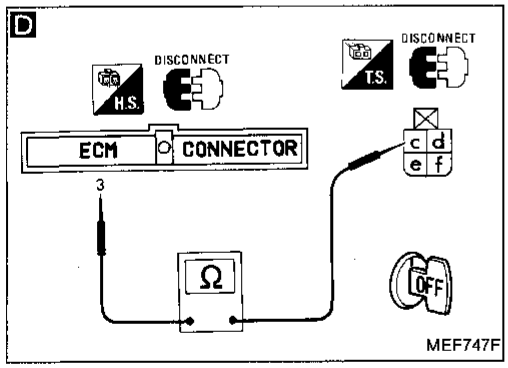


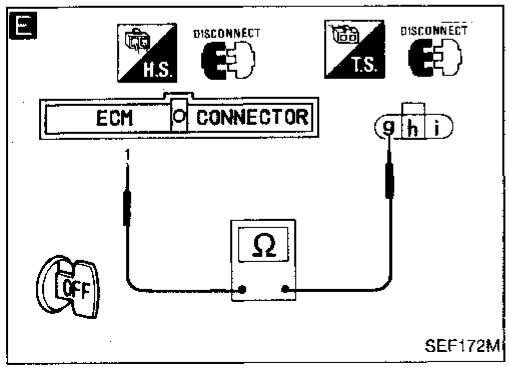
Diagnostic Procedure 27 (Cont'd)











INSPECTION START

A

CHECK POWER SUPPLY.
1) Disconnect ignition coil harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓐ and ground.
Voltage: Battery voltage

NG → Check the following.
- Harness connectors (71M) , (102E)
- Harness continuity between ignition coil and ignition switch

If NG, repair harness or connectors.

OK ↓

CHECK GROUND CIRCUIT–1.
1) Turn ignition switch "OFF".
2) Disconnect resistor and condenser harness connector.
3) Disconnect power transistor harness connector.

B 4) Check harness continuity between terminals ⓑ and ⓓ, ⓘ.
Continuity should exist.

NG → Repair harness or connectors.

OK ↓

CHECK GROUND CIRCUIT–2.

C 1) Check harness continuity between terminal ⓗ and engine ground.
Continuity should exist.

NG → Check the following
- Harness connectors (71M) , (102E)
- Harness continuity between power transistor and engine ground

If NG, repair harness or connectors.

OK ↓

D

CHECK INPUT SIGNAL CIRCUIT.
1) Disconnect ECM harness connector.
2) Check harness continuity between terminal ⓒ and ECM terminal ③.
Continuity should exist.

NG → Check the following.
- Harness connectors (101E) , (70M)
- Harness continuity between resistor and ECM harness connector

If NG, repair harness or connectors.

OK ↓

E

CHECK OUTPUT SIGNAL CIRCUIT.
1) Check harness continuity between terminal ⓖ and ECM terminal ①.
Continuity should exist.

NG → Check the following.
- Harness connectors (102E) , (71M)
- Harness continuity between power transistor and ECM harness connector

If NG, repair harness or connectors.

OK ↓

CHECK COMPONENT
(Ignition coil, resistor and condenser, power transistor).
Refer to "Electrical Components Inspection".
(See page EF & EC-133.)

NG → Replace malfunctioning component(s).

OK ↓

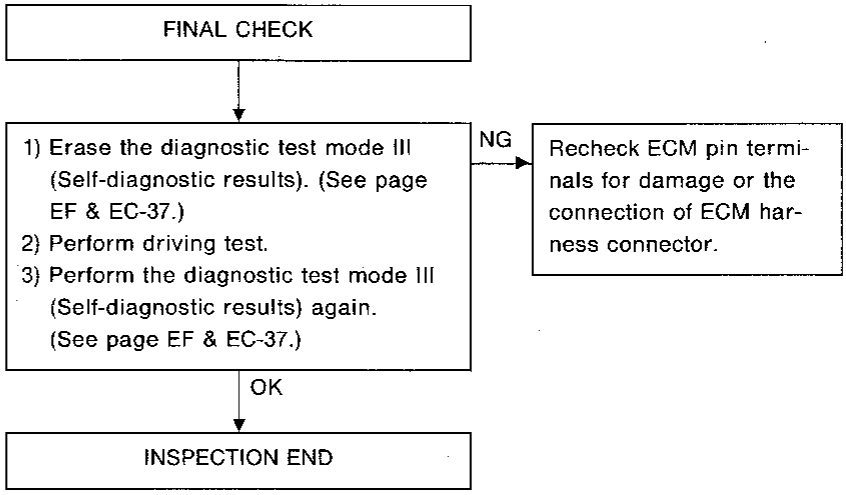
Disconnect and reconnect harness connectors in the circuit, and retest.

Trouble is not fixed. ↓

Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

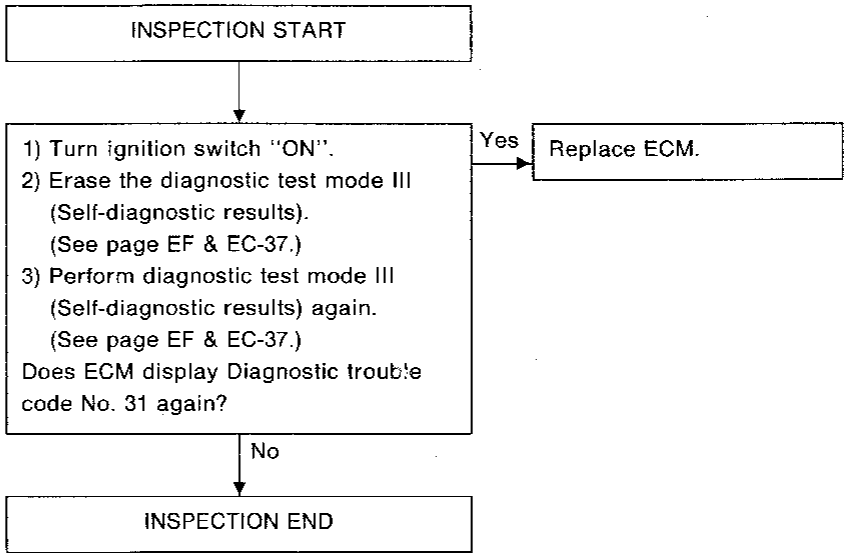
Diagnostic Procedure 27 (Cont'd)

Perform FINAL CHECK by the following procedure after repair is completed.



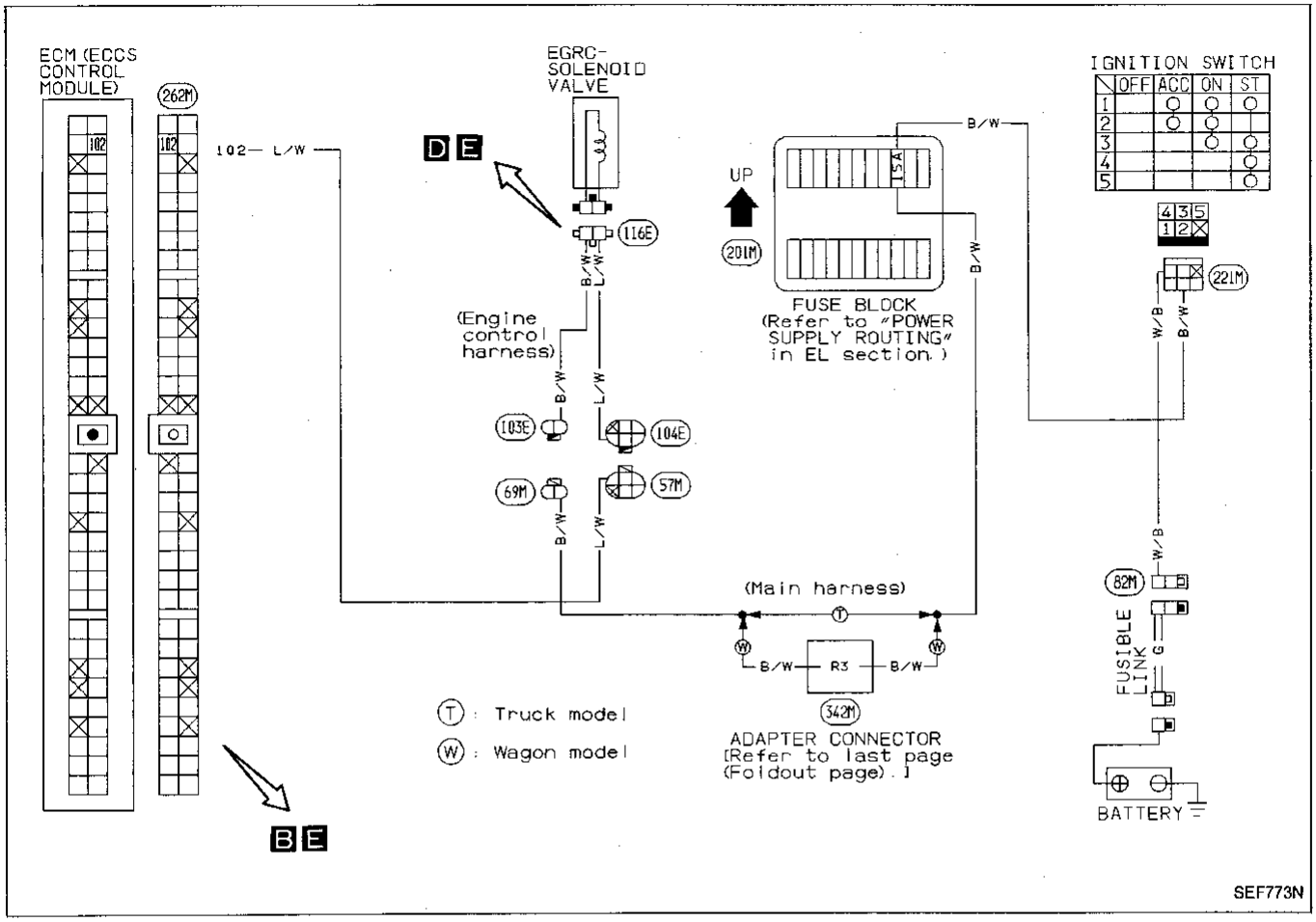
Diagnostic Procedure 28

ENGINE CONTROL MODULE (ECM) (Diagnostic trouble code No. 31) (MALFUNCTION INDICATOR LAMP ITEM)

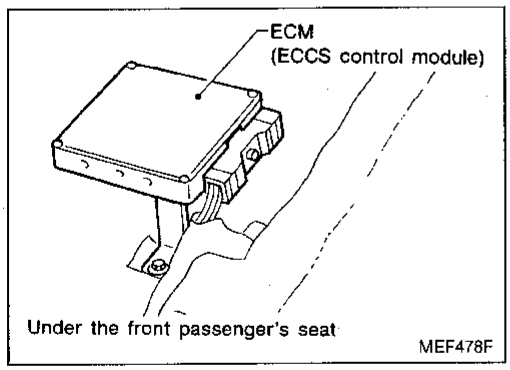


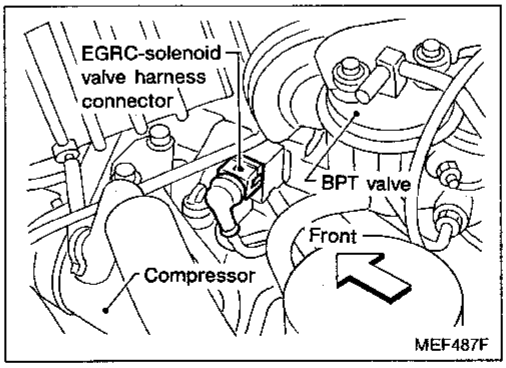
Diagnostic Procedure 29

EGR FUNCTION (Diagnostic trouble code No. 32) CHECK (MALFUNCTION INDICATOR LAMP ITEM)

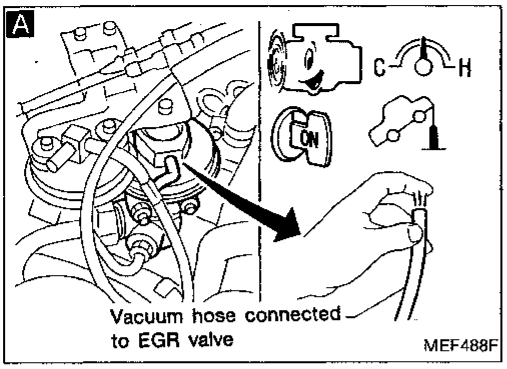


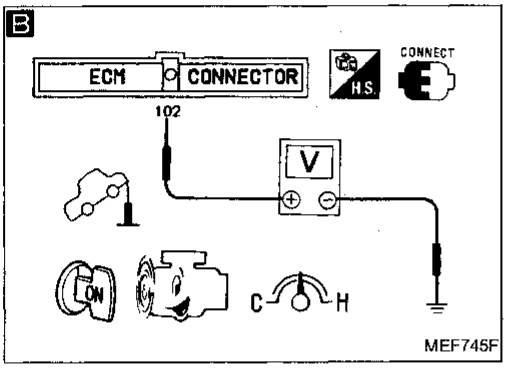
Harness layout

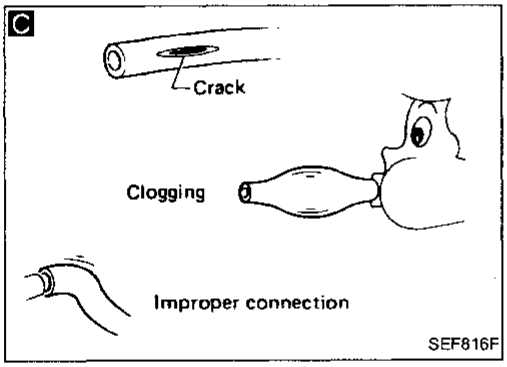


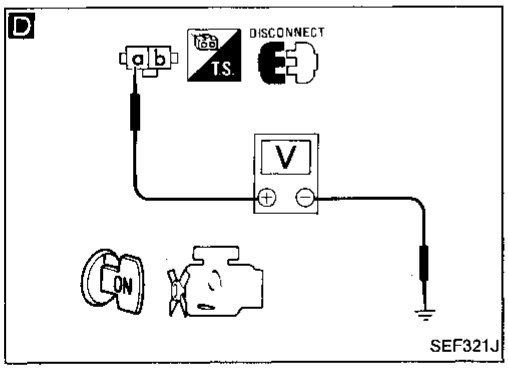


Diagnostic Procedure 29 (Cont'd)









INSPECTION START

A

CHECK VACUUM SOURCE TO EGR VALVE.
1) Jack up drive wheels.
2) Start engine and warm it up sufficiently.
3) Perform diagnostic test mode III (Self-diagnostic results).
   Make sure that diagnostic trouble code No. 12 is not displayed.
   Make sure that both camshaft position sensor and ECM's CPU are not in "fail-safe" state.
4) Set shift lever to 1st position.
5) Keep engine speed at about 2,000 rpm.
6) Disconnect vacuum hose to EGR valve.
7) Make sure that vacuum exists.
   Vacuum should exist.

OK → CHECK COMPONENTS (EGR valve and EGR temperature sensor). Refer to "Electrical Components Inspection". (See page EF & EC-135.)

NG → Replace malfunctioning component(s).

NG

B

CHECK CONTROL FUNCTION.
1) Check voltage between ECM terminal (102) and ground under the following conditions.
   Voltage:
   At idle
   Approximately 0V
   Engine speed is about 2,000 rpm
   Battery voltage

OK → **C**

CHECK VACUUM HOSE.
1) Check vacuum hose for clogging, cracks and proper connection.

NG

D

CHECK POWER SUPPLY.
1) Stop engine.
2) Disconnect EGRC-solenoid valve harness connector.
3) Turn ignition switch "ON".
4) Check voltage between terminal ⓐ and ground.
   Voltage: Battery voltage

NG → Check the following.
- Harness connectors (69M), (103E)
- "15A" fuse
- Harness continuity between EGRC-solenoid valve and ignition switch

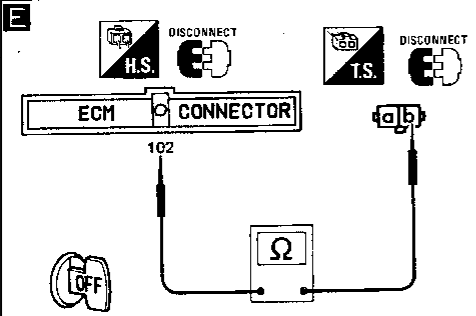
If NG, repair harness or connectors.

OK

Ⓐ

Diagnostic Procedure 29 (Cont'd)

E



SEF176M

F **ROAD TEST**

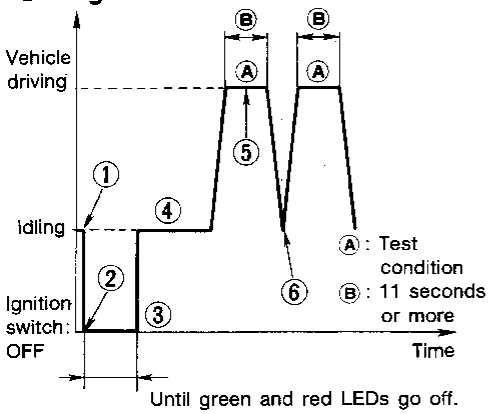
Test condition

Drive vehicle under the following conditions with a suitable shift position.

(1) Engine speed:
2,100 ± 300 rpm

(2) Intake manifold vacuum:
A/T: –26.7 ± 4.0 kPa
(–200 ± 30 mmHg, –7.87 ± 1.18 inHg)
M/T: –32.7 ± 4.7 kPa
(–245 ± 35 mmHg, –9.65 ± 1.38 inHg)

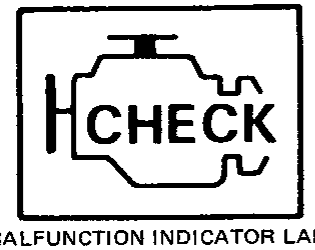
Driving mode



① Start engine and warm it up sufficiently.
② Turn off ignition switch and keep it off until green and red LEDs go off.
③ Start engine and make sure that air conditioner switch and rear defogger are turned "OFF" during driving test.
④ Keep engine running for at least 3 minutes.
⑤ Shift to suitable gear position and drive in "Test condition" for at least 11 seconds.
⑥ Decrease engine revolution to less than 2,000 rpm.
⑦ Repeat steps ⑤through ⑥at least 1 time.

SEF302HA

G



MALFUNCTION INDICATOR LAMP

SEF177M

Ⓐ

E

CHECK OUTPUT SIGNAL CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect ECM harness connector.
3) Check harness continuity between ECM terminal (102) and terminal ⓑ.
Continuity should exist.

NG → Check the following.
- Harness connectors (57M), (184E)
- Harness continuity between EGRC-solenoid valve and ECM
Resistance:
Approximately 0Ω

If NG, repair harness or connectors.

OK ↓

CHECK COMPONENT (EGRC-solenoid valve).
Refer to "Electrical Components Inspection".
(See page EF & EC-134.)

NG → Replace EGRC-solenoid valve.

OK ↓

Check resistance of EGR temperature sensor.
(See page EF & EC-135.)

↓

Disconnect and reconnect harness connectors in the circuit, and retest.

Trouble is not fixed. ↓

Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

Perform FINAL CHECK by the following procedure after repair is completed.

FINAL CHECK ↓

Erase the diagnostic test mode III (Self-diagnostic results).
(See page EF & EC-37.)
Make sure diagnostic trouble code No. 55 is displayed in Diagnostic Test Mode III.

↓

F

Perform driving test under the following conditions.
1) Warm up engine sufficiently.
2) Use test driving modes indicated in figure F .

↓

G

Make sure that malfunction indicator lamp does not come on during driving test.

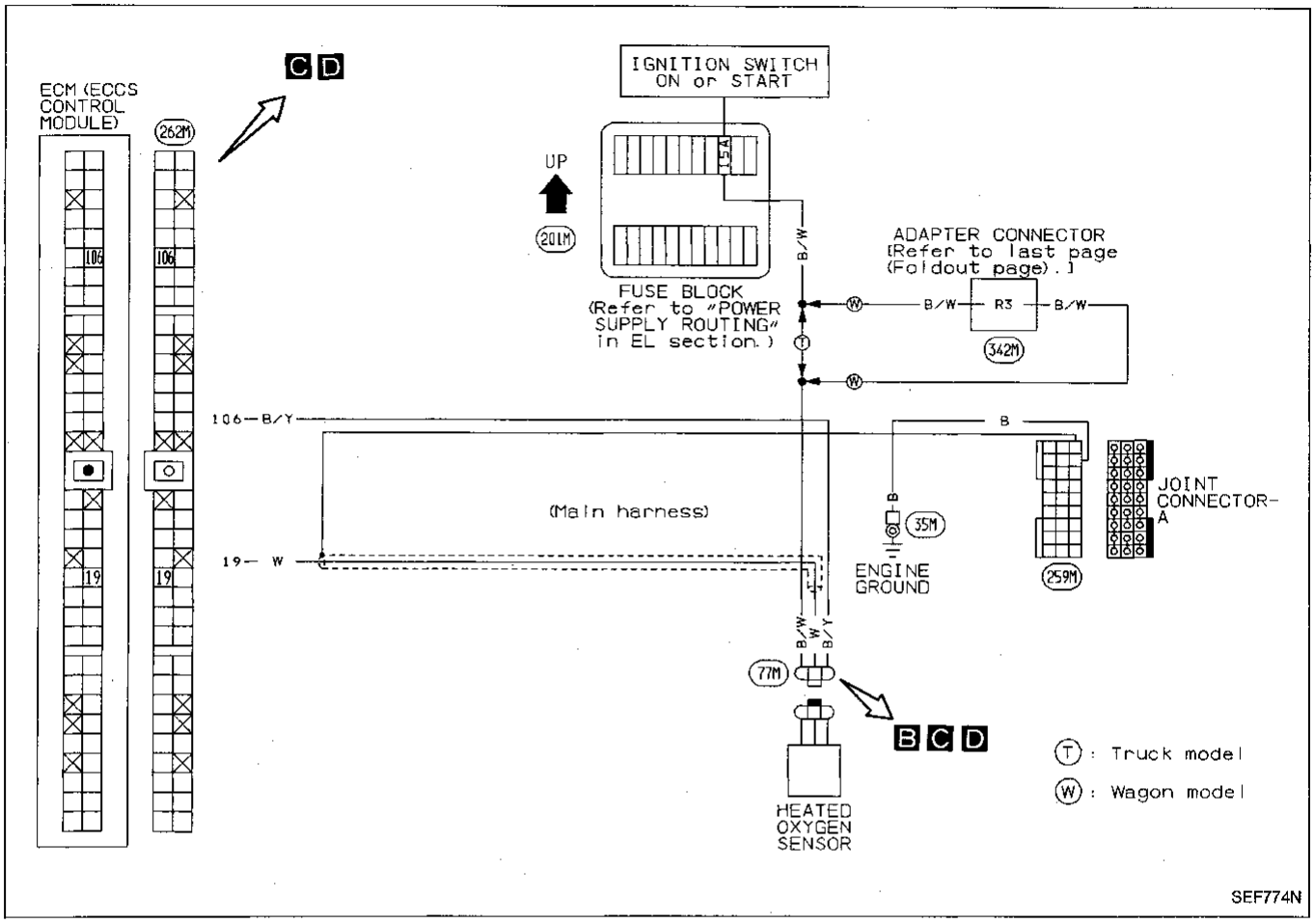
Comes on → Recheck ECM pin terminals for damage or the connection of ECM harness connector.

Does not come on. ↓

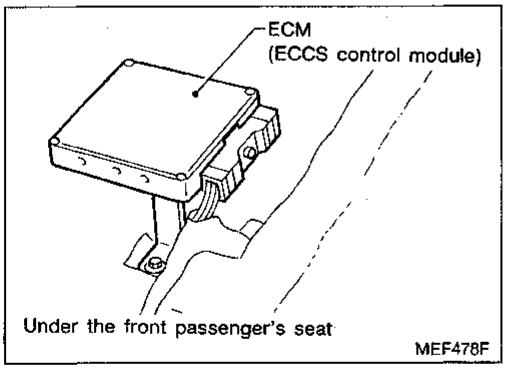
INSPECTION END

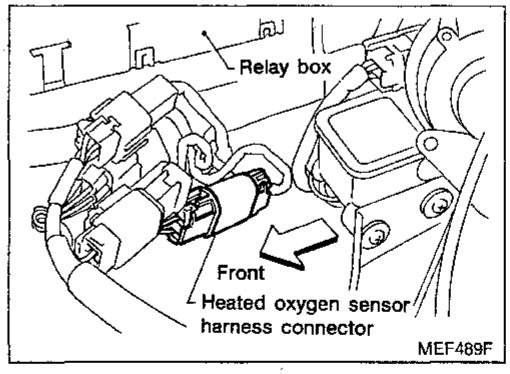
Diagnostic Procedure 30

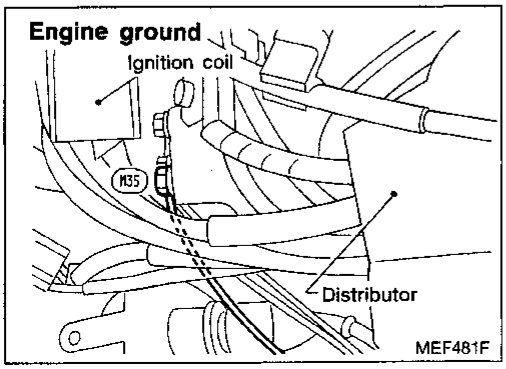
HEATED OXYGEN SENSOR (Diagnostic trouble code No. 33) (MALFUNCTION INDICATOR LAMP ITEM)



Harness layout

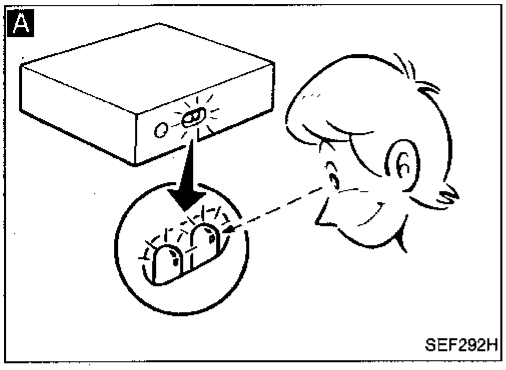






Diagnostic Procedure 30 (Cont'd)

A



SEF292H

INSPECTION START

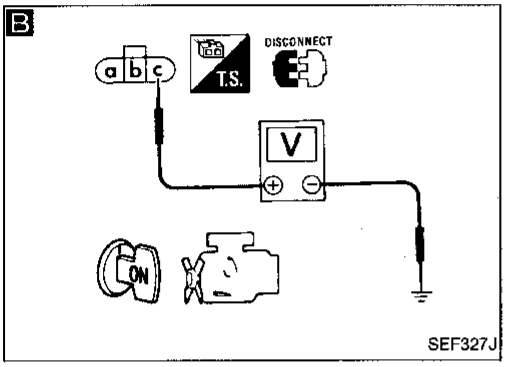
A

CHECK HEATED OXYGEN SENSOR CIRCUIT.
1) Start engine and warm it up sufficiently.
2) Run engine at about 2,000 rpm for about 2 minutes under no-load.
3) Keep engine speed at 2,000 rpm and make sure that green inspection lamp on ECM goes ON and OFF.

OK → INSPECTION END

NG

B



SEF327J

CHECK POWER SUPPLY.
1) Stop engine.
2) Disconnect heated oxygen sensor harness connector.
3) Turn ignition switch "ON".
4) Check voltage between terminal ⓒ and ground.
Voltage: Battery voltage

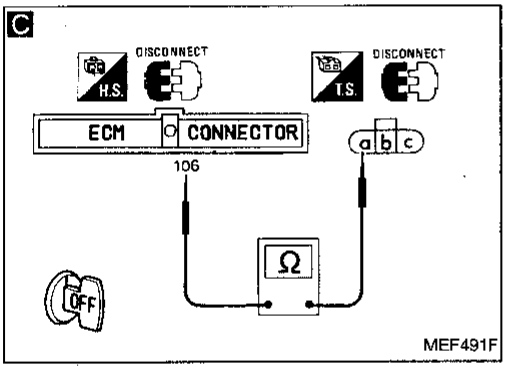
NG → Check the following.
- 15A fuse
- Harness continuity between heated oxygen sensor and ignition switch

If NG, repair harness or connectors.

OK

Loosen and retighten ground screw.

C



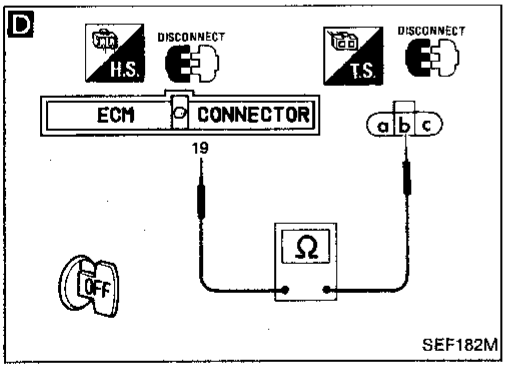
MEF491F

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect ECM harness connector.
3) Check harness continuity between ECM terminal (106) and terminal ⓐ.
Continuity should exist.

NG → Repair harness or connectors.

OK

D



SEF182M

CHECK INPUT SIGNAL CIRCUIT.
1) Check harness continuity between ECM terminal ⑲ and terminal ⓑ.
Continuity should exist.

NG → Repair harness or connectors.

OK

Disconnect and reconnect harness connectors in the circuit, and retest.

Trouble is not fixed.

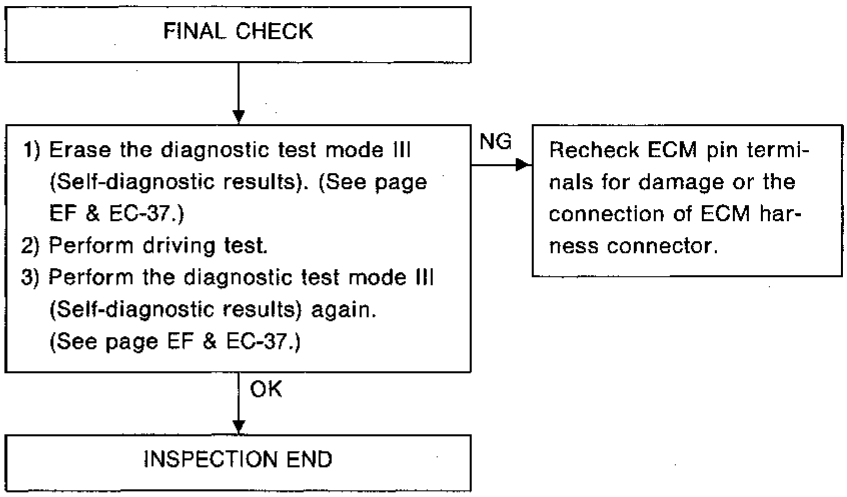
Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

OK

Replace heated oxygen sensor.

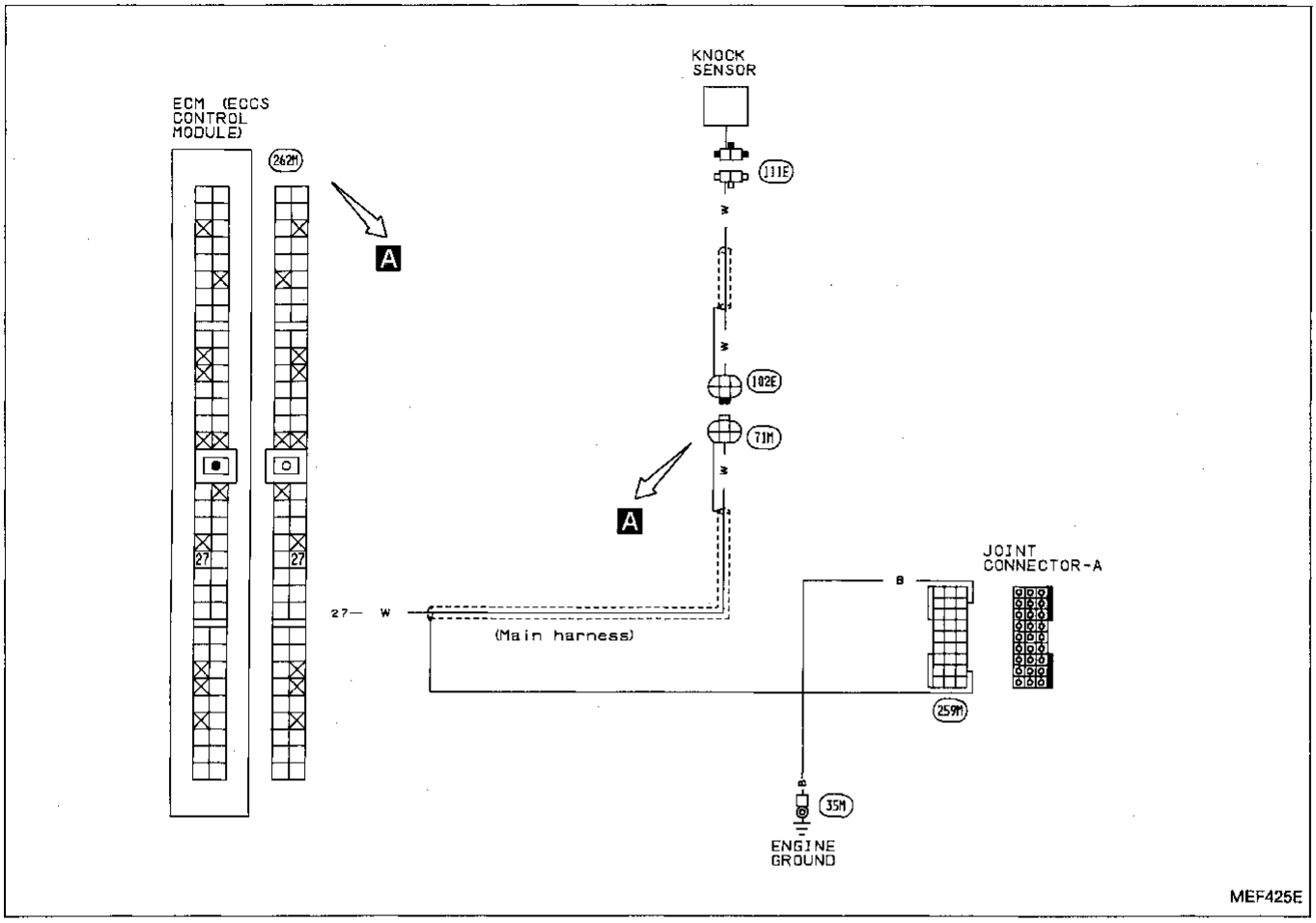
Diagnostic Procedure 30 (Cont'd)

Perform FINAL CHECK by the following procedure after repair is completed.

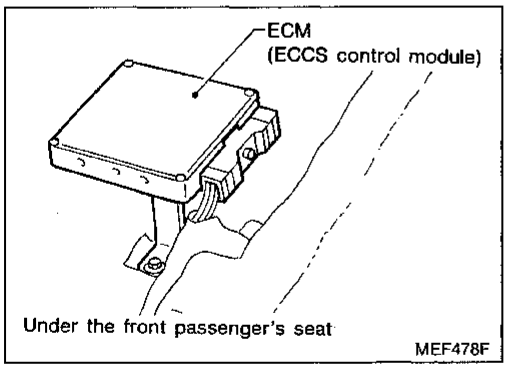


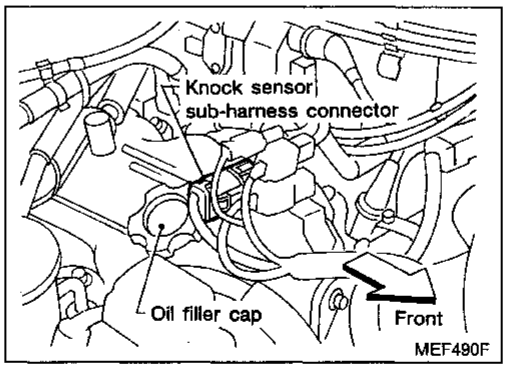
Diagnostic Procedure 31

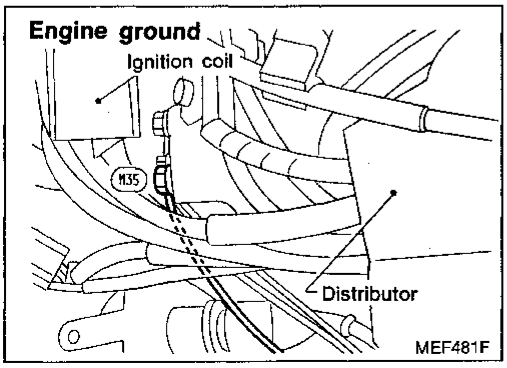
KNOCK SENSOR (Diagnostic trouble code No. 34)



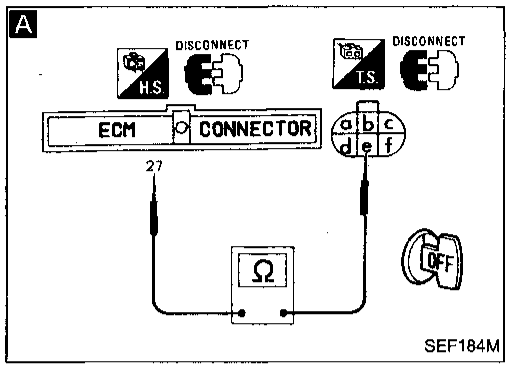
Harness layout







Diagnostic Procedure 31 (Cont'd)



INSPECTION START

Loosen and retighten ground screw.

A

CHECK INPUT SIGNAL CIRCUIT.
1) Disconnect ECM harness connector and knock sensor sub-harness connector.
2) Check harness continuity between terminal ⓔ and ECM terminal ㉗.
Continuity should exist.

NG → Repair harness or connectors.

OK

CHECK COMPONENTS
(Knock sensor).
Refer to "Electrical Components Inspection".
(See page EF & EC-137.)

NG → Replace knock sensor.

OK

Disconnect and reconnect harness connectors in the circuit, and retest.

Trouble is not fixed.

Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

Perform FINAL CHECK by the following procedure after repair is completed.

FINAL CHECK

1) Erase the diagnostic test mode III (Self-diagnostic results). (See page EF & EC-37.)
2) Perform driving test.
3) Perform the diagnostic test mode III (Self-diagnostic results) again.
(See page EF & EC-37.)

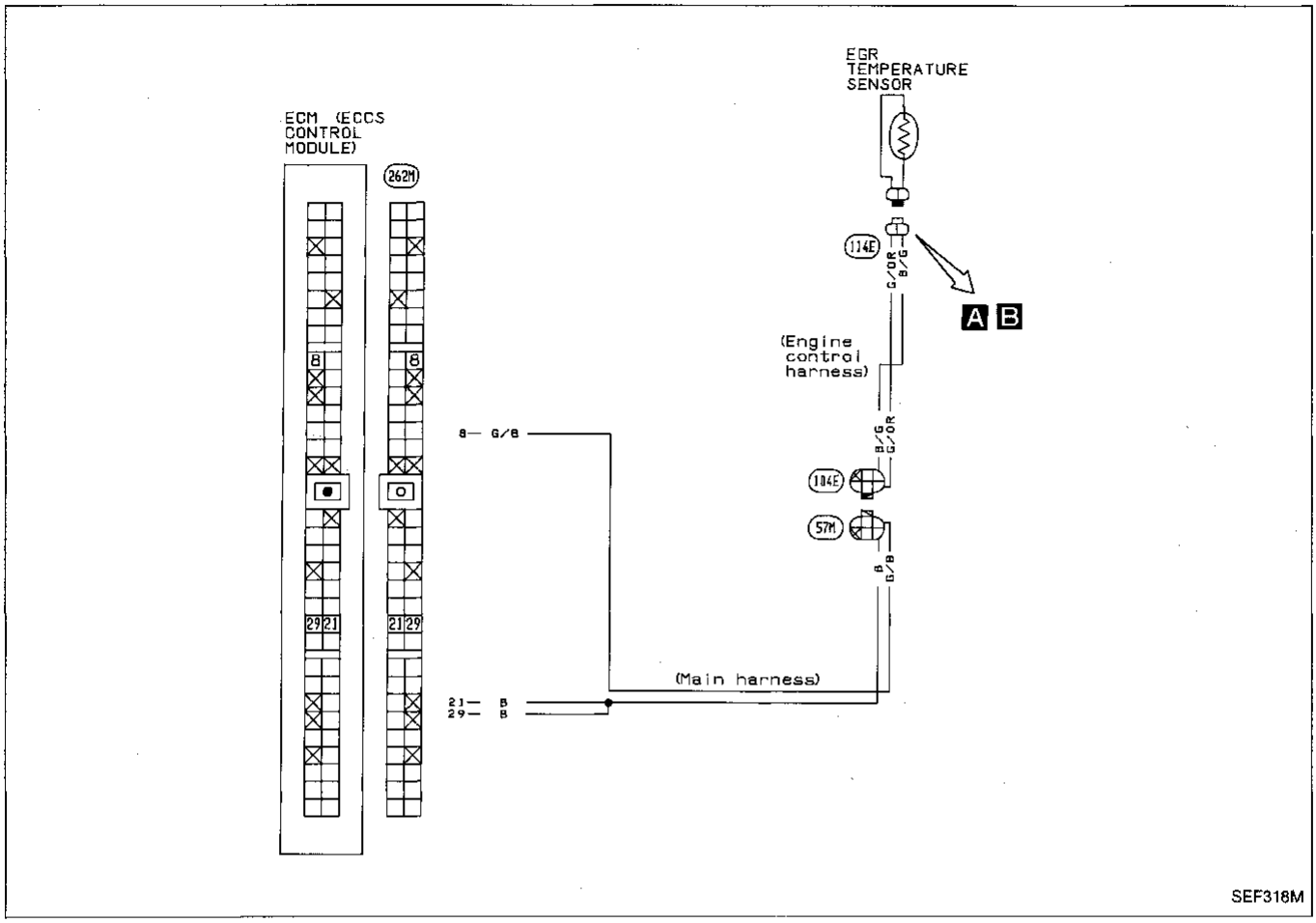
NG → Recheck ECM pin terminals for damage or the connection of ECM harness connector.

OK

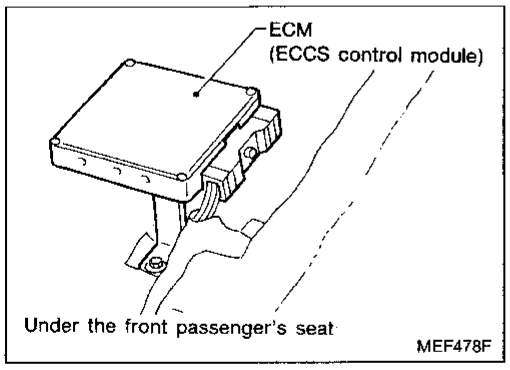
INSPECTION END

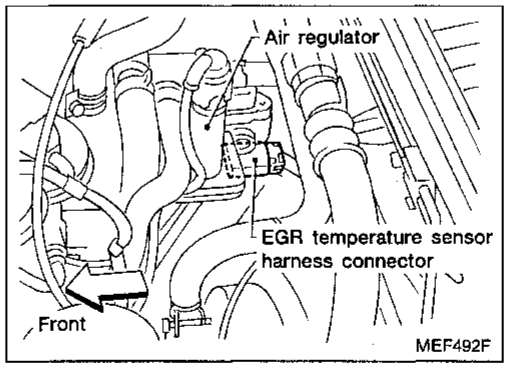
Diagnostic Procedure 32

EGR TEMPERATURE SENSOR (Diagnostic trouble code No. 35) (MALFUNCTION INDICATOR LAMP ITEM)

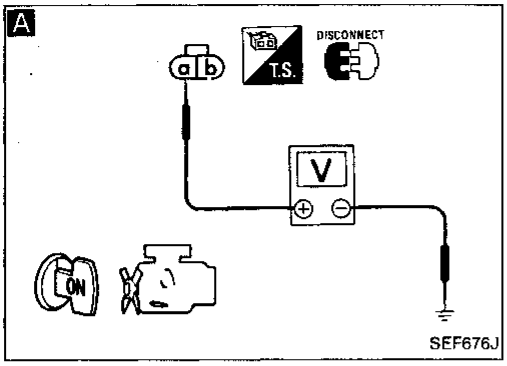


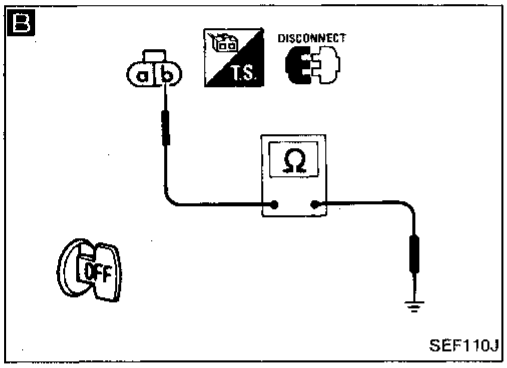
Harness layout





Diagnostic Procedure 32 (Cont'd)





INSPECTION START

A

CHECK POWER SUPPLY.
1) Disconnect EGR temperature sensor harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓐ and ground.
Voltage: Approximately 5V

NG → Check the following.
- Harness connectors (57M) , (104E)
- Harness continuity between ECM and EGR temperature sensor

If NG, repair harness or connectors.

OK ↓

B

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Check harness continuity between terminal ⓑ and engine ground.
Continuity should exist.

NG → Check the following.
- Harness connectors (57M) , (104E)
- Harness continuity between ECM and EGR temperature sensor

If NG, repair harness or connectors.

OK ↓

CHECK COMPONENT
(EGR temperature sensor).
Refer to "Electrical Components Inspection".
(See page EF & EC-135.)

NG → Replace EGR temperature sensor.

OK ↓

Disconnect and reconnect harness connectors in the circuit, and retest.

Trouble is not fixed. ↓

Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

Perform FINAL CHECK by the following procedure after repair is completed.

FINAL CHECK

↓

Erase the diagnostic test mode III (Self-diagnostic results).
(See page EF & EC-37.)

↓

1) Start engine and warm it up sufficiently.
2) Perform driving test for more than 15 minutes

↓

Perform diagnostic test mode III (Self-diagnostic results).
(See page EF & EC-37.)

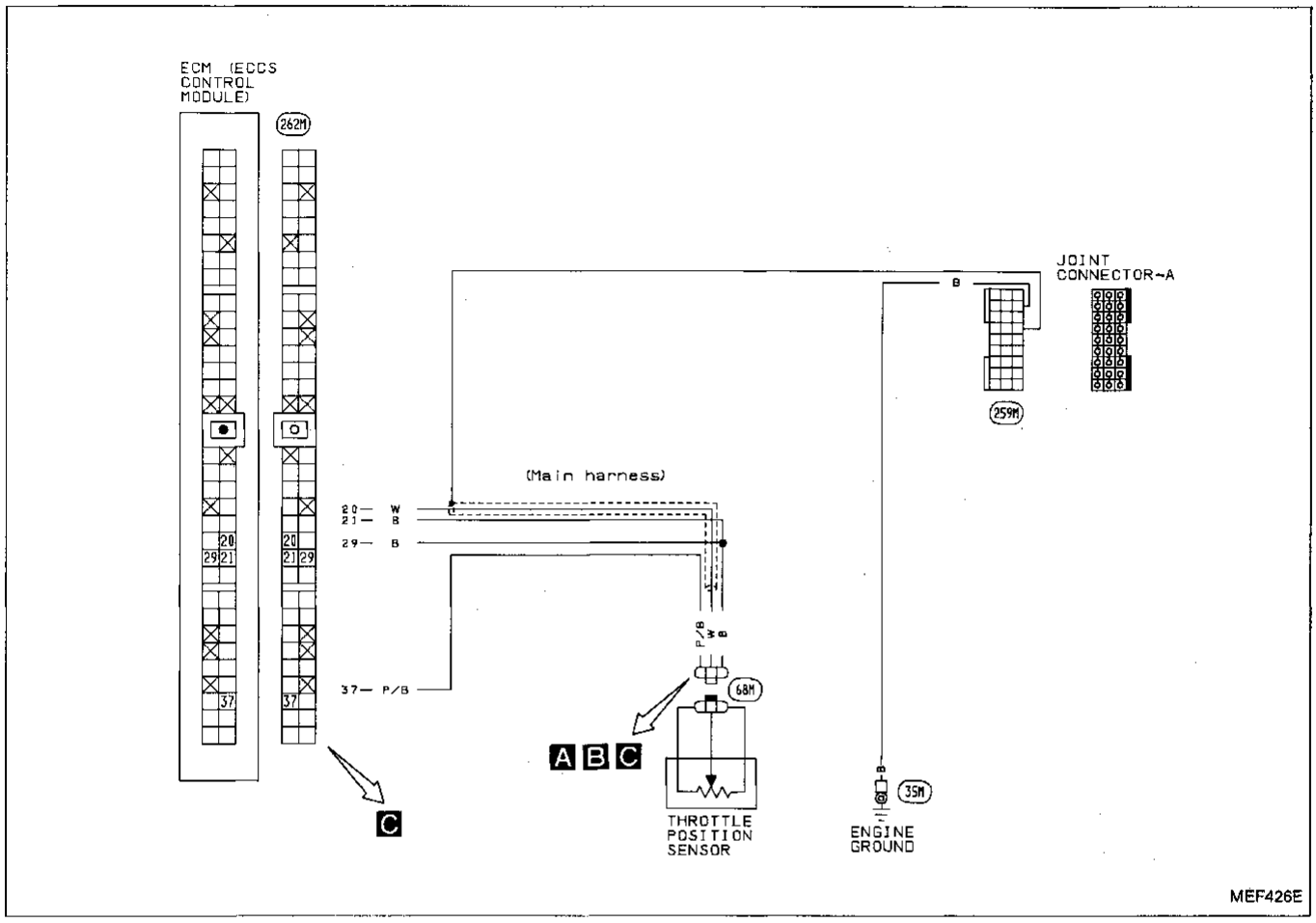
NG → Recheck ECM pin terminals for damage or the connection of ECM harness connector.

OK ↓

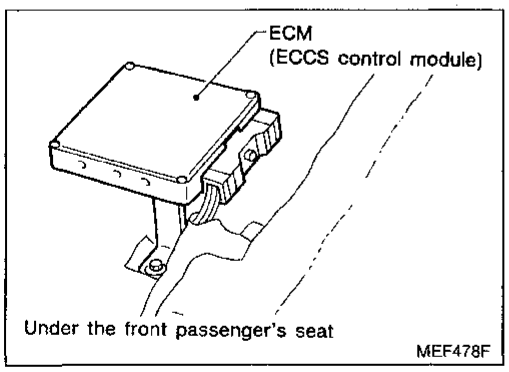
INSPECTION END

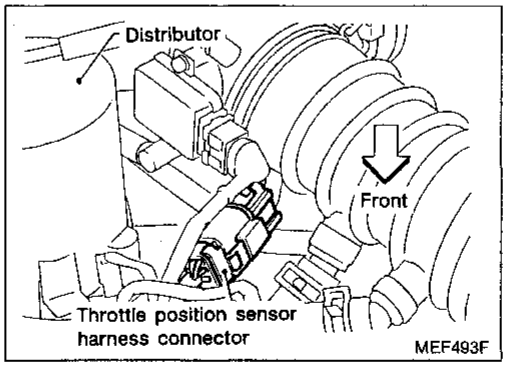
Diagnostic Procedure 33

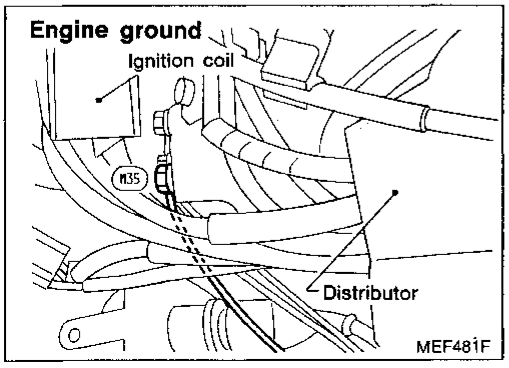
THROTTLE POSITION SENSOR (Diagnostic trouble code No. 43) CHECK (MALFUNCTION INDICATOR LAMP ITEM)



Harness layout

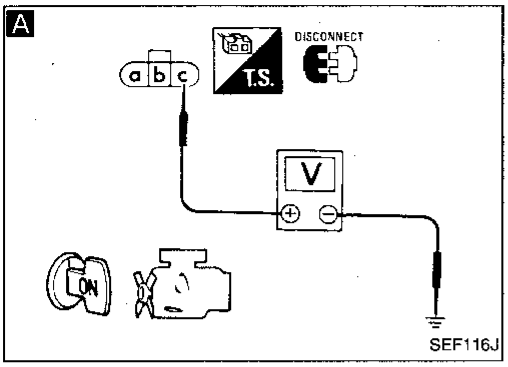






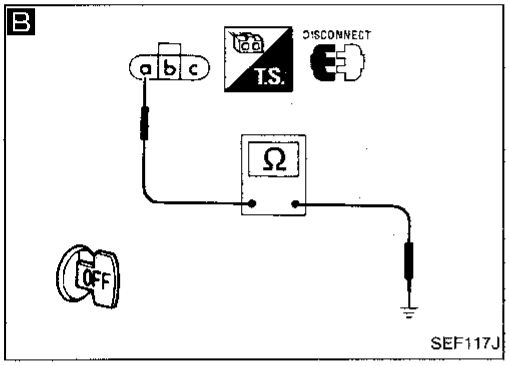
Diagnostic Procedure 33 (Cont'd)

A



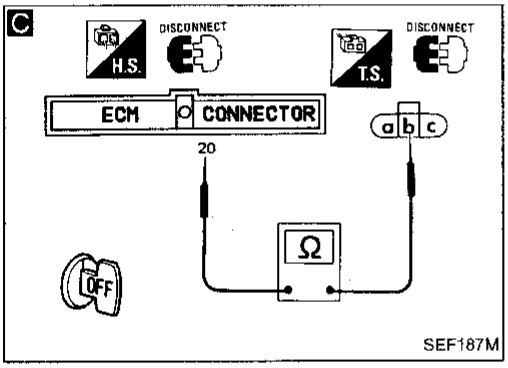
SEF116J

B



SEF117J

C



SEF187M

INSPECTION START

A

CHECK POWER SUPPLY.
1) Disconnect throttle position sensor harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓒ and ground.
Voltage: Approximately 5V

NG → Repair harness or connectors.

OK

Loosen and retighten ground screw.

B

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Check harness continuity between terminal ⓐ and engine ground.
Continuity should exist.

NG → Repair harness or connectors.

OK

C

CHECK INPUT SIGNAL CIRCUIT.
1) Disconnect ECM harness connector.
2) Check harness continuity between ECM terminal ⑳ and terminal ⓑ.
Continuity should exist.

NG → Repair harness or connectors.

OK

CHECK COMPONENT
(Throttle position sensor).
Refer to "Electrical Components Inspection".
(See page EF & EC-135.)

NG → Replace throttle position sensor.

OK

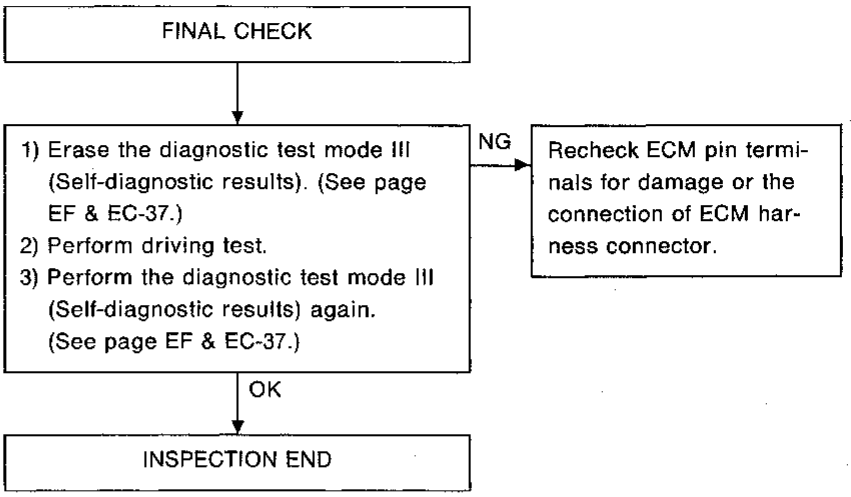
Disconnect and reconnect harness connectors in the circuit, and retest.

Trouble is not fixed.

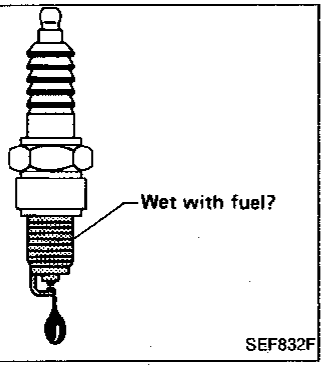
Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

Diagnostic Procedure 33 (Cont'd)

Perform FINAL CHECK by the following procedure after repair is completed.



A



SEF832F

B

ROAD TEST

Test conditions

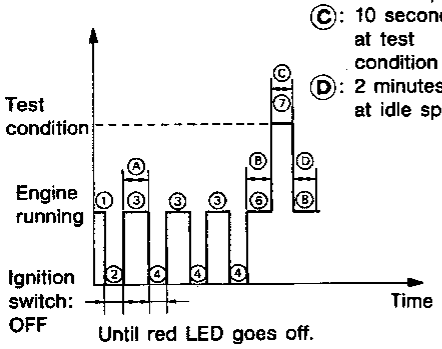
Drive vehicle under the following conditions with suitable gear position.

(1) Engine speed:
M/T: 2,600 ± 600 rpm
A/T: 2,500 ± 700 rpm

(2) Intake manifold vacuum:
–53.3 ± 6.7 kPa
(–400 ± 50 mmHg, –15.75 ± 1.97 inHg)

Driving mode

Ⓐ: More than 13 minutes
Ⓑ: More than 20 minutes at idle speed
Ⓒ: 10 seconds at test condition
Ⓓ: 2 minutes at idle speed



① Start engine and warm it up sufficiently.
② Turn off ignition switch and keep it off until red LED goes off.
③ Start engine and keep it running for more than 13 minutes.
④ Turn off ignition switch and keep it off until red LED goes off.
⑤ Repeat steps ③ through ④ for a total of 3 times.
⑥ Start engine and keep it at idle speed for more than 20 minutes. If engine stalls or ignition turns off within 13 minutes after engine is started, return to step ②. If over 13 minutes, restart step ⑥.
⑦ Shift to suitable gear position and drive in "Test condition" for at least 10 seconds. If the following conditions occur during step ⑦, return to step ⑥.
- Engine races over 4,000 rpm or hardly accelerates for more than 10 seconds.
- Engine stalls or ignition turns off.

⑧ Keep engine at idle speed for more than 2 minutes.

SEF831N

Diagnostic Procedure 34

INJECTOR LEAK (Diagnostic trouble code No. 45)
(CHECK) (MALFUNCTION INDICATOR LAMP ITEM)

INSPECTION START

Start engine and warm it up sufficiently.

Make sure engine runs smoothly at idle after warming.

Runs smoothly.

Does not run smoothly

Set the diagnostic test mode selector of ECM to Diagnostic Test Mode I.

Race engine two or three times under no-load, then run engine at idle speed.

Check if the green inspection lamp on ECM stays off during 10 seconds at idle condition.

Set diagnosis to Diagnostic Test Mode III and check that red and green inspection lamps on ECM blink almost simultaneously at 2,000 rpm under no-load.

Stay off

Does not stay off.

Does not blink.

Blinks.

Check mixture ratio feedback system. (See page EF & EC-24.)

Check idle CO%. (See page EF & EC-24.)

INSPECTION END

A

Remove all spark plugs from cylinder head. Is any plug wet with fuel?

Yes

Replace injector which supply cylinders having wet spark plugs.

No

Remove injector assembly. (See page EF & EC-139.) Keep fuel hoses and all injectors connected to injector gallery.

Drips.

Turn ignition switch "ON". Make sure fuel does not drip from injector.

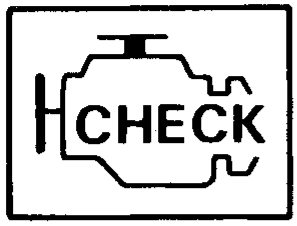
Replace the injectors from which fuel is dripping.

Does not drip.

Go to FINAL CHECK.

Diagnostic Procedure 34 (Cont'd)

C



MALFUNCTION INDICATOR LAMP

SEF177M

Perform FINAL CHECK by the following procedure after repair is completed.

FINAL CHECK

↓

Erase the diagnostic test mode III (Self-diagnostic results).
(See page EF & EC-37.)
Make sure diagnostic trouble code No. 55 is displayed in Diagnostic Test Mode III.
1) Start engine and warm it up sufficiently.
2) Disconnect mass air flow sensor harness connector and run engine for at least 30 seconds at 2,000 rpm
3) Stop engine and reconnect mass air flow sensor harness connector.
4) Make sure Diagnostic trouble code No. 12 is displayed in Diagnostic Test Mode III.
5) Erase the diagnostic test mode III (Self-diagnostic results). Make sure Diagnostic trouble code No. 55 is displayed in Diagnostic Test Mode III.

↓

B

Perform driving test as indicated in figure B .

↓

C

Make sure that malfunction indicator lamp does not come on during engine test.

Comes on → Recheck ECM pin terminals for damage or the connection of ECM harness connector.

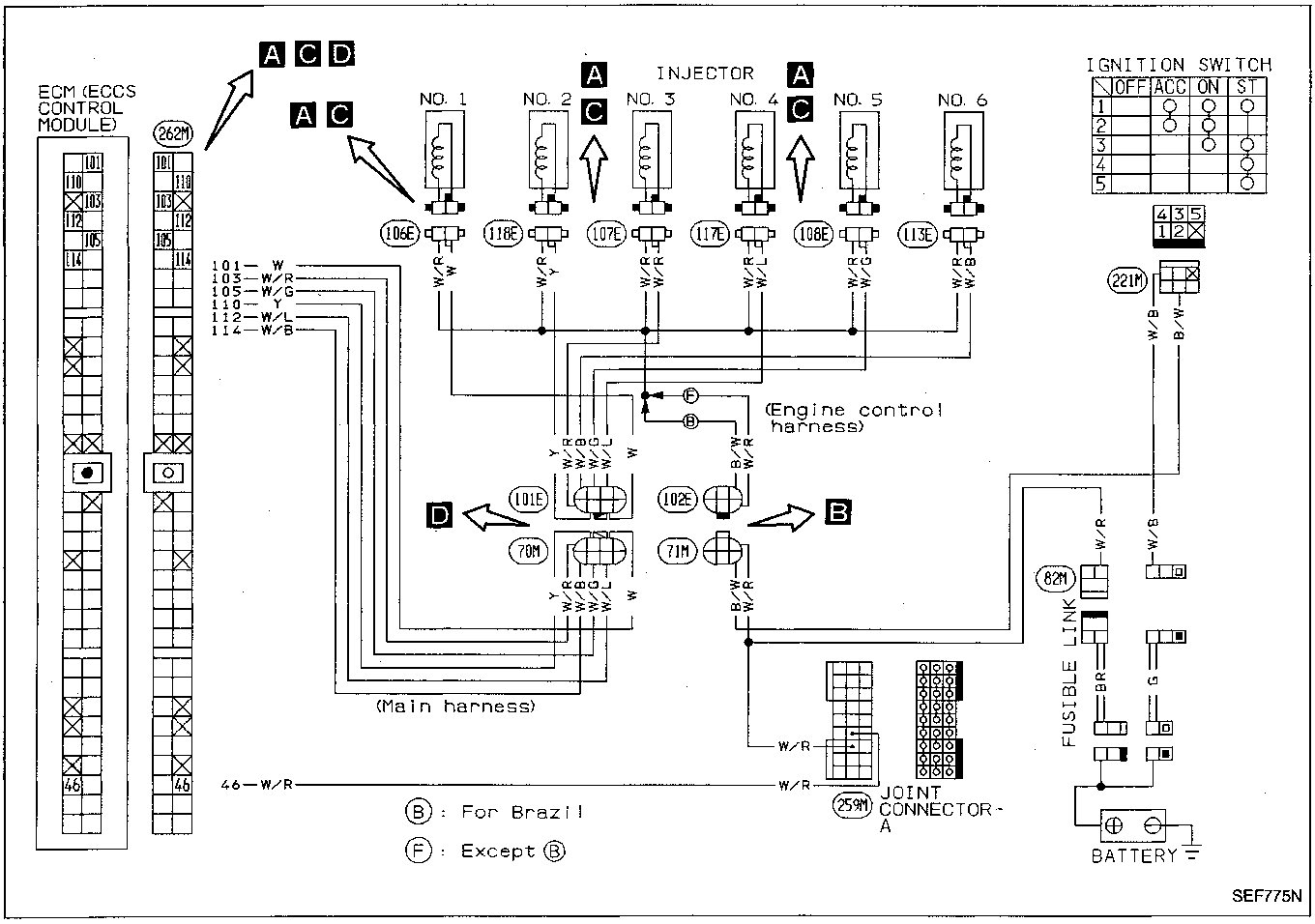
Does not come on.

↓

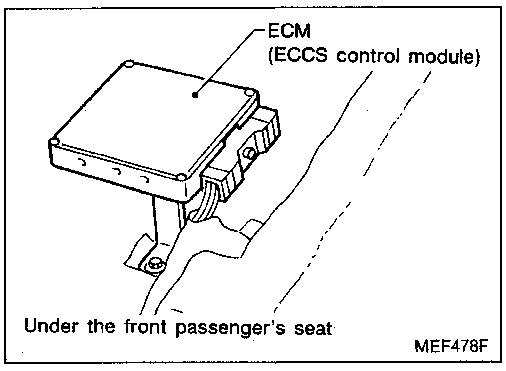
INSPECTION END

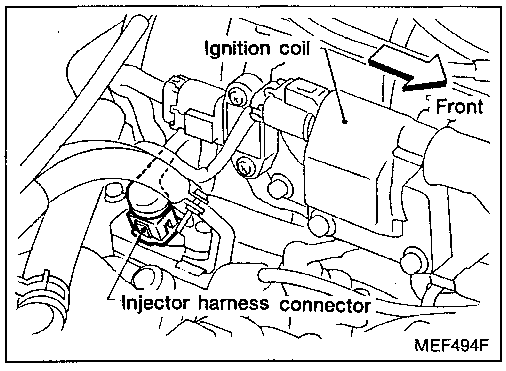
Diagnostic Procedure 35

INJECTOR CIRCUIT (Diagnostic trouble code No. 51) CHECK (MALFUNCTION INDICATOR LAMP ITEM)

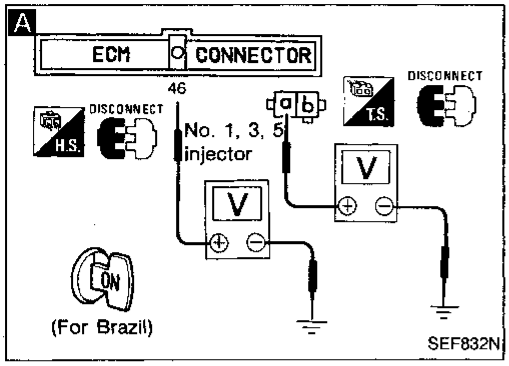


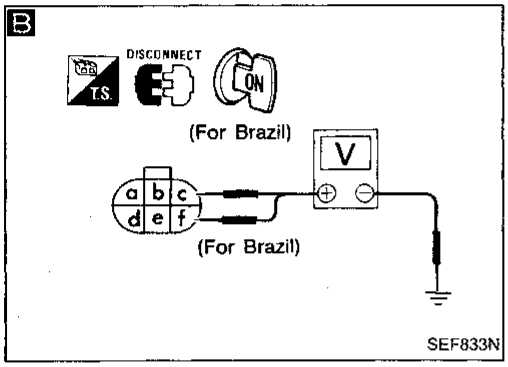
Harness layout

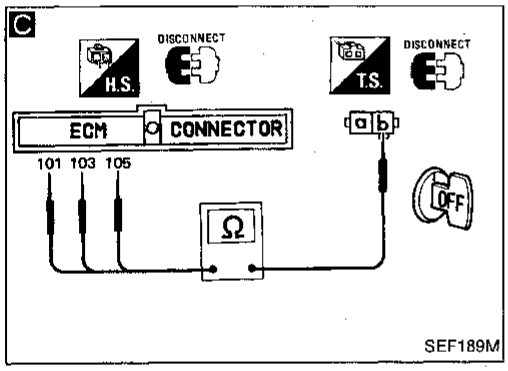


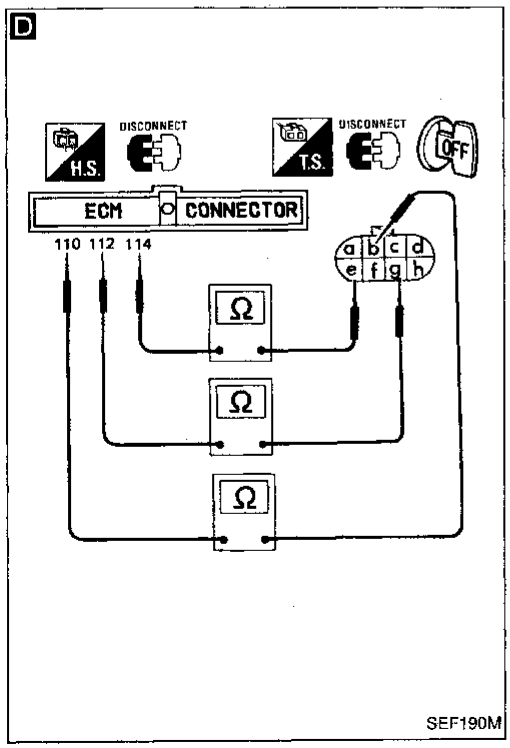


Diagnostic Procedure 35 (Cont'd)









INSPECTION START

A

CHECK POWER SUPPLY.
1) Disconnect harness connectors for No. 1, No. 3 and No. 5 injectors.
2) Disconnect ECM harness connector.
A 3) Check voltage following figure **A** .
Voltage: Battery voltage
4) Disconnect sub-harness connector (71M) , (102E) for No. 2, No. 4 and No. 6 injectors.
B 5) Check voltage between terminal and ground.
Voltage: Battery voltage

NG → Check the following.
- Joint connector-A (259M)
- Harness connectors (71M) , (102E)
- "BR" fusible link
- Harness continuity between battery and injector
- Harness continuity between battery and ECM
- Harness continuity between ignition switch and injector (For Brazil)

If NG, repair harness or connectors.

OK ↓

CHECK OUTPUT SIGNAL CIRCUIT.
C 1) Check harness continuity following figure **C** for No. 1, No. 3 and No. 5 injectors.
Continuity should exist.
2) Disconnect sub-harness connectors (70M) , (101E) for No. 2, No. 4 and No. 6 injectors.
D 3) Check harness continuity following figure **D** .
Continuity should exist.

NG → Check the following.
- Harness connectors (70M) , (101E)
- Harness continuity between injector and ECM

If NG, repair harness or connectors.

OK ↓

CHECK COMPONENT (Injector).
Refer to "Electrical Components Inspection".
(See page EF & EC-137.)

NG → Replace injector.

OK ↓

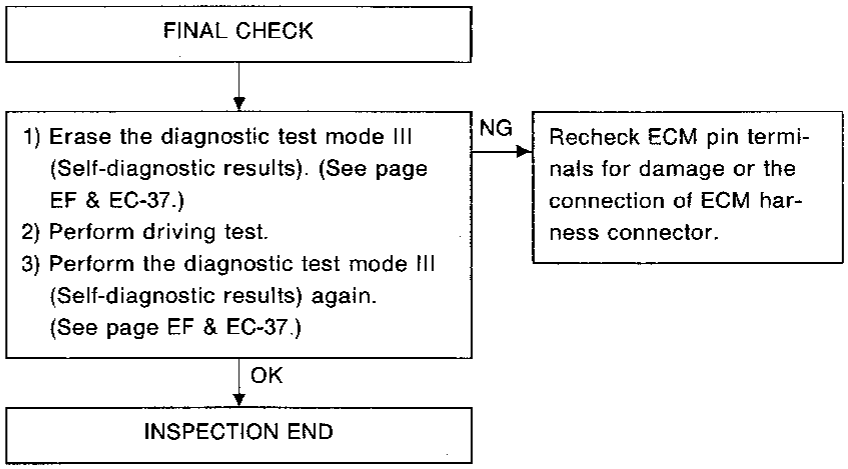
Disconnect and reconnect harness connectors in the circuit, and retest.

Trouble is not fixed. ↓

Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

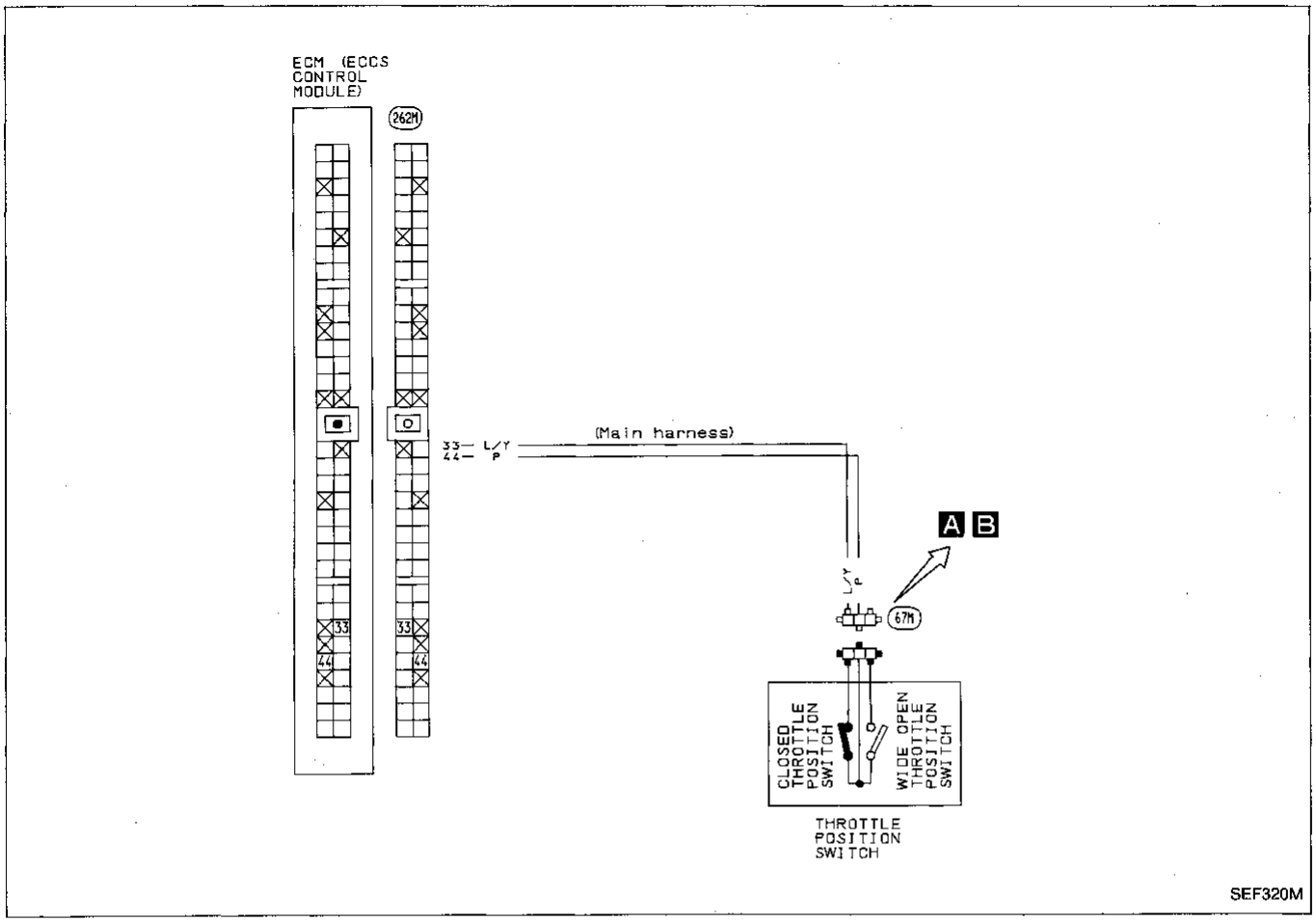
Diagnostic Procedure 35 (Cont'd)

Perform FINAL CHECK by the following procedure after repair is completed.

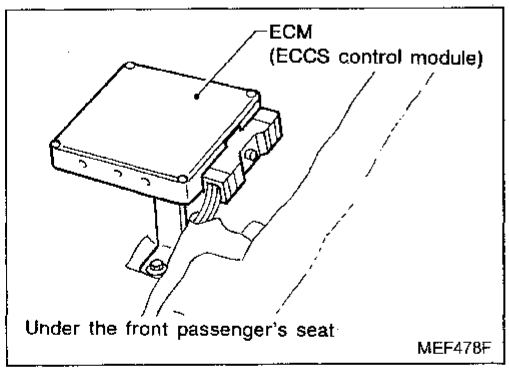


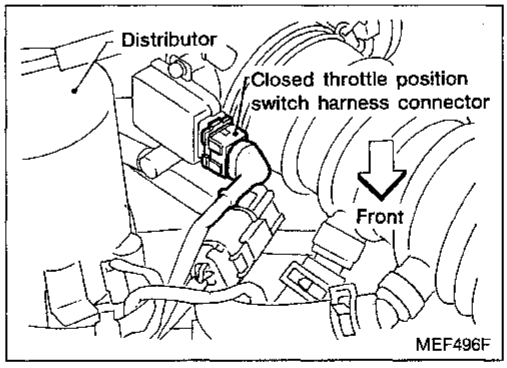
Diagnostic Procedure 36

CLOSED THROTTLE POSITION SWITCH (Switch ON/OFF diagnostic item)

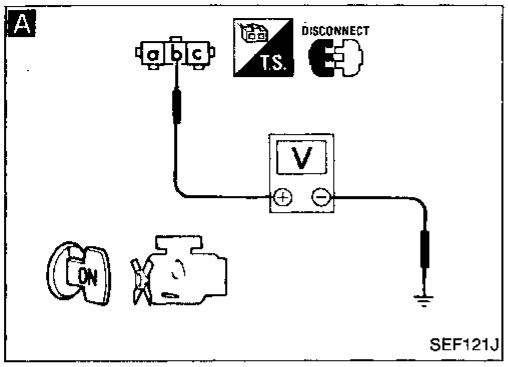


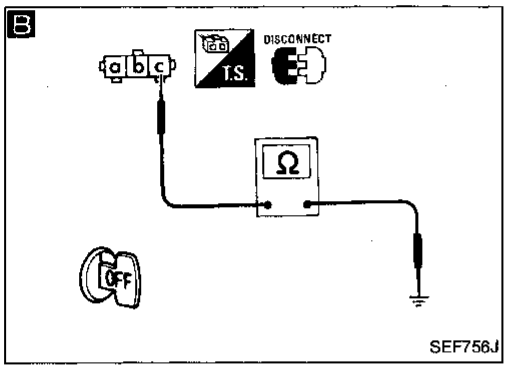
Harness layout





Diagnostic Procedure 36 (Cont'd)





INSPECTION START

A

CHECK POWER SUPPLY.
1) Disconnect closed throttle position switch harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓑ and ground.
Voltage:
Battery voltage

NG → Repair harness or connectors.

OK

B

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Check harness continuity between terminal ⓒ and engine ground.
Continuity should exist.

NG → Repair harness or connectors.

OK

CHECK COMPONENT
(Closed throttle position switch).
Refer to "Electrical Components Inspection".
(See page EF & EC-137.)

NG → Replace closed throttle position switch.

OK

Disconnect and reconnect harness connectors in the circuit, and retest.

Trouble is not fixed.

Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

Perform FINAL CHECK by the following procedure after repair is completed.

FINAL CHECK

1) Start engine.
2) Perform switch ON/OFF diagnosis.
(See page EF & EC-40.)

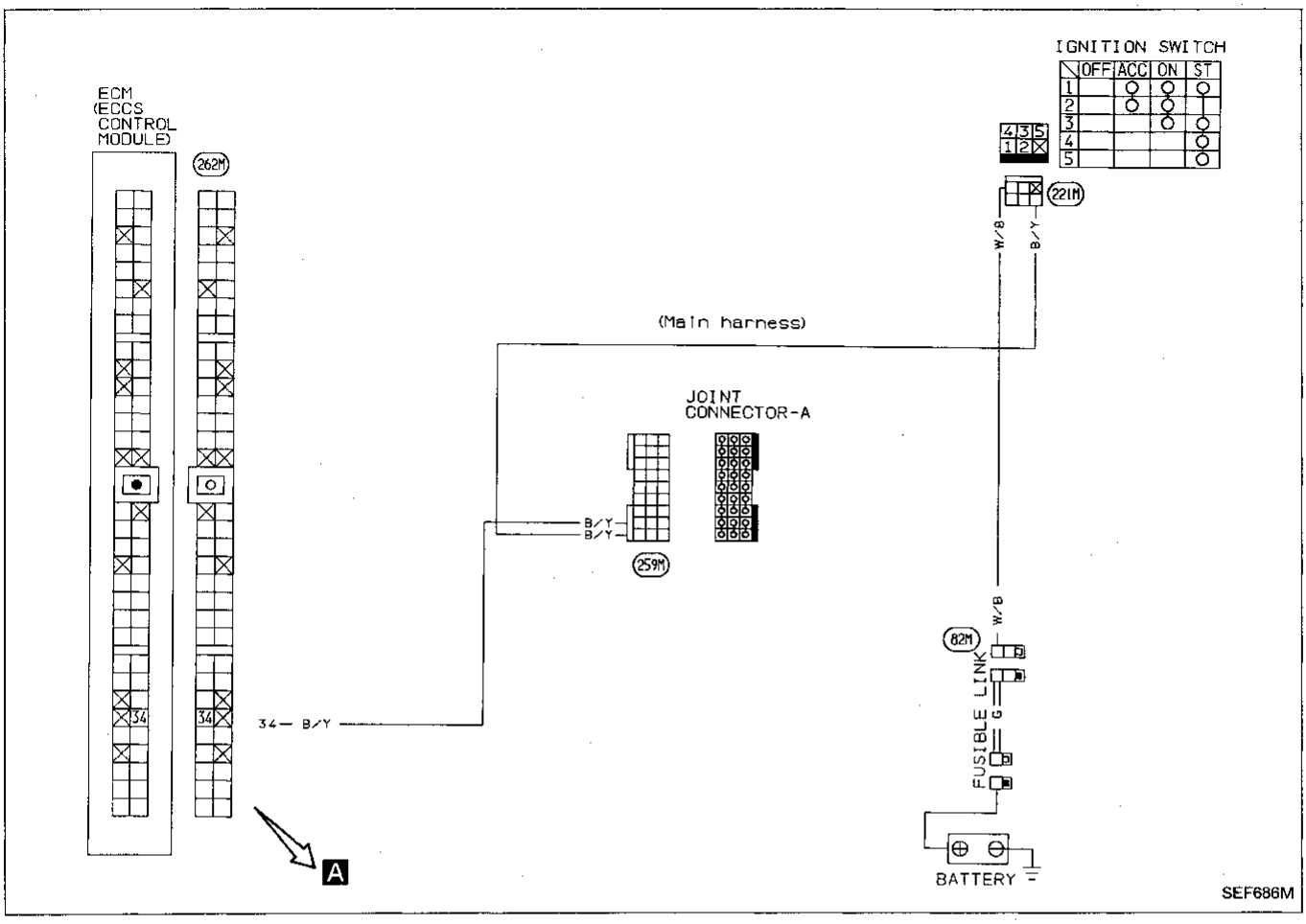
NG → Recheck ECM pin terminals for damage or the connection of ECM harness connector.

OK

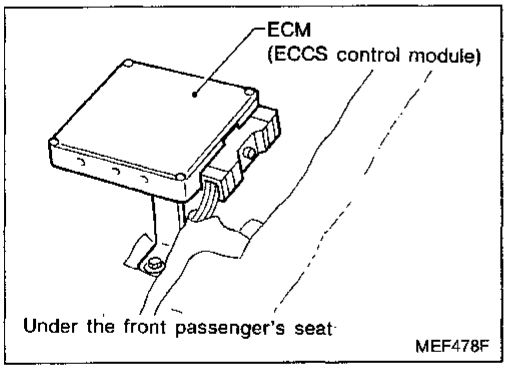
INSPECTION END

Diagnostic Procedure 37

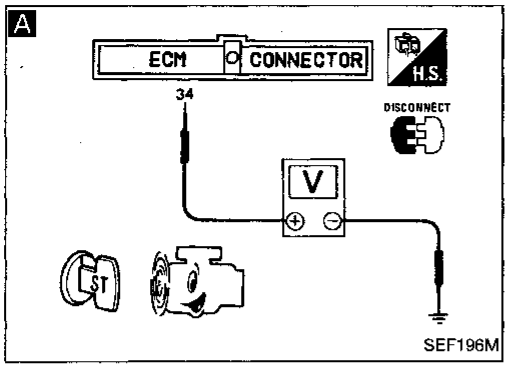
START SIGNAL (Switch ON/OFF diagnostic item)



Harness layout



Diagnostic Procedure 37 (Cont'd)



INSPECTION START

A

CHECK INPUT SIGNAL CIRCUIT.
1) Disconnect ECM harness connector.
2) Turn ignition switch to "ST".
3) Check voltage between ECM terminal ㉞ and ground.
Voltage: Battery voltage

NG → Check the following.
- Joint connector-A (259M)
- Harness continuity between ECM and ignition switch

If NG, repair harness or connectors.

OK ↓

Disconnect and reconnect harness connectors in the circuit, and retest.

Trouble is not fixed. ↓

Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

Perform FINAL CHECK by the following procedure after repair is completed.

FINAL CHECK

1) Turn ignition switch "ON".
2) Perform switch ON/OFF diagnosis. (See page EF & EC-40.)

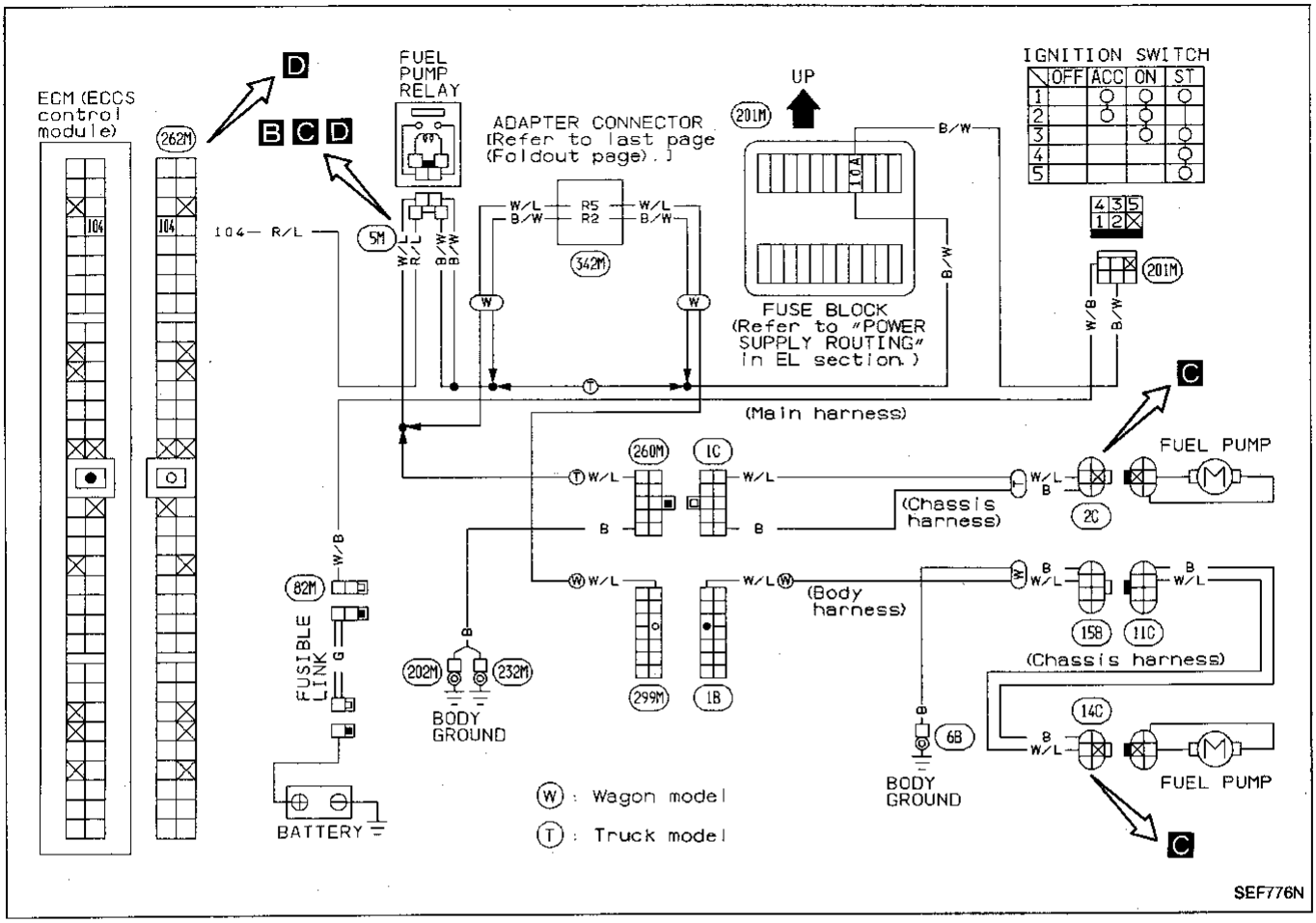
NG → Recheck ECM pin terminals for damage or the connection of ECM harness connector.

OK ↓

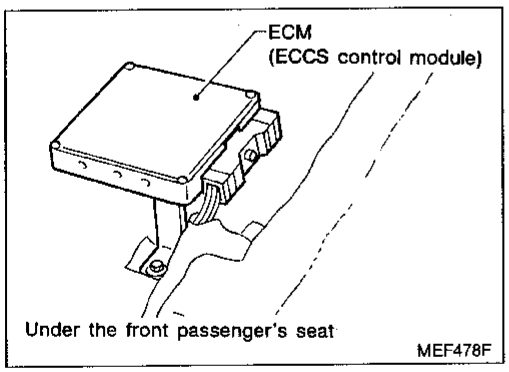
INSPECTION END

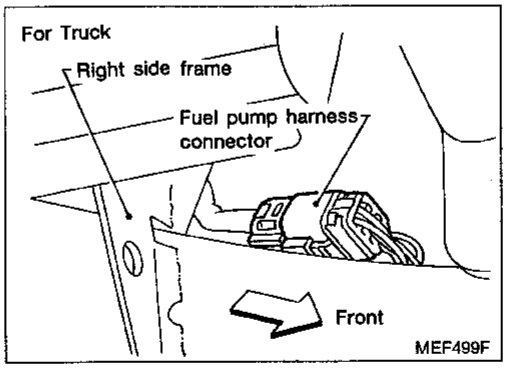
Diagnostic Procedure 38

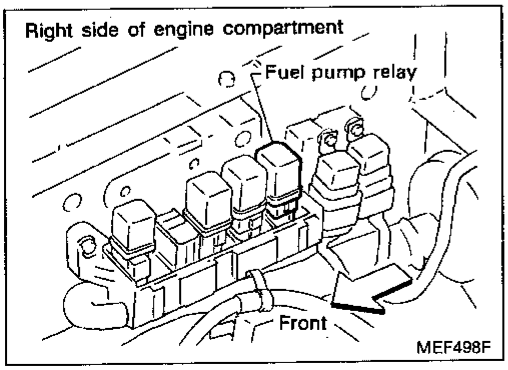
FUEL PUMP (Not self-diagnostic item)

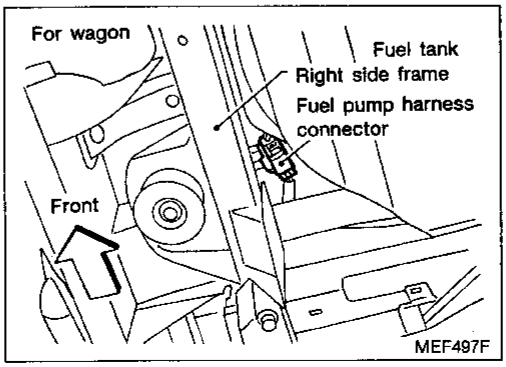


Harness layout



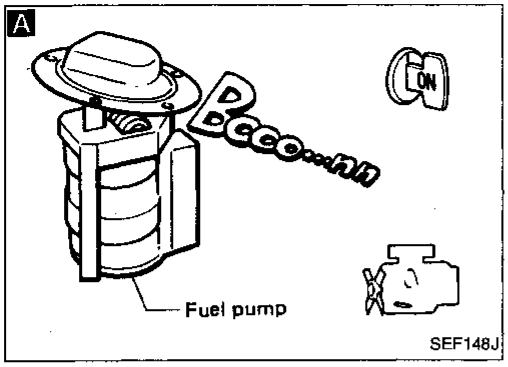




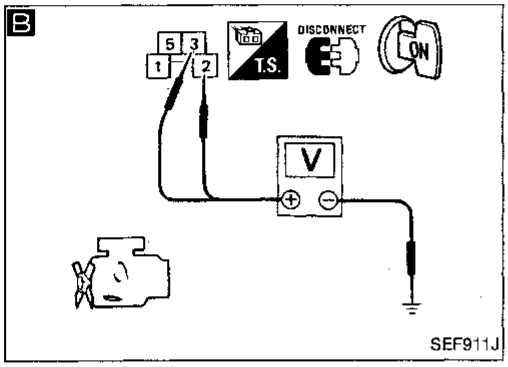


Diagnostic Procedure 38 (Cont'd)

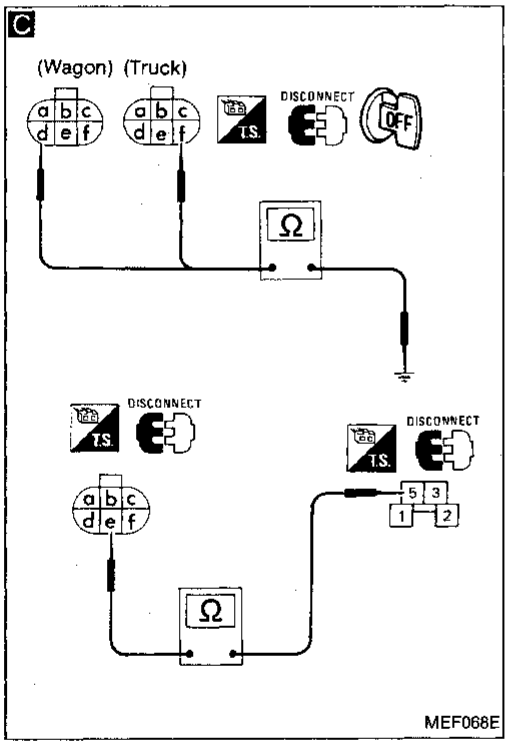
A



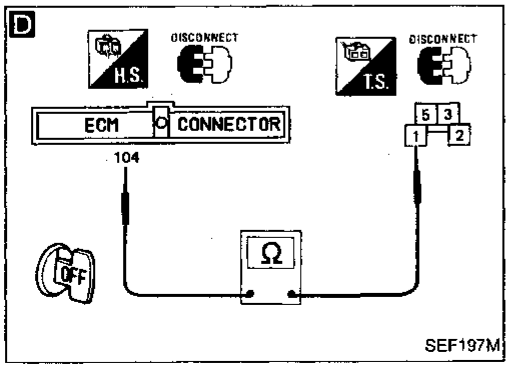
B



C



D



INSPECTION START

A

CHECK OVERALL FUNCTION.
1) Turn ignition switch "ON".
2) Listen to fuel pump operating sound.
Fuel pump should operate for 5 seconds after ignition switch is turned "ON".

OK → INSPECTION END

NG

B

CHECK POWER SUPPLY.
1) Turn ignition switch "OFF".
2) Disconnect fuel pump relay.
3) Turn ignition switch "ON".
4) Check voltage between terminals ②, ③ and ground.
Voltage: Battery voltage

NG → Check the following.
- 10A fuse
- Harness continuity between ignition switch and fuel pump relay

If NG, repair harness or connectors.

OK

C

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect fuel pump harness connector.
3) Check harness continuity between terminal ① and body ground, terminal ④ and body ground, terminal ⑥ and terminal ⑤.
Continuity should exist.

NG → Check the following.
- Harness connectors (260M), (1C), (15B), (11C), (299M), (1B), (280M), (22B)
- Harness continuity between fuel pump and body ground
- Harness continuity between fuel pump and fuel pump relay

If NG, repair harness or connectors.

OK

D

CHECK OUTPUT SIGNAL CIRCUIT.
1) Disconnect ECM harness connector.
2) Check harness continuity between ECM terminal (104) and terminal ①.
Continuity should exist.

NG → Repair harness or connectors.

OK

CHECK COMPONENTS
(Fuel pump and fuel pump relay).
Refer to "Electrical Components Inspection".
(See page EF & EC-138.)

NG → Replace malfunctioning component(s).

OK

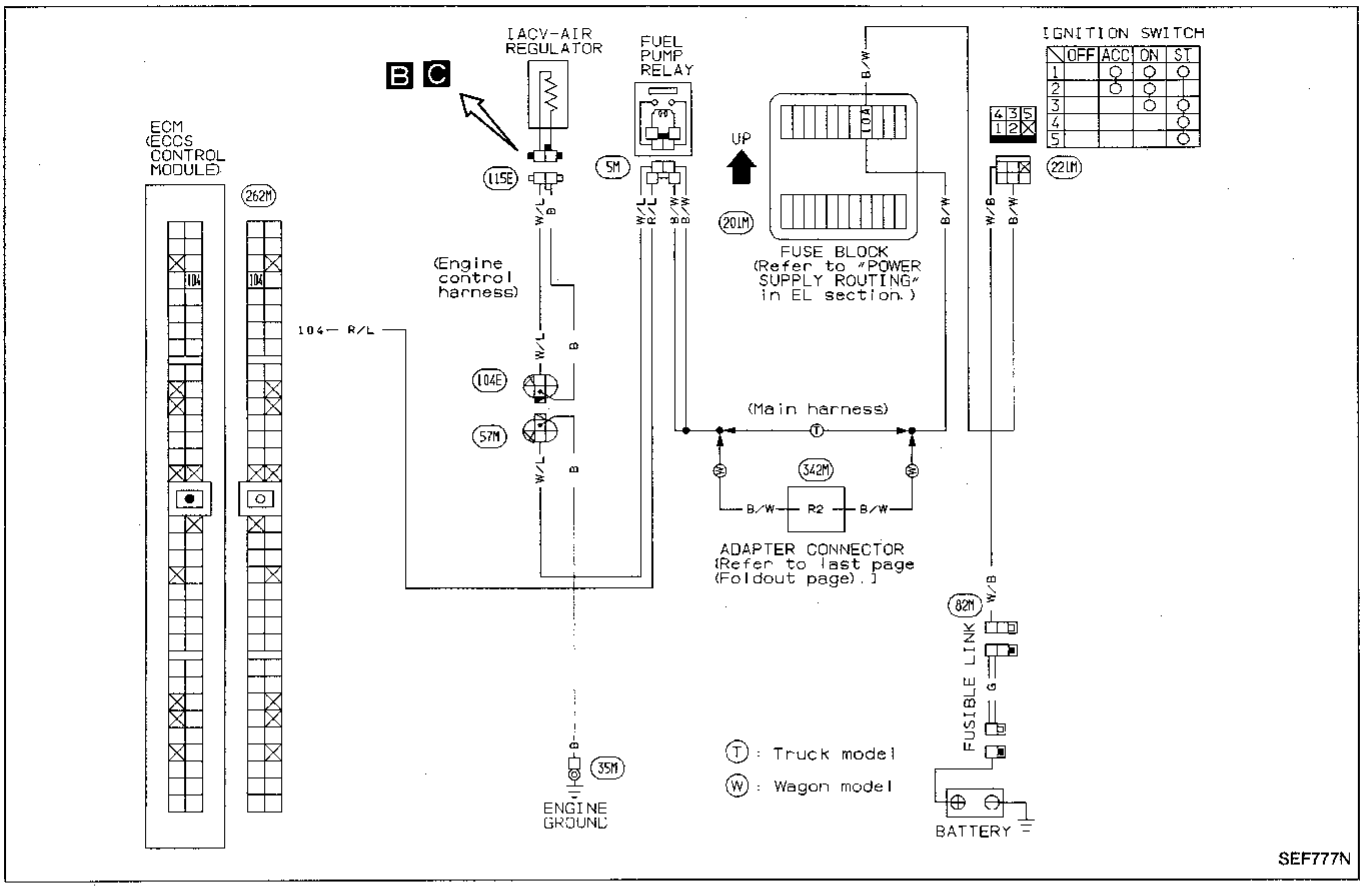
Disconnect and reconnect harness connectors in the circuit, and retest.

Trouble is not fixed.

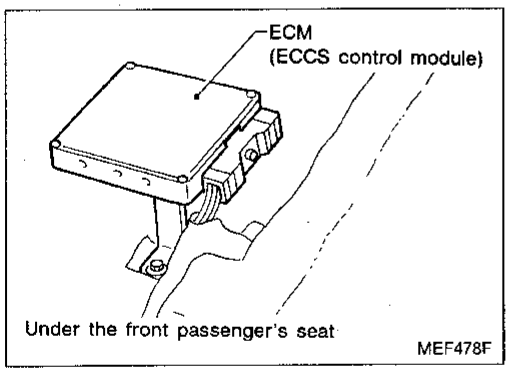
Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

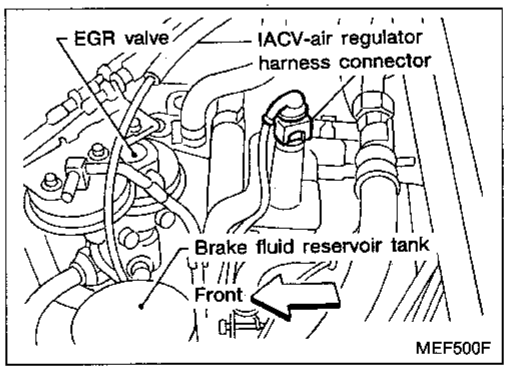
Diagnostic Procedure 39

IACV-AIR REGULATOR (Not self-diagnostic item)

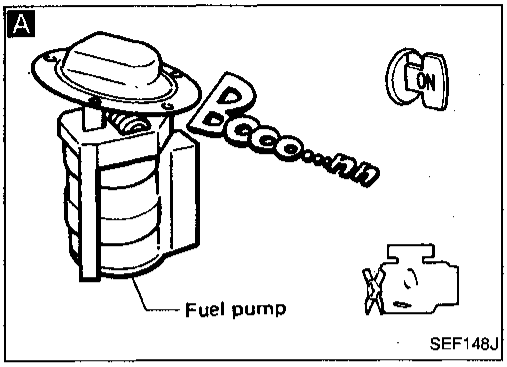


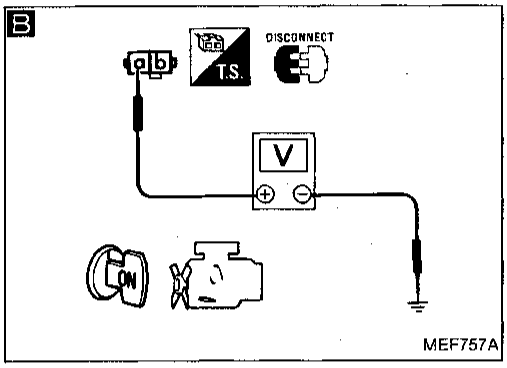
Harness layout

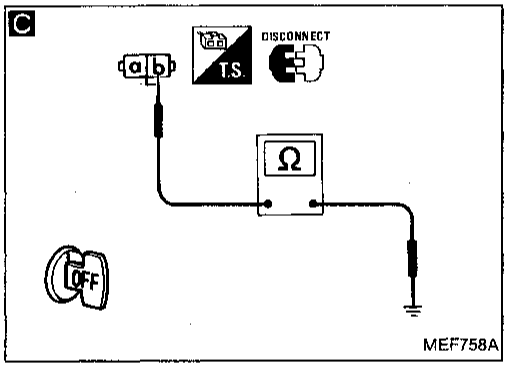




Diagnostic Procedure 39 (Cont'd)







INSPECTION START

A

CHECK OVERALL FUNCTION.
1) Turn ignition switch "ON".
2) Listen to fuel pump operating sound.
Fuel pump should operate for 5 seconds after ignition switch is turned "ON".

NG → Check fuel pump control circuit.
(See page EF & EC-115.)

OK

B

CHECK POWER SUPPLY.
1) Turn ignition switch "OFF".
2) Disconnect IACV-air regulator harness connector.
3) Turn ignition switch "ON".
4) Check voltage between terminal ⓐ and ground.
Battery voltage should exist for 5 seconds after ignition switch is turned "ON".

NG → Check the following.
- Harness connectors (57M), (104E)
- Harness continuity between IACV-air regulator and fuel pump relay

If NG, repair harness or connectors.

OK

C

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Check harness continuity between terminal ⓑ and engine ground.
Continuity should exist.

NG → Check the following.
- Harness connectors (57M), (104E)
- Harness continuity between IACV-air regulator and engine ground

If NG, repair harness or connectors.

OK

CHECK COMPONENT
(IACV-air regulator).
Refer to "Electrical Components Inspection".
(See page EF & EC-137.)

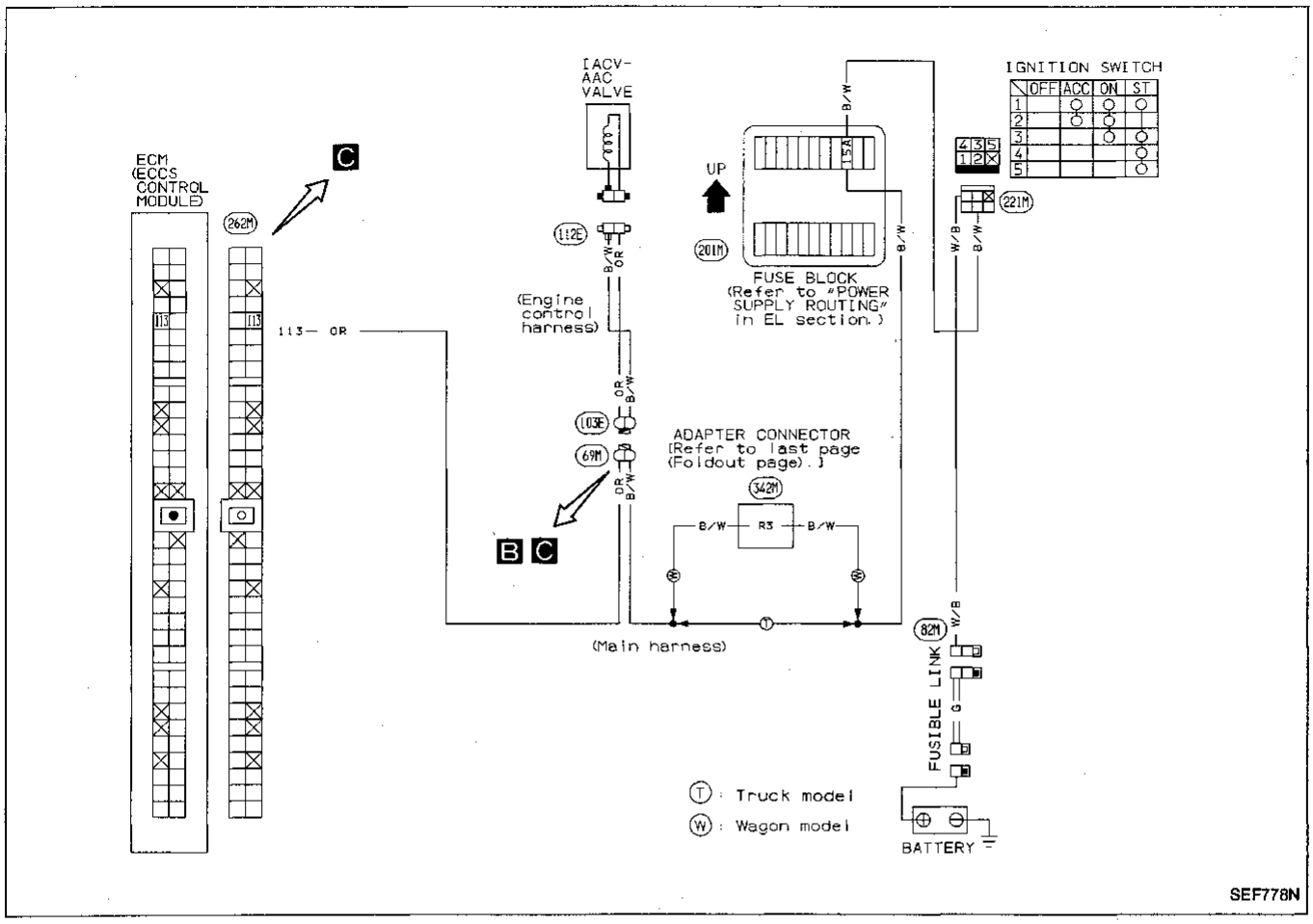
NG → Replace IACV-air regulator.

OK

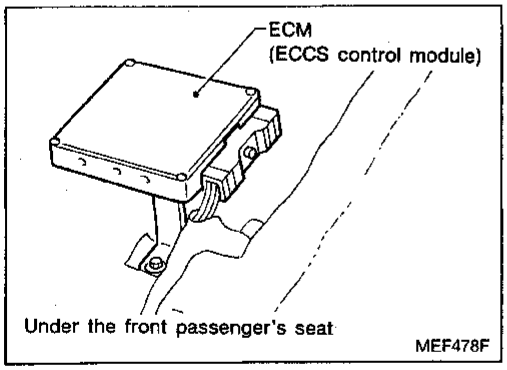
INSPECTION END

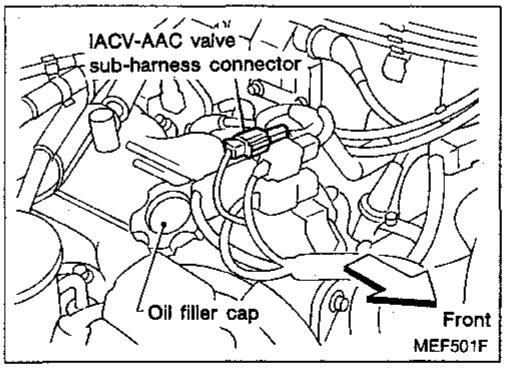
Diagnostic Procedure 40

IACV-AAC VALVE (Not self-diagnostic item)

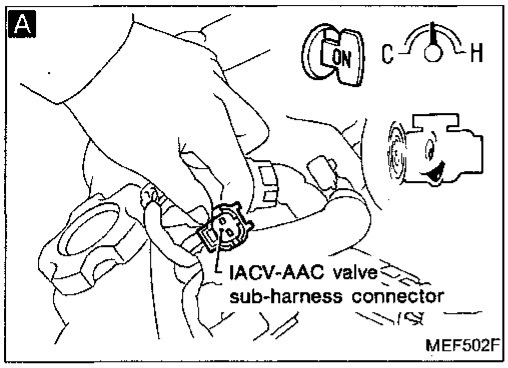


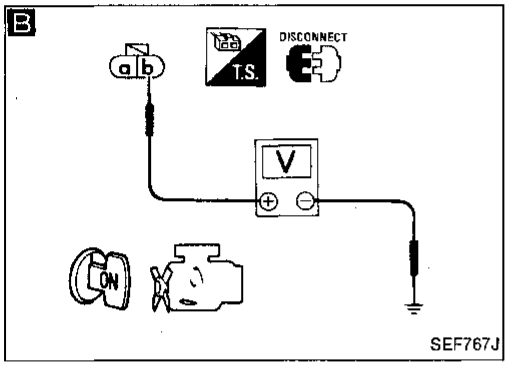
Harness layout

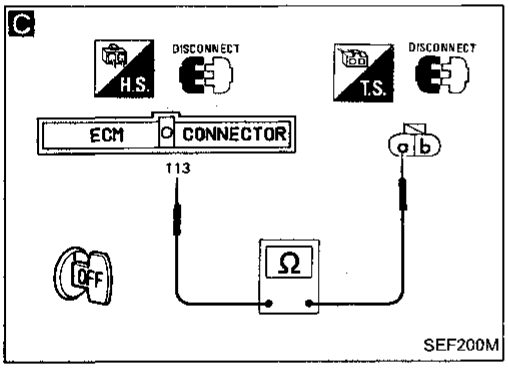




Diagnostic Procedure 40 (Cont'd)







INSPECTION START

A

CHECK OVERALL FUNCTION.
1) Start engine and warm it up sufficiently.
2) Check idle speed.
750±50 rpm
(A/T in "N" position)
If NG, adjust idle speed.
3) Disconnect IACV-AAC valve sub-harness connector.
4) Make sure that idle speed drops.

Drops. → INSPECTION END

Does not drop.

B

CHECK POWER SUPPLY.
1) Stop engine.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓑ and ground.
Voltage: Battery voltage

NG → Check the following.
- 15A fuse
- Harness continuity between IACV-AAC valve sub-harness connector and ignition switch

If NG, repair harness or connectors.

OK

C

CHECK OUTPUT SIGNAL CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect ECM harness connector.
3) Check harness continuity between ECM terminal (113) and terminal ⓐ.
Continuity should exist.

NG → Repair harness or connectors.

OK

CHECK COMPONENT
(IACV-AAC valve)
Refer to "Electrical Components Inspection".
(See page EF & EC-136.)

NG → Replace IACV-AAC valve.

OK

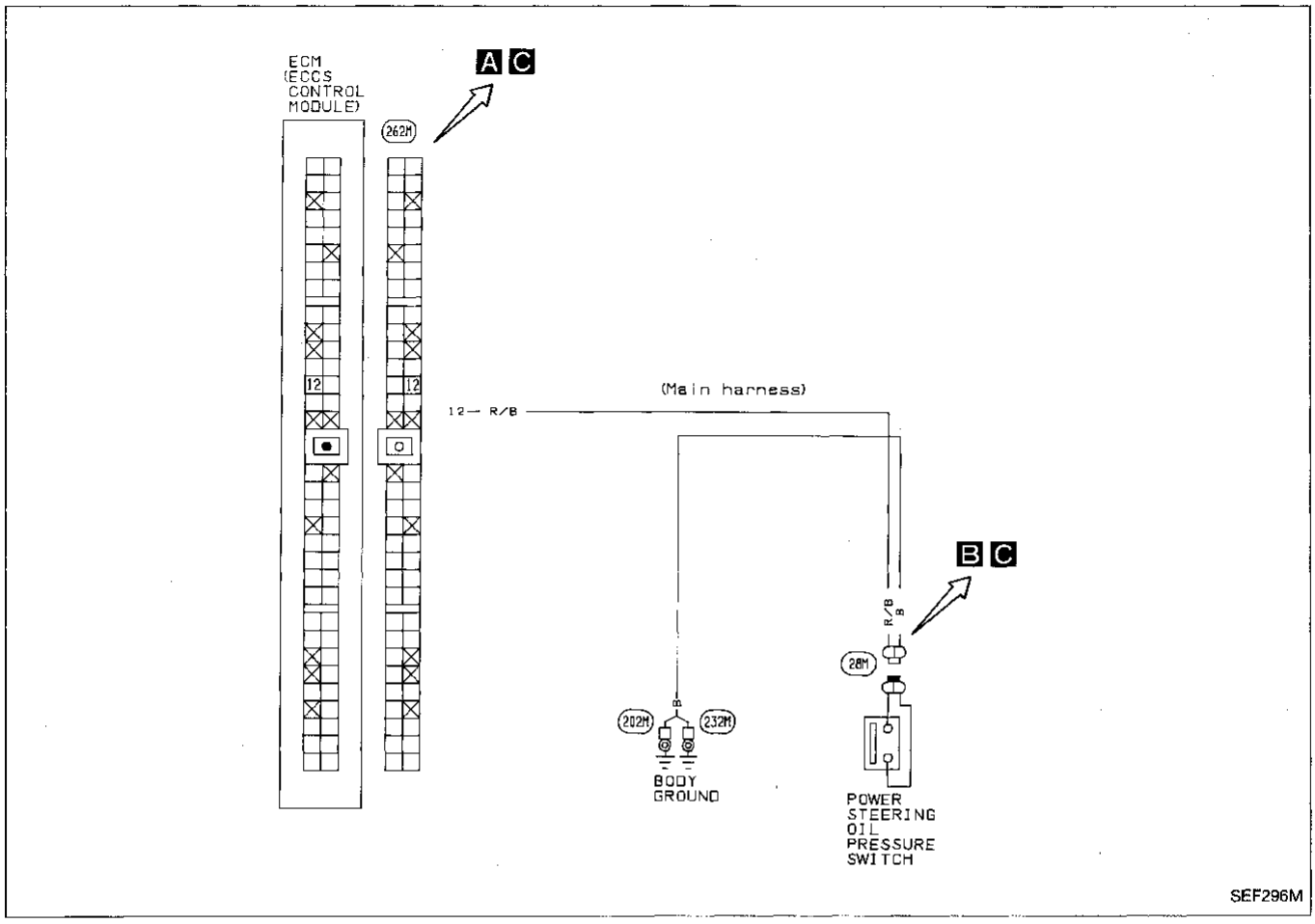
Disconnect and reconnect harness connectors in the circuit, and retest.

Trouble is not fixed.

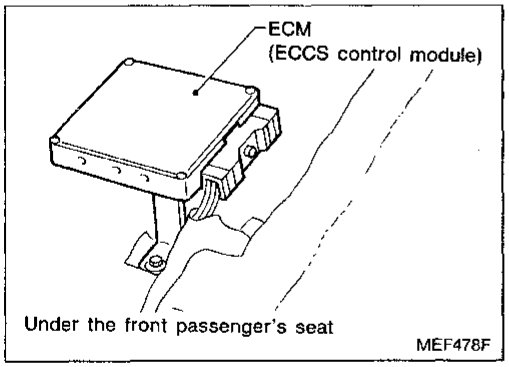
Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

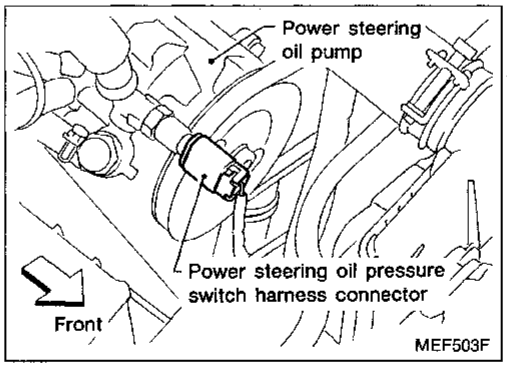
Diagnostic Procedure 41

POWER STEERING OIL PRESSURE SWITCH (Not self-diagnostic item)



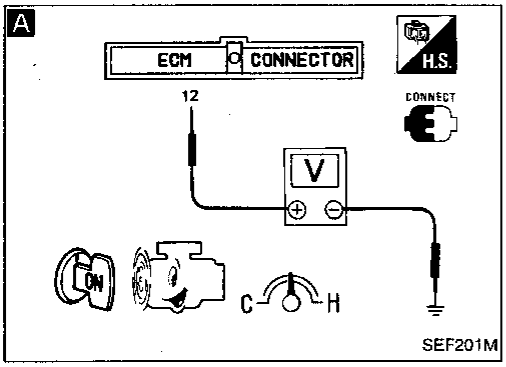
Harness layout





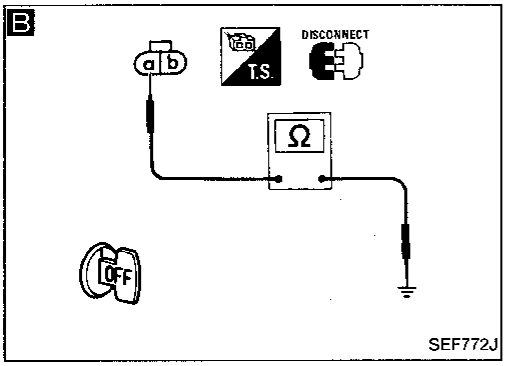
Diagnostic Procedure 41 (Cont'd)

A



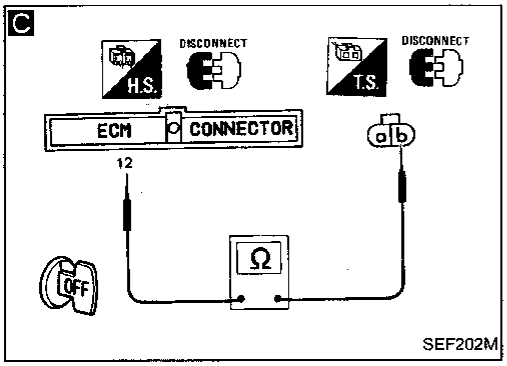
SEF201M

B



SEF772J

C



SEF202M

INSPECTION START

A

CHECK CONTROL FUNCTION.
1) Start engine and warm it up sufficiently.
2) Check voltage between ECM terminal ⑫ and ground.
Voltage:
When steering wheel is turned quickly.
Approximately 0 - 2V
Except above
Approximately 4.8 - 4.9V

OK → INSPECTION END

NG

B

CHECK GROUND CIRCUIT.
1) Stop engine.
2) Disconnect power steering oil pressure switch harness connector.
3) Check harness continuity between terminal ⓐ and body ground.
Continuity should exist.

NG → Repair harness or connectors.

OK

C

CHECK INPUT SIGNAL CIRCUIT.
1) Disconnect ECM harness connector.
2) Check harness continuity between ECM terminal ⑫ and terminal ⓑ.
Continuity should exist.

NG → Repair harness or connectors.

OK

CHECK COMPONENT
(Power steering oil pressure switch).
Refer to "Electrical Components Inspection".
(See page EF & EC-138.)

NG → Replace power steering oil pressure switch.

OK

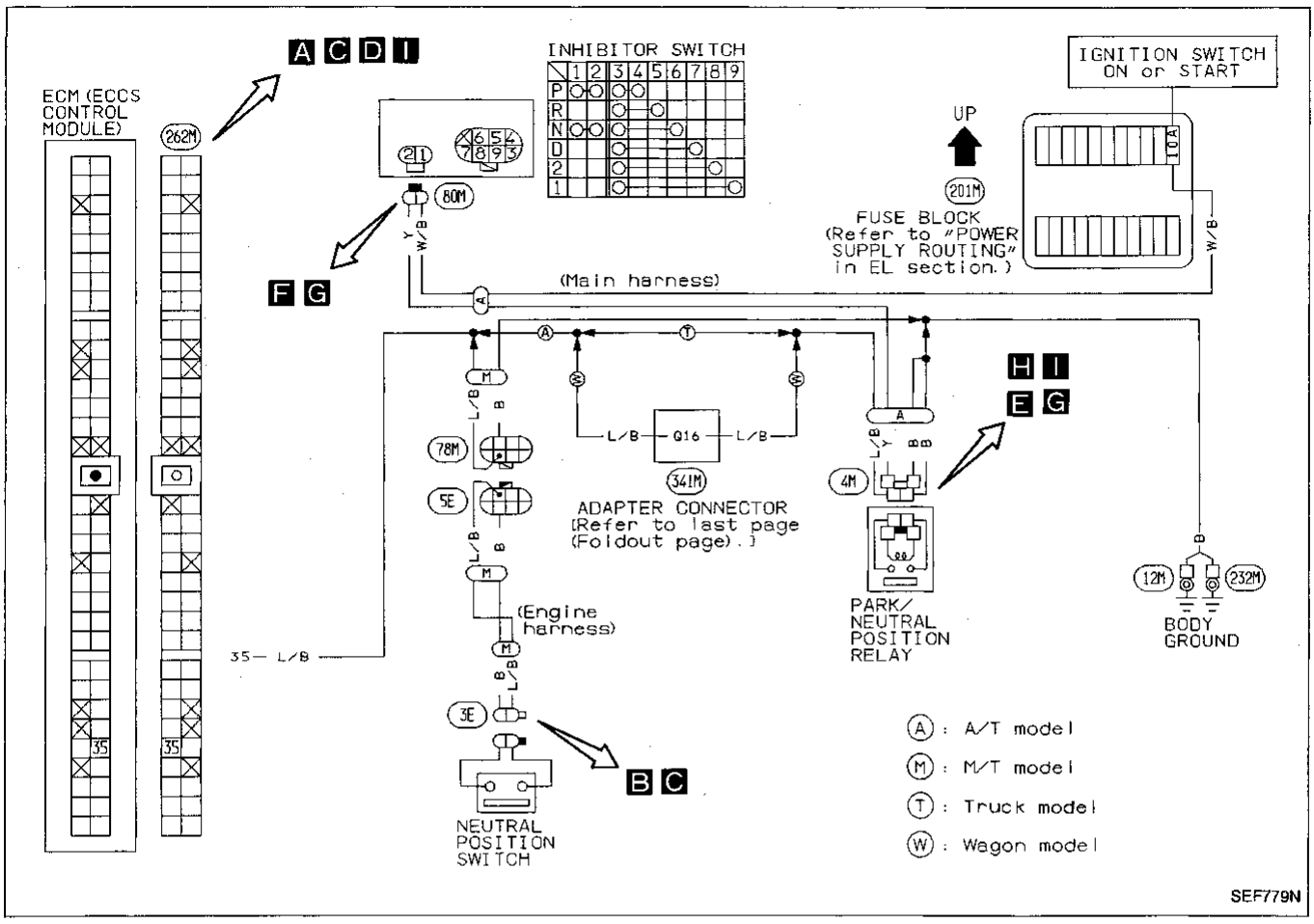
Disconnect and reconnect harness connectors in the circuit, and retest.

Trouble is not fixed.

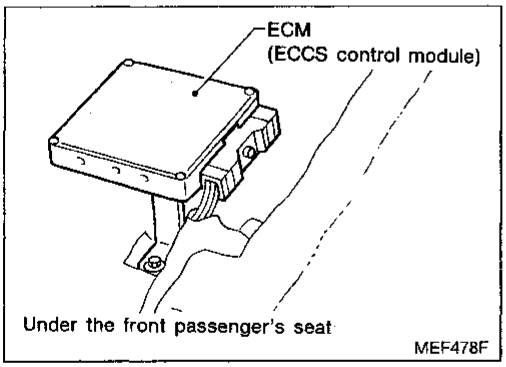
Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

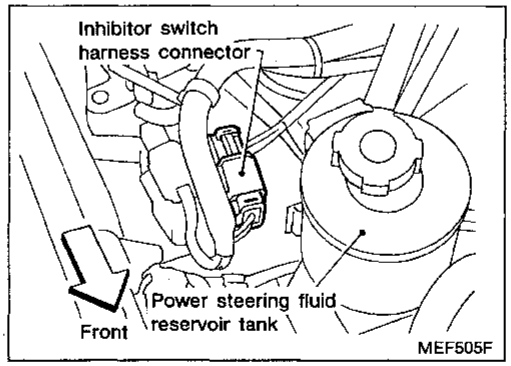
Diagnostic Procedure 42

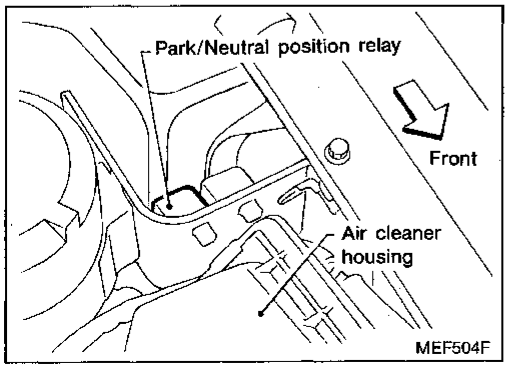
NEUTRAL POSITION/INHIBITOR SWITCH (Not self-diagnostic item)



Harness layout

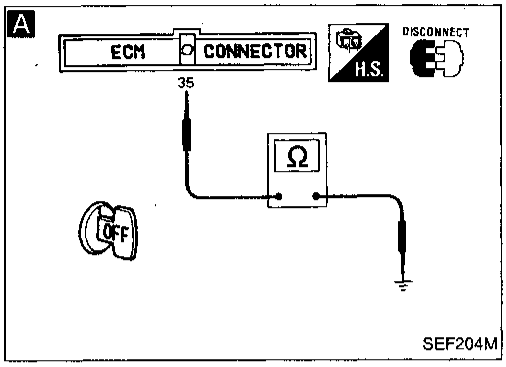




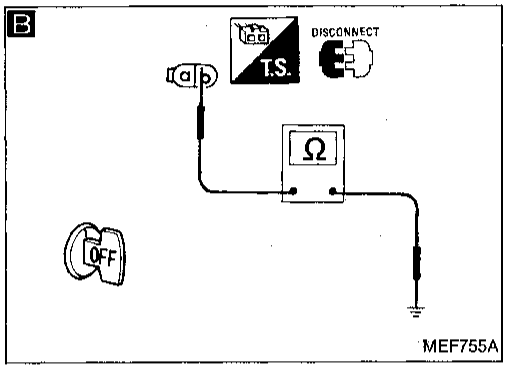


Diagnostic Procedure 42 (Cont'd)

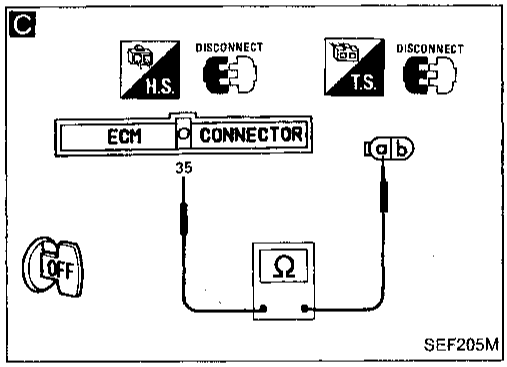
A



B



C



Neutral position switch

INSPECTION START

A

CHECK OVERALL FUNCTION.
1) Set shift lever to the neutral position.
2) Disconnect ECM harness connector.
3) Check harness continuity between ECM terminal ㉟ and body ground.
Continuity should exist.

OK → INSPECTION END

NG

B

CHECK GROUND CIRCUIT.
1) Disconnect neutral position switch harness connector.
2) Check harness continuity between terminal ⓑ and body ground.
Continuity should exist.

NG → Check the following.
- Harness connectors (78M) , (5E)
- Harness continuity between neutral position switch and body ground

If NG, repair harness or connectors.

OK

C

CHECK INPUT SIGNAL CIRCUIT.
1) Check harness continuity between ECM terminal ㉟ and terminal ⑧.
Continuity should exist.

NG → Check the following.
- Harness connectors (78M) , (5E)
- Harness continuity between ECM and neutral position switch

If NG, repair harness or connectors.

OK

CHECK COMPONENT
(Neutral position switch).
Refer to "Electrical Components Inspection".
(See page EF & EC-138.)

NG → Replace neutral position switch.

OK

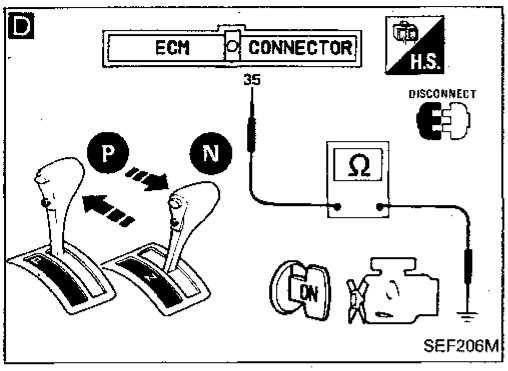
Disconnect and reconnect harness connectors in the circuit, and retest.

Trouble is not fixed.

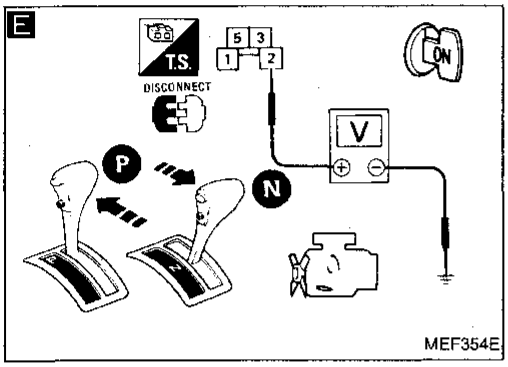
Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

Diagnostic Procedure 42 (Cont'd)

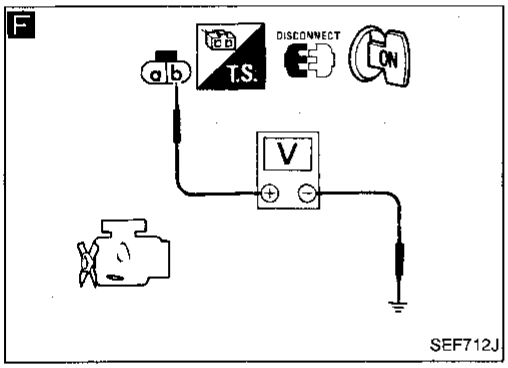
D



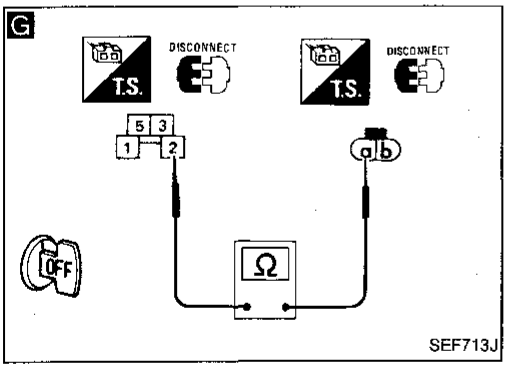
E



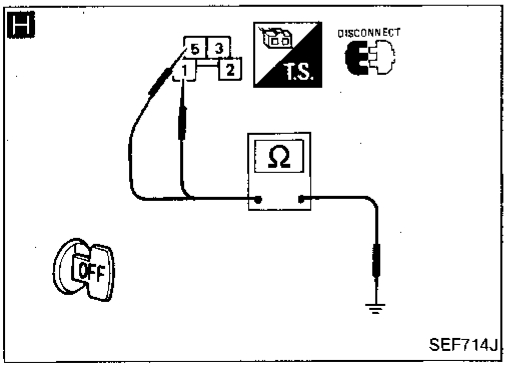
F



G



H



Inhibitor switch

INSPECTION START

D

CHECK OVERALL FUNCTION.
1) Shift selector lever to "P" range.
2) Disconnect ECM harness connector.
3) Turn ignition switch "ON".
4) Check harness continuity between ECM terminal ㉟ and body ground.
Continuity should exist.
5) Shift selector lever to "N" range.
6) Check harness continuity between ECM terminal ㉟ and body ground.
Continuity should exist.

OK → INSPECTION END

NG

E

CHECK POWER SUPPLY.
1) Turn ignition switch "OFF".
2) Disconnect Park/Neutral position relay.
3) Make sure that selector lever is in "N" range.
4) Turn ignition switch "ON".
5) Check voltage between terminal ② and ground.
Voltage: Battery voltage
6) Shift selector lever into "P" range.
7) Check voltage between terminal ② and ground.
Voltage: Battery voltage

NG →

Check the following.

F CHECK HARNESS CONTINUITY BETWEEN INHIBITOR SWITCH AND BATTERY.
1) Turn ignition switch "OFF".
2) Disconnect inhibitor switch harness connector.
3) Turn ignition switch "ON".
4) Check voltage between terminal ⓑ and ground.
Voltage: Battery voltage
If NG, check the following.
- 10A fuse
- Harness continuity between fuse and inhibitor switch

If NG, repair harness or connectors.

G CHECK HARNESS CONTINUITY BETWEEN INHIBITOR SWITCH AND PARK/NEUTRAL POSITION RELAY.
1) Turn ignition switch "OFF".
2) Check harness continuity between terminal ⓐ and terminal ②.
Continuity should exist.

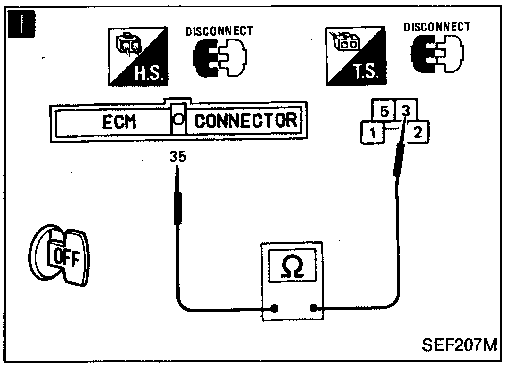
If NG, repair harness or connectors.

CHECK COMPONENT (Inhibitor switch).
Refer to "Electrical Components Inspection".
(See page EF & EC-138.)

OK

Ⓐ

Diagnostic Procedure 42 (Cont'd)



Ⓐ

H

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Check harness continuity between terminals ①, ⑤ and body ground.
Continuity should exist.

NG → Repair harness or connectors.

OK ↓

I

CHECK INPUT SIGNAL CIRCUIT.
1) Check harness continuity between ECM terminal ㉟ and terminal ③.
Continuity should exist.

NG → Repair harness or connectors.

OK ↓

CHECK COMPONENT
(Park/Neutral position relay).
Refer to "Electrical Components Inspection".
(See page EF & EC-138.)

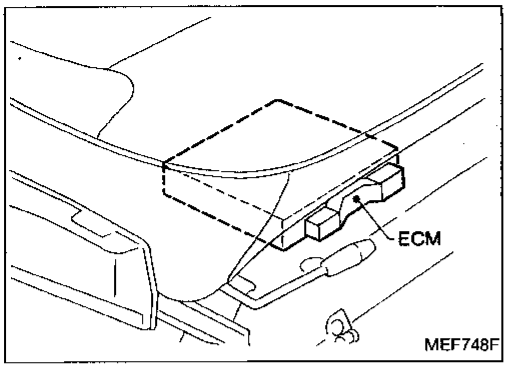
NG → Replace Park/Neutral position relay.

OK ↓

Disconnect and reconnect harness connectors in the circuit, and retest.

Trouble is not fixed. ↓

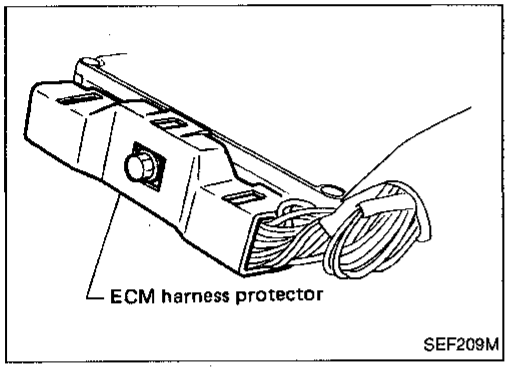
Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.



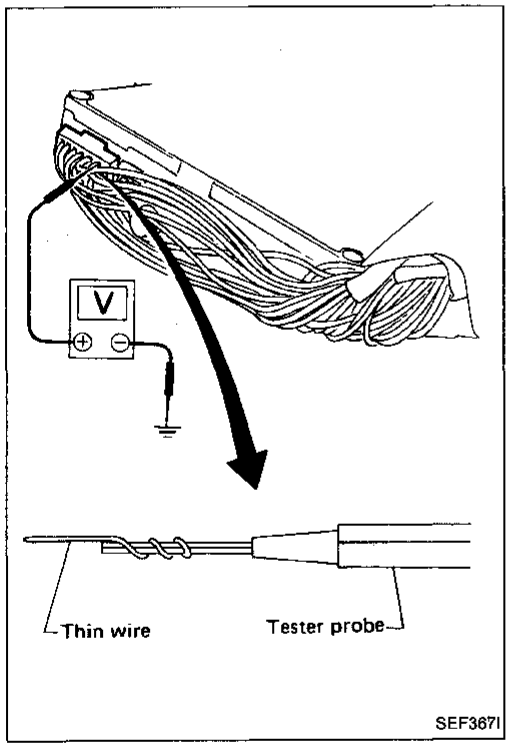
Electrical Components Inspection

ECM INPUT/OUTPUT SIGNAL INSPECTION

1. ECM is located under the passenger seat. For this inspection, remove passenger seat.



2. Remove ECM harness protector.



3. Perform all voltage measurements with the connectors connected.
   Improve tester probe as shown to perform tests easily.

Electrical Components Inspection (Cont'd)

ECM Inspection table

*Data are reference values.

TERMINAL NO.	ITEM	CONDITION	*DATA
1	Ignition signal	Engine is running. └ Idle speed	0.5 - 0.6V
		Engine is running. └ Engine speed is 2,000 rpm.	1.2 - 1.3V
2	Tachometer	Engine is running. └ Idle speed	Approximately 1.0V
		Engine is running. └ Engine speed is 2,000 rpm.	2.7 - 2.9V
3	Ignition check	Engine is running. └ Idle speed	9 - 12V
4	ECM power source (Self-shutoff)	Engine is running. └ Idle speed	0 - 1V
		Engine is not running. └ For a few seconds after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
8	EGR temperature sensor	Engine is running. └ Idle speed	1.0 - 2.0V
		Engine is running. (Racing) └ After warming up	0 - 1.0V
11	Air conditioner relay	Engine is running. └ Both A/C switch and blower switch are "ON".	0 - 1.0V
		Engine is running. └ A/C switch is "OFF".	BATTERY VOLTAGE (11 - 14V)
12	Power steering oil pressure switch	Engine is running. └ Steering wheel is being turned.	0 - 2.0V
		Engine is running. └ Steering wheel is not being turned.	4.8 - 4.9V

Electrical Components Inspection (Cont'd)

***Data are reference values.**

TERMINAL NO.	ITEM	CONDITION	*DATA
16	Mass air flow sensor	Engine is running.	1.0 - 3.0V Output voltage varies with engine speed.
18	Engine coolant temperature sensor	Engine is running.	1.0 - 3.0V Output voltage varies with engine water temperature.
19	Heated oxygen sensor	Engine is running. └ After warming up sufficiently.	0 - Approximately 1.0V
20	Throttle position sensor	Ignition switch "ON"	0.4 - Approximately 4V Output voltage varies with the throttle valve opening angle.
22 30	Camshaft position sensor (Reference signal)	Engine is running. **Do not run engine at high speed under no-load.**	0.2 - 0.5V
27	Knock sensor	Engine is running. └ Idle speed	Approximately 2.5V
28	Throttle opening signal	Ignition switch "ON"	0.3 - Approximately 3V
31 40	Camshaft position sensor (Position signal)	Engine is running. **Do not run engine at high speed under no-load.**	2.0 - 3.0V
33	Closed throttle position switch (⊖ side)	Ignition switch "ON" └ Throttle valve: Idle position	Approximately 8 - 10V
		Ignition switch "ON" └ Throttle valve: Any position except idle position	0V
34	Start signal	Cranking	8 - 12V
35	Neutral position switch & Inhibitor switch	Ignition switch "ON" └ Neutral position/Parking	0V
		Ignition switch "ON" └ Except the above gear position	6 - 7V

Electrical Components Inspection (Cont'd)

*Data are reference values.

TERMINAL NO.	ITEM	CONDITION	*DATA
36	Ignition switch	Ignition switch "OFF"	0V
		Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
37	Throttle position sensor power supply	Ignition switch "ON"	Approximately 5V
38 47	Power supply for ECM	Ignition switch "ON"	BATTERY VOLTAGE
41	Air conditioner switch	Engine is running. └ Both air conditioner switch and blower switch are "ON".	0V
		Engine is running. └ Air conditioner switch is "OFF".	BATTERY VOLTAGE (11 - 14V)
44	Closed throttle position switch (⊕ side)	Ignition switch "ON" └ Throttle valve: Idle position	Approximately 9 - 10V
		Ignition switch "ON" └ Throttle valve: Except idle position	BATTERY VOLTAGE (11 - 14V)
46	Power supply (Back-up)	Ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
101	Injector No. 1	Engine is running.	BATTERY VOLTAGE (11 - 14V)
103	Injector No. 3		
105	Injector No. 5		
110	Injector No. 2		
112	Injector No. 4		
114	Injector No. 6		

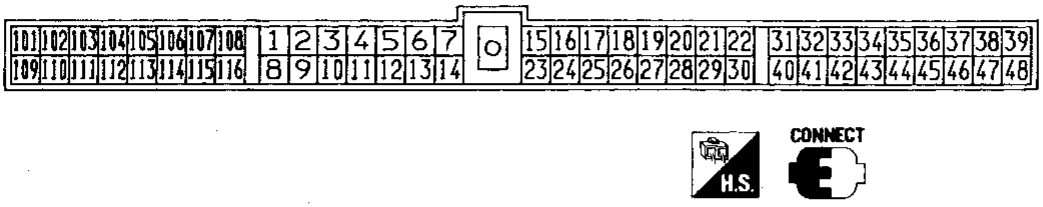
Electrical Components Inspection (Cont'd)

*Data are reference values.

TERMINAL NO.	ITEM	CONDITION	*DATA
102	EGRC-solenoid valve	Engine is running. (Warm-up condition) └ Idle speed (Jack up drive wheels and set shift lever to 1st position.)	0.7 - 0.9V
		Engine is running. (Warm-up condition) └ Engine speed is 2,000 rpm. (Jack up drive wheels and set shift lever to 1st position.)	BATTERY VOLTAGE (11 - 14V)
		Engine is running. (Warm-up condition) └ Engine speed is above 3,100 rpm. (A/T model) Engine speed is above 2,600 rpm. (M/T model) (Jack up drive wheels and set shift lever to 1st position.)	0.8 - 0.9V
104	Fuel pump relay	Ignition switch "ON" └ For 5 seconds after turning ignition switch "ON" Engine is running.	0.7 - 0.9V
		Ignition switch "ON" └ Within 5 seconds after turning ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
106	Heated oxygen sensor heater	Engine is running. └ Engine speed is below 4,200 rpm.	Approximately 0V
		Engine is running. └ Engine speed is above 4,200 rpm.	BATTERY VOLTAGE (11 - 14V)
113	IACV-AAC valve	Engine is running. └ Idle speed	7 - 10V
		Engine is running. └ Steering wheel is being turned. Air conditioner is operating. Rear defogger is "ON". Headlamps are in high position.	4 - 7V

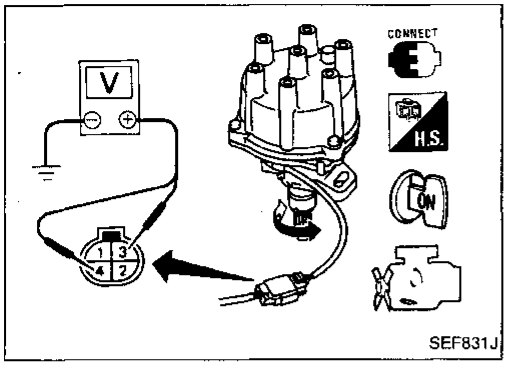
Electrical Components Inspection (Cont'd)

ECM HARNESS CONNECTOR TERMINAL LAYOUT



SEF419H

Electrical Components Inspection (Cont'd)



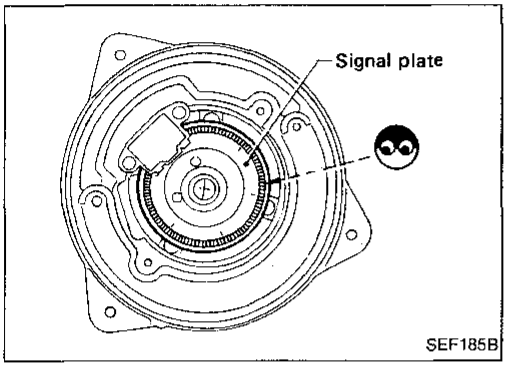
CAMSHAFT POSITION SENSOR

1. Remove distributor from engine. (Camshaft position sensor harness connector should remain connected.)
2. Turn ignition switch "ON".
3. Rotate distributor shaft slowly by hand and check voltage between terminals ③, ④ and ground.

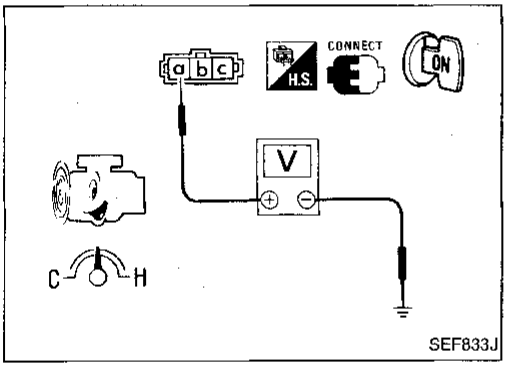
Terminal	Voltage
③ (120° signal)	Tester's pointer fluctuates between 5V and 0V.
④ (1° signal)	

If NG, replace distributor assembly with camshaft position sensor.

4. Visually check signal plate for damage or dust.



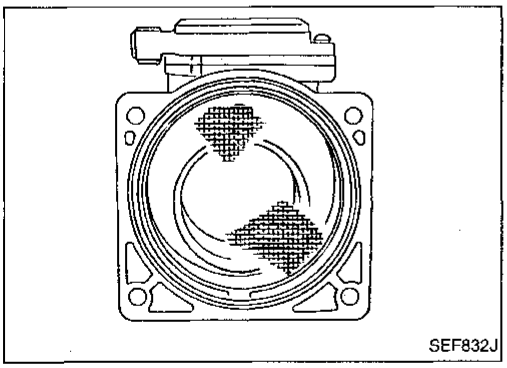
MASS AIR FLOW SENSOR



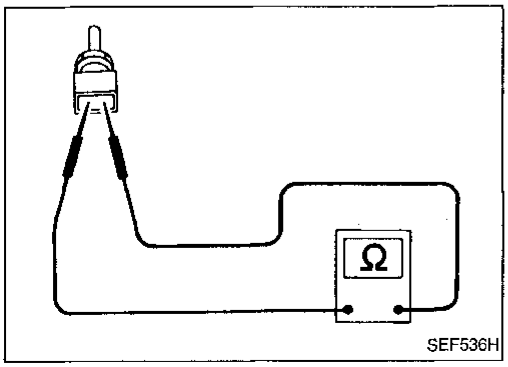
1. Peel mass air flow sensor harness connector rubber as shown in the figure if the harness connector is connected.
2. Turn ignition switch "ON".
3. Start engine and warm it up sufficiently.
4. Check voltage between terminal ⓐ and ground.

Conditions	Voltage V
Ignition switch "ON" (Engine stopped.)	Less than 1.0
Idle (Engine is warm-up sufficiently.)	Approximately 1.5 - 2.0

5. If NG, remove mass air flow sensor from air duct. Check hot wire for damage or dust.



ENGINE COOLANT TEMPERATURE SENSOR

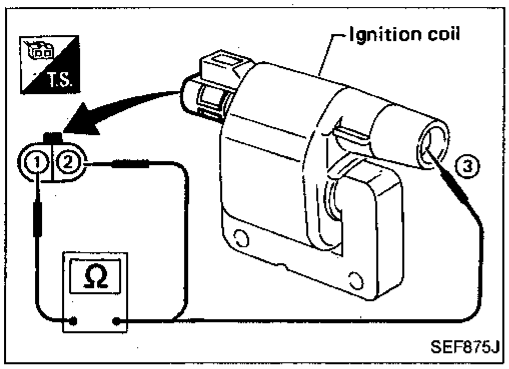


1. Disconnect engine coolant temperature sensor harness connector.
2. Check resistance as shown in the figure.

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.0
80 (176)	0.30 - 0.33

If NG, replace engine coolant temperature sensor.

Electrical Components Inspection (Cont'd)

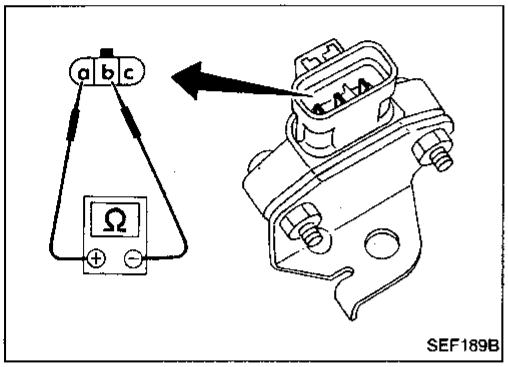


IGNITION COIL

1. Disconnect ignition coil harness connector.
2. Check resistance as shown in the figure.

Terminal	Resistance
① - ②	Approximately 1.0Ω
① - ③	Approximately 10 kΩ

If NG, replace ignition coil.



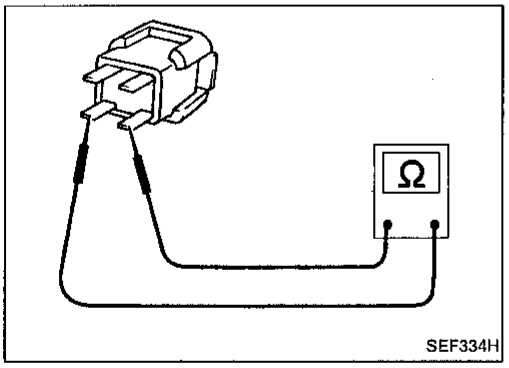
POWER TRANSISTOR

1. Disconnect power transistor harness connector.
2. Check continuity between power transistor terminals with a digital meter.

Set tester in lower range.

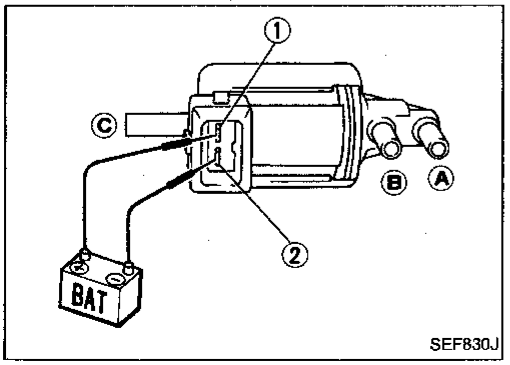
Terminal No.	Tester polarity	Continuity
ⓐ	⊕	No
ⓑ	⊖	
ⓐ	⊖	Yes
ⓑ	⊕	
ⓐ	⊕	No
ⓒ	⊖	
ⓐ	⊖	Yes
ⓒ	⊕	

If NG, replace power transistor.



RESISTOR

1. Disconnect resistor harness connector.
2. Check resistance between terminals.
   Resistance: Approximately 2.2Ω
   If NG, replace resistor.



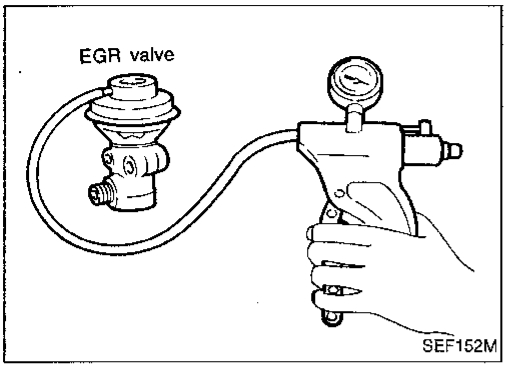
EGRC-SOLENOID VALVE

1. Disconnect EGRC-solenoid valve harness connector.
2. Check solenoid valve, following the table as shown below:

Conditions	Continuity between port Ⓐ and Ⓑ	Continuity between port Ⓑ and Ⓒ
Supply 12V current between terminals ① and ②	Yes	No
No current supply	No	Yes

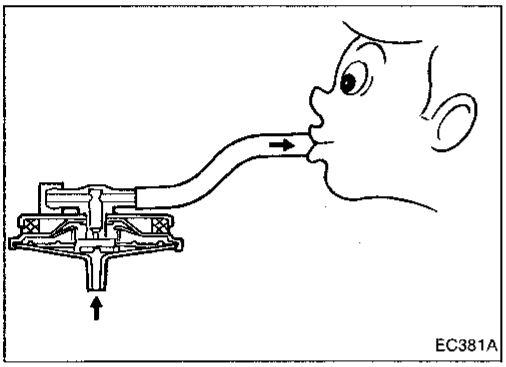
If NG, replace EGRC-solenoid valve.

Electrical Components Inspection (Cont'd)



EGR VALVE

Apply vacuum to EGR vacuum port with a hand vacuum pump.
EGR valve spring should lift.
If NG, replace EGR valve.

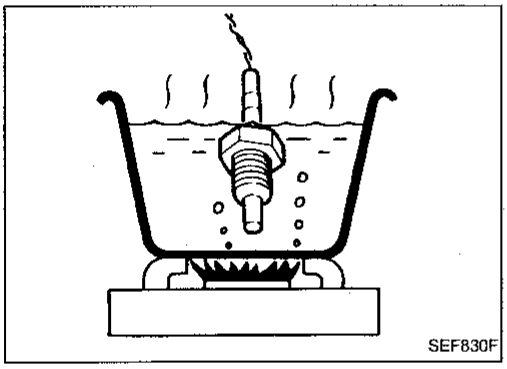


EGRC-BPT VALVE

Plug one of two ports of EGRC-BPT valve.
Apply a pressure above 0.490 kPa (50 mmH_2O, 1.97 inH_2O) to check for leakage. If a leak is noted, replace valve.

HEATED OXYGEN SENSOR

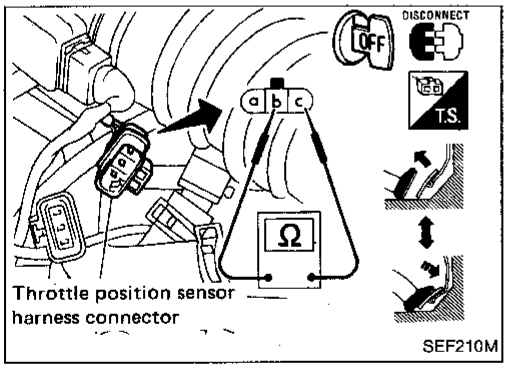
Refer to "Diagnostic Procedure 30".
(See page EF & EC-96.)



EGR TEMPERATURE SENSOR

Check resistance change and resistance value at 100°C (212°F).

- **Resistance should decrease in response to temperature increase.**
  Resistance: 100°C (212°F)
  85.3 ± 8.53 kΩ
  If NG, replace EGR temperature sensor.



THROTTLE POSITION SENSOR

1. Disconnect throttle position sensor harness connector.
2. Make sure that resistance between terminals ⓑ and ⓒ changes when opening throttle valve manually.

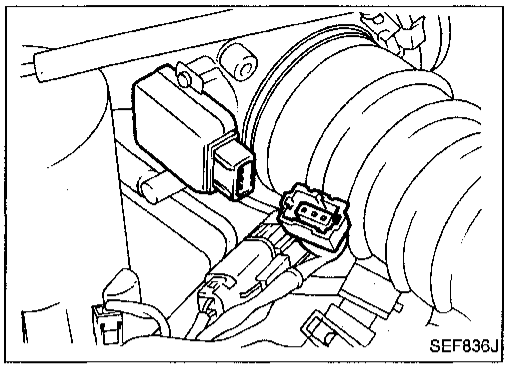
Accelerator pedal conditions	Resistance kΩ
Completely released	Approximately 1
Partially released	1 - 9
Completely depressed	Approximately 9

If NG, replace throttle position sensor.

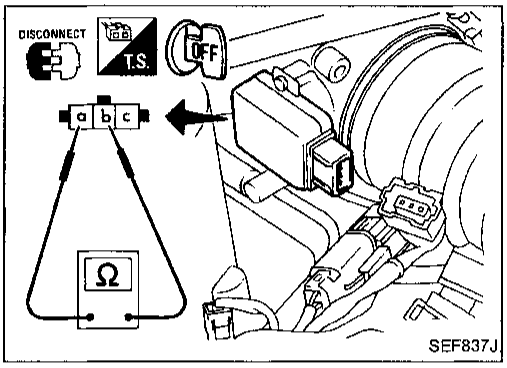
Adjustment

If throttle position sensor, closed throttle position switch and/or wide open throttle position switch is replaced or removed, it is necessary to install in proper position, by following the procedure as shown below:

Electrical Components Inspection (Cont'd)

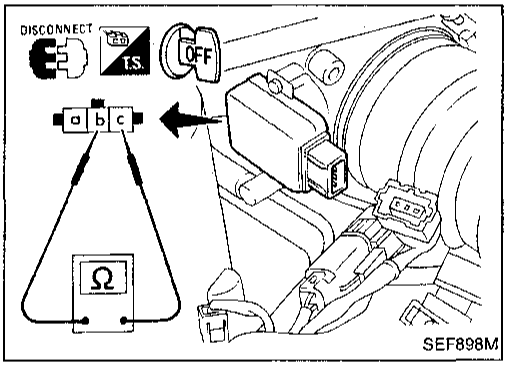

SEF836J

1. Install throttle position sensor body in throttle body. Do not tighten bolts. Leave bolts loose.
2. Connect throttle position sensor and closed throttle position switch harness connector.
3. Start engine and warm it up sufficiently.
4. Disconnect IACV-AAC valve sub-harness connector.
5. Disconnect closed throttle position switch harness connector.
6. Check closed throttle position switch OFF → ON speed with circuit tester, closing throttle valve manually.
   M/T: Idle speed + 250±150 rpm
   A/T: Engine speed (at idle in "N" position) + 250±150 rpm
7. If NG, set closed throttle position switch OFF → ON speed to the specified value by turning throttle position sensor body. Connect circuit tester with terminals ⓐ and ⓑ on closed throttle position switch side and find out OFF → ON point.
8. Tighten throttle position sensor installing bolts carefully after setting so that throttle position sensor does not move.



SEF837J

WIDE OPEN THROTTLE POSITION SWITCH



SEF898M

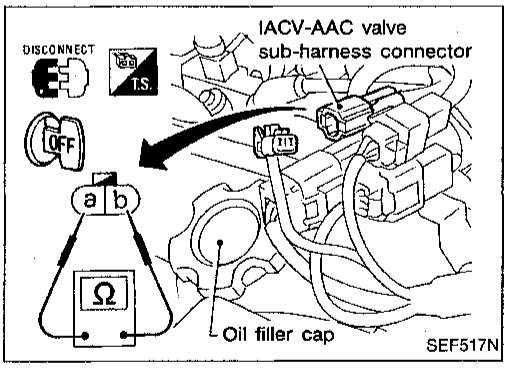
1. Disconnect throttle position switch harness connector.
2. Check continuity between terminals ⓒ and ⓑ.

Accelerator pedal condition	Continuity
Released	No
Depressed	Yes

If NG, replace throttle position switch.

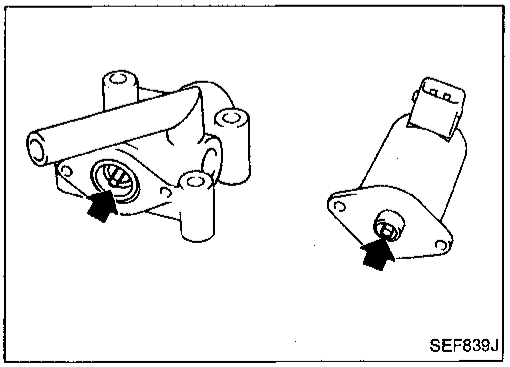
IACV-AAC VALVE

Resistance check



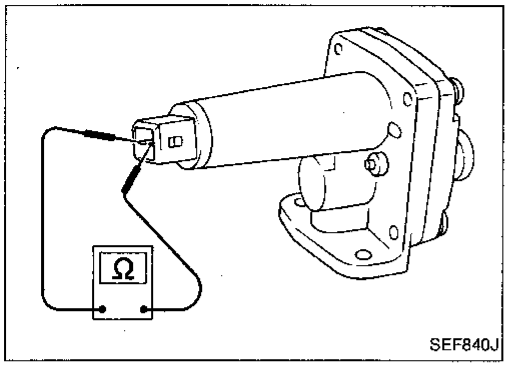
SEF517N

1. Disconnect IACV-AAC valve sub-harness connector.
2. Check resistance between terminals ⓐ and ⓑ.
   Resistance:
   Approximately 10Ω


SEF839J

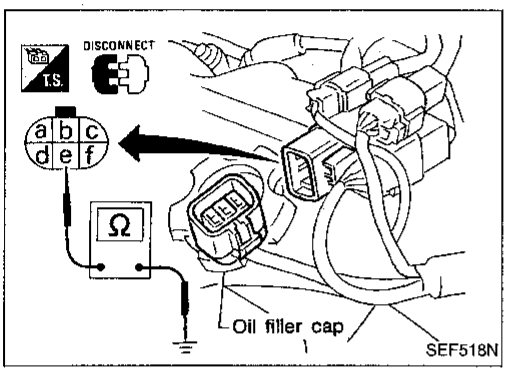
3. Check plunger for seizing or sticking.
4. Check for broken spring.

Electrical Components Inspection (Cont'd)



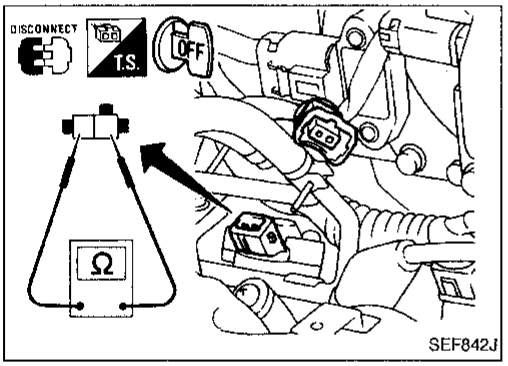
IACV-AIR REGULATOR

1. Disconnect IACV-air regulator harness connector.
2. Check resistance between terminals ⓐ and ⓑ.
   Resistance: Approximately 70 - 80Ω
3. Check IACV-air regulator for clogging.



KNOCK SENSOR

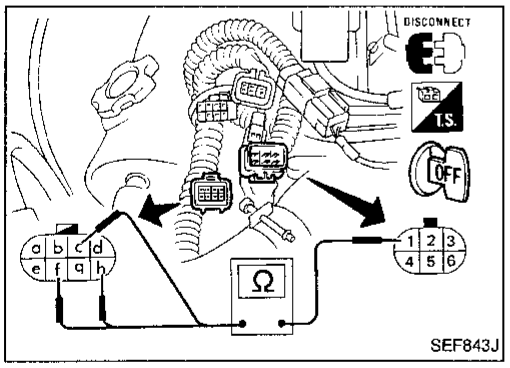
1. Disconnect knock sensor sub-harness connector.
2. Check continuity between terminals ⓔ and ground.
   Continuity should exist.



INJECTOR

No. 1, No. 3 and No. 5 cylinders

1. Disconnect injector harness connector.
2. Check resistance between terminals as shown in the figure.
   Resistance: 10 - 14Ω
   If NG, replace injector.

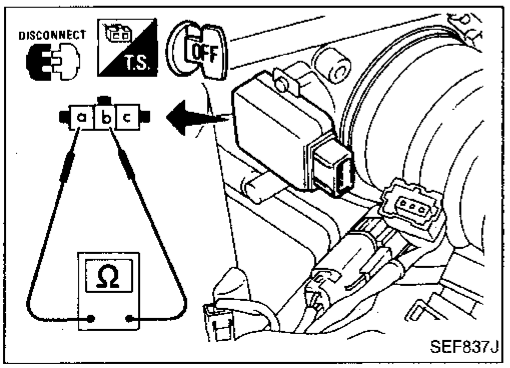


No. 2, No. 4 and No. 6 cylinders

1. Disconnect middle harness connectors for injectors.
2. Check resistance between terminals, following the table as shown below:

Cylinder	Terminal No.	Resistance
No. 2	① - ⓒ	10 - 14Ω
No. 4	① - ⓕ	
No. 6	① - ⓗ	

If NG, replace injector.



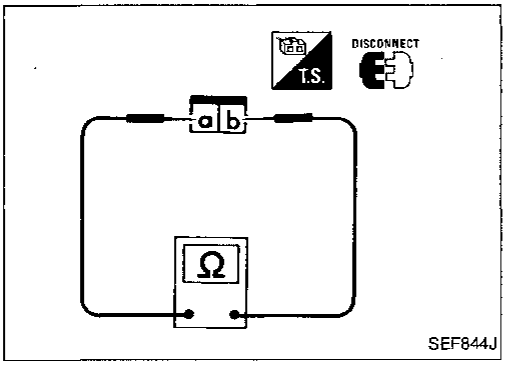
CLOSED THROTTLE POSITION SWITCH

1. Disconnect throttle position switch harness connector.
2. Check continuity between terminals ⓐ and ⓑ.

Accelerator pedal condition	Continuity
Released	Yes
Depressed	No

If NG, replace throttle position switch.

Electrical Components Inspection (Cont'd)



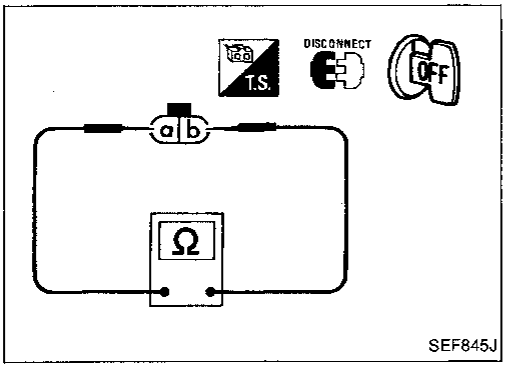
SEF844J

NEUTRAL POSITION SWITCH

Check continuity between terminals ⓐ and ⓑ.

Conditions	Continuity
Shift to Neutral position	Yes
Shift to other position	No

If NG, replace neutral position switch.



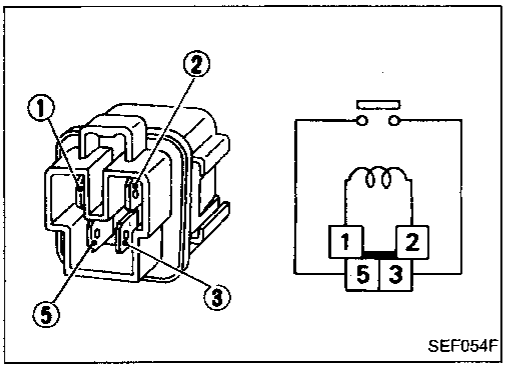
SEF845J

INHIBITOR SWITCH

Check continuity between terminals ⓐ and ⓑ.

Conditions	Continuity
Shift to "P" position	Yes
Shift to "N" position	Yes
Shift to positions other than "P" and "N"	No

If NG, replace inhibitor switch.



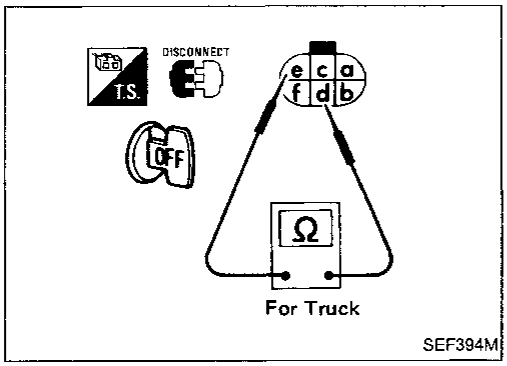
SEF054F

ECCS RELAY, FUEL PUMP RELAY, AIR CONDITIONER RELAY AND PARK/NEUTRAL POSITION RELAY

Check continuity between terminals ③ and ⑤.

Conditions	Continuity
12V current supply between terminals ① and ②	Yes
No current supply	No

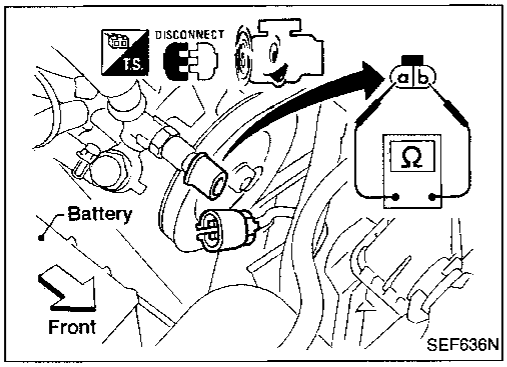
If NG, replace relay.



SEF394M

FUEL PUMP

1. Disconnect fuel pump harness connector.
2. Check resistance between terminals ⓓ and ⓔ.
   Resistance: Approximately 1.5Ω
   If NG, replace fuel pump.

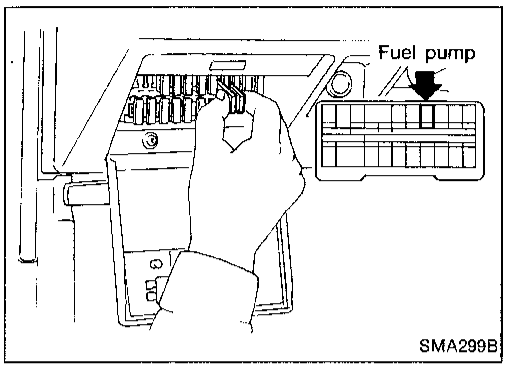


SEF636N

POWER STEERING OIL PRESSURE SWITCH

1. Disconnect power steering oil pressure switch harness connector.
2. Start engine.
3. Check continuity between terminals ⓐ and ⓑ.

Conditions	Continuity
Steering wheel is being turned	Yes
Steering wheel is not being turned	No



Releasing Fuel Pressure

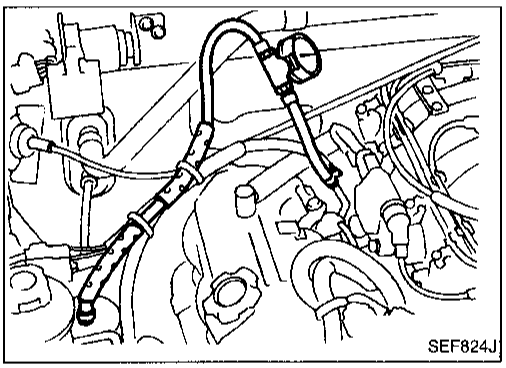
Before disconnecting fuel line, release fuel pressure from fuel line to eliminate danger.

1. Remove fuse for fuel pump.
2. Start engine.
3. After engine stalls, crank it two or three times to release all fuel pressure.
4. Turn ignition switch off and reconnect fuel pump fuse.

Fuel Pressure Check

a. When reconnecting fuel line, always use new clamps.
b. Make sure that clamp screw does not contact adjacent parts.
c. Use a torque driver to tighten clamps.
d. Do not perform fuel pressure check while fuel pressure regulator control system is operating; otherwise, fuel pressure gauge might indicate incorrect readings.

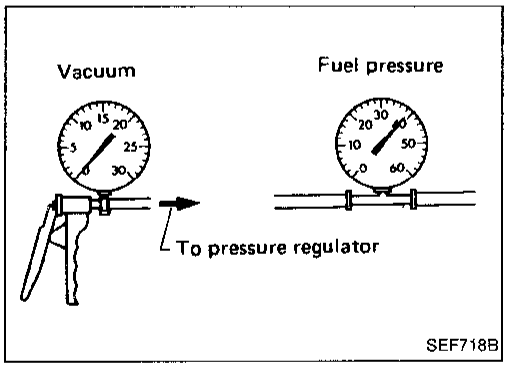
1. Release fuel pressure to zero.
2. Disconnect fuel hose between fuel filter and fuel tube (engine side). Then install pressure gauge.
3. Start engine and check for fuel leakage.



4. Read the indication of fuel pressure gauge.
   At idling:

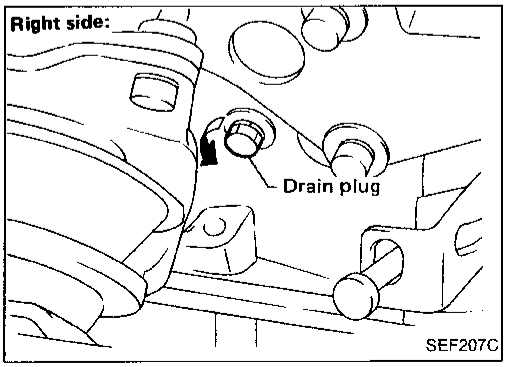
When fuel pressure valve vacuum hose is connected.	Approximately 235 kPa (2.4 kg/cm^2, 34 psi)
When fuel pressure valve vacuum is disconnected.	Approximately 294 kPa (3.0 kg/cm^2, 43 psi)

5. Stop engine and disconnect fuel pressure regulator vacuum hose from intake manifold.
6. Plug intake manifold with a rubber cap.
7. Connect variable vacuum source to fuel pressure regulator.



8. Start engine and read indication of fuel pressure gauge as vacuum is changed.

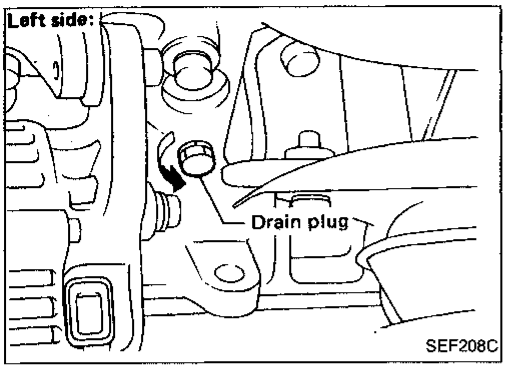
Fuel pressure should decrease as vacuum increases. If results are unsatisfactory, replace fuel pressure regulator.

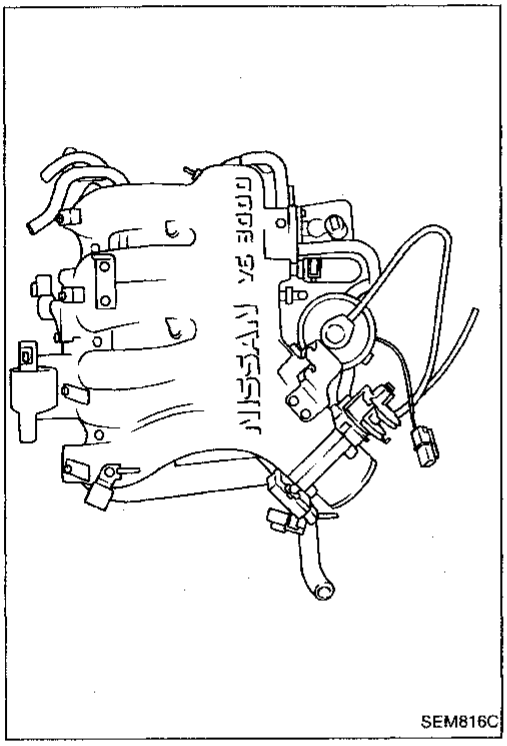


Injector Removal

1. Release fuel pressure to zero.
2. Drain coolant by removing drain plugs from both sides of cylinder block.

Injector Removal (Cont'd)



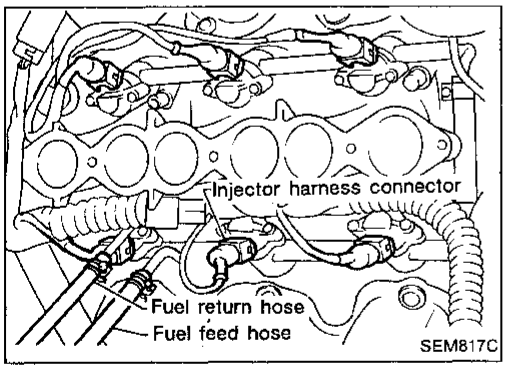


3. Separate ASCD and accelerator control wire from intake manifold collector.
4. Remove intake manifold collector from engine. The following parts should be disconnected to remove intake manifold collector.

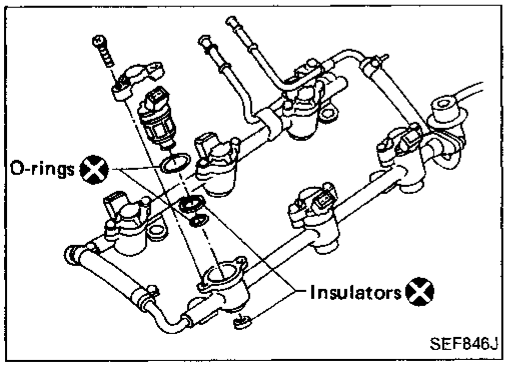
a. Harness connectors for
- IACV-AAC valve
- Throttle position sensor and closed throttle position switch
- Ignition coil
- Power transistor
- EGRC-solenoid valve
- IACV-air regulator
- EGR temperature sensor

b. Water hoses from collector and heater hoses
c. PCV hose from RH rocker cover
d. Vacuum hoses for
- Canister
- Brake master cylinder
- Pressure regulator

e. Purge hose from canister
f. EGR tube
g. Ground harnesses
h. Air duct hose



5. Remove fuel feed and return hose from injector fuel tube assembly.
6. Disconnect all injector harness connectors.
7. Remove injector fuel tube assembly.



8. Remove any malfunctioning injector from injector fuel tube.
9. Replace or clean injector as necessary.

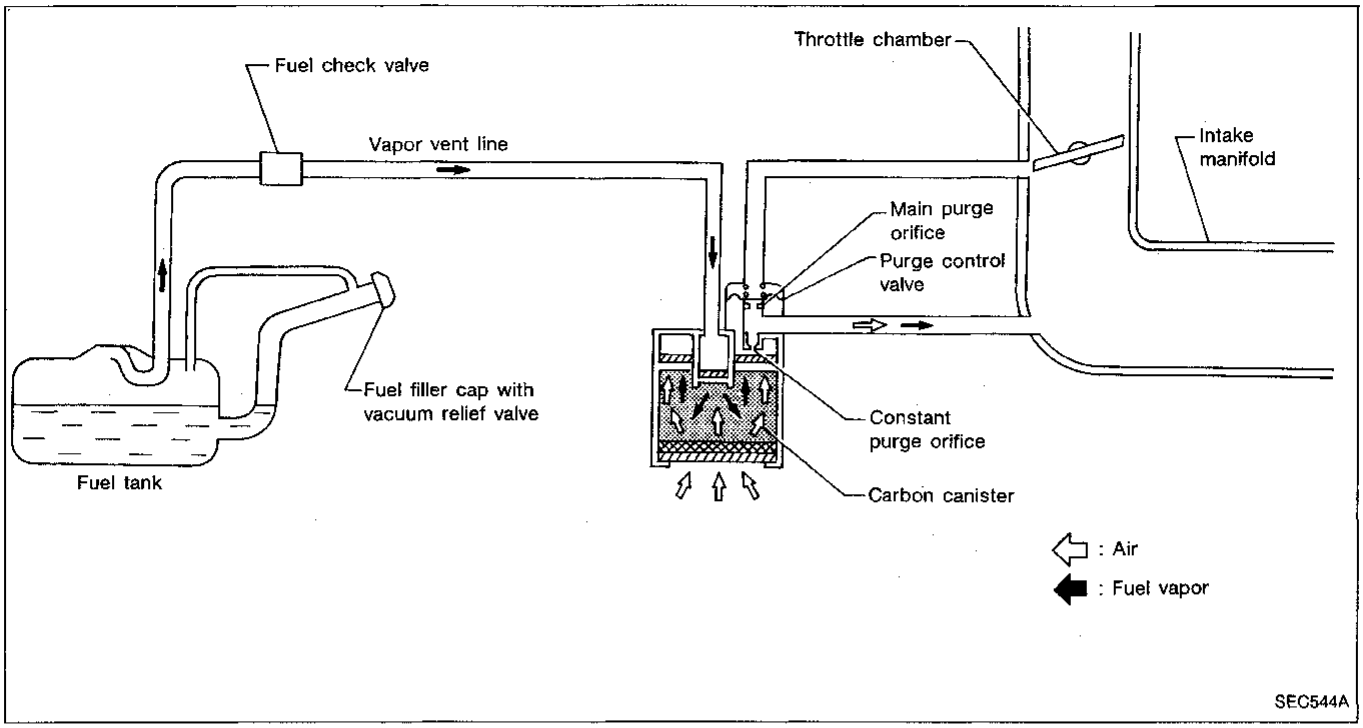
Always replace O-rings and insulators with new ones.

10. Connect injector to injector fuel tube.
11. Reinstall any part removed in reverse order of removal.

CAUTION:

After properly connecting fuel hose to injector and fuel tube, check connection for fuel leakage.

Description

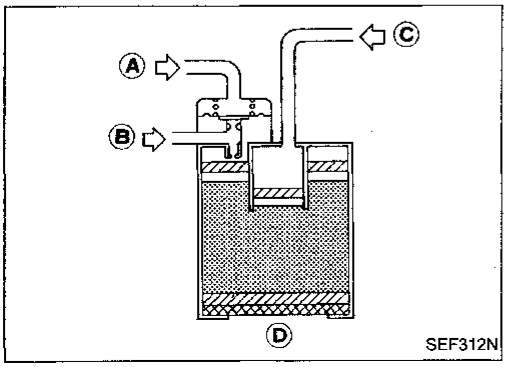


The evaporative emission system is used to reduce hydrocarbons emitted to the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the carbon canister.

The fuel vapor from the sealed fuel tank is led into the canister which contains activated carbon and the vapor is stored there when the engine is not running.

The canister retains the fuel vapor until the canister is purged by the air drawn through the bottom of the canister to the intake manifold when the engine is running. When the engine runs at idle, the purge control valve is closed.

Only a small amount of stored vapor flows into the intake manifold through the constant purge orifice. As the engine speed increases, and the throttle vacuum rises higher, the purge control valve opens and the vapor is sucked into the intake manifold through both the main purge orifice and the constant purge orifice.



Inspection

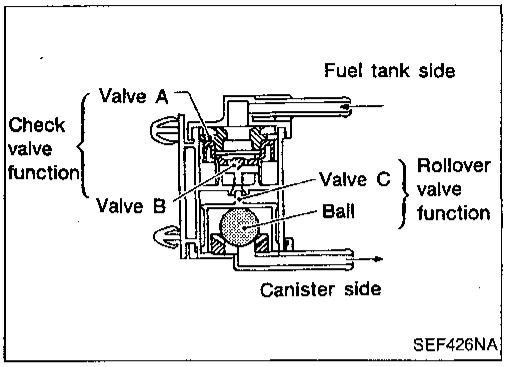
ACTIVATED CARBON CANISTER

Check carbon canister as follows:

1. Blow air in port Ⓐ and ensure that there is no leakage.
2.

- Apply vacuum to port Ⓐ.
- Cover port Ⓓ with hand.
- Blow air in port Ⓒ and ensure free flow out of port Ⓑ.

Inspection (Cont'd)



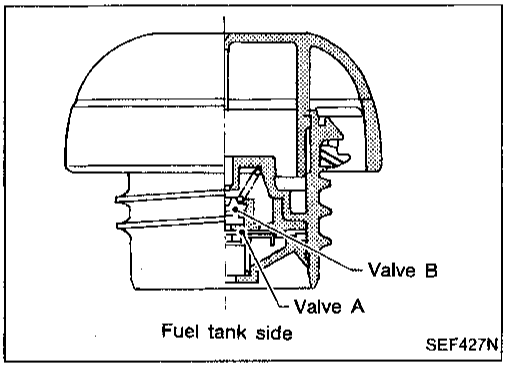
FUEL CHECK VALVE (With rollover valve)

Check valve operation

1. Blow air through connector on fuel tank side.
   A considerable resistance should be felt and a portion of air flow should be directed toward the canister side.
2. Blow air through connector on canister side.
   Air flow should be smoothly directed toward fuel tank side.
3. If fuel check valve is suspected of not properly functioning in steps 1 and 2 above, replace it.

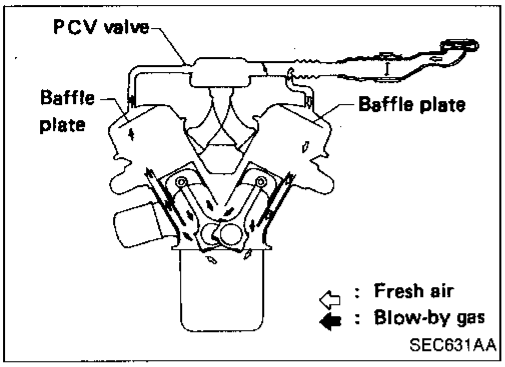
Rollover valve operation

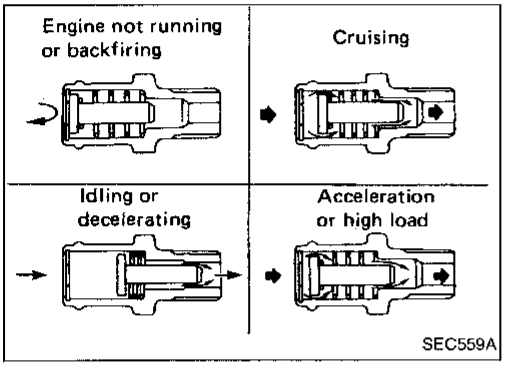
Ensure that continuity of air passage does not exist when the installed rollover valve is tilted to 90° or 180°.



FUEL TANK VACUUM RELIEF VALVE

1. Wipe clean valve housing.
2. Suck air through the cap. A slight resistance accompanied by valve clicks indicates that valve A is in good mechanical condition. Note also that, by further sucking air, the resistance should disappear with valve clicks.
3. Blow air on fuel tank side and ensure that continuity of air passage exists through valve B.
4. If valve is clogged or if no resistance is felt, replace cap as an assembly.





Description

This system returns blow-by gas to both the intake manifold and air cleaner.

The positive crankcase ventilation (PCV) valve is provided to conduct crankcase blow-by gas to the intake manifold.

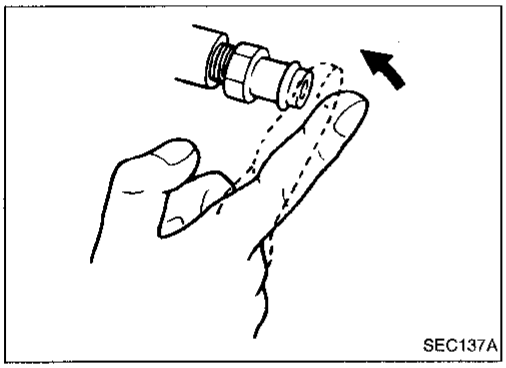
During partial throttle operation of the engine, the intake manifold sucks the blow-by gas through the PCV valve.

Normally, the capacity of the valve is sufficient to handle any blow-by and a small amount of ventilating air.

The ventilating air is then drawn from the air cleaner, through the hose connecting air cleaner to rocker cover, into the crankcase.

Under full-throttle condition, the manifold vacuum is insufficient to draw the blow-by flow through the valve, and its flow goes through the hose connection in the reverse direction.

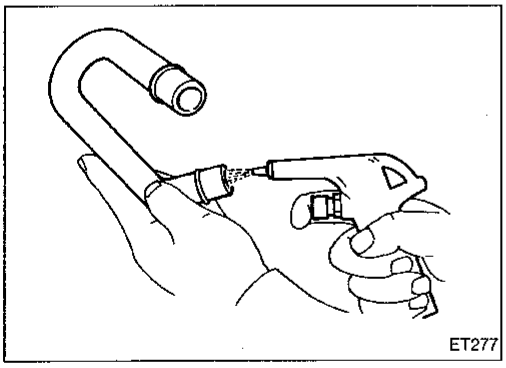
On vehicles with an excessively high blow-by some of the flow will go through the hose connection to the air cleaner under all conditions.



Inspection

PCV (Positive Crankcase Ventilation)

With engine running at idle, remove ventilation hose from PCV valve; if valve is working properly, a hissing noise will be heard as air passes through it and a strong vacuum should be felt immediately when a finger is placed over valve inlet.



VENTILATION HOSE

1. Check hoses and hose connections for leaks.
2. Disconnect all hoses and clean with compressed air. If any hose cannot be freed of obstructions, replace.

General Specifications

PRESSURE REGULATOR	
Regulated pressure kPa (kg/cm^2, psi)	Approx. 294 (3.0, 43)

Inspection and Adjustment

Idle speed*1 rpm	
No-load*2	
M/T	750±50 (700)*3
A/T (in "N" position)	
Air conditioner: ON	
M/T	800±50
A/T (in "N" position)	
Ignition timing degree	15°±2° BTDC
Closed throttle position switch touch speed rpm	
M/T	Idle speed + 250±150*3
A/T (in "N" position)	

*1: Feedback controlled and needs no adjustments
*2: Under the following conditions:
- Air conditioner switch: OFF
- Steering wheel: Kept straight
- Electric load: OFF (Lights, heater, fan & rear defogger)

*3: ( ): Disconnect IACV-AAC valve sub-harness connector.

IGNITION COIL

Primary voltage	V	12
Primary resistance [at 20°C (68°F)]	Ω	Approximately 1.0
Secondary resistance [at 20°C (68°F)]	kΩ	Approximately 10

MASS AIR FLOW SENSOR

Supply voltage	V	Battery voltage (11 - 14)
Output voltage	V	Approximately 1.5 - 2.0*

*: Engine is warmed up sufficiently and idling under no-load.

ENGINE COOLANT TEMPERATURE SENSOR

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.00
80 (176)	0.30 - 0.33

FUEL PUMP

Resistance	Ω	Approximately 1.5

EGR TEMPERATURE SENSOR

Resistance [at 100°C (212°F)]	kΩ	85.3±8.53

IACV-AAC VALVE

Resistance	Ω	Approximately 10.0

INJECTOR

Resistance	Ω	10 - 14

RESISTOR

Resistance	kΩ	Approximately 2.2

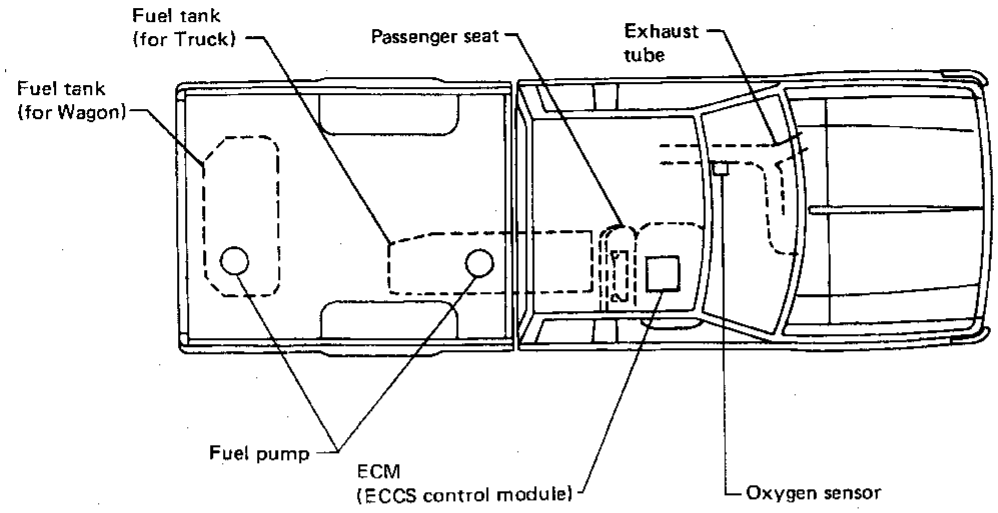
THROTTLE POSITION SENSOR

Accelerator pedal conditions	Resistance kΩ
Completely released	Approximately 1
Partially released	1 - 9
Completely depressed	Approximately 9

IGNITION WIRE

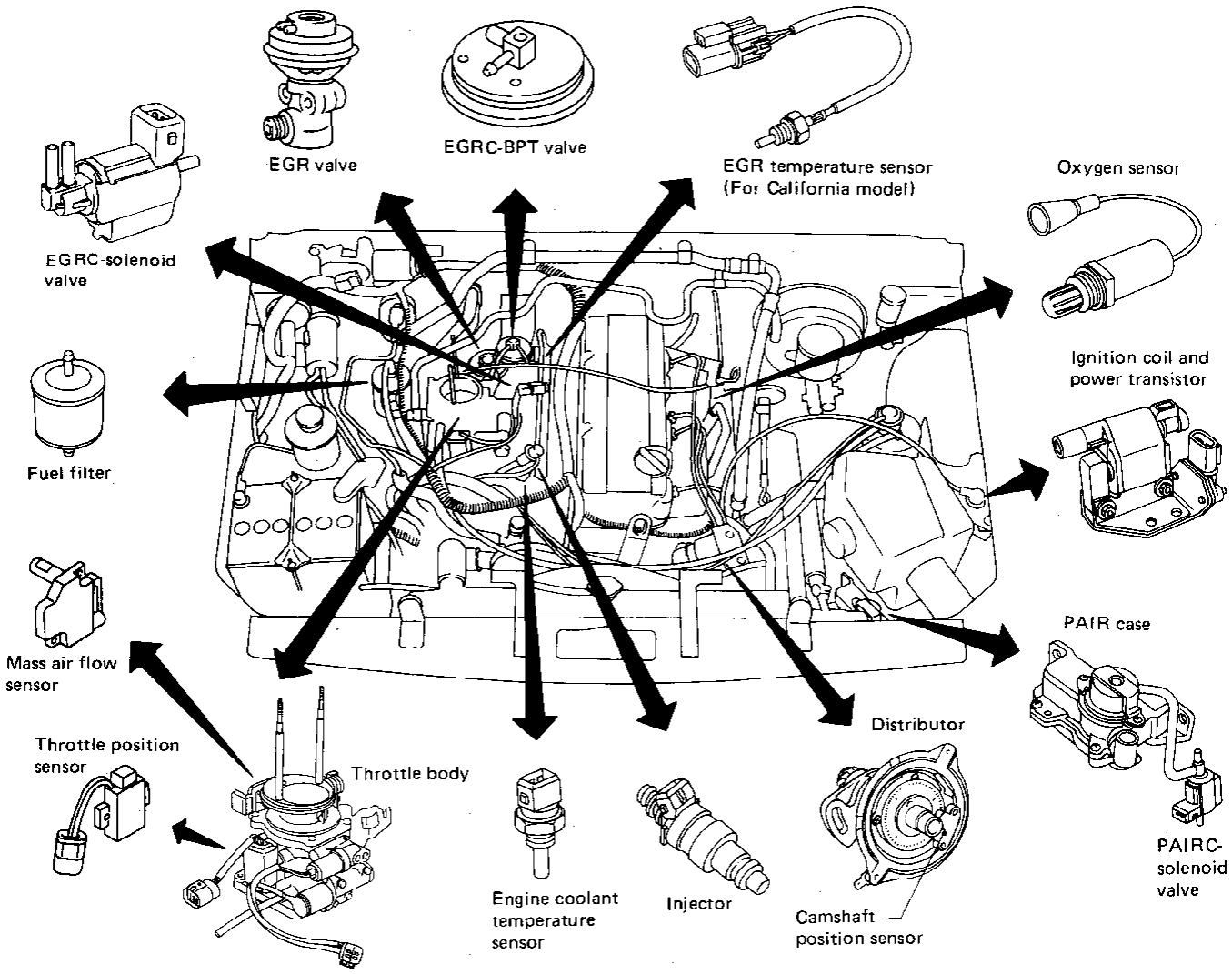
Resistance	kΩ/m (kΩ/ft)	Less than 30 (9.1)

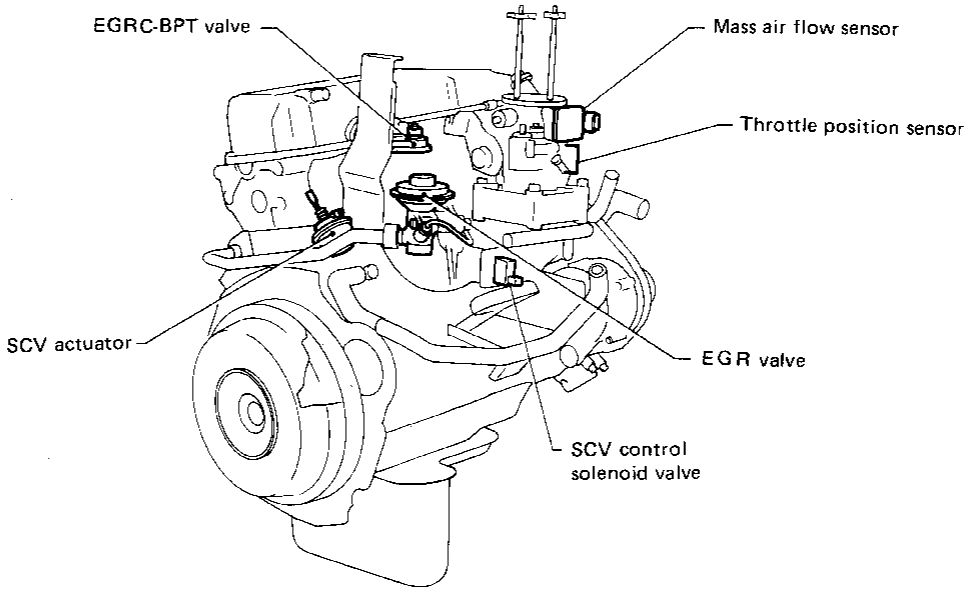
ECCS Component Parts Location



MEF367E

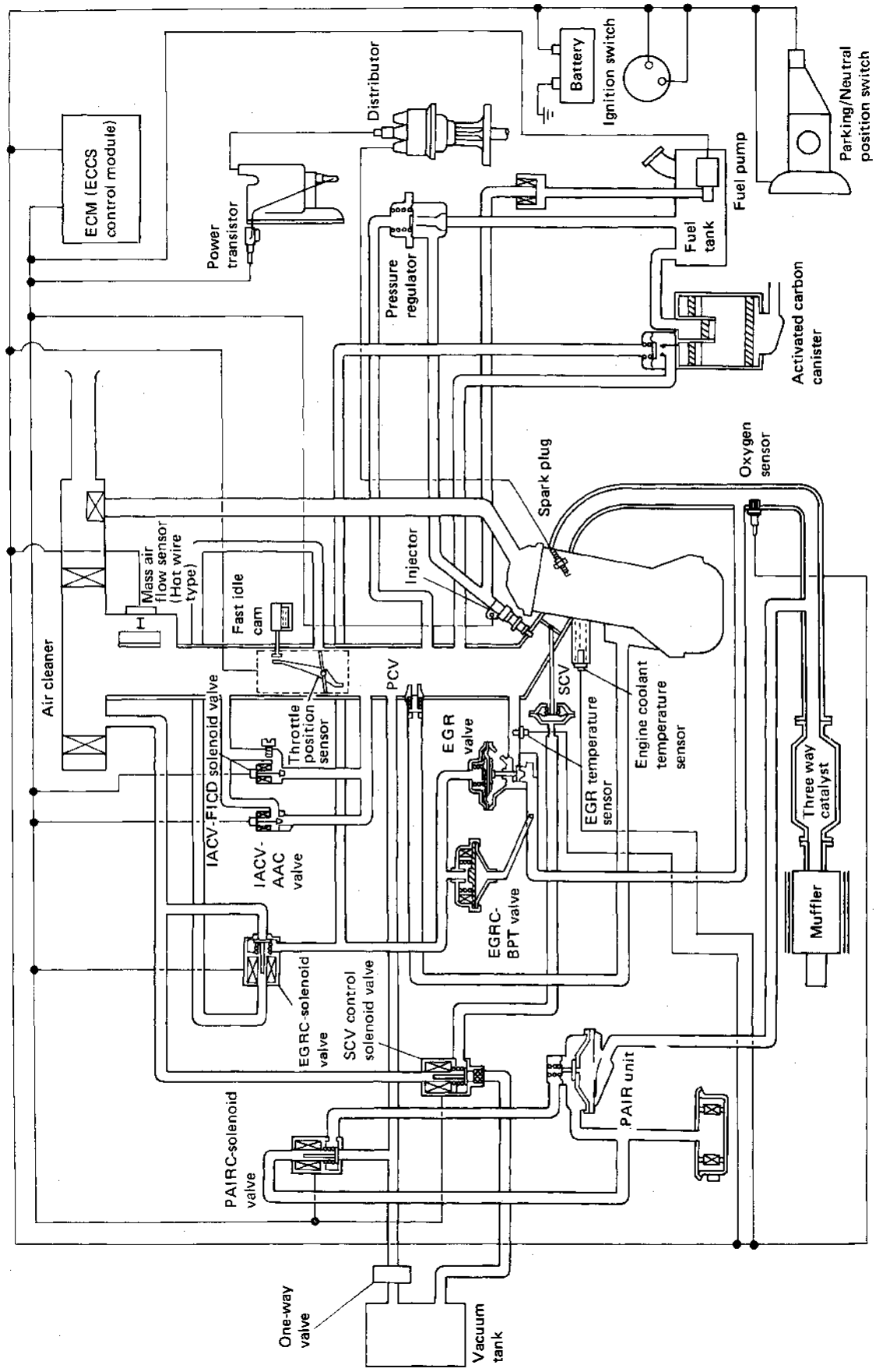
ECCS Component Parts Location (Cont'd)





MEF368EA

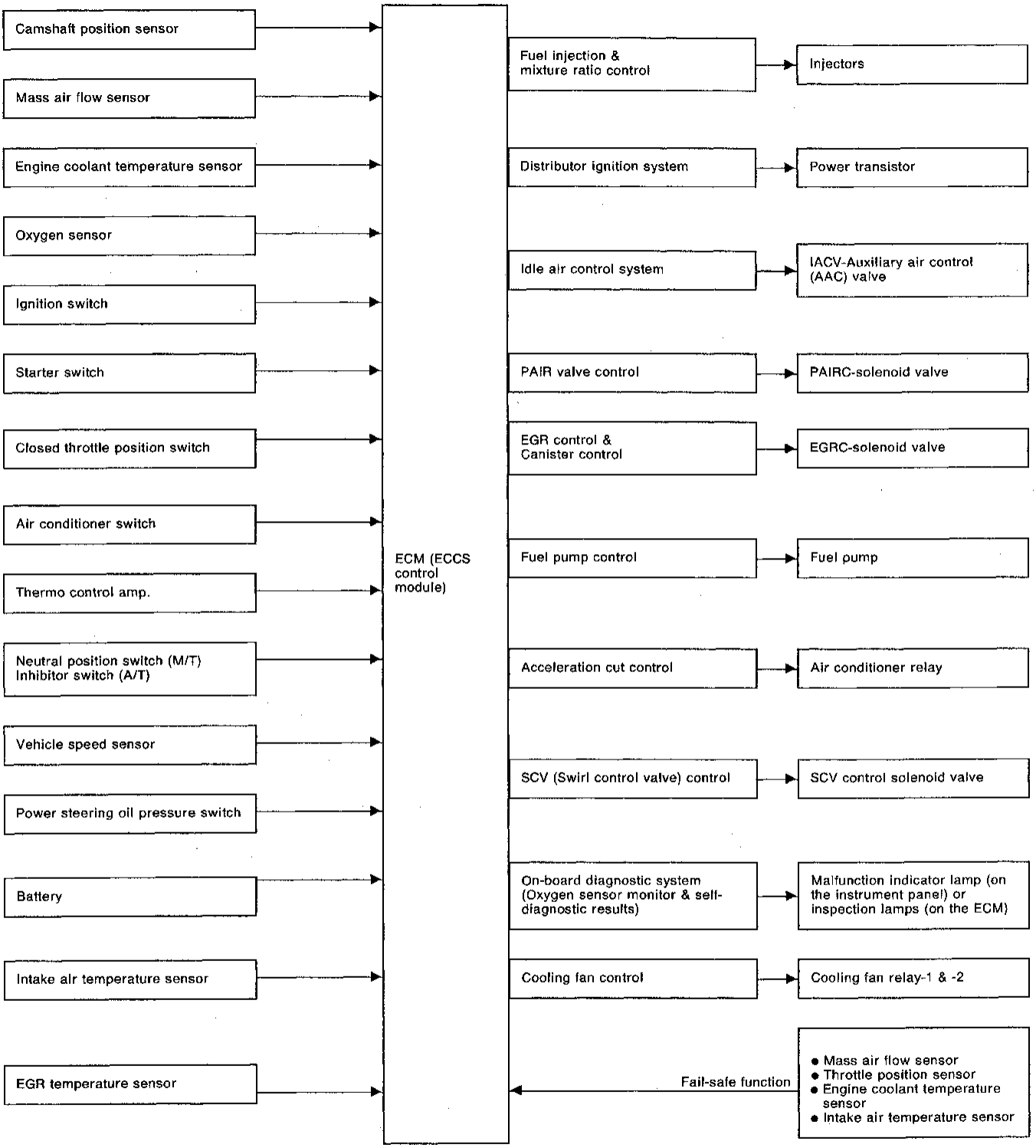
System Diagram



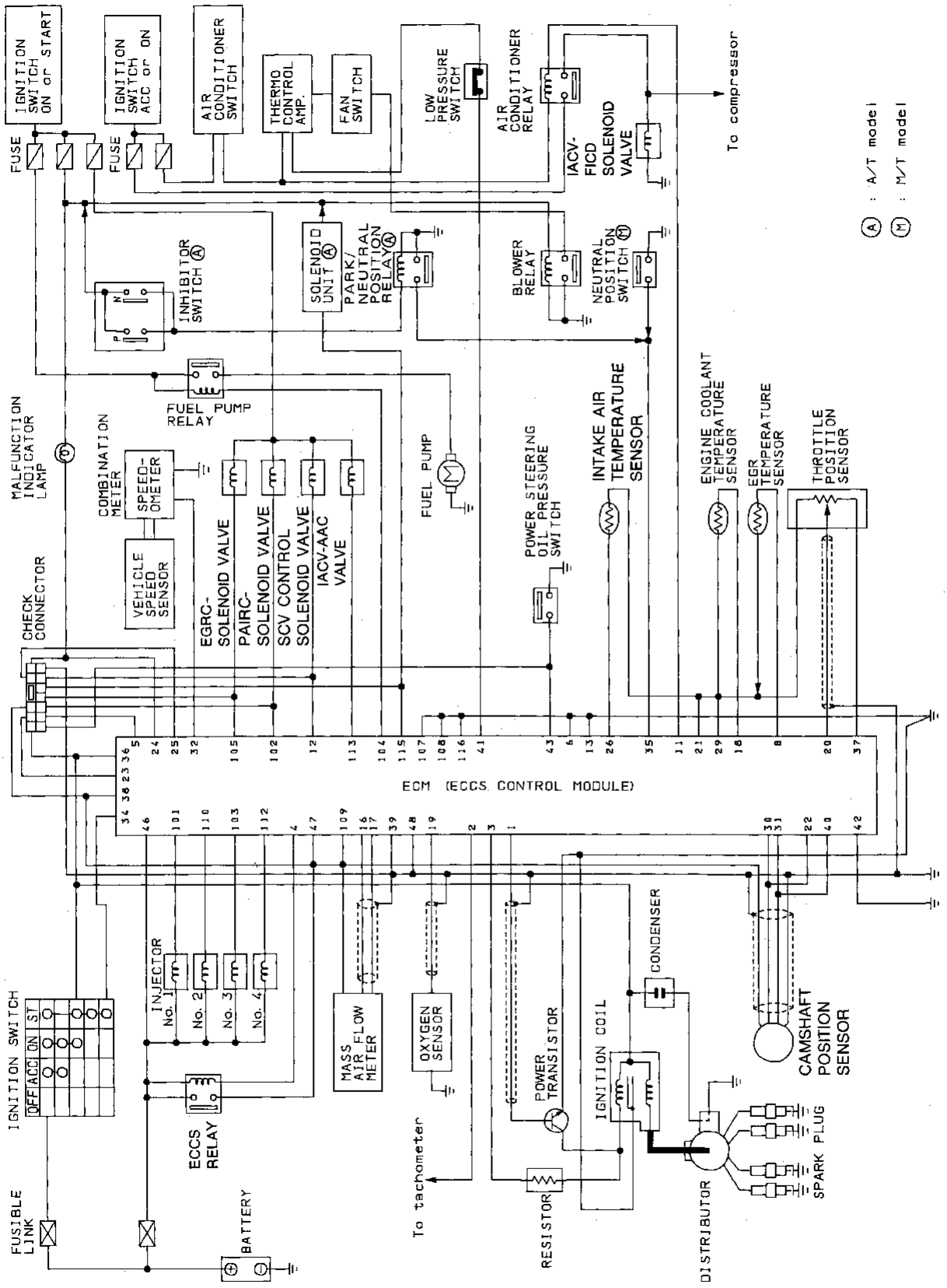
MEF369EA

System Chart

ECCS CONTROL SYSTEM

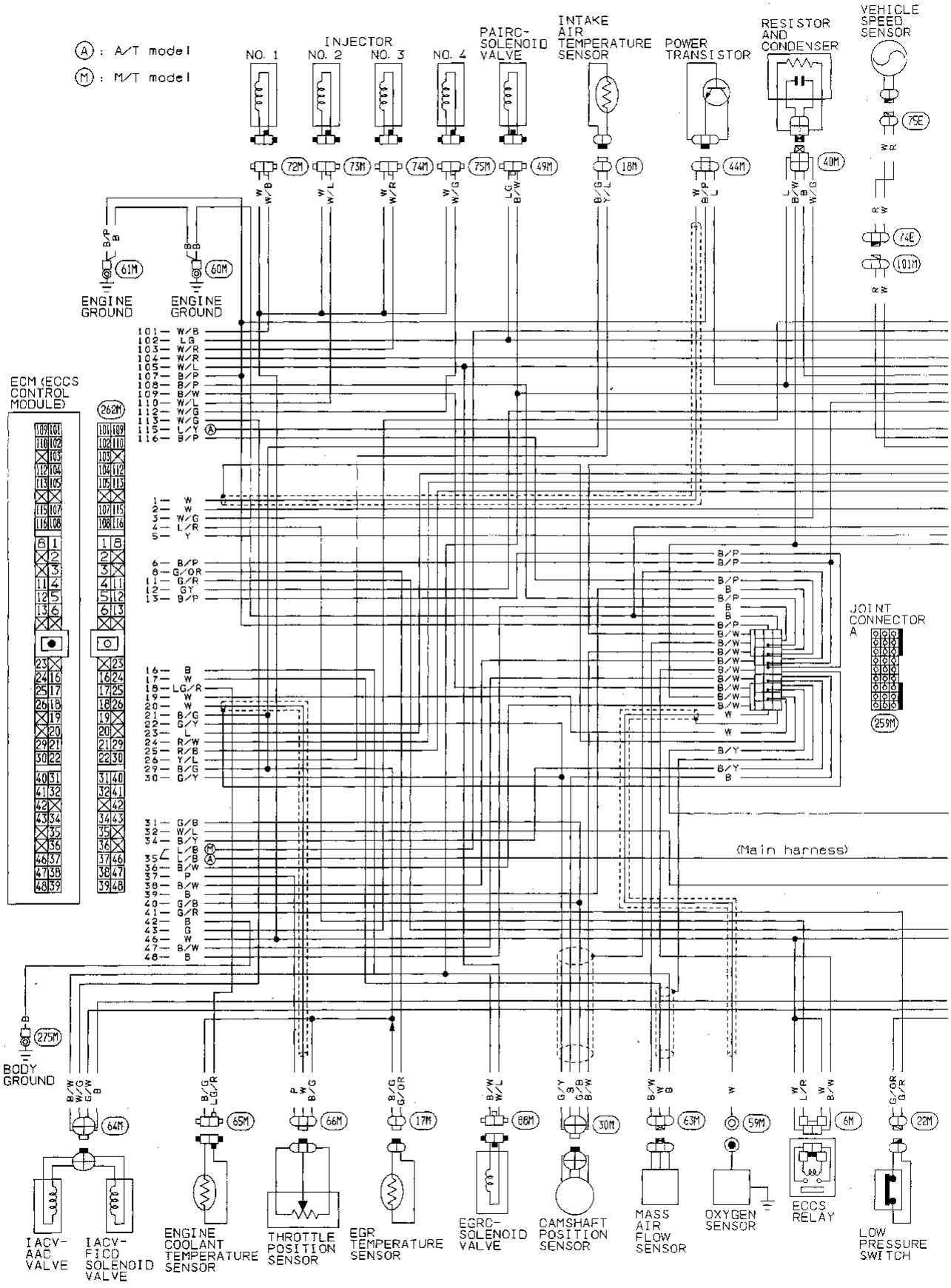


Circuit Diagram

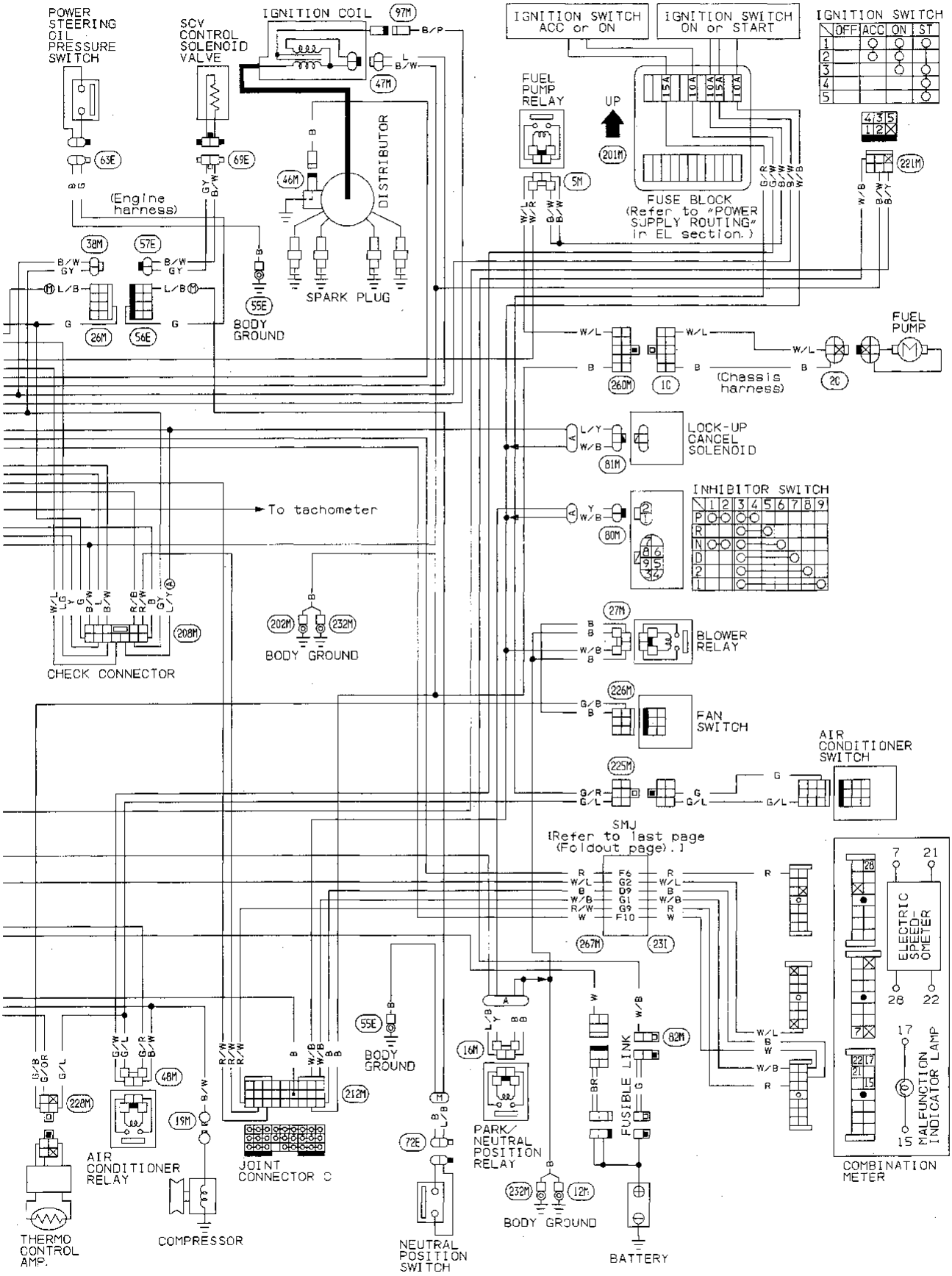


SEF471N

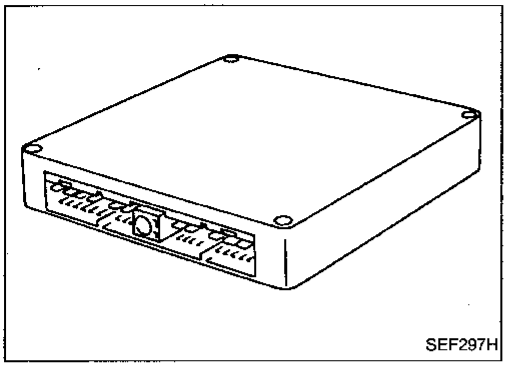
Wiring Diagram



Wiring Diagram (Cont'd)

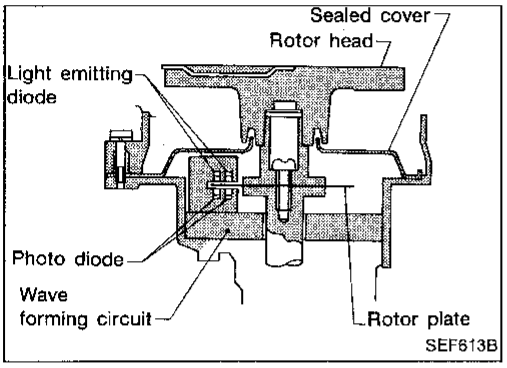


SEF780N


SEF297H

Engine Control Module (ECM)-ECCS Control Module

The ECM consists of a microcomputer, inspection lamps, a diagnostic test mode selector, and connectors for signal input and output and for power supply. The unit controls the engine.



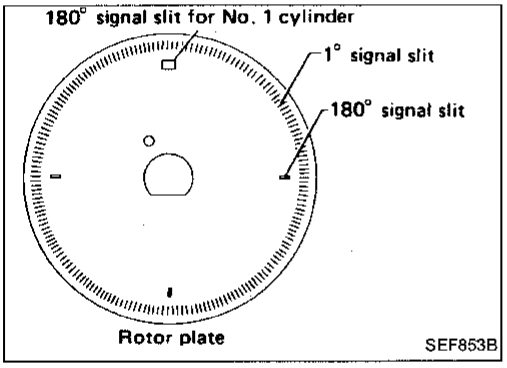
SEF613B

Camshaft Position Sensor (CMPS)

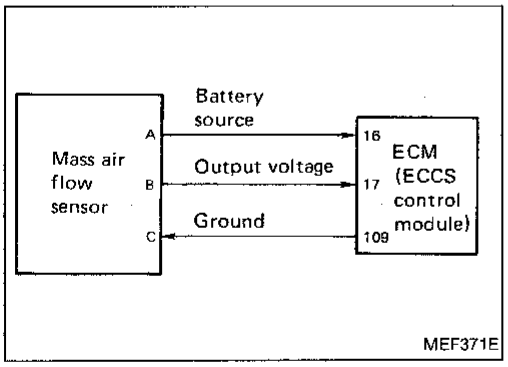
The camshaft position sensor is a basic component of the entire ECCS. It monitors engine speed and piston position, and sends signals to the ECM to control fuel injection, ignition timing and other functions.

The camshaft position sensor has a rotor plate and a wave-forming circuit. The rotor plate has 360 slits for 1° signal and 4 slits for 180° signal. Light Emitting Diodes (LED) and photo diodes are built in the wave-forming circuit.

When the rotor plate passes between the LED and the photo diode, the slits in the rotor plate continually cut the light being transmitted to the photo diode from the LED. This generates rough-shaped pulses which are converted into on-off signals by the wave-forming circuit, which are then sent to the ECM.



SEF853B

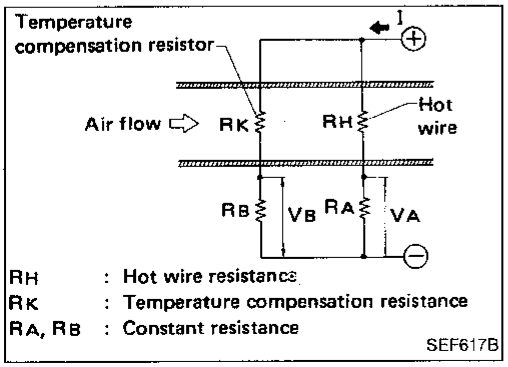


MEF371E

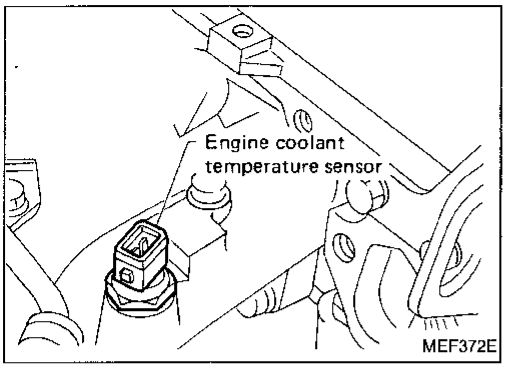
Mass Air Flow Sensor (MAFS)

The mass air flow sensor measures the mass flow rate of intake air. Measurements are made so that the control circuit will emit an electrical output signal corresponding to the amount of heat dissipated from a hot wire placed in the stream of intake air.

The airflow past the hot wire removes the heat from the hot wire. The temperature of the hot wire is very sensitive to the mass flow rate. The higher the temperature of the hot wire, the greater its resistance value. This temperature change (resistance) is determined by the mass air flow rate. The control circuit accurately regulates current (I) in relation to the varying resistance value (R_H) so that V_A always equals V_B. The mass air flow sensor transmits a voltage value V_A to the ECM where the output is converted into an intake air signal.



SEF617B

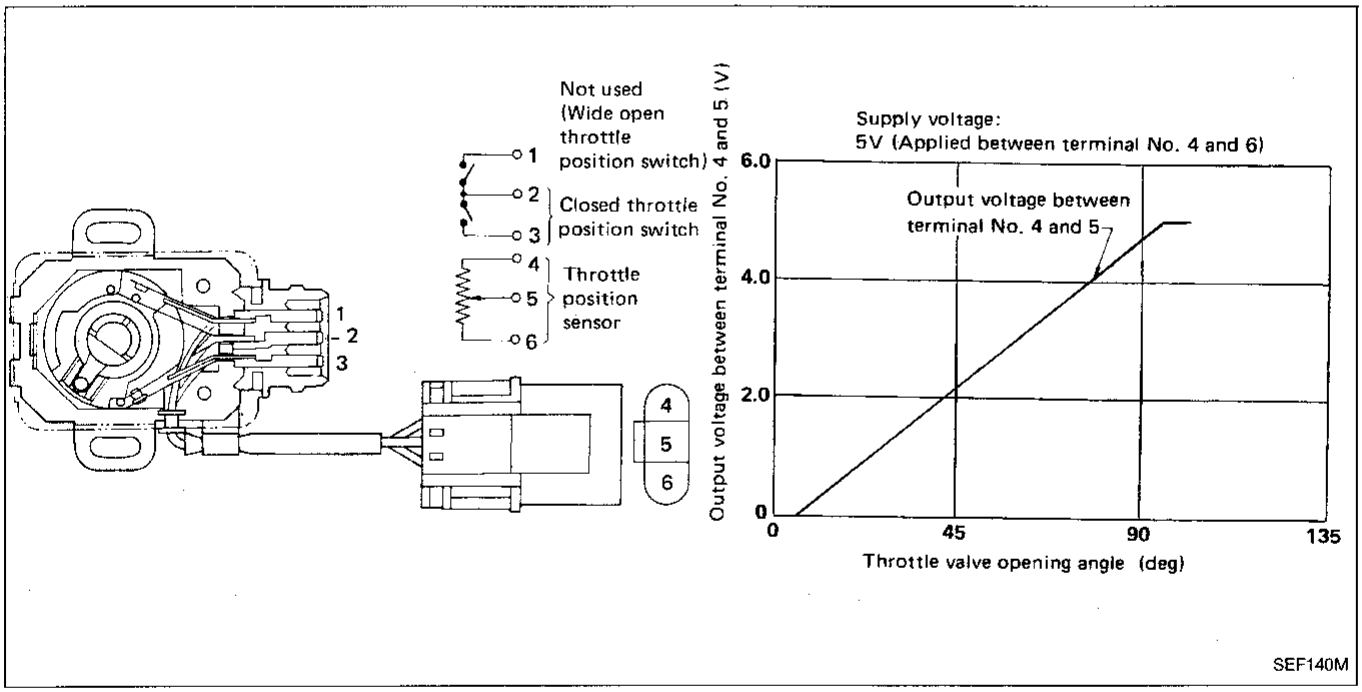


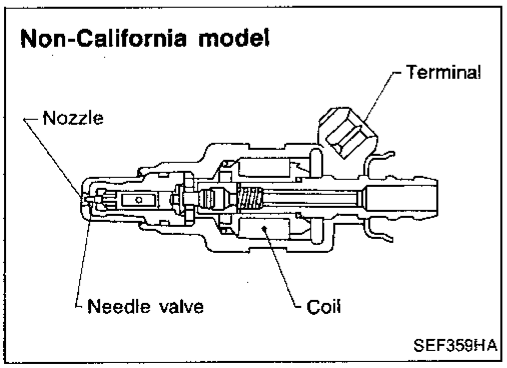
Engine Coolant Temperature Sensor (ECTS)

The engine coolant temperature sensor detects the engine coolant temperature and transmits a signal to the ECM.
The temperature sensing unit employs a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the temperature rise.

Throttle Position Sensor (TPS) & Soft Closed Throttle Position (CTP) Switch

The throttle position sensor responds to the throttle position which, in turn, is determined by accelerator pedal movement. This sensor is a kind of potentiometer which transforms the throttle position into an output voltage, and transmits it to the ECM. The sensor also detects the opening and closing speed of the throttle valve and feeds this information as a voltage signal to the ECM too.
Closed throttle position is determined by the ECM. This positioning system is called the "soft closed throttle position switch" and controls engine operations such as fuel cut.

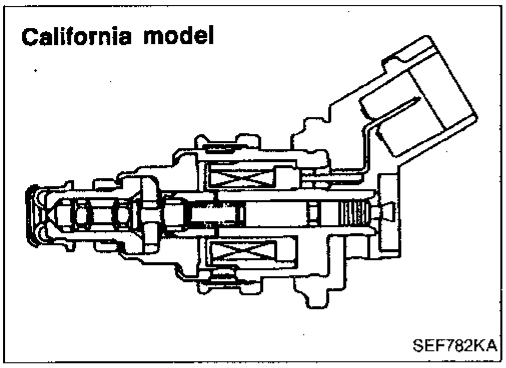


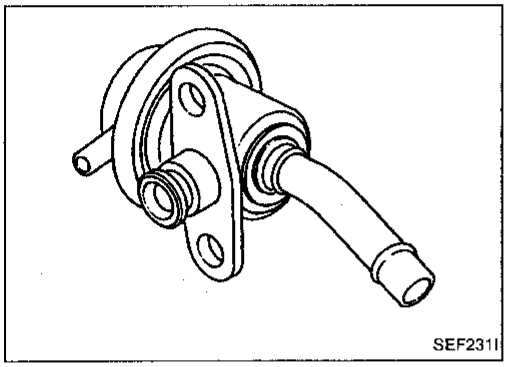


Fuel Injector

The fuel injector is a small, elaborate solenoid valve. As the ECM sends injection signals to the injector, the coil in the injector pulls the needle valve back and fuel is released into the intake manifold through the nozzle. The injected fuel is controlled by the ECM in terms of injection pulse duration.
Brass wire is used in the injector coil and thus the resistance is higher than a conventional injector.

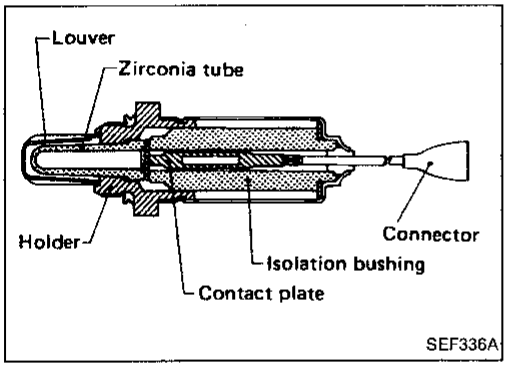
Fuel Injector (Cont'd)





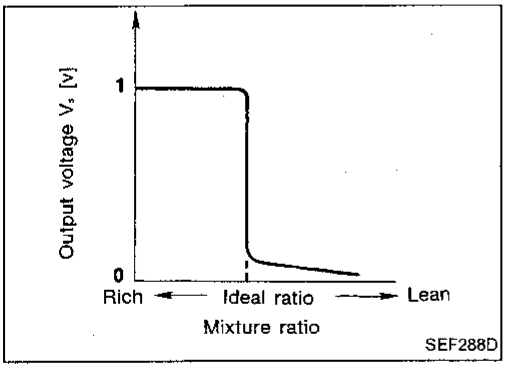
Pressure Regulator

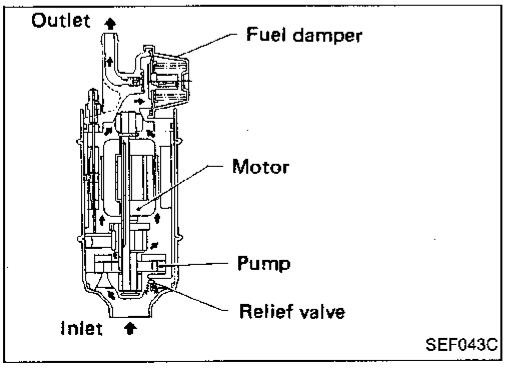
The pressure regulator maintains the fuel pressure at 299.1 kPa (3.05 kg/cm^2, 43.4 psi). Since the injected fuel amount depends on injection pulse duration, it is necessary to maintain the pressure at the above value.



Oxygen Sensor (O2S)

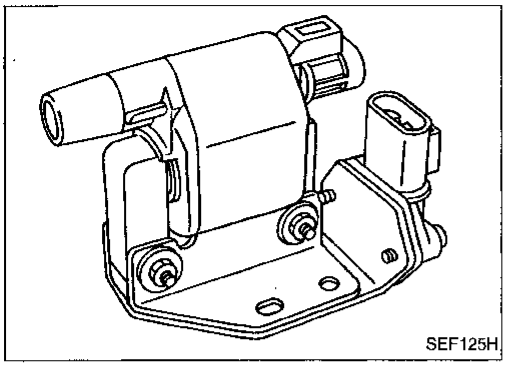
The oxygen sensor, which is placed into the exhaust manifold, monitors the amount of oxygen in the exhaust gas. The sensor has a closed-end tube made of ceramic zirconia. The outer surface of the tube is exposed to exhaust gas, and the inner surface to atmosphere. The zirconia of the tube compares the oxygen density of exhaust gas with that of atmosphere, and generates electricity. In order to improve the generating power of the zirconia, its tube is coated with platinum. The voltage is approximately 1V in a richer condition of the mixture ratio than the ideal air-fuel ratio, while approximately 0V in leaner conditions. The radical change from 1V to 0V occurs at around the ideal mixture ratio. In this way, the oxygen sensor detects the amount of oxygen in the exhaust gas and sends the signal of approximately 1V or 0V to the ECM.





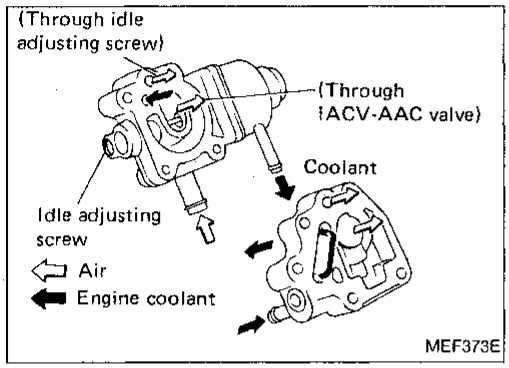
Fuel Pump

The fuel pump with a fuel damper is a submergible type, and are located in the fuel tank.


SEF125H

Power Transistor

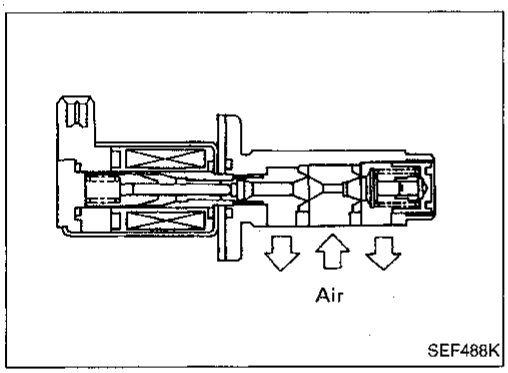
The ignition signal from the ECM is amplified by the power transistor, which turns the ignition coil primary circuit on and off, inducing the proper high voltage in the secondary circuit. The ignition coil is a small, molded type.



MEF373E

Idle Air Adjusting (IAA) Unit

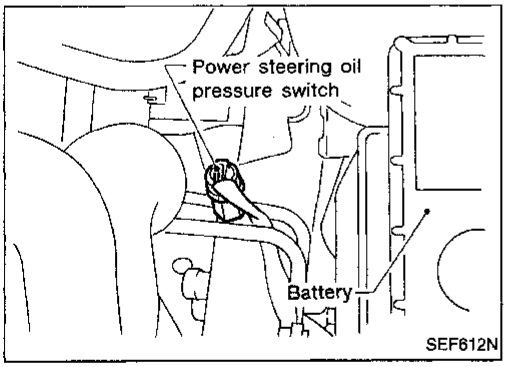
The IAA unit is made up of the IACV-AAC valve and air cut valve. It receives the signal from the ECM and controls the idle speed at the preset value under various conditions.
The air cut valve prevents an abnormal rise of idle rpm when IACV-AAC valve operates abnormally.



SEF488K

Idle Air Control Valve (IACV)-Auxiliary Air Control (AAC) Valve

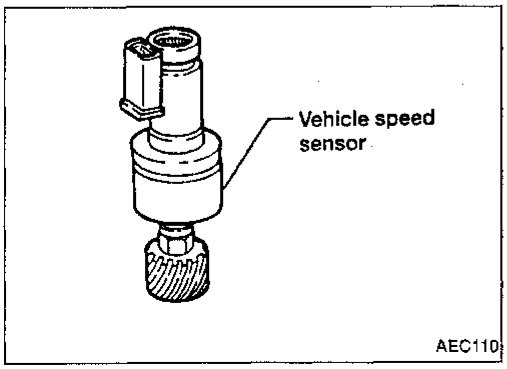
The IACV-AAC valve is attached to the throttle body.
The ECM actuates the IACV-AAC valve by an ON/OFF pulse. The longer that ON pulse is received, the larger the amount of air that will flow through the IACV-AAC valve.
The IACV-AAC valve adjusts idle speed to the specified value.



SEF612N

Power Steering Oil Pressure Switch

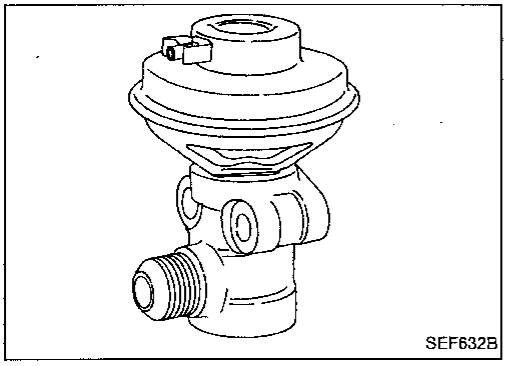
The power steering oil pressure switch is attached to the power steering high-pressure tube and detects the power steering load, sending the load signal to the ECM. The ECM then sends the idle-up signal to the IACV-AAC valve.



AEC110

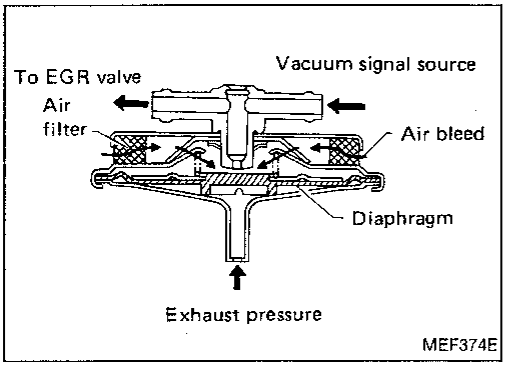
Vehicle Speed Sensor (VSS)

The vehicle speed sensor provides a vehicle speed signal to the ECM.
The speed sensor consists of a reed switch, which is installed on the transmission unit and transforms vehicle speed into a pulse signal.


SEF632B

Exhaust Gas Recirculation (EGR) Valve

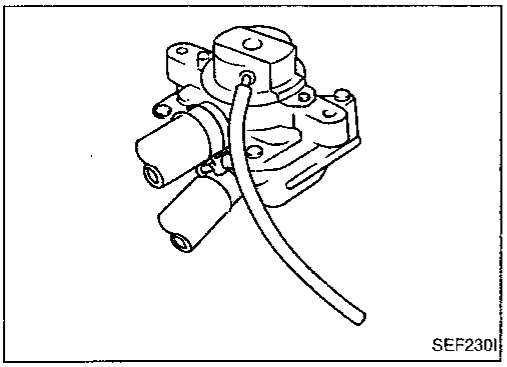
The EGR valve controls the quantity of exhaust gas to be led to the intake manifold through vertical movement of the taper valve connected to the diaphragm, to which vacuum is applied in response to the opening of the throttle valve.



MEF374E

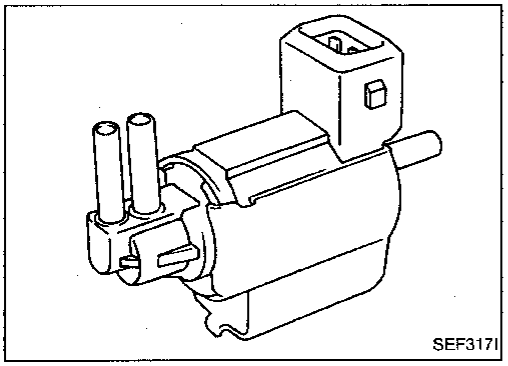
EGR Control (EGRC)-BPT Valve

The EGRC-BPT valve monitors exhaust pressure to activate the diaphragm, controlling throttle body vacuum applied to the EGR valve. In other words, recirculated exhaust gas is controlled in response to positioning of the EGR valve or to engine operation.


SEF230I

Pulsed Secondary Air Injection (PAIR) Valve (PAIR valve)

The PAIR valve sends secondary air to the exhaust manifold, using a vacuum created by exhaust pulsation in the exhaust manifold. When the exhaust pressure is below atmospheric pressure (negative pressure), secondary air is sent to the exhaust manifold. When the exhaust pressure is above atmospheric pressure, the reed valves prevent secondary air from being sent back to the air cleaner.


SEF317I

Pulsed Secondary Air Injection (PAIRC) Solenoid Valve

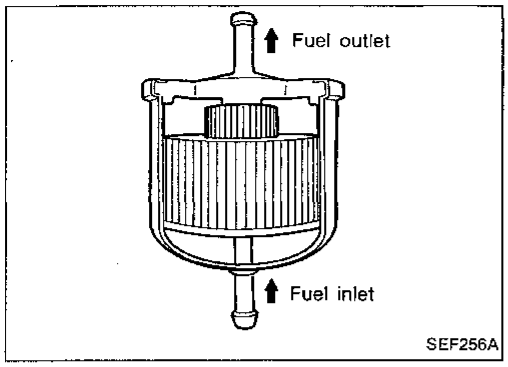
The PAIRC-solenoid valve cuts the intake manifold vacuum signal for PAIR valve control. It responses to the ON/OFF signal from the ECM. When the solenoid is off, the vacuum signal from the intake manifold is cut. When the ECM sends an ON signal, the coil pulls the plunger downward and feeds the vacuum signal to the PAIR valve control valve.

EGR Control (EGRC)-Solenoid Valve

The EGR system is controlled only by the ECM. At both low- and high-speed engine speeds, the solenoid valve turns on and accordingly the EGR valve cuts the exhaust gas leading to the intake manifold.

SCV Control Solenoid Valve

The SCV control solenoid valve cuts the intake manifold vacuum signal for swirl control valve. It responds to the ON/OFF signal from the ECM. When the solenoid is off, the vacuum signal from the intake manifold is cut. When the ECM sends an ON signal the coil pulls the plunger and feeds the vacuum signal to the swirl control valve actuator.

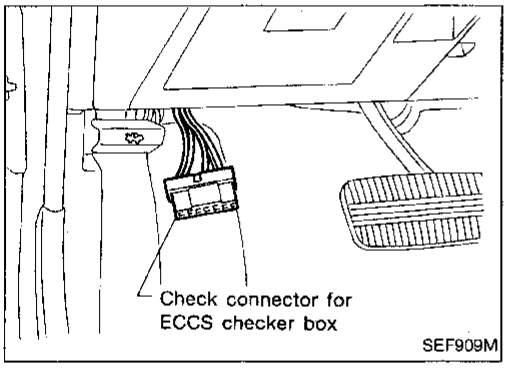


Fuel Filter

The specially designed fuel filter has a metal case in order to withstand high fuel pressure.

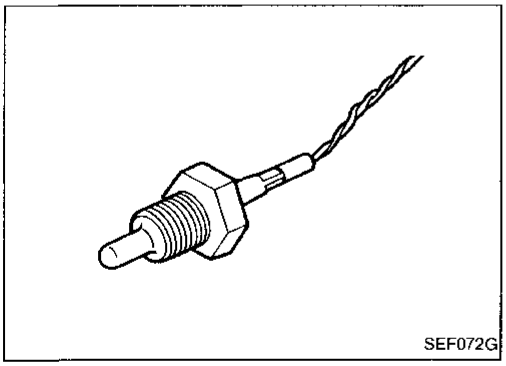
Carbon Canister

The carbon canister is filled with active charcoal to absorb evaporative gases produced in the fuel tank. These absorbed gases are then delivered to the intake manifold by manifold vacuum for combustion purposes.
The vacuum in the intake passage upstream of the throttle valve increases in response to the amount of the intake air.



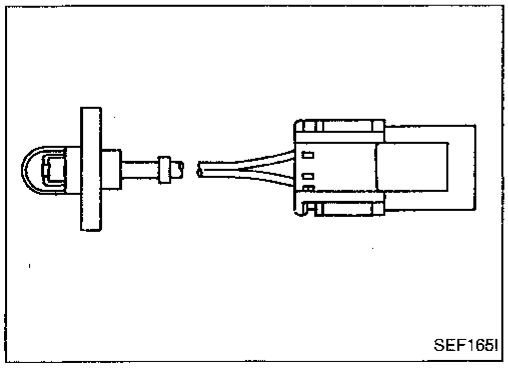
Check Connector for ECCS Checker Box

The check connector for ECCS checker box is beside the fuse box.



EGR Temperature Sensor

The EGR temperature sensor monitors in exhaust gas temperature and transmits a signal to the ECM. The temperature sensing unit employs a thermistor which is sensitive to the change in temperature. Electric resistance of the thermistor decreases in response to the temperature rise.

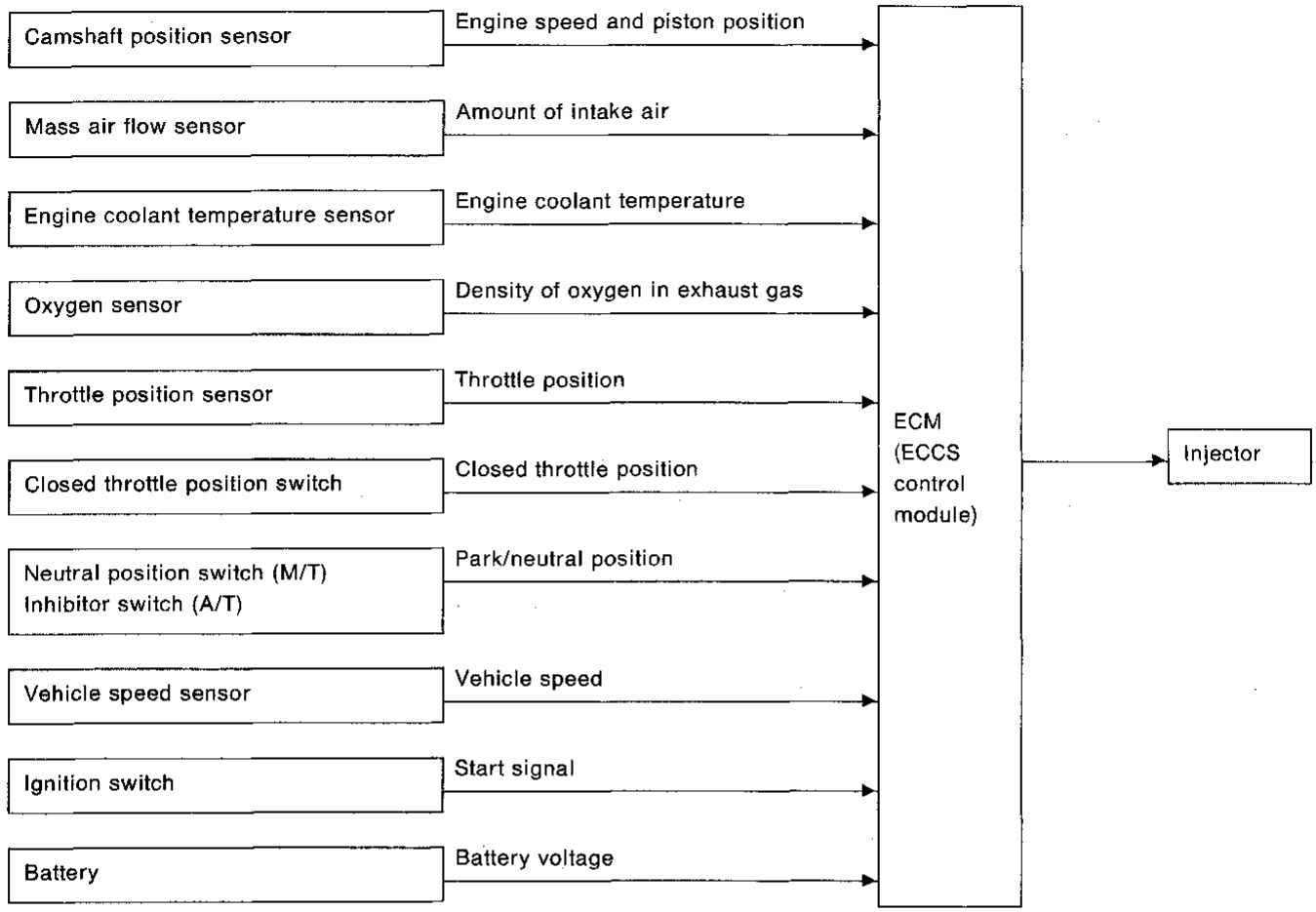


Intake Air Temperature Sensor

The intake air temperature sensor controls ignition timing when the intake air temperature is extremely high, in order not to cause knocking.

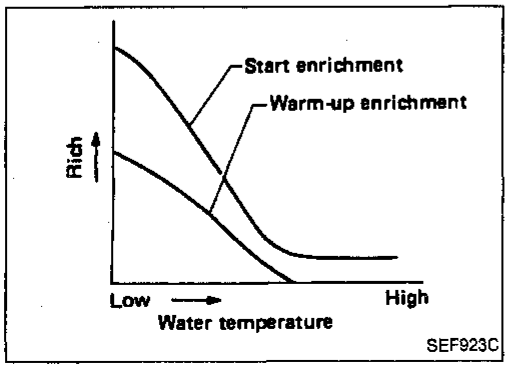
Multiport Fuel Injection (MFI) System

INPUT/OUTPUT SIGNAL LINE



BASIC MULTIPORT FUEL INJECTION SYSTEM

The amount of fuel injected from the fuel injector, or the length of time the valve remains open, is determined by the ECM. The basic amount of fuel injected is a programmable value mapped in the ECM memory. In other words, the programmable value is preset by engine operating conditions determined by input signals (for engine speed and air intake) from both the camshaft position sensor and the mass air flow sensor.



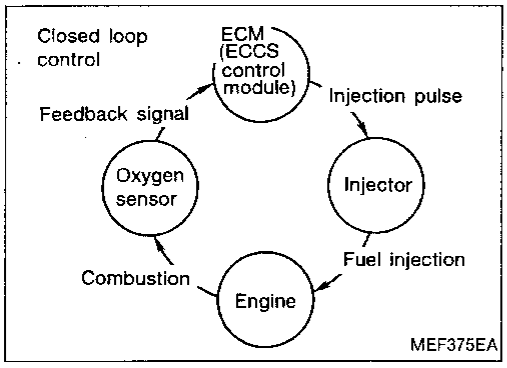
VARIOUS FUEL INJECTION INCREASE/DECREASE COMPENSATION

In addition, the amount of fuel injection is compensated for to improve engine performance under various operating conditions as listed below:

<Fuel increase>
1) During warm-up
2) When starting the engine
3) During acceleration
4) Hot-engine operation

<Fuel decrease>
1) During deceleration

Multiport Fuel Injection (MFI) System (Cont'd)



MIXTURE RATIO FEEDBACK CONTROL

Mixture ratio feedback system is designed to precisely control the mixture ratio to the stoichiometric point so that the three way catalyst can reduce CO, HC and NOx emissions. This system uses an oxygen sensor in the exhaust manifold to check the air-fuel ratio. The ECM adjusts the injection pulse width according to the sensor voltage so the mixture ratio will be within the range of the stoichiometric air-fuel ratio.

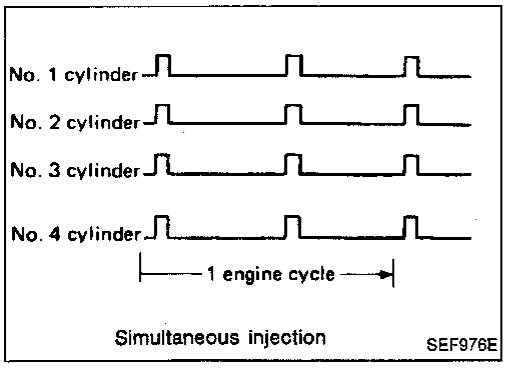
This stage refers to the closed loop control condition. The open loop control condition refers to that under which the ECM detects any of the following conditions and feedback control stops in order to maintain stabilized fuel combustion.

1) Deceleration
2) High-load, high-speed operation
3) Engine idling
4) Malfunctioning of oxygen sensor or its circuit
5) Insufficient activation of oxygen sensor at low engine coolant temperature
6) Engine starting

MIXTURE RATIO SELF-LEARNING CONTROL

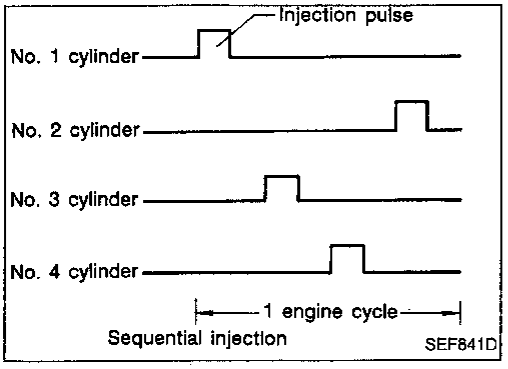
The mixture ratio feedback control system monitors the mixture ratio signal transmitted from the oxygen sensor. This feedback signal is then sent to the ECM to control the amount of fuel injection to provide a basic mixture ratio as close to the theoretical mixture ratio as possible. However, the basic mixture ratio is not necessarily controlled as originally designed. This is due to manufacturing errors (e.g., mass air flow sensor hot wire) and changes during operation (injector clogging, etc.) of ECCS parts which directly affect the mixture ratio.

Accordingly, a difference between the basic and theoretical mixture ratios is quantitatively monitored in this system. It is then computed in terms of "fuel injection duration" to automatically compensate for the difference between the two ratios.



FUEL INJECTION TIMING

Fuel is injected once a cycle for each cylinder in the firing order.



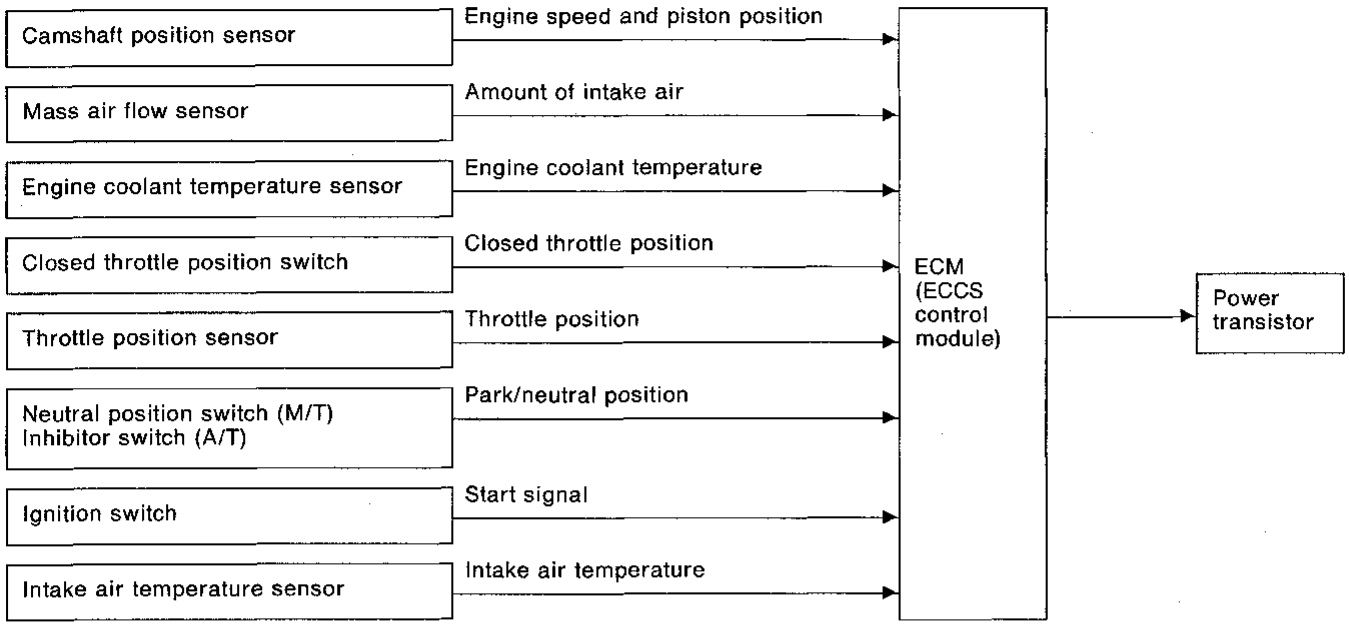
When engine starts, fuel is injected into all four cylinders simultaneously twice a cycle.

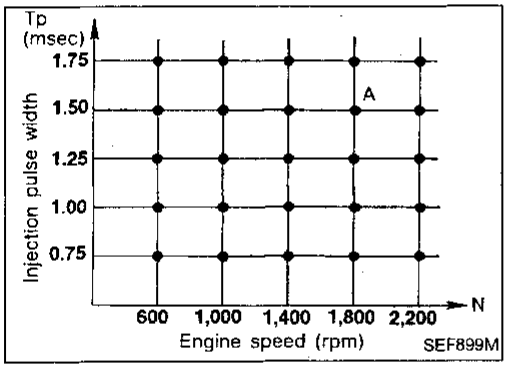
FUEL SHUT-OFF

Fuel to all cylinders is cut off during deceleration or high-speed operation.

Distributor Ignition (DI) System

INPUT/OUTPUT SIGNAL LINE





SYSTEM DESCRIPTION

The ignition timing is controlled by the ECM in order to maintain the best air-fuel ratio in response to every running condition of the engine.

The ignition timing data is stored in the ECM located in the ECM, in the form of the map shown below.

The ECM detects information such as the injection pulse width and camshaft position sensor signal which varies every moment. Then responding to this information, ignition signals are transmitted to the power transistor.

e.g. N: 1,800 rpm, Tp: 1.50 msec
A °BTDC

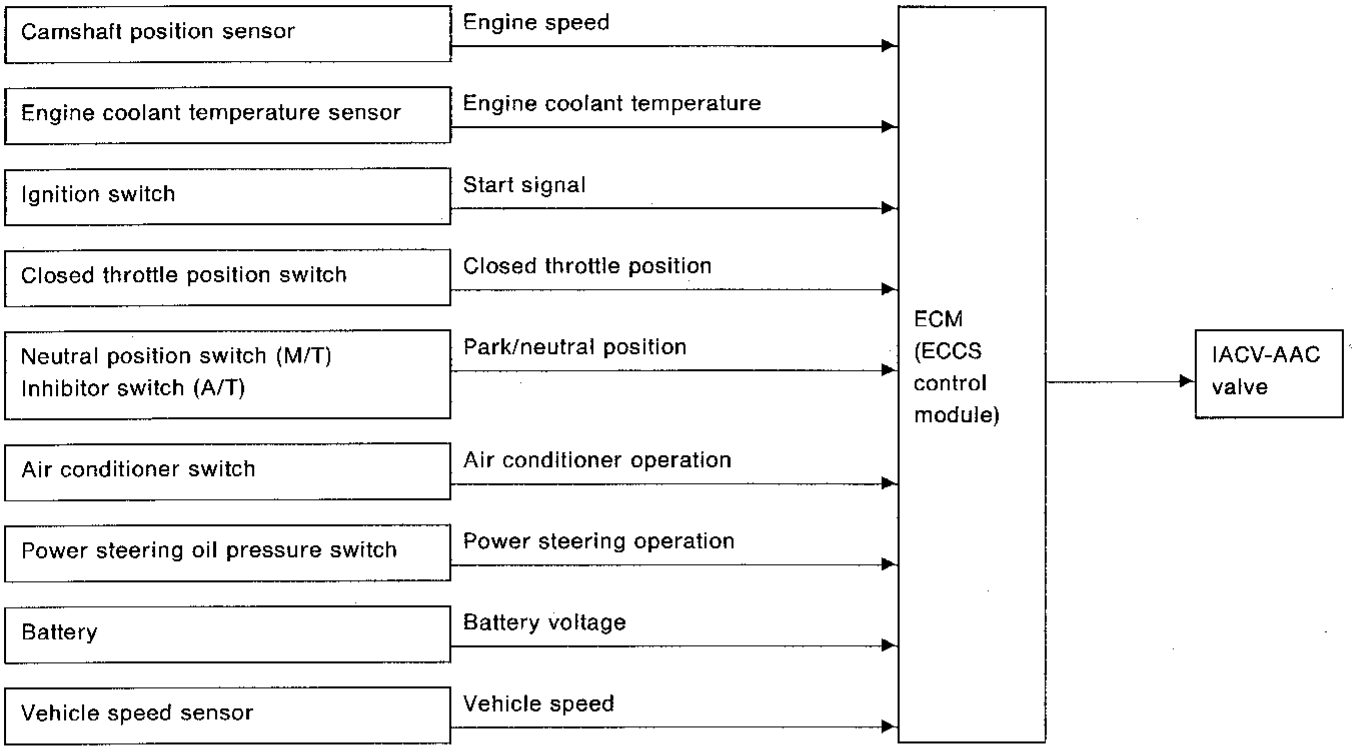
In addition to this,

1 At starting
2 During warm-up
3 At idle
4 At low battery voltage
5 During swirl control valve operates
6 During hot engine operation
7 At acceleration
8 When intake air temperature is extremely high

the ignition timing is revised by the ECM according to the other data stored in the ECM.

Idle Air Control (IAC) System

INPUT/OUTPUT SIGNAL LINE



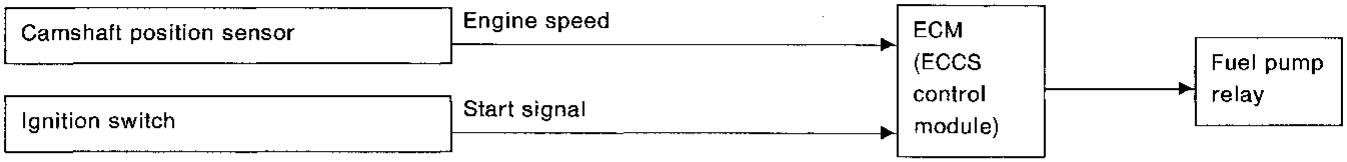
SYSTEM DESCRIPTION

This system automatically controls engine idle speed to a specified level. Idle speed is controlled through fine adjustment of the amount of air which by-passes the throttle valve via IACV-AAC valve. The IACV-AAC valve repeats ON/OFF operation according to the signal sent from the ECM. The camshaft position sensor detects the actual engine speed and sends a signal to the ECM. The ECM then controls the ON/OFF time of the IACV-AAC valve so that engine speed coincides with the target value memorized in ECM.

The target engine speed is the lowest speed at which the engine can operate steadily. The optimum value stored in the ECM is determined by taking into consideration various engine conditions, such as noise and vibration transmitted to the compartment, fuel consumption, and engine load.

Fuel Pump Control

INPUT/OUTPUT SIGNAL LINE



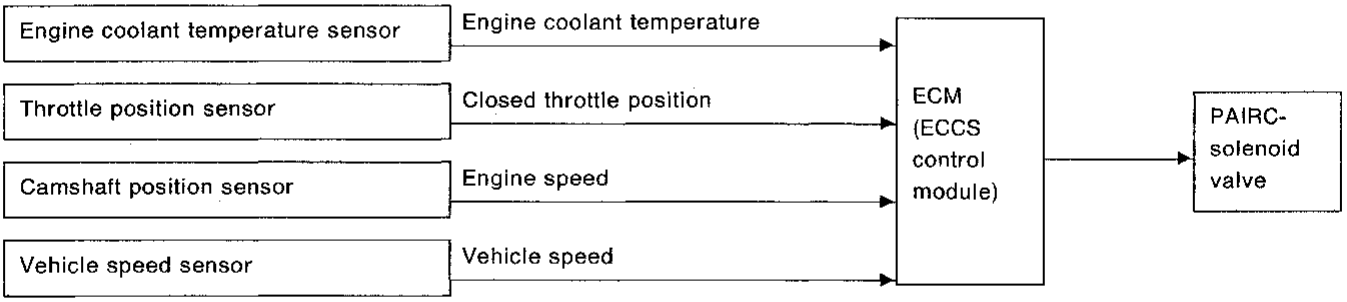
SYSTEM DESCRIPTION

The ECM activates the fuel pump for several seconds after the ignition switch is turned on to improve engine startability. If the ECM receives a 1° signal from the camshaft position sensor, it knows that the engine is rotating, and causes the pump to perform. If the 1° signal is not received when the ignition switch is on, the engine stalls. The ECM stops pump operation and prevents battery discharging, thereby improving safety. The ECM does not directly drive the fuel pump. It controls the ON/OFF fuel pump relay, which in turn controls the fuel pump.

Condition	Fuel pump operation
Ignition switch is turned to ON.	Operates for 5 seconds
Engine running and cranking	Operates
When engine is stopped	Stops in 1 second
Except as shown above	Stops

Pulsed Secondary Air Injection (PAIR) System

INPUT/OUTPUT SIGNAL LINE



SYSTEM DESCRIPTION

The PAIR system is designed to send secondary air to the exhaust manifold, utilizing the vacuum caused by exhaust pulsation in the exhaust manifold.

The exhaust pressure in the exhaust manifold usually pulsates in response to the opening and closing of the exhaust valve and decreases below atmospheric pressure periodically.

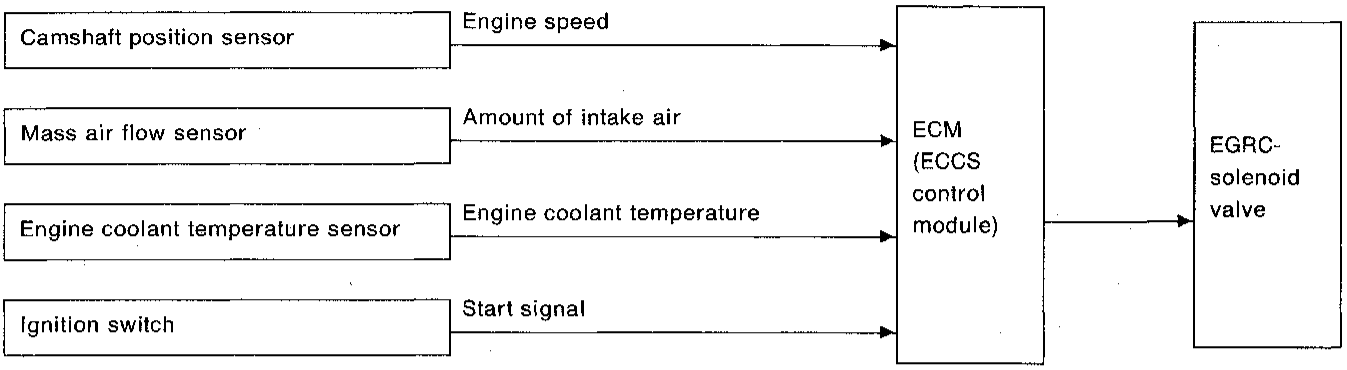
If a secondary air intake pipe is opened to the atmosphere under vacuum conditions, secondary air can be drawn into the exhaust manifold in proportion to the vacuum.

The PAIR valve is controlled by the ECM (ECCS control module), corresponding to the engine coolant temperature. When the engine is cold, the PAIR system operates to reduce HC and CO. In extremely cold conditions, PAIR system does not operate to reduce after-burning. This system also operates during deceleration for the purpose of blowing off water around the PAIR valve.

Engine condition	Engine coolant temperature °C (°F)	PAIRC-solenoid valve	PAIR valve system
Idle or deceleration	Between 28 (82) and 115 (239)	ON	Operates

Exhaust Gas Recirculation (EGR) System

INPUT/OUTPUT SIGNAL LINE



SYSTEM DESCRIPTION

In addition, a system is provided which precisely cuts and controls port vacuum applied to the EGR valve to suit engine operating conditions. This cut-and-control operation is accomplished through the ECM. When the ECM detects any of the following conditions, current flows through the solenoid valve in the EGR control vacuum line. This causes the port vacuum to be discharged into the atmosphere so that the EGR valve remains closed.

1) Low engine coolant temperature
2) Engine starting
3) High-speed engine operation
4) Engine idling

EGRC-solenoid valve operation

Condition		EGRC-solenoid valve
When starting		ON
Engine coolant temperature °C (°F)	Below 60 (140)	
	Above 115 (239)	
Idle & heavy load conditions		
Other conditions		OFF

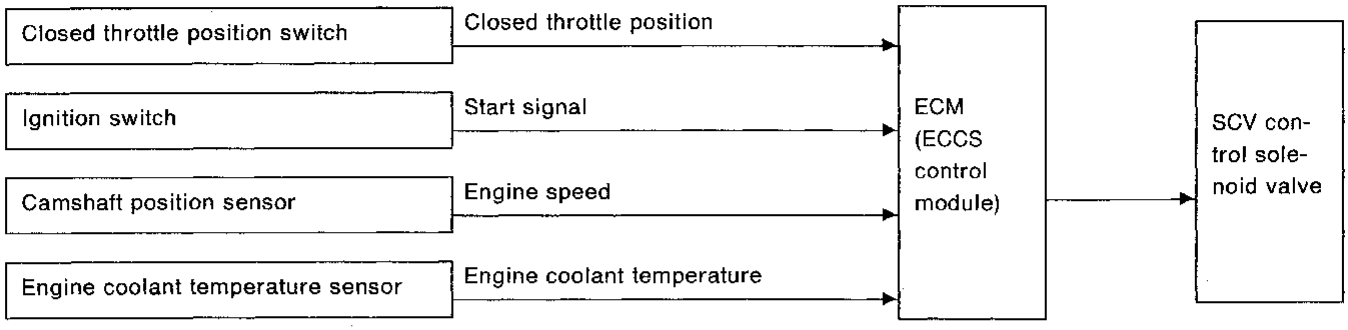
EGR system operation

EGR system operates under only the following conditions

Engine coolant temperature °C (°F)	EGRC-BPT valve		Throttle position	EGRC-solenoid valve	EGR system
	Exhaust gas pressure	Operation			
Between 60 (140) and 115 (239)	High	Closed	Partially open	OFF	Operates

Swirl Control Valve (SCV) Control

INPUT/OUTPUT SIGNAL LINE



SYSTEM DESCRIPTION

This system has a swirl control valve (SCV) in the intake passage of each cylinder.

While idling and during low engine speed operation, the SCV closes. Thus the velocity of the air in the intake passage increases, promoting the vaporization of the fuel and producing a swirl in the combustion chamber.

Because of this operation, this system tends to increase the burning speed of the gas mixture, improve fuel consumption, and increase the stability in running conditions.

Also, except when idling and during low engine speed operation, this system opens the SCV. In this condition, this system tends to increase power by improving intake efficiency via reduction of intake flow resistance, intake flow.

The solenoid valve controls SCV's shut/open condition. This solenoid valve is operated by the ECM.

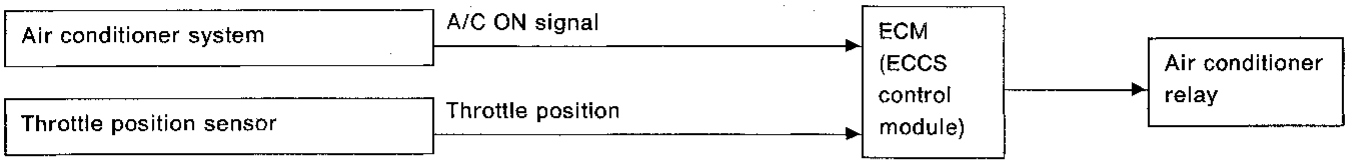
SCV system operation (Engine is running)

Closed throttle position switch	Engine speed	Solenoid valve	SCV
ON	Below 4,000 rpm	ON	Closed
OFF	Less than 2,800 rpm	ON	Closed
	More than 4,000 rpm	OFF	Open

When engine coolant temperature is below 0°C (32°F) SCV is kept open.

Acceleration Cut Control

INPUT/OUTPUT SIGNAL LINE



SYSTEM DESCRIPTION

When accelerator pedal is fully depressed, air conditioner is turned off for a few seconds.
This system improves acceleration when air conditioner is used.

Fail-safe System

MASS AIR FLOW SENSOR MALFUNCTION

If the mass air flow sensor output voltage is above or below the specified value, the ECM senses an mass air flow sensor malfunction. In case of a malfunction, the throttle position sensor substitutes for the mass air flow sensor.
Though mass air flow sensor is malfunctioning, it is possible to drive the vehicle and start the engine. But engine speed will not rise more than 2,400 rpm in order to inform the driver of fail-safe system operation while driving.

Operation

System	Fixed condition
EGR control system	OFF
Idle air control system	A duty ratio is fixed at the preprogrammed value.
Multiport fuel injection system	Fuel is shut off above 2,400 rpm. (Engine speed does not exceed 2,400 rpm.)

ENGINE COOLANT TEMPERATURE SENSOR MALFUNCTION

When engine coolant temperature sensor output voltage is below or above the specified value, water temperature is fixed at the preset value as follows:

Operation

Condition	Engine coolant temperature decided
Just as ignition switch is turned ON or Start	20°C (68°F)
More than 6 minutes after ignition ON or Start	80°C (176°F)
Except as shown above	20 - 80°C (68 - 176°F) (Depends on the time)

THROTTLE POSITION SENSOR MALFUNCTION

When throttle position sensor output voltage is below or above the specified value, throttle position sensor output is fixed at the preset value.

INTAKE AIR TEMPERATURE SENSOR MALFUNCTION

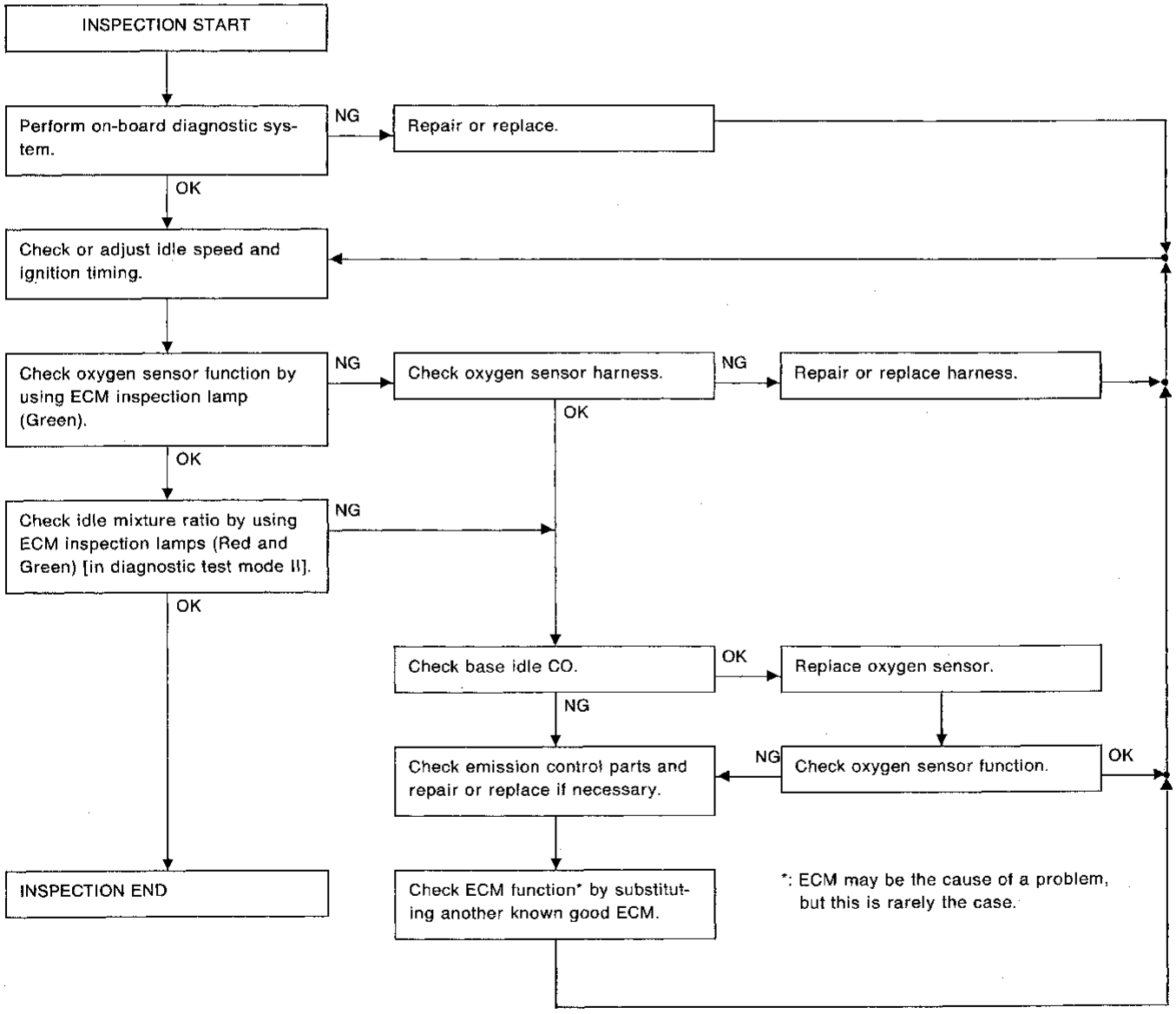
When intake air temperature sensor is below or above the specified value, intake air temperature value is fixed at the preset value [20°C (68°F)].

PREPARATION

1. Make sure that the following parts are in good order.
- Battery
- Ignition system
- Engine oil and coolant levels
- Fuses
- ECM harness connector
- Vacuum hoses
- Air intake system
  (Oil filler cap, oil level gauge, etc.)
- Fuel pressure
- PAIR valve hose
- Engine compression
- EGR valve operation
- Throttle valve and closed throttle position switch

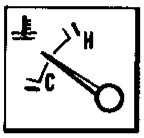
2. On air conditioner equipped models, checks should be carried out while the air conditioner is "OFF".
3. On automatic transaxle equipped models, when checking idle rpm, ignition timing and mixture ratio, checks should be carried out while shift lever is in "N" position.
4. When measuring "CO" percentage, insert probe more than 40 cm (15.7 in) into tail pipe.
5. Turn off headlamps, heater blower, rear defogger.
6. Keep front wheels pointed straight ahead.

Overall inspection sequence



INSPECTION START

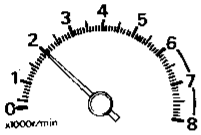
Visually check the following:
- Air cleaner clogging
- Hoses and ducts for leaks
- EGR valve operation
- Electrical connectors
- Gaskets
- Throttle valve and throttle position sensor operation



SEF457C

Start engine and warm it up until engine coolant temperature indicator points to the middle of gauge, and ensure that engine speed is below 1,000 rpm.

Open engine hood and run engine at about 2,000 rpm for about 2 minutes under no-load.



SEF477B

Perform ECM self-diagnosis (Diagnostic Test Mode III, IV, V).

OK

NG

Repair or replace malfunctioning parts as necessary.

Run engine at about 2,000 rpm for about 2 minutes under no-load.
Race engine two or three times under no-load, then run engine for about 1 minute at idle speed.

Turn off engine and disconnect throttle position sensor harness.

Start engine.

Race engine (2,000 - 3,000 rpm) 2 or 3 times under no-load and run engine at idle speed.

Check ignition timing with a timing light.

M/T: 10° ± 2° BTDC
A/T: 10° ± 2° BTDC (In "N" position)

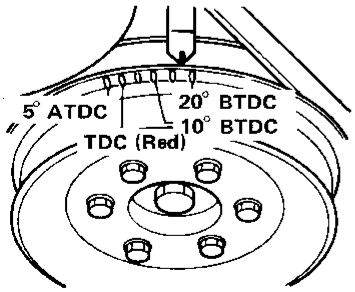
OK

NG

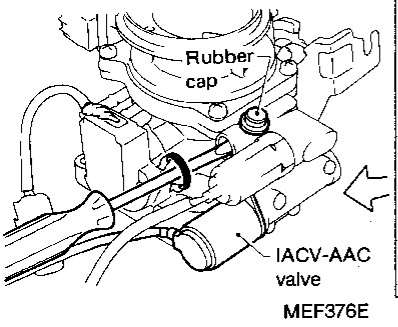
Adjust ignition timing to the specified value by turning distributor after loosing bolts which secure distributor.

M/T: 10° ± 2° BTDC
A/T: 10° ± 2° BTDC (in "N" position)

Ⓐ



SMA189AA



Ⓐ

Check idle speed.

M/T: 750 ± 50 rpm
A/T: 750 ± 50 rpm (in "N" position)

OK

NG

Turn off engine and disconnect throttle position sensor harness connector.

Ⓕ

Start engine.

Race engine (2,000 - 3,000 rpm) 2 or 3 times under no-load and run engine at idle speed.

Adjust idle speed by turning idle speed adjust screw.

M/T: 750 ± 50 rpm
A/T: 750 ± 50 rpm (in "N" position)

OK

Turn off engine and connect throttle position sensor harness connector.

Start engine.

Race engine (2,000 - 3,000 rpm) 2 or 3 times under no-load and run engine at idle speed.

Check idle speed.

M/T: 800 ± 50 rpm
A/T: 800 ± 50 rpm (in "N" position)

OK

NG

Check IACV-AAC valve and replace if necessary.

Check IACV-AAC valve harness and repair if necessary.

Reconnect ECM harness connector and retest.

OK

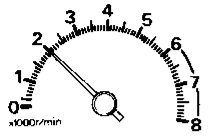
NG

Check ECM function* by substituting another known good ECM.

OK

*: ECM may be the cause of a problem, but this is a rare case.

Ⓒ



SEF477B

Ⓒ

Set the diagnostic test mode of ECM to mode II.

Run engine at about 2,000 rpm for about 2 minutes under no-load.

Make sure that malfunction indicator light on instrument panel goes on and off more than 5 times during 10 seconds (at 2,000 rpm).

OK

INSPECTION END

NG

Check oxygen sensor harness:
1) Turn off engine and disconnect battery ground cable.
2) Disconnect ECM connector from control unit.
3) Disconnect oxygen sensor harness connector and connect terminal for oxygen sensor to ground with a jumper wire.
4) Check for continuity between terminal No. 19 of ECM connector and ground metal on car body.

Continuity exists ..... OK
Continuity does not exist ..... NG

OK

Connect ECM connector to ECM.

NG

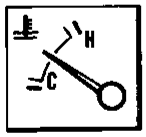
Repair harness.

Ⓕ

- Disconnect engine coolant temperature sensor harness connector.
- Connect a resistor (2.5 kΩ) between terminals of engine coolant temperature sensor harness connector.

Shut off PAIR valve hose.
Disconnect PAIRC-solenoid valve harness.

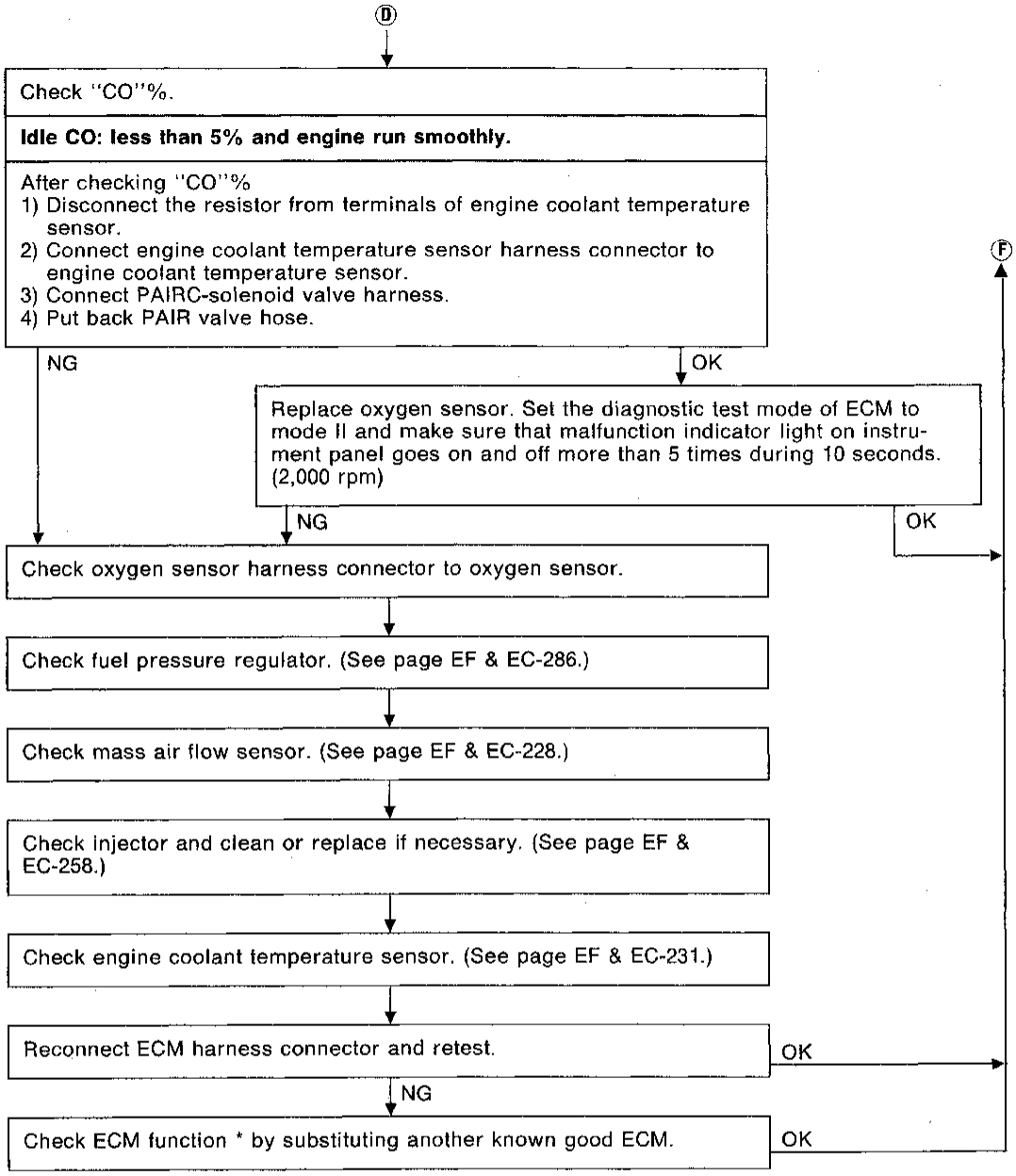
Start engine and warm up engine until engine coolant temperature indicator points to the middle of gauge.
(Be careful to start engine after installing a 2.5 kΩ resistor)



SEF457C

Race engine two or three times under no-load then run engine at idle speed.

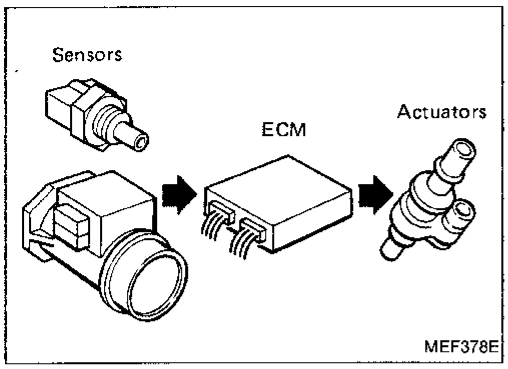
Ⓓ

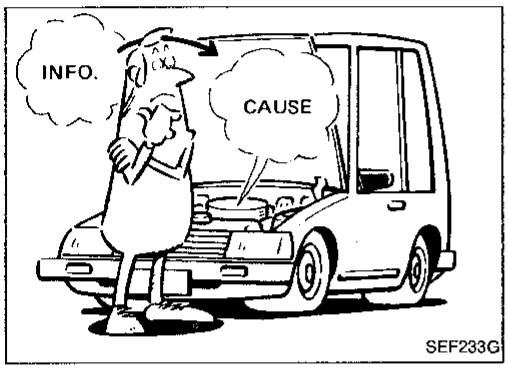


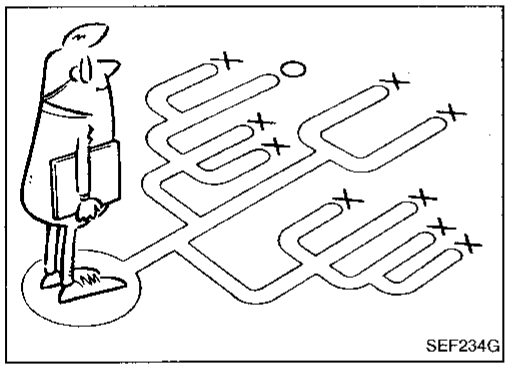
*: ECM may be the cause of a problem, but this is a rare case.

Contents

Contents (Cont'd)







How to Perform Trouble Diagnoses for Quick and Accurate Repair

INTRODUCTION

The engine has an ECM to control major systems such as fuel control, ignition control, idle air control system, etc. The ECM accepts input signals from sensors and instantly drives actuators. It is essential that both kinds of signals are proper and stable. At the same time, it is important that there are no conventional problems such as vacuum leaks, fouled spark plugs, or other problems with the engine.

It is much more difficult to diagnose a problem that occurs intermittently rather than continuously. Most intermittent problems are caused by poor electric connections or faulty wiring. In this case, careful checking of suspicious circuits may help prevent the replacement of good parts.

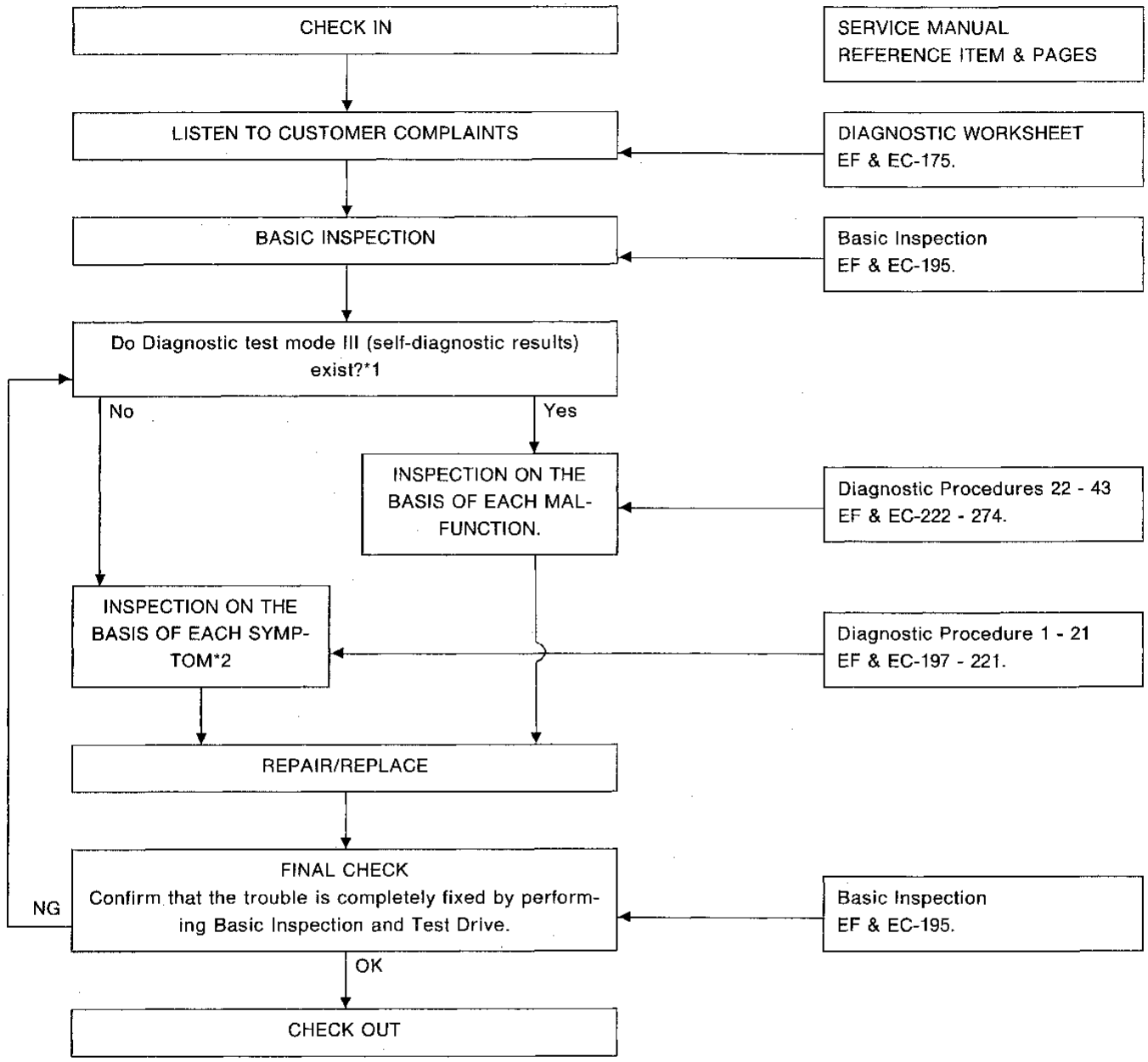
A visual check only may not find the cause of the problems. A road test with a circuit tester connected to a suspected circuit should be performed.

Before undertaking actual checks, take just a few minutes to talk with a customer who approaches with a driveability complaint. The customer is a very good supplier of information on such problems, especially intermittent ones. Through the talks with the customer, find out what symptoms are present and under what conditions they occur.

Start your diagnosis by looking for "conventional" problems first. This is one of the best ways to troubleshoot driveability problems on an electronically controlled engine vehicle.

How to Perform Trouble Diagnoses for Quick and Accurate Repair (Cont'd)

WORK FLOW



***1: If the on-board diagnostic system cannot be performed, check main power supply and ground circuit. (See Diagnostic Procedure 22.)**

***2: If the trouble is not duplicated, see INTERMITTENT PROBLEM SIMULATION (EF & EC-176).**

How to Perform Trouble Diagnoses for Quick and Accurate Repair (Cont'd)

KEY POINTS

WHAT ..... Vehicle & engine model
WHEN ..... Date, Frequencies
WHERE..... Road conditions
HOW ..... Operating conditions, Weather conditions, Symptoms

SEF907L

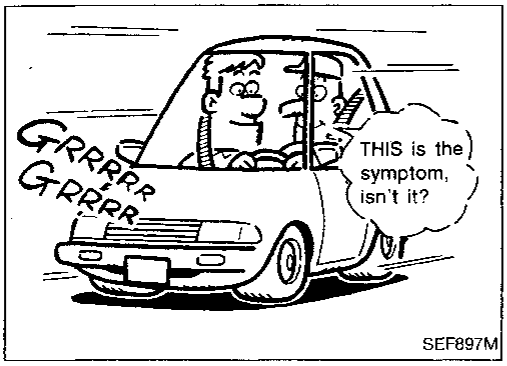
DIAGNOSTIC WORKSHEET

There are many kinds of operating conditions that lead to malfunctions on engine components.
A good grasp of such conditions can make trouble-shooting faster and more accurate.
In general, feelings for a problem depend on each customer. It is important to fully understand the symptoms or under what conditions a customer complains.
Make good use of a diagnostic worksheet such as the one shown below in order to utilize all the complaints for trouble-shooting.

Worksheet sample

Customer name MR/MS	Model & Year	VIN
Engine #	Trans.	Mileage
Incident Date	Manuf. Date	In Service Date

Symptoms	☐ Startability	☐ Impossible to start ☐ No combustion ☐ Partial combustion ☐ Partial combustion affected by throttle position ☐ Partial combustion NOT affected by throttle position ☐ Possible but hard to start ☐ Others [ ]
	☐ Idling	☐ No fast idle ☐ Unstable ☐ High idle ☐ Low idle ☐ Others [ ]
	☐ Driveability	☐ Stumble ☐ Surge ☐ Knock ☐ Lack of power ☐ Intake backfire ☐ Exhaust backfire ☐ Others [ ]
	☐ Engine stall	☐ At the time of start ☐ While idling ☐ While accelerating ☐ While decelerating ☐ Just after stopping ☐ While loading
Incident occurrence		☐ Just after delivery ☐ Recently ☐ In the morning ☐ At night ☐ In the daytime
Frequency		☐ All the time ☐ Under certain conditions ☐ Sometimes
Weather conditions		☐ Not affected
	Weather	☐ Fine ☐ Raining ☐ Snowing ☐ Others [ ]
	Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold ☐ Humid °F
Engine conditions		☐ Cold ☐ During warm-up ☐ After warm-up Engine speed 0 2,000 4,000 6,000 8,000 rpm
Road conditions		☐ In town ☐ In suburbs ☐ Highway ☐ Off road (up-down)
Driving conditions		☐ Not affected ☐ At starting ☐ While idling ☐ At racing ☐ While accelerating ☐ While cruising ☐ While decelerating ☐ While turning (RH/LH) Vihicle speed 0 10 20 30 40 50 60 MPH
Malfunction indicator lamp		☐ Turned on ☐ Not turned on



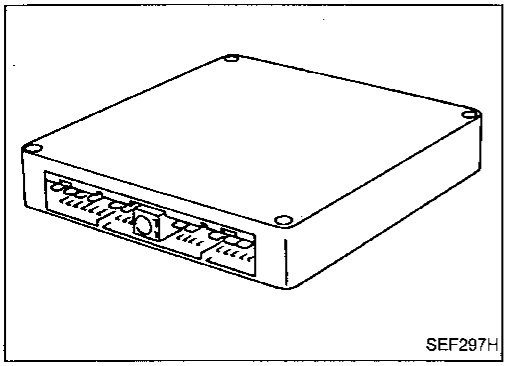
SEF897M

How to Perform Trouble Diagnoses for Quick and Accurate Repair (Cont'd)

INTERMITTENT PROBLEM SIMULATION

In order to duplicate an intermittent problem, it is effective to create similar conditions for component parts, under which the problem might occur.
Perform the activity listed under Service procedure and note the result.

	Variable factor	Influential part	Target condition	Service procedure
1	Mixture ratio	Pressure regulator	Made lean	Remove vacuum hose and apply vacuum.
			Made rich	Remove vacuum hose and apply pressure.
2	Ignition timing	Distributor	Advanced	Rotate distributor clockwise.
			Retarded	Rotate distributor counterclockwise.
3	Mixture ratio feedback control	Oxygen sensor	Suspended	Disconnect oxygen sensor harness connector.
		ECM	Operation check	Perform on-board diagnostic system (Diagnostic Test Mode I/II) at 2,000 rpm.
4	Idle speed	IAA unit	Raised	Turn idle adjusting screw counterclockwise.
			Lowered	Turn idle adjusting screw clockwise.
5	Electric connection (Electric continuity)	Harness connectors and wires	Poor electric connection or faulty wiring	Tap or wiggle.
				Race engine rapidly. See if the torque reaction of the engine unit causes electric breaks.
6	Intake air temperature	ECM	Cooled	Cool with an icing spray or similar device.
			Warmed	Heat with a hair drier. **[WARNING: Do not overheat the unit.]**
7	Moisture	Electric parts	Damp	Wet. **[WARNING: Do not directly pour water on components. Use a mist sprayer.]**
8	Electric loads	Load switches	Loaded	Turn on head lights, air conditioner, rear defogger, etc.
9	Closed throttle position switch condition	ECM	ON-OFF switching	Perform on-board diagnostic system (Diagnostic Test Mode IV).
10	Ignition spark position	Timing light	Spark power check	Try to flash timing light for each cylinder.


SEF297H

On-board Diagnostic System — Description

The on-board diagnostic system is useful to diagnose malfunctions in major sensors and actuators of the ECCS system. There are 5 modes in the on-board diagnostic system.

1. **Diagnostic Test Mode I (Oxygen sensor monitor)**

- During closed loop operation:
  The green inspection lamp turns ON when a lean condition is detected and goes OFF under rich condition.
- During open loop operation condition:
  The green inspection lamp remains OFF or ON.

2. **Diagnostic Test Mode II (Mixture ratio feedback control monitor)**

   The green inspection lamp function is the same as Diagnostic Test Mode I.

- During closed loop operation:
  The red inspection lamp turns ON and OFF simultaneously with the green inspection lamp when the mixture ratio is controlled within the specified value.
- During open loop operation:
  The red inspection lamp remains ON or OFF.

3. **Diagnostic Test Mode III (Self-diagnostic results)**

   In this mode the number of both green and red LED's flashing indicates the group to which the malfunctioning part belongs.

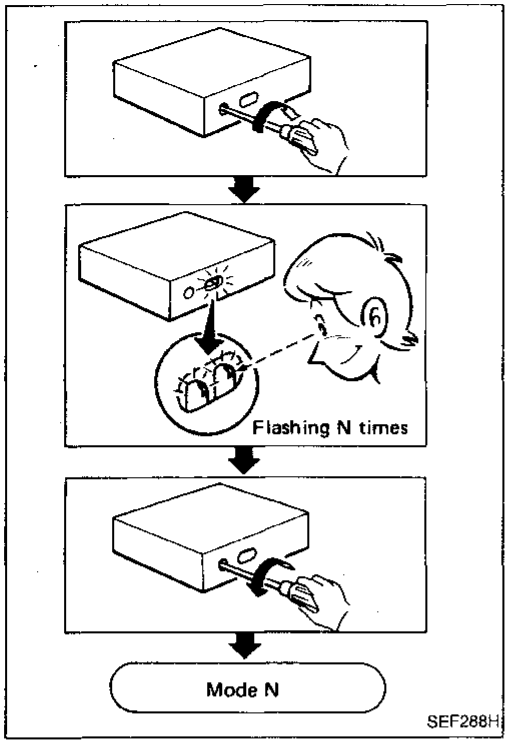
4. **Diagnostic Test Mode IV (Switches ON/OFF diagnostic system)**

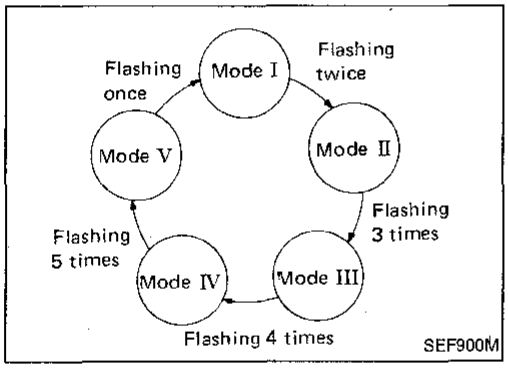
   During this mode, the inspection lamps monitor the switch ON-OFF condition.

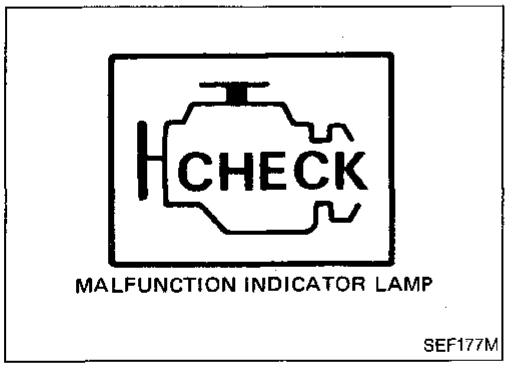
- Soft closed throttle position switch
- Starter switch
- Vehicle speed sensor

5. **Diagnostic Test Mode V (Real-time diagnostic system)**

   The moment the malfunction is detected, the display will be presented immediately. That is, the condition at which the malfunction occurs can be found by observing the inspection lamps during driving test.







On-board Diagnostic System — Description (Cont'd)

HOW TO SWITCH THE DIAGNOSTIC MODES

1. Turn ignition switch "ON".
2. Turn diagnostic test mode selector to ECM (fully clockwise) and wait for inspection lamps to flash.
3. Count the number of flashes, and after the inspection lamps have flashed the number of the required mode, immediately turn diagnostic test mode selector fully counterclockwise.

- **When the ignition switch is turned off during diagnosis in any mode and then turned on again (after power to the ECM has dropped completely), the diagnosis will automatically return to Diagnostic Test Mode I.**
  The stored memory will be lost if:

1. Battery terminal is disconnected.
2. After selecting Diagnostic Test Mode III, Diagnostic Test Mode IV is selected.
   However, if the diagnostic test mode selector is kept turned fully clockwise, it will continue to change in the order of Diagnostic Test Mode I → II → III → IV → V → I ... etc., and in this state the stored memory will not be erased.

This unit serves as an idle speed feedback control. When the diagnostic test mode selector is turned within the "diagnostic test mode OFF" range, a target engine speed can be selected. Mark the original position of the selector before conducting on-board diagnostic system. Upon completion of on-board diagnostic system, return the selector to the previous position. Otherwise, engine speed may change before and after conducting on-board diagnostic system.

MALFUNCTION INDICATOR LAMP

This vehicle has a malfunction indicator lamp on the instrument panel. This light comes ON under the following conditions:

1) When ignition switch is turned "ON" (for bulb check).
2) When systems related to emission performance malfunction in Diagnostic Test Mode I (with engine running).

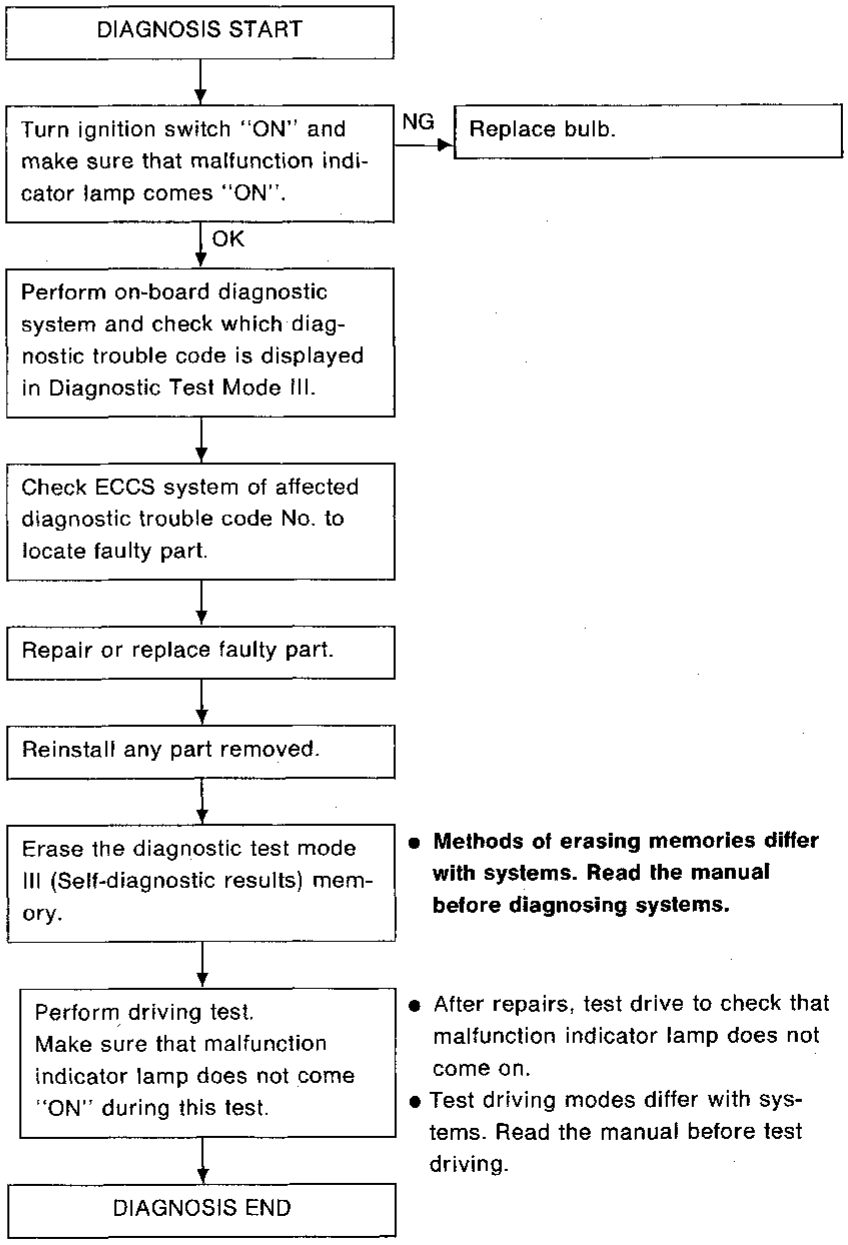
- **This malfunction indicator lamp always illuminates and is synchronous with red LED.**
- **Malfunction systems related to emission performance can be detected by on-board diagnostic system, and they are clarified as diagnostic trouble codes in Diagnostic Test Mode III.**

3) Malfunction indicator lamp will come "ON" only when malfunction is sensed.
   The malfunction indicator lamp will turn off when normal operation is resumed. Diagnostic Test Mode III memory must be cleared as the contents remain stored.

On-board Diagnostic System — Description (Cont'd)

Diagnostic trouble code No.	Malfunction
12	Mass air flow sensor circuit
13	Engine coolant temperature sensor circuit
14	Vehicle speed sensor circuit
31	ECM (ECCS control module)
32	EGR function
33	Oxygen sensor circuit
35	EGR temperature sensor circuit
43	Throttle position sensor circuit
45	Injector leak

Use the following diagnostic flowchart to check and repair a malfunctioning system.



On-board Diagnostic System — Diagnostic Test Mode I (Oxygen sensor monitor)

This mode checks the oxygen sensor for proper functioning. The operation of the ECM LED in this mode differs with mixture ratio control conditions as follows:

Diagnostic Test Mode	LED	Engine stopped (Ignition switch "ON")	Engine running
			Closed loop condition
Diagnostic Test Mode I (Monitor A)	Green	ON	Blinks
	Red	ON	• ON: when the MALFUNCTION INDICATOR LAMP ITEMS are stored in the ECM • OFF: except for the above conditions

OXYGEN SENSOR FUNCTION CHECK

If the number of LED blinks is less than that specified, replace the oxygen sensor.
If the LED does not blink, check oxygen sensor circuit.

OXYGEN SENSOR CIRCUIT CHECK

See page EF & EC-242.

On-board Diagnostic System — Diagnostic Test Mode II (Mixture ratio feedback control monitor)

This mode checks, through the ECM LED, optimum control of the mixture ratio. The operation of the LED, as shown below, differs with the control conditions of the mixture ratio (for example, richer or leaner mixture ratios, etc., which are controlled by the ECM).

Diagnostic Test Mode	LED	Engine stopped (Ignition switch "ON")	Engine running		
			Closed loop condition		
Diagnostic Test Mode II (Monitor B)	Green	ON	Blinks		
	Red	OFF	Compensating mixture ratio		
			More than 5% rich	Between 5% lean and 5% rich	More
			OFF	Synchronized with green LED	Remains ON

If the red LED remains on or off during the closed loop operation, the mixture ratio may not be controlled properly. Using the following procedures, check the related components or adjust the mixture ratio.

COMPONENT CHECK OR MIXTURE RATIO ADJUSTMENT

See page EF & EC-166.

On-board Diagnostic System — Diagnostic Test Mode III (Self-diagnostic Results)

The ECM constantly monitors the function of these sensors and actuators, regardless of ignition key position. If a malfunction occurs, the information is stored in the ECM and can be retrieved from the memory by turning on the diagnostic test mode selector, located on the side of the ECM. When activated, the malfunction is indicated by flashing a red and a green LED (Light Emitting Diode), also located on the ECM. Since all the self-diagnostic results are stored in the ECM's memory even intermittent malfunctions can be diagnosed.

A malfunction is indicated by the number of both red and green flashing LEDs. First, the red LED flashes and the green flashes follow. The red LED corresponds to units of ten and the green LED corresponds to units of one. For example, when the red LED flashes once and the green LED flashes twice, this signifies the number "12", showing that the mass air flow sensor signal is malfunctioning. All problems are classified by diagnostic trouble code numbers in this way.

- **When the engine fails to start, crank it two or more seconds before beginning on-board diagnostic system.**
- **Read out self-diagnostic results first and then erase the malfunction records which are stored in the ECM memory. If it is erased, the on-board diagnostic system function for intermittent malfunctions will be lost.**

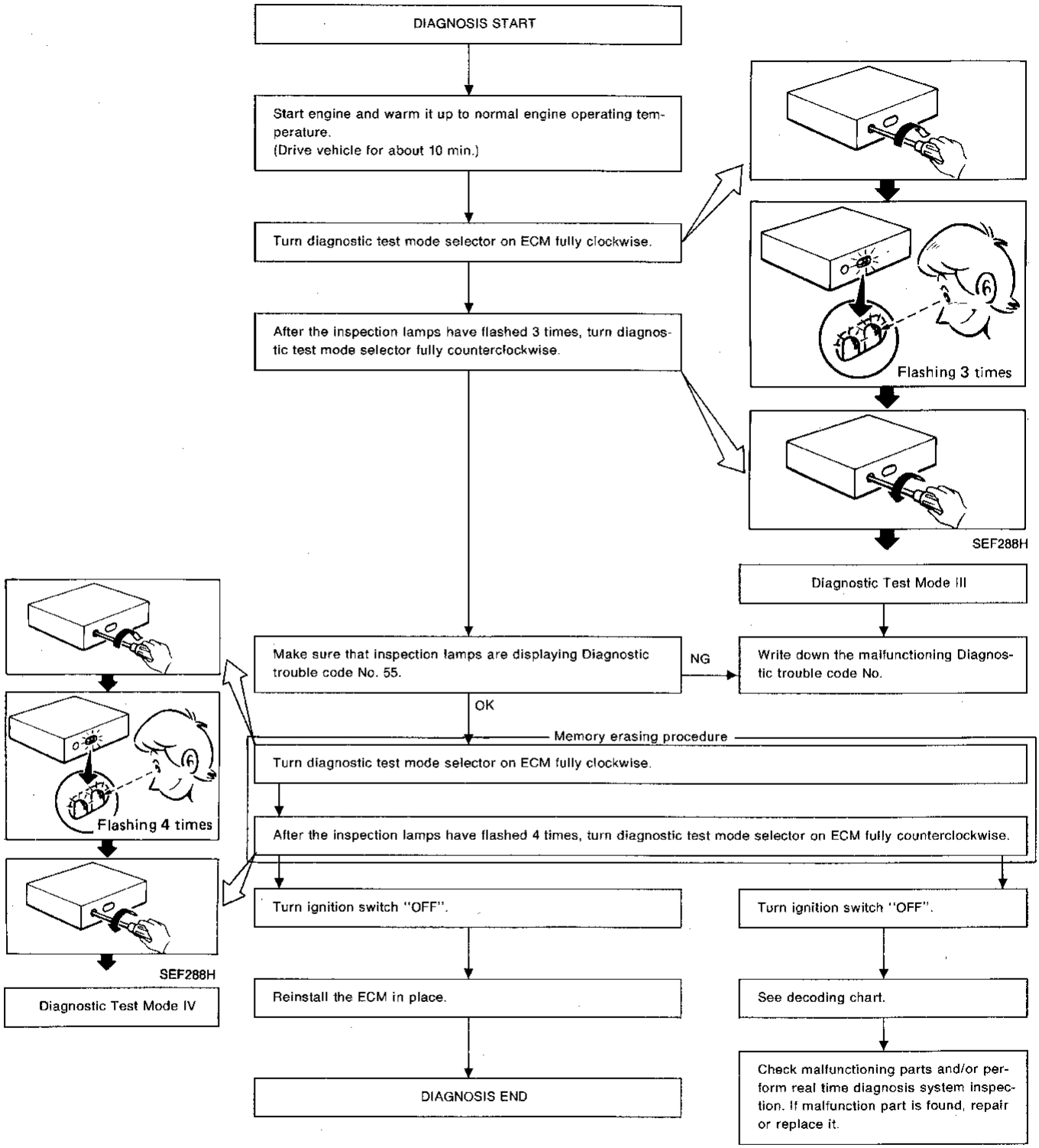
DISPLAY DIAGNOSTIC TROUBLE CODE TABLE

Diagnostic trouble code No.	Detected items	Availability
11	Camshaft position sensor circuit	X
12	Mass air flow sensor circuit	X
13	Engine coolant temperature sensor circuit	X
14	Vehicle speed sensor circuit	X
21	Ignition signal missing in primary coil	X
31	Engine control module (ECM)	X
32	EGR function	X
33	Oxygen sensor circuit	X
35	EGR temperature sensor circuit	X
41	Intake air temperature sensor circuit	X
43	Throttle position sensor circuit	X
45	Injector leak	X
55	No malfunction in the above circuit	X

X: Available

On-board Diagnostic System — Diagnostic Test Mode III (Self-diagnostic Results) (Cont'd)

SELF-DIAGNOSTIC PROCEDURE

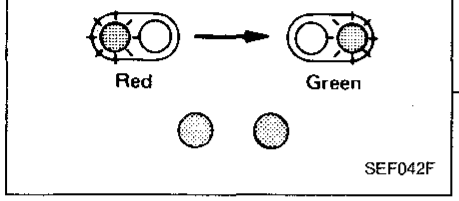
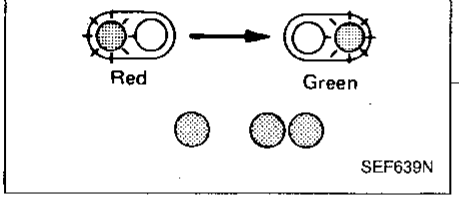
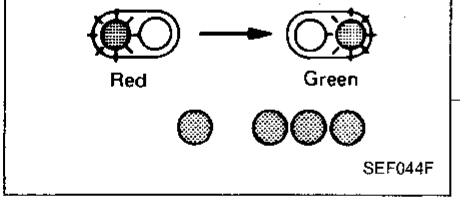
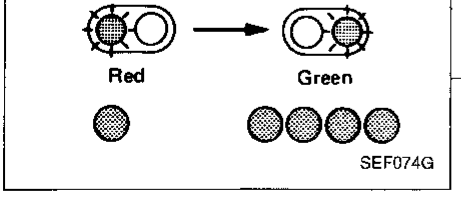


CAUTION:

- **During display of a diagnostic trouble code number in on-board diagnostic system mode (Diagnostic Test Mode III), if another diagnostic test mode is to be performed, be sure to note the malfunction diagnostic trouble code number before turning diagnostic test mode selector on ECM fully clockwise. When selecting an alternative, select the diagnosis mode after turning switch "OFF". Otherwise, on-board diagnostic system information in the ECM memory will be lost.**
  Return the DIAGNOSTIC TEST MODE selector to the previous position.

On-board Diagnostic System — Diagnostic Test Mode III (Self-diagnostic Results) (Cont'd)

DECODING CHART

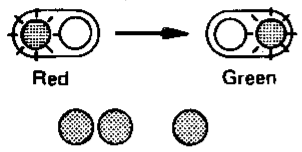
DISPLAY DIAGNOSTIC TROUBLE CODE	MALFUNCTIONING CIRCUIT OR PARTS	ECM SHOWS A MALFUNCTION SIGNAL WHEN THE FOLLOWING CONDITIONS ARE DETECTED.
CAMSHAFT POSITION SENSOR Code No. 11  SEF042F	Camshaft position sensor circuit	• Either 1° or 180° signal is not entered for the first few seconds during engine cranking. • Either 1° or 180° signal is not input often enough while the engine speed is higher than the specified rpm. **SYSTEM INSPECTION** See page EF & EC-225.
MASS AIR FLOW SENSOR (CHECK) Code No. 12  SEF639N	Mass air flow sensor circuit	• The mass air flow sensor circuit is open or shorted. (An abnormally high or low voltage is entered.) **SYSTEM INSPECTION** See page EF & EC-228.
ENGINE COOLANT TEMPERATURE SENSOR (CHECK) Code No. 13  SEF044F	Engine coolant temperature sensor circuit	• The engine coolant temperature sensor circuit is open or shorted. (An abnormally high or low output voltage is entered.) **SYSTEM INSPECTION** See page EF & EC-231.
VEHICLE SPEED SENSOR (CHECK) Code No. 14  SEF074G	Vehicle speed sensor circuit	• Signal circuit is open. **SYSTEM INSPECTION** See page EF & EC-233.

On-board Diagnostic System — Diagnostic Test Mode III (Self-diagnostic Results) (Cont'd)

DISPLAY DIAGNOSTIC TROUBLE CODE	MALFUNCTIONING CIRCUIT OR PARTS	ECM SHOWS A MALFUNCTION SIGNAL WHEN THE FOLLOWING CONDITIONS ARE DETECTED.

IGNITION SIGNAL

Code No. 21



MEF379E

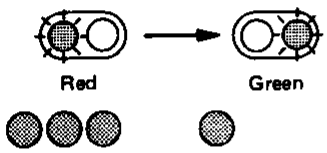
Ignition signal circuit →

- The ignition signal in primary circuit does not enter to ECM during engine cranking or running.

SYSTEM INSPECTION
See page EF & EC-235.

ENGINE CONTROL MODULE (ECM) CHECK

Code No. 31



MEF381E

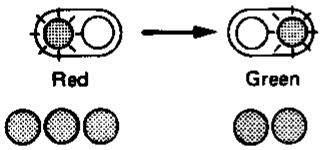
ECM calculation function →

- Signal is beyond "normal" range.

SYSTEM INSPECTION
See page EF & EC-238.

EGR FUNCTION CHECK

Code No. 32



MEF380E

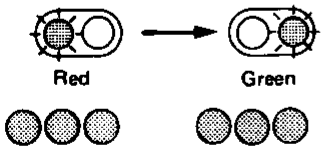
EGR function →

- EGR valve does not operate. (EGR valve spring does not lift.)

SYSTEM INSPECTION
See page EF & EC-239.

OXYGEN SENSOR CHECK

Code No. 33



SEF078G

Oxygen sensor circuit →

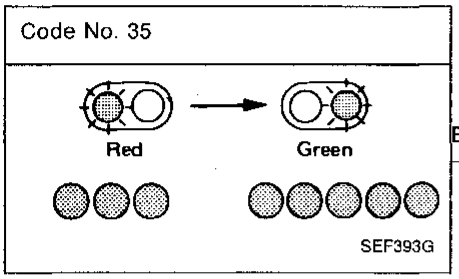
- Signal circuit is open.

SYSTEM INSPECTION
See page EF & EC-242.

On-board Diagnostic System — Diagnostic Test Mode III (Self-diagnostic Results) (Cont'd)

DISPLAY DIAGNOSTIC TROUBLE CODE	MALFUNCTIONING CIRCUIT OR PARTS	ECM SHOWS A MALFUNCTION SIGNAL WHEN THE FOLLOWING CONDITIONS ARE DETECTED.

EGR TEMPERATURE SENSOR CHECK

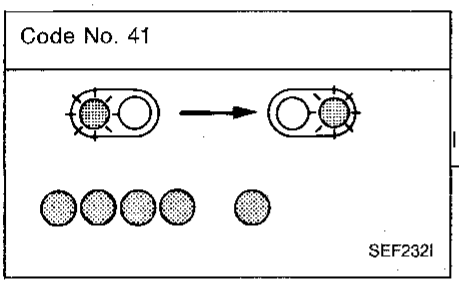


EGR temperature sensor circuit →

- Signal circuit is open.

SYSTEM INSPECTION
See page EF & EC-244.

INTAKE AIR TEMPERATURE SENSOR

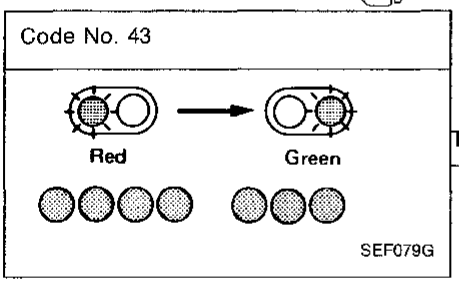


Intake air temperature sensor circuit →

- Signal circuit is open or shorted. (Output voltage is too high or too low.)

SYSTEM INSPECTION
See page EF & EC-246.

THROTTLE POSITION SENSOR CHECK

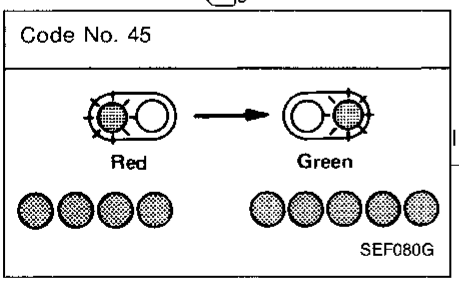


Throttle position sensor circuit →

- Throttle position sensor circuit is open or shorted. (Output voltage is too high or too low.)

SYSTEM INSPECTION
See page EF & EC-248.

INJECTOR LEAK CHECK

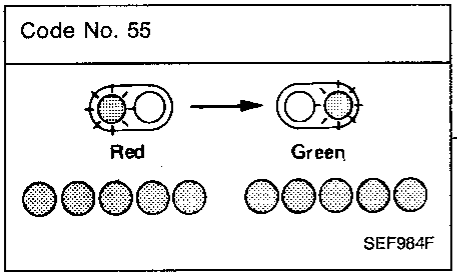


Injector leak →

- Fuel leak from injector.

SYSTEM INSPECTION
See page EF & EC-251.

On-board Diagnostic System — Diagnostic Test Mode III (Self-diagnostic Results) (Cont'd)

DISPLAY DIAGNOSTIC TROUBLE CODE	MALFUNCTIONING CIRCUIT OR PARTS	ECM SHOWS A MALFUNCTION SIGNAL WHEN THE FOLLOWING CONDITIONS ARE DETECTED.
Code No. 55  		Normal operation.

On-board Diagnostic System — Diagnostic Test Mode IV (Switches ON/OFF diagnostic system)

In switches ON/OFF diagnosis system, ON/OFF operation of the following switches can be detected continuously.

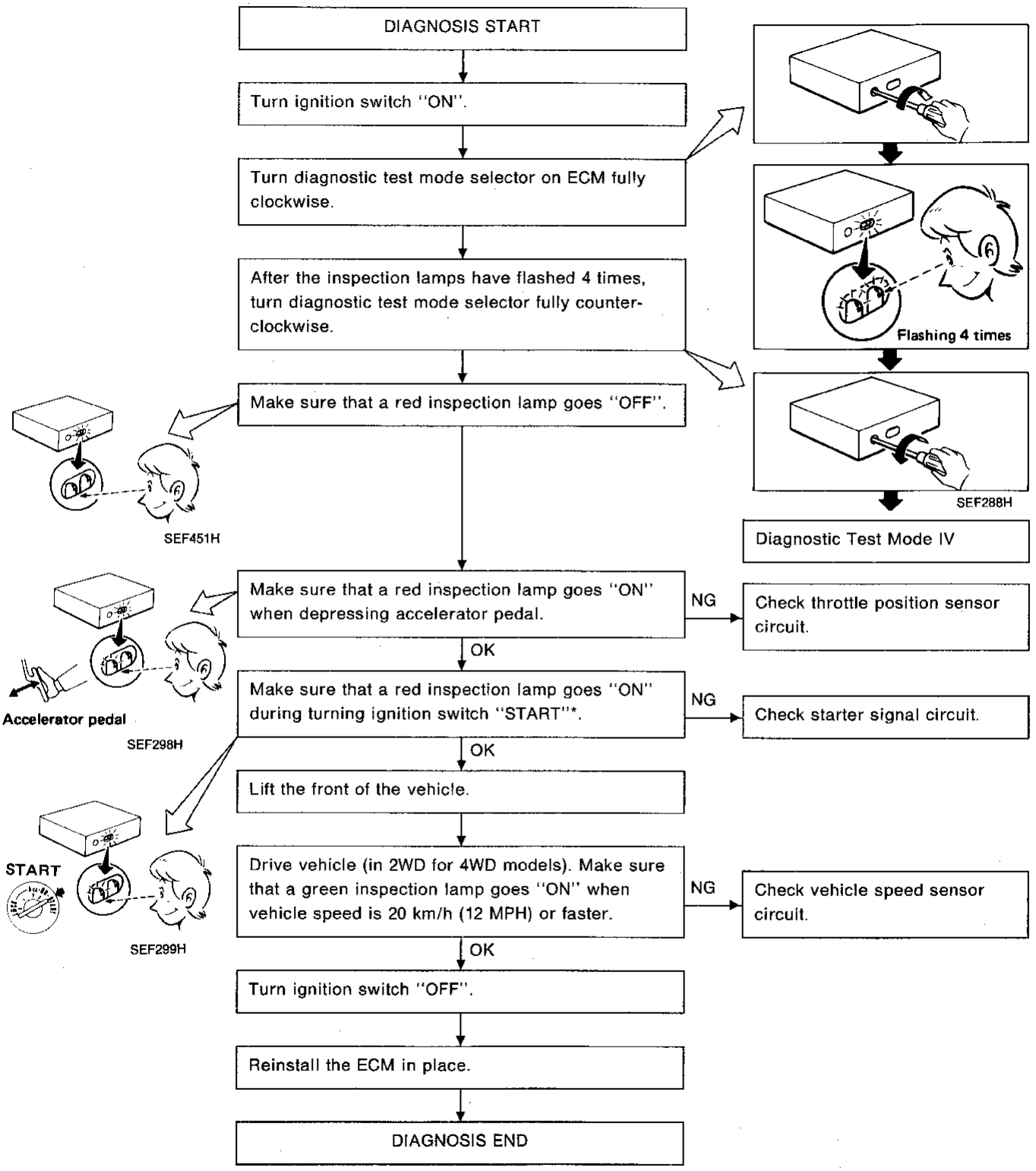
- Soft closed throttle position switch
- Starter switch
- Vehicle speed sensor

(1) Soft closed throttle position switch & Starter switch
The switches ON/OFF status in mode IV is stored in ECM memory. When either switch is turned from "ON" to "OFF" or "OFF" to "ON", the red LED on ECM alternately comes on and goes off each time switching is performed.

(2) Vehicle Speed Sensor
The switches ON/OFF status in mode IV is selected is stored in ECM memory. The green LED on ECM remains off when vehicle speed is 20 km/h (12 MPH) or below, and comes ON at higher speeds.

On-board Diagnostic System — Diagnostic Test Mode IV (Switches ON/OFF diagnostic system) (Cont'd)

SELF-DIAGNOSTIC PROCEDURE



CAUTION:

- **For safety, do not drive rear wheels at higher speed than required.**

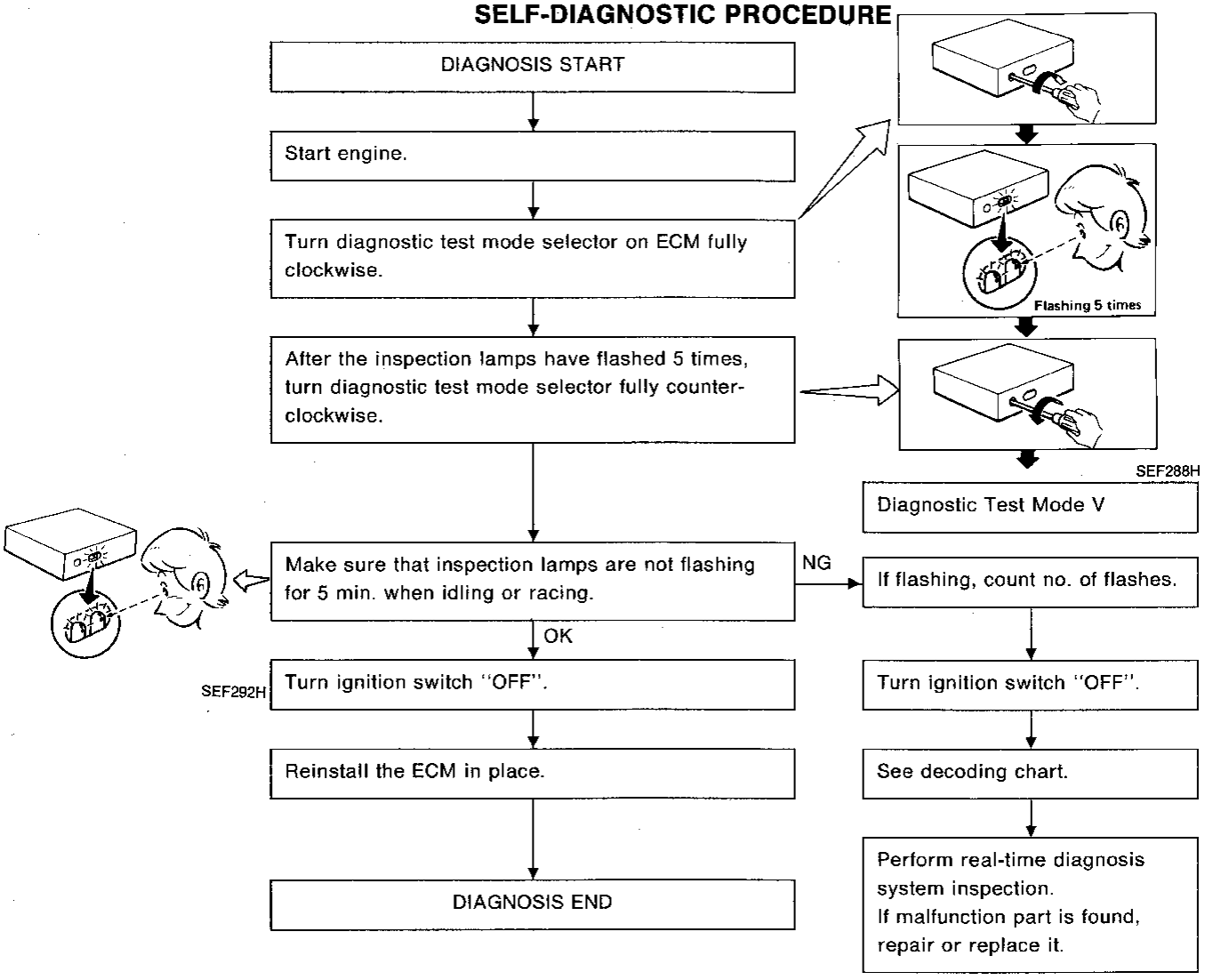
On-board Diagnostic System — Diagnostic Test Mode V (Real-time diagnostic system)

In real-time diagnosis, if the following items are judged to be working incorrectly, a malfunction will be indicated immediately.

- Camshaft position sensor (180° signal & 1° signal) output signal
- Ignition signal
- Mass air flow sensor output signal

Consequently, this diagnosis very effectively determines whether the above systems cause the malfunction, during driving test. Compared with on-board diagnostic system, real-time diagnosis is very sensitive and can detect malfunctions instantly. However, items regarded as malfunctions in this diagnosis are not stored in ECM memory.

SELF-DIAGNOSTIC PROCEDURE



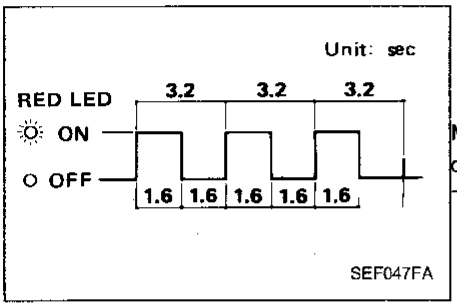
CAUTION:

In real-time diagnosis, pay attention to inspection lamp flashing. ECM displays the diagnostic trouble code only once and does not memorize the inspection.

On-board Diagnostic System — Diagnostic Test Mode V (Real-time diagnostic system) (Cont'd)

DISPLAY DIAGNOSTIC TROUBLE CODE	MALFUNCTIONING CIRCUIT OR PARTS	ECM SHOWS A MALFUNCTION SIGNAL WHEN THE FOLLOWING CONDITIONS ARE DETECTED. (Compare with On-board diagnostic system — Diagnostic Test Mode III.)

CAMSHAFT POSITION SENSOR

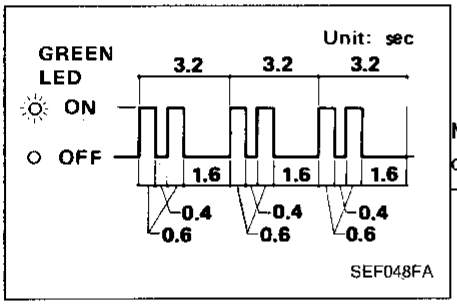


Malfunction of camshaft position sensor circuit

- The 1° or 180° signal is momentarily missing, or, multiple, momentary noise signals enter.

REAL-TIME DIAGNOSTIC INSPECTION
See page EF & EC-190.

MASS AIR FLOW SENSOR

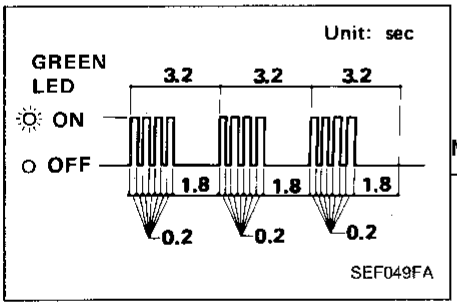


Malfunction of mass air flow sensor circuit

- Abnormal, momentary increase in mass air flow sensor output signal

REAL-TIME DIAGNOSTIC INSPECTION
See page EF & EC-191.

IGNITION SIGNAL



Malfunction of ignition signal

- Signal from the primary ignition coil momentarily drops off.

REAL-TIME DIAGNOSTIC INSPECTION
See page EF & EC-192.

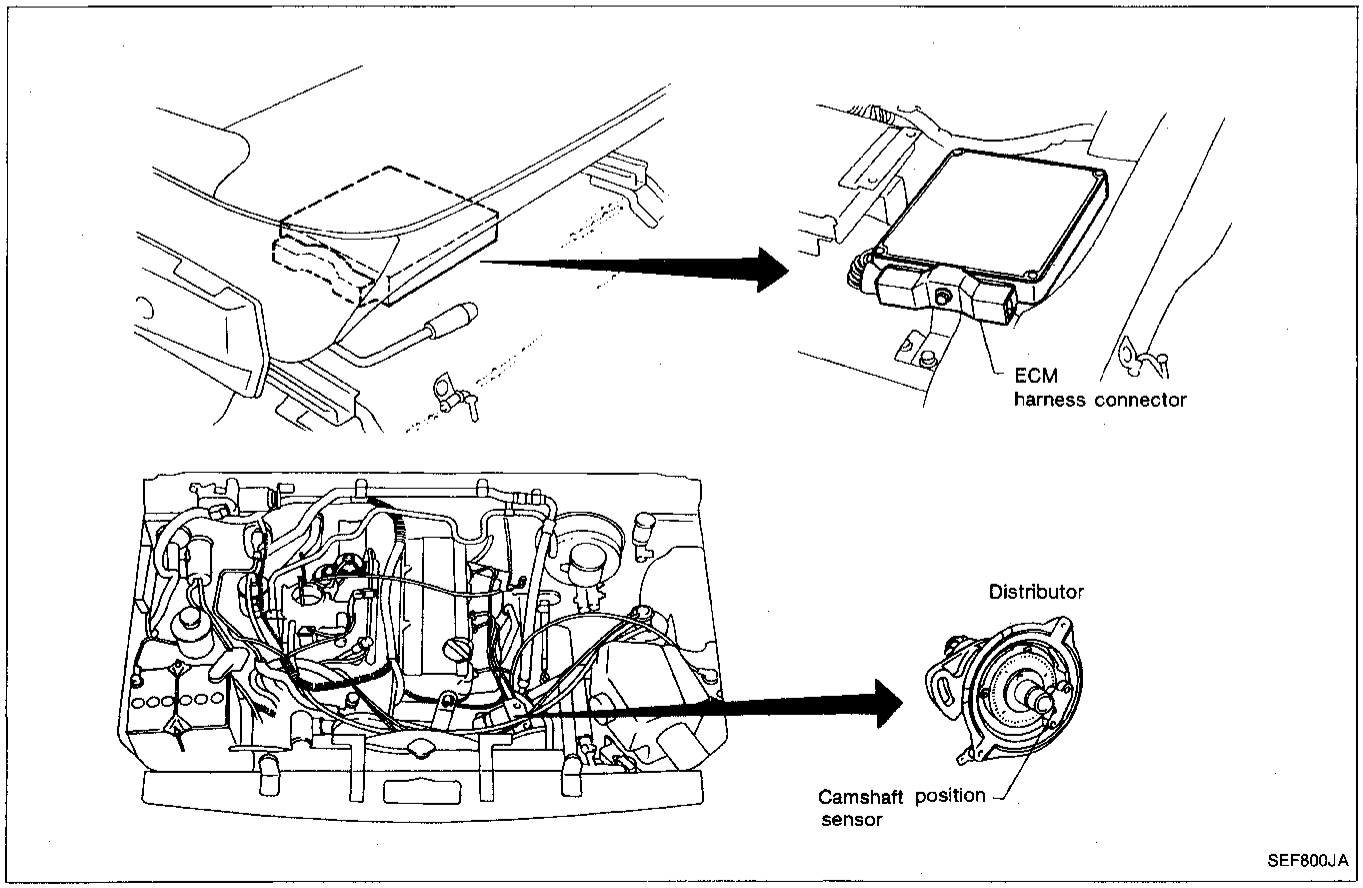
On-board Diagnostic System — Diagnostic Test Mode V (Real-time diagnostic system) (Cont'd)

REAL-TIME DIAGNOSTIC INSPECTION

Camshaft Position Sensor

X: Available
—: Not available

Check sequence	Check items	Check conditions	Check parts			If malfunction, perform the following items.
			Middle connectors	Sensor & actuator	ECM harness connector	
1	Tap harness connector or component during real-time diagnosis.	During real-time diagnosis	X	X	X	Go to check item 2.
2	Check harness continuity at connector.	Engine stopped	X	—	—	Go to check item 3.
3	Disconnect harness connector, and then check dust adhesion to harness connector.	Engine stopped	X	—	X	Clean terminal surface.
4	Check pin terminal bend.	Engine stopped	—	—	X	Take out bend.
5	Reconnect harness connector and then recheck harness continuity at connector.	Engine stopped	X	—	—	Replace terminal.
6	Tap harness connector or component during real-time diagnosis.	During real-time diagnosis	X	X	X	If diagnostic trouble codes are displayed during real-time diagnosis, replace terminal.

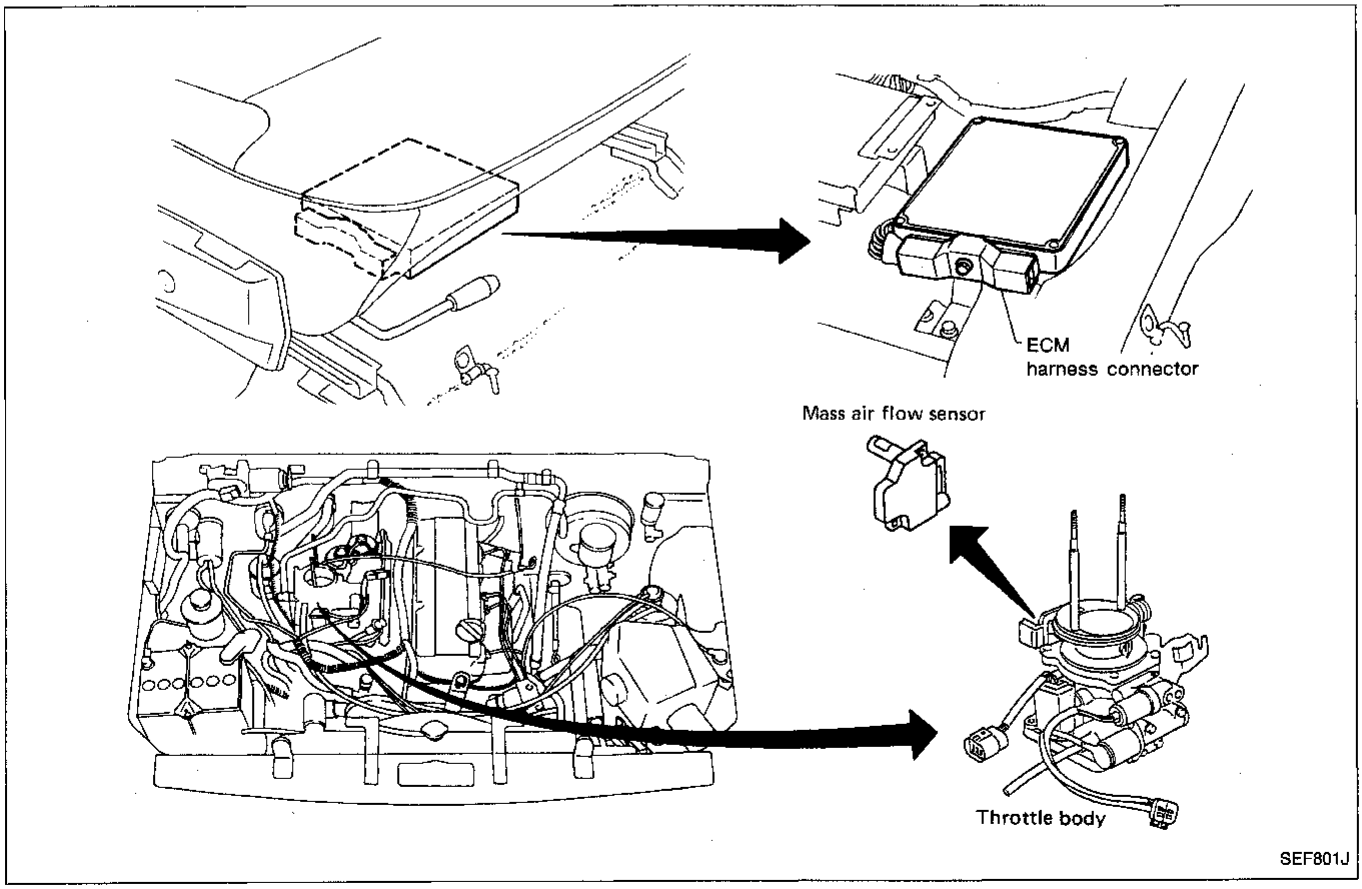


On-board Diagnostic System — Diagnostic Test Mode V (Real-time diagnostic system) (Cont'd)

Mass Air Flow Sensor

X: Available
—: Not available

Check sequence	Check items	Check conditions	Check parts			If malfunction, perform the following items.
			Middle connectors	Sensor & actuator	ECM harness connector	
1	Tap harness connector or component during real-time diagnosis.	During real-time diagnosis	X	X	X	Go to check item 2.
2	Check harness continuity at connector.	Engine stopped	X	—	—	Go to check item 3.
3	Disconnect harness connector, and then check dust adhesion to harness connector.	Engine stopped	X	—	X	Clean terminal surface.
4	Check pin terminal bend.	Engine stopped	—	—	X	Take out bend.
5	Reconnect harness connector and then recheck harness continuity at connector.	Engine stopped	X	—	—	Replace terminal.
6	Tap harness connector or component during real-time diagnosis.	During real-time diagnosis	X	X	X	If diagnostic trouble codes are displayed during real-time diagnosis, replace terminal.

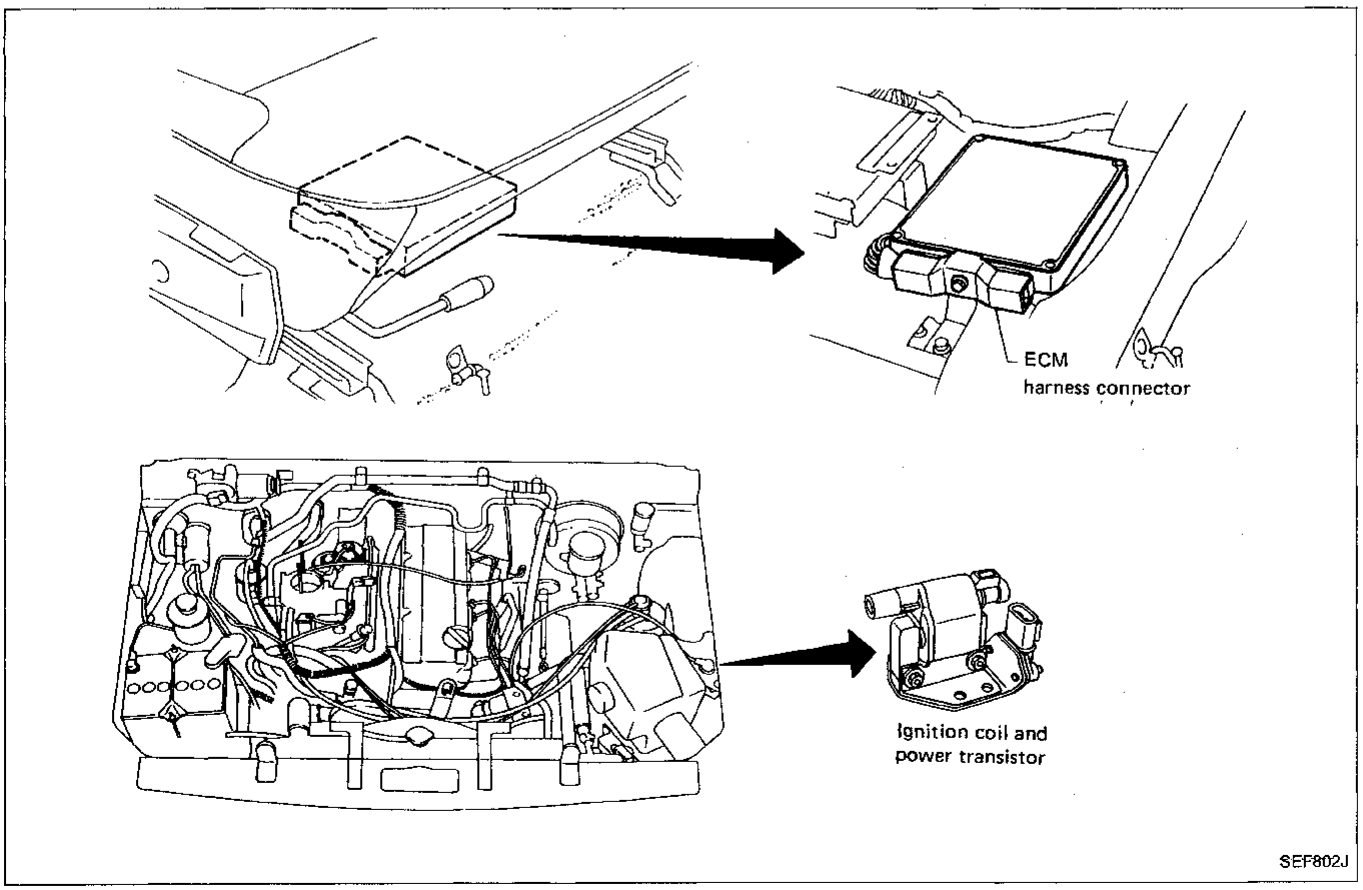


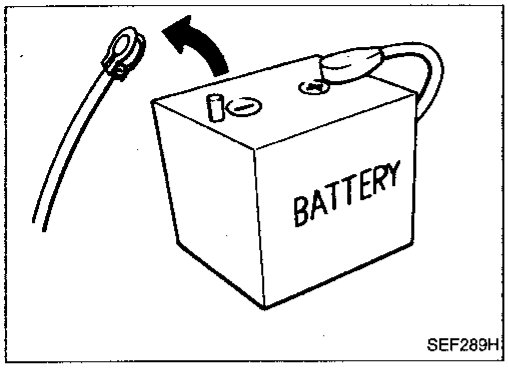
On-board Diagnostic System — Diagnostic Test Mode V (Real-time diagnostic system) (Cont'd)

Ignition Signal

X: Available
—: Not available

Check sequence	Check items	Check conditions	Check parts			If malfunction, perform the following items.
			Middle connectors	Sensor & actuator	ECM harness connector	
1	Tap harness connector or component during real-time diagnosis.	During real-time diagnosis	X	X	X	Go to check item 2.
2	Check harness continuity at connector.	Engine stopped	X	—	—	Go to check item 3.
3	Disconnect harness connector, and then check dust adhesion to harness connector.	Engine stopped	X	—	X	Clean terminal surface.
4	Check pin terminal bend.	Engine stopped	—	—	X	Take out bend.
5	Reconnect harness connector and then recheck harness continuity at connector.	Engine stopped	X	—	—	Replace terminal.
6	Tap harness connector or component during real-time diagnosis.	During real-time diagnosis	X	X	X	If diagnostic trouble codes are displayed during real-time diagnosis, replace terminal.



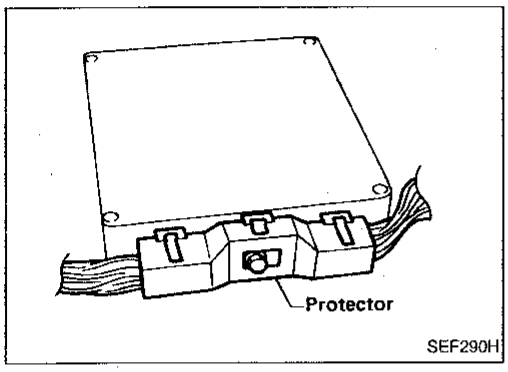


SEF289H

Diagnostic Procedure

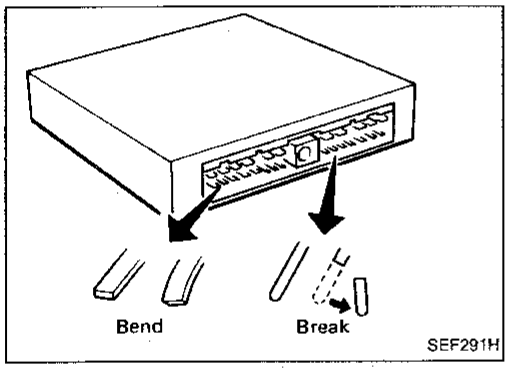
CAUTION:

1. **Before connecting or disconnecting the ECM harness connector to or from any ECM, be sure to turn the ignition switch to the "OFF" position and disconnect the negative battery terminal in order not to damage ECM as battery voltage is applied to ECM even if ignition switch is turned off. Failure to do so may damage the ECM.**



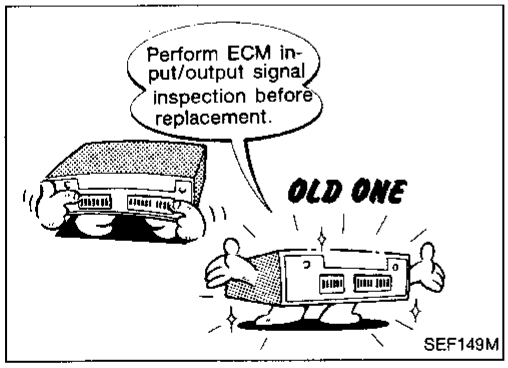
SEF290H

2. **When performing ECM input/output signal inspection, remove connector protector to insert tester probe into connector.**



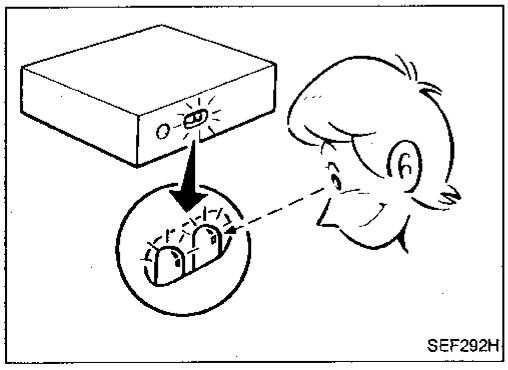
SEF291H

3. **When connecting or disconnecting pin connectors into or from ECM, take care not to damage pin terminals.**
4. **Make sure that there are not any bends or breaks on ECM pin terminal, when connecting pin connectors.**



SEF149M

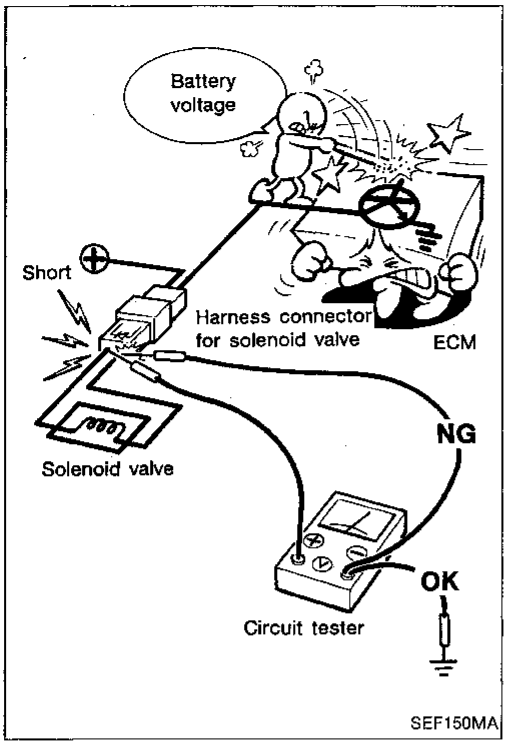
5. **Before replacing ECM, perform ECM input/output signal inspection and make sure whether the ECM unit functions properly or not. (See page EF & EC-275.)**


SEF292H

6. **After performing this "Diagnostic Procedure", perform ECCS on-board diagnostic system and driving test.**

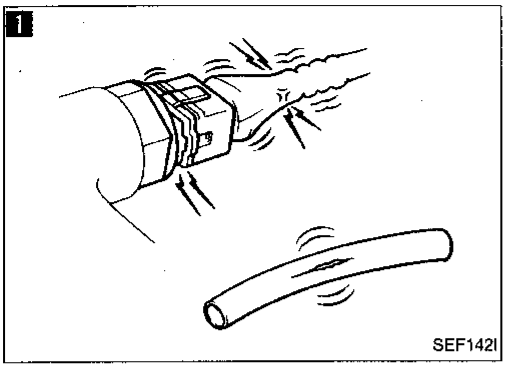
GI MA EM LC EF & EC FE CL MT AT TF PD FA RA BR ST BF HA EL IDX

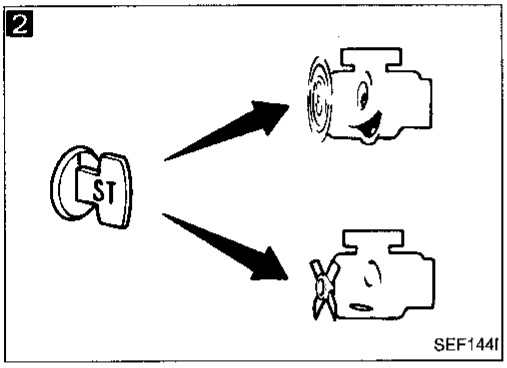
Diagnostic Procedure (Cont'd)



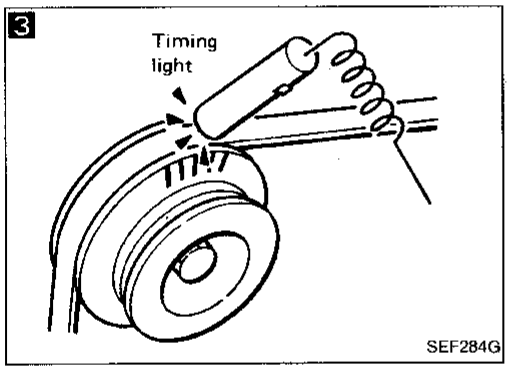
7. **When measuring ECM controlled components supply voltage with a circuit tester, separate one tester probe from the other.**
   If the two tester probes accidentally make contact with each other during measurement, the circuit will be shorted, resulting in damage to the ECM power transistor.

Basic Inspection

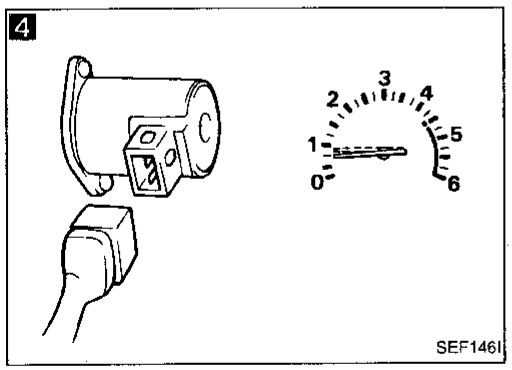

SEF142I



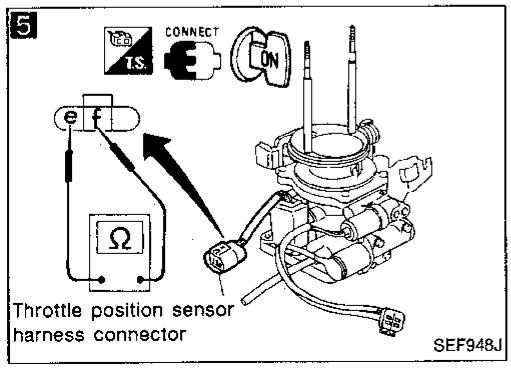
SEF144I



SEF284G



SEF146I



SEF948J

1

BEFORE STARTING
1. Check service records for any recent repairs that may indicate a related problem, or the current need for scheduled maintenance.
2. Open engine hood and check the following:
- Harness connectors for proper connections
- Vacuum hoses for splits, kinks, and proper connections
- Wiring for proper connections, pinches, and cuts

2

DOES ENGINE START? — No → GO TO 5 .

Yes

3

CHECK IGNITION TIMING.
Warm up engine sufficiently and check ignition timing at idle using timing light. (Refer to page EF & EC-166.)
Ignition timing: 10° ± 2° BTDC

NG → Adjust ignition timing by turning camshaft position sensor.

OK

4

CHECK IDLE ADJ. SCREW INITIAL SET RPM.
When disconnecting IACV-AAC valve harness connector, does engine speed fall to 650 ± 50 rpm (A/T in "N" position)?

NG → Adjust engine speed by turning idle adjusting screw.

OK

5

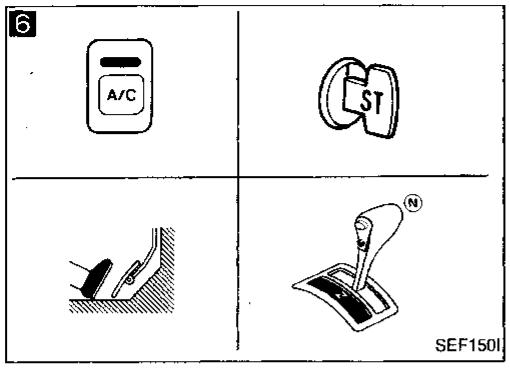
CHECK THROTTLE POSITION SENSOR IDLE POSITION.
Measure output voltage of throttle position sensor using voltmeter, and check that it is approx. 0.4 to 0.6V. (Throttle valve fully closed.)

NG →
1. Adjust output voltage by rotating throttle sensor body.
2. Disconnect throttle position sensor harness connector for a few seconds and then reconnect it.
3. Confirm that "Closed throttle position" stays "ON". Refer to page EF & EC-282.

OK

(Go to Ⓐ on next page.)

Basic Inspection (Cont'd)



Ⓐ

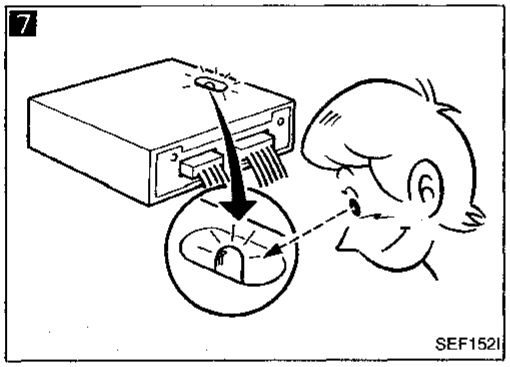
6

CHECK SWITCH INPUT SIGNAL.
Remove ECM from front floor panel and check the above switches' ON-OFF operation using voltmeter at each ECM terminal.

Switch	Condition	Voltage (V)
Start signal	IGN ON → IGN START	0 → 9 - 12V
Closed throttle position	Engine warmed up sufficiently Idle position → Depress the accelerator pedal.	Battery voltage → 0V
A/C signal	A/C OFF → A/C ON (Engine running)	Battery voltage → 0V
Neutral (Parking) position switch	Shift lever is "N" or "P" position → Except "N" and "P" positions	0 → 6 - 7

NG → Repair or replace the malfunctioning switch or its circuit.

OK



7

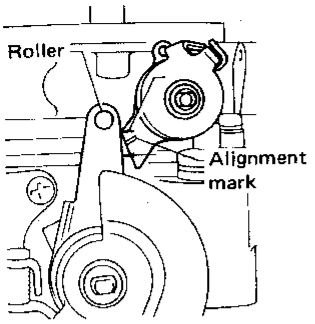
READ SELF-DIAGNOSTIC RESULTS.
1. Set Diagnostic Test Mode III (self-diagnostic results). (Refer to page EF & EC-181.)
2. Count the number of RED and GREEN LED flashes and read out the diagnostic trouble codes.
3. Are the diagnostic trouble codes being output?

Yes → Go to the relevant inspection procedure.

No

INSPECTION END

1



SEF975K

Diagnostic Procedure 1 — High Idling after Warm-up

1

CHECK FAST IDLE CAM.
Does fast idle cam keep cam follower lever released?

Yes → Check fast idle cam adjustment. (See page EF & EC-287.)

No ↓

2

CHECK INTAKE AIR LEAK.
1. Disconnect oxygen sensor harness connectors.
2. After racing engine at 2,000 rpm under no load for about 30 seconds, does the engine speed drop?

Yes → Discover air leak location and repair.

No ↓

3

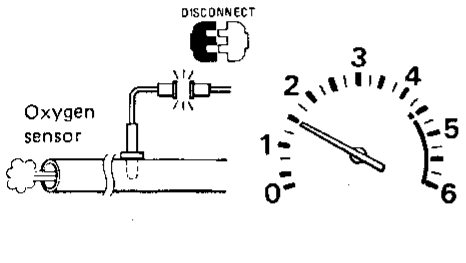
CHECK THROTTLE LINKAGE.
1. Check that throttle linkage moves smoothly.
2. Confirm that throttle both fully opens and fully closes.

NG → Repair throttle linkage or sticking of throttle valve.

OK ↓

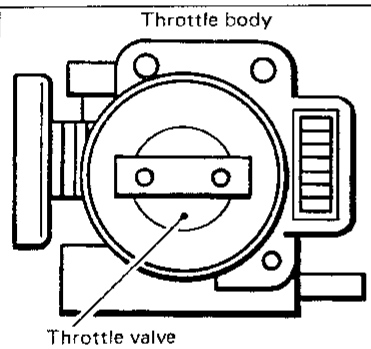
INSPECTION END

2



MEF382E

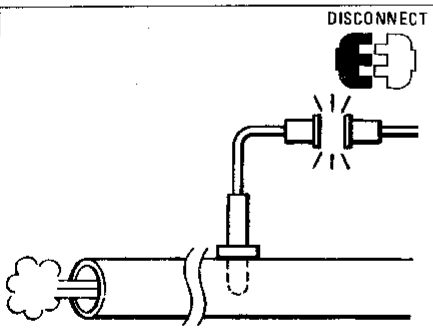
3



MEF383E

Diagnostic Procedure 2 — Hunting

1



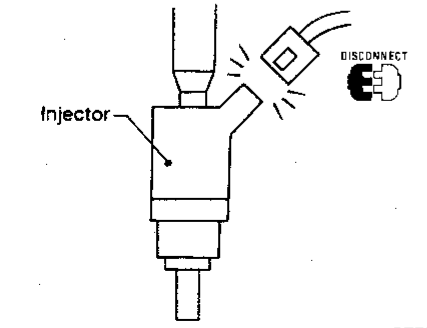
SEF307G

CHECK OXYGEN SENSORS.
When disconnecting oxygen sensor harness connectors, is the hunting fixed?

Yes → Check oxygen sensor. (See page EF & EC-242.)

No ↓

2



SEF958K

PERFORM POWER BALANCE TEST.
When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

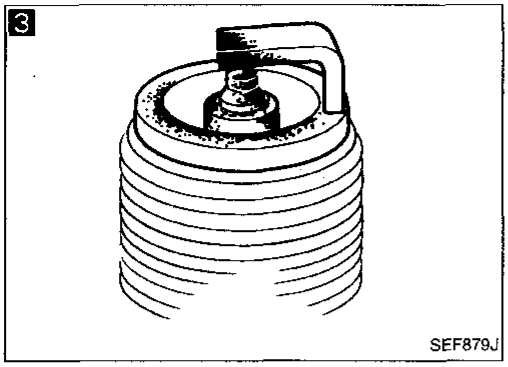
No → Go to 4 .

Yes ↓

(Go to Ⓐ on next page.)

Diagnostic Procedure 2 — Hunting (Cont'd)

3



SEF879J

Ⓐ

3

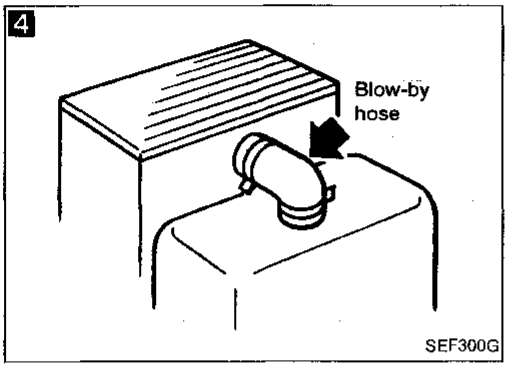
CHECK SPARK PLUGS.
Remove the spark plugs and check for fouling, etc.

NG → Repair or replace spark plug(s).

OK

4

4



SEF300G

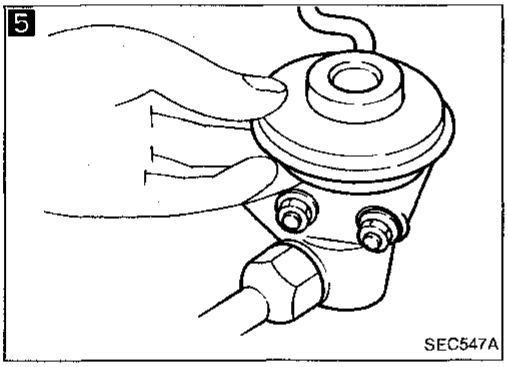
CHECK FOR INTAKE AIR LEAK.
When pinching blow-by hose (lowering the blow-by air supply), does the engine speed rise?

Yes → Discover air leak location and repair.

No

5

5



SEC547A

CHECK EGR VALVE.
Check EGR valve for sticking.

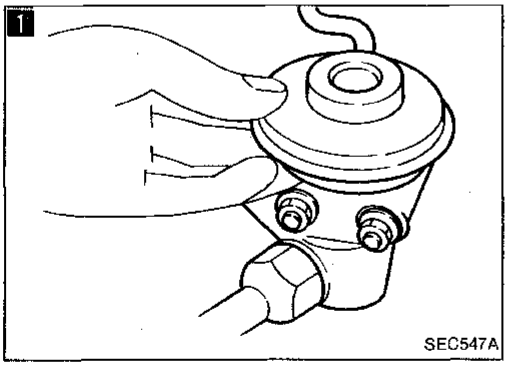
NG → Repair or replace.

OK

INSPECTION END

Diagnostic Procedure 3 — Unstable Idle

1



SEC547A

1

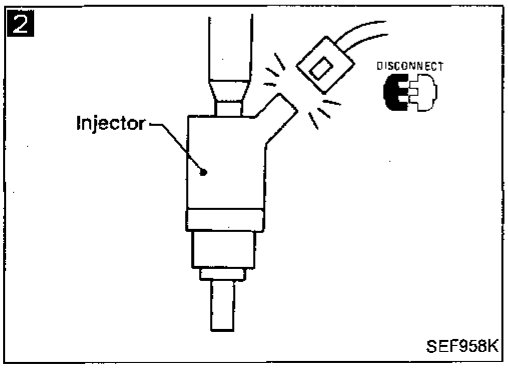
CHECK EGR VALVE.
Check EGR valve for sticking.

NG → Repair or replace.

OK

2

2



SEF958K

When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

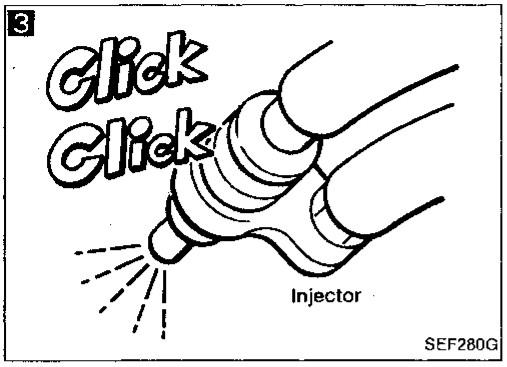
No → Go to 6 .

Yes

(Go to Ⓐ on next page.)

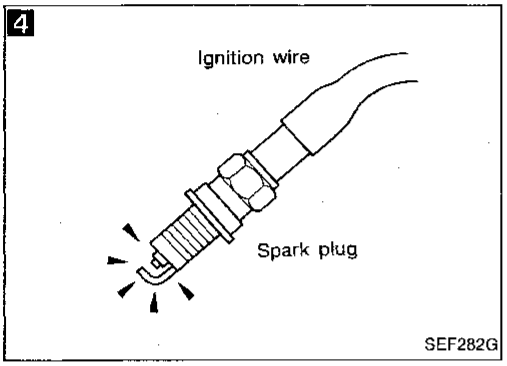
Diagnostic Procedure 3 — Unstable Idle (Cont'd)

3



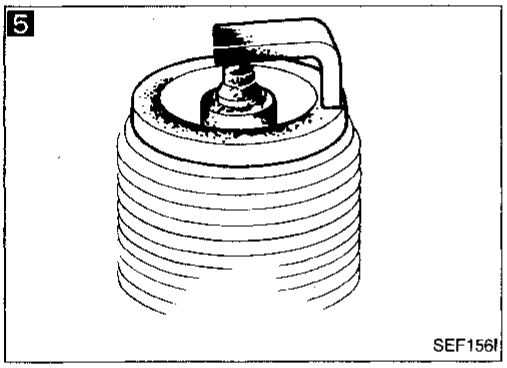
SEF280G

4



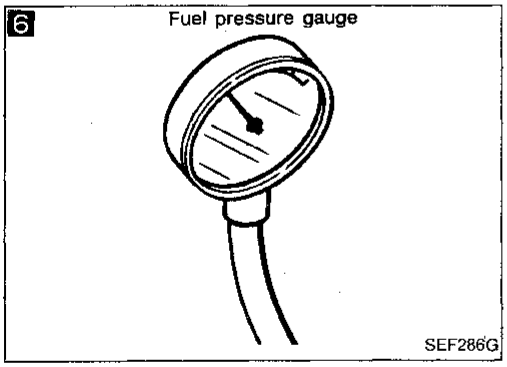
SEF282G

5



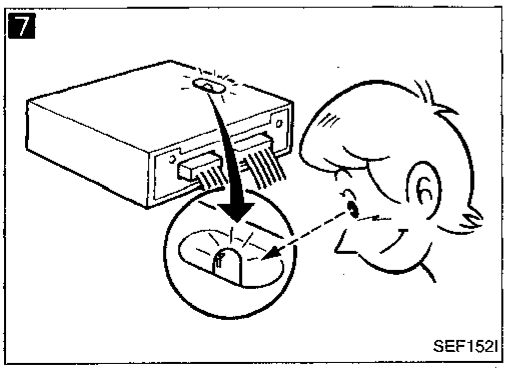
SEF156I

6



SEF286G

7



SEF152I

Ⓐ

3

CHECK INJECTOR.
1. Remove camshaft position sensor with distributor from engine. (Harness connector should remain connected.)
2. Disconnect ignition coil harness connector.
3. Turn ignition switch ON. (Do not start engine.)
4. When rotating camshaft position sensor shaft, does each injector make an operating sound?

No → Check injector(s) and circuit(s).

Yes ↓

4

CHECK IGNITION SPARK.
1. Disconnect ignition wire from rocker cover.
2. Connect a known good spark plug to the ignition wire.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

NG → Check ignition coil, power transistor unit and their circuits. (See page EF & EC-235.)

OK ↓

5

CHECK SPARK PLUGS.
Remove the spark plugs and check for fouling, etc.

NG → Repair or replace spark plug(s).

OK ↓

6

CHECK FUEL PRESSURE.
1. Release fuel pressure to zero. (Refer to page EF & EC-286.)
2. Install fuel pressure gauge and check fuel pressure.
   At idle:
   Approx. 226 kPa (2.3 kg/cm^2, 33 psi)

NG → Check fuel pump and circuit.

OK ↓

7

1. Set Diagnostic Test Mode I (oxygen sensor monitor). (See page EF & EC-180.)
2. Maintaining engine at 2,000 rpm under no-load, check to make sure that RED LED on the ECM goes ON and OFF more than 5 times during 10 seconds.

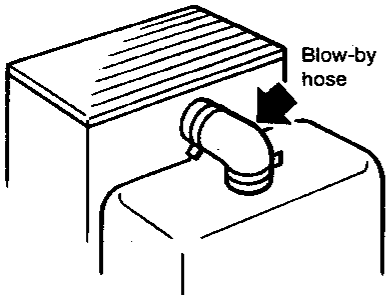
NG → Replace oxygen sensor(s).

OK ↓

(Go to Ⓑ on next page.)

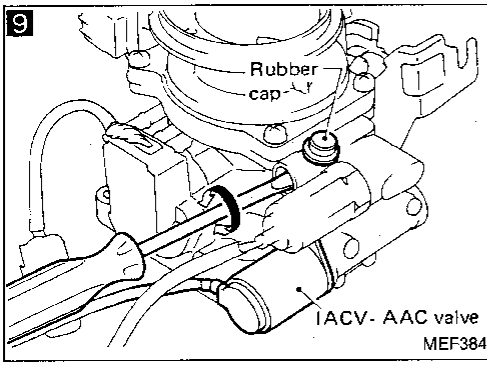
Diagnostic Procedure 3 — Unstable Idle (Cont'd)

8



SEF300G

9



MEF384E

10

COMPRESSION PRESSURE

SEF309G

Ⓑ

8

CHECK FOR INTAKE AIR LEAK.
When pinching blow-by hose (lowering the blow-by air supply), does the engine speed rise?

Yes → Discover air leak location and repair.

No

9

CHECK IDLE ADJ. SCREW CLOGGING.
1. Disconnect throttle position sensor harness connector.
2. Can you set engine speed at 750 ± 50 rpm (A/T in "N" position) by turning idle adjusting screw?

No → Check for IACV-AAC valve clogging or throttle valve clogging.

Yes

10

CHECK COMPRESSION PRESSURE.
- Check compression pressure.

Standard: kPa (kg/cm², psi)/300 rpm
1,196 (12.2, 173)
Minimum: kPa (kg/cm², psi)/300 rpm
883 (9.0, 128)
Difference between each cylinder: kPa (kg/cm², psi)/300 rpm
98 (1.0, 14)

NG → Check pistons, piston rings, valves, valve seats and cylinder head gaskets.

OK

CHECK ECM HARNESS CONNECTOR.
Check the ECM pin terminals for damage or poor connection of ECM harness connector.

NG → Repair or replace.

OK

Disconnect and remove harness connectors in the circuit, then retest.

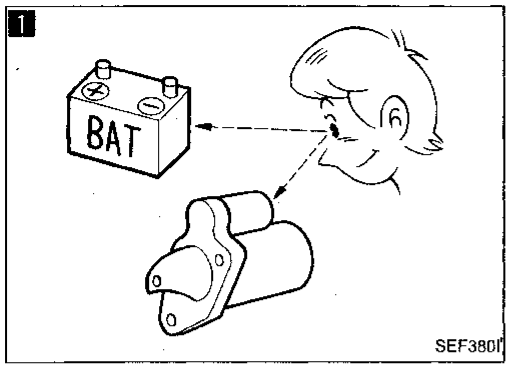
Trouble is not fixed.

TRY A KNOWN GOOD ECM*.

INSPECTION END

*: ECM may be the cause of a problem, but this is rarely the case.

Diagnostic Procedure 4 — Hard to Start or Impossible to Start when the Engine is Cold

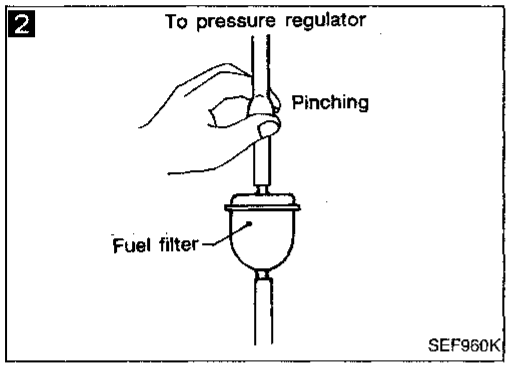


1

CHECK BATTERY AND STARTER.
Check battery and starter condition.
(Refer to EL section.)

NG → Repair or replace.

OK ↓

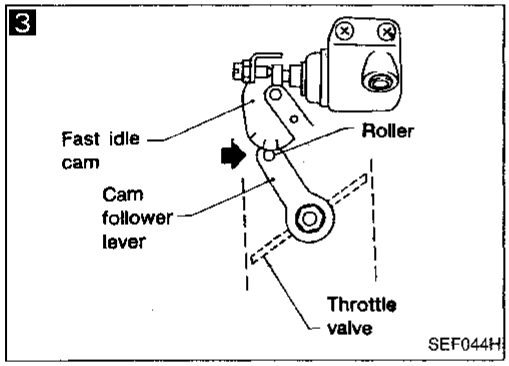


2

CHECK FUEL PRESSURE.
1. Pinch fuel feed hose with fingers.
2. When cranking the engine, is there any pressure on the fuel feed hose?

No → Check fuel pump and circuit. (See page EF & EC-260.)

Yes ↓

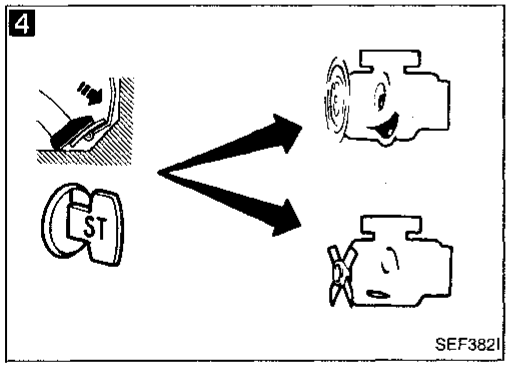


3

CHECK FAST IDLE CAM.
When the engine is cold, does fast idle cam keep cam follower lever in position?

No → Check fast idle cam adjustment. (See page EF & EC-287.)

Yes ↓

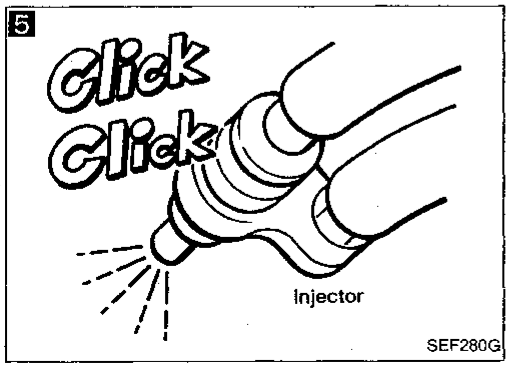


4

CHECK IACV-AAC VALVE.
When pressing accelerator pedal fully, can you start the engine?

Yes → Check IACV-AAC valve and circuit. (See page EF & EC-265.)

No ↓



5

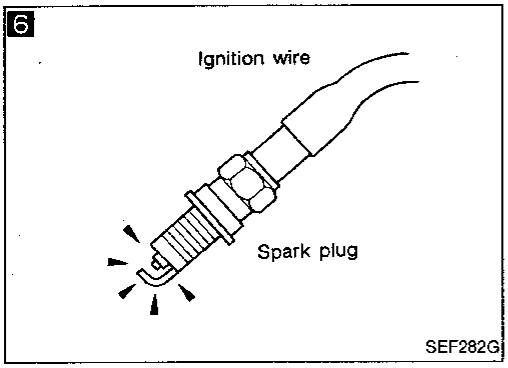
CHECK INJECTOR.
1. Remove camshaft position sensor with distributor from engine. (Harness connector should remain connected.)
2. Disconnect ignition coil harness connector.
3. Turn ignition switch ON. (Do not start engine.)
4. When rotating camshaft position sensor shaft, does each injector make an operating sound?

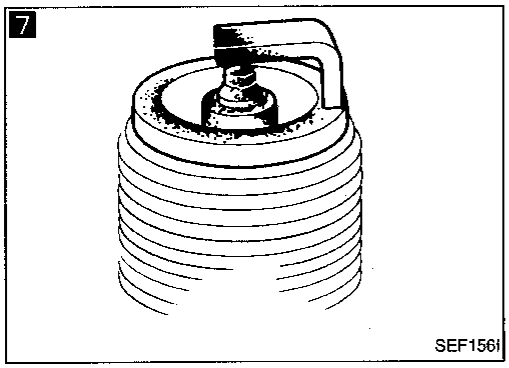
No → Check injector(s) and circuit(s).

Yes ↓

(Go to Ⓐ on next page.)

Diagnostic Procedure 4 — Hard to Start or Impossible to Start when the Engine is Cold (Cont'd)





Ⓐ

6 **CHECK IGNITION SPARK.**
1. Disconnect ignition wire from rocker cover.
2. Connect a known good spark plug to the ignition wire.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

NG → Check ignition coil, power transistor unit and their circuits. (See page EF & EC-235.)

OK ↓

7 **CHECK SPARK PLUGS.**
Remove the spark plugs and check for fouling, etc.

NG → Repair or replace spark plug(s).

OK ↓

CHECK ECM HARNESS CONNECTOR.
Check the ECM pin terminals for damage or poor connection of ECM harness connector.

NG → Repair or replace.

OK ↓

CHECK ECM POWER SUPPLY AND GROUND CIRCUIT.
Refer to page EF & EC-222.

NG → Repair or replace.

OK ↓

Disconnect and remove harness connectors in the circuit, then retest.

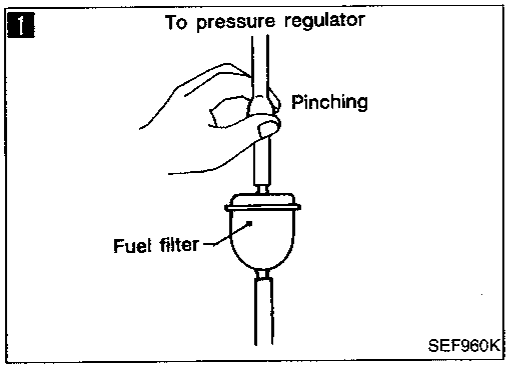
Trouble is not fixed. ↓

TRY A KNOWN GOOD ECM*.

↓

INSPECTION END

*: ECM may be the cause of a problem, but this is rarely the case.



Diagnostic Procedure 5 — Hard to Start or Impossible to Start when the Engine is Hot

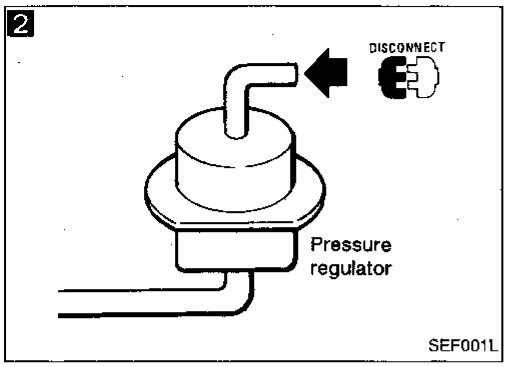
1 **CHECK FUEL PRESSURE.**
1. Pinch fuel feed hose with fingers.
2. When cranking the engine, is there any pressure on the fuel feed hose?

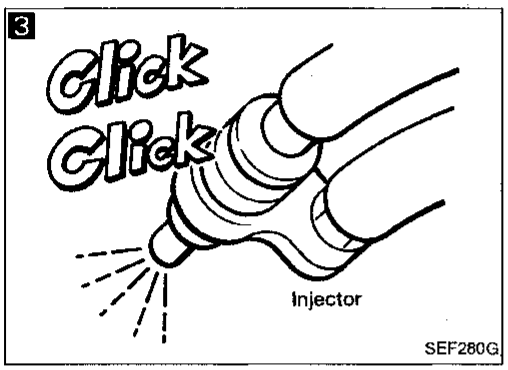
No → Check fuel pump and circuit. (See page EF & EC-260.)

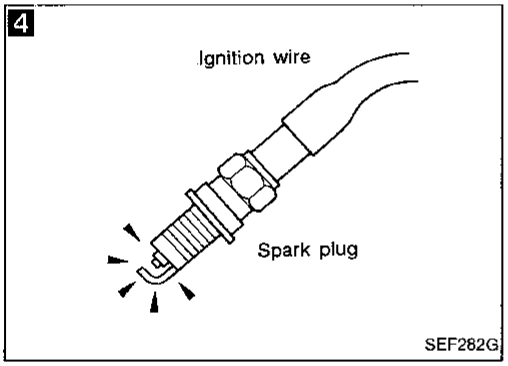
Yes ↓

(Go to Ⓐ on next page.)

Diagnostic Procedure 5 — Hard to Start or Impossible to Start when the Engine is Hot (Cont'd)







Ⓐ

2 **CHECK FUEL VAPOR.**
1. Disconnect fuel pressure regulator vacuum hose and plug hose.
2. Can you start engine?

Yes → Check fuel properties.

No ↓

3 **CHECK INJECTOR.**
1. Remove camshaft position sensor with distributor from engine. (Harness connector should remain connected.)
2. Disconnect ignition coil harness connector.
3. Turn ignition switch ON. (Do not start engine.)
4. When rotating camshaft position sensor shaft, does each injector make an operating sound?

No → Check injector(s) and circuit(s).

Yes ↓

4 **CHECK IGNITION SPARK.**
1. Disconnect ignition wire from rocker cover.
2. Connect a known good spark plug to the ignition wire.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

NG → Check ignition coil, power transistor unit and circuits. (See page EF & EC-235.)

OK ↓

CHECK ECM HARNESS CONNECTOR.
Check the ECM pin terminals for damage or poor connection of ECM harness connector.

NG → Repair or replace.

OK ↓

CHECK ECM POWER SUPPLY AND GROUND CIRCUIT.
Refer to page EF & EC-222.

NG → Repair or replace.

OK ↓

Disconnect and remove harness connectors in the circuit, then retest.

Trouble is not fixed. ↓

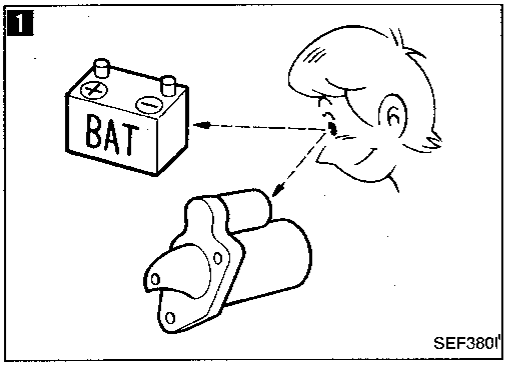
TRY A KNOWN GOOD ECM*

↓

INSPECTION END

*: ECM may be the cause of a problem, but this is rarely the case.

Diagnostic Procedure 6 — Hard to Start or Impossible to Start under Normal Conditions

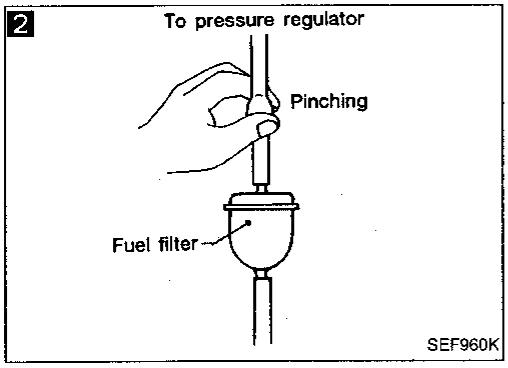


1

CHECK BATTERY AND STARTER.
Check battery and starter operation.
(Refer to EL section.)

NG → Repair or replace.

OK ↓

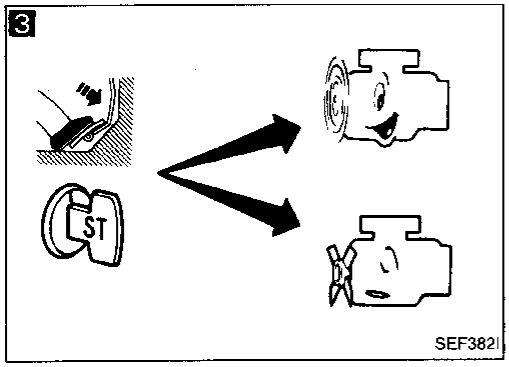


2

CHECK FUEL PRESSURE.
1. Pinch fuel feed hose with fingers.
2. When cranking the engine, is there any pressure on the fuel feed hose?

No → Check fuel pump and circuit. (See page EF & EC-260.)

Yes ↓

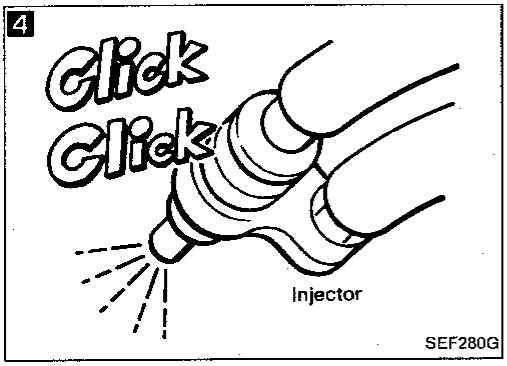


3

CHECK INJECTOR FOR LEAKAGE.
When pressing accelerator pedal fully, can you start the engine?

Yes → Check injector(s) for leakage.

No ↓

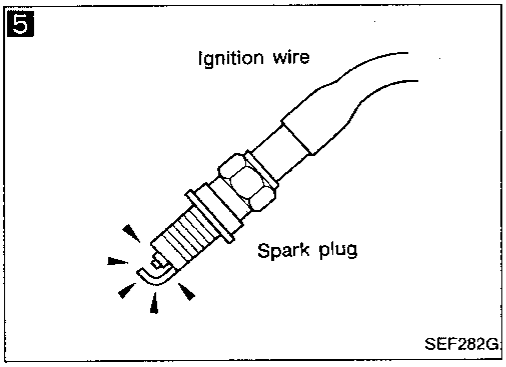


4

CHECK INJECTOR.
1. Remove camshaft position sensor with distributor from engine. (Harness connector should remain connected.)
2. Disconnect ignition coil harness connector.
3. Turn ignition switch ON. (Do not start engine.)
4. When rotating camshaft position sensor shaft, does each injector make an operating sound?

No → Check injectors and circuits.

Yes ↓



5

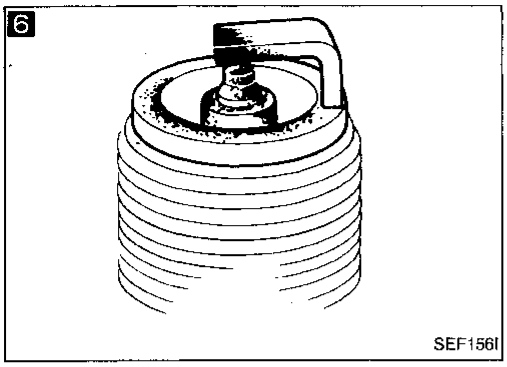
CHECK IGNITION SPARK.
1. Disconnect ignition wire from rocker cover.
2. Connect a known good spark plug to the ignition wire.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

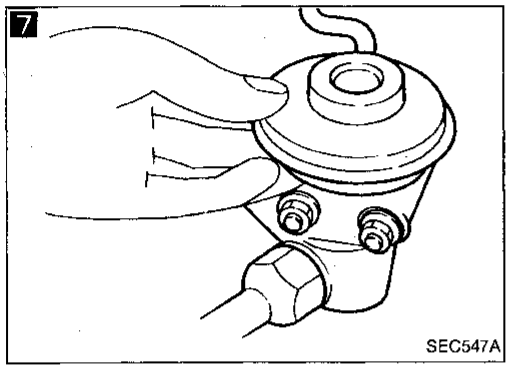
NG → Check ignition coil, power transistor unit and circuits. (See page EF & EC-235.)

OK ↓

(Go to Ⓐ on next page.)

Diagnostic Procedure 6 — Hard to Start or Impossible to Start under Normal Conditions (Cont'd)





Ⓐ

6 **CHECK SPARK PLUGS.**
Remove the spark plugs and check for fouling, etc.
NG → Repair or replace spark plug(s).
OK ↓

7 **CHECK EGR VALVE.**
Check EGR valve for sticking.
NG → Repair or replace.
OK ↓

CHECK ECM HARNESS CONNECTOR.
Check the ECM pin terminals for damage or poor connection of ECM harness connector.
NG → Repair or replace.
OK ↓

CHECK ECM POWER SUPPLY AND GROUND CIRCUIT.
Refer to page EF & EC-222.
NG → Repair or replace.
OK ↓

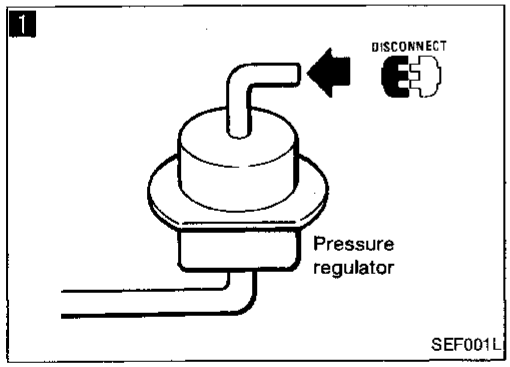
Disconnect and remove harness connectors in the circuit, then retest.
Trouble is not fixed. ↓

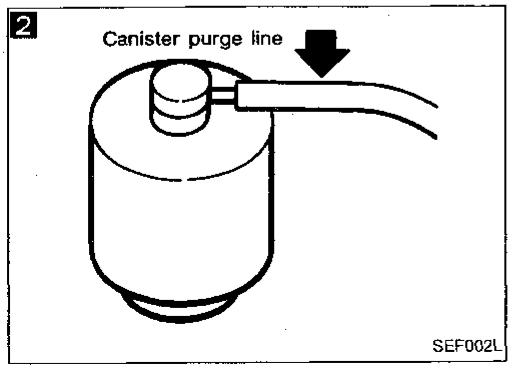
TRY A KNOWN GOOD ECM*.
↓

INSPECTION END

*: ECM may be the cause of a problem, but this is rarely the case.

Diagnostic Procedure 7 — Hesitation when the Engine is Hot





1 **CHECK FUEL VAPOR.**
1. Disconnect fuel pressure regulator vacuum hose and plug hose.
2. Perform cruise test.
3. Does the hesitation disappear?

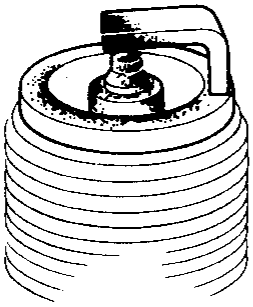
Yes → Check fuel properties.
No ↓

2 **CHECK CANISTER PURGE.**
1. Disconnect canister purge line hose and plug hose.
2. Perform cruise test.
3. Does the hesitation disappear?

Yes → Check purge and vacuum lines.
No ↓

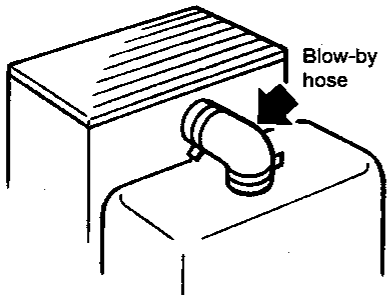
INSPECTION END

1



SEF156I

2



SEF300G

Diagnostic Procedure 8 — Hesitation when the Engine is Cold

1

CHECK SPARK PLUGS.
Remove spark plugs and check for fouling, etc.

NG → Repair or replace spark plug(s).

OK ↓

2

CHECK FOR INTAKE AIR LEAK.
When pinching blow-by hose (lowering the blow-by air supply), does the engine speed rise?

Yes → Discover air leak location and repair.

No ↓

TRY A KNOWN GOOD MASS AIR FLOW SENSOR.

Trouble is fixed. → Replace mass air flow sensor.

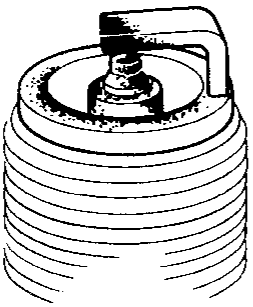
Trouble is not fixed. ↓

CHECK FOR INTAKE VALVE DEPOSITS.
If there are deposits on intake valves, remove them.

↓

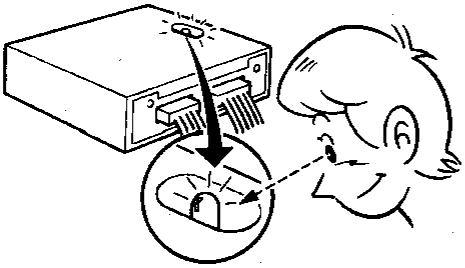
INSPECTION END

1



SEF156I

2



SEF152I

Diagnostic Procedure 9 — Hesitation under Normal Conditions

1

CHECK SPARK PLUGS.
Remove spark plugs and check for fouling, etc.

NG → Repair or replace spark plug(s).

OK ↓

2

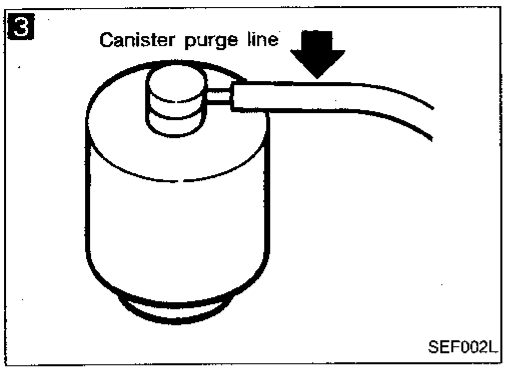
CHECK OXYGEN SENSOR.
1. Set Diagnostic Test Mode I (oxygen sensor monitor). (See page EF & EC-180.)
2. Maintaining engine at 2,000 rpm under no load, check that RED LED on the ECM goes ON and OFF more than 5 times during 10 seconds.

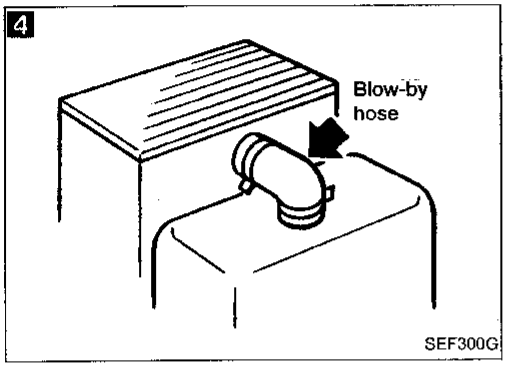
Yes → Replace oxygen sensor(s).

No ↓

(Go to Ⓐ on next page.)

Diagnostic Procedure 9 — Hesitation under Normal Conditions (Cont'd)





Ⓐ

3 **CHECK CANISTER PURGE.**
1. Disconnect canister purge line hose and plug hose.
2. Perform cruise test.
3. Does the hesitation disappear?

Yes → Check purge and vacuum lines.

No ↓

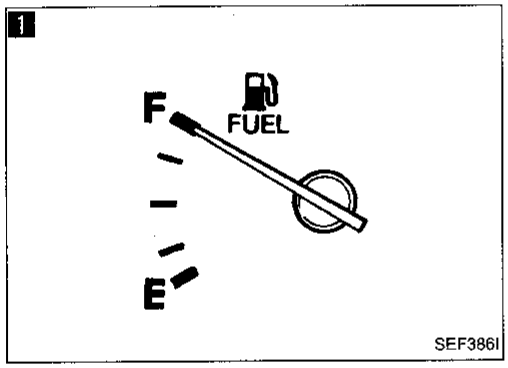
4 **CHECK FOR INTAKE AIR LEAK.**
When pinching blow-by hose (lowering the blow-by air supply), does the engine speed rise?

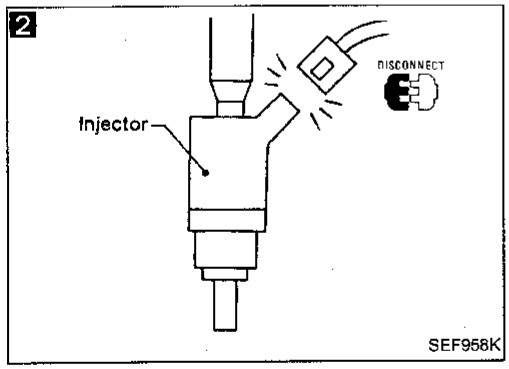
Yes → Discover air leak location and repair.

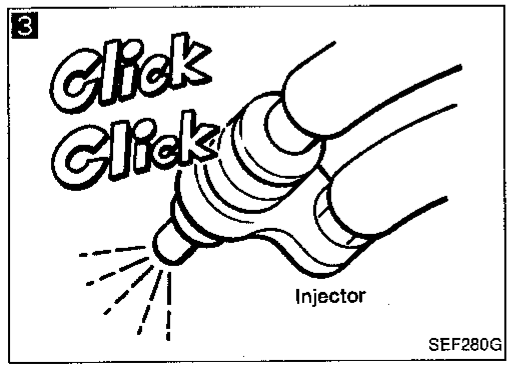
No ↓

INSPECTION END

Diagnostic Procedure 10 — Engine Stalls when Turning







1 **CHECK FUEL LEVEL.**
Check to see that there is enough fuel in tank.

NG → Fill fuel tank with fuel.

OK ↓

2 **PERFORM POWER BALANCE TEST.**
When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

No → Go to **5** .

Yes ↓

3 **CHECK INJECTOR.**
1. Remove camshaft position sensor with distributor from engine. (Harness connector should remain connected.)
2. Disconnect ignition coil harness connector.
3. Turn ignition switch ON. (Do not start engine.)
4. When rotating camshaft position sensor shaft, does each injector make an operating sound?

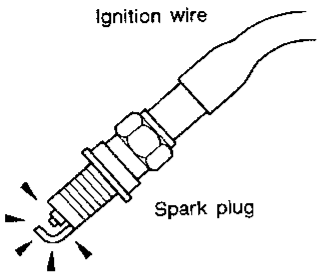
No → Check injector(s) and circuit(s).

Yes ↓

(Go to Ⓐ on next page.)

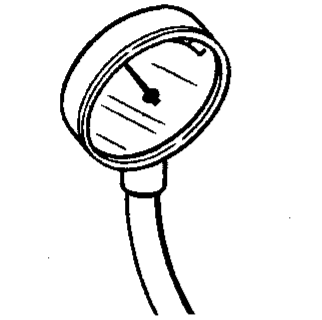
Diagnostic Procedure 10 — Engine Stalls when Turning (Cont'd)

4



SEF282G

5



SEF286G

Ⓐ

4

CHECK IGNITION SPARK.
1. Disconnect ignition wire from rocker cover.
2. Connect a known good spark plug to the ignition wire.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

NG → Check ignition coil, power transistor unit and circuits. (See page EF & EC-235.)

OK ↓

5

CHECK FUEL PRESSURE.
1. Release fuel pressure to zero. (Refer to page EF & EC-286.)
2. Install fuel pressure gauge and check fuel pressure.

A few seconds after ignition switch is turned OFF to ON:
Approx. 294 kPa (3.0 kg/cm^2, 43 psi)
At idle:
Approx. 226 kPa (2.3 kg/cm^2, 33 psi)

NG → Check fuel pressure regulator diaphragm.

OK ↓

CHECK ECM HARNESS CONNECTOR.
Check the ECM pin terminals for damage or poor connection of ECM harness connector.

NG → Repair or replace.

OK ↓

CHECK ECM POWER SUPPLY AND GROUND CIRCUIT.
Refer to page EF & EC-222.

NG → Repair or replace.

OK ↓

Disconnect and remove harness connectors in the circuit, then retest.

Trouble is not fixed. ↓

TRY A KNOWN GOOD ECM*.

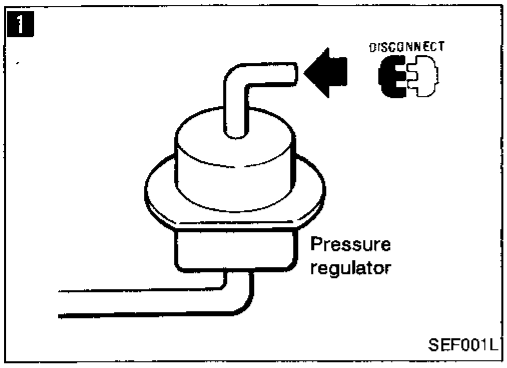
↓

INSPECTION END

*: ECM may be the cause of a problem, but this is rarely the case.

Diagnostic Procedure 11 — Engine Stalls when the Engine is Hot

1

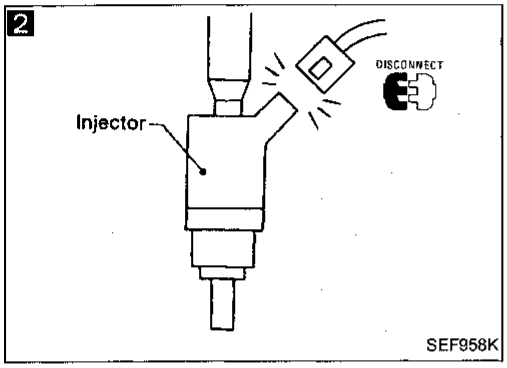


CHECK FUEL VAPOR.
1. Disconnect fuel pressure regulator vacuum hose and plug hose.
2. Perform cruise test.
3. Does the engine stall disappear?

Yes → Check fuel properties.

No ↓

2

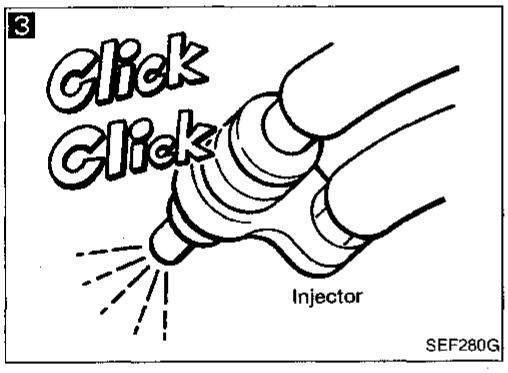


PERFORM POWER BALANCE TEST.
When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

No → Go to 5 .

Yes ↓

3

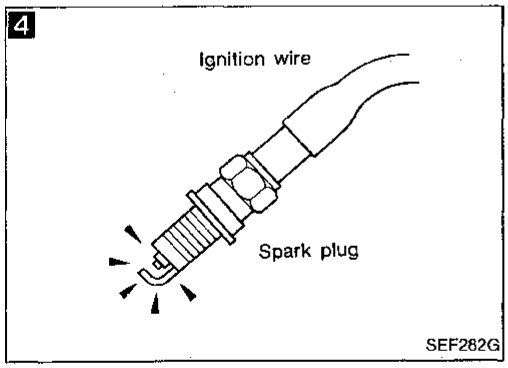


CHECK INJECTOR.
1. Remove camshaft position sensor with distributor from engine. (Harness connector should remain connected.)
2. Disconnect ignition harness connector.
3. Turn ignition switch ON. (Do not start engine.)
4. When rotating camshaft position sensor shaft, does each injector make an operating sound?

No → Check injector(s) and circuit(s).

Yes ↓

4



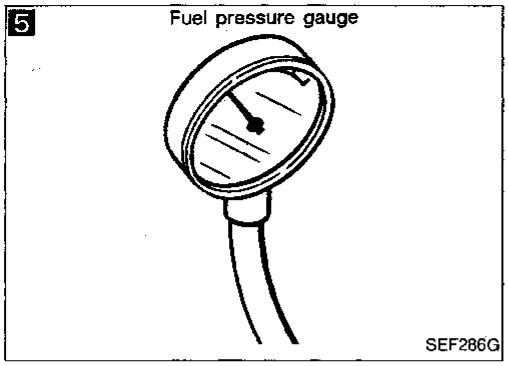
CHECK IGNITION SPARK.
1. Disconnect ignition wire from rocker cover.
2. Connect a known good spark plug to the ignition wire.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

NG → Check ignition coil, power transistor unit and their circuits. (See page EF & EC-235.)

OK ↓

(Go to Ⓐ on next page.)

Diagnostic Procedure 11 — Engine Stalls when the Engine is Hot (Cont'd)



Ⓐ

5

CHECK FUEL PRESSURE.
1. Release fuel pressure to zero. (Refer to page EF & EC-286.)
2. Install fuel pressure gauge and check fuel pressure.
   A few seconds after ignition is turned OFF to ON:
   Approx. 294 kPa (3.0 kg/cm², 43 psi)
   At idle:
   Approx. 226 kPa (2.3 kg/cm², 33 psi)

NG → Check fuel pressure regulator diaphragm.

OK ↓

CHECK ECM HARNESS CONNECTOR.
Check the ECM pin terminals for damage or poor connection of ECM harness connector.

NG → Repair or replace.

OK ↓

CHECK ECM POWER SUPPLY AND GROUND CIRCUIT.
Refer to page EF & EC-222

NG → Repair or replace.

OK ↓

Disconnect and remove harness connectors in the circuit, then retest.

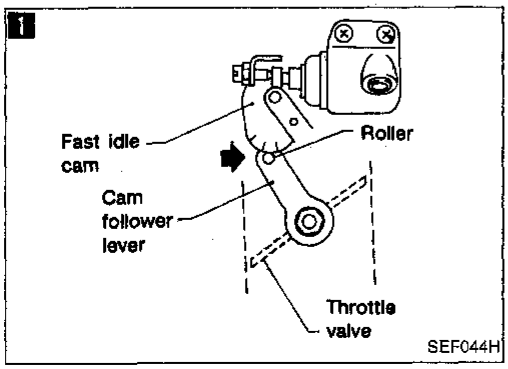
Trouble is not fixed. ↓

TRY A KNOWN GOOD ECM*.

↓

INSPECTION END

*: ECM may be the cause of a problem, but this is rarely the case.



Diagnostic Procedure 12 — Engine Stalls when the Engine is Cold

1

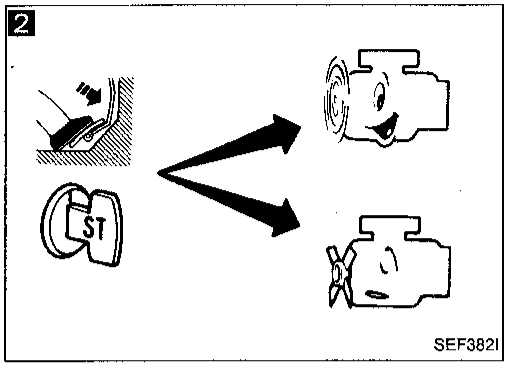
CHECK FAST IDLE CAM.
When the engine is cold, does fast idle cam keep follower lever in position?

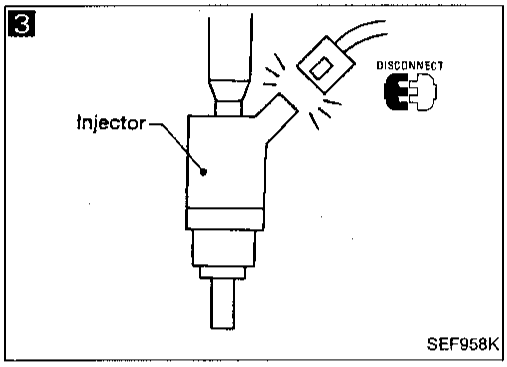
No → Check fast idle cam adjustment. (See page EF & EC-.287)

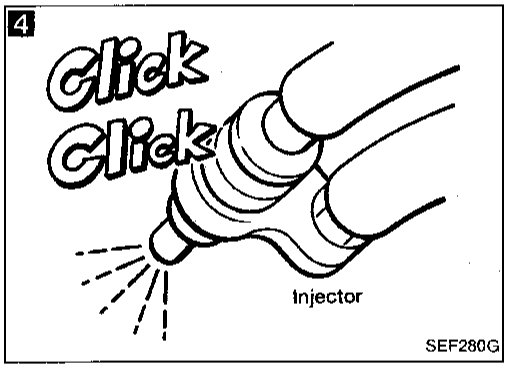
Yes ↓

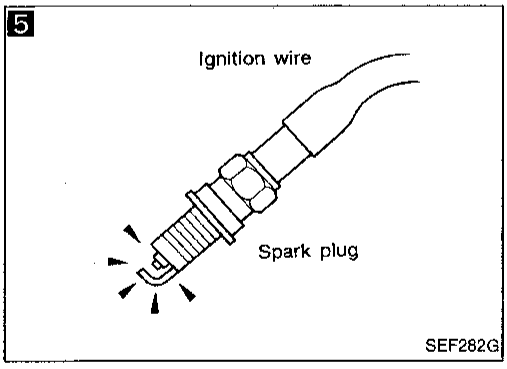
(Go to Ⓐ on next page.)

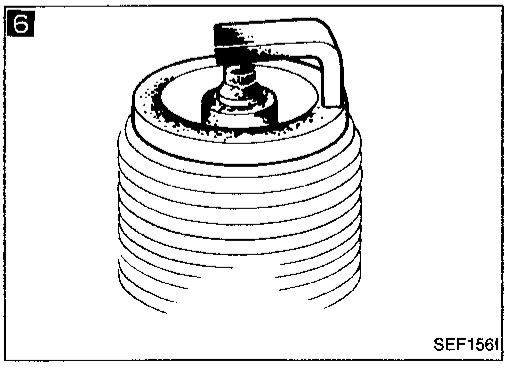
Diagnostic Procedure 12 — Engine Stalls when the Engine is Cold (Cont'd)











Ⓐ

2 **CHECK IACV-AAC VALVE.**
When the engine is cold, can you start the engine when pressing accelerator pedal fully?
- Yes → Check IACV-AAC valve and circuits. (See page EF & EC-265.)
- No ↓

3 **PERFORM POWER BALANCE TEST.**
When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?
- NG → Go to **6**.
- OK ↓

4 **CHECK INJECTOR.**
1. Remove camshaft position sensor with distributor from engine. (Harness connector should remain connected.)
2. Disconnect ignition coil harness connector.
3. Turn ignition switch ON. (Do not start engine.)
4. When rotating camshaft position sensor shaft, does each injector make an operating sound?

- NG → Check injector(s) and circuit(s).
- OK ↓

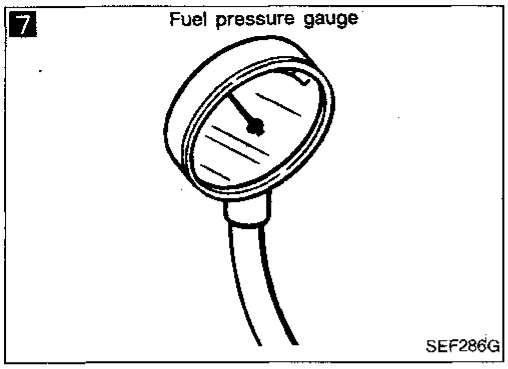
5 **CHECK IGNITION SPARK.**
1. Disconnect ignition coil assembly from rocker cover.
2. Connect a known good spark plug to the ignition coil assembly.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

- NG → Check ignition coil, power transistor unit and circuits. (See page EF & EC-235.)
- OK ↓

6 **CHECK SPARK PLUGS.**
Remove the spark plugs and check for fouling, etc.
- NG → Repair or replace spark plug(s).
- OK ↓

(Go to Ⓐ on next page.)

Diagnostic Procedure 12 — Engine Stalls when the Engine is Cold (Cont'd)



Ⓐ

7

CHECK FUEL PRESSURE.
1. Release fuel pressure to zero. (Refer to page EF & EC-286.)
2. Install fuel pressure gauge and check fuel pressure.
   A few seconds after ignition switch is turned OFF to ON:
   Approx. 294 kPa (3.0 kg/cm², 43 psi)
   At idle:
   Approx. 226 kPa (2.3 kg/cm², 33 psi)

NG → Check fuel pressure regulator diaphragm.

OK ↓

CHECK ECM HARNESS CONNECTOR.
Check the ECM pin terminals for damage or poor connection of ECM harness connector.

NG → Repair or replace.

OK ↓

CHECK ECM POWER SUPPLY AND GROUND CIRCUIT.
Refer to page EF & EC-222.

NG → Repair or replace.

OK ↓

Disconnect and remove harness connectors in the circuit, then retest.

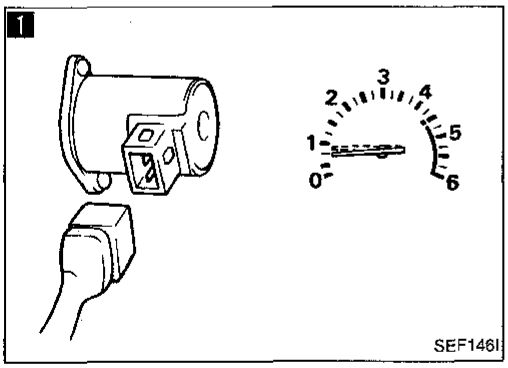
Trouble is not fixed. ↓

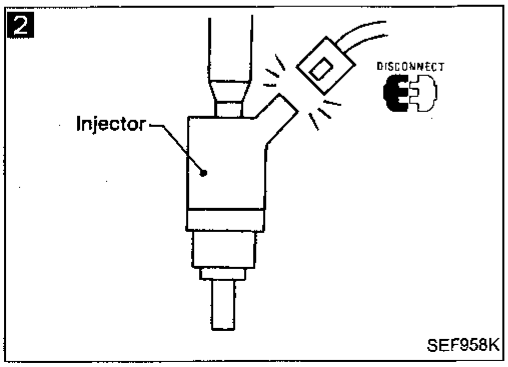
TRY A KNOWN GOOD ECM*.

↓

INSPECTION END

*: ECM may be the cause of a problem, but this is rarely the case.





Diagnostic Procedure 13 — Engine Stalls when Stepping on the Accelerator Momentarily

1

CHECK IACV-AAC VALVE.
When disconnecting IACV-AAC valve harness connector, does the engine speed drop?

No → Check IACV-AAC valve and circuit. (See page EF & EC-265.)

Yes ↓

2

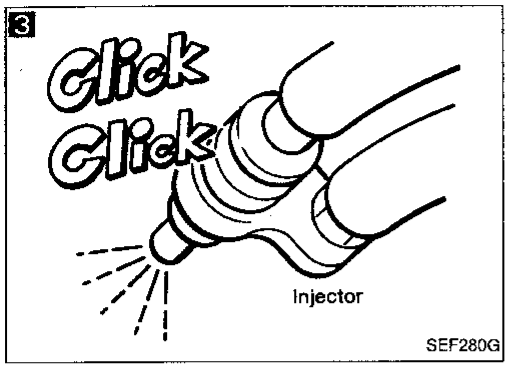
PERFORM POWER BALANCE TEST.
When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

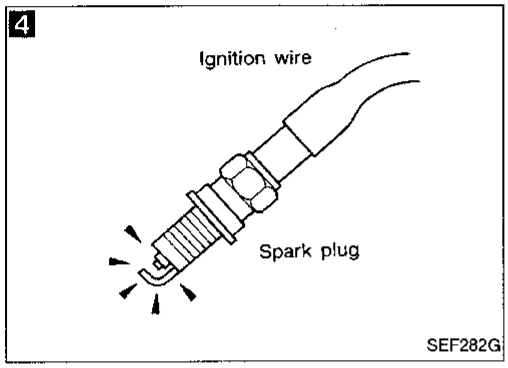
No → Go to **5**.

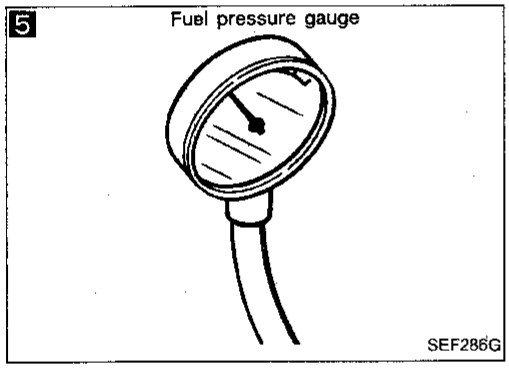
Yes ↓

(Go to Ⓐ on next page.)

Diagnostic Procedure 13 — Engine Stalls when Stepping on the Accelerator Momentarily (Cont'd)







Ⓐ

3 **CHECK INJECTOR.**
1. Remove camshaft position sensor with distributor from engine. (Harness connector should remain connected.)
2. Disconnect ignition coil harness connector.
3. Turn ignition switch ON. (Do not start engine.)
4. When rotating camshaft position sensor shaft, does each injector make an operating sound?

No → Check injector(s) and their circuit(s).

Yes ↓

4 **CHECK IGNITION SPARK.**
1. Disconnect ignition wire from rocker cover.
2. Connect a known good spark plug to the ignition wire.
3. Place end of spark plug against an earth point with engine cranking.
4. Check for spark.

NG → Check ignition coil, power transistor unit and their circuits. (See page EF & EC-235.)

OK ↓

5 **CHECK FUEL PRESSURE.**
1. Release fuel pressure to zero. (Refer to page EF & EC-286.)
2. Install fuel pressure gauge and check fuel pressure.
   A few seconds after ignition switch is turned OFF to ON:
   Approx. 294 kPa (3.0 kg/cm^2, 43 psi)
   At idle:
   Approx. 226 kPa (2.3 kg/cm^2, 33 psi)

NG → Check fuel pressure regulator diaphragm.

OK ↓

CHECK ECM HARNESS CONNECTOR.
Check the ECM pin terminals for damage or poor connection of ECM harness connector.

NG → Repair or replace.

OK ↓

CHECK ECM POWER SUPPLY AND GROUND CIRCUIT.
Refer to page EF & EC-222.

NG → Repair or replace.

OK ↓

Disconnect and remove harness connectors in the circuit, then retest.

Trouble is not fixed. ↓

TRY A KNOWN GOOD ECM*.

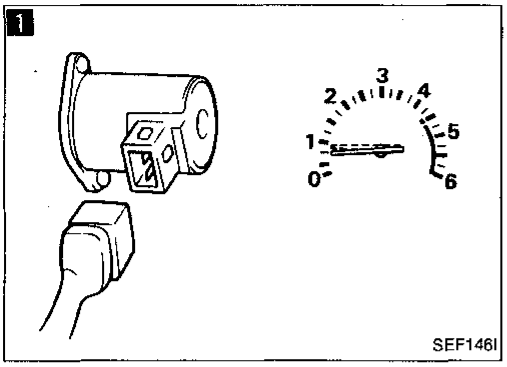
↓

INSPECTION END

*: ECM may be the cause of a problem, but this is rarely the case.

Diagnostic Procedure 14 — Engine Stalls after Decelerating

1



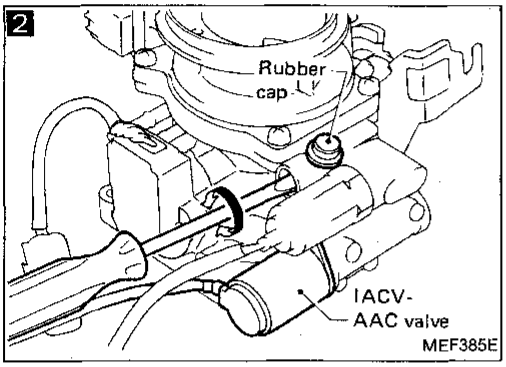
SEF146I

CHECK IACV-AAC VALVE.
When disconnecting IACV-AAC valve harness connector, does the engine speed drop?

No → Check IACV-AAC valve and circuit. (See page EF & EC-265.)

Yes ↓

2



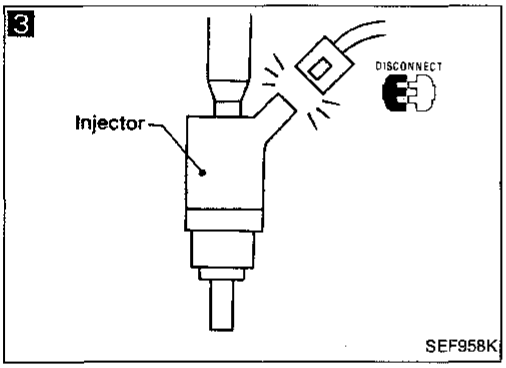
MEF385E

CHECK IDLE ADJ. SCREW CLOGGING.
1. Disconnect IACV-AAC valve harness connector.
2. Can you set engine speed at 650 ± 50 rpm (A/T in "N" position) by turning idle adjusting screw?

No → Check for IACV-AAC valve clogging or throttle body clogging.

Yes ↓

3



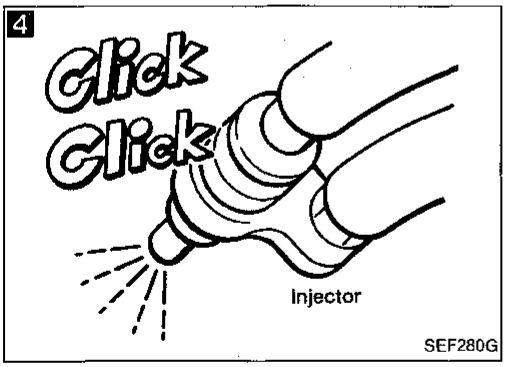
SEF958K

PERFORM POWER BALANCE TEST.
When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

No → Go to 6 .

Yes ↓

4



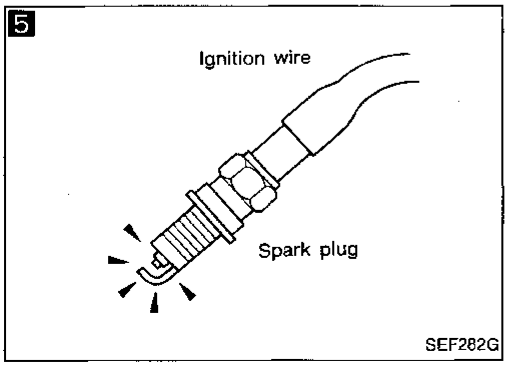
SEF280G

CHECK INJECTOR.
1. Remove camshaft position sensor with distributor from engine. (Harness connector should remain connected.)
2. Disconnect ignition coil harness connector.
3. Turn ignition switch ON. (Do not start engine.)
4. When rotating camshaft position sensor shaft, does each injector make an operating sound?

No → Check injector(s) and circuit(s).

Yes ↓

5



SEF282G

CHECK IGNITION SPARK.
1. Disconnect ignition wire from rocker cover.
2. Connect a known good spark plug to the ignition wire.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

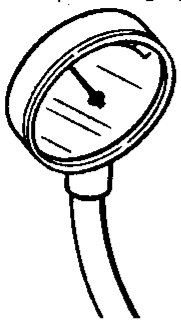
NG → Check ignition coil, power transistor unit and circuits. (See page EF & EC-235.)

OK ↓

(Go to Ⓐ on next page.)

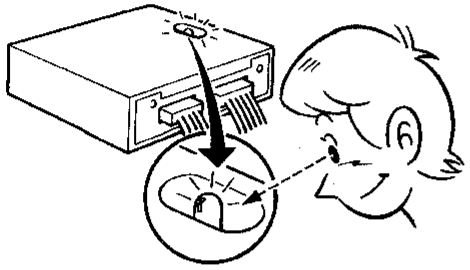
Diagnostic Procedure 14 — Engine Stalls after Decelerating (Cont'd)

6 Fuel pressure gauge



SEF286G

7



SEF152I

Ⓐ

6

CHECK FUEL PRESSURE.
1. Release fuel pressure to zero. (Refer to page EF & EC-286.)
2. Install fuel pressure gauge and check fuel pressure.

A few seconds after ignition switch is turned OFF to ON:
Approx. 294 kPa (3.0 kg/cm², 43 psi)
At idle:
Approx. 226 kPa (2.3 kg/cm², 33 psi)

NG → Check fuel pressure regulator diaphragm.

OK ↓

7

CHECK OXYGEN SENSOR.
1. Set Diagnostic Test Mode I (oxygen sensor monitor). (See page EF & EC-180.)
2. Maintaining engine at 2,000 rpm under no load, check that RED LED on the ECM goes ON and OFF more than 5 times during 10 seconds.

NG → Replace oxygen sensor.

OK ↓

CHECK ECM HARNESS CONNECTOR.
Check the ECM pin terminals for damage or poor connection of ECM harness connector.

NG → Repair or replace.

OK ↓

CHECK ECM POWER SUPPLY AND GROUND CIRCUIT.
Refer to page EF & EC-222.

NG → Repair or replace.

OK ↓

Disconnect and remove harness connectors in the circuit, then retest.

Trouble is not fixed. ↓

TRY A KNOWN GOOD ECM*.

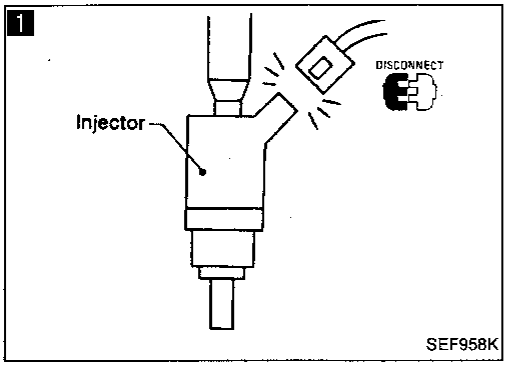
↓

INSPECTION END

*: ECM may be the cause of a problem, but this is rarely the case.

Diagnostic Procedure 15 — Engine Stalls when Accelerating or when Driving at Constant Speed

1



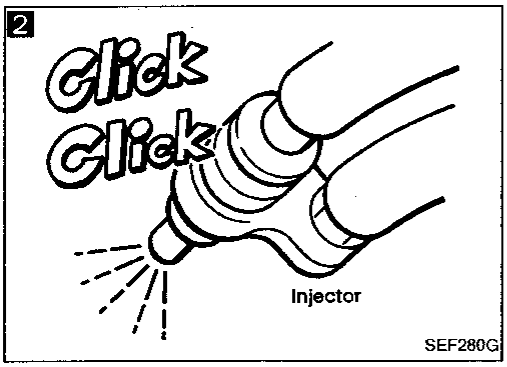
SEF958K

PERFORM POWER BALANCE TEST.
When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

No → Go to 4 .

Yes ↓

2



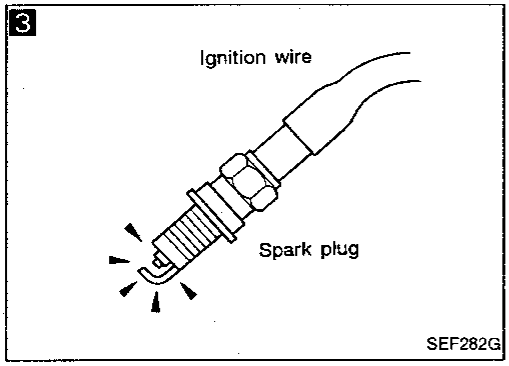
SEF280G

CHECK INJECTOR.
1. Remove camshaft position sensor with distributor from engine. (Harness connector should remain connected.)
2. Disconnect ignition coil harness connector.
3. Turn ignition switch ON. (Do not start engine.)
4. When rotating camshaft position sensor shaft, does each injector make an operating sound?

No → Check injector(s) and circuit(s).

Yes ↓

3



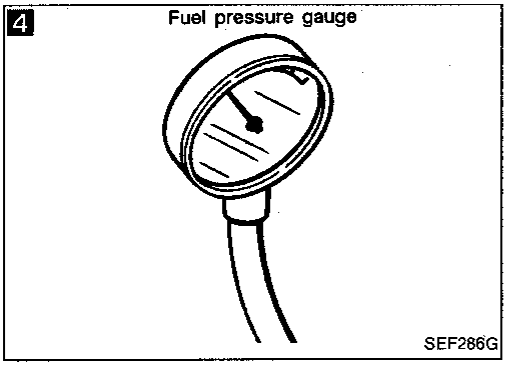
SEF282G

CHECK IGNITION SPARK.
1. Disconnect ignition wire from rocker cover.
2. Connect a known good spark plug to the ignition wire.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

NG → Check ignition coil, power transistor unit and circuits. (See page EF & EC-235.)

OK ↓

4



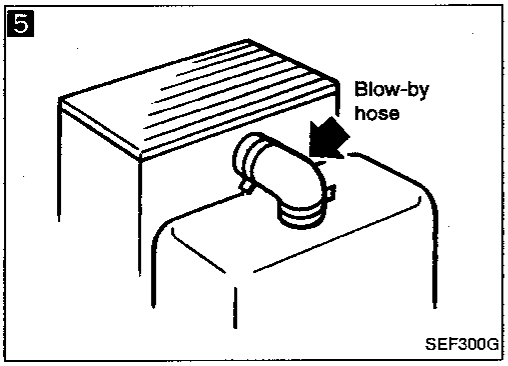
SEF286G

CHECK FUEL PRESSURE.
1. Release fuel pressure to zero. (Refer to page EF & EC-286.)
2. Install fuel pressure gauge and check fuel pressure.
   A few seconds after ignition switch is turned OFF to ON:
   Approx. 294 kPa (3.0 kg/cm^2, 43 psi)
   At idle:
   Approx. 235 kPa (2.4 kg/cm^2, 34 psi)

NG → Check fuel pump, circuit and fuel pressure regulator.

OK ↓

5



SEF300G

CHECK FOR INTAKE AIR LEAK.
When pinching blow-by hose (lowering the blow-by air supply), does the engine speed rise?

Yes → Discover air leak location and repair.

No ↓

(Go to Ⓐ on next page.)

Diagnostic Procedure 15 — Engine Stalls when Accelerating or when Driving at Constant Speed (Cont'd)

Ⓐ

CHECK ECM HARNESS CONNECTOR.
Check the ECM pin terminals for damage or poor connection of ECM harness connector.
NG → Repair or replace.

OK

CHECK ECM POWER SUPPLY AND GROUND CIRCUIT.
Refer to page EF & EC-222.
Yes → Repair or replace.

No

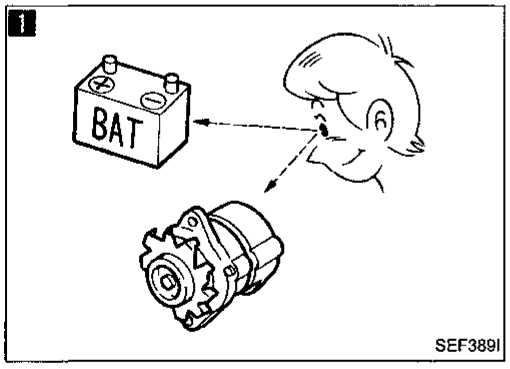
Disconnect and remove harness connectors in the circuit, then retest.

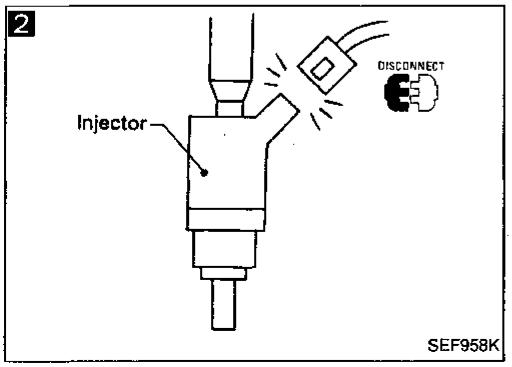
Trouble is not fixed.

TRY A KNOWN GOOD ECM*.

INSPECTION END

*: ECM may be the cause of a problem, but this is rarely the case.





Diagnostic Procedure 16 — Engine Stalls when the Electrical Load is Heavy

1

CHECK BATTERY AND ALTERNATOR.
Check battery and alternator condition. (Refer to EL section.)
NG → Repair or replace.

OK

2

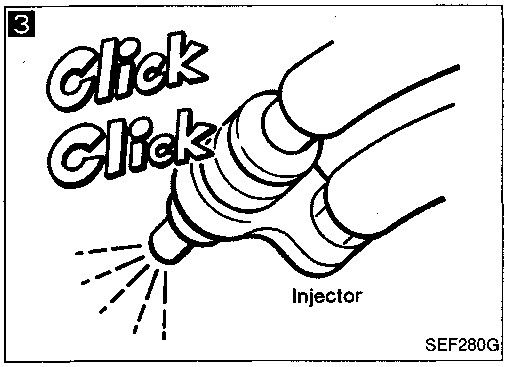
PERFORM POWER BALANCE TEST.
When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?
No → Go to 5 .

Yes

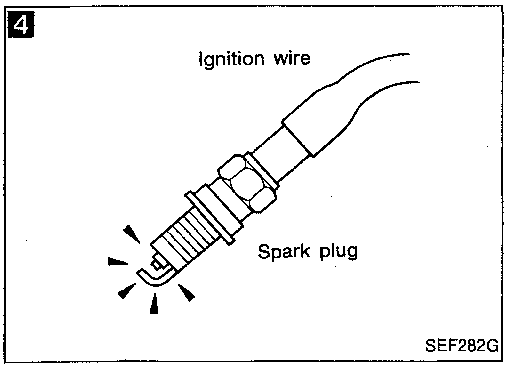
(Go to Ⓐ on next page.)

Diagnostic Procedure 16 — Engine Stalls when the Electrical Load is Heavy (Cont'd)

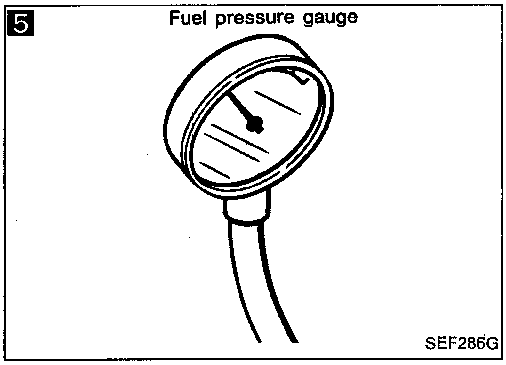
3



4



5



Ⓐ

3

CHECK INJECTOR.
1. Remove camshaft position sensor with distributor from engine. (Harness connector should remain connected.)
2. Disconnect ignition coil harness connector.
3. Turn ignition switch ON. (Do not start engine.)
4. When rotating camshaft position sensor shaft, does each injector make an operating sound?

No → Check injector(s) and circuit(s).

Yes ↓

4

CHECK IGNITION SPARK.
1. Disconnect ignition wire from rocker cover.
2. Connect a known good spark plug to the ignition wire.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

NG → Check ignition coil, power transistor unit and circuits. (See page EF & EC-235.)

OK ↓

5

CHECK FUEL PRESSURE.
1. Release fuel pressure to zero. (Refer to page EF & EC-286.)
2. Install fuel pressure gauge and check fuel pressure.
   A few seconds after ignition switch is turned OFF to ON:
   Approx. 294 kPa (3.0 kg/cm^2, 43 psi)
   At idle:
   Approx. 226 kPa (2.3 kg/cm^2, 33 psi)

NG → Check fuel pressure regulator diaphragm.

OK ↓

CHECK ECM HARNESS CONNECTOR.
Check the ECM pin terminals for damage or poor connection of ECM harness connector.

NG → Repair or replace.

OK ↓

CHECK ECM POWER SUPPLY AND GROUND CIRCUIT.
Refer to page EF & EC-222.

NG → Repair or replace.

OK ↓

Disconnect and remove harness connectors in the circuit, then retest.

Trouble is not fixed. ↓

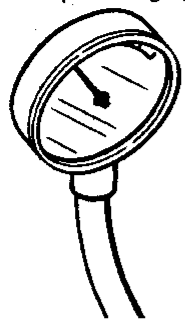
TRY A KNOWN GOOD ECM*.

↓

INSPECTION END

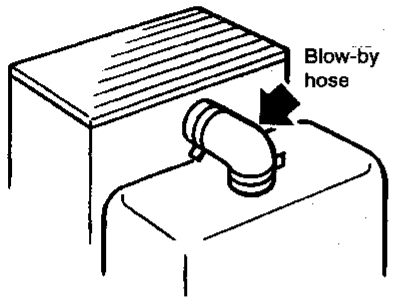
*: ECM may be the cause of a problem, but this is rarely the case.

1 Fuel pressure gauge



SEF286G

2 Blow-by hose



SEF300G

Diagnostic Procedure 17 — Lack of Power and Stumble

1

CHECK FUEL PRESSURE.
1. Release fuel pressure to zero. (Refer to page EF & EC-286.)
2. Install fuel pressure gauge and check fuel pressure.

A few seconds after ignition switch is turned OFF to ON:
Approx. 294 kPa (3.0 kg/cm², 43 psi)
At idle:
Approx. 226 kPa (2.3 kg/cm², 33 psi)

NG → Check fuel pressure regulator diaphragm.

OK ↓

2

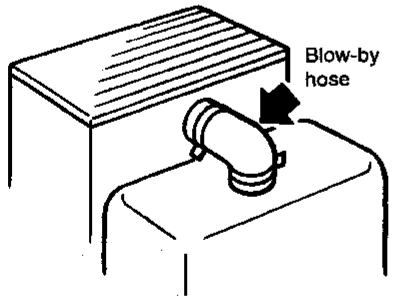
CHECK FOR INTAKE AIR LEAK.
When pinching blow-by hose (lowering the blow-by air supply), does the engine speed rise?

Yes → Discover air leak location and repair.

No ↓

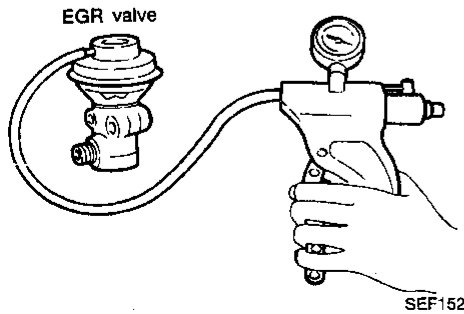
INSPECTION END

1 Blow-by hose



SEF300G

2 EGR valve



SEF152M

Diagnostic Procedure 18 — Knock

1

CHECK FOR INTAKE AIR LEAK.
When pinching blow-by hose (lowering the blow-by air supply), does the engine rpm rise?

Yes → Discover air leak location and repair.

No ↓

2

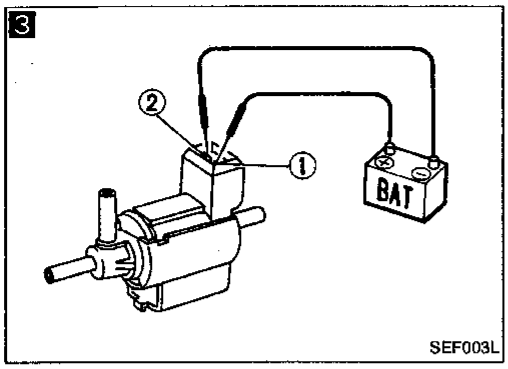
CHECK EGR OPERATION.
1. Apply vacuum directly to the EGR valve using a handy vacuum pump.
2. Check to see that the engine runs rough or dies.

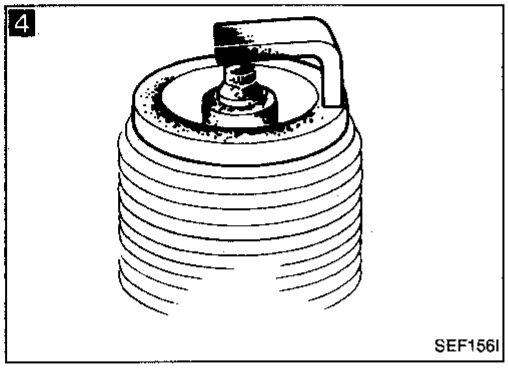
No → Check EGR valve for sticking.

Yes ↓

(Go to Ⓐ on next page.)

Diagnostic Procedure 18 — Knock (Cont'd)





Ⓐ

3

CHECK EGRC-SOLENOID VALVE.
1. Disconnect EGRC-solenoid valve harness connector.
2. Supply EGRC-solenoid valve terminals with battery current and check operating sound.

NG → Check solenoid valve and circuit.

OK ↓

4

CHECK VACUUM HOSES.
Check the following vacuum hoses for clogging, cracks and poor connection.
a) Vacuum hose between EGR valve and EGR control solenoid valve.
b) Vacuum hose between EGRC-solenoid valve and throttle body port.
c) Vacuum hose between EGRC-solenoid valve and air duct.

NG → Repair or replace.

OK ↓

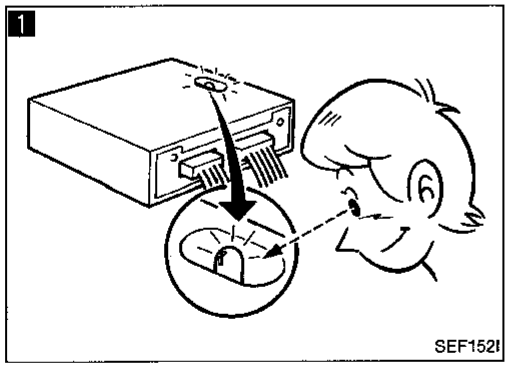
CHECK FOR OIL LEAK TO COMBUSTION CHAMBER.
Remove spark plugs and check for fouling with oil.

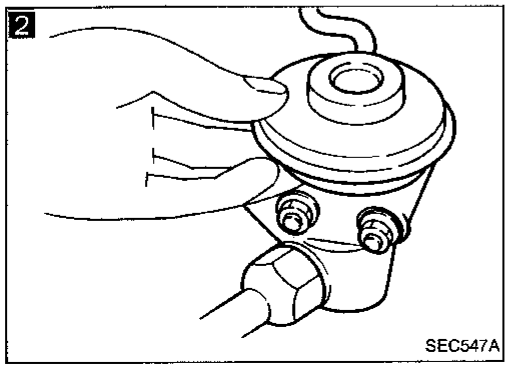
Yes → Check pistons, piston rings, valves, valve seats, valve oil seal, engine oil level, etc.

No ↓

INSPECTION END

Diagnostic Procedure 19 — Surge





1

CHECK OXYGEN SENSOR.
1. Set Diagnostic Test Mode I (oxygen sensor monitor). (See page EF & EC-180.)
2. Maintaining engine at 2,000 rpm under no load, check that RED LED on the ECM goes ON and OFF more than 5 times during 10 seconds.

NG → Replace oxygen sensor(s).

OK ↓

2

CHECK EGR VALVE.
Check EGR valve for sticking.

NG → Repair or replace.

OK ↓

Disconnect and remove harness connectors in the circuit, then retest.

Trouble is not fixed. ↓

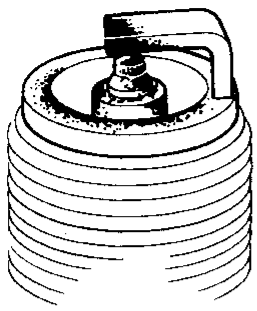
TRY A KNOWN GOOD ECM*.

OK ↓

INSPECTION END

*: ECM may be the cause of a problem, but this is rarely the case.

1



SEF156I

Diagnostic Procedure 20 — Backfire through the Intake

1

CHECK SPARK PLUGS.
Remove the spark plugs and check for fouling, etc.

NG → Repair or replace spark plug(s).

OK ↓

2

CHECK INTAKE AIR LEAK.
When pinching blow-by hose (lowering the blow-by air supply), does the engine speed rise?

Yes → Discover air leak location and repair.

No ↓

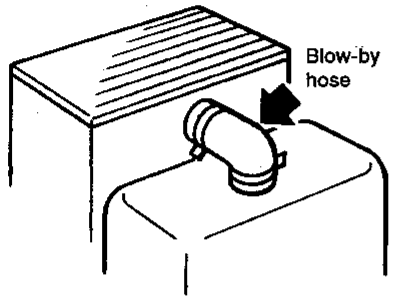
3

CHECK FOR INTAKE VALVE DEPOSITS.
If there are deposits on intake valves, remove them.

↓

INSPECTION END

2



SEF300G

Diagnostic Procedure 21 — Backfire through the Exhaust

CHECK ENGINE COOLANT TEMPERATURE SENSOR.
Check engine coolant temperature sensor and its circuit. (See page EF & EC-231.)

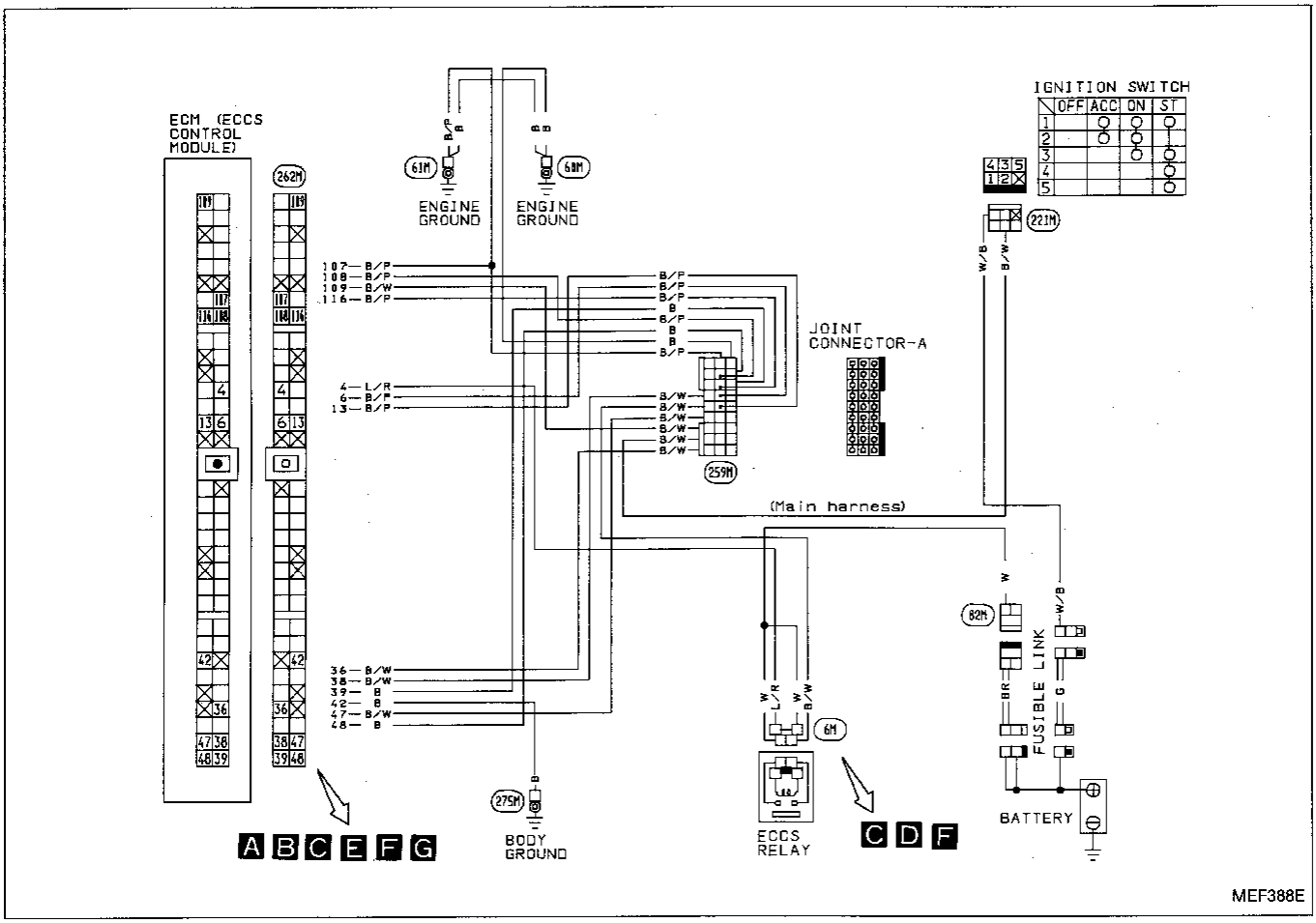
NG → Replace or repair.

OK ↓

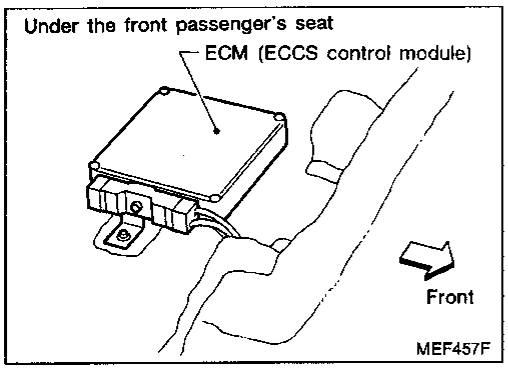
INSPECTION END

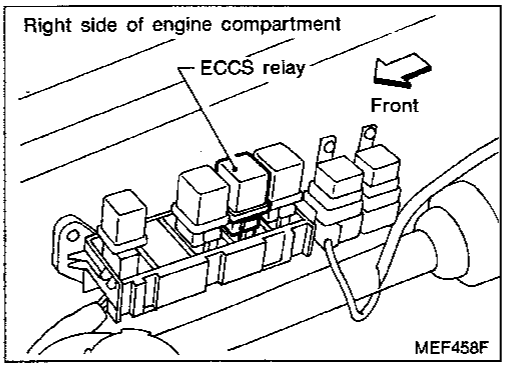
Diagnostic Procedure 22

MAIN POWER SUPPLY AND GROUND CIRCUIT (Not self-diagnostic item)

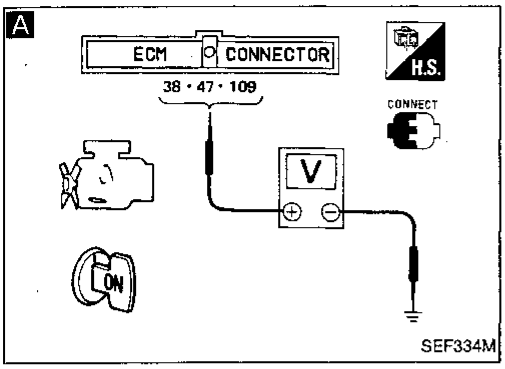


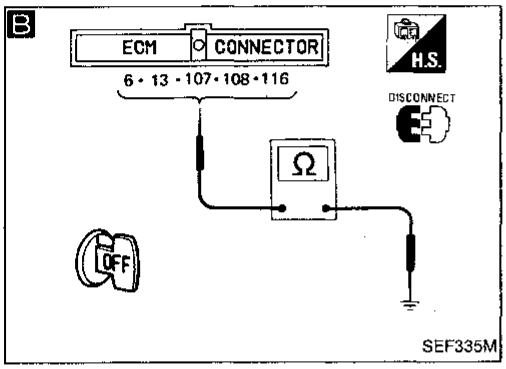
Harness layout

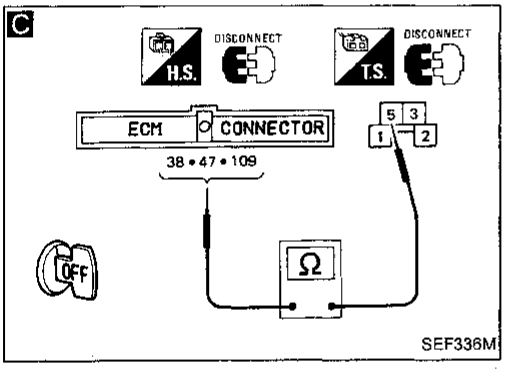


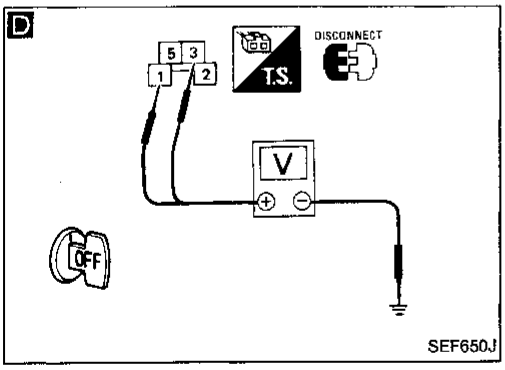


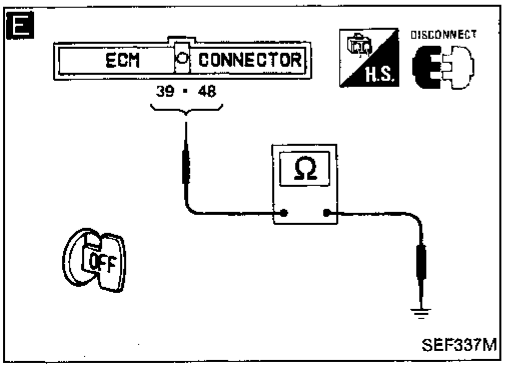
Diagnostic Procedure 22 (Cont'd)











INSPECTION START

A

CHECK POWER SUPPLY.
1) Turn ignition switch "ON".
2) Check voltage between ECM terminals ㊳, ㊼, ⑩⑨ and ground.
Voltage: Battery voltage

OK → **B**

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect ECM harness connector.
3) Check harness continuity between ECM terminals ⑥, ⑬, ①⓪⑦, ①⓪⑧, ①①⑥ and engine ground.
Continuity should exist.
If NG, check the following.
- Joint connector-A (259M)
- Harness continuity between ECM and engine ground

If NG, repair harness or connectors.

OK →
Check ECM pin terminals for damage or the connection of ECM harness connector.

NG ↓

C

CHECK HARNESS CONTINUITY BETWEEN ECCS RELAY AND ECM
1) Turn ignition switch "OFF".
2) Disconnect ECM harness connector.
3) Disconnect ECCS relay.
4) Check harness continuity between ECM terminals ㊳, ㊼, ⑩⑨ and terminal ⑤.
Continuity should exist.

NG →
Check the following.
- Joint connector-A (259M)
- Harness continuity between ECM and ECCS relay

If NG, repair harness or connectors.

OK ↓

D

CHECK VOLTAGE BETWEEN ECCS RELAY AND GROUND.
1) Check voltage between terminals ①, ③ and ground.
Voltage: Battery voltage

NG →
Check the following.
- "BR" fusible link
- Harness continuity between ECCS relay and battery

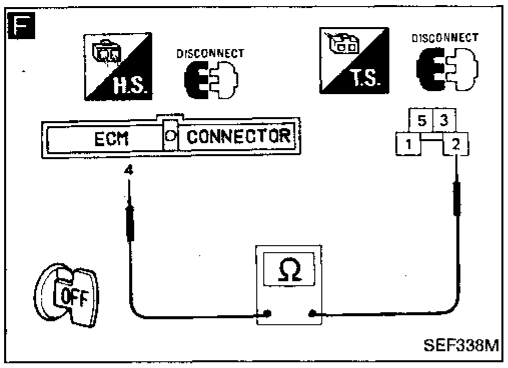
If NG, repair harness or connectors.

OK ↓

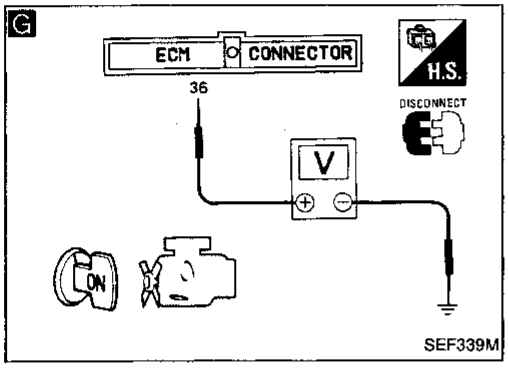
Ⓐ

Diagnostic Procedure 22 (Cont'd)

F



G



Ⓐ

E

CHECK GROUND CIRCUIT.
1) Check harness continuity between ECM terminals ㊴, ㊽ and engine ground.
Continuity should exist.

NG → Check the following.
- Joint connector-A (259M)
- Harness continuity between ECM and engine ground

If NG, repair harness or connectors.

OK

F

CHECK OUTPUT SIGNAL CIRCUIT.
1) Check harness continuity between ECM terminal ④ and terminal ②.
Continuity should exist.

NG → Repair harness or connectors.

OK

G

CHECK INPUT SIGNAL CIRCUIT.
1) Turn ignition switch "ON".
2) Check voltage between ECM terminal ㊱ and ground.
Voltage: Battery voltage

NG → Check the following.
- Joint connector-A (259M)
- Harness continuity between ignition switch and ECM

If NG, repair harness or connectors.

OK

CHECK COMPONENT (ECCS relay).
Refer to "Electrical Components Inspection". (See page EF & EC-280.)

NG → Replace ECCS relay.

OK

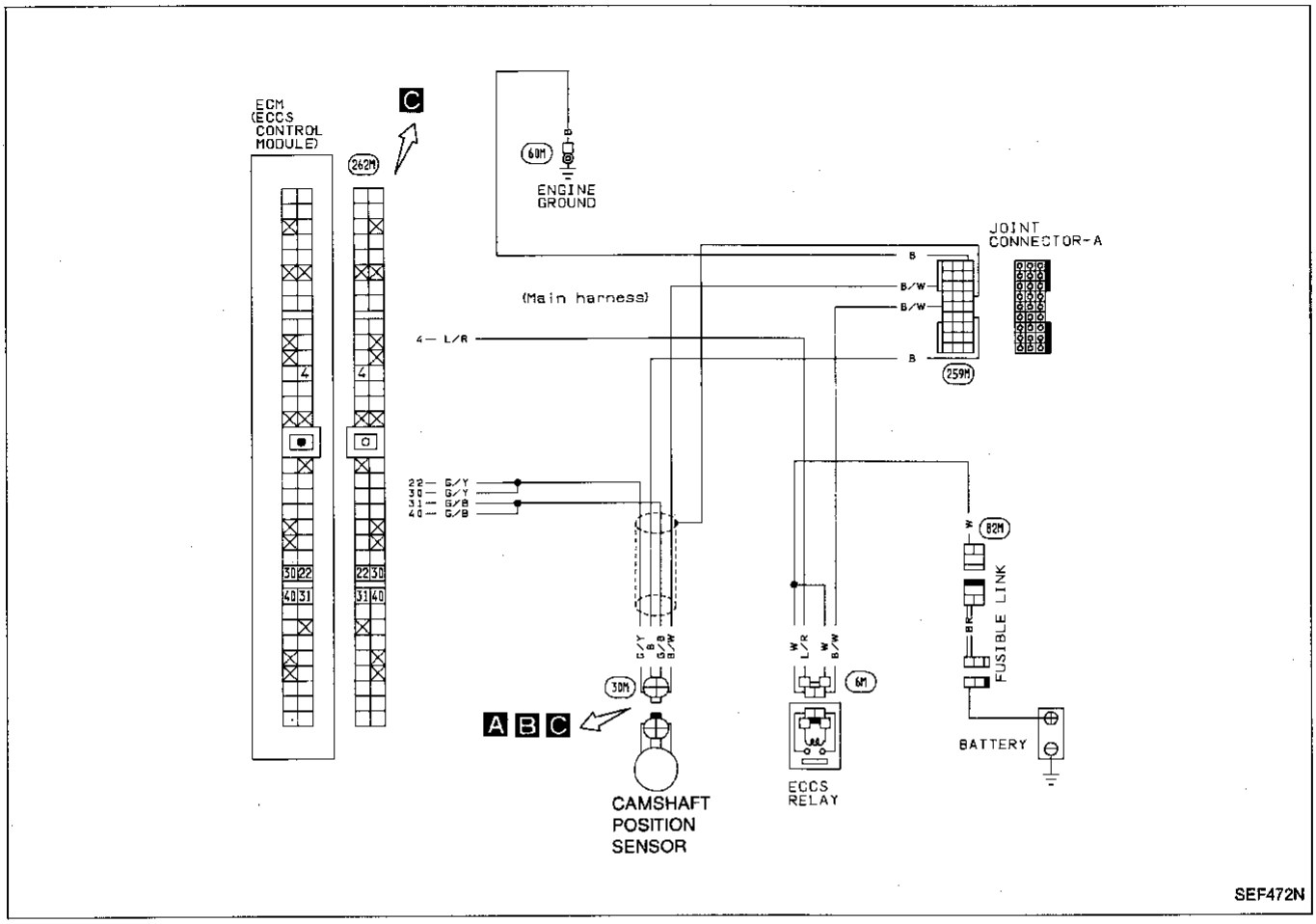
Disconnect and reconnect harness connectors in the circuit, then retest.

Trouble is not fixed.

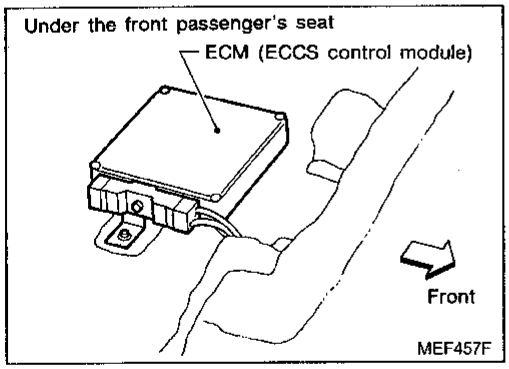
Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

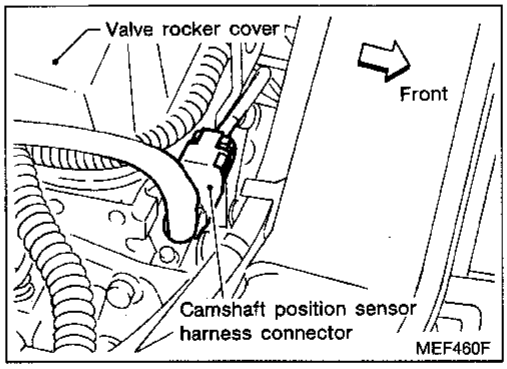
Diagnostic Procedure 23

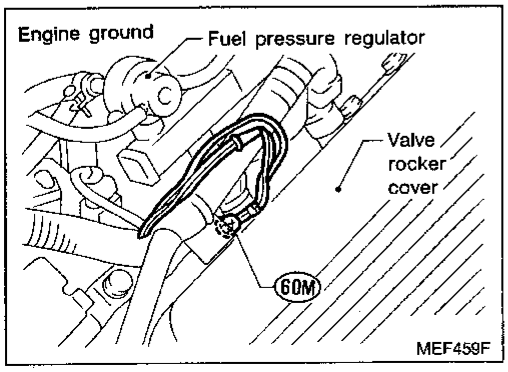
CAMSHAFT POSITION SENSOR (Diagnostic trouble code No. 11)



Harness layout

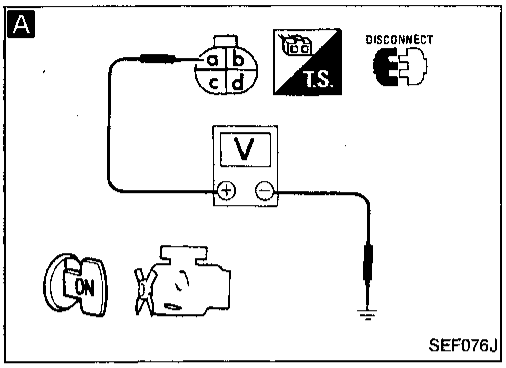




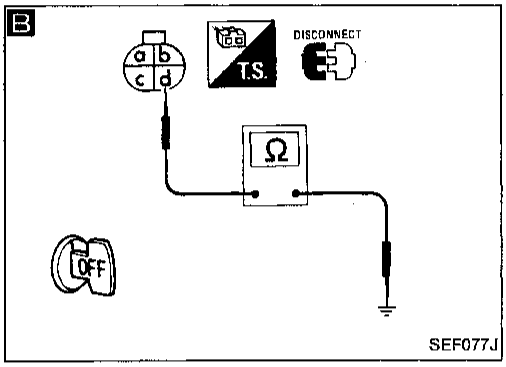


Diagnostic Procedure 23 (Cont'd)

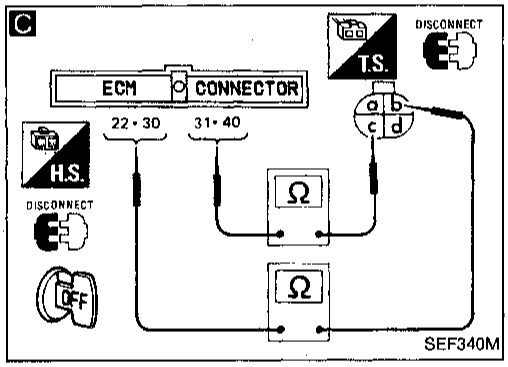
A



B



C



INSPECTION START

A

CHECK POWER SUPPLY.
1) Disconnect camshaft position sensor harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓐ and ground.
Voltage: Battery voltage

NG → Check the following.
- Joint connector-A (259M)
- Harness continuity between camshaft position sensor and ECCS relay

If NG, repair harness or connectors.

OK ↓

B

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Loosen and retighten ground screw.
3) Check harness continuity between terminal ⓓ and engine ground.
Continuity should exist.

NG → Check the following.
- Joint connector-A (259M)
- Harness continuity between camshaft position sensor and engine ground

If NG, repair harness or connectors.

OK ↓

C

CHECK INPUT SIGNAL CIRCUIT.
1) Disconnect ECM harness connector.
2) Check harness continuity between terminal ⓒ and ECM terminals ㉛, ㊵ (1° signal), terminal ⓑ and ECM terminals ㉒, ㉚ (180° signal).
Continuity should exist.

NG → Repair harness or connectors.

OK ↓

CHECK COMPONENT
(Camshaft position sensor).
Refer to "Electrical Components Inspection".
(See page EF & EC-280.)

NG → Replace camshaft position sensor.

OK ↓

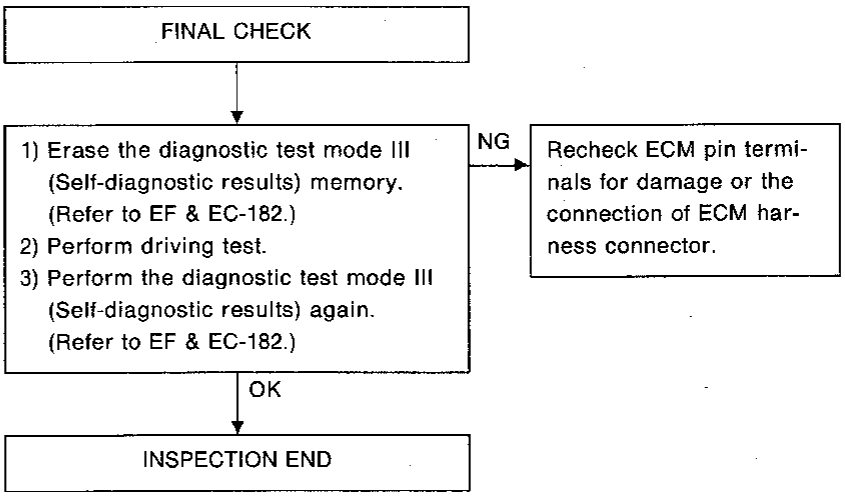
Disconnect and reconnect harness connectors in the circuit, then retest.

Trouble is not fixed. ↓

Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

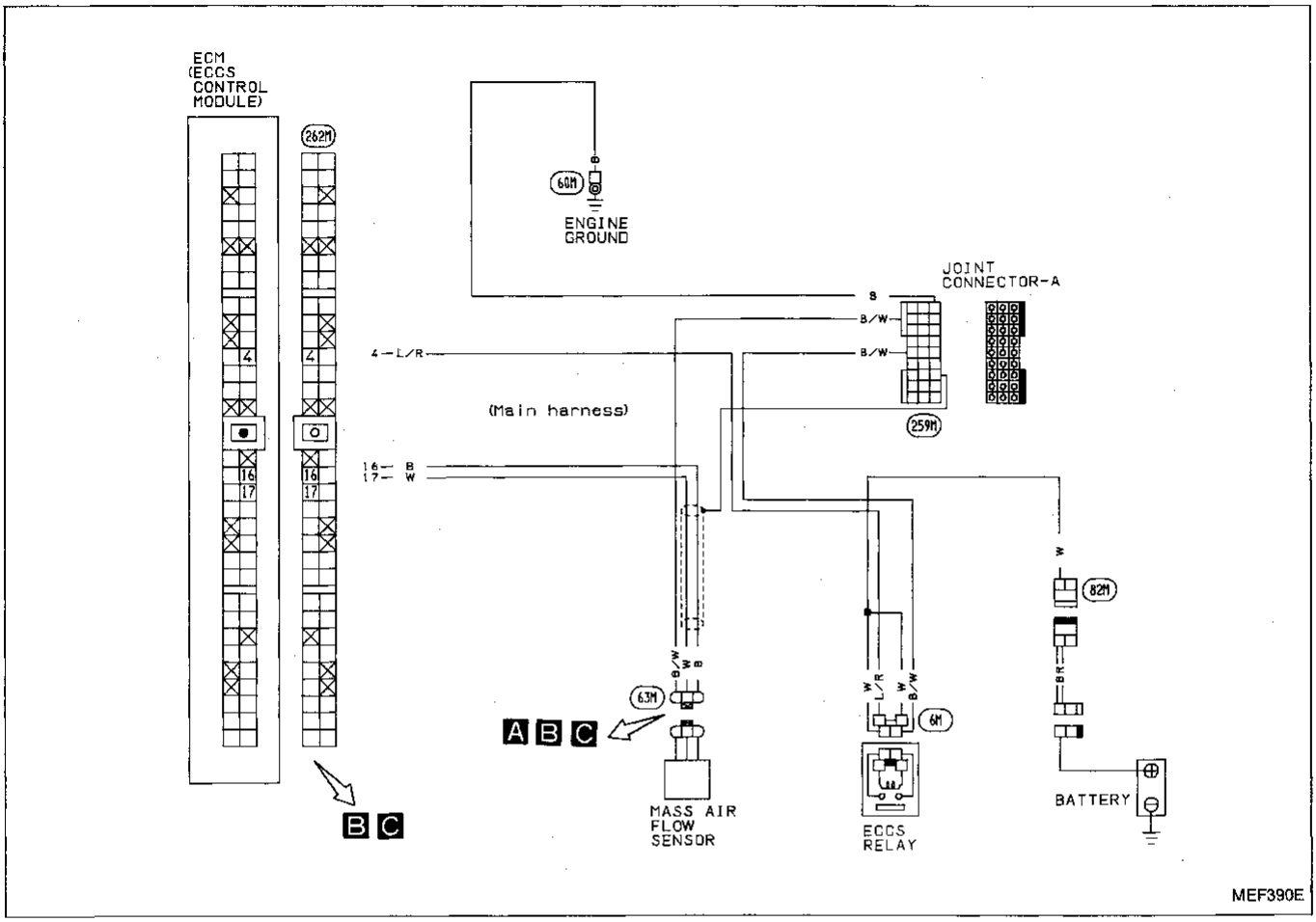
Diagnostic Procedure 23 (Cont'd)

Perform FINAL CHECK by the following procedure after repair is completed.

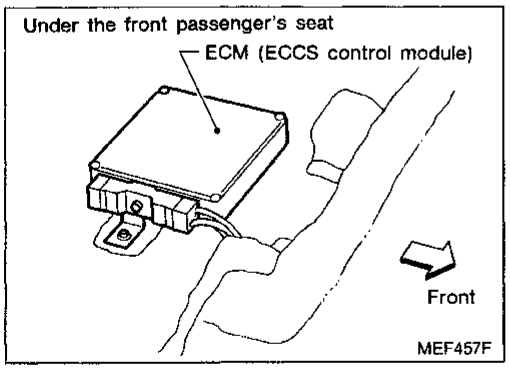


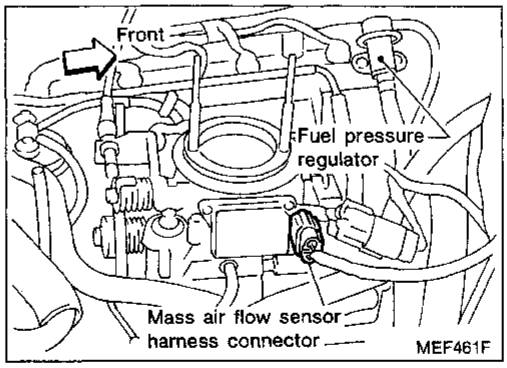
Diagnostic Procedure 24

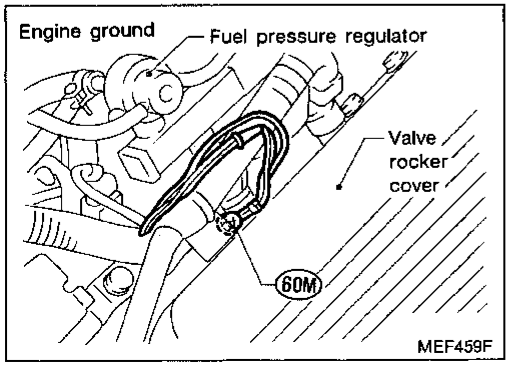
MASS AIR FLOW SENSOR (Diagnostic trouble code No. 12) CHECK (MALFUNCTION INDICATOR LAMP ITEM)



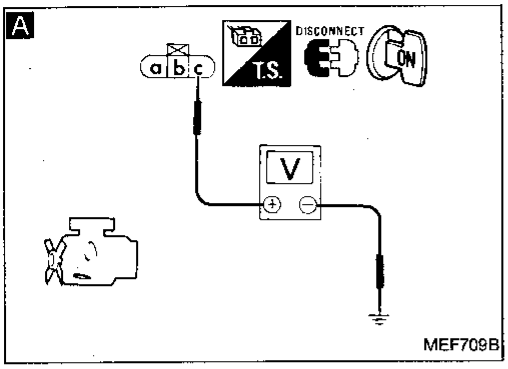
Harness layout

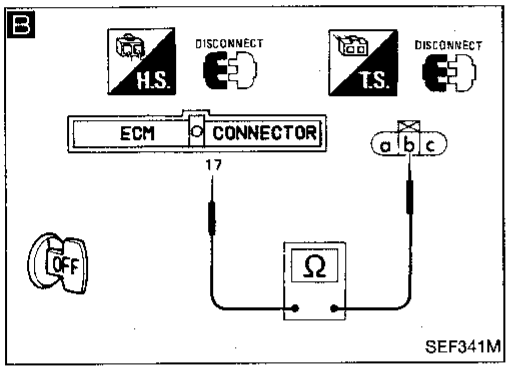


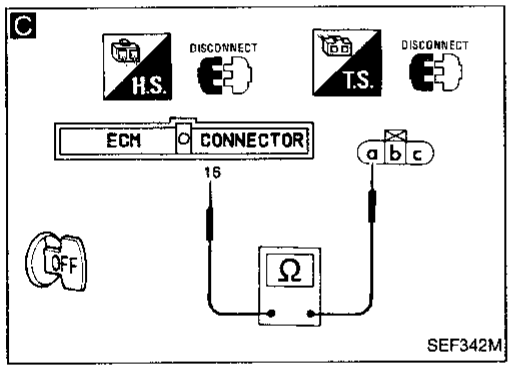




Diagnostic Procedure 24 (Cont'd)







INSPECTION START

A

CHECK POWER SUPPLY.
1) Disconnect mass air flow sensor harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓒ and ground.
Voltage: Battery voltage

NG → Check the following.
- Joint connector-A (259M)
- Harness continuity between mass air flow sensor and ECCS relay

If NG, repair harness or connectors.

OK ↓

Loosen and retighten ground screw.

B

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect ECM harness connector.
3) Check harness continuity between terminal ⓑ and ECM terminal ⑰.
Continuity should exist.

NG → Repair harness or connectors.

OK ↓

C

CHECK INPUT SIGNAL CIRCUIT.
1) Check harness continuity between terminal ⓐ and ECM terminal ⑯.
Continuity should exist.

NG → Repair harness or connectors.

OK ↓

CHECK COMPONENT
(Mass air flow sensor).
Refer to "Electrical Components Inspection".
(See page EF & EC-280.)

NG → Replace mass air flow sensor.

OK ↓

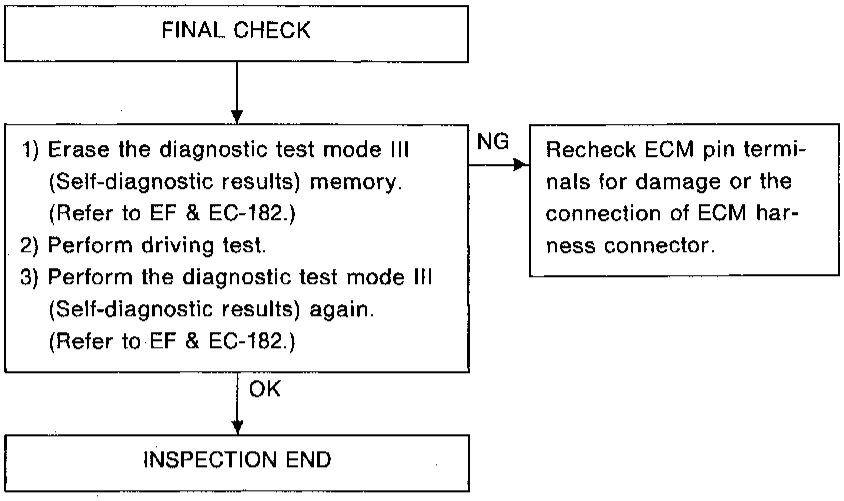
Disconnect and reconnect harness connectors in the circuit, then retest.

Trouble is not fixed. ↓

Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

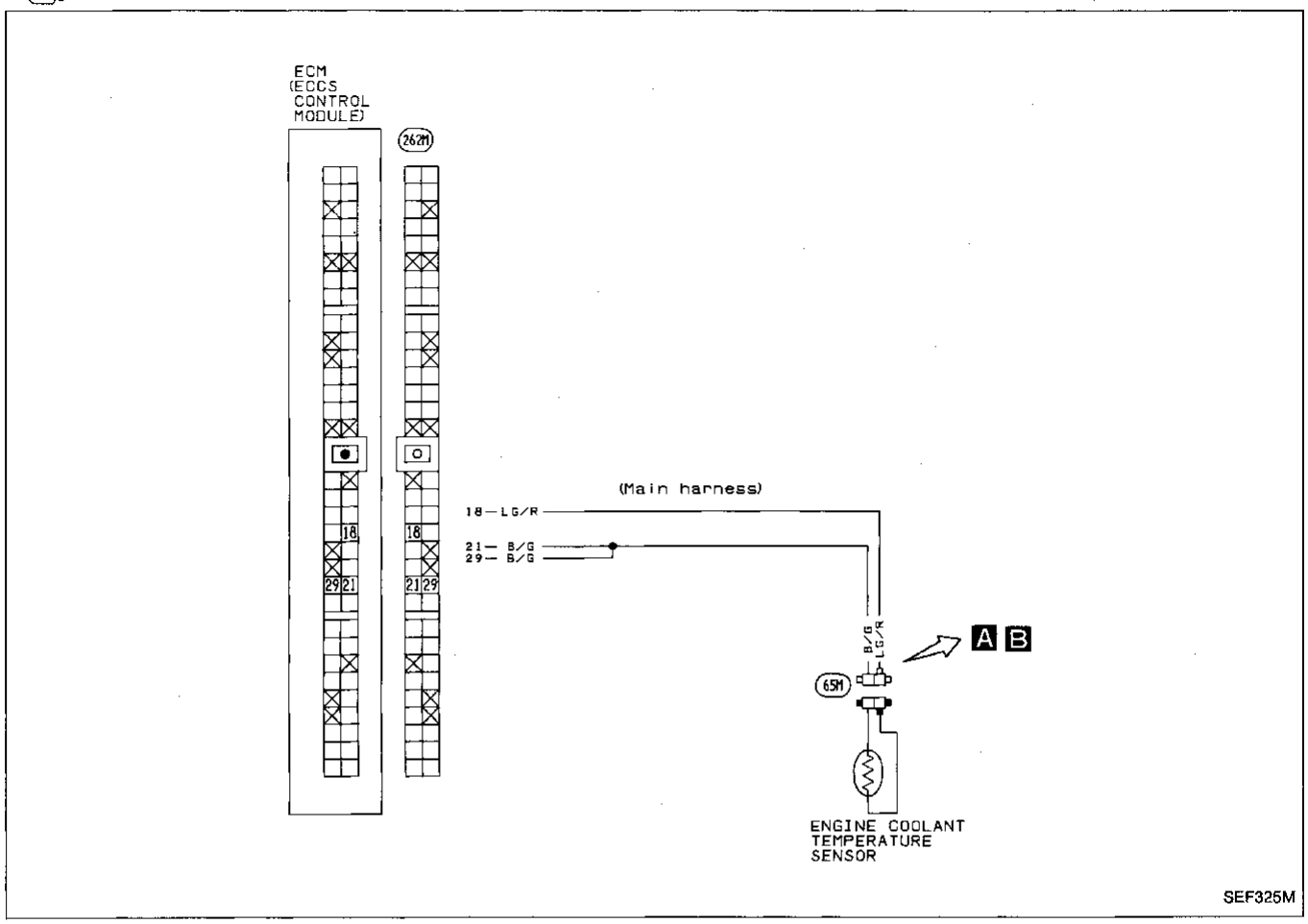
Diagnostic Procedure 24 (Cont'd)

Perform FINAL CHECK by the following procedure after repair is completed.

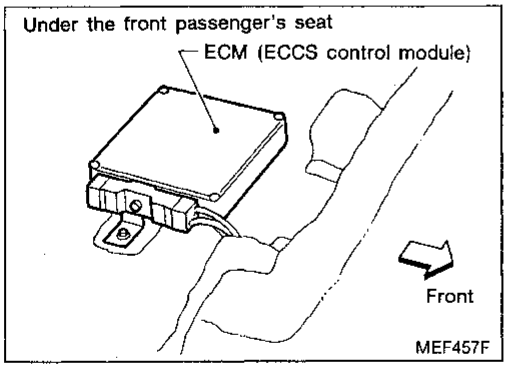


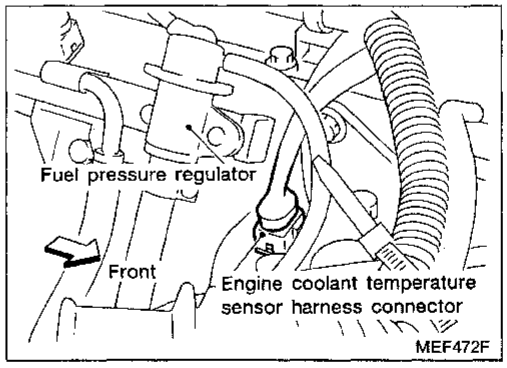
Diagnostic Procedure 25

ENGINE COOLANT TEMPERATURE SENSOR (Diagnostic trouble code No. 13)
(MALFUNCTION INDICATOR LAMP ITEM)

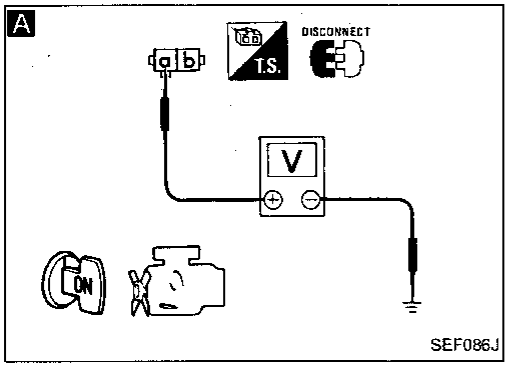


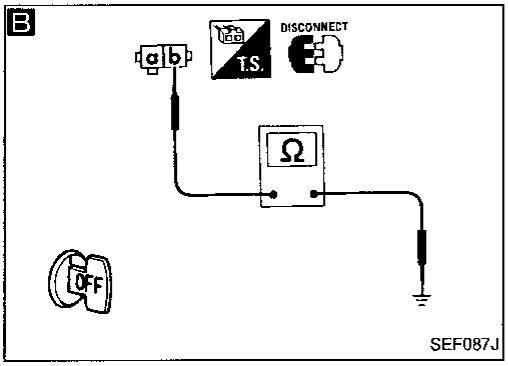
Harness layout





Diagnostic Procedure 25 (Cont'd)





INSPECTION START

A

CHECK POWER SUPPLY.
1) Disconnect engine coolant temperature sensor harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓐ and ground.
Voltage: Approximately 5V

NG → Repair harness or connectors.

OK

B

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Check harness continuity between terminal ⓑ and engine ground.
Continuity should exist.

NG → Repair harness or connectors.

OK

CHECK COMPONENT
(Engine coolant temperature sensor).
Refer to "Electrical Components Inspection".
(See page EF & EC-280.)

NG → Replace engine coolant temperature sensor.

OK

Disconnect and reconnect harness connectors in the circuit, then retest.

Trouble is not fixed.

Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

Perform FINAL CHECK by the following procedure after repair is completed.

FINAL CHECK

1) Erase the diagnostic test mode III (Self-diagnostic results) memory. (Refer to EF & EC-182.)
2) Perform driving test.
3) Perform the diagnostic test mode III (Self-diagnostic results) again. (Refer to EF & EC-182.)

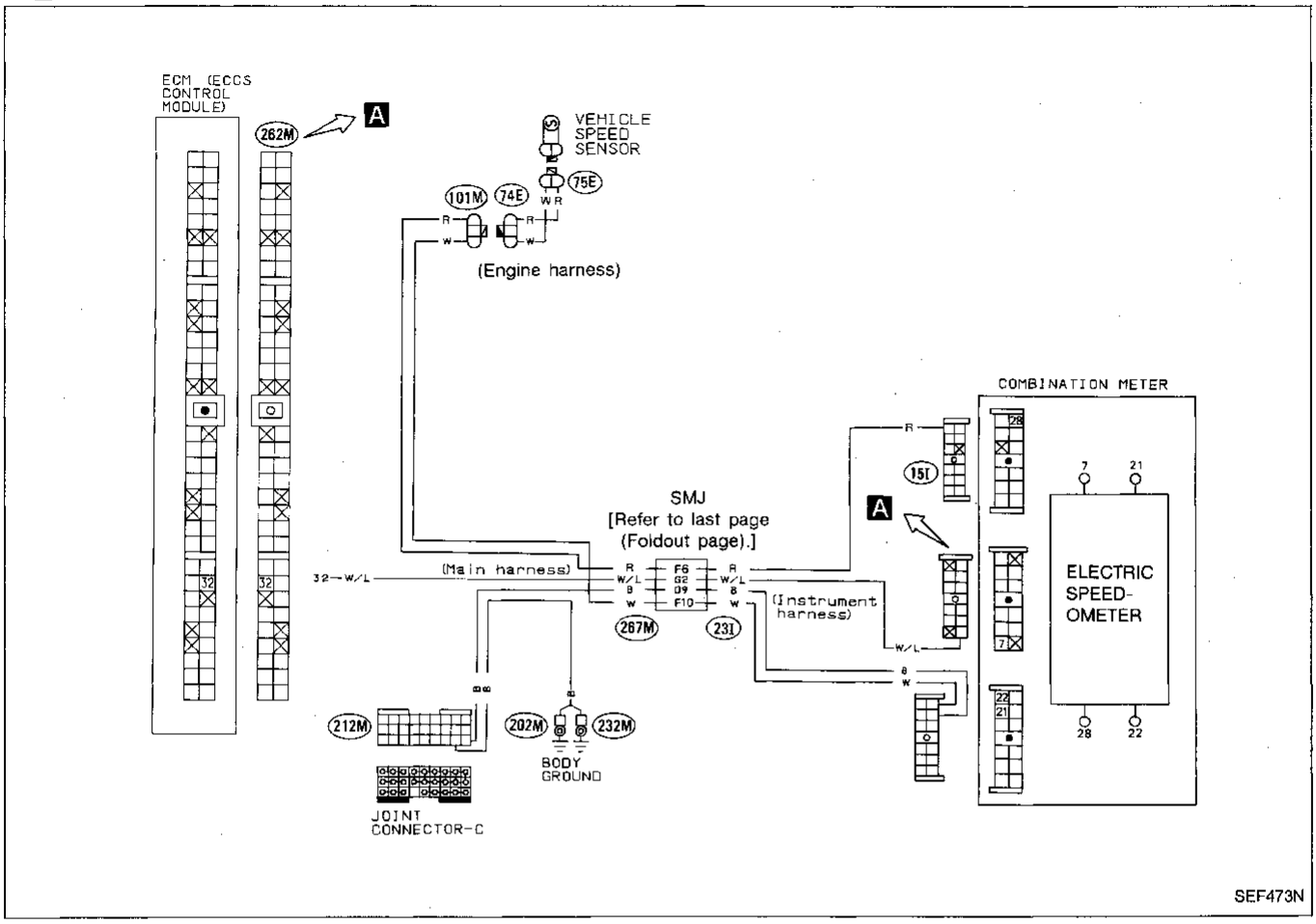
NG → Recheck ECM pin terminals for damage or the connection of ECM harness connector.

OK

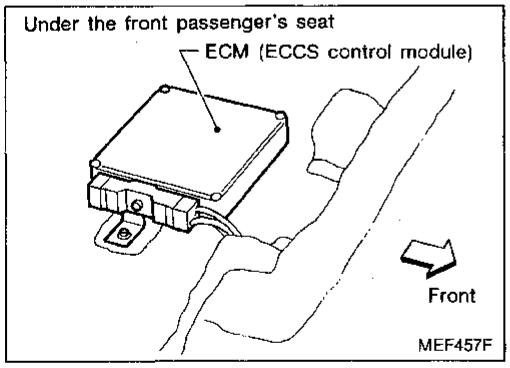
INSPECTION END

Diagnostic Procedure 26

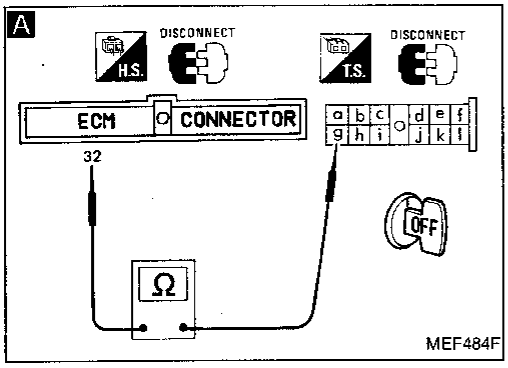
VEHICLE SPEED SENSOR (Diagnostic trouble code No. 14) (Switch ON/OFF diagnostic item)
(MALFUNCTION INDICATOR LAMP ITEM)



Harness layout



Diagnostic Procedure 26 (Cont'd)



INSPECTION START

CHECK SPEEDOMETER FUNCTION.
Make sure that speedometer functions properly.

NG → Check vehicle speed sensor and its circuit. (Refer to EL section.)

OK

A

CHECK INPUT SIGNAL CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect ECM harness connector.
3) Disconnect combination meter harness connector (15I)
4) Check harness continuity between ECM terminal (32) and terminal (g).
Continuity should exist.

NG → Check the following.
- Harness connectors (267M) , (23I)
- Harness continuity between ECM and combination meter

If NG, repair harness or connectors.

OK

Disconnect and reconnect harness connectors in the circuit, then retest.

Trouble is not fixed.

Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

Perform FINAL CHECK by the following procedure after repair is completed.

FINAL CHECK

1) Start engine.
2) Perform the diagnostic test mode IV (switches ON/OFF diagnosis). (Refer to EF & EC-186.)

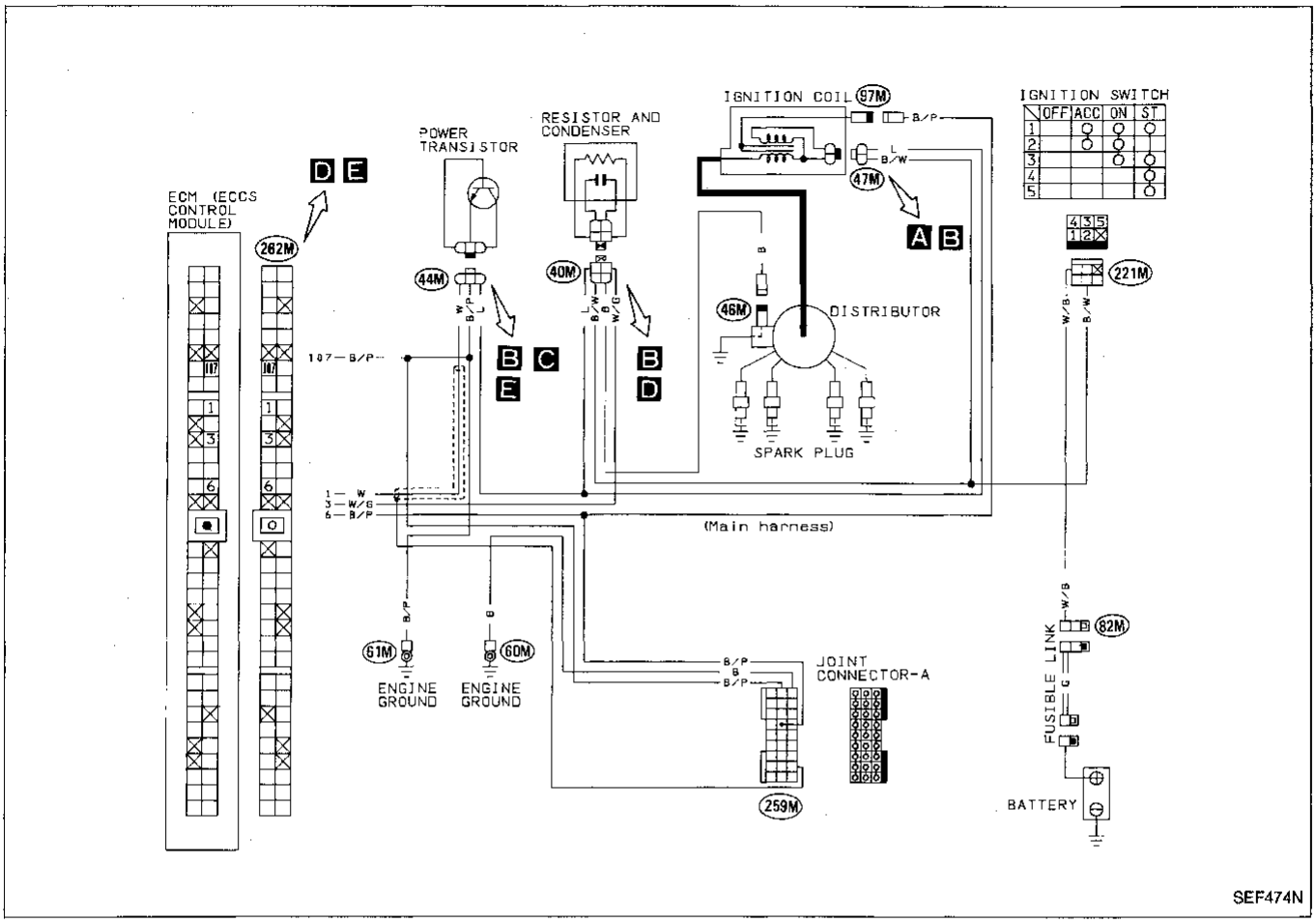
NG → Recheck ECM pin terminals for damage or the connection of ECM harness connector.

OK

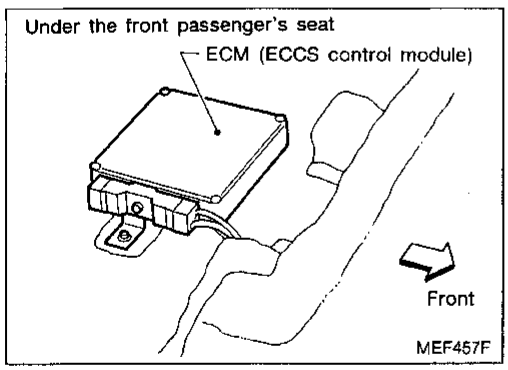
INSPECTION END

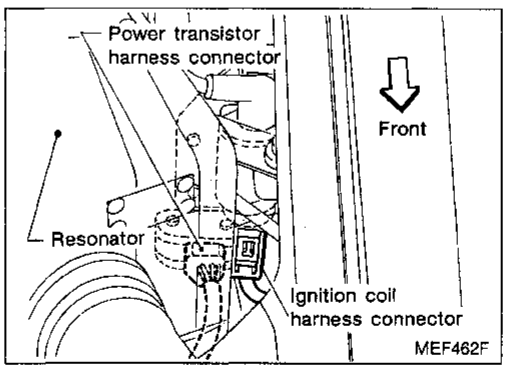
Diagnostic Procedure 27

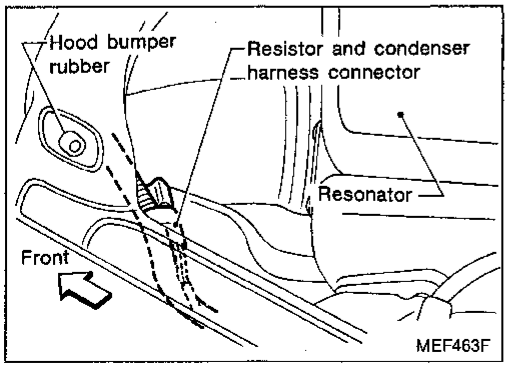
IGNITION SIGNAL (Diagnostic trouble code No. 21)

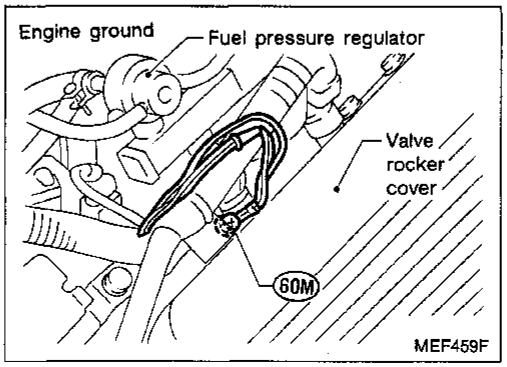


Harness layout



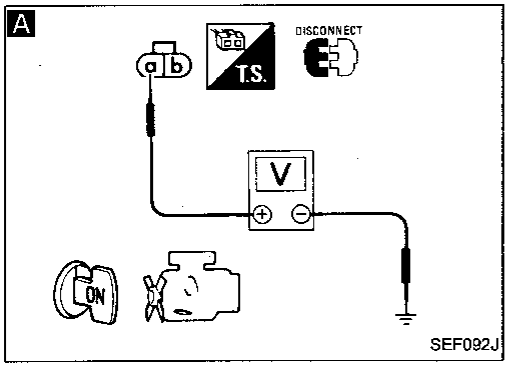




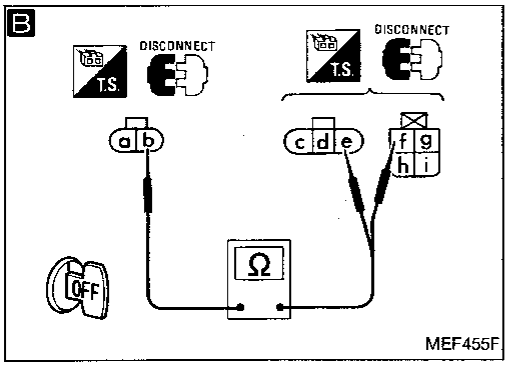


Diagnostic Procedure 27 (Cont'd)

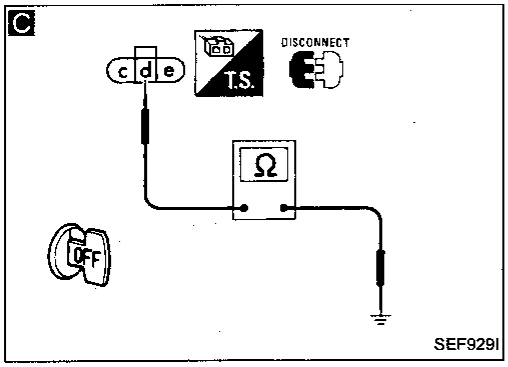
A



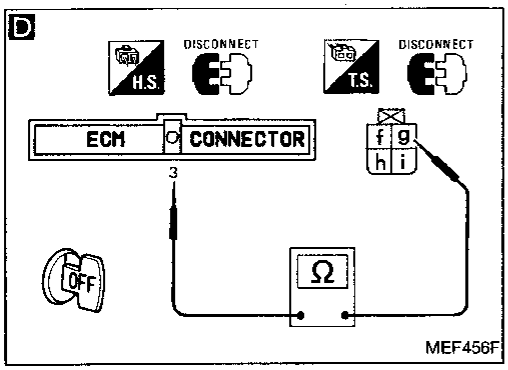
B



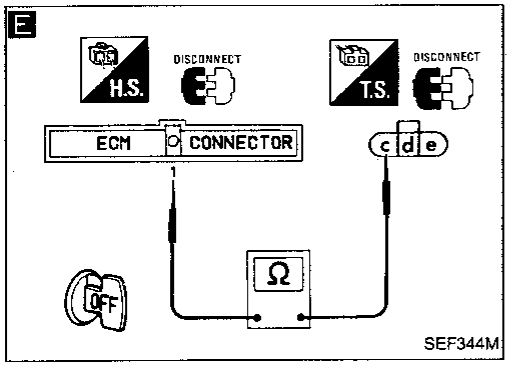
C



D



E



INSPECTION START

A

CHECK POWER SUPPLY.
1) Disconnect ignition coil harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓐ and ground.
Voltage: Battery voltage

NG → Repair harness or connectors.

OK

Loosen and retighten ground screw.

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect resistor and condenser harness connector.
3) Disconnect power transistor harness connector.

B 4) Check harness continuity between terminals ⓑ and ⓔ, ⓕ.
Continuity should exist.

C 5) Check harness continuity between terminal ⓓ and engine ground.
Continuity should exist.

NG → Repair harness or connectors.

OK

D

CHECK INPUT SIGNAL CIRCUIT.
1) Disconnect ECM harness connector.
2) Check harness continuity between terminal ⓖ and ECM terminal ③.
Continuity should exist.

NG → Repair harness or connectors.

OK

E

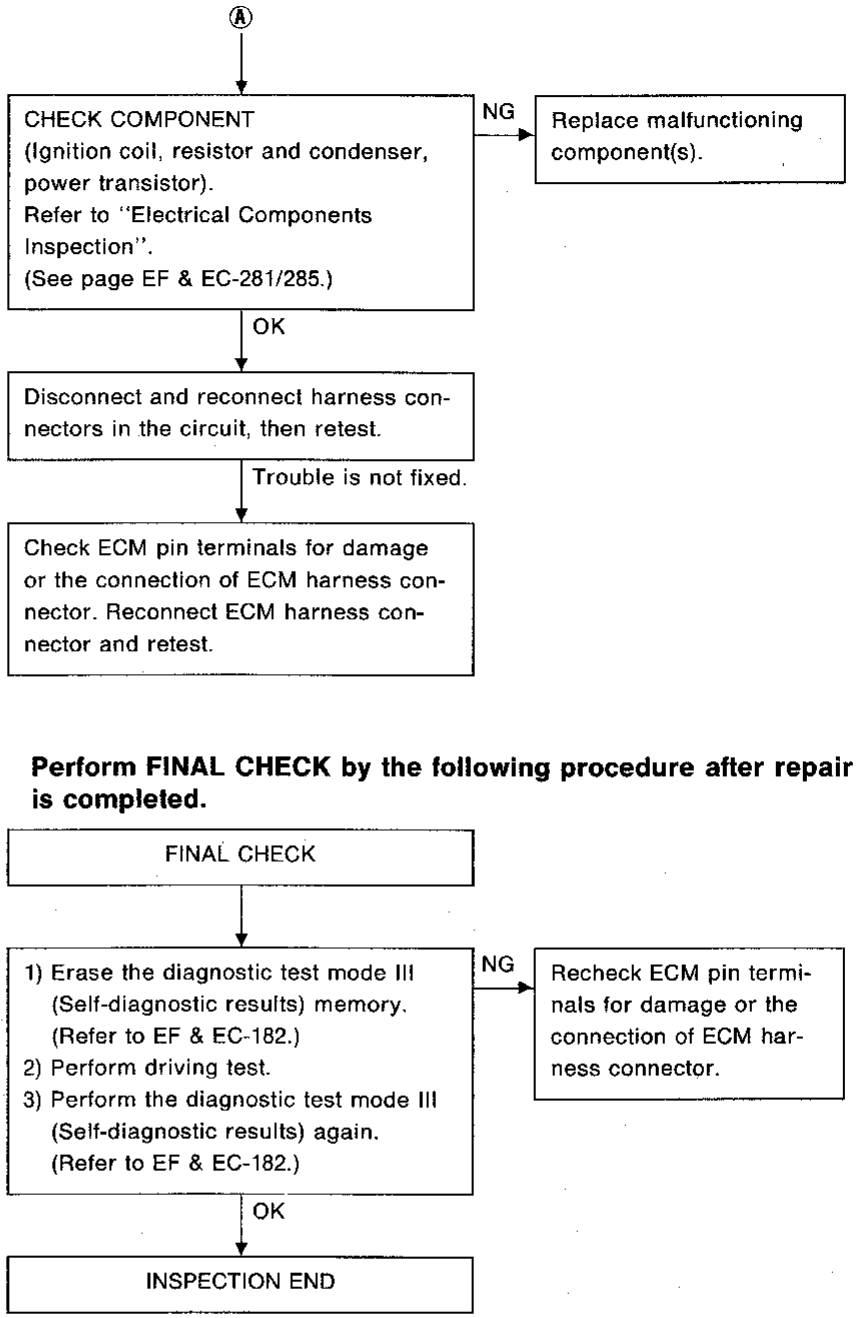
CHECK OUTPUT SIGNAL CIRCUIT.
1) Check harness continuity between terminal ⓒ and ECM terminal ①.
Continuity should exist.

NG → Repair harness or connectors.

OK

Ⓐ

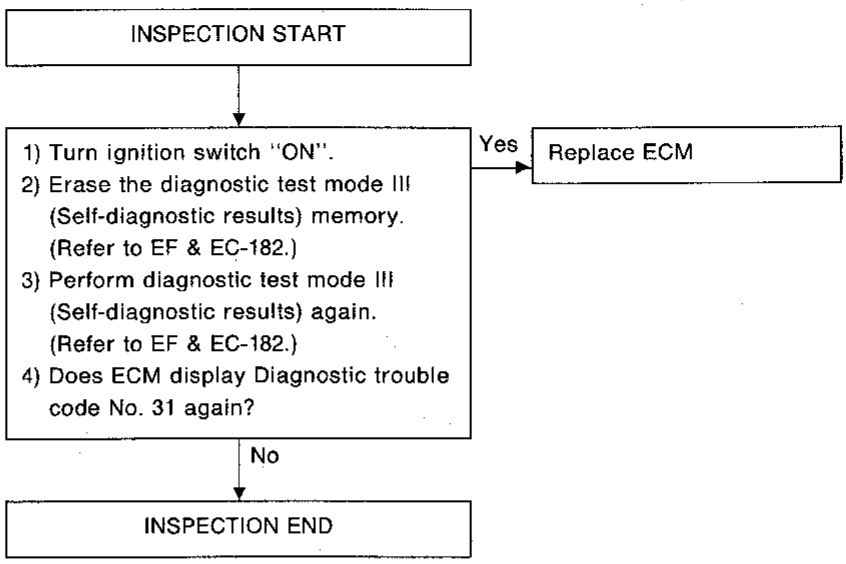
Diagnostic Procedure 27 (Cont'd)



Perform FINAL CHECK by the following procedure after repair is completed.

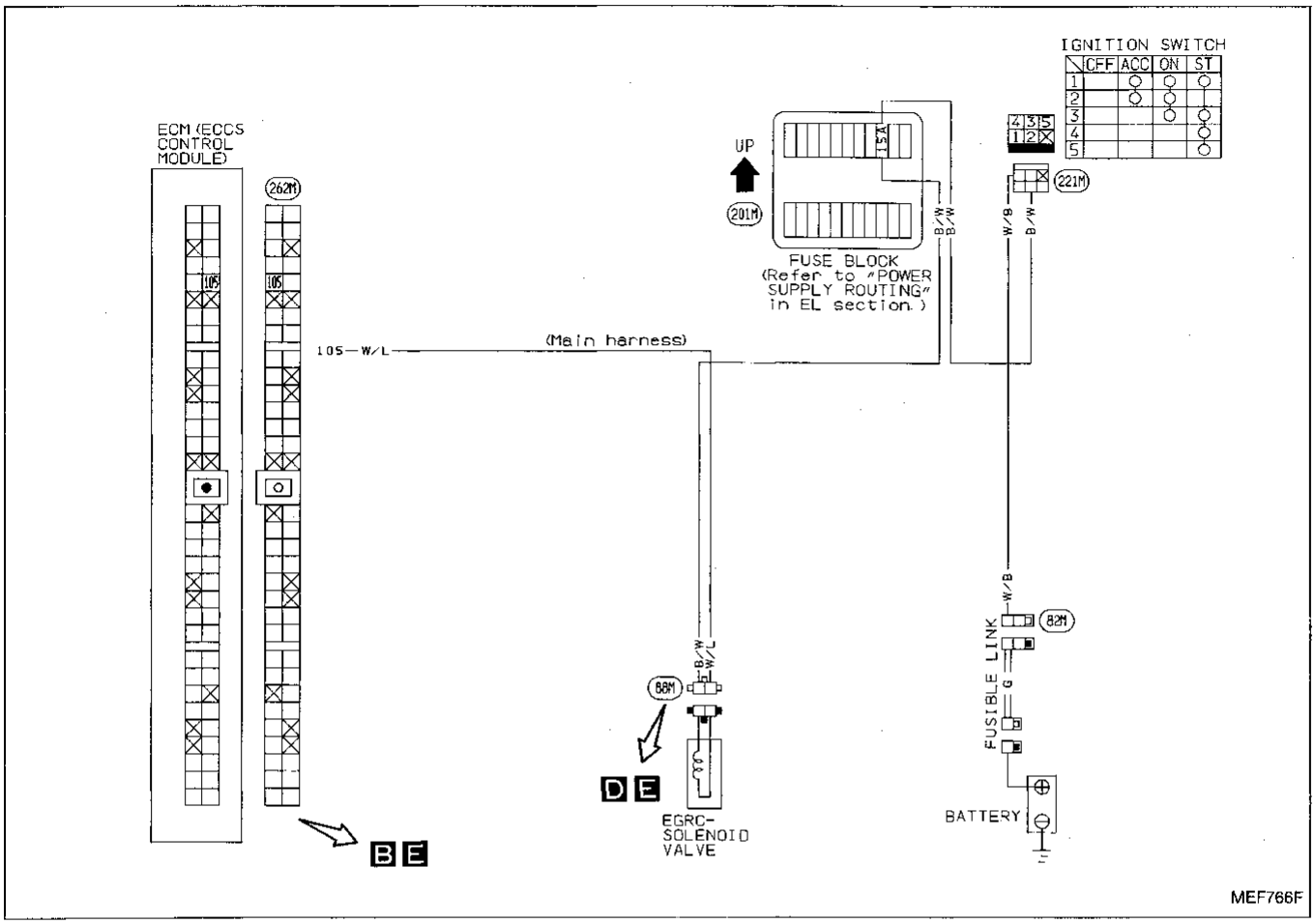
Diagnostic Procedure 28

ENGINE CONTROL MODULE (ECM) (Diagnostic trouble code No. 31) (MALFUNCTION INDICATOR LAMP ITEM)

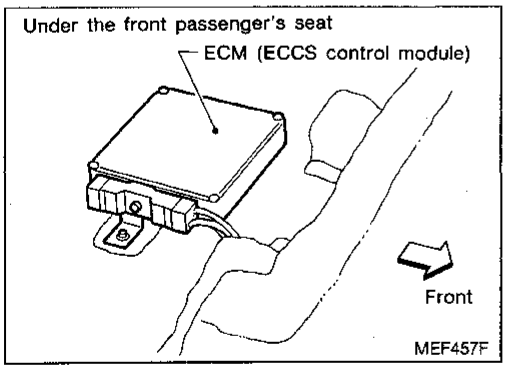


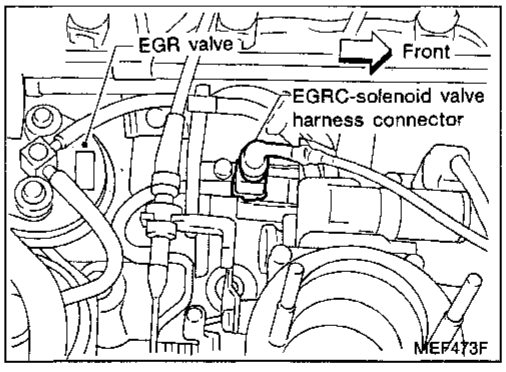
Diagnostic Procedure 29

EGR FUNCTION (Diagnostic trouble code No. 32) (MALFUNCTION INDICATOR LAMP ITEM)

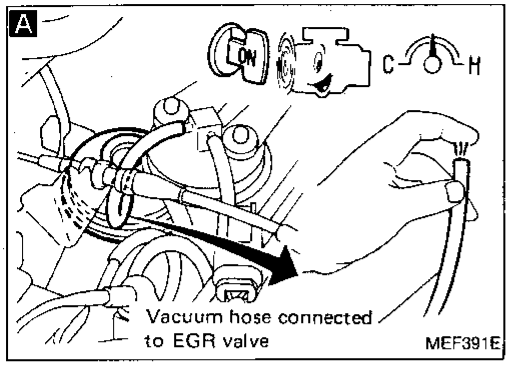


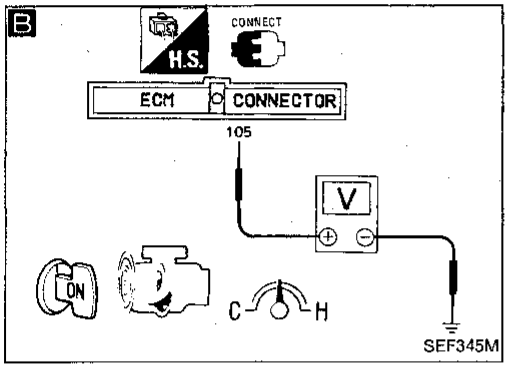
Harness layout

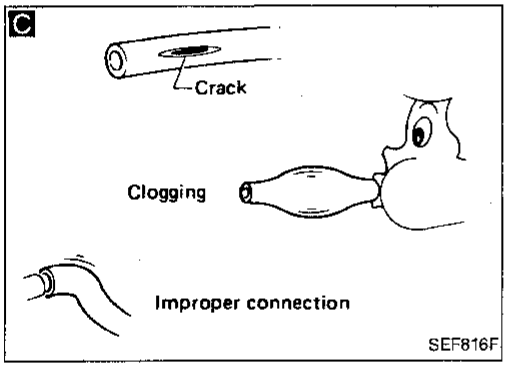


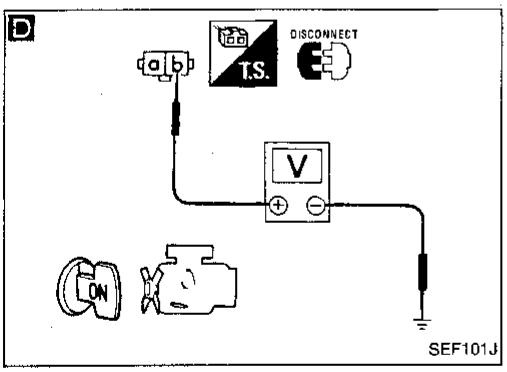


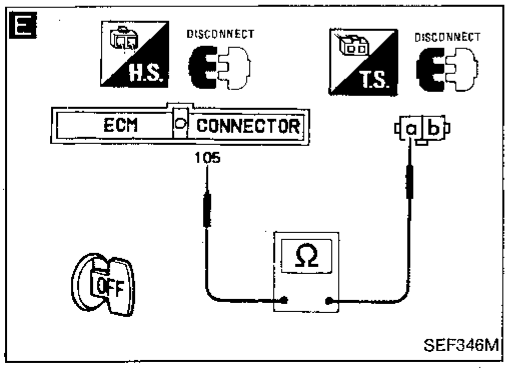
Diagnostic Procedure 29 (Cont'd)











INSPECTION START

A

CHECK VACUUM SOURCE TO EGR VALVE.
1) Start engine and warm it up sufficiently.
2) Perform diagnostic test mode III (self diagnostic results).
Make sure that diagnostic trouble code No. 12 is not displayed.
3) Keep engine speed at about 2,000 rpm.
4) Disconnect vacuum hose to EGR valve.
5) Make sure that vacuum exists.
Vacuum should exist.

OK → CHECK COMPONENTS (EGR valve, EGRC-BPT VALVE and EGR temperature sensor).
Refer to "Electrical Components Inspection".
(See page EF & EC-281/282.)

NG → Replace malfunctioning component(s).

NG

B

CHECK CONTROL FUNCTION.
1) Check voltage between ECM terminal (105) and ground under the following conditions.
Voltage:
At idle
Approximately 0V
Engine speed is about 2,000 rpm
Battery voltage

OK → **C**
CHECK VACUUM HOSE.
1) Check vacuum hose for clogging, cracks and proper connection.

NG

D

CHECK POWER SUPPLY.
1) Stop engine.
2) Disconnect EGRC-solenoid valve harness connector.
3) Turn ignition switch "ON".
4) Check voltage between terminal (b) and ground.
Voltage: Battery voltage

NG → Repair harness or connectors.

OK

E

CHECK OUTPUT SIGNAL CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect ECM harness connector.
3) Check harness continuity between ECM terminal (105) and terminal (a).
Continuity should exist.

NG → Repair harness or connectors.

OK

Ⓐ

Diagnostic Procedure 29 (Cont'd)

F ROAD TEST

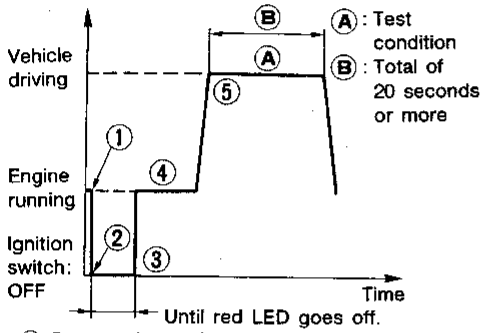
Test conditions

Drive vehicle under the following conditions with suitable gear position.

(1) Engine speed:
A/T models: 2,200 ± 200 rpm
M/T models: 2,500 ± 500 rpm

(2) Intake manifold vacuum:
2WD models with A/T:
−40.0 ± 4.0 kPa
(−300 ± 30 mmHg, −11.81 ± 1.18 inHg)
2WD models with M/T:
−46.7 ± 6.7 kPa
(−350 ± 50 mmHg, −13.78 ± 1.97 inHg)
4WD models:
−48.32 ± 5.00 kPa
(−362.5 ± 37.5 mmHg, −14.272 ± 1.476 inHg)

Driving mode

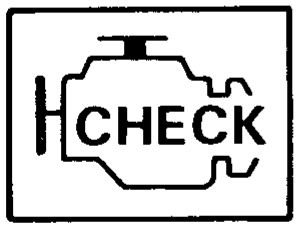


① Start engine and warm it up sufficiently.
② Turn off ignition switch and keep it off until red LED goes off.
③ Start engine and make sure that air conditioning switch and rear defogger are turned "OFF" during test drive.
④ Keep engine running for at least 4 minutes.
⑤ Shift to suitable gear position and drive in "Test condition" for a total 20 seconds or more.

Note: If engine stalls or ignition switch is turned off within step ⑤, return to step ②.

SEF560NA

G



MALFUNCTION INDICATOR LAMP

SEF177M

Ⓐ

CHECK COMPONENT (EGRC-solenoid valve).
Refer to "Electrical Components Inspection".
(See page EF & EC-282.)

NG → Replace EGRC-solenoid valve.

OK

Check resistance of EGR temperature sensor.
(See page EF & EC-282.)

Disconnect and reconnect harness connectors in the circuit, then retest.

Trouble is not fixed.

Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

Perform FINAL CHECK by the following procedure after repair is completed.

FINAL CHECK

Erase the diagnostic test mode III (Self-diagnostic results) memory.
(Refer to EF & EC-182.)

F

Perform driving test under the following conditions.
1) Warm up engine sufficiently.
2) Use test driving modes indicated in figure **F** .

G

Make sure that malfunction indicator lamp does not come on during driving test.

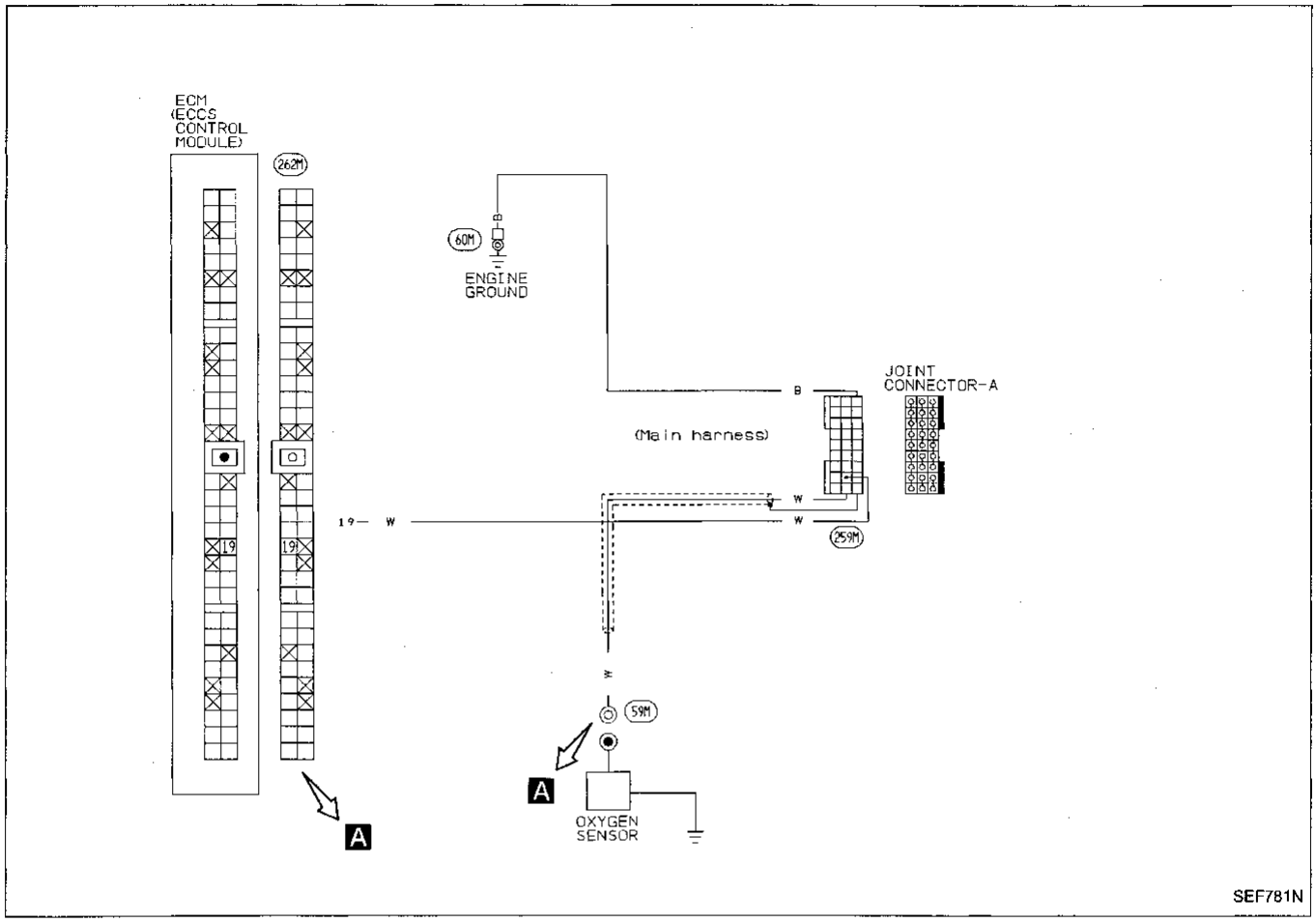
Comes on. → Recheck ECM pin terminals for damage or the connection of ECM harness connector.

Does not come on.

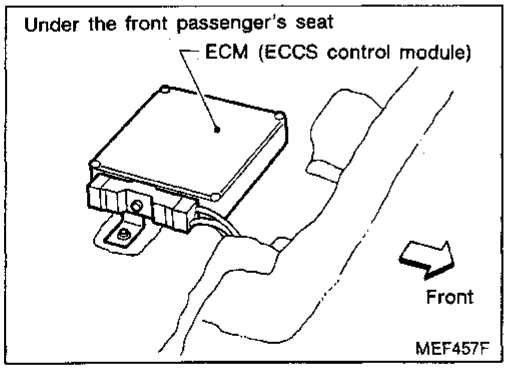
INSPECTION END

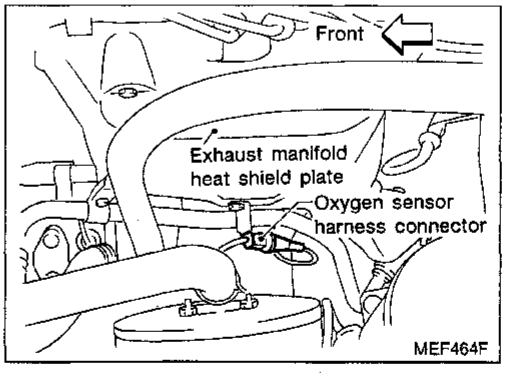
Diagnostic Procedure 30

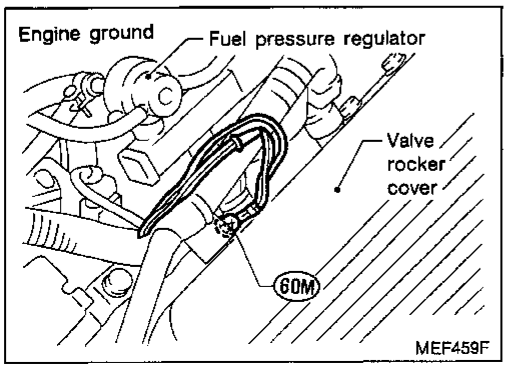
OXYGEN SENSOR (Diagnostic trouble code No. 33) CHECK (MALFUNCTION INDICATOR LAMP ITEM)



Harness layout

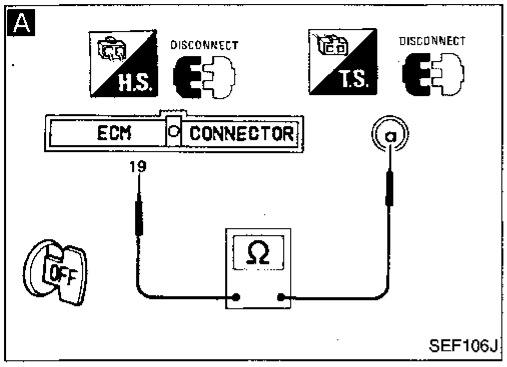






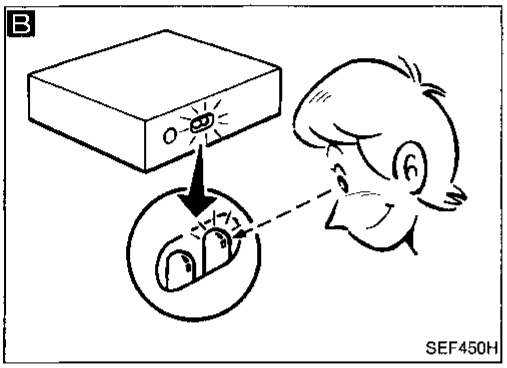
Diagnostic Procedure 30 (Cont'd)

A



SEF106J

B



SEF450H

INSPECTION START

Loosen and retighten ground screw.

A

CHECK INPUT SIGNAL CIRCUIT.
1) Disconnect ECM harness connector and oxygen sensor harness connector.
2) Check harness continuity between terminal ⓐ and ECM terminal ⑲.
Continuity should exist.

NG → Check the following.
- Joint connector-A (259M)
- Harness continuity between ECM and oxygen sensor

If NG, repair harness or connectors.

OK

B

CHECK COMPONENT
(Oxygen sensor).
Make sure that inspection lamp (Green) on ECM goes on and off periodically more than 5 times during 10 seconds at 2,000 rpm under no-load.

NG → Replace oxygen sensor.

OK

Disconnect and reconnect harness connectors in the circuit, then retest.

Trouble is not fixed.

Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

Perform FINAL CHECK by the following procedure after repair is completed.

FINAL CHECK

1) Erase the diagnostic test mode III (Self-diagnostic results) memory. (Refer to EF & EC-182.)
2) Perform driving test.
3) Perform the diagnostic test mode III (Self-diagnostic results) again. (Refer to EF & EC-182.)

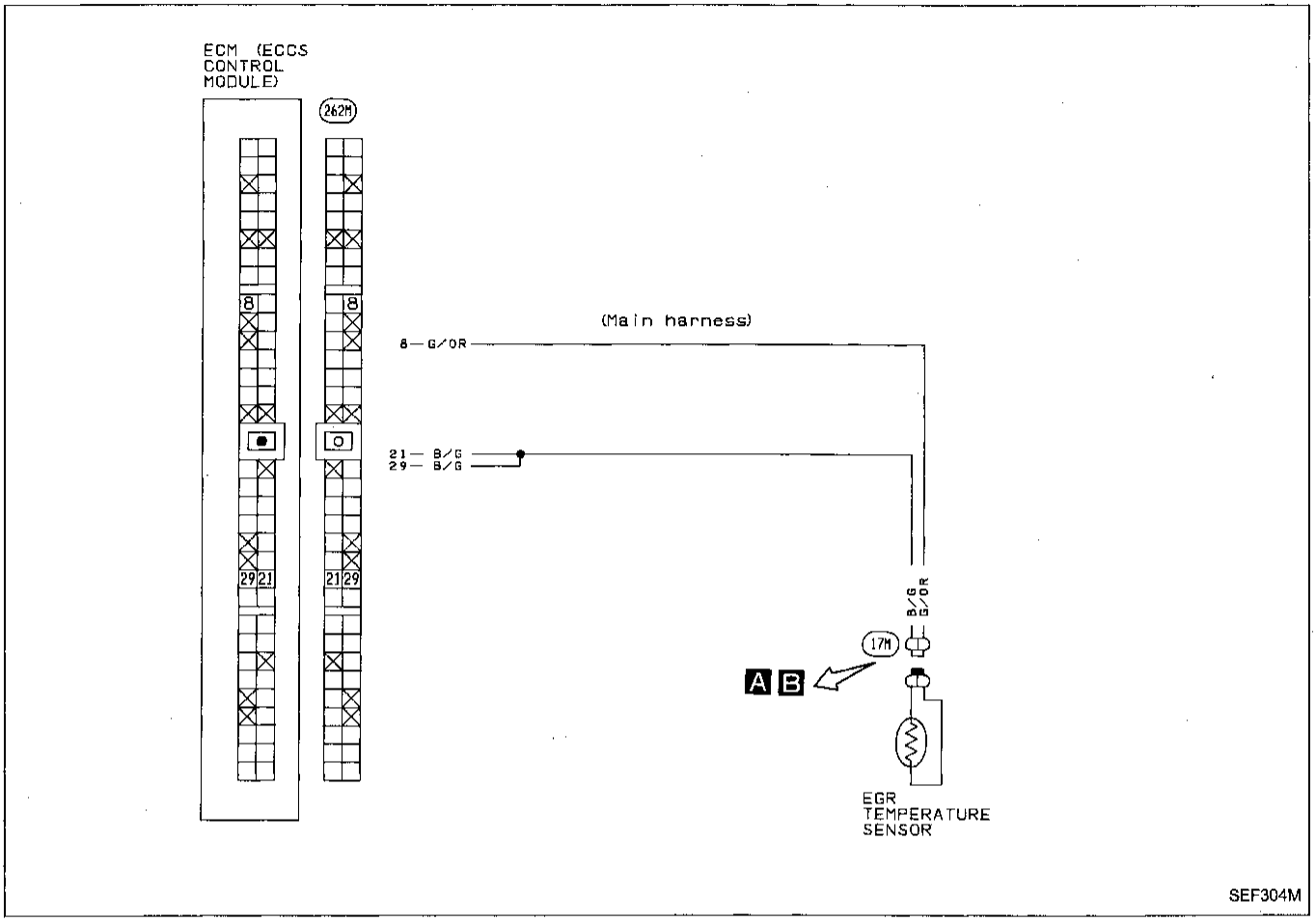
NG → Recheck ECM pin terminals for damage or the connection of ECM harness connector.

OK

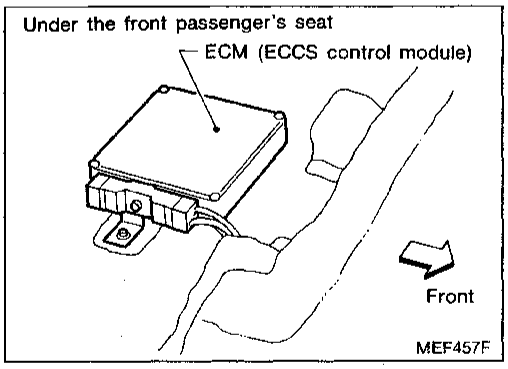
INSPECTION END

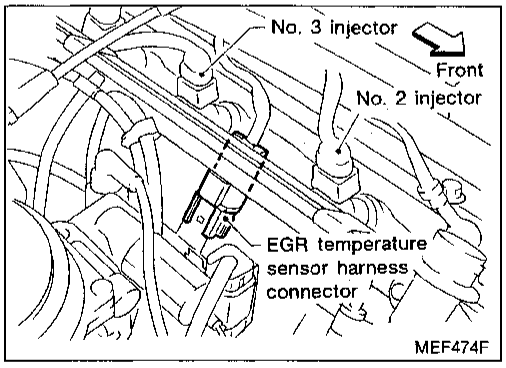
Diagnostic Procedure 31

EGR TEMPERATURE SENSOR (Diagnostic trouble code No. 35) CHECK (MALFUNCTION INDICATOR LAMP ITEM)

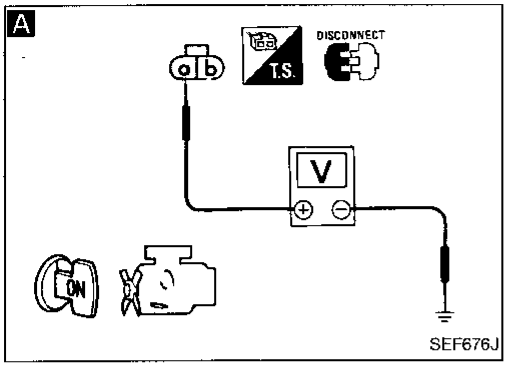


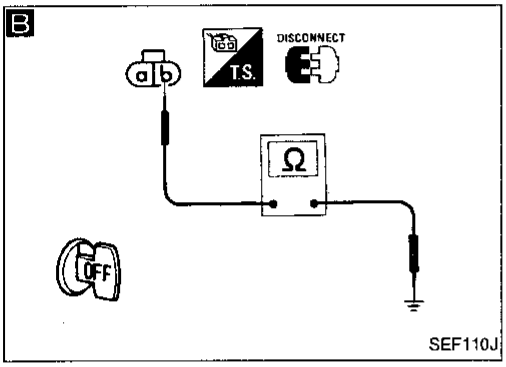
Harness layout





Diagnostic Procedure 31 (Cont'd)





INSPECTION START

A

CHECK POWER SUPPLY.
1) Disconnect EGR temperature sensor harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓐ and ground.
Voltage: Approximately 5V

NG → Repair harness or connectors.

OK

B

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Check harness continuity between terminal ⓑ and engine ground.
Continuity should exist.

NG → Repair harness or connectors.

OK

CHECK COMPONENT
(EGR temperature sensor).
Refer to "Electrical Components Inspection".
(See page EF & EC-282.)

NG → Replace EGR temperature sensor.

OK

Disconnect and reconnect harness connectors in the circuit, then retest.

Trouble is not fixed.

Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

Perform FINAL CHECK by the following procedure after repair is completed.

FINAL CHECK

1) Erase the diagnostic test mode III (Self-diagnostic results) memory. (Refer to EF & EC-182.)
2) Start engine and warm it up sufficiently.
3) Perform driving test for more than 10 minutes.
4) Perform the diagnostic test mode III (Self-diagnostic results) again. (Refer to EF & EC-182.)

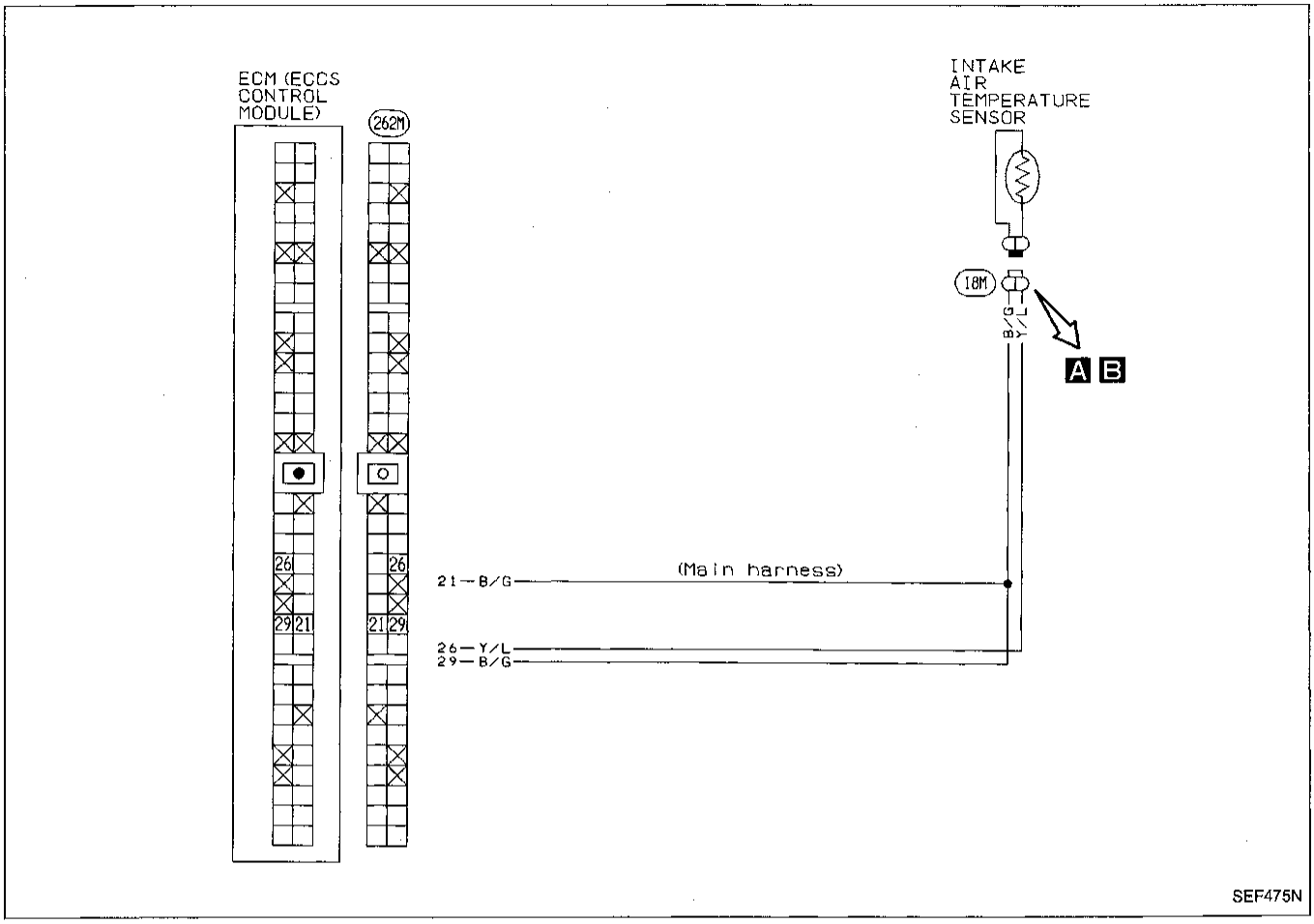
NG → Recheck ECM pin terminals for damage or the connection of ECM harness connector.

OK

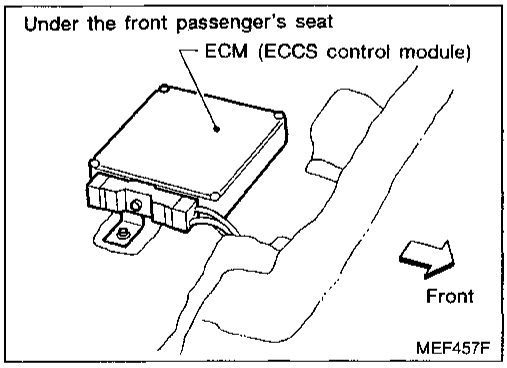
INSPECTION END

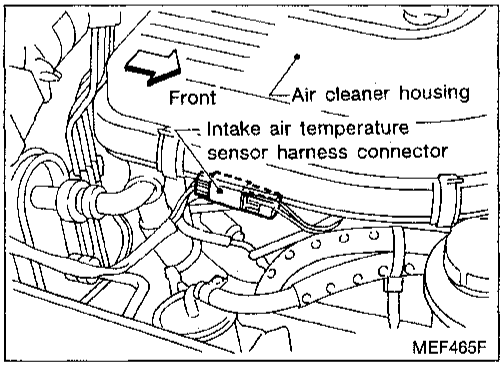
Diagnostic Procedure 32

INTAKE AIR TEMPERATURE SENSOR (Diagnostic trouble code No. 41)

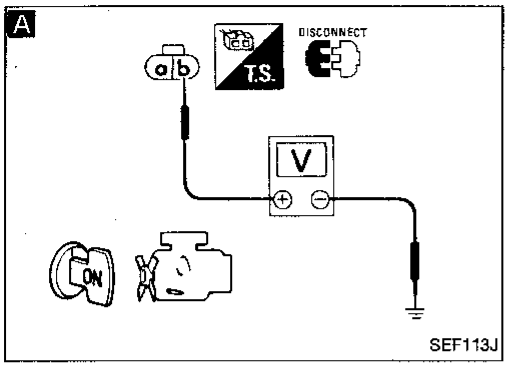


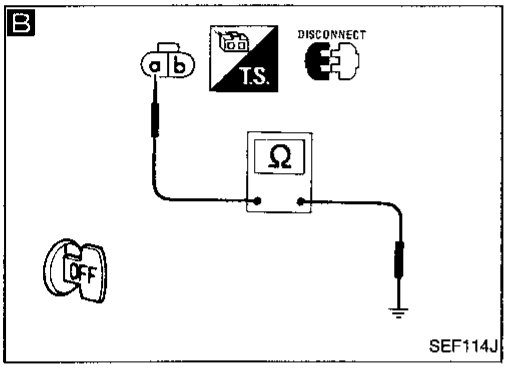
Harness layout





Diagnostic Procedure 32 (Cont'd)





INSPECTION START

A

CHECK POWER SUPPLY.
1) Disconnect intake air temperature sensor harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓑ and ground.
Voltage: Approximately 5V

NG → Repair harness or connectors.

OK

B

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Check harness continuity between terminal ⓐ and engine ground.
Continuity should exist.

NG → Repair harness or connectors.

OK

CHECK COMPONENT
(Intake air temperature sensor).
Refer to "Electrical Components Inspection".
(See page EF & EC-285.)

NG → Replace intake air temperature sensor.

OK

Disconnect and reconnect harness connectors in the circuit, then retest.

Trouble is not fixed.

Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

Perform FINAL CHECK by the following procedure after repair is completed.

FINAL CHECK

1) Erase the diagnostic test mode III (Self-diagnostic results) memory. (Refer to EF & EC-182.)
2) Perform driving test.
3) Perform the diagnostic test mode III (Self-diagnostic results) again. (Refer to EF & EC-182.)

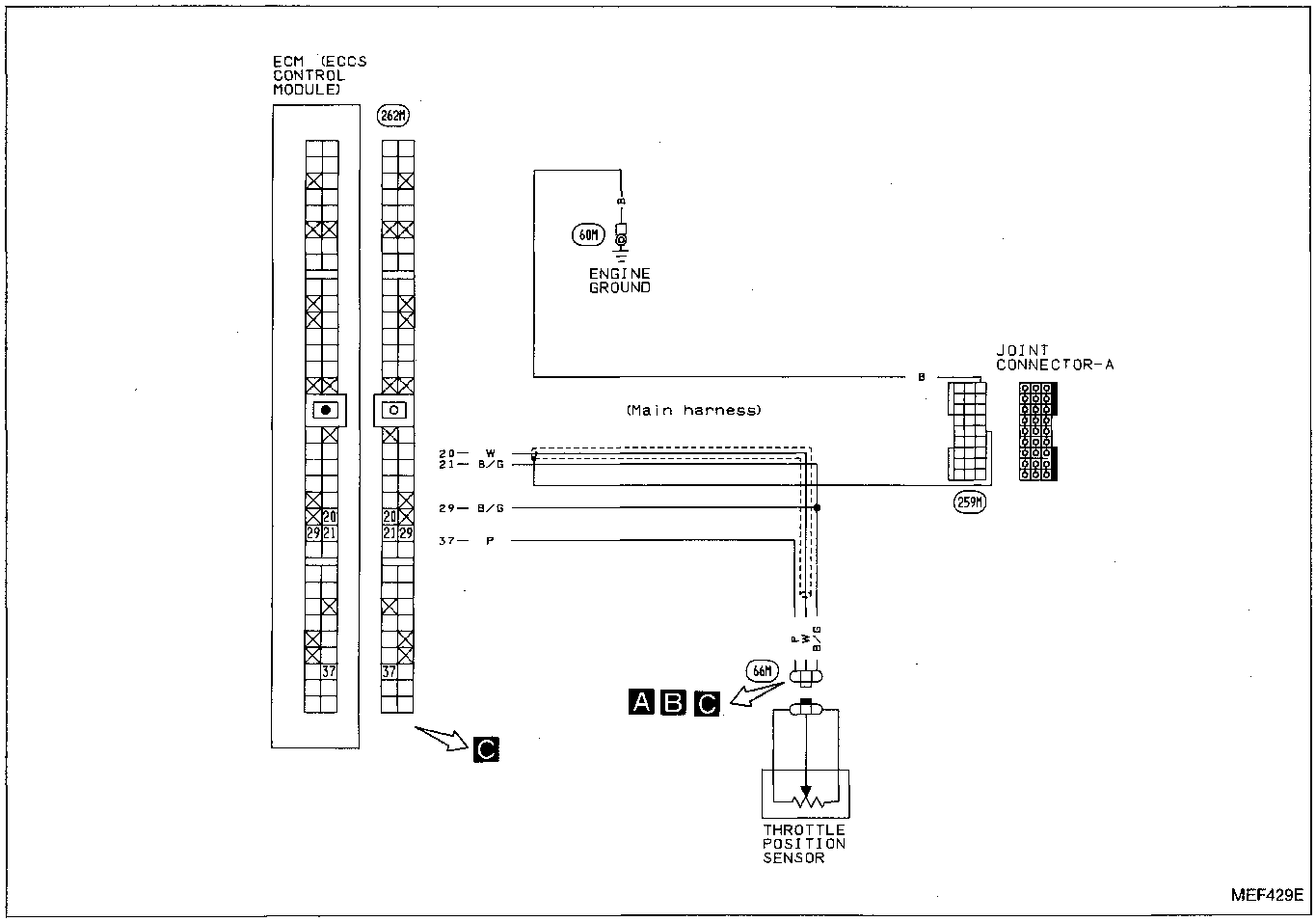
NG → Recheck ECM pin terminals for damage or the connection of ECM harness connector.

OK

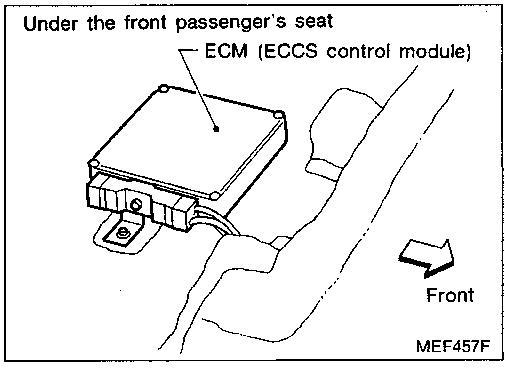
INSPECTION END

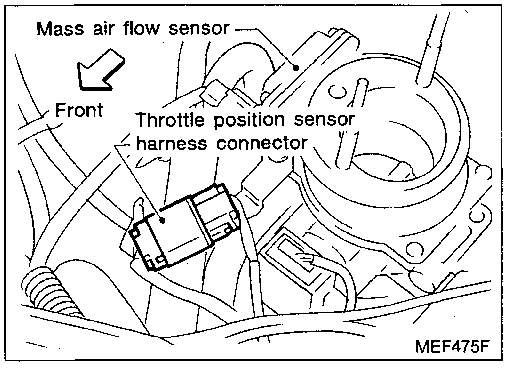
Diagnostic Procedure 33

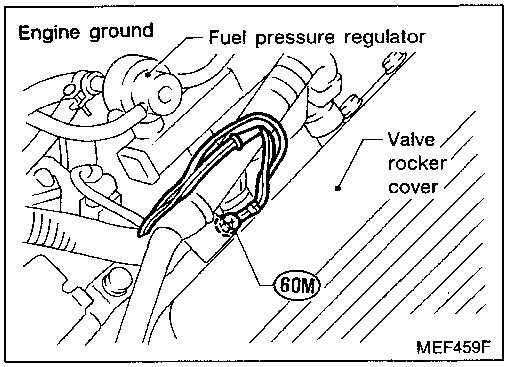
THROTTLE POSITION SENSOR (Diagnostic trouble code No. 43) CHECK (MALFUNCTION INDICATOR LAMP ITEM)



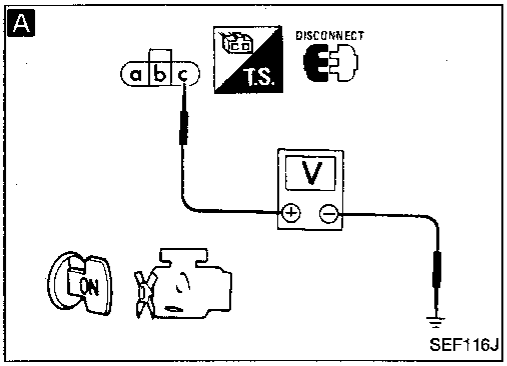
Harness layout

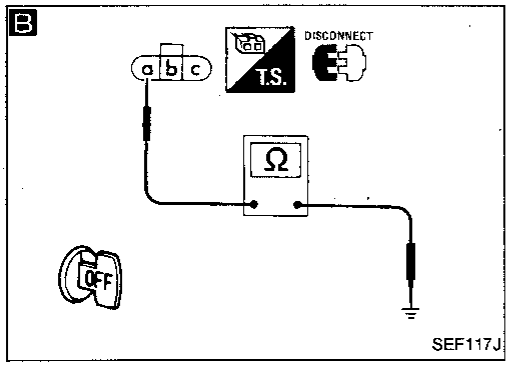


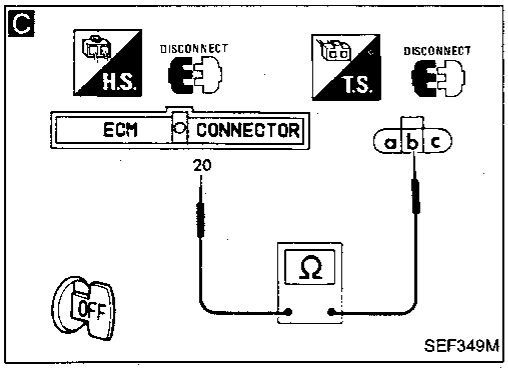




Diagnostic Procedure 33 (Cont'd)







INSPECTION START

A

CHECK POWER SUPPLY.
1) Disconnect throttle position sensor harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓒ and ground.
Voltage: Approximately 5V

NG → Repair harness or connectors.

OK

B

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Loosen and retighten ground screw.
3) Check harness continuity between terminal ⓐ and engine ground.
Continuity should exist.

NG → Repair harness or connectors.

OK

C

CHECK INPUT SIGNAL CIRCUIT.
1) Disconnect ECM harness connector.
2) Check harness continuity between ECM terminal ⑳ and terminal ⓑ.
Continuity should exist.

NG → Repair harness or connectors.

OK

CHECK COMPONENT
(Throttle position sensor).
Refer to "Electrical Components Inspection".
(See page EF & EC-282.)

NG → Replace throttle position sensor.

OK

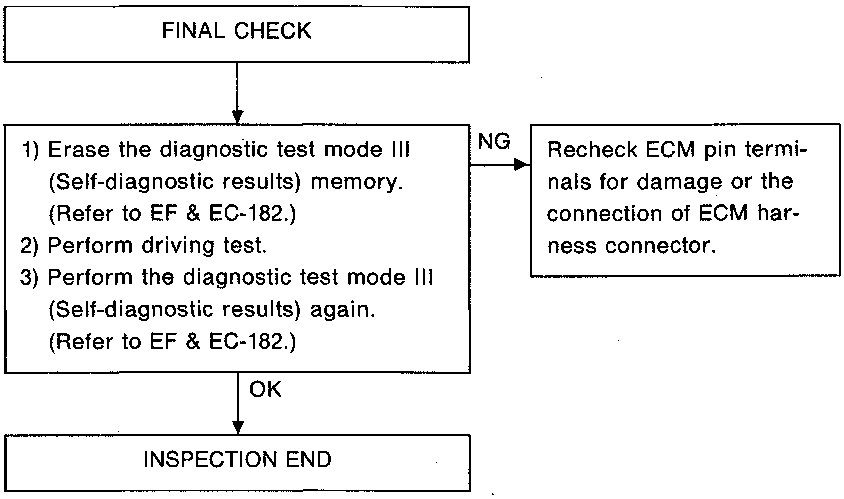
Disconnect and reconnect harness connectors in the circuit, then retest.

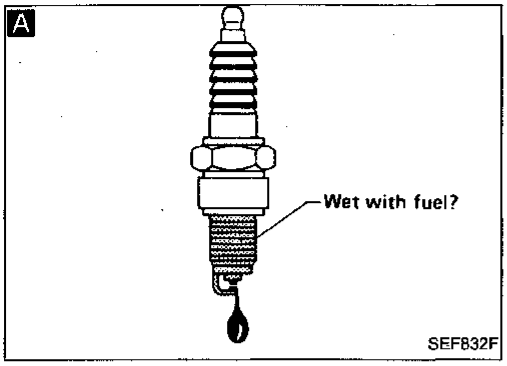
Trouble is not fixed.

Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

Diagnostic Procedure 33 (Cont'd)

Perform FINAL CHECK by the following procedure after repair is completed.





Diagnostic Procedure 34

INJECTOR LEAK (Diagnostic trouble code No. 45)
CHECK (MALFUNCTION INDICATOR LAMP ITEM)

INSPECTION START

Start engine and warm it up sufficiently.

Make sure engine runs smoothly at idle after warming.

Runs smoothly.

Does not run smoothly.

Set the diagnostic test mode selector of ECM to Diagnostic Test Mode I.

Check if the green inspection lamp on ECM stays off during 10 seconds at idle condition.

Stay off.

Does not stay off.

Check mixture ratio feedback system. (See page EF & EC-166.)

Race engine two or three times under no-load, then run engine at idle speed.

Set Diagnostic Test Mode III and check that red and green inspection lamps on ECM blink almost simultaneously at 2,000 rpm under no-load. (Refer to EF & EC-182.)

Does not blink.

Blinks.

Check idle CO%. (See page EF & EC-166.)

INSPECTION END

A

Remove all spark plugs from cylinder head. Is any plug wet with fuel?

Yes

Replace injector which supply cylinders having wet spark plugs.

No

Remove injector assembly. (See page EF & EC-287.) Keep fuel hoses and all injectors connected to injector gallery.

Ⓐ

Diagnostic Procedure 34 (Cont'd)

B

ROAD TEST

Test conditions

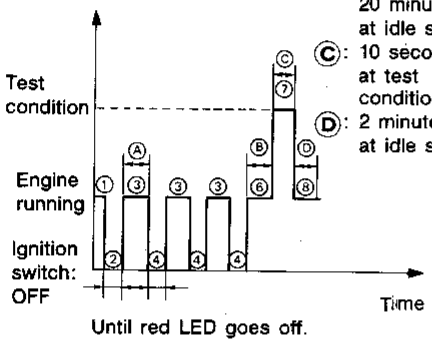
Drive vehicle under the following conditions with suitable gear position.

(1) Engine speed:
1,950 ± 450 rpm

(2) Intake manifold vacuum:
2WD models:
−58.32 ± 8.33 kPa
(−437.5 ± 62.5 mmHg, −17.224 ± 2.461 inHg)
4WD models:
−63.3 ± 10.0 kPa
(−475 ± 75 mmHg, −18.70 ± 2.95 inHg)

Driving mode

Ⓐ: More than 13 minutes
Ⓑ: More than 20 minutes at idle speed
Ⓒ: 10 seconds at test condition
Ⓓ: 2 minutes at idle speed



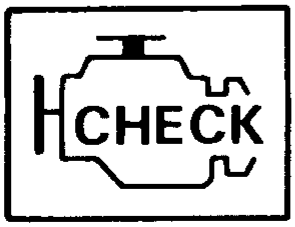
Until red LED goes off.

① Start engine and warm it up sufficiently.
② Turn off ignition switch and keep it off until red LED goes off.
③ Start engine and keep it running for more than 13 minutes.
④ Turn off ignition switch and keep it off until red LED goes off.
⑤ Repeat steps ③ through ④ for a total of 3 times.
⑥ Start engine and keep it at idle for more than 20 minutes.
If engine stalls or ignition turns off within 13 minutes after engine is started, return to step ②. If over 13 minutes, restart step ⑥.
⑦ Shift to suitable gear position and drive in "Test condition" for at least 10 seconds.
If the following conditions occur during step ⑦, return to step ⑥.
- Engine races over 4,000 rpm or hardly accelerates for more than 10 seconds.
- Engine stalls or ignition turns off.

⑧ Keep engine at idle speed for more than 2 minutes.

SEF834N

C



MALFUNCTION INDICATOR LAMP

SEF177M

Ⓐ

Turn ignition switch "ON".
Make sure fuel does not drip from injector.

Drips. → Replace the injectors from which fuel is dripping.

Does not drip.

Go to FINAL CHECK.

Perform FINAL CHECK by the following procedure after repair is completed.

FINAL CHECK

Clear the self-learning data using the following procedure.
1) Start engine and warm it up sufficiently.
2) First disconnect mass air flow sensor connector, and start and run engine for at least 30 seconds at 2,000 rpm
3) Stop engine and reconnect mass air flow sensor connector.
4) Make sure Diagnostic trouble code No. 12 is displayed in Diagnostic Test Mode III.
5) Erase the diagnostic test mode III (Self-diagnostic results) memory.
Make sure Diagnostic trouble code No. 55 is displayed in Diagnostic Test Mode III.
(Refer to EF & EC-182.)

B

Perform test drive as indicated in figure **B** .

C

Make sure that malfunction indicator lamp does not come on during test.

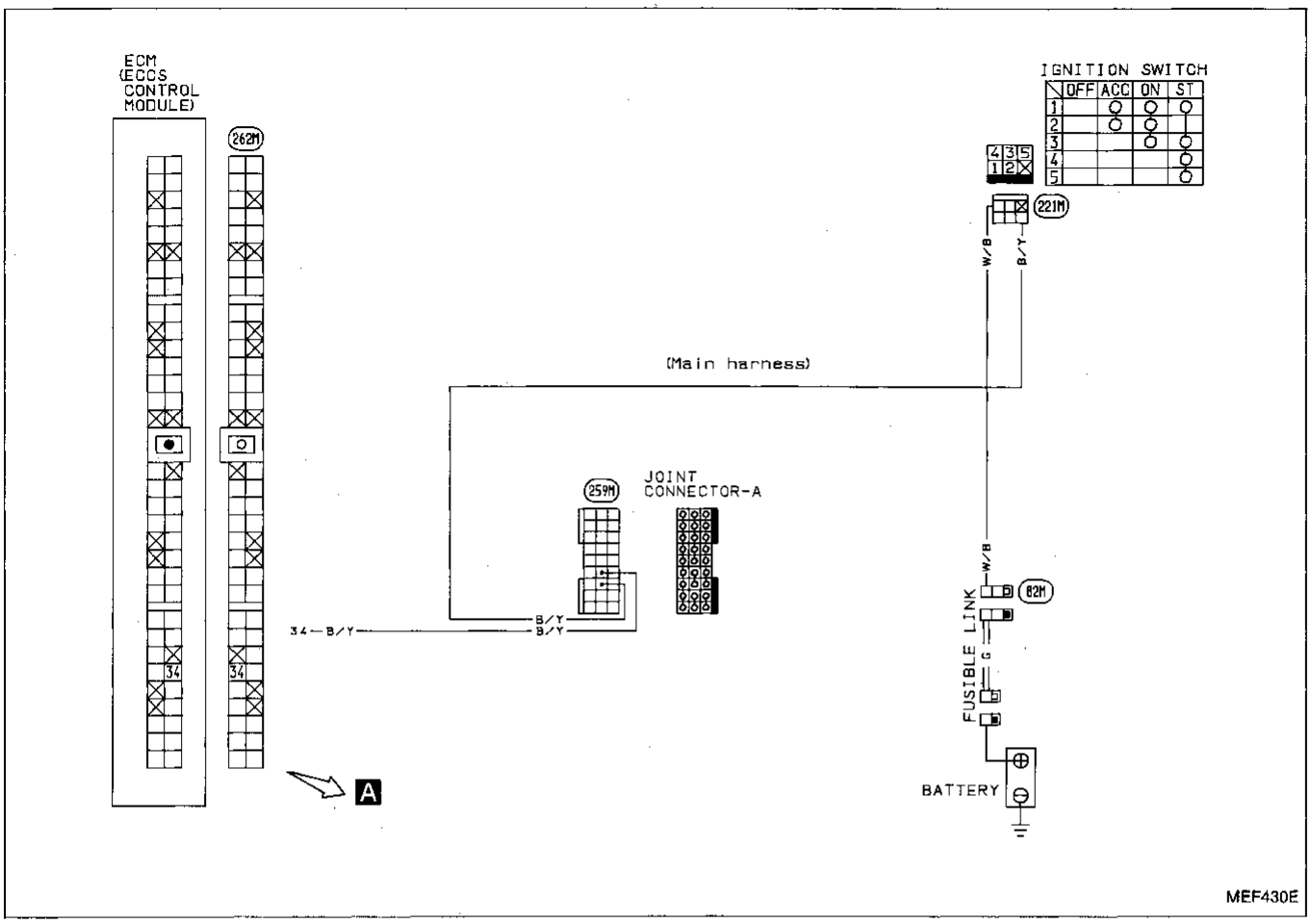
Comes on. → Recheck ECM pin terminals for damage or the connection of ECM harness connector.

Does not come on.

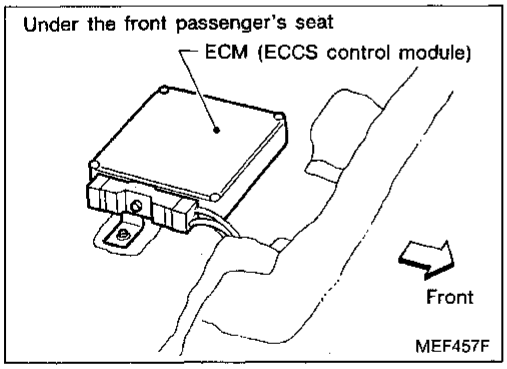
INSPECTION END

Diagnostic Procedure 35

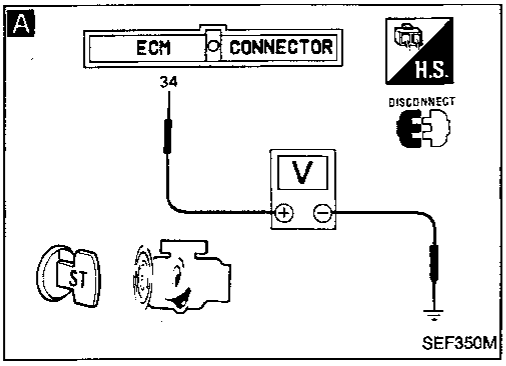
START SIGNAL (Switch ON/OFF diagnostic item)



Harness layout



Diagnostic Procedure 35 (Cont'd)



INSPECTION START

A

CHECK INPUT SIGNAL CIRCUIT.
1) Disconnect ECM harness connector.
2) Turn ignition switch to "ST".
3) Check voltage between ECM terminal ㉞ and ground.
Voltage: Battery voltage

NG → Check the following.
- Joint connector-A (259M)
- Harness continuity between ECM and ignition switch

If NG, repair harness or connectors.

OK ↓

Disconnect and reconnect harness connectors in the circuit, then retest.

Trouble is not fixed. ↓

Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

Perform FINAL CHECK by the following procedure after repair is completed.

FINAL CHECK

1) Turn ignition switch "ON".
2) Perform the diagnostic test mode IV (switches ON/OFF diagnosis). (Refer to EF & EC-186.)

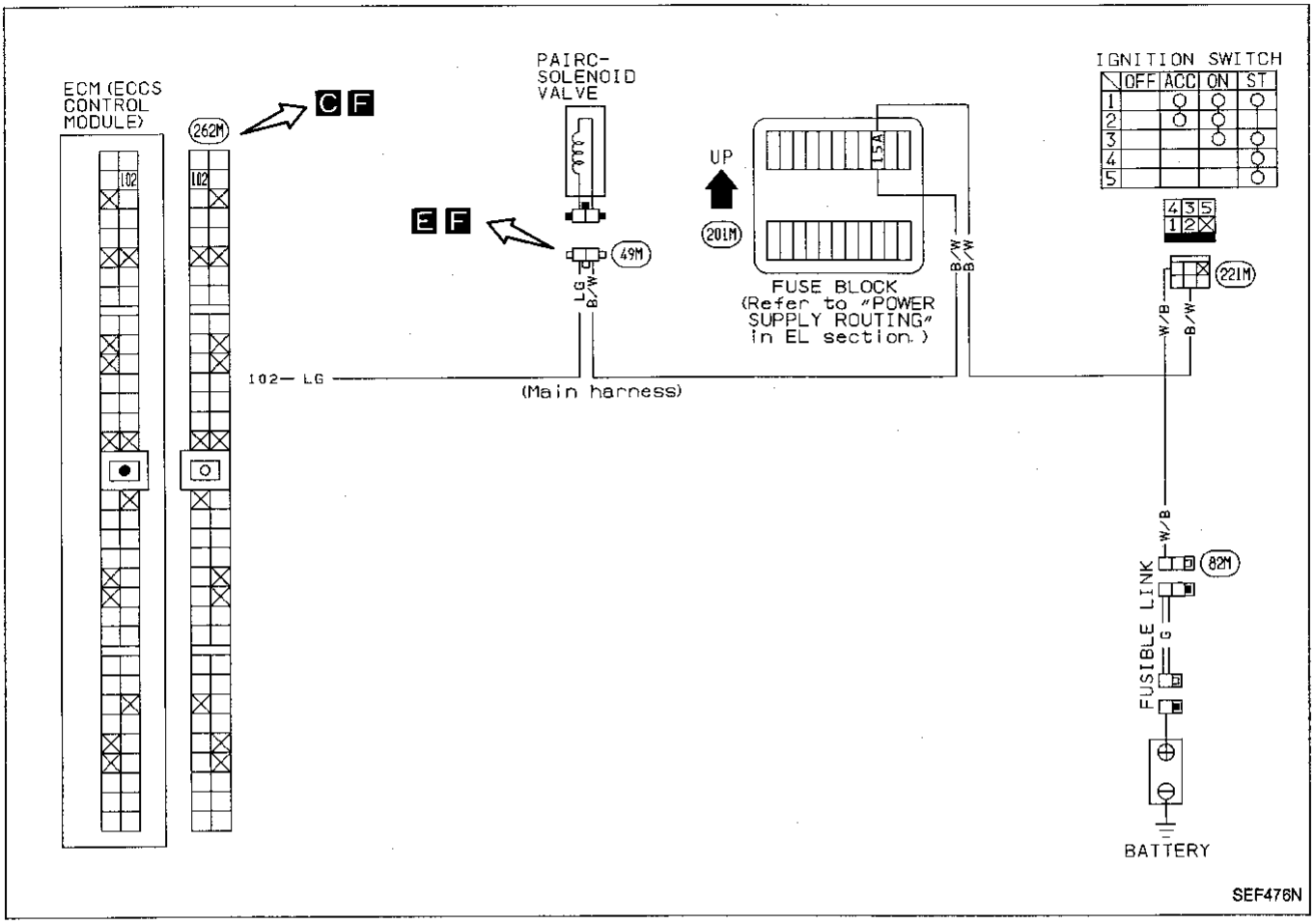
NG → Recheck ECM pin terminals for damage or the connection of ECM harness connector.

OK ↓

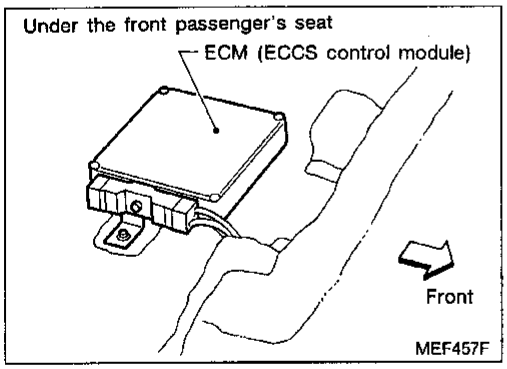
INSPECTION END

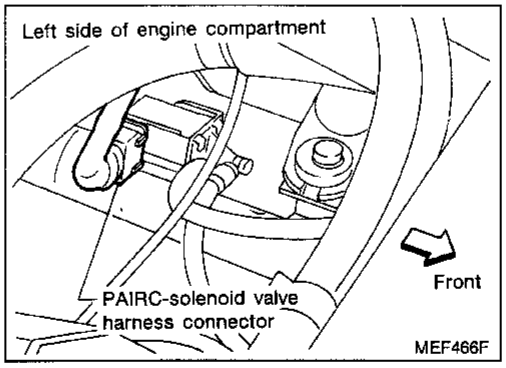
Diagnostic Procedure 36

PAIR VALVE SYSTEM (Not self-diagnostic item)

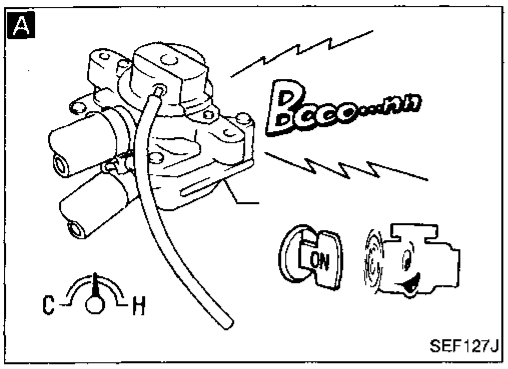


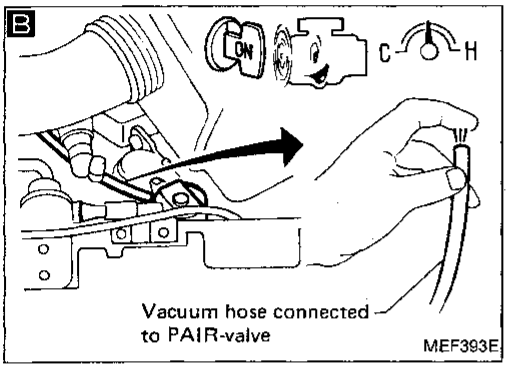
Harness layout

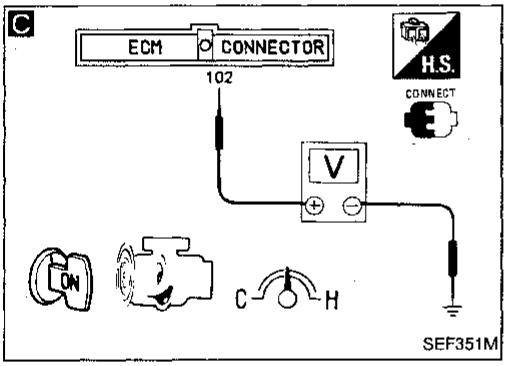


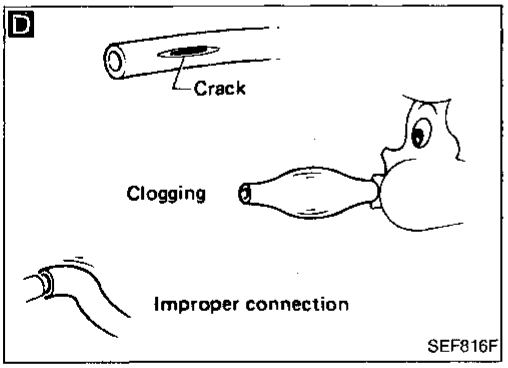


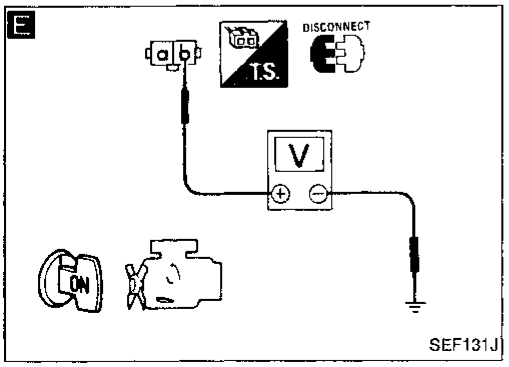
Diagnostic Procedure 36 (Cont'd)











INSPECTION START

A

CHECK OVERALL FUNCTION.
1) Start engine and warm it up sufficiently.
2) Run engine at about 2,000 rpm for about 2 minutes under no-load.
3) Make sure that inspection lamp (Green) on ECM goes on and off periodically more than 5 times during 10 seconds at 2,000 rpm under no-load.
4) Release accelerator pedal fully, and run engine at idle.
5) Listen to PAIR valve operating sound.

At idle:
PAIR valve should operate.
Except at idle:
PAIR valve should not operate.

OK → INSPECTION END

NG

B

CHECK VACUUM SOURCE TO PAIR VALVE.
1) Disconnect vacuum hose to PAIR valve.
2) Make sure that vacuum exists under the following conditions.

At idle:
Vacuum should exist.
Except at idle:
Vacuum should not exist.

OK → CHECK COMPONENTS (PAIR valve)
Refer to "Electrical Components Inspection".
(See page EF & EC-284.)

NG

C

CHECK CONTROL FUNCTION.
1) Check voltage between ECM terminal (102) and ground.

Voltage:
At idle
Approximately 0V
Except at idle
Battery voltage

OK → D

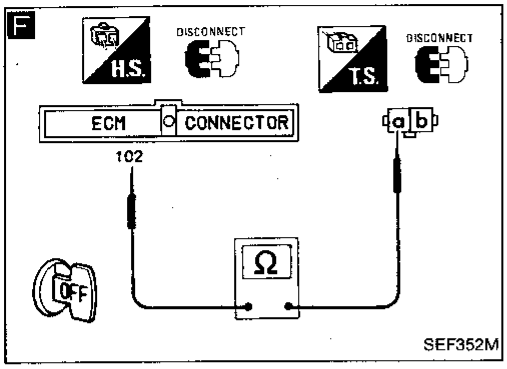
D

CHECK VACUUM HOSE.
Check vacuum hose for clogging, cracks and proper connections.

NG

Ⓐ

Diagnostic Procedure 36 (Cont'd)



Ⓐ

E

CHECK POWER SUPPLY.
1) Stop engine.
2) Disconnect PAIRC-solenoid valve harness connector.
3) Turn ignition switch "ON".
4) Check voltage between terminal ⓑ and ground.
Voltage: Battery voltage

NG → Repair harness or connectors.

OK ↓

F

CHECK OUTPUT SIGNAL CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect ECM harness connector.
3) Check harness continuity between ECM terminal (102) and terminal ⓐ.
Continuity should exist.

NG → Repair harness or connectors.

OK ↓

CHECK COMPONENTS (PAIRC-solenoid valve).
Refer to "Electrical Components Inspection".
(See page EF & EC-282.)

NG → Replace PAIRC-solenoid valve.

OK ↓

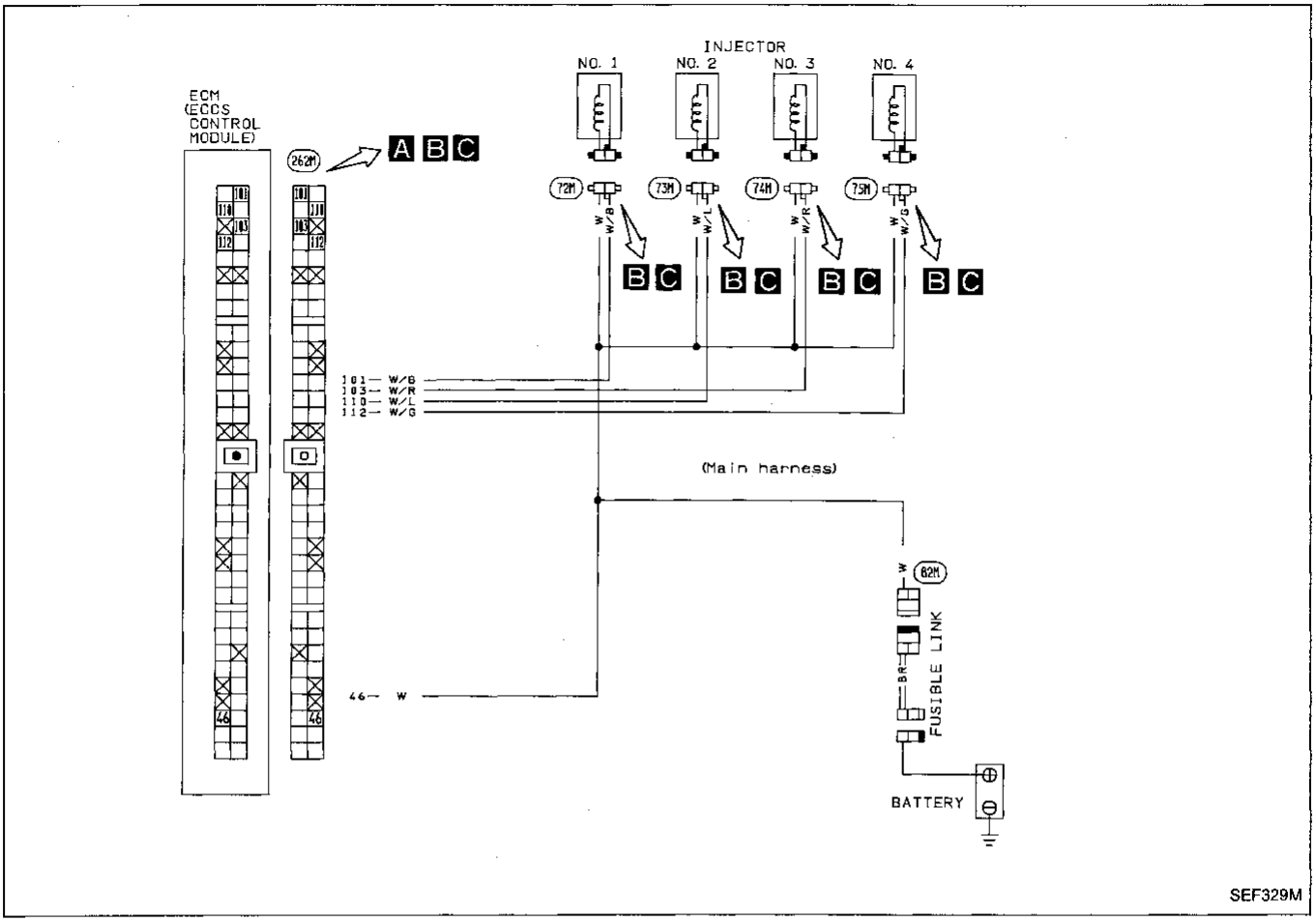
Disconnect and reconnect harness connectors in the circuit, then retest.

Trouble is not fixed. ↓

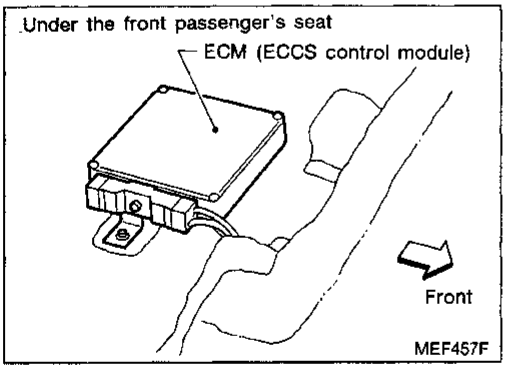
Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

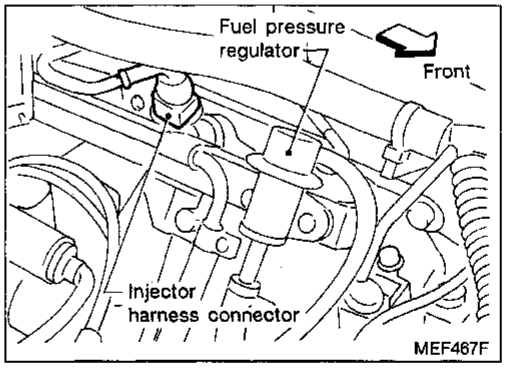
Diagnostic Procedure 37

INJECTOR (Not self-diagnostic item)

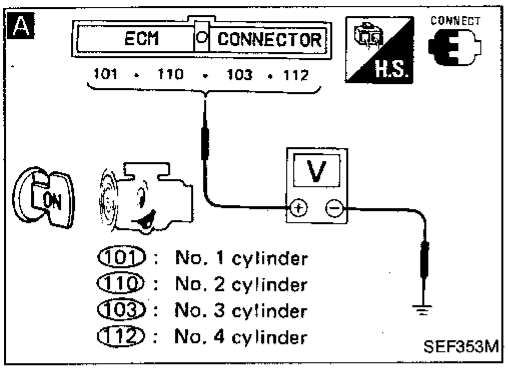


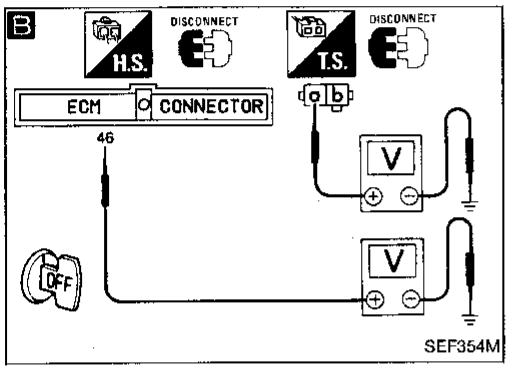
Harness layout

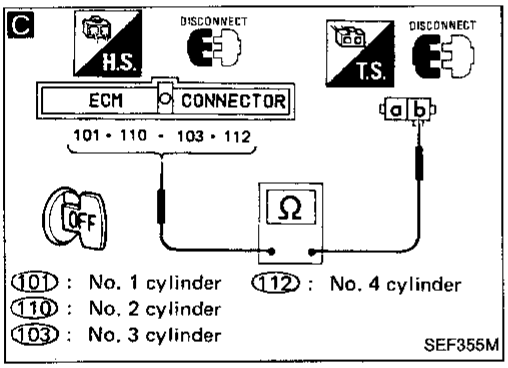




Diagnostic Procedure 37 (Cont'd)







INSPECTION START

A

CHECK CONTROL FUNCTION.
1) Start engine.
2) Check voltage between ECM terminals (101), (110), (103), (112) and ground.
Voltage: Battery voltage

OK → INSPECTION END

NG

B

CHECK POWER SUPPLY.
1) Stop engine.
2) Disconnect injector harness connector and ECM harness connector.
3) Check voltage between terminal (a) and ground, ECM terminal (46) and ground.
Voltage: Battery voltage

NG → Repair harness or connectors.

OK

C

CHECK OUTPUT SIGNAL CIRCUIT.
1) Check harness continuity between terminal (b) and ECM terminals (101) (No. 1 cylinder), (110) (No. 2 cylinder), (103) (No. 3 cylinder), (112) (No. 4 cylinder).
Continuity should exist.

NG → Repair harness or connectors.

OK

CHECK COMPONENT
(Injector).
Refer to "Electrical Components Inspection".
(See page EF & EC-283.)

NG → Replace injector.

OK

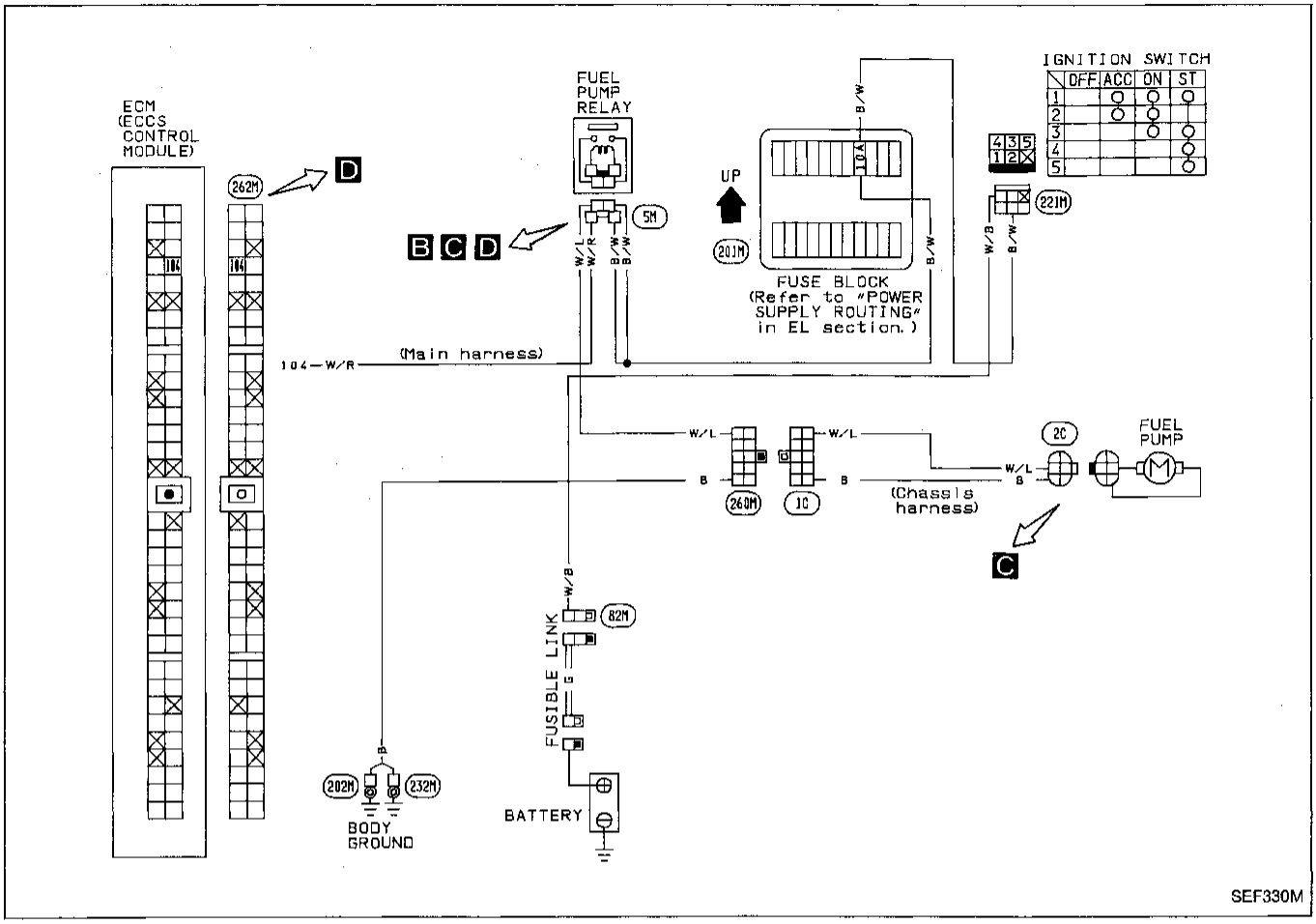
Disconnect and reconnect harness connectors in the circuit, then retest.

Trouble is not fixed.

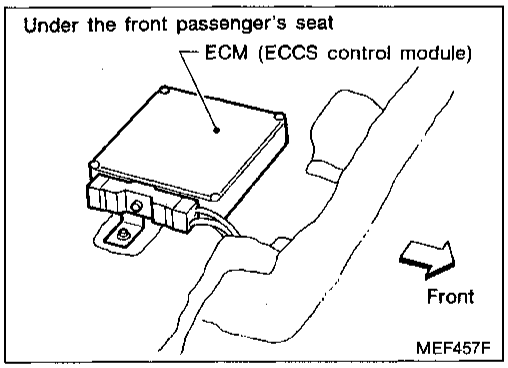
Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

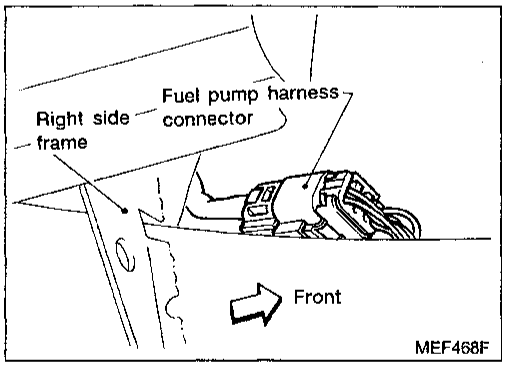
Diagnostic Procedure 38

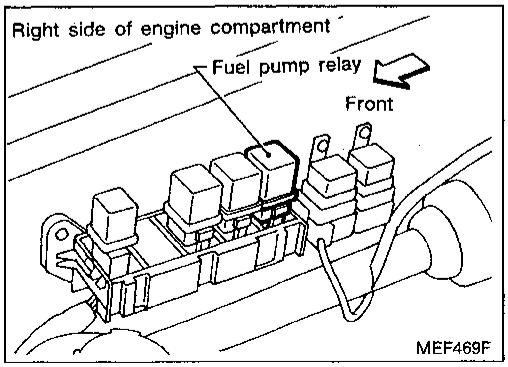
FUEL PUMP (Not self-diagnostic item)



Harness layout

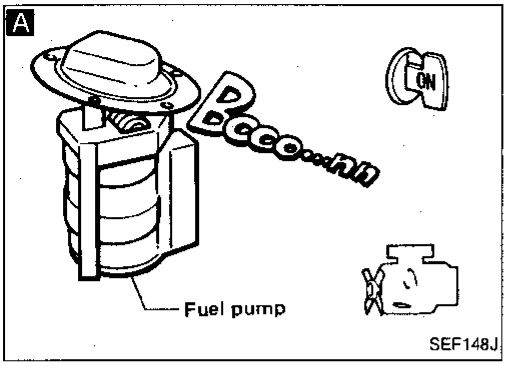






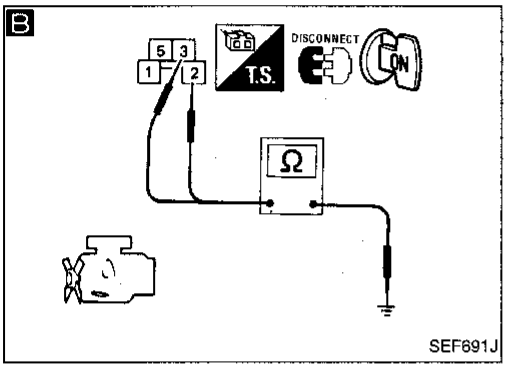
Diagnostic Procedure 38 (Cont'd)

A



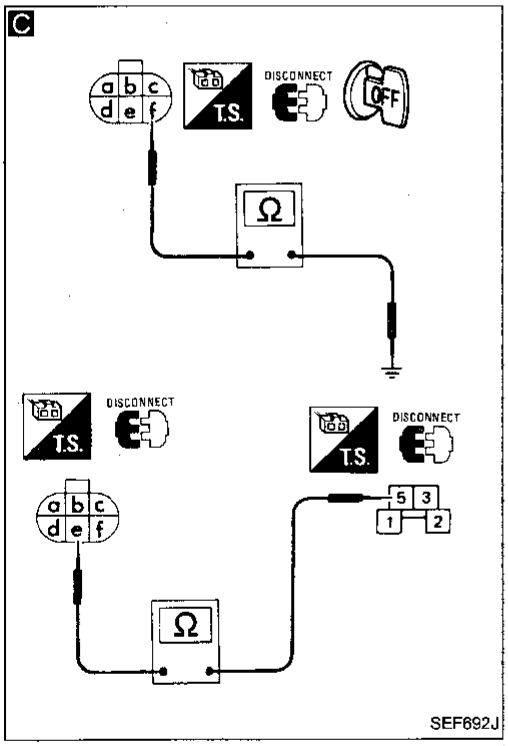
SEF148J

B



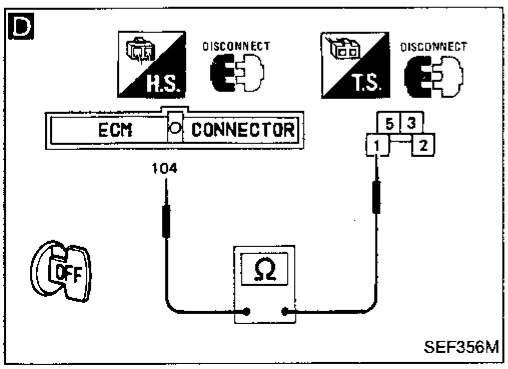
SEF691J

C



SEF692J

D



SEF356M

INSPECTION START

A

CHECK OVERALL FUNCTION.
1) Turn ignition switch "ON".
2) Listen to fuel pump operating sound.
Fuel pump should operate for 5 seconds after ignition switch is turned "ON".

OK → INSPECTION END

NG

B

CHECK POWER SUPPLY.
1) Turn ignition switch "OFF".
2) Disconnect fuel pump relay.
3) Turn ignition switch "ON".
4) Check voltage between terminals ②, ③ and ground.
Voltage: Battery voltage

NG → Check the following.
- 10A fuse
- Harness continuity between ignition switch and fuel pump relay

If NG, repair harness or connectors.

OK

C

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect fuel pump harness connector.
3) Check harness continuity between terminal ⓕ and body ground, terminal ⓔ and terminal ⑤.
Continuity should exist.

NG → Check the following.
- Harness connectors (260M), (1C)
- Harness continuity between fuel pump and body ground
- Harness continuity between fuel pump and fuel pump relay

If NG, repair harness or connectors.

OK

D

CHECK OUTPUT SIGNAL CIRCUIT.
1) Disconnect ECM harness connector.
2) Check harness continuity between ECM terminal (104) and terminal ①.
Continuity should exist.

NG → Repair harness or connectors.

OK

CHECK COMPONENTS
(Fuel pump and fuel pump relay).
Refer to "Electrical Components Inspection".
(See page EF & EC-283.)

NG → Replace malfunctioning component(s).

OK

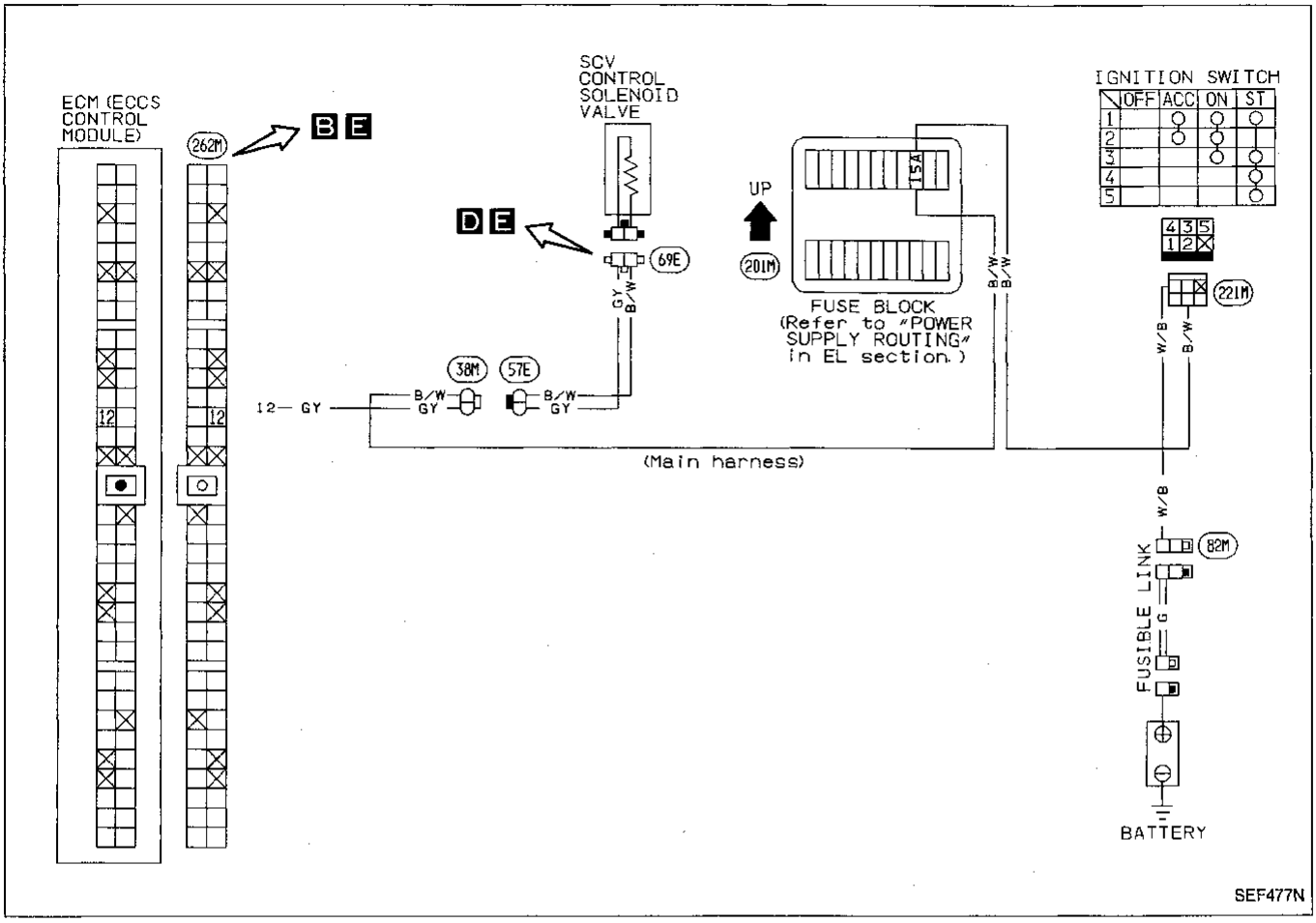
Disconnect and reconnect harness connectors in the circuit, then retest.

Trouble is not fixed.

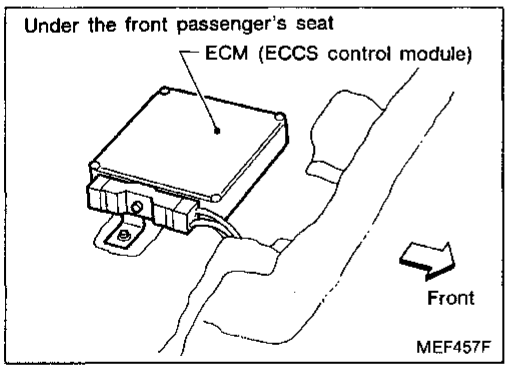
Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

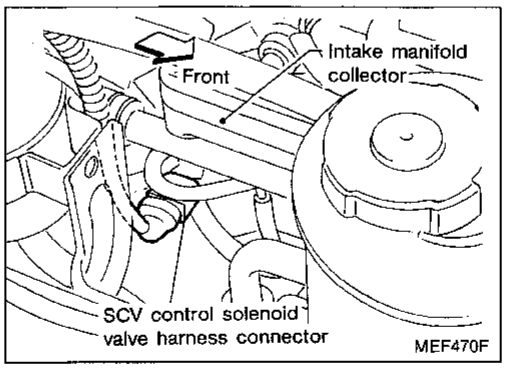
Diagnostic Procedure 39

SCV CONTROL (Not self-diagnostic item)

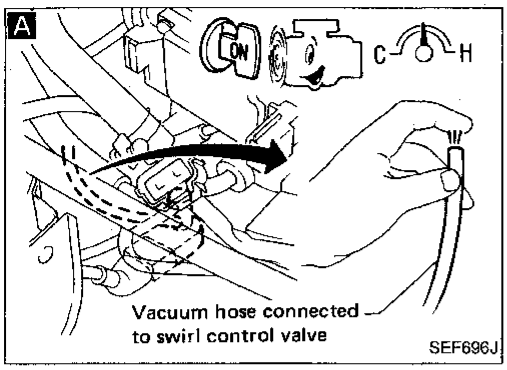


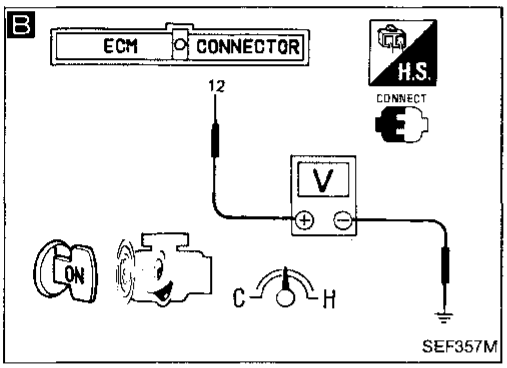
Harness layout

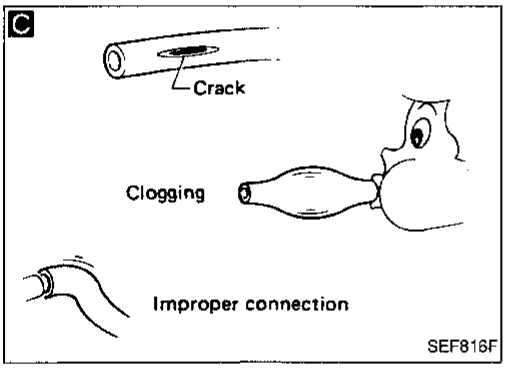


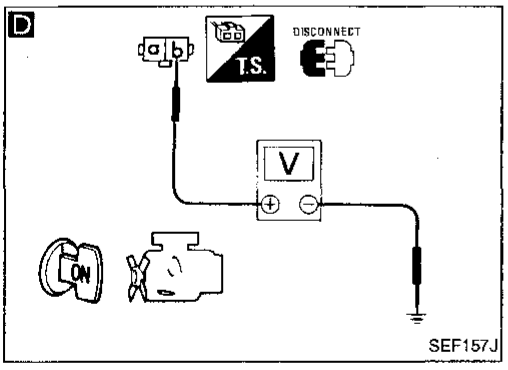


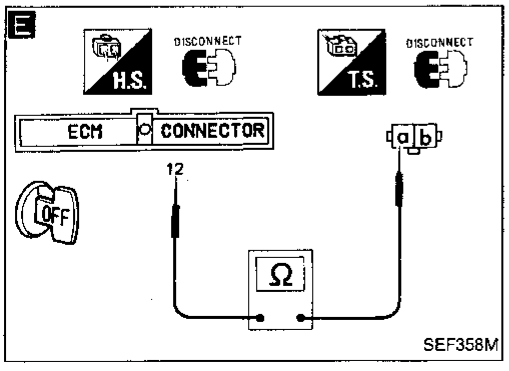
Diagnostic Procedure 39 (Cont'd)











INSPECTION START

A

CHECK VACUUM SOURCE TO SWIRL CONTROL VALVE.
1) Start engine and warm it up sufficiently.
2) Stop engine.
3) After a few seconds, disconnect vacuum hose to swirl control valve and restart engine.
4) Make sure that vacuum exists under the following conditions.

Engine speed is less than 3,600 rpm:
Vacuum should exist.
Engine speed is more than 3,600 rpm:
Vacuum should not exist.

OK → INSPECTION END

NG ↓

B

CHECK CONTROL FUNCTION.
1) Check voltage between ECM terminal ⑫ and ground.

Voltage:
Engine speed is less than 3,600 rpm
Approximately 0V
Engine speed is more than 3,600 rpm
Battery voltage

NG → **C**

CHECK VACUUM HOSE AND SWIRL CONTROL VALVE.
1) Check vacuum hose and swirl control valve for clogging, cracks and proper connection.

OK ↓

D

CHECK POWER SUPPLY.
1) Stop engine.
2) Disconnect SCV control solenoid valve harness connector.
3) Turn ignition switch "ON".
4) Check voltage between terminal ⓑ and ground.

Voltage: Battery voltage

NG → Check the following.
- Harness connectors (38M), (57E)
- Harness continuity between SCV control solenoid valve and ignition switch

If NG, repair harness or connectors.

OK ↓

E

CHECK OUTPUT SIGNAL CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect ECM harness connector.
3) Check harness continuity between ECM terminal ⑫ and terminal ⓐ.

Continuity should exist.

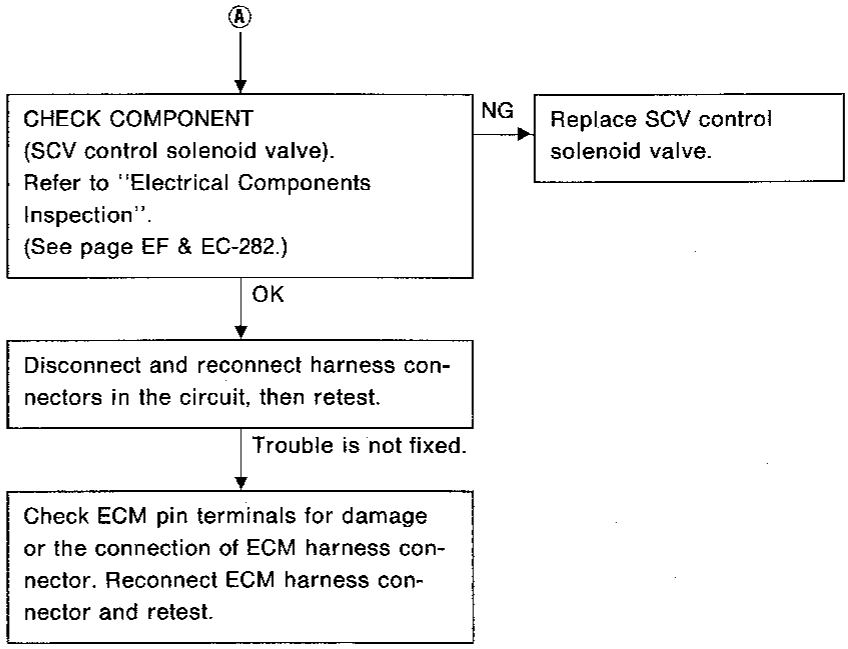
NG → Check the following:
- Harness connectors (38M), (57E)
- Harness continuity between ECM and SCV control solenoid valve

If NG, repair harness or connectors.

OK ↓

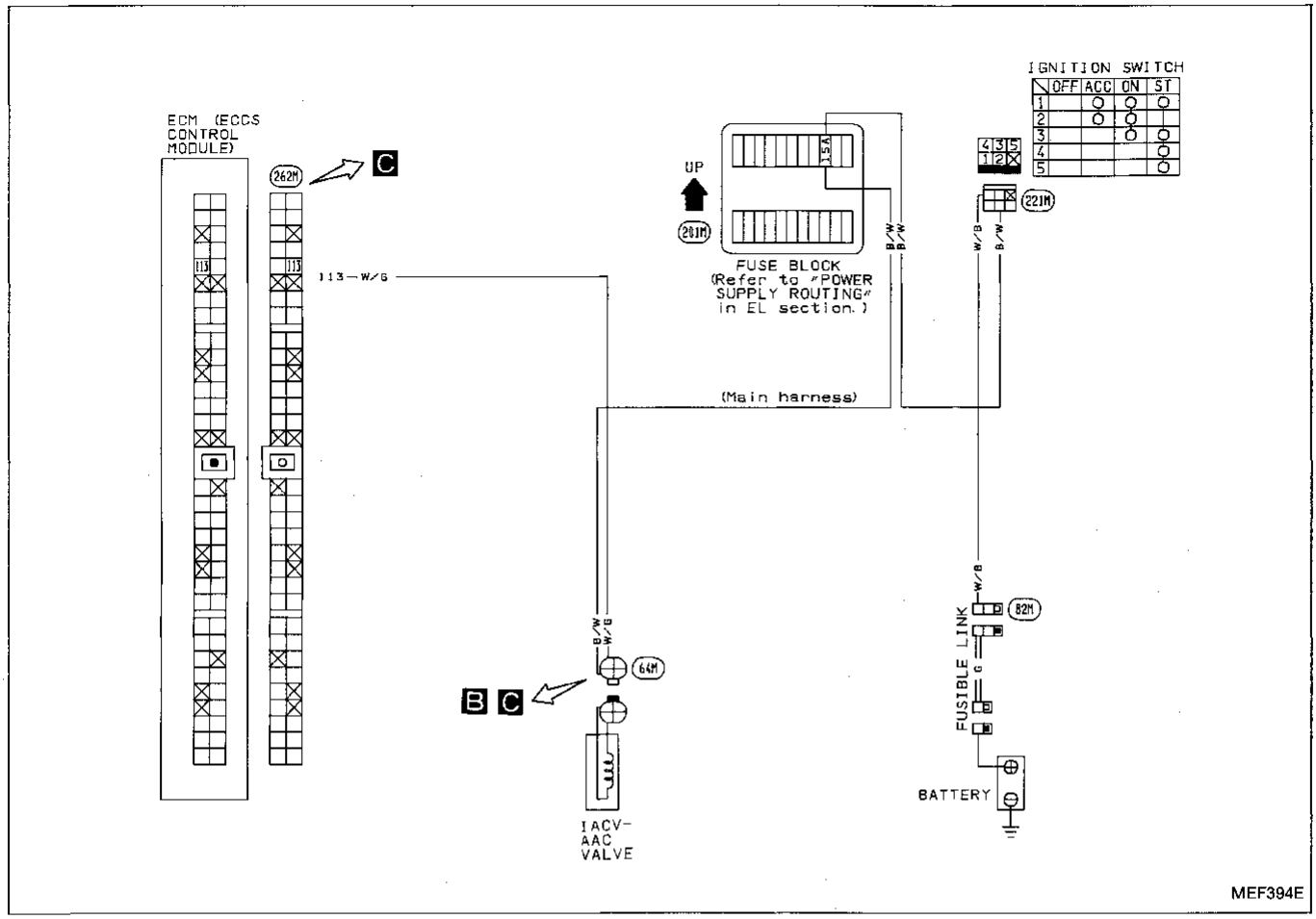
Ⓐ

Diagnostic Procedure 39 (Cont'd)

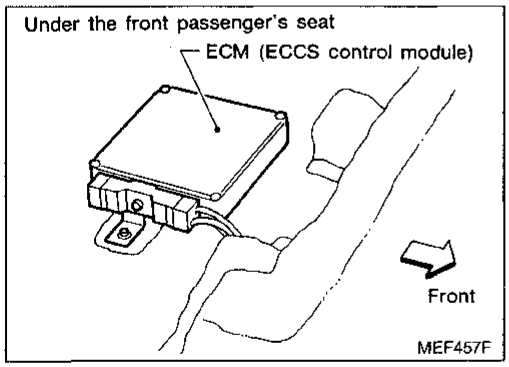


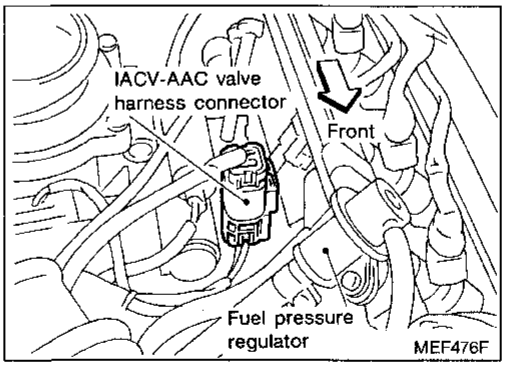
Diagnostic Procedure 40

IACV-AAC VALVE (Not self-diagnostic item)

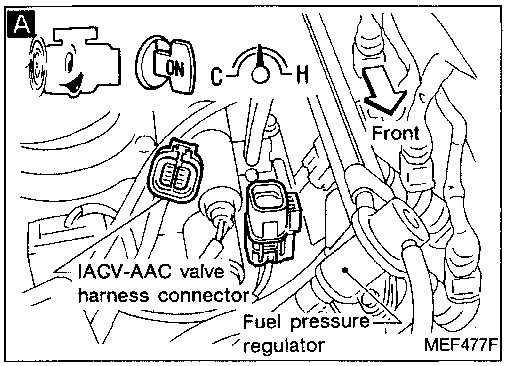


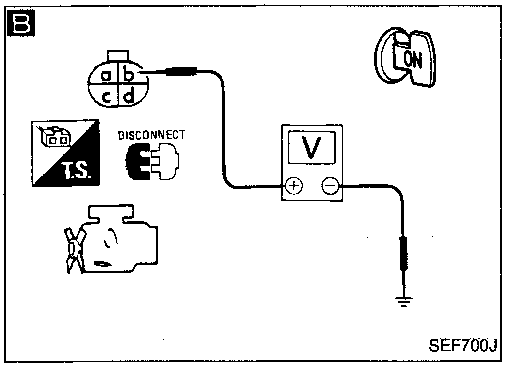
Harness layout

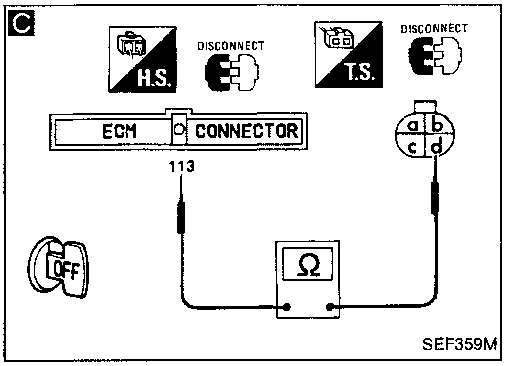




Diagnostic Procedure 40 (Cont'd)







INSPECTION START

A

CHECK OVERALL FUNCTION.
1) Start engine and warm it up sufficiently.
2) Check idle speed.
M/T: 750 ± 50 rpm
A/T: 750 ± 50 rpm (in "N" position)
If NG, adjust idle speed.
3) Disconnect IACV-AAC valve harness connector.
4) Make sure that idle speed drops.

Drops. → INSPECTION END

Does not drop.

B

CHECK POWER SUPPLY.
1) Stop engine.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓑ and ground.
Voltage: Battery voltage

NG → Repair harness or connectors.

OK

C

CHECK OUTPUT SIGNAL CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect ECM harness connector.
3) Check harness continuity between ECM terminal (113) and terminal ⓓ.
Continuity should exist.

NG → Repair harness or connectors.

OK

CHECK COMPONENT
(IACV-AAC valve)
Refer to "Electrical Components Inspection".
(See page EF & EC-283.)

NG → Replace IACV-AAC valve.

OK

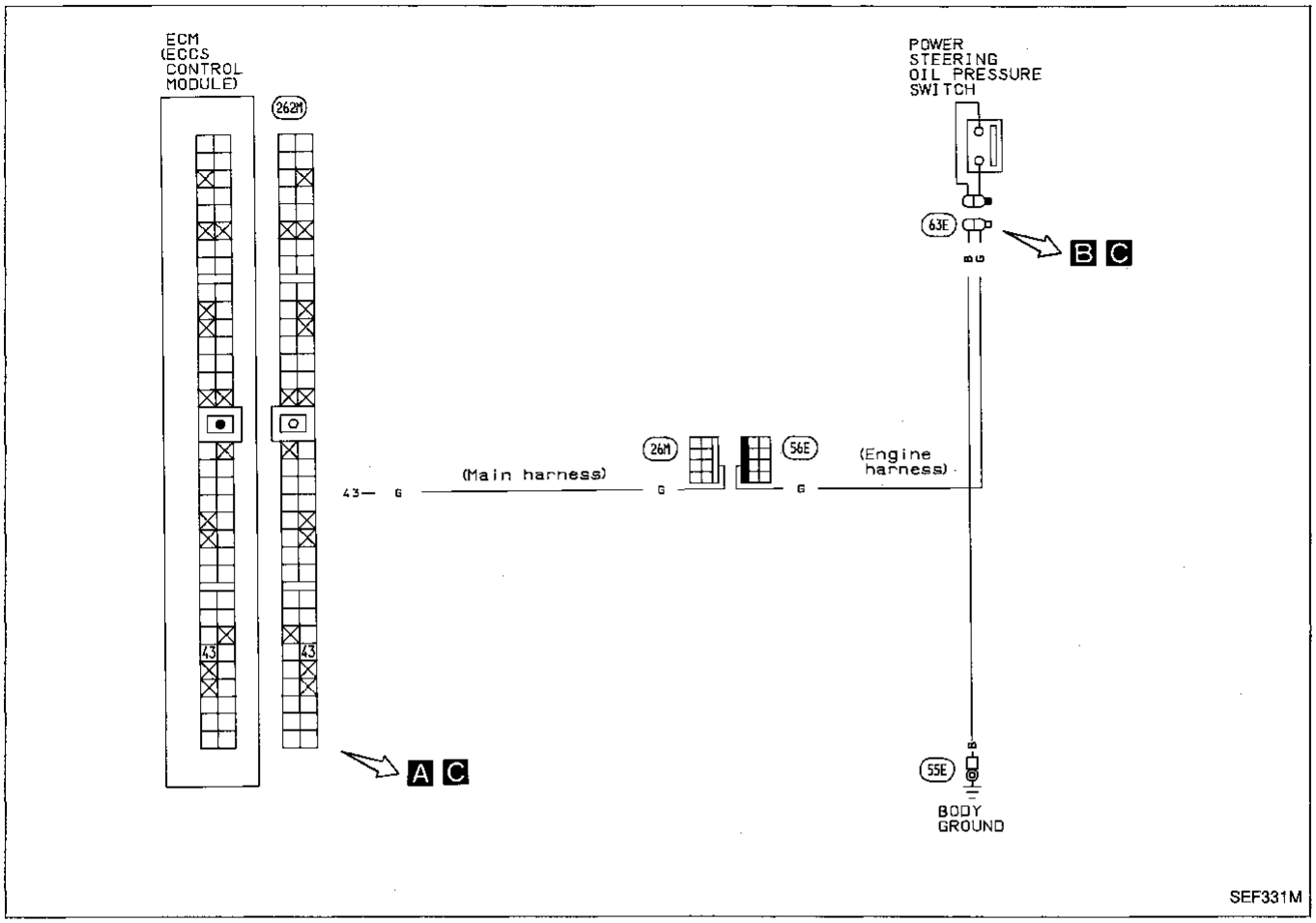
Disconnect and reconnect harness connectors in the circuit, then retest.

Trouble is not fixed.

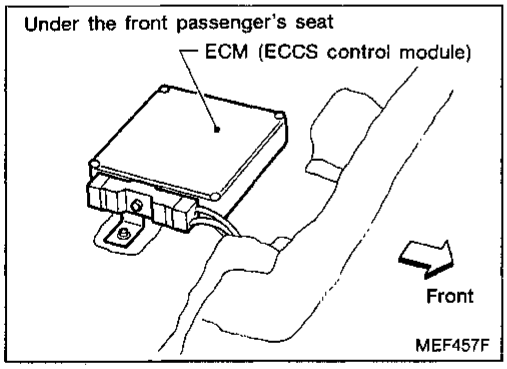
Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

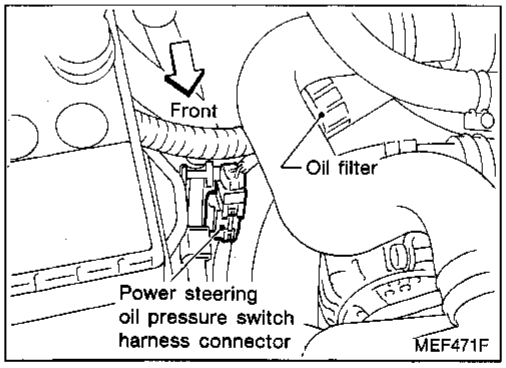
Diagnostic Procedure 41

POWER STEERING OIL PRESSURE SWITCH (Not self-diagnostic item)

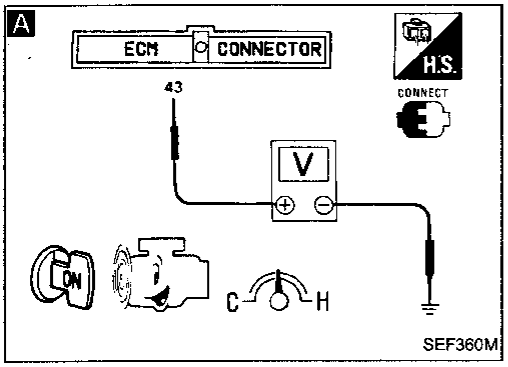


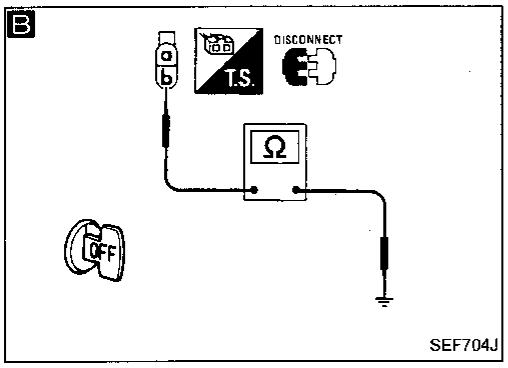
Harness layout

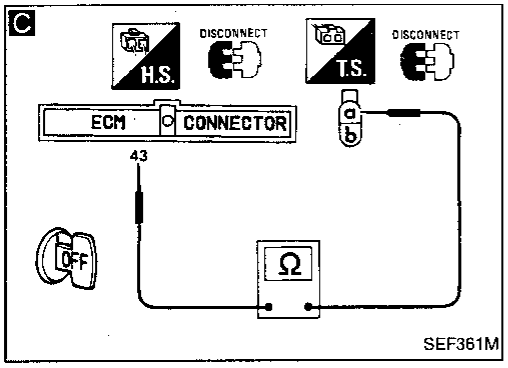




Diagnostic Procedure 41 (Cont'd)







INSPECTION START

A

CHECK CONTROL FUNCTION.
1) Start engine and warm it up sufficiently.
2) Check voltage between ECM terminal ㊸ and ground.

Voltage:

When steering wheel is turned quickly.
Approximately 0V

Except above
Approximately 8 - 9V

OK → INSPECTION END

NG ↓

B

CHECK GROUND CIRCUIT.
1) Stop engine.
2) Disconnect power steering oil pressure switch harness connector.
3) Check harness continuity between terminal ⓑ and body ground.

Continuity should exist.

NG → Repair harness or connectors.

OK ↓

C

CHECK INPUT SIGNAL CIRCUIT.
1) Disconnect ECM harness connector.
2) Check harness continuity between ECM terminal ㊸ and terminal ⓐ.

Continuity should exist.

NG → Check the following.
- Harness connectors (26M) , (56E)
- Harness continuity between ECM and power steering oil pressure switch

If NG, repair harness or connectors.

OK ↓

CHECK COMPONENT
(Power steering oil pressure switch).
Refer to "Electrical Components Inspection".
(See page EF & EC-285.)

NG → Replace power steering oil pressure switch.

OK ↓

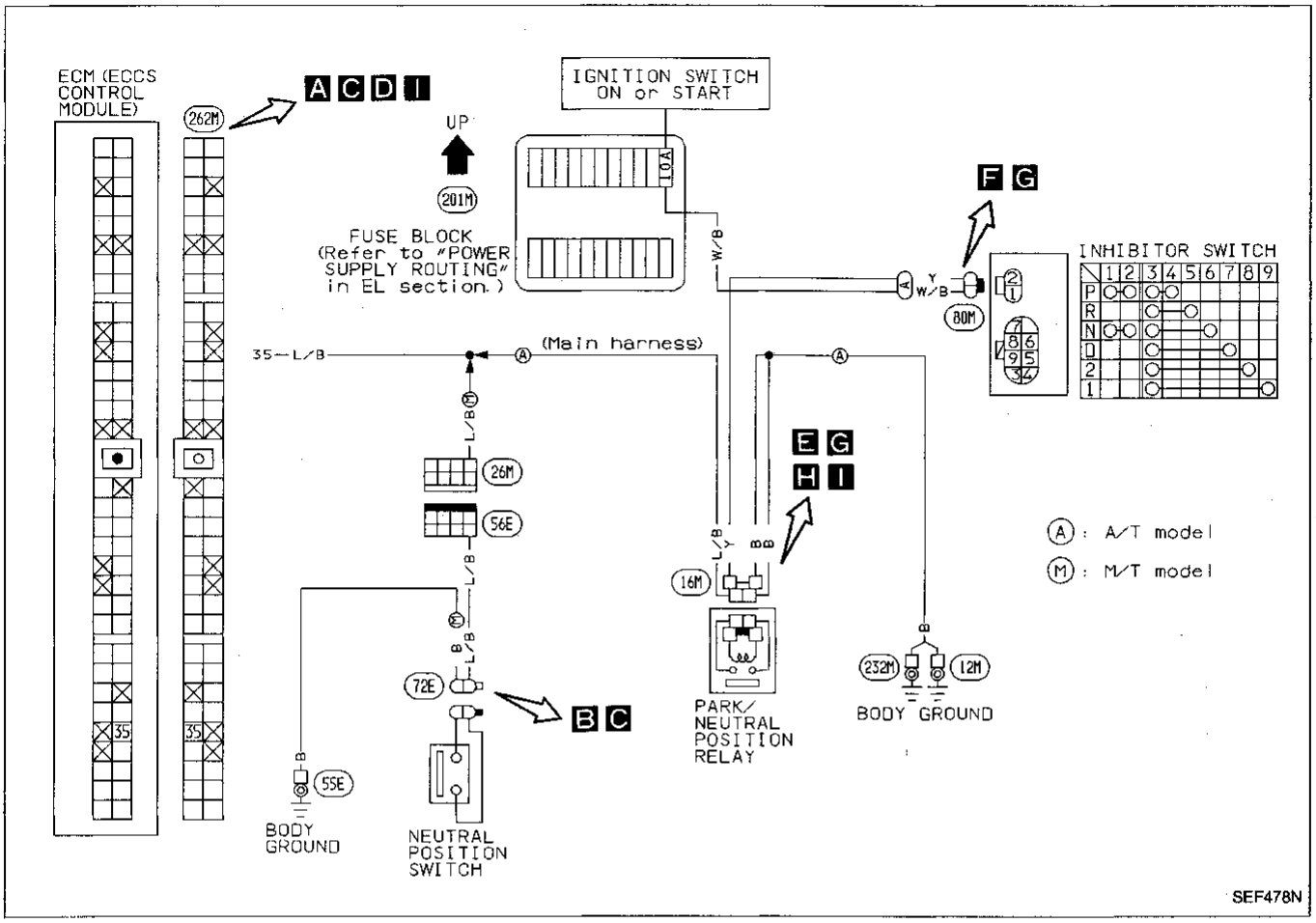
Disconnect and reconnect harness connectors in the circuit, then retest.

Trouble is not fixed. ↓

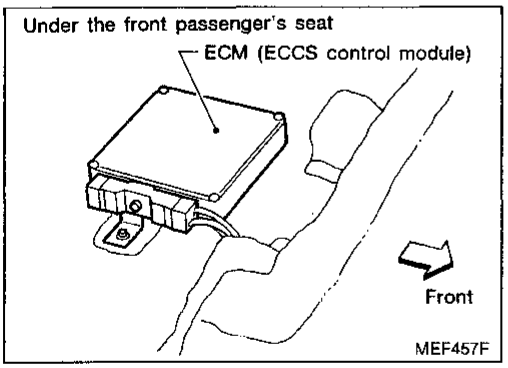
Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

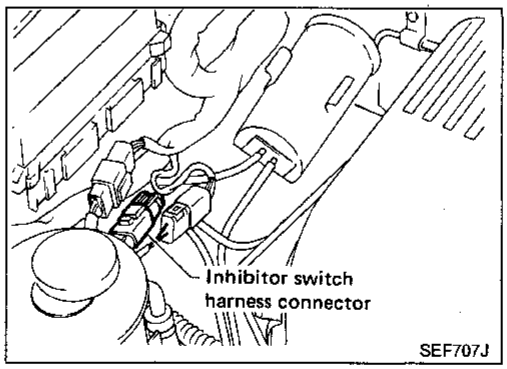
Diagnostic Procedure 42

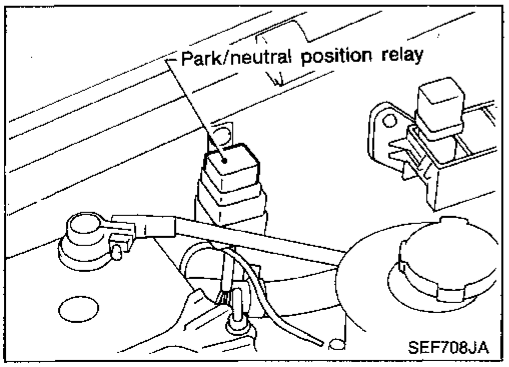
NEUTRAL POSITION/INHIBITOR SWITCH (Not self-diagnostic item)



Harness layout

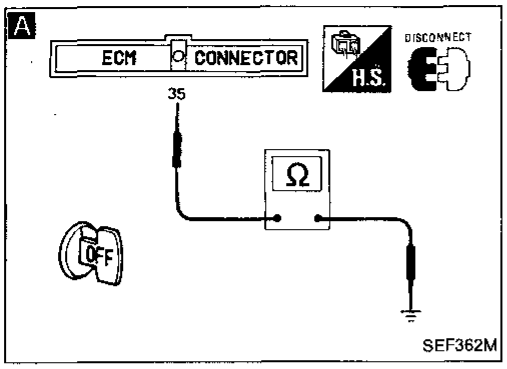






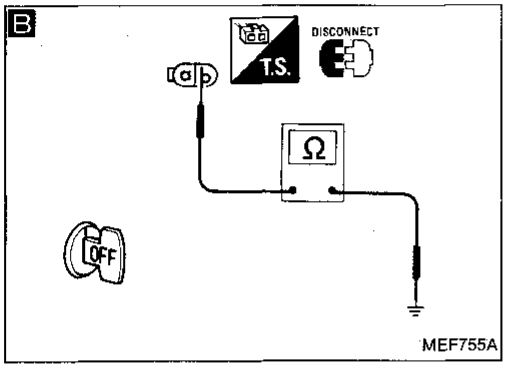
Diagnostic Procedure 42 (Cont'd)

A



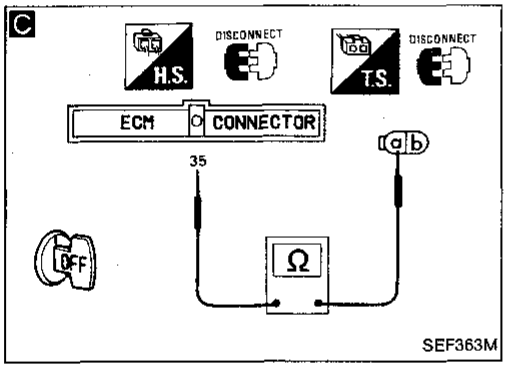
SEF362M

B



MEF755A

C



SEF363M

Neutral position switch

INSPECTION START

A

CHECK OVERALL FUNCTION.
1) Set shift lever to the neutral position.
2) Disconnect ECM harness connector.
3) Check harness continuity between ECM terminal ㉟ and body ground.
Continuity should exist.

OK → INSPECTION END

NG

B

CHECK GROUND CIRCUIT.
1) Disconnect neutral position switch harness connector.
2) Check harness continuity between terminal ⓑ and body ground.
Continuity should exist.

NG → Repair harness or connectors.

OK

C

CHECK INPUT SIGNAL CIRCUIT.
1) Check harness continuity between ECM terminal ㉟ and terminal ⓐ.
Continuity should exist.

NG → Repair harness or connectors.

OK

CHECK COMPONENT
(Neutral position switch).
Refer to "Electrical Components Inspection".
(See page EF & EC-284.)

NG → Replace neutral position switch.

OK

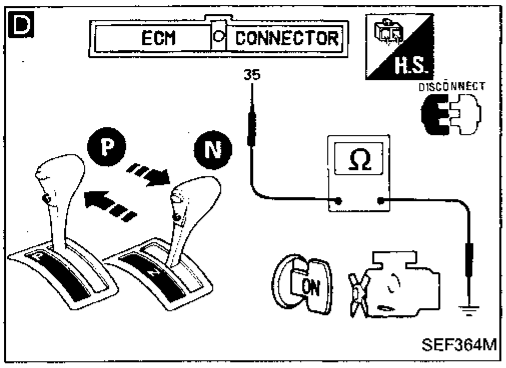
Disconnect and reconnect harness connectors in the circuit, then retest.

Trouble is not fixed.

Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

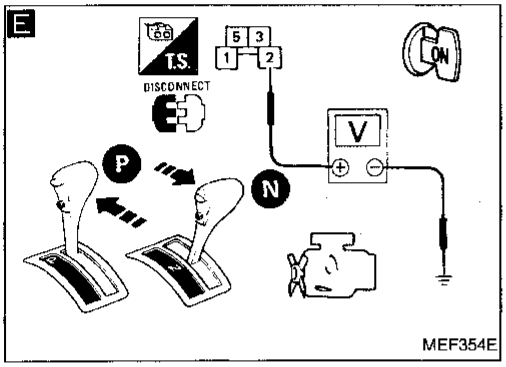
Diagnostic Procedure 42 (Cont'd)

D



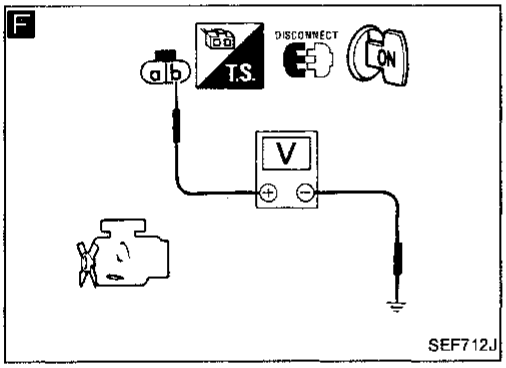
SEF364M

E



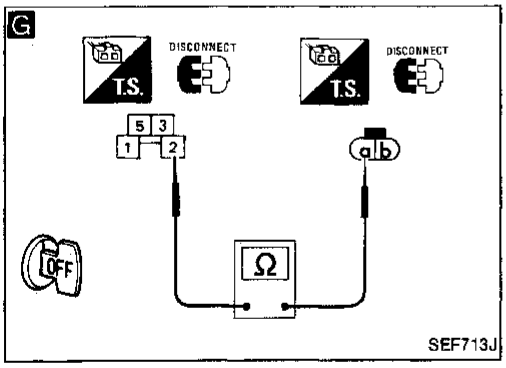
MEF354E

F



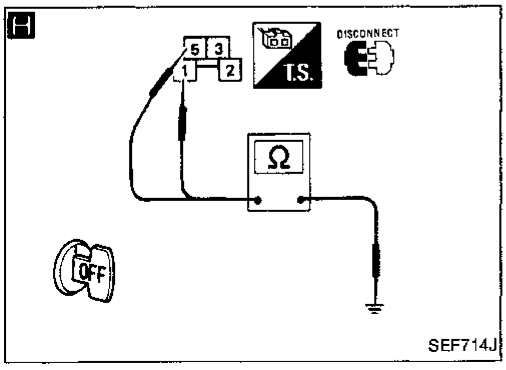
SEF712J

G



SEF713J

H



SEF714J

Inhibitor switch

INSPECTION START

D

CHECK OVERALL FUNCTION.
1) Shift selector lever to "P" position.
2) Disconnect ECM harness connector.
3) Turn ignition switch "ON".
4) Check harness continuity between ECM terminal ㉟ and body ground.
Continuity should exist.
5) Shift selector lever to "N" position.
6) Check harness continuity between ECM terminal ㉟ and body ground.
Continuity should exist.

OK → INSPECTION END

NG

E

CHECK POWER SUPPLY.
1) Turn ignition switch "OFF".
2) Disconnect Park/Neutral position relay.
3) Make sure that selector lever is in "N" position.
4) Turn ignition switch "ON".
5) Check voltage between terminal ② and ground.
Voltage: Battery voltage
6) Shift selector lever into "P" position.
7) Check voltage between terminal ② and ground.
Voltage: Battery voltage

NG →

Check the following.

F CHECK HARNESS CONTINUITY BETWEEN INHIBITOR SWITCH AND BATTERY.
1) Turn ignition switch "OFF".
2) Disconnect inhibitor switch harness connector.
3) Turn ignition switch "ON".
4) Check voltage between terminal ⓑ and ground.
Voltage:
Battery voltage

If NG, check the following.
- 10A fuse
- Harness continuity between fuse and inhibitor switch

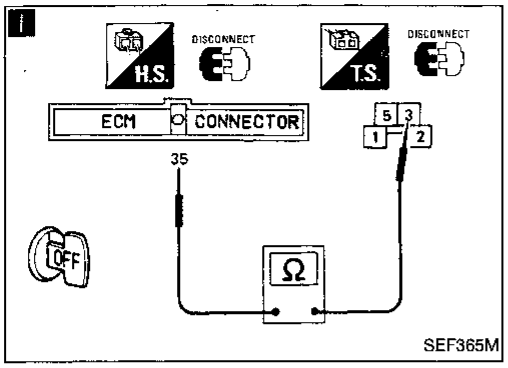
If NG, repair harness or connectors.

OK → Ⓐ

Ⓑ

Diagnostic Procedure 42 (Cont'd)

I



Ⓐ

Ⓑ

G CHECK HARNESS CONTINUITY BETWEEN INHIBITOR SWITCH AND PARK/NEUTRAL POSITION RELAY.
1) Turn ignition switch "OFF".
2) Check harness continuity between terminal ⓐ and terminal ②.
Continuity should exist.
If NG, repair harness or connectors.

CHECK COMPONENT (Inhibitor switch).
Refer to "Electrical Components Inspection".
(See page EF & EC-285.)

H

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Check harness continuity between terminals ①, ⑤ and body ground.
Continuity should exist.

NG → Repair harness or connectors.

OK ↓

I

CHECK INPUT SIGNAL CIRCUIT.
1) Check harness continuity between ECM terminal ㉟ and terminal ③.
Continuity should exist.

NG → Repair harness or connectors.

OK ↓

CHECK COMPONENT (Park/Neutral position relay).
Refer to "Electrical Components Inspection".
(See page EF & EC-285.)

NG → Replace Park/Neutral position relay.

OK ↓

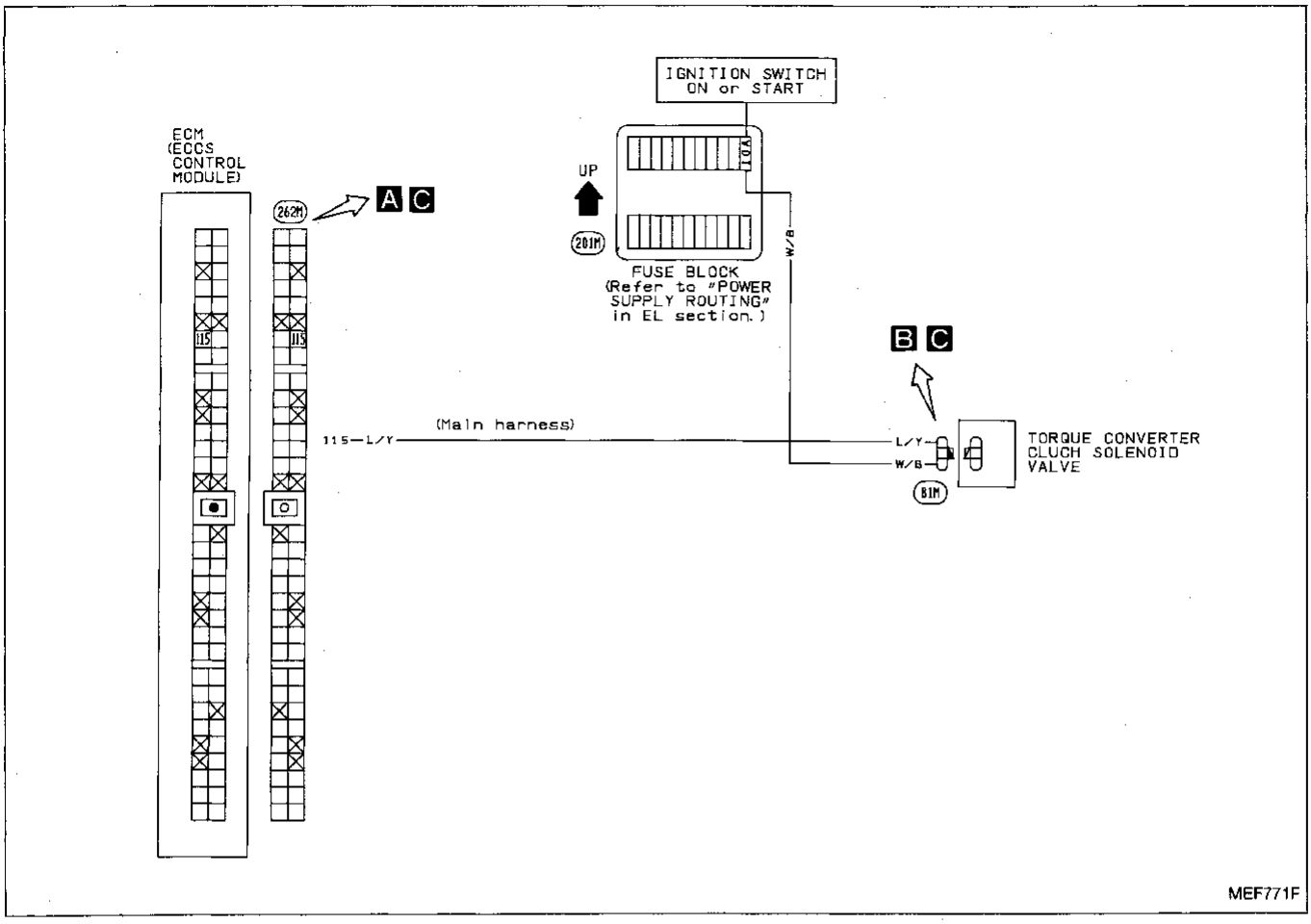
Disconnect and reconnect harness connectors in the circuit, then retest.

Trouble is not fixed. ↓

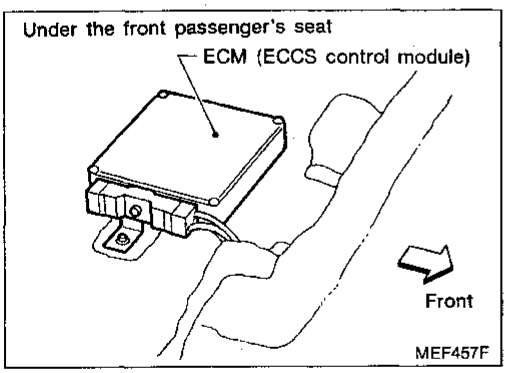
Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

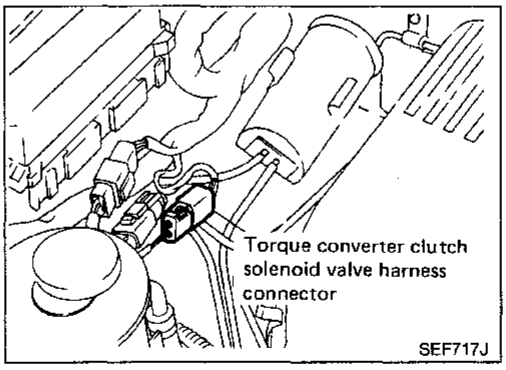
Diagnostic Procedure 43

TORQUE CONVERTER CLUTCH SOLENOID VALVE (Not self-diagnostic item)

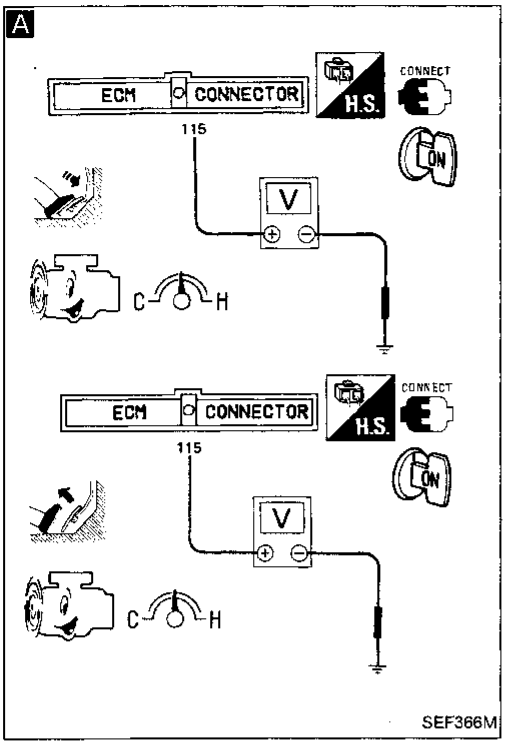


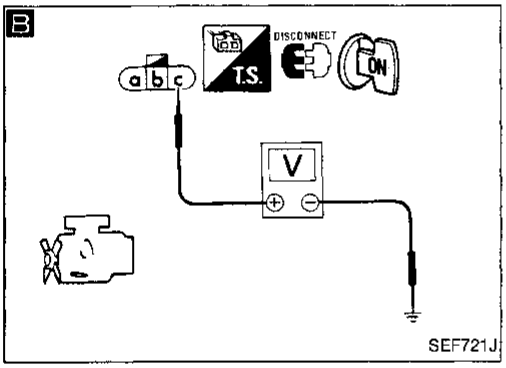
Harness layout

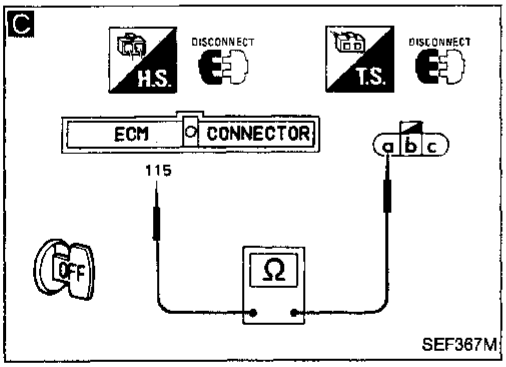




Diagnostic Procedure 43 (Cont'd)







INSPECTION START

A

CHECK CONTROL FUNCTION.
1) Start engine and warm it up sufficiently.
2) Perform the diagnostic test mode III (Self-diagnostic results).
Make sure that diagnostic trouble code No. 43 is not displayed.
3) Check voltage between ECM terminal (115) and ground.
Voltage:
Accelerator pedal is depressed
Battery voltage
Accelerator pedal is fully released
Approximately 0V

OK → CHECK COMPONENT (Torque converter clutch solenoid valve).
Refer to "Electrical Components Inspection".
(Refer to AT section.)

NG ↓

B

CHECK POWER SUPPLY.
1) Stop engine.
2) Disconnect torque converter clutch solenoid valve harness connector.
3) Turn ignition switch "ON".
4) Check voltage between terminal (c) and ground.
Voltage: Battery voltage

NG → Check the following.
- 10A fuse
- Harness continuity between torque converter clutch solenoid valve and fuse

If NG, repair harness or connectors.

OK ↓

C

CHECK OUTPUT SIGNAL CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect ECM harness connector.
3) Check harness continuity between ECM terminal (115) and terminal (a).
Continuity should exist.

NG → Repair harness or connectors.

OK ↓

CHECK COMPONENT
(Torque converter clutch solenoid valve).
Refer to "Electrical Components Inspection".
(Refer to AT section.)

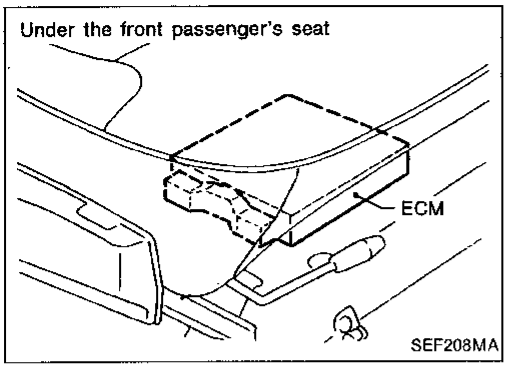
NG → Replace torque converter clutch solenoid valve.

OK ↓

Disconnect and reconnect harness connectors in the circuit, then retest.

Trouble is not fixed. ↓

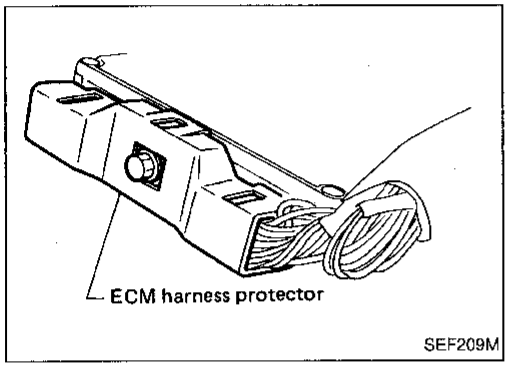
Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.



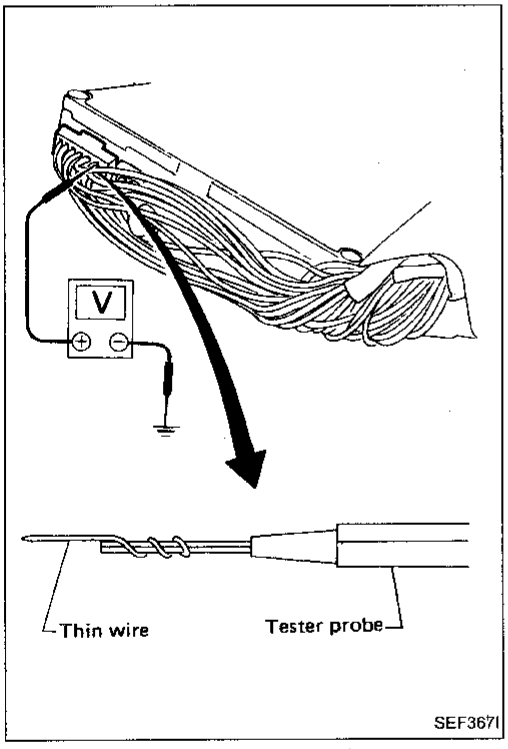
Electrical Components Inspection

ECM INPUT/OUTPUT SIGNAL INSPECTION

1. ECM is located under the front passenger seat. For this inspection, remove passenger seat.



2. Remove ECM harness protector.



3. Perform all voltage measurements with the connectors connected.
   Improve tester probe as shown to perform tests easily.

Electrical Components Inspection (Cont'd)

ECM inspection table

*Data are reference values.

TERMINAL NO.	ITEM	CONDITION	*DATA
1	Ignition signal	Engine is running. └ Idle speed	0.3 - 0.6V
		Engine is running. └ Engine speed is 2,000 rpm.	1.2 - 1.5V
2	Tachometer	Engine is running. └ Idle speed	Approximately 1.0V
		Engine is running. └ Engine speed is 2,000 rpm.	Approximately 2.7V
3	Ignition check	Engine is running. └ Idle speed	9 - 12V
4	ECCS relay (Main relay)	Engine is running. Ignition switch "OFF" └ Within approximately 1 second after turning ignition switch "OFF"	0 - 1V
		Ignition switch "OFF" └ For approximately 1 second after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
8	EGR temperature sensor	Engine is running. └ Idle speed	3.0 - 4.0V
		Engine is running. (Racing) └ After warming up	0 - 3.0V
11	Air conditioner relay	Engine is running. └ Both A/C switch and blower switch are "ON".	0 - 1.0V
		Engine is running. └ A/C switch is "OFF".	0V

Electrical Components Inspection (Cont'd)

*Data are reference values.

TERMINAL NO.	ITEM	CONDITION	*DATA
12	SCV control solenoid valve	Engine is running. └ Idle speed	0 - 1.0V
		Engine is running. └ Engine speed is 3,600 rpm.	BATTERY VOLTAGE (11 - 14V)
16	Mass air flow sensor	Engine is running.	1.0 - 3.0V Output voltage varies with engine speed.
18	Engine coolant temperature sensor	Engine is running.	1.0 - 3.0V Output voltage varies with engine water temperature.
19	Oxygen sensor	Engine is running. └ After warming up sufficiently.	0 - Approximately 1.0V
20	Throttle position sensor	Ignition switch "ON" └ After warming up sufficiently.	0.5 - Approximately 4V Output voltage varies with the throttle valve opening angle.
22 30	Camshaft position sensor (Reference signal)	Engine is running. **Do not run engine at high speed under no-load.**	0.3 - 0.4V
26	Intake air temperature sensor	Ignition switch "ON" └ Intake air temperature is 20°C (68°F).	Approximately 2.4V
		Ignition switch "ON" └ Intake air temperature is 80°C (176°F).	Approximately 0.3V
31 40	Camshaft position sensor (Position signal)	Engine is running. **Do not run engine at high speed under no-load.**	2.0 - 3.0V
34	Start signal	Cranking	8 - 12V
35	Neutral position switch & Inhibitor switch	Ignition switch "ON" └ Neutral position/Parking	0V
		Ignition switch "ON" └ Except the above gear position	6 - 7V

Electrical Components Inspection (Cont'd)

*Data are reference values.

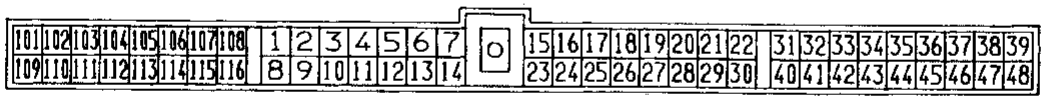
TERMINAL NO.	ITEM	CONDITION	*DATA
36	Ignition switch	Ignition switch "OFF"	0V
		Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
37	Throttle position sensor power supply	Ignition switch "ON"	Approximately 5V
38, 47	Power supply for ECM	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
41	Air conditioner switch	Engine is running. └ Both air conditioner switch and blower switch are "ON".	0V
		Engine is running. └ Air conditioner switch is "OFF".	BATTERY VOLTAGE (11 - 14V)
43	Power steering oil pressure switch	Engine is running. └ Steering wheel is being turned.	0.1 - 0.3V
		Engine is running. └ Steering wheel is not being turned.	Approximately 5V
46	Power supply (Back-up)	Ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
101	Injector No. 1	Engine is running.	BATTERY VOLTAGE (11 - 14V)
103	Injector No. 3		
110	Injector No. 2		
112	Injector No. 4		
105	EGRC-solenoid valve	Engine is running. └ Engine is cold. Engine coolant temperature is below 60°C (140°F).	0.7 - 0.9V
		Engine is running. (Racing) └ After warming up Engine coolant temperature is between 60°C (140°F) and 105°C (221°F).	BATTERY VOLTAGE (11 - 14V)
102	PAIRC-solenoid valve	Engine is running. └ Idle speed	Approximately 0V
		Engine is running. └ Except at idle **Do not run engine at high speed under no-load.**	BATTERY VOLTAGE (11 - 14V)

Electrical Components Inspection (Cont'd)

*Data are reference values.

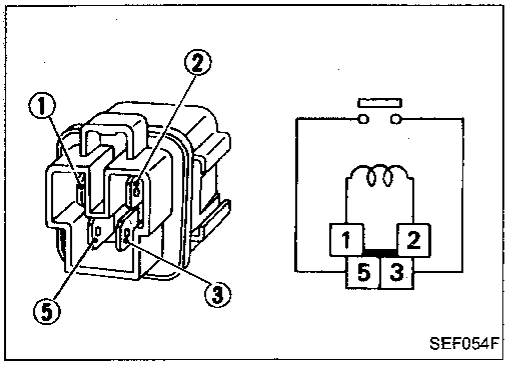
TERMINAL NO.	ITEM	CONDITION	*DATA
104	Fuel pump relay	Ignition switch "ON" └ For 5 seconds after turning ignition switch "ON" Engine is running.	0.7 - 0.9V
		Ignition switch "ON" └ Within 5 seconds after turning ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
113	IACV-AAC valve	Engine is running. └ Idle speed	7 - 10V
		Engine is running. — Steering wheel is being turned. — Air conditioner is operating. — Rear defogger is "ON". └ Headlamps are in high position.	4 - 7V
115	Torque converter clutch solenoid valve	Engine is running. └ Idle speed Engine coolant temperature is below 40°C (104°F).	Approximately 0V
		Engine is running. — After warming up Engine coolant temperature is above 40°C (104°F). └ Engine speed is 2,000 rpm	BATTERY VOLTAGE (11 - 14V)

ECM HARNESS CONNECTOR TERMINAL LAYOUT



SEF419H

Electrical Components Inspection (Cont'd)

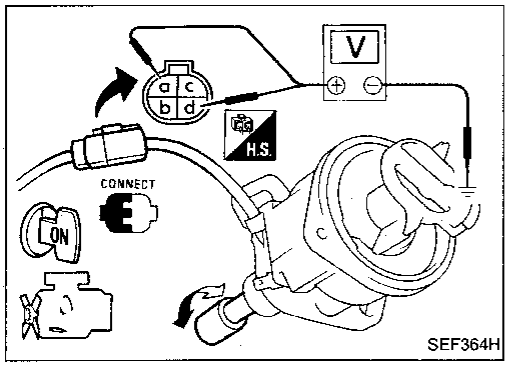


SEF054F

ECCS RELAY

Check continuity between terminals ③ and ⑤.

Condition	Continuity
12V direct current supply between terminals ① and ②	Yes
No supply	No

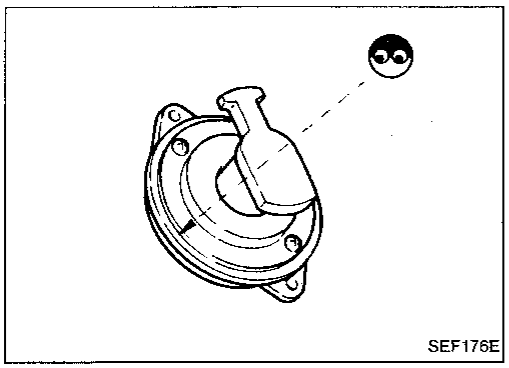


SEF364H

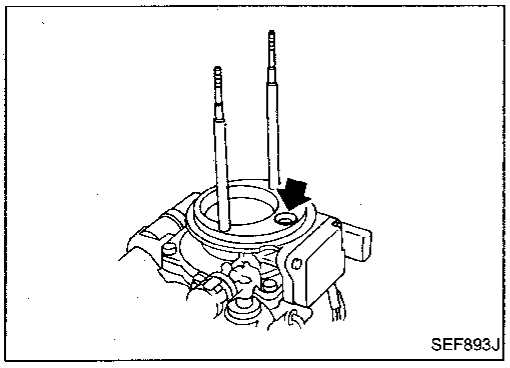
CAMSHAFT POSITION SENSOR

1. Remove distributor from engine. (camshaft position sensor harness connector is connected.)
2. Turn ignition switch "ON".
3. Rotate camshaft position sensor shaft slowly and check voltage between terminals ⓐ, ⓓ and ground.

Voltage fluctuates between 5V and 0V.

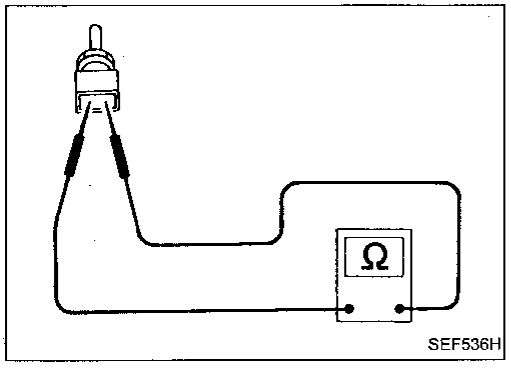

SEF176E

4. Visually check rotor plate for damage or dust.


SEF893J

MASS AIR FLOW SENSOR

- Visually check hot wire air passage for dust.



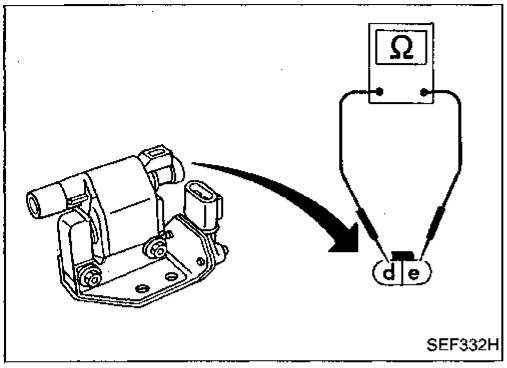
SEF536H

ENGINE COOLANT TEMPERATURE SENSOR

Check engine coolant temperature sensor resistance.

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
80 (176)	0.30 - 0.33

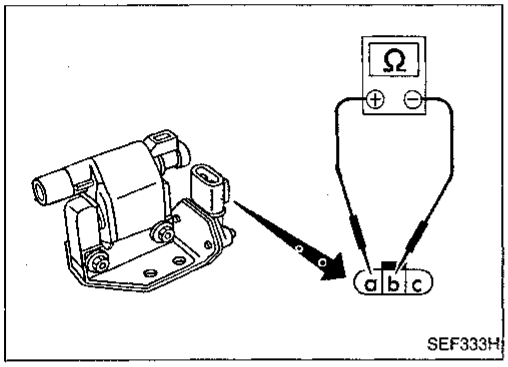
Electrical Components Inspection (Cont'd)



IGNITION COIL

Check ignition coil resistance.

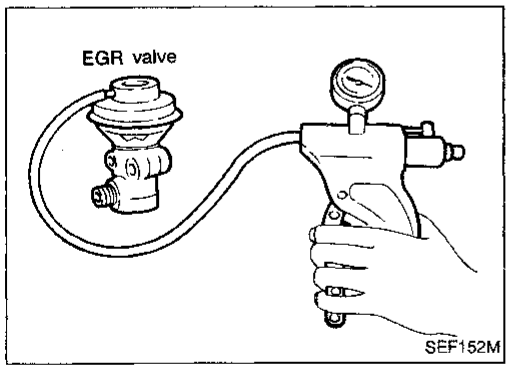
Terminal	Resistance
ⓓ - ⓔ	Approximately 0.7Ω



POWER TRANSISTOR

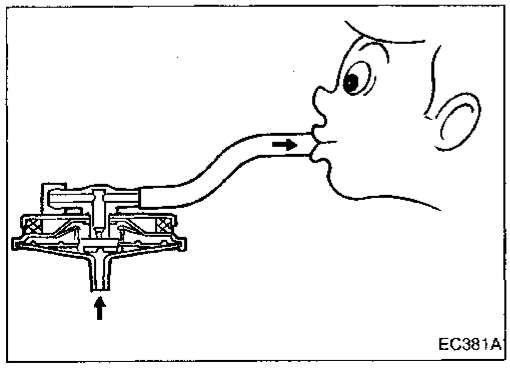
Check continuity between power transistor terminals with a digital tester.

Terminal No.	Tester polarity	Continuity
ⓐ	⊕	No
ⓑ	⊖	
ⓐ	⊖	Yes
ⓑ	⊕	
ⓐ	⊕	No
ⓒ	⊖	
ⓐ	⊖	Yes
ⓒ	⊕	



EGR VALVE

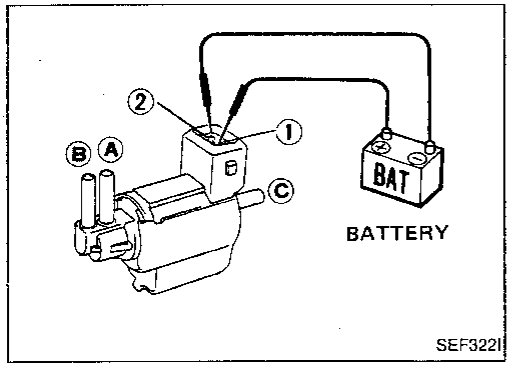
Apply vacuum to EGR vacuum port with a hand vacuum pump.
EGR valve spring should lift.



EGRC-BPT VALVE

Plug one of two ports of EGRC-BPT valve.
Apply a pressure above 0.490 kPa (50 mmH_2O, 1.97 inH_2O) to check for leakage. If a leak is noted, replace valve.

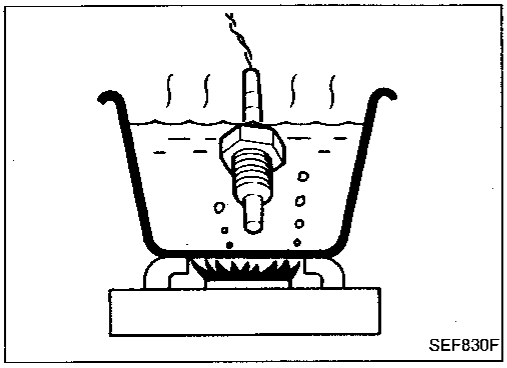
Electrical Components Inspection (Cont'd)



EGRC-SOLENOID VALVE, PAIRC-SOLENOID VALVE AND SCV CONTROL SOLENOID VALVE

Check air passages continuity.

Condition	Air passage continuity between Ⓐ and Ⓑ	Air passage continuity between Ⓐ and Ⓒ
12V direct current supply between terminals ① and ②	Yes	No
No supply	No	Yes



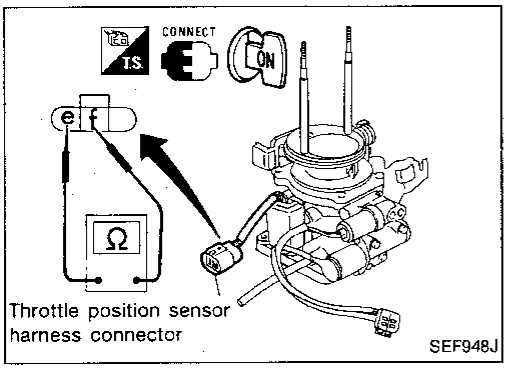
EGR TEMPERATURE SENSOR

Check resistance change and resistance value at 100°C (212°F).

- **Resistance should decrease in response to temperature increase.**

  Resistance: 100°C (212°F)

  85.3 ± 8.53 kΩ



THROTTLE POSITION SENSOR

Make sure that resistance between terminals ⓔ and ⓕ changes when opening throttle valve manually.

Resistance should change.

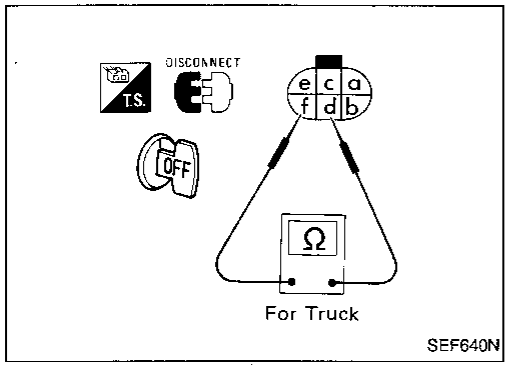
If NG, replace throttle position sensor.

Adjustment

If throttle position sensor is replaced or removed, it is necessary to install it in the proper position, by following the procedure as shown below:

1. Install throttle position sensor body in throttle body. Do not tighten bolts.
2. Connect throttle position sensor harness connector.
3. Start engine and warm it up sufficiently.
4. Measure output voltage of throttle position sensor using voltmeter.
5. Adjust by rotating throttle position sensor body so that output voltage is 0.4 to 0.6V.
6. Tighten mounting bolts.
7. Disconnect throttle position sensor harness connector for a few seconds and then reconnect it.

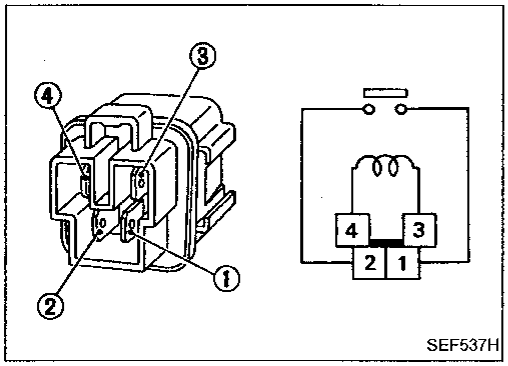
Electrical Components Inspection (Cont'd)



FUEL PUMP

Check continuity between terminals ⓓ and ⓕ.

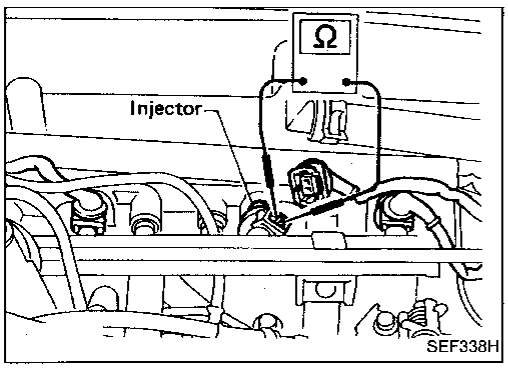
Continuity should exist.



FUEL PUMP RELAY

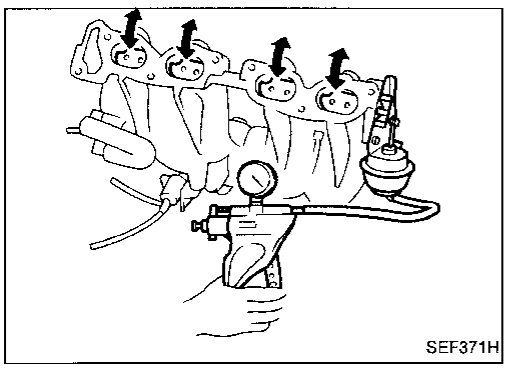
Check continuity between terminals ① and ②.

Condition	Continuity
12V direct current supply between terminals ③ and ④	Yes
No supply	No



INJECTORS

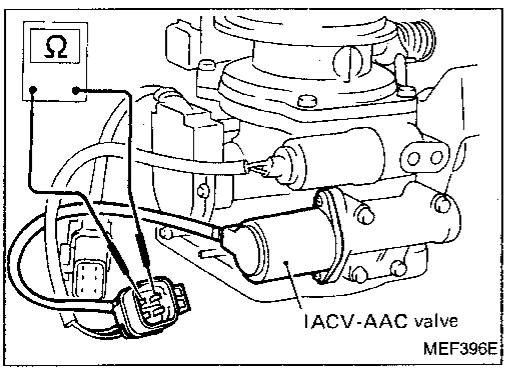
- Check injector resistance.
  Resistance:
  Approximately 10 - 15Ω
- Remove injector and check nozzle for clogging.



SWIRL CONTROL VALVE

Supply vacuum to actuator and check swirl control valve operation.

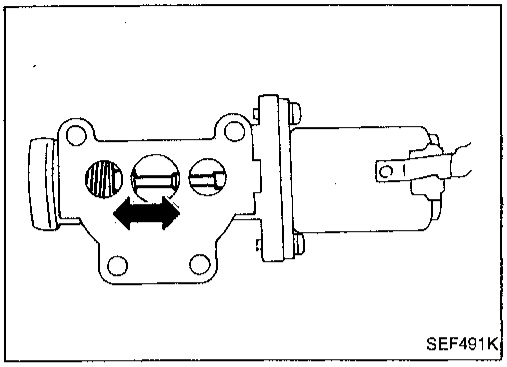
Condition	Swirl control valve
Supply vacuum to actuator	Close
No supply	Open



IACV-AAC VALVE

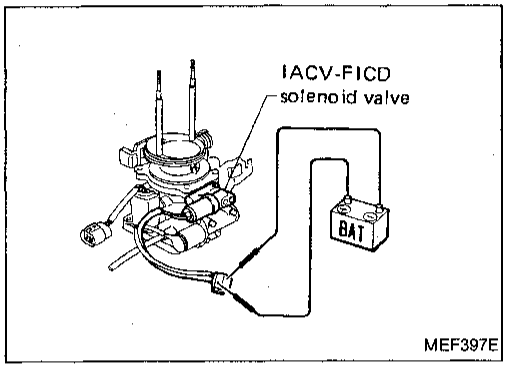
- Check IACV-AAC valve resistance.
  Resistance:
  Approximately 10Ω

Electrical Components Inspection (Cont'd)


SEF491K

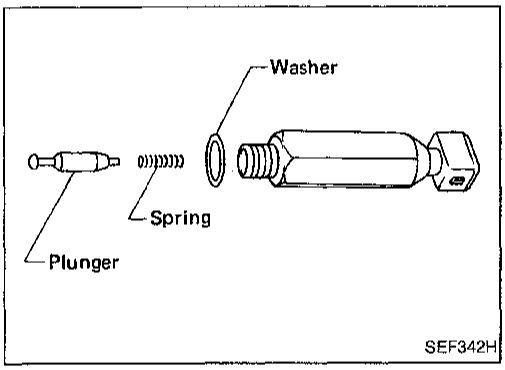
- Check plunger for seizure or sticking.
- Check spring for broken.

IACV-FICD SOLENOID VALVE



MEF397E

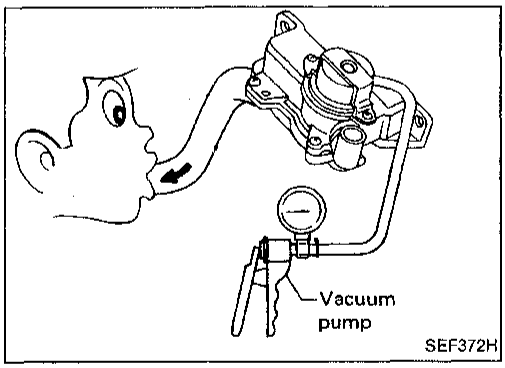
- Check that clicking sound is heard when applying 12V direct current to terminals.



SEF342H

- Check plunger for seizure or sticking.
- Check for broken spring.

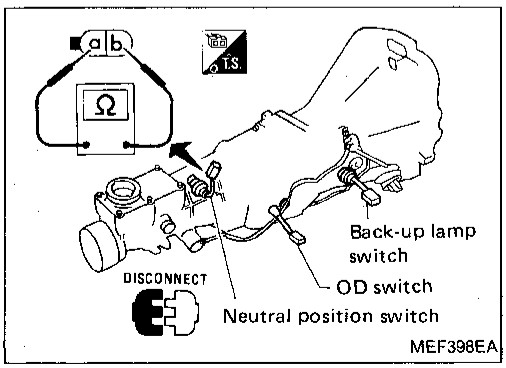
PAIR VALVE



SEF372H

Apply vacuum to vacuum motor, suck or blow hose to make sure that air flows only towards the air induction side.

NEUTRAL POSITION SWITCH (M/T model)

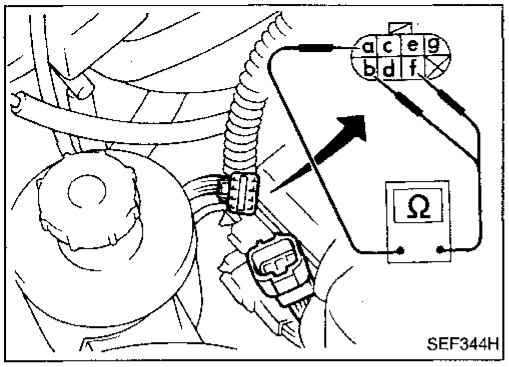


MEF398EA

- Check continuity between terminals ⓐ and ⓑ.

Conditions	Continuity
Shift to Neutral position	Yes
Shift to other position	No

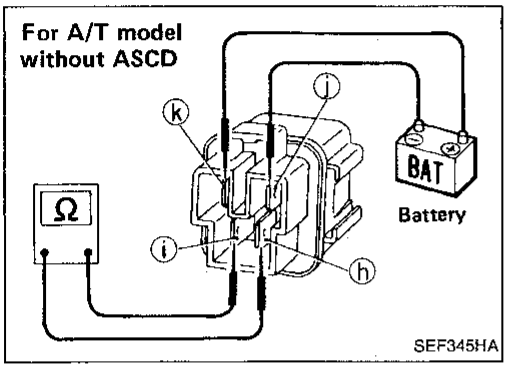
Electrical Components Inspection (Cont'd)



INHIBITOR SWITCH (A/T model)

Check continuity between terminals ⓐ and ⓑ, ⓕ.

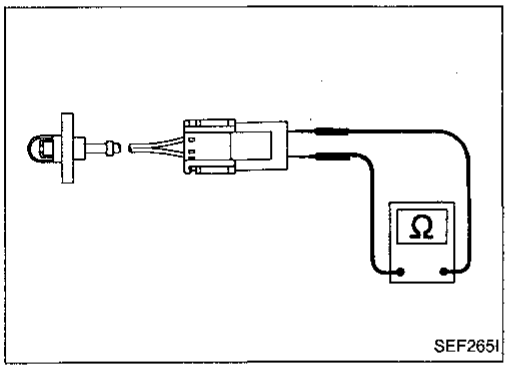
Conditions	Continuity between terminals ⓐ and ⓑ	Continuity between terminals ⓐ and ⓕ
Shift to "P" position	Yes	No
Shift to "N" position	No	Yes
Shift to positions other than "P" and "N"	No	No



PARK/NEUTRAL POSITION RELAY (A/T model)

- Check continuity between terminals ⓗ and ⓘ.

Condition	Continuity between terminals ⓗ and ⓘ
12V direct current supply between terminals ⓘ and ⓚ	Yes
No supply	No



INTAKE AIR TEMPERATURE SENSOR

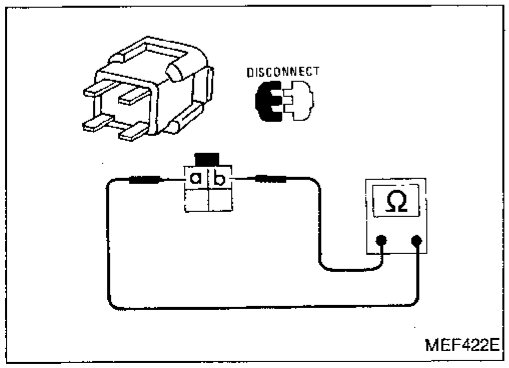
Check intake air temperature sensor resistance.

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
80 (176)	0.27 - 0.38

POWER STEERING OIL PRESSURE SWITCH

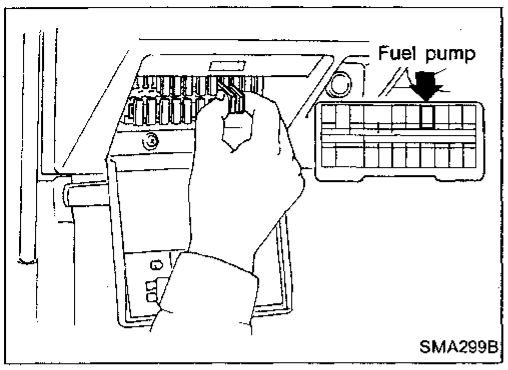
1. Disconnect power steering oil pressure switch harness connector.
2. Check continuity between terminals.

Conditions	Continuity
Steering wheel is being turned.	Yes
Steering wheel is not being turned.	No



RESISTOR

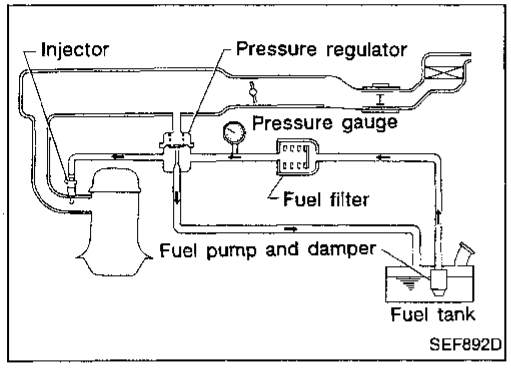
1. Disconnect resistor harness connector.
2. Check resistance between terminals ⓐ and ⓑ.
   Resistance: Approximately 2.2kΩ
   If NG, replace resistor.



Releasing Fuel Pressure

Before disconnecting fuel line, release fuel pressure from fuel line to eliminate danger.

1. Remove fuel pump fuse.
2. Start engine.
3. After engine stalls, crank it two or three times to release all fuel pressure.
4. Turn ignition switch off and reconnect fuel pump fuse.



Fuel Pressure Check

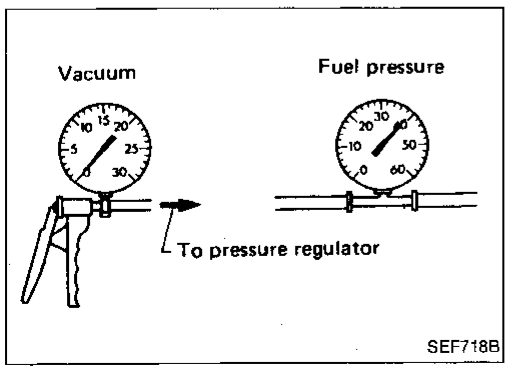
a. When reconnecting fuel line, always use new clamps.
b. Make sure that clamp screw does not contact adjacent parts.
c. Use a torque driver to tighten clamps.
d. Use Pressure Gauge to check fuel pressure.
e. Do not perform fuel pressure check while fuel pressure regulator control system is operating; otherwise, fuel pressure gauge might indicate incorrect readings.

1. Release fuel pressure to zero.
2. Disconnect fuel hose between fuel filter and fuel tube (engine side).
3. Install pressure gauge between fuel filter and fuel tube.
4. Start engine and check for fuel leakage.
5. Read the fuel pressure gauge indication.

At idling:

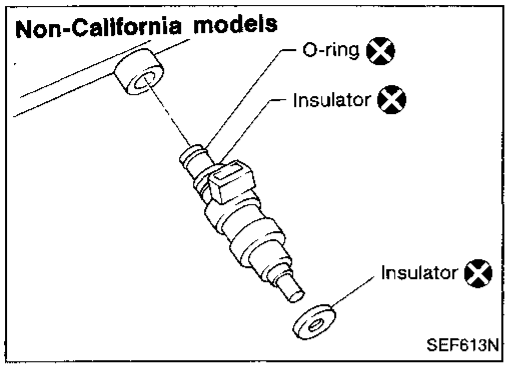
When fuel pressure regulator valve vacuum hose is connected.
More than 226 kPa (2.3 kg/cm^2, 33 psi)
When fuel pressure regulator valve vacuum hose is disconnected.
Approximately 294 kPa (3.0 kg/cm^2, 43 psi)

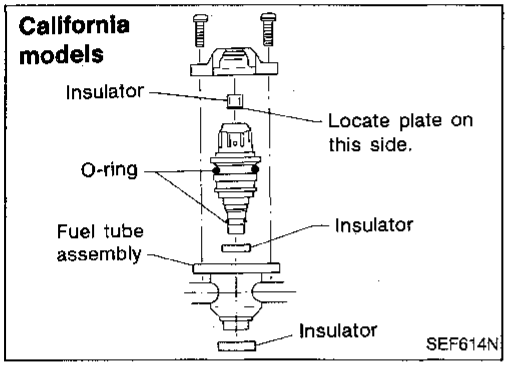
6. Stop engine and disconnect fuel pressure regulator vacuum hose from intake manifold.
7. Plug intake manifold with a rubber cap.
8. Connect variable vacuum source to fuel pressure regulator.



9. Start engine and read fuel pressure gauge indication as vacuum changes.

Fuel pressure should decrease as vacuum increases. If results are unsatisfactory, replace fuel pressure regulator.





Injector Removal and Installation

1. Release fuel pressure to zero.
2. Remove or disconnect the following:
- EGRC-BPT valve
- Fuel tube securing bolts
3. Remove injectors with fuel tube assembly.
4. Remove injector from fuel tube.

For California model, push out injector from fuel tube assembly. Do not extract injector by pinching electric connector.

5. Install injector to fuel tube after cleaning exterior of injector.

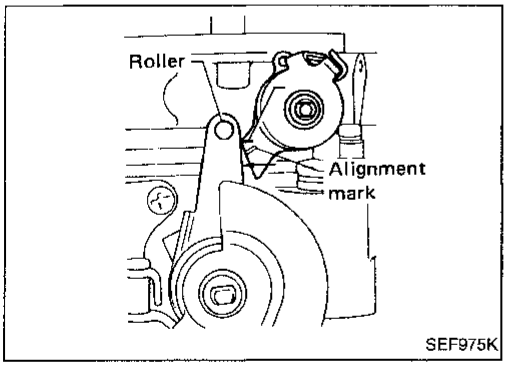
Use new O-rings and insulators.
Lubricate O-rings with a smear of silicone oil.

CAUTION:
After properly connecting injectors to fuel tube, check connection for fuel leakage.

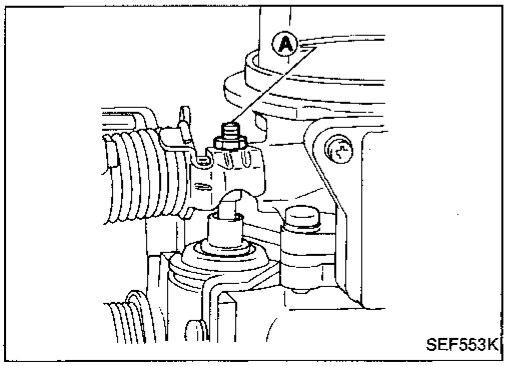
6. Assemble injectors with fuel pipe to intake manifold.

Fast Idle Inspection and Adjustment

1. Start engine and warm it up until water temperature indicator points to the normal operating temperature.
2. Stop engine and remove air cleaner assembly.

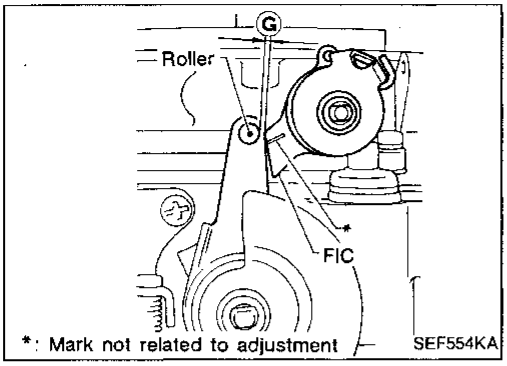


3. Be sure to set the mark to point to the roller center as shown in the figure.
- On throttle bodies, an alignment mark is impressed on the FIC so that the top of the cam may be faced in the correct direction.



- If necessary, adjust the adjusting screw Ⓐ until the top of the cam faces the center of the lever roller.

Fast Idle Inspection and Adjustment (Cont'd)



4. Measure clearance Ⓖ between the roller and the top of the FIC using a feeler gauge. (See figure.)

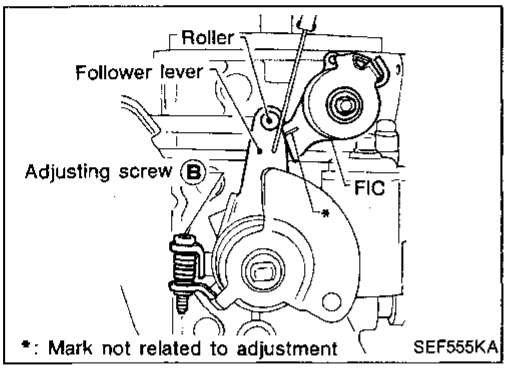
Clearance Ⓖ:

M/T model

2.0 - 2.6 mm (0.079 - 0.102 in)

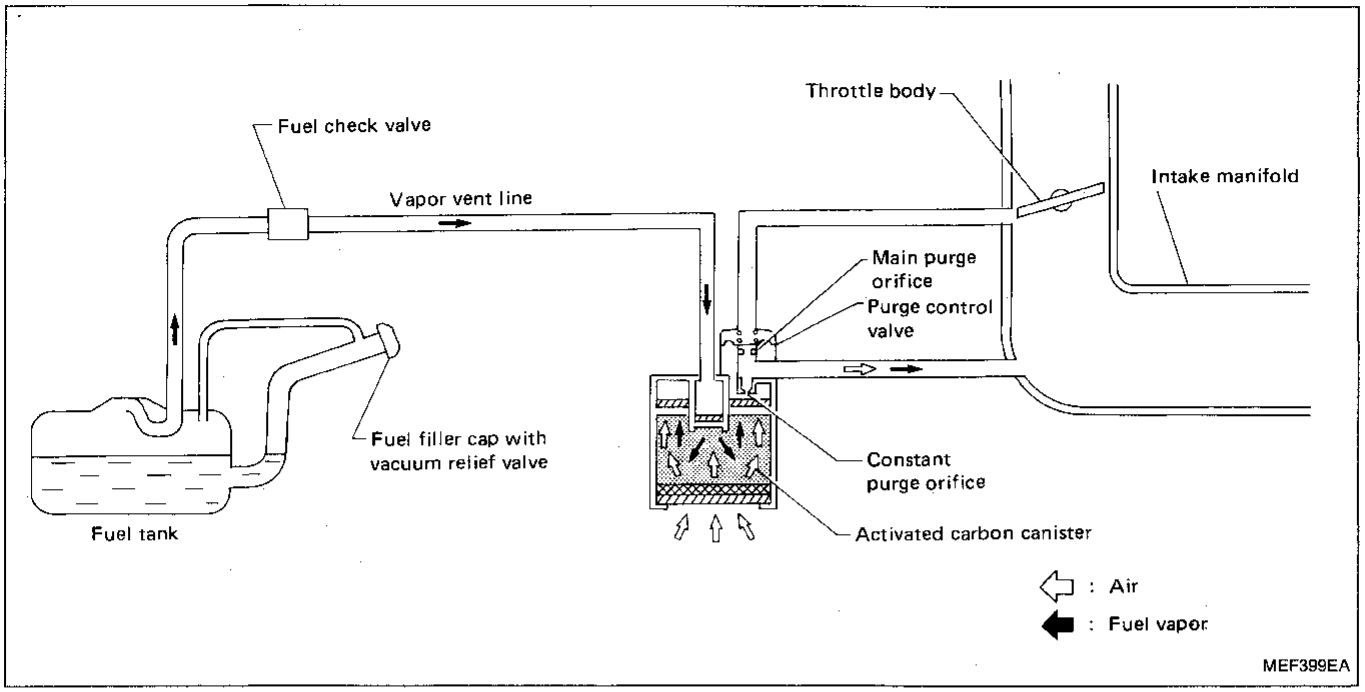
A/T model

1.8 - 2.4 mm (0.071 - 0.094 in)



- If clearance Ⓖ is out of specification, adjust clearance Ⓖ using adjusting screw Ⓑ to 2.3 mm (0.091 in) (M/T) or 2.1 mm (0.083 in) (A/T).

Description

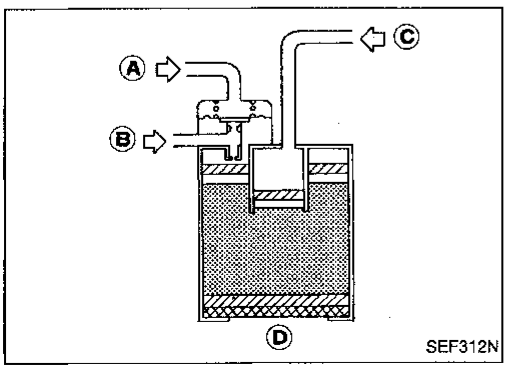


The evaporative emission system is used to reduce hydrocarbons emitted to the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the carbon canister.

The fuel vapor from the sealed fuel tank is led into the canister which contains activated carbon and the vapor is stored there when the engine is not running.

The canister retains the fuel vapor until the canister is purged by the air drawn through the bottom of the canister to the intake manifold when the engine is running. When the engine runs at idle, the purge control valve is closed.

Only a small amount of stored vapor flows into the intake manifold through the constant purge orifice. As the engine speed increases, and the throttle vacuum increases, the purge control valve opens and the vapor is sucked into the intake manifold through both the main purge orifice and the constant purge orifice.



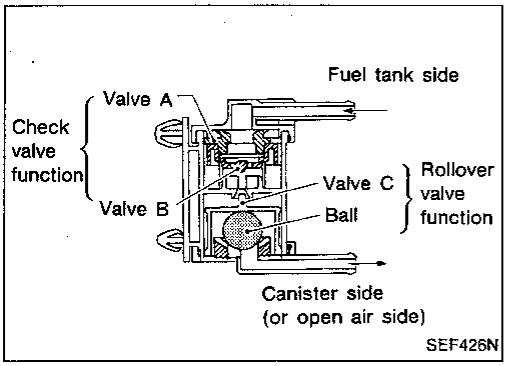
Inspection

ACTIVATED CARBON CANISTER

Check carbon canister as follows:

1. Blow air in port Ⓐ and ensure that there is no leakage.
2.
- Apply vacuum to port Ⓐ.
- Cover port Ⓓ with hand.
- Blow air in port Ⓒ and ensure free flow out of port Ⓑ.

Inspection (Cont'd)



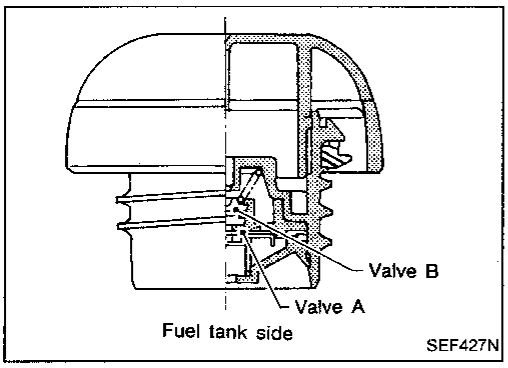
FUEL CHECK VALVE (With rollover valve)

Check valve operation

1. Blow air through connector on fuel tank side.
   A considerable resistance should be felt and a portion of air flow should be directed toward the canister side.
2. Blow air through connector on canister side.
   Air flow should be smoothly directed toward fuel tank side.
3. If fuel check valve is suspected of not properly functioning in steps 1 and 2 above, replace it.

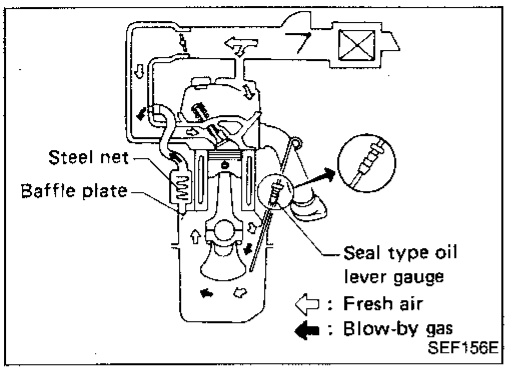
Rollover valve operation

Ensure that continuity of air passage does not exist when the installed rollover valve is tilted to 90° or 180°.



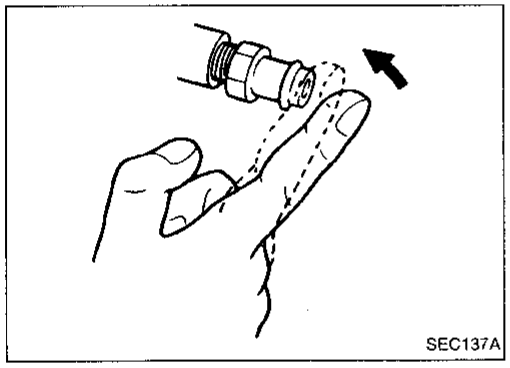
FUEL TANK VACUUM RELIEF VALVE

1. Wipe clean valve housing.
2. Suck air through the cap. A slight resistance accompanied by valve clicks indicates that valve A is in good mechanical condition. Note also that, by further sucking air, the resistance should disappear with valve clicks.
3. Blow air on fuel tank side and ensure that continuity of air passage exists through valve B.
4. If valve is clogged or if no resistance is felt, replace cap as an assembly.



Description

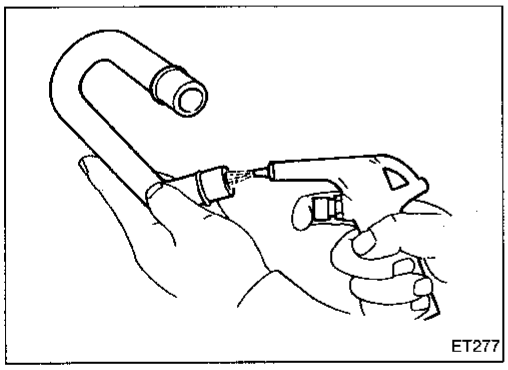
This system returns blow-by gas to both the intake manifold and air cleaner.
The positive crankcase ventilation (PCV) valve is provided to conduct crankcase blow-by gas to the intake manifold.
During partial throttle operation of the engine, the intake manifold sucks the blow-by gas through the PCV valve.
Normally, the capacity of the valve is sufficient to handle any blow-by and a small amount of ventilating air.
The ventilating air is then drawn from the air cleaner, through the hose connecting the air cleaner to rocker cover, into the crankcase.
Under full-throttle condition, the manifold vacuum is insufficient to draw the blow-by flow through the valve, and its flow goes through the hose connection in the reverse direction.
On vehicles with an excessively high blow-by some of the flow will go through the hose connection to the air cleaner under all conditions.



Inspection

PCV (Positive Crankcase Ventilation)

With engine running at idle, remove ventilation hose from PCV valve; if valve is working properly, a hissing noise will be heard as air passes through it and a strong vacuum should be felt immediately when a finger is placed over valve inlet.



VENTILATION HOSE

1. Check hoses and hose connections for leaks.
2. Disconnect all hoses and clean with compressed air. If any hose cannot be freed of obstructions, replace.

General Specifications

IGNITION TIMING	BTDC	10° ± 2°
IDLE SPEED	rpm	M/T 800 ± 50 A/T 800 ± 50 (in "N" position)

Inspection and Adjustment

ENGINE COOLANT TEMPERATURE SENSOR			
Thermistor resistance	kΩ	20°C (68°F)	80°C (176°F)
		2.1 - 2.9	0.30 - 0.33
FUEL PRESSURE at idling			
(Measuring point: between fuel filter and fuel pipe)			
Vacuum hose is connected	kPa (kg/cm², psi)	Approximately 226 (2.3, 33)	
Vacuum hose is disconnected	kPa (kg/cm², psi)	Approximately 294 (3.0, 43)	
FUEL INJECTOR			
Coil resistance	Ω	Approximately 10 - 15	
EGR TEMPERATURE SENSOR			
Thermistor resistance	kΩ	100°C (212°F)	
		85.3 ± 8.53	