ENGINE FUEL & EMISSION CONTROL SYSTEM

SECTION EF & EC

CONTENTS

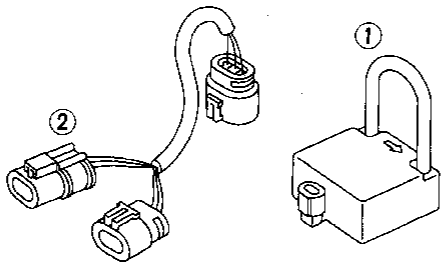
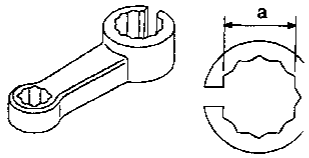
CONTENTS (Cont'd)

For assistance with 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".

Note: Refer to Foldout page for "ECCS WIRING DIAGRAM".

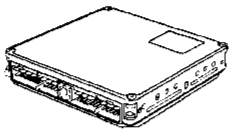
Special Service Tools

Tool number (Kent-Moore No.) Tool name	Description	
① KV109D0010 (J36777-1) Ignition timing adapter coil ② KV10114200 (J-36777-4) Adapter harness	 NT054	Measuring ignition timing
KV10114400 (J-38365) Heated oxygen sensor wrench	 NT636	Loosening or tightening heated oxygen sensor **a: 22 mm (0.87 in)**

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

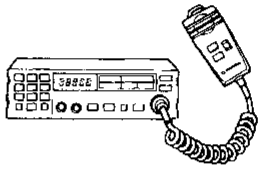
INJECTOR
- Do not disconnect injector harness connectors with engine running.
- Do not apply battery power directly to injectors.

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.



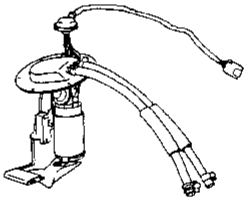
WIRELESS EQUIPMENT
- When installing CB ham radio or a mobile phone, be sure to observe the following: (Such wireless equipment may adversely affect electronic control systems depending on its installation location.)

1) Keep the antenna as far away as possible from the ECM.
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.



ECCS PARTS HANDLING
- Handle air flow meter carefully to avoid damage.
- Do not disassemble 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.

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.



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

Supplemental Restraint System (SRS) "AIR BAG"
The Supplemental Restraint System "Air Bag", used along with a seat belt, helps to reduce the risk or severity of injury to the driver and front passenger in a frontal collision. The Supplemental Restraint System consists of air bag modules (located in the center of the steering wheel and on the instrument panel on the passenger side), sensors, a diagnosis unit, warning lamp, wiring harness and spiral cable.
Information necessary to service the system safely is included in the **RS section** of this service manual.
WARNING:
- **To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance must be performed by an authorized NISSAN dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system.**
- **All SRS electrical wiring harnesses and connectors are covered with yellow outer insulation. Do not use electrical test equipment on any circuit related to the SRS.**

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. This prevents an ECCS system malfunction due to receiving external noise, degraded operation of ICs, etc.
- Keep ECCS parts and harnesses dry.
- Before removing parts, turn off ignition switch and then disconnect battery ground cable.

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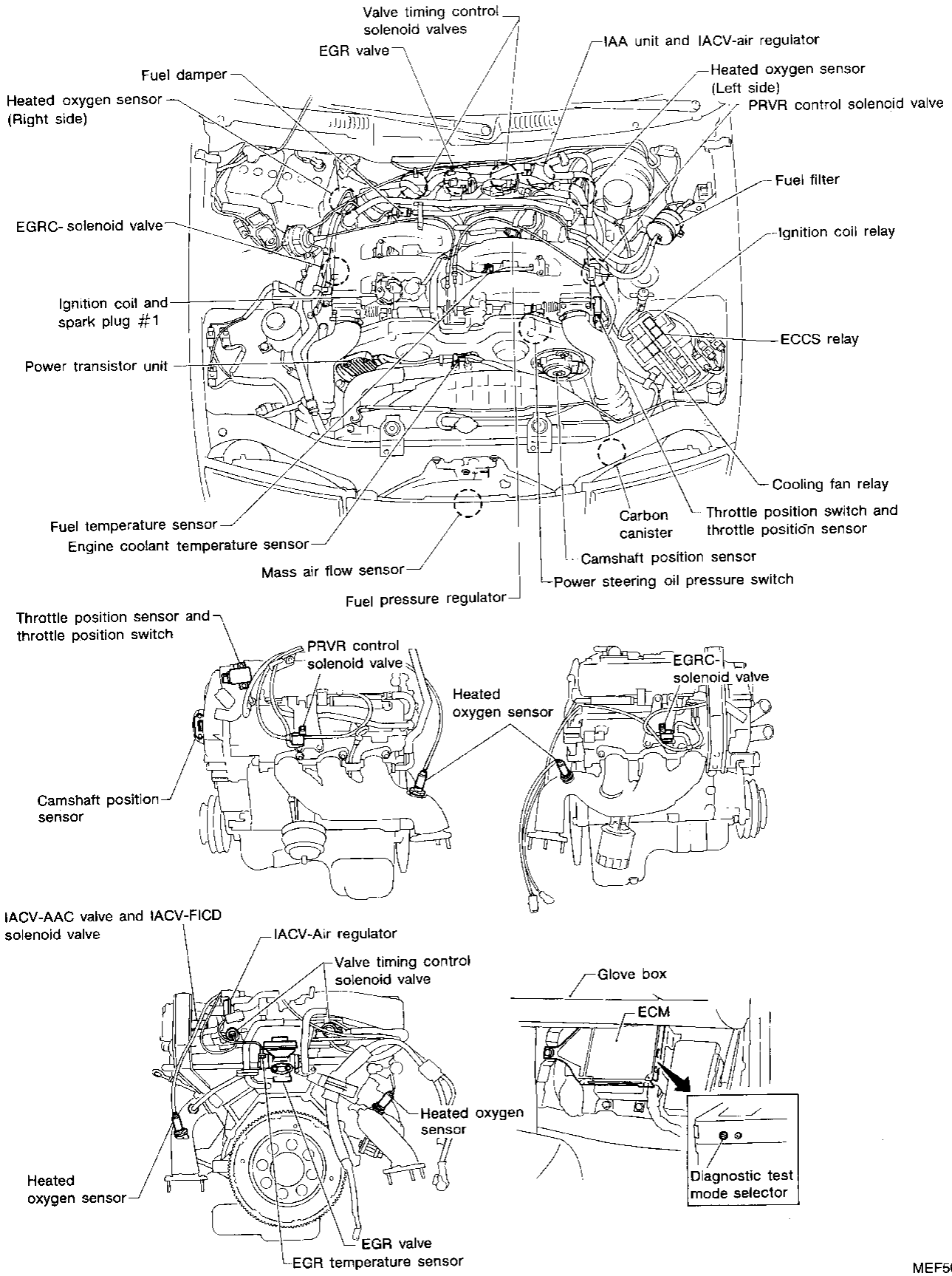
ECCS Component Parts Location

NON-TURBOCHARGER MODEL



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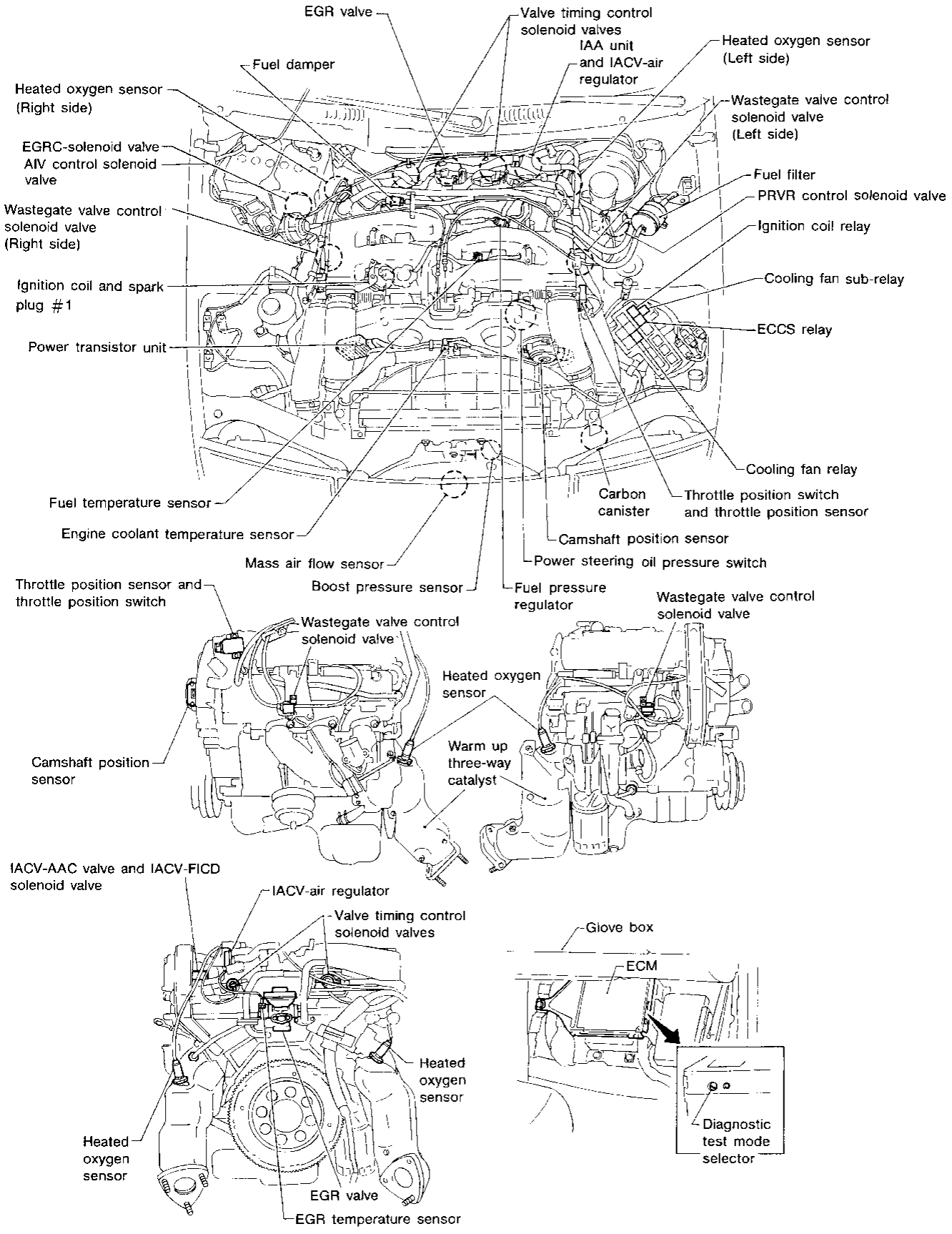
ECCS Component Parts Location (Cont'd)

TURBOCHARGER MODEL



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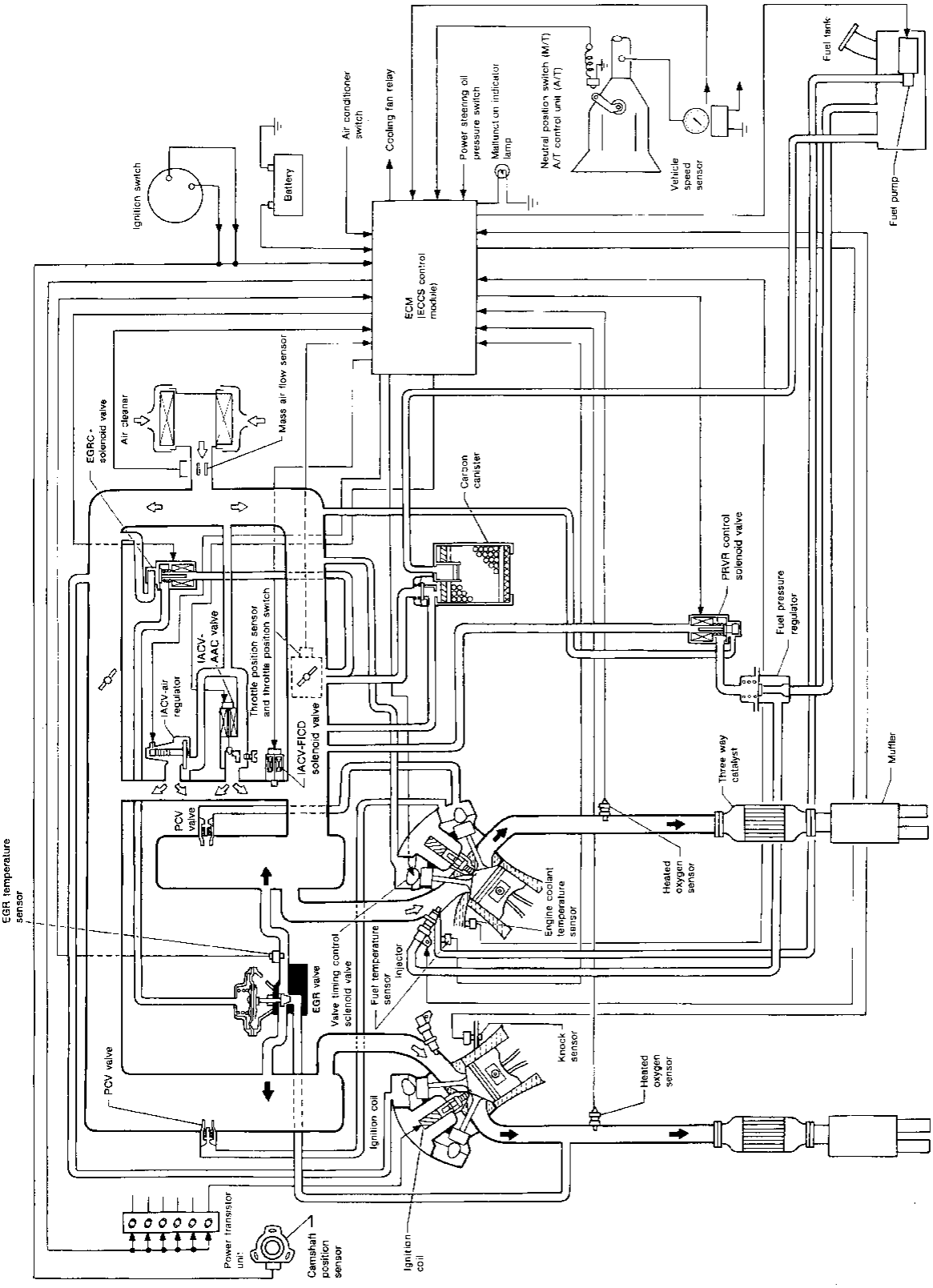
System Diagram

NON-TURBOCHARGER MODEL



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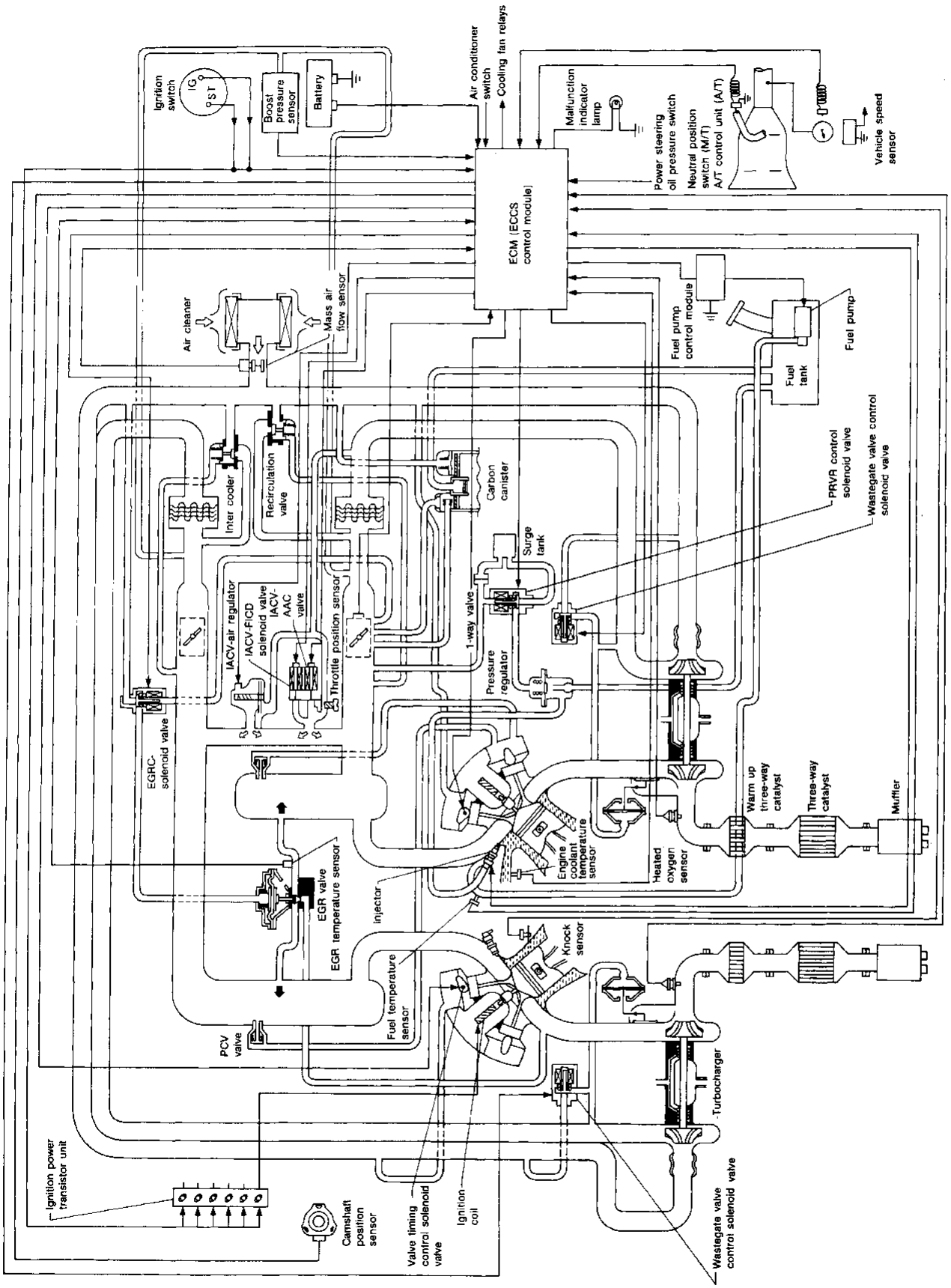
System Diagram (Cont'd)

TURBOCHARGER MODEL



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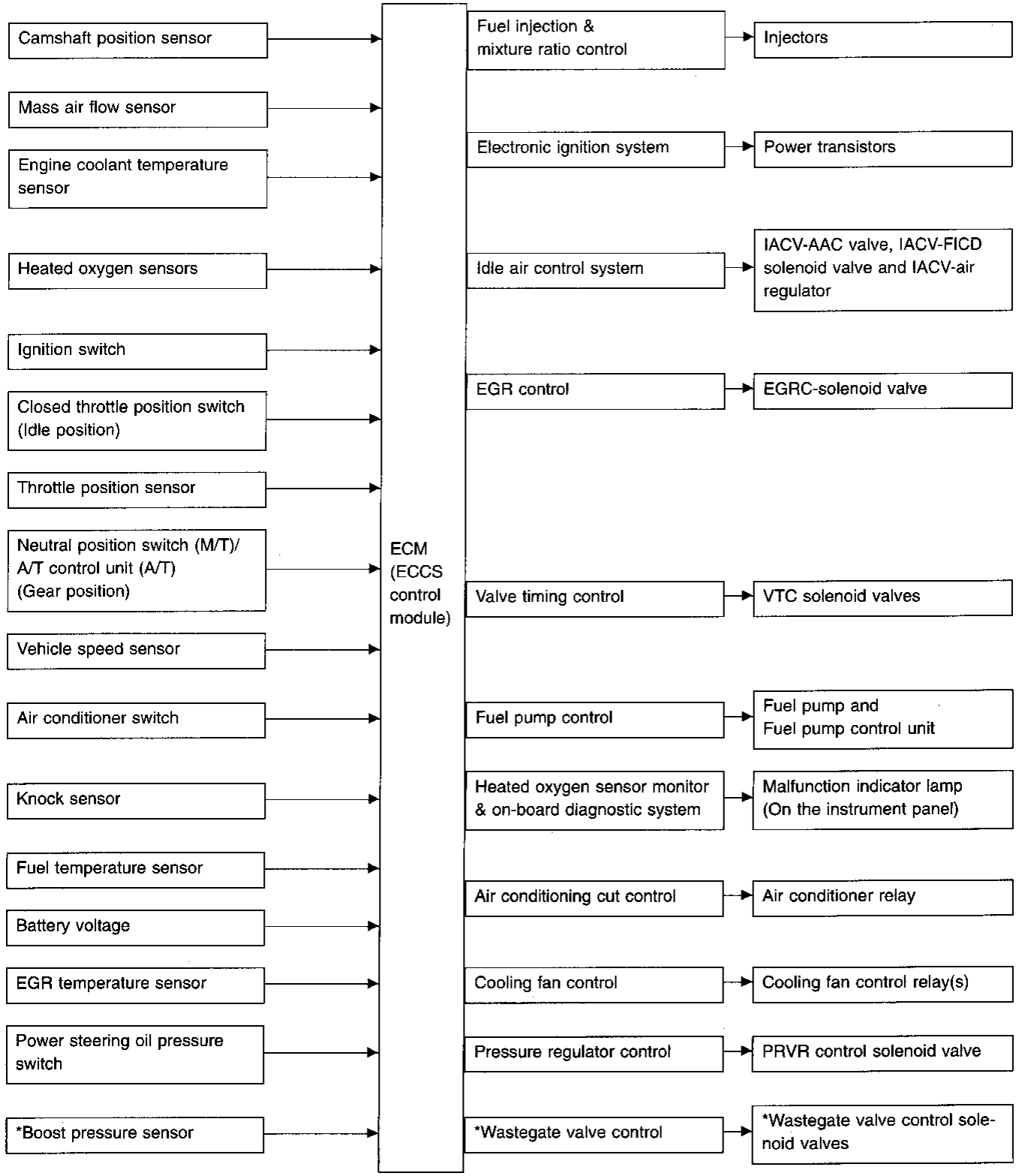
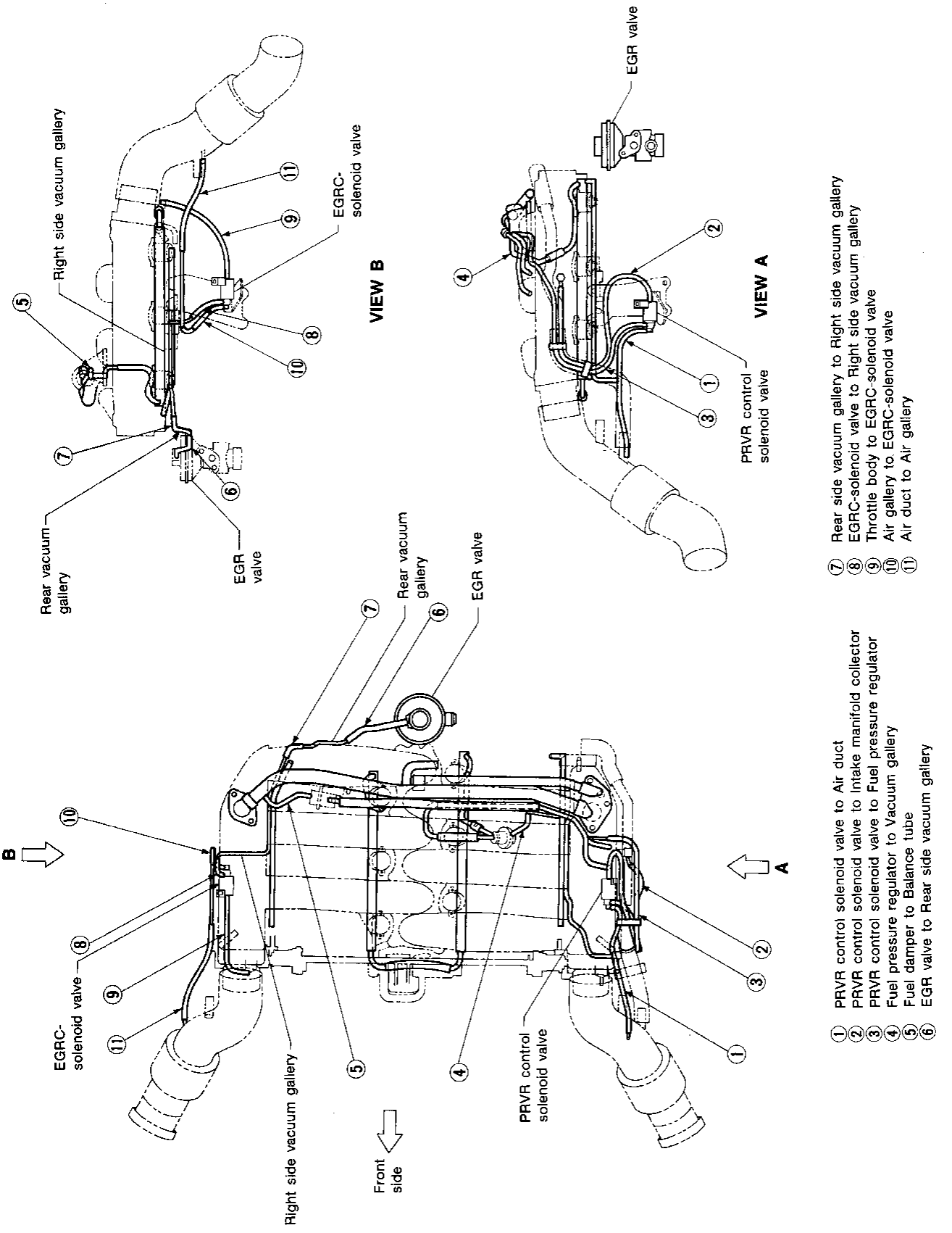
System Chart



* Turbocharger model only

Vacuum Hose Drawing

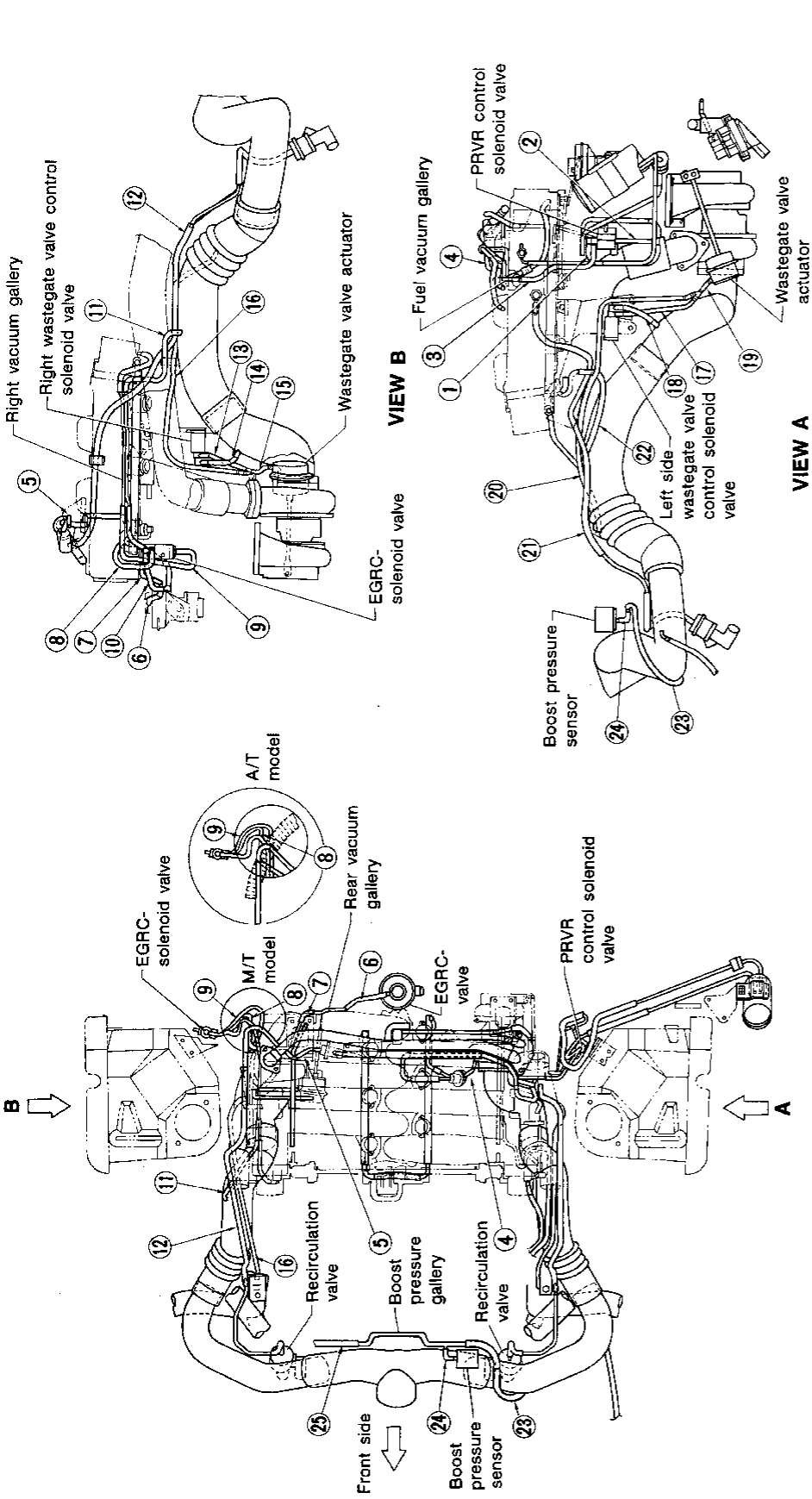
NON-TURBOCHARGER MODEL



SEF739M

Vacuum Hose Drawing (Cont'd)

TURBOCHARGER MODEL



① PRVR control solenoid valve to Vacuum tank
② PRVR control solenoid valve to Intake manifold collector
③ PRVR control solenoid valve to Fuel vacuum gallery
④ Fuel pressure regulator to Fuel vacuum gallery
⑤ Fuel damper to Balance tube
⑥ EGRC-solenoid valve to Rear side vacuum gallery
⑦ Rear side vacuum gallery to Right side vacuum gallery
⑧ EGRC-solenoid valve to Right side vacuum gallery
⑨ Throttle body to EGRC-solenoid valve
⑩ EGRC-solenoid valve to Right side air gallery through 3-way connector
⑪ Air duct to Right side air gallery
⑫ Right side recirculation valve to Intake manifold collector
⑬ Right side wastegate valve control solenoid valve to Air pipe through 3-way connector
⑭ Right side wastegate valve control solenoid valve to Suction pipe
⑮ Right side wastegate valve actuator to Air pipe through 3-way connector
⑯ Air pipe to 3-way connector (For right side wastegate valve control)
⑰ Left side wastegate valve control solenoid valve to Air pipe through 3-way connector
⑱ Left side wastegate valve control solenoid valve to Suction pipe
⑲ Left side wastegate valve actuator to Air pipe through 3-way connector
⑳ Air pipe to 3-way connector (For left side wastegate valve control)
㉑ Left side recirculation valve to Intake manifold collector
㉒ Canister purge line
㉓ Boost pressure sensor to Left side air pipe through boost pressure gallery
㉔ Boost pressure sensor to Boost pressure gallery
㉕ Boost pressure sensor to Right side air pipe through boost pressure gallery

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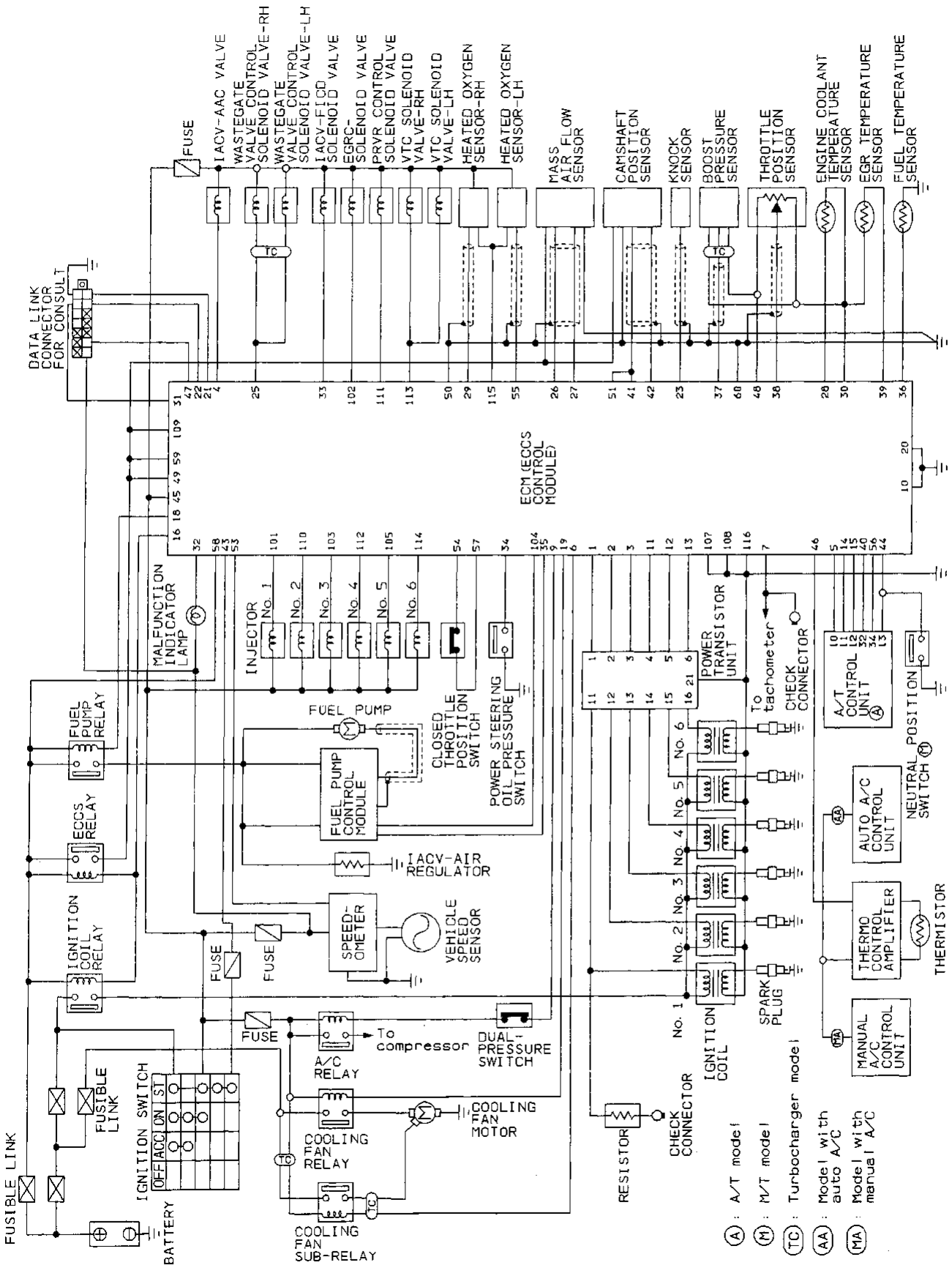
Circuit Diagram



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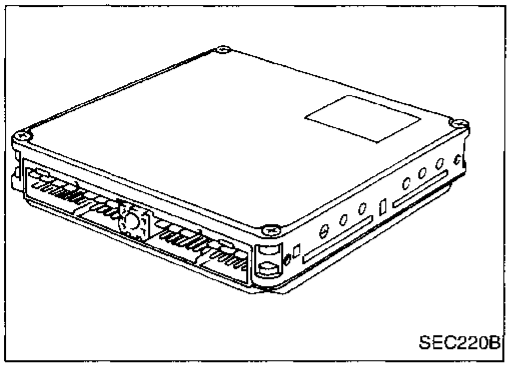
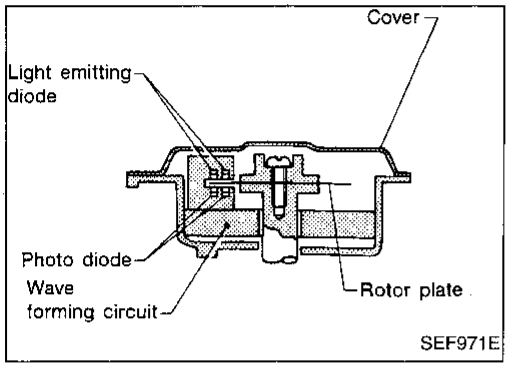

SEC220B

Engine Control Module (ECM)-ECCS Control Module

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



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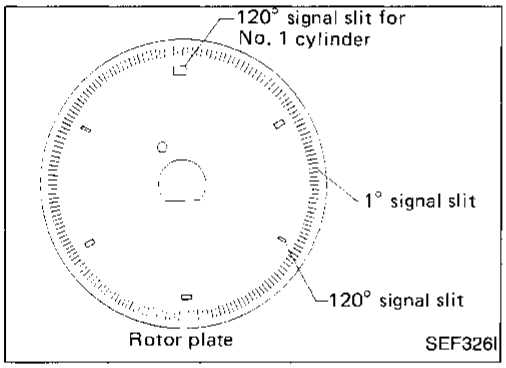
Camshaft Position Sensor (CMPS)

The camshaft position sensor is a basic component of the 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.



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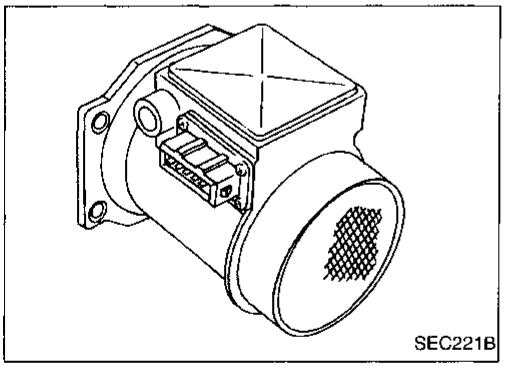
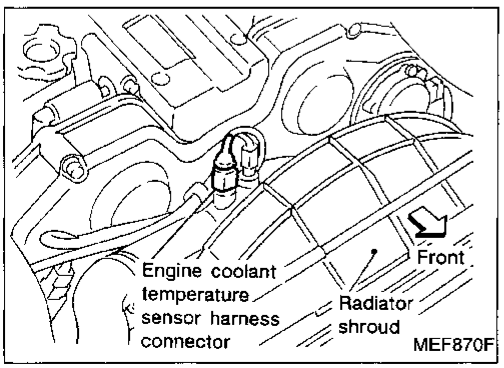
The rotor plate is positioned between the LED and the photo diode. The LED transmits light to the photo diode. As the rotor plate turns, the slits cut the light to generate rough-shaped pulses. These pulses are converted into on-off signals by the wave-forming circuit and sent to the ECM.


SEC221B

Mass Air Flow Sensor (MAFS)

The mass air flow sensor is placed in the stream of intake air. It measures the intake flow rate by measuring a part of the entire intake flow. It consists of a hot film that is supplied with electric current from the ECM. The temperature of the hot film is controlled by the ECM a certain amount. The heat generated by the hot film is reduced as the intake air flows around it. The more air, the greater the heat loss.
Therefore, the ECM must supply more electric current to the hot film as air flow increases. This maintains the temperature of the hot film. The ECM detects the air flow by means of this current change.



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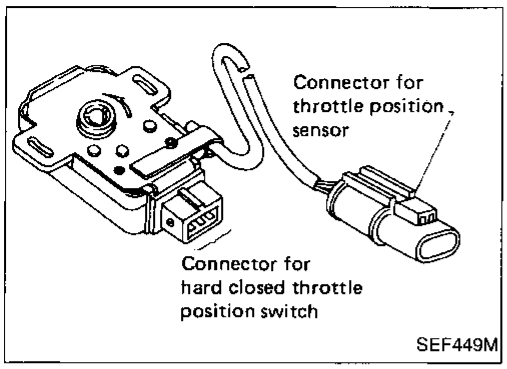
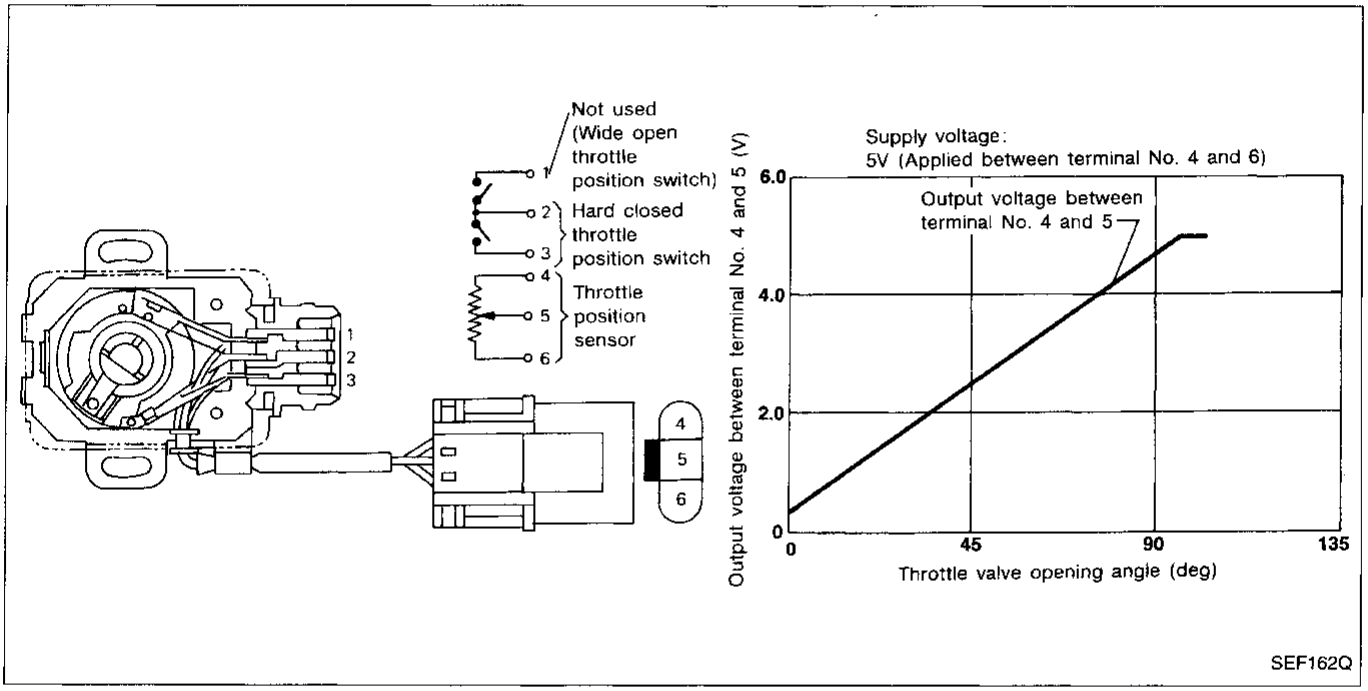
Engine Coolant Temperature Sensor (ECTS)

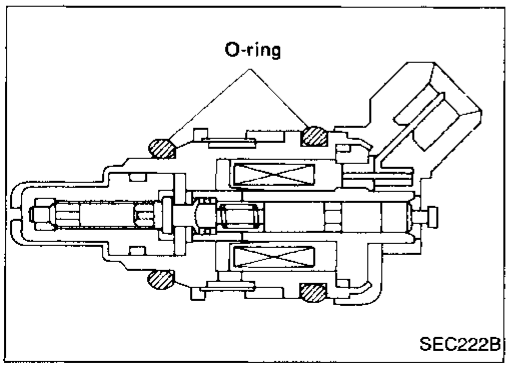
The engine coolant temperature sensor, located on the top of water inlet housing, detects engine coolant temperature and transmits a signal to the ECM.
The temperature sensing unit employs a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases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



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

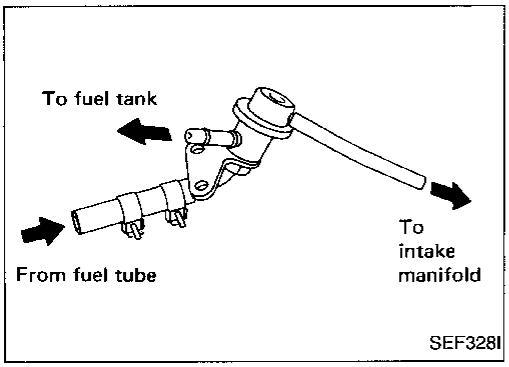
The throttle position sensor responds to accelerator pedal movement. This sensor is a kind of potentiometer which transforms the throttle position into output voltage, and emits the voltage signal to the ECM. In addition, the sensor detects the opening and closing speed of the throttle valve and feeds 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". It controls engine operation such as fuel cut. On the other hand, "hard closed throttle position switch", which is built into the throttle position sensor unit, is used for engine control when soft closed throttle position switch is malfunctioning.





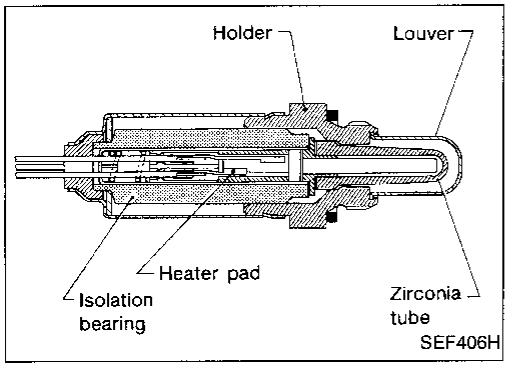
Fuel Injector

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.



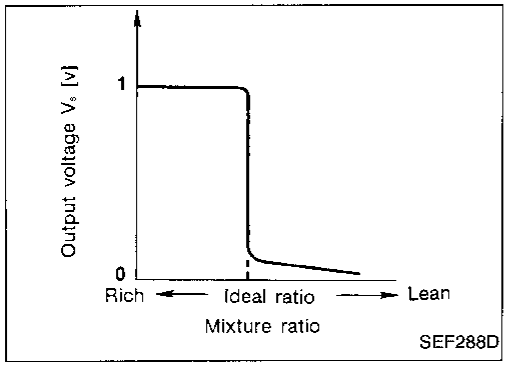
Pressure Regulator

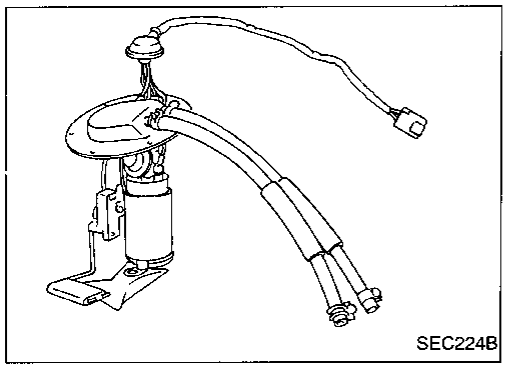
The pressure regulator maintains the fuel pressure at 299.1 kPa (3.05 kg/cm^2, 43.4 psi). Since the injected fuel amount depends on injection pulse duration, it is necessary to maintain the pressure at the above value.



Heated Oxygen Sensor (HO2S)

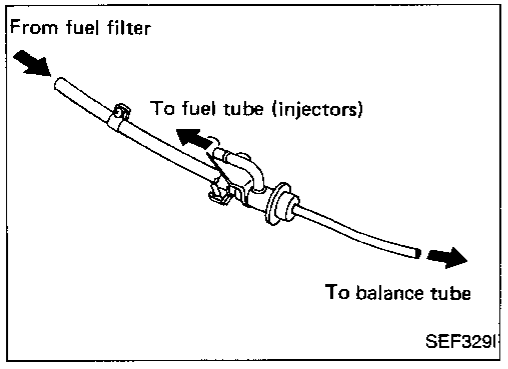
The heated oxygen sensor is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.





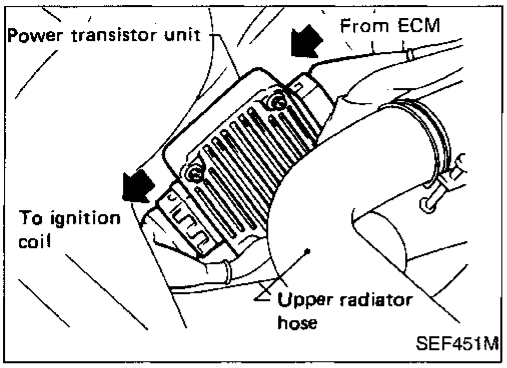
Fuel Pump

The fuel pump is an in-tank type with a fuel damper. Both the pump and damper are located in the fuel tank.



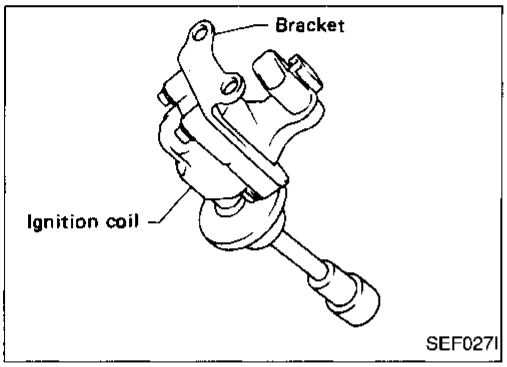
Fuel Damper

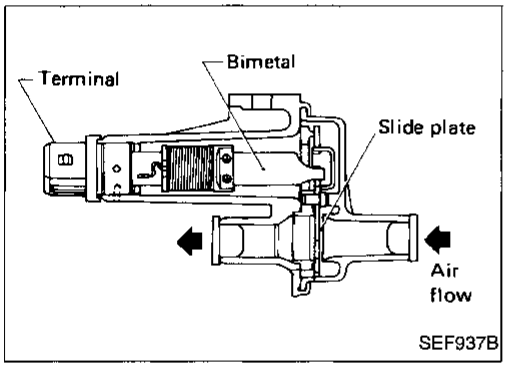
The fuel damper, which consists of a diagram, reduces fuel pressure pulsation in the fuel feed line between the fuel filter and injectors.



Power Transistor Unit & Ignition Coil

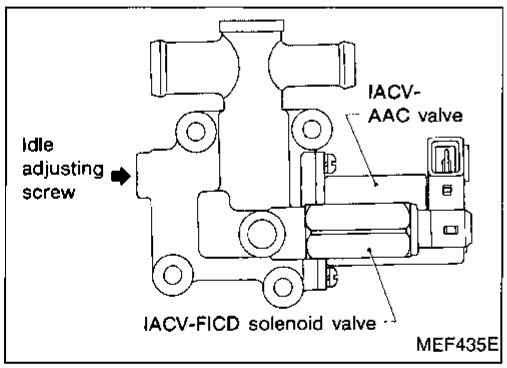
The ignition signal from the ECM is amplified by the power transistor, which turns the ignition coil primary circuit on and off, inducing the proper high voltage in the secondary circuit. The ignition coil is a small, molded type.





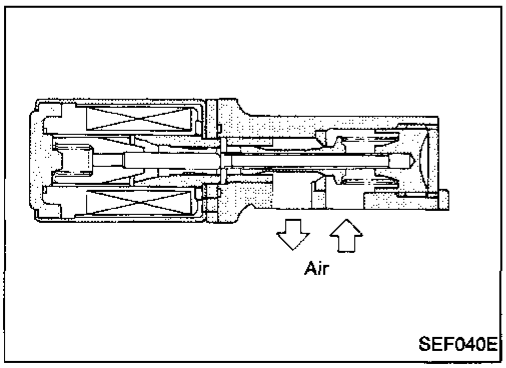
Idle Air Control Valve (IACV)-Air Regulator

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.



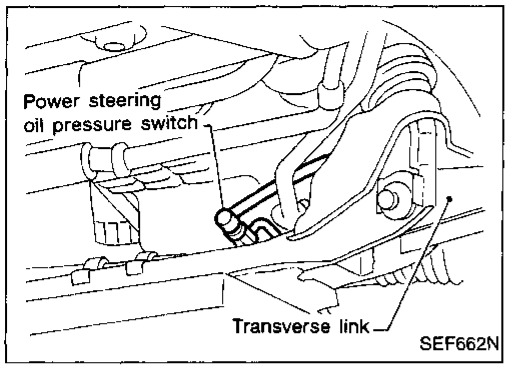
Idle Air Adjusting (IAA) Unit

The IAA unit is made up of the IACV-AAC valve, IACV-FICD solenoid valve and idle adjust screw. It receives the signal from the ECM and controls the idle speed at the preset value.
The IACV-FICD solenoid valve compensates for changes in idle speed caused by the operation of the air compressor.



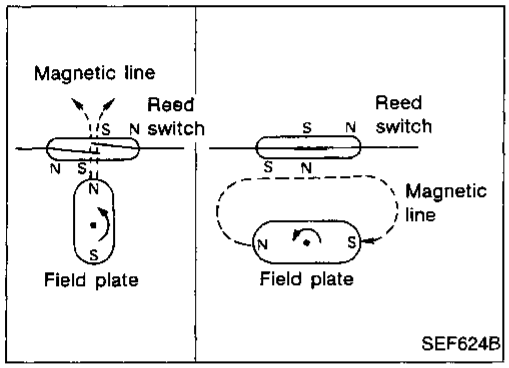
Idle Air Control Valve (IACV)-Auxiliary Air Control (AAC) Valve

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.



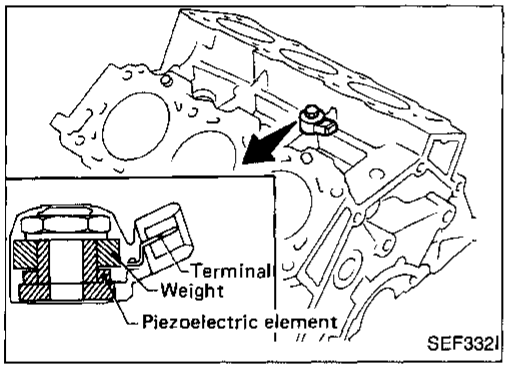
Power Steering Oil Pressure Switch

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.



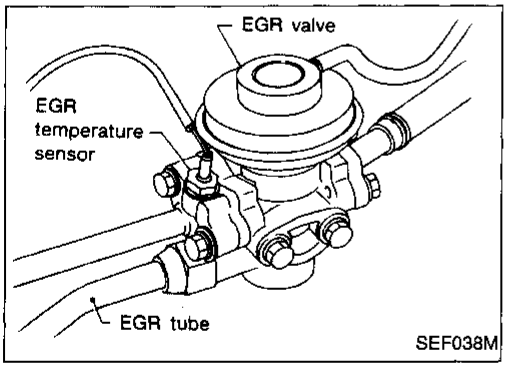
Vehicle Speed Sensor (VSS)

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.



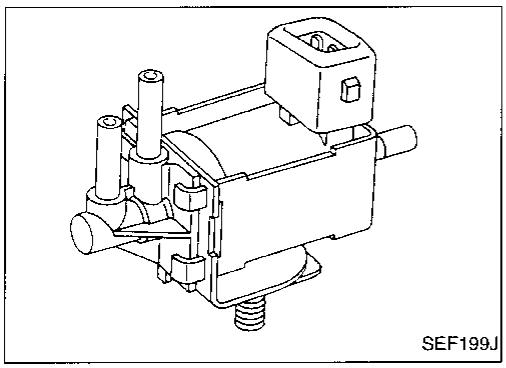
Knock Sensor (KS)

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 diverted to the intake manifold through vertical movement of a taper valve connected to the diaphragm. Vacuum is applied to the diaphragm in response to the opening of the throttle valve.

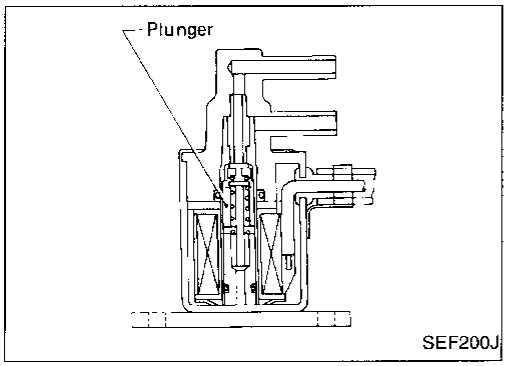

SEF199J

EGR Control (EGRC)-Solenoid Valve

The solenoid valve responds to the ON/OFF signal from the ECM. When it is off, a vacuum signal from the throttle body is fed into the EGR valve. When the ECM sends an ON signal, the coil pulls the plunger downward and cuts the vacuum signal.

Pressure Regulator Vacuum Relief (PRVR) Control Solenoid Valve

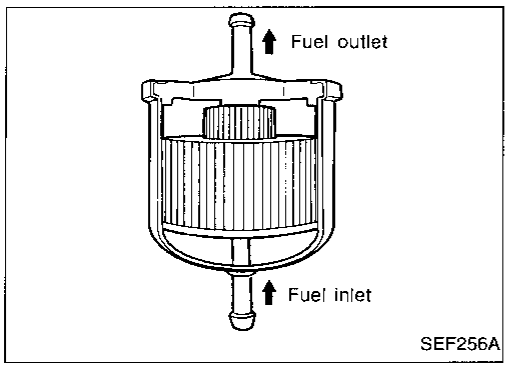
The solenoid valve responds to the ON/OFF signal from the ECM. When it is off, a vacuum signal from the intake manifold is fed into the pressure regulator. When the ECM sends an ON signal, the coil pulls the plunger downward and cuts the vacuum signal.



SEF200J

Wastegate Valve Control Solenoid Valve

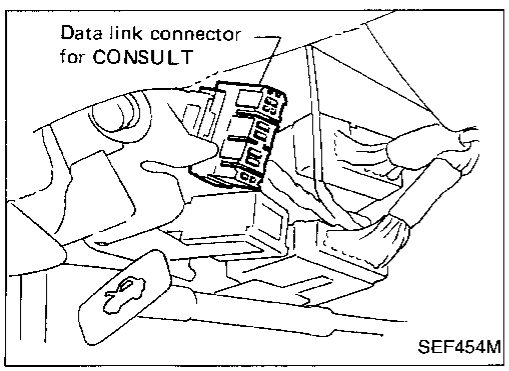
The solenoid valve responds to the ON/OFF signal from the ECM. When it is ON, a vacuum signal from the suction pipe or compressor outlet is fed into the wastegate valve actuator. The actuator is hard to open at this time. When the control module sends an OFF signal, the coil pulls the plunger upward and cuts the route to the suction pipe.



SEF256A

Fuel Filter

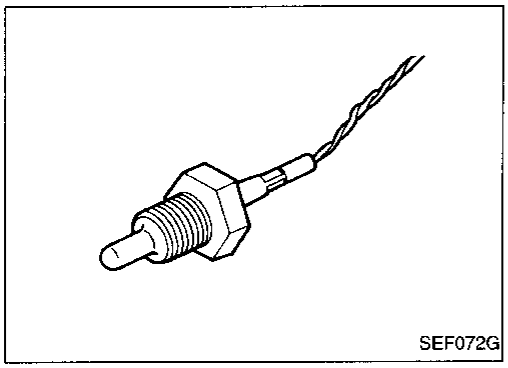
The specially designed fuel filter has a metal case in order to withstand high fuel pressure.



SEF454M

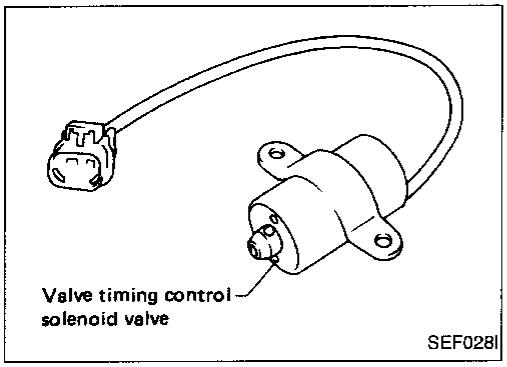
Data Link Connector for CONSULT

The data link connector for CONSULT is located above the hood release handle.


SEF072G

EGR Temperature Sensor

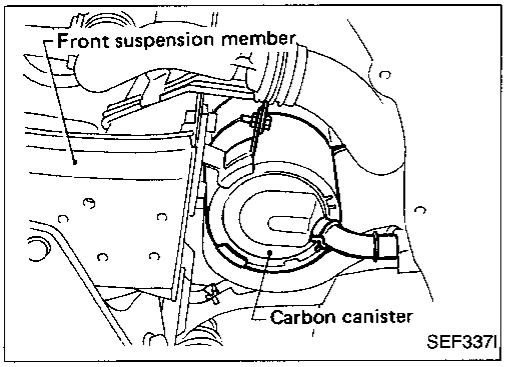
The EGR temperature sensor monitors the exhaust gas temperature and transmits a signal to the ECM. The temperature sensing unit employs a thermistor which is sensitive to the change in temperature. Electric resistance of the thermistor decreases in response to the temperature rise.



SEF028I

Valve Timing Control Solenoid Valve

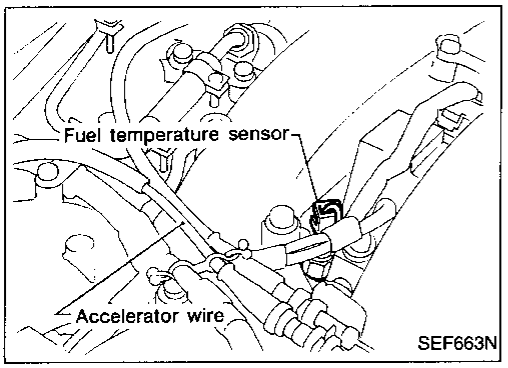
The valve timing control solenoids are installed at the rear end of the intake camshafts, and control oil pressure which regulates the position of the intake camshafts.



SEF337I

Carbon Canister

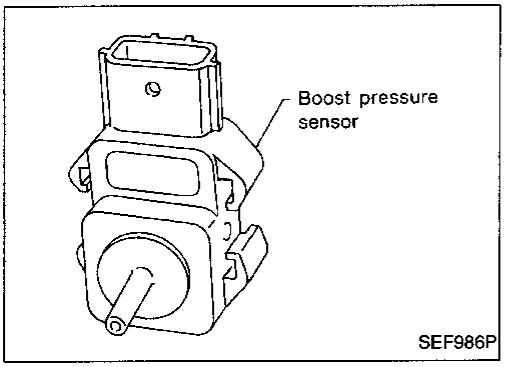
The carbon canister is filled with active charcoal to absorb evaporative gases produced in the fuel tank. These absorbed gases are then delivered to the intake manifold by manifold vacuum for combustion purposes.



SEF663N

Fuel Temperature Sensor

The fuel temperature sensor, built into the fuel tube, senses fuel temperature. When the fuel temperature is higher than specified, the ECM (ECCS control module) turns the PRVR control solenoid valve ON and raises fuel pressure.



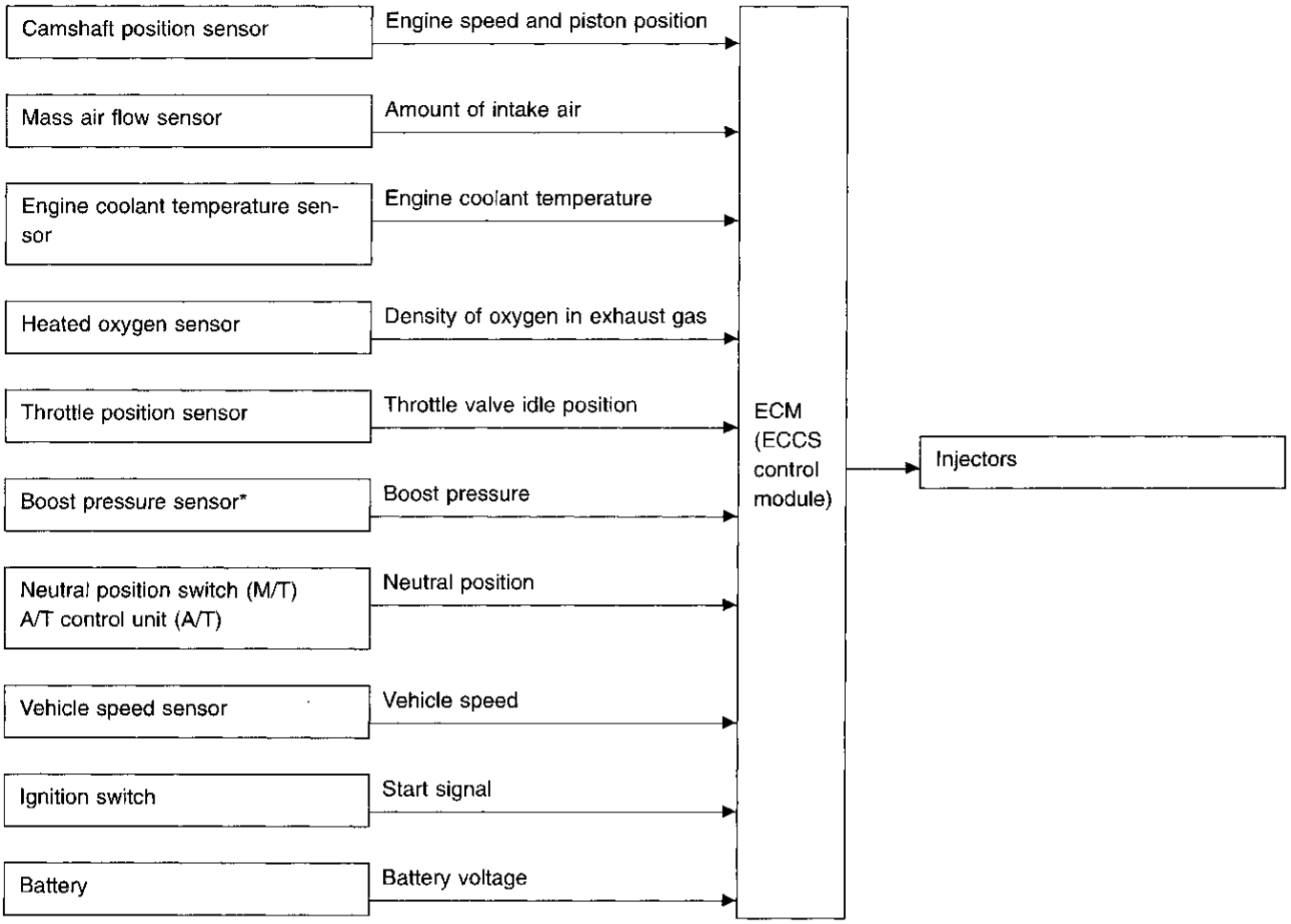
SEF986P

Boost Pressure Sensor

The boost pressure sensor detects boost pressure at the upstream of the throttle body. The pressure signal is transmitted to the ECM.

Multiport Fuel Injection (MFI) System

INPUT/OUTPUT SIGNAL LINE



*Turbocharger only

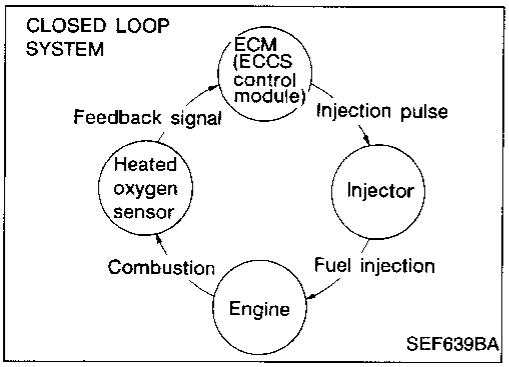
BASIC MULTIPORT FUEL INJECTION SYSTEM

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. The program value is preset by engine operating conditions. These conditions are 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

The amount of fuel injection is compensated for to improve engine performance. This will be made 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
2) During high boost pressure

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



MIXTURE RATIO FEEDBACK CONTROL

The mixture ratio feedback system is used for precise control of the mixture ratio to the stoichiometric point, so that the 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.

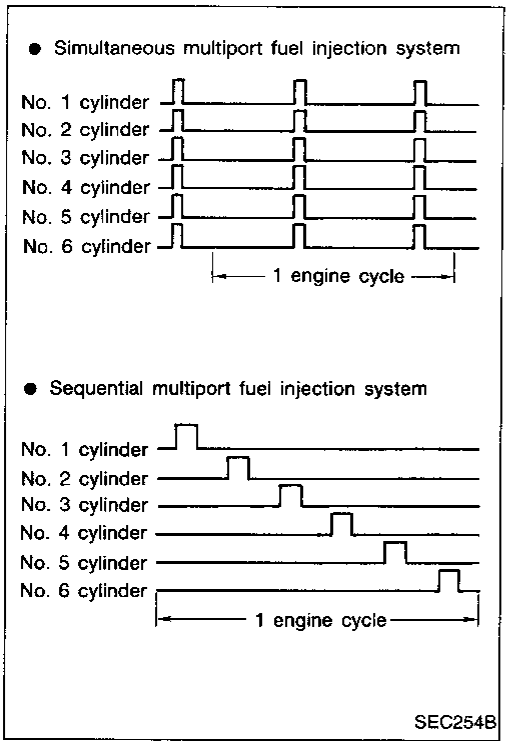
This stage refers to the closed loop control condition. The open loop control condition refers to that under which the ECM detects any of the following conditions and feedback control stops in order to maintain stabilized fuel combustion.

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
7) Heated oxygen sensor high output voltage

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 stoichiometric 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 stoichiometric mixture ratios is 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 systems are used — sequential multiport fuel injection system and simultaneous multiport fuel injection system.

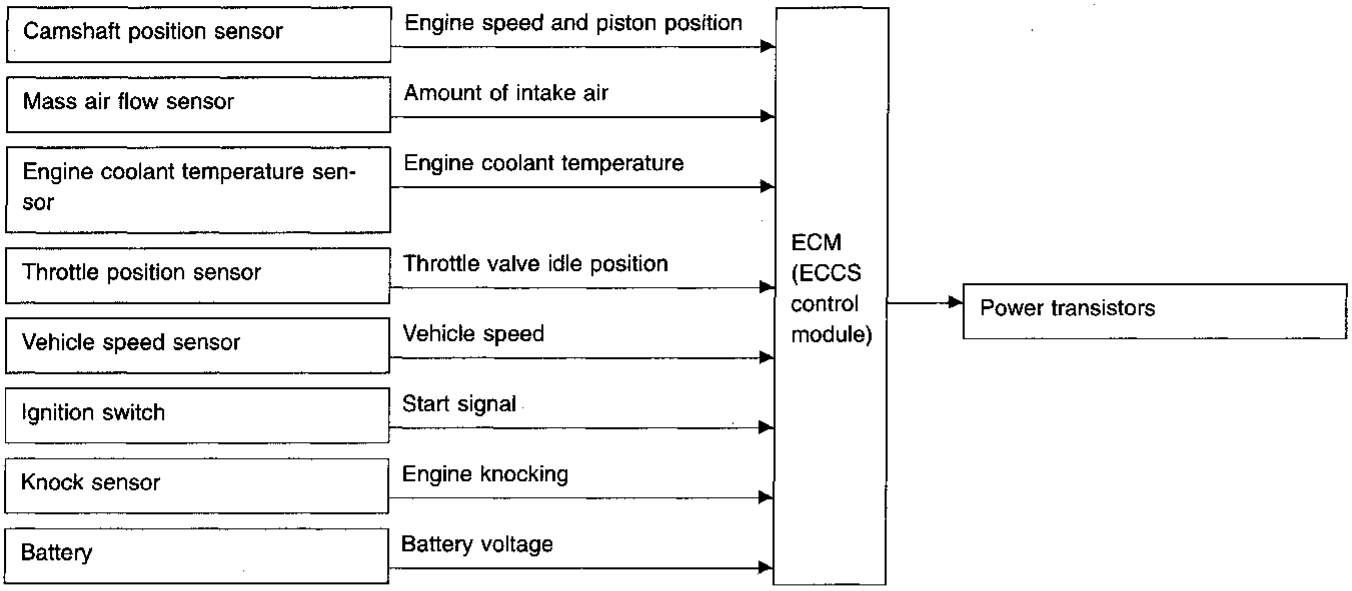
1) Simultaneous multiport fuel injection system
   Fuel is injected simultaneously into all six cylinders twice each engine cycle. In other words, pulse signals of the same width are simultaneously transmitted from the ECM.
   The six injectors will then receive the signals two times for each engine cycle.
   This system is used when the engine is being started and/or if the fail-safe system (CPU) is operating.
2) Sequential multiport fuel injection system
   Fuel is injected into each cylinder during each engine cycle according to the firing order. This system is used when the engine is running.

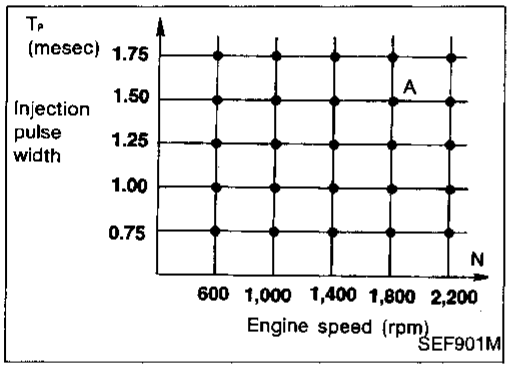
FUEL SHUT-OFF

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

Electronic Ignition (EI) 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. This data forms 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

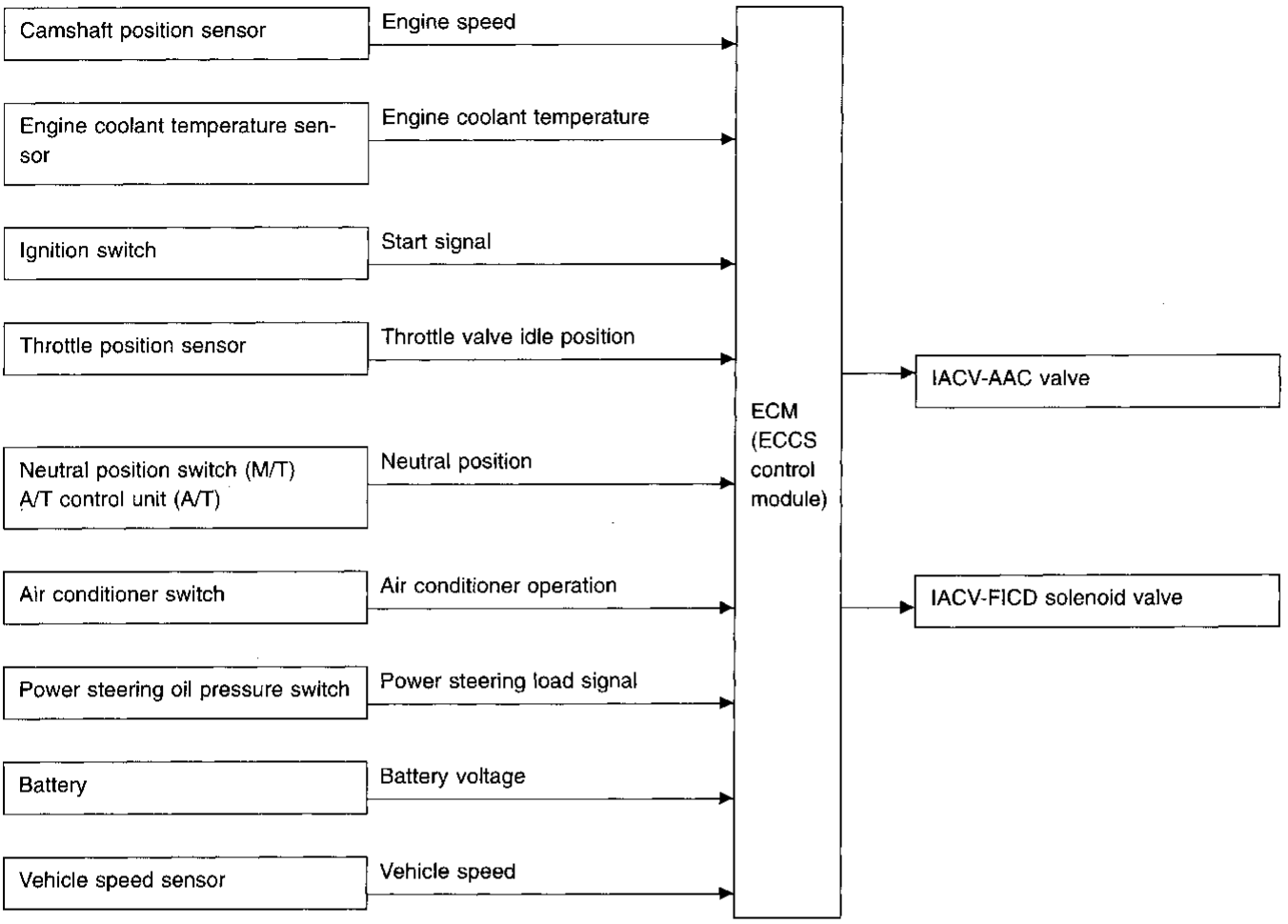
the ignition timing is revised by the ECM according to the other data stored in the ECM.

The retard system, actuated by the 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 eliminate the knocking condition.

Idle Air Control (IAC) System

INPUT/OUTPUT SIGNAL LINE

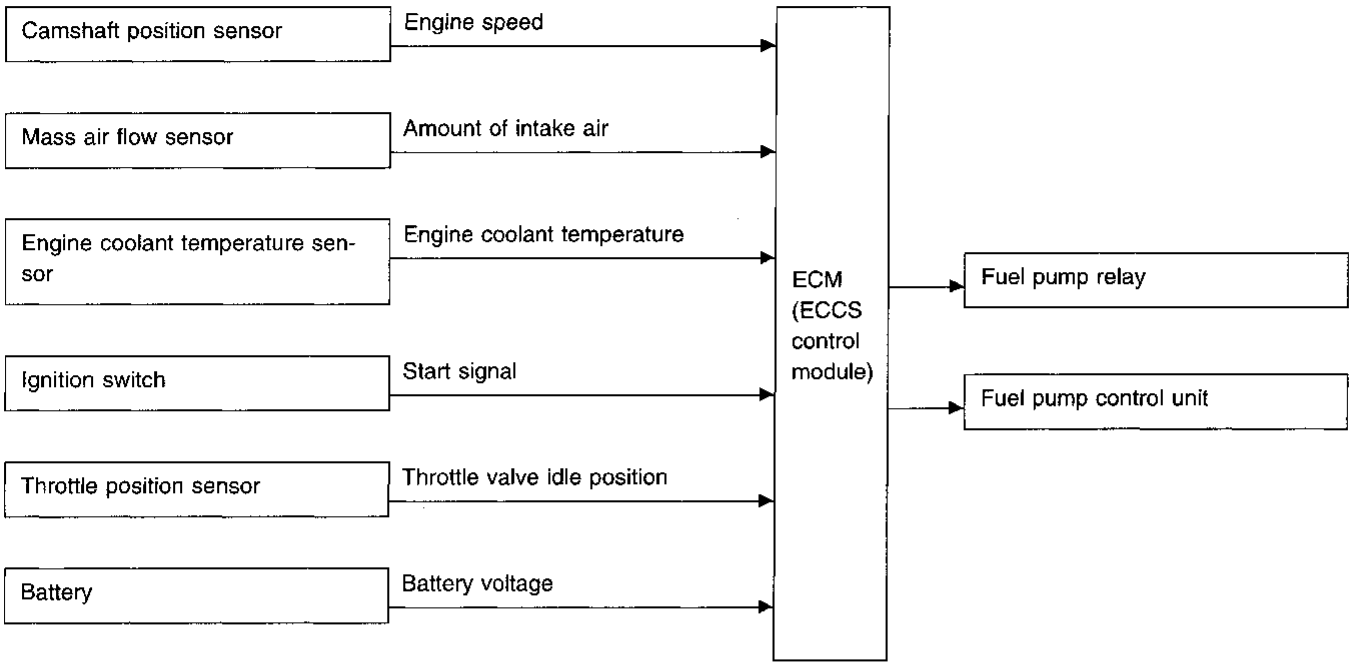


SYSTEM DESCRIPTION

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 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 vehicle interior, fuel consumption, and engine load.

Fuel Pump Control

INPUT/OUTPUT SIGNAL LINE



SYSTEM DESCRIPTION

Fuel pump and IACV-air regulator ON-OFF control

The ECM activates the fuel pump for several seconds after the ignition switch is turned on to improve engine start-up. If the ECM receives a 1° signal from the camshaft position sensor, it knows that the engine is rotating, and causes the pump to activate. 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 1 second
Engine running and cranking	Operates
When engine is stopped	Stops in 1.5 seconds
Except as shown above	Stops

Fuel pump voltage control

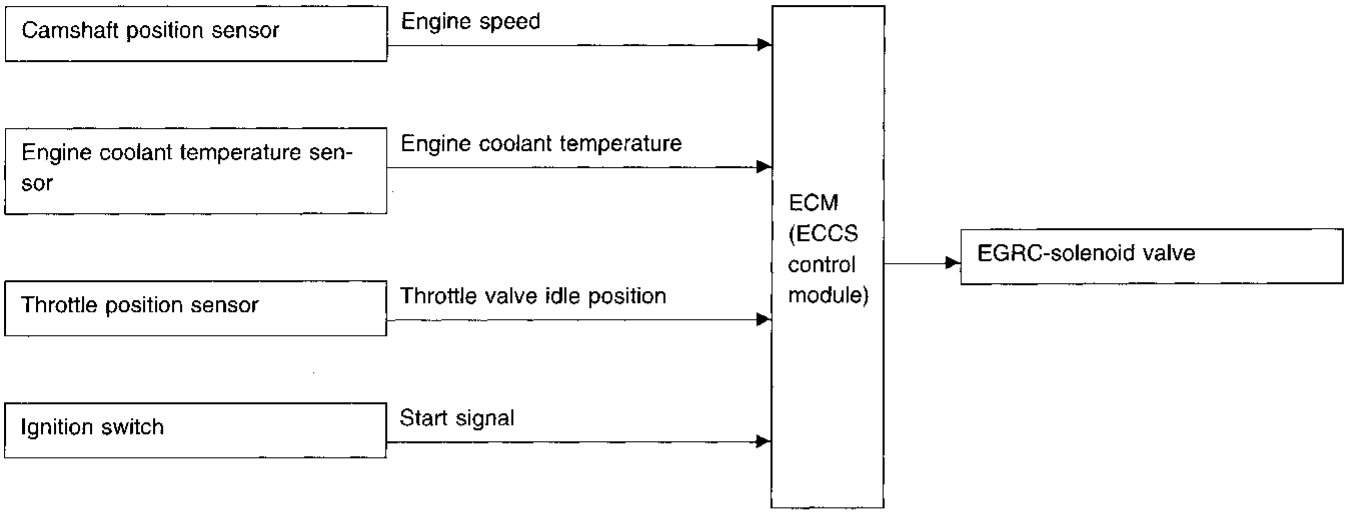
The fuel pump is controlled by the fuel pump control unit adjusting the voltage supplied to the fuel pump.

Conditions	Supplied voltage	
	Turbocharger model	Non-turbocharger model
• 1 second after ignition switch is turned ON • Engine cranking • 30 (*NA)/5 (**TC) seconds after engine start [above 50°C (122°F)] • Engine coolant temperature below 0°C (32°F) • Engine is running under heavy load conditions	Battery voltage	Battery voltage
• Engine is running under middle load conditions	Approx. 7V	Battery voltage
• Except the above	Approx. 6V	Approx. 8V

*NA: Non-turbocharger model **TC: Turbocharger model

Exhaust Gas Recirculation (EGR) System

INPUT/OUTPUT SIGNAL LINE



SYSTEM DESCRIPTION

This system cuts and controls vacuum applied to EGR valve and canister to suit engine operating conditions.

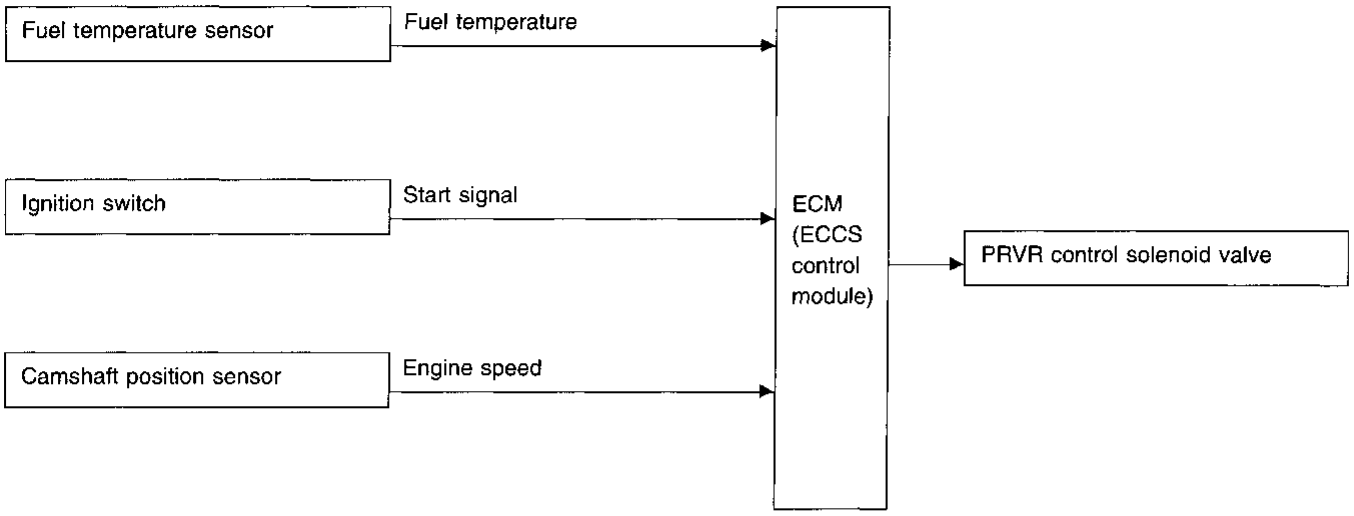
This cut-and-control operation is accomplished through the ECM. When the ECM detects any of the following conditions, current flows through the solenoid valve in the EGR control vacuum line.

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

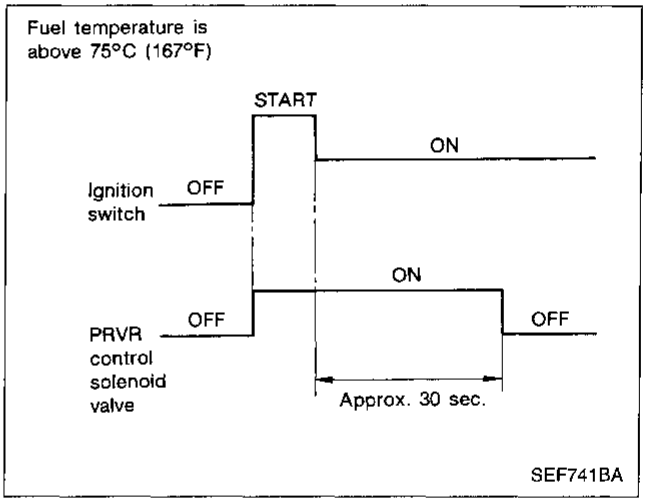
Fuel Pressure Regulator Control

INPUT/OUTPUT SIGNAL LINE



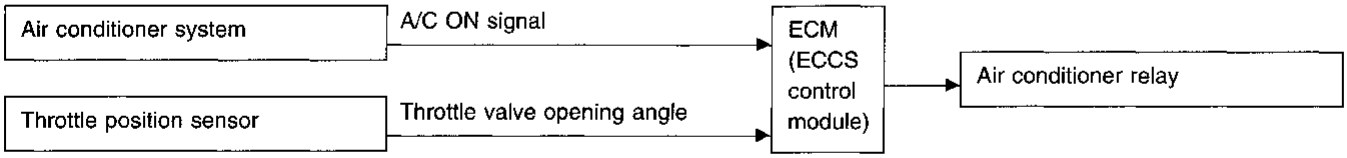
SYSTEM DESCRIPTION

The fuel "pressure-up" control system briefly increases fuel pressure for improved starting performance of a hot engine. Under normal operating conditions, manifold vacuum is applied to the fuel pressure regulator. When starting the engine, however, the ECM allows current to flow through the ON/OFF solenoid valve in the control vacuum line, opening this line to the atmosphere. As a result, atmospheric pressure is applied, restricting the fuel return line so as to increase fuel pressure.



Air Conditioning Cut Control

INPUT/OUTPUT SIGNAL LINE



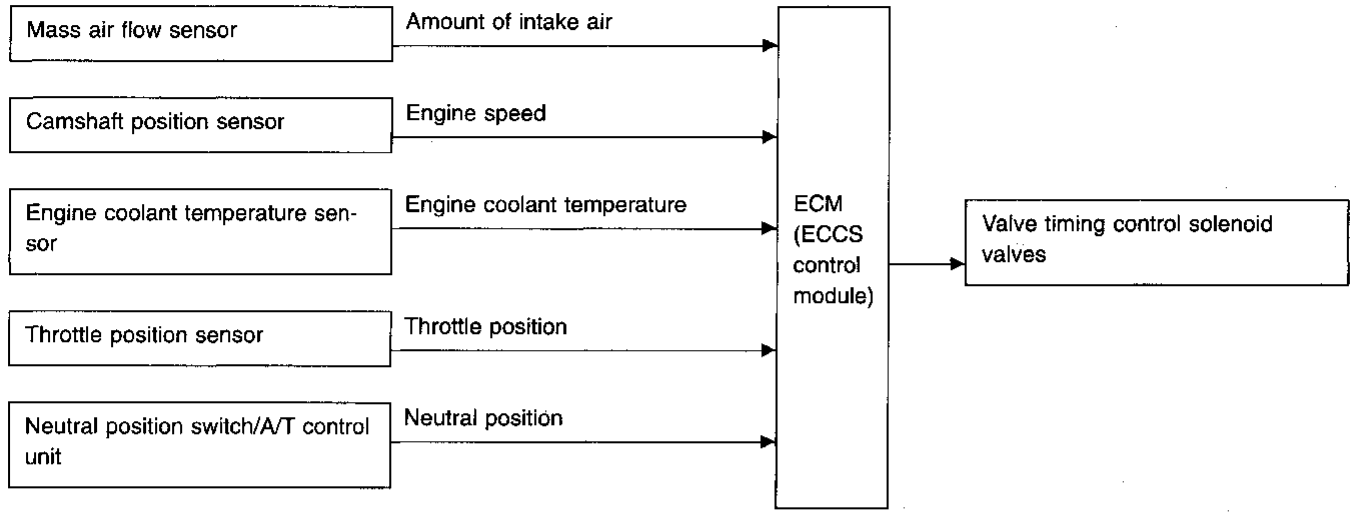
SYSTEM DESCRIPTION

When the accelerator pedal is fully depressed, the air conditioner is turned off for a few seconds.

This system improves acceleration when the air conditioner is used.

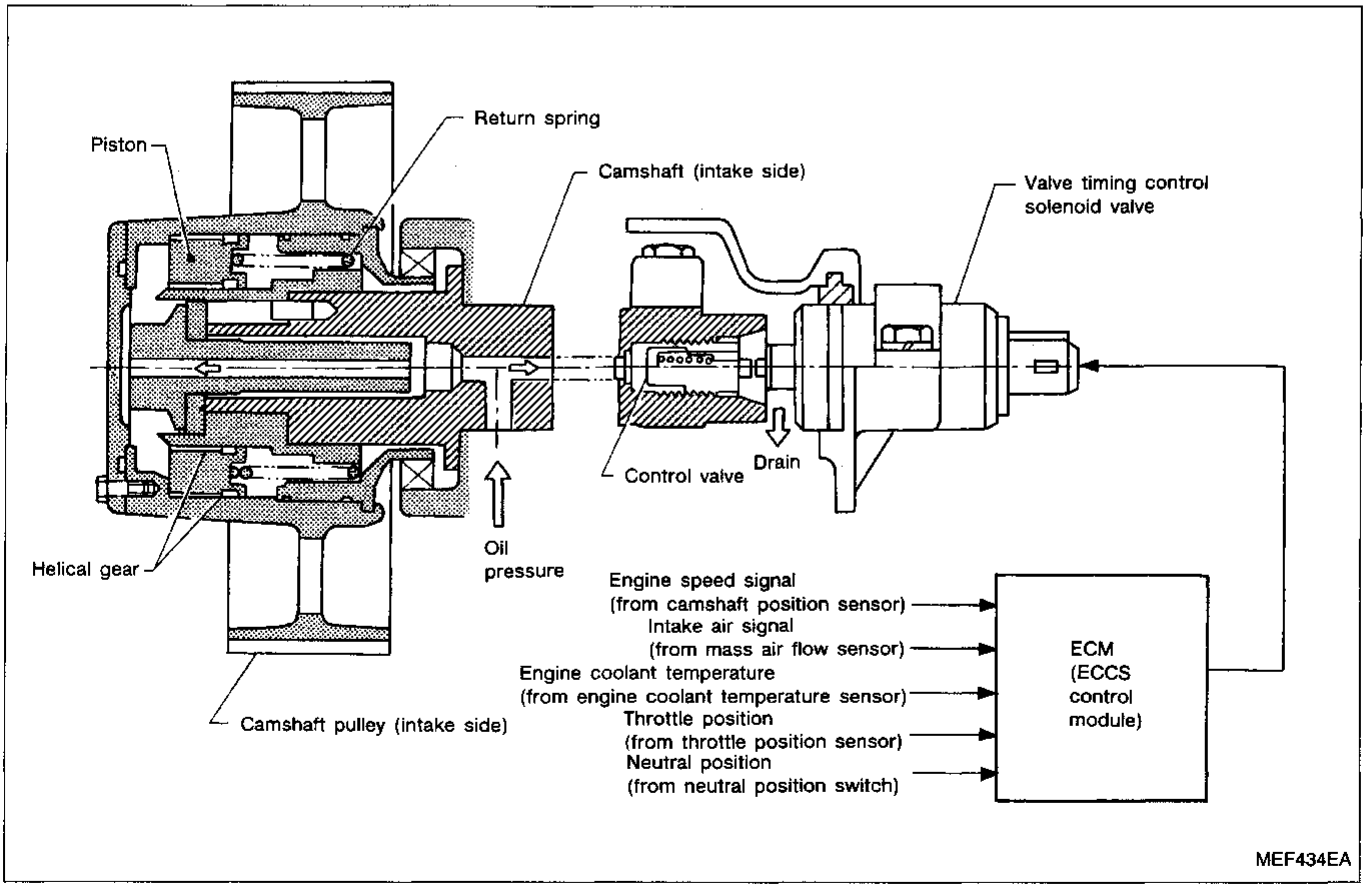
Valve Timing Control

INPUT/OUTPUT SIGNAL LINE



SYSTEM DESCRIPTION

The valve timing control system is utilized to increase engine performance. Intake valve opening and closing time is controlled, according to the engine operating conditions, by the ECM.
Engine coolant temperature signals, engine speed, amount of intake air, throttle position and gear position are used to determine intake valve timing.
The intake camshaft pulley position is regulated by oil pressure, which is controlled by the valve timing control solenoid valve.

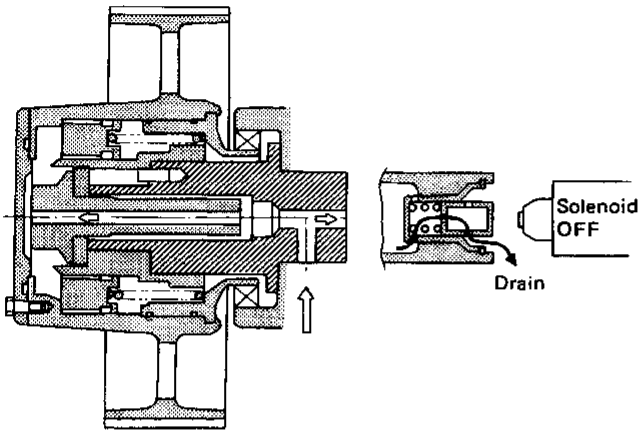


Valve Timing Control (Cont'd)

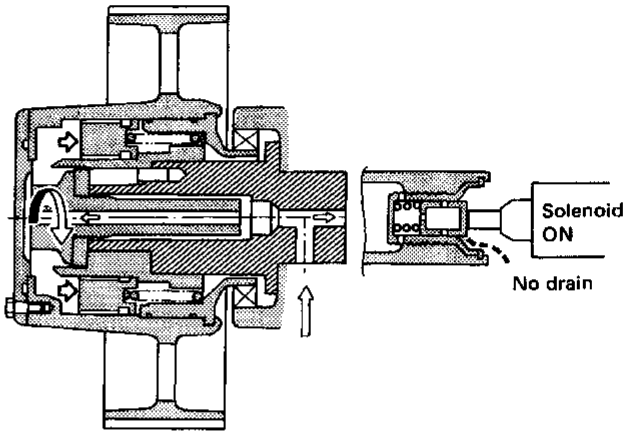
OPERATION

Engine operating condition	Valve timing control solenoid valve	Intake valve opening and closing time	Valve overlap	Engine torque curve
Idling, high speed	OFF	Retard	Decreased	Ⅰ
Low to medium speed	ON	Advance	Increased	Ⅱ

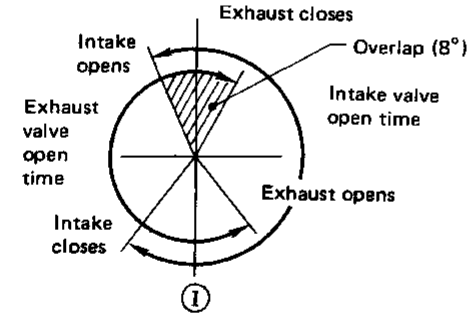
Ⅰ Valve timing control solenoid valve is OFF.

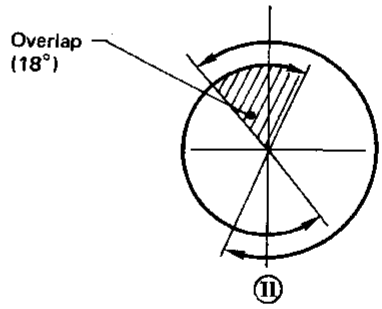


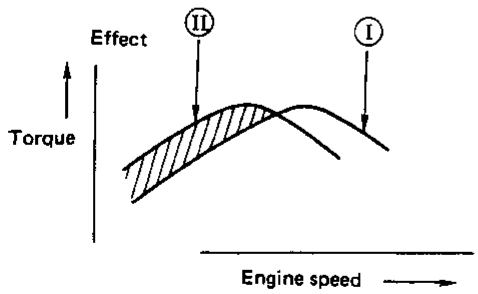
Ⅱ Valve timing control solenoid valve is ON.



SEF009I



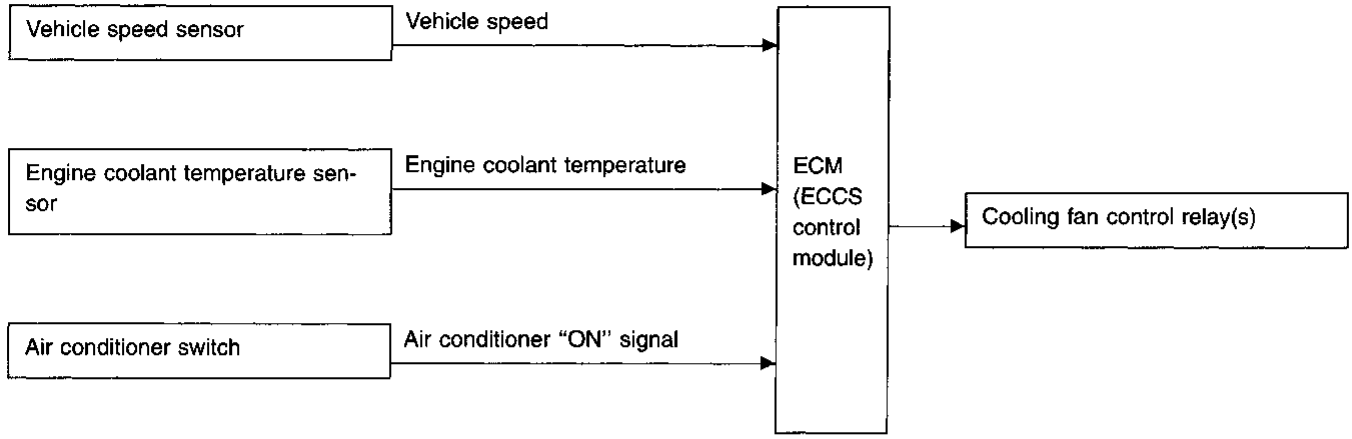




SEF010I

Cooling Fan Control

INPUT/OUTPUT SIGNAL LINE



The ECM controls the cooling fan corresponding to the vehicle speed, engine coolant temperature, and air conditioner ON signal. The non-turbocharger model has 2-step control [ON/OFF]. The turbocharger model has [ON/OFF] and [LOW/HIGH] speed control.

OPERATION

[Non-turbocharger model]

Air conditioner switch is "OFF"

Engine coolant temperature °C (°F)	Cooling fan
Below 104 (219)	OFF
Above 105 (221)	ON

Air conditioner switch is "ON"

Vehicle speed km/h (MPH)	Engine coolant temperature °C (°F)	Cooling fan
Below 39 (24)	Below 94 (201)	OFF
	Above 95 (203)	ON
Above 40 (25)	Below 104 (219)	OFF
	Above 105 (221)	ON

[Turbocharger model]

Air conditioner switch is "OFF"

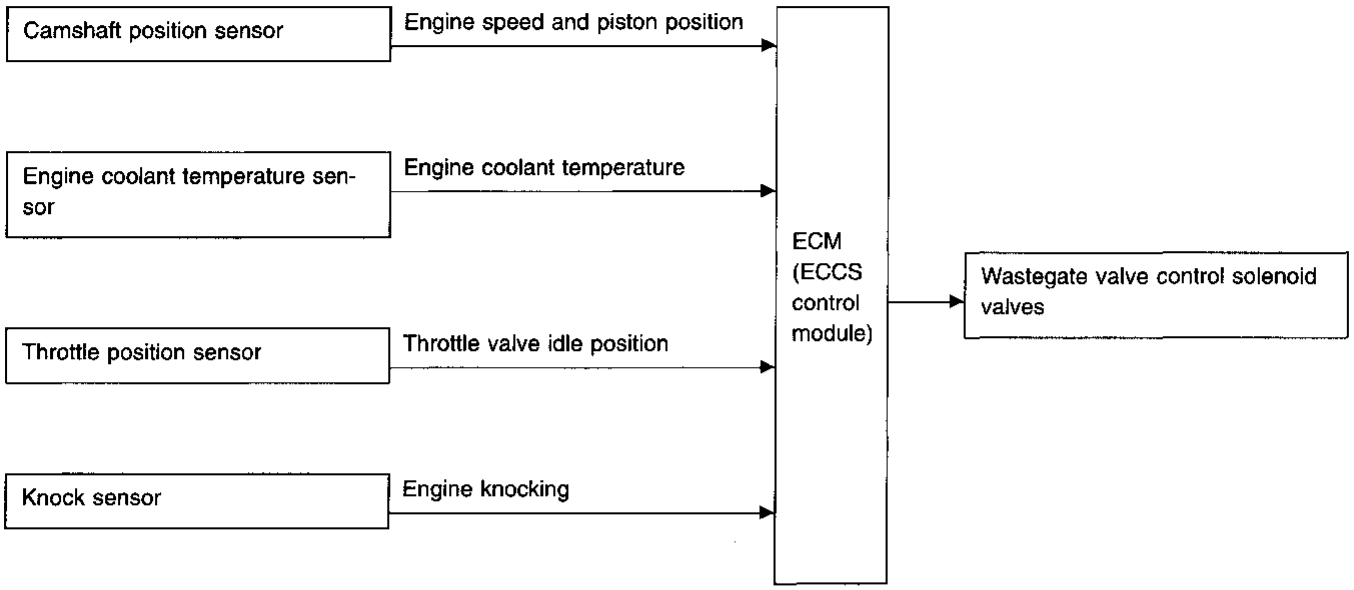
Engine coolant temperature °C (°F)	Cooling fan
Below 104 (219)	OFF
Above 105 (221)	ON (HIGH)

Air conditioner switch is "ON"

Vehicle speed km/h (MPH)	Engine coolant temperature °C (°F)	Cooling fan
Below 39 (24)	Below 89 (192)	OFF
	Between 90 (194) and 99 (210)	LOW
	Above 100 (212)	HIGH
Above 40 (25)	Below 104 (219)	OFF
	Above 105 (221)	HIGH

Wastegate Valve Control

INPUT/OUTPUT SIGNAL LINE



SYSTEM DESCRIPTION

The wastegate valve control solenoid valve changes the source vacuum which activates the actuator. This results in a suitable turbocharger-pressure.
When knock signs are detected, which means a low octane fuel is being used, the solenoid valve turns OFF, and turbocharger pressure becomes low.

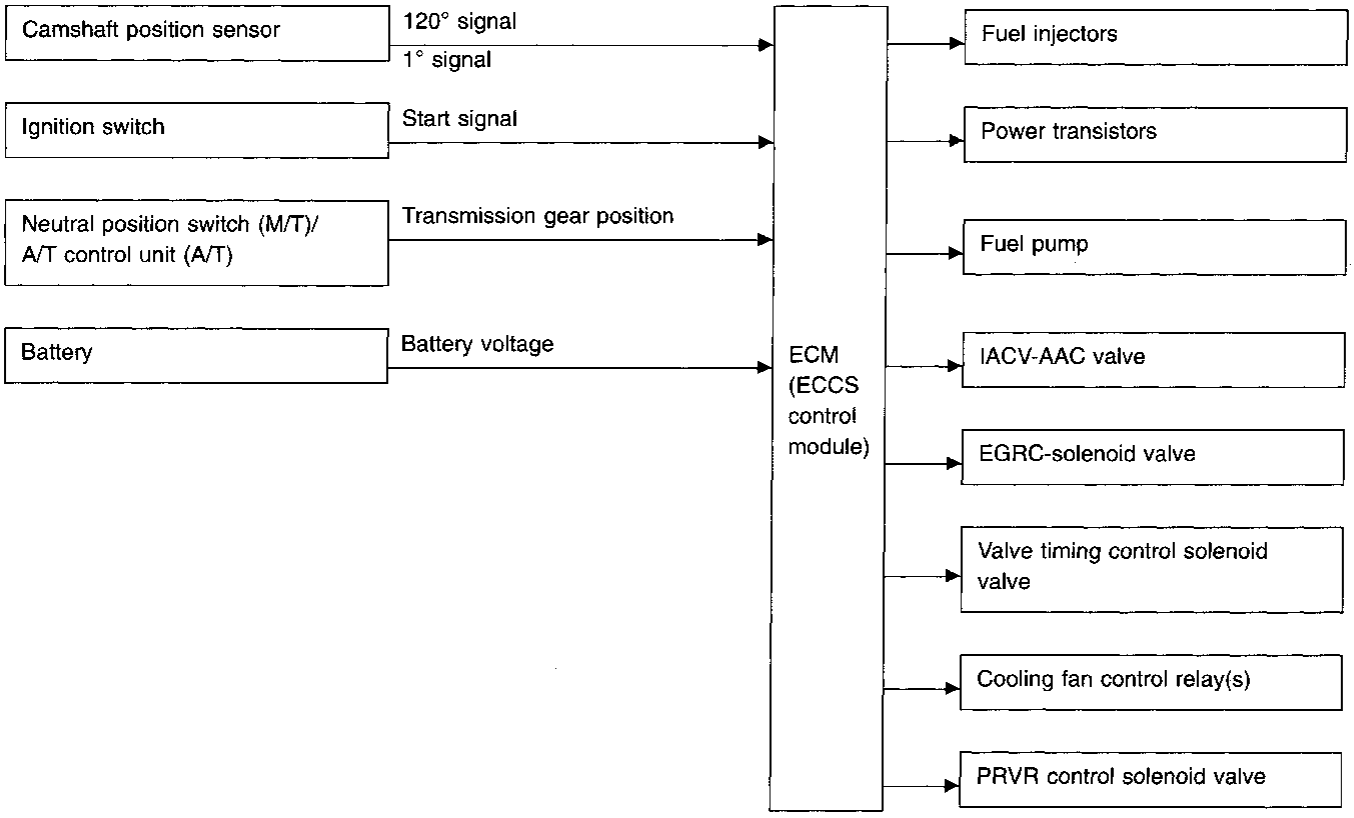
OPERATION

Engine conditions	Wastegate valve control solenoid valves	Wastegate valve actuators	Turbocharger pressure
• Engine running or cranking • Throttle position sensor output voltage: more than 0.1V • Judged fuel quality: hi octane (Detecting no sign of knock) • Engine coolant temperature is less than 55°C (131°F)	ON	Lead to suction pipe or turbocharger compressor outlet	HIGH
• Except the above	OFF	Lead to turbocharger compressor outlet	LOW

Fail-safe System

CPU MALFUNCTION OF ECM

Input/output signal line



Outline

The fail-safe system makes engine starting possible if there is something malfunctioning in the ECM's CPU circuit.

In general, engine starting was difficult under the previously mentioned conditions. But with the provisions in this fail-safe system, it is possible to start the engine.

Fail-safe System (Cont'd)

Fail-safe system activating condition when ECM is malfunctioning

The fail-safe mode operation starts when the computing function of the ECM is judged to be malfunctioning.
When the fail-safe system activates, i.e. if a malfunction condition is detected in the CPU of the ECM, the MALFUNCTION INDICATOR LAMP on the instrument panel lights to warn the driver.

Engine control, with fail-safe system, operates when ECM is malfunctioning

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

Cancellation of fail-safe system when ECM 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 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.
Although the mass air flow sensor is malfunctioning, it is possible to start the engine and drive the vehicle. 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

Engine condition	Starter switch	Fail-safe system	Fail-safe functioning
Stopped	ANY	Does not operate	—
Cranking	ON	Operates	Engine will be started by a pre-determined injection pulse on ECM.
Running	OFF		Engine speed will not rise above 2,400 rpm

ENGINE COOLANT TEMPERATURE SENSOR MALFUNCTION

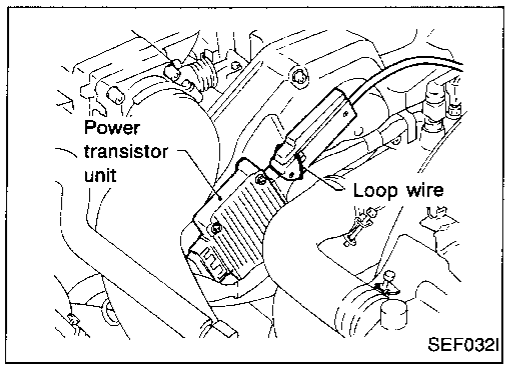
When engine coolant temperature sensor output voltage is below or above the specified value, engine coolant temperature signal is fixed at the preset value as follows:

Engine condition	Engine coolant temperature preset value °C (°F)
Start	20 (68)
Running	80 (176)

FUEL TEMPERATURE SENSOR MALFUNCTION

When fuel temperature sensor output voltage is below or above the specified value, fuel temperature signal is fixed at the preset value as follows:

Engine condition	Fuel temperature preset value °C (°F)
Start	20 (68)
Running	80 (176)



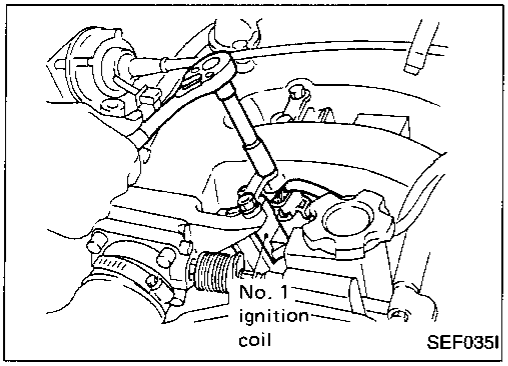
Direct Ignition System

CHECKING IDLE SPEED AND IGNITION TIMING

Idle speed

- **Method (With pulse type tachometer)**

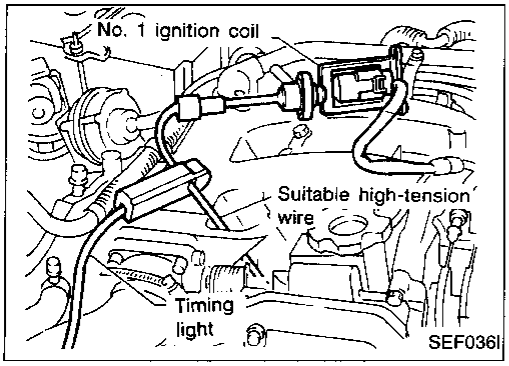
Clamp loop wire as shown.



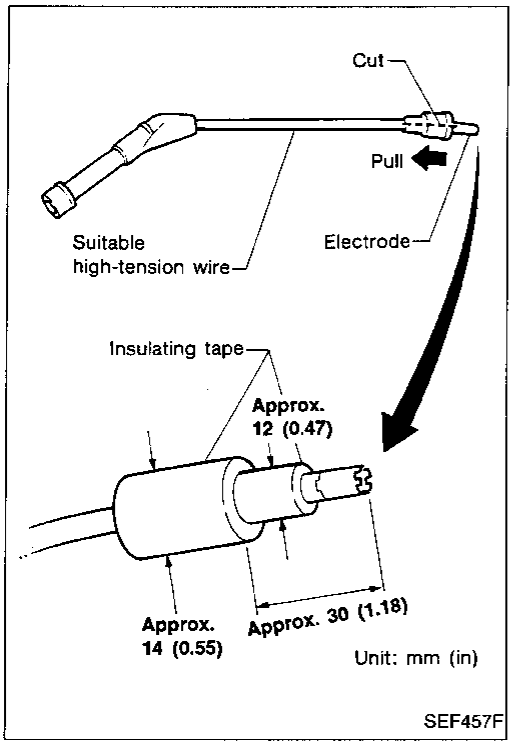
Ignition timing

- **Method A (Without SST)**

1. Remove No. 1 ignition coil.

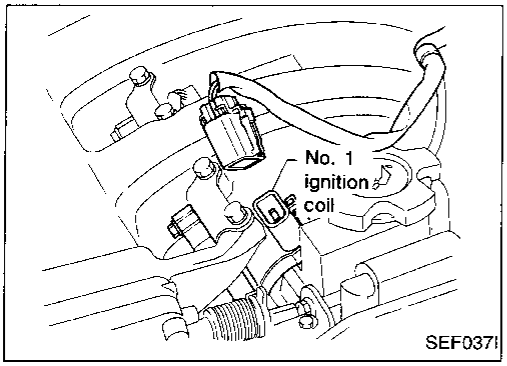


2. Connect No. 1 ignition coil and No. 1 spark plug with suitable high-tension wire as shown, and attach timing light clamp to this wire.
3. Check ignition timing.



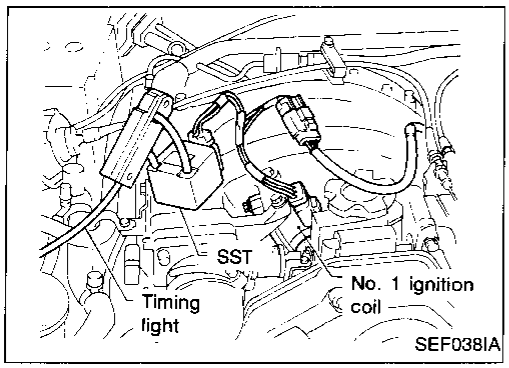
4. For above procedures, enlarge suitable high-tension wire end with insulating tape as shown.

Direct Ignition System (Cont'd)

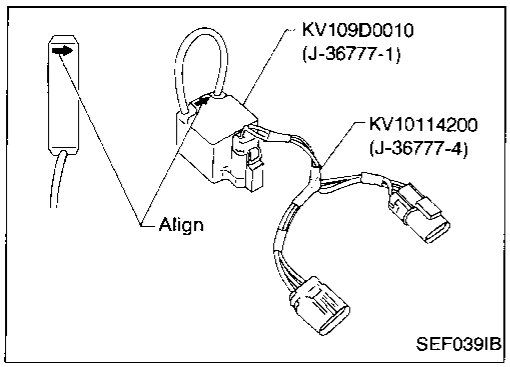


- **Method B (With SST)**

1. Disconnect connector of No. 1 ignition coil.



2. Connect SST and clamp wire with timing light as shown.
3. Check ignition timing.



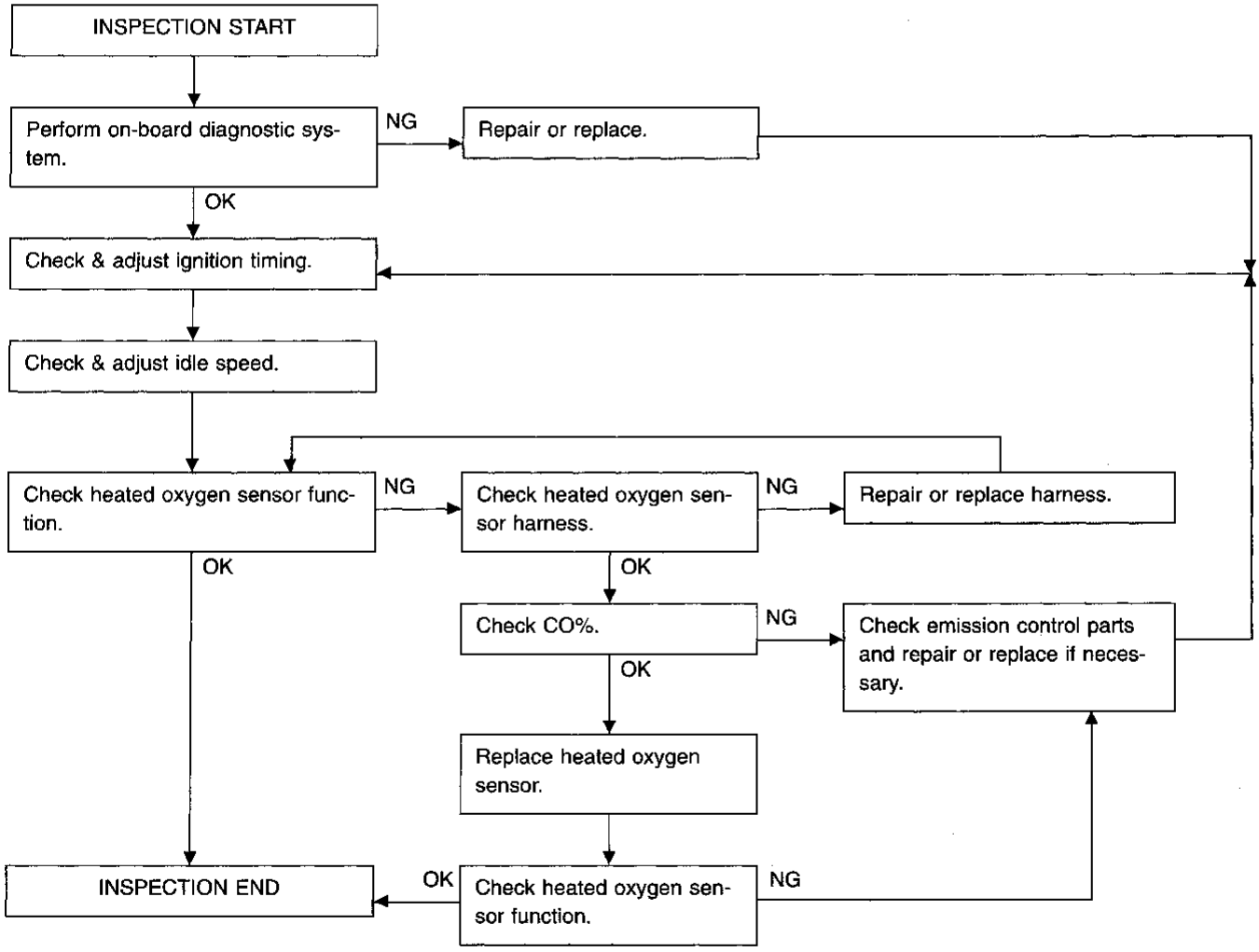
Align direction marks on SST and timing light clamp if aligning mark is punched.

PREPARATION

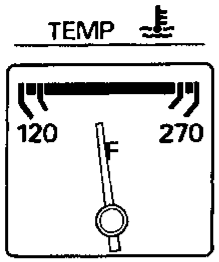
1. Make sure that the following parts are in good order.
- Battery
- Ignition system
- Engine oil and coolant levels
- Fuses
- ECM harness connector
- Vacuum hoses
- Air intake system (Oil filler cap, oil level gauge, etc.)
- Fuel pressure
- Engine compression
- EGR valve operation
- Throttle valve

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 gear 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.

Overall inspection sequence

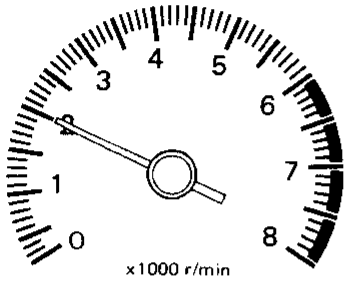


A



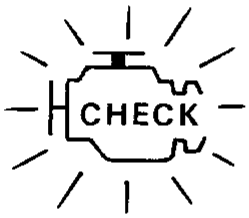
SEF246F

B



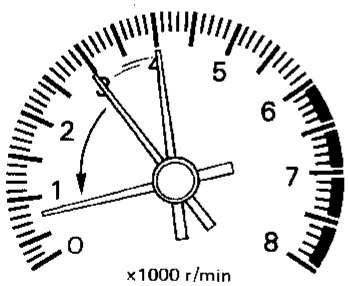
SEF247F

C



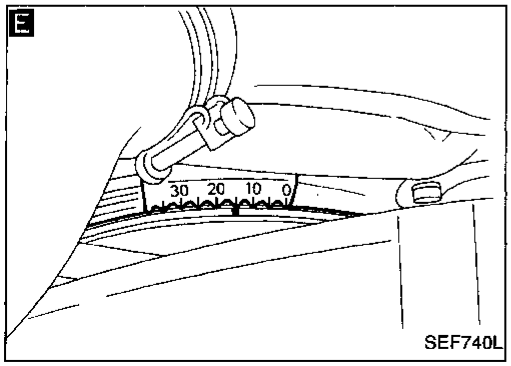
SEF051P

D



SEF248F

E



SEF740L

START

Visually check the following:
- Air cleaner clogging
- Hoses and ducts for leaks
- EGR valve operation
- Electrical connectors
- Gasket

A

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

B

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

C

Perform ECCS on-board diagnostic system.

OK

NG

Repair or replace components as necessary.

Does engine run smoothly?

OK

NG

Clean injectors.

D

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

E

Check ignition timing with a timing light.

15°±2° BTDC

OK

NG

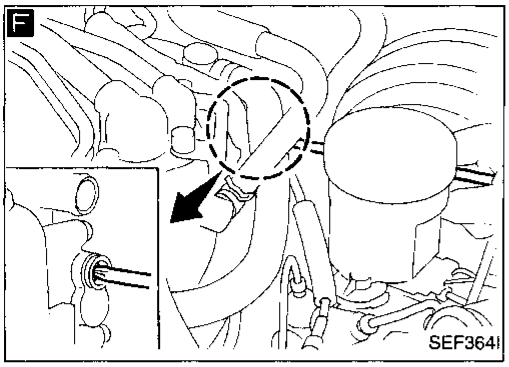
Adjust ignition timing by turning camshaft position sensor after loosening securing bolts.

Ⓐ

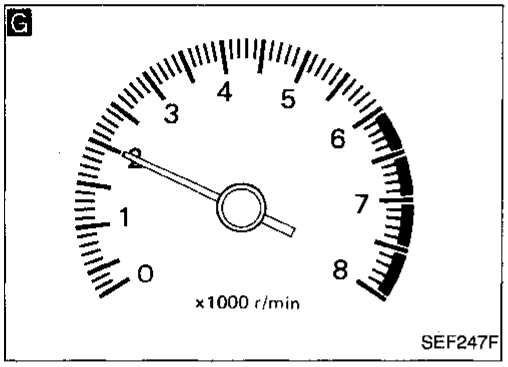
Ⓑ

Ⓙ

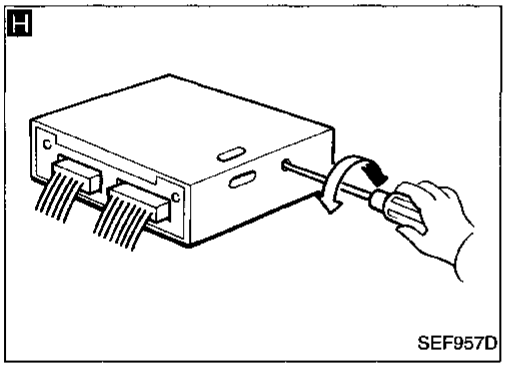
F



G



H



Ⓐ

Check idle speed.

Non-turbocharger
MT: 700±50 rpm
AT: 770±50 rpm (in "N" position)

Turbocharger
MT: 700±50 rpm (U.S.A.)
750±50 rpm (Canada)
AT: 750±50 rpm (in "N" position)

OK

NG

Disconnect throttle position sensor harness connector.

F

Adjust idle speed by turning idle speed adjusting screw.

Non-turbocharger
MT: 650±50 rpm
AT: 720±50 rpm (in "N" position)

Turbocharger
MT: 650±50 rpm (U.S.A.)
700±50 rpm (Canada)
AT: 700±50 rpm (in "N" position)

Connect throttle position sensor harness connector.

Ⓑ

G

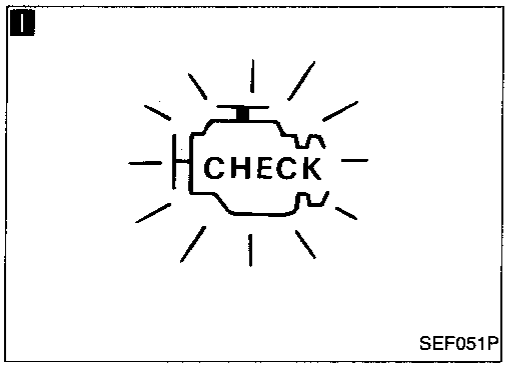
Run engine at about 2,000 rpm for about 2 minutes under no-load.

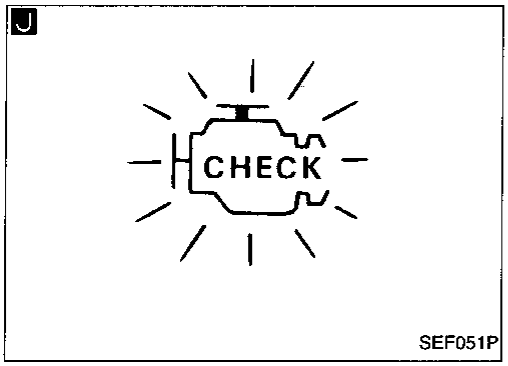
H

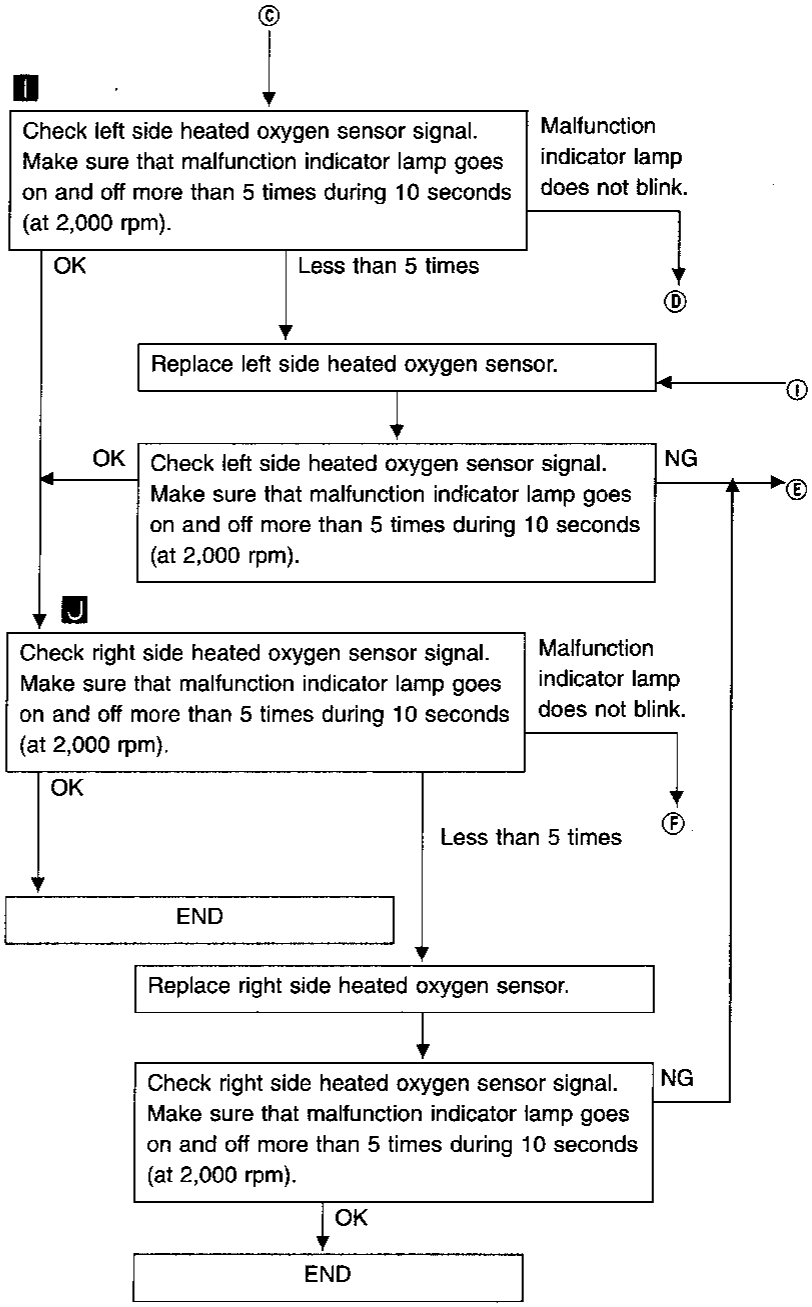
Set the diagnosis mode of ECM to Diagnostic Test Mode II.

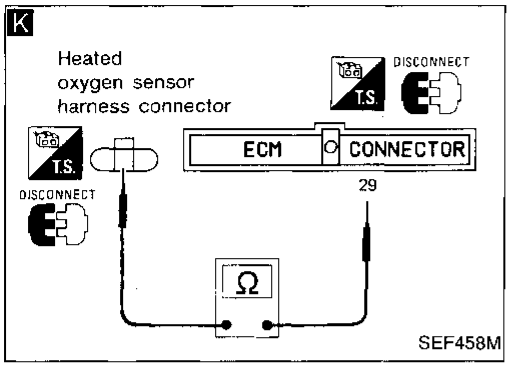
Ⓖ

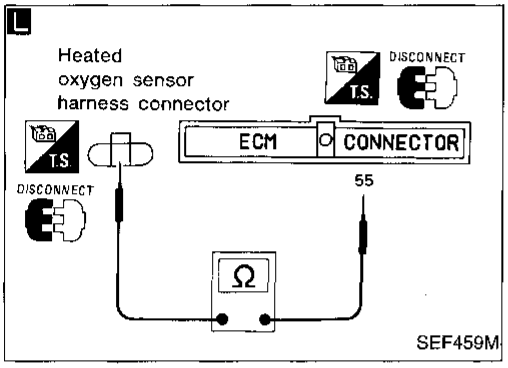
Ⓒ


I
CHECK
SEF051P


J
CHECK
SEF051P


Ⓒ
I
Check left side heated oxygen sensor signal. Make sure that malfunction indicator lamp goes on and off more than 5 times during 10 seconds (at 2,000 rpm).
Malfunction indicator lamp does not blink.
OK
Less than 5 times
Ⓓ
Replace left side heated oxygen sensor.
Ⓘ
OK
Check left side heated oxygen sensor signal. Make sure that malfunction indicator lamp goes on and off more than 5 times during 10 seconds (at 2,000 rpm).
NG
Ⓔ
J
Check right side heated oxygen sensor signal. Make sure that malfunction indicator lamp goes on and off more than 5 times during 10 seconds (at 2,000 rpm).
Malfunction indicator lamp does not blink.
OK
Ⓕ
Less than 5 times
END
Replace right side heated oxygen sensor.
Check right side heated oxygen sensor signal. Make sure that malfunction indicator lamp goes on and off more than 5 times during 10 seconds (at 2,000 rpm).
NG
OK
END





Ⓕ

K

Check right side heated oxygen sensor harness:
1) Turn off engine and disconnect battery ground cable.
2) Disconnect 76-pin connector from ECM.
3) Disconnect right side heated oxygen sensor harness connector.
4) Check for continuity between terminal No. 29 of 76-pin connector and harness connector for heated oxygen sensor.

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

OK

NG → Repair or replace harness. → Ⓖ

Connect 76-pin connector to ECM.

L

Check left side heated oxygen sensor harness:
1) Turn off engine and disconnect battery ground cable.
2) Disconnect 76-pin connector from ECM.
3) Disconnect left side heated oxygen sensor harness connector.
4) Check for continuity between terminal No. 55 of 76-pin connector and harness connector for heated oxygen sensor.

Ⓓ

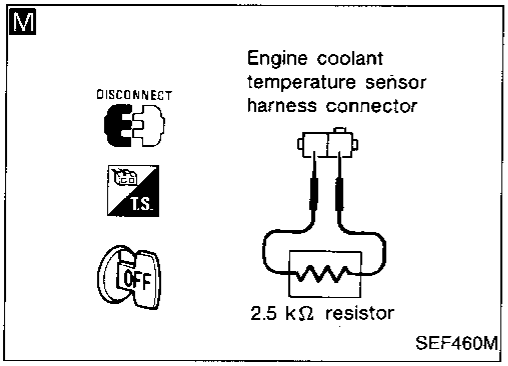
Continuity exists. ..... OK
Continuity does not exist. ..... NG

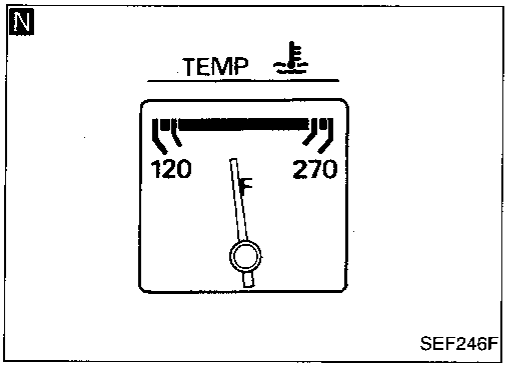
OK

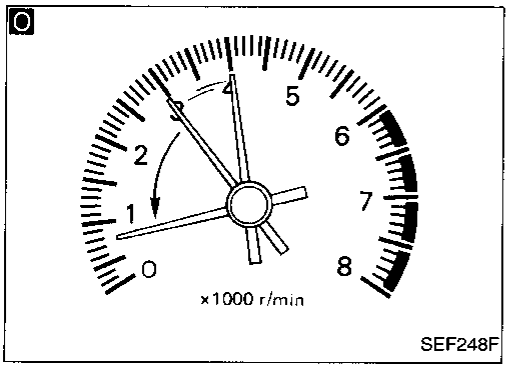
NG → Repair or replace harness. → Ⓖ

Connect 76-pin connector to ECM.

Ⓗ







Ⓗ

M

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

N

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

O

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

Check "CO" %.

Idle CO: 0.2 - 8%

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

OK → Ⓘ

NG → Ⓔ

Connect heated oxygen sensor harness connector to heated oxygen sensor.

Check fuel pressure regulator.

Check mass air flow sensor.

Check injector.
Clean or replace if necessary.

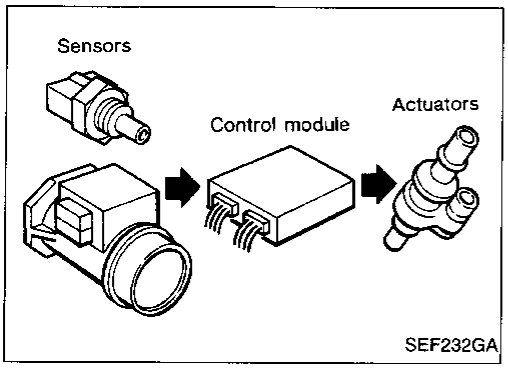
Check engine coolant temperature sensor.

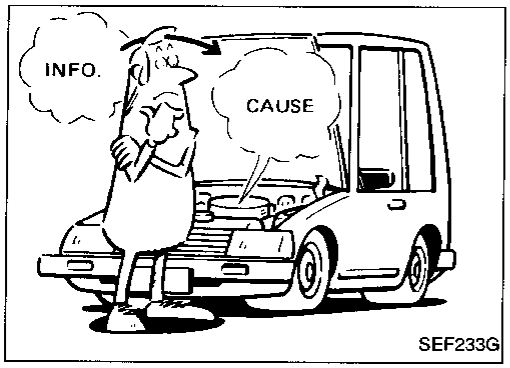
Check ECM function* by substituting another known good ECM. → Ⓙ

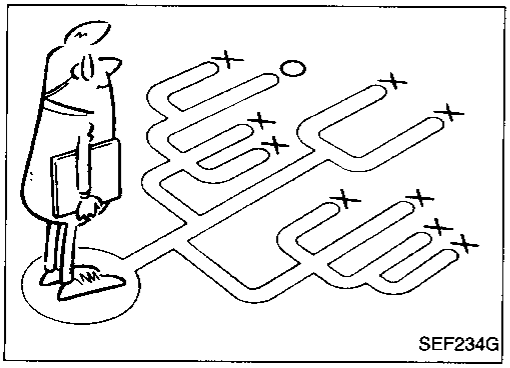
*: ECM may be the cause of a problem, but this is rarely the case.

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.

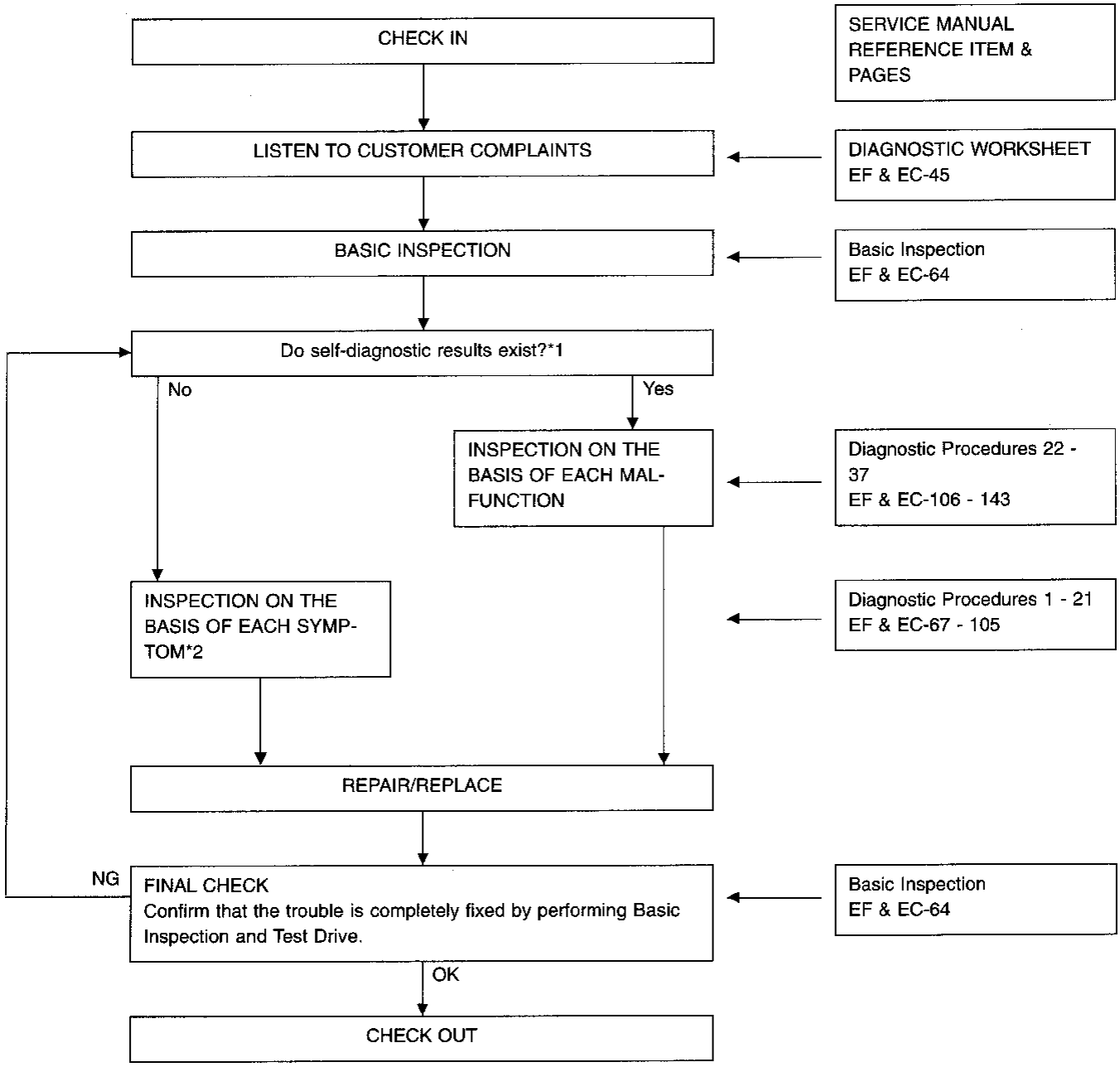
A visual check only may not find the cause of the problems, so a road test with a circuit tester connected to a suspected circuit should be performed.

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.

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-46).**

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

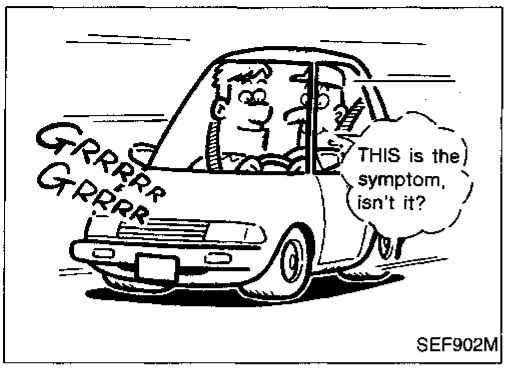
There are many kinds of operating conditions that lead to malfunctions on engine components.
A good grasp of such conditions can make trouble-shooting faster and more accurate.
In general, feelings for a problem depend on each customer. It is important to fully understand the symptoms or under what conditions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



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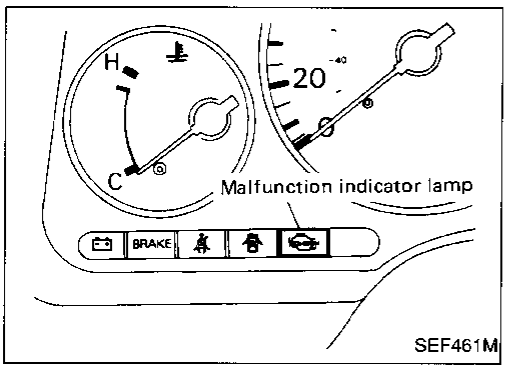
INTERMITTENT PROBLEM SIMULATION

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 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 headlamps, 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).



On-board Diagnostic System

MALFUNCTION INDICATOR LAMP

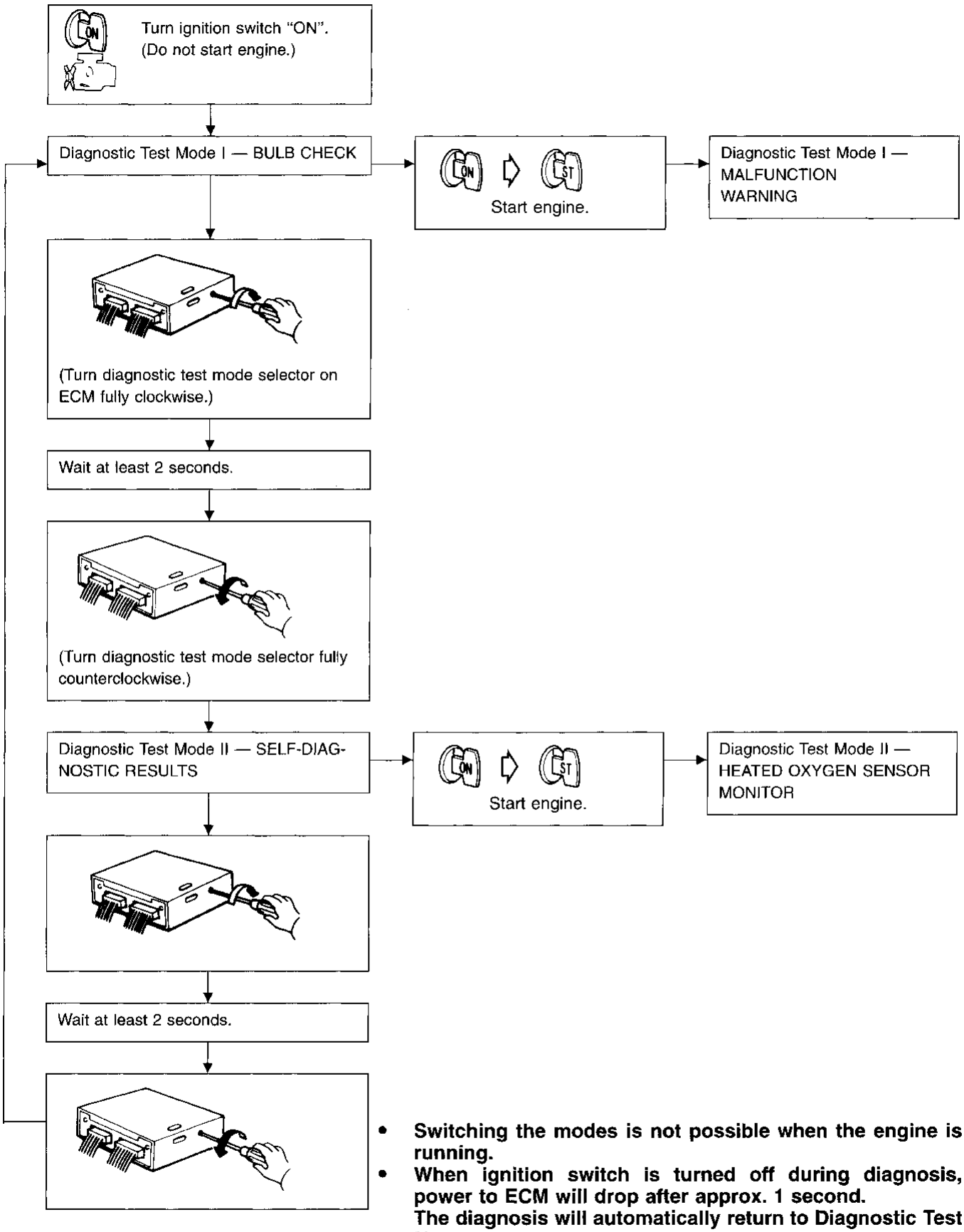
A malfunction indicator lamp has been adopted on the combination meter.

ON-BOARD DIAGNOSTIC SYSTEM FUNCTION

Condition		Diagnostic Test Mode	
		Diagnostic Test Mode I	Diagnostic Test Mode II
Ignition switch in "ON" position	Engine stopped	BULB CHECK	SELF-DIAGNOSTIC RESULTS
	Engine running	MALFUNCTION WARNING	HEATED OXYGEN SENSOR MONITOR

On-board Diagnostic System (Cont'd)

HOW TO SWITCH DIAGNOSTIC TEST MODES



- **Switching the modes is not possible when the engine is running.**
- **When ignition switch is turned off during diagnosis, power to ECM will drop after approx. 1 second. The diagnosis will automatically return to Diagnostic Test Mode I.**

On-board Diagnostic System — Diagnostic Test Mode I

DIAGNOSTIC TEST MODE I — BULB CHECK

In this mode, the MALFUNCTION INDICATOR LAMP in the instrument panel stays "ON".
If either remain "OFF", check the bulb in the MALFUNCTION INDICATOR LAMP.

DIAGNOSTIC TEST MODE I — MALFUNCTION WARNING

MALFUNCTION INDICATOR LAMP	Condition
ON	When the following malfunction (malfunction indicator lamp item) is detected or the ECM's CPU is malfunctioning.
OFF	OK

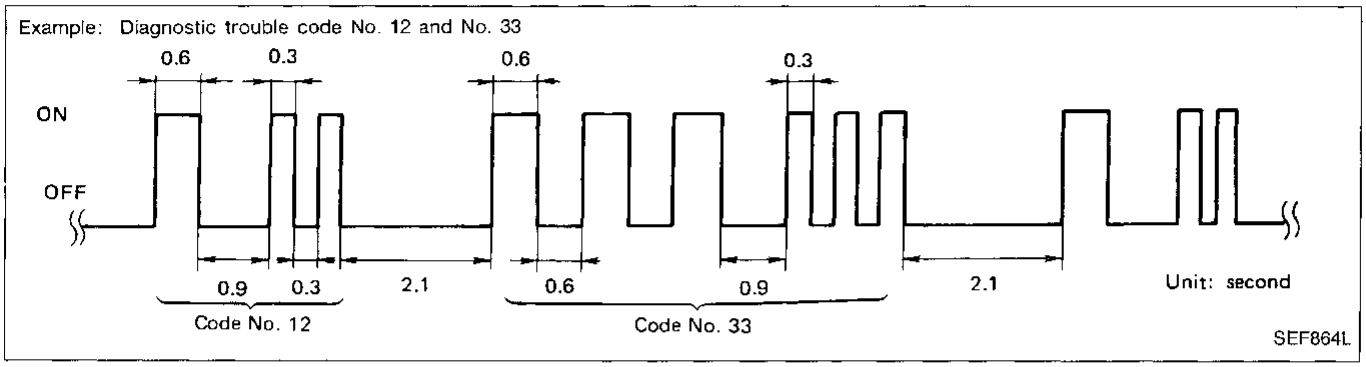
Diagnostic trouble code No.	Malfunction
12	Mass air flow sensor circuit
13	Engine coolant temperature sensor circuit
14	Vehicle speed sensor circuit
26	Boost pressure sensor (Turbocharger model)
31	ECM (ECCS control module)
32	EGR function
33	Heated oxygen sensor circuit (Left side)
35	EGR temperature sensor circuit
43	Throttle position sensor circuit
45	Injector leak
51	Injector circuit
53	Heated oxygen sensor circuit (Right side)

- **These Diagnostic Trouble Code Numbers are clarified in Diagnostic Test Mode II — SELF-DIAGNOSTIC RESULTS.**
- **The MALFUNCTION INDICATOR LAMP will turn off when normal condition is detected. At this time, the Diagnostic Test Mode II — SELF-DIAGNOSTIC RESULTS memory must be cleared as the contents remain stored.**

On-board Diagnostic System — Diagnostic Test Mode II (Self-diagnostic results)

DESCRIPTION

In this mode, a diagnostic trouble code is indicated by the number of flashes from the MALFUNCTION INDICATOR LAMP as shown below:



Long (0.6 second) blinking indicates the number of ten digits and short (0.3 second) blinking indicates the number of single digits. For example, the MALFUNCTION INDICATOR LAMP flashes once for 0.6 seconds and then it flashes twice for 0.3 seconds. This indicates the number "12" and refers to a malfunction in the mass air flow sensor. In this way, all the problems are classified by their diagnostic trouble code numbers.
The diagnostic results will remain in ECM memory.

Display diagnostic trouble code table

Diagnostic trouble code No.	Detected items
11	Camshaft position sensor circuit
12 CHECK	Mass air flow sensor circuit
13 CHECK	Engine coolant temperature sensor circuit
14 CHECK	Vehicle speed sensor circuit
21	Ignition signal circuit
26 CHECK	Boost pressure sensor (Turbocharger model)
31 CHECK	ECM
32 CHECK	EGR function
33 CHECK	Heated oxygen sensor circuit (Left side)
34	Knock sensor circuit
35 CHECK	EGR temperature sensor circuit
42	Fuel temperature sensor circuit
43 CHECK	Throttle position sensor circuit
45 CHECK	Injector leak
51 CHECK	Injector circuit
53 CHECK	Heated oxygen sensor circuit (Right side)
54	Signal circuit from A/T control unit to ECM (A/T only)
55	No malfunction in the above circuits

CHECK : Malfunction indicator lamp item

On-board Diagnostic System — Diagnostic Test Mode II (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
26	Boost pressure sensor (Turbocharger model)	• The boost pressure sensor circuit is open or shorted. (An abnormally high or low output voltage is entered.)	• Harness and connector • Boost pressure leaks • Boost pressure sensor
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 (Left side)	• 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
53	Heated oxygen sensor circuit (Right side)		
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
42	Fuel temperature sensor circuit	• The fuel temperature sensor circuit is open or shorted. (An abnormally high or low voltage is entered.)	• Harness and connector • Fuel 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

*: 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 II (Self-diagnostic results) (Cont'd)

Diagnostic trouble code No.	Detected items	Malfunction is detected when ...	Check item (remedy)
45	Injector leak	• Fuel leaks from injector.	• Injector
51	Injector circuit	• The injector circuit is open.	• Harness and connector • Injector
54	Signal circuit from A/T control unit to ECM (A/T only)	• The A/T communication line is open or shorted.	• Harness and connector

HOW TO ERASE DIAGNOSTIC TEST MODE II (SELF-DIAGNOSTIC RESULTS)

The diagnostic trouble code is erased from the backup memory on the ECM when the diagnostic test mode is changed from Diagnostic Test Mode II to Diagnostic Test Mode I. (Refer to "HOW TO SWITCH DIAGNOSTIC TEST MODES".)

- **When the battery terminal is disconnected, the diagnostic trouble code will be lost from the backup memory within 24 hours.**
- **Before starting on-board diagnostic system, do not erase the stored memory before beginning on-board diagnostic system.**

On-board Diagnostic System — Diagnostic Test Mode II (Heated oxygen sensor monitor)

DESCRIPTION

In this mode, the MALFUNCTION INDICATOR LAMP displays the condition of the fuel mixture (lean or rich) which is monitored by the heated oxygen sensor.

MALFUNCTION INDICATOR LAMP	Fuel mixture condition in the exhaust gas	Air fuel ratio feedback control condition
ON	Lean	Closed loop system
OFF	Rich	
*Remains ON or OFF	Any condition	Open loop system

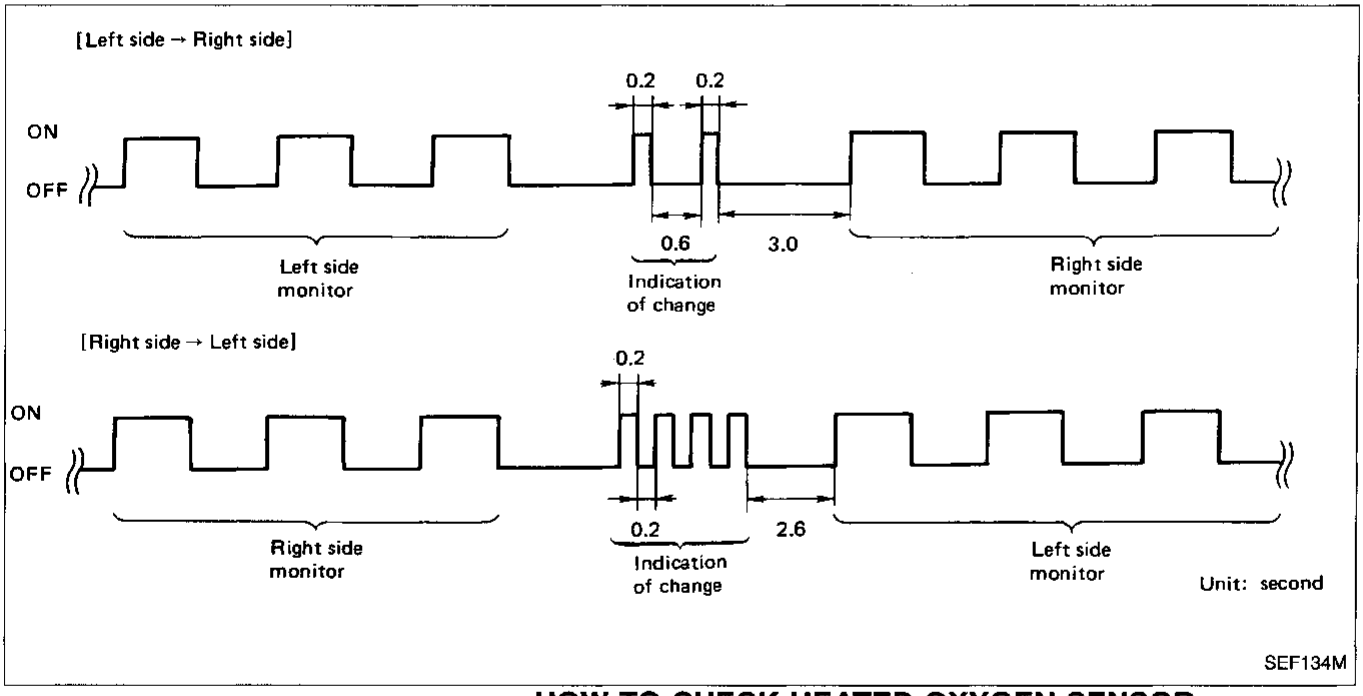
*: Maintains conditions just before switching to open loop.

If two heated oxygen sensors (right side and left side) are fitted on the engine, the left side heated oxygen sensor monitor operates first, when selecting this mode.

HOW TO CHANGE MONITOR FROM LEFT SIDE (Right side) TO RIGHT SIDE (Left side)

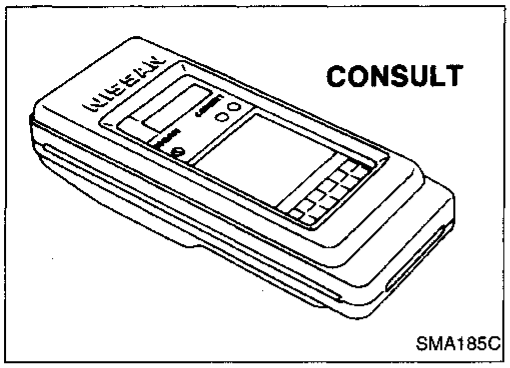
1. Turn diagnostic test mode selector on ECM fully clockwise.
2. Wait at least 2 seconds.
3. Turn diagnostic test mode selector on ECM fully counterclockwise.

- These procedures should be carried out when the engine is running.



HOW TO CHECK HEATED OXYGEN SENSOR

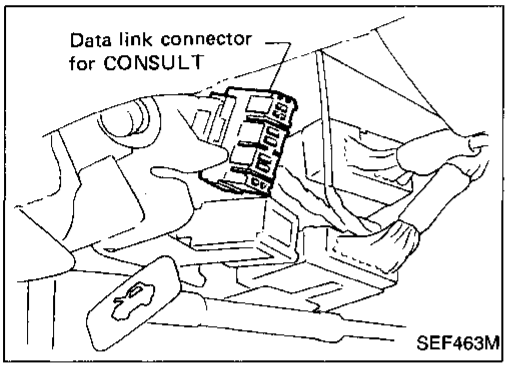
1. Set Diagnostic Test Mode II. (Refer to "HOW TO SWITCH DIAGNOSTIC TEST MODES".)
2. Start engine and warm it up until engine coolant temperature indicator points to the middle of the gauge.
3. Run engine at about 2,000 rpm for about 2 minutes under no-load conditions.
4. Make sure MALFUNCTION INDICATOR LAMP goes ON and OFF more than 5 times every 10 seconds; measured at 2,000 rpm under no-load.



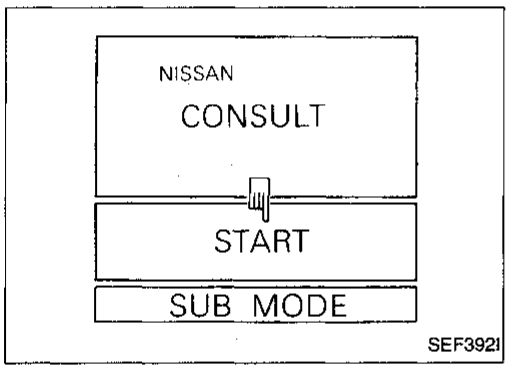
Consult

CONSULT INSPECTION PROCEDURE

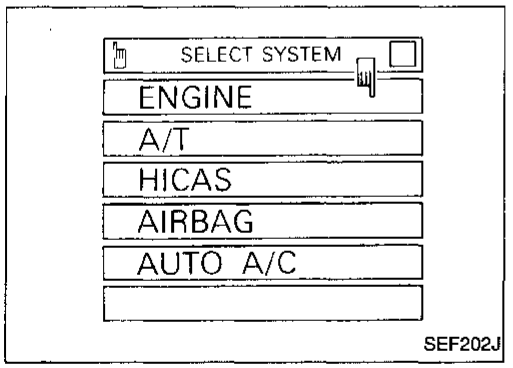
1. Turn off ignition switch.
2. Connect "CONSULT" to data link connector for CONSULT. (Data link connector for CONSULT is located in left dash side panel.)



3. Turn on ignition switch.
4. Touch "START".

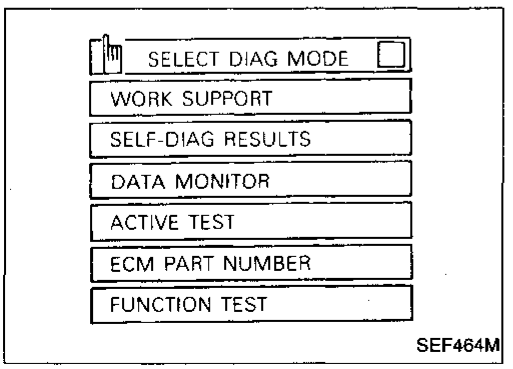


5. Touch "ENGINE".



6. Perform each diagnostic test mode according to the inspection sheet as follows:

For further information, see the CONSULT Operation Manual.



Consult (Cont'd)

ECCS COMPONENT PARTS APPLICATION

	ECCS COMPONENT PARTS	DIAGNOSTIC TEST MODE				
		WORK SUPPORT	SELF-DIAGNOSTIC RESULTS	DATA MONITOR	ACTIVE TEST	FUNCTION TEST
INPUT	Camshaft position sensor		X	X		
	Mass air flow sensor		X	X		
	Engine coolant temperature sensor		X	X	X	
	Heated oxygen sensors		X	X		X
	Vehicle speed sensor		X	X		X
	Throttle position sensor	X	X	X		X
	Boost pressure sensor		X			
	Fuel temperature sensor		X	X		
	EGR temperature sensor		X	X		
	Knock sensor		X			
	Ignition switch (start signal)			X		X
	Air conditioner switch			X		
	Neutral position switch			X		
	Power steering oil pressure switch			X		X
	Battery			X		
	A/T signal		X			
OUTPUT	Injectors		X	X	X	X
	Power transistors (ignition timing)		X (Ignition signal)	X	X	X
	IACV-AAC valve	X		X	X	X
	IACV-FICD solenoid valve			X	X	X
	Valve timing control solenoid valve			X	X	X
	PRVR control solenoid valve			X	X	X
	EGRC-solenoid valve			X	X	X
	Wastegate valve control solenoid valve			X		
	Air conditioner relay			X		
	Fuel pump relay	X		X	X	X
	Cooling fan			X	X	X

X: Applicable

FUNCTION

Diagnostic test mode	Function
Work support	This mode enables a technician to adjust some devices faster and more accurately by following the indications on the CONSULT unit.
Self-diagnostic results	Self-diagnostic results can be read and erased quickly.
Data monitor	Input/Output data in the ECM can be read.
Active test	Diagnostic Test Mode in which CONSULT drives some actuators apart from the ECMs and also shifts some parameters in a specified range.
ECM part number	ECM part number can be read.
Function test	Conducted by CONSULT instead of a technician to determine whether each system is "OK" or "NG".

WORK SUPPORT MODE

WORK ITEM	CONDITION	USAGE
THRTL POS SEN ADJ	CHECK THE THROTTLE POSITION SENSOR SIGNAL. ADJUST IT TO THE SPECIFIED VALUE BY ROTATING THE SENSOR BODY UNDER THE FOLLOWING CONDITIONS. • IGN SW "ON" • ENG NOT RUNNING • ACC PEDAL NOT PRESSED	When adjusting throttle position sensor initial position.
IGNITION TIMING ADJUSTMENT*	• IGNITION TIMING FEEDBACK CONTROL WILL BE HELD BY TOUCHING "START". AFTER DOING SO, ADJUST IGNITION TIMING WITH A TIMING LIGHT BY TURNING THE CAMSHAFT POSITION SENSOR.	When adjusting initial ignition timing.
IACV-AAC/V ADJ	SET ENGINE SPEED AT THE SPECIFIED VALUE UNDER THE FOLLOWING CONDITIONS. • ENGINE WARMED UP • NO-LOAD	When adjusting idle speed.
FUEL PRESSURE RELEASE	• FUEL PUMP WILL STOP BY TOUCHING "START" DURING IDLING. CRANK A FEW TIMES AFTER ENGINE STALLS.	When releasing fuel pressure from fuel line.

*: The ignition timing feedback control is not adopted on model 300ZX, so it is not necessary to perform IGNITION TIMING ADJUSTMENT.

Consult (Cont'd)

SELF-DIAGNOSTIC RESULTS MODE

DIAGNOSTIC ITEM	DIAGNOSTIC ITEM IS DETECTED WHEN ...	CHECK ITEM (REMEDY)
CAMSHAFT POSITION SEN*	• 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.)
MASS AIR FLOW SEN	• 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.)
COOLANT TEMP SEN	• 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
VEHICLE SPEED SEN	• The vehicle speed sensor circuit is open or shorted.	• Harness and connector • Vehicle speed sensor (reed switch)
IGN SIGNAL—PRIMARY*	• The ignition signal in primary circuit is not entered during engine cranking or running.	• Harness and connector • Power transistor unit
TURBO PRESS SENSOR	• The boost pressure sensor circuit is open or shorted. (An abnormally high or low output voltage is entered.)	• Harness and connector • Boost pressure sensor • Boost pressure leaks
ECM	• ECM calculation function is malfunctioning.	[Replace ECM (ECCS control module).]
EGR SYSTEM	• EGR valve does not operate. (EGR valve spring does not lift.)	• EGR valve • EGRC-solenoid valve
OXYGEN SEN OXYGEN SEN-R	• 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
KNOCK SENSOR	• The knock sensor circuit is open or shorted. (An abnormally high or low voltage is entered.)	• Harness and connector • Knock sensor
EGR TEMP SENSOR	• The EGR temperature sensor circuit is open or shorted. (An abnormally high or low voltage is entered.)	• Harness and connector • EGR temperature sensor
FUEL TEMP SENSOR	• The fuel temperature sensor circuit is open or shorted. (An abnormally high or low voltage is entered.)	• Harness and connector • Fuel temperature sensor
THROTTLE POSI SEN	• The throttle position sensor circuit is open or shorted. (An abnormally high or low voltage is entered.)	• Harness and connector • Throttle position sensor
INJECTOR FUEL LEAK	• Fuel leaks from injector.	• Injector
INJECTOR OPEN	• The injector circuit is open.	• Injector
A/T COMM LINE	• The A/T communication line is open or shorted.	• Harness and connector

*: Check items causing a malfunction of camshaft position sensor circuit first, if both "CAMSHAFT POSITION SENSOR" and "IGN SIGNAL—PRIMARY" are displayed at the same time.

DATA MONITOR MODE

Remarks: • Specification data are reference values.
• Specification data are out-put/in-put values which are detected or supplied by ECM at the connector.
*: Specification data may not be directly related to their components signals/values/operations.
ie. Adjust ignition timing with a timing light before monitoring IGN TIMING, because the monitor may show the specification data in spite of the ignition timing being not adjusted to the specification data. This IGN TIMING monitors the calculated data by ECM according to the input signals from camshaft position sensor and other ignition timing related sensors.

MONITOR ITEM	CONDITION		SPECIFICATION	CHECK ITEM WHEN OUTSIDE SPEC.
CMPS•RPM (POS) CMPS•RPM (REF)	• Tachometer: Connect • Run engine and compare tachometer indication with the CONSULT value.		Almost the same speed as the CONSULT value.	• Harness and connector • Camshaft position sensor
MAS AIR/FL SE	• Engine: After warming up, idle the engine • A/C switch "OFF" • Shift lever "N" • No-load	Idle	0.8 - 1.5V	• Harness and connector • Mass air flow sensor
		2,000 rpm	1.4 - 1.8V	
COOLAN TEMP/S	• Engine: After warming up		More than 70°C (158°F)	• Harness and connector • Engine coolant temperature sensor
O2 SEN O2 SEN-R	• Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ↔ 0.6 - 1.0V	• Harness and connector • Heated oxygen sensor • Intake air leaks • Injectors
M/R F/C MNT M/R F/C MNT-R			LEAN ↔ RICH Changes more than 5 times during 10 seconds.	
VHCL SPEED SE	• Turn drive wheels and compare speedometer indication with the CONSULT value		Almost the same speed as the CONSULT value	• Harness and connector • Vehicle speed sensor
BATTERY VOLT	• Ignition switch: ON (Engine stopped)		11 - 14V	• Battery • ECM power supply circuit
THRTL POS SEN	• Ignition switch: ON (Engine stopped)	Throttle valve fully closed	0.4 - 0.5V	• Harness and connector • Throttle position sensor • Throttle position sensor adjustment
		Throttle valve fully opened	Approx. 4.0V	
FUEL TEMP SEN	• Engine: After warming up		20 - 60°C (68 - 140°F)	• Harness and connector • Fuel temp. sensor
EGR TEMP SEN	• Engine: After warming up		Less than 4.5V	• Harness and connector • EGR temperature sensor
START SIGNAL	• Ignition switch: ON → START		OFF → ON	• Harness and connector • Start switch
CLOSED TH/POS	• Ignition switch: ON (Engine stopped)	Throttle valve: Idle position	ON	• Harness and connector • Throttle position sensor • Throttle position sensor adjustment
		Throttle valve: Slightly open	OFF	
AIR COND SIG	• Engine: After warming up, idle the engine	A/C switch "OFF"	OFF	• Harness and connector • Air conditioner switch
		A/C switch "ON"	ON	
NEUT POSI SW	• Ignition switch: ON	Shift lever "P" or "N"	ON	• Harness and connector • Neutral position switch
		Except above	OFF	
PW/ST SIGNAL	• Engine: After warming up, idle the engine	Steering wheel in neutral position (forward direction)	OFF	• Harness and connector • Power steering oil pressure switch
		The steering wheel is turned	ON	
INJ PULSE INJ PULSE-R	• Engine: After warming up • A/C switch "OFF" • Shift lever "N" • No-load	Idle	2.0 - 3.0 msec.	• Harness and connector • Injector • Mass air flow sensor • Intake air system
		2,000 rpm	2.0 - 3.0 msec.	

Consult (Cont'd)

MONITOR ITEM	CONDITION		SPECIFICATION	CHECK ITEM WHEN OUTSIDE SPEC.
IGN TIMING	ditto	Idle	15° BTDC	• Harness and connector • Camshaft position sensor
		2,000 rpm	More than 25° BTDC	
IACV-AAC/V	ditto	Idle	15 - 40%	• Harness and connector • IACV-AAC valve
		2,000 rpm	—	

ACTIVE TEST MODE

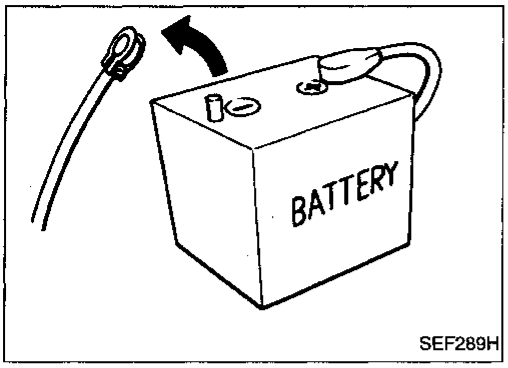
TEST ITEM	CONDITION	JUDGMENT	CHECK ITEM (REMEDY)
FUEL INJECTION TEST	• Engine: Return to the original trouble condition • Change the amount of fuel injection with the CONSULT.	If trouble symptom disappears, see CHECK ITEM.	• Harness and connector • Fuel injectors • Heated oxygen sensor
IACV-AAC/V OPENING TEST	• Engine: After warming up, idle the engine. • Change the IACV-AAC valve opening percent with the CONSULT.	Engine speed changes according to the opening percent.	• Harness and connector • IACV-AAC valve
ENG COOLANT TEMP TEST	• Engine: Return to the original trouble condition • Change the engine coolant temperature with the CONSULT.	If trouble symptom disappears, see CHECK ITEM.	• Harness and connector • Engine coolant temperature sensor • Fuel injectors
IGN TIMING TEST	• Engine: Return to the original trouble condition • Timing light: Set • Retard the ignition timing with the CONSULT.	If trouble symptom disappears, see CHECK ITEM.	• Adjust initial ignition timing
POWER BALANCE TEST	• Engine: After warming up, idle the engine. • A/C switch "OFF" • Shift lever "N" • Cut off each injector signal one at a time with the CONSULT.	Engine runs rough or dies.	• Harness and connector • Compression • Injectors • Power transistor • Spark plugs • Ignition coils
COOLING FAN TEST	• Ignition switch: ON • Turn the cooling fan "ON" and "OFF" with the CONSULT.	Cooling fan moves and stops.	• Harness and connector • Cooling fan motor
FICD SOL/V TEST	• Engine: After warming up, idle the engine. • A/C switch "OFF" • Shift lever "N" • Turn the IACV-FICD solenoid valve "ON" with the CONSULT.	Engine speed will increase momentarily by approx. 200 rpm.	• Harness and connector • IACV-FICD solenoid valve
FUEL PUMP RLY TEST	• Ignition switch: ON (Engine stopped) • Turn the fuel pump relay "ON" and "OFF" with the CONSULT and listen to operating sound.	Fuel pump relay makes the operating sound.	• Harness and connector • Fuel pump relay
EGRC SOLENOID VALVE TEST PRVR CONT SOL/V TEST VALVE TIM SOL TEST	• Ignition switch: ON • Turn solenoid valve "ON" and "OFF" with the CONSULT and listen to operating sound.	Each solenoid valve makes an operating sound.	• Harness and connector • Solenoid valve
SELF-LEARN CONT TEST	• In this test, the coefficient of self-learning control mixture ratio returns to the original coefficient by touching "CLEAR" on the screen.		

FUNCTION TEST MODE

TEST ITEM	CONDITION	JUDGEMENT		CHECK ITEM (REMEDY)
SELF-DIAG RESULTS	• Ignition switch: ON (Engine stopped) • Displays the results of on-board diagnostic system.	—		Objective system
CLOSED THROTTLE POSI (CLOSED THROTTLE POSITION SWITCH CIRCUIT)	• Ignition switch: ON (Engine stopped) • Closed throttle position switch circuit is tested when throttle is opened and closed fully. ("CLOSED THROTTLE POSI" is the test item name for the vehicles in which idle is selected by throttle position sensor.)	Throttle valve: opened	OFF	• Harness and connector • Throttle position sensor (Closed throttle position switch) • Throttle position sensor (Closed throttle position switch) adjustment • Throttle linkage • Verify operation in DATA MONITOR mode.
		Throttle valve: closed	ON	
THROTTLE POSI SEN CKT	• Ignition switch: ON (Engine stopped) • Throttle position sensor circuit is tested when throttle is opened and closed fully.	Range (Throttle valve fully opened — Throttle valve fully closed)	More than 3.0V	• Harness and connector • Throttle position sensor • Throttle position sensor adjustment • Throttle linkage • Verify operation in DATA MONITOR mode.
NEUTRAL POSI SW CKT	• Ignition switch: ON (Engine stopped) • Neutral position switch circuit is tested when shift lever is manipulated.	OUT OF N/P-RANGE	OFF	• Harness and connector • Neutral position switch/Inhibitor switch • Linkage + Inhibitor switch adjustment
		IN N-RANGE	ON	
FUEL PUMP CIRCUIT	• Ignition switch: ON (Engine stopped) • Fuel pump circuit is tested by checking the pulsation in fuel pressure when fuel tube is pinched.	There is pressure pulsation on the fuel feed hose.		• Harness and connector • Fuel pump • Fuel pump relay • Fuel filter clogging • Fuel level
EGRC SOL/V CIRCUIT	• Ignition switch: ON (Engine stopped) • EGR control S/V circuit is tested by checking solenoid valve operating noise.	The solenoid valve makes an operating sound every 3 seconds.		• Harness and connector • EGRC-solenoid valve
PRVR CONT S/V CIRCUIT	• Ignition switch: ON (Engine stopped) • PRVR CONT S/V circuit is tested by checking solenoid valve operating noise.	The solenoid valve makes an operating sound every 3 seconds.		• Harness and connector • PRVR control solenoid valve
VALVE TIMING S/V CKT	• Ignition switch: ON (Engine stopped) • Valve timing S/V circuit is tested by checking solenoid valve operating noise.	The solenoid valve makes an operating sound every 3 seconds.		• Harness and connector • Valve timing solenoid valve
COOLING FAN CIRCUIT	• Ignition switch: ON (Engine stopped) • Cooling fan circuit is tested by checking cooling fan operation.	The cooling fan rotates and stops every 3 seconds.		• Harness and connector • Cooling fan motor • Cooling fan relay

Consult (Cont'd)

TEST ITEM	CONDITION	JUDGEMENT		CHECK ITEM (REMEDY)
START SIGNAL CIRCUIT	• Ignition switch: ON → START • Start signal circuit is tested when engine is started by operating the starter. Battery voltage and water temperature before cranking, and average battery voltage, mass air flow sensor output voltage and cranking speed during cranking are displayed.	Start signal: OFF → ON		• Harness and connector • Ignition switch
PW/ST SIGNAL CIRCUIT	• Ignition switch: ON (Engine running) • Power steering circuit is tested when steering wheel is rotated fully and then set to a straight line running position.	Locked position	ON	• Harness and connector • Power steering oil pressure switch • Power steering oil pump
		Neutral position	OFF	
VEHICLE SPEED SEN CKT	• Vehicle speed sensor circuit is tested when vehicle is running at a speed of 10 km/h (6 MPH) or higher.	Vehicle speed sensor input signal is greater than 4 km/h (2 MPH)		• Harness and connector • Vehicle speed sensor • Electric speedometer
IGN TIMING ADJ	• After warming up, idle the engine. • Ignition timing adjustment is checked by reading ignition timing with a timing light and checking whether it agrees with specifications.	The timing light indicates the same value on the screen.		• Adjust ignition timing (by moving camshaft position sensor or distributor) • Camshaft position sensor drive mechanism
MIXTURE RATIO TEST	• Air-fuel ratio feedback circuit (injection system, ignition system, vacuum system, etc.) is tested by examining the O_2 sensor output at 2,000 rpm under non-loaded state.	• O_2 SEN COUNT: More than 5 times during 10 seconds (O_2 SEN-R COUNT: More than 5 times during 10 seconds)		• INJECTION SYS (Injector, fuel pressure regulator, harness or connector) • IGNITION SYS (Spark plug, power transistor, ignition coil, harness or connector) • VACUUM SYS (Intake air leaks) • O_2 sensor circuit • O_2 sensor operation • Fuel pressure high or low • Mass air flow sensor
POWER BALANCE	• After warming up, idle the engine. • Injector operation of each cylinder is stopped one after another, and resultant change in engine rotation is examined to evaluate combustion of each cylinder. (This is only displayed for models where a sequential multiport fuel injection system is used.)	Difference in engine speed is greater than 25 rpm before and after cutting off the injector of each cylinder.		• Injector circuit (Injector, harness or connector) • Ignition circuit (Spark plug, power transistor, ignition coil, harness or connector) • Compression • Valve timing
IACV-AAC/V SYSTEM	• After warming up, idle the engine. • IACV-AAC valve system is tested by detecting change in engine speed when IACV-AAC valve opening is changed to 0%, 20% and 80%.	Difference in engine speed is greater than 150 rpm between when valve opening is at 80% (102 steps) and at 20% (25 steps).		• Harness and connector • IACV-AAC valve • Air passage restriction between air inlet and IACV-AAC valve • IAS (Idle adjusting screw) adjustment
IACV-FICD S/V SYSTEM	• After warming up, idle the engine. A/C switch: OFF Light switch: OFF • FICD system is tested by detecting change in engine speed when IACV-FICD solenoid valve is ON and OFF.	Difference in engine speed is greater than 50 rpm between IACV-FICD solenoid valve "ON" and "OFF".		• Harness and connector • IACV-FICD solenoid valve • Air passage

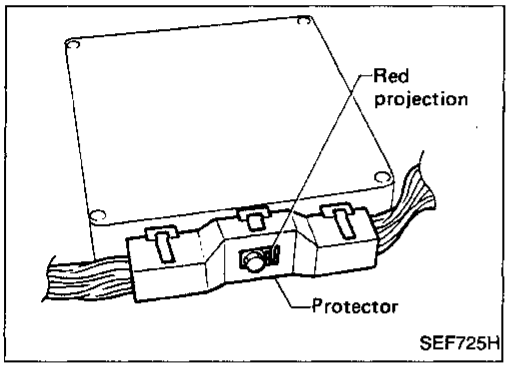


SEF289H

Diagnostic Procedure

CAUTION:

1. **Before connecting or disconnecting the ECM harness connector, turn ignition switch OFF and disconnect negative battery terminal. Failure to do so may damage the ECM. Because battery voltage is applied to ECM even if ignition switch is turned off.**



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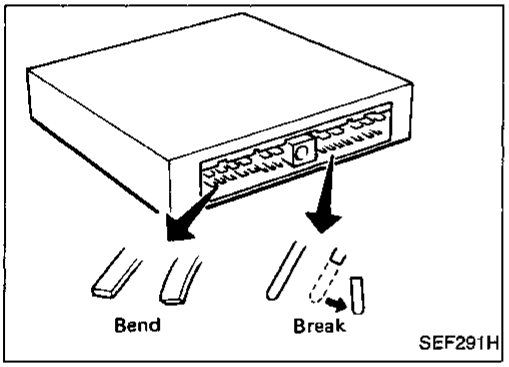
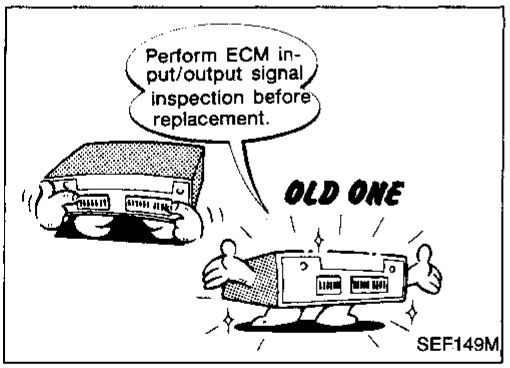
2. **When connecting ECM harness connector, tighten securing bolt until red projection is in line with connector face.**



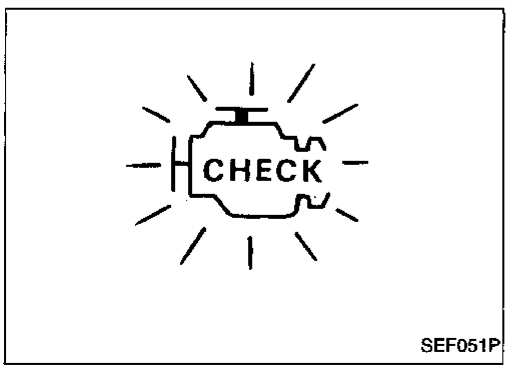
SEF291H

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

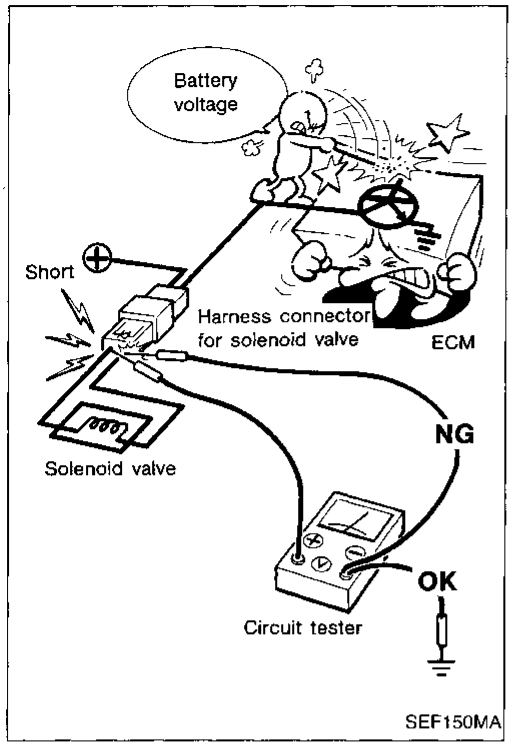
5. **Before replacing ECM, perform ECM input/output signal inspection and make sure whether ECM functions properly or not. (See page EF & EC-176.)**



SEF051P

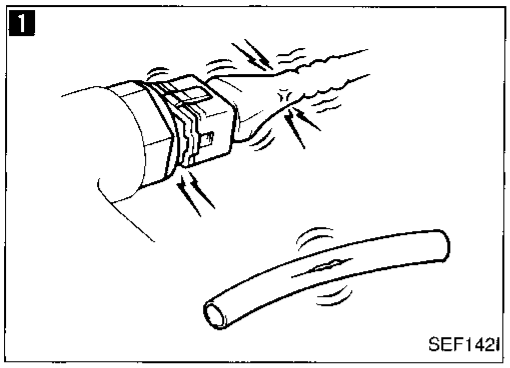
6. **After performing this "Diagnostic Procedure", perform diagnostic test mode II (Self-diagnostic results) and driving test.**

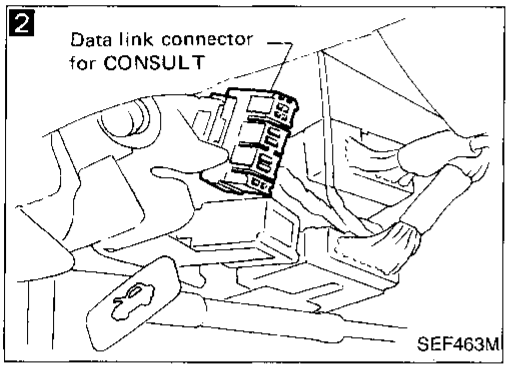
Diagnostic Procedure (Cont'd)

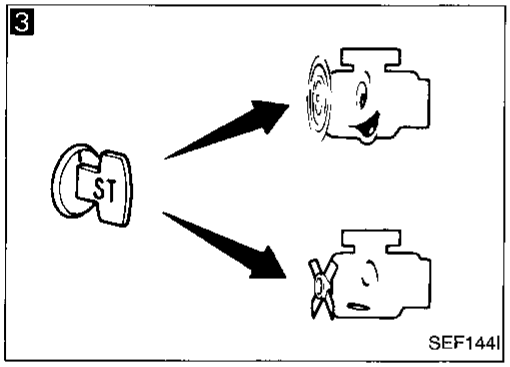


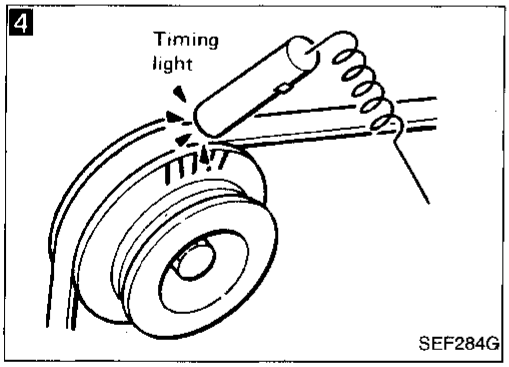
7. **When measuring ECM signals with a circuit tester, never bring the two tester probes into contact.**
   Accidental contact of probes will cause a short circuit and damage the ECM power transistor.

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

CONNECT CONSULT TO THE VEHICLE

Connect "CONSULT" to the data link connector for CONSULT and select "ENGINE" from the menu. (Refer to page EF & EC-54.)

3

DOES ENGINE START?

No → Go to **6** .

Yes

4

CHECK IGNITION TIMING.

Warm up engine sufficiently and check ignition timing at idle using timing light. (Refer to page EF & EC-35.)

Ignition timing: 15°±2° BTDC
(in "N" position for AT model)

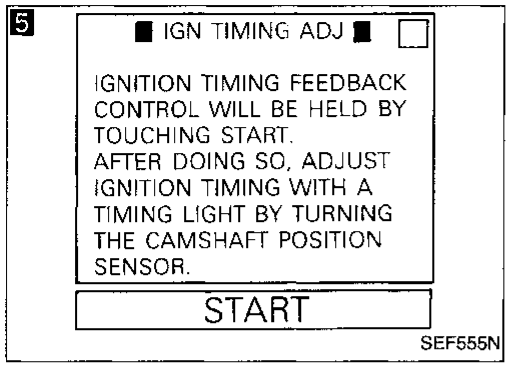
NG → Adjust ignition timing by turning camshaft position sensor.

OK

(Go to Ⓐ on next page.)

Basic Inspection (Cont'd)

5



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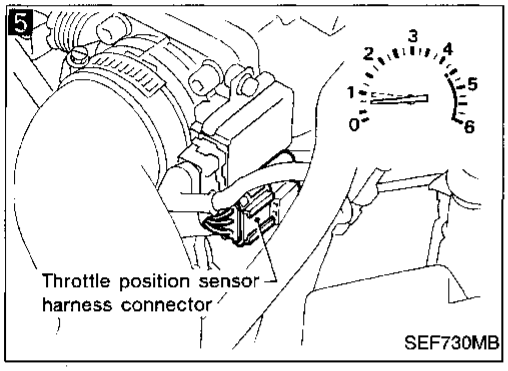

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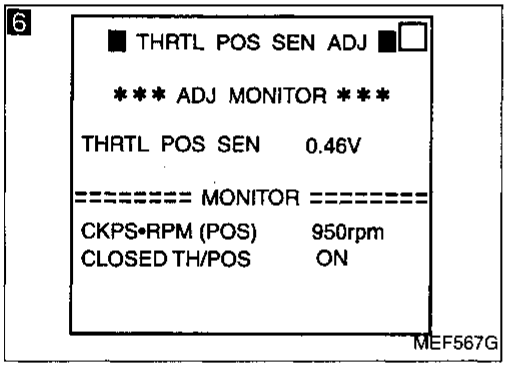

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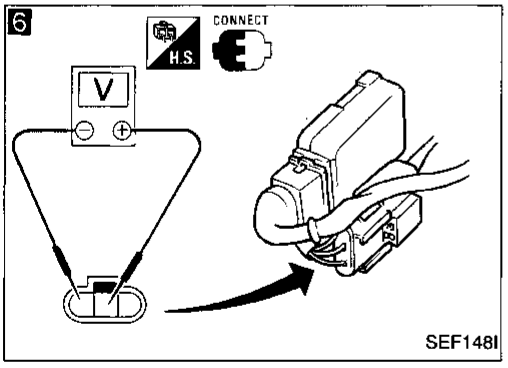


Ⓐ

5

CHECK IDLE ADJ. SCREW INITIAL SET RPM.

1. Select "IGN TIMING ADJ" in "WORK SUPPORT" mode.
2. When touching "START", does engine speed fall to;
   Non-turbocharger
   M/T: 650±50 rpm
   A/T: 720±50 rpm
   [in "N" position]?
   Turbocharger
   M/T: 650±50 rpm (U.S.A.)
   700±50 rpm (Canada)
   A/T: 700±50 rpm
   [in "N" position]?

No → Adjust engine speed by turning idle adjusting screw.

OR

When disconnecting throttle position sensor harness connector, does engine speed fall to:
Non-turbocharger
M/T: 650±50 rpm
A/T: 720±50 rpm
[in "N" position]?
Turbocharger
M/T: 650±50 rpm (U.S.A.)
700±50 rpm (Canada)
A/T: 700±50 rpm
[in "N" position]?

Yes

6

CHECK THROTTLE POSITION SENSOR IDLE POSITION.

1. Perform "THRTL POS SEN. ADJ." in "WORK SUPPORT" mode.
2. Check that output voltage of throttle position sensor is 0.4 to 0.5V. (Throttle valve fully closes.) and "CLOSED TH/POS" stays "ON".

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 "CLOSED TH/POS" stays "ON".

OR

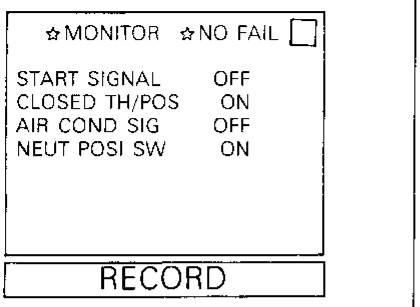
Measure output voltage of throttle position sensor using voltmeter, and check that it is 0.4 to 0.5V. (Throttle valve fully closed.)

OK

(Go to Ⓑ on next page.)

Basic Inspection (Cont'd)

7



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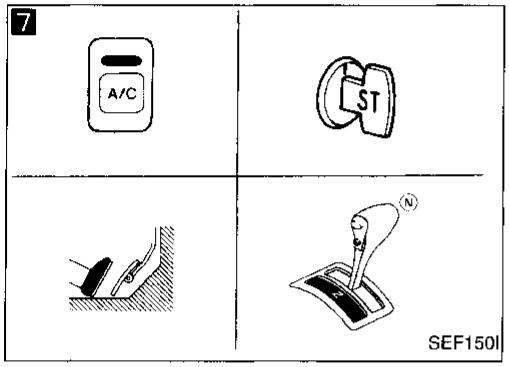
7



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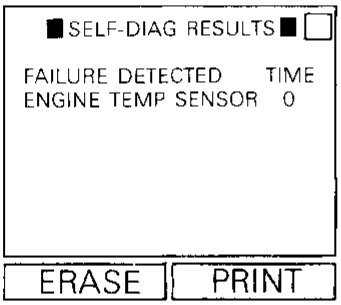
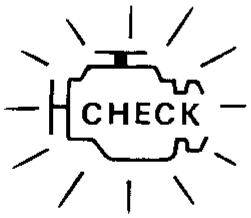
8



SEF151I

8



SEF051P

Ⓑ

7

CHECK SWITCH INPUT SIGNAL.

Select the following switches in "DATA MONITOR" mode,
a) Start signal,
b) Idle position,
c) Air conditioner signal,
d) Neutral position (Parking) switch,
and check the switches' ON-OFF operation.

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

OR

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 → Battery voltage
Idle position	—	—
A/C signal	A/C OFF → A/C ON (Engine running)	Battery voltage → 0.5 - 0.7
Park/Neutral position switch	Shift lever is "N" or "P" position → Except "N" and "P"	0 → 8.0 - 9.0

OK

8

READ SELF-DIAGNOSTIC RESULTS.

1. Perform "SELF-DIAG RESULTS" mode.
2. Read out self-diagnostic results.
3. Is a failure detected?

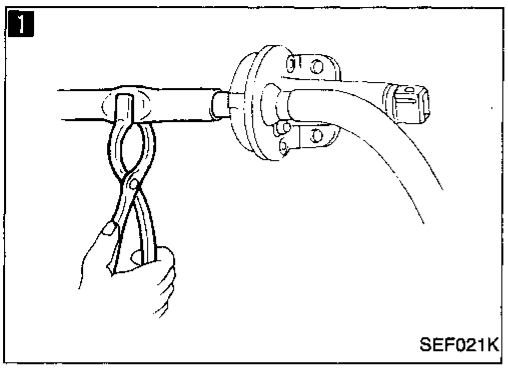
Yes → Go to the relevant inspection procedure.

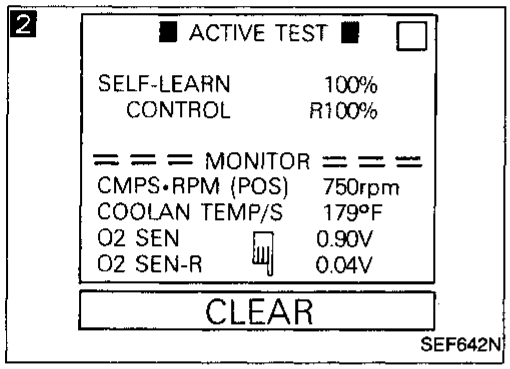
OR

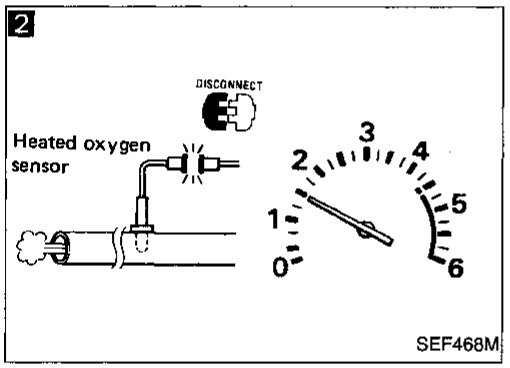
1. Set "Self-diagnostic results mode" in Diagnostic Test Mode II. (Refer to page EF & EC-50.)
2. Count the number of malfunction indicator lamp flashes and read out the diagnostic trouble codes.
3. Are the diagnostic trouble codes being output?

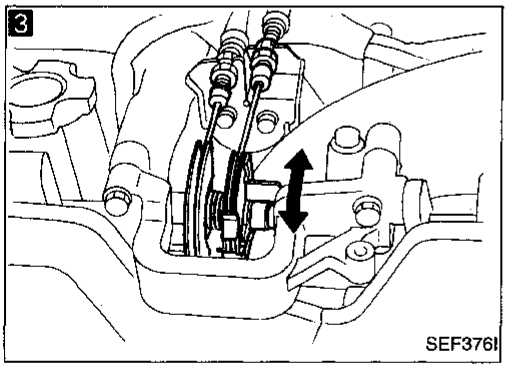
No

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. Select "SELF-LEARNING CONT" in "ACTIVE TEST" mode.
2. Clear the self-learning control coefficient by touching "CLEAR".
3. Does the engine speed drop?

Yes → Discover air leak location and repair.

— OR —

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

No ↓

3

CHECK THROTTLE LINKAGE.

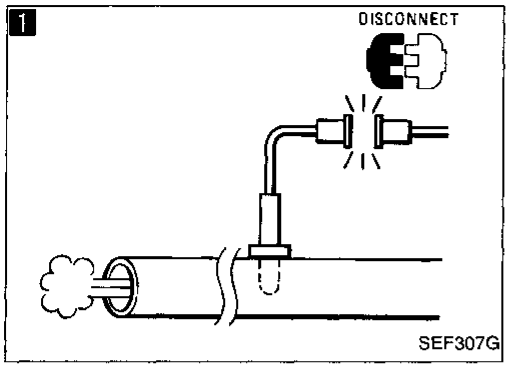
1. Check that throttle linkage moves smoothly.
2. Confirm that throttle valve both fully opens and fully closes.

NG → Repair throttle linkage or sticking of throttle valve.

OK ↓

INSPECTION END

Diagnostic Procedure 2 — Hunting

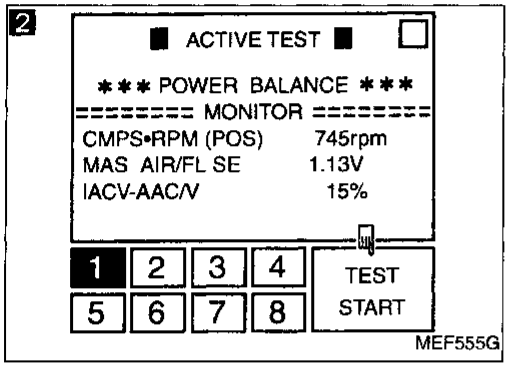


1

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

Yes → Check heated oxygen sensor(s). (See page EF & EC-129.)

No ↓



2

PERFORM POWER BALANCE TEST.

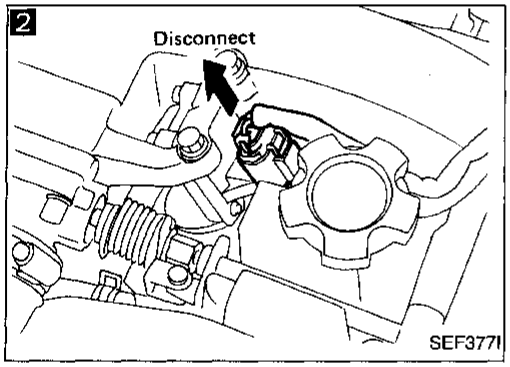
1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

OR

When disconnecting each ignition coil harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

No → Go to **4**.

Yes ↓



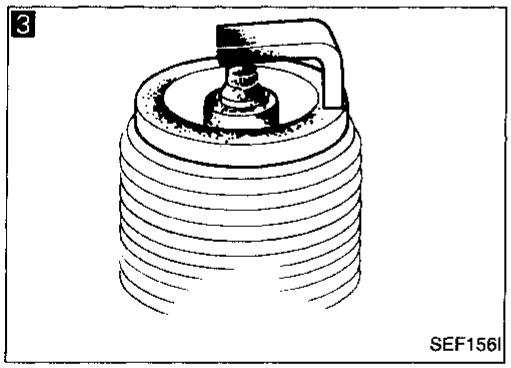
3

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

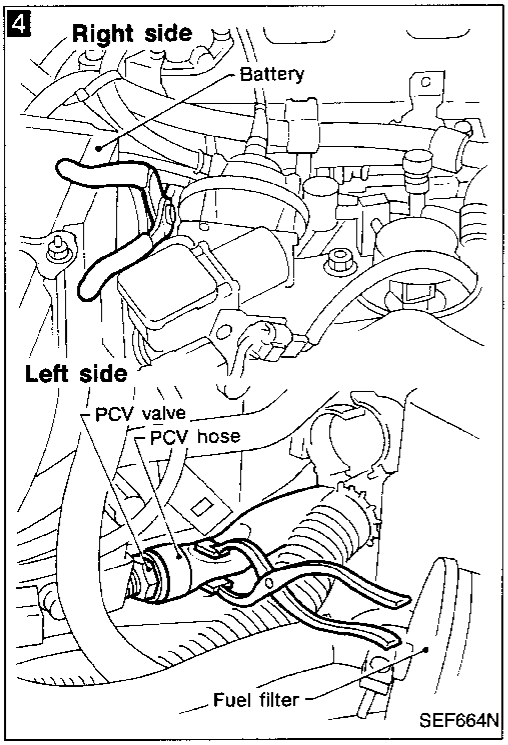
NG → Repair or replace spark plug(s).

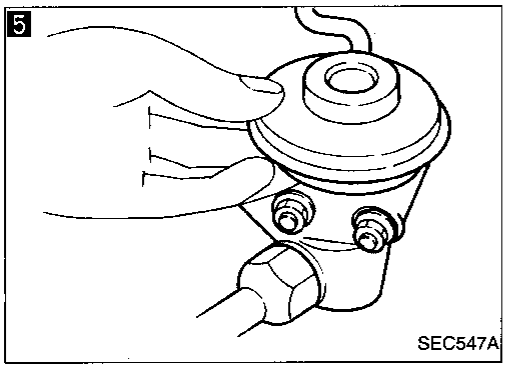
OK ↓

(Go to Ⓐ on next page.)



Diagnostic Procedure 2 — Hunting (Cont'd)





Ⓐ

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

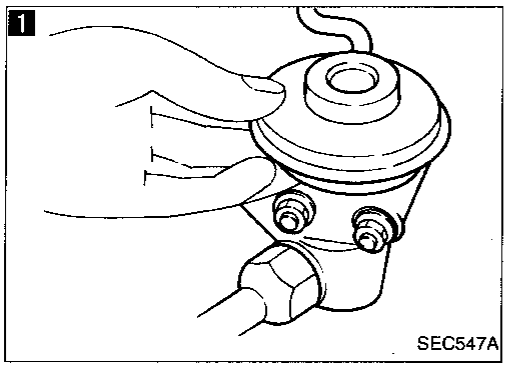
CHECK EGR VALVE.
Check EGR valve for sticking.

NG → Repair or replace.

OK

INSPECTION END

Diagnostic Procedure 3 — Unstable Idle



1

CHECK EGR VALVE.
Check EGR valve for sticking.

NG → Repair or replace.

OK ↓

2

PERFORM POWER BALANCE TEST.

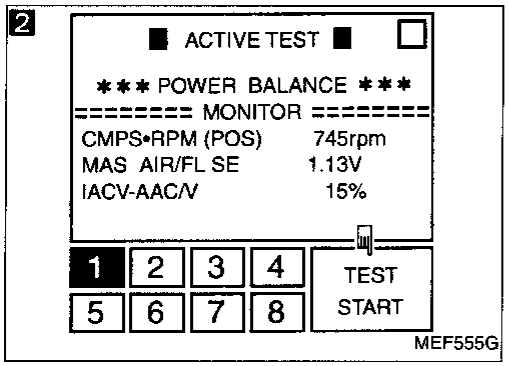
1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

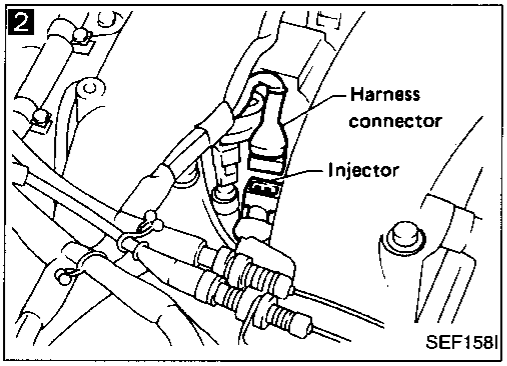
— OR —

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 ↓





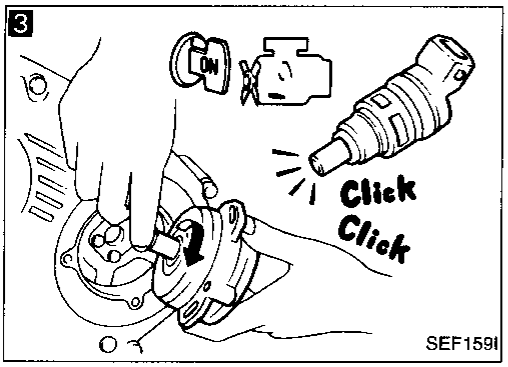
3

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

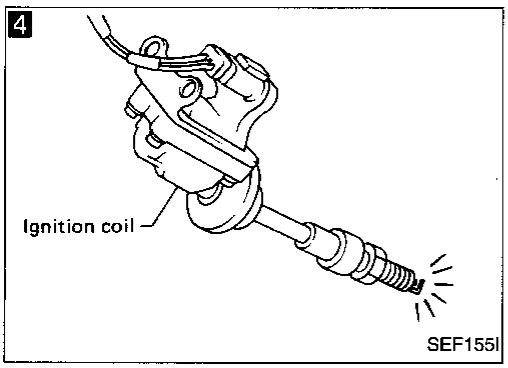
CHECK IGNITION SPARK.

1. Disconnect ignition coil assembly from collector.
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 their circuits. (See page EF & EC-119.)

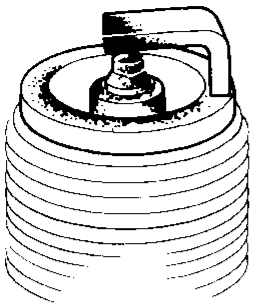
OK ↓

(Go to Ⓐ on next page.)



Diagnostic Procedure 3 — Unstable Idle (Cont'd)

5



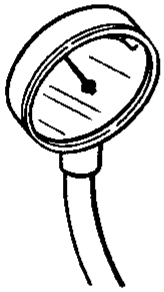
SEF156I

6

■ FUEL PRES RELEASE ■

FUEL PUMP WILL STOP BY TOUCHING START DURING IDLE.
CRANK A FEW TIMES AFTER ENGINE STALL.

START



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Ⓐ

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. Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode in order to release fuel pressure to zero.
2. Install fuel pressure gauge and check fuel pressure.
   At idle approx. 255 kPa (2.6 kg/cm^2, 37 psi)

NG → Check fuel pump and circuit.

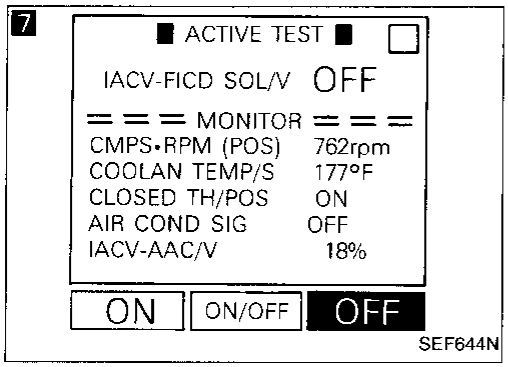
OR

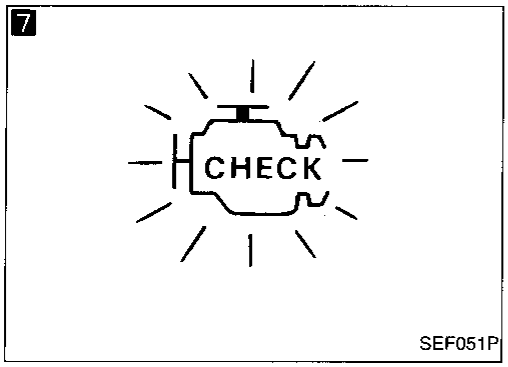
1. Release fuel pressure to zero. (Refer to page EF & EC-189.)
2. Install fuel pressure gauge and check fuel pressure.

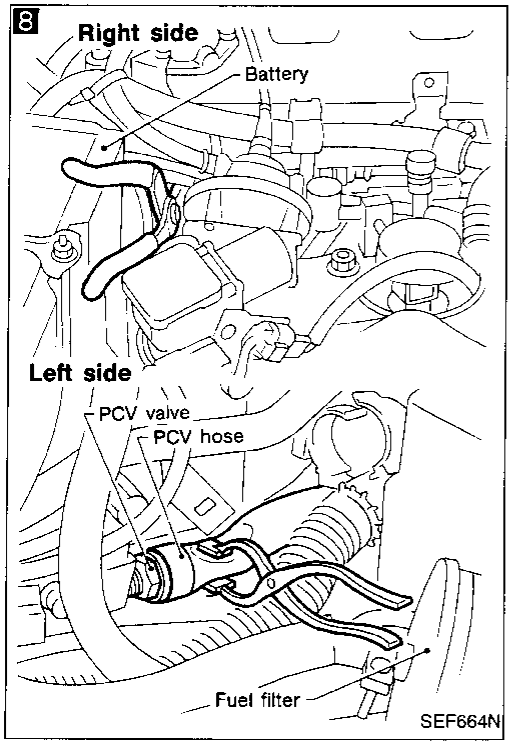
OK

(Go to Ⓑ on next page.)

Diagnostic Procedure 3 — Unstable Idle (Cont'd)







Ⓑ

7

CHECK HEATED OXYGEN SENSOR.

1. See "M/R F/C MNT (right and left sides)" in "Data monitor" mode.
2. Maintaining engine at 2,000 rpm under no-load (engine is warmed up sufficiently.), check that the monitor fluctuates between "LEAN" and "RICH" more than 5 times during 10 seconds.
   1 time: RICH → LEAN → RICH
   2 times: RICH → LEAN → RICH → LEAN → RICH

NG → Replace heated oxygen sensor(s).

OR

1. Set "Heated oxygen sensor monitor" in Diagnostic Test Mode II. (See page EF & EC-53.)
2. Maintaining engine at 2,000 rpm under no-load, check to make sure that malfunction indicator lamp goes ON and OFF more than 5 times during 10 seconds.

OK

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.

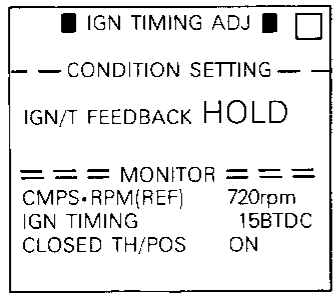
No

(Go to Ⓒ on next page.)

Diagnostic Procedure 3 — Unstable Idle (Cont'd)

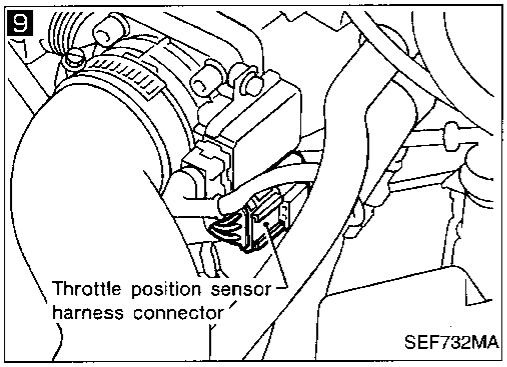
©

9



SEF645NA

9



SEF732MA

10

COMPRESSION PRESSURE

SEF309G

9

CHECK IDLE ADJ. SCREW CLOGGING.

1. Perform "IGN TIMING ADJ" in "WORK SUPPORT" mode.
2. Can you set engine speed as follows by turning idle adjusting screw?
   Non-turbocharger
   M/T: 650±50 rpm
   A/T: 720±50 rpm
   [in "N" position]
   Turbocharger
   M/T: 650±50 rpm (U.S.A.)
   700±50 rpm (Canada)
   A/T: 700±50 rpm
   [in "N" position]

No → Check for IAS clogging or throttle valve clogging.

OR

1. Disconnect throttle position sensor harness connector.
2. Can you set engine speed as follows by turning idle speed adjusting screw?
   Non-turbocharger
   M/T: 650±50 rpm
   A/T: 720±50 rpm
   [in "N" position]
   Turbocharger
   M/T: 650±50 rpm (U.S.A.)
   700±50 rpm (Canada)
   A/T: 700±50 rpm
   [in "N" position]

Yes ↓

10

CHECK COMPRESSION PRESSURE.

- Check compression pressure.
  Standard: kPa (kg/cm², psi)/300 rpm
  1,285 (13.1, 186)
  Minimum: kPa (kg/cm², psi)/300 rpm
  981 (10.0, 142)
  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*.

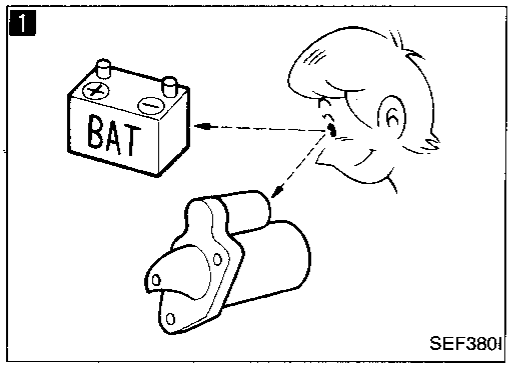
OK ↓

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



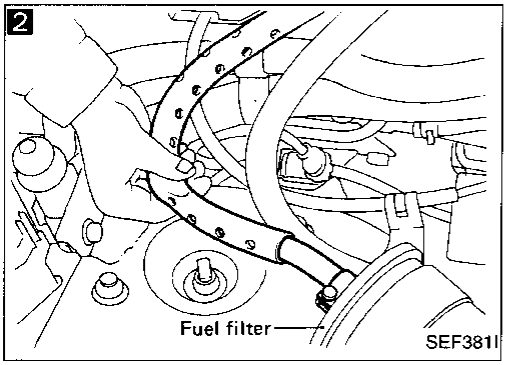
SEF380I

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

NG → Repair or replace.

OK ↓

2



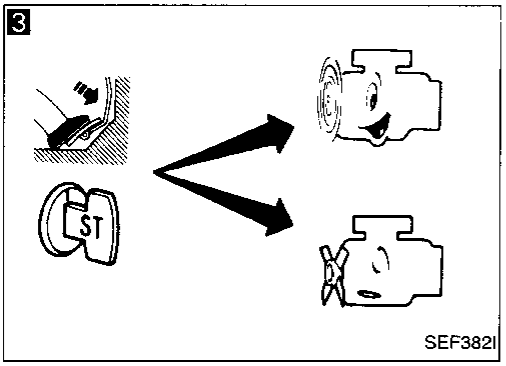
SEF381I

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-153.)

Yes ↓

3



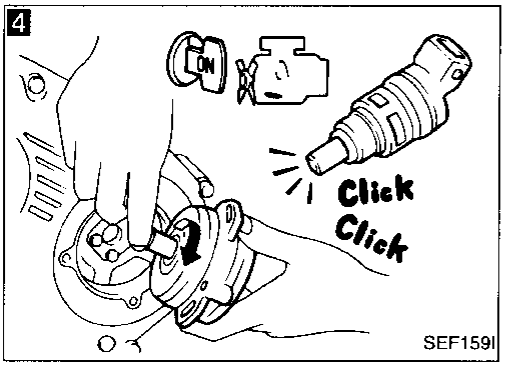
SEF382I

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-156 - 159.)

No ↓

4



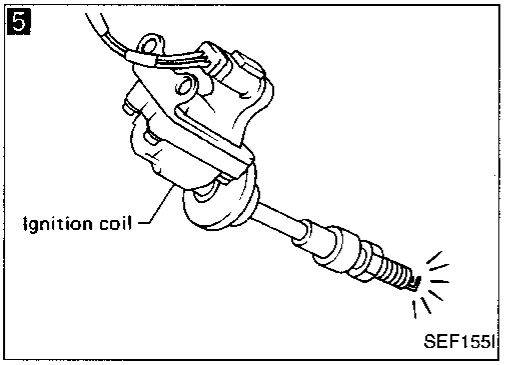
SEF159I

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



SEF155I

CHECK IGNITION SPARK.
1. Disconnect ignition coil assembly from collector.
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.

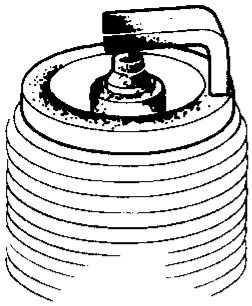
NG → Check ignition coil, power transistor unit and their circuits. (See page EF & EC-119.)

OK ↓

(Go to Ⓐ on next page.)

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

6



SEF156I

Ⓐ

6

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 ↓

Reconnect ECM harness connector and retest.

Trouble is not fixed. ↓

CHECK ECM POWER SUPPLY AND GROUND CIRCUIT.
Refer to page EF & EC-106.

NG → Repair or replace.

OK ↓

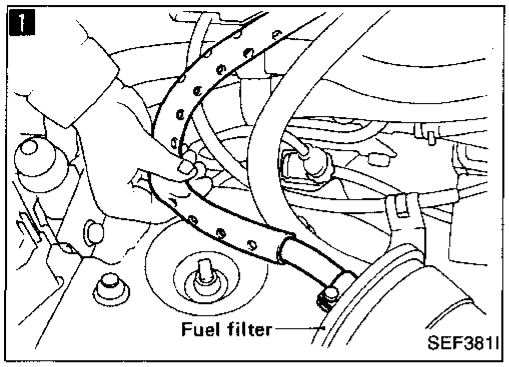
TRY A KNOWN GOOD ECM*.

↓

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

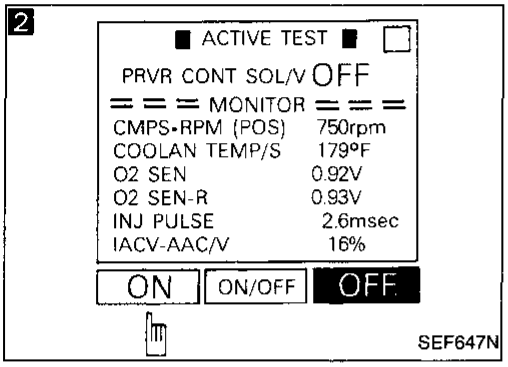


1

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-153.)

Yes ↓



2

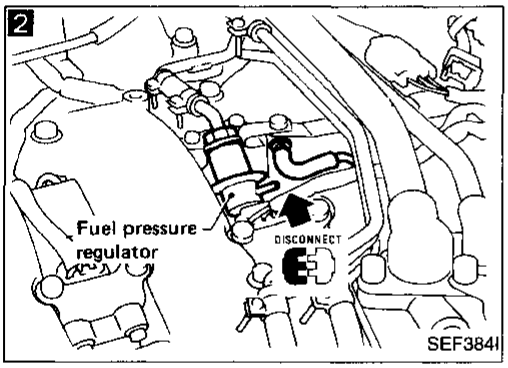
CHECK FUEL VAPOR.
1. Select "PRVR CONT SOL VALVE" in "ACTIVE TEST" mode.
2. After touching "ON", can you start the engine?

OR

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

Yes → Check fuel properties.

No ↓

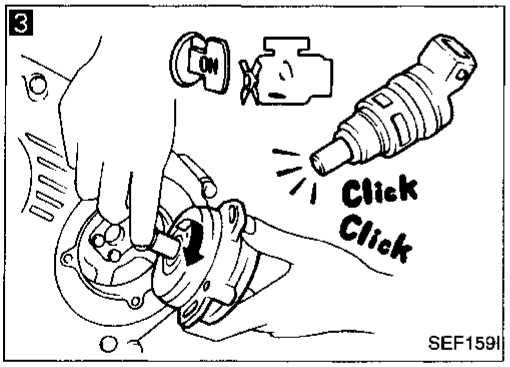


3

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 ↓



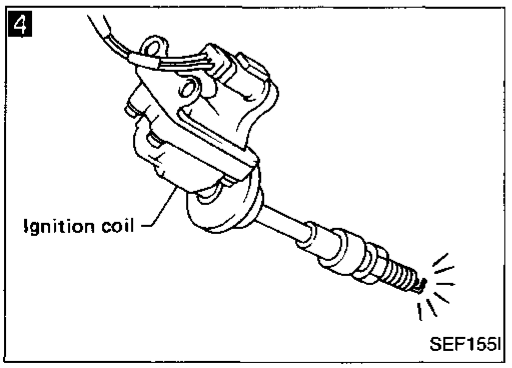
4

CHECK IGNITION SPARK.
1. Disconnect ignition coil assembly from collector.
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.

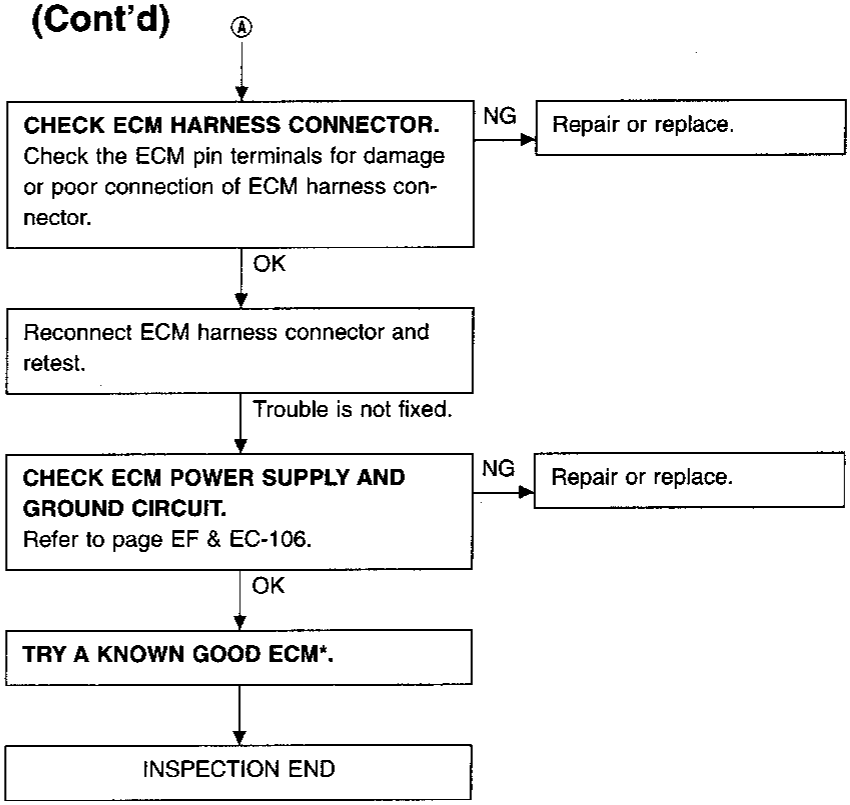
NG → Check ignition coil, power transistor unit and circuits. (See page EF & EC-119.)

OK ↓

(Go to Ⓐ on next page.)

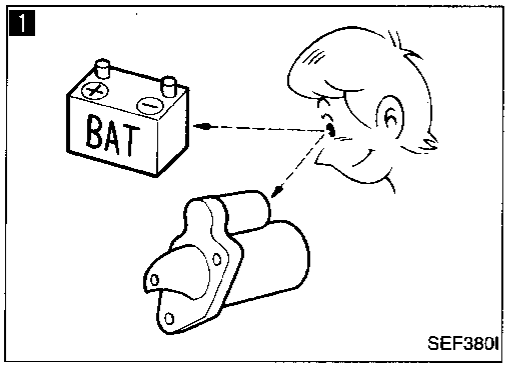


Diagnostic Procedure 5 — Hard to Start or Impossible to Start when the Engine is Hot (Cont'd)



*: 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

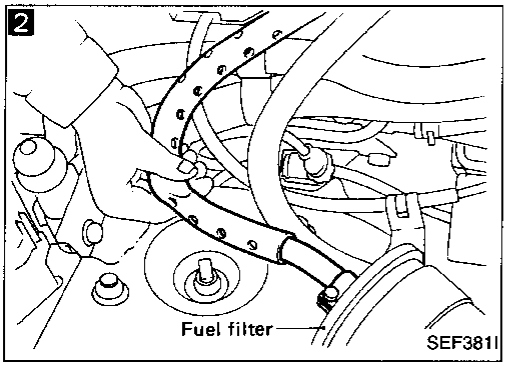


1

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

NG → Repair or replace.

OK ↓

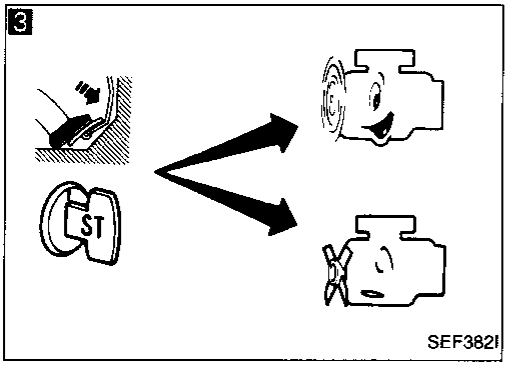


2

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-153.)

Yes ↓



3

CHECK INJECTOR FOR LEAKAGE.
When pressing accelerator pedal fully, can you start the engine?

Yes → Check injector(s) for leakage.

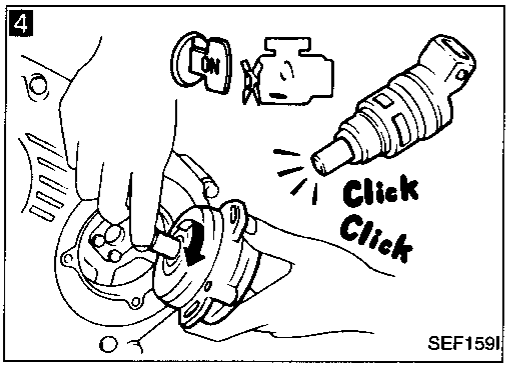
No ↓

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 ↓



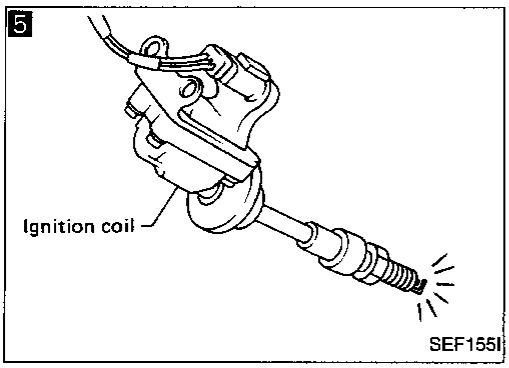
5

CHECK IGNITION SPARK.
1. Disconnect ignition coil assembly from collector.
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.

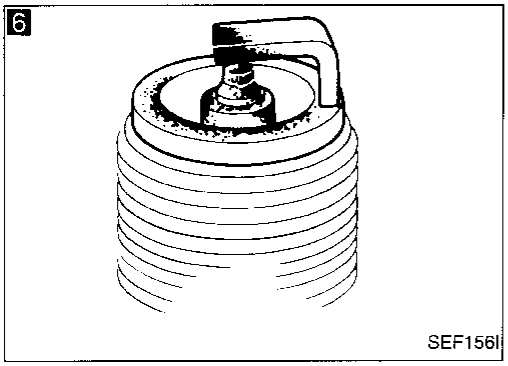
NG → Check ignition coil, power transistor unit and circuits. (See page EF & EC-119.)

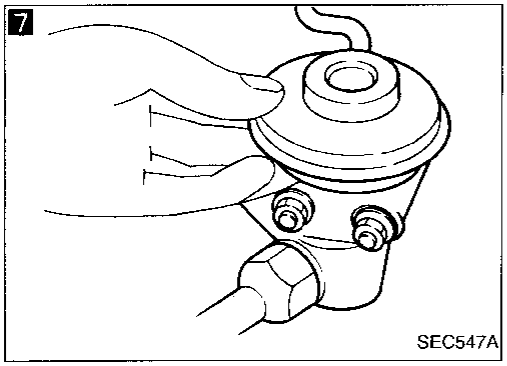
OK ↓

(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 ↓

Reconnect ECM harness connector and retest.
Trouble is not fixed. ↓

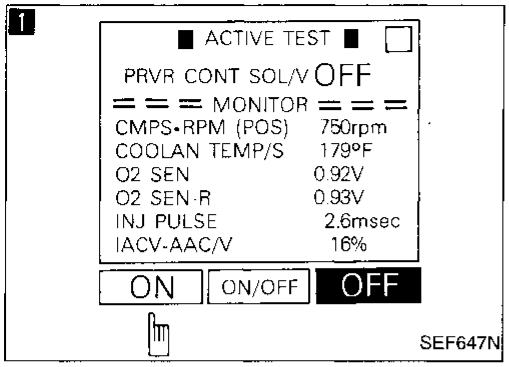
CHECK ECM POWER SUPPLY AND GROUND CIRCUIT.
Refer to page EF & EC-106.
NG → Repair or replace.
OK ↓

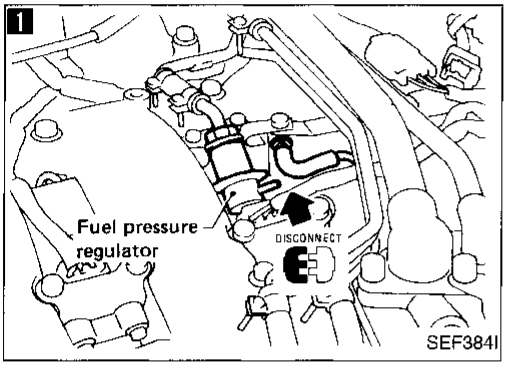
TRY A KNOWN GOOD ECM*. ↓

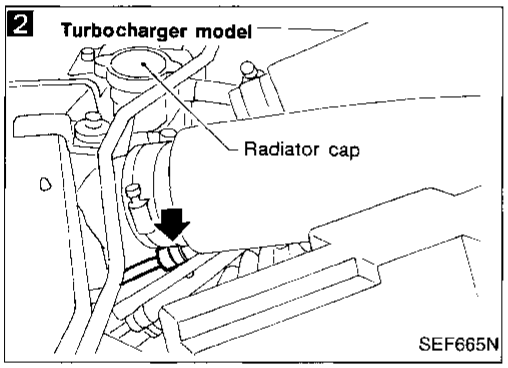
CHECK TIMING BELT FOR PROPER INSTALLATION.
NG → Replace timing belt.
OK ↓

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. Select "PRVR CONT SOL VALVE" in "ACTIVE TEST" mode.
2. After touching "ON", perform cruise test.
3. Does the hesitation disappear?

Yes → Check fuel properties.

OR

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

No ↓

2

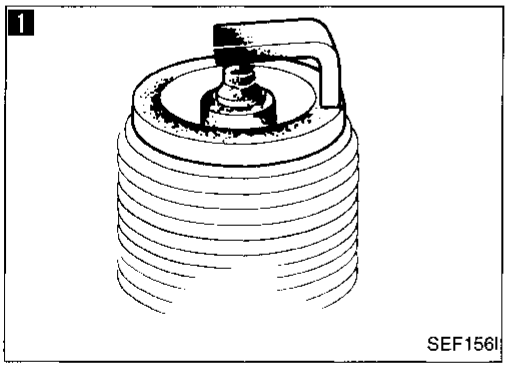
CHECK CANISTER PURGE.

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.

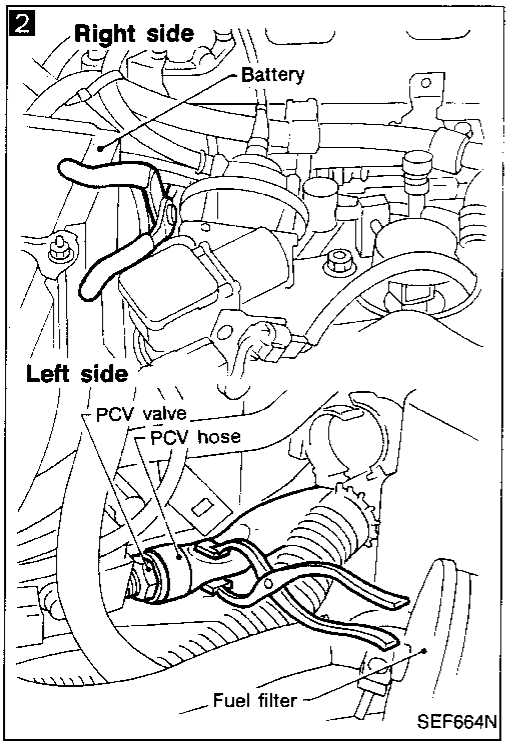
NG → Repair or replace spark plug(s).

OK ↓

Ⓐ

Diagnostic Procedure 8 — Hesitation when the Engine is Cold (Cont'd)

2



SEF664N

Ⓐ

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 ↓

Disconnect and reconnect mass air flow sensor. Then retest.

Trouble is not fixed. ↓

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. See "M/R F/C MNT (right and left sides)" in "DATA MONITOR" mode.
2. Maintaining engine at 2,000 rpm under no-load (with engine warmed up sufficiently.), check to make sure that the monitor fluctuates between "LEAN" and "RICH" more than 5 times during 10 seconds.
   1 time: RICH → LEAN → RICH
   2 times: RICH → LEAN → RICH → LEAN → RICH

Yes → Replace heated oxygen sensor(s).

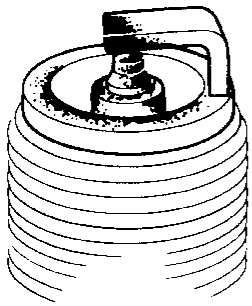
OR

1. Set "Heated oxygen sensor monitor" in Diagnostic Test Mode II. (See page EF & EC-53.)
2. Maintaining engine at 2,000 rpm under no load, check that malfunction indicator lamp goes ON and OFF more than 5 times during 10 seconds.

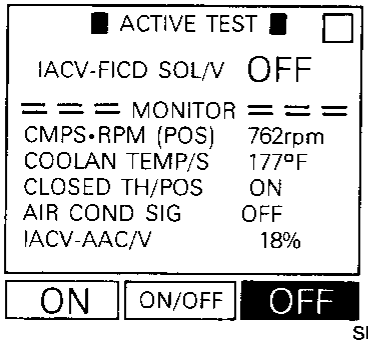
No ↓

(Go to Ⓐ on next page.)

1

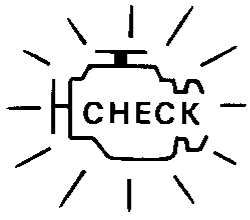

SEF156I

2



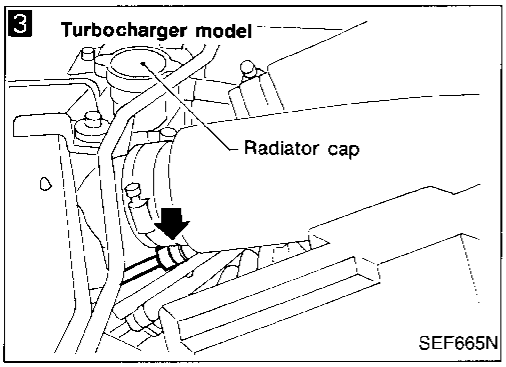
SEF644N

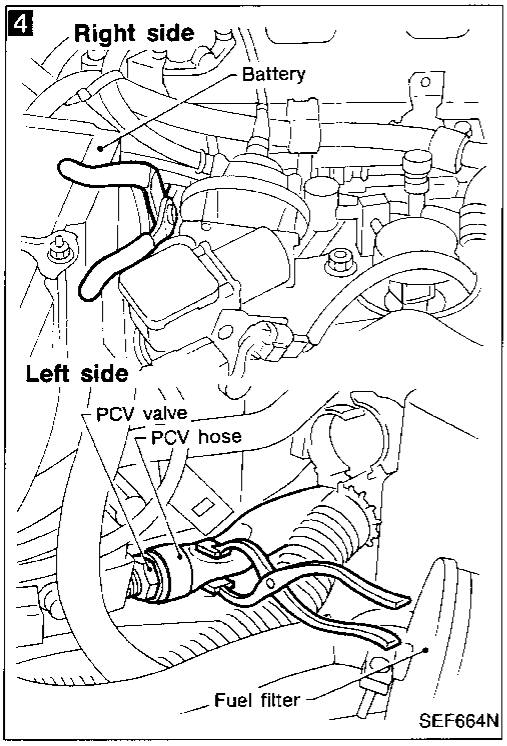
2



SEF051P

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

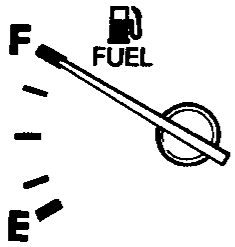
CHECK FOR INTAKE AIR LEAK.
When pinching blow-by hose (lowering the blow-by air supply), does the engine speed rise?

Yes → Discover air leak location and repair.

No

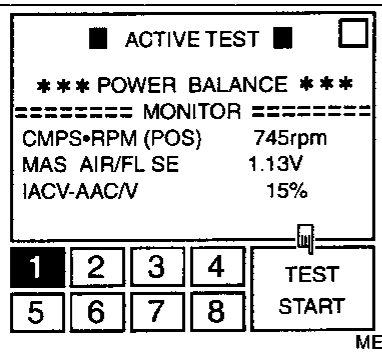
INSPECTION END

1



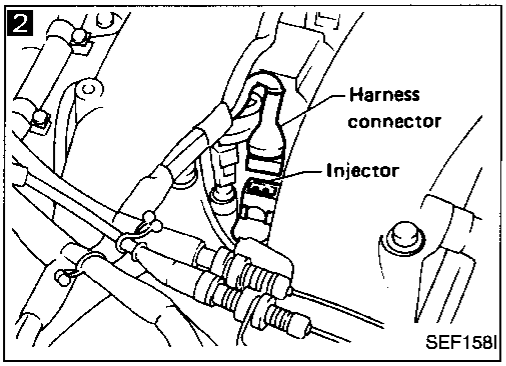
SEF386I

2



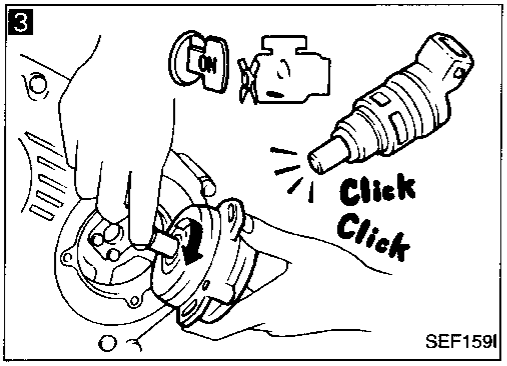
MEF555G

2



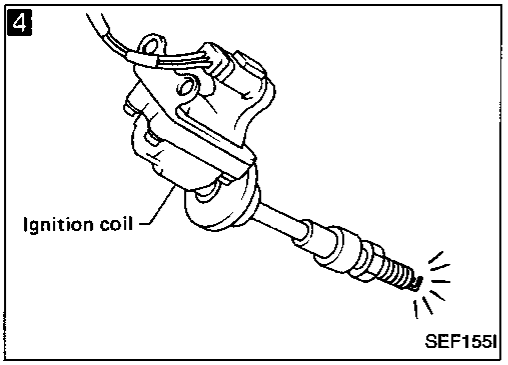
SEF158I

3



SEF159I

4



SEF155I

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.
1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

No → Go to 5 .

OR

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

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 ↓

4

CHECK IGNITION SPARK.
1. Disconnect ignition coil assembly from collector.
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-119.)

OK ↓

(Go to Ⓐ on next page.)

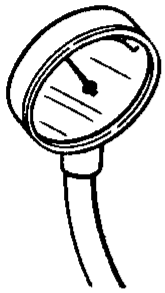
Diagnostic Procedure 10 — Engine Stalls when Turning (Cont'd)

5

■ FUEL PRES RELEASE ■

FUEL PUMP WILL STOP BY TOUCHING START DURING IDLE.
CRANK A FEW TIMES AFTER ENGINE STALL.

START



SEF204J

Ⓐ

5

CHECK FUEL PRESSURE.

1. Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode in order to release fuel pressure to zero.
2. Install fuel pressure gauge and check fuel pressure.
   At idle approx. 255 kPa (2.6 kg/cm², 37 psi)
   The moment throttle valve is fully open:
   approx. 304 kPa (3.1 kg/cm², 44 psi)

NG → Check fuel pressure regulator diaphragm.

OR

1. Release fuel pressure to zero. (Refer to page EF & EC-189.)
2. Install fuel pressure gauge and check fuel pressure.

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-106.

NG → Repair or replace.

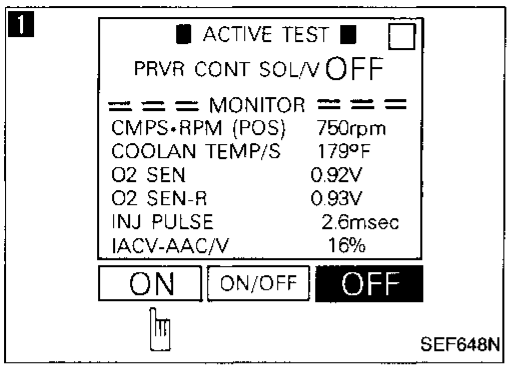
OK ↓

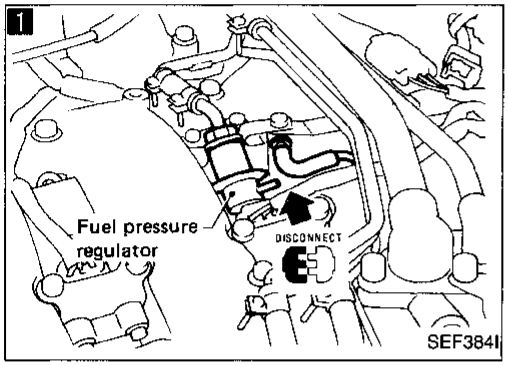
TRY A KNOWN GOOD ECM*.

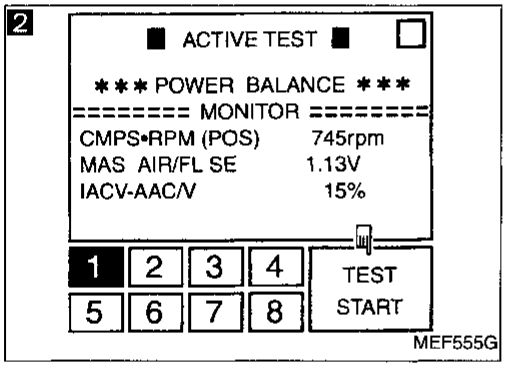
↓

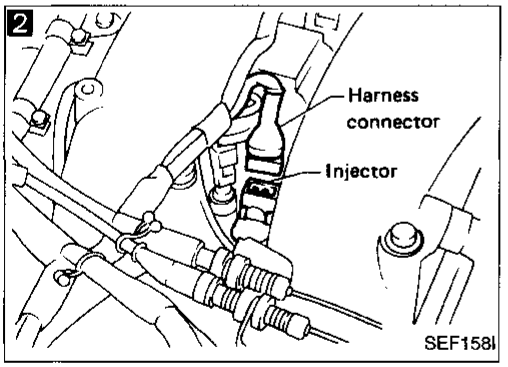
INSPECTION END

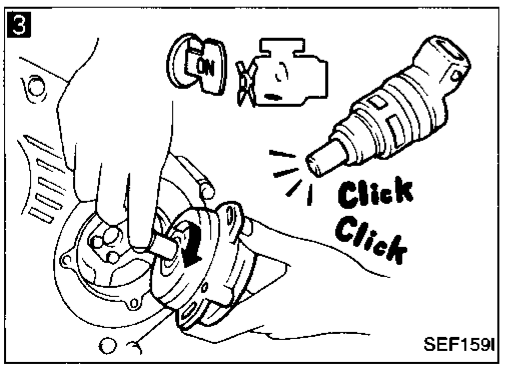
*: ECM may be the cause of a problem, but this is rarely the case.











Diagnostic Procedure 11 — Engine Stalls when the Engine is Hot

1

CHECK FUEL VAPOR.

1. Select "PRVR CONT SOL VALVE" in "ACTIVE TEST" mode.
2. After touching "ON", perform cruise test.
3. Does the engine stall disappear?

Yes → Check fuel properties.

OR

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

No

2

PERFORM POWER BALANCE TEST.

1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

No → Go to 5 .

OR

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

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?

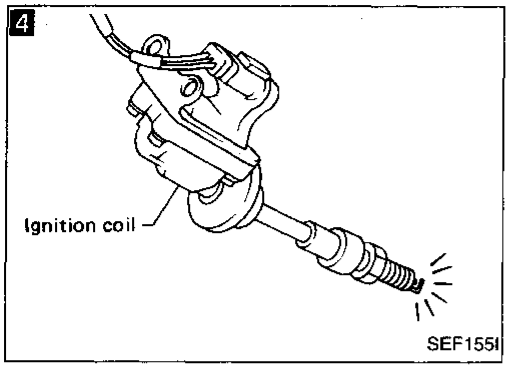
No → Check injector(s) and circuit(s).

Yes

(Go to Ⓐ on next page.)

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

4



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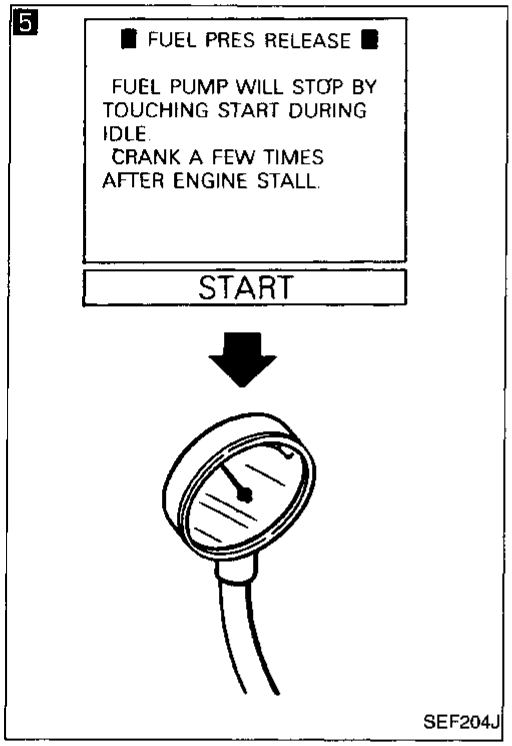


Ⓐ

4

CHECK IGNITION SPARK.
1. Disconnect ignition coil assembly from collector.
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 their circuits. (See page EF & EC-119.)

OK ↓

5

CHECK FUEL PRESSURE.
1. Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode in order to release fuel pressure to zero.
2. Install fuel pressure gauge and check fuel pressure.
   At idle approx. 255 kPa (2.6 kg/cm², 37 psi)
   The moment throttle valve is fully open:
   approx. 304 kPa (3.1 kg/cm², 44 psi)

NG → Check fuel pressure regulator diaphragm.

— OR —

1. Release fuel pressure to zero. (Refer to page EF & EC-189.)
2. Install fuel pressure gauge and check fuel pressure.

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-106.

NG → Repair or replace.

OK ↓

TRY A KNOWN GOOD ECM*.

↓

CHECK TIMING BELT FOR PROPER INSTALLATION.

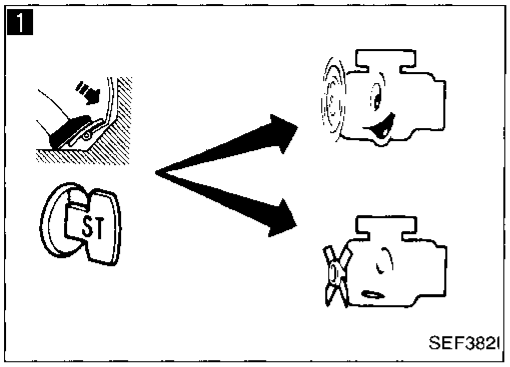
NG → Replace timing belt.

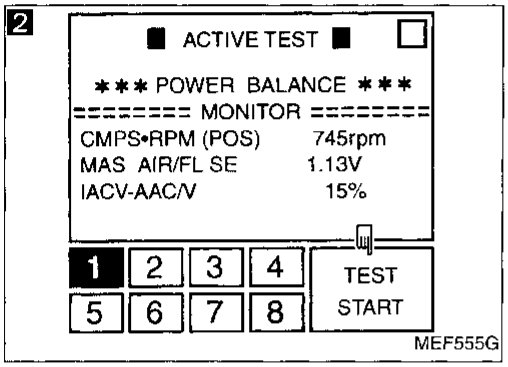
OK ↓

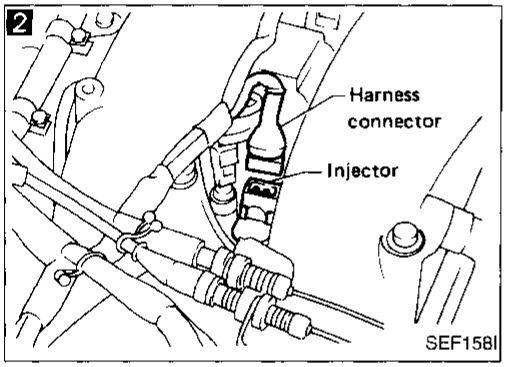
INSPECTION END

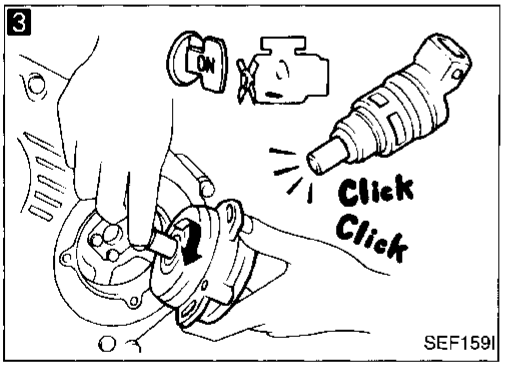
*: ECM may be the cause of a problem, but this is rarely the case.

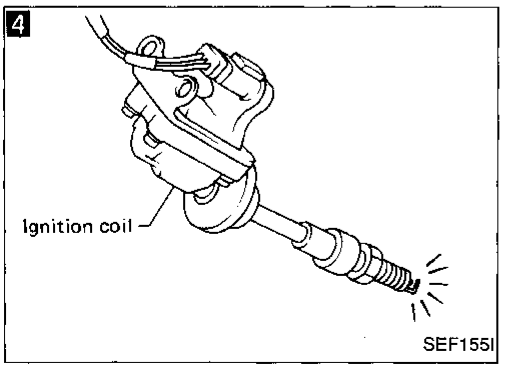
Diagnostic Procedure 12 — Engine Stalls when the Engine is Cold











1

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-156 - 159.)

OK ↓

2

PERFORM POWER BALANCE TEST.
1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

NG → Go to 6 .

OR

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

OK ↓

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?

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

OK ↓

4

CHECK IGNITION SPARK.
1. Disconnect ignition coil assembly from collector.
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.

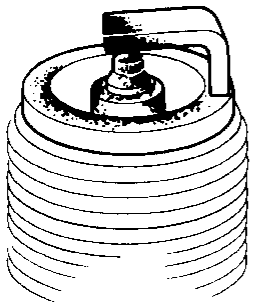
NG → Check ignition coil, power transistor unit and circuits. (See page EF & EC-119.)

OK ↓

(Go to Ⓐ on next page.)

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

5



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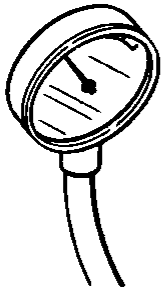
6

■ FUEL PRES RELEASE ■

FUEL PUMP WILL STOP BY TOUCHING START DURING IDLE.
CRANK A FEW TIMES AFTER ENGINE STALL.

START



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Ⓐ

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. Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode in order to release fuel pressure to zero.
2. Install fuel pressure gauge and check fuel pressure.
   At idle approx. 255 kPa (2.6 kg/cm^2, 37 psi)
   The moment throttle valve is fully open:
   approx. 304 kPa (3.1 kg/cm^2, 44 psi)

NG → Check fuel pressure regulator diaphragm.

OR

1. Release fuel pressure to zero. (Refer to page EF & EC-189.)
2. Install fuel pressure gauge and check fuel pressure.

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-106.

NG → Repair or replace.

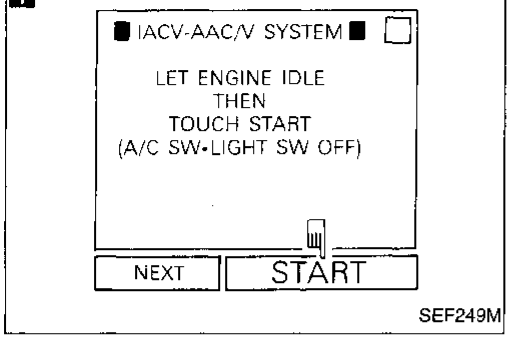
OK

TRY A KNOWN GOOD ECM*.

INSPECTION END

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

1



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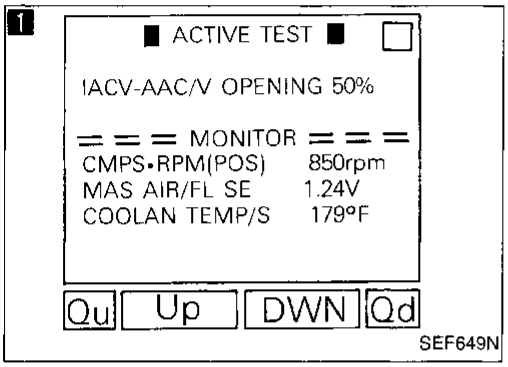

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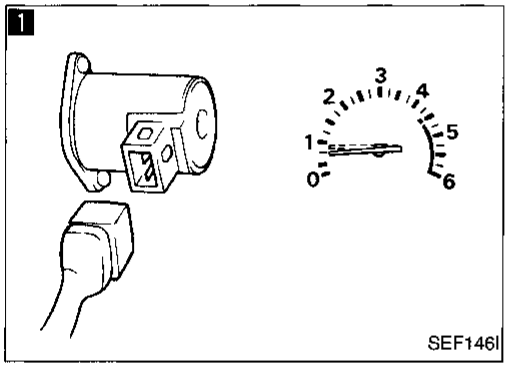

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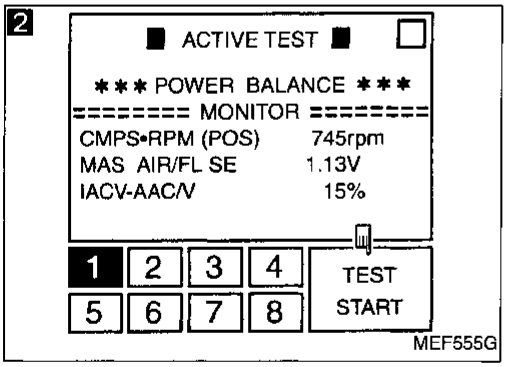

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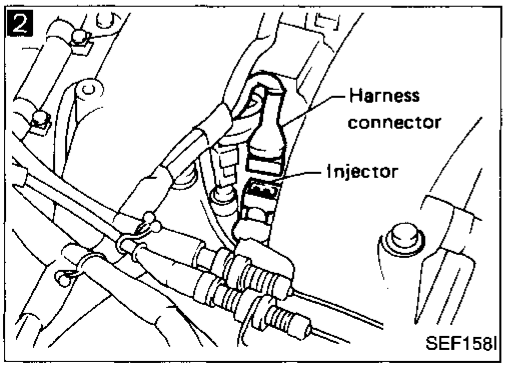


Diagnostic Procedure 13 — Engine Stalls when Stepping on the Accelerator Momentarily

1

CHECK OVERALL FUNCTION.

1. Start engine and warm it up sufficiently.
2. Check idle speed.
   Non-turbocharger
   MT: 700±50 rpm
   AT: 770±50 rpm
   [in "N" position]
   Turbocharger
   MT: 700±50 rpm (U.S.A.)
   750±50 rpm (Canada)
   AT: 750±50 rpm
   [in "N" position]

No → Check IACV-AAC valve and circuit. (See page EF & EC-159.)

3. Perform "IACV-AAC/V SYSTEM" in "FUNCTION TEST" mode with CONSULT.

OR

1. Select "IACV-AAC/V OPENING" in "ACTIVE TEST" mode.
2. When touching "Qu" and "Qd", does the engine speed change according to the percent of IACV-AAC valve opening?

OR

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

Yes

2

PERFORM POWER BALANCE TEST.

1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

No → Go to 5 .

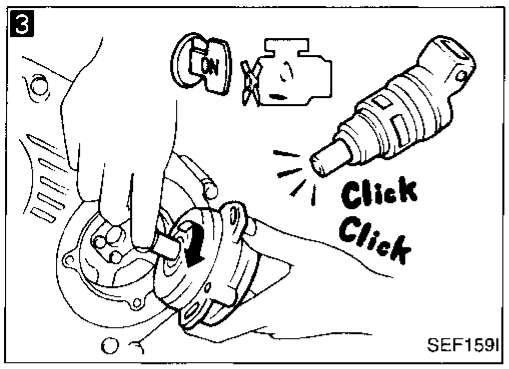
OR

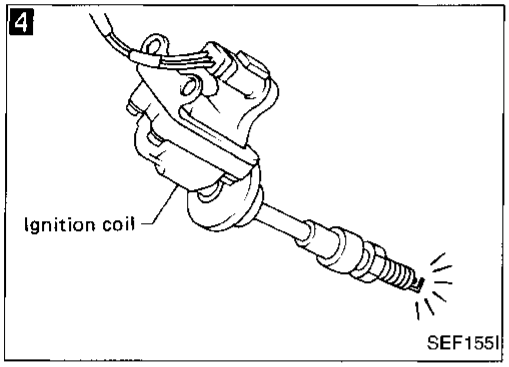
When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

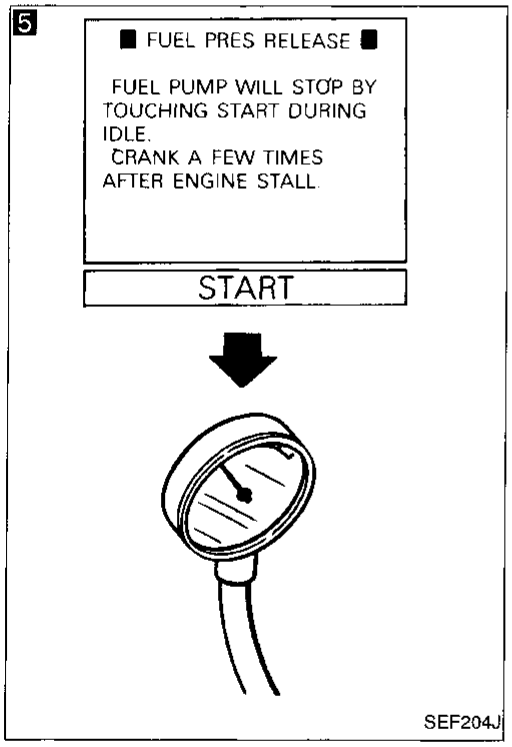
Yes

(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 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 ignition coil assembly from collector.
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 their circuits. (See page EF & EC-119.)

OK

5

CHECK FUEL PRESSURE.

1. Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode in order to release fuel pressure to zero.
2. Install fuel pressure gauge and check fuel pressure.
   At idle approx. 255 kPa (2.6 kg/cm², 37 psi)
   The moment throttle valve is fully open:
   approx. 304 kPa (3.1 kg/cm², 44 psi)

NG → Check fuel pressure regulator diaphragm.

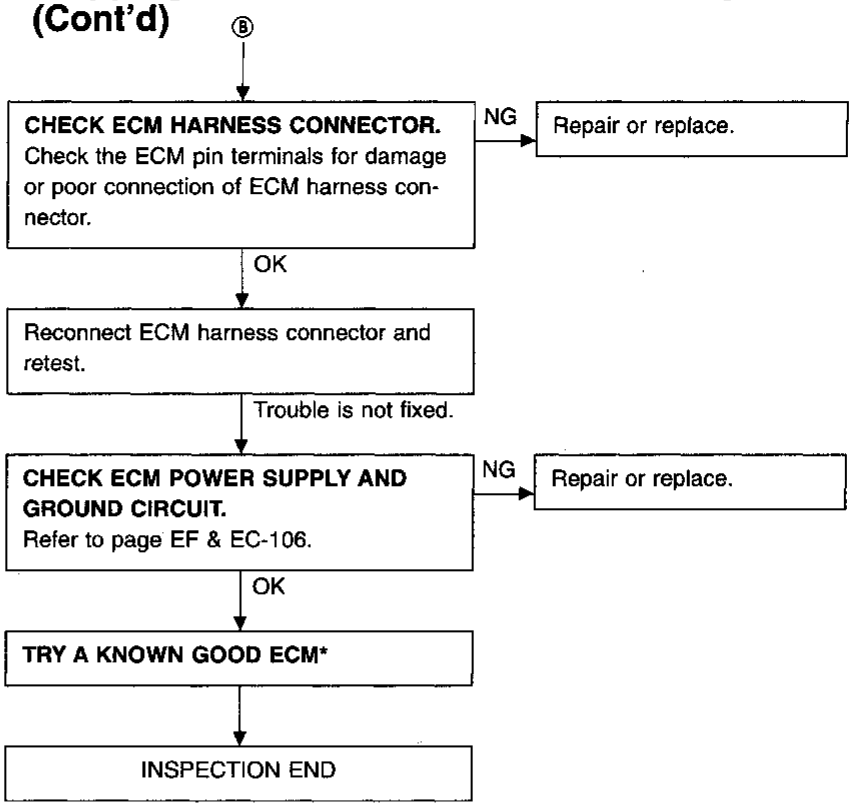
OR

1. Release fuel pressure to zero. (Refer to page EF & EC-189.)
2. Install fuel pressure gauge and check fuel pressure.

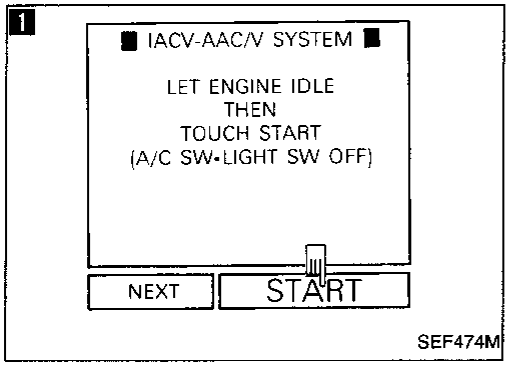
OK

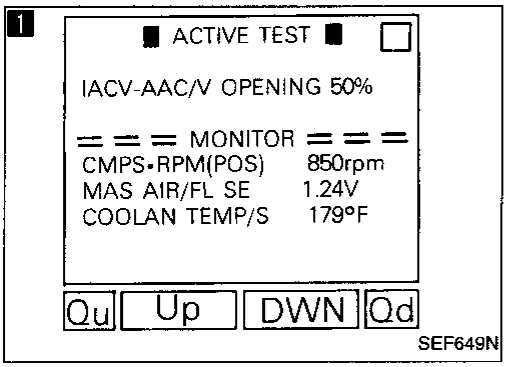
(Go to Ⓑ on next page.)

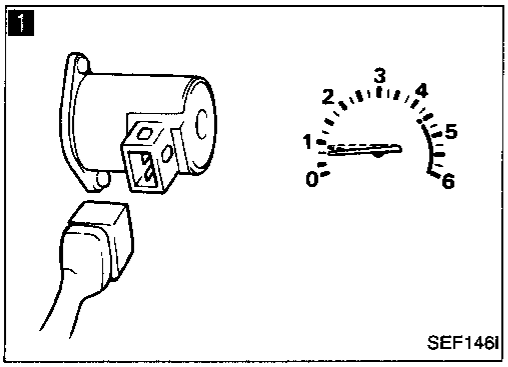
Diagnostic Procedure 13 — Engine Stalls when Stepping on the Accelerator Momentarily (Cont'd)



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







Diagnostic Procedure 14 — Engine Stalls after Decelerating

1

CHECK OVERALL FUNCTION.

1. Start engine and warm it up sufficiently.
2. Check idle speed.
   Non-turbocharger
   MT: 700±50 rpm
   AT: 770±50 rpm
   [in "N" position]
   Turbocharger
   MT: 700±50 rpm (U.S.A.)
   750±50 rpm (Canada)
   AT: 750±50 rpm
   [in "N" position]

3. Perform "IACV-AAC/V SYSTEM" in "FUNCTION TEST" mode with CONSULT.

No → Check IACV-AAC valve and circuit. (See page EF & EC-159.)

OR

1. Select "IACV-AAC/V OPENING" in "ACTIVE TEST" mode.
2. When touching "Qu" and "Qd", does the engine speed change according to the percent of IACV-AAC valve opening?

OR

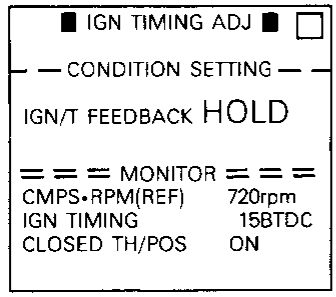
When disconnecting IACV-AAC valve harness connector, does the engine speed drop?

Yes

(Go to Ⓐ on next page.)

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

2



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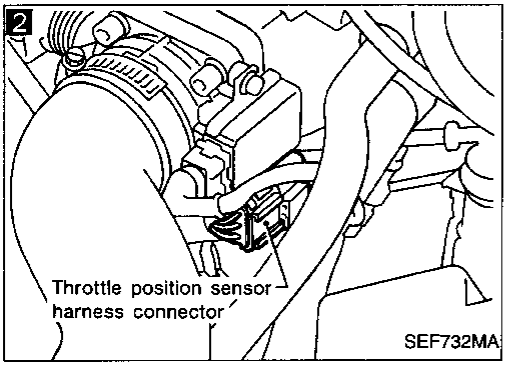

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Ⓐ

2

CHECK IDLE ADJ. SCREW CLOGGING.

1. Perform "IGN TIMING ADJ" in "WORK SUPPORT" mode.
2. Can you set engine speed as follows by turning idle adjusting screw?

Non-turbocharger
M/T: 650±50 rpm
A/T: 720±50 rpm
[in "N" position]
Turbocharger
M/T: 650±50 rpm (U.S.A.)
700±50 rpm (Canada)
A/T: 700±50 rpm
[in "N" position]

No → Check for IAS clogging or throttle body clogging.

OR

1. Disconnect throttle position sensor harness connector.
2. Can you set engine speed as follows by turning idle speed adjusting screw?

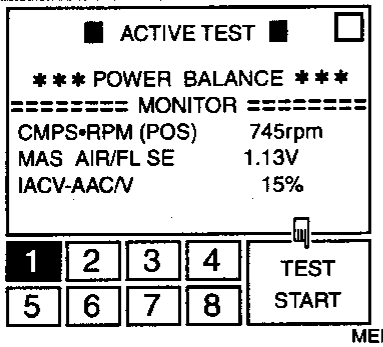
Non-turbocharger
M/T: 650±50 rpm
A/T: 720±50 rpm
[in "N" position]
Turbocharger
M/T: 650±50 rpm (U.S.A.)
700±50 rpm (Canada)
A/T: 700±50 rpm
[in "N" position]

Yes

(Go to Ⓑ on next page.)

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

3



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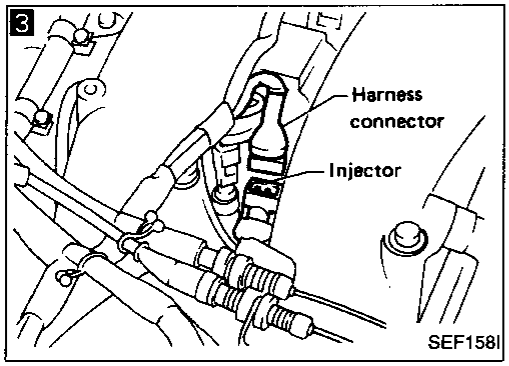

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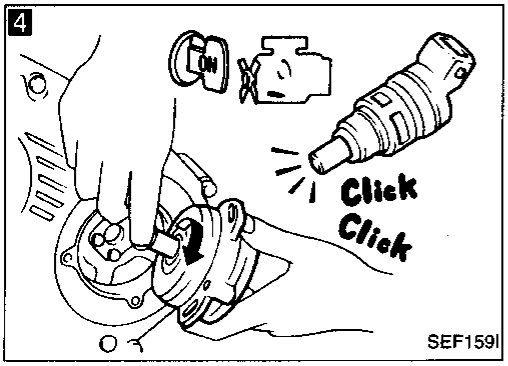
4



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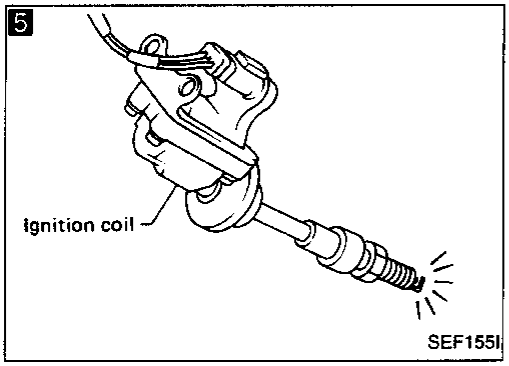

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Ⓑ

3

PERFORM POWER BALANCE TEST.

1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

No → Go to **6** .

OR

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

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.

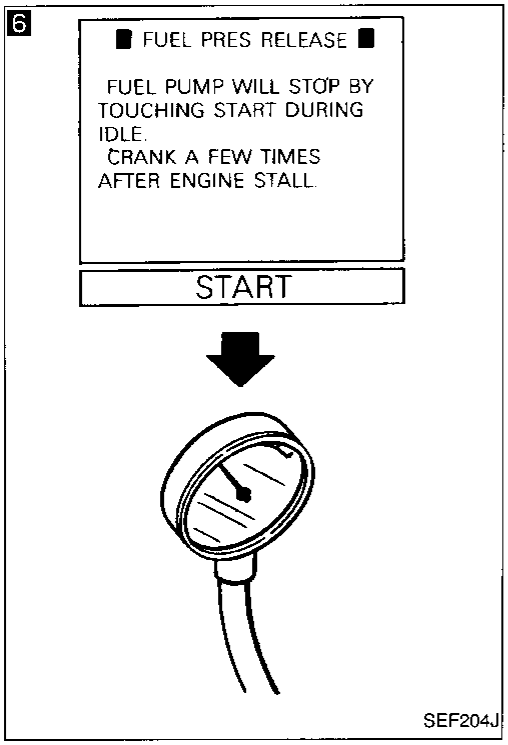
1. Disconnect ignition coil assembly from collector.
2. Connect a known good spark plug to the ignition coil assembly.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

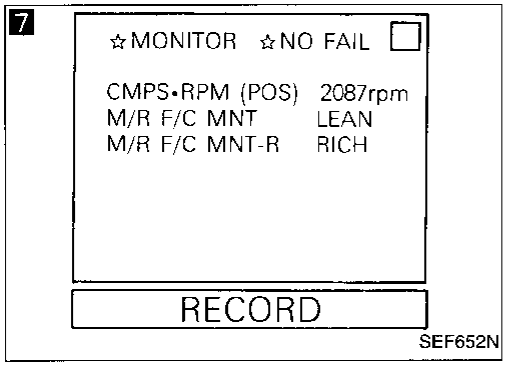
NG → Check ignition coil, power transistor unit and circuits. (See page EF & EC-119.)

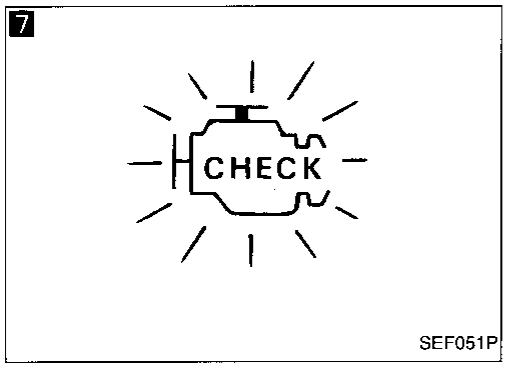
OK

(Go to Ⓒ on next page.)

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







Ⓒ

6

CHECK FUEL PRESSURE.

1. Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode in order to release fuel pressure to zero.
2. Install fuel pressure gauge and check fuel pressure.
   At idle approx. 255 kPa (2.6 kg/cm², 37 psi)
   The moment throttle valve is fully open:
   approx. 304 kPa (3.1 kg/cm², 44 psi)

NG → Check fuel pressure regulator diaphragm.

OR

1. Release fuel pressure to zero. (Refer to page EF & EC-189.)
2. Install fuel pressure gauge and check fuel pressure.

OK

7

CHECK HEATED OXYGEN SENSOR.

1. See "M/R F/C MNT (right and left sides)" in "DATA MONITOR" mode.
2. Maintaining engine at 2,000 rpm under no-load (with engine warmed up sufficiently.), check to make sure that the monitor fluctuates between "LEAN" and "RICH" more than 5 times during 10 seconds.
   1 time: RICH → LEAN → RICH
   2 times: RICH → LEAN → RICH → LEAN → RICH

NG → Replace heated oxygen sensor(s).

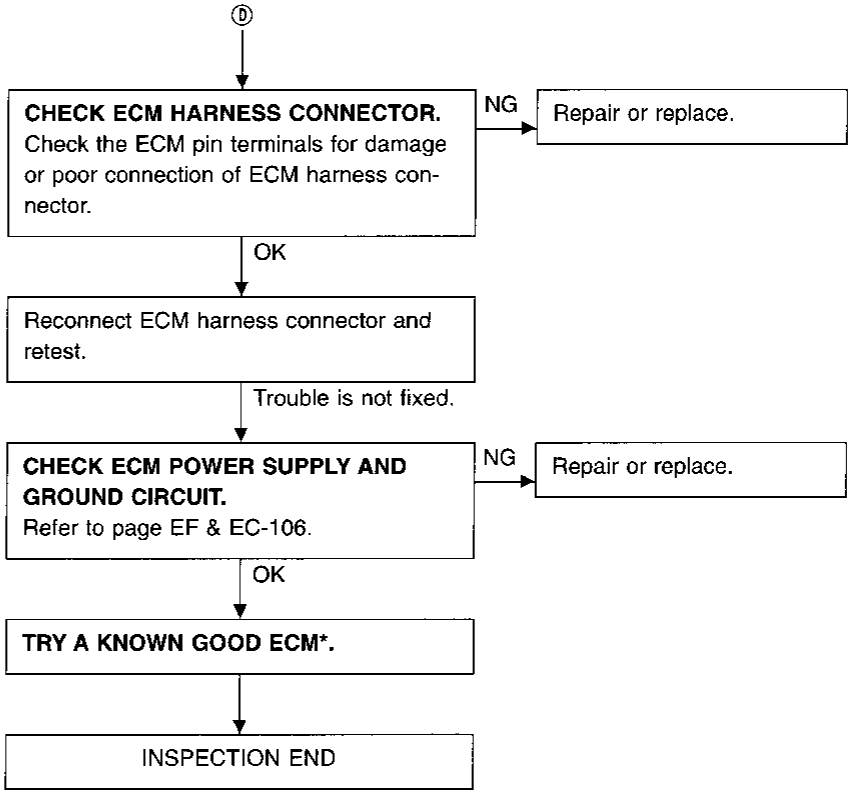
OR

1. Set "Heated oxygen sensor monitor" in Diagnostic Test Mode II. (See page EF & EC-53.)
2. Maintaining engine at 2,000 rpm under no load, check that malfunction indicator lamp goes ON and OFF more than 5 times during 10 seconds.

OK

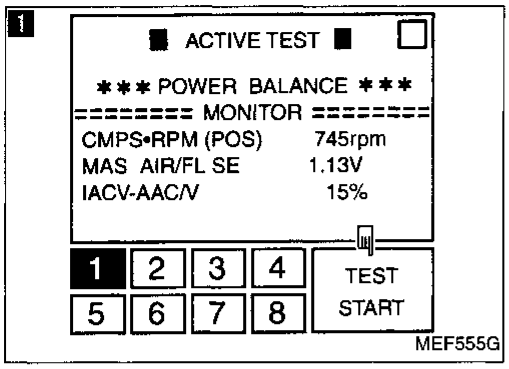
(Go to Ⓓ on next page.)

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



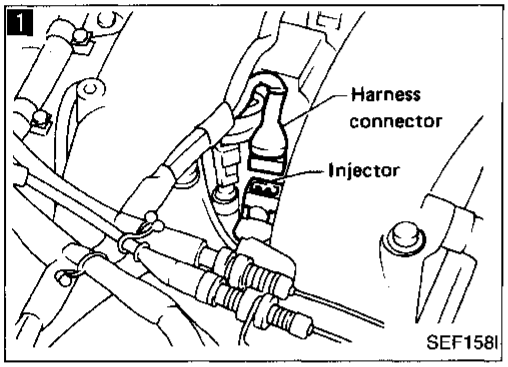
*: ECM may be the cause of a problem, but this is rarely the case.

1



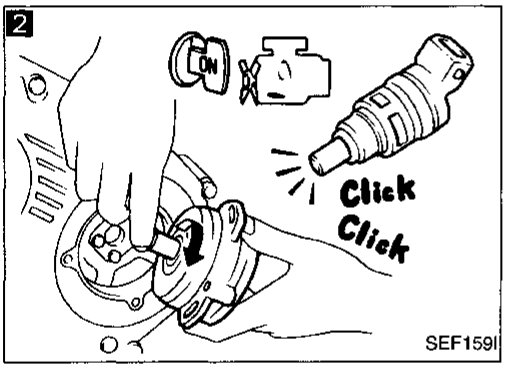
MEF555G

1



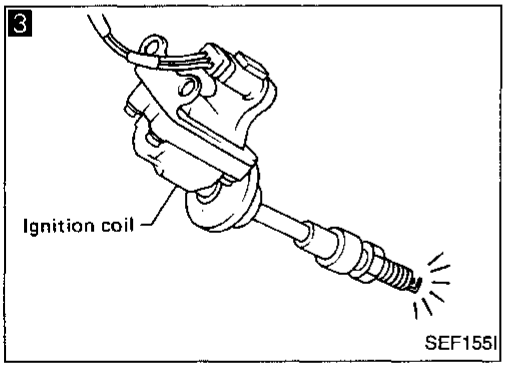
SEF158I

2



SEF159I

3



SEF155I

Diagnostic Procedure 15 — Engine Stalls when Accelerating or Cruising

1

PERFORM POWER BALANCE TEST.

1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

No → Go to 4 .

OR

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

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 ignition coil assembly from collector.
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-119.)

OK ↓

(Go to Ⓐ on next page.)

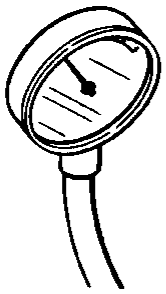
Diagnostic Procedure 15 — Engine Stalls when Accelerating or Cruising (Cont'd)

4

■ FUEL PRES RELEASE ■

FUEL PUMP WILL STOP BY TOUCHING START DURING IDLE.
CRANK A FEW TIMES AFTER ENGINE STALL.

START



SEF204J

Ⓐ

4

CHECK FUEL PRESSURE.

1. Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode in order to release fuel pressure to zero.
2. Install fuel pressure gauge and check fuel pressure.
   At idle approx. 255 kPa (2.6 kg/cm², 37 psi)
   The moment throttle valve is fully open:
   approx. 304 kPa (3.1 kg/cm², 44 psi)

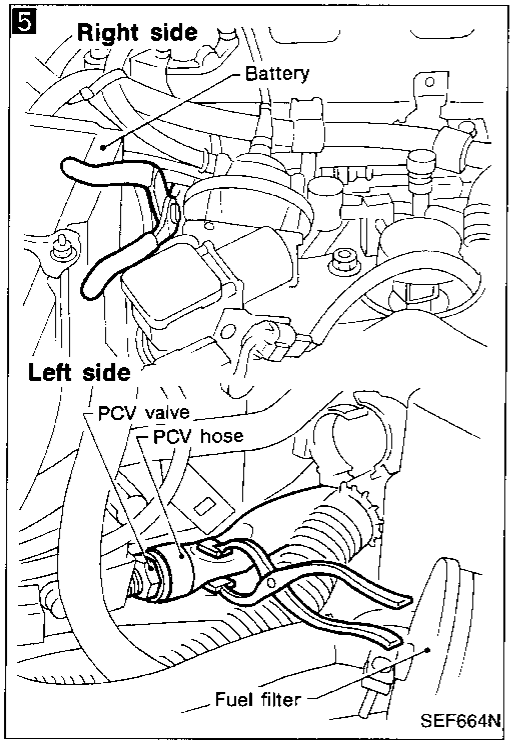
NG → Check fuel pump, circuit and fuel pressure regulator.

OR

1. Release fuel pressure to zero. (Refer to page EF & EC-189.)
2. Install fuel pressure gauge and check fuel pressure.

OK ↓

5



SEF664N

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 ↓

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-106.

Yes → Repair or replace.

No ↓

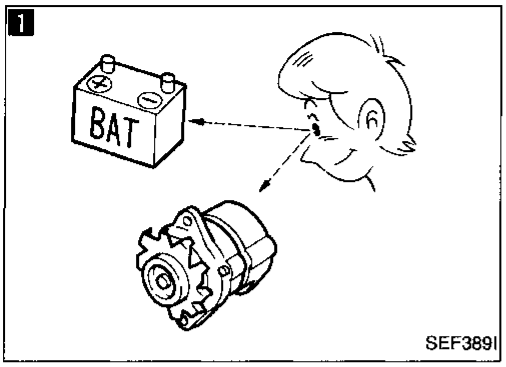
TRY A KNOWN GOOD ECM*.

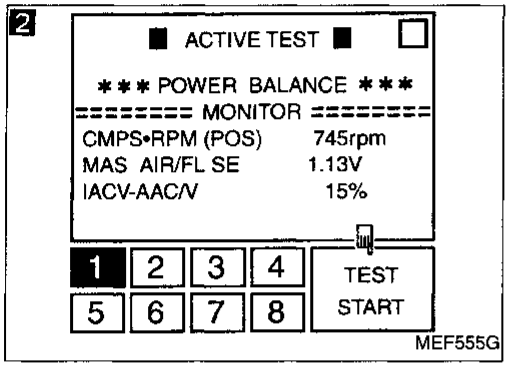
↓

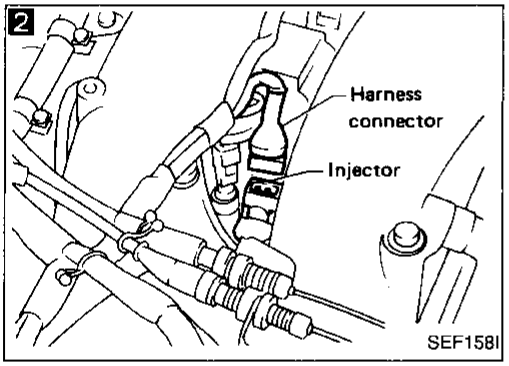
INSPECTION END

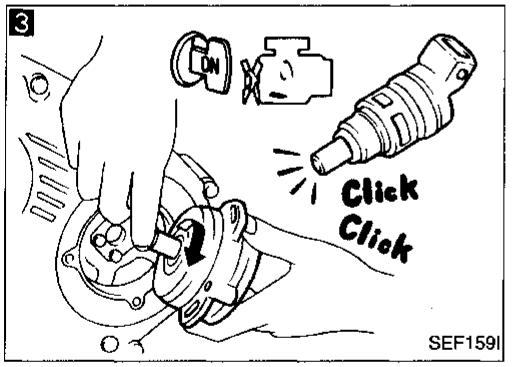
*: ECM may be the cause of a problem, but this is rarely the case.

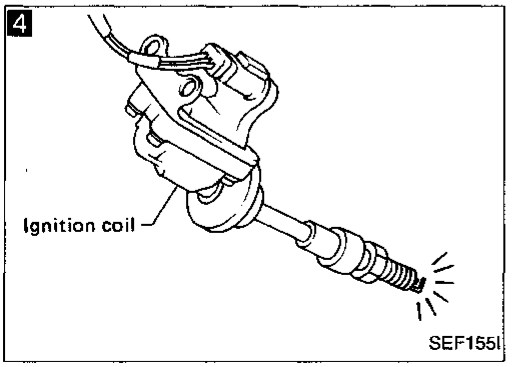
Diagnostic Procedure 16 — Engine Stalls when the Electrical Load is Heavy











1

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

NG → Repair or replace.

OK ↓

2

PERFORM POWER BALANCE TEST.
1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

No → Go to 5 .

OR

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

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 ↓

4

CHECK IGNITION SPARK.
1. Disconnect ignition coil assembly from collector.
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-119.)

OK ↓

(Go to Ⓐ on next page.)

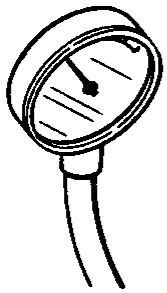
Diagnostic Procedure 16 — Engine Stalls when the Electrical Load is Heavy (Cont'd)

5

■ FUEL PRES RELEASE ■

FUEL PUMP WILL STOP BY TOUCHING START DURING IDLE.
CRANK A FEW TIMES AFTER ENGINE STALL.

START



SEF204J

Ⓐ

5

CHECK FUEL PRESSURE.

1. Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode in order to release fuel pressure to zero.
2. Install fuel pressure gauge and check fuel pressure.
   At idle approx. 255 kPa (2.6 kg/cm², 37 psi)
   The moment throttle valve is fully open:
   approx. 304 kPa (3.1 kg/cm², 44 psi)

NG → Check fuel pressure regulator diaphragm.

— OR —

1. Release fuel pressure to zero. (Refer to page EF & EC-189.)
2. Install fuel pressure gauge and check fuel pressure.

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-106.

NG → Repair or replace.

OK ↓

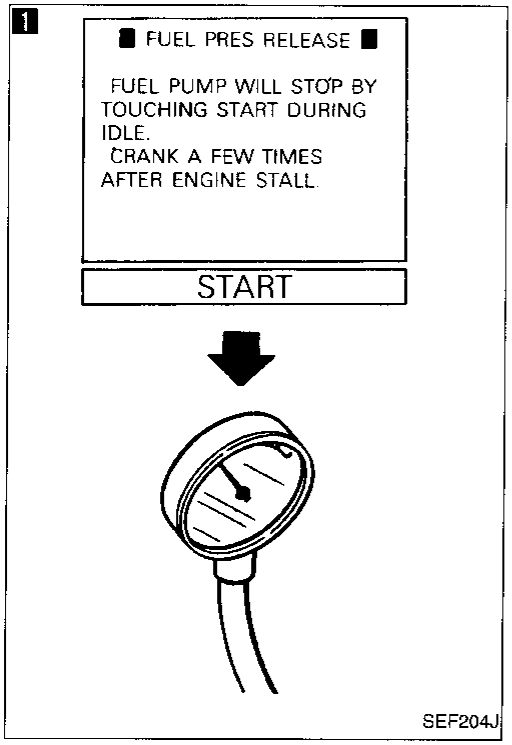
TRY A KNOWN GOOD ECM*.

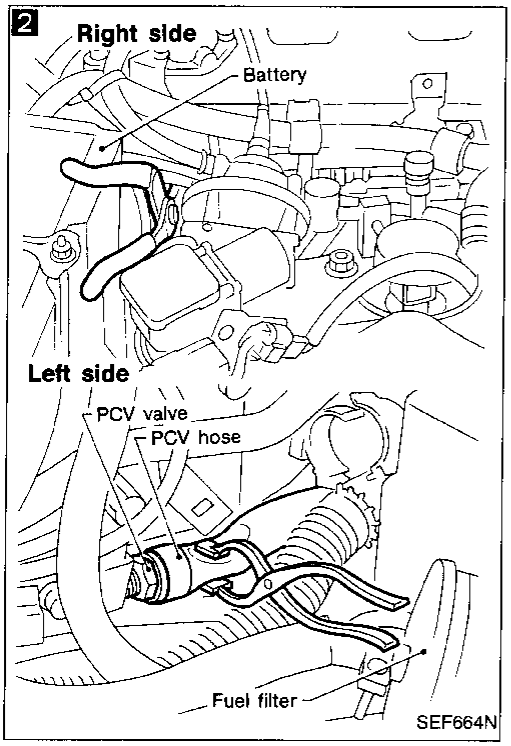
↓

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. Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode in order to release fuel pressure to zero.
2. Install fuel pressure gauge and check fuel pressure.
   At idle approx. 255 kPa (2.6 kg/cm², 37 psi)
   The moment throttle valve is fully open:
   approx. 304 kPa (3.1 kg/cm², 44 psi)

NG → Check fuel pressure regulator diaphragm.

OR

1. Release fuel pressure to zero. (Refer to page EF & EC-189.)
2. Install fuel pressure gauge and check fuel pressure.

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 ↓

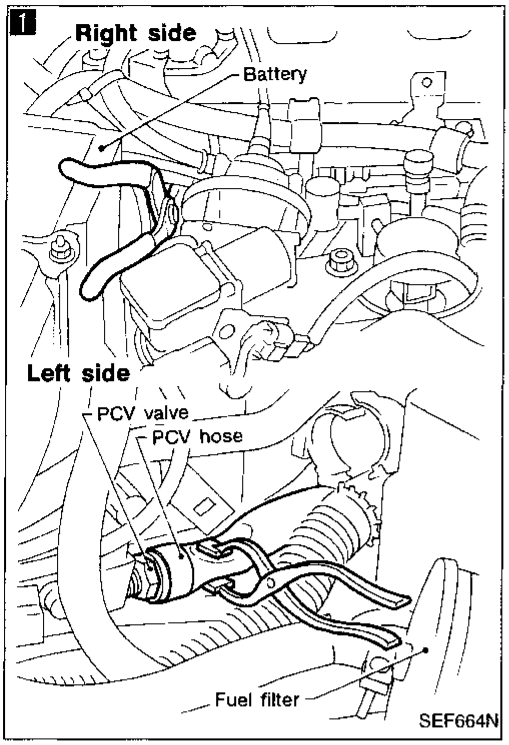
CHECK TIMING BELT FOR PROPER INSTALLATION.

NG → Replace timing belt.

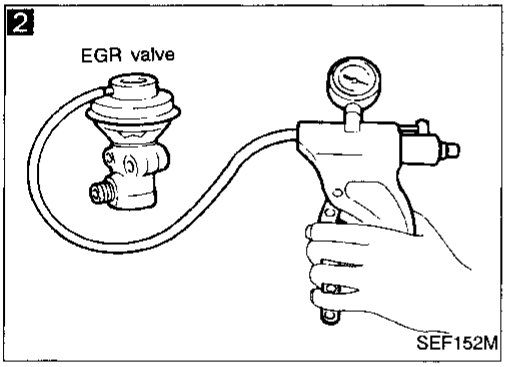
OK ↓

INSPECTION END

1



2



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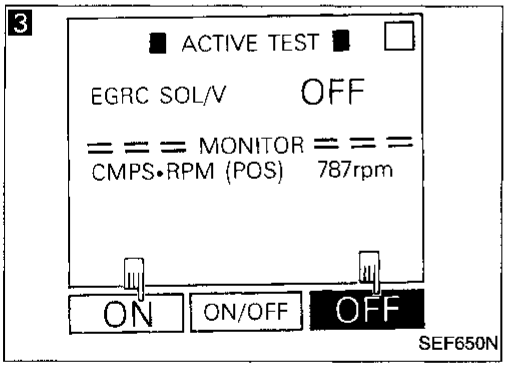
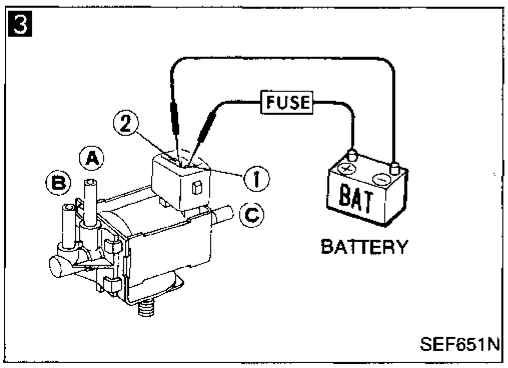


3



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. Select "EGRC. SOL/V" in "ACTIVE TEST" mode.
2. Turn EGRC-solenoid valve ON and OFF.
3. Check operating sound.

OR

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

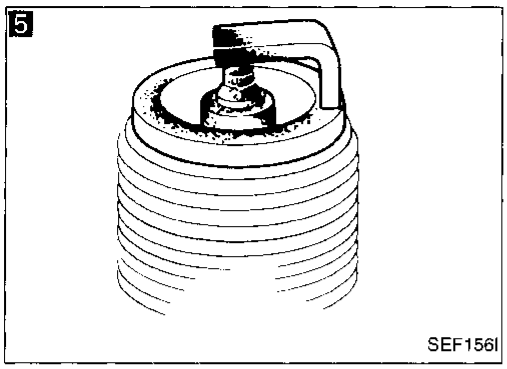
CHECK VACUUM HOSES.
Check the following vacuum hoses for clogging, cracks and poor connection.
a) Vacuum hose between EGR valve and EGRC-solenoid valve.
b) Vacuum hose between EGRC-solenoid valve and throttle body port.
c) Vacuum hose between EGRC-solenoid valve and air duct.

NG → Repair or replace.

OK ↓

(Go to Ⓐ on next page.)

Diagnostic Procedure 18 — Knock (Cont'd)



Ⓐ

5

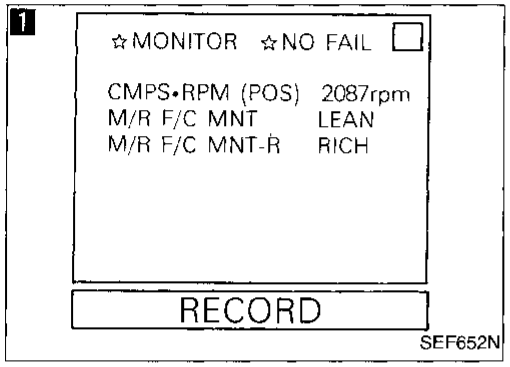
CHECK FOR OIL LEAK TO COMBUSTION CHAMBER.
Remove spark plugs and check for fouling with oil.

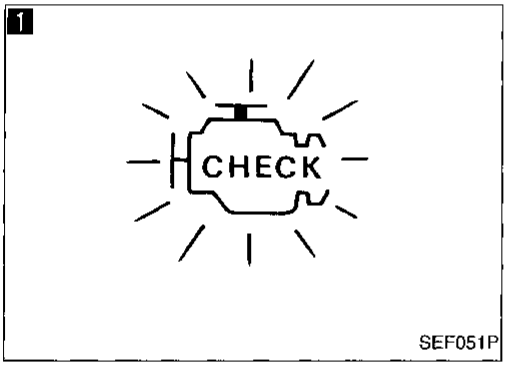
Yes → Check pistons, piston rings, valves, valve seats, valve oil seal, engine oil level, etc.

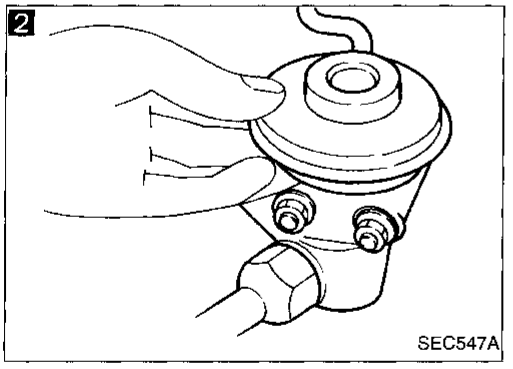
No ↓

INSPECTION END

Diagnostic Procedure 19 — Surge







1

CHECK HEATED OXYGEN SENSOR.

1. See "M/R F/C MNT (right and left sides)" in "DATA MONITOR" mode.
2. Maintaining engine at 2,000 rpm under no-load (with engine warmed up sufficiently.), check to make sure that the monitor fluctuates between "LEAN" and "RICH" more than 5 times during 10 seconds.
   1 time: RICH → LEAN → RICH
   2 times: RICH → LEAN → RICH → LEAN → RICH

NG → Replace heated oxygen sensor(s).

OR

1. Set "Heated oxygen sensor monitor" in Diagnostic Test Mode II. (See page EF & EC-53.)
2. Maintaining engine at 2,000 rpm under no load, check that malfunction indicator lamp goes ON and OFF more than 5 times during 10 seconds.

OK ↓

2

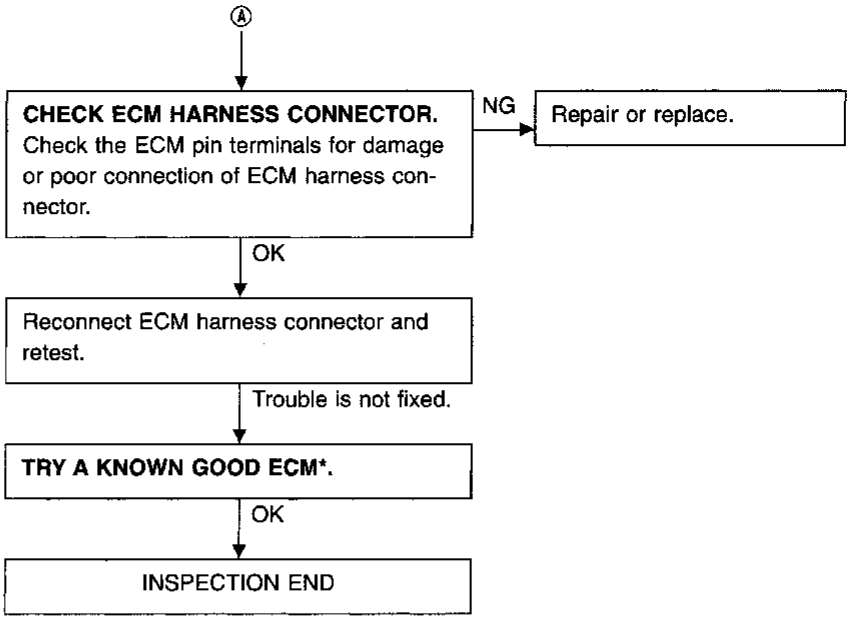
CHECK EGR VALVE.
Check EGR valve for sticking.

NG → Repair or replace.

OK ↓

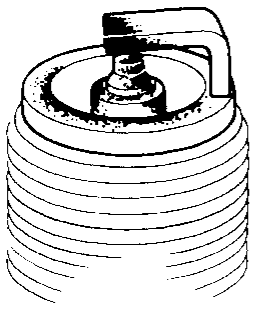
(Go to Ⓐ on next page.)

Diagnostic Procedure 19 — Surge (Cont'd)



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

1



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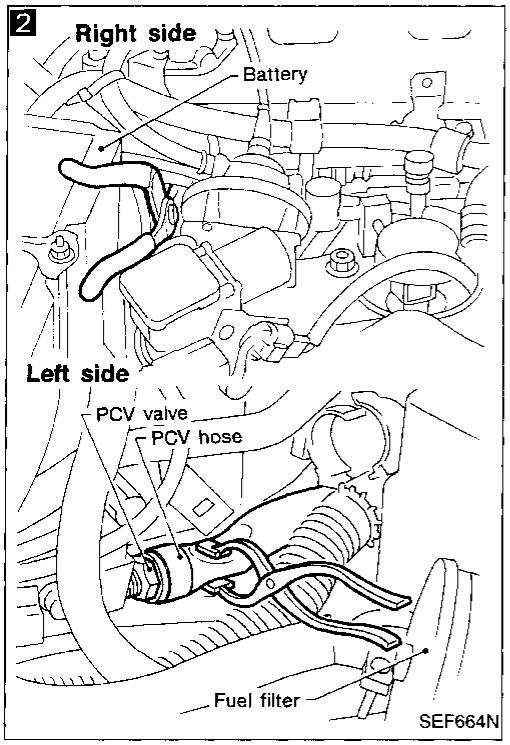
2



SEF664N

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-114.)

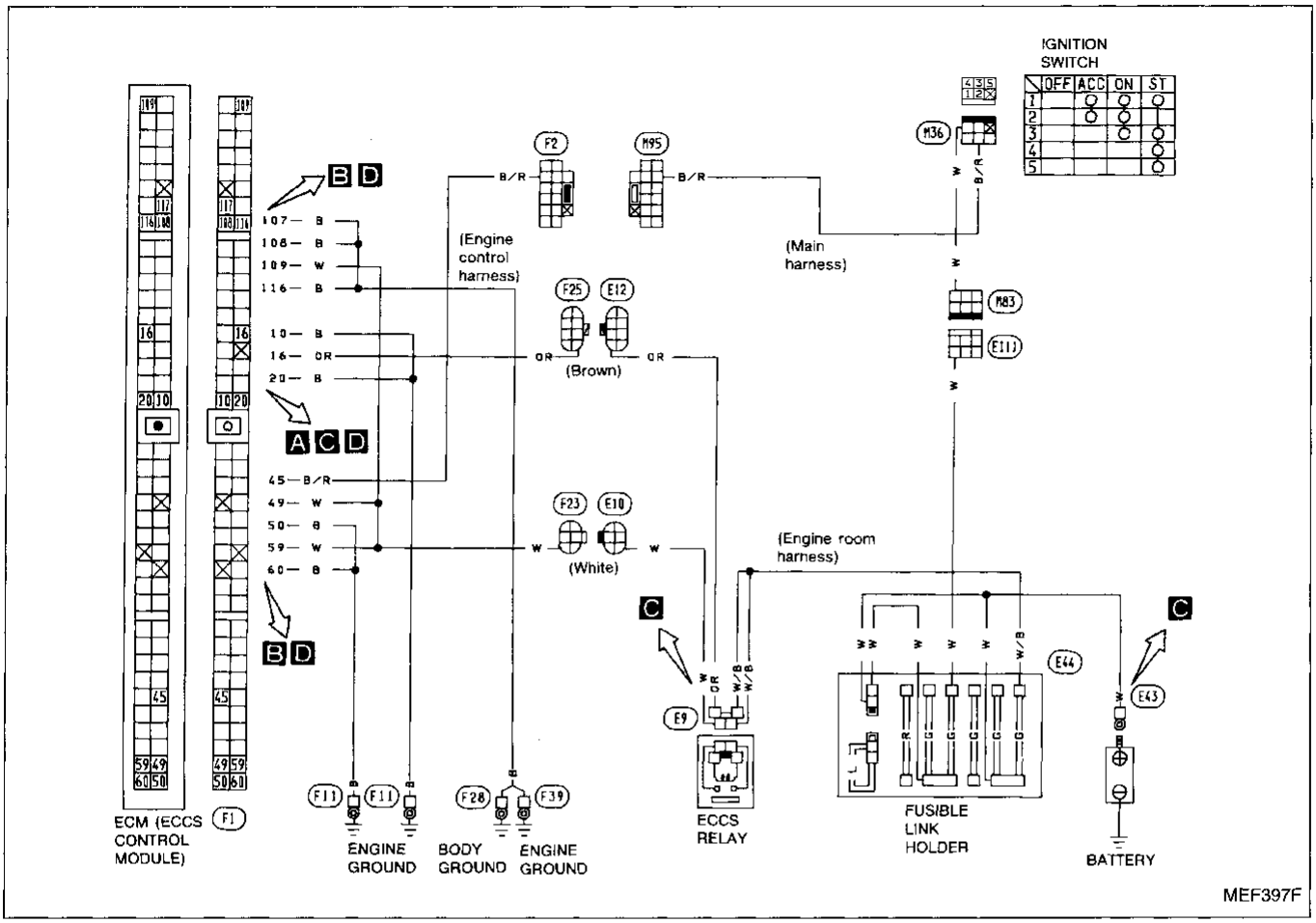
NG → Replace or repair.

OK ↓

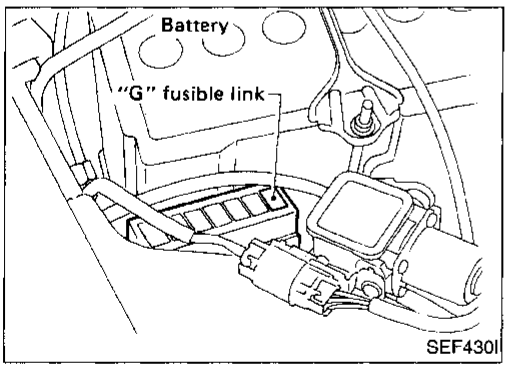
INSPECTION END

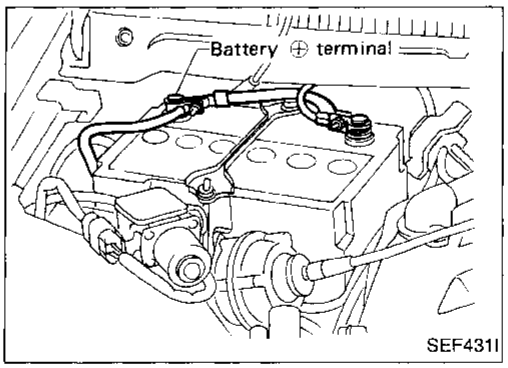
Diagnostic Procedure 22

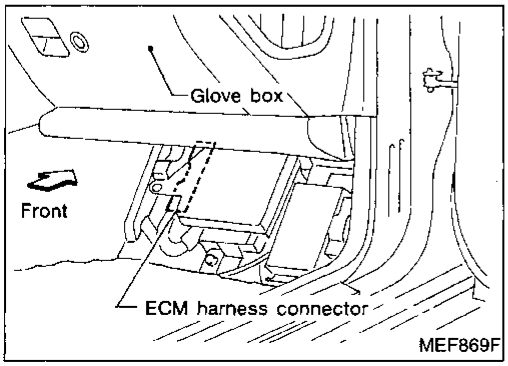
MAIN POWER SUPPLY AND GROUND CIRCUIT (Not self-diagnostic item)



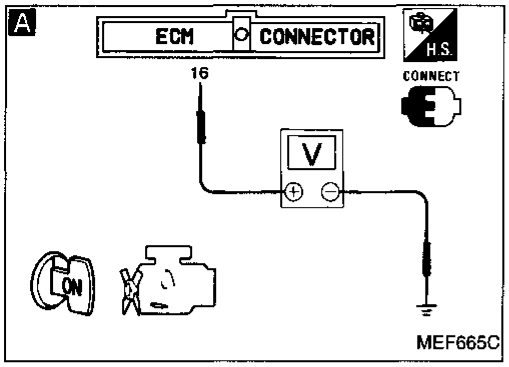
Harness layout

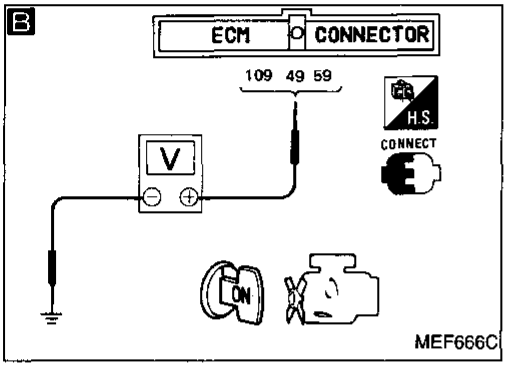


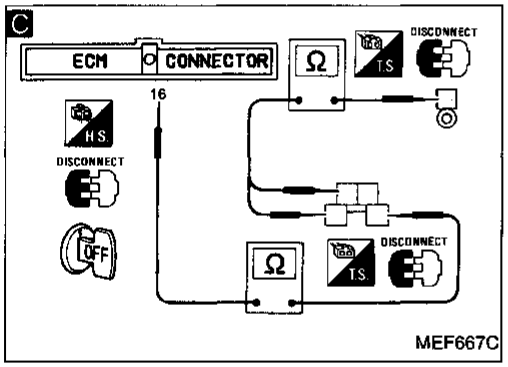


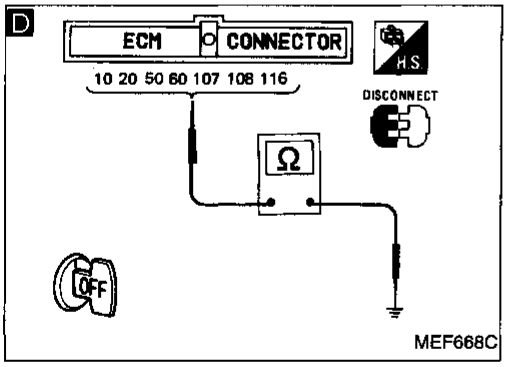


Diagnostic Procedure 22 (Cont'd)









INSPECTION START

CHECK POWER SUPPLY.
1) Turn ignition switch "ON".
A 2) Check voltage between ECM pin terminal ⑯ and ground.
Voltage:
Approximately 0.8 - 1.0V
B 3) Check voltage between ECM pin terminals ㊾, ㊾, (109) and ground.
Voltage: Battery voltage

NG → C

C
Check the following items.
1) ECCS relay
Refer to "Electrical Components Inspection".
(See page EF & EC-187.)
2) "G" fusible link
3) Harness continuity between ECCS relay and battery ⊕ terminal
Continuity should exist.
4) Harness continuity between ECCS relay and ECM pin terminal ⑯
Continuity should exist.

OK

D
CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect ECM harness connector.
3) Check harness continuity between ECM pin terminals ⑩, ⑳, ㊿, ㊿, (107), (108), (116) and ground.
Continuity should exist.

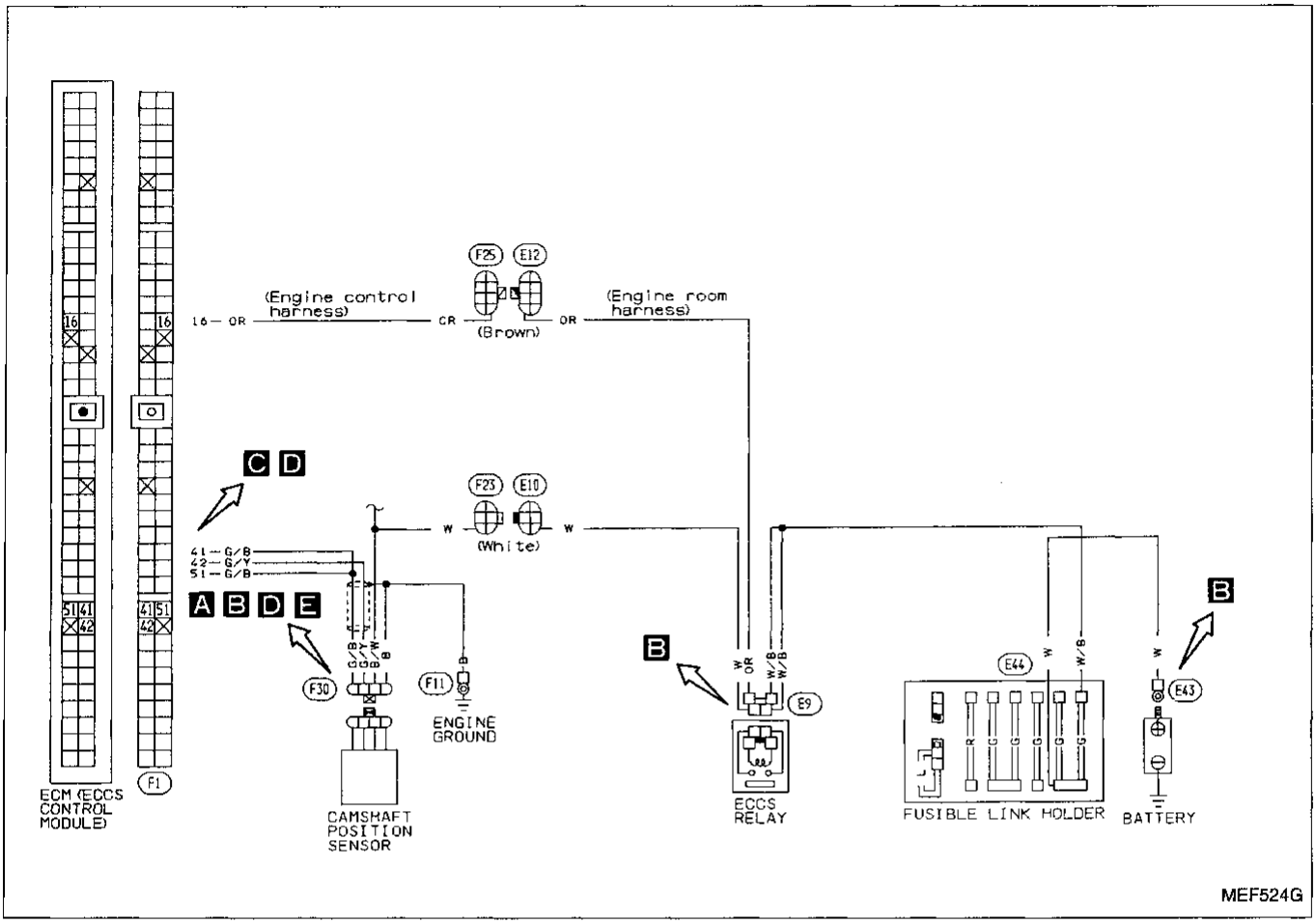
NG →
1) Check if engine ground terminal connectors (F28), (F11) and (F39) make contact with engine body properly.
2) Repair harness or connectors.

OK

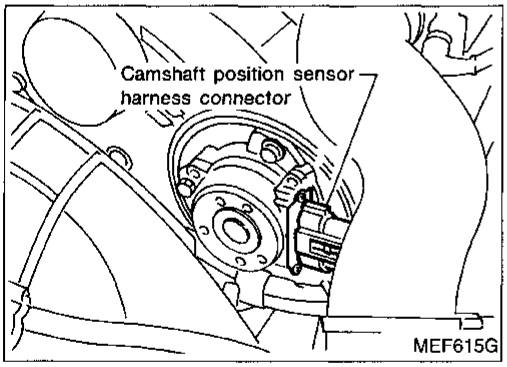
INSPECTION END

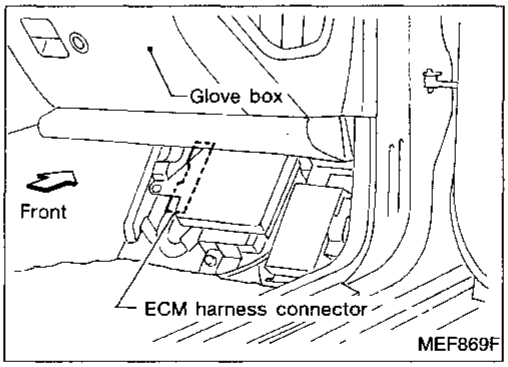
Diagnostic Procedure 23

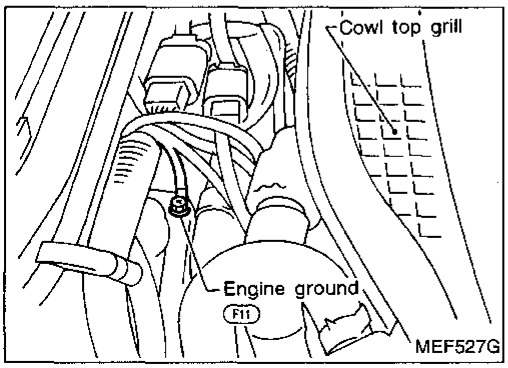
CAMSHAFT POSITION SENSOR (Diagnostic trouble code No. 11)



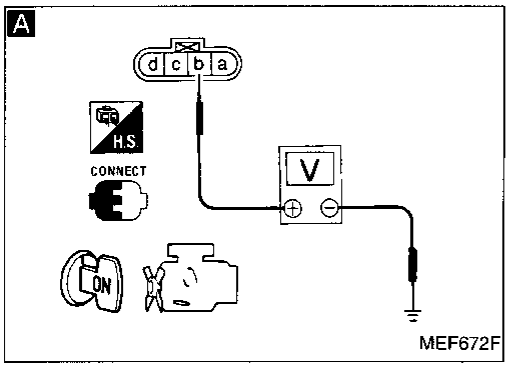
Harness layout

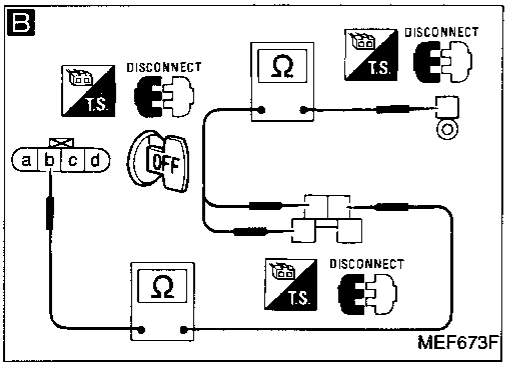


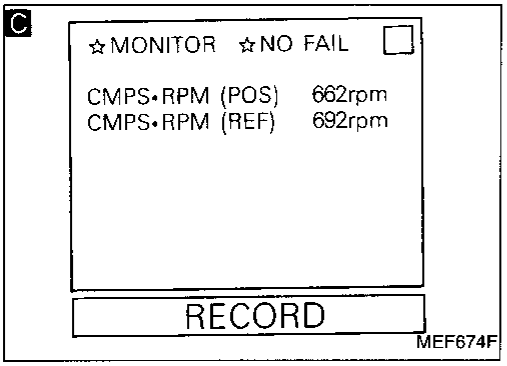


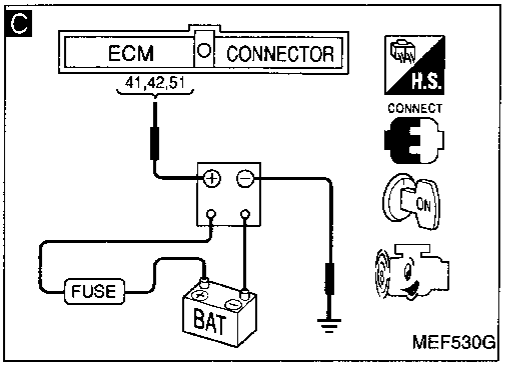


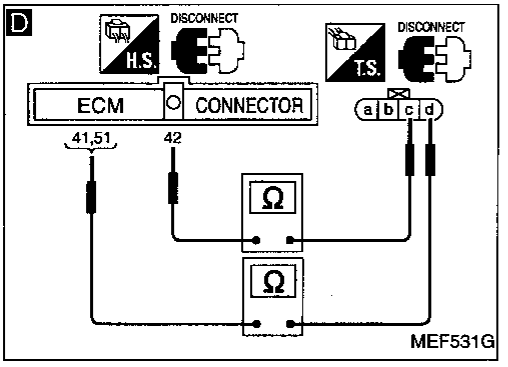
Diagnostic Procedure 23 (Cont'd)











INSPECTION START

A

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

NG → **B**

Check the following items.
1) ECCS relay
Refer to "Electrical Components Inspection".
(See page EF & EC-187.)
2) "G" fusible link
3) Harness continuity between ECCS relay and battery ⊕ terminal
Continuity should exist.
4) Harness continuity between ECCS relay and camshaft position sensor terminal ⓑ.
Continuity should exist.

OK ↓

C

CHECK INPUT SIGNAL.
1) Start engine.
2) Read "CMPS•RPM" in "DATA MONITOR" mode with CONSULT.
Non-turbocharger
MT: 700±50 rpm
AT: 770±50 rpm
[in "N" position]
Turbocharger
MT: 700±50 rpm (U.S.A.)
750±50 rpm (Canada)
AT: 750±50 rpm
[in "N" position]

— OR —

2) Check that pulse signals exist in ECM terminals ㊶, ㊺ and ㊷ with logic probe.
Pulse signal should exist.
㊶, ㊺: 120° signal
㊷: 1° signal

NG → **D**

CHECK HARNESS CONTINUITY BETWEEN ECM AND CAMSHAFT POSITION SENSOR.
1) Stop engine.
2) Disconnect camshaft position sensor harness connector.
3) Disconnect ECM harness connector.
4) Check harness continuity between ECM terminals ㊶, ㊺ and terminal ⓓ, ECM terminal ㊷ and terminal ⓒ.
Continuity should exist.
If NG, repair harness or connectors.

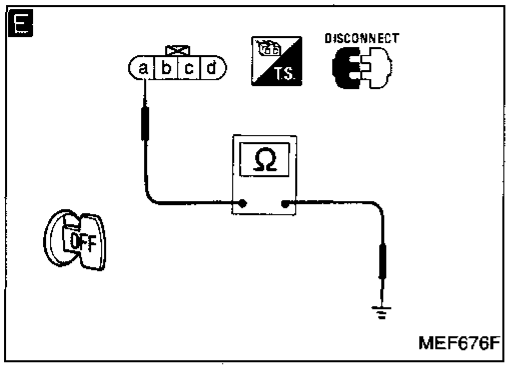
OK ↓

CHECK COMPONENT (Camshaft position sensor).
Refer to "Electrical Components Inspection".
(See page EF & EC-181.)

OK ↓

Ⓐ

Diagnostic Procedure 23 (Cont'd)



Ⓐ

E

CHECK GROUND CIRCUIT.
1) Stop engine.
2) Disconnect camshaft position sensor harness connector.
3) Loosen and retighten ground screws.
4) Check harness continuity between terminal ⓐ and ground.
Continuity should exist.

NG → Repair harness or connectors.

OK ↓

Reinstall any part removed.

1) Erase the diagnostic test mode II (Self-diagnostic results) memory. (Refer to EF & EC-52.)
2) Perform test drive and then perform diagnostic test mode II (Self-diagnostic results) again. (Refer to EF & EC-50.)

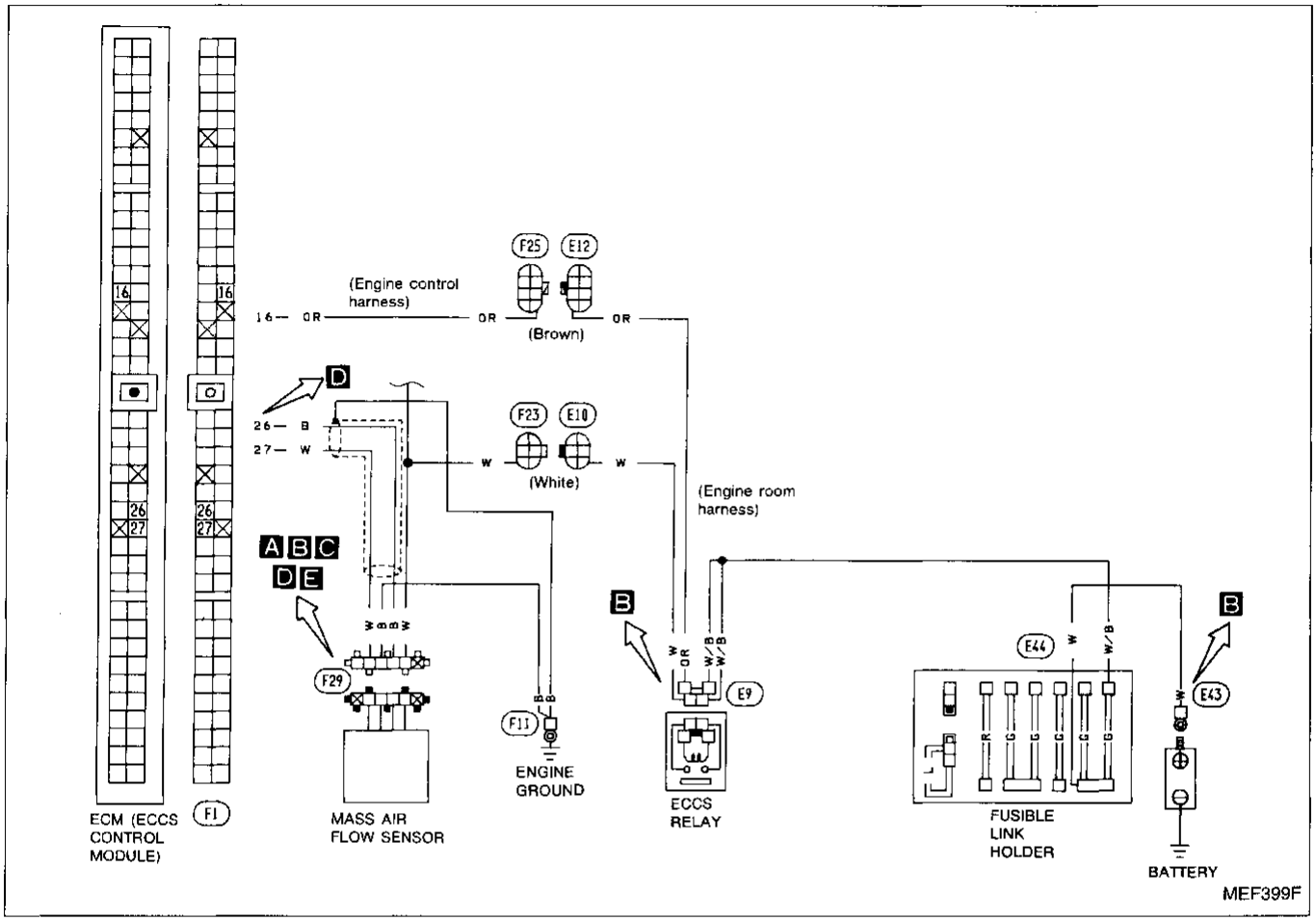
NG → 1) Perform ECM input/output signal inspection test.
2) If NG, recheck the ECM pin terminals for damage.
Check the connection at the ECM harness connector.

OK ↓

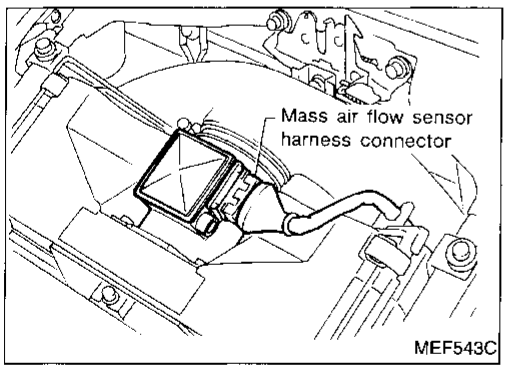
INSPECTION END

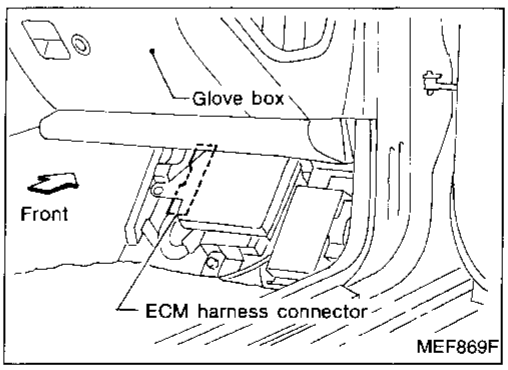
Diagnostic Procedure 24

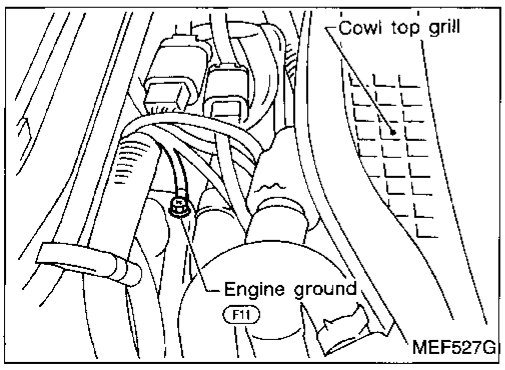
MASS AIR FLOW SENSOR (Diagnostic trouble code No. 12) CHECK (MALFUNCTION INDICATOR LAMP ITEM)



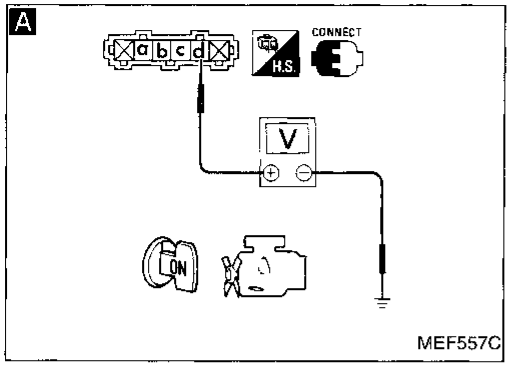
Harness layout

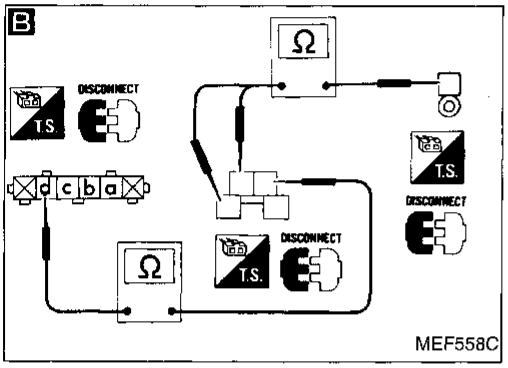


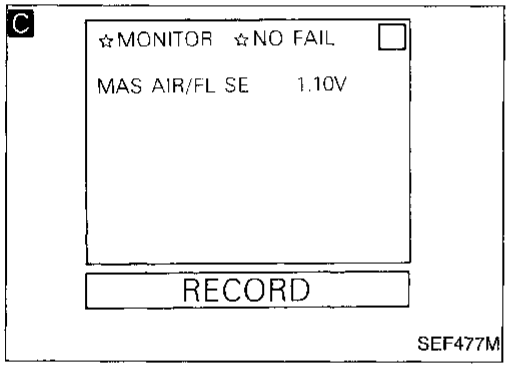


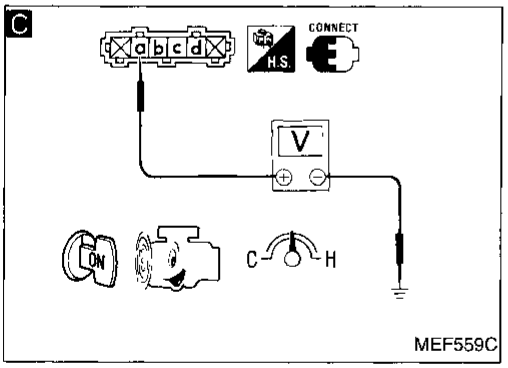


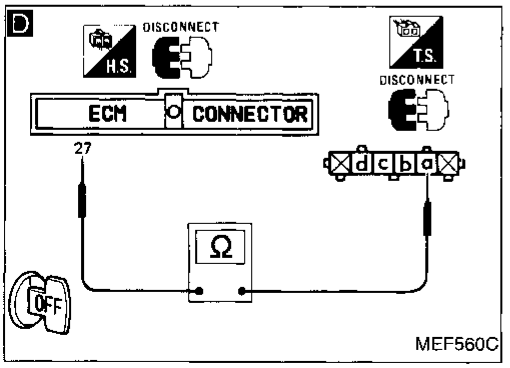
Diagnostic Procedure 24 (Cont'd)











INSPECTION START

A

CHECK POWER SOURCE.
1) Turn ignition switch "ON".
2) Check voltage between terminal ⓓ and ground.
Voltage: Battery voltage

NG → **B**

Check the following items.
1) ECCS relay
Refer to "Electrical Components Inspection". (See page EF & EC-187.)
2) "G" fusible link
3) Harness continuity between ECCS relay and battery ⊕ terminal
Continuity should exist.
4) Harness continuity between ECCS relay and mass air flow sensor terminal ⓓ.
Continuity should exist.

OK

C

CHECK INPUT SIGNAL.
1) Start engine and warm it up sufficiently.
2) Read "MAS AIR/FL SE" in "DATA MONITOR" mode with CONSULT.
Voltage: 0.8 - 1.5V

OR

2) Check voltage between terminal ⓖ and ground at idle under no-load.
Voltage: 0.8 - 1.5V

NG → **D**

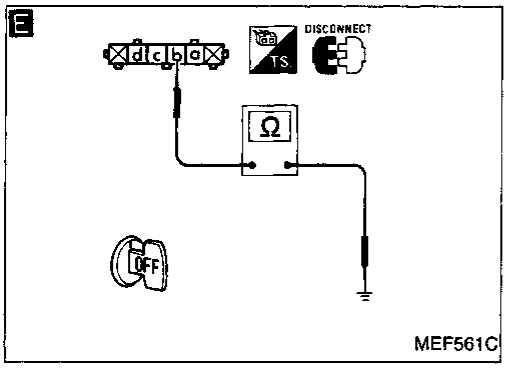
CHECK HARNESS CONTINUITY BETWEEN MASS AIR FLOW SENSOR AND ECM.
1) Stop engine.
2) Disconnect mass air flow sensor harness connector.
3) Disconnect ECM harness connector.
4) Check harness continuity between ECM terminal ㉗ and terminal ⓐ.
Continuity should exist.
If NG, repair harness or connectors.

OK

CHECK COMPONENT (Mass air flow sensor).
Refer to "Electrical Components Inspection".
(See page EF & EC-181.)

Ⓐ

Diagnostic Procedure 24 (Cont'd)



Ⓐ

E

CHECK GROUND CIRCUIT.
1) Stop engine.
2) Disconnect mass air flow sensor harness connector.
3) Loosen and retighten ground screws.
4) Check harness continuity between terminal ⓑ and ground.
Continuity should exist.

NG → Repair harness or connectors.

OK ↓

Reinstall any part removed.

1) Erase the diagnostic test mode II (Self-diagnostic results) memory. (Refer to EF & EC-52.)
2) Perform test drive and then perform diagnostic test mode II (Self-diagnostic results) again. (Refer to EF & EC-50.)

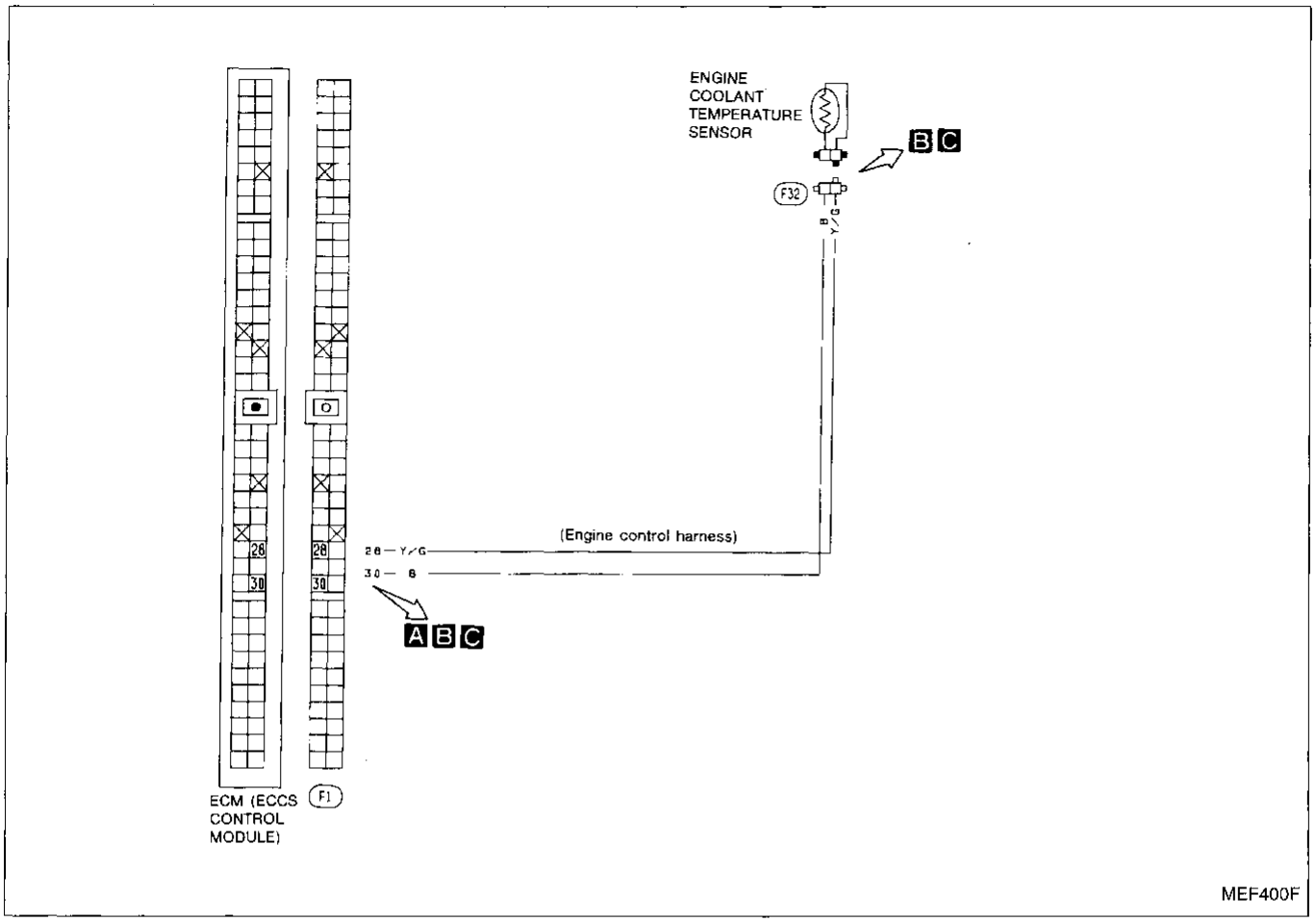
NG → 1) Perform ECM input/output signal inspection test.
2) If NG, recheck the ECM pin terminals for damage.
Check the connection at the ECM harness connector.

OK ↓

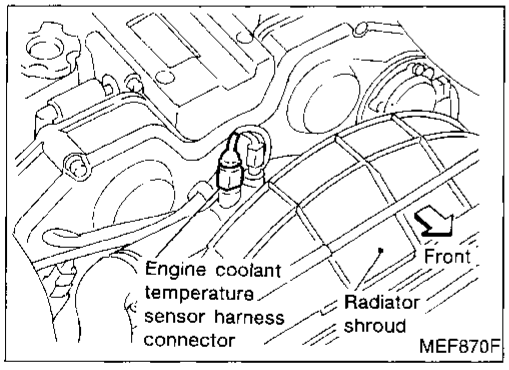
INSPECTION END

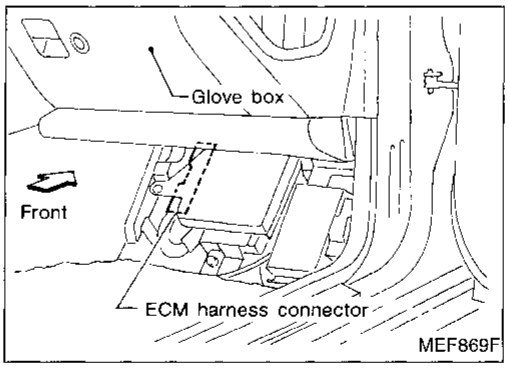
Diagnostic Procedure 25

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

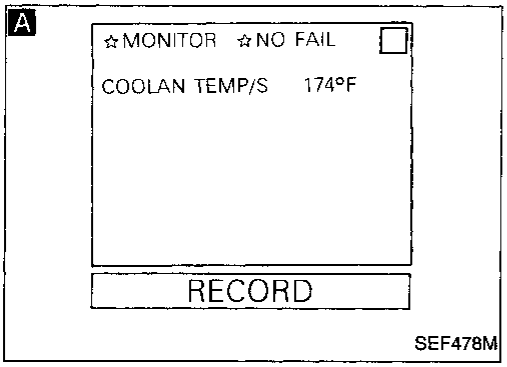


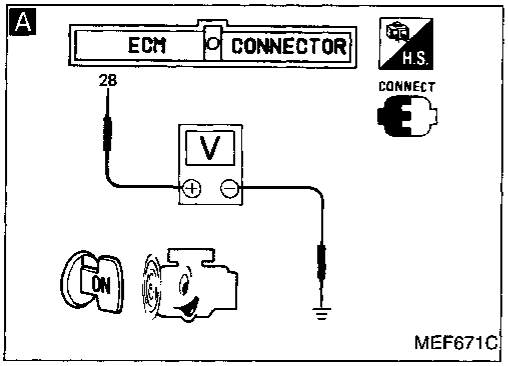
Harness layout

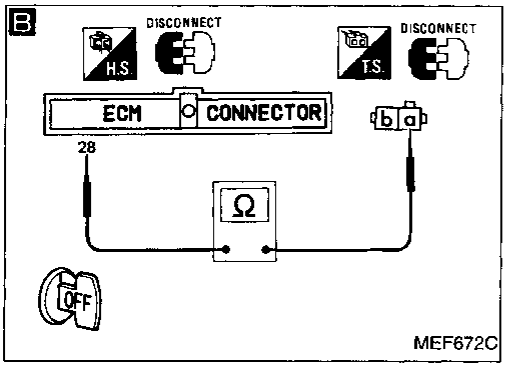


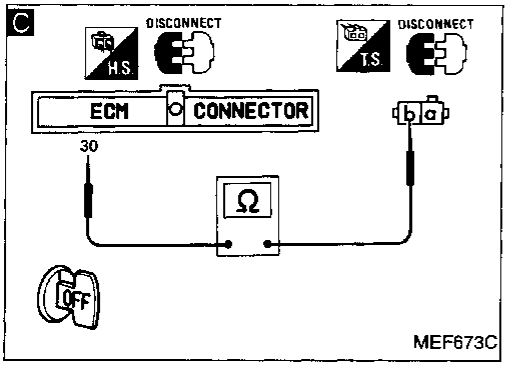


Diagnostic Procedure 25 (Cont'd)









INSPECTION START

A

CHECK INPUT SIGNAL.
1) Start engine.
2) Read "COOLAN TEMP/S" in "DATA MONITOR" mode with CONSULT.
Engine coolant temperature should gradually rise and reach more than 70°C (158°F) after engine warm-up.

OR

2) Make sure that voltage between ECM terminal ㉘ and ground changes during engine warm-up.
Cold → Hot:
Approximately 5 - 0V

NG → **B**

B

CHECK HARNESS CONTINUITY BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM.
1) Stop engine.
2) Disconnect engine coolant temperature sensor harness connector.
3) Disconnect ECM harness connector.
4) Check harness continuity between ECM terminal ㉘ and terminal ⓐ.
Continuity should exist.
If NG, repair harness or connectors.

OK

CHECK COMPONENT (Engine coolant temperature sensor).
Refer to "Electrical Components Inspection".
(See page EF & EC-181.)

OK

C

CHECK GROUND CIRCUIT.
1) Stop engine.
2) Disconnect engine coolant temperature sensor harness connector.
3) Disconnect ECM harness connector.
4) Check harness continuity between ECM terminal ㉚ and terminal ⓑ.
Continuity should exist.

NG → Repair harness or connectors.

OK

Reinstall any part removed.

1) Erase the diagnostic test mode II (Self-diagnostic results) memory. (Refer to EF & EC-52.)
2) Perform test drive and then perform diagnostic test mode II (Self-diagnostic results) again. (Refer to EF & EC-50.)

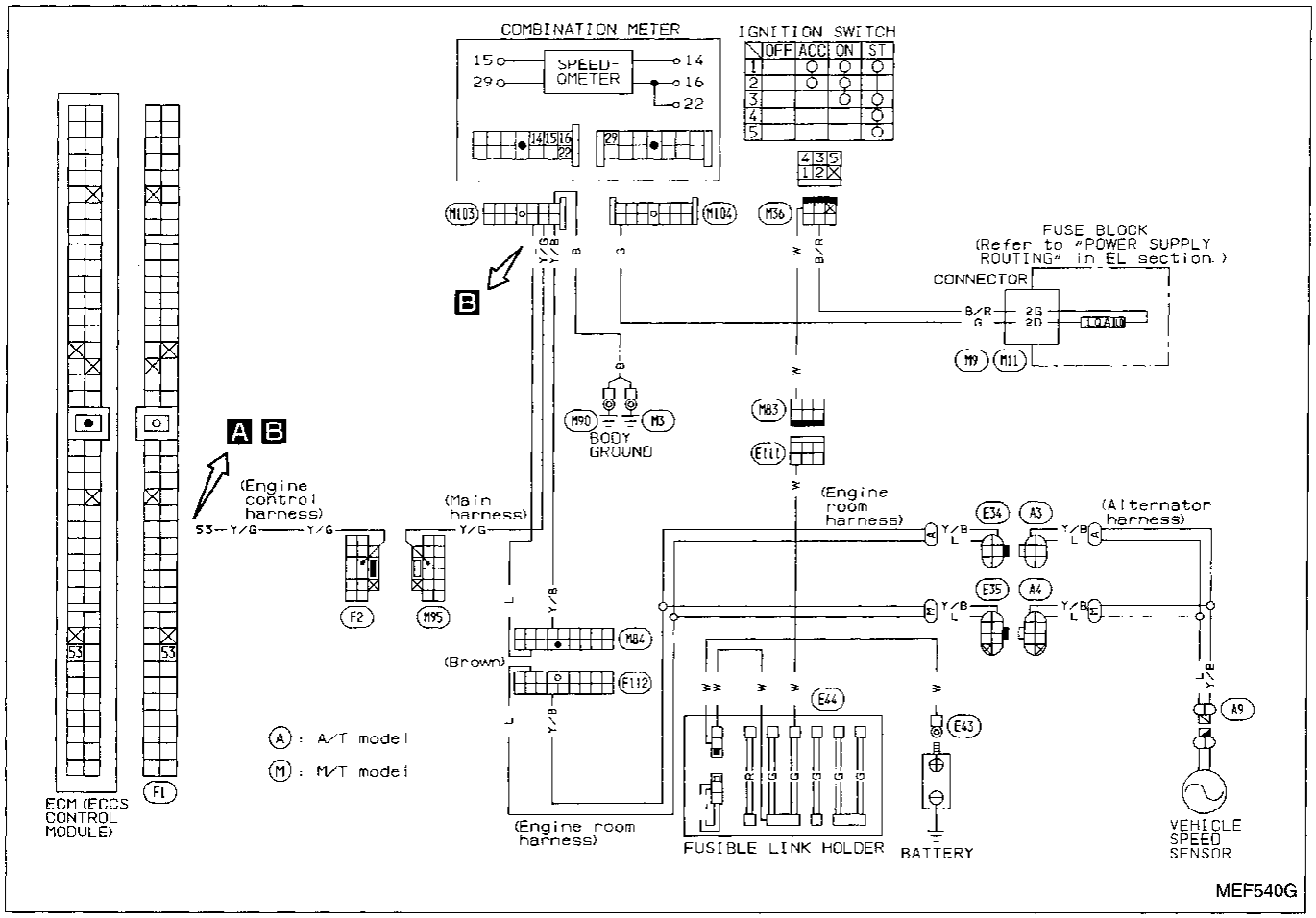
NG →
1) Perform ECM input/output signal inspection test.
2) If NG, recheck the ECM pin terminals for damage.
Check the connection at the ECM harness connector.

OK

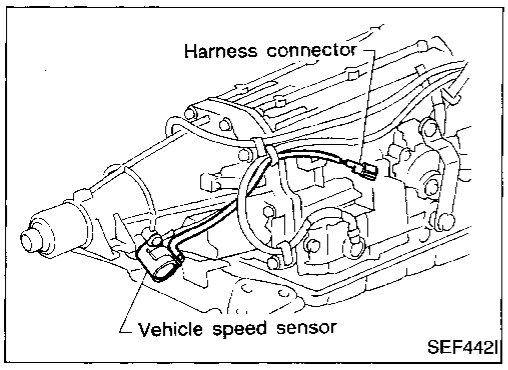
INSPECTION END

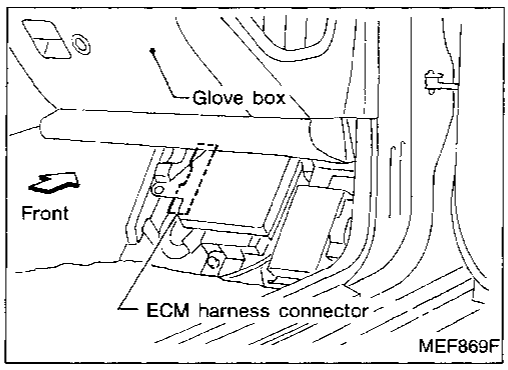
Diagnostic Procedure 26

VEHICLE SPEED SENSOR (Diagnostic trouble code No. 14) CHECK (MALFUNCTION INDICATOR LAMP ITEM)

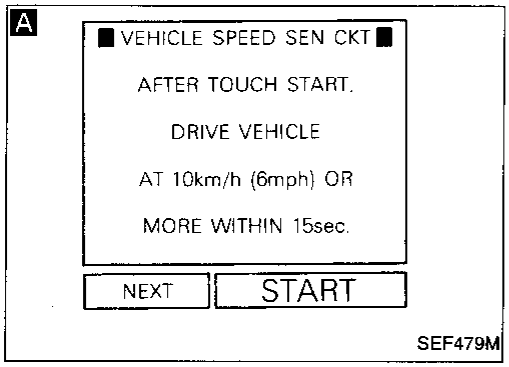


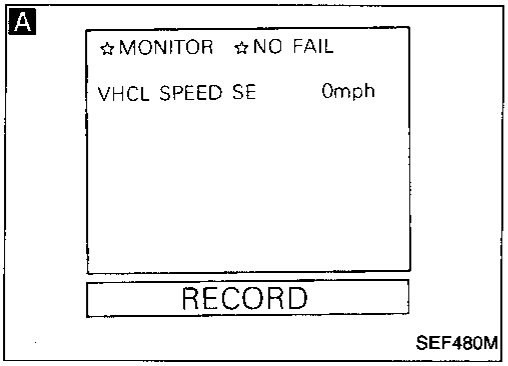
Harness layout

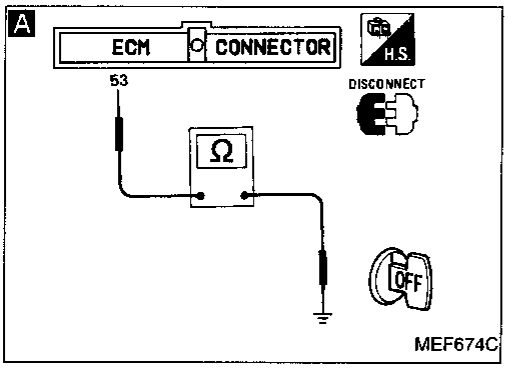


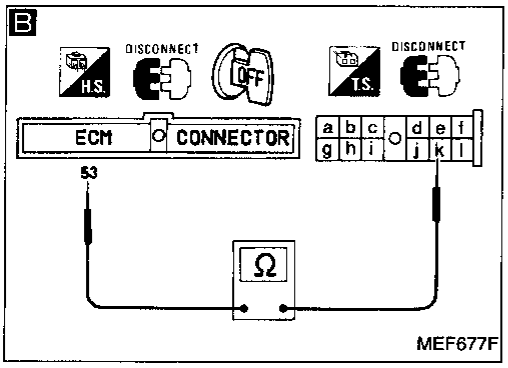


Diagnostic Procedure 26 (Cont'd)









INSPECTION START

Make sure that speedometer in combination meter operates properly.

NG → Check power supply and ground circuit for combination meter. (See "METER AND GAUGES" in EL section.) If NG, repair harness or connectors.

OK

A

CHECK INPUT SIGNAL CIRCUIT.

1) Perform "VEHICLE SPEED SEN CKT" in "FUNCTION TEST" mode with CONSULT.

OR

1) Read "VHCL SPEED SE" in "DATA MONITOR" mode with CONSULT. **CONSULT value should be the same as the speedometer indication.**

OR

1) Jack up rear wheels.
2) Disconnect ECM harness connector.
3) Check resistance between ECM terminal ⑤③ and ground. With transmission in neutral position, turn both rear wheels. **Continuity should be intermittent.**

NG → CHECK COMPONENT (Vehicle speed sensor). Refer to "Electrical Components Inspection". (See page EF & EC-182.)

B

NG → CHECK HARNESS CONTINUITY BETWEEN COMBINATION METER AND ECM.
1) Remove combination meter from instrument panel.
2) Disconnect combination meter harness connector (M103).
3) Check harness continuity between ECM terminal ⑤③ and terminal Ⓚ. **Continuity should exist.**

OK

Reinstall any part removed.

1) Erase the diagnostic test mode II (Self-diagnostic results) memory. (Refer to EF & EC-52.)
2) Make sure diagnostic trouble code No. 55 is displayed in diagnostic test mode II.

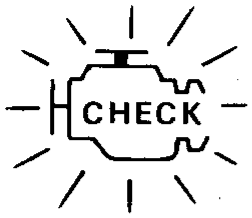
NG → 1) Perform ECM input/output signal inspection test.
2) If NG, recheck the ECM pin terminals for damage. Check the connection at the ECM harness connector.

OK

Ⓐ

Diagnostic Procedure 26 (Cont'd)

C



SEF051P

Ⓐ

1) Start engine and warm it up sufficiently.
2) Shift to a suitable gear position and maintain the following test drive conditions for at least 5 seconds.

Drive conditions
(1) Engine speed:
Non-turbocharger model
2,200±200 rpm
Turbocharger model
2,050±250 rpm
(2) Intake manifold vacuum:
Non-turbocharger model
−28.0±5.3 kPa (−210±40 mmHg, −8.27±1.57 inHg)
Turbocharger model
−39.3±6.0 kPa (−295±45 mmHg, −11.61±1.77 inHg)
(3) Vehicle speed
5 km/h (3 MPH) or more

C

Make sure malfunction indicator lamp does not come "ON" during test drive.

Comes "ON"

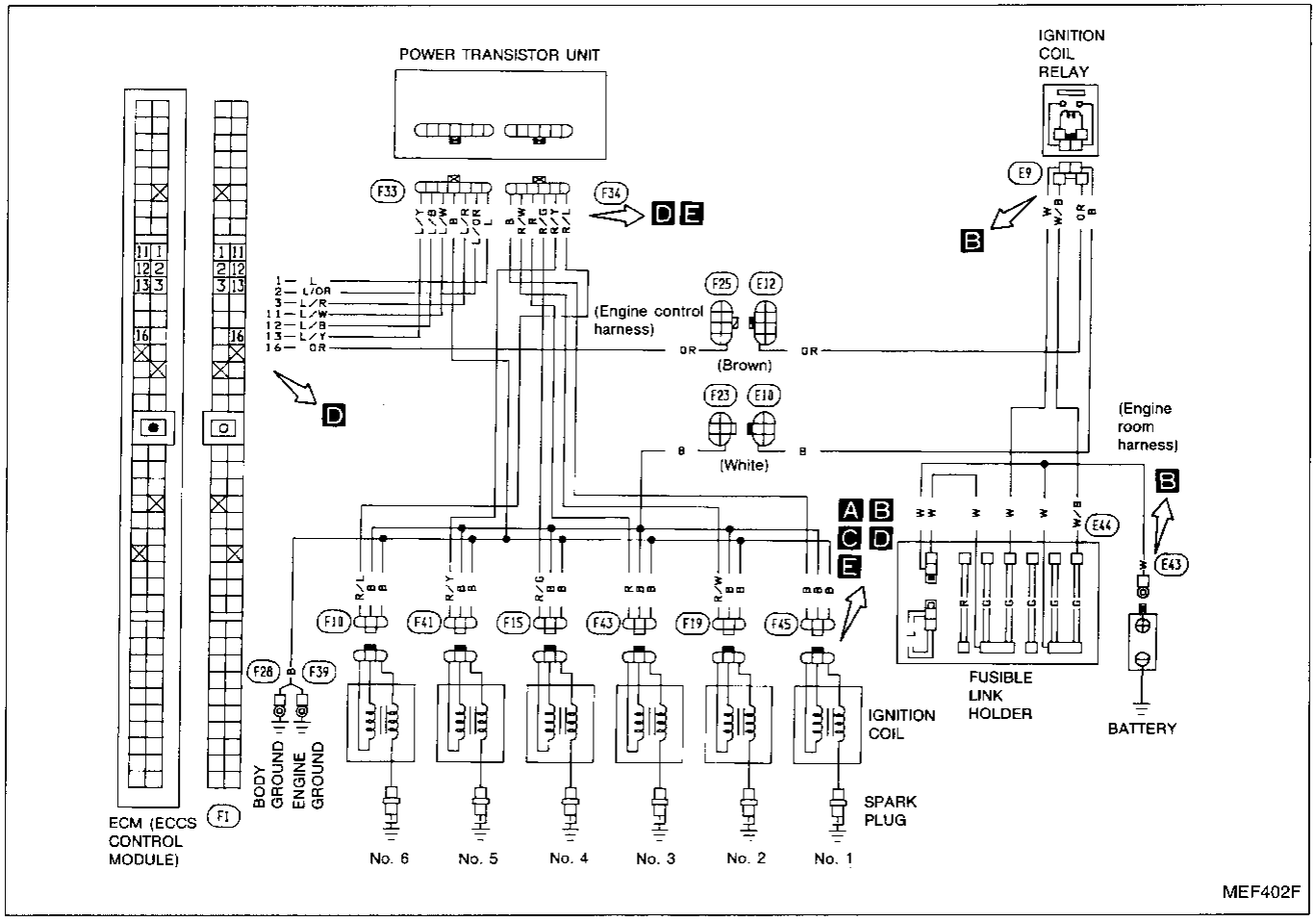
Perform diagnostic test mode II (Self-diagnostic results) and find diagnostic trouble code. According to displayed Diagnostic trouble code No., perform electronic control system inspection.

Does not come "ON"

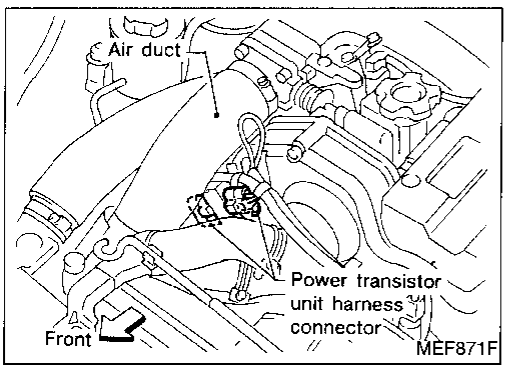
INSPECTION END

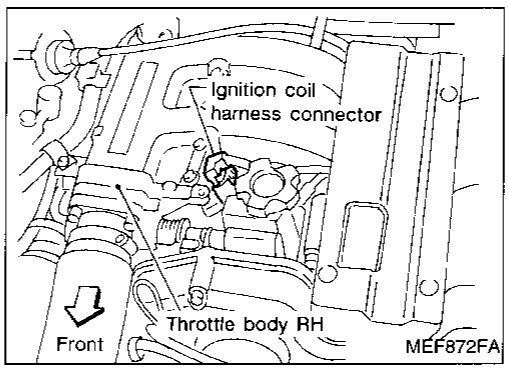
Diagnostic Procedure 27

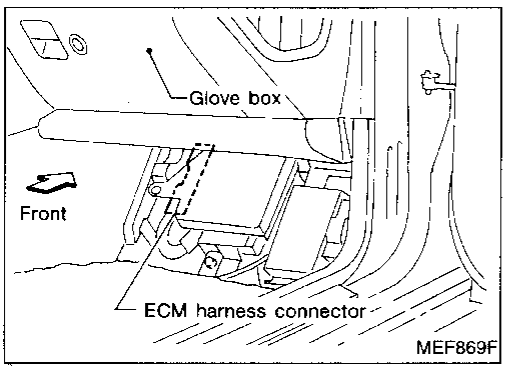
IGNITION SIGNAL (Diagnostic trouble code No. 21)



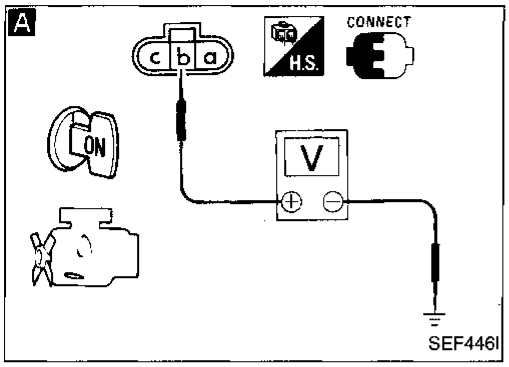
Harness layout

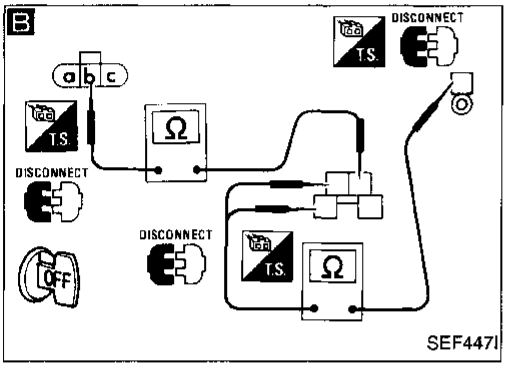


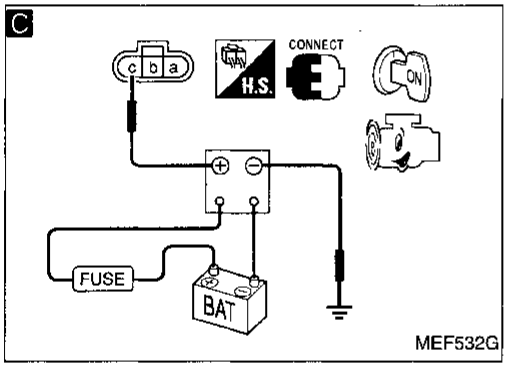


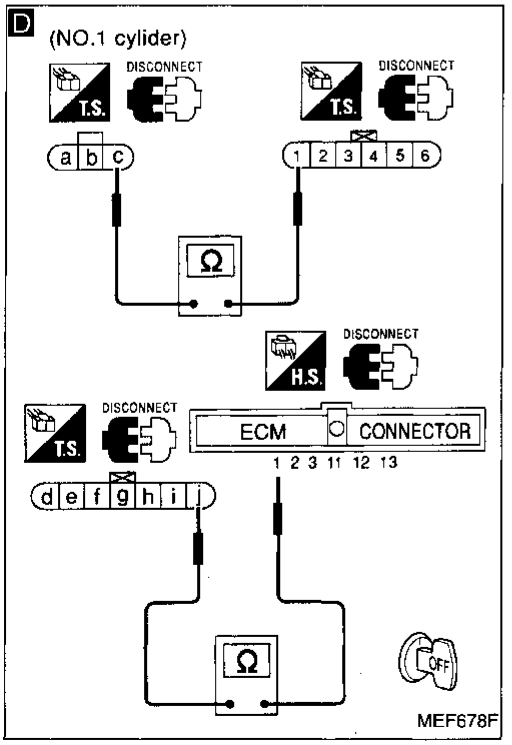


Diagnostic Procedure 27 (Cont'd)









INSPECTION START

A

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

NG → **B**

Check the following items.
1) Ignition coil relay
Refer to "Electrical Components Inspection". (See page EF & EC-187.)
2) "G" fusible link
3) Harness continuity between ignition coil relay and ignition coils.
Continuity should exist.
4) Harness continuity between ignition coil relay and battery ⊕ terminal.
Continuity should exist.

OK

C

CHECK OUTPUT SIGNAL.
1) Start engine.
2) With logic probe make sure that pulse signal exists between terminal ⓒ and ground.
Pulse signal should exist.

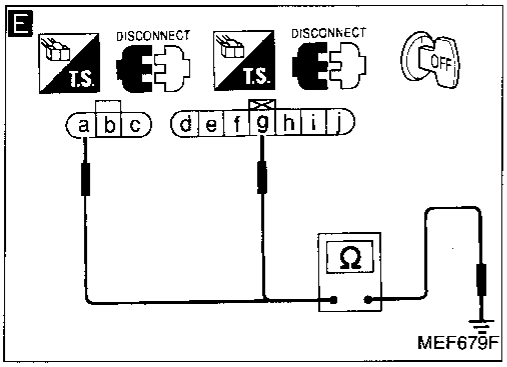
NG → **D**

Check the following items.
1) Power transistor unit
Refer to "Electrical Components Inspection". (See page EF & EC-182.)
2) Harness continuity between terminal ⓒ and power transistor terminals ① (No. 1 cylinder), ② (No. 2 cylinder), ... ⑥ (No. 6 cylinder).
Continuity should exist.
3) Harness continuity between power transistor terminals and ECM terminals.
① - ⓙ ⑪ - ⓕ
② - ⓘ ⑫ - ⓔ
③ - ⓗ ⑬ - ⓓ
Continuity should exist.

OK

Ⓐ

Diagnostic Procedure 27 (Cont'd)



Ⓐ

E

CHECK GROUND CIRCUIT.
1) Stop engine.
2) Disconnect ignition coil and power transistor harness connectors.
3) Check harness continuity between terminals ⓐ, ⓖ and ground.
Continuity should exist.

NG → Repair or replace harness.

OK ↓

Reinstall any part removed.

1) Erase the diagnostic test mode II (Self-diagnostic results) memory. (Refer to EF & EC-52.)
2) Perform test drive and then perform diagnostic test mode II (Self-diagnostic results) again. (Refer to EF & EC-50.)

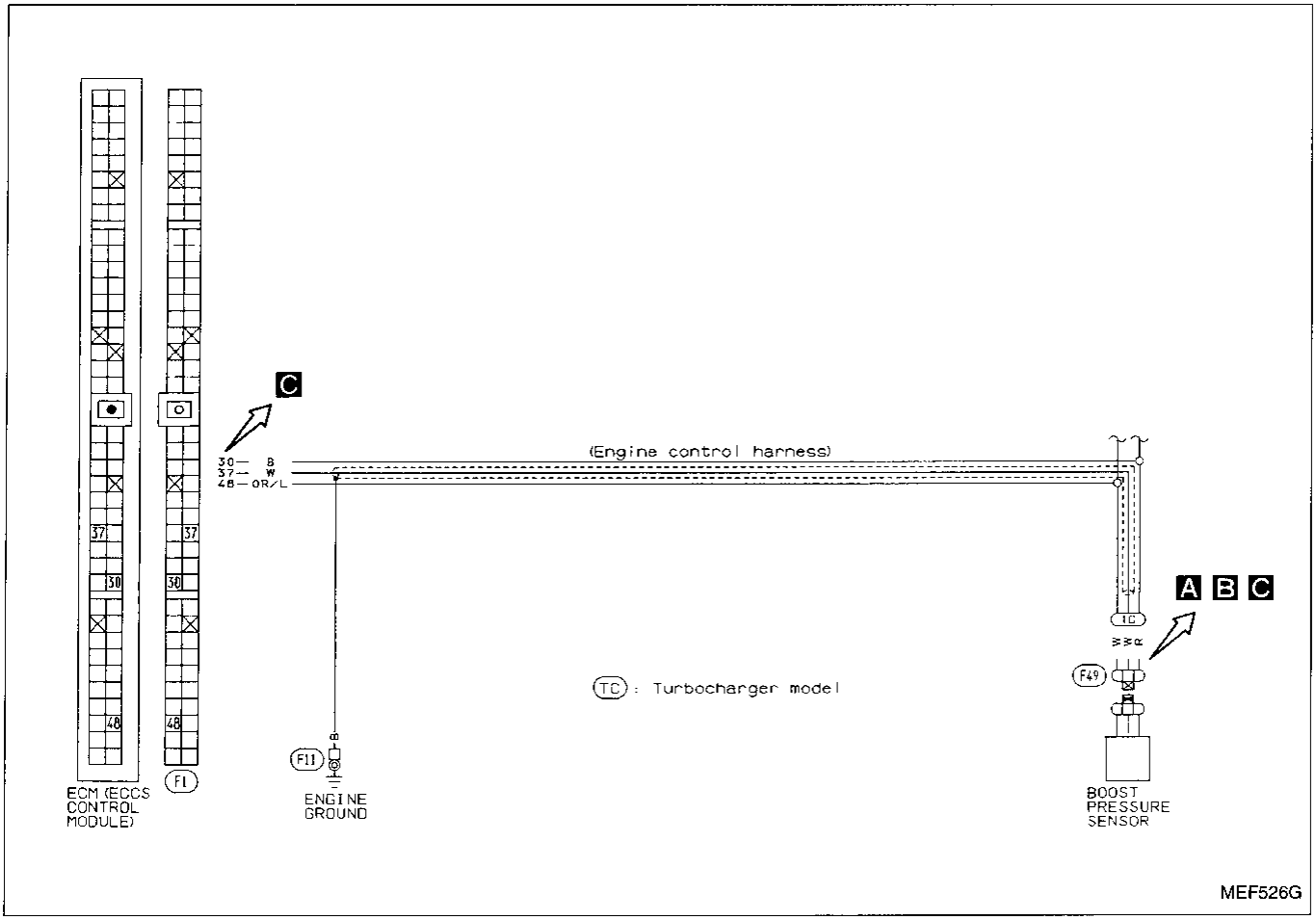
NG → 1) Perform ECM input/output signal inspection test.
2) If NG, recheck the ECM pin terminals for damage or the connection of ECM harness connector.

OK ↓

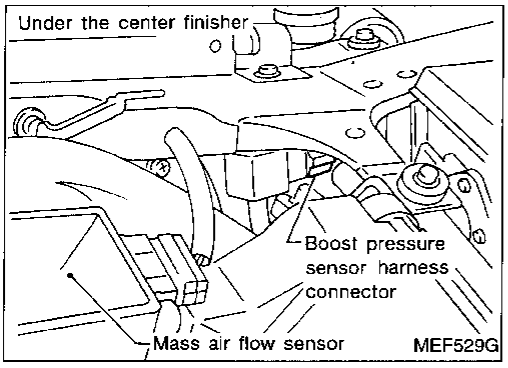
INSPECTION END

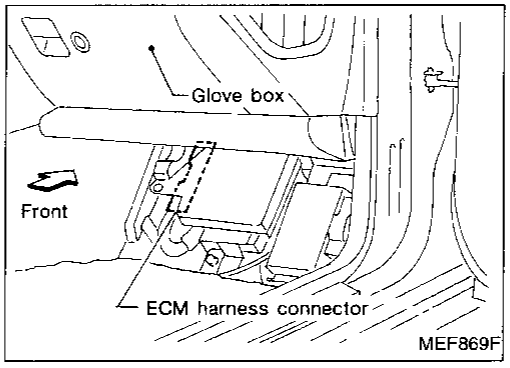
Diagnostic Procedure 28

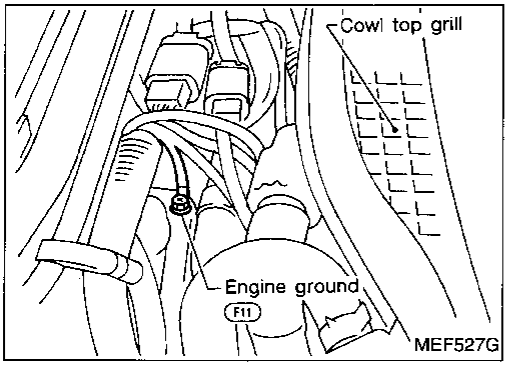
BOOST PRESSURE SENSOR (Diagnostic trouble code No. 26) (CHECK) (MALFUNCTION INDICATOR LAMP ITEM)



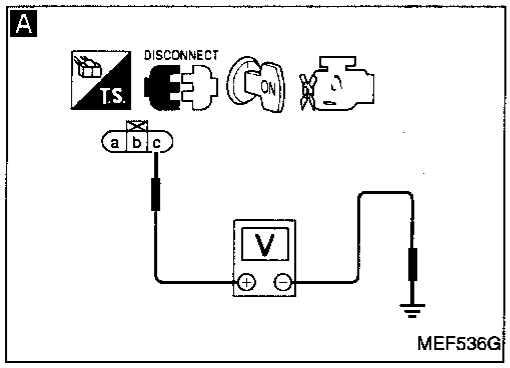
Harness layout

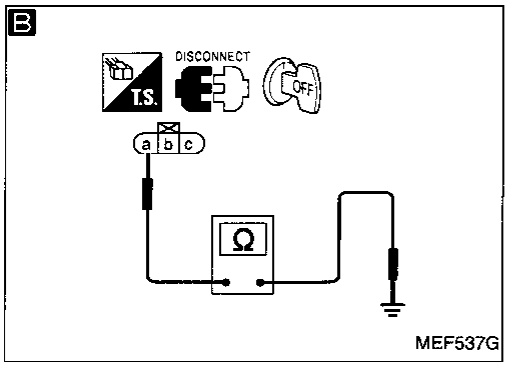


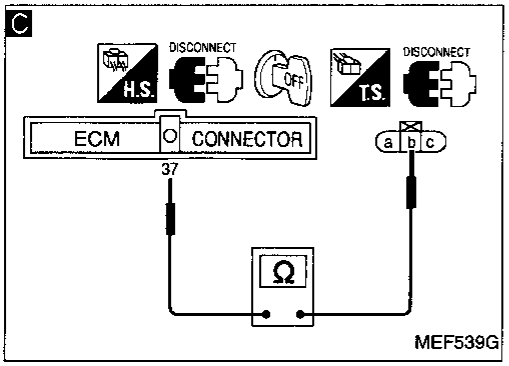




Diagnostic Procedure 28 (Cont'd)







INSPECTION START

A

CHECK POWER SUPPLY.
1) Disconnect boost pressure 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 screws.
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 ㊲ and terminal ⓑ.
Continuity should exist.

NG → Repair harness or connectors.

OK

CHECK COMPONENT
(Boost pressure sensor).
Refer to "Electrical Components Inspection".
(See page EF & EC-188.)

NG → Replace boost pressure sensor.

OK

Reinstall any part removed.

1) Erase the diagnostic test mode II (Self-diagnostic results) memory. (Refer to EF & EC-52.)
2) Perform test drive and then perform diagnostic test mode II (Self-diagnostic results) again. (Refer to EF & EC-50.)

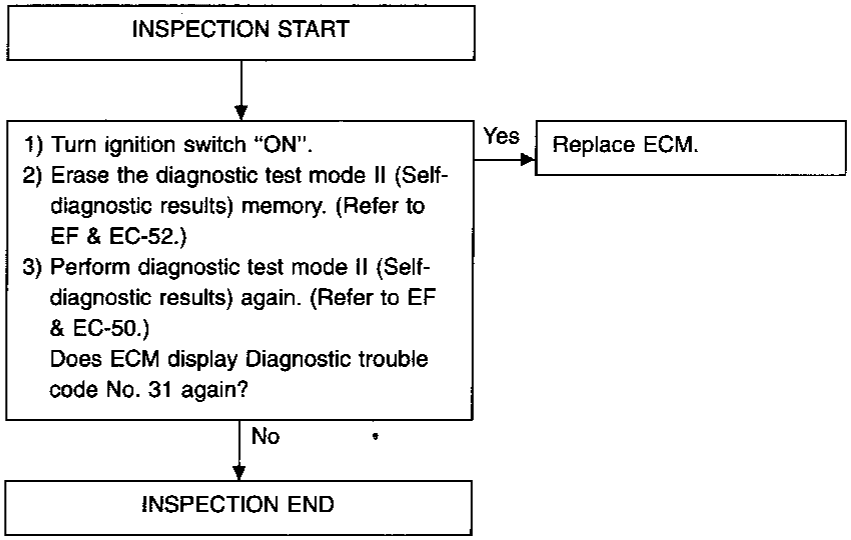
NG →
1) Perform ECM input/output signal inspection test.
2) If NG, recheck the ECM pin terminals for damage or the connection of ECM harness connector.

OK

INSPECTION END

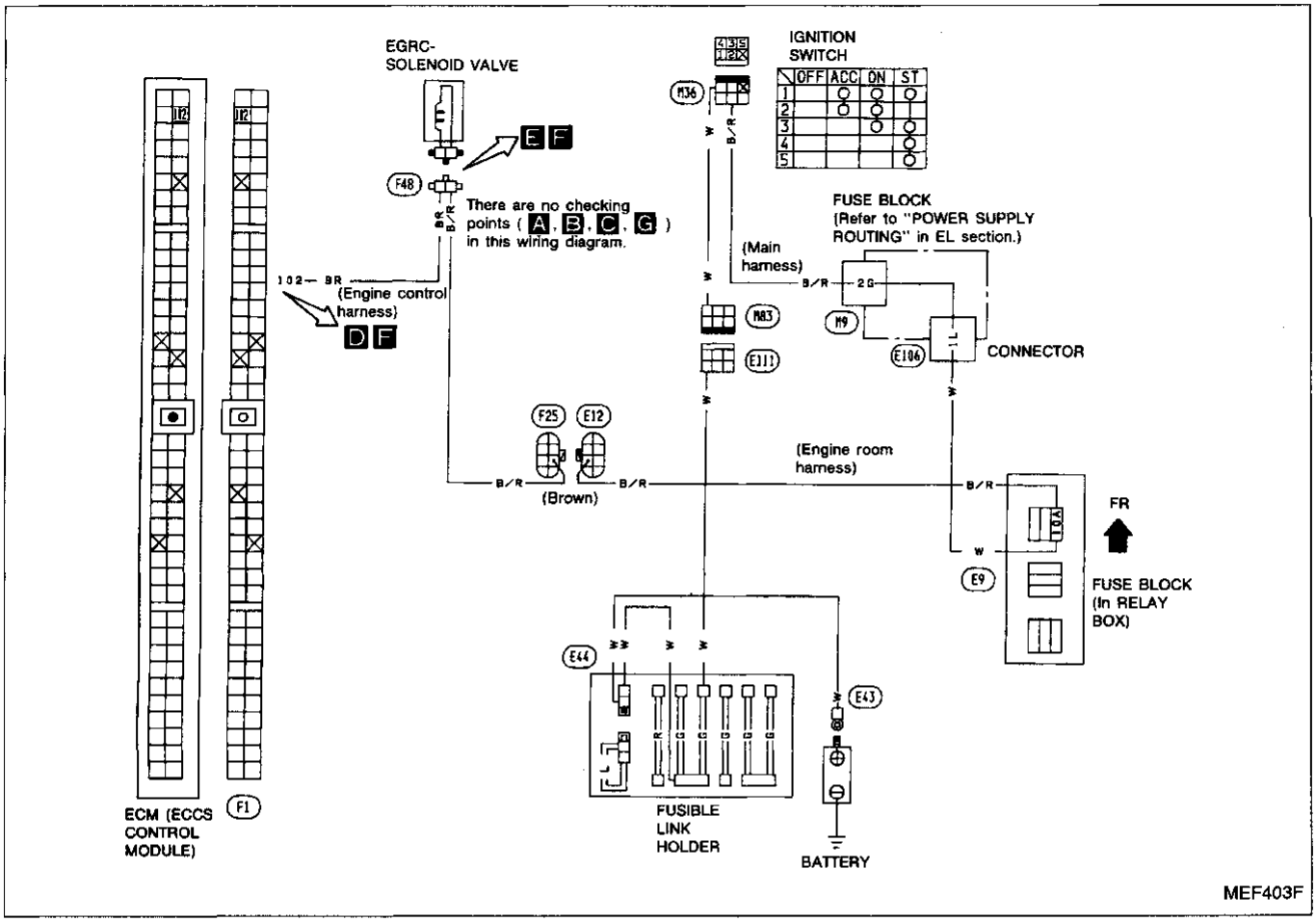
Diagnostic Procedure 29

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

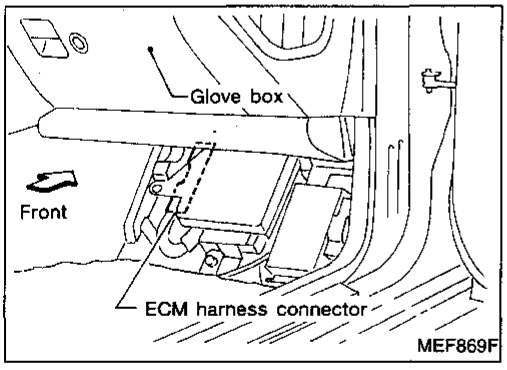


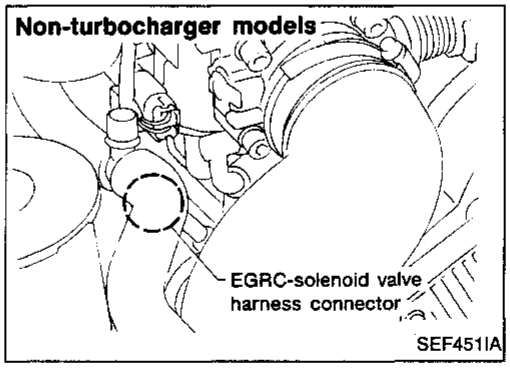
Diagnostic Procedure 30

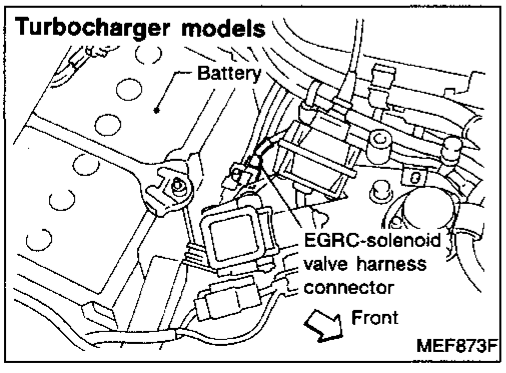
EGR FUNCTION (Diagnostic trouble code No. 32) (CHECK) (MALFUNCTION INDICATOR LAMP ITEM)



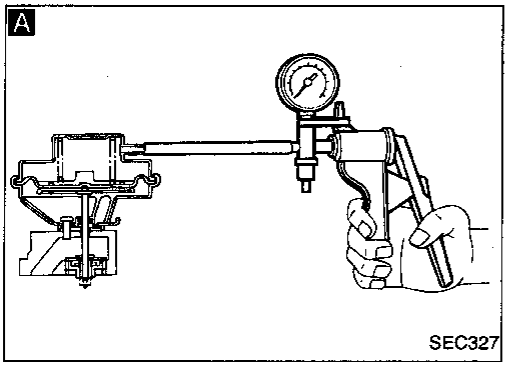
Harness layout

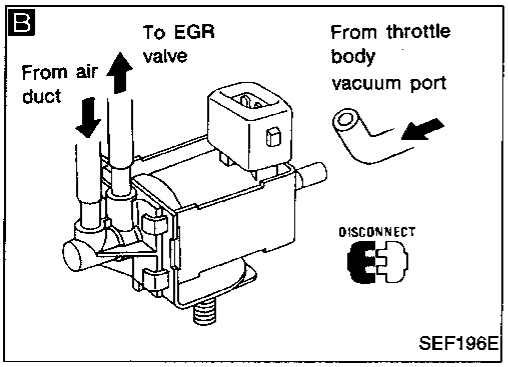


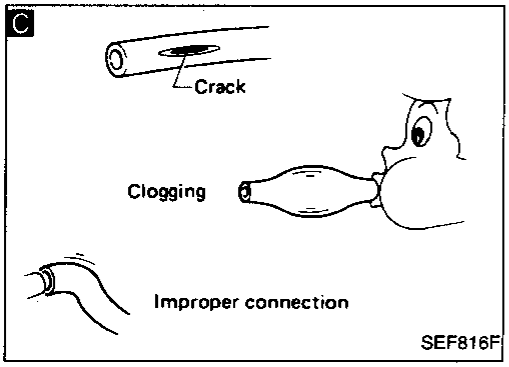


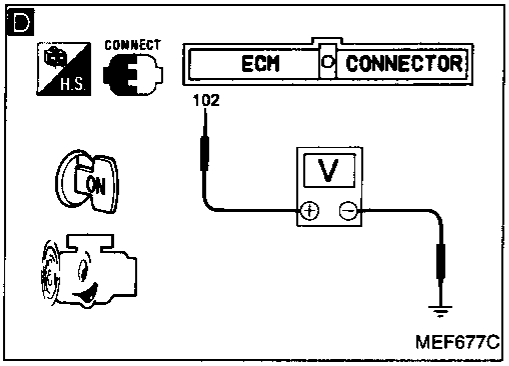


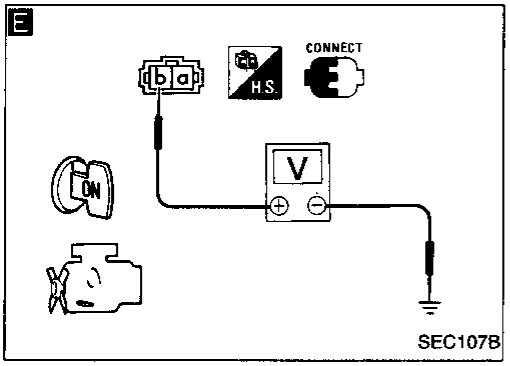
Diagnostic Procedure 30 (Cont'd)











INSPECTION START

A CHECK EGR VALVE OPERATION.
Make sure that EGR valve lifts up when applying vacuum.
- NG → Replace or repair EGR valve.
- OK ↓

B CHECK VACUUM SOURCE TO EGR VALVE.
1) Disconnect vacuum hose connected to EGRC-solenoid valve.
2) Make sure vacuum exists when racing engine.
- NG → CHECK THROTTLE BODY VACUUM PORT FOR CLOGGING.
- OK ↓

C CHECK VACUUM HOSE.
Check vacuum hose for clogging, cracks or improper connections.
- NG → If necessary, replace vacuum hose or reconnect vacuum hose firmly.
- OK ↓

D CHECK ECM OUTPUT SIGNAL.
1) Check voltage between ECM terminal (102) and ground under the following conditions:

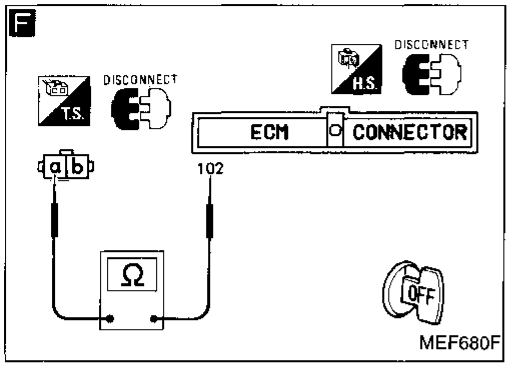
Engine condition	Voltage
Idle	Approx. 0V
Racing (Less than approx. 3,000 rpm)	Battery voltage

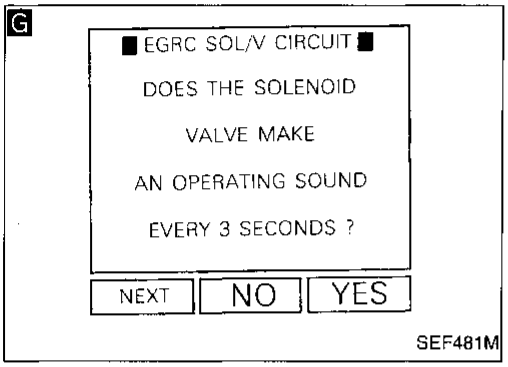
- NG →
  E CHECK POWER SOURCE TO EGRC-SOLENOID VALVE.
  1) Stop engine.
  2) Turn ignition switch "ON".
  3) Check voltage between terminal ⓑ and ground.
  Voltage: Battery voltage

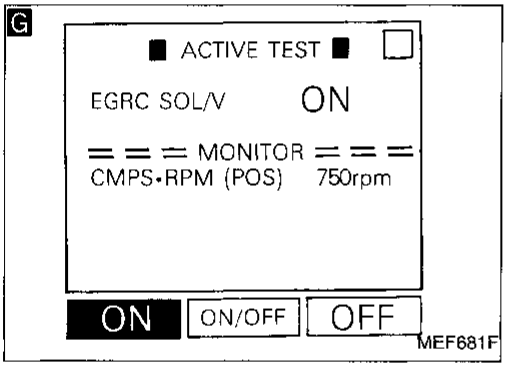
  F CHECK GROUND CIRCUIT.
  1) Turn ignition switch "OFF".
  2) Disconnect ECM harness connector.
  3) Disconnect EGRC-solenoid valve harness connector.
  4) Check resistance between ECM terminal (102) and terminal ⓐ.
  Resistance: Approximately 0Ω
  If NG, repair or replace harness.
- OK ↓

Ⓐ

Diagnostic Procedure 30 (Cont'd)







Ⓐ

G

CHECK COMPONENT (EGRC-solenoid valve).

1) Turn ignition switch "ON".
2) Perform "EGRC SOL/V CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

OR

1) Turn ignition switch "ON".
2) Turn EGRC-solenoid valve "ON" and "OFF" in "ACTIVE TEST" mode with CONSULT and check operating sound.

OR

Refer to "Electrical Components Inspection".
(See page EF & EC-183.)

NG → Replace EGRC-solenoid valve.

OK

Check resistance of EGR temperature sensor.
(See page EF & EC-184.)

Reinstall any part removed.

Erase the diagnostic test mode II (Self-diagnostic results) memory.
(See page EF & EC-52.)
Make sure Diagnostic trouble code No. 55 is displayed in Diagnostic Test Mode II.

Ⓑ

Diagnostic Procedure 30 (Cont'd)

H **ROAD TEST**

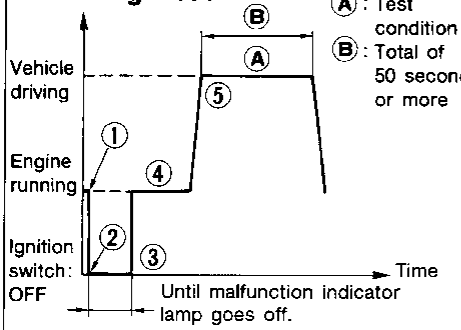
Test conditions

Drive vehicle under the following conditions with suitable gear position.

(1) Engine speed:
Non-turbocharger model
2,650 ± 150 rpm
Turbocharger model
2,150 ± 150 rpm

(2) Intake manifold vacuum:
Non-turbocharger model
−40.0 kPa
(−300 mmHg, −11.81 inHg)
Turbocharger model
−33.3 kPa
(−250 mmHg, −9.84 inHg)

Driving mode



Ⓐ : Test condition
Ⓑ : Total of 50 seconds or more

① Start engine and warm it up sufficiently.
② Turn off ignition switch and keep it off until malfunction indicator lamp 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 for 30 seconds.
⑤ Shift to suitable gear position and drive in "Test condition" for a total of 50 seconds or more.

Note: If engine stalls or ignition switch is turned off within step ⑤, return to step ②.

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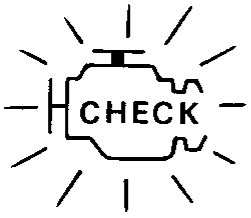
I



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Ⓑ

H

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

I

Make sure malfunction indicator lamp does not come "ON" during test drive.

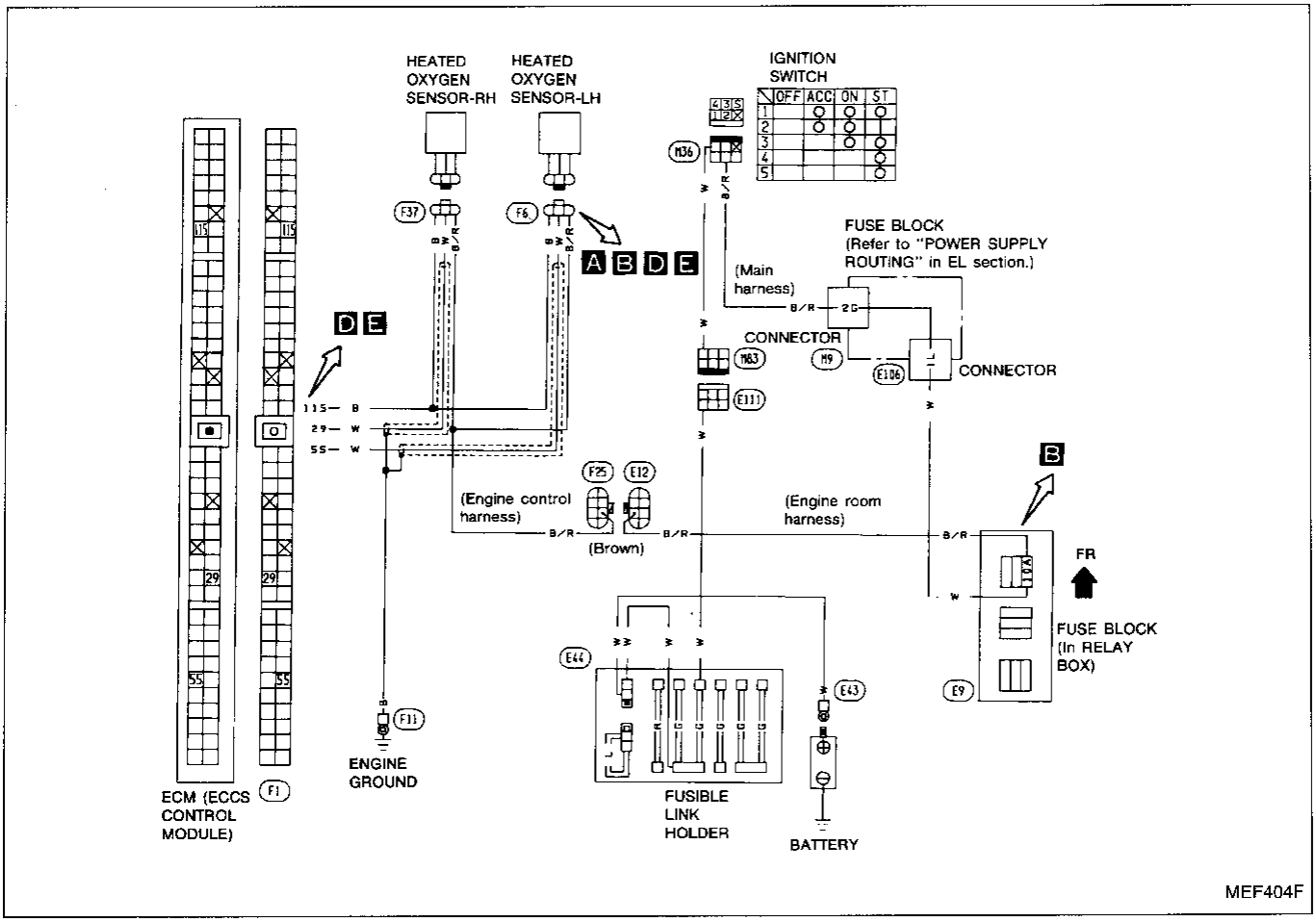
Comes "ON" → Perform diagnostic test mode II (Self-diagnostic results) and find diagnostic trouble code. According to displayed Diagnostic trouble code No., perform electronic control system inspection.

Does not come "ON"

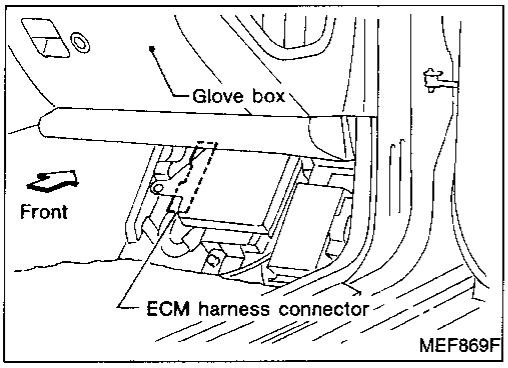
INSPECTION END

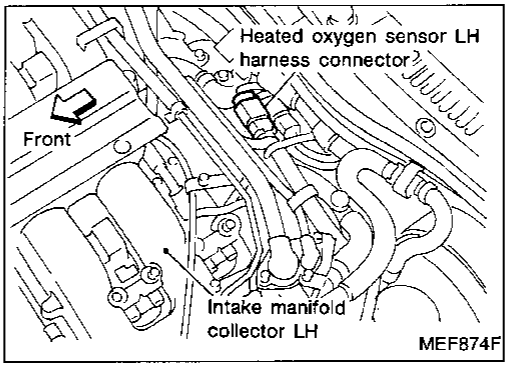
Diagnostic Procedure 31

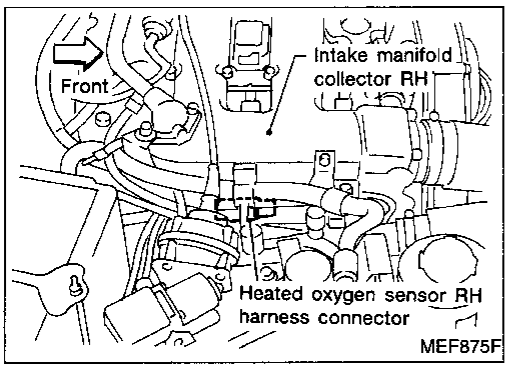
HEATED OXYGEN SENSOR (Diagnostic trouble code No. 33 and 53) CHECK (MALFUNCTION INDICATOR LAMP ITEM)

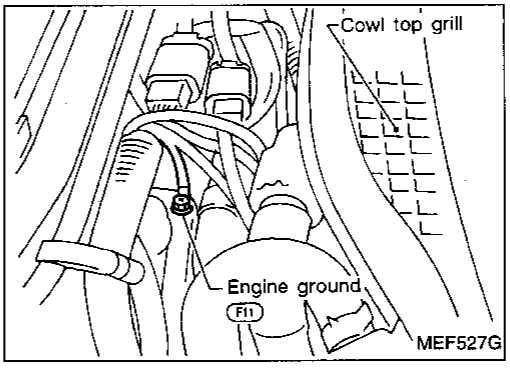


Harness layout

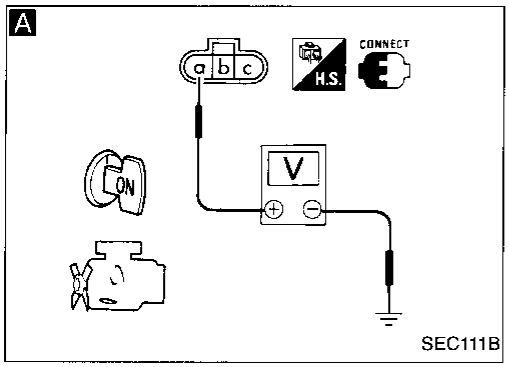


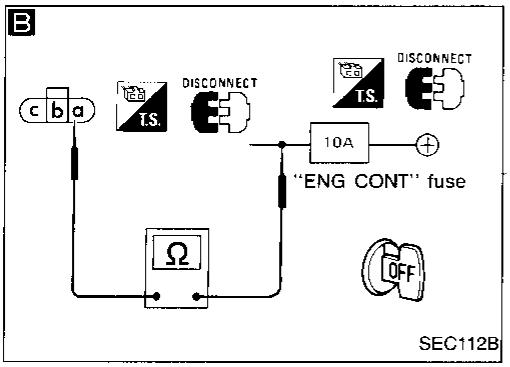


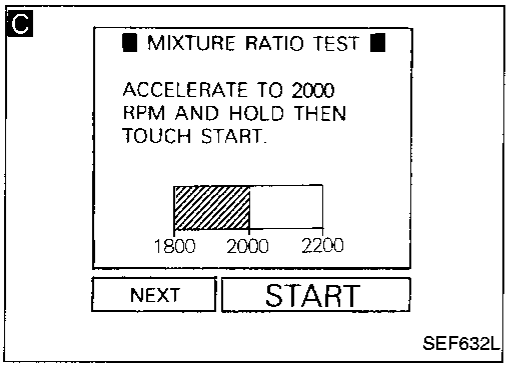


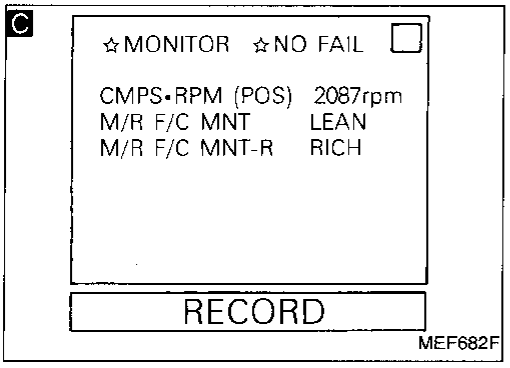


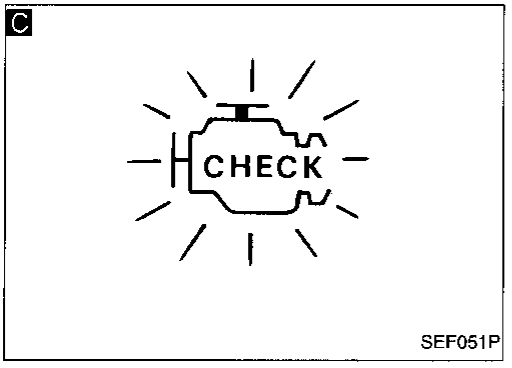
Diagnostic Procedure 31 (Cont'd)











INSPECTION START

A

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

NG → **B**

CHECK HARNESS CONTINUITY BETWEEN HEATED OXYGEN SENSOR AND FUSE.
1) Turn ignition switch "OFF".
2) Disconnect heated oxygen sensor harness connector.
3) Disconnect "ENG CONT" fuse.
4) Check harness continuity between terminal ⓐ and the fuse.
Continuity should exist.
If NG, repair harness or connectors.

OK

C

CHECK OVERALL FUNCTION.
1) Start engine and warm it up sufficiently.
2) Perform "MIXTURE RATIO TEST" in "FUNCTION TEST" mode with CONSULT.

OR

2) Make sure that "M/R F/C MNT(R)" in "DATA MONITOR" mode indicates "RICH" and "LEAN" periodically more than 5 times during 10 seconds at 2,000 rpm.

OR

2) Make sure that malfunction indicator lamp goes on and off periodically more than 5 times during 10 seconds at 2,000 rpm in on-board diagnostic system (Diagnostic Test Mode II). (Refer to EF & EC-53.)

NG → **D**

CHECK HARNESS CONTINUITY BETWEEN HEATED OXYGEN SENSOR AND ECM.
1) Stop engine.
2) Disconnect heated oxygen sensor harness connector.
3) Disconnect ECM harness connector.
4) Check harness continuity between ECM terminals and heated oxygen sensor terminals.
Right side: ㉙ - ⓑ
Left side: ㊺ - ⓑ
Continuity should exist.
If NG, repair harness or connectors.

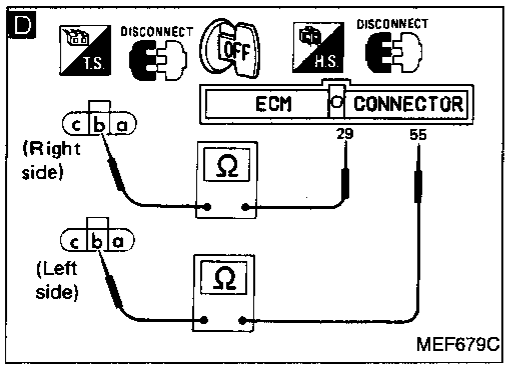
OK

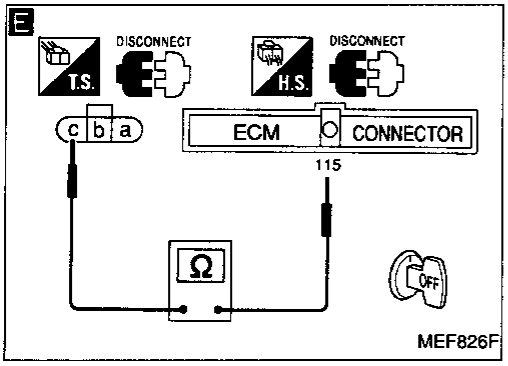
Replace heated oxygen sensor.

OK

Ⓐ

Diagnostic Procedure 31 (Cont'd)





Ⓐ

E

CHECK GROUND CIRCUIT.
1) Stop engine.
2) Disconnect heated oxygen sensor harness connector.
3) Disconnect ECM harness connector.
4) Loosen and retighten ground screws.
5) Check harness continuity between ECM terminal (115) and terminal ⓒ.
Continuity should exist.

NG → Repair harness or connectors.

OK ↓

Reinstall any part removed.

1) Erase the diagnostic test mode II (Self-diagnostic results) memory. (Refer to EF & EC-52.)
2) Perform test drive and then perform diagnostic test mode II (Self-diagnostic results) again. (Refer to EF & EC-50.)

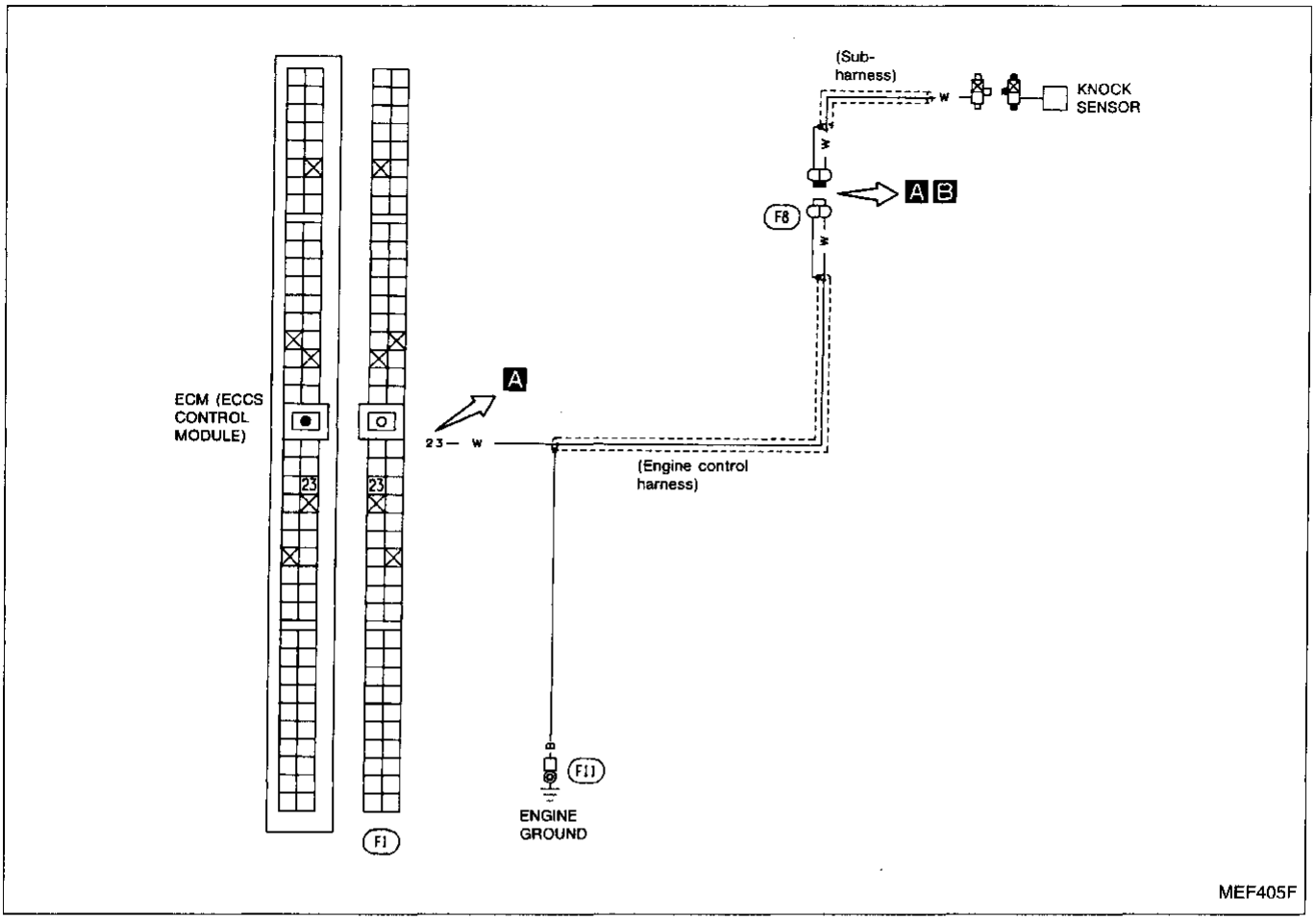
NG → 1) Perform ECM input/output signal inspection test.
2) If NG, recheck ECM pin terminals for damage or the connection of ECM harness connector.

OK ↓

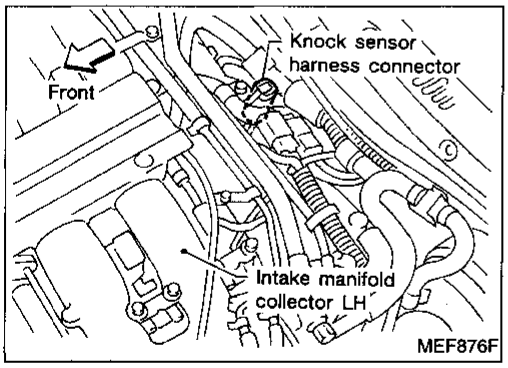
INSPECTION END

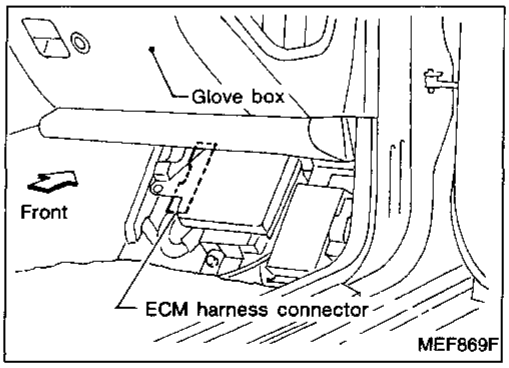
Diagnostic Procedure 32

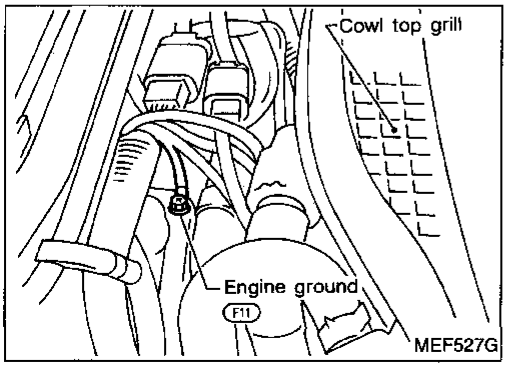
KNOCK SENSOR (Diagnostic trouble code No. 34)



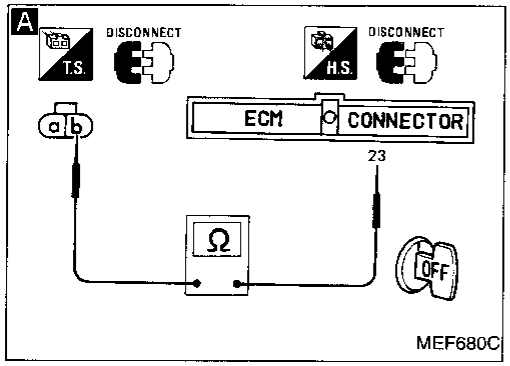
Harness layout

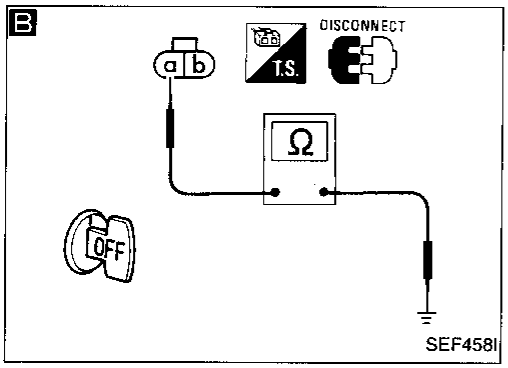






Diagnostic Procedure 32 (Cont'd)





INSPECTION START

A

CHECK INPUT SIGNAL CIRCUIT.
1) Make sure that ignition switch is in "OFF" position.
2) Disconnect knock sensor sub-harness connector.
3) Disconnect ECM harness connector.
4) Check harness continuity between ECM terminal ㉓ and terminal ⓑ.
Continuity should exist.

NG → Repair harness or connectors.

OK

B

CHECK GROUND CIRCUIT.
1) Loosen and retighten ground screws.
2) Check harness continuity between terminal ⓐ and ground.
Continuity should exist.

NG → Repair harness or connectors.

OK

CHECK COMPONENT
(Knock sensor).
Refer to "Electrical Components Inspection".
(See page EF & EC-186.)

NG → Replace knock sensor.

OK

Reinstall any part removed.

1) Erase the diagnostic test mode II (Self-diagnostic results) memory. (Refer to EF & EC-52.)
2) Perform test drive and then perform diagnostic test mode II (Self-diagnostic results) again. (Refer to EF & EC-50.)

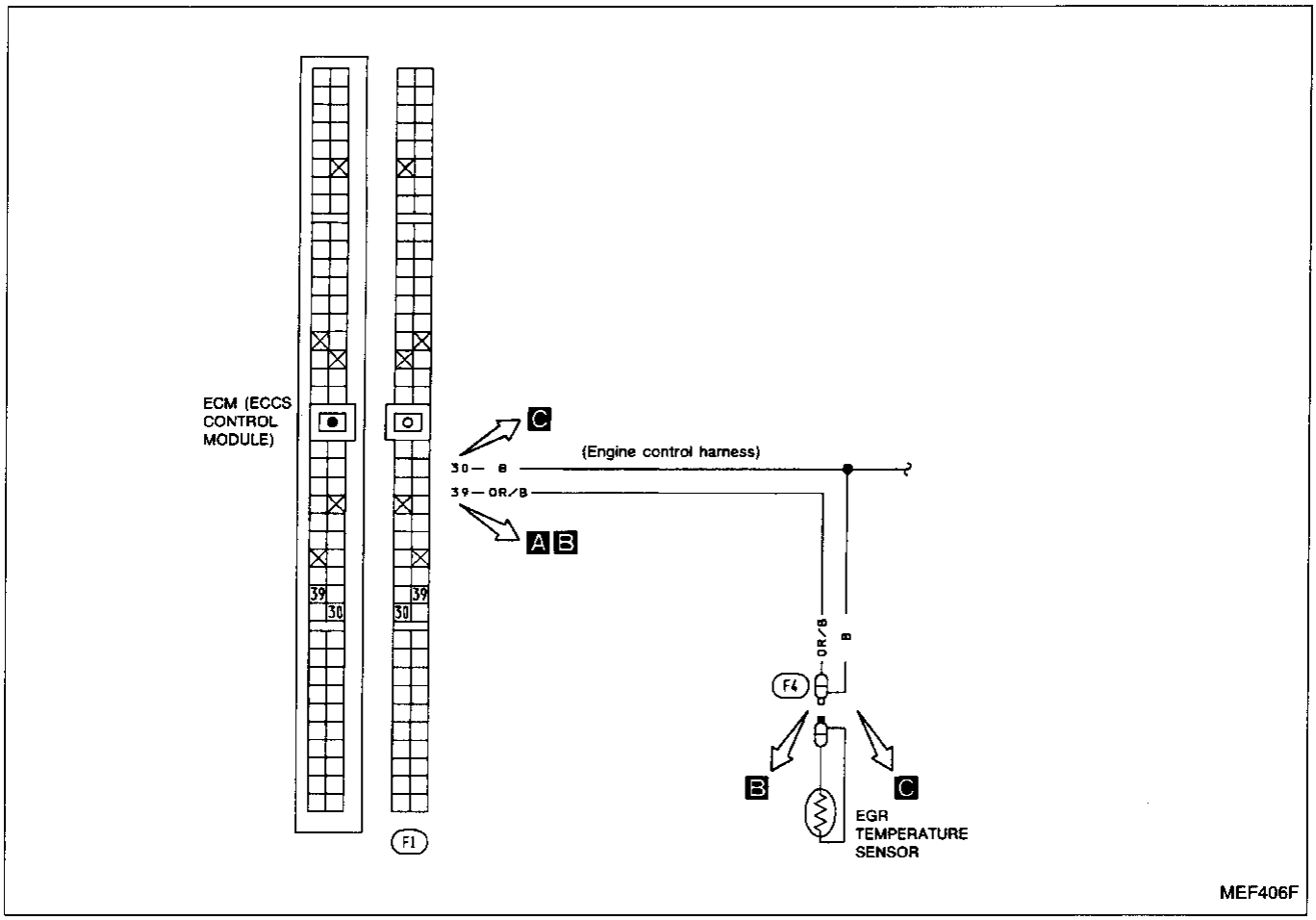
NG → 1) Perform ECM input/output signal inspection test.
2) If NG, recheck the ECM pin terminals for damage or the connection of ECM harness connector.

OK

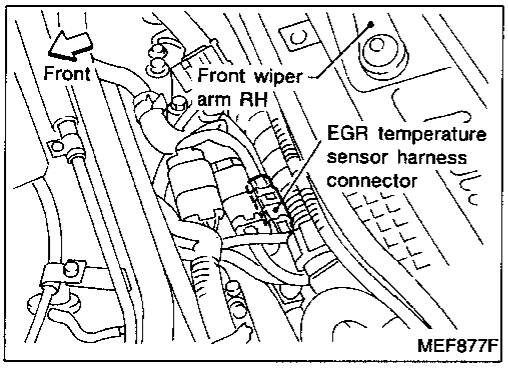
INSPECTION END

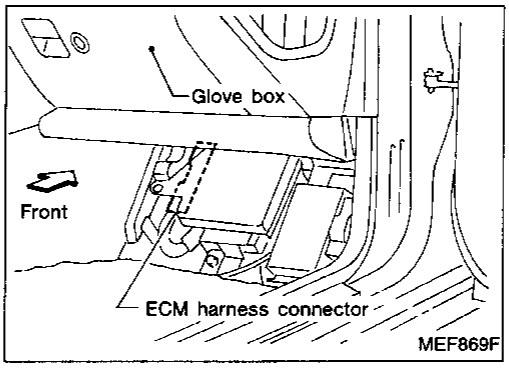
Diagnostic Procedure 33

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

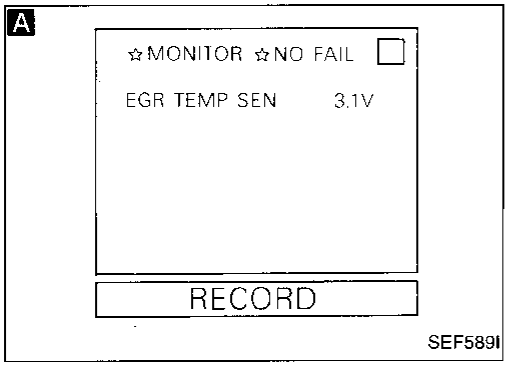


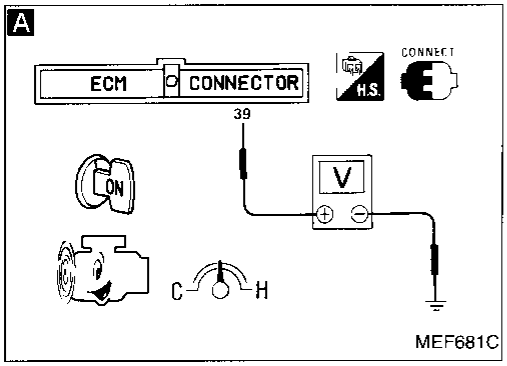
Harness layout

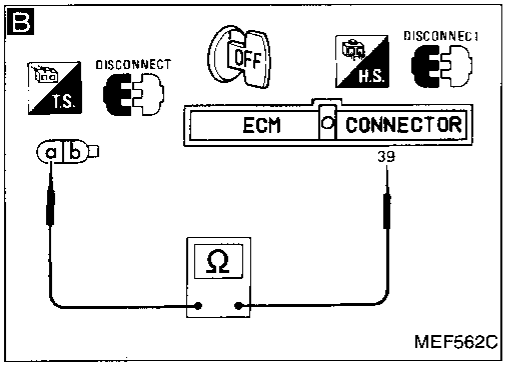


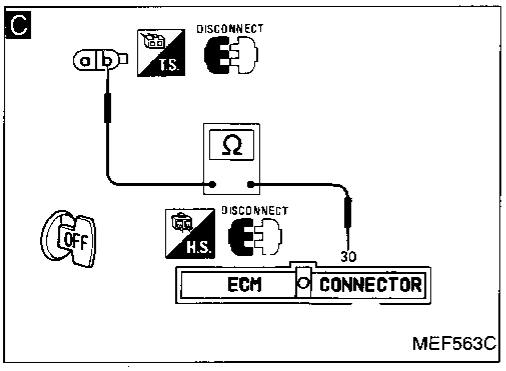


Diagnostic Procedure 33 (Cont'd)









INSPECTION START

A

CHECK INPUT SIGNAL.
1) Start engine and warm it up sufficiently.
2) Read "EGR TEMP SEN" in "DATA MONITOR" mode with CONSULT.
Voltage:
Less than 4.5V

OR

2) Check voltage between ECM terminal ㊴ and ground.
Voltage:
Less than 4.5V

NG → **B**

CHECK HARNESS CONTINUITY BETWEEN ECM AND EGR TEMPERATURE SENSOR.
1) Stop engine.
2) Disconnect ECM harness connector.
3) Disconnect EGR temperature sensor harness connector.
4) Check continuity between ECM terminal ㊴ and terminal ⓐ.
Continuity should exist.

OK → CHECK COMPONENT (EGR temperature sensor). Refer to "Electrical Components Inspection". (See page EF & EC-184.)

OK

C

CHECK GROUND CIRCUIT.
1) Stop engine.
2) Disconnect ECM harness connector.
3) Disconnect EGR temperature sensor harness connector.
4) Check harness continuity between ECM terminal ㉚ and terminal ⓑ.
Continuity should exist.

NG → Repair harness or connectors.

OK

Reinstall any part removed.

1) Erase the diagnostic test mode II (Self-diagnostic results) memory. (Refer to EF & EC-52.)
2) Start engine and warm it up sufficiently.
3) Perform test drive for more than 15 minutes.
4) Perform diagnostic test mode II (Self-diagnostic results) again. (Refer to EF & EC-50.)

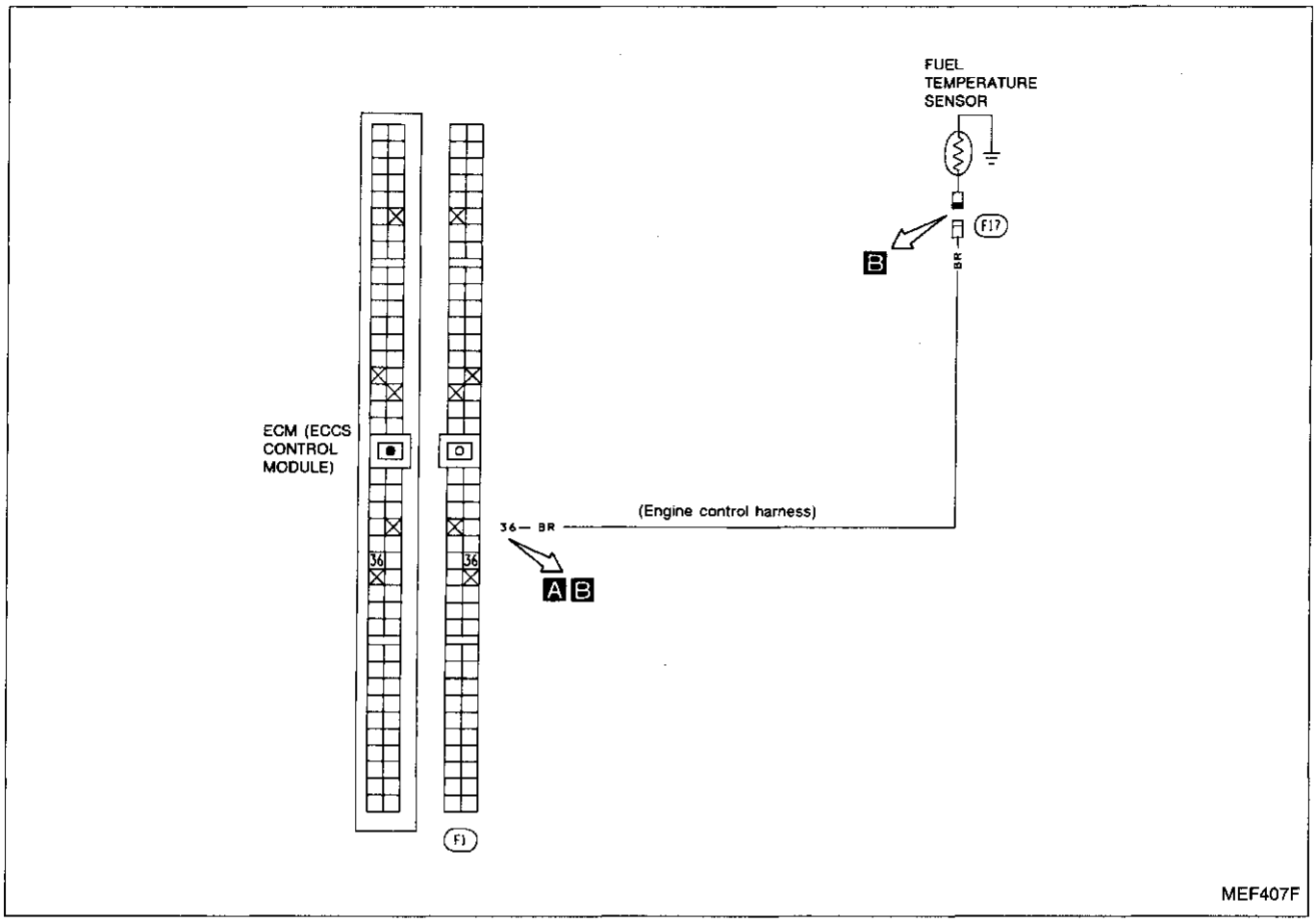
NG → 1) Perform ECM input/output signal inspection test.
2) If NG, recheck the ECM pin terminals for damage or the connection of ECM harness connector.

OK

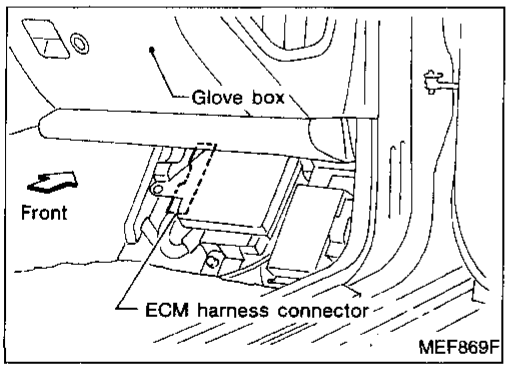
INSPECTION END

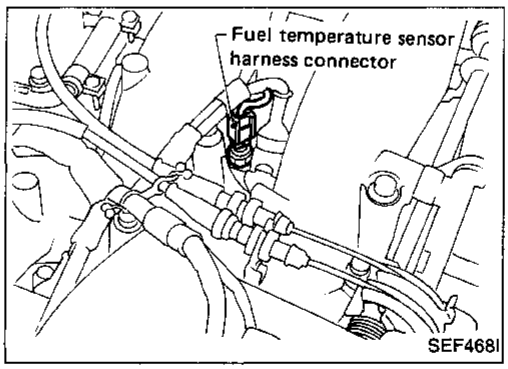
Diagnostic Procedure 34

FUEL TEMPERATURE SENSOR (Diagnostic trouble code No. 42)

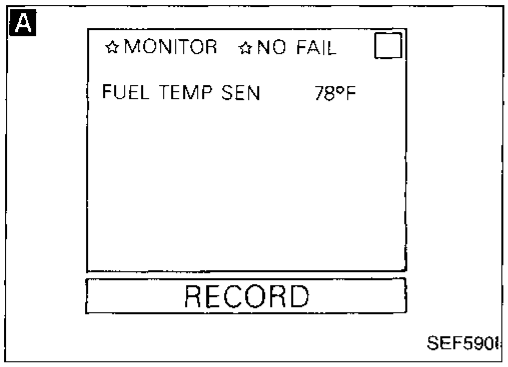


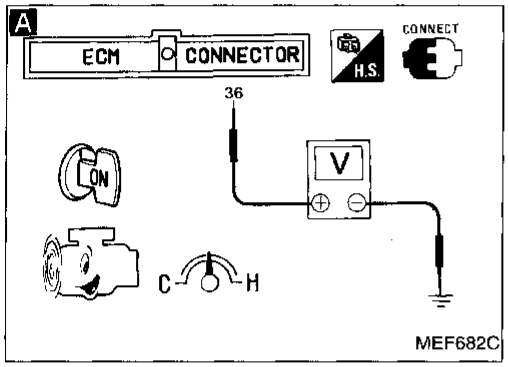
Harness layout

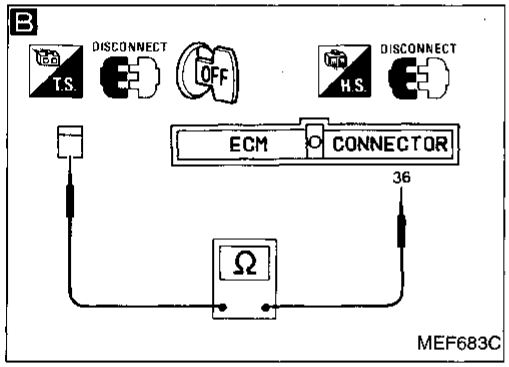




Diagnostic Procedure 34 (Cont'd)







INSPECTION START

A

CHECK INPUT SIGNAL.
1) Start engine and warm it up sufficiently.
2) Read "FUEL TEMP SEN" in "DATA MONITOR" mode with CONSULT.
Fuel temperature:
20 - 60°C (68 - 140°F)

OR

2) Check voltage between ECM terminal ㊱ and ground.
Voltage: 0 - 5.0V

NG → **B**

B

CHECK HARNESS CONTINUITY BETWEEN ECM AND FUEL TEMPERATURE SENSOR.
1) Stop engine.
2) Disconnect ECM harness connector.
3) Disconnect fuel temperature sensor harness connector.
4) Check continuity between ECM terminal ㊱ and fuel temperature sensor terminal.
Continuity should exist.

OK

CHECK COMPONENT (Fuel temperature sensor).
Refer to "Electrical Components Inspection".
(See page EF & EC-188.)

OK

Reinstall any part removed.

1) Erase the diagnostic test mode II (Self-diagnostic results) memory. (Refer to EF & EC-52.)
2) Perform test drive and then perform diagnostic test mode II (Self-diagnostic results) again. (Refer to EF & EC-50.)

NG

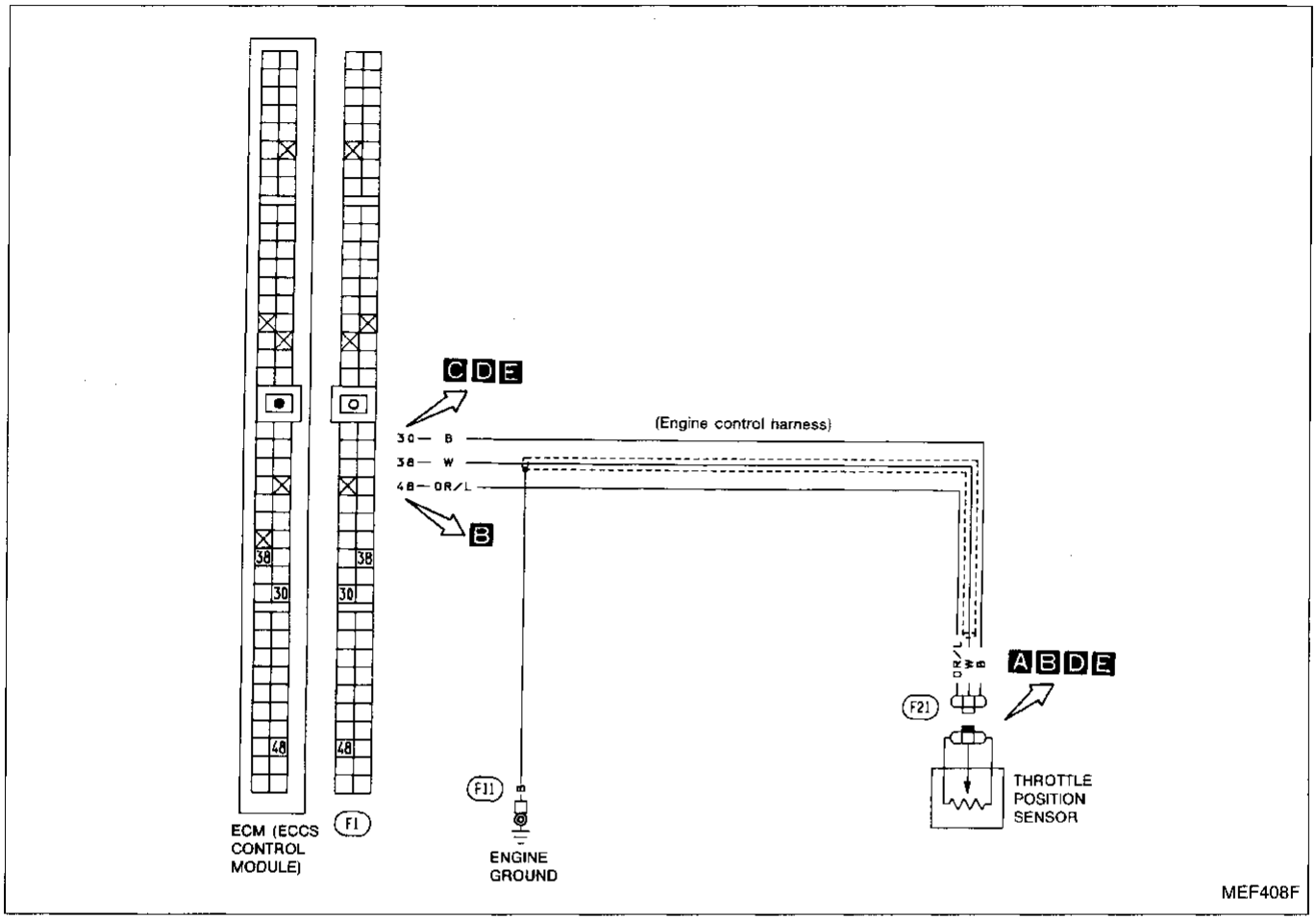
1) Perform ECM input/output signal inspection test.
2) If NG, recheck the ECM pin terminals for damage or the connection of ECM harness connector.

OK

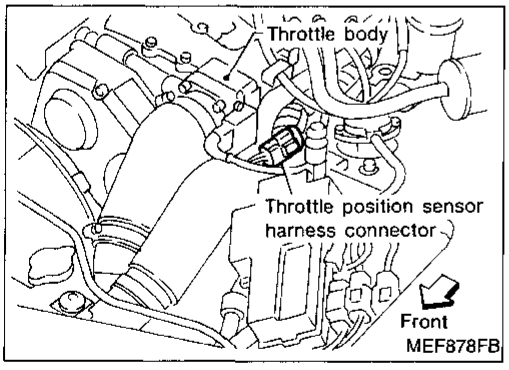
INSPECTION END

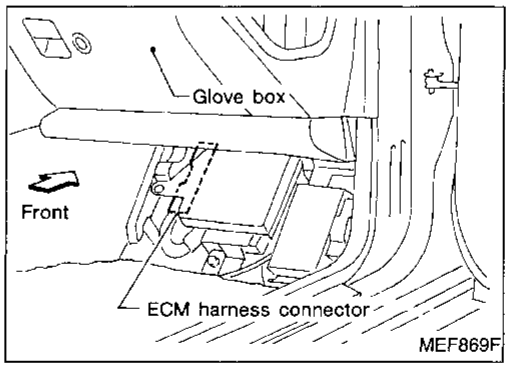
Diagnostic Procedure 35

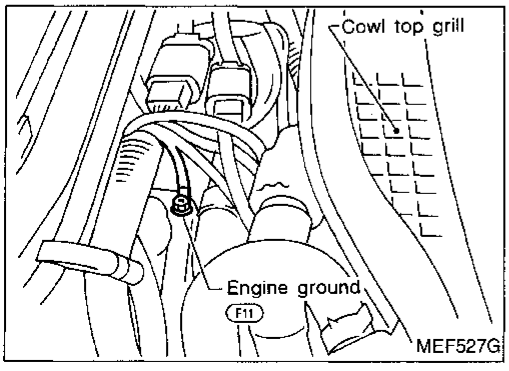
THROTTLE POSITION SENSOR (Diagnostic trouble code No. 43) CHECK (MALFUNCTION INDICATOR LAMP ITEM)



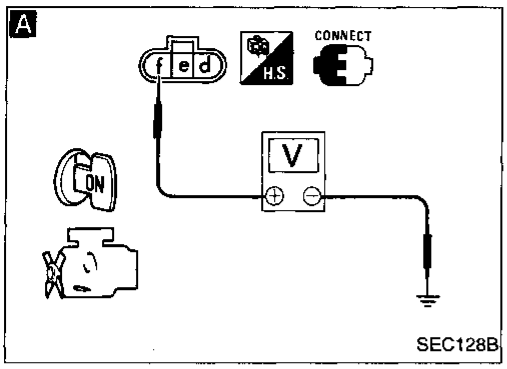
Harness layout

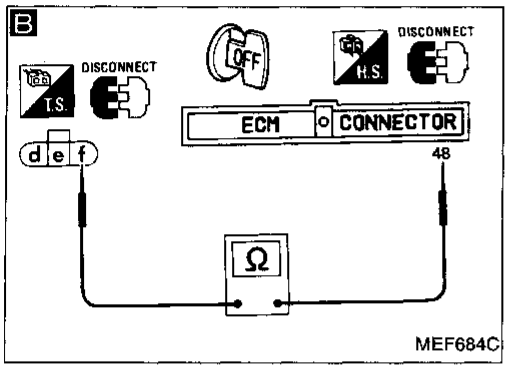


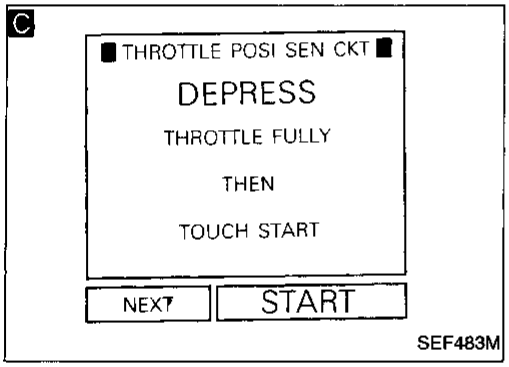


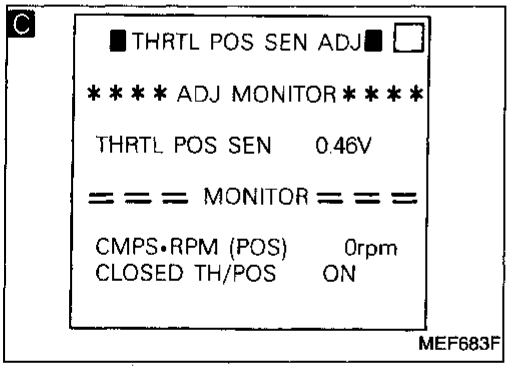


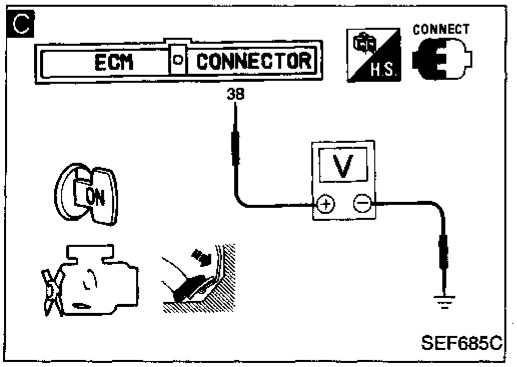
Diagnostic Procedure 35 (Cont'd)











INSPECTION START

A

CHECK POWER SOURCE.
1) Turn ignition switch "ON".
2) Check voltage between terminal ⓘ and ground.
Voltage:
Approximately 5.0V

NG → **B**

CHECK HARNESS CONTINUITY BETWEEN THROTTLE POSITION SENSOR AND ECM.
1) Turn ignition switch "OFF".
2) Disconnect throttle position sensor harness connector.
3) Disconnect ECM harness connector.
4) Check harness continuity between ECM terminal ㊽ and terminal ⓘ.
Continuity should exist.
If NG, repair harness or connectors.

OK

C

CHECK INPUT SIGNAL.
Perform "THROTTLE POSI SEN CKT" in "FUNCTION TEST" mode with CONSULT.

OR

Read "THRTL POS SEN" in "WORK SUPPORT" mode with CONSULT.
Throttle valve fully closed:
0.4 - 0.5V
Throttle valve fully open:
Approx. 4.0V

OR

Make sure that voltage between ECM terminal ㊳ and ground changes when accelerator pedal is depressed.
Voltage:
Throttle valve fully closed:
0.4 - 0.5V
Throttle valve fully open:
Approx. 4.0V

NG → ADJUST THROTTLE POSITION SENSOR INITIAL POSITION.
(See page EF & EC-185.)

D

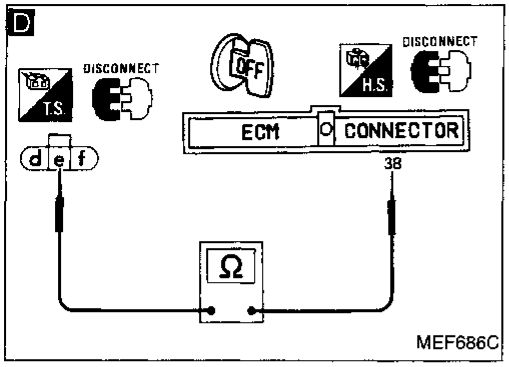
CHECK HARNESS CONTINUITY BETWEEN THROTTLE POSITION SENSOR AND ECM.
1) Turn ignition switch "OFF".
2) Disconnect throttle position sensor harness connector.
3) Disconnect ECM harness connector.
4) Check harness continuity between ECM terminal ㊳ and terminal ⓔ.
Continuity should exist.
If NG, repair harness or connectors.

OK → Ⓑ

OK → Ⓐ

Diagnostic Procedure 35 (Cont'd)

D



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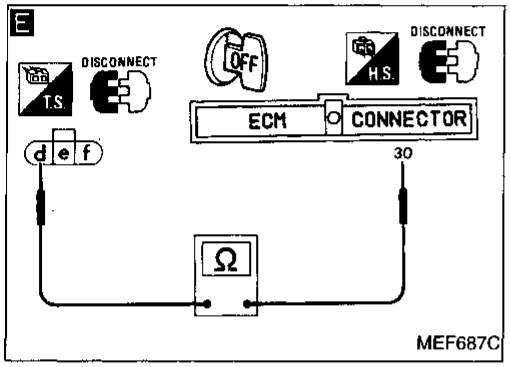
E



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Ⓐ

E

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect ECM harness connector.
3) Disconnect throttle position sensor harness connector.
4) Loosen and retighten ground screws.
5) Check resistance between ECM terminal ㉚ and terminal ⓓ.
Continuity should exist.

NG → 1) Check harness continuity between throttle position sensor and ground.
2) ECM ground circuit.

OK ↓

Reinstall any part removed. ↓

1) Erase the diagnostic test mode II (Self-diagnostic results) memory. (Refer to EF & EC-52.)
2) Perform test drive and then perform diagnostic test mode II (Self-diagnostic results) again. (Refer to EF & EC-50.)

NG → 1) Perform ECM input/output signal inspection test.
2) If NG, recheck the ECM pin terminals for damage or the connection of ECM harness connector.

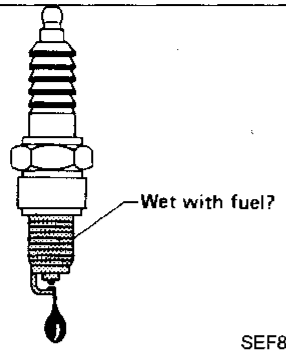
OK ↓

INSPECTION END

Ⓑ

CHECK COMPONENT
(Throttle position sensor).
Refer to "Electrical Components Inspection".
(See page EF & EC-184.)

Ⓐ



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Ⓑ **ROAD TEST**

Test conditions

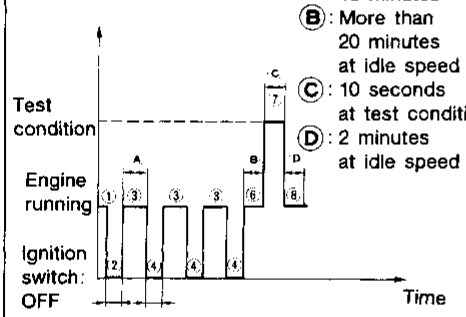
Drive vehicle under the following conditions with suitable gear position.

(1) Engine speed:
Non-turbocharger
2,150 ± 350 rpm
Turbocharger
2,150 ± 450 rpm

(2) Intake manifold vacuum:
Non-turbocharger
−43.3 ± 10.0 kPa
(−325 ± 75 mmHg, −12.80 ± 2.95 inHg)
Turbocharger
−33.3 ± 13.3 kPa
(−250 ± 100 mmHg, −9.84 ± 3.94 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 malfunction indicator lamp goes off.

① Start engine and warm it up sufficiently.
② Turn off ignition switch and keep it off until malfunction indicator lamp goes off.
③ Start engine and keep it running for more than 13 minutes.
④ Turn off ignition switch and keep it off until malfunction indicator lamp 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 is turns off.

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

SEF668NA

Diagnostic Procedure 36

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 warm-up.

Runs smoothly.

Does not run smoothly.

Set the diagnosis mode selector of ECM to Diagnostic Test Mode II. (Refer to EF & EC-48.)

These inspections should be performed on both heated oxygen sensors by changing monitor from left side to right side. (Refer to EF & EC-53.)
Check if the malfunction indicator lamp stays off during 10 seconds at 1,000 rpm under no-load.

Stays off.

Does not stay off.

Check mixture ratio feedback system. (See page EF & EC-35.)

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

These inspections should be performed on both heated oxygen sensors by changing monitor from left side to right side. (Refer to EF & EC-53.)
Set diagnosis to Diagnostic Test Mode II and check that malfunction indicator lamp blinks at 2,000 rpm under no-load.

Does not blink.

Blinks.

Check idle CO%. (See page EF & EC-35.)

INSPECTION END

Ⓐ

Remove all spark plugs from intake manifold. Are plugs wet with fuel?

Yes

Replace the injector in which cylinder spark plug is wet with fuel.

(Go to Ⓐ on next page.)

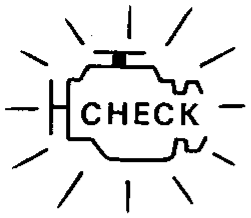
No

Remove injector assembly. (See page EF & EC-190.)
Keep fuel hose and all injectors connected to injector gallery.

Ⓑ

Diagnostic Procedure 36 (Cont'd)

C



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Ⓑ

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

Drips. → Replace the injectors which allow fuel to drip.

Does not drip.

Reinstall any part removed.

Erase the diagnostic test mode II (Self-diagnostic results) memory.
(Refer to EF & EC-52.)
Make sure Diagnostic trouble code No. 55 is displayed in Diagnostic Test Mode II.

Ⓐ

1) Start engine and warm it up sufficiently.
2) Disconnect both heated oxygen sensor harness connectors for at least 30 seconds at 1,500 rpm.

Connect both heated oxygen sensor harness connectors.

B

Perform driving test as indicated in figure B .

C

Make sure malfunction indicator lamp does not come "ON" while engine is running.

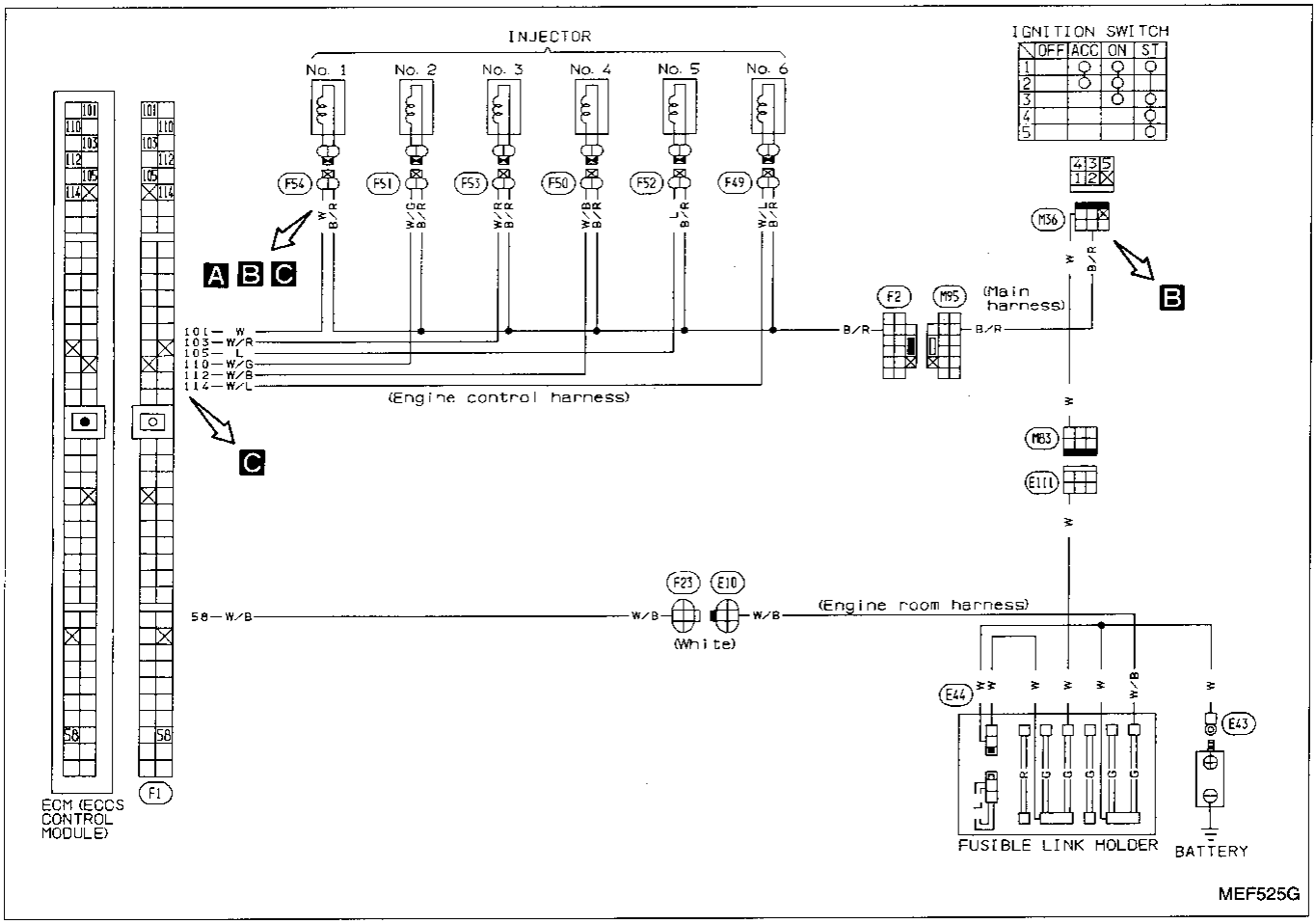
Comes "ON". →
1) Perform diagnostic test mode II (Self-diagnostic results) and find diagnostic trouble code.
2) According to displayed Diagnostic trouble code No., perform "Diagnostic Procedure".
3) If Diagnostic trouble code No. 45 is displayed again, replace all injectors, then perform "Diagnostic Procedure".

Does not come "ON".

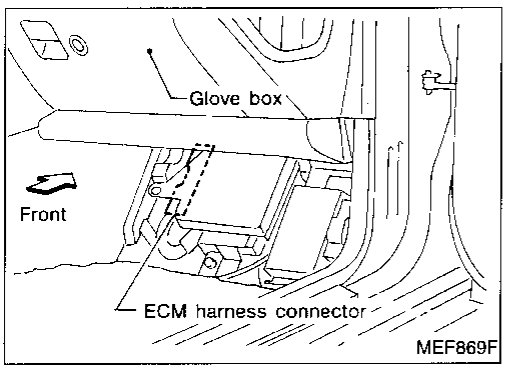
INSPECTION END

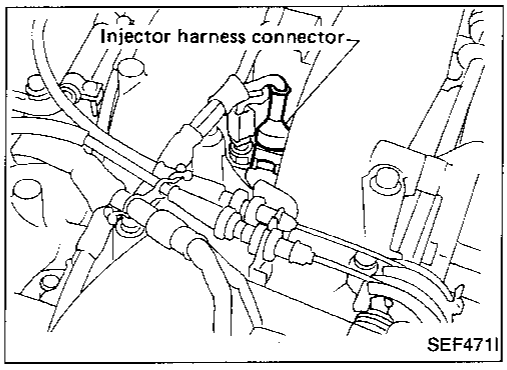
Diagnostic Procedure 37

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

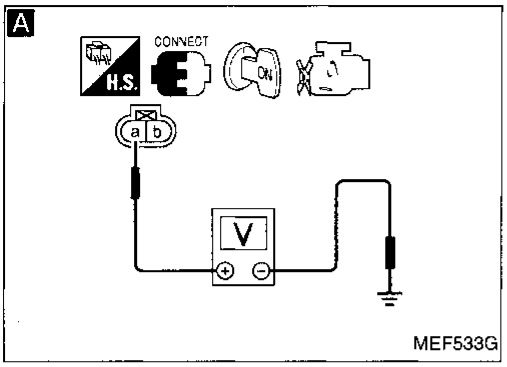


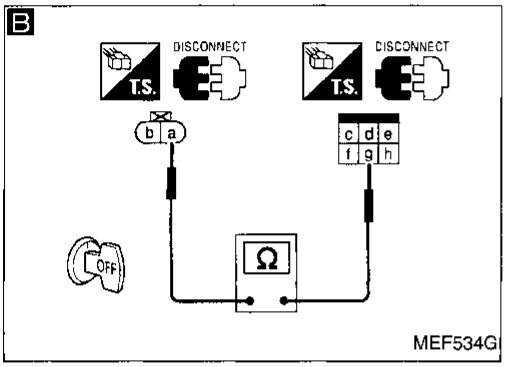
Harness layout

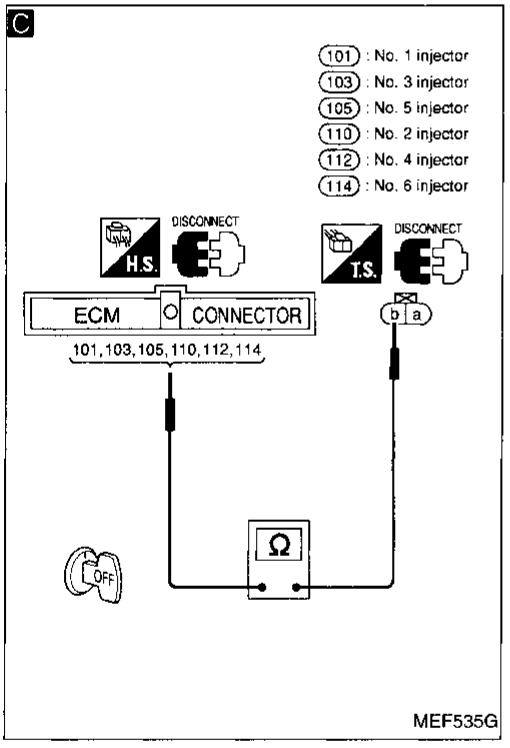




Diagnostic Procedure 37 (Cont'd)







INSPECTION START

A

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

NG → **B**

CHECK HARNESS CONTINUITY BETWEEN INJECTORS AND IGNITION SWITCH.
1) Turn ignition switch "OFF".
2) Disconnect injector harness connector.
3) Disconnect ignition switch harness connector.
4) Check harness continuity between terminal ⓐ and terminal ⓖ.
Continuity should exist.
If NG, replace harness, connector or fusible link.

OK

C

CHECK HARNESS CONTINUITY BETWEEN INJECTORS AND ECM.
1) Turn ignition switch "OFF".
2) Disconnect injector harness connectors and ECM harness connector.
3) Check harness continuity between terminals ⓑ and ECM terminals (101), (103), (105), (110), (112), (114).
Continuity should exist.

NG → Repair harness or connectors.

OK

CHECK COMPONENT (Injector).
Refer to "Electrical Components Inspection".
(See page EF & EC-186.)

NG → Repair or replace injector.

OK

Reinstall any part removed.

1) Erase the diagnostic test mode II (Self-diagnostic results) memory. (Refer to EF & EC-52.)
2) Perform test drive and then perform diagnostic test mode II (Self-diagnostic results) again. (Refer to EF & EC-50.)

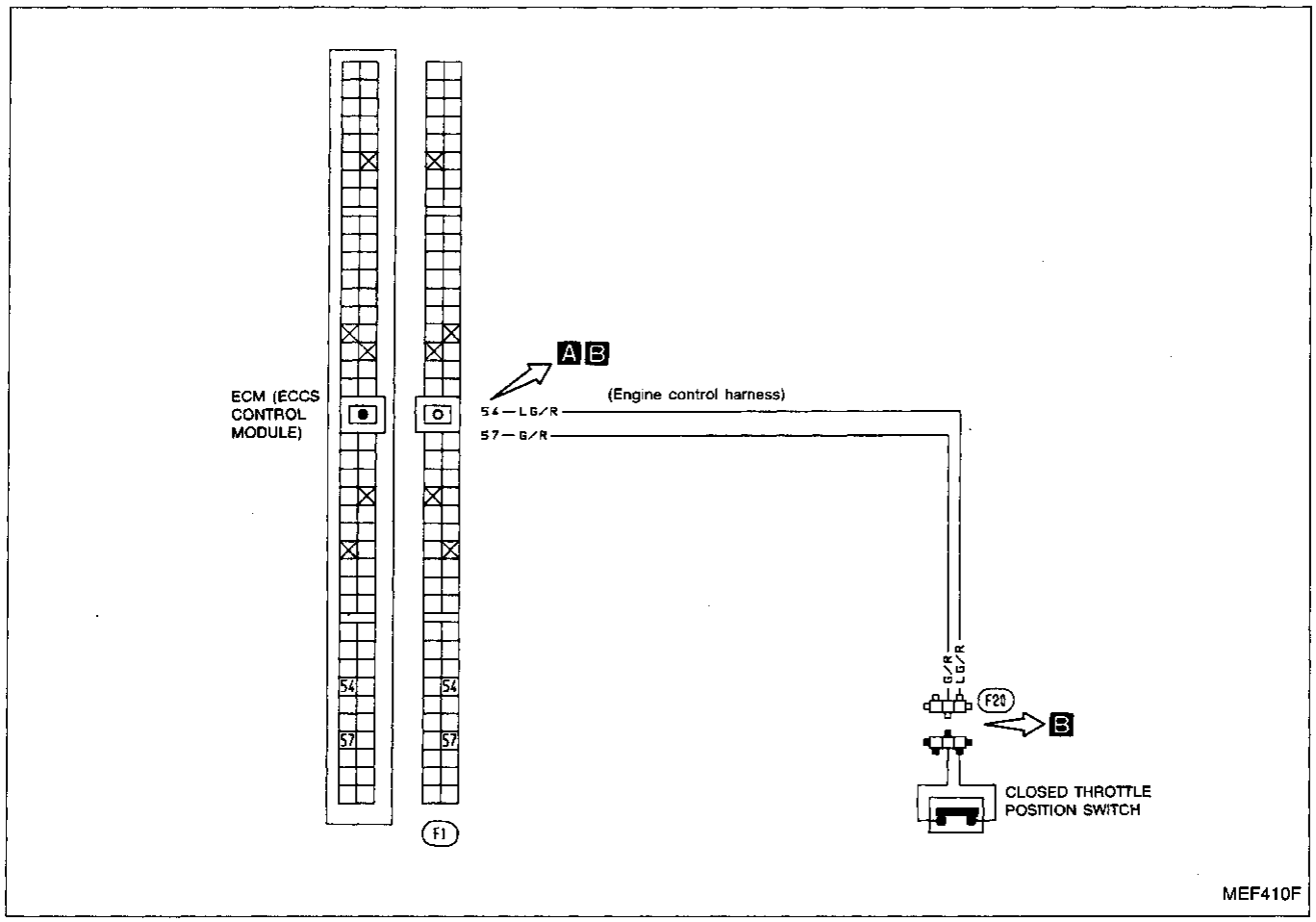
NG →
1) Perform ECM input/output signal inspection test.
2) If NG, recheck the ECM pin terminals for damage or the connection of ECM harness connector.

OK

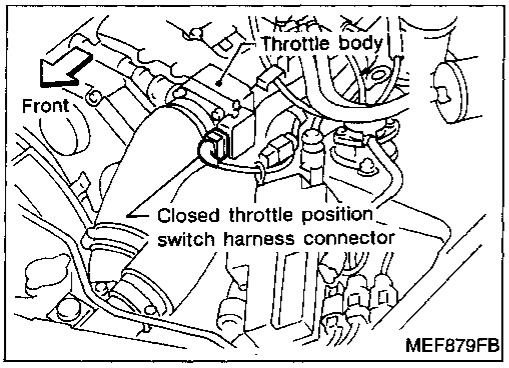
INSPECTION END

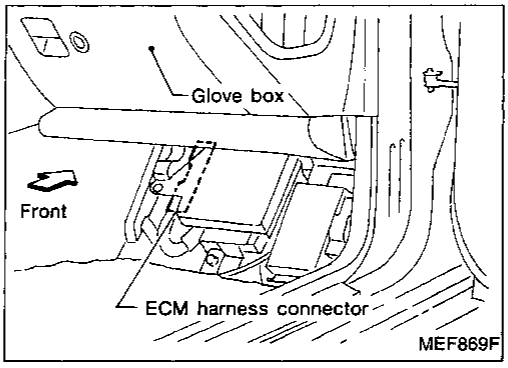
Diagnostic Procedure 38

CLOSED THROTTLE POSITION SWITCH (Idle position) (Not self-diagnostic item)

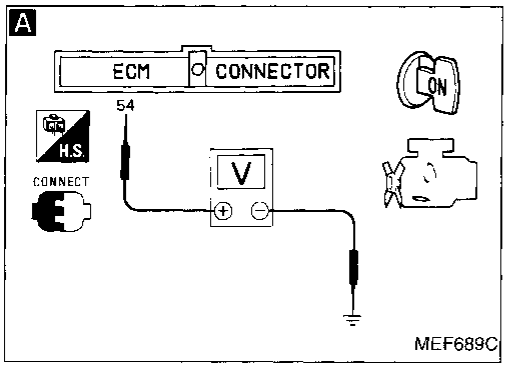


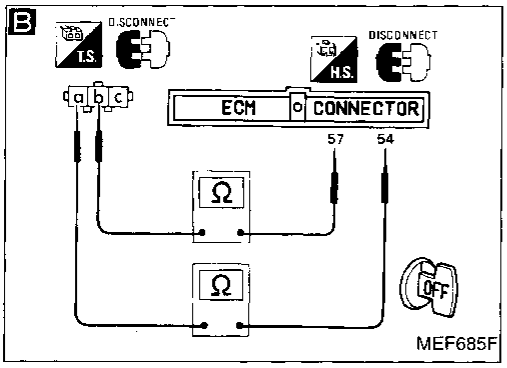
Harness layout





Diagnostic Procedure 38 (Cont'd)





INSPECTION START

A

CHECK INPUT SIGNAL.
1) Turn ignition switch "ON".
2) Check voltage between ECM terminal ⑤④ and ground.
Voltage:
Throttle valve fully closed:
9.0 - 10.0V
Throttle valve fully open:
0V

NG → B

CHECK HARNESS CONTINUITY BETWEEN ECM AND CLOSED THROTTLE POSITION SWITCH.
1) Turn ignition switch "OFF".
2) Disconnect closed throttle position switch harness connector.
3) Disconnect ECM harness connector.
4) Check harness continuity between ECM terminals ⑤④, ⑤⑦ and terminals ⓐ, ⓑ.
Continuity should exist.
If NG, repair harness or connectors.

OK

Check if closed throttle position switch (throttle position sensor body) is installed in proper position.
(See page EF & EC-185.)

OK

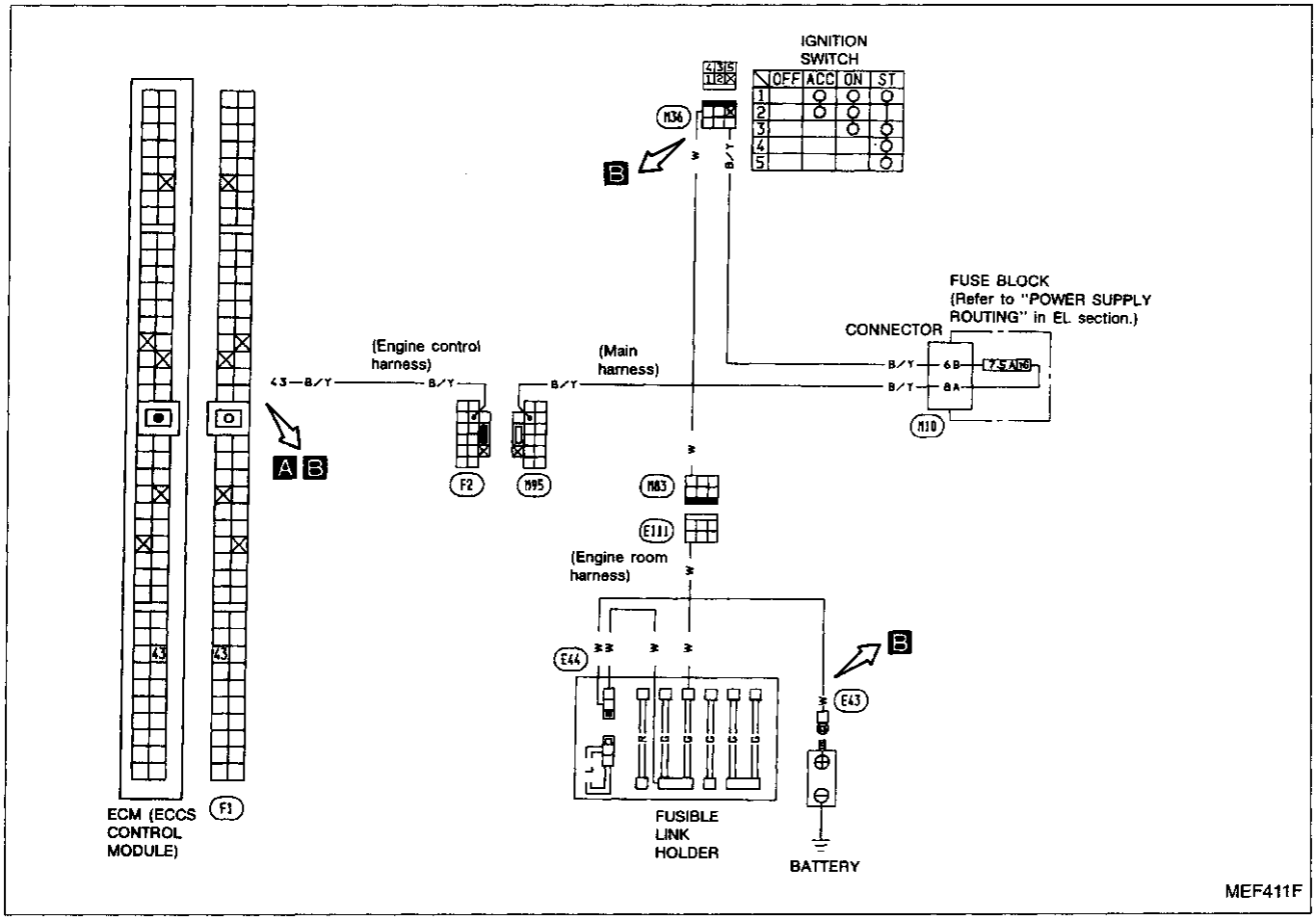
CHECK COMPONENT (closed throttle position switch).
Refer to "Electrical Components Inspection".
(See page EF & EC-185.)

OK

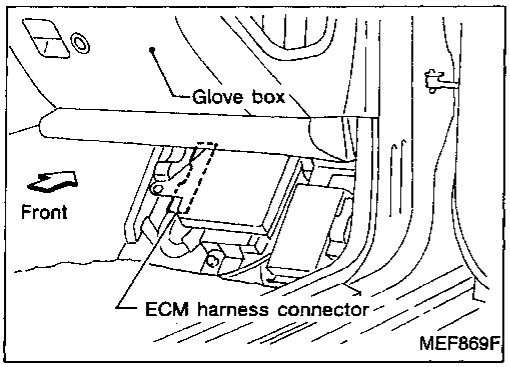
INSPECTION END

Diagnostic Procedure 39

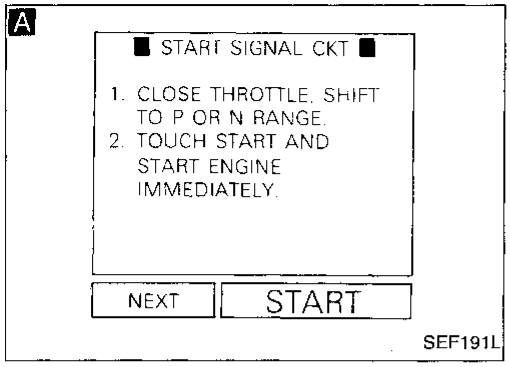
START SIGNAL (Not self-diagnostic item)

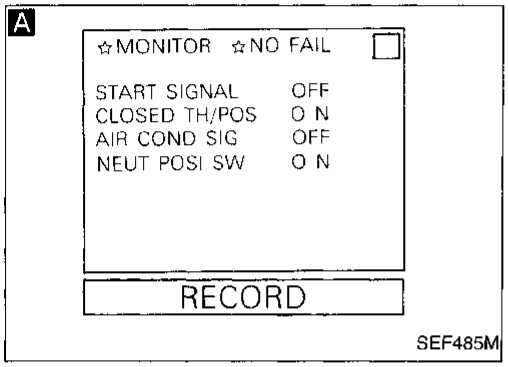


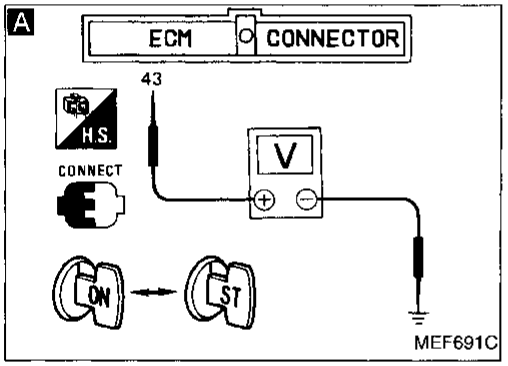
Harness layout

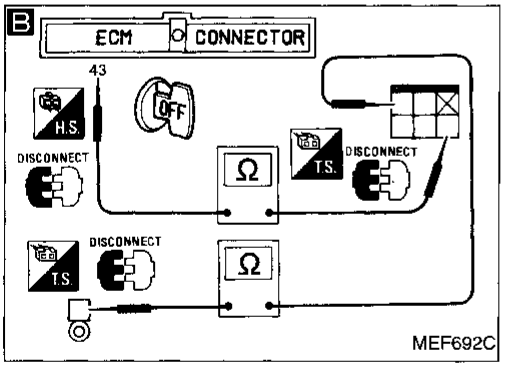


Diagnostic Procedure 39 (Cont'd)









INSPECTION START

A

CHECK OVERALL FUNCTION.

1) Turn ignition switch "ON".
2) Perform "START SIGNAL CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

OR

1) Turn ignition switch "ON".
2) Check "START SIGNAL" in "DATA MONITOR" mode with CONSULT.

IGN "ON"	OFF
IGN "START"	ON

OR

1) Check voltage between ECM terminal ㊸ and ground.
When cranking:
Battery voltage
Except above:
0V

NG → B

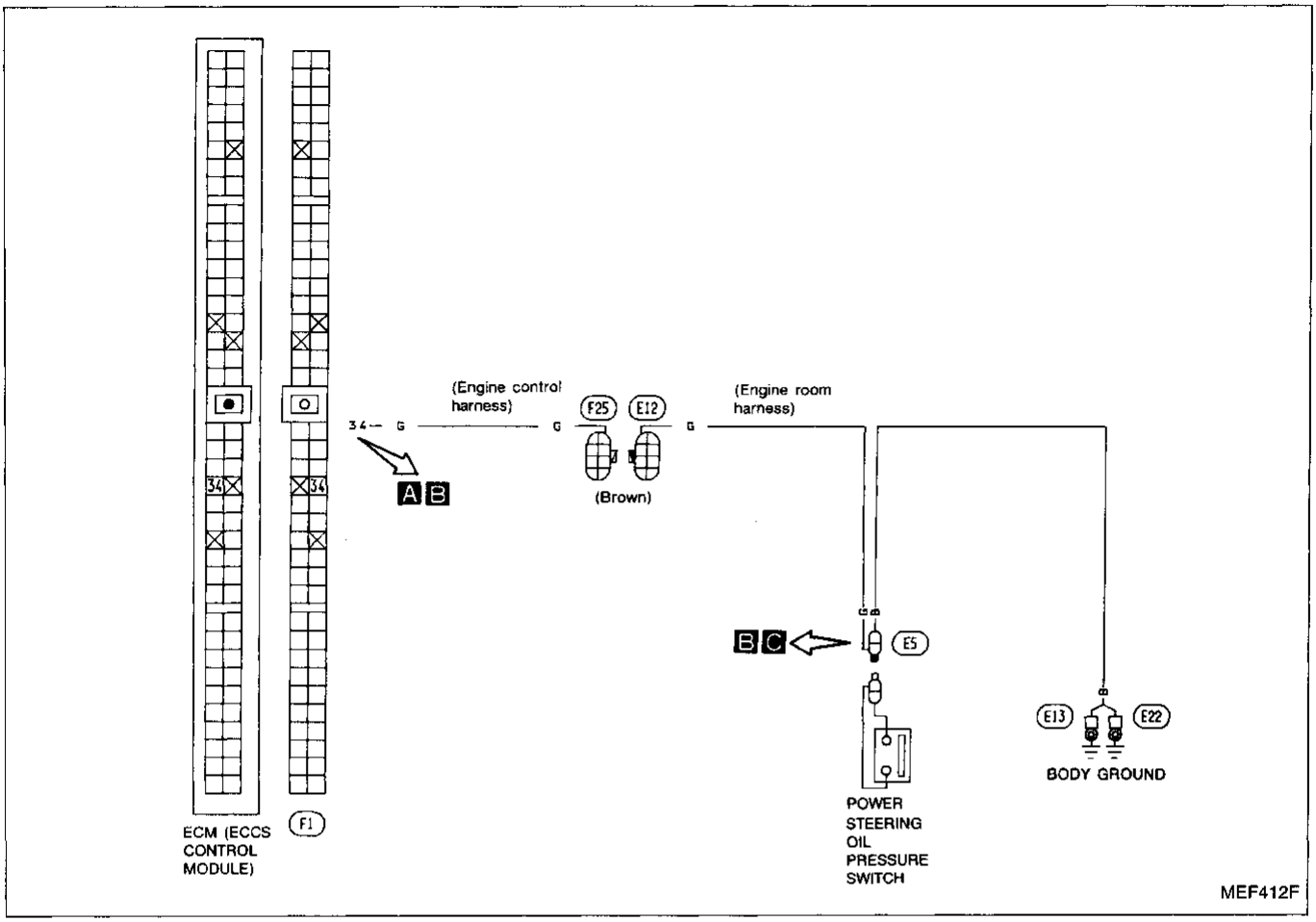
Check the following items.
1) "G" fusible link
2) "7.5A" fuse
3) Ignition switch
4) Harness continuity between ECM and ignition switch
Continuity should exist.
5) Harness continuity between battery ⊕ terminal and ignition switch
Continuity should exist.

OK

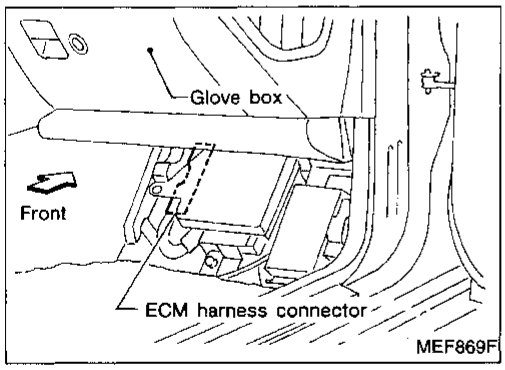
INSPECTION END

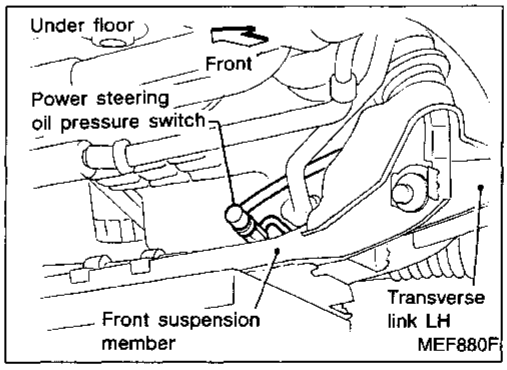
Diagnostic Procedure 40

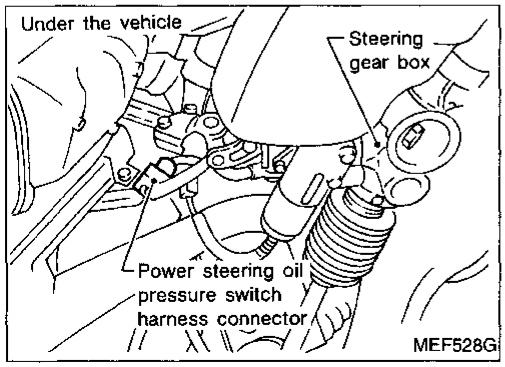
POWER STEERING OIL PRESSURE SWITCH (Not self-diagnostic item)



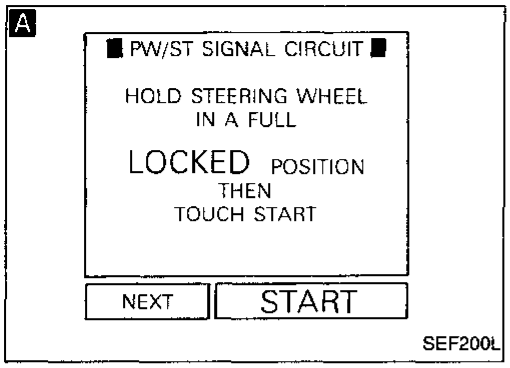
Harness layout

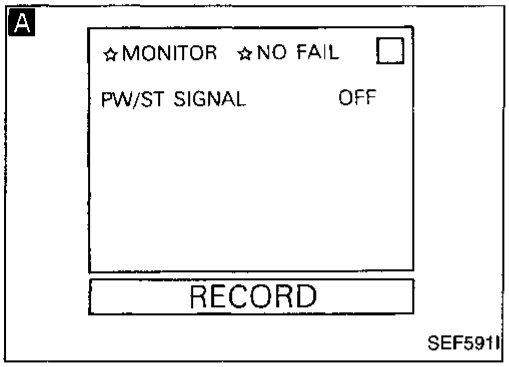


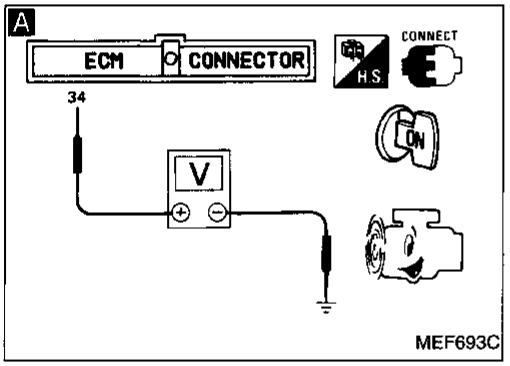


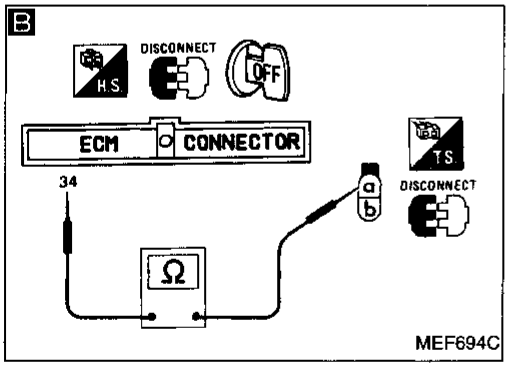


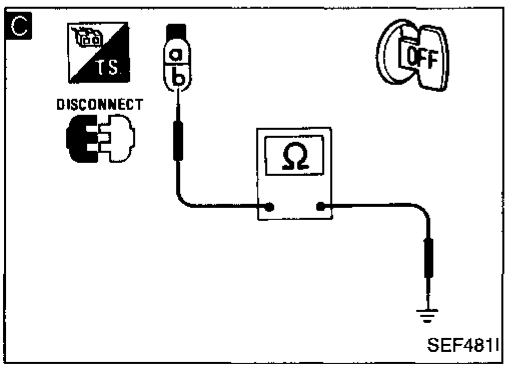
Diagnostic Procedure 40 (Cont'd)











INSPECTION START

A

CHECK OVERALL FUNCTION.
1) Turn ignition switch "ON".
2) Perform "PW/ST SIGNAL CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

OK → INSPECTION END

OR

1) Start engine.
2) Check "PW/ST SIGNAL" in "DATA MONITOR" mode with CONSULT.
Steering is neutral position: OFF
Steering is turned: ON

OR

1) Start engine.
2) Check voltage between ECM terminal ㉞ and ground with tester.
Voltage:
Steering is neutral position:
Approx. 5V
Steering is turned:
Approx. 0V

NG

B

CHECK HARNESS CONTINUITY BETWEEN POWER STEERING OIL PRESSURE SWITCH AND ECM.
1) Turn ignition switch "OFF".
2) Disconnect ECM harness connector and power steering oil pressure switch harness connector.
3) Check harness continuity between ECM terminal ㉞ and ⓑ.
Continuity should exist.

NG → Repair or replace harness or connectors.

OK

C

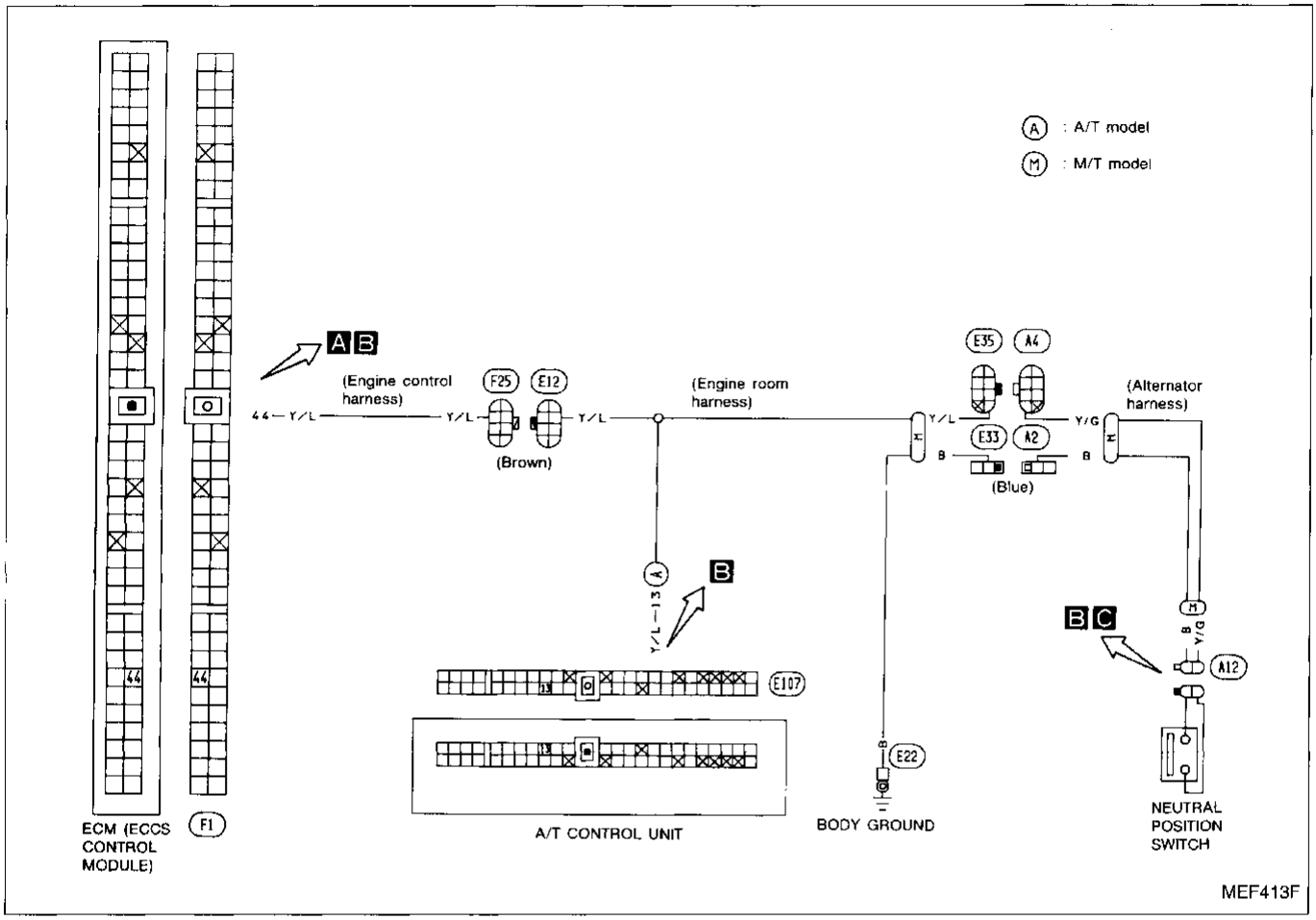
CHECK GROUND CIRCUIT.
Check harness continuity between terminal ⓑ and ground.
Continuity should exist.

NG → Repair or replace harness or connectors.

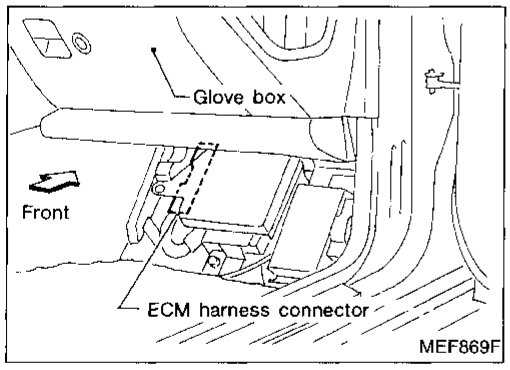
OK → CHECK COMPONENT. (Power steering oil pressure switch)
Refer to "Electrical Components Inspection".
(See page EF & EC-187.)

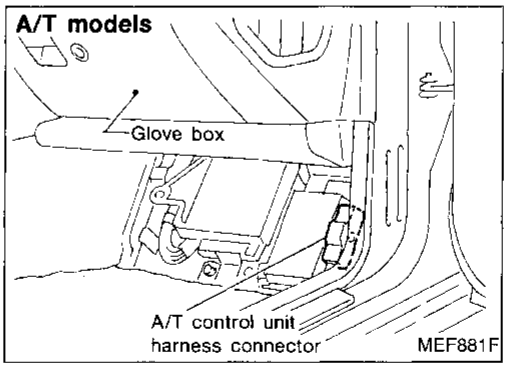
Diagnostic Procedure 41

NEUTRAL POSITION SWITCH & A/T CONTROL UNIT (NEUTRAL POSITION SIGNAL) CIRCUIT (Not self-diagnostic item)

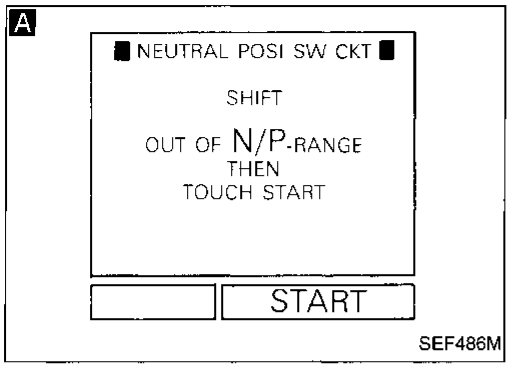


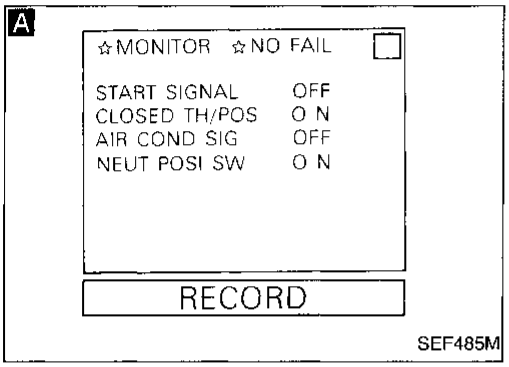
Harness layout

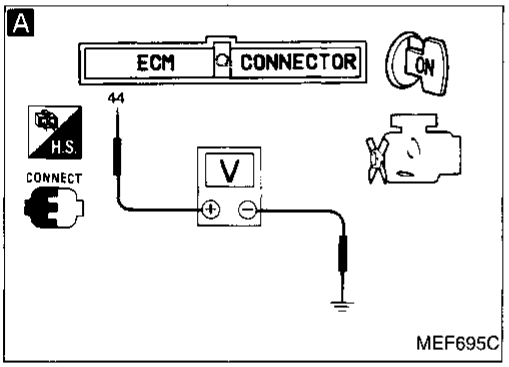


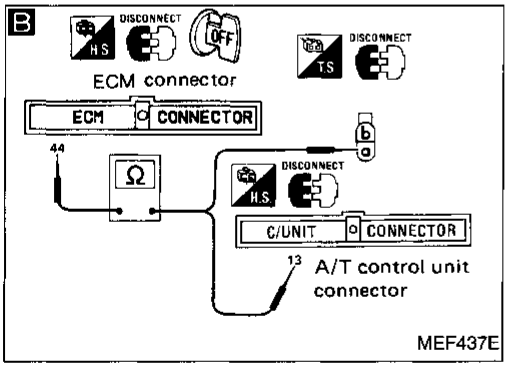


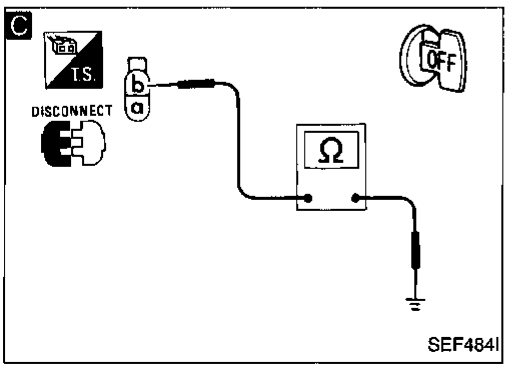
Diagnostic Procedure 41 (Cont'd)











INSPECTION START

A

CHECK OVERALL FUNCTION.
1) Turn ignition switch "ON".
2) Perform "NEUTRAL POSI SW CKT" in "FUNCTION TEST" mode with CONSULT.

OK → INSPECTION END

OR

1) Turn ignition switch "ON".
2) Perform "NEUT POSI SW" in "DATA MONITOR" mode with CONSULT.
"N" or "P": ON
Except above: OFF

OR

2) Check voltage between ECM terminal ㊹ and ground.
"N" or "P": Approx. 0V
Except above: Approx. 5V

NG

B

CHECK HARNESS CONTINUITY BETWEEN ECM AND NEUTRAL POSITION SWITCH (A/T CONTROL UNIT).
1) Turn the ignition switch "OFF".
2) Disconnect ECM harness connector.
3) Disconnect neutral position switch harness connector or A/T control unit harness connector.
4) Check harness continuity between ECM terminal ㊹ and ⑧ or ⑬.
Continuity should exist.

NG → Repair or replace harness or connectors.

OK

C

CHECK GROUND CIRCUIT
(M/T only).
Check harness continuity between terminal ⑥ and ground.
Continuity should exist.

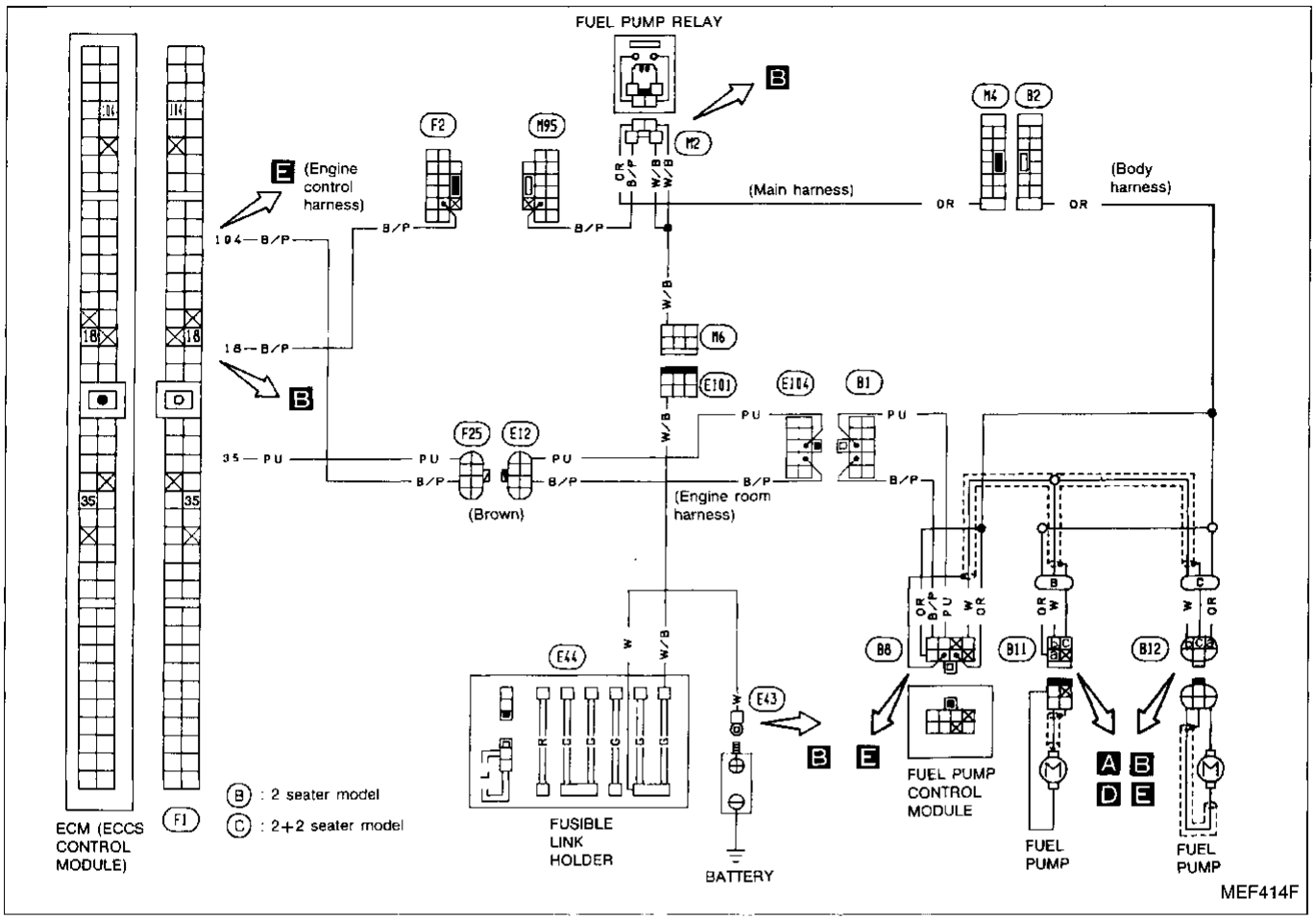
NG → Repair or replace harness or connectors.

OK

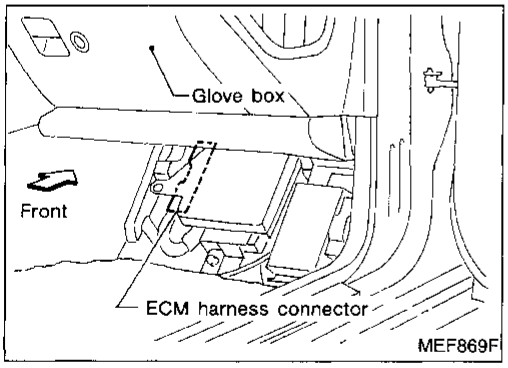
CHECK COMPONENT.
- (Neutral position switch) Refer to "Electrical Components Inspection". (See page EF & EC-187.)
- (A/T control unit) See "TROUBLE DIAGNOSES" in A/T section.
- (Inhibitor switch) Refer to "Electrical Components Inspection". (See page EF & EC-187.)

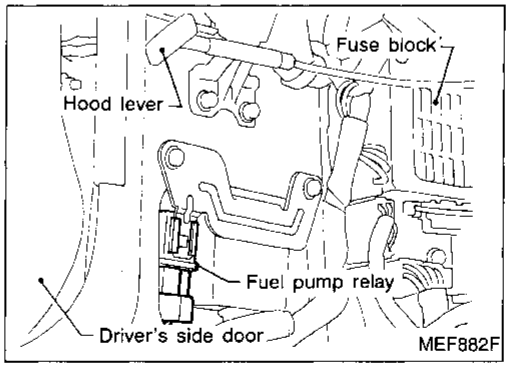
Diagnostic Procedure 42

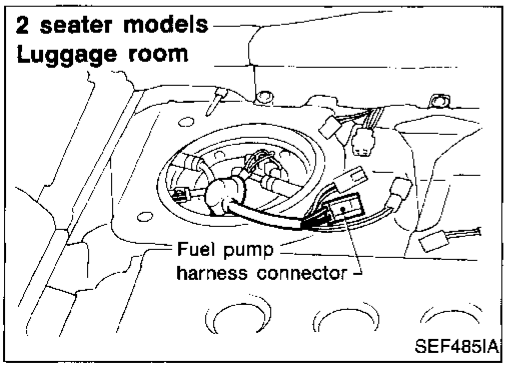
FUEL PUMP (Not self-diagnostic item)

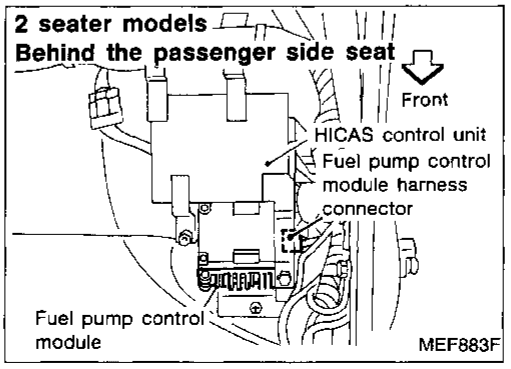


Harness layout

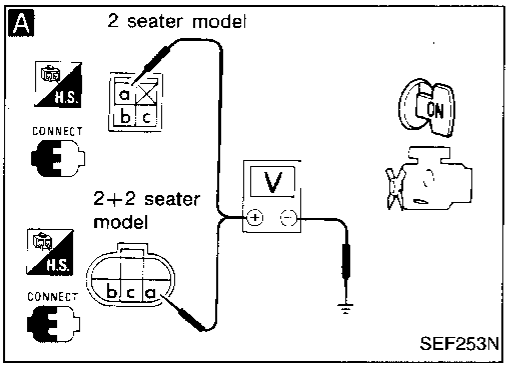


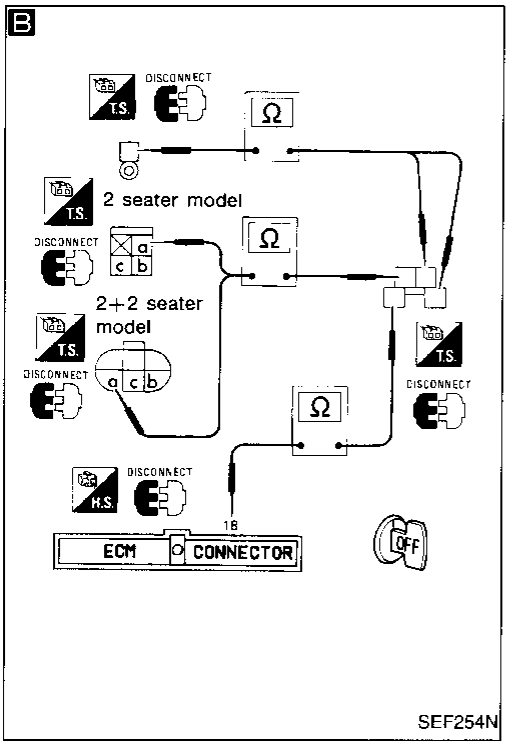


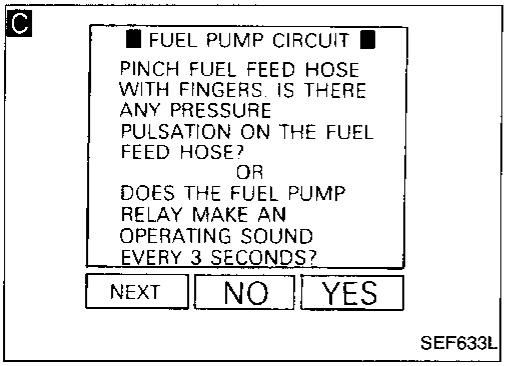


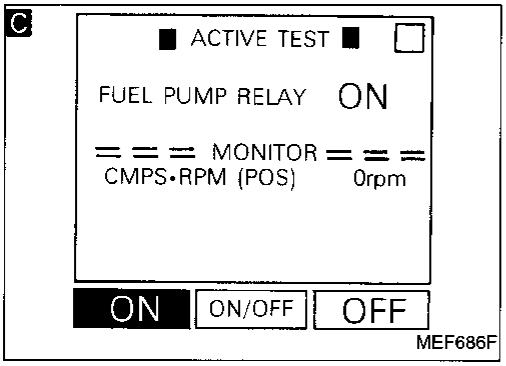


Diagnostic Procedure 42 (Cont'd)









INSPECTION START

A

CHECK POWER SUPPLY.
1) Turn ignition switch "ON".
2) Check voltage between fuel pump connector terminal ⓐ and ground.
Battery voltage indication should appear for 5 seconds after turning ignition switch "ON".

NG → **B**

Check the following items.
1) "G" fusible link
2) Harness continuity between
- battery ⊕ terminal and fuel pump relay
- fuel pump relay and fuel pump
- fuel pump relay and ECM terminal ⑱

Continuity should exist.

OK → **C**

CHECK COMPONENT (Fuel pump relay).

Perform "FUEL PUMP CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

OR

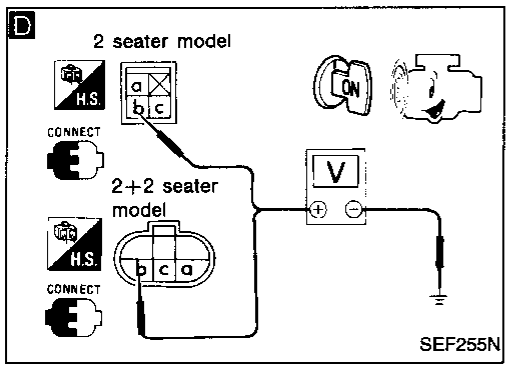
Perform "FUEL PUMP RELAY TEST" in "ACTIVE TEST" mode with CONSULT and check for operating sound.

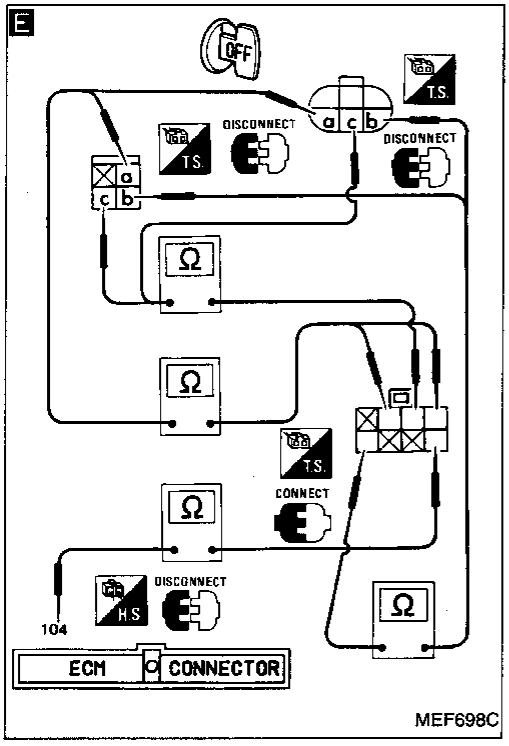
OR

Refer to "Electrical Components Inspection". (See page EF & EC-187.)

OK → Ⓐ

Diagnostic Procedure 42 (Cont'd)





Ⓐ

D

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Loosen and retighten ground screws.
3) Start engine.
4) Check voltage between fuel pump terminal ⓑ and ground under the following conditions.

Idling	Approx. 3 - 6V
For 30 seconds after starting engine	Battery voltage

NG → **E**

Check the following items.
Harness continuity between
- fuel pump and fuel pump control module
- fuel pump control module and ECM terminal (104)

Continuity should exist.

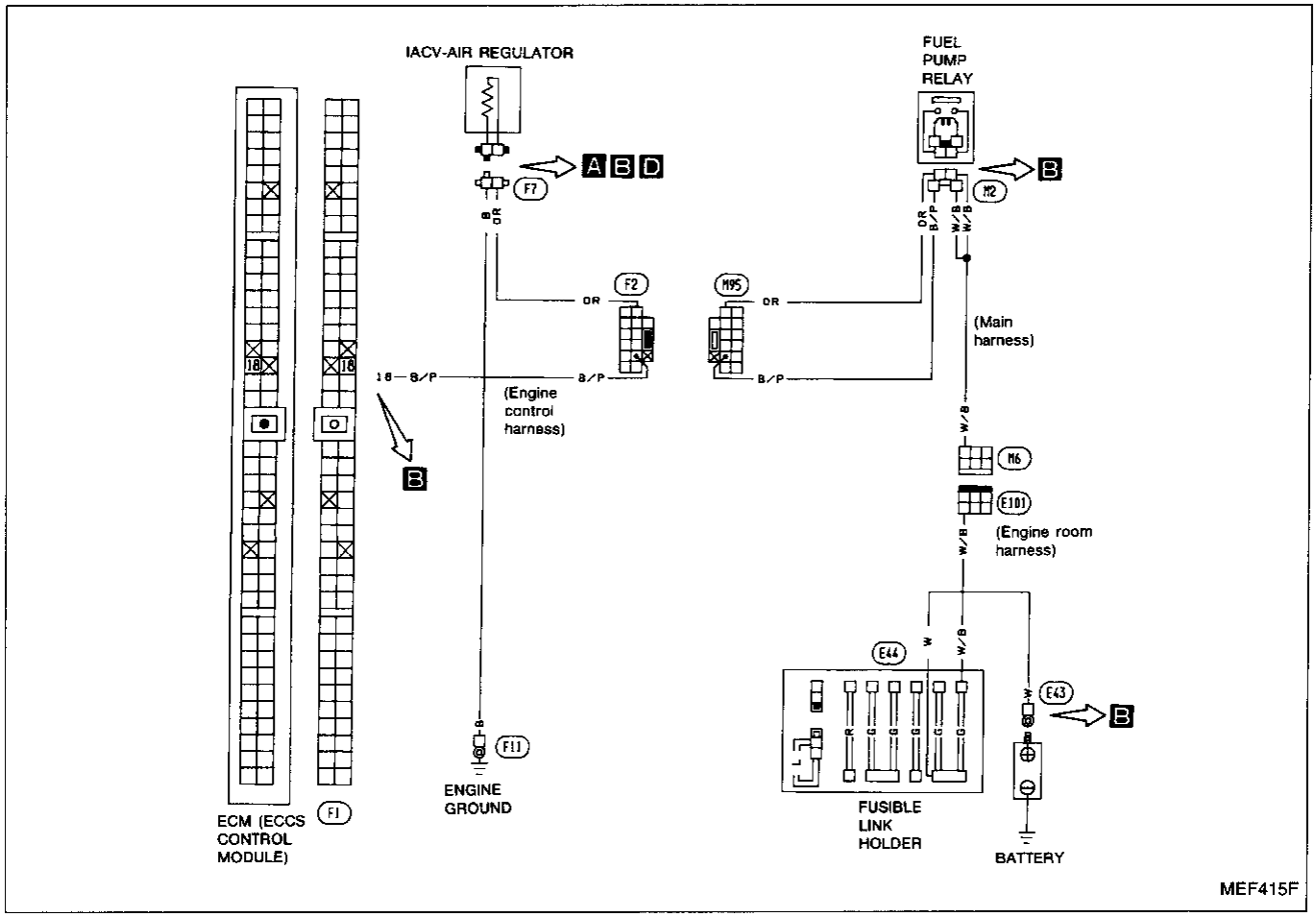
OK → CHECK COMPONENT (Fuel pump).
Refer to "Electrical Components Inspection".
(See page EF & EC-182.)

NG → Replace fuel pump control module.

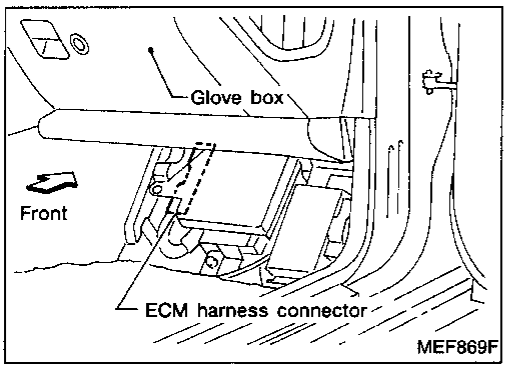
OK → INSPECTION END

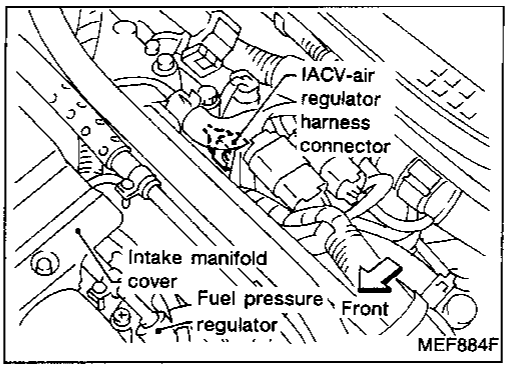
Diagnostic Procedure 43

IACV-AIR REGULATOR (Not self-diagnostic item)

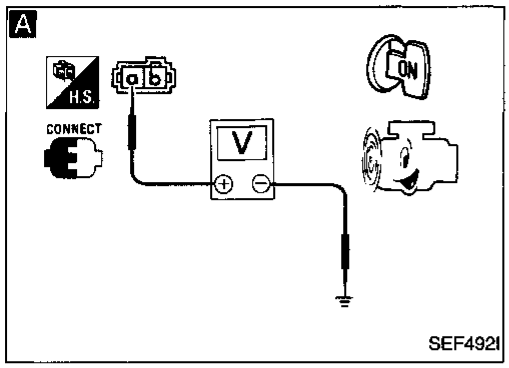


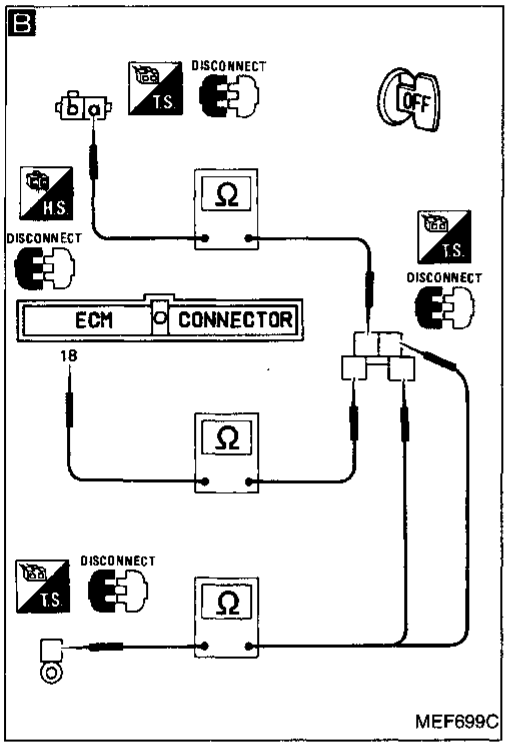
Harness layout

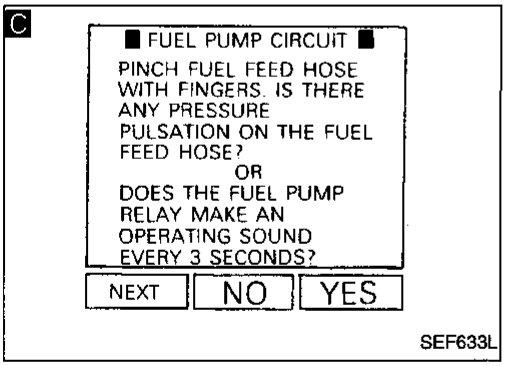


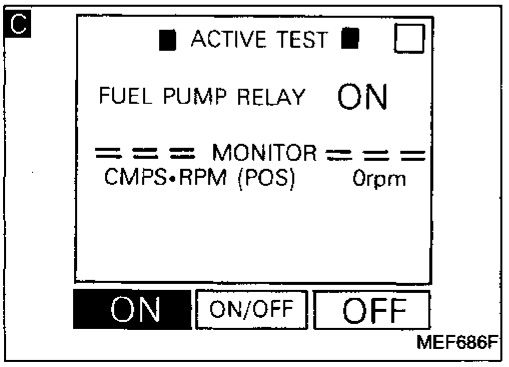


Diagnostic Procedure 43 (Cont'd)









INSPECTION START

A

CHECK POWER SUPPLY.
1) Start engine.
2) Check voltage between IACV-air regulator terminal ⑧ and ground.
Voltage: Battery voltage

NG → B

B

Check the following items.
1) Harness continuity between
- IACV-air regulator and fuel pump relay
- fuel pump relay and battery ⊕ terminal
- fuel pump relay and ECM terminal ⑱

Continuity should exist.
2) "G" fusible link

OK → C

OK

C

CHECK COMPONENT (Fuel pump relay).

Perform "FUEL PUMP CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

OR

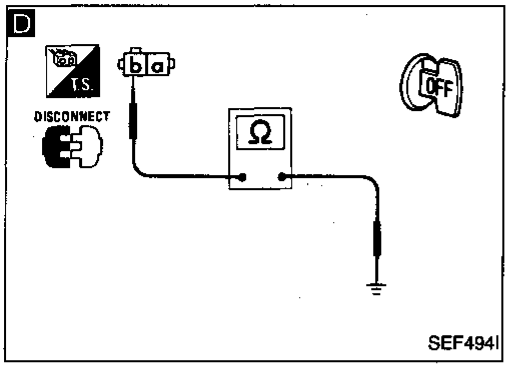
Perform "FUEL PUMP RELAY TEST" in "ACTIVE TEST" mode with CONSULT and check for operating sound.

OR

Refer to "Electrical Components Inspection". (See page EF & EC-187.)

Ⓐ

Diagnostic Procedure 43 (Cont'd)



Ⓐ

D

CHECK GROUND CIRCUIT.
1) Stop engine.
2) Disconnect IACV-air regulator harness connector.
3) Check harness continuity between terminal ⓑ and ground.
Continuity should exist.

NG → Repair or replace harness or connectors.

OK ↓

CHECK COMPONENT
(IACV-air regulator).
Refer to "Electrical Components Inspection".
(See page EF & EC-186.)

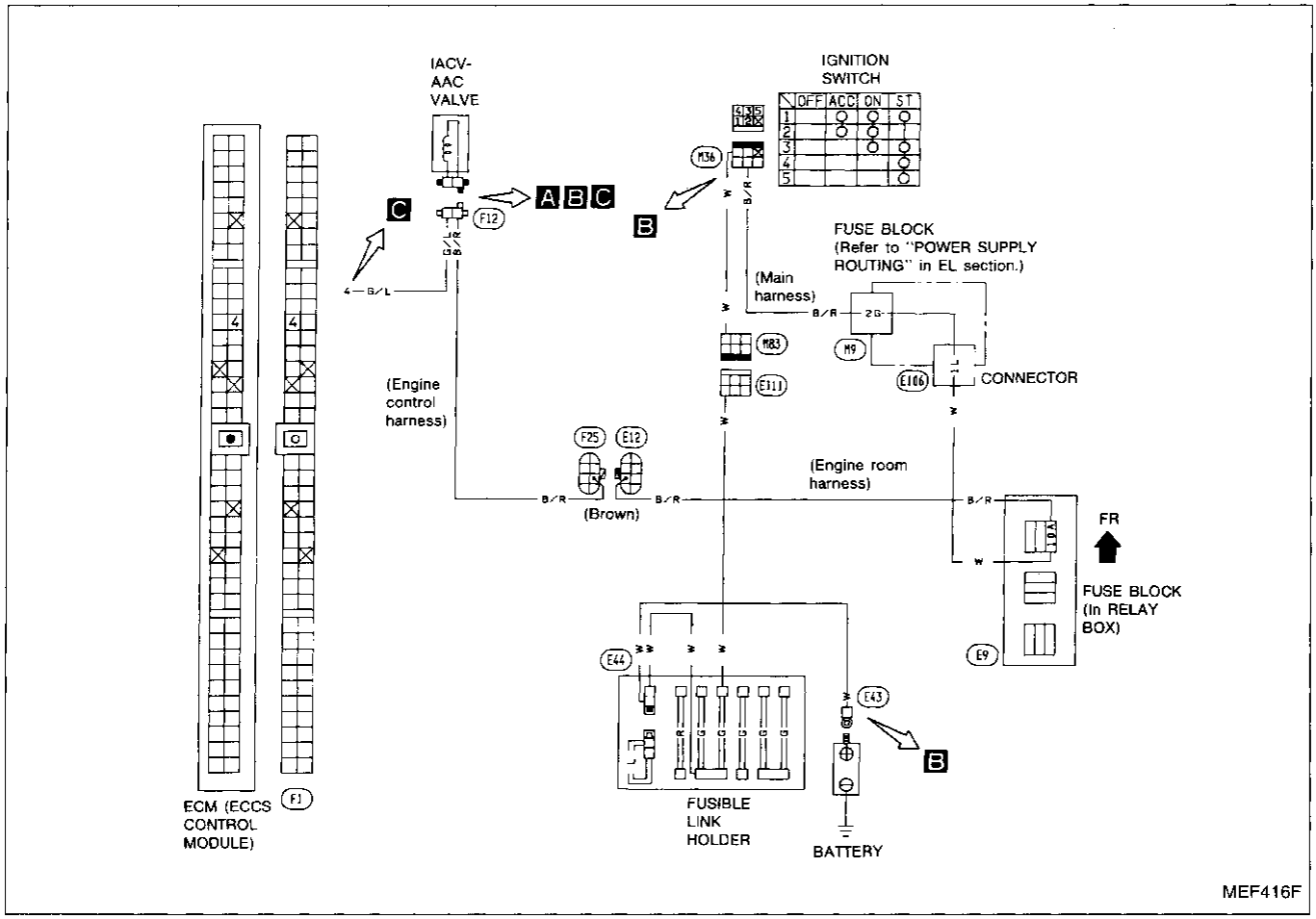
NG → Repair or replace IACV-air regulator.

OK ↓

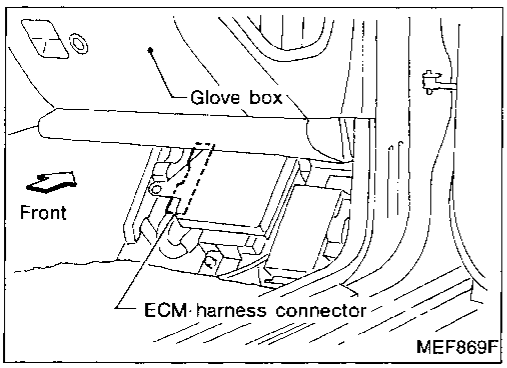
INSPECTION END

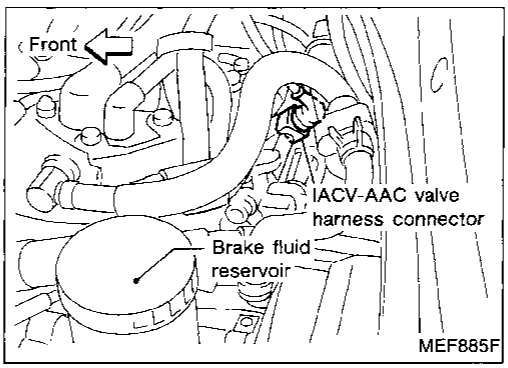
Diagnostic Procedure 44

IACV-AAC VALVE (Not self-diagnostic item)



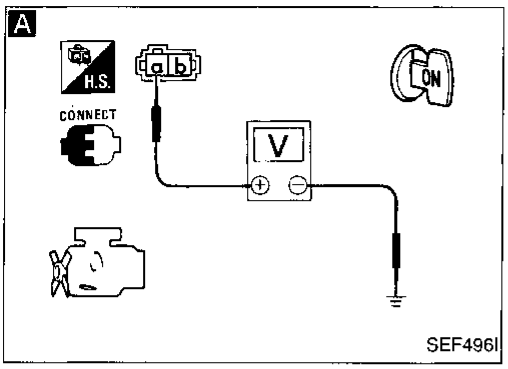
Harness layout



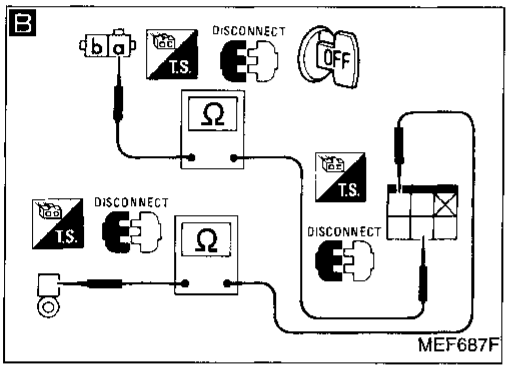


Diagnostic Procedure 44 (Cont'd)

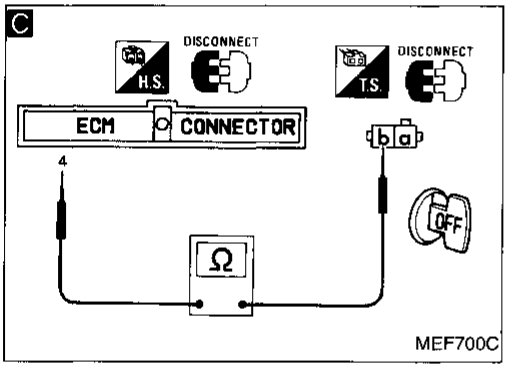
A



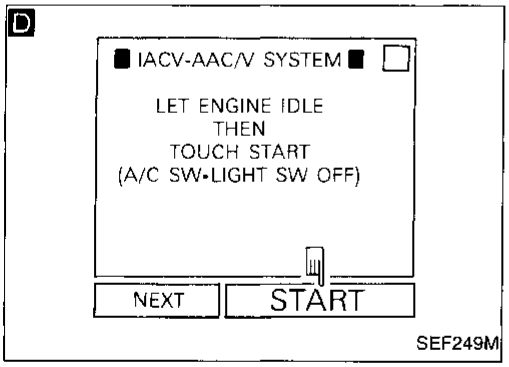
B



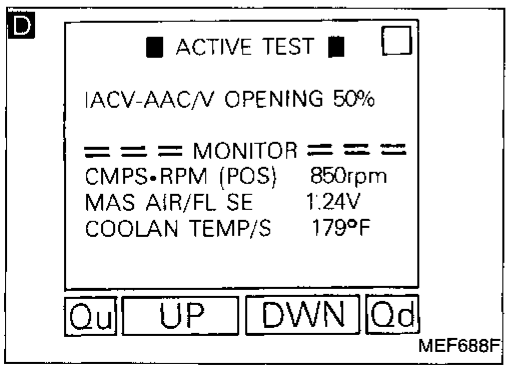
C



D



D



INSPECTION START

A

CHECK POWER SUPPLY.
1) Turn ignition switch "ON".
2) Check voltage between IACV-AAC valve terminal ⓐ and ground.
Voltage: Battery voltage.

NG → **B**

Check the following items.
1) "G" fusible link
2) Ignition switch
3) "10A" fuses
4) Harness continuity between terminals:
- IACV-AAC valve and ignition switch
- Ignition switch and battery ⊕ terminal.

OK ↓

C

CHECK HARNESS CONTINUITY BETWEEN IACV-AAC VALVE AND ECM.
1) Turn ignition switch "OFF".
2) Disconnect ECM harness connector and IACV-AAC valve harness connector.
3) Check harness continuity between terminal ⓑ and ECM terminal ④.
Continuity should exist.

NG → Repair or replace harness or connectors.

OK ↓

D

CHECK COMPONENT (IACV-AAC valve).
1) Reconnect ECM harness connector and IACV-AAC valve harness connector.
2) Start engine and let it idle.
3) Perform "IACV-AAC/V SYSTEM" in "FUNCTION TEST" mode with CONSULT.

— OR —

3) Select "IACV-AAC/V OPENING" in "ACTIVE TEST" mode with CONSULT.
4) When touching "Qu" and "Qd", check that engine speed changes according to the IACV-AAC valve opening percentage.

— OR —

3) Disconnect IACV-AAC valve harness connector.
4) Make sure that idle speed drops.

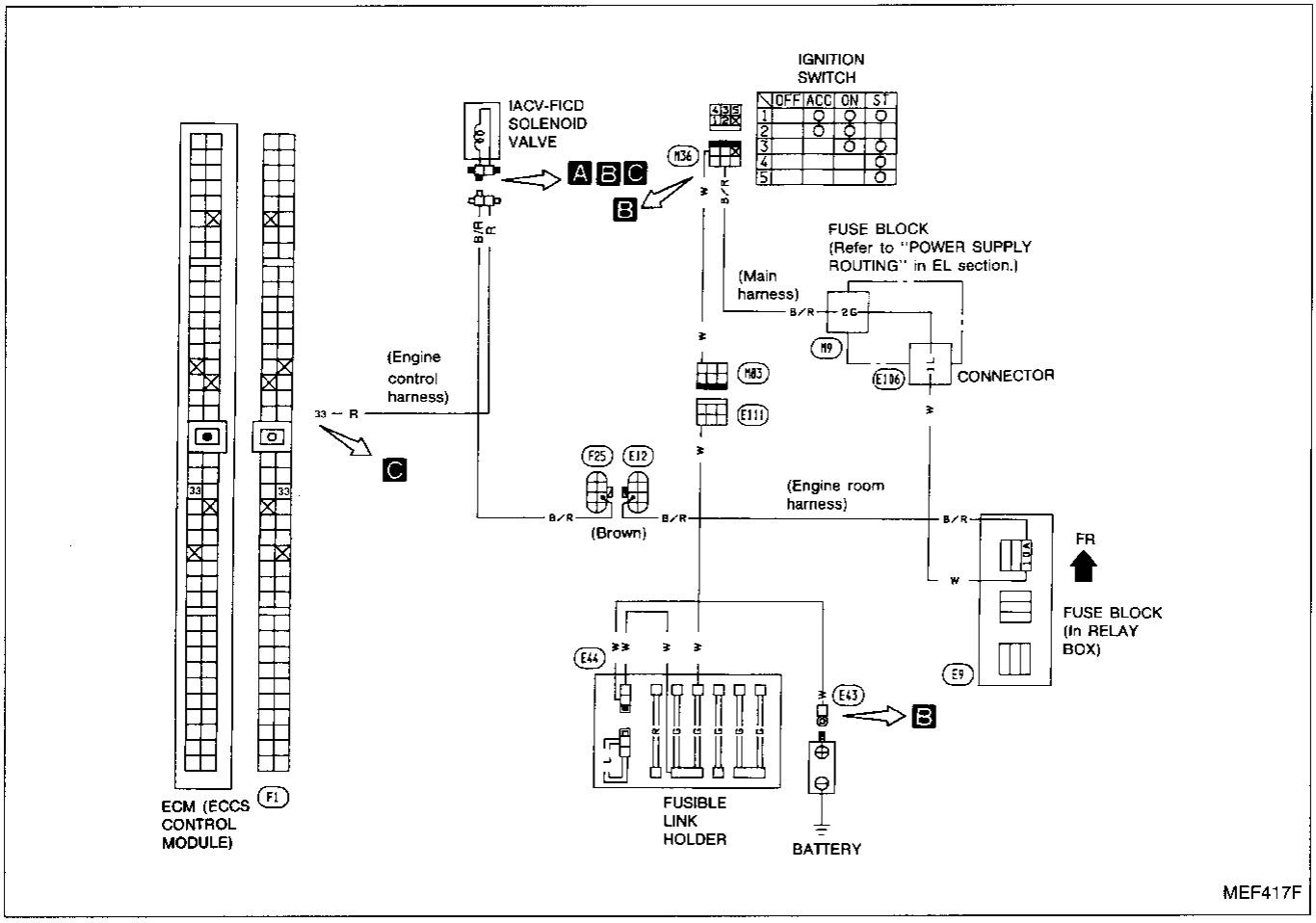
NG → Repair or replace IACV-AAC valve.

OK ↓

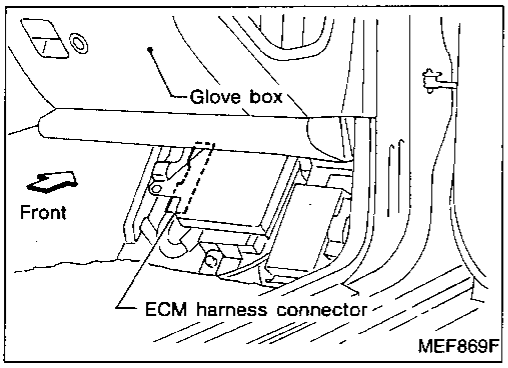
INSPECTION END

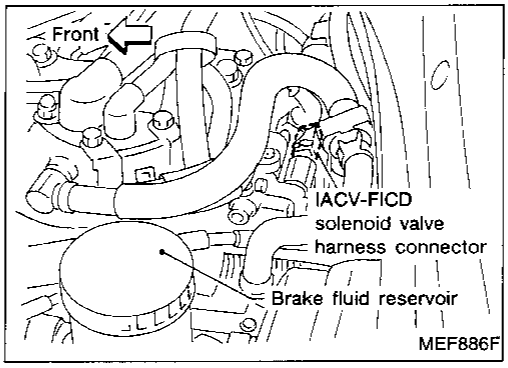
Diagnostic Procedure 45

IACV-FICD SOLENOID VALVE (Not self-diagnostic item)

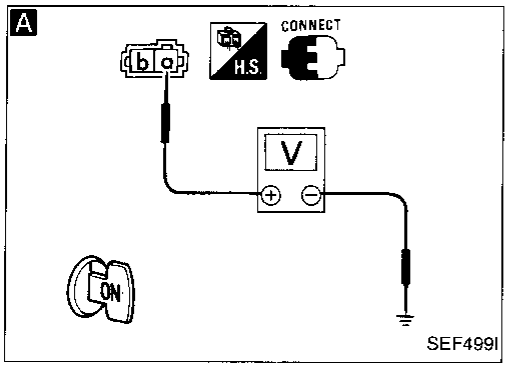


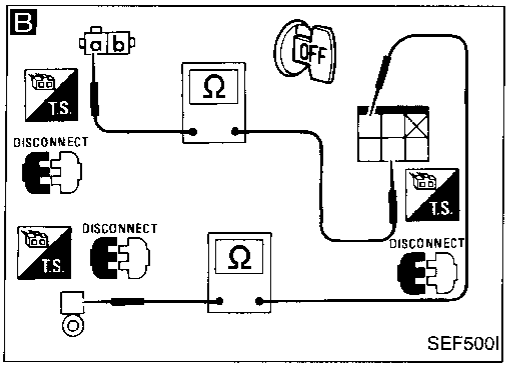
Harness layout

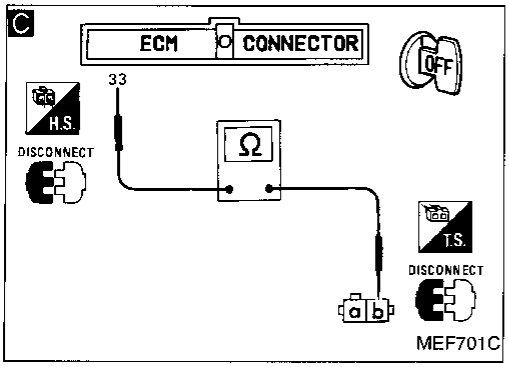


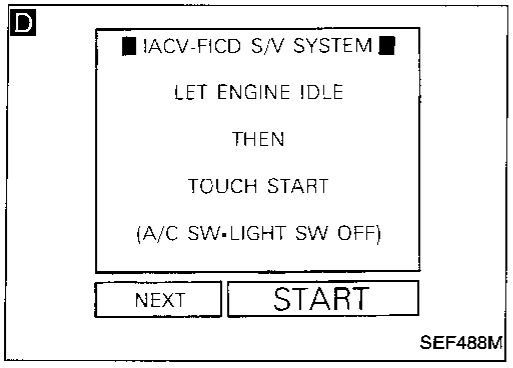


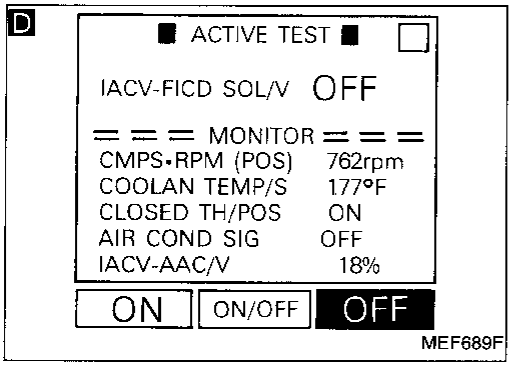
Diagnostic Procedure 45 (Cont'd)











INSPECTION START

A

CHECK POWER SUPPLY.
1) Turn ignition switch "ON".
2) Check voltage between IACV-FICD solenoid valve terminal ⓐ and ground.
Voltage: Battery voltage.

NG → **B**

Check the following items.
1) "G" fusible link
2) "10A" fuses
3) Ignition switch
4) Harness continuity between terminals:
- IACV-FICD solenoid valve and ignition switch
- Ignition switch and battery ⊕ terminal.

Continuity should exist.

OK

C

CHECK HARNESS CONTINUITY BETWEEN IACV-FICD SOLENOID VALVE AND ECM.
1) Turn ignition switch "OFF".
2) Disconnect ECM harness connector and IACV-FICD solenoid valve harness connector.
3) Check harness continuity between IACV-FICD solenoid valve terminal ⓑ and ECM terminal ㉝.
Continuity should exist.

NG → Repair or replace harness or connectors.

OK

D

CHECK COMPONENT
(IACV-FICD solenoid valve).
1) Reconnect ECM harness connector and IACV-FICD solenoid valve harness connector.
2) Start engine and let it idle.
3) Perform "IACV-FICD S/V SYSTEM" in "FUNCTION TEST" mode with CONSULT.

OR

3) Perform "IACV-FICD SOL/V TEST" in "ACTIVE TEST" mode with CONSULT.

OR

Refer to "Electrical Components Inspection".
(See page EF & EC-186.)

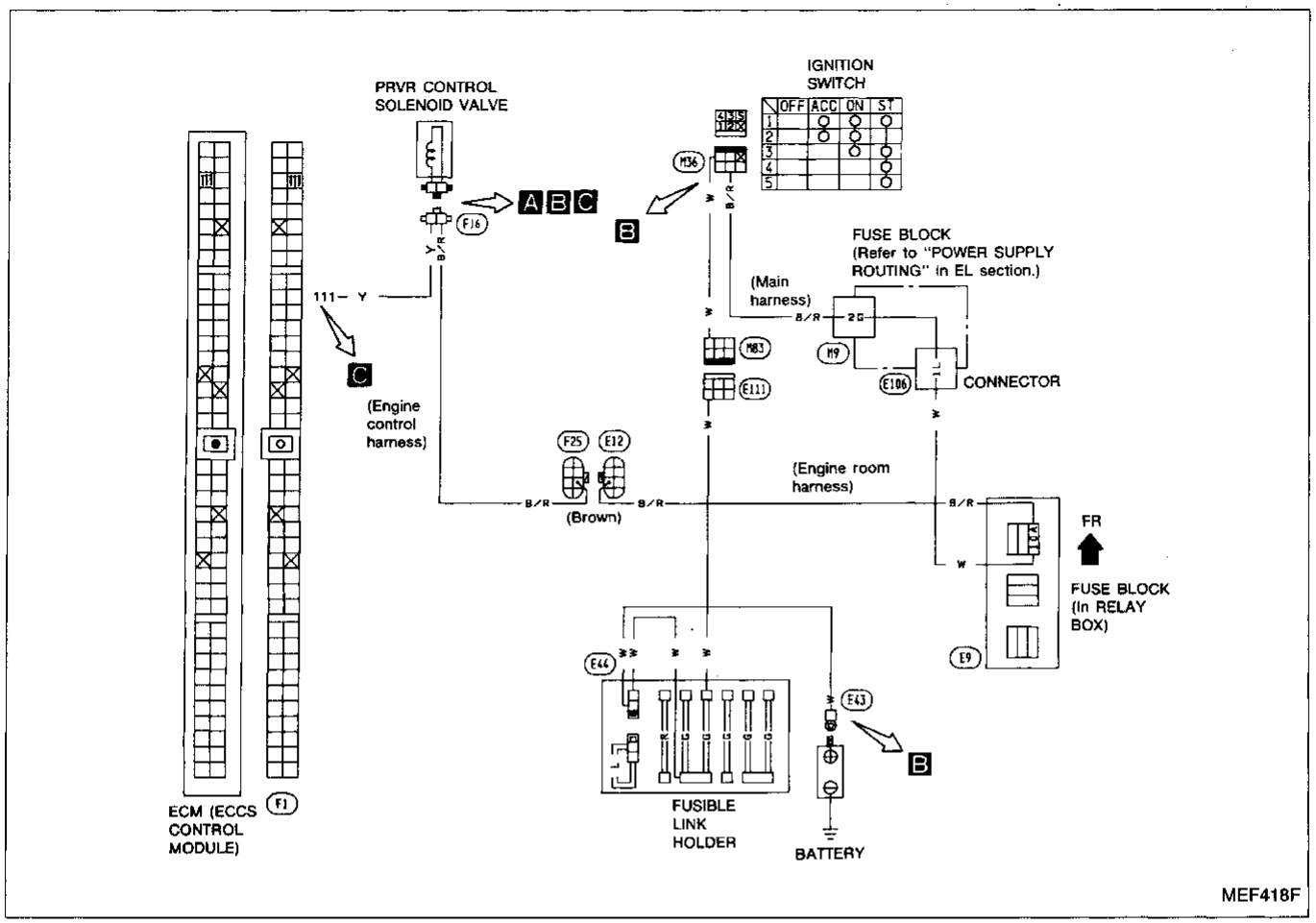
NG → Repair or replace IACV-FICD solenoid valve.

OK

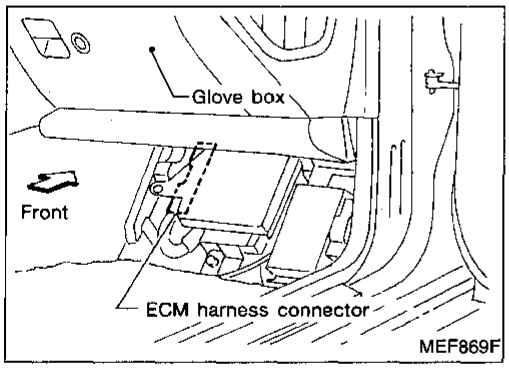
INSPECTION END

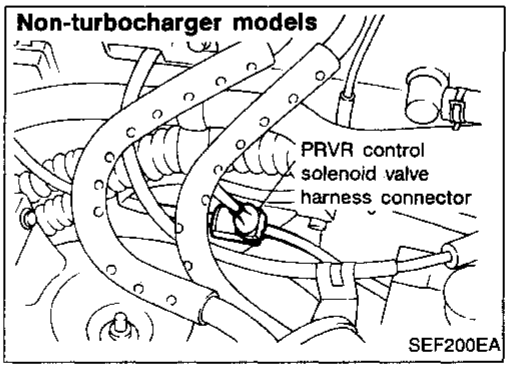
Diagnostic Procedure 46

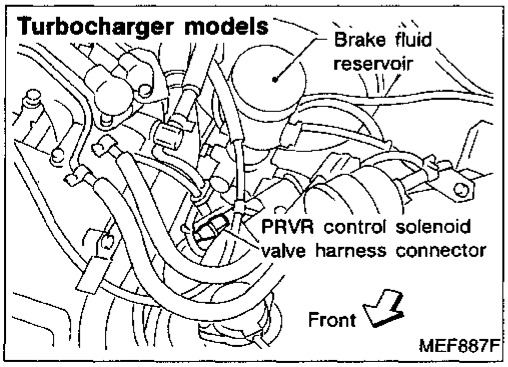
PRVR CONTROL SOLENOID VALVE (Not self-diagnostic item)



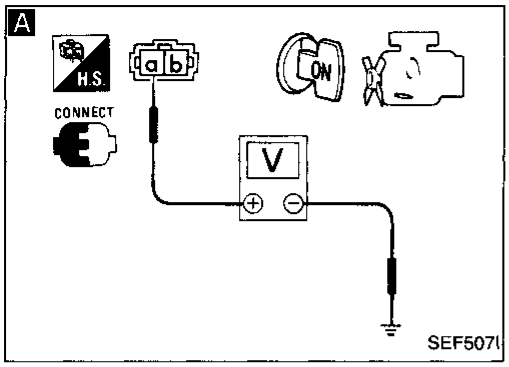
Harness layout

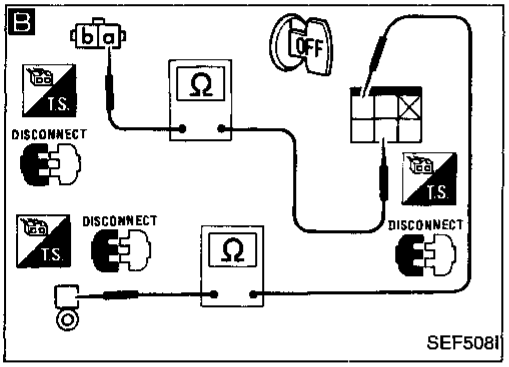


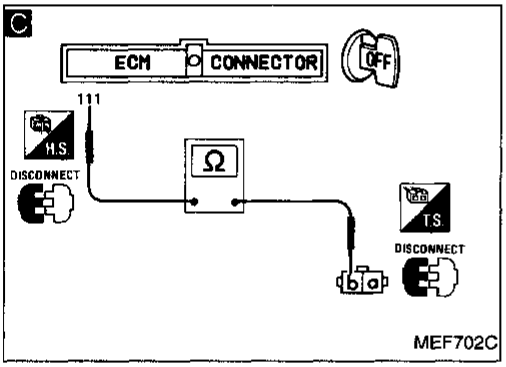


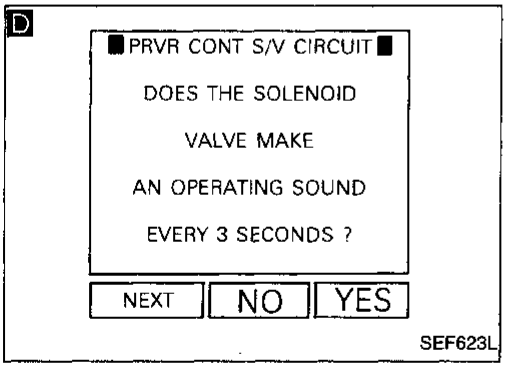


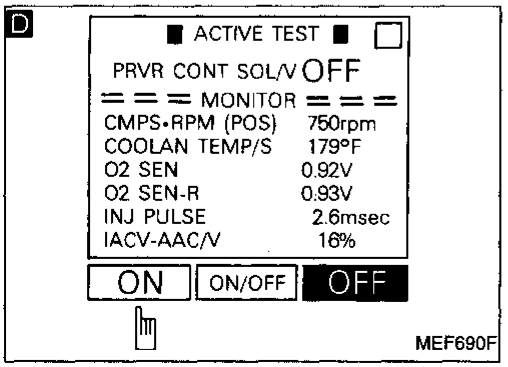
Diagnostic Procedure 46 (Cont'd)











INSPECTION START

A

CHECK POWER SUPPLY.
1) Turn ignition switch "ON".
2) Check voltage between PRVR control solenoid valve terminal ⓐ and ground.
Voltage: Battery voltage.

NG → **B**

Check the following items.
1) "G" fusible link
2) "10A" fuses
3) Ignition switch
4) Harness continuity between terminals:
- PRVR control solenoid valve and ignition switch
- Ignition switch and battery ⊕ terminal.

Continuity should exist.

OK ↓

C

CHECK HARNESS CONTINUITY BETWEEN PRVR CONTROL SOLENOID VALVE AND ECM.
1) Turn ignition switch "OFF".
2) Disconnect ECM harness connector and PRVR control solenoid valve harness connector.
3) Check harness continuity between terminal ⓑ and ECM terminal (111).
Continuity should exist.

NG → Repair or replace harness or connectors.

OK ↓

D

CHECK COMPONENT
(PRVR control solenoid valve).
1) Reconnect ECM harness connector and PRVR control solenoid valve harness connector.

2) Perform "PRVR CONT S/V CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

OR

2) Perform "PRVR CONTROL SOLENOID VALVE TEST" in "ACTIVE TEST" mode with CONSULT.

OR

Refer to "Electrical Components Inspection".
(See page EF & EC-183.)

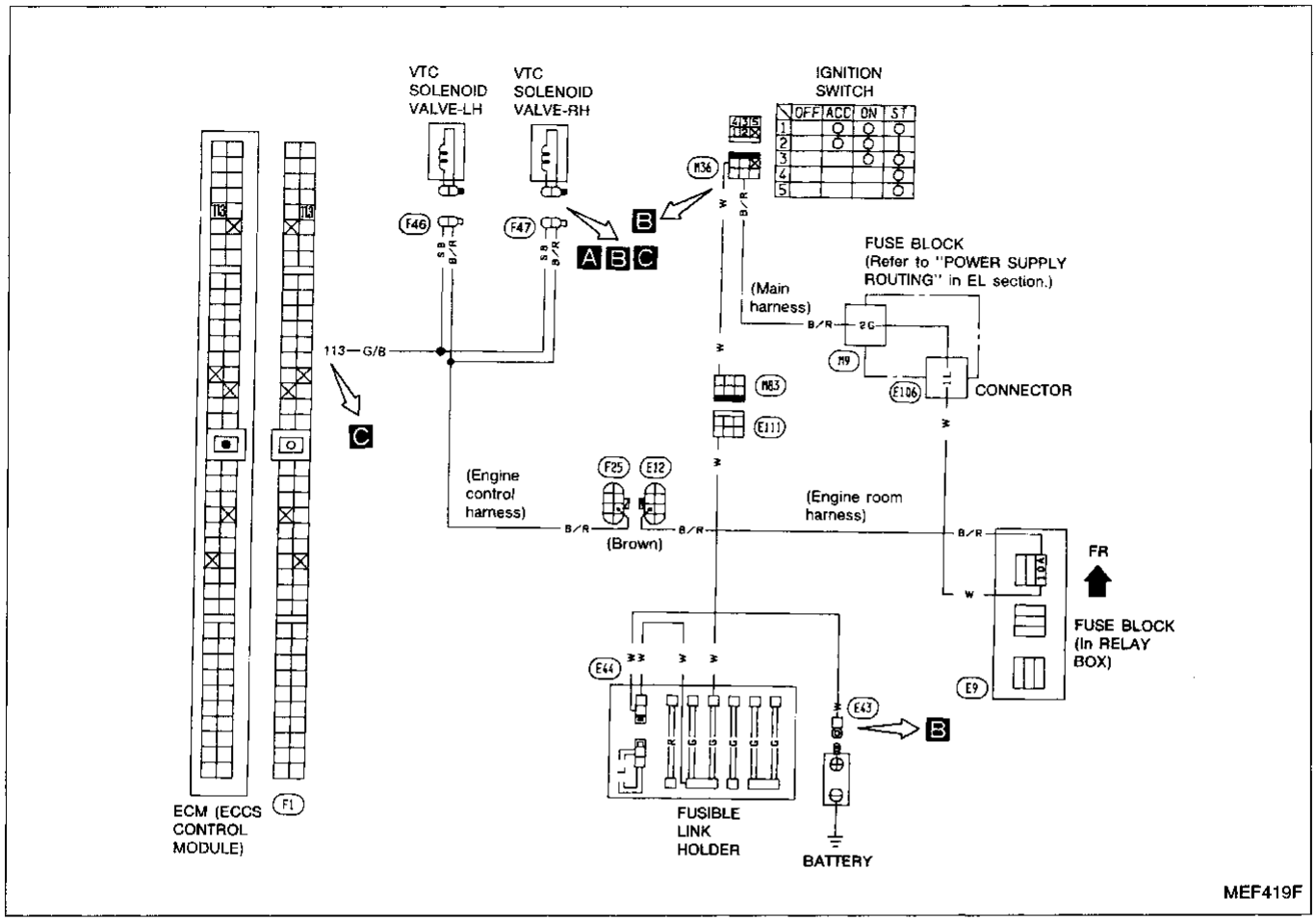
NG → Repair or replace PRVR control solenoid valve.

OK ↓

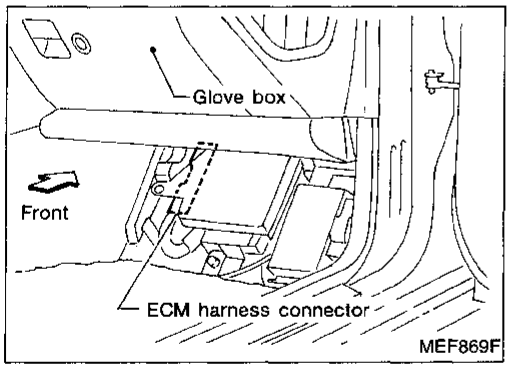
INSPECTION END

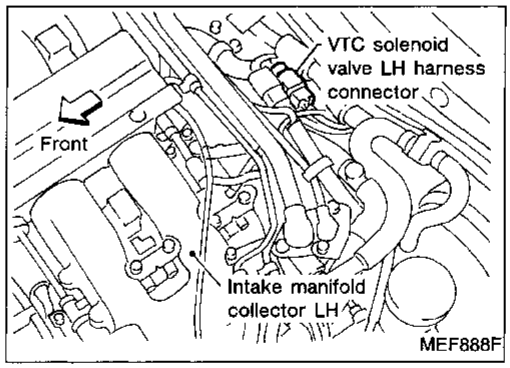
Diagnostic Procedure 47

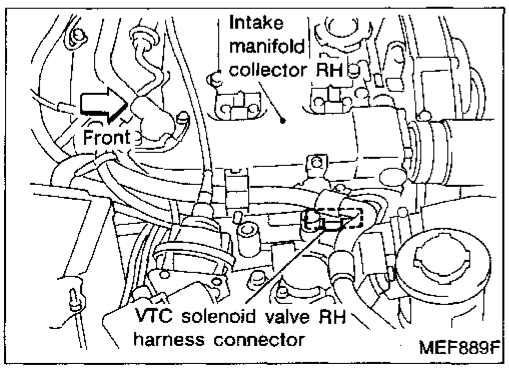
VTC SOLENOID VALVE (Not self-diagnostic item)



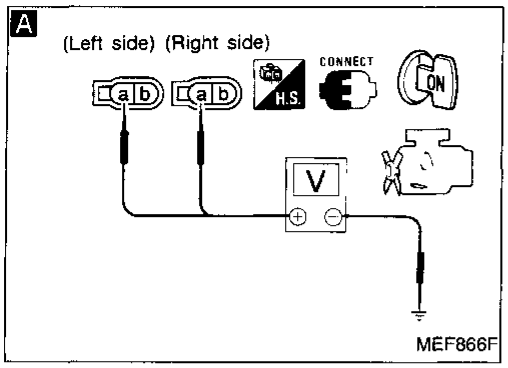
Harness layout

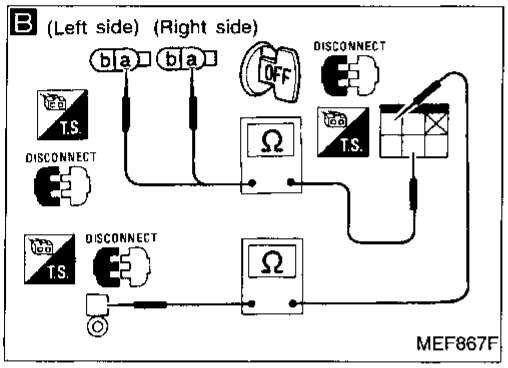


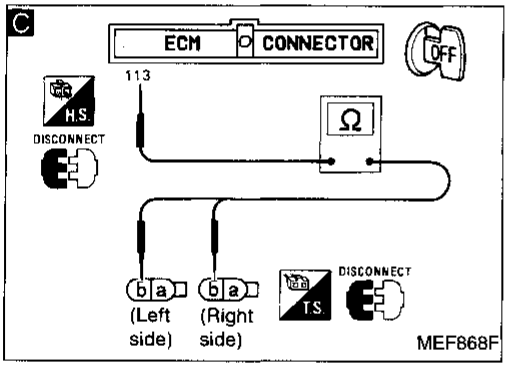


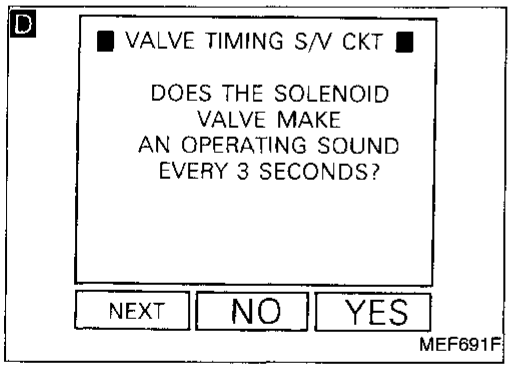


Diagnostic Procedure 47 (Cont'd)









INSPECTION START

A

CHECK POWER SUPPLY.
1) Turn ignition switch "ON".
2) Check voltage between VTC solenoid valve terminal ⓐ and ground.
Voltage: Battery voltage.

NG → **B**

Check the following items.
1) "G" fusible link
2) "10A" fuses
3) Ignition switch
4) Harness continuity between terminals:
- VTC solenoid valve and ignition switch
- Ignition switch and battery ⊕ terminal.

Continuity should exist.

OK

C

CHECK HARNESS CONTINUITY BETWEEN VTC SOLENOID VALVE AND ECM.
1) Turn ignition switch "OFF".
2) Disconnect ECM harness connector and VTC solenoid valve harness connectors.
3) Check harness continuity between terminal ⓑ and ECM terminal (113).
Continuity should exist.

NG → Repair or replace harness or connectors.

OK

D

CHECK COMPONENT (VTC solenoid valve).

1) Reconnect ECM harness connector and VTC solenoid harness connectors.
2) Perform "VALVE TIMING S/V CKT" in "FUNCTION TEST" mode with CONSULT.

NG → Repair or replace VTC solenoid valve.

OR

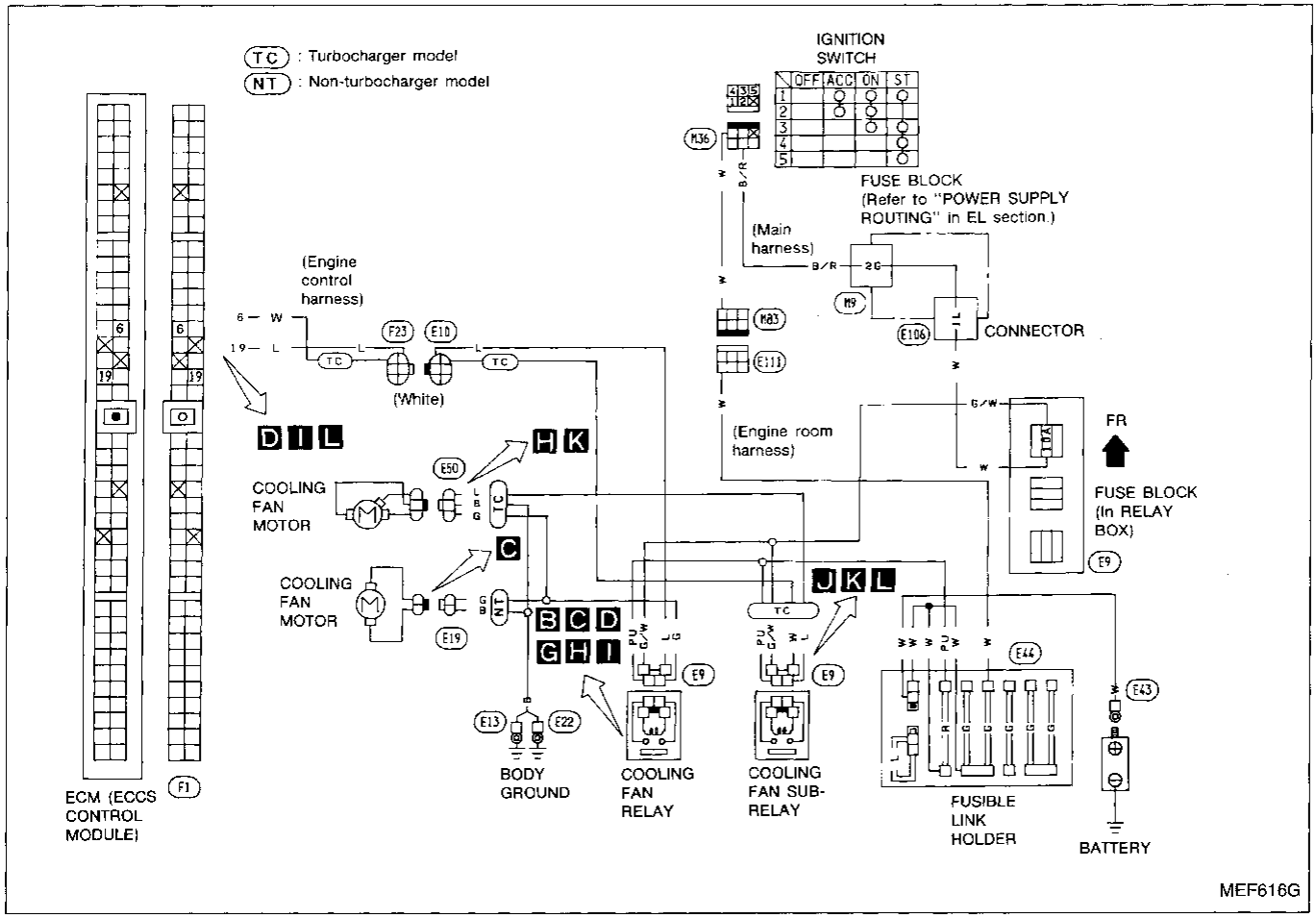
Refer to "Electrical Components Inspection".
(See page EF & EC-187.)

OK

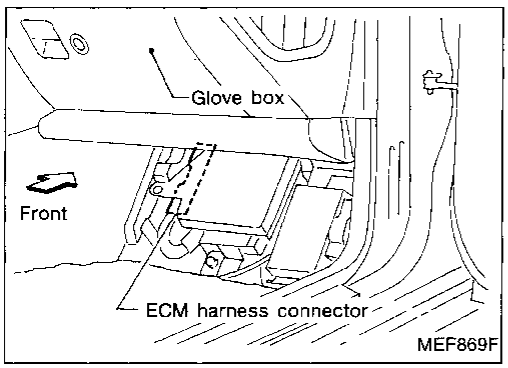
INSPECTION END

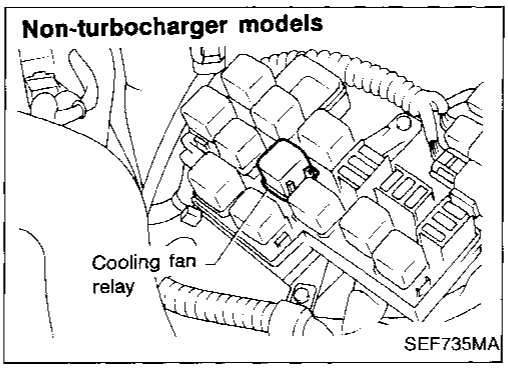
Diagnostic Procedure 48

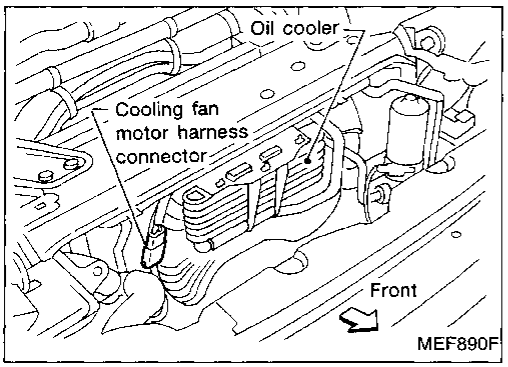
COOLING FAN CONTROL (Not self-diagnostic item)

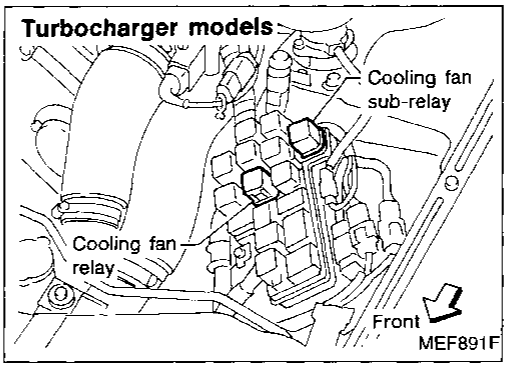


Harness layout

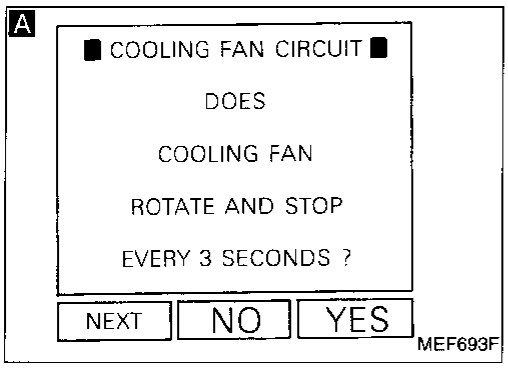


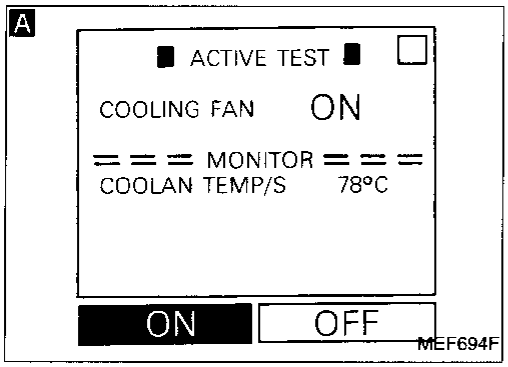


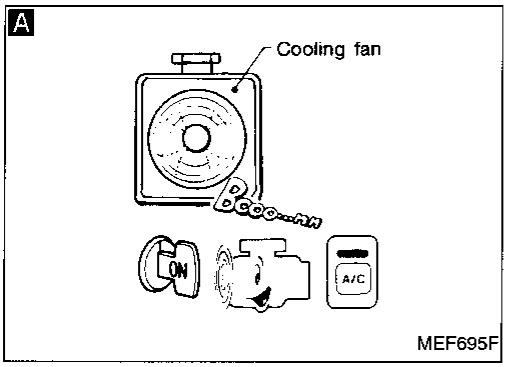


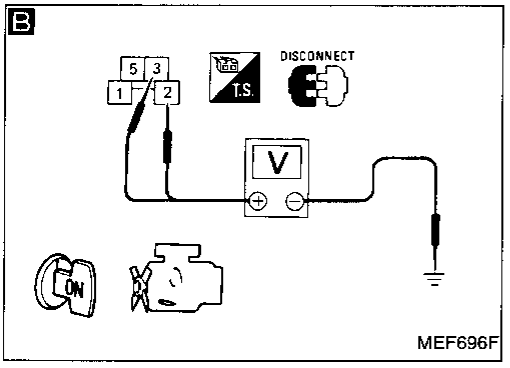


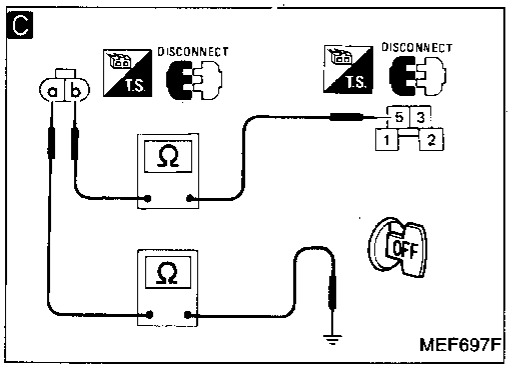
Diagnostic Procedure 48 (Cont'd)











Non-turbocharger models

INSPECTION START

A

CHECK OVERALL FUNCTION.

1) Turn ignition switch "ON".
2) Perform "COOLING FAN CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

OK → INSPECTION END

OR

1) Turn ignition switch "ON".
2) Perform "COOLING FAN" in "ACTIVE TEST" mode with CONSULT.

OR

1) Start engine.
2) Set temperature lever at full cold position.
3) Turn air conditioner switch "ON".
4) Turn blower fan switch "ON".
5) Run engine at idle for a few minutes with air conditioner operating.
6) Make sure that cooling fan operates.

NG

Turn air conditioner switch and blower fan switch "OFF".

B

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

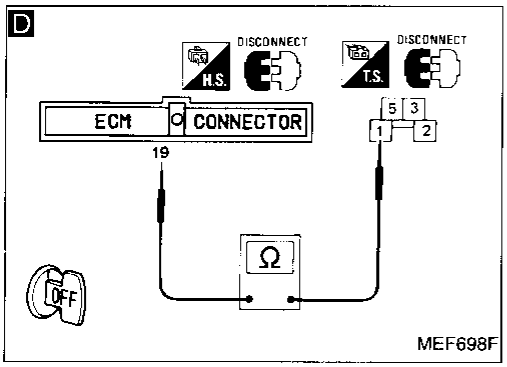
NG → Check the following.
- "L" fusible link
- "R" fusible link
- 10A fuse
- Harness continuity between battery and cooling fan relay
- Harness continuity between fuse and cooling fan relay

If NG, repair harness or connectors.

OK

Ⓐ

Diagnostic Procedure 48 (Cont'd)



Ⓐ

C

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect cooling fan motor harness connector.
3) Check harness continuity between terminal ⓑ and terminal ⑤, terminal ⓐ and body ground.
Continuity should exist.

NG → Repair harness or connectors.

OK ↓

D

CHECK OUTPUT SIGNAL CIRCUIT.
1) Disconnect ECM harness connector.
2) Check harness continuity between ECM terminal ⑲ and terminal ①.
Continuity should exist.

NG → Check the following.
- Harness connectors (F23), (E10)
- Harness continuity between ECM and cooling fan relay

If NG, repair harness or connectors.

OK ↓

CHECK COMPONENT
(Cooling fan relay).
Refer to "Electrical Components Inspection".
(See page EF & EC-187.)

NG → Replace cooling fan relay.

OK ↓

CHECK COMPONENT
(Cooling fan motor).
Refer to "Electrical Components Inspection".
(See page EF & EC-183.)

NG → Replace cooling fan motor.

OK ↓

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

Trouble is not fixed. ↓

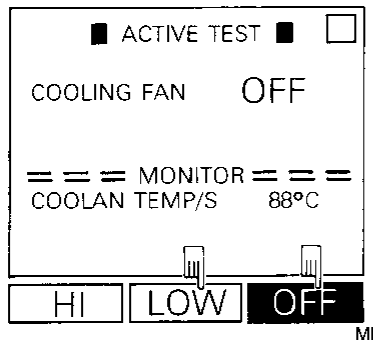
Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

↓

INSPECTION END

Diagnostic Procedure 48 (Cont'd)

E



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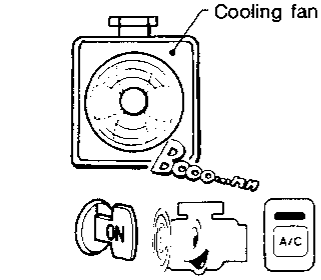
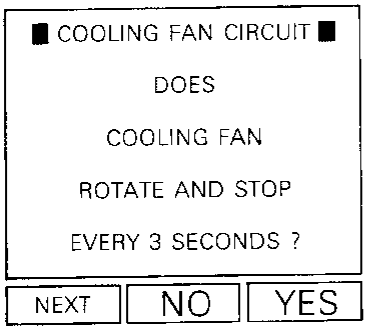
E



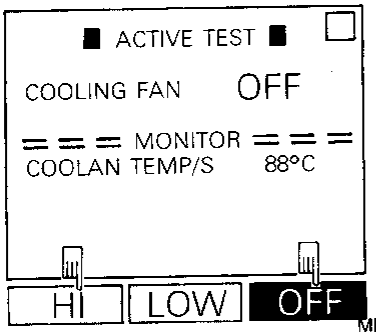
MEF695F

F



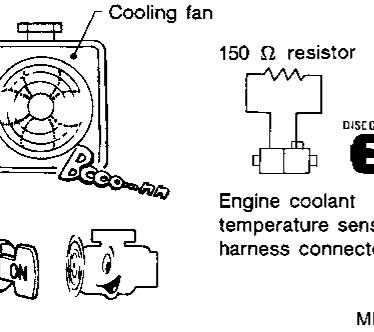
MEF693F

F



MEF700F

F



MEF701F

Turbocharger models

INSPECTION START

E

CHECK COOLING FAN LOW SPEED OPERATION.

1) Turn ignition switch "ON".
2) Perform "COOLING FAN" in "ACTIVE TEST" mode with CONSULT.

OR

1) Start engine.
2) Set temperature lever at full cold position.
3) Turn air conditioner switch "ON".
4) Turn blower fan switch "ON".
5) Run engine at idle for a few minutes with air conditioner operating.
6) Make sure that cooling fan operates at low speed.

NG → Check cooling fan low speed control circuit. (Go to PROCEDURE A.)

OK

F

CHECK COOLING FAN HIGH SPEED OPERATION.

1) Turn ignition switch "OFF".
2) Turn ignition switch "ON".
3) Perform "COOLING FAN CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

OR

2) Turn ignition switch "ON".
3) Perform "COOLING FAN" in "ACTIVE TEST" mode with CONSULT.

OR

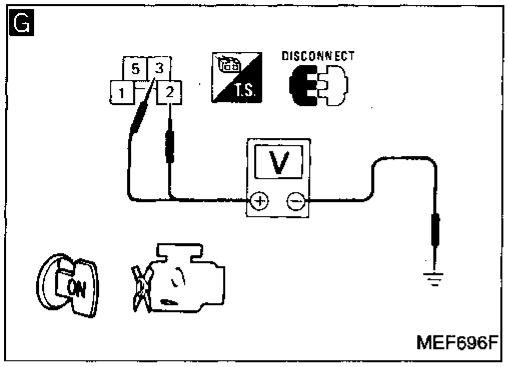
2) Turn air conditioner switch and blower fan switch "OFF".
3) Disconnect engine coolant temperature sensor harness connector.
4) Connect 150Ω resistor to engine coolant temperature sensor harness connector.
5) Restart engine and make sure that cooling fan operates at higher speed than low speed.

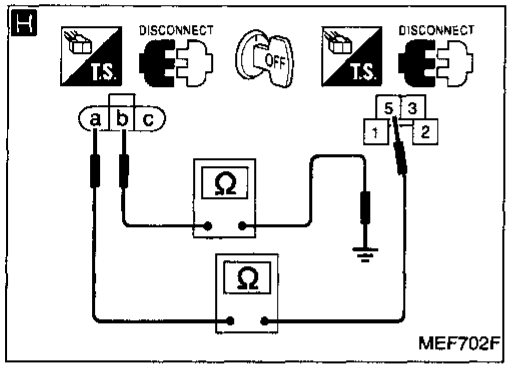
NG → Check cooling fan high speed control circuit. (Go to PROCEDURE B.)

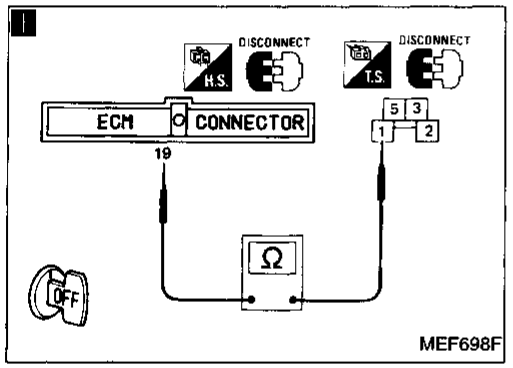
OK

INSPECTION END

Diagnostic Procedure 48 (Cont'd)







PROCEDURE A

INSPECTION START

G

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

NG → Check the following.
- "L" fusible link
- "R" fusible link
- 10A fuse
- Harness continuity between battery and cooling fan relay
- Harness continuity between fuse and cooling fan relay

If NG, repair harness or connectors.

OK ↓

H

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect cooling fan motor harness connector.
3) Check harness continuity between terminal ⑧ and terminal ⑤, terminal ⑥ and ground.
Continuity should exist.

NG → Repair harness or connectors.

OK ↓

I

CHECK OUTPUT SIGNAL CIRCUIT.
1) Disconnect ECM harness connector.
2) Check harness continuity between ECM terminal ⑲ and terminal ①.
Continuity should exist.

NG → Check the following.
- Harness connectors (F23), (E10)
- Harness continuity between ECM and cooling fan relay

If NG, repair harness or connectors.

OK ↓

CHECK COMPONENT
(Cooling fan relay).
Refer to "Electrical Components Inspection".
(See page EF & EC-187.)

NG → Replace cooling fan relay.

OK ↓

⑧

Diagnostic Procedure 48 (Cont'd)

Ⓑ

CHECK COMPONENT
(Cooling fan motor).
Refer to "Electrical Components Inspection".
(See page EF & EC-183.)

NG → Replace cooling fan motor.

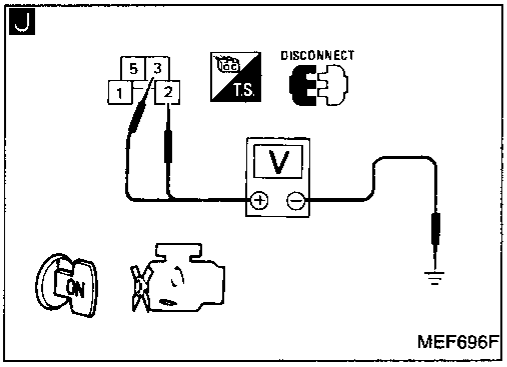
OK

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.

J



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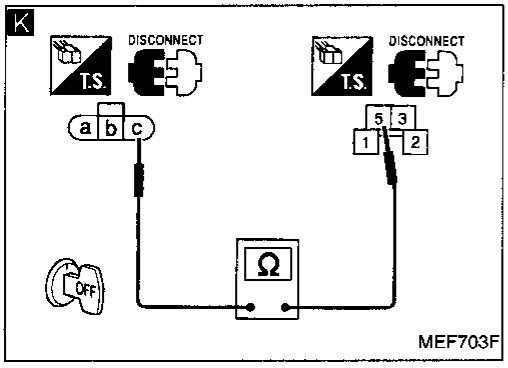
K



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PROCEDURE B

INSPECTION START

J

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

NG → Check the following.
- Harness continuity between battery and cooling fan sub-relay
- Harness continuity between fuse and cooling fan sub-relay

If NG, repair harness or connectors.

OK

K

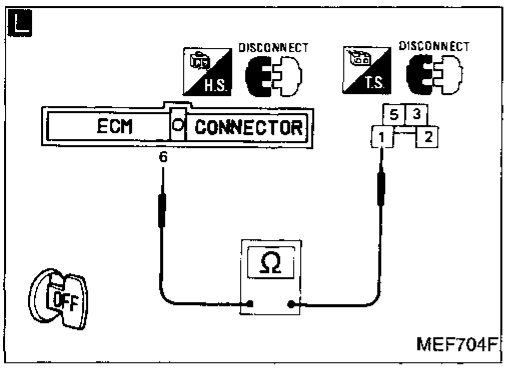
CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect cooling fan motor harness connector.
3) Check harness continuity between terminal ⓒ and terminal ⑤ .
Continuity should exist.

NG → Repair harness or connectors.

OK

Ⓒ

Diagnostic Procedure 48 (Cont'd)



Ⓒ

L

CHECK OUTPUT SIGNAL CIRCUIT.
1) Disconnect ECM harness connector.
2) Check harness continuity between ECM terminal ⑥ and terminal ①.
Continuity should exist.

NG → Check the following.
- Harness connectors (F23), (E10)
- Harness continuity between ECM and cooling fan sub-relay

If NG, repair harness or connectors.

OK ↓

CHECK COMPONENT
(Cooling fan sub-relay).
Refer to "Electrical Components Inspection".
(See page EF & EC-187.)

NG → Replace cooling fan sub-relay.

OK ↓

CHECK COMPONENT
(Cooling fan motor).
Refer to "Electrical Components Inspection".
(See page EF & EC-183.)

NG → Replace cooling fan motor.

OK ↓

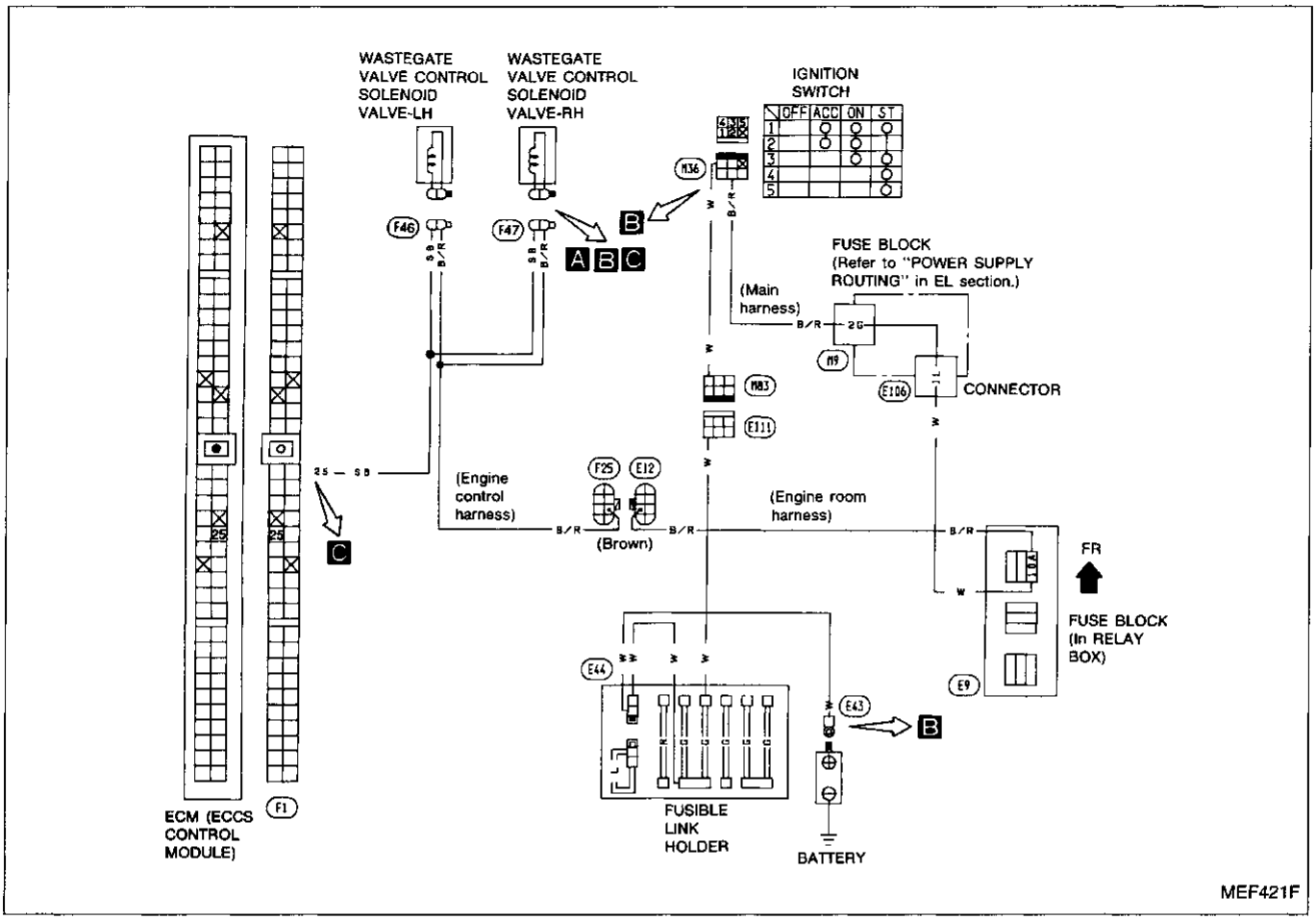
Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed. ↓

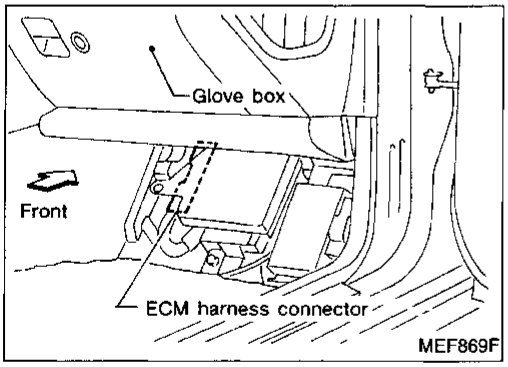
Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

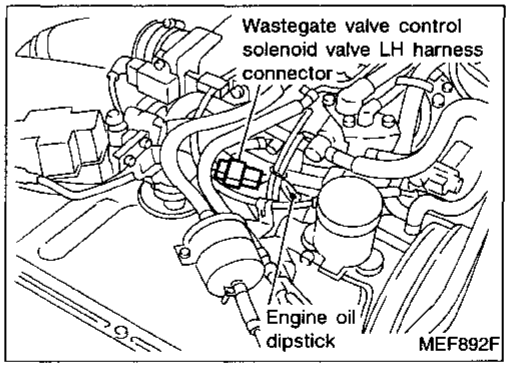
Diagnostic Procedure 49

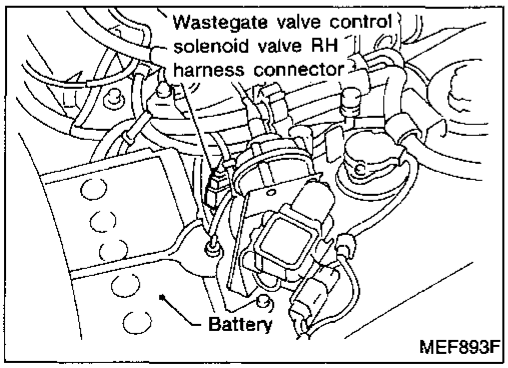
WASTEGATE VALVE CONTROL SOLENOID VALVE (Not self-diagnostic item): Turbocharger model only



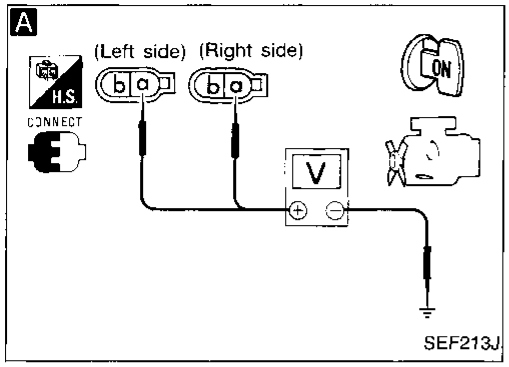
Harness layout

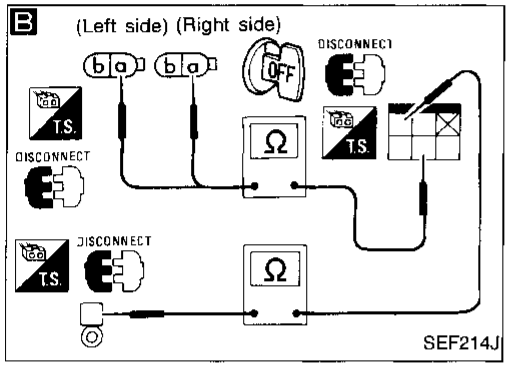


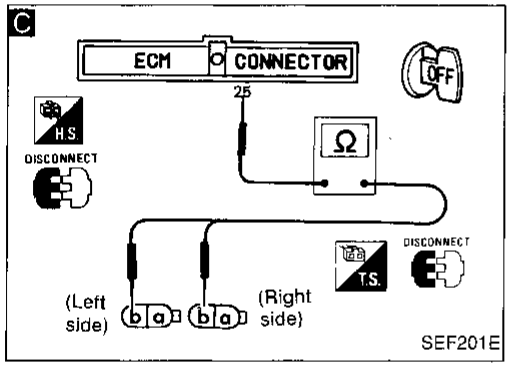




Diagnostic Procedure 49 (Cont'd)







INSPECTION START

A

CHECK POWER SUPPLY.
1) Turn ignition switch "ON".
2) Check voltage between wastegate valve control solenoid valve terminal ⓐ and ground.
Voltage: Battery voltage.

NG → B

Check the following items.
1) "G" fusible link
2) "10A" fuses
3) Ignition switch
4) Harness continuity between terminals:
- Wastegate valve control solenoid valve and ignition switch
- Ignition switch and battery ⊕ terminal.

Continuity should exist.

OK

C

CHECK HARNESS CONTINUITY BETWEEN WASTEGATE VALVE CONTROL SOLENOID VALVE AND ECM.
1) Turn ignition switch "OFF".
2) Disconnect ECM harness connector and wastegate valve control solenoid valve harness connectors.
3) Check harness continuity between wastegate valve control solenoid valve terminal ⓑ and ECM terminal ㉕.
Continuity should exist.

NG → Repair or replace harness or connectors.

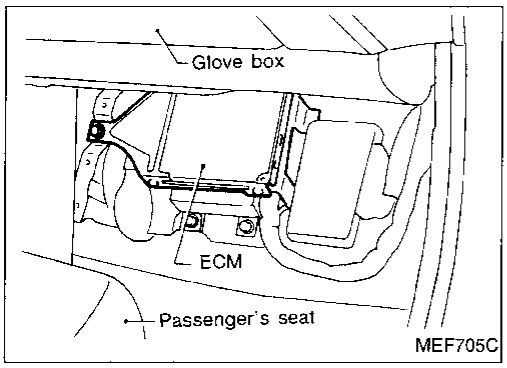
OK

CHECK COMPONENT
(Wastegate valve control solenoid valve).
Refer to "Electrical Components Inspection".
(See page EF & EC-183.)

NG → Repair or replace wastegate valve control solenoid valve.

OK

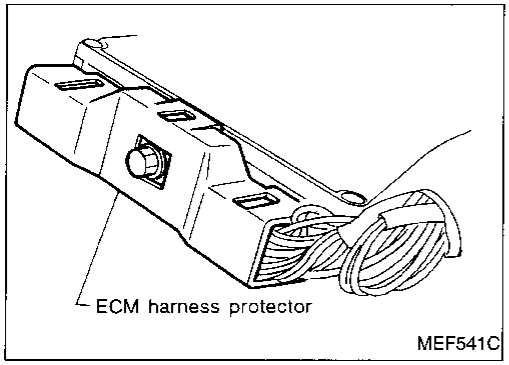
INSPECTION END



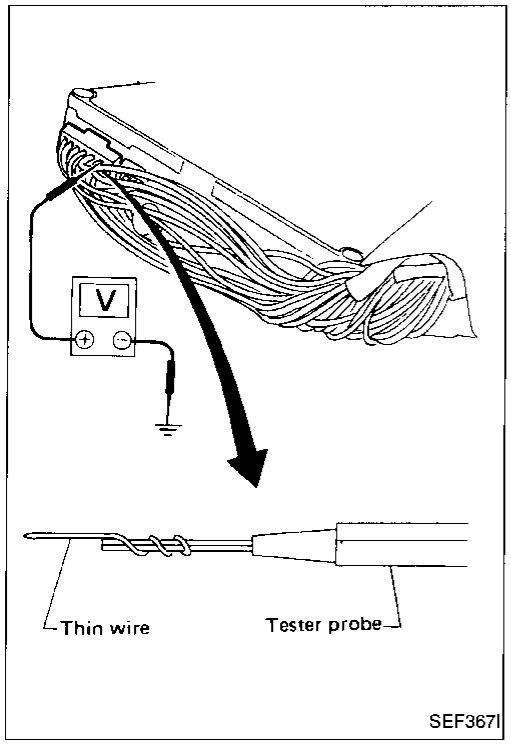
Electrical Components Inspection

ECM INPUT/OUTPUT SIGNAL INSPECTION

1. ECM is located behind front passenger side floor board. For this inspection, remove the front passenger side floor board.

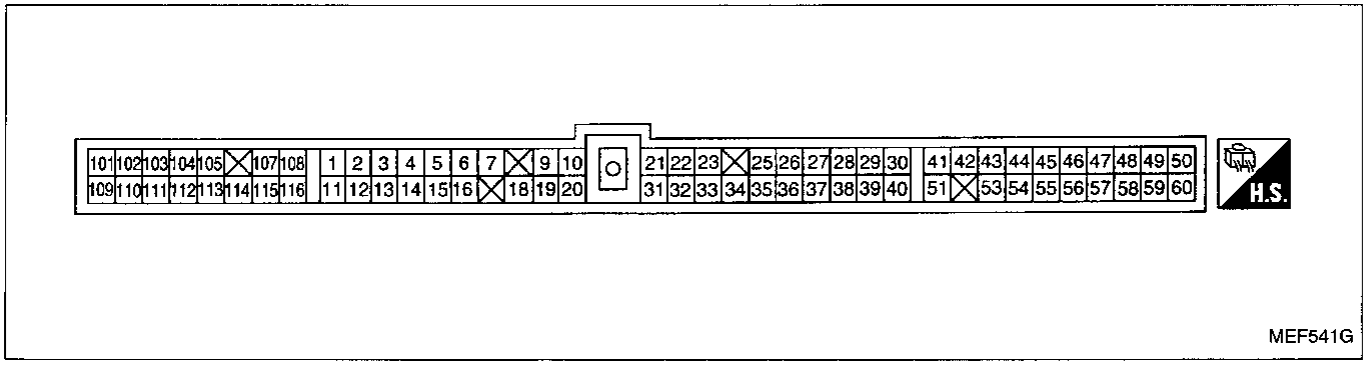


2. Remove ECM harness protector.



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

ECM HARNESS CONNECTOR TERMINAL LAYOUT



ECM inspection table

*Data are reference values.

TERMINAL NO.	ITEM	CONDITION	*DATA
1 2 3 11 12 13	Ignition signal	Engine is running. └ Idle speed	Approx. 0.1V
		Engine is running. └ Engine speed is 2,000 rpm.	Approx. 0.14V
4	IACV-AAC valve	Engine is running. └ Racing condition	Voltage briefly decreases from battery voltage (11 - 14V).
6	Cooling fan sub-relay (Turbocharger model)	Engine is running. └ Cooling fan is not operating.	BATTERY VOLTAGE (11 - 14V)
		Engine is running. └ Cooling fan is operating.	Approx. 0V
7	Tachometer	Engine is running. └ Idle speed	1.0 - 1.5V
		Engine is running. └ Engine speed is 2,000 rpm	2.3 - 2.8V
9	Air conditioner relay	Engine is running. └ Air conditioner switch "OFF"	BATTERY VOLTAGE (11 - 14V)
		Engine is running. └ Air conditioner switch "ON"	Approx. 0V
16	ECM power source (Self-shutoff)	Engine is running. └ Idle speed	0.8 - 1.0V
		Engine is not running. └ For a few seconds after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
18	Fuel pump relay	Ignition switch "ON" └ For a few seconds after turning ignition switch "ON" Engine is running.	0.7 - 0.9V
		Ignition switch "ON" └ A few seconds after turning ignition switch "ON" and thereafter	BATTERY VOLTAGE (11 - 14V)
19	Cooling fan relay	Engine is running. └ Cooling fan is not operating.	BATTERY VOLTAGE (11 - 14V)
		Engine is running. └ Cooling fan is operating.	Approx. 0V
23	Knock sensor	Engine is running. └ Idle speed	Approx. 2.5V
25	Wastegate valve control solenoid valves (Turbocharger model)	Ignition switch "ON" Engine is running. └ Idle speed	BATTERY VOLTAGE (11 - 14V)
		Engine is racing. └ Engine speed is up to 3,000 rpm	Approx. 0.2V

Electrical Components Inspection (Cont'd)

*Data are reference values.

TERMINAL NO.	ITEM	CONDITION	*DATA
27	Mass air flow sensor	Engine is running. (Warm-up condition) └ Idle speed	0.8 - 1.5V
		Engine is running. (Warm-up condition) └ Engine speed is 2,000 rpm.	1.0 - 1.6V
28	Engine coolant temperature sensor	Engine is running.	0 - 5.0V Output voltage varies with engine coolant temperature.
29	Right side heated oxygen sensor	Engine is running. └ After warming up sufficiently and engine speed is 2,000 rpm.	0 ↔ Approx. 1.0V
55	Left side heated oxygen sensor		
33	IACV-FICD solenoid valve	Engine is running. └ A/C compressor is not operating.	BATTERY VOLTAGE (11 - 14V)
		Engine is running. └ A/C compressor is operating.	0 - 1.0V
34	Power steering oil pressure switch	Engine is running. └ Steering wheel is in the "straight ahead" position.	Approx. 5V
		Engine is running. └ Steering wheel is turned.	Approx. 0V
35	Fuel pump voltage control (Turbocharger model)	Ignition switch "ON" └ Engine stopped	0V
		Engine is running. └ Idle speed	1 - 2V
		Engine is racing.	4 - 5V
36	Fuel temperature sensor	Engine is running.	0 - 5.0V Output voltage varies with fuel temperature.
37	Boost pressure sensor (Turbocharger model)	Engine is running. └ Idle speed	Approx. 2.7V
		Engine is running. └ Engine is racing from idle to 4,500 rpm.	Approx. 3.1V
38	Throttle position sensor	Ignition switch "ON"	0.4 - 4.0V Output voltage varies with throttle valve opening angle.
39	EGR temperature sensor	Engine is running. (Warm-up condition) └ Idle speed	Less than 4.5V
		Engine is running. (Warm-up condition) └ EGR system is operating.	0 - 1.0V
41 51	Camshaft position sensor (Reference signal)	Engine is running. **Do not run engine at high speed under no-load.**	0.8 - 1.8V Output voltage varies slightly with engine speed.
42	Camshaft position sensor (Position signal)	Engine is running. **Do not run engine at high speed under no-load.**	2.5 - 2.7V Output voltage varies slightly with engine speed.

Electrical Components Inspection (Cont'd)

*Data are reference values.

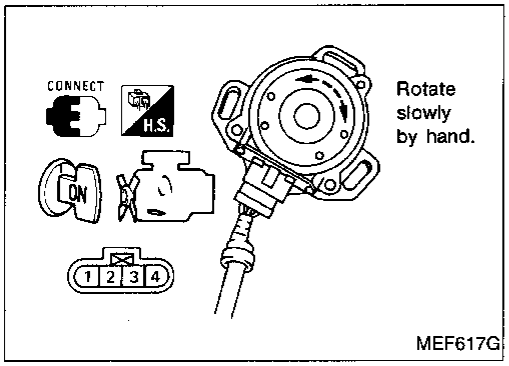
TERMINAL NO.	ITEM	CONDITION	*DATA
43	Start signal	Ignition switch "ON"	Approx. 0V
		Ignition switch "START"	BATTERY VOLTAGE (11 - 14V)
44	Neutral position switch (M/T model) A/T control unit (A/T model)	Ignition switch "ON" └ Gear position is "Neutral position" (M/T model). └ Gear position is "N" or "P" position (A/T model).	Approx. 0V
		Ignition switch "ON" └ Except the above conditions	Approx. 5V
45	Ignition switch	Ignition switch "ON" └ Engine stopped	BATTERY VOLTAGE (11 - 14V)
46	Air conditioner switch	Engine is running. └ Air conditioner switch "OFF"	BATTERY VOLTAGE (11 - 14V)
		Engine is running. └ Air conditioner switch "ON"	0.5 - 0.7V
48	Power source for sensors	Ignition switch "ON" └ Engine stopped	Approximately 5.0V
49 59	Battery source	Ignition switch "ON" └ Engine stopped	BATTERY VOLTAGE (11 - 14V)
54	Closed throttle position switch (Idle position)	Ignition switch "ON" └ Accelerator pedal is fully released (engine running).	8.0 - 10.0V
		Ignition switch "ON" └ Accelerator pedal is depressed (engine running).	0V
57	Power source for closed throttle position switch	Ignition switch "ON" └ Engine running	BATTERY VOLTAGE (11 - 14V)
58	Power supply	Ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
101 103 105 110 112 114	Injectors	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
102	EGRC-solenoid valve	Engine is running. (Warm-up condition) └ Idle speed	Approx. 0V
		Engine is running. (Warm-up condition) └ Engine speed is 2,000 rpm.	BATTERY VOLTAGE (11 - 14V)
104	Fuel pump voltage control	Ignition switch "ON" └ Engine stopped	0V
		Engine is running. (Warm-up condition) └ Idle speed	1 - 2V

Electrical Components Inspection (Cont'd)

***Data are reference values.**

TERMINAL NO.	ITEM	CONDITION	*DATA
111	PRVR control solenoid valve	Stop and restart engine after warming it up. └ Fuel temperature is above 75°C (167°F)	0 - 1.0V (For 30 seconds after engine is start.) BATTERY VOLTAGE (30 seconds after engine is start.)
		Stop and restart engine after warming it up. └ Fuel temperature is below 75°C (167°F)	BATTERY VOLTAGE (11 - 14V)
113	Valve timing control solenoid valves	Engine is running. └ Idle speed	BATTERY VOLTAGE (11 - 14V)
		Engine is racing. (Jack-up drive wheels and shift selector lever to 1st position.) └ Engine speed is below 2,000 rpm.	0.2 - 0.5V
115	Heated oxygen sensor heater	Engine is running. └ Engine speed is below 2,800 rpm.	Approx. 0V
		Engine is running. └ Engine speed is above 2,800 rpm.	BATTERY VOLTAGE (11 - 14V)

Electrical Components Inspection (Cont'd)



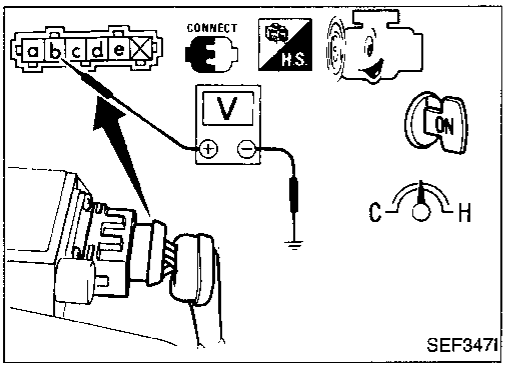
CAMSHAFT POSITION SENSOR

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

Terminal	Voltage
② (120° signal)	Voltage fluctuates between 5V and 0V.
① (1° signal)	

If NG, replace camshaft position sensor.

After this inspection, diagnostic trouble code No. 11 might be displayed though the camshaft position sensor is functioning properly. In this case erase the stored memory.

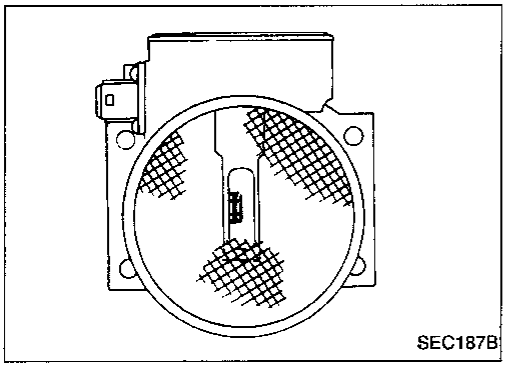


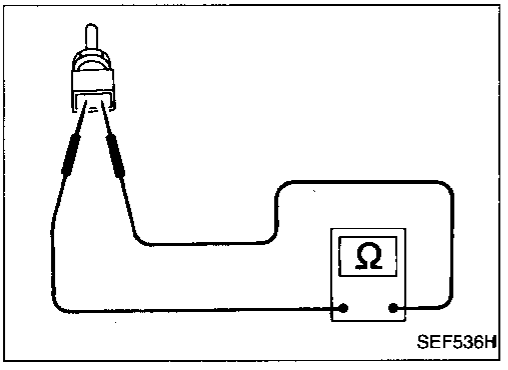
MASS AIR FLOW SENSOR

1. Fold back 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.)	Approximately 0.8
Idle (Engine is warm-up sufficiently.)	Approximately 0.8 - 1.5

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





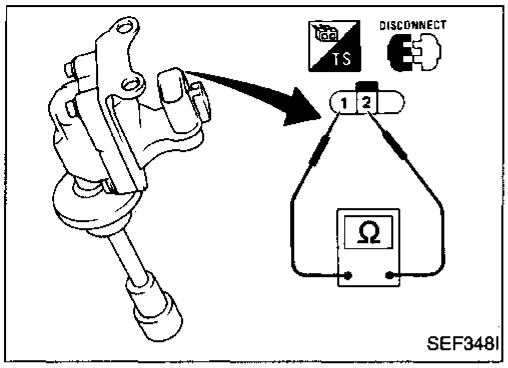
ENGINE COOLANT TEMPERATURE SENSOR

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 - 1.00
80 (176)	0.30 - 0.33

If NG, replace engine coolant temperature sensor.

Electrical Components Inspection (Cont'd)

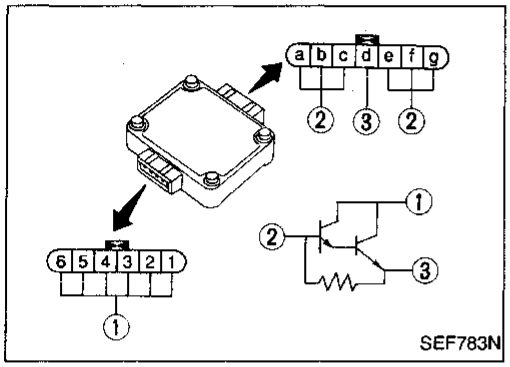


IGNITION COIL

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

Terminal	Resistance
① - ②	Approximately 0.7Ω

If NG, replace ignition coil.

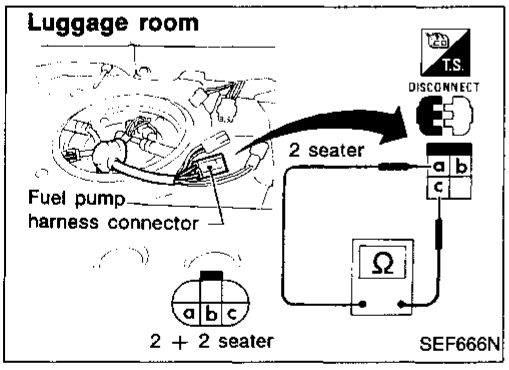


POWER TRANSISTOR

1. Disconnect power transistor harness connector.
2. Check power transistor continuity between terminals as shown in the figure.

Terminal combination	Tester polarity	Resistance	Tester polarity	Resistance
③ ①	⊕ ⊖	Not ∞ or 0	⊖ ⊕	∞
③ ②	⊕ ⊖	Not ∞ or 0	⊖ ⊕	Not ∞ or 0
① ②	⊕ ⊖	∞	⊖ ⊕	Not ∞ or 0

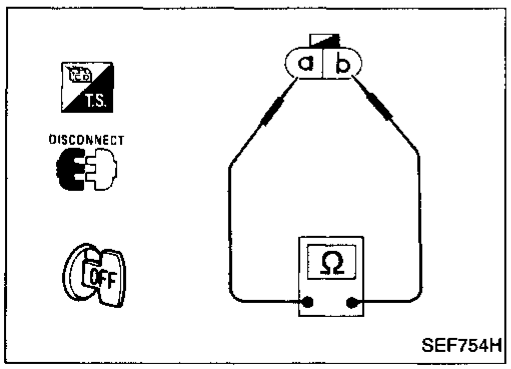
If NG, replace power transistor.



FUEL PUMP

1. Disconnect fuel pump harness connector.
2. Check resistance between terminals ⓐ and ⓒ.
   Resistance: Approximately 0.2 - 5.0Ω

If NG, replace fuel pump.



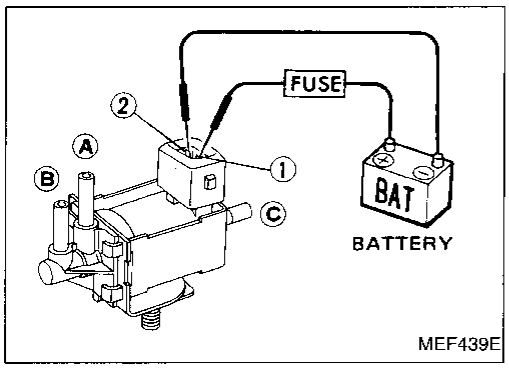
VEHICLE SPEED SENSOR

1. Jack up rear wheels. Use stands to support vehicle.
2. Disconnect vehicle speed sensor harness connector.
3. Check continuity between terminals ⓐ and ⓑ while rotating rear wheel by hand.

Continuity should come and go.

If NG replace vehicle speed sensor.

Electrical Components Inspection (Cont'd)



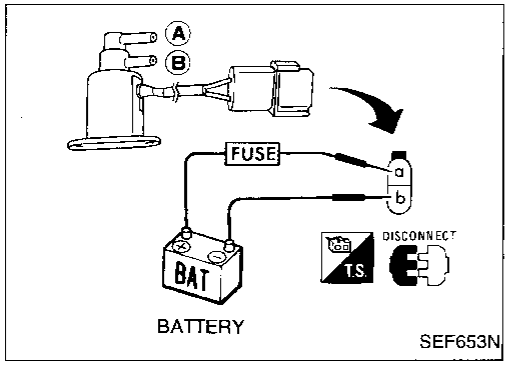
EGRC-SOLENOID VALVE

PRVR CONTROL SOLENOID VALVE

Check air passage 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

If NG, replace solenoid valve.

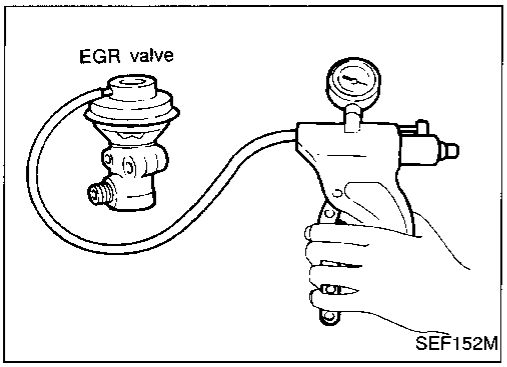


WASTEGATE VALVE CONTROL SOLENOID VALVE

Check air passage continuity.

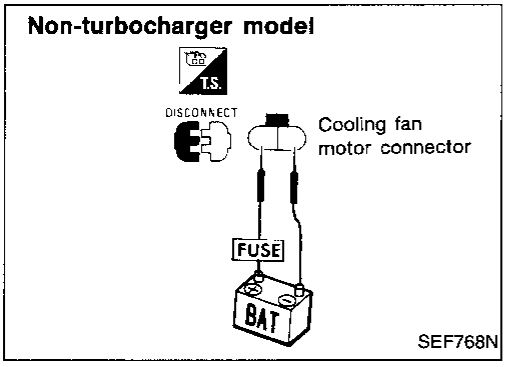
Condition	Air passage continuity between Ⓐ and Ⓑ
12V direct current supply between terminals ⓐ and ⓑ	Yes
No supply	No

If NG, replace solenoid valve.



EGR VALVE

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



COOLING FAN MOTOR

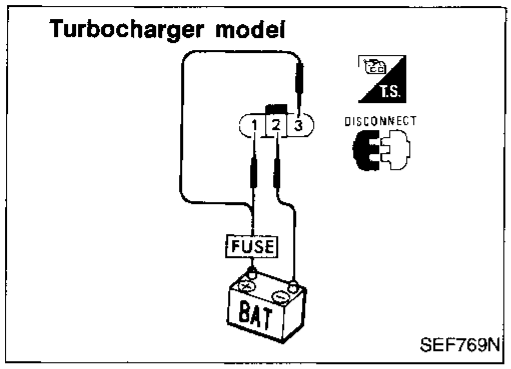
1. Disconnect cooling fan motor harness connector.
2. Supply cooling fan motor terminals with battery voltage and check operation.

Non-turbocharger model

Cooling fan motor should operate.

If NG, replace cooling fan motor.

Electrical Components Inspection (Cont'd)

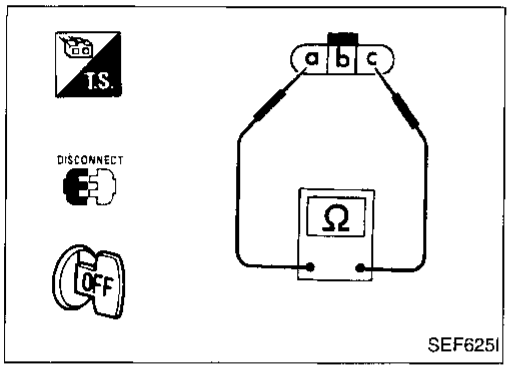


Turbocharger model

Cooling fan motor operation	Terminals	
	⊕	⊖
Low speed	③	②
High speed	① and ③	②

Cooling fan motor should operate.

If NG, replace cooling fan motor.



HEATED OXYGEN SENSOR

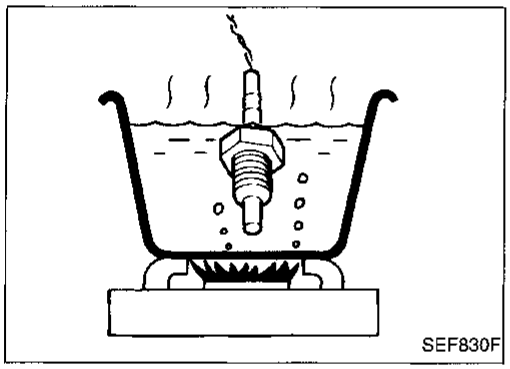
Refer to "Diagnostic Procedure 30".
(See page EF & EC-129.)

HEATED OXYGEN SENSOR HEATER

Check resistance between terminals ⓐ and ⓒ.

Resistance: 3 - 1,000Ω

If NG, replace heated oxygen sensor.



EGR TEMPERATURE SENSOR

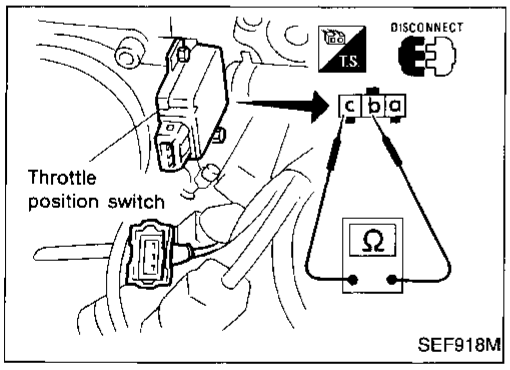
Check resistance change and resistance value at 100°C (212°F).

- **Resistance should decrease in response to temperature increase.**

  Resistance: 100°C (212°F)

  85.3±8.53 kΩ

  If NG, replace EGR temperature sensor.

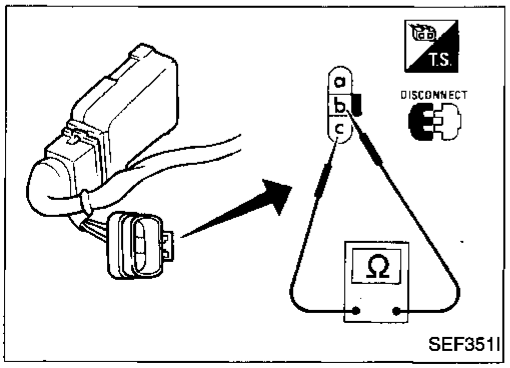


WIDE OPEN THROTTLE POSITION SWITCH

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.



THROTTLE POSITION SENSOR

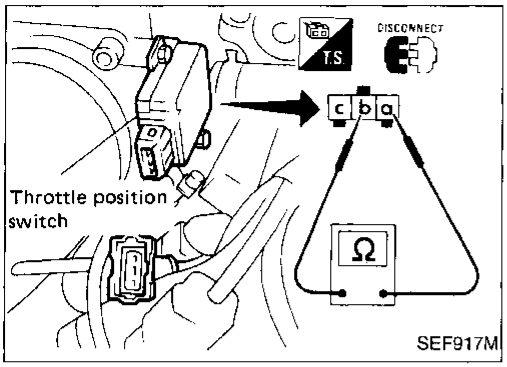
1. Disconnect throttle position sensor harness connector.
2. Make sure that resistance between terminals ⓑ and ⓒ changes when opening throttle valve manually.

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

If NG, replace throttle position sensor.

Electrical Components Inspection (Cont'd)

CLOSED THROTTLE POSITION SWITCH (Idle position)



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

Accelerator pedal condition	Continuity
Released	Yes
Depressed	No

If NG, replace closed throttle position switch.

Adjustment

If throttle position sensor or throttle position switch 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 and throttle position switch harness connector.
3. Start engine and warm it up sufficiently.
4. Disconnect throttle position switch harness connector.
5. Check closed throttle position switch OFF → ON speed with circuit tester, closing throttle valve manually.

Closed throttle position switch OFF → ON speed:

Non-turbocharger

MT: 900±150 rpm

AT: 970±150 rpm

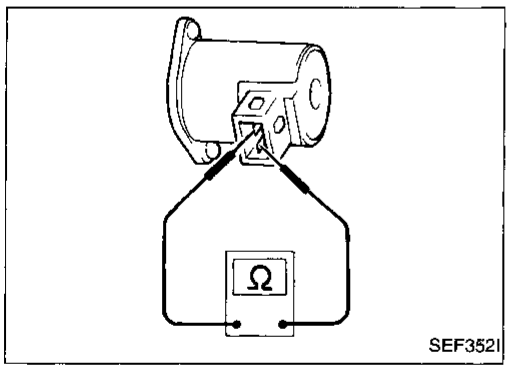
Turbocharger

MT: 900±150 rpm (U.S.A.)

950±150 rpm (Canada)

AT: 950±150 rpm [in "N" position]

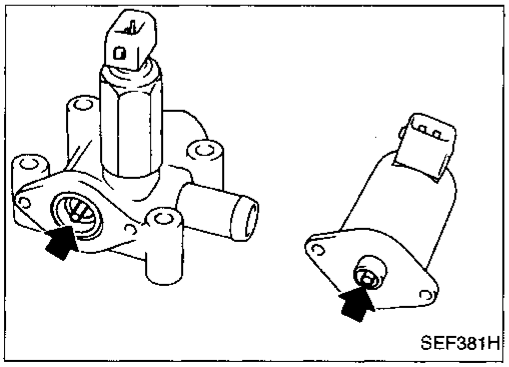
IACV-AAC VALVE



- Check IACV-AAC valve resistance.

Resistance:

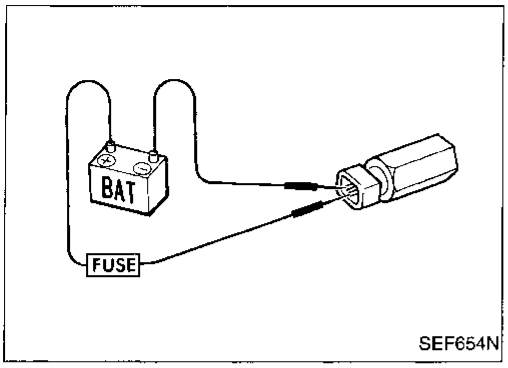
Approximately 10Ω



- Check plunger for seizing or sticking.
- Check for broken spring.

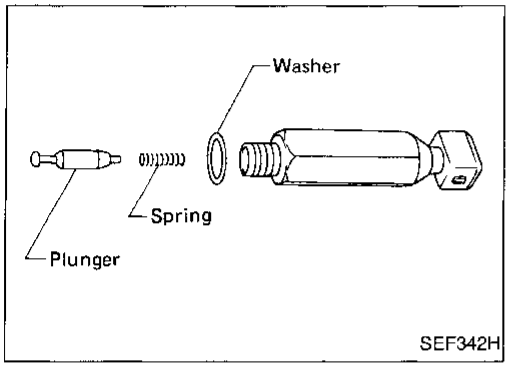
Electrical Components Inspection (Cont'd)

IACV-FICD SOLENOID VALVE



SEF654N

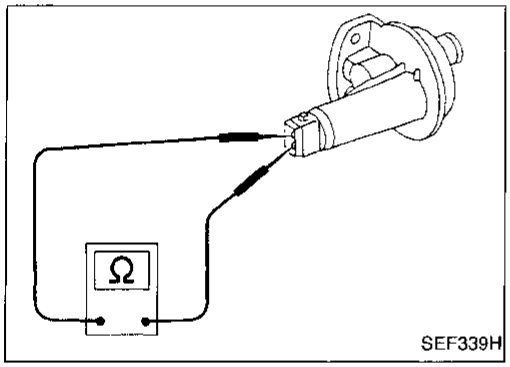
- Check for clicking sound when applying 12V direct current to terminals.



SEF342H

- Check plunger for seizing or sticking.
- Check for broken spring.

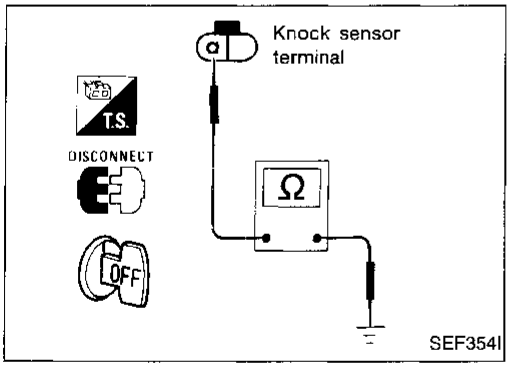
IACV-AIR REGULATOR



SEF339H

- Check IACV-air regulator resistance.
  Resistance:
  Approximately 70 - 80Ω
- Check IACV-air regulator for clogging.

KNOCK SENSOR

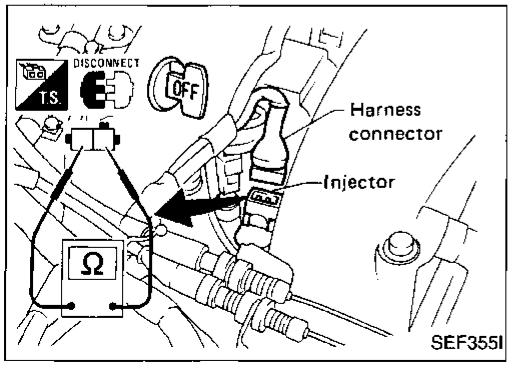


SEF354I

1. Disconnect knock sensor sub-harness connector.
2. Check continuity between terminal ⓐ and ground.

Continuity should exist.

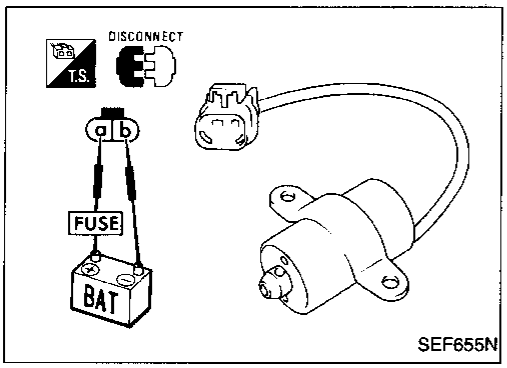
INJECTOR



SEF355I

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

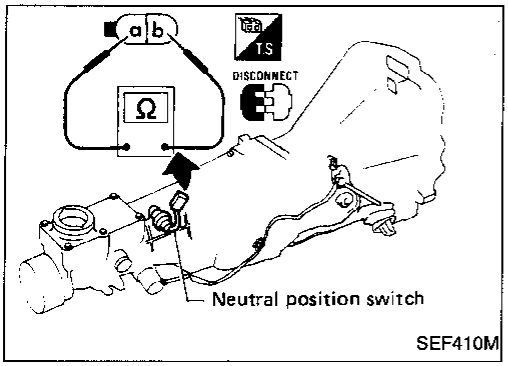
Electrical Components Inspection (Cont'd)



SEF655N

VALVE TIMING CONTROL SOLENOID VALVE

Check valve timing control solenoid valve for normal operation by supplying it with battery voltage between terminals ⓐ and ⓑ.
If NG, replace solenoid valve.



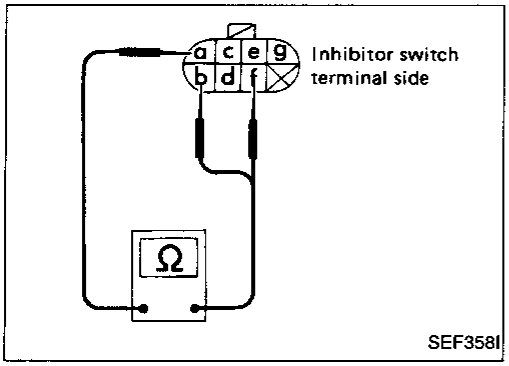
SEF410M

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.

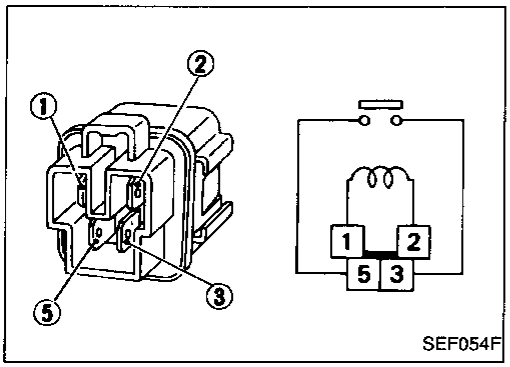


SEF358I

INHIBITOR SWITCH

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



SEF054F

ECCS RELAY, FUEL PUMP RELAY, COOLING FAN RELAY, COOLING FAN SUB-RELAY AND IGNITION COIL RELAY

Check continuity between terminals ③ and ⑤.

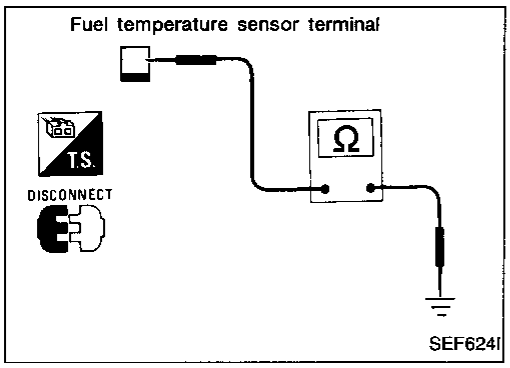
Conditions	Continuity
12V direct current supply between terminals ① and ②	Yes
No current supply	No

If NG, replace relay.

POWER STEERING OIL PRESSURE SWITCH

1. Disconnect power steering oil pressure switch harness connector.
2. Check resistance between terminals.
   Resistance: Approximately 2 - 3Ω

Electrical Components Inspection (Cont'd)

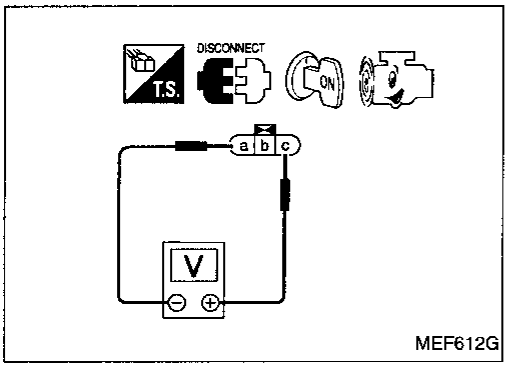


FUEL TEMPERATURE SENSOR

1. Disconnect fuel temperature sensor harness connector.
2. Check resistance between terminal and ground as shown in the figure.

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

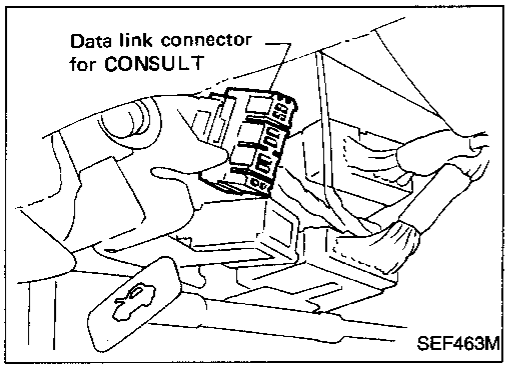
If NG, replace fuel inhibitor switch.



BOOST PRESSURE SENSOR

Check voltage between terminals.

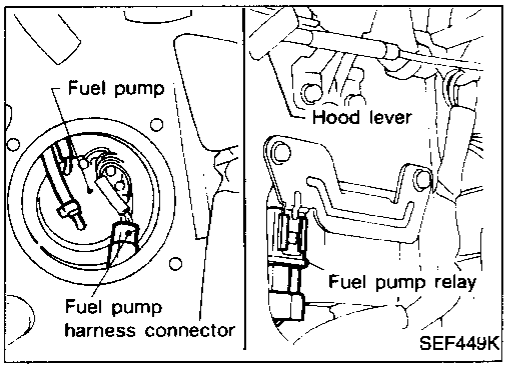
+	−	Engine condition	Voltage (V)
c	a	Idle	Approx. 5.2
c	b	Idle - 4,500 rpm	Approx. 2.7
c	b	Above 4,500 rpm	Approx. 3.1



Releasing Fuel Pressure

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

Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode with CONSULT.

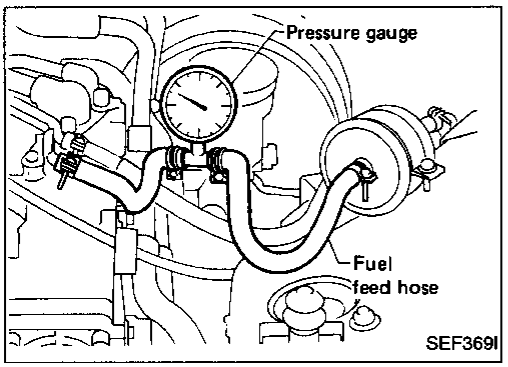


1. Remove fuel pump relay or disconnect fuel pump connector.
2. Start engine.
3. After engine stalls, crank it two or three times to release all fuel pressure.
4. Turn ignition switch off and reconnect fuel pump relay or fuel pump connector.

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.

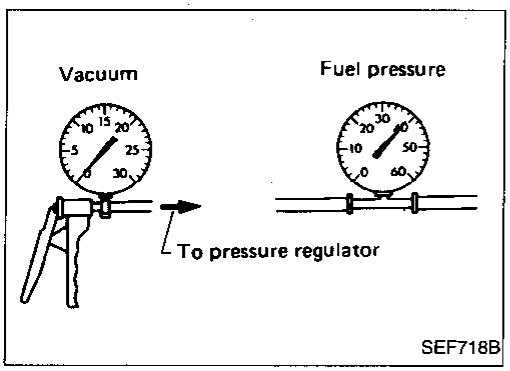
1. Release fuel pressure to zero.
2. Disconnect fuel hose between fuel filter and fuel tube (engine side).
3. Install pressure gauge between fuel filter and fuel tube.
4. Start engine and check for fuel leakage.



5. Read the indication of fuel pressure gauge.
   At idling:
   When fuel pressure regulator valve vacuum hose is connected.
   Approximately 250.1 kPa (2.55 kg/cm^2, 36.3 psi)
   When fuel pressure regulator valve vacuum hose is disconnected.
   Approximately 299.1 kPa (3.05 kg/cm^2, 43.4 psi)

Fuel Pressure Check (Cont'd)

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 indication of fuel pressure gauge as vacuum is changed.

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

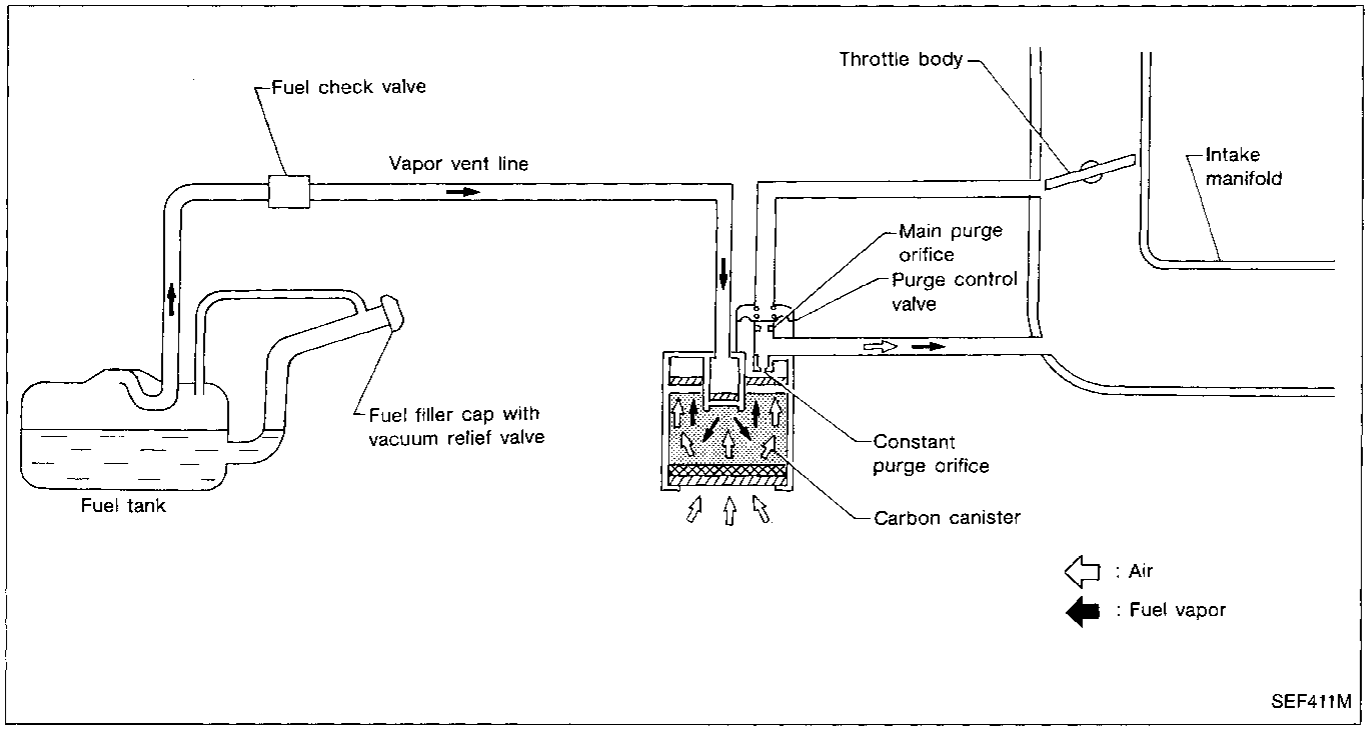
Injector Removal and Installation

1. Release fuel pressure to zero.
2. Drain coolant from radiator drain cock.
3. Remove or disconnect the following:
- Related harnesses, wires and tubes
- Intake manifold collector
  For details, refer to EM section.
4. Remove injectors with fuel tube assembly.
5. Remove injectors from fuel tube assembly.
6. Install injectors as follows:
1) Clean exterior of injector tail piece.
2) Use new O-rings.

CAUTION:
After properly connecting injectors to fuel tube assembly, check connections for fuel leakage.

7. Assemble injectors with fuel tube assembly to intake manifold.

Description



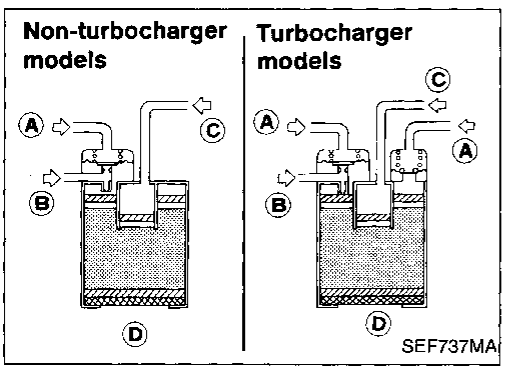
The evaporative emission system is used to reduce hydrocarbons emitted into the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the carbon canister.

The fuel vapor from sealed fuel tank is led into the canister when the engine is off. The fuel vapor is then stored in the canister. The canister retains the fuel vapor until the canister is purged by air.

When the engine is running, the air is drawn through the bottom of the canister. The fuel vapor will then be led to the intake manifold.

When the engine runs at idle, the purge control valve is closed. Only a small amount of vapor flows into the intake manifold through the constant purge orifice.

As the engine speed increases and the throttle vacuum rises, the purge control valve opens. The vapor is sucked through both main purge and constant purge orifices.



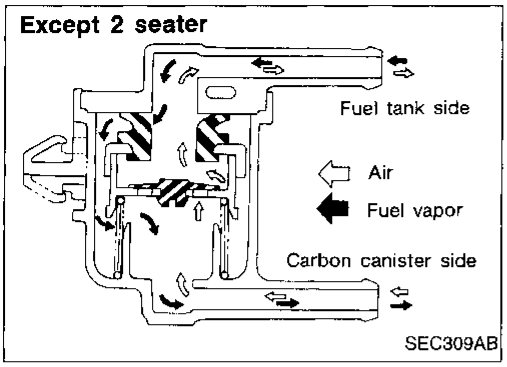
Inspection

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 Ⓑ.

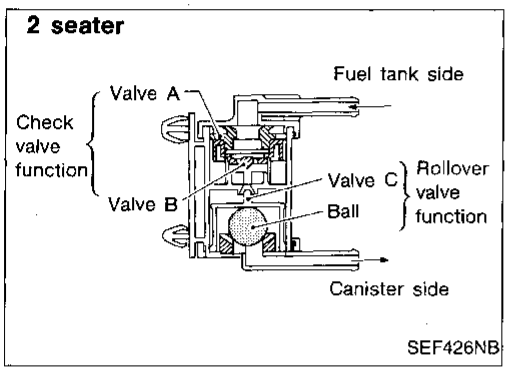
Inspection (Cont'd)



FUEL CHECK VALVE

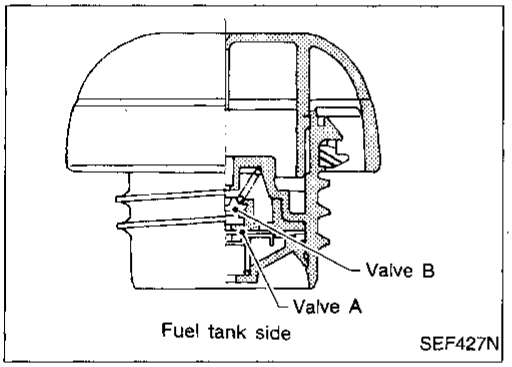
Check valve operation

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°.



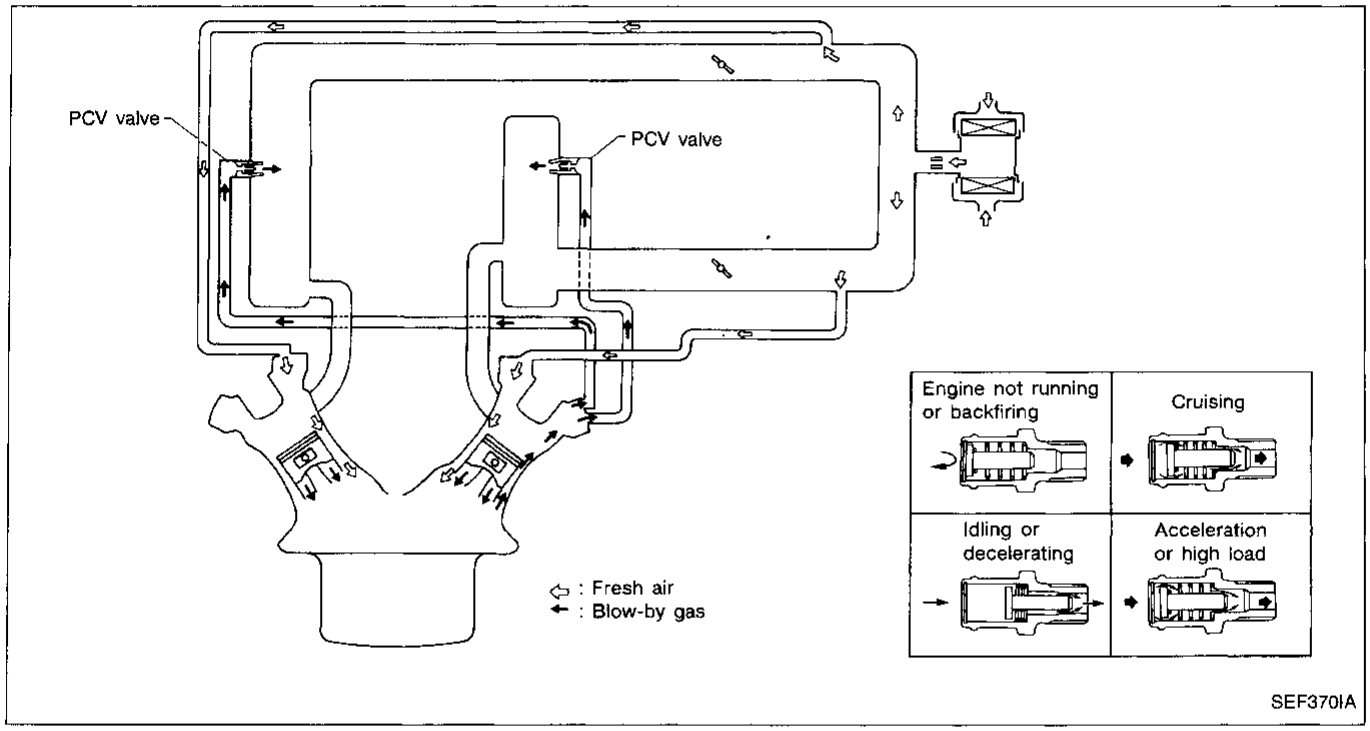
FUEL TANK VACUUM RELIEF VALVE

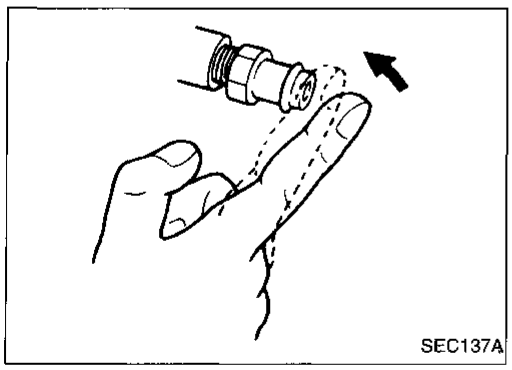
1. Wipe clean valve housing.
2. Suck air through the cap. A slight resistance accompanied by valve clicks indicates that valve A is in good mechanical condition. Note also that, by further sucking air, the resistance should disappear with valve clicks.
3. Blow air on fuel tank side and ensure that continuity 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 inlet tubes.
The positive crankcase ventilation (PCV) valves are 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 valves.
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 air inlet tubes into crankcase through a hose. The hose connects the air inlet tubes and the rocker cover.
Under full-throttle condition, the manifold vacuum is insufficient to draw the blow-by flow through the PCV valves. Flow then goes through the hose connection in the reverse direction.
Under any condition, some of the flow goes through the hose connection to the air inlet tubes. This will occur on vehicles with an excessively high blow-by.

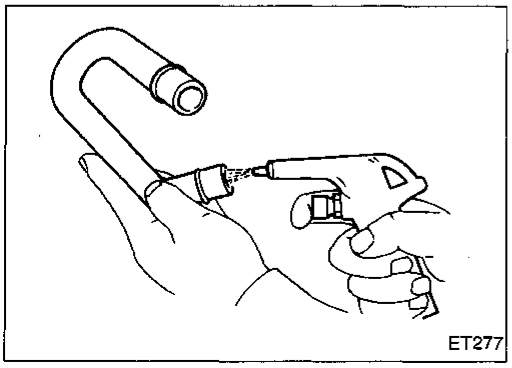




Inspection

PCV (Positive Crankcase Ventilation)

With engine running at idle, remove ventilation hose from PCV valve; if the 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)	299.1 (3.05, 43.4)

Inspection and Adjustment

		Turbocharger	Non-turbo charger
Idle speed*1	rpm		
No-load*2			
M/T			
U.S.A.		700±50	700±50
Canada		750±50	
A/T		750±50	770±50
Air conditioner: ON		850±50	800±50
Ignition timing	degree	15±2 BTDC	
Throttle position sensor idle position	V	0.4 - 0.5	

*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)
- Cooling fan: OFF

IGNITION COIL

Primary voltage	V	12
Primary resistance [at 20°C (68°F)]	Ω	Approximately 0.7
Secondary resistance [at 20°C (68°F)]	kΩ	Approximately 8

ENGINE COOLANT TEMPERATURE SENSOR AND FUEL 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

BOOST PRESSURE SENSOR

Engine condition	Voltage (V)
Idle - 4,500 rpm	Approximately 2.7
Above 4,500 rpm	Approximately 3.1

FUEL PUMP

Resistance	Ω	Approximately 0.2 - 5.0

EGR TEMPERATURE SENSOR

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

HEATED OXYGEN SENSOR HEATER

Resistance	Ω	3 - 1,000

IACV-AAC VALVE

Resistance	Ω	Approximately 10

INJECTOR

Resistance	Ω	10 - 14

THROTTLE POSITION SENSOR

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

IACV-AIR REGULATOR

Resistance	Ω	70 - 80

POWER STEERING OIL PRESSURE SWITCH

Resistance	Ω	Approximately 2 - 3